

**Certification of Construction Completion
Report
Citrus County Class I Central Landfill
Phase 3 Expansion Project
Citrus County, Florida**

Volume 2 of 2

Prepared for:

Citrus County



230 West Gulf To Lake Highway
Lecanto, Florida 34461

Presented by:

SCS ENGINEERS

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Florida Board of Professional Engineers
Certification No. 00004892

April 8, 2011
File No. 09207049.06

Offices Nationwide
www.scsengineers.com

Certification of Construction Completion Report

**Citrus County Class I Central Landfill
Phase 3 Expansion Project
Citrus County, Florida**

Volume 2 of 2

Presented To:

Citrus County
230 West Gulf To Lake Highway
Lecanto, Florida 34461

Presented From:

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4041 Park Oaks Blvd.
Suite 100
Tampa, Florida 33610
(813) 621-0080

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SECTION 7 GEOCOMPOSITE INSTALLATION REPORT

7.1 REQUIREMENTS AND SPECIFICATIONS

7.1.1 Triplanar Geocomposite

The plans call for a triplanar geocomposite in the leachate collection portion of the liner system. Triplanar geocomposite is a three-layer material comprised of an inner core of 3 layer of strands, one arranged longitudinally and two inclined in opposite directions of high density polyethylene (HDPE) geonet between an upper and lower layer of non-woven geotextile. The geotextile is thermally fused to both sides of the geonet. Syntec, the geocomposite manufacturer performed testing on the material to verify compliance with the contract specifications prior to approval by SCS. Syntec performed manufacturer’s quality control (MQC) tests on the triplanar geocomposite prior to delivery. The MQC tests were conducted in accordance with the manufacturer’s quality control program. One test per every 100,000 square feet of triplanar geocomposite produced was performed. The quality control certificates, which contain the recorded results for each roll of triplanar geocomposite tests, are included in Attachment 7-1.

Table 8 presents the results of the MQC testing compared with the project specifications. The tests indicate that the triplanar geocomposite and components met or exceeded the project specifications.

Table 8 Comparison of Geocomposite Properties

Parameter	Specification	Range of MQC Test Results ¹
Geonet		
Thickness tensile Strength (lbs/ft)	300	314-335
Tensile Strength (MD) (lbs/ft)	1,200	1,207 - 1,340
Carbon Black (percent)	2 - 3	2.31 - 2.68
Polymer Density (g/cm ³)	0.94	0.954 - 0.956
Polymer Melt Index (g/10min)	<1.0	0.041
Geotextile		
Mass per Unit Area (oz/yd ²)	6	6.1 - 7.8
Grab Tensile (lbs)	160	173 - 232.16
Grab Elongation (percent)	50	69 - 91
Puncture Resistance (lbs)	85	122 - 152
Trapezoidal Tear Strength (lbs)	60	77 - 124
Permittivity (sec ⁻¹)	1.1	1.50 - 2.24
Apparent Opening Size, sieve size (mm)	#70 (0.212)	70 - 80
Geocomposite		
Transmissivity (m ² /sec)	2.0x10 ⁻³	2.08x10 ⁻³ - 4.33x10 ⁻³
Ply Adhesion (lbs/in)	1.0	2.4

Notes:

1 Range of values.

7.1.2 Biplanar Geocomposite

The plans call for a biplanar geocomposite in the detection collection portion of the liner system. Biplanar geocomposite is a three-layer material composed of overlaying and intertwined parallel strands that create high capacity flow channels. They are produced by the extrusion of high density polyethylene (HDPE) geonet between and upper and lower layer of non-woven geotextile. The geotextile is thermally fused to both sides of the geonet. GSE Lining Technology, Inc (GSE) manufactured and supplied the biplanar geocomposite. GSE performed testing on the material to verify compliance with the contract specifications prior to approval by SCS. GSE performed manufacturer’s quality control (MQC) tests on the biplanar geocomposite prior to delivery. The MQC tests were conducted in accordance with the manufacturer’s quality control program. One test per every 100,000 square feet of triplanar geocomposite produced was performed. The quality control certificates, which contain the recorded results for each roll of biplanar geocomposite tests, are included in Attachment 7-2.

Table 9 presents the results of the MQC testing compared with the project specifications. The tests indicate that the biplanar geocomposite and components met or exceeded the project specifications.

Table 9 Comparison of Geocomposite Properties

Parameter	Specification	Range of MQC Test Results ¹
Geonet		
Thickness	250	294 - 303
tensile Strength (lbs/ft)		
Tensile Strength (MD) (lbs/ft)	55	80 - 98
Carbon Black (percent)	2 - 3	2.4 - 2.8
Polymer Density (g/cm ³)	0.940	0.962 - 0.963
Polymer Melt Index (g/10min)	<1.0	0.36
Geotextile		
Mass per Unit Area (oz/yd ²)	6	6.2 - 7.1
Grab Tensile (lbs)	170	187 - 267
Puncture Resistance (lbs)	90	95 - 122
Trapezoidal Tear Strength (lbs)	70	77 - 227
Permittivity (sec ⁻¹)	1.5	1.6 - 2.4
Apparent Opening Size, sieve size (mm)	#70 (0.212)	0.212
Geocomposite		
Transmissivity (m ² /sec)	5x10 ⁻⁴	5x10 ⁻⁴
Ply Adhesion (lbs/in)	1.0	1.0

Notes:

1 Range of values.

7.2 CONFORMANCE TESTING

The geocomposite was visually examined by the CQA Representative as it was placed. Roll numbers were verified as conforming to rolls tested by the manufacturers, Syntec for the triplanar geocomposite and GSE for the biplanar geocomposite under the Manufacturer’s Quality Control. The geocomposite was randomly sampled to verify conformance with the project technical specifications. The conformance tests were conducted by TRI Environmental, Inc. on material used in this project. The test results further verify that the geocomposite met the project specifications. The results of the conformance testing for the geocomposite are presented in Tables 10 (triplanar geocomposite) and 11 (biplanar geocomposite) and laboratory results are included in Attachment 7-3 (triplanar geocomposite) and Attachment 7-4 (biplanar geocomposite).

Table 10 Comparison of Triplanar Geocomposite Properties in Conformance Testing

Parameter	Specification	Average Range of Test Results
Geonet		
Thickness tensile Strength (lbs/ft)	300	334 - 342
Tensile Strength (MD) (lbs/ft)	1,200	1,324 - 1,648.49
Carbon Black (percent)	2 - 3	2.46 - 2.85
Polymer Density (g/cm ³)	0.940	0.951 - 0.954
Geotextile		
Mass per Unit Area (oz/yd ²)	6	6.14 - 7.45
Grab Tensile (lbs)	160	176 - 221
Grab Elongation (percent)	50	82 - 93
Puncture Resistance (lbs)	85	107 - 123
Trapezoidal Tear Strength (lbs)	60	78 - 95
Permittivity (sec ⁻¹)	1.1	1.54 - 2.05
Apparent Opening Size, sieve size (mm)	#70 (0.212)	80-140
Geocomposite		
Transmissivity (m ² /sec)	2.0x10 ⁻³	2.07x10 ⁻³ - 2.83x10 ⁻³
Ply Adhesion (lbs/in)	1.0	1.5 - 2.6

Table 11 Comparison of Biplanar Geocomposite Properties in Conformance Testing

Parameter	Specification	Average Range of Test Results
Geonet		
Thickness tensile Strength (lbs/ft)	250	290 - 292
Tensile Strength (MD) (lbs/ft)	55	1,106.99 - 1,195.50
Carbon Black (percent)	2 - 3	2.49 - 2.80
Polymer Density (g/cm ³)	0.940	0.954 - 0.955
Geotextile		

Parameter	Specification	Average Range of Test Results
Mass per Unit Area (oz/yd ²)	6	6.37 - 7.0
Grab Tensile (lbs)	170	172 - 190
Puncture Resistance (lbs)	90	95 - 109
Trapezoidal Tear Strength (lbs)	70	85 - 98
Permittivity (sec ⁻¹)	1.5	1.69 - 2.35
Apparent Opening Size, sieve size (mm)	#70 (0.212)	70 - 170
Geocomposite		
Transmissivity (m ² /sec)	5x10 ⁻⁴	1.69x10 ⁻³ 2.59x10 ⁻³
Ply Adhesion (lbs/in)	1.0	2.7 - 5.3

7.3 DIRECT SHEAR TESTS

To confirm the project materials would meet the technical specifications of 20.5 degrees for the interface friction angle and the minimum required Factor of Safety of 1.5 against sliding, SCS had separate CQA samples of the project materials tested by TRI. TRI performed interface direct shear tests on these project materials in accordance with ASTM D5321. To simulate the range of stresses during final Buildout of the Phase 3 Expansion cell, normal loads of 1,000, 5,000, and 9,000 pounds per square foot (psf) were used during the testing in saturated condition. The following CQA interface friction angle test results all meet the construction permit requirement of at least 20.5 degrees for the geocomposite interfaces which therefore also meet the minimum safety factor of 1.5 against sliding. Please refer to Attachment 7-5 for the CQA Interface Friction Test Reports.

CQA Interface Friction Angle Test Results:

- Syntec Tendrain 770-2 Double Sided Geocomposite (Triplanar Geocomposite) versus Agru 60 mil HDPE Microspike Geomembrane = 23.3 degrees with 253 psf adhesion
- Protective Cover Soil versus Syntec Tendrain 770-2 Double Sided Geocomposite (Triplanar Geocomposite) = 28.9 degrees with 192 psf adhesion
- GSE Double Sided Geocomposite (Biplanar Geocomposite) versus Agru 60 mil HDPE Microspike Geomembrane = 22.7 degrees with 264 psf adhesion

7.4 PANEL PLACEMENT

The geocomposite panels were placed one at a time. Adjacent panels were deployed and adjusted prior to seaming. Upon deployment, individual panels were assigned sequential panel numbers. Panel numbers, with corresponding manufacturer's Geocomposite roll number were recorded by the CQA Representative and Comanco's Quality Control Technician. SCS' Geocomposite placement logs are included in Attachment 7-6 (triplanar geocomposite) and 7-7 (biplanar geocomposite). Also recorded on the placement logs are length, width, orientation of the panels along with the date the panels were deployed. A space for comments about the panels

may include a weather description, a shape description of a panel that is not rectangular, or a more detailed description of location.

Attachment 7-1

Triplanar Geocomposite MQC Certificates



Vendor Certificate of Analysis

Customer:	Syntec LLC
Customer PO#:	104
Ship Date:	4/25/2010
Polymer Grade:	E924
Polymer Type:	Polyethylene
Weight:	193,600
Lot #:	4322
Railcar #:	FPAX200412

Properties as Reported by Producer	
	Results
Melt Index - M ₁₂	8.5 HLMI
Density:	0.950

Note- Only those properties associated with the specific resin are reported

Nexus Resin Group, LLC has no control over the use to which others may put this material. Nexus Resin Group, LLC does not guarantee that the same results as described will be obtained by the end user. Nexus Resin Group, LLC does not guarantee the effectiveness or safety of any material for the design or the suitability of the material nor the designs of both for the end user's own particular use. Statements concerning possible or suggested uses of the materials or designs described herein are not to be construed as recommendations for use of such materials or designs.

37 Water Street Mystic, CT 06355 Ph:860-536-1550 Fax: 860-536-1275

4800 Pulaski Highway • Baltimore, Maryland 21224
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August 30, 2010

COMANCO

Mr. Nick Bridges
Project Engineer
4301 Sterling Commerce Drive
Plant City, FL 33566-7372
OFFICE: 813-988-8829
FAX: 813-386-7392

Subject: Citrus County LF: Tendrain 770-2 and Testing Methods and Units Clarification

Dear Mr. Bridges:

This letter is to address the submittal 310520-10A and the shop drawings regarding the Mass per Unit Area Test as well as the Resin Test Method and Units.

Mass per Unit Area: ASTM D 3776 vs. ASTM D 5261

ASTM D 3776 is an older test method for geotextiles that measures Mass per Unit Area (weight) of Woven Fabric. This test method primarily weighs the whole roll to determine the weight value. This is a practical standpoint since the end user normally has scales at the fabrication location to verify the weight.

ASTM D 5261 is the test method of preference to certify to, given that it is the most current test method for the measurement of Mass per Unit Area of geotextiles. Coupons are used with this test method since the customer normally has it delivered to the jobsite with no way to verify the whole roll weight, therefore coupons can be sent to the lab for verification.

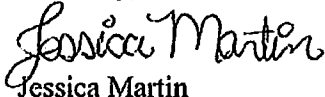
Even though we prefer to have the geotextile certified to ASTM D 5261, there is however, the option in ASTM D 3776 to take coupons for the weight calculation. We can have our supplier certify to the ASTM D 3776 method for weight on the nonwovens which will be utilized in the final product Tendrain 770-2 if need be.

Geonet Resin Submittal: Test Methods and Units

The Geonet Resin that is supplied to us is tested by our supplier and then tested by SYNTEC once again. In the Vendor Certificate of Analysis that was provided, The Melt Index (MI₂) as per ASTM D 1238 was reported with a value of 8.5 HLMI (High Load Melt Index) which test the melt flow at 21.6 kg. The Melt Flow Index value of 1.0 g/10 minutes that is in our specification sheet and which we verify in our laboratory upon receipt of the raw resin material is measured at the normal load of 2.16 kg. We will therefore certify to the Melt Flow Index of 1.0 g/10 minutes for our MQC Certification.

Please let me know if you have any further questions.

Sincerely,



Jessica Martin

Project Manager

SYNTEC

Office: (410) 327-1070 X 222

Cell: (443) 250-0646

jmartin@synteccorp.com

jsm

**TNS Advanced Technologies
by Crown Resources**

681 DeYoung Road
Greenville, SC 29651

(864) 968-0592 Tel
(864) 879-4639 Fax

7/28/2010

REF: TNS E060
PO# 113

Syntec LLC
4800 Pulaski Highway
Baltimore, Maryland 21224

Dear Sir/Madam:

This is to certify that TNS E060 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS E060 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Mass Per Unit Area	ASTM D 5261	oz/yd ²	6
Grab Tensile	ASTM D 4632	lbs	160
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs	60
Puncture	ASTM D 4833	lbs	85
A.O.S.	ASTM D 4751	U.S. Sieve	70
Permittivity	ASTM D 4491	1/sec	1.1
U.V. Resistance	ASTM D 4355	% strength retained at 500 hrs.	70 %

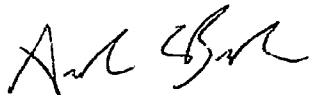
Marshall O. Gaddy

Marshall O. Gaddy
Quality Control Manager

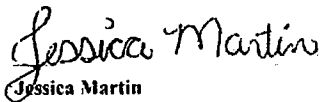
Geonet MQC Test Results

Product TD 7
Project Citrus County
Batch # 1
Dimensions 13' x 2040'
Testing Lab Syntec

Geonet Roll	Date Tested	Thickness ASTM D5199-98 (mils)	Resin Density ASTM D1505 (g/cm3)	Carbon Black ASTM D4218-96 (%)	Resin MFI ASTM D 1238-00 (g/10ml)	Tensile Strength ASTM D4595 (lb/ft)
1000068	5/26/2010	314	0.956	2.68	0.041	1252
1000070	5/27/2010	330	0.954	2.44	0.041	1340
1000072	5/28/2010	329	0.954	2.31	0.041	1207
Average		324	0.955	2.48	0.041	1266
Standard Dev.		9	0.001	0.19	0.000	68
Specifications		300	0.940	2.00 - 3.00	< 1	1200 +/- 10%

Tested by 
 Andrew Barker

Date 7/27/2010

Checked by 
 Jessica Martin

Date 7/27/2010

Geonet MQC Test Results

Product TD 7
Project Citrus County
Batch # 2
Dimensions 13' x 2040'
Testing Lab Syntec

Geonet Roll	Date Tested	Thickness ASTM D5199-98 (mils)	Resin Density ASTM D1505 (g/cm ³)	Carbon Black ASTM D4218-96 (%)	Resin MFI ASTM D 1238-00 (g/10m)	Tensile Strength ASTM D4595 (lb/ft)
1000072	5/28/2010	329	0.954	2.31	0.041	1207
1000074	5/29/2010	335	0.956	2.36	0.041	1241
Average		332	0.955	2.33	0.041	1224
Standard Dev.		4	0.001	0.04	0.000	24
Specifications		300	0.940	2.00 - 3.00	< 1	1200 +/- 10%

Tested by *Andrew Barker* Date 7/27/2010
 Andrew Barker

Checked by *Jessica Martin* Date 7/27/2010
 Jessica Martin

E060 168"x1,000'

Syntec

ROLL#	STYLE	WDTH	LGTH	WGHT	GTMD	GTXMD	GEMD	GEXMD	TTMD	TTXMD	PUNC	PERT	AOS
2020943802	E060	168	1000	7.6	205	264	77	86	97	130	135	1.50	70
2020943804	E060	168	1000	7.6	205	264	77	86	97	130	135	1.50	70
2020943805	E060	168	1000	7.6	205	264	77	86	97	130	135	1.50	70
2020943808	E060	168	1000	7.8	207	258	76	78	124	158	135	1.50	70
2020943809	E060	168	1000	7.8	207	258	76	78	124	158	135	1.50	70
2020943811	E060	168	1000	7.8	207	258	76	78	124	158	135	1.50	70
2020943812	E060	168	1000	7.8	207	258	76	78	124	158	135	1.50	70
2020943814	E060	168	1000	7.8	207	258	76	78	124	158	137	1.50	70
2020943815	E060	168	1000	6.8	177	216	71	89	94	125	137	1.55	70
2020943816	E060	168	1000	6.8	177	216	71	89	94	125	137	1.55	70
2020943817	E060	168	1000	6.8	177	216	71	89	94	125	137	1.55	70
2020943833	E060	168	1000	6.8	177	216	71	89	94	125	152	1.55	70
2020943843	E060	168	1000	6.8	177	216	71	89	94	125	152	1.55	70
2020943845	E060	168	1000	7.2	173	261	77	89	78	113	152	2.13	80
2020943846	E060	168	1000	7.2	173	261	77	89	78	113	152	2.13	80
2020943848	E060	168	1000	6.7	191	257	69	82	92	103	152	2.13	80
2020943853	E060	168	1000	6.7	191	257	69	82	92	103	152	2.13	80
2020943854	E060	168	1000	6.7	191	257	69	82	92	103	122	2.13	80
2020943862	E060	168	1000	6.7	191	257	69	82	92	103	122	2.13	80
2020943863	E060	168	1000	6.7	191	257	69	82	92	103	122	2.13	80
2020943865	E060	168	1000	7.1	203	265	82	89	84	115	122	2.13	80
2020943866	E060	168	1000	7.1	203	265	82	89	84	115	122	2.13	80
2020943867	E060	168	1000	7.1	203	265	82	89	84	115	130	2.13	80
2020943870	E060	168	1000	7.1	203	265	82	89	84	115	130	2.13	80
2020943871	E060	168	1000	7.1	203	265	82	89	84	115	130	2.13	80
2020943872	E060	168	1000	7.1	203	265	82	89	84	115	130	2.13	80
2020943874	E060	168	1000	6.3	196	230	81	94	77	97	130	2.13	80
2020943875	E060	168	1000	6.3	196	230	81	94	77	97	130	2.13	80
2020943876	E060	168	1000	6.3	196	230	81	94	77	97	130	2.13	80
2020943877	E060	168	1000	6.3	196	230	81	94	77	97	125	2.13	80

ROLL#	STYLE	WIDTH	LGTH	WGHT	GTMD	GTXMD	GEMD	GEXMD	TTMD	TTXMD	PUNC	PERT	AOS
2020943878	E060	168	1000	6.3	196	230	81	94	77	97	125	2.13	80
2020943879	E060	168	1000	6.3	196	230	81	94	77	97	125	2.13	80
2020943880	E060	168	1000	6.1	211	247	76	86	109	81	125	2.13	80
2020943881	E060	168	1000	6.1	211	247	76	86	109	81	125	2.13	80
2020944760	E060	168	1000	6.1	211	247	76	86	109	81	125	2.13	80

SYNTEC CORPORATION

Traceability, Peel and Transmissivity Report

PRODUCT TenDrain 770-2
 JOB Citrus County
 BATCH 1

COMPOSITE #	NET #	Top TEXTILE #	Bottom TEXTILE #	Roll length (ft)	Top Geotextile ASTM D 7005 Peel Adhesion (psi) (avg)	Bottom Geotextile ASTM D 7005 Peel Adhesion (psi) (avg)	ASTM D 7005 Peel Adhesion (psi) (req)	ASTM D 4716 Transmissivity (m2/sec) Value	ASTM D 4716 Transmissivity (m2/sec) Required*	Gradient
1000051	1000069	2020943804	2020943846	200	1.82	2.04	1	2.08 x 10-3	2.00 x 10-3	0.1
1000052	1000069	2020943804	2020943846	200						
1000053	1000069	2020943804	2020943846	200						
1000054	1000069	2020943804	2020943846	200						
1000055	1000069	2020943804	2020943846	200						
1000056	1000069	2020943817	2020943845	200						
1000057	1000069	2020943817	2020943845	200						
1000058	1000069	2020943817	2020943845	200						
1000059	1000069	2020943817	2020943845	200						
1000060	1000069	2020943817	2020943845	200						
1000061	1000070	2020943866	2020943853	200						
1000062	1000070	2020943866	2020943853	200						
1000063	1000070	2020943866	2020943853	200						
1000064	1000070	2020943866	2020943853	200						
1000065	1000070	2020943866	2020943853	200						
1000066	1000070	2020943862	2020943809	200						
1000067	1000070	2020943862	2020943809	200						
1000068	1000070	2020943862	2020943809	200						
1000069	1000070	2020943862	2020943809	200						
1000070	1000070	2020943862	2020943809	200						
1000071	1000071	2020943808	2020943854	200						
1000072	1000071	2020943808	2020943854	200						
1000073	1000071	2020943808	2020943854	200						
1000074	1000071	2020943808	2020943854	200						
1000075	1000071	2020943808	2020943854	200						
1000076	1000071	2020943816	2020943815	200						
1000077	1000071	2020943816	2020943815	200						
1000078	1000071	2020943816	2020943815	200						
1000079	1000071	2020943816	2020943815	200						
1000080	1000071	2020943816	2020943815	200						
1000081	1000072	2020943811	2020943812	200						
1000082	1000072	2020943811	2020943812	200						
1000083	1000072	2020943811	2020943812	200						
1000084	1000072	2020943811	2020943812	200						
1000085	1000072	2020943811	2020943812	200						
1000086	1000072	2020943833	2020943843	200						
1000087	1000072	2020943833	2020943843	200						
1000088	1000072	2020943833	2020943843	200						
1000089	1000072	2020943833	2020943843	200						
1000090	1000072	2020943833	2020943843	200						

*Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows
 Steel Plate / Ottawa Sand / Geocomposite / 60mil HDPE Membrane / Steel Plate
 with a seating period of 100 hours at a load of 15,000 psf

Total Square Feet:

100000

Tested by: *[Signature]*
 Checked by: *Jessica Martin*
 Authorized by: *[Signature]*

SYNTEC CORPORATION

Traceability, Peel and Transmissivity Report

PRODUCT TenDrain 770-2
 JOB: Citrus County
 Batch 2

COMPOSITE #	NET #	Top TEXTILE #	Bottom TEXTILE #	Roll length (ft)	Top Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	Bottom Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	ASTM D 7005 Peel Adhesion lbs/in (req.)	ASTM D 4716 Transmissivity (m2/sec) Value	ASTM D 4716 Transmissivity (m2/sec) Required	Gradient
1000091	1000073	2020944760	2020943875	200	1.66	1.91	1	2.08 x 10-3	2.00 x 10-3	0.1
1000092	1000073	2020944760	2020943875	200						
1000093	1000073	2020944760	2020943875	200						
1000094	1000073	2020944760	2020943875	200						
1000095	1000073	2020944760	2020943875	200						
1000096	1000073	2020943863	2020943865	200						
1000097	1000073	2020943863	2020943865	200						
1000098	1000073	2020943863	2020943865	200						
1000099	1000073	2020943863	2020943865	200						
1000100	1000073	2020943863	2020943865	200						
1000101	1000074	2020943848	2020943879	200						
1000102	1000074	2020943848	2020943879	200						
1000103	1000074	2020943848	2020943879	200						
1000104	1000074	2020943848	2020943879	200						
1000105	1000074	2020943848	2020943879	200						
1000106	1000074	2020943880	2020943880	200						
Total Square Feet:				40000						

*Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows:
 Steel Plate / Ottawa Sand / Geocomposite / 60mil HDPE Membrane / Steel Plate with a seating period of 100 hours at a load of 15,000 psf

Tested by *[Signature]*
 Checked by *Jessica Martin*
 Authorized by *[Signature]*

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QUALITY CONTROL SUMMARY

Syntec TenDrain 770-2

Date: September 21, 2010

Batch #3 - FINAL

Project: Citrus County

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SECTION I

PRODUCT SPECIFICATION

**product
specifications**

TENDRAIN 770-2

**Citrus County Central Landfill Phase 3, FL
(Leachate Collection)**

The drainage geocomposite is comprised of a tri-axial geonet structure with thermally bonded nonwoven geotextiles on both sides. The product is capable of providing high transmissivity in a soil environment under both low and high loads and will have properties conforming to the values and test methods listed below.

PROPERTY	TEST METHODS	UNITS	VALUE	QUALIFIER	TEST FREQUENCY
Resin					
• Density	ASTM D 1505	g/cm ³	0.94	MAV	lot
• Melt Flow Index	ASTM D 1238	g/10min	1.0	MAX	lot
Geonet Core¹					
• Tensile Strength – MD	ASTM D 4595	lb/ft	1200	±10 %	100,000 sf
• Thickness	ASTM D 5199	mil	300	MAV	100,000 sf
• Carbon Black	ASTM D 4218	%	2-3	range	100,000 sf
Geotextile¹					
• Mass per Unit Area	ASTM D 5261	oz/yd ²	6	MARV	100,000 sf
• Grab Tensile	ASTM D 4632	lbs	160	MARV	100,000 sf
• Grab Elongation	ASTM D 4632	%	50	MARV	100,000 sf
• Tear Strength	ASTM D 4533	lbs	60	MARV	100,000 sf
• Puncture Resistance	ASTM D 4833	lbs	85	MARV	100,000 sf
• AOS	ASTM D 4751	US Sieve	70	MaxARV	500,000 sf
• Permittivity	ASTM D 4491	Sec ⁻¹	1.1	MARV	500,000 sf
Geocomposite					
• Peel Adhesion – MD	ASTM D 7005	lb/in	1.0	MAV	100,000 sf
• Transmissivity ² - MD (m ² /sec) Gradient / load	ASTM D 4716 GRI - GC8	15,000 psf			
0.1		2.0x10 ⁻³		MAV	200,000 sf

Qualifiers: MARV=Minimum Average Roll Value (MARV), MAV=Minimum Average Value, MAX=Maximum Value, MaxARV=Maximum average roll value.

NOTES: 1. Geotextile and geonet properties listed are prior to lamination. 2. Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows: steel plate / Ottawa sand / geocomposite / geomembrane / steel plate, and seating period of 100 hours according to GRI-GC8.



SYNTEC
GEOSYNTHETICS EVOLVED

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Phone 410.327.1070 800.874.7437
Fax 410.327.1078
www.synteccorp.com

11/03/09

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SECTION II

RESIN REPORT



Vendor Certificate of Analysis

Customer:	Syntec LLC
Customer PO#:	155
Ship Date:	8/26/2010
Polymer Grade:	E924
Polymer Type:	Polyethylene
Weight:	195,050
Lot #:	4616
Railcar #:	FPAX970360

Properties as Reported by Producer	
	Results
Melt Index- Mlz	8.0 HMI
Density:	0.949

Note- Only those properties associated with the specific resin are reported

Nexus Resin Group, LLC has no control over the use to which others may put this material. Nexus Resin Group, LLC does not guarantee that the same results as described will be obtained by the end user. Nexus Resin Group, LLC does not guarantee the effectiveness or safety of any material for the design or the suitability of the material nor the designs of both for the end user's own particular use. Statements concerning possible or suggested uses of the materials or designs described herein are not to be construed as recommendations for use of such materials or designs.

37 Water Street Mystic, CT 06355 Ph:860-536-1550 Fax: 860-536-1275

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SECTION III

GEONET REPORT AND MQC

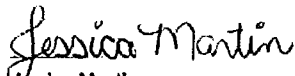
Geonet MQC Test Results

Product TD 7
Project Citrus County
Batch # 3
Dimensions 13' x 1400'
Testing Lab Syntec

Geonet Roll	Date Tested	Thickness ASTM D5199-98 (mils)	Resin Density ASTM D1505 (g/cm ³)	Carbon Black ASTM D4218-96 (%)	Resin MFI ASTM D 1238-00 (g/10m)	Tensile Strength ASTM D4595 (lb/r)
1000125	9/17/2010	311	0.948	2.08	0.083	1567
1000128	9/17/2010	312	0.954	2.86	0.083	1565
1000131	9/18/2010	315	0.951	2.98	0.083	1586
1000134	9/20/2010	312	0.950	2.41	0.083	1576
Average		312	0.951	2.58	0.083	1574
Standard Dev.		2	0.003	0.42	0.000	10
Specifications		300	0.940	2.00 - 3.00	< 1	1200 +/- 10%

Tested by 
 Andrew Barker

Date 9/20/2010

Checked by 
 Jessica Martin

Date 9/20/2010

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SECTION IV

GEOTEXTILE REPORT

TNS Advanced Technologies
by Crown Resources
681 DeYoung Road
Greenville, SC 29651

(864) 968-0592 Tel
(864) 879-4639 Fax

9/21/2010

REF: TNS E060
PO# 157

Syntec LLC
4800 Pulaski Highway
Baltimore, Maryland 21224

Dear Sir/Madam:

This is to certify that TNS E060 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS E060 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Mass Per Unit Area	ASTM D 5261	oz/yd ²	6
Grab Tensile	ASTM D 4632	lbs	160
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs	60
Puncture	ASTM D 4833	lbs	85
A.O.S.	ASTM D 4751	U.S. Sieve	70
Permittivity	ASTM D 4491	1/sec	1.1
U.V. Resistance	ASTM D 4355	% strength retained at 500 hrs.	70 %

Marshall O. Gaddy

Marshall O. Gaddy
Quality Control Manager

Packing List

Syntec

PO # 157

E060 14' x 1000'

Trailer # 7034

Roll number	Style	Width	Length	SY	OZ	THCK	ELNG	ELNG	GRAB	GRAB	TRAP	TRAP	PUNC	BRST	FLOW	PERM	PERM	AOS
					MD	XMD	MD	XMD	MD	XMD	MD	XMD	REST	STRG	RATE	ABL	ITY	
2021002143	E060	168	1000	6.7	68	74	93	208.58	251.2	81.75	112.1	122.24	356	129.73	0.317	1.757	70	
2021002179	E060	168	1000	7.2	71	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70	
2021002180	E060	168	1000	6.4	57	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70	
2021002182	E060	168	1000	6.4	57	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70	
2021002185	E060	168	1000	6.2	71	76	112	229.57	249.68	100.59	108.4	112.79	349	129.73	0.317	1.757	70	
2021002186	E060	168	1000	6.2	71	76	112	229.57	249.68	100.59	108.4	112.79	349	129.73	0.317	1.757	70	
2021002204	E060	168	1000	6.8	70	77	101	225.8	233.39	82.61	117.94	124.01	354	135.2	0.387	1.83	70	
2021215427	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70	
2021215428	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70	
2021215429	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70	
2021215430	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70	
2021215431	E060	168	1000	10	117	94	99	252.25	349.53	96.54	161	106.75	370	151.4	0.377	2.05	70	
2021215434	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215435	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215436	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215437	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215438	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215439	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215441	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215442	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215443	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70	
2021215444	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70	
2021215447	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70	
2021215448	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70	
2021215486	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215487	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215488	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215489	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215490	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215491	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70	
2021215492	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70	
2021215493	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70	
2021215494	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70	
2021216839	E060	168	1000	7.3	81	77	90	184.41	267.94	73.52	107.61	106.75	370	128.98	0.346	1.747	70	
2021216840	E060	168	1000	7.3	69	77	90	184.41	267.94	73.52	107.61	106.75	370	165.68	0.464	2.243	70	
2021216841	E060	168	1000	7.3	69	77	90	184.41	267.94	73.52	107.61	106.75	370	165.68	0.464	2.243	70	
2021216842	E060	168	1000	7.3	69	77	90	184.41	267.94	73.52	107.61	106.75	370	165.68	0.464	2.243	70	

Packing List																	
Syntec																	
PO # 157																	
E060 14' x 1000'																	
Trailer # 537615																	
Roll number	Style	Width	Length	SY	OZ/ THCK	GRAB MD	GRAB XMD	ELNG MD	ELNG XMD	TRAP MD	TRAP XMD	IPUNC REST	BRST STRG	FLOW RATE	PERM ABL	PERM ITY	AOS
2021215445	E060	168	1000	6.7	75	186.53	270.81	77	86	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215446	E060	168	1000	6.7	75	186.53	270.81	77	86	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215450	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215452	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215453	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215454	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215455	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215456	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215457	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215458	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215459	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215460	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215461	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215462	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215463	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215464	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215465	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215466	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215467	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215468	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215469	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215470	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215471	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215472	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215473	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215474	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215475	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215476	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215477	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215479	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215480	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215481	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215482	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215483	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215484	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215485	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70

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SECTION V

TRACEABILITY REPORT

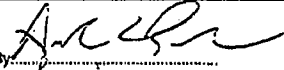
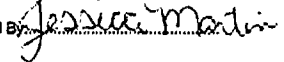
SYNTEC CORPORATION

Traceability, Peel and Transmissivity Report

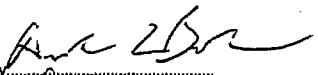
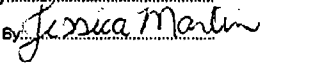
PRODUCT : TenDrain 770-2
 JOB: Citrus County
 Batch 3

COMPOSITE #	NET #	Top TEXTILE #	Bottom TEXTILE #	Roll length (ft)	Top Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	Bottom Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	ASTM D 7005 Peel Adhesion lbs/in (req.)	ASTM D 4716 Transmissivity (m2/sec) Value	ASTM D 4716 Transmissivity (m2/sec) Required*	Gradient
1000107	1000126	2021215455	2021215466	170	1.312	2.49	1	4.33 x 10-3	2.00 x 10-3	0.1
1000108	1000126	2021215455	2021215466	170						
1000109	1000126	2021215455	2021215466	170						
1000110	1000126	2021215455	2021215466	170						
1000111	1000126	2021215455	2021215466	170						
1000112	1000126	2021215465	2021215450	170						
1000113	1000126	2021215465	2021215450	170						
1000114	1000126	2021215465	2021215450	170						
1000115	1000127	2021215465	2021215450	170						
1000116	1000127	2021215465	2021215450	170						
1000117	1000127	2021215445	2021215446	170						
1000118	1000127	2021215445	2021215446	170						
1000119	1000127	2021215445	2021215446	170						
1000120	1000127	2021215445	2021215446	170						
1000121	1000127	2021215445	2021215446	170						
1000122	1000127	2021215464	2021215463	170						
1000123	1000128	2021215464	2021215463	170						
1000124	1000128	2021215464	2021215463	170						
1000125	1000128	2021215464	2021215463	170						
1000126	1000128	2021215464	2021215463	170						
1000127	1000128	2021215435	2021215459	170						
1000128	1000128	2021215435	2021215459	170						
1000129	1000128	2021215435	2021215459	165						
1000130	1000128	2021215435	2021215459	165						
1000131	1000128	2021215435	2021215459	165						
1000132	1000128	2021215435	2021215459	165						
1000133	1000129	2021215437	2021215460	165						
1000134	1000129	2021215437	2021215460	165						
1000135	1000129	2021215437	2021215460	165						
1000136	1000129	2021215437	2021215460	165						
1000137	1000129	2021215437	2021215460	165						
1000138	1000129	2021215437	2021215460	165						
1000139	1000129	2021215447	2021215448	165						
1000140	1000129	2021215447	2021215448	165						
1000141	1000130	2021215447	2021215448	165						
1000142	1000130	2021215447	2021215448	165						
1000143	1000130	2021215447	2021215448	165						
1000144	1000130	2021215447	2021215448	165						
1000145	1000130	2021215491	2021215493	165						
1000146	1000130	2021215491	2021215493	165						
1000147	1000130	2021215491	2021215493	165						
1000148	1000130	2021215491	2021215493	165						
1000149	1000131	2021215491	2021215493	165						
1000150	1000131	2021215491	2021215493	165						
1000151	1000131	2021215494	2021215490	165						

*Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows:
 Steel Plate / Ottawa Sand / Geocomposite / 60mil HDPE Membrane / Steel Plate with a seating period of 100 hours at a load of 15,000 psf

Tested By: 
 Checked By: 

1000152	1000131	2021215494	2021215490	165
1000153	1000131	2021215494	2021215490	165
1000154	1000131	2021215494	2021215490	165
1000155	1000131	2021215494	2021215490	165
1000158	1000131	2021215494	2021215490	165
1000157	1000131	2021215492	2021215489	165
1000158	1000132	2021215492	2021215489	165
1000159	1000132	2021215492	2021215489	165
1000160	1000132	2021215492	2021215489	165
1000161	1000132	2021215492	2021215489	165
Total Square Feet:				114813

Tested By: 
 Checked By: 



TESTING LABORATORY

QUALITY CONTROL

PLY ADHESION WORKSHEET

Revision 1

DATE: 09/16/2010

PRODUCT TYPE / ROLL SIZE / ROLL # / JOB :

TenDrain 770-2

12.5' x 170'

1000107

Citrus County

TEST #

1

TEST STANDARD

-
-
- ASTM D7005
-

TESTING DEVICE

- CHATILLON
-
-

LABORATORY CONDITIONS

TEMPERATURE C 20.6
HUMIDITY % 37%

PRODUCT NOTES

Batch 3

MEASURED CHARACTERISTICS

SPECIMEN	(LB)	(LB)
	TOP	BOTTOM
1	<u>4.080</u>	<u>3.47</u>
2	<u>1.250</u>	<u>7.31</u>
3	<u>8.460</u>	<u>10.85</u>
4	<u>4.800</u>	<u>12.21</u>
5	<u>7.650</u>	<u>15.88</u>

AVERAGE (TOP) 5.248

LB/IN 1.312

AVERAGE (BTM) 9.944

LB/IN 2.486

Notes:

Tested by: *A. C. Barker* Date: 9/20/10
Andrew Barker

Checked by: *Jessica Martin* Date: 9/20/10
Jessica Martin

TRANSMISSIVITY TEST DATA

ASTM D-4716

TEST CONFIGURATION

TOP PLATE
Sand
Geocomposite
Geomembrane
BOTTOM PLATE

Date: September 16, 2010

Roll #: 1000107 Thickness: _____ mils

Job: Citrus County

Unit Weight: _____ gm/m²

Product: TenDrain 770-2

Recipe: Batch 3 - 12.5' x 170'



Load (psf)	Seating (hours)	Gradient	Q ₁ (liters)	T ₁ (sec)	Q ₂ (liters)	T ₂ (sec)	Q ₃ (liters)	T ₃ (sec)	Temp. (C°)	Average Q (liter/min)	Transmissivity (m ² /s.m)	Flow Rate (gpm/ft)
15,000	0.5	0.10	2.00	13.37	3.00	19.99	4.00	27.05	20.10	8.94	4.89E-03	23.6
15,000	24	0.10	2.00	14.30	3.00	22.12	4.00	29.70	19.40	8.30	4.54E-03	21.9
15,000	48	0.10	2.00	15.11	3.00	22.64	4.00	30.38	19.50	8.11	4.43E-03	21.4
15,000	72	0.10	2.00	15.30	3.00	23.03	4.00	31.13	19.20	8.02	4.39E-03	21.2
15,000	100	0.10	2.00	15.45	3.00	23.38	4.00	31.78	19.10	7.92	4.33E-03	20.9

Tested By: *Andrew Barker*

Date: 9/20/10

Andrew Barker

Checked By: *Jessica Martin*

Date: 9/20/10

Jessica Martin

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QUALITY CONTROL SUMMARY

Syntec TenDrain 770-2

Date: September 21, 2010

Batch #4 - FINAL

Project: Citrus County

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SECTION I

PRODUCT SPECIFICATION

**product
specifications**

TENDRAIN 770-2

**Citrus County Central Landfill Phase 3, FL
(Leachate Collection)**

The drainage geocomposite is comprised of a tri-axial geonet structure with thermally bonded nonwoven geotextiles on both sides. The product is capable of providing high transmissivity in a soil environment under both low and high loads and will have properties conforming to the values and test methods listed below.

PROPERTY	TEST METHODS	UNITS	VALUE	QUALIFIER	TEST FREQUENCY
Resin					
• Density	ASTM D 1505	g/cm ³	0.94	MAV	lot
• Melt Flow Index	ASTM D 1238	g/10min	1.0	MAX	lot
Geonet Core¹					
• Tensile Strength – MD	ASTM D 4595	lb/ft	1200	±10 %	100,000 sf
• Thickness	ASTM D 5199	mil	300	MAV	100,000 sf
• Carbon Black	ASTM D 4218	%	2-3	range	100,000 sf
Geotextile¹					
• Mass per Unit Area	ASTM D 5261	oz/yd ²	6	MARV	100,000 sf
• Grab Tensile	ASTM D 4632	lbs	160	MARV	100,000 sf
• Grab Elongation	ASTM D 4632	%	50	MARV	100,000 sf
• Tear Strength	ASTM D 4533	lbs	60	MARV	100,000 sf
• Puncture Resistance	ASTM D 4833	lbs	85	MARV	100,000 sf
• AOS	ASTM D 4751	US Sieve	70	MaxARV	500,000 sf
• Permittivity	ASTM D 4491	Sec ⁻¹	1.1	MARV	500,000 sf
Geocomposite					
• Peel Adhesion – MD	ASTM D 7005	lb/in	1.0	MAV	100,000 sf
• Transmissivity ² - MD (m ² /sec) Gradient / load	ASTM D 4716 GRI - GC8	<u>15,000 psf</u>			
0.1		2.0x10 ⁻³		MAV	200,000 sf

Qualifiers: MARV=Minimum Average Roll Value (MARV), MAV=Minimum Average Value, MAX=Maximum Value, MaxARV=Maximum average roll value.

NOTES: 1. Geotextile and geonet properties listed are prior to lamination. 2. Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows: steel plate / Ottawa sand / geocomposite / geomembrane / steel plate, and seating period of 100 hours according to GRI-GC8.



SYNTEC
GEOSYNTHETICS EVOLVED

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Phone 410.327.1070 800.874.7437
Fax 410.327.1078
www.synteccorp.com

11/11/09

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SECTION II

RESIN REPORT



Vendor Certificate of Analysis

Customer:	Syntec LLC
Customer PO#:	155
Ship Date:	8/26/2010
Polymer Grade:	E924
Polymer Type:	Polyethylene
Weight:	195,050
Lot #:	4616
Railcar #:	FPAX970360

Properties as Reported by Producer	
	Results
Melt Index- Mlz	8.0 HLMI
Density:	0.949

Note- Only those properties associated with the specific resin are reported

Nexus Resin Group, LLC has no control over the use to which others may put this material. Nexus Resin Group, LLC does not guarantee that the same results as described will be obtained by the end user. Nexus Resin Group, LLC does not guarantee the effectiveness or safety of any material for the design or the suitability of the material nor the designs of both for the end user's own particular use. Statements concerning possible or suggested uses of the materials or designs described herein are not to be construed as recommendations for use of such materials or designs.

37 Water Street Mystic, CT 06355 Ph:860-536-1550 Fax: 860-536-1275

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SECTION III

GEONET REPORT AND MQC

Geonet MQC Test Results

Product TD 7
Project Citrus County
Batch # 4
Dimensions 13' x 1400'
Testing Lab Syntec

Geonet Roll	Date Tested	Thickness ASTM D5199-98 (mils)	Resin Density ASTM D1505 (g/cm ³)	Carbon Black ASTM D4218-96 (%)	Resin MFI ASTM D 1238-00 (g/10m)	Tensile Strength ASTM D4595 (lb/f)
1000119	9/13/2010	312	0.956	2.51	0.083	1419
1000122	9/16/2010	323	0.951	2.98	0.083	1499
1000125	9/17/2010	311	0.948	2.08	0.083	1567
1000128	9/17/2010	312	0.954	2.86	0.083	1565
1000131	9/18/2010	315	0.951	2.98	0.083	1586
1000134	9/20/2010	312	0.950	2.41	0.083	1576
Average		314	0.952	2.64	0.083	1536
Standard Dev.		5	0.003	0.36	0.000	65
Specifications		300	0.940	2.00 - 3.00	< 1	1200 +/- 10%

Tested by  Date 9/20/2010
 Andrew Barker

Checked by  Date 9/20/2010
 Jessica Martin

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SECTION IV

GEOTEXTILE REPORT

TNS Advanced Technologies
by Crown Resources
681 DeYoung Road
Greenville, SC 29651

(864) 968-0592 Tel
(864) 879-4639 Fax

9/21/2010

REF: TNS E060
PO# 157

Syntec LLC
4800 Pulaski Highway
Baltimore, Maryland 21224

Dear Sir/Madam:

This is to certify that TNS E060 is a 100% polypropylene, nonwoven, needle-punched fabric. TNS E060 is resistant to degradation due to ultraviolet exposure and resists commonly encountered soil chemicals, insects, mildew, and is non-biodegradable. Polypropylene is stable within a pH range of 2 to 13. TNS E060 conforms to the physical properties listed in the following table:

<u>FABRIC PROPERTY</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>M.A.R.V</u>
Mass Per Unit Area	ASTM D 5261	oz/yd ²	6
Grab Tensile	ASTM D 4632	lbs	160
Grab Elongation	ASTM D 4632	%	50
Trap Tear	ASTM D 4533	lbs	60
Puncture	ASTM D 4833	lbs	85
A.O.S.	ASTM D 4751	U.S. Sieve	70
Permittivity	ASTM D 4491	1/sec	1.1
U.V. Resistance	ASTM D 4355	% strength retained at 500 hrs.	70 %

Marshall O. Gaddy

Marshall O. Gaddy
Quality Control Manager

Packing List

Syntec

PO # 157

E060 14' x 1000'

Trailer # 7034

Roll number	Style	Width	Length	SY	MD	XMD	MD	XMD	MD	XMD	REST	STRG	RATE	ABL	PERM	ITV	AOS
2021002143	E060	168	1000	6.7	68	74	93	208.58	251.2	81.75	112.1	122.24	356	129.73	0.317	1.757	70
2021002179	E060	168	1000	7.2	71	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70
2021002180	E060	168	1000	6.4	57	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70
2021002182	E060	168	1000	6.4	57	91	101	212.98	259.27	88.83	121.86	108.19	359	129.73	0.317	1.757	70
2021002185	E060	168	1000	6.2	71	76	112	229.57	249.68	100.59	108.4	112.79	349	129.73	0.317	1.757	70
2021002186	E060	168	1000	6.2	71	76	112	229.57	249.68	100.59	108.4	112.79	349	129.73	0.317	1.757	70
2021002204	E060	168	1000	6.8	70	77	101	225.8	233.39	82.61	117.94	124.01	354	135.2	0.387	1.83	70
2021215427	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70
2021215428	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70
2021215429	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70
2021215430	E060	168	1000	7.2	82	90	96	178.77	260.08	77.78	127.89	106.75	370	151.4	0.377	2.05	70
2021215431	E060	168	1000	10	117	94	99	252.25	349.53	96.54	161	106.75	370	151.4	0.377	2.05	70
2021215434	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215435	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215436	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215437	E060	168	1000	6.9	75	89	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215438	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215439	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215441	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215442	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215443	E060	168	1000	6.9	75	85	88	185.94	217.33	88.55	139.38	106.75	370	151.4	0.377	2.05	70
2021215444	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215447	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215448	E060	168	1000	6.7	75	77	86	186.53	270.81	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215486	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215487	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215488	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215489	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215490	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215491	E060	168	1000	7.1	78	75	91	220.11	309.36	89.75	134.06	106.75	370	128.98	0.346	1.747	70
2021215492	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70
2021215493	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70
2021215494	E060	168	1000	7.8	78	82	88	217.85	265.59	85.93	124.35	106.75	370	128.98	0.346	1.747	70
2021216839	E060	168	1000	7.3	81	77	90	184.41	267.94	73.52	107.61	106.75	370	128.98	0.346	1.747	70
2021216840	E060	168	1000	7.3	81	77	90	184.41	267.94	73.52	107.61	106.75	370	128.98	0.346	1.747	70
2021216841	E060	168	1000	7.3	81	77	90	184.41	267.94	73.52	107.61	106.75	370	128.98	0.346	1.747	70
2021216842	E060	168	1000	7.3	81	77	90	184.41	267.94	73.52	107.61	106.75	370	128.98	0.346	1.747	70

Packing List																	
Syntec																	
PO # 157																	
E060 14' x 1000'																	
Trailer # 537615																	
Roll number	Style	Width	Length	OZ	THCK	GRAB	GRAB	ELNG	ELNG	TRAP	TRAP	PUNC	BRST	FLOW	PERM	PERM	AOS
				SY	MD	XMD	MD	XMD	MD	XMD	MD	REST	STRG	RATE	ABL	ITY	
2021215445	E060	168	1000	6.7	75	186.53	270.81	77	86	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215446	E060	168	1000	6.7	75	186.53	270.81	77	86	108.07	165.07	106.75	370	151.4	0.377	2.05	70
2021215450	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215452	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215453	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215454	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215455	E060	168	1000	7.1	76	181.04	240.99	77	90	108.26	144.43	106.75	370	151.4	0.377	2.05	70
2021215456	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215457	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215458	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215459	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215460	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215461	E060	168	1000	6.6	7	177.51	252.44	81	91	86	115.39	106.75	370	151.4	0.377	2.05	70
2021215462	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215463	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215464	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215465	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215466	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215467	E060	168	1000	8.2	8	232.16	327.9	85	88	92.97	155.54	106.75	370	128.98	0.346	1.747	70
2021215468	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215469	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215470	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215471	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215472	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215473	E060	168	1000	7.1	74	195.5	255.82	87	91	70.76	114.06	106.75	370	128.98	0.346	1.747	70
2021215474	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215475	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215476	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215477	E060	168	1000	6.9	72	196.78	257.42	82	86	80.9	119.37	106.75	370	128.98	0.346	1.747	70
2021215479	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215480	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215481	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215482	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215483	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215484	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70
2021215485	E060	168	1000	7.1	77	191.7	260.81	87	93	72.33	111.8	106.75	370	128.98	0.346	1.747	70

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SECTION V

TRACEABILITY REPORT

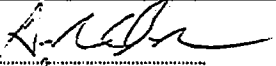
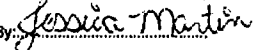
SYNTEC CORPORATION

Traceability, Peel and Transmissivity Report

PRODUCT : TenDrain 770-2
 JOB: Citrus County
 Batch 4

COMPOSITE #	NET #	Top TEXTILE #	Bottom TEXTILE #	Roll length (ft)	Top Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	Bottom Geotextile ASTM D 7005 Peel Adhesion lbs/in (avg.)	ASTM D 7005 Peel Adhesion lbs/in (req.)	ASTM D 4716 Transmissivity (m2/sec) Value	ASTM D 4716 Transmissivity (m2/sec) Required*	Gradient
1000162	1000132	2021215488	2021215487	155	1.865	2.40	1	4.33 x 10-3	2.00 x 10-3	0.1
1000163	1000132	2021215488	2021215487	155						
1000164	1000133	2021215488	2021215487	155						
1000165	1000133	2021215488	2021215487	155						
1000166	1000133	2021215488	2021215487	155						
1000167	1000133	2021215488	2021215487	155						
1000168	1000133	2021216839	2021216840	155						
1000169	1000133	2021216839	2021216840	155						
1000170	1000133	2021216839	2021216840	155						
1000171	1000134	2021216839	2021216840	155						
1000172	1000134	2021216839	2021216840	155						
1000173	1000134	2021216839	2021216840	155						
1000174	1000134	2021216839	2021216840	155						
1000175	1000134	2021215428	2021215429	155						
1000176	1000134	2021215428	2021215429	155						
1000177	1000122	2021215428	2021215429	155						
1000178	1000122	2021215428	2021215429	155						
1000179	1000122	2021215428	2021215429	155						
1000180	1000122	2021215428	2021215429	155						
1000181	1000122	2021215434	2021215431	155						
1000182	1000122	2021215434	2021215431	155						
1000183	1000122	2021215434	2021215431	155						
1000184	1000123	2021215434	2021215431	155						
1000185	1000123	2021215434	2021215431	155						
1000186	1000123	2021215434	2021215431	155						
1000187	1000123	2021215434	2021215431	150						
1000188	1000123	2021215456	2021215457	150						
1000189	1000123	2021215456	2021215457	150						
1000190	1000125	2021215456	2021215457	150						
1000191	1000125	2021215456	2021215457	150						
1000192	1000125	2021215456	2021215457	150						
1000193	1000125	2021215456	2021215457	150						
1000194	1000125	2021215453	2021215454	150						
1000195	1000125	2021215453	2021215454	150						
1000196	1000125	2021215453	2021215454	150						
1000197	1000124	2021215453	2021215454	150						
1000198	1000124	2021215453	2021215454	150						
1000199	1000124	2021215453	2021215454	150						
1000200	1000124	2021215453	2021215454	150						
1000201	1000124	2021215472	2021215471	150						
1000202	1000124	2021215472	2021215471	150						
1000203	1000121	2021215472	2021215471	150						
1000204	1000121	2021215472	2021215471	150						
1000205	1000121	2021215472	2021215471	150						
1000206	1000121	2021215472	2021215471	150						


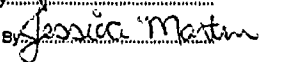
*Geocomposite transmissivity measured by manufacturer per ASTM D4716 with testing boundary conditions as follows:
 Steel Plate / Ottawa Sand / Geocomposite / 60mil HDPE Membrane / Steel Plate
 with a seating period of 100 hours at a load of 15,000 psf

Tested By: 
 Checked By: 

1000207	1000121	2021215475	2021215477
1000208	1000121	2021215475	2021215477
1000209	1000121	2021215475	2021215477

150
150
150
91563

Total Square Feet:

Tested By: 
Checked By: 



TESTING LABORATORY

PLY ADHESION WORKSHEET

QUALITY CONTROL

Revision 1

DATE: 09/18/2010

PRODUCT TYPE / ROLL SIZE / ROLL # / JOB :

TEST #

TenDrain 770-2

12.5' x 155'

1000162

Citrus County

1

TEST STANDARD

TESTING DEVICE

LABORATORY CONDITIONS

PRODUCT NOTES

-
-
- ASTM D7005
-

- CHATILLON
-
-

TEMPERATURE C 20.4
HUMIDITY % 38%

Batch 4

MEASURED CHARACTERISTICS

SPECIMEN	(LB)	
	TOP	BOTTOM
1	<u>10.680</u>	<u>9.86</u>
2	<u>4.330</u>	<u>11.17</u>
3	<u>5.420</u>	<u>15.65</u>
4	<u>5.720</u>	<u>9.85</u>
5	<u>11.150</u>	<u>1.51</u>

AVERAGE (TOP) 7.460

LB/IN 1.865

AVERAGE (BTM) 9.608

LB/IN 2.402

Notes:

Tested by: Andrew Barker Date: 9/21/10
Andrew Barker

Checked by: Jessica Martin Date: 9/21/10
Jessica Martin

TRANSMISSIVITY TEST DATA

ASTM D-4716

TEST CONFIGURATION

TOP PLATE
Sand
Geocomposite
Geomembrane
BOTTOM PLATE

Date: September 16, 2010 Roll #: 1000107 Thickness: _____ mils
 Job: Citrus County Unit Weight: _____ gm/m²
 Product: TenDrain 770-2 Recipe: Batch 3 - 12.5' x 170'



Load (psf)	Seating (hours)	Gradient	Q ₁ (liters)	T ₁ (sec)	Q ₂ (liters)	T ₂ (sec)	Q ₃ (liters)	T ₃ (sec)	Temp. (c°)	Average Q (liter/min)	Transmissivity (m ² /s.m)	Flow Rate (gpm/ft)	Flow Rate (gpm/ft)
15,000	0.5	0.10	2.00	13.37	3.00	16.99	4.00	27.05	20.10	8.94	4.89E-03	23.6	2.4
15,000	24	0.10	2.00	14.80	3.00	22.12	4.00	29.70	19.40	8.30	4.54E-03	21.9	2.2
15,000	48	0.10	2.00	15.11	3.00	22.64	4.00	30.36	19.50	8.11	4.43E-03	21.4	2.1
15,000	72	0.10	2.00	15.30	3.00	23.03	4.00	31.13	19.20	8.02	4.39E-03	21.2	2.1
15,000	100	0.10	2.00	15.45	3.00	23.36	4.00	31.78	19.10	7.92	4.33E-03	20.9	2.1

Tested By: Andrew Barker

Date: 9/21/10

Andrew Barker

Checked By: Jessica Martin

Date: 9/21/10

Jessica Martin

Attachment 7-2

Biplanar Geocomposite MQC Certificates

Equistar Chemicals, LP
One Houston Center
1221 McKinney
Houston TX 77010

Certificate Of Analysis

Certificate of Analysis Contact:
TRACY BRADFORD
GSE LINING TECHNOLOGY
HOUSTON TX 77073
Fax No. : 281-230-8630

Ship-To Address:
GSE LINING TECHNOLOGY INC
1245 EASTLAND AVENUE
KINGSTREE SC 29556
USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM.002

Data reported was generated in an approved
Quality Assurance Lab.

Print Date: June 15, 2010 BNLITTLE
This information is available 24 hours a day at
www.CustomerXPRESS.com
Questions ? Call Customer Service: 888-777-0232

This Certificate of Analysis contains the most current information available as of the print date.
This document shall not be reproduced except in full, without the written approval of the issuer.

GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Resin Lot</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
131348202	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348203	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348204	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348205	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348206	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348207	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348208	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348209	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348210	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348211	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348212	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348213	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348214	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150
131348215	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	150

GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Resin Lot</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
131348174	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348175	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348176	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348177	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348178	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348179	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348180	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348181	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348182	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348183	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348184	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348185	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348186	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348187	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348188	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348189	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348190	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348191	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348192	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348193	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348194	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348195	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348196	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348197	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348198	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348199	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348200	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155
131348201	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	155

GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Resin Lot</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
131348150	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348151	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348152	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348153	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348154	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348155	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348156	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348157	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348158	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348159	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348160	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348161	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348162	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348163	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348164	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348165	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348166	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348167	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348168	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348169	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348170	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348171	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165
131348172	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	165

GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Resin Lot</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
131348131	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348132	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348133	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348134	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348135	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348136	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348137	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348138	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348139	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348140	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348141	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348142	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348143	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348144	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348145	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348146	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348147	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348148	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170
131348149	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/6/2010	170

GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

Roll#	Resin Lot	Product Code	Description	Mfg. Date	Length
131348089	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348090	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348091	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348092	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348093	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348094	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348095	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348096	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348097	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348098	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348099	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348100	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348101	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348102	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348103	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348104	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348105	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348106	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348107	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348108	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348109	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348110	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348111	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348112	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348113	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348114	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348115	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348116	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348117	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348118	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348119	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212
131348120	CB20061401	FS2-275E-06-06-E-00	FS2-275E-06-06-E-00	8/5/2010	212

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Monday, August 09, 2010

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Roll Test Data Report

Sales Order No. **62099** Project Number Customer Name **Comanco** Project Location **Lecanto, FL** Product Name **FS2-275E-06-06-E-00** Report Date **8/9/2010**



Roll No	ASTM D 5199	ASTM D 7179 / D 5015	ASTM D 4218 / D 1603*	ASTM D 1505 / D 792	GRI GC7* - ASTM D7085	
	Average	Geosol Tenile	Carbon Black	Density	Foot Strength	Foot Strength
	Thickness	Strength	Content		Side A - Average	Side B - Average
	mil	pph	%	g/cc	pph	pph
	every 15ft	every 15ft	every 15ft	every 15ft	every 15ft	every 15ft
131348202	297	97	2.6	0.963	2.82	2.92
131348203	297	97	2.6	0.963	2.82	2.92
131348204	297	97	2.6	0.963	2.82	2.92
131348205	297	97	2.6	0.963	2.82	2.92
131348206	297	97	2.6	0.963	2.82	2.92
131348207	297	97	2.6	0.963	2.82	2.92
131348208	297	97	2.6	0.963	2.82	2.92
131348209	297	97	2.6	0.963	2.82	2.92
131348210	297	84	2.4	0.962	3.14	2.76
131348211	297	84	2.4	0.962	3.14	2.76
131348212	297	84	2.4	0.962	3.14	2.76
131348213	297	84	2.4	0.962	3.14	2.76
131348214	297	84	2.4	0.962	3.14	2.76
131348215	297	84	2.4	0.962	3.14	2.76

Laboratory Manager: Joe Allen

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Roll Test Data Report

Sales Order No. 62099 Project Number Customer Name Comanco Project Location Lecanto, FL Product Name FS2-275E-06-06-E-00 Report Date 8/9/2010



Roll No.	ASTM D 5199	ASTM D 7179 / D 5035	ASTM D 4218 / D 1603*	ASTM D 1505 / D 792	GRI GC7* / ASTM D7005	
	Average	Geomet Tensile	Carbon Black	Density	Peel Strength	Peel Strength
	Thickness	Strength	Content		Side A - Average	Side B - Average
	(mils)	(psi)	(%)	(g/cc)	(ppf)	(ppf)
	every 15th	every 15th	every 15th	every 15th	every 15th	every 15th
131348174	294	85	2.4	0.962	2.48	2.68
131348175	294	85	2.4	0.962	2.48	2.68
131348176	294	85	2.4	0.962	2.48	2.68
131348177	294	85	2.4	0.962	2.48	2.68
131348178	294	85	2.4	0.962	2.48	2.68
131348179	294	85	2.4	0.962	2.48	2.68
131348180	298	81	2.8	0.962	1.52	1.68
131348181	298	81	2.8	0.962	1.52	1.68
131348182	298	81	2.8	0.962	1.52	1.68
131348183	298	81	2.8	0.962	1.52	1.68
131348184	298	81	2.8	0.962	1.52	1.68
131348185	298	81	2.8	0.962	1.52	1.68
131348186	298	81	2.8	0.962	1.52	1.68
131348187	298	81	2.8	0.962	1.52	1.68
131348188	298	81	2.8	0.962	1.52	1.68
131348189	298	81	2.8	0.962	1.52	1.68
131348190	298	81	2.8	0.962	1.52	1.68
131348191	298	81	2.8	0.962	1.52	1.68
131348192	298	81	2.8	0.962	1.52	1.68
131348193	298	81	2.8	0.962	1.52	1.68
131348194	298	81	2.8	0.962	1.52	1.68
131348195	297	97	2.6	0.963	2.82	2.92
131348196	297	97	2.6	0.963	2.82	2.92
131348197	297	97	2.6	0.963	2.82	2.92
131348198	297	97	2.6	0.963	2.82	2.92
131348199	297	97	2.6	0.963	2.82	2.92
131348200	297	97	2.6	0.963	2.82	2.92
131348201	297	97	2.6	0.963	2.82	2.92

Laboratory Manager: *Joe Allen*

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Roll Test Data Report

Sales Order No.
62099

Project Number

Customer Name
Comanco

Project Location
Lecanto, FL

Product Name
FS2-275E-06-06-E-00



Report Date
8/9/2010

Roll No	ASTM D 5199	ASTM D 7179 / D 5035	ASTM D 4218 / D 1603*	ASTM D 1505 / D 792	GRI GC7* / ASTM D7005	
	Average	Gaonol Tensile	Carbon Black	Density	Peel Strength	Peel Strength
	Thickness	Strength	Content		Side A - Average	Side B - Average
	(mils)	(psi)	(%)	(g/cc)	(psi)	(psi)
	every 15th	every 15th	every 15th	every 15th	every 15th	every 15th
131348150	299	80	2.6	0.962	1.89	2.05
131348151	299	80	2.6	0.962	1.89	2.05
131348152	299	80	2.6	0.962	1.89	2.05
131348153	299	80	2.6	0.962	1.89	2.05
131348154	299	80	2.6	0.962	1.89	2.05
131348155	299	80	2.6	0.962	1.89	2.05
131348156	299	80	2.6	0.962	1.89	2.05
131348157	299	80	2.6	0.962	1.89	2.05
131348158	299	80	2.6	0.962	1.89	2.05
131348159	299	80	2.6	0.962	1.89	2.05
131348160	299	80	2.6	0.962	1.89	2.05
131348161	299	80	2.6	0.962	1.89	2.05
131348162	299	80	2.6	0.962	1.89	2.05
131348163	299	80	2.6	0.962	1.89	2.05
131348164	299	80	2.6	0.962	1.89	2.05
131348165	294	85	2.4	0.962	2.48	2.68
131348166	294	85	2.4	0.962	2.48	2.68
131348167	294	85	2.4	0.962	2.48	2.68
131348168	294	85	2.4	0.962	2.48	2.68
131348169	294	85	2.4	0.962	2.48	2.68
131348170	294	85	2.4	0.962	2.48	2.68
131348171	294	85	2.4	0.962	2.48	2.68
131348172	294	85	2.4	0.962	2.48	2.68

Laboratory Manager: Joe Allen

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Roll Test Data Report

Sales Order No. 62099 Project Number Customer Name Comanco Project Location Lecanto, FL Product Name FS2-275E-06-06-E-00 Report Date 8/9/2010



Roll No	ASTM D 5199	ASTM D 7179 / D 5035	ASTM D 4218 / D 1603*	ASTM D 1505 / D 792	GRI GC7* / ASTM D7005	
	Average	Control Tensile	Carbon Black	Density	Pool Strength	Pool Strength
	Thickness	Strength	Content	Density	Side A - Average	Side B - Average
	(mil)	(psi)	(%)	(g/cc)	(psi)	(psi)
	every 15th	every 15th	every 15th	every 15th	every 15th	every 15th
131348131	301	96	2.4	0.962	4.61	2.82
131348132	301	96	2.4	0.962	4.61	2.82
131348133	301	96	2.4	0.962	4.61	2.82
131348134	301	96	2.4	0.962	4.61	2.82
131348135	291	90	2.4	0.962	1.96	2.16
131348136	291	90	2.4	0.962	1.96	2.16
131348137	291	90	2.4	0.962	1.96	2.16
131348138	291	90	2.4	0.962	1.96	2.16
131348139	291	90	2.4	0.962	1.96	2.16
131348140*	291	90	2.4	0.962	1.96	2.16
131348141	291	90	2.4	0.962	1.96	2.16
131348142	291	90	2.4	0.962	1.96	2.16
131348143	291	90	2.4	0.962	1.96	2.16
131348144	291	90	2.4	0.962	1.96	2.16
131348145	291	90	2.4	0.962	1.96	2.16
131348146	291	90	2.4	0.962	1.96	2.16
131348147	291	90	2.4	0.962	1.96	2.16
131348148	291	90	2.4	0.962	1.96	2.16
131348149	291	90	2.4	0.962	1.96	2.16

Laboratory Manager: Joe Allen

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Roll Test Data Report

Sales Order No. 62099

Project Number

Customer Name Comanco

Project Location Lecanto, FL

Product Name FS2-275E-06-06-E-00



Report Date 8/9/2010

Roll No	ASTM D 5199	ASTM D 7179 / D 5035	ASTM D 4218 / D 1603*	ASTM D 1505 / D 792	GRI GC7* / ASTM D7005	
	Average	Glass Tensile	Carbon Black		Flex Strength	Peel Strength
	Thickness	Strength	Content	Density	Side A - Average Side B - Average	
	(mils)	(psi)	(%)	(g/cc)	(psi)	(psi)
	every 15th	every 15th	every 15th	every 15th	every 15th	every 15th
131348089	303	92	2.6	0.963	5.11	5.09
131348090	295	81	2.5	0.963	3.31	4.10
131348091	295	81	2.5	0.963	3.31	4.10
131348092	295	81	2.5	0.963	3.31	4.10
131348093	295	81	2.5	0.963	3.31	4.10
131348094	295	81	2.5	0.963	3.31	4.10
131348095	295	81	2.5	0.963	3.31	4.10
131348096	295	81	2.5	0.963	3.31	4.10
131348097	295	81	2.5	0.963	3.31	4.10
131348098	295	81	2.5	0.963	3.31	4.10
131348099	295	81	2.5	0.963	3.31	4.10
131348100	295	81	2.5	0.963	3.31	4.10
131348101	295	81	2.5	0.963	3.31	4.10
131348102	295	81	2.5	0.963	3.31	4.10
131348103	295	81	2.5	0.963	3.31	4.10
131348104	295	81	2.5	0.963	3.31	4.10
131348105	292	98	2.4	0.962	3.45	3.01
131348106	292	98	2.4	0.962	3.45	3.01
131348107	292	98	2.4	0.962	3.45	3.01
131348108	292	98	2.4	0.962	3.45	3.01
131348109	292	98	2.4	0.962	3.45	3.01
131348110	292	98	2.4	0.962	3.45	3.01
131348111	292	98	2.4	0.962	3.45	3.01
131348112	292	98	2.4	0.962	3.45	3.01
131348113	292	98	2.4	0.962	3.45	3.01
131348114	292	98	2.4	0.962	3.45	3.01
131348115	292	98	2.4	0.962	3.45	3.01
131348116	292	98	2.4	0.962	3.45	3.01
131348117	292	98	2.4	0.962	3.45	3.01
131348118	292	98	2.4	0.962	3.45	3.01
131348119	292	98	2.4	0.962	3.45	3.01
131348120	301	96	2.4	0.962	4.61	2.82

Laboratory Manager: *Joe Allen*

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GSE

Geocomposite Traceability

Customer Comanco
Location Lecanto, FL

Job Name Citrus County Central
Order 62099

Roll_No	Product	Resin Lot	Top Geo	Bottom Geo
131348202	FS2-275E-06-06-E-00	CB20061401	130359441	130359438
131348203	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348204	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348205	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348206	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348207	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348208	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348209	FS2-275E-06-06-E-00	CB20061401	130359441	130359440
131348210	FS2-275E-06-06-E-00	CB20061401	130363070	130359440
131348211	FS2-275E-06-06-E-00	CB20061401	130363070	130359440
131348212	FS2-275E-06-06-E-00	CB20061401	130363070	130359440
131348213	FS2-275E-06-06-E-00	CB20061401	130363070	130359439
131348214	FS2-275E-06-06-E-00	CB20061401	130363070	130359439
131348215	FS2-275E-06-06-E-00	CB20061401	130363070	130359439

GSE

Geocomposite Traceability

Customer Comanco
Location Lecanto, FL

Job Name Citrus County Central
Order 62099

Roll No	Product	Resin Lot	Top Geo	Bottom Geo
131348174	FS2-275E-06-06-E-00	CB20061401	130364516	130364497
131348175	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348176	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348177	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348178	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348179	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348180	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348181	FS2-275E-06-06-E-00	CB20061401	130364516	130364515
131348182	FS2-275E-06-06-E-00	CB20061401	130364494	130364515
131348183	FS2-275E-06-06-E-00	CB20061401	130364494	130364515
131348184	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348185	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348186	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348187	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348188	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348189	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348190	FS2-275E-06-06-E-00	CB20061401	130364494	130364499
131348191	FS2-275E-06-06-E-00	CB20061401	130359445	130364499
131348192	FS2-275E-06-06-E-00	CB20061401	130359445	130364499
131348193	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348194	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348195	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348196	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348197	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348198	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348199	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348200	FS2-275E-06-06-E-00	CB20061401	130359445	130359438
131348201	FS2-275E-06-06-E-00	CB20061401	130359441	130359438

GSE

Geocomposite Traceability

Customer Comanco
Location Lecanto, FL

Job Name Citrus County Central
Order 62099

Roll_No	Product	Resin Lot	Top Geo	Bottom Geo
131348150	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348151	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348152	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348153	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348154	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348155	FS2-275E-06-06-E-00	CB20061401	130364490	130359444
131348156	FS2-275E-06-06-E-00	CB20061401	130359442	130359444
131348157	FS2-275E-06-06-E-00	CB20061401	130359442	130359444
131348158	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348159	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348160	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348161	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348162	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348163	FS2-275E-06-06-E-00	CB20061401	130359442	130359446
131348164	FS2-275E-06-06-E-00	CB20061401	130359460	130359446
131348165	FS2-275E-06-06-E-00	CB20061401	130359460	130359446
131348166	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348167	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348168	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348169	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348170	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348171	FS2-275E-06-06-E-00	CB20061401	130359460	130364497
131348172	FS2-275E-06-06-E-00	CB20061401	130359460	130364497

GSE

Geocomposite Traceability

Customer Comanco
Location Lecanto, FL

Job Name Citrus County Central
Order 62099

Roll_No	Product	Resin Lot	Top Geo	Bottom Geo
131348131	FS2-275E-06-06-E-00	CB20061401	130360427	130363071
131348132	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348133	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348134	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348135	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348136	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348137	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348138	FS2-275E-06-06-E-00	CB20061401	130360427	130360430
131348139	FS2-275E-06-06-E-00	CB20061401	130364502	130360430
131348140	FS2-275E-06-06-E-00	CB20061401	130364502	130360430
131348141	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348142	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348143	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348144	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348145	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348146	FS2-275E-06-06-E-00	CB20061401	130364502	130364495
131348147	FS2-275E-06-06-E-00	CB20061401	130364490	130364495
131348148	FS2-275E-06-06-E-00	CB20061401	130364490	130364495
131348149	FS2-275E-06-06-E-00	CB20061401	130364490	130359444

GSE

Geocomposite Traceability

Customer Comanco
Location Lecanto, FL

Job Name Citrus County Central
Order 62099

Roll_No	Product	Resin Lot	Top Geo	Bottom Geo
131348089	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348090	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348091	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348092	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348093	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348094	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348095	FS2-275E-06-06-E-00	CB20061401	130363095	130363059
131348096	FS2-275E-06-06-E-00	CB20061401	130363069	130363059
131348097	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348098	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348099	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348100	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348101	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348102	FS2-275E-06-06-E-00	CB20061401	130363069	130363067
131348103	FS2-275E-06-06-E-00	CB20061401	130363094	130363067
131348104	FS2-275E-06-06-E-00	CB20061401	130363094	130363093
131348105	FS2-275E-06-06-E-00	CB20061401	130363094	130363093
131348106	FS2-275E-06-06-E-00	CB20061401	130363094	130363093
131348107	FS2-275E-06-06-E-00	CB20061401	130363094	130363093
131348108	FS2-275E-06-06-E-00	CB20061401	130363094	130363093
131348109	FS2-275E-06-06-E-00	CB20061401	130363074	130363093
131348110	FS2-275E-06-06-E-00	CB20061401	130363074	130363093
131348111	FS2-275E-06-06-E-00	CB20061401	130363074	130363078
131348112	FS2-275E-06-06-E-00	CB20061401	130363074	130363078
131348113	FS2-275E-06-06-E-00	CB20061401	130363074	130363078
131348114	FS2-275E-06-06-E-00	CB20061401	130363074	130363078
131348115	FS2-275E-06-06-E-00	CB20061401	130363074	130363078
131348116	FS2-275E-06-06-E-00	CB20061401	130363068	130363078
131348117	FS2-275E-06-06-E-00	CB20061401	130363068	130363058
131348118	FS2-275E-06-06-E-00	CB20061401	130363068	130363058
131348119	FS2-275E-06-06-E-00	CB20061401	130363068	130363058
131348120	FS2-275E-06-06-E-00	CB20061401	130363068	130363058



Roll Test Data Report

Sales Order No. 62099
 Project Number
 Customer Name Comanco
 Project Location Lecanto, FL
 Product Name FBR-060E-EBC-E-00
 Report Date 8/26/2010



Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261	
	Average Sample		Apparent	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	Permittivity	Opening Size	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	Unit Area
	(gallon/min/ft ²)	(Sec-1)	(mm)	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(oz./yd ²)
	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	
130359438	127	1.70	0.212	97	145	108	128	100	188	190	6.4
130359439	127	1.70	0.212	97	145	108	128	100	188	190	6.4
130359440	127	1.70	0.212	97	145	108	128	100	188	190	6.4
130359441	119	1.60	0.212	97	145	108	128	100	188	190	6.4
130363070	179	2.40	0.212	95	101	82	131	99	244	188	6.2

Laboratory Manager: Spice Allen

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Kingstree Lab - US



Lining Technology, Inc

Roll Test Data Report

Sales Order No.

Project Number

Customer Name

Project Location

Product Name



Report Date

62099

Comanco

Lecanto, FL

FBR-060E-EBC-E-00

8/26/2010

Roll No.	ASTM D 4491		ASTM D 4751		ASTM D 4833		ASTM D 4533		ASTM D 4632		ASTM D 5261	
	Average Sample	Permittivity	Apparent	Opening Size	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	(Sec-1)	(mm)	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	MD	Unit Area
	(gallon/min:ft ²)			(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(lbs)	(oz :yd ²)
	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	
130359438	127	1.70	0.212	97	145	108	128	100	188	190	6.4	
130359441	119	1.60	0.212	97	145	108	128	100	188	190	6.4	
130359445	123	1.70	0.212	98	175	122	129	96	211	187	6.6	
130364494	126	1.70	0.212	112	207	166	124	97	217	207	6.2	
130364497	116	1.60	0.212	112	207	166	124	97	217	207	6.2	
130364499	116	1.60	0.212	114	161	195	131	92	208	225	6.5	
130364515	153	2.10	0.212	110	147	182	132	87	219	221	6.4	
130364516	153	2.10	0.212	110	147	182	132	87	219	221	6.4	

Laboratory Manager: Joe Allen

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Kingtree Lab - US



Roll Test Data Report

Sales Order No.
62099

Project Number

Customer Name
Comanco

Project Location
Lecanto, FL

Product Name
FBR-060E-EBC-E-00



Report Date
8/26/2010

Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261		
	Average Sample	Flow Rate	Permittivity	Apparent	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	(gallon min/ft ²)	(Sec-1)	(mm)	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	MD	Unit Area
	every 4th	every 4th	every 4th	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(lbs)	(oz /yd ²)
130359442	119	1.60	0.212	98	175	122	129	96	211	187	6.6	
130359444	119	1.60	0.212	98	175	122	129	96	211	187	6.6	
130359446	123	1.70	0.212	97	192	121	140	104	210	192	6.9	
130359460	141	1.90	0.212	111	128	113	132	94	218	203	6.7	
130364490	111	1.50	0.212	122	151	127	132	85	247	236	7.1	
130364497	116	1.60	0.212	112	207	166	124	97	217	207	6.2	

Laboratory Manager: Joe Allen

GSE-8.2.4-029 Rev 01 02/10

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Kingstree Lab - US



Roll Test Data Report

Sales Order No. 62099
 Project Number
 Customer Name Comanco
 Project Location Lecanto, FL
 Product Name FBR-060E-EBC-E-00
 Report Date 8/26/2010



Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261	
	Average Sample		Apparent	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	Permittivity	Opening Size	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	Unit Area
	(gallon/min/ft ²)	(Sec-1)	(mm)	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(oz /yd ²)
	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	
130359444	119	1.60	0.212	98	175	122	129	96	211	187	6.6
130360427	133	1.80	0.212	107	190	113	143	96	203	184	6.5
130360430	133	1.80	0.212	95	226	116	133	107	226	167	6.4
130363071	141	1.90	0.212	109	131	77	148	110	253	207	6.9
130364490	111	1.50	0.212	122	151	127	132	85	247	236	7.1
130364495	116	1.60	0.212	112	207	166	124	97	217	207	6.2
130364502	127	1.70	0.212	119	149	227	128	86	223	219	6.5

Laboratory Manager: Paul Allen

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Kingstree Lab - US



Roll Test Data Report

Sales Order No.

Project Number

Customer Name

Project Location

Product Name



Report Date

62099

Comanco

Lecanto, FL

FBR-060E-EBC-E-00

8/26/2010

Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261	
	Average Sample		Apparent	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	Permittivity	Opening Size	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	Unit Area
	(gallons/min/ft ²)	(Sec-1)	(mm)	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(oz /yd ²)
	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	every 4th	
130363058	111	1.50	0.212	111	109	91	136	97	268	203	6.8
130363059	119	1.60	0.212	105	81	86	132	109	228	212	6.8
130363067	179	2.40	0.212	95	101	82	131	99	244	188	6.2
130363068	179	2.40	0.212	95	101	82	131	99	244	188	6.2
130363069	179	2.40	0.212	95	101	82	131	99	244	188	6.2
130363074	141	1.90	0.212	109	131	77	148	110	253	207	6.9
130363078	128	1.70	0.212	114	119	98	130	116	267	201	7.0
130363093	121	1.60	0.212	107	175	125	121	101	231	201	6.4
130363094	121	1.60	0.212	107	175	125	121	101	231	201	6.4
130363095	121	1.60	0.212	93	174	118	123	99	215	191	6.4

Laboratory Manager:

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Kingstree Lab - US

Equistar Chemicals, LP
One Houston Center
1221 McKinney
Houston TX 77010

Certificate Of Analysis

Certificate of Analysis Contact:
TRACY BRADFORD
GSE LINING TECHNOLOGY
HOUSTON TX 77073
Fax No. : 281-230-8630

Ship-To Address:
GSE LINING TECHNOLOGY INC
1245 EASTLAND AVENUE
KINGSTREE SC 29556
USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM 002

Data reported was generated in an approved
Quality Assurance Lab.

Print Date: June 15, 2010 BNLITTLE
This information is available 24 hours a day at
www.CustomerXPRESS.com
Questions ? Call Customer Service: 888-777-0232

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HOUSTON TX 77073
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1245 EASTLAND AVENUE
KINGSTREE SC 29556
USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM 002

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Houston TX 77010

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HOUSTON TX 77073
Fax No. : 281-230-8630

Ship-To Address:

GSE LINING TECHNOLOGY INC
1245 EASTLAND AVENUE
KINGSTREE SC 29556
USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM 002

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Fax No. : 281-230-8630

Ship-To Address:

GSE LINING TECHNOLOGY INC
1245 EASTLAND AVENUE
KINGSTREE SC 29556
USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM 002

Data reported was generated in an approved
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Houston TX 77010

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USA

Equistar Material : 504295 PETROTHENE® LR732001
Batch Number : CB20061401
Vehicle Number : EQUX630694
Estimated Quantity : 202,800 LBS

Customer Order No. : 03-062623
Customer Number : 42584
Date Shipped : June 15, 2010
Equistar Order No. : 1891613 000010
Delivery Item No. : 82313400 000010

Test Description	Test Result	Unit of Measure	
Vehicle ID	EQUX630694		
Vehicle Type	HOPPER CAR		
Density, Extrudate @ 23C	0.9540	g/cc	STM 011
Melt Index, 2160g @ 190C	0.36	g/10 min.	STM 002

Data reported was generated in an approved
Quality Assurance Lab.

Print Date: June 15, 2010 BNLITTLE
This information is available 24 hours a day at
www.CustomerXPRESS.com
Questions ? Call Customer Service: 888-777-0232

This Certificate of Analysis contains the most current information available as of the print date.
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1245 Eastland Avenue
Kingstree, SC 29556
Phone 843-382-4603
Fax 843-382-4604

Date: August 9, 2010

Project: # 62099 Citrus County Central Landfill Phase 3

Ref: Ultraviolet (UV) Resistance

To Whom It May Concern:

The resistance of nonwoven needle punched geotextiles to ultraviolet light depends primarily on antioxidant and carbon black package mixed with resin to prepare a formulation for fiber extrusion. As long as this formulation remains the same the UV resistance of a geotextiles does not change. Therefore, GSE performs UV testing only once per resin formulation. The testing is performed according to ASTM Test Method D 4355 and results are included on GSE geotextile specification sheet. Currently, all GSE geotextiles meet or exceed a value of 70% strength retained after 500 hours of UV exposure. GSE will meet or exceed this value for the referenced project.

Although GSE geotextiles are manufactured using one of the best available antioxidant packages, we recommend covering the geotextiles within 15 days of exposure to direct Sunlight. This period does not include time during which geotextiles rolls remain on site covered in black shrink-wrap. Our recommendation is based on UV performance data published in technical literature indicating geotextile strength can decrease sharply after prolonged exposure to Sunlight.

Actual data from an independent laboratory can be supplied upon request.

A handwritten signature in cursive script, appearing to read "Jane Allen", written in black ink.

Jane Allen
Laboratory Manager

Attachment 7-3

Triplanar Geocomposite CQA Conformance Test Results



August 24, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc:dcooper@scsengineers.com

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Bill To:

<= Same (P.O. # 092070.04-1)

Project:

Citrus County

TRI Job Reference Number:

E2343-57-08

Material(s) Tested:

Two, Syntec TENDRAIN 770-2 Double Sided Geocomposite(s)

Test(s) Requested:

Transmissivity (ASTM D 4716) - GC
Peel Strength (GRI GC 7) - GC
Thickness (ASTM D 5199) - GN & GC
Wide Width Tensile (ASTM D 4595) - GN
Mass/Unit Area (ASTM D 3776) - GT
Density (ASTM D 1505) - GN
Carbon Black Content (ASTM D 4218) - GN
Grab Tensile (ASTM D 4632) - GT
Puncture Strength (ASTM D 4833) - GT
Trapezoidal Tear (ASTM D 4533) - GT
Apparent Opening Size (ASTM D 4751) - GT
Permittivity (ASTM D 4491) - GT

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000055
TRI Log #: E2343-57-08

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Hydraulic Transmissivity (ASTM D 4716)												
Direction Tested: Machine Direction Normal Load (psf): 15,000 Hydraulic Gradient: 0.1 Test Length (in): 12 Test Width (in): 12												
Plate / Site soil-Protective Sand-Cover / GC Sample / Agru-60 mil. HDPE TXGM / Plate												
Seat Time (hours)	Specimen 1											
Volume (cc)		798	798	797								
Time (s)		10.2	10.1	10.1								
Flow Rate (GPM/ft width)		1.25	1.25	1.25								
Transmissivity (m ² /s)		2.52E-03	2.52E-03	2.52E-03								
Test Temp (C)		21.0										
Temp. Corr. Factor		0.976										
											1.25	0.00
											2.52E-03	3.89E-06
Hydraulic Transmissivity (ASTM D 4716)												
Direction Tested: Machine Direction Normal Load (psf): 15,000 Hydraulic Gradient: 0.1 Test Length (in): 12 Test Width (in): 12												
Plate / Site soil-Protective Sand-Cover / GC Sample / Agru-60 mil. HDPE TXGM / Plate												
Seat Time (hours)	Specimen 1											
Pre-Test Thickness (in)		0.395										
Post-Test Thickness (in)		0.364										
Volume (cc)		630	638	635								
Time (s)		9.9	10.1	10.1								
Flow Rate (GPM/ft width)		1.01	1.00	1.00								
Transmissivity (m ² /s)		2.08E-03	2.07E-03	2.07E-03								
Permeability (cm/s)		22.5	22.4	22.4								
Test Temp (C)		20.0										
Temp. Corr. Factor		1.000										
											1.00	0.00
											2.07E-03	6.52E-06
											22.5	0.1
Peel Strength (GRI GC 7)												
A - Average Peel Strength (ppi)	0.4	1.2	0.7	6.4	1.6						2.1	2.5
A - Average Peel Strength (g/in)	182	545	318	2906	726						935	1121
B - Average Peel Strength (ppi)	2.7	0.9	2.0	6.9	0.4						2.6	2.6
B - Average Peel Strength (g/in)	1226	409	908	3133	182						1171	1170
Nqte: A and B represent a randomly assigned top and bottom of the sample												
Thickness (ASTM D 5199)												
Thickness (mils)	407	400	412	404	413	401	401	397	395	385	402	8
											385	<< min

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
 Sample Identification: 1000055
 TRI Log #: E2343-57-08

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5199)													
Thickness (mils)	361	319	351	352	316	311	319	366	371	337	340	23	
											311	<< min	
Density (ASTM D 1505)													
Density (g/cm3)	0.954	0.954	0.954								0.954	0.000	
Carbon Black Content (ASTM D 4218)													
% Carbon Black	2.88	2.81									2.85	0.05	
Wide Width Tensile Properties (ASTM D 4595)													
MD Specimen Width (inches)	8												
MD Specimen Width (mm)	203												
MD Ultimate Strength (lbs)	1018	1147	1063	761	694	779					910	188	
MD Ultimate Strength (ppi)	127	143	133	95.1	86.7	97.4					114	24	
MD Ultimate Strength (kN/m)	22.3	25.1	23.3	16.7	15.2	17.1					19.9	4.1	
MD Break Elongation (%)	23.8	19.1	17.8	26.6	25.8	24.9					23.0	3.7	
TD Specimen Width (in)	8												
TD Specimen Width (mm)	203												
TD Ultimate Strength (lbs)	337	391	405	391	383	484					398	48	
TD Ultimate Strength (ppi)	42.2	48.8	50.6	48.9	47.8	60.5					49.8	6.0	
TD Ultimate Strength (kN/m)	7.39	8.56	8.87	8.57	8.38	10.6					8.73	1.05	
TD Break Elongation (%)	137	144	142	145	100	138					134	17	
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000055
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	2.86	2.80	2.75	2.78	2.90	2.50	2.14	3.42	3.13	3.12	2.84	0.35
Mass/Unit Area (oz/sq.yd)	6.65	6.51	6.40	6.47	6.75	5.82	4.98	7.95	7.28	7.26	6.61	0.82
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	194	211	208	158	179	187	206	227	190	216	197	20
TD - Tensile Strength (lbs)	235	277	248	292	305	224	242	303	228	270	262	31
MD - Elong. @ Max. Load (%)	89	91	72	84	103	78	100	82	86	98	88	10
TD - Elong. @ Max. Load (%)	104	87	94	97	86	87	101	98	82	99	95	8
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	136	132	73	135	127	122	115	109	106	107	110	21
	94	78	136	91	92							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	84	82	86	86	75	113	69	87	78	115	88	15
TD - Tear Strength (lbs)	142	123	116	170	116	131	129	116	126	123	129	16
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.111	0.151	0.112	0.172	0.113						0.132	0.028
Sieve No.	120	80	120	80	120						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000055
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	69	69	69	69	69	69	69	69	69	69		
Time (s)	16.6	16.6	16.9	16.5	16.9	18.1	18.4	18.5	18.5	18.5		
Specimen Permittivity (s-1)	1.71	1.71	1.68	1.72	1.68	1.57	1.54	1.53	1.53	1.53		
Specimen Permittivity @20°C (sec-1)	1.71	1.71	1.68	1.72	1.68	1.57	1.54	1.53	1.53	1.53		
Specimen Flow rate (GPM/R2)	128	128	126	129	126	117	115	115	115	115		
Specimen Permeability (cm/s)	0.30	0.30	0.29	0.30	0.29	0.27	0.27	0.27	0.27	0.27		
Test Specimen No. >:	3					4						
Thickness (mils)	70	70	70	70	70	64	64	64	64	64		
Time (s)	17.2	17.5	17.6	17.5	17.8	21.6	21.5	21.9	21.9	21.9		
Permittivity (s-1)	1.65	1.62	1.61	1.62	1.59	1.31	1.32	1.30	1.30	1.30		
Specimen Permittivity @20°C (sec-1)	1.65	1.62	1.61	1.62	1.59	1.31	1.32	1.30	1.30	1.30		
Specimen Flow rate (GPM/R2)	123	121	121	121	119	98.3	98.7	96.9	96.9	96.9		
Specimen Permeability (cm/s)	0.29	0.29	0.29	0.29	0.28	0.21	0.21	0.21	0.21	0.21		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)		1.54
										Flow rate (GPM/R2)		115
										Permeability (cm/s)		0.27

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000055
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	2.38	2.08	2.73	2.29	2.42	2.88	2.77	2.97	3.06	2.81	2.64	0.32
Mass/Unit Area (oz/sq.yd)	5.54	4.84	6.35	5.33	5.63	6.70	6.44	6.91	7.12	6.54	6.14	0.76
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	184	162	211	198	193	218	217	197	204	242	203	22
TD - Tensile Strength (lbs)	192	263	229	214	250	305	316	292	312	304	268	45
MD - Elong. @ Max. Load (%)	81	91	81	83	91	97	95	76	90	99	88	8
TD - Elong. @ Max. Load (%)	85	106	91	93	105	98	94	101	96	99	98	7
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	90	122	123	108	103	108	93	127	109	125	107	12
	112	94	98	104	94							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	91	71	71	90	72	93	80	92	103	105	87	13
TD - Tear Strength (lbs)	105	138	99	85	117	138	133	108	139	148	121	21
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.120	0.162	0.145	0.105	0.106						0.128	0.025
Sieve No.	120	80	100	140	140						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000055
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	63	63	63	63	63	55	55	55	55	55		
Time (s)	18.2	18.1	18.5	18.4	18.4	13.4	13.4	13.8	13.5	13.8		
Specimen Permittivity (s-1)	1.56	1.57	1.53	1.54	1.54	2.12	2.12	2.06	2.10	2.06		
Specimen Permittivity @20°C (sec-1)	1.56	1.57	1.53	1.54	1.54	2.12	2.12	2.06	2.10	2.06		
Specimen Flow rate (GPM/R2)	117	117	115	115	115	158	158	154	157	154		
Specimen Permeability (cm/s)	0.25	0.25	0.25	0.25	0.25	0.30	0.30	0.29	0.29	0.29		
Test Specimen No. >:	3					4						
Thickness (mils)	52	52	52	52	52	47	47	47	47	47		
Time (s)	15.3	15.7	15.6	15.7	15.6	14.1	15.0	15.0	15.0	15.0		
Permittivity (s-1)	1.85	1.81	1.82	1.81	1.82	2.01	1.89	1.89	1.89	1.89		
Specimen Permittivity @20°C (sec-1)	1.85	1.81	1.82	1.81	1.82	2.01	1.89	1.89	1.89	1.89		
Specimen Flow rate (GPM/R2)	139	135	136	135	136	150.5	141.5	141.5	141.5	141.5		
Specimen Permeability (cm/s)	0.24	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)		1.84
										Flow rate (GPM/R2)		138
										Permeability (cm/s)		0.25

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite

Sample Identification: 1000093

TRI Log #: E2343-57-08

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Peel Strength (GRI GC 7)													
A - Average Peel Strength (ppi)	2.0	2.4	1.0	1.8	0.6							1.6	0.7
A - Average Peel Strength (g/in)	908	1090	454	817	272							708	336
B - Average Peel Strength (ppi)	3.6	1.1	1.1	4.5	1.3							2.3	1.6
B - Average Peel Strength (g/in)	1634	499	499	2043	590							1053	732
Note: A and B represent a randomly assigned top and bottom of the sample													
Thickness (ASTM D 5199)													
Thickness (mils)	379	380	370	382	381	381	397	385	373	384		381	7
												370	<< min
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000093
TRI Log #: E2343-57-08

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5199)													
Thickness (mils)	319	351	365	324	327	341	334	326	328	327	334	14	
											319	<< min	
Density (ASTM D 1505)													
Density (g/cm3)	0.953	0.953	0.953								0.953	0.000	
Carbon Black Content (ASTM D 4218)													
% Carbon Black	2.82	2.80									2.81	0.01	
Wide Width Tensile Properties (ASTM D 4595)													
MD Specimen Width (inches)	8												
MD Specimen Width (mm)	203												
MD Ultimate Strength (lbs)	981	746	741	1121	937	773					883	155	
MD Ultimate Strength (ppi)	123	93.2	92.7	140	117	96.7					110	19	
MD Ultimate Strength (kN/m)	21.5	16.3	16.2	24.5	20.5	16.9					19.3	3.4	
MD Break Elongation (%)	23.2	26.6	29.3	17.7	25.5	27.5					25.0	4.1	
TD Specimen Width (in)	8												
TD Specimen Width (mm)	203												
TD Ultimate Strength (lbs)	376	483	380	389	360	347					389	48	
TD Ultimate Strength (ppi)	47.0	60.4	47.5	48.6	45.0	43.4					48.7	6.0	
TD Ultimate Strength (kN/m)	8.24	10.58	8.32	8.51	7.89	7.61					8.52	1.06	
TD Break Elongation (%)	105	127	122	134	139	126					126	12	
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000093
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	2.98	2.45	2.93	2.53	2.61	2.93	2.97	2.92	2.98	2.85	2.82	0.20
Mass/Unit Area (oz/sq.yd)	6.93	5.70	6.82	5.88	6.07	6.82	6.91	6.79	6.93	6.63	6.55	0.47
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	197	174	222	219	280	213	170	203	187	189	205	32
TD - Tensile Strength (lbs)	367	279	282	230	235	268	339	297	334	304	293	44
MD - Elong. @ Max. Load (%)	95	77	78	95	93	84	90	75	87	89	86	7
TD - Elong. @ Max. Load (%)	110	98	105	90	91	100	103	119	96	94	101	9
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	78	104	110	95	109	150	160	111	112	137	118	22
	106	135	116	107	141							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	123	95	85	87	90	92	69	93	67	97	90	15
TD - Tear Strength (lbs)	89	137	122	171	101	149	170	144	165	139	139	28
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.148	0.148	0.127	0.149	0.148						0.144	0.009
Sieve No.	100	100	100	100	100						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000093
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20.5											
Correction Factor:	0.988											
Test Specimen No. >:	1					2						
Thickness (mils)	69	69	69	69	69	61	61	61	61	61		
Time (s)	17.2	17.5	17.5	17.8	17.8	13.1	13.2	12.8	13.2	13.1		
Specimen Permittivity (s-1)	1.65	1.62	1.62	1.59	1.59	2.17	2.15	2.22	2.15	2.17		
Specimen Permittivity @20°C (sec-1)	1.63	1.60	1.60	1.57	1.57	2.14	2.12	2.19	2.12	2.14		
Specimen Flow rate (GPM/ft ²)	122	120	120	118	118	160	159	164	159	160		
Specimen Permeability (cm/s)	0.29	0.28	0.28	0.28	0.28	0.33	0.33	0.34	0.33	0.33		
Test Specimen No. >:	3					4						
Thickness (mils)	59	59	59	59	59	61	61	61	61	61		
Time (s)	16.3	16.2	16.2	16.3	16.5	17.1	17.5	17.5	17.5	17.5		
Permittivity (s-1)	1.74	1.75	1.75	1.74	1.72	1.66	1.62	1.62	1.62	1.62		
Specimen Permittivity @20°C (sec-1)	1.72	1.73	1.73	1.72	1.70	1.64	1.60	1.60	1.60	1.60		
Specimen Flow rate (GPM/ft ²)	129	129	129	129	127	122.6	119.8	119.8	119.8	119.8		
Specimen Permeability (cm/s)	0.26	0.26	0.26	0.26	0.25	0.25	0.25	0.25	0.25	0.25		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)		1.77
										Flow rate (GPM/ft²)		132
										Permeability (cm/s)		0.28
MD Machine Direction	TD Transverse Direction					NA Not Available						

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite

Sample Identification: 1000093

TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	2.91	2.59	2.96	2.89	2.48	2.63	2.83	2.33	2.93	2.59	2.71	0.22
Mass/Unit Area (oz/sq.yd)	6.77	6.02	6.88	6.72	5.77	6.12	6.58	5.42	6.82	6.02	6.31	0.51
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	196	174	225	214	184	183	186	206	197	162	193	19
TD - Tensile Strength (lbs)	221	267	327	303	218	240	286	166	293	221	254	49
MD - Elong. @ Max. Load (%)	92	91	82	87	95	89	91	75	86	90	88	6
TD - Elong. @ Max. Load (%)	100	97	92	95	87	93	91	92	86	83	93	7
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	93	112	155	108	105	111	94	106	89	102	109	16
	129	112	103	109	103							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	85	82	85	96	68	76	90	105	94	78	86	11
TD - Tear Strength (lbs)	123	130	163	117	115	97	113	104	118	102	118	19
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.104	0.105	0.103	0.104	0.075						0.098	0.013
Sieve No.	140	140	140	140	200						140	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: Syntec TENDRAIN 770-2 Double Sided Geocomposite
Sample Identification: 1000093
TRI Log #: E2343-57-08

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)													
Water Temp. (C):	21												
Correction Factor:	0.976												
Test Specimen No. >:	1					2							
Thickness (mils)	62	62	62	62	62	62	62	62	62	62			
Time (s)	19.0	19.1	19.1	19.1	19.1	13.5	13.1	13.4	13.4	13.5			
Specimen Permittivity (s-1)	1.49	1.49	1.49	1.49	1.49	2.10	2.17	2.12	2.12	2.10			
Specimen Permittivity @20°C (sec-1)	1.46	1.45	1.45	1.45	1.45	2.05	2.11	2.07	2.07	2.05			
Specimen Flow rate (GPM/R2)	109	108	108	108	108	153	158	155	155	153			
Specimen Permeability (cm/s)	0.23	0.23	0.23	0.23	0.23	0.32	0.33	0.33	0.33	0.32			
Test Specimen No. >:	3					4							
Thickness (mils)	79	79	79	79	79	65	65	65	65	65			
Time (s)	22.2	21.9	21.9	21.9	21.9	15.6	15.6	16.0	15.9	16.0			
Permittivity (s-1)	1.28	1.30	1.30	1.30	1.30	1.82	1.82	1.77	1.78	1.77			
Specimen Permittivity @20°C (sec-1)	1.25	1.26	1.26	1.26	1.26	1.77	1.77	1.73	1.74	1.73			
Specimen Flow rate (GPM/R2)	93	95	95	95	95	132.8	132.8	129.4	130.3	129.4			
Specimen Permeability (cm/s)	0.25	0.25	0.25	0.25	0.25	0.29	0.29	0.29	0.29	0.29			
										TEMPERATURE CORRECTED VALUES		Permittivity (s-1) Flow rate (GPM/R2) Permeability (cm/s)	
												1.63	
												122	
												0.27	

MD Machine Direction TD Transverse Direction NA Not Available

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October 4, 2010
October 6, 2010

Updated with MD Grab Tensile Retest Result per client's request.

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com

Bill To:

< == Same

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Central Landfill Phase 3 Expansion

TRI Job Reference Number: E2348-26-03

Material(s) Tested: 2 Syntec TenDrain 770-2 Double Sided Geocomposite(s)

Test(s) Requested: Transmissivity (ASTM D 4716) - GC
Peel Strength (GRI GC7) - GC
Thickness (ASTM D 5199) - GC, GN
Density (ASTM D 1505) - GN
Carbon Content (ASTM D 4218) - GN
Wide Width Tensile (ASTM D 4595) - GN
Mass/Unit Area (ASTM D 5261) - GT
Grab Tensile (ASTM D 4632) - GT
Puncture Strength (ASTM D 4833) - GT
Trapezoidal Tear (ASTM D 4533) - GT
Apparent Opening Size (ASTM D 4751) - GT
Permittivity (ASTM D 4491) - GT

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000127
TRI Log #: E2348-26-03

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.																																								
	1	2	3	4	5	6	7	8	9	10																																										
<p>Hydraulic Transmissivity (ASTM D 4716)</p> <p>Direction Tested: Machine Direction</p> <table border="1"> <tr><td>Normal Load (psf):</td><td>15,000</td></tr> <tr><td>Hydraulic Gradient:</td><td>0.1</td></tr> <tr><td>Test Length (in)</td><td>12</td></tr> <tr><td>Test Width (in)</td><td>12</td></tr> </table> <p>Plate / Protective Sand / GC Sample / Agru-60 mil. HDPE MSGM / Plate</p> <p>Seat Time (hours)</p> <table border="1"> <tr><td>Specimen</td><td>1</td></tr> <tr><td>Volume (cc)</td><td>801 793 800</td></tr> <tr><td>Time (s)</td><td>8.06 7.95 8.09</td></tr> <tr><td>Flow Rate (GPM/ft width)</td><td>1.58 1.58 1.57</td></tr> <tr><td>Transmissivity (m²/s)</td><td>3.26E-03 3.27E-03 3.24E-03</td></tr> <tr><td>Test Temp (C)</td><td>20.0</td></tr> <tr><td>Temp. Corr. Factor</td><td>1.000</td></tr> <tr><td>Pre-Test Thickness (in)</td><td>0.374</td></tr> <tr><td>Post-Test Thickness (in)</td><td>0.347</td></tr> <tr><td>Volume (cc)</td><td>725 723 730</td></tr> <tr><td>Time (s)</td><td>8.40 8.33 8.49</td></tr> <tr><td>Flow Rate (GPM/ft width)</td><td>1.37 1.38 1.36</td></tr> <tr><td>Transmissivity (m²/s)</td><td>2.83E-03 2.85E-03 2.82E-03</td></tr> <tr><td>Permeability (cm/s)</td><td>32.2 32.3 32.0</td></tr> <tr><td>Test Temp (C)</td><td>20.0</td></tr> <tr><td>Temp. Corr. Factor</td><td>1.000</td></tr> </table>													Normal Load (psf):	15,000	Hydraulic Gradient:	0.1	Test Length (in)	12	Test Width (in)	12	Specimen	1	Volume (cc)	801 793 800	Time (s)	8.06 7.95 8.09	Flow Rate (GPM/ft width)	1.58 1.58 1.57	Transmissivity (m ² /s)	3.26E-03 3.27E-03 3.24E-03	Test Temp (C)	20.0	Temp. Corr. Factor	1.000	Pre-Test Thickness (in)	0.374	Post-Test Thickness (in)	0.347	Volume (cc)	725 723 730	Time (s)	8.40 8.33 8.49	Flow Rate (GPM/ft width)	1.37 1.38 1.36	Transmissivity (m ² /s)	2.83E-03 2.85E-03 2.82E-03	Permeability (cm/s)	32.2 32.3 32.0	Test Temp (C)	20.0	Temp. Corr. Factor	1.000
Normal Load (psf):	15,000																																																			
Hydraulic Gradient:	0.1																																																			
Test Length (in)	12																																																			
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Test Temp (C)	20.0																																																			
Temp. Corr. Factor	1.000																																																			
Peel Strength (GRI GC7)																																																				
A - MD Average Peel Strength (ppi)	1.2	1.6	2.0	1.4	1.1						1.5	0.4																																								
A - MD Average Peel Strength (g/in)	545	726	908	636	499						663	162																																								
B - MD Average Peel Strength (ppi)	1.9	0.5	2.1	3.2	1.5						1.8	1.0																																								
B - MD Average Peel Strength (g/in)	863	227	953	1453	681						835	444																																								
Note: A and B represent a randomly assigned top and bottom of the sample																																																				
Thickness (ASTM D 5199)																																																				
Thickness (mils)	381	410	394	379	405	415	393	384	374	371	391	15																																								
											371	<< min																																								
Thickness (ASTM D 5199) GEONET COMPONENT																																																				
Thickness (mils)	346	352	341	335	331	331	327	328	332	328	335	8																																								
											327	<< min																																								
Density (ASTM D 1505) GEONET COMPONENT																																																				
Density (g/cm3)	0.951	0.951	0.951								0.951	0.000																																								
Carbon Black Content (ASTM D 4218) GEONET COMPONENT																																																				
% Carbon Black	2.58	2.55									2.57	0.02																																								



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite

Sample Identification: 1000127

TRI Log #: E2348-26-03

Geonet Component

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Wide Width Tensile Properties (ASTM D 4595)													
MD Specimen Width (inches)	8												
MD Specimen Width (mm)	203												
MD Ultimate Strength (lbs)	1073	1103	1070	1136	1178	1032					1099	52	
MD Ultimate Strength (ppi)	134	138	134	142	147	129					137	7	
MD Ultimate Strength (kN/m)	23.5	24.2	23.4	24.9	25.8	22.6					24.1	1.1	
MD Break Elongation (%)	25.1	23.3	23.4	25.3	21.0	20.8					23.1	1.9	
TD Specimen Width (in)	8												
TD Specimen Width (mm)	203												
TD Ultimate Strength (lbs)	356	425	314	413	418	431					393	47	
TD Ultimate Strength (ppi)	44.5	53	39.2	52	52	54					49.1	5.9	
TD Ultimate Strength (kN/m)	7.8	9.3	6.9	9.1	9.2	9.4					8.6	1.0	
TD Break Elongation (%)	166	183	124	185	181	193					172	25	
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000127
TRI Log #: E2348-26-03

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	3.66	2.82	3.38	3.18	2.68	3.11	2.88	3.42	3.60	3.28	3.20	0.33
Mass/Unit Area (oz/sq.yd)	8.51	6.56	7.86	7.40	6.23	7.23	6.70	7.95	8.37	7.63	7.45	0.77
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	217	193	221	201	225	218	237	237	232	228	221	14
TD - Tensile Strength (lbs)	303	258	267	256	265	241	293	320	253	261	272	25
MD - Elong. @ Max. Load (%)	86	80	85	81	87	77	88	81	84	91	84	4
TD - Elong. @ Max. Load (%)	83	78	87	77	77	71	80	87	68	80	79	6
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	122	108	93	116	125	134	135	125	103	138	123	16
	122	102	148	144	125							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	89	82	82	85	99	88	92	102	130	100	95	14
TD - Tear Strength (lbs)	92	152	117	143	114	141	123	106	129	139	126	19
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.105	0.166	0.146	0.177	0.144						0.147	0.027
Sieve No.	140	80	100	80	100						100	
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	91	91	91	91	91	102	102	102	102	102		
Time (s)	12.8	12.8	13.1	13.2	13.1	14.7	15.1	15.1	15.0	15.1		
Specimen Permittivity (s-1)	2.22	2.22	2.17	2.15	2.17	1.93	1.88	1.88	1.89	1.88		
Specimen Permittivity @20°C (sec-1)	2.16	2.16	2.11	2.10	2.11	1.88	1.83	1.83	1.85	1.83		
Specimen Flow rate (GPM/ft ²)	162	162	158	157	158	141	137	137	138	137		
Specimen Permeability (cm/s)	0.50	0.50	0.49	0.48	0.49	0.49	0.48	0.48	0.48	0.48		
Test Specimen No. >:	3					4						
Thickness (mils)	106	106	106	106	106	84	84	84	84	84		
Time (s)	15.1	15.0	15.3	15.4	15.4	11.3	11.6	11.9	11.6	11.6		
Permittivity (s-1)	1.88	1.89	1.85	1.84	1.84	2.51	2.45	2.38	2.45	2.45		
Specimen Permittivity @20°C (sec-1)	1.83	1.85	1.81	1.80	1.80	2.45	2.39	2.33	2.39	2.39		
Specimen Flow rate (GPM/ft ²)	137	138	135	134	134	183	179	174	179	179		
Specimen Permeability (cm/s)	0.49	0.50	0.49	0.48	0.48	0.52	0.51	0.50	0.51	0.51		
	TEMPERATURE CORRECTED VALUES					Permittivity (s-1) Flow rate (GPM/ft ²) Permeability (cm/s)					2.05	
											153	
											0.49	

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000127
TRI Log #: E2348-26-03

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	3.17	3.06	3.13	3.51	2.75	4.02	2.76	3.77	3.52	2.90	3.26	0.43
Mass/Unit Area (oz/sq.yd)	7.37	7.12	7.28	8.16	6.40	9.35	6.42	8.77	8.19	6.75	7.58	1.00
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	247	187	216	204	232	238	239	197	254	185	220	25
TD - Tensile Strength (lbs)	335	253	251	260	278	303	331	268	309	261	285	32
MD - Elong. @ Max. Load (%)	87	92	95	78	91	86	89	97	87	82	88	6
TD - Elong. @ Max. Load (%)	101	84	101	97	90	103	85	107	85	79	93	10
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	136	113	104	119	120	124	127	148	137	121	126	14
	121	126	123	158	114							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	122	81	113	123	100	120	82	100	107	91	104	16
TD - Tear Strength (lbs)	120	139	132	124	152	187	136	129	130	179	143	23
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.183	0.147	0.147	0.103	0.137						0.143	0.028
Sieve No.	70	100	100	140	100						100	
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	71	71	71	71	71	73	73	73	73	73		
Time (s)	17.9	18.2	18.2	18.1	18.2	12.6	12.5	12.2	12.5	12.2		
Specimen Permittivity (s-1)	1.59	1.56	1.56	1.57	1.56	2.25	2.27	2.33	2.27	2.33		
Specimen Permittivity @20°C (sec-1)	1.55	1.52	1.52	1.53	1.52	2.20	2.22	2.27	2.22	2.27		
Specimen Flow rate (GPM/ft2)	116	114	114	114	114	164	166	170	166	170		
Specimen Permeability (cm/s)	0.28	0.27	0.27	0.28	0.27	0.41	0.41	0.42	0.41	0.42		
Test Specimen No. >:	3					4						
Thickness (mils)	72	72	72	72	72	68	68	68	68	68		
Time (s)	17.2	17.2	17.3	17.2	17.2	15.0	15.0	15.3	15.0	15.3		
Permittivity (s-1)	1.65	1.65	1.64	1.65	1.65	1.89	1.89	1.85	1.89	1.85		
Specimen Permittivity @20°C (sec-1)	1.61	1.61	1.60	1.61	1.61	1.85	1.85	1.81	1.85	1.81		
Specimen Flow rate (GPM/ft2)	120	120	120	120	120	138	138	135	138	135		
Specimen Permeability (cm/s)	0.29	0.29	0.29	0.29	0.29	0.32	0.32	0.31	0.32	0.31		
	TEMPERATURE CORRECTED VALUES					Permittivity (s-1)					1.80	
						Flow rate (GPM/ft2)					135	
						Permeability (cm/s)					0.33	

MD Machine Direction TD Transverse Direction NA Not Available

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
 Sample Identification: 1000169
 TRI Log #: E2348-26-03

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.		
	1	2	3	4	5	6	7	8	9	10				
Peel Strength (GRI GC7)														
A - MD Average Peel Strength (ppi)	3.2	0.4	3.2	0.5	0.2								1.5	1.6
A - MD Average Peel Strength (g/in)	1453	182	1453	227	91								681	706
B - MD Average Peel Strength (ppi)	0.6	1.2	1.4	2.6	1.1								1.4	0.7
B - MD Average Peel Strength (g/in)	272	545	636	1180	499								627	337
Note: A and B represent a randomly assigned top and bottom of the sample														
Thickness (ASTM D 5199)														
Thickness (mils)	368	392	397	406	402	380	390	411	381	386			391	13
													368	<< min
Thickness (ASTM D 5199) GEONET COMPONENT														
Thickness (mils)	337	340	338	350	348	349	340	347	340	331			342	6
													331	<< min
Density (ASTM D 1505) GEONET COMPONENT														
Density (g/cm ³)	0.952	0.952	0.951										0.952	0.001
Carbon Black Content (ASTM D 4218) GEONET COMPONENT														
% Carbon Black	2.46	2.46											2.46	0.00
MD Machine Direction	TD Transverse Direction		NA Not Available											

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000169
TRI Log #: E2348-26-03

GeoNet Component

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Wide Width Tensile Properties (ASTM D 4595)													
MD Specimen Width (inches)	8												
MD Specimen Width (mm)	203												
MD Ultimate Strength (lbs)	1011	1141	1077	984	979	954					1024	71	
MD Ultimate Strength (ppi)	126	143	135	123	122	119					128	9	
MD Ultimate Strength (kN/m)	22.1	25.0	23.6	21.6	21.4	20.9					22.4	1.6	
MD Break Elongation (%)	19.1	22.1	18.1	21.2	22.0	20.6					20.5	1.6	
TD Specimen Width (in)	8												
TD Specimen Width (mm)	203												
TD Ultimate Strength (lbs)	285	299	330	351	309	325					317	24	
TD Ultimate Strength (ppi)	35.6	37	41.2	44	39	41					39.6	3.0	
TD Ultimate Strength (kN/m)	6.2	6.6	7.2	7.7	6.8	7.1					6.9	0.5	
TD Break Elongation (%)	185	184	192	178	184	182					184	4	
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000169
TRI Log #: E2348-26-03

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 5261)												
5" diameter circle (grams)	3.13	3.03	3.02	3.28	3.15	2.87	2.72	3.53	2.95	2.95	3.06	0.23
Mass/Unit Area (oz/sq.yd)	7.28	7.05	7.02	7.63	7.33	6.68	6.33	8.21	6.86	6.86	7.12	0.53
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	173	170	218	138	152	171	174	212	171	181	176	24
TD - Tensile Strength (lbs)	255	214	245	248	198	241	289	227	283	223	242	29
MD - Elong. @ Max. Load (%)	96	79	83	81	70	87	82	71	87	81	82	8
TD - Elong. @ Max. Load (%)	86	79	90	79	93	95	90	103	80	100	90	9
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	103	113	118	87	124	98	98	150	97	110	109	17
	124	90	120	96	101							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	102	117	90	65	88	86	71	101	87	84	89	15
TD - Tear Strength (lbs)	118	140	151	120	125	108	114	145	103	113	124	16
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.135	0.121	0.146	0.137	0.147						0.137	0.010
Sieve No.	100	120	100	100	100						100	
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	60	60	60	60	60	61	61	61	61	61		
Time (s)	21.9	20.9	20.5	20.5	20.5	11.0	11.4	11.4	11.3	11.3		
Specimen Permittivity (s-1)	1.30	1.36	1.38	1.38	1.38	2.58	2.49	2.49	2.51	2.51		
Specimen Permittivity @20°C (sec-1)	1.26	1.32	1.35	1.35	1.35	2.52	2.43	2.43	2.45	2.45		
Specimen Flow rate (GPM/ft2)	94.6	99.1	101.0	101.0	101.0	188	182	182	183	183		
Specimen Permeability (cm/s)	0.19	0.20	0.21	0.21	0.21	0.39	0.38	0.38	0.38	0.38		
Test Specimen No. >:	3					4						
Thickness (mils)	72	72	72	72	72	64	64	64	64	64		
Time (s)	17.4	17.7	17.7	18.0	18.0	11.4	11.3	11.7	11.7	11.4		
Permittivity (s-1)	1.63	1.60	1.60	1.58	1.58	2.49	2.51	2.43	2.43	2.49		
Specimen Permittivity @20°C (sec-1)	1.59	1.56	1.56	1.54	1.54	2.43	2.45	2.37	2.37	2.43		
Specimen Flow rate (GPM/ft2)	119	117	117	115	115	182	183	177	177	182		
Specimen Permeability (cm/s)	0.29	0.29	0.29	0.28	0.28	0.39	0.40	0.38	0.38	0.39		
											1.94	
											145	
											0.31	

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Syntec TenDrain 770-2 Double Sided Geocomposite
Sample Identification: 1000169
TRI Log #: E2348-26-03

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Mass/Unit Area (ASTM D 5261)													
5" diameter circle (grams)	2.91	3.22	2.81	2.59	3.01	2.48	3.01	3.86	3.18	2.61	2.97	0.40	
Mass/Unit Area (oz/sq.yd)	6.77	7.49	6.54	6.02	7.00	5.77	7.00	8.98	7.40	6.07	6.90	0.93	
Grab Tensile Properties (ASTM D 4632)													
MD - Tensile Strength (lbs)	139	142	175	137	162	110	162	118	198	137	148	26	
TD - Tensile Strength (lbs)	241	252	254	239	171	222	273	253	232	220	236	28	
MD - Elong. @ Max. Load (%)	94	88	99	99	82	98	104	89	87	87	93	7	
TD - Elong. @ Max. Load (%)	84	100	103	96	95	95	103	124	91	86	98	11	
Grab Tensile Properties (ASTM D 4632) RETEST													
MD - Tensile Strength (lbs)	195	291	225	280	246	139	127	223	129	161	202	61	
MD - Elong. @ Max. Load (%)	80	107	101	96	119	88	90	90	108	101	98	11	
Puncture Resistance (ASTM D 4833)													
Puncture Strength (lbs)	153	86	90	113	85	98	107	111	103	115	108	17	
	120	115	120	100	111								
Trapezoidal Tear (ASTM D 4533)													
MD - Tear Strength (lbs)	67	73	76	67	87	61	78	118	78	71	78	16	
TD - Tear Strength (lbs)	146	145	129	103	97	173	92	98	133	134	125	27	
Apparent Opening Size (ASTM D 4751)													
Opening Size Diameter (mm)	0.103	0.104	0.136	0.141	0.141						0.125	0.020	
Sieve No.	140	140	100	100	100						120		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)													
Water Temp. (C):	21												
Correction Factor:	0.976												
Test Specimen No. >:	1					2							
Thickness (mils)	60	60	60	60	60	67	67	67	67	67			
Time (s)	11.3	11.7	11.3	11.6	11.7	16.4	16.7	16.7	16.7	16.7			
Specimen Permittivity (s-1)	2.51	2.43	2.51	2.45	2.43	1.73	1.70	1.70	1.70	1.70			
Specimen Permittivity @20°C (sec-1)	2.45	2.37	2.45	2.39	2.37	1.69	1.66	1.66	1.66	1.66			
Specimen Flow rate (GPM/R2)	183	177	183	179	177	126	124	124	124	124			
Specimen Permeability (cm/s)	0.37	0.36	0.37	0.36	0.36	0.29	0.28	0.28	0.28	0.28			
Test Specimen No. >:	3					4							
Thickness (mils)	64	64	64	64	64	60	60	60	60	60			
Time (s)	15.1	15.1	15.1	15.1	15.1	12.3	12.2	12.2	12.6	12.3			
Permittivity (s-1)	1.88	1.88	1.88	1.88	1.88	2.31	2.33	2.33	2.25	2.31			
Specimen Permittivity @20°C (sec-1)	1.83	1.83	1.83	1.83	1.83	2.25	2.27	2.27	2.20	2.25			
Specimen Flow rate (GPM/R2)	137	137	137	137	137	168	170	170	164	168			
Specimen Permeability (cm/s)	0.30	0.30	0.30	0.30	0.30	0.34	0.35	0.35	0.33	0.34			
											TEMPERATURE CORRECTED VALUES	Permittivity (s-1) Flow rate (GPM/R2) Permeability (cm/s)	2.04 152 0.32

MD Machine Direction TD Transverse Direction NA Not Available

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Attachment 7-4

Biplanar Geocomposite CQA Conformance Test Results



August 24, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc: ehilton@scsengineers.com

Bill To:

<= Same (P.O. # 092070.04-1)

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project:

Citrus County

TRI Job Reference Number:

E2343-67-06

Material(s) Tested:

Three, GSE 275 mil. 6 oz. Double Sided Geocomposite(s)

Test(s) Requested:

Transmissivity (ASTM D 4716) - GC
Peel Strength (ASTM D 7005) - GC
Wide Width Tensile (ASTM D 4595) - GN
Thickness (ASTM D 1777) - GN
Mass/Unit Area (ASTM D 3776, Option C) - GT
Density (ASTM D 1505) - GN
Carbon Black Content (ASTM D 4218) - GN
Grab Tensile (ASTM D 4632) - GT
Puncture Strength (ASTM D 4833) - GT
Trapezoidal Tear (ASTM D 4533) - GT
Apparent Opening Size (ASTM D 4751) - GT
Permittivity (ASTM D 4491) - GT

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOCOMPOSITE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348090
TRI Log #: E2343-67-06

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.																																												
	1	2	3	4	5	6	7	8	9	10																																														
<p>Hydraulic Transmissivity (ASTM D 4716)</p> <p>Direction Tested: Machine Direction</p> <p>Normal Load (psf): <table border="1"><tr><td>10,000</td></tr></table></p> <p>Hydraulic Gradient: <table border="1"><tr><td>0.1</td></tr></table></p> <p>Test Length (in): <table border="1"><tr><td>12</td></tr></table></p> <p>Test Width (in): <table border="1"><tr><td>12</td></tr></table></p> <p>Plate / Agru 60 mil. TXHDGM / Sample / Agru 60 mil. TXHDGM / Plate</p> <p>Seat Time (hours)</p> <table border="1"> <thead> <tr> <th>Specimen</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Volume (cc)</td> <td>933</td> <td>943</td> <td>930</td> </tr> <tr> <td>Time (s)</td> <td>10.4</td> <td>10.4</td> <td>10.4</td> </tr> <tr> <td>Flow Rate (GPM/ft width)</td> <td>1.43</td> <td>1.44</td> <td>1.42</td> </tr> <tr> <td>Transmissivity (m²/s)</td> <td>2.96E-03</td> <td>2.98E-03</td> <td>2.95E-03</td> </tr> <tr> <td>Test Temp (C)</td> <td colspan="3">20.0</td> </tr> <tr> <td>Temp. Corr. Factor</td> <td colspan="3">1.000</td> </tr> </tbody> </table>													10,000	0.1	12	12	Specimen	1	2	3	Volume (cc)	933	943	930	Time (s)	10.4	10.4	10.4	Flow Rate (GPM/ft width)	1.43	1.44	1.42	Transmissivity (m ² /s)	2.96E-03	2.98E-03	2.95E-03	Test Temp (C)	20.0			Temp. Corr. Factor	1.000														
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12																																																								
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Permeability (cm/s)	31.4	31.5	31.4																																																					
Test Temp (C)	20.0																																																							
Temp. Corr. Factor	1.000																																																							
<p>Peel Strength (ASTM D 7005)</p> <table border="1"> <tbody> <tr> <td>A - MD Average Peel Strength (ppi)</td> <td>5.6</td> <td>4.3</td> <td>6.2</td> <td>5.1</td> <td>5.1</td> <td></td> <td></td> </tr> <tr> <td>A - MD Average Peel Strength (g/in)</td> <td>2542</td> <td>1952</td> <td>2815</td> <td>2315</td> <td>2315</td> <td></td> <td></td> </tr> <tr> <td>B - MD Average Peel Strength (ppi)</td> <td>7.5</td> <td>3.5</td> <td>5.9</td> <td>6.3</td> <td>5.8</td> <td></td> <td></td> </tr> <tr> <td>B - MD Average Peel Strength (g/in)</td> <td>3405</td> <td>1589</td> <td>2679</td> <td>2860</td> <td>2633</td> <td></td> <td></td> </tr> </tbody> </table> <p>Note: A and B represent a randomly assigned top and bottom of the sample</p>													A - MD Average Peel Strength (ppi)	5.6	4.3	6.2	5.1	5.1			A - MD Average Peel Strength (g/in)	2542	1952	2815	2315	2315			B - MD Average Peel Strength (ppi)	7.5	3.5	5.9	6.3	5.8			B - MD Average Peel Strength (g/in)	3405	1589	2679	2860	2633														
A - MD Average Peel Strength (ppi)	5.6	4.3	6.2	5.1	5.1																																																			
A - MD Average Peel Strength (g/in)	2542	1952	2815	2315	2315																																																			
B - MD Average Peel Strength (ppi)	7.5	3.5	5.9	6.3	5.8																																																			
B - MD Average Peel Strength (g/in)	3405	1589	2679	2860	2633																																																			

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348090
 TRI Log #: E2343-67-06

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 1777)												
Thickness (mils)	298	294	290	289	293	291	286	292	289	289	291 286	3 << min
Density (ASTM D 1505)												
Density (g/cm3)	0.955	0.955	0.955								0.955	0.000
Carbon Black Content (ASTM D 4218)												
% Carbon Black	2.61	2.61									2.61	0.00
Wide Width Tensile Properties (ASTM D 4595)												
MD Specimen Width (inches)	8											
MD Specimen Width (mm)	203											
MD Ultimate Strength (lbs)	723	785	715	682	703	740					725	35
MD Ultimate Strength (ppi)	90.4	98.1	89.4	85.3	87.8	92.5					90.6	4.4
MD Ultimate Strength (kN/m)	15.8	17.2	15.7	14.9	15.4	16.2					15.9	0.8
MD Break Elongation (%)	16.4	17.1	18.3	18.7	21.1	19.6					18.5	1.7
TD Specimen Width (in)	8											
TD Specimen Width (mm)	203											
TD Ultimate Strength (lbs)	293	291	302	268	268	308					288	17
TD Ultimate Strength (ppi)	36.7	36.4	37.8	33.5	33.5	38.5					36.1	2.1
TD Ultimate Strength (kN/m)	6.42	6.37	6.61	5.86	5.88	6.75					6.32	0.37
TD Break Elongation (%)	82.4	92.9	92.6	91.3	104	92.9					92.7	6.8
MD Machine Direction	TD Transverse Direction											

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348090
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	3.22	2.61	2.38	2.49	2.78	2.61	2.64	3.14	3.10	2.43	2.74	0.31
Mass/Unit Area (oz/sq.yd)	7.49	6.07	5.54	5.79	6.47	6.07	6.14	7.30	7.21	5.65	6.37	0.72
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	128	228	230	163	149	230	181	171	197	184	186	35
TD - Tensile Strength (lbs)	180	218	252	242	211	234	217	185	193	266	220	29
MD - Elong. @ Max. Load (%)	83	89	88	97	73	87	84	87	94	93	88	7
TD - Elong. @ Max. Load (%)	110	100	111	105	105	101	98	108	117	100	106	6
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	113	103	135	101	73	114	102	102	108	113	101	20
	67	76	77	117	123							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	133	87	84	96	98	93	110	135	93	72	100	20
TD - Tear Strength (lbs)	138	175	101	111	191	111	98	121	138	158	134	32
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.075	0.180	0.149	0.159	0.075						0.128	0.049
Sieve No.	200	80	100	80	200						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348090
 TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	75	75	75	75	75	66	66	66	66	66		
Time (s)	19.5	20.1	20.0	20.3	20.7	14.2	14.3	14.0	14.4	14.4		
Specimen Permittivity (s-1)	1.46	1.41	1.42	1.40	1.37	2.00	1.98	2.03	1.97	1.97		
Specimen Permittivity @20°C (sec-1)	1.46	1.41	1.42	1.40	1.37	2.00	1.98	2.03	1.97	1.97		
Specimen Flow rate (GPM/ft2)	109	106	106	105	103	149	148	152	147	147		
Specimen Permeability (cm/s)	0.28	0.27	0.27	0.27	0.26	0.33	0.33	0.34	0.33	0.33		
Test Specimen No. >:	3					4						
Thickness (mils)	64	64	64	64	64	78	78	78	78	78		
Time (s)	12.5	12.5	12.5	12.5	12.5	13.5	13.5	13.7	13.5	13.7		
Permittivity (s-1)	2.27	2.27	2.27	2.27	2.27	2.10	2.10	2.07	2.10	2.07		
Specimen Permittivity @20°C (sec-1)	2.27	2.27	2.27	2.27	2.27	2.10	2.10	2.07	2.10	2.07		
Specimen Flow rate (GPM/ft2)	170	170	170	170	170	157.2	157.2	154.9	157.2	154.9		
Specimen Permeability (cm/s)	0.37	0.37	0.37	0.37	0.37	0.42	0.42	0.41	0.42	0.41		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1) Flow rate (GPM/ft2) Permeability (cm/s)		1.94 145 0.35

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348090
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	2.65	3.00	3.06	2.82	2.86	2.63	2.78	3.12	3.43	2.53	2.89	0.27
Mass/Unit Area (oz/sq.yd)	6.16	6.98	7.12	6.56	6.65	6.12	6.47	7.26	7.98	5.88	6.72	0.63
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	170	212	213	165	153	244	150	160	186	201	185	31
TD - Tensile Strength (lbs)	236	233	225	270	219	166	274	239	200	209	227	32
MD - Elong. @ Max. Load (%)	105	79	77	75	67	81	98	80	82	87	83	11
TD - Elong. @ Max. Load (%)	78	91	86	84	107	85	89	95	83	88	90	9
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	113	94	105	113	117	92	93	123	82	130	105	13
	98	109	106	115	89							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	99	101	90	96	84	95	91	89	88	112	94	8
TD - Tear Strength (lbs)	147	125	124	153	109	107	117	102	122	163	127	21
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.075	0.075	0.075	0.125	0.075						0.085	0.022
Sieve No.	200	200	200	120	200						170	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348090
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	74	74	74	74	74	68	68	68	68	68		
Time (s)	17.2	17.2	17.5	17.5	17.5	14.7	15.0	15.0	14.6	15.0		
Specimen Permittivity (s-1)	1.65	1.65	1.62	1.62	1.62	1.93	1.89	1.89	1.94	1.89		
Specimen Permittivity @20°C (sec-1)	1.65	1.65	1.62	1.62	1.62	1.93	1.89	1.89	1.94	1.89		
Specimen Flow rate (GPM/ft2)	123	123	121	121	121	144	141	141	145	141		
Specimen Permeability (cm/s)	0.31	0.31	0.30	0.30	0.30	0.33	0.33	0.33	0.34	0.33		
Test Specimen No. >:	3					4						
Thickness (mils)	66	66	66	66	66	72	72	72	72	72		
Time (s)	15.9	16.0	15.9	16.3	16.3	15.9	16.3	16.3	16.2	16.3		
Permittivity (s-1)	1.78	1.77	1.78	1.74	1.74	1.78	1.74	1.74	1.75	1.74		
Specimen Permittivity @20°C (sec-1)	1.78	1.77	1.78	1.74	1.74	1.78	1.74	1.74	1.75	1.74		
Specimen Flow rate (GPM/ft2)	133	133	133	130	130	133.5	130.2	130.2	131.0	130.2		
Specimen Permeability (cm/s)	0.30	0.30	0.30	0.29	0.29	0.33	0.32	0.32	0.32	0.32		
	TEMPERATURE CORRECTED VALUES										Permittivity (s-1)	1.76
											Flow rate (GPM/ft2)	132
											Permeability (cm/s)	0.31

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348120
TRI Log #: E2343-67-06

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Peel Strength (ASTM D 7005)													
A - MD Average Peel Strength (ppi)	3.6	2.3	1.9	2.5	3.2							2.7	0.7
A - MD Average Peel Strength (g/in)	1634	1044	863	1135	1453							1226	313
B - MD Average Peel Strength (ppi)	3.7	2.9	2.8	3.3	3.4							3.2	0.4
B - MD Average Peel Strength (g/in)	1680	1317	1271	1498	1544							1462	168

Note: A and B represent a randomly assigned top and bottom of the sample

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348120
 TRI Log #: E2343-67-06

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 1777)												
Thickness (mils)	299	293	301	298	295	292	287	287	284	286	292 284	6 << min
Density (ASTM D 1505)												
Density (g/cm ³)	0.953	0.954	0.954								0.954	0.001
Carbon Black Content (ASTM D 4218)												
% Carbon Black	2.48	2.50									2.49	0.01
Wide Width Tensile Properties (ASTM D 4595)												
MD Specimen Width (inches)	8											
MD Specimen Width (mm)	203											
MD Ultimate Strength (lbs)	760	729	770	806	840	878					797	55
MD Ultimate Strength (ppi)	95.0	91.1	96.3	101	105	110					100	7
MD Ultimate Strength (kN/m)	16.6	16.0	16.9	17.7	18.4	19.2					17.5	1.2
MD Break Elongation (%)	18.8	22.3	17.4	18.4	16.3	15.4					18.1	2.4
TD Specimen Width (in)	8											
TD Specimen Width (mm)	203											
TD Ultimate Strength (lbs)	341	280	273	308	294	325					303	26
TD Ultimate Strength (ppi)	42.6	35.0	34.1	38.5	36.7	40.6					37.9	3.3
TD Ultimate Strength (kN/m)	7.47	6.13	5.98	6.74	6.43	7.11					6.64	0.58
TD Break Elongation (%)	68.5	79.1	73.5	86.3	76.7	90.9					79.2	8.2
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348120
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	2.83	3.07	3.23	2.86	3.08	2.79	3.16	2.86	2.97	3.03	2.99	0.15
Mass/Unit Area (oz/sq.yd)	6.58	7.14	7.51	6.65	7.16	6.49	7.35	6.65	6.91	7.05	6.95	0.35
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	187	204	167	231	184	196	179	189	184	171	189	18
TD - Tensile Strength (lbs)	254	246	192	305	223	244	182	238	237	279	240	36
MD - Elong. @ Max. Load (%)	77	74	58	97	75	87	72	67	86	77	77	11
TD - Elong. @ Max. Load (%)	82	81	96	82	94	80	84	82	89	89	88	8
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	109	99	113	86	118	99	104	138	117	116	108	13
	89	115	106	100	106							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	95	74	112	106	82	107	109	119	91	89	98	14
TD - Tear Strength (lbs)	138	104	131	129	117	124	160	129	155	126	131	17
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.150	0.148	0.148	0.145	0.150						0.148	0.002
Sieve No.	100	100	100	100	100						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348120
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	75	75	75	75	75	76	76	76	76	76		
Time (s)	13.1	13.1	13.1	13.1	13.4	15.6	15.3	15.6	15.7	15.6		
Specimen Permittivity (s-1)	2.17	2.17	2.17	2.17	2.12	1.82	1.85	1.82	1.81	1.82		
Specimen Permittivity @20°C (sec-1)	2.17	2.17	2.17	2.17	2.12	1.82	1.85	1.82	1.81	1.82		
Specimen Flow rate (GPM/ft2)	162	162	162	162	158	136	139	136	135	136		
Specimen Permeability (cm/s)	0.41	0.41	0.41	0.41	0.40	0.35	0.36	0.35	0.35	0.35		
Test Specimen No. >:	3					4						
Thickness (mils)	75	75	75	75	75	77	77	77	77	77		
Time (s)	23.1	23.5	23.4	23.1	25.4	17.5	17.8	17.8	17.8	17.8		
Permittivity (s-1)	1.23	1.21	1.21	1.23	1.12	1.62	1.59	1.59	1.59	1.59		
Specimen Permittivity @20°C (sec-1)	1.23	1.21	1.21	1.23	1.12	1.62	1.59	1.59	1.59	1.59		
Specimen Flow rate (GPM/ft2)	92	90	91	92	84	121.3	119.2	119.2	119.2	119.2		
Specimen Permeability (cm/s)	0.23	0.23	0.23	0.23	0.21	0.32	0.31	0.31	0.31	0.31		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)	1.69	
										Flow rate (GPM/ft2)	127	
										Permeability (cm/s)	0.33	

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348120
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	2.56	2.90	2.87	3.01	2.85	2.98	2.68	2.96	3.14	2.66	2.86	0.18
Mass/Unit Area (oz/sq.yd)	5.95	6.75	6.68	7.00	6.63	6.93	6.23	6.88	7.30	6.19	6.65	0.42
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	159	207	207	191	196	173	197	187	173	188	188	16
TD - Tensile Strength (lbs)	211	218	230	259	233	208	243	230	246	259	234	18
MD - Elong. @ Max. Load (%)	92	84	69	87	77	67	89	84	77	89	81	9
TD - Elong. @ Max. Load (%)	89	81	100	98	89	105	79	87	91	93	93	9
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	80	133	111	130	105	116	122	105	99	96	109	16
	125	112	99	117	82							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	81	95	100	111	85	101	76	93	125	91	96	14
TD - Tear Strength (lbs)	103	130	127	132	165	145	118	117	153	142	133	18
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.138	0.173	0.149	0.149	0.146						0.151	0.013
Sieve No.	100	80	100	100	100						80	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348120
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	79	79	79	79	79	81	81	81	81	81		
Time (s)	12.1	12.4	12.4	12.1	12.5	15.6	15.6	15.6	15.6	15.6		
Specimen Permittivity (s-1)	2.34	2.29	2.29	2.34	2.27	1.82	1.82	1.82	1.82	1.82		
Specimen Permittivity @20°C (sec-1)	2.29	2.23	2.23	2.29	2.22	1.77	1.77	1.77	1.77	1.77		
Specimen Flow rate (GPM/ft2)	171	167	167	171	166	133	133	133	133	133		
Specimen Permeability (cm/s)	0.46	0.45	0.45	0.46	0.44	0.37	0.37	0.37	0.37	0.37		
Test Specimen No. >:	3					4						
Thickness (mils)	75	75	75	75	75	68	68	68	68	68		
Time (s)	14.7	14.7	14.6	14.9	14.6	16.9	16.9	17.2	17.1	17.2		
Permittivity (s-1)	1.93	1.93	1.94	1.90	1.94	1.68	1.68	1.65	1.66	1.65		
Specimen Permittivity @20°C (sec-1)	1.88	1.88	1.90	1.86	1.90	1.64	1.64	1.61	1.62	1.61		
Specimen Flow rate (GPM/ft2)	141	141	142	139	142	122.6	122.6	120.4	121.1	120.4		
Specimen Permeability (cm/s)	0.36	0.36	0.36	0.35	0.36	0.28	0.28	0.28	0.28	0.28		
	TEMPERATURE CORRECTED VALUES										Permittivity (s-1)	1.88
											Flow rate (GPM/ft2)	141
											Permeability (cm/s)	0.36
MD Machine Direction	TD Transverse Direction					NA Not Available						

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348200
TRI Log #: E2343-67-06

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Peel Strength (ASTM D 7005)													
A - MD Average Peel Strength (ppi)	1.6	2.1	3.0	1.5	1.0							1.8	0.8
A - MD Average Peel Strength (g/in)	726	953	1362	681	454							835	344
B - MD Average Peel Strength (ppi)	1.4	1.2	2.6	1.9	0.7							1.6	0.7
B - MD Average Peel Strength (g/in)	636	545	1180	863	318							708	328

Note: A and B represent a randomly assigned top and bottom of the sample

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348200
 TRI Log #: E2343-67-06

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 1777)													
Thickness (mils)	288	295	282	294	290	293	286	292	295	281	290 281	5 << min	
Density (ASTM D 1505)													
Density (g/cm ³)	0.954	0.955	0.956								0.955	0.001	
Carbon Black Content (ASTM D 4218)													
% Carbon Black	2.75	2.75									2.75	0.00	
Wide Width Tensile Properties (ASTM D 4595)													
MD Specimen Width (inches)	8												
MD Specimen Width (mm)	203												
MD Ultimate Strength (lbs)	726	720	780	782	718	742					745	30	
MD Ultimate Strength (ppi)	90.7	90.0	97.5	97.8	89.7	92.8					93.1	3.7	
MD Ultimate Strength (kN/m)	15.9	15.8	17.1	17.1	15.7	16.3					16.3	0.6	
MD Break Elongation (%)	14.7	15.1	19.1	17.2	15.0	16.6					16.3	1.7	
TD Specimen Width (in)	8												
TD Specimen Width (mm)	203												
TD Ultimate Strength (lbs)	303	297	300	341	316	309					311	16	
TD Ultimate Strength (ppi)	37.8	37.1	37.5	42.7	39.5	38.6					38.9	2.1	
TD Ultimate Strength (kN/m)	6.63	6.50	6.56	7.47	6.93	6.76					6.81	0.36	
TD Break Elongation (%)	75.4	91.8	79.0	99.5	90.6	79.6					86.0	9.3	
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348200
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	2.95	2.79	2.88	2.65	2.67	2.69	3.00	2.78	2.96	2.75	2.81	0.13
Mass/Unit Area (oz/sq.yd)	6.86	6.49	6.70	6.16	6.21	6.26	6.98	6.47	6.88	6.40	6.54	0.30
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	174	188	158	167	170	181	179	179	166	163	172	9
TD - Tensile Strength (lbs)	182	185	141	185	179	164	211	162	189	202	180	20
MD - Elong. @ Max. Load (%)	73	66	66	79	69	63	80	73	93	78	74	9
TD - Elong. @ Max. Load (%)	79	86	79	74	105	105	81	79	83	88	88	12
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	108	97	68	91	114	98	101	103	111	87	100	13
	96	106	87..07	120	104							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	77	87	94	85	79	77	89	102	77	83	85	8
TD - Tear Strength (lbs)	125	103	104	107	102	116	118	108	91	124	110	11
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.149	0.148	0.150	0.150	0.146						0.148	0.002
Sieve No.	100	100	100	100	100						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348200
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	78	78	78	78	78	62	62	62	62	62		
Time (s)	11.8	12.2	12.1	12.2	12.2	15.0	14.5	14.9	15.0	14.7		
Specimen Permittivity (s-1)	2.40	2.33	2.34	2.33	2.33	1.89	1.96	1.90	1.89	1.93		
Specimen Permittivity @20°C (sec-1)	2.35	2.27	2.29	2.27	2.27	1.85	1.91	1.86	1.85	1.88		
Specimen Flow rate (GPM/ft2)	176	170	171	170	170	138	143	139	138	141		
Specimen Permeability (cm/s)	0.46	0.45	0.45	0.45	0.45	0.29	0.30	0.29	0.29	0.30		
Test Specimen No. >:	3					4						
Thickness (mils)	69	69	69	69	69	84	84	84	84	84		
Time (s)	14.1	14.0	14.0	13.8	14.3	15.3	15.3	15.2	15.3	15.3		
Permittivity (s-1)	2.01	2.03	2.03	2.06	1.98	1.85	1.85	1.87	1.85	1.85		
Specimen Permittivity @20°C (sec-1)	1.96	1.98	1.98	2.01	1.94	1.81	1.81	1.82	1.81	1.81		
Specimen Flow rate (GPM/ft2)	147	148	148	150	145	135.4	135.4	136.3	135.4	135.4		
Specimen Permeability (cm/s)	0.34	0.35	0.35	0.35	0.34	0.39	0.39	0.39	0.39	0.39		
	TEMPERATURE CORRECTED VALUES										Permittivity (s-1)	1.99
											Flow rate (GPM/ft2)	149
											Permeability (cm/s)	0.37

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348200
 TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Mass/Unit Area (ASTM D 3776, Option C)													
5" diameter circle (grams)	2.81	3.06	2.60	3.00	2.79	2.73	2.90	2.83	2.87	2.40	2.80	0.19	
Mass/Unit Area (oz/sq.yd)	6.54	7.12	6.05	6.98	6.49	6.35	6.75	6.58	6.68	5.58	6.51	0.44	
Grab Tensile Properties (ASTM D 4632)													
MD - Tensile Strength (lbs)	161	168	199	154	158	177	158	151	190	188	170	17	
TD - Tensile Strength (lbs)	147	177	141	214	179	176	169	216	244	175	184	32	
MD - Elong. @ Max. Load (%)	77	70	69	79	73	70	76	66	77	101	76	10	
TD - Elong. @ Max. Load (%)	84	75	84	109	81	83	89	93	71	99	89	12	
Puncture Resistance (ASTM D 4833)													
Puncture Strength (lbs)	90	87	94	90	121	75	87	114	112	82	95	14	
	81	88	87	107	110								
Trapezoidal Tear (ASTM D 4533)													
MD - Tear Strength (lbs)	82	82	86	93	81	81	88	108	94	84	88	9	
TD - Tear Strength (lbs)	133	104	107	120	126	104	140	79	90	128	113	19	
Apparent Opening Size (ASTM D 4751)													
Opening Size Diameter (mm)	0.149	0.142	0.148	0.143	0.150						0.147	0.004	
Sieve No.	100	100	100	100	80						100		
MD Machine Direction	TD Transverse Direction		NA Not Available										

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348200
TRI Log #: E2343-67-06

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	72	72	72	72	72	77	77	77	77	77		
Time (s)	12.1	12.5	12.4	12.5	12.5	14.3	14.3	14.4	14.4	14.3		
Specimen Permittivity (s-1)	2.34	2.27	2.29	2.27	2.27	1.98	1.98	1.97	1.97	1.98		
Specimen Permittivity @20°C (sec-1)	2.29	2.22	2.23	2.22	2.22	1.94	1.94	1.92	1.92	1.94		
Specimen Flow rate (GPM/ft ²)	171	166	167	166	166	145	145	144	144	145		
Specimen Permeability (cm/s)	0.42	0.41	0.41	0.41	0.41	0.38	0.38	0.38	0.38	0.38		
Test Specimen No. >:	3					4						
Thickness (mils)	76	76	76	76	76	88	88	88	88	88		
Time (s)	11.1	10.7	11.6	11.6	11.5	16.3	16.3	16.6	16.5	16.6		
Permittivity (s-1)	2.56	2.65	2.45	2.45	2.47	1.74	1.74	1.71	1.72	1.71		
Specimen Permittivity @20°C (sec-1)	2.49	2.59	2.39	2.39	2.41	1.70	1.70	1.67	1.68	1.67		
Specimen Flow rate (GPM/ft ²)	187	194	179	179	180	127.1	127.1	124.8	125.5	124.8		
Specimen Permeability (cm/s)	0.48	0.50	0.46	0.46	0.46	0.38	0.38	0.37	0.38	0.37		
	TEMPERATURE CORRECTED VALUES										Permittivity (s-1)	2.07
											Flow rate (GPM/ft ²)	155
											Permeability (cm/s)	0.41
MD Machine Direction	TD Transverse Direction					NA Not Available						

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August 31, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc: ehilton@scsengineers.com

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Bill To:

<= Same (P.O. # 092070.04-1)

Project:

Citrus County

TRI Job Reference Number:

E2343-77-09

Material(s) Tested:

One, GSE FS2-275E-06-06-E- Double Sided Geocomposite(s)

Test(s) Requested:

Transmissivity (ASTM D 4716) - GC
Peel Strength (ASTM D 7005) - GC
Wide Width Tensile (ASTM D 4595) - GN
Thickness (ASTM D 1777) - GN
Mass/Unit Area (ASTM D 3776, Option C) - GT
Density (ASTM D 1505) - GN
Carbon Black Content (ASTM D 4218) - GN
Grab Tensile (ASTM D 4632) - GT
Puncture Strength (ASTM D 4833) - GT
Trapezoidal Tear (ASTM D 4533) - GT
Apparent Opening Size (ASTM D 4751) - GT
Permittivity (ASTM D 4491) - GT
Thickness (ASTM D 5199) GC

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348157
TRI Log #: E2343-77-09

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Hydraulic Transmissivity (ASTM D 4716)												
Direction Tested: Machine Direction												
Normal Load (psf):	10,000											
Hydraulic Gradient:	0.1											
Test Length (in)	12											
Test Width (in)	12											
Plate / Agru 60 mil. TXHDGM / Sample / Agru 60 mil. TXHDGM / Plate												
Seat Time (hours)	Specimen 1											
Volume (cc)	616	624	635									
Time (s)	9.9	10.1	10.2									
Flow Rate (GPM/ft width)	0.99	0.98	0.99								0.98	0.00
Transmissivity (m ² /s)	2.04E-03	2.03E-03	2.04E-03								2.04E-03	8.66E-06
Test Temp (C)	20.0											
Temp. Corr. Factor	1.000											
Hydraulic Transmissivity (ASTM D 4716)												
Direction Tested: Machine Direction												
Normal Load (psf):	10,000											
Hydraulic Gradient:	0.1											
Test Length (in)	12											
Test Width (in)	12											
Plate / Agru 60 mil. TXHDGM / Sample / Agru 60 mil. TXHDGM / Plate												
Seat Time (hours)	Specimen 100											
Pre-Test Thickness (in)	0.361											
Post-Test Thickness (in)	0.318											
Volume (cc)	516	513	516									
Time (s)	10.0	10.0	10.0									
Flow Rate (GPM/ft width)	0.81	0.81	0.82								0.81	0.00
Transmissivity (m ² /s)	1.69E-03	1.68E-03	1.69E-03								1.69E-03	2.42E-06
Permeability (cm/s)	20.9	20.8	20.9								20.9	0.0
Test Temp (C)	20.0											
Temp. Corr. Factor	1.000											
Peel Strength (ASTM D 7005)												
A - MD Average Peel Strength (ppi)	3.7	1.8	2.1	4.0	2.1						2.7	1.0
A - MD Average Peel Strength (g/in)	1680	817	953	1816	953						1244	466
B - MD Average Peel Strength (ppi)	2.4	2.1	2.8	3.1	3.7						2.8	0.6
B - MD Average Peel Strength (g/in)	1090	953	1271	1407	1680						1280	282
Note: A and B represent a randomly assigned top and bottom of the sample												
Thickness (ASTM D 5199)												
Thickness (mils)	371	371	364	362	370	368	375	378	375	367	370	5
											362	<< min

MD Machine Direction TD Transverse Direction NA Not Available

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348157
 TRI Log #: E2343-77-09

GEONET COMPONENT

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 1777)												
Thickness (mils)	298	293	288	292	284	291	294	291	291	290	291	4
											284	<< min
Density (ASTM D 1505)												
Density (g/cm ³)	0.955	0.955	0.955								0.955	0.000
Carbon Black Content (ASTM D 4218)												
% Carbon Black	2.83	2.77									2.80	0.04
Wide Width Tensile Properties (ASTM D 4595, mod. for GN)												
MD Specimen Width (inches)	8											
MD Specimen Width (mm)	203											
MD Ultimate Strength (lbs)	750	726	733	756	727	736					736	12
MD Ultimate Strength (ppi)	93.8	90.8	91.7	94.5	90.9	92.0					92.3	1.5
MD Ultimate Strength (kN/m)	16.4	15.9	16.1	16.6	15.9	16.1					16.2	0.3
MD Break Elongation (%)	15.6	16.8	19.3	19.0	19.4	16.6					17.8	1.7
TD Specimen Width (in)	8											
TD Specimen Width (mm)	203											
TD Ultimate Strength (lbs)	348	286	298	319	288	301					307	24
TD Ultimate Strength (ppi)	43.5	35.7	37.2	39.9	36.0	37.7					38.3	3.0
TD Ultimate Strength (kN/m)	7.63	6.26	6.52	7.00	6.31	6.60					6.72	0.52
TD Break Elongation (%)	87.6	79.6	89.2	84.4	77.1	76.7					82.4	5.4
MD Machine Direction	TD Transverse Direction										NA Not Available	

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348157
TRI Log #: E2343-77-09

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	2.87	2.65	3.01	2.77	2.61	2.93	2.68	3.06	2.63	3.20	2.84	0.21
Mass/Unit Area (oz/sq.yd)	6.68	6.16	7.00	6.44	6.07	6.82	6.23	7.12	6.12	7.44	6.61	0.48
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	143	234	180	184	154	208	185	177	212	170	184	27
TD - Tensile Strength (lbs)	174	239	144	275	188	207	196	156	192	187	196	38
MD - Elong. @ Max. Load (%)	72	98	69	93	79	101	87	80	95	79	85	11
TD - Elong. @ Max. Load (%)	112	108	131	107	111	98	108	103	105	129	111	10
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	115	129	94	107	94	107	99	103	103	100	102	18
	87	66	131	75	126							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	77	79	76	73	71	105	138	77	98	82	88	21
TD - Tear Strength (lbs)	121	126	107	122	159	124	110	97	121	136	122	17
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.104	0.194	0.190	0.141	0.104						0.147	0.044
Sieve No.	140	70	70	100	140						100	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
 Sample Identification: 131348157
 TRI Log #: E2343-77-09

GEOTEXTILE COMPONENT - A

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	89	89	89	89	89	66	89	66	66	66		
Time (s)	11.7	12.0	12.0	12.0	12.0	9.6	10.2	10.4	10.2	10.3		
Specimen Permittivity (s-1)	2.43	2.36	2.36	2.36	2.36	2.96	2.78	2.73	2.78	2.75		
Specimen Permittivity @20°C (sec-1)	2.37	2.31	2.31	2.31	2.31	2.88	2.71	2.66	2.71	2.69		
Specimen Flow rate (GPM/ft2)	177	173	173	173	173	216	203	199	203	201		
Specimen Permeability (cm/s)	0.53	0.52	0.52	0.52	0.52	0.48	0.61	0.45	0.46	0.45		
Test Specimen No. >:	3					4						
Thickness (mils)	83	83	83	83	83	78	83	78	78	78		
Time (s)	13.4	14.0	14.0	14.0	14.0	11.6	11.9	11.8	11.8	11.9		
Permittivity (s-1)	2.12	2.03	2.03	2.03	2.03	2.45	2.38	2.40	2.40	2.38		
Specimen Permittivity @20°C (sec-1)	2.07	1.98	1.98	1.98	1.98	2.39	2.33	2.35	2.35	2.33		
Specimen Flow rate (GPM/ft2)	155	148	148	148	148	179	174	176	176	174		
Specimen Permeability (cm/s)	0.44	0.42	0.42	0.42	0.42	0.47	0.49	0.46	0.46	0.46		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)		2.35
										Flow rate (GPM/ft2)		176
										Permeability (cm/s)		0.48

MD Machine Direction TD Transverse Direction NA Not Available

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
167

TRI Log #: E2343-77-09

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Mass/Unit Area (ASTM D 3776, Option C)												
5" diameter circle (grams)	3.02	2.81	3.31	2.67	2.83	2.67	3.30	3.51	3.05	2.91	3.01	0.29
Mass/Unit Area (oz/sq.yd)	7.02	6.54	7.70	6.21	6.58	6.21	7.68	8.16	7.09	6.77	7.00	0.67
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	175	201	177	185	176	214	192	219	181	177	190	16
TD - Tensile Strength (lbs)	210	203	165	255	224	139	240	178	228	131	197	42
MD - Elong. @ Max. Load (%)	79	89	71	87	81	87	96	86	86	92	85	7
TD - Elong. @ Max. Load (%)	94	101	117	104	104	121	101	98	95	95	103	9
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	106	81	109	90	91	106	114	108	95	134	100	15
	80	111	94	83	105							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	83	73	88	77	81	92	88	86	98	93	86	8
TD - Tear Strength (lbs)	95	118	117	109	137	149	119	112	93	103	115	17
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.106	0.146	0.135	0.105	0.104						0.119	0.020
Sieve No.	140	100	100	140	140						120	
MD Machine Direction	TD Transverse Direction		NA Not Available									

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOCOMPOSITE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County

Material: GSE 275 mil. 6 oz. Double Sided Geocomposite
Sample Identification: 131348157
TRI Log #: E2343-77-09

GEOTEXTILE COMPONENT - B

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	21											
Correction Factor:	0.976											
Test Specimen No. >:	1					2						
Thickness (mils)	83	83	83	83	83	88	88	88	88	88		
Time (s)	9.7	9.7	10.0	10.0	10.0	11.9	12.2	12.2	11.9	12.2		
Specimen Permittivity (s-1)	2.93	2.93	2.84	2.84	2.84	2.38	2.33	2.33	2.38	2.33		
Specimen Permittivity @20°C (sec-1)	2.85	2.85	2.77	2.77	2.77	2.33	2.27	2.27	2.33	2.27		
Specimen Flow rate (GPM/ft2)	214	214	207	207	207	174	170	170	174	170		
Specimen Permeability (cm/s)	0.60	0.60	0.58	0.58	0.58	0.52	0.51	0.51	0.52	0.51		
Test Specimen No. >:	3					4						
Thickness (mils)	90	90	90	90	90	110	110	110	110	110		
Time (s)	12.5	12.5	12.5	12.8	12.5	13.2	13.4	13.5	13.4	13.2		
Permittivity (s-1)	2.27	2.27	2.27	2.22	2.27	2.15	2.12	2.10	2.12	2.15		
Specimen Permittivity @20°C (sec-1)	2.22	2.22	2.22	2.16	2.22	2.10	2.07	2.05	2.07	2.10		
Specimen Flow rate (GPM/ft2)	166	166	166	162	166	157	155	153	155	157		
Specimen Permeability (cm/s)	0.51	0.51	0.51	0.49	0.51	0.59	0.58	0.57	0.58	0.59		
TEMPERATURE CORRECTED VALUES										Permittivity (s-1)		2.34
										Flow rate (GPM/ft2)		175
										Permeability (cm/s)		0.55

MD Machine Direction TD Transverse Direction NA Not Available

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Attachment 7-5

Geocomposite CQA Interface Friction Test Reports



Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/18/2010

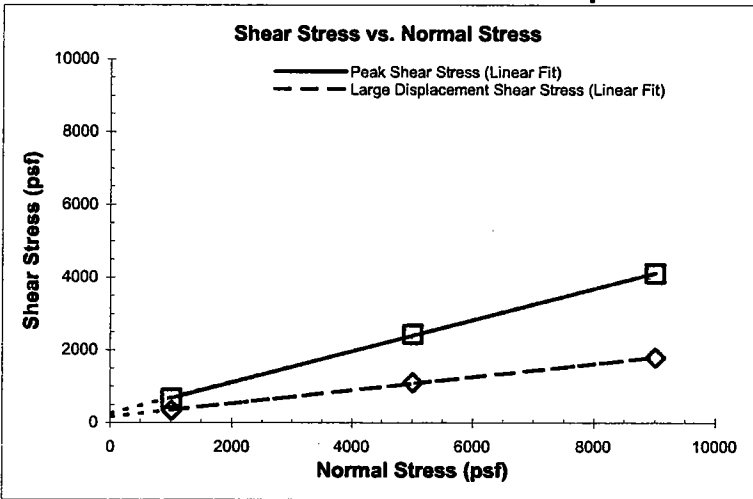
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 5321

Quality Review/Date

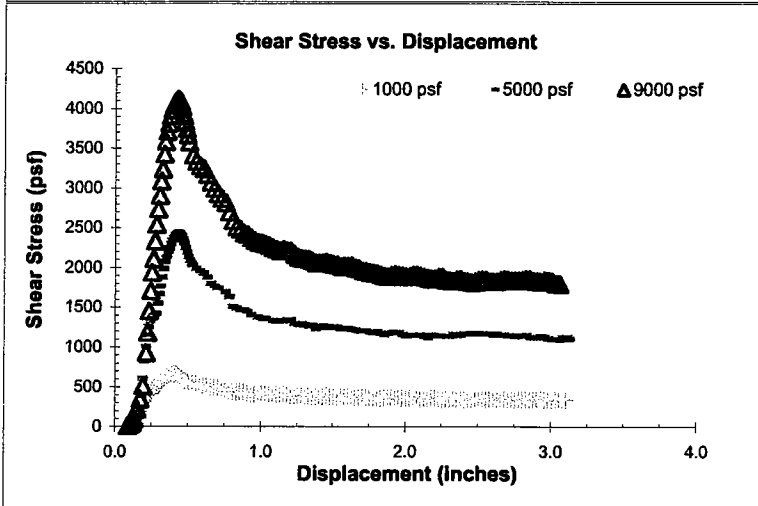
Test Date: 10/07/10-10/07/10

Tested Interface: Syntec TenDrain 770-2 Double-sided Geocomposite (1000051) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	23.3	10.3
Y-intercept or Adhesion (psf):	253	171

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Syntec TenDrain 770-2 double-sided geocomposite (rib side)
Lower Box	Agru 60 mil HDPE Microspike geomembrane (dull side)
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hour prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	667	2444	4117
Corrected Large Displacement Shear Stress (psf)	342	1105	1799
Peak Secant Angle (degrees)	33.7	26.0	24.6
Large Displacement Secant Angle (degrees)	18.9	12.5	11.3
Asperity (mils)	27.0	28.4	28.2

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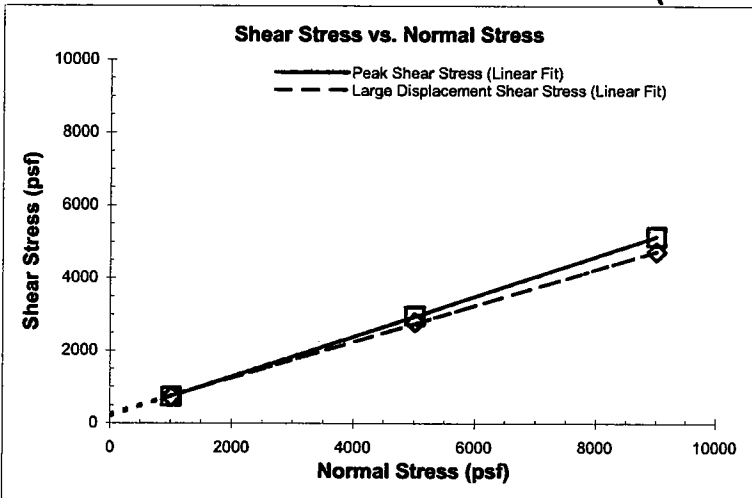


Interface Friction Test Report

Client: **SCS Engineers** TRI Log#: E2337-95-02
 Project: **Citrus County Central Landfill Phase 3** Test Method: ASTM D 5321
 Test Date: 08/26/10-08/27/10

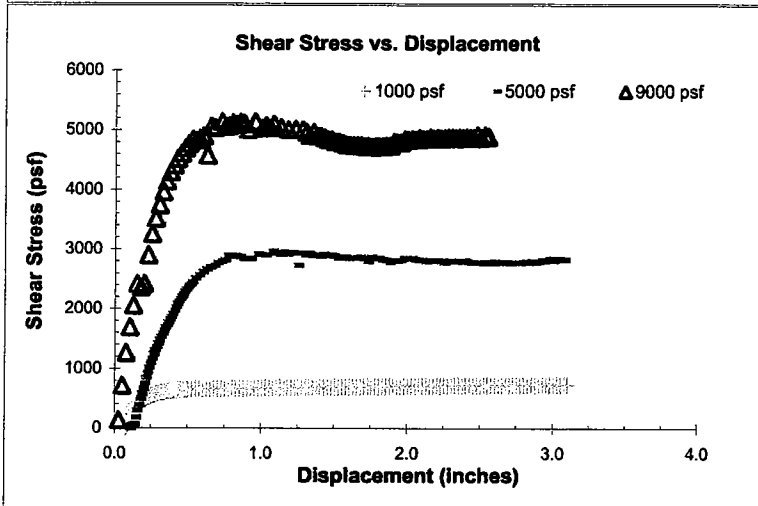
John M. Allen, P.E., 08/27/2010
 Quality Review/Date

Tested Interface: Protective Cover Soil vs. Syntec TenDrain 770-2 Double-sided Geocomposite (1000051)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	28.9	26.5
Y-intercept or Adhesion (psf):	192	256

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Protective cover soil remolded to 100.4 pcf at 13.9%
Lower Box	Syntec TenDrain 770-2 Double-sided Geocomposite (ribs down)
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 6 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	735	2967	5148
Corrected Large Displacement Shear Stress (psf)	735	2792	4729
Peak Secant Angle (degrees)	36.3	30.7	29.8
Large Displacement Secant Angle (degrees)	36.3	29.2	27.7

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Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/04/2010

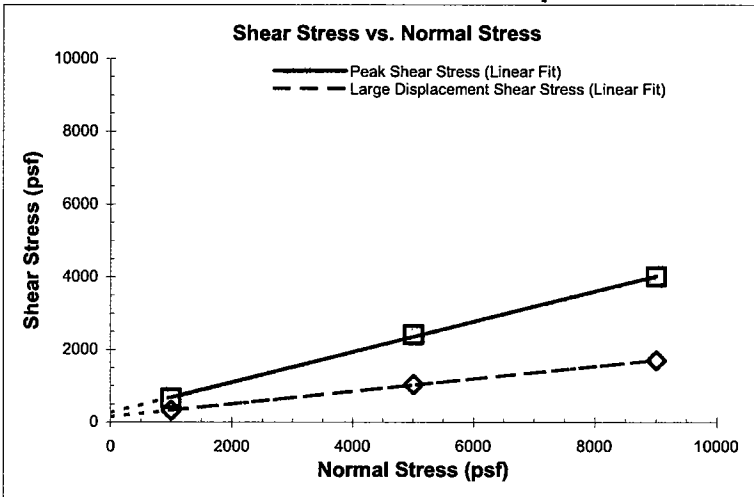
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 5321

Quality Review/Date

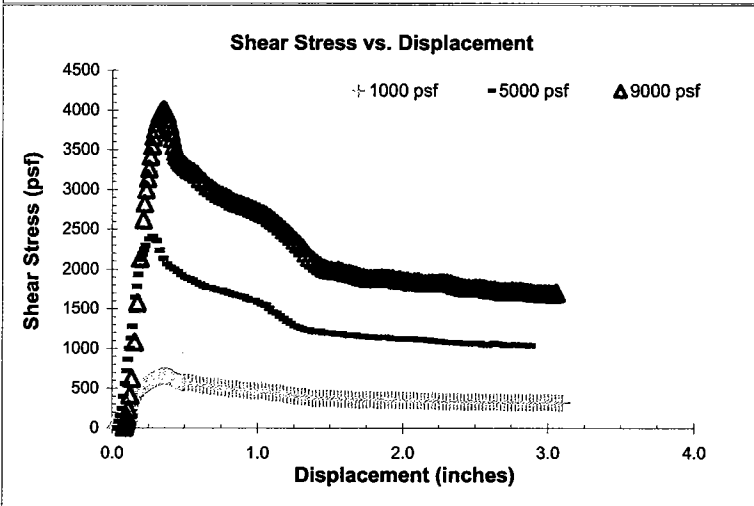
Test Date: 10/04/10-10/04/10

Tested Interface: GSE Double-sided Geocomposite (131348090) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	22.7	9.8
Y-intercept or Adhesion (psf):	264	158

Shearing occurred at the interface.



Test Conditions	
Upper Box &	GSE double-sided geocomposite
Lower Box	Agru 60 mil HDPE Microspike geomembrane (dull side)
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hour prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	658	2407	4007
Corrected Large Displacement Shear Stress (psf)	323	1038	1705
Peak Secant Angle (degrees)	33.3	25.7	24.0
Large Displacement Secant Angle (degrees)	17.9	11.7	10.7
Asperity (mils)	30.4	29.0	28.4

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Attachment 7-6

Triplanar Geocomposite Placement Logs

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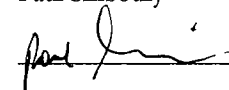
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-1	1000164	155	12.5	300	E-W	0720	
P-2	1000175	155	12.5	300	E-W	0710	
P-3	1000170	155	12.5	300	E-W	0717	
P-4	1000176	155	12.5	300	E-W	0724	
P-5	1000181	155	12.5	300	E-W	0739	
P-6	1000184	155	12.5	300	E-W	0747	
P-7	1000179	155	12.5	300	E-W	0755	
P-8	1000178	155	12.5	300	E-W	0810	
P-9	1000085	152	12.5	300	E-W	0819	
P-10	1000093	80	12.5	300	E-W	0828	
P-11	1000085	47	12.5	300	NE-SW	0837	
P-12	1000092	85	12.5	300	NE-SW	0845	
P-13	1000093	120	12.5	300	NE-SW	0857	
P-14	1000169	155	12.5	300	NE-SW	0908	
P-15	1000180	155	12.5	300	NE-SW	0923	
P-16	1000165	155	12.5	300	NE-SW	0935	
P-17	1000204	150	12.5	300	NE-SW	0944	
P-18	1000203	150	12.5	300	NE-SW	1053	
P-19	1000197	150	12.5	300	NE-SW	1104	
P-20	1000051	127	12.5	300	NE-SW	1118	

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COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-21	1000092	101	12.5	300	NE-SW	1230	
P-22	1000083	77	12.5	300	NE-SW	1241	
P-23	1000051	50	12.5	300	NE-SW	1250	
P-24	1000051	23	12.5'	300	NE-SW	1259	
P-25	1000201	150	12.5	300	NE-SW	1311	
P-26	1000187	150	12.5	300	NE-SW	1319	
P-27	1000205	150	12.5	300	NE-SW	1325	
P-28	1000202	150	12.5	300	NE-SW	1332	
P-29	1000209	150	12.5	300	NE-SW	1342	
P-30	1000200	150	12.5	300	NE-SW	1351	
P-31	1000189	150	12.5	300	NE-SW	1400	
P-32	1000195	150	12.5	300	NE-SW	1409	
P-33	1000193	150	12.5	300	NE-SW	1419	
P-34	1000066	32	12.5	300	NE-SW	1426	
P-35	1000066	63	12.5	300	N-S	1437	
P-36	1000066	92	12.5	300	N-S	1445	
P-37	1000083	123	12.5	300	N-S	1455	
P-38	1000190	150	12.5	300	N-S	1503	
P-39	1000188	150	12.5	300	N-S	1520	
P-40	1000208	150	12.5	300	N-S	1537	

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COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-41	1000198	150	12.5	300	NE-SW	1552	
P-42	1000198	150	12.5	300	NE-SW	1602	
P-43	1000162	155	12.5	300	N-S	1617	
P-44	1000172	155	12.5	300	N-S	1645	
P-45	1000177	155	12.5	300	N-S	0845	10/15/10
P-46	1000171	155	12.5	300	N-S	0901	10/15/10
P-47	1000186	155	12.5	300	N-S	0915	10/15/10
P-48	1000191	155	12.5	300	N-S	0924	10/15/10
P-49	1000173	155	12.5	300	N-S	0932	10/15/10
P-50	1000185	155	12.5	300	N-S	0941	10/15/10
P-51	1000166	155	12.5	300	N-S	0952	10/15/10
P-52	1000163	155	12.5	300	N-S	1010	10/15/10
P-53	1000167	155	12.5	300	N-S	1037	10/15/10
P-54	1000174	155	12.5	300	N-S	1052	10/15/10
P-55	1000182	155	12.5	300	N-S	1103	10/15/10
P-56	1000183	155	12.5	300	N-S	1126	10/15/10
P-57	1000129	155	12.5	300	N-S	1245	10/15/10
P-58	1000134	155	12.5	300	N-S	1312	10/15/10
P-59	1000145	155	12.5	300	N-S	1340	10/15/10
P-60	1000135	155	12.5	300	N-S	1405	10/15/10

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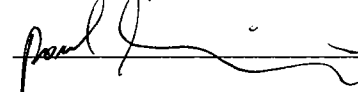
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-61	1000074	114	12.5	300	N-S	1411	
P-62	1000074	62	12.5	300	N-S	1417	
P-63	1000153	165	12.5	300	N-S	1426	
P-64	1000130	165	12.5	300	N-S	1434	
P-65	1000141	165	12.5	300	N-S	1442	
P-66	1000159	165	12.5	300	N-S	1448	
P-67	1000156	165	12.5	300	N-S	1454	
P-68	1000144	165	12.5	300	N-S	1501	
P-69	1000131	165	12.5	300	N-S	1509	
P-70	1000138	165	12.5	300	N-S	1516	
P-71	1000136	165	12.5	300	N-S	1523	
P-72	1000148	165	12.5	300	N-S	1530	
P-73	1000161	165	12.5	300	N-S	1536	
P-74	1000088	113	12.5	300	N-S	1015	10/25/10
P-75	1000058	138	12.5	300	N-S	1022	10/25/10
P-76	1000054	146	12.5	300	N-S	1025	10/25/10
P-77	1000081	153	12.5	300	N-S	1034	10/25/10
P-78	1000095	153	12.5	300	N-S	1039	10/25/10
P-79	1000088	21	12.5	300	N-S	1044	10/25/10
P-80	1000095	126	12.5	300	N-S	1052	10/25/10

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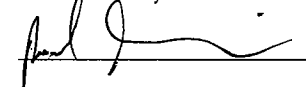
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-81	1000081	57	12.5	300	N-S	1103	
P-82	1000054	34	12.5	300	N-S	1110	
P-83	1000081	17	12.5	300	N-S	1113	
P-84	1000067	168	12.5	300	N-S	1117	
P-85	1000071	170	12.5	300	N-S	1124	
P-86	1000100	173	12.5	300	N-S	1238	
P-87	1000086	188	12.5	300	N-S	1243	
P-88	1000069	180	12.5	300	N-S	1248	
P-89	1000073	179	12.5	300	N-S	1254	
P-90	1000094	169	12.5	300	N-S	1304	
P-91	1000098	164	12.5	300	N-S	1311	
P-92	1000096	154	12.5	300	N-S	1316	
P-93	1000101	153	12.5	300	N-S	1325	
P-94	1000101	32	12.5	300	N-S	1337	
P-95	1000096	27	12.5	300	N-S	1347	
P-96	1000098	28	12.5	300	N-S	1352	
P-97	1000094	21	12.5	300	N-S	1359	
P-98	1000067	23	12.5	300	N-S	1404	
P-99	1000071	16	12.5	300	N-S	1409	
P-100	1000087	143	12.5	300	N-S	1416	

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COMPOSITE PLACEMENT LOG	PROJECT TITLE	Central Landfill Phase 3 Expansion		
	PROJECT NO.	09207049.06		
	DATE	10/25/10		

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-101	1000065	135	12.5	300	N-S	1423	
P-102	1000057	130	12.5	300	N-S	1434	
P-103	1000102	129	12.5	300	N-S	1447	
P-104	1000102	60	12.5	300	N-S	1456	
P-105	1000065	63	12.5	300	N-S	1510	
P-106	1000087	42	12.5	300	N-S	1525	
P-107	1000067	13	12.5	300	N-S	1537	
P-108	1000073	13	12.5	300	N-S	1543	
P-109	1000057	50	12.5	300	N-S	1605	
P-110	1000147	165	12.5	300	N-S	1015	11/4/10
P-111	1000154	165	12.5	300	N-S	1027	11/4/10
P-112	1000137	165	12.5	300	N-S	1042	11/4/10
P-113	1000146	165	12.5	300	N-S	1052	11/4/10
P-114	1000149	165	12.5	300	N-S	1100	11/4/10
P-115	1000157	165	12.5	300	N-S	0740	11/5/10
P-116	1000132	165	12.5	300	N-S	0752	11/5/10
P-117	1000135	165	12.5	300	N-S	0804	11/5/10
P-118	1000160	165	12.5	300	N-S	0814	11/5/10
P-119	1000152	165	12.5	300	N-S	0825	11/5/10
P-120	1000150	165	12.5	300	N-S	0843	11/5/10

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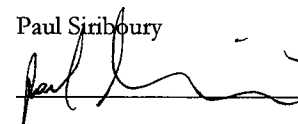
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-121	1000155	165	12.5	300	N-S	0851	
P-122	1000158	165	12.5	300	N-S	0910	
P-123	1000151	165	12.5	300	N-S	0925	
P-124	1000118	170	12.5	300	N-S	0937	
P-125	1000121	170	12.5	300	N-S	0951	
P-126	1000120	170	12.5	300	N-S	1017	
P-127	1000127	170	12.5	300	N-S	1023	
P-128	1000109	170	12.5	300	N-S	1030	
P-129	1000114	170	12.5	300	N-S	1037	
P-130	1000112	170	12.5	300	N-S	1041	
P-131	1000123	170	12.5	300	N-S	1052	
P-132	1000107	170	12.5	300	N-S	1102	
P-133	1000126	170	12.5	300	N-S	1114	
P-134	1000115	170	12.5	300	N-S	1125	
P-135	1000122	170	12.5	300	N-S	1245	
P-136	1000119	170	12.5	300	N-S	1303	
P-137	1000111	170	12.5	300	N-S	1314	
P-138	1000116	170	12.5	300	N-S	1327	
P-139	1000117	170	12.5	300	N-S	1337	
P-140	1000124	170	12.5	300	N-S	1351	

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COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-141	1000143	138	12.5	300	N-S	1359	
P-142	1000110	121	12.5	300	N-S	1404	
P-143	1000199	105	12.5	300	N-S	1413	
P-144	1000056	91	12.5	300	N-S	1420	
P-145	1000068	77	12.5	300	N-S	1427	
P-146	1000084	65	12.5	300	N-S	1435	
P-147	1000084	47	12.5	300	N-S	1442	
P-148	1000056	30	12.5	300	N-S	1450	
P-149	1000056	17	12.5	300	NW-SE	1457	
P-150	1000140	14	12.5	300	NW-SE	1504	
P-151	1000140	37	12.5	300	NW-SE	1516	
P-152	1000140	54	12.5	300	N-S	1524	
P-153	1000192	71	12.5	300	N-S	1533	
P-154	1000068	85	12.5	300	N-S	1542	
P-155	1000060	98	12.5	300	N-S	1550	
P-156	1000196	111	12.5	300	N-S	1557	
P-157	1000194	124	12.5	300	N-S	1621	
	1000056	200	12.5	300	E-W	0905	11/8/10
	1000089	200	12.5	300	E-W	0920	IN LEACHATE COLLECTION TRENCH
	1000060	200	12.5	300	E-W	0938	IN LEACHATE COLLECTION TRENCH

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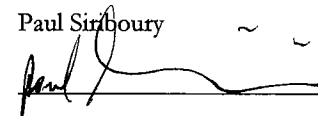
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
	1000140	200	12.5	300	E-W	0952	IN LEACHATE COLLECTION TRENCH
P-158	1000064	116	12.5	300	N-S	0720	11/11/10
P-159	1000064	74	12.5	300	N-S	0725	11/11/10
P-160	1000055	42	12.5	300	N-S	0734	11/11/10
P-161	1000055	100	12.5	300	N-S	0740	11/11/10
P-162	1000055	42	12.5	300	N-S	0746	11/11/10
P-163	1000063	60	12.5	300	N-S	0752	11/11/10
P-164	1000063	97	12.5	300	N-S	0759	11/11/10
P-165	1000063	28	12.5	300	N-S	0804	11/11/10
P-166	1000073	68	12.5	300	N-S	0815	11/11/10
P-167	1000073	95	12.5	300	N-S	0824	11/11/10
P-168	1000073	36	12.5	300	N-S	0831	11/11/10
P-169	1000072	58	12.5	300	N-S	0837	11/11/10
P-170	1000072	86	12.5	300	N-S	0843	11/11/10
P-171	1000072	40	12.5	300	N-S	0847	11/11/10
P-172	1000089	45	12.5	300	N-S	0851	11/11/10
P-173	1000089	85	12.5	300	N-S	0856	11/11/10
P-174	1000089	70	12.5	300	N-S	0902	11/11/10
P-175	1000052	78	12.5	300	N-S	0908	11/11/10
P-176	1000052	67	12.5	300	N-S	0915	11/11/10

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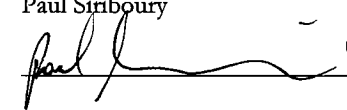
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-177	1000075	75	12.5	300	N-S	0921	
P-178	1000075	72	12.5	300	N-S	0927	
P-179	1000075	39	12.5	300	N-S	0934	
P-180	1000052	31	12.5	300	N-S	0941	
P-181	1000052	33	12.5	300	N-S	0948	
P-182	1000052	64	12.5	300	N-S	0952	
P-183	1000052	33	12.5	300	N-S	0959	
P-184	1000052	70	12.5	300	N-S	1008	
P-185	1000059	67	12.5	300	N-S	1018	
P-186	1000059	49	12.5	300	N-S	1025	
P-187	1000059	21	12.5	300	N-S	1032	
P-188	1000070	70	12.5	300	N-S	1039	
P-189	1000070	72	12.5	300	N-S	1048	
P-190	1000070	27	12.5	300	N-S	1054	
P-191	1000070	44	12.5	300	N-S	1100	
P-192	1000080	69	12.5	300	N-S	1108	
P-193	1000080	42	12.5	300	N-S	1117	
P-194	1000080	23	12.5	300	N-S	1125	
P-195	1000090	77	12.5	300	N-S	1134	
P-196	1000090	70	12.5	300	N-S	1141	

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COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-197	1000078	71	12.5	300	N-S	1238	
P-198	1000078	75	12.5	300	N-S	1245	
P-199	1000078	36	12.5	300	N-S	1254	
P-200	1000001	33	12.5	300	N-S	1309	
P-201	1000001	66	12.5	300	N-S	1315	
P-202	1000001	64	12.5	300	N-S	1324	
P-203	1000001	20	12.5	300	N-S	1332	
P-204	1000007	44	12.5	300	N-S	1340	
P-205	1000007	63	12.5	300	N-S	1346	
P-206	1000007	64	12.5	300	N-S	1352	
P-207	1000061	65	12.5	300	N-S	1403	
P-208	1000076	65	12.5	300	N-S	1413	
P-209	1000076	71	12.5	300	N-S	1420	
P-210	1000076	50	12.5	300	N-S	1427	
P-211	1000061	21	12.5	300	N-S	1434	
P-212	1000061	68	12.5	300	N-S	1445	
P-213	1000007	15	12.5	300	N-S	1453	
P-214	1000061	52	12.5	300	N-S	1459	
P-215	1000106	69	12.5	300	N-S	1514	
P-216	1000106	69	12.5	300	N-S	1528	

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 DATE 11/11/10

COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-217	1000106	52	12.5	300	N-S	1540	
P-218	1000108	53	12.5	300	N-S	1554	
P-219	1000108	50	12.5	300	N-S	1611	
P-220	1000108	34	12.5	300	N-S	1628	
P-221	1000207	145	12.5	300	E-W	1634	
P-222	1000206	146	12.5	300	E-W	1646	
P-223	1000100	155	12.5	300	E-W	1652	
P-224	1000122	162	12.5	300	E-W	1701	
P-225	1000110	167	12.5	300	E-W	1103	11/30/10
P-226	1000082	170	12.5	300	E-W	1115	11/30/10
P-227	1000113	167	12.5	300	E-W	1135	11/30/10

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Attachment 7-7

Biplanar Geocomposite Placement Logs

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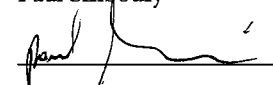
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-1	48186	155	15	250	E-W	0800	
P-2	48191	155	15	250	E-W	0810	
P-3	48188	155	15	250	E-W	0817	
P-4	48183	155	15	250	E-W	0823	
P-5	48187	155	15	250	E-W	0829	
P-6	48179	155	15	250	E-W	0837	
P-7	48174	155	15	250	E-W	0845	
P-8	48126	104	15	250	E-W	0850	
P-9	48126	55	15	250	E-W	0901	
P-10	48177	155	15	250	NE-SW	0917	
P-11	48182	155	15	250	NE-SW	0930	
P-12	48184	155	15	250	NE-SW	0945	
P-13	48185	155	15	250	NE-SW	0950	
P-14	48126	40	15	250	NE-SW	0959	
P-15	48125	89	15	250	NE-SW	1010	
P-16	48125	111	15	250	NE-SW	1020	
P-17	48121	109	15	250	NE-SW	1045	
P-18	48205	150	15	250	NE-SW	1100	
P-19	48212	150	15	250	NE-SW	1117	
P-20	48181	155	15	250	NE-SW	1215	

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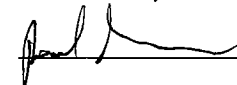
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-21	48208	150	15	250	NE-SW	1300	
P-22	48207	150	15	250	NE-SW	1315	
P-23	48209	150	15	250	NE-SW	1328	
P-24	48213	150	15	250	NE-SW	1400	
P-25	48203	150	15	250	NE-SW	1420	
P-26	48206	150	15	250	NE-SW	1445	
P-27	48121	91	15	250	N-S	0745	10/11/10
P-28	48127	70	15	250	N-S	0800	10/11/10
P-29	48127	130	15	250	N-S	0808	10/11/10
P-30	48214	150	15	250	N-S	0817	10/11/10
P-31	48204	150	15	250	N-S	0822	10/11/10
P-32	48122	149	15	250	N-S	0832	10/11/10
P-33	48122	51	15	250	N-S	0841	10/11/10
P-34	48211	150	15	250	N-S	0900	10/11/10
P-35	48199	155	15	250	N-S	0907	10/11/10
P-36	48194	155	15	250	N-S	0917	10/11/10
P-37	48197	155	15	250	N-S	0925	10/11/10
P-38	48193	155	15	250	N-S	0931	10/11/10
P-39	48176	155	15	250	N-S	0939	10/11/10
P-40	48178	155	15	250	N-S	0947	10/11/10
P-41	48180	155	15	250	N-S	0953	10/11/10

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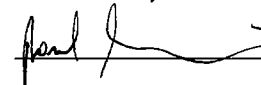
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-42	48208	155	15	250	N-S	1015	
P-43	48200	155	15	250	N-S	1025	
P-44	48201	155	15	250	N-S	1036	
P-45	48198	155	15	250	N-S	1042	
P-46	48190	155	15	250	N-S	1054	
P-47	48156	165	15	250	N-S	1100	
P-48	48162	165	15	250	N-S	1110	
P-49	48169	165	15	250	N-S	1125	
P-50	48129	150	15	250	N-S	1245	
P-51	48129	50	15	250	N-S	1254	
P-52	48152	165	15	250	N-S	1310	
P-53	48150	165	15	250	N-S	1325	
P-54	48159	165	15	250	N-S	1340	
P-55	48164	165	15	250	N-S	1400	
P-56	48154	165	15	250	N-S	1409	
P-57	48153	165	15	250	N-S	1430	
P-58	48168	165	15	250	N-S	1446	
P-59	48160	165	15	250	N-S	1506	
P-60	48158	165	15	250	N-S	1520	
P-61	48161	165	15	250	N-S	1540	
P-62	48165	165	15	250	N-S	1608	

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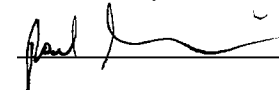
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-63	48101	125	15	250	N-S	0810	
P-64	48110	146	15	250	N-S	0822	
P-65	48120	148	15	250	N-S	0836	
P-66	48120	57	15	250	N-S	0840	
P-67	48110	24	15	250	N-S	0854	
P-68	48101	80	15	250	N-S	0903	
P-69	48109	169	15	250	N-S	0910	
P-70	48089	177	15	250	N-S	0925	
P-71	48119	178	15	250	N-S	0947	
P-72	48119	26	15	250	N-S	0954	
P-73	48089	41	15	250	N-S	0910	
P-74	48100	21	15	250	N-S	0927	
P-75	48093	28	15	250	N-S	0942	
P-76	48110	32	15	250	N-S	0950	
P-77	48109	35	15	250	N-S	0955	
P-78	48093	178	15	250	N-S	1001	
P-79	48100	175	15	250	N-S	1020	
P-80	48092	163	15	250	N-S	1029	
P-81	48096	157	15	250	N-S	1040	
P-82	48094	144	15	250	N-S	1045	
P-83	48090	142	15	250	N-S	1100	

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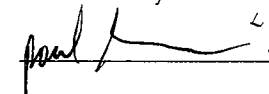
COMPOSITE PLACEMENT LOG

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P-84	48095	137	15	250	N-S	1240	
P-85	48095	70	15	250	N-S	1245	
P-86	48090	61	15	250	N-S	1300	
P-87	48090	55	15	250	N-S	1315	
P-88	48092	25	15	250	N-S	1326	
P-89	48096	49	15	250	N-S	1335	
P-90	48118	127	15	250	N-S	1345	
P-91	48118	84	15	250	N-S	1403	
P-92	48122	20	15	250	N-S	1417	
P-93	48092	18	15	250	N-S	1438	
P-94	48155	166	15	250	N-S	0715	11/1/10
P-95	48166	165	15	250	N-S	0720	11/1/10
P-96	48151	164	15	250	N-S	0727	11/1/10
P-97	48172	164	15	250	N-S	0736	11/1/10
P-98	48167	164	15	250	N-S	0742	11/1/10
P-99	48171	164	15	250	N-S	0748	11/1/10
P-100	48170	162	15	250	N-S	0753	11/1/10
P-101	48163	164	15	250	N-S	0759	11/1/10
P-102	48157	165	15	250	N-S	0807	11/1/10
P-103	48141	169	15	250	N-S	0816	11/1/10
P-104	48146	169	15	250	N-S	0823	11/1/10

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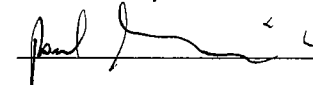
COMPOSITE PLACEMENT LOG

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P-105	48136	169	15	250	N-S	0831	
P-106	48148	170	15	250	N-S	0837	
P-107	48131	169	15	250	N-S	0848	
P-108	48132	170	15	250	N-S	0906	
P-109	48142	170	15	250	N-S	0916	
P-110	48149	170	15	250	N-S	0924	
P-111	48139	169	15	250	N-S	0938	
P-112	48133	168	15	250	N-S	0948	
P-113	48143	170	15	250	N-S	0955	
P-114	48134	169	15	250	N-S	1005	
P-115	48144	169	15	250	N-S	1018	
P-116	48138	169	15	250	N-S	1027	
P-117	48140	157	15	250	N-S	1038	
P-118	48195	137	15	250	N-S	1048	11/2/10
P-119	48123	123	15	250	N-S	1103	11/2/10
P-120	48130	109	15	250	N-S	1118	11/2/10
P-121	48124	95	15	250	N-S	0731	11/2/10
P-122	48124	78	15	250	N-S	0746	11/2/10
P-123	48128	63	15	250	N-S	0753	11/2/10
P-124	48123	52	15	250	N-S	0809	11/2/10
P-125	48128	32	15	250	N-S	0820	11/2/10

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11/2/10

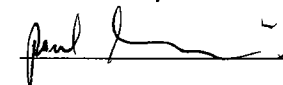
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-126	48123	20	15	250	NW-SE	0827	
P-127	48128	22	15	250	NW-SE	0836	
P-128	48128	46	15	250	E-W	0843	
P-129	48130	63	15	250	E-W	0902	
P-130	48099	77	15	250	E-W	0914	
P-131	48099	94	15	250	E-W	0922	
P-132	48215	109	15	250	E-W	0934	
P-133	48210	126	15	250	E-W	1002	
P-134	48196	141	15	250	E-W	1009	
P-135	48192	159	15	250	E-W	1019	
P-136	48137	169	15	250	E-W	1038	
P-137	48145	169	15	250	E-W	1055	
P-138	48202	163	15	250	E-W	1116	
P-139	48202	149	5	250	E-W	1128	
P-140	48112	146	15	250	E-W	1234	
P-141	48112	21	15	250	N-S	1243	
P-142	48112	66	15	250	N-S	1300	
P-143	48112	66	15	250	N-S	1317	
P-144	48105	66	15	250	N-S	1328	
P-145	48105	65	15	250	N-S	1342	
P-146	48105	66	15	250	N-S	1404	

PRINT NAME:

Paul Siriboury

SIGNATURE:



SCS Engineers (BI-PLANAR)

SHEET

8

of

10

PROJECT TITLE

Central Landfill Phase 3 Expansion

PROJECT NO.

09207049.06

DATE

11/2/10

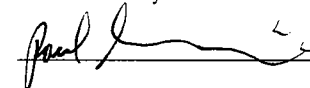
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-147	48105	66	15	250	N-S	1430	
P-148	48113	220	15	250	NW-SE	1445	
P-149	48106	65	15	250	N-S	0815	11/8/10
P-150	48106	66	15	250	N-S	0822	11/8/10
P-151	48106	65	15	250	N-S	0831	11/8/10
P-152	48097	65	15	250	N-S	0845	11/8/10
P-153	48097	65	15	250	N-S	0851	11/8/10
P-154	48097	65	15	250	N-S	0858	11/8/10
P-155	48115	65	15	250	N-S	0909	11/8/10
P-156	48115	65	15	250	N-S	0914	11/8/10
P-157	48115	67	15	250	N-S	0923	11/8/10
P-158	48114	69	15	250	N-S	0935	11/8/10
P-159	48114	69	15	250	N-S	0942	11/8/10
P-160	48114	69	15	250	N-S	0951	11/8/10
P-161	48111	69	15	250	N-S	1002	11/8/10
P-162	48111	68	15	250	N-S	1015	11/8/10
P-163	48111	68	15	250	N-S	1024	11/8/10
P-164	48091	68	15	250	N-S	1037	11/8/10
P-165	48091	67	15	250	N-S	1047	11/8/10
P-166	48091	69	15	250	N-S	1055	11/8/10
P-167	48104	69	15	250	N-S	1104	11/8/10

PRINT NAME:

Paul Siriboury

SIGNATURE:



SCS Engineers (BI-PLANAR)

SHEET

9

of

10

PROJECT TITLE

Central Landfill Phase 3 Expansion

PROJECT NO.

09207049.06

DATE

11/8/10

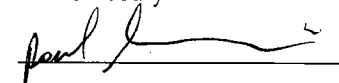
COMPOSITE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
P-168	48104	70	15	250	N-S	1116	
P-169	48104	66	15	250	N-S	1123	
P-170	48106	6	15	250	N-S	1245	
P-171	48117	73	15	250	N-S	1300	
P-172	48117	75	15	250	N-S	1313	
P-173	48117	58	15	250	N-S	1325	
P-174	48116	18	15	250	N-S	1334	
P-175	48116	81	15	250	N-S	1341	
P-176	48098	83	15	250	N-S	1349	
P-177	48116	85	15	250	N-S	1358	
P-178	48103	84	15	250	N-S	1404	
P-179	48097	7	15	250	N-S	1417	
P-180	48098	89	15	250	N-S	1427	
P-181	48103	89	15	250	N-S	1438	
P-182	48103	31	15	250	N-S	1448	
P-183	48098	30	15	250	N-S	1456	
P-184	48116	21	15	250	N-S	1509	
P-185	48100	14	15	250	N-S	1523	
P-186	48108	104	15	250	N-S	1548	
P-187	48108	106	15	250	N-S	1600	
P-188	48107	112	15	250	N-S	1608	

PRINT NAME:

Paul Siriboury

SIGNATURE:



SECTION 8 GEOMEMBRANE INSTALLATION REPORT

8.1 REQUIREMENTS AND SPECIFICATIONS

Geomembrane is defined as high-density polyethylene (HDPE) geomembrane with a formulated sheet density greater than 0.940 g/ml. Only textured geomembrane surfaces are included under this project. Geomembrane panels were placed one at a time and temporarily secured along the edges with sand bags to prevent uplift by the wind. Adjacent panels were deployed and adjusted prior to seaming. Upon deployment, individual panels were assigned sequential panel numbers. Panel numbers, with the corresponding manufacturer's geomembrane roll numbers, were marked on the panels and recorded on the Geomembrane Placement Log. Please refer to Attachment 8-4 of this section for the SCS Geomembrane Placement Logs. The SCS CQA representative recorded on the Geomembrane Panel Placement Log the following information for each panel:

- Location, orientation, and length of the panel.
- Date of installation.
- Panel number (identification code) with alpha prefix (S - secondary or P - primary).
- Originating manufacturer's geomembrane roll number.

8.2 TRIAL WELDS

As required by the contract technical specifications, the equipment used to fusion and extrusion weld the geomembrane seams each day were pre-heated and tested prior to use on the liner system. Each seaming crew was required to produce trial welds on a segment of excess geomembrane approximately 3 feet long. The seaming crew adjusted equipment temperatures to compensate for varying weather and seaming conditions. Hot wedge welding machines were generally set at speeds of 10 to 15 and temperature of 800 to 850 degrees Fahrenheit. Extrusion welders were generally set around 450 to 480 degrees Fahrenheit.

The trial welds were tested for compliance with the project specifications at the site using a field tensiometer supplied by COMANCO. Ten one-inch wide specimens were cut from each welded seam. The trial welded seams were required to meet or exceed the minimum requirements of peel strength of 78 psi for extrusion and 98 psi for fusion welded seams with a minimum of 120 psi for shear strength at 2-feet per minute. In addition, a peel incursion of less than 10% was required prior to welding deployed panels. Please refer to Attachments 8-4 of this section respectively for the Geomembrane Trial Weld Logs.

8.3 GEOMEMBRANE SEAMING

Adjoining panels were aligned to maintain the specified minimum six-inch overlap. Once the panels were aligned, excess moisture and dirt were removed from the edges to be seamed. As the COMANCO seaming crews progressed, wrinkles were removed from the geomembrane. Upon completion of the seaming operation, the seams were pressure-tested with compressed air

in accordance with the methods described in Section 8.4 and destructive samples were taken in accordance with Section 8.6.

Fusion and extrusion welded seams continued the entire length of the panels to include the seam that extends into the geomembrane anchor trench. Any portion of the seam that was observed to be damaged or inadequate was repaired by patching, cap stripping, or extrusion welding the defective portion of the seam. The methods of repair are described in Section 8.4.

Observation activities carried out by the SCS CQA representative during seaming operations are documented in the SCS Geomembrane Seaming Logs and the SCS Geomembrane Repair Logs of this section. Please refer to Attachments 8-7 of this section respectively for the SCS Geomembrane Seaming Logs. Please refer to Attachments 8-8 of this section respectively for the SCS Geomembrane Repair Log. Observations include:

- Seam numbers.
- Welder's name and machine number.
- Welding machine speed and temperature.
- Marked and documented locations of seam repairs.

8.4 SEAM AND PANEL REPAIRS

Patching was used for small repairs. Patches consisted of excess geomembrane large enough to cover 6 inches beyond the edges of the damage. The patches were temporarily fastened in place using a hot air gun. The patch was extrusion welded to the panel. The extruded weld was tested for leaks using a vacuum box assembly and soapy solution.

Large lengths of seams, such as tie-in seams, were extruded. Those areas of seams not passing air testing or destructive sampling were repaired by cap stripping. Patches in repair areas were cut to cover the length of the repair and extend a minimum of 6 inches beyond the edges of the repair area. The patches were heat sealed and extrusion welded as previously noted. All repair areas and extrusion welds were tested in accordance with Section 8.5.

Wrinkles at seam overlaps were cut along the ridge of the wrinkle and folded over to achieve a flat seam. The overlapped portion of the wrinkle was trimmed, cleaned, and extrusion welded. Any portion of a new seam that had an inadequate overlap received a cap strip.

Repairs were inspected by both the COMANCO CQC representative and the SCS CQA representative. Repair activities were documented in the SCS Geomembrane Repair Log as previously mentioned provided in Attachment 8-8 of this section.

8.5 NON-DESTRUCTIVE SEAM TESTING

A non-destructive test was conducted on the entire length of each seam. This project utilized a split wedge, fusion welder. The split wedge welder formed an air channel between the two

welds, which allowed for non-destructive air pressure tests to verify the integrity of the seam. Air pressure tests were conducted by initially sealing each end of the air channel. The air channel was pressurized to a minimum of 25 to 30 pounds per square inch (psi) with an air pump. Once the pressure in the air channel stabilized, the time was noted. The test was conducted for five minutes and a drop of 2 psi was permitted for the seam to pass. When five minutes had passed, the air channel at the far end of the seam was lanced. A smooth and steady drop in pressure indicated that the entire air channel in the seam had been tested.

Extrusion welds were tested by the vacuum box method. A soapy solution was applied to the extruded weld. The vacuum box was placed over the wetted area and a vacuum of 5 psi was held for 10 seconds. Any leaks in the weld were detected by air bubbles escaping from the weld and were subsequently repaired and retested.

All non-destructive tests were observed and documented by the SCS CQA representative as provided in the SCS Non-Destructive Test Log included as Attachment 8-6 of this section.

8.6 DESTRUCTIVE SEAM SAMPLE TESTING

Destructive test samples were cut at a frequency of one test per approximately 500 lineal feet of seam. A total of 64 seam samples were cut and tested by SCS on the secondary and primary liners. Sample locations were chosen and marked by the SCS CQA representative and cut by COMANCO'S CQC representative. The samples were marked for identification. The description included confirmation as to liner, a sequential number, cut location, panels included in the sample, date seamed, seamer's initials and machine number. The top outside track was indicated on the samples for proper orientation in the testing equipment. The QA sample was sent to TRI via a courier for testing. COMANCO'S samples were tested on site by the COMANCO CQC representative. Defects in the geomembrane seam indicated by the destructive test sampling were immediately repaired in accordance with Section 8.4. TRI destructive test results were transmitted to the SCS Field Office on site for relay to COMANCO.

The size of the destructive sample was approximately 12 inches by 48 inches, with the seam centered lengthwise. A 12-inch by 14-inch field sample was cut and tested for shear and peel strength by the COMANCO CQC representative. If the sample passed, a 12-inch by 14-inch sample was forwarded to TRI for testing. Locations of each destructive sample are shown in the as-built panel layout drawing located in Attachment 2-1 for the geomembrane of this section. The results of the destructive samples are discussed in Section 8.8.

8.7 DESTRUCTIVE SEAM SAMPLE LABORATORY TESTING PROCEDURES

Destructive seam samples were sent to the TRI testing laboratory in Austin, Texas. TRI performed shear tests to measure strength and peel tests to measure adhesion. Testing was conducted in accordance to ASTM D6392 (1.0 inch wide, crosshead rate of 2 inches per minute). Five specimens from each destructive sample for each test (shear and peel) were conducted for

conformance. SCS required five out of five specimens on each test to meet the minimum acceptable project specifications of 78 (lbs. per inch width) and less than 10% film tear bond for wedge and extrusion welded seams peel test. Shear test specified values were 120 (lbs. per inch width) and less than 10% film tear bond for both wedge and extrusion welded seams.

8.8 DESTRUCTIVE SEAM SAMPLE TEST RESULTS

The CQA results of the destructive seam sample tests from the geomembrane seams conducted by TRI are contained in Attachment 8-10 of this section. All destructive tests were observed and documented by the SCS CQA representative as provided in the SCS Destructive Test Log included in Attachment 8-9 of this section.

8.9 GEOMEMBRANE MANUFACTURER QUALITY ASSURANCE

As part of the project technical specifications the manufacturer of the geomembrane, GSE, was required to perform initial quality control tests on the geomembrane prior to delivery to the project site. The Manufacturer Quality Control (MQC) tests were conducted by GSE at the factory at a minimum frequency of one test per every 50,000 square feet of geomembrane produced. The MQC certificates, which contain the results for geomembrane tests, are included in Attachment 8-1 of this section.

Table 12 presents the results of the MQC testing compared with the project specifications. The tests indicate that the geomembrane and components met or exceeded the project specifications.

Table 12 Comparison of Geomembrane Properties

Parameter	Specification	Range of MQC Test Results ¹
Resin		
Density (g/cc)	>0.932	0.937 - 0.938
Sheet		
Thickness Min. Average (mil)	60±5%	60
Asperity Height Min. Average (mil)	10	10
Density (g/cc)	>0.940	0.944 - 0.948
Tensile Yield Stress (lb/in width)	126	134 - 167
Tensile Yield Elongation (percent)	12	15.54 - 18.11
Tensile Break Stress (lb/in width)	90	132 - 189
Tensile Break Elongation (percent)	200	393.4 - 523.6
Puncture Resistance (lb)	90	125.21 - 142.85
Tear Resistance (lb)	42	47.24 - 55.09
Carbon Black Content (percent)	2 - 3	2.20 - 2.32
Carbon Black Dispersion (category)	1 or 2	1
% Standard OIT Retained	55	63
% High Pressure OIT Retained	80	106
% HP-OIT Retained	50	104

Notes:

- 1 Range of values.

8.10 CONFORMANCE TESTING

The geomembrane delivered for installation was randomly sampled to verify conformance with the project technical specifications. Samples were obtained across the entire width of the geomembrane roll. The machine direction from the manufacturing process of the geomembrane was indicated on the samples for proper orientation of the testing equipment. The samples were sent to TRI for conformance testing.

The geomembrane rolls were divided into groups of material produced from similar railcar loads of resin or production dates. Conformance samples were selected so as to be representative of the installed materials. Conformance samples were removed from the geomembrane rolls prior to installation. The samples were required to meet or exceed the project technical specifications.

As shown in Table 13 below, the manufacturer and independent conformance tests conducted by TRI indicate that the geomembrane meets or exceeds the project technical specifications. The results of the SCS CQA geomembrane conformance tests are contained in Attachment 8-2 of this section.

Table 13 Comparison Of Geomembrane Properties

Parameter	Specification	Average Range of Test Results
Sheet		
Thickness Min. Average (mil)	60±5%	62 - 63
Asperity Height Min. Average (mil)	10	28 - 29
Density (g/cc)	>0.940	0.945 - 0.946
Tensile Yield Stress (lb/in width)	126	155 - 166
Tensile Yield Elongation (percent)	12	20 - 24
Tensile Break Stress (lb/in width)	90	171 - 183
Tensile Break Elongation (percent)	200	407 - 445
Carbon Black Content (percent)	2 - 3	2.27 - 2.37

8.11 RECORD SURVEY

Please refer to Attachment 2-3 for the record survey drawing created by Berglund of the Phase 3 Expansion cell Subbase which identifies the top of the subbase which the geosynthetic materials were placed.

8.12 DIRECT SHEAR TESTS

To confirm the project materials would meet the technical specifications of 20.5 degrees for the interface friction angle and the minimum required Factor of Safety of 1.5 against sliding, SCS had separate CQA samples of the project materials tested by TRI. TRI performed interface direct shear tests on these project materials in accordance with ASTM D5321. To simulate the range of stresses during final Buildout of the Phase 3 Expansion cell, normal loads of 1,000, 5,000, and 9,000 pounds per square foot (psf) were used during the testing in a saturated condition. The following CQA interface friction angle test results all meet the construction permit requirement of at least 20.5 degrees which therefore also meet the minimum safety factor of 1.5 against sliding. Please refer to Attachment 8-3 of this section for the CQA Interface Friction Test Reports.

CQA Interface Friction Angle Test Results

- Subbase Soil versus Marifi 5XT Geogrid (Biaxial Geogrid) versus Agru 60 mil HDPE Microspike Geomembrane = 25.7 degrees with 240 psf adhesion
- Syntec Tendrain 770-2 Double Sided Geocomposite (Triplanar Geocomposite) versus Agru 60 mil HDPE Microspike Geomembrane = 23.3 degrees with 253 psf adhesion
- GSE Double Sided Geocomposite (Biplanar Geocomposite) versus Agru 60 mil HDPE Microspike Geomembrane = 22.7 degrees with 264 psf adhesion
- Bentomat GCL versus Agru 60 mil HDPE Microspike Geomembrane = 23.0 degrees with 394 psf adhesion

Attachment 8-1
Geomembrane MQC Certificates



Citrus County Central Landfill
Lecanto, FL

This is to confirm that all extrudate is manufactured by one Manufacturer, Agru America, Inc. and the resin is supplied from the same supplier, has the same properties, and matches the sheet resin.

Paul Barker (handwritten signature)

Paul W. Barker
Technical Director

Date: July 22, 2010



Resin Supplier Plant Locations

**Chevron Phillips
Cedar Bayou Chemical Complex LLDPE 7104 resin (Geomembrane)
9500 I-10 East Exit 796
Baytown, TX
77521-9570
USA**

**Chevron Phillips
Pasadena Plastics Complex HDPE K307 resin (Geomembrane)
1400 Jefferson Rd
Pasadena, TX
77506**

Chevron Phillips HDPE 5502BN resin (Geonet)

**Formosa Plastics Corporation, USA HD DF3721A and HD 5502B resin (Geomembrane)
P.O. Box 700
201 Formosa Drive
Point Comfort, TX
77978**

For more information and technical assistance contact:

Chevron Phillips Chemical Company LP
P.O. Box 4910
The Woodlands, TX 77387-4910
800.231.1212



PREMIUM EXTRUSION AND RIGID PACKAGING RESINS

Marlex® K307

MEDIUM DENSITY POLYETHYLENE

This medium density, high molecular weight hexene copolymer is tailored for geomembrane applications that require:

- Outstanding ESCR
- Broad fusion range
- Excellent melt strength
- Good processability

Typical geomembrane applications for K307 include:

- Landfill liners
- Gasoline and chemical tank containment liners
- Tunnel moisture barriers
- Mine tailing collection projects

This resin meets these specifications:

- ASTM D4976 - PE 225
- GRI-GM13 except carbon black requirements
- FDA 21 CFR 177.1520(c) 3.1a, use conditions C through G per 21 CFR 176.170(c). Volume of food contacting article must be equal to or greater than 5 gallons.

NOMINAL PHYSICAL PROPERTIES ⁽¹⁾	English	SI	Method
Density	---	0.937 g/cm ³	ASTM D1505
Flow Rate (HLMI, 190/21.6)	---	21.0 g/10 min	ASTM D1238
Tensile Strength at Yield, 2 in/min, Type IV bar	2,900 psi	20 MPa	ASTM D638
Elongation at Break, 2 in/min, Type IV bar	800%	800%	ASTM D638
Flexural Modulus, Tangent - 16:1 span:depth, 0.5 in/min	120,000 psi	830 MPa	ASTM D790
ESCR, Condition B (10% Igepal), F ₅₀	>1,500 h	>1,500 h	ASTM D1693
ESCR, Condition C (100% Igepal), F ₅₀	>1,500 h	>1,500 h	ASTM D1693
SP-NCTL	>900 h	>900 h	ASTM D5397 (Appendix)
Durometer Hardness, Type D (Shore D)	57	57	ASTM D2240
Vicat Softening Temperature, Loading 1, Rate A	221°F	105°C	ASTM D1525
Heat Deflection Temperature, 66 psi, Method A	137°F	58°C	ASTM D648
Brittleness Temperature, Type A, Type I specimen	<-103°F	<-75°C	ASTM D746
Tensile Impact, Type S bar	190 ft·lb/in ²	400 kJ/m ²	ASTM D1822

1. The nominal properties reported herein are typical of the product, but do not reflect normal testing variance and therefore should not be used for specification purposes. Values are rounded. The physical properties were determined on compression molded specimens that were prepared in accordance with Procedure C of ASTM D4703, Annex A1.

MSDS #240370

Revision Date July, 2004

Another quality product from



Before using this product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Chevron Phillips Chemical Company LP does not make, and expressly disclaims, all warranties, including warranties of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.



CoA Date: 08/30/2010

Certificate of Analysis

Shipped To: AGRU AMERICA INC
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

CPC Delivery #: 88118435
PO #: 5556
Weight: 182900 LB
Ship Date: 08/30/2010
Package: BULK
Mode: Hopper Car
Car #: CHVX898104
Seal No: 264706

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: 8200987

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.25	g/10mi
HLMI Flow Rate	ASTM D1238	23	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	29	pel/g
Production Date		08/27/2010	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4782



CoA Date: 08/30/2010

Certificate of Analysis

Shipped To: AGRU AMERICA INC
500 GARRISON RD
GEORGETOWN SC 29440
USA

CPC Delivery #: 88118436
PO #: 5556
Weight: 182400 LB
Ship Date: 08/30/2010
Package: BULK
Mode: Hopper Car
Car #: CHVX896033
Seal No: 264707

Recipient: PALMER
Fax:

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: 8200988

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.25	g/10mi
HLMI Flow Rate	ASTM D1238	22	g/10mi
Density	D1505 or D4883	0.937	g/cm3
Pellet Count	P02.08.03	29	pel/g
Production Date		08/27/2010	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP.
However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4782



CoA Date: 09/01/2010

Certificate of Analysis

Shipped To: AGRU AMERICA INC
500 GARRISON RD
GEORGETOWN SC 29440
USA

Recipient: PALMER
Fax:

CPC Delivery #: 88119675
PO #: 5589
Weight: 184700 LB
Ship Date: 09/01/2010
Package: BULK
Mode: Hopper Car
Car #: NAHX620297
Seal No: 264703

Product:
MARLEX POLYETHYLENE K307 BULK

Lot Number: 8200990

Property	Test Method	Value	Unit
Melt Index	ASTM D1238	0.26	g/10mi
HLMF Flow Rate	ASTM D1238	21	g/10mi
Density	D1505 or D4883	0.938	g/cm ³
Pellet Count	P02.08.03	31	pel/g
Production Date		08/27/2010	

The data set forth herein have been carefully compiled by Chevron Phillips Chemical Company LP. However, there is no warranty of any kind, either expressed or implied, applicable to its use, and the user assumes all risk and liability in connection therewith.

Troy Griffin
Quality Systems Coordinator

For CoA questions contact Customer Service Representative at +1-832-813-4782



Rex L. Bobsein, Ph.D., Polyethylene Materials and Applications Development
 Room 109 PTC ■ Bartlesville, OK 74004 ■
 918-661-0089 ■ bobsei1@cpchem.com ■ Fax: 918-662-2550 ■ www.cpchem.com

January 16, 2006

Grant Palmer
 Agru America
 500 Garrison Road
 Georgetown, SC 29440

Dear Grant:

This letter is to re-report the results of oven aging and UV aging testing (according to GRI-GM13 and GRI-GM17) on Agru America sheet samples that you provided to us in 2004. A graphical summary of the results was sent to you on 4/1/2005. The testing was performed by CPChem's Evaluation Laboratory in Bartlesville, OK. Oven-aging tests were completed 12/17/2004. UV-aging tests were completed on 12/13/2004.

GRI-GM13 (HDPE) and GRI-GM17 (LLDPE) durability testing was done according to the following procedures.

Test	Exposure	Method
Std. OIT	200°C, atmospheric pressure oxygen	D3895
HP-OIT	150°C, 500 psi oxygen	D5885
Oven Aging	90 days, 85°C	D5721
UV Aging	1600 UV hrs (Conditions were 20 hours UVA-340 at 75°C followed by 4 hrs dark with condensation at 60°C. Irradiance was 0.72 W/m ² at 340nm.)	GRI-GM11

Oven Aging Results

Sample	Initial HP-OIT (min.)	HP-OIT Value after Oven Aging (min.)	% HP-OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE tex Roll # 312588 from Marlex [®] 7104 Lot # CPN811170	514	396	77	60
60 mil HDPE Roll # 315103-04 from Marlex [®] K307 Lot # 71-3-1465	1461	1547	106	80

Sample	Initial Std. OIT (min.)	Std. OIT Value after Oven Aging (min.)	% Std. OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE tex Roll # 312588 from Marlex [®] 7104 Lot # CPN811170	151	58	38	35
60 mil HDPE Roll # 315103-04 from Marlex [®] K307 Lot # 71-3-1465	201	127	63	55


UV Aging Results

Sample	Initial HP-OIT (min.)	HP-OIT Value after UV Aging (min.)	% HP-OIT Retained	GRI-GM13 or GRI-GM17 % Retained Requirement
40 mil LLDPE tex Roll # 312588 from Marlex® 7104 Lot # CPN811170	514	460	89	35
60 mil HDPE Roll # 315103-04 from Marlex® K307 Lot # 71-3-1465	1461	1513	104	50

According to these test results, the durability requirements are met.

If you have any questions, please call me at 918-661-0089.

Sincerely,



Rex L. Bobsein, Ph.D.
Polyethylene Materials and Applications Development

*Any technical advice, recommendations, results, or analysis ("Information") contained herein, including, without limitation, information as it may relate to the selection of a specific product ("Product") for your use and application, is given **without warranty or guarantee** and is accepted at your sole risk. It is imperative that you test the Information (and Product, if applicable) to determine to your own satisfaction whether the Information (and Product, if applicable) are suitable for your intended use and application. You expressly assume, and release Chevron Phillips Chemical Company, from all risk and liability, whether based in contract, tort or otherwise, in connection with the use of, or results obtained from, such Information (and Product, if applicable).*



Rex L. Bobsein, Polyethylene Materials and Applications Development
Room 109 PTC ■ Bartlesville, OK 74004 ■
918-661-0089 ■ bobseri@cpchem.com ■ Fax: 918-662-2550 ■ www.cpchem.com

May 12, 2010

Grant Palmer
Agru America
500 Garrison Road
Georgetown, SC 29440

Dear Grant:

Per your request for this information, there has been no change to the additive formulation specifications of Marlex[®] 7104 and K307 polyethylene resins since GRI-GM13 and GRI-GM17 oven- and UV-aging testing was performed on Agru America sheet from these resins in December 2004.

If you have any questions, please call me at 918-661-0089.

Sincerely,

A handwritten signature in cursive script that reads "Rex L. Bobsein".

Rex L. Bobsein, Ph.D.
Polyethylene Materials and Applications Development

Any technical advice, recommendations, results, or analysis ("Information") contained herein, including, without limitation, information as it may relate to the selection of a specific product ("Product") for your use and application, is given without warranty or guarantee and is accepted at your sole risk. It is imperative that you test the Information (and Product, if applicable) to determine to your own satisfaction whether the Information (and Product, if applicable) are suitable for your intended use and application. You expressly assume, and release Chevron Phillips Chemical Company, from all risk and liability, whether based in contract, tort or otherwise, in connection with the use of, or results obtained from, such Information (and Product, if applicable).



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ROLL # **338579-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.63 mm	64 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	27/32 mil AVE:	1.52 mm	60 mil	TEST RESULTS		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

Specific Gravity	Density			g/cc	.947	
ASTM D792						

MFI ASTM D1238	Melt Flow Index 190°C /2160 g			g/10 min	.25	
COND. E						
GRADE:	K307					

Carbon Black Content	Range			%	2.28	
ASTM D4218						

Carbon Black Dispersion	Category				10 In Cat 1	
ASTM D5596						

Tensile Strength	Average Strength @ Yield	26 N/mm (kN/m)	148 ppi	2,481 psi
ASTM D6693				
ASTM D638 (Modified)	Average Strength @ Break	29 N/mm (kN/m)	168 ppi	2,808 psi
(2 inches / minute)				

Elongation ASTM D6693	Average Elongation @ Yield			%	17.28	
ASTM D638 (Modified)						
(2 inches / minute)	Average Elongation @ Break			%	469.2	
Lo = 1.3" Yield						
Lo = 2.0" Break						

Dimensional Stability	Average Dimensional change			%	-0.12	
ASTM D1204 (Modified)						

Tear Resistance	Average Tear Resistance	233.4 N			52.462 lbs
ASTM D-1004 (Modified)					

Puncture Resistance	Load	378.6 N			85.124 lbs
FTMS 101 Method 2065 (Modified)					

Puncture Resistance	Load	602.6 N			135.47 lbs
ASTM D4833 (Modified)					

ESCR	Minimum Hrs w/o Failures	1500 hrs			CERTIFIED
ASTM D1693					

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs			ONGOING
ASTM D5397					

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-24-10**
 Signature..... *[Signature]*
 Quality Control Department
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quality certificate

ROLL # **338680-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.41 mm	56 mil	Length.....	146.306 m	480.0 feet
	MAX:	1.63 mm	64 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	27/31 mil AVE:	1.49 mm	59 mil	OIT(Standard) ASTM D3895 minutes 190		

TEST RESULTS

Specific Gravity ASTM D792	Density			g/cc		.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g			g/10 min		.25
Carbon Black Content ASTM D4218	Range			%		2.28
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			25 N/mm (kN/m)	146 ppi	2,481 psi
	Average Strength @ Break			29 N/mm (kN/m)	165 ppi	2,808 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		17.28
	Average Elongation @ Break			%		469.2
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			233.4 N		52,462 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			378.6 N		85.124 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			602.6 N		135.47 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-24-10**

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 Quality Control Department

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quality certificate

ROLL # **338681-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.62 mm	64 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	27/31 mil	AVE:	1.51 mm	59 mil		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.32
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26	N/mm (kN/m)	150	ppi	2,523 psi
	Average Strength @ Break	29	N/mm (kN/m)	167	ppi	2,811 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.05
	Average Elongation @ Break		%			457.3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.0	N			48.788 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	366.8	N			82.458 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	557.0	N			125.21 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
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 Destination **Lecanto, FL**

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ROLL # **338682-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.47 mm	58 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.61 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	28/33 mil AVE:	1.53 mm	60 mil	TEST RESULTS		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.32
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27	N/mm (kN/m)	152	ppi	2,523 psi
	Average Strength @ Break	30	N/mm (kN/m)	169	ppi	2,811 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.05
	Average Elongation @ Break		%			457.3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.0	N			48.788 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	366.8	N			82.458 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	557.0	N			125.21 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
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Date:..... **9-25-10**

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ROLL # **338683-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.60 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 27/33 mil AVE: 1.54 mm 61 mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes **190** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.946**

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.25**

Carbon Black Content ASTM D4218 Range % **2.32**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 (2 inches / minute)	Average Strength @ Yield	27 N/mm (kN/m)	153 ppi	2,523 psi
	Average Strength @ Break	30 N/mm (kN/m)	170 ppi	2,811 psi

Elongation ASTM D6693 (2 inches / minute)	Average Elongation @ Yield	%	16.05
Lo = 1.3" Yield	Average Elongation @ Break	%	457.3

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.12**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **217.0** N **48.788** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **366.8** N **82.458** lbs

Puncture Resistance ASTM D4833 (Modified) Load **557.0** N **125.21** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
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Destination **Lecanto, FL**

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ROLL # **338684-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.44 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.66 mm	65 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	27/31 mil	AVE:	1.51 mm	59 mil		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.32
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26	N/mm (kN/m)	150	ppi	2,523 psi
	Average Strength @ Break	29	N/mm (kN/m)	167	ppi	2,811 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.05
	Average Elongation @ Break		%			457.3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	217.0	N			48.788 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	366.8	N			82.458 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	557.0	N			125.21 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
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 Quality Control Department

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ROLL # **338685-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.60 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 28/29 mil AVE: 1.51 mm 59 mil OIT(Standard) ASTM D3895 minutes **190** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc .946

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min .25

Carbon Black Content ASTM D4218 Range % 2.28

Carbon Black Dispersion ASTM D5596 Category 10 In Cat 1

Tensile Strength ASTM D6693 Average Strength @ Yield 24 N/mm (kN/m) 136 ppi 2,288 psi
 ASTM D638 (Modified) Average Strength @ Break 28 N/mm (kN/m) 159 ppi 2,670 psi
 (2 inches / minute)

Elongation ASTM D6693 Average Elongation @ Yield % 17.34
 ASTM D638 (Modified) Average Elongation @ Break % 474.5
 (2 inches / minute)
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % -0.12

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance 210.1 N 47.243 lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load 417.1 N 93.774 lbs

Puncture Resistance ASTM D4833 (Modified) Load 568.3 N 127.75 lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**
 Signature: *[Signature]*
 Quality Control Department

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ROLL # **338686-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.40 mm	55 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.53 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	27/30 mil AVE:	1.49 mm	59 mil	TEST RESULTS		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.28
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	24	N/mm (kN/m)	134	ppi	2,288 psi
	Average Strength @ Break	27	N/mm (kN/m)	157	ppi	2,670 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.34
	Average Elongation @ Break		%			474.5
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	210.1	N			47.243 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	417.1	N			93.774 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	568.3	N			127.75 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**

Signature: *[Handwritten Signature]*
 Quality Control Department

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quality certificate

ROLL # **338687-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.39 mm	55 mil	Length.....	146.306 m	480.0 feet
	MAX:	1.59 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	27/30 mil AVE:	1.50 mm	59 mil	OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density			g/cc		.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g			g/10 min		.25
Carbon Black Content ASTM D4218	Range			%		2.28
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			24 N/mm (kN/m)	135 ppi	2,288 psi
	Average Strength @ Break			28 N/mm (kN/m)	158 ppi	2,670 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		17.34
	Average Elongation @ Break			%		474.5
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			210.1 N		47.243 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			417.1 N		93.774 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			568.3 N		127.75 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-25-10**

Signature..... *[Signature]*
 Quality Control Department

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quality certificate

ROLL # **338688-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.61 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	25/37 mil	AVE:	1.52 mm	60 mil		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.28
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	24	N/mm (kN/m)	137	ppi	2,288 psi
	Average Strength @ Break	28	N/mm (kN/m)	160	ppi	2,670 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.34
	Average Elongation @ Break		%			474.5
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	210.1	N			47.243 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	417.1	N			93.774 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	568.3	N			127.75 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**

Signature: 
 Quality Control Department

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quality certificate

ROLL # **338689-10** Lot #: **8200987** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.63 mm	64 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 27/32 mil AVE: 1.52 mm 60 mil OIT(Standard) ASTM D3895 minutes 190 **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc .948

MFI ASTM D1238 COND. E GRADE: K307 Melt Flow Index 190°C /2160 g g/10 min .25

Carbon Black Content ASTM D4218 Range % 2.20

Carbon Black Dispersion ASTM D5596 Category 10 In Cat 1

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Yield 27 N/mm (kN/m) 152 ppi 2,537 psi
 Average Strength @ Break 29 N/mm (kN/m) 163 ppi 2,728 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Yield % 17.40
 Lo = 1.3" Yield Average Elongation @ Break % 456.2
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % -0.12

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance 229.9 N 51.690 lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load 418.4 N 94.063 lbs

Puncture Resistance ASTM D4833 (Modified) Load 627.4 N 141.04 lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs CERTIFIED

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**
 Signature: *[Handwritten Signature]*
 Quality Control Department

60HDmic FRM
 REV 03
 12/23/05



quality certificate

ROLL # **338690-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

MIN:

METRIC ENGLISH
1.39 mm 55 mil

MAX:

1.65 mm 65 mil

AVE:

1.51 mm 59 mil

Thickness..... 1.5 mm 60 mil
Length..... 146.306 m 480.0 feet
Width..... 7.00 m; 23.0 feet

Asperity ASTM D7466: 29/29 mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes 190 **TEST RESULTS**

Specific Gravity
ASTM D792

Density

g/cc

.948

MFI ASTM D1238
COND. E
GRADE: **K307**

Melt Flow Index 190°C /2160 g

g/10 min

.25

Carbon Black Content
ASTM D4218

Range

%

2.20

Carbon Black Dispersion
ASTM D5596

Category

10 In Cat 1

Tensile Strength
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Yield

26 N/mm (kN/m)

151 psi

2,537 psi

Average Strength @ Break

28 N/mm (kN/m)

162 psi

2,728 psi

Elongation ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Yield

%

17.40

Average Elongation @ Break

%

456.2

Dimensional Stability
ASTM D1204 (Modified)

Average Dimensional change

%

-0.12

Tear Resistance
ASTM D-1004 (Modified)

Average Tear Resistance

229.9 N

51.690 lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified)

Load

418.4 N

94.063 lbs

Puncture Resistance
ASTM D4833 (Modified)

Load

627.4 N

141.04 lbs

ESCR
ASTM D1693

Minimum Hrs w/o Failures

1500 hrs

CERTIFIED

Notched Constant Tensile Load
ASTM D5397

pass / fail @ 30%

300 hrs

ONGOING

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-25-10**

Signature: *[Handwritten Signature]*
Quality Control Department

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12/23/05



quality certificate

ROLL # **338691-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.62 mm	64 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 30/30 mil AVE: 1.50 mm 59 mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes 190 **TEST RESULTS**

Specific Gravity Density g/cc .948
 ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min .25
 COND. E
 GRADE: K307

Carbon Black Content Range % 2.20
 ASTM D4218

Carbon Black Dispersion Category 10 In Cat 1
 ASTM D5596

Tensile Strength Average Strength @ Yield 26 N/mm (kNm) 150 ppi 2,537 psi
 ASTM D6693
 ASTM D638 (Modified)
 (2 inches / minute)
 Average Strength @ Break 28 N/mm (kNm) 161 ppi 2,728 psi

Elongation ASTM D6693 Average Elongation @ Yield % 17.40
 ASTM D638 (Modified)
 (2 inches / minute)
 Lo = 1.3" Yield
 Lo = 2.0" Break Average Elongation @ Break % 456.2

Dimensional Stability Average Dimensional change % -0.12
 ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance 229.9 N 51.690 lbs
 ASTM D-1004 (Modified)

Puncture Resistance Load 418.4 N 94.063 lbs
 FTMS 101 Method 2065 (Modified)

Puncture Resistance Load 627.4 N 141.04 lbs
 ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs CERTIFIED
 ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs ONGOING
 ASTM D5397

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**
 Signature: *[Handwritten Signature]*
 Quality Control Department

60H0mic FRM
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 12/23/05



quality certificate

ROLL # **338692-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.60 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **28/29 mil AVE: 1.52 mm 60 mil** OIT(Standard) ASTM D3895 minutes **190** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.948**

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.25**

Carbon Black Content ASTM D4218 Range % **2.20**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 Average Strength @ Yield **27 N/mm (kN/m) 152 ppi 2,537 psi**
 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Break **29 N/mm (kN/m) 163 ppi 2,728 psi**

Elongation ASTM D6693 Average Elongation @ Yield % **17.40**
 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Break % **456.2**
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.12**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **229.9 N 51.690 lbs**

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **418.4 N 94.063 lbs**

Puncture Resistance ASTM D4833 (Modified) Load **627.4 N 141.04 lbs**

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**
 Signature: *[Signature]*
 Quality Control Department

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quality certificate

ROLL # **338693-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	146.306 m	480.0 feet
(Modified)	MAX:	1.54 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	25/33 mil	AVE:	1.50 mm	59 mil		
				OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc				.945
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min				.25
Carbon Black Content ASTM D4218	Range	%				2.24
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm (kN/m)	146 ppi			2,472 psi
	Average Strength @ Break	27 N/mm (kN/m)	153 ppi			2,596 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%				16.50
	Average Elongation @ Break	%				450.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%				-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	245.0 N			55.086 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	458.3 N			103.03 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	601.3 N			135.18 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs				CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-25-10**
 Signature..... *[Signature]*
 Quality Control Department

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 12/23/05



quality certificate

ROLL # **338694-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

	METRIC	ENGLISH
MIN:	1.48 mm	58 mil
MAX:	1.59 mm	63 mil
AVE:	1.54 mm	61 mil

Thickness.....	1.5 mm	60 mil
Length.....	146.306 m	480.0 feet
Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **27/27** mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes **190** **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.945
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MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.25
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Carbon Black Content ASTM D4218	Range	%	2.24
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Carbon Black Dispersion ASTM D5596	Category		10 In Cat 1
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Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm (kN/m)	150 ppi	2,472 psi
	Average Strength @ Break	28 N/mm (kN/m)	157 ppi	2,596 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.50
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	Average Elongation @ Break	%	450.6
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Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.12
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Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	245.0 N	55.086 lbs
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Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	458.3 N	103.03 lbs
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Puncture Resistance ASTM D4833 (Modified)	Load	601.3 N	135.18 lbs
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ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
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Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING
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Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date:..... **9-25-10**

Signature..... *[Signature]*
Quality Control Department

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quality certificate

ROLL # **338695-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.44 mm	57 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.66 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 27/30 mil AVE: 1.52 mm 60 mil OIT(Standard) ASTM D3895 minutes 190 **TEST RESULTS**

Specific Gravity
ASTM D792 Density g/cc .945

MFI ASTM D1238
COND. E Melt Flow Index 190°C /2160 g g/10 min .25
GRADE: K307

Carbon Black Content
ASTM D4218 Range % 2.24

Carbon Black Dispersion
ASTM D5596 Category 10 In Cat 1

Tensile Strength
ASTM D6693 Average Strength @ Yield 26 N/mm (kN/m) 148 ppi 2,472 psi
ASTM D638 (Modified)
(2 inches / minute) Average Strength @ Break 27 N/mm (kN/m) 155 ppi 2,596 psi

Elongation ASTM D6693
ASTM D638 (Modified) Average Elongation @ Yield % 16.50
(2 inches / minute)
Lo = 1.3" Yield Average Elongation @ Break % 450.6
Lo = 2.0" Break

Dimensional Stability
ASTM D1204 (Modified) Average Dimensional change % -0.12

Tear Resistance
ASTM D-1004 (Modified) Average Tear Resistance 245.0 N 55.086 lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified) Load 458.3 N 103.03 lbs

Puncture Resistance
ASTM D4833 (Modified) Load 601.3 N 135.18 lbs

ESCR
ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-25-10**
Signature: *[Handwritten Signature]*
Quality Control Department

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quality certificate

ROLL # **338696-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.65 mm	65 mil	Width.....	7.00 m;	23.0 feet
Asperity ASTM D7466:	26/31 mil	AVE:	1.53 mm	60 mil		
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	190

TEST RESULTS

Specific Gravity ASTM D792	Density			g/cc		.945
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g			g/10 min		.25
Carbon Black Content ASTM D4218	Range			%		2.24
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			26 N/mm (kN/m)	149 ppi	2,472 psi
	Average Strength @ Break			27 N/mm (kN/m)	156 ppi	2,596 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		16.50
	Average Elongation @ Break			%		450.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.12
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			245.0 N		55.086 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			458.3 N		103.03 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			601.3 N		135.18 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-25-10**

Signature: *[Handwritten Signature]*
 Quality Control Department

60HDmic FRM
 REV 03
 12/23/05



quality certificate

ROLL # **338797-10**

Lot #: **8200987**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.66 mm	65 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	26/30 mil AVE:	1.53 mm	60 mil	OIT(Standard) ASTM D3895	minutes	190
TOP / BOTTOM						TEST RESULTS

Specific Gravity ASTM D792	Density			g/cc		.946
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MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g			g/10 min		.25
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Carbon Black Content ASTM D4218	Range			%		2.42
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Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
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Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	28 N/mm (kN/m)	159 ppi	2,642 psi
	Average Strength @ Break	32 N/mm (kN/m)	182 ppi	3,020 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield	Average Elongation @ Yield			%	15.54
Lo = 2.0" Break	Average Elongation @ Break			%	470.2

Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%	-0.12
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Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	212.0 N		47.670 lbs
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Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	422.0 N		94.875 lbs
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Puncture Resistance ASTM D4833 (Modified)	Load	568.0 N		127.70 lbs
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ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs		CERTIFIED
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Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs		ONGOING
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Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-26-10**
 Signature..... *[Signature]*
 Quality Control Department

60HDmic.FRM
 REV 03
 12/23/05



quality certificate

ROLL # **338798-10** Lot #: **8200988** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.67 mm	66 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/31 mil AVE: 1.53 mm 60 mil OIT(Standard) ASTM D3895 minutes 194 **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc .947

MFI ASTM D1238 COND. E GRADE: K307 Melt Flow Index 190°C /2160 g g/10 min .25

Carbon Black Content ASTM D4218 Range % 2.42

Carbon Black Dispersion ASTM D5596 Category 10 In Cat 1

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Yield 28 N/mm (kN/m) 159 ppi 2,642 psi
Average Strength @ Break 32 N/mm (kN/m) 182 ppi 3,020 psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break Average Elongation @ Yield % 15.54
Average Elongation @ Break % 470.2

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % -0.55

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance 212.0 N 47.670 lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load 422.0 N 94.875 lbs

Puncture Resistance ASTM D4833 (Modified) Load 568.0 N 127.70 lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-26-10**
Signature: *[Signature]*
Quality Control Department

60HDmic.FRM
REV 03
12/23/05



quality certificate

ROLL # **338799-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

METRIC ENGLISH
MIN: 1.39 mm 55 mil
MAX: 1.64 mm 65 mil

Thickness..... 1.5 mm 60 mil
Length..... 153.926 m 505.0 feet
Width..... 7.00 m; 23.0 feet

Asperity ASTM D7466: 27/33 mil AVE: 1.51 mm 59 mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes 194 **TEST RESULTS**

Specific Gravity
ASTM D792

Density g/cc .947

MFI ASTM D1238
COND. E
GRADE: **K307**

Melt Flow Index 190°C /2160 g g/10 min .25

Carbon Black Content
ASTM D4218

Range % 2.42

Carbon Black Dispersion
ASTM D5596

Category 10 In Cat 1

Tensile Strength
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Yield 28 N/mm (kN/m) 157 ppi 2,642 psi

Average Strength @ Break 31 N/mm (kN/m) 180 ppi 3,020 psi

Elongation ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Yield % 15.54

Average Elongation @ Break % 470.2

Dimensional Stability
ASTM D1204 (Modified)

Average Dimensional change % -0.55

Tear Resistance
ASTM D-1004 (Modified)

Average Tear Resistance 212.0 N 47.670 lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified)

Load 422.0 N 94.875 lbs

Puncture Resistance
ASTM D4833 (Modified)

Load 568.0 N 127.70 lbs

ESCR
ASTM D1693

Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397

pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-26-10**

Signature: *[Signature]*
Quality Control Department

80HDmic FRM
REV 03
12/23/05



quality certificate

ROLL # **338700-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.36 mm	54 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.58 mm	62 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **26/30** mil AVE: **1.50** mm **59** mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity
ASTM D792 Density g/cc **.947**

MFI ASTM D1238
COND. E Melt Flow Index 190°C /2160 g g/10 min **.25**
GRADE: **K307**

Carbon Black Content
ASTM D4218 Range % **2.42**

Carbon Black Dispersion
ASTM D5596 Category **10 In Cat 1**

Tensile Strength
ASTM D6693 Average Strength @ Yield **27** N/mm (kN/m) **156** ppi **2,642** psi
ASTM D638 (Modified)
(2 inches / minute) Average Strength @ Break **31** N/mm (kN/m) **178** ppi **3,020** psi

Elongation ASTM D6693
ASTM D638 (Modified) Average Elongation @ Yield % **15.54**
(2 inches / minute)
Lo = 1.3" Yield Average Elongation @ Break % **470.2**
Lo = 2.0" Break

Dimensional Stability
ASTM D1204 (Modified) Average Dimensional change % **-0.55**

Tear Resistance
ASTM D-1004 (Modified) Average Tear Resistance **212.0** N **47.670** lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified) Load **422.0** N **94.875** lbs

Puncture Resistance
ASTM D4833 (Modified) Load **568.0** N **127.70** lbs

ESCR
ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-26-10**

Signature: *[Handwritten Signature]*

Quality Control Department

80HDmic.FRM
REV 03
12/23/05



quality certificate

ROLL # **338701-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.64 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **26/30** mil AVE: **1.52 mm 60 mil** OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**
 TOP / BOTTOM

Specific Gravity ASTM D792	Density		g/cc			.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.42
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27	N/mm (kNm)	152	ppi	2,534 psi
	Average Strength @ Break	32	N/mm (kNm)	184	ppi	3,083 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.84
	Average Elongation @ Break		%			523.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.1	N			49.924 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	412.9	N			92.826 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	576.6	N			129.62 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**
 Signature: *[Signature]*
 Quality Control Department

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ROLL # **338702-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.42 mm	56 mil	Length.....	153.926 m	505.0 feet
	MAX: 1.58 mm	62 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: 29/30 mil	AVE: 1.50 mm	59 mil	TEST RESULTS		
TOP / BOTTOM			OIT(Standard) ASTM D3895 minutes	194	
Specific Gravity ASTM D792	Density		g/cc		.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min		.25
Carbon Black Content ASTM D4218	Range		%		2.42
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm (kN/m)	150 ppi	2,534	psi
	Average Strength @ Break	32 N/mm (kN/m)	182 ppi	3,083	psi
Elongation ASTM D6693 (Modified) (2 inches / minute)	Average Elongation @ Yield		%		17.84
Lo = 1.3" Yield	Average Elongation @ Break		%		523.6
Lo = 2.0" Break					
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.1 N		49.924	lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	412.9 N		92.826	lbs
Puncture Resistance ASTM D4833 (Modified)	Load	576.6 N		129.62	lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

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 Quality Control Department

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ROLL # **338703-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.47 mm	58 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.62 mm	64 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **28/32** mil AVE: **1.53** mm **60** mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity Density g/cc **.947**
 ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min **.25**
 COND. E
 GRADE: **K307**

Carbon Black Content Range % **2.42**
 ASTM D4218

Carbon Black Dispersion Category **10 In Cat 1**
 ASTM D5596

Tensile Strength Average Strength @ Yield **27** N/mm (kN/m) **153** ppi **2,534** psi
 ASTM D6693
 ASTM D638 (Modified)
 (2 inches / minute)

Average Strength @ Break **33** N/mm (kN/m) **186** ppi **3,083** psi

Elongation ASTM D6693 Average Elongation @ Yield % **17.84**
 ASTM D638 (Modified)
 (2 inches / minute)

Lo = 1.3" Yield Average Elongation @ Break % **523.6**
 Lo = 2.0" Break

Dimensional Stability Average Dimensional change % **-0.55**
 ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance **222.1** N **49.924** lbs
 ASTM D-1004 (Modified)

Puncture Resistance Load **412.9** N **92.826** lbs
 FTMS 101 Method 2065 (Modified)

Puncture Resistance Load **576.6** N **129.62** lbs
 ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures **1500** hrs **CERTIFIED**
 ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% **300** hrs **ONGOING**
 ASTM D5397

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

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ROLL # **338704-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.44 mm	57 mil	Length.....	153.926 m	505.0 feet
	MAX:	1.58 mm	62 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	30/32 mil	AVE:	1.51 mm	59 mil	OIT(Standard) ASTM D3895	minutes 194

TEST RESULTS

Specific Gravity ASTM D792	Density		g/cc			.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.42
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26	N/mm (kN/m)	151	ppi	2,534 psi
	Average Strength @ Break	32	N/mm (kN/m)	183	ppi	3,083 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.84
	Average Elongation @ Break		%			523.6
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.1	N			49.924 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	412.9	N			92.826 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	576.6	N			129.62 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

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ROLL # **338705-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.55 mm	61 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/29 mil AVE: 1.50 mm 59 mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes 194 **TEST RESULTS**

Specific Gravity Density g/cc .946
 ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min .25
 COND. E
 GRADE: **K307**

Carbon Black Content Range % 2.29
 ASTM D4218

Carbon Black Dispersion Category 10 In Cat 1
 ASTM D5596

Tensile Strength Average Strength @ Yield 27 N/mm (kN/m) 153 ppi 2,583 psi
 ASTM D6693
 ASTM D638 (Modified)
 (2 inches / minute)

Average Strength @ Break 27 N/mm (kN/m) 155 ppi 2,618 psi

Elongation ASTM D6693 Average Elongation @ Yield % 16.79
 ASTM D638 (Modified)
 (2 inches / minute)
 Lo = 1.3" Yield
 Lo = 2.0" Break

Average Elongation @ Break % 427.3

Dimensional Stability Average Dimensional change % -0.55
 ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance 229.0 N 51.473 lbs
 ASTM D-1004 (Modified)

Puncture Resistance Load 475.8 N 106.97 lbs
 FTMS 101 Method 2065 (Modified)

Puncture Resistance Load 635.4 N 142.85 lbs
 ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
 ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
 ASTM D5397

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

Signature: *[Handwritten Signature]*
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ROLL # **338706-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.61 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 28/29 mil AVE: 1.52 mm 60 mil OIT(Standard) ASTM D3895 minutes 194 **TEST RESULTS**

Specific Gravity
ASTM D792 Density g/cc .946

MFI ASTM D1238
COND. E Melt Flow Index 190°C /2160 g g/10 min .25
GRADE: **K307**

Carbon Black Content
ASTM D4218 Range % 2.29

Carbon Black Dispersion
ASTM D5596 Category 10 In Cat 1

Tensile Strength
ASTM D6693 Average Strength @ Yield 27 N/mm (kN/m) 155 ppi 2,583 psi
ASTM D638 (Modified)
(2 inches / minute) Average Strength @ Break 27 N/mm (kN/m) 157 ppi 2,618 psi

Elongation ASTM D6693
ASTM D638 (Modified) Average Elongation @ Yield % 16.79
(2 inches / minute)
Lo = 1.3" Yield Average Elongation @ Break % 427.3
Lo = 2.0" Break

Dimensional Stability
ASTM D1204 (Modified) Average Dimensional change % -0.55

Tear Resistance
ASTM D-1004 (Modified) Average Tear Resistance 229.0 N 51.473 lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified) Load 475.8 N 106.97 lbs

Puncture Resistance
ASTM D4833 (Modified) Load 635.4 N 142.85 lbs

ESCR
ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-26-10**
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ROLL # **338707-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

METRIC ENGLISH
MIN: **1.43 mm 56 mil**
MAX: **1.61 mm 63 mil**

Thickness..... **1.5 mm 60 mil**
Length..... **153.926 m 505.0 feet**
Width..... **7.00 m 23.0 feet**

Asperity ASTM D7466: **28/30 mil**
TOP / BOTTOM

AVE: **1.49 mm 59 mil**

OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity
ASTM D792

Density **g/cc** **.946**

MFI ASTM D1238
COND. E
GRADE: **K307**

Melt Flow Index 190°C /2160 g **g/10 min** **.25**

Carbon Black Content
ASTM D4218

Range **%** **2.29**

Carbon Black Dispersion
ASTM D5596

Category **10 In Cat 1**

Tensile Strength
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Yield **27 N/mm (kN/m)** **152 ppi** **2,583 psi**

Average Strength @ Break **27 N/mm (kN/m)** **154 ppi** **2,618 psi**

Elongation ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Yield **%** **16.79**

Average Elongation @ Break **%** **427.3**

Dimensional Stability
ASTM D1204 (Modified)

Average Dimensional change **%** **-0.55**

Tear Resistance
ASTM D-1004 (Modified)

Average Tear Resistance **229.0 N** **51.473 lbs**

Puncture Resistance
FTMS 101 Method 2065 (Modified)

Load **475.8 N** **106.97 lbs**

Puncture Resistance
ASTM D4833 (Modified)

Load **635.4 N** **142.85 lbs**

ESCR
ASTM D1693

Minimum Hrs w/o Failures **1500 hrs** **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397

pass / fail @ 30% **300 hrs** **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date:..... **9-26-10**

Signature..... *[Signature]*
Quality Control Department

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ROLL # **338708-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	28/28 mil AVE:	1.52 mm	60 mil			
TOP / BOTTOM				OIT(Standard) ASTM D3895	minutes	194

TEST RESULTS

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.25
Carbon Black Content ASTM D4218	Range		%			2.29
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27	N/mm (kN/m)	155	ppi	2,583 psi
	Average Strength @ Break	27	N/mm (kN/m)	157	ppi	2,618 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.79
	Average Elongation @ Break		%			427.3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	229.0	N			51.473 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	475.8	N			106.97 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	635.4	N			142.85 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

Signature: 
 Quality Control Department

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ROLL # **338709-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.39 mm	55 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.57 mm	62 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **28/30** mil AVE: **1.50** mm **59** mil OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity
ASTM D792 Density g/cc **.945**

MFI ASTM D1238
COND. E Melt Flow Index 190°C /2160 g g/10 min **.25**
GRADE: **K307**

Carbon Black Content
ASTM D4218 Range % **2.27**

Carbon Black Dispersion
ASTM D5596 Category **10 In Cat 1**

Tensile Strength
ASTM D6693 Average Strength @ Yield **27** N/mm (kN/m) **155** ppi **2,619** psi
ASTM D638 (Modified)
(2 inches / minute) Average Strength @ Break **31** N/mm (kN/m) **176** ppi **2,975** psi

Elongation ASTM D6693
ASTM D638 (Modified) Average Elongation @ Yield % **17.50**
(2 inches / minute)
Lo = 1.3" Yield Average Elongation @ Break % **493.8**
Lo = 2.0" Break

Dimensional Stability
ASTM D1204 (Modified) Average Dimensional change % **-0.55**

Tear Resistance
ASTM D-1004 (Modified) Average Tear Resistance **238.6** N **53.644** lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified) Load **473.8** N **106.52** lbs

Puncture Resistance
ASTM D4833 (Modified) Load **624.1** N **140.31** lbs

ESCR
ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-26-10**

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ROLL # **338710-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.42 mm	56 mil	Length.....	153.926 m	505.0 feet
	MAX:	1.53 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	26/34 mil	AVE:	1.48 mm 58 mil	OIT(Standard) ASTM D3895	minutes	194

TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.945		
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.25		
Carbon Black Content ASTM D4218	Range	%	2.27		
Carbon Black Dispersion ASTM D5596	Category		10 In Cat 1		
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27 N/mm (kN/m)	153 ppi	2,619	psi
	Average Strength @ Break	30 N/mm (kN/m)	173 ppi	2,975	psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	17.50		
	Average Elongation @ Break	%	493.8		
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.55		
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	238.6 N	53.644 lbs		
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	473.8 N	106.52 lbs		
Puncture Resistance ASTM D4833 (Modified)	Load	624.1 N	140.31 lbs		
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED		
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING		

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

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ROLL # **338712-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.40 mm	55 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/27 mil AVE: 1.51 mm 59 mil OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity ASTM D792	Density			g/cc		.945
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g			g/10 min		.25
Carbon Black Content ASTM D4218	Range			%		2.27
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield			27 N/mm (kN/m)	156 ppi	2,619 psi
	Average Strength @ Break			31 N/mm (kN/m)	177 ppi	2,975 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield			%		17.50
	Average Elongation @ Break			%		493.8
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change			%		-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance			238.6 N		53.644 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load			473.8 N		106.52 lbs
Puncture Resistance ASTM D4833 (Modified)	Load			624.1 N		140.31 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures			1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%			300 hrs		ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

Signature: *[Handwritten Signature]*

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ROLL # **338713-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.47 mm	58 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.59 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/31 mil AVE: 1.53 mm 60 mil OIT(Standard) ASTM D3895 minutes 194 **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc .944

MFI ASTM D1238 COND. E GRADE: K307 Melt Flow Index 190°C /2160 g g/10 min .25

Carbon Black Content ASTM D4218 Range % 2.20

Carbon Black Dispersion ASTM D5596 Category 10 In Cat 1

Tensile Strength ASTM D6693 Average Strength @ Yield 29 N/mm (kN/m) 167 ppi 2,771 psi
 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Break 33 N/mm (kN/m) 189 ppi 3,132 psi

Elongation ASTM D6693 Average Elongation @ Yield % 16.95
 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Break % 496.7
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % -0.55

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance 228.8 N 51.433 lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load 417.9 N 93.956 lbs

Puncture Resistance ASTM D4833 (Modified) Load 560.9 N 126.09 lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**
 Signature: *[Signature]*
 Quality Control Department

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ROLL # **338714-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement ASTM D5994 (Modified)		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
	MIN:	1.44 mm	57 mil	Length.....	153.926 m	505.0 feet
	MAX:	1.60 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	28/30 mil	AVE:	1.50 mm	59 mil	OIT(Standard) ASTM D3895 minutes 194	

TEST RESULTS

Specific Gravity ASTM D792	Density	g/cc	.944	
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.25	
Carbon Black Content ASTM D4218	Range	%	2.20	
Carbon Black Dispersion ASTM D5596	Category		10 In Cat 1	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	29 N/mm (kN/m)	164 ppi	2,771 psi
	Average Strength @ Break	32 N/mm (kN/m)	185 ppi	3,132 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.95	
	Average Elongation @ Break	%	496.7	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.55	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	228.8 N	51.433 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	417.9 N	93.956 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	560.9 N	126.09 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

Signature: 
 Quality Control Department

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ROLL # **339101-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.58 mm	62 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/30 mil AVE: 1.49 mm 59 mil OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.944**

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.25**

Carbon Black Content ASTM D4218 Range % **2.20**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Yield **28** N/mm (kN/m) **163** ppi **2,771** psi

Average Strength @ Break **32** N/mm (kN/m) **184** ppi **3,132** psi

Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Yield % **16.95**

Lo = 1.3" Yield Average Elongation @ Break % **496.7**

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.55**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **228.8** N **51.433** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **417.9** N **93.956** lbs

Puncture Resistance ASTM D4833 (Modified) Load **560.9** N **126.09** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-26-10**

Signature: *[Handwritten Signature]*
 Quality Control Department

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ROLL # **339102-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

METRIC ENGLISH
MIN: **1.45 mm 57 mil**
MAX: **1.66 mm 65 mil**

Thickness..... **1.5 mm 60 mil**
Length..... **153.926 m 505.0 feet**
Width..... **7.00 m; 23.0 feet**

Asperity ASTM D7466: **26/32 mil**
TOP / BOTTOM

AVE: **1.52 mm 60 mil**

OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity
ASTM D792

Density **g/cc** **.944**

MFI ASTM D1238
COND. E
GRADE: **K307**

Melt Flow Index 190°C /2160 g **g/10 min** **.25**

Carbon Black Content
ASTM D4218

Range **%** **2.20**

Carbon Black Dispersion
ASTM D5596

Category **10 In Cat 1**

Tensile Strength
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Yield **29 N/mm (kN/m)** **166 ppi** **2,771 psi**

Average Strength @ Break **33 N/mm (kN/m)** **187 ppi** **3,132 psi**

Elongation ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Yield **%** **16.95**

Average Elongation @ Break **%** **496.7**

Dimensional Stability
ASTM D1204 (Modified)

Average Dimensional change **%** **-0.55**

Tear Resistance
ASTM D-1004 (Modified)

Average Tear Resistance **228.8 N** **51.433 lbs**

Puncture Resistance
FTMS 101 Method 2065 (Modified)

Load **417.9 N** **93.956 lbs**

Puncture Resistance
ASTM D4833 (Modified)

Load **560.9 N** **126.09 lbs**

ESCR
ASTM D1693

Minimum Hrs w/o Failures **1500 hrs** **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397

pass / fail @ 30% **300 hrs** **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-27-10**

Signature:
Quality Control Department

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ROLL # **339103-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.57 mm	62 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **26/31** mil AVE: **1.49 mm 59 mil** OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**
 TOP / BOTTOM

Specific Gravity ASTM D792 Density g/cc **.947**

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.25**

Carbon Black Content ASTM D4218 Range % **2.26**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 Average Strength @ Yield **26** N/mm (kN/m) **146** ppi **2,497** psi
 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Break **27** N/mm (kN/m) **155** ppi **2,643** psi

Elongation ASTM D6693 Average Elongation @ Yield % **18.11**
 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Break % **424.9**
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.55**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **218.7** N **49.164** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **399.1** N **89.726** lbs

Puncture Resistance ASTM D4833 (Modified) Load **557.3** N **125.29** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-27-10**
 Signature: *[Signature]*
 Quality Control Department

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ROLL # **339104-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.49 mm	59 mil	Length.....	153.926 m	505.0 feet
	MAX: 1.69 mm	67 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	26/28 mil	AVE: 1.56 mm	61 mil	OIT(Standard) ASTM D3895 minutes	194
Specific Gravity ASTM D792	Density		g/cc		.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min		.25
Carbon Black Content ASTM D4218	Range		%		2.26
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield		27 N/mm (kN/m)	153 ppi	2,497 psi
	Average Strength @ Break		28 N/mm (kN/m)	162 ppi	2,643 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		18.11
	Average Elongation @ Break		%		424.9
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.55
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance		218.7 N		49.164 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		399.1 N		89.726 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		557.3 N		125.29 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures		1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%		300 hrs		ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-27-10**

Signature: *[Handwritten Signature]*
 Quality Control Department

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ROLL # **339105-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement
ASTM D5994
(Modified)

METRIC ENGLISH
MIN: 1.44 mm 57 mil
MAX: 1.75 mm 69 mil

Thickness..... 1.5 mm 60 mil
Length..... 153.926 m 505.0 feet
Width..... 7.00 m 23.0 feet

Asperity ASTM D7466: 29/29 mil AVE: 1.57 mm 62 mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity
ASTM D792

Density g/cc **.947**

MFI ASTM D1238
COND. E

Melt Flow Index 190°C /2160 g g/10 min **.25**

GRADE: **K307**

Carbon Black Content
ASTM D4218

Range % **2.26**

Carbon Black Dispersion
ASTM D5596

Category **10 In Cat 1**

Tensile Strength
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Yield **27** N/mm (kN/m) **154** ppi **2,497** psi

Average Strength @ Break **29** N/mm (kN/m) **163** ppi **2,643** psi

Elongation ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Yield % **18.11**

Average Elongation @ Break % **424.9**

Dimensional Stability
ASTM D1204 (Modified)

Average Dimensional change % **-0.55**

Tear Resistance
ASTM D-1004 (Modified)

Average Tear Resistance **218.7** N **49.164** lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified)

Load **399.1** N **89.726** lbs

Puncture Resistance
ASTM D4833 (Modified)

Load **557.3** N **125.29** lbs

ESCR
ASTM D1693

Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397

pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-27-10**

Signature: 
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ROLL # **339106-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.40 mm	55 mil	Length.....	153.926 m	505.0 feet
	MAX: 1.64 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 29/31 mil AVE: 1.53 mm 60 mil OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity ASTM D792	Density	g/cc	.946	
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g	g/10 min	.25	
Carbon Black Content ASTM D4218	Range	%	2.25	
Carbon Black Dispersion ASTM D5596	Category		10 In Cat 1	
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm (kN/m)	149 ppi	2,468 psi
	Average Strength @ Break	28 N/mm (kN/m)	162 ppi	2,687 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%	16.72	
	Average Elongation @ Break	%	472.3	
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%	-0.55	
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	222.6 N	50.053 lbs	
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	402.8 N	90.551 lbs	
Puncture Resistance ASTM D4833 (Modified)	Load	549.6 N	123.56 lbs	
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED	
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs	ONGOING	

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-27-10**

Signature: 
Quality Control Department

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ROLL # **339107-10**

Lot #: **8200988**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.67 mm	66 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **27/28** mil AVE: **1.52** mm **60** mil OIT(Standard) ASTM D3895 minutes **194** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.946**

MFI ASTM D1238 COND. E GRADE: **K307** Melt Flow Index 190°C /2160 g g/10 min **.25**

Carbon Black Content ASTM D4218 Range % **2.25**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 Average Strength @ Yield **26** N/mm (kN/m) **148** ppi **2,468** psi
 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Break **28** N/mm (kN/m) **161** ppi **2,687** psi

Elongation ASTM D6693 Average Elongation @ Yield % **16.72**
 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Break % **472.3**
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.55**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **222.6** N **50.053** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **402.8** N **90.551** lbs

Puncture Resistance ASTM D4833 (Modified) Load **549.6** N **123.56** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-27-10**

Signature: 
 Quality Control Department

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ROLL # **339223-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.62 mm	64 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **26/30** mil AVE: **1.49** mm **59** mil OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity ASTM D792 Density g/cc **.947**

MFI ASTM D1238 COND. E Melt Flow Index 190°C /2160 g g/10 min **.26**
 GRADE: **K307**

Carbon Black Content ASTM D4218 Range % **2.38**

Carbon Black Dispersion ASTM D5596 Category **10 In Cat 1**

Tensile Strength ASTM D6693 Average Strength @ Yield **27** N/mm (kN/m) **153** ppi **2,615** psi
 ASTM D638 (Modified) (2 inches / minute) Average Strength @ Break **26** N/mm (kN/m) **150** ppi **2,557** psi

Elongation ASTM D6693 Average Elongation @ Yield % **18.01**
 ASTM D638 (Modified) (2 inches / minute) Average Elongation @ Break % **413.3**
 Lo = 1.3" Yield
 Lo = 2.0" Break

Dimensional Stability ASTM D1204 (Modified) Average Dimensional change % **-0.66**

Tear Resistance ASTM D-1004 (Modified) Average Tear Resistance **226.1** N **50.840** lbs

Puncture Resistance FTMS 101 Method 2065 (Modified) Load **443.8** N **99.771** lbs

Puncture Resistance ASTM D4833 (Modified) Load **558.9** N **125.64** lbs

ESCR ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-29-10**
 Signature: *[Handwritten Signature]*
 Quality Control Department

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ROLL # **339224-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.40 mm	55 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.59 mm	63 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466:	30/25 mil	AVE:	1.49 mm	59 mil	OIT(Standard) ASTM D3895	minutes	188	TEST RESULTS
	TOP / BOTTOM							

Specific Gravity	Density	g/cc	.947
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	.26
COND. E			
GRADE:	K307		

Carbon Black Content	Range	%	2.38
ASTM D4218			

Carbon Black Dispersion	Category	10 In Cat 1
ASTM D5596		

Tensile Strength	Average Strength @ Yield	27 N/mm (kN/m)	153 ppi	2,615 psi
ASTM D6693				
ASTM D638 (Modified)				
(2 inches / minute)				

Average Strength @ Break	26 N/mm (kN/m)	150 ppi	2,557 psi
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Elongation ASTM D6693	Average Elongation @ Yield	%	18.01
ASTM D638 (Modified)			
(2 inches / minute)			

Lo = 1.3" Yield	Average Elongation @ Break	%	413.3
Lo = 2.0" Break			

Dimensional Stability	Average Dimensional change	%	-0.66
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	226.1 N	50.840 lbs
ASTM D-1004 (Modified)			

Puncture Resistance	Load	443.8 N	99.771 lbs
FTMS 101 Method 2065 (Modified)			

Puncture Resistance	Load	558.9 N	125.64 lbs
ASTM D4833 (Modified)			

ESCR	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	ONGOING
ASTM D5397			

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-29-10**

Signature: *[Handwritten Signature]*

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quality certificate

ROLL # **339225-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.39 mm	55 mil	Length.....	153.926 m	505.0 feet
	MAX: 1.60 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	28/30 mil	AVE: 1.49 mm		59 mil	
			OIT(Standard) ASTM D3895	minutes	188
Specific Gravity ASTM D792	Density				.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g				.26
Carbon Black Content ASTM D4218	Range				2.38
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield		27 N/mm (kN/m)	153 ppi	2,615 psi
	Average Strength @ Break		26 N/mm (kN/m)	150 ppi	2,557 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		18.01
	Average Elongation @ Break		%		413.3
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance		226.1 N		50.840 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load		443.8 N		99.771 lbs
Puncture Resistance ASTM D4833 (Modified)	Load		558.9 N		125.64 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures		1500 hrs		CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%		300 hrs		ONGOING

TEST RESULTS

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *[Handwritten Signature]*
 Quality Control Department

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ROLL # **339226-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.39 mm	55 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.58 mm	62 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 29/24 mil AVE: 1.49 mm 59 mil OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity Density g/cc .947
ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min .26
COND. E
GRADE: **K307**

Carbon Black Content Range % 2.38
ASTM D4218

Carbon Black Dispersion Category 10 In Cat 1
ASTM D5596

Tensile Strength Average Strength @ Yield 27 N/mm (kN/m) 153 ppi 2,615 psi
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Average Strength @ Break 26 N/mm (kN/m) 150 ppi 2,557 psi

Elongation ASTM D6693 Average Elongation @ Yield % 18.01
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break
Average Elongation @ Break % 413.3

Dimensional Stability Average Dimensional change % -0.66
ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance 226.1 N 50.840 lbs
ASTM D-1004 (Modified)

Puncture Resistance Load 443.8 N 99.771 lbs
FTMS 101 Method 2065 (Modified)

Puncture Resistance Load 558.9 N 125.64 lbs
ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
ASTM D5397

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date:..... **9-29-10**
Signature..... *[Signature]*
Quality Control Department

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12/23/05



quality certificate

ROLL # **339227-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement	METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN: 1.38 mm	54 mil	Length.....	153.926 m	505.0 feet
	MAX: 1.64 mm	65 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	25/28 mil	AVE: 1.51 mm		59 mil	
			OIT(Standard) ASTM D3895	minutes	188
Specific Gravity ASTM D792	Density				TEST RESULTS .947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g				.26
Carbon Black Content ASTM D4218	Range				2.27
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	26 N/mm (kNm)	146 ppi	2,459 psi	
	Average Strength @ Break	24 N/mm (kNm)	138 ppi	2,329 psi	
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield	%			16.51
	Average Elongation @ Break	%			393.4
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change	%			-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.0 N			50.359 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	435.6 N			97.931 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	591.6 N			133.01 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *[Signature]*
 Quality Control Department

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ROLL # **339228-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.39 mm	55 mil	Length.....	153.926 m	505.0 feet
(Modified)	MAX:	1.64 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/25 mil AVE: 1.49 mm 59 mil
TOP / BOTTOM

OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity ASTM D792	Density		g/cc		.947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min		.26
Carbon Black Content ASTM D4218	Range		%		2.27
Carbon Black Dispersion ASTM D5596	Category				10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	25 N/mm (kN/m)		144 ppi	2,459 psi
	Average Strength @ Break	24 N/mm (kN/m)		137 ppi	2,329 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%		16.51
	Average Elongation @ Break		%		393.4
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%		-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.0 N			50.359 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	435.6 N			97.931 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	591.6 N			133.01 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs			ONGOING

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

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ROLL # **339230-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994 (Modified)	MIN:	1.38 mm	54 mil	Length.....	158.498 m	520.0 feet
	MAX:	1.52 mm	60 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466: TOP / BOTTOM	32/28 mil	AVE:	1.44 mm	57 mil		
				OIT(Standard) ASTM D3895	minutes	188
Specific Gravity ASTM D792	Density					TEST RESULTS .947
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g					.26
Carbon Black Content ASTM D4218	Range					2.27
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	24 N/mm (kN/m)		139 psi		2,459 psi
	Average Strength @ Break	23 N/mm (kN/m)		132 psi		2,329 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			16.51
	Average Elongation @ Break		%			393.4
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	224.0 N				50.359 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	435.6 N				97.931 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	591.6 N				133.01 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs				CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

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ROLL # **339333-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **29/30** mil AVE: **1.50 mm 59 mil** OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity Density g/cc **.946**
ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min **.26**
COND. E
GRADE: **K307**

Carbon Black Content Range % **2.29**
ASTM D4218

Carbon Black Dispersion Category **10 In Cat 1**
ASTM D5596

Tensile Strength Average Strength @ Yield **25** N/mm (kNm) **143** ppi **2,414** psi
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)
Average Strength @ Break **27** N/mm (kNm) **157** ppi **2,656** psi

Elongation ASTM D6693 Average Elongation @ Yield % **18.58**
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break Average Elongation @ Break % **464.8**

Dimensional Stability Average Dimensional change % **-0.66**
ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance **210.7** N **47.366** lbs
ASTM D-1004 (Modified)

Puncture Resistance Load **371.1** N **83.425** lbs
FTMS 101 Method 2065 (Modified)

Puncture Resistance Load **581.6** N **130.75** lbs
ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
ASTM D5397

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-29-10**

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ROLL # **339334-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.56 mm	61 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7468: 29/29 mil
TOP / BOTTOM

AVE: 1.48 mm 58 mil

OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity
ASTM D792 Density g/cc **.946**

MFI ASTM D1238
COND. E Melt Flow Index 190°C /2160 g g/10 min **.26**
GRADE: **K307**

Carbon Black Content
ASTM D4218 Range % **2.29**

Carbon Black Dispersion
ASTM D5596 Category **10 In Cat 1**

Tensile Strength
ASTM D6693 Average Strength @ Yield **25** N/mm (kN/m) **141** ppi **2,414** psi
ASTM D638 (Modified)
(2 inches / minute) Average Strength @ Break **27** N/mm (kN/m) **155** ppi **2,656** psi

Elongation ASTM D6693
ASTM D638 (Modified) Average Elongation @ Yield % **18.58**
(2 inches / minute)
Lo = 1.3" Yield Average Elongation @ Break % **464.8**
Lo = 2.0" Break

Dimensional Stability
ASTM D1204 (Modified) Average Dimensional change % **-0.66**

Tear Resistance
ASTM D-1004 (Modified) Average Tear Resistance **210.7** N **47.366** lbs

Puncture Resistance
FTMS 101 Method 2065 (Modified) Load **371.1** N **83.425** lbs

Puncture Resistance
ASTM D4833 (Modified) Load **581.6** N **130.75** lbs

ESCR
ASTM D1693 Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**

Notched Constant Tensile Load
ASTM D5397 pass / fail @ 30% 300 hrs **ONGOING**

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date:..... **9-29-10**

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ROLL # **339335-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.47 mm	58 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.64 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466:	27/33 mil	AVE:	1.52 mm	60 mil	OIT(Standard) ASTM D3895	minutes	188	TEST RESULTS
	TOP / BOTTOM							

Specific Gravity	Density	g/cc	.945
ASTM D792			

MFI ASTM D1238	Melt Flow Index 190°C /2160 g	g/10 min	.26
COND. E			
GRADE:	K307		

Carbon Black Content	Range	%	2.43
ASTM D4218			

Carbon Black Dispersion	Category	10 In Cat 1
ASTM D5596		

Tensile Strength	Average Strength @ Yield	26 N/mm (kN/m)	151 ppi	2,518 psi
ASTM D6693				
ASTM D638 (Modified)	Average Strength @ Break	32 N/mm (kN/m)	180 ppi	3,016 psi
(2 inches / minute)				

Elongation ASTM D6693	Average Elongation @ Yield	%	17.84
ASTM D638 (Modified)			
(2 inches / minute)	Average Elongation @ Break	%	508.3
Lo = 1.3" Yield			
Lo = 2.0" Break			

Dimensional Stability	Average Dimensional change	%	-0.66
ASTM D1204 (Modified)			

Tear Resistance	Average Tear Resistance	235.4 N	52.927 lbs
ASTM D-1004 (Modified)			

Puncture Resistance	Load	367.6 N	82.646 lbs
FTMS 101 Method 2065 (Modified)			

Puncture Resistance	Load	590.9 N	132.85 lbs
ASTM D4833 (Modified)			

ESCR	Minimum Hrs w/o Failures	1500 hrs	CERTIFIED
ASTM D1693			

Notched Constant Tensile Load	pass / fail @ 30%	300 hrs	ONGOING
ASTM D5397			

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date: **9-29-10**
 Signature: *[Handwritten Signature]*
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ROLL # **339336-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.43 mm	56 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.54 mm	61 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466:	25.33 mil	AVE:	1.49 mm	59 mil	OIT(Standard) ASTM D3895	minutes	188	TEST RESULTS
TOP / BOTTOM								

Specific Gravity Density g/cc **.945**
ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min **.26**
COND. E
GRADE: **K307**

Carbon Black Content Range % **2.43**
ASTM D4218

Carbon Black Dispersion Category **10 In Cat 1**
ASTM D5596

Tensile Strength Average Strength @ Yield **26** N/mm (kN/m) **148** ppi **2,518** psi
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Break **31** N/mm (kN/m) **177** ppi **3,016** psi

Elongation ASTM D6693 Average Elongation @ Yield % **17.84**
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Break % **508.3**

Dimensional Stability Average Dimensional change % **-0.66**
ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance **235.4** N **52.927** lbs
ASTM D-1004 (Modified)

Puncture Resistance Load **367.6** N **82.646** lbs
FTMS 101 Method 2065 (Modified)

Puncture Resistance Load **590.9** N **132.85** lbs
ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
ASTM D5397

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date: **9-29-10**

Signature: *[Signature]*
Quality Control Department

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ROLL # **339337-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.40 mm	55 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.66 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: **26/35** mil AVE: **1.51** mm **59** mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity Density g/cc **.945**
 ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min **.26**
 COND. E
 GRADE: **K307**

Carbon Black Content Range % **2.43**
 ASTM D4218

Carbon Black Dispersion Category **10 In Cat 1**
 ASTM D5596

Tensile Strength Average Strength @ Yield **26** N/mm (kN/m) **150** ppi **2,518** psi
 ASTM D6693
 ASTM D638 (Modified)
 (2 inches / minute)
 Average Strength @ Break **31** N/mm (kN/m) **179** ppi **3,016** psi

Elongation ASTM D6693 Average Elongation @ Yield % **17.84**
 ASTM D638 (Modified)
 (2 inches / minute)
 Lo = 1.3" Yield
 Lo = 2.0" Break Average Elongation @ Break % **508.3**

Dimensional Stability Average Dimensional change % **-0.66**
 ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance **235.4** N **52.927** lbs
 ASTM D-1004 (Modified)

Puncture Resistance Load **367.6** N **82.646** lbs
 FTMS 101 Method 2065 (Modified)

Puncture Resistance Load **590.9** N **132.85** lbs
 ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
 ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
 ASTM D5397

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**
 Signature..... *[Signature]*
 Quality Control Department

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ROLL # **339338-10** Lot #: **8200990** Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.41 mm	56 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.63 mm	64 mil	Width.....	7.00 m;	23.0 feet

Asperity ASTM D7466: 29/27 mil AVE: 1.53 mm 60 mil OIT(Standard) ASTM D3895 minutes 188 **TEST RESULTS**

Specific Gravity Density g/cc .945
ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min .26
COND. E
GRADE: **K307**

Carbon Black Content Range % 2.43
ASTM D4218

Carbon Black Dispersion Category 10 In Cat 1
ASTM D5596

Tensile Strength Average Strength @ Yield 27 N/mm (kN/m) 152 ppi 2,518 psi
ASTM D6693
ASTM D638 (Modified)
(2 inches / minute)

Average Strength @ Break 32 N/mm (kN/m) 182 ppi 3,016 psi

Elongation ASTM D6693 Average Elongation @ Yield % 17.84
ASTM D638 (Modified)
(2 inches / minute)
Lo = 1.3" Yield
Lo = 2.0" Break

Average Elongation @ Break % 508.3

Dimensional Stability Average Dimensional change % -0.66
ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance 235.4 N 52.927 lbs
ASTM D-1004 (Modified)

Puncture Resistance Load 367.6 N 82.646 lbs
FTMS 101 Method 2065 (Modified)

Puncture Resistance Load 590.9 N 132.85 lbs
ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs **CERTIFIED**
ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs **ONGOING**
ASTM D5397

Customer: **Comanco Environmental**
PO: **6591 Citrus Cty LF**
Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *[Signature]*
Quality Control Department

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ROLL # **339339-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.46 mm	57 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.64 mm	65 mil	Width.....	7.00 m	23.0 feet

Asperity ASTM D7466: 26/29 mil AVE: 1.55 mm 61 mil
 TOP / BOTTOM OIT(Standard) ASTM D3895 minutes 188 **TEST RESULTS**

Specific Gravity Density g/cc .946
 ASTM D792

MFI ASTM D1238 Melt Flow Index 190°C /2160 g g/10 min .26
 COND. E
 GRADE: **K307**

Carbon Black Content Range % 2.21
 ASTM D4218

Carbon Black Dispersion Category 10 In Cat 1
 ASTM D5596

Tensile Strength Average Strength @ Yield 28 N/mm (kN/m) 157 ppi 2,574 psi
 ASTM D6693
 ASTM D638 (Modified)
 (2 inches / minute)
 Average Strength @ Break 31 N/mm (kN/m) 177 ppi 2,904 psi

Elongation ASTM D6693 Average Elongation @ Yield % 17.16
 ASTM D638 (Modified)
 (2 inches / minute)
 Lo = 1.3" Yield
 Lo = 2.0" Break Average Elongation @ Break % 459.8

Dimensional Stability Average Dimensional change % -0.66
 ASTM D1204 (Modified)

Tear Resistance Average Tear Resistance 233.5 N 52.487 lbs
 ASTM D-1004 (Modified)

Puncture Resistance Load 429.2 N 96.488 lbs
 FTMS 101 Method 2065 (Modified)

Puncture Resistance Load 574.1 N 129.07 lbs
 ASTM D4833 (Modified)

ESCR Minimum Hrs w/o Failures 1500 hrs CERTIFIED
 ASTM D1693

Notched Constant Tensile Load pass / fail @ 30% 300 hrs ONGOING
 ASTM D5397

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *[Handwritten Signature]*
 Quality Control Department

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quality certificate

ROLL # **339340-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.45 mm	57 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.60 mm	63 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	29/26 mil	AVE:	1.53 mm	60 mil		
	TOP / BOTTOM					

OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity ASTM D792	Density					.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g					.26
Carbon Black Content ASTM D4218	Range					2.21
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27 N/mm (kN/m)		155 ppi		2,574 psi
	Average Strength @ Break	31 N/mm (kN/m)		175 ppi		2,904 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.16
	Average Elongation @ Break		%			459.8
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	233.5 N				52.487 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	429.2 N				96.488 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	574.1 N				129.07 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500 hrs				CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300 hrs				ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *[Signature]*
 Quality Control Department

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quality certificate

ROLL # **339341-10**

Lot #: **8200990**

Liner Type: **MICROSPIKE™ HDPE**

Measurement		METRIC	ENGLISH	Thickness.....	1.5 mm	60 mil
ASTM D5994	MIN:	1.42 mm	56 mil	Length.....	158.498 m	520.0 feet
(Modified)	MAX:	1.62 mm	64 mil	Width.....	7.00 m	23.0 feet
Asperity ASTM D7466:	26/29 mil	AVE:	1.54 mm	61 mil		
TOP / BOTTOM						

OIT(Standard) ASTM D3895 minutes **188** **TEST RESULTS**

Specific Gravity ASTM D792	Density		g/cc			.946
MFI ASTM D1238 COND. E GRADE: K307	Melt Flow Index 190°C /2160 g		g/10 min			.26
Carbon Black Content ASTM D4218	Range		%			2.21
Carbon Black Dispersion ASTM D5596	Category					10 In Cat 1
Tensile Strength ASTM D6693 ASTM D638 (Modified) (2 inches / minute)	Average Strength @ Yield	27	N/mm (kN/m)	156	ppi	2,574 psi
	Average Strength @ Break	31	N/mm (kN/m)	176	ppi	2,904 psi
Elongation ASTM D6693 ASTM D638 (Modified) (2 inches / minute) Lo = 1.3" Yield Lo = 2.0" Break	Average Elongation @ Yield		%			17.16
	Average Elongation @ Break		%			459.8
Dimensional Stability ASTM D1204 (Modified)	Average Dimensional change		%			-0.66
Tear Resistance ASTM D-1004 (Modified)	Average Tear Resistance	233.5	N			52.487 lbs
Puncture Resistance FTMS 101 Method 2065 (Modified)	Load	429.2	N			96.488 lbs
Puncture Resistance ASTM D4833 (Modified)	Load	574.1	N			129.07 lbs
ESCR ASTM D1693	Minimum Hrs w/o Failures	1500	hrs			CERTIFIED
Notched Constant Tensile Load ASTM D5397	pass / fail @ 30%	300	hrs			ONGOING

Customer: **Comanco Environmental**
 PO: **6591 Citrus Cty LF**
 Destination **Lecanto, FL**

Date:..... **9-29-10**

Signature..... *JH Palmer*

Quality Control Department

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Lecanto, FL

16 rolls 60 HD micro (480)	left
33 rolls 60 HD micro (505)	left
10 rolls 60 HD micro (520)	left
check weld rod qty (if ordered)	wgt

roll #	ENGLISH DIMENSIONS			check weld rod qty (if ordered)	wgt			
	wid	len	area					
(X)338579 .10	23	480	11040	(480ft) 16tot	1	3556	2 x 2ft fric + sqs	8200987
(X)338680 .10	23	480	11040	(480ft) 16tot	2	3566		8200987
(X)338681 .10	23	480	11040	(480ft) 16tot	3	3562		8200987
(X)338682 .10	23	480	11040	(480ft) 16tot	4	3570		8200987
(X)338683 .10	23	480	11040	(480ft) 16tot	5	3576		8200987
(X)338684 .10	23	480	11040	(480ft) 16tot	6	3574		8200987
(X)338685 .10	23	480	11040	(480ft) 16tot	7	3570		8200987
(X)338686 .10	23	480	11040	(480ft) 16tot	8	3586		8200987
(X)338687 .10	23	480	11040	(480ft) 16tot	9	3554		8200987
(X)338688 .10	23	480	11040	(480ft) 16tot	10	3564	sqs	8200987
(X)338689 .10	23	480	11040	(480ft) 16tot	11	3566		8200987
(X)338690 .10	23	480	11040	(480ft) 16tot	12	3568		8200987
(X)338691 .10	23	480	11040	(480ft) 16tot	13	3570		8200987
(X)338692 .10	23	480	11040	(480ft) 16tot	14	3570		8200987
(X)338693 .10	23	480	11040	(480ft) 16tot	15	3576		8200987
(X)338694 .10	23	480	11040	(480ft) 16tot	16	3564		8200987
(X)338695 .10	23	505	11615	(505ft) 33tot	1	3580		8200987
(X)338696 .10	23	505	11615	(505ft) 33tot	2	3552		8200987
(X)338797 .10	23	505	11615	(505ft) 33tot	3	3740	sqs	8200987
(X)338798 .10	23	505	11615	(505ft) 33tot	4	3740		8200988
(X)338799 .10	23	505	11615	(505ft) 33tot	5	3742		8200988
(X)338700 .10	23	505	11615	(505ft) 33tot	6	3750		8200988
(X)338701 .10	23	505	11615	(505ft) 33tot	7	3730		8200988
(X)338702 .10	23	505	11615	(505ft) 33tot	8	3730		8200988
(X)338703 .10	23	505	11615	(505ft) 33tot	9	3734		8200988
(X)338704 .10	23	505	11615	(505ft) 33tot	10	3740		8200988
(X)338705 .10	23	505	11615	(505ft) 33tot	11	3734	sqs	8200988
(X)338706 .10	23	505	11615	(505ft) 33tot	12	3742		8200988
(X)338707 .10	23	505	11615	(505ft) 33tot	13	3746		8200988
(X)338708 .10	23	505	11615	(505ft) 33tot	14	3744		8200988
(X)338709 .10	23	505	11615	(505ft) 33tot	15	3746		8200988
(X)338710 .10	23	505	11615	(505ft) 33tot	16	3742		8200988
(X)338711 .10	23	505	11615	(505ft) 33tot	17	3742		8200988
(X)338712 .10	23	505	11615	(505ft) 33tot	18	3742		8200988
(X)338713 .10	23	505	11615	(505ft) 33tot	19	3740		8200988
(X)338714 .10	23	505	11615	(505ft) 33tot	20	3737	sqs	8200988
(X)339101 .10	23	505	11615	(505ft) 33tot	21			8200988
(X)339102 .10	23	505	11615	(505ft) 33tot	22			8200988
(X)339103 .10	23	505	11615	(505ft) 33tot	23			8200988
(X)339104 .10	23	505	11615	(505ft) 33tot	24			8200988
(X)339105 .10	23	505	11615	(505ft) 33tot	25			8200988
(X)339106 .10	23	505	11615	(505ft) 33tot	26			8200988
(X)339107 .10	23	505	11615	(505ft) 33tot	27			8200988

Lecanto, FL

16 rolls 60 HD micro (460)	left
33 rolls 60 HD micro (505)	left
10 rolls 60 HD micro (520)	left
check weld rod qty (if ordered)	wgt

roll #	ENGLISH DIMENSIONS			check weld rod qty (if ordered)	wgt	sqft	total
	wid	len	area				
(X)339223 .10	23	505	11615	(505ft)	33tot	28	3722
(X)339224 .10	23	505	11615	(505ft)	33tot	29	3708
(X)339225 .10	23	505	11615	(505ft)	33tot	30	3708
(X)339226 .10	23	505	11615	(505ft)	33tot	31	3708
(X)339227 .10	23	505	11615	(505ft)	33tot	32	3704
(X)339228 .10	23	505	11615	(505ft)	33tot	33	3708
(X)339230 .10	23	520	11960	(520ft)	10tot 1		3744
(X)339333 .10	23	520	11960	(520ft)	10tot 2		
(X)339334 .10	23	520	11960	(520ft)	10tot 3		
(X)339335 .10	23	520	11960	(520ft)	10tot 4	sqft	
(X)339336 .10	23	520	11960	(520ft)	10tot 5		
(X)339337 .10	23	520	11960	(520ft)	10tot 6		
(X)339338 .10	23	520	11960	(520ft)	10tot 7		
(X)339339 .10	23	520	11960	(520ft)	10tot 8		
(X)339340 .10	23	520	11960	(520ft)	10tot 9		
(X)339341 .10	23	520	11960	(520ft)	10tot 10		

Attachment 8-2

Geomembrane CQA Conformance Test Results



September 30, 2010

Mail To:

Bill To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Central Landfill Phase 3 Expansion

TRI Job Reference Number: E2348-30-10

Material(s) Tested: 5 Agru 60 mil Microspike HDPE Geomembrane(s)

Test(s) Requested:
Thickness (ASTM D 5994)
Asperity Height (GRI GM 12)
Density (ASTM D 1505)
Carbon Content (ASTM D 1603, mod.)
Carbon Dispersion (ASTM D 5596)
Tensile (ASTM D 6693/GRI GM13)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Agru 60 mil Microspike HDPE Geomembrane
Sample Identification: 338579.10
TRI Log #: E2348-30-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5994)												
Thickness (mils)	61	62	65	65	61	61	63	64	63	62	63	2
											61	<< min
Asperity Height (GRI GM 12)												
Asperity Height (mils) - Side A	33	29	31	27	30	29	26	25	30	24	28	3
Asperity Height (mils) - Side B	26	25	23	24	26	24	27	23	23	25	25	1
Density (ASTM D 1505)												
Density (g/cm3)	0.945	0.945	0.945								0.945	0.000
Carbon Black Content (ASTM D 1603, mod.)												
% Carbon Black	2.33	2.35									2.34	0.01
Carbon Black Dispersion (ASTM D 5596)												
Rating - 1st field view	1	1	1	1	1							
Rating - 2nd field view	1	1	1	1	1							
Tensile Properties (ASTM D 6693/GRI GM17, Type IV specimen)												
MD Yield Strength (ppi)	159	168	163	158	161						162	4
TD Yield Strength (ppi)	181	169	164	177	177						174	7
MD Break Strength (ppi)	179	197	186	159	166						177	15
TD Break Strength (ppi)	170	183	201	123	164						168	29
MD Yield Elongation (%)	20	20	22	19	20						20	1
TD Yield Elongation (%)	17	19	18	17	17						18	1
MD Break Elongation (%)	438	428	434	436	450						437	8
TD Break Elongation (%)	489	531	605	338	480						489	98
MD Machine Direction	TD Transverse Direction			NA Not Available								

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Agru 60 mil Microspike HDPE Geomembrane
Sample Identification: 338688.10
TRI Log #: E2348-30-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5994)												
Thickness (mils)	60	62	65	64	63	65	61	63	61	62	63	2
											60	<< min
Asperity Height (GRI GM 12)												
Asperity Height (mils) - Side A	31	32	28	31	27	27	31	30	31	26	29	2
Asperity Height (mils) - Side B	23	25	27	23	29	25	27	23	25	28	26	2
Density (ASTM D 1505)												
Density (g/cm3)	0.945	0.945	0.945								0.945	0.000
Carbon Black Content (ASTM D 1603, mod.)												
% Carbon Black	2.27	2.27									2.27	0.00
Carbon Black Dispersion (ASTM D 5596)												
Rating - 1st field view	1	1	1	1	1							
Rating - 2nd field view	1	1	1	1	1							
Tensile Properties (ASTM D 6693/GRI GM17, Type IV specimen)												
MD Yield Strength (ppi)	171	161	160	177	160						166	8
TD Yield Strength (ppi)	178	170	158	187	165						172	11
MD Break Strength (ppi)	188	166	163	197	178						178	14
TD Break Strength (ppi)	208	175	170	192	120						173	33
MD Yield Elongation (%)	21	21	21	21	21						21	0
TD Yield Elongation (%)	17	17	17	17	17						17	0
MD Break Elongation (%)	443	443	394	465	451						439	27
TD Break Elongation (%)	600	516	526	515	96						451	201
MD Machine Direction	TD Transverse Direction					NA Not Available						

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GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Agru 60 mil Microspike HDPE Geomembrane
Sample Identification: 338797.10
TRI Log #: E2348-30-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5994)												
Thickness (mils)	62	61	61	63	64	63	64	65	60	62	63	2
											60	<< min
Asperity Height (GRI GM 12)												
Asperity Height (mils) - Side A	25	32	30	29	29	30	29	32	28	30	29	2
Asperity Height (mils) - Side B	27	26	28	27	24	26	23	26	22	22	25	2
Density (ASTM D 1505)												
Density (g/cm3)	0.945	0.945	0.945								0.945	0.000
Carbon Black Content (ASTM D 1603, mod.)												
% Carbon Black	2.31	2.29									2.30	0.01
Carbon Black Dispersion (ASTM D 5596)												
Rating - 1st field view	1	1	1	1	1							
Rating - 2nd field view	1	1	1	1	1							
Tensile Properties (ASTM D 6693/GRI GM17, Type IV specimen)												
MD Yield Strength (ppi)	154	151	170	169	154						160	9
TD Yield Strength (ppi)	168	163	190	182	164						173	12
MD Break Strength (ppi)	172	172	197	192	183						183	11
TD Break Strength (ppi)	172	180	194	206	180						186	14
MD Yield Elongation (%)	19	19	21	20	20						20	1
TD Yield Elongation (%)	17	17	17	17	17						17	0
MD Break Elongation (%)	464	455	426	443	439						445	15
TD Break Elongation (%)	518	539	521	571	563						542	24
MD Machine Direction	TD Transverse Direction					NA Not Available						

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GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Agru 60 mil Microspike HDPE Geomembrane
Sample Identification: 338705.10
TRI Log #: E2348-30-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5994)													
Thickness (mils)	61	61	64	63	61	61	61	61	61	61	62	62 61	1 << min
Asperity Height (GRI GM 12)													
Asperity Height (mils) - Side A	30	28	29	28	25	32	29	28	29	27		29	2
Asperity Height (mils) - Side B	26	24	25	25	29	27	26	24	22	27		26	2
Density (ASTM D 1505)													
Density (g/cm3)	0.946	0.946	0.946									0.946	0.000
Carbon Black Content (ASTM D 1603, mod.)													
% Carbon Black	2.38	2.35										2.37	0.02
Carbon Black Dispersion (ASTM D 5596)													
Rating - 1st field view	1	1	1	1	1								
Rating - 2nd field view	1	1	1	1	1								
Tensile Properties (ASTM D 6693/GRI GM17, Type IV specimen)													
MD Yield Strength (ppi)	151	170	172	144	151							158	13
TD Yield Strength (ppi)	179	167	184	153	160							169	13
MD Break Strength (ppi)	179	201	199	158	152							178	23
TD Break Strength (ppi)	192	187	138	184	200							180	24
MD Yield Elongation (%)	21	21	21	17	20							20	2
TD Yield Elongation (%)	17	17	17	17	20							18	1
MD Break Elongation (%)	435	429	406	464	406							428	24
TD Break Elongation (%)	556	571	185	589	624							505	181
MD Machine Direction	TD Transverse Direction			NA Not Available									

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Central Landfill Phase 3 Expansion

Material: Agru 60 mil Microspike HDPE Geomembrane
Sample Identification: 338714.10
TRI Log #: E2348-30-10

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Thickness (ASTM D 5994)												
Thickness (mils)	60	63	63	62	62	61	62	63	61	60	62 60	1 << min
Asperity Height (GRI GM 12)												
Asperity Height (mils) - Side A	26	28	32	28	30	30	29	30	28	25	29	2
Asperity Height (mils) - Side B	25	24	24	28	23	26	24	27	24	22	25	2
Density (ASTM D 1505)												
Density (g/cm3)	0.945	0.945	0.945								0.945	0.000
Carbon Black Content (ASTM D 1603, mod.)												
% Carbon Black	2.30	2.38									2.34	0.06
Carbon Black Dispersion (ASTM D 5596)												
Rating - 1st field view	1	1	1	1	1							
Rating - 2nd field view	1	1	1	1	1							
Tensile Properties (ASTM D 6693/GRI GM17, Type IV specimen)												
MD Yield Strength (ppi)	152	154	158	160	150						155	4
TD Yield Strength (ppi)	158	169	184	159	178						170	11
MD Break Strength (ppi)	148	166	175	196	168						171	17
TD Break Strength (ppi)	170	162	196	185	159						174	16
MD Yield Elongation (%)	22	25	25	25	23						24	1
TD Yield Elongation (%)	19	17	15	18	18						17	2
MD Break Elongation (%)	380	420	349	413	474						407	47
TD Break Elongation (%)	514	161	563	561	446						449	168
MD Machine Direction	TD Transverse Direction			NA Not Available								

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Attachment 8-3

Geomembrane CQA Interface Friction Test Reports



Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/21/2010

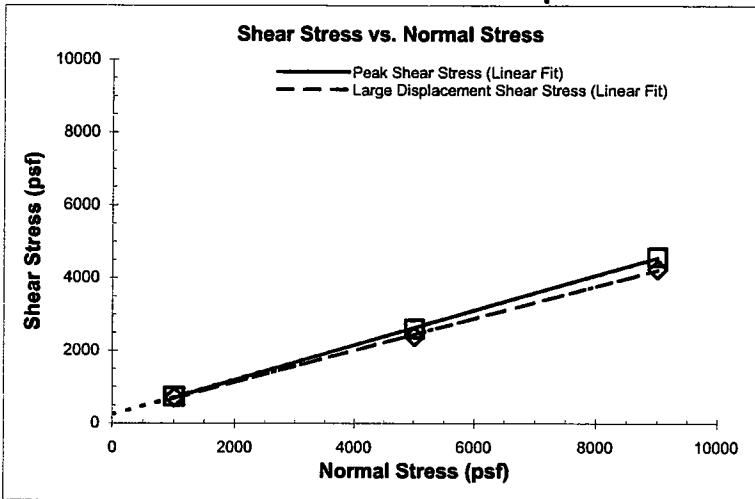
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 5321

Quality Review/Date

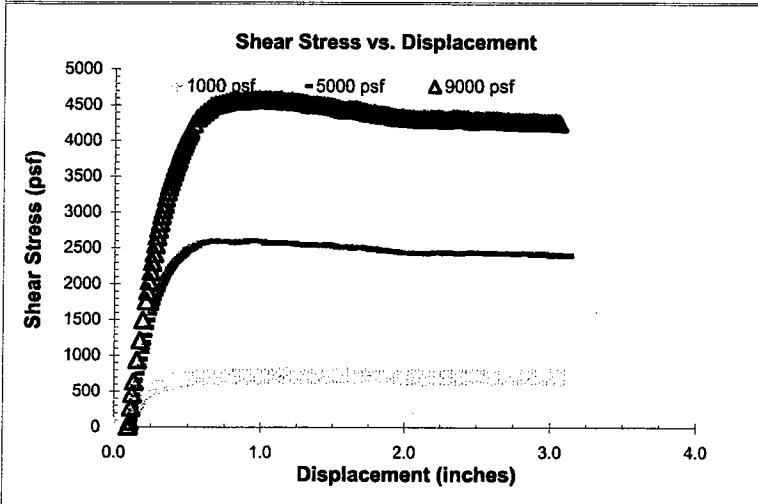
Test Date: 10/18/10-10/20/10

Tested Interface: Subbase Soil vs. Marifi 5XT Geogrid (32191666) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	25.7	23.9
Y-intercept or Adhesion (psf):	240	246

Shearing occurred at the geogrid/geomembrane interface.



Test Conditions	
Upper Box &	Subbase Soil remolded to 102.7 pcf at 14.6% moisture content
Floating Lower Box	Marifi 5XT Geogrid Agru 60 mil HDPE Microspike Geomembrane (shiny side)
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	739	2607	4584
Corrected Large Displacement Shear Stress (psf)	717	2399	4254
Peak Secant Angle (degrees)	36.4	27.5	27.0
Large Displacement Secant Angle (degrees)	35.6	25.6	25.3
Large Displacement Secant Angle (degrees)	30.0	30.2	30.6

The testing herein 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 of the material.

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Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/18/2010

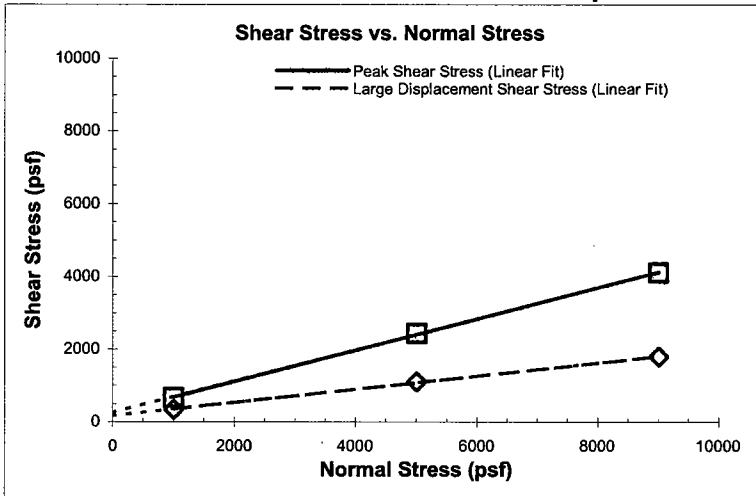
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 5321

Quality Review/Date

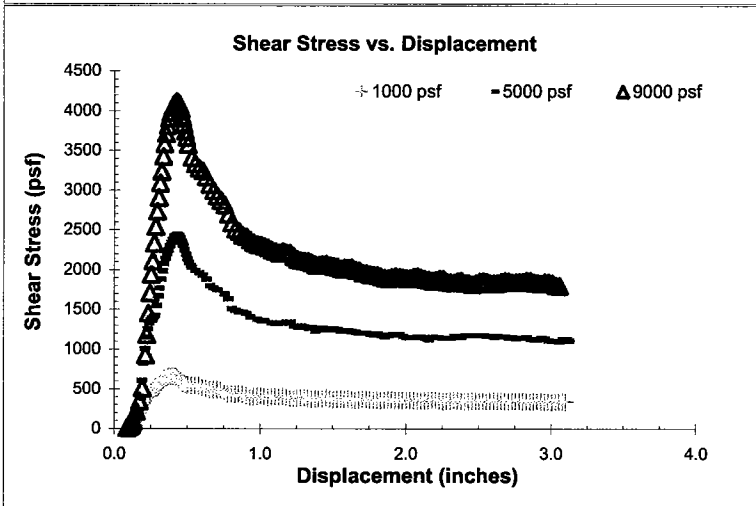
Test Date: 10/07/10-10/07/10

Tested Interface: Syntec TenDrain 770-2 Double-sided Geocomposite (1000051) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	23.3	10.3
Y-intercept or Adhesion (psf):	253	171

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Syntec TenDrain 770-2 double-sided geocomposite (rib side)
Lower Box	Agru 60 mil HDPE Microspike geomembrane (dull side)
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hour prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	667	2444	4117
Corrected Large Displacement Shear Stress (psf)	342	1105	1799
Peak Secant Angle (degrees)	33.7	26.0	24.6
Large Displacement Secant Angle (degrees)	18.9	12.5	11.3
Asperity (mils)	27.0	28.4	28.2

The testing herein 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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/04/2010

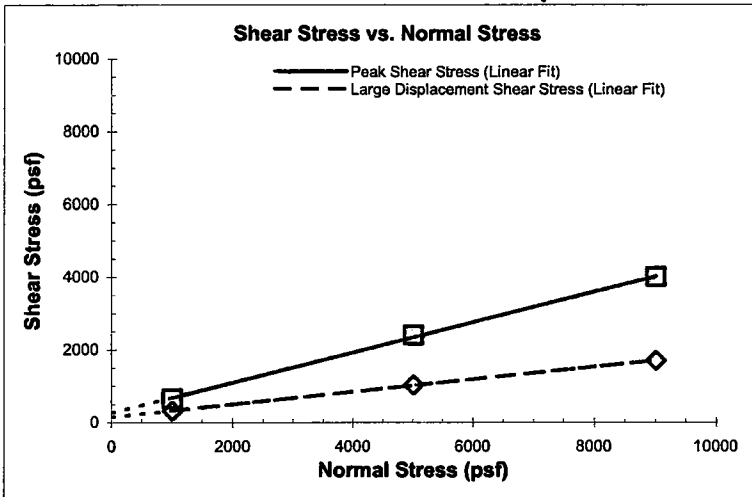
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 5321

Quality Review/Date

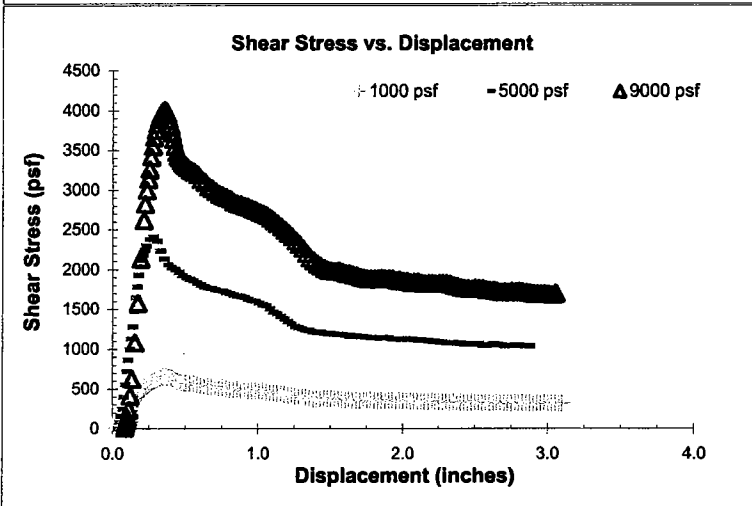
Test Date: 10/04/10-10/04/10

Tested Interface: GSE Double-sided Geocomposite (131348090) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	22.7	9.8
Y-intercept or Adhesion (psf):	264	158

Shearing occurred at the interface.



Test Conditions	
Upper Box &	GSE double-sided geocomposite
Lower Box	Agru 60 mil HDPE Microspike geomembrane (dull side)
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 1 hour prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	658	2407	4007
Corrected Large Displacement Shear Stress (psf)	323	1038	1705
Peak Secant Angle (degrees)	33.3	25.7	24.0
Large Displacement Secant Angle (degrees)	17.9	11.7	10.7
Asperity (mils)	30.4	29.0	28.4

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Interface Friction Test Report

Client: **SCS Engineers**

TRI Log#: E2337-95-02

John M. Allen, P.E., 10/06/2010

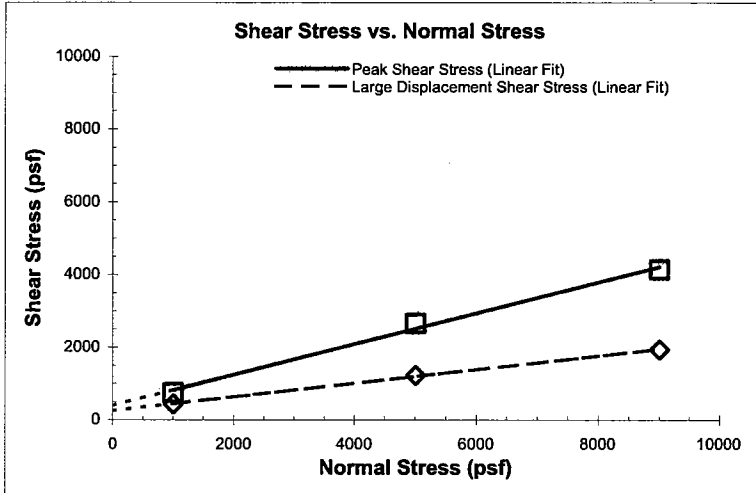
Project: **Citrus County Central Landfill Phase 3**

Test Method: ASTM D 6243

Quality Review/Date

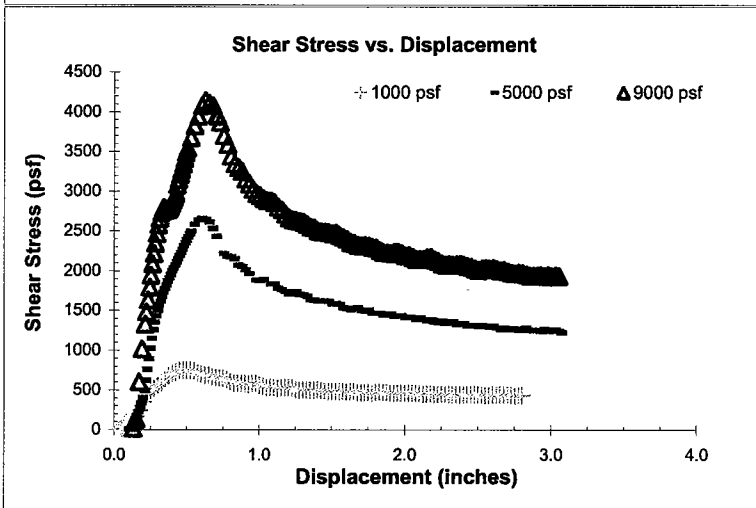
Test Date: 10/04/10-10/04/10

Tested Interface: Bentomat ST GCL (7911) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	23.0	10.7
Y-intercept or Adhesion (psf):	394	258

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Bentomat ST GCL (black side)
Lower Box	Agru 60 mil HDPE Microspike geomembrane (shiny side)
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	748	2656	4142
Corrected Large Displacement Shear Stress (psf)	433	1224	1938
Peak Secant Angle (degrees)	36.8	28.0	24.7
Large Displacement Secant Angle (degrees)	23.4	13.8	12.2
Asperity (mils)	30.4	31.8	30.4

The testing herein 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 of the material.

TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Attachment 8-4
Geomembrane Panel Placement Logs

SCS Engineers (Primary)

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PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-12-10

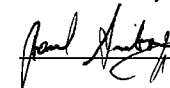
GEOMEMBRANE PLACEMENT LOG

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P-2	339227	154	22.5	60	E-W	0735		
P-3	339227	152	22.5	60	E-W	0743		
P-4	338692	155	22.5	60	E-W	0755		
P-5	338692	153	22.5	60	E-W	0806		
P-6	338692	85	22.5	60	E-W	0815		
P-7	338692	31	22.5	60	E-W	0828		
P-8	338694	136	22.5	60	NE-SW	0845		
P-9	338694	152	22.5	60	NE-SW	0851		
P-10	338694	133	22.5	60	NE-SW	0858		
P-11	339223	99	22.5	60	NE-SW	0912		
P-12	339223	61	22.5	60	NE-SW	0920		
P-13	339227	21	22.5	60	NE-SW	0930		
P-14	339223	154	22.5	60	NE-SW	0940		
P-15	339223	151	22.5	60	NE-SW	0946		
P-16	338680	152	22.5	60	NE-SW	1000		
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**GEOMEMBRANE PLACEMENT
LOG**

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

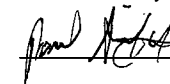
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P-21	338707	121	22.5	60	N-S	1345		
P-22	338707	44	22.5	60	N-S	1400		
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P-24	338690	149	22.5	60	N-S	1430		
P-25	338690	152	22.5	60	N-S	1445		
P-26	338688	150	22.5	60	N-S	0740	10/13/10	
P-27	338688	153	22.5	60	N-S	0750	10/13/10	
P-28	338688	153	22.5	60	N-S	0810	10/13/10	
P-29	338691	153	22.5	60	N-S	0820	10/13/10	
P-30	338691	156	22.5	60	N-S	0840	10/13/10	
P-31	338691	153	22.5	60	N-S	0850	10/13/10	
P-32	338579	157	22.5	60	N-S	0901	10/13/10	
P-33	338579	156	22.5	60	N-S	0910	10/13/10	
P-34	338579	156	22.5	60	N-S	0919	10/13/10	
P-35	339339	158	22.5	60	N-S	0935	10/13/10	
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**GEOMEMBRANE PLACEMENT
LOG**

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

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09207049.06

DATE

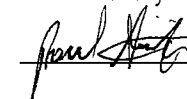
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P-39	338706	163	22.5	60	N-S	1050		
P-40	338706	160	22.5	60	N-S	1100		
P-41	339105	290	22.5	60	E-W	0845	10/22/10	
P-42	339105	217	17	60	E-W	0853	10/22/10	
P-43	339103	73	17	60	E-W	0910	10/22/10	
P-44	339103	288	22.5	60	E-W	0924	10/22/10	
P-45	339105	217	5.5	60	E-W	0941	10/22/10	
P-46	339103	73	5.5	60	E-W	0951	10/22/10	
P-47	339103	141	22.5	60	E-W	1005	10/22/10	
P-48	338705	140	22.5	60	E-W	1015	10/22/10	
P-49	338705	281	22.5	60	E-W	1023	10/22/10	
P-50	339228	245	22.5	60	E-W	1055	10/22/10	
P-51	339228	138	22.5	60	E-W	1114	10/22/10	
P-52	339228	11	22.5	60	E-W	1135	10/22/10	
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PROJECT TITLE

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PROJECT NO.

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10-22-10

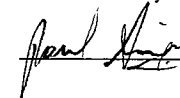
**GEOMEMBRANE PLACEMENT
LOG**

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P-58	338712	165	22.5	60	N-S	0748	11/3/10	
P-59	338702	165	22.5	60	N-S	0752	11/3/10	
P-60	338702	165	22.5	60	N-S	0806	11/3/10	
P-61	338702	165	22.5	60	N-S	0821	11/3/10	
P-62	339338	166	22.5	60	N-S	0830	11/3/10	
P-63	339338	168	22.5	60	N-S	0839	11/3/10	
P-64	339338	169	22.5	60	N-S	0854	11/3/10	
P-65	339341	169	22.5	60	N-S	0912	11/3/10	
P-66	339341	170	22.5	60	N-S	0921	11/3/10	
P-67	339341	172	22.5	60	N-S	0931	11/3/10	
P-68	339336	172	22.5	60	N-S	0940	11/3/10	
P-69	339336	172	22.5	60	N-S	0952	11/3/10	
P-70	339336	169	22.5	60	N-S	1008	11/3/10	
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SCS Engineers (Primary)

SHEET

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of

7

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

11-3-10

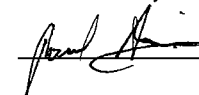
**GEOMEMBRANE PLACEMENT
LOG**

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P-74	338695	92	22.5	60	N-S	1054		
P-75	339339	64	22.5	60	N-S	1102		
P-76	339226	49	11	60	N-S	1116		
P-77	338680	20	11	60	E-W	1123		
P-78	338695	40	22.5	60	E-W	1240		
P-79	338695	74	22.5	60	E-W	1251		
P-80	338695	101	22.5	60	E-W	1304		
P-81	338695	127	22.5	60	E-W	1326		
P-82	339340	153	15	60	E-W	1331		
P-83	339225	107	22.5	60	N-S	0720	11/9/10	
P-84	339225	104	22.5	60	N-S	0736	11/9/10	
P-85	339225	98	22.5	60	N-S	0751	11/9/10	
P-86	339225	94	22.5	60	N-S	0804	11/9/10	
P-87	338799	95	22.5	60	N-S	0816	11/9/10	
P-88	339225	90	22.5	60	N-S	0825	11/9/10	
P-89	338799	79	22.5	60	N-S	0843	11/9/10	
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SCS Engineers (Primary)

SHEET

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of

7

**GEOMEMBRANE PLACEMENT
LOG**

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

11-9-10

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS	
P-91	338799	70	22.5	60	N-S	0910		
P-92	338799	69	22.5	60	N-S	0915		
P-93	338799	68	22.5	60	N-S	0919		
P-94	339224	67	22.5	60	N-S	0925		
P-95	339224	67	22.5	60	N-S	0931		
P-96	339224	67	22.5	60	N-S	0938		
P-97	339224	67	22.5	60	N-S	0942		
P-98	339224	67	22.5	60	N-S	0950		
P-99	339224	66	22.5	60	N-S	0957		
P-100	339224	66	22.5	60	N-S	1010		
P-101	338714	66	22.5	60	N-S	1017		
P-102	338714	66	22.5	60	N-S	1023		
P-103	338714	65	22.5	60	N-S	1028		
P-104	338714	66	22.5	60	N-S	1035		
P-105	338714	65	22.5	60	N-S	1045		
P-106	338714	63	22.5	60	N-S	1105		
P-107	338695	38	22.5	60	N-S	1116		
P-108	338700	63	22.5	60	N-S	1127		
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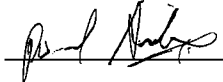


SCS Engineers (Primary)

GEOMEMBRANE PLACEMENT LOG

SHEET 7 of 7
 PROJECT TITLE Central Landfill Phase 3 Expansion Project
 PROJECT NO. 09207049.06
 DATE 11-9-10

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS	
P-109	338700	30	22.5	60	N-S	1315		
P-110	338693	144	22.5	60	E-W	1324		
P-111	338693	157	22.5	60	E-W	1409		
P-112	338700	178	22.5	60	E-W	1429		
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PRINT NAME: Paul Siriboury
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SCS Engineers (Secondary)

SHEET

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of

7

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-5-10

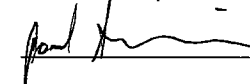
GEOMEMBRANE PLACEMENT LOG

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S-2	339106	151	22.5	60	E-W	1310		
S-3	339106	150	22.5	60	E-W	1319		
S-4	338682	150	22.5	60	E-W	1325		
S-5	338682	82	22.5	60	E-W	1340		
S-6	338682	32	22.5	60	E-W	1350		
S-7	338682	130	22.5	60	E-W	1357		
S-8	338681	148	22.5	60	NE-SW	1408		
S-9	338681	145	22.5	60	NE-SW	1430		
S-10	338681	94	22.5	60	NE-SW	1510		
S-11	338709	57	22.5	60	NE-SW	1520		
S-12	338709	15	22.5	60	NE-SW	1538		
S-13	339106	129	22.5	60	NE-SW	1550		
S-14	338709	129	22.5	60	NE-SW	1600		
S-15	338709	141	22.5	60	NE-SW	1101	10/6/10	
S-16	338689	151	22.5	60	NE-SW	1119	10/6/10	
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SHEET

2 of 7

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-6-10

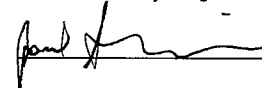
GEOMEMBRANE PLACEMENT LOG

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S-20	338708	153	22.5	60	NE-SW	1237		
S-21	338708	122	22.5	60	NE-SW	1248		
S-22	338708	44	22.5	60	NE-SW	1256		
S-23	338684	154	22.5	60	N-S	1313		
S-24	338684	151	22.5	60	N-S	1321		
S-25	338684	154	22.5	60	N-S	1334		
S-26	338683	152	22.5	60	N-S	1355		
S-27	338683	153	22.5	60	N-S	1409		
S-28	338683	154	22.5	60	N-S	1435		
S-29	338686	157	22.5	60	N-S	1500		
S-30	338686	155	22.5	60	N-S	1050	10/7/10	
S-31	338686	154	22.5	60	N-S	1058	10/7/10	
S-32	338687	156	22.5	60	N-S	1115	10/7/10	
S-33	338687	159	22.5	60	N-S	1126	10/7/10	
S-34	338687	156	22.5	60	N-S	1134	10/7/10	
S-35	339335	160	22.5	60	N-S	1235	10/7/10	
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SCS Engineers (Secondary)

SHEET

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PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-7-10

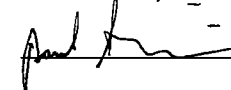
GEOMEMBRANE PLACEMENT LOG

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S-38	338713	16	22.5	60	N-S	1328		
S-39	338713	164	22.5	60	N-S	1337		
S-40	338713	163	22.5	60	N-S	1348		
S-41	338711	163	22.5	60	N-S	1415		
S-42	338704	285	22.5	60	E-W	1100	10/20/10	
S-43	338704	217	17	60	E-W	1130	10/20/10	
S-44	338797	73	17	60	E-W	1140	10/20/10	
S-45	338797	294	22.5	60	E-W	1145	10/20/10	
S-46	338704	217	5	60	E-W	1156	10/20/10	
S-47	338797	73	5	60	E-W	1201	10/20/10	
S-48	338797	138	22.5	60	E-W	1300	10/20/10	
S-49	339104	148	22.5	60	E-W	1310	10/20/10	
S-50	339104	288	22.5	60	E-W	1325	10/20/10	
S-51	339107	248	22.5	60	E-W	1345	10/20/10	
S-52	339107	156	22.5	60	E-W	1348	10/20/10	
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PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

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DATE

10-20-10

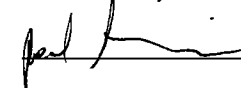
GEOMEMBRANE PLACEMENT LOG

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S-56	339104	31	12	60	E-W	1426		
S-57	338798	258	17	60	E-W	1100	10/26/10	
S-58	338798	56	21	60	E-W	1230	10/26/10	
S-59	338798	231	17	60	E-W	1245	10/26/10	
S-60	339101	252	22.5	60	E-W	1257	10/26/10	
S-61	338798	231	5.5	60	E-W	1305	10/26/10	
S-62	339101	148	22.5	60	E-W	1313	10/26/10	
S-63	339228	31	22.5	60	E-W	1320	10/26/10	
S-64	339101	21	22.5	60	E-W	1325	10/26/10	
S-65	339101	9	22.5	60	E-W	1332	10/26/10	
S-66	339101	63	10	60	E-W	1340	10/26/10	
S-67	338798	17	17	60	E-W	1352	10/26/10	
S-68	338711	166	22.5	60	N-S	1320	10/27/10	
S-69	338711	166	22.5	60	N-S	1337	10/27/10	
S-70	338696	168	22.5	60	N-S	1345	10/27/10	
S-71	338696	169	22.5	60	N-S	1352	10/27/10	
S-72	338696	166	22.5	60	N-S	1400	10/27/10	
Page Total		41,967 SQF						
Cumulative Total		197,503 SQF						

PRINT NAME:

Paul Siriboury

SIGNATURE:



SCS Engineers (Secondary)

SHEET

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of

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PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-27-10

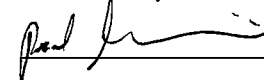
GEOMEMBRANE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS	
S-73	339334	166	22.5	60	N-S	1410		
S-74	339334	169	22.5	60	N-S	1421		
S-75	339334	168	22.5	60	N-S	1435		
S-76	339230	168	22.5	60	N-S	1447		
S-77	339230	168	22.5	60	N-S	1500		
S-78	338703	65	22.5	60	N-S	1046	10/28/10	
S-79	338703	65	22.5	60	N-S	1049	10/28/10	
S-80	338703	65	22.5	60	N-S	1100	10/28/10	
S-81	338703	66	22.5	60	N-S	1107	10/28/10	
S-82	338703	66	22.5	60	N-S	1115	10/28/10	
S-83	338703	67	22.5	60	N-S	1132	10/28/10	
S-84	338703	65	22.5	60	N-S	1145	10/28/10	
S-85	338710	66	22.5	60	N-S	1215	10/28/10	
S-86	339230	168	22.5	60	N-S	0810	10/29/10	
S-87	339337	168	22.5	60	N-S	0816	10/29/10	
S-88	339337	168	22.5	60	N-S	0824	10/29/10	
S-89	339337	171	22.5	60	N-S	0832	10/29/10	
S-90	338701	158	22.5	60	N-S	0850	10/29/10	
Page Total		49,433 SQF						
Cumulative Total		246,937 SQF						

PRINT NAME:

Paul Siripoury

SIGNATURE:



SCS Engineers (Secondary)

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of

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PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10-29-10

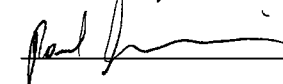
GEOMEMBRANE PLACEMENT LOG

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS	
S-91	338701	133	22.5	60	N-S	0905		
S-92	338701	110	22.5	60	N-S	0914		
S-93	339102	88	22.5	60	N-S	0925		
S-94	339335	65	22.5	60	N-S	0953		
S-95	339701	37	22.5	60	NW-SE	1005		
S-96	339102	19	11	60	NW-SE	1023		
S-97	339102	53	8	60	NW-SE	1035		
S-98	338708	48	11	60	E-W	1053		
S-99	339102	74	22.5	60	E-W	1106		
S-100	339102	101	22.5	60	E-W	1120		
S-101	339102	125	22.5	60	E-W	1130		
S-102	339340	152	22.5	60	E-W	1245		
S-103	339340	171	22.5	60	E-W	1300		
S-104	339340	176	22.5	60	E-W	1318		
S-105	338685	172	22.5	60	E-W	1330		
S-106	338685	167	22.5	60	E-W	1402		
S-107	338685	67	22.5	60	N-S	1435		
S-108	338685	54	22.5	60	N-S	1502		
Page Total		39,231 SQF						
Cumulative Total		286,168 SQF						

PRINT NAME:

Paul Siriboury

SIGNATURE:



Attachment 8-5
Geomembrane Trial Weld Logs

SCS Engineers (Primary)

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PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

DATE

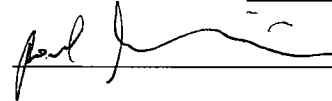
10-12-10

TRIAL WELD LOG

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS	
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED													
0830	DL	A055	58			850	60	146	155	117	142	135	183	177	178	186	183	P		
								136	135	145	139	132								
0831	RO	A039	60			800	11	130	136	130	134	130	176	186	178	181	190	P		
								128	142	133	119	133								
0840	RO	A039	61			800	10	119	125	120	120	134	157	158	151	161	163	P		
								141	127	140	126	120								
0840	DL	A055	61			800	8	140	135	125	116	133	180	186	180	177	188	P		
								144	124	146	129	136								
0945	DL	A091	69			800	15	117	105	120	101	107	166	162	160	162	158	P		
								127	109	114	125	122								
1241	RO	A039	82			800	11	102	110	99	108	116	165	170	157	152	152	P		
								127	114	101	100	111								
1246	RO	A039	83			800	10	110	123	116	105	105	149	136	147	146	149	P		
								120	113	111	114	110								
1250	DL	A091	82			800	15	111	110	123	116	123	151	139	148	153	149	P		
								109	109	112	106	106								
				10/13/10																
0800	DL	A091	60			800	15	139	123	138	117	118	177	178	166	185	178	P		
								120	131	133	123	134								
0802	RO	A039	60			800	11	126	130	115	103	127	186	188	177	183	183	P		
								148	146	135	116	127								
0805	RO	A039	60			800	10	133	130	124	131	128	162	178	164	164	170	P		
								139	144	138	125	127								

PRINT NAME: PAUL SIRIBOURY

SIGNATURE:



SCS Engineers (Primary)

SHEET

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of

4

PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

DATE

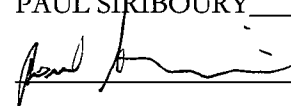
10-13-10

TRIAL WELD LOG

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR				P/F	COMMENTS	
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
0744	CM	A036	60	500	485			152	160	150	140	148	165	178	160	166	162	P	T/T
1230	CM	A036	82	480	470			134	141	131	133	140	134	143	140	129	144	P	T/T
1230	RO	A068	82	460	440			133	135	127	116	131	139	139	138	140	142	P	T/T
				10/22/10															
1120	RO	A039	69			800	7	122	132	110	118	117	145	142	139	147	129	P	T/T
								125	132	106	107	123							
1025	RO	A039	69			800	11	113	140	108	99	114	173	169	153	156	168	P	S/S
								130	128	107	101	105							
0940	DL	A091	70			800	15	110	125	133	117	118	165	170	161	138	164	P	S/S
								120	111	133	126	110							
0945	DL	A091	70			800	15	126	107	119	106	113	165	160	148	150	142	P	S/T
								115	114	104	112	108							
1000	DL	A091	70			800	15	131	137	133	120	130	141	140	137	135	139	P	T/T
								130	133	136	119	122							
1110	CM	A036	74	480	455			129	117	115	117	125	166	163	164	157	163	P	T/T
1320	JP	A068	82	470	445			113	110	101	125	109	142	136	131	130	136	P	T/T
1320	RO	A039	82			800	10	116	116	129	120	113	130	140	136	136	125	P	T/T
								127	118	121	114	130							
1330	DL	A091	83			800	15	110	115	106	102	120	145	154	150	143	151	P	S/S
								119	123	125	121	127							
				11/3/10															
0900	DL	A055	70			800	15	128	110	111	127	124	183	170	135	149	154	P	S/S
								117	125	112	118	109							

PRINT NAME: PAUL SIRIBOURY

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SCS Engineers (Primary)

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of

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TRIAL WELD LOG

PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

DATE

11-3-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
0900	SM	A047	70			800	12	141	129	129	138	126	166	148	170	172	177	P	S/S
								125	131	122	125	140							
0900	CM	A036	70	510	480			128	135	137	129	134	147	160	156	145	146	P	T/T
1300	CM	A036	80	470	455			121	137	122	117	119	140	136	139	138	134	P	T/T
1310	DL	A091	80			800	18	120	111	105	107	105	145	140	148	152	143	P	S/S
								99	115	99	103	105							
1303	SM	A047	80			800	13	117	117	117	115	132	150	151	153	151	155	P	S/S
								117	113	111	109	130							
1310	SM	A047	80			800	13	119	120	116	120	116	141	129	134	130	133	P	T/T
								119	116	120	113	126							
																			11/4/10
0730	CM	A036	70	500	480			130	138	130	125	150	132	139	148	149	138	P	T/T
																			11/9/10
0820	SM	A047	50			800	12	141	124	151	159	143	189	186	193	192	199	P	S/S
								99	143	131	124	119							
0825	SM	A047	50			800	12	120	125	128	132	144	176	177	177	177	176	P	S/T
								143	152	139	136	149							
0820	DL	A058	50			800	10	127	123	126	114	137	196	198	197	190	193	P	S/S
								124	98	125	129	119							
0825	DL	A058	50			800	9	133	153	141	130	128	166	159	172	164	164	P	T/T
								154	135	137	120	132							
0900	CM	A036	52	480	465			146	117	122	131	130	151	152	144	133	145	P	T/T

PRINT NAME: PAUL SIRIBOURY

SIGNATURE:



SCS Engineers (Primary)

SHEET

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PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

DATE

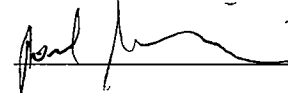
11-9-10

TRIAL WELD LOG

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
1200	CM	A036	77	480	440			132	125	139	145	136	130	141	137	136	137	P	T/T
1200	DL	A058	77			800	12	119	114	99	125	105	154	152	144	140	141	P	S/S
								120	108	102	106	115							
1200	SM	A047	79			800	13	123	111	115	130	142	160	162	156	157	162	P	S/S
								129	129	125	113	113							
1200	SM	A047	77			800	13	124	141	131	131	128	139	134	137	140	139	P	T/T
								153	131	134	133	131							
1300	DL	A058	79			800	10	122	117	119	117	121	154	146	145	152	153	P	S/T
								124	118	125	134	117							
																			11/10/10
0830	CM	A036	49	480	460			147	153	130	150	134	172	180	180	165	167	P	S/T
0830	SM	A061	49	480	400			163	157	147	157	164	183	180	183	173	169	P	T/T
1300	SM	A061	79	480	400			99	109	112	103	108	136	140	135	145	134	P	T/T
1300	CM	A036	79	460	410			121	128	125	129	134	138	133	135	135	130	P	T/T
																			11/23/10
1330	CM	A036	75	480	440			128	125	117	129	131	134	140	137	131	132	P	T/S
1230	JP	A068	75	460	430			101	106	108	109	102	139	138	140	138	146	P	T/T
1234	DL	A047	75			800	12	124	117	121	117	121	131	127	128	135	136	P	S/S
								121	123	117	123	113							
1033	CM	A036	72	480	430			119	120	125	111	115	138	136	144	136	132	P	11/24/10-T/T
1600	SM	A047	70			800	11	117	120	118	133	128	147	145	141	147	155	P	S/T-11/29/10
								121	105	113	106	109							
0800	CM	A036	66	490	465			136	121	139	123	136	144	143	145	140	148	P	S/T11/30/10

PRINT NAME: PAUL SIRIBOURY

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SCS Engineers(Secondary)

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PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

TRIAL WELD LOG

PROJECT NUMBER

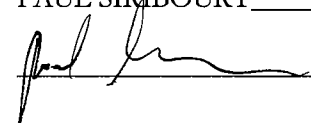
DATE

10-5-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
1351	SM	A041	80			800	16	109	105	108	119	119	170	153	150	158	153	P	S/S
								121	108	110	115	112							
1433	SM	A041	78			800	14	106	103	107	108	107	126	126	138	125	126	P	T/T
								111	101	108	115	117							
1402	DL	A055	79			850	55	133	122	131	111	114	149	145	148	146	150	P	S/T
								115	112	112	120	122							
1412	DL	A055	79			850	60	112	116	108	103	119	159	147	155	165	161	P	S/S
								118	116	110	122	101							
1423	RO	A039	79			800	9	112	121	116	107	123	158	157	157	160	161	P	T/T
								115	119	134	111	113							
				10/6/10															
0740	CM	A036	59	500	455			138	117	149	136	111	178	184	208	184	190	P	T/T
1140	DL	A055	72			850	50	107	112	109	104	110	137	136	142	143	146	P	S/T
								127	123	115	114	107							
1145	DL	A055	73			850	55	124	122	112	135	109	161	162	162	155	155	P	S/S
								114	117	136	119	113							
1150	RO	A039	72			800	11	119	100	109	106	103	155	153	154	161	165	P	S/S
								116	127	112	117	122							
1153	RO	A039	73			800	10	134	114	116	115	124	151	139	151	151	150	P	S/T
								125	117	110	123	118							
1245	CM	A036	75	480	430			113	123	119	127	93	149	142	151	143	149	P	T/T

PRINT NAME: PAUL SIRIBOURY

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SCS Engineers(Secondary)

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TRIAL WELD LOG

PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

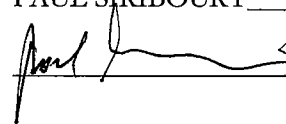
DATE

10-7-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
0830	CM	A036	51	520	465			142	155	128	145	143	167	170	161	165	164	P	T/T
1234	RO	A039	77			800	11	115	104	109	111	115	158	159	153	152	154	P	S/S
								102	113	100	118	118							
1240	RO	A039	76			800	10	129	118	110	116	125	171	152	164	174	152	P	S/T
								127	107	110	118	113							
1246	DL	A055	77			850	60	107	103	113	111	132	152	155	150	149	155	P	S/S
								118	138	113	125	111							
1240	DL	A055	77			850	55	132	132	116	118	130	163	155	153	144	141	P	T/S
								123	120	117	131	125							
1245	CM	A036	77	470	420			138	134	125	124	127	158	162	146	146	130	P	T/T
				10/8/10															
0820	CM	A036	51	510	480			123	108	101	127	125	190	183	190	200	201	P	T/T
				10/20/10															
1120	RO	A039	77			800	11	114	109	99	101	99	168	155	157	155	156	P	S/S
								122	124	134	105	114							
1125	RO	A039	78			800	10	116	102	113	115	125	148	163	145	141	144	P	S/T
								131	130	122	123	120							
1128	RO	A039	78			800	10	102	113	106	105	107	140	140	136	143	141	P	T/T
								129	130	113	100	106							
1130	DL	A091	78			800	15	131	99	122	100	104	152	155	153	150	155	P	S/S
								133	109	109	105	105							
1135	DL	A091	78			800	14	114	120	130	129	98	161	149	162	161	156	P	S/T
								138	149	140	137	117							

PRINT NAME: PAUL SIRIBOURY

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SCS Engineers(Secondary)

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PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

TRIAL WELD LOG

PROJECT NUMBER

DATE

10-20-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
1230	CM	A036	83	485	465			116	113	122	112	120	134	138	145	140	130	P	T/T
1310	DL	A091	83			800	14	119	116	110	109	118	128	124	126	145	133	P	T/T
								127	125	120	129	124							
1530	RO	A039	83			800	10	110	120	118	115	126	138	142	130	142	141	P	T/T
								124	106	111	118	120							
1550	JP	A068	85	460	425			112	115	103	107	112	141	140	143	144	131	P	T/T
				10/21/10															
0900	CM	A036	66	480	460			137	146	142	141	141	152	149	148	147	143	P	T/T
				10/26/10															
1050	DL	A091	81			800	18	114	108	117	105	101	140	135	138	142	132	P	S/S
								116	110	118	106	103							
1100	DL	A091	81			800	15	116	99	100	98	102	140	141	135	135	141	P	S/T
								111	115	128	121	108							
1100	RO	A039	81			800	11	106	108	112	113	103	151	150	152	148	159	P	S/S
								102	122	127	120	128							
1058	JP	A039	81			800	10	114	125	127	122	115	137	150	151	152	148	P	T/T
								118	116	129	109	116							
1100	CM	A036	81	465	450			126	128	139	121	121	144	135	138	142	143	P	T/T
				10/27/10															
0800	CM	A036	72	475	455			129	122	120	121	117	128	140	132	133	134	P	T/T
1320	RO	A039	86			800	11	105	108	102	103	107	141	144	141	144	147	P	S/S
								124	99	117	104	111							

PRINT NAME: PAUL SIRIBOURY

SIGNATURE:



SCS Engineers(Secondary)

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TRIAL WELD LOG

PROJECT TITLE

Phase 3 Landfill Expansion - Citrus County Landfill

PROJECT NUMBER

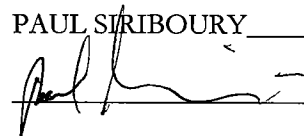
DATE

10-27-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
1315	DL	A091	86			800	18	132	120	141	108	112	144	143	151	148	149	P	S/S
								125	118	126	108	104							
0800	CM	A036	90	475	455			110	108	108	116	110	125	130	133	125	123	P	10/28/10-T/T
1230	CM	A036	90	460	440			119	117	115	130	112	126	136	128	129	126	P	T/T
1120	RO	A039	90			800	10	120	119	122	132	131	129	129	158	140	138	P	T/T
								116	119	130	116	136							
1140	DL	A091	90			800	18	115	110	109	108	109	140	134	140	127	130	P	S/S
								105	116	98	124	107							
1130	RO	A039	90			800	10	116	99	119	104	105	143	140	138	130	138	P	S/T
								124	117	128	106	118							
0930	RO	A039	67			800	11	120	115	113	129	132	164	162	168	168	171	P	10/29/10-S/S
								119	119	117	123	124							
0925	RO	A039	67			800	10	121	115	115	134	139	140	141	137	141	141	P	T/T
								121	124	127	120	139							
0930	DL	A091	67			800	15	139	120	139	120	126	179	179	170	171	171	P	S/S
								130	125	148	142	120							
0930	SM	A047	67			800	10	121	111	118	108	130	167	168	174	166	171	P	S/S
								117	107	109	123	123							
0925	SM	A047	67			800	10	151	121	130	121	118	169	171	159	163	174	P	T/T
								115	120	118	124	119							
1310	SM	A047	79			800	12	113	117	114	114	124	145	147	142	145	144	P	S/T
								110	105	108	109	118							

PRINT NAME: PAUL STRIBOURY

SIGNATURE:



SCS Engineers(Secondary)

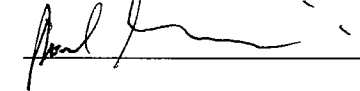
TRIAL WELD LOG

SHEET
PROJECT TITLE
PROJECT NUMBER
DATE

5 of 5
 Phase 3 Landfill Expansion - Citrus County Landfill
 10-29-10

TIME	TECH I.D.	MACH. I.D.	AMB. TEMP	EXTRUSION WELDS		FUSION WELDS		PEEL					SHEAR					P/F	COMMENTS
				BARREL TEMP.	PREHEAT TEMP.	WEDGE TEMP	WEDGE SPEED												
1305	DL	A091	79			800	18	124	106	103	121	115	156	149	150	150	156	P	S/S
								120	108	109	116	117							
1310	RO	A039	79			800	10	113	115	114	113	109	138	143	143	144	155	P	T/T
								105	100	105	101	105							
1315	RO	A039	79			800	11	116	121	117	140	127	164	156	160	158	159	P	S/S
								126	124	112	124	122							
1315	SM	A047	79			800	12	117	110	117	111	108	155	150	154	151	151	P	S/S
								114	108	116	117	115							
0730	SM	A061	58	480	440			137	124	125	135	129	181	172	173	173	170	P	10/30/10-T/T
0730	CM	A036	58	490	470			134	121	159	119	154	163	165	161	161	156	P	T/T
1310	CM	A036	82	490	470			124	115	130	129	111	140	145	148	150	143	P	T/T
1315	SM	A061	83	480	440			124	128	135	128	130	151	148	160	149	146	P	T/T
0800	CM	A036	64	480	470			119	110	103	99	112	144	154	152	150	152	P	11/1/10-T/T

PRINT NAME: PAUL SIRIBOURY _____

SIGNATURE:  _____

Attachment 8-6

Geomembrane Non-Destructive Seam Test Logs

SCS Engineers (Primary)

SHEET

1 of 11

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/12/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
1/ph-2	CL	30	29	1	1050	1055	5 MIN.	P		
1/2	CL	30	30	0	1055	1100	5 MIN.	P		
3/2	CL	30	30	0	1056	1101	5 MIN.	P		
3/4	CL	30	29	1	1053	1058	5 MIN.	P		
4/5	CL	30	30	0	1054	1059	5 MIN.	P		
5/6	CL	30	29	1	1055	1100	5 MIN.	P		
5/8	CL	30	30	0	1105	1110	5 MIN.	P		
6/7	CL	30	28	2	1101	1106	5 MIN.	P		
7/8	CL	30	29	1	1104	1109	5 MIN.	P		
6/8	CL	30	29	1	1104	1109	5 MIN.	P		
8/9	CL	30	30	0	1143	1148	5 MIN.	P		
9/10	CL	30	30	0	1145	1150	5 MIN.	P		
10/11	CL	30	30	0	1146	1151	5 MIN.	P		
11/12	CL	30	29	1	1148	1153	5 MIN.	P		
12/13	CL	30	29	1	1149	1154	5 MIN.	P		
13/14	CL	30	30	0	1150	1155	5 MIN.	P		
12/14	CL	30	30	0	1300	1305	5 MIN.	P		
11/14	CL	30	30	0	1300	1305	5 MIN.	P		
10/14	CL	30	29	1	1302	1307	5 MIN.	P		
15/14	CL	30	29	1	1350	1355	5 MIN.	P		
15/16	CL	30	30	0	1352	1357	5 MIN.	P		
16/17	CL	30	30	0	1305	1310	5 MIN.	P		
16/17	CL	30	30	0	1359	1404	5 MIN.	P		

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE

2 of 11
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/12/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			
17/18	CL	30	30	0	1400	1405	5 MIN.	P		
18/19	CL	30	30	0	1402	1407	5 MIN.	P		
19/20	CL	30	30	0	1440	1445	5 MIN.	P		
18/20	CL	30	30	0	1440	1445	5 MIN.	P		
20/21	CL	30	30	0	1401	1406	5 MIN.	P		
21/22	CL	30	30	0	1402	1407	5 MIN.	P		
21/23	CL	30	30	0	1525	1530	5 MIN.	P		
22/23	CL	30	30	0	1525	1530	5 MIN.	P		
23/24	CL	30	30	0	1525	1530	5 MIN.	P		
24/25	CL	30	30	0	1535	1540	5 MIN.	P		
25/26	CL	30	29	1	1145	1150	5 MIN.	P	10/13/10	
25/26	CL	30	30	0	1146	1151	5 MIN.	P	10/13/10	
26/27	CL	30	30	0	1147	1152	5 MIN.	P	10/13/10	
27/28	CL	30	30	0	1148	1153	5 MIN.	P	10/13/10	
28/29	CL	30	30	0	1150	1155	5 MIN.	P	10/13/10	
29/30	CL	30	30	0	1151	1156	5 MIN.	P	10/13/10	
30/31	CL	30	30	0	1255	1300	5 MIN.	P	10/13/10	
31/32	CL	30	30	0	1300	1305	5 MIN.	P	10/13/10	
33/32	CL	30	30	0	1301	1306	5 MIN.	P	10/13/10	
33/34	CL	30	30	0	1302	1307	5 MIN.	P	10/13/10	
34/35	CL	30	30	0	1303	1308	5 MIN.	P	10/13/10	
35/36	CL	30	30	0	1305	1310	5 MIN.	P	10/13/10	
36/37	CL	30	30	0	1320	1325	5 MIN.	P	10/13/10	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE

3 of 11
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/13/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			
36/38	CL	30	30	0	1325	1330	5 MIN.	P		
37/38	CL	30	30	0	1321	1326	5 MIN.	P		
38/39	CL	30	30	0	1322	1327	5 MIN.	P		
39/40	CL	30	30	0	1323	1328	5 MIN.	P		
41/PH-2	SM								P	10/22/10
41/PH-2	SM								P	
41/42	CL	30	30	0	1316	1321	5 MIN.	P		
41/43	CL	30	30	0	1316	1321	5 MIN.	P		
42/43	CL	30	30	0	1317	1322	5 MIN.	P		
42/44	CL	30	30	0	1317	1322	5 MIN.	P		
42/44	CL	30	30	0	1317	1322	5 MIN.	P		
44/45	CL	30	30	0	1353	1358	5 MIN.	P		
45/47	CL	30	30	0	1347	1352	5 MIN.	P		
45/48	CL	30	30	0	1347	1352	5 MIN.	P		
44/46	CL	30	30	0	1353	1358	5 MIN.	P		
46/48	CL	30	30	0	1355	1400	5 MIN.	P		
47/48	CL	30	30	0	1347	1352	5 MIN.	P		
43/44	CL	30	29	1	1320	1325	5 MIN.	P		
47/49	CL	30	30	0	1348	1353	5 MIN.	P		
48/49	CL	30	30	0	1348	1353	5 MIN.	P		
49/50	CL	30	29	1	1405	1410	5 MIN.	P		
49/50	CL	30	30	0	1405	1410	5 MIN.	P		
51/55	CL	30	28	2	1455	1500	5 MIN.	P		

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
26/55	CL	30	30	0	1545	1550	5 MIN.	P			
27/55	CL	30	30	0	1541	1546	5 MIN.	P			
28/55	CL	30	30	0	1542	1547	5 MIN.	P			
29/55	CL	30	30	0	1555	1600	5 MIN.	P			
1/41	CL	30	30	0	1408	1413	5 MIN.	P			
2/42	CL	30	30	0	1407	1412	5 MIN.	P			
3/44	CL	30	30	0	1410	1415	5 MIN.	P			
4/47	CL	30	30	0	1411	1416	5 MIN.	P			
5/49	CL	30	30	0	1425	1430	5 MIN.	P			
9/50	CL	30	28	2	1426	1431	5 MIN.	P			
14/51	CL	30	30	0	1438	1443	5 MIN.	P			
15/51	CL	30	30	0	1439	1444	5 MIN.	P			
16/52	CL	30	28	2	1440	1445	5 MIN.	P			
17/52	CL	30	30	0	1440	1445	5 MIN.	P			
17/53	CL	30	30	0	1515	1520	5 MIN.	P			
20/53	CL	30	30	0	1516	1521	5 MIN.	P			
23/53	CL	30	28	2	1517	1522	5 MIN.	P			
24/53	CL	30	30	0	1543	1548	5 MIN.	P			
24/54	CL	30	30	0	1543	1548	5 MIN.	P			
25/55	CL	30	30	0	1544	1549	5 MIN.	P			
51/54	CL	30	30	0	1519	1524	5 MIN.	P			
51/53	CL	30	30	0	1455	1500	5 MIN.	P			
51/52	CL	30	30	0	1455	1500	5 MIN.	P			

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
53/54	CL	30	28	2	1519	1524	5 MIN.	P			
52/53	CL	30	30	0	1520	1525	5 MIN.	P			
50/55	CL	30	30	0	1513	1518	5 MIN.	P			
50/51	CL	30	30	0	1513	1518	5 MIN.	P			
40/56	CL	30	30	0	0940	0945	5 MIN.	P		11/03/10	
56/57	CL	30	30	0	0944	0949	5 MIN.	P			
57/58	CL	30	30	0	1010	1025	5 MIN.	P			
58/59	CL	30	30	0	0941	0946	5 MIN.	P			
59/60	CL	30	30	0	1011	1016	5 MIN.	P			
60/61	CL	30	30	0	1012	1017	5 MIN.	P			
61/62	CL	30	30	0	1030	1035	5 MIN.	P			
62/63	CL	30	30	0	1031	1036	5 MIN.	P			
63/64	CL	30	30	0	1040	1045	5 MIN.	P			
64/65	CL	30	30	0	1124	1129	5 MIN.	P			
65/66	CL	30	30	0	1125	1130	5 MIN.	P			
66/67	CL	30	30	0	1111	1116	5 MIN.	P			
66/67	CL	30	28	2	1126	1131	5 MIN.	P			
67/68	CL	30	30	0	1140	1145	5 MIN.	P			
68/69	CL	30	30	0	1141	1146	5 MIN.	P			
69/70	CL	30	30	0	1301	1306	5 MIN.	P			
69/70	CL	30	30	0	1310	1315	5 MIN.	P			
70/71	CL	30	30	0	1417	1422	5 MIN.	P			
71/72	CL	30	30	0	1419	1424	5 MIN.	P			

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET

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of 11

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

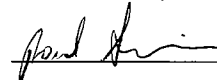
11/3/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
72/73	CL	30	30	0	1420	1425	5 MIN.	P			
73/74	CL	30	30	0	1440	1445	5 MIN.	P			
74/75	CL	30	29	1	1453	1458	5 MIN.	P			
75/76	CL	30	30	0	1502	1507	5 MIN.	P			
76/77	CL	30	30	0	1533	1538	5 MIN.	P			
77/78	CL	30	30	0	1538	1543	5 MIN.	P			
78/79	CL	30	30	0	1540	1545	5 MIN.	P			
79/80	CL	30	30	0	1622	1627	5 MIN.	P			
80/81	CL	30	30	0	1634	1639	5 MIN.	P			
81/82	CL	30	30	0	1656	1701	5 MIN.	P			
76/78	CL	30	30	0	1612	1617	5 MIN.	P			
75/78	CL	30	30	0	1615	1620	5 MIN.	P			
75/79	CL	30	30	0	1621	1626	5 MIN.	P			
74/79	CL	30	30	0	1622	1627	5 MIN.	P			
74/80	CL	30	30	0	1635	1640	5 MIN.	P			
73/80	CL	30	30	0	1634	1639	5 MIN.	P			
73/81	CL	30	30	0	1655	1700	5 MIN.	P			
72/81	CL	30	30	0	1656	1701	5 MIN.	P			
72/82	CL	30	30	0	1656	1701	5 MIN.	P			
41/83	CL	30	30	0	0930	0935	5 MIN.	P		11/09/10	
43/83	CL	30	30	0	0930	0935	5 MIN.	P			
44/83	CL	30	30	0	0931	0936	5 MIN.	P			
46/83	CL	30	30	0	0931	0936	5 MIN.	P			

PRINT NAME: Paul Siriboury

SIGNATURE:



SCS Engineers (Primary)

SHEET

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of 11

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

11/9/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
48/83	CL	30	30	0	0933	0938	5 MIN.	P		
49/83	CL	30	28	2	0933	0938	5 MIN.	P		
83/84	CL	30	30	0	1004	1009	5 MIN.	P		
84/85	CL	30	30	0	1005	1010	5 MIN.	P		
85/86	CL	30	30	0	1020	1025	5 MIN.	P		
86/87	CL	30	30	0	1021	1026	5 MIN.	P		
87/88	CL	30	30	0	1022	1027	5 MIN.	P		
88/89	CL	30	30	0	1047	1052	5 MIN.	P		
89/90	CL	30	30	0	1048	1053	5 MIN.	P		
90/91	CL	30	29	1	1049	1054	5 MIN.	P		
91/92	CL	30	30	0	1050	1055	5 MIN.	P		
92/93	CL	30	30	0	1051	1056	5 MIN.	P		
93/94	CL	30	30	0	1052	1057	5 MIN.	P		
94/95	CL	30	30	0	1310	1315	5 MIN.	P		
95/96	CL	30	30	0	1311	1316	5 MIN.	P		
96/97	CL	30	30	0	1312	1317	5 MIN.	P		
97/98	CL	30	30	0	1313	1318	5 MIN.	P		
98/99	CL	30	30	0	1314	1319	5 MIN.	P		
99/100	CL	30	30	0	1315	1320	5 MIN.	P		
100/101	CL	30	30	0	1316	1321	5 MIN.	P		
101/102	CL	30	30	0	1317	1322	5 MIN.	P		
102/103	CL	30	30	0	1318	1323	5 MIN.	P		
103/104	CL	30	30	0	1451	1456	5 MIN.	P		

PRINT NAME: Paul Siriboury

SIGNATURE:



NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
104/105	CL	30	30	0	1452	1457	5 MIN.	P		
105/106	CL	30	30	0	1453	1458	5 MIN.	P		
106/107	CL	30	29	1	1535	1540	5 MIN.	P		
107/108	CL	30	28	2	1615	1620	5 MIN.	P		
108/109	CL	30	30	0	1620	1625	5 MIN.	P		
30/50	CL	30	30	0	1000	1005	5 MIN.	P		
30/83	CL	30	30	0	1000	1005	5 MIN.	P		
31/83	CL	30	30	0	1004	1009	5 MIN.	P		
31/84	CL	30	30	0	1004	1009	5 MIN.	P		
32/84	CL	30	29	1	1005	1010	5 MIN.	P		
32/85	CL	30	28	2	1005	1010	5 MIN.	P		
33/85	CL	30	28	2	1020	1025	5 MIN.	P		
33/86	CL	30	30	0	1020	1025	5 MIN.	P		
34/86	CL	30	30	0	1021	1026	5 MIN.	P		
34/87	CL	30	29	1	1021	1026	5 MIN.	P		
35/87	CL	30	30	0	1128	1133	5 MIN.	P		
35/88	CL	30	30	0	1128	1133	5 MIN.	P		
36/88	CL	30	30	0	1130	1135	5 MIN.	P		
36/89	CL	30	30	0	1130	1135	5 MIN.	P		
37/89	CL	30	30	0	1131	1136	5 MIN.	P		
37/90	CL	30	30	0	1131	1136	5 MIN.	P		
38/90	CL	30	30	0	1132	1137	5 MIN.	P		
38/91	CL	30	30	0	1132	1137	5 MIN.	P		

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
39/91	CL	30	30	0	1355	1400	5 MIN.	P		
39/92	CL	30	30	0	1355	1400	5 MIN.	P		
40/92	CL	30	30	0	1356	1401	5 MIN.	P		
40/93	CL	30	30	0	1356	1401	5 MIN.	P		
56/93	CL	30	28	2	1357	1402	5 MIN.	P		
56/94	CL	30	30	0	1357	1402	5 MIN.	P		
57/94	CL	30	30	0	1358	1403	5 MIN.	P		
57/95	CL	30	30	0	1358	1403	5 MIN.	P		
58/95	CL	30	29	1	1419	1424	5 MIN.	P		
58/96	CL	30	30	0	1419	1424	5 MIN.	P		
59/96	CL	30	30	0	1420	1425	5 MIN.	P		
59/97	CL	30	30	0	1420	1425	5 MIN.	P		
60/97	CL	30	30	0	1421	1426	5 MIN.	P		
60/98	CL	30	30	0	1421	1426	5 MIN.	P		
61/98	CL	30	28	2	1422	1427	5 MIN.	P		
61/99	CL	30	30	0	1422	1427	5 MIN.	P		
62/99	CL	30	30	0	1517	1522	5 MIN.	P		
62/100	CL	30	30	0	1517	1522	5 MIN.	P		
63/100	CL	30	30	0	1518	1523	5 MIN.	P		
63/101	CL	30	30	0	1518	1523	5 MIN.	P		
64/101	CL	30	30	0	1519	1524	5 MIN.	P		
64/102	CL	30	30	0	1519	1524	5 MIN.	P		
65/102	CL	30	30	0	1520	1525	5 MIN.	P		

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
65/103	CL	30	30	0	1520	1525	5 MIN.	P			
66/103	CL	30	30	0	1605	1610	5 MIN.	P			
66/104	CL	30	30	0	1605	1610	5 MIN.	P			
67/104	CL	30	30	0	1606	1611	5 MIN.	P			
67/105	CL	30	30	0	1607	1612	5 MIN.	P			
68/105	CL	30	30	0	1607	1612	5 MIN.	P			
68/106	CL	30	30	0	1607	1612	5 MIN.	P			
69/106	CL	30	30	0	1608	1613	5 MIN.	P			
69/107	CL	30	30	0	1608	1613	5 MIN.	P			
109/111	CL	30	30	0	1630	1635	5 MIN.	P			
109/110	CL	30	30	0	1630	1635	5 MIN.	P			
110/PH-2	SM								P	11/10/10 - TIE IN	
110/PH-2	CL	30	30	0	0910	0915	5 MIN.	P		TIE-IN	
110/111	CL	30	30	0	0905	0910	5 MIN.	P			
111/112	CL	30	30	0	0904	0909	5 MIN.	P			
113/82	CL	30	30	0	0903	0908	5 MIN.	P			
83/PH-2	SM								P	TIE-IN	
84/PH-2	SM								P	TIE-IN	
85/PH-2	SM								P	TIE-IN	
86/PH-2	SM								P	TIE-IN	
87/PH-2	SM								P	TIE-IN	
88/PH-2	SM								P	TIE-IN	
89/PH-2	SM								P	TIE-IN	
90/PH-2	SM								P	TIE-IN	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE

11 of 11
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
11/10/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
91/PH-2	SM								P	TIE-IN
92/PH-2	SM								P	TIE-IN
93/PH-2	SM								P	TIE-IN
94/PH-2	SM								P	TIE-IN
95/PH-2	SM								P	TIE-IN
96/PH-2	SM								P	TIE-IN
97/PH-2	SM								P	TIE-IN
98/PH-2	SM								P	TIE-IN
99/PH-2	SM								P	TIE-IN
100/PH-2	SM								P	TIE-IN
101/PH-2	SM								P	TIE-IN
102/PH-2	SM								P	TIE-IN
103/PH-2	SM								P	TIE-IN
104/PH-2	SM								P	TIE-IN
105/PH-2	SM								P	TIE-IN
106/PH-2	SM								P	TIE-IN
107/PH-2	SM								P	TIE-IN
108/PH-2	SM								P	TIE-IN
109/PH-2	SM								P	TIE-IN
108/70	SM								P	11/24/10
108/112	SM								P	11/24/10
112/113	LO	30	30	0	1655	1700	5 MIN.	P		11/29/10

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST						P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME					
		START	END	DROP	START	END	DURATION			
1/ph-2	CL	30	30	0	1500	1505	5 MIN.	P		
1/2	CL	30	29	1	1536	1541	5 MIN.	P	R-7 TO R-6	
1/2	CL	30	30	0	1523	1528	5 MIN.	P	R-6 TO R-5	
1/2	CL	30	30	0	1555	1600	5 MIN.	P	R-5 TO R-60	
2/3	CL	30	30	0	1604	1609	5 MIN.	P		
3/4	CL	30	30	0	1605	1610	5 MIN.	P		
4/5	CL	30	30	0	1606	1611	5 MIN.	P		
5/8	CL	30	29	1	1632	1637	5 MIN.	P		
5/6	CL	30	30	0	1632	1637	5 MIN.	P		
6/7	CL	30	30	0	1635	1640	5 MIN.	P		
6/8	CL	30	30	0	1633	1638	5 MIN.	P		
7/8	CL	30	29	1	1635	1640	5 MIN.	P		
8/9	CL	30	28	2	0802	0807	5 MIN.	P	10/6/10	
9/10	CL	30	30	0	0803	0808	5 MIN.	P	10/6/10	
10/11	CL	30	30	0	0808	0813	5 MIN.	P	10/6/10	
10/14	CL	30	30	0	0808	0813	5 MIN.	P	10/6/10	
11/14	CL	30	30	0	0808	0813	5 MIN.	P	10/6/10	
12/14	CL	30	30	0	0820	0825	5 MIN.	P	R-24 TO R-25 10/6/10	
12/14	CL	30	30	0	0824	0829	5 MIN.	P	R-25 TO R-23 10/6/10	
13/14	CL	30	30	0	0839	0844	5 MIN.	P	10/6/10	
11/12	CL	30	30	0	0815	0820	5 MIN.	P	10/6/10	
12/13	CL	30	30	0	0824	0829	5 MIN.	P	10/6/10	
14/15	CL	30	30	0	1449	1454	5 MIN.	P	10/6/10	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

SHEET

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of 11

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/6/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
15/16	CL	30	30	0	1450	1455	5 MIN.	P		R-29 TO END OF SEAM	
15/16	CL	30	30	0	1458	1503	5 MIN.	P		R-29 TO R- 77	
16/17	CL	30	30	0	1451	1456	5 MIN.	P			
17/18	CL	30	29	1	1452	1457	5 MIN.	P			
18/19	CL	30	30	0	1512	1517	5 MIN.	P			
19/20	CL	30	30	0	1512	1517	5 MIN.	P			
18/20	CL	30	29	1	1513	1518	5 MIN.	P			
20/21	CL	30	30	0	1533	1538	5 MIN.	P			
21/23	CL	30	29	1	1533	1538	5 MIN.	P			
21/22	CL	30	30	0	1544	1549	5 MIN.	P			
22/23	CL	30	30	0	1544	1549	5 MIN.	P			
23/24	CL	30	30	0	1621	1626	5 MIN.	P			
24/25	CL	30	30	0	1622	1627	5 MIN.	P			
25/26	CL	30	29	1	1627	1632	5 MIN.	P			
26/27	CL	30	29	1	1630	1635	5 MIN.	P		R-36 TO END OF SEAM	
27/28	CL	30	30	0	1631	1636	5 MIN.	P			
28/29	CL	30	30	0	0810	0815	5 MIN.	P		10/7/10	
26/27	CL	30	29	1	0818	0823	5 MIN.	P		R-36 TO R-89 10/7/10	
29/30	CL	30	30	0	1500	1505	5 MIN.	P		10/7/10	
30/31	CL	30	29	1	1501	1506	5 MIN.	P		10/7/10	
31/32	CL	30	30	0	1502	1507	5 MIN.	P		10/7/10	
32/33	CL	30	30	0	1504	1509	5 MIN.	P		10/7/10	
33/34	CL	30	30	0	1505	1510	5 MIN.	P		10/7/10	

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NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
34/35	CL	30	30	0	1506	1511	5 MIN.	P			
35/36	CL	30	30	0	1523	1528	5 MIN.	P			
36/37	CL	30	30	0	1524	1529	5 MIN.	P			
37/38	CL	30	30	0	1525	1530	5 MIN.	P			
36/38	CL	30	30	0	1530	1535	5 MIN.	P			
38/39	CL	30	29	1	1607	1612	5 MIN.	P			
39/40	CL	30	30	0	1611	1616	5 MIN.	P			
40/41	CL	30	30	0	1612	1617	5 MIN.	P			
42/PH-2	SM								P	10/20/10 TIE-IN	
42/43	CL	30	28	2	1325	1330	5 MIN.	P			
42/44	CL	30	28	2	1325	1330	5 MIN.	P			
43/44	CL	30	29	1	1338	1343	5 MIN.	P			
44/45	CL	30	30	0	1326	1331	5 MIN.	P			
43/45	CL	30	29	1	1343	1348	5 MIN.	P			
45/46	CL	30	30	0	1418	1423	5 MIN.	P			
45/47	CL	30	30	0	1418	1423	5 MIN.	P			
47/49	CL	30	30	0	1355	1400	5 MIN.	P			
46/49	CL	30	30	0	1355	1400	5 MIN.	P			
48/46	CL	30	30	0	1335	1340	5 MIN.	P			
48/49	CL	30	28	2	1335	1340	5 MIN.	P			
48/50	CL	30	30	0	1422	1427	5 MIN.	P			
49/50	CL	30	30	0	1422	1427	5 MIN.	P			
50/51	CL	30	29	1	1530	1535	5 MIN.	P			

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NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
50/51	CL	30	30	0	1530	1535	5 MIN.	P		R-74 TO R-70	
51/52	CL	30	30	0	1531	1536	5 MIN.	P			
51/53	CL	30	30	0	1654	1659	5 MIN.	P			
52/53	CL	30	30	0	1654	1659	5 MIN.	P			
52/56	CL	30	30	0	1619	1624	5 MIN.	P			
52/55	CL	30	30	0	1619	1624	5 MIN.	P			
54/52	CL	30	30	0	1644	1649	5 MIN.	P			
54/55	CL	30	30	0	1638	1643	5 MIN.	P			
55/56	CL	30	30	0	1612	1617	5 MIN.	P			
1/42	CL	30	28	2	1444	1449	5 MIN.	P			
2/43	CL	30	29	1	1450	1455	5 MIN.	P			
2/45	CL	30	29	1	1450	1455	5 MIN.	P			
3/45	CL	30	30	0	1459	1504	5 MIN.	P			
4/48	CL	30	30	0	1507	1512	5 MIN.	P			
5/50	CL	30	30	0	1508	1513	5 MIN.	P			
9/51	CL	30	28	2	1517	1522	5 MIN.	P			
10/52	CL	30	28	2	1521	1526	5 MIN.	P			
15/52	CL	30	29	1	1543	1548	5 MIN.	P			
16/56	CL	30	30	0	1610	1615	5 MIN.	P			
17/56	CL	30	30	0	1610	1615	5 MIN.	P			
17/55	CL	30	30	0	1612	1617	5 MIN.	P			
20/55	CL	30	28	2	1635	1640	5 MIN.	P			
23/55	CL	30	30	0	1635	1640	5 MIN.	P			

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NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
24/54	CL	30	30	0	1638	1643	5 MIN.	P			
25/52	CL	30	30	0	1644	1649	5 MIN.	P			
25/53	CL	30	28	2	1700	1705	5 MIN.	P			
26/53	CL	30	30	0	1700	1705	5 MIN.	P			
27/53	CL	30	30	0	1718	1723	5 MIN.	P			
28/51	CL	30	30	0	1720	1725	5 MIN.	P			
29/51	CL	30	30	0	1720	1725	5 MIN.	P			
30/51	CL	30	30	0	1722	1727	5 MIN.	P			
57/PH-2	SM								P	10/26/10 - TIE-IN	
58/ph-2	SM								P	10/26/10 - TIE-IN	
57/58	CL	30	28	2	1450	1455	5 MIN.	P			
59/67	CL	30	29	1	1452	1457	5 MIN.	P			
58/67	CL	30	29	1	1452	1457	5 MIN.	P			
58/59	CL	30	30	0	1455	1500	5 MIN.	P		R-101 TO R-100	
58/59	CL	30	28	2	1457	1502	5 MIN.	P		R-100 TO R-99	
57/59	CL	30	30	0	1515	1520	5 MIN.	P		R-98 TO R-109	
57/59	CL	30	28	2	1514	1519	5 MIN.	P		R-98 TO R-99	
59/60	CL	30	28	2	1454	1459	5 MIN.	P			
67/60	CL	30	29	1	1454	1459	5 MIN.	P			
60/61	CL	30	30	0	1550	1555	5 MIN.	P			
61/62	CL	30	30	0	1556	1601	5 MIN.	P			
62/63	CL	30	30	0	1559	1604	5 MIN.	P			
62/64	CL	30	30	0	1610	1615	5 MIN.	P			

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SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
63/64	CL	30	29	1	1602	1607	5 MIN.	P			
61/65	CL	30	30	0	1628	1633	5 MIN.	P			
65/62	CL	30	30	0	1628	1633	5 MIN.	P			
65/66	CL	30	30	0	1650	1655	5 MIN.	P			
60/65	CL	30	30	0	1651	1656	5 MIN.	P			
60/66	CL	30	30	0	1651	1656	5 MIN.	P			
42/57	CL	30	30	0	1525	1530	5 MIN.	P			
44/59	CL	30	30	0	1525	1530	5 MIN.	P			
45/60	CL	30	30	0	1538	1543	5 MIN.	P			
49/62	CL	30	30	0	1540	1545	5 MIN.	P			
50/63	CL	30	30	0	1540	1545	5 MIN.	P		R-112 TO R-113	
50/63	CL	30	28	2	1548	1553	5 MIN.	P		R-113 TO R-114	
30/63	CL	30	30	0	1548	1553	5 MIN.	P			
31/63	CL	30	30	0	1602	1602	5 MIN.	P			
32/64	CL	30	30	0	1603	1608	5 MIN.	P			
33/64	CL	30	30	0	1603	1608	5 MIN.	P			
34/64	CL	30	28	2	1610	1615	5 MIN.	P			
35/62	CL	30	30	0	1616	1621	5 MIN.	P			
36/62	CL	30	28	2	1616	1621	5 MIN.	P			
37/62	CL	30	30	0	1627	1632	5 MIN.	P			
38/62	CL	30	30	0	1627	1632	5 MIN.	P			
38/65	CL	30	30	0	1650	1655	5 MIN.	P			
39/66	CL	30	28	2	1652	1657	5 MIN.	P			

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			
40/66	CL	30	30	0	1652	1657	5 MIN.	P		
41/66	CL	30	30	0	1655	1700	5 MIN.	P		
41/68	CL	30	30	0	1438	1443	5 MIN.	P	10/27/10	
68/69	CL	30	30	0	1439	1444	5 MIN.	P		
69/70	CL	30	30	0	1440	1445	5 MIN.	P		
70/71	CL	30	30	0	1441	1446	5 MIN.	P		
71/72	CL	30	30	0	1515	1520	5 MIN.	P		
72/73	CL	30	30	0	1516	1521	5 MIN.	P		
73/74	CL	30	30	0	1517	1522	5 MIN.	P		
74/75	CL	30	30	0	1518	1523	5 MIN.	P		
75/76	CL	30	30	0	1550	1555	5 MIN.	P	R-139 TO R-130	
75/76	CL	30	28	2	1600	1605	5 MIN.	P	R-130 TO R-199	
76/77	CL	30	30	0	1556	1601	5 MIN.	P	R-140 TO R-129	
76/77	CL	30	30	0	1557	1602	5 MIN.	P	R-129 TO R-200	
58/78	CL	30	30	0	1350	1355	5 MIN.	P		
67/78	CL	30	30	0	1350	1355	5 MIN.	P		
60/78	CL	30	29	1	1353	1358	5 MIN.	P		
66/78	CL	30	30	0	1355	1400	5 MIN.	P		
68/78	CL	30	30	0	1359	1404	5 MIN.	P		
69/79	CL	30	30	0	1359	1404	5 MIN.	P		
70/80	CL	30	28	2	1420	1425	5 MIN.	P		
81/71	CL	30	30	0	1412	1417	5 MIN.	P		
72/82	CL	30	30	0	1422	1427	5 MIN.	P	R-154 TO R-155 10/28/10	

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NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
72/82	CL	30	30	0	1422	1427	5 MIN.	P		R-155 TO R-156	
73/83	CL	30	30	0	1424	1429	5 MIN.	P			
74/84	CL	30	30	0	1431	1436	5 MIN.	P			
75/85	CL	30	30	0	1434	1439	5 MIN.	P			
84/85	CL	30	30	0	1434	1439	5 MIN.	P			
78/79	CL	30	30	0	1428	1433	5 MIN.	P			
79/80	CL	30	30	0	1424	1429	5 MIN.	P		R-151 TO R-144	
79/80	CL	30	30	0	1413	1418	5 MIN.	P		R-144 TO R-197	
80/81	CL	30	30	0	1412	1417	5 MIN.	P			
81/82	CL	30	30	0	1403	1408	5 MIN.	P			
82/83	CL	30	30	0	1403	1408	5 MIN.	P			
83/84	CL	30	30	0	1359	1404	5 MIN.	P			
78/PH-2	SM								P	10/30/10 - TIE-IN	
79/PH-2	SM								P	10/30/10 - TIE-IN	
80/PH-2	SM								P	10/30/10 - TIE-IN	
81/PH-2	SM								P	10/30/10 - TIE-IN	
82/PH-2	SM								P	10/30/10 - TIE-IN	
83/PH-2	SM								P	10/30/10 - TIE-IN	
84- 85/PH-2	SM								P	10/30/10 - TIE-IN	
77/86	CL	30	30	0	1050	1055	5 MIN.	P		10/29/10	
86/87	CL	30	30	0	1051	1056	5 MIN.	P		10/29/10	
87/88	CL	30	30	0	1052	1057	5 MIN.	P		10/29/10	
88/89	CL	30	30	0	1053	1058	5 MIN.	P		10/29/10	

PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
89/90	CL	30	30	0	1053	1058	5 MIN.	P			
90/91	CL	30	28	2	1058	1103	5 MIN.	P			
91/92	CL	30	30	0	1130	1135	5 MIN.	P			
92/93	CL	30	30	0	1131	1136	5 MIN.	P			
93/94	CL	30	30	0	1132	1137	5 MIN.	P			
94/95	CL	30	30	0	1135	1140	5 MIN.	P			
95/96	CL	30	28	2	1150	1155	5 MIN.	P			
96/97	SM								P	11/1/10	
97/98	CL	30	30	0	1547	1552	5 MIN.	P			
98/99	CL	30	30	0	1547	1552	5 MIN.	P			
99/100	CL	30	30	0	1551	1556	5 MIN.	P			
100/101	CL	30	30	0	1612	1617	5 MIN.	P			
101/102	CL	30	30	0	1614	1619	5 MIN.	P			
102/103	CL	30	30	0	1629	1634	5 MIN.	P		R-176 TO R-178	
103/104	CL	30	30	0	1705	1710	5 MIN.	P			
95/97	CL	30	30	0	1540	1545	5 MIN.	P			
94/97	CL	30	30	0	1550	1555	5 MIN.	P			
94/99	CL	30	30	0	1550	1555	5 MIN.	P			
93/99	CL	30	30	0	1551	1556	5 MIN.	P			
93/100	CL	30	30	0	1611	1616	5 MIN.	P			
92/100	CL	30	30	0	1611	1616	5 MIN.	P			
92/101	CL	30	28	2	1613	1618	5 MIN.	P			
91/101	CL	30	30	0	1613	1618	5 MIN.	P			

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE

10 of 11
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/29/10

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							P/F	VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME						
		START	END	DROP	START	END	DURATION				
91/102	CL	30	30	0	1615	1620	5 MIN.	P			
90/102	CL	30	30	0	1615	1620	5 MIN.	P			
90/103	CL	30	28	2	1637	1642	5 MIN.	P			
102/103	CL	30	30	0	1629	1634	5 MIN.	P		R-178 TO R-190	
95/97	CL	30	30	0	1545	1550	5 MIN.	P			
104/105	CL	30	30	0	1710	1715	5 MIN.	P			
104/105	CL	30	30	0	1705	1710	5 MIN.	P			
105/106	CL	30	30	0	1706	1711	5 MIN.	P			
85/107	CL	30	29	1	0805	0810	5 MIN.	P		10/30/10	
107/108	CL	30	30	0	0807	0812	5 MIN.	P			
107/109	CL	30	30	0	0807	0812	5 MIN.	P			
108/109	CL	30	30	0	0807	0812	5 MIN.	P			
109/110	CL	30	29	1	0815	0820	5 MIN.	P			
108/110	CL	30	30	0	0815	0820	5 MIN.	P			
110/111	CL	30	28	2	0842	0847	5 MIN.	P		R-203 TO R-205	
110/111	CL	30	29	1	0842	0847	5 MIN.	P		R-205 TO R-204	
111/112	CL	30	30	0	0849	0854	5 MIN.	P			
112/113	CL	30	28	2	0855	0900	5 MIN.	P			
113/114	CL	30	30	0	0916	0921	5 MIN.	P			
107/76	CL	30	30	0	0805	0810	5 MIN.	P			
109/77	CL	30	30	0	0830	0835	5 MIN.	P			
110/86	CL	30	30	0	0830	0835	5 MIN.	P			
111/87	CL	30	30	0	0835	0840	5 MIN.	P			

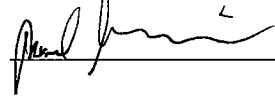
PRINT NAME: Paul Siriboury

SIGNATURE: 

NON-DESTRUCTIVE TEST LOG

SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			
112/88	CL	30	30	0	0835	0840	5 MIN.	P		
113/89	CL	30	30	0	0915	0920	5 MIN.	P		
114/89	CL	30	30	0	0915	0920	5 MIN.	P		
103/114	CL	30	30	0	0917	0922	5 MIN.	P		
114/105	CL	30	30	0	0920	0925	5 MIN.	P		
114/106	CL	30	29	1	0920	0925	5 MIN.	P		
107/PH-2	SM								P	TIE-IN
108/PH-2	SM								P	TIE-IN
110/PH-2	SM								P	TIE-IN
111/PH-2	SM								P	TIE-IN
112/PH-2	SM								P	TIE-IN
113/PH-2	SM								P	TIE-IN
114/PH-2	SM								P	TIE-IN
106/PH-2	SM								P	TIE-IN

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Attachment 8-7
Geomembrane Seam Logs

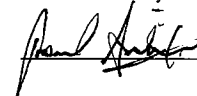
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
1/Phase-2	121'	DL	A055	FUSION	60	0850	61	850	TIE-IN TO PHASE-2	
1/2	143'	DL	A055	FUSION	60	0910	62	850		
2/3	143'	RO	A039	FUSION	11	0910	62	800	DP-1	
3/4	143'	RO	A039	FUSION	11	0930	62	800		
4/5	137'	DL	A091	FUSION	60	0945	62	850	DP-2	
5/6	99'	RO	A039	FUSION	11	0950	62	800		
5/8	45'	RO	A039	FUSION	11	1035	62	800		
6/7	49'	DL	A091	FUSION	15	0930	62	800		
7/8	47'	RO	A039	FUSION	11	1017	64	800		
6/8	51'	RO	A039	FUSION	11	1020	64	800		
9/8	141'	DL	A091	FUSION	15	1010	64	800	DP-3	
10/9	129'	DL	A091	FUSION	15	0920	64	800		
11/10	109'	RO	A039	FUSION	11	1046	64	800		
11/12	71'	DL	A091	FUSION	15	1055	64	800		
12/13	34'	RO	A039	FUSION	12	1115	64	800		
13/14	29'	RO	A039	FUSION	12	1126	66	800	DP-4	
12/14	37'	RO	A039	FUSION	10	1133	66	800		
11/14	37'	RO	A039	FUSION	10	1140	66	800		
10/14	38'	RO	A039	FUSION	10	1145	66	800		
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Cumulative Total				1,603 LF						

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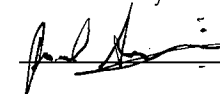
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
14/15	139'	DL	A091	FUSION	15	1135	67	800	
15/16	140'	DL	A091	FUSION	15	1250	69	800	
16/17	140'	RO	A039	FUSION	11	1300	69	800	DP-5
17/18	139'	DL	A091	FUSION	15	1330	70	800	
18/19	74'	RO	A039	FUSION	11	1330	70	800	
19/20	76'	RO	A039	FUSION	11	1355	77	800	
18/20	68'	RO	A039	FUSION	11	1350	77	800	
20/21	142'	DL	A091	FUSION	15	1400	80	800	DP-6
21/22	75'	DL	A091	FUSION	15	1430	82	800	
21/23	67'	DL	A091	FUSION	15	1505	82	800	
22/23	76'	RO	A039	FUSION	10	1500	82	800	
23/24	144'	DL	A091	FUSION	15	1510	82	800	
24/25	142'	DL	A091	FUSION	15	1525	82	800	DP-7
25/26	142'	RO	A039	FUSION	11	0830	60	800	10-13-10
26/27	144'	DL	A091	FUSION	15	0820	60	800	10-13-10
27/28	145'	DL	A091	FUSION	15	0850	62	800	10-13-10
28/29	146'	RO	A039	FUSION	11	0900	63	800	DP-8/10-13-10
29/30	145'	DL	A091	FUSION	15	0910	63	800	10-13-10
30/31	149'	RO	A039	FUSION	11	0925	63	800	10-13-10
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Cumulative Total				3,896 LF					

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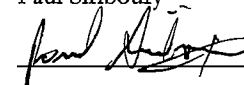
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
31/32	149'	DL	A091	FUSION	15	0935	66	800	DP-9
32/33	150'	RO	A039	FUSION	11	0948	70	800	
33/34	148'	DL	A091	FUSION	15	0955	71	800	
34/35	148'	DL	A091	FUSION	15	1020	73	800	DP-10
35/36	143'	DL	A091	FUSION	15	1040	75	800	
36/37	89'	RO	A039	FUSION	11	1017	73	800	
36/38	68'	RO	A039	FUSION	10	1044	75	800	
37/38	80'	RO	A039	FUSION	10	1050	75	800	DP-11
38/39	155'	DL	A091	FUSION	15	1110	76	800	
39/40	154'	DL	A091	FUSION	15	1335	82	800	DP-12
41/PH-2	156'	CM	A036	EXTRUSION	455	1100	69	480	10/22/10
41/PH-2	134'	JP	A061	EXTRUSION	455	1322	82	470	DP-13
41/42	212'	DL	A091	FUSION	15	1020	69	800	
41/43	71'	DL	A091	FUSION	15	1015	69	800	
42/43	9'	DL	A091	FUSION	15	1010	69	800	
42/44	221'	DL	A091	FUSION	15	1050	72	800	DP-14
44/45	212'	RO	A039	FUSION	11	1140	80	800	
45/47	138'	RO	A039	FUSION	11	1040	76	800	DP-15
45/48	73'	RO	A039	FUSION	11	1055	76	800	
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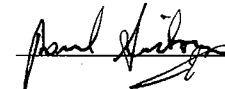
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
44/46	70	DL	A091	FUSION	15	1300	82	800		
46/48	70	RO	A039	FUSION	11	1100	71	800		
47/48	22	DL	A091	FUSION	15	1325	82	800		
43/44	70	DL	A091	FUSION	15	1103	71	800		
47/49	136	RO	A039	FUSION	11	1120	73	800		
48/49	144	RO	A039	FUSION	11	1140	75	800		
49/50	274	DL	A091	FUSION	15	1330	83	800	DP-16	
51/55	22	DL	A091	FUSION	15	1350	83	800		
50/51	153	DL	A091	FUSION	15	1400	84	800		
50/55	53	DL	A091	FUSION	15	1408	84	800		
51/52	31	DL	A091	FUSION	15	1430	84	800		
51/53	64	DL	A091	FUSION	15	1431	84	800		
52/53	15	DL	A091	FUSION	15	1425	83	800		
51/54	19	DL	A091	FUSION	15	1433	84	800		
53/54	8	DL	A091	FUSION	15	1419	83	800		
1/41	17	RO	A039	FUSION	15	1340	84	800		
2/42	15	RO	A039	FUSION	11	1346	84	800		
3/44	10	RO	A039	FUSION	11	1355	84	800		
4/47	16	RO	A039	FUSION	11	1359	84	800		
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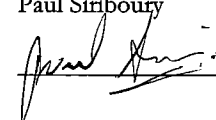
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
5/49	15	RO	A039	FUSION	10	1403	83	800	
9/50	17	RO	A039	FUSION	10	1405	83	800	
14/51	19	RO	A039	FUSION	10	1413	83	800	
15/51	17	RO	A039	FUSION	10	1417	83	800	
16/52	18	RO	A039	FUSION	10	1420	83	800	
17/52	10	RO	A039	FUSION	10	1428	83	800	
17/53	9	RO	A039	FUSION	10	1430	83	800	
20/53	19	RO	A039	FUSION	10	1440	84	800	DP-17
23/53	18	RO	A039	FUSION	10	1445	84	800	
24/53	5	RO	A039	FUSION	10	1505	84	800	
24/54	13	RO	A039	FUSION	10	1506	84	800	
25/55	12	RO	A039	FUSION	10	1511	84	800	
26/55	15	RO	A039	FUSION	10	1513	84	800	
27/55	15	RO	A039	FUSION	10	1516	84	800	
28/55	20	RO	A039	FUSION	10	1519	84	800	
29/55	17	RO	A039	FUSION	10	1522	85	800	
40/56	155	SM	A047	FUSION	12	0855	72	800	11/03/10
56/57	154	SM	A047	FUSION	12	0925	72	800	DP-18
57/58	156	SM	A047	FUSION	12	0940	72	800	
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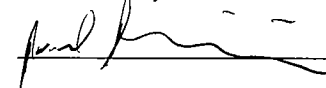
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
58/59	152	DL	A091	FUSION	15	0915	71	800	
59/60	155	DL	A091	FUSION	15	0925	71	800	DP-19
60/61	155	DL	A091	FUSION	15	0945	72	800	
61/62	156	DL	A091	FUSION	15	1005	72	800	
62/63	157	SM	A047	FUSION	12	1008	72	800	
63/64	159	SM	A047	FUSION	12	1027	74	800	DP-20
64/65	159	SM	A047	FUSION	12	1045	75	800	
65/66	160	DL	A091	FUSION	15	1025	74	800	
66/67	160	DL	A091	FUSION	15	1055	75	800	DP-21
67/68	160	SM	A047	FUSION	12	1118	76	800	
68/69	155	DL	A091	FUSION	15	1120	76	800	
69/70	151	DL	A091	FUSION	15	1140	78	800	
70/71	148	SM	A047	FUSION	13	1324	81	800	DP-22
71/72	142	SM	A047	FUSION	13	1340	81	800	
72/73	117	SM	A047	FUSION	13	1356	82	800	
73/74	93	SM	A047	FUSION	13	1430	83	800	
74/75	68	SM	A047	FUSION	13	1442	83	800	DP-23
75/76	40	SM	A047	FUSION	13	1500	83	800	
76/77	17	SM	A047	FUSION	13	1520	83	800	
Page Total		2,504 LF							
Cumulative Total		9,592 LF							

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GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
77/78	13	SM	A047	FUSION	13	1525	83	800		
78/79	51	SM	A047	FUSION	13	1530	83	800		
79/80	78	DL	A091	FUSION	18	1535	83	800		
80/81	107	DL	A091	FUSION	18	1545	83	800		
81/82	133	DL	A091	FUSION	18	1410	81	800	DP-24	
76/78	28	SM	A047	FUSION	13	1535	83	800		
75/78	11	SM	A047	FUSION	13	1539	83	800		
75/79	22	SM	A047	FUSION	13	1542	83	800		
74/79	12	SM	A047	FUSION	13	1546	83	800		
74/80	20	SM	A047	FUSION	13	1548	83	800		
73/80	14	SM	A047	FUSION	13	1552	83	800		
73/81	18	SM	A047	FUSION	13	1556	84	800		
72/81	16	SM	A047	FUSION	13	1600	84	800		
72/82	17	SM	A047	FUSION	13	1604	84	800		
41/83	21	SM	A047	FUSION	12	0842	51	800	11/9/10	
43/83	16	SM	A047	FUSION	12	0844	51	800		
44/83	21	SM	A047	FUSION	12	0846	51	800		
46/83	5	SM	A047	FUSION	12	0850	51	800		
48/83	21	SM	A047	FUSION	12	0852	51	800		
Page Total				578 LF						
Cumulative Total				10,170 LF						

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GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
49/83	21	SM	A047	FUSION	12	0854	52	800		
83/84	106	SM	A047	FUSION	12	0856	52	800		
84/85	100	SM	A047	FUSION	12	0912	52	800		
85/86	95	SM	A047	FUSION	12	0930	53	800	DP-25	
86/87	90	DL	A058	FUSION	10	0845	52	800		
87/88	84	DL	A058	FUSION	10	0900	52	800		
88/89	80	DL	A058	FUSION	10	0915	53	800		
89/90	75	DL	A058	FUSION	10	0930	53	800		
90/91	70	DL	A058	FUSION	10	0945	53	800		
91/92	68	DL	A058	FUSION	10	0955	53	800		
92/93	67	DL	A058	FUSION	10	1010	54	800	DP-27	
93/94	66	DL	A058	FUSION	10	1025	54	800		
94/95	66	DL	A058	FUSION	10	1040	54	800		
95/96	66	DL	A058	FUSION	10	1055	54	800		
96/97	66	DL	A058	FUSION	10	1103	55	800		
97/98	65	SM	A047	FUSION	12	1046	54	800		
98/99	65	SM	A047	FUSION	12	1100	55	800		
99/100	65	DL	A058	FUSION	10	1115	55	800		
100/101	64	DL	A058	FUSION	10	1130	56	800	DP-29	
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Cumulative Total				11,549 LF						

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GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
101/102	64	SM	A047	FUSION	12	1118	65	800		
102/103	63	DL	A058	FUSION	10	1145	66	800		
103/104	64	SM	A047	FUSION	12	1300	74	800		
104/105	63	DL	A058	FUSION	10	1340	74	800		
105/106	61	DL	A058	FUSION	10	1350	74	800		
106/107	61	SM	A047	FUSION	13	1540	76	800		
107/108	49	SM	A047	FUSION	13	1557	76	800		
108/109	46	SM	A047	FUSION	13	1610	76	800		
30/50	8	SM	A047	FUSION	12	0954	56	800		
30/83	11	SM	A047	FUSION	12	0956	56	800		
31/83	9	SM	A047	FUSION	12	0958	56	800		
31/84	11	SM	A047	FUSION	12	1000	56	800		
32/84	9	SM	A047	FUSION	12	1002	56	800		
32/85	10	SM	A047	FUSION	12	1004	56	800		
33/85	10	SM	A047	FUSION	12	1006	56	800		
33/86	11	SM	A047	FUSION	12	1008	56	800		
34/86	7	SM	A047	FUSION	12	1010	56	800		
34/87	8	SM	A047	FUSION	12	1012	56	800		
35/87	9	SM	A047	FUSION	12	1014	56	800		
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Cumulative Total				12,123 LF						

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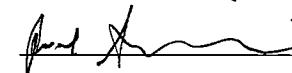
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
35/88	8	SM	A047	FUSION	12	1016	67	800		
36/88	11	SM	A047	FUSION	12	1018	67	800		
36/89	9	SM	A047	FUSION	12	1020	67	800		
37/89	11	SM	A047	FUSION	12	1022	67	800		
37/90	6	SM	A047	FUSION	12	1024	67	800		
38/90	11	SM	A047	FUSION	12	1026	67	800		
38/91	8	SM	A047	FUSION	12	1028	69	800		
39/91	11	SM	A047	FUSION	12	1030	69	800		
39/92	7	SM	A047	FUSION	12	1032	69	800		
40/92	12	SM	A047	FUSION	12	1107	72	800		
40/93	8	SM	A047	FUSION	12	1109	72	800		
56/93	12	SM	A047	FUSION	12	1111	72	800		
56/94	8	SM	A047	FUSION	12	1113	72	800		
57/94	11	SM	A047	FUSION	12	1115	72	800	DP-28	
57/95	8	SM	A047	FUSION	12	1117	72	800		
58/95	12	SM	A047	FUSION	12	1119	72	800		
58/96	7	SM	A047	FUSION	12	1121	72	800		
59/96	11	SM	A047	FUSION	12	1123	72	800		
59/97	6	SM	A047	FUSION	12	1125	72	800		
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Cumulative Total				12,300 LF						

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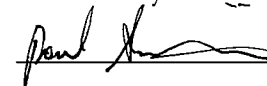
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
60/97	11	SM	A047	FUSION	12	1126	72	800		
60/98	7	SM	A047	FUSION	12	1128	72	800		
61/98	12	SM	A047	FUSION	12	1130	72	800		
61/99	8	SM	A047	FUSION	12	1132	72	800		
62/99	12	SM	A047	FUSION	12	1134	72	800		
62/100	8	SM	A047	FUSION	12	1136	72	800		
63/100	11	SM	A047	FUSION	12	1138	74	800		
63/101	7	SM	A047	FUSION	13	1330	77	800		
64/101	11	SM	A047	FUSION	13	1331	77	800		
64/102	7	SM	A047	FUSION	13	1333	77	800		
65/102	11	SM	A047	FUSION	13	1335	77	800		
65/103	7	SM	A047	FUSION	13	1337	77	800		
66/103	11	SM	A047	FUSION	13	1339	79	800		
66/104	8	SM	A047	FUSION	13	1341	79	800		
67/104	11	SM	A047	FUSION	13	1343	79	800		
67/105	8	SM	A047	FUSION	13	1345	80	800		
68/105	10	SM	A047	FUSION	13	1347	80	800	DP-30	
68/106	8	SM	A047	FUSION	13	1349	80	800		
69/106	11	SM	A047	FUSION	13	1351	80	800		
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Cumulative Total				12,479 LF						

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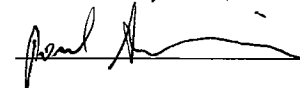
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
69/107	8	SM	A047	FUSION	13	1353	78	800		
109/111	24	DL	A058	FUSION	12	1612	80	800		
109/110	23	DL	A058	FUSION	12	1614	80	800		
110/PH-2	30	CM	A036	EXTRUSION	465	0930	52	480	11/10/10	
110/PH-2	110	DL	A058	FUSION	10	1300	79	800	11/9/10	
110/111	151	DL	A058	FUSION	12	1440	82	800		
111/112	152	DL	A058	FUSION	12	1535	83	800	DP-31	
113/82	149	SM	A047	FUSION	13	1534	83	800		
83/PH-2	22	CM	A036	EXTRUSION	465	0930	53	480		
84/PH-2	22	CM	A036	EXTRUSION	465	0945	54	480		
85/PH-2	22	CM	A036	EXTRUSION	465	1000	54	480		
86/PH-2	22	CM	A036	EXTRUSION	465	1015	54	480		
87/PH-2	22	CM	A036	EXTRUSION	465	1030	55	480		
88/PH-2	22	CM	A036	EXTRUSION	465	1045	55	480	DP-26	
89/PH-2	22	CM	A036	EXTRUSION	465	1100	57	480		
90/PH-2	22	CM	A036	EXTRUSION	465	1120	59	480		
91/PH-2	22	CM	A036	EXTRUSION	465	1140	62	480		
92/PH-2	22	SM	A036	EXTRUSION	440	1330	78	480		
93/PH-2	22	SM	A036	EXTRUSION	440	1345	78	480		
Page Total				889 LF						
Cumulative Total				13,368 LF						

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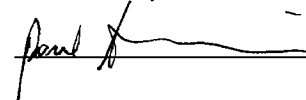
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SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
94/PH-2	22	CM	A047	EXTRUSION	440	1400	82	480	
95/PH-2	22	CM	A058	EXTRUSION	440	1416	82	480	
96/PH-2	22	CM	A058	EXTRUSION	440	1432	84	480	
97/PH-2	22	CM	A036	EXTRUSION	440	1445	84	480	
98/PH-2	22	CM	A058	EXTRUSION	440	1500	84	480	
99/PH-2	22	CM	A058	EXTRUSION	440	1515	84	480	
100/PH-2	22	CM	A058	EXTRUSION	440	1530	84	480	
101/PH-2	22	CM	A047	EXTRUSION	440	1545	84	480	
102/PH-2	22	CM	A036	EXTRUSION	440	1600	84	480	
103/PH-2	22	CM	A036	EXTRUSION	440	1615	84	480	
104/PH-2	22	CM	A036	EXTRUSION	440	1630	84	480	
105/PH-2	22	CM	A036	EXTRUSION	440	1639	85	480	
106/PH-2	22	CM	A036	EXTRUSION	440	1649	85	480	
107/PH-2	22	CM	A036	EXTRUSION	460	0900	52	480	DP-32/11/10/10
108/PH-2	22	CM	A036	EXTRUSION	460	0915	52	480	
109/PH-2	22	CM	A036	EXTRUSION	460	0930	53	480	
70/108	22	CM	A036	EXTRUSION	480	1105	74	430	11/24/10
112/108	15	CM	A036	EXTRUSION	480	1305	74	430	11/24/10
112/113	101	SM	A047	FUSION	11	1645	70	800	11/29/10
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Cumulative Total				13,858 LF					

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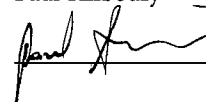
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
1/Phase-2	117	DL	A055	FUSION	55	1414	79	850	TIE-IN TO PHASE-2	
1/2	139	SM	A041	FUSION	16	1410	79	800		
2/3	143	RO	A039	FUSION	10	1409	79	800	DS-1	
3/4	142	RO	A039	FUSION	10	1436	80	800		
4/5	138	SM	A041	FUSION	16	1430	80	800	DS-2	
5/6	95	DL	A055	FUSION	60	1448	80	850		
5/8	42	RO	A039	FUSION	10	1500	81	800		
6/7	44	DL	A055	FUSION	60	1500	81	850		
6/8	43	SM	A041	FUSION	14	1500	81	800		
7/8	45	SM	A041	FUSION	14	1505	81	800		
9/8	141	RO	A039	FUSION	10	1510	81	800		
10/9	137	DL	A055	FUSION	60	1515	81	850	DS-3	
11/10	101	RO	A039	FUSION	10	1540	81	800		
10/14	35	RO	A039	FUSION	10	1610	80	800		
11/14	34	DL	A055	FUSION	55	1634	80	850		
12/14	32	DL	A055	FUSION	55	1630	80	850		
13/14	20	DL	A055	FUSION	55	1623	80	850		
11/12	71	DL	A055	FUSION	55	1545	81	850	DS-4	
12/13	31	DL	A055	FUSION	55	1600	80	850		
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Cumulative Total				1,550 LF						

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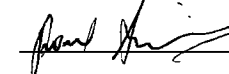
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
14/15	135	RO	A039	FUSION	11	1240	73	800		
15/16	141	DL	A055	FUSION	55	1255	73	850	DS-5	
16/17	143	RO	A039	FUSION	11	1305	73	800		
17/18	142	DL	A055	FUSION	55	1317	73	850		
18/19	76	RO	A039	FUSION	11	1330	73	800		
19/20	74	RO	A039	FUSION	11	1350	74	800		
18/20	65	RO	A039	FUSION	11	1335	73	800	DS-6	
20/21	144	DL	A055	FUSION	55	1350	74	850		
21/23	67	DL	A055	FUSION	55	1435	73	850		
21/22	80	RO	A039	FUSION	11	1405	73	800		
22/23	77	DL	A055	FUSION	55	1430	73	850		
23/24	137	RO	A039	FUSION	11	1440	73	800		
24/25	143	DL	A055	FUSION	55	1453	74	850	DS-7	
25/26	143	RO	A039	FUSION	11	1500	74	800		
26/27	142	DL	A055	FUSION	55	1520	75	850		
27/28	145	RO	A039	FUSION	11	1530	75	800	DS-8	
28/29	145	DL	A055	FUSION	55	1605	76	850		
29/30	146	RO	A039	FUSION	11	1240	78	800	DS-9 10/7/10	
30/31	147	DL	A055	FUSION	60	1245	78	850	10/7/10	
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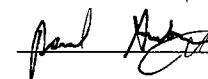
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
31/32	146	RO	A039	FUSION	11	1310	78	800	DS-10	
32/33	146	DL	A055	FUSION	60	1315	78	850		
33/34	143	RO	A039	FUSION	11	1335	78	800		
34/35	149	RO	A039	FUSION	11	1400	78	800		
35/36	150	DL	A055	FUSION	60	1355	78	850	DS-11	
36/37	90	DL	A055	FUSION	60	1340	78	850		
37/38	93	DL	A055	FUSION	55	1425	78	850		
36/38	60	DL	A055	FUSION	60	1420	78	850		
38/39	151	RO	A039	FUSION	11	1440	78	800		
39/40	154	DL	A055	FUSION	60	1450	79	850	DS-12	
40/41	154	RO	A039	FUSION	11	1505	79	800		
42/PH-2	285	CM	A036	EXTRUSION	465	1300	83	485	DS-13 10-20-10	
42/43	213	DL	A091	FUSION	15	1153	79	800		
42/44	73	DL	A091	FUSION	15	1145	79	800	DS-14	
43/44	16	RO	A039	FUSION	10	1310	83	800		
44/45	71	RO	A039	FUSION	10	1315	83	800		
43/45	213	RO	A039	FUSION	10	1320	83	800		
45/46	212	RO	A039	FUSION	10	1341	84	800	DS-15	
45/47	72	RO	A039	FUSION	10	1410	84	800		
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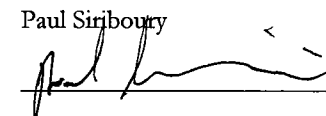
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
47/49	72	DL	A091	FUSION	15	1336	83	800		
46/49	74	DL	A091	FUSION	15	1330	83	800		
48/46	138	DL	A091	FUSION	15	1310	83	800		
48/49	21	DL	A091	FUSION	14	1325	83	800		
48/50	137	DL	A091	FUSION	15	1355	83	800		
49/50	147	DL	A091	FUSION	15	1402	84	800		
50/51	284	DL	A091	FUSION	15	1425	84	800	DS-16	
51/52	155	DL	A091	FUSION	15	1450	84	800		
51/53	50	DL	A091	FUSION	15	1453	84	800		
52/53	20	DL	A091	FUSION	15	1535	84	800		
52/56	31	DL	A091	FUSION	15	1515	84	800		
52/55	62	DL	A091	FUSION	15	1517	84	800		
54/52	17	DL	A091	FUSION	15	1520	84	800		
54/55	8	RO	A039	FUSION	15	1510	84	800		
55/56	13	RO	A039	FUSION	10	1515	84	800		
1/42	17	RO	A039	FUSION	10	1430	84	800		
2/43	12	RO	A039	FUSION	10	1320	83	800		
2/45	6	RO	A039	FUSION	10	1341	83	800		
3/45	13	RO	A039	FUSION	10	1410	84	800		
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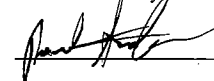
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
4/48	17	RO	A039	FUSION	10	1456	84	800		
5/50	17	RO	A039	FUSION	10	1459	84	800		
9/51	18	RO	A039	FUSION	10	1505	84	800		
10/52	14	RO	A039	FUSION	10	1510	85	800		
15/52	19	RO	A039	FUSION	10	1520	85	800	DS-17	
16/56	15	RO	A039	FUSION	10	1530	85	800		
17/56	9	RO	A039	FUSION	10	1534	85	800		
17/55	10	RO	A039	FUSION	10	1535	85	800		
20/55	20	RO	A039	FUSION	10	1538	85	800		
23/55	21	RO	A039	FUSION	10	1548	85	800		
24/54	7	RO	A039	FUSION	10	1605	85	800		
25/52	5	RO	A039	FUSION	10	1610	85	800		
25/53	11	RO	A039	FUSION	10	1613	85	800		
26/53	22	RO	A039	FUSION	10	1616	85	800		
27/53	14	RO	A039	FUSION	10	1620	85	800		
28/51	21	RO	A039	FUSION	10	1625	85	800		
29/51	22	RO	A039	FUSION	10	1630	85	800		
30/51	11	RO	A039	FUSION	10	1635	85	800		
57/PH-2	201	CM	A036	EXTRUSION	450	1110	81	465	DS-18 10/26/10	
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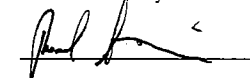
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
58/ph-2	55	CM	A036	EXTRUSION	450	1140	81	465		
57/58	13	RO	A039	FUSION	10	1330	83	800		
59/67	14	RO	A039	FUSION	10	1355	83	800		
58/67	22	DL	A091	FUSION	18	1348	83	800		
58/59	33	DL	A091	FUSION	18	1310	83	800		
57/59	201	DL	A091	FUSION	18	1312	83	800		
59/60	236	DL	A091	FUSION	18	1402	84	800	DS-19	
67/60	22	DL	A091	FUSION	18	1400	84	800		
60/61	176	DL	A091	FUSION	18	1430	84	800		
61/62	175	RO	A039	FUSION	11	1340	84	800		
62/63	35	RO	A039	FUSION	11	1405	84	800		
62/64	63	RO	A039	FUSION	11	1410	84	800	DS-20	
63/64	14	RO	A039	FUSION	10	1403	84	800		
61/65	6	RO	A039	FUSION	10	1545	85	800		
65/62	6	RO	A039	FUSION	10	1546	85	800		
65/66	11	RO	A039	FUSION	10	1550	85	800		
60/65	16	DL	A091	FUSION	18	1457	85	800		
60/66	63	DL	A091	FUSION	18	1459	85	800		
42/57	16	RO	A039	FUSION	10	1440	84	800		
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Cumulative Total				9,361 LF						

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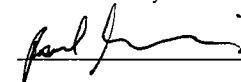
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
44/59	16	RO	A039	FUSION	10	1455	84	800		
45/60	21	RO	A039	FUSION	10	1449	84	800		
49/62	20	RO	A039	FUSION	10	1454	84	800		
50/63	19	RO	A039	FUSION	10	1459	84	800		
30/63	13	RO	A039	FUSION	10	1503	84	800		
31/63	20	RO	A039	FUSION	10	1510	84	800		
32/64	20	RO	A039	FUSION	10	1514	84	800		
33/64	17	RO	A039	FUSION	10	1518	84	800		
34/64	20	RO	A039	FUSION	10	1521	84	800		
35/62	21	RO	A039	FUSION	10	1525	84	800		
36/62	20	RO	A039	FUSION	10	1518	84	800		
37/62	20	RO	A039	FUSION	10	1533	84	800		
38/62	6	RO	A039	FUSION	10	1536	84	800		
38/65	12	RO	A039	FUSION	10	1549	85	800		
39/66	15	DL	A091	FUSION	15	1515	84	800		
40/66	19	DL	A091	FUSION	15	1516	84	800		
41/66	6	DL	A091	FUSION	15	1517	84	800		
41/68	152	RO	A039	FUSION	11	1345	87	800	10/27/10	
68/69	154	DL	A091	FUSION	18	1345	87	800	DS-21	
Page Total				577 LF						
Cumulative Total				9,938 LF						

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GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
69/70	153	DL	A091	FUSION	18	1405	87	800	
70/71	156	RO	A039	FUSION	11	1407	87	800	
71/72	151	DL	A091	FUSION	18	1420	87	800	DS-22
72/73	154	RO	A039	FUSION	11	1430	87	800	
73/74	155	DL	A091	FUSION	18	1445	87	800	
74/75	157	RO	A039	FUSION	11	1455	87	800	DS-23
75/76	156	DL	A091	FUSION	18	1520	87	800	
76/77	159	RO	A039	FUSION	11	1523	87	800	
58/78	21	RO	A039	FUSION	11	1157	90	800	10/28/10
67/78	13	RO	A039	FUSION	11	1200	90	800	
60/78	15	RO	A039	FUSION	11	1203	90	800	
66/78	8	RO	A039	FUSION	11	1207	90	800	
68/78	22	RO	A039	FUSION	11	1340	91	800	
69/79	22	RO	A039	FUSION	11	1344	91	800	
70/80	22	RO	A039	FUSION	11	1348	91	800	DS-25
81/71	22	RO	A039	FUSION	11	1352	91	800	
72/82	20	RO	A039	FUSION	11	1403	91	800	
73/83	21	RO	A039	FUSION	11	1406	91	800	
74/84	21	RO	A039	FUSION	11	1413	92	800	
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Cumulative Total				11,386 LF					

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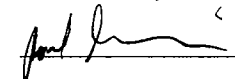
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS	
75/85	22	RO	A036	FUSION	11	1418	91	800		
84/85	63	DL	A091	FUSION	18	1420	91	800		
78/79	63	DL	A091	FUSION	18	1150	90	800		
79/80	58	DL	A091	FUSION	18	1200	90	800	DS-24	
80/81	65	DL	A091	FUSION	18	1215	90	800		
81/82	64	DL	A091	FUSION	18	1339	91	800		
82/83	64	DL	A091	FUSION	18	1348	91	800		
83/84	58	DL	A091	FUSION	18	1405	91	800		
78/PH-2	22	CM	A036	EXTRUSION	440	1000	72	460		
79/PH-2	22	CM	A036	EXTRUSION	440	1025	73	460		
80/PH-2	22	CM	A036	EXTRUSION	440	1050	74	460		
81/PH-2	22	CM	A036	EXTRUSION	440	1105	75	460		
82/PH-2	22	CM	A036	EXTRUSION	440	1130	75	460		
83/PH-2	22	CM	A036	EXTRUSION	440	1145	75	460		
84/PH-2	22	CM	A036	EXTRUSION	440	1310	90	460		
85/PH-2	22	CM	A036	EXTRUSION	440	1340	90	460		
77/86	168	RO	A039	FUSION	11	0935	67	800	10/29/10	
86/87	161	DL	A091	FUSION	15	0955	67	800		
87/88	158	SM	A047	FUSION	10	0950	67	800	DS-27	
Page Total				1,120 LF						
Cumulative Total				12,506 LF						

PRINT NAME:

Paul Siriboury

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GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
88/89	161	SM	A047	FUSION	10	1013	70	800	
89/90	162	DL	A091	FUSION	15	1013	70	800	
90/91	135	RO	A039	FUSION	11	1035	70	800	
91/92	116	RO	A047	FUSION	10	1056	70	800	DS-28
92/93	93	RO	A039	FUSION	11	1107	72	800	
93/94	66	SM	A047	FUSION	10	1139	72	800	
94/95	40	RO	A039	FUSION	11	1144	72	800	
95/96	14	RO	A039	FUSION	11	1156	72	800	
96/97	10	CM	A036	EXTRUSION	440	0930	66	460	11/1/30
97/98	39	SM	A047	FUSION	12	1405	81	800	10/29/10
97,98/99	47	SM	A047	FUSION	12	1356	81	800	
99/100	75	SM	A047	FUSION	12	1340	81	800	
100/101	100	DL	A091	FUSION	18	1345	81	800	DS-29
101/102	126	DL	A091	FUSION	18	1402	81	800	
102/103	110	DL	A091	FUSION	18	1430	83	800	
103/104	164	DL	A091	FUSION	18	1445	83	800	
95/97	11	SM	A047	FUSION	12	1418	83	800	
94/97	9	SM	A047	FUSION	12	1424	83	800	
94/99	21	SM	A047	FUSION	12	1425	83	800	
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Cumulative Total		13,991 LF							

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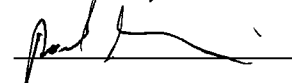
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
93/99	11	SM	A047	FUSION	12	1426	83	800	
93/100	20	SM	A047	FUSION	12	1427	83	800	
92/100	14	SM	A047	FUSION	12	1429	83	800	
92/101	17	SM	A047	FUSION	12	1430	83	800	
91/101	17	SM	A047	FUSION	12	1432	83	800	
91/102	14	SM	A047	FUSION	12	1433	83	800	
90/102	22	SM	A047	FUSION	12	1435	83	800	
90/103	11	SM	A047	FUSION	12	1437	83	800	
102/103	44	DL	A091	FUSION	18	1406	83	800	
95/97	19	SM	A047	FUSION	12	1419	83	800	
104/105	163	DL	A091	FUSION	18	1643	83	800	
105/106	149	DL	A091	FUSION	18	1640	83	800	DS-30
85/107	65	SM	A047	FUSION	12	1735	83	800	
107/108	54	DL	A091	FUSION	18	1737	83	800	
107/109	10	DL	A091	FUSION	18	1740	83	800	
108/109	22	DL	A091	FUSION	18	1742	83	800	
109/110	12	DL	A091	FUSION	18	1755	83	800	
108/110	31	DL	A091	FUSION	18	1750	83	800	
110/111	50	DL	A091	FUSION	18	1800	80	800	
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Cumulative Total				14,586 LF					

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Paul Siriboury

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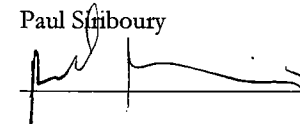
GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
111/112	64	DL	A091	FUSION	18	1825	80	800	DS-31
112/113	62	DL	A091	FUSION	18	1845	76	800	
113/114	52	DL	A091	FUSION	18	1850	76	800	
107/76	20	SM	A047	FUSION	12	1748	83	800	
77/109	20	SM	A047	FUSION	12	1751	83	800	
86/110	20	SM	A047	FUSION	12	1754	83	800	
87/111	22	SM	A047	FUSION	12	1757	83	800	
88/112	17	SM	A047	FUSION	12	1801	80	800	
89/113	11	SM	A047	FUSION	12	1810	80	800	
89/114	6	SM	A047	FUSION	12	1812	80	800	
103/114	11	SM	A047	FUSION	12	1814	80	800	
114/105	22	SM	A047	FUSION	12	1818	80	800	
114/106	23	SM	A047	FUSION	12	1820	78	800	
107/PH-2	22	CM	A036	EXTRUSION	470	0800	59	490	10/30/10
108/PH-2	22	CM	A036	EXTRUSION	470	0815	59	490	
110/PH-2	22	CM	A036	EXTRUSION	470	0845	61	490	
111/PH-2	22	CM	A036	EXTRUSION	470	0910	63	490	
112/PH-2	22	CM	A036	EXTRUSION	470	1000	65	490	
113/PH-2	22	CM	A036	EXTRUSION	470	1026	65	490	DS-32
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Cumulative Total		15,121 LF							

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Paul Striboury

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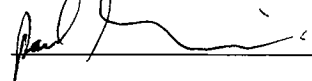
SCS Engineers (Secondary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE

13 of 13
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10-30-10

GEOMEMBRANE SEAMING LOG

SEAM NO.	LENGTH OR SIZE	TECH. ID	MACH. NO.	WELD TYPE	SPEED SET	TIME	AIR TEMP (deg. F)	MACH. TEMP	WEATHER/CONDITIONS/COMMENTS
114/PH-2	22	CM	A036	EXTRUSION	470	1100	69	490	
106/PH-2	153	CM	A036	EXTRUSION	470	1305	73	490	
Page Total					175 LF				
Cumulative Total					15,254 LF				

PRINT NAME: Paul Siriboury
SIGNATURE: 

Attachment 8-8
Geomembrane Panel Repair Logs

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE1 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/13/10**GEOMEMBRANE REPAIR LOG**

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/13/10	1	1/PH-2		BO	6 X 6	CM	A036	10/13/10	SM	
10/13/10	2	1/2		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	3	2/3		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	4	3/4		IO	2 X 6	CM	A036	10/13/10	SM	
10/13/10	5	4/5		BO	2 X 10	CM	A036	10/13/10	SM	
10/13/10	6	5/6		BO	2 X 3	CM	A036	10/13/10	SM	
10/13/10	7	6/7		BO	2 X 3	CM	A036	10/13/10	SM	
10/13/10	8	7/8		BO	2 X 5	CM	A036	10/13/10	SM	
10/13/10	9	8/9		BO	2 X 4	CM	A036	10/13/10	SM	
10/13/10	10	9/10		IO	2 X 8	CM	A036	10/13/10	SM	
10/13/10	11	13/14		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	12	14/15		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	13	15/16		SS	2 X 2	CM	A036	10/13/10	SM	
10/13/10	14	16/17		BO	2 X 3	CM	A036	10/13/10	SM	
10/13/10	15	17/18		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	16	19/20		BO	2 X 2	CM	A036	10/13/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE2 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/13/10**GEOMEMBRANE REPAIR LOG**

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/13/10	17	20/21		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	18	21/22		BO	2 X 5	CM	A036	10/13/10	SM	
10/13/10	19	22/23		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	20	23/24		BO	2 X 4	CM	A036	10/13/10	SM	
10/13/10	21	24/25		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	22	21/22/23		T	4 X 3	CM	A036	10/13/10	SM	
10/13/10	23	18/19/20		T	5 X 3	CM	A036	10/13/10	SM	
10/13/10	24	17/16		BO	2 X 2	CM	A036	10/13/10	SM	
10/13/10	25	10/11/14		T	2 X 4	CM	A036	10/13/10	SM	
10/13/10	26	11/12/14		T	2 X 4	CM	A036	10/13/10	SM	
10/13/10	27	12/13/14		T	2 X 4	CM	A036	10/13/10	SM	
10/13/10	28	6/7/8		T	2 X 3	CM	A036	10/13/10	SM	
10/13/10	29	5/6/8		T	2 X 3	CM	A036	10/13/10	SM	
10/13/10	30	26/25		BO	2 X 3	CM	A036	10/13/10	SM	
10/13/10	31	26/27		BO	2 X 2	CM	A036	10/14/10	SM	
10/13/10	32	27/28		BO	2 X 4	CM	A036	10/14/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/13/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/13/10	33	28/29		BO	2 X 2	CM	A036	10/14/10	SM	
10/13/10	34	29/30		BO	2 X 3	CM	A036	10/14/10	SM	
10/13/10	35	30/31		BO	2 X 2	CM	A036	10/14/10	SM	
10/13/10	36	31/32		BO	2 X 4	CM	A036	10/14/10	SM	
10/13/10	37	32/33		BO	2 X 2	CM	A036	10/14/10	SM	
10/13/10	38	33/34		BO	2 X 3	CM	A036	10/14/10	SM	
10/13/10	39	34/35		BO	2 X 3	CM	A036	10/14/10	SM	
10/13/10	40	35/36		BO	2 X 4	CM	A036	10/14/10	SM	
10/13/10	41	38/36		BO	2 X 2	CM	A036	10/14/10	SM	
10/13/10	42	38/39		BO	2 X 4	CM	A036	10/14/10	SM	
10/13/10	43	39/40		BO	2 X 4	CM	A036	10/14/10	SM	
10/13/10	44	1/PH-2		IO	6 X 3	CM	A036	10/14/10	SM	
10/13/10	45	2/3		DS	2 X 6	CM	A036	10/14/10	SM	DP-1
10/13/10	46	4/5		DS	2 X 6	CM	A036	10/14/10	SM	DP-2
10/13/10	47	8/9		DS	2 X 6	CM	A036	10/14/10	SM	DP-3
10/13/10	48	13/14		DS	2 X 6	CM	A036	10/14/10	SM	DP-4

DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTH/WK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE4 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/13/10**GEOMEMBRANE REPAIR LOG**

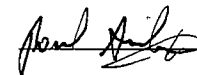
DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/13/10	49	16/17		DS	2 X 6	CM	A036	10/14/10	SM	DP-5
10/13/10	50	20/21		DS	2 X 6	CM	A036	10/14/10	SM	DP-6
10/13/10	51	24/25		DS	2 X 6	CM	A036	10/14/10	SM	DP-7
10/13/10	52	25/26		BO	2 X 6	CM	A036	10/14/10	SM	
10/13/10	53	26		D	2 X 2	CM	A036	10/14/10	SM	
10/13/10	54	26		D	2 X 2	CM	A036	10/14/10	SM	
10/13/10	55	28/29		DS	2 X 6	CM	A036	10/14/10	SM	DP-8
10/13/10	56	31/32		DS	2 X 6	CM	A036	10/14/10	SM	DP-9
10/13/10	57	34/35		DS	2 X 6	CM	A036	10/14/10	SM	DP-10
10/13/10	58	36/37/38		T	2 X 4	CM	A036	10/14/10	SM	
10/13/10	59	37/38		DS	2 X 6	CM	A036	10/14/10	SM	DP-11
10/13/10	60	39/40		DS	6 X 2	CM	A036	10/14/10	SM	DP-12
10/13/10	61	26/27		BO	2 X 4	CM	A036	10/14/10	SM	
10/22/10	62	41/PH-2		DS	2 X 7	JP	A068	10/25/10	SM	DP-13
10/22/10	63	44/45/46/48		T	6 X 7	JP	A068	10/25/10	SM	
10/22/10	64	41/42/43		T	3 X 6	JP	A068	10/25/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/VEHICLE EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE:



SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE5 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/22/10**GEOMEMBRANE REPAIR LOG**

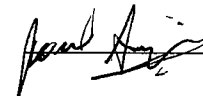
DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/22/10	65	42/43/44		T	2 X 3	JP	A068	10/25/10	SM	
10/22/10	66	45/47/48		T	2 X 3	JP	A068	10/25/10	SM	
10/22/10	67	45/47		DS	2 X 6	JP	A068	10/25/10	SM	DP-15
10/22/10	68	42/44		DS	2 X 6	CM	A036	10/25/10	SM	DP-14
10/22/10	69	42/44		D	2 X 3	CM	A036	10/25/10	SM	
10/22/10	70	47/48/49		T	2 X 2	JP	A068	10/25/10	SM	
10/22/10	71	49/50		DS	2 X 6	CM	A036	10/25/10	SM	DP-16
10/22/10	72	49/50		BO	2 X 4	JP	A068	10/25/10	SM	
10/22/10	73	50/51/55		T	2 X 2	JP	A068	10/25/10	SM	
10/22/10	74	51/52/53		T	5 X 4	CM	A036	10/25/10	SM	
10/22/10	75	53/54/51		T	2 X 2	JP	A068	10/25/10	SM	
10/22/10	76	1/PH-2/41		T	3 X 2	CM	A036	10/25/10	SM	
10/22/10	77	2/3/41/42		T	2 X 8	CM	A036	10/25/10	SM	
10/22/10	78	42/44/2		T	2 X 2	CM	A036	10/25/10	SM	
10/22/10	79	2/3/44		T	7 X 15	CM	A036	10/25/10	SM	
10/22/10	80	44/45/47/3/ 4		T	3 X 10	CM	A036	10/25/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWORK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE:



SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE6 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/22/10**GEOMEMBRANE REPAIR LOG**

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/22/10	81	4/5/47/49		T	2 X 7	CM	A036	10/25/10	SM	
10/22/10	82	5/8/9		T	21 X 3	CM	A036	10/25/10	SM	
10/22/10	83	9/14/50/51/10		T	2 X 11	CM	A036	10/25/10	SM	
10/22/10	84	14/15/51		T	10 X 3	CM	A036	10/25/10	SM	
10/22/10	85	15/16/51/52		T	2 X 10	CM	A036	10/25/10	SM	
10/22/10	86	16/17/52		T	2 X 2	CM	A036	10/25/10	SM	
10/22/10	87	52/53/17		T	2 X 2	CM	A036	10/25/10	SM	
10/22/10	88	17/18/20/53		T	7 X 4	CM	A036	10/25/10	SM	
10/22/10	89	53/20		DS	6 X 2	JP	A068	10/25/10	SM	DP-17
10/22/10	90	20/21/23/53		T	10 X 4	JP	A068	10/25/10	SM	
10/22/10	91	23/24/53		T	3 X 4	JP	A068	10/25/10	SM	
10/22/10	92	24/54/53		T	3 X 2	JP	A068	10/25/10	SM	
10/22/10	93	24/25/54		T	2 X 2	JP	A068	10/25/10	SM	
10/22/10	94	51/54/55/25		T	2 X 6	JP	A068	10/25/10	SM	
10/22/10	95	25/26/55		T	2 X 3	JP	A068	10/25/10	SM	
10/22/10	96	26/55		BO	3 X 2	JP	A068	10/25/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/CK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/22/10	97	26/27/55		T	2 X 2	JP	A068	10/25/10	SM	
10/22/10	98	27/28/55/50		T	7 X 3	JP	A068	10/25/10	SM	
10/22/10	99	28/29/50		T	2 X 7	JP	A068	10/25/10	SM	
10/22/10	100	56/40		BO	2 X 2	JP	A068	10/25/10	SM	
11/3/10	101	56/57		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	102	57/58		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	103	58/59		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	104	59/60		BO	2 X 4	CM	A036	11/4/10	SM	
11/3/10	105	60/61		BO	4 X 2	CM	A036	11/4/10	SM	
11/3/10	106	61/62		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	107	62/63		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	108	63/64		BO	3 X 2	CM	A036	11/4/10	SM	
11/3/10	109	64/65		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	110	65/66		BO	2 X 6	CM	A036	11/4/10	SM	
11/3/10	111	66/67		BO	2 X 3	CM	A036	11/4/10	SM	
11/3/10	112	67/68		BO	3 X 2	CM	A036	11/4/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/VEHICLE EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET

8

of 15

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

11/3/10

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM /PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/3/10	113	68/69		BO	2 X 8	CM	A036	11/4/10	SM	
11/3/10	114	69/70		BO	6 X 2	CM	A036	11/4/10	SM	
11/3/10	115	69/70		BO	2 X 3	CM	A036	11/4/10	SM	
11/3/10	116	70/71		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	117	71/72		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	118	72/73		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	119	73/74		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	120	74/75		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	121	75/76		BO	2 X 2	CM	A036	11/4/10	SM	
11/3/10	122	76/77		BO	2 X 2	CM	A036	11/4/10	SM	
11/4/10	123	77/78		BO	2 X 2	CM	A036	11/4/10	SM	
11/4/10	124	78/79		BO	3 X 2	CM	A036	11/4/10	SM	
11/4/10	125	79/80		BO	2 X 2	CM	A036	11/4/10	SM	
11/4/10	126	80/81		BO	2 X 3	CM	A036	11/4/10	SM	
11/4/10	127	81/82		BO	2 X 3	CM	A036	11/4/10	SM	
11/4/10	128	76/77/78		T	3 X 4	CM	A036	11/4/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/VEHICLE EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE9 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
11/4/10**GEOMEMBRANE REPAIR LOG**

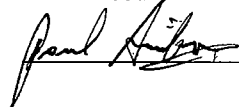
DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/4/10	129	75/76/78		T	2 X 3	CM	A036	11/4/10	SM	
11/4/10	130	78/79/75		T	3 X 2	CM	A036	11/4/10	SM	
11/4/10	131	74/75/79		T	2 X 3	CM	A036	11/4/10	SM	
11/4/10	132	79/80/74		T	2 X 2	CM	A036	11/4/10	SM	
11/4/10	133	73/74/80		T	3 X 2	CM	A036	11/4/10	SM	
11/4/10	134	80/81/73		T	3 X 2	CM	A036	11/4/10	SM	
11/4/10	135	72/73/81		T	3 X 2	CM	A036	11/4/10	SM	
11/4/10	136	81/82/72		T	3 X 2	CM	A036	11/4/10	SM	
11/4/10	137	71/72/82		T	2 X 2	CM	A036	11/4/10	SM	
11/4/10	138	66/67		DS	12 X 2	CM	A036	11/4/10	SM	DP-21
11/4/10	139	70/71		DS	7 X 2	CM	A036	11/4/10	SM	DP-22
11/4/10	140	74/75		DS	7 X 2	CM	A036	11/4/10	SM	DP-23
11/4/10	141	81/82		DS	7 X 2	CM	A036	11/4/10	SM	DP-24
11/4/10	142	63/64		DS	7 X 3	CM	A036	11/4/10	SM	DP-20
11/4/10	143	59/60		DS	7 X 3	CM	A036	11/4/10	SM	DP-19
11/4/10	144	56/57		DS	7 X 4	CM	A036	11/4/10	SM	DP-18

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/VEHICLE EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE:



GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/9/10	145	PH-2/83/41		T	2 X 3	CM	A036	11/10/10	SM	
11/9/10	146	83/84/PH-2		T	3 X 2	CM	A036	11/10/10	SM	
11/9/10	147	84/85/PH-2		T	2 X 2	CM	A036	11/10/10	SM	
11/9/10	148	86/87/PH-2		T	2 X 2	CM	A036	11/10/10	SM	
11/9/10	149	88/PH-2		DS	2 X 6	CM	A036	11/10/10	SM	DP-26
11/9/10	150	92/93/PH-2		T	2 X 2	CM	A036	11/10/10	SM	
11/9/10	151	110/PH-2		BO	2 X 2	CM	A036	11/10/10	SM	
11/9/10	152	110/PH-2		BO	3 X 2	CM	A036	11/10/10	SM	
11/9/10	153	82/113		BO	4 X 2	CM	A036	11/10/10	SM	
11/9/10	154	111/112		DS	7 X 2	CM	A036	11/10/10	SM	DP-31
11/9/10	155	111/112		SS	2 X 2	CM	A036	11/10/10	SM	
11/9/10	156	110/111/109		T	2 X 2	CM	A036	11/10/10	SM	
11/24/10	157	109/111/112		T	2 x 4	CM	A036	11/24/10	SM	
11/24/10	158	108/109/112		T	2 x 4	CM	A036	11/24/10	SM	
11/24/10	159	82/113/71		T	2 x 4	CM	A036	11/24/10	SM	
11/24/10	160	70/71		BO	3 x 9	CM	A036	11/24/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/30/10	161	112/113/71		T	18 X 3	CM	A036	11/30/10	SM	
11/24/10	162	107/108		BO	2 X 3	CM	A036	11/24/10	SM	
11/24/10	163	69/70/107/108		T	2 X 3	CM	A036	11/24/10	SM	
11/10/10	164	69/106/107		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	165	68/69/106		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	166	105/106/68		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	167	68/105/67		DS&T	2 X 10	CM	A036	11/10/10	SM	DP-30
11/10/10	168	104/105/67		T	3 X 2	CM	A036	11/10/10	SM	
11/10/10	169	66/67/104		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	170	103/104/66		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	171	65/66/103		T	3 X 2	CM	A036	11/10/10	SM	
11/10/10	172	102/103/65		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	173	64/65/102		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	174	64/102/101		T	2 X 3	CM	A036	11/10/10	SM	
11/10/10	175		101	D	2 X 3	CM	A036	11/10/10	SM	
11/10/10	176		101	D	2 X 2	CM	A036	11/10/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/10/10	177	63/64/101		T	2 X 2	CM	A036	11/10/10	SM	
11/10/10	178	100/101/63		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	179	100/101		DS	2 X 7	SM	A061	11/10/10	SM	DP-29
11/10/10	180	62/63/100		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	181	99/100/62		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	182	61/62/99		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	183	98/99/61		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	184	60/61/98		T	3 X 2	SM	A061	11/10/10	SM	
11/10/10	185	60/97/98		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	186	59/60/97		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	187	96/97/59		T	3 X 2	SM	A061	11/10/10	SM	
11/10/10	188	58/59/96		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	189	95/96/58		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	190	57/58/95		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	191	57/94/95		DS&T	2 X 10	SM	A061	11/10/10	SM	DP-28
11/10/10	192	56/57/94		T	2 X 2	SM	A061	11/10/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Primary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE13 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
11/10/10**GEOMEMBRANE REPAIR LOG**

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/10/10	193	93/94/56		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	194	40/56/93		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	195	92/93/40		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	196	92/93		DS	2 X 7	SM	A061	11/10/10	SM	DP-27
11/10/10	197	39/40/92		T	2 X 5	SM	A061	11/10/10	SM	
11/10/10	198	91/92/39		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	199	38/39/91		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	200	90/91/38		T	3 X 2	SM	A061	11/10/10	SM	
11/10/10	201	37/38/90		T	2 X 4	SM	A061	11/10/10	SM	
11/10/10	202	89/90/37		T	2 X 4	SM	A061	11/10/10	SM	
11/10/10	203	36/37/89		T	3 X 2	SM	A061	11/10/10	SM	
11/10/10	204	88/89/36		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	205	35/36/88		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	206	87/88/35		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	207	34/35/87		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	208	86/87/34		T	2 X 2	SM	A061	11/10/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE:



GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

11/10/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/10/10	209		86	D	2 X 2	SM	A061	11/10/10	SM	
11/10/10	210	34/33/86		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	211	85/86/33		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	212	85/86		DS	2 X 7	SM	A061	11/10/10	SM	DS-25
11/10/10	213	32/33/85		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	214	84/85/32		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	215	31/32/84		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	216	83/84/31		T	3 X 2	SM	A061	11/10/10	SM	
11/10/10	217	30/31/83		T	2 X 4	SM	A061	11/10/10	SM	
11/10/10	218	50/30/83		T	2 X 4	SM	A061	11/10/10	SM	
11/10/10	219	30/29/50		T	3 X 6	SM	A061	11/10/10	SM	
11/10/10	220	83/48/49		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	221	46/48/83		T	2 X 2	SM	A061	11/10/10	SM	
11/10/10	222	44/83/46		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	223	43/44/83		T	2 X 3	SM	A061	11/10/10	SM	
11/10/10	224	41/43/83		T	2 X 2	SM	A061	11/10/10	SM	

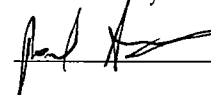
DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTHWORK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME:

Paul Siriboury

SIGNATURE:



GEOMEMBRANE REPAIR LOG

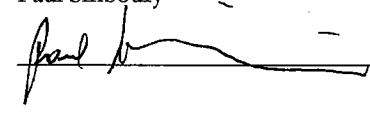
DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/10/10	225	56		D	2 X 2	CM	A036	11/10/10	SM	
11/10/10	226	106		D	2 X 2	CM	A036	11/10/10	SM	
11/10/10	227	107/PH-2		DS	2 X 7	CM	A036	11/10/10	SM	DP-32
11/24/10	228	108/109/111/112		IO	15 X 22	CM	A036	11/24/10	SM	
11/30/10	229	112		BS	7 X 12	CM	A036	11/30/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/VEHICLE EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE:



GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/6/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/6/10	1	1/PH-2		BO	2 X 4	CM	A036	10/8/10	SM	
10/6/10	2	1/PH-2		IO	2 X 2	CM	A036	10/8/10	SM	
10/6/10	3	1/PH-2		IO	2 X 2	CM	A036	10/8/10	SM	
10/6/10	4	1/PH-2		IO	2 X 2	CM	A036	10/8/10	SM	
10/6/10	5	1/2		BO	2 X 4	CM	A036	10/8/10	SM	
10/6/10	6	1/2		BO	2 X 2	CM	A036	10/8/10	SM	
10/6/10	7	1/2		BO	2 X 3	CM	A036	10/8/10	SM	
10/6/10	8	3/2		BO	2 X 3	CM	A036	10/8/10	SM	
10/6/10	9	3/2		DS	2 X 6	CM	A036	10/8/10	SM	DS-1
10/6/10	10	3/4		BO	2 X 3	CM	A036	10/8/10	SM	
10/6/10	11	4/5		BO	2 X 6	CM	A036	10/8/10	SM	
10/6/10	12	4/5		DS	2 X 6	CM	A036	10/8/10	SM	DS-2
10/6/10	13	5/6/8		SS	2 X 8	CM	A036	10/8/10	SM	
10/6/10	14	5/6		BO	2 X 3	CM	A036	10/8/10	SM	
10/6/10	15	6/7		BO	2 X 4	CM	A036	10/8/10	SM	
10/6/10	16	6/7/8		SS	2 X 7	CM	A036	10/8/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

SHEET

2

of 15

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/6/10

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/6/10	17	7/8		BO	2 X 4	CM	A036	10/8/10	SM	
10/6/10	18	9/10		DS	2 X 6	CM	A036	10/8/10	SM	DS-3
10/6/10	19	9/10		BO	2 X 5	CM	A036	10/8/10	SM	
10/6/10	20	10/11		BO	2 X 8	CM	A036	10/8/10	SM	
10/6/10	21	10/11/14		T	2 X 4	CM	A036	10/8/10	SM	
10/6/10	22	11/22		DS	2 X 5	CM	A036	10/8/10	SM	DS-4
10/6/10	23	11/12/14		T	2 X 3	CM	A036	10/8/10	SM	
10/6/10	24	13/12/14		T	2 X 3	CM	A036	10/8/10	SM	
10/6/10	25	14/12		BO	2 X 3	CM	A036	10/8/10	SM	
10/6/10	26	13/14		SS	2 X 3	CM	A036	10/8/10	SM	
10/6/10	27	14/13		BO	2 X 2	CM	A036	10/8/10	SM	
10/7/10	28	14/15		SS	2 X 3	CM	A036	10/8/10	SM	
10/7/10	29	15/16		BO	2 X 2	CM	A036	10/8/10	SM	
10/7/10	30	16/17		BO	2 X 4	CM	A036	10/8/10	SM	
10/7/10	31	18/19/20		T	2 X 4	CM	A036	10/8/10	SM	
10/7/10	32	19/20		SS	2 X 2	CM	A036	10/8/10	SM	

DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTH/VEHICLE EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/7/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/7/10	33	21/22/23		BO	2 X 5	CM	A036	10/8/10	SM	
10/7/10	34	23/24		SS	2 X 8	CM	A036	10/8/10	SM	
10/7/10	35	25/26		SS	2 X 4	CM	A036	10/8/10	SM	
10/7/10	36	26/27		BO	2 X 4	CM	A036	10/8/10	SM	
10/7/10	37	27/28		SS	2 X 2	CM	A036	10/8/10	SM	
10/7/10	38	28/29		SS	2 X 2	CM	A036	10/8/10	SM	
10/7/10	39	26		D	2 X 3	CM	A036	10/8/10	SM	
10/7/10	40	15/16		DS	2 X 3	CM	A036	10/8/10	SM	DS-5
10/7/10	41	18/20		DS	2 X 6	CM	A036	10/8/10	SM	DS-6
10/7/10	42	24/25		DS	2 X 6	CM	A036	10/8/10	SM	DS-7
10/7/10	43	27/28		DS	2 X 6	CM	A036	10/8/10	SM	DS-8
10/7/10	44	29/30		SS	2 X 3	CM	A036	10/8/10	SM	
10/7/10	45	31/32		BO	2 X 2	CM	A036	10/8/10	SM	
10/7/10	46	32/33		BO	2 X 2	CM	A036	10/8/10	SM	
10/7/10	47	33/34		BO	2 X 4	CM	A036	10/8/10	SM	
10/8/10	48	34/35		SS	2 X 4	CM	A036	10/8/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/8/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/8/10	49	35/36		BO	2 X 5	CM	A036	10/8/10	SM	
10/8/10	50	36/38		BO	2 X 4	CM	A036	10/8/10	SM	
10/8/10	51	36/37/38		SS	3 X 4	CM	A036	10/8/10	SM	
10/8/10	52	38/39		BO	2 X 4	CM	A036	10/8/10	SM	
10/8/10	53	39/40		SS	2 X 4	CM	A036	10/8/10	SM	
10/8/10	54	40/41		BO	2 X 2	CM	A036	10/8/10	SM	
10/8/10	55	29/30		DS	2 X 6	CM	A036	10/8/10	SM	DS-9
10/8/10	56	31/32		DS	2 X 6	CM	A036	10/8/10	SM	DS-10
10/8/10	57	35/36		DS	2 X 6	CM	A036	10/8/10	SM	DS-11
10/8/10	58	39/40		DS	2 X 6	CM	A036	10/8/10	SM	DS-12
10/20/10	59	1/42/PH-2		T	3 X 4	JP	A068	1/21/10	SM	
10/20/10	60	1/2/42/43		T	3 X 4	JP	A068	1/21/10	SM	
10/20/10	61	42/PH-2		DS	2 X 5	CM	A036	1/21/10	SM	DS-13
10/20/10	62	42/43/44		T	3 X 3	CM	A036	1/21/10	SM	
10/20/10	63	43/44/45		T	3 X 2	CM	A036	1/21/10	SM	
10/20/10	64	43/45/2		T	3 X 2	JP	A068	1/21/10	SM	

DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/20/10	65	2/3/45		T	3 X 10	JP	A068	10/21/10	SM	
10/20/10	66	45/46/3/4/48		T	3 X 10	JP	A068	10/21/10	SM	
10/20/10	67	46/48/49		T	3 X 4	JP	A068	10/21/10	SM	
10/20/10	68	46/47/45/49		T	2 X 6	CM	A036	10/21/10	SM	
10/20/10	69	4/5/48/50		T	2 X 5	JP	A068	10/21/10	SM	
10/20/10	70	5/8/50/51/9		T	2 X 8	CM	A036	10/21/10	SM	
10/20/10	71	48/49/50		T	2 X 3	CM	A036	10/21/10	SM	
10/20/10	72	42/44		DS	2 X 6	CM	A036	10/21/10	SM	DS-14
10/20/10	73	45/46		DS	2 X 6	CM	A036	10/21/10	SM	DS-15
10/20/10	74	50/51		DS	2 X 6	JP	A068	10/21/10	SM	DS-16
10/20/10	75	51/52/9/10		T	3 X 6	CM	A036	10/21/10	SM	
10/20/10	76	15/52		DS	5 X 8	CM	A036	10/21/10	SM	DS-17
10/20/10	77	15/16/52/56		T	3 X 6	CM	A036	10/21/10	SM	
10/20/10	78	55/56/52		T	3 X 3	CM	A036	10/21/10	SM	
10/21/10	79	54/55/52		T	3 X 2	CM	A036	10/21/10	SM	
10/21/10	80	52/53/51		T	3 X 2	CM	A036	10/21/10	SM	

DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTHWORK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME: Paul Siribotry

SIGNATURE: 

SCS Engineers (Secondary)

SHEET

6

of 15

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/20/10

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/20/10	81	16/17/56		T	3 X 2	CM	A036	10/21/10	SM	
10/21/10	82	55/56/17		T	3 X 2	CM	A036	10/21/10	SM	
10/21/10	83	17/18/20/55		T	6 X 4	CM	A036	10/21/10	SM	
10/21/10	84	20/21/23/55		T	3 X 6	CM	A036	10/21/10	SM	
10/21/10	85	23/24/54/55		T	8 X 4	CM	A036	10/21/10	SM	
10/21/10	86	24/25/52/54		T	2 X 6	CM	A036	10/21/10	SM	
10/21/10	87	25/53/52		T	2 X 3	CM	A036	10/21/10	SM	
10/21/10	88	25/26/53		T	2 X 3	CM	A036	10/21/10	SM	
10/21/10	89	26/27/53		T	2 X 3	CM	A036	10/21/10	SM	
10/21/10	90	27/51/53		T	2 X 2	CM	A036	10/21/10	SM	
10/21/10	91	27/28/51		T	2 X 4	CM	A036	10/21/10	SM	
10/21/10	92	28/29/51		T	2 X 2	CM	A036	10/21/10	SM	
10/21/10	93	29/30/51		T	2 X 2	CM	A036	10/21/10	SM	
10/20/10	94	10/14/15/52		T	6 X 3	CM	A036	10/21/10	SM	
10/26/10	95	57/58/PH-2		T	9 X 2	CM	A036	10/30/10	SM	
10/26/10	96	57/PH-2		DS	6 X 2	CM	A036	10/30/10	SM	DS-18

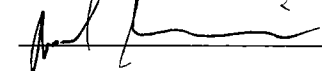
DEFECT CODES:

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/CK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME:

Paul Sinbouy

SIGNATURE:



GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/26/10	97	59/60		DS	3 X 7	CM	A036	10/30/10	SM	DS-19
10/26/10	98	57/59		BO	3 X 2	CM	A036	10/30/10	SM	
10/26/10	99	57/58/59		T	2 X 3	CM	A036	10/30/10	SM	
10/26/10	100	58/59		BO	3 X 2	CM	A036	10/30/10	SM	
10/26/10	101	58/59/67		T	2 X 3	CM	A036	10/30/10	SM	
10/26/10	102	59/67/60		T	2 X 4	CM	A036	10/30/10	SM	
10/27/10	103	65/66/60		T	4 X 3	CM	A036	10/30/10	SM	
10/27/10	104	61/60/65		T	9 X 3	CM	A036	10/30/10	SM	
10/27/10	105	61/62/65		T	2 X 3	CM	A036	10/30/10	SM	
10/27/10	106	62/63/64		T	2 X 2	CM	A036	10/30/10	SM	
10/27/10	107	62/64		DS	2 X 6	CM	A036	10/30/10	SM	DS-20
10/26/10	108	42/57/PH-2		T	2 X 5	CM	A036	10/30/10	SM	
10/26/10	109	42/44/57/59		T	4 X 5	CM	A036	10/30/10	SM	
10/26/10	110	44/45/59/60		T	3 X 3	CM	A036	10/30/10	SM	
10/26/10	111	45/47/49/60 /61/62		T	6 X 8	CM	A036	10/30/10	SM	
10/26/10	112	49/50/62/63		T	3 X 2	CM	A036	10/30/10	SM	

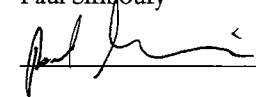
DEFECT CODES:

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTH/CK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME:

Paul Siriboury

SIGNATURE:



GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/26/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/26/10	113	50/63		BO	2 X 2	CM	A036	10/30/10	SM	
10/26/10	114	50/30/63/51		T	5 X 8	CM	A036	10/30/10	SM	
10/26/10	115	30/31/63		T	2 X 3	CM	A036	10/30/10	SM	
10/26/10	116	63/64/31/32		T	3 X 5	CM	A036	10/30/10	SM	
10/26/10	117	32/33/64		T	2 X 3	CM	A036	10/30/10	SM	
10/27/10	118	33/34/64		T	2 X 4	CM	A036	10/30/10	SM	
10/27/10	119	34/35/62/64		T	4 X 3	CM	A036	10/30/10	SM	
10/27/10	120	35/36/62		T	2 X 3	CM	A036	10/30/10	SM	
10/27/10	121	36/37/62		T	2 X 3	CM	A036	10/30/10	SM	
10/27/10	122	37/38/62		T	6 X 2	CM	A036	10/30/10	SM	
10/27/10	123	62/65/38		T	2 X 4	CM	A036	10/30/10	SM	
10/27/10	124	38/39/65/66		T	8 X 5	CM	A036	10/30/10	SM	
10/27/10	125	39/40/66		T	2 X 3	CM	A036	10/30/10	SM	
10/27/10	126	40/41/66		T	3 X 2	CM	A036	10/30/10	SM	
10/28/10	127		70	D	2 X 2	CM	A036	10/30/10	SM	
10/28/10	128		70	D	3 X 2	CM	A036	10/30/10	SM	

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/WK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

ITB No. 040-10

DATE

10/28/10

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/28/10	129	76/77		BO	2 X 4	CM	A036	10/30/10	SM	
10/28/10	130	75/76		BO	2 X 12	CM	A036	10/30/10	SM	
10/28/10	131	41/68		BO	2 X 3	CM	A036	10/30/10	SM	
10/28/10	132	68/69		BO	3 X 2	CM	A036	10/30/10	SM	
10/28/10	133	69/70		BO	2 X 6	CM	A036	10/30/10	SM	
10/28/10	134	70/71		BO	2 X 4	CM	A036	10/30/10	SM	
10/28/10	135	71/72		BO	6 X 3	CM	A036	10/30/10	SM	
10/28/10	136	72/73		BO	2 X 3	CM	A036	10/30/10	SM	
10/28/10	137	73/74		BO	2 X 6	CM	A036	10/30/10	SM	
10/28/10	138	74/75		BO	4 X 2	CM	A036	10/30/10	SM	
10/28/10	139	75/76		BO	2 X 4	CM	A036	10/30/10	SM	
10/28/10	140	76/77		BO	2 X 5	CM	A036	10/30/10	SM	
10/28/10	141	68/69		DS	2 X 6	CM	A036	10/30/10	SM	DS-21
10/28/10	142	71/72		DS	3 X 7	CM	A036	10/30/10	SM	DS-22
10/28/10	143	74/75		DS	2 X 7	CM	A036	10/30/10	SM	DS-23
10/28/10	144	79/80		DS	3 X 11	CM	A036	10/30/10	SM	DS-24

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/WK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/28/10	145	58/78/PH-2		T	2 X 4	CM	A036	10/30/10	SM	
10/28/10	146	58/78/67		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	147	67/78/60		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	148		60	D	3 X 2	CM	A036	10/30/10	SM	
10/28/10	149	60/66/41/78 /68		T	3 X 15	CM	A036	10/30/10	SM	
10/28/10	150	68/69/78/79		T	3 X 4	CM	A036	10/30/10	SM	
10/28/10	151	69/70/79/80		T	4 X 3	CM	A036	10/30/10	SM	
10/28/10	152	70/80		DS	7 X 3	CM	A036	10/30/10	SM	DS-25
10/28/10	153	70/71/80/81		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	154	71/72/81/82		T	3 X 3	CM	A036	10/30/10	SM	
10/28/10	155	82/72		BO	2 X 2	CM	A036	10/30/10	SM	
10/28/10	156	72/73/82/83		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	157	73/74/83/84		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	158	74/75/84/85		T	3 X 3	CM	A036	10/30/10	SM	
10/28/10	159	84/85/PH-2		T	2 X 3	CM	A036	10/30/10	SM	
10/28/10	160	83/84/PH-2		T	3 X 6	CM	A036	10/30/10	SM	

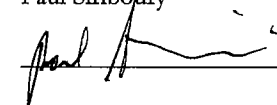
DEFECT CODES

AD	-ANIMAL RELATED DAMAGE	DS	-DESTRUCTIVE SAMPLE	IO	-INSUFFICIENT OVERLAP	SS	-START/STOP
B	-UNDISPERSED RESIN BEAD	EE	-EARTH/WK EQUIP DAMAGE	LB	-LEISTER BURN	SSI	-SOIL SURFACE IRREGULARITY
BO	-BURN OUT	EXT	-EXTENSION	MOT	-MACHINE OFF TRACK	T	-MULTIPLE PANEL INTERSECTION
BS	-BOOT SKIRT	FB	-FUSION WELDER BURN	N	-NODULE	VL	-VACUUM TEST LEAK
C	-COUPON	FD	-FACTORY DAMAGE	PTC	-PRESSURE TEST CUT	WC	-WRINKLE CUT
CO	-CHANGE OF OVERLAP	FM	-FISH MOUTH	SI	-SUBGRADE IRREGULARITY	WR	-WRINKLE
CR	-CREASE	FS	-FAILED SEAM	SL	-SLAG ON TEXTURED SHEET	WS	-WELDER RESTART
D	-INSTALLATION DAMAGE	HT	-HEAT TACK BURN	SO	-SHARP OBJECT		

PRINT NAME:

Paul Siribotry

SIGNATURE:



GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/1/10	161	86/87		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	162	87/88		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	163	88/89		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	164	89/90		BO	3 X 5	CM	A036	11/1/10	SM	
11/1/10	165	90/91		BO	3 X 2	CM	A036	11/1/10	SM	
11/1/10	166	91/92		BO	3 X 2	CM	A036	11/1/10	SM	
11/1/10	167	92/93		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	168	93/94		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	169	94/95		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	170	95/96		BO	2 X 4	CM	A036	11/1/10	SM	
11/1/10	171	97/98		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	172	98/99		BO	2 X 2	CM	A036	11/1/10	SM	
11/1/10	173	99/100		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	174	100/101		BO	3 X 3	CM	A036	11/1/10	SM	
11/1/10	175	101/102		BO	2 X 3	CM	A036	11/1/10	SM	
11/1/10	176	102/103		BO	3 X 5	CM	A036	11/1/10	SM	

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTH/WK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
11/1/10	177	103/104		BO	2 X 5	CM	A036	11/1/10	SM	
11/1/10	178	102/103		BO	5 X 3	CM	A036	11/1/10	SM	
11/1/10	179	97/98/99		T	5 X 3	CM	A036	11/1/10	SM	
10/30/10	180	95/96/97		T	3 X 3	SM	A061	11/1/10	SM	
10/30/10	181	94/95/97		T	3 X 2	SM	A061	11/1/10	SM	
10/30/10	182	94/97/99		T	3 X 2	SM	A061	11/1/10	SM	
10/30/10	183	93/94/99		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	184	93/99/100		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	185	92/93/100		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	186	100/101/92		T	2 X 4	SM	A061	11/1/10	SM	
10/30/10	187	91/92/101		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	188	101/102/91		T	2 X 5	SM	A061	11/1/10	SM	
10/30/10	189	90/91/102		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	190	90/102/103		T	5 X 5	SM	A061	11/1/10	SM	
10/30/10	191	89/90		BO	2 X 3	SM	A061	11/1/10	SM	
10/30/10	192	104/105		BO	3 X 2	SM	A061	11/1/10	SM	

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

SHEET
PROJECT TITLE
PROJECT NO.
DATE13 of 15
Central Landfill Phase 3 Expansion Project
ITB No. 040-10
10/30/10**GEOMEMBRANE REPAIR LOG**

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/30/10	193	104/105		BO	2 X 5	SM	A061	11/1/10	SM	
10/30/10	194	105/106		BO	7 X 3	SM	A061	11/1/10	SM	
10/30/10	195	95/97		T	2 X 3	SM	A061	11/1/10	SM	
10/28/10	196	78/79/PH-2		T	2 X 2	CM	A036	11/1/10	SM	
10/28/10	197	79/80/PH-2		T	3 X 2	CM	A036	11/1/10	SM	
10/28/10	198		85	D	3 X 2	CM	A036	11/1/10	SM	
10/30/10	199	85/75/76/107		T	2 X 9	SM	A061	11/1/10	SM	
10/30/10	200	76/77/107/109		T	2 X 3	SM	A061	11/1/10	SM	
10/30/10	201	107/108/109		T	2 X 3	SM	A061	10/30/10	SM	
10/30/10	202	108/109/110		T	2 X 4	SM	A061	10/30/10	SM	
10/30/10	203	109/110/77/86		T	2 X 3	SM	A061	10/30/10	SM	
10/30/10	204	110/111		IO	2 X 15	CM	A036	10/30/10	SM	
10/30/10	205	110/111		BO	2 X 3	SM	A061	10/30/10	SM	
10/30/10	206	86/87/110/111		T	3 X 3	SM	A061	10/30/10	SM	
10/30/10	207	87/88/111/112		T	3 X 3	SM	A061	10/30/10	SM	
10/30/10	208	112/88/113/89		T	8 X 2	SM	A061	10/30/10	SM	

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siribouty

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/30/10	209	113/114/89		T	2 X 3	SM	A061	10/30/10	SM	
10/30/10	210	114/89/90/103		T	5 X 3	SM	A061	10/30/10	SM	
10/30/10	211	103/104/105/114		T	6 X 3	SM	A061	10/30/10	SM	
10/30/10	212	105/106/114		T	3 X 2	SM	A061	10/30/10	SM	
10/30/10	213		109	D	2 X 2	SM	A061	10/30/10	SM	
10/30/10	214	107/108/PH-2		T	2 X 2	CM	A036	10/30/10	SM	
10/30/10	215	108/110/PH-2		T	2 X 2	CM	A036	10/30/10	SM	
10/30/10	216	111/112/PH-2		T	2 X 2	CM	A036	10/30/10	SM	
10/30/10	217	112/113/PH-2		T	2 X 3	CM	A036	10/30/10	SM	
10/30/10	218	113/114/PH-2		T	2 X 2	CM	A036	10/30/10	SM	
10/30/10	219	114/106/PH-2		T	2 X 2	CM	A036	10/30/10	SM	
10/30/10	220		106	D	2 X 2	CM	A036	10/30/10	SM	
10/30/10	221	86/77		DS	2 X 7	SM	A061	11/1/10	SM	DS-26
10/30/10	222	87/88		DS	2 X 7	SM	A061	11/1/10	SM	DS-27
10/30/10	223	91/92		DS	2 X 7	SM	A061	11/1/10	SM	DS-28
10/30/10	224	100/101		DS	2 X 7	SM	A061	11/1/10	SM	DS-29

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

GEOMEMBRANE REPAIR LOG

DATE REPAIRED	REPAIR NO.	SEAM / PANEL ID	LOCATION	DEFECT CODE	SIZE OF REPAIR	TECH ID	MACHINE NO.	DATE TESTED	TESTED BY	COMMENTS
10/30/10	225	105/106		DS	2 X 7	CM	A036	11/1/10	SM	DS-30
10/30/10	226	111/112		DS	2 X 7	SM	A061	11/1/10	SM	DS-31
10/30/10	227	113/PH-2		DS	2 X 7	CM	A036	11/1/10	SM	DS-32

DEFECT CODES

AD -ANIMAL RELATED DAMAGE	DS -DESTRUCTIVE SAMPLE	IO -INSUFFICIENT OVERLAP	SS -START/STOP
B -UNDISPERSED RESIN BEAD	EE -EARTHWK EQUIP DAMAGE	LB -LEISTER BURN	SSI -SOIL SURFACE IRREGULARITY
BO -BURN OUT	EXT -EXTENSION	MOT -MACHINE OFF TRACK	T -MULTIPLE PANEL INTERSECTION
BS -BOOT SKIRT	FB -FUSION WELDER BURN	N -NODULE	VL -VACUUM TEST LEAK
C -COUPON	FD -FACTORY DAMAGE	PTC -PRESSURE TEST CUT	WC -WRINKLE CUT
CO -CHANGE OF OVERLAP	FM -FISH MOUTH	SI -SUBGRADE IRREGULARITY	WR -WRINKLE
CR -CREASE	FS -FAILED SEAM	SL -SLAG ON TEXTURED SHEET	WS -WELDER RESTART
D -INSTALLATION DAMAGE	HT -HEAT TACK BURN	SO -SHARP OBJECT	

PRINT NAME: Paul Siriboury

SIGNATURE: 

Attachment 8-9
Geomembrane Destructive Test Logs

SCS Engineers (Primary)

SHEET:

1

of

2

DESTRUCTIVE TEST LOG

PROJECT TITLE:

Central Landfill Phase 3 Expansion Project

PROJECT NO:

ITB No. 040-10

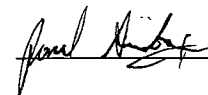
DATE:

10-12-10

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS			COMMENTS
						PASS/FAIL			
						INSTALLER	SCS	ARCH	
DP-1	2/3	A039	FUSION	10-12-10	10-13-10	PASS	PASS		R-45
DP-2	4/5	A091	FUSION	10-12-10	10-13-10	PASS	PASS		R-46
DP-3	8/9	A091	FUSION	10-12-10	10-13-10	PASS	PASS		R-47
DP-4	13/14	A039	FUSION	10-12-10	10-13-10	PASS	PASS		R-48
DP-5	16/17	A039	FUSION	10-12-10	10-13-10	PASS	PASS		R-49
DP-6	20/21	A091	FUSION	10-12-10	10-13-10	PASS	PASS		R-50
DP-7	24/25	A091	FUSION	10-12-10	10-13-10	PASS	PASS		R-51
DP-8	28/29	A039	FUSION	10-13-10	10-13-10	PASS	PASS		R-55
DP-9	31/32	A091	FUSION	10-13-10	10-13-10	PASS	PASS		R-56
DP-10	34/35	A091	FUSION	10-13-10	10-13-10	PASS	PASS		R-57
DP-11	37/38	A039	FUSION	10-13-10	10-13-10	PASS	PASS		R-59
DP-12	39/40	A091	FUSION	10-13-10	10-13-10	PASS	PASS		R-60
DP-13	41/PHASE-2	A061	EXT.	10-22-10	10-22-10	PASS	PASS		R-62
DP-14	42/44	A091	FUSION	10-22-10	10-22-10	PASS	PASS		R-68
DP-15	45/47	A039	FUSION	10-22-10	10-22-10	PASS	PASS		R-67
DP-16	49/50	A091	FUSION	10-22-10	10-22-10	PASS	PASS		R-71
DP-17	53/20	A039	FUSION	10-22-10	10-22-10	PASS	PASS		R-89
DP-18	57/56	A047	FUSION	11-3-10	11-3-10	PASS	PASS		R-144
DP-19	59/60	A091	FUSION	11-3-10	11-3-10	PASS	PASS		R-143
DP-20	63/64	A047	FUSION	11-3-10	11-3-10	PASS	PASS		R-142
DP-21	66/67	A091	FUSION	11-3-10	11-3-10	PASS	PASS		R-138
DP-22	70/71	A047	FUSION	11-3-10	11-3-10	PASS	PASS		R-139
DP-23	74/75	A047	FUSION	11-3-10	11-3-10	PASS	PASS		R-140

PRINT NAME: Paul Siriboury

SIGNATURE:



SCS Engineers (Primary)

SHEET: 2 of 2

DESTRUCTIVE TEST LOG

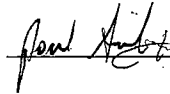
PROJECT TITLE: **Central Landfill Phase 3 Expansion Project**

PROJECT NO: **ITB No. 040-10**

DATE: **11-3-10**

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS			COMMENTS
						PASS/FAIL			
						INSTALLER	SCS	ARCH	
DP-24	81/82	A091	FUSION	11-3-10	11-3-10	PASS	PASS		R-141
DP-25	85/86	A047	FUSION	11-9-10	11-9-10	PASS	PASS		R-212
DP-26	88/PHASE-2	A036	EXT.	11-9-10	11-9-10	PASS	PASS		R-149
DP-27	92/93	A058	FUSION	11-9-10	11-9-10	PASS	PASS		R-196
DP-28	57/94	A047	FUSION	11-9-10	11-9-10	PASS	PASS		R-191
DP-29	100/101	A058	FUSION	11-9-10	11-9-10	PASS	PASS		R-179
DP-30	105/68	A047	FUSION	11-9-10	11-9-10	PASS	PASS		R-167
DP-31	111/112	A058	FUSION	11-9-10	11-9-10	PASS	PASS		R-154
DP-32	107/PHASE-2	A036	EXT.	11-10-10	11-10-10	PASS	PASS		R-227

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

DESTRUCTIVE TEST LOG

SHEET: 1 of 2
 PROJECT TITLE: Central Landfill Phase 3 Expansion Project
 PROJECT NO: ITB No. 040-10
 DATE: 10-5-10

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS			COMMENTS
						PASS/FAIL			
						INSTALLER	SCS	ARCH	
DS-1	2/3	A039	FUSION	10-5-10	10-5-10	PASS	PASS		R-9
DS-2	4/5	A041	FUSION	10-5-10	10-5-10	PASS	PASS		R-12
DS-3	10/9	A055	FUSION	10-5-10	10-5-10	PASS	PASS		R-18
DS-4	11/12	A055	FUSION	10-5-10	10-5-10	PASS	PASS		R-22
DS-5	16/15	A055	FUSION	10-6-10	10-6-10	PASS	PASS		R-40
DS-6	20/18	A039	FUSION	10-6-10	10-6-10	PASS	PASS		R-41
DS-7	24/25	A055	FUSION	10-6-10	10-6-10	PASS	PASS		R-42
DS-8	28/27	A039	FUSION	10-6-10	10-6-10	PASS	PASS		R-43
DS-9	30/29	A039	FUSION	10-7-10	10-7-10	PASS	PASS		R-55
DS-10	31/32	A039	FUSION	10-7-10	10-7-10	PASS	PASS		R-56
DS-11	35/36	A055	FUSION	10-7-10	10-7-10	PASS	PASS		R-57
DS-12	39/40	A055	FUSION	10-7-10	10-7-10	PASS	PASS		R-58
DS-13	42/PHASE-2	A036	EXT.	10-20-10	10-20-10	PASS	PASS		R-61
DS-14	44/42	A091	FUSION	10-20-10	10-20-10	PASS	PASS		R-72
DS-15	45/46	A039	FUSION	10-20-10	10-20-10	PASS	PASS		R-73
DS-16	50/51	A091	FUSION	10-20-10	10-20-10	PASS	PASS		R-74
DS-17	15/52	A039	FUSION	10-20-10	10-20-10	PASS	PASS		R-76
DS-18	57/PHASE-2	A036	EXT.	10-26-10	10-26-10	PASS	PASS		R-96
DS-19	59/60	A091	FUSION	10-26-10	10-26-10	PASS	PASS		R-97
DS-20	62/64	A039	FUSION	10-26-10	10-26-10	PASS	PASS		R-107
DS-21	68/69	A091	FUSION	10-27-10	10-27-10	PASS	PASS		R-141
DS-22	71/72	A091	FUSION	10-27-10	10-27-10	PASS	PASS		R-142
DS-23	74/75	A039	FUSION	10-27-10	10-27-10	PASS	PASS		R-143

PRINT NAME: Paul Siriboury

SIGNATURE: 

SCS Engineers (Secondary)

SHEET: 2 of 2

DESTRUCTIVE TEST LOG

PROJECT TITLE: Central Landfill Phase 3 Expansion Project

PROJECT NO: ITB No. 040-10

DATE: 10-28-10

SAMPLE NO.	SEAM I.D.	MACHINE NO.	WELD TYPE	DATE SEAMED	DATE SAMPLED	TEST STATUS			COMMENTS
						PASS/FAIL			
						INSTALLER	SCS	ARCH	
DS-24	79/80	A091	FUSION	10-28-10	10-28-10	PASS	PASS		R-144
DS-25	70/80	A039	FUSION	10-28-10	10-28-10	PASS	PASS		R-152
DS-26	77/86	A039	FUSION	10-29-10	10-30-10	PASS	PASS		R-221
DS-27	87/88	A047	FUSION	10-29-10	10-30-10	PASS	PASS		R-222
DS-28	91/92	A047	FUSION	10-29-10	10-30-10	PASS	PASS		R-223
DS-29	100/101	A091	FUSION	10-29-10	10-30-10	PASS	PASS		R-224
DS-30	105/106	A091	FUSION	10-29-10	10-30-10	PASS	PASS		R-225
DS-31	111/112	A091	FUSION	10-29-10	10-30-10	PASS	PASS		R-226
DS-32	113/PHASE-2	A036	EXT.	10-30-10	10-30-10	PASS	PASS		R-227

PRINT NAME: Paul Siriboury

SIGNATURE: 

Attachment 8-10

Geomembrane CQA Destructive Seam Test Results



Date: 2010-10-07

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:

SCS Engineers

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: **Citrus Central Landfill Phase 3 Expansion Project**

TRI Job Reference Number: **4266**

Material(s) Tested: (4) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Melissa Hunter
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4266

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-1 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	128	137	124	137	140	133
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	121	130	128	118	126	125
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	183	180	183	186	183	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-2 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	130	127	125	128	124	127
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	142	155	150	162	148	151
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	186	189	187	182	185
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4266

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-3 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	119	127	122	132	127	125
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	140	143	144	148	134	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	175	184	178	174	179
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-4 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	140	147	141	138	142	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	127	133	133	135	136	133
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	173	176	173	173	175	174
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2010-10-11

Mail To:
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Job # : 09207049.06

e-mail:
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Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4315**

Material(s) Tested: (4) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4315

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-9 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	123	120	120	123	129	123
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	118	121	115	147	149	130
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	173	180	178	182	174	178
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-10 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	131	124	132	133	136	131
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	157	159	152	148	153	154
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	175	177	182	178	176	177
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4315

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-11 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	157	154	155	149	159	155
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	136	141	129	145	134	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	176	174	176	175	183	177
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-12 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	151	138	160	151	159	152
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	139	134	142	148	131	139
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	170	174	172	173	178	173
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2010-10-21

Mail To:
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SCS Engineers
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Tampa , FL , 33610-9501

Bill To:
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Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4472**

Material(s) Tested: (4) Heat Fusion Weld Seam(s)
(1) Single Extrusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4472

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-14 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	129	132	122	123	125	126
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	150	148	156	140	145	148
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	170	172	171	179	177	174
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-15 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	122	132	136	126	126	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	116	122	136	124	118	123
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	164	161	160	163	165	162
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4472

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-16 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	153	133	146	132	134	140
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	131	153	124	147	130	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	179	180	172	173	175	176
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-17 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	137	140	130	130	130	133
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	147	141	144	146	138	143
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	154	159	152	149	152	153
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS - SINGLE TRACK

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60 mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4472

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-13 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	131	157	141	152	130	142
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	169	175	176	173	183	175
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2010-10-29

Mail To:
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SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4587**

Material(s) Tested: (7) Heat Fusion Weld Seam(s)
(1) Single Extrusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4587

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-19 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	125	137	138	146	113	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	143	130	125	117	149	133
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	176	170	175	174	172	173
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-20 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	132	134	134	138	136	135
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	120	123	124	127	128	124
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	183	187	188	182	184	185
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4587

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-21 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	128	144	131	161	126	138
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	135	150	137	120	126	134
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	184	185	185	180	181	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-22 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	111	131	131	132	136	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	115	135	124	128	126	126
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	178	177	185	184	181
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4587

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-23 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	123	133	137	135	125	130
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	125	129	129	130	129	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	184	181	181	181	182	182
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-24 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	145	111	138	121	134	130
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	118	121	115	120	125	120
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	176	176	181	177	183	179
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4587.

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-25 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	151	164	157	160	156	158
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	151	145	144	147	138	145
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	169	163	165	164	172	167
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS - SINGLE TRACK

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60 mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4587

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-18 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	147	133	138	138	138	139
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	175	184	183	173	179
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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Date: 2010-10-14

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4372**

Material(s) Tested: (12) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-1 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	123	120	114	129	120	121
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	121	117	120	130	116	121
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	185	183	178	181	180	181
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-2 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	143	145	134	129	141	138
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	151	130	131	154	142	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	184	174	183	191	191	185
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-3 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	124	139	139	137	142	136
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	143	121	141	142	148	139
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	178	176	176	189	184	180
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-4 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	138	130	133	132	129	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	130	120	128	132	120	126
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	160	162	157	156	160	159
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-5 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	154	149	145	147	151	149
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	131	127	123	133	128	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	177	179	175	185	180	179
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-6 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	156	140	135	139	142	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	130	114	121	111	117	119
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	179	182	178	171	178
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-7 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	144	151	147	158	168	154
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	131	124	123	122	137	127
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	185	183	186	187	189	186
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-8 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	170	160	137	162	163	158
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	121	119	126	128	122	123
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	187	194	194	188	188	190
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-9 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	126	141	144	129	145	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	153	135	125	139	148	140
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	181	191	185	180	185	185
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-10 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	135	122	127	128	131	129
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	137	130	132	138	137	135
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	198	195	190	191	181	191
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4372

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-11 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	127	136	114	133	132	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	128	109	109	114	108	114
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	189	191	179	174	182	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-12 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	140	127	126	130	139	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	129	134	126	128	136	131
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	194	194	175	178	175	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2010-11-02

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4620**

Material(s) Tested: (6) Heat Fusion Weld Seam(s)
(1) Single Extrusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Melissa Hunter
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4620

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-26 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	134	126	119	119	120	124
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	113	120	126	129	118	121
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	184	184	185	192	190	187
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-27 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	136	140	149	130	129	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	157	143	138	152	139	146
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	197	197	191	189	192	193
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4620

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-28 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	133	138	146	140	137	139
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	129	135	132	127	118	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	200	199	193	192	195	196
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-29 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	140	143	139	157	133	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	126	132	126	134	124	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	190	190	186	185	187	188
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4620

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-30 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	132	137	127	134	129	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	159	155	147	158	139	152
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	191	201	202	195	198	197
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DS-31 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	143	145	135	143	129	139
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	145	139	144	137	141	141
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	197	189	189	191	196	192
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS - SINGLE TRACK

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60 mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4620

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DS-32 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	170	145	164	144	153	155
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	172	169	177	176	171	173
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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Date: 2010-10-25

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4525**

Material(s) Tested: (4) Heat Fusion Weld Seam(s)
(1) Single Extrusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Melissa Hunter
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4525

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-14 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	127	131	129	121	131	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	120	144	120	138	134	131
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	165	161	162	166	163	163
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-15 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	131	124	130	130	124	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	132	151	150	158	152	149
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	183	189	172	189	182	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4525

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-16 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	157	142	136	142	148	145
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	138	132	133	128	133	133
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	179	179	164	177	174	175
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-17 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	154	161	146	145	158	153
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	164	151	147	139	159	152
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	179	172	178	182	178	178
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS - SINGLE TRACK

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60 mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4525

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-13 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	159	148	101	153	148	142
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	179	171	171	176	172	174
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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Date: 2010-11-05

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4678**

Material(s) Tested: (7) Heat Fusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4678

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-18 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	137	142	134	129	142	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	145	145	145	128	149	142
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	188	180	180	178	178	181
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-19 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	139	138	137	138	139	138
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	150	136	142	151	149	146
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	187	181	188	180	184
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4678

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-20 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	141	140	137	144	134	139
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	120	125	117	131	134	126
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	187	186	180	182	181	183
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-21 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	140	144	134	150	130	140
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	135	116	126	125	138	128
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	180	184	186	182	180	182
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4678

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-22 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	160	155	157	157	153	157
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	131	120	117	130	119	123
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	181	187	187	180	185	184
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-23 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	127	127	129	142	129	131
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	124	131	127	133	122	127
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	182	189	182	187	183	185
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4678

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-24 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	122	133	118	134	125	127
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	118	129	122	128	118	123
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	168	171	171	168	171	170
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



Date: 2010-11-11

Mail To:
Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa , FL , 33610-9501

Bill To:
SCS Engineers
Job # : 09207049.06 ITB # : 040

e-mail:
dbramlett@scsengineers.com ehilton@scsengineers.com psiriboury@scsengineers.com

Dear Ms. Bramlett,

Thank you for consulting with TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus Central Landfill Phase 3 Expansion Project

TRI Job Reference Number: **4750**

Material(s) Tested: (6) Heat Fusion Weld Seam(s)
(2) Single Extrusion Weld Seam(s)

Test(s) Requested: SAME DAY Peel and Shear
(ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

Codes:	
AD	Adhesion Failure (100% Peel)
BRK	Break in sheeting away from Seam edge.
SE	Break in sheeting at edge of seam.
AD-BRK	Break in sheeting after some adhesion failure - partial peel.
SIP	Separation in the plane of the sheet (leaving the bond intact).
FTB	Film tearing bond (all non "AD" failures).
NON-FTB	100% peel.

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Jennifer Tenney
Project Manager
Geosynthetic Services Division
<http://www.geosyntheticstestinc.com>



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4750

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-25 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	124	129	119	126	126	125
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	122	124	117	130	118	122
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	174	173	172	168	175	172
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-27 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	139	138	132	137	126	134
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	132	134	128	137	130	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	174	174	178	178	173	176
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

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DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4750

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-28 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	133	129	129	129	125	129
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	139	142	140	122	133	135
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	142	142	142	147	148	144
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-29 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	141	138	137	135	132	137
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	139	137	132	122	129	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	173	173	172	177	176	174
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS
TRI Client: SCS Engineers
Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60mil. HDPE
SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)
TRI Log#: 4750

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-30 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	125	129	129	126	124	127
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	131	132	134	133	130	132
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	146	147	145	152	150	148
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-31 Weld: Heat Fusion						
Side: A						Peel A
Peel Strength (ppi)	139	141	137	129	146	138
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Side: B						Peel B
Peel Strength (ppi)	137	138	134	136	137	136
Peel Incursion (%)	<5	<5	<5	<5	<5	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	168	166	165	172	174	169
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



DESTRUCTIVE SEAM QUALITY ASSURANCE TEST RESULTS - SINGLE TRACK

TRI Client: SCS Engineers

Project: Citrus Central Landfill Phase 3 Expansion Project

Material: 60 mil. HDPE

SAME DAY Peel and Shear (ASTM D 6392/GRI GM19/D 4437/NSF 54/882 mod.)

TRI Log#: 4750

PARAMETER	TEST REPLICATE NUMBER					MEAN
	1	2	3	4	5	
Sample ID: DP-26 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	152	163	159	162	169	161
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	154	154	153	159	160	156
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	
Sample ID: DP-32 Weld: Single Extrusion						
Side: Peel						Peel
Peel Strength (ppi)	116	144	155	142	93	130
Peel Incursion (%)	<5%	<5%	<5%	<5%	<5%	
Peel Locus Of Failure Code	SE	SE	SE	SE	SE	
Peel NSF Failure Code	FTB	FTB	FTB	FTB	FTB	
Shear						Shear
Shear Strength (ppi)	151	156	152	159	156	155
Shear Elongation @ Break (%)	>50	>50	>50	>50	>50	

The testing is based upon accepted industry practices 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 claims as to the final use and purpose of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

SECTION 9 GEOSYNTHETIC CLAY LINER

9.1 REQUIREMENTS AND SPECIFICATIONS

The plans call for a geosynthetic clay liner (GCL) along the bottom of the cell. CETCO, the GCL manufacturer performed testing on the materials to verify compliance with the contract specifications prior to approval by SCS. CETCO performed manufacturer’s quality control (MQC) tests on the GCL prior to delivery. The MQC tests were conducted in accordance with the manufacturer’s quality control program. The grab elongation and grab strength was tested at a frequency of one test per every 200,000 square feet of GCL produced. The Mass per unit area was tested at a frequency of one test per every 40,000 square feet of GCL produced. The hydraulic conductivity was tested weekly.

Table 14 presents results of the MQC testing for the GCL (Bentomat ST) compared with the project specifications. The tests indicate that the GCL met or exceeded the project specifications.

Table 14 Comparison of GCL Properties

Parameter	Specification	Range of MQC Test Results ¹
Bentonite		
Swell Index	24 ml/2 g	35
Moisture Content (%) (max)	12	8.2 - 8.4
Fluid Loss (ml) (max)	18	14.6
Finish GCL Properties		
Mass per Unit Area (psf)	0.75	0.88 - 0.93
Grab Strength (lbs)	90	147.7 - 274.3
Puncture Resistance (lbs)	60	92.8

Notes:

- 1 Range of values.

9.2 CONFORMANCE TESTING

The GCL was visually inspected by the CQA Representative as it was placed. Roll numbers were verified as conforming to rolls tested by CETCO under Manufacturer’s Quality Control. The results of the conformance testing for the GCL are presented in Table 15 and laboratory results are included in Attachment 9-2. The conformance tests were conducted by TRI Environmental, Inc. on material representative of the GCL used in this project. The test results further verify that the GCL met the project specifications.

Table 15 Comparison of Biplanar Geocomposite Properties in Conformance Testing

Parameter	Specification	Average Range of Test Results
Mass per Unit Area (psf)	0.75	0.82 - 0.88
Grab Strength (lbs)	90	118
Index Flux (m/sec (max))	1×10^{-8}	3.5×10^{-9}
Hydraulic Conductivity (cm/sec)	5×10^{-9}	2.9×10^{-9}

9.3 DIRECT SHEAR TESTS

To confirm the project materials would meet the technical specifications of 12 degrees for the interface friction angle of GCL/Biaxial Geogrid and 20.5 degrees for the interface friction angle of GCL/liner, SCS has separate CQA samples of the project materials tested by TRI. TRI performed interface direct shear tests on these project materials in accordance with ASTM D5321. To simulate the range of stresses during final Buildout of the Phase 3 Expansion cell, normal loads of 1,000, 5,000, and 9,000 pounds per square foot (psf) were used during the testing in saturated condition. The following CQA interface friction angle test results all meet the construction permit requirement of at least 12 degrees for the GCL/Biaxial Geogrid interface and 20.5 degrees for the GCL/Liner interface which therefore also meet the minimum safety factor of 1.5 against sliding. Please refer to Attachment 9-3 for the CQA Interface Friction Test Reports.

CQA Interface Friction Angle Test Results:

- Subbase Soil versus Marifi 5XT Geogrid (Biaxial Geogrid) versus Bentomat ST GCL = 25.5 degrees with 234 psf adhesion
- Bentomat ST GCL versus Agru 60 mil HDPE Microspike Geomembrane = 23.0 degrees with 394 psf adhesion

The technical specifications also required an internal friction angle of 20.5 degrees therefore; SCS had a separate CQA sample of the project material tested by TRI. TRI performed internal direct shear tests on the project material in accordance with ASTM D5321. To simulate the range of stresses during final Buildout of the Phase 3 Expansion cell, normal loads of 1,000, 5,000 and 9,000 psf were used during the testing under fully hydrated conditions. The following CQA internal friction angle test met the construction permit requirement of at least 20.5 degrees. Please refer to Attachment 9-3 for the CQA Internal Friction Test Report.

CQA Internal Friction Angle Test Result:

- Internal Shear of Bentomat ST GCL = 33.0 degrees with 2181 psf adhesion

9.4 PANEL PLACEMENT

GCL panels were placed one at a time and temporarily secured along the edges with sandbags to prevent uplift by the wind. The GCL panels were deployed and numbered sequentially as placed, beginning at the corner of the southwest slope. Panel numbers, with corresponding manufacturer's GCL roll number were recorded by the CQA Representative and Comanco's Quality Control Technician. SCS' GCL placement logs are included in Attachment 9-4. Also recorded on the placement logs are length, width, orientation of the panels along with the date the panels were deployed. A space for comments about the panels may include a weather description, a shape description of a panel that is not rectangular, or a more detailed description of location.

Attachment 9-1
GCL MQC Certificates



Date: 8/25/2010
Purchase Order: 6596
ORDER NUMBER: 000263913

Clayton Lung
Comanco

Plant City, FL 33566
clung@comanco.com

To Whom it May Concern:

Please find enclosed the MQA/MQC test data package for Geosynthetic Clay Liner shipments to Comanco.

The enclosed data package includes results of all the MQC tests required by ASTM D5889, with the exception of index flux/hydraulic conductivity. This test, which is run according to ASTM D5887, is normally performed once per production lot (once per week), unless a higher frequency is required by the project specifications. Because of the GCL's low permeability, this test can take several weeks to complete. The index flux/hydraulic conductivity results associated with this lot of material will be provided under separate cover as soon as they are available.

Although the index flux/hydraulic conductivity test results are not yet available, CETCO accepts responsibility for our GCL should the index flux/hydraulic conductivity tests produce unacceptable results. If, upon delivery and prior to installation, individual rolls of GCL are found to be nonconforming to accepted project specifications, CETCO will replace the nonconforming material at no charge.

Questions regarding this information should be directed to Chris Athanassopoulos, Technical Support Engineer, at (847) 851-1831.

Sincerely,

Melanie King
Quality Assurance Coordinator
CETCO Cartersville Plant



**GEOSYNTHETIC CLAY LINER
MANUFACTURING QUALITY ASSURANCE DATA PACKAGE**

PROJECT NAME: Citrus County Central LF

CUSTOMER P.O.: 6596

ORDER NUMBER: 000263913

PREPARED FOR: Comanco

CONTENTS:

- Product Certifications
- GCL Order packing list and MQA tracking form
- GCL manufacturing quality control test data
- Bentonite clay certification
- Raw material test results

PREPARED BY: Melanie King
Quality Assurance Coordinator
CETCO
218 Industrial Park

Cartersville, GA 30121
Telephone: (770) 387-7773
E-Mail: melanie.king@cetco.com



PRODUCT CERTIFICATIONS

PROJECT NAME: Citrus County Central LF
CUSTOMER P.O.: 6596
ORDER NUMBERS: 000263913
PREPARED FOR: Comanco

The GCL manufactured for the above-referenced order number(s) is certified to meet the values listed in the tables below:

GCL PROPERTY SPECIFICATIONS FOR BENTOMAT ST

Test Method	Test Method Property	Test Frequency	Certified Value
ASTM D 5891	Bentonite Fluid Loss	1 per 50 Tons	18 ml Max
ASTM D 5993	Bentonite Mass/Area	40,000 sq ft (4000 sq m)	10.75 lb /sq ft Min
ASTM D 5890	Bentonite Swell Index	1 per 50 Tons	24 ml/2g Min
ASTM D 6768	GCL Grab Strength	200,000 sq ft (20,000 sq m)	30 lbs/m MARV
ASTM D 6243	GCL Hydrated Internal Shear Strength	Periodic	500 psf typ @ 200 psf normal load
ASTM D 5887	GCL Hydraulic Conductivity	Weekly	5.0E-9 cm/s Max
ASTM D 5887	GCL Index Flux	Weekly	1.0E-8 m ³ /m ² /s Max
ASTM D 6496	GCL Peel Strength	40,000 sq ft (4000 sq m)	3.5 lbs/in Min

SPECIALY REQUESTED CERTIFIED PROPERTIES FOR THIS ORDER OF BENTOMAT ST

Test Method	Test Method Property	Requested Frequency	Requested Value	Requested Conditions
ASTM D 4632	Grab Elongation	1/200,000sf	Report	Standard
ASTM D4632*	Grab Strength*modified with 4-inch grips	1/200,000sf	90lbs	Standard
ASTM D4632*	Peel Strength*modified with 4-inch grips	1/40,000sf	15lbs	Standard
ASTM D 4833	GCL Puncture	1/project	60lbs	Standard

Bentonite property tests are performed at a bentonite processing facility before shipment to CETCO's production facility.
All tensile testing is in the machine direction using ASTM D 6768. All peel strength testing is performed using ASTM D 6496. Upon request tensile and peel results can be reported per modified ASTM D 4632 using 4 inch grips

NEEDLE DETECTION AND REMOVAL PROCEDURE

CETCO hereby affirms that all Bentomat[®] geosynthetic clay liner material manufactured for this project is continually passed under a magnet for needle removal and then screened with a metal detection device. CETCO certifies Bentomat[®] to be essentially free of broken needles and fragments of needles that would negatively effect the performance of the final product.

Melanie King
Quality Assurance Coordinator



GCL PACKING LIST AND MQA TRACKING FORM

Listing of finished and raw materials used to produce certification package number 000263913

GCL							Geotextiles					Clay
CV-BENTOMAT ST							N/W-WHITE			WOVEN	CV-CG 50	
Order	GCL Int#	GCL Roll#	Length	Width	Weight	Sq. Ft.	Roll# Tested	Cap. Lot#	Cap. Roll#	Roll# Tested	Base Roll #	Clay Lot #
000263913	201035CV	7863	150	15	2810	2250	7863	201035CV	00003665	00003656	2021087622	975457A
000263913	201035CV	7864	150	15	2784	2250	7863	201035CV	00003665	00003656	2021087622	975457A
000263913	201035CV	7865	150	15	2784	2250	7863	201035CV	00003665	00003656	2021087622	975457A
000263913	201035CV	7866	150	15	2724	2250	7863	201035CV	00003665	00003656	2021087622	975457A
000263913	201035CV	7867	150	15	2726	2250	7863	201035CV	00003665	00003656	2021087622	975457A
000263913	201035CV	7868	150	15	2734	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7869	150	15	2714	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7870	150	15	2736	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7871	150	15	2712	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7872	150	15	2740	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7873	150	15	2710	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7874	150	15	2712	2250	7863	201035CV	00003666	00003666	2021087622	975457A
000263913	201035CV	7875	150	15	2700	2250	7863	201035CV	00003667	00003666	2021087622	975457A
000263913	201035CV	7876	150	15	2696	2250	7863	201035CV	00003667	00003666	2021087622	975457A
000263913	201035CV	7877	150	15	2696	2250	7863	201035CV	00003667	00003666	2021087622	975457A
000263913	201035CV	7878	150	15	2700	2250	7863	201035CV	00003667	00003666	2021087622	975457A
000263913	201035CV	7879	150	15	2702	2250	7863	201035CV	00003667	00003666	2021087622	975457A
000263913	201035CV	7880	150	15	2746	2250	7880	201035CV	00003667	00003666	2021090914	975457A
000263913	201035CV	7881	150	15	2744	2250	7880	201035CV	00003667	00003666	2021090914	975457A
000263913	201035CV	7882	150	15	2684	2250	7880	201035CV	00003667	00003666	2021090914	975457A
000263913	201035CV	7883	150	15	2690	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7884	150	15	2692	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7885	150	15	2698	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7886	150	15	2698	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7887	150	15	2700	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7888	150	15	2690	2250	7880	201035CV	00003668	00003666	2021090914	975457A
000263913	201035CV	7889	150	15	2692	2250	7880	201035CV	00003668	00003666	2021090914	975457B
000263913	201035CV	7890	150	15	2692	2250	7880	201035CV	00003663	00003656	2021090914	975457B
000263913	201035CV	7891	150	15	2684	2250	7880	201035CV	00003663	00003656	2021090914	975457B
000263913	201035CV	7894	150	15	2684	2250	7880	201035CV	00003663	00003656	2021090914	975457B
000263913	201035CV	7895	150	15	2664	2250	7880	201035CV	00003663	00003656	2021090914	975457B

Order	GCL Lot #	GCL Roll #	Length	Width	Weight	Sq ft	Roll # Tested	Cap Lot #	Cap Roll #	Roll # Tested	Base Roll #	Clay Lot #
000263913	201035CV	7896	150	15	2678	2250	7880	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7897	150	15	2666	2250	7880	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7898	150	15	2712	2250	7880	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7899	150	15	2728	2250	7899	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7900	150	15	2688	2250	7899	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7901	150	15	2672	2250	7899	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7902	150	15	2668	2250	7899	201035CV	00003669	00003666	2021090914	975457B
000263913	201035CV	7903	150	15	2674	2250	7899	201035CV	00003670	00003666	2021090914	975457B
000263913	201035CV	7904	150	15	2662	2250	7899	201035CV	00003670	00003666	2021090914	975457B
000263913	201035CV	7905	150	15	2678	2250	7899	201035CV	00003670	00003666	2021090914	975457B
000263913	201035CV	7906	150	15	2678	2250	7899	201035CV	00003670	00003666	2021090914	975457B
000263913	201035CV	7907	150	15	2684	2250	7899	201035CV	00003670	00003666	2021133142	975457B
000263913	201035CV	7908	150	15	2668	2250	7899	201035CV	00003670	00003666	2021133142	975457B
000263913	201035CV	7909	150	15	2668	2250	7899	201035CV	00003670	00003666	2021133142	975457B
000263913	201035CV	7910	150	15	2668	2250	7899	201035CV	00003671	00003666	2021133142	975457B
000263913	201035CV	7911	150	15	2586	2250	7899	201035CV	00003671	00003666	2021133142	975457B
000263913	201035CV	7912	150	15	2586	2250	7899	201035CV	00003671	00003666	2021133142	975457B
Total sq ft: 108000							Total Number of Rolls Certified: 48					



GCL MANUFACTURING QUALITY CONTROL TEST DATA

The following rolls in GCL certification package number 000263913 have been tested in our production facility lab.

Product	Lot # Tested	Roll # Tested	Mass Area	Grab Strength	Peel Strength 6496			Peel 4632 Modified	Puncture
ASTM Test Method:			D 5993	D 6768	D 6496	D 4632	D4632*	D4632*	D 4833
Required Value:			0.75 lb /sq ft Min	30 lbs/in MARV	3.5 lbs/in Min	Report	90lbs	15lbs	60lbs
CV-BENTOMAT ST	201035CV	7863	0.93	68.6	6.2	29.3	274.3	30.0	92.8
CV-BENTOMAT ST	201035CV	7880	0.88	68.6	6.1	29.3	274.3	30.5	-
CV-BENTOMAT ST	201035CV	7899	0.89	68.6	9.7	29.3	274.3	46.8	-

modified ASTM D 4632 using 4 inch grips

BENTONITE CLAY CERTIFICATION

The Bentonite Clay used to produce package 000263913

has been tested by American Colloid Company and yielded the following test results.

Clay Lot #	Moist	Swell	Fluid Loss
ASTM Test Method:	D 2216	D 5890	D 5891
Required Value:	12% Max	24 ml/2g Min	18 ml Max
975457A	8.20	35.00	14.60
975457B	8.40	35.00	14.60



GEOTEXTILE TEST RESULTS FROM MATERIAL SUPPLIERS

The GCL in certification package number 000263913 was manufactured with geotextiles which were tested with the following results.

BASE GEOTEXTILE				COVER GEOTEXTILE			
Material	Roll Number	Mass Area oz/yd2	Grab Strength lbs	Material	Roll Number	Mass Area oz/yd2	Grab Strength lbs
PPX 82TEX	2021087622	3.5	147.7	CV-NON-WOVEN	00003656	6.4	43.6
PPX 82TEX	2021090914	3.6	161.1	CV-NON-WOVEN	00003666	6.7	54.7
PPX 82TEX	2021133142	3.3	149.7				

Certifications from our suppliers are on file at our production facility

An 'M' or 'PT' indicates supplier certifications were unavailable prior to shipping so testing was performed at a CETCO lab

Attachment 9-2

GCL CQA Conformance Test Results



September 2, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc: ehilton@scsengineers.com

Bill To:

<= Same (P.O. # 092070.04-1)

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Central Landfill Phase 3 Expansion

TRI Job Reference Number: E2347-04-05

Material(s) Tested: 4 Bentomat ST GCL(s)

Test(s) Requested: Mass/Unit Area (ASTM D 5993)
Grab Tensile Properties (ASTM D 4632, mod.)
Index Flux (ASTM D 5887)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

John M. Allen, P.E.
Division Director
Geosynthetic Services Division
www.GeosyntheticTesting.com



GCL TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County Central Landfill Phase 3 Expansion

Material: Bentomat ST GCL
Sample Identification: 7863
TRI Log #: E2347-04-05

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)													
Bentonite mass/unit area (lbs/ft ²)	0.92	0.89	0.85	0.90	0.82							0.88	0.04
Moisture Content (%)	26.3	26.6	23.3	24.5	23.1							24.8	1.6
Grab Tensile Properties (ASTM D 4632)													
MD - Peak Tensile Strength (lbs)	113	134	114	115	115	117	122	116	110	124		118	7
TD - Peak Tensile Strength (lbs)	175	183	195	153	186	221	226	216	129	126		181	36
MD - Elongation @ Max. Load (%)	18	171	181	17	17	184	183	180	18	18		99	86
TD - Elongation @ Max. Load (%)	161	169	151	150	145	152	161	155	135	157		154	9
Index Flux (ASTM D 5887)													
Index Flux (m ³ /m ² /sec)	3.5E-09										3.5E-09		
Hydraulic Conductivity (cm/sec)	2.9E-09										2.9E-09		

MD Machine Direction TD Transverse Direction NA Not Available

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GCL TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County Central Landfill Phase 3 Expansion

Material: Bentomat ST GCL
 Sample Identification: 7880
 TRI Log #: E2347-04-05

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)													
Bentonite mass/unit area (lbs/ft ²)	0.86	0.86	0.90	0.81	0.90							0.87	0.04
Moisture Content (%)	26.6	28.0	25.0	25.7	24.1							25.9	1.5
MD Machine Direction	TD Transverse Direction				NA Not Available								

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GCL TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County Central Landfill Phase 3 Expansion

Material: Bentomat ST GCL
 Sample Identification: 7899
 TRI Log #: E2347-04-05

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)													
Bentonite mass/unit area (lbs/ft ²)	0.89	0.80	0.82	0.87	0.81							0.84	0.04
Moisture Content (%)	25.1	26.0	24.7	25.3	23.9							25.0	0.8
Grab Tensile Properties (ASTM D 4632)													
MD - Peak Tensile Strength (lbs)	83	102	69	103	86	76	81	95	88	78		86	11
TD - Peak Tensile Strength (lbs)	278	183	261	133	212	193	131	169	211	182		195	48
MD - Elongation @ Max. Load (%)	61	129	103	145	121	51	133	131	129	138		114	33
TD - Elongation @ Max. Load (%)	129	119	133	115	138	135	108	139	140	124		128	11

MD Machine Direction TD Transverse Direction NA Not Available

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GCL TEST RESULTS

TRI Client: SCS Engineers

Project: Citrus County Central Landfill Phase 3 Expansion

Material: Bentomat ST GCL
 Sample Identification: 7911
 TRI Log #: E2347-04-05

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	
	1	2	3	4	5	6	7	8	9	10			
Bentonite - Mass/Unit Area (ASTM D 5993, result @ 0% M.C.)													
Bentonite mass/unit area (lbs/ft ²)	0.85	0.82	0.82	0.80	0.83							0.82	0.02
Moisture Content (%)	37.2	42.1	40.8	39.9	40.6							40.1	1.8
MD Machine Direction	TD Transverse Direction			NA Not Available									

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Attachment 9-3
GCL CQA Interface Friction Test Reports
And Internal Shear Test Report



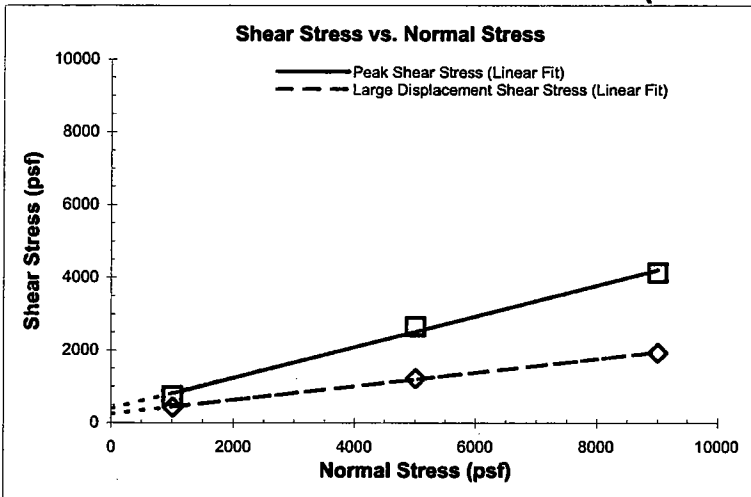
Interface Friction Test Report

Client: **SCS Engineers**
 Project: **Citrus County Central Landfill Phase 3**
 Test Date: 10/04/10-10/04/10

TRI Log#: E2337-95-02
 Test Method: ASTM D 6243

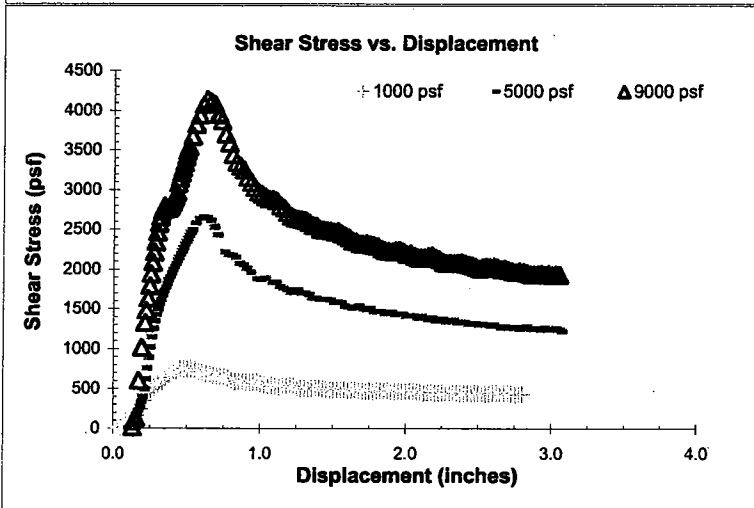
John M. Allen, P.E., 10/06/2010
 Quality Review/Date

Tested Interface: Bentomat ST GCL (7911) vs. Agru 60 mil HDPE Microspike Geomembrane (338579.10)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	23.0	10.7
Y-intercept or Adhesion (psf):	394	258

Shearing occurred at the interface.



Test Conditions	
Upper Box &	Bentomat ST GCL (black side)
Lower Box	Agru 60 mil HDPE Microspike geomembrane (shiny side)
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	748	2656	4142
Corrected Large Displacement Shear Stress (psf)	433	1224	1938
Peak Secant Angle (degrees)	36.8	28.0	24.7
Large Displacement Secant Angle (degrees)	23.4	13.8	12.2
Asperity (mils)	30.4	31.8	30.4

The testing herein 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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



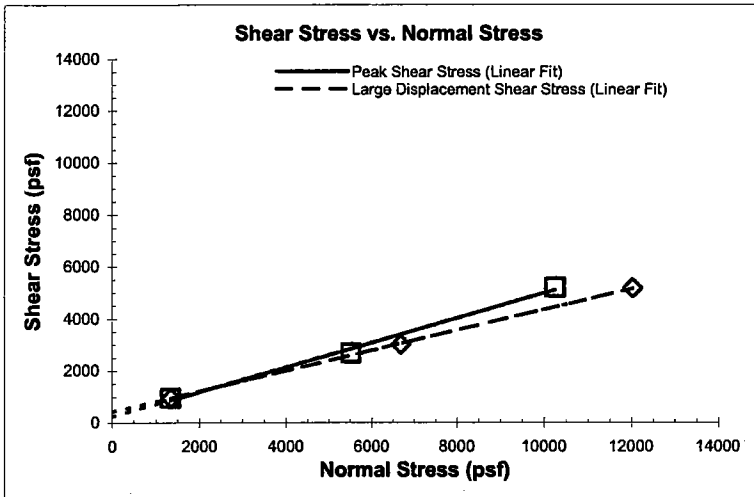
Interface Friction Test Report

Client: **SCS Engineers**
Project: **Citrus County Central Landfill Phase 3**
Test Date: 10/20/10-10/21/10

TRI Log#: E2337-95-02
Test Method: ASTM D 6243

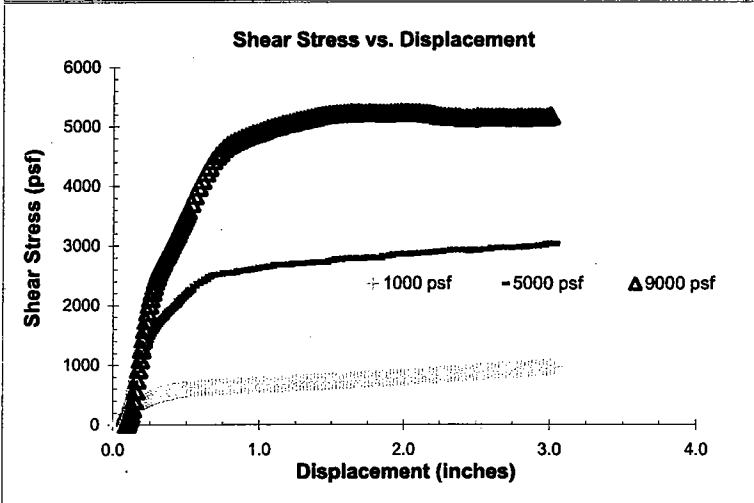
John M. Allen, P.E., 10/21/2010
Quality Review/Date

Tested Interface: Bentomat ST GCL (7911) vs. Marifi 5XT Geogrid (32191666) vs. Subbase Soil



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	25.5	21.6
Y-intercept or Adhesion (psf):	234	422

Note: Regression angles include an area correction. Shearing occurred at the geogrid/GCL interface under the 5000 & 9000 psf loads and at the geogrid/soil interface under 1000 psf load.



Test Conditions	
Upper Box & Floating	Bentomat ST GCL (white side) Marifi 5XT geogrid
Lower Box	Subbase Soil remolded to 102.7 pcf at 14.6% moisture content
Box Dimensions:	12"x12"x4"
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition:	Wet
Shearing Rate:	0.04 inches/minute

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Area Corrected Normal Stress (psf)	1327	5507	10241
Area Corrected Peak Shear Stress (psf)	963	2683	5207
Area Corrected Large Displacement Normal Stress (psf)	1331	6673	12008
Area Corrected Large Displacement Shear Stress (psf)	964	3028	5183
Peak Secant Angle (degrees)	36.0	26.0	27.0
Large Displacement Secant Angle (degrees)	35.9	24.4	23.3

The testing herein 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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



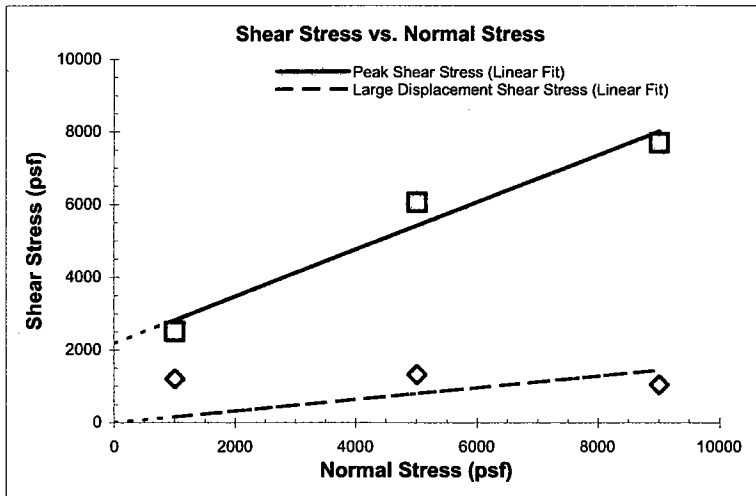
Interface Friction Test Report

Client: **SCS Engineers**
Project: **Citrus County Central Landfill Phase 3**
Test Date: **08/31/10-09/01/10**

TRI Log#: **E2337-95-02**
Test Method: **ASTM D 6243**

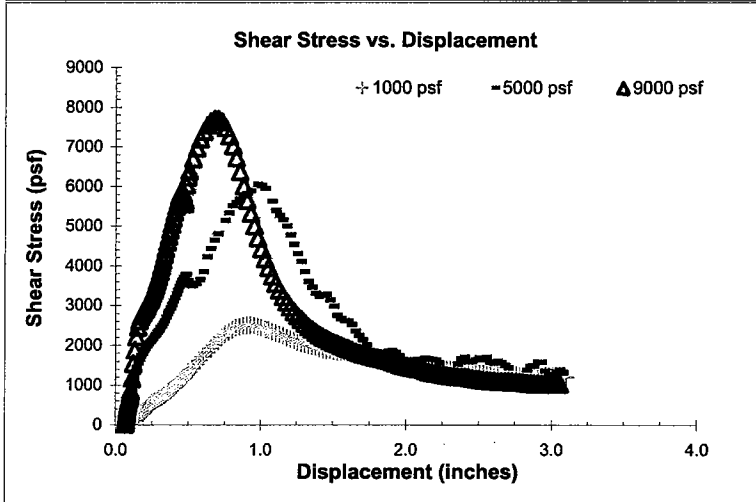
John M. Allen, P.E., 09/01/2010
Quality Review/Date

Tested Interface: Internal Shear of Bentomat ST GCL (7911)



Test Results		
	Peak	Large Displacement (@ 3.0 in.)
Friction Angle (degrees):	33.0	9.1
Y-intercept or Adhesion (psf):	2181	0

GCL sheared internally. The large displacement friction angle regression analysis was adjusted to fit a zero y-intercept.



Test Conditions	
Upper Box &	Bentomat ST GCL
Lower Box	Bentomat ST GCL
Box Dimensions: 12"x12"x4"	
Interface Conditioning:	Interface soaked and loading applied for a minimum of 24 hours prior to shear.
Test Condition: Wet	
Shearing Rate: 0.04 inches/minute	

Test Data			
Specimen No.	1	2	3
Bearing Slide Resistance (lbs)	18	56	94
Normal Stress (psf)	1000	5000	9000
Corrected Peak Shear Stress (psf)	2514	6056	7706
Corrected Large Displacement Shear Stress (psf)	1207	1325	1045
Peak Secant Angle (degrees)	68.3	50.5	40.6
Large Displacement Secant Angle (degrees)	50.4	14.8	6.6

The testing herein 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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Attachment 9-4

GCL Panel Placement Logs

SCS Engineers

SHEET

1

of

3

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10/5/10

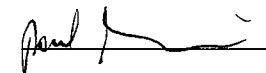
GCL PLACEMENT LOG

ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
7863	150'	15'	300	E-W	0910	2250 sqf 10-5-10
7897	150'	15'	300	E-W	0835	10/6/10
7898	150'	15'	300	E-W	0855	10/6/10
7890	150'	15'	300	E-W	0900	10/7/10
7874	150'	15'	300	E-W	0920	10/7/10
7875	150'	15'	300	E-W	0800	10/20/10
7869	150'	15'	300	E-W	0815	10/20/10
7872	150'	15'	300	E-W	0822	10/20/10
7878	150'	15'	300	E-W	0828	10/20/10
7896	150'	15'	300	E-W	0835	10/20/10
7881	150'	15'	300	E-W	0839	10/20/10
7867	150'	15'	300	E-W	0845	10/20/10
7903	150'	15'	300	E-W	0850	10/20/10
7901	150'	15'	300	E-W	0855	10/20/10
7906	150'	15'	300	E-W	0901	10/20/10
7889	150'	15'	300	E-W	0907	10/20/10
7905	150'	15'	300	E-W	0914	10/20/10
7902	150'	15'	300	E-W	0920	10/20/10
7871	150'	15'	300	E-W	0927	10/20/10
7904	150'	15'	300	E-W	0938	10/20/10

PRINT NAME:

Paul Siriboury

SIGNATURE:



SCS Engineers

SHEET

2

of

3

PROJECT TITLE

Central Landfill Phase 3 Expansion Project

PROJECT NO.

09207049.06

DATE

10/20/10

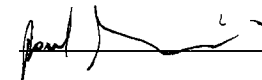
GCL PLACEMENT LOG

ROLL-NO.	LENGTH	WIDTH	THICK-NESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
7895	150'	15'	300	E-W	0947	
7910	150'	15'	300	E-W	0954	
7865	150'	15'	300	E-W	1020	
7883	150'	15'	300	E-W	1029	
7879	150'	15'	300	E-W	1039	
7884	150'	15'	300	E-W	1048	
7894	150'	15'	300	E-W	0735	10/26/10
7882	150'	15'	300	E-W	0744	10/26/10
7900	150'	15'	300	E-W	0805	10/26/10
7877	150'	15'	300	E-W	0910	10/26/10
7899	150'	15'	300	E-W	0917	10/26/10
7866	150'	15'	300	E-W	0925	10/26/10
7813	150'	15'	300	E-W	0954	10/26/10
7868	150'	15'	300	E-W	1004	10/26/10
7870	150'	15'	300	E-W	1020	10/26/10
7907	150'	15'	300	E-W	0815	10/27/10
7877	150'	15'	300	E-W	0828	10/27/10
7912	150'	15'	300	E-W	0814	10/28/10
7876	150'	15'	300	E-W	0905	10/28/10
7908	150'	15'	300	E-W	0920	10/28/10

PRINT NAME:

Paul Siriboury

SIGNATURE:

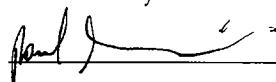


SCS Engineers

SHEET 3 of 3
PROJECT TITLE Central Landfill Phase 3 Expansion Project
PROJECT NO. 09207049.06
DATE 10/28/10

GCL PLACEMENT LOG

ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
7912	150'	15'	300	E-W	0926	
7888	150'	15'	300	E-W	0934	
7891	150'	15'	300	E-W	0943	
7880	150'	15'	300	E-W	0955	
7864	150'	15'	300	E-W	1006	
7911	150'	15'	300	E-W	1021	

PRINT NAME: Paul Siriboury
SIGNATURE: 

SECTION 10 RAIN TARP

10.1 REQUIREMENTS AND SPECIFICATIONS

The plans call for a geosynthetic rain tarp to cover the exposed cell bottom and sideslopes where operations are not occurring. The rain tarp consists of two layers of high-strength polyethylene film laminated together with a third layer of molten polyethylene. All three layers contain fine carbon black to absorb UV radiation and enhance outdoor life. Raven Industries, the rain tarp manufacturer performed testing on the materials to verify compliance with the contract specifications prior to approval by SCS. Raven Industries performed manufacturer’s quality control (MQC) tests on the rain tarp prior to delivery. The MQC tests were conducted in accordance with the manufacturer’s quality control program. The quality control certificates, which contain the recorded results for each roll of rain tarp tests, are included in Attachment 10-1.

Table 16 presents results of the MQC testing for the rain tarp (Dura Skrim 12BV) compared with the project specifications. The tests indicate that the rain tarp met or exceeded the project specifications.

Table 16 Comparison of GCL Properties

Parameter	Specification	Range of MQC Test Results¹
Thickness (mil)	12	16.8 - 17.4
Tensile Strength (lbs)	59	76 - 80.3
Grab Tensile (lbs)	90	99.5 - 113
Trapezoidal Tear (lbs) ²	72	67.4 - 74.4

Notes:

- 1 Range of values.
- 2 FDEP approved the material at the reduced trapezoidal tear strength per email dated September 16, 2010.

10.2 CONFORMANCE TESTING

The rain tarp was visually inspected by the CQA Representative as it was placed. Roll numbers were verified as conforming to rolls tested by Raven Industries under Manufacturer’s Quality Control. The results of the conformance testing for the rain tarp are presented in Table 17 and laboratory results are included in Attachment 10-2. The conformance tests were conducted by TRI Environmental Inc. on material representative of the rain tarp used in this project. The test results further verify that the rain tarp met the project specifications.

Table 17 Comparison of Rain Tarp Properties in Conformance Testing

Parameter	Specification	Average Range of Test Results
Thickness (mil)	12	13 - 14
Tensile Strength (lbs)	59	69 - 80
Grab Tensile (lbs)	90	110 - 115
Trapezoidal Tear (lbs) ¹	72	57 - 68

Notes:

- 1 FDEP approved the material at the reduced trapezoidal tear strength per email dated September 16, 2010.

10.3 PANEL PLACEMENT

The rain tarp was installed according to specifications and at the locations as directed by the CQA Representative.

Attachment 10-1
Rain Tarp MQC Certificates



RAVEN INDUSTRIES INC.
Description and Statement of Compliance

SUBJECT: DURA SKRIM R12BV
DATE: August 23, 2010
IN REFERENCE TO: Citrus County, Sales Order #173411

DESCRIPTION: DURA SKRIM 12BV consists of two layers of high-strength polyethylene film laminated together with a third layer of molten polyethylene. All three layers contain fine carbon black to absorb UV radiation and enhance outdoor life. The polyethylene is stabilized against oxidative degradation through the addition of a combination of antioxidants. A 1000 denier polyester scrim reinforcement placed between these plies greatly enhances tear resistance, improves dimensional stability (resistance to creep) and increases the service life of the finished product.

DURA SKRIM 12BV is formulated and constructed to withstand up to five years use in outdoor applications under normal use conditions.

DURA SKRIM 12BV complies with the information provided in the current Raven Industries product information sheet for R12BV, including the following specific requirements:

- 1" Tensile ASTM D 7003 59 lbf.
- Grab Tensile ASTM D 7004 90 lbf.
- Trapezoid Tear ASTM D 4533 72 lbf.

A handwritten signature in cursive script that reads "Clint Boerhave".

Clint Boerhave
Quality Manager
Raven Industries - Engineered Films Division



Product Certification

Product Name: Dura Skrim
Sales Order: 173411

Product Number: R12BV
Size of tarps: 60' x 460'

DURA SKRIM 12BV consists of two layers of high-strength polyethylene film laminated together with a third layer of molten polyethylene. All three layers contain fine carbon black to absorb UV radiation and enhance outdoor life. The polyethylene is stabilized against oxidative degradation through the addition of a combination of antioxidants. A 1000 denier polyester scrim reinforcement placed between these plies greatly enhances tear resistance, improves dimensional stability (resistance to creep) and increases the service life of the finished product. DURA SKRIM 12BV is formulated and constructed to withstand up to five years use in outdoor applications under normal use conditions. DURA SKRIM 12BV complies with the information provided in the current Raven Industries product information sheet for R12BV.

Roll#	Size	Thickness	Grab Tensile	Elongation	1" Tensile	Elongation	Trapezoid Tear	CBR Puncture
			ASTM D7004	ASTM D7004	ASTM D7003	ASTM D7003	ASTM D5884	ASTM D6241
4953914	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953915	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953916	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953917	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953918	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953919	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953920	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953921	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953922	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953923	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953924	60x460	17.4 mil	113 lbf	17.4%	80.3 lbf	691%	74.4 lbf	318 lbf
4953925	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4953926	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4953927	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4953928	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4953929	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954246	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954248	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954256	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954257	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954259	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954260	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf
4954261	60x460	16.8 mil	112 lbf	17.2%	80.0 lbf	664%	73.2 lbf	294 lbf

Note: Any resins used to make this product have met suppliers' certifications

Customer: Comanco Construction
Job reference: Citrus County

Date: August 23, 2010

Clint Boerhave
Quality Manager

Raven Industries, Inc. • Engineered Films Division • 1813 E. Avenue • Sioux Falls, SD 57104

Ph: 605.335.0174 • Fax: 605.331.0331 • www.rufco.com



Product Certification

Product Name: Dura Skrim
Sales Order: 176515

Product Number: R12BV
Size of tarps: See chart

DURA SKRIM 12BV consists of two layers of high-strength polyethylene film laminated together with a third layer of molten polyethylene. All three layers contain fine carbon black to absorb UV radiation and enhance outdoor life. The polyethylene is stabilized against oxidative degradation through the addition of a combination of antioxidants. A 1000 denier polyester scrim reinforcement placed between these plies greatly enhances tear resistance, improves dimensional stability (resistance to creep) and increases the service life of the finished product. DURA SKRIM 12BV is formulated and constructed to withstand up to five years use in outdoor applications under normal use conditions. DURA SKRIM 12BV complies with the information provided in the current Raven Industries product information sheet for R12BV.

Roll#	Size	Thickness	Grab Tensile	Elongation	1" Tensile	Elongation	Trapezoid Tear	CBR Puncture
			ASTM D7004	ASTM D7004	ASTM D7003	ASTM D7003	ASTM D5884	ASTM D6241
5089484	60x460	16.79 mil	99.47 lbf	22.2%	76.0 lbf	616%	67.4lbf	268 lbf
5089497	60x460	16.79 mil	99.47 lbf	22.2%	76.0 lbf	616%	67.4lbf	268 lbf
5095323	60x300	16.79 mil	99.47 lbf	22.2%	76.0 lbf	616%	67.4 lbf	268 lbf

Note: Any resins used to make this product have met suppliers' certifications

Customer: Comanco Construction

Date: November 16, 2010

Job reference:

Pamela Weiler

Senior Quality Assurance Technician

Attachment 10-2

Rain Tarp CQA Conformance Test Results



September 1, 2010
September 7, 2010

Updated with Direction correction A and B instead of MD and TD

Mail To:

Bill To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

<= Same (P.O. # 092070.04-1)

email: dbramlett@scsengineers.com
cc:email: ehilton@scsengineers.com

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Landfill

TRI Job Reference Number: E2343-81-04

Material(s) Tested: 2, R12BV Reinforced Geomembrane(s)
Rain Tarp

Test(s) Requested: Thickness (ASTM D 5199)
Tensile Properties (ASTM D 7003, Strip Tensile)
Trapezoidal Tear (ASTM D 4533)
Tensile Properties (ASTM D 7004, Grab Tensile)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Landfill

Material: R12BV Reinforced Geomembrane
Sample Identification: 1
TRI Log #: E2343-81-04

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	PROJ. SPEC.
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5199)													
Thickness (mils)	17	12	13	12	13	14	12	15	13	12	13 12	2 << min	
Tensile Properties (ASTM D 7003 - 12 ipm strain rate, Strip Tensile)													
A Maximum Strength (ppi)	79	77	65	66	58						69	9	59 min
B Maximum Strength (ppi)	78	78	79	79	80						79	1	59 min
A Elongation (%) at Max. Load	23	21	19	19	21						21	2	
B Elongation (%) at Max. Load	21	21	21	23	22						22	1	
Trapezoidal Tear (ASTM D 4533)													
A - Tear Strength (lbs)	89	59	68	69	65	67	62	71	65	69	68	8	72 min
B - Tear Strength (lbs)	85	61	61	69	72	62	68	67	72	60	68	8	72 min
Tensile Properties (ASTM D 7004 - 12 ipm strain rate, Grab Tensile)													
A Maximum Strength (lbs)	116	104	109	110	111						110	5	90 min
B Maximum Strength (lbs)	110	100	109	109	99						105	5	90 min
A Elongation (%) at Max. Load	21	19	20	21	20						20	1	
B Elongation (%) at Max. Load	19	17	19	19	17						18	1	

A aligned with scrip in one direction B aligned with scrip in other direction(Opposite to A direction)

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Landfill

Material: R12BV Reinforced Geomembrane
Sample Identification: 2
TRI Log #: E2343-81-04

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	PROJ. SPEC.
	1	2	3	4	5	6	7	8	9	10			
Thickness (ASTM D 5199)													
Thickness (mils)	13	13	14	14	14	14	15	16	15	13	14	1	
											13	<< min	
Tensile Properties (ASTM D 7003 - 12 ipm strain rate, Strip Tensile)													
A Maximum Strength (ppi)	79	80	77	78	80						79	1	59 min
B Maximum Strength (ppi)	80	79	63	80	74						75	7	59 min
A Elongation (%) at Max. Load	21	22	21	21	23						22	1	
B Elongation (%) at Max. Load	22	22	19	22	19						21	2	
Trapezoidal Tear (ASTM D 4533)													
A - Tear Strength (lbs)	68	58	61	61	65	67	62	64	65	67	64	3	72 min
B - Tear Strength (lbs)	57	56	65	59	66	89	62	59	61	61	64	10	72 min
Tensile Properties (ASTM D 7004 - 12 ipm strain rate, Grab Tensile)													
A Maximum Strength (lbs)	108	114	114	114	113						113	3	90 min
B Maximum Strength (lbs)	110	112	113	112	113						112	1	90 min
A Elongation (%) at Max. Load	19	20	21	20	20						20	1	
B Elongation (%) at Max. Load	21	21	20	19	22						21	1	

A aligned with scrip in one direction B aligned with scrip in other direction (Opposite to A direction)

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



September 15, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc:email: ehilton@scsengineers.com

Bill To:

<= Same

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Landfill

TRI Job Reference Number: E2348-06-01

Material(s) Tested: 2, R12BV Reinforced Geomembrane(s)
Rain Tarp

Test(s) Requested: Trapezoidal Tear (ASTM D 4533)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Landfill

Material: R12BV Reinforced Geomembrane
 Sample Identification: 1 Roll# 5009691
 TRI Log #: E2348-06-01

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	PROJ. SPEC.
	1	2	3	4	5	6	7	8	9	10			
Trapezoidal Tear (ASTM D 4533)													
A - Tear Strength (lbs)	61	59	63	56	60	52	54	66	54	53	58	5	72 min
B - Tear Strength (lbs)	59	60	59	48	58	56	51	66	54	55	57	5	72 min

A aligned with scrip in one direction B aligned with scrip in other direction (Opposite to A direction)

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Landfill

Material: R12BV Reinforced Geomembrane
 Sample Identification: 2 Roll # 5010023
 TRI Log #: E2348-06-01

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	PROJ. SPEC.
	1	2	3	4	5	6	7	8	9	10			
Trapezoidal Tear (ASTM D 4533)													
A - Tear Strength (lbs)	60	61	59	65	58	72	65	57	59	58	61	5	72 min
B - Tear Strength (lbs)	63	65	66	62	58	63	64	60	66	70	64	3	72 min

A aligned with srip in one direction B aligned with srip in other direction(Opposite to A direction)

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



November 17, 2010

Mail To:

Dominique Bramlett
SCS Engineers
4041 Park Oaks Blvd., Suite 100
Tampa, Florida 33610-9501

email: dbramlett@scsengineers.com
cc:email: ehilton@scsengineers.com

Dear Ms. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Bill To:

<= Same (P.O. # 092070.04-1)

Project: Citrus County Landfill

TRI Job Reference Number: E2348-75-02

Material(s) Tested: 1, Reinforced Geomembrane(s) - rain Tarp

Test(s) Requested: Thickness (ASTM D 5199)
Tensile Properties (ASTM D 7003, Strip Tensile)
Trapezoidal Tear (ASTM D 4533)
Tensile Properties (ASTM D 7004, Grab Tensile)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOMEMBRANE TEST RESULTS

TRI Client: SCS Engineers
Project: Citrus County Landfill

Material: Reinforced Geomembrane - Rain Tarp
Sample Identification: No Label
TRI Log #: E2348-75-02

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.	PROJ. SPEC.		
	1	2	3	4	5	6	7	8	9	10					
Thickness (ASTM D 5199)															
Thickness (mils)	14	15	14	14	14	14	15	14	15	14	14	14	0	<< min	
Tensile Properties (ASTM D 7003 - 12 ipm strain rate, Strip Tensile)															
A Maximum Strength (ppi)	81	83	79	80	77								80	2	59 min
B Maximum Strength (ppi)	82	80	81	83	93								84	5	59 min
A Elongation (%) at Max. Load	18	17	17	18	16								17	1	
B Elongation (%) at Max. Load	19	18	17	18	19								18	1	
Trapezoidal Tear (ASTM D 4533)															
A - Tear Strength (lbs)	54	59	56	61	59	54	58	53	55	60			57	3	72 min
B - Tear Strength (lbs)	50	54	55	54	53	55	51	58	58	58			55	3	72 min
Tensile Properties (ASTM D 7004 - 12 ipm strain rate, Grab Tensile)															
A Maximum Strength (lbs)	113	112	117	125	111								115	6	90 min
B Maximum Strength (lbs)	106	112	111	106	109								109	3	90 min
A Elongation (%) at Max. Load	19	15	17	15	17								17	2	
B Elongation (%) at Max. Load	14	15	15	15	14								14	1	

A aligned with scrip in one direction B aligned with scrip in other direction(Opposite to A direction)

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

SECTION 11 INSTALLATION OF DRAINAGE SAND

11.1 TESTING

The project specifications required that the protective sand layer be composed of select sand having a hydraulic conductivity of greater than 5.2×10^{-4} cm/sec. On September 27, 2010 PSI provided a letter report (Attachment 11-1) presenting the results of the hydraulic conductivity testing of the sand proposed for use as the protective sand layer. The sand samples were taken from the approved offsite borrow area. The result indicates that the material exceeded the specification for hydraulic conductivity. Based on the result the proposed material was approved and placed over the liner system in the floor of the cell.

The permeability of the installed drainage sand was 1.36×10^{-3} cm/sec. Refer to Attachment 11-1 for the test result.

11.2 PLACEMENT THICKNESS

The thickness of the in-place sand layer was verified by survey and physical thickness checks. The CQA Representative visually observed the placement of drainage sand. The survey verifying the minimum 2-foot thickness is contained in Attachment 2-5.

Attachment 11-1

Protective/Drainage Sand Layer

FALLING HEAD PERMEABILITY

Project No: 0390309-10

Tested By: KS

Project Name: Citrus Land Fill PH3

Date: 9/27/2010

Soil Classification (USCS)-(AASHTO): Orange Fine Sand

Location: Roadway *off site material for protective drainage sand layer.*

Length Measurements (Sample)

Length (in.)	Diameter (in.)
1- 4.561	1- 2.879
2- 4.524	2- 2.862
3- 4.508	3- 2.84
4- 4.489	4- 2.834
$L_{avg} = 4.5205$	$D_{avg} = 2.85375$

<u>Measurements</u>		<u>Density Calculations</u>		<u>Moisture Content</u>	
$L_{avg} = 4.5205$ (in)		$Ws + Ww + Wc = 1402.12$ (gms)		$Ws + Ww + Wc = 111.11$ (gms)	
$D_{avg} = 2.85375$ (in)		$Wc = 453.45$ (gms)		$Ws + Wc = 103.83$ (gms)	
$A = 6.40$ (in ²)		$Ws + Ww = 948.67$ (gms)		$Ww = 7.28$ (gms)	
$A = 41.27$ (cm ²)		$Wet Density = 125.0$ (PCF)		$Wc = 50.16$ (gms)	
$L_{avg} = 11.48$ (cm)		$Dry Density = 110.1$ (PCF)		$Ws = 53.67$ (gms)	
$a = 1.87$ (cm ²)				$Moisture Content = 13.6$ (%)	
$V = 473.8$ (cm ³)					

#200 Sieve Wash Analysis

H1	H2	hf	hf	Elapsed Time	D-Time (Sec)	K= (cm/s)
0	5	48	43	42		0.001363
0	10	48	38	89		0.001366
0	15	48	33	143		0.001364
0	5	48	28	206		0.001362
0	5	48	43	42		0.001363

$Ws + Wc$ (Before) =	103.83 (gms)
$Ws + Wc$ (After) =	102.86 (gms)
$Wc =$	50.16 (gms)
Ws (Before) =	53.67 (gms)
Ws (After) =	52.7 (gms)
Percent Passing =	1.8 %

$K_{avg} = 0.001363$ (cm/sec) $K_{avg} = 3.8649471$ (ft/day)

OK ✓ 1.363×10^{-3} (cm/sec) spec 5.2×10^{-4} cm/sec (not less than)

Respectfully Submitted,
Professional Service Industries, Inc.

James Kenney
Project Manager

SECTION 12 LEACHATE COLLECTION/DETECTION SYSTEM

12.1 LEACHATE SYSTEM ROCK

The plans call for a No. 57 and No. 89 aggregate as specified in the Florida Department of Transportation's (FDOT), Standard Specifications for Road and Bridge Construction. Quality Control Certifications for the No. 57 and No. 89 aggregate used in the leachate collection/detection system can be found in Attachment 12-1.

The thickness of the in-place aggregate layer was verified by survey and physical thickness checks. The CQA Representative visually observed the placement of aggregate. The survey verifying the minimum thicknesses for No. 57 and No. 89 aggregate can be found in Attachment 2-5.

12.2 LEACHATE PIPING

The plans call for an SDR 17 pipe as calculations show this would be acceptable. Quality Control Certifications for the Corrugated High Density Polyethylene Pipe (HDPE) pipe used in the collection/detection system can be found in Attachment 12-2. The survey showing the invert elevations of the leachate piping system can be found in Attachment 2-5.

After the installation of the leachate piping system it was jet cleaned and video inspected. The results of the video inspection tape and report can be found in Attachment 12-3.

12.3 NON WOVEN GEOTEXTILE

12.3.1 Manufacturer's Quality Control Testing

The plans call for a 16 oz non woven geotextile for the stormwater leachate collection and removal system. GSE, the non woven geotextile manufacturer performed testing on the materials to verify compliance with the contract specifications prior to approval by SCS. GSE performed manufacturer's quality control (MQC) tests on the non woven geotextile prior to delivery. The MQC tests were conducted in accordance with the manufacturer's quality control program. One test per every 100,000 square feet of non woven geotextile was performed. The quality control certificates, which contain the recorded results for each roll of non woven geotextile tests, are included in Attachment 12-4.

Table 18 presents results of the MQC testing for the non woven geotextile compared with the project specifications. The tests indicate the non woven geotextile met or exceeded the project specifications.

Table 18 Comparison of Non Woven Geotextile Properties

Parameter	Specification	Range of MQC Test Results ¹
Tensile Strength (lbs)	360	404
Apparent Opening Size (Sieve)	No. 100	0.150
Mullen Burst Strength (psi)	650	843
Puncture Strength (lbs)	225	246
Trapezoidal Tear (lbs)	75	245
Permittivity (sec ⁻¹)	0.7	0.8

Notes:

1 Range of Values

12.3.2 Conformance Testing

The non woven geotextile was visually inspected by the CQA Representative as it was placed. Roll numbers were verified as conforming to rolls tested by GSE under Manufacturer’s Quality Control. The results of the conformance testing for the non woven geotextile is presented in Table 19 and laboratory results are included in Attachment 12-5. The conformance tests were conducted by TRI Environmental, Inc. on material representative of the non woven geotextile used in this project. The test results further verify that the non woven geotextile met the project specifications.

Table 19 Comparison of Non Woven Geotextile Properties in Conformance Testing

Parameter	Specification	Average Range of Test Results
Tensile Strength (lbs)	360	415
Apparent Opening Size (Sieve)	No. 100	200
Mullen Burst Strength (psi)	650	874
Puncture Strength (lbs)	225	275
Trapezoidal Tear (lbs)	75	183
Permittivity (sec ⁻¹)	0.7	0.77

12.4 VALVES AND ACCESSORIES

The shop drawing submittal for the valves is located in Attachment 12-6.

Attachment 12-1

Leachate Collection System Rock

Mine ID: GA183
Terminal ID:
Material ID: C10
Process: 1
Geological Type: 05
(Granite)

Statistical Data
Last 30 Samples
Sample Type: 03 (QC-Producer at Source)

Total Samples for
1 yr: 36

No. 57 gradation

Gradation Analysis

 Start Weight Problem. Required: 10,000

	Samples Found	Mean	Std. Dev.	Min	Max	Est. of Compliance	Z-Value	Lower Limit	Upper Limit	Target
1.5 in Sieve	30	100.0	0.00	100.0	100.0	OK		100.0	100.0	
1 in Sieve	30	99.2	0.46	98.2	100.0	OK	8.951	95.0	100.0	
1/2 in Sieve	30	36.2	2.93	27.9	41.6	OK	3.825	25.0	60.0	
No. 4 Sieve	30	2.3	1.03	1.1	5.5	OK	7.431	0.0	10.0	
No. 8 in Sieve	30	0.6	0.23	0.4	1.5	OK	18.958	0.0	5.0	

Minus 200 Analysis

	Samples Found	Mean	Std. Dev.	Min	Max	Est. of Compliance	Z-Value	Lower Limit	Upper Limit	Target
Minus 200	30	0.37	0.09	0.21	0.54	OK	15.650	0.00	1.75	

Physical Properties

	Samples Found	Mean	Std. Dev.	Min	Max	Est. of Compliance	Z-Value	Lower Limit	Upper Limit	Target
Los Angeles Abrasion	6	16.2	1.17	15	18	OK	24.664	0	45	
Bulk Specific Gravity	1	2.663	0.000	2.663	2.663					
SSD Specific Gravity	1	2.680	0.000	2.680	2.680					
Apparent Specific Gravity	1	2.707	0.000	2.707	2.707					
Absorption	1	0.61	0.00	0.6	0.6					

Insoluble Residue

NO DATA

Est. of Compliance using Z-Value

OK = Greater than or equal to 95% Compliance.

OUT <95% = Greater than or equal to 90% and less than 95% Compliance.

SUSPEND = Less than 90% Compliance.

NOTE: Use discretion for maximum-sized sieve with Lower Limit = 100. (Review data for oversized material.)

Est. of Compliance not using Z-Value

OK = Passes FDOT Criteria.

FAIL = Does not pass FDOT Criteria.

 means the clock was reset on the date indicated for this test.(Only on Gradation and Minus 200)

*NFP next to a failure means Not Fully Programmed. NP as a failure means the failure is Not Programmed yet. A blank failure means there is no failure programmed for this test.

Mine ID: GA183

Terminal ID:

Material ID: C10

Process: 1

Sample Type: 03

Gradation by Sample

#	Sample Date	LIMS ID	Sample #	1.5 in Sieve	1 in Sieve	1/2 in Sieve	No. 4 Sieve	No. 8 in
1	10/15/2010	1000130034	104102	100.0	98.9	27.9	2.8	0.5
2	10/15/2010	1000130033	104101	100.0	98.3	33.6	2.3	0.8
3	09/28/2010	1000123195	103901	100.0	99.2	38.5	4.1	0.5
4	06/01/2010	1000071174	102201	100.0	98.2	38.0	5.5	0.6
5	05/26/2010	1000069027	102102	100.0	100.0	36.2	3.0	0.6
6	05/25/2010	1000069026	102101	100.0	99.7	39.3	4.3	1.5
7	05/17/2010	1000069025	102001	100.0	99.2	31.6	3.0	0.8
8	05/10/2010	1000062731	101901	100.0	98.8	32.5	3.4	0.6
9	05/03/2010	1000062705	101801	100.0	98.7	36.3	3.8	0.8
10	04/26/2010	1000054839	101701	100.0	99.4	35.8	1.5	0.6
11	04/19/2010	1000054838	101601	100.0	99.5	31.9	1.2	0.4
12	04/13/2010	1000047382	101501	100.0	98.7	37.0	1.1	0.4
13	04/06/2010	1000047327	101401	100.0	99.6	38.5	1.3	0.4
14	03/29/2010	1000041545	101301	100.0	99.4	38.7	1.7	0.6
15	03/22/2010	1000041544	101201	100.0	99.8	34.2	1.4	0.4
16	03/16/2010	1000039410	101101	100.0	98.8	38.5	1.8	0.4
17	03/09/2010	1000032696	101002	100.0	98.8	37.8	1.9	0.9
18	03/08/2010	1000032695	101001	100.0	98.8	41.6	2.2	0.6
19	03/01/2010	1000032611	100901	100.0	99.0	35.7	1.2	0.4
20	02/22/2010	1000026339	100801	100.0	99.2	33.8	2.1	0.6
21	02/16/2010	1000026338	100701	100.0	99.7	34.5	1.8	0.6
22	02/10/2010	1000026177	100602	100.0	99.0	33.9	2.1	0.5
23	02/08/2010	1000026176	100601	100.0	99.3	37.0	2.7	0.8
24	02/01/2010	1000015482	100501	100.0	99.6	34.0	1.8	0.7
25	01/26/2010	1000014231	100401	100.0	99.7	38.7	2.2	1.0
26	01/18/2010	1000008536	100301	100.0	99.0	37.2	1.8	0.6
27	01/11/2010	1000008535	100201	100.0	99.7	38.8	1.9	0.4
28	12/31/2009	1000000568	095201	100.0	98.4	38.0	1.7	0.6
29	12/10/2009	0900155684	094902	100.0	99.1	37.8	2.3	0.5
30	12/08/2009	0900155683	094901	100.0	99.2	39.3	1.9	0.5

Mine ID: GA183

Terminal ID:

Material ID: C10

Process: 1

Sample Type: 03

Minus 200 by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	10/15/2010	1000130034	104102	0.32
2	10/15/2010	1000130033	104101	0.31
3	06/01/2010	1000071174	102201	0.54
4	05/17/2010	1000069025	102001	0.25
5	05/10/2010	1000062731	101901	0.40
6	05/03/2010	1000062705	101801	0.42
7	04/26/2010	1000054839	101701	0.33
8	04/19/2010	1000054838	101601	0.29
9	04/13/2010	1000047382	101501	0.37
10	04/06/2010	1000047327	101401	0.42
11	03/29/2010	1000041545	101301	0.40
12	03/22/2010	1000041544	101201	0.49
13	03/16/2010	1000039410	101101	0.44
14	03/09/2010	1000032696	101002	0.25
15	03/08/2010	1000032695	101001	0.42
16	03/01/2010	1000032611	100901	0.22
17	02/22/2010	1000026339	100801	0.38
18	02/16/2010	1000026338	100701	0.40
19	02/10/2010	1000026177	100602	0.44
20	02/08/2010	1000026176	100601	0.43
21	02/01/2010	1000015482	100501	0.53
22	01/26/2010	1000014231	100401	0.44
23	01/18/2010	1000008536	100301	0.36
24	01/11/2010	1000008535	100201	0.21
25	12/31/2009	1000000568	095201	0.52
26	12/10/2009	0900155684	094902	0.32
27	12/08/2009	0900155683	094901	0.30
28	12/02/2009	0900153552	094801	0.32
29	11/19/2009	0900148188	094601	0.38
30	11/04/2009	0900142822	094402	0.31

Start Weight by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	10/15/2010	1000130034	104102	11,431.5
2	10/15/2010	1000130033	104101	13,217.3
3	09/28/2010	1000123195	103901	12,683.6
4	06/01/2010	1000071174	102201	12,091.4
5	05/26/2010	1000069027	102102	7.2
6	05/25/2010	1000069026	102101	10,023.8
7	05/17/2010	1000069025	102001	12,477.3
8	05/10/2010	1000062731	101901	11,827.6
9	05/03/2010	1000062705	101801	11,232.3
10	04/26/2010	1000054839	101701	10,848.6
11	04/19/2010	1000054838	101601	11,337.4
12	04/13/2010	1000047382	101501	10,897.5
13	04/06/2010	1000047327	101401	11,075.3
14	03/29/2010	1000041545	101301	10,976.1
15	03/22/2010	1000041544	101201	11,804.9
16	03/16/2010	1000039410	101101	11,631.2
17	03/09/2010	1000032696	101002	12,623.8
18	03/08/2010	1000032695	101001	10,242.3
19	03/01/2010	1000032611	100901	11,139.0
20	02/22/2010	1000026339	100801	12,123.5
21	02/16/2010	1000026338	100701	10,690.4
22	02/10/2010	1000026177	100602	11,215.6
23	02/08/2010	1000026176	100601	11,834.2
24	02/01/2010	1000015482	100501	10,439.1
25	01/26/2010	1000014231	100401	10,221.3
26	01/18/2010	1000008536	100301	10,312.8
27	01/11/2010	1000008535	100201	13,521.3
28	12/31/2009	1000000568	095201	10,817.6
29	12/10/2009	0900155684	094902	10,312.6
30	12/08/2009	0900155683	094901	10,178.4

Los Angeles Abrasion by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	06/01/2010	1000071174	102201	15
2	05/03/2010	1000062705	101801	16
3	03/29/2010	1000041545	101301	16
4	03/01/2010	1000032611	100901	18
5	12/08/2009	0900155683	094901	17
6	11/03/2009	0900142821	094401	15

Insoluble Residue by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	06/01/2010	1000071174	102201	15
2	05/03/2010	1000062705	101801	16
3	03/29/2010	1000041545	101301	16
4	03/01/2010	1000032611	100901	18
5	12/08/2009	0900155683	094901	17
6	11/03/2009	0900142821	094401	15

Bulk Specific Gravity by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	01/11/2010	1000008535	100201	2.663

Absorption by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	01/11/2010	1000008535	100201	0.6

Mine ID: GA183 Terminal ID: Material ID: C10 Process: 1 Sample Type: 03

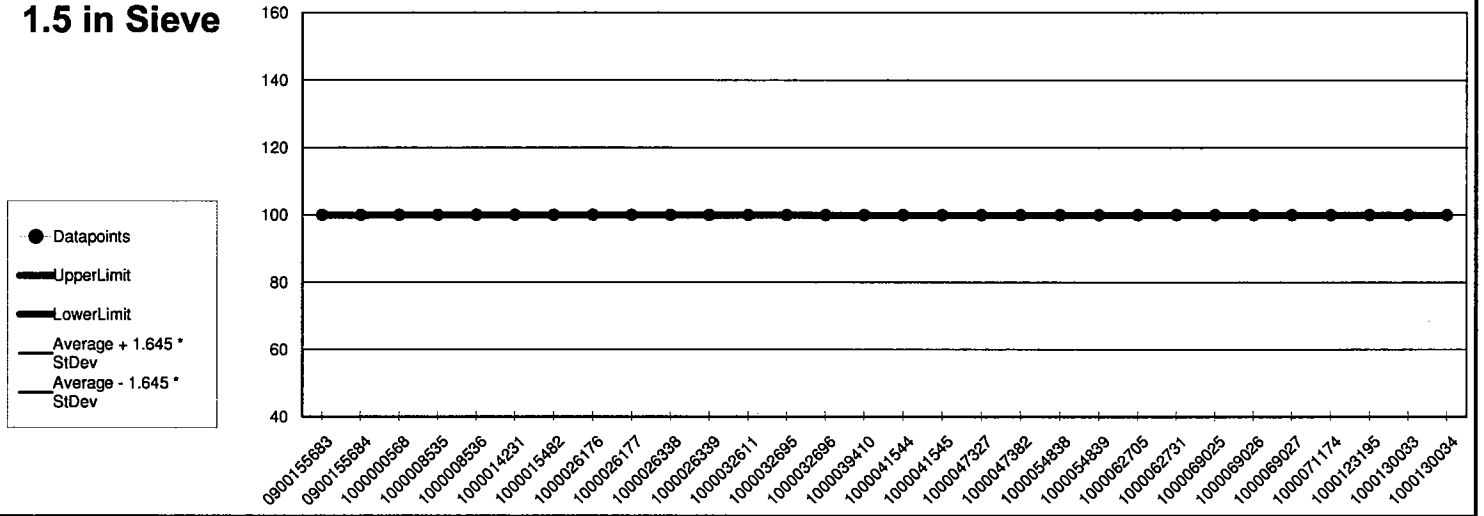
SSD Specific Gravity by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	01/11/2010	1000008535	100201	2.680

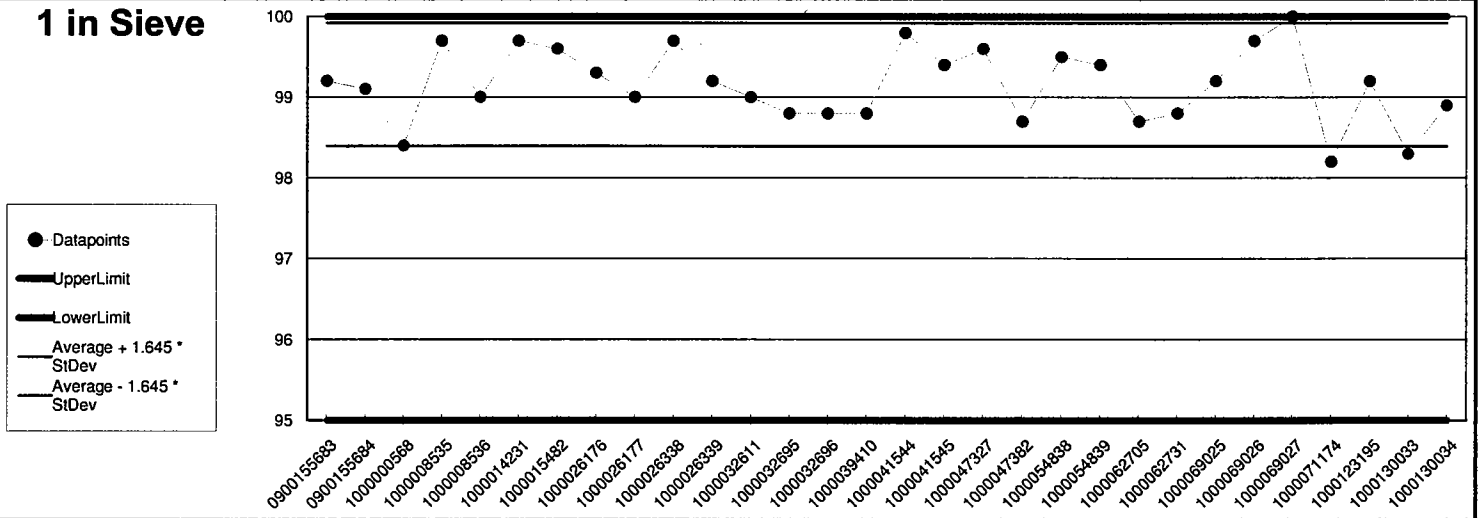
Apparent Specific Gravity by Sample

#	Sample Date	LIMS ID	Sample #	RESULT
1	01/11/2010	1000008535	100201	2.707

1.5 in Sieve

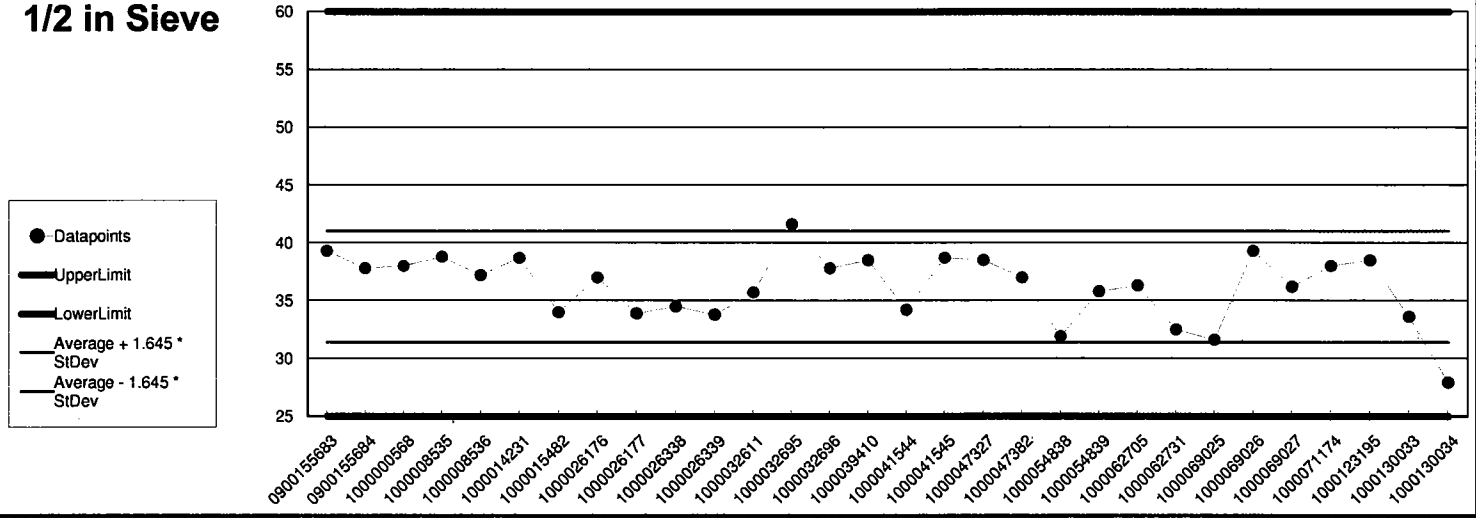


1 in Sieve

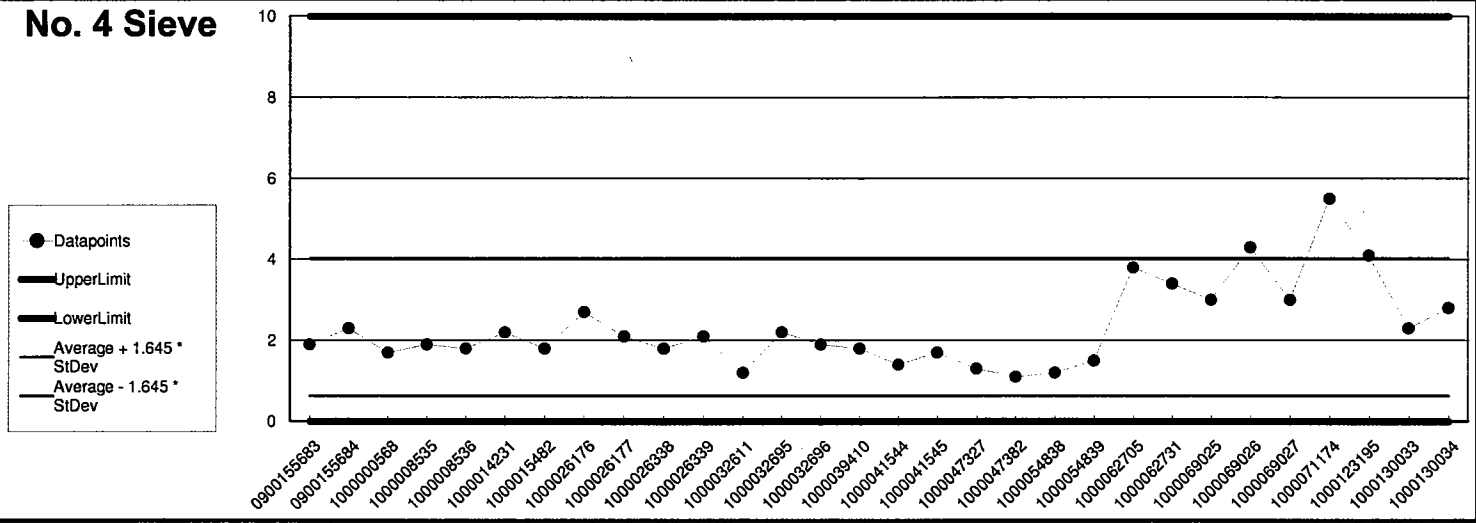


Mine ID: GA183 Terminal ID: Material ID: C10 Process: 1 Sample Type: 03

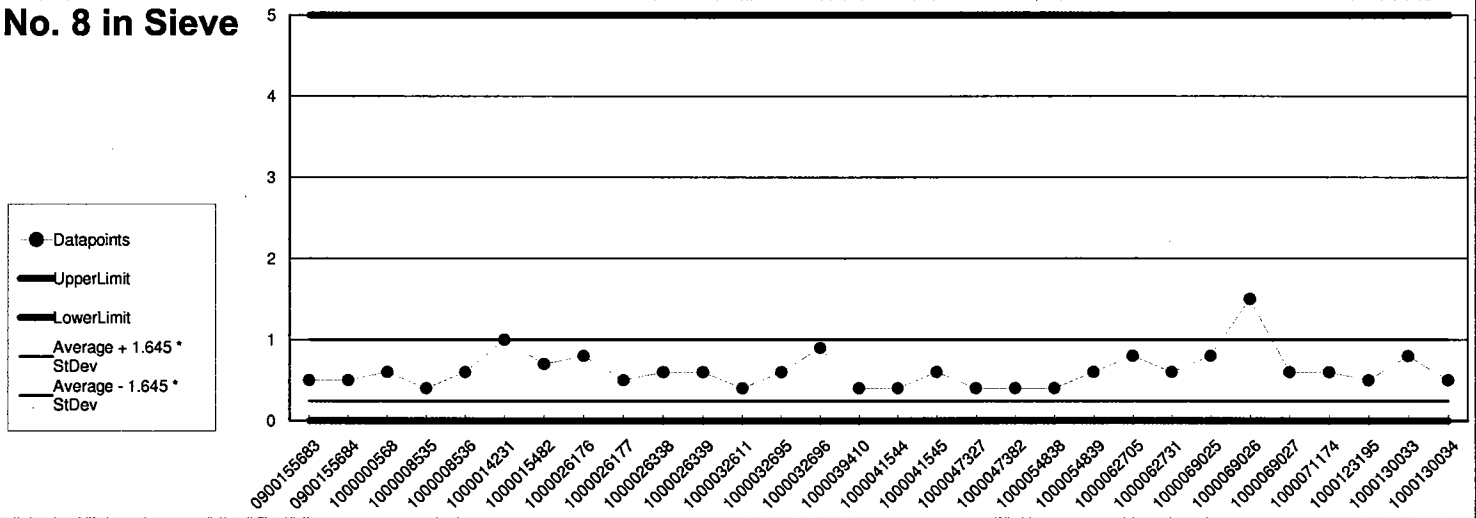
1/2 in Sieve



No. 4 Sieve



No. 8 in Sieve



Mine ID: GA183

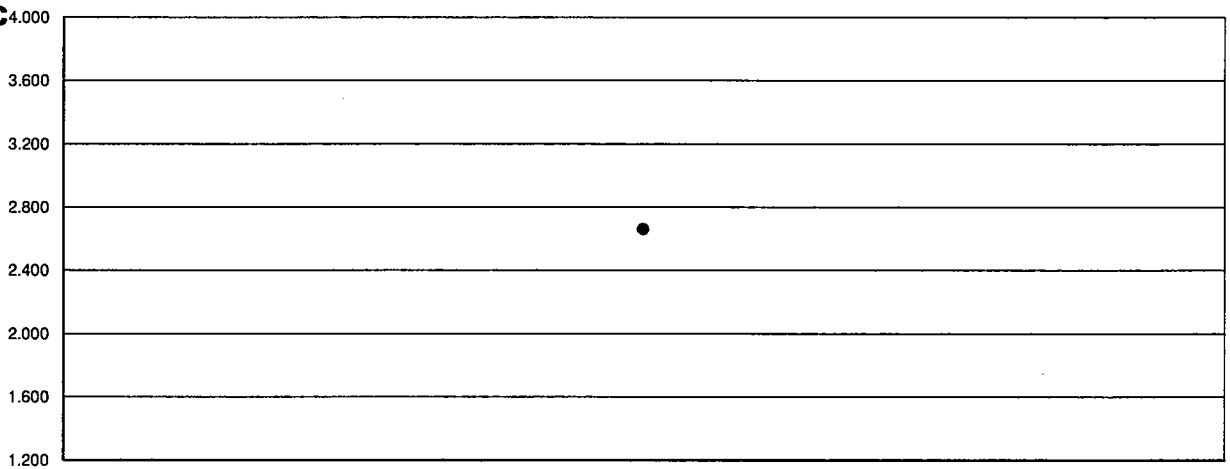
Terminal ID:

Material ID: C10

Process: 1

Sample Type: 03

Bulk Specific Gravity



1000008535



Statistical Analysis 10/26/2010 - 10/26/2010
Oldcastle Materials 21403403-Wildwood Terminal GRAN-GA-DAN89-GA183/#89/C55

no. 89 gradation

Sample Id	Date	Status	1/2" (12.5mm)	3/8" (9.5mm)	#4 (4.75mm)	#8 (2.36mm)	#16 (1.18mm)	#30 (0.6mm)	PAN (0um)	
1699573192	10/26/2010 13:13	Pass	100.0	100.0	49.5	9.1	2.0	1.1	0.00	
1699670501	10/26/2010 13:13	Pass	100.0	100.0	49.3	10.0	2.3	1.5	0.00	
1699725074	10/26/2010 13:13	Pass	100.0	100.0	48.7	10.4	2.5	1.7	0.00	
			1/2" (12.5mm)	3/8" (9.5mm)	#4 (4.75mm)	#8 (2.36mm)	#16 (1.18mm)	#30 (0.6mm)	PAN (0um)	
			Count	3	3	3	3	3	3	
			Min	100.0	100.0	48.7	9.1	2.0	1.1	0.00
			Max	100.0	100.0	49.5	10.4	2.5	1.7	0.00
			Range	0.0	0.0	0.8	1.3	0.5	0.6	0.00
			Mean	100.0	100.0	49.2	9.8	2.3	1.4	0.00
			Median	100.0	100.0	49.3	10.0	2.3	1.5	0.00
			St Dev	0.0	0.0	0.4	0.7	0.3	0.3	0.00
			CV	0.0	0.0	0.0	0.1	0.1	0.2	
			Skewness	0.0	0.0	-0.3	-0.3	-0.2	-0.2	0.0
			Kurtosis	0.0	0.0	-2.3	-2.3	-2.3	-2.3	0.0
			Pay Factor							
			Lower Target							
			Upper Target							
			Lower Spec (LSL)	100	90	20	5	0		
			Upper Spec (USL)	100	100	55	30	10		
			PWS	100.0	100.0	100.0	100.0	100.0		
			Lower Limit (LCL)	100.0	100.0	48.3	8.4	1.8	0.8	0.00
			Upper Limit (UCL)	100.0	100.0	50.1	11.2	2.8	2.0	0.00
			PWL	100.0	100.0	95.4	95.4	95.4	95.4	100.0

Query
 Query Selections
 Date Created 10/27/2010
 Date Range 10/20/2010 - 10/27/2010
 Plant 21403403-Wildwood Terminal
 Product GRAN-GA-DAN89-GA183/#89/C55
 Specification FLDOT 89
 Limit Auto-Compute

 Passing: 3
 Failures: 0
 Conformance: 100.0 %



Statistical Analysis 10/26/2010 - 10/26/2010
Oldcastle Materials 21403403-Wildwood Terminal GRAN-GA-DAN89-GA183/#89/C55

Non-Conformance: 0.0 %

Attachment 12-2

Corrugated High Density Polyethylene Pipe

PolyPipe® EHMW PE3408/PE3608 Pipe

Extra High Molecular Weight (EHMW) High Density Polyethylene for use in industrial applications such as underground fire mains, mining, landfill, water reclamation or sewer.

Typical Printline: 12" IPS SDR 9 – POLYPIPE® EHMW – PE3408/PE3608 –ASTM F714 C3 -- MANUFACTURING CODE

TYPICAL PHYSICAL PROPERTIES			
PROPERTY	ASTM TEST METHOD	*NOMINAL VALUES	
		SI UNITS	ENGLISH UNITS
Density, Natural	D1505	0.946 gm/cc	--
Density, Black	D1505	0.955 gm/cc	--
Melt Index (190°C/2.16 kg)	D1238	0.07 gm/10 min.	--
Flow Rate (190°C/21.6 kg)	D1238	8.5 gm/10 min.	--
Tensile Strength @ Yield	D638	22.1 MPa	3,200 psi
Ultimate Elongation	D638	>800%	>800%
Flexural Modulus 2% Secant	D790	938 MPa	136,000 psi
Environmental Stress Crack Resistance (ESCR)			
F ₀ , Condition C	D1693	>10,000 hrs.	>10,000 hrs.
PENT	F1473	>100 hrs.	>100 hrs.
Brittleness Temperature	D746	<-117°C	<-180°F
Hardness, Shore D	D2240	64	64
Vicat Softening Temperature	D1525	124°C	255°F
Izod Impact Strength (Notched)	D256	0.37 KJ/m	7 ft – lb/in
Volume Resistivity	D991	>10 ¹⁵ ohm-cm	--
Thermal Expansion Coefficient		2x 10 ⁻⁴ cm/cm/°C	1.0x10 ⁻⁴ in/in/°F
CELL CLASSIFICATION:	D3350	345464C	Grade PE36
MATERIAL CLASSIFICATION:	D1248	Type III Category 5	Class C
PPI HYDROSTATIC DESIGN BASIS (HDB)	D2837	11.0 MPa @ 23°C	1,600 psi @ 73.4°F
<i>(As listed in PPI TR-4)</i>		5.5 MPa @ 60°C	800 psi @ 140°F
PPI HYDROSTATIC DESIGN STRESS (HDS)		5.5 MPa @ 23°C	800 psi @ 73.4°F
<i>(As established by the Hydrostatic Stress Board (HSB) of the Plastics Pipe Institute (PPI))</i>			

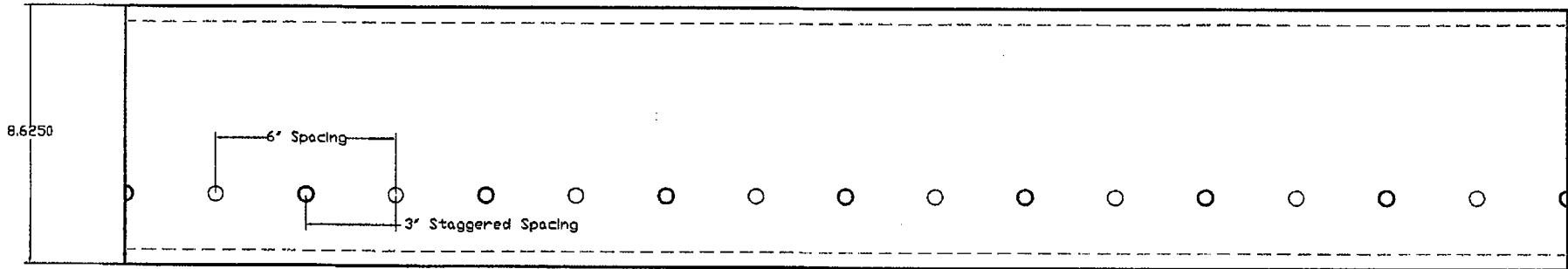
*Nominal values are intended to be guides only, and not as specification limit.

*Some of the data listed above was determined from compression molded test specimens; therefore, may deviate from pipe specimens.

PolyPipe® PE3408/PE3608 Pipe

Pipe Data and Pressure Ratings – IPS

Pressure Rating		Class 265 DR7		Class 200 DR9		Class 160 DR11		Class 130 DR13.5		Class 100 DR17		Class 80 DR21		Class 65 DR26		Class 50 DR32.5	
Nominal Pipe Size	OD Size, inches	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft	Min. Wall, inches	Weight, lbs/ft
½"	0.840	0.120	0.12	0.093	0.10	0.076	0.08	---	---	---	---	---	---	---	---	---	---
¾"	1.050	0.150	0.18	0.117	0.15	0.095	0.13	---	---	---	---	---	---	---	---	---	---
1"	1.315	0.188	0.29	0.146	0.23	0.120	0.20	---	---	---	---	---	---	---	---	---	---
1 ¼"	1.660	0.237	0.46	0.184	0.37	0.151	0.31	0.123	0.26	---	---	---	---	---	---	---	---
1 ½"	1.900	0.271	0.60	0.211	0.49	0.173	0.41	0.141	0.34	---	---	---	---	---	---	---	---
2"	2.375	0.339	0.94	0.264	0.76	0.216	0.64	0.176	0.53	0.140	0.43	---	---	---	---	---	---
3"	3.500	0.500	2.05	0.389	1.66	0.318	1.39	0.259	1.15	0.206	0.93	0.167	0.76	0.135	0.62	---	---
4"	4.500	0.643	3.38	0.500	2.74	0.409	2.29	0.333	1.91	0.265	1.54	0.214	1.26	0.173	1.03	0.138	0.83
5"	5.375	0.768	4.83	0.597	3.91	0.489	3.27	0.398	2.72	0.316	2.20	0.256	1.80	0.207	1.47	0.165	1.19
5"	5.563	0.795	5.17	0.618	4.18	0.506	3.51	0.412	2.91	0.327	2.35	0.265	1.93	0.214	1.57	0.171	1.27
6"	6.625	0.946	7.34	0.736	5.93	0.602	4.97	0.491	4.13	0.390	3.34	0.315	2.74	0.255	2.23	0.204	1.80
7"	7.125	1.018	8.49	0.792	6.86	0.648	5.75	0.528	4.78	0.419	3.86	0.339	3.17	0.274	2.58	0.219	2.08
8"	8.625	1.232	12.43	0.958	10.05	0.784	8.43	0.639	7.00	0.507	5.66	0.411	4.64	0.332	3.78	0.265	3.05
10"	10.750	1.536	19.31	1.194	15.62	0.977	13.09	0.796	10.88	0.632	8.79	0.512	7.20	0.413	5.88	0.331	4.74
12"	12.750	1.821	27.17	1.417	21.97	1.159	18.41	0.944	15.30	0.750	12.36	0.607	10.13	0.490	8.27	0.392	6.67
14"	14.00	2.000	32.76	1.556	26.49	1.273	22.20	1.037	18.45	0.824	14.91	0.667	12.22	0.538	9.97	0.431	8.04
16"	16.00	2.286	42.79	1.778	34.60	1.455	28.99	1.185	24.09	0.941	19.47	0.762	15.96	0.615	13.02	0.492	10.51
18"	18.00	2.571	54.15	2.000	43.79	1.636	36.70	1.333	30.49	1.059	24.64	0.857	20.20	0.692	16.48	0.554	13.30
20"	20.00	2.857	66.85	2.222	54.06	1.818	45.30	1.481	37.64	1.176	30.42	0.952	24.94	0.769	20.35	0.615	16.42
22"	22.00	---	---	2.444	65.41	2.000	54.82	1.630	45.55	1.294	36.81	1.048	30.17	0.846	24.62	0.677	19.86
24"	24.00	---	---	2.667	77.85	2.182	65.24	1.778	54.21	1.412	43.80	1.143	35.99	0.923	29.30	0.738	23.64
28"	28.00	---	---	3.111	105.96	2.545	88.80	2.074	73.78	0.647	59.62	1.333	48.87	1.077	39.88	0.862	32.17
30"	30.00	---	---	3.333	121.63	2.727	101.93	2.222	84.70	1.765	68.44	1.429	56.11	1.154	45.78	0.923	36.93
32"	32.00	---	---	3.556	138.39	2.909	115.98	2.370	96.37	1.882	77.87	1.524	63.84	1.231	52.09	0.985	42.02
36"	36.00	---	---	4.000	175.152	3.273	146.78	2.667	121.96	2.118	98.55	1.714	80.79	1.385	65.92	1.108	53.19
42"	42.00	---	---	---	---	---	---	3.111	166.01	2.471	134.14	2.000	109.97	1.615	89.73	1.292	72.39
48"	48.00	---	---	---	---	---	---	---	---	2.824	175.21	2.286	143.63	1.846	117.19	1.477	94.55
54"	54.00	---	---	---	---	---	---	---	---	3.176	221.74	2.571	181.78	2.077	148.32	1.662	119.67
63"	63.00	---	---	---	---	---	---	---	---	3.706	301.818	3.000	247.42	2.423	201.89	1.938	162.88
65"	65.00	---	---	---	---	---	---	---	---	3.824	321.285	3.095	263.38	2.500	214.91	2.000	173.39



8" AND 24" SUMP PIPE PERFORATION DETAIL

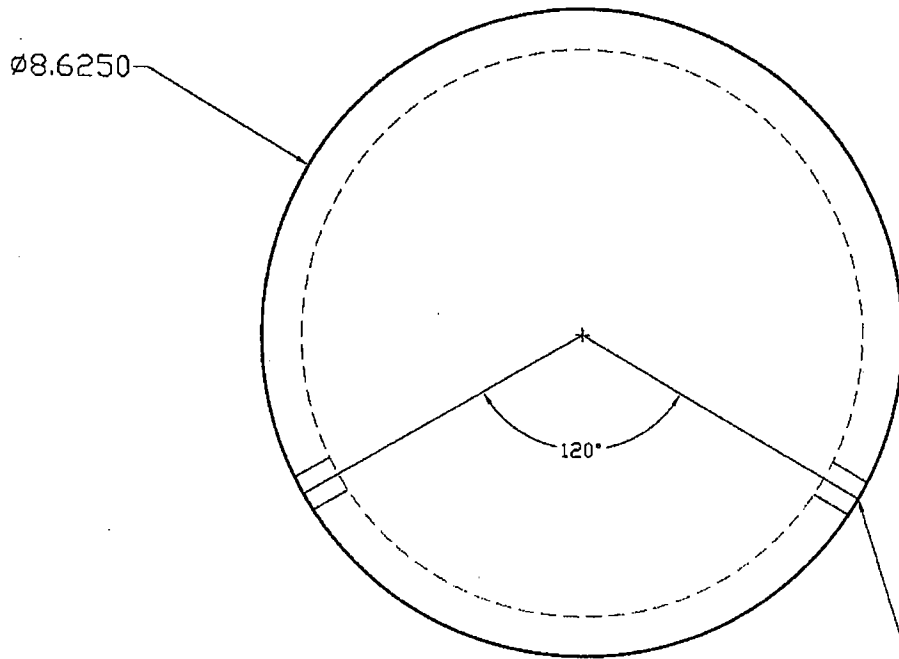
SCALE: NTS

REV	BY	APP'D	DATE
0	HRH		



*Pipe, Valves, Fittings, Fusion, and
Fabrication*
 www.hdpeinc.com (866) 996-PIPE

TOLERANCE	DR BY	DATE	INTERNAL	HDPE
FRACT=1/16"	Marc Hazel	7/19/10		
XX = 0.015	APP'D BY	DATE		
XXX = 0.005				
XXXX = 0.001	SCALE	NTS		
DWG NAME				
Citrus Cty Landfill Sump Pipe Perf Details				



1/2" Perforations
Set @ 120 deg apart

8" AND 24" SUMP PIPE PERFORATION DETAIL

SCALE: NTS

REV	BY	APP'D	DATE
0	HRH		

HDPE inc.
 Pipe, Valves, Fittings, Fusion, and
 Fabrication (866) 996-PIPE
 www.hdpeinc.com

TOLERANCE	DR BY	DATE	MATERIAL
FRACT. = 1/16"	NAME: HOSSETT	7/19/10	HDPE
XX = 2.015	DATE		
XXX = 2.015	SCALE	NTS	
XXXX = 2.001			

FIG. 1006
 Citrus Cty Landfill Sump Pipe Perf Details

Attachment 12-3
Video Inspection Tape and Report



SUBMITTAL TRANSMITTAL

Submittal Description: Piping System

Submittal No: 335110-06A

Spec Section: 335110

ENGINEER: Dominique Bramlett	Routing	Sent	Received
OWNER: CITRUS COUNTY BOCC	Contractor/CM		
PROJECT: 07104101 CITRUS COUNTY CENTRAL LF	CM/Engineer	1/17/2011	
	Engineer/CM		
CONTRACTOR: COMANCO Environmental Corp.	CM/Contractor		

We are sending you

Attached

Under separate cover via _____

Submittals for review and comment

Product data for information only

Remarks: _____

Item	Copies	Date	Section No.	Description	Review Action	Reviewer Initials	Review comments attached
1	1	1/17/2011	1.02	Video Inspection Tape and Report			

Contractor

Certify either A or B:

- A. We have verified that the material or equipment contained in this submittal meets all the requirements, including coordination with all related work, specified (no exceptions).
- B. We have verified that the material or equipment contained in this submittal meets all the requirements specified except for the attached deviations.

No.	Deviation

Certified by: _____

Nick Bridges, Project Eng

SUBMITTAL REVIEW BY ENGINEER

No exceptions taken

Make corrections noted. Do not resubmit

Make corrections noted and resubmit

Rejected. Resubmit in accordance with contract documents

BY: _____

DATE: _____

Engineer Comments: _____


GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
130368741	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368742	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368743	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368744	GEO-160E-EBC-E-00	NW16	8/3/2010	300



Roll Test Data Report

Sales Order No. 62099	Project Number	Customer Name Comanco	Project Location Lecanto, FL	Product Name GEO-160E-EBC-E-00		Report Date 8/10/2010
---------------------------------	-----------------------	---------------------------------	--	--	---	---------------------------------

Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 3786	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261	
	Average Sample	Permittivity	Apparent	Mullen Burst	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	(Sec-1)	Opening Size	Strength	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	Unit Area
	(gallon/min/ft ²)	(mm)	(psi)	(lbs)	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(oz./yd ²)
	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th
130368741	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368742	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368743	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368744	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5

Laboratory Manager: Gene Allen

GSE-8.2.4-029 Rev -- 03/05

This test report shall not be reproduced, except in full, without written approval of the laboratory.

Kingstree Lab - US



1245 Eastland Avenue
Kingstree, SC 29556
Phone 843-382-4603
Fax 843-382-4604

Date: August 9, 2010

Project: # 62099 Citrus County Central Landfill Phase 3

Ref: Ultraviolet (UV) Resistance

To Whom It May Concern:

The resistance of nonwoven needle punched geotextiles to ultraviolet light depends primarily on antioxidant and carbon black package mixed with resin to prepare a formulation for fiber extrusion. As long as this formulation remains the same the UV resistance of a geotextiles does not change. Therefore, GSE performs UV testing only once per resin formulation. The testing is performed according to ASTM Test Method D 4355 and results are included on GSE geotextile specification sheet. Currently, all GSE geotextiles meet or exceed a value of 70% strength retained after 500 hours of UV exposure. GSE will meet or exceed this value for the referenced project.

Although GSE geotextiles are manufactured using one of the best available antioxidant packages, we recommend covering the geotextiles within 15 days of exposure to direct Sunlight. This period does not include time during which geotextiles rolls remain on site covered in black shrink-wrap. Our recommendation is based on UV performance data published in technical literature indicating geotextile strength can decrease sharply after prolonged exposure to Sunlight.

Actual data from an independent laboratory can be supplied upon request.

A handwritten signature in cursive script, appearing to read 'Jane Allen', is written over a horizontal line.

Jane Allen
Laboratory Manager

SHOP DRAWING SUBMITTAL

SHOP DRAWING SUBMITTAL NO.: 335110-06A

SUBMITTAL PREPARED BY: Nick Bridges Project Engineer
 (Name) (Title)

DATE SUBMITTAL PREPARED: 1-17-11

RESUBMITTAL OF PREVIOUS SHOP DRAWING: X
 YES NO

IF YES, ORIGINAL SHOP DRAWING NO.:

PROJECT NAME: Central Landfill Phase 3 Expansion Project

PROJECT LOCATION: 230 West Gulf to Lake Highway, Lecanto, FL 34461

OWNER'S BID NO. ITB 040-10

SHOP DRAWING DISTRIBUTION BY CONTRACTOR				
Owner's Representative: Central Landfill 230 West Gulf to Lake Hwy Lecanto, FL 34461 Attn.: Casey Stephens	No. Copies		Date Sent	
Engineer's Home Office: 4041 Park Oaks Blvd. Suite 100 Tampa, FL 33610 Attn.: Dominique Bramlett	No. Copies	1	Date Sent	1-17-11, Electronic
Owner's Field Office:	No. Copies		Date Sent	
Engineer's Field Office:	No. Copies		Date Sent	
Contractor's Field Office:	No. Copies		Date Sent	
Other:	No. Copies		Date Sent	
Attn:				

ITEM NO.	SUBMITTAL NO.	NO. COPIES	VENDOR	DESCRIPTION	ENGINEER'S ACTION
1	335110-06A	1	Florida JetClean	Video Inspection Tape and Report	

ACTION CODES: NE - No Exceptions Taken
 MC - Make Corrections Noted
 AR - Amend and Resubmit
 RR - Rejected, Resubmit

Date Submittal Received: _____

Date Submittal Reviewed: _____

Response Prepared By: _____
(Name) (Title)

Response Reviewed By: _____
(Name) (Title)

ITEM NO.	ENGINEER'S COMMENTS

SHOP DRAWING DISTRIBUTION BY ENGINEER				
Owner's Representative Home Office: Central Landfill 230 West Gulf to Lake Hwy Lecanto, FL 34461 Attn.: Casey Stephens	No. Copies		Date Sent	
Contractor's Home Office: COMANCO 4301 Sterling Commerce Drive Plant City, FL 33566 Attn: Justin Endsley	No. Copies		Date Sent	
Owner's Field Office:	No. Copies		Date Sent	
Engineer's Field Office:	No. Copies		Date Sent	
Contractor's Field Office:	No. Copies		Date Sent	
Other: Attn.:	No. Copies		Date Sent	

END OF SHOP DRAWING FORM

CONTRACTOR'S SHOP DRAWING STAMP

PROJECT NAME:	<u>Central Landfill Phase 3 Expansion Project</u>
SHOP DRAWING SUBMITTAL NO.:	<u>335110-06A</u>
SPECIFICATION SECTION:	<u>33 51 10 1.02</u>
<p>WITH RESPECT TO THIS SHOP DRAWING OR SAMPLE, I HAVE DETERMINED AND VERIFIED ALL QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE CRITERIA, INSTALLATION REQUIREMENTS, MATERIALS, CATALOG NUMBERS, AND SIMILAR DATA WITH RESPECT THERETO AND REVIEWED OR COORDINATED THIS SHOP DRAWING OR SAMPLE WITH OTHER SHOP DRAWINGS AND SAMPLES AND CERTIFY THAT IT IS IN ACCORDANCE WITH THE REQUIREMENTS OF THE WORK AND THE CONTRACT DOCUMENTS.</p>	
<p>INITIALS</p> <div style="border: 1px solid black; width: 100px; height: 50px; margin: 0 auto; text-align: center; vertical-align: middle;"> <p style="font-size: 2em; margin: 0;">NB</p> </div>	
<p>THIS SUBMITTAL IS CERTIFIED THAT THERE ARE NO VARIATIONS FROM THE CONTRACT DOCUMENT.</p>	
<p>THIS SUBMITTAL IS A DEVIATION FROM THE CONTRACT DOCUMENTS AND THE CONTRACTOR REQUESTS APPROVAL OF A VARIATION FROM THE CONTRACT DOCUMENTS AS NOTED BELOW.</p>	
<p><u>Nick Bridges</u></p> <p>(Name)</p>	<p><u>Project Engineer</u></p> <p>(Title)</p>
<p><u>1-17-11</u></p> <p>(Date Reviewed and Verified)</p>	

END OF CONTRACTOR'S SHOP DRAWING STAMP FORM

FLORIDA JETCLEAN

HIGH PRESSURE WATER JETTING
VIDEO PIPELINE INSPECTION
NO DIG POINT REPAIRS
WWW.FLORIDAJETCLEAN.COM

19019 FERN MEADOW LOOP
LUTZ, FL 33558
TEL: 800-226-8013 FAX: 813-926-4616
FLORIDAJETCLEAN@YAHOO.COM

Comanco Environmental Citrus County Landfill Phase 3 High-pressure Water-jetting & Explosion-proof Video-inspection

Work Performed January 2011

Conducted By:
Florida Jetclean
800-226-8013

FLORIDA JETCLEAN

HIGH PRESSURE WATER JETTING
VIDEO PIPELINE INSPECTION
NO DIG POINT REPAIRS
WWW.FLORIDAJETCLEAN.COM

19019 FERN MEADOW LOOP
LUTZ, FL 33558
TEL: 800-226-8013 FAX: 813-926-4616
FLORIDAJETCLEAN@YAHOO.COM

DATE : 1/7/2011
TO : Troy Watral – Comanco
FROM : Ralph Calistri (floridajetclean@yahoo.com)
SUBJECT : Citrus County Landfill - Phase 3 Expansion

Florida Jetclean completed the high-pressure water-jetting and explosion-proof video-inspection of the new Phase 3 leachate collection and detection piping on 1/6/2011. Please find included with this report the applicable jetting log, CCTV survey list, pipe graphic reports, and the video-inspection footage in DVD format for further reference.

High-Pressure Water-Jetting:

As the below jetting log documents, the new cell's leachate collection and detection piping was jetcleaned end-to-end utilizing a high-pressure water-jetting nozzle. All new piping was clean and blockage free upon completion.

CITRUS COUNTY LANDFILL – PHASE 3 JANUARY 2011 JETTING LOG

<u>LOCATION</u>	<u>ACHIEVED DISTANCE (ft)</u>
Collection Sump 1	183'
Collection Sump 2	180'
Detection Sump	165'
Collection Lateral 1 (West C/O)	1,190'

Explosion-Proof Video-Inspection:

After the high-pressure jetcleaning was completed, the above piping was video-inspected in entirety utilizing explosion-proof video-inspection equipment. All areas of the pipe viewed with the inspection camera appear to be in good condition, with no specific defects noted. The inspection camera was submerged under liquid for portions of the video-inspections since no pumps had been installed at the time of this work. Although there was still a visible video picture in some portions of the survey with the camera below water, in any areas where video quality was obscured by those high liquid levels, the fact that both the inspection tractor/camera and the large high-pressure water-jetting nozzle were not restricted in any way while advancing through the pipe would support the contention that those areas of the leachate collection system are also in good working order.

Please call us with questions or concerns.

Regards,



Ralph Calistri – Florida Jetclean

CCTV Surveys List for COMANCO

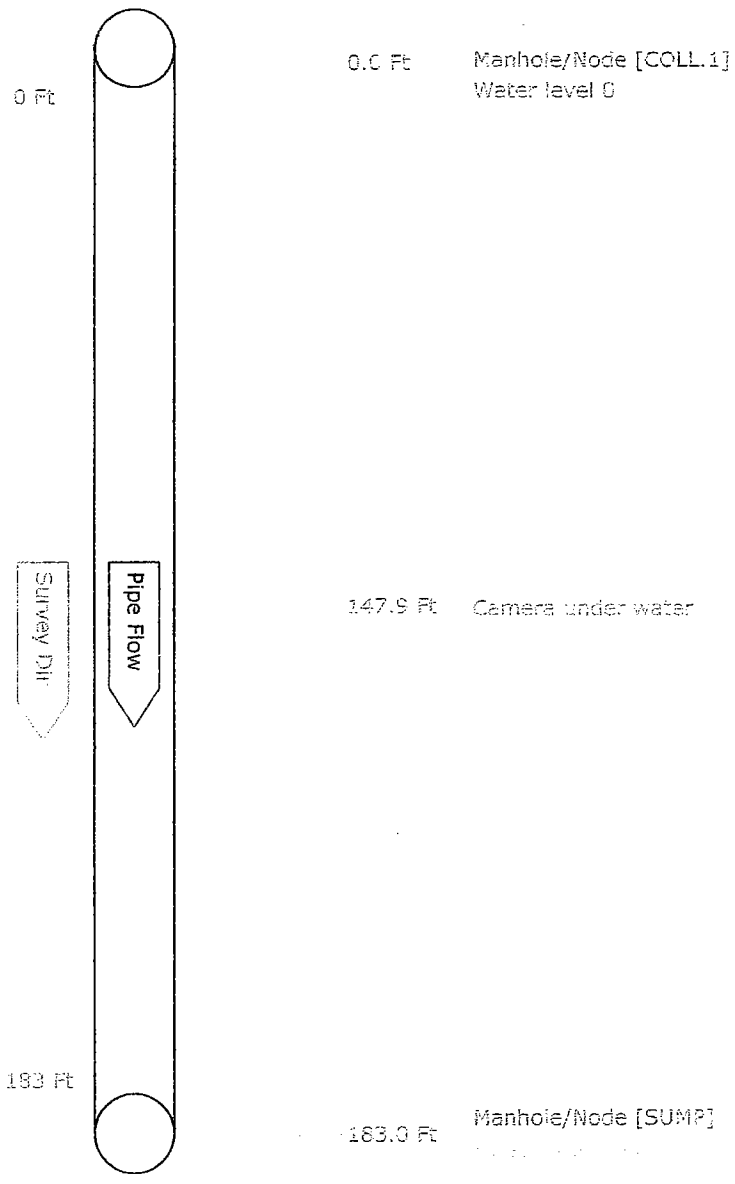
Number of surveys in this list is 5 as of Thursday, January 06, 2011

Unit of measure: ft

Setup	Date	Street	Start MH	Finish MH	Dir	Size inch	Pre Clean	Vid Cassette	Scheduled Length	Surveyed Length
1	1/6/2011	CITRIS CO LANDFILL	COLL.1	SUMP	D	24	Y	DVD.1	183.0	183.0
2	1/6/2011	CITRIS CO LANDFILL	COLL.2	SUMP	D	24	Y	DVD.1	179.7	179.7
3	1/6/2011	CITRIS CO LANDFILL	DET	SUMP	D	24	Y	DVD.1	165.5	165.4
4	1/6/2011	CITRIS CO LANDFILL	CO.LAT.1 WEST	CO.LAT.1 EAST	U	8	Y	DVD.1		1042.1
5	1/6/2011	CITRIS CO LANDFILL	CO.LAT.1 EAST	CO LAT 1 WEST	D	8	Y	DVD.1		550.3
Total Scheduled Length									528.2	
Total Length Surveyed										2,120.5

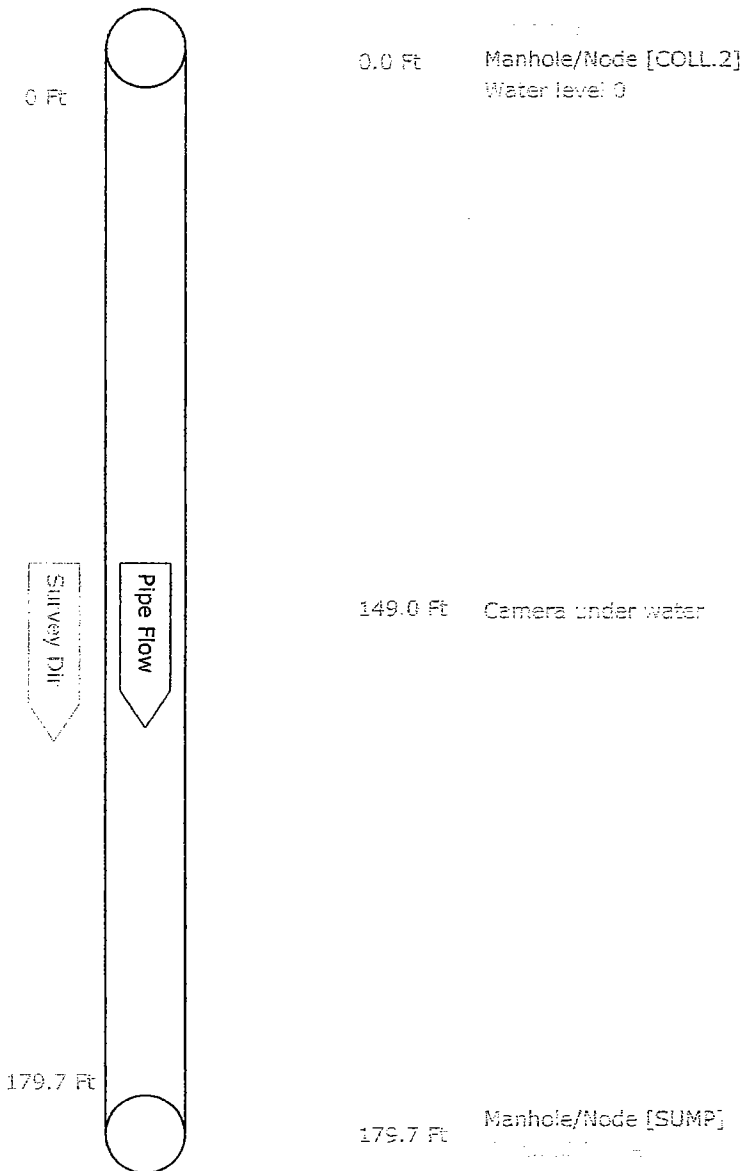
Pipe Graphic Report of PLR COLL.1 X for COMANCO

Work Order	Contract	Video	DVD.1	Setup	1
Facility	Operator DWH	Van Ref	3	Surveyed On	01/06/2011
Street Name	CITRIS CO LANDFILL	City	CITRIS CO LANDFILL		
Location type	LANDFILL				
Surface	Survey purpose Assessment of complete remedial or renovation works			Weather	Light rainfall
Pipe Use	Schedule length 183.0 Ft	From COLL.1	Depth	Ft	
Shape Circular	Size 24 by ins	To SUMP	Depth	Ft	
Material Polyethylene - High density	Joint spacing Ft	Direction	Downstream		
Lining	Year laid	Pre-clean Y	Last cleaned		
General note LECANTO FL		Structural	Service	Constructional	
Location note PHASE 3			Hydraulic		



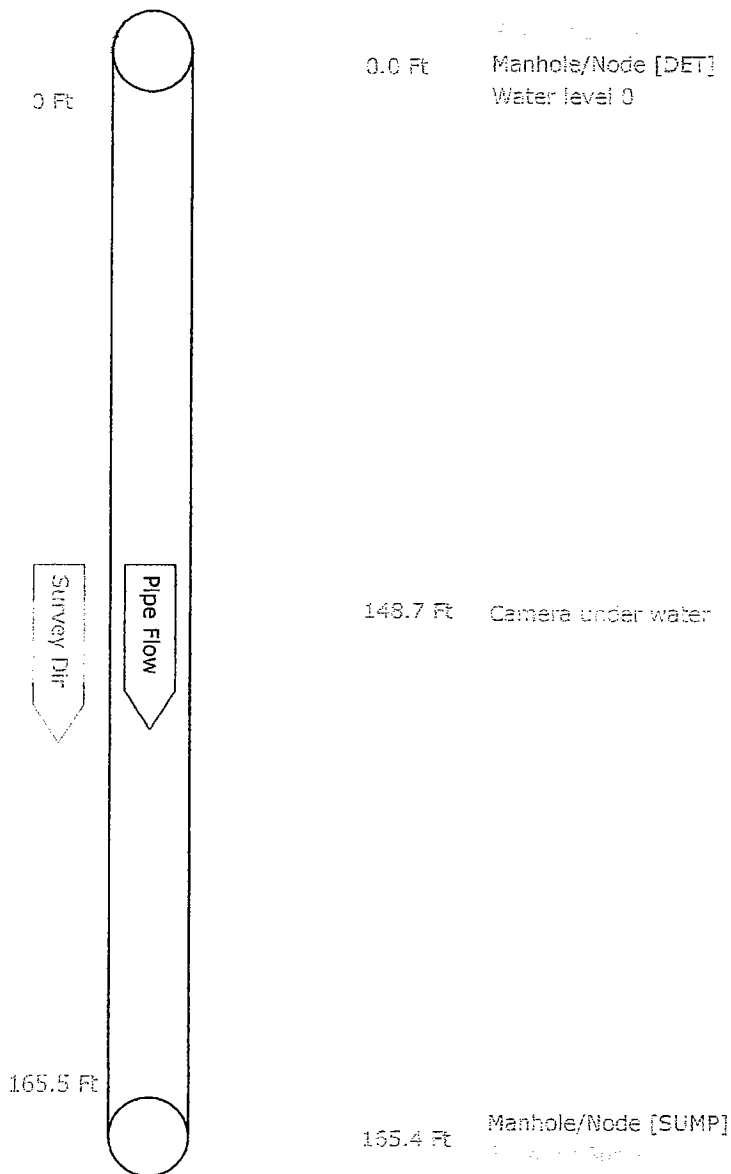
Pipe Graphic Report of PLR COLL.2 X for COMANCO

Work Order	Contract	Video	DVD.1	Setup	2
Facility	Operator DWH	Van Ref	3	Surveyed On	01/06/2011
Street Name	CITRIS CO LANDFILL	City	CITRIS CO LANDFILL		
Location type	LANDFILL				
Surface					
Survey purpose	Assessment of complete remedial or renovation works		Weather	Light rainfall	
Pipe Use		Schedule length	179.7 Ft	From	COLL.2
Shape	Circular	Size	24 by ins	To	SUMP
Material	Polyethylene - High density		Joint spacing	Ft	
Lining		Year laid		Direction	Downstream
General note	LECANTO FL		Pre-clean	Y	Last cleaned
Location note	PHASE 3			Structural	Service Constructional
					Hydraulic



Pipe Graphic Report of PLR DET X for COMANCO

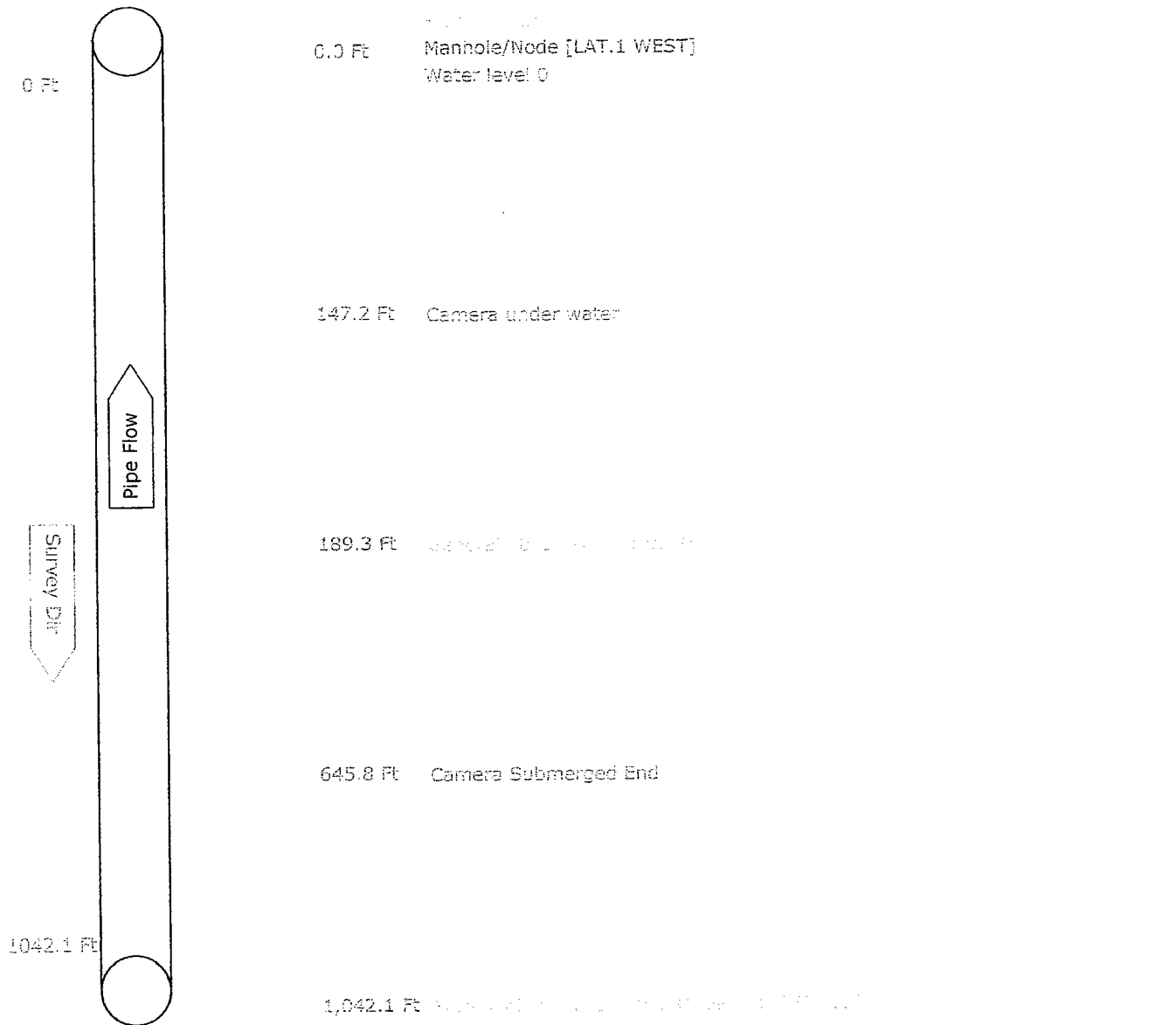
Work Order	Contract	Video	DVD.1	Setup	3
Facility	Operator DWH	Van Ref	3	Surveyed On	01/06/2011
Street Name	CITRIS CO LANDFILL	City	CITRIS CO LANDFILL		
Location type	LANDFILL				
Surface					
Survey purpose	Assessment of complete remedial or renovation works	Weather	Light rainfall		
Pipe Use		Schedule length	165.5	From	DET
Shape	Circular	Size	24	by	ins
Material	Polyethylene - High density	Joint spacing	Ft		
Lining		Year laid		Direction	Downstream
General note	LECANTO FL	Pre-clean	Y	Last cleaned	
Location note	PHASE 3	Structural		Service	Constructional
		Hydraulic			



Pipe Graphic Report of PLR CO.LAT.1 EAST X

for COMANCO

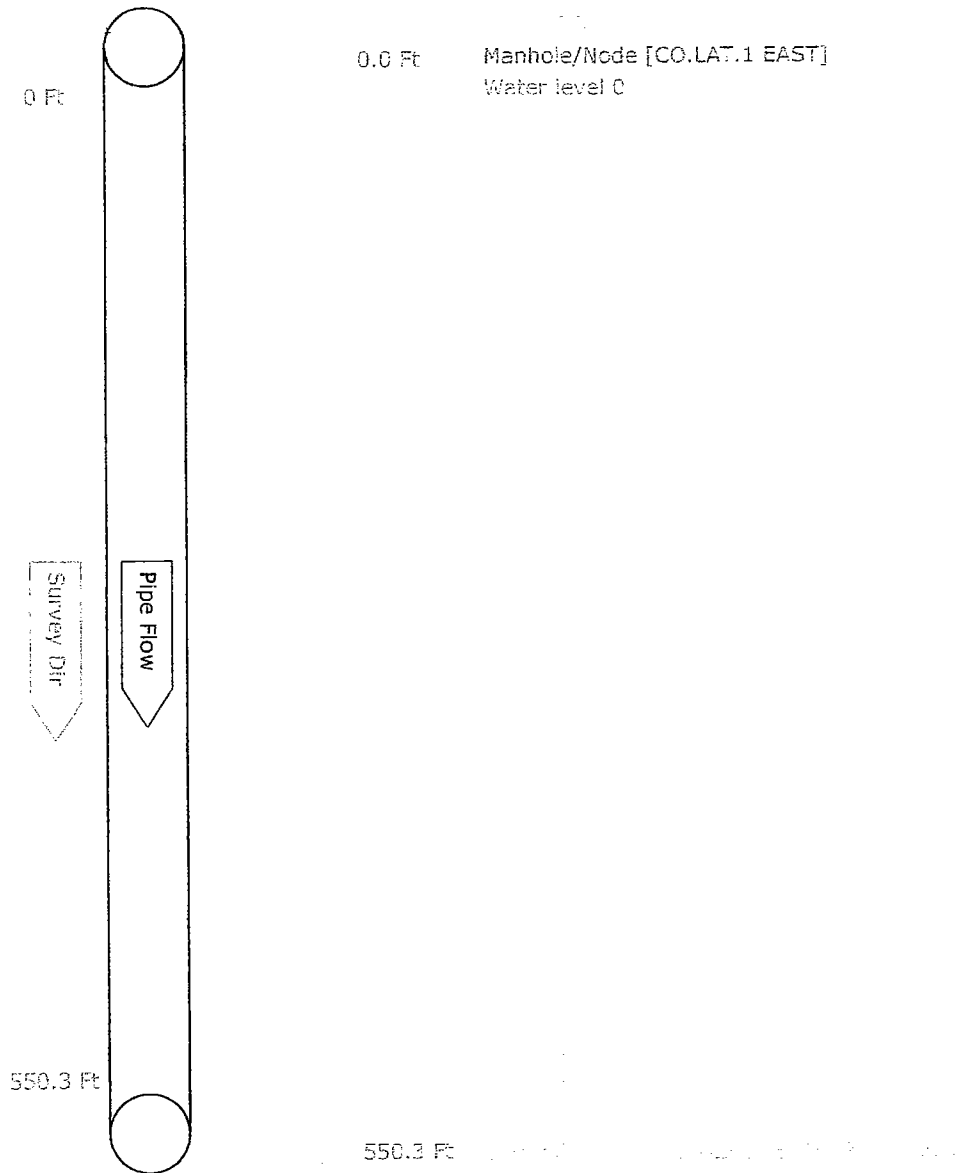
Work Order	Contract	Video	DVD.1	Setup	4
Facility	Operator DWH	Van Ref	3	Surveyed On	01/06/2011
Street Name	CITRIS CO LANDFILL	City	CITRIS CO LANDFILL		
Location type	LANDFILL				
Surface					
Survey purpose	Assessment of complete remedial or renovation works		Weather	Light rainfall	
Pipe Use		Schedule length	Ft	From	CO.LAT.1 WEST
Shape	Circular	Size 8	by	Depth	Ft
Material	Polyethylene - High density	Joint spacing	Ft	To	CO.LAT.1 EAST
Lining		Year laid		Direction	Upstream
				Pre-clean	Y
				Last cleaned	
General note	LECANTO FL			Structural	Service
Location note	PHASE 3				Constructional
					Hydraulic



Pipe Graphic Report of PLR CO.LAT.1 EAST B

for COMANCO

Work Order	Contract	Video	DVD.1	Setup	5
Facility	Operator DWH	Van Ref 3	Surveyed On 01/06/2011		
Street Name	CITRIS CO LANDFILL	City	CITRIS CO LANDFILL		
Location type	LANDFILL				
Surface					
Survey purpose	Assessment of complete remedial or renovation works		Weather	Light rainfall	
Pipe Use	Schedule length	Ft	From	CO.LAT.1 EAST	Depth
Shape Circular	Size 8	by	To	CO LAT 1 WEST	Depth
Material Polyethylene - High density	Joint spacing	Ft	Direction	Downstream	
Lining	Year laid		Pre-clean	Y	Last cleaned
General note	LECANTO FL TO OVER LAT THIS LINE		Structural	Service	Constructional
Location note	PHASE 3		Hydraulic		



ATTENTION



A DVD CONTAINING VIDEO IS ALSO AVAILABLE WITH THIS REPORT

- To view this dvd please contact:

State of Florida

Department of Environmental Protection

Solid Waste Program

13051 North Telecom Parkway

Temple Terrace, FL 33637-0926

Phone: (813) 632-7600

Attachment 12-4

Non-Woven Geotextile MQC Certificates


GSE Roll Allocation

Order 62099
Customer Comanco
Site Citrus County Central Landfill Phase 3

<i>Roll#</i>	<i>Product Code</i>	<i>Description</i>	<i>Mfg. Date</i>	<i>Length</i>
130368741	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368742	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368743	GEO-160E-EBC-E-00	NW16	8/3/2010	300
130368744	GEO-160E-EBC-E-00	NW16	8/3/2010	300



Roll Test Data Report

Sales Order No. 62099	Project Number	Customer Name Comanco	Project Location Lecanto, FL	Product Name GEO-160E-EBC-E-00		Report Date 8/10/2010
---------------------------------	-----------------------	---------------------------------	--	--	---	---------------------------------

Roll No.	ASTM D 4491		ASTM D 4751	ASTM D 3786	ASTM D 4833	ASTM D 4533		ASTM D 4632			ASTM D 5261	
	Average Sample	Permittivity	Apparent	Mullen Burst	Puncture	Trap Tear	Trap Tear	Grab Elongation	Grab Elongation	Grab Strength	Grab Strength	Mass per
	Flow Rate	(Sec-1)	Opening Size	Strength	Resistance	Strength CD	Strength MD	CD	MD	CD	MD	Unit Area
	(gallon/min/ft ²)	(mm)	(psi)	(lbs)	(lbs)	(lbs)	(lbs)	(%)	(%)	(lbs)	(lbs)	(oz./yd ²)
	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	every 20th	
130368741	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368742	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368743	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5
130368744	59	0.80	0.150	843	246	528	245	108	118	589	404	16.5

Laboratory Manager: Gene Allen

GSE-8.2.4-029 Rev -- 03/05

This test report shall not be reproduced, except in full, without written approval of the laboratory.

Kingstree Lab - US



1245 Eastland Avenue
Kingstree, SC 29556
Phone 843-382-4603
Fax 843-382-4604

Date: August 9, 2010

Project: # 62099 Citrus County Central Landfill Phase 3

Ref: Ultraviolet (UV) Resistance

To Whom It May Concern:

The resistance of nonwoven needle punched geotextiles to ultraviolet light depends primarily on antioxidant and carbon black package mixed with resin to prepare a formulation for fiber extrusion. As long as this formulation remains the same the UV resistance of a geotextiles does not change. Therefore, GSE performs UV testing only once per resin formulation. The testing is performed according to ASTM Test Method D 4355 and results are included on GSE geotextile specification sheet. Currently, all GSE geotextiles meet or exceed a value of 70% strength retained after 500 hours of UV exposure. GSE will meet or exceed this value for the referenced project.

Although GSE geotextiles are manufactured using one of the best available antioxidant packages, we recommend covering the geotextiles within 15 days of exposure to direct Sunlight. This period does not include time during which geotextiles rolls remain on site covered in black shrink-wrap. Our recommendation is based on UV performance data published in technical literature indicating geotextile strength can decrease sharply after prolonged exposure to Sunlight.

Actual data from an independent laboratory can be supplied upon request.

A handwritten signature in black ink, appearing to read 'Jane Allen', is written over a thin horizontal line.

Jane Allen
Laboratory Manager

Attachment 12-5

Non-Woven Geotextile CQA Conformance Test Results



September 7, 2010

Mail To:

Dominique H. Bramlett
SCS Engineers
4041 Park Oaks Blvd, Suite 100
Tampa, Florida 33610

Bill To:

<= Same(Project Number 09207049.06)

email: dbramlett@scsengineers.com
cc:email: ehilton@scsengineers.com

Dear Mr. Bramlett:

Thank you for consulting TRI/Environmental, Inc. (TRI) for your geosynthetics testing needs. TRI is pleased to submit this final report for laboratory testing.

Project: Citrus County Central Landfill Phase 3 Expansion

TRI Job Reference Number: E2343-97-07

Material(s) Tested: 1 GSE 16 oz. Nonwoven Geotextile

Test(s) Requested: Grab Tensile (ASTM D 4632)
Puncture Strength (ASTM D 4833)
Trapezoidal Tear (ASTM D 4533)
Mullen Burst Strength (ASTM D 3786, modified)
Apparent Opening Size (ASTM D 4751)
Permittivity (ASTM D 4491)

If you have any questions or require any additional information, please call us at 1-800-880-8378.

Sincerely,

Dr. Mansukh Patel
Sr. Laboratory Coordinator
Geosynthetic Services Division
www.GeosyntheticTesting.com

cc: Sam R. Allen, Vice President and Division Manager



GEOTEXTILE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Central Landfill Phase 3 Expansion

Material: GSE 16 oz. Nonwoven Geotextile
 Sample Identification: 130368741
 TRI Log #: E2343-97-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Grab Tensile Properties (ASTM D 4632)												
MD - Tensile Strength (lbs)	417	366	530	413	393	413	419	453	387	363	415	48
TD - Tensile Strength (lbs)	557	641	618	548	636	634	653	504	629	630	605	50
MD - Elong. @ Max. Load (%)	99	95	96	104	110	101	95	94	101	103	100	5
TD - Elong. @ Max. Load (%)	83	95	95	85	95	91	91	85	87	101	91	6
Puncture Resistance (ASTM D 4833)												
Puncture Strength (lbs)	287	265	295	292	267	275	250	324	258	270	275	26
	261	236	248	324	266							
Trapezoidal Tear (ASTM D 4533)												
MD - Tear Strength (lbs)	181	177	152	179	195	184	210	169	182	197	183	16
TD - Tear Strength (lbs)	257	292	292	292	286	279	266	251	260	273	275	16
Mullen Burst Strength (ASTM D 3786, modified)												
Tare (psi):	20											
Burst Strength (psi)	1100	975	870	790	795	780	860	900	890	780	874	102
	Tare Not Subtracted											
Apparent Opening Size (ASTM D 4751)												
Opening Size Diameter (mm)	0.075	0.075	0.075	0.075	0.075						0.075	0.000
Sieve No.	200	200	200	200	200						170	
MD Machine Direction	TD Transverse Direction			NA Not Available								

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.



GEOTEXTILE TEST RESULTS

TRI Client: SCS Engineers
 Project: Citrus County Central Landfill Phase 3 Expansion

Material: GSE 16 oz. Nonwoven Geotextile
 Sample Identification: 130368741
 TRI Log #: E2343-97-07

PARAMETER	TEST REPLICATE NUMBER										MEAN	STD. DEV.
	1	2	3	4	5	6	7	8	9	10		
Falling Head Permittivity (ASTM D 4491, 9-in Upper Standpipe; 2 in opening)												
Water Temp. (C):	20											
Correction Factor:	1.000											
Test Specimen No. >:	1					2						
Thickness (mils)	137	137	137	137	137	137	137	137	137	137		
Time (s)	41.9	44.1	45.3	46.3	46.6	30.3	31.3	31.3	31.6	32.0		
Specimen Permittivity (s-1)	0.68	0.64	0.63	0.61	0.61	0.94	0.91	0.91	0.90	0.89		
Specimen Permittivity @20°C (sec-1)	0.68	0.64	0.63	0.61	0.61	0.94	0.91	0.91	0.90	0.89		
Specimen Flow rate (GPM/ft2)	50.7	48.1	46.8	45.8	45.5	70.0	67.8	67.8	67.2	66.3		
Specimen Permeability (cm/s)	0.24	0.22	0.22	0.21	0.21	0.33	0.32	0.32	0.31	0.31		
Test Specimen No. >:	3					4						
Thickness (mils)	120	120	120	120	120	132	132	132	132	132		
Time (s)	39.4	39.8	40.3	40.3	40.6	33.8	34.4	34.1	34.4	34.4		
Permittivity (s-1)	0.72	0.71	0.70	0.70	0.70	0.84	0.82	0.83	0.82	0.82		
Specimen Permittivity @20°C (sec-1)	0.72	0.71	0.70	0.70	0.70	0.84	0.82	0.83	0.82	0.82		
Specimen Flow rate (GPM/ft2)	53.9	53.3	52.7	52.7	52.3	62.8	61.7	62.2	61.7	61.7		
Specimen Permeability (cm/s)	0.22	0.22	0.21	0.21	0.21	0.28	0.28	0.28	0.28	0.28		
	TEMPERATURE CORRECTED VALUES					Permittivity (s-1) Flow rate (GPM/ft2) Permeability (cm/s)					0.77	
											57.6	
											0.26	

MD Machine Direction TD Transverse Direction NA Not Available

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 of the material. TRI observes and maintains client confidentiality. TRI limits reproduction of this report, except in full, without prior approval of TRI.

Attachment 12-6

Valve and Accessories Shop Drawing Submittal

LETTER OF TRANSMITTAL



TO:
Comanco Environmental Corp
ADDRESS:
4301 Sterling Commerce Drive

Plant City, FL 33566-7372
ATTN: PH: 813-988-8829
Nick Bridges FAX: 813-386-7392

DATE:
November 10, 2010
PROJECT:
Citrus County Landfill Expansion
PROJECT LOCATION:
230 Gulf-to-Lake Highway Lecanto, FL 34461
PROPOSAL # / JOB # CHANGE ORDER #
Estimate # 1381

WE SUBMIT TO YOU:

VIA: Pick Up Mail Messenger Overnight Fax - Page 1 of _____
THE FOLLOWING: Prints Specifications Samples Shop Drawings
 Other
FOR YOUR: Approval Use/Info Review & Comment
 Proposal Due By _____

FOR WORK

Quantity	Date	Description
1 SET	11/10/2010	PVC Gate valves, Timesaver Butterfly valves, ARI Air Release valves, & Valve boxes

THE ITEMS LISTED ABOVE ARE:

Approved as Submitted
 Approved as Noted
 To be Revised and Resubmitted
 Rejected

REMARKS

BY: Randy Conrad

cc: John Bragg



Specifications

Sizes: 1-1/2" - 14"
 Body: High Impact PVC
 Models: Flanged (ANSI)

Types/Sizes: "P" Type: PP, 1-1/2" - 14"
 Seals: EPDM, FKM(Optional)

Sizes 1 1/2" - 14" PVC/PP/EPDM/FKM
 Models available with NSF-61 Certification



Standard Features

- Straight-through flow with minimal pressure drop
- Unique sliding cylindrical plug design provides larger seating area than conventional gate valves
- Made of durable, corrosion resistant plastic
- No metal to media contact anywhere in valve
- Clean-out (drain) plug in bottom area of valve body
- Rated for full vacuum service
- Light weight for easier and economical installation
- Positive bubble-tight shut-off
- Visual position indicator

Options

- 2" square operating nut
- Stem extensions
- Locking handles
- Electric actuation, up to 3"
- FKM seals

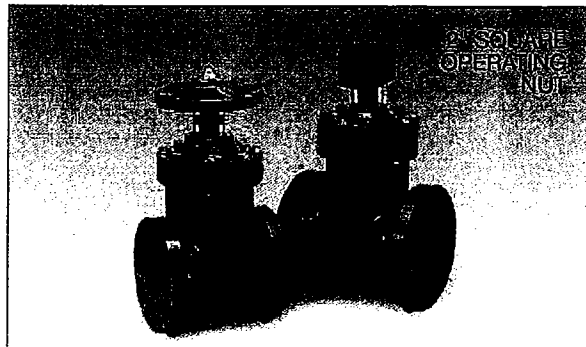
Caution

- Never remove valve from pipeline under pressure.
- Always wear protective gloves and goggles.

Type P Parts (Sizes 1-1/2" - 6")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC
2	Gate (Plug)	1	PP
3	Stem	1	PVC
4	Bonnet (A)	1	PVC
5	Bonnet (B)*	1	PVC
6	Thrust Bearing	1 Set	PP
7	Bolt, Nut, Washer	-	Stainless Steel 304
8	Hand Wheel	1	PP
9	Indicating Cover	1	PC
10	Indicating Ring	1	PVC
11	Guide Pin	1	Stainless Steel 304
12	Guide Pin Holder	1	PVC
13	Gasket	1	EPDM
14	O-Ring (A)	1	EPDM
15	Washer	1	PVC
16	Nut	1	Stainless Steel 304
17	O-Ring (B)	1	EPDM, Others
18	O-Ring (C)	2	EPDM, Others
23	Sheet Gasket	1	EPDM, Others
24	Plug	1	PVC

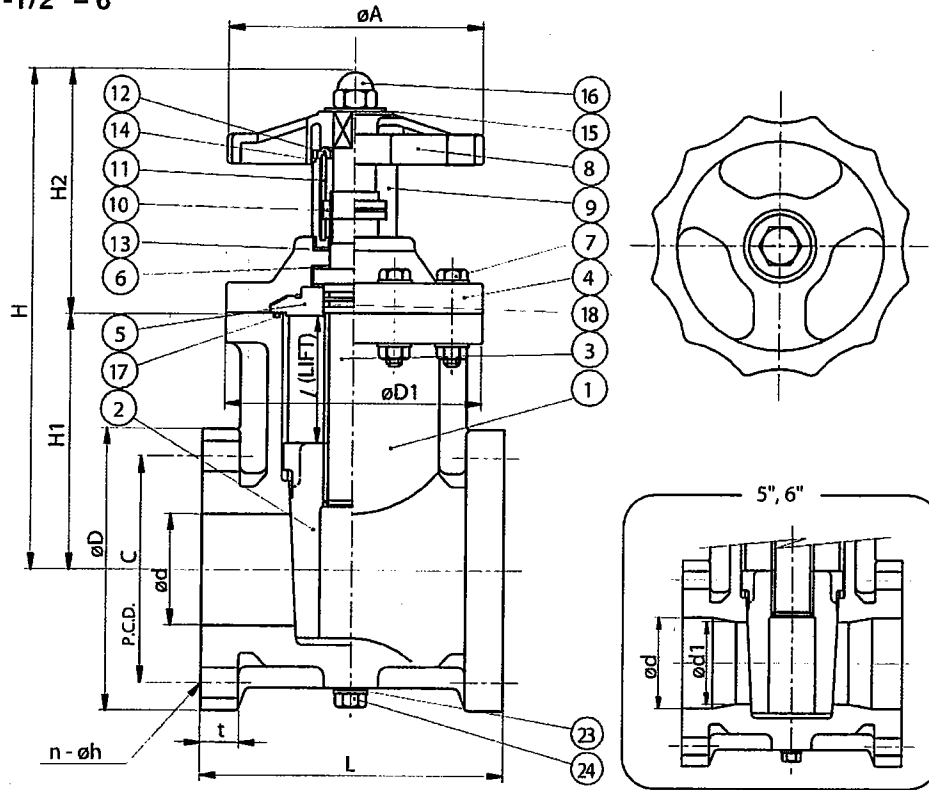
* Stem holder



Type P

Gate Valves

Sizes 1-1/2" - 6"



Troubleshooting

What if fluid still flows when fully closed?

1. Body or plug is worn or damaged. Replace.
2. Seat is worn or damaged. Replace.
3. Foreign material caught at the bottom of body. Needs cleaning.

What if handle does not engage with stem?

1. Stem damaged or broken. Change stem.

2. Engaging part of stem and/or plug damaged or broken. Need to replace stem and/or plug.

What if there are leaks between bonnet and body?

1. Bolts are not tightened properly. Tighten diagonally and evenly.
2. O-ring between body and bonnet damaged or worn. Change O-ring.

Dimensions (Sizes 1-1/2" - 6")

NOMINAL SIZE		ANSI CLASS 150														
INCHES	mm	d	d1	D	C	n	h	L	t	D1	A	/	H1	H2	H	
1 1/2	40	1.57	-	5.00	3.88	4	0.62	6.50	0.87	4.72	4.72	1.93	4.21	5.20	9.41	
2	50	1.97	-	6.00	4.75	4	0.75	7.01	0.91	5.12	5.12	2.36	5.28	5.35	10.63	
2 1/2	65	2.56	-	7.00	5.50	4	0.75	7.48	0.94	6.10	6.10	2.95	5.98	5.91	11.89	
3	80	2.95	-	7.50	6.00	4	0.75	7.99	0.98	6.69	6.69	3.35	6.69	6.10	12.79	
4	100	3.94	-	9.00	7.50	8	0.75	9.02	1.06	7.68	7.68	4.33	8.15	6.42	14.57	
5	125	4.92	4.33	10.00	8.50	8	0.88	10.24	1.06	9.25	9.25	4.61	8.94	7.09	16.03	
6	150	5.91	5.12	11.00	9.50	8	0.88	10.51	1.06	10.63	10.63	5.43	10.35	7.17	17.52	

Pressure vs. Temp. (PSI, WATER, NON-SHOCK)

NOMINAL SIZE		30° F	120° F
INCHES	mm		
1 1/2 - 8	40-200	150	
10	250	110	
12-14	300-350	75	

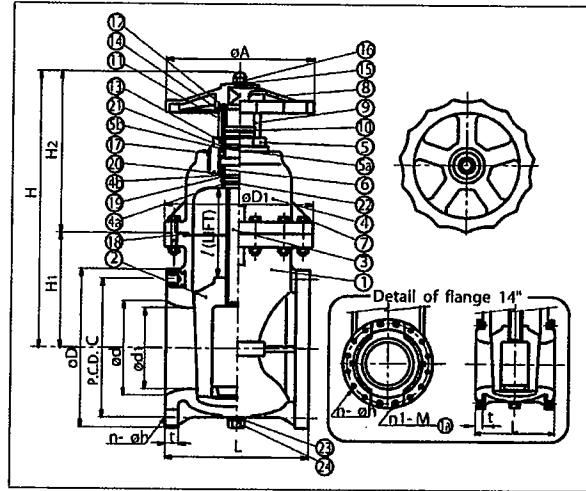
Gate Valves

Type P

Type P Parts (Sizes 8" - 14")

Sizes: 8" - 14"

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC
2	Gate (Plug)	1	PP
3	Stem	1	PVC
4	Bonnet (A)	1	PVC
4a	Bush (A)	1	PP
4b	Knock Pin (A)	1	PP
5	Bonnet (B)*	1	PVC
5a	Bush (B)	1	PP
5b	Knock Pin (B)	1	PP
6	Thrust Bearing	1 Set	High Carbon Chromium
7	Bolt, Nut, Washer	-	Stainless Steel 304
8	Hand Wheel	1	PP
9	Indicating Cover	1	PC
10	Indicating Ring	1	PVC
11	Guide Pin	1	Stainless Steel 304
12	Guide Pin Holder	1	PVC
13	Gasket	1	EPDM
14	O-Ring (A)	1	EPDM
15	Washer	1	PVC
16	Nut	1	Stainless Steel 304
17	Screw	1	Stainless Steel 304
18	O-Ring (B)	1	EPDM, Others
19	O-Ring (C)	3	EPDM, Others
20	O-Ring (D)	1	EPDM, Others
21	O-Ring (E)	1	EPDM, Others
22	O-Ring (F)	1	EPDM, Others
23	Sheet Gasket	1	EPDM, Others
24	Plug	1	PVC
1a	Body Metal Inserts**	-	Copper Alloy



Cv Values

Weight (POUNDS)

NOMINAL SIZE		Cv
INCHES	mm	
1 1/2	40	130
2	50	180
2 1/2	65	415
3	80	470
4	100	690
5	125	1000
6	150	1400
8	200	2900
10	250	3700
12	300	5200
14	350	7000

NOMINAL SIZE		FLANGED
INCHES	mm	
1 1/2	40	7.50
2	50	10.20
2 1/2	65	13.00
3	80	16.60
4	100	22.00
5	125	29.00
6	150	42.00
8	200	68.50
10	250	95.00
12	300	150.00
14	350	188.00

* Stem holder
 ** 8" and 12" sizes: 4 inserts; 14" size: 8 inserts

Sample Specification

All Gate Valves shall be constructed of High Impact PVC and have no metal-to-media contact. The gate shall be a tapered cylindrical plug design PVC shall conform to ASTM D1784 Cell Classification 12454-A, & PP to ASTM D4101 Cell Classification PPO210B67272. Valves shall have a pressure rating of 150 psi at 70 degrees F sizes 1-1/2" through 8", 110 psi at 70 degrees F size 10", and

75 psi at 70 degrees F sizes 12" and 14". The valve shall have a non-rising stem, come standard with sealed position indicator, clean-out plug and EPDM or FKM seals as manufactured by Asahi/America Inc.

Dimensions (Sizes: 8" - 14")

NOMINAL SIZE		ANSI CLASS 150														
INCHES	mm	d	d1	D	C	n	h	n1 - M	L	t	D1	A	/	H1	H2	H
8	200	7.72	6.61	13.50	11.75	6	0.88	2 - 3/4 UNC	11.50	1.10	12.20	12.20	7.09	9.45	13.27	22.72
10	250	9.72	8.27	16.00	14.25	12	0.98	-	14.96	1.18	14.17	14.17	8.90	10.63	16.54	27.17
12	300	11.73	10.04	19.00	17.00	10	0.98	2 - 7/8 UNC	15.75	1.22	16.14	16.14	10.75	12.60	18.90	31.50
14	350	13.70	11.69	21.00	18.75	8	1.14	4 - 1 UNC	16.93	1.26	17.32	17.91	12.56	12.20	23.62	35.83

Tyler/Union

6850 SERIES CAST IRON TWO-PIECE VALVE BOXES for 4" through 12" valves, 5 1/4" shaft, screw-type

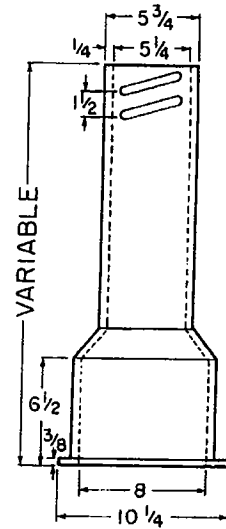
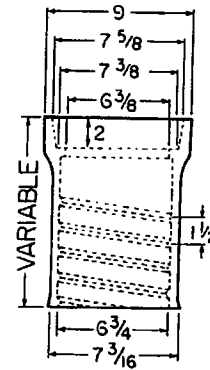
New ways to save on valve boxes. Eliminate extra handling by buying pre-assembled units. Save on single parts and accessories. Lower unit cost by purchasing Valu-Paks of 30 to 80 pieces of tops and bottoms in crates. See price sheet for pricing details.

THREE WAYS TO SAVE 6850 VALVE BOX

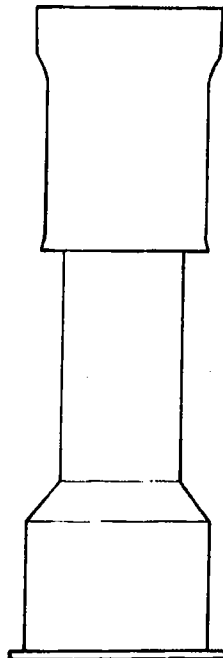
Level 1	Level 2	Level 3
Boxes Assembled	Individual Parts Not Assembled	VALU-PAK Parts Not Assembled

Note: A "BOX" is one top and one bottom

Level Two Top



Level Two Bottom



Box Assembled

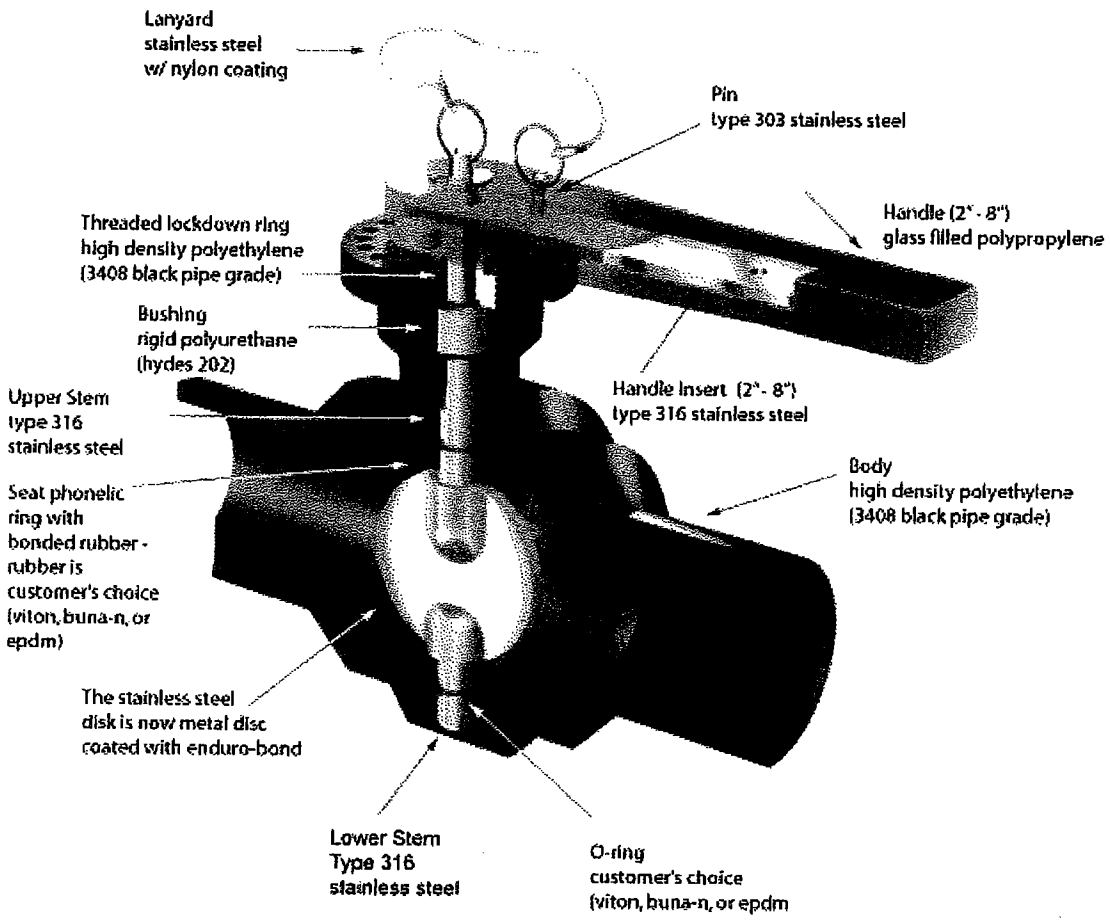
LEVEL ONE: BOXES ASSEMBLED LESS LIDS

Box (Component)	Extension Height	UPC No. 670610	Weight
461-S (10T + 10B)	19-22	(Not Offered Assembled)	
462-S (10T + 10B)	27-32	(Not Offered Assembled)	
562-S (16T + 16B)	27-37	145790	71
563-S (16T + 16B)	33-43	145752	78
564-S (16T + 16B)	39-50	145806	85
662-S (26T + 26B)	36-52	145769	93
664-S (26T + 26B)	39-60	145813	100
666-S (26T + 26B + #60 Ext)	51-71	(Not Offered Assembled)	
668-S (26T + 26B + #60 Ext)	62-82	(Not Offered Assembled)	

Lids marked "WATER" will ship unless otherwise specified:
Also available 5 1/4" Drop Lids"

WATER OMA
SEWER
MWW
(PLAIN)
GAS

TIME SAVER™ BUTTERFLY BUTT-FUSE VALVE



TIME SAVER™ BUTTERFLY BUTT-FUSED VALVE DATA

Full Port

Size IPS**	Body OD (Inches)	Disc OD (Inches)	Cv@ 90°	Δ P psi Valve @ 10 Ft./Sec	Equiv Lg. SDR11 Pipe-Ft.****	Valve Length (Inches)	Height (Inches)	Weight (Lbs)	Pipe End O.D. (Inches)	Pipe End Minwall SDR-11 (Inches)
2	5.00	2.27	145	0.40	5.3	13.00	9.00	4	2.375	0.216
3	6.37	3.31	325	0.40	7.7	13.00	10.50	10	3.5	0.318
4	8.40	4.17	590	0.30	8.6	18.20	12.50	15	4.5	0.409
6	10.35	6.06	1950	0.20	5.7	20.50	15.00	24	6.625	0.602
8	15.00	7.85	3250	0.20	8.0	24.00	20.00	80	8.625	0.784
10	17.75	9.77	5000	0.13	10.6	25.00	23.00	105	10.75	0.977
12	20.58	11.81	7500	0.12	11.3	32.00	26.00	145	12.75	1.159
14	22.50	13.20	10000	0.10	10.3	34.00	*37.42	175	14	1.217
16	26.50	15.24	13600	0.10	11.0	44.00	*42.38	290	16	1.391
18	30.00	17.15	18000	0.081	11.88	50.00	48.13	535	18	1.636

Cv values are estimated.

*Includes gear operator and 18" hand/wheel

**DIPS sizes are available

*** METRIC sizes are available on for Butt-Fusa

****Number of feet of pipe with the same pressure drop as experienced across the valve at 10 ft./sec.

SIZES AVAILABLE FROM 18" - 24" ON SPECIAL ORDER

Reduced Port

Size IPS**	Body OD (Inches)	Disc OD (Inches)	Cv@ 90°	Δ P psi Valve @ 10 Ft./Sec	Equiv Lg. SDR11 Pipe-Ft.****	Valve Length (Inches)	Height (Inches)	Weight (Lbs)	Pipe End O.D. (Inches)	Pipe End Minwall SDR-11 (Inches)
3	5.00	2.27	145	1.90	38.8	12.50	9.00	4.5	3.5	0.318
4	6.37	3.31	325	1.00	28.2	12.50	10.50	11	4.5	0.409
6	8.40	4.17	590	1.40	62.7	18.00	12.50	18	6.625	0.602
8	10.35	6.06	1950	0.40	22.4	20.50	15.00	28	8.625	0.784
10	15.00	7.85	3250	0.30	25.0	24.00	20.00	65	10.75	0.977
12	17.75	9.77	5000	0.30	25.5	29.00	23.00	118	12.75	1.159
14	20.58	11.81	7500	0.20	18.3	33.00	26.00	149	14	1.217
16	22.50	13.20	10000	0.20	20.5	37.00	*37.42	198	16	1.391
18	26.50	15.24	13600	0.15	20.3	44.00	*42.38	310	18	1.636
20	30.00	17.15	18000	0.128	20.46	50.00	46.13	567	20	1.818

Cv values are estimated.

*Includes gear operator and 18" hand/wheel

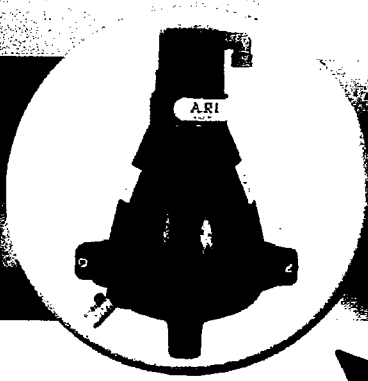
**DIPS sizes are available

*** METRIC sizes are available on for Butt-Fusa

****Number of feet of pipe with the same pressure drop as experienced across the valve at 10 ft./sec.

SIZES AVAILABLE FROM 18" - 24" ON SPECIAL ORDER

- Body: High Density Polyethylene
Cell Class PE34544C - ASTM D 3350
1600psi HDB at 73° F - ASTM D 2837
ESCR > 10000 hours - ASTM D 1693
Tensile Strength = 3500 psi - ASTM D 638
- Handle:
10" - 12", forged type 316 stainless steel.
14" & up, gear operated with hand wheel.
- Disk: Stainless Steel Type 316
Yield Strength > 30,000psi
- Stem: Stainless Steel Type 316
Yield Strength > 30,000psi
- Seats:
EPDM - Standard
Buna N - Optional
Viton - Optional
Other materials on special request
- Pressure Rating: All Sizes
160psi Maximum Non-Shock Service @ 73°F
Seating to bubble tight shut-off
- Tests:
Every valve is performance tested per MSS SP-67 Type 1
(no leak allowed) requirements and leakage tested per AWWA
C. 504 @ 160psi and 73°F



021 PN 10



Combination Air Valve -Specially Suited for Reclaimed Water

Description

The Combination Air Valve combines an Air & vacuum large orifice and an Automatic small orifice in a single body. The valve is specially designed to operate with liquids carrying solid particles such as wastewater and effluent. The combination air valve discharges air (gases) during the filling or charging of the system, admits air to the system while draining and at water column separation and discharges accumulated air (gases) from the system while operating under pressure. The valve's unique design guarantees separation of the liquid from the sealing mechanism and provides optimum work conditions.

Operation

The air & vacuum component, discharges air at high flow rates during the filling of the system and admits air into the system at high flow rates during its drainage and at water column separation. Water entry to the lower portion of the valve will cause the sealing of the valve. At any time during system operation, should internal pressure of the system fall below atmospheric pressure, air will re-enter the system. The smooth release of air prevents pressure surges and other destructive phenomena. Admitting air in response to negative pressure protects the system from destructive vacuum conditions and prevents damage caused by water column separation. Air re-entry is essential to efficiently drain the system. The automatic component releases entrapped air from pressurized systems where the valve is installed.

Without air valves, pockets of accumulated air may cause the following destructive phenomena:

- Obstruction to effective flow and hydraulic conductivity of the system along with a throttling effect similar to a partially closed valve. In extreme cases this will cause complete flow stoppage.
- Accelerate cavitation damages.
- High-pressure surges.
- Accelerate corrosion.
- Danger of a high-energy burst of compressed air.

As the system starts to fill, the valve functions in the following stages:

Air is discharged by the valve.
 When the reclaimed water level reaches the valve's lower float, it rises, and draws the "seal plug" to its sealing position. The entrapped air is confined in a pocket between the liquid and the sealing mechanism. The air pressure is equal to the system pressure.
 Increased pressure compresses the trapped air in the upper section of the cone shaped chamber. Due to the conical shape, the large initial air pocket guarantees the height of the air gap.

This assures complete separation of the liquid from the sealing mechanism.

Entrapped air (gas) accumulating at peaks and at the crown of the pipe at locations along the system rises to the top of the valve, and displaces liquid in the valve's body.

When the liquid level drops to a point where the float is no longer buoyant, the float will descend, peeling the rolling seal. This action opens the valve's orifice and allows part of the air that accumulated in the upper portion of the valve to be released to the atmosphere.

Liquid enters the valve. The float rises, unrolling the rubber seal to its sealing position. The remaining air gap prevents the **reclaimed water** from fouling the sealing mechanism.

When internal pressure falls below atmospheric pressure:

1. Both orifices will be immediately unplugged as the floats drop.
2. Air is admitted to the system.

Main Features

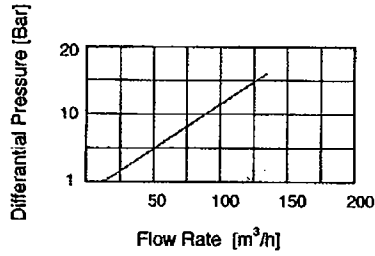
- Working pressure range: 0.2-10 bar Testing pressure: 16 bar
 - Working Temperature: 60° C.
 - Maximum working temperature for short time period: 90° C.
 - The valve's unique design prevents any contact between reclaimed water and the sealing mechanism by creating an air gap at the top of the valve. This air gap is guaranteed even under extreme conditions.
- These features are achieved by:
- The conical body shape designed to assure a large initial air/gas pocket, maintaining the maximum distance between the liquid and the Sealing Mechanism; while allowing minimum body height.
 - A spring supported joint between the stem and the upper float assures that vibrations of the lower float will not unseal the air release orifice of the air valve. Release of air will occur only after enough air accumulates.
 - The valve discharges air at high flow rate without premature closing.
 - The Rolling Seal Mechanism in the valve design, is less sensitive to pressure changes than a direct float seal. It allows a comparably large orifice for a wide pressure range (up to 150 psi).
 - Funnel-shaped lower body is designed to ensure that residue reclaimed water matter will drain to the pipe, to be carried away by the flow, and will not remain in the valve. drainage tap ball valve is provided.
 - Body made of composite materials, resistant to corrosion.
 - All internal metal parts are made of stainless steel. The floats are made of composite materials.

- 3/8" threaded discharge outlet enables removal of excess fluids.
- The valve discharges air at high flow rate without premature closing.

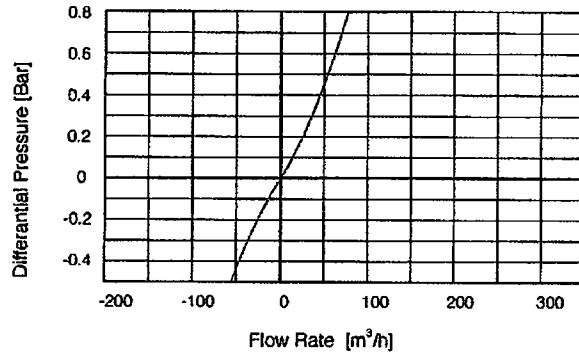
Valve Selection

- These valves are available with 1" 2" NPT male threads.
- With a Vacuum Guarding, Out-only attachment, which only allows air discharge, not allowing air intake.

AUTOMATIC AIR DISCHARGE



AIR AND VACUUM FLOW RATE

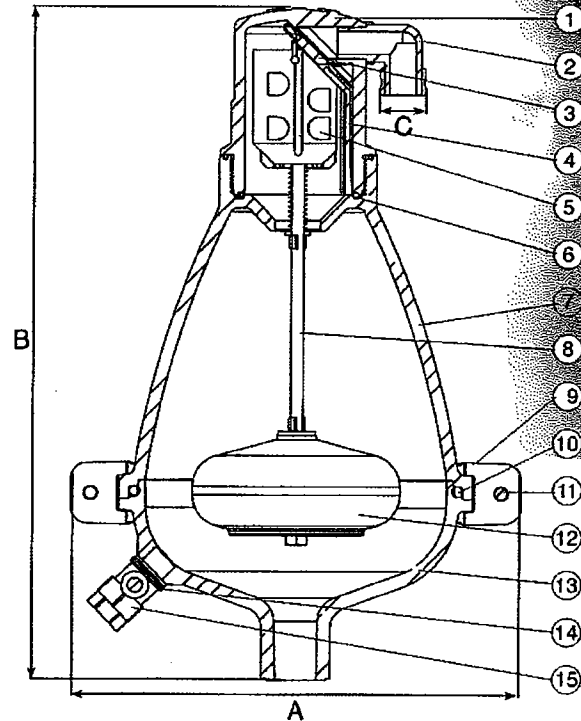


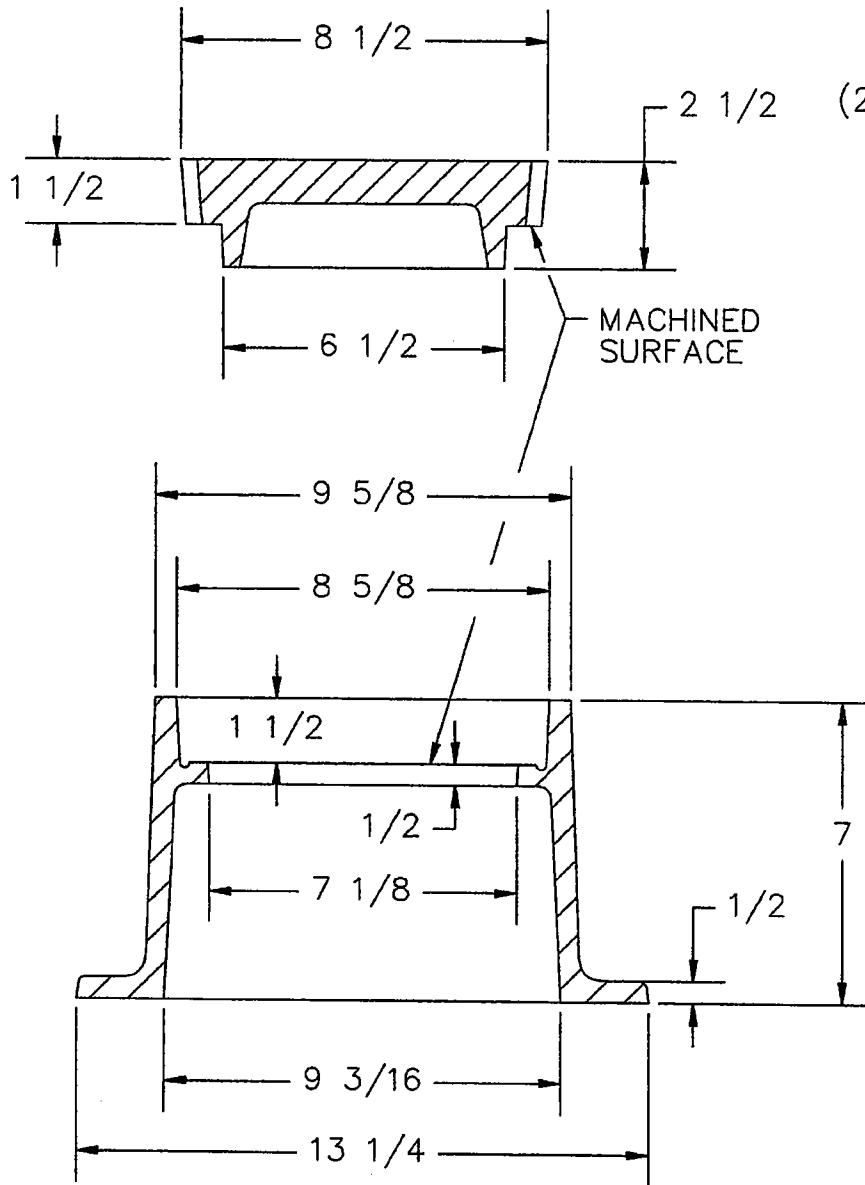
DIMENSIONS AND WEIGHTS

Model	Dimensions mm			Weight Kg.	Orifice Area mm²	
	A	B	Internal C external		Auto.	Kln.
1" 2"	216	324	3/8" BSP 17.8	1.78	100	12

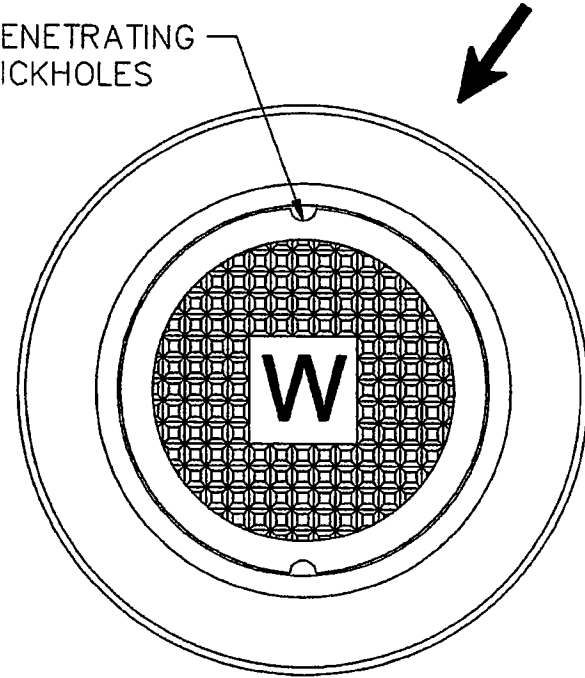
PARTS LIST AND SPECIFICATION


No.	Part	Material
1.	Body D-040 1"	Reinforced Nylon
2.	Discharge Outlet	Polypropylene
3.	Rolling Seal	E.P.D.M.
4.	Clamping Stem	Reinforced Nylon
5.	Float	Foamed Polypropylene
6.	O-Ring	BUNA-N
7.	Body	Reinforced Nylon
8.	Float Stem	Stainless Steel SAE 316
9.	Clamp	Reinforced Nylon
10.	O-Ring	BUNA-N
11.	Bolt & Nut	Stainless Steel SAE 316
12.	Float	Foamed Polypropylene
13.	Base	Reinforced Nylon
14.	Seal	Reinforced Nylon
15.	Ball Valve	Stainless Steel





(2)- PENETRATING PICKHOLES



 U.S. FOUNDRY & MFG. CORP. MEDLEY, FLORIDA			
DESCRIPTION			
USF 7610 RING & FC COVER			
MATERIAL: ASTM-A48		GRAY IRON CLASS: 35B	
RING WEIGHT: 40		COVER WEIGHT: 25	
UNLESS OTHERWISE NOTED WEIGHT IS IN POUNDS AND APPROXIMATED			
DWG. BY:	SCALE:	ITEM No.:	DWG. DATE:
ULS	1/4"=1'		07-06-05
REV. BY:	CRG. BY:	REV. No.:	REV.:

REV: 1 DATE: 02-26-07 DESCRIPTION: ITEM No. FOR SET TO BE ADDED REV BY: NR

GENERAL INFORMATION

SPECIFICATIONS CAST IRON CONSTRUCTION CASTINGS

- MATERIAL:** Casting materials conform to specification ASTM-A48 Class 35B, Gray Cast Iron, unless otherwise specified.
- APPEARANCE:** Castings are free from blowholes, shrinkage or other imperfections not true to pattern.
- MANUFACTURING:** Castings are manufactured with critical dimensions conforming to those specified on respective data sheets and drawings. Critical dimensions are defined as those that affect the load bearing capacity, interchangeability and drainage opening where applicable. Noncritical dimensions may change slightly to facilitate proper molding and casting technique. We reserve the right to make modifications to these products as required without notification.
- TOLERANCES:** Casting Tolerances, unless otherwise specified, are plus or minus 1/16 inch, and an additional plus or minus 1/16 inch per foot of dimension. Notwithstanding these tolerances, all frames, covers, grates and curb hoods of the same nominal size are interchangeable.
- MACHINING:** Bearing surfaces of circular heavy and medium duty manhole rings, covers and grates are machined to insure proper fit and prevent rattling.
- WEIGHTS:** Casting weights are approximate and shall be within plus or minus 5% of catalog published weight.
- PAINT:** Castings are supplied unpainted as a standard (See U.S. Foundry's No Paint Policy on page 13).
For special paint applications, contact our customer service department.

LOAD DESIGNATIONS

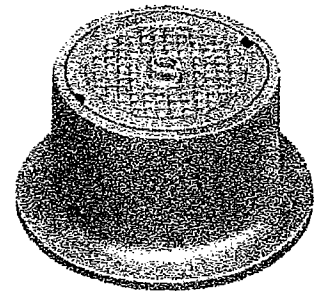
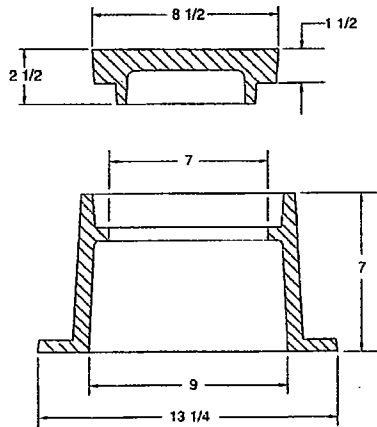
CLASSIFICATION	LOAD APPLICATIONS	PROOF LOAD TEST
HEAVY DUTY	Highway traffic loads or 16,000 lb. Wheel loads	25,000 lbs. * (Ref: Commercial Item Description A-A 60005)
MEDIUM DUTY	Driveways, parking lots, ramps and other similar applications where wheel loads do not exceed 12,000 lbs.	18,000 lbs *
LIGHT DUTY	Areas such as sidewalks, terraces and other areas which do not receive vehicular traffic.	1,000lbs *

* Proof load is applied over 9" x 9" area in center of the casting and held for one minute without failure or permanent deflection.

For special load requirements consult our sales or customer service representatives.

USF 7610 HANDHOLE RING AND FC COVER

1. Specify letter, if required.
2. Penetrating pickhole.



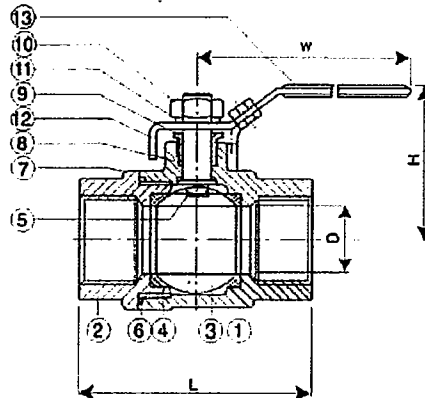
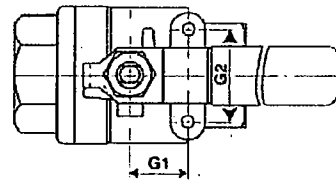
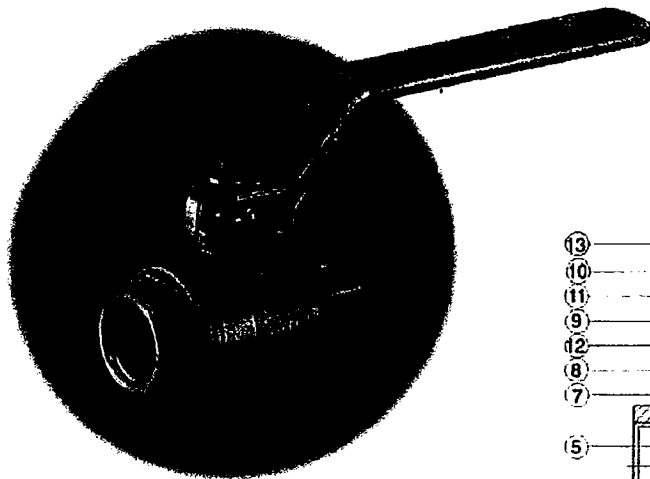
COVER TYPE	LOAD RATING	COVER WEIGHT	TOTAL WEIGHT
FC	HEAVY DUTY	25	65



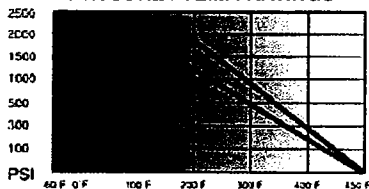
STAINLESS STEEL BALL VALVE

FULL PORT, SCREWED END 1/4"-1" 2000WOG
 1-1/4"-2" 1500WOG
 2 1/2"-3" 1000WOG

MODEL: #522



PRESSURE / TEMP. RATINGS



STANDARD
 DESIGN: ANSI B16.34
 TESTING: API 598

MATERIAL LIST

1	BODY	ASTM-CF8M-A351
2	BODY CAP	ASTM-CF8M-A351
3	BALL	ASTM-CF8M-A351
4	SEAT	REINFORCED PTFE WITH 10% GLASS FIBER
5	STEM	AISI 316
6	BODY SEAT	PTFE
7	THRUST WASHER	PTFE
8	PACKING	PTFE
9	GLAND NUT	AISI 304
10	STEM NUT	AISI 304
11	STEM WASHER	AISI 304
12	HANDLE	AISI 304
13	COVER	PLASTIC

DIMENSIONS

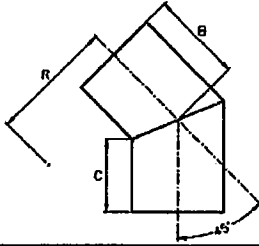
(inch)

1/4"	0.45	1.09	2.17	2.09	4.04	0.50	1.12	6	36	0.57
3/8"	0.49	1.09	2.17	2.09	4.04	0.50	1.12	7	36	0.57
1/2"	0.59	1.30	2.56	2.28	5.12	0.50	1.12	10	43	0.90
3/4"	0.79	1.47	2.95	2.44	5.12	0.88	1.38	25	65	1.19
1"	0.98	1.71	3.50	2.95	6.02	0.88	1.38	35	101	2.01
1-1/4"	1.26	2.01	3.98	3.07	6.02	1.00	1.50	46	158	2.98
1-1/2"	1.50	2.17	4.29	3.27	7.17	1.00	1.50	80	187	4.32
2"	1.97	2.44	4.88	3.58	7.17	1.00	1.50	110	230	6.70
2-1/2"	2.56	3.25	6.30	5.28	9.84	N/A	2.28	310	430	14.77
3"	3.15	3.84	8.77	5.83	9.84	N/A	2.78	360	1380	19.93



INDUSTRIAL PIPE FITTINGS, LLC

HOUSTON, TX / CORSICANA, TX / MISSOULA, MT




Fabricated IPS 2-Segment 45 Ell

ALL M&I ELBOWS 10" - 24" NOW PRODUCED TO

AWWA C906

PE 4710 AND PE 100 ON REQUEST

Nominal Size Actual OD	Pressure Class (psi)	Feed Stock	Dimensions R x C x B (in)	Std. Item	Weight per Item (lbs.)
 24" 24.000"	80	DR 17	24 x 8 x 13	N	94
	100	DR 11			141
	128	DR 11			141
	160	DR 9			168
	200	DR 7			201
28"† 28.000"	80	DR 17	38 1/8 x 14 x 19 3/4	N	198
	100	DR 11			295
	128	DR 11			295
	160	DR 9			353
30"† 30.000"	80	DR 17	38 3/8 x 14 x 20 1/4	N	228
	100	DR 11			339
	128	DR 11			339
	160	DR 9			405
32"† 32.000"	80	DR 17	38 3/8 x 14 x 20 5/8	N	268
	100	DR 11			396
	128	DR 11			396
34"† 34.000"	80	DR 17	38 3/8 x 14 x 21	N	307
	100	DR 11			458
	128	DR 11			458
36"† 36.000"	80	DR 17	38 1/2 x 14 x 21 1/2	N	353
	100	DR 11			525
	128	DR 11			525
42"† 42.000"	65	DR 21	50 3/8 x 21 x 29 3/4	N	513
	80	DR 17			659
48" 48.000"	65	DR 21	50 3/8 x 21 x 31	N	742
	80	DR 17			905
54" 54.000"	50	DR 28	50 3/4 x 21 x 32 1/8	N	775
	65	DR 21			969
63" 63.000"	50	DR 26	56 3/4 x 21 x 34	N	1145
	65	DR 21			1404

† - Fittings 28" - 42" are produced to dimensional requirements of F-714 and can be manufactured to meet AWWA standards for a premium. - Dimensions and weights are approximate and subject to change.

July 2007 Supersedes all previous price sheets

Industrial Pipe Fittings, LLC

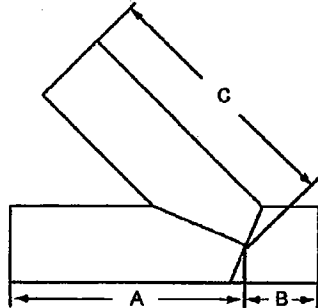
6020 Osborn / Houston, TX 77033 / Ph. 800-241-4175 / Fax 713-645-1756

Web: www.hdp fittings.com

INDEPENDENT PIPE PRODUCTS, INC.



"BETTER BY DESIGN"®



IPS Fabricated 45° Lateral Wye Unreinforced

(Dimensions in Inches)

IPS Size	A	B	C	SDR	WPR (psi)	Weight (lbs)
2"	18.0	6.0	14.0	7	200	3
				9	160	2
				11	128	2
3"	18.0	7.0	14.0	7	200	7
				9	160	6
				11	128	5
4"	22.0	7.0	22.0	7	200	16
				9	160	14
				11	128	12
6"	28.0	7.0	28.0	7	200	42
				9	160	33
				11	128	30
8"	30.0	8.0	30.0	7	200	74
				9	160	59
				11	128	51
10"	31.0	8.0	31.0	7	200	119
				9	160	98
				11	128	79
				17	80	55
12"	33.0	11.0	33.0	7	200	181
				9	160	148
				11	128	124
				17	80	84
14"	42.0	11.0	42.0	7	200	271
				9	160	217
				11	128	181
				17	80	123
16"	44.0	13.0	44.0	7	200	383
				9	160	311
				11	128	258
				17	80	174
18"	57.0	14.0	57.0	7	200	605
				9	160	493
				11	128	415
				17	80	280

• IPS 45° Lateral Wyes Continued Next Page •

Other sizes and DR's not listed are available - Call For Quick Quote

Sizes 24" and smaller meet AWWA C906 fitting requirements, sizes 26" and larger are quoted per fitting.

WPR represents the long term hydrostatic pressure capacity of the fabricated wye with a 1.5:1 safety factor. To achieve a 2:1 safety factor like that of the straight pipe the WPR will be reduced.

1-800-499-6927

Page 15 - 2

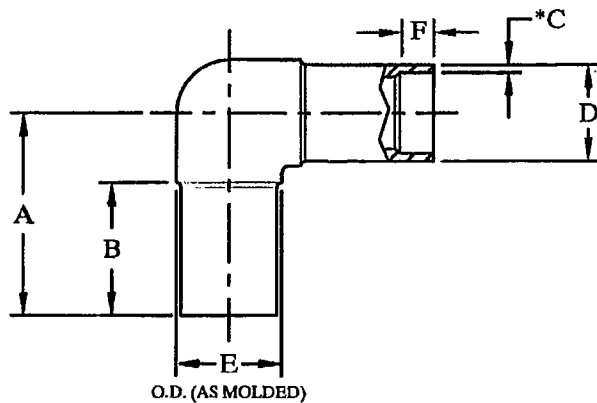
www.indpipe.net

90° ELBOW

BUTT FUSION FITTINGS

(BUTT) IPS & CTS

FOR REFERENCE ONLY



NOMINAL SIZE	DIMENSION A	DIMENSION B	DIMENSION C	DIAMETER D	DIAMETER E (AS MOLDED)	DIMENSION F
3/4" IPS (SDR 9.3)	4.00	2.63	.113 +.060	1.050 ±.008	1.19	N/A
	101.6 mm	66.8 mm	2.87 mm	26.67 mm	30.2 mm	
1" CTS (.101 WALL)	3.69	2.25	.101 MIN.	1.125 ±.013	1.27	N/A
	93.7 mm	57.2 mm	2.57 mm	28.58 mm	32.3 mm	
1" IPS (SDR 9.3)	4.00	2.63	.141 +.028	1.315 ±.010	1.47	N/A
	101.6 mm	66.8 mm	3.58 mm	33.40 mm	37.3 mm	
1 1/4" IPS (SDR 9.3)	4.00	2.63	.178 +.035	1.660 ±.010	1.84	N/A
	101.6 mm	66.8 mm	4.52 mm	42.16 mm	46.7 mm	
1 1/2" IPS (SDR 9.3)	4.00	2.63	.204 +.041	1.900 ±.010	2.09	N/A
	101.6 mm	66.8 mm	5.18 mm	48.26 mm	53.1 mm	
2" IPS (SDR 9.3)	4.50	2.81	.255 +.051	2.375 ±.010	2.63	1.00
	114.3 mm	71.4 mm	6.48 mm	60.33 mm	66.8 mm	25.4 mm
2" IPS (SDR 11)	4.70	2.54	.216 +.043	2.375 ±.010	2.66	NA
	119.3 mm	64.6 mm	5.49 mm	60.33 mm	67.6 mm	
3" IPS (SDR 9.3)	5.13	3.00	.377 +.075	3.500 ±.012	3.88	1.00
	130.3 mm	76.2 mm	9.58 mm	88.90 mm	98.6 mm	25.4 mm
3" IPS (SDR 11)	5.13	3.00	.318 +.064	3.500 ±.012	3.88	1.00
	130.3 mm	76.2 mm	8.08 mm	88.90 mm	98.6 mm	25.4 mm
4" IPS (SDR 9.3)	5.75	3.00	.484 +.097	4.500 ±.015	4.75	1.00
	146.1 mm	76.2 mm	12.29 mm	114.30 mm	120.7 mm	25.4 mm
4" IPS (SDR 11)	5.75	3.00	.409 +.081	4.500 ±.015	4.75	1.00
	146.1 mm	76.2 mm	10.39 mm	114.30 mm	120.7 mm	25.4 mm
6" IPS (SDR 11)	9.00	4.38	.603 +.121	6.625 ±.018	6.81	1.40
	228.6 mm	111.3 mm	15.32 mm	168.28 mm	173.0 mm	35.6 mm
8" IPS (SDR 9)	12.00	6.00	.958 +.115	8.625 ±.025	9.00	1.37
	304.8 mm	152.4 mm	24.33 mm	219.08 mm	228.6 mm	34.8 mm
8" IPS (SDR 11)	12.00	6.00	.785 +.157	8.625 ±.025	9.00	1.37
	304.8 mm	152.4 mm	19.94 mm	219.08 mm	228.6 mm	34.8 mm
10" IPS (SDR 11)	13.25	6.00	.978 +.186	10.750 ±.027	11.25	2.98
	336.6 mm	152.4 mm	24.84 mm	273.05 mm	285.8 mm	75.7 mm
12" IPS (SDR 11)	15.88	7.50	1.160 +.232	12.750 ±.036	13.35	3.73
	403.4 mm	190.5 mm	29.46 mm	323.85 mm	339.1 mm	94.7 mm

Item shown are standard sizes and wall thicknesses. Fitting sizes other than those shown can be furnished upon request
 BUTT90EL.M5 See SDR Chart for other wall thicknesses.

11/9/01

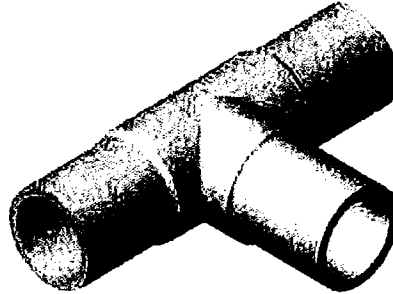
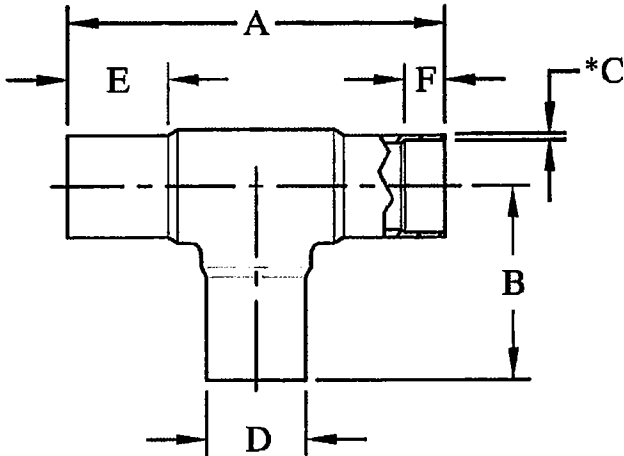
Tees

BUTT FUSION FITTINGS

(BUTT) IPS & CTS

FOR REFERENCE ONLY

	Central Plastics Company	Phone: 800-654-3872
	1901 W. Independence St	405-273-6302
	Shawnee, OK USA 74801	800-733-5993
	www.centralplastics.com	405-273-5993



NOMINAL SIZE	DIMENSION A	DIMENSION B	DIMENSION C	DIAMETER D	DIMENSION E	DIMENSION F
1/2" CTS (.090)	5.70	2.85	.090 MIN.	.625 +.010	1.75	N/A
	144.8 mm	72.4 mm	2.29 mm	15.88 mm	44.3 mm	
3/4" IPS (SDR 11)	6.12	3.06	.095 +.019	1.050 +.010	1.75	N/A
	155.4 mm	77.7 mm	2.41 mm	26.67 mm	44.3 mm	
1" CTS (.090)	7.25	3.62	.090 MIN.	1.125 +.013	2.25	N/A
	184.2 mm	91.9 mm	2.29 mm	28.58 mm	57.2 mm	
1" IPS (SDR 11)	6.38	3.19	.120 +.024	1.315 +.010	1.75	N/A
	162.1 mm	81.0 mm	3.05 mm	33.40 mm	44.3 mm	
1 1/4" IPS (SDR 11)	6.76	3.38	.151 +.030	1.660 +.010	1.88	N/A
	171.7 mm	85.9 mm	3.84 mm	42.16 mm	47.8 mm	
1 1/2" IPS (SDR 11)	8.50	4.25	.173 +.035	1.900 +.010	2.30	N/A
	215.9 mm	108.0 mm	4.39 mm	48.26 mm	58.4 mm	
2" IPS (SDR 11)	9.28	4.68	.216 +.043	2.375 +.010	2.54	NA
	235.7 mm	118.8 mm	5.49 mm	60.33 mm	64.6 mm	
3" IPS (SDR 11)	10.26	5.13	.318 +.048	3.500 +.012	3.00	1.00
	260.6 mm	130.3 mm	8.08 mm	88.90 mm	76.2 mm	25.4 mm
4" IPS (SDR 11)	11.20	5.60	.409 +.061	4.500 +.015	3.00	1.00
	284.5 mm	142.2 mm	10.39 mm	114.30 mm	76.2 mm	25.4 mm
6" IPS (SDR 11)	18.00	9.00	.603 +.121	6.625 +.018	4.38	1.40
	457.2 mm	228.6 mm	15.32 mm	168.28 mm	111.3 mm	35.6 mm
8" IPS (SDR 11)	24.00	12.00	.785 +.157	8.625 +.025	6.00	3.00
	609.6 mm	304.8 mm	19.94 mm	219.08 mm	152.4 mm	76.2 mm
10" IPS (SDR 11)	26.50	13.25	.978 +.195	10.750 +.027	6.00	3.00
	673.1 mm	336.6 mm	24.84 mm	273.05 mm	152.4 mm	76.2 mm
12" IPS (SDR 11)	31.75	15.88	1.160 +.232	12.750 +.036	7.50	3.75
	806.5 mm	403.4 mm	29.46 mm	323.85 mm	190.5 mm	95.3 mm



Items shown are standard sizes and wall thicknesses. Fitting sizes other than those shown can be furnished upon request
 *See SDR Chart for other wall thicknesses

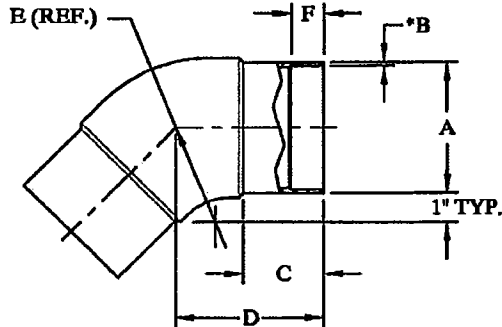
45° ELBOW

(BUTT)

BUTT FUSION FITTINGS

FOR REFERENCE ONLY

	Central Plastics Company	Phone: 800-654-3872
	1901 W. Independence St	405-273-8302
	Shawnee, OK USA 74801	Fax: 800-733-5993
	www.centralplastics.com	405-273-5993



NOMINAL SIZE	DIAMETER A	DIMENSION B	DIMENSION C	DIMENSION D	DIMENSION E (REF.)	DIMENSION F
3" IPS (SDR 9.3)	3.500 ±.012	.377 +.075	3.13	5.00	2.976	.92
	88.90 mm	9.58 mm	79.5 mm	127.0 mm	75.59 mm	23.4 mm
3" IPS (SDR 11)	3.500 ±.012	.318 +.064	3.13	5.00	2.976	.92
	88.90 mm	8.08 mm	79.5 mm	127.0 mm	75.59 mm	23.4 mm
4" IPS (SDR 9.3)	4.500 ±.012	.484 +.097	3.00	5.00	3.518	.92
	114.30 mm	12.29 mm	76.2 mm	127.0 mm	89.36 mm	23.4 mm
4" IPS (SDR 11)	4.500 ±.012	.409 +.081	3.00	5.00	3.518	.92
	114.30 mm	10.39 mm	76.2 mm	127.0 mm	89.36 mm	23.4 mm
6" IPS (SDR 11)	6.625 ±.012	.603 +.121	4.38	7.00	4.668	1.37
	168.28 mm	15.32 mm	111.3 mm	177.8 mm	118.57 mm	34.8 mm
8" IPS (SDR 11)	8.625 ±.012	.785 +.157	6.00	11.00	5.570	1.37
	219.08 mm	19.94 mm	152.4 mm	279.4 mm	141.48 mm	34.8 mm
10" IPS (SDR 11)	10.750 ±.012	.978 +.186	6.00	13.25	6.900	2.98
	273.05 mm	24.84 mm	152.4 mm	336.6 mm	175.26 mm	75.7 mm
12" IPS (SDR 11)	12.750 ±.012	1.160 +.232	7.50	15.75	7.982	3.73
	323.85 mm	29.46 mm	190.5 mm	400.1 mm	202.74 mm	94.7 mm

Item shown are standard sizes and wall thicknesses. Fitting sizes other than those shown can be furnished upon request

*See SDR Chart for other wall thicknesses.

REDUCERS

(BUTT) IPS

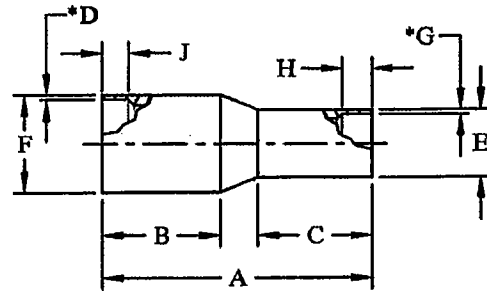
BUTT FUSION FITTINGS

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1901 W. Independence St
Shawnee, OK USA 74801
www.centralplastics.com

Phone: 800-654-3872
405-273-6302
Fax: 800-733-5993
405-273-5993



NOMINAL SIZE	DIMENSION A	DIMENSION B	DIMENSION C	DIMENSION D	DIAMETER E	DIAMETER F	DIMENSION G	DIMENSION H	DIMENSION J
1" x 1/2" (SDR 9.3)	4.00	1.50	1.25	.142 +.028	.840 ±.008	1.315 ±.010	.090 +.018	N/A	N/A
	101.6 mm	38.1 mm	31.8 mm	3.61 mm	21.34 mm	33.40 mm	2.29 mm		
1" x 3/4" (SDR 9.3)	4.50	1.50	1.85	.142 +.028	1.050 ±.008	1.315 ±.010	.113 +.023	N/A	N/A
	114.3 mm	38.1 mm	47.0 mm	3.61 mm	26.67 mm	33.40 mm	2.87 mm		
1 1/4" x 1" (SDR 11)	4.25	1.85	1.92	.151 +.030	1.315 ±.010	1.660 ±.010	.119 +.024	N/A	N/A
	108.0 mm	47.2 mm	48.8 mm	3.84 mm	33.40 mm	42.16 mm	3.02 mm		
1 1/2" x 3/4" (SDR 9.3)	5.69	2.50	2.50	.204 +.041	1.050 ±.008	1.900 ±.010	.113 +.022	N/A	N/A
	144.5 mm	63.5 mm	63.5 mm	5.18 mm	26.67 mm	48.26 mm	2.87 mm		
1 1/2" x 1" (SDR 11)	5.75	2.50	2.28	.173 +.035	1.315 ±.010	1.900 ±.010	.119 +.024	N/A	N/A
	146.1 mm	63.5 mm	57.9 mm	4.39 mm	33.40 mm	48.26 mm	3.02 mm		
2" x 1" (SDR 11)	6.31	2.49	2.88	.216 +.043	1.315 ±.010	2.375 ±.010	.119 +.024	N/A	N/A
	160.3 mm	63.2 mm	73.2 mm	5.49 mm	33.40 mm	60.33 mm	3.02 mm		
2" x 1 1/4" (SDR 11)	6.44	3.25	2.56	.216 +.043	1.660 ±.010	2.375 ±.010	.151 +.030	N/A	N/A
	163.6 mm	82.6 mm	65.0 mm	5.49 mm	42.16 mm	60.33 mm	3.84 mm		
2" x 1 1/2" (SDR 11)	6.00	2.50	2.72	.216 +.043	1.900 ±.010	2.375 ±.010	.173 +.035	N/A	N/A
	152.4 mm	63.5 mm	69.1 mm	5.49 mm	48.26 mm	60.33 mm	4.39 mm		
3" x 2" (SDR 11)	6.65	3.22	2.50	.318 +.064	2.375 ±.010	3.500 ±.012	.216 +.043	1.25	1.25
	168.9 mm	81.8 mm	63.5 mm	8.08 mm	60.33 mm	88.90 mm	5.49 mm	31.8 mm	31.8 mm
4" x 2" (SDR 9.3)	11.87	3.00	3.00	.484 +.097	2.375 ±.010	4.500 ±.015	.253 +.051	0.92	0.92
	301.5 mm	76.2 mm	76.2 mm	12.29 mm	60.33 mm	114.30 mm	6.43 mm	23.4 mm	23.4 mm
4" x 2" (SDR 11)	7.16	2.75	2.75	.409 +.082	2.375 ±.010	4.500 ±.015	.216 +.043	1.25	1.25
	181.9 mm	69.9 mm	69.9 mm	10.39 mm	60.33 mm	114.30 mm	5.49 mm	31.8 mm	31.8 mm
4" x 3" (SDR 9.3)	8.62	3.13	3.13	.484 +.097	3.500 ±.012	4.500 ±.015	.377 +.075	0.92	0.92
	218.9 mm	79.5 mm	79.5 mm	12.29 mm	88.90 mm	114.30 mm	9.58 mm	23.4 mm	23.4 mm
4" x 3" (SDR 11)	6.38	3.00	2.50	.409 +.082	3.500 ±.012	4.500 ±.015	.318 +.064	1.25	1.25
	161.9 mm	76.2 mm	63.5 mm	10.39 mm	88.90 mm	114.30 mm	8.08 mm	31.8 mm	31.8 mm
6" x 4" (SDR 11)	9.13	4.22	3.75	.603 +.121	4.500 ±.015	6.625 ±.018	.409 +.082	1.37	1.37
	231.9 mm	107.2 mm	95.3 mm	15.32 mm	114.30 mm	168.28 mm	10.39 mm	34.8 mm	34.8 mm
8" x 6" (SDR 11)	9.38	4.95	4.69	.785 +.157	6.625 ±.018	8.625 ±.025	.603 +.121	2.00	2.75
	238.3 mm	125.7 mm	119.1 mm	19.94 mm	168.28 mm	219.08 mm	15.32 mm	50.8 mm	69.9 mm
10" x 8" (SDR 11)	16.00	6.00	5.95	.978 +.196	8.625 ±.025	10.750 ±.048	.785 +.157	3.00	3.00
	406.4 mm	152.4 mm	151.1 mm	24.84 mm	219.08 mm	273.05 mm	19.94 mm	76.2 mm	76.2 mm
12" x 10" (SDR 11)	16.00	6.00	6.00	1.159 +.232	10.750 ±.027	12.750 ±.036	.978 +.196	2.98	2.98
	406.4 mm	152.4 mm	152.4 mm	29.44 mm	273.05 mm	323.85 mm	24.84 mm	75.7 mm	75.7 mm



Items shown are standard sizes and wall thicknesses. Fitting sizes other than those shown can be furnished upon request.
*See SDR Chart for other wall thicknesses. VALUES SUBJECT TO CHANGE WITHOUT NOTIFICATION

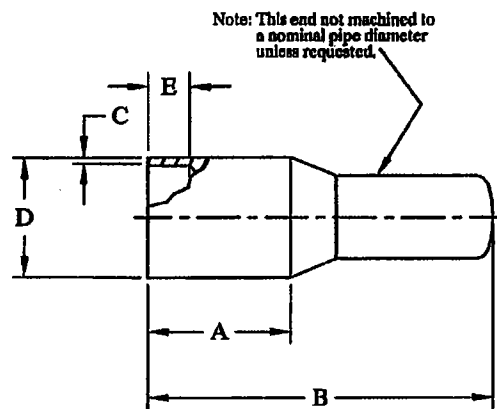
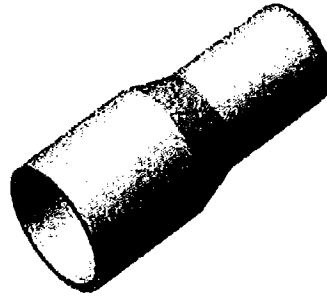
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1/17/2003

END CAPS

BUTT FUSION FITTINGS

(BUTT)

FOR REFERENCE ONLY



NOMINAL SIZE	DIMENSION A	DIMENSION B	DIMENSION C	DIAMETER D	DIAMETER E
2" IPS (SDR 11)	3.13	7.00	.216 +.043	2.375 ±.010	1.00 MIN.
	79.5 mm	177.8 mm	5.49 mm	60.33 mm	25.4 mm
3" IPS (SDR 11)	2.88	7.43	.318 +.064	3.500 ±.012	1.00 MIN.
	73.2 mm	188.7 mm	8.08 mm	88.90 mm	25.4 mm
4" IPS (SDR 11)	3.00	7.75	.409 +.082	4.500 ±.015	1.00 MIN.
	76.2 mm	196.9 mm	10.39 mm	114.30 mm	25.4 mm
6" IPS (SDR 11)	4.22	10.25	.603 +.121	6.625 ±.018	1.37 MIN.
	107.2 mm	260.4 mm	15.32 mm	168.28 mm	34.8 mm
8" IPS (SDR 11)	4.00	11.13	.785 +.157	8.625 ±.025	3.00 MIN.
	101.6 mm	282.7 mm	19.94 mm	219.08 mm	76.2 mm

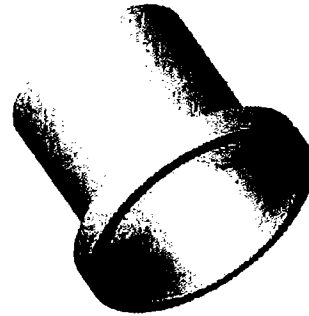
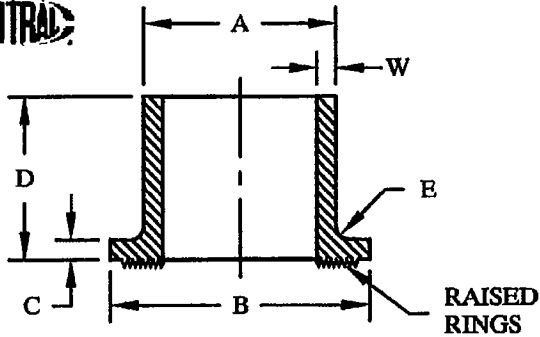


ns shown are standard sizes and wall thicknesses. Fitting sizes other than those shown can be furnished upon request.

Flange Adapters/Stub Ends (BUTT) IPS SDR17

BUTT FUSION FITTINGS

FOR REFERENCE ONLY



NOMINAL SIZE	A O.D.	B DIAMETER	C DIMENSION	W DIMENSION		D DIMENSION	E RADIUS
				MIN.	MAX.		
2" IPS	2.375 ±.010	3.94	.39	.140	.168	6.00	.25
	60.33 mm	100.0 mm	9.9 mm	3.56 mm (MIN.)		152.4 mm	6.4 mm
3" IPS	3.500 ±.012	5.00	.63	.206	.247	6.00	.25
	88.90 mm	127.0 mm	15.9 mm	5.23 mm (MIN.)		152.4 mm	6.4 mm
4" IPS	4.500 ±.015	6.00	.54	.265	.318	6.00	.38
	114.30 mm	152.4 mm	13.7 mm	6.73 mm (MIN.)		152.4 mm	9.5 mm
6" IPS	6.625 ±.016	8.50	0.78	.390	.468	7.75	.38
	168.28 mm	215.9 mm	19.8 mm	9.91 mm (MIN.)		196.9 mm	9.5 mm
8" IPS	8.625 ±.025	10.63	1.00	.507	.609	10.63	.38
	219.08 mm	269.9 mm	25.4 mm	12.88 mm (MIN.)		270.0 mm	9.5 mm
10" IPS	10.750 ±.027	12.75	1.28	.632	.759	12.00	.38
	273.05 mm	323.9 mm	32.6 mm	16.05 mm (MIN.)		304.8 mm	9.5 mm
12 IPS	12.750 ±.036	15.00	1.54	.750	.900	12.00	.38
	323.85 mm	381.0 mm	39.2 mm	19.05 mm (MIN.)		304.8 mm	9.5 mm
14" IPS	14.000 ±.063	17.50	1.50	.824	.988	12.00	.50
	355.60 mm	444.5 mm	38.1 mm	20.93 mm (MIN.)		304.8 mm	12.7 mm
16" IPS	16.000 ±.072	20.00	1.75	.941	1.129	12.00	.50
	406.40 mm	508.0 mm	44.5 mm	23.90 mm (MIN.)		304.8 mm	12.7 mm
18" IPS	18.000 ±.081	21.38	1.88	1.059	1.271	12.00	.50
	457.20 mm	542.9 mm	47.6 mm	26.90 mm (MIN.)		304.8 mm	12.7 mm
20" IPS	20.000 ±.090	23.47	2.27	1.176	1.412	12.00	.50
	508.00 mm	596.1 mm	57.7 mm	29.87 mm (MIN.)		304.8 mm	12.7 mm
21.5" IPS	21.500 ±.097	25.59	2.44	1.265	1.518	12.00	.50
	546.10 mm	650.0 mm	62.0 mm	32.13 mm (MIN.)		304.8 mm	12.7 mm
22" IPS	22.000 ±.099	25.59	2.50	1.294	1.553	12.00	.50
	558.80 mm	650.0 mm	63.5 mm	32.87 mm (MIN.)		304.8 mm	12.7 mm
24" IPS	24.000 ±.108	27.85	2.82	1.412	1.694	12.00	.50
	609.60 mm	707.4 mm	71.7 mm	35.86 mm (MIN.)		304.8 mm	12.7 mm

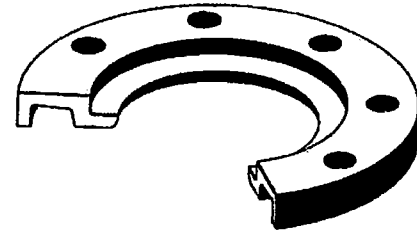
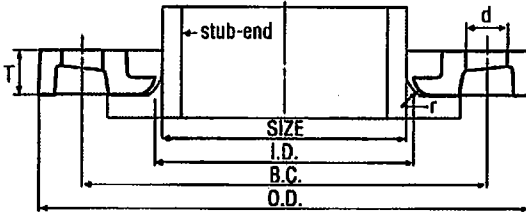
Notes: (1) Dimension W (wall thickness) is determined by the SDR number.

*Refer to SDR table.

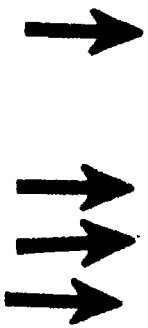
(2) Dimension C (flange thickness) to meet or exceed Dimension W (wall thickness).

(3) Other sizes can be furnished upon request.

Stainless Steel Flange/Backup Ring



- **Description** Utilizes the patented IPP Deltaflex® flange cross section.
- **Utilization** HDPE, stainless steel, and carbon steel stub-ends.
- **Materials** Cast in stainless steel ASTM A351CF8M (316), CF8 (304), tensile 70,000 psi; yield 30,000 psi; 30% elongation.
- **Dimensions** Bolt circle is ANSI/B16.5 class 150. Mates with ANSI B16.5, B16.47, AWWA C207.
- **Finish** Net shape to fully machined.



Pipe Diameter	IPP Product Code*	Outside Dia. O.D.	Flange Thickness T	Inside Dia. I.D.	Bolt Count N	Dia. Bolt Hole B.D.	Bolt Circle B.C.	Radius r	Weight lbs/pc	Operating ¹ Pressure
1"	SS316-SDR7-01	4.25	0.56	1.38	4	0.63	3.13	0.13	2.0	267
1 1/2"	SS316-SDR7-0150	5.00	0.69	1.97	4	0.63	3.88	0.22	2.0	267
2"	SS316-SDR7-02	6.00	0.75	2.46	4	0.75	4.75	0.27	3.0	267
2"	SS316-SDR11-02	6.00	0.40	2.46	4	0.75	4.75	0.27	2.0	160
3"	SS316-SDR7-03	7.50	0.94	3.60	4	0.75	6.00	0.33	5.0	267
3"	SS316-SDR13.5-03	7.50	0.40	3.60	4	0.75	6.00	0.33	3.0	128
4"	SS316-SDR7-04	9.00	0.94	4.60	8	0.75	7.50	0.39	6.0	267
4"	SS316-SDR13.5-04	9.00	0.50	4.60	8	0.75	7.50	0.39	5.0	128
6"	SS316-SDR7-06	11.00	1.00	6.75	8	0.88	9.50	0.44	9.0	267
6"	SS316-SDR13.5-06	11.00	0.60	6.75	8	0.88	9.50	0.44	6.0	128
8"	SS316-SDR7-08	13.50	1.12	8.75	8	0.88	11.75	0.44	12.0	267
8"	SS316-SDR13.5-08	13.50	0.70	8.75	8	0.88	11.75	0.44	9.0	128
10"	SS316-SDR7-10	16.00	1.27	10.92	12	1.00	14.25	0.50	20.0	267
10"	SS316-SDR7.3-10	16.00	1.19	10.92	12	1.00	14.25	0.42	18.0	250
10"	SS316-SDR13.5-10	16.00	0.90	10.92	12	1.00	14.25	0.42	12.0	128
12"	SS316-SDR7-12	19.00	1.77	12.92	12	1.00	17.00	0.50	37.0	267
12"	SS316-SDR11-12	19.00	1.25	12.92	12	1.00	17.00	0.42	24.0	160
12"	SS316-SDR13.5-12	19.00	1.05	12.92	12	1.00	17.00	0.42	21.0	128
14"	SS316-SDR7-14	21.00	1.78	14.18	12	1.13	18.75	0.41	50.0	267
14"	SS316-SDR9.3-14	21.00	1.38	14.18	12	1.13	18.75	0.50	40.0	183
14"	SS316-SDR17-14	21.00	1.13	14.18	12	1.13	18.75	0.41	25.0	100
16"	SS316-SDR7-16	23.50	2.17	16.19	16	1.13	21.25	0.40	67.0	267
16"	SS316-SDR13.5-16	23.50	1.44	16.19	16	1.13	21.25	0.50	52.0	160
16"	SS316-SDR17-16	23.50	1.25	16.19	16	1.13	21.25	0.41	31.0	80
18"	SS316-SDR7-18	25.00	2.06	18.20	16	1.25	22.75	0.40	67.0	267
18"	SS316-SDR11-18	25.00	1.56	18.20	16	1.25	22.75	0.50	57.0	160
18"	SS316-SDR21-18	25.00	1.34	18.20	16	1.25	22.75	0.41	33.0	80
20"	SS316-SDR7-20	27.50	2.27	20.25	20	1.25	25.00	0.31	90.0	267
20"	SS316-SDR13.5-20	27.50	1.69	20.25	20	1.25	25.00	0.50	69.0	128
20"	SS316-SDR21-20	27.50	1.47	20.25	20	1.25	25.00	0.38	39.0	80

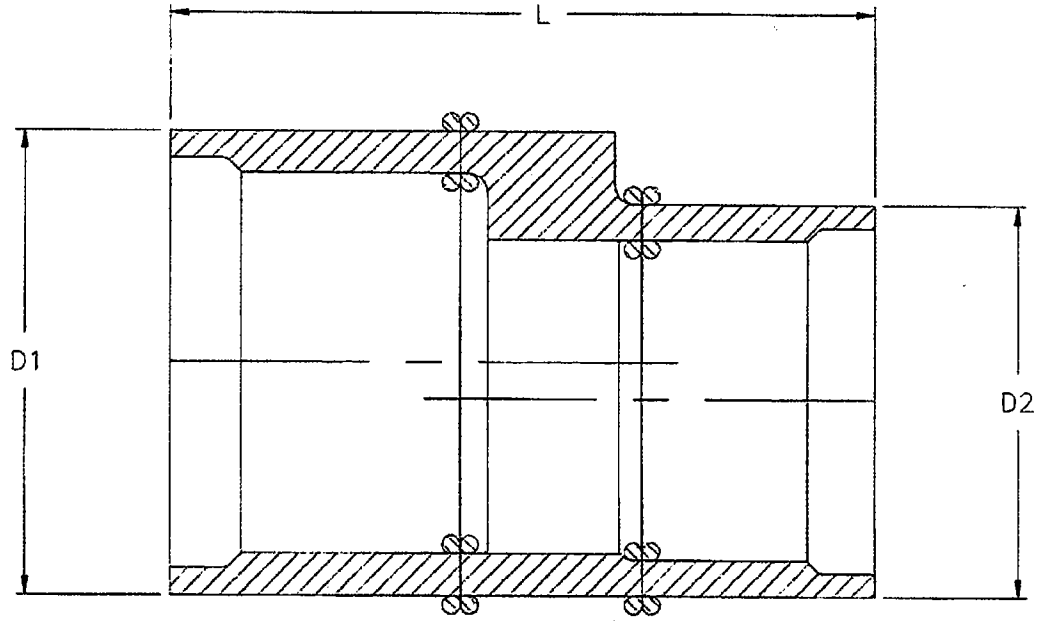
1. Operating pressure on HDPE stub-ends at a safety factor of two.

*Material code, either 316 or 304

IPP has the engineering capability to design in-house any back-up flange in the IPP Deltaflex® flange shape to any design pressure and temperature conditions at dramatic savings in cost

Continued for sizes 22" through 63" on pg. 5

DIMENSIONS (INCHES)			
IPS SIZE	L	IPS SIZE	L
3 X 2	13.0	20 X 16	22.5
4 X 3	14.0	20 X 18	22.5
6 X 3	14.5	24 X 20	22.5
6 X 4	15.5	24 X 22	22.5
8 X 4	16.0	26 X 24	39.9
8 X 6	16.5	28 X 24	39.2
10 X 6	17.5	28 X 26	54.2
10 X 8	18.0	30 X 26	53.6
12 X 8	19.5	30 X 28	52.6
12 X 10	19.5	32 X 28	53.0
14 X 10	21.0	32 X 30	52.0
14 X 12	22.5	36 X 32	52.7
16 X 12	22.5	36 X 34	52.7
16 X 14	22.5	42 X 36	51.1
18 X 14	22.5	48 X 42	51.8
18 X 16	22.5	54 X 48	51.3



1.) ALL DIMENSIONS ARE IN INCHES.

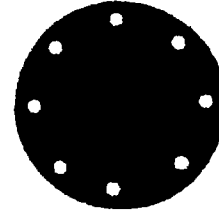
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REFERENCE DRAWINGS		DATE: 6-10-05	INDUSTRIAL PIPE FITTINGS 6020 OSBORN ST HOUSTON, TEXAS 77033 Phone: 713-645-2858 Fax: 713-645-1756
DO NOT SCALE DRAWING		SCALE: N.T.S.	
INDUSTRIAL PIPE FITTING, LLC		PROJECT NO. F EC RED 70B335	SHEET 1 OF 1



HDPE Blind Flanges IPS & DIPS

(Dimensions in Inches)



Nominal Size	Diameter Of Flange	1" Thick Weight (lbs)	2" Thick Weight (lbs)
2"	6.00	1	2
3"	7.50	2	4
4"	9.00	3	6
6"	11.00	4	8
8"	13.50	5	10
10"	16.00	7	14
12"	19.00	10	20
14"	21.00	12	24
16"	23.50	15	30
18"	25.00	18	36
20"	27.50	21	42
22"	29.50	24	48
24"	32.00	28	56

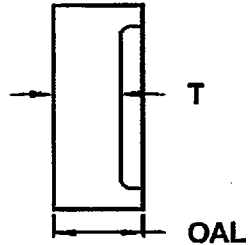
Also available manufactured from PVC material - Call For Quick Quote

These blind flanges are ordinarily used for closure or night-capping of flanged pipes. They are NOT fully pressure rated. Without the use of a metal back up blind flange, the HDPE flange may leak between bolt-holes at moderate pressures.

INDEPENDENT PIPE PRODUCTS, INC.



"BETTER BY DESIGN"®



IPS Machined End Caps 10" - 54"

(Dimensions in Inches)

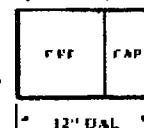
IPS Nominal Size	T (min)	OAL	DR	Weight (lbs)
10"	2.62	4.00	11-32.5	15
12"	3.00	4.00	11-32.5	17
14"	3.00	4.00	11-32.5	19
16"	3.38 2.87	5.00 4.00	11 17-32.5	32 24
18"	3.80 3.22	5.00 4.00	11 17-32.5	41 30
20"	4.20 3.00	5.00 4.00	11 - 17 21 -32.5	50 37
22"	4.65 3.70	6.00 5.00	11 17-32.5	75 45
24"	5.06 4.00	2"	11 17-32.5	89 68
26"	3.00	4.00	10 PSI Only	62
28"	3.00	4.00	10 PSI Only	72
30"	3.00	4.00	10 PSI Only	83
32"	3.00	4.00	10 PSI Only	94
34"	3.00	4.00	10 PSI Only	106
36"	3.00	4.00	10 PSI Only	115
40"	3.00	4.00	10 PSI Only	142
42"	3.00	4.00	10 PSI Only	157
48"	3.00	4.00	10 PSI Only	205
54"	3.00	4.00	10 PSI Only	253



Other sizes, pressure ratings, and DR's not listed are available - Call For Quick Quote

Sizes 24" and smaller meet AWWA C906 fitting requirements, sizes 26" and larger are quoted per fitting.

Field fusion of machined end caps may require the use of a stub end holder. Sufficient length of pipe may be fused to end cap to eliminate the use of a stub end holder. Call for a Quick Quote on this fabricated option.



1-800-499-6927

Page 5 - 2

www.indpipe.net



1101 McKinley Street
Anoka, MN 55303
Phone (763) 786-6682
Fax (763) 786-2167

Part Name: Male thread HDPE Transition Fitting
Series 710 Carbon Steel, T304*T316, Stainless Steel*

Threaded Transitions

The POLY-CAM Threaded Transition Adaptors is a multi-level mechanical transition fitting, protected under patent number 5,211,429, which is hydraulically compressed unto the polyethylene or pipe quality copolymer material.

Design

The relaxation creates a seal to prevent leakage. Under pressure, the internal pressure within the pipe increase the sealing surface area on the barb. Under zero internal pressure, the compression strain and tensional strain created by the compression of the multi-level barbs is greater then the stress created by relaxation and/or thero expansion and contraction. As the internal pressure increases the joining of the polyethylene or copolymer and the coupling increases.

Sizes range from .5" to 12" NPT. All National Pipe Threads are made to ANSI/ASME B1.20-1983 R 1992.

System Performance

The transition fitting is designed to handle the pressure rating of the HDPE pipe with a 2:1 safety factor at 73.40 degrees Fahrenheit with a minimum 50 year design life.

Quality Assurance

The transition fitting shall be manufactured by Poly-Cam, Inc. Poly-Cam, Inc. shall provide quality assurance with regards to proper installation, compatibility, performance, and acceptance. Transition joint meets or exceeds the requirements of ASTM D2513 Category 3. Upon request Poly-cam can install a stainless steel insert to meet ASTM 2513 Category 1. All Fittings meet ARRA requirements. Manufactured in the United States

Installation

HDPE pipe end: Install transition fitting so as to comply with the pipe manufacturer's recommended procedures. All field welds shall be accomplished in accordance with Plastic Pipe Institute's welding procedure for butt fusion.

Steel Fitting: The entrance of the coupling is tapered at the beginning. The Polyethylene or copolymer material is cold pressed into the coupling. This allows the material to relax into the patented multi-level barb system.

Material

The POLY-CAM Threaded Transition is manufactured of Carbon Steel (A53 or A106 grade) Type 304 or Type 316 (ASTM A249 or ASTM A269) and or ERW pipe (ASTM SA-312) and incorporated with the transition manufactured of HDPE (cell class 345454c) or pipe quality Copolymer material.(pe3408, pe3608 and pe4710). All pipe meets ASTM 3035 and ASTM 714. It complies AWWA C-901 ,C906 and NSF 61. All certification will be submitted upon request.

The **epoxy coating** (IF 194T Red Iron Oxide) is fusion bonded to the metal. It has approvals NSF 61, FDA 175.300, AWWA C116-01,C213-01, UL 262 and FM 1120/1130
The carbon steel epoxy POLY-CAM threaded transition fittings complies with AWWA and NSF 61 material requirements.

Warranty

Warranty period is one year after date of substantial completion of installation.

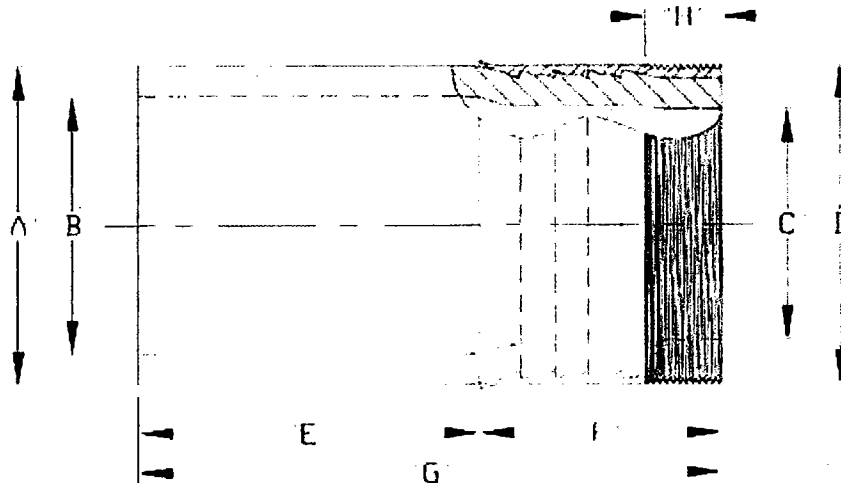
POLY-CAM®

1101 McKinley Street
 Anoka, MN 55303
 Phone (763) 786-6682
 Fax (763) 786-2167

Series 710
 Transition with
 Male NPT



Nominal Size	Exposed PE Pipe O.D. "A"	Exposed SDR11 PE Pipe I.D. "B"	Pressed SDR11 PE Pipe I.D. "C"	Coupling O.D. "D"	Exposed PE Pipe Length "E"	Coupling Length "F"	Overall Length "G"	Thread Length "H"
.5	0.840	0.667	~0.625	1.000	4.4	1.6	6	0.64
.75	1.050	0.839	~0.80	1.250	4.2	1.8	6	0.7
1	1.315	1.051	~0.84	1.315	4	2	6	0.985
1.25	1.660	1.340	~1.06	1.660	3.4	2.6	6	1.008
1.5	1.900	1.533	~1.28	1.900	3.4	2.6	6	1.025
2	2.375	1.917	~1.64	2.360 C.S. 2.375 S.S.	5	3	8	1.058
2.5	2.875	2.312	~1.99	2.875	4.5	3.5	8	1.25
3	3.500	2.826	~2.42	3.500	4	4	8	1.261
4	4.500	3.633	~3.23	4.500 C.S. 4.490 S.S.	4	4	8	1.478
5	5.563	4.490	~3.8	5.532	7	5	12	1.5
6	6.625	5.349	~4.8	6.625	7	5	12	1.56
8	8.625	6.963	~6.3	8.625	6	7	13	1.75
10	10.750	8.679	~7.9	10.750	7	8	15	1.851
12	12.750	10.293	~9.5	12.750	7	9	16	2.27



Fully pressure rated • Standard SDR sizes 7,9,11,17 • Metric sizing available
 Manufactured to D3035, D1599, F-714, ASTM D3350
 11/00 * Registered Trademark Poly-Cam, Inc. - US Patent # 5,211,429

Dixon "Andrews" / "Boss-Lock" Type A Adapters

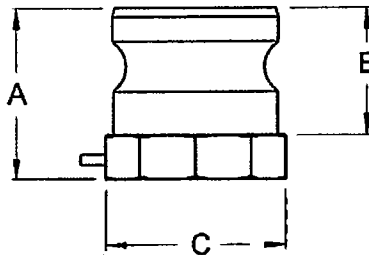


Male Adapter x Female NPT

	Aluminum	Aluminum Hard Coat	Brass	Unplated Malleable Iron	Plated Malleable Iron	Stainless Steel
Size	Part #	Part #	Part #	Part #	Part #	Part #
1/2"	50-A-AL	---	50-A-BR	---	---	50-A-SS
3/4" x 1/2"	7550-A-AL	---	7550-A-BR	---	---	7550-A-SS
3/4"	75-A-AL	---	75-A-BR	---	75-A-PM	75-A-SS
1"	100-A-AL	---	100-A-BR	---	100-A-PM	100-A-SS
1 1/4"	125-A-AL	---	125-A-BR	---	---	125-A-SS
1 1/2"	150-A-AL	150-A-ALH	150-A-BR	150-A-MI	150-A-PM	150-A-SS
2"	200-A-AL	200-A-ALH	200-A-BR	200-A-MI	200-A-PM	200-A-SS
2 1/2"	250-A-AL	---	250-A-BR	---	250-A-PM	250-A-SS
3"	300-A-AL	300-A-ALH	300-A-BR	300-A-MI	300-A-PM	300-A-SS
4"	400-A-AL	400-A-ALH	400-A-BR	400-A-MI	400-A-PM	400-A-SS
5"	500-A-AL	---	---	500-A-MI	---	500-A-SS
6"	600-A-AL	600-A-ALH	600-A-BR	---	600-A-PM	600-A-SS
8" AND*	800-A-AL	---	---	---	---	---
8" BL*	801-A-AL	---	---	---	---	---

- * "Andrews" and "Boss-Lock" Cam and Groove Couplings **DO NOT INTERCHANGE IN THE 8" SIZE.**
- The 8" "Boss-Lock" were designed to interchange with 8" Cam & Groove Couplings manufactured by P.T. Coupling.

SAFETY ALERT



ALUMINUM, BRASS and MALLEABLE IRON DIMENSIONS

Size	1/2"	3/4" x 1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8" AND	8" BL
A Overall Length	1 9/16	1 5/8	1 7/16	1 11/16	2 3/16	2 7/32	2 19/32	2 3/4	2 3/4	3 1/8	3 17/32	3 3/8	4 13/16	4 7/16
B Adapter Length	1	1	1	1 5/16	1 9/16	1 5/8	1 7/8	1 15/16	2	2 1/16	2 5/16	2 1/4	3 9/16	2 1/4
C Distance Across Flats	1	1 5/16	1 5/16	1 1/2	2	2 9/32	2 25/32	3 1/4	3 7/8	5	5 15/16	7 3/4	10 5/8	10 5/8

STAINLESS STEEL DIMENSIONS

Size	1/2"	3/4" x 1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	5"	6"	8" AND	8" BL
A Overall Length	1 9/16	1 19/32	1 1/2	1 31/32	2 3/16	2 3/16	2 19/32	2 11/16	2 29/32	3 11/64	3 5/16	3 1/4	-----	-----
B Adapter Length	1	1	1	1 5/16	1 9/16	1 5/8	1 7/8	1 15/16	2	2 1/16	2 5/16	2 1/4	-----	-----
C Distance Across Flats	1	1 5/16	1 5/16	1 1/2	2	2 1/4	2 11/16	3 1/4	3 3/4	5	6 3/4	6 3/4	-----	-----

* Distance Over Lugs.



Unaflex Industrial Products, Inc.

3901 N.E. 12TH AVENUE, POMPANO BEACH, FL 33064
800-257-2467, IN FLORIDA 954-785-3539, FAX 954-948-3583

TYPE 92 HYPALON

DURO: 60+ -5

TENSILE 1500 PSI

ELONGATION: 400%

TEMPERATURE RANGE: -20 DEGREES F. TO +225 DEGREES F.

COLOR: BLACK, PLATE FINISH

GOOD OIL RESISTANCY



Designation: A 307 - 07b

Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength¹

This standard is issued under the fixed designation A 307; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope^{*}

1.1 This specification² covers the chemical and mechanical requirements of three grades of carbon steel bolts and studs in sizes 1/4 in. through 4 in. The fasteners are designated by "Grade" denoting tensile strength and intended use, as follows:

Grade	Description
Grade A	Bolts and studs having a minimum tensile strength of 60 ksi and intended for general applications.
Grade B	Bolts and studs having a tensile strength of 60 to 100 ksi and intended for flanged joints in piping systems with cast iron flanges, and
Grade C	Replaced by Specification F 1554 Gr.38

1.1.1 The term *studs* includes stud stock, sometimes referred to as *threaded rod*.

1.2 This specification does not cover requirements for machine screws, thread cutting/forming screws, mechanical expansion anchors or similar externally threaded fasteners.

1.3 Suitable nuts are covered in Specification A 563. Unless otherwise specified, the grade and style of nut for each grade of fastener, of all surface finishes, shall be as follows:

Fastener Grade and Size	Nut Grade and Style ⁴
A 1/4 to 1 1/2 in.	A, hex
A over 1 1/2 to 4 in.	A, heavy hex
B, 1/4 to 4 in.	A, heavy hex

⁴ Nuts of other grades and styles having specified proof load stresses (Specification A 563, Table 3), greater than the specified grade and style of nut are also suitable.

1.4 The values stated in inch-pound units are to be regarded as the standard.

1.5 Supplementary Requirement S1 of an optional nature is provided, which describes additional restrictions to be applied when bolts are to be welded. It shall apply only when specified in the inquiry, order, and contract.

1.6 Terms used in this specification are defined in Terminology F 1789 unless otherwise defined herein.

2. Referenced Documents

2.1 ASTM Standards:³

- A 563 Specification for Carbons and Alloy Steel Nuts
- A 706/A 706M Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- B 695 Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- D 3951 Practice for Commercial Packaging
- F 606 Test Methods for Determining the Mechanical Properties of Externally and Internally Threaded Fasteners, Washers, Direct Tension Indicators, and Rivets
- F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection
- F 1554 Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- F 1789 Terminology for F16 Mechanical Fasteners
- F 2329 Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners

2.2 ASME Standards:

- B 1.1 Unified Screw Threads⁴
- B 18.2.1 Square and Hex Bolts and Screws⁴
- B 18.2.2 Part Identifying Number (PIN) Code System⁵

3. Ordering Information

3.1 Orders for externally threaded fasteners (including nuts and accessories) under this specification shall include the following:

- 3.1.1 ASTM designation and year of issue,

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets and Washers.

Current edition approved Dec. 1, 2007. Published January 2008. Originally approved in 1947. Last previous edition approved in 2007 as A 307 - 07a.

² For ASME Boiler and Pressure Vessel Code applications see related Specification SA-307 in Section II of that Code.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁵ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

*A Summary of Changes section appears at the end of this standard.

TABLE 3 Tensile Requirements for Full-Size Bolts and Studs

Bolt Size, In.	Threads per Inch	Stress Area, ^A in. ²	Tensile Strength, lbf ^B		
			Grade A, min ^C	Grade B	
				min ^D	max ^D
1/4	20	0.0318	1 900	1 800	3 180
5/16	18	0.0524	3 100	3 100	5 240
3/8	16	0.0775	4 650	4 650	7 750
7/16	14	0.1063	6 350	6 350	10 630
1/2	13	0.1419	8 500	8 500	14 190
5/8	12	0.182	11 000	11 000	18 200
3/4	11	0.228	13 550	13 550	22 600
7/8	10	0.331	20 050	20 050	33 400
1	9	0.462	27 700	27 700	46 200
1 1/8	8	0.606	36 350	36 350	60 600
1 1/4	7	0.763	46 000	45 800	76 300
1 1/2	7	0.969	58 150	58 150	96 900
1 3/4	6	1.155	69 300	69 300	115 500
2	6	1.405	84 300	84 300	140 500
2 1/4	5	1.90	114 000	114 000	190 000
2 1/2	4 1/2	2.50	150 000	150 000	250 000
2 3/4	4 1/2	3.25	195 000	195 000	325 000
3	4	4.00	240 000	240 000	400 000
3 1/2	4	4.93	295 800	295 800	493 000
4	4	5.97	358 200	358 200	597 000
4 1/2	4	7.10	426 000	426 000	710 000
5	4	8.33	499 800	499 800	833 000
5 1/2	4	9.66	579 600	579 600	966 000
6	4	11.08	664 800	664 800	1 108 000

^A Area calculated from the equation:
 $A_s = 0.7854 \{D - (0.9743/n)\}^2$

where:

A_s = stress area,
 D = nominal diameter of bolt, and
 n = threads per inch.

^B 1 lbf = 4.448 N.

^C Based on 80 ksi (414 MPa).

^D Based on 60-100 ksi (414-690 MPa).

TABLE 4 Tensile Requirements for Machined Specimens

	Grade A	Grade B
Tensile strength, ksi	60 min	60-100
Yield point, min ksi		
Elongation in 2 in., min, %	18	18

shall take precedence in the event that there is controversy over low readings of hardness tests.

7. Dimensions

7.1 Unless otherwise specified, threads shall be the Course Thread Series as specified in the latest issue of ASME B 1.1, and shall have a Class 2A tolerance.

7.2 Unless otherwise specified, Grade A bolts shall be hex bolts with dimensions as given in the latest issue of ASME B 18.2.1. Unless otherwise specified, Grade B bolts shall be heavy hex bolts with dimensions as given in the latest issue of ASME B 18.2.1.

7.3 Unless otherwise specified, bolts and studs to be used with nuts or tapped holes which have been tapped oversize, in accordance with Specification A 563, shall have Class 2A

threads before hot-dip or mechanically deposited zinc coating. After zinc coating the maximum limit of pitch and major diameter shall not exceed the Class 2A maximum limit by more than the following amounts:

Diameter, in.	Oversize Limit, in. (mm) ^A
1/4	0.016
5/16, 3/8	0.017
7/16, 1/2	0.018
5/8 to 3/4, incl	0.020
3/4	0.022
1.0 to 1 1/4, incl	0.024
1 1/4, 1 1/2	0.027
1 3/4 to 4.0, incl	0.050

^A These values are the same as the overlapping required for zinc-coated nuts in Specification A 563.

7.4 The gaging limit for bolts and studs shall be verified during manufacture or use by assembly of a nut tapped as nearly as practical to the amount oversize shown above. In case of dispute, a calibrated thread ring gage of that same size (Class X tolerance, gage tolerance plus) shall be used. Assembly of the gage, or the nut described above, must be possible with hand effort following application of light machine oil to prevent galling and damage to the gage. These inspections, when performed to resolve disputes, shall be performed at the frequency and quality described in Table 5.

8. Number of Tests and Retests

8.1 The requirements of this specification shall be met in continuous mass production for stock, and the manufacturer shall make sample inspections to ensure that the product conforms to the specified requirements. Additional tests of individual shipments of material are not ordinarily contemplated. Individual heats of steel are not identified in the finished product.

8.2 When specified in the order, the manufacturer shall furnish a test report certified to be the last completed set of mechanical tests for each stock size in each shipment.

8.3 When additional tests are specified on the purchase order, a lot, for purposes of selecting test samples, shall consist of all material offered for inspection at one time that has the following common characteristics:

- 8.3.1 One type of item,
- 8.3.2 One nominal size, and
- 8.3.3 One nominal length of bolts and studs.

8.4 From each lot, the number of tests for each requirement shall be as follows:

TABLE 5 Sample Sizes and Acceptance Numbers for Inspection of Hot-Dip or Mechanically Deposited Zinc-Coated Threads

Lot Size	Sample Size ^A	Acceptance Number
2 to 90	13	1
91 to 150	20	2
151 to 290	32	3
291 to 500	50	5
501 to 1 200	80	7
1 201 to 3 200	125	10
3 201 to 10 000	200	14
10 001 and over	315	21

^A Inspect all bolts in the lot if the lot size is less than the sample size.

 A 307 - 07b

Number of Pieces in Lot	Number of Samples
800 and under	1
801 to 8 000	2
8 001 to 22 000	3
Over 22 000	5

8.5 If any machined test specimen shows defective machining it shall be discarded and another specimen substituted.

8.6 Should any sample fail to meet the requirements of a specified test, double the number of samples from the same lot shall be tested, in which case all of the additional samples shall meet the specification.

9. Test Methods

9.1 Grades A and B bolts and studs shall be tested in accordance with Test Methods F 606.

9.2 Standard square and hex head bolts only shall be tested by the wedge tension method except as noted in 9.4. Fracture shall be in the body or threads of the bolt without any fracture at the junction of the head and body. Other headed bolts shall be tested by the axial tension method.

9.3 Speed of testing as determined with a free running crosshead shall be a maximum of 1 in./min for the tensile strength tests of bolts.

10. Inspection

10.1 If the inspection described in 10.2 is required by the purchaser it shall be specified in the inquiry, order or contract.

10.2 The inspector representing the purchaser shall have free entry to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests and inspections required by the specification that are requested by the purchaser's representative shall be made before shipment, and shall be conducted as not to interfere unnecessarily with the operation of the works.

11. Responsibility

11.1 The party responsible for the fastener shall be the organization that supplies the fastener to the purchaser.

12. Rejection and Rehearing

12.1 Disposition of nonconforming lots shall be in accordance with Guide F 1470, specifically sections on disposition of nonconforming lots, suppliers option, and purchasers option.

13. Product Marking

13.1 *Grades A and B Bolts and Studs:*

13.1.1 Bolt heads and one end of studs shall be marked with a unique identifier by the manufacturer to identify the manufacturer or private label distributor, as appropriate. Additional marking required by the manufacturer for his own use shall be at the option of the manufacturer.

13.1.2 In addition to the requirements of 13.1, all bolt heads, one end of studs $\frac{1}{2}$ in. and larger, and whenever feasible studs less than $\frac{1}{2}$ in. shall be marked with a grade marking as follows:

Grade	Marking
A	307A
B	307B

13.1.3 All markings shall be located on the top of the bolt head or stud end and shall be raised or depressed at the option of the manufacturer.

14. Packaging and Package Marking

14.1 *Packaging:*

14.1.1 Unless otherwise specified, packaging shall be in accordance with Practice D 3951.

14.1.2 When special packaging requirements are required, they shall be defined at the time of the inquiry and order.

14.2 *Package Marking:*

14.2.1 Each shipping unit shall include or be plainly marked with the following information:

14.2.1.1 ASTM designation and grade,

14.2.1.2 Size,

14.2.1.3 Name and brand or trademark of the manufacturer,

14.2.1.4 Number of pieces,

14.2.1.5 Purchase order number,

14.2.1.6 Country of origin.

15. Keywords

15.1 bolts; carbon steel; steel; studs

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirement shall apply only when specified in the purchase order or contract:

SECTION 13 CAST-IN-PLACE CONCRETE

In lieu of a precast box culvert, Comanco did a poured in place box culvert. Please refer to Attachment 13-1 for the Cast-In-Place Concrete Product data report signed and sealed by Mark Schroder, a Registered Professional Engineer in the State of Florida.

Attachment 13-1

Cast-In-Place Concrete Product Data

**GEOTECHNICAL ENGINEERING
SERVICES REPORT**

For

**CITRUS COUNTY, CENTRAL LANDFILL
PHASE 3
BEARING CAPACITY CERTIFICATION
FOR SOILS NEAR NEW BOX CULVERT**

LECANTO, FLORIDA

Prepared for


**SCS Engineers, Inc.
4041 Park Oaks Boulevard
Tampa, Florida**

Prepared by

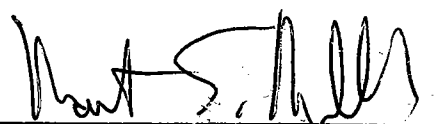
**Professional Service Industries, Inc.
16550 Scheer Boulevard
Hudson, Florida, 34337
Telephone (727) 868-9526
Fax (727) 868-0094**

PSI Project No. 0390309-27

January 11, 2011



Thomas B. Harper, EI
Staff Engineer



Martin E. Millburg, P.E.
Senior Engineer
Florida License No. 36584
1/11/2011

1.0 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided by Ms. Dominique Bramlett of SCS Engineers, Inc. in an email dated 11/29/2010. Per the instructions in the November email, the scope of work for the existing PSI Project known as The Citrus County Central Landfill Phase 3 Expansion (PSI Project No.: 0390309) will be expanded at the request of SCS Engineers to include the additional geotechnical services that are reported in this document. For tracking purposes, these additional services are associated with PSI Work Order Number 0390309-27.

2.0 PROPOSED PROJECT AND SCOPE OF WORK

The purpose of this study was to determine, in our opinion, if subsurface conditions at the site of a new box culvert can provide an allowable bearing capacity of 2000 pounds per square foot (psf). To accomplish this objective, we conducted a limited exploration and evaluation of the subsurface soil and groundwater conditions in the area 10 feet south of the box culvert. The box culvert lies on the west side of the Phase 3 disposal cell that is currently under construction. The boring was performed in the bottom of the disposal cell's perimeter ditch at the approximate level of the box culvert floor. The approximate location is identified on Sheet 1 in the appendix.

The requested scope of work for this study included the following:

1. Performed one (1) Standard Penetration Test (SPT) in the soils adjacent to the box culvert. The boring was extended to a depth of 20 feet below grade. Samples were collected and SPT resistances were measured virtually continuously for the top 10 feet and on intervals of 5 feet thereafter.
2. Measured groundwater conditions in the borings and identified the soil conditions at the boring locations.
3. Conducted a laboratory examination and visual classification of the sampled soils to characterize the nature of the soils.
4. Prepared this report, which summarizes our study, opinions and evaluations regarding the previous stated objective.

3.0 SITE CONDITIONS

The site is located in Section 1, Township 19 South, and Range 18 East in Lecanto, Citrus County Florida. The address of the site is 230 West Gulf to Lake Highway. The project is contained within an active Citrus County landfill. Much of the site has undergone extensive earthwork associated with the landfill operation. The top of the lined Phase 3 disposal cell lies approximately fifteen feet east of our boring location. The bottom of the excavation is estimated to be 70 feet below the grade at our boring location. A review of



the USGS Topographic Map titled "Lecanto, Florida indicates that the elevation of the natural ground in the vicinity of the boring is approximately +110 feet, based on the National Geodetic Vertical Datum of 1929. The natural topography of the area near the site is low sloping hills.

4.0 SUBSURFACE CONDITIONS

4.1 GENERAL GEOLOGY

The subsurface conditions were explored using one (1) SPT boring. The boring was performed approximately 10 feet south of the new box culvert. The boring was extended to a depth of 20 feet below grade. Fine sand to slightly silty fine sand (Unified Classification SP, SP-SM) was encountered in the boring to a depth of approximately 14 feet below grade. The sandy materials were underlain by sandy clay to clay soils (Unified Classification CL, CH). The boring was terminated in the clayey layer at a depth of 20 feet below grade. The sandy materials encountered in the boring ranged from loose to very dense and the relative density tended to increase with depth. The clayey materials had a stiff consistency. Groundwater was not encountered in the upper ten feet at the time of drilling. Drilling fluid circulation was maintained for the duration of the test.

The soil profile included on Sheet 1 in the appendix should be reviewed as it includes the soil description, stratifications and penetration resistances. The stratification shown on the boring profile represents the conditions only at the actual boring location. The stratification represents the approximate boundary between subsurface materials and the actual transition may be gradual.

5.0 EVALUATION

Information regarding the anticipated building loads and other details of the proposed structure were not provided to PSI at the time of this report. In general, the borings identified subsurface conditions that are considered suitable for support of the new box culvert. A bearing pressure of 2,000 pounds per square foot can be used at the boring location if the recommendations below are implemented.

We recommend foundation bearing soils be compacted to at least 95 percent of the modified Proctor value prior to placement of reinforcing steel and concrete. Testing should be performed to verify the specified compaction has been attained. Settlement should be within tolerable limits provided soil preparation is performed in compliance with our recommendations. It should be noted that the box culvert was already constructed at the time of our boring, and our recommendations assume soil conditions under the box culvert are the same as those encountered in our boring which was performed adjacent to the box culvert.



6.0 REPORT LIMITATIONS

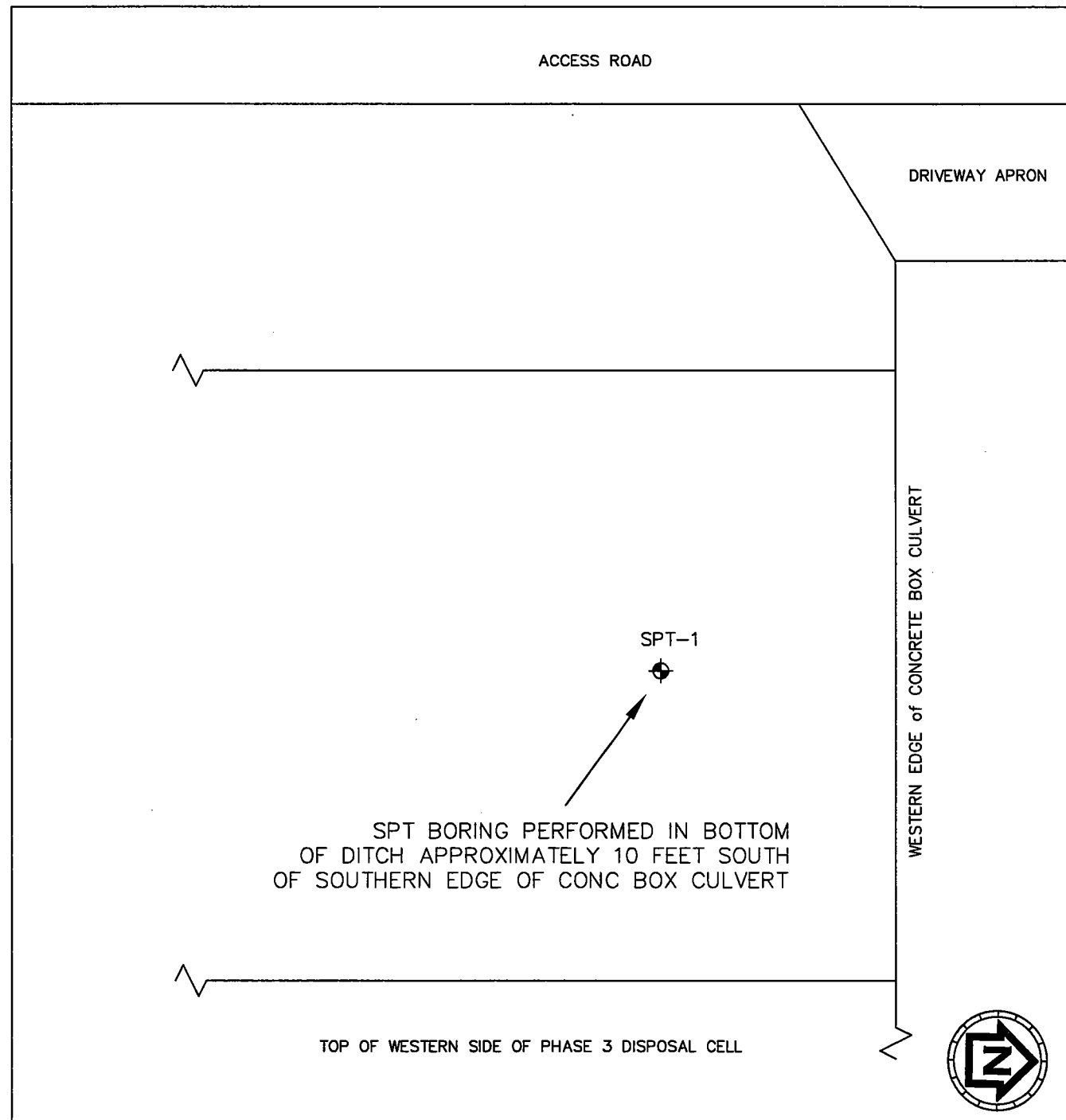
The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

Florida is underlain by a soluble limestone formation. This limestone can dissolve, resulting in subsidence of overlying soils and the formation of sinkholes at the ground surface. PSI's geotechnical study did not include an evaluation of the relative potential for sinkhole development at this site.

The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by SCS Engineers, Inc. for the new concrete box culvert on the west end of the Phase 3 disposal cell. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

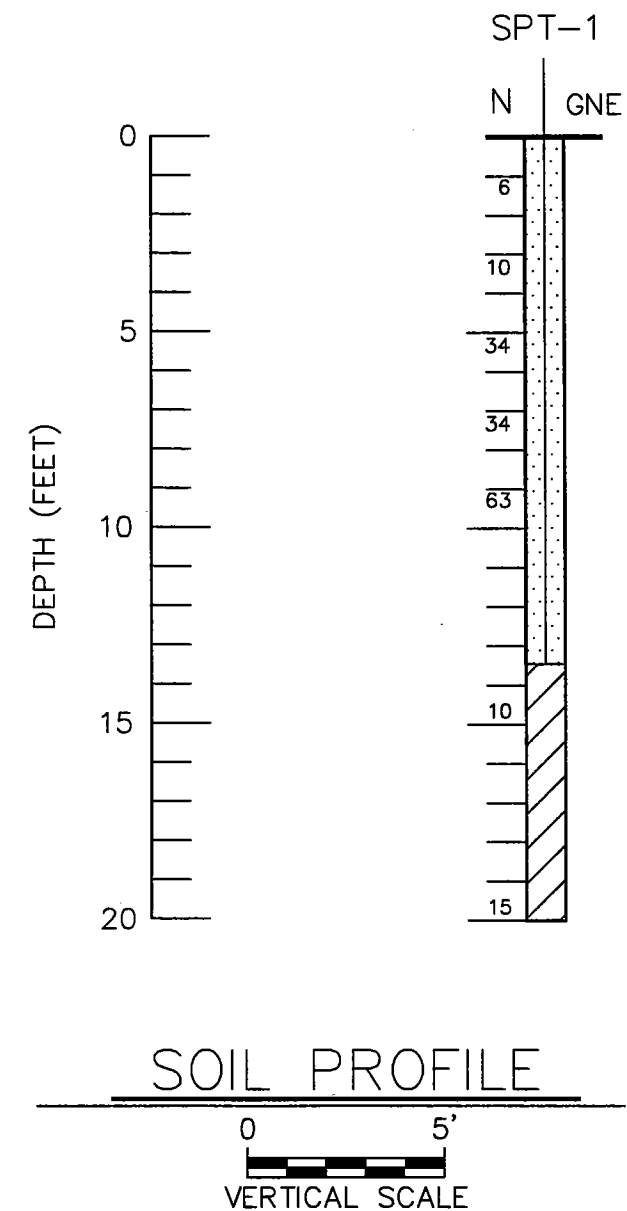
This report has been prepared for the exclusive use of SCS Engineers, Inc. and its consultants for the concrete box culvert located west of the Phase 3 Disposal Cell within the Central Landfill at 230 West Gulf to Lake Highway, Lecanto, Citrus County, Florida.





BORING LOCATION PLAN

NOT TO SCALE




SOIL PROFILE

LEGEND

N SPT N-value in blows/foot

⊕ Approximate SPT boring location

GNE Groundwater level not encountered in upper 10 feet, JAN 2011

①  Brown fine SAND to slightly silty fine SAND (SP, SP-SM)

②  Orange sandy CLAY to CLAY (CL, CH)

DRAWN	TBH
CHECKED	MEM
APPROVED	MEM
SCALE	NOTED

GEOTECHNICAL SERVICES
 CENTRAL LAND FILL PHASE 3 BOX CULVERT
 CITRUS COUNTY, FLORIDA

PSI Information
 To Build On
 Engineering • Consulting • Testing

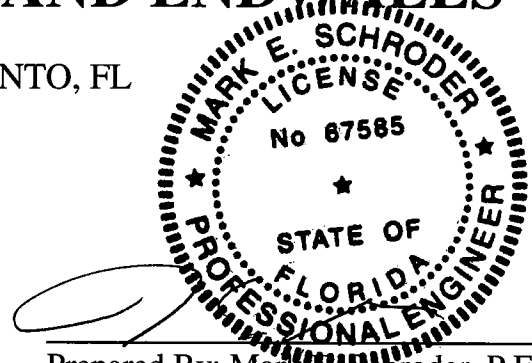
DATE JAN 2011 PROJ. NO. 0390309-27 SHEET 1

CALCULATION WORKSHEETS

FOR

**CITRUS CENTRAL LANDFILL
PHASE 3 EXPANSION PROJECT
BOX CULVERT AND ENDWALLS**

LECANTO, FL



Prepared By: Mark E. Schroder, P.E.
Florida License #67585
JAN 11 2011

December 2010

Project No. 10-154

Kings Bay Engineering

9478 W Marquette Lane, Crystal River, FL 34428 | 352-564-8017 | mes@kbcivil.com

FL Certificate #28555

Box Culvert Program: Estimate of Quantities

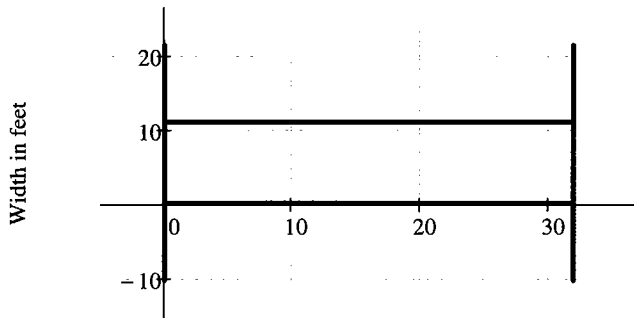
© 2002 Florida Department of Transportation

Project = "CCLandfill Box Culvert"

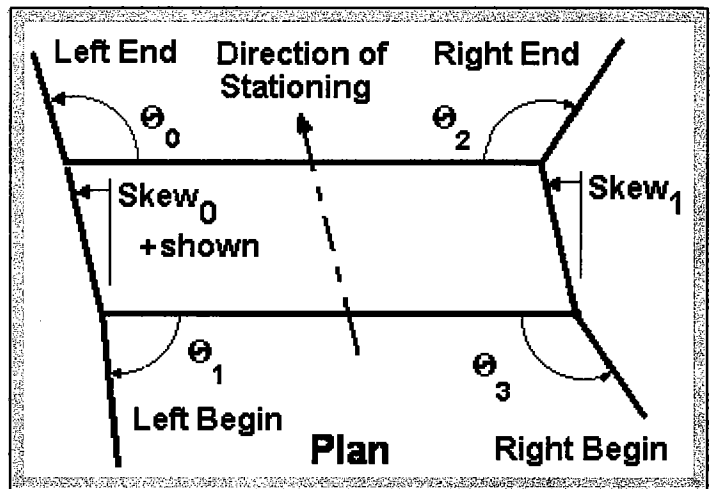
DesignedBy = "Mark E Schroder, P.E."

CheckedBy = "MES"

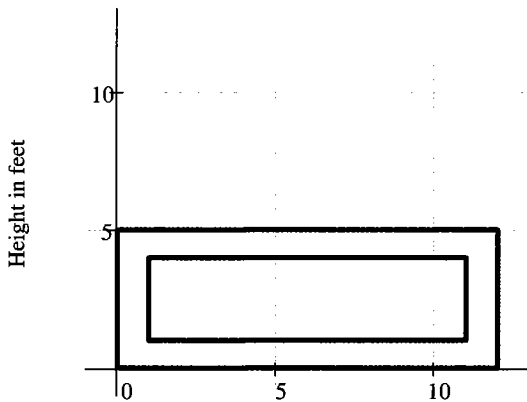
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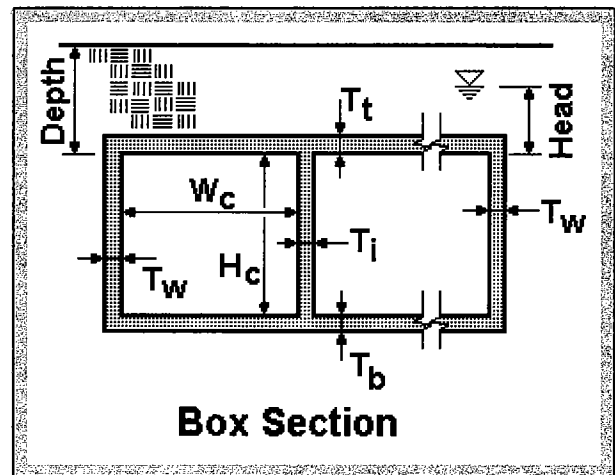
Length in feet
Plan - Box Culvert



Plan Right Begin



Width in feet
Cross Section - Box Culvert



Box Section

Box Dimensions	HydraulicOpening := $W_c \cdot H_c \cdot \text{NoOfCells}$	HydraulicOpening = 30 ft ²	SoilHeight = 0.2 ft
NoOfCells = 1	$W_c = 10$ ft	$H_c = 3$ ft	$L_c = 32$ ft
$\theta^T = (90 \ 90 \ 90 \ 90) \cdot \text{deg}$	Head = 0 ft		
$T_t = 12$ -in	$T_b = 12$ -in	$T_w = 12$ -in	$T_i = 12$ -in
Cover = 2-in	Depth = 1.17 ft		

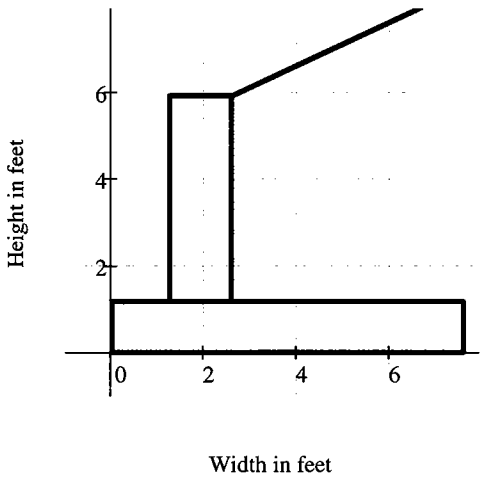
Cutoff wall and Headwall Dimensions

Skew _{left} = 0-deg	B _{lh_w} = 16-in	H _{lh_w} = 21-in	B _{lc_w} = 12-in	H _{lc_w} = 24-in
------------------------------	-------------------------------------	-------------------------------------	-------------------------------------	-------------------------------------

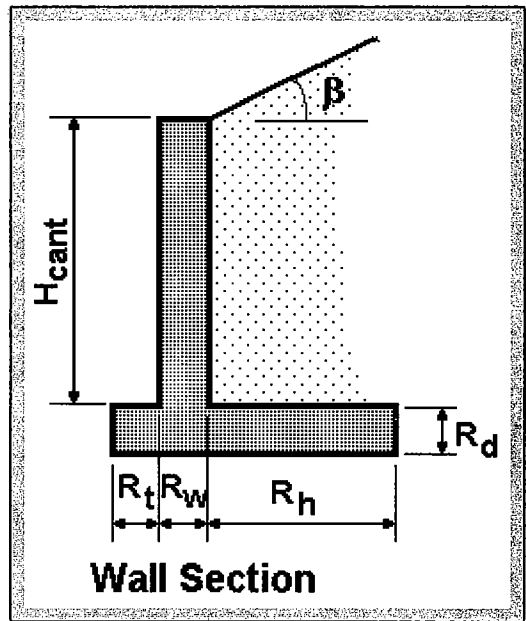
Skew_{right} = 0·deg B_{rhw} = 16·in H_{rhw} = 21·in B_{rcw} = 12·in H_{rcw} = 24·in

Wingwall Dimensions

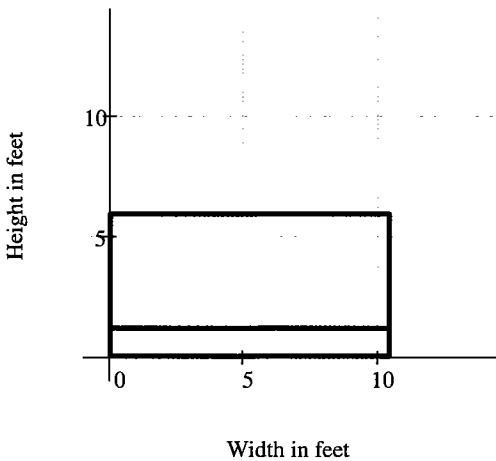
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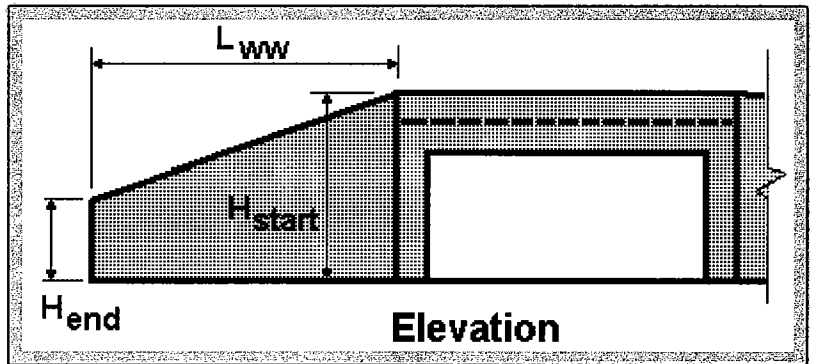
Cross Section - First Wingwall



$$R_t = \begin{pmatrix} 15 \\ 15 \\ 15 \\ 15 \end{pmatrix} \cdot \text{in} \quad R_w = \begin{pmatrix} 16 \\ 16 \\ 16 \\ 16 \end{pmatrix} \cdot \text{in} \quad R_h = \begin{pmatrix} 60 \\ 60 \\ 60 \\ 60 \end{pmatrix} \cdot \text{in} \quad R_d = \begin{pmatrix} 14 \\ 14 \\ 14 \\ 14 \end{pmatrix} \cdot \text{in} \quad \beta = \begin{pmatrix} 26.57 \\ 26.57 \\ 26.57 \\ 26.57 \end{pmatrix} \cdot \text{deg}$$



Elevation - First Wingwall



$$H_{\text{end}} = \begin{pmatrix} 4.75 \\ 4.75 \\ 4.75 \\ 4.75 \end{pmatrix} \text{ft} \quad H_{\text{start}} = \begin{pmatrix} 4.75 \\ 4.75 \\ 4.75 \\ 4.75 \end{pmatrix} \text{ft} \quad L_{\text{ww}} = \begin{pmatrix} 10.42 \\ 10.42 \\ 10.42 \\ 10.42 \end{pmatrix} \text{ft} \quad \theta = \begin{pmatrix} 90 \\ 90 \\ 90 \\ 90 \end{pmatrix} \cdot \text{deg}$$

Summary of Concrete Quantities

$Vol_{cw.left} = 0.44 \cdot yd^3$ $Vol_{cw.right} = 0.44 \cdot yd^3$

$Vol_{bot.slab} = 15.56 \cdot yd^3$ $Vol_{walls} = 7.11 \cdot yd^3$ $Vol_{top.slab} = 14.22 \cdot yd^3$

$Vol_{hw.left} = 0.44 \cdot yd^3$ $Vol_{hw.right} = 0.44 \cdot yd^3$

$Vol_{wall} = \begin{pmatrix} 2.44 \\ 2.44 \\ 2.44 \\ 2.44 \end{pmatrix} \cdot yd^3$
 $Vol_{ww.cowall} = \begin{pmatrix} 0.3216 \\ 0.3216 \\ 0.3216 \\ 0.3216 \end{pmatrix} \cdot yd^3$
 $Vol_{footing} = \begin{pmatrix} 3.41 \\ 3.41 \\ 3.41 \\ 3.41 \end{pmatrix} \cdot yd^3$
 $TotalVol_{wingwall} = \begin{pmatrix} 6.18 \\ 6.18 \\ 6.18 \\ 6.18 \end{pmatrix} \cdot yd^3$

$Vol_{box} = 38.73 \cdot yd^3$
 $\sum Vol_{wall} = 9.78 \cdot yd^3$
 $\sum TotalVol_{footing} = 14.94 \cdot yd^3$
 $TotalVolume = 63.45 \cdot yd^3$

Summary of Soil and Miscellaneous Values

$E = 3020 \cdot ksi$ $f_c = 3.4 \cdot ksi$ $Extension = 0$ Extension type
 0 - new box (no extension)
 1 - left extension
 2 - right extension
 $Env = 1$ Environmental Class
 1 - slightly aggressive
 2 - moderately aggressive
 3 - extremely aggressive

$ConsiderLLSurcharge_{ww} = 1$ 0 - No
 1 - Yes $ConsiderLL_{hw} = 1$ 0 - No
 1 - Yes $BarrierDL_{hw} = 0 \cdot \frac{kip}{ft}$

$\gamma_{soil} = 110 \cdot \frac{lbf}{ft^3}$ $k_s = 100000 \cdot \frac{lbf}{ft^3}$ $\phi = 32 \cdot deg$ $q_{nom} = 2000 \cdot \frac{lbf}{ft^2}$

Summary of Reinforcement Check Values

$Check_{box} = "OK"$ $Check_{cw} = "OK"$ $Check_{hw} = "OK"$ $Check_{ww} = "OK"$ $TotalCheck = "OK"$

$BarSize_{slabs} = \begin{pmatrix} 5 \\ 5 \\ 5 \\ 5 \end{pmatrix}$ $S_{slabs} = \begin{pmatrix} 8 \\ 8 \\ 8 \\ 8 \end{pmatrix} \cdot in$ *top slab, top mat*
top slab, bot mat
bot slab, top mat
bot slab, bot mat $BarSize_{long} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix}$ $S_{long} = \begin{pmatrix} 12 \\ 12 \\ 12 \\ 12 \end{pmatrix} \cdot in$ *top slab, top mat*
top slab, bot mat
interior wall(s)
exterior walls
bot slab, both m.

$BarSize_{walls} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$ $S_{walls} = \begin{pmatrix} 12 \\ 12 \end{pmatrix} \cdot in$ *interior wall(s)*
exterior walls $BarSize_{corners} = \begin{pmatrix} 5 \\ 5 \end{pmatrix}$ $S_{corners} = \begin{pmatrix} 8 \\ 8 \end{pmatrix} \cdot in$ *top corner*
bot corner

$BarSize_{cw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix}$ $Num_{cw} = \begin{pmatrix} 2 \\ 2 \\ 2 \\ 2 \end{pmatrix}$ *top bar, left cw*
bot bar, left cw
top bar, right cw
bot bar, right cw $StirSize_{cw} = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$ $S_{stirrup.cw} = \begin{pmatrix} 15 \\ 15 \end{pmatrix} \cdot in$

$$\text{BarSize}_{hw} = \begin{pmatrix} 5 \\ 5 \\ 5 \\ 5 \end{pmatrix} \quad \text{Num}_{hw} = \begin{pmatrix} 4 \\ 4 \\ 4 \\ 4 \end{pmatrix} \quad \begin{array}{l} \textit{top bar, left hw} \\ \textit{bot bar, left hw} \\ \textit{top bar, right hw} \\ \textit{bot bar, right hw} \end{array}$$

$$\text{StirSize}_{hw} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \quad S_{stirrup, hw} = \begin{pmatrix} 10 \\ 10 \end{pmatrix} \cdot \text{in}$$

Reinforcement List - Main Box

Reinf_{box} =

	0	1	2
0	"Bar Location"	"Size"	"Desig"
1	"top face, top slab"	5	101
2	"bot face, top slab"	5	102
3	"top face, bot slab"	5	103
4	"bot face, bot slab"	5	104
5	"top ext corner"	5	105
6	"bot ext corner"	5	106
7	"inside face, ext wall"	4	108
8	"long top face, bot slab"	4	109
9	"long top face, top slab"	4	110
10	"long bot face, top slab"	4	111
11	"long bot face, bot slab"	4	112
12	"long each face, ext wall"	4	113
13	"long each face, ext wall"	4	...

Reinforcement Lists - Left Begin and Left End Wingwalls

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"	
Rw0 =	"wall vert, soil side"	5	401	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0	
	"wall horiz, front side"	4	402	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0	
	"wall horiz, soil side"	4	404	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0	
	"wall vert, front side"	4	406	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0	
	"wall vert, soil side"	5	407	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0	
	"top footing heel"	3	409	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0	0
	"bot footing toe"	3	410	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0	0
	"temp footing"	3	411	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0	0
	"wall to box ties"	5	412	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0	0
	0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0	0

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"	
Rw1 =	"wall vert, soil side"	5	501	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0	
	"wall horiz, front side"	4	502	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0	
	"wall horiz, soil side"	4	504	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0	
	"wall vert, front side"	4	506	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0	
	"wall vert, soil side"	5	507	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0	
	"top footing heel"	3	509	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0	0
	"bot footing toe"	3	510	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0	0
	"temp footing"	3	511	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0	0
	"wall to box ties"	5	512	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0	0
	0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0	0

Reinforcement Lists - Right Begin and Right End Wingwalls

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
Rw ₂ =	"wall vert, soil side"	5	601	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
	"wall horiz, front side"	4	602	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall horiz, soil side"	4	604	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall vert, front side"	4	606	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
	"wall vert, soil side"	5	607	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
	"top footing heel"	3	609	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
	"bot footing toe"	3	610	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
	"temp footing"	3	611	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall to box ties"	5	612	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
	0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
Rw ₃ =	"wall vert, soil side"	5	701	4.5	20	1	0	0	4.5	0	0	0	0	0	0	0	0
	"wall horiz, front side"	4	702	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall horiz, soil side"	4	704	10.09	6	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall vert, front side"	4	706	4.5	12	1	0	0	4.5	0	0	0	0	0	0	0	0
	"wall vert, soil side"	5	707	6.08	14	10	0	0	2.25	3.83	0	0	0	0	0	0	0
	"top footing heel"	3	709	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
	"bot footing toe"	3	710	7.25	14	1	0	0	7.25	0	0	0	0	0	0	0	0
	"temp footing"	3	711	10.09	20	1	0	0	10.09	0	0	0	0	0	0	0	0
	"wall to box ties"	5	712	21.17	6	1	0	0	10.09	11.09	0	0	0	0	0	0	0
	0	0	0	21.17	0	0	0	0	10.09	11.09	0	0	0	0	0	0	0

Reinforcement Lists - Headwalls and Cutoff Walls

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
Rh ₁ =	"top"	5	801	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
	"bottom"	5	802	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
	"stirrups"	3	803	5.13	15	27	0	0	1.36	0.5	0.5	0.42	0.95	0.83	0.83	0	0

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
Rh ₂ =	"top"	5	804	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
	"bottom"	5	805	11.67	4	1	0	0	11.67	0	0	0	0	0	0	0	0
	"stirrups"	3	806	5.13	15	27	0	0	1.36	0.5	0.5	0.42	0.95	0.83	0.83	0	0

	"Bar Location"	"Size"	"Desig"	"Len"	"Num"	"Type"	"A"	"G"	"B"	"C"	"D"	"E"	"F"	"H"	"J"	"K"	"N"
Rc ₁ =	"top"	4	807	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
	"bottom"	4	808	11.67	2	1	0	0	11.67	0	0	0	0	0	0	0	0
	"stirrups"	3	809	4.9	10	7	0	0	1.61	0.67	0.5	0.5	0	0	0	0	0

$$Rc_2 = \begin{pmatrix} \text{"Bar Location"} & \text{"Size"} & \text{"Desig"} & \text{"Len"} & \text{"Num"} & \text{"Type"} & \text{"A"} & \text{"G"} & \text{"B"} & \text{"C"} & \text{"D"} & \text{"E"} & \text{"F"} & \text{"H"} & \text{"J"} & \text{"K"} & \text{"N"} \\ \text{"top"} & 4 & 810 & 11.67 & 2 & 1 & 0 & 0 & 11.67 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \text{"bottom"} & 4 & 811 & 11.67 & 2 & 1 & 0 & 0 & 11.67 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \text{"stirrups"} & 3 & 812 & 4.9 & 10 & 7 & 0 & 0 & 1.61 & 0.67 & 0.5 & 0.5 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

No variables are modified in this file CurrentDataFile = "\Data Files\CCLandFillBox1.dat"

QuickWall 7.1 - RETAINING WALL ANALYSIS AND DESIGN

=====
 Job ID : CC Central Landfill

Job Description : Headwalls

Designed By : Mark Schroder, PE
 =====

FOOTING DESIGN METHOD: Ultimate Strength ACI 318-08
 STEM DESIGN METHOD : Ultimate Strength ACI 318-08 (Concrete)
 WALL TYPE : Cantilever Retaining Wall

RETAINING WALL DIMENSIONS:

 Wall Stem Height = 6.00 ft.
 Stem Thickness @ Top = 12.00 in.
 Stem Thickness @ Bottom = 12.00 in.

 Footing Thickness = 12.00 in.
 Heel Width = 2.50 ft.
 Toe Width = 1.50 ft.

 Stem Bar Size = # 5 at 12.00 in. o.c.
 Heel Bar Size = # 5 at 12.00 in. o.c.
 Toe Bar Size = # 5 at 12.00 in. o.c.

 Footing Key Depth = 0.00 ft.
 Footing Key Width = 0.00 ft.
 BackFill Slope (Vert/Horiz) = 0.00 :12

RETAINING WALL LOADS:

 Horizontal Equivalent Fluid Pressure = 35.00 pcf. (Load Case = Soil)
 Backfill Height = 6.00 ft.
 Equivalent Fluid Pressure Angle = 0.00 deg.
 Vertical Surcharge on Backfill = 220 psf. (Load Case = Soil)
 Horizontal Surcharge = 0 psf. (Load Case = Live)
 Vertical Surcharge on Toe = 0 psf. (Load Case = Soil)
 Wind Load on Fence = 0 psf. (Load Case = Wind)
 Fence Height = 0.00 ft.

Line No.	Ld. Type (H or V)	Magnitude (plf)	Dist. (x) (ft.)	Load Case
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Notes: 1. "H" = Horizontal loads. "V" = Vertical loads.
 2. Vertical loads are positive down.

ULTIMATE STRENGTH LOAD COMBINATIONS (Concrete Design):

1.4D + 1.4H
1.2D + 1.6L + 1.6H + 0.5R
1.2D + 1.6R + 1.0L
1.2D + 1.6R + 0.8W
1.2D + 1.6W + 1.0L + 0.5R
1.2D + 1.0E + 1.0L + 0.2R
0.9D + 1.6W + 1.6H
0.9D + 1.0E + 1.6H

WORKING STRESS LOAD COMBINATIONS (Stability Checks and Masonry Design):

D + L + R + H
D + L + W + H
D + L + W + 0.5R + H
D + L + R + 0.5W + H
D + L + R + E/1.4 + H
D + E/1.4 + H

RETAINING WALL RESISTING FORCES:

Allowable Soil Pressure = 2,000 psf.
Passive Equivalent Fluid Press. = 300.00 pcf.
Passive Soil Height = 1.00 ft.
Coefficient of Friction = 0.50
Cohesion = 0 psf.

Use Vertical Surcharge as Resisting Wt.? = No

Overturning Safety Factor = 2.50
Sliding Safety Factor = 1.50
Limit Reaction to Mid 1/3? = No

MATERIAL DATA:

Concrete Strength, f'c = 3.40 ksi.
Steel Yield Strength, Fy = 60.00 ksi.

Concrete Unit Weight = 150.00 pcf.
Soil Unit Weight = 110.00 pcf.
Fence Weight = 0.00 psf.

REINFORCING STEEL DATA:

Concrete cover to center of steel:
 Wall Inside Face = 3.00 in.
 Footing Heel (Top Face) = 3.00 in.
 Footing Toe (Bottom Face) = 3.00 in.

Minimum Ratios for Shrinkage and Temperature Reinf:

 Vertical Stem Reinf. = 0.0018
 Horizontal Stem Reinf. = 0.0020
 Footing Reinforcement = 0.0018

SUMMARY OF RESULTS

DIMENSIONS:

Stem Height	= 6.00 ft.	Heel Length	= 2.50 ft.
Stem Thick. @ Top	= 12.00 in.	Toe Length	= 1.50 ft.
Stem Thick. @ Base	= 12.00 in.	Total Ftg. Width, B	= 5.00 ft.
Footing Thickness	= 12.00 in.	Key Depth	= 0.00 ft.
		Key Width	= 0.00 ft.

ANALYSIS RESULTS:

Max Brg Press. @ Toe	= 1,267 psf. O.K.	Sliding Force	= 1,348 Lb
	@ Heel = 119 psf. O.K.	Resisting Force	= 2,183 Lb
Allowable Brg. Press.	= 2,000 psf.	F.O.S. =	1.62 O.K.
Resultant Loc From C.L.	= 0.69 ft.	Overturn. Moment	= 3,716 ft-lb
Kern Point Loc., B/6	= 0.83 ft.	Resisting Moment	= 9,986 ft-lb
Limit Resultant To Mid 1/3?	= No	F.O.S. =	2.69 O.K.

DESIGN RESULTS: Design Method, Stem: USD, ACI 318-08 (Concrete)
Ftg.: Ultimate Strength ACI 318-08

	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	Shr Chk.	As Reqd. (in ²)	As Furn. (in ²)	Astl. Chk.	Devel. Lgth.
Stem :	4.03	1.68	9.45	O.K.	0.303	0.310	O.K.	O.K.
Toe :	1.72	1.22	9.45	O.K.	0.259	0.310	O.K.	O.K.
Heel :	2.57	1.76	9.45	O.K.	0.259	0.310	O.K.	O.K.
Key :	0.00	0.00	0.00		0.000	0.000		

- Notes: 1. Stem moments are positive if they cause tension on the soil face. Negative if they cause tension on the outside face. Stem shear is positive to the left as measured on a section cut below the top of wall.
2. Heel moments are positive if they cause tension in the top of the footing. Heel shear is positive up as measured on a section cut to the right of the end of the heel.
3. Toe moments are positive if they cause tension in the bottom of the footing. Toe shear is positive up as measured on a section cut to the left of the end of the toe.

 S T A B I L I T Y A N A L Y S I S R E P O R T

Stability Analysis: Governing Combination = D + L + R + H

-----RESISTING FORCES-----				-----OVERTURNING FORCES-----			
Element	Weight	x Arm	= Moment	Element	Force	x Arm	= Moment
Soil	1,815		6,311	R at Top			
Ftg.	750	2.50	1,875	R at Bot.			
Stem	900	2.00	1,800	Horiz. EFP	858	2.33	2,001
Vert Sur				Vert Sur	490	3.50	1,715
Vert EFP				Horiz Sur			
Toe Sur.				Wind			
Fence Wt.				Horiz line			
V. line				Vert. line			
Sum WT =	3,465	MR =	9,986	Sum F =	1,348	MOT =	3,716

Friction Force	=	1,733 Lb	F.O.S. Sliding	=	RF / F =	1.62
Passive Pressure	=	450 Lb	F.O.S. Overturn.	=	MR / MOT =	2.69
Cohesion	=	0 Lb				
Resist. Force, Sum RF	=	2,183 Lb	Coef. Vert. Surcharge or Line Load to Horiz. = EFP / Soil Dens. =			0.318

Resultant Loc From Toe,	X = (MR - MOT) / Sum WT	=	1.81 ft.
Eccentricity From Ftg. C.L., e	= (B / 2) - X	=	0.69 ft.
Soil Pressure @ Toe	= (WT / B) * (1 + 6e/B)	=	1,267 psf.
Soil Pressure @ Heel	= (WT / B) * (1 - 6e/B)	=	119 psf.

 D E T A I L E D D E S I G N R E P O R T

STEM DESIGN: Steel Design Comb = 1.2D + 1.6L + 1.6H + 0.5R
 Shr Strength @ Base, Phi Vn = 9.45 kip

Dist From Top (ft)	d (in.)	Mu (ft-k)	Vu (kip)	As Flex. (in^2)	As Min. (in^2)	As T+S (in^2)	As Reqd (in^2)	Comb
0.60	9.00	0.02	0.08	0.001	0.001	0.259	0.259	2
1.20	9.00	0.10	0.17	0.002	0.003	0.259	0.259	2
1.80	9.00	0.24	0.29	0.006	0.008	0.259	0.259	2
2.40	9.00	0.45	0.43	0.011	0.015	0.259	0.259	2
3.00	9.00	0.76	0.59	0.019	0.025	0.259	0.259	2
3.60	9.00	1.16	0.77	0.029	0.038	0.259	0.259	2
4.20	9.00	1.68	0.96	0.042	0.056	0.259	0.259	2
4.80	9.00	2.32	1.18	0.058	0.077	0.259	0.259	2
5.40	9.00	3.10	1.42	0.077	0.103	0.259	0.259	2
6.00	9.00	4.03	1.68	0.101	0.134	0.303	0.303	2

Vertical Stem Reinforcement:

Shear-Friction Steel Added at Stem Base (ACI 08 11.6), Avf = 0.044 in^2
 Available Length for Hook Embedment into Footing = 9.50 in.
 Available Length for Straight Embedment into Stem = 70.00 in.

	Development Length		Percent Develop.	Spac. (in.)	50% Cut Off (in.)
	Straight (in.)	Hook (in.)			
#4	12.35	7.20	100.00	7.91	72.00
#5	15.43	9.00	100.00	12.26	72.00
#6	18.52	10.80	87.93	15.30	72.00
#7	27.01	12.61	75.37	17.88	72.00
#8	30.87	14.41	65.95	18.00	72.00
#9	34.82	16.25	58.46	18.00	72.00
#10	41.49	18.30	51.93	18.00	72.00
#11	51.14	20.31	46.77	18.00	72.00

Horizontal Stem Reinforcement:

Area of steel for Shrinkage and Temp. Reinforcement = 0.288 in^2

	-----Spacing, in.-----		-----Total Bars-----	
	I.F. Only	EA. Face	I.F. Only	EA. Face
#4	8.33	16.67	10.00	6.00
#5	12.92	18.00	7.00	5.00
#6	18.00	18.00	5.00	5.00
#7	18.00	18.00	5.00	5.00
#8	18.00	18.00	5.00	5.00
#9	18.00	18.00	5.00	5.00
#10	18.00	18.00	5.00	5.00
#11	18.00	18.00	5.00	5.00

TOE DESIGN:

- * Steel Design Comb. = $0.9D + 1.6W + 1.6H$
- * Thickness Design Comb. = $0.9D + 1.6W + 1.6H$
- * Available Length for Hook Embedment into Stem = 9.50 in.
- * Available Length for Straight Embed. into Toe = 16.00 in.

d (in.)	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	As Flex. (in ²)	As Min. (in ²)	As T+S (in ²)	As Req'd (in ²)
9.00	1.72	1.22	9.45	0.043	0.057	0.259	0.259

	Development Length			
	Straight (in.)	Hook (in.)	Percent Develop.	Spac. (in.)
#4	12.35	7.20	100.00	9.26
#5	15.43	9.00	100.00	14.35
#6	18.52	10.80	86.38	17.60
#7	27.01	12.61	59.24	16.45
#8	30.87	14.41	51.83	18.00
#9	34.82	16.25	45.95	18.00
#10	41.49	18.30	38.56	18.00
#11	51.14	20.31	31.28	18.00

HEEL DESIGN:

- * Steel Design Comb. = $1.2D + 1.6L + 1.6H + 0.5R$
- * Thickness Design Comb. = $0.9D + 1.6W + 1.6H$
- * Available Length for Straight Embedment into Toe = 28.00 in.
- * Available Length for Straight Embedment into Heel = 28.00 in.

d (in.)	Mu (ft-k)	Vu (kip)	Phi Vn (kip)	As Flex. (in ²)	As Min. (in ²)	As T+S (in ²)	As Req'd (in ²)
9.00	2.57	1.76	9.45	0.064	0.085	0.259	0.259

	Development Length			
	Straight (in.)	Hook (in.)	Percent Develop.	Spac. (in.)
#4	12.35	7.20	100.00	9.26
#5	15.43	9.00	100.00	14.35
#6	18.52	10.80	100.00	18.00
#7	27.01	12.61	100.00	18.00
#8	30.87	14.41	90.70	18.00
#9	34.82	16.25	80.41	18.00
#10	41.49	18.30	67.48	18.00
#11	51.14	20.31	54.75	18.00

LONGITUDINAL FOOTING REINFORCEMENT (TEMP & SHRINK ONLY):

	Spacing (in.)
#4	9.26
#5	14.35
#6	20.37
#7	27.78
#8	36.57
#9	46.30
#10	58.80
#11	72.22

CITRUS COUNTY SOLID WASTE MANAGEMENT DIVISION

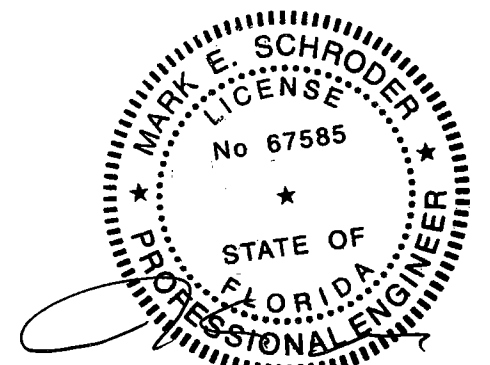
CENTRAL LANDFILL PHASE 3 EXPANSION PROJECT BOX CULVERT AND HEADWALLS

DRAWING INDEX

<u>DRAWING NO.</u>	<u>DRAWING TITLE</u>
1	COVER SHEET
2	BOX CULVERT DATA
3	BOX CULVERT - INDEX 289, SHEET 1
4	BOX CULVERT - INDEX 289, SHEET 2
5	BOX CULVERT - INDEX 289, SHEET 3
6	BOX CULVERT - INDEX 289, SHEET 5
7	24" RCP HEADWALL DETAILS

Kings Bay Engineering

FL Certificate #28555
9478 W Marquette Lane
Crystal River, FL 34428
(352) 564-8017



Mark E. Schroder, P.E.
Florida License #67585
DATE: JAN 11 2011

BOX CULVERT DATA TABLES

BOX, HEADWALL AND CUTOFF WALL DATA TABLE (inches unless shown otherwise)																				Table Date 7-01-09	
LOCATION	STRUCTURE / BRIDGE NUMBER	BOX									HEADWALL AND CUTOFF WALL										
		Wc(ft)	Hc(ft)	Tt	Tw	Tb	Ti	#cells	Lc(ft)	Cover	Blhw	Hlhw	Brhw	Hrhw	Blcw	Hlcw	Brcw	Hrcw	SL(deg)	SR(deg)	
PHASE 3	BC1	10	3	12	12	12	na	1	32	2	16	21	16	21	12	24	12	24	0	0	

LEFT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise)																		Table Date 7-01-09	
STRUCTURE / BRIDGE NUMBER	LEFT END WINGWALL									LEFT BEGIN ENDWALL									
	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	
BC1	15	16	60	14	90	26.57	4.75	4.75	10.42	15	16	60	14	90	26.57	4.75	4.75	10.42	

RIGHT SIDE WINGWALLS DATA TABLE (inches unless shown otherwise)																		Table Date 7-01-09	
STRUCTURE / BRIDGE NUMBER	RIGHT END WINGWALL									RIGHT BEGIN ENDWALL									
	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	Rt	Rw	Rh	Rd	SW(deg)	β(deg)	He(ft)	Hs(ft)	Lw(ft)	
BC1	15	16	60	14	90	26.57	4.75	4.75	10.42	15	16	60	14	90	26.57	4.75	4.75	10.42	

ESTIMATED CONCRETE QUANTITIES (CY)																						Table Date 7-01-09	
STRUCTURE / BRIDGE NUMBER	BOX							LEFT END WINGWALL			LEFT BEGIN WINGWALL			RIGHT END WINGWALL			RIGHT BEGIN WINGWALL			Culvert Total			
	Left Cutoff Wall	Right Cutoff Wall	Bottom Slab	Walls	Top Slab	Left Head Wall	Right Head Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall	Sub Total	Footing	Wall		Sub Total		
BC1	0.44	0.44	15.56	7.11	14.22	0.44	0.44	38.73	3.41	2.76	6.18	3.41	2.76	6.18	3.41	2.76	6.18	3.41	2.76	6.18	63.45		

MAIN STEEL REINFORCEMENT SPACING (inches)																			Table Date 7-01-09	
STRUCTURE / BRIDGE NUMBER	BOX															HEADWALLS		CUTOFF WALLS		
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115, 116...	803	806	809	812	
BC1	8	8	8	8	8	8	na	12	12	12	12	12	12	12	na	10	10	15	15	

WINGWALL STEEL REINFORCEMENT SPACING (inches)																									Table Date 7-01-09			
STRUCTURE / BRIDGE NUMBER	LEFT END WINGWALL					LEFT BEGIN WINGWALL					RIGHT END WINGWALL					RIGHT BEGIN WINGWALL												
	401 (407(B))	402 (403)	404 (405)	406	409	410	411	501 (507(B))	502 (503)	504 (505)	506	509	510	511	601 (607(B))	602 (603)	604 (605)	606	609	610	611	701 (707(B))	702 (703)	704 (705)	706	709	710	711
BC1	10	12	12	12	10	10	10	10	12	12	12	10	10	10	10	12	12	12	10	10	10	10	12	12	12	10	10	10

WINGWALL NOTE: Bar designations in "()" are only required for variable height wingwalls.

MAIN STEEL REINFORCING SIZE																			TABLE BY MES	
STRUCTURE / BRIDGE NUMBER	BOX															HEADWALLS		CUTOFF WALLS		
	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	803	806	809	812	
BC1	5	5	5	5	5	5	na	4	4	4	4	4	4	4	na	3	3	3	3	

WINGWALL STEEL REINFORCING SIZE																									TABLE BY MES			
STRUCTURE / BRIDGE NUMBER	LEFT END WINGWALL					LEFT BEGIN WINGWALL					RIGHT END WINGWALL					RIGHT BEGIN WINGWALL												
	401	402	404	406	409	410	411	501	502	504	506	509	510	511	601	602	604	606	609	610	611	701	702	704	706	709	710	711
BC1	5	4	4	4	3	3	3	5	4	4	4	3	3	3	5	4	4	4	3	3	3	5	4	4	4	3	3	3

NOTES:

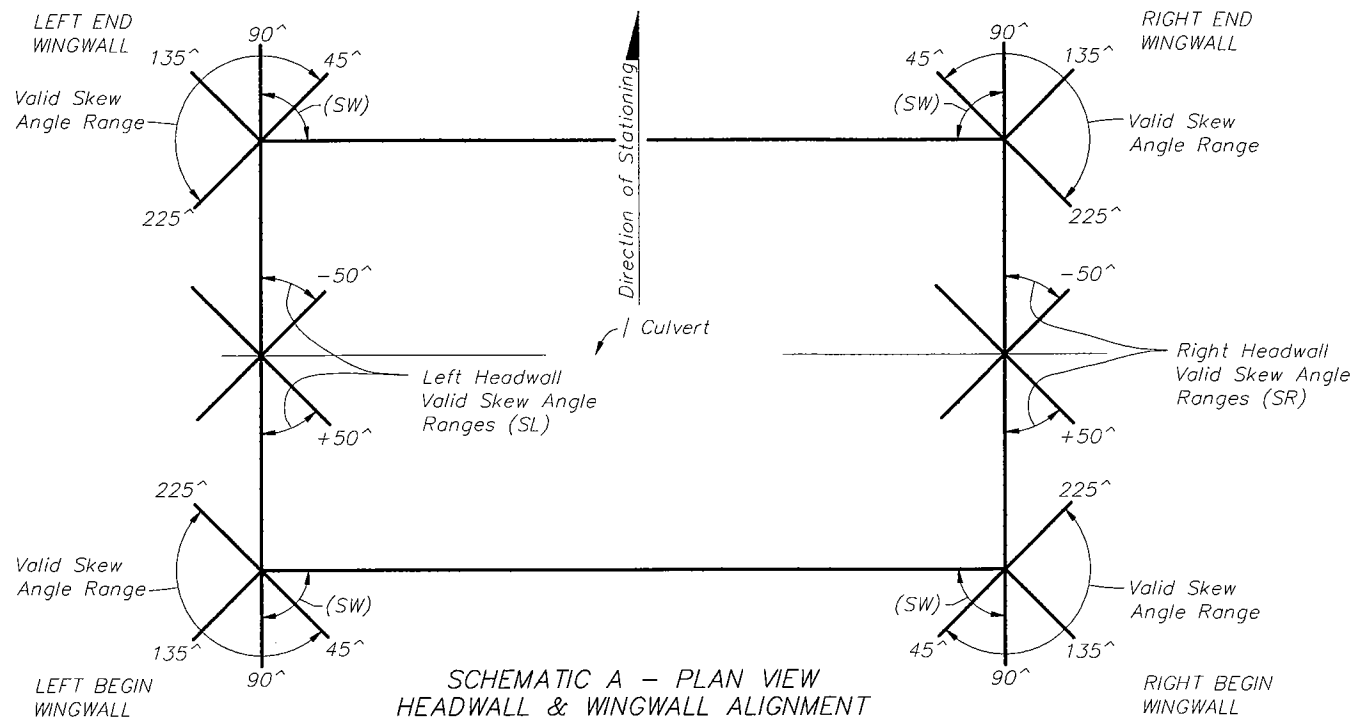
1. Environmental Class : 1
2. Reinforcing Steel, Grade : 60
3. Concrete Class : 11 $f'c = : 3.4 \text{ ksi}$
4. Soil Properties:
Friction Angle : 32
Modulus of Subgrade Reaction : 9
Nominal Bearing Resistance : 2,000psi
5. Total Estimated Quantity of Reinforcing Steel : n/a lbs
6. Work this Drawing with Design Standards Index No. 289 and Sheet Nos. : 1, 2, 3 & 5
7. n/a

ENGINEER'S NOTES:

1. THE DESIGN HAS BEEN PERFORMED USING THE FDOT LFRD BOX CULVERT DESIGN SOFTWARE.
2. SINCE NO SOIL DATA WAS PROVIDED THIS DESIGN CONSIDERS THE FOLLOWING SOIL CONDITIONS:
 - 2.1. MAXIMUM BEARING CAPACITY OF 2,000PSF;
 - 2.2. ENVIRONMENTAL CLASS 1 OR SLIGHTLY AGGRESSIVE SOIL
5. REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BILLET STEEL
6. MINIMUM 2 INCH STEEL COVER REQUIRED, 3 INCHES WHERE SURFACE WILL BE IN CONTACT WITH SOIL.
7. ALL STEEL INTERSECTIONS SHALL BE TIED.
8. MINIMUM SPLICE LENGTH SHALL BE 30 INCHES.
9. MINIMUM BENDING RADIUS IS 5 INCHES.
10. CONCRETE SHALL BE CLASS 11 - 3,400 PSI 28 DAY MINIMUM STRENGTH.
11. THE CONTRACTOR IS PERMITTED TO USE CONCRETE WITH A MAXIMUM 7 INCH SLUMP WITH THE USE OF A HIGH RANGE WATER REDUCER.
12. NO CHANGES MAY BE MADE TO THIS DESIGN WITHOUT CONSULTING THE DESIGN ENGINEER INCLUDING BUT NOT LIMITED TO ADDITIONAL STEEL, LARGER STEEL THAN SPEC'D, STRONGER CONCRETE THAN SPEC'D AND THICKER CROSS-SECTIONS.

Mark E. Schroder
 Mark E. Schroder, P.E.
 Florida License #67585
 DATE: JAN 11 2011

REVISION:	DATE:	BY:	JOB NUMBER:
(1) Issued for County Permit	12/10/10	MES	10-14
Kings Bay Engineering Ft. Lauderdale 33305 9478 W. Marquette Lane Coral Springs, FL 33067 (954) 566-8017			
BOX CULVERT DATA			
TITLE:			
JOB NAME: CC CENTRAL LANDFILL PHASE III EXPANSION PROJECT			
SHEET	2		OF 7



NOTE: All headwall and culvert skew angles are measured in degrees from a line perpendicular to the centerline of culvert (counter-clockwise positive), see Schematic B.

GENERAL NOTES:

DESIGN SPECIFICATIONS: AASHTO LRFD Bridge Design Specifications, 3rd Edition.

LIVE LOAD: HL-93.

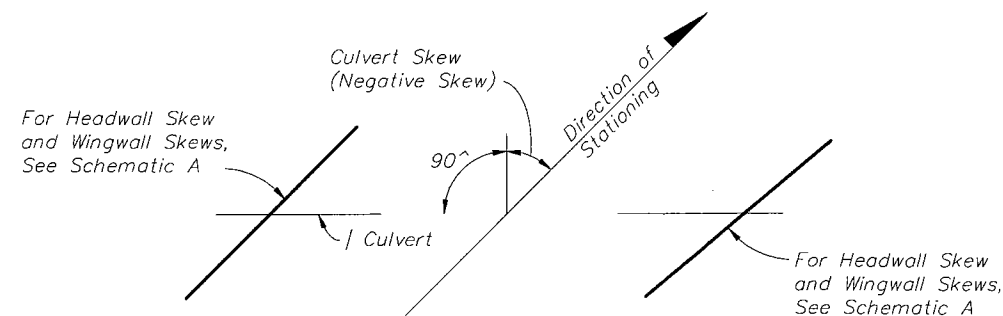
CONSTRUCTION LOADING: It is the construction Contractor's responsibility to provide for supporting construction loads that exceed AASHTO HL-93, and any construction load applied prior to 2 feet of compacted fill placed above the top slab.

SURFACE FINISH: All concrete surfaces shall receive a general surface finish.

SKewed CONSTRUCTION JOINTS: Construction joints in barrels of culverts with skewed wingwalls may be placed parallel to the headwalls and the reinforcing steel, and the slabs may be cut provided that the cut reinforcing steel extends beyond the construction joint enough for splices to be made in accordance with Table 1 on this sheet. The cost of construction joints and additional reinforcing shall be at the expense of the Contractor.

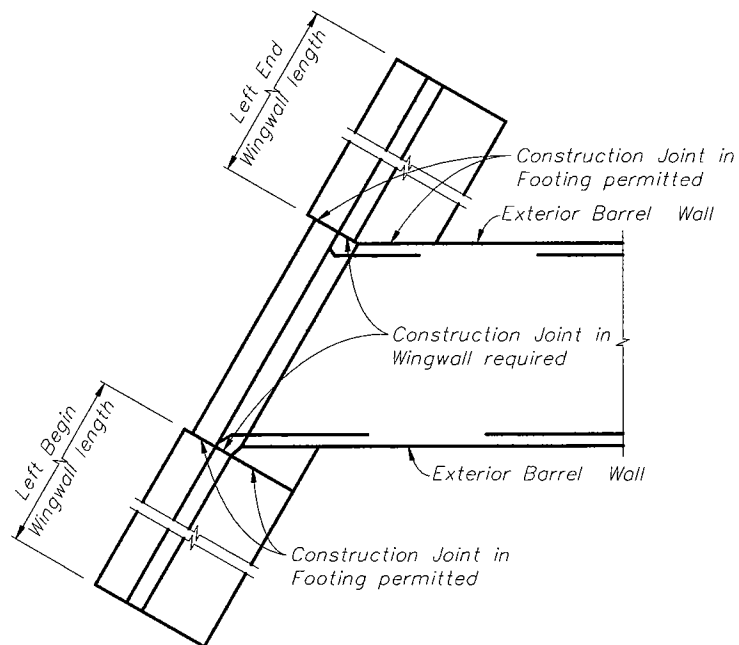
CULVERT EXTENSIONS: For cut backs and ties into existing concrete box culverts see Sheet 6 of 7.

REINFORCING STEEL: ASTM A615, see the Box Culvert Data Tables in the Contract Plans for grade and bar spacing. See the Reinforcing Bar List in the Contract Plans for bar sizes and bar bending details.



SCHEMATIC B - PLAN VIEW CULVERT ALIGNMENT

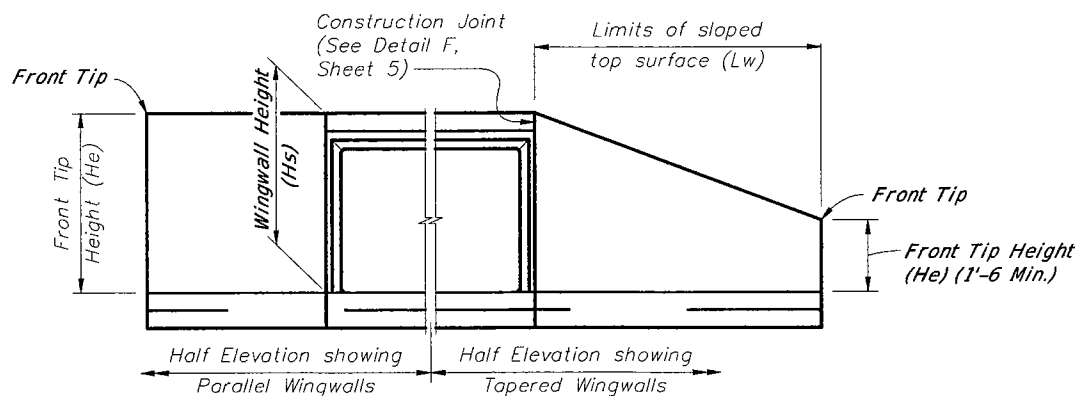
NOTE: For Culvert Skew see Contract Plans.



PART PLAN SHOWING PARALLEL WINGWALLS AND LOCATION OF CONSTRUCTION JOINTS

NOTE:

Construction Joints in wingwalls and footings are located as follows: For non-skewed wingwalls they are located adjacent to the exterior face of the exterior barrel wall; when the angle of wingwall and angle of exterior barrel wall results in an acute angle see Left End Wingwall above, and when the angle is obtuse see Left Begin Wingwall above and Detail C (Sheet 5).



END ELEVATION OF CULVERT

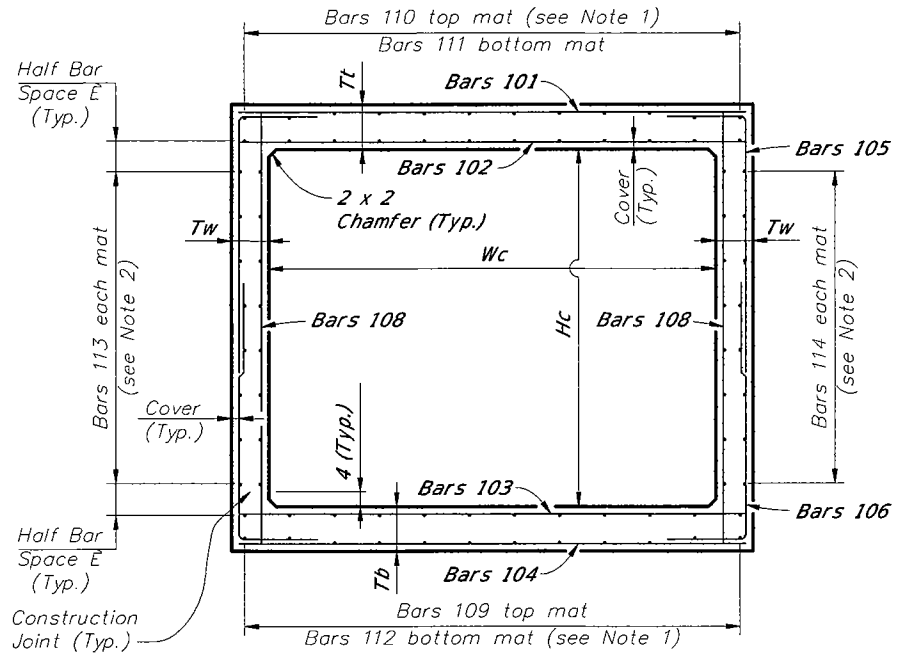
BAR SIZE	SPLICE (CLASS B)		BAR SIZE	SPLICE (CLASS B)	
	CLASS II (3400 psi)	CLASS IV (5500 psi)		CLASS II (3400 psi)	CLASS IV (5500 psi)
#3	1'-0	1'-0	#8	3'-6	2'-9
#4	1'-4	1'-4	#9	4'-5	3'-6
#5	1'-8	1'-8	#10	6'-7	4'-5
#6	1'-11	1'-11	#11	7'-10	6'-5
#7	2'-8	2'-3			

TABLE 1 NOTE: Splice lengths are based on an AASHTO Class B tension lap splice for the Specification Section 346 concrete class shown.

THIS SHEET IS AN EXACT REPRODUCTION OF THE SHEET FROM THE FDOT 2010 DESIGN STANDARDS INDEX 289 AS PROVIDED BY THE FDOT. SOME REFERENCES TO MULTIPLE BARREL CULVERTS HAVE BEEN REMOVED FOR CLARITY.

Mark E. Schroeder, P.E.
Florida License #67585
DATE: JAN 11 2011

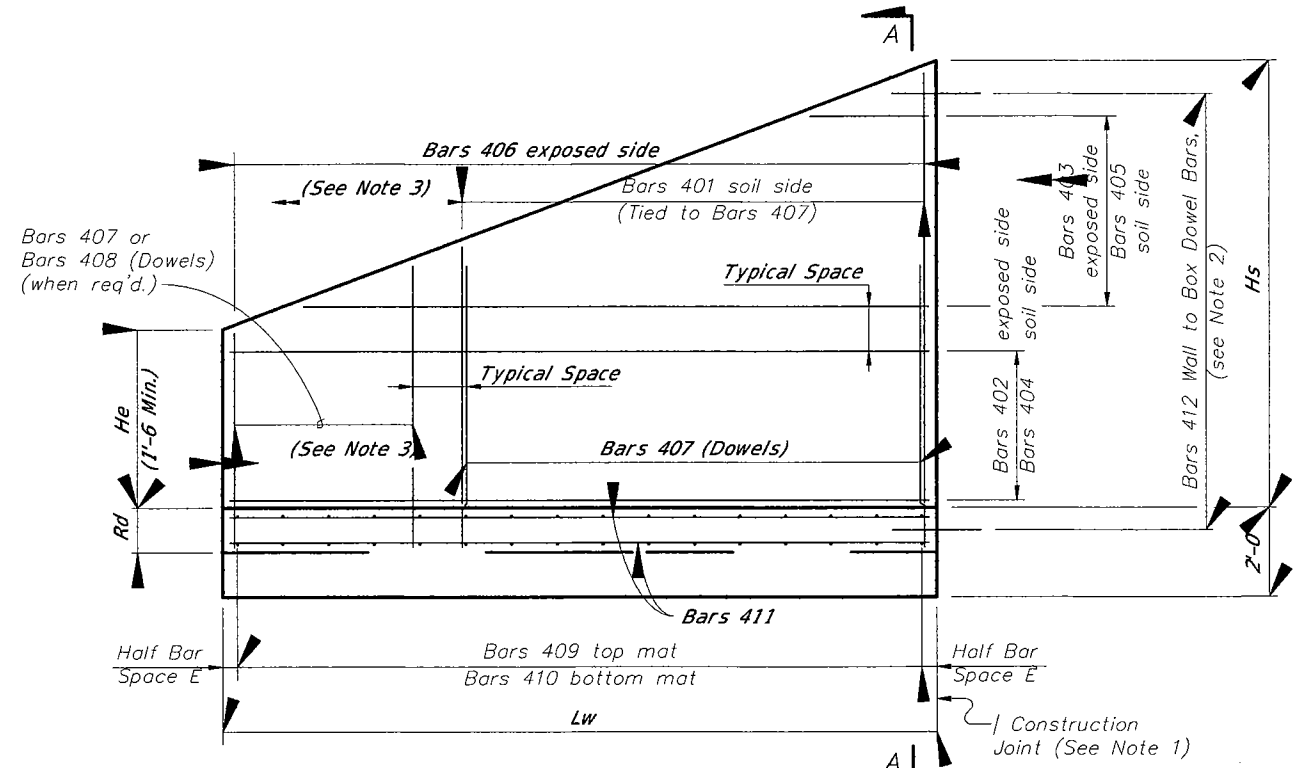
REVISION: 1) Issued for County Permit	DATE: 12/1/10	DESIGNED BY: MES	JOB NUMBER: 10-154
Kings Bay Engineering FL Certificate #28285 9478 W. Mangrove Lane Coral Gables, FL 33134 (305) 564-8017			
TITLE: BOX CULVERT - INDEX 289, SHEET 1			
JOB NAME: CC CENTRAL LANDFILL PHASE III EXPNSION PROJECT			
SHEET 3	OF 7		



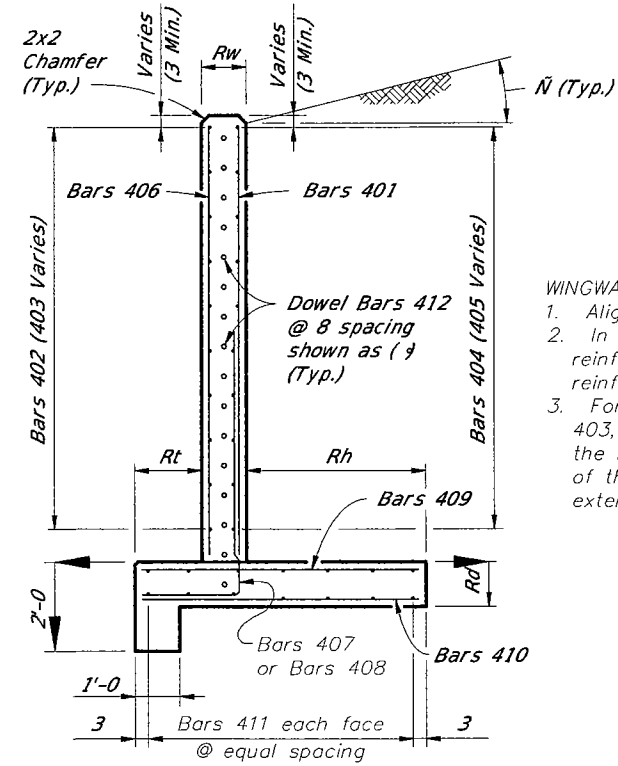
TYPICAL SECTION THRU SINGLE BARREL CULVERT

CULVERT BARREL NOTES:

1. Space Bars 110 and 112 with a bar in each corner, and at the 1/2 of interior walls (for multiple barrel culverts only), and the remaining bars placed at equal spacing shown in the Contract Plans. Adjust last bar spacing when required.
2. Place Bars 113 and 114 at spacing shown in the Contract Plans evenly between Bars 109 and 111.
3. Locate the first transverse bar from the ends of the culvert at one half the bar spacing, but provide the minimum reinforcement cover and not greater than 4 clear.



WINGWALL ELEVATION - Variable Height
(Left End shown - other corners similar)



WINGWALL SECTION A-A

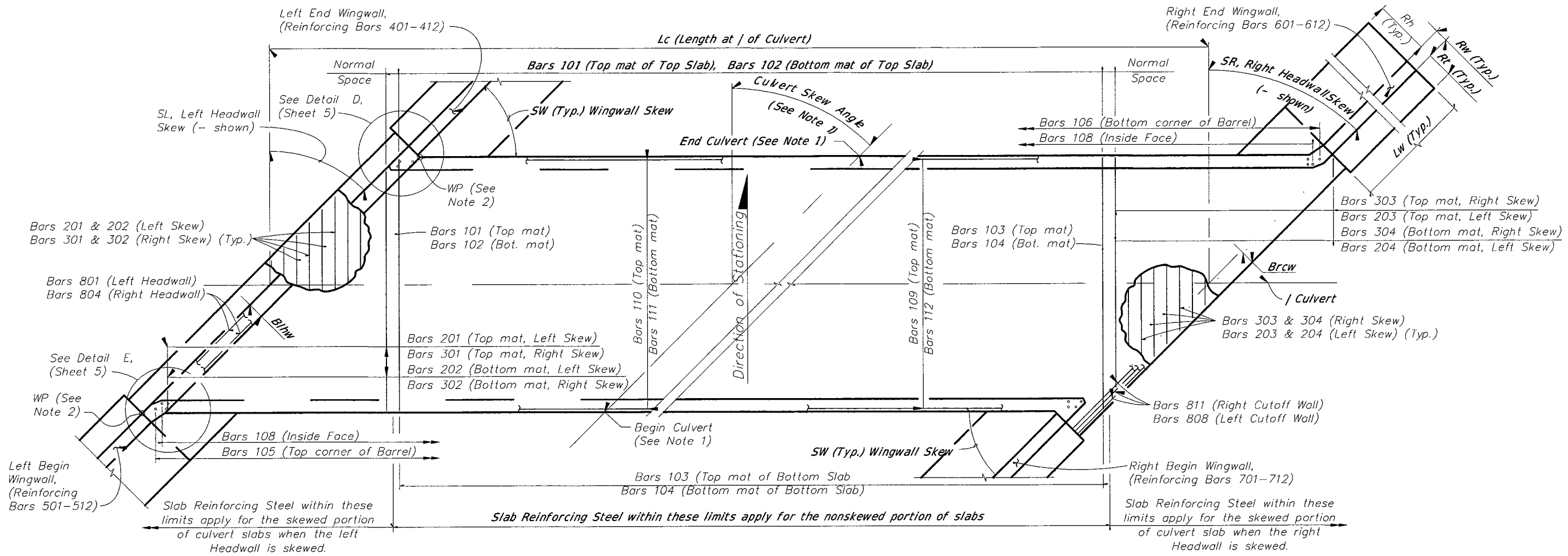
WINGWALL NOTES:

1. Align construction joint perpendicular to wingwall.
2. In the vicinity of the construction joint, field bend reinforcement as necessary to maintain minimum reinforcement cover.
3. For constant height wingwalls, variable length Bars 403, 405 & 408 are not required, and as such the limits of Bars 401 & 407 extend the full length of the wingwall, and the limits of Bars 402 & 404 extend to the full height of the wingwall.

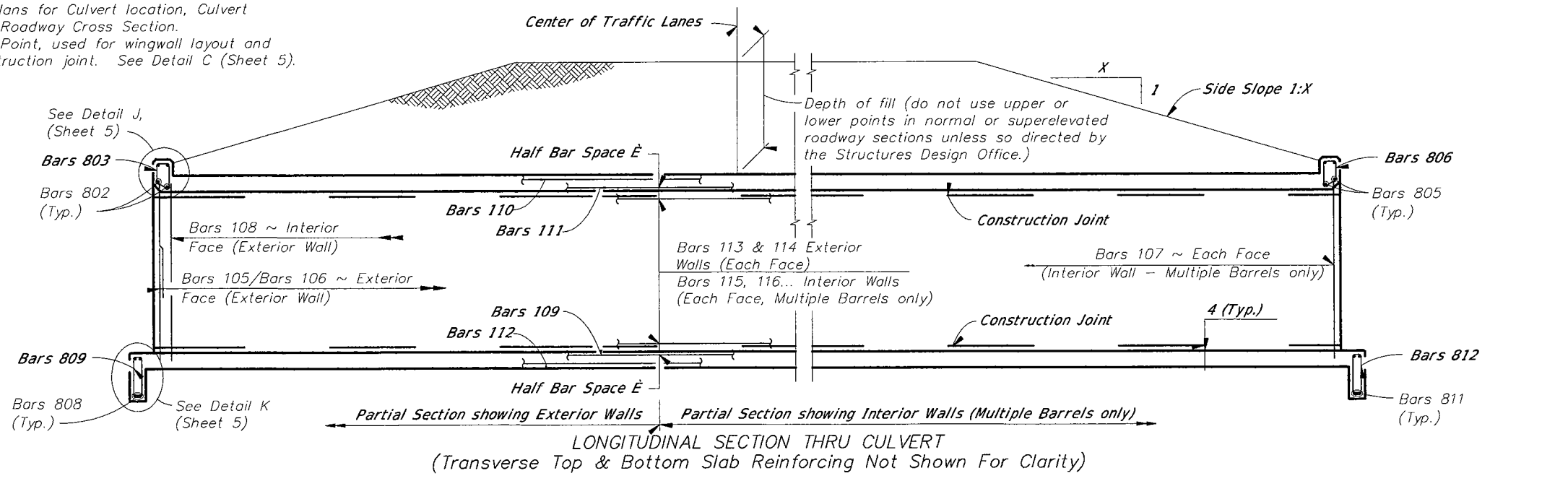
Mark E. Schroder, P.E.
Florida License #67585
DATE: JAN 11 2011

THIS SHEET IS AN EXACT REPRODUCTION OF THE SHEET FROM THE FDOT 2010 DESIGN STANDARDS INDEX 289 AS PROVIDED BY THE FDOT. SOME REFERENCES TO MULTIPLE BARREL CULVERTS HAVE BEEN REMOVED FOR CLARITY.

REVISION:	DATE:	DATE:	DATE:
1) Based on County Permit	12/1/10	12/1/10	12/1/10
DRAWN BY: MES		JOB NUMBER: 10-154	
Kings Bay Engineering FL Certificate #26855 9478 W. Marquette Lane Cape Coral, FL 33914 (813) 566-8017			
TITLE: BOX CULVERT - INDEX 289, SHEET 2			
JOB NAME: CC CENTRAL LANDFILL PHASE III EXPNSION PROJECT			
SHEET:	OF 7		
4			



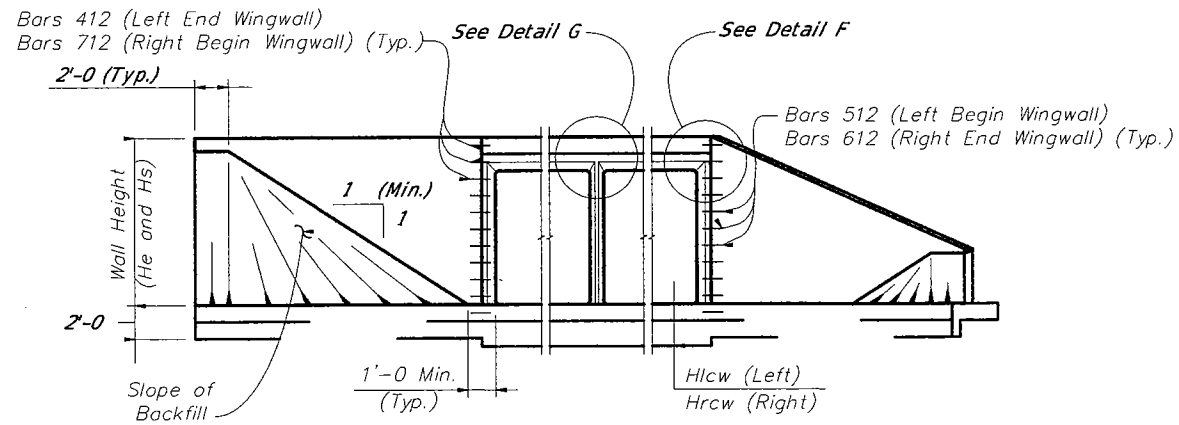
- NOTES:**
1. See Contract Plans for Culvert location, Culvert Skew Angle and Roadway Cross Section.
 2. WP = Working Point, used for wingwall layout and location of construction joint. See Detail C (Sheet 5).



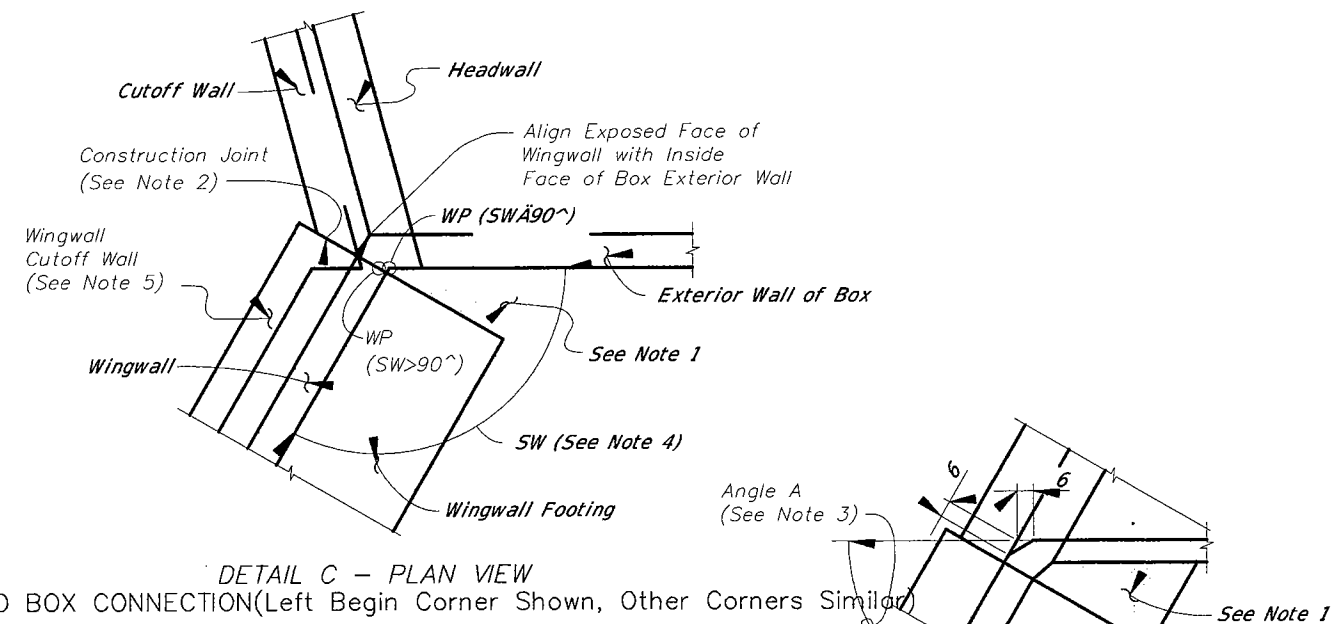
THIS SHEET IS AN EXACT REPRODUCTION OF THE SHEET FROM THE FDOT 2010 DESIGN STANDARDS INDEX 289.45 PROVIDED BY THE FDOT. SOME REFERENCES TO MULTIPLE BARREL CULVERTS HAVE BEEN REMOVED FOR CLARITY.

Mark E. Schroder, P.E.
 Florida License #67585
 DATE: JAN 11 2011

REVISION:	DATE:	BY:	JOB NUMBER:
(1) Issued for County Permit	12/1/10	MES	10-154
Kings Bay Engineering			
P.O. Box 10000 9478 W. Kings Bay Blvd. Orlando, FL 32817 (321) 564-8017			
TITLE: BOX CULVERT - INDEX 289, SHEET 3			
JOB NAME: CC CENTRAL LANDFILL PHASE III EXPANSION PROJECT			
SHEET	OF 7		

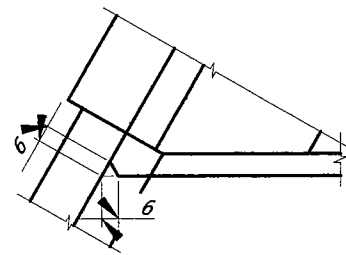


END ELEVATION
(Showing Constant Height And Variable Height Wingwalls)

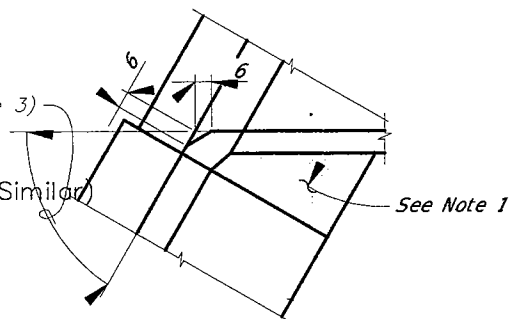


DETAIL C - PLAN VIEW

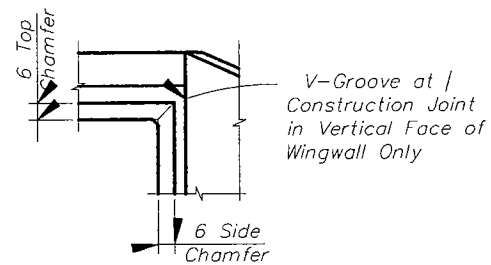
TO BOX CONNECTION (Left Begin Corner Shown, Other Corners Similar)



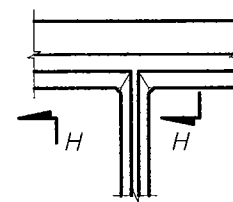
DETAIL D



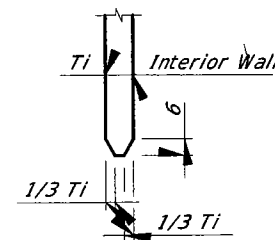
DETAIL E



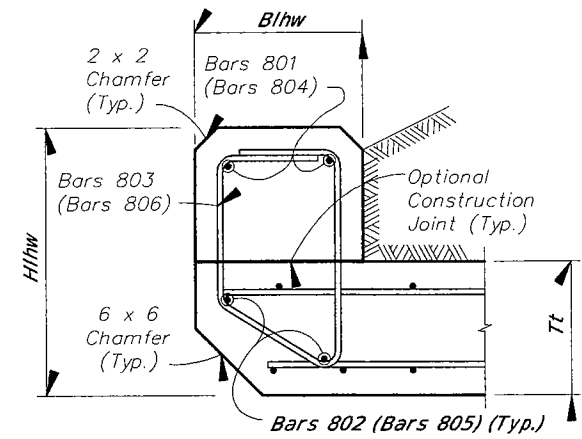
DETAIL F



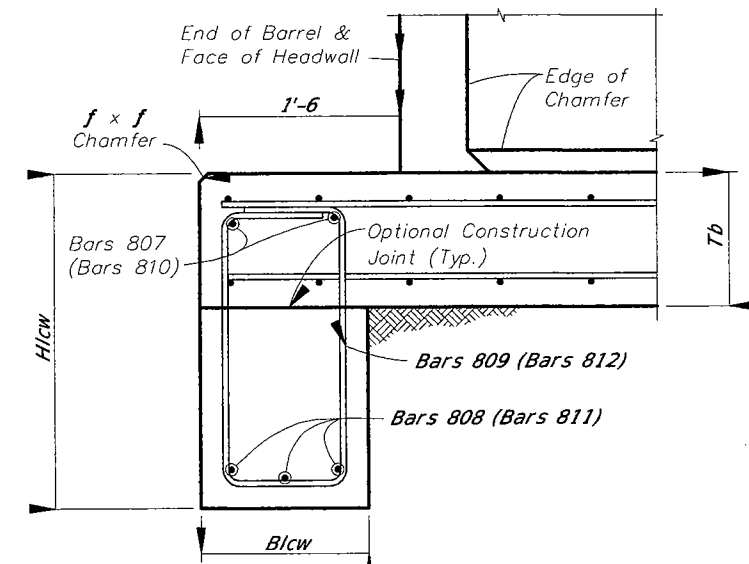
DETAIL G



SECTION H-H



DETAIL J
LEFT HEADWALL SECTION (Right Headwall similar)



DETAIL K
LEFT CUTOFF WALL SECTION (Right Cutoff Wall similar)

NOTES:

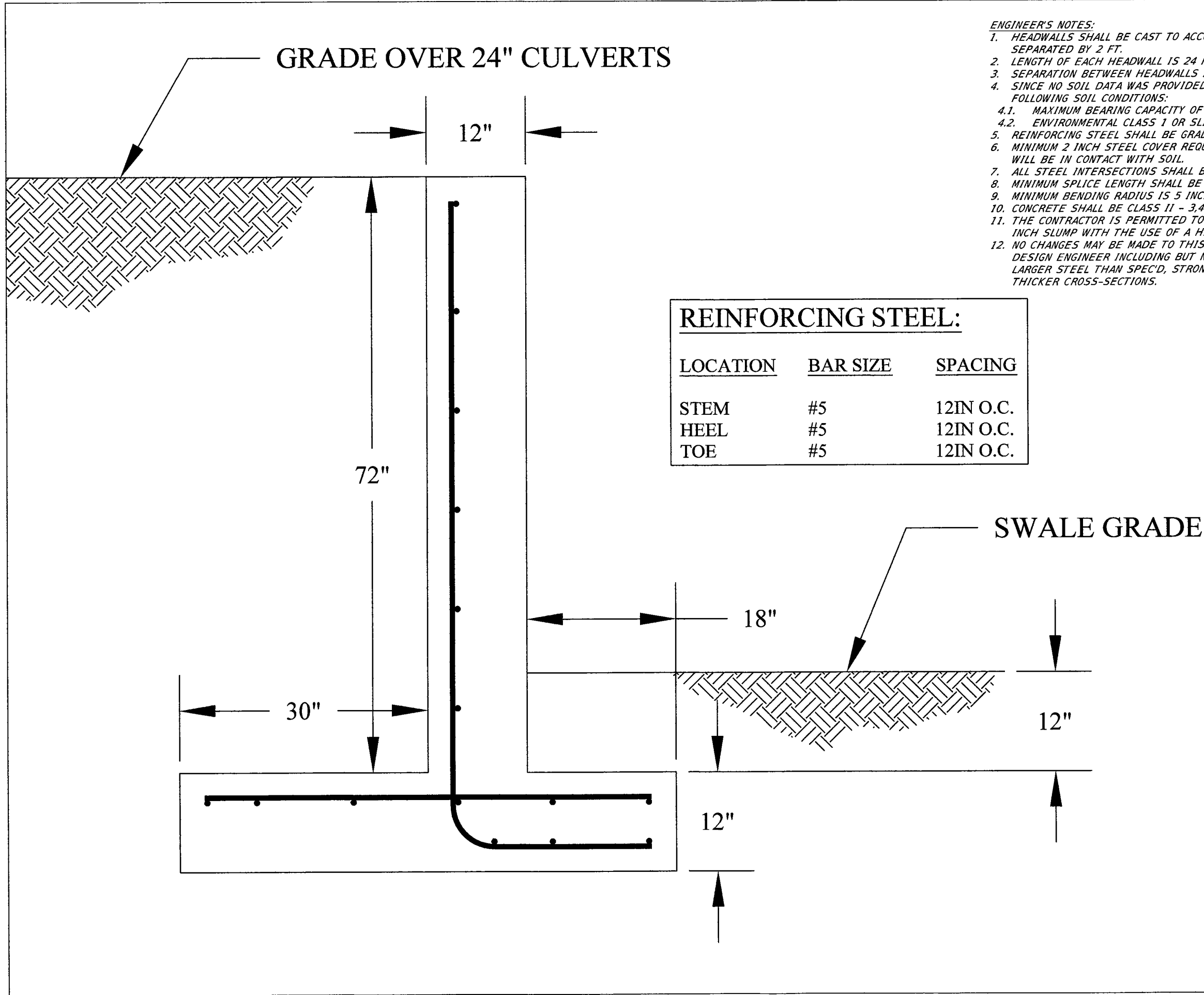
- For small angles, the Contractor may elect to fill the area between the box and the wingwall footing with unreinforced concrete. For wingwall skew angles less than 90 degrees, field bend wingwall reinforcement as necessary while maintaining cover. No additional payment will be made for this work.
- Location of Construction Joint determined by WP at theoretical intersection of:
 - Soil side face of Headwall and outside face of Box Exterior Wall, for $SW < 90^\circ$;
 - Outside face of Wingwall and outside face of Box Exterior Wall, for $SW > 90^\circ$.
- Provide 6 chamfer when angle A is greater than 45° . Maintain minimum wall thickness. Field adjust reinforcing to maintain cover.
- Wingwall Skew Angles (SW) are measured from the adjacent box exterior wall to the wingwall.
- Turn or extend Wingwall Cutoff Wall as necessary to meet Box Cutoff Wall.
- Provide additional reinforcement in the top of the top slab below traffic railings to ensure a minimum area of 0.80 sq. in./ft. transverse reinforcing.

CROSS REFERENCE:
See Sheet 3 for locations of Details D, E, J & K.
See Sheet 4 for locations of Detail C.

THIS SHEET IS AN EXACT REPRODUCTION OF THE SHEET FROM THE FDOT 2010 DESIGN STANDARDS INDEX 289.45 PROVIDED BY THE FDOT. SOME REFERENCES TO MULTIPLE BARREL CULVERTS HAVE BEEN REMOVED FOR CLARITY.

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Florida License #67585
DATE: JAN 11 2011

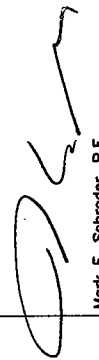
REVISION: 1) Issued for County Permit	DATE: 12/1/10	BY: MIES	JOB NUMBER: 10-154
Kings Bay Engineering FL Certificate #0805 9478 W. Mangrove Lane Coral Gables, FL 33134 (305) 554-8017			
TITLE: BOX CULVERT - INDEX 289, SHEET 5			
JOB NAME: CC CENTRAL LANDFILL PHASE III EXPANSION PROJECT			
SHEET: 6	OF 7		



- ENGINEER'S NOTES:**
- HEADWALLS SHALL BE CAST TO ACCOMMODATE 24" RCP CULVERTS SEPARATED BY 2 FT.
 - LENGTH OF EACH HEADWALL IS 24 FT.
 - SEPARATION BETWEEN HEADWALLS IS 35 FT.
 - SINCE NO SOIL DATA WAS PROVIDED THIS DESIGN CONSIDERS THE FOLLOWING SOIL CONDITIONS:
 - MAXIMUM BEARING CAPACITY OF 2,000PSF;
 - ENVIRONMENTAL CLASS 1 OR SLIGHTLY AGGRESSIVE SOIL
 - REINFORCING STEEL SHALL BE GRADE 60 DEFORMED BILLET STEEL
 - MINIMUM 2 INCH STEEL COVER REQUIRED, 3 INCHES WHERE SURFACE WILL BE IN CONTACT WITH SOIL.
 - ALL STEEL INTERSECTIONS SHALL BE TIED.
 - MINIMUM SPLICE LENGTH SHALL BE 30 INCHES.
 - MINIMUM BENDING RADIUS IS 5 INCHES.
 - CONCRETE SHALL BE CLASS II - 3,400 PSI 28 DAY MINIMUM STRENGTH.
 - THE CONTRACTOR IS PERMITTED TO USE CONCRETE WITH A MAXIMUM 7 INCH SLUMP WITH THE USE OF A HIGH RANGE WATER REDUCER.
 - NO CHANGES MAY BE MADE TO THIS DESIGN WITHOUT CONSULTING THE DESIGN ENGINEER INCLUDING BUT NOT LIMITED TO ADDITIONAL STEEL, LARGER STEEL THAN SPEC'D, STRONGER CONCRETE THAN SPEC'D AND THICKER CROSS-SECTIONS.

REINFORCING STEEL:

LOCATION	BAR SIZE	SPACING
STEM	#5	12IN O.C.
HEEL	#5	12IN O.C.
TOE	#5	12IN O.C.


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 Florida License #67585
 DATE: JAN 11 2011

REVISION: (1) Issued for County Permit
DATE: 12/1/10
DRAWN BY: MES
JOB NUMBER: 10-154
Kings Bay Engineering
 FL Certificate #28835
 9478 W. Mangrove Lane
 Clearwater, FL 34617
 (813) 564-8017
TITLE: 24" RCP HEADWALL DETAILS
JOB NAME: CC CENTRAL LANDFILL
 PHASE III EXPNSION PROJECT
SHEET: 7 OF 7

SECTION 14 CONSTRUCTION PHOTOGRAPHS

In accordance with Specific Condition B.3.a.6) of the Construction Permit Number 21375-013-SC/01 for the Citrus County Central Class I Landfill Phase 3 Expansion Construction, please refer to Attachment 13-1 which contains a compact disc of photographs that are representative of construction activities as work progressed during completion of the project. In addition, Attachment 3-2 of this report includes copies of the SCS Monthly Progress Reports which also contains copies of photographs that are representative of construction activities as work progressed during completion of the project.

Attachment 14-1

Compact Disc Containing Construction Photographs

ATTENTION



A CD CONTAINING PHOTOS IS ALSO AVAILABLE WITH THIS REPORT

- To view this cd please contact:

State of Florida
Department of Environmental Protection
Solid Waste Program
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926
Phone: (813) 632-7600