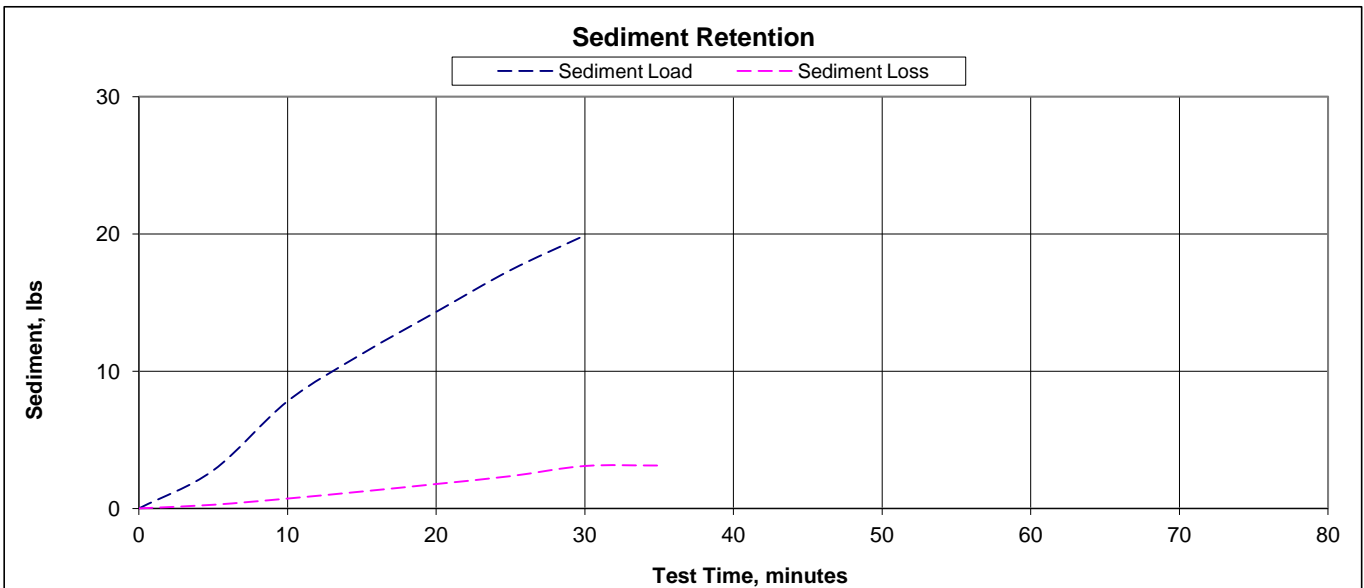
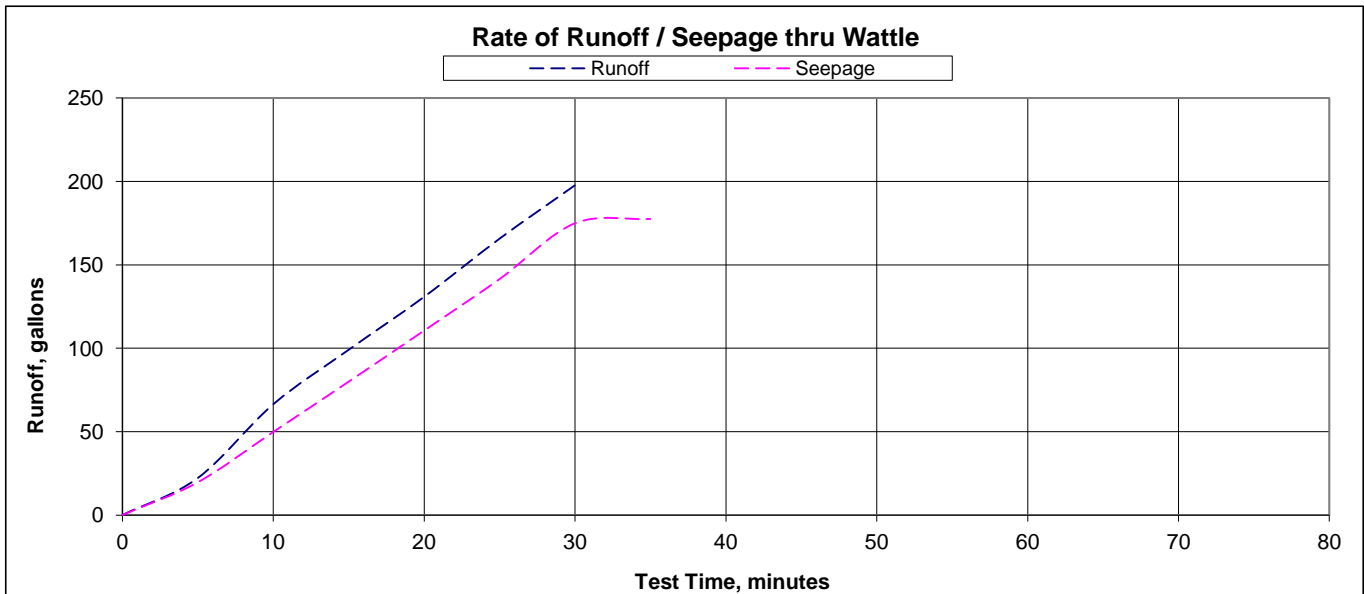


**Project:** ASTM D 7351  
**Client / Listing # / Product:** NTPEP / ECP-2019-03-006 / BioD-SiltTrap 9"  
**Test Date:** 9/19/2019  
**Test Setup:** Toe-of-Slope Installation per Manufacturer Recommendation  
**Duration:** 35 minutes  
**Water / Soil Input:** 1650 lbs water 20 lbs soil  
**Sediment Concentration:** Sandy Clay @ 1.2%

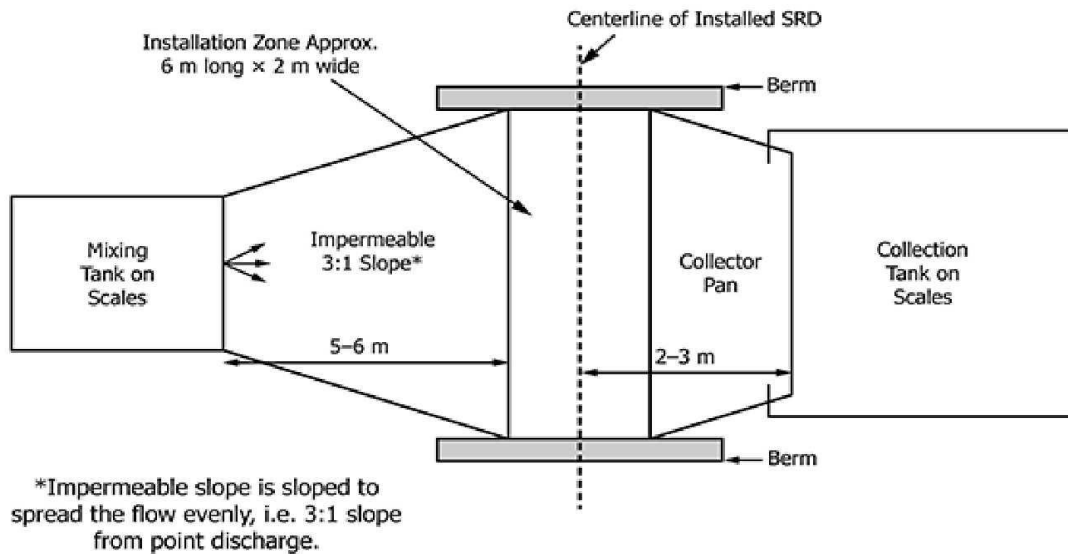
**Soil Retention Effectiveness:** 84.24%  
**Water Retention Effectiveness:** 10.26%  
**Seepage Effectiveness:** 89.74%



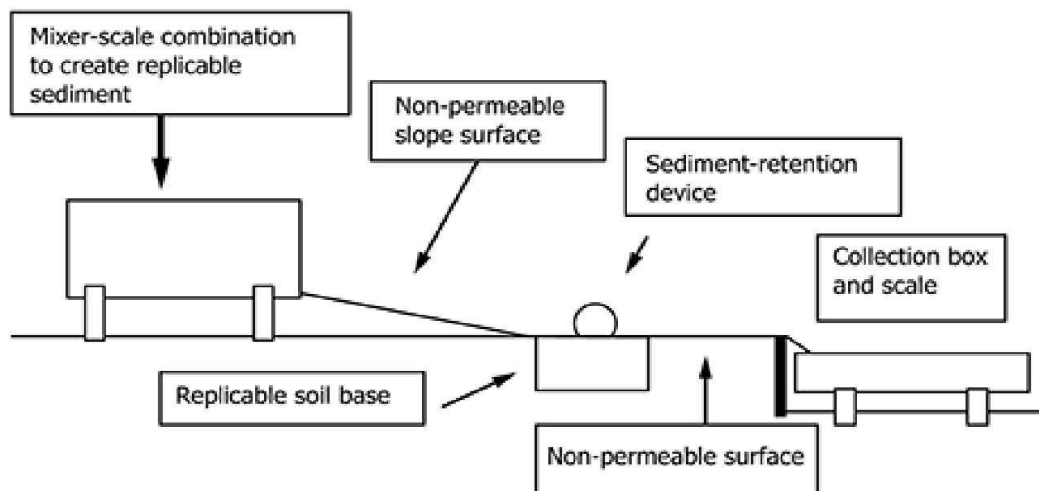
The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose

Testing Overview

The large-scale testing reported herein was performed in general accordance with ASTM D7351. Schematics of the D7351 setup are shown below. For this testing, a simulated toe-of-slope installation 7-ft wide was used. The SRD was installed in the middle of the installation zone according to manufacturer recommendations and exposed to simulated runoff. Sediment-laden water was mixed and discharged onto the 3:1 slope and allowed to run to and seep through the installed SRD. The weight of sediment-laden flow was measured in both the mixing and collection tanks during the test. Additionally, grab samples of the seepage were taken every 5 minutes. The measurement of sediment that passes through the installed SRD is compared to the measured amount in the upstream flow and is used to quantify the effectiveness of the SRD in retaining sediments while allowing continued seepage.



D7351 Schematic (Plan)



D7351 Schematic (Profile)

SRD "Benchmark" Testing

Prior to testing, samples of the SRD are submitted for index testing in order to establish "benchmark" properties of the product tested. SRD index properties from independent laboratory testing are presented in Table 1.

Table 1. "Benchmark" Test Results (Tested Product - 3 units received)

Property	Units	Average	Range
Length	in.	121.4	117.3 - 122.0
Weight (as received)	lb	6.7	5.74 - 7.91
Height	in.	7.9	7.50 - 8.40
Depth	in.	3.3	2.90 - 3.45
Density	lbs/ft <sup>3</sup>	3.7	3.45 - 3.91

Test Setup

The test procedure requires an integrated system of equipment to accomplish the full-scale testing of toe-of-slope SRDs. The system used for this testing includes the following components:

- A mixing tank with an internal paddle device mounted on scales capable of holding/weighing 10,000 lb of sediment-laden water.
- An elevated simulated storm drain inlet with a fully contained area for upstream ponding and downstream accessibility for sampling.
- A tank mounted on scales of sufficient volume to collect all runoff passing the SRD.

Concentrated sediment-laden flow is discharged from the mixing tank to an impermeable slope located between the mixing and the SRD installation zone. The installation zone is about 4 feet by the width of the slope and is comprised of prepared soil subgrade to allow full-scale installation of the SRD. The discharged sediment-laden water is allowed to run up to and seep through, over, and/or under (but not around the ends of) an SRD installed along the toe of the slope. The seepage drains into the collection tank.

Test Soil

The test soil used in the test plots had the characteristics shown in Table 2.

Table 2. Test Soil Characteristics

Soil Characteristic	Test Method	Value
% Gravel	ASTM D 422	0
% Sand		50
% Silt		12
% Clay		38
Liquid Limit, %	ASTM D 4318	50
Plasticity Index, %		26
Soil Classification	USDA	Sandy Clay
Soil Classification	ASTM	Fat Clay (CH)

Preparation of the Installation Zone

The installation zone subgrade soil is placed and compacted. Compaction is verified to be 90% ( $\pm$  3%) of Standard Proctor density and moisture content is verified to be within  $\pm$ 3% of optimum moisture content using ASTM D2937 (drive cylinder method).

Toe-of-Slope SRD Installation

The SRD is installed in the installation zone in accordance with the provided installation instructions and as shown in the pictures herein. Close-ups of the tested SRD unit are shown below.



Close-up of Test SRD and Installation

### Mixing Sediment-Laden Runoff

Sediment-laden runoff was created by combining water and soil in the mixing tank and agitating during the test. 1650 lb of water and 20 lb (dry weight) of test soil were combined to create the sediment-laden runoff of 1.2% (12000 mg/L). These quantities represent the "default" condition given in the standard which is a hypothetical 30-minute, peak flow from a 24-hour, 4-inch rainfall on a 100-ft long x 20-ft wide bare soil slope. The water and soil quantities were adjusted to reflect a 7-ft wide installation.

### Specific Test Procedure

After the SRD is installed, the sediment-laden runoff is discharged evenly for 30 minutes while agitation is maintained. The quantity of released runoff is measured at 5-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 ( $1670 \text{ lb} / 30 \text{ min} = 56 \text{ lb} / \text{min}$ ). For this testing, the discharge flow is introduced to allow it to flow up to and through the SRD. Retention observations and ponding depths, and associated times, are recorded during the test. As runoff passing the SRD system is collected, the weight and volume in the collection tank is recorded and grab samples are taken at 5 minute intervals. Cutoff time is the earlier of 90 minutes or when there is low-volume ponding and minimal discharge. Grab samples are evaluated in a lab to determine turbidity (using a Hach 2100 AN Turbidimeter) and to determine percent dry solids content. Drying of collected sediments is accomplished in a forced air oven at  $110^{\circ}\text{C}$  for a minimum of 24 hours or until all moisture is driven off. All weighing of sediments is done with laboratory scales accurate to  $\pm 0.01$  grams.



Test Setup and Product Installed



Test Flow and Ponding/Seepage



Sampling of Seepage / Retained Solids after Seepage Ends

APPENDIX - DATA

**ASTM 7351 Soil Retention and Water Seepage Effectiveness**

Client / Product: NTPEP / ECP-2019-03-006 / BioD-SiltTrap 9"    Soil: 1.2% Sediment Concentration

Test Setup: Toe-of-Slope Installation per Manufacturer Recommen

Date: 9/19/2019

Start Time: 1:18 PM

End Time: 1:53 PM

Sample Number	Test Time, minutes	Turbidity	Total Weight, g	Dry Weight, g	Bottle Weight, g	Dry Sediment Weight, mg	Total Collected Water Wt., g	Total Collected Volume, l	Sediment Conc., mg/l	% Solids	Reservoir Weight, lb	Assoc. Water Discharge, gal	Cumm Water Discharge, gal	Coll. Tank Depth, mm	plot time	SRD Ponding Height, mm	Cumm Soil Loss, lbs	Assoc. Solids Loss, lbs	Soil Retention Effectiveness, %	Water Retention Effectiveness, %						
Upstream																			0		0		0			
B0	0	3796	383.29	160.39	156.86	3530	66.04	0.25	14120	1.56%	1670	22.2	22.2		5.0		2.8	2.8								
B5	5	3964	381.23	160.01	156.86	3150	64.36	0.25	12600	1.40%	1482	44.2	66.4		10.0		7.8	5.0								
B10	10	4463	364.64	159.93	157.25	2680	47.46	0.25	10720	1.29%	1108	32.7	99.1		15.0		11.3	3.4								
B15	15	4782	381.90	159.63	156.92	2710	65.35	0.25	10840	1.20%	832	31.8	130.9		20.0		14.3	3.1								
B20	20	5256	380.03	159.12	156.70	2420	64.21	0.25	9680	1.08%	564	34.9	165.7		25.0		17.4	3.0								
B25	25	99999	377.21	159.09	156.92	2170	61.20	0.25	8680	0.99%	270	32.1	197.8		30.0		19.9	2.5								
B30	30	4342	346.30	158.58	156.89	1690	30.83	0.25	6760	0.89%	0	-	-		-		-	-								
Water Added To Mixer (lbs): 1650			Soil Added To Mixer (lbs): 20				AVGS: 10486		1.20%	TOTALS: 197.8								19.9								
Downstream																			0		0		0			
A0	0	3573	-	-	-	-	-	-	-	0.17%	0	19.6	19.6	0.0	5	0.0	0.3	0.3	84.24%	10.26%						
A5	5	2030	376.47	157.43	157.06	370	61.98	0.25	1480	0.17%	164	30.2	49.8	17.0	10	16.0	0.7	0.5								
A10	10	2690	381.13	157.82	157.39	430	65.92	0.25	1720	0.19%	416	30.1	79.9	30.0	15	18.0	1.2	0.5								
A15	15	2924	381.37	156.83	156.34	490	68.20	0.25	1960	0.22%	668	30.6	110.6	44.0	20	18.0	1.8	0.5								
A20	20	2890	384.24	157.52	157.04	480	69.68	0.25	1920	0.21%	924	30.9	141.4	57.0	25	19.0	2.4	0.6								
A25	25	3134	378.25	157.50	156.98	520	63.77	0.25	2080	0.24%	1182	33.5	174.9	69.0	30	18.0	3.1	0.7								
A30	30	3964	386.36	157.78	157.10	680	71.48	0.25	2720	0.30%	1462	2.6	177.5	84.0	35	19.0	3.2	0.0								
A35	35	630	386.52	157.50	157.44	60	71.58	0.25	240	0.03%	1484	-	-	85.0	-	8.0	-	-								
A45	45																									
A60	60																									
A75	75																									
A90	90																									
									1731	0.19%	1484	177.5									3.2					
<b>Soil Collected (lbs):</b> n/a							(avg)	(avg)	(total)	(total)							(approx.)									