



2180 Montreal Rd,
Ottawa, ON

STORMWATER MANAGEMENT REPORT

FOR PROPERTY OF PETRO-CANADA LOCATED AT

2180 MONTREAL RD, OTTAWA, ONTARIO

Prepared For
SUNCOR ENERGY PRODUCTS PARTNERSHIP



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Table of Contents

1. INTRODUCTION	4
2. GENERAL INFORMATION	4
2.1 STUDY AREA	4
2.2 BACKGROUND	5
2.3 OBJECTIVES OF DRAINAGE AND STORMWATER MANAGEMENT STUDY.....	5
3. DESIGN	6
3.1 DESIGN CRITERIA.....	6
3.2 SITE DRAINAGE CONDITIONS.....	6
3.2.1 EXISTING DRAINAGE CONDITIONS	6
3.2.2 PROPOSED DRAINAGE CONDITIONS	7
3.3 ALLOWABLE RELEASE RATE	8
3.4 PROPOSED STORMWATER MANAGEMENT PLAN	9
3.4.1 QUANTITY CONTROL.....	9
3.4.2 QUANTITY CONTROL SUMMARY	13
3.4.3 WATER BALANCE TARGET	14
3.4.4 QUALITY CONTROL.....	15
4. OPERATIONS AND MAINTENANCE MANUAL	15
5. EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION	16
6. SUMMARY AND CONCLUSION	16

TABLES

Table 3-1 Runoff coefficients for Pre-development controlled catchment 1	7
Table 3-2 Runoff coefficients for Pre-development controlled catchment 2.....	7
Table 3-3 Runoff coefficients for Post-development catchment 1	8
Table 3-4 Runoff coefficients for Post-development catchment 2	8
Table 3-5 Adjusted runoff coefficients	8
Table 3-6 Peak Flows 5 - 100 Year Events (Controlled).....	9
Table 3-7 Peak Flows 5 – 100 Year Events (Uncontrolled)	10
Table 3-8 Required Storage Volume for 100yr storm event (Catchment 1).....	11
Table 3-9 Summary of Actual Storage Provided in Stormwater management structures for Catchment 1	11
Table 3-10 Summary of Actual Storage Provided in Ponding for Catchment 1.....	12
Table 3-11 Summary of Actual Storage Provided in Underground conduits for Catchment 1	12



Table 3-12 Summary of Total Storage for Catchment 1.....	12
Table 3-13 Summary of Actual Storage Provided.....	13
Table 3-14 Water balance requirement for the site.....	14
Table 3-15 Water Balance – Total Water Retained on site.....	14

FIGURES

Figure 1: Study Area.....	4
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1. INTRODUCTION

This stormwater management report was prepared on April 2026 by James Sam (P.Eng with direct experience with the Ministry related items for 15+ years in the civil field) for the site located in 2180 Montreal Rd to meet the stormwater management objectives set out by the MOE, City of Ottawa and the MECP and in a manner that mitigates any adverse effects. This report is accurate as of April 2026 based on the site assessment conducted in respect to the catchment area of the stormwater management works and following information provided:

- (1) Topographical and Legal survey by Northern Link Survey Group dated 23 November 2024
- (2) City Record Drawing obtained from City of Ottawa : (Drg No: 87-1268-6 prepared by R.W. Connerly Associated Ltd dated April 1988)
- (3) Site plan prepared by K Paul Archirect Inc dated 2026-04-02
- (4) Geotechnical Investigation Report prepared by Terrapex dated May 24, 2024

2. GENERAL INFORMATION

2.1 Study Area

The study area is located at south-west corner of the intersection of Shefford Rd and Montreal Rd. The civic address for this property is 2180 Montreal Rd, Ottawa, Ontario and is shown in Figure 1. The study area includes two existing properties which are to be combined. The larger property is an existing gas station and a car wash and the other is a small residential development with a house. Please refer to SP1 in the appendix. The proposed redevelopment scope includes relocation of gas pumps and relocation of the existing convenience store into a new building to include a drive through restaurant. A portion of the site will be redeveloped to accommodate for the abovementioned changes.



Figure 1: Study Area



I, James Sam conducted an assessment of the site and in my opinion, the proposed activity is an activity prescribed by section 2 of Environmental Protection Act - O. Reg. 245/11 -Registration under Part II.2 of the Act – General. The main activities proposed at this site as part of this redevelopment are fuel refilling, instore sales, drive through sales, and a carwash. Monitoring wells have been installed at various locations throughout the site to monitor any impact to the groundwater from the proposed activities at this site.

The site is located within the Rideau Valley Source Protection Area and not within any drinking water intake protection zones or well head protection areas. Moreover, the site is situated in Ottawa, and not located in the Lake Simcoe watershed, Niagara escarpment planning area, the portion of the Oak Ridges Moraine Area or the protected countryside in the greenbelt plan established under the Greenbelt Act 2025.

The precipitation patterns in this area is characterized by a humid continental climate with precipitation throughout the year, including snowy winters and wet summer months. Although annual precipitation is consistent, the highest rainfall typically occurs in late spring and summer, particularly in June while early spring conditions are influenced by snowmelt and increased runoff.

The site itself is generally flat, with most drainage contained internally; however, a portion along the property boundary adjacent to Shefford Rd and Montreal Rd currently drains toward the right-of-way. As per the Geotechnical Report prepared by Terrapex dated May 24, 2024, the groundwater depth at the site varies between 0.7 to 1.7 meters below ground surface. As per the report, the nature of the soil beneath the topsoil is mostly Silty clay.

2.2 Background

This study addresses the Stormwater Management (SWM) requirements for the proposed redevelopment and provides details for stormwater quantity and quality control to ensure that the proposed development will not have any adverse effects on the existing drainage system.

2.3 Objectives of Drainage and Stormwater Management Study

The objectives of the SWM study are to develop a strategy that will:

- Identify potential stormwater runoff (quality and quantity) impacts to the receiving watercourses from the proposed development area.
- Address concerns from the review agencies including the City of Ottawa, and the Ministry of Environment, Conservation and Parks (MECP) for the preparation of a Stormwater Management study for quantity & quality purposes.
- Provide an appropriate site drainage system for safe operational use.

3. DESIGN

3.1 Design criteria

General Stormwater Management guidelines and information was obtained from the criteria outlined in the comments received from City of Ottawa dated 2025, the Stormwater Management Planning and Design Manual 2003 and Ontario MOE: *Understanding Stormwater Management: An Introduction to Stormwater Management Planning and Design*.

The post-development hydrologic conditions for the site were established utilizing the current (IDF information derived from the Meteorological Services of Canada rainfall data taken from the MacDonald Cartier Airport) including the current 5-Year to 100-Year IDF data. A conservative surface run-off coefficient of 0.90 was used for impervious surfaces and 0.25 was used for pervious surfaces (ie. landscape). (Refer to drainage plan P-302). Considering the subject property is a relatively small area, the “Modified Rational Method” was used to calculate the predevelopment and post development flow generated from the property.

3.2 Site Drainage Conditions

3.2.1 Existing Drainage Conditions

The existing gas station property is fully developed with a car wash, pumping station and a convenience store with an area of 0.51 ha. The rear property which is to be included with this site as part of the redevelopment, includes a residential dwelling and a driveway with an area of 0.09 ha. The existing commercial property is fully developed with drainage structures and conveyance system in place. It is currently directing the captured drainage to the municipal storm sewer along Shefford Rd. The site topography drains in the easterly direction towards Shefford Rd. The residential property does not have any stormwater management controls in place.

The study area is delineated into two catchments for both predevelopment and post development conditions, identified as controlled catchment 1 and uncontrolled sub-catchment 2. Refer to Drainage Plan P-302.

Predevelopment Catchment-1 (Controlled)

The controlled Predevelopment Catchment-1 consists of the majority of the commercial site area (0.4784 ha). The existing residential property does not have any stormwater control in place, therefore the predevelopment catchment 1 comprises only of the controlled portion of the commercial property. The stormwater runoff from the predevelopment catchment-1 is captured by the currently existing stormwater catchment structures within the commercial property. Table 3-1 below summarizes the existing areas and runoff coefficients for the entire predevelopment-controlled catchment 1.

Surface Composition		Impervious	Pervious Grass / Mulch	Total under consideration
Existing Condition	(m ²)	3178.72	1605.28	4784
	(ha)	0.318	0.161	0.478
Runoff Coefficient		0.900	0.250	0.68

Table 3-1 Runoff coefficients for Pre-development controlled catchment 1

Predevelopment Catchment-2 (Uncontrolled)

The Predevelopment catchment -2 (0.128 ha) represents a small strip of landscape area along the north east and east of the commercial property and the entire area of the residential property. This area will flow uncontrolled mostly towards Shefford Rd while a portion will flow on to Montreal Rd and they will both enter the stormwater collection system along the municipal right of way. Table 3-2 below summarize the existing areas and runoff coefficients for the entire predevelopment uncontrolled catchment 2.

Surface Composition		Impervious	Pervious Grass / Mulch	Total under consideration
Existing Condition	(m ²)	853.46	423.20	1277
	(ha)	0.0853	0.042	0.128
Runoff Coefficient		0.900	0.250	0.68

Table 3-2 Runoff coefficients for Pre-development controlled catchment 2

3.2.2 Proposed Drainage Conditions

The post development study area is delineated into two catchments, identified as controlled catchment 1 and uncontrolled sub-catchment 2 (Refer to Drainage Plan P-303).

Post-development Catchment-1 (Controlled)

Catchment-1 consist of the majority of the site area (0.5438 ha). The stormwater runoff from the post-development catchment-1 will be captured by various existing and proposed drainage structures throughout the site. The flow will be controlled by a 121mm orifice tube installed at the outlet of STM MH3 and treated by a proposed Jellyfish filter, prior to discharging into the 400mm lateral and eventually into the 550 mm existing storm sewer along Shefford Rd. (Refer to Servicing Plan P-301 in Appendix C). The proposed areas and runoff coefficients and for Post-development catchment-1 are shown in Table 3-3 below:

Surface Composition		Impervious	Pervious Grass	Total under consideration
Proposed Condition	(m ²)	4159	1279	5438
	(ha)	0.416	0.128	0.544
Runoff Coefficient		0.900	0.250	0.75

Table 3-3 Runoff coefficients for Post-development catchment 1

Post-development Catchment-2 (Un-controlled)

The uncontrolled catchment -2 (0.072 ha) represents a small strip of landscape area along the northeast and east of the property. This area will sheetflow uncontrolled mostly towards Shefford Rd while a portion will flow on to Montreal Rd and they will both enter the stormwater collection structures along the municipal right of way. The proposed areas and runoff coefficients for the post-development sub-catchment-2 are shown below in Table 3-4.

Surface Composition		Impervious	Pervious Grass	Total under consideration
Proposed Condition	(m ²)	68	555	623
	(ha)	0.007	0.055	0.062
Runoff Coefficient		0.900	0.250	0.32

Table 3-4 Runoff coefficients for Post-development catchment 2

3.3 Allowable Release Rate

For estimating flows using the Rational Method for storms greater than the 10-year return storm, for proposed site conditions, runoff coefficients are increased 10%, 20% and 25% for the 25-year, 50-year and 100-year storms respectively to account for additional runoff due to soil saturation and the reduced accuracy associated with larger storms. (Refer to Table 3-5 below)

St. Event	Controlled	
	Existing	Proposed
Runoff Coefficient		
2-Year	0.500	0.75
5-Year	0.500	0.75
10-Year	0.500	0.75
25-Year	0.500	0.82
50-Year	0.500	0.90
100-Year	0.500	0.93

Table 3-5 Adjusted runoff coefficients

A runoff coefficient of **0.5** was used to generate the flow for existing site condition. The calculated allowable release rate for the project site is as follows:

$$Q = 0.00278 C I A \leftarrow \text{Equation (1)}$$

Where Q : = Maximum Runoff Rate (m^3/sec)
 C : = Runoff Coefficient
 I : = Rainfall Intensity (mm/hr) (5 – year storm event)
 A : = Drainage Area (ha)

$$Q_{\text{target}} = 0.00278 * 0.5 * 104.19 * 0.478$$

$$Q_{\text{target}} = 0.0693 \text{m}^3/\text{sec} \rightarrow \text{Allowable Release Rate}$$

3.4 Proposed Stormwater management plan

3.4.1 Quantity Control

The drainage pattern is expected to change due to the increase in impervious surfaces for the proposed development. In order to satisfy the City requirements, quantity controls have been provided to ensure post development peak run-off is controlled to pre-development levels for the 5 – 100-year storm events.

Onsite storage and flow control is provided using an orifice tube restrictor located at the outlet of Storm Manhole #3 for the post development controlled catchment 1 prior to discharging off-site to limit the release rates to the allowable release rate.

Considering this is a relatively small area, the “Modified Rational Method” was used to generate the surface runoff for each storm event as follows:

Proposed Controlled flow rate

The results of peak flow rates (m^3) generated by the “Modified Rational Method” for existing and proposed conditions for the controlled and uncontrolled catchments in the post development conditions are shown in Table 3-6 & Table 3-7 below.

Storm Event	Rainfall Intensity (mm/hr)				<Equation 1> Flow Rate (m^3/sec)		
	a	b	c	I	Existing Controlled	Proposed- Controlled	Excess Flow
2-Year	732.951	0.810	6.199	76.81	0.0511	0.0867	0.0357
5-Year	998.071	0.814	6.053	104.19	0.0693	0.1177	0.0484
10-Year	1174.184	0.816	6.014	122.14	0.0812	0.1379	0.0567
25-Year	1402.884	0.819	6.018	144.69	0.0962	0.1798	0.0835
50-Year	1569.580	0.820	6.014	161.47	0.1074	0.2188	0.1115
100-Year	1735.688	0.820	6.014	178.56	0.1187	0.2521	0.1333

Table 3-6 Peak Flows 5 - 100 Year Events (Controlled)

Storm Event	Rainfall Intensity (mm/hr)				<Equation 1> Flow Rate (m ³ /sec)		
	a	b	c	I	Existing - Uncontrolled	Proposed - Uncontrolled	Excess Flow Uncontrolled
2-Year	732.951	0.810	6.199	76.81	0.0187	0.0043	-0.0144
5-Year	998.071	0.814	6.053	104.19	0.0253	0.0058	-0.0195
10-Year	1174.184	0.816	6.014	122.14	0.0297	0.0068	-0.0229
25-Year	1402.884	0.819	6.018	144.69	0.0352	0.0080	-0.0271
50-Year	1569.580	0.820	6.014	161.47	0.0392	0.0090	-0.0303
100-Year	1735.688	0.820	6.014	178.56	0.0434	0.0099	-0.0335

Table 3-7 Peak Flows 5 – 100 Year Events (Uncontrolled)

As per Table 3-6, the allowable release rate for the predevelopment catchment 1 is based on the 5-year storm event which has a flow rate of 0.0693m³/s. However, this rate will be reduced to a target flow rate of **0.0594m³/s** to compensate for the flow from the uncontrolled post development catchment 2 (0.009m³/s). The target release rate will be achieved using an orifice tube restrictor at the outlet of Storm Manhole #3.

Sizing of the orifice is given by the formula.

$$1.1.1.1.1.1.1. \quad Q = C A \sqrt{2 g h} \quad \leftarrow \text{Equation (2)}$$

Where Q = Flow Rate Through Orifice (m³/sec) = $Q_{\text{Allowable}}$

C = Contraction Coefficient = 0.80 (For Orifice Pipe)

A = Area of Orifice Pipe (m²)

g = Acceleration Due To Gravity (m/sec²) = 9.81 (m/sec²)

h = Pressure Head To Be Dissipated (m)

By trial-and-error calculations, a 121mm orifice pipe is required to control the flow to the Target release rate.

$$Q = (0.80)\pi \left(\frac{0.121}{2}\right)^2 \sqrt{2 * 9.81 * \left(67.45 - 65.29 - \left(\frac{0.121}{2}\right)\right)}$$

$$Q = 0.0590 \text{ m}^3/\text{sec} \leq 0.0594 \text{ m}^3/\text{sec} \text{ (target release rate)}$$

Based on the calculated orifice release rate of $Q = 0.0590\text{m}^3/\text{s}$, the required storage for the 100-year storm event is calculated using the “Modified Rational Method” and is shown below Table 3-8.

Storm Event	Tc	Id 100 Years	Qpost	Qorrifice	Excess Flow	Volume(m³)
5 Yr Pre 100 Yr Post	5	243	0.3426	0.0590	0.2836	85.088
	7	212	0.2988	0.0590	0.2398	100.721
	10	179	0.2521	0.0590	0.1931	115.842
	15	143	0.2017	0.0590	0.1427	128.448
	20	120	0.1693	0.0590	0.1103	132.394
	25	104	0.1466	0.0590	0.0876	131.391
	30	92	0.1297	0.0590	0.0707	127.229
	35	83	0.1166	0.0590	0.0576	120.893
	40	75	0.1061	0.0590	0.0471	112.978
	45	69	0.0975	0.0590	0.0385	103.868
	50	64	0.0903	0.0590	0.0313	93.824
	55	60	0.0842	0.0590	0.0252	83.032
	60	56	0.0789	0.0590	0.0199	71.628
	65	53	0.0743	0.0590	0.0153	59.713
	70	50	0.0703	0.0590	0.0113	47.367
	Max Volume Required					132.39

Table 3-8 Required Storage Volume for 100yr storm event (Catchment 1)

Therefore, the 121mm orifice tube at the outlet of Storm Manhole #3 will generate an on-site required storage of 132.39 m³. The storage is met by a combination of underground piping, storm drainage structures (CB's and MH's) and proposed dry ponds above stormwater catchment structures within the subject property. The generated storage is illustrated in the tables below:

Structure	Size	Area	Maximum.	Invert	Volume
	(mm)	(m²)	Water level	(m)	(m³)
CB1	600x600	0.36	67.45	66.05	0.50
CBMH1	1500	1.77	67.31	65.83	2.61
CB2	600x600	0.36	67.33	65.91	0.51
STM MH1	1200	1.13	67.34	65.63	1.94
CBMH2	1500	1.77	67.20	65.47	3.05
EX.STM MH1	1200	1.13	67.45	66.68	0.87
CB3	600x600	0.36	67.35	66.08	0.46
CBMH3	1200	1.13	67.25	65.93	1.49
CBMH4	1500	1.77	67.20	65.76	2.54
STM MH3	1500	1.77	67.45	65.29	3.81
CB4	600x600	0.36	66.80	65.99	0.29
Sum					18.07

Table 3-9 Summary of Actual Storage Provided in Stormwater management structures for Catchment 1



Ponding	Area (m ²)	Top of Ponding	Bottom of Ponding	Volume (m ³)
Ponding 1	132.00	67.45	67.33	5.28
Ponding 2	57.48	67.45	67.31	2.68
Ponding 3	196.94	67.45	67.20	16.41
Ponding 4	401.63	67.45	67.20	33.47
Ponding 5	44.92	67.45	67.25	2.99
Ponding 6	19.48	67.45	67.35	0.65
Ponding 7	88.38	67.45	66.80	31.91
Sum				93.4

Table 3-10 Summary of Actual Storage Provided in Ponding for Catchment 1

Pipe ID	Diameter (mm)	Area (m ²)	Length (m)	Volume (m ³)
1	250	0.05	19.40	0.95
2	250	0.05	18.20	0.89
3	150	0.02	9.40	0.17
4	150	0.02	9.10	0.16
5	600	0.28	32.30	9.13
6	150	0.02	6.30	0.11
7	150	0.02	9.50	0.17
8	300	0.07	12.90	0.91
9	400	0.13	8.20	1.03
10	250	0.05	20.40	1.00
11	300	0.07	9.40	0.66
12	150	0.02	11.20	0.20
13	600	0.28	28.90	8.17
14	300	0.07	19.50	1.38
15	600	0.28	16.70	4.72
Sum				29.65

Table 3-11 Summary of Actual Storage Provided in Underground conduits for Catchment 1

Storage Volume for 100-year Storm Event (m³)	
Catch Basins and Manholes	18.07
Underground Conduits	29.65
Ponding	93.40
Total Provided	141.11
Total Required	132.39

Table 3-12 Summary of Total Storage for Catchment 1

The total storage provided on site for stormwater runoff is 141.11 m³ which is more than the required volume of 132.39m³.

50% Blockage

The inlet capacity of the stormwater catchment structures have been analyzed below, assuming 50% blockage-on-site for the 100 yr storm flow rate, using the “*MTO Design Chart 4.19 Inlet Capacity at Road Sag*”.

Drain Catchment Reference	Drain Reference	Cacthment Structure Top Elevation	Max Ponding Elevation	Depth/Head (m)	Inlet Capcity (m3/s) (MTO Design 4.19)	Inlet Capacity at 50% Blocked Condition (m3/s)2	Excess Flow Capacity of CB/MH (m3/s)
A	CB1	67.55	67.45		-		
C	CB2	67.33	67.45	0.12	0.09	0.04	0.02
B	CBMH1	67.31	67.45	0.14	0.11	0.06	0.03
D	CBMH2	67.20	67.45	0.25	0.18	0.09	0.06
F	CB3	67.35	67.45	0.10	0.06	0.03	0.01
G	CBMH3	67.25	67.45	0.20	0.16	0.08	0.07
H	CBMH4	67.20	67.45	0.25	0.18	0.09	0.06

Table 3-13 Summary of Actual Storage Provided

The 50% blocked inlet condition capacity of each catchment at 100-Year Post Dev exceeds the 100-Year Post Site flow rate indicating that the catch basins will have sufficient capacity to capture runoffs within the internal storm sewer system.

3.4.2 Quantity Control Summary

The overall release rate for the site is the sum of the controlled flow rate from the post-development controlled catchment 1+ the post development uncontrolled flow from the catchment 2. See below for overall release rate.

Overall release rate for the site = Controlled Post-development Catchment 1+ Uncontrolled Post-development Catchment 2

$$Q = 0.0590 + 0.009$$

$$Q = 0.0689 \text{ m}^3/\text{s}$$

Therefore, the overall release rate is 0.0689m³/s which is less than the allowable release rate of 0.0693m³/s as per calculations shown in section 3.2.1.

The controlled flow from the site will discharge into the city 550mm storm sewer via the existing city owned catch basin along Shefford Rd.

3.4.3 Water Balance target

The primary objective of the Water Balance Targets/Criteria is to capture and manage annual rainfall on the development site itself to preserve the pre-development hydrology through a combination of infiltration, evapotranspiration, landscaping, rainwater reuse and/or other low impact development practices. The water balance target for this site is to retain runoff from a **5mm, 24-hour event** as illustrated in Table 3-14.

Total Site Area [m2]	6060.66
Rainfall depth to be retained [m]	5.00
Volume to be retained [m3]	30.30

Table 3-14 Water balance requirement for the site

To achieve the required water balance, the site composition is assigned an initial abstraction value as follows: 5mm (landscape) and 1mm (hard surface -roof/concrete/asphalt).

In addition to the initial abstraction, the dry pond proposed at the southwest corner of the site for quantity control purpose will also contribute to the water balance requirement. However due to high groundwater elevation, limited space and the nature of the type of soil encountered in this site, the amount of water to be infiltrated is limited.

Cover Type	Area [m2]	IA [mm]	Volume [m3]
Landscape	2028.48	5	10.14
Asphalt/ Concrete	2911.87	1	2.91
Building	1120.30	1	1.12
Total - Initial Abstraction	6060.66	-	14.17
Dry pond #6	-	-	31.91
Total - Infiltration	-	-	31.91
TOTAL WATER RETAINED	-	-	46.08

Table 3-15 Water Balance – Total Water Retained on site

Methods investigated that could not be implemented due site conditions and restrictions included:

1. Green roofs – cannot be implemented due to additional loading to structure and conflicts with mechanical equipment.
2. Infiltration trench – cannot be implemented due to high ground water levels (Based on the Geotech report prepared by Terrapex dated May 24, 2024, the groundwater depth at the site varies between 0.7 to 1.7 meters below ground surface.)
3. Bio-retention – cannot be implemented with the limited amount of space.



Therefore the maximum volume of water that can be retain in the site for water balance purpose is 46.08 m³. Overall, various water balance techniques were explored, and best management practices have been implemented on this project.

3.4.4 Quality Control

Stormceptor EFO4 has been proposed at the outlet of the storm system prior to discharging into the existing City storm network on Shefford Rd.

As the subject property is a gas station, the potential for contaminants captured by runoffs is high and may contain variety of pollutants including but not limited to the following: sediments, free oils and petroleum hydrocarbons. Additional requirements include meeting the enhanced TSS removal target of 80%

As per the attached Stormceptor Report in Appendix D the selected Stormceptor EFO4 is able to achieve a TSS removal rate of 85% and the proposed Stormceptor EFO4 performance is certified in accordance with Canadian ETV (Environmental Technology Certification) Program. The Stormceptor is designed to capture and retain sediments (TSS), free oils, heavy metals and petroleum hydrocarbons from runoffs prior to discharge into the municipal storm sewer network.

4. OPERATIONS AND MAINTENANCE MANUAL

Sediments and contaminants (i.e hydrocarbons, free oils, etc) will be captured and treated via an oil grit separator (OGS) and other methods prior to discharge offsite. Examples of pretreatment devices include, but are not limited to, an appropriately sized catchbasin(s) and manholes with sump, and a Stormceptor EFO4. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendation. The majority of suspended solids will be captured and treated by the Stormceptor.

Maintenance of the Stormceptor would be required under the following conditions:

1. Post construction if inspection indicates presence of construction sediment depth greater than a few inches.
2. Once the sediment depth for the selected EFO4 reaches the depth of 8in/610mm
3. Immediately after oil, fuel, or chemical spill.

Maintenance is to be carried out during dry weather conditions when no runoff is entering the OGS and carried out from grade through the manhole access cover via a standard vacuum truck to remove pollutants from the lower chamber via the outlet riser.

Please refer to the Stormceptor EF Owner's Manual in Appendix D for further operations and maintenance details.

5. EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

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 silt-sacks and mud-mats, etc. as shown on Drg P-303 - Erosion Control 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.

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6. SUMMARY AND CONCLUSION

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

- The Stormwater flow from the Site is controlled to pre-development conditions.
- The proposed SWM facilities provide ENHANCED level of protection as specified by the Ministry of the Environment
- The proposed SWM techniques meet both quantity and quality requirements.
- 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, sedimentation, and erosion control.

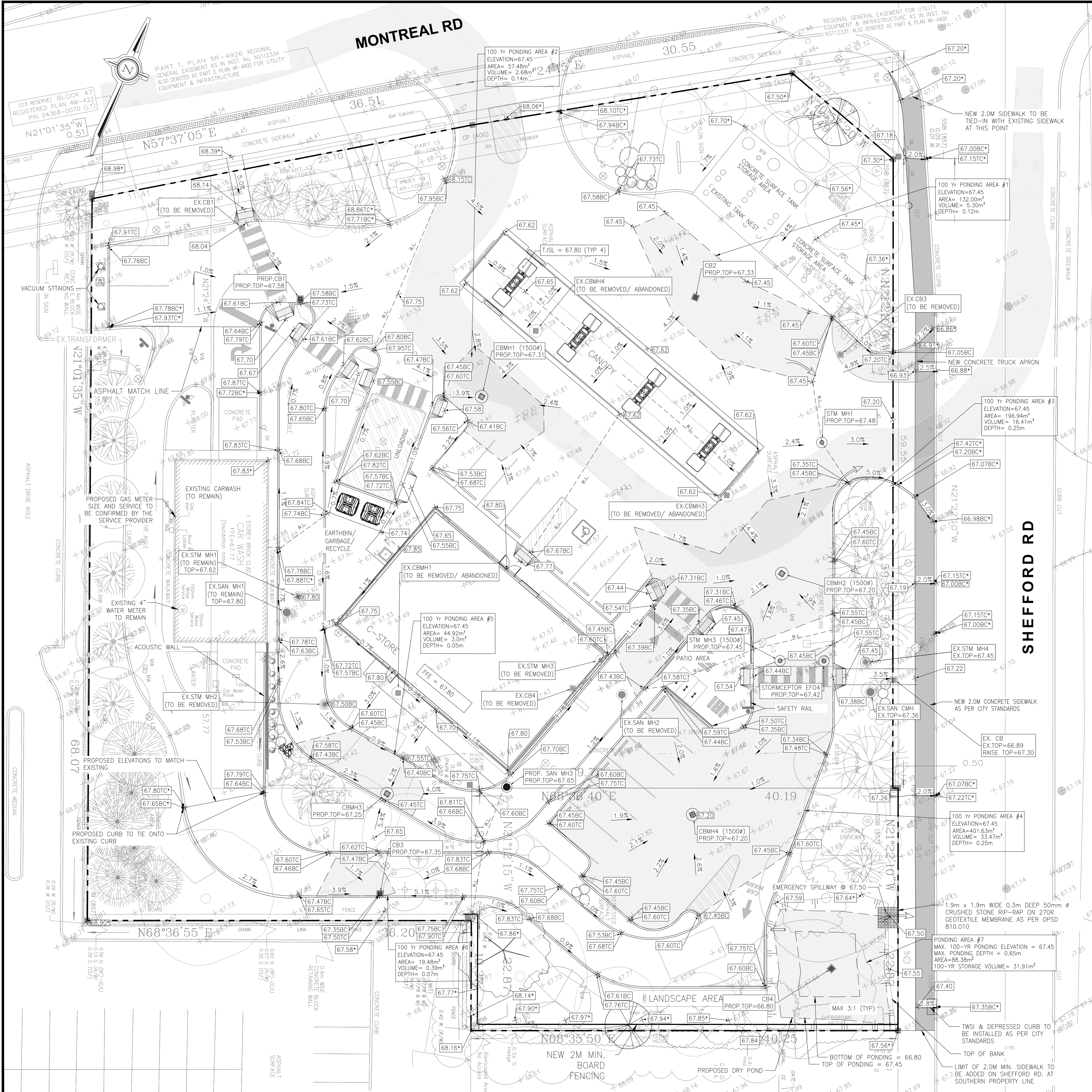
James Sam, P.Eng
Tel (416) 229-2636
j.sam@jandb-inc.com





2180 Montreal Rd,
Ottawa, ON

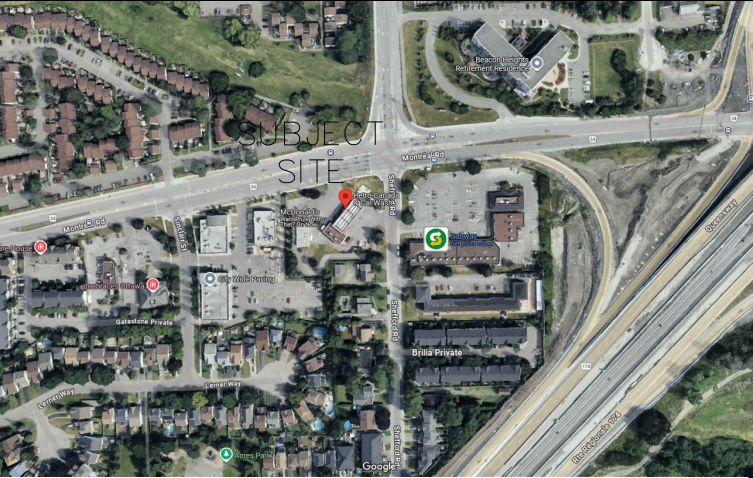
Appendix A - GRADING PLAN



GENERAL NOTES

1. VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.
2. DO NOT SCALE DRAWINGS.
3. REPORT ALL DISCOVERIES OF ERRORS, OMISSIONS OR DISCREPANCIES TO THE DESIGN ENGINEER AS APPLICABLE.
4. USE ONLY LATEST REVISED DRAWINGS OR THOSE THAT ARE MARKED "ISSUED FOR CONSTRUCTION".
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6. ALL WORKS AND MATERIALS USED SHALL COMPLY AS REQUIRED BY THE BUILDING CODE LATEST EDITION.
7. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS & SPECIFICATIONS.
8. EVERYTHING IS TO BE CONSIDERED NEW UNLESS SPECIFIED EXISTING OTHERWISE.

NO DISTURBANCE TO THE EXISTING GRADE WITHIN ALL TPZ SHOWN ON LANDSCAPE PLANTING PLAN L-01 & L-02 BY RUHLAND AND ASSOCIATES LTD DATED 2026/01/06



KEY PLAN
NTS

PLAN OF SURVEY OF
BLOCK 60 AND PART OF BLOCK 59
REGISTERED PLAN 4M-916
AND PART OF LOT 16
CONCESSION 1 (OTTAWA FRONT)
(GEOGRAPHIC TOWNSHIP OF GLOUCESTER)
CITY OF OTTAWA

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BEARINGS SHOWN HEREON ARE GRID AND ARE REFERRED TO THE WESTERLY LIMIT OF SHEFFORD ROAD AS DERIVED FROM OBSERVED CONTROL POINTS 'A' AND 'B' AND HAVING A BEARING OF N 21°22'10" W.
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NOTES

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FENCES AND OCCUPATION ARE AS INDICATED ON THIS PLAN OF SURVEY.

OBSERVATIONS TO STRUCTURES ON THE SUBJECT LANDS HAVE BEEN MADE TO THE EXPOSED EXTERIOR CLADDING OF THE STRUCTURES AS SHOWN.

BEARING ROTATION:

FOR BEARING COMPARISONS, A ROTATION OF 00°39'40" COUNTER-CLOCKWISE WAS APPLIED TO PLAN P3.

BENCHMARK

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LOCAL BENCHMARK:

THE TOP NUT OF A FIRE HYDRANT LOCATED APPROXIMATELY 14m SOUTH OF DRIVEWAY ENTRANCE TO THE SUBJECT LANDS ALONG SHEFFORD ROAD AND HAVING AN ELEVATION OF 67.88 (NAD83; CSRS: v7-2010, GEOD MODEL HT2.0-2002.0)

LEGEND

- EXISTING ELEVATION
- EXISTING CATCHBASIN
- EXISTING C.B./M.H.
- EXISTING STM MANHOLE
- EXISTING SANITARY MANHOLE
- PROPOSED SLOPE
- FLUSH WITH FINISH GRADE ABOVE FINISH GRADE
- PROPOSED ELEVATION MATCH EXIST. ELEVATION
- PROP. ELE. (CURB TOP)
- PROP. ELE. (CURB BOTTOM)
- NEW CATCHBASIN
- NEW C.B./M.H.
- NEW SANITARY MANHOLE
- PROPERTY LINE
- RIDGE LINE
- OVERLAND FLOW
- SURFACE PONDING AREA

REVISION TABLE

REV.	DESCRIPTION	DRAWN	APP'D.	DATE
1	REVISED AS PER CITY COMMENT	DL	JS	2026-07-23

ISSUE TABLE

TO	FOR	DATE
SUNCOR	ISSUED FOR REVIEW	16 MAR '26
SUNCOR	ISSUED FOR REVIEW	31 MAR '26
SUNCOR	ISSUED FOR COORDINATION	05 AUG '26
SUNCOR	ISSUED FOR SPA	23 SEP '26

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SEAL



CONSULTANT



DRAWING TITLE:

SITE GRADING PLAN

PROJECT:

2180 MONTREAL RD
@SHEFFORD RD
OTTAWA, ON

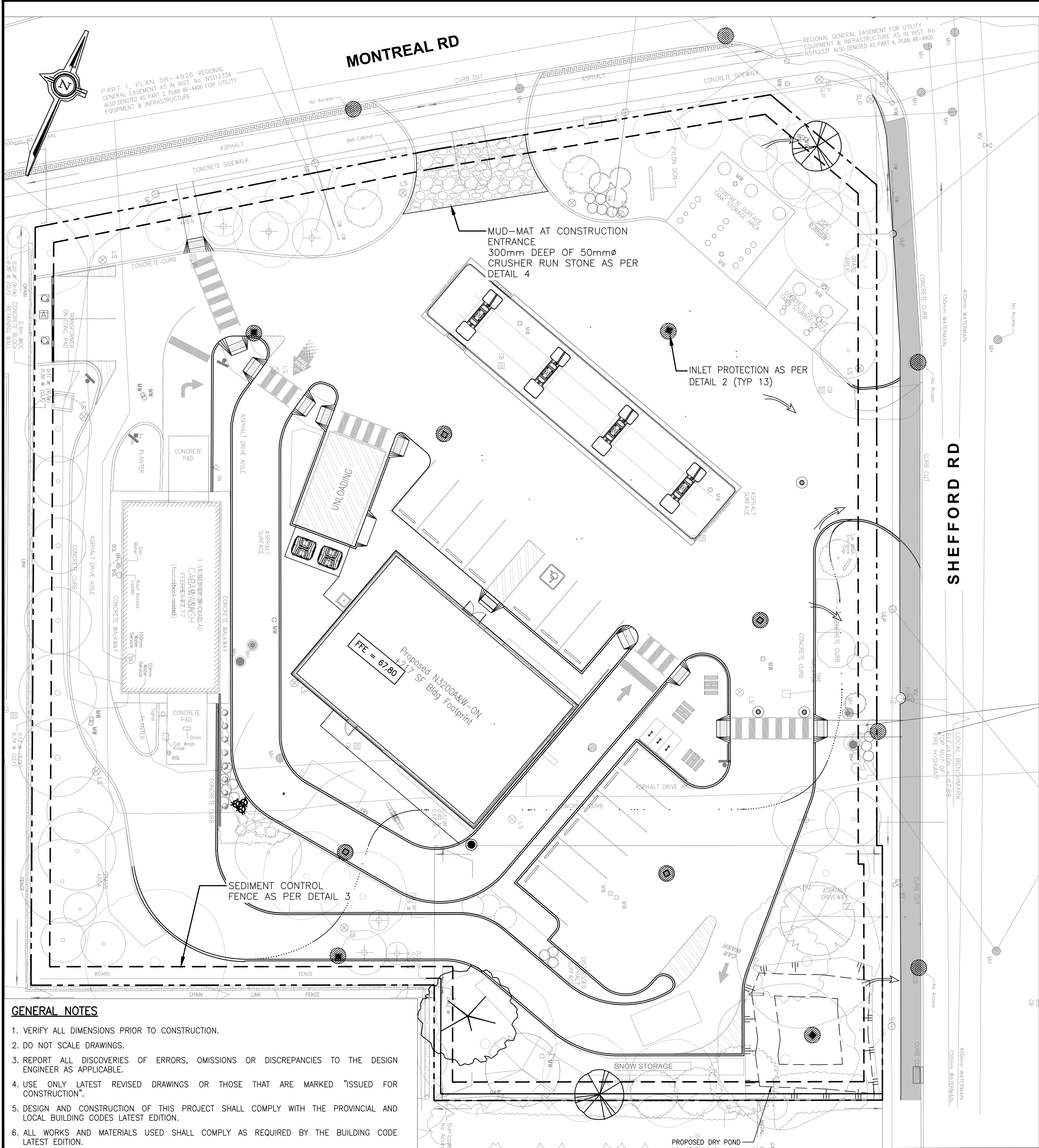
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DRAWING SCALE:	1:200	CONSULTANT	PETRO-CANADA
DATE DRAWN:	DEC 03 '25	PROJECT	250344-P-300
CHECKED BY:		PLOT SCALE	1:1
APPROVED BY:		PLOT DATE	
		PLOT CONFIGURATION	

STD No./OUTLET No.	65004	SHEET No.	P300
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2180 Montreal Rd,
Ottawa, ON

Appendix B – ESC PLAN



GENERAL NOTES

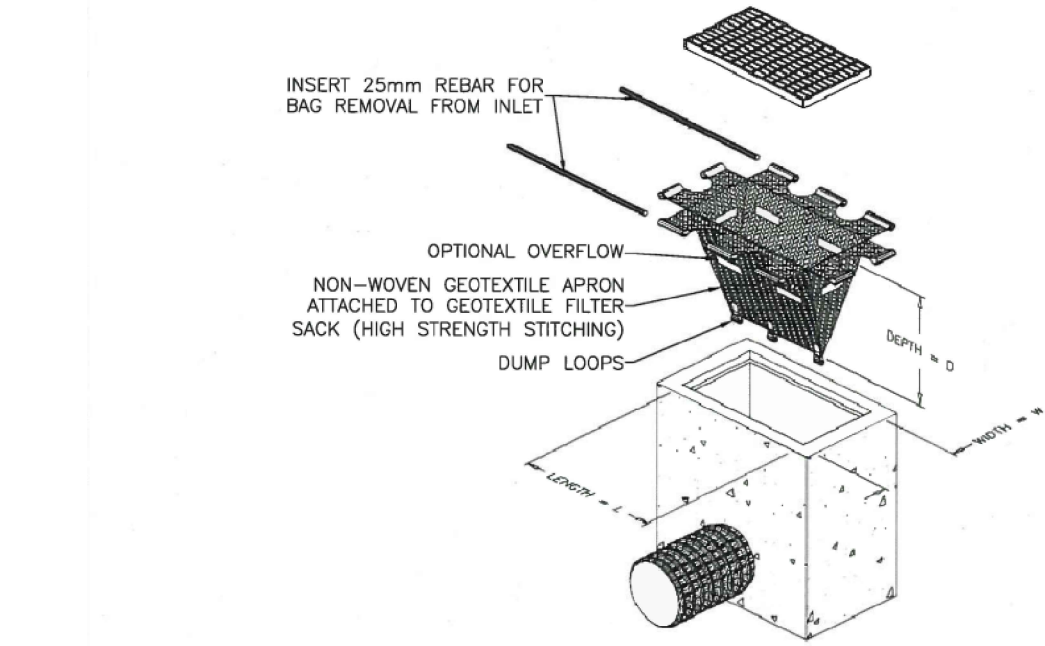
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1 EROSION AND SEDIMENT CONTROL PLAN

P-303 SCALE: 1:200

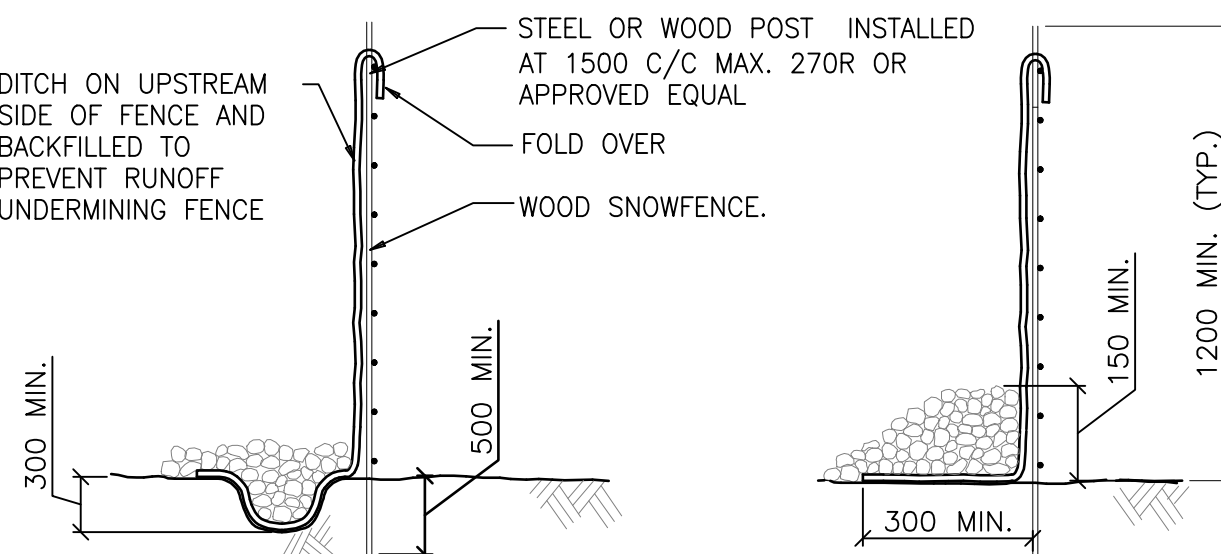
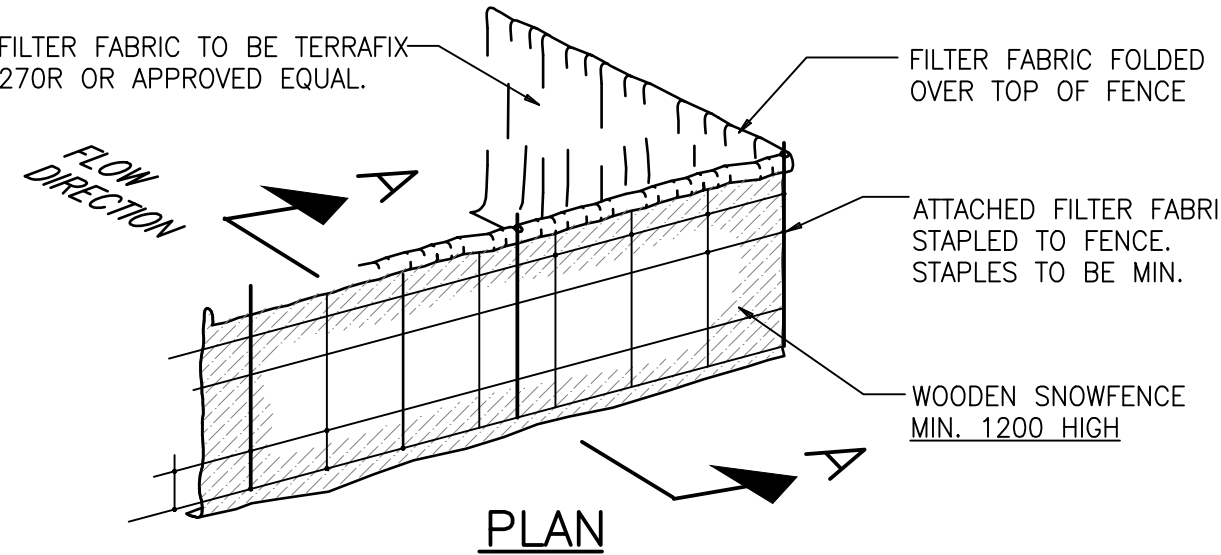
EROSION & SEDIMENT CONTROL NOTES:

1. THE OWNER IS RESPONSIBLE FOR OBTAINING ALL NECESSARY APPROVALS FROM THE CITY AND EXTERNAL AGENCIES PRIOR TO ANY SITE ALTERATION ACTIVITY.
2. PRIOR TO COMMENCEMENT OF ANY ON-SITE WORK/SOIL STRIPPING, EROSION AND SEDIMENT CONTROL (ESC) MEASURES, AS PER ACCEPTED SITE ALTERATION PLANS, MUST BE INSTALLED AND APPROVED BY THE DIRECTOR OF ENGINEERING. ADDITIONAL ESC MEASURES, IF REQUIRED, SHALL BE INSTALLED AS DIRECTOR OF ENGINEERING. THE ESC MEASURES SHALL REMAIN IN PLACE UNTIL DIRECTOR OF ENGINEERING FOR THEIR REMOVAL.
3. TREES ARE TO BE PRESERVED AS PER THE ACCEPTED TREE PRESERVATION PLANS.
4. NO CONSTRUCTION ACTIVITIES OR MACHINERY SHALL BE ALLOWED BEYOND THE SILT/SNOW FENCE OR LIMITS OF THE SUBDIVISION.
5. THE CONTRACTOR IS RESPONSIBLE TO IMPLEMENT DUST CONTROL MEASURES AND CONSTRUCTION PRACTICE GUIDELINES AS APPROVED BY THE CITY.
6. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING ALL ESC MEASURES IN WORKING CONDITION AT ALL TIMES TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING. THE CONTRACTOR SHALL ROUTINELY INSPECT ALL ESC MEASURES AT A MINIMUM OF ONCE A WEEK AND AFTER EACH RAINFALL EVENT GREATER THAN 10mm TO ENSURE THE ESC MEASURES ARE IN PROPER WORKING CONDITIONS. ANY DAMAGES MUST BE REPAIRED WITHIN 24 HOURS.
7. ALL CONSTRUCTION VEHICLES MUST ENTER AND EXIT THE SITE ONLY FROM THE APPROVED ACCESS ROUTE(S) AS SHOWN ON THE ACCEPTED SITE ALTERATION PLANS.
8. CATCHBASIN SEDIMENT CONTROL MEASURE ARE TO BE INSTALLED IMMEDIATELY AFTER INSTALLATION OF CATCHBASINS.
9. ALL DISTURBED GROUND LEFT INACTIVE FOR OVER 30 DAYS SHALL BE VEGETATED, SUBJECT TO WEATHER CONDITIONS, BY SEEDING OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
10. ALL SOIL STOCKPILES IF REMAINING ON SITE FOR MORE THAN 30 DAYS SHALL BE VEGETATED, SUBJECT TO WEATHER CONDITIONS, BY SEEDING OR APPROVED EQUIVALENT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
11. STREET SWEEPING/CATCHBASIN CLEANING PROGRAM SHALL BE IMPLEMENTED UPON COMPLETION OF BASE ASPHALT TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING.
12. ALL SOIL STOCKPILES SHALL BE SURROUNDED WITH SEDIMENT CONTROL FENCE. THE MAXIMUM SIDE SLOPES FOR STOCKPILES SHALL BE 1.5 (H) TO 1.0 (V). THE MAXIMUM HEIGHT OF STOCKPILE SHALL NOT EXCEED 3.0 m.
13. THE CONTRACTOR SHALL ENDEAVOR TO PREVENT MUD TRUCKING ONTO EXISTING RIGHT-OF-WAY AND SHALL PROVIDE CLEAN UP AT HIS/HER OWN EXPENSE AS DIRECTED BY THE DIRECTOR OF ENGINEERING.
14. THE CONTRACTOR SHALL CARE AND CONTROL SPILLS, FLUIDS, AND MATERIALS DURING CONSTRUCTION TO MINIMIZE RISK TO THE ENVIRONMENT.



2 TYP. CATCHBASIN SEDIMENT PROTECTION DETAIL

P-303 SCALE: NTS



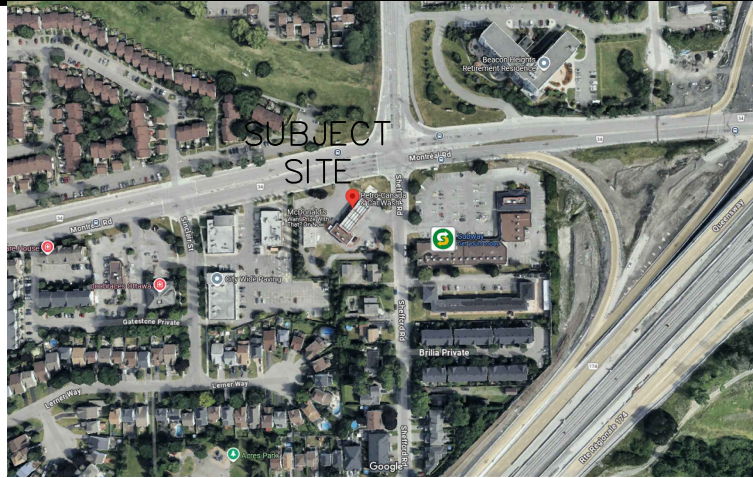
3 SEDIMENT CONTROL FENCE

P-303 SCALE: NTS

FROZEN CONDITION

4 TYP. MUDMAT DETAIL

P-303 SCALE: NTS



KEY PLAN NTS

PLAN OF SURVEY OF
BLOCK 60 AND PART OF BLOCK 59
REGISTERED PLAN 4M-916
AND PART OF LOT 16
CONCESSION 1 (OTTAWA FRONT)
(GEOGRAPHIC TOWNSHIP OF GLOUCESTER)
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LEGEND

- EXISTING CATCHBASIN
- EXISTING MANHOLE
- NEW SANITARY MANHOLE
- NEW CATCHBASIN
- NEW C.B./M.H.
- NEW STORM MANHOLE
- PROPERTY LINE
- OVERLAND FLOW
- INLET PROTECTION
- SILT FENCE

REVISION TABLE		
REV.	DESCRIPTION	DRAWN / APP'D. DATE
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ISSUE TABLE		
TO	FOR	DATE
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SEAL

CONSULTANT

J + B ENGINEERING INC.
TORONTO: 28 CENTURION DR. CALGARY: 636-1114 AVE. SW
SUITE 501 SUITE 501
M4M 1B7 CALGARY AB T2R 0E2
416 229 2938 403 355 2295

PETRO-CANADA
A Suncor Energy Business

DRAWING TITLE:

EROSION AND SEDIMENT CONTROL PLAN

PROJECT:

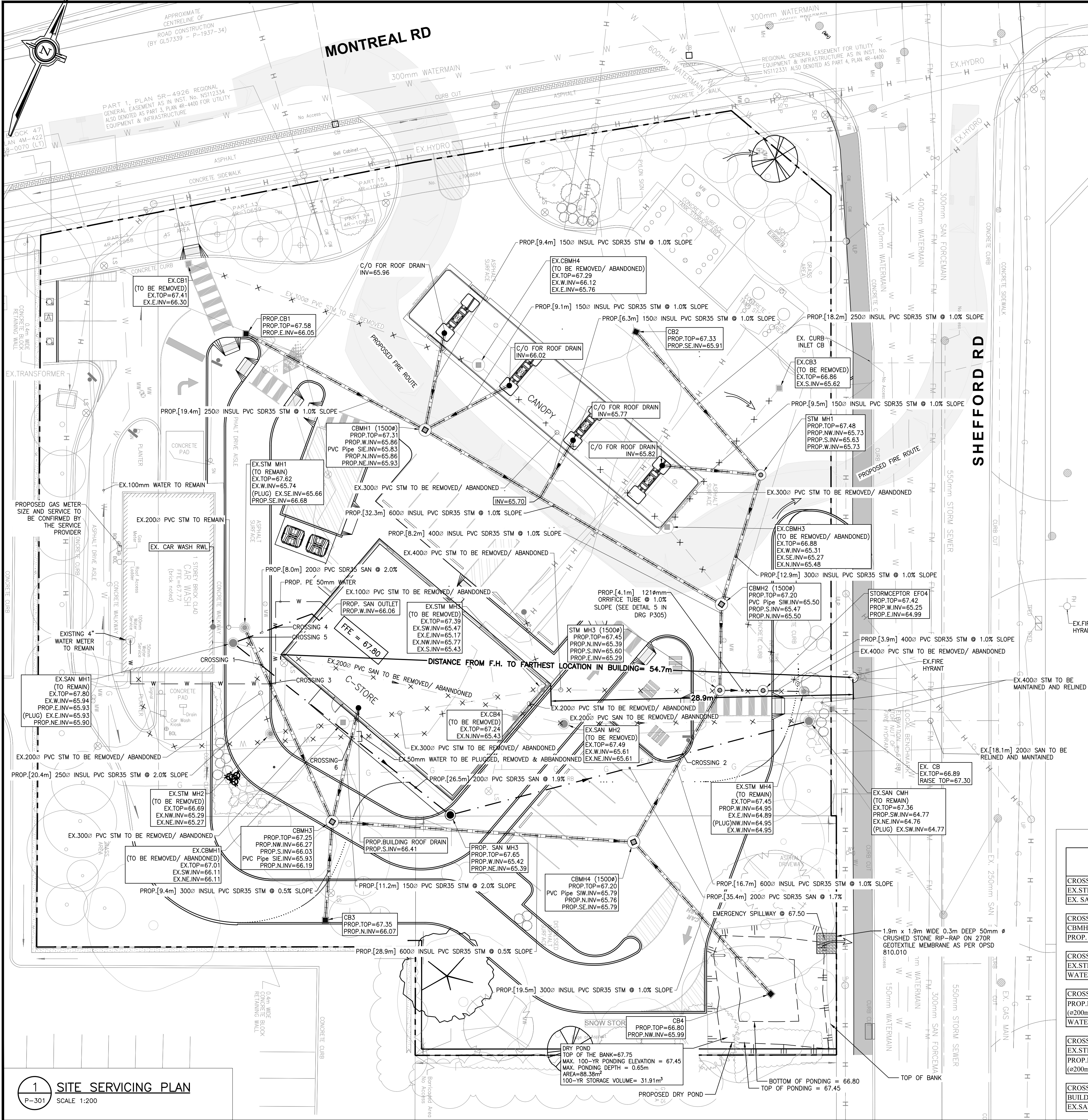
2180 MONTREAL RD @SHEPPARD RD
OTTAWA, ON

DRAWN BY:	EM	CAD INFO:	SHEET SIZE D (559 x 864)
DRAWING SCALE:	1:200	CONSULTANT	PETRO-CANADA
DATE DRAWN:	DEC 03 '25	CONSULTANT	250344-P-303
CHECKED BY:		CONSULTANT	PLOT SCALE 1:1
APPROVED BY:		CONSULTANT	PLOT DATE
STD No./OUTLET No.	65004	SHEET No.	P303



2180 Montreal Rd,
Ottawa, ON

Appendix C – SITE SERVICING PLAN



- SPECIFICATIONS FOR C.B'S AND M.H.'S**
- STORM:**
- DROP STRUCTURE IF REQUIRED AS CITY SPECIFICATION AND PER OPSD 1003.010.
 - 600x600 PRECAST CB AS PER OPSD 705.010 c/w FRAME AND GRATE AS PER S19. GOSS TRAP AND SUBDRAINS AS PER CITY STANDARD.1
 - ALL CB TO HAVE 3.0m -150mmø PERFORATED SUBDRAIN IN ALL 4 DIRECTIONS AS PER CITY STANDARDS.
 - 1200ø PRECAST MH AS PER OPSD 701.010 c/w FRAME AS PER S25 AND COVER AS PER S24.1 AND S28.1.
 - BENCHING AS PER OPSD 701.021.
 - BEDDING AS PER CITY STD S6.
 - ADJUSTMENT UNITS AND CAPS AS PER OPSD 704.01.
 - SEWER COVER-GRANULAR 'A' CONFORMING TO OPSD 802.03.
 - PIPE-PVC SDR35 UNLESS NOTED OTHERWISE.
 - CB CONNECTIONS AS PER OPSD 708.03
 - ALL EX. STORM AND SANITARY ABANDONED SHOWN ON THE PLAN OR ENCOUNTERED DURING CONSTRUCTION ARE TO BE EXCAVATED AT THE STREET LINE AND SEALED TO CITY STD.
 - WHEN THE DEPTH OF THE COVER OVER THE PROP. SANITARY OR STORM SEWERS IS LESS THAN 2.0m, SEWER LINES ARE TO BE INSULATED AS PER CITY STD. THE INSULATION TO BE STYROFOAM BRAND H.I. TYPE IV OR EQUAL.
 - DROP STRUCTURE ON STORM OR SANITARY AS PER OPSD 1003.010 OR OPSD 1003.020,AS APPLICABLE

- WATERMAINS:**
- ALL NEW WATERMAIN CONNECTIONS SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE CITY STANDARDS.
 - WATERMAIN AND/OR WATER SERVICES TO HAVE A MINIMUM OF 1.0m HORIZONTAL SEPARATION FROM OTHER UTILITIES AS PER CITY STANDARDS.
 - WHERE WATERMAIN AND/OR WATER SERVICES CROSSES UNDER SANITARY OR STORM SEWER A MINIMUM CLEARANCE OF 0.5m SHALL BE PROVIDED.
 - BEDDING MATERIAL TO BE INSTALLED AS PER CITY STANDARDS.
 - WATER SERVICE TO HAVE MIN. 2.4m COVER. WHERE THE MINIMUM COVER IS NOT POSSIBLE INSULATE AS PER CITY OF OTTAWA STANDARD W22
 - ALL TEES, PLUGS AND BENDS TO HAVE CONCRETE THRUST BLOCKS AS PER CITY STD
 - CONTRACTOR TO PROVIDE PRESSURE TEST RESULTS OF NEW WATERMAIN AND FIRE MAIN.
 - WATERMAIN TO BE INSTALLED WITH TRACER WIRE.

- SANITARY**
- 1200ø PRECAST M.H.'S AS PER OPSD 701.01 c/w FRAME AS PER S25 AND COVER AS PER S24.
 - DROP STRUCTURE IF REQUIRED AS CITY SPECIFICATION AND PER OPSD 1003.010.
 - BEDDING AS PER CITY STD S6.
 - BENCHING AS PER OPSD 701.021.
 - SANITARY PIPES TO BE PVC SDR35.
 - ALL SANITARY SEWERS TO BE TESTED IN ACCORDANCE WITH THE REQUIREMENT OF OBC 7.3.6

EX. UTILITIES NOTES

EXISTING INFORMATION REGARDING UTILITIES ALONG MONTREAL RD AND SHEFFORD RD TO BE SITE VERIFIED

INFORMATION REGARDING EXISTING STORM, SANITARY AND WATER EXTRACTED FROM BOUNDARY AND TOPOGRAPHIC SURVEY DATED 2024-11-23 BY NORTHERN LINK AND "SHEFFORD RD CH 0+0.00 TO 0+283 - DRG # 87-1268-6" DATED APRIL 1988 BY R.W. CONNELLY ASSOCIATED LTD.

SERVICES NOTES:

CONTACT LOCAL UTILITY AGENCIES (GAS, HYDRO, & TELEPHONE) TO LOCATE THE EXISTING INCOMING SERVICES, AND USE THE SAME TO SERVE NEW INSTALLATIONS (IF APPLICABLE).

CROSSING	ELEVATION (m)	VERTICAL CLEARANCE (m)
CROSSING 1		
EX.STM MH1-CBMH3 (ø200mm)	INV 66.61	0.54
EX. SAN MH1-PROP. SAN MH3 (ø200mm)	OBV 66.07	
CROSSING 2		
CBMH4-STM MH3 (ø600mm)	INV 65.67	0.50
PROP. SAN MH3-EX. SAN CMH (ø200mm)	OBV 65.17	
CROSSING 3		
EX.STM MH1-CBMH3 (ø200mm)	INV 66.57	1.82
WATER (ø50mm)	OBV 64.75	
CROSSING 4		
PROP.BUILDING OUTLET-EX. SAN MH1 (ø200mm)	INV 66.03	1.28
WATER (ø50mm)	OBV 64.75	
CROSSING 5		
EX.STM MH1-CBMH3 (ø200mm)	INV 66.67	0.50
PROP.BUILDING OUTLET-EX. SAN MH1 (ø200mm)	OBV 66.17	
CROSSING 6		
BUILDING RWL-CBMH3 (ø150mm)	INV 66.36	0.50
EX.SAN MH1-PROP.SAN MH3 (ø200mm)	OBV 65.86	

PLAN OF SURVEY OF
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LEGEND

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- EXISTING C.B./M.H.
- EXISTING STM MANHOLE
- EXISTING SANITARY MANHOLE
- EXISTING WATER LINE
- EXISTING STORM LINE
- EXISTING SANITARY LINE
- NEW CATCHBASIN
- NEW C.B./M.H.
- NEW SANITARY MANHOLE
- NEW STM MANHOLE
- PROPERTY LINE
- OVERLAND FLOW
- REMOVALS
- PROPOSED STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED WATER
- INSULATED PIPE
- OVERLAND FLOW ROUTE

REVISION TABLE

REV.	DESCRIPTION	DRAWN	APP'D.
		DATE	
1	REVISED AS PER CITY COMMENT	DL JS	
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CONSULTANT

J + B ENGINEERING INC.
TORONTO: 28 CANTERBURY DR., SUITE 201, BARRIDALE, ON L3R 9A8 416 229 2606
CALGARY: 6361 17th AVE. SW, SUITE 201, CALGARY, AB T2C 0E2 403 355 2265

PETRO-CANADA
A Suncor Energy Business

DRAWING TITLE:

SITE SERVICING PLAN

PROJECT:

2180 MONTREAL RD @SHEFFORD RD
OTTAWA, ON

DRAWN BY:	EM	CAD INFO:
DRAWING SCALE:	1:200	SHEET SIZE D (559 x 864)
DATE DRAWN:	DEC 03 '25	PETRO-CANADA
CHECKED BY:		CONSULTANT 250344-P-301
APPROVED BY:		PLOT SCALE 1:1
STD No./OUTLET No.	65004	PLOT CONFIGURATION
		SHEET No.
		P301



2180 Montreal Rd,
Ottawa, ON

Appendix D – STORMCEPTOR EFO4 SIZING REPORT & OWNER'S MANUAL

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

07/13/2026

Province:	Ontario	Project Name:	2180 Montreal Rd
City:	Ottawa	Project Number:	250344
Nearest Rainfall Station:	OTTAWA CDA RCS	Designer Name:	David Liu
Climate Station Id:	6105978	Designer Company:	J+B
Years of Rainfall Data:	20	Designer Email:	d.liu@jandb-inc.com
		Designer Phone:	647-801-7358
Site Name:	2180 Montreal Rd @ Shefford Rd	EOR Name:	
		EOR Company:	
Drainage Area (ha):	0.61	EOR Email:	
% Imperviousness:	70.00	EOR Phone:	
Runoff Coefficient 'c': 0.72			

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	14.18
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	59.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	494
Estimated Average Annual Sediment Volume (L/yr):	402

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	85
EFO5	89
EFO6	93
EFO8	97
EFO10	98
EFO12	100

Recommended Stormceptor EFO Model: EFO4
Estimated Net Annual Sediment (TSS) Load Reduction (%): 85
Water Quality Runoff Volume Capture (%): > 90

THIRD-PARTY TESTING AND VERIFICATION

► **Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

► **Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

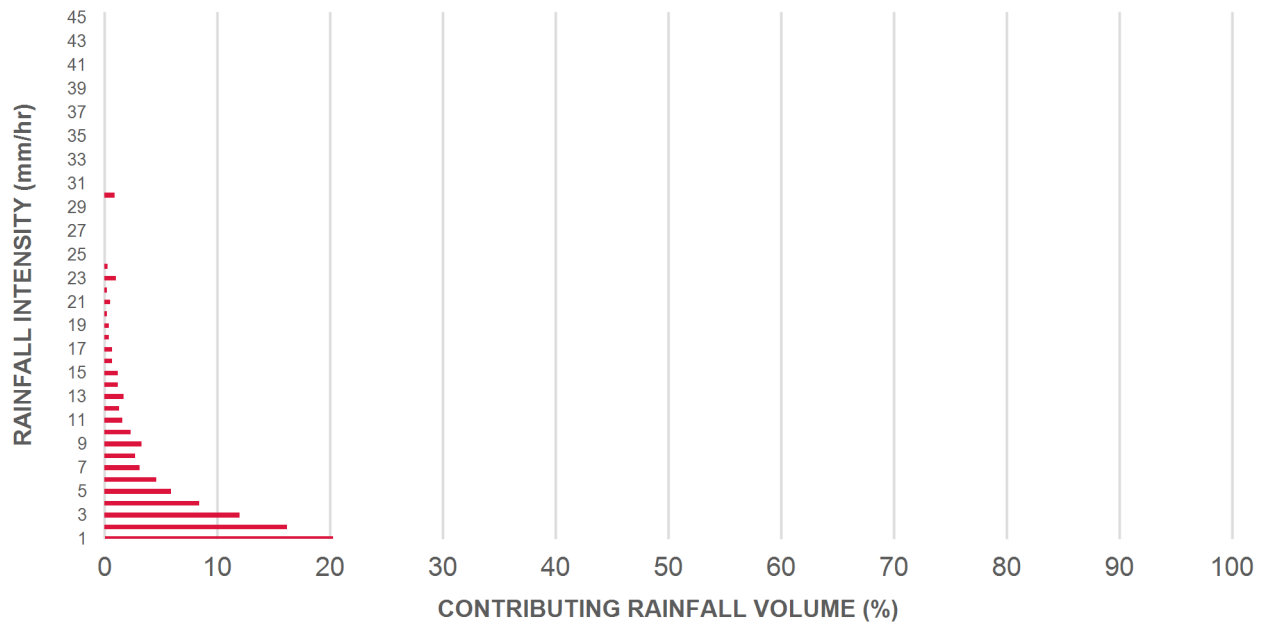
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

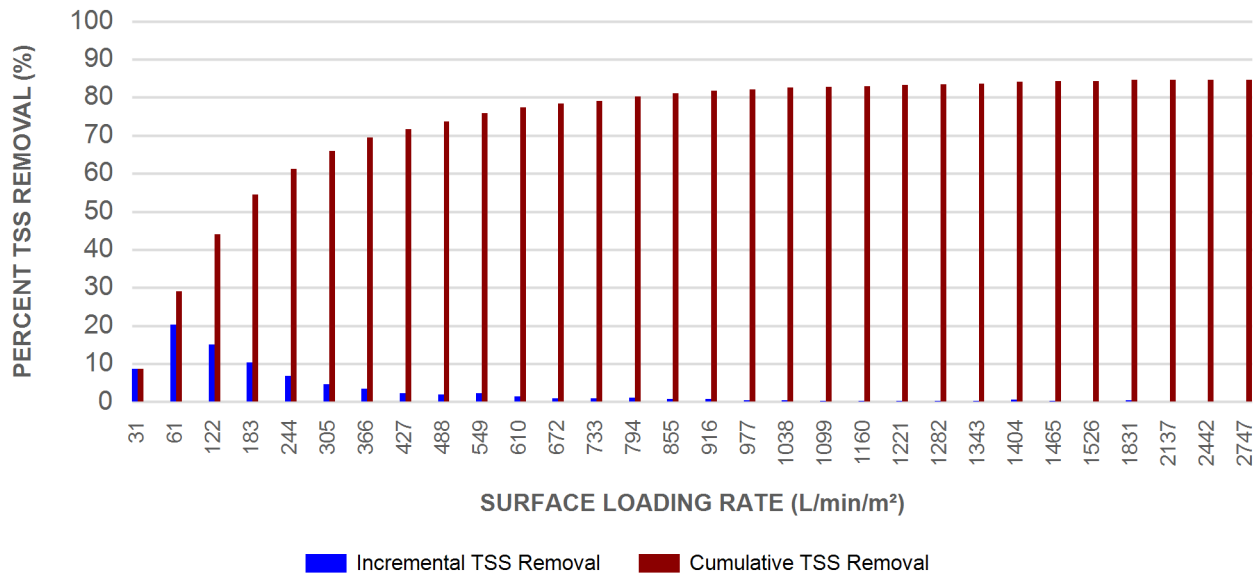
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.61	37.0	31.0	100	8.6	8.6
1.00	20.3	29.0	1.22	73.0	61.0	100	20.3	29.0
2.00	16.2	45.2	2.44	147.0	122.0	93	15.1	44.1
3.00	12.0	57.2	3.66	220.0	183.0	86	10.3	54.4
4.00	8.4	65.6	4.88	293.0	244.0	81	6.9	61.2
5.00	5.9	71.6	6.10	366.0	305.0	78	4.7	65.9
6.00	4.6	76.2	7.33	440.0	366.0	76	3.5	69.4
7.00	3.1	79.3	8.55	513.0	427.0	73	2.2	71.6
8.00	2.7	82.0	9.77	586.0	488.0	70	1.9	73.6
9.00	3.3	85.3	10.99	659.0	549.0	67	2.2	75.8
10.00	2.3	87.6	12.21	733.0	610.0	65	1.5	77.3
11.00	1.6	89.2	13.43	806.0	672.0	64	1.0	78.3
12.00	1.3	90.5	14.65	879.0	733.0	64	0.8	79.1
13.00	1.7	92.2	15.87	952.0	794.0	63	1.1	80.2
14.00	1.2	93.5	17.09	1026.0	855.0	63	0.8	81.0
15.00	1.2	94.6	18.31	1099.0	916.0	62	0.7	81.7
16.00	0.7	95.3	19.54	1172.0	977.0	62	0.4	82.1
17.00	0.7	96.1	20.76	1245.0	1038.0	61	0.5	82.6
18.00	0.4	96.5	21.98	1319.0	1099.0	59	0.2	82.8
19.00	0.4	96.9	23.20	1392.0	1160.0	58	0.2	83.0
20.00	0.2	97.1	24.42	1465.0	1221.0	56	0.1	83.2
21.00	0.5	97.5	25.64	1538.0	1282.0	55	0.3	83.4
22.00	0.2	97.8	26.86	1612.0	1343.0	54	0.1	83.6
23.00	1.0	98.8	28.08	1685.0	1404.0	52	0.5	84.1
24.00	0.3	99.1	29.30	1758.0	1465.0	50	0.1	84.2
25.00	0.9	100.0	30.52	1831.0	1526.0	48	0.5	84.7
30.00	0.9	100.9	36.63	2198.0	1831.0	40	0.4	85.0
35.00	-0.9	100.0	42.73	2564.0	2137.0	34	N/A	84.7
40.00	0.0	100.0	48.84	2930.0	2442.0	30	0.0	84.7
45.00	0.0	100.0	54.94	3297.0	2747.0	27	0.0	84.7
Estimated Net Annual Sediment (TSS) Load Reduction =								85 %

Climate Station ID: 6105978 Years of Rainfall Data: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

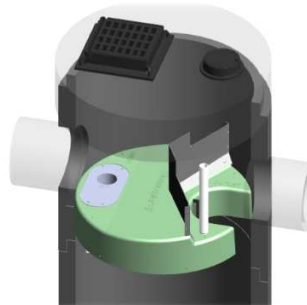
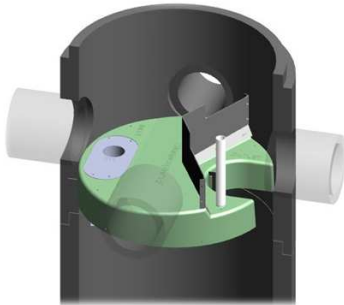
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

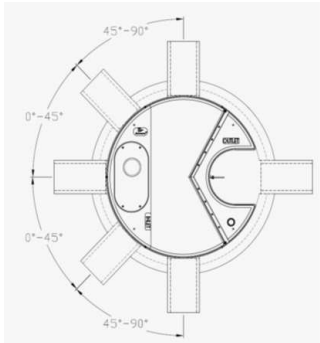
DESIGN FLEXIBILITY

► **Stormceptor® EF and EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.





INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef>

STANDARD PERFORMANCE SPECIFICATION FOR “OIL GRIT SEPARATOR” (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m ³ sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m ³ sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m ³ sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m ³ sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m ³ sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m ³ sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators**, with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

Stormceptor® EF4 and EFO4 Oil-Grit Separators

Developed by Imbrium Systems, Inc.,
Whitby, Ontario, Canada

In accordance with

ISO 14034:2016

**Environmental management —
Environmental technology verification (ETV)**



John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions



November 10, 2017
Vancouver, BC, Canada

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada | V6C 3E2

Technology description and application

The Stormceptor® EF4 and EFO4 are treatment devices designed to remove oil, sediment, trash, debris, and pollutants attached to particulates from Stormwater and snowmelt runoff. The device takes the place of a conventional manhole within a storm drain system and offers design flexibility that works with various site constraints. The EFO4 is designed with a shorter bypass weir height, which accepts lower surface loading rate into the sump, thereby reducing re-entrainment of captured free floating light liquids.

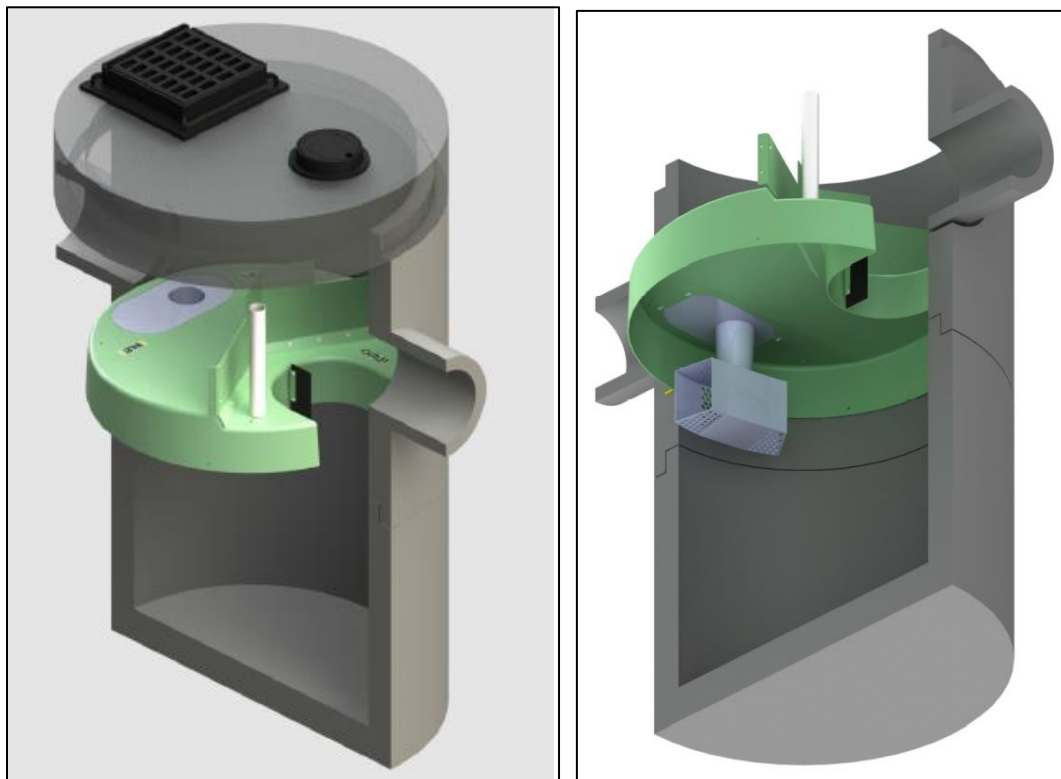


Figure 1. Graphic of typical inline Stormceptor® unit and core components.

Stormwater and snowmelt runoff enters the Stormceptor® EF/EFO's upper chamber through the inlet pipe(s) or a surface inlet grate. An insert divides the unit into lower and upper chambers and incorporates a weir to reduce influent velocity and separate influent (untreated) from effluent (treated) flows. Influent water ponds upstream of the insert's weir providing driving head for the water flowing downwards into the drop pipe where a vortex pulls the water into the lower chamber. The water diffuses at lower velocities in multiple directions through the drop pipe outlet openings. Oil and other floatables rise up and are trapped beneath the insert, while sediments undergo gravitational settling to the sump's bottom. Water from the sump can exit by flowing upward to the outlet riser onto the top side of the insert and downstream of the weir, where it discharges through the outlet pipe.

Maximum flow rate into the lower chamber is a function of weir height and drop pipe orifice diameter. The Stormceptor® EF and EFO are designed to allow a surface loading rate of 1135 L/min/m² (27.9 gal/min/ft²) and 535 L/min/m² (13.1 gal/min/ft²) into the lower chamber, respectively. When prescribed surface loading rates are exceeded, ponding water can overtop the weir height and bypass the lower treatment chamber, exiting directly through the outlet pipe. Hydraulic testing and scour testing demonstrate that the internal bypass effectively prevents scour at all bypass flow rates. Increasing the bypass flow rate does not increase the orifice-controlled flow rate into the lower treatment chamber where sediment is stored. This internal bypass feature allows for in-line installation, avoiding the cost of

additional bypass structures. During bypass, treatment continues in the lower chamber at the maximum flow rate. The Stormceptor® EFO's lower design surface loading rate is favorable for minimizing re-entrainment and washout of captured light liquids. Inspection of Stormceptor® EF and EFO devices is performed from grade by inserting a sediment probe through the outlet riser and an oil dipstick through the oil inspection pipe. The unit can be maintained by using a vacuum hose through the outlet riser.

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Imbrium Systems Inc.'s Stormceptor® OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test^a:

During the capture test, the Stormceptor® EF OGS device, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 46, 44, and 49 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m², respectively.

Stormceptor® EFO, with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removes 70, 64, 54, 48, 42, 40, and 34 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, and 1400 L/min/m², respectively.

Scour test^a:

During the scour test, the Stormceptor® EF and Stormceptor® EFO OGS devices, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the manufacturer's recommended maximum sediment storage depth, generate corrected effluent concentrations of 4.6, 0.7, 0, 0.2, and 0.4 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m², respectively.

Light liquid re-entrainment test^a:

During the light liquid re-entrainment test, the Stormceptor® EFO OGS device with surrogate low-density polyethylene beads preloaded within the lower chamber oil collection zone, representing a floating light liquid volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.5, 99.8, 99.8, and 99.9 percent of loaded beads by mass during the 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m².

^a The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory Testing of Oil Grit Separators (Version 3.0, June 2014)

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

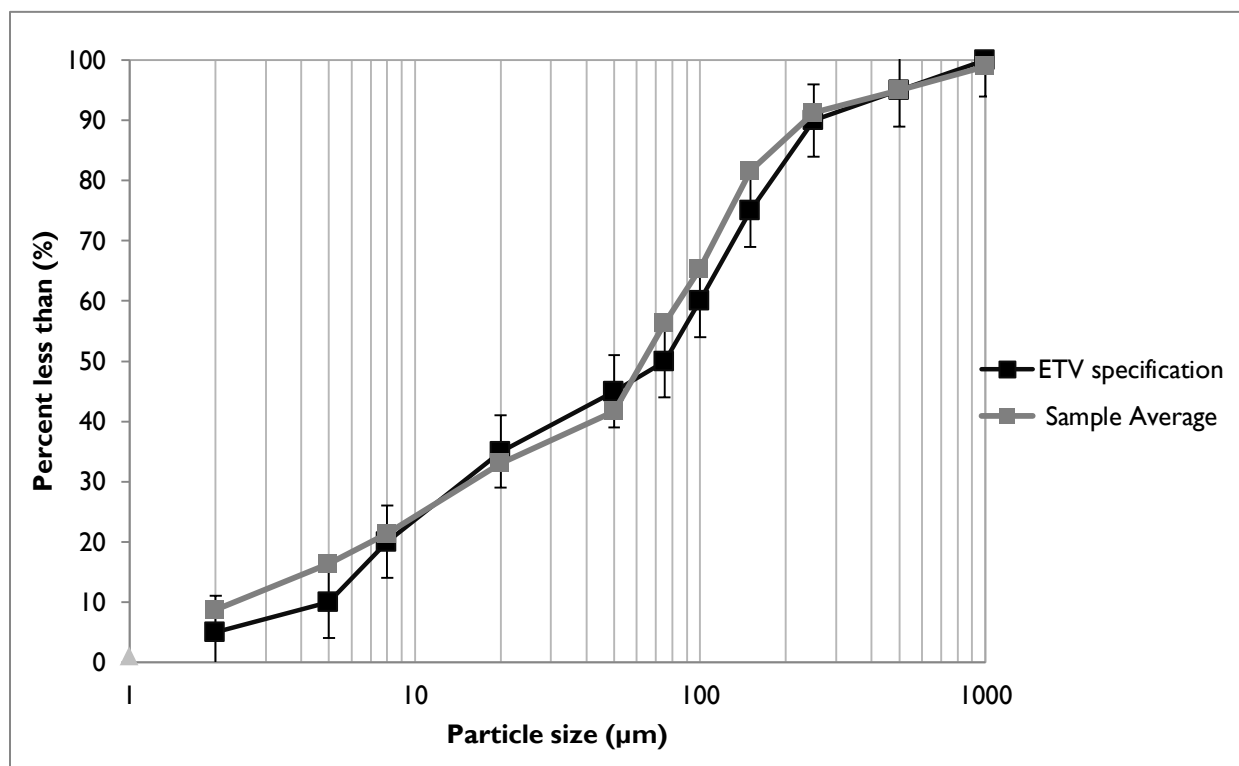


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at seven surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1). Since the EF and EFO models are identical except for the weir height, which bypasses flows from the EFO model at a surface loading rate of 535 L/min/m² (13.1 gpm/ft²), sediment capture tests at surface loading rates from 40 to 400 L/min/m² were only performed on the EF unit. Surface loading rates of 600, 1000, and 1400 L/min/m² were tested on both units separately. Results for the EFO model at these higher flow rates are presented in Table 2.

In some instances, the removal efficiencies were above 100% for certain particle size fractions. These discrepancies are not unique to any one test laboratory and may be attributed to errors relating to the blending of sediment, collection of representative samples for laboratory submission, and laboratory

analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see [Bulletin # CETV 2016-11-0001](#)). The results for “all particle sizes by mass balance” (see Table 1 and 2) are based on measurements of the total injected and retained sediment mass, and are therefore not subject to blending, sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) of the EF4 at specified surface loading rates

Particle size fraction (µm)	Surface loading rate (L/min/m ²)						
	40	80	200	400	600	1000	1400
>500	90	58	58	100*	86	72	100*
250 - 500	100*	100*	100	100*	100*	100*	100*
150 - 250	90	82	26	100*	100*	67	90
105 - 150	100*	100*	100*	100*	100*	100*	100
75 - 105	100*	92	74	82	77	68	76
53 - 75	Undefined ^a	56	100*	72	69	50	80
20 - 53	54	100*	54	33	36	40	31
8 - 20	67	52	25	21	17	20	20
5 - 8	33	29	11	12	9	7	19
<5	13	0	0	0	0	0	4
All particle sizes by mass balance	70.4	63.8	53.9	47.5	46.0	43.7	49.0

^a An outlier in the feed sample sieve data resulted in a negative removal efficiency for this size fraction.

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 101 and 171% (average 128%). See text and [Bulletin # CETV 2016-11-0001](#) for more information.

Table 2. Removal efficiencies (%) of the EFO4 at surface loading rates above the bypass rate of 535 L/min/m²

Particle size fraction (µm)	Surface loading rate (L/min/m ²)		
	600	1000	1400
>500	89	83	100*
250 - 500	90	100*	92
150 - 250	90	67	100*
105 - 150	85	92	77
75 - 105	80	71	65
53 - 75	60	31	36
20 - 53	33	43	23
8 - 20	17	23	15
5 - 8	10	3	3
<5	0	0	0
All particle sizes by mass balance	41.7	39.7	34.2

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 103 and 111% (average 107%). See text and [Bulletin # CETV 2016-11-0001](#) for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the sediment retained by the EF4 at each of the tested surface loading rates. Figure 4 shows the same graph for the EFO4 unit at surface loading rates above the bypass rate of 535 L/min/m².

As expected, the capture efficiency for fine particles in both units was generally found to decrease as surface loading rates increased.

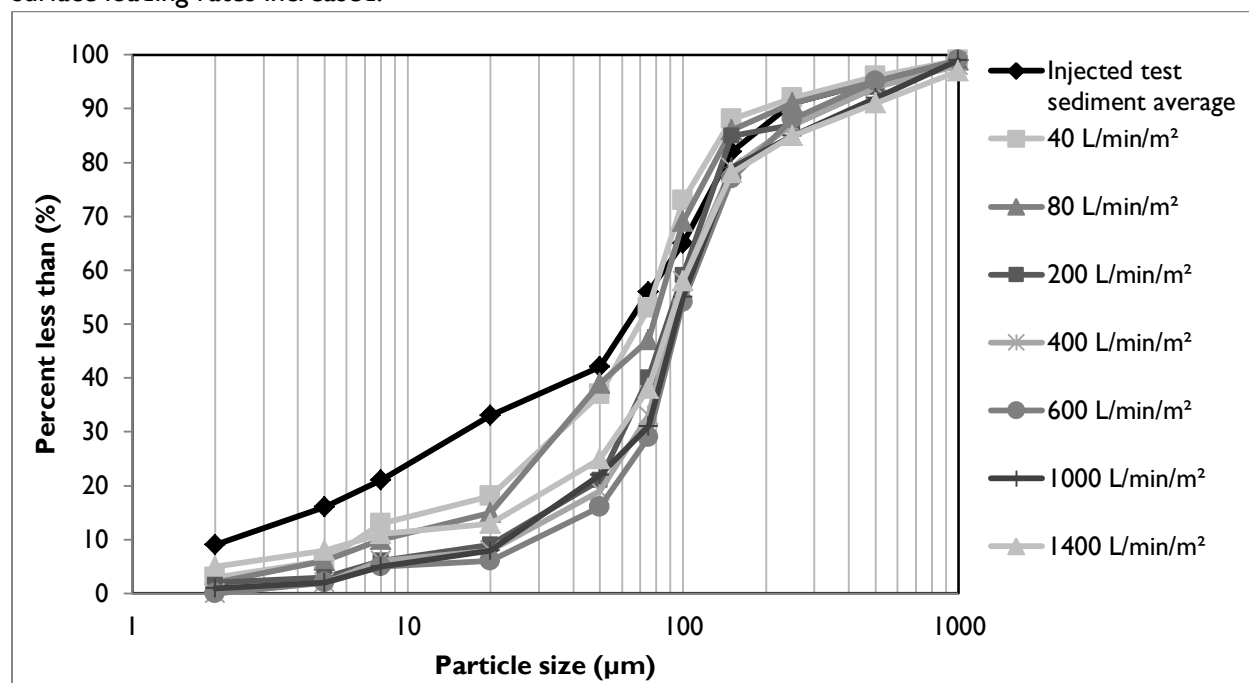


Figure 3. Particle size distribution of sediment retained in the EF4 in relation to the injected test sediment average.

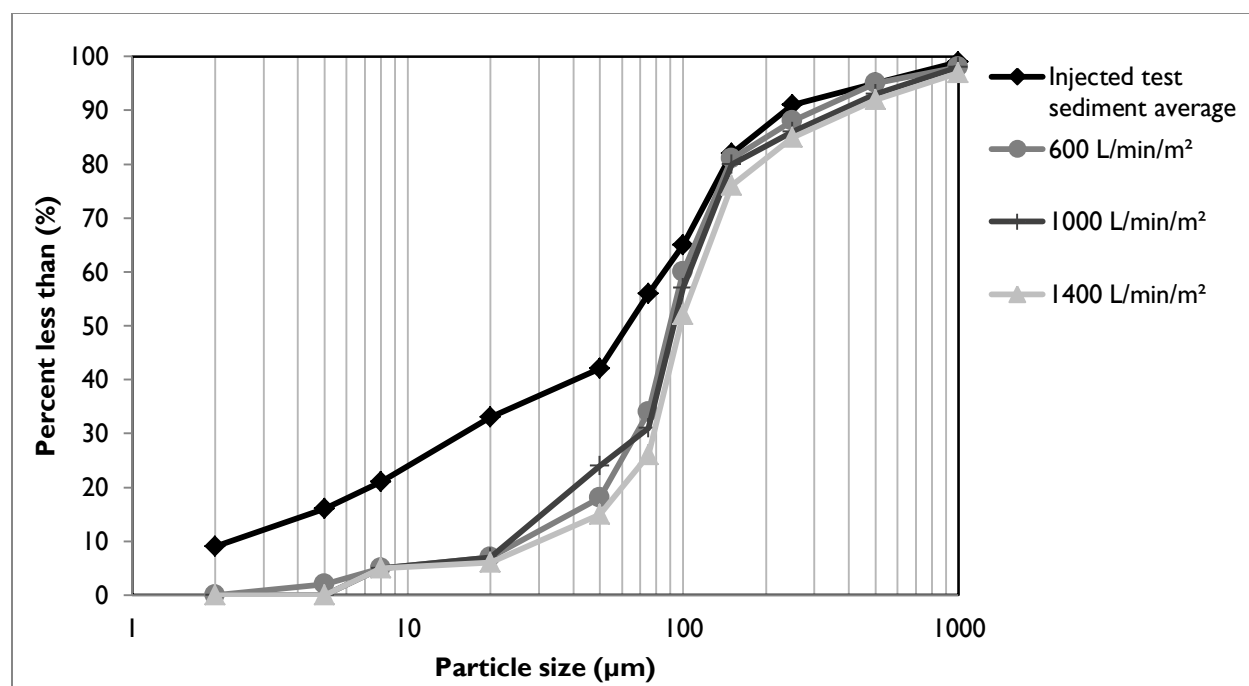


Figure 4. Particle size distribution of sediment retained in the EFO4 in relation to the injected test sediment average at surface loading rates above the bypass rate of 535 L/min/m²

Table 4 shows the results of the sediment scour and re-suspension test for the EF4 unit. The EFO4 was not tested as it was reasonably assumed that scour rates would be lower given that flow bypass occurs at a lower surface loading rate. The scour test involved preloading 10.2 cm of fresh test sediment into

the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Clean water was run through the device at five surface loading rates over a 30 minute period. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water. Typically, the smallest 5% of particles captured during the 40 L/min/m² sediment capture test is also used to adjust the concentration, as per the method described in [Bulletin # CETV 2016-09-0001](#). However, since the composites of effluent concentrations were below the Reporting Detection Limit of the Laser Diffraction PSD methodology, this adjustment was not made. Results showed average adjusted effluent sediment concentrations below 5 mg/L at all tested surface loading rates.

It should be noted that the EF4 starts to internally bypass water at 1135 L/min/m², potentially resulting in the dilution of effluent concentrations, which would not normally occur under typical field conditions because the field influent concentration would contain a much higher sediment concentration than during the lab test. Recalculation of effluent concentrations to account for dilution at surface loading rates above the bypass rate showed sediment effluent concentrations to be below 1.6 mg/L.

Table 4. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m ²)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L) ^a	Average (mg/L)
1	200	1:00	<RDL	11.9	4.6
		2:00		7.0	
		3:00		4.4	
		4:00		2.2	
		5:00		1.0	
		6:00		1.2	
2	800	7:00	<RDL	1.1	0.7
		8:00		0.9	
		9:00		0.6	
		10:00		1.4	
		11:00		0.1	
		12:00		0	
3	1400	13:00	<RDL	0	0
		14:00		0.1	
		15:00		0	
		16:00		0	
		17:00		0	
		18:00		0	
4	2000	19:00	1.2	0.2	0.2
		20:00		0	
		21:00		0	
		22:00		0.7	
		23:00		0	

		24:00		0.4	
5	2600	25:00	1.6	0.3	0.4
		26:00		0.4	
		27:00		0.7	
		28:00		0.4	
		29:00		0.2	
		30:00		0.4	

^a The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the background concentration. For more information see [Bulletin # CETV 2016-09-0001](#).

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 5. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m²) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device continuously at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m²). Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 5. Light liquid re-entrainment test results for the EFO4.

Surface Loading Rate (L/min/m ²)	Time Stamp	Amount of Beads Re-entrained			
		Mass (g)	Volume (L) ^a	% of Pre-loaded Mass Re-entrained	% of Pre-loaded Mass Retained
200	62	0	0	0.00	100
800	247	168.45	0.3	0.52	99.48
1400	432	51.88	0.09	0.16	99.83
2000	617	55.54	0.1	0.17	99.84
2600	802	19.73	0.035	0.06	99.94
Total Re-entrained		295.60	0.525	0.91	--
Total Retained		32403	57.78	--	99.09
Total Loaded		32699	58.3	--	--

^a Determined from bead bulk density of 0.56074 g/cm³

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

- I. During the capture test, the 40 L/min/m² and 80 L/min/m² surface loading rates were evaluated over 3 and 2 days respectively due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit at these lower flow rates. Pumps were shut down at the end of each intermediate day, and turned on again the following morning. The target flow rate was re-established within 30 seconds of switching on the pump. This procedure may have allowed sediments to be captured that otherwise may have exited the unit if the test was

continuous. On the basis of practical considerations, this variance was approved by the verifier prior to testing.

2. During the scour test, the coefficient of variation (COV) for the lowest flow rate tested (200 L/min/m²) was 0.07, which exceeded the specified limit of 0.04 target specified in the OGS Procedure. A pump capable of attaining the highest flow rate of 3036 L/min had difficulty maintaining the lowest flow of 234 L/min but still remained within +/- 10% of the target flow and is viewed as having very little impact on the observed results. Similarly, for the light liquid re-entrainment test the COV for the flow rate of the 200 L/min/m² run was 0.049, exceeding the limit of 0.04, but is believed to introduce negligible bias.
3. Due to pressure build up in the filters, the runs at 1000 L/min/m² for the Stormceptor® EF4 and 1000 and 1400 L/min/m² for the Stormceptor® EFO4 were slightly shorter than the target. The run times were 54, 59 and 43 minutes respectively, versus targets of 60 and 50 minutes. The final feed samples were timed to coincide with the end of the run. Since >25 lbs of sediment was fed, the shortened time did not invalidate the runs.

Verification

The verification was completed by the Verification Expert, Toronto and Region Conservation Authority, contracted by GLOBE Performance Solutions, using the International Standard **ISO 14034:2016 Environmental management – Environmental technology verification (ETV)**. Data and information provided by Imbrium Systems Inc. to support the performance claim included the following: Performance test report prepared by Good Harbour Laboratories, and dated September 8, 2017; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO 14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV), and was developed and published by the *International Organization for Standardization (ISO)*. The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the Stormceptor® EF4 and EFO4 please contact:

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407 Fairview Drive
Whitby, ON
L1N 3A9, Canada
Tel: 416-960-9900
info@imbriumsystems.com

For more information on ISO 14034:2016 / ETV please contact:

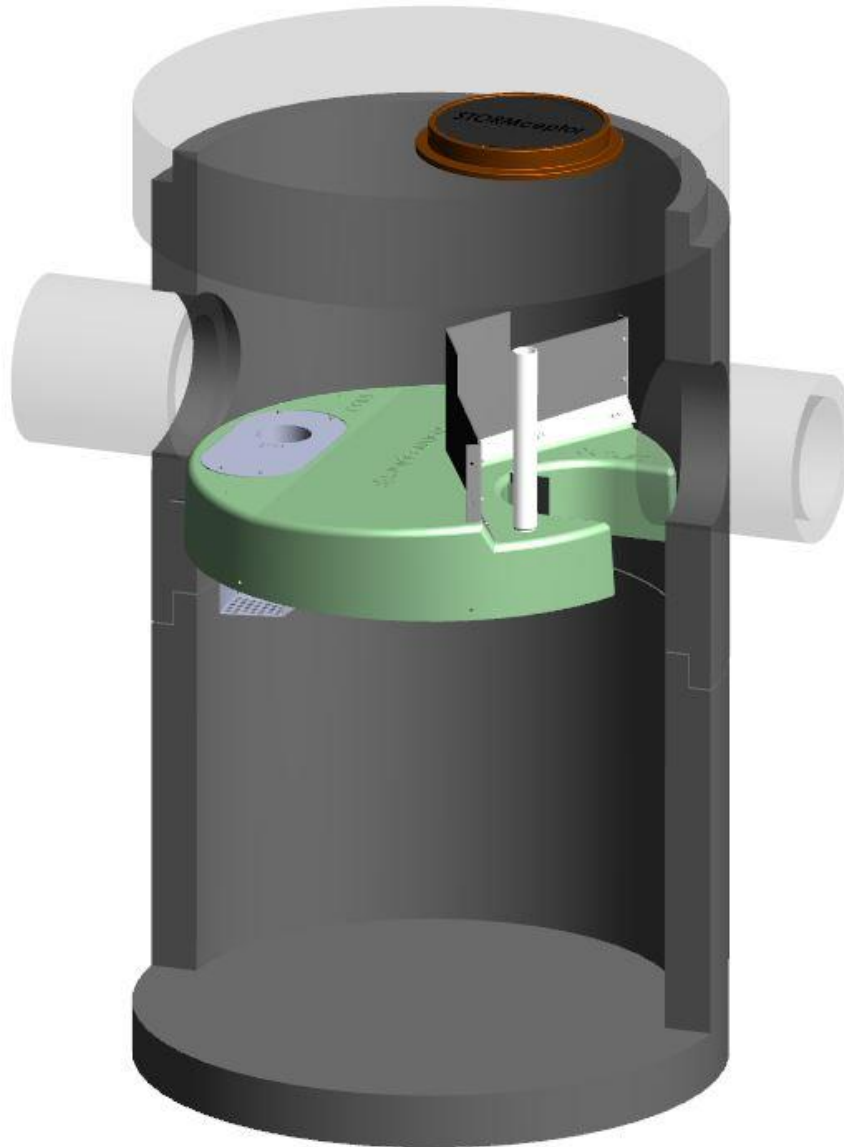
GLOBE Performance Solutions
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404 – 999 Canada Place
Vancouver, BC
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Limitation of verification

GLOBE Performance Solutions and the Verification Expert provide the verification services solely on the basis of the information supplied by the applicant or vendor and assume no liability thereafter. The responsibility for the information supplied remains solely with the applicant or vendor and the liability for the purchase, installation, and operation (whether consequential or otherwise) is not transferred to any other party as a result of the verification.

Stormceptor[®] **EF**

Owner's Manual



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

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
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. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

Table of Contents:

1 - Stormceptor EF Overview

2 - Stormceptor EF Operation, Components

3 - Stormceptor EF Model Details

4 - Stormceptor EF Identification

5 - Stormceptor EF Inspection & Maintenance

6 – Stormceptor Contacts

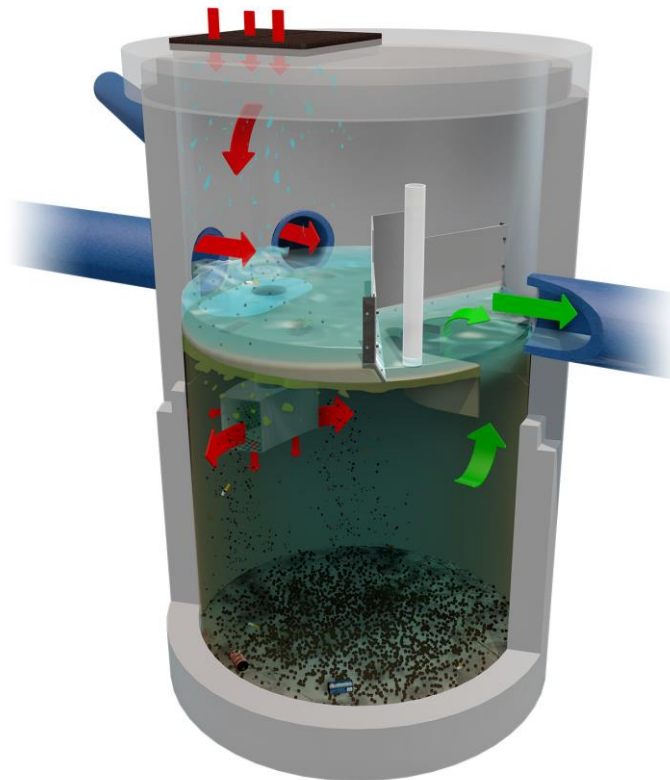
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - **Stormceptor®**. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

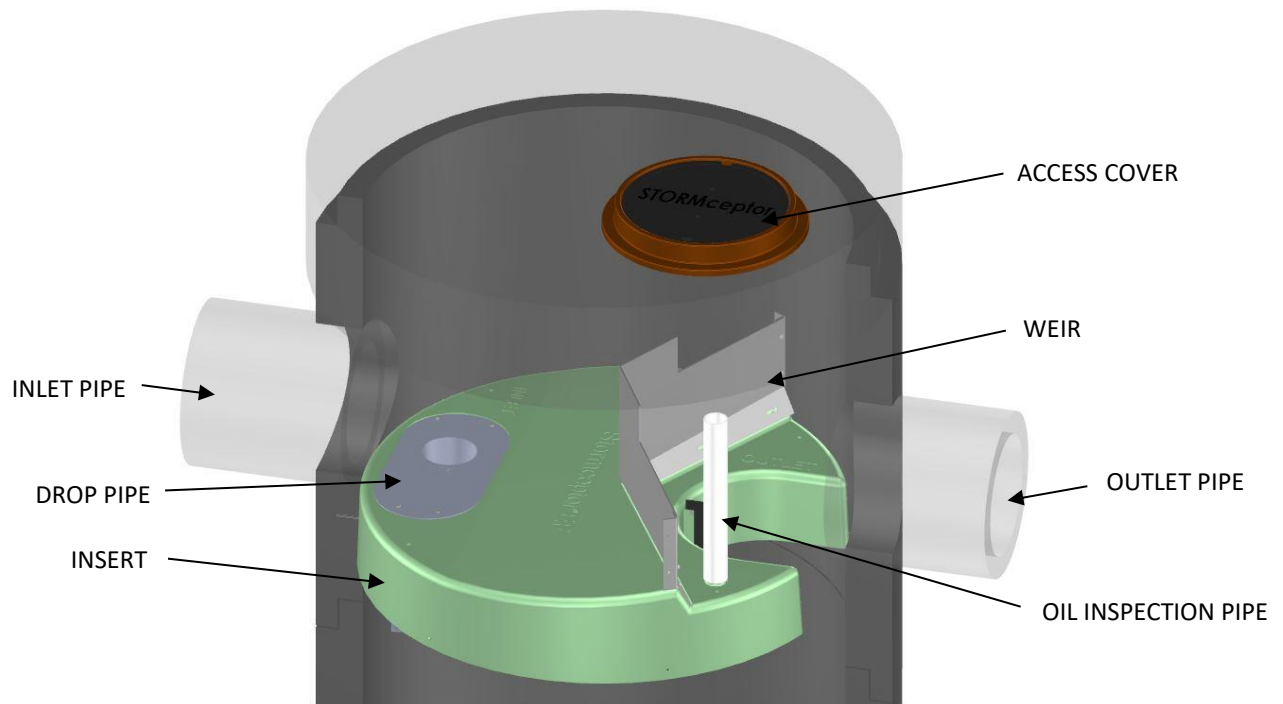


Figure 1

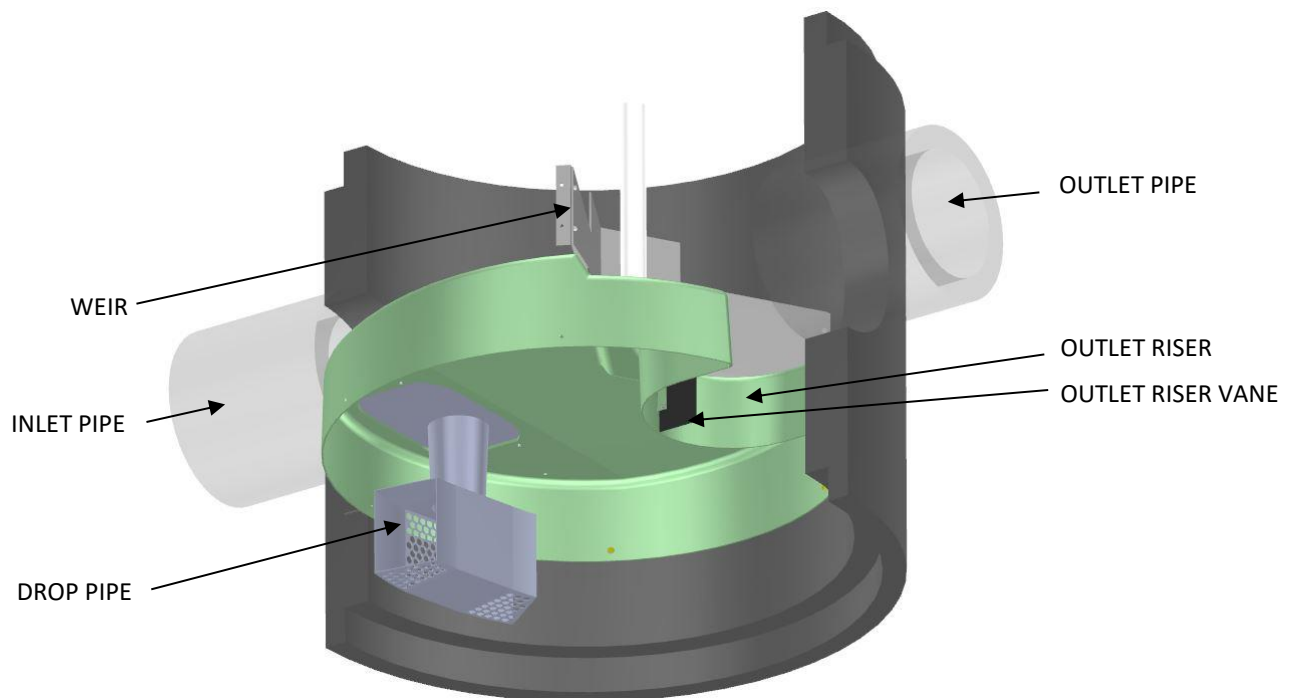


Figure 2

OUTLET PLATFORM (UP position)

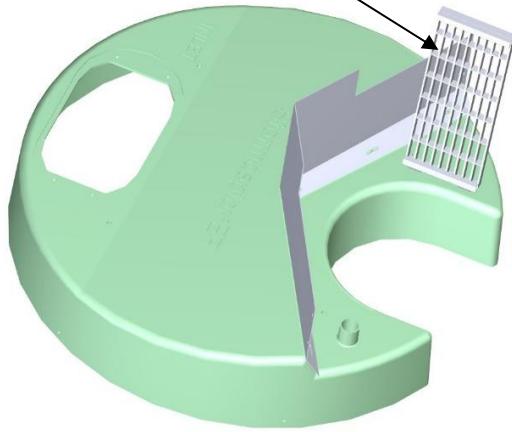


Figure 3A

OUTLET PLATFORM (DOWN position)

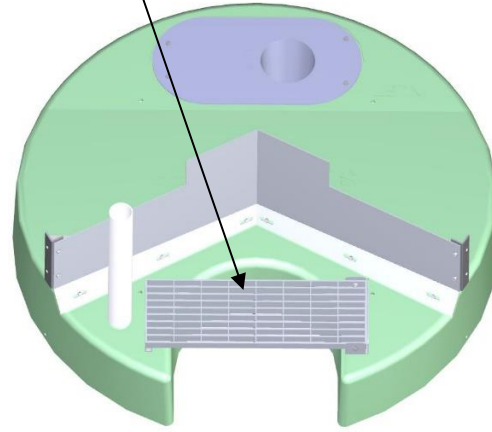


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity ¹ (m ³)	Hydrocarbon Storage Capacity ² (L)	Maximum Flow Rate into Lower Chamber ³ (L/s)	Peak Conveyance Flow Rate ⁴ (L/s)
EF4 / EFO4	1.22	1219/914	1524	1780	1.19	265	22.1 / 10.4	425
EF5/EFO5	1.52	1219	1626	3150	1.95	420	34.6 / 16.2	708
EF6 / EFO6	1.83	1219	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1219	3886	40800	31.22	2475	198.7 / 93.7	2830

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity ¹ (ft ³)	Hydrocarbon Storage Capacity ² (gal)	Maximum Flow Rate into Lower Chamber ³ (cfs)	Peak Conveyance Flow Rate ⁴ (cfs)
EF4 / EFO4	4	48 / 36	60	471	42	70	0.78 / 0.37	15
EF5 / EFO5	5	48	64	833	75	111	1.22 / 0.57	25
EF6 / EFO6	6	48	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	48	153	10779	1103	655	7.02 / 3.31	100

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name **Stormceptor®** embossed on the access cover at grade as shown in **Figure 3**. The tradename **Stormceptor®** is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

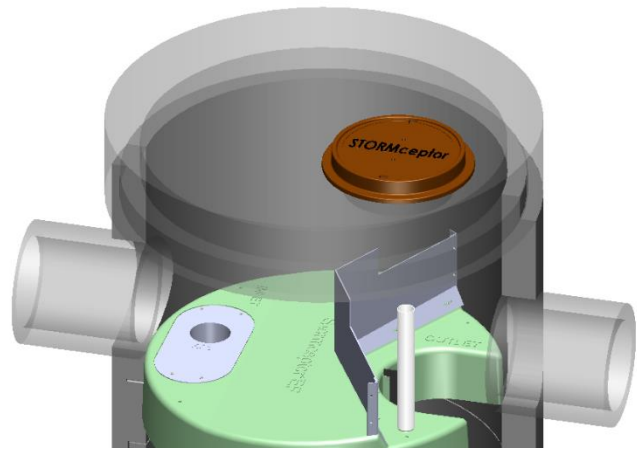


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

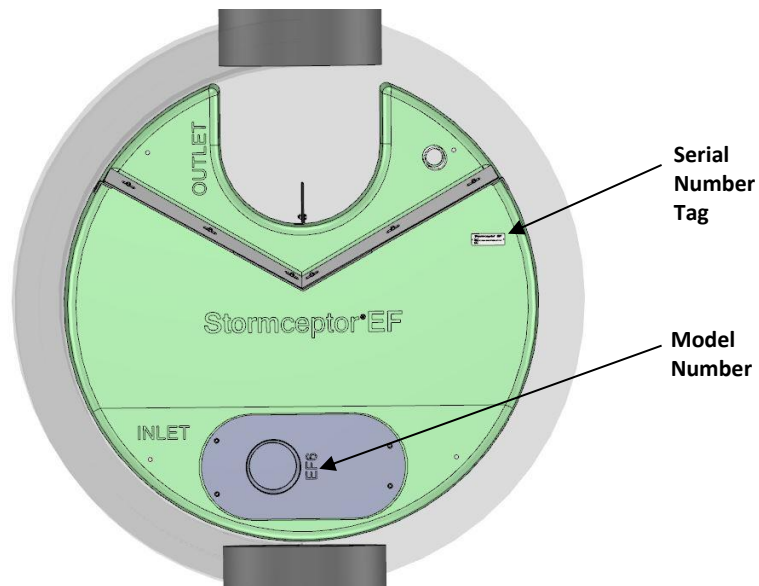


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
NOTE: EF4/EFO4 & EF5/EFO5 require the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4 & EF5/EFO5), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

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 pollutant 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.

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

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF5 / EFO5	12 / 305
EF6 / EFO6	12 / 305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 41 inches (1,041 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

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 (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.
- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

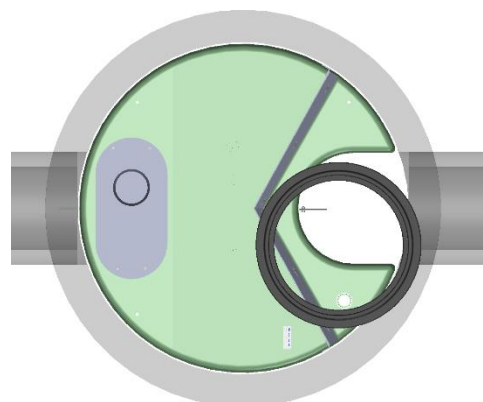


Figure 6

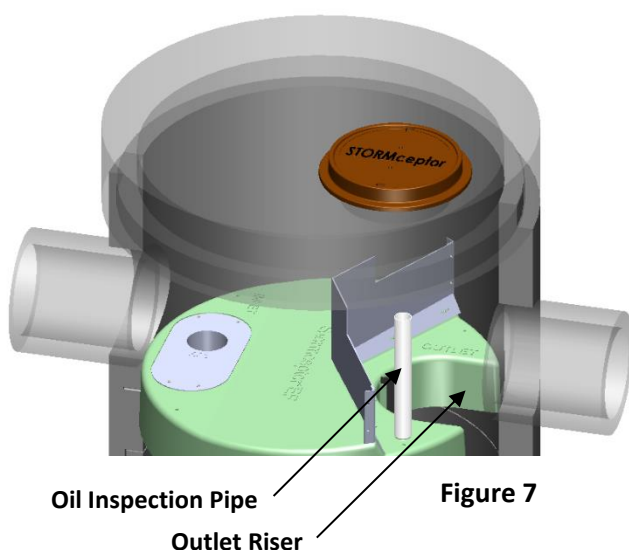


Figure 7



Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.



Figure 9

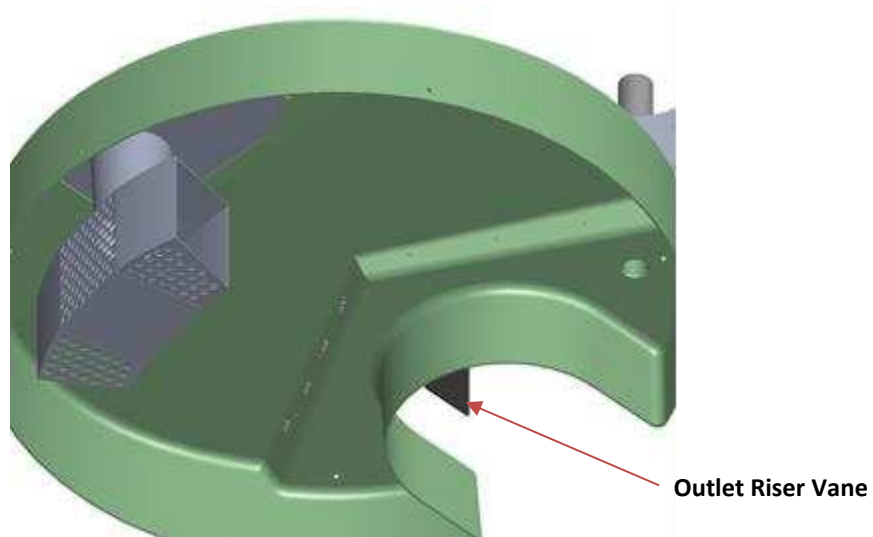


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 & EF5/EFO5 models require a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.

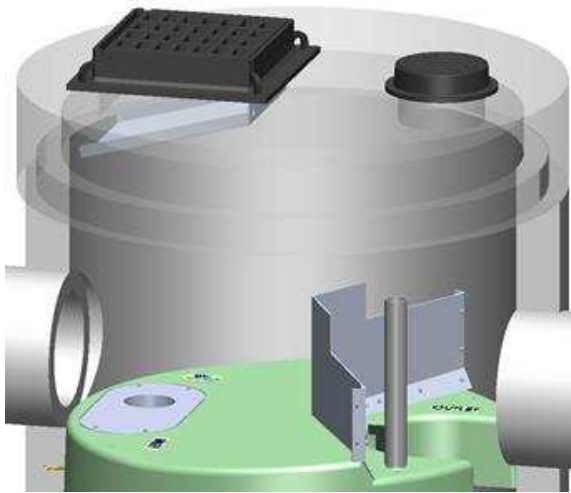
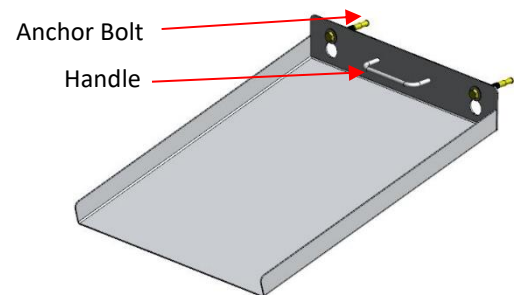


Figure 11

How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations ($< 10 \text{ mg/L}$). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems>.

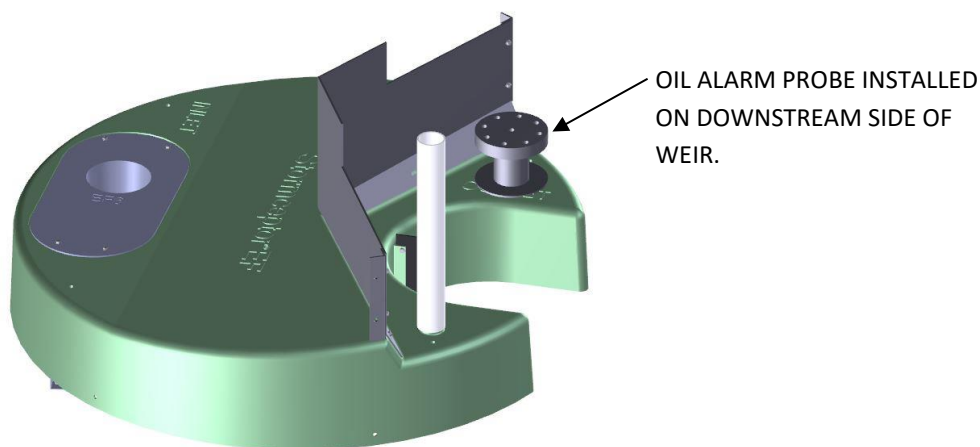


Figure 12

Replacement Parts

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

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Imbrium representative or by visiting our website at www.imbriumsystems.com.

Imbrium Systems Inc. & Imbrium Systems LLC

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Technical Manual

OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - **Stormceptor®**. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures.

During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.

- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.

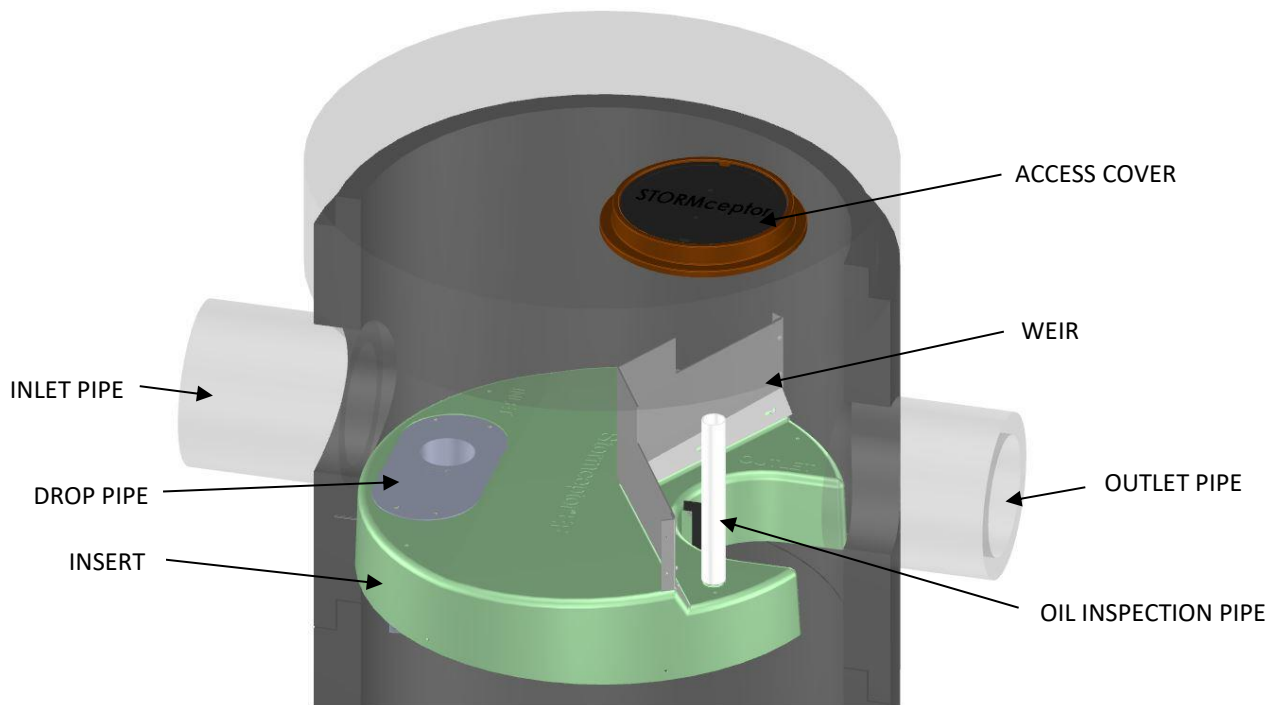


Figure 1

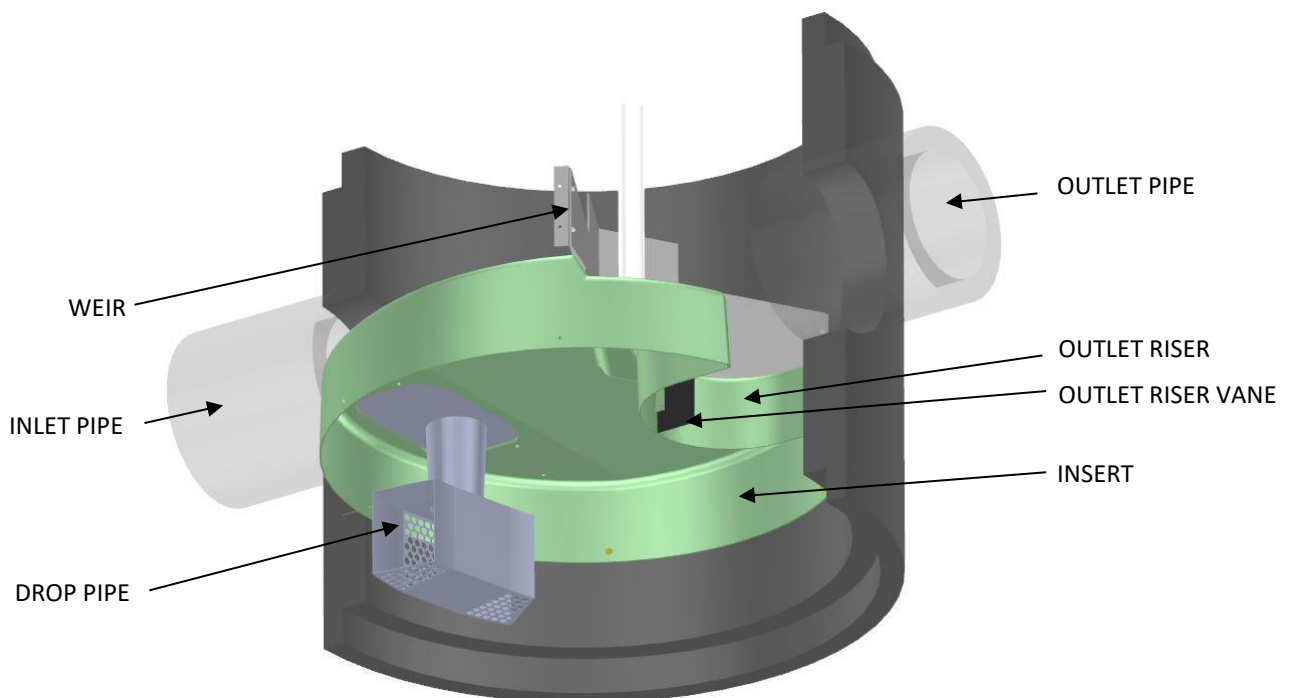


Figure 2

FEATURES AND BENEFITS

Feature	Benefit
Patent-pending enhanced flow treatment and scour prevention technology	Superior verified third-party performance
Oil capture and retention (EFO)	Superior verified third-party performance (EFO)
Functions as bend, junction or inlet structure	Design flexibility
Minimal drop between inlet and outlet	Site installation ease
Large diameter outlet riser for inspection and maintenance	Easy access and maintenance from grade

APPLICATIONS

Stormceptor EF is designed as an 'at source' solution for commercial and industrial sites, urban environments, and residential developments. Stormceptor EF is ideal for:

- Pretreatment of wet ponds, filters, infiltration systems, bioretention, and other Low Impact Development (LID) applications
- Commercial sites
- Manufacturing/Industrial sites
- Residential developments
- Fueling stations, convenience stores, fast food restaurants
- Roads and highways
- Airports, seaports, and military bases
- Hydrocarbon spill, high pollutant load hotspots (Stormceptor EFO)

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity ¹ (m ³)	Hydrocarbon Storage Capacity ² (L)	Maximum Flow Rate into Lower Chamber ³ (L/s)	Peak Conveyance Flow Rate ⁴ (L/s)
EF4 / EFO4	1.22	1219/914	1524	1780	1.19	265	22.1 / 10.4	425
EF5/EFO5	1.52	1219	1626	3150	1.95	420	34.6 / 16.2	708
EF6 / EFO6	1.83	1219	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1219	3886	40800	31.22	2475	198.7 / 93.7	2830

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity ¹ (ft ³)	Hydrocarbon Storage Capacity ² (gal)	Maximum Flow Rate into Lower Chamber ³ (cfs)	Peak Conveyance Flow Rate ⁴ (cfs)
EF4 / EFO4	4	48 / 36	60	471	42	70	0.78 / 0.37	15
EF5 / EFO5	5	48	64	833	75	111	1.22 / 0.57	25
EF6 / EFO6	6	48	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	48	153	10779	1103	655	7.02 / 3.31	100

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

UNIT DESIGN

SIZING METHODOLOGY

Stormceptor® EF is sized using **PCSWMM for Stormceptor®**, a continuous simulation model based on US EPA SWMM and third-party performance testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. The SWMM sizing program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision in conjunction with Stormceptor EF's third party laboratory performance data, every Stormceptor unit is designed to achieve a defined water quality objective. The simulation model calculates TSS removal based on:

- Site parameters
- Historical rainfall data, including duration, distribution, peaks and inter-event dry periods
- The Canadian ETV particle size distribution, and associated Canadian ETV laboratory test results

State, provincial, and local regulatory agencies and municipalities may have specific sizing and design criteria for stormwater treatment systems such as Oil-Grit Separators (OGS). To ensure proper sizing and design, contact your local Stormceptor representative for sizing and design assistance or visit www.imbriumsystems.com for more information.

ONLINE APPLICATION

Stormceptor EF's internal bypass and patent-pending scour prevention technology has demonstrated very effective retention of pollutants in third-party testing and verification following the Canadian ETV's **Procedure for Laboratory Testing of Oil-Grit Separators**. Sediment scour prevention demonstrated an effluent concentration of less than 10 mg/L for sediment particles ranging from 1 to 1,000 microns, even during peak influent flow rates associated with infrequent high intensity storm events. While Stormceptor EF will capture oil, only the **Stormceptor EFO** configuration has been third-party tested and verified to retain greater than 99% of captured oil.

Based on these verified performance attributes, the most efficient and widely accepted application of Stormceptor EF is an online configuration, which allows all upstream conveyance flows to enter and exit the unit. The online application eliminates the need for costly additional bypass structures, piping and installation expense.

FLOW ENTRANCE OPTIONS

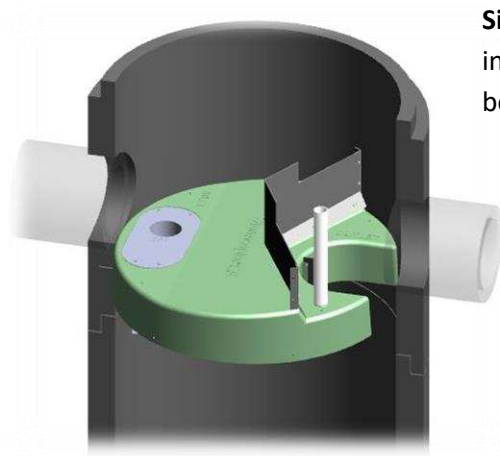


Figure 3

Single Inlet Pipe – A common design which includes one inlet pipe and one outlet pipe. A 90-degree (maximum) bend is also accepted with this configuration.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in / mm)	OUTLET (in / mm)
EF4 / EFO4	24 / 610	24 / 610
EF5 / EFO5	30 / 762	30 / 762
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

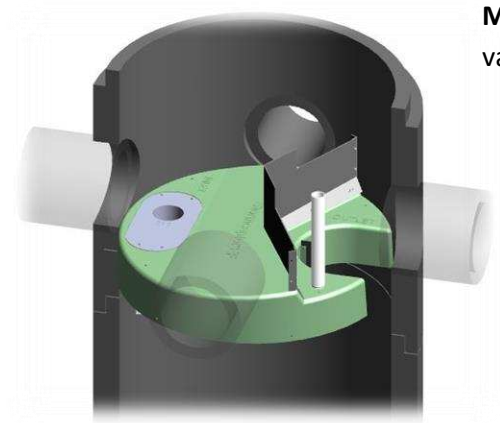


Figure 4

Multiple Inlet Pipes – Allows for multiple inlet pipes of various diameters to enter the unit.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in / mm)	OUTLET (in / mm)
EF4 / EFO4	18 / 457	24 / 610
EF5 / EFO5	24 / 610	30 / 762
EF6 / EFO6	30 / 762	36 / 915
EF8 / EFO8	42 / 1067	48 / 1220
EF10 / EFO10	60 / 1524	72 / 1828
EF12 / EFO12	60 / 1524	72 / 1828

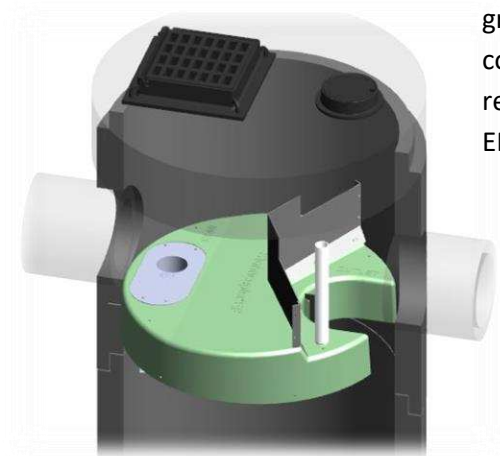


Figure 5

Inlet Grate – Allows surface runoff to enter the unit from grade. The inlet grate option can also be used in conjunction with one inlet pipe or multiple inlet pipes. A removable flow deflector is added in the Stormceptor EF4/EFO4 & EF5/EFO5.

MAXIMUM PIPE DIAMETER		
MODEL	INLET (in/mm)	OUTLET (in/mm)
EF4 / EFO4	24 / 610	24 / 610
EF5 / EFO5	30 / 762	30 / 762
EF6 / EFO6	36 / 915	36 / 915
EF8 / EFO8	48 / 1220	48 / 1220
EF10 / EFO10	72 / 1828	72 / 1828
EF12 / EFO12	72 / 1828	72 / 1828

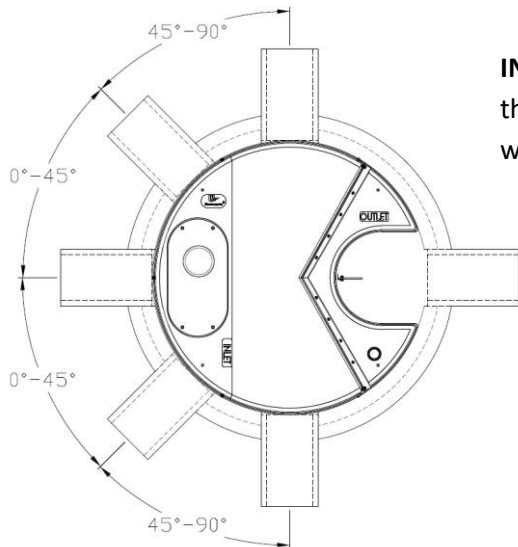


Figure 6

INLET-TO-OUTLET DROP – Elevation differential between the inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

0° – 45°: The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° – 90°: The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

SUBMERGED (TAILWATER) DESIGN

Submerged or tailwater conditions are defined as standing water above the insert elevation during zero-runoff conditions. A weir height modification allows Stormceptor EF to operate under submerged conditions. The following information is necessary to properly design Stormceptor EF for the submerged condition:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

NOTE: The maximum weir height for Stormceptor EF is 48 inches (1200 mm).
Contact your local Stormceptor representative for design assistance.

LIVE LOAD

Stormceptor EF is typically designed for local highway truck loading. In instances where other live loads are required, Stormceptor EF can be customized to meet the necessary structural requirements. Contact your local Stormceptor representative for design assistance.

SHALLOW COVER

Stormceptor EF is typically designed with a minimum depth of burial to the outlet invert based on the diameter of the inlet and outlet pipes. A common minimum burial depth to the outlet invert is 48 inches (1.2 meters). In instances where there may be site constraints to the depth of burial contact your local Stormceptor representative for design assistance.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

ABOVE-GROUND INSTALLATIONS

Stormceptor EF can be designed as a free-standing above-ground unit, constructed of fiberglass. These customized units are lightweight and can be installed within a building footprint, providing structural support and installation advantages. Contact your local Stormceptor representative for design assistance.

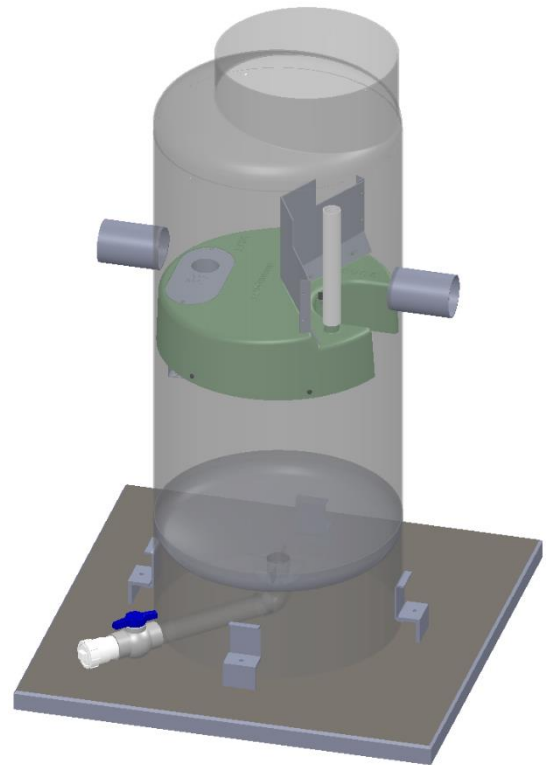


Figure 7

PERFORMANCE VERIFICATION TESTING

Stormceptor EF has been third-party performance tested according to the Canadian Environmental Technical Verification (ETV) *Procedure for Laboratory Testing of Oil-Grit Separators*, and has received **ISO 14034 Environmental Management – Environmental Technology Verification (ETV)**.

For more information, please visit www.imbriumsystems.com or contact your local Stormceptor representative.

INSTALLATION

For installation details, please visit www.imbriumsystems.com and refer to the **Stormceptor® EF Installation Guideline** or contact your local Stormceptor representative.

INSPECTION AND MAINTENANCE

As with any stormwater treatment device, periodic inspection and maintenance of Stormceptor EF is required for long-term performance.

Inspection and maintenance is performed from grade without entering the unit. Sediment depth inspections are performed through the outlet riser, and oil presence can be determined through the oil inspection pipe. Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths. Visual inspections of the insert can be performed to ensure there is no damage or blockages. A beneficial feature of Stormceptor EF in comparison to many other treatment practices is that once it is maintained, Stormceptor EF is functionally restored to its original condition.

When maintenance is required, a standard vacuum truck is used to remove the pollutants (sediment and floatables) from the lower chamber of the unit through the outlet riser. When an appreciable amount of oil or other hydrocarbons is present, these floatable pollutants can be removed by hydrovac from the water surface. Should an oil/fuel spill occur, or presence of oil/fuel be identified within the unit, it should be cleaned immediately by a licensed liquid waste hauler.

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF5 / EFO5	12 / 305
EF6 / EFO6	12 / 305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 41 inches (1,041 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, location, and transportation distance(s).

For more details on inspection and maintenance refer to the **Stormceptor® EF Owner's Manual** at www.imbriumsystems.com

HYDROCARBON CAPTURE AND RETENTION

Stormceptor EFO

Stormceptor is often installed on high-traffic pollutant hotspots where hydrocarbon spill potential exists. The technology platform of Stormceptor EFO is the same as Stormceptor EF, however the maximum surface loading rate into the lower chamber is restricted to a lower value with Stormceptor EFO, thereby ensuring excellent oil retention. Third-party testing in accordance with the Light Liquid Re-entrainment testing provisions within the Canadian ETV protocol **Procedure for Laboratory Testing of Oil-Grit**

Separators demonstrated greater than 99% oil retention. Stormceptor EFO is engineered to capture and retain free floating oil/chemical/fuel spills, not emulsified hydrocarbons.

OIL SHEEN

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EFO may still be functioning as intended.

DISPOSAL

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of hydrocarbons.

OIL LEVEL ALARM

As an added safeguard, an oil level alarm is available as an optional feature for Stormceptor EFO. This is an electronic monitoring system designed to trigger a visual and audible alarm when a preset level of oil is captured in the lower chamber. The oil level alarm is installed as illustrated in Figure 8.

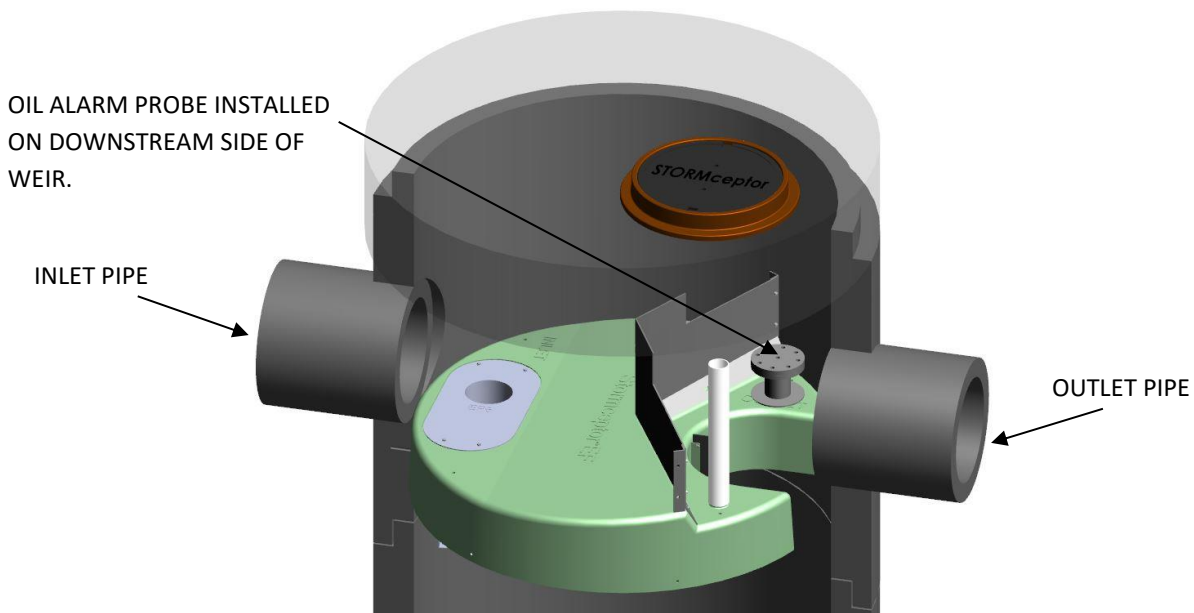


Figure 8

ADDITIONAL POLLUTANT STORAGE CAPACITY

Stormceptor EF/EFO can be easily modified to increase sediment storage capacity by extending the depth of the lower chamber. Stormceptor EFO can be modified to increase hydrocarbon storage capacity by extending the outlet riser, thereby providing the storage volumes depicted in the table below.

Stormceptor Model	Standard Hydrocarbon Storage Capacity ¹ (L / gal)	Extended Hydrocarbon Storage Capacity ^{1, 2} (L / gal)
EFO4	265 / 70	395 / 105
EFO5	420 / 111	871 / 230
EFO6	610 / 160	1615 / 425
EFO8	1070 / 280	4340 / 1145
EFO10	1670 / 440	NA
EFO12	2475 / 655	NA

¹ Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert.

² Distance from bottom of the extended outlet riser to top of the sediment maintenance depth is 914 mm (36 in).

NA –Not available in these model sizes

Contact your local Stormceptor representative for additional information and design assistance.

HEALTH AND SAFETY

For all aspects of installation and inspection/maintenance, OSHA and appropriate local regulations should be followed to ensure safe practice.