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**CONSTRUCTION CERTIFICATION REPORT  
FOR  
LINER SYSTEM REPAIR - PHASE II**

**LINCOLN COUNTY LANDFILL  
PERMIT NO. 55-03  
CROUSE, NORTH CAROLINA  
S&ME Project No. 1356-11-030**

Prepared for:



**North Carolina Department of Environment and Natural Resources  
Division of Waste Management – Solid Waste Section  
2090 U.S. Highway 70  
Swannanoa, NC 28778**

Prepared by:



**S&ME, Inc.  
9751 Southern Pine Blvd  
Charlotte, North Carolina 28273**

November 9, 2011



November 9, 2011

North Carolina Department of Environment and Natural Resources  
Division of Waste Management  
Solid Waste Section  
2090 U.S. Highway 70  
Swannanoa, NC 28778

Attention: Mr. Larry Frost  
Regional Engineer

**Reference: CONSTRUCTION CERTIFICATION REPORT  
LINER SYSTEM REPAIR, PHASE II**  
Lincoln County Landfill, Permit No. 55-03  
Crouse, North Carolina  
S&ME Project No. 1356-11-030

Dear Mr. Frost:

S&ME, Inc. (S&ME) is pleased to submit this Construction Certification Report to the North Carolina Department of Environment and Natural Resources (NCDENR) for the liner system damage repair in Phase II of the Lincoln County Landfill (LCLF). The Certification Statement provided in Attachment 1 certifies that the project has been completed in general accordance with the project specifications. This report summarizes the field observation services performed by S&ME during liner system repair activities performed by GSI Construction, Inc. (GSI) on October 12, 2011.

## **PROJECT INFORMATION**

On October 4, 2011, the liner system in Phase II of the LCLF was damaged by an operator working on the operations/interim cover soil. On that same day, Mr. Mark Bivins of Lincoln County notified NCDENR by phone and contacted S&ME to assess damage to the liner system.

As requested by Lincoln County, on October 4, 2011 Mr. William Harrison, P.E., of S&ME travelled to LCLF and assessed liner system damage. The assessment indicated that all three geosynthetic layers of the liner system were damaged. Further, the assessment indicated that the damaged area was small and not located in an area where either leachate or stormwater would flow or accumulate. Lincoln County temporarily protected the damaged area by covering it with two tarps until the liner system was repaired on October

12, 2011. Please refer to the attached S&ME Field Report and Photos 1 through 9 dated October 4, 2011 provided in Attachment 2 for additional information.

## **LINER SYSTEM REPAIR**

On behalf of Lincoln County, S&ME contracted GSI to perform the repair work. GSI arrived on site on October 12, 2011 and completed the repair activities. Ms. Courtney Murphy, P.G., of S&ME observed the replacement of the following damaged materials with new materials.

### Geosynthetic Clay Liner (GCL)

The damaged GCL layer was repaired as documented in the S&ME Field Report and Photos 10 through 13 dated October 12, 2011 included in Attachment 3. The existing isolated damaged GCL section was removed. A new GCL section was placed in the repair area. Bentonite was sprinkled around and under the new GCL section where it overlapped the existing GCL. Repair of the GCL was performed in general accordance with the project specifications.

### Geomembrane

The damaged geomembrane was repaired as documented in the S&ME Field Report and Photos 14 through 19 dated October 12, 2011 provided in Attachment 3. The damaged geomembrane section was removed. The geomembrane repair section was placed over the damaged area and heat-tacked to the existing geomembrane. The edges of the new geomembrane and the underlying existing geomembrane were then ground to remove oxidation. Following trial seam welding and testing, the existing and new geomembrane were welded together by extrusion welding. The extrusion welded seam was then tested with a vacuum box, and no leaks were observed.

### Geocomposite

The damaged geocomposite layer was repaired as documented in the S&ME Field Report and Photos 20 and 21 dated October 12, 2011 provided in Attachment 3. The damaged section of the existing geocomposite was removed. A new geocomposite section was placed over the damaged area such that it overlapped the existing geocomposite by approximately six inches. The geocomposites were then zip tied together every six inches along the overlapped sections. A nonwoven geotextile filter fabric was then placed over the repair patch and heat tacked to the existing geocomposite.

### Protective Cover

After geosynthetic repair work was completed, approximately four feet of protective cover soil was placed over the repair area as documented in the S&ME Field Report and Photo 22 dated October 12, 2011 provided in Attachment 3.

## **CLOSURE**

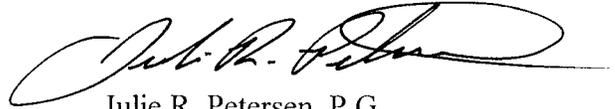
S&ME, Inc. appreciates your time in reviewing this certification letter report. If you have any questions or need additional information regarding this report, please contact us.

Respectfully submitted,

**S&ME, Inc.**



William M. Harrison, P.E.  
Staff Engineer



Julie R. Petersen, P.G.  
Project Manager

Senior Reviewed by Jason S. Reeves, P.E., Senior Engineer

### Attachments:

1. Construction Certification Statement
2. Liner System Damage Assessment Field Report (10/04/11 W. Harrison)  
Liner System Damage Assessment Photo Log (10/04/11 W. Harrison)
3. Liner System Repair Field Report (10/12/11 C. Withers)  
Liner System Repair Photo Log (10/12/11 C. Withers)
4. Select Sections of Project Specifications  
Geosynthetic Installation Forms and MQC Data (Provided by GSI)

**ATTACHMENT 1:  
CONSTRUCTION CERTIFICATION  
STATEMENT**

**CONSTRUCTION CERTIFICATION STATEMENT  
FOR  
LINCOLN COUNTY LANDFILL  
LINER SYSTEM REPAIR – PHASE II  
CERTIFICATION REPORT**

OWNER: LINCOLN COUNTY  
OPERATOR: LINCOLN COUNTY

by:

S&ME, Inc.  
9751 Southern Pine Boulevard  
Charlotte, North Carolina 28273-5560

I hereby certify that based on construction quality assurance activities conducted by S&ME Inc., as summarized in this report, the Lincoln County Landfill Phase II liner system repairs were constructed in general accordance with the requirements of the approved construction documents.



---

William M. Harrison, P.E.  
N.C. Registration No. 037883

## **ATTACHMENT 2: LINER SYSTEM DAMAGE ASSESSMENT**

- Liner System Damage Assessment Field Report (10/04/11 W. Harrison)
- Liner System Damage Assessment Photo Log (10/04/11 W. Harrison)



9751 Southern Pine Blvd  
 Charlotte, NC 28273  
 (704) 523-4726  
 (704) 525-3953

Field Report	
Date 10/04/11	Job No. N/A
Project/Location Lincoln County Landfill	
Contractor n/a	Weather/Temp Sunny / 70+
Present at Site Will Harrison-S&ME, Inc. Mark Bivins-Lincoln Cty	
Time 1500-1800	Mileage 90 mi. round trip

Services Performed	
<input type="checkbox"/> Concrete Testing	<input type="checkbox"/> Asphalt Coring
<input type="checkbox"/> Cylinder Pickup	<input type="checkbox"/> Concrete Coring
<input type="checkbox"/> Asphalt Testing	<input type="checkbox"/> Undercut Evaluation
<input type="checkbox"/> Steel Testing	<input type="checkbox"/> Foundation Evaluation
	<input type="checkbox"/> Proofrolling
	<input type="checkbox"/> In-Place Density
Landfill Liner System Damage Assessment	

**Observations/Remarks:**

Received word earlier in the day that Lincoln County Landfill (LCL) operators had damaged LCL liner system and it was requested that I travel to the site to assess the damage. Left S&ME Charlotte office for LCL at approximately approx. 1500 to assess landfill liner system damage.

Arrived at the LCL and parked vehicle at the vehicle maintenance yard. Met Mark Bivins in the vehicle maintenance building and travelled in his county vehicle to assess the liner system damage. We travelled to the perimeter of Phase II, where the liner system had been damaged. Two equipment operators (no names taken) had followed us in a separate vehicle and together with Mark Bivins pointed out the damaged area. The liner system did indeed appear to be damaged and the operators had uncovered ~1' x 1' section by hand (carefully, with shovels). They had also dug down to the liner system at two locations offset from the damaged area to assess the protective cover thickness. The damaged area is located within the limit of waste at the tie in of interim cover and the perimeter berm (Mark Bivins located the damaged area on a site map I brought along and it is apparently on the west perimeter of Phase II). Observed that the area tributary to the damaged area was covered with interim cover and that the damaged area was sloped in such a way that leachate would not flow to it or pond over it.

Expressed that it was good that the operators had noticed the damage and that repair work would be probably be a straightforward process. Discussed that during the repair process, Lincoln County will probably want to expose the liner system a few feet on either side of the damaged area to evaluate the integrity of adjacent area.

As Mark Bivins and I left the site to travel back to the vehicle maintenance yard, I noted that storm water channel was badly eroded and that repairs should be made. Mark Bivins explained that the erosion was caused by a few days of heavy rainfall and said that channel repair work was scheduled later this year.

Left LCL at approximately 1700. Called Ken Daly immediately after leaving site and described my observations. Arrived back at office at approximately 1800.

ATTACHMENTS

- Photos
- Site Map

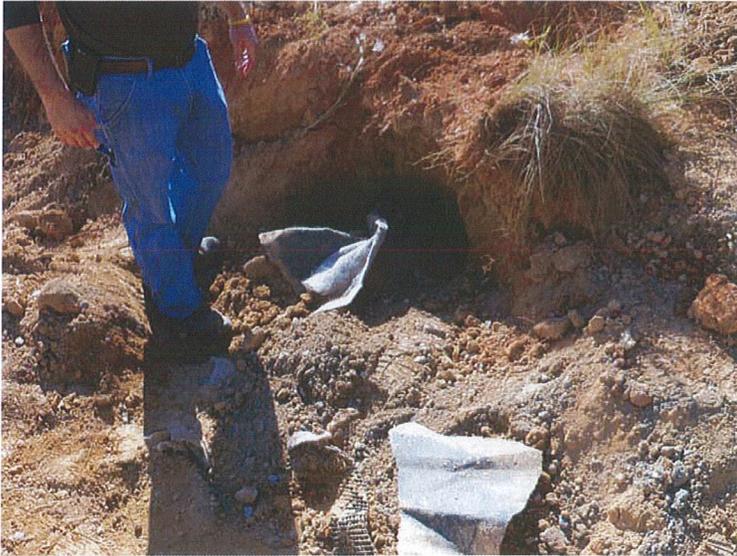
END OF REPORT

Mark Bivins  
 On-Site Representative/Company

Will Harrison  
 S&ME Personnel

**Disclaimer:** The presence of S&ME at the project site shall not be construed as an acceptance or approval of activities at the site. S&ME is at the project site to perform specific services and has certain responsibilities which are limited to those specifically authorized in our agreement with our client. In no event shall S&ME be responsible for the safety or the means and methods of other parties at the project site. **The information presented in this field report has not been reviewed by an engineer and is to be considered preliminary.**

Photograph 1	
	
<b>Date:</b> 10-04-11	
<b>Photographer:</b> William Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~5 Feet Northeast of Damaged Area – Facing Southwest
<b>Remarks</b>	Liner System Damage

Photograph 2	
	
<b>Date:</b> 10-04-11	
<b>Photographer:</b> William Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~5 Feet Northeast of Damaged Area – Facing Southwest
<b>Remarks</b>	Liner System Damage

Photograph 3		
		<b>Date:</b> 10-04-11
		<b>Photographer:</b> Will Harrison
<b>Location / Orientation</b>	Inside Phase II – ~10 Feet South of Damaged Area - Facing North	
<b>Remarks</b>	Liner System Damage	

Photograph 4		
		<b>Date:</b> 10-04-11
		<b>Photographer:</b> Will Harrison
<b>Location / Orientation</b>	Inside Phase II – ~10 Feet South of Damaged Area - Facing North	
<b>Remarks</b>	Liner System Damage	

Photograph 5	
	
Date: 10-04-11	
Photographer: Will Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~50 Feet South of Damaged Area - Facing North
<b>Remarks</b>	Liner System Damage and Operations Soil Cover

Photograph 6	
	
Date: 10-04-11	
Photographer: Will Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~50 Feet North of Damaged Area – Facing Northeast
<b>Remarks</b>	Operations Soil Cover

Photograph 7	
	
Date: 10-04-11	
Photographer: Will Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~50 Feet North of Damaged Area – Facing Northwest
<b>Remarks</b>	Operations Soil Cover Bermed Up North (Upstream) of Damage

Photograph 8	
	
Date: 7-08-10	
Photographer: William Harrison	
<b>Location / Orientation</b>	Inside Phase II – ~50 North of Damaged Area – Facing Southwest
<b>Remarks</b>	Liner System Damage and Perimeter Berm

Photograph 9



Date: 10-04-11

Photographer: William Harrison

<b>Location / Orientation</b>	Inside Phase II – ~50 North of Damaged Area – Facing South
<b>Remarks</b>	Liner System Damage and Perimeter Berm

## **ATTACHMENT 3: LINER SYSTEM REPAIR**

- Liner System Repair Field Report (10/12/11 C. Murphy)
- Liner System Repair Photo Log (10/12/11 C. Murphy)



9751 Southern Pine Blvd  
 Charlotte, NC 28273  
 (704) 523-4726  
 (704) 525-3953

## Field Report

<b>Date</b> 10/12/11	<b>Job No.</b> 1356-11-030
<b>Project/Location</b> Lincoln County Landfill	
<b>Contractor</b> GSI	<b>Weather/Temp</b> Pt. Cloudy / ~70 F Intermittent drizzle
<b>Present at Site</b> Courtney Murphy-S&ME Mark Bivins-Lincoln Co. Brandon Price & JM (initials)-GSI	
<b>Time</b> 0730-1445	<b>Mileage</b> 90 mi. round trip

Services Performed	
<input type="checkbox"/> Concrete Testing <input type="checkbox"/> Cylinder Pickup <input type="checkbox"/> Asphalt Testing <input type="checkbox"/> Steel Testing	<input type="checkbox"/> Asphalt Coring <input type="checkbox"/> Concrete Coring <input type="checkbox"/> Undercut Evaluation <input type="checkbox"/> Foundation Evaluation <input type="checkbox"/> Proofrolling <input type="checkbox"/> In-Place Density
Landfill Liner System Repair	

### Observations/Remarks:

0730 – Courtney arrived on-site  
 0840 – GSI arrived on-site

0910 – Used a track-hoe to pull temporary cover (scrap geomembrane) off to expose damaged area. Observed that GCL was damaged. Cut a new GCL patch and placed over damaged area with a bentonite ring.

0930 – Noticed that new liner that was delivered on-site is smooth instead of textured. Went to look at rolls of textured liner on-site that had been left over from Phase III construction to see if we could get a roll number for reference and use that material. No roll numbers were observed, so called Ken Daly of S&ME. Ken said to go ahead and use the smooth liner since the damaged area was approximately a 3-foot by 3-foot patch and it was not at the top of a slope.

1000 – Heat-tacking the liner patch over the GCL patch.

1020 – CQA of extrusion weld method. Temperature of extrusion gun was 175° F and 240° F. Pulled 5, 1-inch test strips for peel tests and 5, 1-inch test strips for shear tests using a tensiometer (Machine #1). Peel results were 82, 97, 104, 116, and 91 which pass the required value of 78 for 60 mil liner peel. Shear results were 127, 141, 148, 128, and 125 which pass the required value of 120 for 60 mil liner shear.

1055 – Grinding/cleaning liner patch seam.

1120 – Extrusion welding liner patch along seam.

1135 – Soap and vacuum test of weld seal. Passed – good seal.

1155 – Repair of drainage layer. Using torch to burn holes in felt layer for zip-ties to be placed every 6 inches along seams.

1230 – Heat-tacked new felt over drainage net.

1235 – Called Mark to tell him liner system patch was completed if he wanted to come see before the soil cover was replaced. He said he didn't need to see it... that he was good if I was good.

1240 – GSI left site.

1245 – Lunch

1410 – Lincoln County personnel covering liner system patch with approximately 4 feet of soil. Cover soil came from on-site borrow soils.

1445 – Courtney left site.

\*Photographs were taken as additional documentation of field activities.

END OF REPORT

Mark Bivins  
**On-Site Representative/Company**

Courtney Murphy  
**S&ME Personnel**

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**Photograph 10**



Date: 10-12-11

Photographer: C. Murphy

<b>Location / Orientation</b>	Temporary cover of liner system damage
<b>Remarks</b>	Used scrap geomembrane to cover damaged area (located under center of temporary cover). Pipe was placed under cover to deter water from ponding on the cover.

**Photograph 11**



Date: 10-12-11

Photographer: C. Murphy

<b>Location / Orientation</b>	Looking down on area of exposed liner system damage.
<b>Remarks</b>	Damaged drainage layer, liner, and GCL

**Photograph 12**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation**

GCL patch

**Remarks**

Bentonite ring placed under GCL patch

**Photograph 13**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation**

Heat-tacking liner patch over GCL patch

**Remarks**

Smooth textured, 60 mil liner

**Photograph 14**



Date: 10-12-11

Photographer: C. Murphy

<b>Location / Orientation</b>	Grinding/cleaning liner patch seam
<b>Remarks</b>	none

**Photograph 15**

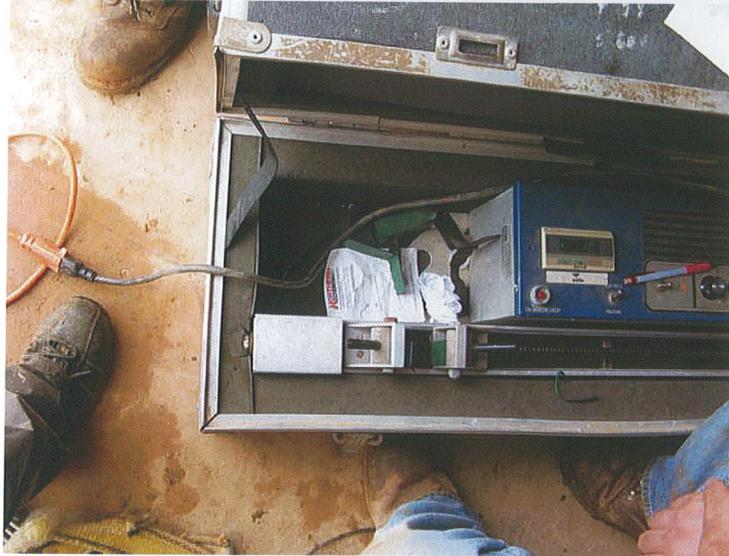


Date: 10-12-11

Photographer: C. Murphy

<b>Location / Orientation</b>	1-inch liner weld test strips
<b>Remarks</b>	5 strips for peel, and 5 strips (not shown) for shear

**Photograph 16**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation**

Tensiometer pulling a liner weld test strip (Machine #1)

**Remarks**

Example of peel test

**Photograph 17**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation**

Extrusion Weld

**Remarks**

Temp of gun = 175° F and 240° F

**Photograph 18**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation** Soap and vacuum test of weld seal

**Remarks** none

**Photograph 19**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation** Completed liner patch

**Remarks** Marked with technician's initials "JM" and date "10-12-11"

**Photograph 20**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation** Drainage layer repair

**Remarks** Zip-ties every 6-inches

**Photograph 21**



Date: 10-12-11

Photographer: C. Murphy

**Location / Orientation** Completed patch of liner system

**Remarks** none

**Photograph 22**



Date: 10-12-11

Photographer: C. Murphy

<b>Location / Orientation</b>	Soil cover placed over liner system patch
<b>Remarks</b>	Approximately 4 feet thick; placed by Lincoln County personnel

# **ATTACHMENT 4: PROJECT SPECIFICATIONS AND DOCUMENTATION**

- Select Sections of Project Specifications
- Geosynthetic Installation Forms and MQC (Provided by GSI)

the Contract Documents.

### 2.3.2 Materials

#### 2.3.2.1 Compacted Soil Liner

On-site soils that meet all of the following requirements shall be classified as soil liner fill material for use in construction of the compacted soil liner.

Soil liner fill materials are potentially available in on-site borrow areas that have been located by the OWNER and ENGINEER. Soil liner fill materials shall be classified according to the Unified Soil Classification System as SC, CL, CH, ML or MH (ASTM D 2487-83). Liquid limit, plasticity index, and percent passing the No. 200 sieve will be considered for proper classification. The soil liner material shall have a Plasticity Index (PI) greater than 10 or as subsequently specified based on laboratory testing.

Soil liner fill materials shall be reasonably free of gypsum, ferrous, and/or calcareous concretions and nodules or other deleterious substances. Soil liner fill material shall have a maximum size aggregate of 1 inch. The soil liner material shall be raked or sieved by the CONTRACTOR, if necessary, to remove all aggregate greater than 1 inch in diameter. No more than 5 percent of the soil liner fill material should be retained on the No. 4 sieve.

All clay clods will be broken down with tillers and/or discs to provide a homogeneous clay soil (prior to compaction) that is free of clay clods greater than 2 inches in diameter.

Continuous and repeated visual inspection of the materials will be performed by the CONTRACTOR to ensure proper soils are being used. In addition, the ENGINEER will make frequent inspections of the soil liner placement operations and materials, and will consult with the site personnel on suitable liner fill and locations of such. All soil liner fill proposed shall be inspected by the ENGINEER prior to actual use.

#### 2.3.2.2 Geosynthetic Clay Liner (GCL)

The (GCL) shall be "Bentomat" or "Claymax" as manufactured by Colloid Environmental Technologies Company (CETCO), or equivalent.

“Bentomat DN” shall consist of high quality swelling sodium bentonite contained by two nonwoven needle punched geotextile. Bentomat DN shall be used on cell side slopes as shown on the drawings.

“Claymax 200R” shall consist of high quality sodium bentonite between two geotextiles that are continuously adhered together. The “200 R” shall be used for the cell bottom only as shown on the drawings.

The geosynthetic clay liner shall consist of a minimum of 0.75 lb. of bentonite per square foot.

The geosynthetic clay liner shall be a minimum of 12 ft. wide panels. The cell slope lengths will require some rolls to be longer than 100 ft. up to a maximum of 150 ft.

The CONTRACTOR shall submit proposed GCL panel layouts to the ENGINEER at least 2 weeks prior to installation. Once the panel layout is approved, the CONTRACTOR may not change the layout without written permission of the ENGINEER.

The GCL shall be shipped rolled with a protective wrap around each roll, labeled with a roll number. Manufacturers quality control documentation shall be included with each roll.

The GCL shall be dry and free of holes or any sign of contamination by foreign matter. The ENGINEER may reject all or portions of the GCL if significant quantities of production flaws are observed.

### 2.3.3 Sampling and Testing

- 2.3.3.1 The compacted soil liner material when tested in accordance with ASTM D5084-90 must achieve a coefficient of permeability not greater than  $1.0 \times 10^{-5}$  cm/sec. Bulk samples will be taken by the ENGINEER at intervals of 1 sample per 3,000 cubic yards of material to be placed from the borrow area(s). The samples will be transported to a soils laboratory for compaction and permeability testing. The samples will be compacted to at least 95 percent of standard Proctor at moisture contents similar to field conditions and/or as subsequently specified based on laboratory testing results. The ENGINEER may request that an in-situ permeability test be performed on the in-place soil liner material if the material being placed is not consistent with the material previously tested and approved for construction.

**TABLE 1**

REQUIRED PHYSICAL PROPERTIES OF MEMBRANE LINER (HDPE) SHEET

<u>Property</u>	<u>Test Method</u>	<u>Required Values</u> 60 Mil HDPE
Thickness	ASTM D-751	57/60 Mil*
Sheet Density	ASTM D-1505	0.940 g/cm <sup>3</sup> min.
% Elongation at Yield**	ASTM D-638	12/10
% Elongation at Break**	ASTM D-638	560/150
Tensile Strength at Yield	Test Specimen Type IV	130 lb/in. min.
Tensile Strength** at Break	ASTM D-638	228 lb/in. min./130 lb/in. min.
Carbon Black Content	ASTM D-1603	2% min-3% max
Carbon Black Dispersion	ASTM D-3015	A1, A2, or B1
Environmental Stress-Crack Resistance	ASTM D-1693 (As Modified in NSF54 Appendix A)	200 hours min.
Low Temperature Impact	ASTM D-746	-60°F or lower
Dimensional Stability	ASTM D-1204 (As Modified in NSF54 Appendix A)	± 2.0% max.
Puncture Resistance	FTMS 101B Method 2065	70 lb. min.
Tear Resistance	ASTM D 1004 DIE C	42 lb. min.
<u>Seam Strengths</u>		
1. Shear Strength	ASTM D-3083 Appendix A	FTB, 95% of Parent
2. Shear Strain @ Yield	ASTM D-3083 as modified in NSF 54 Appendix A	10% (min.)
3. Peel Strength	ASTM D-413 Appendix A	FTB, 62% of Parent
<u>Non-Destructive Testing</u>		
1. Single Weld	Continuous Vacuum Box;	Maintain Vacuum of 3 psi for 15 seconds
2. Double Weld	Air Testing	Maintain 30 psi for not less than 5 minutes; pressure loss not greater than 3 psi for last 3 minutes

\* Thickness - first value represents lowest individual value  
- second value represents average across roll

\*\* Second value represents minimum value for textured sheet.

**TABLE 2**  
 REQUIRED PRE-SHIPING SHEET TESTING  
 OF  
 MEMBRANE LINER (HDPE)

<u>Property</u>	<u>Test Method</u>	<u>Frequency</u>
Thickness	ASTM D-1593 Par. 8.1.3	Each Roll
Sheet Density	ASTM D-792 Method A	Each Roll
Tensile Properties	ASTM D638, Type IV (As modified in NSF54)	Each Roll
Tear Resistance	ASTM D1004 Die C	Every Fifth Roll
Puncture Resistance	FTMS 101B Method 2065	Every Fifth Roll
Carbon Black Content	ASTM D1603	Every Fifth Roll
Carbon Black Dispersion	ASTM D-3015 (As modified in NSF54)	Every Fifth Roll
Dimensional Stability	ASTM D1204 (1 Hour @ 100°C)	Every Tenth Roll
Low Temperature Impact	ASTM D746	Every Tenth Roll
Melt Flow Index	ASTM D1238 Condition 190/2.16 (At two normal loads)	Every 180,000 lb. (81.6 mg) of Resin*
Environmental Stress Crack	ASTM D-1693 Appendix A (As modified in NSF54)	Every 180,000 lb. (81.6 mg) of Resin*

\* Or at least once per railcar for railcars containing less than 180,000 lb (81.6 mg).

The GEOSYNTHETIC INSTALLER shall submit quality control certificates for each batch of resin. The certificates shall contain lot, batch and roll numbers; sampling and test methods; and results of quality control tests. The quality control testing and frequencies shall meet the following:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Frequency</u>
Fabric Weight	D3776	Every 100,000 ft <sup>2</sup>
Grab Strength	D4632	Every 100,000 ft <sup>2</sup>
Grab/Tensile Elongation	D4632	Every 100,000 ft <sup>2</sup>
Wide Width Tensile	D4595	Every 100,000 ft <sup>2</sup>
Hydraulic Conductivity	D4491	One Per Lot
Puncture Strength	D4833	Every 100,000 ft <sup>2</sup>
Tear Strength	D4533	Every 100,000 ft <sup>2</sup>
Apparent Opening Size	D4751	One Per Lot
Mullen Burst Strength	D3786	Every 100,000 ft <sup>2</sup>

Samples that do not meet the specified properties shall be rejected, and additional testing of rolls may be required by the manufacturer to identify any additional non-complying rolls.

Geotextile rolls shall be supplied in a protective wrap and tagged with the manufacturer, product name, lot or batch number, and roll number.

The ENGINEER, at his discretion, may randomly sample the geotextile for conformance testing.

#### 4.2.4 Geonet

The synthetic mesh structure shall consist of solid rib extruded high density polyethylene. A sample of the geonet shall be submitted to the ENGINEER for approval prior to acceptance.

The geonet shall have an 8 oz. nonwoven geotextile above the geonet. The 8 oz. nonwoven geotextile shall conform to Section 4.2.3. No bonding is required between the nonwoven geotextile and the geonet.

The geonet shall meet or exceed the following minimum average roll values:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Required Value</u>
Density	D1505 or D792	0.94 g/cm <sup>3</sup>
Wide Width Tensile Strength (M.D.)	D4595	45 lb/in.
Carbon Black Content	D1603	2% min to 3% max

The geonet and filter geotextile for the floor shall have a minimum transmissivity of  $1.0 \times 10^{-4}$  m<sup>2</sup>/sec at a hydraulic gradient of 0.25 and a normal load of 10,000 psf at a time of 100 hours when tested with compacted soil against the filter geotextile and 60 mil HDPE against the geonet, tested in accordance with ASTM D4716. Transmissivity curves with the specified conditions must be submitted to the ENGINEER before the geonet and geotextile materials will be accepted.

The GEOSYNTHETIC INSTALLER shall submit quality control certificates for each batch of resin. The certificates shall contain lot, batch and roll numbers; sampling and test methods; and results of quality control tests. The quality control testing and frequencies shall meet the following:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Frequency</u>
Density	D792 or D1505	Every 50,000 ft <sup>2</sup>
Carbon Black Content	D1603	Every 50,000 ft <sup>2</sup>
Transmissivity	D4716	One Test Per Landfill Phase

Samples that do not meet the specified properties shall be rejected, and additional testing of rolls may be required by the manufacturer to identify any additional non-complying rolls.

Geonet rolls shall be tagged with the manufacturer, product name, lot or batch number, and roll number.

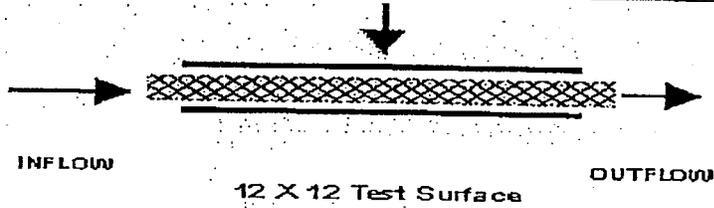






<b>Client:</b> <b>Project:</b> <b>Product:</b> TN270-2-6	<b>Job #</b> 2851
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**Test Configuration:**



**Test Information:**

<b>Boundary Conditions:</b> Sand Geocomposite Liner	<b>Normal Load:</b> 10000 psf <b>Gradient:</b> 0.25 ft <b>Seating Time:</b> 24 hours <b>Flow Direction:</b> MD
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**Test Results:**

Roll No.	Pressure (psf)	Gradient, ft	Transmissivity, m <sup>2</sup> /sec
			24 hours
285110001	10000	0.25	4.12 x 10 <sup>-1</sup>
285110015			4.18 x 10 <sup>-1</sup>
285110030			4.09 x 10 <sup>-1</sup>
285110045			4.21 x 10 <sup>-1</sup>
285110060			4.06 x 10 <sup>-1</sup>
285110075			4.11 x 10 <sup>-1</sup>
285110090			4.17 x 10 <sup>-1</sup>
285110105			4.22 x 10 <sup>-1</sup>