Large-Scale Sediment Retention Device Testing (ASTM D 7351)

of

SedCatch® Sediment Basket™ Inlet Filter Exposed to 1.5% Sediment Load

February 2010

Submitted to:
SedCatch Environmental Products
8380 Point O'Woods Ct.
Springboro, Ohio 45066

Attn: Mr. Greg Vreeland

Submitted by:
TRI/Environmental, Inc.
9063 Bee Caves Road
Austin, TX 78733

C. Joel Sprague
Project Manager

February 2, 2010

Mr. Greg Vreeland
SedCatch Environmental Products
8380 Point O'Woods
Springborg, Ohio 45066
E-mail: greg@erosionrunner.com

Subject: Sediment Retention Device Testing of Inlet Filters (# 2278-01-49)

Dear Mr. Vreeland:

This letter report presents the results of large-scale sediment retention device tests performed on **SedCatch® Sediment Basket™** inlet filters. Included are data developed for simulated sediment-laden runoff (1.5% sediment load) from a 100-ft long, 3:1 slope exposed to a 4 inch storm event. All testing work was performed in general accordance with the ASTM D 7351, *Standard Test Method For Determination Of Sediment Retention Device Effectiveness In Sheet Flow Application*, though the protocol was modified to present the flow from the entire storm event to an inlet. Generated results were used to develop the following effectiveness percentage for the tested material:

Property	200 SedCatch® Sediment Basket™
Retention Effectiveness (Filtration Efficiency)	80.6 %
Soil Captured During Rain Event (@ 80 lb/ft^3)	0.60 ft^3
Tested Bag Capacity (below overflow level)	3.13 ft^3
Capacity Utilization Rate	19 %
% of (4-inch) Storm Event Handled	100 %

TRI is pleased to present this final report. The data presented herein appears to be consistent with commonly reported values. Please feel free to call if we can answer any questions or provide any additional information.

Sincerely,

C. Joel Sprague, P.E.
Senior Engineer
Geosynthetics Services Division

Cc: Sam Allen, Jarrett Nelson – TRI

SEDIMENT RETENTION DEVICE (SRD) TESTING REPORT

SedCatch® Sediment Basket™ Inlet Filter
Exposed to 1.5% Sediment Load

TESTING EQUIPMENT AND PROCEDURES

Overview of Test and Apparatus

TRI/Environmental, Inc.'s (TRI's) large-scale sediment retention device testing facility is located at the Denver Downs Research Farm in Anderson, SC. Testing oversight is provided by C. Joel Sprague, P.E. The large-scale testing is performed in accordance with ASTM D 7351 *modified to present the flow from the entire storm event to an inlet*. At a minimum, the amount (via water and soil weight) of sediment-laden flow is measured both upstream and downstream of the SRD. The measurement of sediment that passes through the SRD compared to the amount in the upstream flow is used to quantify the effectiveness of the SRD in retaining sediments.

This test method is full-scale and therefore, appropriate as an indication of product performance, for general comparison of product capabilities, and for assessment of product installation techniques. For this testing, a simulated area inlet comprised of a wooden "box" section and inlet opening was used to position the Inlet Filters in a representative condition.

The test apparatus and setup is shown in Figure 1 and the inlet filter is shown in Figure 2.

Sediment Retention Device (SRD)

The following table describes the tested SRDs.

Table 1. Tested SRD Descriptions

Fabric Component	200 SedCatch® Sediment Basket™
Description	Woven, monofilament
AOS, mm	0.49
Water Flow Rate, gpm	200
Tested Bag Capacity*, ft^3	3.13

(* below overflow level)

Test Soil

The test soil used as sediment was a sandy loam screened through a ½-inch mesh. The base soil gradation is shown in the appendix.

Test Setup

SRD Installation – The Sediment Retention Device (SRD) installation used a simulated area inlet comprised of a wooden "box" section and inlet opening to position the Inlet Filter Bags in a representative condition.

Mixing Sediment-Laden Runoff - Sediment-laden runoff was created by combining water and soil in the mixing tank and agitated during the test. 4000 lb of water and 240 lb of soil were combined to create the sediment-laden runoff. This amount of water and sediment simulates sheet flow from a slope measuring 16 ft (4.8 m) wide by 100 ft (30 m) long during the peak 30 minutes of a 4 in (100 mm) per hour rainfall hydrograph as outlined in the following calculation (which is outlined in the standard). . .

"For this testing, a standard 10-year, 6-hour storm event (mid-Atlantic region of US) was selected. This return frequency is commonly used for sizing sediment control ponds and, thus, was deemed appropriate for the testing of other SRDs. Using this criterion, a 100 mm (4 in) rainfall was selected. It was also assumed that approximately 25% of the storm would occur during the peak 30 minutes, and that 50% of the rainfall would infiltrate into the ground. A theoretical contributory area of 30 m (100 ft) slope length by 6 m (20 ft) wide was selected to limit runoff to sheet flow conditions. Runoff and associated sediment were calculated using the Modified Universal Soil Loss Equation (MUSLE) which allows for calculating a storm-specific quantity of sediment. Following is the MUSLE (SI formula):

$$T = 89.6\,(V \times Q_p)^{0.56}\,K\,LS\,C\,P$$

Where: T = *sediment yield (tonnes);* V = *runoff* (m^3) = *(Rainfall – Infiltration) x Area;* Q_p = *peak flow* (m^3/s)*; and K, LS, C, P are from RUSLE charts*

The following calculations provided the runoff and sediment load used in the testing:

$V = (0.5)^* \times (0.1\ m) \times (180\ m^2) = 9\ m^3$
$Q_p = (0.1m) \times (0.25)^* \times (0.5)^{**} \times (180m^2) = 2.25\ m^3/\ 30min = 0.00125\ m^3/s$
(= 25% of storm during 30-min peak; ** = 50% infiltration)*
K, sandy-silt = 0.041; LS, 2-10%/30m = 0.46 (approx); C, P = 1.0

$T = 89.6\,(9 \times 0.00125)^{0.56}\,(0.041)\,(0.46)\,(1.0)\,(1.0) = 0.136$ *Tonnes = 136 kg of soil*
(assume most sediment is generated during the peak flow period)

Std. Test Quantities: 30-Minute Runoff: $2.25\ m^3 \times 1000\ kg/m^3 = 2250\ kg$ *(approx. 5000 lb)*
Sediment Load: 136 kg (approx. 300 lb)"

Actual Test Quantities adjusted for 16 ft wide slope:
30-Minute Runoff: 5000 lb x (16 ft / 20 ft) = 4000 lb
Sediment Load: 300 lb x (16 ft / 20 ft) = 240 lb

For this testing, 1/4 sediment load was used to simulate the beneficial effects of upstream controls.

Sediment Load: 240 lb / 4 = 60 lb

Installation of Sediment Retention Device

As noted, the submitted SRD installation used a simulated area inlet comprised of a wooden "box" section and inlet opening to position the inlet filters in a representative condition. This facilitated multiple test repetitions. Sediment laden flow was introduced through a pipe from the mixing tank as shown in Figure 1.


Figure 1. Test set-up, including mixing tank, supply pipe and wooden box with simulated area inlet inside collection tank.

Test Procedure

Releasing, and Collecting Sediment-Laden Runoff - The sediment-laden water was discharged evenly for a maximum of 30 minutes. The quantity of released runoff was measured at 1-minute intervals by noting the reduction in weight in the mixing tank, adjusting the valve on the tank outlet to increase/decrease flow to stay as close as possible to the target (4060 lb / 30 min = 135 lb/min). The discharge flow introduced to the inlet area through a 6-inch diameter pipe. Runoff passing the SRD is sampled at intervals. Additionally, retention observations and associated times are recorded during the test.


Figure 2. 200 SedCatch® Sediment Basket™ Collecting Sediments in Test

Collecting and Measuring Sediments - Grab samples are evaluated in a lab to percent dry solids content. Drying of collected sediments is accomplished in a forced air oven at 110°C for a minimum of 24 hours or until all moisture is driven off, whichever is greater. All weighing of sediments is done with laboratory scales accurate to ± 0.01 lbs.

TEST RESULTS

Total sediment and associated runoff measured during the testing are the principle data used to determine the performance of the products tested. This data is entered into a spreadsheet (see appendix) that transforms the sediment concentration and collected runoff into the retention effectiveness and percent of storm event values shown in Table 2.

Table 2. Measures of Effectiveness

Property	200 SedCatch® Sediment Basket™
Retention Effectiveness (Filtration Efficiency)	80.6 %
Soil Captured During Rain Event (@ 80 lb/ft^3)	0.60 ft^3
Tested Bag Capacity (below overflow level)	3.13 ft^3
Capacity Utilization Rate	19 %
% of (4-inch) Storm Event Handled	100 %

APPENDIX A – RECORDED DATA AND CALCULATIONS

Data Tabulation and Retention Effectiveness Calculation Spreadsheets

Retention Effectiveness Calculations
Run F: 200 SedCatch® Sediment Basket™ @ 1.5% Sediment Load
11/10/2009

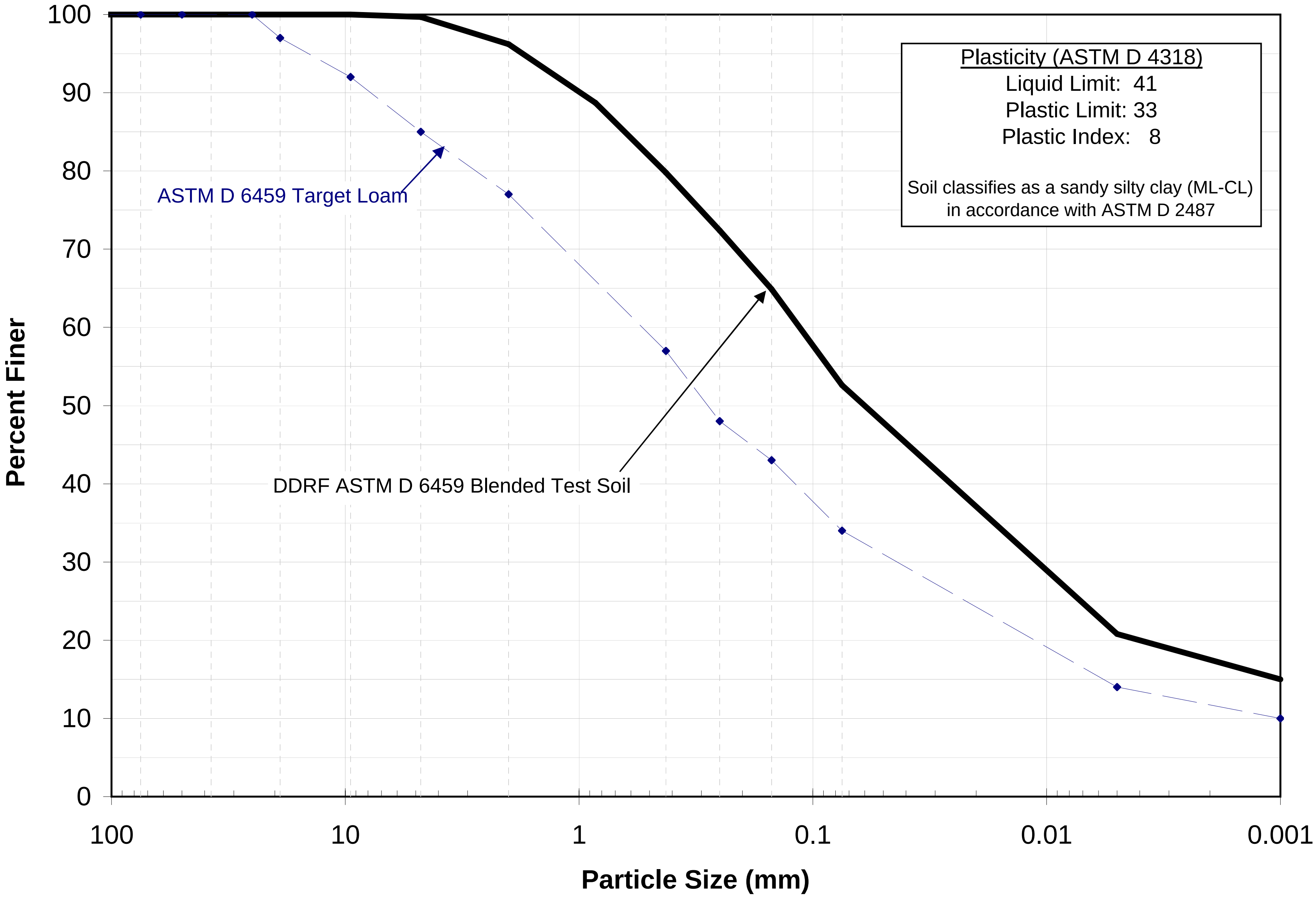
Sample Number	Test Time, minutes	Total Weight, g	Decanted Weight, g	Dry Weight, g	Bottle Weight, g	Dry Sediment Weight, mg	Total Collected Water Wt., g	Total Collected Volume of Water, l	Sediment Conc., mg/l	Corrected Sediment Conc., mg/l	% Solids	Reservoir Weight, lb	Assoc. Water Discharge, gal	Cumm Water Discharge, gal	plot time	Cumm Soil Collected, lbs	Cumm Soil Loss, lbs	Assoc. Solids Loss, lbs	Soil Retention Effectiveness, %
Upstream										15000					0		0		
	0								12839	18875	1.89%	4060	44	44	2.5		6.9	6.9	
T1	5	309.01	57.24	36.40	32.90	3500	272.61	0.27	12839	18875	1.89%	3320	84	127	7.5		20.0	13.2	
T2	10	313.54	58.04	36.12	32.90	3220	277.42	0.28	11607	17064	1.71%	2640	78	205	12.5		31.1	11.1	
T3	15	302.48	58.92	35.41	32.90	2510	267.07	0.27	9398	13817	1.38%	2000	73	278	17.5		39.6	8.5	
T4	20	306.52	62.51	35.18	32.90	2280	271.34	0.27	8403	12353	1.24%	1400	77	355	22.5		47.5	7.9	
T5	25	315.58	45.19	35.19	32.90	2290	280.39	0.28	8167	12007	1.20%	700	83	438	27.5		55.8	8.3	
	30								8167	12007	1.20%	0	41	480	30.0		60.0	4.2	
Water Added To Mixer (lbs): 4000				Soil Added To Mixer (lbs): 60				AVGS:	10203	15000	1.50%	TOTALS:	480					60.0	
Downstream										2900					0	0	0		
	0								5498	3860	0.39%	0	44	44	2.5	5.5	1.4	1.4	
F5	5	309.07	53.87	34.41	32.90	1510	274.66	0.27	5498	3860	0.39%	740	84	127	7.5	15.9	4.1	2.7	
F10	10	317.41	46.74	34.40	32.90	1500	283.01	0.28	5300	3721	0.37%	1420	78	205	12.5	24.6	6.5	2.4	
F15	15	297.77	48.55	34.25	32.90	1350	263.52	0.26	5123	3597	0.36%	2060	73	278	17.5	30.9	8.7	2.2	
F20	20	313.72	44.78	33.60	32.90	700	280.12	0.28	2499	1754	0.18%	2660	77	355	22.5	37.7	9.8	1.1	**80.55%**
F25	25	313.72	44.78	33.60	32.90	700	280.12	0.28	2499	1754	0.18%	3360	83	438	27.5	44.7	11.1	1.2	
F30	30	313.72	44.78	33.60	32.90	700	280.12	0.28	2499	1754	0.18%	4060	41	480	30.0	48.3	11.7	0.6	
									4131	4131	0.29%	4060	480					11.7	
Soil Collected from Bag (lbs): 48.3				**Time to End (mins):**				**30**	(avg)		(avg)	(total)	(total)					(approx.)	**48.30**

APPENDIX B – TEST SOIL

Test Soil Grain Size Distribution Curve
(before screening through ½-inch mesh)

TRI/Environmental, Inc.
A Texas Research International Company

November 2009



APPENDIX C – LABORATORY QUALIFICATIONS

Testing Expertise

TRI/Environmental (TRI) is a leading, accredited geosynthetic, plastic pipe, and erosion and sediment control product testing laboratory. TRI's large-scale erosion and sediment control testing facility in the upstate of South Carolina at the Denver Downs Research Farm (DDRF) is initially focused on the following full-scale erosion and sediment control performance tests:

- ASTM D 6459: Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Hillslopes from Rainfall-Induced Erosion;
- ASTM D 6460: Determination of Rolled Erosion Control Product (RECP) Performance in Protecting Earthen Channels from Stormwater-Induced Erosion;
- ASTM D 7208: Determination of Temporary Ditch Check Performance in Protecting Earthen Channels from Stormwater-Induced Erosion.
- ASTM D 7351: Determination of Sediment Retention Device Effectiveness In Sheet Flow Applications.

Technical Oversight

Joel Sprague, P.E., TRI's Senior Engineer provides technical oversight of all of TRI's erosion and sediment control testing and can be contacted at:

Mr. C. Joel Sprague, Senior Engineer
PO Box 9192, Greenville, SC 29604
Ph: 864/242-2220; Fax 864/242-3107; jsprague@tri-env.com

Mr. Sprague has been involved with the design of erosion and sediment control systems and the research, development, and application of erosion and sediment control products/materials for many years. He was the lead consultant in the development of bench-scale testing procedures for the Erosion Control Technology Council. Mr. Sprague has authored numerous technical papers on his research and is readily available to assist clients with their research and testing needs.

Operations Management

Sam Allen, TRI's Division Vice President provides operational management of all TRI laboratories and can be contacted at:

Mr. Sam Allen, Vice President & Program Manager
9063 Bee Caves Road
Austin, TX 78733
Ph: 512/263-2101; Fax: 512/263-2558; sallen@tri-env.com

Mr. Allen pioneered the laboratory index testing of rolled erosion control products (RECPs) and has been actively involved in the development and standardization of testing protocol and apparatus for more than 10 years. He set up and oversees TRI's erosion and sediment control testing laboratories. His oversight responsibilities include test coordination, reporting, and failure resolution associated with the National Transportation Product Evaluation Program (NTPEP) for RECPs.