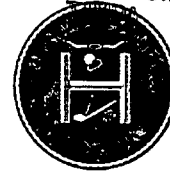


FLORIDA DEPARTMENT OF  
ENVIRONMENTAL PROTECTION

JUN 29 2006

SOUTHWEST DISTRICT



**Conformed Documents  
Phase II Section I Landfill Expansion  
Hardee County Landfill Facility  
Hardee County, Florida**

**SCS ENGINEERS**

**Prepared for:**

Board of County Commissioners  
Hardee County  
205 Hanchey Road  
Wauchula, Florida 33873

**Prepared by:**

SCS Engineers  
3012 U.S. Highway 301 North, Suite 700  
Tampa, Florida 33619-2242  
(813) 621-0080  
Fax (813) 623-6757

Florida Board of Professional Engineers  
Certificate No. 00004892

June 20, 2006  
File No. 09199033.16

*FILE  
ONLY*

**SCS ENGINEERS****Dept. of Environmental  
Protection**

July 7, 2006  
File No. 09199033.16

JUL 10 2006

Susan J. Pelz, P.E.  
Solid Waste Program Manager  
Florida Department of Environmental Protection  
Southwest District  
13051 N. Telecom Parkway  
Temple Terrace, FL 33637

**Southwest District**

Subject: Hardee County Phase II Section I Construction Expansion  
Clarifications of Conformed Documents  
Construction Permit No. 3814-008-SC/01  
Hardee County Landfill Facility

Dear Susan:

SCS Engineers (SCS) previously submitted to the Florida Department of Environmental Protection (FDEP) the Conformed Construction Documents dated June 20, 2006 per Specific Condition B.4(a)(1) of Construction Permit No. 38414-008-SC/01 for the Hardee County Landfill Phase II Section I Construction Expansion.

Per your request via the email entitled "Hardee LF Conformed Documents" dated July 2, 2006, the following information is being supplied by SCS to clarify the Conformed Documents. For ease of review, the items listed in the email have been reiterated in bold type followed by our response.

- 1. Please confirm that the CQA Plan has not changed from the version listed in the permit.**

SCS did not modify the Construction Quality Assurance (CQA) Plan from the version that is listed in Construction Permit No. 38414-008-SC/01 for the Hardee County Landfill Phase II Section I Construction Expansion.

- 2. Also, as indicated in Item #7.e., the Phase II leachate collection (and detection?) sump was changed to connect directly to the forcemain from the existing MH-8 to the tanks. Please clarify how the collection and detection sump discharges are maintained separate.**

The 3-inch HDPE leachate detection piping from the leachate detection sump connects via a 3"x3"x3" Tee into the 3-inch HDPE leachate collection piping from the leachate collection sump. This 3-inch HDPE line is then connected to a 3"x4" reducer connected to the 4-inch HDPE pipe that will connect directly into the existing 4-inch PVC forcemain between MH-8 and the existing above ground leachate storage tanks. Flow meters are placed in the leachate detection piping and leachate collection piping to monitor the



Ms. Susan Pelz, P.E.  
July 7, 2006  
Page 2

amount of flow within each line separately. In addition, a 1/4-inch labcock valve is located in the leachate detection piping and leachate collection piping that will enable sampling from each line separately before they are joined in the 4-inch HDPE pipe that will connect directly into the existing 4-inch PVC forcemain between MH-8 and the existing above ground leachate storage tanks.

**3. Please clarify if backflow preventers are proposed to ensure that the leachate from Phase II does not backflow into MH-8.**

SCS reviewed the Record Drawings created by Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) for MH-8 and the 4-inch PVC forcemain between MH-8 and the existing above ground leachate storage tanks. The Record Drawings indicate that check valves were previously installed in the 4-inch PVC forcemain located directly next to MH-8. These check valves will prevent backflow into MH-8 when the 4-inch HDPE pipe from Phase II Section I is connected into the existing 4-inch PVC forcemain between MH-8 and the existing above ground leachate storage tanks. In addition, a plug valve was also previously installed to control on/off service and flow in the existing 4-inch forcemain.

**4. Please provide additional details of the "pipe sleeve."**

The 4-inch HDPE pipe that will connect directly into the existing 4-inch PVC forcemain between MH-8 and the existing above ground leachate storage tanks will be placed within a pipe sleeve where the portion of the 4-inch HDPE pipe goes under the asphalt roadway to the leachate loading station. The purpose of the pipe sleeve is to protect the 4-inch HDPE pipe from damage due to vehicles traveling on the roadway above the 4-inch HDPE pipe. The pipe sleeve will be a ductile iron pipe and a minimum of 8-inches in diameter. The ductile iron pipe sleeve that will encase the 4-inch HDPE pipe will extend a minimum of five feet beyond the edges of the asphalt roadway.

Please do not hesitate to call should you have any questions or require additional information.

Sincerely,



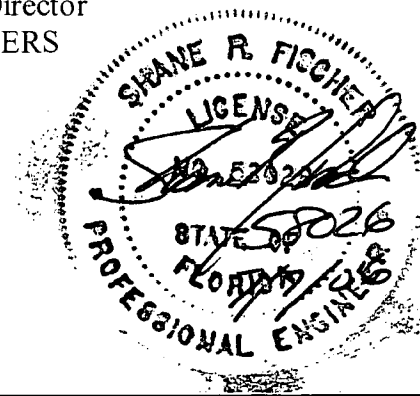
Shane R. Fischer, P.E.  
Senior Project Professional  
SCS ENGINEERS



C. Ed Hilton, P.E.  
Solid Waste Director  
SCS ENGINEERS

cc: Teresa Carver, Hardee County Solid Waste Director

SRF/CEH:srf



**SCS ENGINEERS**

June 28, 2006  
File No. 09199033.16

Susan J. Pelz, P.E.  
Solid Waste Program Manager  
Florida Department of Environmental Protection  
Southwest District  
13051 N. Telecom Parkway  
Temple Terrace, FL 33637

FLORIDA DEPARTMENT OF  
ENVIRONMENTAL PROTECTION

JUN 29 2006

SOUTHWEST DISTRICT  
TAMPA

Subject: Hardee County Landfill Phase II Section I Construction  
Conformed Documents, Specific Condition B.4(a)(1)  
Construction Permit No. 3814-008-SC/01  
Hardee County Landfill Facility

Dear Ms. Pelz:

On behalf of Hardee County, SCS Engineers (SCS) is submitting to the Florida Department of Environmental Protection (FDEP) the Conformance Documents per Specific Condition B.4(a)(1) of Construction Permit No. 38414-008-SC/01 for the Hardee County Landfill Phase II Section I Construction.

In addition, the following revisions or clarifications were implemented by SCS to the Technical Specifications and Construction Drawings from the original permitted documents. It is the professional opinion of SCS that the following changes performed by SCS to these documents do not impact the original permitted concept or design.

1. Conformed Technical Specification SECTION 01025 MEASUREMENT AND PAYMENT
  - a. The MEASUREMENT AND PAYMENT Technical Specification was revised from the original approved documents during Addendum Number 2 of the bidding process to include Item No. 036 - RipRap and Rock Lining.
  - b. Table 01025-1 BID FORM was revised from the original approved documents during Addendum Number 2 of the bidding process to include and/or update units and quantities for Bid Item Numbers 015 Install 12" Groundwater Collection Pipe, 036 Riprap and 037 Topsoil, Sodding, Seeding and Mulching. In addition, the Bid Item Numbers and Item Descriptions have been updated to correspond to the revised Technical Specification SECTION 01025 MEASUREMENT AND PAYMENT.
2. Conformed Technical Specification SECTION 02221 SUB-BASE
  - a. The SUB-BASE Technical Specification was revised from the original approved documents during Addendum Number 2 of the bidding process. The original





0/c Technical Specification required the sub-base material to meet specified hydraulic conductivity requirements. The design intent of the sub-base material is for stability and not to act as an impermeable layer. The hydraulic conductivity requirements have been removed from the amended SUB-BASE Technical Specification and requirements based on compaction efforts have been included.

3. ✓ Conformed Technical Specification SECTION 02371 RIPRAP AND ROCK LINING

- a. A RIPRAP AND ROCK LINING Technical Specification was added during Addendum Number 2 of the bidding process for clarity to the Construction Documents. This additional Technical Specification is based on requirements from the Florida Department of Transportation (FDOT) Drainage Specifications.

4. ✓ Conformed Technical Specification SECTION 02776 HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER

- a. A minor modification to Specific Condition # B.11e of the Construction Permit was requested to change the minimum Interface Friction Angle for the cover sand/geocomposite, geomembrane/geocomposite (bi-planar and tri-planar) interfaces from 26.9 degrees to 20.5 degrees.

5. ✓ Conformed Technical Specification SECTION 02930 TRI-PLANAR GEOCOMPOSITE

- a. A minor modification to Specific Condition # B.11e of the Construction Permit was requested to change the minimum Interface Friction Angle for the cover sand/geocomposite, geomembrane/geocomposite (bi-planar and tri-planar) interfaces from 26.9 degrees to 20.5 degrees.

6. ✓ Conformed Technical Specification SECTION 02931 BI-PLANAR GEOCOMPOSITE

- a. A minor modification to Specific Condition # B.11e of the Construction Permit was requested to change the minimum Interface Friction Angle for the cover sand/geocomposite, geomembrane/geocomposite (bi-planar and tri-planar) interfaces from 26.9 degrees to 20.5 degrees.

7. Conformed Construction Drawings

- ✓ a. SCS modified the revision block as required for any revisions made to the original permitted documents and included Conformed Drawings on all the sheets.
- ✓ b. Drawing Sheets 5 and 11 of 16 - The Groundwater Interceptor Pump Station pumps located within the lift station, that will be constructed by the contractor, will be determined for size based upon field observations. The County will provide an

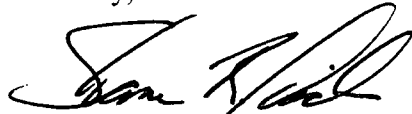
Ms. Susan Pelz, P.E.  
June 28, 2006  
Page 3

interim pump system and use onsite pumps until permanent pumps are efficiently sized, selected and installed at a later date.

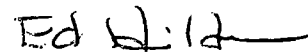
- ✓ c. Drawing Sheet 7 of 16 - The existing 8-inch diameter leachate line between Manhole 6 (MH-6) and Manhole 7 (MH-7) will be replaced with a 10-inch diameter SDR 11 pipe instead of being repaired as previously indicated. The existing 8-inch connection to the Manholes will be cored such as to accommodate the new 10-inch diameter pipe. Details for the leachate line replacement are shown on Detail 2, Sheet 16.
- ✓ d. Drawing Sheet 7 of 16 - The existing 8-inch diameter leachate line between MH-7 and Manhole 8 (MH-8) will be replaced with a 10-inch diameter SDR 11 pipe instead of being repaired as previously indicated. The existing 8-inch connection to the Manholes will be cored such as to accommodate the new 10-inch diameter pipe. Details for the leachate line replacement are shown on Detail 5, Sheet 16.
- break flow? e. Drawing Sheet 7 of 16 - The sump for Phase II - Section I connects directly into the 4-inch forcemain between MH-8 and the existing above ground leachate storage tanks. The original Permit Drawings indicted the sump was piped directly into MH-8.
- f. Drawing Sheet 14 of 16 - Detail 4 *Wetland Discharge Structure* was revised from referring to Sheet 6 to Sheet 7.
- g. Drawing Sheet 16 of 16 - The *Typical Exist. Collection Improvement Pipe Installation* Detail was revised from Detail 3 to Detail 2.

Please do not hesitate to call should you have any questions or require additional information.

Sincerely,



Shane R. Fischer, P.E.  
Senior Project Engineer  
SCS ENGINEERS



C. Ed Hilton, P.E.  
Solid Waste Director  
SCS ENGINEERS

cc: Teresa Carver, Hardee County Solid Waste Director

SRF/CEH:srf

**CONFORMED TECHNICAL SPECIFICATIONS  
PHASE II SECTION I LANDFILL EXPANSION  
HARDEE COUNTY LANDFILL FACILITY  
HARDEE COUNTY, FLORIDA**

**Prepared for:**

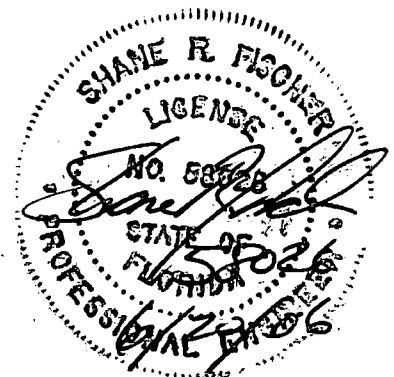
Board of County Commissioners  
Hardee County  
205 Hanchey Road  
Wauchula, Florida 33873

FLORIDA DEPARTMENT OF  
ENVIRONMENTAL PROTECTION  
JUN 29 2006  
SOUTHWEST DISTRICT  
TAMPA

**Prepared by:**

SCS Engineers  
3012 U.S. Highway 301 North, Suite 700  
Tampa, Florida 33619-2242  
(813) 621-0080  
Fax: (813) 623-6757

File No. 09199033.16  
June 20, 2006



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**HARDEE COUNTY LANDFILL FACILITY**  
**HARDEE COUNTY, FLORIDA**

**DIVISION 1 - GENERAL REQUIREMENTS**

01010	Summary of Work
01025	Measurement and Payment
01050	Site Conditions Surveys
01200	Meetings and Conferences
01300	Contractors Submittals
01311	Construction Schedule
01500	Temporary Facilities
01505	Mobilization and Demobilization
01560	Temporary Environmental Controls
01568	Temporary Erosion and Sedimentation Control
01700	Contract Start-Up, Completion and Closeout

**DIVISION 2 - SITE WORK**

02110	Site Clearing
02140	Dewatering
02212	Low Permeability Soil
02220	Excavation, Backfill, Fill and Grading
02221	Sub-base
02371	RipRap and Rock Lining
02776	High Density Polyethylene Geomembrane Liner
02911	Littoral Zone Planting
02930	Tri-Planar Geocomposite
02931	Bi-Planar Geocomposite
02940	Geotextile
02941	Geosynthetic Rain Tarp
02990	Seeding and Sodding

**DIVISION 3 - CONCRETE**

03300	Concrete
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**DIVISION 11 - PUMPS**

11200	Leachate Disposal Pumps
11202	Groundwater Pump Station

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**HARDEE COUNTY, FLORIDA**

**DIVISION 15 - MECHANICAL**

15060	Piping System
15080	Pipe, Fittings, Valves, and Appurtenances

**EXHIBITS**

A	CQA Plan
B	FDEP Construction Expansion Permit
C	February 2006 Aerial Topographic Survey

## SECTION 01010

### SUMMARY OF WORK

#### PART 1 - GENERAL

##### 1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. Description of work: The work of this Contract consists of developing a 5.0 acre portion of a landfill referred to as Phase II Section I. The work includes excavating, filling, dewatering, construction of a groundwater control system placement and compaction of a low-permeability soil sub-base, installation of geocomposite drainage layers, installation of a 60-mil geomembrane liner system, constructing leachate collection trenches and piping, associated quality assurance testing, tie-ins to completed construction, and required plumbing and electrical work if necessary for proper operation of the leachate pumping system.

Additionally, channels, dewatering ponds and other stormwater appurtenances will be constructed south of the landfill in association with the establishment of man-made stormwater treatment system.

- B. Site of Work: The work of this Contract is located in the central portion of Hardee County, Florida, at the Hardee County Landfill. CONTRACTOR shall be aware of the nature of the activities at a landfill which may restrict access to the portions of the site due to general landfill operations.

##### 1.02 WORK BY OTHERS

- A. Work may be conducted at the site by other contractors during the performance of the work under this contract. The CONTRACTOR shall conduct its operations to minimize interference of other contractors, and shall cooperate fully with such contractors and the project representatives to provide continued safe access to perform their respective contracts. The following work will be performed by other contractors during the contract period for this contract.

##### 1.03 LINES AND GRADE

- A. All work shall be done to the lines, grades, and elevations shown on the Drawings.
- B. Basic horizontal and vertical control points will be established or designated by COUNTY. These points shall be used as datum for the work. All additional survey, layout, and measurement work shall be performed by CONTRACTOR as a part of the work.

- C. CONTRACTOR shall provide experienced instrument personnel, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, CONTRACTOR shall furnish, without charge, competent personnel from its force and such tools, stakes, and other materials as PROJECT MANAGER may require in establishing or designating control points, or in checking survey, layout, and measurement of work performed by CONTRACTOR.
- D. CONTRACTOR shall keep the PROJECT MANAGER informed, a reasonable time in advance, of the times and places at which it wishes to do work.
- E. CONTRACTOR shall remove and reconstruct work that is improperly located at no additional cost to the COUNTY.

#### **1.04 REFERENCE STANDARDS**

- A. Reference to the standards of any technical society, organization, or association or to codes of local or state authorities shall mean the latest effective standard, code, specification, or standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.

#### **1.05 AVAILABILITY OF LAND**

- A. The land available for the CONTRACTOR's use during the performance of the work is limited to the area defined by that area which is shown ON THE Construction Drawings and identified as "Contractors Storage/Laydown Area".
- B. Areas outside the limits of construction that have been disturbed by the CONTRACTOR shall be returned to the original condition or better upon completion of the work at no additional cost to the COUNTY.

#### **1.06 ERRORS AND/OR OMISSIONS IN PLANS AND SPECIFICATIONS**

- A. The intent of the specifications is to outline or indicate the items of work, or both, which cannot be readily shown on the drawings and, further to indicate the types and qualities of materials. Drawings and specifications shall be considered as being complimentary and items or work mentioned or indicated in one and not in the other shall be included as if mentioned in both. Should drawings disagree in themselves or with the specifications the better quality or greater quantity of work or materials shall be estimated upon, and shall be provided.

#### **1.07 VERIFY EXISTING ELEVATION**

- A. The contours and spot elevations shown on the Drawings reflect the best available information regarding existing site conditions at the time the design was prepared. The CONTRACTOR is required to prepare a pre-condition survey prior to commissioning and work on the project pursuant to Section

01050-Site Conditions Surveys. The pre-condition survey will be used to establish pay quantities for excavation and backfill.

**1.08 WORKING TIMES**

- A. Allowable work times shall be Monday through Saturday from 7:30 a.m. to 5:30 p.m., except some Legal holidays. CONTRACTOR shall submit for approval to the PROJECT MANAGER 48 hours notice prior to Sunday or Legal holiday work, and work shall be limited to eight hours maximum on such days. Hours outside the work times prescribed above must be approved by the COUNTY and PROJECT MANAGER.

**PART 2 – PRODUCTS (Not Used)**

**PART 3 – EXECUTION (Not Used)**

**- END OF SECTION -**



## **SECTION 01025**

### **MEASUREMENT AND PAYMENT**

#### **PART 1 - GENERAL**

##### **1.01 DESCRIPTION**

- A. Payment for the various items on the Contractors Bid Form, as further specified herein, shall include all compensation to be received by the CONTRACTOR for furnishing all tools, equipment, supplies, and manufactured articles and for all labor, operations, supervision, overhead, and profit, and incidentals appurtenant to the items of work being described as necessary to complete the various items of the work all in accordance with the requirements of the Contract Documents, including all appurtenances thereto, and including all costs of compliance with the regulations of public agencies having jurisdiction, including Safety and Health Requirements of the Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor.
- B. No separate payment will be made for any item that is not specifically set forth on the CONTRACTOR's Bid Form and all costs therefore shall be included in the prices named on the Contractor's Bid Form for the various appurtenant items of work. Payment for complying with the safety requirements for construction on the work site shall be included in the contract unit price paid for the various items of work wherein it is required, and no separate payment will be made therefore.
- C. The total Bid Amount shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment and tools; including all costs and expenses for taxes, commissions, transportation charges and expenses, permit fees, patent fees, royalties, handling and tests; and performing all necessary labor and supervision to fully complete the work shall be included in the bid. All work not specifically set forth as a pay item on the Contractor's Bid Form shall be considered a subsidiary obligation of CONTRACTOR and all costs in connection therewith shall be included in the unit prices bid.
- D. The quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the CONTRACTOR feel that the cost for any item of work has not been established by the Contractor's Bid Form, he shall include the cost for that work in some other applicable bid

item, so that his proposal for the project does reflect his total price for completing the work in its entirety.

- E. All estimated quantities stipulated on the CONTRACTOR's Bid Form are approximate and are to be used only (a) as a basis for estimating the probable cost of the work and (b) for the purpose of comparing the bids submitted for the work. The actual amounts of work done and materials under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished unless it exceeds the estimated quantities in which case a change order must be approved prior to payment for quantities exceeding the estimated quantity.
- F. Unit prices provided by CONTRACTOR on Bid Form shall be valid and applicable for quantities up to 130 percent of the estimated quantities shown on the Bid Form.

## **1.02 COMPUTATION OF QUANTITIES**

- A. Measurement of quantities expressed as area shall be based upon a horizontal, planimetric projection to the work limits as determined by survey record drawings prepared by surveyor licensed in the State of Florida. Cost of surveying shall be paid by CONTRACTOR, and incorporated into Bid Items, as appropriate.
- B. Measurement of linear items will be for quantities actually field installed to the specified work limits, based upon surveyed stations recorded along the straight or curved centerline of each respective item. Measurement conducted by survey is to be conducted by the CONTRACTOR's approved Florida licensed land surveyor.
- C. Measurement of quantities expressed as volume will be based upon a neat plan line projection to the work limits (planimetric measure) as determined by survey record drawings for each item, with no additional allowances for shrinkage, swelling, or creep. Quantities expressed as volume will be in-place volumes to the dimensions indicated on the drawings.
- D. Payment will be made to the limits as specified in the Contract Documents. If the constructed limits are less than the specified limit, payment will be made to the actual limits of construction as shown on the Record Drawings. Payment for quantities that exceed the specified contract limits will only be made with the approval of the PROJECT MANAGER. Payment for quantities that exceed the Contract quantities can only be obtained through an approved change order.
- E. No partial payments shall be made for the installation of items that have not been tested and approved.

- F. Partial payment will be made for material delivered to the site, and adequately stored and protected until installation. Materials will be paid for at direct cost plus shipping, upon presentation of a valid receipt of bill with the payment request. All such requests must have material quantities verified by the PROJECT MANAGER prior to payment. Conditions for payment of stockpile of material will be discussed during the Pre-Construction Meeting. At a minimum the materials must have an approved shop drawing and or manufacturers materials certification.
- G. Payment will be made monthly until completion of each unit price item based on quantity completed by Contractor, and verified by the PROJECT MANAGER. Final payment will be based on quantity calculated from record drawings prepared by surveyor licensed in the State of Florida and confirmed by field measurement by the PROJECT MANAGER and the County.
- H. Payment for Lump Sum items will be made as described for each individual lump sum Bid Item, as described in Part 3 of this Section.

#### **1.03 VARIATIONS IN ESTIMATED QUANTITIES**

- A. The quantities given in the Contract Documents are approximate only, and are given as a basis for the uniform comparison of bids. The COUNTY does not expressly, or by implication, agree that the actual amount of work will correspond therewith.
- B. The CONTRACTOR must provide, for Unit Price Work, a proposed contract price determined on the basis of estimated quantities required for each item. The estimated quantities of items are not guaranteed and are solely for the purpose of comparing bids. Each such unit will be deemed to include an amount for overhead, profit and indirect costs for each separately defined item.

#### **1.04 BID FORM**

- A. Table 01025-1 presents the Bid Form for the items contained within this section.

### **PART 2 - PRODUCTS (Not Used)**

### **PART 3 EXECUTION**

#### **3.01 MEASUREMENT AND PAYMENT**

- A. Item No. 001 - Mobilization/Demobilization

Measurement (Lump Sum pro-rated as percentage of project completion)

This item includes all work addressed in Division 1 – General Requirements not specifically referenced in other bid items, Section 01505 – Mobilization and Demobilization, Section 02990 – Seeding and Sodding and all related work as shown on the Drawings. Measurement will be on a percent of original contract amount earned basis.

Payment

No price adjustments will be made for this item due to changes in the work.

The Contract Price for mobilization/demobilization shall be subject to the following provisions:

1. The maximum amount allowed to be bid for mobilization/demobilization is 10 percent of the total bid price.
2. Partial payments for mobilization/demobilization will be made in accordance with the following schedule.

<b>Condition or Percent of Total Contract Amount Earned</b>	<b>Allowable Percent of the Lump Sum Price for the Item</b>
Submittal/completion of items listed in Section 01505	25
10 percent total contract amount earned	40
25 percent total contract amount earned	60
50 percent total contract amount earned	80
100 percent total contract amount earned	100

The final payment for mobilization/demobilization will not be made until all temporary facilities, temporary erosion and sedimentation controls, equipment, and appurtenances have been removed from the site.

**B. Item No. 002 - Site Clearing**

Measurement (Per Acre)

The Contract Price for this item shall include all work contemplated in Section 02110 – Site Clearing and all related work within the limits of geomembrane as shown on the Drawings. This item will be measured to the nearest tenth of an acre.

Payment

Payment for this item shall be on a unit price per acre basis for completion of all work included in Section 02110 – Site Clearing and as shown on the Drawings.

The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

C. Item No. 003 - Survey

Measurement (Lump Sum)

The Contract Price for this item includes all survey work contemplated in Section 01050 – Site Condition Surveys. Measurement for various survey items will be on a demonstrated completed basis for the surveys required in Section 01050. All items associated with the surveys shall be included in the lump sum price.

Payment

Payment for this item will be on a percentage complete basis as defined below:

<u>Lump Sum Item Earned</u>	<u>Allowable Percent of Item Lump Sum</u>
Pre-construction Survey	20
Leachate Replacement Lines	10
Excavation	10
Groundwater Collection System	10
Liner Subgrade Survey	10
Top of Sand	10
Post-construction Survey	30

Payment will not be made until survey deliverables are submitted and accepted by the PROJECT MANAGER.

D. Item No. 004 - Temporary Erosion and Sedimentation Control

Measurement (Lump Sum)

The Contract Price for this item includes all work contemplated under Section 01568 – Temporary Erosion and Sedimentation Control.

Payment

Payment for this item will be on a lump sum basis and will be full compensation for all work contemplated under this item throughout the construction duration until the site is stabilized.

E. Item No. 005 – Replace Leachate Line Between Manhole 6 and Manhole 7

Measurement (Lump Sum)

The Contract Price for this item includes materials, labor, and all general work to replace the pipe between Manhole 6 and Manhole 7 including manhole connections.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

- F. Item No. 006 – Replace Leachate Line Between Manhole 7 and Manhole 8

Measurement (Lump Sum)

The Contract Price for this item includes materials, labor, and all general work to replace the pipe between Manhole 7 and Manhole 8, including manhole connections.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

- G. Item No. 007 – Videotape the Replaced Pipes

Measurement (Lump Sum)

The Contract Price for this item includes materials, labor, and all general work to videotape the pipe between Manhole 6 and Manhole 7 and the pipe replacement between Manhole 7 and Manhole 8.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

- H. Item No. 008 – Dewatering and Excavation (Stormwater Management Area)

Measurement (Lump Sum)

The Contract Price for this item includes preparation, submission, and approval of the dewatering, excavation and backfilling plan, and all general excavation work contemplated under Section 02220, paragraphs 1.02 A and B, 3.01, 3.05, and 3.06 and all related work as shown on the Drawings. .

Payment

Payment of this item shall be on a lump sum. The payment shall be paid on percent complete for work performed in the Stormwater Management Area only.

- I. Item No. 009 – Excavation (Temporary Construction Dewatering Pond - Central)

Measurement (Lump Sum)

The Contract Price for this item includes all general fill, backfill, and compaction work contemplated in Section 02220, paragraphs 1.01, 2.01, 3.03, 3.04, and 3.05 and all related work as shown on the Drawings.

Payment

Payment of this item shall be on a percent complete as determined by the Project Manager. The payment shall be for work performed in the Central Temporary Construction Dewatering Pond only.

- J. Item No. 010 – Excavation (Temporary Construction Dewatering Pond - West)

Measurement (Lump Sum)

The Contract Price for this item includes all general fill, backfill, and compaction work contemplated in Section 02220, paragraphs 1.01, 2.01, 3.03, 3.04, and 3.05 and all related work as shown on the Drawings.

Payment

Payment of this item shall be on a percent complete as determined by the Project Manager. The payment shall be for work performed in the West Temporary Construction Dewatering Pond only. .

- K. Item No. 011 – Excavation (Landfill Cell – Phase II Section I)

Measurement (Lump Sum)

The Contract Price for this item includes all general fill, backfill, and compaction work contemplated in Section 02220, paragraphs 1.01, 2.01, 3.03, 3.04, and 3.05 and all related work as shown on the Drawings.

Payment

Payment of this item shall be on a percent complete as determined by the Project Manager. The payment shall be for work performed in the Landfill Cell – Phase II Section I only.

- L. Item No. 012 – Groundwater Dewatering of the Excavation (Landfill Cell – Phase II Section I

Measurement (Lump Sum)

The Contract Price for this item shall include all work contemplated in the following section; Section 02140.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

(PLEASE NOTE IF THIS LINE ITEM IS NOT USED IT WILL NOT BE PAID TO THE CONTRACTOR)

- M. Item No. 013 – Install Groundwater Control Pump Station (minus pumps)

Measurement (Lump Sum)

The Contract Price for this item shall include all work contemplated in the following sections; Section 02220, Section 03300, Section and Section 15080 and all related work as shown on the Drawings. All items associated with the Pump Station shall be included in the lump sum price.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

- N. Item No. 014 – Install 8” Groundwater Collection Pipe

Measurement (Linear Foot)

The Contract Price for this item shall include all work contemplated under Section 02140, Section 15060, and Section 15080 and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system including pipe material, stone associated fittings (previously included as Item No 016) and geotextile wrap.

Payment

Payment of this item shall be on a unit price per linear-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for this item.

- O. Item No. 015 – Install 12” Groundwater Collection Pipe (Solid and Perforated)

Measurement (Linear Foot)

The Contract Price for this item shall include all work contemplated under Section 02140, Section 15060, and Section 15080 and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system including pipe material, stone and geotextile wrap and associated fittings (previously included as Item No 016).

Payment

Payment of this item shall be on a unit price per linear-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for this item.



P. Item No. 016 – Install Groundwater Collection Pipe Cleanouts

Measurement (per Each)

The Contract Price for this item shall include all work contemplated under Section 02140, Section 15060 and Section and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system cleanouts including associated fittings (previously included in Item No. 016)

Payment

Payment of this item shall be a unit price per each unit installed. The unit price bid times the actual quantities for this item shall be payment in full for this item.

Q. Item No. 017 – Sub-Base

Measurement (Cubic Yard)

The Contract Price for this item shall include all work contemplated under Section 02221 and all related work as shown on the Drawings. This item shall be measured on a square foot installed basis and surveyed to show a twelve-inch minimum depth. The depth measurements shall be based on site surveys prior to and upon completion and accepted testing of the sub-base. No payment will be made for sub-base quantities installed in excess of the design cross-section and construction limits for this item shown on the Drawings. Payment will not be made until survey deliverables are submitted and accepted by the PROJECT MANAGER.

Payment

Payment of this item shall be on a unit price per cubic yard installed. The unit price bid times the actual quantities for this item shall be payment in full for this item including laboratory testing.

R. Item No. 018 – Low Permeability Soil

Measurement (Cubic Yard)

The Contract Price for this item shall include all work contemplated under Section 02212 and all related work as shown on the Drawings. This item shall be measured on a square foot installed basis and surveyed to show a six-inch minimum depth. The depth measurements shall be based on site surveys prior to and upon completion and accepted testing of the sub-base. No payment will be made for soil quantities installed in excess of the design cross-section and construction limits for this item shown on the Drawings. Payment will not be made until survey deliverables are submitted and accepted by the PROJECT MANAGER.

Payment

Payment of this item shall be on a unit price per cubic yard installed. The unit price bid times the actual quantities for this item shall be payment in full for this item including laboratory testing.

- S. Item No. 019 – 60-mil Geomembranes (Primary and Secondary)

Measurement (Square Foot)

The Contract Price for this item shall include all work contemplated under Section 02776 and all related work as shown on the Drawings for the primary and secondary 60-mil textured HDPE geomembrane liners. This item shall be measured on a per square-foot installed basis. The quantity of geomembrane required for installation of the anchor trench or waste shall not be measured separately, but shall be included in the Unit Price.

Payment

Payment of this item shall be on a unit price per square-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

- T. Item Nos. 020 – Geocomposite (Primary)

Measurement (Square Foot)

The Contract Price for this item shall include all work contemplated under Section 02930 and all related work as shown on the Drawings. This item shall be measured on a per square-foot installed basis as measured in the field. The quantity required for installation of the anchor trench or waste shall not be measured separately, but shall be included in the Unit Price.

Payment

Payment for this item will be on a unit price per square-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

- U. Item Nos. 021 – Geocomposite (Secondary)

Measurement (Square Foot)

The Contract Price for this item shall include all work contemplated under Section 02930 and all related work as shown on the Drawings. This item shall be measured on a per square-foot installed basis as measured in the field. The quantity required for installation of the anchor trench or waste shall not be measured separately, but shall be included in the Unit Price.

Payment

Payment for this item will be on a unit price per square-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

V. Item No. 022 – 24-inch Protective Layer / Drainage Sand Layer

Measurement (CY)

The Contract Price for this item shall include all work contemplated under Section 02220 and all related work as shown on the Drawings. Depth shall be measured based on site surveys compared against the pre-construction or other interim surveys as appropriate to demonstrate actual depth.

Payment

Payment for this item shall be on a unit price per cubic yard installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item including laboratory testing.

W. Item No. 023 - 8-inch Diameter Leachate Collection Pipe

Measurement (Linear Foot)

The Contract Price for this item shall include all work contemplated under Section 02220, Section 02940, and Section 15080 associated with the 8-inch diameter HDPE pipe and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system including pipe material, stone and geotextile wrap.

Payment

Payment for this item shall be on a unit price per linear foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

X. Item No. 024 – 8-inch Diameter Leachate Detection Pipe

Measurement (Linear Foot)

The Contract Price for this item shall include all work contemplated under Section 02220, Section 02940, and Section 15080 associated with the 8-inch diameter HDPE pipe and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system including pipe material, stone and geotextile wrap.

Payment

Payment for this item shall be on a unit price per linear foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

Y. Item No. 025 - 8-inch Diameter Leachate Collection Cleanouts

Measurement (per Each)

The Contract Price for this item shall include all work contemplated under Section 02220, Section 02940, and Section 15080 associated with the 8-inch diameter HDPE pipe cleanouts and all related work as shown on the Drawings. This item shall be measured on a linear foot installed basis. The work includes all materials included in the piping system including pipe material, fittings, and appurtenances.

Payment

Payment for this item shall be on a unit price per unit installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

Z. Item No. 026 - 8-inch Diameter Leachate Detection Cleanouts

Measurement (per Each)

The Contract Price for this item shall include all work contemplated under Section 02220, Section 02940, and Section 15080 associated with the 8-inch diameter HDPE pipe cleanouts and all related work as shown on the Drawings. This item shall be measured on a per unit installed basis. The work includes all materials included in the piping system including pipe material, fittings, and appurtenances.

Payment

Payment for this item shall be on a unit price per unit installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

AA. Item No. 027 - Leachate Collection/Detection Sumps

Measurement (per Lump Sum)

The Contract Price for this item shall include all work contemplated under Section 02220, Section 02940, and Section 15080 associated with the 24-inch diameter HDPE sumps, leachate disposal pumps and all related work as shown on the Drawings. This item shall be measured on a per unit installed basis. The work includes all materials included in the sump system including pipe material and appurtenances and connection to the existing 4-inch force main.

Payment

Payment for this item shall be on a unit price per unit installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

- BB. Item No. 028 – Videotape the Installed Pipes (Leachate Collection, Leachate Detection and Groundwater Control)

Measurement (Lump Sum)

The Contract Price for this item includes materials, labor, and all general work to videotape installed pipe in the Leachate Collection, Leachate Detection and Groundwater Control piping systems.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

- CC. Item No. 029 - Leachate Collection/Detection Pumps

Measurement (per Each)

The Contract Price for this item shall include all work contemplated under Section 11200 associated with the leachate disposal pumps and all related work as shown on the Drawings. This item shall be measured on a per unit installed basis. The work includes all materials included in the pumping systems including piping, pumps, and appurtenances.

Payment

Payment for this item shall be on a unit price per unit installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item.

- DD. Item No. 030 – HDPE Liner Penetrations

Measurement (per Each)

The Contract Price for this item shall include all work contemplated under Section 02776 and all related work as shown on the Drawings for the HDPE geomembrane Liner Penetrations. This item shall be measured on a per unit installed basis. The quantity of geomembrane required for installation of the penetrations, labor and other materials shall be included in the Unit Price.

Payment

Payment of this item shall be on a unit price per unit installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

EE. Item No. 031 – Rain Tarp

Measurement (Square Foot)

The Contract Price for this item shall include all work contemplated under Section 02941 and all related work as shown on the Drawings for the rain tarp geomembrane. This item shall be measured on a per square-foot installed basis. The quantity of geomembrane required for installation of the anchor trench or waste shall not be measured separately, but shall be included in the Unit Price.

Payment

Payment of this item shall be on a unit price per square-foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

FF. Item No. 032 – Shell Rock Road

Measurement (Lump Sum)

The Contract Price for this item shall include all work contemplated under Section 02220 and all related work as shown on the Drawings.

Payment

Payment for this item shall be on a lump sum and billed as percent complete.

GG. Item No. 033 – Asphalt Road and Sub-Base ( previously Item 036)

Measurement (Lump Sum)

The Contract Price for this item shall include all work contemplated under Section 02220 and all related work as shown on the Drawings.

Payment

Payment for this item shall be on a lump sum and billed as percent complete as approved by the Project Manager

HH. Item No. 034 – Erosion Control Mat

Measurement (Square Foot)

The Contract Price for this item shall include all work contemplated in Section 01560 and as necessary to complete the installation of erosion control mat in all

drainage channels. This item shall be measured on a square foot installed basis as measured in the field.

Payment

Payment for this item shall be on a square foot installed. The unit price bid times the actual quantities for this item shall be payment in full for all work associated with this item including materials, installation and maintenance of the matted areas until final acceptance of the project.

II. Item No. 035 – Stormwater Structures

Measurement (Lump Sum)

The Contract Price for this item shall include all work contemplated in Section 02220, Section 1568, Section 03300 and as necessary to complete the installation of stormwater structures in the Stormwater Management Area and in the Wetlands Improvement Areas in addition to weirs and piping. This item shall be measured on a lump sum basis.

Payment

Payment of this item shall be on a lump sum basis. The payment sum for this item shall be in full for all completed work under this item.

JJ. Item No. 036 – Riprap

Measurement (Cubic Yard)

The Contract Price for this item shall include all work contemplated under Section 02220 and all related work including geotextile as required in the Drawing.

Payment

Payment for this item shall be on a unit price per cubic yard installed. The unit price bid times the actual quantities for this item shall be payment in full for all work under this item.

KK. Item No. 037 – Topsoil, Sodding, Seeding, and Mulching

Measurement (Square Yard)

The Contract Price for this item shall include all work contemplated in Section 02990 and as necessary to complete the installation of establishing vegetation in all areas with 3H:1V slopes within the limits of construction as shown on the Drawings. This item shall be measured on a square yard installed basis as measured in the field.

Payment

Payment for this item shall be on a square yard installed basis. The unit price bid times the actual quantities for this item shall be payment in full for materials, installation and maintenance of the planted areas until final acceptance of the project.

**- END OF SECTION -**



## **SECTION 01050**

### **SITE CONDITIONS SURVEYS**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The CONTRACTOR shall perform, or obtain other professional subcontractors to complete topographic surveys that meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code, to document elevations, grades, locations, maintain survey control during construction, and perform related field engineering as specified in the Contract Documents.
- B. The CONTRACTOR shall provide civil, structural or other professional engineering services specified or required to execute the CONTRACTOR'S construction methods.

##### **1.02 SURVEY REFERENCE POINTS**

- A. The CONTRACTOR shall locate reference points prior to starting WORK, and shall protect and preserve all permanent reference points during construction. The COUNTY shall provide control elevations and coordinates for the reference points to be used by CONTRACTOR.
  - 1. CONTRACTOR shall make no changes or relocate any reference point without prior written notice to the PROJECT MANAGER.
  - 2. CONTRACTOR shall report to the PROJECT MANAGER when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
  - 3. CONTRACTOR, at no additional cost to the COUNTY, shall replace and resurvey reference points that have been lost or destroyed. The replaced reference point shall be surveyed by a registered, professional land surveyor. Replacement will be based on original survey control.
- B. Prior to any work, the CONTRACTOR shall immediately notify the PROJECT MANAGER of any discrepancies with the reference points from the coordinates and elevations provided.

### **1.03 RECORD DRAWINGS**

- A. All survey record documents, submitted to the PROJECT MANAGER for approval, shall be signed and sealed by a professional land surveyor registered in the State of Florida.
- B. Submitted survey record documents shall include the following:
  - 1. As stages of the WORK are completed, submit a site survey, signed and sealed by a professional land surveyor, registered in the State of Florida. The Record Drawing information shall be submitted on 24-inch by 36-inch sheets, as well as AutoCAD drawing files on CD-ROM.
  - 2. AutoCAD drawing file requirements: Contour lines shall be continuous, unbroken polylines with a width of zero and an elevation (z-coordinate) assigned according to the elevation of the contour line. All spot elevations shall have horizontal controls with vertical z-coordinates. Contours shall be at 1 foot intervals, with index contours at every fifth interval. Objects in the drawing shall be drawn to scale.
  - 3. All survey information submitted shall be on the State Coordinate System based on the monuments provided by the COUNTY.
  - 4. All submitted record drawings shall have the COUNTY-provided monuments shown on the drawings for the purposes of orientation, both horizontally and vertically.
  - 5. If multiple sheets are required, each sheet shall include match lines.

### **1.04 SUBMITTALS**

- A. The CONTRACTOR shall submit the name and address of the surveyor to the PROJECT MANAGER.
- B. Upon request of the PROJECT MANAGER, the CONTRACTOR shall submit documentation signed by a surveyor registered in the State of Florida, certifying that elevations and locations of improvements are in conformance with the Contract Documents, or if not in conformance, certifying variances from the Contract Documents.
- C. RECORD DRAWINGS – The CONTRACTOR shall provide and submit to the PROJECT MANAGER for approval, a signed and sealed drawing, representing the horizontal and vertical limits, as follows:
  - 1. Initial Conditions: Prior to performing any earthwork, a pre-construction survey of the site within and 50 feet beyond the limits of construction as shown on the Drawings.

2. Existing Liner – Prior to performing any earthwork, the existing liner in the northern and eastern area must be staked and surveyed every 50 feet.
  3. Excavation Limits: A topographic survey representing the horizontal and vertical limits of excavation.
  4. Subgrade Surface: A topographic survey representing the completed subgrade surface. This survey shall represent the surface prior to installation of the sub-base.
  5. Sub-Base Surface: A topographic survey representing the completed sub-base surface. This survey shall represent the surface prior to installation of the lower geomembrane.
  6. Leachate Collection and Removal System (LCRS) pipes: A location survey and inverts of the installed HDPE pipes of the LCRS. Pipe inverts shall be noted every 50 linear feet along the pipe and at each change in direction and elevation.
  7. Geomembrane Limits: A location survey of the edge of geomembrane. This survey shall represent the limits of geomembrane, along the sides of Section 8.
  8. Top of Protective Cover Soil: A topographic survey representing the completed elevation of the one foot thick protective sand layer. This survey shall represent the surface prior to installation of the processed tires.
  9. Top of Drainage Sand: A topographic survey representing the completed elevation of the drainage sand layer.
  10. Groundwater Collection System (GCS): A topographic survey representing the completed elevation of the GCS shall be provided. The survey will include at a minimum the start elevation and the end elevations of each pipe and every 100 feet.
  11. Existing leachate pipe replacement: A topographic survey representing the elevation of all constructed inverts at MH-6, MH-7, and MH-8, in addition to every 50 feet between MH-7 and MH-8.
- D. All Partial Field Surveys are to include photocopies of the field surveyor's log that has been signed and dated by the surveyor performing the survey.

## **PART 2 - PRODUCTS (Not Used)**

## **PART 3 - EXECUTION**

### **3.01 SURVEYING**

- A. The CONTRACTOR shall be responsible for the preservation of all benchmarks, stakes, and marks. If any benchmarks, stakes, or marks are disturbed by the CONTRACTOR, the CONTRACTOR shall not proceed with any WORK until he has established such points, marks, lines and elevations as may be necessary for the prosecution of the WORK.
  - 1. The accuracy of any method of staking shall be the responsibility of the CONTRACTOR. All engineering for vertical and horizontal control shall be the responsibility of the CONTRACTOR.
- B. All surveys shall be topographic surveys that meet the minimum standards of Chapter 61-G17 of the Florida Administrative Code. Surveys shall include (but are not limited to) grading, extent of liner system, structure locations and elevations (of slabs), pipe inverts, piping, and other permanent structures.
- C. The topographic information collected shall be taken on a 50 foot by 50 foot grid, at a minimum, one point directly above the previous, as necessary to provide an accurate representation of the contour topography (i.e., spot elevations, grade breaks, ditches, mounds, etc.). For ditches and leachate collection trenches, spot elevations shall be taken, at a minimum, every 50 linear feet, to include, at a minimum, the centerline of the ditch, the toe and top of ditch slopes, and any grade breaks.
- D. The CONTRACTOR shall survey the limits of the geomembrane and place markers delineating the limits of geomembrane.

### **3.02 RECORD KEEPING**

- A. The surveyor shall maintain a complete, accurate log of all control and survey WORK as it progresses. This log shall be available for periodic review by the PROJECT MANAGER.
- B. Grade elevations and locations will be required at certain phases (or stages) of construction. The CONTRACTOR'S Florida-registered land surveyor will provide and maintain record notes and a finished record drawing at the completion of each phase as listed in Paragraph 1.04 of this Section. Each phase must be accepted by the PROJECT MANAGER in writing before the start of the next phase. Record Drawings reflecting elevations and location information shall be submitted to the PROJECT MANAGER.

### **3.03 TOLERANCES**

- A. The elevation and grades shall be within an accuracy of 0.2 feet vertical and 0.5 feet horizontal as shown in the Contract Documents. Unless otherwise stated, all surveys shall be at a scale of 1 inch equals 50 feet, with contours at one foot intervals.

### **3.04 ACCEPTANCE OF WORK**

- A. The sub-base shall not be installed until the Survey of the surface upon which sub-base is to be placed has been completed and approved by the PROJECT MANAGER.
- B. No geomembrane installation shall occur until the sub-base upon which the geomembrane is to be installed has been completed and approved by PROJECT MANAGER.

### **3.05 PARTIAL SURVEYS**

- A. Should sequence of construction selected by the CONTRACTOR or the COUNTY be such that the WORK is to be completed stages then, copies of the surveyor's official field notes for each stage shall be submitted to the PROJECT MANAGER for approval. The field notes shall be signed and dated by the surveyor performing the survey. The field notes shall include the design elevation, the as-built information, and the differences in elevation. Upon completion of each layer of the liner system (i.e. all surveys as outlined in Part 1.05), a complete record drawing, reflecting the submitted field note information and meeting the requirements outlined for Record Drawings in this Section, shall be submitted to the PROJECT MANAGER for approval.

### **3.06 PHOTOGRAPHIC RECORD**

- A. Preliminary Photos: The CONTRACTOR shall provide a photographic record of the project site prior to the start of any work. At a minimum, the photographic record shall consist of two sets of 48 photographs, each 4 inches by 6 inches. Significant items (i.e., roads, wells, vegetation) shall be chosen for a record of the initial site conditions. The photographs shall be of good quality and camera date stamped. The back of each photograph shall include project name, view orientation, the date the picture was taken, name of photographer, and a brief description of the activity covered in the picture.
- B. Progress Photos: The CONTRACTOR shall provide a photographic record of construction progress every other week to the COUNTY. For each submittal, at a minimum, the photographic record shall consist of two sets of 12 color photographs, each 5 inches by 7 inches. The PROJECT MANAGER shall reserve the right to select the views to be photographed. The photographs shall be of good quality and camera date stamped. The back of each photograph shall include project name, view orientation, the date the picture was taken, name of

photographer, and a brief description of the activity covered in the picture. Polaroid or similar instant type photographs will not be acceptable, nor will video recordings.

- C. Aerial Photo: The CONTRACTOR shall provide aerial photographs of the project after the one foot drainage sand layer is installed over the upper geocomposite (i.e., prior to the installation of the processed tire layer). The photographs shall be of good quality, in color and at a minimum flown at a scale of 1 inch equals 50 feet accuracy. The submittal shall include three (3) 8 inches by 10 inches photographs. An electronic copy of the aerial photograph should also be provided to the ENGINEER.

**- END OF SECTION -**

## **SECTION 01200**

### **MEETINGS AND CONFERENCES**

#### **PART 1 - GENERAL**

##### **1.01 PRECONSTRUCTION CONFERENCE**

- A. In accordance with the General Conditions, prior to the commencement of WORK, a preconstruction conference will be held at a mutually agreed time and place. The conference may be attended by:
  - 1. Responsible officer of CONTRACTOR and superintendent assigned to the project.
  - 2. Principal subcontractors.
  - 3. Representatives of principal suppliers and manufacturers as appropriate.
  - 4. CONTRACTOR'S Quality Control Representative.
  - 5. PROJECT MANAGER.
  - 6. Representatives of the COUNTY.
  - 7. Others as requested by CONTRACTOR, COUNTY, or PROJECT MANAGER.
- B. Unless previously submitted to PROJECT MANAGER, CONTRACTOR shall bring to the conference a Preliminary Progress schedule for each of the following:
  - 1. Progress and order of the work.
  - 2. Values for progress payment purposes.
  - 3. Shop drawings and other submittals.
- C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include as a minimum:
  - 1. CONTRACTOR'S tentative schedules.
  - 2. Transmittal, review, and distribution of CONTRACTOR'S submittals.

3. Processing applications for payment.
  4. Maintaining record documents.
  5. Critical work sequencing.
  6. Field decisions and change orders.
  7. Use of premises, office and storage areas, security, housekeeping, and COUNTY'S needs.
  8. Major equipment deliveries and priorities.
  9. CONTRACTOR'S assignments for safety and first aid.
- D. PROJECT MANAGER will preside at the conference and will make arrangements for keeping the minutes and distributing them to all persons in attendance.

## **1.02 PROGRESS MEETINGS**

- A. PROJECT MANAGER shall schedule and conduct regular progress meetings at least weekly and at other times as required by progress of the WORK. CONTRACTOR, PROJECT MANAGER, and all subcontractors active on the site shall be represented at each meeting. CONTRACTOR may request attendance by representatives of its suppliers, manufacturers, and other subcontractors.
- B. PROJECT MANAGER shall preside at the meetings and provide for keeping minutes and distribution of the minutes to the COUNTY, CONTRACTOR, and others. The purpose of these meeting will be to review the progress of the WORK, maintain coordination of efforts, discuss changes in scheduling, and resolve problems which may develop.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**- END OF SECTION -**



## **SECTION 01300**

### **CONTRACTOR SUBMITTALS**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL**

- A. Whenever submittals are required hereunder, all such CONTRACTOR submittals shall be submitted to the ENGINEER or as designated by the ENGINEER.
- B. Within 10 days after Award, but prior to preconstruction meeting. The CONTRACTOR shall submit the following items to the ENGINEER for review:
  - 1. A preliminary schedule of Shop Drawing submittals.
  - 2. A list of all permits and licenses the CONTRACTOR shall obtain indicating the agency required to grant the permit and the expected date of submittal for the permit and required date for receipt of the permit.

##### **1.02 SHOP DRAWINGS**

- A. Wherever called for in the Contract Documents, or where required by the ENGINEER, the CONTRACTOR shall furnish to the ENGINEER for review, five copies of each submittal. The term "submittal" as used herein shall be understood to include detail design calculations, shop drawings, fabrication and installation drawings, erection drawings, lists, graphs, operating instructions, catalog sheets, data sheets, samples, and similar items. Any submittal, which is not complete or does not provide the level of detail outlined in the specifications, shall not be considered acceptable for review and may be returned for resubmittal. Should any submittal be a part of any schedule milestone and is considered to be unacceptable by the COUNTY, the appropriate milestone shall be considered as not having been met until a complete and properly detailed submittal is received.
- B. All shop drawings or other submittals shall be accompanied by the COUNTY'S standard submittal transmittal form. This form may be obtained in quantity from the ENGINEER at reproduction cost. Any submittal not accompanied by such a form or if all applicable items on the form are not completed, the submittal will be returned for resubmittal. Ultimate responsibility for the accuracy and completeness of the information contained in the submittal shall remain with the CONTRACTOR.

- C. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturer's "package" or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the ENGINEER. Submittals shall be a complete package for each system.
- D. Except as may otherwise be provided herein, the ENGINEER will return prints of each submittal to the CONTRACTOR, with its comments noted thereon, within a reasonable number of calendar days following their receipt by the ENGINEER. It is considered reasonable that the CONTRACTOR shall make a complete and acceptable submittal to the ENGINEER. The COUNTY reserves the right to withhold monies due the CONTRACTOR to cover additional costs of the ENGINEER'S review when multiple submittals are required due to CONTRACTOR'S failure to comply with the specifications.
- E. If two copies of a submittal are returned to the CONTRACTOR marked "**NO EXCEPTIONS TAKEN,**" formal revision and resubmission of said submittal will not be required.
- F. If two copies of a submittal are returned to the CONTRACTOR marked "**MAKE CORRECTIONS NOTED,**" formal revision and resubmission of said submittal will not be required.
- G. If one copy of the submittal is returned to the CONTRACTOR marked "**AMEND - RESUBMIT,**" the CONTRACTOR shall have five work days to revise said submittal and shall resubmit five copies of said revised submittal to the ENGINEER.
- H. If one copy of the submittal is returned to the CONTRACTOR marked "**REJECTED - RESUBMIT,**" the CONTRACTOR shall have five work days to revise said submittal and shall resubmit five copies of said revised submittal to the ENGINEER.
- I. Fabrication of an item shall not commence before the ENGINEER has reviewed the pertinent submittals and returned copies to the CONTRACTOR marked either "**NO EXCEPTIONS TAKEN**" or "**MAKE CORRECTIONS NOTED.**" Revisions indicated on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis of claims for extra work.
- J. All CONTRACTOR submittals shall be reviewed by an authorized representative of the CONTRACTOR prior to submission to the ENGINEER. Each submittal shall be dated, signed, and certified by the CONTRACTOR as

being correct. No consideration for review by the ENGINEER of any CONTRACTOR submittals will be made for any items which have not been so certified by the CONTRACTOR. All non-certified submittals will be returned to the CONTRACTOR without action taken by the ENGINEER, and any delays caused thereby shall be the total responsibility of the CONTRACTOR.

- K. The ENGINEER'S review of CONTRACTOR submittals shall not relieve the CONTRACTOR of the entire responsibility for the correctness of details and dimensions. The CONTRACTOR shall assume all responsibility and risk for any misfits due to any errors in CONTRACTOR submittals. Any fabrication or other work performed in advance of the receipt of approved submittals shall be entirely at the CONTRACTOR's risk and expense. The CONTRACTOR shall be responsible for the dimensions and the design of adequate connections and details.

### **1.03 CONTRACTOR'S SCHEDULE**

- A. The schedule shall be comprehensive, covering both activities at the site of the WORK and offsite activities such as design, procurement, and fabrication. The schedule shall be orderly and realistic and shall be revised as necessary to meet this requirement. The CONTRACTOR shall promptly advise the ENGINEER of any occurrence that may impact the schedule. No revision to the schedule can be made without the review and acceptance by the ENGINEER.
- B. The CONTRACTOR shall assist the ENGINEER in reviewing and evaluating each schedule furnished. Schedules which are not accepted and which are returned to the CONTRACTOR shall be revised to correct the defects noted and shall be resubmitted to the ENGINEER within fifteen calendar days after receipt.
- C. When required to perform and complete the changed WORK in accordance with the revised schedule, the CONTRACTOR shall provide additional labor, materials, equipment, or other factors of production in excess of those in use before the changed WORK was ordered.

### **1.04 SAMPLES**

- A. CONTRACTOR's samples shall be prepared, submitted, reviewed, monitored and approved in accordance with this paragraph and paragraph 7.12 of the General Conditions.
- B. Unless otherwise specified, wherever in the Specifications samples are required, the CONTRACTOR shall submit not less than two samples of each item or material to the ENGINEER for approval at no additional cost to the COUNTY.
- C. Samples, as required herein, shall be submitted for approval a minimum of fifteen working days prior to ordering such material for delivery to the jobsite

and shall be submitted in an orderly sequence so that dependent materials or equipment can be assembled and reviewed without causing delays in the WORK.

- D. All samples shall be individually and indelibly labeled or tagged, indicating thereon all specified physical characteristics and manufacturer's name for identification.
- E. Unless otherwise specified, all colors and textures of specified items will be selected by the COUNTY from the manufacturer's standard colors and standard product lines.

#### **1.05 TECHNICAL MANUALS**

- A. The CONTRACTOR shall furnish to the ENGINEER three identical sets of technical manuals. Each set shall consist of one or more volumes, each of which shall be bound in a standard size, three-ring, looseleaf, vinyl plastic hard cover binder suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches. A table of contents shall be provided which indicates all equipment in the technical manuals.
- B. The technical manuals shall include for each item of mechanical and electrical equipment:
  - 1. Complete operating instructions, including location of controls, special tools or other equipment required, related instrumentation, and other equipment needed for operation.
  - 2. Lubrication schedules, including the lubricant SAE grade and type, temperature range of lubricants, and frequency of required lubrication.
  - 3. Preventive maintenance procedures and schedules.
  - 4. Parts lists by generic title and identification number complete with exploded views of each assembly.
  - 5. Disassembly and reassembly instructions.
  - 6. Name and location of nearest supplier and spare parts warehouse.
  - 7. Recommended troubleshooting and start-up procedures.
  - 8. Reproducible prints of the record drawings, including diagrams and schematics, as required under the electrical and instrumentation portions of these specifications (if any).

- C. The CONTRACTOR shall submit the required technical manuals complete and in the number and fashion specified prior to requesting payment in excess of seventy-five percent of the base contract value. Failure to do so shall be cause for the COUNTY to withhold any further payments to the CONTRACTOR until the requirements of this paragraph have been met.

#### **1.06 SPARE PARTS LISTS**

- A. The CONTRACTOR shall furnish to the ENGINEER three identical sets of spare parts information for all mechanical, electrical, and instrumentation equipment. The spare parts list shall include the current list price of each spare part. The spare parts list shall be limited to those spare parts, which the manufacturer recommends, be maintained by the COUNTY in inventory at the site. Each manufacturer of supplier shall indicate the name, address, and telephone number of its nearest outlet of spare parts to facilitate the COUNTY in ordering. The CONTRACTOR shall cross-reference all spare parts lists to the equipment numbers designated in the specifications or on the drawings.

The spare parts lists shall be bound in standard size, three-ring, looseleaf, vinyl plastic hard cover binders suitable for bookshelf storage. Binder ring size shall not exceed 2.5 inches.

- B. The CONTRACTOR shall submit the required spare parts lists complete and in the number and fashion specified prior to requesting payment in excess of seventy-five percent of the base contract value. Failure to do so shall be cause for the COUNTY to withhold any further payments to the CONTRACTOR until the requirements of this paragraph are met.

#### **1.07 RECORD DRAWINGS**

- A. Contractor's record drawings shall be maintained in accordance with this Section, Article 7.9 of the General Conditions, and the Supplemental Conditions.
- B. The CONTRACTOR shall keep and maintain at the job site one record set of drawings. On these, the CONTRACTOR shall mark all project conditions, locations, configurations, and any other changes or deviations which may vary from the details represented on the original Contract Drawings, including buried or concealed construction and utility features which are revealed during the course of construction. Special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the locations indicated or which were not indicated on the Contract Drawings. Said record drawings shall be supplemented by any detailed sketches or typewritten changes to the specifications, as necessary or directed to indicate fully the WORK as actually constructed. These master record drawings of the CONTRACTOR'S representation of as-built conditions, including all revisions

made necessary by addenda, change orders, and the likes shall be maintained up-to-date during the progress of the WORK.

- C. In the case of those drawings which depict the detail requirements for equipment to be assembled as wired in the factory, such as motor control centers and the like, the record drawings shall be updated by indicating those portions which are superseded by change order drawings or final shop drawings and by including appropriate reference information describing the change orders by number and the shop drawings by manufacturer, drawing, and revision number.
- D. Record drawings shall be accessible to the ENGINEER at all times during the construction period and shall be delivered to the ENGINEER, upon completion of the WORK prior to final acceptance of project.
- E. Application for Payment will not be approved if the record drawings are not kept up to date.
- F. Final payment will not be approved until the CONTRACTOR prepared record drawings have been approved by the ENGINEER. Record drawings may be in the form of a set of prints with carefully plotted information overlaid in red pencil or in electronic format compatible with AutoCAD 2000.
- G. Upon substantial completion of WORK and prior to final acceptance, the CONTRACTOR shall complete and deliver a complete set of record drawings to the ENGINEER for transmittal to the COUNTY, conforming to the construction records of the CONTRACTOR. This set of drawings shall consist of corrected plans showing the reported location of the WORK. The information submitted by the CONTRACTOR and incorporated by the ENGINEER into the record drawings will be assumed to be reliable, and the ENGINEER will not be responsible for the accuracy of such information, nor for any errors or omissions which may appear on the record drawings as a result.

#### **1.08 EXCAVATION PLAN**

- A. CONTRACTOR shall prepare and submit to the ENGINEER for approval an excavation plan for the WORK contained in the Contract prior to beginning the WORK. The plan shall indicate the general plan for performing excavation. The excavation plan is to be provided for information only. Submission and acceptance by the ENGINEER of this information shall not relieve the CONTRACTOR from constructing the WORK in a continuously safe manner at all times and in accordance with the Contract Documents.

#### **1.09 SITE CONDITIONS SURVEYS**

- A. CONTRACTOR shall submit the site conditions survey data as required in the Section 01050, "Site Conditions Surveys."

### **1.10 PROGRESS REPORTS**

- A. A progress report shall be furnished to ENGINEER with each Application for Payment. If the WORK falls behind schedule, CONTRACTOR shall submit additional progress reports at such intervals as ENGINEER may request.
- B. Each progress report shall include sufficient narrative to describe any current and anticipated delaying factors, their effect on the construction schedule, and proposed corrective actions. Any WORK reported complete, but which is not readily apparent to ENGINEER, must be substantiated with satisfactory evidence.
- C. Each progress report shall include a list of the activities completed with their actual start and completion dates, a list of the activities currently in progress, and the number of working days required to complete each.

### **1.11 SCHEDULE OF VALUES**

- A. Contractor's Schedule of Values shall be prepared, submitted, reviewed, monitored and approved in accordance with this Section and Article 15.1 of the General Conditions.
- B. At least ten days prior to submitting the first Application for Payment the CONTRACTOR shall prepare and submit to ENGINEER a schedule of values covering each lump-sum item. The schedule of values showing the value of each kind of work shall be acceptable to ENGINEER before any partial payment estimate is prepared. Such items as Bond premium, temporary construction facilities and plant may be listed separately in the schedule of values, provided the amounts can be substantiated.
- C. The sum of the items listed in the schedule of values shall equal the contract lump sum price. Overhead and profit shall not be listed as separate items in the schedule of values.
- D. An unbalanced schedule of values providing for overpayment of CONTRACTOR on items of WORK which would be performed first will not be accepted. The schedule of values shall be revised and resubmitted until acceptable to ENGINEER.

### **1.12 SURVEY DATA**

- A. All field books, notes, and other data developed by CONTRACTOR in performing the surveys required by the WORK shall be available to ENGINEER for examination throughout the construction period. All such data shall be submitted to ENGINEER with documentation required for final acceptance of the WORK.

### **1.13 QUALITY ASSURANCE/QUALITY CONTROL PLAN**

- A. CONTRACTOR's Quality Control responsibilities shall be discharged in accordance with this Section, Article 14.2.2 of the General Conditions.
- B. CONTRACTOR shall prepare and submit a Quality Assurance/Quality Control Plan for the WORK contained in the Contract prior to beginning the WORK. This Plan will indicate the actions, documentation, and responsible party or parties that will assure compliance with the specifications and plans, and that quality requirements for inspections and testing are implemented. The Plan will contain a checklist of quality related activities applicable to various construction activities for scheduling and implementation purposes.

### **1.14 DAILY FORCE REPORT**

CONTRACTOR shall submit to the ENGINEER, or designee, a daily force report. The report shall be delivered not later than 9 a.m. of the work day following the report date and shall include the following:

- A. Day of week, date, CONTRACTOR name, CIP number, and Report number.
- B. Summary of work in process (segregated by CONTRACTOR and Subcontractor).
- C. Details of work accomplished including quantities of work installed.
- D. Summary of equipment working and where working.
- E. Summary of manpower by work element and Subcontractor.
- F. Receipt of major equipment or materials.

### **1.15 QUALITY CONTROL TESTING LOG**

- A. The CONTRACTOR shall submit for approval a testing log which lists all of the required quality control tests and which has columns for when the test is performed and if the test result is satisfactory. The CONTRACTOR will submit monthly updated testing logs with the application for payment.

### **1.16 QUALITY CONTROL REPRESENTATIVE'S RESUME**

- A. The CONTRACTOR shall submit the Quality Control Representative's resume to the ENGINEER within fifteen days of the Notice to Proceed.



**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**- END OF SECTION -**

## SECTION 01311

### CONSTRUCTION SCHEDULE

#### PART 1 - GENERAL

##### 1.01 SUBMITTAL PROCEDURES

- A. Submittal Requirements.- A Bar Chart schedule shall be employed for the planning and scheduling of all work required under the Contract Documents.

Schedule shall be on an 11 inch x 17 inch sheet of paper, or larger if needed to clearly show progress of work.

The time scale (horizontal) shall be in weeks. The activities shall be listed on the left-hand side (vertical).

Activities shall be broken down into sufficient detail to show most work activities. The listing from top to bottom shall be in a logical manner of which the work will be accomplished. Space shall be provided between activities and within bars to allow for marking of actual progress.

Time of Submittals.- Within fifteen working days after Notice-to-Proceed, CONTRACTOR shall submit a bar chart schedule and narrative for review by the PROJECT MANAGER. The schedule submitted shall indicate a project completion date, the same as the contract completion date. A copy of the schedule, clearly showing progress made shall be submitted on a two week basis.

##### 1.02 PROGRESS MEETINGS

For the weekly progress meeting, Contractor shall submit a three week look-ahead schedule showing all activities in progress, uncompleted or scheduled to be worked during the three weeks. The three weeks include the current week plus the next two. The three week schedule shall list all activities from the approved schedule for work during the period, which are currently planned to be worked even if out of sequence and work which is unfinished but scheduled to be finished. The schedule shall also show the planned resources and deviations from that plan. Supervisors and general labor not assigned to specific activities may be shown as an "additional labor" line so that the total resources equal the manpower on site.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**- END OF SECTION -**

## **SECTION 01500**

### **TEMPORARY FACILITIES**

#### **PART 1 - GENERAL**

##### **1.01 Summary**

- A. CONTRACTOR shall provide temporary utilities, facilities and temporary controls for protection of the WORK as described herein. CONTRACTOR shall provide storm water control within the limits of construction as shown on the drawings. CONTRACTOR shall provide temporary petroleum storage containment as described herein and use a designated equipment maintenance area as approved by the COUNTY and described herein.

##### **1.02 RELATED SECTIONS**

- A. Section 01700 – Contract Completion, Start-up and Closeout

##### **1.03 TEMPORARY ELECTRICITY**

- A. CONTRACTOR shall provide and pay for required power service from Utility source.
- B. CONTRACTOR shall provide a temporary electric feeder from an existing electrical service. Power consumption shall not disrupt COUNTY'S need for continuous service.
- C. CONTRACTOR shall provide power outlets for construction operations, with branch wiring and distribution boxes as required. CONTRACTOR shall provide flexible power cords as required for his use.

##### **1.04 TELEPHONE SERVICE**

- A. CONTRACTOR shall provide, maintain, and pay for telephone service to field offices at time of project mobilization.

##### **1.05 TEMPORARY WATER SERVICE**

- A. CONTRACTOR shall connect to existing water source for construction operations.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections

#### **1.06 TEMPORARY SANITARY FACILITIES**

- A. CONTRACTOR shall provide and maintain required facilities and enclosures. Existing facilities shall not be used.
- B. CONTRACTOR shall provide portable facilities for WORK force on site and comply with federal, state, and local codes.
- C. CONTRACTOR shall provide running water in field offices.

#### **1.07 BARRIERS**

- A. CONTRACTOR shall provide barriers to prevent unauthorized entry to construction areas.
- B. CONTRACTOR shall provide barricades and protection around groundwater monitoring wells at a minimum distance of 25 feet for each well within 200 feet of the limits of construction as shown on the drawings.
- C. CONTRACTOR shall protect non-owned vehicular traffic, stored materials, site and structures from damage during construction.

#### **1.08 STORMWATER CONTROL**

- A. CONTRACTOR shall grade site to drain. Excavations shall be maintained free of water. CONTRACTOR shall provide, operate and maintain pumping equipment as necessary.
- B. CONTRACTOR shall protect site from standing or flowing water. CONTRACTOR shall provide water barriers as required to protect site from soil erosion, silt, and sediment.

#### **1.09 PROTECTION OF INSTALLED WORK**

- A. CONTRACTOR shall protect installed WORK and provide special protection as specified in the contract documents.
- B. CONTRACTOR shall provide temporary and removable protection for installed products. CONTRACTOR shall control activity in the immediate WORK area to minimize damage to surrounding area.
- C. Traffic is prohibited in landscaped areas.

#### **1.10 SECURITY**

- A. CONTRACTOR shall provide the security to protect WORK, existing facilities and operations from unauthorized entry, vandalism, and theft.

- B. CONTRACTOR shall coordinate with COUNTY'S security program.

#### **1.11 ACCESS ROADS**

- A. CONTRACTOR shall extend and relocate access roads as WORK progress requires. Provide construction detours necessary for unimpeded traffic flow on site.
- B. CONTRACTOR shall provide and maintain access to fire hydrants free of obstructions.
- C. Existing on-site roads may be used for construction traffic. CONTRACTOR shall repair damage resulting from the WORK.

#### **1.12 PARKING**

- A. Provide temporary parking areas to accommodate project personnel.

#### **1.13 PROGRESS CLEANING**

- A. CONTRACTOR shall keep temporary services and facilities clean and neat in appearance, operate in a safe and efficient manner and take necessary fire prevention measures. Do not overload facilities, nor permit them to interfere with progress. Do not allow hazardous dangerous, unsanitary conditions, nor public nuisances to develop or persist on the site.
- B. CONTRACTOR shall remove waste materials, debris, and rubbish from the site and field offices weekly and dispose on-site in areas designated by the COUNTY.

#### **1.14 FIELD OFFICES**

- A. Contractor's Field Office shall be weather-tight with lighting, electrical outlets, heating, cooling, and ventilating equipment. It shall be equipped with sturdy furniture and drawing display table.
  - 1. During the performance of this Contract, CONTRACTOR'S field office shall be the headquarters of the CONTRACTOR'S representative authorized to receive drawings, instruction, or other communications or articles. Communications given to said representative or delivered to CONTRACTOR'S field office in his absence shall be deemed to have been delivered to the CONTRACTOR.
- B. The CONTRACTOR shall provide a suitable field office for the PROJECT MANAGER on site, separate from the CONTRACTOR'S field offices. It shall be a multiple room, fully furnished, air conditioned, heated and ventilated office

space for the sole use of the PROJECT MANAGER, ENGINEER, and CQA CONSULTANT. The CONTRACTOR shall pay all normal costs associated with this office, such as electricity, telephone, water, sewer, equipment maintenance, janitorial, and maintenance service. At a minimum, the office space configuration shall include: two standard size offices with lockable doors, a larger room for meetings, a covered entrance way, and a separate main entrance with new lock and four keys. Other minimum requirements for the office space of the PROJECT MANAGER are:

1. Minimum 720 square feet with a minimum dimension 12 feet.
2. Linoleum or tile covered floor.
3. Minimum of three windows with minimum total area of 10 percent of floor area. Windows shall have operable sash and insect screens. Locate offices to provide window views of construction area.
4. Electrical Distribution Panel with four circuits minimum, 110 volt, 60 hz service.
5. Minimum of six 110-volt duplex convenience outlets, at least one on each wall in the main area and two in each office.
6. Two direct telephone lines with local access, one direct line with four telephone connections. One telephone per room, an answering machine and one independent direct-line for fax machine.
7. Portable lavatory toilet facilities with toilet paper, and paper towels, resupplied as needed.
8. Bottled drinking water, water cooler, and paper drinking cups, resupplied as needed.
9. Two standard size desks, 3 ft x 5 ft with three drawers each and two swivel arm desk chairs on casters.
10. One drafting table, at least 30-inches x 72 inches and a drafting table stool of proper height.
11. Two fire-resistant four-drawer legal-size metal filing cabinets with locks and two keys per lock.
12. Six linear feet of bookshelves, minimum 4 feet high for each desk.
13. Three waste baskets.

14. Outside thermometer.
  15. Dry type copy machine capable of making 8 ½ x 11 inch and 11 x 17 inch copies without reductions. Provide all supplies, expendables and maintenance for the period the field office is required.
  16. Dry type plain paper fax machine including all supplies, expendables and maintenance for the period the field office is required.
  17. One standard conference table with eight chairs.
  18. Packaged new basic first aid kit.
  19. Two 5 pound nominal capacity wall mounted fire extinguishers, including one UL-rated for use on electronic (i.e., computers) equipment.
- C. After the project is completed, CONTRACTOR shall remove or dispose properly all furnishings listed.

#### **1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

- A. CONTRACTOR shall remove temporary above grade or buried utilities, equipment, facilities, and materials prior to Final Application for Payment inspection.
- B. CONTRACTOR shall clean and repair damage caused by installation or use of temporary WORK.
- C. CONTRACTOR shall restore existing facilities used during construction to original condition and restore permanent facilities used during construction to specified condition.

#### **1.16 PETROLEUM STORAGE CONTAINMENT**

- A. CONTRACTOR shall be responsible for abiding by and obtaining all necessary local, state, and federal codes and permits regarding storage of petroleum products.
- B. CONTRACTOR shall provide a spill/leak containment vessel or lined containment area for above ground petroleum storage tanks used for completion of the WORK. The containment vessel or area shall have a spill/leak proof storage capacity exceeding 125 percent of the volume of the petroleum storage tank.



- C. The CONTRACTOR shall provide tie down anchors for the petroleum storage tank to prevent the flotation of an empty tank due to rain water filling the containment vessel or area.
- D. The CONTRACTOR shall provide operating fire extinguishers and no smoking signs. Fire extinguishers shall be accessible to personnel operating on or near the containment vessel or area.
- E. The CONTRACTOR shall provide a raintarp or cover and shall cover the containment vessel or area to prevent accumulation of stormwater within the containment vessel or area. If the CONTRACTOR does not elect to cover the containment vessel or area, then the CONTRACTOR shall submit a proposed plan to the ENGINEER for approval, describing disposal methods of the collected stormwater.
- F. In the event of spills/leaks outside of the containment vessel or area and upon completion of the WORK, the CONTRACTOR shall collect and dispose of all contaminated soils and containment liners at no cost to the COUNTY.
- G. Any and all costs associated with testing of water or soils contaminated by petroleum from the CONTRACTOR'S petroleum storage containment area shall be the responsibility of the CONTRACTOR.

#### **1.17 EQUIPMENT MAINTENANCE AREA**

- A. The CONTRACTOR shall designate an equipment maintenance and repair area for completion of the WORK. The location of this area shall be approved by the COUNTY. Maintenance and repair of equipment shall be conducted within this area. Petroleum and equipment fluids spilled or leaking on the soil shall be collected and disposed by the CONTRACTOR.
- B. Non-repairable equipment, leaks or spills of petroleum or equipment fluids outside the maintenance repair area shall be completely removed by the CONTRACTOR and disposed of properly.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**-END OF SECTION-**

## **SECTION 01505**

### **MOBILIZATION AND DEMOBILIZATION**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site all equipment and materials as required for the proper performance and completion of the WORK. Mobilization shall include but not limited to, the following principal items:
1. Move onto the site all CONTRACTOR'S equipment and materials required for the project.
  2. Establish fire protection plan and safety program.
  3. Provide on-site sanitary facilities and potable water facilities as specified.
  4. Arrange for and erect CONTRACTOR'S work and storage yard and employees' parking facilities.
  5. Submit all required insurance certificates and bonds.
  6. Obtain all required permits.
  7. Post all OSHA, EPA, Department of Labor, and all other required notices.
  8. Have CONTRACTOR'S superintendent and QUALITY CONTROL representative at the job site full time.
  9. Submit a detailed construction schedule acceptable to the COUNTY as specified.
  10. Submit a finalized schedule of values of the WORK in the COUNTY'S approved format.
  11. Submit a finalized schedule of submittals.
  12. No additional payment will be made for demobilization.

## 1.02 PAYMENT FOR MOBILIZATION

- A. No payment for mobilization, or any part thereof, will be approved for payment under the Contract until all mobilization items listed above have been completed as specified. On Lump Sum contracts, the option is available for the CONTRACTOR to spread the mobilization cost over the items included in the schedule of values. In Unit Price contracts where the County has not included a specific unit price item for mobilization in the Bid Proposal, the mobilization cost may be spread over the items in the schedule of values.
- B. The lump sum Bid Price for mobilization shall include the obtaining of all permits, insurance, and bonds; moving onto the site of all plant and equipment; furnishing and erecting plants, temporary buildings, temporary access roads, and other construction facilities, and other items as noted in Part 1 General Section 1.06 "Schedule of Values", and providing field office trailers and sanitary and portable water facilities as required for the proper performance and completion of the WORK.

Partial payment for mobilization will be made in accordance with the following schedule.

Condition or Percent of Total Contract Amount Earned	Allowable Percent of the Lump Sum Price for the Item
Submittal/completion of items listed in Section 01505	25
10 percent of total contract amount earned	40
25 percent of total contract amount earned	60
50 percent of total contract amount earned	80
100 percent of total contract amount earned	100

The final payment will not be made until all temporary facilities, temporary erosion and sedimentation controls, equipment, and appurtenances have been removed from the site (i.e. demobilization is complete).

**PART 2 – PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**- END OF SECTION -**

## SECTION 01560

### TEMPORARY ENVIRONMENTAL CONTROLS

#### PART 1 - GENERAL

##### 1.01 DUST ABATEMENT

- A. CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective dust abatement measures wherever and as often as necessary and as directed by the PROJECT MANAGER to prevent CONTRACTOR'S operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals or causing a nuisance to persons living in or occupying buildings in the vicinity or as directed by PROJECT MANAGER. CONTRACTOR shall be responsible for any damage resulting from any dust originating from CONTRACTOR'S operations. The dust abatement payment measures shall be continued until CONTRACTOR is relieved of further responsibility by the PROJECT MANAGER. No separate payment will be allowed for dust abatement measures and all costs therefor shall be included in the CONTRACTOR'S Bid Price.

##### 1.02 RUBBISH CONTROL

- A. During the progress of the WORK, CONTRACTOR shall keep the site of the WORK and other areas used by the CONTRACTOR in a neat and clean condition and free from any accumulation of rubbish. CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the WORK site and establish regular intervals of collection and disposal of all such materials and waste. Equipment and material storage shall be confined to areas approved by the PROJECT MANAGER. Disposal of rubbish and surplus materials shall be off the site of construction at the CONTRACTOR'S expense at a location approved by the PROJECT MANAGER, all in accordance with local codes and ordinances governing locations and methods of disposal, in conformance with all applicable safety laws, and to the particular requirements of Subpart H, Section 1926.252 of the OSHA Standards for Construction.

##### 1.03 SANITATION

- A. Toilet facilities. Fixed or portable chemical toilets shall be provided wherever needed for use of employees. Toilets conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.
- B. Sanitary And Other Organic Wastes. CONTRACTOR shall establish a regular collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by CONTRACTOR or organic material wastes from

any other source related to CONTRACTOR'S operations shall be disposed of away from the site in a manner satisfactory to the PROJECT MANAGER and in accordance with all laws and regulations pertaining thereto. Disposal of all such wastes shall be at CONTRACTOR'S expense.

#### **1.04 TEMPORARY DRAINAGE PROVISIONS**

- A. CONTRACTOR shall provide for the drainage of stormwater and such water as may be applied or discharged on the site in performance of the WORK. Stormwater drainage and dewatering shall be conveyed to the temporary sediment basins shown on the Drawings. Drainage facilities shall be adequate to prevent damage and turbidity problems to the WORK, the site, and adjacent property.
- B. CONTRACTOR shall submit a drainage plan for temporary drainage to the PROJECT MANAGER for approval prior to beginning construction.

#### **1.05 POLLUTION CONTROL**

- A. CONTRACTOR shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**- END OF SECTION -**

## **SECTION 01568**

### **TEMPORARY EROSION AND SEDIMENTATION CONTROL**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this Section includes installing, maintaining and removing temporary erosion and sedimentation controls as necessary. All existing and foreseeable conditions that affect the WORK both inside and outside the construction limits shall be CONTRACTOR's responsibility.
- B. Temporary erosion controls shall include, but are not limited to:
  - 1. Grassing, mulching, sodding, netting, watering and reseeding on-site surfaces and soil and borrow area surfaces.
  - 2. Providing interceptor ditches or temporary drainage pipes at those locations that will ensure erosion during construction will be either eliminated or maintained within acceptable limits of applicable laws and regulation.
- C. Temporary sedimentation controls shall include, but are not limited to:
  - 1. Silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces.
  - 2. Silt dams, traps, or barriers installed in drainage ways (i.e., swales or surface drainage courses), or other areas of stormwater discharge, and as shown on the Drawings. Stormwater and dewatering discharge shall be conveyed to the temporary sediment basins shown on the Drawings.
- D. CONTRACTOR shall provide and maintain effective temporary erosion and sediment control measures during construction and until final controls become effective, or until the WORK is accepted by PROJECT MANAGER. CONTRACTOR may, with approval from PROJECT MANAGER, perform WORK outside the construction limits to establish, maintain or enhance the erosion control systems.
- E. CONTRACTOR shall install additional erosion and sedimentation control measures deemed necessary by the PROJECT MANAGER as a result of variations in the CONTRACTOR's operations, or shall perform repairs to existing system as directed by the PROJECT MANAGER. Additional controls or repairs shall be installed at no additional cost to COUNTY.

## **PART 2 - PRODUCTS**

### **2.01 EROSION CONTROL**

- A. Netting Grade 1800 – Miramat, as manufactured by Mirafi or approved substitution.

### **2.02 SEDIMENTATION CONTROL**

- A. Bales: Bales shall be clean, seed-free cereal hay type bales.
- B. Silt Fence: Envirofence, as manufactured by Mirafi or approved substitution.
- C. Filter Stone: Grade No. 57 crushed stone, as described in FDOT Standard Specifications.
- D. Stakes: Commercial grade, relatively free of knots or irregularities, durable.
- E. Drainage Pipes: Manufactured by ADS, Type N-12, or approved substitution.

## **PART 3 - EXECUTION**

### **3.01 EROSION CONTROL**

- A. Minimum procedures for erosion control grassing are:
  - 1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
  - 2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
  - 3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches. Mulch will be made available on site at no cost to the CONTRACTOR.
  - 4. Apply netting over mulched areas on sloped surfaces, if necessary.
  - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Re-seed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

### **3.02 SEDIMENTATION CONTROL**

- A. Install and maintain silt dams, traps, barriers, and appurtenances as required.

- B. Control systems which deteriorate and filter stone which is dislodged shall be replaced or repaired at no additional cost to the COUNTY.

### **3.03 PERFORMANCE**

- A. CONTRACTOR will obtain all applicable dewatering permits required during construction. Methods used to control erosion and sedimentation will comply with applicable federal, state, and local regulations. The site dewatering plan must be submitted seven days prior to construction (SC-B-4b).
- B. During construction, denuded areas are to be covered immediately by mulch (such as straw, hay, synthetic fiber) or by sod or seed and mulch with temporary or permanent vegetation.
- C. Prior to final inspection, the CONTRACTOR shall remove accumulated silt and debris from the stormwater management system.
- D. Floating and/or staked silt barriers will be anchored in place to protect against accumulation of silt and sediment upstream and downstream of the WORK. Silt barriers will be placed to effectively control silt and sediment dispersion under the conditions present at site. Silt fences also shall be installed, where necessary, outside limits of construction.
- E. All swales, ditches, channels, retention ponds and detention areas will be sodded or seeded as required as soon as possible.
- F. Should any of the temporary erosion and sediment control measures employed by the CONTRACTOR fail to produce results which comply with the requirements of the State of Florida, COUNTY, PROJECT MANAGER; CONTRACTOR shall immediately take whatever steps necessary to correct the deficiency at no additional cost to the COUNTY.
- G. Maintenance of the system shall be undertaken on a routine basis by the CONTRACTOR and as directed by the PROJECT MANAGER.
- H. Prior to final inspection, CONTRACTOR shall remove all remaining materials used for temporary erosion and sedimentation control.

**- END OF SECTION -**



## **SECTION 01700**

### **CONTRACT COMPLETION, START-UP AND CLOSEOUT**

#### **1.01 RELATED REQUIREMENTS**

- A. General Conditions
- B. Special Conditions

#### **1.02 COMPLETION PROCEDURES**

- A. Substantial Completion is as defined in the General Conditions. When the CONTRACTOR believes Substantial Completion has been achieved, CONTRACTOR shall request, in writing, to the PROJECT MANAGER, that Substantial Completion be recognized as having been achieved and request that the COUNTY issue a Certificate of Substantial Completion. Prior to making such a request, the CONTRACTOR must:
  - 1. Complete all work that in the opinion of the PROJECT MANAGER and Professionals is necessary for the safe, proper and complete use or operation of the facility as intended. At a minimum this will include completion of all work in the specifications necessary for the Project to function as designed.
  - 2. Prepare and receive acceptance of accurate blueline plans as required for all work completed to date.
  - 3. Submit and receive acceptance of accurate record drawings for all work completed to date.
  - 4. Submit and receive acceptance of all specified warranties, guaranties and operation and maintenance manuals.
  - 5. Complete all required vendor training, testing, and where required, start-up.
  - 6. Deliver all required spare parts.
- B. Upon receipt of the request from the CONTRACTOR, the PROJECT MANAGER and designated representatives shall review the request and inspect the Work relative to the above requirements to determine whether the CONTRACTOR has achieved Substantial Completion. If this inspection fails to support Substantial Completion, the Project manager shall so notify the

CONTRACTOR in writing citing the reasons for rejection. If the PROJECT MANAGER determines the CONTRACTOR has reached Substantial Completion, the following procedures will be followed:

1. The PROJECT MANAGER, his/her representative and user representatives will review CONTRACTOR's punch list to assure all remaining deficiencies are noted on a final punch list.
  2. The PROJECT MANAGER will schedule and conduct a pre-final walk-through of the facility (this will follow inspection addressed under paragraph B.) with representatives of the COUNTY user department, the PROFESSIONAL, the CONTRACTOR and others, for the purpose of formally reviewing the Work, the final punch list and the readiness of the Project for use. A copy of the final punch list will be provided to all participants and any additional items noted during the walk-through will be added to the list.
  3. Upon completion of the pre-final walk-through the PROJECT MANAGER, provided the walk-through has verified that the Project is in fact ready for use and occupancy by the COUNTY for its intended purpose, shall issue to the CONTRACTOR a Certificate of Substantial Completion.
- C. Final Completion will be deemed to have occurred when all Work is completed including the following:
1. All final punch list items have been corrected, signed off by the CONTRACTOR, the PROJECT MANAGER and the Professional and demonstrated to the COUNTY during a final walk through.
  2. All updates to the record log and any drawings have been made.
  3. Demobilization and site clean up are complete.
  4. All facilities and/or equipment have been properly demonstrated to be functioning as required.
  5. The PROJECT MANAGER has issued a Certificate of Final Completion.

### **1.03 START-UP PROCEDURES**

- A. CONTRACTOR is responsible for the complete test, checkout , and start-up preparation of the project. The CONTRACTOR shall verify these activities through daily inspection reports, test records, on-site vendor certifications, and by other appropriate means.

1. Component test and check out is the verification that each component of the Work is in compliance with the Contract Documents, and is ready to perform its intended function.
  2. Start-up preparation is preparing the entire project to be placed into service.
- B. CONTRACTOR shall conduct all test, check out and start-up requirements specified in the Contract Documents and provide documentation of same to the COUNTY prior to start-up. Where vendor on-site inspections are required prior to or during start-up, the CONTRACTOR shall require each vendor to provide a written statement that the installation and check out is complete and proper and that the item(s) are ready for start-up.

#### **1.04 CLOSE-OUT PROCEDURE**

- A. PROJECT MANAGER and CONTRACTOR shall meet and resolve all outstanding issues including, but not limited to:
1. Claims and adjustments for time or costs.
  2. Outstanding, unused allowances.
  3. Procedures for handling warranty issues.

**- END OF SECTION -**

## **SECTION 02110**

### **SITE CLEARING**

#### **PART 1 - GENERAL**

##### **1.01 GENERAL**

- A. This section includes removal of trees and associated roots, clearing and grubbing, topsoil stripping, and removing above-grade or below-grade improvements.
- B. Site clearing activities shall be conducted to ensure minimum interference with roads, streets, walks, and other adjacent in-service facilities. CONTRACTOR shall not close or obstruct streets, walks or other facilities; or interfere with the operations of the landfill, or other contractors working on-site, without coordinating with the PROJECT MANAGER.
- C. CONTRACTOR shall provide necessary protection as required to prevent damage to existing improvements indicated to remain in place.

##### **1.02 MEASUREMENT AND PAYMENT**

See Section 01025 – Measurement and Payment

#### **PART 2 – PRODUCTS (NOT USED)**

#### **PART 3 – EXECUTION**

##### **3.01 SITE CLEARING**

- A. General: Remove shrubs, grass and other vegetation, improvements or obstructions as required to allow the installation of project. Soils containing roots, vegetation, organics or other deleterious materials shall be removed until acceptable material is encountered vertically and laterally. Removal includes digging out stumps and root systems to the extent acceptable to the PROJECT MANAGER.
- B. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectional materials. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Stripping of topsoil shall be to a minimum depth of 2 inches, with rocks, roots, vegetation, or other deleterious materials exceeding 1-inch in the smallest dimension being removed from the soil.

### **3.02 DISPOSAL OF WASTE MATERIALS**

- A. Materials shall be incorporated into the project, or transported and disposed of as directed by the PROJECT MANAGER.
- B. On-site disposal areas will be provided for the CONTRACTOR's use. Materials not incorporated into the project shall be segregated according to material type, and disposed of at the designated on-site disposal area, as directed by the PROJECT MANAGER.

**- END OF SECTION -**

## **SECTION 02140**

### **DEWATERING**

#### **PART 1 – GENERAL**

##### **1.01 SUMMARY**

- A. The work required to be performed under this Section shall include furnishing all equipment and labor necessary to control erosion and sedimentation, remove storm and subsurface waters from the excavation and backfill areas during completion of the WORK.
- B. Dewatering structures shall include all the terms and conditions imposed by EPA's proposed NPDES Multi-Sector General permit (MSGP).

##### **1.02 RELATED SECTIONS**

- A. Section 02220 – Excavating, Backfill, Compaction, Fill and Grading

##### **1.03 SUBMITTALS**

Prior to any construction, the CONTRACTOR shall submit an erosion and sedimentation plan outlining methods, equipment, and layout for minimizing the amount of sedimentation entering the dewatering ditch.

#### **PART 2 - PRODUCTS (NOT USED)**

#### **PART 3 – EXECUTION**

##### **3.01 DEWATERING**

- A. The CONTRACTOR shall be responsible for the following:
  - 1. Dewatering all construction areas to allow for proper excavation and construction. Dewatering shall include removal of all groundwater and stormwater that may accumulate within the construction area.
  - 2. Development and management of erosion and sedimentation control during construction. The controls shall minimize the amount of sedimentation flowing from the construction area into the stormwater management system.
  - 3. Installation of Groundwater Control Pump Station not to include the pump.

4. Install wyes as shown on the drawings for future dewatering of Phase II Section II. The wyes shall be flanged to protect the materials. The wyes shall be clearly marked and surveyed.
- B. If stormwater or subsurface waters are encountered or inhibit construction operations or compaction, CONTRACTOR shall utilize equipment properly sized and specifically designed, for removal of the water.
- C. The dewatering method shall consist of lowering and maintaining the water levels and hydrostatic pressures of the groundwater a minimum of 2 feet below the lowest elevation of construction.
- D. If construction activities bring water to the surface or the ground exhibits pumping during compaction, water levels shall be lowered to an elevation so the contract document specifications can be achieved. Two piezometers will be installed by the CONTRACTOR and monitored for pumping effects to the nearby wetlands.
- E. Construction operations, to include backfilling and compaction, shall be performed in moisture levels within the soils so as to achieve the specifications outlined in the Contract Documents.
- F. Dewatering methods shall not adversely affect constructed slopes or on-site structures.

### **3.02 QUALITY CONTROL**

- A. The CONTRACTOR's supervising personnel of the dewatering system shall maintain adequate supervision and control to ensure stability of the excavated slopes, the construction area is not adversely affected by water, erosion is controlled, flooding of the excavation and downstream area does not occur, and sedimentation and turbidity is maintained within local, state, and federal guidelines (less than 29 NTUs above background water quality or approximately 34 NTUs total).
- B. The CONTRACTOR's supervising personnel of the dewatering system shall dispose of the waters in strict accordance with the latest revisions of all local, state and federal rules and regulations.
- C. CONTRACTOR shall be responsible for all permit violations that are the result of CONTRACTOR's activities and shall pay all penalties and/or fines that result from any violations at no additional cost to OWNER.

### **3.03 WATER LEVELS**

- A. Subsurface (groundwater) elevations and stormwater runoff vary with time of year and rainfall amounts across the limits of construction as defined in the Contract

Documents. Neither the ENGINEER nor the OWNER can accurately estimate the water elevations that may be encountered during construction.

- B. The best available information regarding subsurface water levels is indicated in the Contract Documents. Groundwater elevations provided in the Contract Documents are based upon elevations measured within on-site monitoring wells. Subsurface soils vary across the construction area. The best available information is provided in the Contract Documents.
- C. Stormwater measures shall be controlled by the CONTRACTOR to minimize erosion and flooding within and outside of the construction area.

**END OF SECTION**



## **SECTION 02212**

### **LOW PERMEABILITY SOIL**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this Section includes excavation, transporting, stockpiling, mixing, moisture conditioning, spreading, compacting, grading, rolling, testing, inspection and repairing of the low permeability soil layer system as shown on the Drawings and as specified herein.

##### **1.02 QUALITY CONTROL/QUALITY ASSURANCE**

- A. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. All reports, inspections, testing and related activities of the CQC Consultant shall be at the CONTRACTORS expense. The CQC consultant shall not be the same consultant retained by the COUNTY for Construction Quality Assurance. The CQC consultant shall oversee all low permeability soil installation activities and the quality control testing as specified herein. The CQC consultant shall prepare a final report certifying the low permeability soil and installation are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.
- B. Construction Quality Assurance (CQA) will include field and laboratory testing during liner construction, which will be conducted by a qualified soil-testing laboratory representing the COUNTY. A qualified field technician representing the COUNTY shall provide full time, on-site inspection during liner construction. The field technician shall work under the supervision of a professional engineer with experience in soil liner construction.
- C. The CONTRACTOR shall schedule his work so as to provide sufficient time as required to complete CQC and CQA field testing and shall keep the laboratory informed of the progress.

##### **1.03 SUBMITTALS**

- A. CQC Qualifications: Qualifications of the CQC Consultant shall be submitted to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil material, including tests conducted on the borrow source.

- B. CQC Plan: The CONTRACTOR shall prepare and submit a Construction Quality Control Plan to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil materials, including tests conducted on the borrow source.

The CQC Plan shall outline project specifications and construction requirements. The plan shall specify performance criteria for the soil liner, and provide quality control testing procedures and minimum sampling frequencies. In addition, the plan shall define the responsibilities of the parties that will be involved in soil liner construction, and shall present minimum qualifications of each party to fulfill their identified responsibilities.

C. Borrow Source Qualifications

1. Notification: The CONTRACTOR shall notify the ENGINEER in writing of the individual on-site or off-site borrow source(s) for the low permeability soil at least 7 calendar days prior to the date of anticipated construction use of such material. Notification of individual borrow source(s) shall include:
  - a. Supplier's name and borrow location.
  - b. Verification that adequate quantities are available to complete the work.
  - c. Three representative samples of the proposed low permeability soil at no additional cost to the COUNTY. The three samples shall consist of 1-gallon, individually sealed containers of the proposed low permeability soil.
2. Borrow Source Report: The CONTRACTOR shall prepare and submit a Borrow Source Report to the ENGINEER in accordance with Section 01300-Submittals prior to any geotechnical testing of the low permeability soil materials. The Borrow Source Report shall document the horizontal and vertical extent and the homogeneity of the soil strata proposed for use as liner material.
  - a. The CONTRACTOR shall notify the ENGINEER in writing a minimum of 3 working days prior to sampling and shall coordinate the ENGINEER's observation of borrow source sampling. ENGINEER reserves the right to obtain independent samples. Rejection by the ENGINEER of the low permeability soil for not meeting the Specification requirements shall not relieve the CONTRACTOR of submitting the required data for an alternate borrow source. Additional costs or delays resulting from the rejection of a soil shall be at no cost to the COUNTY.

- b. The report shall be signed by a professional engineer registered in the State of Florida to certify the soil furnished for the low permeability soil complies with the Specification requirements and include all borrow source information and test result data.
  - c. The CONTRACTOR shall submit to the ENGINEER field and laboratory test data prior to importing and/or prior to any construction using the low permeability soil. Soils shall not be imported and/or used for construction on the project until approved by the ENGINEER.
  - d. Laboratory testing shall be performed on the proposed low permeability soil borrow source by the CQC consultant with the results submitted to the ENGINEER at least 7 calendar days prior to test strip installation. Representative samples shall be collected from a minimum of three locations in the proposed borrow source and submitted to the CQC consultant for testing. Testing shall be in accordance with Table 02212-2.
- D. Test Strip Report: The CONTRACTOR shall prepare and submit a Test Strip Report to the ENGINEER in accordance with completion of the Test Strip, and prior to full-scale installation of the low permeability soil material. The report shall be signed by a professional engineer registered in the State of Florida. The report shall include laboratory results, and proposed full-scale installation methods (e.g., equipment, number of passes, moisture conditioning, destructive test repair methods, etc.) based upon the results of the test section as described in Part 3.02, this Section.
- E. Testing Results During Construction: During the installation of the low permeability soil, the CQC Consultant shall provide the ENGINEER with preliminary laboratory test results, in writing, for the purposes of CQA monitoring.
- F. Final Report: The CONTRACTOR shall prepare and submit a Final Report to the ENGINEER in accordance with Section 01300-Submittals upon completion of the installation of the low permeability soil material.

The report shall include all laboratory test results and a map, drawn by the CQC Consultant, which indicates the location and type of the test. The CQC Consultant shall record all test locations on a test location map. The laboratory test results shall be identified, numerically, alphabetically or a combination, in the report. A location map shall correlate the laboratory test identification with test location by use of a key or legend. Laboratory tests are outlined in Table 02212-1. The location map shall be the same scale as the Drawings and accurately depict field test locations. The report shall be signed and sealed by a professional engineer registered in the State of Florida.

## **1.04 LABORATORY HYDRAULIC AND LEACHATE CONDUCTIVITY TESTING**

### **A. Hydraulic Conductivity Test Using Water**

1. Hydraulic Conductivity test samples, using water, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type permeameters per ASTM D-5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10-psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow is achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, and by stable values of the coefficient permeability. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.
2. Deaired potable water shall be used in laboratory hydraulic conductivity tests.

### **B. Hydraulic Conductivity Test Using Leachate (EPA Test Method 9100)**

1. Hydraulic Conductivity test samples, using water, shall be encapsulated within a flexible latex membrane and mounted in triaxial-type permeameters per ASTM D-5084. The test specimens shall then be consolidated under an isotropic consolidation stress of no greater than 10-psi and permeated with water under an adequate back pressure to achieve saturation of the test specimens. The inflow and outflow from the samples shall then be monitored and the coefficient of permeability calculated for each recorded flow increment using the constant head method. The tests shall continue until steady-state flow has been achieved as evidenced by values of inflow and outflow that do not differ by more than 20 percent, stable values of the coefficient permeability have been achieved, and a minimum of two pore volumes have passed through the sample after stabilization. Time and flow data shall be recorded for at least one day beyond the time when the inflow and outflow rates meet the above criterion, at which time the pressures may be relieved and physical measurements of the specimens obtained for calculations. Hydraulic gradients shall be in accordance with the values in ASTM D-5084 unless otherwise approved by the ENGINEER.
2. Deaired leachate shall be used in leachate hydraulic conductivity tests.

- C. If tests conducted by the CQC Consultant indicate that the material does not meet specification requirements, the soil material shall be rejected. CONTRACTOR shall be responsible for all additional costs for testing and inspection as a result of failure of the material to meet specification requirements.
- D. The water used for laboratory testing or for field moisture conditioning of the low permeability soil shall be clean and uncontaminated, and shall be obtained at no additional cost to the COUNTY. Laboratory water can be distilled or tap water. Saltwater shall not be used.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. The low permeability soil shall be a fat clay (CH), clayey sand (SC) or lean clay (CL) as classified by the Unified Soil Classification System.
- B. The low permeability soil shall be free from organics, roots, rubbish or debris, rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), calcareous deposits, or any other deleterious material. The CONTRACTOR shall remove any materials, which the ENGINEER considers to be objectionable in the low permeability soil at no additional cost to the COUNTY.
- C. The CQC consultant in accordance with these specifications shall perform testing for final acceptance.
- D. Installed low permeability soil which does not meet the specifications shall be reworked, retested, and replaced if required at no additional cost to the COUNTY.

### **2.02 BORROW SOURCE**

- A. Prior Test Results: A borrow source for the low permeability soil can be approved by the ENGINEER if demonstrated field experience is available in the form of geotechnical reports from at least three prior successful projects of five or more acres each to document that a given borrow source can meet the requirements of the project specifications, then extensive laboratory testing of the borrow source will not be required. However, additional testing is required for this project to verify that the material is geologically similar to those used on the prior projects. At a minimum, 3 representative samples from the appropriate thickness of the in-situ stratum or from stockpiles of the borrow material proposed for liner construction shall be submitted to an independent soil testing laboratory to document through index testing that the proposed material is consistent with the material used on prior successful projects. Testing shall be in accordance with Table 02212-1.

- B. Source Material Testing: If demonstrated field experience is not available or cannot be documented, then the following requirements shall be met:
1. In support of the Borrow Source Report specified in Part 1.03 (C), the CONTRACTOR shall perform the index tests as stipulated in Table 02212-2 for each potential borrow stratum to quantify the variability of the borrow materials and to document that the proposed borrow material complies with these specifications on a minimum of 3 samples. The borrow source will only be considered suitable if the hydraulic conductivity of the material, as documented on laboratory test specimens, can be shown to meet the requirements of the project specifications at the 98 percent confidence level.
  2. At a minimum, the following data shall be submitted to the ENGINEER with the results of each permeability test:
    - a. Dates samples collected.
    - b. Sample number and location.
    - c. Sampling method.
    - d. Specimen length and diameter.
    - e. Specimen dry unit weight and in situ moisture content.
    - f. Hydraulic gradient.
    - g. Degree of saturation.
    - h. Maximum cell pressure and back pressure.
    - i. Calculated permeability.
    - j. Name and signature (with date) of person performing quality assurance check for the CQC consultant.

## **PART 3 – EXECUTION**

### **3.01 SUBGRADE PREPARATION**

- A. Prior to the installation of the low permeability soil, clear, excavate, backfill, compact, and grade as shown on the Drawings and as specified herein. Subgrade preparation activities shall be performed in accordance with Section 02220.
- B. Rocks (greater than 2-inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, debris or any other deleterious materials shall not be permitted within 6 inches of the surface upon which the low permeability soil will be installed.
- C. Surface of prepared subgrade shall be free of irregularities, loose soil, and abrupt changes in grade.

- D. Subgrade Testing: Density tests shall be conducted on the completed surface of the subgrade using the Standard Proctor Method (ASTM D-698) at a frequency of two tests per acre.
- E. The surface of the prepared subgrade shall be inspected by the ENGINEER prior to installation of the low permeability soil. If subgrade conditions do not meet the requirements as specified, including grades, density, moisture, or deleterious materials, corrective action by the CONTRACTOR shall be completed prior to proceeding with the installation of the low permeability soil at no additional cost to the COUNTY.

### **3.02 TEST STRIP SECTION**

- A. Prior to full-scale liner installation, a field test section or test strip shall be constructed at the site above the prepared subgrade to verify that the proposed low permeability soil and construction techniques will consistently achieve the parameters specified herein.
- B. The dimensions of the test section shall be a sufficient size as determined by the CONTRACTOR (a minimum of not less than 50 feet wide by 200 feet long) such that full-scale liner installation procedures can be duplicated within the test section. The test section shall be located within the construction area over which the low permeability soil will be installed.
- C. The test section shall be constructed using the same equipment for spreading, kneading and compaction and the same construction procedures (e.g., number of passes, moisture addition and homogenization, if needed) that are anticipated for use during full-scale liner installation.
- D. The low permeability soil shall be placed in a maximum single 8-inch loose lift, and then compacted and tested as required herein. The total in-place compacted low permeability soil thickness shall be a minimum of 6 inches. A compacted in-place 6-inch thickness is defined as one lift.
- E. The CQC consultant shall observe the construction of the test section and document the equipment and methods used during test section construction, including:
  - 1. Placement and spreading.
  - 2. Resulting loose lift thickness.
  - 3. Uniformity of soil after spreading.
  - 4. Incorporation of water (i.e. moisture conditioning).
  - 5. Equipment type, weight, configuration, and number of passes.
  - 6. Repair of disturbances due to quality assurance sampling.

- F. The CQC consultant shall perform and report all necessary sampling and testing of the test section to determine the optimum percent compaction and corresponding molding moisture content (and range) in order to achieve a coefficient of permeability less than specified.
- G. The test strip shall be considered acceptable if the measured hydraulic conductivities of undisturbed samples from the test strip meet the requirements of the project specifications at the 98 percent confidence level.
- H. Compaction requirements for soil shall be established by the CQC consultant based upon the test section results and pre-construction laboratory test results.
- I. If the test section fails to achieve the desired results, additional test sections shall be constructed and tested by the CONTRACTOR at no additional cost to the COUNTY.
- J. Additional testing shall be conducted on test section if any construction techniques (e.g., addition of moisture, additional passes of equipment, different equipment) or soil materials are altered. Testing and inspecting the new test section will be at no additional cost to the COUNTY. New test sections shall be constructed and tested at no additional cost to the COUNTY.
- K. At a minimum, the liner test section shall be subject to the field and laboratory testing requirements presented in Table 02212-3. The test locations shall be selected at random by the ENGINEER.
- L. Laboratory hydraulic conductivity testing shall be conducted in triaxial type permeameters (ASTM D-5084). The test specimens shall be consolidated under an isotropic consolidation stress no greater than 10 pounds per square inch and permeated with water under an adequate backpressure to achieve saturation of the test specimens. The inflow to and outflow from the specimens shall be monitored with time and the hydraulic conductivity calculated for each recorded flow increment. The test shall continue until steady state flow is achieved and relatively constant values of hydraulic conductivity are measured (ASTM D-5084).

### **3.03 PLACING LOW PERMEABILITY SOIL**

- A. Full-scale liner installation may begin only after completion of a successful liner test section.
- B. The CONTRACTOR shall be responsible for maintaining the low permeability soil stockpile at the landfill site by sloping and compacting it so that it will not become soft and overly saturated during rain events, or desiccate from dryness.
- C. Installation procedures developed during test section construction shall be utilized for the entire low permeability soil.



- D. Testing methods and frequencies during the installation of the low-permeable soil beyond the test section area and for the remainder of the project shall be in accordance with Table 02212-4. However, during construction of the first 5 acres of the liner, these frequencies shall be doubled. Samples shall be obtained from random locations selected by an independent soil testing laboratory. If there are indications of a change in product quality or construction procedures during liner construction, the ENGINEER may select additional to determine compliance.
- E. At the time of compaction, the molding moisture content in the soil shall be within the range determined by the test section results.
1. For soil that is above the optimum soil moisture content range as determined by the CQC consultant, the CONTRACTOR shall spread, dry, and rehomogenize the soil in order to meet the specifications.
  2. For soil that is below the optimum soil moisture content range as determined by the CQC soils testing laboratory, the CONTRACTOR shall add water uniformly over the soil, then homogeneously mixing and kneading to achieve a uniform moisture content throughout the lift.
- F. Adjacent soil strips shall be scarified at the end and overlapped to assure adequate bonding.
- G. REWORKING OR REPAIRING AREAS: The results of all permeability tests performed on undisturbed samples of the low permeability soil shall be less than or equal to the value in Table 02212-4. In the event the permeability is greater than specified, the CONTRACTOR shall, at no additional expense to the COUNTY, rework the represented area. Reworking may include moisture conditioning, scarifying and recompacting, or removal and replacement of in-place soil. If replacement is required, the limits of replacement shall be approved by the ENGINEER prior to removal. The ENGINEER shall randomly select additional locations for testing. A minimum of four additional permeability tests shall be conducted for each area of the low permeability soil to be re-tested. The CQC consultant shall perform Atterberg limits, gradation, and permeability testing on each re-tested sample, at no additional cost to the COUNTY. For areas less than 1 acre, a minimum of one test to verify compaction shall be conducted.
- H. If desiccation or surficial crusting occurs, the area shall be scarified to the depth necessary to expose sufficiently moist soil, and the scarified soil shall be brought to the correct moisture content, remixed and homogenized prior to recompaction. The low permeability soil shall be deemed acceptable only when it is completely free from desiccation to any depth or surficial crusting.
- I. Upon completing the low permeability soil, the surface shall be visually inspected by the ENGINEER. Areas that appear to be inadequately installed will be sampled, tested, and reworked if necessary to achieve the specified properties, at

no additional cost to the COUNTY. The CONTRACTOR is responsible for protecting the low permeability soil from drying, cracking or other damage until the overlying protective soil is installed.

- J. A flexible membrane liner may be used as temporary protection for the completed low permeability soil. The membranes shall be overlapped 1 foot and properly anchored in place by sandbags or partial soil backfill.
- K. The CONTRACTOR shall maintain the surface of the installed low permeability soil, and prevent it from becoming softened due to precipitation, desiccating and cracking due to lack of moisture, or damage by stormwater runoff erosion. The secondary geomembrane layer shall not be installed over the low permeability soil that has been damaged until repairs have been completed and the ENGINEER has approved the area.
- L. The CONTRACTOR shall bring the final grades, elevations, and contours of the low permeability soil to within the project specifications and as indicated on the Drawings while maintaining a minimum thickness of 6 inches for the installed low permeability soil. Only when each lift of the low permeability soil has been brought to the final grades, elevations, and contours shall the tests outlined in this section be conducted.
- M. Perforations, test holes and depth probes of the low permeability soil shall be over-excavated with minimum 45 degree side-slopes, and repaired by backfilling the hole with maximum 3-inch lifts of low permeability soil and bentonite powder. Each lift in the repair shall be compacted using a heavy, blunt-ended object in such a manner that the soil is well compacted, and well blended with the adjacent soil. Moisture condition the soil whenever necessary.
- N. Reworked areas, at any time during the course of construction, shall be fully repaired and tested, as outlined in Table 02212-4 with the exception as specified in Part 3.03 (F), at no additional cost to the COUNTY.
- O. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, re-wet as needed, rehomogenize and compact to the required density prior to further construction, at no additional cost to the COUNTY. The reworked area shall be retested, at no additional expense to the COUNTY, at the frequency specified in Table 02212-4 with the exception as specified in Part 3.03 (F). Installation of the reworked area shall be governed by the methods determined during the test section.
- P. The CONTRACTOR shall be responsible for all settlement to fills and backfill areas that may occur within the maintenance period stipulated in the General Conditions.

### **3.04 CONFINED AREAS**

- A. Low permeability soils in confined areas, such as adjacent to structures or areas where heavy equipment operation is limited, shall be placed and compacted in lifts so as to meet the project specifications. Soils placed in these areas shall not have clumps exceeding 1/2 inch in any dimension. The soil shall be placed in lifts not to exceed 4 inches. The soil shall be compacted using hand tools or pneumatic mechanical devices to tamp each successive lift in place. The CQC Consultant shall define the compaction procedures with the approval of the ENGINEER. A representative density and permeability test shall be conducted by the CQC Consultant to verify the procedure.

### **3.05 CERTIFICATION OF COMPLETION**

- A. Upon completion of the low permeability soil, the CQC consultant shall certify that:
  - 1. The low permeability soil was constructed in accordance with the approved project Drawings and specifications.
  - 2. The low permeability soil meets all requirements of the approved project Drawings and specifications.
  - 3. Any damage to the low permeability soil from any construction operation has been repaired as specified herein.

### **3.06 FINAL ACCEPTANCE**

- A. The CONTRACTOR shall retain the ownership and responsibility for the low permeability soil until final acceptance by the COUNTY. The CONTRACTOR is responsible for achieving the required permeability, minimum field compaction and moisture range stated in Table 02212-1 of this section. Moisture range shall be adjusted, if necessary as demonstrated by the tests section, to achieve the required permeability.
- B. The low permeability soil shall be accepted by the COUNTY when:
  - 1. All installation activities are completed.
  - 2. All documentation of installation is completed and the CQC laboratory's final report is submitted to the ENGINEER.
  - 3. All documents presented in Part 1.03, this Section have been submitted to the ENGINEER and approved.

**TABLE 02212-1. BORROW SOURCE VERIFICATION TESTING REQUIREMENTS**

Description	Specified Value	Method
Percent passing No. 200 sieve	none	ASTM D-1140 or D-421/D-422
Atterberg Limits: -Liquid Limit (percent) -Plasticity Index (percent)	20<LL<80 10<PI<40	ASTM D-4318
Moisture Content	none	ASTM D-2216
Density	[1]	ASTM D-698

Notes for Table 02212-1:

- [1] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

**TABLE 02212-2. NEW BORROW SOURCE TESTING REQUIREMENTS**

Description	Specified Value	Method
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422
Atterberg Limits: -Liquid Limit (percent) -Plasticity Index (percent)	20<LL<80 10<PI<40	ASTM D-4318
Moisture Content	none	ASTM D-2216
Density	[1]	ASTM D-698
Maximum Permeability	$1.0 \times 10^{-5}$ cm/sec	ASTM D-5084
Permeability using Leachate <sup>[2]</sup>	$1.0 \times 10^{-5}$ cm/sec	EPA Method 9100

**Notes for Table 02212-2:**

- [1] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between - 1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.
- [2] Conduct test in accordance with USEPA Test Method 9100 on one representative sample using leachate from the Hardee County Landfill.

**TABLE 02212-3. INITIAL TEST STRIP TESTING REQUIREMENTS**

Description	Specified Value	Method	Frequency
<b>Upon Delivery of Material:</b>			
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422	5
Organic Content	1%	ASTM D-2974	5
Atterberg Limits:			
-Liquid Limit (percent)	20<LL<80	ASTM D-4318	5
-Plasticity Index (percent)	10<PI<40		
Moisture Content	no value	ASTM D-2216	5
Density	no value	ASTM D-698	5
<b>Per Lift<sup>[1]</sup>:</b>			
Thickness	6 inches <sup>[2]</sup>	None	5
Moisture Content	[3]	ASTM D-2216	5
Maximum Permeability	1.0 x 10 <sup>-5</sup> cm/sec	ASTM D-5084	5
Density	95%	ASTM D-698	5

**Notes for Tables 02212-3:**

- [1] Lift is defined as a 6-inch compacted in-place thickness.
- [2] Minimum thickness required, regardless of survey tolerances.
- [3] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.

**TABLE 02212-4. FULL SCALE SOIL TESTING REQUIREMENTS**

Description	Specified Value	Method	Frequency <sup>[1]</sup>
Percent passing No. 200 sieve	Less than 25%	ASTM D-1140 or D-421/D-422	2/acre/lift <sup>[2]</sup>
Organic Content	1%	ASTM D-2974	1/acre/lift <sup>[3]</sup>
Atterberg Limits:			
Liquid Limit (percent)	20<LL<80	ASTM D-4318	1/acre/lift
Plasticity Index (percent)	10<PI<40		
Thickness	6 inches <sup>[4]</sup>	none	4/acre/lift
Moisture Content	[5]	ASTM D-2216	2/acre/lift
Maximum Permeability	1.0 x 10 <sup>-5</sup> cm/sec	ASTM D-5084	1/acre/lift
Density	95%	ASTM D-698	2/acre/ lift <sup>[3]</sup>
Field Moisture related to Proctor:	95% <sup>[5,6,7]</sup>		2/acre/lift
-Nuclear Densimeter Method		ASTM D-3017	
-Direct Heating Method		ASTM D-4959	
-Calcium Carbide Gas Method		ASTM D-4944	
Field Density as a % of Proctor:	95% <sup>[5,6,7]</sup>		2/acre/lift
-Drive Cylinder Method		ASTM D-2937	
-Nuclear Densimeter Method		ASTM D-2922	

**Notes for Tables 02212-4:**

- [1] Frequency of testing is doubled for the initial 5 acres of construction.
- [2] Lift is defined as a 6-inch compacted in-place thickness.
- [3] And when visually change in material occurs.
- [4] Minimum thickness required, regardless of survey tolerances.
- [5] Required range of moisture content to be determined as a result of the laboratory and test section. The anticipated moisture range is between -1 percent to +3 percent of the optimum moisture content. The minimum percent compaction shall be 92 percent of the Standard Proctor.
- [6] Nuclear, Direct Heat, and Calcium Carbide Gas Method determination of field moisture contents may be used only after correlation with laboratory results have been established. In the event of conflict, the laboratory results will govern.
- [7] Nuclear determination of field density may be used only after correlation with Direct Cylinder Method has been established. In event of conflict, the Direct Cylinder Method results will govern.
- [8] See Part 3.03 (F), this Section, for the necessary testing requirements to repaired or reworked areas.
- [9] See Part 3.04 (A), this Section, for the necessary testing requirements of the soil backfill in confined areas.

**- END OF SECTION -**

## **SECTION 02220**

### **EXCAVATION, BACKFILL, FILL AND GRADING**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this section includes excavating, trenching, shoring, transporting, stockpiling, placing, backfilling, compacting, grading, disposing materials, field testing, and quality control/quality assurance laboratory services required for the construction as shown on the Drawings and in the Specifications.

##### **1.02 RELATED SECTIONS**

- A. Section 01568 – Temporary Erosion and Sedimentation Control
- B. Section 02140 – Dewatering

##### **1.03 AVAILABLE INFORMATION**

The ENGINEER has relied upon the reports listed below. The reports are available from the ENGINEER upon request, or may be reviewed at the COUNTY.

- A. Envisors, Incorporated Drawings dated June 1983.
- B. PSI Geotechnical Report dated March 1997.
- C. PSI Soil Boring Log dated November 1997.
- D. SCS Engineers Geotechnical Report dated March, 2004.

##### **1.04 DEFINITIONS**

The following definitions apply only to the terms and conditions contained within this specification.

- A. Suitable Soil: Soil that meets the requirements specified in Part 2.
- B. Unsuitable Soil: Soil that does not meet the requirements specified in Part 2.
- C. Backfill: The suitable soil that is placed back into the Expansion and compacted after the unsuitable soils are excavated and removed. The backfill shall be free of clays and compacted to meet the specified requirements contained within these specifications.
- D. CQC Consultant: Independent geotechnical consultant retained by the Contractor to perform the Construction Quality Control (CQC). The CQC Consultant shall



oversee all geotechnical activities and the quality control testing services as presented in these specifications.

## **1.05 QUALITY CONTROL**

- A. Construction Quality Control (CQC) will be performed by an independent geotechnical consultant retained by the CONTRACTOR. The CQC consultant cannot be the same consultant retained by the COUNTY for Construction Quality Assurance (CQA). The CQC Consultant shall oversee all geotechnical activities and the quality control testing as specified herein. The CQC Consultant shall prepare a final report certifying the geotechnical activities performed on this project are in accordance with the Contract Documents. The final report shall be signed and sealed by a professional Engineer licensed in the State of Florida.
1. Qualifications for the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 15 calendar days prior to conducting any geotechnical laboratory or field testing related to the project. Information to be submitted is listed under Part 1.06 of this Section.

## **1.06 SUBMITTALS**

- A. Health and Safety Plan:
1. The CONTRACTOR shall submit to the ENGINEER for review a Health and Safety Plan. The Health and Safety Plan shall include descriptions of the methods, equipment, and safety procedures to be used during construction activities, including dewatering, excavating, backfilling, and compacting. The plan shall also include response procedures for emergencies.
    - a. Excavation and backfilling is planned only for areas that are not known to have buried solid waste. However, the Health and Safety Plan must also reflect that there is the possibility that various materials (municipal solid waste (MSW), industrial waste, solvents, petroleum hydrocarbons, caustics, medical wastes, animal carcasses, asbestos, etc.) may be encountered while conducting the WORK.
  2. Activities related to excavating and backfilling shall be conducted in accordance with the approved Health and Safety Plan. WORK shall be performed in compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations.
  3. The CONTRACTOR shall have a Health and Safety officer, with requisite qualifications and experience, on site during all construction activities. The Health and Safety officer shall be responsible for preventing accidents

at the site and shall hold weekly site safety meetings for all on-site personnel.

4. The review of the Health and Safety Plan by the ENGINEER shall be for method only. The CONTRACTOR shall retain complete responsibility for the application, adequacy and safety of the methods. However, construction shall not begin until the Health and Safety Plan has been submitted and reviewed by the ENGINEER.

**B. Excavation Plan:**

1. Prior to beginning WORK, the CONTRACTOR shall provide a detailed excavation plan for addressing excavation, backfilling, compacting, and grading construction.
2. Plan shall include methods of excavation, slope stabilization, shoring, dewatering, and backfilling techniques.
3. Plan shall address safety issues in consideration of OSHA, Federal, State, and local safety requirements.
4. Plan shall include temporary controls for stormwater runoff and erosion control in full conformance with all existing permits.
5. Plan shall be submitted to the ENGINEER for review and approval prior to starting construction activities.

**C. For all borrow sources, the CONTRACTOR shall notify the ENGINEER in writing of the material source for each soil type specified within Part 2 of this Section at least 15 calendar days prior to the date of anticipated use of such material. Notification shall include:**

1. Supplier's name.
2. Borrow location.
3. Documentation confirming adequate quantities are available for this project.
4. A representative sample of the proposed material, consisting of one 5-gallon, sealed container from each borrow location.
5. Test results for a minimum of 2 samples as required within Part 2.07 of this Section. The CONTRACTOR shall submit to the ENGINEER the parameters for the testing equipment. Parameters include, but not limited to, ASTM test method used, sieve sizes, liquids used for permeability testing, and parameters outlined in the appropriate ASTM test method.

- D. The Qualification of the geotechnical CQC Consultant shall be submitted to the ENGINEER at least 15 calendar days prior to conducting any geotechnical laboratory or field testing related to the project. The submittal shall include, at a minimum, the following information:
1. The resumes of key personnel involved in the geotechnical testing and observation activities. Key personnel shall include field personnel, laboratory personnel and immediate supervisors. The CQC Consultant shall have a minimum experience of 2 prior similar projects (landfills only) within the last 5 years.
  2. Written confirmation that the project specifications have been received for the project and that WORK shall be performed in compliance with the project specifications.
  3. Written confirmation that the CQC Consultant has sufficient personnel and equipment available to meet the project schedule.
- E. CQC Consultant Final Report: A report shall be signed and sealed by a professional Engineer licensed in the State of Florida and submitted to the ENGINEER at the conclusion of the project which certifies the geotechnical activities performed on this project are in accordance with these specifications. At a minimum, the report shall contain:
1. Field Density Test Report (with field activity log and test location map).
  2. Summary of test results from both qualifying the products and during placement.

## **1.07 NOTIFICATION**

- A. Upon identification, the CONTRACTOR shall notify the ENGINEER in writing if the site conditions encountered during construction differ from that indicated on the Drawings. Notification shall include an explicit description of the differences.

## **PART 2 - PRODUCTS**

### **2.01 GENERAL FILL**

- A. Soil for general backfill use shall be well-drained, and free of sticks, roots, organic matter, MSW, and stones larger than 1-inch in any dimension.
- B. Material shall be well-graded sand (SW), poorly graded sands (SP), silty-clayey sand (SP-SC), or clayey sand (SC) as classified by the Unified Soil Classification System, or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.

## **2.02 STRUCTURAL FILL**

Soil for structural fill use shall be well-drained, and free of sticks, roots, organic matter, MSW, and stones larger than 1-inch in any dimension. Acceptable soil types, as classified by the Unified Soil Classification System (ASTM D 2487), SP, SP-SM, SC or SP-SC or other soil as approved by the ENGINEER. For soils with Atterberg limits, Liquid Limit shall be less than 30 with a Plasticity index greater than 10.

## **2.03 LOW PERMEABILITY SOIL (See Section 02212)**

## **2.04 FDOT NO. 4 ROUNDED RIVER ROCK**

- A. The rock placed around the leachate collection pipes shall be quartz or granite-based rounded river rock, washed and free of deleterious material.
- B. The gradation shall comply with the requirements for No. 4 aggregate as specified in the Florida Department of Transportation's (FDOT), Standard Specifications for Road and Bridge Construction (2000), Section 901, Table 1, Standard Sizes of Coarse Aggregate, or other materials as approved by the ENGINEER.

## **2.05 GROUNDWATER COLLECTION SYSTEM ROCK**

- A. The rock placed around the groundwater collection pipes shall be limerock, quartz or granite-based crushed or rounded river rock, washed and free of deleterious material.
- B. The gradation shall comply with the requirements for No. 4 or 57 aggregate as specified in the Florida Department of Transportation's (FDOT), Standard Specifications for Road and Bridge Construction (2000), Section 901, Table 1, Standard Sizes of Coarse Aggregate, or other materials as approved by the ENGINEER.

## **2.06 PROTECTIVE/DRAINAGE SOIL LAYER**

- A. Material shall be free of sticks and roots larger than 1-inch in any dimension, MSW, organic matter and stones. The material shall be a sand with a minimum hydraulic conductivity of  $1 \times 10^{-3}$  cm/sec, when a laboratory sample is compacted to 95 percent of the Standard Proctor, and conforming to the following gradation:

**Table 02220-1. PROTECTIVE/DRAINAGE SOIL LAYER**

<u>Sieve Size</u>	<u>Maximum Percent Passing</u>
No. 10	100
No. 30	95
No. 50	65
No. 70	20
No. 200	0-10

The above gradation may be modified by the ENGINEER if the soil gradation varies from the gradation curve above but still meets the permeability and geotextile requirements.

**2.07 TOPSOIL**

- A. Topsoil material shall be fertile natural soil typical of the locality, free from MSW, stones, roots, sticks, clay, peat, weeds and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth. The material shall comply with the requirements of FDOT's Standard Specifications for Road and Bridge Construction (2000), Section 987 for Topsoil. Topsoil will be tested for nutrient deficiencies to determine the appropriate amounts of organic material and fertilizer to be added.

**2.08 QUALIFICATION TESTS**

- A. Prior to placement, soils shall be tested in accordance with Table 02220-2.
- B. Composite soil samples are not allowed.
- C. Testing shall be repeated each time there is a visual change in the material or upon direction of the ENGINEER.

**SECTION 1 TABLE 02220-2. SOIL QUALIFICATION TESTING**

Material	Test	ASTM No.
General Fill	Standard Proctor	D 698
	Soil Classification	D 2487
	Sieve Analysis	D 422
	Atterberg Limits	D 4318
Structural Fill	Soil Classification	D 2487
	Sieve Analysis	D 422
	Atterberg Limits	D 4318
	Standard Proctor	D 698
Sub-Base	See Section 02212	
Protective/ Drainage Cover Soil	Sieve Analysis	D 422
	Hydraulic Conductivity	D 5084
Rock	Sieve Analysis	D 422
Topsoil	Soil Classification	D 2487
	Nutrient content	NA
	Organic Content	D-2974

**PART 3 - EXECUTION****3.01 EXCAVATION**

- A. The CONTRACTOR shall conduct excavation activities according to the requirements below:
1. Layout all excavations and establish grades as shown on the Drawings. Replace existing survey markers at original location if disturbed or destroyed. Layout work shall be performed by a licensed land surveyor registered in the State of Florida.
  2. Excavation, backfilling, sampling, and testing shall be performed by the CONTRACTOR only when the ENGINEER is present. A minimum of 24-hours prior notice shall be given to the ENGINEER.
  3. Provide drainage at all times during construction by shaping excavated areas and maintaining ditches and drains. Protect graded areas against action of elements. Re-establish grade where settlement, washouts, or erosion damage occurs. Damaged areas shall be repaired at no additional cost to the COUNTY.

4. When excavation has reached prescribed depths, the ENGINEER shall be notified that an inspection of the excavation may be performed.
5. If the bottom of any excavation is removed below the limits shown on the Drawings or as directed by the ENGINEER, it shall be backfilled at the CONTRACTOR'S expense with material approved by the ENGINEER.
6. The CONTRACTOR shall not leave any excavations, boreholes, or trenches open at the completion of work each day. All open holes shall be backfilled flush with existing grade or covered, at the ENGINEER's direction, with acceptable material prior to leaving the site.
7. All excavations shall conform to the Health and Safety Plan submitted under Part 1.06, of this Section.

### **3.02 STOCKPILE OF MATERIALS**

- A. Excavated materials shall be transported to the stockpile areas designated by the ENGINEER. Excavated materials may be segregated during excavation and the ENGINEER shall direct locations for segregated materials. The ENGINEER shall identify materials that require segregated stockpiling.
- B. The CONTRACTOR shall be responsible for vehicle traffic safety and shall coordinate with the ENGINEER to determine site-specific safety concerns.
- C. The CONTRACTOR shall sweep or wash paved roadways that become covered with soil. The CONTRACTOR shall provide all equipment, water, and personnel necessary to clear the paved roads. This activity shall be performed at a minimum of once per week or as the ENGINEER directs.

### **3.03 PLACEMENT OF GENERAL FILL**

- A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.
- B. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.
- C. The surface for which the fill will be placed shall be proof-rolled a minimum of 4 complete passes with a 10-ton vibratory steel drum roller (with vibratory action turned on) or other equipment approved by the ENGINEER, prior to backfilling operations. The surface for which the fill is to be placed shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.

- D. Place and compact soil in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.09, this Section.
- E. In cuts, all loose or protruding rocks on the excavated side-slopes shall be loosened and removed to line or finished grade of slope. All cut and fill slopes shall be as shown on the Drawings or as directed by the ENGINEER.
- F. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

### **3.04 PLACEMENT OF STRUCTURAL FILL**

- A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.
- B. Prior to backfilling, all unsuitable soil shall be removed, at a minimum, to the elevations shown on the Drawings. The vertical extent of the unsuitable soil is to be field verified by the CONTRACTOR.
- C. The surface for which the fill will be placed shall be proof-rolled a minimum of 4 complete passes with a 10-ton vibratory steel drum roller (with vibratory action turned on) or other equipment approved by the ENGINEER, prior to backfilling operations. The surface for which the fill is to be placed shall be compacted to a depth of 6-inches at the specified density. Proof-rolled area shall be accepted by the ENGINEER prior to beginning backfilling.
- D. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.
- E. Place and compact soil in maximum 12-inch compacted lifts. Compaction effort shall be in accordance with Part 3.09, this Section.
- F. In cuts, all loose or protruding rocks on the excavated side-slopes shall be loosened and removed to line or finished grade of slope. All cut and fill slopes shall be as shown on the Drawings or as directed by the ENGINEER.
- G. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.



### **3.05 PLACEMENT OF SUB-BASE**

- A. See Section 02221.

### **3.06 PLACEMENT OF PROTECTIVE/DRAINAGE COVER SOIL**

- A. Place protective cover soil to the lines and grades shown on Drawings.
- B. Place protective cover in a manner to not cause wrinkles and undue stresses in the primary geocomposite.
- C. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.
- D. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

### **3.07 PLACEMENT OF ROCK**

- A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.

### **3.08 PLACEMENT OF TOPSOIL**

- A. Place fill materials, perform grading improvements, and construct embankments to the lines and grades shown on Drawings.
- B. Materials excessively wet or dry are considered unsuitable. Allow such material to dry, or moisten, as required, to bring material generally within 3 percent of optimum moisture content range for specified compaction.
- C. Maintain proper drainage during grading operations until final acceptance. Repair any fill or grading materials which may be lost or displaced as a result of natural causes such as storms, squalls, etc., or as a result of movement, consolidation or settlement of the ground or foundation with acceptable material. Repair shall be performed at no additional cost to the COUNTY.

### **3.09 TESTING REQUIREMENTS DURING PLACMENT**

- A. During placement, all materials shall be testing in accordance with Table 02220-3.
- B. Composite soil samples are not allowed.

- C. Density shall be a percentage of maximum dry density within 3 percent of optimum moisture content.
- D. Nuclear determination of field density may be used only after correlation with Direct Cylinder Method (ASTM D 2937) has been established. In event of conflict, the Direct Cylinder Method results will govern.
- E. Location of field moisture-density tests shall be approved by the ENGINEER.

**TABLE 02220-3. TESTING DURING PLACEMENT**

Material	Test	ASTM No.	Frequency	Value
General Fill	Density	D 2937	2/acre/lift	95 percent of Standard Proctor
	Standard Proctor	D 698	Upon visual change or change in source	Five Point Test
	Sieve Analysis	D 422		See 2220-2.01
	Atterberg Limits	D 4318		See 2220-2.01
Structural Fill	Density	D 2937	2/acre/lift	95 percent of Standard Proctor
	Standard Proctor	D 698	Upon visual change or change in source	Five Point Test
	Sieve Analysis	D 422		See 2220- 2.02
	Atterberg Limits	D 4318		
Sub-Base	See Section 02221			
Protective/ Drainage Cover Soil	Sieve Analysis	D 422	1/acre	See Section 02220-2.06
	Permeability (@95% Std Proctor)	D 5084	1/acre	1.0 x 10 <sup>-3</sup> cm/sec
Rock	Sieve Analysis	D422	1/10,000 cy	No. 4 or 57
Topsoil	Organic Content	D2974	1/5,000 cy	2 to 10 percent

### **3.10 FINAL GRADING**

- A. Grading in preparation of topsoil application shall be performed to the lines, grades, and elevations shown in the Drawings. All unacceptable material defined in Part 1, this Section, shall be removed and disposed of as directed by the ENGINEER.
- B. All work on slopes shall be uniformly dressed to the grades shown on the Drawings.
- C. The ENGINEER reserves the right to make adjustments or revisions to plans as the WORK progresses to achieve the intent of the design.

### **3.11 TOLERANCES**

- A. The CONTRACTOR shall bring final grading to within the tolerance specified in Section 01050.

### **3.12 DISPOSAL OF SURPLUS AND UNSUITABLE MATERIALS**

- A. No materials shall be removed from the site or disposed of by the CONTRACTOR except as directed by the ENGINEER. An on-site disposal area will be designated by the COUNTY for surplus or unsuitable materials. CONTRACTOR shall coordinate disposal activities with ENGINEER to not interfere with on-going landfill operations activities. Materials shall be placed at the designated disposal site, within the limits and to the fill heights as directed by the ENGINEER.
- B. Materials shall be stored in an area of sufficient distance from excavations to not create a surcharge loading adjacent to any excavation.

### **3.13 SETTLEMENT**

- A. The CONTRACTOR shall anticipate settlement due to consolidation associated with construction activities. The CONTRACTOR shall provide survey documentation of the settlements, if significant, to quantify volumes. The additional documentation shall be at no additional cost to the COUNTY.

### **3.14 DUST CONTROL**

- A. The CONTRACTOR shall spray water over the construction area, haul roads, or other places impacted by the CONTRACTOR, in order to limit airborne dust, or as directed by the ENGINEER or COUNTY.
- B. If due to construction activities, the dust reduces the visibility so vehicles and personnel are limited and cause an Health and Safety problem, all construction

activities will be stopped immediately until the CONTRACTOR, apply water to the construction area, haul roads, or other places being impacted by the CONTRACTORS activities. The ENGINEER or COUNTY will make final decisions whether dust is a site Health and Safety problem.

**- END OF SECTION -**

## **SECTION 02221**

### **SUB-BASE**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this Section includes excavation, transporting, stockpiling, mixing, moisture conditioning, spreading, compacting, grading, rolling, testing, inspection and repairing of the sub-base layer system as shown on the Drawings and as specified herein.

##### **1.02 QUALITY CONTROL/QUALITY ASSURANCE**

- A. Construction Quality Control (CQC) will be performed by an independent geotechnical CQC consultant retained by the CONTRACTOR. All reports, inspections, testing and related activities of the CQC Consultant shall be at the CONTRACTOR's expense. The CQC consultant shall not be the same consultant retained by the COUNTY for Construction Quality Assurance (CQA). The CQC consultant shall oversee all sub-base installation activities and the quality control testing as specified herein. The CQC consultant shall prepare a final report certifying that the sub-base material and installation procedures were in accordance with the Contract Documents. The final report shall be signed and sealed by a professional engineer licensed in the State of Florida.
- B. Construction Quality Assurance (CQA) will be performed by an independent geotechnical CQA consultant retained by the COUNTY.
- C. The CONTRACTOR shall schedule his work so as to provide sufficient time as required to complete CQC and CQA field and laboratory testing.

##### **1.03 SUBMITTALS**

- A. The CONTRACTOR shall submit to the PROJECT MANAGER field and laboratory test data prior to importing and/or prior to any construction using the sub-base. Soils shall not be imported and/or used for construction on the project until approved by the PROJECT MANAGER.
- B. Qualifications of the CQC Consultant shall be submitted to the PROJECT MANAGER for approval prior to any geotechnical testing of the borrow source of the sub-base materials. The CQC Consultant's qualifications shall be submitted to the PROJECT MANAGER as required in Section 02220.
- C. Borrow Source Qualification (on-site and/or off-site): The CONTRACTOR shall notify the PROJECT MANAGER in writing of the individual borrow

source(s) for the sub-base at least 15 calendar days prior to the date of anticipated construction use of such material. Notification of individual borrow source(s) shall include:

1. Supplier's name and borrow location.
2. Verification that adequate quantities are available to complete the work.
3. At the time of submittal of the above notification, the CONTRACTOR also shall deliver three representative samples of the proposed sub-base at no additional cost to the COUNTY. Each of the three samples proposed sub-base samples shall be delivered in 1-gallon individually sealed containers.
4. Laboratory testing shall be performed on the proposed sub-base borrow source by the CQC consultant with the results submitted to the PROJECT MANAGER at least 15 calendar days prior to test section installation. Representative samples shall be collected from a minimum of 3 locations in the proposed borrow source and submitted to the CQC consultant for testing. The following series of tests shall be performed on each of the samples:
  - Standard Proctor compaction testing (ASTM D 698), one test per representative sample.
  - Atterberg Limits testing, ASTM D 4318, one test per sample.
  - Grain size (gradation) analysis (ASTM D 422), one test per sample.
  - Natural Moisture Content (In-Place at the Borrow Source), ASTM D 2216, one test per sample.
5. The CONTRACTOR shall notify the PROJECT MANAGER in writing a minimum of 3 working days prior to sampling and shall coordinate the PROJECT MANAGER's observation of borrow source sampling. PROJECT MANAGER reserves the right to obtain independent samples. Rejection by the PROJECT MANAGER of the sub-base for not meeting the Specification requirements shall not relieve the CONTRACTOR of submitting the required data for an alternate borrow source. Additional costs or delays resulting from the rejection of a soil shall be at no cost to the COUNTY.
6. Borrow Source Report: The CONTRACTOR shall submit three copies of the CQC consultant's borrow source analysis. The report shall be signed by a professional engineer registered in the State of Florida to certify the soil furnished for the sub-base complies with the Specification

requirements. The report shall include all borrow source information, soil classification, and test result data.

- D. Project Report: The CONTRACTOR shall submit three copies of the CQC consultants test results for the installed sub-base upon project completion. During sub-base installation the CQC Consultant shall provide the PROJECT MANAGER in writing with preliminary field and laboratory test results so conformance with the project specifications of the sub-base installation may be monitored by the CQA Consultant. The report shall include all field and laboratory test results and a map, drawn by the CQC Consultant, which indicates the location and type of the test. The CQC Consultant shall record all test locations on a test location map. The laboratory test results shall be identified, numerically, alphabetically or a combination, in the report. A location map shall correlate the laboratory test identification with test location by use of a key or legend. Laboratory tests are outlined in Table 02221-1. The location map shall be the same scale as the Drawings and accurately depict field test locations. The report shall be signed and sealed by a professional engineer registered in the State of Florida.
- E. Topographic Survey (as built record drawings)-See Section 01050.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. The sub-base shall be a lean clay (CL), clayey sand (SC) or poorly graded clayey sand (SP-SC) as classified by the Unified Soil Classification System.
- B. The sub-base shall be free from roots, rubbish or debris, rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), calcareous deposits, or any other deleterious material. The CONTRACTOR shall remove any materials that the PROJECT MANAGER considers to be objectionable in the sub-base at no additional cost to the COUNTY.
- C. Testing for final acceptance shall be performed by the CQC consultant in accordance with these specifications.
- D. Installed sub-base which does not meet the specifications shall be reworked, retested, and replaced if required at no additional cost to the COUNTY.

**TABLE 02221-1. PROPERTIES OF SUB-BASE**

Description	Specified Value	Method	Frequency <sup>1,5</sup>
Soil Classification (Unified Soil Classification System)	See 2.01 A, this section	ASTM D 2487	2/acre/lift <sup>2</sup>
Grain Size (gradation) Analysis		ASTM D 422	
Atterberg Limits Plasticity Index (percent)	6<PI<40	ASTM D 4318	
Organic Content (percent)	<1	ASTM-2974	1/acre/lift (2/acre/lift when organics are visibly present)
Thickness	6 inches minimum, regardless of survey tolerance	Direct destructive tests on total thickness only	3/acre/lift
Compaction Characteristics of Soil by the Standard Proctor Method		ASTM-D 698	
Field Moisture (percent) Laboratory Nuclear Direct Heating Calcium Carbide Gas	+/- 2% optimum moisture content	ASTM D 2216 ASTM D 3017 ASTM D 4959 ASTM D 4944	2/acre/lift
Field Density (percent) Sand-Cone Method Drive Cylinder Nuclear Density	95% of maximum standard proctor	ASTM D 1556 ASTM D 2937 ASTM D 2922	2/acre/lift

**Notes for Table 02221-1:**

1. Frequency of testing is doubled for the initial 2 acres of sub-base construction.
2. Lift is defined as a 6-inch compacted in-place thickness.

**2.02 WATER**

- A. The water used for laboratory testing or for field moisture conditioning of the sub-base shall be clean and uncontaminated, and shall be obtained at no additional cost to the COUNTY. Laboratory water can be distilled or tap water. Saltwater shall not be used.



## **PART 3 – EXECUTION**

### **3.01 SELECT BACKFILL PREPARATION**

- A. Prior to the installation of the sub-base, clear, excavate, grade, backfill, and compact the site as shown on the Drawings and as specified herein. Select Backfill preparation activities shall be performed in accordance with Section 02220.
- B. Rocks (greater than 1/4-inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, debris or any other deleterious materials shall not be permitted within 6 inches of the surface upon which the sub-base will be installed.
- C. Surface of prepared select backfill shall be free of irregularities, loose soil, and abrupt changes in grade.
- D. The surface of the prepared select backfill shall be inspected by the PROJECT MANAGER prior to installation of the sub-base. If conditions do not meet the requirements as specified, including grades, density, moisture, or deleterious materials, corrective action by the CONTRACTOR shall be completed prior to proceeding with the installation of the sub-base at no additional cost to the COUNTY.

### **3.02 SUB-BASE**

- A. Testing methods and frequencies shall be in accordance with Table 02221-1 and notes on Table 02221-1.
- B. At the time of compaction, the moisture content in the soil shall be within the range determined by the test section results.
  - 1. For soil that is above the optimum soil moisture content range as determined by the CQC consultant, the CONTRACTOR shall spread, dry, and re-compact the soil in order to meet the specifications.
  - 2. For soil that is below the optimum soil moisture content range as determined by the CQC consultant, the CONTRACTOR shall add water uniformly over the soil, then mix to achieve a uniform moisture content and soil consistency throughout the lift.
- C. Adjacent soil strips shall be scarified at the end and overlapped to assure adequate bonding.
- D. If desiccation or surficial crusting occurs, the area shall be scarified to the depth necessary to expose sufficiently moist soil, and the scarified soil shall be brought to the correct moisture content, remixed and recompacted. The sub-base shall

be deemed acceptable only when it is completely free from desiccation to any depth and free from surficial crusting.

- E. Upon completing the sub-base, the surface shall be visually inspected by the PROJECT MANAGER. Areas that appear to be inadequately installed will be sampled, tested, and reworked if necessary to achieve the specified properties, at no additional cost to the COUNTY. The CONTRACTOR is responsible for protecting the sub-base from drying, cracking and other damage until the overlying geomembrane is installed.
- F. A flexible membrane liner may be used as temporary protection for the completed sub-base. The membranes shall be overlapped 1 foot and properly anchored in place by sandbags or partial soil backfill.
- G. The CONTRACTOR shall maintain the surface of the installed sub-base, and prevent it from becoming softened due to precipitation, desiccating and cracking due to lack of moisture, or damage by stormwater runoff erosion. The geomembrane layer shall not be installed over sub-base that has been damaged until repairs have been completed and the PROJECT MANAGER has approved the area.
- H. The CONTRACTOR shall bring the final grades, elevations, and contours of the sub-base to within the project specifications and as indicated on the Drawings while maintaining a minimum thickness of 6 inches for the installed sub-base. Only when the sub-base has been brought to the final grades, elevations, and contours shall the tests outlined in this section be conducted.
- I. Perforations, test holes and depth probes of the sub-base shall be over-excavated with minimum 45 degree side-slopes, and repaired by backfilling the hole with 3-inch lifts (maximum) of sub-base material and bentonite powder. Each lift in the repair shall be compacted using a heavy, blunt-ended object in such a manner that the soil is well compacted, and well blended with the adjacent soil. Moisture condition the soil whenever necessary.
- J. Reworked areas, at any time during the course of construction, shall be fully repaired and tested, as outlined in Table 02221-1 with the exception as specified in Part 3.03.F, at no additional cost to the COUNTY.
- K. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, re-wet as needed, and compact to the required density prior to further construction, at no additional cost to the COUNTY. The reworked area shall be retested, at no additional expense to the COUNTY, at the frequency specified in Table 02221-1 with the exception as specified in Part 3.03.F. Installation of the reworked area shall be governed by the methods determined during the test section.

- L. The CONTRACTOR shall be responsible for all settlement to fills and shall backfill areas that may occur within the maintenance period stipulated in the General Conditions.

### **3.03 CONFINED AREAS**

- A. Sub-bases in confined areas, such as adjacent to structures or areas where heavy equipment operation is limited, shall be placed and compacted in lifts to meet the project specifications. Soils placed in these areas shall not have clumps exceeding 1/2 inch in any dimension. The soil shall be placed in lifts not to exceed 4 inches. The soil shall be compacted using hand tools or pneumatic mechanical devices to tamp each successive lift in place. The CQC Consultant shall define the compaction procedures with the approval of the PROJECT MANAGER.

### **3.04 CERTIFICATION OF COMPLETION**

- A. Upon completion of the sub-base, the CQC consultant shall certify in the final project report that:
  - 1. The sub-base was constructed in accordance with the approved project Drawings and specifications.
  - 2. Any damage to the sub-base from any construction operation was repaired as specified herein.

### **3.05 FINAL ACCEPTANCE**

- A. The CONTRACTOR shall retain the ownership and responsibility for the sub-base until final acceptance by the PROJECT MANAGER. The sub-base shall be acceptable when:
  - 1. All installation activities are completed.
  - 2. All documentation of installation is completed and the CQC consultant's final project report is submitted to the PROJECT MANAGER and approved.

**END OF SECTION**

## **SECTION 02371**

### **RIPRAP AND ROCK LINING**

#### **PART 1 GENERAL**

##### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Riprap placed loose.
- B. Related Sections:
  - 1. Section 01568 – Temporary Erosion and Sedimentation Control
  - 2. Section 02140 - Dewatering.

##### **1.02 UNIT PRICE - MEASUREMENT AND PAYMENT**

- A. Riprap:
  - 1. Basis of Measurement: By cubic yard of riprap placed
  - 2. Basis of Payment: Includes supply and placing riprap.

##### **1.03 QUALITY ASSURANCE**

- A. Furnish each aggregate material from single source throughout the Work.
- B. Perform Work in accordance with Florida Department of Transportation Standard Specifications.

#### **PART 2 PRODUCTS**

##### **2.01 MATERIALS**

- A. Furnish materials in accordance with Florida Department of Transportation Standard Specifications.
- B. Riprap: Limestone or clean broken concrete; solid and nonfriable with rough and angular surfaces. Use broken stone or broken concrete meeting the following gradation and thickness requirements:

**TABLE 02371-1. PROPERTIES OF RIPRAP**

Weight Maximum (pounds)	Weight 50% (pounds)	Weight Minimum (pounds)	Minimum Thickness (feet)
75	30	15 <sup>1</sup>	2

Note 1 15 pound minimum is typical to size/weight relationship for a 6-inch stone.

- C. Geotextile Fabric: Non-biodegradable, woven.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verification of existing conditions before starting work.

#### **3.02 PLACEMENT**

- A. Place geotextile fabric over substrate, lap edges and ends.
- B. Place riprap in channels, at pipe ends, and as indicated on Drawings.
- C. Installed Thickness: As indicated on Drawings.

**END OF SECTION**

## SECTION 02776

### HIGH DENSITY POLYETHYLENE (HDPE) GEOMEMBRANE LINER

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. The work specified in this Section includes manufacture, handling, transportation, storage and all equipment and labor necessary for installing, seaming, repairing, and testing the textured geomembrane as shown on the Drawings and as specified herein.
- B. Geomembrane is defined as high density polyethylene (HDPE) geomembranes with a formulated sheet density greater than 0.940 g/cc. Both smooth and textured geomembrane surfaces are included under this specification. **ONLY textured geomembrane is specified for use on this project.**
- C. All materials shall conform to the following requirements and be free from defects and imperfections, of recent manufacture (within 2 years prior to installation) and unused.
- D. The CONTRACTOR shall coordinate the progress of geomembrane installation with excavation, grading, and protective cover soil placement.

##### 1.02 QUALITY CONTROL/ASSURANCE

- A. Construction Quality Control (CQC) will be performed by a CQC Consultant retained by the CONTRACTOR. The CQC Consultant cannot be the same company retained by the COUNTY for Construction Quality Assurance (CQA). The CQC Consultant shall review the installation plan submitted by the Installer for completeness; supervise all geomembrane installation activities and quality control testing as specified herein; and prepare a final report certifying the materials and installation are in accordance with the approved installation plan and other applicable portion of the Contract Documents.
- B. Construction Quality Assurance (CQA) will be performed by an independent CQA Consultant retained by the COUNTY. The CQA Consultant shall observe and inspect the geomembrane installation activities and conduct CQA testing at a random frequency and location. The CQA Consultant shall submit a final report, signed and sealed by a professional engineer licensed in the State of Florida, certifying the test results.

- C. Based upon review of the CQC and CQA final reports, the Engineer will provide certification to the regulatory agencies that the geomembrane was installed in accordance with the Contract Documents.
- D. The CONTRACTOR shall schedule work to provide sufficient time as required to complete CQC and CQA field testing and documentation prior to placing any overlying layers above the geomembrane and shall keep the CQC/CQA Consultant's laboratory informed of the construction progress to provide sufficient time for laboratory testing.

### **1.03 QUALIFICATIONS**

- A. Manufacturer Qualifications: A qualified Manufacturer shall be a company, corporation, or firm regularly engaged in the development and manufacture of geomembranes with a history of successful production of geomembrane for a minimum period of 5 years. The geomembrane rolls shall be manufactured by a single Manufacturer. A company other than manufacturer may supply the geomembrane, however, the manufacturer of the geomembrane shall be required to submit and meet the requirements stated in the Section. The Manufacturer shall submit written information on the following:
  - 1. Information on plant size (square feet of geomembrane produced daily), number of shifts, and capacity of each shift.
  - 2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.
  - 3. Quality Control program manual of descriptive documentation for production. The manual shall define sampling procedures, test frequencies and methods. The Manufacturer shall, at a minimum, comply with the quality control specification for this WORK.
  - 4. A statement from the Manufacturer stating the manufacturing quality control measures specified for this WORK will be followed and the manufactured geomembrane products will meet or exceed the product specifications for this WORK.
  - 5. Verification that the Manufacturer has successfully supplied geomembrane for a minimum of 6 projects in the United States, during the last 5 years, of similar size and scope totaling to a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Manufacturer had total manufacturing responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Manufacturer shall submit written information as follows:
    - a. Name and location of project and date of installation.

- b. Contact name and phone number for each project.
  - c. Geomembrane thickness and surface area of geomembrane installed.
- B. Fabricator Qualifications: Qualified Fabricator shall be a company, corporation, or firm regularly engaged in the seaming and fabrication of geomembrane products, under factory-controlled conditions, for the installation of geomembrane under field conditions. The Fabricator usually seams together combinations of smaller rolls of geomembrane into larger factory panels for deployment in the field. The geomembrane shall be fabricated by a single Fabricator. The Fabricator shall submit written information on the following:
  - 1. Information on plant size (square feet of geomembrane fabricated daily), number of shifts, and capacity of each shift.
  - 2. Daily production quantity shall be sufficient to meet the demands of the schedule for this WORK.
  - 3. Quality Control procedures (manual) for fabrication. The manual shall define sampling procedures, test frequencies and methods. The Fabricator shall, at a minimum, comply with the quality control specification for this WORK.
  - 4. A statement from the Fabricator stating the fabrication quality control measures specified for this WORK will be followed and the fabricated geomembrane products will meet or exceed the product specifications for this WORK.
  - 5. The Fabricator shall have successfully fabricated geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Fabricator had total fabrication responsibility for geomembrane production and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Fabricator shall submit written information as follows:
    - a. Name and location of project and date of installation.
    - b. Contact name and phone number for each project.
    - c. Geomembrane thickness and surface area geomembrane installed.
- C. Installer Qualifications: Qualified Installer shall be a company, Corporation, or a single Installer. The Installer shall submit written information on the following:



1. Daily installation quantity shall be sufficient to meet the demands of the schedule for this WORK.
2. Quality Control Procedures (manual) for field installation. The Installer shall, at a minimum, comply with the specifications for this WORK. If differences exist between the Installer's quality control procedures and the quality control procedures specified by the Engineer or CQA Consultant the procedures specified for the WORK shall govern installation.
3. Quality Assurance/Quality Control Field Program: The QA/QC program shall provide for recording all inspection and testing of all WORK items to ensure conformance to applicable specifications and drawings with respect to materials, workmanship, construction, functional performance and identification. The QA/QC program shall be subject to approval by the Engineer, and include:
  - a. Storage and Handling (equipment).
  - b. Panel Identification.
  - c. Panel Inspection.
  - d. Panel Layout Drawings/Shop Drawings.
  - e. Seam Identification.
  - f. Seaming Process and Equipment.
  - g. Seaming Inspection.
  - h. Non-Destructive Tests (Seams, Repairs, Geomembrane Boots).
  - i. Destructive Tests.
  - j. Laboratory Tests.
  - k. Methods for Testing and Calibration of Field Testing Equipment.
  - l. Corrective Actions (i.e., addition of geomembrane, reduction of geomembrane, topography changes).
  - m. Procedures for Development of Record Drawings.
  - n. Weather Contingencies.
  - o. Record Keeping.
4. A statement from the Installer stating the installation quality control measures specified for this WORK will be followed and the installed geomembrane products will meet or exceed the product specifications for this WORK.
5. The Installer shall have successfully installed geomembrane products for at least 6 projects, during the last 5 years, of similar size and function totaling a minimum of 10 million square feet of installed geomembrane. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years. The Installer shall submit written information as follows:

- a. Name and location of project and date of installation.
  - b. Contact name and phone number for each project.
  - c. Geomembrane thickness and surface area geomembrane installed.
6. Installer's Personnel shall have the following minimum qualifications;
- a. Field Installation Supervisor qualifications to be assigned to this WORK. The Field Installation Supervisor shall have directly supervised the installation of a minimum of 2,000,000 square feet of geomembrane. No geomembrane shall be installed without the presence of the Field Installation Supervisor.
  - b. Master Seamer Qualifications to be assigned to this WORK. All personnel performing seaming operations shall be qualified by experience or by successfully passing seaming tests. At least one seamer shall have experience seaming a minimum of 1,000,000 linear feet of geomembrane seams using the same type of seaming apparatus to be used for this WORK. No seaming shall be carried out without the presence of the master seamer within the immediate vicinity.
  - c. Installation quality control testing personnel in the field shall have a minimum of 400,000 square feet of geomembrane quality control testing. Only the actual square footage that the personnel have directly performed quality control testing on shall be counted as fulfillment of the minimum square footage.
- D. CQC Consultant Qualifications: The CQC Consultant shall have previously performed quality control supervision totaling a minimum of 2 million square feet of installed geomembrane. The CQC Consultant may be the Installer's Supervisor or part of the Installer's company or corporation. Projects shall be considered similar only if the Installer had total installation responsibility for geomembrane installation and the installed geomembrane has successfully fulfilled its primary function for a minimum of 2 years.

#### **1.04 SUBMITTALS**

- A. Thirty days prior to the delivery of the geomembrane to the site, the CONTRACTOR shall submit to the Engineer, for approval, documentation on the following:
  - 1. Manufacturer's Qualification.
  - 2. Fabricator's Qualification (If a Fabricator is used).

3. Installer's Qualification.
  4. Warranty (Materials).
  5. Geomembrane Resin Information & Quality Control Certificates.
  6. Geomembrane Manufacturer material properties sheet, including at a minimum all properties specified in GRI GM 13, including test methods used & Quality Control Certificates.
  7. Fabricator's Quality Control Certificates & Material Certification.
  8. Geomembrane Accessories.
  9. Extrudate Rod Resin Information.
  10. Recommended Loading, Unloading, and Handling Equipment (include Model Number or Load Capacity).
  11. A list indicating correlation between the Manufacturer's Quality Control Certificates and individual geomembrane rolls.
  12. The date of shipment of geomembrane from the Manufacturer or Fabricator. A minimum of 14 days shall be given to the Engineer so as to provide sufficient time to perform conformance sampling and receive laboratory test results prior to shipment.
  13. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02(F).
  14. Direct Shear Test Results (interface): Direct Shear Test Results tests demonstrating compliance with Part 2.02(G).
- B. Installation Plan: Thirty days prior to the delivery of the geomembrane to the site, the Installer shall provide written information to the Engineer on the following (reserves the right to require changes to the installation plan): Engineer
1. Quality assurance/quality control (QA/QC) plan.
  2. Description of welding equipment, techniques, and materials.
  3. Panel layout plan with panel location, orientation, identification, and installed square footage of geomembrane.
  4. Complete set of forms used to record installation quality assurance/quality control data.

5. Resumes of key geomembrane installation personnel. (The Field Installation Supervisor, Master Seamer, and quality control personnel shall be clearly identified).
  6. Qualifications of CQC Consultant.
  7. Non-destructive test methods for geomembrane seams and repairs.
  8. Warranty (Workmanship).
- C. Resin: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for the raw resin material used to produce each roll of geomembrane. The frequency of the testing of the resin batches shall be per Manufacturer's quality control plan but shall not be less than 1 test per resin lot. A resin lot is defined as 180,000 pounds or less of raw resin material.

TEST	TEST METHOD
Density	ASTM D 1505
Melt Flow Index	ASTM D 1238 Cond. E

- D. Sheet: Manufacturer's Quality Control Certificate, written on the Manufacturer's company letterhead, shall be provided for each roll of geomembrane, including roll identification number, and the results (Listed Individually) of quality assurance/quality control testing performed by the Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. At a minimum, the following tests shall be performed at a frequency of one test per 50,000 square feet of material per lot:

TEST	TEST METHOD
Density	ASTM D 1505
Thickness	ASTM D 5199 (Smooth) ASTM D 5994 (Textured)
Tensile Properties	
-Yield Stress	ASTM D 638 (each direction)
-Yield Elongation	ASTM D 638 (each direction)
-Break Stress	ASTM D 638 (each direction)
-Break Elongation	ASTM D 638 (each direction)
Carbon Black Content	ASTM D 1603
Carbon Black Dispersion <sup>1</sup>	ASTM D 5596

Note 1 Carbon black dispersion for 10 different views: all 10 in categories 1, 2.

- E. Sheet: Manufacturer's Quality Certificate, identifying the Manufacturer shall be provided for each roll of geomembrane, including roll identification number, and the results of quality assurance/quality control testing performed by the

Manufacturer. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line.

TEST	TESTING FREQUENCY.	TEST METHOD
Oxidative Induction Time (OIT)	200,000 lb	ASTM D 3895 (Standard OIT) or ASTM D 5885 (High Pressure OIT)
Stress Crack Resistance <sup>1</sup>	per GRI-GM 10	ASTM D 5397 (Appendix)

Note 1 Stress Crack Resistance (SP-NCTL) tests on textured geomembranes can be performed on smooth samples from the same lot. Yield stress to be Manufacturer's mean value via MQC testing.

- F. Sheet: Letter Certification, written on the Manufacturer's company letterhead, for the following tests and certifying the material shall meet the WORK specifications.

TEST	TEST METHOD
Puncture Resistance	ASTM D 4833
Tear Resistance	ASTM D 1004

- G. Warranties from the Manufacturer and Installer. Manufacturer shall warranty the geomembrane material on a pro-rated basis for a period not less than 5 years from the date of final acceptance. The Installer shall warranty workmanship for a period of not less than 1 year from the date of final acceptance.

- H. Record Drawings: The CONTRACTOR shall submit a panel layout drawing reflecting as-built conditions and related installation details (i.e., panel layout, penetrations, boots, connections) of the actual geomembrane lining system. The panel layout record drawings shall:

1. Be at the same scale as the Contract Drawings, and use applicable drafting standards including a border identifying the Installer, COUNTY project name and drawing name.
2. Indicate the installed field panel and seam numbering, configuration and dimensions, geomembrane penetrations, and berms. If applicable, factory seams shall be differentiated from field seams. The CQC Consultant shall correlate the identification numbers for each roll of material to the installation field panel.
3. Include the installed area, in square feet, of installed geomembrane.
4. Include the locations of destructive samples with the correct corresponding sample number and repairs.

- I. Prior to geomembrane installation, the CONTRACTOR shall supply the Engineer with survey data that clearly indicates the grades and elevation meet the project specifications.
- J. Prior to deploying the geomembrane, the Installer shall submit written documentation certifying their acceptance of the surface on which the geomembrane is to be placed.
- K. If the Installer proposes to conduct seaming operations outside of the approved conditions as specified herein (i.e., outside the weather parameters or night operations), written information and supporting data verifying seam quality can be maintained shall be submitted to the Engineer for review and approval. Alternate seaming operations will not be allowed without prior approval from the Engineer.

## **PART 2 - PRODUCTS**

### **2.01 GEOMEMBRANE RESIN MATERIAL**

- A. The geomembrane shall comprise of virgin, uncontaminated polyethylene resin designed and manufactured specifically for the purpose of liquid containment in hydraulic structures. No post consumer resin (PCR) shall be used or added to the geomembrane formulation. The resin shall contain no more than 10 percent rework of the same formulation as the parent material. The clear polyethylene resin shall meet or exceed a density of 0.932 g/cc per ASTM D 1505.
- B. All compound ingredients of geomembrane shall be randomly sampled on delivery to the manufacturing facility to ensure compliance with specifications. Tests will be conducted by the Manufacturer on density (ASTM D 1505) and melt index (ASTM D 1238, Condition E), with results submitted to the CQA Consultant.
- C. Any geomembrane manufactured from resin not meeting the WORK specifications shall be rejected and shall not be delivered to the project.

### **2.02 GEOMEMBRANE SHEET**

- A. For general information purposes only, Geomembrane manufacturers are GSE Lining Technology, Inc., Agru/America, Inc., Poly-Flex, Inc., or an ENGINEER-approved substitution.
- B. The geomembrane materials shall conform to the physical properties requirements, at a minimum, as shown in Table 02776-1. Values presented in Table 02776-1 are based upon the minimum standards established by the Geosynthetics Research Institute (GRI) for HDPE.
- C. The geomembrane shall be so produced as to be free of holes, blisters, undispersed raw materials, or any sign of contamination by foreign matter. Any

**TABLE 02776-1. GEOMEMBRANE MATERIAL PROPERTIES - 60 MIL TEXTURED**

PROPERTY	UNIT	TEST METHOD	TEST VALUE <sup>1</sup>	TEST FREQUENCY (MIN)	SUBMITTAL REQUIREMENT
<b>Resin</b>					
Density	g/cc	ASTM D 1505	>0.932	1 per 180,000 lb	MQC Certificate, See Section 1.04
<b>Sheet</b>					
Thickness Min. Average	mil	ASTM D 5994	60±5%	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Low Individual (any 10 values)	mil	ASTM D 5994	54	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Density	g/cc	ASTM D 1505	>0.940	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Tensile Properties (Notes 2,3,4)					
Yield Stress	lb/in width	ASTM D 638	126	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Yield Elongation	percent	Type IV Dumbbell	12	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Break Stress	lb/in width	2.0" Gage Length	90	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Break Elongation	percent	2.0 in/min	200	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Puncture Resistance	lb	ASTM D 4833	90	1 per lot	Letter Certificate, See Section 1.04
Tear Resistance	lb	ASTM D 1004	42	1 per lot	Letter Certificate, See Section 1.04
Stress Crack Resistance	hours	ASTM 5397, Appendix	200	1 per lot	MQC Certificate, See Section 1.04
Carbon Black Content	percent	ASTM D 1603	2.0-3.0	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Carbon Black Dispersion	Category	ASTM D 5596	1 or 2	1 per 50,000 ft <sup>2</sup>	MQC Certificate, See Section 1.04
Oxidative Induction Time (OIT)					
Standard OIT, or	minutes	<u>ASTM D 3895</u>	100	1 per lot	MQC Certificate, See Section 1.04
High Pressure OIT	minutes	ASTM D 5885	400	1 per lot	MQC Certificate, See Section 1.04

- Notes: 1) Test values are minimum unless otherwise noted.  
2) Tensile properties shall be tested and reported separately for the Machine Direction (MD) and the Cross Machine Direction (XMD).  
3) Machine Direction (MD) and Cross Machine Direction (XMD) shall be average values on the basis of 5 test specimens each direction.  
4) Yield Elongation Gage Length = 33 mm; Break Elongation Gage Length = 50 mm.

such defects shall be repaired using the extrusion fusion welding technique in accordance with the Manufacturer's recommendations.

- D. The Manufacturer shall agree to allow the COUNTY and ENGINEER to visit the manufacturing plant prior to or during the manufacturing of the geomembrane rolls for the WORK. The ENGINEER will review the manufacturing process, quality control, laboratory facilities, and testing procedures, including:
  - 1. Verification that properties for which guarantees have been provided by the Manufacturer meets all the specifications herein.
  - 2. Verification that the measurements of properties are properly documented and test methods used are acceptable.
  - 3. Observe packaging and transportation procedures.
  - 4. Verification that roll packages have a label indicating the name of the Manufacturer, type of geomembrane, sheet thickness, and roll number.
- E. The geomembrane shall be packaged and shipped by the Manufacturer in a manner to protect the integrity of the geomembrane from damage.
- F. Direct Shear Test (Interface Shear Resistance): The CONTRACTOR will perform one (1) direct shear test, in accordance with ASTM D5321, on representative samples of the Bi-planar Geocomposite/Geomembrane (textured) to be provided for this project. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the direct shear testing;
  - 1. Initial Seating – Saturate (water) Geocomposite/Geomembrane for 1 hour at 2 psi.
  - 2. Testing to be conducted under fully saturated (water) conditions.
  - 3. Three Normal Load = 1,000, 3,000, and 6,000 psf.
  - 4. Test Configuration: Geocomposite (bi-planar)clamped to top box  
Geomembrane (textured) clamped to bottom Box
  - 5. Strain Rate = 0.040 in/min.
  - 6. Continue testing to ensure a full 3-inch of displacement.
  - 7. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.



- ✓ OK
8. A minimum PEAK value of 0 psf adhesion and 20.5 degrees friction is required for this project (based upon the best fit line).
  9. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.
- G. Direct Shear Test (Interface Shear Resistance): The CONTRACTOR will perform one (1) direct shear test, in accordance with ASTM D5321, on representative samples of the Tri-planar Geocomposite/Geomembrane (textured) to be provided for this project. The cost for shipping and testing the samples shall be included in the price of the materials. The following testing parameters will be followed for the direct shear testing;
1. Initial Seating – Saturate (water) Geocomposite/Geomembrane for 1 hour at 2 psi.
  2. Testing to be conducted under fully saturated (water) conditions.
  3. Three Normal Load = 1,000, 3,000, and 6,000 psf.
  4. Test Configuration: Geocomposite (tri-planar) clamped to top box  
Geomembrane (textured) clamped to bottom Box
  5. Strain Rate = 0.040 in/min.
  6. Continue testing to ensure a full 3-inch of displacement.
  7. Plot and report (Peak and Residual values) for the best fit line through each of the three test results.
  8. A minimum PEAK value of 0 psf adhesion and 20.5 degrees friction is required for this project (based upon the best fit line).
  9. Adhesion may be considered by the ENGINEER to determine equivalent stability for this project.

### **PART 3 - EXECUTION**

#### **3.01 DELIVERY, STORAGE, AND HANDLING**

- A. Upon delivery to the project site, the geomembrane material shall be inspected by the CONTRACTOR to confirm that proper labeling, transportation, handling, and storage procedures are followed. Damaged materials will be identified and repaired or rejected at the discretion of the ENGINEER. Materials to be repaired as specified herein. Repairs will be at no additional cost to the COUNTY.

Rejected materials will be identified and removed from the project site at no additional cost to the COUNTY.

- B. Each roll shall be delivered to the site bearing markings which provide the roll number, thickness of the material, length and width of the material, and the proper direction to unroll the material to facilitate layout and positioning in the field.
- C. Within the installation report, the CQC Consultant shall correlate the identification numbers for each roll of material to the installation panel location.
- D. The CONTRACTOR shall provide transportation, labor, and handling for delivery of the geomembrane to and from the project location. Special transportation or handling requirements required for the geomembrane shall be provided by the CONTRACTOR.
- E. The equipment for transportation, handling, loading and unloading the geomembrane shall be of sufficient size and capacity to safely and efficiently handle geomembrane materials without damage or personnel injury occurring. The type, size and capacity shall be according to Manufacturer / Fabricator / Installer requirements.
- F. The CONTRACTOR shall provide all equipment and labor necessary for the loading, unloading, handling, and installation of the geomembrane.
- G. The materials shall be unloaded by the CONTRACTOR in areas designated by the COUNTY. If the COUNTY has not specified a storage area, the CONTRACTOR shall determine an area for storage of the materials to meet the WORK schedule requirements. In any case the materials shall not be stored or unloaded in areas that will impair the operations of the landfill facility or be deleterious to the materials.
- H. Storage requirements for the materials shall be specified by the Manufacturer / Fabricator / Installer. At a minimum, geomembrane rolls shall not be stacked upon one another to the extent that deformation of the core or flattening of the rolls occurs. Outdoor storage should not be allowed to exceed six months. For storage for more than six months a temporary enclosure shall be constructed or they should be moved to within an enclosed facility. If stored outdoors, water shall be prevented from accumulating beneath the rolls. Rolls shall be fully supported on pallets or other devices to be prevented from contacting the ground.
- I. Protection shall be provided, at a minimum, from puncture, cutting, ultraviolet radiation, precipitation, dirt or other damaging or deleterious conditions.

### 3.02 CONFORMANCE TESTING (CQA)

- A. In-Plant Conformance Sample Testing Services. The COUNTY and COUNTY'S REPRESENTATIVE have geomembrane inspectors to collect conformance samples directly at the following facilities;

GSE Lining Company, Houston, Texas

Agru-America, Kingwood, Texas

Poly-Flex, Inc., Grand Prairie, Texas

1. The MANUFACTURER shall inform, in writing, the COUNTY 14 days prior to the actual date of shipment.
2. Conformance sample(s) of the geomembrane will be collected and tested, by the COUNTY'S REPRESENTATIVE or CQA Consultant, prior to shipment to the site. Once sampled at the Manufacturer's plant, geomembrane products shall not be added or removed from the shipment.
3. If the material is shipped to the project, prior to conformance sampling at the manufacturers plant, then all cost associated with collecting and shipping samples from the project will be manufacturers responsibility.

- B. Conformance Sample Test Frequency (CQA). The geomembrane shall be randomly sampled by the COUNTY'S REPRESENTATIVE at a rate of 1 sample per lot, or 1 sample per 100,000 square feet of installed material from consecutively numbered rolls, which ever is smaller. A lot is defined as a group of consecutively numbered rolls manufactured from the same resin batch or production line. The initial conformance testing shall be at the COUNTY's expense.

- C. The initial conformance tests shall include the following;

- |    |                                     |                         |
|----|-------------------------------------|-------------------------|
| 1. | Thickness                           | ASTM D-5199/ASTM D-5994 |
| 2. | Carbon Black Content                | ASTM D-1603             |
| 3. | Carbon Black Dispersion             | ASTM D-5596             |
| 4. | Density                             | ASTM D-1505             |
| 5. | Tensile Properties (each direction) | ASTM D-638              |

- D. Samples shall be taken across the entire width of the rolls and shall not include the first three feet if stored outside or damaged. The averaged test results of the geomembrane samples shall meet or exceed the contract specifications.

- E. Samples which do not satisfy the contract specifications shall be cause to reject applicable rolls. If a geomembrane sample fails to meet specifications, subsequent tests shall be performed at random on additional geomembrane samples produced from the same resin batch to determine whether all rolls produced from the same batch shall be considered as unsatisfactory and therefore rejected. This additional testing, at no additional cost to the COUNTY, may be performed to more closely identify the rolls which do not comply with the specifications. Rejected rolls will not be installed and shall be removed from the project site at no additional cost to the COUNTY.
- F. The CQA Consultant will conduct one test on the actual extrudate welding rod used in the field for seaming and repairing the geomembrane panels to verify the material is compatible with the geomembrane. The tests shall consist of:
  - 1. Density (ASTM D-1505)
  - 2. Carbon Black Content (ASTM D-1603).

### **3.03 GEOMEMBRANE SUBBASE**

- A. Surface to be lined shall be smooth and tested as shown on the Drawings. The area shall be free of all rocks (greater than 1/4- inch in any dimension), sticks (greater than 1/4-inch in diameter), roots, grass, refuse, sharp objects, or debris of any kind. The surface shall provide a firm, unyielding foundation for the geomembrane with no sudden, sharp, or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.
- B. All areas that have been subject to erosion shall be repaired and tested in place as shown on the drawings. The repaired surface for geomembrane placement shall be even with no abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed.

### **3.04 GEOMEMBRANE INSTALLATION**

- A. Geomembrane installation shall be in accordance with the approved installation plan, and in accordance with the Drawings. Textured sheets shall be installed as shown in the Drawings.
- B. Field panels shall be placed so that seams are oriented parallel to the line of maximum slope. Horizontal seams, seams perpendicular to the maximum slope, are not allowed within 5 feet of the toe of slope. When full roll lengths do not extend past the toe of slope, panel ends may be seamed provided the panel is cut at an angle greater than 45 degrees to minimize seam stress. The use of 45-degree seams along the slope shall not be allowed unless unavoidable due to the slope length and geometry.

- C. Field panels shall not be placed if any of following conditions exists: inadequate geomembrane foundation, precipitation, presence of excessive moisture (i.e. fog, dew), ponded water, or presence of excessive winds.
- D. The geomembrane panels shall be placed in a manner to allow for a minimum overlap of 4 inches for extrusion welding and 6 inches for fusion welding.
- E. Geomembrane seams shall be welded using the double-seam hot wedge method. Extrusion welding shall be used only on those seams inaccessible with the hot wedge welder. Description and specifications for welding equipment, techniques, and materials shall be those outlined in the CQA Plan.
- F. All activities by personnel and equipment in the vicinity of the geomembrane during and after geomembrane placement shall be monitored by the CONTRACTOR to insure that the geomembrane and geomembrane foundation are not damaged.
- G. Temporary loading and/or anchoring shall be placed on the geomembrane to prevent uplift from the winds. The CONTRACTOR shall have sufficient sand bags or other appropriate anchoring materials on site to secure the geomembrane. CONTRACTOR shall replace or repair all geomembrane damaged (as determined by the Engineer) by wind or insufficient anchoring at no additional cost to the COUNTY.
- H. Immediately prior to seaming procedures, the seam area shall be completely free of moisture, dirt, or foreign material of any kind.
- I. Welding procedures shall not be allowed in the presence of any form of precipitation. Welding shall not occur when ambient air temperature measured one-foot above the geomembrane is less than 32°F or more than 104°F.
- J. If seaming operations are carried out at night, written approval, by the Engineer, shall be required 24 hours in advance of the intended night operation. Adequate illumination shall be provided by the CONTRACTOR. If during the course of the night operations, the Engineer, CQA Consultant, or COUNTY decides the illumination is inadequate, proper illumination shall be provided by the CONTRACTOR or night operations shall be ceased. Contract specifications for placing and seaming the geomembrane shall apply to the night operations.
- K. "Fishmouths" or wrinkles at the seam overlaps shall be cut along the ridge of the wrinkle in order to achieve a flat overlap. The cut fishmouths or wrinkles shall be seamed and any portion where the overlap is inadequate shall then be patched with an oval or round patch of the same geomembrane extending a minimum of 6 inches beyond the cut in all directions.

- L. The geomembrane shall be installed so as to minimize stresses in the sheet materials. The geomembrane shall be installed so as to conform to the contours and grade breaks. The geomembrane shall remain in contact with the underlying soils. Sand bags or excess material, placed during deployment, shall be used to prevent bridging due to temperature or installation procedures. Allowances for additional material due to temperature and installation procedures shall be included in the bid and at no additional cost to the COUNTY.

### **3.05 DESTRUCTIVE TESTING**

- A. Welding equipment shall be calibrated prior to each day's welding in accordance with the Installation Plan. The CQC Consultant shall record all calibration data for inclusion in the final report. Additional test welds shall be performed for each welding machine every 4 hours, if welder is turned off, prior to starting work, after lunch, or as directed by the CQA Consultant.
- B. Destructive Seam Testing:
1. Installed geomembrane shall be tested at a rate of 1 test per 500 linear feet of welded seam at locations selected by the CQA Consultant.
  2. The CQC Consultant shall remove the sample along the seam, approximately 12 inches wide across the seam by 42 inches long, and test a portion of the geomembrane seam in accordance with the CQA Plan. The location shall be recorded, repaired and tested. The repair of the destructive seam samples shall be at no additional cost to the COUNTY. The CQC Consultant shall deliver:
    - a. A 12-inch by 14-inch portion to the CQA Consultant for quality assurance testing.
    - b. A 12-inch by 14-inch portion shall be retained by the CQC Consultant for field testing.
    - c. A 12-inch by 14-inch portion to the COUNTY for archive storage.
  3. Testing performed on each sample shall include geomembrane peel adhesion and seam strength. Seam peel strength and shear strength shall meet the requirements specified in Table 02776-2.

**TABLE 02776-2. PEEL AND SHEAR SEAM STRENGTH VALUES**

Peel Strength	ASTM D-6392
Wedge Weld (lb/in width)	98 and FTB <sup>1,2,3</sup>
Extrusion Weld (lb/in width)	78 and FTB <sup>1,2,3</sup>

Shear Strength	ASTM D-6392
Wedge Weld (lb/in width)	120 and FTB <sup>1,2,3</sup>
Extrusion Weld (lb/in width)	120 and FTB <sup>1,2,3</sup>

- Notes
1. FTB =Film Tear Bond - The sheet on either side of the seam fails rather than delamination of the seam itself.
  2. Delamination limited to 15 percent of the total seam length and width.
  3. Both inside and outside welds to be tested and meet strength values.
4. Ten 1-inch wide strips shall be cut from the CQC Consultant's portion of the sample and these shall be tested in the field by the CQC Consultant.
  5. Field Testing: The ten 1-inch wide strips shall be tested by the CQC Consultant, in the field, using a tensiometer, five for peel and five for shear, and shall meet the specifications established for this project. If any field test sample fails to pass, then the procedures outlined in 3.05 (7) shall be followed.
  6. Laboratory Testing: Testing by the CQA Consultant will include Seam Strength and Peel Adhesion. A total of 5 specimens will be tested, from each sample, for each test method. All of the 5 specimens must pass the minimum pounds per inch value listed in Table 02776-2 and all specimens must separate by an FTB for each test in order for the seam to pass destructive test sampling. The results will not be averaged. Specimens will be selected alternately, by test, from the samples (i.e., peel, shear, peel, shear). The CQA Consultant will provide test results to the CONTRACTOR no more than 24 hours after the samples are received at the laboratory. The only exception shall be weekends or official holidays when the laboratories are closed. Arrangements to schedule testing of destructive samples on weekends and holidays shall be approved by the CQA Consultant 24 hours in advance. Additional costs for lab work on holidays or weekends shall be at no additional expense to the COUNTY and shall be paid by the CONTRACTOR.
  7. Procedures for Destructive Test Failure: The following procedures shall apply whenever a sample fails the destructive test, whether the test is conducted by the CQA Consultant's specified laboratory, the geomembrane CQC Consultant's laboratory, or by field tensiometer. The geomembrane Installer shall have two options, the cost of which shall be at no additional expense to the COUNTY:
    - a. The geomembrane Installer can reconstruct the seam between any two passed test locations.
    - b. The geomembrane Installer can trace the welding path to an intermediate location at 10 feet, minimum, from the location of the failed test in each direction, and take a specimen for an additional

field test at each location. If these additional specimens pass the test, then full laboratory destructive samples shall be taken. These additional tests shall be at the expense of the CONTRACTOR. If these laboratory samples pass the test, then the seam shall be reconstructed between these locations. If either sample fails, then the process shall be repeated to establish the zone in which the seam should be reconstructed. In any case, all acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet of reconstructed seam, a sample taken from within the reconstructed zone must pass destructive testing. Whenever a sample fails, additional testing may be required for seams that were welded by the same welder and/or welding apparatus or welded during the same time shift. Such additional testing shall be at the CONTRACTOR's expense.

### **3.06 NON-DESTRUCTIVE TESTING**

- A. The CQA Consultant shall observe and test all seams and repairs by non-destructive methods. Insufficient seams shall be labeled, recorded, repaired and re-tested.
  - 1. Air pressure testing: shall be required for all double-seam hot wedge welds. Testing apparatus shall be capable of generating a minimum pressure of 25 pounds per square inch (psi). Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. The air channel shall be pressurized from 25 to 30 psi and allowed to stabilize. Once stabilized, the channel pressure shall be sustained for a minimum of 5 minutes. If loss of pressure is more than 2 psi, or the pressure does not stabilize, the seam shall be rejected, the faulty area located and repaired and the seam re-tested.

The following procedures shall be followed:

- a. Seal both ends of the seam to be tested.
- b. Insert needle or other approved pressure feed device into the tunnel created by the fusion weld.
- c. Insert a protective cushion between the air pump and the geomembrane.
- d. Energize the air pump to a pressure between 25 and 30 psi, close valve, allow channel pressure to stabilize, and sustain channel pressure for approximately 5 minutes.



- e. If loss of pressure is more than 2 psi or does not stabilize, locate faulty area and repair.
  - f. After a seam has passed a pressure test, release pressure at the end of seam that is opposite the air pump and pressure gauge assembly to ensure that the seam is continuous and has been completely tested.
2. Vacuum box pressure testing: shall be required for all extrusion welds, except for those welds inaccessible to the vacuum box, such as geomembrane boots. Air pressure gauges shall read 0 psi when testing apparatus is not turned on. Pressure gauges not reading 0 psi shall be replaced. Vacuum box apparatus shall be capable of sustaining a vacuum pressure 5 psi (gauge) for 10 seconds while placed on a seam.

The following procedures shall be followed:

- a. Energize the vacuum pump and reduce the tank pressure to approximately 10 inches of mercury, i.e., 5 psi gauge. All gauges shall read 0 psi when the vacuum pump is not turned on. Gauges not reading 0 psi shall be replaced.
  - b. Wet a strip of geomembrane approximately 4 inches by 24 inches with a soapy solution.
  - c. Place the box over the wetted soapy area.
  - d. Close the bleed valve and open the vacuum valve.
  - e. Ensure that a leak tight seal is created.
  - f. For a period of not less than 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles, which would indicate defects in the geomembrane.
  - g. If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum 3 inches overlap, and repeat the process.
  - h. All areas where soap bubbles appear shall be marked and repaired by extrusion weld or patching.
3. Spark Testing: shall be conducted for penetrations or other difficult areas not accessible for vacuum testing, as determined by the ENGINEER and in accordance with ASTM D 6365.

- a. Equipment and Materials:
  - 1) 24-gauge copper wire.
  - 2) Low-amperage electric detector, 20,000 to 30,000 volt, with brush-type electrode capable of causing a visible arc up to 3/4-inch from copper wire.
- b. Procedures:
  - 1) Place copper wire within 1/4-inch of the edge of extrusion seam before or as the seam is being constructed.
  - 2) Pass electrode over seam or clamp area and observe for spark. If a spark is detected, perform a repair.
- B. The CQA Consultant shall include all results from the destructive and non-destructive seam tests into the final report.
- C. Alternative non-destructive test methods, such as spark testing, shall be submitted to the Engineer, for approval, prior to the start of geomembrane installation.

### **3.07 REPAIR PROCEDURES**

#### **A. Defects and Repairs**

All seams and non-seam areas of the geomembrane shall be inspected by the CQC/CQA Consultant for defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of inspection. The geomembrane surface shall be brushed, blown, or washed by the CONTRACTOR if the amount of dust, mud or debris inhibits inspection. The CQA Consultant shall decide if cleaning of the geomembrane is needed to facilitate inspection. All defects and repairs shall be at no additional expense to the COUNTY.

#### **B. Evaluation**

Each suspect location in seam and non-seam areas shall be non-destructively tested as appropriate in the presence of the CQA Consultant. Each location that fails the non-destructive testing shall be marked by the CQA Consultant and repaired accordingly.

#### **C. Repair Procedure**

- 1. Defective seams shall be restarted/reseamed as described in these specifications. Small holes shall be repaired by extrusion welding. If the hole is larger than 1/4 inch, it shall be patched. Tears shall be repaired by

patching. The patch shall be rounded at the ends. Blisters, large holes, undispersed raw materials, and contamination by foreign matter shall be repaired by patches. Surfaces of geomembrane which are to be patched shall be abraded and cleaned no more than 15 minutes prior to the repair. No more than 10 percent of the thickness shall be removed.

2. Patches shall be round or oval in shape made of the same geomembrane and extend a minimum of 6 inches beyond the edge of defects. All patches shall be of the same compound and thickness as the geomembrane specified. All patches shall have their top edge beveled with an angle grinder prior to placement on the geomembrane. Patches shall be applied using approved methods only.
3. Sections of the double welded fusion seam failing the air pressure test shall be cap stripped. The cap strip shall cover the seam extending outward from the seam edges by 6 inches and extend the entire length of the failed seam. The cap strip may be fusion or extrusion welded over the seam.
4. Sections of the seam with insufficient overlap or without two distinct welds from the double fusion split wedge welding machine shall be cap stripped the entire length of seam lacking overlap or welds.
5. Butt seams shall be double fusion welded and air pressure tested the entire length of the seam. Small lengths, less than 10 feet in total length, of butt seam between burnouts or T-welds may be cap stripped and vacuum box tested.

**D. Restart/Reseaming Procedures**

The welding process shall restart by grinding the existing seam and rewelding a new seam. Welding shall commence where the grinding started and must overlap the previous seam by at least 2 inches. Reseaming over an existing seam without regrinding shall not be permitted.

**E. Verification of Repairs**

Each repair shall be non-destructively tested. In addition the CQA Consultant may require a destructive seam sample be obtained from a repaired seam. Repairs that pass the non-destructive and/or destructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be repeated and retested until passing test results are achieved.

### **3.08 ANCHOR TRENCH**

- A. The anchor trench shall be excavated prior to geomembrane installation, and shall be as shown on the Drawings. No loose soil, roots, rocks, or materials capable of damaging the geomembrane shall be allowed beneath the geomembrane. The anchor trench shall be backfilled and compacted as indicated on the Drawings, and in a manner that prevents any damage to the geomembrane. The geomembrane shall not have sharply folded corners when placed into the anchor trench. The geomembrane shall be welded the entire length of the panel, including through the entire dimension of the trench.

### **3.09 OVERLYING GEOCOMPOSITE**

- A. During placement of geocomposite upon the geomembrane, precautions shall be taken to prevent damage to the geomembrane by restricting heavy equipment traffic. Unrolling the geotextile can be accomplished through the use of lightweight, rubber-tired equipment such as a 4-wheel all-terrain vehicle (ATV). This vehicle can be driven directly on the geomembrane, provided the ATV makes no sudden stops, starts, or turns.
- B. The CONTRACTOR shall schedule his work so as to permit as much time as needed for testing and CQC/CQA documentation before placing the overlying soil layer(s). Geomembrane which is covered prior to approval by the CQA Consultant shall be uncovered at no additional cost to the COUNTY.
- C. The CONTRACTOR shall place overlying geocomposite layer(s) immediately upon certification of the geomembrane by the CQA Consultant to prevent damage, uplift, or degradation of the geomembrane.

### **3.10 SURVEY CONTROL STAKES**

Survey stakes in the vicinity of the geomembrane shall be placed with care as not to penetrate the geomembrane liner. Plastic traffic cones, cardboard tubes or other items as approved by the ENGINEER may be used as survey control devices.

### **3.11 FINAL ACCEPTANCE**

- A. The CONTRACTOR shall retain ownership and responsibility for the installed geomembrane until final acceptance by the COUNTY.
- B. Final acceptance of the geomembrane by the COUNTY will occur when:
  - 1. All installation activities are completed.

2. All documentation of installation is completed and the CQC Consultant's final report is submitted to the Engineer.
3. All documents presented in Part 1.04, this Section, have been submitted to the Engineer and approved.

**- END OF SECTION -**

## **SECTION 2911**

### **LITTORAL ZONE PLANTING**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Planting work consists of furnishing, planting, and watering all plants of the species, size, quantity and quality as indicated in this specification and on the plans. Further, the work shall include the maintaining of all plants and planting areas until accepted by the Hardee County Solid Waste Department or their designee, and fulfilling all guarantee provisions as herein specified.
- B. Plant transportation shall comply with applicable Federal and State regulations. Upon delivery at a site, all plants shall be inspected for conformity to specifications and for handling damage. Rejected plants shall be immediately removed from the site by the Contractor and replaced within five (5) working days. In addition, any required inspection certificates shall accompany each shipment, and shall be filed with the Hardee County Solid Waste Department and the Project Engineer.
- C. Plants specified herein shall be used unless sufficient evidence is submitted to the Project Engineer indicating the plant is unavailable. Alternate materials may be used upon receipt of authorization from the Engineer. No substitutions shall be made without written approval of the Engineer and the applicable Federal, State and County regulatory agencies.
- D. The Contractor shall guarantee all planting work for a minimum period of one (1) year after the date of installation. Contractor shall be responsible for the establishment of all species planted. Establishment shall be defined as all plants successfully budding or leafing out. Before final acceptance, Contractor shall replace at no cost to the County any plant material necessary to meet above criteria. In the event Contractor has to replace plant material, the Engineer may allow such plant material to remain through another establishment (minimum 120 days) period.

##### **1.02 MEASUREMENT AND PAYMENT**

- A. Maintenance of sites will be paid at the unit price bid for "Clearing and Grubbing" for all work completed and accepted by the Engineer. Watering shall be included as an incidental expense under the Maintenance category.

- B. Planting will be paid for based on the actual number of each plant installed at the unit price bid. (Refer to the table for plant selection, size and spacing specifications.)

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. The Contractor shall furnish all plants of the species specified herein and in the quantities shown on the Bid Form and as requested by the Engineer or designated representative. All plants shall be true to name as established by the American Joint Committee on Horticultural Nomenclature publication "Standard Plant Names".
- B. The designated authority for the identification of all desirable plant material shall be the two (2) publications of L. H. Bailey, "Hortus II" and the "Manual of Cultivated Plants", and all specimens shall be true to type, name, etc., as described herein. All Exotic/Nuisance Plants species that must be removed shall be as specified in:

**The Identification and Biology of Non-Native Plants in  
Florida's Natural Areas, Editors: K.A. Langeland and K.  
Craddock Burks**

Publication source [http://www.fleppc.org/ID\\_book.htm](http://www.fleppc.org/ID_book.htm)

- C. All trees shall meet the requirements for a Florida Grade 1, listed under single upright trees in "Grades and Standards for Nursery Plants", established by the Florida Department of Agriculture and Consumer Services.
- D. Trees shall minimally be of the 3-gallon size with a minimum height of 4 feet and a caliper measure at mid-height of 0.5 inches to 0.75 inches. The actual height of the tree installed in the field shall be dependent on existing site conditions. It is the Contractor's responsibility to ensure each tree has sufficient height to survive under existing field conditions. All trees shall be sound, healthy, and vigorous, exhibit significant apical growth on the mainstem, be well branched and shaped within normal habit of growth, of proper color, and densely foliated when in leaf. They shall have healthy, well-developed root systems and shall be free of disease and insect pests, eggs or larvae.
- E. All trees shall conform to the measurements specified herein. Plants larger than specified may be used if approved by the Engineer or designated representative, but use of such plants shall not increase the contract price. The spread of roots or ball of earth for larger plants shall be increased in proportion to the size of the plant.

- F. All herbaceous material shall be provided in the size classes specified on the plan sheet. It is the Contractor's responsibility to ensure each plant has sufficient height to survive under existing field conditions. All plants shall be sound, healthy, and vigorous, be shaped within normal habit of growth, of proper color and densely foliated when in leaf. They shall have healthy, well-developed root systems, and shall be free of disease and insect pests, eggs or larvae. Pots shall also be free from weeds and other undesirable plant seedlings. A bare root equivalent for the 4-inch pot size for the herbaceous material shall be a root mass of minimum 5 culms.
- G. In the event that it becomes apparent that any nursery supplying plants for this project has knowingly and consistently represented the grade of plants as being higher than the actual grade as determined by the plant list according to "Grades and Standards for Nursery Plants", all plants already delivered from such source shall be removed from the job at the Contractor's expense. No further plants will be acceptable from such nursery until written evidence is submitted and confirmed that all material for delivery has been inspected and approved by the Engineer as being the grade represented.
- H. Container-Grown Plants
1. Container-grown plants shall have been grown in a container large enough and for sufficient time for the root system to have developed enough to hold its soil together firm and whole. No plants shall be loose in the container. Plants that have become pot bound or for which the top system is too large for the size of the container, will not be acceptable.
  2. Collected plants: Collected plants shall be dug with a root spread at least one-third greater than nursery-grown plants of the same species and size.
  3. Bare Root:
    - a. Plant material removed from natural or man-made wetlands may be transported to the site as bare root plants. However, some provisions must be made to protect this material, especially the roots, from desiccation.
    - b. Bare root plants shall be dug and delivered with roots adequately protected against drying out by means of moist straw, or other approved material. Shipping containers shall be opened and inspected by the Contractor upon arrival and shall be dampened if necessary. Bare root plants will not be permitted to be stored on site for more than 1 day prior to planting. Bare root material left unplanted on the site for more than one day may be rejected by the Engineer.



## **PART 3 - EXECUTION**

### **3.01 INSTALLATIONS SPECIFICATIONS**

- A. Time of Planting: The Contractor shall conduct planting activities under favorable seasonal conditions and will still be required to meet the guarantee provisions set forth herein. All plant material shall be installed under favorable weather conditions. At the option of and under full responsibility of Contractor, planting operations may be conducted under unreasonable conditions without additional compensation.
- B. The Engineer will inspect the plants at the time of planting. Plants will be rejected if improperly planted. Improper planting includes the following conditions: exposed roots, not at the proper depth, or planted in water either too deep or shallow. Plants may not be stored on-site for more than two (2) consecutive days. Any material stored on-site for longer periods of time may be rejected by the Engineer. Contractor should notify the Engineer at least five (5) working days prior to movement of plant material on-site, and shall request the Engineer be present to inspect the plant material as it arrives on-site. The Engineer may reject all plant material not inspected prior to planting, and the Contractor shall remove and replace rejected material without additional compensation.
- C. All containers shall be cut and opened fully, in a manner such as will not damage the root system. Container-grown plants shall not be removed from the container until immediately before planting, and with all due care to prevent damage to the root system.

### **3.02 SOIL AND YARD MULCH MIXTURE**

- A. The Contractor shall provide clean, containment free soils and yard mulch in the area and at the elevations designated on the plans. The soil to yard mulch mix ratio shall be 50/50. Clean soil types include soil with a Unified Soil Classification of SP, SW, SC, or SP-SM. Yard Mulch shall be free from mold, fungus, plastics, metals, and free of containments. The Contractor shall spread the mixture and compact with a dozer only (4 passes minimum).

### **3.03 MAINTENANCE REQUIREMENTS**

- A. The area to be planted shall be free of nuisance species prior to installing new materials. The Contractor will be responsible for providing maintenance of the site to ensure nuisance species remain below 5% of the vegetative cover throughout the one- (1) year guarantee period. For purposes of this project the following species have been deemed as nuisance species.

1. *Ardisia crenata* (= *A. crenulata*) -coral ardisia

2. *Albus precatorius* - rosary pea
3. *Albizia julibrissin*- mimosa, silk tree
4. 4. *Dioscorea bulbifera* - Air potato
5. *Imperata cylindrica* (*Imperata brasiliensis* misapplied) -cogon grass
6. *Lygodium japonicum* -Japanese climbing fern
7. *Ligustrum sinense* - Chinese privet, hedge privet
8. *Ludwigia peruviana* – Primrose willow
9. *Panicum repens* – Torpedo grass
10. *Pueraria montana* (=P. lobata) – kudzu
11. *Rubus* spp. – Blackberry
12. *Salix caroliniana* – Carolina willow
13. *Sapium sebiferum* -popcorn tree, Chinese “tallow tree.”
14. *Schinus terebinthifolius* – Brazilian pepper
15. *Solanum viarum* – tropical soda apple
16. *Typha* spp. –Cattails
17. *Vitis* spp. – Grapevine

- B. Herbicide application or manual removal will be acceptable methods to control the nuisance species. However, the Contractor will be responsible for replacing any desirable native plant material negatively impacted by the maintenance efforts. All plant replacements will be at the Contractors expense and must meet the specifications of the originally planted materials.

### **3.04 STAKING AND GUYING OF TREES**

- A. The Contractor is wholly responsible for the stability and plumb condition of all trees planted under the current contract. All trees located in areas where the soil conditions are unstable must be staked. All staking shall be as specified herein. Trees larger than 1 inch and smaller than 2 inch caliper shall be staked with a 2-inch stake, set at least 24 inches in the ground and extending to the crown of the plant. The tree shall be firmly fastened to the stake with biodegradable twine or hemp, or other approved material.

- B. All trees larger than 2-inch caliper and smaller than 3.5-inch caliper shall be staked with two, 2-inch by 4-inch stakes, 8 feet long, set 2 feet in the ground. The tree shall be midway between the stakes and held firmly in place by biodegradable twine or hemp.

### **3.05 WATERING**

- A. The Contractor shall continue watering to the end of the guarantee period. (1 year) Watering shall be done frequently enough to fully sustain the health of all plantings. Any plantings showing drought damage shall be replaced at the Contractor's expense. Watering will be paid as part of the Maintenance activities.

### **3.06 WARRANTY OF PLANTED MATERIAL**

- A. During planting, Contractor shall request an inspection by the Engineer near the end of the warranty period. When all plants are acceptable, Contractor will be notified of warranty compliance.
- B. Defective work shall be corrected within five working days of notification by Engineer. Upon completion of planting, the Contractor shall remove from the site excess soil, planting containers and debris, and repair any damage to structures, etc., resulting from planting operations.
- C. The Contractor shall be responsible for assuring that all plants at the time of final inspection, exhibit the characteristics and qualifications required for the grade of plant as originally specified.

### **3.07 OBSERVATIONS AND PROVISIONAL ACCEPTANCE**

- A. When the vegetation work is completed, including on-going maintenance, the Engineer will make an observation to determine acceptability. The vegetative work may not be reviewed for final acceptance in parts.
- B. Where vegetative work does not comply with the requirements, the Contractor shall replace rejected work and continue specified maintenance until observed by the Engineer and found to be acceptable and will continue the guarantee period. The Contractor shall remove rejected plants and materials promptly from the project site.
- C. At the end of the guarantee period, inspection of plants will be made by the Engineer upon written notice requesting such inspection, submitted by the Contractor at least three (3) days before the anticipated inspection. All defects discovered shall be repaired or replaced by the Contractor before final acceptance.
- D. Upon completion of the work, prior to Final Acceptance, the Contractor shall thoroughly clean the project site. In addition to removing all equipment, unused

materials, deleterious materials, and surplus materials, the Contractor shall correct any damaged structures or vegetation altered as a result of the landscape work.

**- END OF SECTION -**

## **SECTION 02930**

### **TRI-PLANAR GEOCOMPOSITE**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for tri-planar geocomposite in the leachate detection portion of the liner system. Tri-planar geocomposite is a three-layer material comprised of an inner core of tri-planar 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.
- B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The COUNTY is responsible for the Quality Assurance (QA) testing described in the FDEP-approved CQA Plan.

##### **1.02 MANUFACTURER'S QUALIFICATIONS**

- A. Single Source: All products, or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

##### **1.03 SUBMITTALS**

- A. Data showing manufacturer has a minimum of 5,000,000 ft<sup>2</sup> of experience.
- B. Product Information: The CONTRACTOR shall submit to the PROJECT MANAGER field and laboratory test data prior to importing and/or prior to any construction using the geocomposite. Submit the following information for each product 14 calendar days prior to installation, to the PROJECT MANAGER for approval:
  - 1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02930-1, Table 02930-2, and Table 02930-3. In addition, the manufacturer must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.

2. Transmissivity: Submit manufacturers test data that indicates transmissivity values shown in Table 02930-3 can be met at 100 hours of testing.
3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.
4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.
5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.
6. Material Data: Submit complete manufacturer's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the manufacturer's methodology to comply with the requirements specified for manufacturing quality control.
7. Manufacturing Quality Control: Submit a complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.
8. Installation Instructions: Submit samples of the product with a complete set of specifications, and manufacturer's complete written instructions for storage, handling, installation and joining.
9. Qualifications: Submit manufacturer's qualifications for each product.

10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.
  11. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. Submit direct shear test results that indicate the interface friction values shown in Table 02930-3 can be achieved using the specified project materials.
  12. Transmissivity Test Results (ASTM D 4716), one representative test with the proposed geocomposite and the geomembrane material. Submit transmissivity test results that indicate the values shown in Table 02930-3 can be achieved using the specified project materials.
- C. Manufacturing Quality Control: The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the QA Consultant prior to material shipment:
1. Production Dates: Submit statement of production dates for each product.
  2. Test Reports: See Part 2 of this Section for tests and test frequencies.

## **PART 2 - PRODUCTS**

### **2.01 GEONET**

- A. The geonet shall be Tendrain 770-2, as manufactured by Tenax Corporation, or a PROJECT MANAGER approved substitution.
- B. The geonet shall be manufactured by extruding two sets of strands to form a structure to provide planar water flow meeting the requirements listed in Table 02930-1.
- C. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be anti-oxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

## **2.02 GEOTEXTILE**

- A. The geotextile shall meet the requirements listed in Table 02930-2.

## **2.03 TRI-PLANAR GEOCOMPOSITE**

- A. The final product material shall meet the requirements listed in Table 02930-3.
- B. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02930-3.
- C. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:
1. Manufacturer's name.
  2. Product identification.
  3. Lot number.
  4. Roll number.
  5. Roll dimensions.
- D. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

## **PART 3 - EXECUTION**

### **3.01 MANUFACTURING QUALITY CONTROL TESTING**

- A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the manufacturer's laboratory.
- B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02930-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1 per batch
Polymer Melt Index	ASTM D 1238	1 per batch

- C. The geonet shall be tested during manufacturing for compliance with Table 02930-1. The following minimum test frequencies shall be observed:



Property	Test Method	Minimum Frequency
Polymer Density	ASTM D 1505	1/100,000 sf
Mass per Unit Area	ASTM D 3776	1/100,000 sf
Thickness	ASTM D 1777	1/100,000 sf

- D. Geotextile shall be tested during manufacturing for compliance with Table 02930-2. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Mass per Unit Area	ASTM D 3776	1/100,000 sf
AOS	ASTM D 4751	1/100,000 sf
Grab Tensile	ASTM D 4632	1/100,000 sf
Trapezoidal Tear Strength	ASTM D 4533	1/100,000 sf
Puncture Resistance	ASTM D 4833	1/100,000 sf

- E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02930-3. The following minimum test frequencies shall be observed:

Property	Test Method	Minimum Frequency
Transmissivity	ASTM D 4716	1/100,000 sf
Ply Adhesion (minimum)	GRI GC7	1/100,000 sf

- F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected.

### 3.02 FIELD QUALITY CONTROL

- A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02930-4.
- B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:
1. Reference to product submittals, certifications, substitutions and approvals.
  2. Dates of installation.
  3. Location and quantity of materials installed.

4. Statement of whether materials were installed in accordance with the Technical Specifications.
5. Additional information as required.
6. All product certifications, filed appropriately for future reference.

### **3.03 MANUFACTURER'S RECOMMENDATIONS**

- A. Each Product shall be installed in accordance with the plans, specifications, and the manufacturer's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

### **3.04 CLEANLINESS**

- A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water are present, the CONTRACTOR shall clean the work area. Products which are clogged with silts shall be discarded and shall not be installed.

### **3.05 ROLL JOINING METHODS**

- A. Table 02930-4 summarizes acceptable roll joining methods.
- B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.
- C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.
- D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

### **3.06 ROLL JOINING REQUIREMENTS**

- A. The minimum requirements for joining rolls are specified in Table 02930-4.
- B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to

terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

- C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

### **3.07 INSTALLATION**

- A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.
- B. Orientation:
  - 1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).
- C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.
- D. Physical Damage:
  - 1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.
  - 2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.
- E. Bridging: The product shall be installed to avoid bridging.
- F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.
- G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.

- H. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the PROJECT MANAGER.

### 3.08 REPAIRS

- A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.
- B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosynthetics.
- C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

**TABLE 02930-1. GEONET PROPERTIES**

<b><u>Property</u></b>	<b>Qualifier</b>	<b>Unit</b>	<b>Test Method</b>	<b>Specified Value</b>
Thickness	Minimum	mils	ASTM D 5199	300
Tensile Strength (machine direction)	Minimum	lbs/ft	ASTM D 4595	1,200
Carbon Black	Range	percent	ASTM D 4218	2-3
Polymer Density, Resin	Minimum	g/cm <sup>3</sup>	ASTM D 1505	0.94

**TABLE 02930-2 GEOTEXTILE PROPERTIES**

<b><u>Property</u></b>	<b>Qualifier</b>	<b>Unit</b>	<b>Test Method</b>	<b>Specified Value</b>
Fabric Weight	Minimum	oz/yd <sup>2</sup>	ASTM D 3776	6
Grab Tensile	Minimum	lbs	ASTM D 4632	157
Puncture Resistance	Minimum	lbs	ASTM D 4833	56
Permittivity	Minimum	sec <sup>-1</sup>	ASTM D 4491	0.5
AOS	Maximum	sieve size(mm)	ASTM D 4751	#70 (0.212)

**TABLE 02930-3. GEOCOMPOSITE PROPERTIES**

<b><u>Property</u></b>	<b>Qualifier</b>	<b>Unit</b>	<b>Test Method</b>	<b>Specified Value</b>
Transmissivity (Note 1)	Minimum	m <sup>2</sup> /sec	ASTM D 4716	4 x 10 <sup>-3</sup>
Ply Adhesion	Average	lbs/inch	GRI GC7	1.0
Coefficient of Interface Friction w/ Geomembrane (Note 2) and w/ Protective Cover Soil (Note 3)	Minimum	degrees	ASTM D 5321	Peak 20.5 <sup>o</sup>

Notes:

1. Per ASTM D 4716 with a normal stress of 5,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, soil, composite, geomembrane, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the manufacturer using the identical testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02930-3. Thickness of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity. Hydraulic conductivity shall be a minimum of 10 cm/sec.
2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria is as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 24 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 3,000, and 6,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn

continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

3. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the protective soil material. The testing criteria is as follows: The proposed protective soil material shall be prepared and molded to a minimum of 95% of the Standard Proctor (ASTM D 698). The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 24 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, and 3,000, and 6,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

**TABLE 02930-4. GEOCOMPOSITE JOINING METHODS**

<b>Location</b>	<b>Layer</b>	<b>Joining Method</b>	<b>Min. Overlap</b>	<b>Tying Frequency</b>
Roll End (See Note 1)	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	6"	2' on center
	Lower geotextile	Overlap	6"	N/A
Roll Side	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	4"	5' on center
	Lower geotextile	Overlap	6"	N/A
Repair of minor damage (See Note 2)	Upper geotextile	Machine sewing/ thermal bonding	12"	N/A
	Geonet	N/A	N/A	N/A

1. At termination of geocomposite fold over upper geotextile as defined in Part 3.06.
2. Minor damage is defined in Part 3.08.

**- END OF SECTION -**

**SECTION 02931**  
**BI-PLANAR GEOCOMPOSITE**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. The WORK specified in this Section includes the manufacture, fabrication, testing, and installation of geocomposite (i.e., composite geonet). The Plans call for bi-planar geocomposite, which is a three-layer material comprised of an inner core of bi-planar 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.
- B. All testing specified in this section is quality control (QC) testing and is the CONTRACTOR's responsibility and all costs shall be included in the bid price. The COUNTY is responsible for the Quality Assurance (QA) testing described in the FDEP approved CQA Plan.

**1.02 MANUFACTURER'S QUALIFICATIONS**

- A. Single Source: All products, or components of the product, used for construction shall be obtained from a single manufacturer. Fusion of the geonet and geotextile, for each product, shall be completed by a single manufacturer.

**1.03 SUBMITTALS**

- A. Data showing manufacturer has a minimum of 5,000,000 ft<sup>2</sup> of experience.
- B. Product Information: Submit the following information for each product 14 calendar days prior to installation, to the ENGINEER for approval:
  - 1. Prequalification: Submit independent laboratory test results demonstrating compliance with the material properties listed in Table 02931-1, Table 02931-2, and Table 02931-3. In addition, the manufacturer must provide a certificate of compliance which states that the material to be installed will use the same manufacturing techniques, resin type, and formulation as that for which test results are submitted.
  - 2. Transmissivity: Submit manufacturers test data that indicates transmissivity values shown in Table 02931-3 can be met at 100 hours of testing.

3. Roll Layout Drawings: Submit at a minimum, a roll layout drawing and installation details. The roll layout drawing shall be drawn to scale, and shall be coordinated with the geomembrane panel layout. Installation details shall include cross sections, temporary anchorage, anchor trenches, and other terminations.
4. Protection from Wind and Weather: Submit methodology to protect each product from wind, dirt, and direct sunlight. At a minimum, the methodology shall reflect that materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.
5. Rolls of products shall not be stacked upon one another to the extent that deformation of the core occurs. If stored outdoors, they shall be elevated from the ground and protected with a waterproof cover. Outdoor storage should not be allowed to exceed six months. For storage for more than six months, a temporary enclosure shall be constructed so that the geocomposite rolls are stored inside an enclosed facility.
6. Material Data: Submit complete manufacturer's specifications, descriptive drawings, and literature for each product, including the product identification and suppliers of the polymer resin and recommended method for handling and storage of all materials prior to installation. Describe the manufacturer's methodology to comply with the requirements specified for manufacturing quality control.
7. Manufacturing Quality Control: Submit a complete description of the manufacturer's formal quality control/quality assurance programs for manufacturing, fabricating, handling, installing, and testing. The description shall include, but not be limited to, polymer resin supplier and product identification, acceptance testing, production testing, installation inspection, installation techniques, repairs, and acceptance. The document shall include a complete description of methods for both roll end and roll side joining.
8. Installation Instructions: Submit samples of the product with a complete set of specifications, and manufacturer's complete written instructions for storage, handling, installation and joining.
9. Qualifications: Submit manufacturer's qualifications for each product.
10. Geonet Resin: Submit the name of the HDPE resin supplier, the production plant, the brand name, and name of resin used to manufacture the product.



C. Manufacturing Quality Control: The CONTRACTOR shall submit quality control test reports within 48 hours of completion of the test. Submit the following manufacturing quality control information to the QA Consultant prior to material shipment:

1. Production Dates: Submit statement of production dates for each product.
2. Test Reports: See Part 2 of this Section for tests and test frequencies.

## **PART 2 - PRODUCTS**

### **2.01 GEONET**

- A. The geonet shall be GSE Fabrinet, as manufactured by GSE Lining Technology, Inc., or a ENGINEER approved substitution.
- B. The geonet shall be manufactured by extruding two sets of strands to form a structure to provide planar water flow meeting the requirements listed in Table 02931-1.
- C. The geonet shall consist of new, first-quality products designed and manufactured specifically for the intended purpose designated in this specification, as satisfactorily demonstrated by prior use. The geonet shall contain stabilizers to prevent ultraviolet light degradation. The HDPE shall be unmodified HDPE containing no plasticizer, fillers, chemical additives, reclaimed polymers, or extenders. Approximately 2 percent carbon black shall be added to the resin for ultraviolet resistance. The only other allowable compound elements shall be anti-oxidants and heat stabilizers, of which up to 1.5 percent total, as required for manufacturing, may be added.

### **2.02 GEOTEXTILE**

- A. The geotextile shall meet the requirements listed in Table 02931-2.

### **2.03 BI-PLANAR GEOCOMPOSITE**

- A. The final product material shall meet the requirements listed in Table 02931-3.
- B. Manufacturer: The geocomposite shall be fabricated by heat bonding the geotextile to both sides of the geonet. No burn-through of geotextiles shall be permitted. No glue or adhesive shall be permitted. The bond between the geotextile and the geonet shall meet the requirements listed in Table 02931-3.
- C. Labels: Geocomposite shall be supplied in rolls, marked or tagged with the following information:

1. Manufacturer's name.
2. Product identification.
3. Lot number.
4. Roll number.
5. Roll dimensions.

D. Roll Dimensions: The product shall be supplied as a continuous sheet with no factory seams. During installation, the roll length shall be maximized to provide the largest manageable roll for the fewest field seams.

### **PART 3 - EXECUTION**

#### **3.01 MANUFACTURING QUALITY CONTROL TESTING (For Each Product)**

- A. All of the specified tests are the CONTRACTOR's responsibility. Testing during manufacturing shall be accomplished by the manufacturer's laboratory.
- B. HDPE resin shall be tested at a frequency of one test per resin batch for compliance with Table 02931-1. One batch is defined as one rail car load of resin. The finished rolls shall be identified by a roll number corresponding to the resin batch used. The following minimum test frequencies shall be observed:

<u>Property</u>	<u>Test Method</u>	<u>Minimum Frequency</u>
Polymer Density	ASTM D 1505	1 per batch
Polymer Melt Index	ASTM D 1238	1 per batch

- C. The geonet shall be tested during manufacturing for compliance with Table 02931-1. The following minimum test frequencies shall be observed:

<u>Property</u>	<u>Test Method</u>	<u>Minimum Frequency</u>
Polymer Density	ASTM D 1505	1/100,000 sf
Mass per Unit Area	ASTM D 3776	1/100,000 sf
Thickness	ASTM D 1777	1/100,000 sf

- D. Geotextile shall be tested during manufacturing for compliance with Table 02931-2. The following minimum test frequencies shall be observed:

<u>Property</u>	<u>Test Method</u>	<u>Minimum Frequency</u>
Mass per Unit Area	ASTM D 3776	1/100,000 sf
AOS	ASTM D 4751	1/100,000 sf
Grab Tensile	ASTM D 4632	1/100,000 sf
Trapezoidal Tear Strength	ASTM D 4533	1/100,000 sf
Puncture Resistance	ASTM D 4833	1/100,000 sf

- E. Upon fusion of the geotextile and geonet, the product shall be tested during manufacturing for compliance with Table 02931-3. The following minimum test frequencies shall be observed:

<u>Property</u>	<u>Test Method</u>	<u>Minimum Frequency</u>
Transmissivity	ASTM D 4716	1/100,000 sf
Ply Adhesion (minimum)	GRI GC7	1/100,000 sf

- F. The CONTRACTOR shall inspect every roll for bonding integrity between the geonet and the geotextile. All poorly bonded and/or delaminated material shall be rejected.

### **3.02 FIELD QUALITY CONTROL**

- A. Field Joining: The CONTRACTOR shall inspect all roll end joints and roll side joints. The results of these inspections shall be documented in the daily reports. Field joints shall comply with the requirements of Table 02931-4.
- B. Quality Control Reporting Procedures: All information regarding the installation of the geocomposite will be recorded in the CONTRACTOR's daily report. This information shall include:
1. Reference to product submittals, certifications, substitutions and approvals.
  2. Dates of installation.
  3. Location and quantity of materials installed.
  4. Statement of whether materials were installed in accordance with the Technical Specifications.
  5. Additional information as required.
  6. All product certifications, filed appropriately for future reference.

### **3.03 MANUFACTURER'S RECOMMENDATIONS**

- A. Each Product shall be installed in accordance with the plans, specifications, and the manufacturer's recommendations. In case of a conflict between these documents, the more stringent requirements shall apply.

### **3.04 CLEANLINESS**

- A. The interface between the geocomposite and the geomembrane shall be clean, dry, and free of dirt and dust during installation. If dirt, dust, or water are present, the

CONTRACTOR shall clean the work area. Products which are clogged with silts shall be discarded and shall not be installed.

### **3.05 ROLL JOINING METHODS**

- A. Table 02931-4 summarizes acceptable roll joining methods.
- B. Lap Seams: The bottom layer of geotextile shall be lap seamed. Lap seaming is accomplished by overlapping adjacent geotextile a minimum of 6 inches.
- C. Nylon Ties: The geonet shall be overlapped and fastened with nylon ties. Nylon ties shall be yellow or white in color to facilitate inspection.
- D. Machine Sewn Seams: The top layer of geotextile shall be sewn. Sewing shall be accomplished with a lock-stitching sewing machine. The thread shall be polymeric thread which complies with manufacturer's recommendations. The seam shall be placed at a minimum of 4 inches from the geotextile edges. The finished seam shall be folded to one side.

### **3.06 ROLL JOINING REQUIREMENTS**

- A. The minimum requirements for joining rolls are specified in Table 02931-4.
- B. Roll Ends: The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end. The geonet portion shall be tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.
- C. Adjacent Roll Sides: At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

### **3.07 INSTALLATION**

- A. The product shall be installed in accordance with the manufacturer's recommendations or as specified herein, whichever is more stringent.
- B. Orientation:
  - 1. Geocomposite shall be rolled down the slope in such a manner as to continually keep the material in tension. If necessary, the material shall be positioned by

hand after unrolling to minimize wrinkles. The material shall not be unrolled laterally (i.e., across the slope).

- C. The CONTRACTOR shall provide sufficient ballast and temporary anchorage to protect the product. The CONTRACTOR is responsible for protecting the product from damage due to weather at all times.
- D. Physical Damage:
  - 1. Personnel walking on the product shall not engage in activities or wear footwear that could damage the material. Smoking shall not be permitted on or near the geosynthetics.
  - 2. Vehicular traffic shall not be permitted on the geosynthetics. Equipment shall not damage the material by handling, trafficking, or leakage of hydrocarbons. The surface shall not be used as a work area for preparing patches, storing tools and supplies, or other uses.
- E. Bridging: The product shall be installed to avoid bridging.
- F. Corners: In corners, where overlaps between rolls are staggered, an extra roll shall be installed from the top to the bottom of the slope.
- G. Weather Protection: Each product shall be protected from direct sunlight or precipitation prior to installation. After installation this product shall not be exposed to direct sunlight and shall be covered within 30 days of installation. Product which is exposed to direct sunlight for 30 days or more shall be replaced at the CONTRACTOR's expense.
- H. It is the CONTRACTOR's responsibility to provide all labor and materials for protection of the product during the period of time prior to installation of overlying soils. The CONTRACTOR's protection method is subject to the approval of the ENGINEER.

### **3.08 REPAIRS**

- A. Limitations - In general, damaged, soiled, or delaminated products shall be discarded. Products which have major damage, which require extensive repairs or replacement, shall be discarded at the CONTRACTOR's expense.
- B. Minor Damage - Minor damage is defined as a hole 2 inches or smaller in diameter in the product. Minor damage shall be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal

bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosynthetics.

- C. Major Damage - Major damage is defined as a hole larger than 2 inches in diameter through the product. Major damage shall be repaired by replacing the entire panel width.

**TABLE 02931-1. GEONET PROPERTIES**

Property	Qualifier	Unit	Test Method	Specified Value
Transmissivity	Minimum	m <sup>2</sup> /sec	ASTM D 4716	2 x 10 <sup>-3</sup>
Nominal Thickness	Minimum	inches	ASTM D 1777	0.300
Tensile Strength (machine direction)	Minimum	lbs/in	ASTM D 5035	75
Carbon Black	Range	percent	ASTM D 1603	2-3
Polymer Density, Resin	Minimum	g/cm <sup>3</sup>	ASTM D 1505	0.940

**TABLE 02931-2 GEOTEXTILE PROPERTIES**

Property	Qualifier	Unit	Test Method	Specified Value
Fabric Weight	Minimum	oz/yd <sup>2</sup>	ASTM D 3776	6
Grab Strength	Minimum	Lbs	ASTM D 4632	170
Puncture Resistance	Minimum	Lbs	ASTM D 4833	90
Water Flow Rate	Minimum	gpm/ft <sup>2</sup>	ASTM D 4491	110
AOS	Maximum	sieve size(mm)	ASTM D 4751	#70 (0.210)

**TABLE 02931-3. GEOCOMPOSITE PROPERTIES**

Property	Qualifier	Unit	Test Method	Specified Value
Transmissivity (Note 1)	Minimum	m <sup>2</sup> /s	ASTM D 4716	2.7x10 <sup>-3</sup>
Ply Adhesion	Average	lbs/inch	GRI GC7	1.0
Coefficient of Interface Friction w/ Geomembrane (Note 2)	Minimum	degrees	ASTM D 5321	20.5 <sup>0</sup>

1. Per ASTM D 4716 with a normal stress of 5,000 psf; water at 20°C (68°F); gradient of 0.02; profile of upper load plate, soil, composite, geomembrane, and lower load plate; and a test time period of 100 hours. Apply normal stress, under saturated conditions, for 1 hour minimum prior to start of test. Test data from the manufacturer using the identical

testing configuration and parameter shall indicate that transmissivity values when tested in excess of 100 hours do not fall below the minimum value of Table 02931-3. Thickness of the core geonet must be monitored during application of the normal compressive load and flow testing. Report to provide hydraulic conductivity and transmissivity.

2. Interface Friction Angle (ASTM D 5321), one representative test with the proposed geocomposite and the geomembrane material. The testing criteria is as follows: The direct shear box shall be a minimum of 12 inches by 12 inches. Each normal load shall be preload at the specified normal load, for a minimum of 1 hours, prior to testing to dissipate pore pressures. Fully saturate soil prior to testing for each normal load. The specified testing Normal Stresses are 1,000, 3,000, and 6,000 psf. The strain rate is 1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 20.5 degrees. The interface friction angle shall be the result of a linear regression line drawn continuously through the three shear strength results obtained for the normal loads specified following the procedures outlined in ASTM D 5321. Provide the results of peak and residual values. Adhesion value may be considered in determining the effective interface friction angle.

**TABLE 02931-4. GEOCOMPOSITE JOINING METHODS**

<b>Location</b>	<b>Layer</b>	<b>Joining Method</b>	<b>Min. Overlap</b>	<b>Tying Frequency</b>
Roll End (See Note 1)	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	6"	2' on center
	Lower geotextile	overlap	6"	N/A
Roll Side	Upper geotextile	Machine sewing	4"	N/A
	Geonet	Nylon ties	4"	5' on center
	Lower geotextile	overlap	6"	N/A
Repair of minor damage (See Note 2)	Upper geotextile	Machine sewing/ thermal bonding	12"	N/A
	Geonet	N/A	N/A	N/A

1. At termination of geocomposite fold over upper geotextile as defined in Part 3.06.
2. Minor damage is defined in Part 3.08.

**- END OF SECTION -**

## **SECTION 02940**

### **GEOTEXTILE**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The work specified in this section includes the manufacture, testing, and installation of woven geotextile for the Leachate Collection and Removal System, Groundwater Dewatering System, and stormwater features as shown on the Drawings and as specified herein.

##### **1.02 SUBMITTALS**

- A. Submit manufacturer's prequalification, test reports and data, specifications, installation instructions, roll dimensions, and geotextile approval form.
- B. Submit copies of evaluation reports provided by the manufacturer demonstrating that properties for the materials comply with specification requirements.
- C. PROJECT MANAGER's approval shall be obtained prior to the use of any materials in the project.

##### **1.03 PROTECTION AND STORAGE**

- A. Each roll of material shall have a manufacturer's identification label. Each roll shall be labeled to provide product identification adequate for inventory and quality control purposes. The label shall provide as a minimum the manufacturer's name, product identification, lot number, roll number, and roll dimensions. Rolls shall be labeled as per ASTM D 4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- B. Materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geotextile to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.
- C. Rolls of geotextiles should not be stacked upon one another to the extent that deformation of the core occurs. Outdoor storage shall not exceed six months.



## **PART 2 - PRODUCTS**

### **2.01 GEOTEXTILE**

- A. Material shall be a woven monofilament geotextile equivalent to Filterweave 402 as manufactured by TC Mirafi, or a PROJECT MANAGER approved substitution conforming to the following minimum properties:

<b>Characteristics</b>	<b>Specification</b>	<b>Test Method</b>
Apparent Opening Size	0.425 mm	ASTM D 4751
Flow Rate	145 gal/min/ft <sup>2</sup>	ASTM D 4491
Wide Width Tensile Strength (CD)	140 lbs/in @ ultimate	ASTM D 4595
Grab Tensile/ Elongation	365x200 lbs	ASTM D 4632
Trapezoidal Tearing Strength	115x75 lbs	ASTM D 4533

- B. Geotextile shall be tested by the Manufacturer for the compliance with the following frequencies. Minimum test frequencies shall be observed:

<b>Property</b>	<b>Test Method</b>	<b>Minimum Frequency</b>
Apparent Opening Size	ASTM D 4751	1/100,000 sf
Wide Width Tensile Strength	ASTM D 4595	1/100,000 sf
Grab Tensile/ Elongation	ASTM D 4632	1/100,000 sf
Trapezoidal Tearing Strength	ASTM D 4533	1/100,000 sf

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Geotextiles shall be installed in accordance with the manufacturer's recommendations. No equipment shall be allowed to operate on the geotextile, and any tears or damage to the geotextile shall be repaired prior to placement in the trench. The surface of the geotextile shall be kept relatively clean and free of debris during installation.
- B. Geotextile shall not be placed in a trench that is excessively wet or has standing water.
- C. Geotextile shall be overlapped in the trench as shown in the Drawings. Overlapped material can be sewn to maintain overlap during backfilling operations.

- D. Geotextile sheets shall be joined in accordance with the manufacturer's recommendations.
- E. The CONTRACTOR shall place all cover materials in such a manner to prevent damage to the materials, slippage of the underlying layers, and excessive tensile stresses in the materials.

### **3.02 REPAIRS**

- A. Geotextile damaged during placement shall be replaced or repaired at the CONTRACTOR'S expense in accordance with manufacturer's recommendation. The CONTRACTOR shall be responsible for the documentation of repairs describing location and type of repair. Repair documentation shall be submitted to the PROJECT MANAGER.

### **3.03 GEOTEXTILE EXPOSURE FOLLOWING PLACEMENT**

- A. Exposure of geotextiles to the elements between the time the geotextile is placed in the trench to the time backfilling operations are complete shall be limited to a maximum of 30 days to minimize ultraviolet damage. Any geotextile exposed to sunlight for more than 30 days shall be removed and replaced with new material at the CONTRACTOR'S expense.

**- END OF SECTION -**

## **SECTION 02941**

### **GEOSYNTHETIC RAIN TARP**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The work specified in this section includes the manufacture, testing, and installation of a geosynthetic rain tarp as shown on the Drawings and as specified herein.

##### **1.02 SUBMITTALS**

- A. Submit manufacturer's, test reports and data, specifications, installation instructions, and roll dimensions.
- B. Submit copies of evaluation reports provided by the manufacturer demonstrating that properties for the materials comply with specification requirements.
- C. PROJECT MANAGER's approval shall be obtained prior to the use of any materials in the project.

##### **1.03 PROTECTION AND STORAGE**

- A. Each roll of material shall have a manufacturer's identification label. Each roll shall be labeled to provide product identification adequate for inventory and quality control purposes. The label shall provide as a minimum the manufacturer's name, product identification, lot number, roll number, and roll dimensions. Rolls shall be labeled as per ASTM D 4873, Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples.
- B. Materials shall be shipped and stored in rolls furnished at the manufacturing facility to prevent exposure of the geosynthetic to ultraviolet light, precipitation, moisture, mud, dirt, dust, puncture, or other damaging conditions.
- C. Rolls of material should not be stacked upon one another to the extent that deformation of the core occurs. Outdoor storage shall not exceed six months.

#### **PART 2 - PRODUCTS**

##### **2.01 GEOSYNTHETIC RAIN TARP**

- A. Material shall be a laminated polyethylene film or a polymer type membrane a such as Dura-Skrim 12BBR as manufactured by Raven Industries, PPL-12 Liner/Top Cover as manufactured by Bend Tarp and Liner, Inc., or a PROJECT

MANAGER approved substitution conforming to the following minimum properties:

<b>Characteristics</b>	<b>Specification</b>
Nominal Thickness	12 mil
Moisture Vapor Transmission	0.36 g/m <sup>2</sup> -day or less

- B. The material shall be tested by the Manufacturer for the compliance with the following properties:

<b>Property</b>	<b>Test Method</b>
Permeability	ASTM D 4491 or ASTM E96
Tensile Strength	ASTM D 751
Grab Tensile	ASTM D 751
Moisture Vapor Transmission	ASTM E 96

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. The rain tarp shall be installed in accordance with the manufacturer's recommendations at locations as shown on the Drawings. Ballast such as sand bags shall be placed on the rain tarp to avoid uplift due to wind. No equipment shall be allowed to operate on the rain tarp, and any tears or damage to the rain tarp shall be repaired prior to placement. The surface of the rain tarp shall be kept relatively clean and free of debris during installation.
- B. Sheets shall be joined in accordance with the manufacturer's recommendations.
- C. The CONTRACTOR shall place all cover materials in such a manner to prevent damage to the materials, slippage of the underlying layers, and excessive tensile stresses in the materials.

### **3.02 REPAIRS**

- A. Rain tarp damaged during placement or before final acceptance shall be replaced or repaired at the CONTRACTOR'S expense in accordance with manufacturer's recommendation. The CONTRACTOR shall be responsible for the documentation of repairs describing location and type of repair. Repair documentation shall be submitted to the PROJECT MANAGER.

**- END OF SECTION -**

## **SECTION 02990**

### **SEEDING AND SODDING**

#### **PART 1 – GENERAL**

##### **1.01 SUMMARY**

- A. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals necessary to perform all work and services for completion of all seeding and sodding as shown on the Drawings and specifications, in accordance with provisions of the Contract Documents.
- B. The work shall include, but not necessarily be limited to soil preparation, lime addition, fertilizing, grass seeding, mulching, sodding, and maintenance of all areas as shown on the Drawings and as specified herein, including all areas disturbed by the CONTRACTOR.
- C. Construct grassing operations in strict conformity with the Drawings and specifications.
- D. Submittals
  - 1. Do not incorporate materials in construction until approved by the PROJECT MANAGER.
  - 2. Topsoil: Submit representative samples for use in sodding and seeding operations for analysis by a private laboratory to determine nutrient deficiencies.
  - 3. Seed: Signed copies of vendor's statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentage of purity, germination, and weed seed. Statement shall certify that each container of seed delivered is fully labeled in accord with Federal Seed Act and equals or exceeds specification requirements.
  - 4. Littoral Zone: Plants specified herein shall be used unless sufficient evidence is submitted to the Project Engineer indicating the plant is unavailable. Alternate materials may be used upon receipt of authorization from the Engineer. No substitutions shall be made without written approval of the Engineer and the applicable Federal, State and County regulatory agencies.

5. Sod: prior to placing sod, notify the PROJECT MANAGER of source and permit the PROJECT MANAGER to inspect the sod. Submit species and percentages of purity statement from supplier.
6. Fertilizer: Furnish duplicate copies of invoices for all fertilizer used on project, along with certification of quality and warranty.
7. Guarantee: Furnish copies of manufacturer/supplier warranties or guarantees for all products provided under this specification.

## **PART 2 – PRODUCTS**

### **2.01 TOP SOIL**

- A. Topsoil: Provide fertile, natural soil, typical of the locality, free from stones, roots, sticks, clay, peat, weeds, and sod, obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain material harmful to plant growth.

### **2.02 SEED**

- A. Fresh, clean, new-crop seed labeled in accord with U. S. Department of Agriculture Rules and Regulations and Florida Department of Transportation's Standard Specification under the Federal Seed Act in effect on date of bidding. Provide seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified. Furnish seed in sealed standard containers labeled with producers name and seed mixture and percentage of purity, germination, and weed seed for each grass seed species required. Provide grass seed mixtures in accordance with the following:

<b>Botanical (Common Name)</b>	<b>Percent by Weight</b>	<b>Minimum Percent Germination</b>	<b>Minimum Percent Purity</b>	<b>Maximum Percent of Weed Seed</b>
Bahia Grass (Pensacola)	80	85	85	1.0
Bermuda Grass, Hulled (Cynodon Dactylon)	20	85	85	1.0

### **2.03 LITTORAL ZONE PLANTING**

- A. The designated authority for the identification of all desirable plant material shall be the two (2) publications of L. H. Bailey, "Hortus II" and the "Manual of Cultivated Plants", and all specimens shall be true to type, name, etc., as described herein. All Exotic/Nuisance Plants species that must be removed shall

be as specified in:

**The Identification and Biology of Non-Native Plants in Florida's  
Natural Areas, Editors: K.A. Langeland and K. Craddock Burks**

Publication source [http://www.fleppc.org/ID\\_book.htm](http://www.fleppc.org/ID_book.htm)

**TABLE 02990-1. LITTORAL ZONE PLANTING SCHEDULE**

Scientific Name	Common Name	Quantity	Size	Spacing/Centers
<b>ZONE A (~0.90 ac)</b>				
<b>HERBACEOUS STRATA</b>				
Nymphaea odorata	Fragrant white water-lily	32	b.r.	3 ft.
Pontedaria cordata/lanceolata	Pickerelweed	350	b.r.	3 ft.
Sagittaria graminea	Arrowhead	200	b.r.	3 ft.
Sagittaria latifolia	Common arrowhead	200	b.r.	3 ft.
Scirpus validus/californicus	Bulrush	350	b.r.	3 ft.
Herbaceous/ZONE A Total		1132	b.r.	3 ft.
<b>ZONE B (~0.96 ac)</b>				
<b>SHRUB STRATA</b>				
Cephalanthus occidentalis	Buttonbush	24	1 gal.	3 ft.
Shrub Total		24		
<b>HERBACEOUS STRATA</b>				
Canna flaccida	Golden canna			
Canna flaccida	Sawgrass	48	b.r.	3 ft.
Caladium jamaicense	Roadgrass	300	b.r.	3 ft.
Eleocharis baldwinii	Spikerush	300	b.r.	3 ft.
Eleocharis interstincta	Softrush	450	b.r.	3 ft.
Juncus effusus	Sand cordgrass	450	b.r.	3 ft.
Spartina bakeri		450	b.r.	3 ft.
Herbaceous Total		1998		
ZONE B Total		2022		
<b>ZONE C (~0.39 ac)</b>				
<b>CANOPY STRATA (TREES)</b>				
Acer rebrum	Red maple	12	1 gal.	7 ft.
Fraxinus caroliniana	Pop ash	12	1 gal.	7 ft.
Liquidambar styraciflua	Sweetgum	12	1 gal.	7 ft.
Quercus laurifolia	Laurel Oak	12	1 gal.	7 ft.
Taxodium distichum	Bald cypress	24	3 gal.	7 ft.
Canopy/ZONE C Total		72		

- B. All trees shall meet the requirements for a Florida Grade 1, listed under single upright trees in "Grades and Standards for Nursery Plants", established by the Florida Department of Agriculture and Consumer Services.
- C. Trees shall minimally be of the 3-gallon size with a minimum height of 4 feet and a caliper measure at mid-height of 0.5 inches to 0.75 inches. The actual height of the tree installed in the field shall be dependent on existing site conditions. It is the Contractor's responsibility to ensure each tree has sufficient height to survive under existing field conditions. All trees shall be sound, healthy, and vigorous, exhibit significant apical growth on the mainstem, be well

branched and shaped within normal habit of growth, of proper color, and densely foliated when in leaf. They shall have healthy, well-developed root systems and shall be free of disease and insect pests, eggs or larvae.

- D. All trees shall conform to the measurements specified herein. Plants larger than specified may be used if approved by the Engineer or designated representative, but use of such plants shall not increase the contract price. The spread of roots or ball of earth for larger plants shall be increased in proportion to the size of the plant.
1. All herbaceous material shall be provided in the size classes specified on the plan sheet. It is the Contractor's responsibility to ensure each plant has sufficient height to survive under existing field conditions. All plants shall be sound, healthy, and vigorous, be shaped within normal habit of growth, of proper color and densely foliated when in leaf. They shall have healthy, well-developed root systems, and shall be free of disease and insect pests, eggs or larvae. Pots shall also be free from weeds and other undesirable plant seedlings. A bare root equivalent for the 4-inch pot size for the herbaceous material shall be a root mass of minimum 5 culms.
  2. In the event that it becomes apparent that any nursery supplying plants for this project has knowingly and consistently represented the grade of plants as being higher than the actual grade as determined by the plant list according to "Grades and Standards for Nursery Plants", all plants already delivered from such source shall be removed from the job at the Contractor's expense. No further plants will be acceptable from such nursery until written evidence is submitted and confirmed that all material for delivery has been inspected and approved by the Engineer as being the grade represented.
  3. Container-Grown Plants
    - a. Container-grown plants shall have been grown in a container large enough and for sufficient time for the root system to have developed enough to hold its soil together firm and whole. No plants shall be loose in the container. Plants that have become pot bound or for which the top system is too large for the size of the container, will not be acceptable.
    - b. Collected plants: Collected plants shall be dug with a root spread at least one-third greater than nursery-grown plants of the same species and size.
    - c. Bare Root:



- 1) Plant material removed from natural or man-made wetlands may be transported to the site as bare root plants. However, some provisions must be made to protect this material, especially the roots, from desiccation.
- 2) Bare root plants shall be dug and delivered with roots adequately protected against drying out by means of moist straw, or other approved material. Shipping containers shall be opened and inspected by the Contractor upon arrival and shall be dampened if necessary. Bare root plants will not be permitted to be stored on site for more than 1 day prior to planting. Bare root material left unplanted on the site for more than one day may be rejected by the Engineer.

#### **2.04 SOD**

- A. Provide dense, strongly rooted Bahia grass sod or St. Augustine sod where shown on the Drawings not less than 2 years old and free of weeds and undesirable native grasses. Sod shall be certified to meet Florida State Plant Board Specifications.

#### **2.05 MULCH**

- A. Provide clean, seed-free, threshed straw of oats, wheat, barley, rye, beans, peanuts or other locally available mulch material. Do not use mulch which contains an excessive quantity of matured seeds of noxious weeds or other species that will grow or be detrimental to overseeding, or provide a menace to surrounding land. Do not use mulch material which is fresh or excessively brittle, or which is decomposed and will smother or retard growth of grass. Mulch will be made available on site to the CONTRACTOR.

#### **2.06 FERTILIZER**

- A. Provide commercial fertilizer conforming to FDOT Standard Specifications (2000), Section 982.

#### **2.07 LIMESTONE**

- A. Dolomitic limestone shall be an approved product designated for agriculture use.

#### **2.08 WATER**

- A. The water used in the seeding and sodding operations may be obtained from any approved spring, pond, lake, stream or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which

might be harmful to plant growth or obnoxious traffic. Water containing greater than 800 ppm total dissolved solids shall not be used.

## **PART 3 – EXECUTION**

### **3.01 SOIL PREPARATION**

- A. All areas to receive seed and sod shall be mowed and raked, and all rubbish, sticks, roots and stones larger than 2-in. shall be removed. Subgrade shall be inspected and approved by the PROJECT MANAGER before seed and sod is placed.

### **3.02 APPLICATION OF LIMESTONE AND FERTILIZER**

- A. Limestone: Spread lime uniformly over designated areas to be seeded or sodded at a rate of 30 pounds per 1,000 sq. ft. Thoroughly mix through upper 2-inches of topsoil.
- B. After application of lime, and prior to applying fertilizer, loosen areas to be seeded or sodded with a double disc or other suitable device if soil has become hard or compacted. Correct any surface irregularities in order to prevent pockets or low areas which will allow water to stand.
- C. Fertilizing: Distribute a 10-10-10 fertilizer uniformly over areas to be seeded or sodded at a rate of 30 pounds per 1,000 square feet. Use a suitable distributor.
- D. Incorporate fertilizer into topsoil to depth of at least 2-inches by disc harrowing or other approved methods. Clean surface of stones or other substances which will interfere with turf development or subsequent mowing operations.
- E. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture. Roll and rake, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be seeded or sodded soon after preparation.

### **3.03 SEEDING OPERATION**

- A. All disturbed areas shall be seeded and mulched or sodded. Disturbed areas outside the "Limits of Construction" as shown on the drawings shall be seeded and mulched or sodded at the expense of the CONTRACTOR.
- B. Do not seed or mulch when wind velocities exceed 15 mph. Sow seed only when the soil is moist. Do not perform any seeding when the ground is frozen, unduly wet or otherwise not in a tillable condition. Incorporate grassing into the project at the earliest practical time.
- C. Apply topsoil as specified in Section 02220 Fertilize as above. Prepare the ground for sowing of seeds, sick-harrow and thoroughly pulverize the soil to an

average depth of 6 inches. Make the soil true to grade, not compacted, and free of large clods, roots, and other material which will interfere with the work or subsequent mowing and maintenance operations.

- D. While the soil is still loose, scatter the seed uniformly over the grassing area and immediately mix it into the seed bed to a depth of ¼ inch using the specified seed.
- E. Apply mulch approximately 2 inches, loose thickness, of the mulch material uniformly over the seeded area, and cut the mulch material into the soil to produce a loose mulched thickness of 3 to 4 inches. Do not use harrows.
- F. Immediately after seeding, roll the entire grassed or mulched area with a cultipacker, traffic roller or a horticultural roller. Make at least two passes over the entire area.
- G. Provide a vehicle for applying water to the grassed areas. Do not water newly seeded areas to force the seed germination. Do not apply more than 2 inches of water per acre per week to sustain the grass growth.
- H. Begin maintenance of seeded areas immediately after each portion is planted and continue until final acceptance. Maintain the planted areas as a stand of grass acceptable to the PROJECT MANAGER until final acceptance of the project.
- I. Protect seeded slopes against erosion with erosion netting or other methods approved by PROJECT MANAGER.

### **3.04 LITTORAL ZONE PLANTING OPERATIONS**

- A. Installations Specifications
  - 1. Time of Planting: The Contractor shall conduct planting activities under favorable seasonal conditions and will still be required to meet the guarantee provisions set forth herein. All plant material shall be installed under favorable weather conditions. At the option of and under full responsibility of Contractor, planting operations may be conducted under unreasonable conditions without additional compensation.
  - 2. The Engineer will inspect the plants at the time of planting. Plants will be rejected if improperly planted. Improper planting includes the following conditions: exposed roots, not at the proper depth, or planted in water either too deep or shallow. Plants may not be stored on-site for more than two (2) consecutive days. Any material stored on-site for longer periods of time may be rejected by the Engineer. Contractor should notify the Engineer at least five (5) working days prior to movement of plant material on-site, and shall request the Engineer be present to inspect the plant material as it arrives on-site. The Engineer

may reject all plant material not inspected prior to planting, and the Contractor shall remove and replace rejected material without additional compensation.

3. All containers shall be cut and opened fully, in a manner such as will not damage the root system. Container-grown plants shall not be removed from the container until immediately before planting, and with all due care to prevent damage to the root system.

#### B. Maintenance Requirements

1. The area to be planted shall be free of nuisance species prior to installing new materials. The Contractor will be responsible for providing maintenance of the site to ensure nuisance species remain below 5% of the vegetative cover throughout the one- (1) year guarantee period. For purposes of this project the following species have been deemed as nuisance species.

- a. *Ardisia crenata* (= *A. crenulata*) -coral ardisia
- b. *Albus precatorius* - rosary pea
- c. *Albizia julibrissin*- mimosa, silk tree
- d. *Dioscorea bulbifera* - Air potato
- e. *Imperata cylindrica* (*Imperata brasiliensis* misapplied) -cogon grass
- f. *Lygodium japonicum* -Japanese climbing fern
- g. *Ligustrum sinense* - Chinese privet, hedge privet
- h. *Ludwigia peruviana* – Primrose willow
- i. *Panicum repens* – Torpedo grass
- j. *Pueraria montana* (= *P. lobata*) – kudzu
- k. *Rubus* spp. – Blackberry
- l. *Salix caroliniana* – Carolina willow
- m. *Sapium sebiferum* -popcorn tree, Chinese “tallow tree.”
- n. *Schinus terebinthifolius* – Brazilian pepper
- o. *Solanum viarum* – tropical soda apple
- p. *Typha* spp. –Cattails
- q. *Vitis* spp. – Grapevine

2. Herbicide application or manual removal will be acceptable methods to control the nuisance species. However, the Contractor will be responsible for replacing any desirable native plant material negatively impacted by the maintenance efforts. All plant replacements will be at the Contractors expense and must meet the specifications of the originally planted materials.

#### C. Staking and Guying of Trees

1. The Contractor is wholly responsible for the stability and plumb condition of all trees planted under the current contract. All trees located in areas where the soil conditions are unstable must be staked. All staking shall be as specified herein. Trees larger than 1 inch and smaller than 2 inch caliper shall be staked with a 2-inch stake, set at least 24 inches in the ground and extending to the crown of the plant. The tree shall be firmly fastened to the stake with biodegradable twine or hemp, or other approved material.
2. All trees larger than 2-inch caliper and smaller than 3.5-inch caliper shall be staked with two, 2-inch by 4-inch stakes, 8 feet long, set 2 feet in the ground. The tree shall be midway between the stakes and held firmly in place by biodegradable twine or hemp.

D. Watering

1. The Contractor shall continue watering to the end of the guarantee period. (1 year) Watering shall be done frequently enough to fully sustain the health of all plantings. Any plantings showing drought damage shall be replaced at the Contractor's expense. Watering will be paid as part of the Maintenance activities.

E. Warranty of Planted Material

1. During planting, Contractor shall request an inspection by the Engineer near the end of the warranty period. When all plants are acceptable, Contractor will be notified of warranty compliance.
2. Defective work shall be corrected within five working days of notification by Engineer. Upon completion of planting, the Contractor shall remove from the site excess soil, planting containers and debris, and repair any damage to structures, etc., resulting from planting operations.
3. The Contractor shall be responsible for assuring that all plants at the time of final inspection, exhibit the characteristics and qualifications required for the grade of plant as originally specified.

### 3.05 SODDING OPERATIONS

- A. All slopes 3H:1V or steeper shall be sodded.
- B. Apply topsoil as specified in Section 02220 Fertilize as above. Scarify or loosen the areas requiring sod to a depth of 6 inches. Limit preparation to areas that can be sodded within 72 hours after preparation.
- C. Place sod immediately after ground preparation. Do not use sod which has been cut for more than 72 hours. Stack all sod that is not planted within 24 hours

after cutting and maintain proper moist condition. Do not sod when weather and soil conditions are unsuitable for proper results. Pre-wet the area prior to placing sod. Do not place sod on eroded or washed out sites that have not been repaired.

- D. Place the sod on the prepared surface, with edges in close contact, and embed it firmly and smoothly by light tamping with appropriate tools. Roll using a lightweight turf roller. Provide a true and even surface without any displacement of the sod or deformation. Stagger the sod pieces by not more than 6 inches and avoid a continuous seam. Tamp the outer pieces of sod to produce a featheredge effect.
- E. Thoroughly water the sod immediately after placing. Do not water in excess of ½ inch per acre per week for establishment. Use watering equipment that will prevent damage to the finished sod surface. Keep the sod in a moist condition until final acceptance of the project.
- F. Begin maintenance of sodded areas immediately after each portion is planted and continue until final acceptance. Fill, level, and repair any washed or eroded areas as may be necessary and maintain the sodded areas in a condition satisfactory to the PROJECT MANAGER until final acceptance of the project.
- G. Mow the sodded areas to a height of 6 inches when competing vegetation height exceeds 20 inches in height.

### **3.06 FINAL ACCEPTANCE**

- A. Seeded and sodded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy, uniform, close stand of specified grass is established, free of weeds, bare or dead spots and surface irregularities.

**- END OF SECTION -**

## **SECTION 03300**

### **CONCRETE**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. Section includes cast-in-place concrete; and pre-cast concrete structures, expansion and contraction joint devices associated with concrete WORK, including joint sealants.

##### **1.02 REFERENCES**

- A. American Concrete Institute:
  - 1. ACI 301 - Specifications for Structural Concrete.
  - 2. ACI 305 - Hot Weather Concreting.
  - 3. ACI 318 - Building Code Requirements for Structural Concrete.
- B. American Society for Testing and Materials:
  - 1. ASTM C33 - Standard Specification for Concrete Aggregates.
  - 2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
  - 3. ASTM C150 - Standard Specification for Portland Cement.
  - 4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
  - 5. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
  - 6. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
  - 7. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

##### **1.03 SUBMITTALS**

- A. Section 01300 – Contractor's Submittals.
- B. Product Data: Submit data on pre-cast structures.

##### **1.04 CLOSEOUT SUBMITTALS**

- A. Section 01700 – Contract Start-Up, Completion and Closeout.
- B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

## **1.05 QUALITY ASSURANCE**

- A. Perform WORK in accordance with ACI 301.
- B. Acquire cement and aggregate from one source for WORK.
- C. Conform to ACI 305 when concreting during hot weather.

## **PART 2 - PRODUCTS**

### **2.01 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type I - Normal or Type II - Moderate Portland type.
- B. Fine and Coarse Aggregates: ASTM C33.
- C. Water: Clean and not detrimental to concrete.

### **2.02 ADMIXTURES**

- A. Subject to written authorization by the ENGINEER.

### **2.03 JOINT DEVICES AND FILLER MATERIALS**

- A. Joint Filler; Asphalt impregnated fiberboard or felt.
- B. Construction Joint Devices: Integral extruded plastic; with removable top strip exposing sealant trough.
- C. Sealant: ASTM D1190; Hot applied polymer based asphalt compound.

### **2.04 CONCRETE MIX**

- A. Mix and deliver concrete in accordance with ASTM C94, Option C.
- B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.
- C. Provide concrete to the following criteria:

Unit	Measurement
Compressive Strength (28 day)	3,000 psi
Water/Cement Ratio (maximum)	0.57 by weight (mass)
Aggregate Size (maximum)	1-1/2 inch 38 m
Slump -	Plus or minus 1-inch (50 mm) 4 inches (102 mm)



- D. Use accelerating admixtures in cold weather only when approved. Use of admixtures will not relax cold weather placement requirements.
- E. Do not use calcium chloride.
- F. Use set retarding admixtures during hot weather only when approved.
- G. Add air entraining agent to normal weight concrete mix for WORK exposed to exterior when approved in writing by the ENGINEER.

## **2.05 PRE-CAST CONCRETE**

- A. Pre-cast FDOT Ditch Bottom Inlet, Type H, shall be manufactured by Taylor Precast, Inc. (813-684-8111).
- B. Concrete shall have a minimum compressive strength of 4,000 psi; Type I cement.

## **PART 3 - EXECUTION**

### **3.01 EXAMINATION**

- A. Verify requirements for concrete cover over reinforcement.
- B. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

### **3.02 PREPARATION**

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- B. In locations where new concrete is doweled to existing WORK, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

### **3.03 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 301 ACI 318.
- B. Notify ENGINEER minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed expansion and contraction joints, are not disturbed during concrete placement.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

- E. Place concrete continuously between predetermined expansion, control, and construction joints.
- F. Do not interrupt successive placement; do not permit cold joints to occur.
- G. Place slabs in saw cut pattern indicated.
- H. Saw cut joints within 12 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness unless otherwise noted on drawings.
- I. Screed slabs on grade level, maintaining surface flatness of maximum 1/8 inch in 10 ft (3mm/3m).

### **3.04 CONCRETE FINISHING**

- A. Provide formed concrete surfaces to be left exposed with sack rubbed finish.
- B. Finish concrete floor surfaces to requirements of Section 03350.

### **3.05 CURING AND PROTECTION**

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete floor surfaces to requirements of Section 03390.

### **3.06 PRE-CAST INSTALLATION**

- A. Excavation shall be in accordance with Section 02220. Contractor shall ensure that the bottom of excavation is firm, suitable foundation.

### **3.07 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed in accordance with ACI.
- B. Submit proposed mix design to ENGINEER for review prior to commencement of WORK.
- C. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
- D. Three concrete test cylinders will be taken for every 100 or less cu yds of concrete placed.
- E. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

- F. One slump test will be taken for each set of test cylinders taken.
- G. One air content test will be made for each set of test cylinders taken.

### **3.08 PATCHING**

- A. Allow ENGINEER to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify ENGINEER upon discovery.
- C. Patch imperfections as directed by ENGINEER.

### **3.09 DEFECTIVE CONCRETE**

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by ENGINEER.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of ENGINEER for each individual area.

**-END OF SECTION -**

## **SECTION 11200**

### **LEACHATE PUMPS**

#### **PART 1 - GENERAL**

##### **1.01 WORK INCLUDED**

- A. The work included under this section consists of furnishing and installing one (1) leachate pumping system including leachate collection and detection submersible pumps, motors, control panel, flow meter, telemetry system and related equipment which should be fully tested and in operating conditions as shown on the drawings and specifications. A spare of each of the two pumps is to be provided.

##### **1.02 QUALITY ASSURANCE**

- A. Unit Responsibility: The pumps, motors, control elements, carriage, discharge hose, and appurtenances shall be supplied by the pump supplier to assure unit responsibility. The pump supplier shall have experience in providing complete systems and equipment for leachate removal.
- B. Factory Tests: The pump supplier shall perform the following tests on each pump before shipment from the factory.
  - a. Meg the pump to check for insulation breaks or moisture.
  - b. Run the pump dry for a minimum of five minutes to ensure integrity of mechanical seal and oil lifter. Also check rotation of electric motor in both directions.
- C. Parts Stocking Program: The pump supplier shall provide the owner the following spare parts which should be retained on the landfill site for use as necessary.
  - a. Spare pump end
  - b. Spare motor
  - c. Spare Power Cable 100 feet in length (Includes cable entrance and gland fittings)
  - d. Spare transducer cable with 100 feet of signal cable.
  - e. Spare Filter/Dryer

- D. Each submittal for equipment, components or system components shall be accompanied by an "Equipment Warranty and Certification Form" which is provided in table 11200-A. The form shall be duly executed by an authorized principal of the manufacturer warranting and certifying that the equipment and system components proposed meets or exceeds the specifications, is suitable for its intended purpose and will provide satisfactory performance at the design criteria specified. In the event that the manufacturer is not the supplier, an authorized principal of the supplier shall also execute the equipment warranty and certification form.

### **1.03 SUBMITTALS**

- A. The contractor shall provide shop drawings prepared by the manufacturer and submitted to the engineer for review prior to the manufacture of the proposed equipment. The shop drawings shall include outline dimensions and external connection diagrams. A list of components, pump performance curve showing performance from shutoff to run out as well as a copy of the manufacturers warranty shall be included with each submittal. The manufacturer shall provide to the contractor the required number of submittals at no extra cost to the contractor. In addition the shop drawings shall include the following:
- a. Full description and schematic of mechanical seal design, operation and protection devices, including oil lifter design and operation. A mechanical seal oil lifter must be included in the seal design.
  - b. Full description and schematic of motor cable entrance. Must indicate anti wicking device as well as cable strain relief design.
  - c. Comprehensive two dimensional CAD drawing of the panel exterior as viewed from the front and side. Must also include complete control panel interior layout showing location of panel component parts as well as full electrical schematic of control panel operation.
  - d. Must include manufacturer's warranty which shall be a minimum of three (3) years from date of installation of the pump, and controls.
- B. Operating Instruction: For the pump furnished under this section, the contractor shall submit operation and maintenance manuals. At a minimum these manuals shall include:
- a. General equipment function, description, normal and limiting operating characteristics.
  - b. Installation instructions.
  - c. Operation instructions start up procedure, normal operating conditions, and emergency and normal shutdown procedures.

- d. Lubrication and maintenance instructions (if any)
  - e. Troubleshooting guide
  - f. Suggested parts that should be held on site as spares that are non mandatory and in addition to the parts listed in section 1.02, Section C of this specification.
  - g. Drawings cross sectional views, assembly and wiring diagrams.
  - h. Pump performance curves.
- C. Factory Performance Test Data: A qualified technician from the factory shall be provided for one (1) day to instruct representatives of the owner and the engineer on proper operation and maintenance. With the permission of the owner, this work may be conducted in conjunction with the inspection of the installation and system start up per Section 3 of this section. If there are difficulties in operation of the equipment due to the manufacturers design or fabrication of the equipment, additional services shall be provided at no additional cost to the owner. System start up shall be completed by a factory technician. This technician should be a direct employee of the manufacturer who has had first hand dealings with the equipment through its production at the factory.
- D. Certifications: The contractor shall furnish the engineer with a written certification signed by the manufacturer that the equipment has been properly installed and lubricated, is in accurate alignment, and is free from stress imposed by piping or mounting bolts. The form should indicate that all equipment has been operated without fault under full load conditions and that satisfactory operation has been obtained.

#### **1.04 DELIVERY, STOREAGE AND HANDLING**

- A. Deliver a complete system to include all parts listed in submittal sent to engineer.
- B. Store in a weather tight building or suitable covering to protect against damage of any nature.
- C. Handle during delivery, storage and installation in a manner to prevent damage of any nature.

#### **1.05 WARRANTY AND GUARANTEES**

- A. The supplier of the leachate removal system will provide all warranty services against defects in material and workmanship for a period of 36 months from the date of start up and owner's final inspection and acceptance to the effect that any

defective equipment shall be repaired or replaced without cost or obligation to the owner.

## **PART 2 - PRODUCTS**

### **2.01 PUMPS**

- A. The contractor shall furnish and install one complete leachate pumping system. The pump, control panel and flow meter shall be Sligo Systems, Ormond Beach, FL; Leachator Pumping System, Cumming, GA, or comparable. The primary pump shall be a Sligo Systems Series 3-7.5-4 and the detection pump shall be a Sligo Systems Series model 3-2-2; or the primary pump shall be a Leachator Model LPS275B-5-4 and the detection pump shall be a Leachator model LPS15R-2-2; or approved equal.
- B. The submersible pumps should be capable of handling raw leachate.
- C. The pump shall use a single stage or multi-vane, open type impeller capable of obtaining the required flow and head. This single stage impeller will be fabricated from ASTM A532 93d, class 3 type A high chrome steel or the primary pump can be 304 stainless steel and detection pump cast iron. Multi-stage impeller designs are not acceptable.
- D. The pump must be capable of running dry continuously without damaging the rotating assembly, seal, bearings or motor.
- E. The pump must be capable of ingesting and passing at least 0.78-inch solids without damaging the pump or causing a reduction in pump flow/head performance. The detection pump must be capable of passing solids with a diameter of 0.34-inches. Solids include but are not limited to silt, sand, sediment, HDPE shavings and rock particles. The primary pump will have a 4-inch discharge and the detection pump will have a 2-inch discharge.
- F. The pump shall include a motor cable entrance with an anti-wicking block created by a break in the power cable insulation to prevent liquid migration into the motor housing in the event that the power cable is damaged. Hermetically sealed designs are insufficient. The cable entrance shall include a rubber boot that accommodates differences in thermal expansion between the epoxy potting compound and the motor housing. A limited compression tightening plate shall be used to compress and seal this rubber boot to the motor housing. The rubber boot shall incorporate a strain relief feature that limits the cable bending radius and prevents the conductors from being damaged or cyclically fatigued.
- G. The pump shall be manufactured from (primary - ASTM A48-76 cast iron and detection - cast iron and 304 stainless steel) or ASTM Class 35, A48 cast iron.

- H. Dual inside mechanical seals with silicon carbide faced shall be used to prevent pumped liquid from entering the motor. The seals shall be contained within an oil filled seal chamber. No contact with the pumped liquid is permitted. An oil lifter must be used to ensure that both seal faces are continuously cooled and lubricated by the oil. With the pump running dry, the seals must be capable of operating for at least one hour without damage.
- I. The pump shaft shall be supported by double shielded, permanently lubricated, high temperature C3 ball bearings with a minimum B10 life of 60,000 hours. Shaft bearing designs that require lubrication via the pumped liquid are not acceptable.
- J. The pump shall be fabricated for use in a riser pipe application. The pumping unit shall be enclosed in an engineered polymer skid to enable the pump to slide down the riser pipe and negotiate bends without hanging up on seams or any riser pipe imperfections. The polymer skid will use no moving parts. Wheels shall not be used as a means to send the pump down the riser pipe.
- K. No built in check valve inside the pump will be permitted. Check valves shall be located on the discharge hose assembly and easily accessible for maintenance. If a check valve is to be located at the pump discharge, the valve should be bored with a 3/16" bleed hole that will allow the discharge line to be emptied prior to removing the pump for maintenance.
- L. Motor assemblies shall be air filled and spark free. The operating temperature of the motor and housing shall remain below the ignition point of all landfill gases. With the pump running dry, the motor must be capable of operating for at least one hour without damage.
- M. The pump in the collection zone shall be capable of delivering the following liquid flow rates:  
200 GPM @ 60' TDH. Pump shut off head shall be 79' or 80' TDH. Pump run out will be 430 or 480 GPM. No exceptions to these design points will be accepted. Pump shall operate off 240 V / 3 ph / 60 hz electric service.

The Pump for the detection zone shall be capable of delivering the following liquid flow rates:

10 GPM @ 60' TDH. Pump shut off head shall be 76' TDH. Pump run out will be 106 or 130 GPM. No exceptions to these design points will be accepted. Pump shall operate off 240 V / 3 ph / 60 hz electric service.

## **2.02 CONTROL PANEL**

- A. The single panel shall operate both the primary and secondary pumps independently of one another. The control panel will provide level control and include motor starters, breakers, overload protection devices and circuit breakers



(fuses will not be used as primary protection devices). Panel will provide protection against phase loss and rapid pump cycling. The panel will include a TVSS system as well as additional lightning protection as deemed appropriate. A low voltage control circuit and power transformer shall be provided. A thermostat will be included for interior temperature control of the panel body. Power feed to the panel will be 4 wire, 240 volt, 3 phase.

- B. Control shall be accomplished via a programmable logic controller (PLC) with the requisite number of digital and 4-20 mA analog I/O.
- C. The PLC shall monitor the following alarm conditions:

Alarm	Action	Beacon
High Sump Level	-	Red
Over/Under Voltage	Stop Pumps Until Corrected	Red
Loss Of Phase	Stop Pumps Until Corrected	Red
Pump Failure	Take Pump Out Of Lead/Lag Logic	Red
Level Sensor Failure	Stop Pumps Until Corrected	Blue
Low Flow	-	Blue
No Flow	Stop Pump. Retry A User Defined Number Of Times At A User Defined Interval. If No Response Take Pump Out Of Lead/Lag Logic.	Blue Then Red
Force Main Pressure Over Limit	Stop Pumps Until Corrected	Blue
Motor amp draw over maintenance limit	-	Blue

- D. The PLC shall be "SCADA ready". Addition of a radio unit and a single RJ45 connection shall allow network access and control of PLC data and command registers. Communication protocol shall be MODBUS TCP.
- E. The control panel shall be designed, constructed and tested in accordance with applicable NEMA, UL and ISA standards. The latest edition of the NEC as well as all state and local codes and regulations shall govern the materials, fabrication and installation of the control panel.
- F. The control panel shall be manufactured out of 14 gauge, 304 stainless steel and meet NEMA 4X standards. The enclosure door shall be hinged along its length allowing the door to open out 180 degrees. The door shall have a gasket with a rubber composition material around the perimeter and shall be installed with a retainer to assure a positive weatherproof seal. A stainless steel drip shield shall be included. The panel must be capable of being padlocked. The main power disconnect shall be located on the inner door of the panel. The inner door should not be capable of being opened unless the power is cut off to the panel. A generator receptacle must be provided on the side of the control panel.

- G. Control panel shall include a viewing window to allow the components mounted on the inner door to be seen without the need to open the front of the enclosure. A NEMA 4X momentary on reset / acknowledge push button shall be mounted on the side of the enclosure.
- H. The inner door will include a 10.5" TFT Color touch screen display which will under normal operating conditions indicate to the operator all pertinent information regarding sump liquid levels, pump set points as well as flow data. The touch screen will be used to access the programming levels for pump off levels, pump on and high level conditions. The touch screen will also display any faults that the system identifies. These faults will be displayed on the screen indicating in picture form the failed component and directions as to how to rectify the failed component or problem area. Any fault must be retained in a built in memory within the touch screen assembly for future reference by the operator. The panel (via the screen) will also be capable of displaying flow and liquid level trending information through time. The only switches, dials, bezels or lights that shall be included on the inner door will be one HOA switch per pump and one elapsed time meter per pump. All other information and control will be achieved via referencing the screen and using its programming menus.
- I. All circuit breakers shall be thermal magnetic molded case breakers as manufactured by ABB or equal.
- J. Motor starters shall be open form, across the line, UL/HP rated with individual overload protection built in each leg. Motor starter contact and coil shall be replaceable from the front of the starter without removing it from its position. Adjustable overloads will be used. They shall provide visual trip indication on the overload itself as well as illuminate a motor trip light on the panel inner door. The overload shall be sized for the full load amperage draw of the pump motor.
- K. The HOA switch that will control the pump will remain in the Auto or off position when placed in that position by the operator. It will not be able to remain in the Hand mode unless physically held in that position by the operator.
- L. The elapsed time meters shall be non reset type which will indicate total hours that the pump has run. The run time will be measured up to 99999.9 hours.
- M. The control panel shall be equipped with a NEMA 4X (watertight), LED type amber power on light located on the top of the panel. Red and blue alarm beacons are to be located on top of the panel as well. These lights will be of a 'strobe' design. Rotating beacons are not accepted.
- N. Provision will be made on the side of the panel to switch on the area lights. This area light switch should be watertight and not compromise the NEMA 4X rating of the panel.

- O. All nameplates shall be three ply phenolic, engraved through the first layer. Lettering shall be 0.5cm (3/16") minimum in height.
- P. All nameplates should be securely fixed to the respective panel location.
- Q. A pocket shall be provided on the inner door to house operations manuals.
- R. All control devices leading from the panel shall be intrinsically safe.
- S. Radio communication must be provided between the leachate control panel and the master lift station. If the master lift station is pumping then the leachate pumps will be prevented from pumping and, if the leachate pumps are pumping the master lift station will be prevented from pumping. Under the conditions noted, the lagging system will begin pumping when the active system pumps stop. This capability must be fully automatic and self restarting. No cables will be used. Radio telemetry will be the only acceptable form of controlling this function.
- T. Methane Gas - Combustible Gas Detector

A Methane Gas combustible gas detector will be installed inside the control panel. The detector shall be a micro-processor based and be self calibrating. It shall be designed to monitor gases and vapors within the lower explosive limit (LEL) and provide status indication and alarm outputs.

All of the gas detectors electronics shall be in one self contained, explosion proofed housing and provide a 4-20mA signal which is proportional to 0 to 100% of LEL.

A three digit digital display must be included on the front of the sensor housing. This display shall continuously indicate gas concentrations during normal operation or while in a calibration mode.

The detector must have built in dual redundant MODBUS Communication. The sensor shall be able to communicate with the control panel PLC. When a high level of gas is sensed, the gas detector will send a signal to the PLC which will in turn display a warning screen on the 10.5" TFT Color Touch Screen on the front of the control panel, indicating an abnormal level of combustible gas inside the panel enclosure itself.

Sensor type shall be Continuous diffusion, low temperature catalytic bead. Sensor life shall be 5 years.

Accuracy shall be +/- 3% LEL up to 50% LEL Accuracy shall be +/- 5% LEL when equal to or greater than 51% LEL

Zero drift shall be less than 5% of full scale per year.

Measuring ranges will be 0-100% LEL

Gas detector shall meet the intent of CSA/FM Class 1, Division 1 groups B, C & D; Class 1, zone 1 Ex d IIB+H2, T6

Gas detector shall meet the intent of ATEX T5 EEX d IIB

Detector shall be capable of operating in temperatures between -40 Deg F through 200 Deg F.

Detector shall be capable of operating in humidity ranges between 5% and 100% RH without failure. Detector shall be 'non-condensing'.

Detector shall be power by 20 – 36VDC – 250mA max.

Detector shall have an analog signal of 0-20mA (650 Ohms max load)

The detector shall have a RS-485 output which shall be dual MODBUS RTU suitable for linking up to 128 units or up to 247 units with repeaters.

Baud rates will be 2400, 4800, 9600 or 19,200 BPS

The gas detector shall weight no more than 5.5lbs.

The gas detector shall be 6.4'' in length, 3.4'' in height and 4.1'' in width.

U. Hydrogen Sulfide – Intelligent Gas Detector

A Hydrogen Sulfide combustible gas detector will be installed inside the control panel.

The detector shall be a micro-processor based and be self calibrating. The detector shall be designed to detect Hydrogen Sulfide in parts per million (ppm) levels and provide status indication and alarm outputs.

All of the gas detectors electronics shall be in one self contained, explosion proofed housing. The detector shall provide a 4-20mA signal which is proportional to 0 to 100% of the detection range at the sensor.

A three digit digital display must be included on the front of the sensor housing. This display shall continuously indicate gas concentrations during normal operation or while in a calibration mode.

The detector must have built in dual redundant MODBUS Communication. The sensor shall be able to communicate with the control panel PLC. When a high level of gas is sensed, the gas detector will send a signal to the PLC which will in turn

display a warning screen on the 10.5'' TFT Color Touch Screen on the front of the control panel, indicating an abnormal level of combustible gas inside the panel enclosure itself.

Sensor range shall be 0-20ppm, 0-50ppm or 0-100ppm.

Sensor type shall be Continuous diffusion, adsorption type metal oxide semiconductor (MOS). Sensor life shall be 5 years.

Repeatability shall be +/- 2ppm or 10% of the applied gas, whichever is greater.

Response time shall be T50 – less than 1 minute (screen) Response time shall be T50 – less than 2 minutes (sintered) with full scale gas applied.

Measuring ranges will be 0-20ppm, 0-50ppm, 0-100ppm.

Gas detector shall meet the intent of CSA/FM Class 1, Division 1 groups B, C & D; Class 1, zone 1 Ex d IIB+H2, T6

Gas detector shall meet the intent of ATEX T5 EEX d IIB

Detector shall be capable of operating in temperatures between -40 Deg F through 167 Deg F.

Detector shall be capable of operating in humidity ranges between 5% and 100% RH without failure. Detector shall be 'non-condensing'.

Detector shall be power by 20 – 36VDC – 250mA max.

Detector shall have an analog signal of 0-20mA (650 Ohms max load)

The detector shall have a RS-485 output which shall be dual MODBUS RTU suitable for linking up to 128 units or up to 247 units with repeaters.

Baud rates will be 2400, 4800, 9600 or 19,200 BPS

The gas detector shall weight no more than 5.5lbs.

The gas detector shall be 6.4'' in length, 3.4'' in height and 4.1'' in width.

## **2.03 PRESSURE TRANSDUCERS**

- A. Submersible pressure transducers will be used as a means to indicate liquid level in the sump. This pressure transducer will be surge suppressed and contain the appropriate signal cable length. The transducer will be mounted outside the

body of the pump for ease of cleaning/replacement while protected from damage during installation or extraction of the pumps from the sump.

- B. Transducer must be manufactured out of stainless steel
- C. Static accuracy shall be +/- 1.00%
- D. Resolution shall be infinitesimal.
- E. Excitation shall be 10 to 40VDC, input current (max) will be 20mA and output will be 4-20mA (2 wire)
- F. Output impedance will be 100 megohms at 50 VDC
- G. Compensated operating temperature range shall accommodate 0 degrees Celsius through 50 degrees Celsius. Operating temperature range shall accommodate a span of -20 degrees Celsius through 70 degrees Celsius.
- H. Transducer assembly must be surge suppressed. The suppression (lightening protection) the lightening protection shall be capable of responding to any surge within a time period of less than 10 nanoseconds after identification.

#### **2.04 FLOW METER**

- A. The flow meters shall be manufactured by Sligo Systems or approved equal. The model of flow meter to be supplied will be a Sligo Systems SSFM656 or approved equal.
- B. There shall be two flow meters installed in the discharge lines. One for the primary collection pump and one for the secondary detection pump. The flow meter will record rate and totals of liquid transfer from the sump. The flow meter shall fit into the line and be a self contained unit with readout display attached directly to the flow meter body. Flow meter must meet NEMA 4X standards.
- C. The flow meters shall be magnetic type have NO moving parts inside the unit. Paddle wheel or turbine type flow meters are not acceptable.
- D. A 4-20 mA control signal proportional to the discharge flow rate shall be output for use by the pump controller.
- E. Flow meter must be capable of handling and passing solids of up to 2" in diameter without clogging.
- F. Flow meter will insert into the discharge line and be secured there by flanged connections.
- G. Flow meter must be grounded and bonded through its own grounding system.

- H. Flow meter must possess the following characteristics:
- a. Minimum of 150 lb flanges
  - b. Forward, reverse and net totals
  - c. 4-20 mA scaled pulse frequency
  - d. RS232 digital ports
  - e. Self diagnoses to include current ramp, coil drive check and input simulator.
  - f. Non volatile EEPROM memory
  - g. 2 line, 16 character backlit display
  - h. 77-265VAC powered

## **2.05 PUMP RETRIEVAL CABLE**

- A. Retrieval cable should be a minimum of 3/8" diameter and made of stainless steel. All cable retaining hardware shall be made of stainless steel.
- B. Cable shall be attached to the top of the pump in a secure manner as to facilitate its removal from the riser pipe assembly.

## **2.06 BREAKOUT BOXES**

- A. Contractor shall supply three (3) separate electrical breakout boxes to ensure no gas migration occurs from the sump into the control panel. These breakout boxes will meet NEMA 4X standards. All breakout boxes will have a hinged front door and pad lockable quick release latches to facilitate easy access. Screws to secure the front of the breakout box will not be acceptable. All exposed fittings and fixtures will be stainless steel. Electrical terminal connections inside the box must be DIN rail mounted. Multiple terminal strips will not be acceptable. Each terminal must be able to be separated from the rest without the need to replace the complete connector strip. All conduit connections from the breakout boxes to the control panel must be completely 'sealed off' with an epoxy based potting compound to prevent gas migration into the control panel.
- B. The power cable breakout box (model SSBOB-P-2) shall be manufactured by Sligo Systems or approved equal.
- C. The flow meter breakout box (model SSBOB-F-2) shall be manufactured by Sligo Systems or approved equal.
- D. The transducer cable breakout box (model SSBOB-T-2) shall be manufactured by Sligo Systems or approved equal.

## **PART 3 - - EXECUTION**

### **3.01 INSTALLATION**

- A. All materials and equipment shall be installed as shown on the drawings and as recommended by the manufacturer.

### **3.02 INSPECTION AND TESTING**

- A. Field supervisor: The manufacturer will furnish a suitably qualified technician to inspect the completed installation, make necessary adjustments and instruct operating personnel in the proper care and operation of the equipment, prior to the final acceptance of the pumping station. No distributor, representative or agent acting on behalf of the manufacturer shall be approved to complete start up services. This task must be reviewed and completed by a direct employee of the manufacturer.
- B. Field Test: When the pumping facility is complete and ready for operation, then the station shall be inspected and tested for compliance to the contract documents. Test of equipment shall be made by the contractor in the presence of the engineer, electrical sub contractor, equipment manufacturer and the owner. The equipment tests shall include, but will not be limited to the following:
  - a. Pumps and motors: Pumps shall be run dry to ensure their run dry compatibility as well as being run in the sump under 'wet' conditions. A determination shall be made of the pumping capacity. Performance of the pumps shall meet the specified criteria when field tested.
  - b. Electrical: Readings shall be made of the voltage and amperage draw and recorded on the manufacturers start up form. This form should be kept by the manufacturer, Engineer, Contractor and Owner for future reference.
  - c. Controls: Control primary elements shall be tested to determine satisfactory performance for starting and stopping at the proper liquid levels. Pump sequence and alarm functions will also be tested.
    - a. Equipment: Equipment shall be operated to determine that the pump is located in the correct position in the riser assembly. A check will be conducted to ensure that there is no overloading of the pump or any overheating in any of the controls. A check will be conducted for any abnormal vibration that may be evident in the discharge plumbing. Pump will be raised and reset to ensure correct placement in riser pipe.
    - b. Inspection: An inspection of all mechanical and electrical equipment, controls, piping, valves, fittings, brackets, mountings, seals, conduit, painting and component features shall be made while



the station is being tested to determine performance and compliance with design requirements and the specification.

- c. Structure: The station shall be inspected for performance, structural soundness and water tightness.
- d. Repairs, adjustments and replacement: The contractor shall make any and all necessary repairs, adjustments and replace any component parts until performance has been demonstrated to the satisfaction of the engineer. The contractor shall bear the cost of any repair, adjustment and replacement.
- e. Pump and Controls manufacturer must submit to the engineer for review a full synopsis outlining occasions where the pump assembly has been:
  - 1) Run dry without damage
  - 2) Operated under conditions whereby solids at least 3/8" have been passed through the pump assembly without degrading the pump performance or damaging the pump or motor assembly.
- f. The pumps, control panel, flow meters and break out boxes shall be supplied by the one manufacturer.

Table 11200-A

EQUIPMENT WARRANTY AND CERTIFICATION FORM

Project: Hardee County

Project No.: \_\_\_\_\_

The undersigned hereby attests that he has examined all the referenced project drawings and specifications and hereby warrants and certifies that the equipment, component, or system he proposes to furnish and deliver meets or exceeds the contract specification, is suitable for its intended purpose and installation, and will provide satisfactory performance at the design criteria specified.

This warranty shall be in addition to and not in lieu of all other warranties, express and implied.

Equipment: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

Address: \_\_\_\_\_

By: \_\_\_\_\_

Type Name and Title) \_\_\_\_\_

(Seal)

\_\_\_\_\_  
(Signature/Date)

Equipment Warranty and Certification must be signed by a Principal Person (President, Vice-President, etc.) of the equipment manufacturer. In the event the manufacturer is not the Supplier, than a Principal Person of the Supplier must also sign this form.

By: \_\_\_\_\_  
(Type Name and Title)

(Seal)

\_\_\_\_\_  
(Signature/Date)

**END OF SECTION**

## **SECTION 11202**

### **GROUNDWATER PUMP STATION**

#### **PART 1 - GENERAL**

##### **1.01 SCOPE**

- A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all work and services for complete installation of groundwater pump station and appurtenances as specified herein and as shown on the Drawings, in accordance with the provisions of the Contract Documents.
- B. The CONTRACTOR shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the OWNER of any discrepancy before performing the work.

##### **1.02 MANUFACTURER'S SERVICES**

- A. The CONTRACTOR shall obtain the services of the manufacturer's representative experienced in the installation, adjustment, and operation of the equipment specified. The representative shall supervise the installation, adjustment, and testing of the equipment.

##### **1.03 DELIVERY AND STORAGE**

- A. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants.

##### **1.04 SUBMITTALS**

- A. Submit shop drawings that include the following information:
  - 1. All dimensions, physical characteristics, and technical data for the wet well.
  - 2. Installation instructions and dimensions drawings.
  - 3. Manufacturer's Certificate of Compliance certifying compliance with the reference specifications and standards.
  - 4. Certified copies of factory tests as required by this specification.

## **PART 2 - PRODUCTS**

### **2.01 FIBERGLASS WET WELL**

#### **A. Wet Well Basin**

1. The wetwell shall consist of a heavy fiberglass basin adequately reinforced for buried service. The nominal dimensions of the wetwell basin shall be 72 inches diameter by a depth of 144 inches. The basin shall be molded of fiberglass reinforced resin of the lay-up and spray technique to assure that the interior surface is smooth and resin rich. The basin shall have a minimum wall thickness of 1/4-inch and a minimum of 25% glass fibers shall be used. A vertical heavy rib or bottom flange shall be provided for anchoring the basin in concrete to prevent floatation.

### **2.02 CONCRETE PAD**

- #### **A. Concrete shall be installed as specified in Section 03300 – Concrete.**

## **PART 3 - EXECUTION**

### **3.01 WET WELL INSTALLATION**

- #### **A. Wet well and appurtenances shall be installed in the position in the position indication on the drawings and in accordance with the manufacturer's written instructions.**

### **3.02 PIPING**

- #### **A. Installation of connecting force main shall be as specified in SECTION 15060, Piping System.**

**END OF SECTION**

## **SECTION 15060**

### **PIPING SYSTEM**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The WORK specified in this Section includes the installation of the leachate collection system, including the non-perforated and solid wall collection HDPE pipes and fittings, HDPE forcemains, HDPE slope riser pipes, and related hardware as shown on the Drawings and as specified herein.
- B. Related Work:
  - 1. Section 02220: Excavation, Backfill, Fill, Compaction, and Grading.
  - 2. Section 02940: Geotextile.
  - 3. Section 11200: Leachate Disposal Pumps
  - 4. Section 11202: Groundwater Pump Station

##### **1.02 MEASUREMENT AND PAYMENT**

- A. See Section 01025 – Measurement and Payment.

##### **1.03 SUBMITTALS**

- A. All product data shall be submitted, to the ENGINEER for approval, at least 7 calendar days prior to installation.
- B. Names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe and pipe fitting to be furnished.
- C. Manufacturer's certification that the high-density polyethylene (HDPE) pipe was manufactured from resins in compliance with these Specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM 1248.
- D. The HDPE pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D-2837, and the manufacturer shall provide a product supplying a minimum hydrostatic design basis (HDB) of 1,600 psi, as determined in accordance with ASTM D-2837. The manufacturer

must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D-3350 and F-714.

- E. Manufacturer and model information for HDPE elbows and fittings in accordance with Part 2, this Section.
- F. Details of elbows and fittings.
- G. Back-up rings and related hardware.

## **PART 2 - PRODUCTS**

### **2.01 PIPE AND FITTINGS (Polyethylene Force Mains, Leachate Riser and Leachate Collection Pipes)**

- A. Polyethylene pipe resins shall be high performance, high molecular weight, high density polyethylene (HDPE) conforming to ASTM D-1248 (Type III, Class C, Category 5, Grade P34), ASTM D-2513, and ASTM D-3350 (Cell Classification PE 345434C, with material designation of PE 3408). The pipe and fittings shall be manufactured with a minimum of 2 percent carbon black to withstand outdoor exposure without loss of properties. All HDPE pipe shall meet the requirements of ASTM F-714.
- B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, and Standard Dimension Rating (SDR). All pipe shall be minimum SDR of 15.5.
- C. All HDPE pipe and fittings shall be furnished by a single manufacturer who is fully experienced, reputable, and qualified in the manufacture of the items to be furnished. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same manufacturer's specification as the raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index and other physical properties.
- D. Pipe and perforations shall be of sizes as shown on in the Drawings. Pipe shall be furnished in standard laying lengths.
- E. Pipe shall be furnished perforated or non-perforated as specified and in the locations shown on the Drawings.
- F. Fittings: All HDPE fittings, including reducing tees, cross tees, and elbows shall be factory molded and/or fabricated with butt fusion. All fittings shall meet the requirements of ASTM D-3261 and F-714.
- G. Threaded HDPE plugs at each cleanout, as shown on the Drawings, and one socket adapter shall be provided.

H. Fitting at Leachate Sump Riser Pipe -

The 24-inch nominal diameter fitting connecting the HDPE leachate riser pipe and the leachate sump pipe shall be fabricated from HDPE meeting the specifications in Section 2.01 Pipe and Fittings and shall be equivalent to Phillips Driscopipe 1000 with an SDR of minimum 15.5. The manufacturer of the fitting shall determine after consulting the manufacturer of the leachate pumps, and provider of the HDPE riser pipe and sump pipe, the angle at which the fitting needs to achieve, and how the fitting will be fabricated to achieve the desired deflection angle. The fitting shall be constructed to allow the leachate pumps to be removed and replaced freely without the pump, discharge piping or motor leads being damaged.

**2.02 CORREGATED PLASTIC PIPE (STORMWATER DRAINAGE)**

Stormwater drainage culvert pipe shall be corrugated, smooth interior wall Model N-12, polyethylene pipe as manufactured by ADS, Inc., or Engineer-approved substitute.

- A. Pipe manufactured for this specification shall comply with and have certified requirements for test methods, dimensions and markings found in AASHTO M294 and MP7, current editions. Pipe and fittings shall be made from virgin PE compounds which conform to the requirements of cell class 335400C with SP-NCTL @ 15%/24hr as defined and described in ASTM D3350.
- B. Nominal sizes for this specification include 12– 48 inch and 60-inch diameters designated as AASHTO Type “S” (N-12) as full circular cross-section with an outer corrugated pipe wall and essentially smooth inner wall (waterway). Corrugations for AASHTO Type “S” shall be annular (N-12).
- C. Joints for this specification shall consist of in-line integral bell and spigot with rubber gasket that meets specification requirements of ASTM F477. Bell shall span over three spigot corrugations. Annular Type “S” (N-12) pipe has both Soil Tight and Water Tight joint designs. Soil Tight (N-12) pipe joints are designed to meet a laboratory pressure test of at least 2-psi following ASTM D-3212. Water Tight (N-12 WT) pipe joints are designed to meet a laboratory pressure test of at least 10.8-psi following ASTM D-3212.
- D. Fittings shall not reduce or impair the overall integrity or function of the pipeline. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings such as couplers and reducers, branch assembly fittings such as tees wyes and end caps. Couplers shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Only fittings supplied or recommended by the manufacture shall be used.

- E. Installation for this pipe specification shall be in accordance with ASTM D2321 and as recommended by the manufacture.
- F. All high-density polyethylene (HDPE) pipe used for culvert and storm drain applications shall conform to the requirements of AASHTO M294 current edition and be certified through the Plastics Pipe Institute (PPI) Third Party Certification program. All HDPE pipe delivered and used shall bear the Third Party Administered PPI seal.
- G. The latest revisions of the following standards are applicable as noted herein:
  - AASHTO M294: Standard Specification for Corrugated Polyethylene Pipe 12-inch to 48-inch diameter.
  - AASHTO MP7-97: Standard Specification for Corrugated Polyethylene Pipe 54-inch and 60-inch diameter.
  - ASTM D3350: Standard Specification for Polyethylene Pipe and Fittings Material.
  - ASTM D2321: Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
  - ASTM F477: Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
  - ADS STD-101: Manufacture's recommended Trench Installation Detail.

## **2.03 BACK-UP RING**

- A. Back-up ring shall be stainless steel, Type 316, plate type ANSI B16.5-B1, Class 150 pound. The boltheads and nuts for the back-up ring shall be hexagonal with machine threads manufactured of hot dipped galvanized steel. Galvanized steel flat washers shall be used. All back-up ring shall have 1/8-inch thick gaskets made of Hypalon.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. The installation of HDPE pipe and fittings shall be strictly in accordance with the manufacturer's technical data and printed instructions, at locations shown on the Drawings and as specified herein. All heat fusion joints shall be done by factory qualified fusion technicians.
- B. The CONTRACTOR shall use accepted industry practice in unloading and stockpiling material. HDPE pipe shall never be dumped or dropped from a truck



bed. HDPE pipe shall be lifted and placed on the ground, or rolled down ramps. HDPE pipe and other materials shall never be dragged along the ground.

- C. The CONTRACTOR shall stockpile material only in areas authorized by the ENGINEER. Material stockpiled in an unauthorized area shall be moved by CONTRACTOR at no cost to the OWNER. CONTRACTOR shall stockpile material to insure even and complete support for the material to prevent crimping, marring, crushing, piercing, or other damage. Maximum stacking height shall be limited to 6 feet. CONTRACTOR supplied material which is damaged shall be replaced at no additional cost to the OWNER.
- D. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will over stress or buckle the HDPE piping or impose excessive stress on the joints.
- E. Pipe shall be laid to line and grade, and with bedding and backfill material as shown on the Drawings.
- F. When laying is not in progress (including break times) the open ends of the pipe shall be closed by fabricated plugs, or by other approved means. All plugs shall be outside diameter fitting plugs. No plugs will be allowed that require insertion of the plug into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.
- G. Pipe shall be stored on clean level ground to prevent undue scratching or gouging. The handling of the pipe shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. The maximum allowable depth of cuts, scratches, or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges, or scratches.
- H. Sections of pipe with cuts, scratches or gouges deeper than recommended as acceptable by manufacturer shall be replaced at CONTRACTOR's expense.
- I. HDPE pipes joined using mechanical couplings:
  - 1. Mechanical joints shall be made in accordance with manufacturer's recommendations. CONTRACTOR will provide coupling equipment and trained operator.
  - 2. HDPE pipe coupling equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.

3. Before coupling HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.
  4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.
- J. HDPE pipes joined using fusion welding:
1. Fusion joints shall be made in accordance with manufacturer's recommendations. CONTRACTOR shall provide fusion equipment and trained operator(s).
  2. HDPE pipe fusion equipment shall be of the size and nature to adequately join all HDPE pipe sizes and fittings necessary to complete the project.
  3. Before fusing HDPE pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed.
  4. At the end of each day, all open ends of joined pipe shall be capped or otherwise covered to prevent entry by animals or debris.
- K. HDPE pipe installation:
1. Lengths of fused pipe (4 inches in diameter or greater) to be handled as one section shall not exceed 400 feet.
  2. HDPE pipe shall be allowed sufficient time to adjust to foundation soil temperature prior to any testing, segment tie-ins, and/or backfilling.
  3. The stub-ends, with stainless steel back-up ring, shall be fusion welded to the pipe as shown on the Drawings. Field fabricated bends conforming to the contours and grades of the cell shall to fabricated in the field.
- L. The ENGINEER shall be notified prior to any pipe being installed. The ENGINEER will inspect the following items at this time:
1. All mechanical and butt-fusion joints.
  2. Pipe integrity.
  3. Pipe foundation for rocks and foreign material.
  4. Proper trench or foundation slope.

5. Trench or foundation contour to ensure the pipe will have uniform and continuous support.

CONTRACTOR must correct any irregularities found by the ENGINEER during this inspection before lowering the pipe into the trench or otherwise covering the pipe.

- M. Damaged pipe that results in a reduction of the wall thickness beyond 10 percent shall be cut out and discarded. Damaged pipe shall be repaired according to manufacturer's recommendation, and at no additional cost to the OWNER.
- N. Protection of the Geomembrane:
  1. During installation of geotextile, rock, or pipe, no equipment shall be used that may damage the geomembrane.
  2. Areas of the geomembrane that will be exposed to traffic or other activities shall be protected by geotextiles, additional geomembrane, or other suitable materials. Any portion of the liner which becomes damaged or shows signs of excessive wear shall be replaced at no additional cost to the OWNER.

**- END OF SECTION -**

## **SECTION 15080**

### **PIPE, FITTINGS, VALVES, AND APPURTENANCES**

#### **PART 1 - GENERAL**

##### **1.01 SUMMARY**

- A. The work specified in this section includes supplying, fabricating, transporting, storing, quality control/quality assurance laboratory services required for the installation of the High Density Polyethylene (HDPE) pipe, as shown on the Drawings and as specified herein, in accordance with provisions of the Contract Documents.

##### **1.02 SUBMITTALS**

- A. All product (i.e., pipe, fittings, and valves) data shall be submitted, to the ENGINEER for approval, at least 15 calendar days prior to installation.
- B. The CONTRACTOR shall submit to the ENGINEER the names of the pipe, pipe fitting, and valve suppliers, certificates of compliance on materials to be furnished, and manufacturer's recommendations for storage, handling, installation, inspection, and repair of each type of pipe, pipe fitting, and valve to be furnished.
- C. The CONTRACTOR shall submit to the ENGINEER a manufacturer's certification that the HDPE pipe was manufactured from resins in compliance with these specifications. The certificate shall state the specific resin, its source and the specific information required by ASTM D 1248.
- D. The polyethylene pipe manufacturer shall provide certification that stress regression testing has been performed on the specific product. This stress regression testing shall have been done in accordance with ASTM D 2837.
- E. The manufacturer must warrant the pipe to be free from defects in material and workmanship in accordance with ASTM D 3350 and F 714.
- F. Verification that CONTRACTOR's pipe welding technician has been certified by the manufacturer to conduct heat fusion connections.

#### **PART 2 - PRODUCTS**

##### **2.01 LEACHATE COLLECTION AND REMOVAL SYSTEM**

- A. The HDPE pipe resins shall be high performance, high molecular weight, high density polyethylene (HDPE) conforming to ASTM D 1248 (Type III, Class C, Category 5, Grade P34), and ASTM D 3350 (Cell Classification PE 345434C, with material designation of PE 3408). The pipe and fittings shall be manufactured

with a minimum of 2 percent carbon black to withstand outdoor exposure without loss of properties. All HDPE pipe shall meet the requirements of ASTM F-714. The pipe shall be as manufactured by Driscopipe, or be an ENGINEER approved substitution.

- B. Each pipe length shall be marked with the manufacturer's name or trademark, size, material code, class, and Standard Dimension Ratio (SDR) of 11, as applicable.
- C. All HDPE pipe and fittings shall be furnished by a single manufacturer who is experienced, reputable, and qualified in the manufacture of the items to be furnished. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same manufacturer's specification as the raw material. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index and other physical properties.

## **2.02 PERFORATIONS**

- A. As indicated on the Drawings.
- B. As installed, the pipe shall be aligned to placed so that the perforations at the bottom of the pipe along to the trench.

## **2.03 VALVES AND METERS**

- A. Valves shall be butt fused Time Saver <sup>TM</sup>valves as manufactured by Rinker PolyPipe Materials or an ENGINEER approved substitution. The valves shall be ball type unless otherwise described in the Drawings, shall have a Viton seat and be of the line size into which they are installed.
- B. Flow meter shall be electromagnetic type, 3-inch diameter, Ultra Mag Model UM-06 as manufactured by Water Specialties (distributor: Avanti (853) 453-5336) with remote mounting kit.

## **PART 3 - EXECUTION**

### **3.01 TRANSPORTATION, HANDLING, AND STORAGE**

- A. Transportation: Care shall be taken not to cut, kink or otherwise damage the pipe material during transportation.
- B. Handling:
  - 1. Ropes, fabric or rubber-protected slings and straps shall be used when handling pipe materials.

2. Chains, cables, or hooks inserted into the pipe ends shall not be used. A sling with a spreader bar shall be used for lifting each length of pipe section. Pipe materials shall not be dropped or dragged on rocky or rough ground.
- C. Storage:
1. Pipe materials shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage them in accordance with manufacturer's recommendations.
  2. Stacking of the pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature conditions.
  3. Where necessary due to ground conditions, the pipe shall be stored on wooden pallets and supported to prevent deformation of the pipe.
- D. Pipe material which is damaged by the CONTRACTOR shall be replaced at no additional cost to the COUNTY.

### **3.02 EXCAVATION AND BACKFILL**

- A. All excavation in the preparation of horizontal access pipe shall be performed in accordance with the requirements of Section 02220 - Excavation, Backfill, Fill and Grading.

### **3.03 INSTALLING HDPE PIPE AND FITTINGS**

- A. The installation of pipe shall be in accordance with the manufacturer's recommendations.
- B. Upon satisfactory excavation of the pipe trench, pipe bedding shall be installed to provide continuous uniform support for the piping.
- C. The interior of all pipes shall be thoroughly cleaned of all foreign material before being lowered in the trench and shall be kept clean during laying operations by means of caps, or other industry-approved methods.
- D. Each pipe shall be carefully examined for damage (i.e., cuts, scratches, gouges) before being installed, and sections of pipe with damage exceeding manufacturer recommendations shall be replaced at CONTRACTOR's expense. Pipe shall be repaired according to manufacturer's recommendations.
- E. Under no circumstances shall pipe be installed in trenches that are excessively wet or have standing water. No pipe shall be installed when trench or weather

conditions are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary.

- F. Cutting shall be done with approved mechanical methods in a manner that will not damage the pipe. Pipe shall be firmly and uniformly supported during cutting and fusion activities. Care shall be taken that pipe is not disturbed until joints are cured. The maximum allowable depth of cuts, scratches or gouges on the exterior of the pipe is 10 percent of wall thickness. The interior pipe surface shall be free of cuts, gouges or scratches. Sections of pipe with cuts, scratches or gouges deeper than allowed shall be removed completely and ends of the pipeline rejoined.
- G. Each pipe section shall be joined in strict conformance with the pipe manufacturer's recommendations using approved equipment. Joining and installation of pipe shall be accomplished by a trained and authorized technician.
- H. The CONTRACTOR shall protect the pipe and workers from the build-up of static electricity, which can be generated in the pipe by friction from the handling of pipe in storage, shipping, and installation. The CONTRACTOR shall minimize the hazard of discharge by following recommendations by the pipe manufacturer, such as applying a film of water to the work surface to drain away the static electricity.
- I. When work is not being performed, the open ends of the pipe shall be closed by fabricated caps, or by other approved means. All caps shall be outside diameter fitting caps. No caps will be allowed that require insertion of the cap into the pipe. Any sediment or other contaminants allowed to enter pipe by failure to place cap over end shall be removed at CONTRACTOR's expense.
- J. The ENGINEER shall be notified prior to pipe being backfilled. The ENGINEER will inspect the following items at this time:
  - 1. All joints.
  - 2. Pipe integrity.
  - 3. Pipe bedding for foreign material.
  - 4. Proper slope.
  - 5. Trench contour to ensure the pipe will have uniform and continuous support.

Any pipe which is disturbed or found to be defective after installation shall be removed and replaced by the CONTRACTOR.

- K. The termination of the pipes shall be as shown on the Drawings.

### **3.04 INSTALLING VALVES**

- A. The installation of valves and appurtenances shall be strictly in accordance with manufacturer's technical data and printed instructions, at locations shown on the drawings and as specified herein. All valves shall be butt fused into the line.

### **3.05 MECHANICAL CONNECTIONS**

- A. Mechanical connections of the HDPE pipe to auxiliary equipment through flanged connections such as manholes, shall consist of the following:
  - 1. All stub ends and flange connections shall be thermally butt-fused to the ends of the pipe.
  - 2. A metal back-up ring shall be ductile iron and be sized to ANSI B16.6 outside diameter and drillings.
  - 3. Studs (Thread-rod), not bolts, shall be galvanized ASTM A-354 to connect flanges. All studs shall be coated, just prior to installation, with an anti-seize compound such as manufactured by Kopr-Kote or ENGINEER approved substitution.
  - 4. Other mechanical couplings such as 360 degree full circle clamps can be used only as approved by the ENGINEER.

### **3.06 INTERIM CLEANING**

- A. Care shall be exercised during fabrication to prevent the accumulation of dirt, pipe cuttings and filings, gravel, cleaning rags, etc. within piping sections. All piping shall be examined to assure removal of these and other foreign objects prior to assembly.

### **3.07 FINAL CLEANING AND VIDEO INSPECTION**

- A. Following assembly and testing and prior to final acceptance, all pipelines installed under this section, shall be flushed with water and all accumulated construction debris and other foreign matter removed. Flushing velocities shall be a minimum of 2.5-feet per second. Cone strainers shall be inserted in the connections to attached equipment and shall remain in place until cleaning is accomplished to the satisfaction of the ENGINEER. Accumulated debris shall be removed through fittings or appurtenances.
- B. Upon completion of installation, all pipes (groundwater collection system, leachate collection and detection systems) installed under this section shall be videotaped by the CONTRACTOR. The videotape shall be forwarded to the Engineer.



### **3.08 CERTIFICATION OF COMPLETION**

- A. Upon completion of the covering operation over the pipe, the CONTRACTOR shall certify in writing the following to the ENGINEER:
1. The piping system has been constructed in accordance with the approved project plans and specifications.
  2. The piping system has not been damaged during construction or the backfilling operation.

**- END OF SECTION -**

**EXHIBIT A**

**CQA PLAN**

**CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN  
FOR CONSTRUCTION OF THE HARDEE COUNTY LANDFILL EXPANSION  
PHASE II SECTION I**

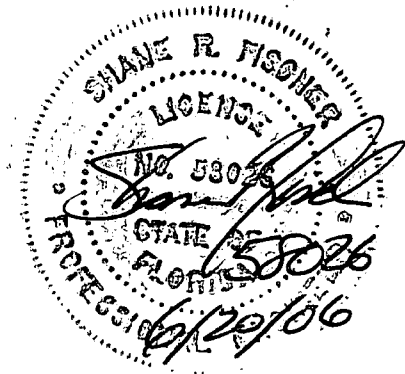
**Prepared for:**

Hardee County  
Board of County Commissioners  
205 Hanchey Road  
Wauchula, Florida 33873

**Prepared by:**

SCS ENGINEERS  
3012 U.S. Highway 301 North  
Suite 700  
Tampa, Florida 33619  
(813) 621-0080  
Florida Certificate of Authorization No. 00004892

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## **Forms**

Daily Field Report  
Certificate of Sub-Base Acceptance  
Geomembrane Placement Log  
Geomembrane Seaming Log  
Non-Destructive Test Log  
Destructive Test Log  
Geomembrane Repair Log  
Trial weld Log  
Geocomposite Placement Log  
Geogrid/Geonet Placement Log

## **SECTION 1**

### **INTRODUCTION**

#### **1.1 GENERAL**

This Construction Quality Assurance (CQA) Plan addresses the construction quality assurance and quality control testing, procedures and requirements for construction activities at the Hardee County Landfill, Phase II Section I. Construction activities include earthwork, piping, surveying, and installation of geosynthetic materials for the containment lining systems. The plan supplements the project plans and Specifications and has been prepared to meet requirements set forth in the Florida Administrative Code (FAC), Chapter 62-701.400.

## **SECTION 2**

### **DEFINITIONS**

#### **2.1 CONSTRUCTION QUALITY CONTROL (CQC)**

A planned system of inspections that is used to directly monitor and control the quality of a construction project. CQC is normally performed by the geosynthetic installer, or for natural soil materials by the Contractor, and is necessary to achieve quality in the constructed or installed system. (CQC refers to measures taken by the installer or Contractor to determine compliance with the requirements for materials and workmanship as stated in the plans and Specifications for the project.)

#### **2.2 CONSTRUCTION QUALITY ASSURANCE (CQA)**

A planned system of activities that provides the COUNTY and permitting agency quality assurance that the facility was constructed as specified in the design. CQA refers to measures taken by the ENGINEER or COUNTY to determine compliance with the requirements for materials and workmanship as stated in the plans and Specifications for the project. CQA includes construction observation and monitoring, materials testing, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. CQA refers to measures taken by the CQA organization to assess if the installer or Contractor is in compliance with the plans and Specifications for a project.

#### **2.3 MANUFACTURING QUALITY CONTROL (MQC)**

A planned system of inspections that is used to directly monitor and control the manufacture of a material which is factory originated. MQC is normally performed by the manufacturer of geosynthetic materials and is necessary to ensure minimum (or maximum) specified values in the manufactured product. MQC refers to measures taken by the manufacturer to determine compliance with the requirements for materials and workmanship as stated in certification documents and contract plans.

#### **2.4 MANUFACTURING QUALITY ASSURANCE (MQA)**

A planned system of activities that provides assurance that the materials were constructed as specified in the certification documents and contract plans. MQA includes manufacturing facility inspections, verifications, audits and evaluation of the raw materials and geosynthetic products to assess the quality of the manufactured materials. MQA refers to measures taken by the MQA organization to determine if the manufacturer is in compliance with the product certification and contract plans for a project.



## **SECTION 3**

### **QUALIFIED PARTIES AND RESPONSIBILITIES**

The principal parties involved in the CQA and CQC of the facility include the Permitting Agency, COUNTY, ENGINEER, CQA Consultant, Contractor, Soils CQA Laboratory, Geosynthetics Manufacturer, Geosynthetics Installer, and Geosynthetics Laboratory. The general responsibilities of each of these parties are described in the following subsections. The responsibility and/or authority of a given party may be modified or expanded as dictated by specific needs as construction progresses.

#### **3.1 PERMITTING AGENCY**

The Permitting Agency is authorized to issue the permit for construction based on review and acceptance of the permit application. The Permitting Agency must have issued a permit for the project prior to the commencement of construction. As construction progresses, the Permitting Agency has the responsibility and authority to review and accept design revisions or requests for variance submitted by the COUNTY.

#### **3.2 COUNTY**

The COUNTY is responsible for the facility, including coordinating the design and construction of the landfill features. This responsibility includes compliance with the permit and the submission of CQA documentation demonstrating that the facility was constructed in accordance with the permit documents and the design plans and Specifications.

The COUNTY has the authority to contract and manage parties charged with design, CQA, and construction activities. The COUNTY also has the authority to accept or reject design plans and Specifications, CQA plans, reports, and recommendations of the CQA Consultant, and the materials and workmanship of Contractors.

#### **3.3 ENGINEER**

The ENGINEER is responsible for the preparation of the design, including Drawings, plans and project Specifications for construction, and this CQA plan.

The ENGINEER is responsible for performing the engineering design and preparing the associated Drawings and Specifications and for approving all design and Specification changes and making design clarifications necessitated during construction. The ENGINEER shall be a professional skilled in the appropriate discipline, certified or licensed as required by regulation. The ENGINEER shall be familiar with the construction details and applicable regulatory requirements.

### **3.4 CQA CONSULTANT**

The CQA Consultant is a party independent of the Contractor(s), Geosynthetic Manufacturer or Installer, and is responsible for field testing, observing, and documenting activities related to the construction and/or permit documents and the CQA Plan. The CQA Consultant is represented on-site by the CQA monitoring personnel and supporting on-site CQA monitoring personnel as appropriate. In general, the responsibilities and authorities of the CQA Consultant include:

- Understanding the permit documents, design plans, and Specifications in relation to all aspects of the CQA Plan.
- Scheduling, coordinating, and performing CQA activities.
- Performing independent on-site observation of the work in progress to assess compliance with the CQA Plan, permit documents, design plans and Specifications.
- Reporting deviations from the CQA Plan, permit documents, design plans and/or Specifications to the COUNTY. Secure documents from the COUNTY which approve the changes.
- Verifying that the Installer's test equipment meets testing and calibration requirements, and that tests are conducted according to procedures defined in the CQA Plan.
- Recording and maintaining test data.
- Verifying that corrective measures are implemented.
- Documenting and reporting CQA activities, and collecting data needed for record documentation, including photographs.
- Maintaining open lines of communication with other parties involved in the construction.
- Preparing the Final Documentation Report, complete with certification statements.

### **3.5 CONTRACTOR**

The Contractor is responsible for excavation of soil and rock, and placement and compaction of the soil and aggregate materials using procedures and equipment necessary to produce the results in conformance with the Contract Documents. The Contractor may also be responsible for the preparation and completion of anchor trenches, dewatering, and other site-specific responsibilities as required by the Contract Documents.

### **3.6 GEOSYNTHETICS MANUFACTURER**

The Geosynthetics Manufacturer(s) is responsible for the production of geosynthetics including geomembranes, geonets, geotextiles, geocomposites, geosynthetic clay liners (GCL) and geogrids which meet the requirements in the Specifications. The Geosynthetics Manufacturer is responsible for providing adequate documentation regarding the characteristics of the raw material, final product, the testing performed to verify the characteristics and the MQC measures taken during manufacturing.

The Geosynthetics Manufacturer(s) is responsible for the transportation of the geosynthetics from the manufacturing plant to the site. The Geosynthetics Manufacturer(s) is responsible for loading and transporting geosynthetics and for damage to the geosynthetics which may occur during these operations.

### **3.7 GEOSYNTHETICS INSTALLER**

The Geosynthetics Installer is responsible for unloading, field handling, storing, seaming, and temporarily loading against wind and other aspects of the geosynthetics installation in accordance with this CQA plan and the Specifications.

The Geosynthetics Installer is responsible for the preparation of the panel layout drawing including dimensions and details, and for providing the installation schedule and a list of proposed field personnel and their qualifications. During installation, the Geosynthetics Installer is responsible for providing CQC documentation and subbase acceptance certificates. Upon completion of the installation, the Geosynthetics Installer shall provide the geomembrane documentation, the Manufacturer's warranty, and the installation warranty.

### **3.8 CQA GEOSYNTHETICS LABORATORY**

The CQA Geosynthetics Laboratory is responsible for performing the laboratory tests on geosynthetic materials as required by the Specifications. The CQA Geosynthetics Laboratory is also responsible for providing documentation of testing equipment used, analytical results and test methods followed. All results should be reported to the CQA Consultant.

### **3.9 CQA SOILS LABORATORY**

The CQA Soils Laboratory is responsible for performing the laboratory testing on soils and aggregate required by the CQA Manual and for providing documentation of analytical results, test methods followed, and testing equipment used. Work schedules and tests of the CQA Soils Laboratory should be reported to the CQA Consultant.

### **3.10 CQC SOILS LABORATORY**

The CQC Soils Laboratory is responsible for performing the laboratory testing on soils and aggregate required by the CQA Manual and for providing documentation of analytical results, test

methods followed, and testing equipment used. Work schedules and tests of the CQC Soils Laboratory should be reported to the Contractor and CQA and CQC Consultants.

## **SECTION 4**

### **COMMUNICATIONS AND MEETINGS**

Continuous communications between parties involved in the construction and CQA of this project, including the COUNTY, Engineer, Contractor, Geosynthetics Manufacturer, Geosynthetics Installer, CQA/CQC Consultant, and Permitting Agency, coupled with regularly scheduled meetings are necessary components of this plan. Such communication and meetings are intended to resolve construction quality and design issues as early as possible, to keep all parties informed of schedules, and verifying that the work is proceeding in accordance with Specifications, schedules and this CQA plan. At a minimum there should be a Pre-Construction Meeting, regular Progress Meetings, and Construction Resolution Meetings, as described below:

#### **4.1 PRE-CONSTRUCTION MEETING**

The Pre-Construction Meeting shall be held at least 1 week prior to start of construction and should be attended, at a minimum, by the COUNTY, Engineer, Geosynthetics Installer superintendent, the CQA Consultant, and the Contractor and surveyor. Specific topics at this meeting include, but are not limited to:

- Introduction of all personnel and review the responsibilities of each party, establish project communication, and delineate authority.
- Review the time schedule for construction, including material shipment and working hours.
- Review methods for documenting and reporting, and for distributing documents and reports.
- Establish protocols for testing, handling deficiencies, repairs, and retesting.
- Review seam testing and repair procedures, layout and numbering systems for panels and seams.
- Establish rules for writing on the geomembrane, i.e., who is authorized to write, what can be written and in what color.
- Outline procedures for packaging and storing archive samples.
- Establish locations for soil and geosynthetic materials stockpile.
- Review status of required submittals from Geosynthetics Installer and Contractor.

- Review project specific permit requirements.

The Engineer or County shall record and distribute the meeting minutes to all parties involved.

#### **4.2 PROGRESS MEETINGS**

Progress Meetings shall be held at a mutually agreed upon day and time, usually once a week, and attended by representatives of the Geosynthetics Installer, Contractor, CQA Consultant, COUNTY, Engineer, and other parties that may be involved in specific activities occurring at that period of time. Meeting minutes shall be prepared by the CQA Consultant and distributed to all parties in attendance in addition to the established distribution list for project communications.

Topics for the Weekly Progress Meetings shall include, but are not limited to:

- Work progress to date, and scheduled activities for the subsequent week(s).
- Review of construction issues including questions on Specifications, design, materials test results, test failures, retests, procedures, weather conditions, working hours, holidays, communications, minutes from previous meetings, problems and resolutions, documentation, Material Quality Control (MQC) certificates, and other project related topics.

#### **4.3 CONSTRUCTION RESOLUTION MEETINGS**

In some cases, construction issues or problems arise that demand specific attention outside of the regular Progress Meetings, and may include parties not available at regular Progress Meetings. Such meetings shall be held as necessary to resolve construction problems or issues in a timely manner so that work can proceed. To the extent possible, these meetings shall be scheduled such that the key parties are available. Meeting minutes shall be prepared by the County and Engineer, and distributed to the established distribution list for project communications.

## **SECTION 5**

### **EARTH MATERIAL QUALITY ASSURANCE**

#### **5.1 GENERAL**

This section of the plan describes CQA procedures for earth material (e.g. soil and rock) components of the project. CQC testing and Contractor installation requirements are outlined in the project Specifications.

#### **5.2 TESTING PROGRAM**

The two categories of quality assurance testing covered in this plan include Pre-Construction Testing and Construction Testing. Within these categories, quality assurance testing shall consist of the following:

- Material Evaluation.
- Construction Quality Evaluation.
- Special Testing.

#### **5.3 MATERIAL EVALUATION**

Pre-construction material evaluations shall be performed on samples from potential soil borrow sources to ascertain their acceptability as construction materials. Construction testing shall be performed during the course of the work to verify material compliance with the project Specifications. Unless otherwise indicated in the project Specifications the following tests shall be performed:

- Natural moisture content (ASTM D 2216).
- Particle Size Analysis (ASTM D 422).
- Atterberg Limits (ASTM D 4318).
- Proctor Compaction Test (ASTM D 698 (Standard) or D 1557(Modified)).

Criteria to be used for determination of acceptability of earth materials for use during construction shall be as defined in the project Specifications. All evaluation tests are to be performed in the CQA Soils Laboratory that has been approved for use by the COUNTY Engineer. Test reports will verify compliance with or state deviation from the applicable ASTM Standards or other accepted standards as outlined in the Specifications.

All soil materials shall meet or exceed the project Specifications.

### **5.3.1 Hydraulic Conductivity Evaluations**

Hydraulic conductivity evaluations shall be conducted on materials proposed for use in the construction of the low permeability soil layer and sand drainage layers. Acceptance criteria of low permeability soils based on measured values of hydraulic conductivity shall be based on project Specifications. Tests may be performed using laboratory equipment and methods that are suitable for the soil type. High permeability materials, such as gravels and sands may be tested using constant head methods in rigid wall or flexible wall permeameter. Low permeability materials such as clays and silts may also be tested in rigid or flexible wall permeameters using falling head methods, provided that sample preparation is performed carefully.

In situ hydraulic conductivity tests methods may be employed to measure test fills as described below.

### **5.3.2 Low Permeability Soil**

Prior to construction of the low permeability soil liner, a test fill (or small-scale test pad) may be constructed to verify that the soil liner material, compaction equipment, and construction methods can produce a liner that meets hydraulic conductivity requirements as indicated in the Specifications. The test fill will be useful in the evaluation of equipment, procedures, soil density and moisture content as related to hydraulic conductivity, and possibly reduce the number of field samples or penetrations that are taken in the constructed soil liner. By monitoring field density, moisture content, degree of saturation at placement, and field and laboratory hydraulic conductivity, the relationship between these factors can be ascertained for use in evaluation of the soil liner construction. This information will also be useful for the Contractor to determine if areas are likely to meet hydraulic conductivity requirements prior to completion of laboratory or field conductivity testing. Other factors such as clod size, compactive effort, soil plasticity and grain-size distribution are also useful in development of these relationships.

Testing procedures for the test fill are outlined in the Specifications. In general, the test fill is built to the same specifications as the soil liner, and may constitute a portion of the actual soil liner, except that more frequent testing is required.

Successful hydraulic conductivity testing within the test fill using the Two-Stage Borehole procedures as described by Boutwell (1992), or other similar field method, may preclude the need to perform field hydraulic conductivity testing within the soil liner. This will allow the Geosynthetics Installer to proceed with geomembrane placement as soon as the soil liner has been completed, which reduces the possibility that the exposed soil liner will be negatively impacted by weather conditions while the tests are underway.

### **5.3.3 Drainage Soil Testing**

Prior to the installation of the drainage soil, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for



approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation and permeability.

#### **5.3.4 General Fill Soil Testing**

Prior to the installation of the general fill, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation, atterberg limits, and a proctor test.

#### **5.3.5 Structural Fill Soil Testing**

Prior to the installation of the structural fill, the Contractor or CQC Consultants shall provide the test results on the soil, as required by the project specifications, to the County or Engineer for approval. Upon receipt to the test information, the CQA Consultant will collect one random sample from the material delivered to the site and test it for gradation, atterberg limits, a proctor test, and conduct one LBR (limerock Bearing Ratio) test on the material.

### **5.4 CONSTRUCTION QUALITY EVALUATION**

Construction quality evaluation shall be performed on all soil components of the construction. These evaluations shall be performed at the frequencies indicated in the Specifications. Criteria to be used for determination of acceptability of the construction work shall be as identified in the project Specifications.

Construction evaluation testing includes the visual observations of the work, layer bonding, and clod sizes; in-place density/moisture content testing; surveys of as-built conditions and elevations; thickness monitoring; and special testing. Observations of the construction work shall include the following:

- Clod size and other physical properties of the soil during processing, placement and compaction.
- Thickness of lifts as loosely placed and as compacted.
- Action of the compaction equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.).
- Procedures used to prevent desiccation and/or freezing of completed lifts and layers.

Determinations of in-place moisture and density shall be performed in accordance with the Specifications.

#### **5.4.1 Deficiencies**

If defects are discovered in the earthwork, the extent and nature shall be evaluated by the CQA Consultant. If a defect is indicated by a failing test, the CQA Consultant shall determine the limits of the affected area by additional tests, observations, a review of records, and other means deemed appropriate. If the defect is related to adverse site conditions, the CQA Consultant shall define the limits and nature of the defect.

#### **5.4.2 Notification**

The CQA Consultant shall notify the COUNTY and Contractor after determining the nature and extent of the defect. Appropriate retests shall be scheduled by the CQA Consultant when the work deficiency is corrected.

#### **5.4.3 Repairs and Retesting**

Deficiencies shall be corrected by the Contractor to the satisfaction of the CQA Consultant. The CQA Consultant shall also verify that all installation requirements have been met and that all submittals are provided.

### **5.5 SPECIAL TESTING**

Special testing to determine the acceptability of materials shall be conducted at the direction of the COUNTY, the Engineer or their representative. Criteria to be used for the determination of acceptability shall be as established by the COUNTY, the Engineer or their representative.

## SECTION 6

### GEOSYNTHETIC MATERIAL QUALITY ASSURANCE

#### 6.1 GEOMEMBRANES

This quality assurance testing program has been established to verify that specified geomembranes are manufactured, installed and tested according to the project Specifications.

##### 6.1.1 Manufacturer Quality Control Documentation

The Geomembrane Manufacturer shall provide documentation and certification that the material meets the requirements outlined in the Specifications and that adequate quality control measures have been implemented during the manufacturing process.

The following should be provided prior to shipment of the geomembrane:

- A properties value certification including at a minimum, guaranteed values for all geomembrane properties required by the Specifications.
- An inventory list of quantities with descriptions of materials which comprise the geomembrane shipment(s).

The CQA Consultant shall verify that the property values certified by the Geomembrane Manufacturer meet the test methods listed in of the Specifications and Manufacturer's guaranteed minimum values.

##### 6.1.2 Manufacturer's Quality Control Certificate

Prior to shipment, the Geomembrane Manufacturer shall also provide the CQA Consultant with quality control certificates for the geomembrane, signed by a responsible party employed by the Geomembrane Manufacturer. The Manufacturer shall be required to perform, at a minimum, the tests listed in the Specifications.

The CQA Consultant shall review the certificates and verify that the quality control certificates have been provided at the specified frequencies for all materials and rolls. The CQA Consultant shall also review the quality control certificates and verify that the test methods meet the requirements included in the Specifications and the Manufacturer's guaranteed minimum values which were provided prior to shipment.

#### **6.1.2.1 Delivery and Storage--**

Upon delivery to the site, visual inspection by the Installer and the CQA Consultant shall be conducted on all rolls for evidence of defects or damage. This inspection shall be done without unrolling the rolls unless damage or defects are detected.

During or following this visual inspection, the CQA Consultant, with the assistance of the Installer or Contractor, shall remove samples to be tested for conformance with the Specifications.

The Installer shall be responsible for the storage of the geomembranes on-site. The storage space shall provide protection from theft, vandalism, and traffic. The storage location shall be such that exposure to environmental factors, construction activities and handling are minimized.

#### **6.1.2.2 Conformance Sampling and Testing--**

The CQA Consultant shall obtain the required number of conformance test samples from the geomembrane upon delivery to the site. These samples shall be sent to the CQA Geosynthetics Laboratory for testing to verify conformance to the values listed in the Specifications. These tests shall be performed prior to installation.

Samples shall be selected by the CQA Consultant and shall not include the first complete revolution. The sample shall be a minimum four feet, as measured along the width of the roll, and extend three feet along the roll. Samples shall be taken at a rate of one per lot, but at a rate not less than one conformance test per 100,000 square feet or portion thereof.

Prior to the deployment of the geomembrane, the CQA Consultant shall review all conformance test results and report any nonconformance to the COUNTY. The CQA Consultant shall be responsible for verifying that all the test results meet or exceed the property values listed in the Specifications.

If failing test results may be the result of the sampling process or due to the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test result shall be rejected, or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications (this procedure is valid only when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

### **6.1.3 Subgrade Preparation and Acceptance**

The Contractor shall be responsible for preparing the subgrade upon which the geomembrane will be placed according to the Specifications.

Prior to acceptance, the CQA Consultant shall verify that:

- A qualified land surveyor has verified all lines and grades.
- The supporting soil meets the density and moisture Specifications, and provides a firm, unyielding foundation.
- The surface to be lined is relatively smooth and free of stones, protrusions, irregularities, roots, loose soil, abrupt changes in grade, or other conditions that may puncture or abrade the geomembrane.
- There is no standing water or areas excessively softened by high moisture content, large desiccation cracks.
- All subgrade density, moisture content, hydraulic conductivity tests, or other tests have been completed and meet Specification requirements, and that no other tests are necessary.

The Installer shall certify, in writing, that the surface on which the geomembrane will be installed is acceptable. A Certificate of Acceptance shall be given by the Installer to the CQA Consultant prior to commencement of geomembrane installation in the area under consideration and a copy of this certificate provided to the COUNTY.

After the supporting soil has been accepted by the Installer, it shall be the Installer's responsibility to indicate to the CQA Consultant any change in the supporting soil condition that may require correction. If the CQA Consultant concurs with the Installer, then the COUNTY shall ensure that the supporting soil is repaired.

### **6.1.4 Subgrade Repair**

At any time during the geomembrane installation, the CQA Consultant shall indicate to the Installer and COUNTY locations which may not provide adequate support to the geomembrane so the areas in question can be tested and, if necessary, repaired.

Special care shall be taken to avoid desiccation cracking of an underlying soil liner in a composite liner system. To that end the soil surface shall be observed by the Installer and the CQA Consultant and the decision to repair cracks, if any, shall be made by the COUNTY and the ENGINEER.

### **6.1.5 Anchor Trenches**

The CQA Consultant shall verify that the anchor trench has been constructed according to design Drawings and Specifications.

Rounded or smoothed corners shall be provided where the geomembrane enters the trench so as to avoid sharp bends in the geomembrane. No loose or excessively wet soil shall be allowed to underlie the geomembrane in the anchor trench.

The anchor trench shall be adequately drained to prevent ponding or otherwise softening of the adjacent soils while the trench is open. The anchor trench shall be carefully backfilled and compacted by the Contractor or the Installer, as outlined in the Specifications. Care shall be taken when backfilling the trenches to prevent bridging of the geomembrane or damage.

### **6.1.6 Field Panel Identification**

The CQA Consultant shall verify that each field panel is given a unique identification code (number or letter-numbered) consistent with the layout plan. This identification code shall be agreed upon by the Installer and CQA Consultant. The CQA Consultant and Installer shall establish a table or chart showing correspondence between roll numbers and field panel identification codes. The field panel identification code shall be used for all quality assurance documentation.

The CQA Consultant shall verify that field panels are installed at the location indicated in the Installer's layout plan, as approved or modified, and that the Installer has marked the identification code and roll number on each installed panel. The Installer and CQA Consultant shall also verify that the condition of the supporting soil has not changed detrimentally during installation. The CQA Consultant shall record the identification code, location, and date of installation of each field panel.

### **6.1.7 Field Panel Placement and Deployment**

Geomembrane panel placement shall not be done during any precipitation, in the presence of excessive moisture (e.g., fog, dew), in areas of ponded water, or in the presence of strong winds. Manufacturer's recommendations or the Specifications should be followed, whichever is more stringent, for extreme ambient temperature conditions.

Panels shall be oriented according to the Installer's panel layout drawing as approved by the CQA Consultant and COUNTY. Seams shall be located outside of areas of potential high stress conditions, at slope intersections and corners, or other areas considered critical. Horizontal seams on slopes steeper than 10 (horizontal) to one (vertical) shall be avoided. The CQA Consultant shall review the seam orientations prior to seaming operations to determine if these conditions are satisfied.

The CQA Consultant shall verify that the geomembrane handling equipment used does not pose risk of damage to the geomembrane or subgrade, and that the Installer's personnel take care in handling the geomembrane at all times.

Contact between the soil liner and the geomembrane shall be maintained in all areas. The Installer shall take into account ambient temperature and its effect on the thermal expansion and contraction of the geomembrane. The geomembrane materials shall be deployed in a manner which minimizes wrinkling. Partial backfilling of anchor trenches, adequate loading of the toe of slope during lower ambient temperatures is recommended to prevent displacement by bridging.

The CQA Consultant shall also verify and notify the COUNTY that:

- Equipment used does not damage the geomembrane during trafficking, handling, excessive heat or other means.
- The method of deploying the geomembrane does not cause excessive scratches or crimps in the geomembrane, and does not damage the approved subgrade surface.
- Personnel working on the geomembrane do not smoke or wear damaging shoes.
- The geomembrane is protected by appropriate means in areas of excessive traffic.
- Adequate ballast (e.g., sand bags) has been placed to prevent wind uplift and is not likely to damage the geomembrane. Continuous loading is recommended along edges of panels in high winds, or when work is terminated for several days or longer periods.

The CQA Consultant shall visually inspect each panel for defects or damage after placement and prior to seaming. Damaged panels or portions of damaged panels shall be marked and repaired, or removed from the work area. Repairs shall be made according to procedures described in the Specifications.

### **6.1.8 Field Seaming**

#### **6.1.8.1 Personnel Requirement--**

The Installer shall be prequalified in accordance with the Specifications and approved by the COUNTY.

The Installer's Superintendent shall be qualified based on previously demonstrated experience, management ability, and authority. The Superintendent is responsible for the Installer's field crew and will represent the Installer at all project meetings.

#### **6.1.8.2 Seam Layout--**

Prior to the installation of geomembrane, the Installer shall provide the COUNTY and CQA Consultant with a panel layout drawing showing all expected major panel seams. The COUNTY or ENGINEER shall approve in writing the panel layout drawing.

#### **6.1.8.3 Seaming Methods--**

Accepted seaming methods consist of those recommended by the Manufacturer of the geomembrane product, and which will result in seams that meet testing requirements as indicated in the Specifications for both destructive and non-destructive samples.

For polyethylene geomembranes, the accepted methods include extrusion and fusion-welding.

Proposed alternate methods shall be documented by the Installer and CQA Consultant. The CQA Consultant shall review all documentation regarding alternative seaming methods to be used. The COUNTY or Engineer shall approve in writing any alternative seaming methods.

Fusion-welding apparatus shall be an automated, roller-mounted device. The fusion-welding apparatus shall be equipped with gauges indicating the applicable temperatures and pressures. The CQA Consultant shall log ambient, seaming apparatus, and geomembrane surface temperatures as well as seaming apparatus pressures.

Extrusion-welding apparatus shall be equipped with gauges indicating the temperature in the apparatus and at the nozzle.

The Installer shall provide documentation regarding the extrudate to the CQA Consultant, and shall certify that the extrudate is compatible with the Specifications and is comprised of the same resin as the geomembrane sheeting.

The CQA Consultant shall log apparatus temperatures, extrudate temperatures, ambient temperatures, and geomembrane surface temperatures at appropriate intervals.

#### **6.1.8.4 Seam Preparation--**

The CQA Consultant shall verify that:

- Seams are aligned with the fewest possible number of wrinkles and "fishmouths".
- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris of any kind, and foreign material.
- If seam overlap grinding is required, the process is completed according to the Manufacturer's instructions within one hour of the seaming operation, and does not damage the geomembrane.



- For cross seams, the edge of the cross seam is ground to a smooth incline (top and bottom) prior to welding.
- A smooth insulating plate or fabric is placed beneath the hot welding apparatus after usage.
- The geomembrane is protected from damage in heavily trafficked areas.
- A movable protective layer (i.e., plywood, geomembrane) may be used as necessary directly below each overlap of geomembrane that is to be seamed to prevent buildup of moisture between the sheets.
- The panels of geomembrane have a finished overlap of 4 inches for extrusion welding and 6 inches for fusion welding, but in any event sufficient overlap shall be provided to allow peel tests to be performed on the seam.
- The procedure used to temporarily bond adjacent panels together does not damage the geomembrane.

#### **6.1.8.5 Weather Conditions for Seaming--**

The Installer and CQA Consultant shall observe weather conditions during seaming operations to determine if excessive temperatures, moisture or humidity, or winds exist that could impact the welding process. Manufacturer's recommendations shall be followed for seaming under extreme weather conditions, unless otherwise approved by the COUNTY and CQA Consultant based on the Installer's experience and recommendations.

As indicated in the Specifications, welding shall not occur when ambient air temperatures measured one-foot above the geomembrane are below 32-degrees F or above 104-degrees F and as noted in the Specifications. Preheating of the seams may be used if trial seams have been performed using the same preheating method(s) and meet all criteria for acceptance. Wind conditions shall also be considered in determination of acceptable ambient conditions.

#### **6.1.8.6 General Seaming Procedures--**

During seaming, the CQA Consultant shall verify the following conditions:

- Seaming shall extend to the outside edge of panels placed within the anchor trench.
- A firm substrate shall be provided using a flat board or similar hard surface directly under the seam overlap to achieve proper support, if necessary.
- "Fishmouths" or wrinkles at the seam overlap shall be cut along the ridge in order to achieve a flat overlap. The cut "fishmouth" or wrinkle shall be seamed and any portion

where the overlap is inadequate shall be patched with an oval or round geomembrane patch that extends a minimum of 6 inches beyond the cut in all directions.

- Adequate lighting shall be provided if seaming operations are performed at night or during periods of diminished natural light.
- Startup testing is conducted and recorded prior to initiating welding.

#### **6.1.9 Seam Testing**

##### **6.1.9.1 Nondestructive Testing of Field Seams--**

The Installer shall nondestructively test all field seams over their full length using a vacuum test unit, air pressure test (double fusion seams only), or other approved method. The purpose of this testing is to determine the continuity of the seams only. Nondestructive testing shall be performed as work progresses, not at completion.

The CQA Consultant shall observe nondestructive testing procedures and inform the Installer and COUNTY of required repairs. The CQA Consultant shall record the location, date, name, and outcome of all testing.

The Installer shall complete required repairs in accordance with the Specifications. The CQA Consultant shall observe the repair and testing of the repair, document the repair and test results, and mark on the geomembrane that the repair has been completed. All repairs shall be shown on the record Drawings, or if this is not practical, noted in repair logs and on daily reports.

Vacuum testing equipment and methods are discussed in the Specifications.

Air pressure testing procedures are applicable to fusion-welding that produces a double seam with an enclosed air channel. The equipment and methods are discussed in the Specifications.

##### **6.1.9.2 Destructive Testing--**

Destructive seam tests shall be performed on seam samples cut from the geomembrane locations selected by the CQA Consultant. The purpose of these tests is to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of all field seaming.

The CQA Consultant shall select locations where seam samples will be cut by the installer for laboratory testing. Those locations shall be established as follows:

- A minimum average frequency of one test location per 500 feet of seam length or one test location per seam, whichever is greater.
- At least one location for each seaming machine each day.

- At locations where the CQA Consultant suspects that inadequate seaming methods or conditions occurred or other factors causing to reduce seam strength exist.

The Installer shall not be informed in advance of the locations where the destructive seam samples will be taken.

#### **6.1.9.3 Sampling Procedures--**

Samples shall be cut by the Installer at locations selected by the CQA Consultant as the seaming progresses, such that laboratory test results are available before the geomembrane is covered by another material.

The CQA Consultant shall observe the sample cutting, assign a number to each sample, and mark it accordingly, and record the sample location on the layout drawing.

All holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired in accordance with specified repair procedures. The continuity of the new seams in the repaired area shall be non-destructively tested according to procedures described herein.

The sample for laboratory testing shall be 12 inches wide across the seam by 42 inches long with the seam centered lengthwise. The sample shall be cut into three segments and distributed as follows:

- 12 inches x 14 inches to the Installer for laboratory testing.
- 12 inches x 14 inches to the CQA Geosynthetics Laboratory for testing.
- 12 inches x 14 inches to the COUNTY for archive storage.

The CQA Consultant is responsible for packaging and shipping samples to the CQA Geosynthetics Laboratory in a manner that will not damage the samples.

#### **6.1.9.4 CQA Geosynthetics Laboratory--**

Testing shall include ASTM D-6392 "Practice for Determining the Integrity of Field Seams Used in Joining Polymer Sheet Membranes". The minimum acceptable values to be obtained in these tests are those indicated in the Specifications. At least five specimens shall be tested for each test method. Specimens shall be selected from the samples and tested alternately (i.e., peel, shear, peel, shear, etc.). For double wedge welds, both inner and outer seams shall be tested and determined to be acceptable.

The CQA Geosynthetics Laboratory shall provide verbal test results no more than 24 hours after they receive the samples. The CQA Consultant shall review laboratory test results as soon as they become available, and make appropriate recommendations to the Installer.

#### **6.1.9.5 Procedures for Destructive Test Failures--**

All acceptable seams must be bounded by two locations from which samples passing laboratory destructive tests have been taken. In cases exceeding 150 feet (50 m) of reconstructed seam, a sample taken from the zone in which the seam has been reconstructed must pass destructive testing.

The procedures outlined in the Specifications shall apply whenever a sample fails a destructive test, whether that test is conducted by the CQA Consultant, the Installer, the Contractors independent CQC laboratory, or by field tensiometer.

The CQA Consultant shall document all actions taken in conjunction with destructive test failures.

#### **6.1.10 Defects, Repairs and Wrinkles**

The entire geomembrane, including seams, shall be visually examined by the CQA Consultant for identification of visual defects, holes, blisters, undispersed raw materials and signs of contamination by foreign matter. The surface of the geomembrane shall be clean at the time of examination. The geomembrane surface shall be swept or washed by the Installer if dust, mud or other matter inhibits examination. All areas having defects and/or requiring repairs shall be repaired.

Work shall not proceed with any materials which will cover locations which have been repaired until the CQA Consultant has re-examined the repaired area and applicable laboratory test results with passing values are available.

Panels or portions of panels which are, in the opinion of the CQA Consultant, damaged beyond repair shall be removed from the site and replaced. Damage, which in the CQA Consultant's opinion, can be repaired may be repaired or replaced.

Any portion of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test shall be repaired. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the CQA Representative, Installer, and ENGINEER.

Each repair shall be numbered and logged. Each repair shall be non-destructively tested using the methods described in the Specifications as appropriate. Repairs which pass the non-destructive test shall be taken as an indication of an adequate repair. Large caps may be of sufficient extent to require destructive test sampling, at the discretion of the CQA Consultant. In the case of failed tests, the repair shall be redone and retested until a passing test results. The CQA Consultant shall observe all repairs and all non-destructive testing of repairs, note on the membrane that it has been repaired, and document each repair thoroughly.

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA Consultant shall

indicate which wrinkles should be cut and re-seamed by the Installer. Wrinkle size shall be evaluated during the time of day and under conditions similar to those expected when overlying protective cover/drainage layer material is to be placed. All wrinkles higher than they are wide (across their base) or more than 6 inches high shall be removed by repair methods and retested.

## **6.2 GEOTEXTILES**

This quality assurance testing program has been established to verify that specified geotextiles are manufactured, installed and tested according to project Specifications.

### **6.2.1 Manufacturer Quality Control Documentation**

The Geotextile Manufacturer shall provide the CQA Consultant with the following information prior to the installation of the geotextile:

- A list of materials which comprise the geotextile and a Specification for the geotextile which includes all properties contained in the project Specifications measured using the appropriate test methods.
- Written certification that the minimum average roll values given in the Specification are guaranteed by the Manufacturer.
- Written certification that the Manufacturer has continuously inspected the geotextile for the presence of needles and found the geotextile to be needle free.
- Quality control certifications, which shall include roll identification numbers, sampling procedures, and quality control test results signed by a responsible party employed by the Manufacturer. At a minimum, results shall be given for:
  1. Mass per unit area, oz/yd<sup>2</sup> (ASTM D 5261)
  2. Apparent Opening Size, US sieve (ASTM D 4751)
  3. Flow Rate, gpm/ft<sup>2</sup> (ASTM D 4491)
  4. Puncture Strength, lb (ASTM D 4833)
  5. Trapezoidal Tear Strength, lb (ASTM D 4533)
  6. Grab Tensile, lb (ASTM D 4632)

Results of quality control tests conducted by the Manufacturer to verify the geotextile meets the project Specifications.

Quality control tests shall be performed in accordance with test methods and frequencies required by the project Specifications.

All rolls of geotextile shall be identified by the Manufacturer with the following:

- Manufacturer's Name.
- Roll Number.
- Product Identification.
- Roll Dimensions.

The CQA Consultant shall review these documents to verify that:

- Property values certified by the Manufacturer meet all Specifications listed in the Specifications.
- The Manufacturer's measurements of properties are properly documented and test methods used acceptable.
- Rolls are properly labeled.
- Project Specifications shall be met with the certified minimum average roll properties.
- Quality control certificates have been provided at the specified frequency for all rolls.

Any discrepancies shall be reported to the COUNTY and Manufacturer.

### **6.2.2 Conformance Sampling and Testing**

The CQA Consultant shall verify that conformance test samples are obtained for the geotextile upon delivery to the site. At a minimum, geotextile conformance tests performed are as follows:

- Mass per unit area, oz/yd<sup>2</sup> (ASTM D 5261)
- Apparent Opening Size, US sieve (ASTM D 4751)
- Flow Rate, gpm/ft<sup>2</sup> (ASTM D 4491)
- Puncture Strength, lb (ASTM D 4833)

The CQA Consultant shall select the rolls to be tested. Samples shall be three feet long by the width of the roll, and shall not include the first complete revolution of the roll. Samples shall not include any portion of a roll which has been subjected to excess pressure or stretching. All lots of material and the particular test sample that represents each lot shall be defined before the samples are taken.

Samples shall be taken at a rate of one per lot, but not less than one conformance test per 100,000 square feet of geotextile or portion thereof.

The CQA Consultant shall review all conformance test results and accept or reject the roll prior to deployment. All nonconforming test results shall be reported to the COUNTY and Installer. The CQA Consultant is responsible for reviewing test results to verify that the property values meet or exceed values listed in the project Specifications.

If any failing test results may be the result of the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test should be rejected or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications. (This procedure is only valid when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

### **6.2.3 Geotextile Storage, Handling and Placement**

Geotextile shall be protected from ultraviolet light exposure, precipitation, mud, puncture, cutting, or other deleterious conditions during shipment, handling and storage. Geotextile rolls shall be shipped and stored in relatively opaque and watertight wrapping which shall be removed shortly before deployment.

The Installer shall handle all geotextile in such a manner as to minimize damage, and the following shall be complied with:

- All deployed geotextile shall be stabilized with sandbags or the equivalent ballast in the presence of wind. Such sandbags shall remain until replaced with cover material.
- The entire surface of the geotextile shall be visually inspected to ensure that no potentially harmful foreign objects are present.
- On slopes, the geotextiles shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the geotextile sheet in tension.
- Geotextiles shall be cut using an approved geotextile cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.
- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.
- Care shall be taken not to entrap stones, excessive dust, or moisture within the geotextile that could damage the geomembrane, result in clogging of drains or filters, or hamper subsequent seaming.
- After installation, a visual examination of the geotextile shall be carried out over the entire surface, to verify that no potentially harmful foreign objects, such as needles or staples, are present.

#### **6.2.4 Seaming Procedures**

Geotextile shall be overlapped in accordance with the requirements of the Specifications. On slopes steeper than 10 feet horizontal to 1 foot vertical (10H:1V), all geotextiles shall be continuously sewn. In general, no horizontal seams shall be allowed on side slopes, except as part of a patch.

Sewing shall be done using polymeric thread with chemical or ultraviolet light resistant properties equal to or greater than those of the geotextile.

#### **6.2.5 Defects and Repairs**

Holes or tears in the geotextile shall be repaired with a patch of the same geotextile double-sewn or heat-tacked into place. Repairs occurring on slopes steeper than 10H:1V shall be double-sewn in place. Should any tear exceed ten percent of the width of the roll, that roll shall be removed and replaced. Soil or other material which may have penetrated the torn geotextile shall be removed.

The CQA Consultant shall observe any repairs and report any noncompliance to the COUNTY.

#### **6.2.6 Placement of Soil Materials**

The Contractor or Installer shall place all soil materials on top of a geotextile in such a manner as to minimize:

- Damage to the geotextile.
- Slippage of the geotextile on underlying layers.
- Excess tensile stresses in the geotextile.

Any noncompliance shall be noted by the CQA Consultant and reported to the Installer and COUNTY.

### **6.3 GEOCOMPOSITES**

#### **6.3.1 Manufacturer Quality Control Documentation**

The Manufacturer shall provide the CQA Consultant with the following information prior to the installation of the geocomposite:

- A list of materials which comprise the geotextile and geotextile and a Specification for the each which includes all properties contained in the project Specifications, measured using the appropriate test methods.



- A specification for the fused geotextile and geonet (geocomposite) which includes all properties contained in the project Specifications, measured using the appropriate test methods.
- Written certification that the minimum average roll values given in the Specification are guaranteed by the Manufacturer.
- Written certification that the Manufacturer has continuously inspected the geotextile for the presence of needles and found the geotextile to be needle free.
- Quality control test results performed in accordance with test methods and frequencies required by the project Specifications.
- Quality control certifications, which shall include roll identification numbers, sampling procedures, and quality control test results for the geotextile, geonet, and geocomposite signed by a responsible party employed by the Manufacturer.

### **6.3.2 Manufacturer Test Results**

Results of quality control tests conducted by the Manufacturer to verify the geocomposite meets the project Specifications. At a minimum, the following results shall be given.

#### **6.3.2.1 HDPE Resin--**

1. Polymer Density (ASTM D 1505)
2. Polymer Melt Index (ASTM D 1238)

#### **6.3.2.2 Geonet--**

1. Density (ASTM 1505)
2. Thickness (ASTM D 1777)
3. Mass per Unit Area (ASTM D 3776)

#### **6.3.2.3 Geotextile--**

1. Mass per unit area (ASTM D 3776)
2. Apparent Opening Size, US sieve (ASTM D 4751)
3. Puncture Resistance, lb (ASTM D 4833)
4. Trapezoidal Tear Strength, lb (ASTM D 4533)
5. Grab Tensile, lb (ASTM D 4632)

#### **6.3.2.4 Geocomposite--**

1. Ply Adhesion (GRI GC7)
2. Transmissivity (ASTM D4716)

All rolls of geocomposite shall be identified by the Manufacturer with the following:

- Manufacturer's Name
- Roll Number
- Product Identification
- Roll Dimensions

The CQA Consultant shall review these documents to verify that:

- Property values certified by the Manufacturer meet all Specifications listed in the Specifications.
- The Manufacturer's measurements of properties are properly documented and test methods used acceptable.
- Rolls are properly labeled.
- Project Specifications shall be met with the certified minimum average roll properties.
- Quality control certificates have been provided at the specified frequency for all rolls.

Any discrepancies shall be reported to the COUNTY and Manufacturer.

### **6.3.3 Conformance Sampling and Testing**

The CQA Consultant shall verify that conformance test samples are obtained for the geotextile upon delivery to the site. At a minimum, conformance tests performed are as follows:

#### **6.3.3.1 Geonet--**

1. Density (ASTM 1505)
2. Thickness (ASTM D 1777)
3. Mass per Unit Area (ASTM D 3776)

#### **6.3.3.2 Geotextile--**

1. Mass per unit area (ASTM D 3776)
2. Apparent Opening Size, US sieve (ASTM D 4751)
3. Puncture Resistance, lb (ASTM D 4833)

#### **6.3.3.3 Geocomposite--**

1. Ply Adhesion (GRI GC7)
2. Transmissivity (ASTM D 4716)

The CQA Consultant shall select the rolls to be tested. Samples shall be three feet long by the width of the roll, and shall not include the first complete revolution of the roll. Samples shall not include any portion of a roll which has been subjected to excess pressure or stretching. All lots of material and the particular test sample that represents each lot shall be defined before the samples are taken.

Samples shall be taken at a rate of one per lot, but not less than one conformance test per 100,000 square feet of geocomposite or portion thereof.

The CQA Consultant shall review all conformance test results and accept or reject the roll prior to deployment. All nonconforming test results shall be reported to the COUNTY and Installer. The CQA Consultant is responsible for reviewing test results to verify that the property values meet or exceed values listed in the project Specifications.

If any failing test results may be the result of the CQA Geosynthetics Laboratory incorrectly conducting the test, the Manufacturer may request a retest to be conducted at the CQA Geosynthetics Laboratory in the presence of a representative of the Manufacturer.

All material from a lot represented by a failing test should be rejected or additional conformance test samples may be taken to isolate the portion of the lot not meeting Specifications. (This procedure is only valid when rolls in a lot are consecutively produced and numbered from one manufacturing line). Additional samples shall be taken from rolls either side of the failing roll, until passing test results are achieved, to establish the range of failure within the lot. All rolls lying within this range of failure shall be rejected.

#### **6.3.4 Geocomposite Storage, Handling and Placement**

Geocomposite shall be protected from ultraviolet light exposure, precipitation, mud, puncture, cutting, or other deleterious conditions during shipment, handling and storage. Geocomposite rolls shall be shipped and stored in relatively opaque and watertight wrapping which shall be removed shortly before deployment.

The Installer shall handle all geocomposite rolls in such a manner as to minimize damage, and the following shall be complied with:

- All deployed geocomposite shall be stabilized with sandbags or an equivalent ballast in the presence of wind. Such sandbags shall remain until replaced with cover material.
- The entire surface of the geocomposite shall be visually inspected to ensure that no potentially harmful foreign objects are present.
- On slopes, the geocomposites shall be securely anchored in the anchor trench and rolled down the slope in such a manner as to continually keep the sheet in tension.

- Geocomposites shall be cut using an approved cutter only. If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geocomposite.
- The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
- Care shall be taken not to entrap stones, excessive dust, or moisture within the geocomposite that could damage the geomembrane, result in clogging of drains or filters, or hamper subsequent seaming.
- After installation, a visual examination of the geocomposite shall be carried out over the entire surface, to verify that no potentially harmful foreign objects, such as needles or staples, are present.

#### **6.3.5 Seaming Procedures**

The end of each roll of geocomposite shall be overlapped a minimum of six inches. The geonet portion shall be shingled, with the uphill end overlapping the downhill end and tied 2 feet on center at a minimum. The bottom layer of geotextile shall be overlapped a minimum of 6 inches. The upper layer of geotextile shall be machine sewn. Sewing shall be done using polymeric thread with chemical or ultraviolet light resistant properties equal to or greater than those of the geotextile. Where the geocomposite is to terminate, the upper geotextile shall be folded over the ends with a minimum of 12 inches of geotextile placed under the geocomposite.

At roll sides, the material shall be overlapped a minimum of 4 inches. The bottom geotextile shall be overlapped. The geonet shall be overlapped and tied a minimum of 5 feet on center with nylon ties as described above. The upper layer of geotextile shall be machine sewn as described above.

#### **6.3.6 Defects and Repairs**

Generally, damaged, soiled, or delaminated products shall be discarded. Holes or tears 2 inches or smaller in diameter may be repaired by snipping out protruding geonet and machine sewing or thermal bonding a geotextile patch over the hole. The patch shall be a minimum of 12 inches larger than the damaged area in all directions. If thermal bonding is conducted, care shall be taken to prevent excessive heat damage to the surrounding geosynthetics.

Panels with holes or tears greater than 2 inches in diameter through the product shall be repaired by replacing the entire panel width. The CQA Consultant shall observe any repairs and report any noncompliance to the COUNTY.

#### **6.3.7 Placement of Soil Materials**

The Contractor or Installer shall place all soil materials on top of a geotextile in such a manner as to minimize:

- Damage to the geocomposite.
- Slippage of the geocomposite on underlying layers.
- Excess wrinkles and tensile stresses in the geocomposite.

Any noncompliance shall be noted by the CQA Consultant and reported to the Installer and COUNTY.

## **SECTION 7**

### **DOCUMENTATION**

An effective CQA Program depends largely on recognition of all construction activities that shall be monitored, and on assigning responsibilities for the monitoring of each activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Consultant shall document that quality assurance requirements have been addressed and satisfied.

The CQA Consultant shall maintain at the site a complete file of design plans, project Specifications, test procedures, daily logs, and other pertinent documents.

#### **7.1 REPORTS**

Standard reporting procedures shall include preparation of a daily report which, at a minimum, shall consist of:

- A daily summary report including memoranda of meetings and discussions with the COUNTY and/or site Contractors.
- Observation logs detailing construction activities for the day, and test results, as appropriate.

Other forms of daily record keeping to be used as appropriate include construction problem and solution data sheets and photographic reporting data sheets. This information shall be regularly submitted to and reviewed by the COUNTY.

##### **7.1.1 Daily Logs and Summary Reports**

The CQA Consultant shall prepare daily logs and summary reports which shall include the following information:

- An identifying report number for cross-referencing and document control.
- Date, project name, location, and other identification.
- Data on weather conditions.
- Information on meetings held or discussions which took place including:
  1. Names of parties to discussion.
  2. Relevant subject matter or issues.
  3. Decisions reached.

#### 4. Activities and their schedule.

- A reduced-scale site plan or sketch showing work areas and test locations.
- Descriptions and locations of ongoing construction.
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented.
- Locations where tests and samples were taken or reference to specific observation logs and/or test data sheets where such information can be found.
- A summary of field/laboratory test results or reference to specific observation logs and/or test data sheets.
- Calibrations of test equipment.
- Off-site materials received, including quality verification documentation.
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality.
- The CQA Consultant's signature.
- Photographs of representative activities

#### **7.1.2 Observation and Testing Reports**

The CQA Consultant shall record observations of construction and CQA-related activities on project specific observation and testing reports. At a minimum, the observation and testing reports shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- Description or title of activity monitored.
- Location of activity and locations of samples collected.
- Locations of field tests performed and their results.
- Results of laboratory tests received.
- Results of monitoring activity in comparison to Specifications.
- The CQA Consultant's signature.

Reports describing problem identification, corrective measures reports or special construction situations shall be prepared by the CQA Consultant and cross-referenced to specific observation and testing reports. These reports shall include the following information:

- An identifying sheet number for cross-referencing and document control.

- A detailed description of the situation or deficiency.
- The location and probable cause of the situation or deficiency.
- How and when the situation or deficiency was found or located.
- Documentation of the response to the situation or deficiency.
- Final results of any responses.
- Any measures taken to prevent a similar situation from occurring in the future.
- The signature of the CQA Consultant and the signature of the COUNTY or ENGINEER indicating concurrence.

The COUNTY shall be made aware of any nonconformance with the project Specifications. The COUNTY shall then determine the cause of the nonconformance and recommend appropriate changes in procedures or Specifications. These changes will be submitted to the Design Engineer for approval. When this type of evaluation is made, the results shall be documented, and any revision to procedures or project Specifications will be approved by the COUNTY, Design Engineer, and, if necessary, the Permitting Agency.

## **7.2 PHOTODOCUMENTATION AND REPORTING DATA SHEETS**

Photodocumentation and reporting data sheets shall be cross-referenced with observation and test reports and/or problem identification and corrective measure reports.

These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. The basic file shall contain color prints; negatives shall be stored in a separate file in chronological order. These records will be presented to the COUNTY upon completion of the project.

In support of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities.

## **7.3 DESIGN AND/OR SPECIFICATION CHANGES**

Design and/or project Specification changes may be required during construction. In such cases, the CQA Consultant shall notify the COUNTY and the Design Engineer. The COUNTY shall then notify the Permitting Agency if necessary.

Design and/or project Specification changes shall be made only with the written agreement of the COUNTY and the Design Engineer, and shall take the form of an Addendum to the project Specifications.



## **7.4      PROGRESS REPORTS**

The CQA Consultant shall prepare a progress report at time intervals established at the Pre-construction meeting and submit to the COUNTY. At a minimum, this report shall include the following information:

- An identifying sheet numbered for cross referencing and document control.
- Date, project name, location, and other identification.
- A summary of work activities during the progress reporting period.
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period.
- A summary of test results, failures, and retests.
- The signature of the CQA Consultant.

The COUNTY shall distribute copies of the Progress Reports to the Permitting Agency and, upon request, Geosynthetics Installer and Contractor or as decided at the Pre-construction Meeting.

## **7.5      AS-BUILT DRAWINGS**

As-Built Drawings shall include, but are not limited to the following:

- Scale plans depicting the location of construction.
- Details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, over excavation, etc.).
- Base maps required for the development of the record plans shall be done by a qualified land surveyor.
- Each layer of geomembrane identifying panels with appropriate numbers, destructive seam samples locations, patches, and repairs locations.
- Pertinent details.
- Changes from the construction Drawings.

## **7.6 FINAL DOCUMENTATION REPORT AND CERTIFICATION**

At the completion of the work, the CQA Consultant shall submit to the COUNTY the signed Final Documentation Report. At a minimum, the Final Documentation Report shall include:

- Summaries of all construction activities.
- Observation logs and test data sheets including sample location plans and supporting field and laboratory test results.
- Construction problems and solutions reports.
- Changes from design and material specifications.
- As-Built Drawings.
- If required by the regulatory agency, a summary statement sealed and signed by a professional engineer registered in the state that the construction has been completed in substantial conformance with project Specifications and design plans.

## **FORMS**



# SCS ENGINEERS DAILY FIELD REPORT

<b>Project</b>	Phase II Section I Landfill Expansion - Hardee County Landfill Hardee County	<b>Project Number:</b>	09199033.16
		<b>Date:</b>	

### Description of Construction Activity

**Field Representative** \_\_\_\_\_ **Date** \_\_\_\_\_

SCS ENGINEERS

## CERTIFICATE OF SUB-BASE ACCEPTANCE

Installer: _____	Project name: _____	Phase II Section I Landfill Expansion - Hardee County Landfill
Address: _____	Project location: _____	Hardee County Landfill
_____		685 Airport Road
_____		Wauchula, Florida 33873
	Owner: _____	Hardee County Board of County Commissioners

I, THE UNDERSIGNED, DULY AUTHORIZED REPRESENTATIVE OF \_\_\_\_\_  
(Geosynthetic Installer)  
DO HEREBY ACCEPT THE AREA OF SOIL SURFACE AS DESCRIBED BELOW.

(SKETCH OR DESCRIBE)


Acceptance of the soil surface for which the geomembrane will be placed is based upon visual observations. Acceptance of the subgrade surface considers that at the time the geomembrane is placed, the structure of the underlying soil surface, which is the responsibility of others, meets or exceeds the project specifications.

_____ NAME	_____ TITLE
_____ SIGNATURE	_____ DATE

Certification received by SCS

_____ NAME	_____ TITLE
_____ SIGNATURE	_____ DATE

# SCS ENGINEERS

## GEOMEMBRANE PLACEMENT LOG

SHEET
PROJECT TITLE
PROJECT NO.
DATE

of  
Phase II Section I Landfill Expansion - Hardee County Landfill  
09199033.16

# GEOMEMBRANE PLACEMENT LOG

[illegible]

**PRINT NAME:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

SCS ENGINEERS

SHEET  
PROJECT TITLE  
PROJECT NO.  
DATE

Phase II Section I Landfill Expansion - Hardee County Landfill  
09199033.16

# GEOMEMBRANE SEAMING LOG

[illegible]

**PRINT NAME:**

**SIGNATURE:**



<b>SCS ENGINEERS</b>  <b>NON-DESTRUCTIVE TEST LOG</b>	<b>SHEET</b> <b>PROJECT TITLE</b> <b>PROJECT NO.</b> <b>DATE</b>	<div style="border-bottom: 1px solid black; display: flex; justify-content: space-between;"> <span></span> <span>of</span> </div> <div style="border-bottom: 1px solid black;"> <b>Phase II Section I Landfill Expansion - Hardee County Landfill</b> </div> <div style="border-bottom: 1px solid black;"> <b>09199033.16</b> </div>
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SEAM NO.	TECH I.D.	AIR TEST							VACUUM BOX P/F	COMMENTS
		PRESSURE (psi)			TIME			P/F		
		START	END	DROP	START	END	DURATION			

PRINT NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

SCS ENGINEERS

---

# DESTRUCTIVE TEST LOG

# DESTRUCTIVE TEST LOG

SHEET: \_\_\_\_\_ of \_\_\_\_\_

PROJECT TITLE: Phase II Section I Landfill Expansion - Hardee County Landfill

PROJECT NO: **09199033.16**

DATE: \_\_\_\_\_

[illegible]

**PRINT NAME:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

SCS ENGINEERS

# GEOMEMBRANE REPAIR LOG

SHEET  
PROJECT TITLE  
PROJECT NO.  
DATE

of

**Phase II Section I Landfill Expansion - Hardee County Landfill**  
09199033.16

[illegible]

## 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:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

# TRIAL WELD LOG

of  
Phase II Section I Landfill Expansion - Hardee County Landfill  
09199033.16

[illegible]

**PRINT NAME:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

<b>SCS ENGINEERS</b>  <b>GEOCOMPOSITE PLACEMENT LOG</b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">SHEET</td> <td style="width: 50%; text-align: right;">of</td> </tr> <tr> <td>PROJECT TITLE</td> <td><u>Phase II Section I Landfill Expansion - Hardee County Landfill</u></td> </tr> <tr> <td>PROJECT NO.</td> <td><u>09199033.16</u></td> </tr> <tr> <td>DATE</td> <td></td> </tr> </table>	SHEET	of	PROJECT TITLE	<u>Phase II Section I Landfill Expansion - Hardee County Landfill</u>	PROJECT NO.	<u>09199033.16</u>	DATE	
SHEET	of								
PROJECT TITLE	<u>Phase II Section I Landfill Expansion - Hardee County Landfill</u>								
PROJECT NO.	<u>09199033.16</u>								
DATE									

PANEL NO.	ROLL NO.	LENGTH	WIDTH	THICKNESS	ORIENTATION	TIME	WEATHER/CONDITIONS/COMMENTS
Page Total							
Cumulative Total							

PRINT NAME: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

## SCS ENGINEERS

### GEOGRID/GEONET PLACEMENT LOG

SHEET	_____ of _____
PROJECT TITLE	<b>Phase II Section I Landfill Expansion - Hardee County Landfill</b>
PROJECT NO.	<b>09199033.16</b>
DATE	_____

\_\_\_\_\_ of \_\_\_\_\_  
Phase II Section I Landfill Expansion - Hardee County Landfill  
09199033.16

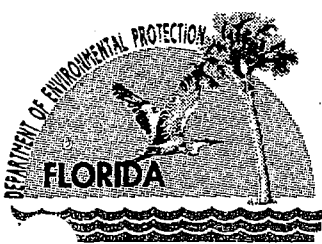
[illegible]

**PRINT NAME:** \_\_\_\_\_

**SIGNATURE:** \_\_\_\_\_

**EXHIBIT B**

**FDEP CONSTRUCTION EXPANSION PERMIT**



Jeb Bush  
Governor

BEST AVAILABLE COPY

# Department of Environmental Protection

09199022.10  
Permit File

Southwest District  
13051 North Telecom Parkway  
Temple Terrace, FL 33637-0926  
Telephone: 813-632-7600

Colleen M. Castille  
Secretary

February 27, 2006

**CERTIFIED MAIL**

**RETURN RECEIPT REQUESTED** 7004 0750 0003 0518 2060

In the matter of an  
Application for Permit by:

Permit No.: 38414-008-SC/01  
~~Desoto County~~

Hardee County Solid Waste Department  
Ms. Teresa Carver, Director  
685 Airport Road  
Wauchula, Fl. 33873

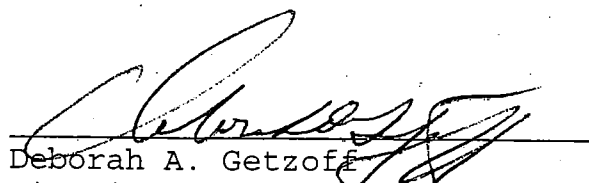
**NOTICE OF PERMIT**

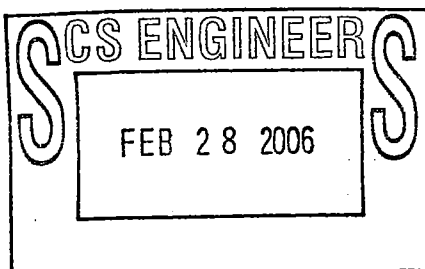
Enclosed is Permit Number **38414-008-SC/01**, issued pursuant to Section(s) 403.087(1), Florida Statutes.

Any party to this Order (permit) has the right to seek judicial review of the Order pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 3900 Commonwealth Blvd., Mail Station 35, Tallahassee, 32399-3000; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this Notice is filed with the Clerk of the Department.

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION

  
Deborah A. Getzoff  
District Director  
Southwest District



"More Protection, Less Process"

Printed on recycled paper.



CERTIFICATE OF SERVICE

This undersigned duly designated deputy clerk hereby certifies that this **NOTICE OF PERMIT** and all copies were mailed before the close of business on 02-27-06 to the listed persons.

FILING AND ACKNOWLEDGMENT  
FILED, on this date, pursuant  
to Section 120.52(10), Florida  
Statutes, with the designated  
Department, Clerk, receipt of  
which is hereby acknowledged.

Marcia Hines 2-27-06  
Clerk Date

DAG/sgm

Attachments

Copies furnished to:

Hardee County Board of County Commissioners

Hardee County Notification List

C. Ed Hilton, P.E., SCS Engineers, 3012 US Highway 301 North, Ste. 700, Tampa, Fl. 33619

Patricia Comer, OGC Tallahassee

Richard Tedder, P.E., FDEP Tallahassee

Fred Wick, FDEP Tallahassee

Cece McKiernan, FDEP WaRM



# Department of Environmental Protection

Jeb Bush  
Governor

Southwest District  
13051 North Telecom Parkway  
Temple Terrace, FL 33637-0926  
Telephone: 813-632-7600

Colleen M. Castille  
Secretary

## PERMITTEE

Hardee County Solid Waste  
Department  
Ms. Teresa Carver, Director  
685 Airport Road  
Wauchula, Florida 33873

## PERMIT/CERTIFICATION

WACS Facility ID No: SWD/25/40612  
Permit No: **38414-008-SC/01**  
Date of Issue: 02-27-06  
Expiration Date: 02-27-11  
County: Hardee  
Lat/Long: 27°34'17"N  
81°46'58"W  
Sec/Town/Rge: 35/33S/25E  
Project: Hardee County Landfill  
Phase II Construction

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 62-4, 62-302, 62-330, 62-520, 62-522, and 62-701. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans and other documents, attached hereto or on file with the Department and made a part hereof and specifically described as follows:

To **construct** an expansion of a Class I landfill (approximately 5 acres), referred to as the **Hardee County Landfill (Phase II, Section I)**, subject to the specific and general conditions attached, located specific and general conditions attached, **located at 685 Airport Rd., Wauchula, Hardee County, Florida**. The specific conditions attached are for the construction of:

1. Class I Landfill, Phase II, Section 1

and related appurtenances

**Replaces Permit No.:** N/A, new

This permit contains compliance items summarized in **Attachment 1** that shall be complied with and submitted to the Department by the dates noted. If the compliance dates are not met and submittals are not received by the Department on the dates noted, enforcement action may be initiated to assure compliance with the conditions of this permit.

General information, Phase II (unless noted):

Disposal acres	Approx. 5 acres (Phase II, Section I only) [ref. SC#A.2.a., Section S]
Lowest Bottom elevation of cell - NE corner of Phase II, Section I (Point 9C)	+79.2 ft. NGVD (pipe, pre-settlement), +78.66 ft. NGVD (pipe, post settlement) [ref. SC#A.2.d., Sheet 12 of 27; SC#A.2.a., Section J, <i>Settlement Calculations</i> ] Bottom of 6-inch low permeability layer= +78.5 ft. NGVD [ref. SC#A.2.a., Section J, page 15]
Top elevation at final buildout (entire landfill-including cover)	max. +159.5 feet NGVD [ref. SC#A.2.a., Part H.1; SC#A.2.d., Sheet 14 of 27]
Sideslopes max.	3H:1V [ref. SC#A.2.d., Sheets 14, 16 and 17 of 27]
Liner system (bottom to top)	12-inch compacted subgrade, 6-inch low permeability soil ( $1 \times 10^{-5}$ cm/sec), 60 mil textured HDPE geomembrane, triplanar geocomposite (geotextile/geonet/geotextile), 60 mil textured HDPE geomembrane, biplanar geocomposite (geotextile/geonet/geotextile), 2-foot drainage sand [ref. SC#A.2.d., Detail 1/Sheet 24 of 27]
LCS drainage system	Drainage/protective sand $\geq 1 \times 10^{-3}$ cm/sec [ref. SC#A.2.d., Detail 1/Sheet 24 of 27; Spec. 02220-2.06]  Two trenches draining from west to east. 8-inch SDR 11 HDPE perforated LCS piping. [ref. SC#A.2.d., Section A, Sheet 23 of 27, Detail 5, Sheet 24 of 27]  LCS pipes drain to sumps on east side, then pumped through sideslope risers through forcemain to lift station; from lift station through existing HDPE force main to tanks [ref. SC#A.2.d., Sheets 9 and 19 of 27]
LDS drainage system	Triplanar geocomposite to sump, then same as LCS
Action leakage rate (ALR)	260 gal/ac/day [ref. SC#A.2.a., Part H.2.c.4, page H-14]
Design life	5 years [ref. Appl. Form #A.14.],
Interface friction angles	All interfaces=26.9°; GM/bi-planar composite drainage net(CDN)° [Spec. 02776-2.02.F.]; GM/tri-planar CDN [Spec. 02776-2.02.G.]
Leachate storage tanks	Two epoxy painted steel, open top tanks; approximately 79,000 gallons each; secondary containment: tank in a tank nominal diameter= 30 feet, 16 ft tall

**GENERAL CONDITIONS:**

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.161, 403.727, or 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
3. As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of rights, nor any infringement of federal, State, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.
4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at reasonable times, access to the premises where the permitted activity is located or conducted to:
  - (a) Have access to and copy any records that must be kept under conditions of the permit;
  - (b) Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
  - (c) Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

**GENERAL CONDITIONS:**

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- (a) A description of and cause of noncompliance; and
- (b) The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Rule 62-4.120 and 62-730.300, Florida Administrative Code, as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (a) Determination of Best Available Control Technology (BACT)
- (b) Determination of Prevention of Significant Deterioration (PSD)
- (c) Certification of compliance with State Water Quality Standards (Section 401, PL 92-500)
- (d) Compliance with New Source Performance Standards

**GENERAL CONDITIONS:**

14. The permittee shall comply with the following:

(a) Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

(b) The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

(c) Records of monitoring information shall include:

1. the date, exact place, and time of sampling or measurements;
2. the person responsible for performing the sampling or measurements;
3. the dates analyses were performed;
4. the person responsible for performing the analyses;
5. the analytical techniques or methods used;
6. the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

**SPECIFIC CONDITIONS: PART A -Solid Waste Facility General Requirements**

1. **Landfill Designation.** This site shall be classified as a Class I landfill and shall be constructed in accordance with all applicable requirements of Chapters 62-4, 62-302, 62-330, 62-520, 62-522, 62-550, 62-701 and 62-703, Florida Administrative Code (F.A.C.) and all applicable requirements of Department rules.

2. **Permit Application Documentation.** This permit is valid for construction of the Phase II expansion of the Class I landfill and related systems (including but not limited to: lined Class I disposal unit, modification of leachate collection and removal system, groundwater interceptor system) in accordance with Department rules, and the reports, plans and other information prepared by SCS Engineers [SCS], Inc. (unless otherwise specified) as follows:

a. Hardee County Landfill Expansion, Construction Permit Application,... (Volumes I and II, 3-ring binders) dated April 2004 (received April 8, 2004), as revised, replaced or amended (information inserted into original) dated November 19, 2004, May 20, 2005 (received May 23, 2005 and July 27, 2005), November 30, 2005, and January 24, 2006 (received January 25, 2006). This information includes, but is not limited to:

- 1) Volume I, Attachment H-2, *Construction Quality Assurance Plan, [CQAP]*,
- 2) Volume I, Attachment H-1, *Technical Specifications [Specs.]*;

b. Responses to Request for Additional Information,... (three-ring bound document) dated November 15, 2004 (received November 19, 2004) as revised, replaced or amended May 20, 2005 (received May 23, 2005), November 30, 2005, and January 24, 2006 (received January 25, 2006) (attachments inserted into original [ref. SC#A.2.a];

c. Operations Plan for Hardee County Landfill,... (three-ring binder) dated November 19, 2004, as revised, replaced or amended May 20, 2005 (received May 23, 2005 and July 27, 2005), and January 24, 2006 (received January 25, 2006).

d. Plan Sheets titled, Hardee County landfill Expansion Construction permit,... (29 sheets) dated April 2004 (received January 25, 2006) including sheets revised November 19, 2004, May 13, 2005, May 20, 2005, September 23, 2005, and December 2, 2005;

e. Operational drawings (reduced size), sheets OP-1 through OP-7, dated May 2005 (received May 23, 2005);

3. **Permit Modifications.**

a. Any construction, operation or other activities not previously approved as part of this permit shall require a separate Department permit unless the Department determines a permit modification to be more appropriate, or unless otherwise approved in writing by the Department. Any significant changes to the construction or operation at the facility shall require a permit modification. Permits shall be modified in accordance with the requirements of Rule 62-4.080, F.A.C. A modification which is reasonably expected to lead to substantially different environmental impacts which require a detailed review by the Department is considered a substantial modification.

b. This permit does not authorize landfill closure construction or construction of the Phase II, Section II Landfill. This permit does not authorize operation of the Phase II landfill.

**SPECIFIC CONDITIONS: PART A -Solid Waste Facility General Requirements**

4. **Permit Renewal.** No later than one hundred eighty (180) days before the expiration of the Department Permit, the permittee shall apply for a renewal of a permit on forms and in a manner prescribed by the Department, in order to assure conformance with all applicable Department rules. Permits shall be renewed at least every five years as required by Rule 62-701.320(10)(b), F.A.C.
5. **Professional Certification.** Where required by Chapter 471 (P.E.) or Chapter 492 (P.G.), Florida Statutes, applicable portions of permit applications and supporting documents which are submitted to the Department for public record shall be signed and sealed by the professional(s) who prepared or approved them.
6. **General Conditions.** The permittee shall be aware of and operate under the "General Conditions". General Conditions are binding upon the permittee and enforceable pursuant to Chapter 403, Florida Statutes.
7. **Permit Acceptance.** By acceptance of this Permit, the Permittee certifies that he/she has read and understands the obligations imposed by the Specific and General Conditions contained herein and also including date of permit expiration and renewal deadlines. It is a violation of this permit for failure to comply with all conditions and deadlines.
8. **Regulations.** Chapter 62-701, F.A.C., effective May 27, 2001, is incorporated into this permit by reference. In the event that the regulations governing this permitted operation are revised, the Department shall notify the permittee, and the permittee shall request modification of those specific conditions which are affected by the revision of regulations to incorporate those revisions.
9. **Prohibitions.** The prohibitions of Rule 62-701.300, F.A.C., shall not be violated by the activities at this facility.
  - a. In the event that limestone is encountered during excavation or construction activities, the excavation/construction activities shall cease and the Department shall be notified **within 24 hours of discovery**. Written notification shall be submitted **within 7 days of discovery**. The written notification shall include the location, elevation, and extent of limestone noted on a plan sheet, a description of the materials encountered, and a plan of action which ensures that groundwater will not be adversely affected by the continued construction and operation of the facility. Excavation or construction activities shall not resume in the affected area until the Department-approved plan of action has been completed.
  - b. In the event that surface depressions or other occurrences which may be indicative of sinkhole activity or subsurface instability, are discovered onsite, or within 500 feet of the site, the Department shall be notified in accordance with Specific Condition #C.6.b. The written notification shall include a description of the incident, the location and size of the affected area shown on an appropriate plan sheet, and a corrective action plan which describes the actions necessary to prevent the unimpeded discharge of waste or leachate into ground or surface water.



**SPECIFIC CONDITIONS: PART A -Solid Waste Facility General Requirements**

(Specific Condition #A.9, cont'd)

c. Open burning of solid waste is prohibited except in accordance with Rule 62-701.300(3) and Chapter 62-256, F.A.C. All fires which require longer than one (1) hour to extinguish must be promptly reported to the Department in accordance with Specific Condition #C.6.b.

d. The lowest cell bottom elevation is **+78.5 feet NGVD** (subgrade, pre-settlement at NE corner of Phase II, Section I) and the Phase II design includes a groundwater control layer below the liner system. However, in the event that subsequent groundwater monitoring indicates that the groundwater elevation is not effectively removed by the groundwater control layer, information that addresses the requirements of Rule 62-701.400(11), F.A.C. shall be submitted for Department review and approval. In the event that corrective actions are required, a permit modification may be required.

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

1. **Construction.** All significant construction activities shall be approved by the Department prior to initiating work, unless specifically authorized otherwise.

a. This permit authorizes the construction of the Phase II, Section I, Class I disposal facility, leachate force mains and related appurtenances (including groundwater control system). This permit does not authorize the **operation** of Phase II. Operation of Phase II shall require a new permit or modification of Operation Permit no. 38414-007-SO or its successors.

2. **Certification of Construction Completion.** All information required by this Specific Condition shall be signed and sealed by a registered professional engineer or land surveyor as appropriate.

a. **Within sixty (60) days** after construction has been completed and **prior to the acceptance of waste**, the following activities shall be completed and submitted by the permittee, and shall be approved by the Department:

1) The owner or operator shall submit a Certification of Construction Completion, Form 62-701.900(2), signed and sealed by the professional engineer in charge of construction and quality assurance to the Department for approval, and shall arrange for Department representatives to inspect the construction in the company of the permittee, the engineer, and the facility operator.

2) The owner or operator shall submit Record Drawings/Documents showing all changes (i.e. all additions, deletions, revisions to the plans previously approved by the Department including site grades and elevations). The Record Documents shall include as-built plans details and elevations (survey) as appropriate.

3) The owner or operator shall submit a narrative indicating all changes in plans, the cause of the deviations, and certification of the Record Drawings/Documents by the Engineer to the Department.

4) The professional engineer of record shall submit to the Department a final report to verify conformance with the plans and specifications in accordance with Rules 62-701.400(7) and (8), F.A.C.

3. **Record Drawings/Documents.**

a. The Record Drawings/Documents shall include, but not be limited to, the following information:

1) Location of all anchor trenches,

2) As-built elevations for the leachate collection pipes (including elevations in the trenches and inverts);

3) Daily construction reports (CQA and general contractor);

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.3.a., cont'd)

- 4) As-built drawings showing the geomembrane panel installation layout, locations of fabricated and field seams, type of seams, destructive sampling locations, locations of all repairs, panel designations;
  - 5) All geomembrane destructive test results;
  - 6) Copies of photographs documenting all stages of the construction project.
  - 7) Details for the groundwater control system, including but not limited to, elevations for piping; discharge location details, etc.;
  - 8) Documentation that demonstrates that all leachate collection system piping has been video inspected and/or pressure cleaned. This documentation shall also detail all deficiencies discovered and corrective actions taken; and
  - 9) Surveys of the top of subgrade, and top of drainage sand layer for the constructed cell (including sideslopes) (see Response #H.2.d.3., dated November 19, 2004).
- b. The Record Documents shall include as-built surveys which demonstrate that the lowest elevation of the cell floor has been constructed no lower than **+79.2 feet NGVD (at NE corner of Section 1 LCS)** [ref. SC#A.2.d., Sheet 12 of 27 ], or as otherwise approved by the Department.

**4. Pre-Construction Submittals.**

- a. **At least thirty (30) days prior** to initiation of construction activity, unless otherwise specified, the permittee shall submit the following information to the Department:
  - 1) A complete set of Plans, Specifications and CQA Plan to be used for construction which includes all changes (i.e., all additions, deletions, revisions to the plans previously approved by the Department). Significant changes in the plans, as determined by the Department, shall require a permit modification. All changes in the plans shall be noted on the plans and accompanied by a narrative indicating the change, the cause of the deviation, and a re-certification of the alternate design by the design engineer. These alternate designs shall be approved by the Department prior to construction. If no changes have been made to the construction plans, Specifications or CQA Plan, the permittee shall notify the Department in writing that no changes have been made, and re-submittal of these documents will not be required prior to construction;
  - 2) The borrow source qualification information required by Rule 62-701.400(8)(c), F.A.C., for the low permeability soil materials [see Spec. 02212-1.03.C.1.]. The Borrow Source Report shall demonstrate that the low permeability soil material meets the required hydraulic conductivity at the 98% confidence level [Spec. 02212-2.02.B.1.]; and
  - 3) The role and name of the specific company/organization for each of the parties in the Project team [CQAP Figure 1].

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.4., cont'd)

b. **At least 30 days prior to initiation** of installation of the geosynthetics, the results of the interface friction testing using actual construction materials shall be submitted to the Department [ref. SC#A.2.a., Part H.2.d.7., page H-16; Spec. 02776-1.04.A.13 & 14, 02776-2.02.F & G.]. The results must demonstrate that each liner system interface exhibits a minimum safety factor of 1.5 against sliding. Placement of the geomembrane shall not proceed prior to the Engineer's receipt of the results of the interface friction testing which meet the requirements of this condition.

c. **Prior to initiation of construction**, the Permittee shall submit a copy of the contractor's dewatering plan to the Department for review. [See Spec. 02140-1.03.A.] Two copies shall be provided: one copy to the Solid Waste Section, and one copy to the Industrial Wastewater Section. In the event that a dewatering permit is required by the Department's Industrial Wastewater Section, dewatering shall not proceed until that permit is obtained. Dewatering water shall only be discharged into areas that have been properly prepared to receive the discharge [Spec. 02140-3.02.F.].

d. **No later than 2 weeks prior to construction** of the following components of the project, the Department shall be notified of the initiation of construction of these components (for each phase of construction) to allow the Department to observe:

- 1) the construction of groundwater control system;
- 2) connection of new LCS and LDS to lift station and/or manholes;
- 3) the construction of liner penetrations;
- 4) spark testing of any welds; and
- 5) seaming performed using a method other than double-fusion (wedge) or extrusion welding.

e. **At least 1 week prior to full scale construction** of the low permeability soil layer, the permittee shall submit the Test Section Report [Spec. 02212-1.03.D.] to the Department.

5. **Pre-Construction Meeting Notification.** Department Solid Waste Permitting staff shall be notified **at least one (1) week prior** to all pre-construction meetings. Prior to initiating construction activities, the permittee shall make arrangements for the Engineer of Record to meet on site and discuss all plan changes with Department Solid Waste Permitting Staff of the Southwest District Office. A copy of the minutes from the pre-construction conference shall be submitted to the Department **within two (2) weeks** of the conference.

6. **Construction Schedule and Progress Report.**

a. **No later than one (1) week after** the pre-construction conference, the owner or operator shall submit a construction schedule which includes estimated dates for each portion of the construction to the Department. The Engineer of Record or another qualified professional engineer shall make periodic inspections during construction to ensure that design integrity is maintained.

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.6., cont'd)

b. An updated construction schedule and progress report shall be submitted to the Department **monthly, by the 15<sup>th</sup> of each month.** The monthly progress report should be submitted in an appropriately labeled three-ring binder of sufficient size to store the monthly progress reports for the entire project. The monthly progress reports shall include, but not be limited to:

- 1) A narrative explaining the status (and any delays) of major stages of the construction (i.e., liner, piping, liner penetrations, etc.),
- 2) A summary of submittals and change order requests,
- 3) Weekly progress meeting minutes, and
- 4) Color copies of photographs which are representative of the typical construction activities for the reporting period, and photographs which show overall views and details of major stages of construction (e.g., liner penetrations, lift station construction, etc.).

**7. Construction Tolerances.**

a. Invert elevations of the leachate collection pipes shall be recorded at least every 50 feet to demonstrate that the leachate collection system has been constructed to the slopes and grades shown on the drawings. This information shall be included with the Record Documents.

b. The tolerance for the elevations of the top of the leachate collection/detection trenches, and invert elevations of piping above the liner system shall be  $\pm 0.10$  ft. The leachate collection/detection sumps, trenches, piping shall be constructed no lower than the elevations specified on the drawings.

c. As-built topographic surveys shall demonstrate that each liner component, groundwater control system, top of sand drainage layer, leachate collection system, piping, etc., was constructed within the tolerance required by the Drawings and Specifications.

d. The sand drainage layer shall be constructed to a minimum installed thickness of 24 inches.

**8. Construction Quality Assurance.**

a. Liner and leachate collection systems shall have a construction quality assurance plan to provide personnel with adequate information to achieve continuous compliance with the construction requirements. The Construction Quality Assurance Plan shall be in accordance with Rules 62-701.400(7) and (8), F.A.C., the CQA Plan [ref. SC#A.2.a(1)], and the conditions of this permit. The professional engineer or his designee shall be on-site at all times during construction (including liner system and leachate collection) to monitor construction activities.

b. A complete set of construction drawings and shop drawings, which include daily additions, deletions and revisions, shall be maintained on-site at all times for reference. Drawings which show the locations of geomembrane panel seams and repairs shall be kept on-site at all times for reference. Work shall not be concealed until required information is recorded. [Spec. 01300-1.07.B.; CQAP 7.0.]

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.8., cont'd)

c. Leachate shall not be deposited, injected, dumped, spilled, leaked, or discharged in any manner to the land, surface water or groundwater outside the liner system at any time during the construction activities.

d. Unsatisfactory, defective or non-conforming work shall be reported to the Engineer and shall be corrected, or the reasons for not correcting the work shall be recorded and maintained onsite for reference and inspections. Documentation of the corrections or reasons for not correcting the work shall be submitted with the Record Documents required by Specific Conditions #B.2 and #B.3.

e. Construction activities such as geomembrane seaming, QA/QC testing of the geosynthetic materials, surveying, etc. shall not be carried out in non-daylight hours without prior Department approval. [see Spec. 02776-3.04.J.; see CQAP 6.1.8.6.] If these activities will be conducted during nighttime hours, the Department shall be notified **at least 1 week** in advance to allow for Department observation. This notification shall include a description of the methods which will be used to provide adequate illumination to ensure that the quality of the construction is not compromised.

f. Sandbags or other temporary anchoring devices shall be removed prior to subsequent placement of materials over the geosynthetics.

g. Where sod is used over lined areas, pegging of sod shall not damage the liner.

h. All portions of the leachate collection system, liner and groundwater control system construction shall be observed and documented by the CQA Consultant.

i. CQA daily reports shall include weather conditions (e.g., precipitation, temperature).

j. Areas to be backfilled, including trenches, shall be free of building debris, rubbish, and water.

k. Runoff from stockpiled soils shall not discharge to surface water bodies or wetlands such that Department surface water standards are violated at the point of discharge.

l. All excavations shall be maintained free from standing water. Except for the stormwater management system construction, no construction, including pipe laying, shall be allowed in water. Groundwater shall be maintained at least 12 inches below excavations. In the event that it appears that the excavation is being impacted by groundwater, the contractor shall take the corrective actions necessary to demonstrate that the groundwater is sufficiently below the bottom of the excavation.

9. **Laboratory and Field Testing Requirements.** Field and laboratory testing during the construction activities shall be conducted by a qualified testing laboratory, independent of the manufacturer or installer, representing the owner. A qualified field technician representing the owner shall provide full time, on-site inspection during construction. The field technician shall work under the supervision of a professional engineer registered in the State of Florida with experience in landfill liner construction.

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

**10. Soil Materials.**

a. Surfaces adjacent to geosynthetics (including the subgrade) shall be smooth and free of depressions, rocks, stones, sticks, roots, sharp objects, or debris.

b. The low permeability soil shall be free from organics, roots, rubbish, debris or rocks greater than ¼ inch in any dimension, sticks greater than ¼ inch in diameter, calcareous deposits or any other deleterious material [Spec. 02212-2.01.B; 02776-3.03.A].

c. The protective cover soil/sand shall have a minimum permeability of  $1 \times 10^{-3}$  cm/sec. [Spec. 02220-2.06.A.] A sufficient number of permeability tests shall be performed on the drainage sand material to demonstrate the required permeability [see Table 02220-3].

d. Soils shall not be imported or used for construction in the low permeability soil layer until approved by the Department [see Spec. 02212-1.03.C.2.c].

e. In the event that portions of the low permeability soil layer must be replaced, a minimum of 4 additional permeability tests shall be conducted for each area of low permeability soil to be retested [Spec. 02212-3.03.G.]. Hydraulic conductivity tests for the low permeability soil layer shall be conducted in accordance with ASTM D5084. Two stage borehole procedures shall not be used exclusively [See CQA 5.3.2].

f. The frequency of thickness, moisture content, permeability and density tests listed in Table 02212-3 shall be doubled for the first 5 acres of low permeability soil installation as required by Rule 62-701.400(8)(e), F.A.C. The frequency of the tests listed in Table 02212-4 shall be doubled for the first 5 acres of low permeability soil installation.

g. Conformance tests of the rounded river rock [Spec. 02220-2.04] that will be used in the leachate collection and detection systems shall be taken in accordance with Table 02220-3.

**11. Geosynthetic Materials.**

**a. Conformance testing.**

1) The CQA Consultant or designee shall take conformance samples of the geosynthetics materials [CQAP 6.1.2.2.]. Conformance testing for the geosynthetic materials shall be in accordance with the Specifications. The geosynthetics shall meet the requirements listed in Specification Tables 02776-2 (geomembrane), Tables 02930-1, 2 and 3 (tri-planar composite drainage net (CDN)), Tables 02931-1, 2 and 3 (bi-planar CDN) or this permit, whichever is more stringent. Conformance testing of the geomembrane shall include environmental stress cracking and oxidative induction time. In all cases, the test results shall meet or exceed the property values in the Specifications.

2) Conformance samples of the geosynthetics may be taken by the permittee's representative or CQA consultant prior to shipment of the material to the jobsite. In this case, once sampled geosynthetics shall not be added to or removed from the shipment [Spec. 02776-3.02.A.2.].

**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.11., cont'd)

b. Seaming.

- 1) Seaming processes other than fusion or extrusion welding shall be approved by the Engineer and submitted to the Department prior to implementation.
- 2) Seaming apparatus or personnel which have failed trial welds shall not be used for seaming until passing welds are achieved.
- 3) Geomembrane seaming activities shall only be conducted during daylight hours and within the weather requirements of the Specifications, unless otherwise specifically approved by the Department [see Spec. 02776-3.04.J.; see CQAP 6.1.8.6.]. Seaming shall only take place with the "master seamer" present. No geomembrane seaming shall be performed unless the CQA Consultant is on-site.
- 4) The procedure used to temporarily bond adjacent geomembrane panels together shall not damage the geomembrane.

c. Destructive testing.

- 1) Destructive tests of the geomembrane seams shall be taken at random locations, at a minimum frequency of one test location per 500 feet of seam. This frequency shall not be based on an average throughout the entire facility. [see CQAP 6.1.9.2]
- 2) Geomembrane seams shall meet the requirements of Geomembrane Specifications, Table 02776-3, but in all cases destructive tests conducted on the geomembrane field seams shall demonstrate that the actual shear strength is at least 90 percent of the yield strength of the geomembrane, and failure is outside of the seam area. All of the samples shall meet the requirements for each test method (peel and shear) listed in Geomembrane Specifications, Table 02776-3. The strength results shall not be averaged and both sides of fusion welds shall be tested [Spec. 02776-3.05.B.6.].
- 3) Work shall not proceed with any materials which will cover locations which have been destructively tested or repaired until laboratory test results which demonstrate passing values are provided to the onsite CQA manager/inspector.
- 4) All areas which fails nondestructive testing shall be marked for repair by the CQA Consultant or onsite CQA inspector or the Engineer [Spec. 02776-3.07.B.].
- 5) Trial welds [Spec. 02776-3.05.A.] shall be tested for shear and peel and shall meet the requirements for seams in Table 02776-3.

d. Transmissivity.

- 1) The transmissivity test results required by the Specifications shall be submitted to the Engineer for review before the proposed materials are approved for use on the project. [Spec. 02930-1.03.B.; 02931-1.03.B.]
- 2) The transmissivity of the tri-planar CDN material (LDS) shall be a minimum of  $4 \times 10^{-3}$  m<sup>2</sup>/sec based upon a gradient of 2% and a normal load of 5,000 psf. [Spec. Table 02930-3.] The transmissivity of the bi-planar CDN material (LCS) shall be a minimum of  $2.7 \times 10^{-3}$  m<sup>2</sup>/sec based upon a gradient of 2% and a normal load of 5,000 psf [Spec. Table 02931-3].



**SPECIFIC CONDITIONS: PART B - Construction Requirements**

(Specific Condition #B.11., cont'd)

- e. Interface friction angles. The minimum interface friction angle for cover sand/geocomposite, geomembrane/geocomposite (bi-planar and tri-planar) interfaces shall be **26.9 degrees** [Spec. 02776-2.02.F. & G.; Table 02930-3; SC#A.2.a., Section J, page 14].
- f. The construction methods used shall minimize wrinkles. All wrinkles higher than they are wide (across their base) or more than 6 inches high shall be removed, repaired and retested [CQAP 6.1.10]. Excessive wrinkles shall be removed, and the areas repaired. Areas where wrinkles are removed shall be repaired and re-tested in accordance with the Specifications and CQA Plan.
- g. The liner system shall not be damaged by excessive traffic.
- h. The geocomposite drainage net (CDN) material and geotextile shall be handled (stored, placed, etc.) in a manner which prevents the infiltration of dirt and protects the CDN and geotextile from abrasion, punctures and excessive moisture.
- i. In areas where stakes are used, stakes shall not be of a type or used in a way that may damage the geomembrane.
- j. Prior to placement of materials on the subgrade, an as-built topographic survey shall be provided to the Engineer to verify conformance with the Drawings and Specifications. The subgrade shall be accepted by the Liner Installer and Engineer in writing before placement of the next layer.
- k. During the construction of, and until the geomembrane is placed on the subgrade, the subgrade shall be inspected daily for signs of desiccation, excessive moisture, or other damage. In the event that the condition of the subgrade deteriorates, corrective actions shall be implemented immediately. Washouts or erosion of the subgrade shall be repaired immediately. [Spec. 02776-3.03.A & B; 02776-3.04.C.; CQAP 6.1.7.]
- l. No geomembrane shall be placed in an area that has become softened by precipitation or desiccated and cracked due to lack of moisture. No standing water or excessive moisture shall be allowed on the area to be lined before the geomembrane installation [Spec. 02776-3.04.C.; CQAP 6.1.7.]

**12. Leachate collection and removal system.**

- a. HDPE pipe or fittings shall not be dropped during loading, unloading or placement.
- b. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench or weather conditions are unsuitable for such work [Spec. 15080-3.03.E.].
- c. All non-pressurized (perforated and nonperforated) HDPE piping shall be jet cleaned and video inspected prior to final acceptance in accordance with Specification Section 15080. The cleaning report and/or videotapes shall be provided as part of the Record Documents required in Specific Condition #B.3. [Spec. 15080-3.07.B.]
- d. Quantities of leachate from the leakage detection system shall be recorded (metered) separately from the quantities of leachate recorded from the leachate collection system.

**SPECIFIC CONDITIONS: PART C - Operation Requirements**

**1. Facility Operation Requirements.**

a. The permittee shall operate this facility in accordance with Chapter 62-701, F.A.C., and Operation Permit no. 38414-007-SO, or its successors.

b. Leachate shall not be deposited, injected, dumped, spilled, leaked, or discharged in any manner to soils, surface water or groundwater outside the liner and leachate management systems at any time during the construction or operation of this facility.

c. In the event of a peak storm event (25yr/24 hr storm), the permittee shall increase leachate disposal (hauling) rates to ensure that the storage tanks' capacity is not exceeded (see SC#A.2.a., Attachment 9B-1, Sheet 3, received November 19, 2004). At the end of each week, the permittee shall ensure that sufficient storage capacity is available in the leachate storage tanks to accommodate leachate generated from rainfall that occurs when the facility is closed (i.e., weekends and holidays).

**2. Operating Personnel.** The owner or operator shall provide adequate personnel for constructing, operating, monitoring and maintaining the facility in an orderly, safe, and sanitary manner.

**3. Control of Access.** Access to, and use of, the facility shall be controlled as required by Rule 62-701.500(5), F.A.C.

**4. Monitoring of Waste.** In no event shall waste be accepted in Phase II, Section I until the following requirements have been completed and submitted by the Permittee, and approved by the Department:

a. Certification of Construction Completion requirements of Specific Condition #B.2.,

b. financial assurance requirements of Specific Condition #D.4.c.,

c. construction of groundwater monitoring wells and gas probes as required by Specific Condition #E.1.,

d. construction of the stormwater management system, and

e. issuance of a separate permit or modification of Operation Permit no. 38414-007-SO (or its successors) that authorizes operation of Phase II.

**5. Control of Nuisance Conditions.** The owner or operator shall control odors, vectors (mosquitoes, other insects, rodents), and fugitive particulates (dust, smoke) arising from the construction so as to protect the public health and welfare. Such control shall minimize the creation of nuisance conditions on adjoining property. Complaints received from the general public, and confirmed by Department personnel upon site inspection, shall constitute a nuisance condition, and the permittee must take immediate corrective action to abate the nuisance.

**6. Facility Maintenance and Repair.**

a. The site shall be properly maintained including maintenance of access roads to disposal areas, equipment, stormwater/leachate management systems, cover systems and berms, gas monitoring system, surface water monitoring system, and groundwater monitoring system. Erosion and ponded water in disposal areas shall be prevented.

**SPECIFIC CONDITIONS: PART C - Operation Requirements**

(Specific Condition #C.6., cont'd)

b. In the event of damage to any portion of the landfill site facilities, unauthorized leachate discharges, failure of any portion of the landfill systems (including damaged or dry groundwater monitoring wells), fire, explosion, the development of sinkhole(s) or other subsurface instability at the site, the permittee shall **immediately (within 24 hours)** notify the Department explaining such occurrence and remedial measures to be taken, method to prevent reoccurrence, and time needed for repairs. **Written, detailed notification shall be submitted to the Department within seven (7) days following the occurrence.** Routine maintenance does not require notification but shall be noted on daily reports.

c. In the event that any portion of the groundwater monitoring system is damaged or unable to be sampled, corrective actions shall be completed **within sixty (60) days** of the written notification specified in Specific Condition #C.6.b., unless otherwise approved by the Department. Corrective actions which include relocation or installation of new groundwater monitoring wells shall be in accordance with Operation Permit no. 38414-007-SO, or its successors, or as otherwise approved by the Department.

d. In the event that the leachate management system is damaged or is not operating effectively, corrective actions shall be initiated **within thirty (30) days** of the written notification specified in Specific Condition #C.6.b., unless otherwise approved by the Department.

**7. Stormwater Management.** The site shall have a surface water management system designed, constructed, operated, and maintained to prevent surface water from running on to waste filled areas, and a stormwater runoff control system designed, constructed, operated, and maintained to collect and control stormwater to meet the requirements of Chapter 62-330, F.A.C., and the requirements for management and storage of surface water in accordance with Rule 62-701.500(10), F.A.C., to meet applicable standards of Chapters 62-3, 62-302, and 62-330, F.A.C. The stormwater management system shall be inspected for damage and proper operation daily.

**SPECIFIC CONDITIONS: PART D - Recordkeeping**

1. **Report submittals.** Unless otherwise specified, all submittals, notifications, requests for permit modification, reports for compliance with this permit, etc. shall be sent to: Solid Waste Section, Department of Environmental Protection, Southwest District Office, 13051 North Telecom Parkway, Temple Terrace, Florida 33637-0926.
2. **Operation Plan and Operating Record.** Each landfill owner or operator shall have an operational plan which meets the requirements of Rule 62-701.500(2), F.A.C. A copy of the Department approved permit, operational plan, construction reports and record drawings, and supporting information shall be kept at the facility at all times for reference and inspections. Operating records as required by Rule 62-701.500(3), F.A.C., are part of the operations plan, and shall also be maintained at the site.
3. **Waste Records.** The permittee shall maintain all records required by the construction specifications, CQA Plan and this permit onsite, and shall provide copies to the Department upon request.
4. **Financial Assurance.** The permittee shall provide financial assurance for this facility and related appurtenances in accordance with Rule 62-701.630, F.A.C.
  - a. All costs for closure shall be adjusted and submitted **annually, by September 1<sup>st</sup> each year** to: Solid Waste Manager, Solid Waste Section, Department of Environmental Protection, 13051 North Telecom Parkway, Temple Terrace, Florida 33637-0926.
  - b. Proof that the financial mechanism has been adequately funded shall be submitted **annually** to: Financial Coordinator, Solid Waste Section, Department of Environmental Protection, 2600 Blair Stone Road, MS#4565, Tallahassee, Florida 32399-2400.
  - c. Proof of the initial funding of the financial assurance mechanism shall be submitted **no later than 60 days prior** to receipt of waste in the expansion area.

**SPECIFIC CONDITIONS: PART E - Water Quality Monitoring Requirements**

**1. Monitor Well/Piezometer Construction.**

a. The proposed monitor wells and piezometers shall be designed and constructed in accordance with revised Attachment M-1 ("Revised Ground Water Monitoring Plan") to the "Engineering Report," prepared by SCS Engineers, dated April 2, 2004, revised November 15, 2004, and May 4, 2005 [Ref.S.C.#A.2.a.]. The locations of the proposed monitor wells and piezometers are shown on Figure M-1 entitled "Hardee County Solid Waste, Ground Water, Surface Water, and Leachate Monitoring Location Points, Hardee County, Florida," received November 19, 2004 (**attached**), as described below:

<u>Well No.</u>	<u>WACS Testsite</u>		<u>Designation</u>	<u>Location</u>
	<u>ID Number</u>	<u>Aquifer</u>		
MW-10 *	21063	Surficial	Detection	See Figure M-1
MW-11 *	21882	Surficial	Detection	↓
MW-12 *	21883	Surficial	Detection	↓
P-17 *	* N/A	Surficial	Piezometer	See
Figure M-1				
P-18 *	* N/A	Surficial	Piezometer	↓
P-19 *	* N/A	Surficial	Piezometer	↓
P-20 *	* N/A	Surficial	Piezometer	↓
P-21 *	* N/A	Surficial	Piezometer	↓
P-22 *	* N/A	Surficial	Piezometer	↓
P-23 *	* N/A	Surficial	Piezometer	↓

\* = to be installed **at least 30 days prior to completion of construction activities for the Phase II, Section I cell** in accordance with the construction details presented in Table M-2 of Part M of the "Engineering Report," prepared by SCS Engineers, revised November 15, 2004 [Ref.S.C.#A.2.a.]; documentation of well construction shall be provided in accordance with Specific Condition Nos. E.1.b. and E.1.c.

\* = to be installed **at least 30 days prior to completion of construction activities for the Phase II, Section I cell** in accordance with the construction details presented in Table M-4 of Part M of the "Engineering Report," prepared by SCS Engineers, revised November 15, 2004 [Ref.S.C.#A.2.a.]; documentation of piezometer shall be provided in accordance with Specific Condition Nos. E.1.b. and E.1.c.

b. Construction details for the proposed monitor wells and piezometer shall be provided to the Department's Southwest District Office on Department Form No. 62-522.900(3), Monitor Well Completion Report (**attached**) and shall be included in the Certification of Construction Completion described in Specific Condition No. B.2.

**SPECIFIC CONDITIONS: PART E - Water Quality Monitoring Requirements**

(Specific Condition #E.1., continued)

c. A surveyed drawing shall be submitted in accordance with Rule 62-701.510(3)(d)(1), F.A.C., showing the location of all monitoring wells (active and abandoned), horizontally located in degrees, minutes and seconds of latitude and longitude, and showing the elevation of the top of the well casing to the nearest 0.01 foot, National Geodetic Vertical Datum. The surveyed drawing shall include the monitor well identification numbers, locations and elevations of all permanent benchmarks and/or corner monument markers at the site. The survey shall be conducted by a Florida Registered Surveyor and shall be included in the Certification of Construction Completion described in Specific Condition No. B.2.

2. **Monitor Well/Piezometer Abandonment.** Existing monitor well MW-9 and existing piezometers P-3, P-4, P-5 and P-12 shall be abandoned **at least 30 days prior to the initiation of construction activities for the Phase II, Section I cell.** These locations shall be plugged and abandoned in accordance with Rule 62-532.440, F.A.C., and the rules of the Southwest Florida Water Management District. The written documentation of monitor well and piezometer abandonment shall be included in the Certification of Construction Completion described in Specific Condition No. B.2.

**SPECIFIC CONDITIONS: PART F - Landfill Gas Management**

**1. Landfill Gas - NSPS and Title V Air Requirements.**

a. This solid waste permit will meet the statutory requirement to obtain an air construction permit before modifying or constructing a source of air pollution, except for those landfills that are subject to the prevention of significant deterioration (PSD) requirements of Chapter 62-212, F.A.C. Facilities that are subject to the PSD requirements shall obtain an air construction permit from the Bureau of Air Regulation prior to beginning construction or modification pursuant to Rule 62-210.400, F.A.C.

b. The permittee shall comply with any applicable Title V air operation permit application requirements of Chapter 62-213, F.A.C., and 40 CFR 60, Subparts WWW and CC, as adopted by reference at Rule 62-204.800, F.A.C. Title V Permit applications shall be submitted to the District Air Program Administrator or County Air Program Administrator with air permitting authority for the landfill.

c. The permittee shall submit to the Division of Air Resources Management, Department of Environmental Protection, Mail Station 5500, 3900 Commonwealth Blvd., Tallahassee, FL 32399-3000, any amended design capacity report and any Non-Methane Organic Compound (NMOC) emission rate report, as applicable, pursuant to 40 CFR 60.757(a)(3) and (b).

d. **Within 90 days of issuance of this permit**, the permittee shall submit all information required by the Department's Air Resources Division to comply with Title V air requirements for the expanded landfill.

**2. Gas Monitoring and Control.** Landfill gas shall be monitored and controlled as required by Operation Permit no. 38414-007-SO or its successors.

**3. Gas Monitoring Locations.**

a. Gas monitoring probes shall be located as listed in Operation Permit no. 38414-007-SO or its successors, and the conditions of this permit.

b. **Landfill Gas Probe Construction.** Proposed gas probes GP-12 and GP-13 shall be designed and constructed in accordance with the inset table entitled "Landfill Gas Monitoring Probe Schedule" on Sheet 26 of 27 of the "Site Plans," prepared by SCS Engineers, revised November 19, 2004 [Ref.S.C.#A.2.d]. The locations of proposed gas probes GP-12 and GP-13 are shown on Figure O-1 entitled "Gas Probe Locations, Hardee County Landfill Expansion, Hardee County, Florida," received November 19, 2004 (**attached**). Written confirmation of proposed gas probe construction shall be included in the Certification of Construction Completion described in Specific Condition No. B.2.

c. **Landfill Gas Probe Abandonment.** Existing gas probes GP-7 and GP-8 shall be abandoned **at least 30 days prior to the initiation of construction activities for the Phase II, Section I cell**. Written confirmation of gas probe abandonment shall be included in the Certification of Construction Completion described in Specific Condition No. B.2.

**SPECIFIC CONDITIONS: PART F - Landfill Gas Management**

4. **Gas Remediation.** In the event that the Lower Explosive Limit (LEL) is greater than 25% inside structures both on or off of the landfill site, or greater than 100% at the property boundary, the owner shall submit to the Department, **within 7 days of detection**, a remediation plan detailing the nature and extent of the problem and the proposed remedy. The remedy shall be completed **within 60 days of detection** unless otherwise approved by the Department.



**SPECIFIC CONDITIONS: PART G - Closure and Long-Term Care Requirements**

**1. Closure Requirements.**

**a. Long-Term Care Requirements.**

1) The owner or operator shall perform long-term care for the site in accordance with Rule 62-701.620, F.A.C., and the conditions of Permit Operation Permit no. 38414-007-SO or its successors.

2) Long-term care includes, but is not limited to, water quality, leachate and gas monitoring, maintenance of the final cover system, maintenance of the leachate collection and removal system, erosion control, and the prevention of ponding within disposal areas.

**b. Closing Requirements.**

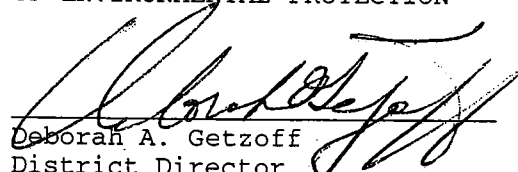
1) **No later than ninety (90) days** prior to the date when wastes will no longer be accepted for portions of the landfill which have reached closure design dimensions, the landfill owner or operator shall submit a closure permit application to the Department, in order to assure conformance with all applicable Department rules. A closure permit is required prior to implementing closure related activities.

**2. Use of Closed Landfill Areas.** Prior to implementation, the owner or operator shall submit a plan for any proposed uses of the closed portions of the landfill to the Department for approval. This plan shall include a description of the proposed use, and evaluation of the impact on the existing landfill systems (e.g. final cover, leachate collection, bottom liner), engineering designs, calculations and plans as appropriate, etc. The proposed activity shall not be initiated without prior Department approval, and may require a permit modification or separate permit.

**3. Final Cover.** Portions of the landfill which have been filled with waste to the extent of designed dimensions shall be closed (shall receive final cover) within 180 days after reaching design dimensions, in accordance with Rule 62-701.500(7)(g), F.A.C. and all applicable requirements of Department rules.

Executed in Tampa, Florida.

STATE OF FLORIDA DEPARTMENT  
OF ENVIRONMENTAL PROTECTION

  
Deborah A. Getzoff  
District Director  
Southwest District

ATTACHMENT 1

Specific Condition	Submittal Due Date	Required Item
A.4.	180 days prior to permit expiration	Submit permit renewal application
A.9.a.	Within 24 hours of discovery  Within 7 days of verbal notification	Notification of sinkholes or subsurface instability  Written notification & corrective action plan
B.2.a.	Within 60 days of completion of construction	Submit certification of construction completion, record drawings, etc.
B.4.a.	At least 30 days prior to construction	Submit complete plans, specification, CQA plan, or statement that no changes have occurred; borrow source report; org. chart with parties/roles
B.4.b.	At least 30 days prior to installation of the geosynthetics.	Submit interface friction testing results
B.4.c.	Prior to construction	Submit dewatering plan
B.4.d.	<b>No later than 2 weeks prior to construction of:</b> groundwater control system; connections to manholes; liner penetrations; spark testing; alternate seaming	Notify of construction initiation to allow for observation
B.4.e.	At least 1 week prior to full scale construction of low permeability layer	Submit Test Section Report
B.5.	At least 1 week prior	Notify of preconstruction meeting
B.6.a.	No later than 1 week after pre-construction meeting	Submit meeting minutes
B.6.b.	Monthly, by the 15 <sup>th</sup> each month	Submit monthly progress report & schedule
B.8.e.	At least 1 week prior	Notify of night work

ATTACHMENT 1, cont'd		
Specific Condition	Submittal Due Date	Required Item
C.6.b.	Within 24 hours of discovery	Notification of: hazardous waste receipt, failure of landfill systems or equipment
	Within 7 days of verbal notification	Written notification & corrective action plan
C.6.c.	Within 60 days of written notification	Complete corrective actions for groundwater monitoring system
C.6.d.	Within 30 days of written notification	Implement corrective actions for leachate management system
D.4.a.	Annually, by September 1 <sup>st</sup> each year	Submit revised cost estimates
D.4.b.	Annually	Submit proof of funding
D.4.c.	No later than 60 days prior to receipt of waste	Submit proof of initial funding
E.1.a.	At least 30 days prior to completion of construction	Install new wells
E.1.b..	Within 60 days of completion of construction	Submit construction details and survey information for new wells
E.2.	At least 30 days prior to construction	Abandon MW-9, P-3, P-4, P-5, and P-12
F.1.	Within 90 days of permit issuance	Submit information to Air Resources Division in Tallahassee for Title V
F.3.b.	Within 60 days of completion of construction	Submit gas probe construction details
F.3.c.	construction	Submit gas probe abandonment information
F.4.	Within 7 days of detection	Submit gas remediation plan
	Within 60 days of detection	Complete corrective actions
G.1.b(1)	No later than 90 days prior to the date when wastes will no longer be received	Submit Closure Permit application

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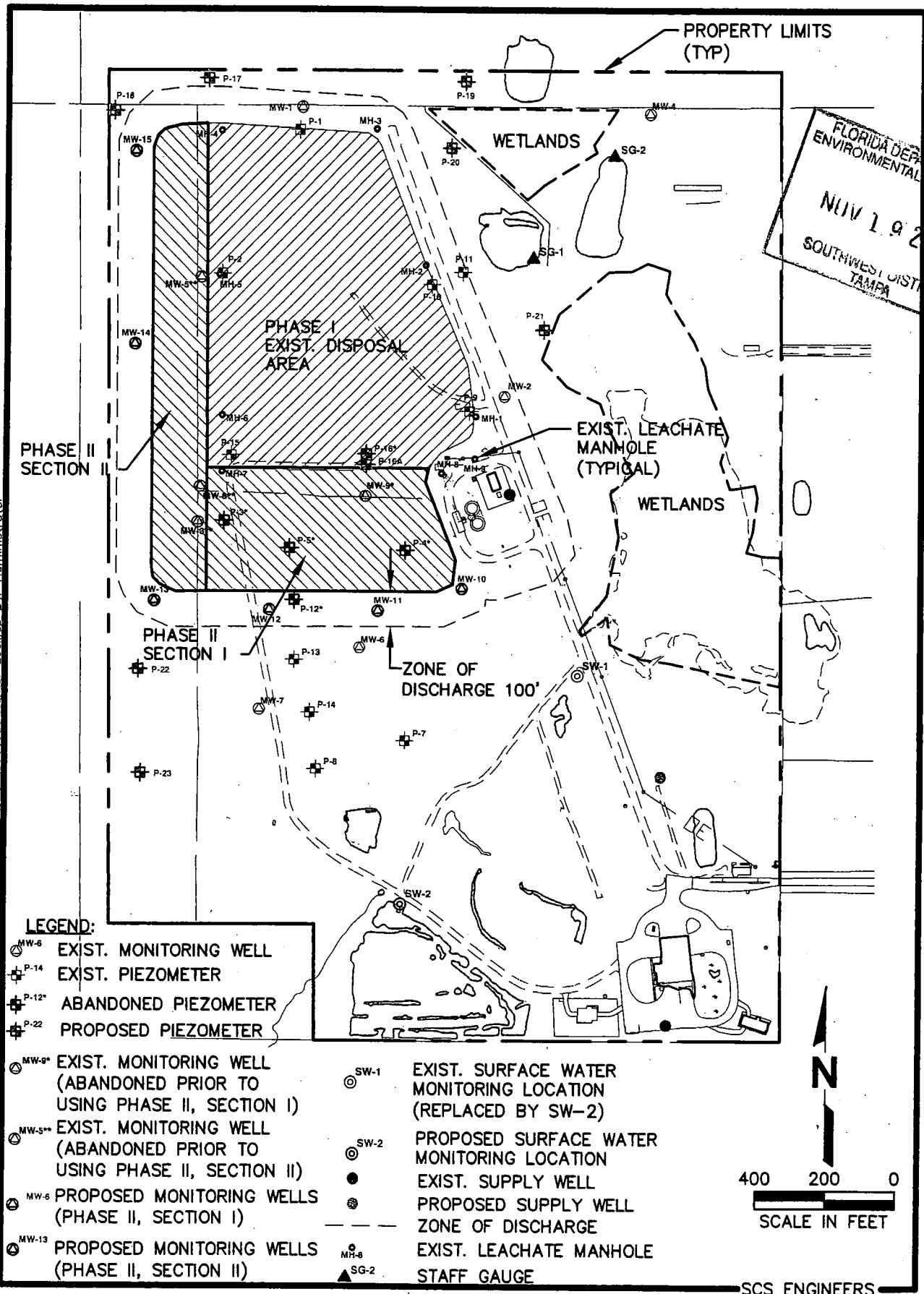


Figure M-1. Hardee County Solid Waste, Groundwater, Surface Water, and Leachate Monitoring Location Points, Hardee County, Florida.

NOV 19 2004

SOUTHWEST DISTRICT  
TAMPA

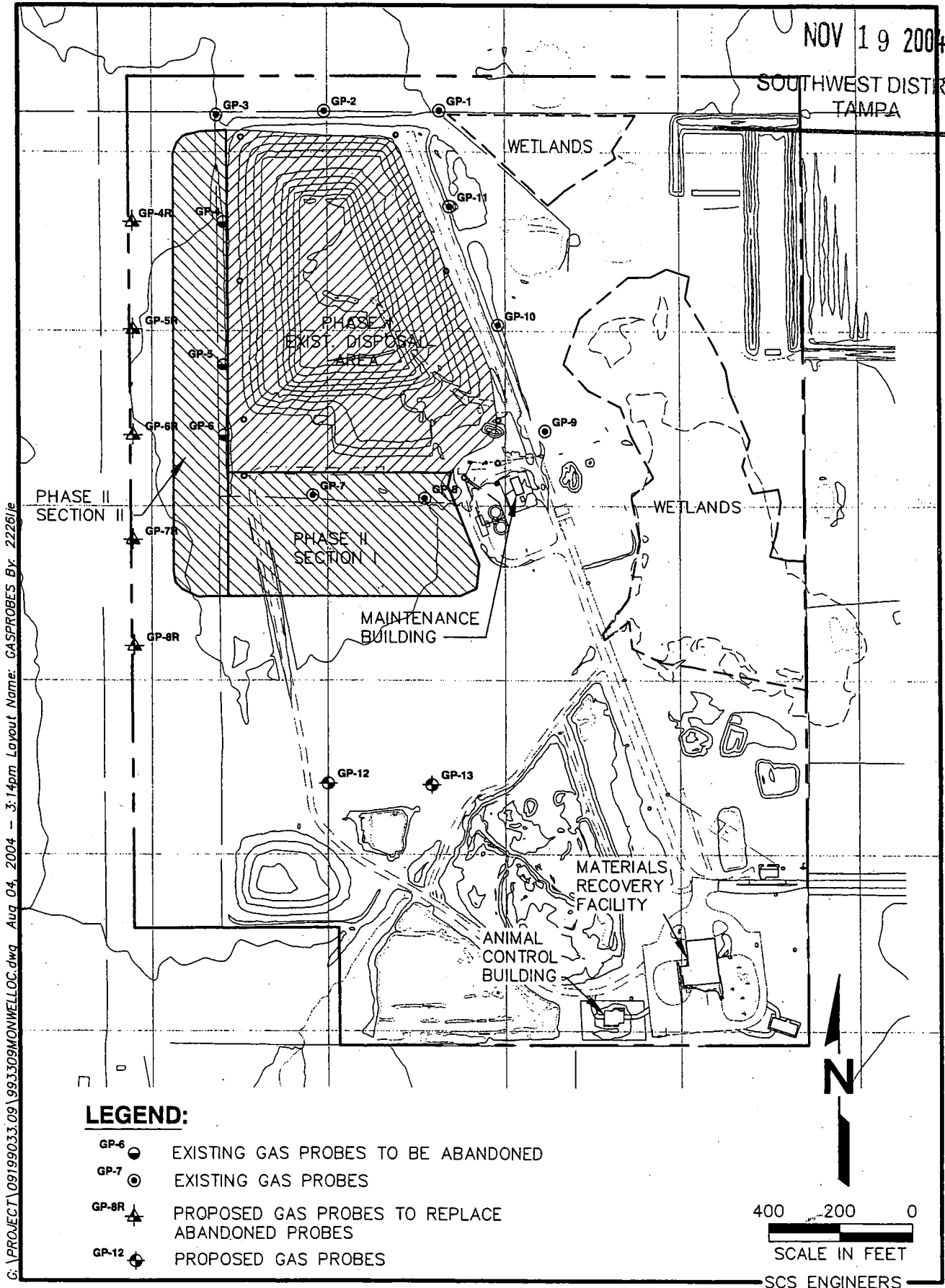


Figure O-1. Gas Probe Locations, Hardee County Landfill Expansion, Hardee County, Florida

Florida Department of Environmental Protection  
Twin Towers Office Bldg. 2600 Blair Stone Road Tallahassee, Florida 32399-2400

DEP Form # 62-522.900(3)
Form Title <u>MONITOR WELL COMPLETION REPORT</u>
Effective Date _____
DEP Application No. _____ (Filled in by DEP)

## MONITOR WELL COMPLETION REPORT

DATE: \_\_\_\_\_

INSTALLATION NAME: \_\_\_\_\_

DEP PERMIT NUMBER: \_\_\_\_\_ GMS NUMBER: \_\_\_\_\_

WELL NUMBER: \_\_\_\_\_ WELL NAME: \_\_\_\_\_

DESIGNATION: Background \_\_\_\_\_ Immediate \_\_\_\_\_ Compliance \_\_\_\_\_

LATITUDE/LONGITUDE: \_\_\_\_\_

AQUIFER MONITORED: \_\_\_\_\_

INSTALLATION METHOD: \_\_\_\_\_

INSTALLED BY: \_\_\_\_\_

TOTAL DEPTH: \_\_\_\_\_ (bls) DEPTH OF SCREEN: \_\_\_\_\_ (bls)

SCREEN LENGTH: \_\_\_\_\_ SCREEN SLOT SIZE: \_\_\_\_\_ SCREEN TYPE: \_\_\_\_\_

CASING DIAMETER: \_\_\_\_\_ CASING TYPE: \_\_\_\_\_

LENGTH OF CASING: \_\_\_\_\_ FILTER PACK MATERIAL: \_\_\_\_\_

TOP OF CASING ELEVATION (MSL): \_\_\_\_\_

GROUND SURFACE ELEVATION (MSL): \_\_\_\_\_

COMPLETION DATE: \_\_\_\_\_

DESCRIBE WELL DEVELOPMENT: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

POST DEVELOPMENT WATER LEVEL ELEVATION (MSL): \_\_\_\_\_

DATE AND TIME MEASURED: \_\_\_\_\_

REMARKS: (soils information, stratigraphy, etc.): \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

REPORT PREPARED BY: \_\_\_\_\_

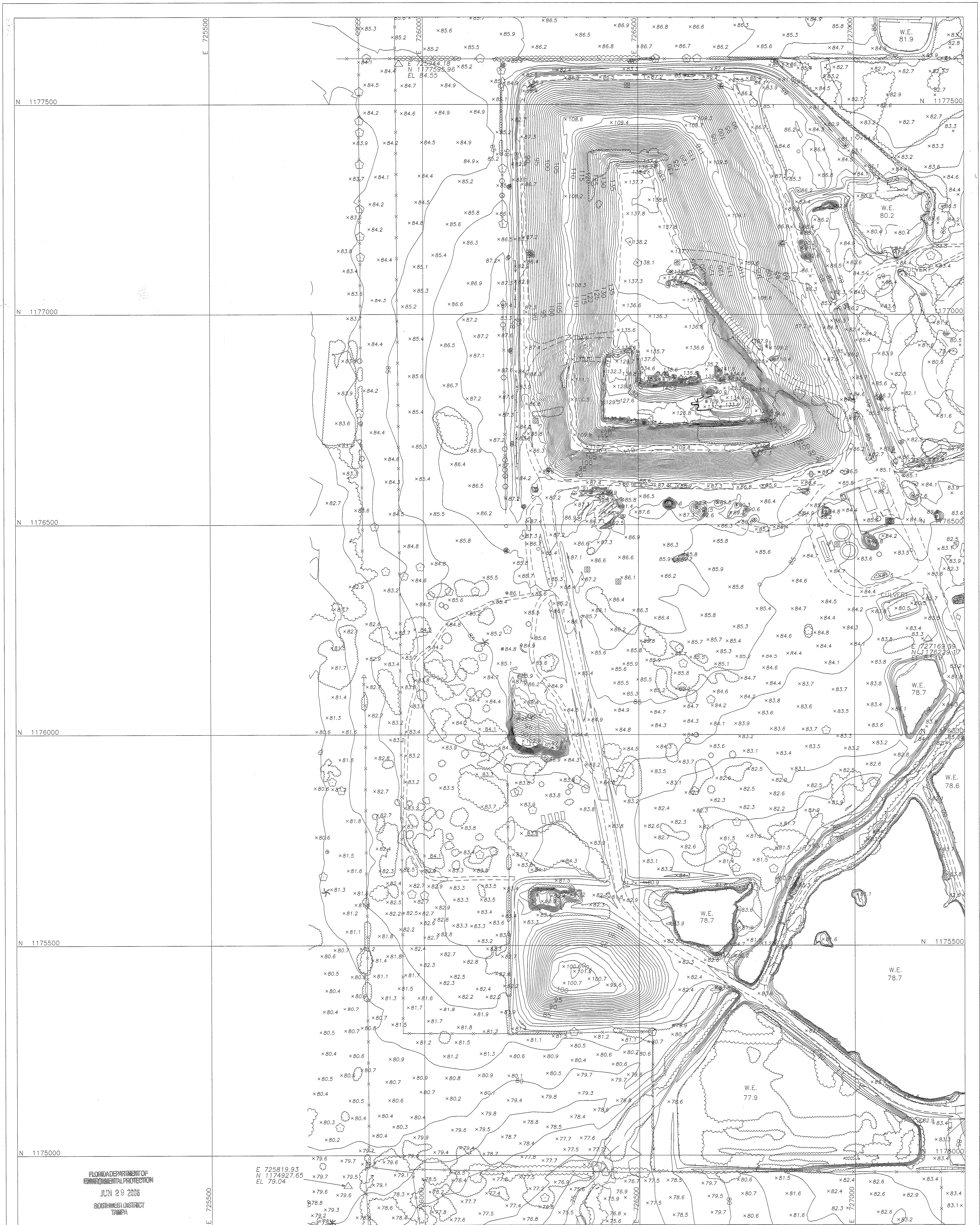
(name, company, phone number)

NOTE: PLEASE ATTACH BORING LOG.

(bls)= Below Land Surface

**EXHIBIT C**  
**FEBRUARY 2006**  
**AERIAL TOPOGRAPHIC SURVEY**





**SURVEYOR'S NOTES:**

- 1.) North, the grid, and the coordinates shown herein are referenced to the West Zone of the Florida State Plane Coordinate System, NAD 83, 1990 adjustment.
- 2.) Elevations are to National Geodetic Vertical Datum of 1929.
- 3.) This topographic survey was prepared by photogrammetric methods. See the attached report for map accuracy and surveyor's signature and seal. This map is limited to those features visible on aerial photography.

(THESE FEATURES ARE REPRESENTED BY SYMBOLS NOT TO SCALE)

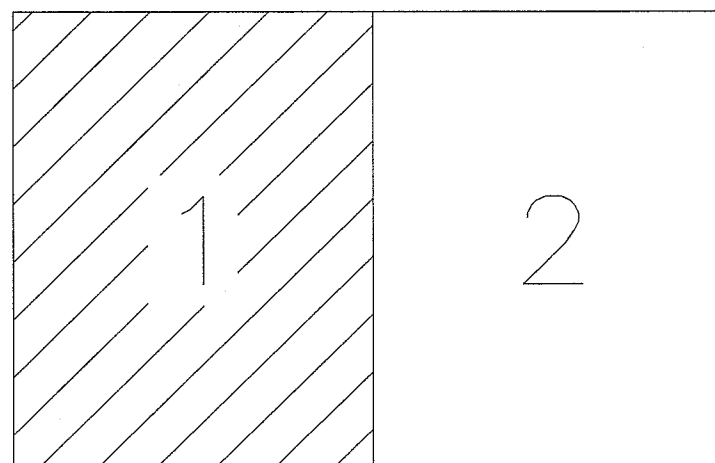
- △ CONTROL
- UTILITY POLE
- ★ LIGHT POLE
- ⊕ TRAFFIC LIGHT
- ⊙ SIGN
- ⊙ POST
- ⊙ FLAG
- ⊙ MAIL BOX
- ⊙ GUYWIRE
- ⊙ MANHOLE
- ⊙ HYDRANT
- ⊙ CATCH BASIN
- ⊙ VALVE
- ⊙ ELECTRICAL
- ⊙ AC
- ⊙ MISC SYMBOL
- ⊙ CULVERT
- ⊙ SWAMP/MARSH
- ⊙ TREE
- ⊙ PALM
- ⊙ SHRUB

**LEGEND:**

(THESE FEATURES ARE TO SCALE)

- CURB
- PAVED ROAD
- CONCRETE SURFACE
- UNPAVED ROAD
- FENCE
- GUARDRAIL
- WALL
- RAILROAD
- STRUCTURE
- TREE LINE
- SHRUB LINE

- PIPELINE
- RECREATION
- EDGE OF GROVE
- EDGE OF WATER
- SWAMPLINE
- OBSERVED CONTOUR
- DEPRESSION CONTOUR
- (THESE INFORMATIVE LABELS ARE NOT SCALE DEPENDENT)
- W.E. 74.4 WATER ELEVATION
- × 120.0 TYPICAL SPOT ELEVATION
- × 120.0 OBSERVED SPOT ELEVATION



**TOPOGRAPHIC SURVEY**

**HARDEE COUNTY LANDFILL**

PREPARED FOR: SCS ENGINEERS

475 SOUTH FIRST AVENUE  
BARTOW, FLORIDA 33830  
PHONE: (888) 555-9095  
FAX: (888) 554-1484



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SURVEYING & PHOTOGRAMMETRY  
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WAUCHULA, FLORIDA 33880  
PHONE: (888) 773-3880  
FAX: (888) 773-3822

THIS MAP AND ATTACHED REPORT ARE NOT FULL AND COMPLETE WITHOUT THE OTHER AND ARE NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER

No.	DATE	APPROVED	REVISION
01	02/17/06		ORIGINAL RELEASE

PROJECT NO.	14198
DRAWING NO.	1
OF	1
LD 3246	2