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VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

LittaTrap™ Catch Basin System

Enviropod International Ltd.
North Harbour, Auckland, New Zealand

Registration: GPS-ETV_V2021-11-15

In accordance with

ISO 14034:2016

Environmental Management —
Environmental Technology Verification (ETV)

John D. Wiebe, PhD
Executive Chairman
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November 15, 2021
Vancouver, BC, Canada

Verification Body
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Technology description and application

The LittaTrap™ Catch Basin System is a removable insert installed in a pre-cast sumped catch basin with a submerged outlet baffle designed to improve the capture of solids, trash and debris, and reduce resuspension of captured sediment particles in the sump (Figure 1). The system employs screening, energy dissipation, flow distribution and gravitational settling to remove pollutants from stormwater runoff.

The system functions by draining stormwater surface runoff through a grate, curb opening or both. Once the runoff drops below the surface it is diverted through the screened basket where it is intercepted by a patented energy dissipation mechanism. This mechanism reverses the direction of flow and distributes the sediment across the surface area of the sump. The process of intercepting and distributing the flow enhances settling in the catch basin sump and reduces the resuspension of TSS, while retaining and storing gross solids and debris (>5 mm) in a dewatered environment. Retention of organic gross pollutants and holding them in a dry environment prevents them from breaking down and releasing nutrients and other contaminants into the water.

The patented mesh batten basket is made of inert light weight plastic for easy removal and maintenance without the need for specialized equipment. An adjustable bypass at the top of the basket provides a secondary flow path into the catch basin should the basket become filled or temporarily clogged. The unit comes in different sizes to fit standard catch basins of variable dimensions.

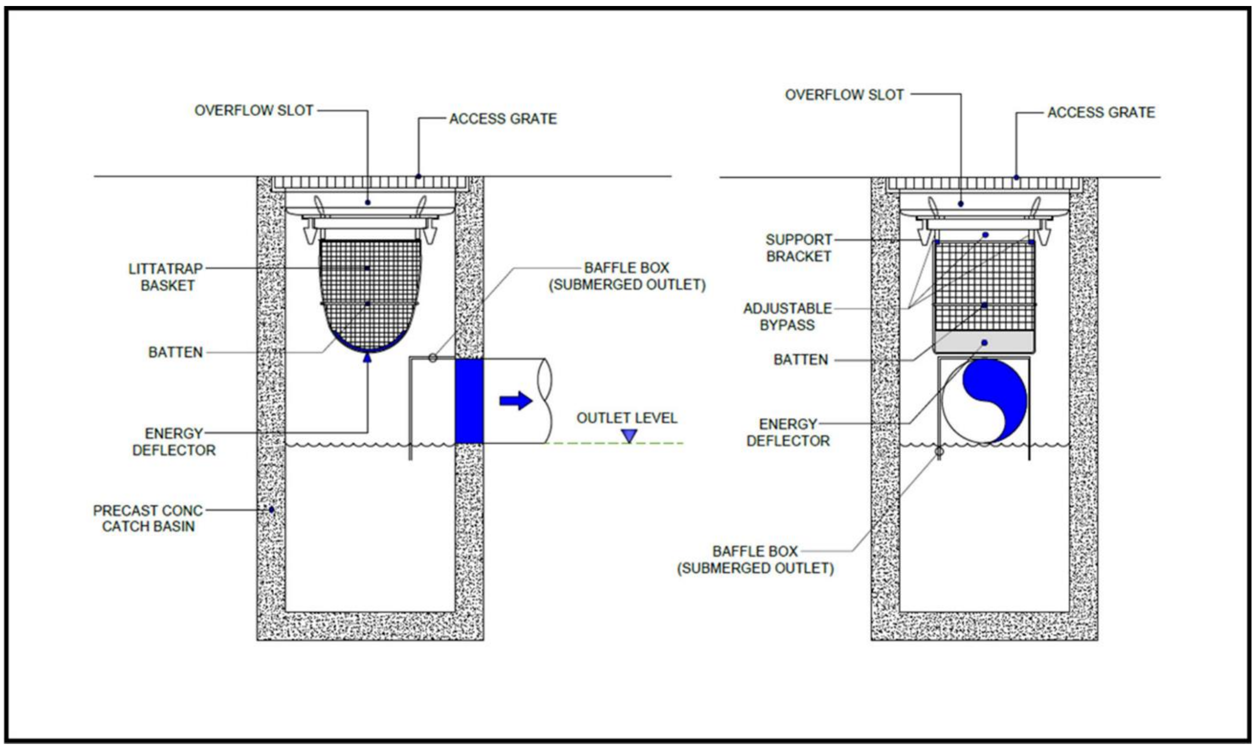

Figure 1: Enviropod® LittaTrap™ Catch Basin System

Performance conditions

The data and results published in this Technology Verification Statement were obtained from a testing program conducted on Enviropod International's LittaTrap™ Catch Basin System. The testing program was based on the *Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014)*, and associated *Bulletins*, with modifications to accommodate the surface inlet and small storage capacity of the catch basin (see variance section below for details). These modifications to the *Procedure* were developed to comply with the ISO 14034 Environmental Technology Verification standard and were approved by the verifier in advance of the test. The *Procedure for Laboratory Testing of Oil-Grit Separators* was prepared by the Toronto and Region Conservation Authority (TRCA) for the Canadian Environmental Technology Verification Program. A copy of the Procedure may be accessed on the Canadian ETV website at www.etvcanada.ca.

Performance claim(s)

Capture test[1]:

During the capture test, the LittaTrap™ Catch Basin System device, with a false floor set at 50% of the maximum sediment storage depth and influent test sediment concentration of 200 mg/L, removes 62, 59, 49, 41, 37, 34, 28 and 25 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 800, 1000, and 1400 L/min/m^2, respectively.

Scour test[1]:

During the scour test, the LittaTrap™ Catch Basin System, with 10.2 cm (4 inches) of test sediment pre-loaded onto a false floor reaching 50% of the maximum sediment storage depth, generates corrected effluent concentrations of 2.8, 2.3, 0.1, 0.5 and 0.7 mg/L at 5-minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Performance results

The sediment used to test the technology 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 average (minimum 3 samples) of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%, with a median no greater than 75 µm. 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 these conditions, with an average d50 particle size of 73 µm. The average was determined from three samples prepared for each of the tested surface loading rates. All three samples had a median particle size less than 75 µm.

[1] 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 of Testing of Oil Grit Separators (Version 3.0, June 2014)

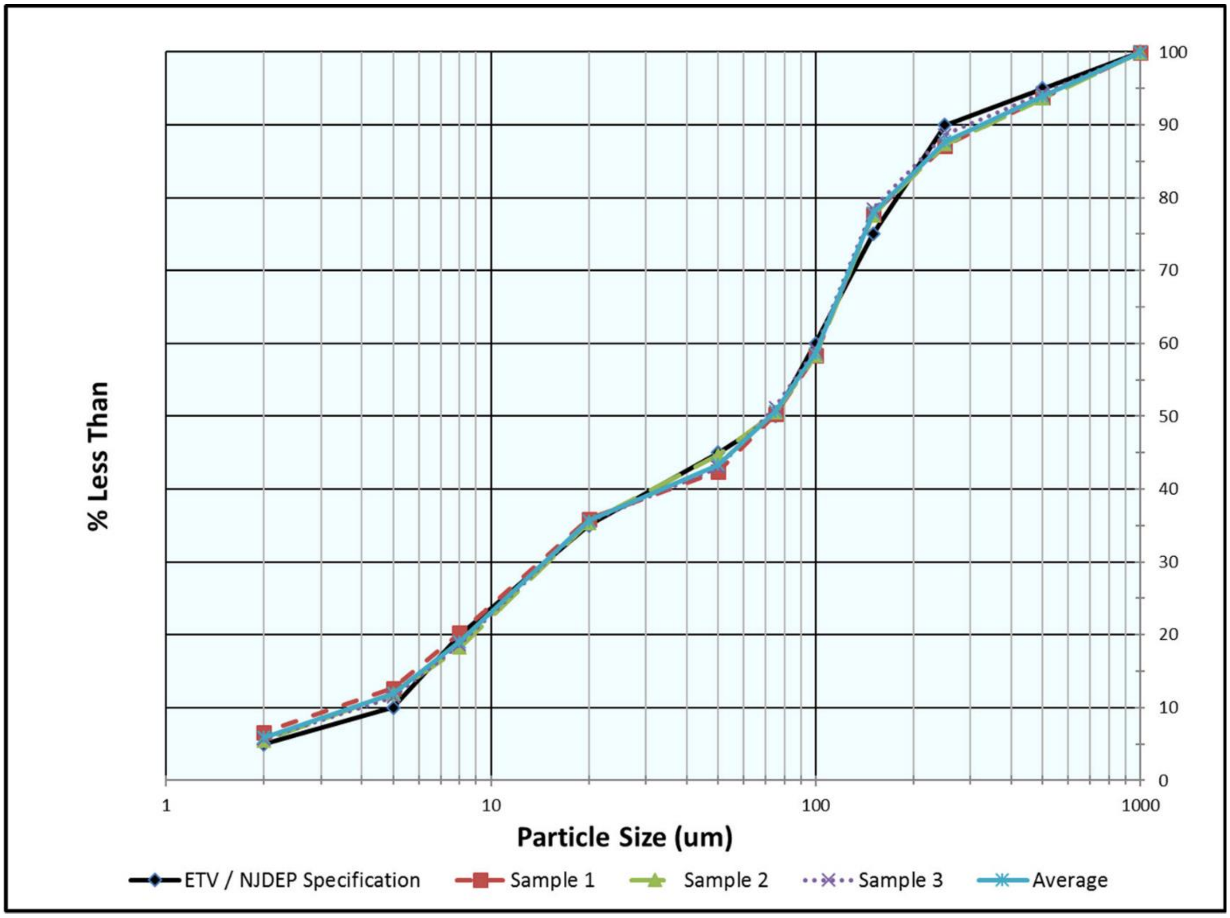

Figure 2: Average particle size distribution of test sediment relative to the ETV specification

Calibration samples of the test sediment were taken for each of the 8 runs. This includes one additional run (800 L/min/m^2) not specified in the *Procedure* that was undertaken at the request of the vendor. The results presented in Figure 2 show that the PSD met the specification for all runs, with median PSDs less than or equal to 75 µm. An anomaly occurred on the feed sediment for the 1000 L/min/m^2 which the test laboratory attributed to a sediment sieving error that was not expected to affect the capture test results.

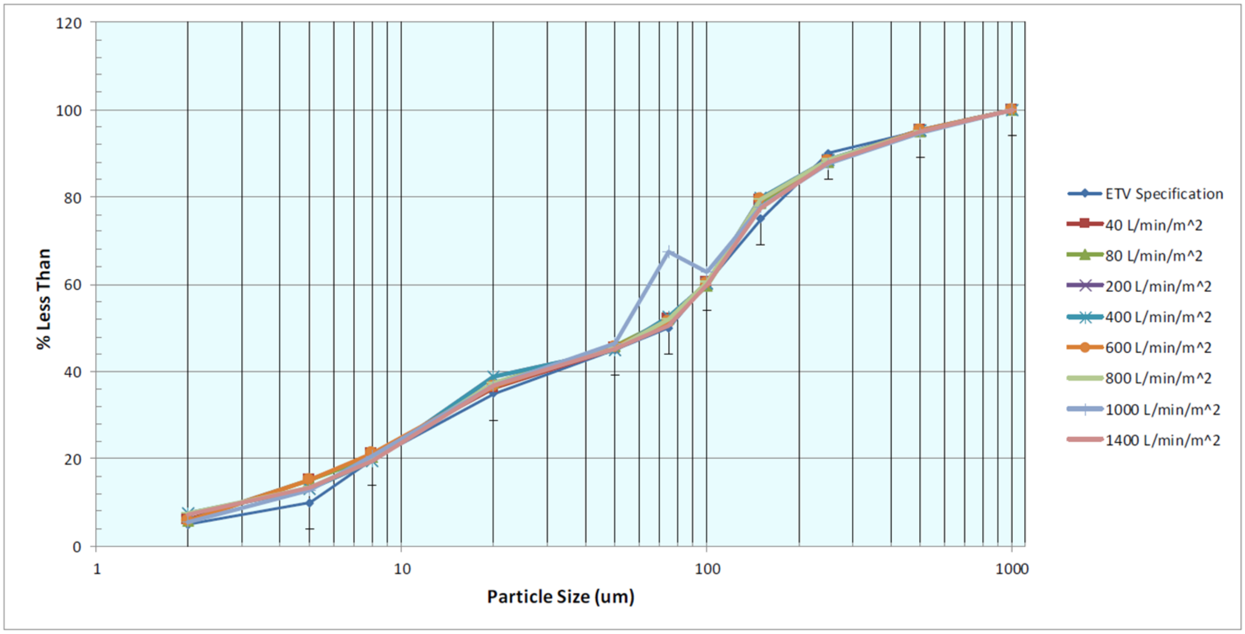

Figure 3: Particle size distribution of individual feed sediment calibration samples compared to the ETV specification

The LittaTrap technology was installed into a simulated 600 x 600 mm catch basin based on the design specified by the City of Toronto in the drawing *T-705.010, Pre-cast Catch Basin with Sump, Rev1; Apr2013*. Since runoff flows into catch basins through a surface grate, a simulated streetscape was used to test the capacity of the unit to capture sediment and prevent re-entrainment of captured sediment. The streetscape was graded at a 2% slope and a 2% cross slope with baffles to concentrate flow and direct it towards the sediment injection point 0.7 m upstream of the catch basin grate. Slopes and surface coatings were used to minimize build-up of sediment on the surface. The mass of feed sediment injected, averaging 4.2 kg, was less than the 11.3 kg min prescribed in the *Procedure* because of the much smaller storage capacity of a catch basin sump relative to an Oil Grit Separator. Test durations remained the same as specified in the *Procedure*.

The capacity of the LittaTrap™ Catch Basin system to retain sediment was determined at eight 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 at 45 cm from the bottom, simulating the technology filled to 50% of the sediment storage depth (as measured between the outlet invert and catch basin bottom). The test was carried out with clean water that maintained a sediment concentration below 20 mg/L.

Table 1 shows the location of sediment deposition in the unit during the capture test. No sediment was retained on the streetscape surface and an insignificant amount was retained on the grate. During the two lowest surface loading rates, between 32 and 37% of the retained sediment was captured in the basket on the flow deflection device. Subsequent PSD analysis of this sediment showed that the sediment retained in the basket was coarser than the sediment in the sump. Approximately 10% of retained sediment was captured in the basket at the 200 L/min/m^2 surface loading rate.

Table 1: Location of sediment deposition during the capture test. No sediment was retained on the streetscape during any of the tested surface loading rates.

Surface Loading Rate (L/min/m²)	40	80	200	400	600	800	1000	1400
Total Mass Injected (kg)	4.011	3.974	4.313	4.302	4.058	4.257	4.056	4.533
Sediment Captured in sump (kg)	1.6487	1.4553	1.8777	1.7114	1.4983	1.4284	1.1547	1.1435
Sediment Captured in basket (kg)	0.7976	0.8526	0.2162	0.0581	-	-	-	-
Sediment Captured on the catch basin grate (kg)	0.0525	0.0233	0.0028	-	-	-	-	-
Total Mass Retained (kg)	2.4989	2.3312	2.0967	1.7695	1.4983	1.4284	1.1547	1.1435

Removal efficiency results for individual particle size classes and for the test sediment as a whole 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 are attributed to challenges relating to the blending of sediment and the collection of representative samples for laboratory submission. 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 "removal efficiency based on mass balance" (see Table 2) are based on measurements of the total mass of injected and retained sediment, and are therefore not subject to blending, sub-sampling or PSD analysis errors or anomalies.

Table 2. Removal efficiency summary at each surface loading rate by particle size and total mass.

Particle Size Fraction (µm)	**Removal Efficiency (%)**							
	40 (L/min/m^2)	**80 (L/min/m^2)**	**200 (L/min/m^2)**	**400 (L/min/m^2)**	**600 (L/min/m^2)**	**800 (L/min/m^2)**	**1000 (L/min/m^2)**	**1400 (L/min/m^2)**
> 500	100*	100*	95	100*	100*	99	68	100*
250 - 500	100*	100*	99	100*	100*	96	67	99
150 - 250	93	100	78	82	64	71	51	48
100 - 150	98	94	97	66	49	54	63	31
75 - 100	81	77	56	49	32	36	-66**	10
50 - 75	100*	55	85	25	18	24	9	2
20 - 50	41	25	11	12	4	4	0	0
8 - 20	25	11	2	1	0	0	0	0
5 - 8	0	0	0	0	0	0	0	0
< 5	10	9	9	7	6	6	6	4
Removal Efficiency based on mass balance (%)	62.31	58.65	48.61	41.13	36.92	33.56	28.47	25.23

* Removal efficiencies were calculated to be above 100%. Calculated values ranged between 106 and 158%

** An outlier in the retained sediment sample sieve data resulted in negative removal for this size fraction

Figure 4 compares the particle size distribution (PSD) specification of the test sediment to the PSD of the sediment retained in the catch basin at each of the tested surface loading rates. As expected, the capture efficiency for fine particles in the unit was generally found to decrease as surface loading rates increased although retained sediment at the 600 L/min/m^2 surface loading rate was unexpectedly coarse.

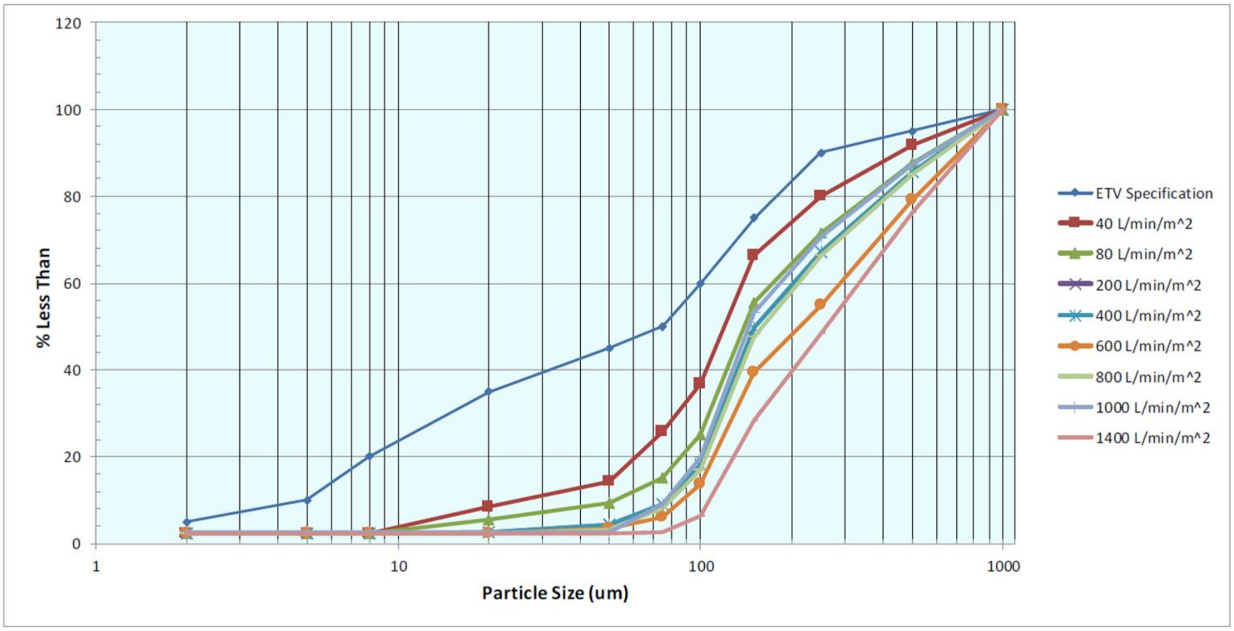

Figure 4: Particle size distribution of retained sediment compared to the ETV specified test sediment.

Table 3 shows the results of the sediment scour and re-suspension test for the LittaTrap™ Catch Basin system. The scour test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the catch basin. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum 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. The smallest 5% of particles captured during the 40 L/min/m^2 surface loading rate are also commonly used to adjust the concentration, as per the method described in Bulletin # CETV 2016-09-0001. However, the sediment concentration was too low to conduct aqueous sample PSD tests, hence the results are adjusted based on background concentration of influent water alone. Results showed average adjusted effluent sediment concentrations below 3 mg/L at all tested surface loading rates.

Table 3: Sediment effluent concentration from the scour test, adjusted by the background concentration.

Run	SLR (L/min/m²)	Run Time	SSC Initial (mg/L)	SSC Adjusted (mg/L)	Average Adjusted (mg/L)
1	200	1:00	9.6	4.9	2.8
		2:00	10	5.3	
		3:00	7.1	2.5	
		4:00	6.4	1.8	
		5:00	5.5	0.9	
		6:00	6.1	1.6	
2	800	7:00	7.1	2.6	2.3
		8:00	11	6.3	
		9:00	8.9	4.0	
		10:00	5.9	0.8	
		11:00	4.2	0	
		12:00	4.2	0	
3	1400	13:00	5.9	0.1	0.1
		14:00	6.9	0.4	
		15:00	4.1	0	
		16:00	4.7	0	
		17:00	2.9	0	
		18:00	1.8	0	
4	2000	19:00	13	3.0	0.5
		20:00	8.2	0	
		21:00	3.0	0	
		22:00	3.2	0	
		23:00	1.9	0	
		24:00	3.0	0	
5	2600	25:00	4.2	2.2	0.7
		26:00	2.6	0.8	
		27:00	2.1	0.5	
		28:00	1.0	0	
		29:00	1.4	0.2	
		30:00	1.7	0.7	

Variances from testing Procedure

The *Procedure for Laboratory Testing of Oil Grit Separators* was used as the basis for testing with the following modifications to accommodate the surface inlet and small size of the catch basin sump:

1. A simulated streetscape (2.4 m long x 0.61 m wide) was used to direct flows into the catch basin through a surface grate. The streetscape had a 2% slope to the catchbasin (CB) and a 2% cross slope to the outlet side of the CB. Baffles were used to direct water towards the sediment injection point 0.7 m upslope of the surface grate to promote thorough mixing of sediment and avoid accumulation of sediment on the streetscape surface.
2. The sump area of a catchbasin is approximately one third that of a typical 1.2 m diameter Oil Grit Separator. To ensure test durations similar to those normally completed for OGS, the mass of sediment injected per run was reduced to an average of 4.2 kg (see Table1 above).
3. The two lowest surface loading rates of 40 and 80 L/min/m2 had flow rates of only 0.24 and 0.48 L/s. These low flow rates required that: (i) sediment calibration samples be taken over 2 minutes rather than one to capture the minimum quantity of sediment for weighing, and (ii) higher tolerance for flow meter error (0.9% rather than 0.2%) as the lowest flow rate (0.24 L/s) lies outside of the flow meter calibration range. Although greater tolerances were suggested for sediment concentrations in the test plan, the test was within the 200±25 mg/L specified in the *Procedure*.
4. The highest flow rate during the scour test (15.6 L/s) requires switching of pumps which meant that flow rates were recorded manually ever 30 seconds for the 5 minute duration of this flow rate.

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 Enviropod International Inc. to support the performance claim included the Performance Test Report prepared by Good Harbour Laboratories, Inc , and dated June 8, 2021. This report is based on testing completed in accordance with the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) and associated Bulletins, with some modifications required to accommodate the application of the *Procedure* to a catch basin treatment unit.

What is ISO14034:2016 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.

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