FILE

SCS ENGINEERS

Hardee County Landfill Expansion
Construction Permit Application
Hardee County, Florida
Volume 2 of 2

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION
APR - 8 2004
SOUTHWEST DISTRICT
TAMPA

Prepared for:

Hardee County
Board of County Commissioners
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April 2004
File No. 09199033.09

CONSTRUCTION PERMIT APPLICATION
FOR
HARDEE COUNTY LANDFILL EXPANSION

VOLUME 2 OF 2

Prepared for:

Hardee County
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VOLUME 2 OF 2

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SECTION J

GEOTECHNICAL INVESTIGATION REQUIREMENTS

Please attachment J-1 for the Geotechnical Report.

ATTACHMENT J-1

GEOTECHNICAL REPORT

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

GEOTECHNICAL REPORT

ATTACHMENT J-1
TO THE

CONSTRUCTION PERMIT APPLICATION
FOR
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Prepared for:

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File No. 09199033.09
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GEOTECHNICAL REPORT

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ENGINEERING CERTIFICATION

This Geotechnical Report (Report) was prepared specifically for the permit application prepared for the expansion of the Hardee County Landfill. The geotechnical subsurface investigation, interpretations, and design recommendations were completed under my direct supervision and have been reviewed by SCS Engineers for engineering accuracy and completeness. This Report has been prepared in accordance with accepted professional engineering practices.

(Signature, Date)
Joseph H. O'Neill, P.E.
P.E. Registration No. 052049
(State of Florida)

SCS Engineers
Florida Certificate of Authorization No. 00004892

The recommendations submitted in this Report are based on the available subsurface information contained within this report. If there are revisions to the plans and recommendations for this project or if deviations from the subsurface conditions noted in this Report are encountered, SCS Engineers should be notified immediately to determine if changes in the project recommendation are required.

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GEOTECHNICAL REPORT

This Geotechnical Report (Report) was prepared by SCS Engineers (SCS) for the expansion of the Hardee County Landfill (Facility) located in Hardee County, Florida. The proposed expansion includes development of a new double-lined disposal area and vertical expansion of the existing landfill disposal area. The new double-lined disposal area is designated as Phase II area and the existing disposal area was designated as Phase I. The site investigation, soil boring logs, laboratory data, calculations, and subsequent design recommendations outlined in this Report were prepared to address the requirements outlined in Rule 62-701.410(2) and 62-701.430, F.A.C.

SUBSURFACE INVESTIGATION BACKGROUND INFORMATION

Prior to conducting the site investigation, SCS reviewed previous geotechnical information that had been collected at the Facility. The previous geotechnical information, reviewed by SCS, included the following reports or boring logs:

1. November 1982," Hardee County Landfill" – Envisors, Incorporated.
2. March 1997, " Geotechnical Engineering Services, Hardee County Sanitary Landfill, PSI Report No. 757-75054", PSI.
3. November 1997, "SPT Boring Log SB-01", PSI.

Copies of the above information is contained in Attachment A of this Report.

SUBSURFACE INVESTIGATION PLAN OUTLINE

SCS prepared a site specific geotechnical subsurface investigation for the area designated for the expansion of the Hardee County Landfill. SCS subcontracted the drilling and laboratory sampling to Professional Services, Incorporated (PSI) of Tampa, Florida. Based upon the proposed limits of the expansion and previously collect boring information, SCS selected the locations for seven geotechnical borings. The location for the seven geotechnical borings was established to obtain subsurface information directly within the expansion footprint as well as to estimate the perimeter subsurface soil strata conditions that may influence the design of the expansion.

After reviewing the previously collected subsurface information, SCS estimated that the upper soil strata consisted of approximately 15 feet of silty and poorly graded sands. The next soil strata was a clayey sand, approximately 5 to 10 feet thick, above a stiff low plasticity clay. Below the stiff clay layer, the previous investigations indicate a dense to very dense sand with phosphate particles. SCS prepared a drilling and testing plan to classify the soils, estimate the relative density of the subsurface soil layers using Standard Penetration Tests (SPT), estimate the insitu permeability of the soils, and retrieving samples of the sandy clay and stiff clay layers for shear strength estimations and consolidation properties. The soil investigation testing methods are outlined below:

- Subsurface Soil Classification – Field classification, SPT N-values, grain size analysis, atterberg limits. Based upon field classification, grain size and atterberg limits the soils were classified using the Unified Soil Classification System (USCS). Blow counts from the Standard Penetration Testing were used to estimate the in-situ density of the soil layers.

- Soil borings were conducted by PSI using a CME-45 drill rig capable of conducting Standard Penetration Tests (SPT) and retrieving both spilt spoon samples and undisturbed Shelby Tube soil samples. Spilt spoon samples were used to field classify the soils and Shelby tubes were used to recover undisturbed samples for the laboratory sampling.

- Permeability – A flexible wall permeameter was used to test the soil samples retrieved from the Shelby tubes.

- Tri-Axial Consolidated Undrained (CU) Testing – Samples retrieved from the Shelby tubes were consolidated under various loads and then loaded until the samples sheared under undrained conditions. The shear strength parameters, cohesion and phi angle, were estimated over a range of loading conditions to estimate the soils strength.

- Consolidation Testing – The consolidation test conducted was to estimate the amount of consolidation (settlement) in the soil layer that could be expected due to the additional loading and stresses induced by the overlying landfill waste material.

A copy of the boring logs and laboratory test results prepared by PSI (April through September 2003) is contained in Attachment B of this Report.

SUBSURFACE SOIL BORINGS

The field work for the expansion soils boring was conducted from April 22 through 24, 2003. The drilling logs for the soil borings are contained in Attachment B of this Report. The seven geotechnical boreholes were designated as Test Hole Numbers 1 through 7 (TH-1 through TH-7). SCS has summarized the boring log information for each borehole below:

TH-1: From ground surface to approximately eighteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 8 to 13 with an average of about 10. Based on N-values, this sand layer would be classified as loose to medium dense soil layers. Groundwater was estimated to be approximately seven feet bls. The next major soil stratum, from eighteen to twenty-eight feet bls, encountered was a low plasticity clay. The upper five feet had a blow count of approximately 7 (a medium stiff layer) over a very stiff lower five feet of clay with a blow count of 19. A Shelby tube, Undisturbed Sample No.1 (US-1) was collected in the upper clay layer for tri-axial testing since the upper layer had a lower density and anticipated shear strength. A Shelby tube were also taken in the lower stiffer clay to estimate consolidation however the sample in the tube had too much silty sand, probably from miscellaneous drill cuttings, and was not representative of the in-situ, stiff clay layer. Hence US-2, was disregarded. The soils strata below the clay layer were generally sandy clays and clays with sand and phosphates. The blow counts from approximately twenty-eight feet bls to seventy feet bls (the end of the boring) had blow counts ranging from 19 to 50 blows per inch with the majority of the blow county above 50. Below twenty-eight feet bls the soils would be classified as dense to very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-2: From ground surface to approximately eight feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 6 to 11 with an average of about 11. Based on N-values, this sand layer would be classified as a medium dense soil layer. Groundwater was estimated to be approximately six and half feet bls. A five- foot clayey sand layer was encounter next. From thirteen to twenty-three feet bls, poorly graded to silty sands with SPT N-values ranging from 12 to 28 were encountered. From twenty three to thirty three feet bls, a very stiff to hard low plasticity clay layer was encountered. From thirty-three to forty-five feet bls, the soils were generally sandy clays and clays with sand and phosphates. The blow counts ranging from approximately 47 to 50 blows per 5-inches with the majority of the blow county above 50. The soils would be classified as dense to very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-3: From ground surface to approximately eighteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 5 to 20 with an average of about 10. Based on N-values, this sand layer would be classified as loose to medium dense layer soil layers. Groundwater was not measured in this borehole. A five-foot highly weather fragmented limestone layer was encounter next. From thirteen to twenty-three feet bls, low plasticity clay layer with SPT N-values ranging from 38 to 69 were encountered. This is would be classified as a hard to very hard clay layer. From thirty-three to forty-five feet bls, a sand clay to clayey soils were encountered with blow counts ranging from approximately 32 to 50 blows per 6-inches. These soils would be classified as dense to very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-4: From ground surface to approximately thirteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 6 to 21. Based on N-values, this sand layer would be classified as loose to medium dense soil layers.

Groundwater was measured approximately five and half feet bls in this borehole. A five-foot sandy clay layer with a blow count of 19 was encountered next. From eighteen to twenty-four feet bls, low plasticity clay layer with SPT N-values of 10 was encountered. This is would be classified as a stiff clay layer. A Shelby tube (US-3) sample was collected from this layer however insufficient sample material was retrieved to accurately test. From twenty four to twenty eight feet bls, the clay transitioned to a more sandy clay material with a blow county of 24. A Shelby tube (US-4) was collected from the lower more stiff clays and this sample was tested for shear strength. From twenty eight to forty five feet bls, clayey sands were encountered with blow counts ranging from approximately 24 to 45 blows per 6-inches. These soils would be classified as dense to very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-5: From ground surface to approximately thirteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 8 to 27. Based on N-values, this sand layer would be classified as loose to medium dense soil layers. Groundwater was measured approximately five and half feet bls in this borehole. From thirteen to twenty-three feet bls, a low plasticity clay layer with SPT N-values ranging from 8 to 18 was encountered. This is would be classified as a stiff to very stiff clay layer. A Shelby tube (US-5) was collected from the upper stiff clay for shear strength testing. From twenty-three to forty five feet bls, a clayey sands were encountered with blow counts ranging from approximately 21 to 51 blows. These soils would be classified as medium to very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-6: From ground surface to approximately eighteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 10 to 50 blows for 6 inches. Based on N-values, this sand layer would be classified as a medium to very dense soil layers. Groundwater was not measured in this borehole. From thirteen to twenty-three feet bls, a low plasticity clay layer with SPT N-values of 5 was encountered. This is would be classified medium stiff clay layer. A Shelby tube (US-6) was collected from the upper stiff clay for shear strength testing. From twenty three to thirty five feet bls, clayey sands were encountered with blow counts ranging from approximately 51 to 51 blows for 4 inches. These soils would be classified very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

TH-7: From ground surface to approximately thirteen feet below land surface (bls) the soils consist of poorly graded and silty sands. SPT N-values range from 7 to 28 blows. Based on N-values, this sand layer would be classified as a loose to medium dense soil layers. Groundwater was measured approximately six and half feet bls in this borehole. From thirteen to twenty-three feet bls, a low plasticity clay layer with SPT N-values ranging from 7 to 9 was encountered. This is would be classified medium stiff clay layer. A Shelby tube (US-7) was collected from the upper stiff clay for permeability and shear strength testing. In the upper portion of the Shelby tube a sandy clay sample was identified for permeability testing as well as a clay sample for permeability testing. The sandy clay transition was present at all the transition zones of the borings so the permeability would transition from a clayey sand to a clay. A consolidation sample was also retrieved from the tube estimate the amount of settlement could be anticipated in the medium stiff clays. From twenty three to thirty five feet bls, clayey sands and low plasticity clays were encountered with blow counts ranging from approximately 22 to 50 blow for 5 inches. These soils would be classified very stiff to hard, very dense soils. Very high shear strengths and little settlement would be anticipated in these layers due to the high density of the soils. Upon completion of the boring the borehole was grouted, with portland cement and bentonite, from boring terminus to ground surface.

MUCK, PREVIOUSLY FILLED AREAS, SOFT GROUND, LINEAMENTS, AND SINKHOLES

A review of the all borings contained in Attachments A and B indicated no muck or high organic soils layers are present within or adjacent to the expansion or existing landfill disposal areas.

The area within the Phase II area has remained undisturbed since operations began in 1983. During the subsurface investigation conducted by PSI, SCS examined the spilt spoon samples retrieved from the borings. The split spoon samples did not have multiple soils types or colors that are generally found in filled areas. This indicates that the area has not been disturbed or previously filled.

No soft ground depressions or weak subsurface soil layers were noted in the borings.

SCS reviewed the sinkhole activity information that is currently available for Hardee County on the Florida Department of Environmental Protection/Florida Geology Survey's Sinkhole Database. A copy of the sinkhole activity available for Hardee County is contained in Attachment C.

FAULT AREAS, SEISMIC IMPACT ZONES, UNSTABLE AREAS

A review of the revised Seismic Impact Zone Map, contained with the Municipal Solid Waste Disposal Facility Criteria Technical Manual published by the United States Environmental Protection Agency, the Hardee County Landfill is not in a known fault area or in a high probability seismic impact zone. A copy of the Seismic Impact Zone Map is contained in Attachment D.

A review of the subsurface information contained in Attachment A and B indicates no unstable subsurface soil layers were present within the proposed expansion area.

ESTIMATED AVERAGE AND HIGH GROUNDWATER TABLE ELEVATIONS ACROSS THE SITE

To estimate the average and high groundwater table elevations across the site, SCS reviewed the groundwater elevation data collected for the piezometers and groundwater monitoring wells on-site. The period reviewed was from June 1997 to December 2003. The Facility had a leachate spray irrigation system in operation until April of 1999. Consequently, groundwater elevation data prior to April of 1999 may have been influenced to some extent by the underdrain system or spray field operations. SCS also collected rainfall data from a NOAA weather station, Weather station COOP ID # 089401, located in the City of Wauchula, Florida. The weather station is approximately three miles of the landfill. The rainfall data reviewed was from January 1990 through December 2003. According to the NOAA rainfall data, the average yearly rainfall for the area is approximately 52.2 inches. It should be noted that during 1997, 1998, and 2002 the yearly rainfall amounts were 65.8, 66.1, and 62.2 inches, respectively.

The estimated average groundwater elevations across the site range from approximately EL. 81.7 at MW-1 located on the north side of the site to approximately EL. 77.5 in MW-7 located south of the existing Phase I disposal area.

The high groundwater elevations across the site range from approximately EL. 84.1 at MW-1 located on the north side of the Facility to approximately EL. 83.44 in MW-6 located south of the existing Phase I disposal area.

No piezometers or wells are located within the borrow pit area. To estimate the seasonal high groundwater table, SCS had the County dig test holes in five locations, several feet below existing grade, surrounding the borrow pit. Soil staining observations, made in accordance with SFWMD district guidelines, were used to estimate the groundwater elevations. Pits Number 1 and 5 were used to estimate the seasonal high water table. In Pits Number 2, 3,and 4 no distinct soil staining layers were observed possibly due to the close proximity to the adjoining former borrow pit. Groundwater is pumped out of the existing borrow pit into the former borrow pit so the water levels are not representative of natural groundwater levels. The County surveyed in the stained soil layer in Pit Numbers 1 and 5. Based upon the survey, the average groundwater elevation in the borrow pit was estimated to be at approximately Elevation 78.53, which is consistent with the elevations observed in the piezometers located on the southern end of the former spray field, specifically piezometers P-13 and P-14.

SCS plotted the groundwater elevations within the proposed expansion area and checked the geomembrane and six-inch subbase materials to make certain that the bottom of the subbase material would above the average groundwater elevations. A groundwater control system was designed to collect groundwater the rises above the average elevations within the expansion area. The average groundwater elevations and the expansion cell elevations are shown Table 1.

TABLE 1. MONITORING POINTS, GROUNDWATER ELEVATIONS, and CELL ELEVATIONS

Monitoring Point	Average Elevation of Groundwater	Elevation of Geomembrane	Elevation of bottom of 6-in subbase	Location of Points on Geomembrane
MW-5	79.26	83.15	82.65	Leachate trench west of MW-5
MW-8	78.36	81.36	80.86	Leachate trench south of MW-8
MW-9	77.61	79.00	78.50	Low Point of Cell – Sump Area
P-3	78.95	82.69	82.19	Leachate trench south of P-3
P-4	77.57	79.70	79.20	Leachate trench east of P-4
P-5	78.40	81.75	81.25	Leachate trench north of P-5

Please refer to Attachment E for the estimated average and high groundwater table elevation maps, groundwater data, and rainfall information.

GEOTECHNICAL DESIGN RECOMMENDATIONS

Based upon the previously collected geotechnical information collected for the site and the subsurface investigation plan outlined by SCS for the expansion area, SCS has prepared the following geotechnical design recommendations for the construction and operations of the expansion and existing landfill disposal areas.

ESTIMATED SETTLEMENT AT THE BOTTOM OF THE EXPANSION AREA

Two conditions were analyzed for the leachate collection and detection systems in the expansion area. Settlement, due to the proposed waste loading, will influence the conveyance of leachate to the leachate collection and detection pumps. The two bottom cell conditions analyzed are as follows:

Leachate Collection/Detection Trenches --

- The leachate Collection/Detection trenches were designed to convey the leachate collected from the geocomposite drainage layer to the leachate sump. The slope of the trenches were designed to convey the high flow rates during the initial open cell condition as well as retain sufficient slope after settlement to convey the estimated flow rates as filling occurs in the expansion area.

Cross Slope of the Cell --

- The design of the bottom of the expansion area included a typical "saw-tooth" pattern or a series of peaks (ridgelines) and valleys (leachate collection/detection trenches). This pattern, and the spacing of the trenches, was designed to limit the potential hydrostatic head above the primary and secondary containment geomembrane. The flow rate and transmissivity of the geocomposite drainage layer and cross slope between the peaks and valleys was used in the USEPA's HELP model to estimate the potential head above the various geomembrane layers. As the expansion area is loaded, settlement will decrease the initial cross slopes. Settlement of several cross slopes was computed, the resultant slopes estimated, and the long-term slopes were then used in the USEPA's HELP model to estimate the head of the geomembrane layers.

Settlement Calculation Procedure

The estimated settlement of the subsurface soil layers in the expansion area was computed at several points, specifically along the length of each segment of pipeline and at points in the trenches and ridgeline. The location of the points was selected in areas of maximum anticipated loading (stress), along the tie-in between the existing and expansion area, at the sump, and along the outer toe of slope. At these locations the deflection of the pipes in the trenches and the cross slope of the cell was computed.

At each selected point, the pre-existing (prior to excavation for the expansion) stress in the various subsurface layers was estimated based upon the effective (buoyant) overburden stress at the mid-point of each soil type. Soil layers were grouped together based upon similar soil classification and blow counts. Settlement estimates were terminated in very dense layers since these layers are at or near the maximum anticipated density for that layer. SCS estimated the unit weight of each soil types over a range of relative densities that are representative of SPT N-values recorded in the field. The unit weight of the clay soils was tested in the laboratory. The soil stratification at each point was estimated using the nearest borehole. Groundwater levels were estimated from the nearest monitoring well and the lowest water elevations taken to maximize the overburden stress in the soil layers.

Next the SCS estimated the unit weight of the waste material to be placed in the expansion cell. To conservatively estimate the anticipated settlement, SCS maximized the unit weight of the waste material. In the settlement calculations, the waste material was assumed to be fully saturated. In addition, the drainage sand and cover soils were computed using saturated soil weights. The incoming waste is compressed in a baler at the MRF. The baled waste has an approximate unit weight of 43 pounds per cubic foot. The incoming moisture content was estimated to be approximately 12 percent based upon estimated composition and average moisture contents. The baled waste initial moisture content was then raised to approximately 40 percent. Above 40 percent moisture is generally considered for very wet waste materials that are associated with a bio-reactor landfill. Hardee County is not considering a bio-reactor cell however using a 40 percent moisture content is a very conservative estimate for the moisture content and unit weight of the material. In addition, the daily cover soils were computed as saturated soils. A composite unit weight of 56 pcf was estimated for fully saturated waste materials and daily cover soil. This was rounded up to 60 pcf for settlement calculations.

SCS computed the maximum anticipated settlements for the leachate collection trenches and cross slopes based upon the procedures outlined. Refer to Attachment F for the settlement calculations. The locations of the settlement points is shown on Figure 1 and 2 within Attachment F. The results of the settlement estimates are summarized in Tables 2 and 3.

TABLE 2. SUMMARY OF ESTIMATED SETTLEMENT AND SLOPES LEACHATE COLLECTION/DETECTION TRENCHES

	Initial Conditions			Final Conditions		
Points	Initial Elevation (ft NGVD)	Distance Between Points (ft)	Initial Slope (%)	Settlement (ft)	Long Term Elevation (ft NGVD)	Long Term Slope (%)
9C	79.0			0.53	78.5	
		324.9	0.52			0.24
11C	80.7			1.45	79.2	
		326.2	0.28			0.41
5C	81.6			1.01	80.6	
		433.0	0.24			0.37
3C	82.6			0.45	82.2	
		597.9	0.26			0.26
1	84.2			0.48	83.7	
12	79.7			0.53	79.2	
		385.9	0.49			0.33
8C	81.6			1.15	80.5	
		386.1	0.50			0.66
6	83.5			0.53	83.0	
10	80.0			0.44	79.6	
		408.9	0.50			0.48
8A	82.1			0.54	81.5	
		332.0	0.50			0.51
7	83.7			0.53	83.2	
10	80.0			0.44	79.6	
		90.0	0.33			0.43
12	79.7			0.53	79.2	
		116.0	0.60			0.61
9C	79.0			0.53	78.5	

TABLE 3. SUMMARY OF ESTIMATED SETTLEMENT AND SLOPES CROSS (PERPENDICULAR) TO TRENCHES

	Initial Conditions				Final Conditions			
Points	Initial Elevation (ft NGVD)	Difference (ft)	Distance (ft)	Slope (%)	Settlement (ft)	Elevation (ft NGVD)	Difference (ft)	Slope (%)
8A	82.1				0.54	81.5		
		1.3	47.2	2.84			1.0	2.02
8B	83.4				0.92	82.5		
		1.8	63.7	2.81			2.0	3.17
8C	81.6				1.15	80.5		
		1.2	44.0	2.70			0.9	2.11
8D	82.8				1.41	81.4		
		2.1	67.0	3.13			2.1	3.20
11C	80.7				1.45	79.2		
		1.0	45.6	2.19			0.9	2.04
11B	81.7				1.52	80.2		
3B	84.6				0.73	83.9		
		2.0	70.8	2.75			1.7	2.37
3C	82.6				0.45	82.2		
		1.9	68.1	2.75			2.0	3.00
3D	84.5				0.28	84.2		
2A	85.8				1.56	84.2		
		2.1	77.3	2.75			1.7	2.14
2B	83.7				1.09	82.6		
		2.0	73.9	2.75			2.5	3.34
2C	85.7				0.65	85.1		

Results: Based upon the maximum anticipated settlements in the Phase II area, the designed leachate collection and cross slopes are adequate maintain the flow within the pipelines and minimize the head over liner.

EFFECT OF VERTICAL EXPANSION ON THE EXISTING LEACHATE COLLECTION

To estimate the effects of adding additional waste on top of the existing Phase I landfill's perimeter leachate collection system, SCS computed the anticipated settlement along the western and southern sides of the Phase I disposal area. Using the estimated settlement at points along the leachate collection system, the anticipated long-term slope of the pipeline was computed. The maximum settlement occurs along the south side. After settlement, the slope on the pipeline between Manhole No. 7 and Manhole No. 8 (the lift station) will essentially be flat. In addition, a pipe separation was noted during the latest video inspection between Manhole No. 7 and Manhole No. 6.

Results: The recommendation is to repairs the pipe separation and install a new leachate collection line extending from Manhole No. 6 to Manhole No. 8. After settlement, the long-term slope on the new leachate collection line will be sufficient to carry a maximum flow rate that can be handled by the two pumps located in the lift station. A pipe crushing analysis was also computed to ensure the proposed 10-inch SDR 11 HDPE pipe has sufficient strength to carry the maximum loads anticipated during the final buildout of the Phase II area.

The loading across the western and southern sides of the Phase I area will be uniformly distributed along the perimeter and along the interface between the Phase I and II area. No differential settlement is anticipated along the length of the pipeline or along the interface between the Phase I and II areas.

Calculations for the existing landfill and collection system are contained in Attachment G of this Report.

BEARING CAPACITY

The estimated foundation bearing capacity of the foundation soils beneath the expansion area estimated to be a minimum of 4,800 pounds per square foot. This is based upon a very conservative estimate for the unit weight of the waste material (60 pcf at 40 percent saturation) and a maximum depth of waste, sand, and cover materials of approximately 75 feet at the center of the expansion.

Results: The results of the slope stability analysis of the foundation soils and the maximum anticipated settlements indicate that the design of the expansion area meets regulatory requirements. Therefore, the foundation soils have sufficient bearing capacity to support the proposed final buildout plans presented with this Permit Application.

SLOPE STABILITY

A circular and non-circular slope stability search was conducted on the existing slope with various waste shear strength properties. The circular analysis was analyzed to identify potential global circular failure planes extending through the waste material and foundation soils. The non-circular block models were used to analyze the horizontal bale to bale interface friction shear strength properties or potential defined failure planes.

To compute the slope stability of the expansion, SCS first modeled the existing conditions, as of March 2003, to estimate the baled and loose waste shear strength properties. The existing conditions of the landfill were taken from the aerial topography survey conducted by I.F. Rooks, and Associates. The existing southern sideslope was modeled with the CAT D7R Series II dozer on the top of the landfill at the edge of the upper slope. Since no slippage or failures have been observed when the dozer is operating on the slope, the slope stability models were run to estimate the minimum waste strength properties that would be needed to maintain a minimum factor of safety equal to 1.0. The minimum waste shear strength values estimated from the existing conditions would be used for the basis of all other models. The slope stability analysis models are contained in Attachment H.

Slope Stability Analyses

Two cross section were modeled for the expansion area. One cross section runs north and south through the highest buildout elevation of the expansion. The other cross section runs east and west through the middle of the westside of the expansion. The following potential failure planes were analyzed;

Potential Failure through the waste mass – A circular failure analysis was conducted from outside the toe of slope to the upper surface. All failure planes passed through the foundation soils and waste material. Non-circular (block) models analyzed potential failure planes extending through the baled and loosed waste and extending horizontally along potential bale to bale failure planes.

Potential Failure along the liner system – A non-circular (block) failure analysis was performed along the liner system to simulate potential slip failure planes between geosynthetic components of the liner system.

Potential Failure through the foundation soils – A circular failure analysis was performed from outside the toe of slope to the upper surface. All failure planes passed through the foundation soils and waste material. Non-circular (block) models analyzed potential deep failure planes along the expansion foundation.

Potential Failure along the liner interface along the existing slope – A non-circular (block) failure analysis model was performed to simulate various pieces of equipment that may be traversing the sideslopes during construction and operations of the expansion area.

TABLE 4. SUMMARY OF SLOPE STABILITY EVALUATIONS
SLOPE STABILITY WITH EQUIPMENT LOADS

Potential Failure Surface	NS		E/W	
	Circular	Block	Circular	Block
Pass through waste mound	1.9	1.7	1.6	
Along liner system[1]	NA	1.7	NA	1.5
Pass through foundation soils	1.9	1.7	1.6	1.6
Liner interface with existing slope with D7R[2]	NA	1.5	NA	1.5
Liner interface with existing slope with D6[3]	NA	1.5	NA	1.5
Liner interface with existing slope with D5N[4]	NA	1.5	NA	1.5
Initial Filling of Phase II Section I – El 96 [5]		1.5		1.5
Filling Phase II Section I El 110 [5]		1.8		1.8
Filling Phase II Section I El 150 [5]		2.2		2.2
Initial Excavation of Phase II Section I [6]	1.6	1.7	NA	NA

[1]Minimum interface friction angle of 15 degree along the bottom; 15 degrees on the sideslope
[2]Minimum interface friction angle of 26.9 degree peak ; equipment pressure 1617.6 psf
[3]Minimum interface friction angle of 26.5 degree ; equipment pressure 983.4 psf
[4]Minimum interface friction angle of 26.3; equipment pressure 945.4 psf
[5] Minimum interface friction angle of 26.5 degree; equipment used CAT D7R
The N/S and E/W direction are the same since filling will occur in any direction
[6] During Excavation of Phase II Section I CAT D6 (construction) and CAT D7 (operations)

Results: Based upon the results of the slope stability analysis the following recommendations are proposed for excavation, equipment loading, and geosynthetic interface friction properties;

- Excavation of the Phase II Section I and II areas; Prior to excavation, the groundwater control system should be installed, at a minimum, and the contractor should provide additional dewatering of ponded surfacewater. This will keep the excavation dry for subbase placement as well as improve the stability of the north and east sideslopes.

- The north and east sideslopes were designed to keep construction equipment away from the existing geomembrane that forms the southern barrier wall for the Phase I disposal area. When excavation of the Phase II cell begins, only equipment (total operating weight of 44,000 pounds and a contact pressure less than 6.6 psi) such as a CAT 6R Series dozer are recommended near the top of the excavation of the Phase II Section I cell. The recommendation also applies to placement of sand over the geomembrane on the sideslopes.

- During operations, the existing D7R dozer for operations should only be used on the Phase II cell ramp. Waste placement should begin along the northern and eastern toe of slope to form a buttress to improve stability. Once the waste has reached Elevation 86 then, equipment can traverse the site freely.

- Geosynthetic interface friction requirements;

    1. Upon final buildout of Phase I and II, the minimum friction angle needed for a factor of safety above 1.5 is approximately 15 degrees on the both the sideslope and bottom liners. The low interface friction angle is due to the toe buttress provided by the western and southern berms of Phase II.

    2. During filling of Phase II Section I and construction of Phase II Section II, the berm between the two section will be removed and the liners system connected. This will form a long slip plane with minimal cover over the geosynthetic materials. To provide stability during operation of Phase II Section I and construction of Phase II Section II, a minimum interface friction angle of 26.5 degrees is recommended to achieve a minimum factor of safety equal to 1.5.

    3. During placement of sand over the geomembrane cover on the sideslope of the Phase I, the slope stability analysis indicated the minimum interface friction angle recommended for both construction and operations is 26.9 for a factor of safety equal to 1.5.

    4. As required by FDEP regulations and SCS, the interface friction angle testing should be conducted and approved prior to construction in accordance with ASTM D 5321. The following testing requirements are recommended;

        - Initial loading Interface Friction Angle (ASTM D 5321) test: 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 hour, prior to testing. Each test shall be conducted under fully saturate conditions for each normal load. The specified testing Normal Stresses are 1000, 3000, and 6,000 psf. The strain rate is1 mm/min (0.04 in/min). The minimum PEAK interface friction angle shall be 26.9 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.

Based upon the above recommendations, the estimated shear strength properties of the waste materials, the foundation soil test results, the proposed geosynthetic materials, and the slope stability model results, the design of the expansion cell will meet the regulatory requirements.

GROUNDWATER CONTROL PLAN

A groundwater control system was designed to control and minimize the upward migration of the groundwater into the subbase layer of the expansion area containment layers. As discussed previously in this Report, the average groundwater elevation for the expansion area varies, but the Seasonal High Groundwater Table (SHGWT) is at approximately Elevation 77.6 NGVD in the area for the proposed leachate collection sump. However, high groundwater elevations, recorded as a result of heavy rainfall in December of 2002, indicate that groundwater levels within the area of the sump have been recorded as high as Elevation 83.5 NGVD.

The proposed elevation of the top of geomembrane in the sump of the expansion cell is Elevation 79.0 NGVD. The bottom of the 6–inch subbase would therefore be at Elevation 78.5 NGVD. The proposed groundwater control system was designed to collect groundwater if it rises above the SHGWT elevations across the expansion area and minimize the amount of groundwater entering the 6-inch subbase soil materials.

The groundwater control system is a series of collection trenches and pipes spaced at selected intervals to collect the rising groundwater. The collection trenches and pipes are spaced so the mounded groundwater between the trenches and pipes is below the bottom of the subbase soil materials. The closer the spacing, the lower the mounding of groundwater between the pipes and likewise the farther the spacing, the higher the groundwater will mound between pipes. The spacing of the pipe was design to keep the highest point of the groundwater from rising into the subbase materials.

The collection trenches and pipes are sloped to allow for gravity collection of the groundwater. The groundwater will be conveyed to a central groundwater pump station. As the groundwater collection pump station fills, the groundwater will be pumped into the stormwater collection swale located immediately east of the station. The anticipated pumping rate (only when groundwater elevations rise above the SHGWT elevations in the expansion area) will be approximately 600 to 700 gallons per minute. The stormwater collection system will convey the collected groundwater toward the former borrow pit area located on the southern side of the Facility. The former borrow pit will be converted into a wet detention stormwater management area. The stormwater management area will be designed as a detention system and discharge from the stormwater management area will be in accordance with the water quality criteria established for the Facility.

The pipelines for the groundwater collection system will have cleanouts at the end of the individual pipelines. The cleanout will allow access to the pipeline for periodic maintenance jetcleaning to ensure the pipeline remain in operation. To ensure long-term operation of the collection system, the slope on the pipelines was checked to ensure proper flow capacity. Pipe crushing analyses were also computed for construction and final buildout loading on the groundwater collection pipelines.

Calculations for the groundwater control system are contained in Attachment I of this Report.

ATTACHMENT A

PREVIOUS SITE GEOTECHNICAL INFORMATION

ENVISOR PERMIT PLANS 1983

BEST AVAILABLE COPY

Hardee County

Sanitary Landfill

For

Board Of County Commissioners

MAURICE HENDERSON	CHAIRMAN
SAMUEL L. RAWLS	VICE-CHAIRMAN
BENNY W. ALBRITTON	COMMISSIONER
ROLAND L. SKIPPER	COMMISSIONER
JOHN ROY GOUGH	COMMISSIONER
HARRY E. LAMPE, P.E.	COUNTY ADMINISTRATOR & COUNTY ENGINEER
JEFFREY J. McKIBBEN	COUNTY ATTORNEY

SHEET INDEX

CONTRACTOR CONSTRUCTION DRAWINGS

1.) COVER SHEET
2.) GENERAL NOTES & VICINITY MAP
3.) SOILS INFORMATION
4.) SOILS INFORMATION
5.) PHASE I SITE PLAN
6.) CONSTRUCTION DETAILS
7.) DEWATERING STATION AND DETAILS
8.) GATE HOUSE, SITE PLAN AND DETAILS
9.) GATE HOUSE, EXTERIOR ELEVATIONS
10.) MAINTENANCE BLDG., SITE PLAN & DETAILS
11.) WELL & MISC. DETAILS
12.) MONITORING WELL DETAILS
13.) FENCING
14.) WATER STANDARD DETAILS

85.76
87.66
80.86
84.2
80.96

D E P
JUN 06 1997

70,000 yd 24' high

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements as constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

FILE COPY — ONLY COPY

ENgineering ad VISORS, Inc.

CONSULTING ENGINEERS

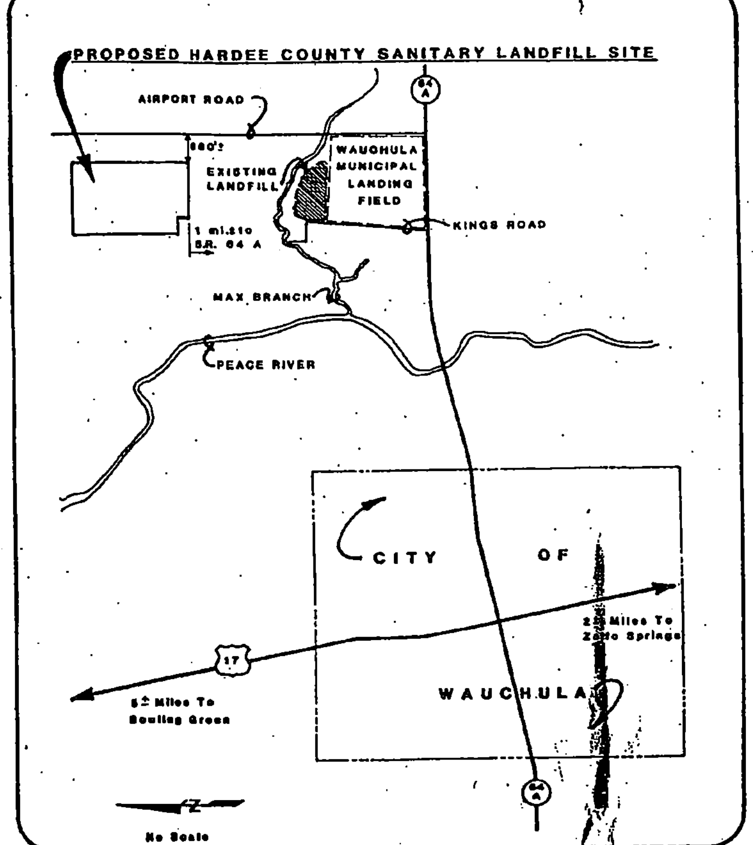
MARGATE · TAMPA · WINTER HAVEN, FLORIDA

D.E.P.
JUN - 6 1997
TAMPA

DOUGLAS M. DARDEN
FLORIDA PROFESSIONAL ENGINEER NO. 13097
PROJECT NO. 81014-82(1)
DATE NOVEMBER 1982
SET NO.

BEST AVAILABLE COPY

VICINITY MAP



GENERAL NOTES

1) LOCATIONS, ELEVATIONS, AND DIMENSIONS OF EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES ARE SHOWN ACCORDING TO THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION OF THESE DRAWINGS BUT DO NOT PURPORT TO BE ABSOLUTELY CORRECT. THE CONTRACTOR SHALL VERIFY LOCATIONS, ELEVATIONS, AND DIMENSIONS OF ALL EXISTING UTILITIES, STRUCTURES, AND OTHER FEATURES AFFECTING HIS WORK PRIOR TO CONSTRUCTION.

2) THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY WHEN CONFLICT BETWEEN THE DRAWINGS AND ACTUAL CONDITIONS ARE DISCOVERED DURING THE COURSE OF CONSTRUCTION OF ANY IMPROVEMENTS SHOWN ON THESE DRAWINGS.

3) IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VISIT THE SITE PRIOR TO BIDDING THE WORK AND TO PERFORM SUCH TESTS, STUDIES, AND SURVEYS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO THE ACTUAL SURFACE AND SUBSURFACE CONDITIONS EXISTING AT THE SITE. ACTUAL CONDITIONS DIFFERENT FROM THOSE SHOWN ON THE DRAWINGS SHALL NOT CONSTITUTE GROUNDS FOR AN EXTRA.

4) ALL CONCRETE SHALL BE 3,750 PSI UNLESS OTHERWISE INDICATED AND SHALL BE IN CONFORMANCE WITH THE LATEST A.C.I. CODE REQUIREMENTS.

5) ALL ELEVATIONS ARE REFERRED TO THE MEAN SEA LEVEL DATUM OF THE NATIONAL GEODETIC DATUM.

6) ALL COMPACTED BACKFILL, WHERE INDICATED, SHALL BE COMPACTED IN EIGHT INCH (8") MAXIMUM LAYERS AT 9? PERCENT DENSITY OF THE ORIGINAL UNDISTURBED MATERIAL IN CONFORMANCE WITH ASTM D1557, METHOD "A".

7) ALL HOSE BIBBS SHOWN ON PLANS SHALL RECEIVE AN ANTI-SIPHON VACUUM BREAKER, WATTS SERIES 288A OR EQUAL.

8) FINISHED GRADE FOR GROUND ELEVATIONS ON DRAWINGS REFER TO GRADE AFTER SODDING.

9) THE CONTRACTOR SHALL PROVIDE AT LEAST 48 HOURS NOTICE TO THE VARIOUS UTILITY COMPANIES IN ORDER TO PERMIT THE LOCATION OF EXISTING UNDERGROUND UTILITIES IN ADVANCE OF CONSTRUCTION.

10) AERIAL SURVEY FLOWN ON FEBRUARY 1982. SUBSEQUENT EVENTS MAY HAVE ALTERED INFORMATION PRESENTED HEREON AND NEITHER THE COUNTY NOR THE ENGINEER MAY BE HELD RESPONSIBLE FOR SUCH CHANGES. THE CONTRACTOR IS REQUESTED TO VERIFY ALL FIELD CONDITIONS AND ADVISE THE ENGINEER OF ANY CHANGES.

11) SUBSURFACE SOILS INFORMATION PRESENTED HEREIN REPRESENTS THE RESULTS OF FIELD WORK AND NEITHER THE ENGINEER NOR THE COUNTY MAY BE HELD RESPONSIBLE OR LIABLE FOR SUBSURFACE CONDITIONS THAT VARY FROM THE INFORMATION PRESENTED HEREIN.

12) BOUNDARY SURVEY SHOWN ON PLANS OF TOWNSHIP 33 SOUTH, RANGE 25 EAST, IN SECTION 35, DERIVED FROM SURVEY PERFORMED BY MARK P. PORTER, R.L.S., CHASTAIN-SKILLMAN, INC., LAKELAND FLORIDA, 9 DECEMBER 1981.

13) AERIAL PHOTOGRAMMETRY PERFORMED BY KUCERA & ASSOCIATES, INC., FEBRUARY 1982.

POTABLE WATER NOTES

1) ALL WATER MAINS SHALL HAVE A MINIMUM COVER OF 36 INCHES BELOW FINISHED GRADE AND SHALL BE LOCATED AS SHOWN ON THE DRAWINGS, UNLESS OTHERWISE DIRECTED BY THE ENGINEER. ALL WATER FACILITIES AND ACCESSORIES SHALL BE INSTALLED IN CONFORMANCE WITH THE "WATER STANDARDS" DRAWINGS AND THE REQUIREMENTS OF HARDEE COUNTY, THE FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION (FDER), AND THE HEALTH DEPARTMENT.

2) ALL PIPE, FITTINGS, SPECIALS, AND VALVES, INCLUDING LINING AND COATINGS, PRESSURE TESTING, DISINFECTION, AND PIPE INSTALLATION SHALL CONFORM TO THE SPECIFICATIONS.

3) ALL WATER MAINS, WHERE INDICATED, UNLESS OTHERWISE SHOWN OR DIRECTED, SHALL BE POLYVINYL CHLORIDE (PVC) PIPE WITH PUSH-ON JOINTS. PIPE AND ACCESSORIES SHALL CONFORM TO PRODUCT STANDARDS 22-70 OR ASTM SPECIFICATIONS D-2241 AND D-1784, AS IT APPLIES TO CLASS 12453-B OR 12454-A PVC PLASTIC PIPE, SDR-26 AND A WORKING PRESSURE RATING OF 160 PSI AT 23°C (73.4). PIPE SHALL BE DESIGNED AND LAID IN CONFORMANCE WITH TRENCH LAYING CONDITION TYPE 2.

4) ALL GATE VALVES FOUR INCHES (4") TO 12 INCHES SHALL BE RESILIENT SEATED, CAST IRON BODY, AND SHALL BE FURNISHED WITH MECHANICAL JOINT ENDS AND SUITABLE FOR 200 PSI WORKING PRESSURE. GATE VALVES LARGER THAN 12 INCHES AND SMALLER THAN FOUR INCHES (4") SHALL BE OF THE CONVENTIONAL TYPE SUITABLE FOR 150 PSI WORKING PRESSURE AND BE IN CONFORMANCE WITH THE SPECIFICATIONS.

5) ALL TEES, CROSSES, BENDS (HORIZONTAL AND VERTICAL), DEFLECTING 11-1/4° OR MORE, PLUGS, FIRE HYDRANTS, AND OTHER APPURTENANCES FOUR INCHES (4") AND LARGER SHALL BE INSTALLED WITH A CONCRETE THRUST BLOCK OF THE SIZE SHOWN ON THE "WATER STANDARDS" DRAWINGS.

6) SPECIAL PIPE FOUNDATIONS, IF REQUIRED, SHALL BE DETERMINED IN THE FIELD AND THE TYPE REQUIRED WILL BE AS DIRECTED BY THE ENGINEER OR COUNTY.

7) AERIAL SURVEY FLOWN ON FEBRUARY 1982. SUBSEQUENT EVENTS MAY HAVE ALTERED INFORMATION PRESENTED HEREON AND NEITHER THE COUNTY NOR THE ENGINEER MAY BE HELD RESPONSIBLE FOR SUCH CHANGES. PROSPECTIVE BIDDERS ARE REQUIRED TO VERIFY CONDITIONS, ADVISE THE ENGINEER OF ANY CHANGES, AND ACCOUNT FOR ANY CHANGES IN THEIR CONSTRUCTION COST BID.

8) ALL FITTINGS FOR PVC OR C.I./D.I. WATER MAINS SHALL BE CAST IRON/DUCTILE IRON, SHORT BODY WITH MECHANICAL JOINTS, AND SHALL BE PROVIDED WITH HIGH STRENGTH CORROSION RESISTANT ALLOY, T-HEAD BOLTS, IN CONFORMANCE WITH THE SPECIFICATIONS.

9) ALL COLD WATER SERVICE CONNECTIONS SHALL BE POLYETHYLENE (P.E.) TUBING TYPE III, GRADE 3, CLASS 160. SINGLE SERVICE CONNECTIONS SHALL BE A MINIMUM OF ONE INCH (1") P.E. AND DOUBLE SERVICE CONNECTIONS SHALL BE ONE AND ONE-HALF INCH (1-1/2") P.E. AND SHALL BE INSTALLED IN CONFORMANCE WITH THE "WATER STANDARDS" DRAWINGS AND THE REQUIREMENTS OF HARDEE COUNTY.

10) A MINIMUM OF 18 INCHES VERTICAL CLEARANCE AND TEN FEET (10') HORIZONTAL CLEARANCE SHALL BE MAINTAINED BETWEEN ALL WATER AND SEWER LINES. WHEN THIS IS NOT POSSIBLE OR FEASIBLE, THE SANITARY LINE SHALL BE ENCASED IN SIX INCHES (6") OF CONCRETE FOR A DISTANCE OF TEN FEET - ZERO INCHES (10'-0") ON BOTH SIDES OF THE CONFLICT IN CONFORMANCE WITH THE "WATER STANDARDS" DRAWINGS.

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements he constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

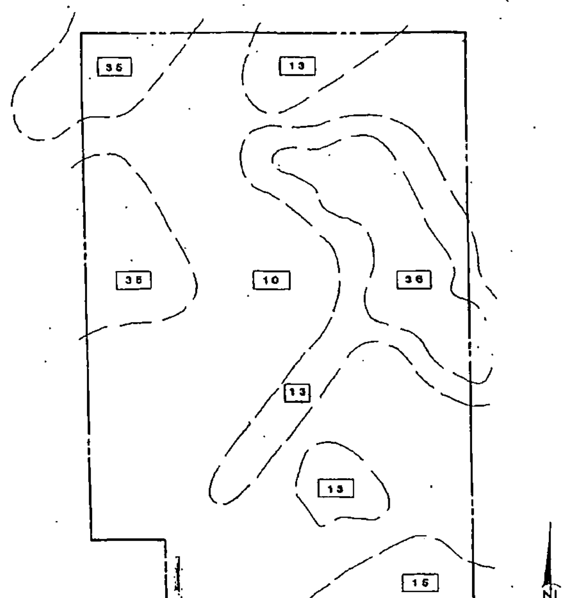
Designed	D.D.				
Drawn	C.S.L.				
Checked	D.D.				
Approved	D.D.				
Job No	81014	1	New Sheet	CSL	D.D.	1-85
Date	10/82	No.	Revision Description	By	Chk.	Date

HARDEE COUNTY, FLORIDA
REGIONAL SANITARY LANDFILL
GENERAL NOTES & VICINITY MAP

Florida Registered Professional Engineer No. 18097

EVI ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

SHEET NUMB 2 OF 14

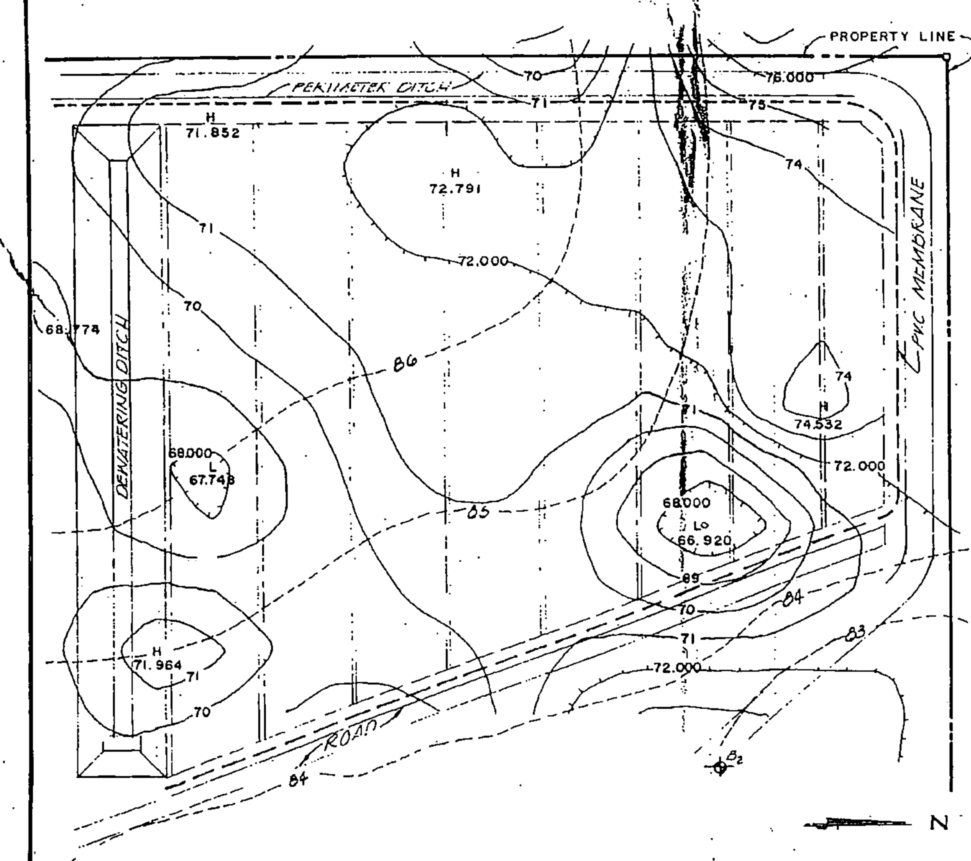


LEGEND

10	POMONA FINE SAND
13	FLORIDANA MUCKY FINE SAND, DEPRESSIONAL
15	IMMOKALEE FINE SAND
35	OLDSMAR FINE SAND
36	TOMOKA MUCK
— — —	SITE BOUNDARY
	LIMITS OF SPECIFIC SOILS ASSOCIATION

Reference: Interim Soil Survey Report, Maps and Interpretations by U.S.D.A. Soil Conservation Service.

SURFACE SOILS ASSOCIATIONS PLAN



CLAY LAYER ELEVATIONS

SCALE: 1" = 100'

NOTES

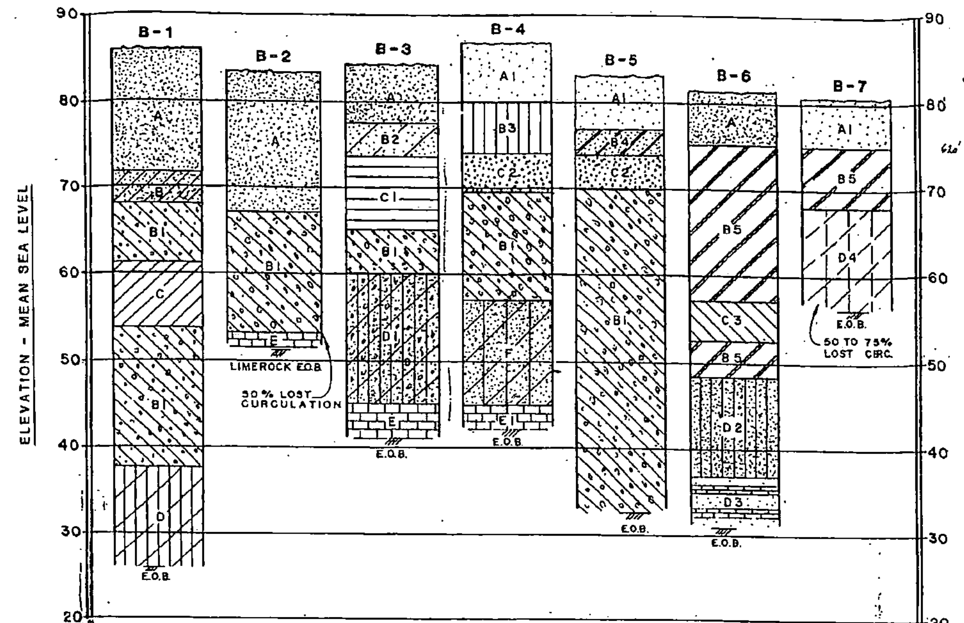
1) THIS FIGURE. REPRESENTS THE RESULTS OF A REFRACTION SEISMIC SURVEY OF THE NORTHWEST CORNER OF THE SITE, PERFORMED BY ARMAC ENGINEERS, INC., 8430 NORTH 40TH STREET, TAMPA, FLORIDA 33604. THIS SURVEY WAS PERFORMED IN ORDER TO ESTABLISH THE EXISTENCE OF AND ESTIMATE THE DEPTH TO THE UNDERLYING CONFINING CLAY LAYER. CORRELATION WITH KNOWN SOIL DEPTH DATA WAS ESTABLISHED BY PERFORMING THE SURVEY IN CLOSE PROXIMITY TO PREVIOUSLY PERFORMED SPT BORINGS B-2 AND B-4. CHARACTERISTIC COMPRESSIVE WAVE VELOCITIES WERE ESTABLISHED FOR BOTH THE UPPER SURFICIAL SOILS AND UNDERLYING CLAY SOILS. THESE AVERAGE COMPRESSION WAVE VELOCITIES WERE FOUND TO BE 1362 AND 4824, RESPECTIVELY. THIS HIGH VELOCITY DIFFERENTIAL WAS USED TO IDENTIFY THESE SEPARATE SOIL STRATA.

THE FIGURE SHOWS THE RESULTS OF THIS SEISMOGRAPH INVESTIGATION WHICH INDICATE THAT THE UNDERLYING COHESIVE CLAY LAYER IS ESTIMATED TO LIE AT DEPTHS RANGING FROM ABOUT 8.4 TO 18.0 FEET BELOW GROUND SURFACE (ELEVATION 67.8 TO 77.3 FEET MSL). THE COHESIVE SOIL STRATA WAS FOUND TO BE CONTINUOUS IN THE SUBJECT AREA, BUT POSSIBLE HIGH VELOCITY HARDPAN OR SURFICIAL CLAY LAYERS WERE FOUND TO EXIST AT THREE OUT OF 22 SURVEY GRID LOCATIONS. THESE NEAR-SURFACE HIGH VELOCITY SOIL LAYERS PRODUCED ANOMALOUS WAVE REVERSALS PREVENTING DEEPER SOIL ANALYSIS AT THESE LOCATION.

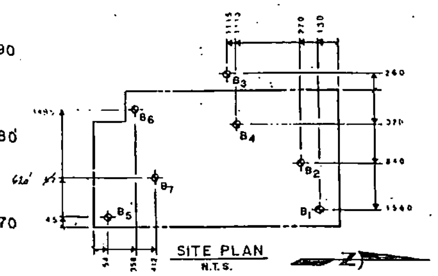
2) CLAY CONTOURS AT ONE FOOT (1') INTERVALS.

LEGEND

—68.000—	SUBSURFACE CLAY CONTOUR W/ELEVATION
L	LOW CLAY
H	HIGH CLAY
--86--	GROUND CONTOUR
⌖	BORING LOCATION
- - - - -	IMPERMEABLE PVC MEMBRANE BARRIER



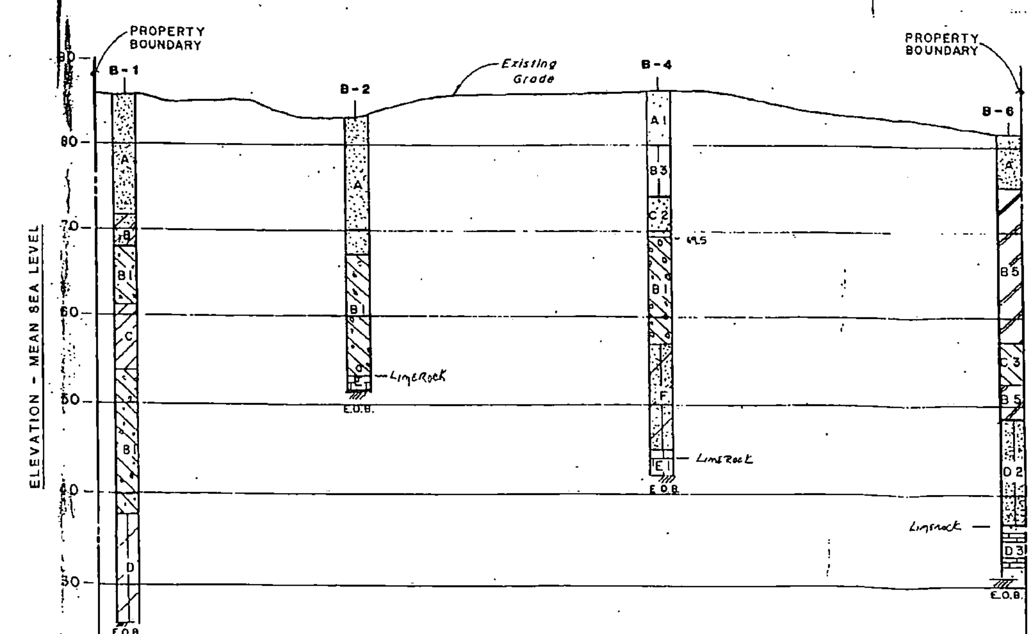
SOIL BORING PROFILES



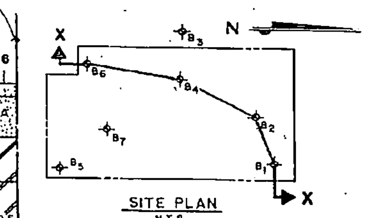
LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
C2	GRAY SAND
C3	GRAY-GREEN CLAY
D	GREEN SANDY CALCAREOUS
D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
D2	GRAY-GREEN CALCAREOUS
D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREENISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREENISH GRAY LIMEROCK & SANDY CLAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

NOTE: ALL SUBSURFACE SOILS WORK CONDUCTED BY ARMAC ENGINEERING, INC., TAMPA, FLORIDA.



SECTION X-X



LEGEND

A	GRAY & BROWN SAND
A1	BROWN SAND
B	CLAYEY SAND
B1	GRAY-GREEN SANDY CLAY W/ PHOSPHATE
B2	GRAY SANDY CLAY
B3	HARDPAN
B4	GRAY CLAYEY SAND
B5	GRAY-GREEN SANDY CLAY
C	HARD GRAY-GREEN CLAY
C1	GREEN CLAY
C2	GRAY SAND
C3	GRAY-GREEN CLAY
D	GREEN SANDY CALCAREOUS
D1	GRAY-GREEN CALCAREOUS SANDY CLAY W/ PHOSPHATE
D2	GRAY-GREEN CALCAREOUS
D3	GRAY-GREEN CALCAREOUS CLAY W/ L.R. LENSES
D4	GRAY TO TAN CALCAREOUS SANDY CLAY
E	GREENISH GRAY CLAYEY LIMEROCK W/ PHOSPHATE
E1	GREENISH GRAY LIMEROCK & SANDY CLAY
F	YELLOW MOTTLED GRAY-GREEN SANDY CLAY

D.E.P.
JUN - 6 1997
TAMPA

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements he constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

No.	Revision Description	By	Chk.	Date
△	New Sheet	CSL	DD	1-4-83

Designed	—
Drawn	C.S.L.
Checked	D. D.
Approved	D. D.
Job No	81014
Date	10/82

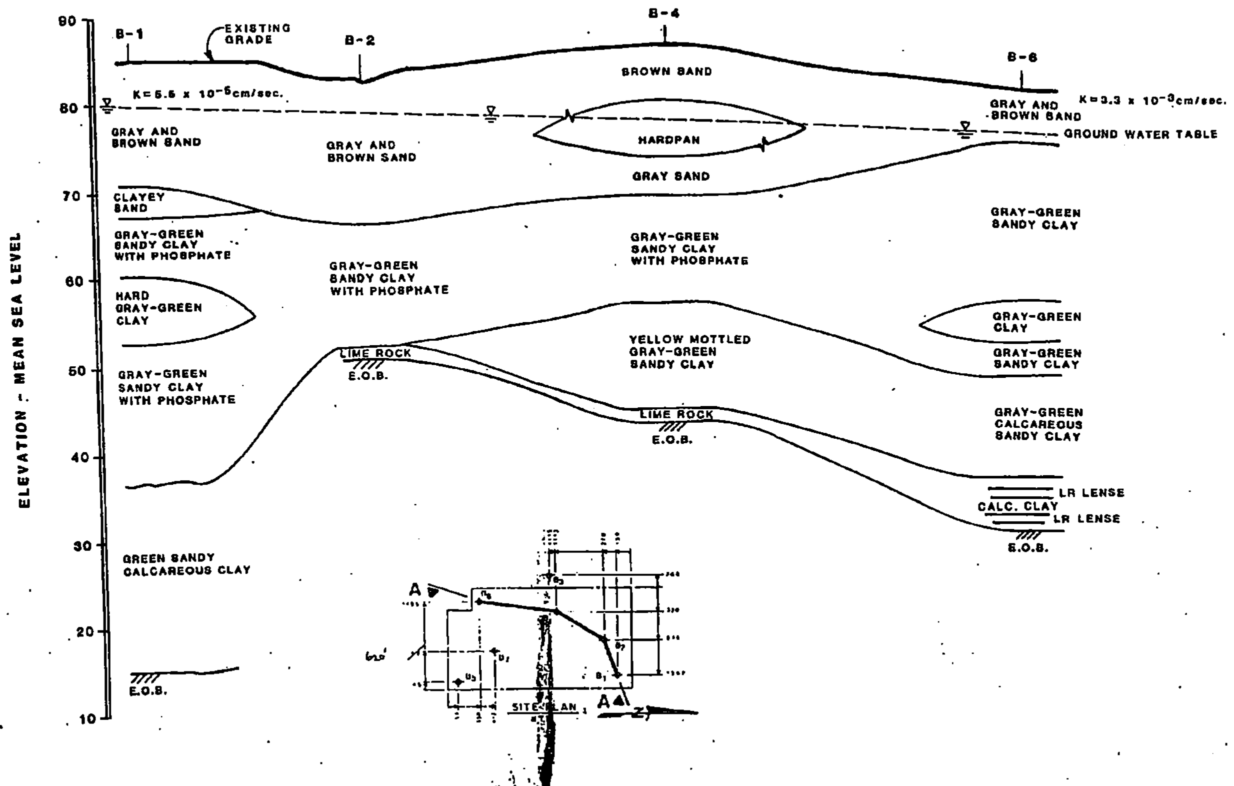
HARDEE COUNTY, FLORIDA
REGIONAL SANITARY LANDFILL

SOILS INFORMATION

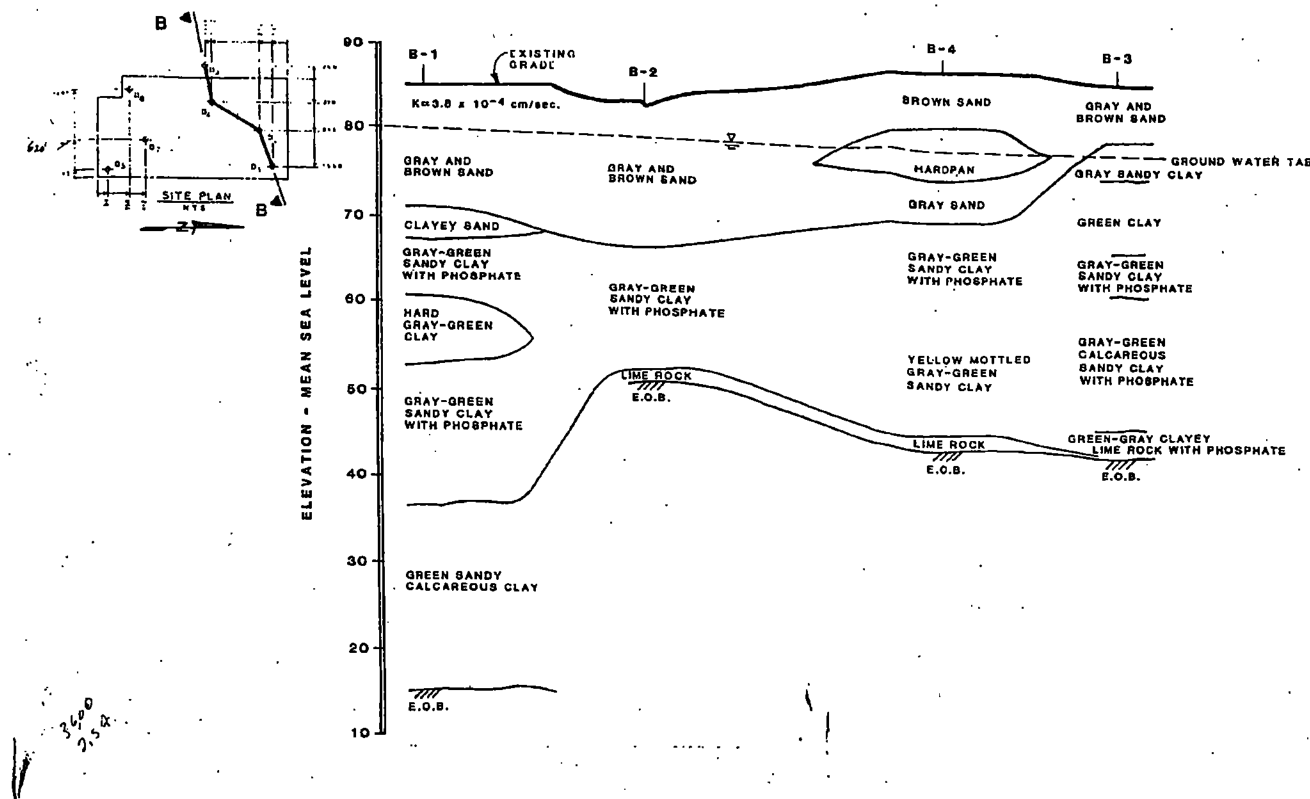
Florida Registered Professional Engineer No. 13097

EVI ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists, and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

SHEET NUMBER
3
OF 14 SHEETS

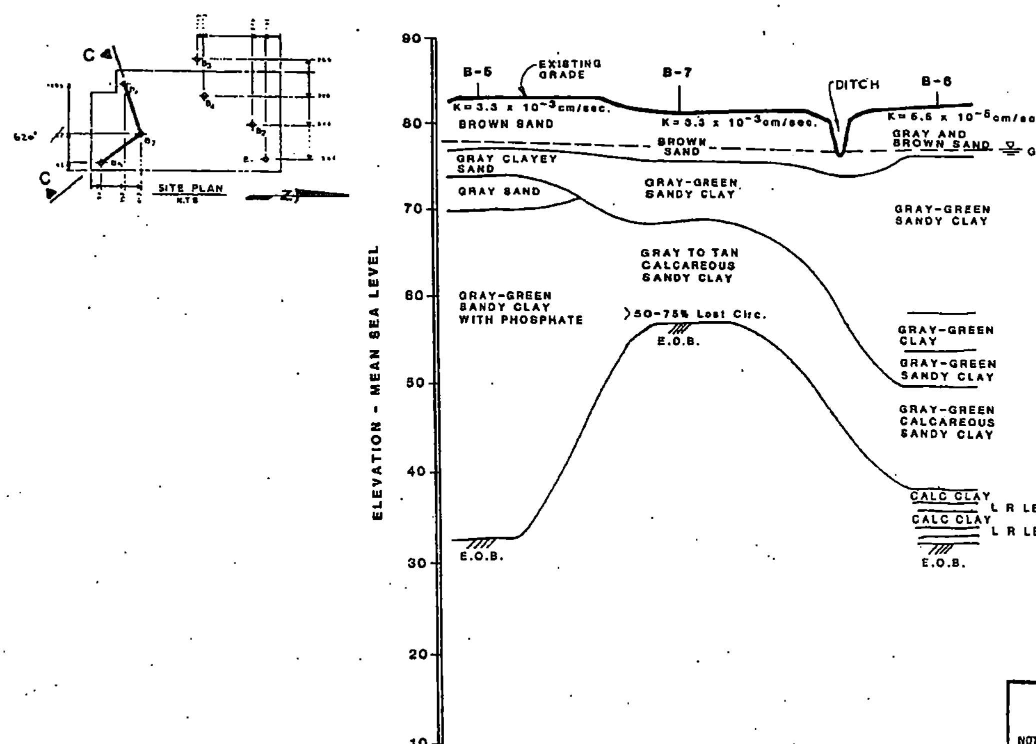


SECTION A-A



SECTION B-B

NOTES: 1.) ALL SUBSURFACE SOILS WORK CONDUCTED BY ARMAC ENGINEERING, INC., TAMPA, FLORIDA
2.) SUBSURFACE CONDITIONS BETWEEN BORING LOCATIONS ARE INTERPOLATED.



SECTION C-C

RECORD DRAWING

NOTE: The information presented hereon is based upon drawings, specifications, addenda, shop drawings, modifications, etc. annotated by the contractor during the construction period to reflect the in-situ parameters of the improvements he constructed.

The Engineer, Envisors, Inc., is not responsible for the accuracy or validity of the Record Drawing information depicted hereon.

HARDEE COUNTY, FLORIDA
REGIONAL SANITARY LANDFILL

SOILS INFORMATION

Florida Registered Professional Engineer No. 13097

EVI ENVISORS, Inc.
Consulting Civil & Environmental Engineers
Economists, and Planners
WINTER HAVEN, TAMPA, & MARGATE, FLORIDA

Designed	
Drawn	C.S.L.
Checked	D.D.
Approved	D.D.
Job No.	81014
Date	10/82

No.	Revision Description	By	Chk.	Date
1	New Sheet	CH	DD	1/6/83

SHEET NUMBER 4 OF 14

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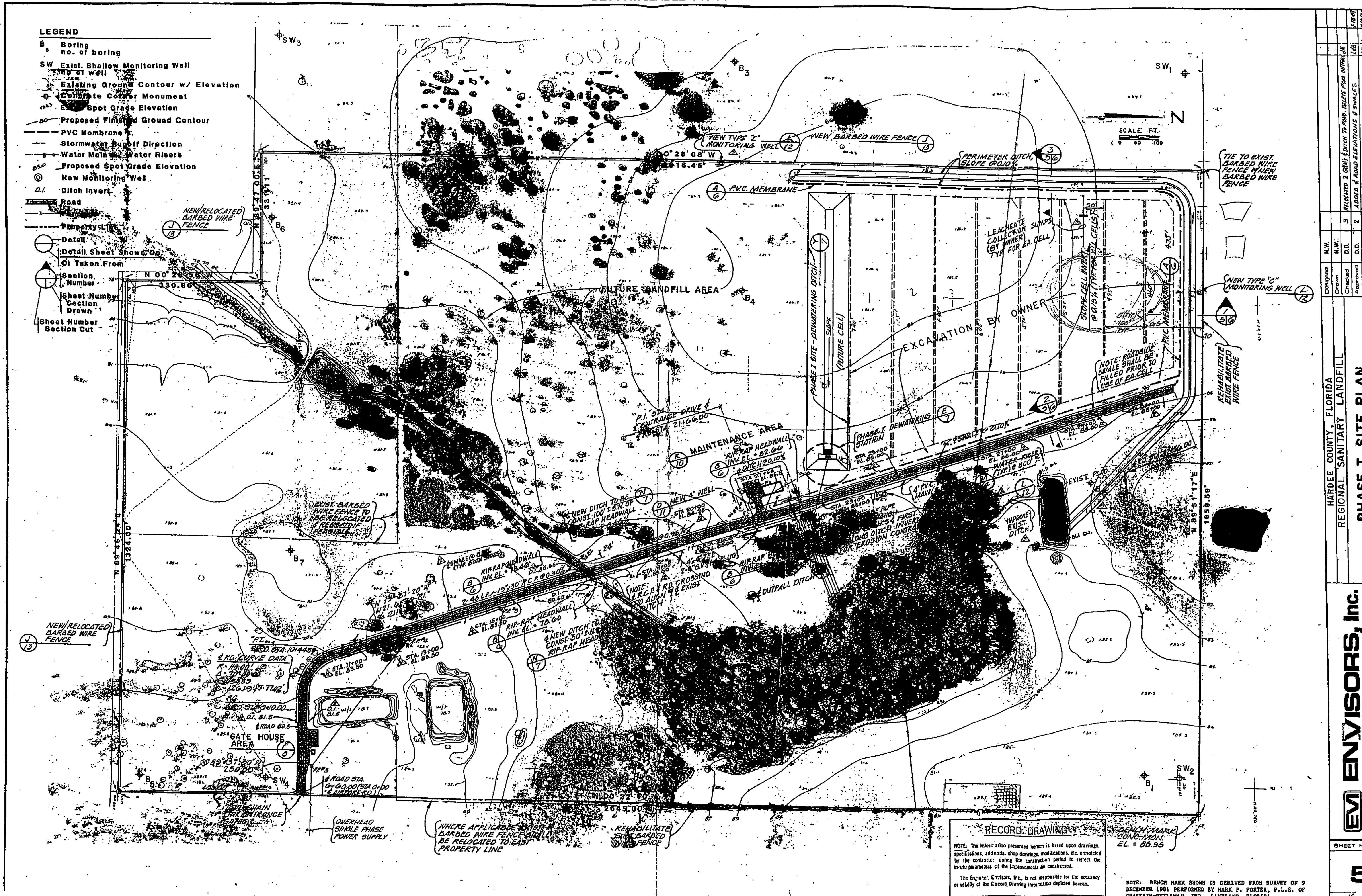


PSI GEOTECHNICAL REPORT (MARCH 1997)

Report
Geotechnical Engineering Services
Hardee County Sanitary Landfill
PSI Project No. 757-75054

PSI Environmental Geotechnical Construction
Consulting • Engineering • Testing

Information To Build On

PSI Environmental
Geotechnical
Construction
Consulting • Engineering • Testing

March 10, 1997

Post, Buckley, Schuh & Jernigan, Inc.
1560 Orange Avenue, Suite 700
Winter Park, Florida 32789

Attention: Mr. Bob Mackey, P.E.
Project Manager

RE: Report
Geotechnical Engineering Services
Hardee County Sanitary Landfill
PSI Project No.: 757-75054

Dear Mr. Mackey:

In accordance with our proposal to you dated February 5, 1997, Professional Service Industries, Inc. (PSI) has provided geotechnical engineering services in connection with the referenced project. This report includes an overview of the field work and laboratory testing that we completed for the assignment. Also provided are preliminary recommendations for site preparation and foundation design of the leachate storage tanks.

PROJECT CONSIDERATIONS

The Hardee County Sanitary Landfill is located in northeast Hardee County, east of U.S. 17 and north of County Road 636. The property is located in Section 35, Township 33 South, Range 25 East. The landfill site is generally rectangular in shape occupying a plan area of approximately 100 acres.

At the present time, geotechnical engineering services have been directed at the northwest corner of the site, where a liner wall will be constructed as well as above ground leachate storage tanks. The liner wall will be located south of the existing dewatering ditch and will consist of installing a High Density Polyethylene (HDPE) liner in a trench. The HDPE liner will be keyed into low permeable clays at depth providing a hydraulic cut off barrier.

The leachate storage tanks are to be built near the maintenance building. They will comprise two 50,000 gallon above ground tanks. It is proposed that the tanks be supported on a shallow foundation system.

A generalized plan view of the facility and the area of interest at this time is included on Sheet 1.

PSI • 1675 Lee Road • Winter Park, FL 32789 • Phone 407/645-5560 • Fax 407/645-1320

SUBSOIL AND GROUNDWATER CONDITIONS

General

To evaluate subsoil and groundwater conditions in the area of interest to this assignment, we drilled/sampled six Standard Penetration Test (SPT) borings. These borings were completed in general accordance with the procedures outlined in ASTM D-1586. The borings were advanced to depths in the range 25 to 40 feet below grade. The approximate locations at which the borings were drilled are indicated on Sheet 1.

In the upper 10 feet, SPT samples were recovered continuously then at 5 foot centers thereafter to boring termination. Samples recovered from the borings were visually stratified in the laboratory by a geotechnical engineer, following guidelines contained in the Unified Soil Classification System (USCS). Records of the materials encountered in the borings are presented as soil profiles on Sheet 2. Sheet 2 includes a legend describing the various materials in USCS format.

Stratigraphy

The borings disclosed reasonably consistent subsoil conditions in the area of evaluation. For the purpose of discussions, these conditions have been generalized as follows. From the ground surface to depths in the range 12 to 18 feet below grade is a varying sequence of fine sands. These sands grade from being relatively clean to slightly silty and silty/clayey in composition (i.e. SP, SP/SM, SM and SC materials). Based on the SPT blow counts, these materials are in a loose to medium dense condition.

Underlying the upper sands is clays. These clays grade from being sandy to silty in composition and from soft to extremely hard in consistency. There are clay zones that are primarily derived from weathered limestone, with SPT blow counts in excess of 50 blows for a few inches. All four of the proposed liner wall borings were terminated in clay.

Groundwater

Groundwater level measurements were made in the borings at the time of drilling. These measurements disclosed the water table at depths in the range 4.0 to 7.8 feet below grade. As a result of recharge during the rainy season, the water table will rise some 2 to 3 feet above current levels. The groundwater levels at the site will also be impacted by construction activities.

LABORATORY TESTING

As noted earlier, the laboratory testing work included the stratification of all soil samples in accordance with USCS procedures. Additionally, we carried out four laboratory permeability tests plus nominal classification tests to determine pertinent engineering characteristics/parameters. All permeability tests were performed in a triaxial cell at a confining pressure of 5 psi. Results of the laboratory tests are presented in Table 1. This table also includes details on boring numbers and sample depths for the test specimens.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

General

The results of the borings and laboratory testing indicate low permeable soils at depth in the area of the proposed liner wall. Subsoils at the site of leachate storage tanks are considered generally suitable for grade support of these structures. In order to enhance foundation performance, the tanks should be supported on subgrade soils that have been densified by surface proof rolling. A design bearing value of 3000 pounds per square foot can be used to size foundations.

Site Preparation For Storage Tanks

At the outset of construction, the site should be stripped of the existing vegetation cover and topsoils. Next, the subgrade soils should be compacted in-situ by surface rolling with a large self propelled vibratory roller. The roller should be capable of imparting a dynamic drum force of at least 36,000 pounds. The tank subgrade soils should be uniformly compacted with the roller to attain a degree of densification that is at least 95 percent of the materials ASTM D-1557 maximum dry density for a depth of 2 feet.

Proof rolling operations should be observed by a representative of this office. Observations would be made as to the general stability of the subgrade in response to rolling. In the event that yielding/pumping soils are encountered during vibratory compaction, such materials should be removed and replaced with clean granular fill. The replacement fill should also be thoroughly compacted to provide a stable subgrade.

Fill required to raise site grades should comprise clean sand with less than 12 percent by dry weight passing the U.S. Standard Number 200 sieve. The fill should be placed in one foot lifts and be compacted to 95 percent or more of the materials ASTM D-1557 maximum dry density.

Foundation Support

Results of our evaluations indicate that the subsurface materials have adequate shear strength to support fully loaded tanks. We estimate that foundations designed for a bearing pressure of 3000 psf will have a factor of safety against a bearing capacity failure in excess of three. This value is based on the assumption that the structures will be founded on thoroughly compacted native soils and/or engineered fill. The outside foundations/edges of the tank should be adequately protected by soil as to prevent undermining.

Based on our current understanding of the general loading conditions for the tanks, we anticipate settlement performance being within tolerable structural limits. We would be pleased to address settlement matters more fully when actual design loads are known.

PSI appreciates the opportunity to be of service to you on this assignment and we trust that the foregoing and accompanying attachments are of assistance to you at this time. In the event that you have any questions on the report or if you require additional information, please call.

Very truly yours,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Ian Kinnear, P. E.
Senior Geotechnical Engineer
FL Registration No. 32614

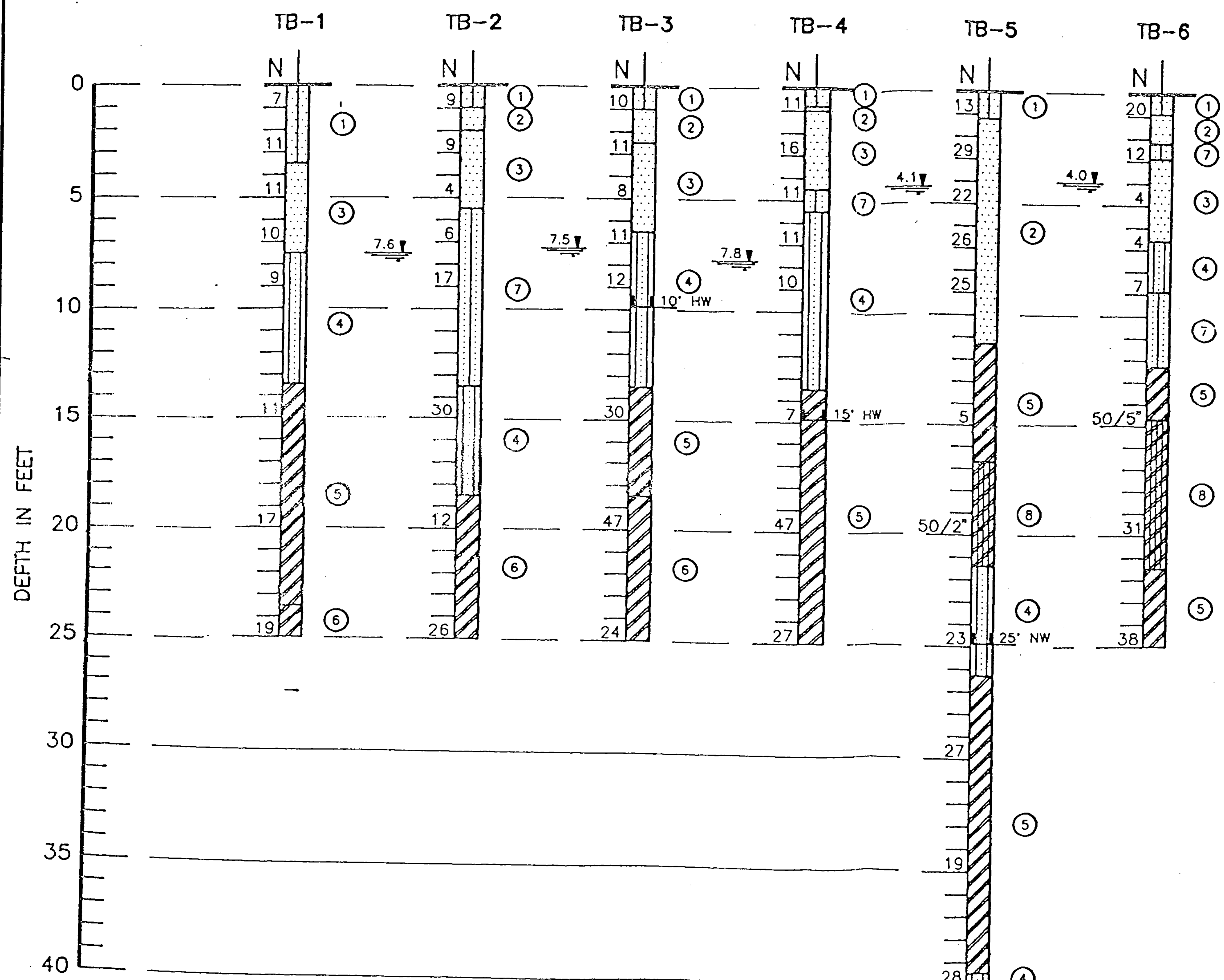
IK:cd
IK\75775054.311

Attachments
- Table 1
- Sheets 1 and 2

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS
HARDEE COUNTY SANITARY LANDFILL

Permeability Test Results		
Boring TB-1 at 15 Feet		
Permeability	=	3.3×10^{-7} cm/sec
Wet Density	=	104.4 pcf
Moisture Content	=	56.4 %
Confining Pressure	=	5 psi
Boring TB-2 at 25 Feet		
Permeability	=	7.7×10^{-8} cm/sec
Wet Density	=	89.0 pcf
Moisture Content	=	112.7 %
Confining Pressure	=	5 psi
Boring TB-3 at 25 Feet		
Permeability	=	4.3×10^{-7} cm/sec
Wet Density	=	93.5 pcf
Moisture Content	=	80.7 %
Confining Pressure	=	5 psi
Boring TB-4 at 17 Feet		
Permeability	=	6.1×10^{-8} cm/sec
Wet Density	=	118.9 pcf
Moisture Content	=	30.8 %
Confining Pressure	=	5 psi



LEGEND

(1)	GRAY TO BROWN FINE SAND TO SLIGHTLY SILTY FINE SAND TRACE ROOTS, (SP), (SP-SM)
(2)	LIGHT GRAY FINE SAND, (SP)
(3)	LIGHT BROWN FINE SAND, (SP)
(4)	GRAY TO BROWN SILTY FINE SAND TO CLAYEY FINE SAND, (SM), (SC)
(5)	GREEN TO GRAY CLAY WITH SAND SEAMS OCCASIONAL PHOSPHATES, (CL)
(6)	GREEN CLAY, (CH)
(7)	LIGHT TO DARK RED-BROWN SLIGHTLY SILTY TO SILTY FINE SAND, OCCASIONAL WEAKLY CEMENTED FINE SAND, (SP-SM), (SM)
(8)	LIGHT GRAY BROWN INDURATED CLAY/SILT TO WEATHERED LIMESTONE
(SP)	UNIFIED SOIL CLASSIFICATION GROUP SYMBOL
7.6	DEPTH TO GROUNDWATER LEVEL IN FEET: 2/13/97 TO 2/17/97
N	STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT
50/5"	NUMBERS OF BLOWS REQUIRED (50) TO DRIVE SAMPLING SPOON 5 INCHES
10' NW/HW	DEPTH TO WHICH NW/HW CASING WAS DRIVEN IN FEET, (NOTE: 3" CASING/4" CASING RESPECTIVELY)

GEOTECHNICAL ENGINEERING SERVICES

HARDEE COUNTY LANDFILL

WACHULA, FLORIDA

Environmental Geotechnical Construction

Consulting • Engineering • Testing

DRAWN: DCB	SCALE: NOTED	PROJ. NO: 757-75054
CHKD: IK	DATE: 2-21-97	SHEET: 2

PSI BORING (NOV 1997)

Boring in SW section of site

SITE LOCATION: Hardee County Landfill

PAGE: 1 OF: 3

BORING/WELL*: SB-01

JECT NO: 778-72070

DATE BEGAN: 11-20-97 | DATE FINISHED: 11-24-97 | GEOLOGIST: C. Cummins

PERMIT*: | SECTION: -- | CHECKED BY:

GROUND SURFACE ELEV.*: -- | TOWNSHIP: -- | GWL DEPTH: 1.5'

DRILLING METHOD: Mud Rotary, 10 7/8" bit | RANGE: -- | DRILL EQUIP: Dietrich

CONTRACTOR: PSI | GWL-DATE/TIME: 11-20-97

WELL CONSTRUCTION
MONITOR WELL NO.:
BOREHOLE DIAMETER:
SURFACE CASING:
SCREEN LENGTH:
SEAL TYPE:
DEVELOPMENT TIME:

DEPTH (FT)	FIELD SAMPLE TYPE AND NO.
0.00	EL 86.4
-5.00	EL 81.4
-10.00	EL 76.4
-15.00	EL 71.4
-20.00	EL 66.4
	63.4
	EL 62
-25.00	61.4
-30.00	EL 56.4
-35.00	
-40.00	

ASTM (N)
2, 2 4
5, 10 15
9, 9 18
7, 10 17
9, 10 19
10, 10 20
7, 12 19
12, 12 24
4, 5 9
7, 8 15
4, 6 10
9, 12 21
3, 6 9
9, 11 20
10, 22 32
18, 20 38
3, 6 9
11, 15 26
16, 22 37
50/.33
23, 50/
10, 32 42
50 50
11, 22 32
27, 45 72
14, 20 34
27, 50 77
13, 15 28
21, 35 56
15, 26 41
50/.33
50/.5
14, 35

DESCRIPTION
SAND: Quartz, white, fine grained, subrounded to rounded, moderate sorting.
SILTY SAND: Quartz, brown, fine to very fine grained, subrounded, poor to moderate sorting, minor amount of roots(1.5-2.5 ft.).
CLAYEY SAND: Quartz, gray/brown, fine grained, rounded to subrounded, moderate to poor sorting, minor amount of phosphorite.
SANDY CLAY TO CLAY: Light green, soft; Quartz and phosphorite sand matrix: medium to very fine grained, rounded to subrounded, poor sorting; very stiff orange\brown clay lense 19.0- 19.33 ft.
SANDY CLAY: Light green, stiff, friable; quartz matrix: fine grained sand to pebbles, rounded to subrounded, poor sorting; refusal at 24.33 ft.
NO SAMPLE:
CLAYEY SAND: Quartz, light green to orange/brown mottled, fine grained, rounded to subrounded, poor sorting; dry; friable; refusal at 26 ft.
NO SAMPLE:
SANDY CLAY: Orange/ light green mottled, stiff, friable; quartz sand matrix: medium to fine grained, rounded to subrounded, poor sorting; high sand content; refusal at 28.5 ft.
NO SAMPLE:
SANDY CLAY: Light orange/ brown to light green, stiff, friable, phosphatic.
SANDY CLAY: Light orange/ brown to light green, stiff to very stiff; abundant granule to sand sized phosphorite; thin lense of hard clay at 35 ft.; refusal at 36.5 ft.
NO SAMPLE:
SANDY CLAY: gray/green, hard, phosphotic.

SITE LOCATION: Hardee County Landfill

PROJECT NO: 778-72070

BORING/WELL*: SB-01

DATE BEGAN: 11-20-97

DATE FINISHED: 11-24-97

GEOLOGIST: C. Cummins

PERMIT*:

SECTION: —

CHECKED BY:

GROUND SURFACE ELEV.: --

TOWNSHIP: —

GWL DEPTH: 1.5'

DRILLING METHOD: Mud Rotary, 10 7/8"bit

RANGE: —

DRILL EQUIP: Dietrich

CONTRACTOR: PSI

GWL-DATE/TIME: 11-20-97

WELL CONSTRUCTION
MONITOR WELL NO.:
BOREHOLE DIAMETER:
SURFACE CASING:
SCREEN LENGTH:
SEAL TYPE:
DEVELOPMENT TIME:

WATER TABLE	DEPTH (FT)	FIELD SAMPLE TYPE AND NO.	ASTM (N)	PROFILE	DESCRIPTION
	-40.00		39, 47 13, 50/ 12, 50/		CLAYEY SAND TO SANDY CLAY: Gray/green, stiff, friable; phosphorite and quartz sand matrix; fine to very fine grained, rounded, poor sorting, thin lense of moderately indurated cemented sand at 42 ft., refusal at 42 ft.
					NO SAMPLE:
	-45.00		12, 18 20, 50/		SANDY CLAY: Gray/green to buff, stiff, friable; phosphorite and quartz sand matrix; fine to very fine grained, rounded, poor sorting; thin lense of moderately indurated mudstone at 45 ft.; refusal at 46.75 ft.
			5, 20		NO SAMPLE:
			50/.5		SANDY CLAY: Gray/green mottled, stiff, friable; phosphatic; relatively high clay content; refusal at 49.5 ft.
	-50.00				NO SAMPLE:
			27, 15 20, 23		SANDY CLAY: Gray/green mottled, stiff, friable; phosphorite and quartz sand matrix; fine grained, rounded, poor sorting.
	-55.00				NO SAMPLE:
			50/.13		SANDY CLAY: Light gray, stiff, friable; phosphorite and quartz sand matrix; fine to very fine grained, rounded, poor sorting; refusal at 58.13 ft.
	-60.00				NO SAMPLE:
			10, 28 50/.5		CLAYEY SAND: Quartz and phosphorite, light gray, fine to very fine grained, rounded, poor sorting; refusal at 64.5 ft.
	-65.00				NO SAMPLE:
			50/.33		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 68.33 ft.
	-70.00				NO SAMPLE:
			50/.33		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 73.33 ft.
	-75.00				NO SAMPLE:
			50/.33		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 78.33 ft.
	-80.00				

SITE LOCATION: Hardee County Landfill

BORING/WELL*: SB-01

PROJECT NO: 778-72070

DATE BEGAN: 11-20-97 DATE FINISHED: 11-24-97 GEOLOGIST: C. Cummins

PERMIT*: SECTION: -- CHECKED BY:

GROUND SURFACE ELEV.: -- TOWNSHIP: -- GWL DEPTH: 1.5'

DRILLING METHOD: Mud Rotary, 10 7/8"bit RANGE: -- DRILL EQUIP: Dietrich

CONTRACTOR: PSI GWL-DATE/TIME: 11-20-97

WELL CONSTRUCTION
MONITOR WELL NO.:
BOREHOLE DIAMETER:
SURFACE CASING:
SCREEN LENGTH:
SEAL TYPE:
DEVELOPMENT TIME:

WATER TABLE	DEPTH (FT)	FIELD SAMPLE TYPE AND NO.	ASTM (N)	PROFILE	DESCRIPTION
	-80.00				NO SAMPLE:
			50/.33		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 83.33 ft.
	-85.00				NO SAMPLE:
			50/ 5 F		SANDY CLAY: Light gray, very stiff, friable, phosphatic, refusal at 88.5 ft.
	-90.00				NO SAMPLE:
			36, 25, 50/ 5 F		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 94.5 ft.
	-95.00				NO SAMPLE:
			50/.5 F		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 98.5 ft.
	-100.00				NO SAMPLE:
			50/.13		SANDY CLAY: Light gray, hard, friable, phosphatic, refusal at 103.13 ft.
	-105.00				NO SAMPLE:
			15, 50/		SANDY CLAY: Light gray, very stiff, friable, phosphatic, refusal at 108.75 ft.
					NO SAMPLE:
	-110.00				Termination of Boring.
	-115.00				
	-120.00				

ATTACHMENT B

PSI GEOTECH REPORT (2003)

GEOTECHNICAL ENGINEERING SERVICES REPORT

For the

PROPOSED LANDFILL EXPANSION
HARDEE COUNTY, FLORIDA

Prepared for

SCS Engineers
3012 US Highway 301 North
Suite 700
Tampa, FL 33619-2242

Prepared by

Professional Service Industries, Inc.
5801 Benjamin Center Drive
Suite 112
Tampa, Florida 33634
Telephone (813) 886-1075
Fax (813) 888-6514
Engineering Business No. 3684

PSI Project No. 775-35140

September 25, 2003

psi *Information To Build On*
Engineering • Consulting • Testing

Larry P. Moore, P.E.
Vice President
Florida Registration No. 47673

Robin Saunders, EI
Staff Engineer

Martin E. Millburg, P.E. 9/25/03
Geotechnical Department Manager
Florida Registration No. 36584

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1.2 PROJECT DESCRIPTION 1
1.3 PURPOSE AND SCOPE OF WORK 1

2.0 SITE AND SUBSURFACE CONDITIONS 2
2.1 SITE LOCATION AND DESCRIPTION 2
2.2 SUBSURFACE CONDITIONS 2
2.2 SUBSURFACE CONDITIONS 3
2.4 GROUNDWATER INFORMATION 3

3.0 REPORT LIMITATIONS 4

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SOIL PROFILES .... SHEET 2

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GRAIN SIZE ANALYSES

APPENDIX II
CONSOLIDATION TEST RESULTS

APPENDIX III
MOISTURE- DENSITY (PROCTOR)

APPENDIX IV
TRI-AXIAL STRENGTH TEST RESULTS

1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided SCS Engineers in the form of Work Order Hardee-01, which was executed 5/1/2003. This study was conducted in accordance with the Scope of Work outlined in the PSI proposal for these services dated April 17, 2003, PSI Proposal No. 775-3G0159.

1.2 PROJECT DESCRIPTION

The existing Hardee County landfill is planned to be expanded. Geotechnical data is required to design the planned expansion. A geotechnical study with soil borings and laboratory testing has been performed to provide data to assist with the design of the planned landfill expansion.

If this information is incorrect, PSI should be notified to determine if either changes in the recommendations are required or additional deeper borings may be necessary.

1.3 PURPOSE AND SCOPE OF WORK

The following services have been provided in order to provide the requested geotechnical data:

1. Executed an program of subsurface exploration consisting of subsurface sampling and field testing. PSI performed seven (7) Standard Penetration Test (SPT) borings. One of these borings was extended to a depth of 70 feet below the ground surface. Four borings were advanced to a depth of 45 feet, and two borings were advanced to a depth of 35 feet. In each boring, samples were collected and Standard Penetration Test resistances have been measured virtually continuously for the top 10 feet and on intervals of 5 feet thereafter.

2. After the performance of the soil borings, five soil borings were performed by drilling without sampling to various depths. At those various depths, thin-walled (Shelby) tube samples were obtained. A list of the samples obtained is presented in the table below:

Boring No.	Depth, feet	Sample Name
TH-1	18.0-20.0	US1
TH-1	23.5-25.0	US2
TH-4	23.0-24.0	US3
TH-4	23.0-24.0	US4
TH-5	13.0-15.0	US5
TH-6	18.0-20.0	US6
TH-7	13.0-15.0	US7

3. Visually classified representative soil samples in the laboratory using the Unified Soil Classification System (USCS). In addition to the visual classifications, an extensive laboratory testing was performed to help define the characteristics of the subsurface materials at this site.

4. Collected groundwater level measurements and estimated normal wet seasonal high groundwater tables.

5. The results of the exploration were used in the engineering analysis and the formulation of recommendations. The results of the subsurface exploration, including the recommendations and the data on which they are based, are presented in this written report prepared by a professional engineer.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client. It is our understanding that an environmental site assessment is currently being performed at this site.

2.0 SITE AND SUBSURFACE CONDITIONS

2.1 SITE LOCATION AND DESCRIPTION

The site is located at the existing Hardee County landfill located on Airport Road, approximately 2 miles east and 2 miles north of Wauchula, Florida.

2.2 SUBSURFACE CONDITIONS

The subsurface conditions were explored using seven (7) Standard Penetration Test (SPT) borings drilled depths ranging from 35 to 70 feet below the existing ground surface. The borings were located in the field by SCS personnel who directed the location and depth of each soil boring. The approximate boring locations and soil profiles are presented on Sheet 1 in the Appendix of this report.

SPT soil borings were advanced utilizing rotary mud drilling methods and soil samples were routinely obtained at select intervals during the drilling process. Drilling and sampling techniques were accomplished in general accordance with ASTM standards. Select soil samples were returned to our laboratory for visual classification and laboratory testing. After the performance of the SPT borings, soil borings were advanced without sampling until desired depths were attained. Then, 3 inch diameter thin-wall (Shelby) tube samples were obtained at depths ranging from 13 to 25 feet.

A generalized description of the subsurface stratigraphy at this site is presented in the table below:

Depth, Feet	Description	Range of N-values
0-18	Sand, slightly silty fine sand, and silty sand (SP/SP-SM, SM)	5 - >50
18-70	Clayey sand, silty clay, sandy clay (SC, CL/CH)	5 - >50

Exceptions to this general pattern occurred at boring TH-3, where highly weathered limestone was encountered from 18 to 23 feet. Also, at TH-2, a clayey sand (SC) was found from 8 to 13 feet.

The previous descriptions are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles included on Sheet 2 should be reviewed for specific information at individual boring locations. These profiles include soil descriptions, groundwater levels, stratification, and penetration resistance. The stratifications shown on the boring profiles represent the conditions only at the actual boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

2.3 LABORATORY TESTING PROGRAM

Laboratory testing was performed as directed by SCS. Laboratory testing included moisture content, Atterberg limits, sieve analyses, tri-axial strength, permeability, standard Proctor and consolidation testing.

A summary of laboratory test results is presented in the Appendix of this report. Detailed laboratory reports are also presented in the Appendix of this report.

2.4 GROUNDWATER INFORMATION

Groundwater levels were recorded immediately after drilling, during the time of the subsurface exploration and corroborated through a visual examination of the obtained soil samples. Groundwater was found at a depth of 5 ½ to 7 feet below the current ground surface.

It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. A seasonal effect will occur in which higher groundwater levels are normally recorded in rainy seasons. Groundwater levels presented in this report are the levels that were measured at the time of our field activities. Based on the upper limit of the iron oxidation and the observed groundwater levels, the seasonal high depth to groundwater at this site is estimated to be on the order of 3 ½ feet below the existing ground surface at the boring locations.

3.0 REPORT LIMITATIONS

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

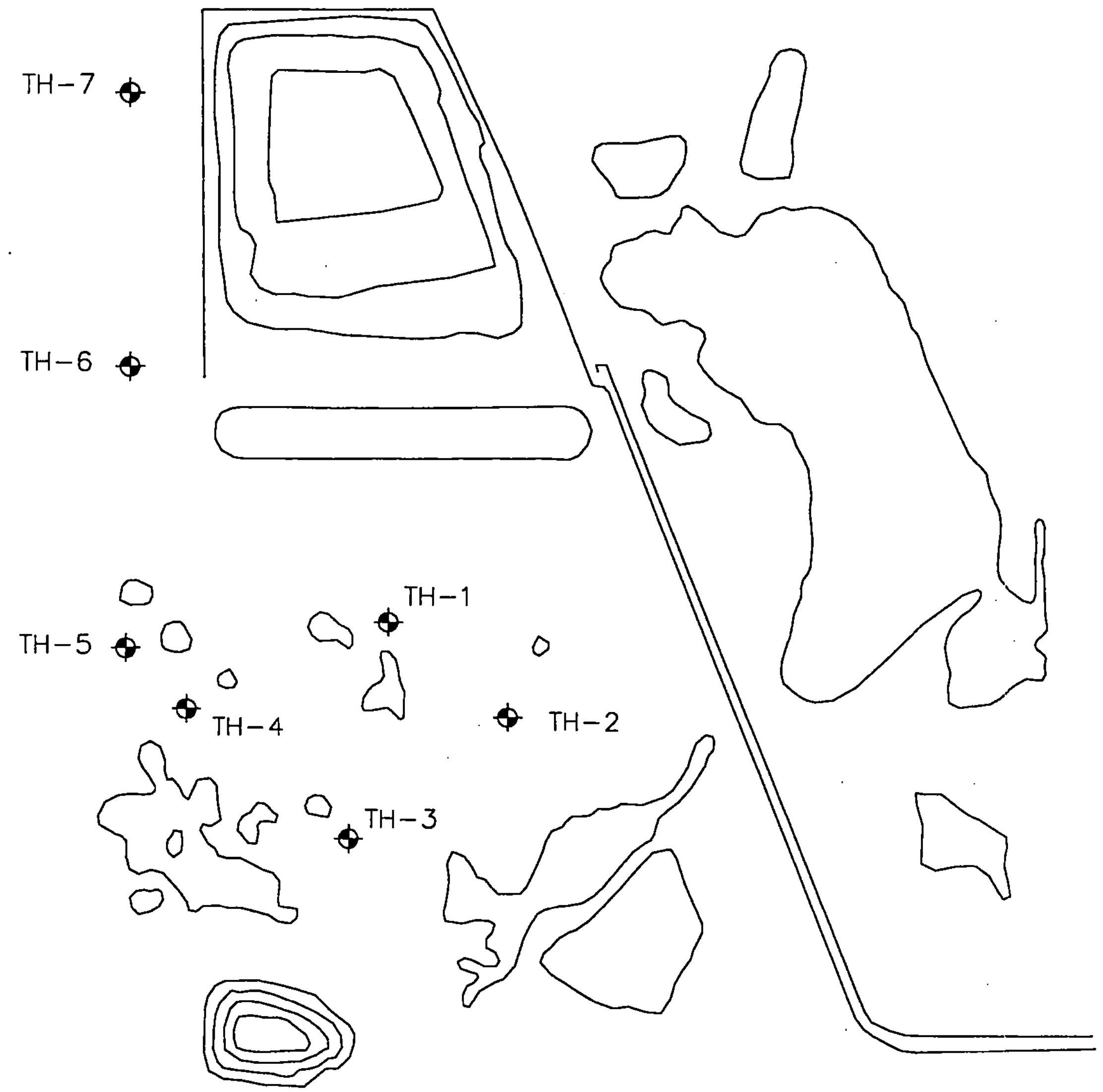
The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by SCS Engineers for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. The State of Florida is underlain by a soluble limestone formation. This limestone can be dissolved, resulting in the formation of sinkholes. An evaluation for the existence of or the potential for sinkhole development was not a part of the scope of services for this project.

After the plans and specifications are more complete, the Geotechnical Engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of SCS Engineers in Hardee County, Florida.

SHEETS

BOIRNG LOCATION PLAN

SOIL PROFILES



BORING LOCATION PLAN

0 365'

APPROXIMATE PLAN SCALE

NOTE: PROVIDED TO PSI BY SCS ON 7/25/03.

LEGEND

Approximate SPT boring location

DRAWN	DJG
CHECKED	GC
APPROVED	MEM
SCALE	NOTED

GEOTECHNICAL SERVICES

PROPOSED LANDFILL EXPANSION

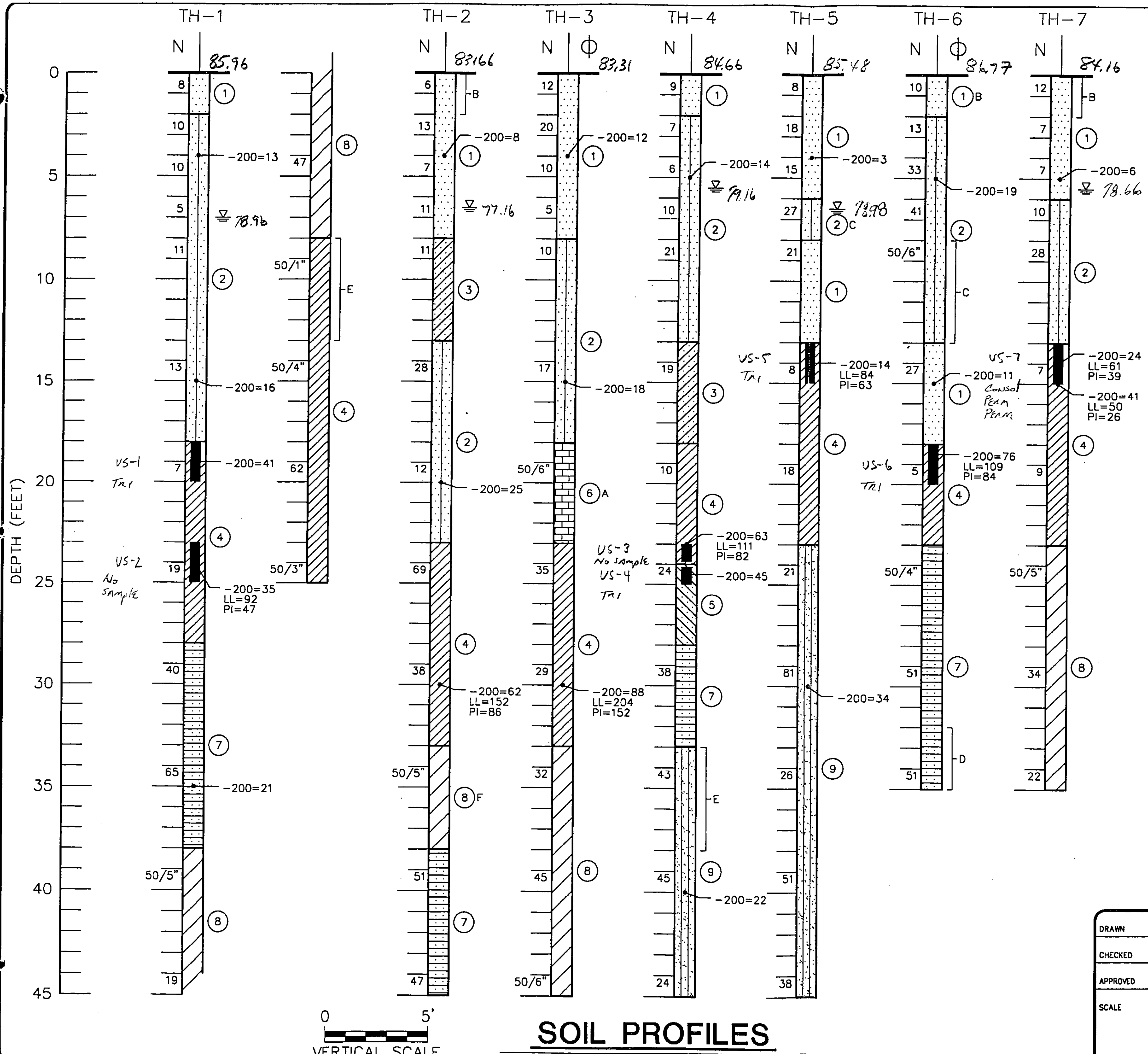
HARDEE COUNTY, FLORIDA

psi Information To Build On

Engineering • Consulting • Testing

DATE	PROJ. NO.	
JUNE 03	775-35140	SHEET 1

s:\geo\projects\775\35140_Landfill_Expansion\35140s1



SOIL PROFILES

LEGEND

1. Gray, brown SAND to slightly silty SAND (SP/SP-SM)
2. Gray, brown, yellow silty SAND (SP-SM/SM)
3. Gray, brown, yellow clayey SAND (SC)
4. Gray, brown, yellow silty CLAY (CL/CH)
5. Gray silty to clayey SAND (SM/SC)
6. Highly weathered LIMESTONE (LS)
7. Gray to tan phosphatic clayey SAND (SC)
8. Gray to tan phosphatic sandy CLAY to CLAY (CL/CH)
9. Gray to tan phosphatic silty to clayey SAND (SM/SC)

SP	Unified Soil Classification System (ASTM D 2487) group symbol as determined by visual review
⊻	Groundwater level, April 2003
Φ	Groundwater level not measured
N	SPT N-value in blows/foot
50/6"	Fifty blows for six inches
▮	Shelby tube sample location
A	With phosphate fragments
B	With grass roots
C	With trace organic soil
D	With trace cemented sand
E	With chert fragments
F	With limestone fragments
-200	Fines passing No. 200 sieve (%)
LL	Liquid Limit (%)
PI	Plasticity Index (%)

DRAWN	DJG
CHECKED	GC
APPROVED	MEM
SCALE	NOTED

GEOTECHNICAL SERVICES
PROPOSED LANDFILL EXPANSION
HARDEE COUNTY, FLORIDA

psi *Information To Build On*
Engineering • Consulting • Testing

DATE	PROJ. NO.	
JUNE 03	775-35140	SHEET 2

s:\geo\projects\775\35140_Landfill_Expansion\35140s2

TABLES

TABLE 1 SUMMARY OF LABORATORY TEST RESULTS PROPOSED LANDFILL EXPANSION HARDEE COUNTY, FLORIDA PSI PROJECT NO. 775-35140										
Boring Number	Sample Depth (feet)	Sieve Analysis (%)					Atterberg Limits (%)		USGS Group	Stratum Number
		#10	#40	#60	#100	#200	LL	PI		
TH-1	4.0 - 6.0	98	93	75	48	13	-	-	SP-SM/SM	2
TH-1	13.5 - 15.0	99	71	36	22	17	-	-	SP-SM/SM	2
TH-1	18.0 - 20.0	-	100	-	85	41	-	-	CL/CH	4
TH-1	23.0 - 25.0	85	74	67	58	36	92	47	CL/CH	4
TH-1	33.5 - 35.0	99	89	64	24	21	-	-	SC	7
TH-2	2.0 - 4.0	100	95	76	50	8	-	-	SP/SP-SM	1
TH-2	18.5 - 20.0	100	81	41	27	25	-	-	SP-SM/SM	2
TH-2	28.5 - 30.0	100	100	98	87	61	152	86	CL/CH	4
TH-3	2.0 - 4.0	100	95	75	50	12	-	-	SP/SP-SM	1
TH-3	13.5 - 15.0	100	88	47	22	18	-	-	SP-SM/SM	2
TH-3	28.5 - 30.0	100	99	97	95	87	204	152	CL/CH	4
TH-4	4.0 - 6.0	100	93	71	48	17	-	-	SP-SM/SM	2
TH-4	23.0 - 24.0	100	100	-	95	63	111	82	CL/CH	4
TH-4	24.0 - 25.0	-	-	-	-	45	-	-	SM/SC	5
TH-4	38.5 - 40.0	99	86	53	25	23	-	-	SM/SC	9
TH-5	2.0 - 4.0	100	93	70	43	8	-	-	SP/SP-SM	1
TH-5	13.0 - 15.0	92	50	-	27	14	84	63	CL/CH	4
TH-5	28.5 - 30.0	99	81	49	36	34	-	-	SM/SC	9
TH-6	4.0 - 6.0	100	95	78	56	23	-	-	SP/SP-SM	2
TH-6	13.5 - 15.0	100	72	31	16	12	-	-	SP/SP-SM	1
TH-6	18.0 - 20.0	100	98	-	82	76	109	84	CL/CH	4
TH-7	4.0 - 6.0	99	95	77	52	10	-	-	SP/SP-SM	1
TH-7	13.0 - 14.0	100	96	-	32	24	61	39	CL/CH	4
TH-7	14.0 - 15.0	-	-	-	-	41	50	26	CL/CH	4

TABLE 2
SUMMARYOF CONSOLIDATION PARAMETER TEST RESULTS
PROPOSED LANDFILL EXPANSION
HARDEE COUNTY, FLORIDA
PSI PROJECT NO. 775-35140

Boring Number	Sample Number	Sample Depth (feet)	Initial Moisture Content (%)	Dry Density (pcf)	Initial Void Ratio (%)	Initial Liquid Limit (%)	Initial Plasticity Index (%)	Preconsolidation Pressure (P_c) (psf)	Conpression Index (C_c)
TH-7	US-7	13.0 – 15.0	49	74	1.28	61	39	1250	0.44

TABLE 3 SUMMARY OF STANDARD PROCTOR COMPACTION TEST RESULTS PROPOSED LANDFILL EXPANSION HARDEE, FLORIDA PSI PROJECT NO. 775-35140					
Boring Number	**Sample Depth (ft)**	**Maximum Dry Density (pcf)**	**Optimum Moisture Content (%)**	**USGS Group**	**Stratum Number**
TH-1	0.0 - 4.0	112.1	10.5	SP-SM/SM	2

TABLE 4 SUMMARY OF PERMEABILITY TEST TABLE PROPOSED LANDFILL EXPANSION HARDEE, FLORIDA PSI PROJECT NO. 775-35140							
Boring Number	Sample Number	Sample Depth (ft)	Saturation (%)	Average Hydraulic Conductivity(ft/day)	USGS Group	Stratum Number	Confining Pressure, psi
TH-1	Bulk	0.0-4.0	100	2.1	SP-SM/SM	2	*
TH-7	US-7	13.0 - 14.0	98	0.039	CL/CH	4	70
TH-7	US-7	14.0 - 15.0	98	0.0003	CL/CH	4	45

TH-1 Bulk sample remolded to 95% of 112.1 pcf.

*Permeability test performed on remolded sample placed in permeameter to attain required unit weight, no confining pressure imposed.

TABLE 5
SUMMARY OF TRIAXIAL COMPRESSION TEST (CONSOLIDATED-UNDRAINED) RESULTS
PROPOSED LANDFILL EXPANSION
HARDEE COUNTY, FLORIDA
PSI PROJECT NO. 775-35140

Boring Number	Sample Number	Sample Depth (feet)	Effective Stress		USGS Group	Stratum Number
			Cohesion (psf)	Angle of Friction		
TH-1	US-1	18.0-20.0	0	13	CL/CH	4
TH-4	US-4	23.0-24.0	300	9	CL/CH	4
TH-5	US-5	13.0-15.0	0	28	CL/CH	4
TH-6	US-6	18.0-20.0	0	30	CL/CH	4

Boring Number	Sample Number	Sample Depth (feet)	Total Stress		USGS Group	Stratum Number
			Cohesion (psf)	Angle of Friction		
TH-1	US-1	18.0-20.0	500	7	CL/CH	4
TH-4	US-4	23.0-24.0	300	5	CL/CH	4
TH-5	US-5	13.0-15.0	0	16	CL/CH	4
TH-6	US-6	18.0-20.0	500	13	CL/CH	4

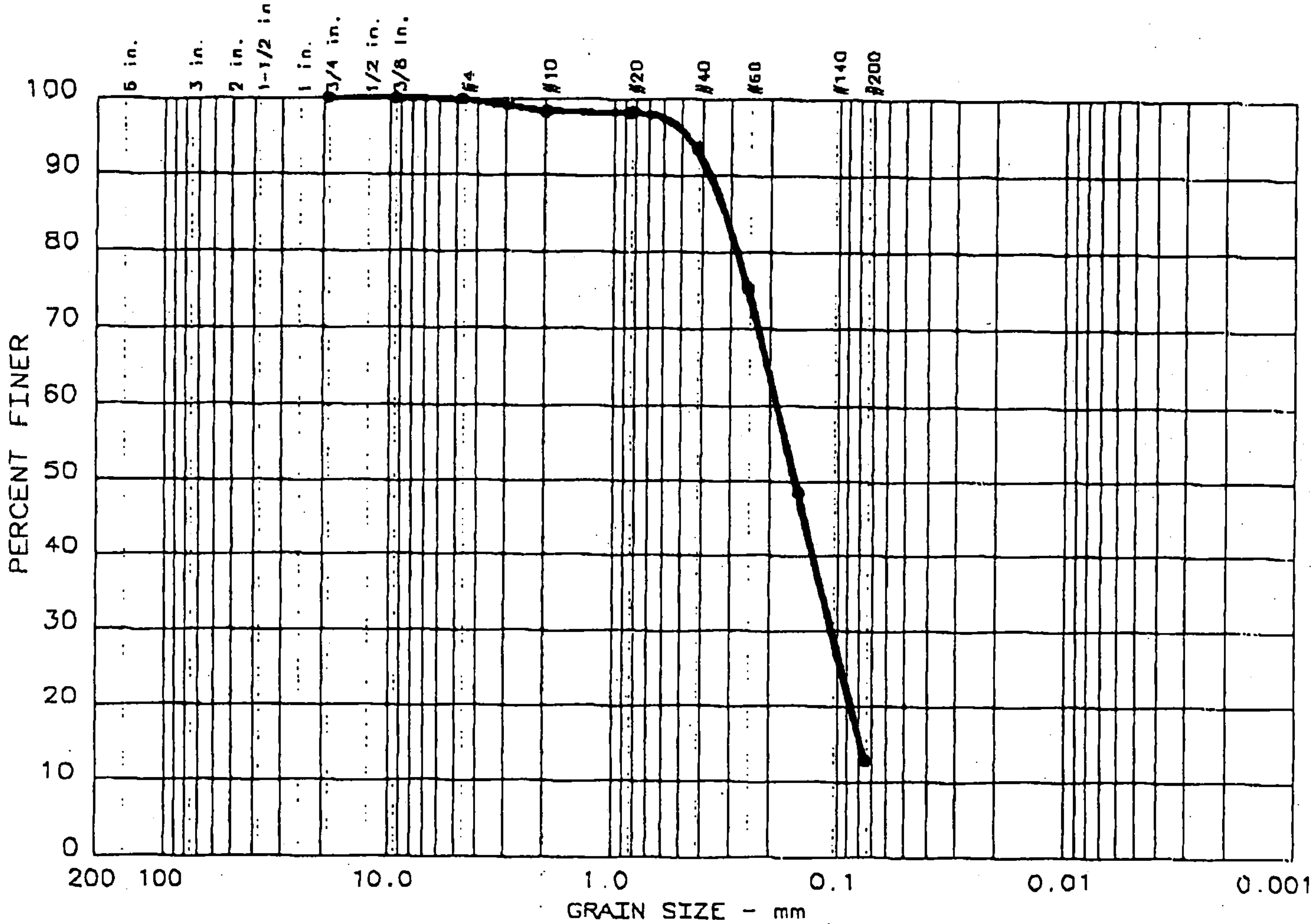
APPENDIX I

GRAIN SIZE ANALYSES

psi

2/2

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	1.7	85.3	13.0	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.316	0.186	0.154	0.105	0.0781			

MATERIAL DESCRIPTION	USCS	AASHTO
● LIGHT BROWN SLIGHTLY SILTY FINE SAND	SM	A-2-4(0.2)

Project No.: 761
Project: HARDEE COUNTY LANDFILL
● Location: DELIVERED BT TAMPA LAB
TH1 4' below surface
Date: 5-19-2003

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140

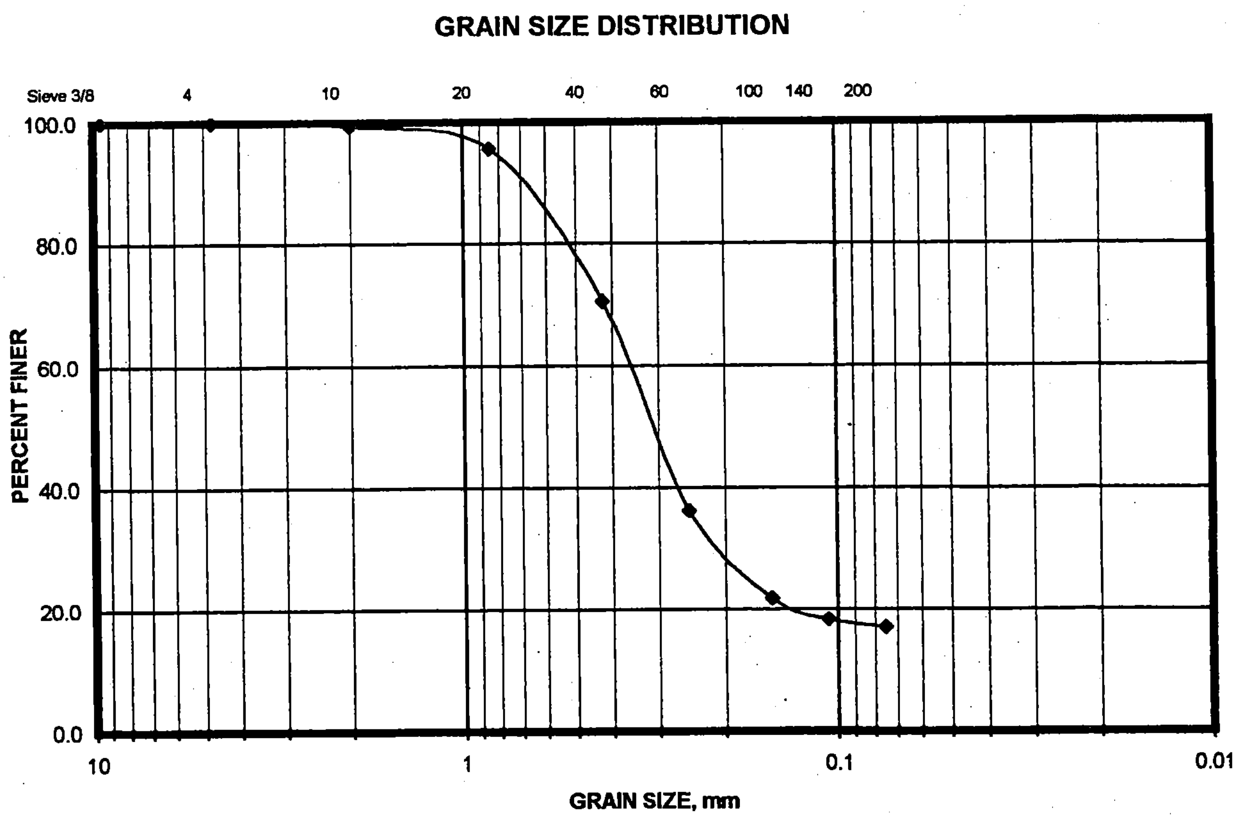
Date: 5/20/2003

Project: Hardee County Landfill

Sample Location: TH1 15'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel		% Sand		%-200
0.0		83.0		17.0
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/03

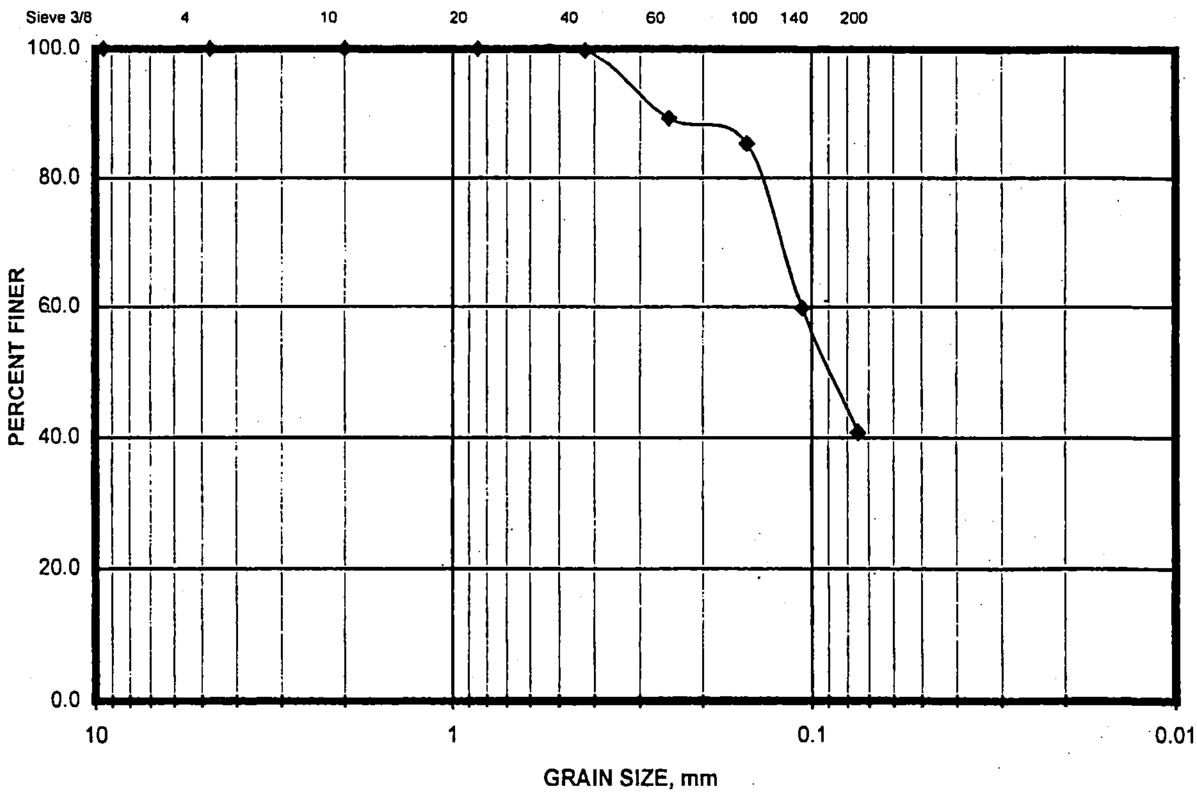
Project: Hardee County Landfill

Sample Location: TH1 18-20'

Soil Description: 0

Soil Classification: 0 LL PI

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	59.3	40.7

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 775-35140 Date: 6/10/03

Project: Hardee County Landfill

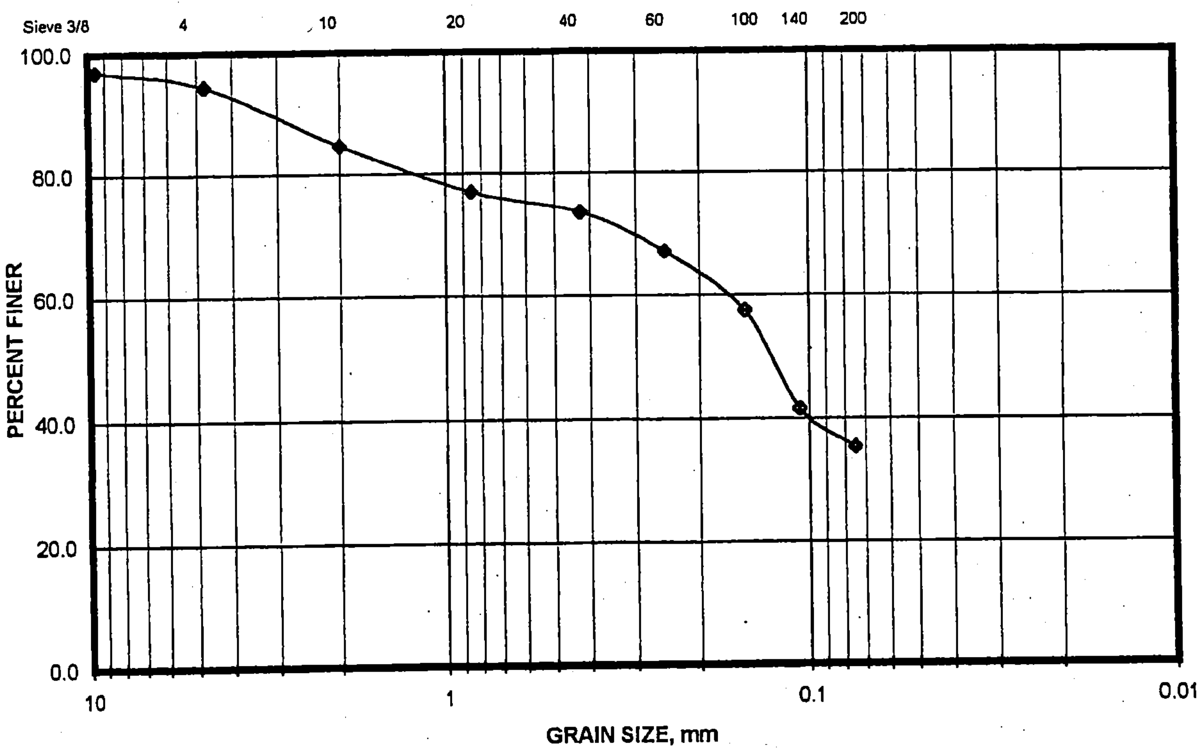
Sample Location: US-2 TH-1 @ 23.5'-25'

Soil Description: Tan and Light Green Clay With Rock

Soil Classification: 0 LL 92 PI 47

NMC % 47.4

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
5.5	59.0	35.5

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/23/2003

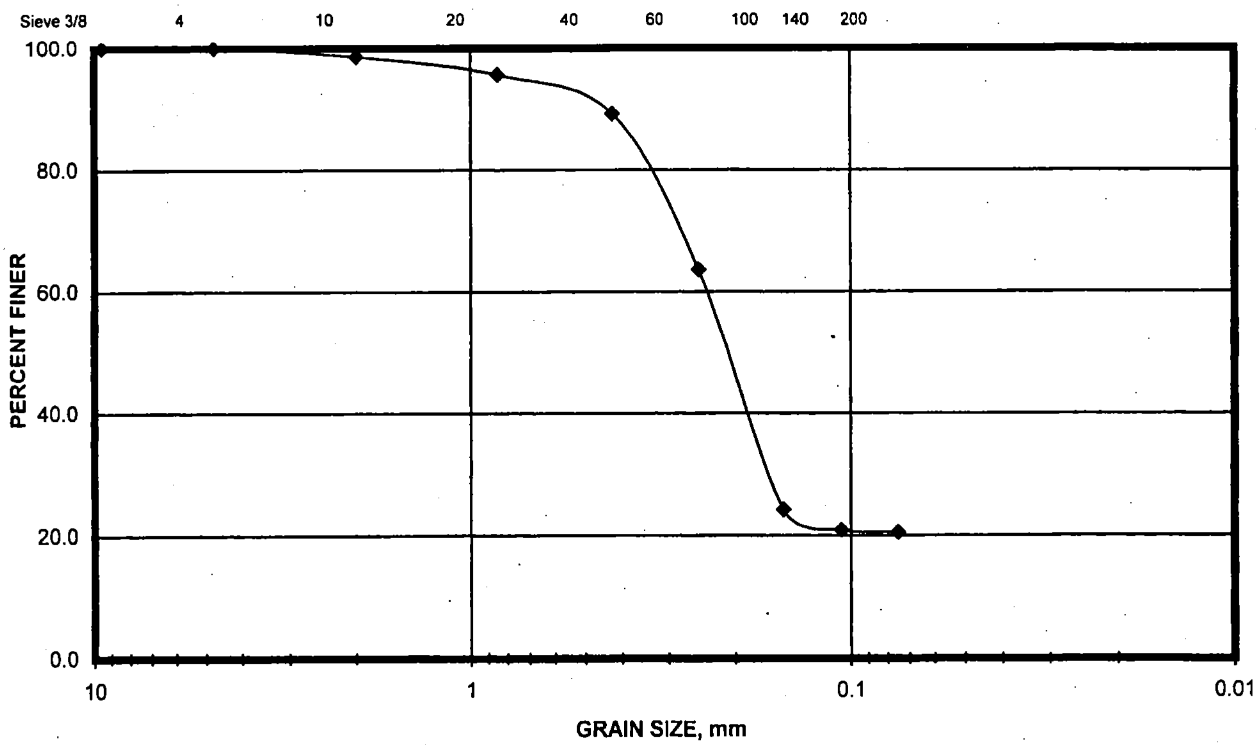
Project: Hardee County Landfill

Sample Location: TH1 35'

Soil Description: 0

Soil Classification: 0 LL PI

GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
0.0		79.5		20.5
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/23/2003

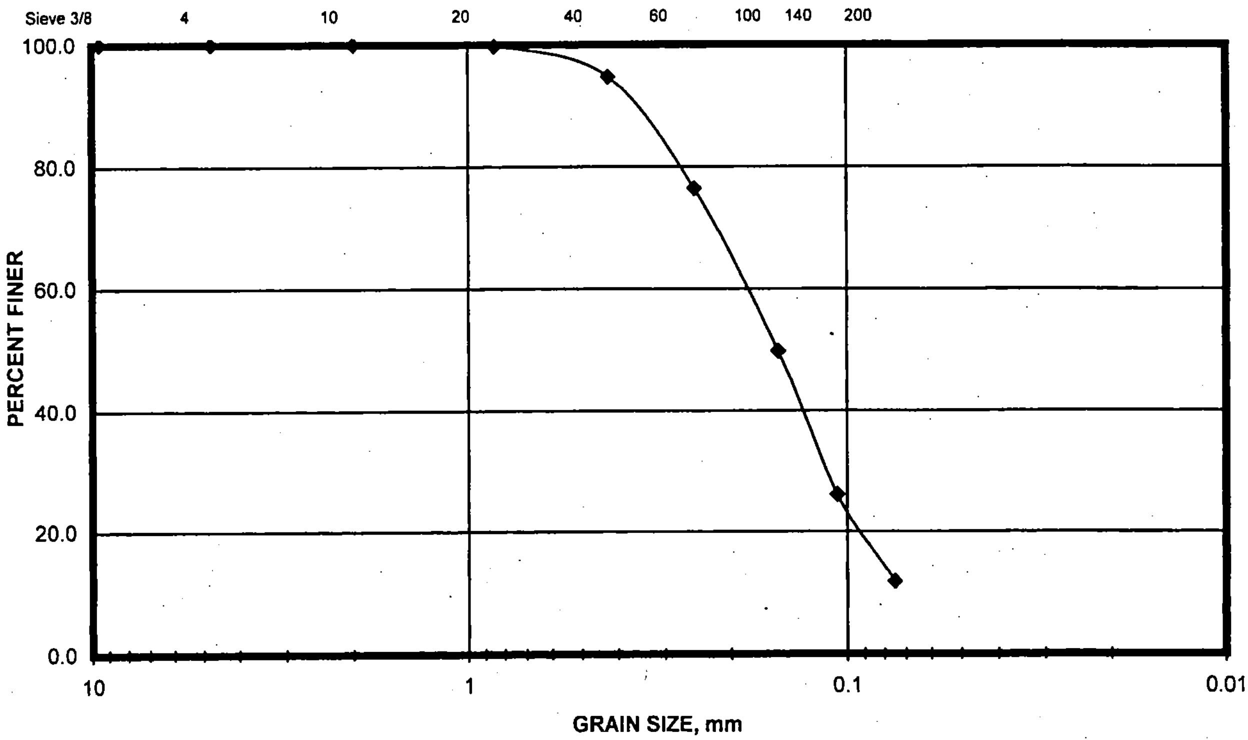
Project: Hardee County Landfill

Sample Location: TH2 4'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	88.1	11.9

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

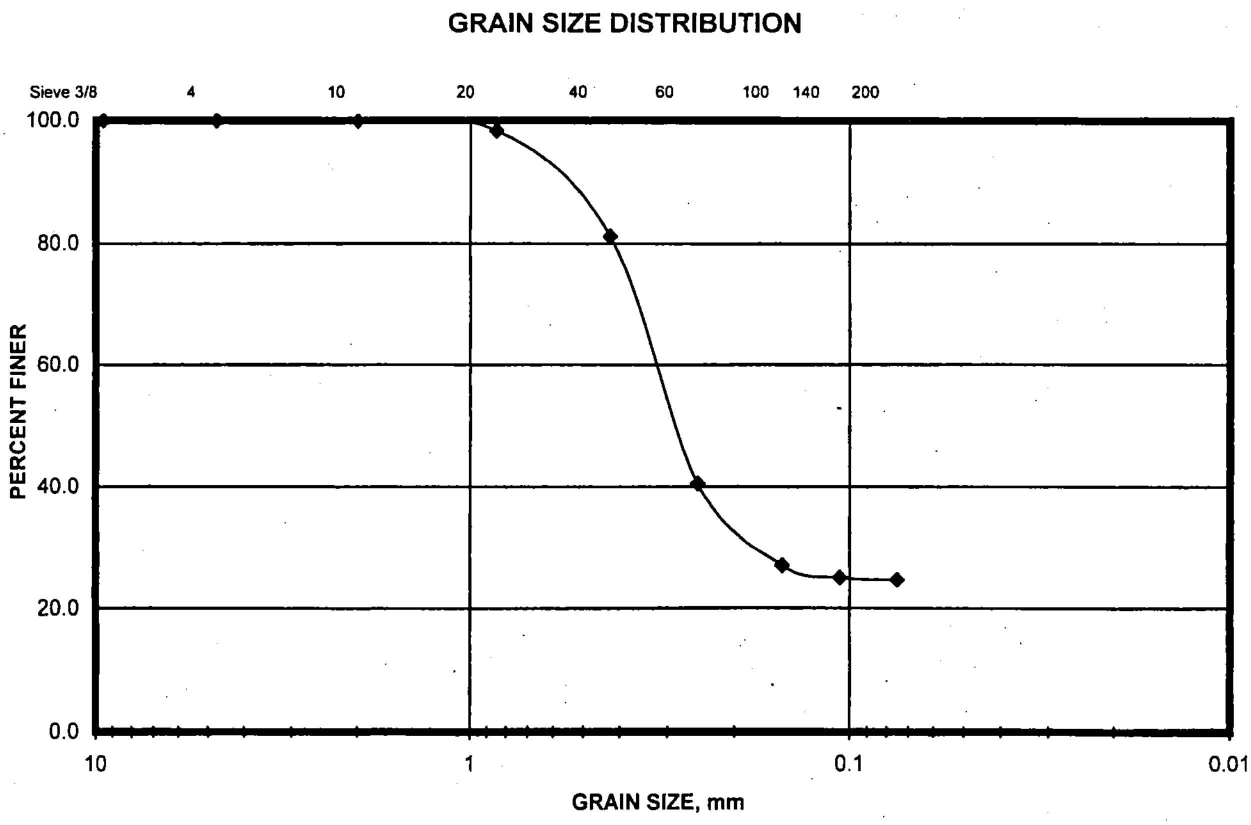
Project No. 35140 Date: 5/23/2003

Project: Hardee County Landfill

Sample Location: TH2 20'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel		% Sand		%-200
0.0		75.3		24.7
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/21/2003

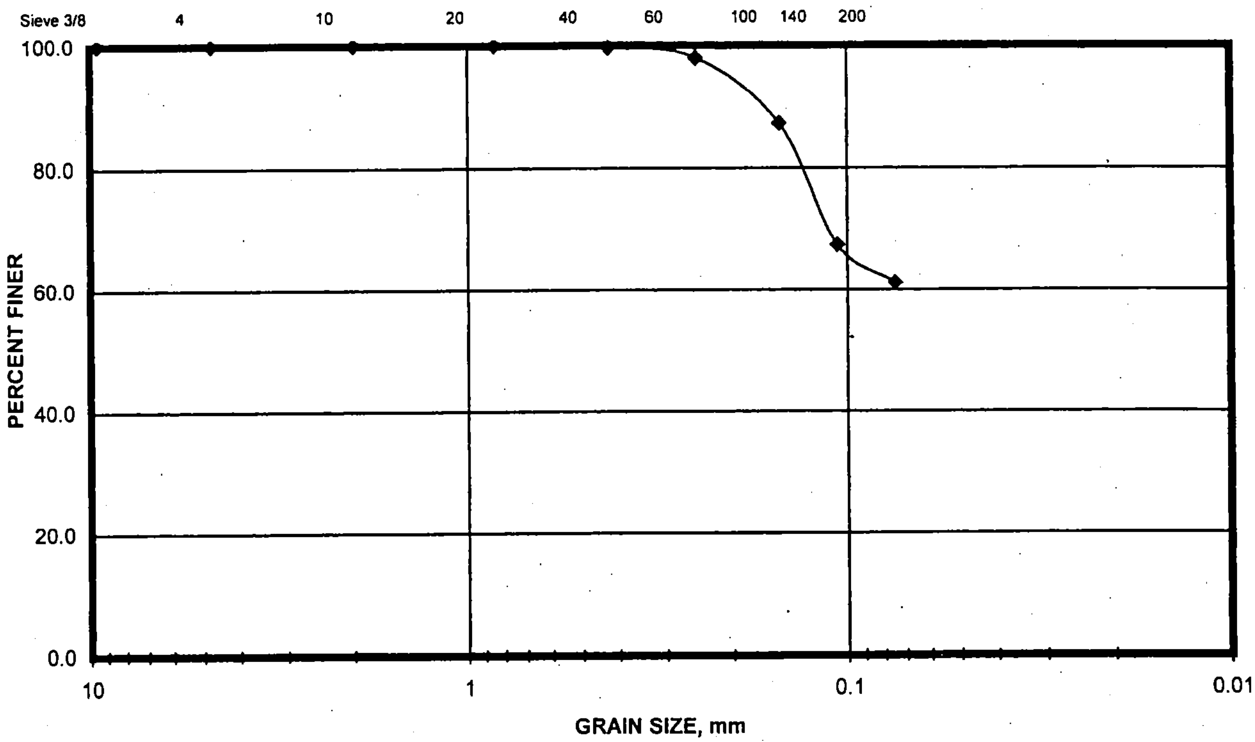
Project: Hardee County Landfill

Sample Location: TH2 30'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	38.8	61.2

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/22/2003

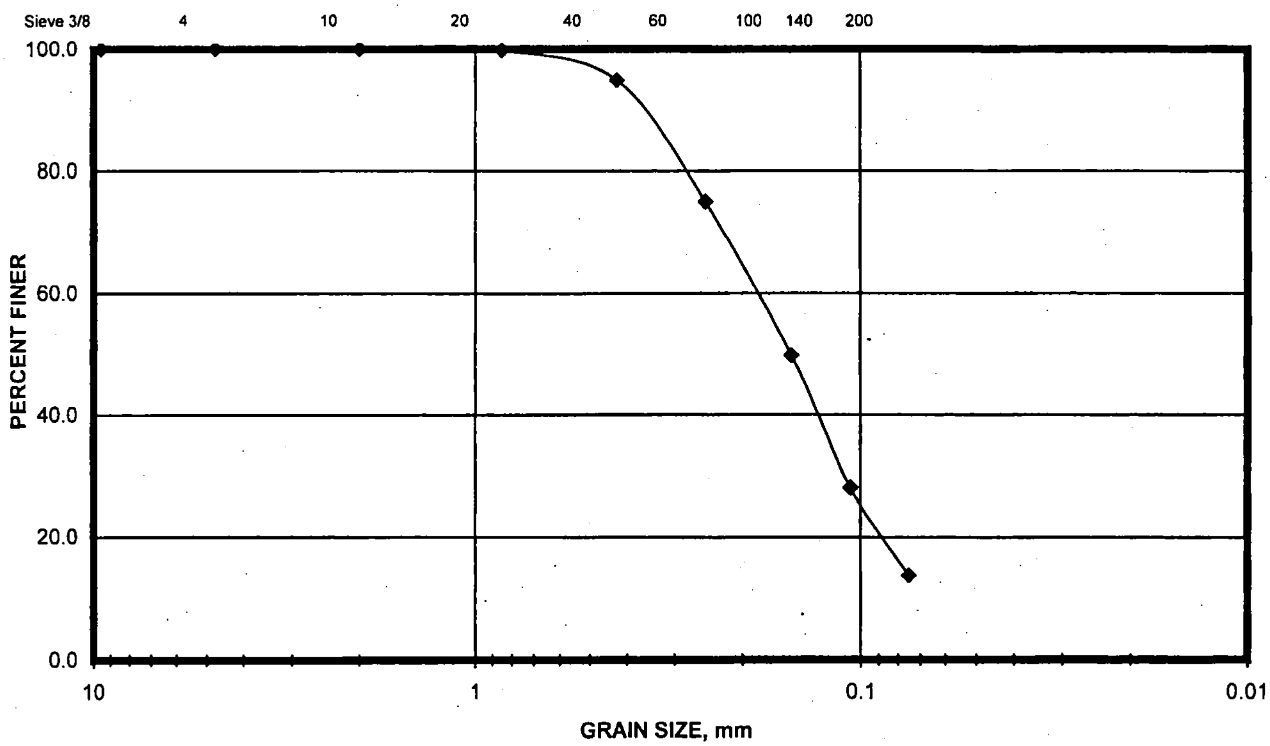
Project: Hardee County Landfill

Sample Location: TH3 4'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	86.3	13.7

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/22/2003

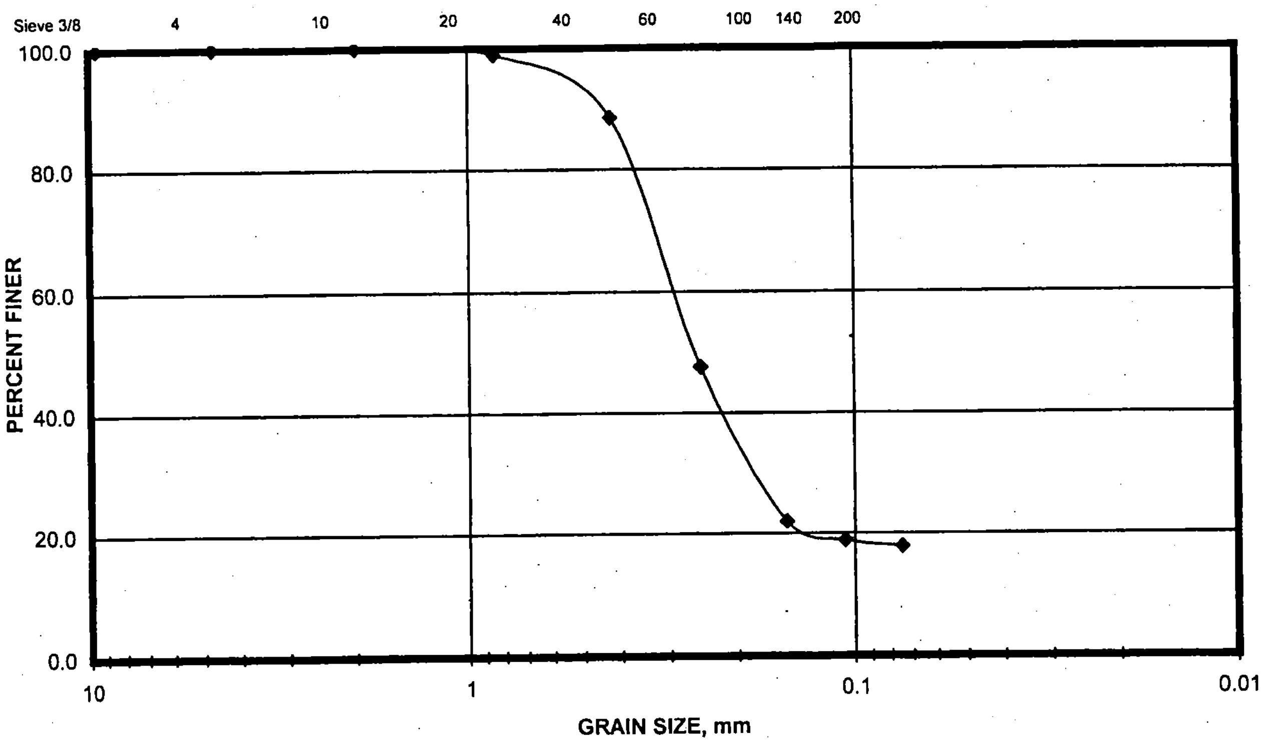
Project: Hardee County Landfill

Sample Location: TH3 15'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
0.0		82.1		17.9
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/22/2003

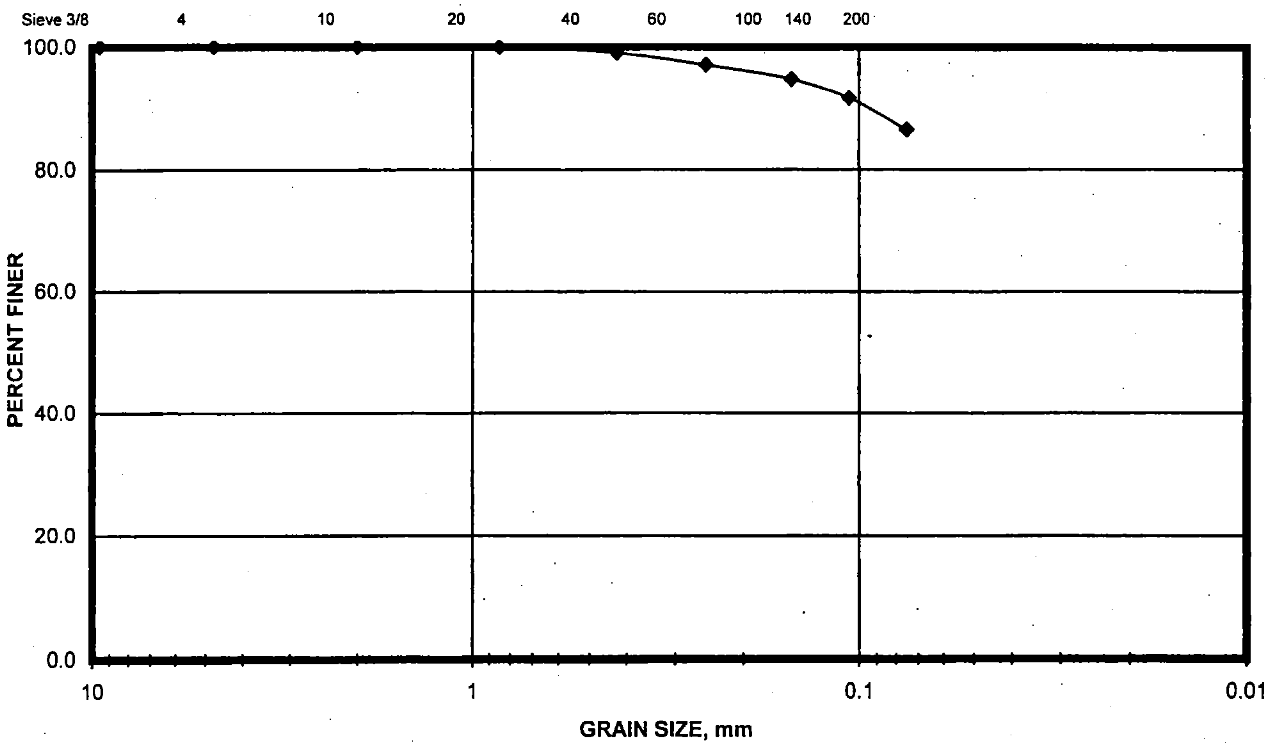
Project: Hardee County Landfill

Sample Location: TH3 30'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	13.5	86.5

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/23/2003

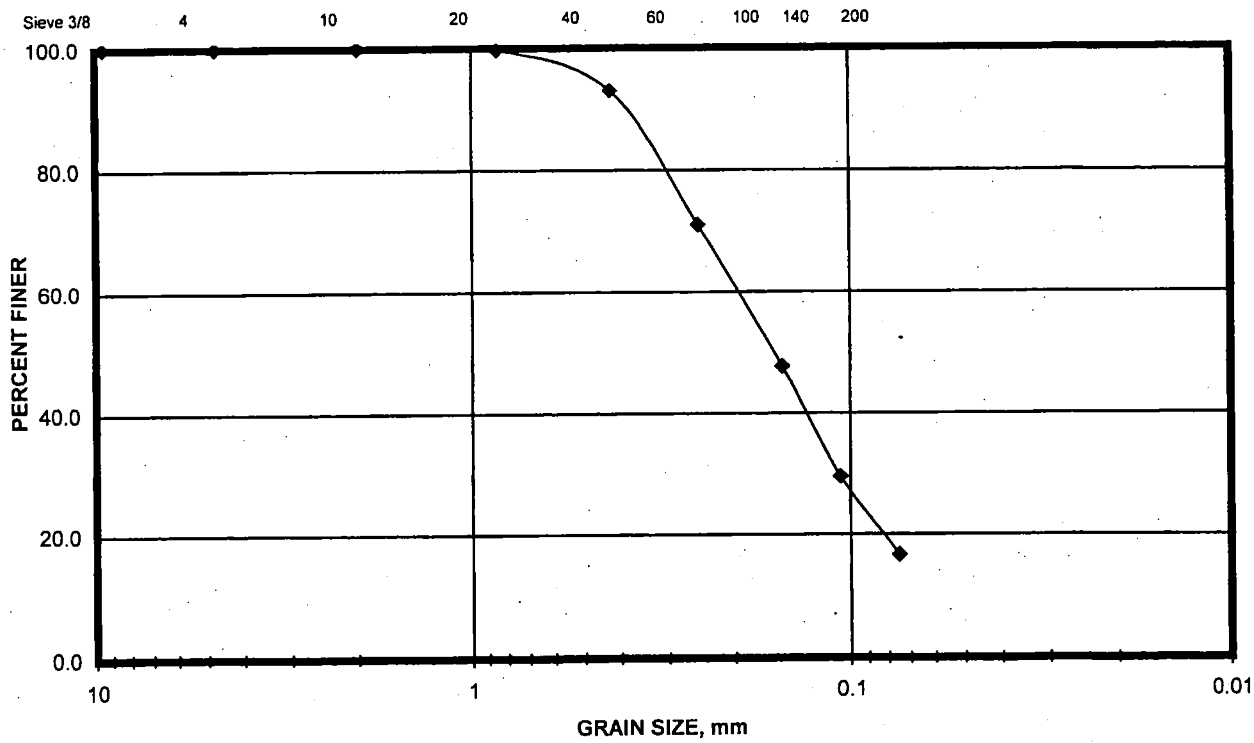
Project: Hardee County Landfill

Sample Location: TH4 5'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	83.2	16.8

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/2003

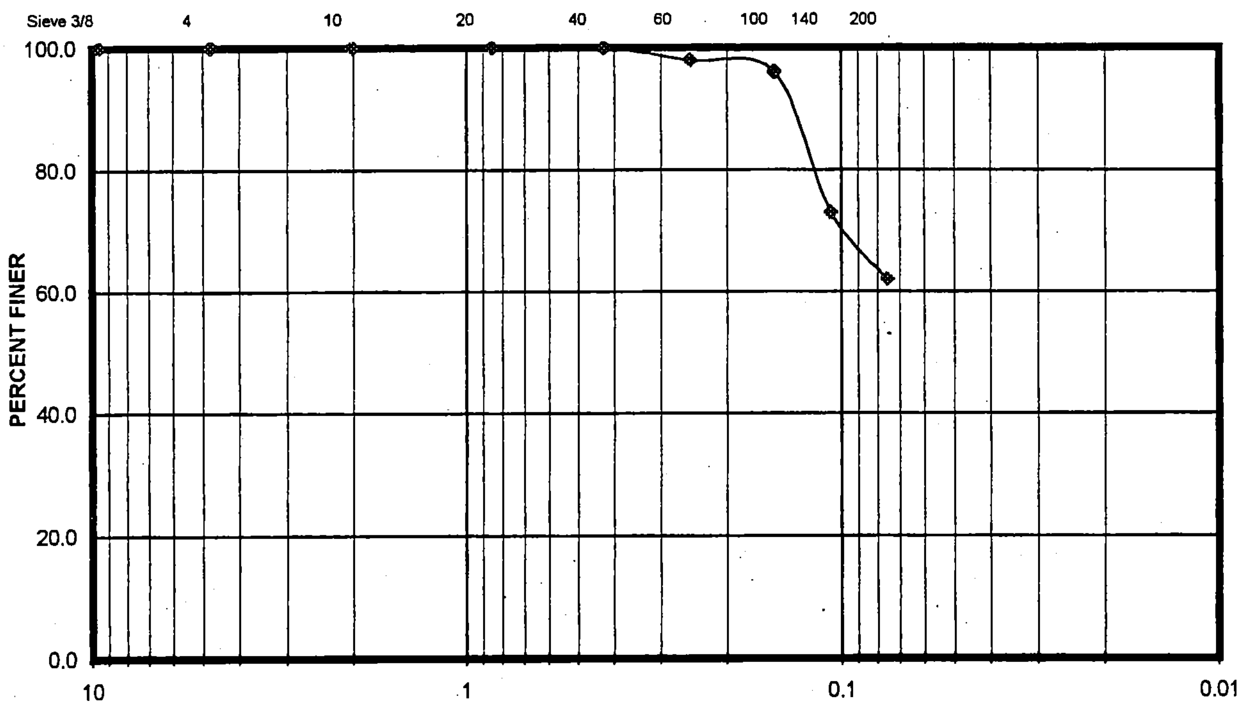
Project: Hardee County Landfill

Sample Location: TH4 23-24'

Soil Description: ____

Soil Classification: ____ LL ____ PI ____

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	38.0	62.0

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/03

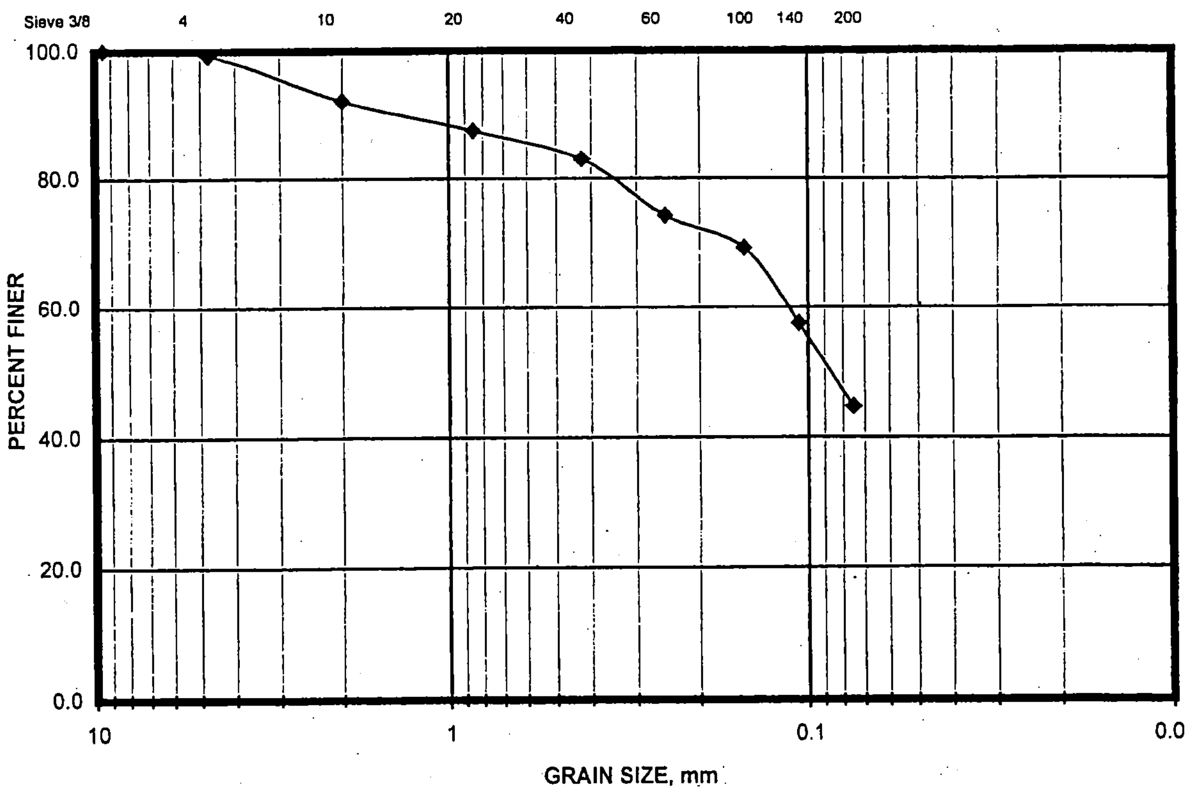
Project: Hardee County Landfill

Sample Location: TH4 24-25'

Soil Description: 0

Soil Classification: 0 LL PI

GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
0.8		54.6		44.7
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

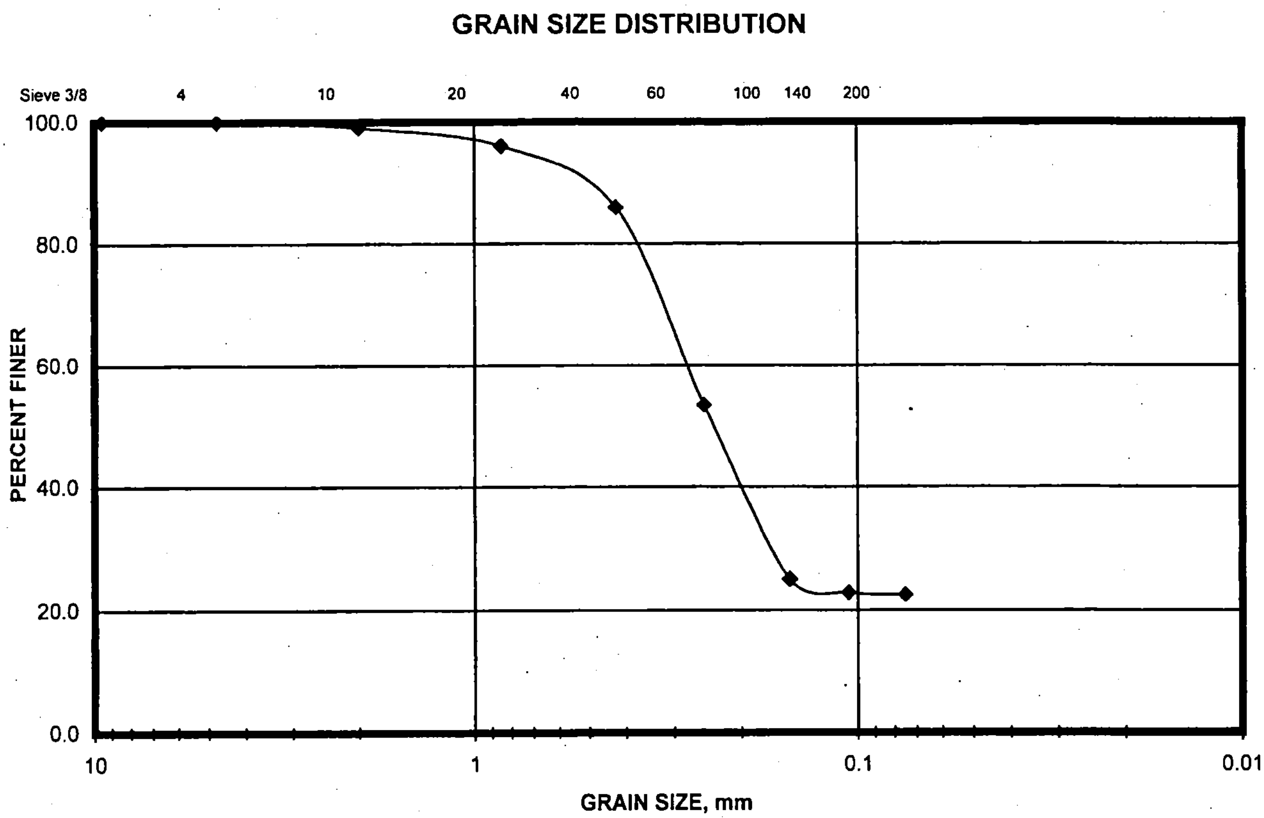
Project No. 35140 Date: 5/22/2003

Project: Hardee County Landfill

Sample Location: TH4 40'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel	% Sand	%-200
0.0	77.4	22.6

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 5/27/2003

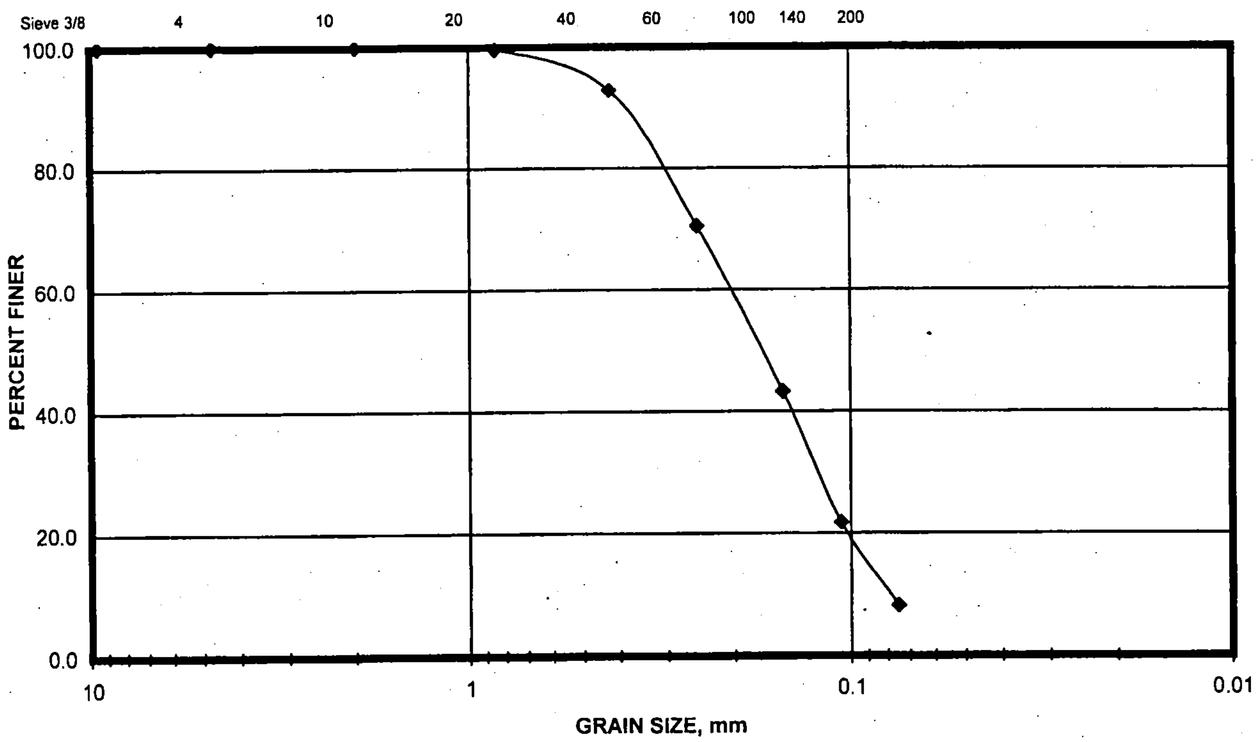
Project: Hardee County Landfill

Sample Location: TH5 4'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel	% Sand	%-200
0.0	91.9	8.1

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/2003

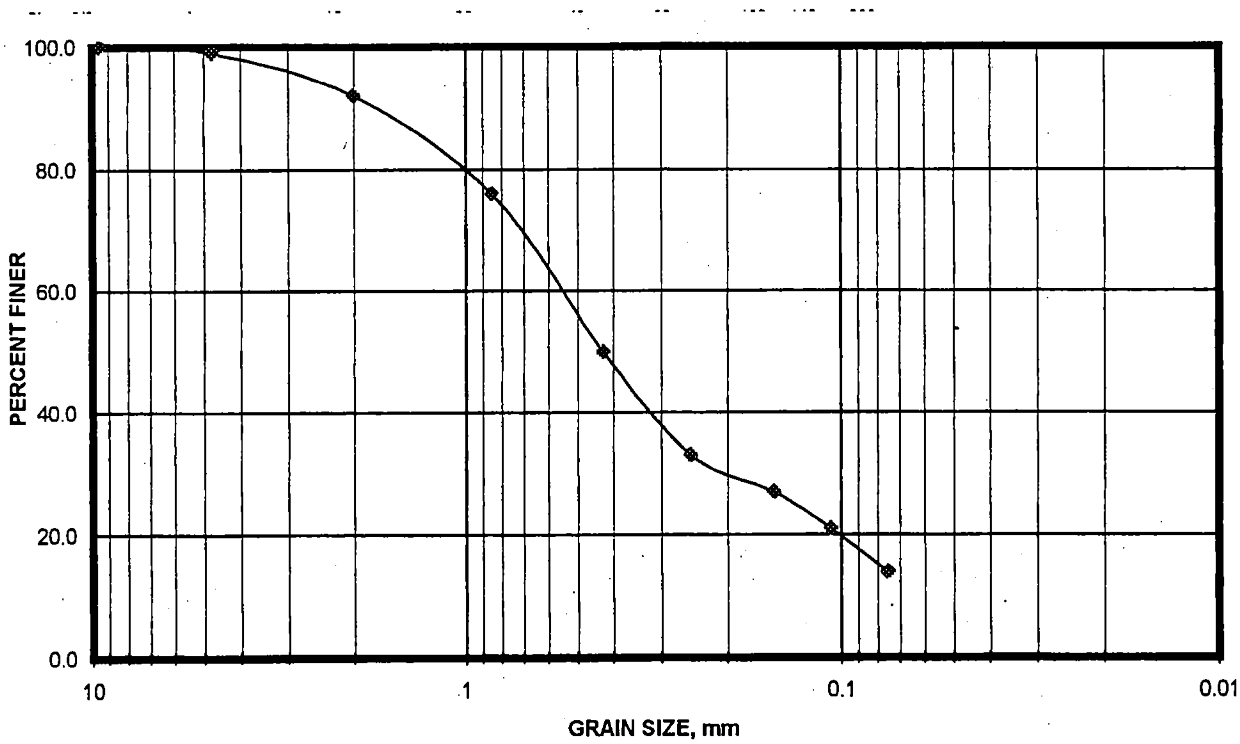
Project: Hardee County Landfill

Sample Location: TH5 13-15'

Soil Description: ______

Soil Classification: ______ LL ______ PI ______

GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
1.0		85.0		14.0
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

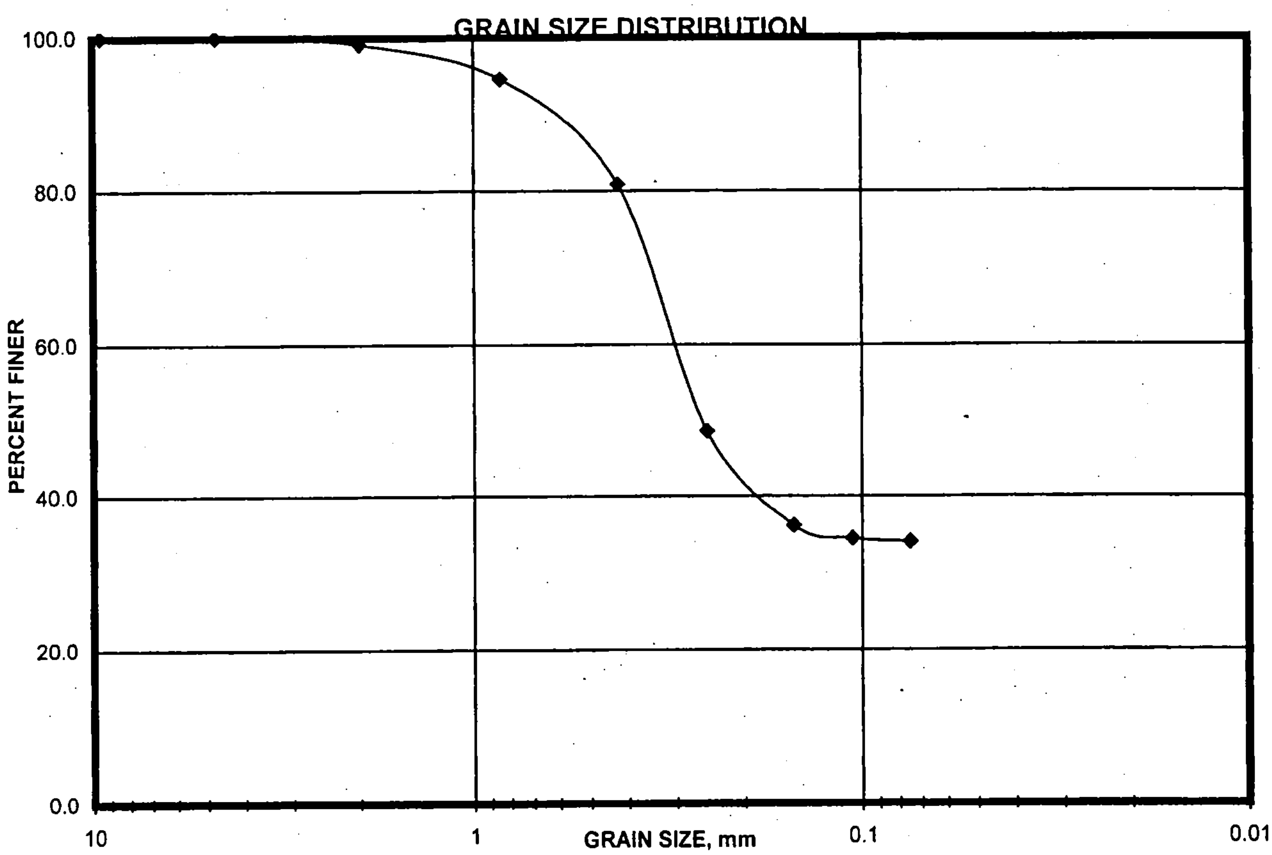
Project No. 35140 Date: 5/23/2003

Project: Hardee County Landfill

Sample Location: TH5 30'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel		% Sand		%-200
0.0		65.9		34.1
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

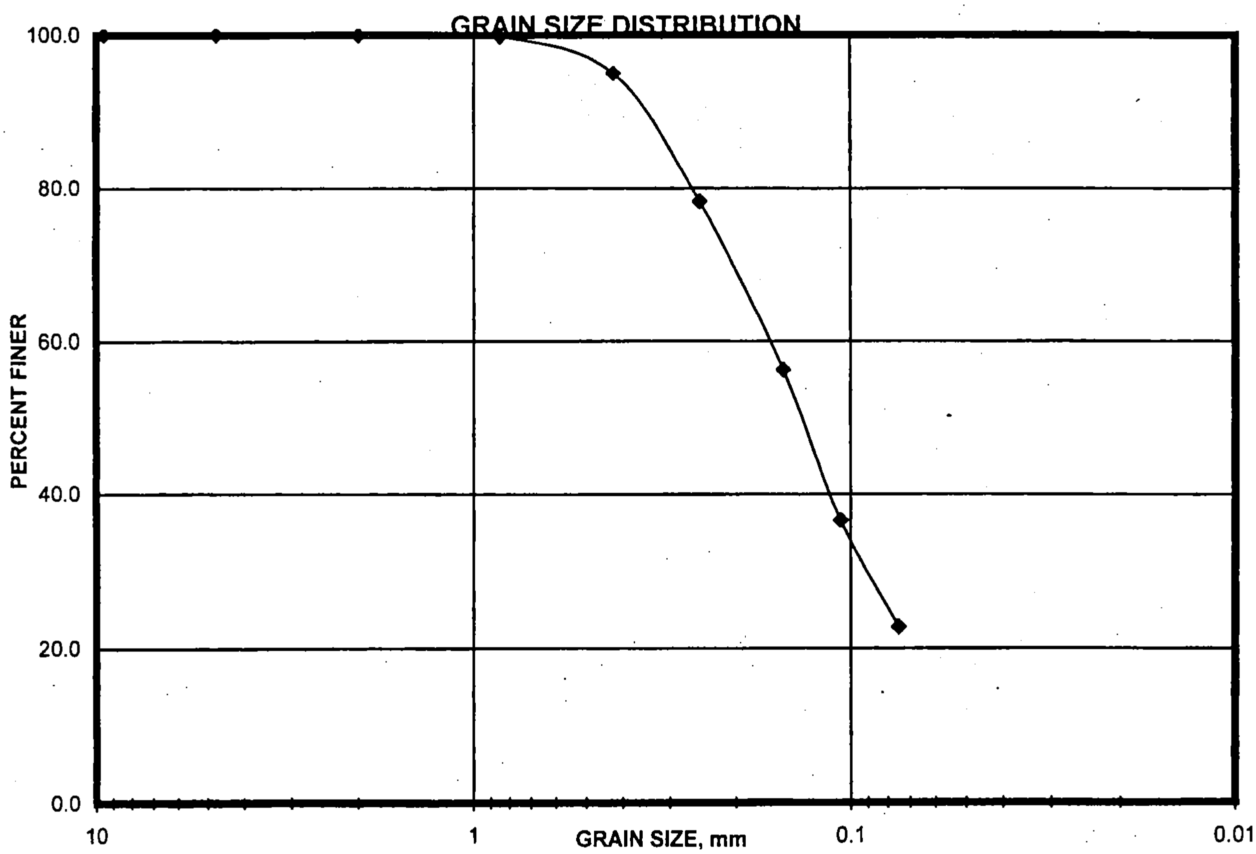
Project No. 35140 Date: 5/22/2003

Project: Hardee County Landfill

Sample Location: TH6 5'

Soil Description: 0

Soil Classification: 0 LL ______ PI ______



% Gravel		% Sand		%-200
0.0		77.3		22.7
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

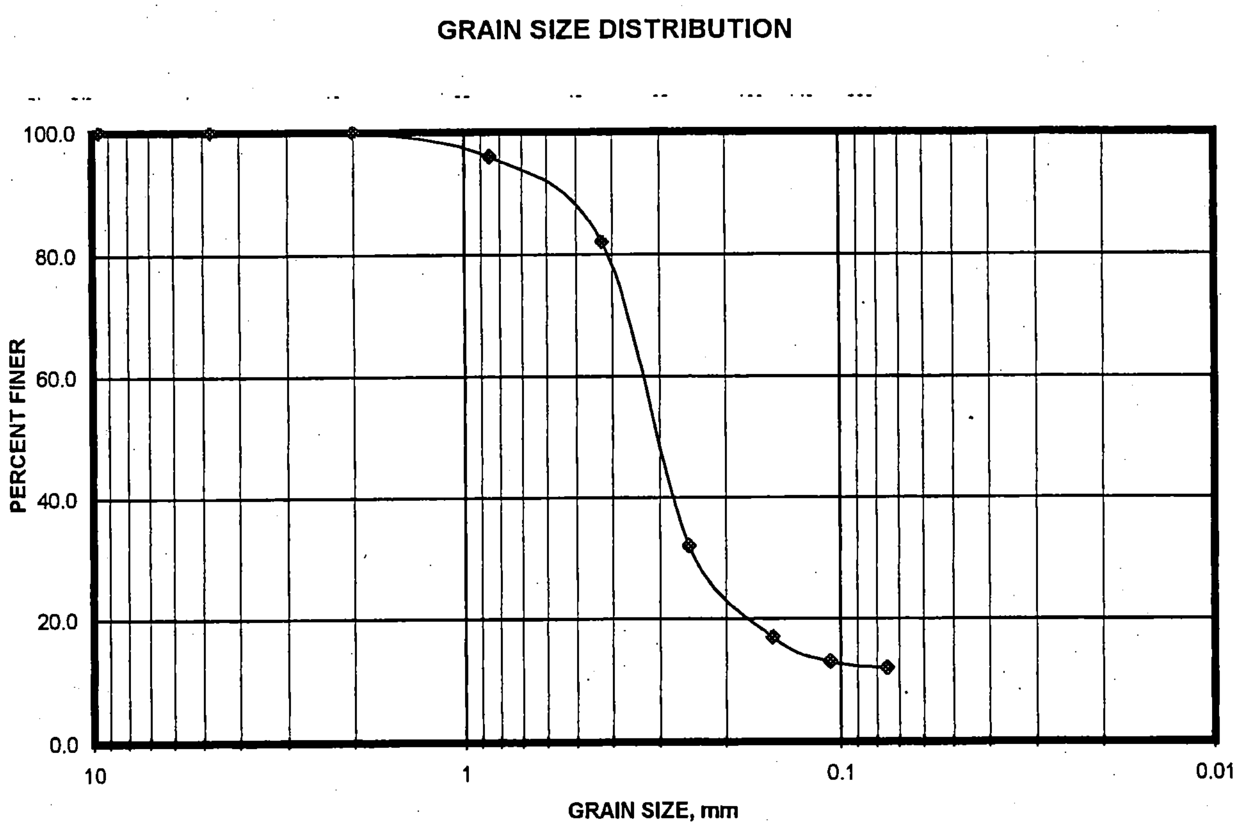
Project No. 35140 Date: 6/11/2003

Project: Hardee County Landfill

Sample Location: TH6 15'

Soil Description:

Soil Classification: LL PI



% Gravel	% Sand	%-200
0.0	88.0	12.0

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/03

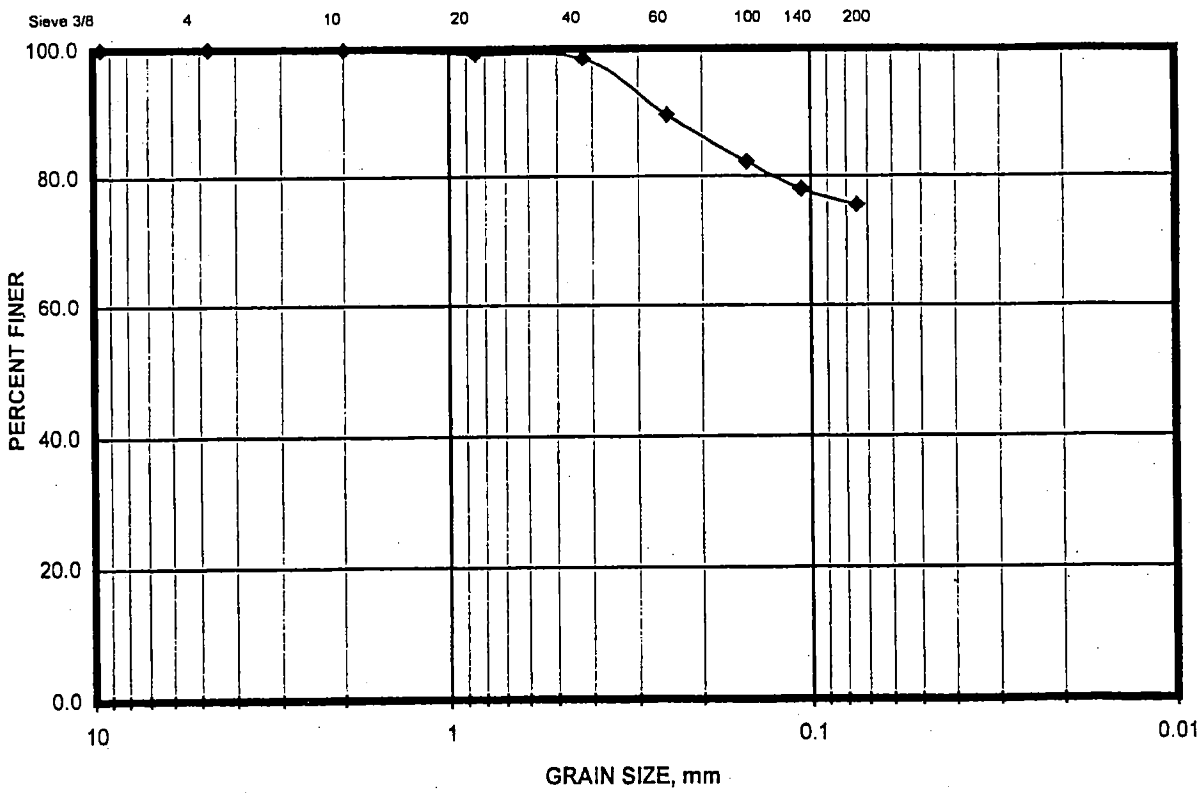
Project: Hardee County Landfill

Sample Location: TH6 18-20'

Soil Description: 0

Soil Classification: 0 LL PI

GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
0.0		24.5		75.5
D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

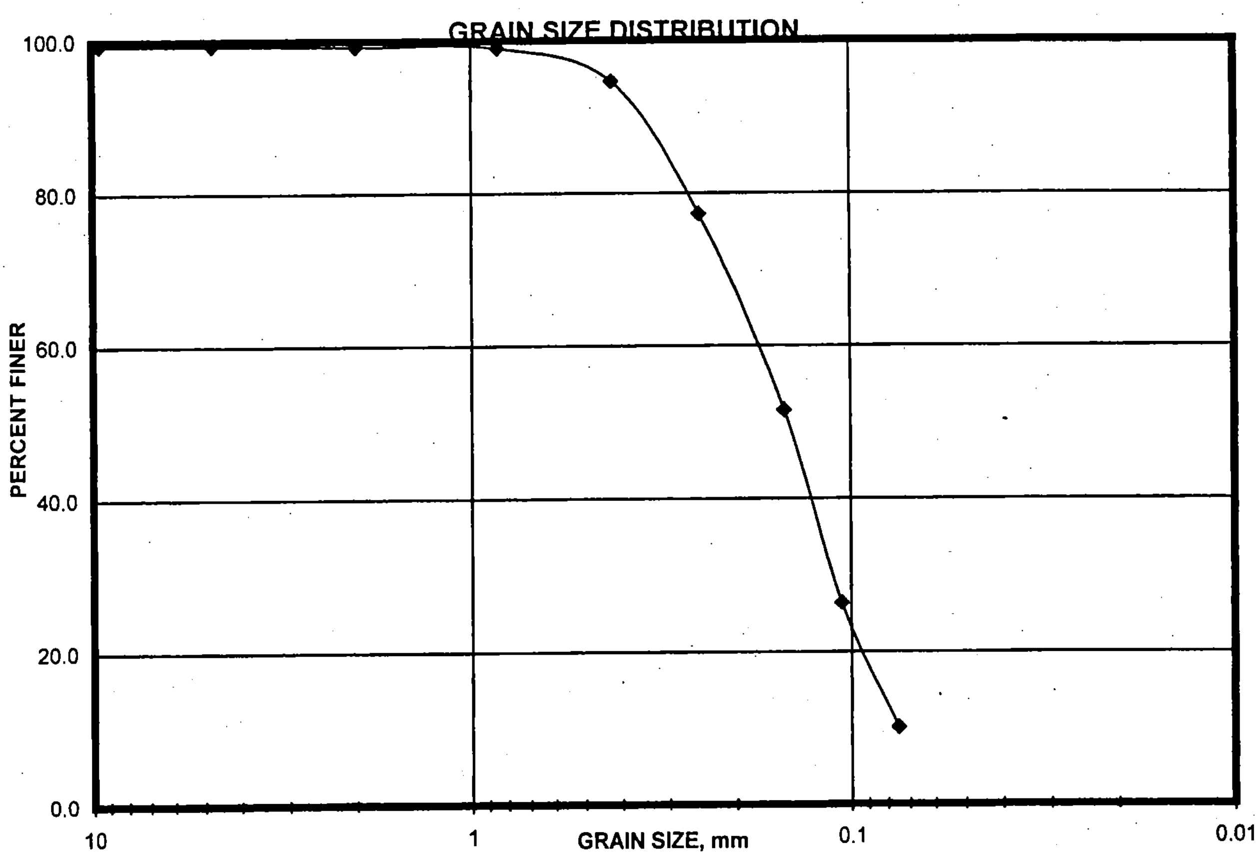
Project No. 35140 Date: 5/27/2003

Project: Hardee County Landfill

Sample Location: TH7 5'

Soil Description: 0

Soil Classification: 0 LL PI



% Gravel	% Sand	%-200
0.6	89.3	10.1

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

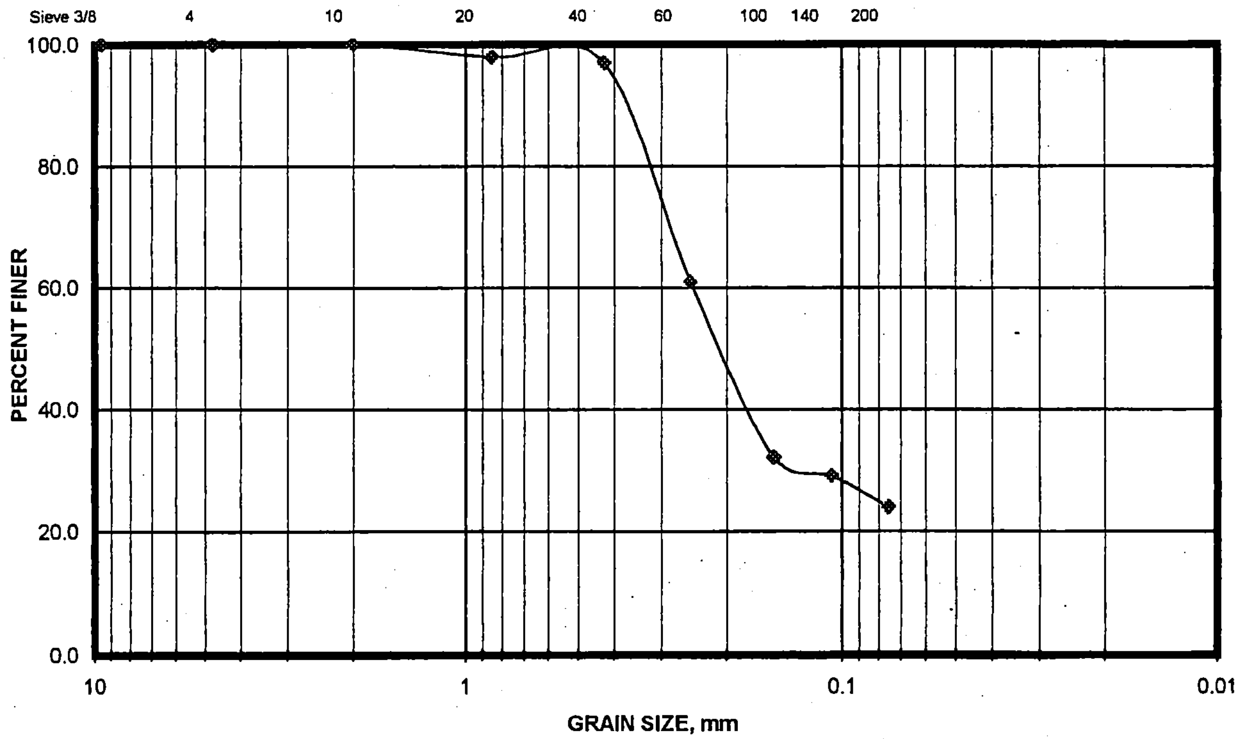
Project No. 35140 Date: 6/11/2003

Project: Hardee County Landfill

Sample Location: TH7 13-15' CONSOL

Soil Description:

Soil Classification: LL 61 PI 39



% Gravel	% Sand	%-200
0.0	76.0	24.0

D60	D30	D10	CC	CU

GRAIN SIZE DISTRIBUTION TEST REPORT

PROFESSIONAL SERVICE INDUSTRIES, INC.

Project No. 35140 Date: 6/11/2003

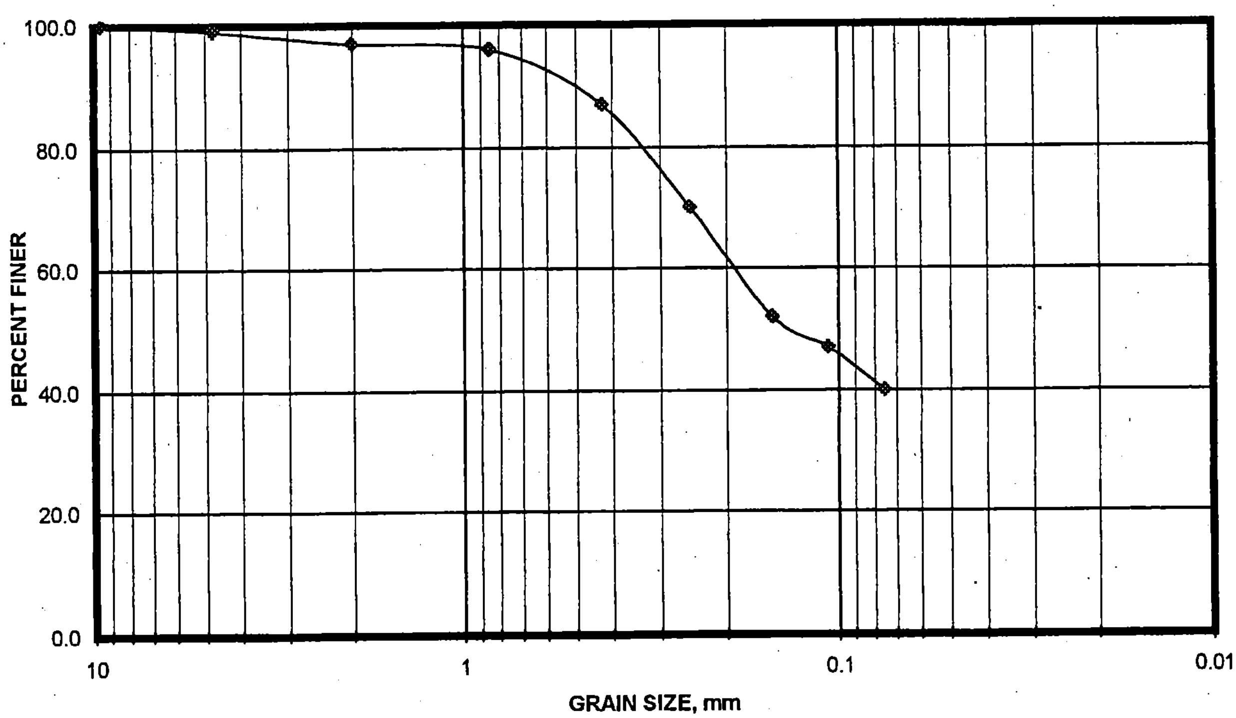
Project: Hardee County Landfill

Sample Location: TH7 13-15' PERM

Soil Description:

Soil Classification: LL 50 PI 26

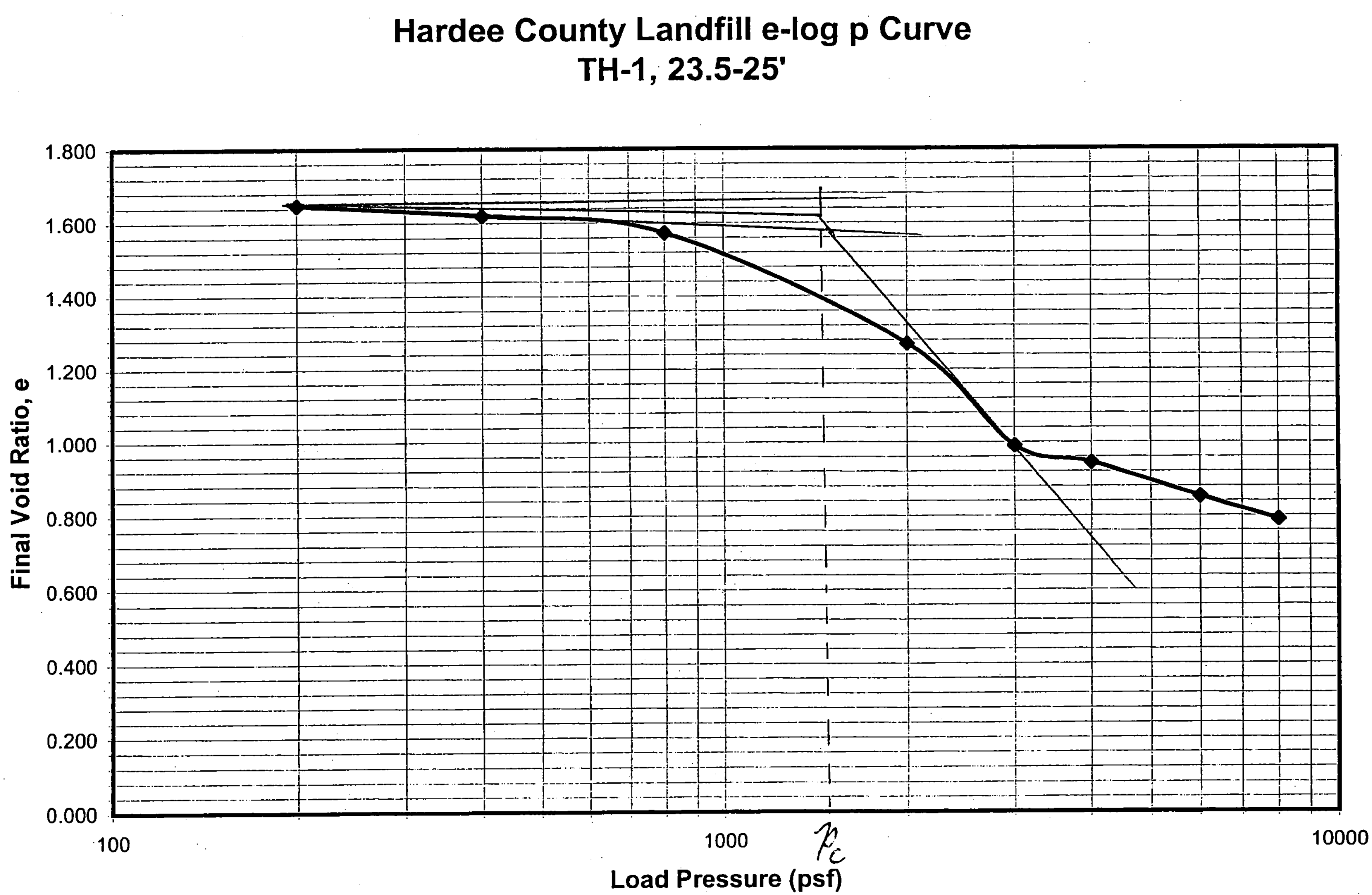
GRAIN SIZE DISTRIBUTION



% Gravel		% Sand		%-200
1.0		59.0		40.0
D60	D30	D10	CC	CU

APPENDIX II

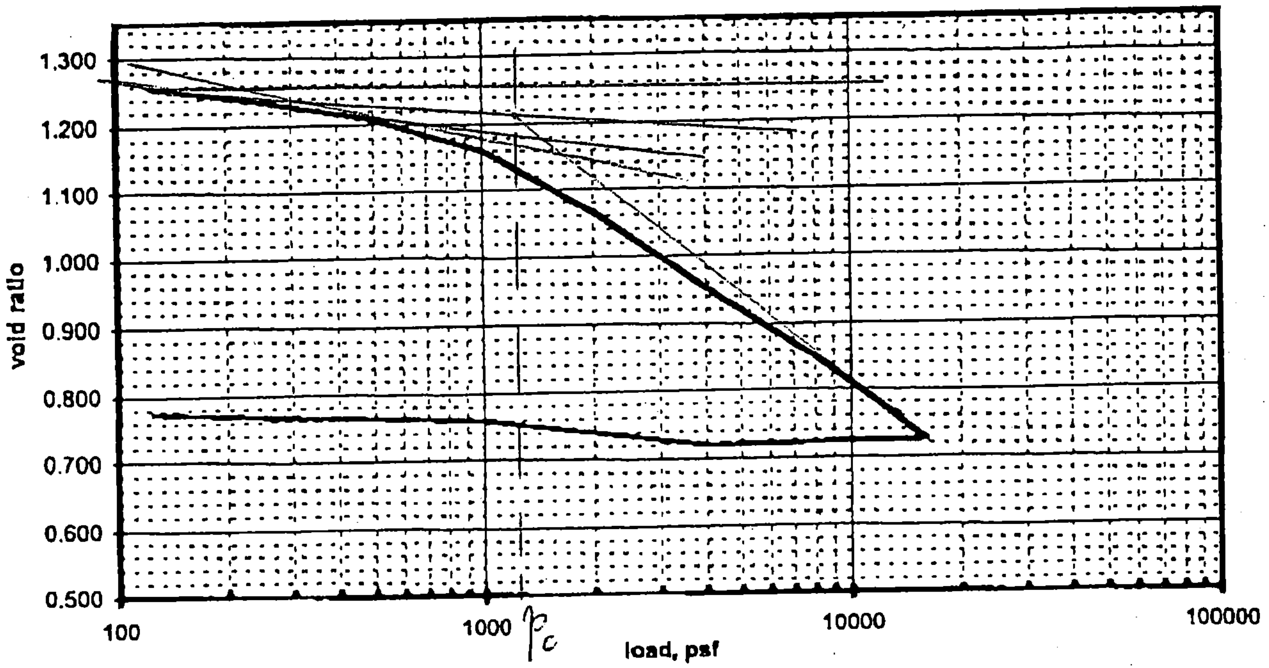
CONSOLIDATION TEST RESULTS

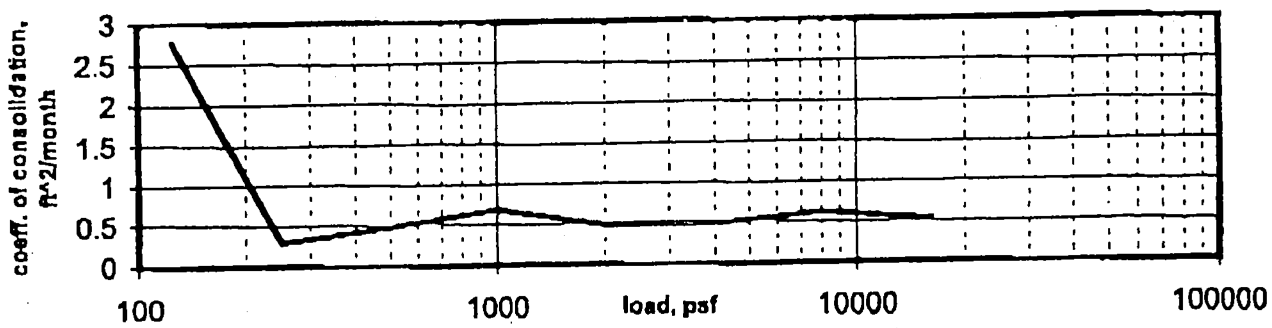


Hardee County Landfill e-log p Curve
TH-1, 23.5-25'
Final Void Ratio, e
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
100
1000
10000
P_c
Load Pressure (psf)

psi Information To Build On
Engineering - Consulting - Testing

MEMPHIS GEOTECHNICAL DEPARTMENT





CONSOLIDATION TEST RESULTS

			before test	
Sample I.D.:	US-7 13'-15'			
Sample Classification:		Moisture, %:	48.8	
Liquid Limit:	61	Void Ratio:	1.279	
Plasticity Index:	39	Saturation, %:	100.0	
Dry Density:	73.9 pcf	Specific Gravity:		2.7

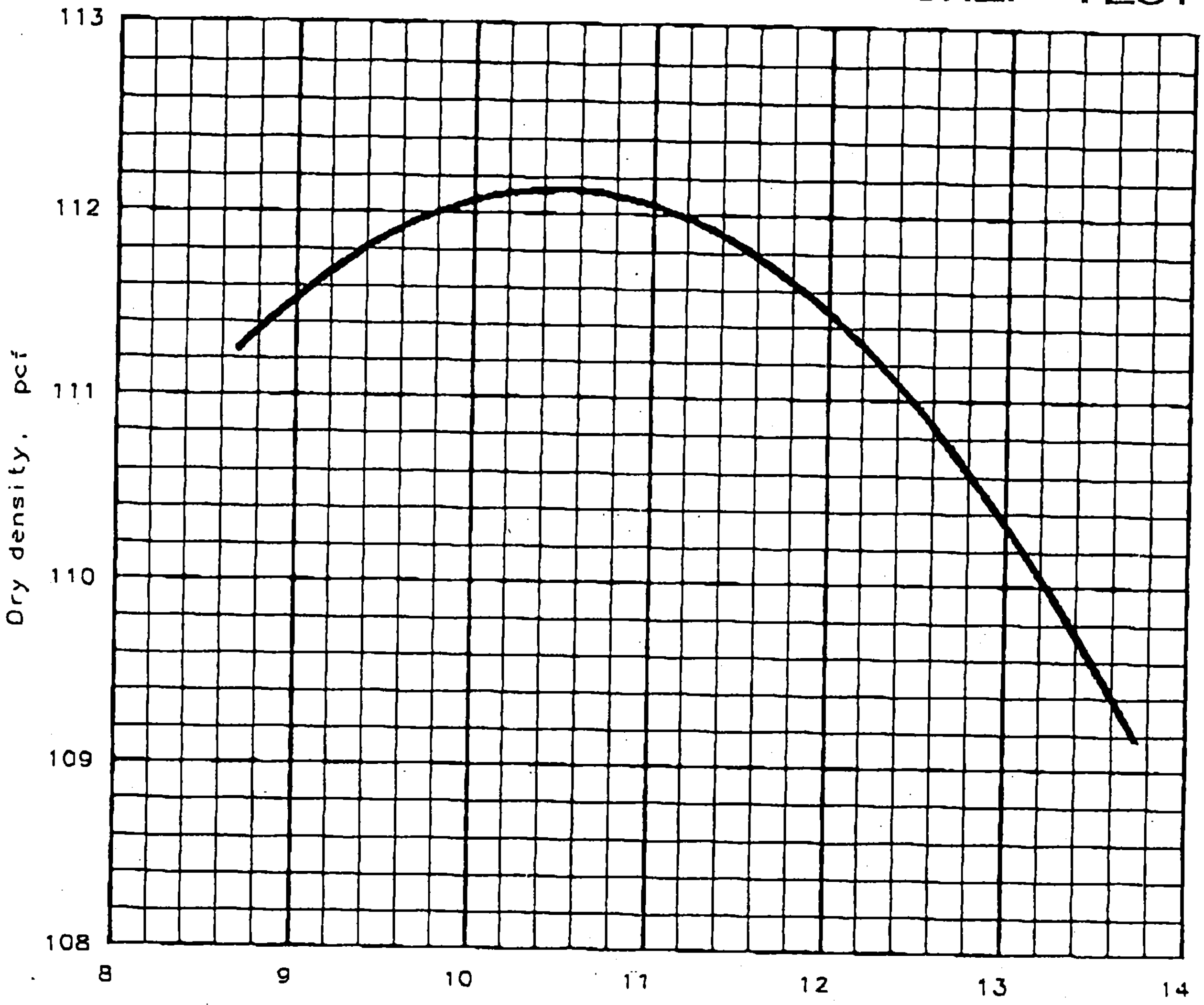
PROJECT:	FILE NO:
Hardee Landfill	775-35140
	DATE:
	6/10/03

APPENDIX III

MOISTURE-DENSITY (PROCTOR)

Proctor

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 112.1 pcf Optimum moisture = 10.5 %	LT.BROWN SL.SILTY FINE SAND

Project No.: 761

Project: HARDEE COUNTY LANDFILL

Location: TH-1 (4' BELOW SURFACE)

Date: 5-19-2003

Remarks:

FILE#382

MOISTURE-DENSITY RELATIONSHIP TEST

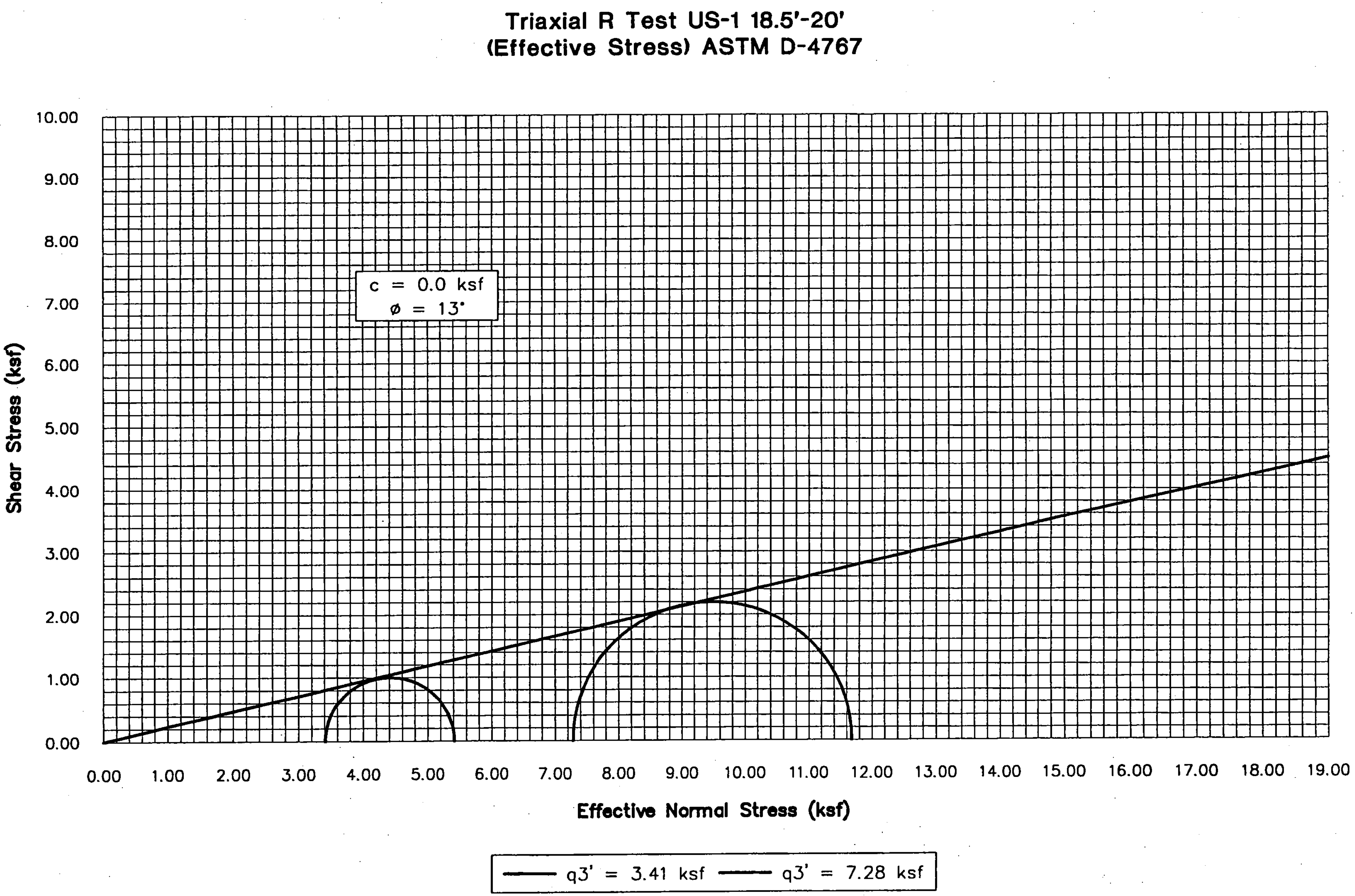
PSI, Inc.

Fig. No.

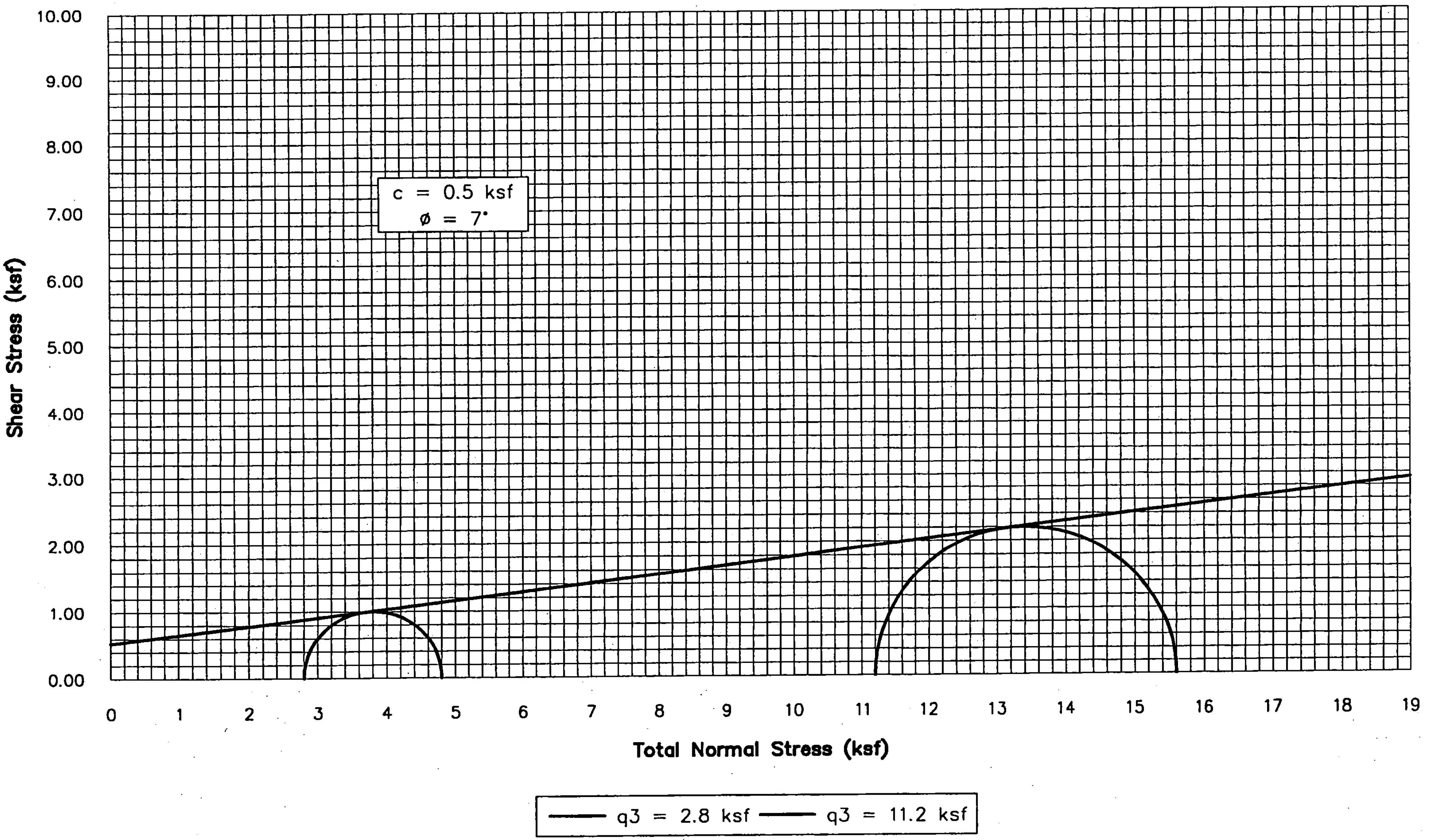
<u>APPENDIX IV</u>

TRI-AXIAL STRENGTH TEST RESULTS

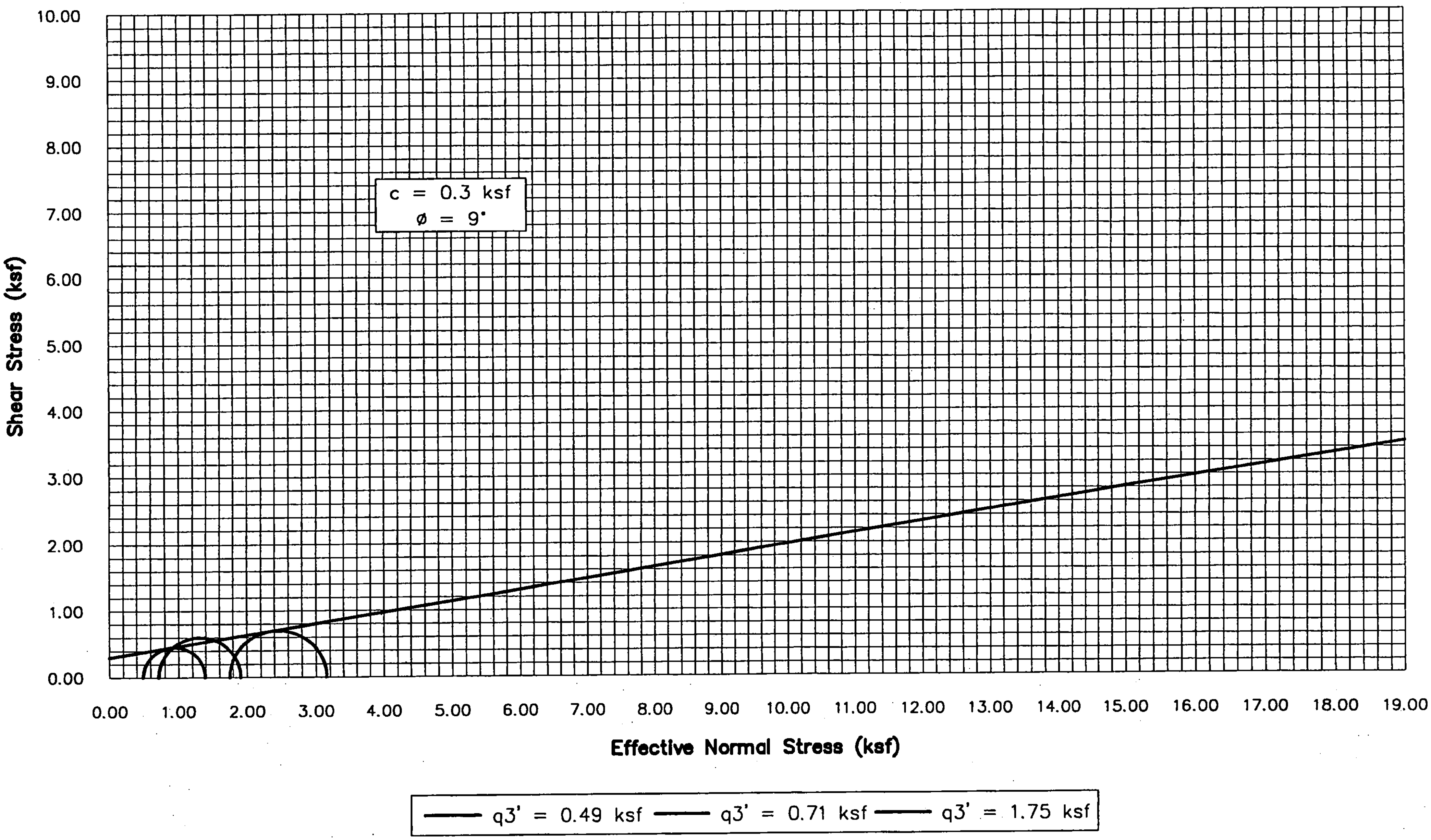
psi


Triaxial R Test US-1 18.5'-20'
(Effective Stress) ASTM D-4767
c = 0.0 ksf
ø = 13°
Shear Stress (ksf)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00
Effective Normal Stress (ksf)
q3' = 3.41 ksf
q3' = 7.28 ksf

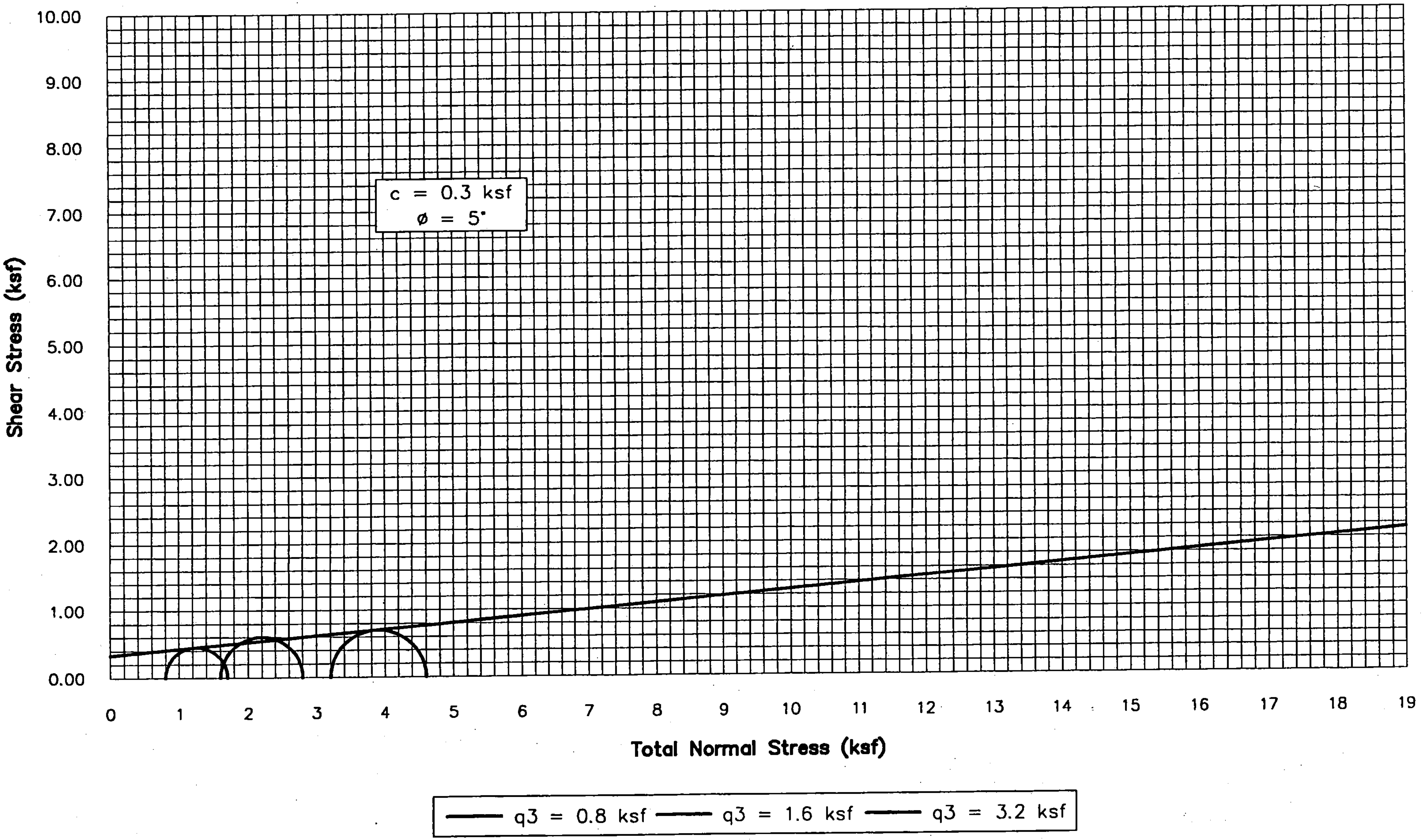
Triaxial R Test US-1 18.5'-20'
(Total Stress) ASTM D-4767

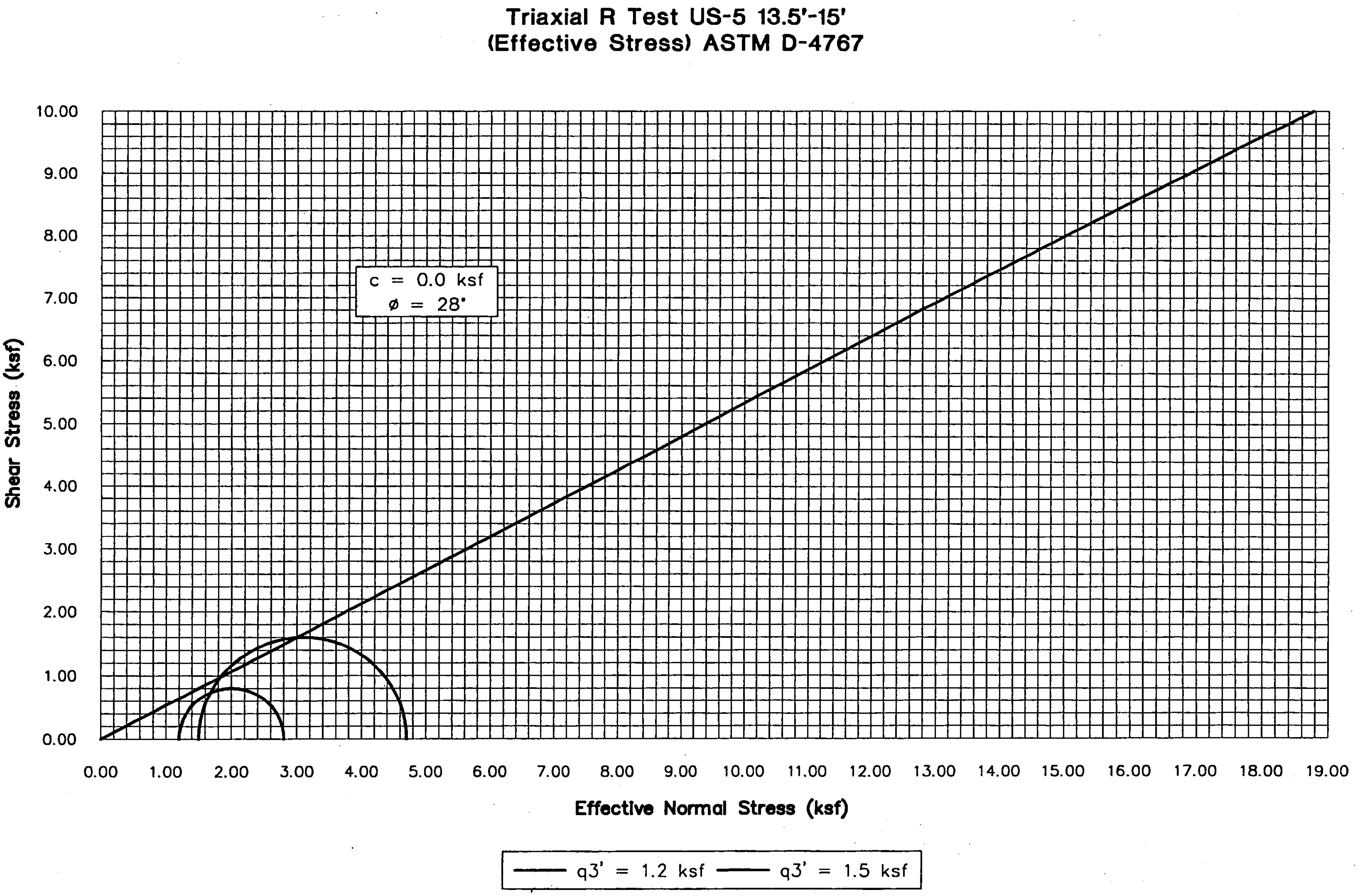


Triaxial R Test US-4 23'-24'
(Effective Stress) ASTM D-4767



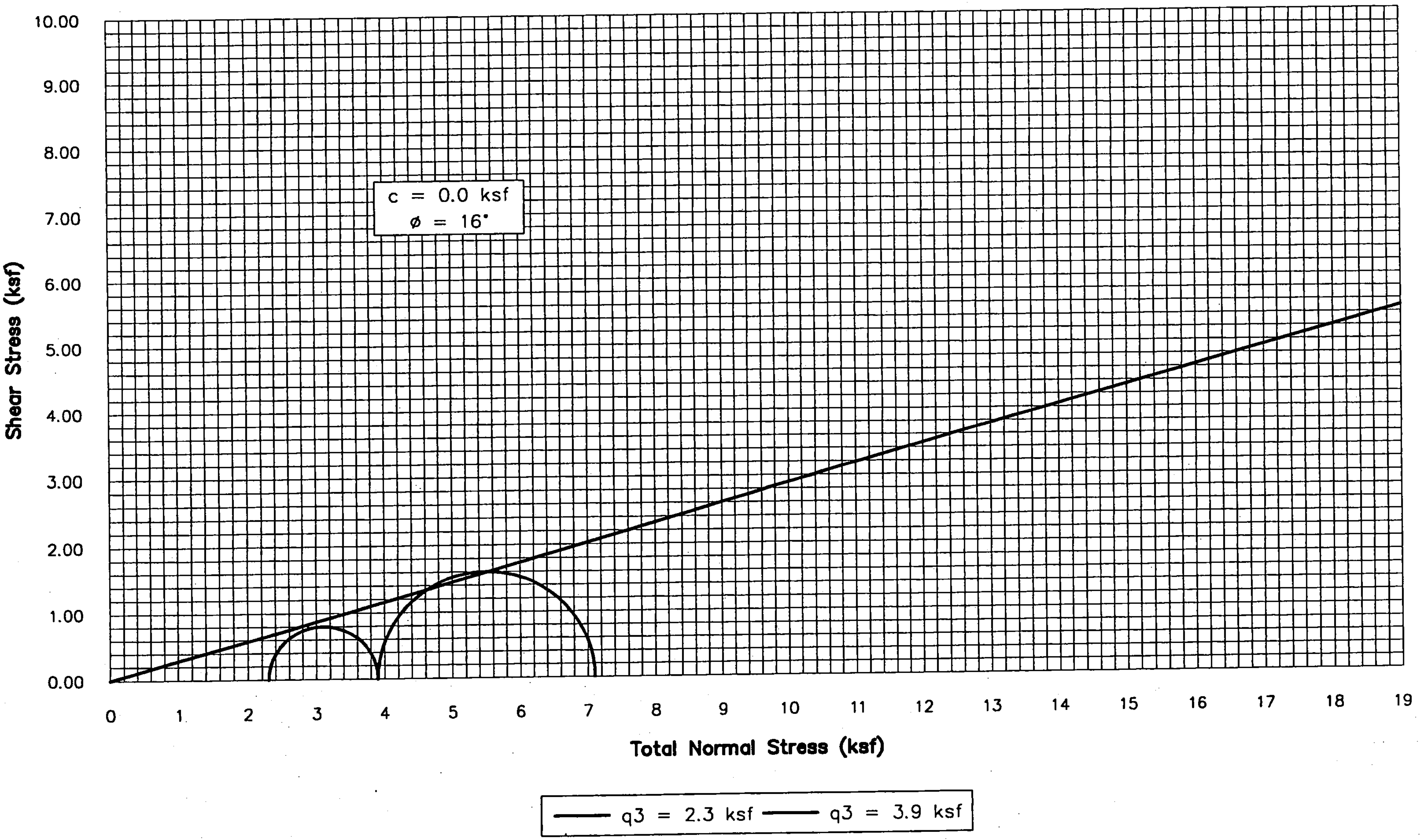
Triaxial R Test US-4 23'-24'
(Total Stress) ASTM D-4767



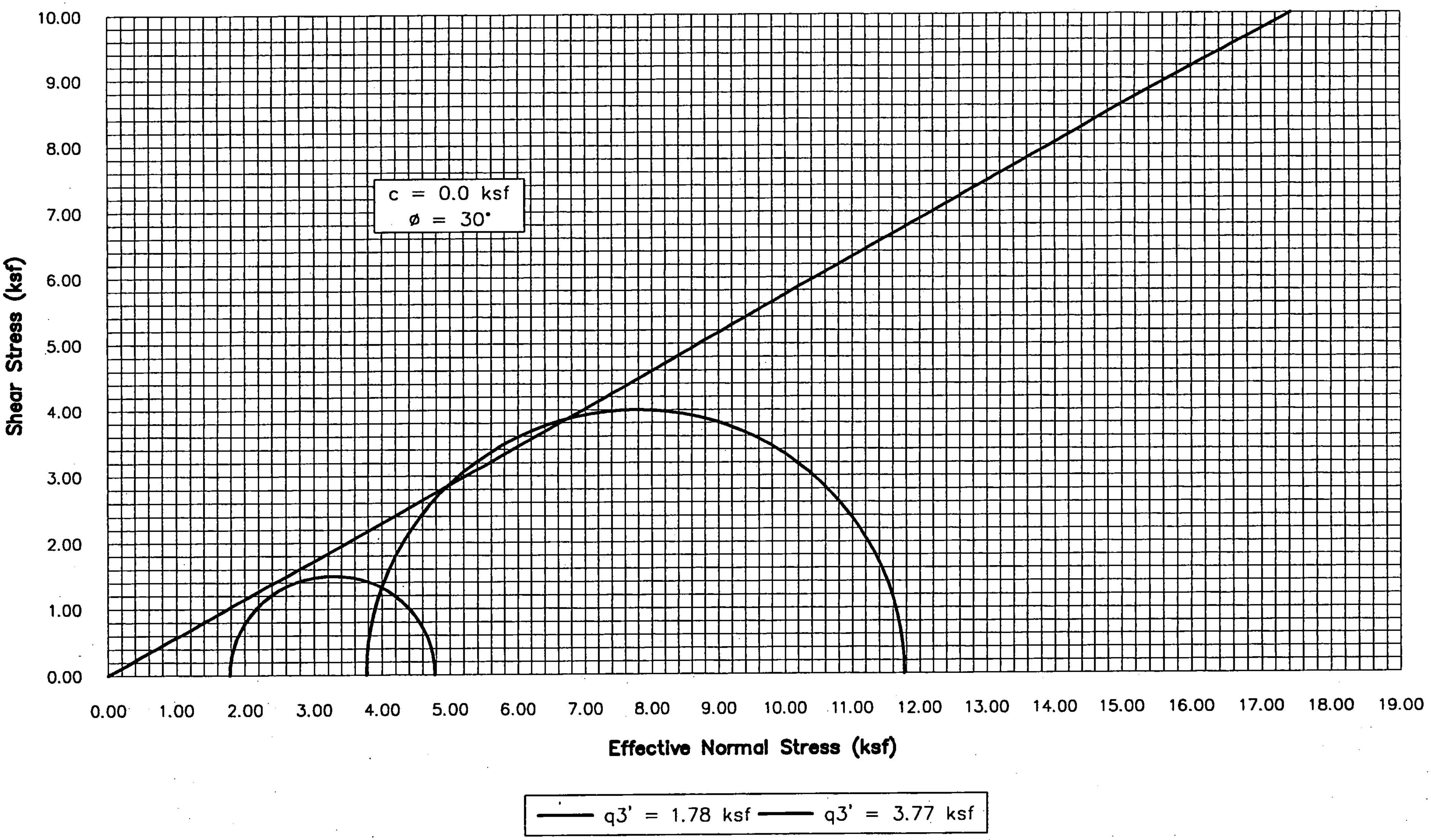


Triaxial R Test US-5 13.5'-15'
(Effective Stress) ASTM D-4767
c = 0.0 ksf
ø = 28°
Shear Stress (ksf)
Effective Normal Stress (ksf)
q3' = 1.2 ksf
q3' = 1.5 ksf
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
10.00
11.00
12.00
13.00
14.00
15.00
16.00
17.00
18.00
19.00

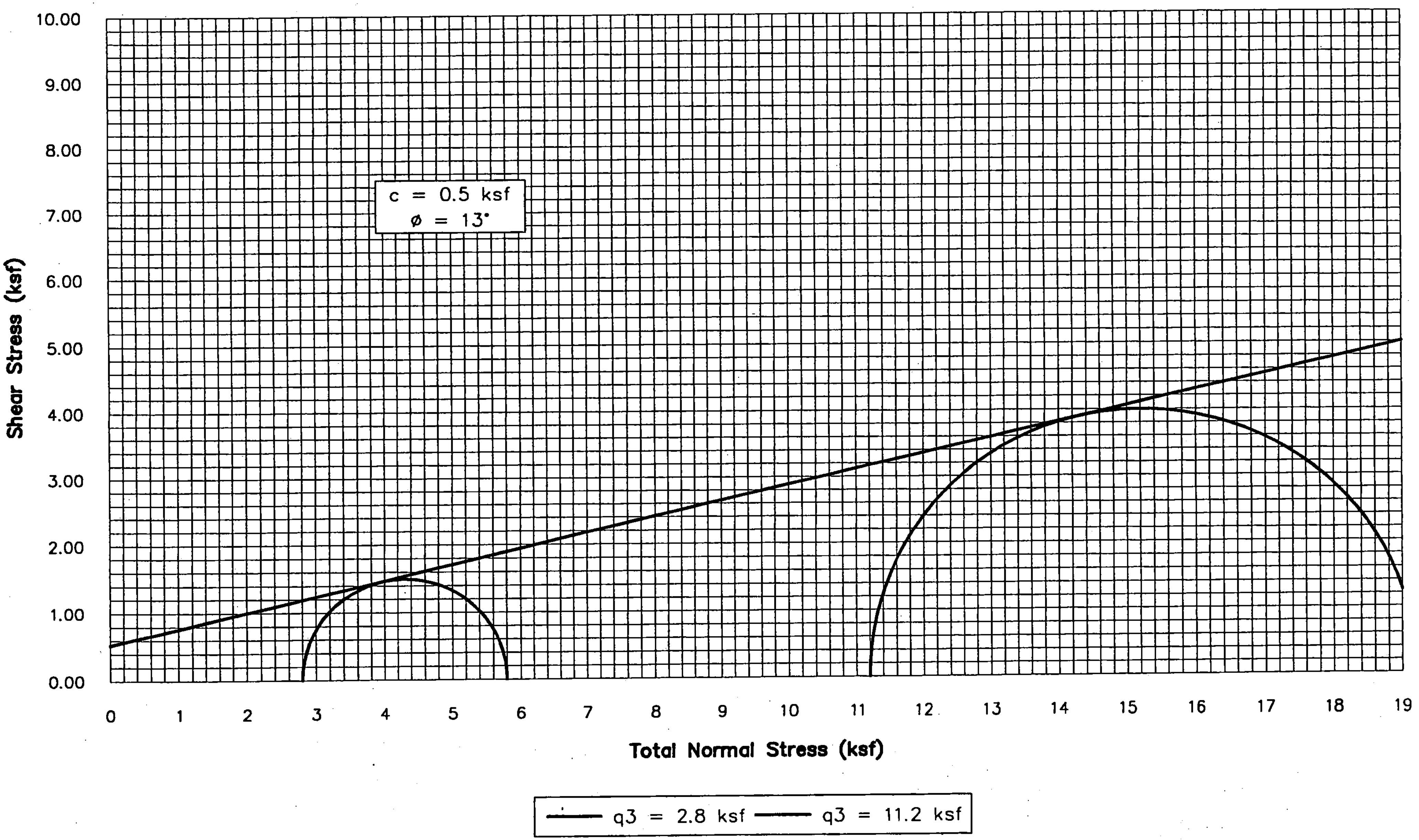
Triaxial R Test US-5 13.5'-15'
(Total Stress) ASTM D-4767



Triaxial R Test US-6 18'-20'
(Effective Stress) ASTM D-4767



Triaxial R Test US-6 18'-20'
(Total Stress) ASTM D-4767



ATTACHMENT C

FLORIDA GEOLOGICAL SURVEY
SINKHOLE DATABASE

			DATE																LOCATION
Reference Number	Date Added	Date Revised	Month Occur	Day Occur	Year Occur	Time Occur	Longitude Degrees	Longitude Minutes	Longitude Seconds	Latitude Degrees	Latitude Minutes	Latitude Seconds	County	Township	Location Range	Section	Qtr. Section of	Qtr. Section	USGS Topographic Quadrangle
REF_NUM	DATE_ADD	DATE_REV	MONTH	DAY	YEAR	TIME	LONG_DD	LONG_MM	LONG_SS	LAT_DD	LAT_MM	LAT_SS	CO	TWNSHP	RANGE	ECTIOI	QTRSECT	QTRSECT	QUAD
06-001			1	1	60	999	81	49	3	27	34	23	HARDEE	33S	25E	28		SW	WAUCHULA(CC37)
06-002			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-003			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-004			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-005			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-006			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-007			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-008			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-009			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-010			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-011			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-012			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-013			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-014			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-015			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)
06-016			5	23	89	999	81	40	20	27	29	45	HARDEE	34S	26E	25		NW	SWEETWATER(DD38)

SNR271-01 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT 01-03-03
22:08:43 REGULATORY DATA BASE SYSTEM PAGE: 1

SINKHOLE INFORMATION REPORT

COUNTY: HARDEE

T/R/S	ADDRESS	CITY	OCCURRENCE DATE	SITE #
332431	FORT GREEN RD	WAUCHULA	02/10/1997	335
332431	FORT GREEN ROAD	WAUCHULA	06/30/1996	2072
332528	OLD BRADENTON RD & SMITH RD	WAUCHULA	03/02/1989	319
342625	CLIFTON BRYAN RD/DEER RUN ESTATE	ZOLFO SPRINGS	05/23/1989	320
342625	CLIFTON BRYAN RD/DEER RUN ESTATE	ZOLFO SPRINGS	05/23/1989	322
342625	CLIFTON BRYAN RD/DEER RUN EST.	ZOLFO SPRINGS	05/23/1989	324
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	325
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	326
342625	CLIFTON BRYAN RD	ZOLFO SPRINGS	05/23/1989	327
342625	DEER RUN ESTATES/CLIFTON BRYAN	ZOLFO SPRINGS	05/23/1989	328
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	329
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	330
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	331
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	332
342625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	334
352716	6126 SR 66 E	ZOLFO SPRINGS	04/12/2000	2130

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COUNTYNAME      S    ,ADDRESS                            ,CITY                        ,LAT     ,LON     ,LL S
HARDEE       ,  2431,"FORT GREEN RD                    ","WAUCHUL                     ",27332900,81571900,UNKN
HARDEE       ,332431,"FORT GREEN ROAD                  ","WAUCHULA                    ",27332907,81571921,FIEL
HARDEE       ,332528,"OLD BRADENTON RD & SMITH RD      ","WAUCHULA                    ",27342300,81490300,UNKN
HARDEE       ,342625,"CLIFTON BRYAN RD/DEER RUN ESTATE","ZOLFO SPRINGS               ",27294500,81402000,UNKN
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HARDEE       ,342625,"DEER RUN ESTATES                 ","ZOLFO SPRINGS               ",27294500,81402000,UNKN
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http://www.swfwmd.state.fl.us/sinkdata/hardee.dat

NR271-01 SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT 01-03-03
2:08:43 REGULATORY DATA BASE SYSTEM PAGE: 1

SINKHOLE INFORMATION REPORT

/R/S	COUNTY: HARDEE ADDRESS	CITY	OCCURRENCE DATE	SITE #
32431	FORT GREEN RD	WAUCHULA	02/10/1997	335
32431	FORT GREEN ROAD	WAUCHULA	06/30/1996	2072
32528	OLD BRADENTON RD & SMITH RD	WAUCHULA	03/02/1989	319
42625	CLIFTON BRYAN RD/DEER RUN ESTATE	ZOLFO SPRINGS	05/23/1989	320
42625	CLIFTON BRYAN RD/DEER RUN ESTATE	ZOLFO SPRINGS	05/23/1989	322
42625	CLIFTON BRYAN RD/DEER RUN EST.	ZOLFO SPRINGS	05/23/1989	324
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	325
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	326
42625	CLIFTON BRYAN RD	ZOLFO SPRINGS	05/23/1989	327
42625	DEER RUN ESTATES/CLIFTON BRYAN	ZOLFO SPRINGS	05/23/1989	328
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	329
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	330
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	331
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	332
42625	DEER RUN ESTATES	ZOLFO SPRINGS	05/23/1989	334
52716	6126 SR 66 E	ZOLFO SPRINGS	04/12/2000	2130

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OUNTYNAME  ,TRS   ,ADDRESS                          ,CITY                              ,LAT      ,LON
ARDEE      ,332431,"FORT GREEN RD                   ","WAUCHULA                        ",27332900,8157
ARDEE      ,332431,"FORT GREEN ROAD                 ","WAUCHULA                        ",27332907,8157
IARDEE     ,332528,"OLD BRADENTON RD & SMITH RD     ","WAUCHULA                        ",27342300,8149
IAR        ,342625,"CLIFTON BRYAN RD/DEER RUN ESTATE","ZOLFO SPRINGS                   ",27294500,8140
IARD       ,342625,"CLIFTON BRYAN RD/DEER RUN ESTATE","ZOLFO SPRINGS                   ",27294500,8140
IARDEE     ,342625,"CLIFTON BRYAN RD/DEER RUN EST.  ","ZOLFO SPRINGS                   ",27294500,8140
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IARDEE     ,342625,"CLIFTON BRYAN RD                ","ZOLFO SPRINGS                   ",27294500,8140
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ATTACHMENT D

SEISMIC IMPACT ZONES

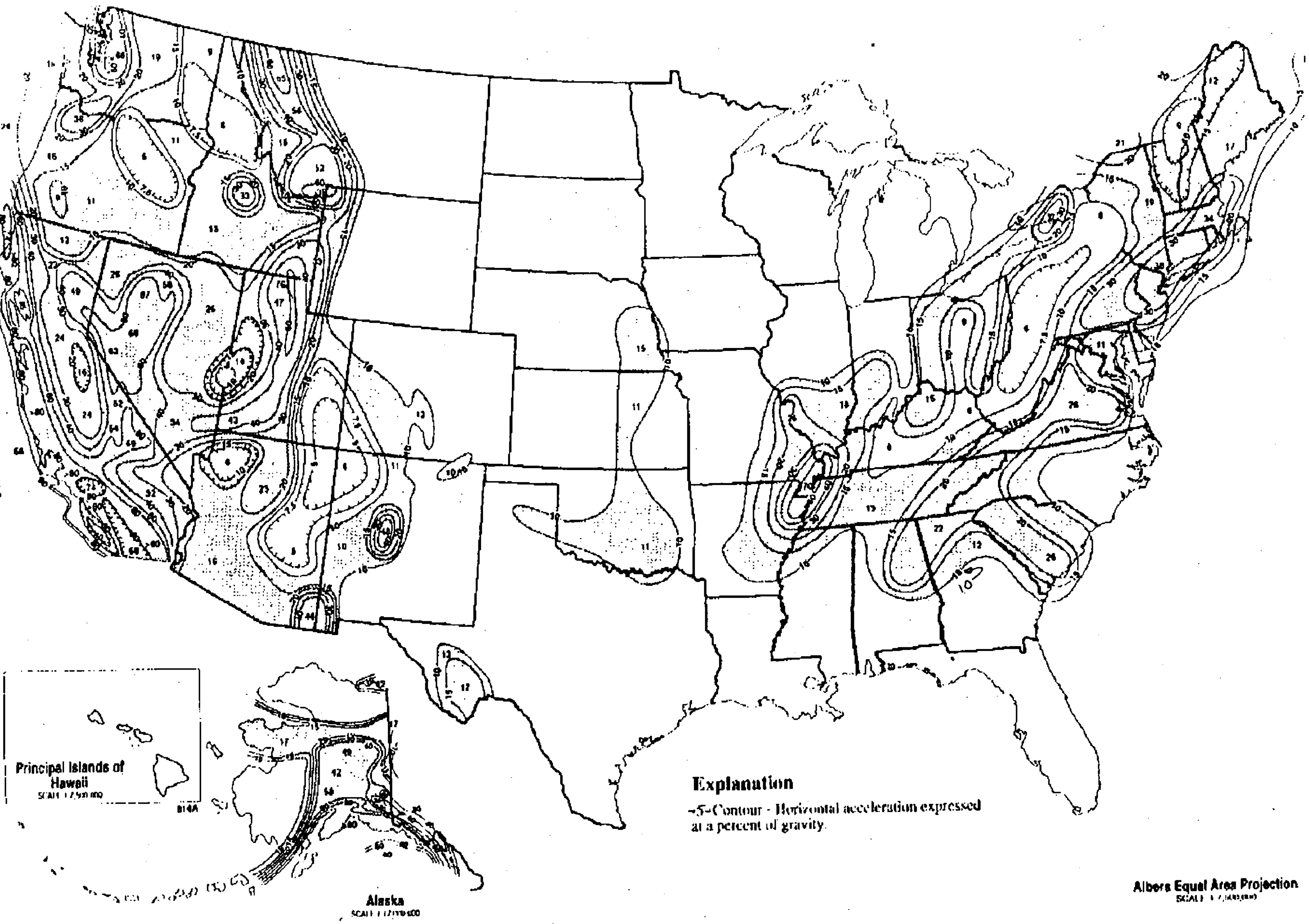


Figure 2-6. Seismic Impact Zones
(Areas with a 10% or greater probability that the maximum horizontal acceleration will exceed .10g in 250 years)

SOURCE: USEPA SOLID WASTE DISPOSAL FACILITY CRITERIA TECH. MANUAL NOV 93 EPA530-R-93-017
HTTP://WWW.EPA.GOV/EPAOSWER/NON-HW/MUNCPL/LANDFILL/TECHMAN

ATTACHMENT E

AVERAGE AND HIGH GROUNDWATER ELEVATIONS

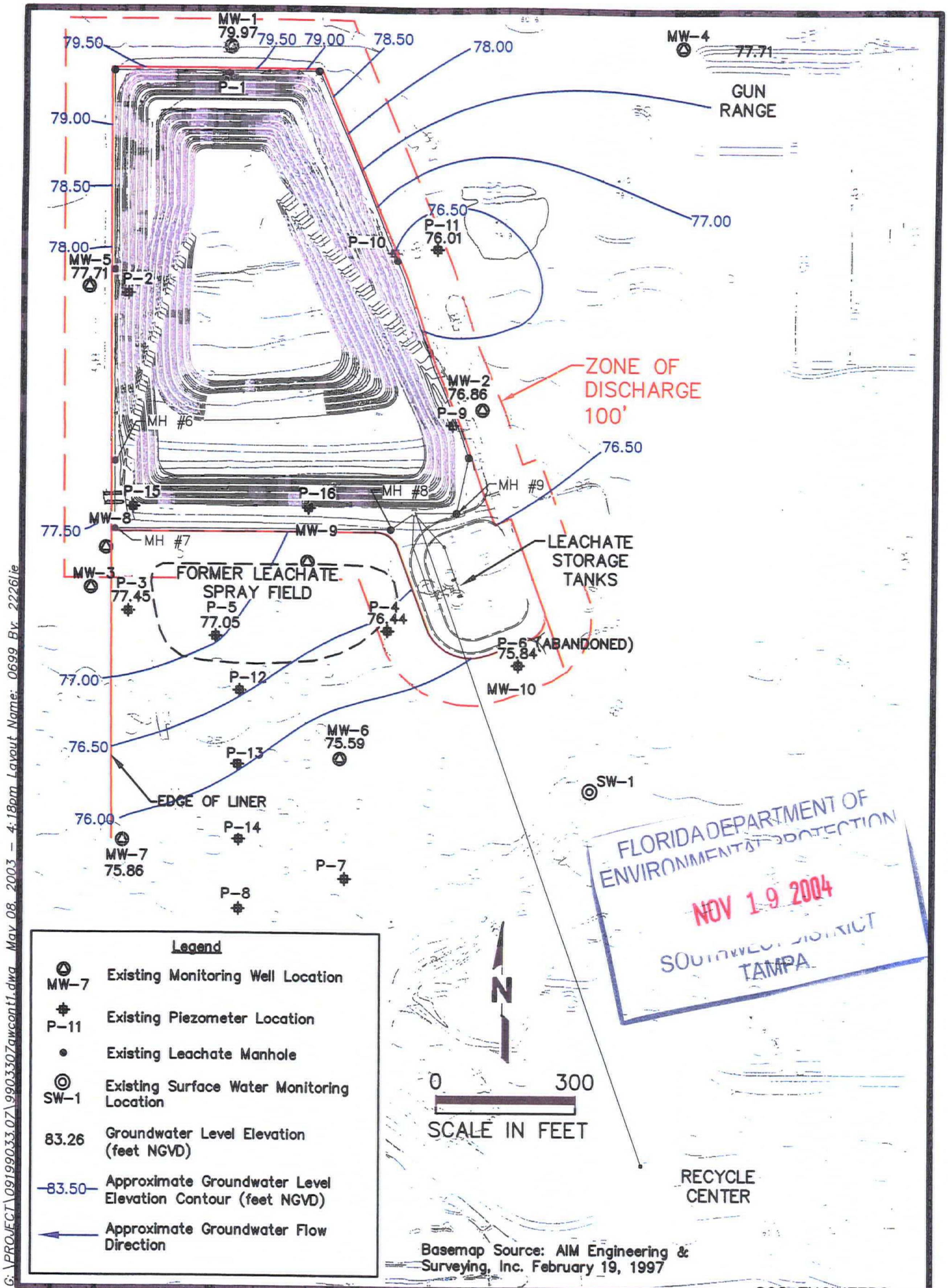
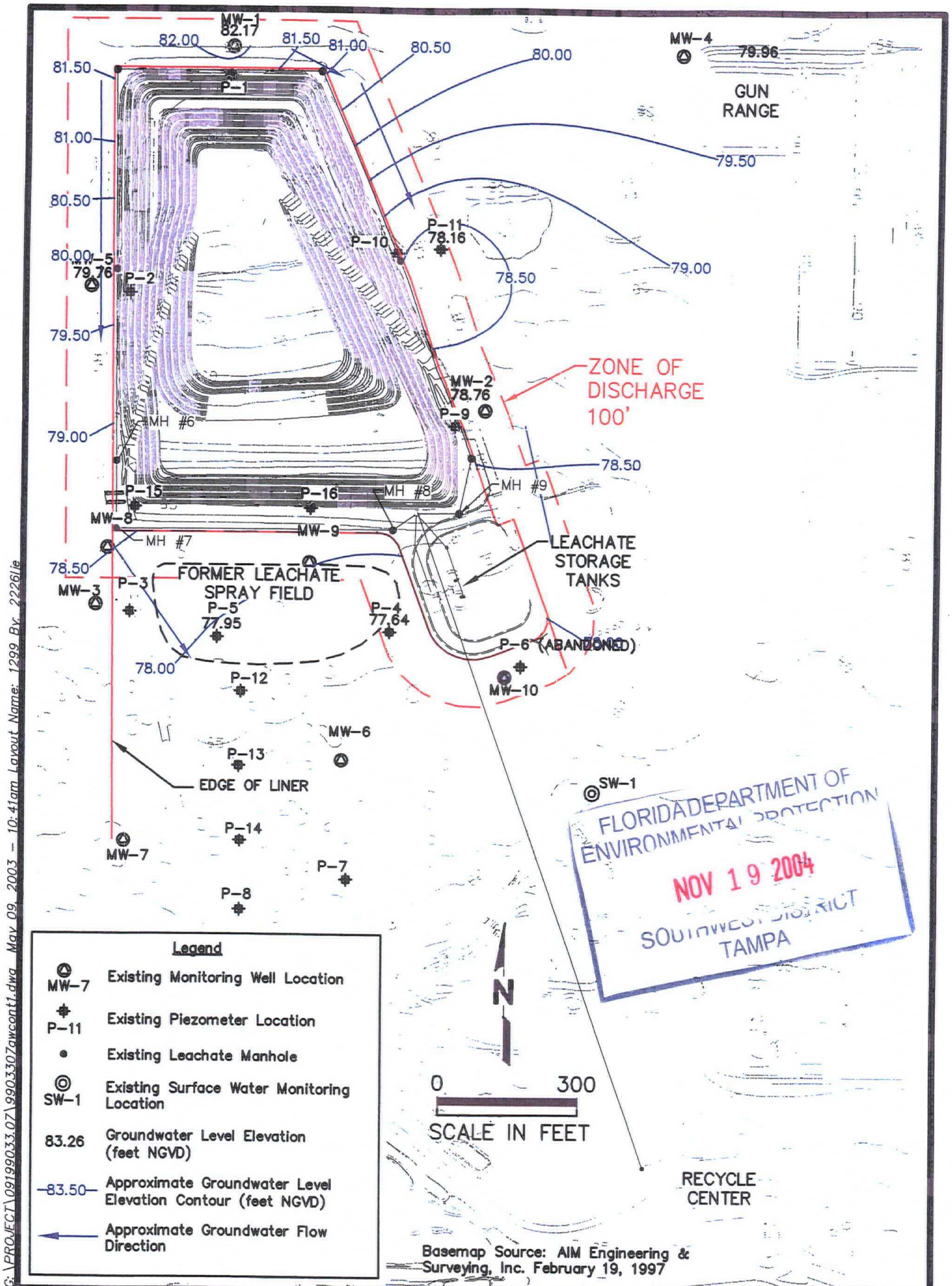


Figure E-1. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility June 1999



G:\PROJECT\09199033.07\9903307awcont1.dwg May 09, 2003 - 10:41am Layout Name: 1299 By: 2226lie

Figure E-2. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility December 1999

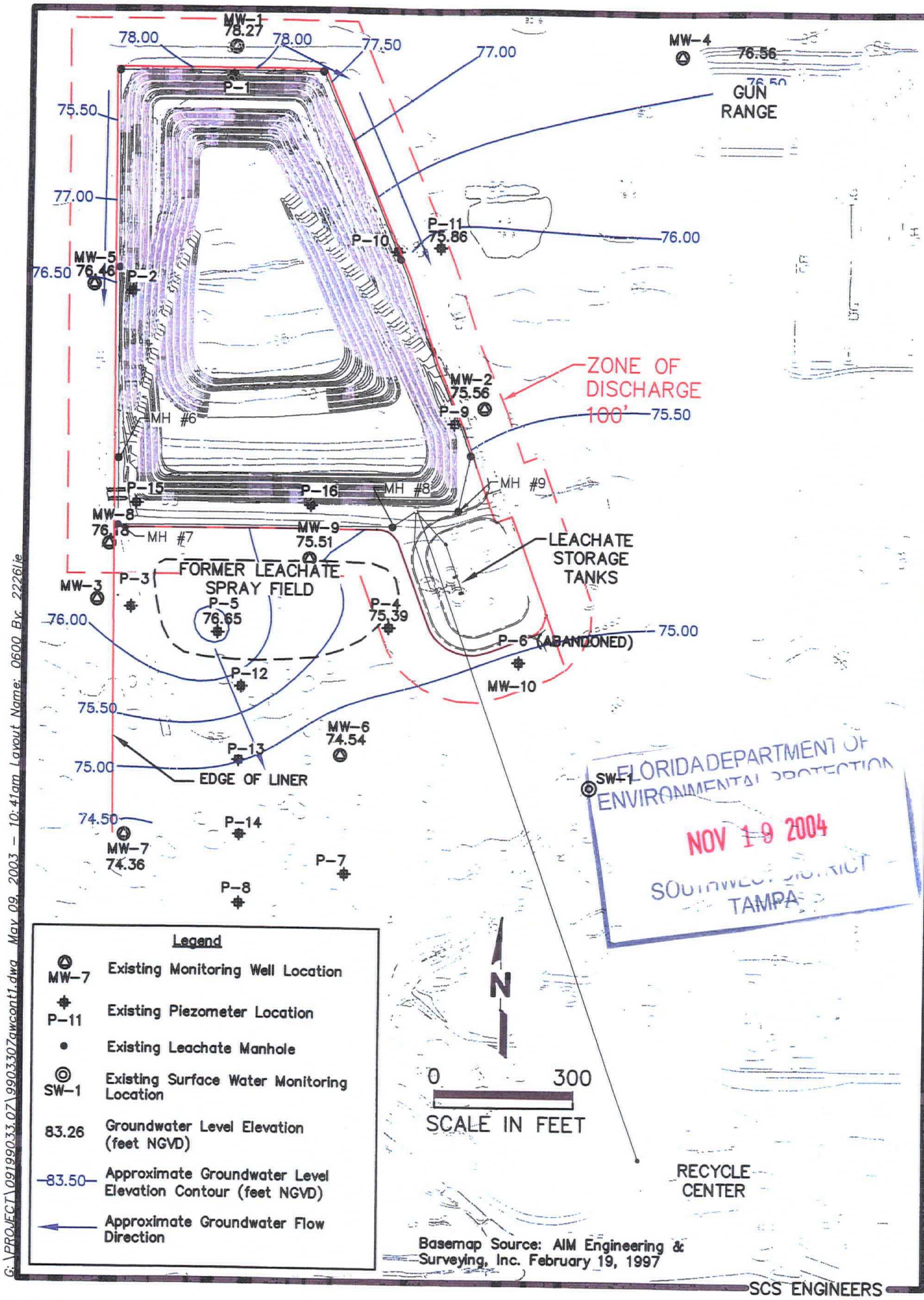


Figure E–3. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
June 2000

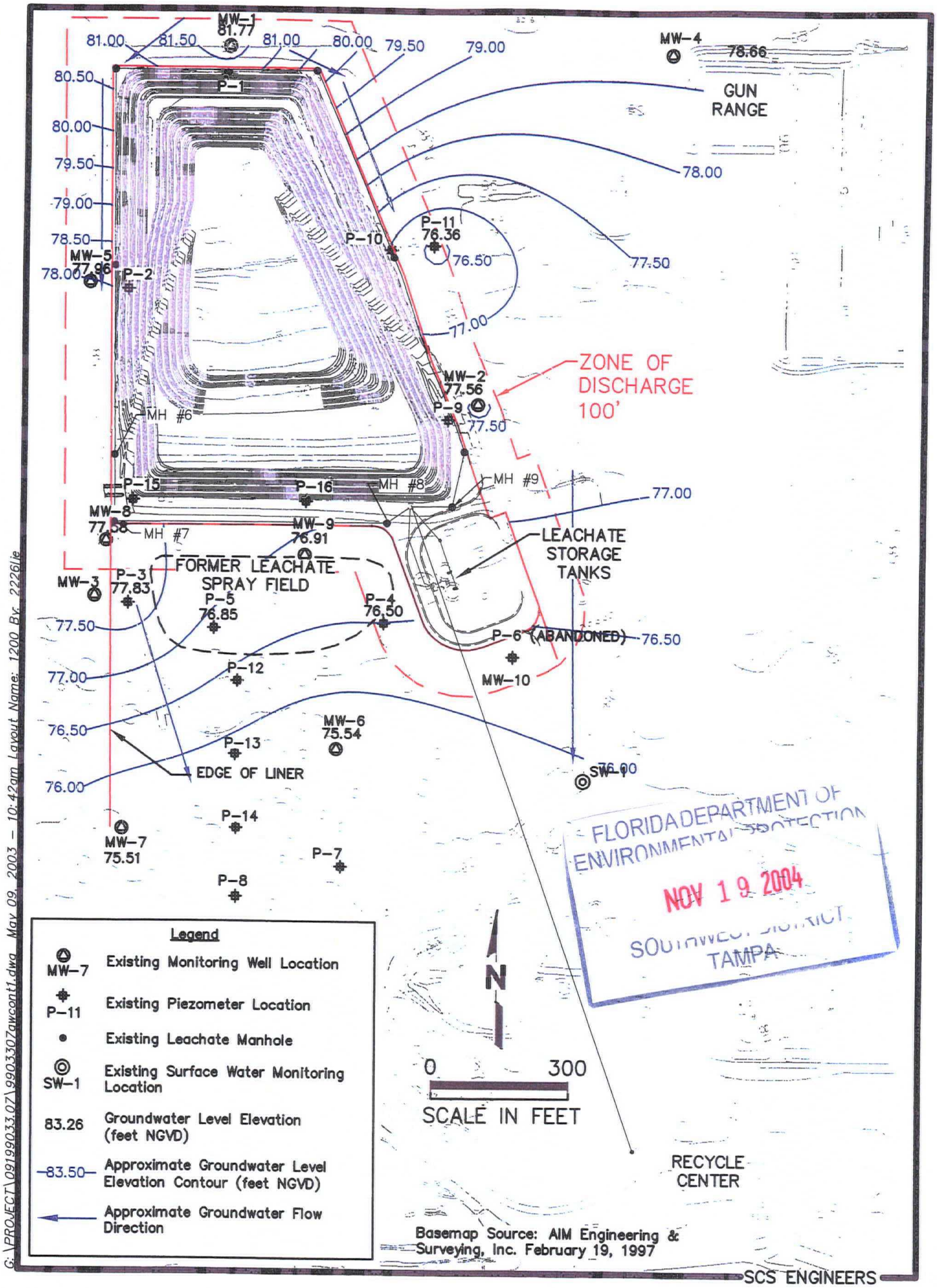


Figure E-4. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
December 2000

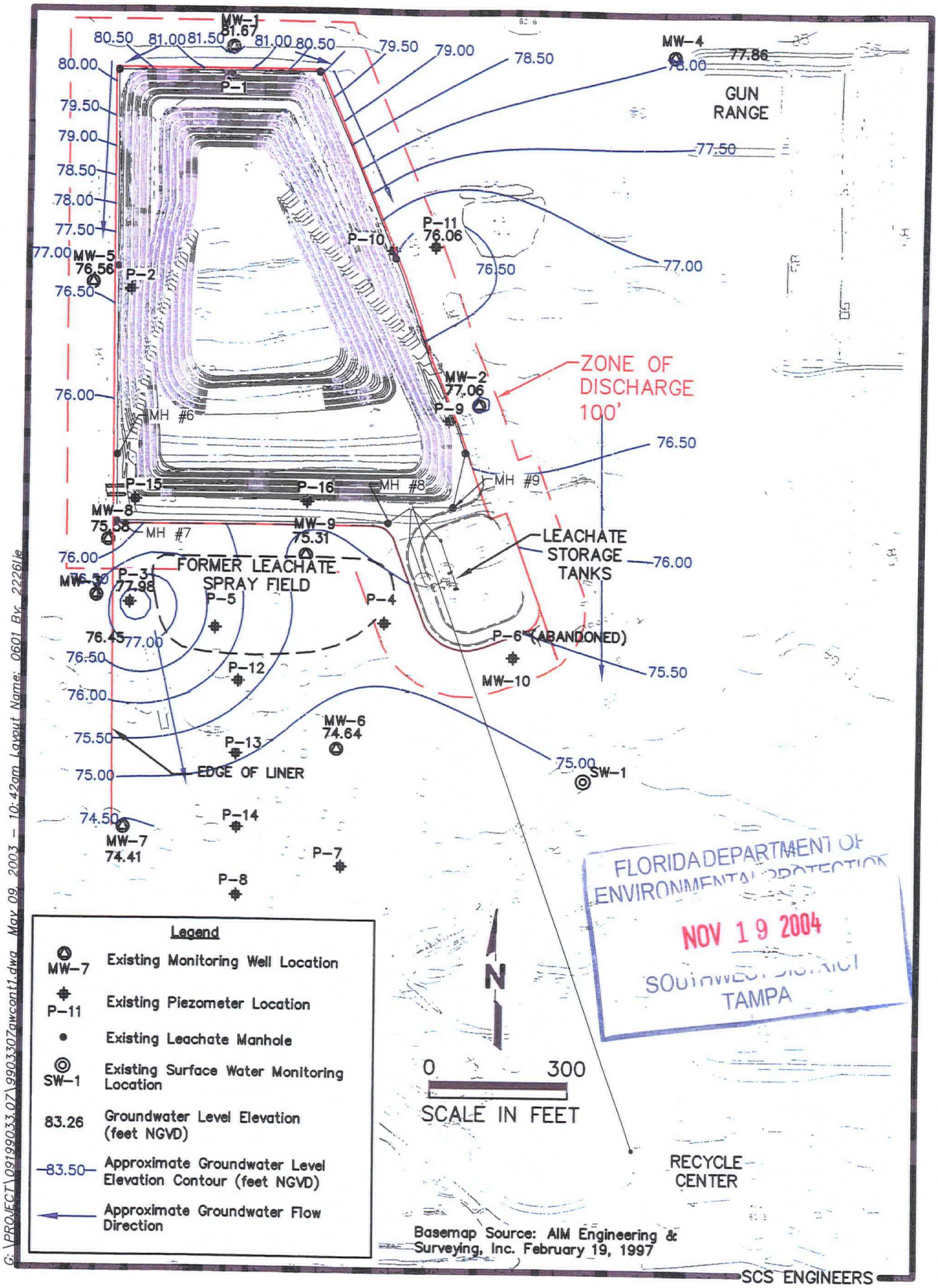


Figure E-5. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
June 2001

G:\PROJECT\09199033.07\9903307gwcont1.dwg May 09, 2003 - 10:51am Layout Name: 1201 By: 2226lie

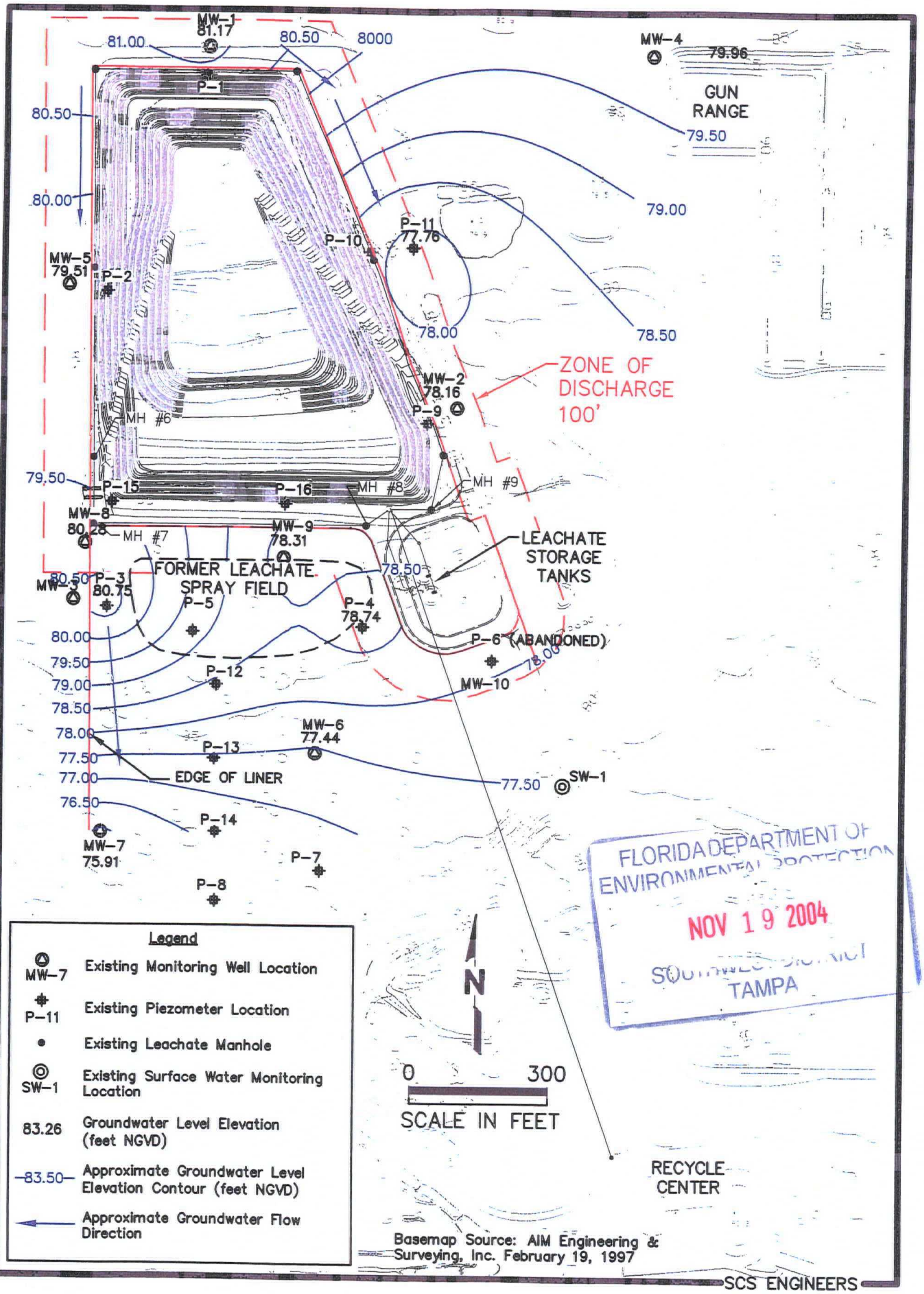


Figure E-6. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility December 2001

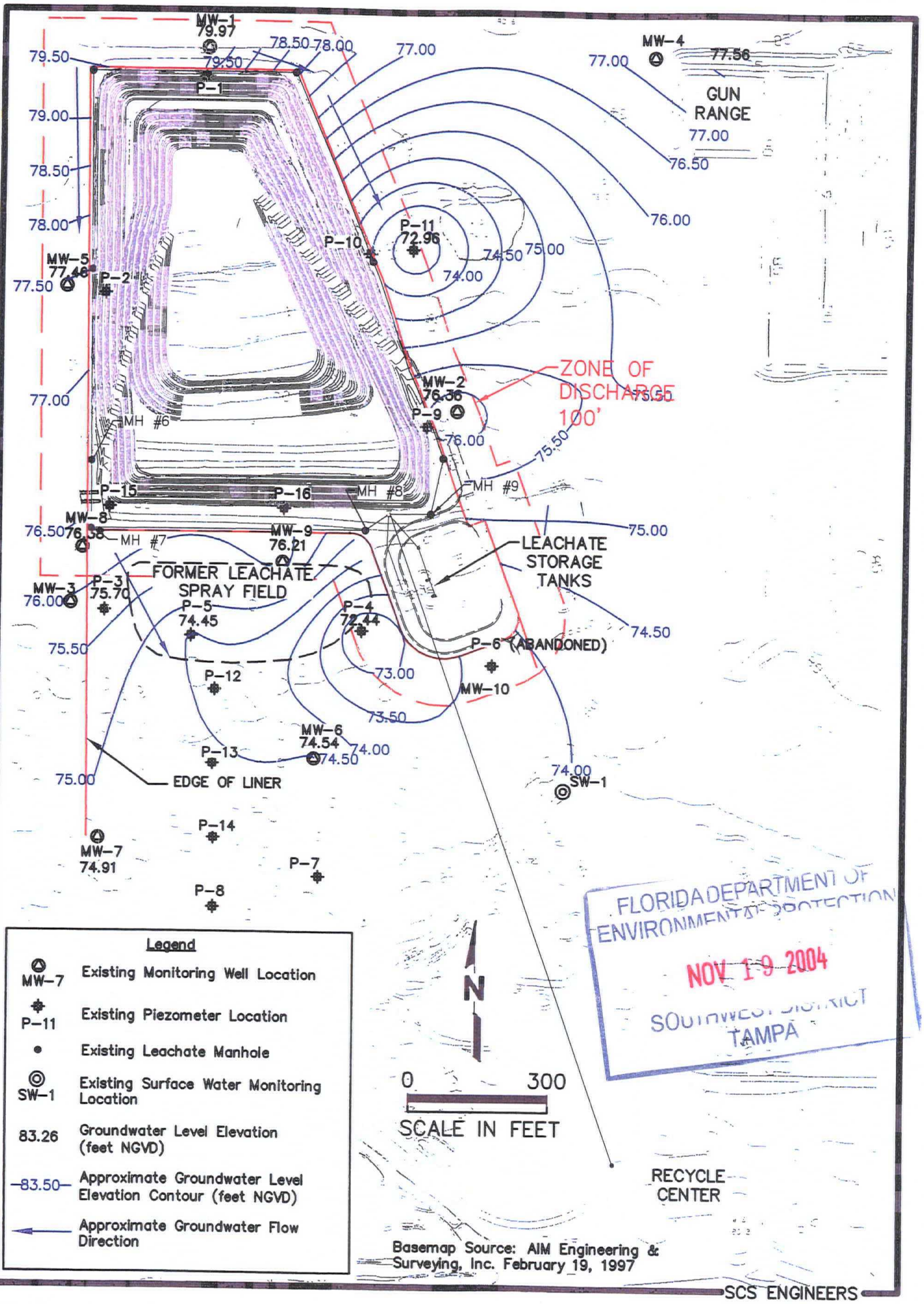


Figure E-7. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility
June 2002

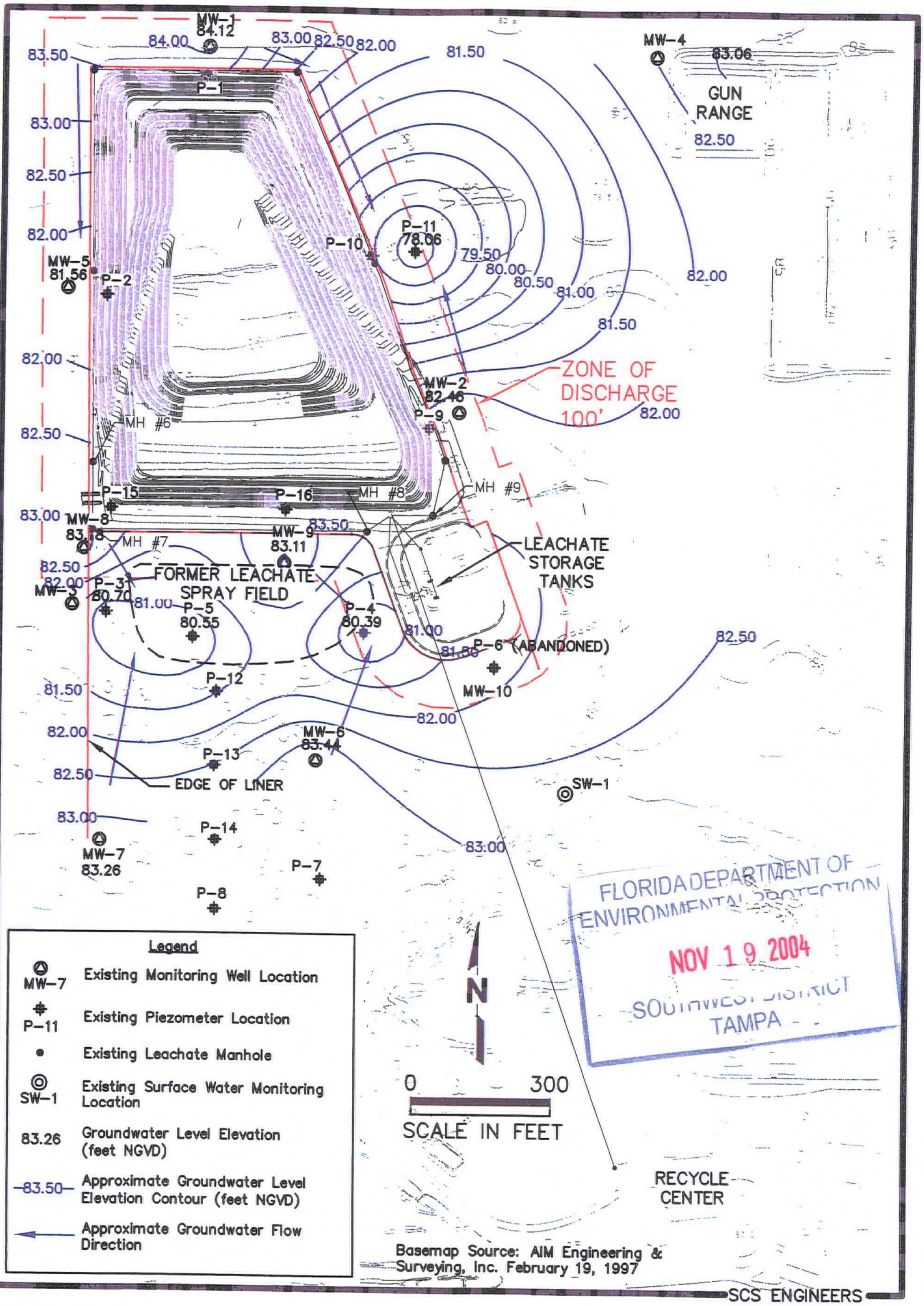


Figure E–8. Surficial Aquifer Potentiometric Map, Hardee County Solid Waste Disposal Facility December 2002

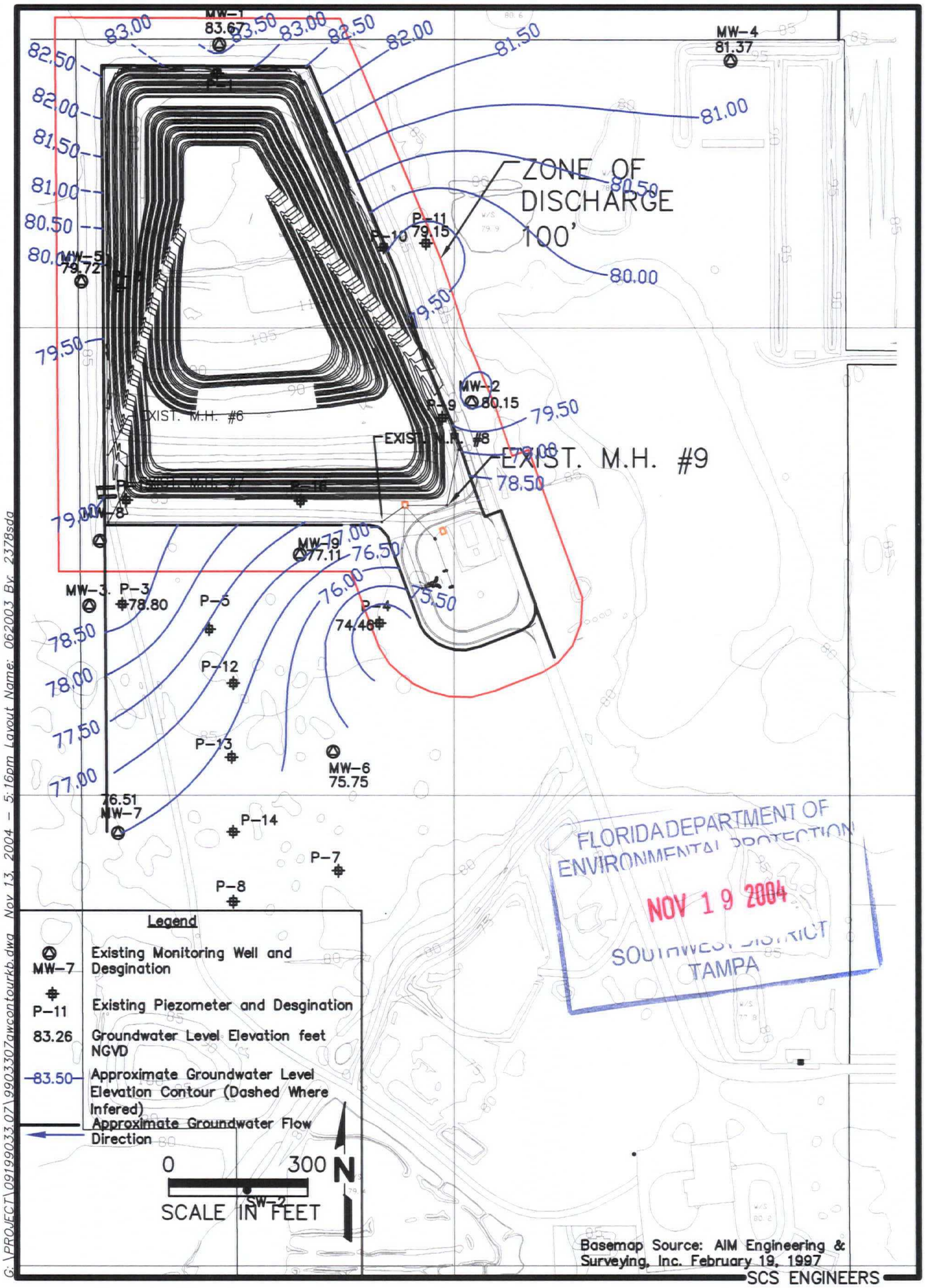


Figure E-9. June 2003 Groundwater Contour Map, Hardee County Solid Waste Disposal Facility

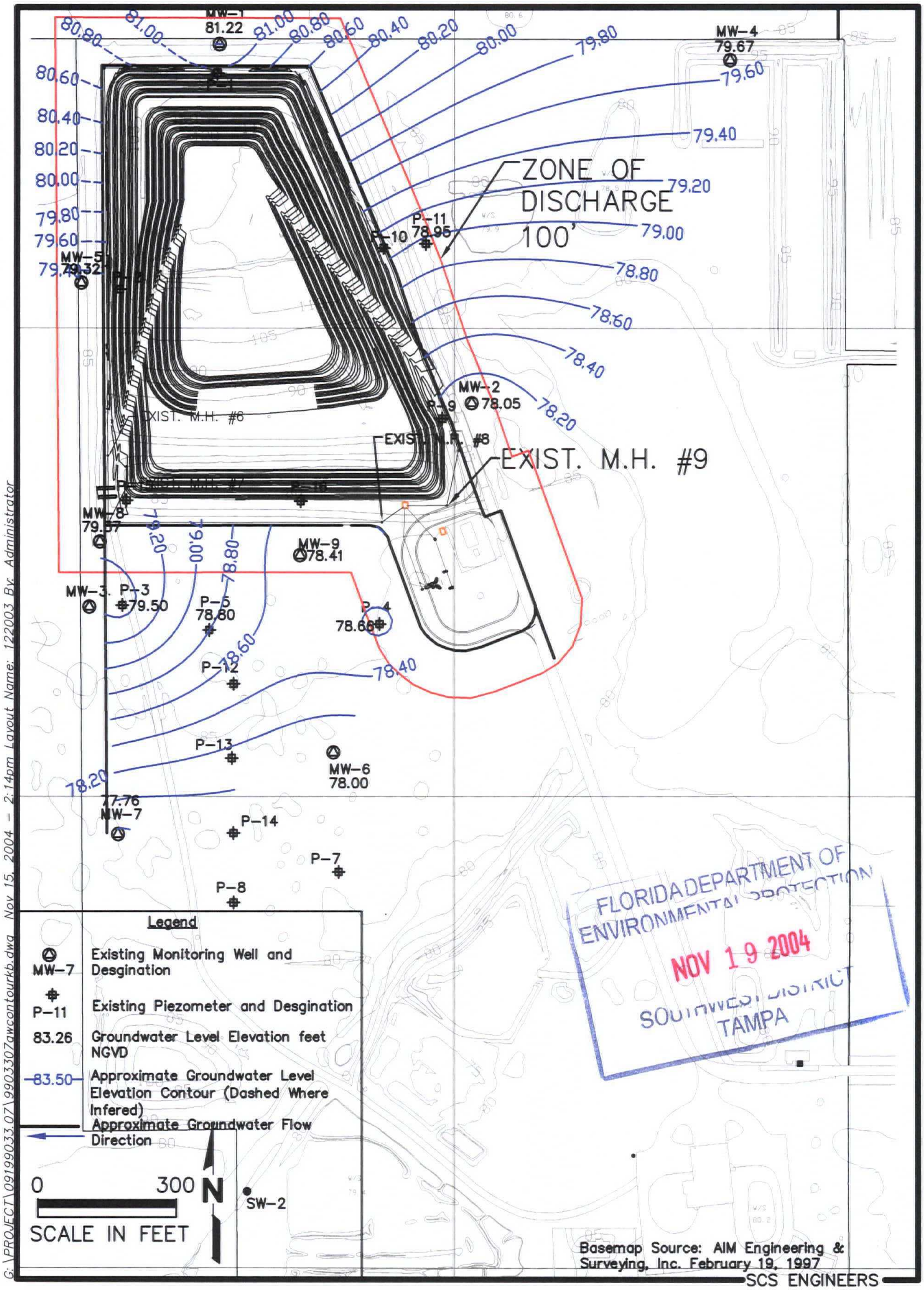


Figure E–10. December 2003 Groundwater Contour Map, Hardee County Solid Waste Disposal Facility

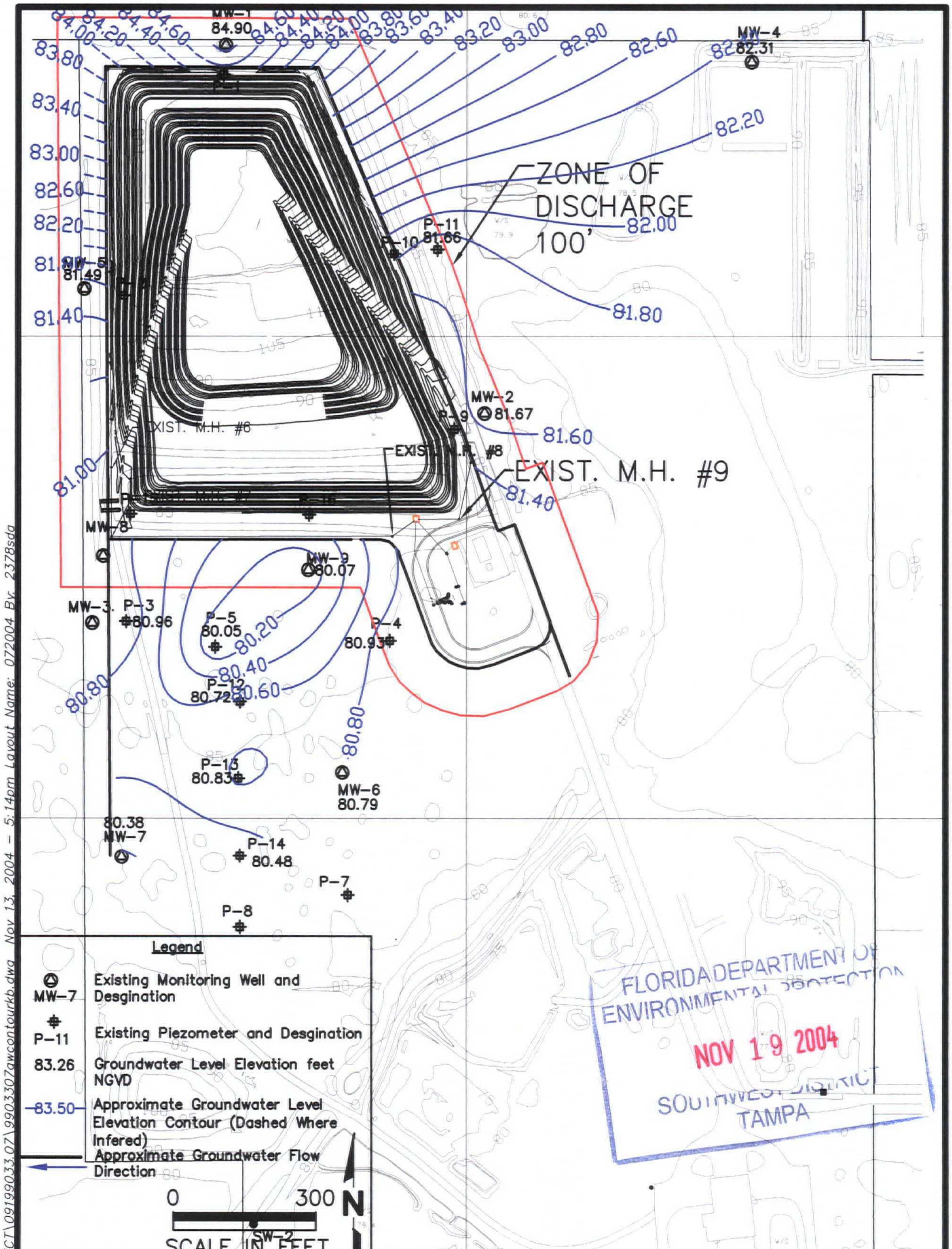
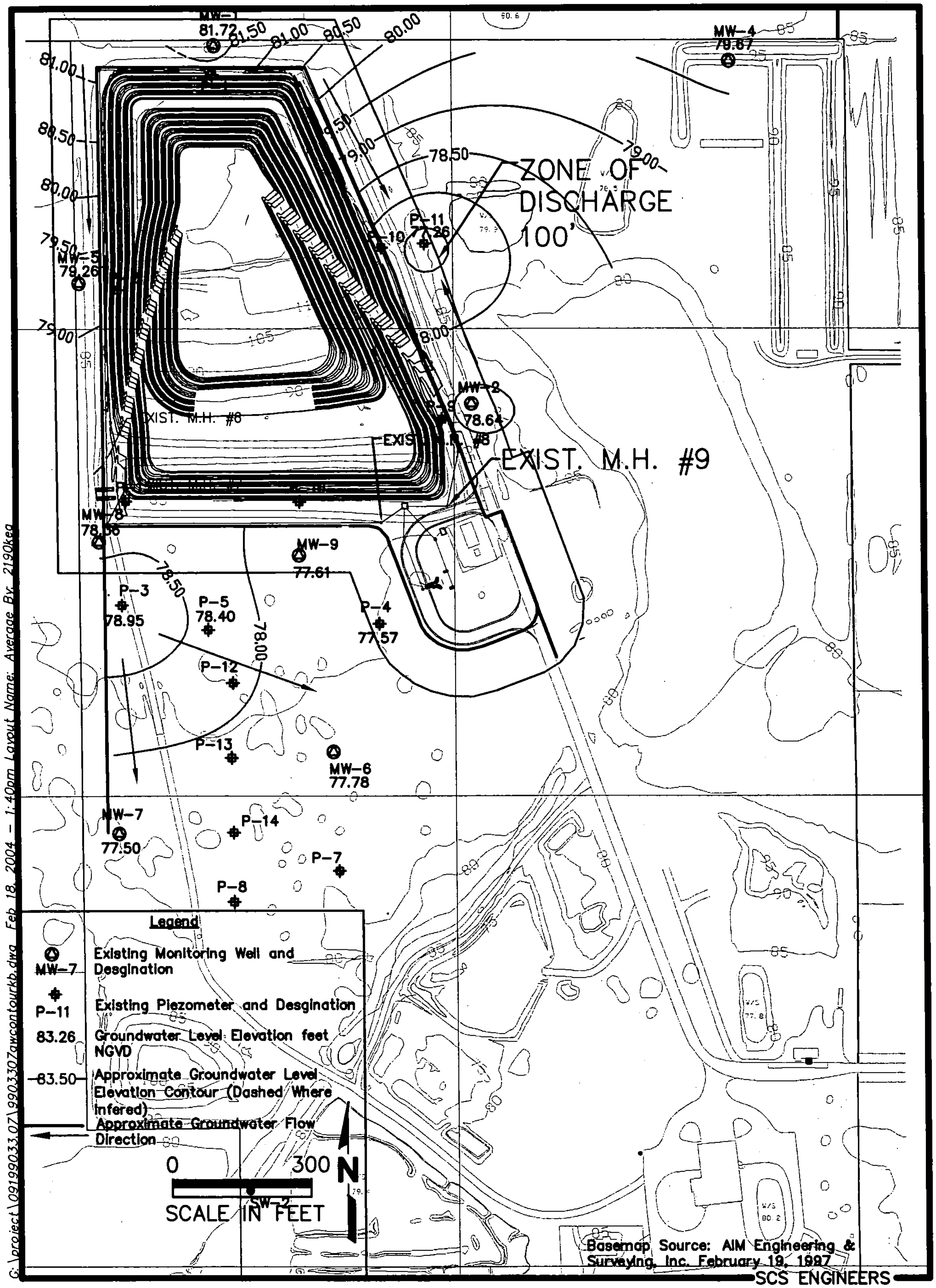
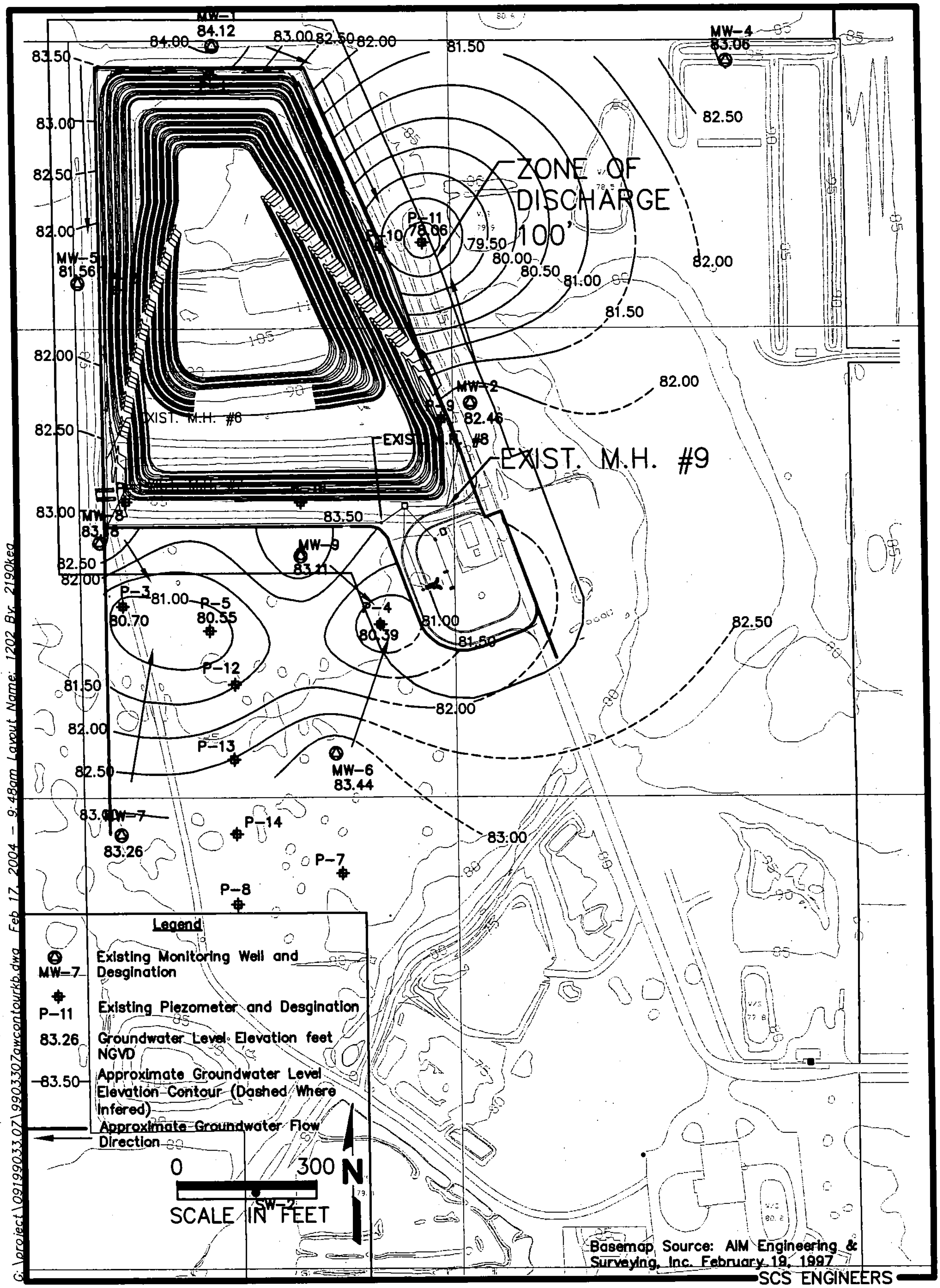


Figure E-11. July 2004 Groundwater Contour Map, Hardee County Solid Waste Disposal Facility

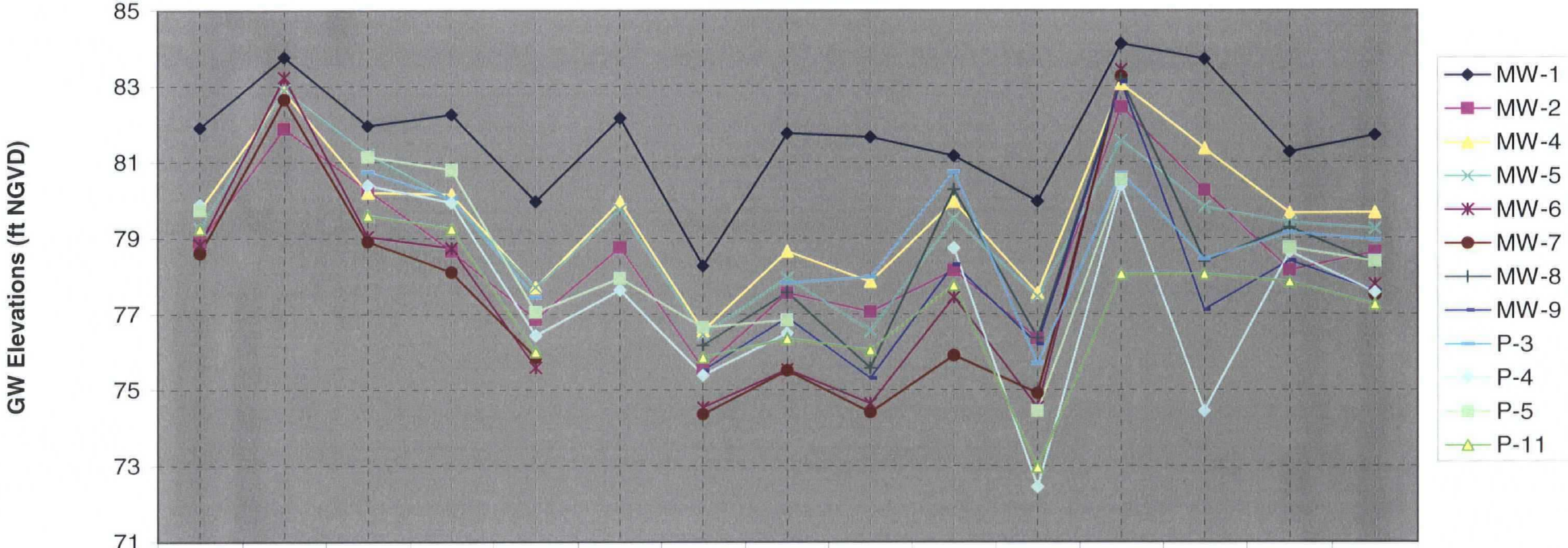


Average Groundwater Contour Map, Hardee County Solid Waste Disposal Facility



December 2002 Groundwater Contour Map, Hardee County Solid Waste Disposal Facility

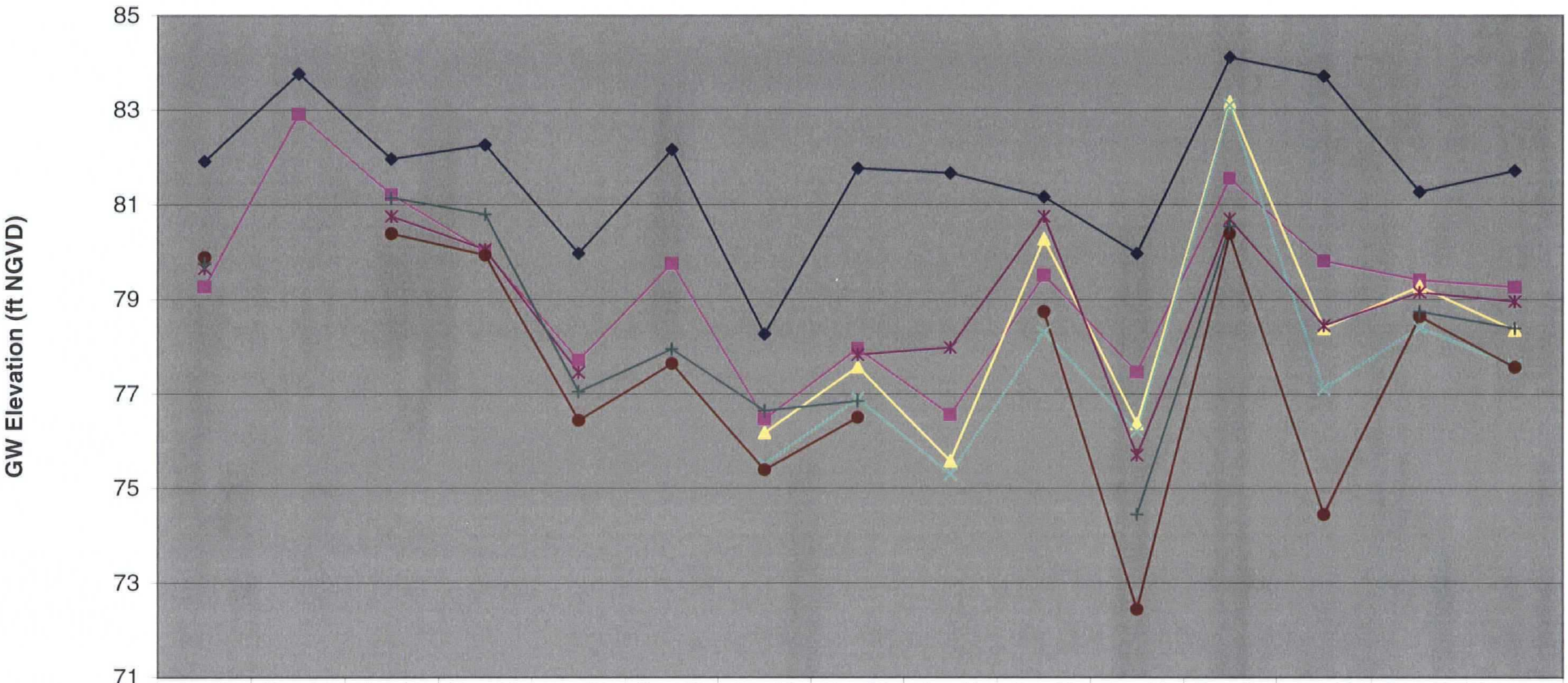
Hardee County Landfill
Average Groundwater Elevations Across the Site



	Jun-97	Dec-97	Jun-98	Dec-98	Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02	Jun-03	Dec-03	Average
MW-1	81.92	83.77	81.97	82.27	79.97	82.17	78.27	81.77	81.67	81.17	79.97	84.12	83.72	81.27	81.72
MW-2	78.91	81.89	80.26	78.66	76.86	78.76	75.56	77.56	77.06	78.16	76.36	82.46	80.26	78.16	78.64
MW-4	79.76	82.86	80.21	80.16	77.71	79.96	76.56	78.66	77.86	79.96	77.56	83.06	81.36	79.66	79.67
MW-5	79.26	82.91	81.21	80.01	77.71	79.76	76.46	77.96	76.56	79.51	77.46	81.56	79.81	79.41	79.26
MW-6	78.84	83.24	79.04	78.74	75.59		74.54	75.54	74.64	77.44	74.54	83.44			77.78
MW-7	78.61	82.66	78.91	78.11	75.86		74.36	75.51	74.41	75.91	74.91	83.26			77.50
MW-8							76.18	77.58	75.58	80.28	76.38	83.18	78.39	79.28	78.36
MW-9							75.51	76.91	75.31	78.31	76.21	83.11	77.11	78.41	77.61
P-3	79.65		80.75	80.05	77.45			77.83	77.98	80.75	75.7	80.7	78.45	79.15	78.95
P-4	79.89		80.39	79.94	76.44	77.64	75.39	76.5		78.74	72.44	80.39	74.44	78.64	77.57
P-5	79.75		81.15	80.8	77.05	77.95	76.65	76.85			74.45	80.55		78.75	78.40
P-11	79.26		79.61	79.26	76.01		75.86	76.36	76.06	77.76	72.96	78.06	78.06	77.86	77.26

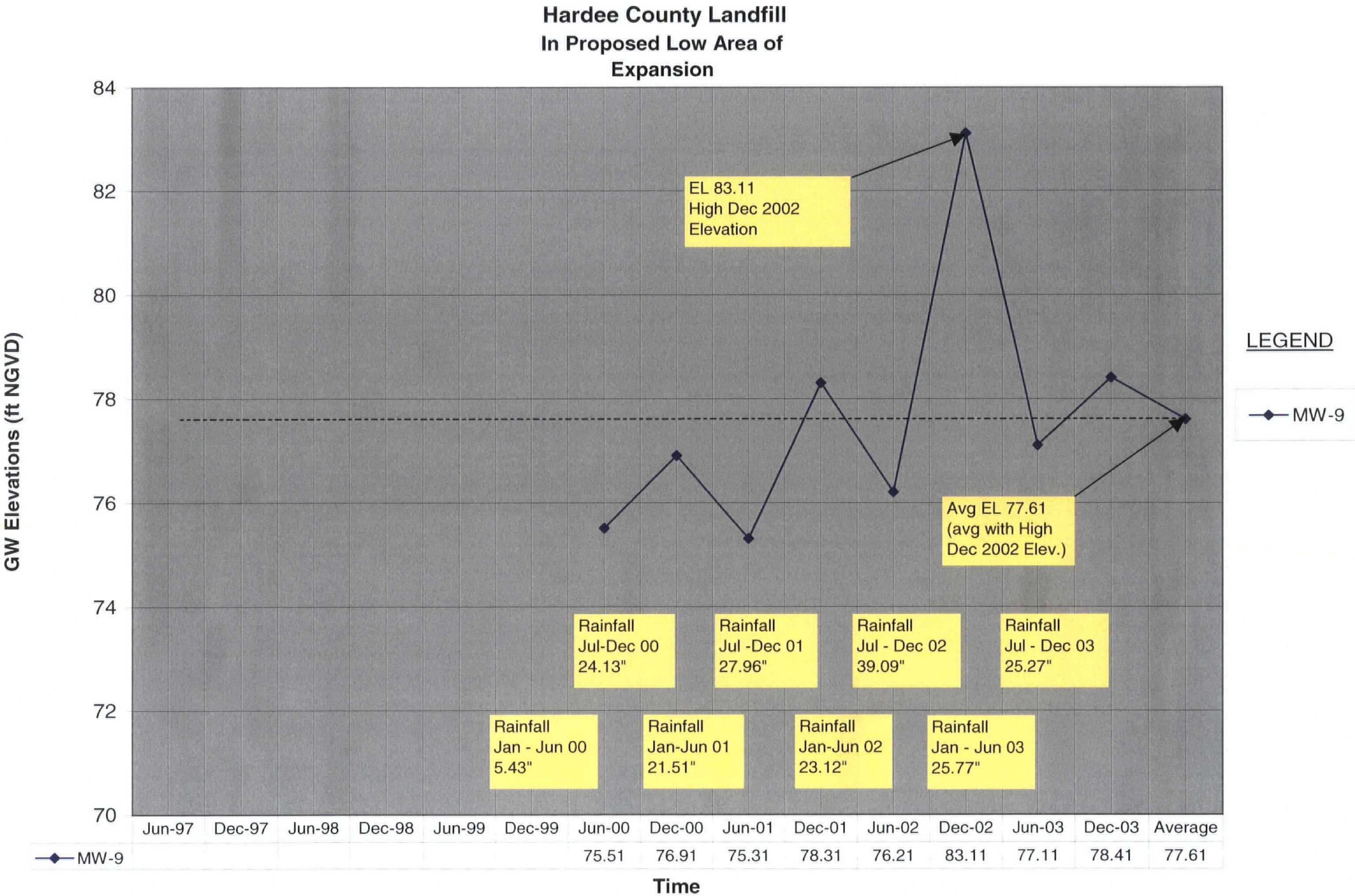
Time

Hardee County Landfill
Groundwater Elevation in Expansion Area



	Jun-97	Dec-97	Jun-98	Dec-98	Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02	Jun-03	Dec-03	Average	Top Geomem
MW-1	81.92	83.77	81.97	82.27	79.97	82.17	78.27	81.77	81.67	81.17	79.97	84.12	83.72	81.27	81.72	
MW-5	79.26	82.91	81.21	80.01	77.71	79.76	76.46	77.96	76.56	79.51	77.46	81.56	79.81	79.41	79.26	83.15
MW-8							76.18	77.58	75.58	80.28	76.38	83.18	78.39	79.28	78.36	81.36
MW-9							75.51	76.91	75.31	78.31	76.21	83.11	77.11	78.41	77.61	79.00
P-3	79.65		80.75	80.05	77.45			77.83	77.98	80.75	75.7	80.7	78.45	79.15	78.95	82.69
P-4	79.89		80.39	79.94	76.44	77.64	75.39	76.5		78.74	72.44	80.39	74.44	78.64	77.57	79.70
P-5	79.75		81.15	80.8	77.05	77.95	76.65	76.85			74.45	80.55		78.75	78.40	81.75

Time



	Jun-97	Dec-97	Jun-98	Dec-98	Jun-99	Dec-99	Jun-00	Dec-00	Jun-01	Dec-01	Jun-02	Dec-02	Jun-03	Dec-03	Average
MW-9							75.51	76.91	75.31	78.31	76.21	83.11	77.11	78.41	77.61

f:/projects/hardee/09199033.09/ERP/sitegw.xls

Environmental Consultants

3012 U.S. Highway 301 North
Suite 700
Tampa, FL 33619-2242

813 621-0080
FAX 813 623-6757

SCS ENGINEERS

October 15, 2003
File No. 09199033.09

INTEROFFICE MEMORANDUM

TO: Joseph O'Neill, P.E.

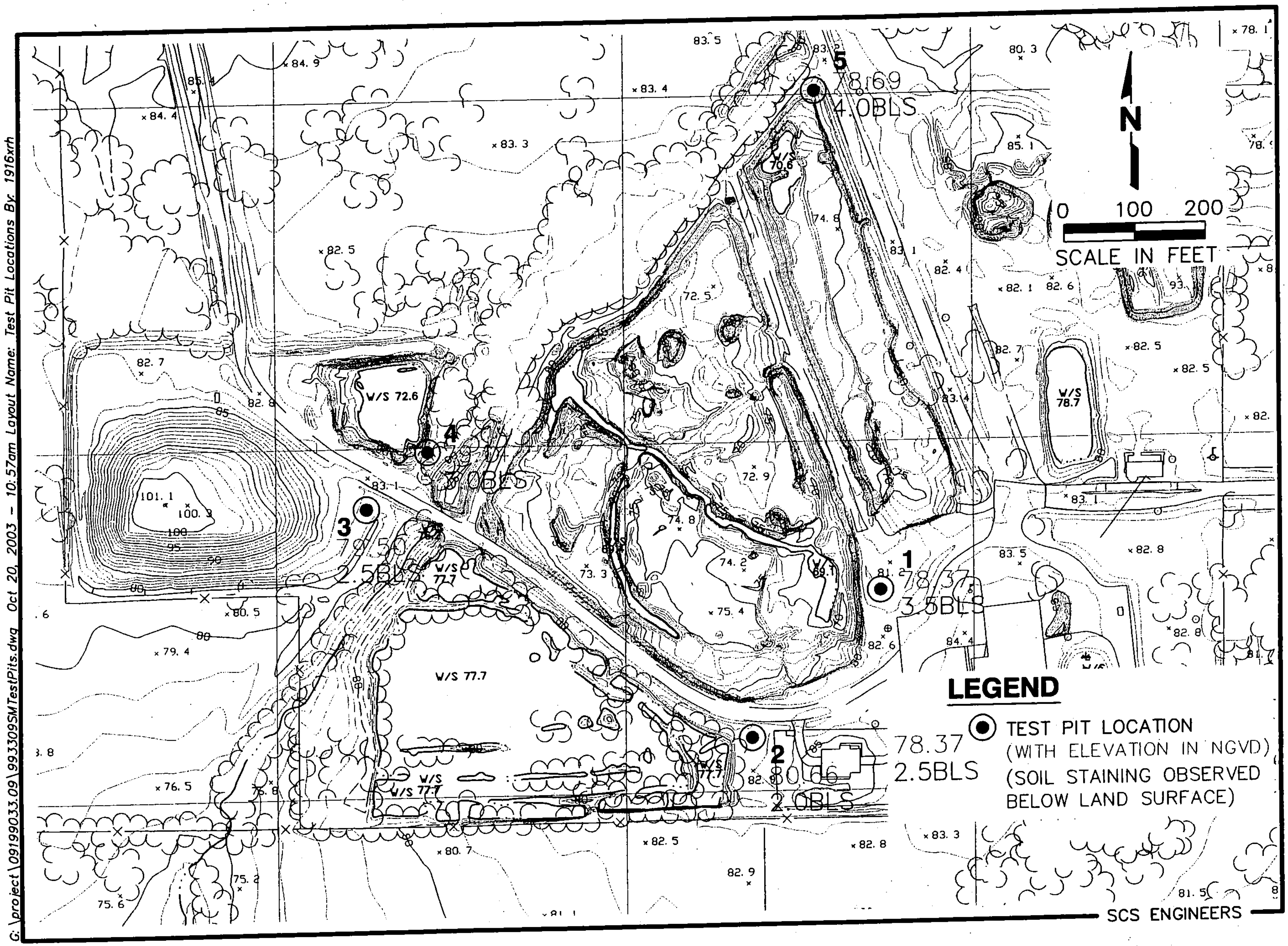
FROM: Kim Byer

THRU: Robert L. Westly, P.G.

SUBJECT: Hardee County Landfill Mean High Water Level Determination

On September 12, 2003 SCS staff evaluated five test pits in order to determine the mean high water table in the vicinity of the stormwater management area (SWMA) at the Hardee County Landfill (site). The mean high water table was determined using techniques outlined in the document *Methods for Identifying Soils and Determining Seasonal High Ground Water Table (SHGWT) Elevations* prepared by the Southwest Florida Water Management District (SWFWMD). These methods consisted of excavating five test pits in close proximity to the SWMA then observing and marking soil staining or mottling in the pits. The staining of the soils at each pit consisted of black to gray mottling ranging in depths from 2.5 to 4 feet below land surface. The soil-stained areas in each pit were marked by SCS and later surveyed by Hardee County. The locations of the test pits and the elevations of the field determined mean high water tables are shown on the attached figure.

The soil staining observed at test pits number one and five were utilized to determine the mean high water level at the site because the other pits appeared to be influenced by nearby water bodies. The soil staining at test pits one and five indicate the mean high water table at the site is 78.53 feet NGVD.



Locations of Test Pits at the Hardee County Landfill.

Table 4-1 Groundwater Elevations for the Piezometers and Groundwater Monitoring Wells located at the Hardee County Landfill

June 1999 through December 2002

Location	Top of Casing Elevation (NGVD)	6/1/1999 GW Elevation (NGVD)	12/6/1999 GW Elevation (NGVD)	6/8/2000 GW Elevation (NGVD)	12/6/2000 GW Elevation (NGVD)	6/6/2001 GW Elevation (NGVD)	12/10/2001 GW Elevation (NGVD)	6/10/2002 GW Elevation (NGVD)	12/16/2002 GW Elevation (NGVD)
MW-1	87.97	79.97	82.17	78.27*	81.77	81.67	81.17	79.97	84.12**
MW-2	85.86	76.86	78.76	75.56*	77.56	77.06	78.16	76.36	82.46**
MW-4	87.16	77.71	79.96	76.56*	78.66	77.86	79.96	77.56	83.06**
MW-5	88.76	77.71	79.76	76.46*	77.96	76.56	79.51	77.46	81.56**
MW-6	87.94	75.59	ND	74.54	75.54	74.64	77.44	74.54*	83.44**
MW-7	87.51	75.86	ND	74.36*	75.51	74.41	75.91	74.91	83.26**
MW-8	88.98	ND	ND	76.18	77.58	75.58*	80.28	76.38	83.18**
MW-9	88.71	ND	ND	75.51	76.91	75.31*	78.31	76.21	83.11**
P-1 ∠	91.27	79.92	80.87	80.02	80.47	80.27	81.37**	77.47*	78.57
P-2 ∠	90.66	77.56	79.46	76.56	77.61	76.46	79.76**	74.11*	78.46
P-3	89.23	77.45	ND	ND	77.83	77.98	80.75	75.70*	80.70**
P-4	88.34	76.44	77.64	75.39	76.5	Dry	78.74	72.44*	80.39**
P-5	89.25	77.05	77.95	76.65	76.85	Dry	OBSTRUCTED	74.45*	80.55**
P-9 ∠	87.06	76.56	78.86	75.71	76.66	75.66	78.56	ND	ND
P-10 ∠	88.56	Dry	80.06**	ND	77.46	Dry	79.16	74.06*	76.96
P-11	87.16	76.01	ND	75.86	76.36	76.06	77.76	72.96*	78.06**
P-15 ∠	89.21	ND	ND	ND	75.81	74.56	ND	71.26*	78.41**
P-16 ∠	88.83	ND	ND	72.65	76.33	Dry	75.55	70.33*	79.69**

Notes:
1. ND = No Data Reported
2. NGVD = National Geodetic Vertical Datum.
3. TOC = top of casing.
4. * = Minimum groundwater level for the reporting period
5. ** = Maximum groundwater level for the reporting period
6. GW= Groundwater

∠ = PIEZOMETERS INSIDE OF LANDFILL
NOT REPRESENTATIVE GROUNDWATER TABLES

SOURCE: BIENNAL GROUNDWATER REPORT JUN 99—DEC 2002
HARDEE COUNTY LANDFILL, MAY 2003
BY SCS ENGINEERS

Water Level Elevation Data
(Feet Above Mean Sea Level)

Monitor Well	Collection Date			
	10-Jun-97	08-Dec-97	01-Jun-98	08-Dec-98
MW-1	81.92	83.77	81.97	82.27
MW-2	78.91	81.89	80.26	78.66
MW-3	79.45	84.25	81.45	80.45
MW-4	79.76	82.86	80.21	80.16
MW-5	79.26	82.91	81.21	80.01
MW-6	78.84	83.24	79.04	78.74
MW-7	78.61	82.66	78.91	78.11
P-1	80.37	NA*	88.97	80.77
P-2	79.21	NA*	NA*	79.86
P-3	79.65	NA*	80.75	80.05
P-4	79.89	NA*	80.39	79.94
P-5	79.75	NA*	81.15	80.80
P-6	78.69	NA*	78.54	79.69
P-7	77.59	NA*	76.14	75.44
P-8	77.89	NA*	76.94	76.04
P-9	78.41	NA*	79.51	78.26
P-10	78.96	NA*	79.86	79.36
P-11	79.26	NA*	79.61	79.26
P-12	79.41	NA*	80.21	79.41 — 79.68 Avg
P-13	78.65	NA*	79.10	78.30 — 78.68 Avg
P-14	78.25	NA*	77.70	77.35 — 77.79 Avg

NA = Not Available

Source: Biennal Groundwater Technical Report (Jun 97 - Dec 98)
Hardee County Landfill, Nov 2000
By Hardee County

Joe O'Neill

From: Teresa Carver [teresa.carver@hardeecounty.net]
S Monday, February 16, 2004 11:05 AM
To: joneill@scsengineers.com
Subject: ground water ele

June 2003

MW-1 83.72
MW-2 80.26
MW-4 81.36
MW-5 79.81
MW-8 78.39
MW-9 77.11

P-1 80.67
P-2 76.76
P-3 78.45
P-4 74.44
P-9 77.36
P-10 77.86
P-11 78.06
P-15 76.51
P-16 75.73

December 2003

M\ 81.27
MW-ح 78.16
MW-4 79.66
MW-5 79.41
MW-8 79.28
MW-9 78.41
For some reason I do not have Piezometers for December.
We will try to find out why and get back with you.
Rainfall
Aug 12.28
Sept 3.95
Oct. 1.27
Nov. .76
Dec. 2.61
Sorry no January yet.

Joe O'Neill

From: Teresa Carver [teresa.carver@hardeecounty.net]
Sent: Monday, February 16, 2004 11:09 AM
To: joneill@scsengineers.com
Subject: piezometer

Sorry I was looking in the wrong place

P-1	80.87
P-2	79.26
P-3	79.15
P-4	78.64
P-5	78.75
P-10	78.41
P-11	77.86
P-15	77.41
P-16	76.43

HARDEE COUNTY LANDFILL
HARDEE COUNTY, FLORIDA
MONTHLY RAINFALL DATA 1990-2003

Month	Rainfall (inch)
Jan-90	0.14
Feb-90	4.96
Mar-90	0.68
Apr-90	2.71
May-90	2.05
Jun-90	5.34
Jul-90	10.76
Aug-90	10.8
Sep-90	5.65
Oct-90	1.43
Nov-90	0.45
Dec-90	1.03
1990 Total:	46.00

Month	Rainfall (inch)
Jan-91	2.59
Feb-91	1.31
Mar-91	4.35
Apr-91	4.18
May-91	4.05
Jun-91	12.94
Jul-91	10.25
Aug-91	7.37
Sep-91	2.21
Oct-91	3.47
Nov-91	0.12
Dec-91	0.28
1991 Total:	53.12

Month	Rainfall (inch)
Jan-92	0.3
Feb-92	5.21
Mar-92	2.07
Apr-92	6.44
May-92	1.61
Jun-92	12.75
Jul-92	2.91
Aug-92	12.76
Sep-92	4.95
Oct-92	2.95
Nov-92	1.55
Dec-92	0.69
1992 Total:	54.19

Month	Rainfall (inch)
Jan-93	5.93
Feb-93	2.15
Mar-93	5.52
Apr-93	4.34
May-93	2.42
Jun-93	7.62
Jul-93	7.47
Aug-93	6.24
Sep-93	5.23
Oct-93	5.16
Nov-93	0.72
Dec-93	1.27
1993 Total:	54.07

Month	Rainfall (inch)
Jan-94	3.2
Feb-94	1.58
Mar-94	3.34
Apr-94	1.45
May-94	2.71
Jun-94	13.04
Jul-94	7.29
Aug-94	7.44
Sep-94	**no data**
Oct-94	**no data**
Nov-94	**no data**
Dec-94	**no data**
1994 Total:	40.05

Month	Rainfall (inch)
Jan-95	**no data**
Feb-95	**no data**
Mar-95	**no data**
Apr-95	6.6
May-95	0.65
Jun-95	8.56
Jul-95	11.41
Aug-95	9.99
Sep-95	5.58
Oct-95	8.64
Nov-95	1.45
Dec-95	0.33
1995 Total:	53.21

Month	Rainfall (inch)
Jan-96	2.67
Feb-96	1.38
Mar-96	3.79
Apr-96	0.76
May-96	4.25
Jun-96	4.24
Jul-96	3.71
Aug-96	8.56
Sep-96	7.83
Oct-96	3.49
Nov-96	0.74
Dec-96	2.51
1996 Total:	43.93

Month	Rainfall (inch)
Jan-97	0.44
Feb-97	0.3
Mar-97	2.6
Apr-97	5.95
May-97	2.85
Jun-97	7.42
Jul-97	12.26
Aug-97	8.66
Sep-97	5.38
Oct-97	3.24
Nov-97	10.38
Dec-97	6.29
1997 Total:	65.77

19.56"
46.21"

Month	Rainfall (inch)
Jan-98	6.09
Feb-98	8.82
Mar-98	12.14
Apr-98	2.53
May-98	3.57
Jun-98	1.69
Jul-98	6.78
Aug-98	7.58
Sep-98	10.19
Oct-98	1.76
Nov-98	3.34
Dec-98	1.56
1998 Total:	66.05

34.84"
31.21"

Month	Rainfall (inch)
Jan-99	3.73
Feb-99	0.8
Mar-99	0.87
Apr-99	2.65
May-99	2.47
Jun-99	4.08
Jul-99	2.9
Aug-99	7.26
Sep-99	5.5
Oct-99	5.61
Nov-99	2
Dec-99	2.4
1999 Total:	40.27

14.60"
25.67"

Month	Rainfall (inch)
Jan-00	0
Feb-00	0
Mar-00	0.85
Apr-00	1.4
May-00	0
Jun-00	3.18
Jul-00	5.8
Aug-00	5.62
Sep-00	10.47
Oct-00	0
Nov-00	0.79
Dec-00	1.45
2000 Total:	29.56

5.43"
24.13"

Month	Rainfall (inch)
Jan-01	0
Feb-01	0
Mar-01	6.98
Apr-01	0
May-01	5.37
Jun-01	9.16
Jul-01	13.31
Aug-01	6.15
Sep-01	7.03
Oct-01	0.67
Nov-01	0.8
Dec-01	0
2001 Total:	49.47

21.51"
27.96"

Month	Rainfall (inch)
Jan-02	2.02
Feb-02	6.03
Mar-02	0
Apr-02	4.28
May-02	1.77
Jun-02	9.02
Jul-02	7.17
Aug-02	7.24
Sep-02	3.46
Oct-02	4.87
Nov-02	8.46
Dec-02	7.89
2002 Total:	62.21

23.12"
39.09"

Month	Rainfall (inch)
Jan-03	1.28
Feb-03	2.05
Mar-03	2.02
Apr-03	3.45
May-03	5.07
Jun-03	11.9
Jul-03	4.4
Aug-03	12.28
Sep-03	3.95
Oct-03	1.27
Nov-03	0.76
Dec-03	2.61
2003 Total:	51.04

25.77"
25.27"

Source: NOAA Weather Station - Wachula
Coop ID # 089401

AVERAGE MONTHLY RAINFALL DISTRIBUTION

Month	Rainfall (inch)
Jan	2.18
Feb	2.66
Mar	3.48
Apr	3.34
May	2.77
Jun	7.92
Jul	7.60
Aug	8.43
Sep	5.96
Oct	3.27
Nov	2.43
Dec	2.18
Average:	52.22

Note: Monthly averages do not include months with "No Data' Reported.

f:/project/hardee/09199033.09/calcs/rainfalldata.xls

ATTACHMENT F

SETTLEMENT CALCULATIONS

SETTLEMENT CALCULATION PROCEDURES

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County LF	PROJECT Hardee County LF Expansion	JOB NO. 09199033.09	
SUBJECT Settlement Calculations Procedure		BY JHD	DATE
		CHECKED	DATE

Settlement

References

1) Estimate soil properties

Soil Borings
PSI Nov 97
PSI Feb 97
PSI Apr 2003
Envisor 1983

A) Soils are generally silty sands (SM)
poorly graded sands (SP)
clayey sands (SC) or
low plasticity clays (CL)
(Note: CL properties from lab test PSI 2003)

B) SPT blow counts vary from ~5 to >50
therefore each layer has a
different relative density and
unit weight

C) To estimate unit weights of soils
use SPT blow counts to estimate
relative density of soils, then
based on relative density estimate
void ratio, degree of saturation
and compute unit weights

D) Using approx. relationship between
blow counts and relative density
representative values were selected
to cover the range of SPT N values
recorded in the field

Reference
Principles of
Geotechnical
Engineering
B. DAS (1985)

SPT N value	Relative Density
10	30%
20	45%
30	60%
>40	95%

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County LF	PROJECT Hardee County LF Expansion	JOB NO. 09199033.09
SUBJECT Settlement Calculations Procedures	BY HD	DATE
	CHECKED	DATE

Settlement

1) Estimate Soil Properties (Cont)

E) Estimate Min & Max Soil Properties

Reference: Lambe Whitman 1969 Chapt. 3

Use Silty Sands for SM/SP/SC

Void Ratio		Porosity		Dry Weight	
e_{max}	e_{min}	N_{max}	N_{min}	$\gamma_{d\,min}$	$\gamma_{d\,max}$
0.90	0.30	47	23	87	127

F) For Relative Density (DR) and Soil Properties in 1.E) estimate unit weights

//Example//

SPT N = 10 DR 30%

Density γ_d min 87 lb/ft³

γ_d max 127 lb/ft³

γ_d @ 30% ⇒ 96 lb/ft³

Eq 3.1 Lambe Whitman Chapter 3

$$D_R = \frac{\gamma_{d\,max}}{\gamma_d} \times \left(\frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{d\,min}} \right)$$

$$\Rightarrow \frac{127}{96} \times \left(\frac{96 - 87}{127 - 87} \right)$$

$$D_R \Rightarrow 0.30$$

CLIENT Hardee County LF	PROJECT Hardee County LF Expansion	JOB NO. 09199033.09
SUBJECT Settlement Calculations	BY JAO	DATE
Procedures	CHECKED	DATE

Settlement

1) Estimate soil properties (cont)

6) Estimate insitu void ratio

Reference "Soil Mechanics" Lambe Whitman 1969 Chapt 3

Use Eq 3.1 (Lambe Whitman 1969) $\frac{e_{max} - e}{e_{max} - e_{min}} = D_r$

//Example//

SPT N = 10 $D_r \cong 30\%$

See 1E) $\frac{e_{max} - e}{e_{max} - e_{min}}$

$\Rightarrow \frac{0.90 - 0.72}{0.90 - 0.30}$ ← initial void ratio e_0

$e \Rightarrow 0.30$

7) Estimate saturated soil weight

Lambe Whitman Chapter 3 $\gamma_{Total} = \left(\frac{G + Se}{1 + e}\right)\gamma_w$

G = specific gravity of solids (G = 2.6)

γ_w = unit weight water (62.4 lb/ft³)

e = void ratio

S = degree of saturation = 1 100% saturated

//Example//

SPT N = 10 $D_r = 30\%$ G = 2.6

e = 0.72 $\gamma_w = 62.4$

$\gamma_{Total} = \{(2.6 + (1)(0.72)) / 1 + 0.72\} 62.4$

$= 120.4$ lb/ft³

Estimated Soil Properties
Hardee County Landfill

SPT N values 10 of (approx)		
Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.3	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	96	pcf
Dr computed	0.30	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.72	
Dr computed	0.30	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	120.4	pcf (saturated)
(assumes pore space filled with water)		

SPT N values of 20 (approx)		
Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.45	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	101.5	pcf
Dr computed	0.45	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.63	
Dr computed	0.45	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	123.7	pcf (saturated)
(assumes pore space filled with water)		

SPT N values 30 of (approx)		
Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.6	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	107.4	pcf
Dr computed	0.60	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.54	
Dr computed	0.60	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	127.2	pcf (saturated)
(assumes pore space filled with water)		

SPT N values 40 to greater than 50 of (approx)		
Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.95	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	124	pcf
Dr computed	0.95	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.33	
Dr computed	0.95	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	137.5	pcf (saturated)
(assumes pore space filled with water)		

f:/projects/hardee/09199033.09/geo/soilprop.xls

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County LF	PROJECT Hardee County LF Expansion		JOB NO. 09199033.09
SUBJECT Settlement Calculations		BY JHD	DATE 12/2003
Procedures		CHECKED	DATE

Settlement

1) Estimate Soil Properties (cont) — Reference

Using 1A – 1H compute various soil properties and various relative densities

See spreadsheet for soil unit weights

2) Estimate Consolidation (Settlement) Properties — Reference

"Basics of Soil Engineering" B.K. Hough 1957 Chapter 5

for CL soils (PSI 2003) conducted one dimensional consolidation test (see PSI report)

for SM/SP soils, use method presented in "Basics of Soil Engineering" B.K. Hough)

for SC soils use method presented in "Basics of Soil Engineering" B.K. Hough

$C_c \approx a(e_0 - b)$

e_0 = initial void ratio (computed from 1.G)

$b = e_{min}$ (computed in 1E)

a = Soil Property (Table 5-1 from Hough)

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County LF Expansion	JOB NO. 09199033.09
SUBJECT Estimated Settlements	BY JHB	DATE
Sandy Soil Properties	CHECKED	DATE

ESTIMATED COMPRESSION INDEX VALUES
FOR SILTY AND CLAYEY SANDS

From fig 5-12 (Basic Soils Engineering Hough 2nd Ed)

$C_c \sim a(e_o - b)$

a - Coefficient from Table 5-1
b - Coefficient from Table 5-1 or E_{min}
e_o - Initial void ratio
e_{min} = minimum void ratio

Soils are silty sands (SM) AND clayey sands (SC)

USE Silty sands (SM)

$a = 0.15$ Table 5-1 (Basics of Soils Eng. Hough)
$b = e_{min} = 0.30$ (Series in Soils Engineering, Lambe Whitman Table 3.2)

USE clayey sands (SC)

$a = 0.23$ Table 5-1 (Basics of Soils Eng Hough)
$b = e_{min} = 0.30$ Table 3.2 (Series of Soils Engineering Lambe Whitman)

Silty Sands (SM)

Relative Density	SPT N	a	b	e_o	C_c
D_R 30%	10	0.15	0.30	0.72	0.063
45%	20	0.15	0.30	0.63	0.050
60%	30	0.15	0.30	0.54	0.036
95%	>40	0.15	0.30	0.33	0.005

Clayey Sands (SC)

Relative Density	SPT N	a	b	e_o	C_c
D_R 30%	10	0.23	0.30	0.72	0.097
45%	20	0.23	0.30	0.63	0.076
60%	30	0.23	0.30	0.54	0.055
95%	>40	0.23	0.30	0.33	0.007

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County LF	PROJECT Hardee County LF Expansion		JOB NO. 09199033.04
SUBJECT Settlement Calculations		BY JHO	DATE
Procedure		CHECKED	DATE

Settlement

3) Estimate Settlement in each soil layer based upon soil type & relative density & estimate properties

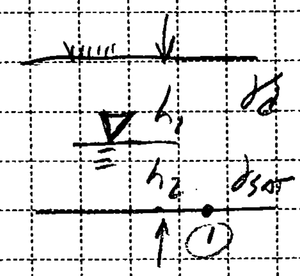
Use equation to estimate settlement

Normally Consolidated Soils

$$\Delta H = \frac{C_c H}{1+e_0} \log\left(\frac{P_0 + \Delta P}{P_0}\right)$$

ΔH = Change in soil strata settlement (ft)
H = Soil thickness (ft)
e_0 = initial void ratio
P_0 = initial "effective" pressure (psf) (stress)
ΔP = change in pressure (psf)

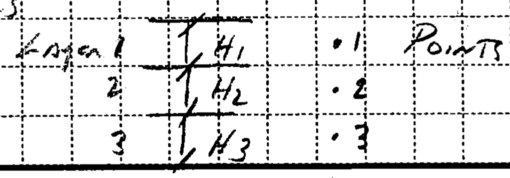
$\sigma_v' = $ Effective stress $= H(\gamma_{sat} - \gamma_{water})$



Effective stress = Pressure

$\sigma_v' = \gamma d(h_1) + (\gamma_{sat} - \gamma_w) h_2$ at point 1

* For Layer compute effective stress at midpoint of layers



SCS ENGINEERS

SHEET ______ OF ______

CLIENT	PROJECT	JOB NO.	
SUBJECT		BY	DATE
		CHECKED	DATE

ESTIMATED SETTLEMENTS

$$S = \frac{C_c H}{1+e_o} \log\left(\frac{P_o + \Delta P}{P_o}\right)$$

C_c = Compression Index
H = Height of strata (ft)
e_o = Initial Void Ratio
P_o = initial stress within strata (psf)
ΔP = change in stress with strata (psf)

Inputs

C_c - use estimated values for sandy sand clay soils
- use consolidation tests for CL soils

H = Height of soil strata use boring logs from PSI Reports (1997/2003) or Emersons (1983)

e_o = Estimated void ratio at relative density or lab test

P_o = initial stresses estimated by computing soil properties from relative densities or lab test

initial stresses computed using ground elevations (Survey Chastain Skillman 2003) and low groundwater elevations (SCS Biennal Groundwater Report 2003)

ΔP = change in stress due to excavation and placement of waste over the site (stress = density waste x height)

SCS ENGINEERS

SHEET ______ OF ______

CLIENT	PROJECT	JOB NO.
SUBJECT	BY	DATE
	CHECKED	DATE

ESTIMATED SOIL PROPERTIES

(SM) Silty Sands and Clayey Sand (SC)

	N value	D_r		N	D_r
SPT N values from	5-10	5-30%	⇒	10	30%
	10-30	30-60%	⇒	30	60%
	30-50	60-95%	⇒	50	95%

D_r = Relative Density

$$D_r = \frac{\gamma_{d\,max}}{\gamma_d} \times \frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{min}}$$

$\gamma_{d\,max}$ = max dry Density

$\gamma_{d\,min}$ = min dry Density

γ_d = Insitu Density (dry)

$D_r = 30\%$

$\gamma_{dry} = 96$ pcf

$\gamma_{SAT} = 120.4$ pcf

$e = 0.72$

$D_r = 60\%$

$$D_r = \frac{e_{max} - e}{e_{max} - e_{min}}$$

$\gamma_{dry} = 107.4$ pcf

$\gamma_{SAT} = 127.2$ pcf

$e = 0.54$

e_{max} = Void Ratio max

e_{min} = Void Ratio min

e = Insitu Void Ratio

$D_r = 95\%$

$\gamma_{dry} = 124$ pcf

$\gamma_{SAT} = 137.5$ pcf

$e = 0.30$

Clayey Soils (Low Plasticity Clays) CL & CH

$\gamma_d = 73.9$ pcf From consolidation test

Moisture content from consolidation test

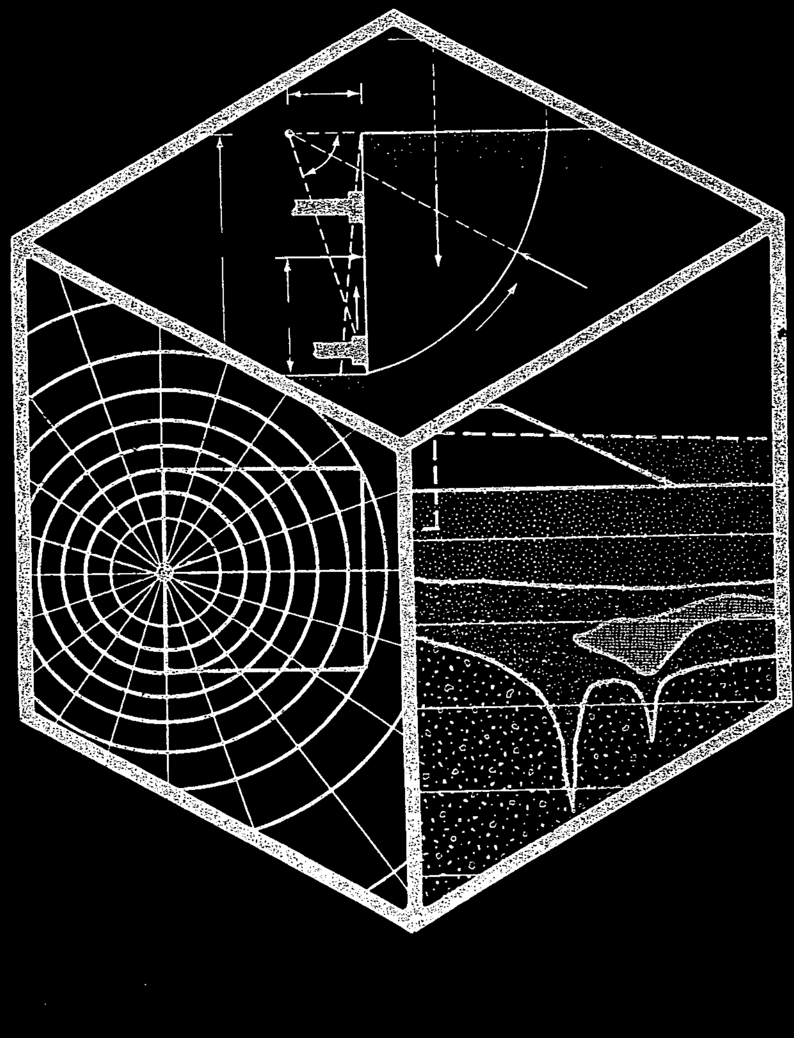
$$\gamma_d = \frac{\gamma_T}{1+w} \Rightarrow \gamma_{Total} = \gamma_d(1+w) \Rightarrow 73.9(1+0.488)$$

$$\Rightarrow 110 \text{ pcf}$$

REFERENCE MATERIAL

Principles of Geotechnical Engineering

BRAJA M. DAS



Source: B. Das
"Principles of Geotech.
Engineering" P85

Table 13.2 Approximate Correlation of Standard Penetration Number and Consistency of Clay

Standard penetration number, N	Consistency	Unconfined compression strength, q_u (ton/ft^2)
0		0
	Very soft	
2		0.25
	Soft	
4		0.5
	Medium stiff	
8		1
	Stiff	
16		2
	Very stiff	
32		4
>32	Hard	>4

Note: 1 ton/ft^2 = 95.76 kN/m^2

Blow Count vs
Stiffness
(Clays)

overburden pressure (and hence higher lateral confining pressure) at depth h_2 will contribute to a higher value of the standard penetration number. This fact has clearly been demonstrated by Gibbs and Holtz (1957). The results of their findings are shown in Figure 13.10. As an example, one can see that at $D_r \approx 80\%$, the standard penetration number is about 12 with $\sigma' = 0$ lb/ft^2. It increases to about 50 with $\sigma' = 40$ lb/in.^{2} (276 kN/m^2). For that reason, it is necessary to convert the standard penetration numbers obtained at various depths to reflect a constant effective overburden pressure. Peck, Hanson, and Thornburn (1974) proposed the following empirical correlation for converting the field standard penetration number to an effective overburden pressure of $\sigma' = 1$ ton/ft^2 (95.6 kN/m^2).

$$N' = C_N N_F = 0.77 N_F \log\left(\frac{20}{\sigma'}\right) \quad (\text{for } \sigma' > 0.25 \text{ ton/ft}^2) \tag{13.6}$$

where

N' = corrected standard penetration number
N_F = field standard penetration number
C_N = correction factor

The unit of σ' is in ton/ft^2.

In SI units, the preceding equation can be expressed as

$$N' = 0.77 N_F \log\left(\frac{20}{0.0105\,\sigma'}\right) \quad (\text{for } \sigma' > 23.9 \text{ kN/m}^2) \tag{13.7}$$

The unit of σ' in Eq. (13.7) is in kN/m^2.

Source: B. Das "Principle of Geotech. Engineering" 1985

Table 13.3 Approximate Relation Between Corrected Standard Penetration Number, Angle of Friction, and Relative Density of Sand

Corrected standard penetration number, N	Relative density, D_r (%)	Angle of friction, ϕ (degrees)
0–5	0–5	26–30
5–10	5–30	28–35
10–30	30–60	35–42
30–50	60–95	38–46

Blow Counts vs Relative Density (DR) Sands

The standard penetration number is a very useful guideline in soil exploration and assessment of subsoil conditions, provided that the results are interpreted correctly. Note that all equations and correlations relating to the standard penetration numbers are approximate. Since soil is not homogeneous, a wide variation in the N-value may be obtained in the field. In soil deposits

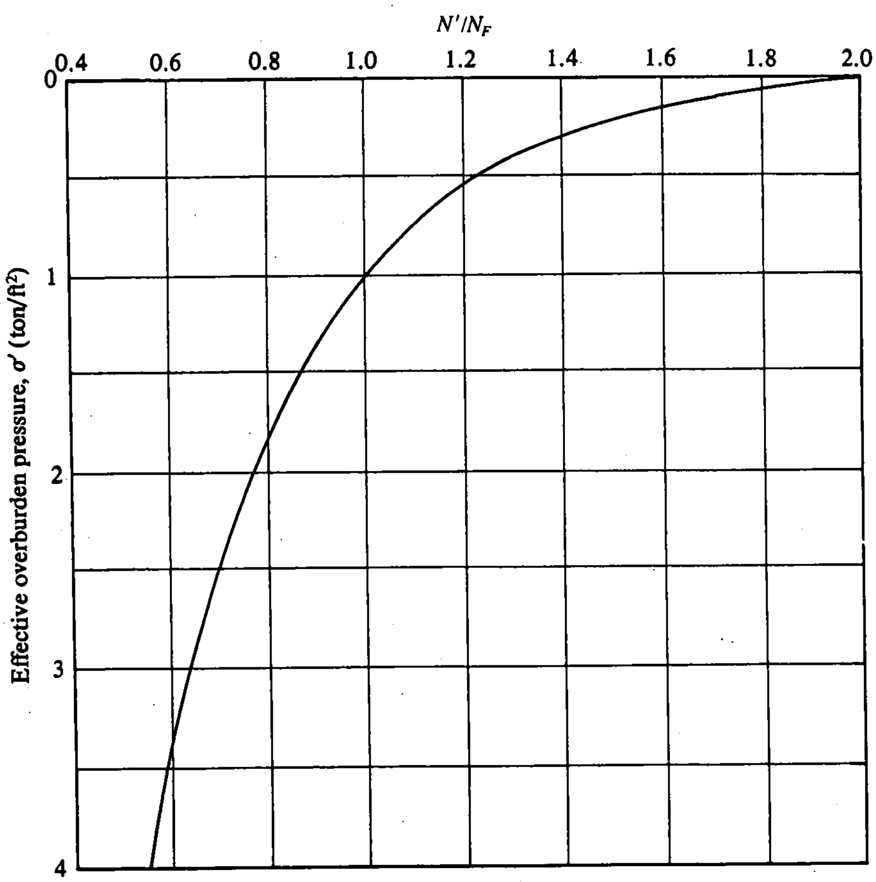


Figure 13.11 Variation of N'/N_F with vertical effective stress, σ' (after Peck, Hanson, and Thornburn, 1974)

Soil Mechanics

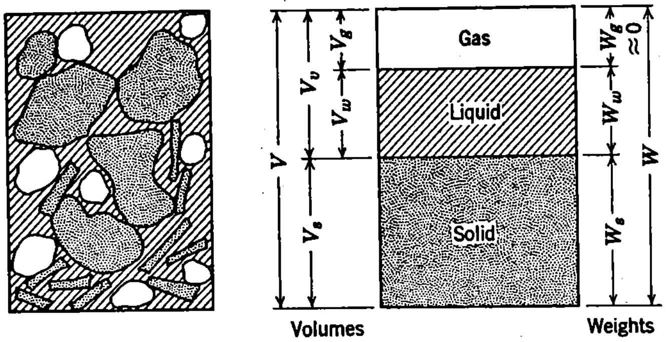
T. William Lambe • Robert V. Whitman

Massachusetts Institute of Technology

1969

JOHN WILEY & SONS, New York • Chichester • Brisbane • Toronto • Singapore

Source: T. Lambe R. Whitman
"Soil Mechanics" 1969



(a) (b)

Fig. 3.1 Relationships among soil phases. (a) Element of natural soil. (b) Element separated into phases.

Volume

Porosity:

$$n = \frac{V_v}{V} \times 100 = \%$$

Void ratio:

$$e = \frac{V_v}{V_s}$$

Degree of saturation:

$$S = \frac{V_w}{V_v} \times 100 = \%$$

$$n = \frac{e}{1 + e}; \qquad e = \frac{n}{1 - n}$$

Weight

Water content:

$$w = \frac{W_w}{W_s} \times 100 = \%$$

Specific Gravity

Mass:

$$G_m = \frac{\gamma_t}{\gamma_0}$$

Water:

$$G_w = \frac{\gamma_w}{\gamma_0}$$

Solids:

$$G = \frac{\gamma_s}{\gamma_0}$$

γ_0 = Unit weight of water at 4°C $\approx \gamma_w$

Note that $Gw = Se$ $\quad Se = \frac{V_w}{V_v} \cdot \frac{V_v}{V_s} = \frac{V_w}{V_s}$

$$Gw = \frac{\gamma_s}{\gamma_0} \cdot \frac{W_w}{W_s} = \frac{W_w}{\gamma_0} \cdot \left(\frac{1}{\frac{W_s}{\gamma_s}}\right) = \frac{V_w}{V_s}$$

Unit Weight

Total:

$$\gamma_t = \frac{W}{V} = \frac{G + Se}{1 + e}\gamma_w = \frac{1 + w}{1 + e}G\gamma_w$$

Solids:

$$\gamma_s = \frac{W_s}{V_s}$$

Water:

$$\gamma_w = \frac{W_w}{V_w}$$

Dry:

$$\gamma_d = \frac{W_s}{V} = \frac{G}{1 + e}\gamma_w = \frac{G\gamma_w}{1 + wG/S} = \frac{\gamma_t}{1 + w}$$

Submerged (buoyant): "Effective"

$$\gamma_b = \gamma_t - \gamma_w = \frac{G - 1 - e(1 - S)}{1 + e}\gamma_w$$

Submerged (saturated soil):

$$\gamma_b = \gamma_t - \gamma_w = \frac{G - 1}{1 + e}\gamma_w$$

Specific gravity is the unit weight divided by the unit weight of water. Values of specific gravity of solids G for a selected group of minerals[3] are given in Table 3.1.

Table 3.1 Specific Gravities of Minerals

Quartz	2.65
K-Feldspars	2.54–2.57
Na–Ca-Feldspars	2.62–2.76
Calcite	2.72
Dolomite	2.85
Muscovite	2.7–3.1
Biotite	2.8–3.2
Chlorite	2.6–2.9
Pyrophyllite	2.84
Serpentine	2.2–2.7
Kaolinite	2.61[a]
	2.64 ± 0.02
Halloysite (2 H_2O)	2.55
Illite	2.84[a]
	2.60–2.86
Montmorillonite	2.74[a]
	2.75–2.78
Attapulgite	2.30

[a] Calculated from crystal structure.

The expression $Gw = Se$ is useful to check computations of the various relationships.

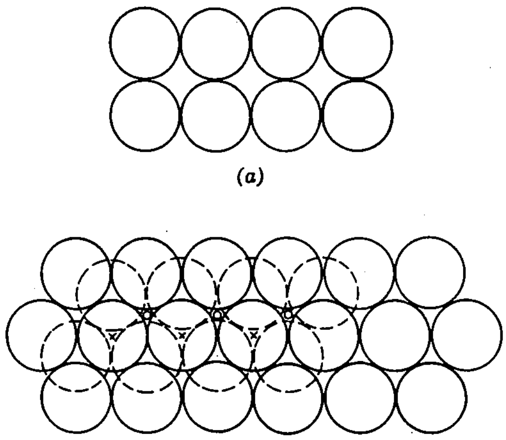
The student in soil mechanics must understand the meanings of the relationships in Fig. 3.1, convince himself once and for all that they are correct, and add these terms to his active vocabulary. These relationships are basic to most computations in soil mechanics and thus are an essential part of soil mechanics.

Typical Values of Phase Relationships for Granular Soils

Figure 3.2 shows two of the many possible ways that a system of equal-sized spheres can be packed. The dense packings represent the densest possible state for such a system. Looser systems than the simple cubic packing can be obtained by carefully constructing arches within the packing, but the simple cubic packing is the loosest of the stable arrangements. The void ratio and porosity of

[3] Chapter 4 discusses the common soil minerals.

Source: T. Lambe R. Whitman "Soil Mechanics" 1969



(a) (b)

Fig. 3.2 Arrangements of uniform spheres. (a) Plan and elevation view: simple cubic packing. (b) Plan view: dense packing. Solid circles, first layer; dashed circles, second layer; ∘, location of sphere centers in third layer: face-centered cubic array; ×, location of sphere centers in third layer: close-packed hexagonal array. (From Deresiewicz, 1958.)

these simple packings can be computed from the geometry of the packings, and the results are given in Table 3.2.

This table also gives densities for some typical granular soils in both the "dense" and "loose" states. A variety of tests have been proposed to measure the maximum and

Table 3.2 Maximum and Minimum Densities for Granular Soils

	Void Ratio		Porosity (%)		Dry Unit Weight (pcf)	
Description	e_{max}	e_{min}	n_{max}	n_{min}	$\gamma_{d\,min}$	$\gamma_{d\,max}$
Uniform spheres	0.92	0.35	47.6	26.0	—	—
Standard Ottawa sand	0.80	0.50	44	33	92	110
SW Clean uniform sand	1.0	0.40	50	29	83	118
Uniform inorganic silt	1.1	0.40	52	29	80	118
SM/SC Silty sand	0.90	0.30	47	23	87	127
SP Fine to coarse sand	0.95	0.20	49	17	85	138
Micaceous sand	1.2	0.40	55	29	76	120
Silty sand and gravel	0.85	0.14	46	12	89	146

minimum void ratios (Kolbuszewski, 1948). The test to determine the maximum density usually involves some form of vibration. The test to determine minimum density usually involves pouring oven-dried soil into a container. Unfortunately, the details of these tests have not been entirely standardized, and values of the maximum density and minimum density for a given granular soil depend on the procedure used to determine them. By using special measures, one can obtain densities greater than the so-called maximum density. Densities considerably less than the so-called minimum density can be obtained, especially with very fine sands and silts, by slowly sedimenting the soil into water or by fluffing the soil with just a little moisture present.

The smaller the range of particle sizes present (i.e., the more nearly uniform the soil), the smaller the particles, and the more angular the particles, the smaller the minimum density (i.e., the greater the opportunity for building a loose arrangement of particles). The greater the range of particle sizes present, the greater the maximum density (i.e., the voids among the larger particles can be filled with smaller particles).

A useful way to characterize the density of a natural granular soil is with relative density D_r, defined as

$$D_r = \frac{e_{max} - e}{e_{max} - e_{min}} \times 100\%$$

$$= \frac{\gamma_{d\,max}}{\gamma_d} \times \frac{\gamma_d - \gamma_{d\,min}}{\gamma_{d\,max} - \gamma_{d\,min}} \times 100\% \qquad (3.1)$$

where

e_{min} = void ratio of soil in densest condition
e_{max} = void ratio of soil in loosest condition
e = in-place void ratio
$\gamma_{d\,max}$ = dry unit weight of soil in densest condition
$\gamma_{d\,min}$ = dry unit weight of soil in loosest condition
γ_d = in-place dry unit weight

Table 3.3 characterizes the density of granular soils on the basis of relative density.

Table 3.3 Density Description

Relative Density (%)	Descriptive Term
0–15	Very loose
15–35	Loose
35–65	Medium
65–85	Dense
85–100	Very dense

MOISTURE TEST

$\omega = \frac{M_s}{M_w}$

Values of water content for natural granular soils vary from less than 0.1% for air-dry sands to more than 40% for saturated, loose sand.

Typical Values of Phase Relationships for Cohesive Soils

The range of values of phase relationships for cohesive soils is much larger than for granular soils. Saturated sodium montmorillonite at low confining pressure can exist at a void ratio of more than 25; saturated clays

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BASIC SOILS ENGINEERING

B. K. HOUGH

SECOND EDITION

References for Settlement

THE RONALD PRESS COMPANY • NEW YORK

ditions, the slope of the recompression diagram gives a more realistic indication of the compressibility of the formation than the slope of the virgin curve. One would then represent in the diagram the anticipated load increment Δp and establish the prospective change in void ratio as the difference between the values of e_1 and e_2. For these conditions, the change in thickness of a compressible soil layer would be calculated by substitution of these values in Eq. (5-4).

5-14. LIMITATIONS OF COMPRESSION TESTING

In order to evaluate the compression index of soil in the manner described above, suitable specimens must be obtained or prepared and one or more laboratory compression tests must be conducted. In most cases, undisturbed specimens are considered necessary. Because of the limitations of present-day sampling equipment, however, especially the equipment in the hands of most contract drillers, it is for all practical purposes impossible to obtain undisturbed samples except in stone-free clay and silt formations. Testing equipment is at present also similarly limited to use with these particular soil types. Thus there remains the problem of establishing the compression index or some similar parameter for mixed soils containing significant amounts of gravel or stone fragments as well as clay or silt, and for cohesionless formations in general. There has been some tendency in the past to dismiss this problem with the assertion that the last-mentioned soil types are relatively incompressible. While this is true in certain cases (as with hardpan or dense sand and gravel formations), there are many occasions when the problem cannot be thus dismissed. The fact is that *all* particulate materials are compressible to some degree. Some fine-grained cohesionless soil formations, especially those containing significant amounts of mica or organic matter, for example, are considerably more compressible than certain clays while many others are at least equally compressible. Furthermore, with unusual combinations of loading and settlement limitations,[12] the compressibility of even the most compact sand and gravel formation or compacted fill may become a matter of practical importance.

Perhaps the most important consideration, however, is that what is known as the *allowable bearing capacity* of soil formations for support of spread foundations is directly related to soil compressibility. Evaluation of bearing capacity, which is an essential preliminary step in the design of spread foundations (footings in particular), cannot be accom-

[12] See *Jour. Soil Mech. & Fdns. Div.*, ASCE, April 1960, discussion by Lev Zetlin of paper by B. K. Hough, "Compressibility as the Basis for Soil Bearing Value."

plished except by the most empirical procedures, unless the compressibility of the bearing materials is known at least approximately; this is true whether the soil happens to be stoney or stone-free.

An alternative to use of data from conventional compression tests for evaluating the compression index is therefore an evident necessity in many cases. Even with stone-free, cohesive materials, some alternative is often desirable since there are many occasions when preliminary settlement estimates or bearing capacity evaluations must be made before laboratory testing programs can be completed or even initiated. The following section deals with one such alternative.

Compression Index as a Function of Initial Density

5-15. SUPPORTING EVIDENCE AND DEVELOPMENT OF RELATIONSHIP

Virgin compression curves and typical C_c values for specimens of many different types of soil are presented in Fig. 5-11. Some of the specimens were undisturbed (U); some remolded (R). Examination of the converging pattern of these curves clearly indicates that, in a general way, compressibility varies with initial void ratio; the looser the specimen initially, the more compressible it is over any given loading range, and vice versa.

The nature of the relationship between the compression index, C_c, and no-load void ratio, e_0, for certain types of material can be established by conducting tests on remolded specimens prepared at densities which vary over a significant range. It is then possible to plot C_c as a function of e_0. In Fig. 5-12, curves plotted on this basis for remolded specimens of four different types of sand are presented. For each individual type and within the range of densities characteristic of the type, the relationship appears to be approximately linear. When this is true, the relationship may be expressed by the equation

$$C_c = a(e_0 - b) \tag{5-7}$$

In Eq. (5-7), the terms C_c and e_0 are the dependent variables, the terms a and b constants for a particular soil type. From presently available information it appears that the term a, which represents the slope of a given diagram, is dependent chiefly on particle shape, size, and gradation. The term b, the value of the intercept on the X-axis, is apparently a close approximation of the minimum void ratio of the material. Values of a and b for the sand specimens represented in Fig. 5-12 are given in the figure and values for other materials are given in a later section.

Similar soils.

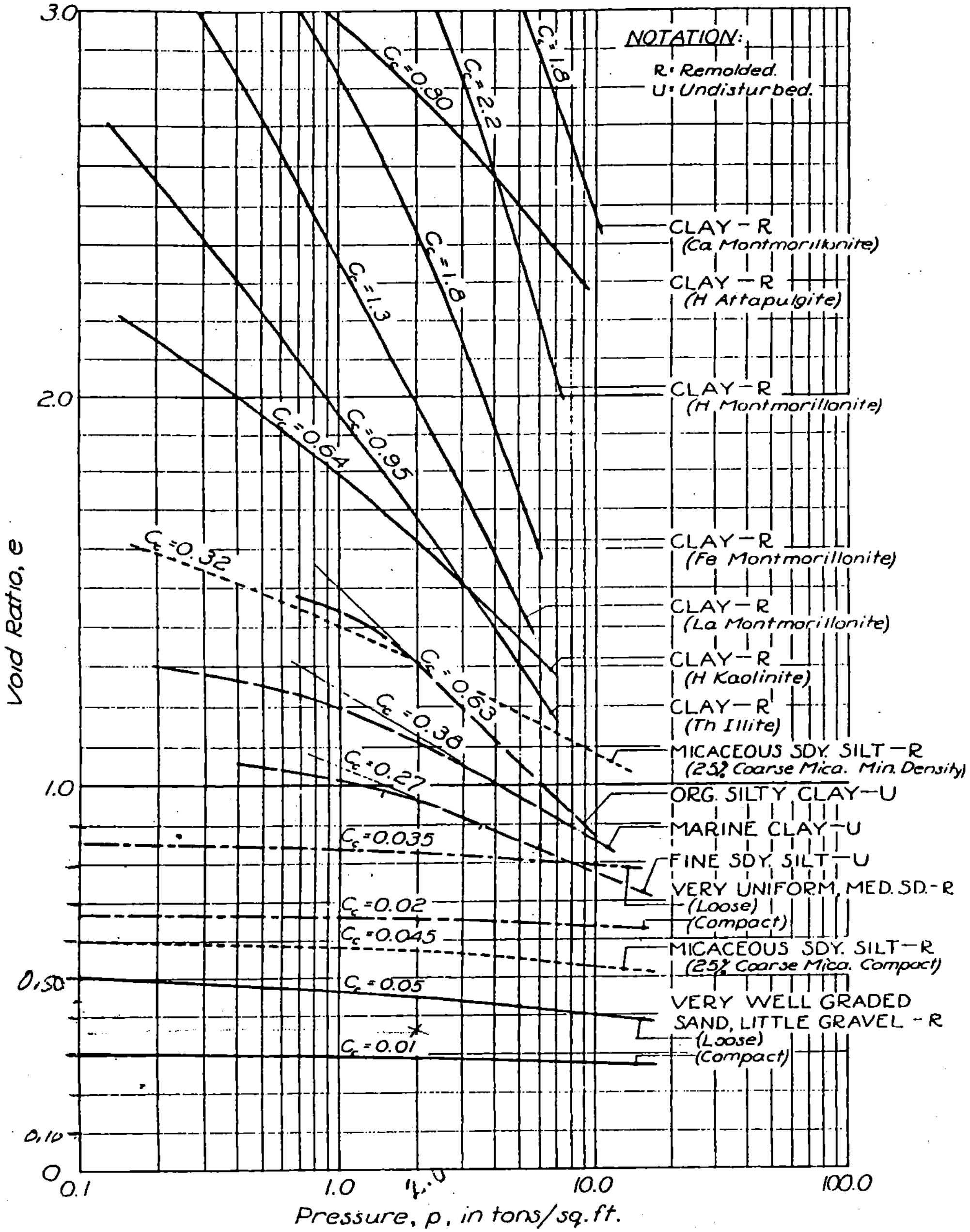


Fig. 5–11. Variation in slope of p-e curves with initial void ratio.

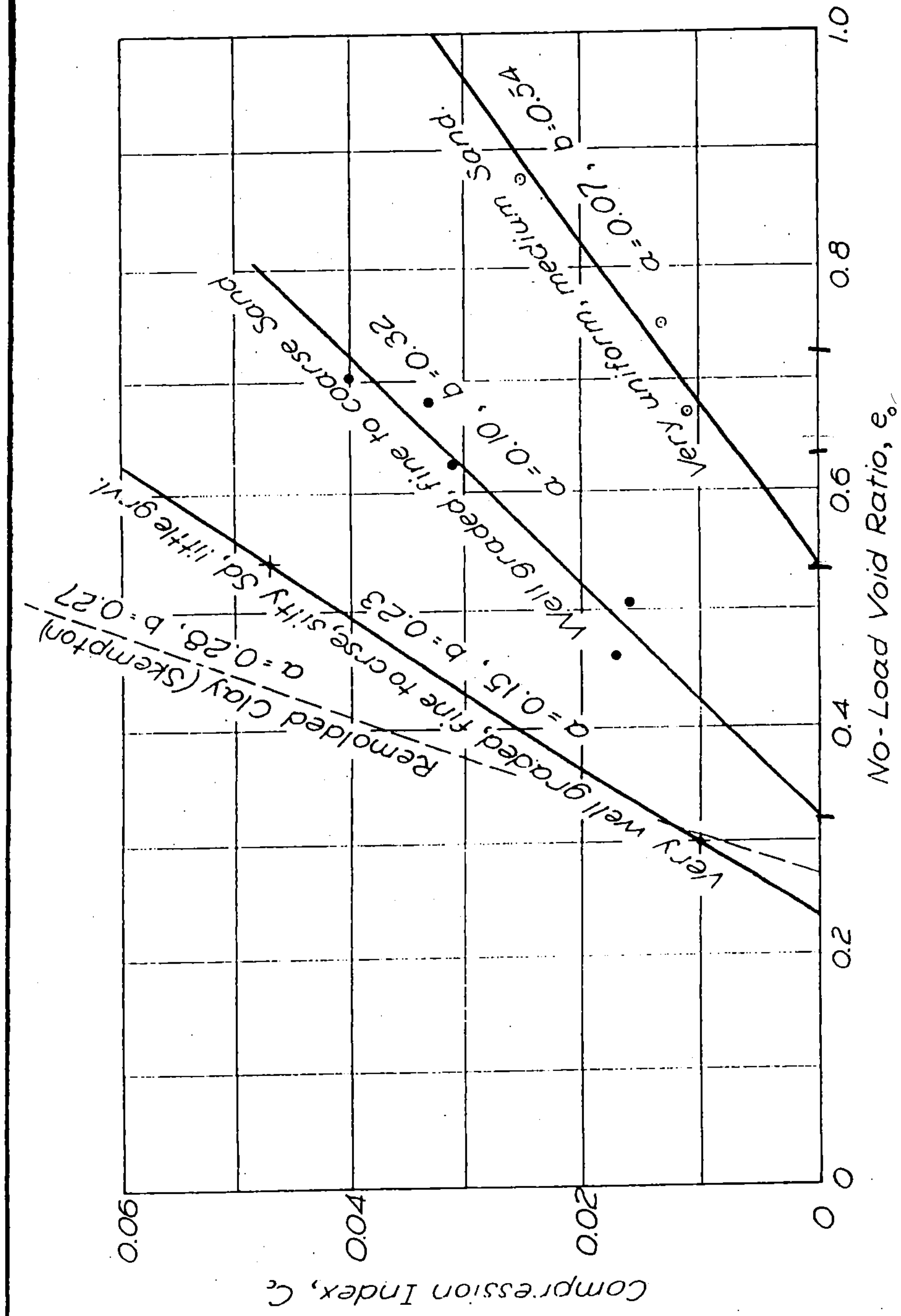


Fig. 12. Variation of C_c with no-load void ratio, e_o.

values 0.285 and 0.270, respectively; a curve plotted on this basis is included in Fig. 5-12 for comparative purposes.

Values of the constants a and b of Eq. (5–7) obtained from tests on laboratory prepared specimens of many different soil types, including those described above, are summarized in Table 5–1. The values given

TABLE 5–1
Values of the Constants of Equation (5–7) for Typical Materials

	Type of Soil	Value of Constant a	Value of Constant b*
	Uniform cohesionless material ($C_u \leq 2$)		
	Clean gravel	0.05	0.50
	Coarse sand	0.06	0.50
SP	Medium sand	0.07	0.50
	Fine sand	0.08	0.50
	Inorganic silt	0.10	0.50
	Well-graded, cohesionless soil		
SP/SM	Silty sand and gravel	0.09	0.20
	Clean, coarse to fine sand	0.12	0.35
SM	Coarse to fine silty sand	0.15	0.25
SC	Sandy silt (inorganic)	0.18 (0.23)	0.25
	Inorganic, cohesive soil		
CL	Silt, some clay; silty clay; clay	0.29	0.27
	Organic, fine-grained soil		
	Organic silt, little clay	0.35	0.50

* The value of the constant b should be taken as e_{min} whenever the latter is known or can conveniently be determined. Otherwise, use tabulated values as a rough approximation.

for materials such as sand and gravel, which are too coarse for testing in consolidometers of conventional size, represent assumptions based on study of available settlement records.

5–16. GENERALIZATIONS AS TO COMPRESSIBILITY

Before describing procedures for utilizing Eq. (5–7) for evaluation of the compression index in practical applications, it may be instructive to consider certain general aspects of compressibility which are evident from the discussion which has thus far been presented. These generalities may be stated in the following manner.

At a given void ratio, a (confined) *uniform* material is less compressible than one which is well graded.

Considering (confined) uniform materials at a given void ratio, the fine[illegible] particle size, the more compressible is the material.

Soils in general with bulky, angular, or rounded particles are less compressible than those with flat particles.

Clays with needle-shaped particles, such as attapulgite (and to a lesser degree, halloysite), are less compressible than those with plate-shaped particles, montmorillonite (plate-shaped particles plus expanding lattice) in particular.

Materials of any given type which include significant amounts of mica and/or organic matter are more (sometimes considerably more) compressible than those of the same type which do not.

As an overall generalization, the greater its void ratio prior to loading, the greater is the compressibility of any given soil type; and vice versa.[15]

5–17. INITIAL DENSITY OF SOIL FORMATIONS

It is evident that information on the original, "no-load" void ratio of a formation must be available if the C_c, e_0 relationship is to be used directly for estimating soil compressibility. A rather general impression apparently exists to the effect that sedimentary formations, at least, are laid down initially in a condition approximating their maximum void ratio. Skempton's work suggests that this is true in the case of fine-grained sedimentary formations, clay in particular. Coupled with this belief is the assumption that the present, in-place condition of such formations is entirely the result of loading subsequent to deposition. If these assumptions could be completely accepted, the value e_{max} could be substituted for e_0 in Eq. (5–7) and application of the equation would be greatly simplified.

Unfortunately, there are many reasons for doubting the general applicability of such assumptions as the above. For example, in a texturally uniform deposit of fine-grained sand or silt, if these assumptions were valid, the void ratio of the material would steadily decrease with depth and at any given depth would have the same value at points which laterally are some distance apart. The finding of such a condition in a natural formation, however, is very much more the exception than the rule. In many cases, void ratio varies quite unpredictably both laterally and with depth. Most surprising to the layman, perhaps, is the finding that void ratio often *increases* with depth, loose sand layers being found beneath more compact surface layers and soft clay intervals underlying stiff clay.

The construction of compression diagrams based on use of the C_c, e_0 relationship in the manner described in the next section is often helpful

[15] This, of course, is the justification for the expenditure of [illegible]siderable sums of money to compact both earth fills and natural soil formations [illegible] to loading.

sion index without recourse to undisturbed sampling and laboratory testing.

Field Compression Diagrams

5–18. DEFINITION

As the term is used in this book, a field compression diagram is a pressure-void ratio curve originating at or passing through a point which represents the in-place density of an element in a natural soil formation or earth fill and the existing overburden pressure.

5–19. CONSTRUCTION AND UTILIZATION

The recommended construction should be performed on semilog paper with pressure and void ratio scales appropriate to the conditions of the problem. The void ratio scale should cover the range from e_{max} to e_{min} for the material in question. For the pressure scale, it is usually sufficient to make provision for two logarithmic cycles ranging from 0.1 to 1.0 and from 1.0 to 10.0 tons per sq. ft., respectively.

A pressure-void ratio curve originating at $e = e_{max}$ and $p = 0.1$ ton per sq. ft. is then constructed as shown in Fig. 5–14, by utilization of the relationship,

$$C_c = a(e_{max} - b)$$

For clay soils, e_{max} can be taken as the void ratio at the liquid limit. For other soil types, an indication of e_{max} can be obtained by reference to Table 2–3 or by test on representative material. Although of less practical importance, it may be of interest to draw a second diagram, originating at e_{min}. The latter may be assumed to be a horizontal line.

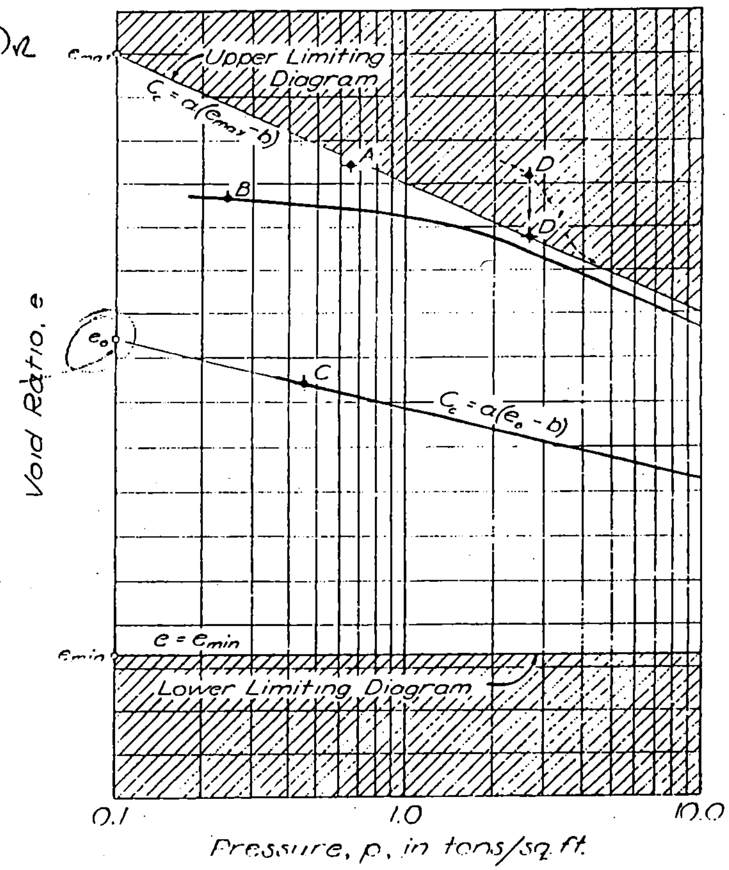
The two diagrams described above establish limits on the area within which a point representing the in-place condition of the soil will fall except in a very few cases, which are mentioned later. Points A, B, and C in Fig. 5–14 represent examples of in-place condition points for ordinary situations.

If a plotting of the in-place void ratio and overburden pressure for a soil element of any type results in a point such as point A, close to the uppermost limiting diagram, it may reasonably be assumed that the material was laid down in an approximation of its loosest condition and that the subsequent reduction in void ratio was due entirely to weight of present overburden. If the soil is a cohesive type it would to obtain an approximation of the compression index for this material.

If the soil is a clay which is in such a condition that the in-place void ratio and pressure plot at point B, it should be presumed, initially at least, that it is precompressed and that the field compression diagram will resemble that shown by the full line diagram through B in Fig. 5–14. This plotting provides a reasonable basis for recommending a program of undisturbed sampling and laboratory testing even though greater than ordinary expense may be involved.

0% Dr

In Place



100% Relative Density

Fig. 5–14. Illustration of procedure for constructing field compression diagrams.

SOIL PROPERTIES

Estimated Soil Properties
Hardee County Landfill

SPT N values 10 of (approx)

Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.3	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	96	pcf
Dr computed	0.30	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.72	
Dr computed	0.30	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	120.4	pcf (saturated) ← Soils w/ SPT N ~10
(assumes pore space filled with water)		

SPT N values of 20 (approx)

Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.45	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	101.5	pcf
Dr computed	0.45	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.63	
Dr computed	0.45	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	123.7	pcf (saturated) ← Soils w/ SPT N ~20
(assumes pore space filled with water)		

SPT N values 30 of (approx)

Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.6	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	107.4	pcf
Dr computed	0.60	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.54	
Dr computed	0.60	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	127.2	pcf (saturated) ← Soils w/ SPT N ~ 30
(assumes pore space filled with water)		

SPT N values 40 to greater than 50 of (approx)

Soil Type	SM/SC	Silty sands and clayey sands
Dr (target)	0.95	Target Relative Density
Density min (dry)	87	pcf
Density max (dry)	127	pcf
Density initial (dry)	124	pcf
Dr computed	0.95	Computed Relative Density
Void Ratio max	0.9	
Void Ratio min	0.3	
Void Ratio init	0.33	
Dr computed	0.95	Computed Relative Density
Degree of Saturation	1	Pore space fully sat. @ Relative Density
Specific Gravity soil	2.6	
Density (sat)	137.5	pcf (saturated) ← Soils w/ SPT N ~ 40 → GREATER
(assumes pore space filled with water)		

f:/projects/hardee/09199033.09/geo/soilprop.xls

ESTIMATED INITIAL MOISTURE CONTENT OF BALE/LOOSE WASTE

Estimated Waste Properties Moisture Content
Moisture Content & Waste Density
Hardee County Landfill

	% Total	Wet (tons)	% Moisture	Dry (tons)	Ref. Waste (See Note 2)
Metals	24	3,197.0	3.0	3,103.9	Other Metal
Plastic	4	532.8	2.0	522.4	Plastic
Other Paper	13	1,731.7	5.0	1,649.2	Carboard
Misc	28	3,729.8	25.0	2,983.8	
Newspaper	2	266.4	6.0	251.3	Paper
Glass	3	399.6	2.0	391.8	Glass
Yard Trash	8			0.0	
Tires	1			0.0	
C&D	8	1,065.7	15.0	926.7	Rubbish
Food Waste	7	932.5	70.0	548.5	Food Waste
Textile	2	266.4	10.0	242.2	Textile
	100	12,121.9		10,619.8	

Total Tons	18,501.0 tons	Landfill	72.0% See Note 1
Landfill	13,320.7 tons	Recycled	28.0%
Recycled	5,180.3 tons		

BALE WEIGHT = 2150 lbs
BALE VOLUME = 2.6'x3.8'x5.1' = 50.388 ft³
BALE DENSITY = 42.67 lb/ft³

Percent Moisture		**Waste Density**	
Wet	12,121.9 Tons	Wet	42.67 pcf
Dry	10,619.8 Tons	Moisture	12.39 %
Moisture	12.4 %	Dry	37.97 pcf

ESTIMATED INITIAL MOISTURE

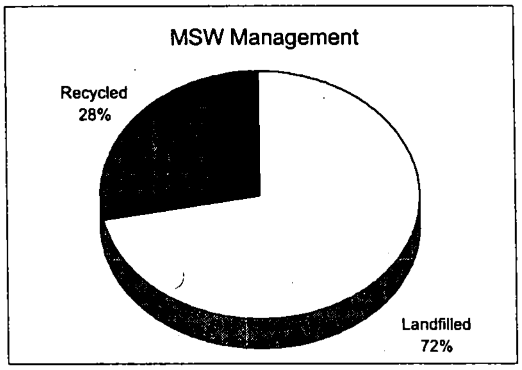
ESTIMATED UNIT WEIGHT OF SOLIDS

Note
1) Source: Waste Composition - FDEP "Solid Waste Management in Florida 2000-2001"
2) Source: Waste Moisture Contents - "Intergrated Solid Waste Management"
1993 ed Chapter 4 ISBN 0-07-063237-5

MOISTURE CONTENT $= \omega = \left(\frac{\text{WET} - \text{dry}}{\text{WET}}\right) \times 100$
(SOURCE: SEE NOTE 2)

Hardee County
(Jan. 1, 1999 - Dec. 31, 1999)

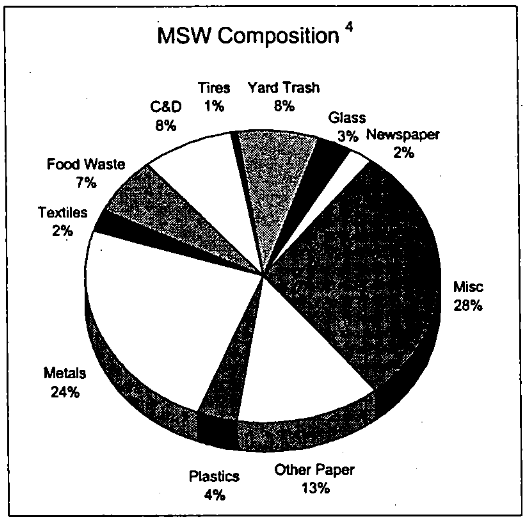
1. Population [1]	22,594
2. MSW Management (tons) [2]	
A. Landfilled	13,324
B. Combusted	0
C. Recycled	5,177
D. Total	18,501
E. Total Pounds per Capita Per Day [1]	4.49



3. MSW Collected & Recycled

A. Minimum Five Wastes [3]	Collected (tons)	Recycled (%)
1. Newspaper	412	19
2. Glass	541	9
3. Aluminum Cans	320	20
4. Plastic Bottles	312	0
5. Steel Cans	392	0

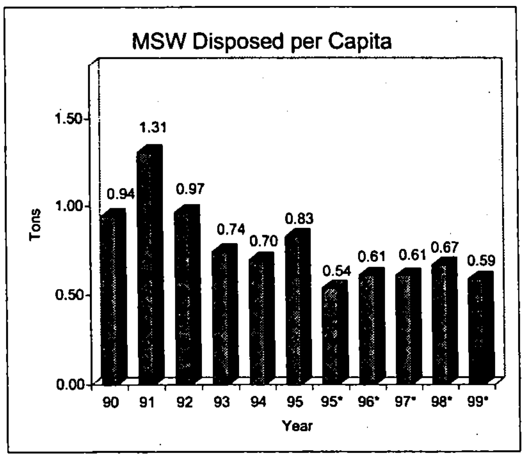
B. Special Wastes [5]	Collected (tons)	Recycled (%)
1. C&D Debris	1,519	0
2. Yard Trash	1,399	100
3. White Goods	465	100
4. Tires	96	100
5. Process Fuel	0	0
C. Other Wastes	13,045	23
D. Total Recycling Rate (%)		28
E. Adjusted Recycling Rate (%) [5,6]		28



F. Waste Reduction Per Capita (%)
(A negative number indicates an increase in the MSW disposal rate per capita.)

1. Base Year: July 1988-June 1989	63
2. Base Year: July 1989-June 1990	37
3. Base Year: July 1990-June 1991	55
4. Base Year: July 1991-June 1992	39
5. Base Year: July 1992-June 1993	21
6. Base Year: July 1993-June 1994	16

G. Participation in Recycling [7]	Units	Percent [8]
1. Single-family Curbside	10,174	10
2. Multi-family Curbside [9]	640	3
3. Commercial [10]	882	
a) Scheduled collection		34
b) On call collection		0



[1] Official1999 Governor's Office estimate.
[2] From 2000 - 2001 Recycling and Education grant applications.
[3] The Legislature established a goal of 50 percent for each material by the end of 1994.
[4] Some materials have been combined: Metals include Aluminum Cans, Steel Cans, Ferrous and Non-ferrous metals, and White Goods; Other Paper includes Corrugated, Office and Other Paper; and Plastics include Plastic Bottles and Other Plastics.
[5] The total of Special Wastes can count towards no more than one half of the recycling goal for each county.
[6] The legislature established a goal of 30 percent by the end of 1994 for all counties with a population of over 75,000.
[7] Participation means availability and usage of recycling services (As of June 1999).
[8] Percentage of total county units (single/multi-family dwellings and commercial establishments) participating in recycling.
[9] Includes apartments, condominiums and others.
[10] May also include government and institutional.
* Calendar year data.

FDEP
1/30/2003

SOURCE: FDEP "Solid Waste Management in Florida 2000-2001"
http://www.fdep.state.fl.us/waste/categories/recycling

INTEGRATED SOLID WASTE MANAGEMENT
Engineering Principles and Management Issues

1993 Edition

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referred to in the solid waste literature incorrectly as density. In U.S. customary units density is expressed correctly as slug/ft^3.) Because the specific weight of MSW is often reported as *loose, as found in containers, uncompacted, compacted*, and the like, the basis used for the reported values should always be noted. Specific weight data are often needed to assess the total mass and volume of waste that must be managed. Unfortunately, there is little or no uniformity in the way solid waste specific weights have been reported in the literature. Frequently, no distinction has been made between uncompacted or compacted specific weights. Typical specific weights for various wastes as found in containers, compacted, or uncompacted are reported in Table 4-1.

TABLE 4-1
Typical specific weight and moisture content data for residential, commercial, industrial, and agricultural wastes

	Specific weight, lb/yd^3		Moisture content, % by weight	
Type of waste	Range	Typical	Range	Typical
Residential (uncompacted)				
Food wastes (mixed)	220–810	490	50–80	70
Paper	70–220	150	4–10	6
Cardboard	70–135	85	4–8	5
Plastics	70–220	110	1–4	2
Textiles	70–170	110	6–15	10
Rubber	170–340	220	1–4	2
Leather	170–440	270	8–12	10
Yard wastes	100–380	170	30–80	60
Wood	220–540	400	15–40	20
Glass	270–810	330	1–4	2
Tin cans	85–270	150	2–4	3
Aluminum	110–405	270	2–4	2
Other metals	220–1940	540	2–4	3
Dirt, ashes, etc.	540–1685	810	6–12	8
Ashes	1095–1400	1255	6–12	6
Rubbish	150–305	220	5–20	15
Residential yard wastes				
Leaves (loose and dry)	50–250	100	20–40	30
Green grass (loose and moist)	350–500	400	40–80	60
Green grass (wet and compacted)	1000–1400	1000	50–90	80
Yard waste (shredded)	450–600	500	20–70	50
Yard waste (composted)	450–650	550	40–60	50
Municipal				
In compactor truck	300–760	500	15–40	20
In landfill				
Normally compacted	610–840	760	15–40	25
Well compacted	995–1250	1010	15–40	25
Commercial				
Food wastes (wet)	800–1600	910	50–80	70
Appliances	250–340	305	0–2	1

(continued)

COMPOSITE UNIT WEIGHT OF WASTE ESTIMATES

Estimated Composite Waste & Soil & Water Weight
Hardee County Landfill

	WASTE & DAILY & WATER					CLOSURE CAP & INTERMEDIATE & DRAINAGE SAND					
	Height (ft)	Dry (pcf)	Moisture (%)	Total (pcf)	Stress (psf)		Height (ft)	Dry (pcf)	Moisture (%)	Total (pcf)	Stress (psf)
Closure Cap	--	--	--	--	--	--	2.0	112.1	10.5	123.9	247.7
Intermed	--	--	--	--	--	--	1.5	112.1	10.5	123.9	185.8
waste	6.5	38.0	40.0	53.1	345.5						
daily	0.5	112.1	10.5	123.87	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
daily	0.5	112.1	10.5	123.9	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
daily	0.5	112.1	10.5	123.9	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
daily	0.5	112.1	10.5	123.9	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
daily	0.5	112.1	10.5	123.9	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
daily	0.5	112.1	10.5	123.9	61.9						
waste	10.0	38.0	40.0	53.1	531.5						
Drain Sand	--	--	--	--	--	--	2.0	112.1	10.5	123.9	247.7
	69.5 ft				3905.9 psf		5.5 ft				681.3 psf

Total Height	69.5 ft (Daily+waste)	Total Stress	3905.9 psf (Daily+waste)
	5.5 ft (Cap,Intermed,Sand)		681.3 psf (Cap, Intermed,Sand)
	75.0 ft (Bottom to Final Cap)		4587.2 psf (Bottom to Final Cap)

Soil		**Initial Waste**	
Dry Weight	112.1 pcf	Dry Weight	38.0 pcf
Moisture	10.5 %	Moisture	12.4 %
Total Weight	123.9 pcf	Total Weight	42.7 pcf

Composite Unit Weight
Daily Cover + Waste + Moisture

Total Stress	3905.9 psf
Height	69.5 ft
Comp. Weight	56.2 lb/ft^3

CONSERVATIVELY USE $\gamma_{WASTE} = 60$ pcf

SETTLEMENT CALCULATIONS POINTS

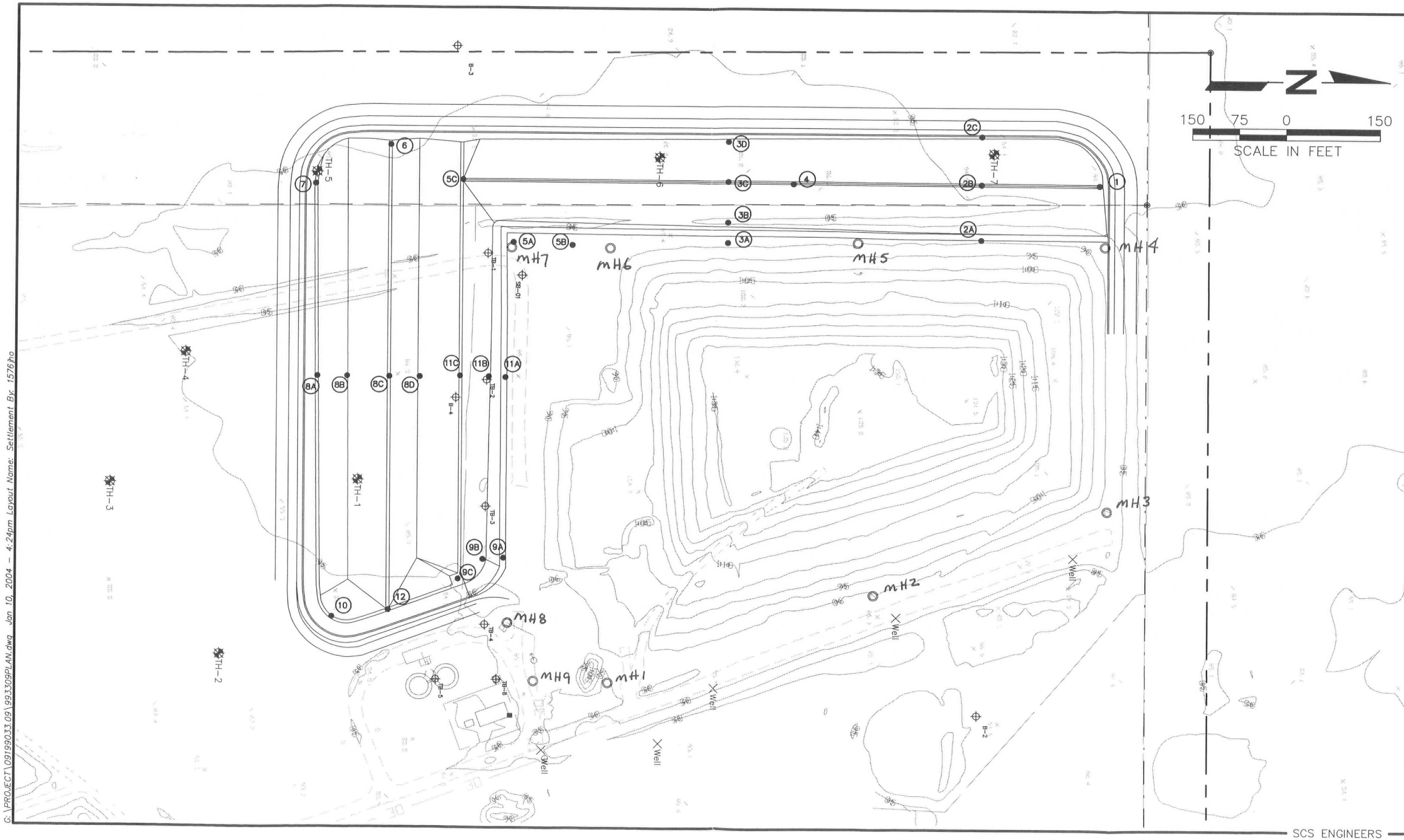


Figure 1 – Settlement Calculation Points w/ Bottom Layout, Hardee County Landfill Expansion

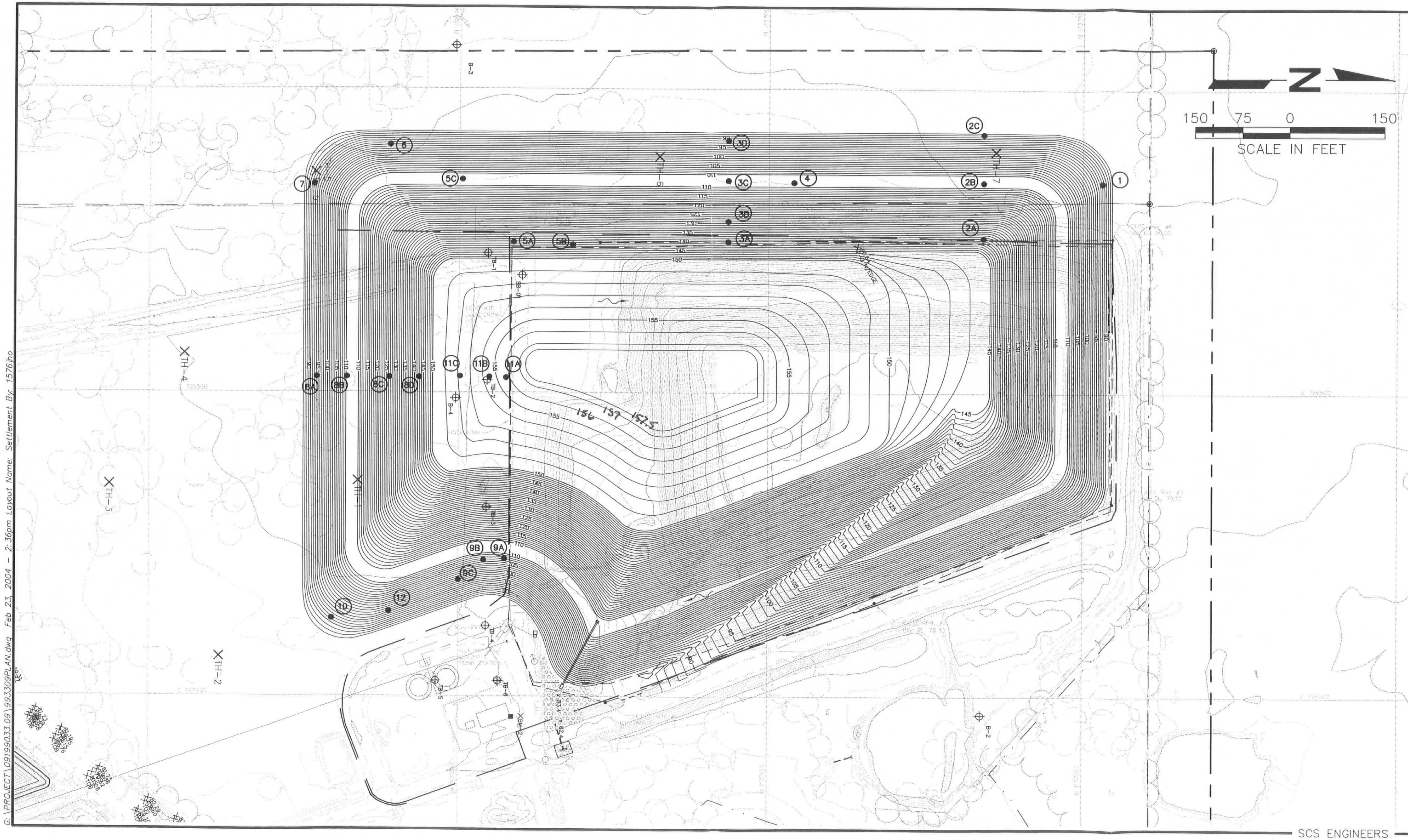


Figure 1 – Settlement Calculation Points w/ Bottom Layout, Hardee County Landfill Expansion

FOUNDATION SOIL STRESS CALCULATIONS

HARDL OUNTY
ESTIMATED STRESS

Point 1

Initial Stress Conditions
(Use Boring TH-7 PSI 2003)

Ground Surface	84.2
Water Table	77.4

Buildout Stress Conditions

Final Closure Elev	94	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	92	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	84.2	Waste/Daily	4.3 ft	60.0 pcf	258.0 psf
Depth	9.8	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	77.4	Depth	9.8 ft	Total Bottom Stress	939.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1	84.2	9.0	96.0	432.0	9.0	432.0	939.3	1,371.3	939.3
(SP)	75.2		120.4						
Point 2	75.2	4.0	107.4	909.6	4.0	910.0		1,849.3	939.7
(SP-SM)	71.2		127.2						
Point 3	71.2	10.0	73.9	1,277.2	10.0	1,277.6		2,216.9	939.7
(SC)	61.2		110.0						
Point 4	61.2	2.0	124.0	1,590.3	2.0	1,590.7		2,530.0	939.7
SC	59.2		137.5						

Point 2A

Initial Stress Conditions
(Use Boring TH-7 PSI 2003)

Ground Surface	84.2
Water Table	77.4

Buildout Stress Conditions

Final Closure Elev	140	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	138	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	85.8	Waste/Daily	48.7 ft	60.0 pcf	2,922.0 psf
Depth	54.2	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	77.4	Depth	54.2 ft	Total Bottom Stress	3,603.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1	84.2	9.0	96.0	432.0	10.6	508.8	3,603.3	4,112.1	3,680.1
(SP)	75.2		120.4						
Point 2	75.2	4.0	107.4	909.6	4.0	1,063.6		4,666.9	3,757.3
(SP-SM)	71.2		127.2						
Point 3	71.2	10.0	73.9	1,277.2	10.0	1,431.2		5,034.5	3,757.3
(CL)	61.2		110.0						
Point 4	61.2	2.0	124.0	1,590.3	2.0	1,744.3		5,347.6	3,757.3
SC	59.2		137.5						

HARDEE COUNTY
ESTIMATED STRESS

Point 2B
Initial Stress Conditions
(Use Boring TH-7 PSI 2003)

Ground Surface	84.2
Water Table	77.4

Buildout Stress Conditions

Final Closure Elev	112	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	110	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	83.67	Waste/Daily	22.8 ft	60.0 pcf	1,369.8 psf
Depth	28.33	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	77.4	Depth	28.3 ft	Total Bottom Stress	2,051.1 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							2,051.1		
Point 1	84.2	9.0	96.0	432.0	8.5	406.6		2,457.7	2,025.7
(SP)	75.2		120.4						
Point 2	75.2	4.0	107.4	909.6	4.0	860.6		2,911.7	2,002.0
(SP-SM)	71.2		127.2						
Point 3	71.2	10.0	73.9	1,277.2	10.0	1,228.2		3,279.3	2,002.0
(CL)	61.2		110.0						
Point 4	61.2	2.0	124.0	1,590.3	2.0	1,541.3		3,592.4	2,002.0
SC	59.2		137.5						

Point 2C
Initial Stress Conditions
(Use Boring TH-7 PSI 2003)

Ground Surface	84.2
Water Table	77.4

Buildout Stress Conditions

Final Closure Elev	92	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	90	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	85.7	Waste/Daily	0.8 ft	60.0 pcf	48.0 psf
Depth	6.3	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	77.4	Depth	6.3 ft	Total Bottom Stress	729.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							729.3		
Point 1	84.2	9.0	96.0	432.0	10.5	504.0		1,233.3	801.3
(SP)	75.2		120.4						
Point 2	75.2	4.0	107.4	909.6	4.0	1,054.0		1,783.3	873.7
(SP-SM)	71.2		127.2						
Point 3	71.2	10.0	73.9	1,277.2	10.0	1,421.6		2,150.9	873.7
(CL)	61.2		110.0						
Point 4	61.2	2.0	124.0	1,590.3	2.0	1,734.7		2,464.0	873.7
SC	59.2		137.5						

HARD... COUNTY
ESTIMATED STRESS

Point 3A

Initial Stress Conditions
(Use Boring TH-6 PSI 2003)

Ground Surface	86.77
Water Table	76.32

Buildout Stress Conditions

Final Closure Elev	142	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	140	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	86	Waste/Daily	50.5 ft	60.0 pcf	3,030.0 psf
Depth	56	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	76.32	Depth	56.0 ft	Total Bottom Stress	3,711.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							3,711.3		
Point 1 (SP)	86.77 81.77	5.0	96.0 120.4	240.0	4.2	203.0		3,914.3	3,674.3
Point 2 (SP-SM)	81.77 68.77	13.0	107.4 127.2	1,133.4	13.0	1,059.5		4,770.7	3,637.4
Point 3 (SC)	68.77 63.77	5.0	73.9 110.0	1,673.6	5.0	1,599.7		5,310.9	3,637.4
Point 4 SC	63.77 61.77	2.0	124.0 137.5	1,867.7	2.0	1,793.8		5,505.0	3,637.4

Point 3B

Initial Stress Conditions
(Use Boring TH-6 PSI 2003)

Ground Surface	86.77
Water Table	76.32

Buildout Stress Conditions

Final Closure Elev	132	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	130	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	84.58	Waste/Daily	41.9 ft	60.0 pcf	2,515.2 psf
Depth	47.42	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	76.32	Depth	47.4 ft	Total Bottom Stress	3,196.5 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							3,196.5		
Point 1 (SP)	86.77 81.77	5.0	96.0 120.4	240.0	2.8	134.9		3,331.4	3,091.4
Point 2 (SP-SM)	81.77 68.77	13.0	107.4 127.2	1,133.4	13.0	924.1		4,120.6	2,987.2
Point 3 (SC)	68.77 63.77	5.0	73.9 110.0	1,673.6	5.0	1,464.3		4,660.8	2,987.2
Point 4 SC	63.77 61.77	2.0	124.0 137.5	1,867.7	2.0	1,658.4		4,854.9	2,987.2

HARDEE COUNTY
ESTIMATED STRESS

Point 3C
Initial Stress Conditions
(Use Boring TH-6 PSI 2003)

Ground Surface	86.77
Water Table	76.32

Buildout Stress Conditions

Final Closure Elev	112	Cover Soil	2.0 ft	123.9 pcf		247.7 psf
Intermed Cvr Elev	110	Intermed Soil	1.5 ft	123.9 pcf		185.8 psf
Bottom Elev	82.63	Waste/Daily	23.9 ft	60.0 pcf		1,432.2 psf
Depth	29.37	Drainage Sand	2.0 ft	123.9 pcf		247.7 psf
Water Table	76.32	Depth	29.4 ft	Total Bottom Stress		2,113.5 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							2,113.5		
Point 1 (SP)	86.77 81.77	5.0	96.0 120.4	240.0	0.9	41.3		2,154.8	1,914.8
Point 2 (SP-SM)	81.77 68.77	13.0	107.4 127.2	1,133.4	13.0	735.9		2,849.4	1,716.1
Point 3 (SC)	68.77 63.77	5.0	73.9 110.0	1,673.6	5.0	1,276.1		3,389.6	1,716.1
Point 4 SC	63.77 61.77	2.0	124.0 137.5	1,867.7	2.0	1,470.2		3,583.7	1,716.1

Point 3D
Initial Stress Conditions
(Use Boring TH-6 PSI 2003)

Ground Surface	86.77
Water Table	76.32

Buildout Stress Conditions

Final Closure Elev	94	Cover Soil	2.0 ft	123.9 pcf		247.7 psf
Intermed Cvr Elev	92	Intermed Soil	1.5 ft	123.9 pcf		185.8 psf
Bottom Elev	84.5	Waste/Daily	4.0 ft	60.0 pcf		240.0 psf
Depth	9.5	Drainage Sand	2.0 ft	123.9 pcf		247.7 psf
Water Table	76.32	Depth	9.5 ft	Total Bottom Stress		921.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							921.3		
Point 1 (SP)	86.77 81.77	5.0	96.0 120.4	240.0	2.7	131.0		1,052.3	812.3
Point 2 (SP-SM)	81.77 68.77	13.0	107.4 127.2	1,133.4	13.0	919.9		1,841.2	707.8
Point 3 (SC)	68.77 63.77	5.0	73.9 110.0	1,673.6	5.0	1,460.1		2,381.4	707.8
Point 4 SC	63.77 61.77	2.0	124.0 137.5	1,867.7	2.0	1,654.2		2,575.5	707.8

HARD[illegible] COUNTY
ESTIMATED STRESS

Point 4
Initial Stress Conditions
(Use Boring TH-6 PSI 2003)

Ground Surface	86.77
Water Table	76.32

Buildout Stress Conditions

Final Closure Elev	112	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	110	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	82.9	Waste/Daily	23.6 ft	60.0 pcf	1,416.0 psf
Depth	29.1	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	76.32	Depth	29.1 ft	Total Bottom Stress	2,097.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							2,097.3		
Point 1	86.77	5.0	96.0	240.0	1.1	54.2		2,151.5	1,911.5
(SP)	81.77		120.4						
Point 2	81.77	13.0	107.4	1,133.4	13.0	761.9		2,859.1	1,725.8
(SP-SM)	68.77		127.2						
Point 3	68.77	5.0	73.9	1,673.6	5.0	1,302.1		3,399.3	1,725.8
(SC)	63.77		110.0						
Point 4	63.77	2.0	124.0	1,867.7	2.0	1,496.2		3,593.4	1,725.8
SC	61.77		137.5						

Point 5A
Initial Stress Conditions
(Use Boring SB-01 PSI Nov 1997)

Ground Surface	86.4
Water Table	75.58

Buildout Stress Conditions

Final Closure Elev	144	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	142	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	86	Waste/Daily	52.5 ft	60.0 pcf	3,150.0 psf
Depth	58	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.58	Depth	58.0 ft	Total Bottom Stress	3,831.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							3,831.3		
Point 1	86.4	5.0	96.0	240.0	4.6	220.8		4,052.1	3,812.1
(SP)	81.4		120.4						
Point 2	81.4	5.0	101.5	733.8	5.0	695.4		4,526.6	3,792.9
(SP-SM)	76.4		123.7						
Point 3	76.4	13.0	73.9	1,317.9	13.0	1,280.1		5,111.4	3,793.4
(SC)	63.4		110.0						
Point 4	63.4	1.4	124.0	1,679.9	1.4	1,642.0		5,473.3	3,793.4
SC	62		137.5						

HARDEE COUNTY
ESTIMATED STRESS

Point 5B
Initial Stress Conditions
(Use Boring SB-01 PSI Nov 1997)

Ground Surface	86.4
Water Table	75.58

Buildout Stress Conditions

Final Closure Elev	144
Intermed Cvr Elev	142
Bottom Elev	86
Depth	58
Water Table	75.58

Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Waste/Daily	52.5 ft	60.0 pcf	3,150.0 psf
Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Depth	58.0 ft	Total Bottom Stress	3,831.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1	86.4	5.0	96.0	240.0	4.6	220.8	3,831.3	4,052.1	3,812.1
(SP)	81.4		120.4						
Point 2	81.4	5.0	101.5	733.8	5.0	695.4		4,526.6	3,792.9
(SP-SM)	76.4		123.7						
Point 3	76.4	13.0	73.9	1,317.9	13.0	1,280.1		5,111.4	3,793.4
(SC)	63.4		110.0						
Point 4	63.4	1.4	124.0	1,679.9	1.4	1,642.0		5,473.3	3,793.4
SC	62		137.5						

Point 5C
Initial Stress Conditions
(Use Boring SB-01 PSI Nov 1997)

Ground Surface	86.4
Water Table	75.58

Buildout Stress Conditions

Final Closure Elev	112
Intermed Cvr Elev	110
Bottom Elev	81.6
Depth	30.4
Water Table	75.58

Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Waste/Daily	24.9 ft	60.0 pcf	1,494.0 psf
Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Depth	30.4 ft	Total Bottom Stress	2,175.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1	86.4	5.0	96.0	240.0	0.2	9.6	2,175.3	2,184.9	1,944.9
(SP)	81.4		120.4						
Point 2	81.4	5.0	101.5	733.8	5.0	272.9		2,448.2	1,714.5
(SP-SM)	76.4		123.7						
Point 3	76.4	13.0	73.9	1,317.9	13.0	857.7		3,033.0	1,715.0
(SC)	63.4		110.0						
Point 4	63.4	1.4	124.0	1,679.9	1.4	1,219.6		3,394.9	1,715.0
SC	62		137.5						

HARDL ,OUNTY
ESTIMATED STRESS

Point 6

Initial Stress Conditions
(Use Boring TH-5 PSI 2003)

Ground Surface 85.5
Water Table 75.58

Buildout Stress Conditions

Final Closure Elev	96	Cover Soil	2.0 ft	123.9 pcf		247.7 psf
Intermed Cvr Elev	94	Intermed Soil	1.5 ft	123.9 pcf		185.8 psf
Bottom Elev	83.54	Waste/Daily	7.0 ft	60.0 pcf		417.6 psf
Depth	12.46	Drainage Sand	2.0 ft	123.9 pcf		247.7 psf
Water Table	75.58	Depth	12.5 ft	Total Bottom Stress		1,098.9 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							1,098.9		
Point 1 (SP)	85.5 72.5	13.0	101.5 123.7	659.8	11.0	560.3		1,659.2	999.4
Point 2 (CL)	72.5 62.5	10.0	73.9 110.0	1,433.7	10.0	1,234.7		2,333.6	900.0
Point 3 (SM)	62.5 55.5	7.0	101.5 123.7	1,886.2	7.0	1,687.3		2,786.2	900.0

Point 7

Initial Stress Conditions
(Use Boring TH-5 PSI 2003)

Ground Surface 85.5
Water Table 75.58

Buildout Stress Conditions

Final Closure Elev	94	Cover Soil	2.0 ft	123.9 pcf		247.7 psf
Intermed Cvr Elev	92	Intermed Soil	1.5 ft	123.9 pcf		185.8 psf
Bottom Elev	83.73	Waste/Daily	4.8 ft	60.0 pcf		286.2 psf
Depth	10.27	Drainage Sand	2.0 ft	123.9 pcf		247.7 psf
Water Table	75.58	Depth	10.3 ft	Total Bottom Stress		967.5 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							967.5		
Point 1 (SP)	85.5 72.5	13.0	101.5 123.7	659.8	11.2	569.9		1,537.4	877.7
Point 2 (CL)	72.5 62.5	10.0	73.9 110.0	1,433.7	10.0	1,252.6		2,220.1	786.4
Point 3 (SM)	62.5 55.5	7.0	101.5 123.7	1,886.2	7.0	1,705.2		2,672.7	786.4

HARDEE COUNTY
ESTIMATED STRESS

Point 8A
Initial Stress Conditions
(Use Boring TH-1 PSI 2003)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	97	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	95	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	82.06	Waste/Daily	9.4 ft	60.0 pcf	566.4 psf
Depth	14.94	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.45	Depth	14.9 ft	Total Bottom Stress	1,247.7 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							1,247.7		
Point 1 (SM)	85.96 67.96	18.0	96.0 120.4	864.0	14.1	660.1		1,907.8	1,043.8
Point 2 (CL)	67.96 57.96	10.0	73.9 110.0	1,681.4	10.0	1,307.0		2,554.7	873.3
Point 3 (SC)	57.96 50.96	7.0	124.0 137.5	2,182.2	7.0	1,807.8		3,055.5	873.3

Point 8B
Initial Stress Conditions
(Use Boring TH-1 PSI 2003)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	112	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	110	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	83.4	Waste/Daily	23.1 ft	60.0 pcf	1,386.0 psf
Depth	28.6	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.45	Depth	28.6 ft	Total Bottom Stress	2,067.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							2,067.3		
Point 1 (SM)	85.96 67.96	18.0	96.0 120.4	864.0	15.4	741.1		2,808.4	1,944.4
Point 2 (CL)	67.96 57.96	10.0	73.9 110.0	1,681.4	10.0	1,435.6		3,502.9	1,821.5
Point 3 (SC)	57.96 50.96	7.0	124.0 137.5	2,182.2	7.0	1,936.5		4,003.8	1,821.5

HARDL ,OUNTY
ESTIMATED STRESS

Point 8C

Initial Stress Conditions
(Use Boring TH-1 PSI 2003)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	128	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	126	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	81.609	Waste/Daily	40.9 ft	60.0 pcf	2,453.5 psf
Depth	46.391	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.45	Depth	46.4 ft	Total Bottom Stress	3,134.8 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							3,134.8		
Point 1	85.96	18.0	96.0	864.0	13.6	629.3		3,764.0	2,900.0
(SM)	67.96		120.4						
Point 2	67.96	10.0	73.9	1,681.4	10.0	1,262.8		4,397.6	2,716.2
(CL)	57.96		110.0						
Point 3	57.96	7.0	124.0	2,182.2	7.0	1,763.7		4,898.4	2,716.2
(SC)	50.96		137.5						

Point 8D

Initial Stress Conditions
(Use Boring TH-1 PSI 2003)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	144	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	142	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	82.799	Waste/Daily	55.7 ft	60.0 pcf	3,342.1 psf
Depth	61.201	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.45	Depth	61.2 ft	Total Bottom Stress	4,023.4 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							4,023.4		
Point 1	85.96	18.0	96.0	864.0	14.8	709.7		4,733.0	3,869.0
(SM)	67.96		120.4						
Point 2	67.96	10.0	73.9	1,681.4	10.0	1,378.0		5,401.4	3,720.0
(CL)	57.96		110.0						
Point 3	57.96	7.0	124.0	2,182.2	7.0	1,878.9		5,902.2	3,720.0
(SC)	50.96		137.5						

HARDEE COUNTY
ESTIMATED STRESS

Point 9A

Initial Stress Conditions
(Use Boring TB-04 PSI 1997)

Ground Surface	84.7
Water Table	75.31

Buildout Stress Conditions

Final Closure Elev	110	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	108	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	86	Waste/Daily	18.5 ft	60.0 pcf	1,110.0 psf
Depth	24	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.31	Depth	24.0 ft	Total Bottom Stress	1,791.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1 (SM)	84.7 71.2	13.5	96.0 120.4	648.0	14.8	710.4	1,791.3	2,501.7	1,853.7
Point 2 (CL)	71.2 64.7	6.5	73.9 110.0	1,294.9	6.5	1,419.3		3,210.6	1,915.7

Point 9B

Initial Stress Conditions
(Use Boring TB-04 PSI 1997)

Ground Surface	84.7
Water Table	75.31

Buildout Stress Conditions

Final Closure Elev	110	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	108	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	80.5	Waste/Daily	24.0 ft	60.0 pcf	1,440.0 psf
Depth	29.5	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.31	Depth	29.5 ft	Total Bottom Stress	2,121.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1 (SM)	84.7 71.2	13.5	96.0 120.4	648.0	9.3	446.4	2,121.3	2,567.7	1,919.7
Point 2 (CL)	71.2 64.7	6.5	73.9 110.0	1,294.9	6.5	891.3		3,012.6	1,717.7

HARDL .OUNTY
ESTIMATED STRESS

Point 9C
Initial Stress Conditions
(Use Boring TB-04 PSI 1997)

Ground Surface	84.7
Water Table	75.31

Buildout Stress Conditions

Final Closure Elev	104	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	102	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	79	Waste/Daily	19.5 ft	60.0 pcf	1,170.0 psf
Depth	25	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.31	Depth	25.0 ft	Total Bottom Stress	1,851.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1 (SM)	84.7 71.2	13.5	96.0 120.4	648.0	7.8	366.4	1,851.3	2,217.7	1,569.7
Point 2 (CL)	71.2 64.7	6.5	73.9 110.0	1,294.9	6.5	735.1		2,586.4	1,291.5

Point 10
Initial Stress Conditions
(Use Borings TH-1 & TH-2 PSI 2003)

Ground Surface	84.81
Water Table	72.44

Buildout Stress Conditions

Final Closure Elev	94	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	92	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	80	Waste/Daily	8.5 ft	60.0 pcf	510.0 psf
Depth	14	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	72.44	Depth	14.0 ft	Total Bottom Stress	1,191.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
Point 1 (SM)	84.81 64.31	20.5	96.0 120.4	984.0	15.7	742.3	1,191.3	1,933.6	949.6
Point 2 (CL)	64.31 54.31	10.0	73.9 110.0	1,902.1	10.0	1,435.3		2,626.6	724.5

HARDEE COUNTY
ESTIMATED STRESS

Point 11A

Initial Stress Conditions
(Use Borings TH-1 & TB-02 PSI 2003, PSI 1997)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	158
Intermed Cvr Elev	156
Bottom Elev	86
Depth	72
Water Table	75.45

Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Waste/Daily	66.5 ft	60.0 pcf	3,990.0 psf
Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Depth	72.0 ft	Total Bottom Stress	4,671.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							4,671.3		
Point 1 (SM)	85.96 67.96	18.0	96.0 120.4	864.0	18.0	865.9		5,537.2	4,673.2
Point 2 (CL)	67.96 57.96	10.0	73.9 110.0	1,681.4	10.0	1,685.2		6,356.5	4,675.1
Point 3 (SC)	57.96 50.96	7.0	124.0 137.5	2,182.2	7.0	2,186.1		6,857.4	4,675.1

Point 11B

Initial Stress Conditions
(Use Borings TH-1 & TB-02 PSI 2003, PSI 1997)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	156.7
Intermed Cvr Elev	154.7
Bottom Elev	81.7
Depth	75
Water Table	75.45

Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Waste/Daily	69.5 ft	60.0 pcf	4,170.0 psf
Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Depth	75.0 ft	Total Bottom Stress	4,851.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							4,851.3		
Point 1 (SM)	85.96 67.96	18.0	96.0 120.4	864.0	13.7	636.0		5,487.3	4,623.3
Point 2 (CL)	67.96 57.96	10.0	73.9 110.0	1,681.4	10.0	1,272.4		6,123.7	4,442.3
Point 3 (SC)	57.96 50.96	7.0	124.0 137.5	2,182.2	7.0	1,773.3		6,624.6	4,442.3

HARD[illegible] COUNTY
ESTIMATED STRESS

Point 11C
Initial Stress Conditions
(Use Borings TH-1 & TB-02 PSI 2003, PSI 1997)

Ground Surface	85.96
Water Table	75.45

Buildout Stress Conditions

Final Closure Elev	154	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	152	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	80.7	Waste/Daily	67.8 ft	60.0 pcf	4,068.0 psf
Depth	73.3	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	75.45	Depth	73.3 ft	Total Bottom Stress	4,749.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							4,749.3		
Point 1	85.96	18.0	96.0	864.0	12.7	548.9		5,298.2	4,434.2
(SM)	67.96		120.4						
Point 2	67.96	10.0	73.9	1,681.4	10.0	1,147.6		5,896.9	4,215.5
(CL)	57.96		110.0						
Point 3	57.96	7.0	124.0	2,182.2	7.0	1,648.5		6,397.8	4,215.5
(SC)	50.96		137.5						

Point 12
Initial Stress Conditions
(Use Borings TH-1 & TH-2 PSI 2003)

Ground Surface	84.81
Water Table	72.44

Buildout Stress Conditions

Final Closure Elev	97	Cover Soil	2.0 ft	123.9 pcf	247.7 psf
Intermed Cvr Elev	95	Intermed Soil	1.5 ft	123.9 pcf	185.8 psf
Bottom Elev	79.7	Waste/Daily	11.8 ft	60.0 pcf	708.0 psf
Depth	17.3	Drainage Sand	2.0 ft	123.9 pcf	247.7 psf
Water Table	72.44	Depth	17.3 ft	Total Bottom Stress	1,389.3 psf

	Initial Conditions				Final Conditions				Change In Stress
Soil Layers	Elevation (ft NGVD)	Thickness (ft)	Unit Weight (pcf)	Initial Stress (psf)	Thickness (ft)	Excavation (psf)	Waste/Soil (psf)	Final Stress (psf)	Stress (psf)
							1,389.3		
Point 1	84.81	20.5	96.0	984.0	15.4	738.7		2,128.0	1,144.0
(SM)	64.31		120.4						
Point 2	64.31	10.0	73.9	1,902.1	10.0	1,439.6		2,828.9	926.8
(CL)	54.31		110.0						

SETTLEMENT CALCULATIONS

HARDEE COUNTY
ESTIMATED SETTLEMENTS

Point 1

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	9	0.063	0.72	432.00	939.29	0.17
Point 2	SM	60	4	0.036	0.54	1849.29	939.65	0.02
Point 3	CL		10	0.440	1.25	2216.89	939.65	0.30
Point 4	SC	95	2	0.007	0.33	2529.99	939.65	0.00
							total	0.48 ft
								5.80 in

Point 2A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	10.6	0.063	0.72	432.00	3680.09	0.38
Point 2	SM	60	4	0.036	0.54	909.64	3757.25	0.07
Point 3	CL		10	0.440	1.25	1277.24	3757.25	1.16
Point 4	SC	95	2	0.007	0.33	1590.34	3757.25	0.01
							total	1.56 ft
								18.75 in

Point 2B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	8.47	0.063	0.72	432.00	2025.65	0.23
Point 2	SM	60	4	0.036	0.54	909.64	2002.01	0.05
Point 3	CL		10	0.440	1.25	1277.24	2002.01	0.80
Point 4	SC	95	2	0.007	0.33	1590.34	2002.01	0.00
							total	1.09 ft
								13.03 in

Point 2C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	10.5	0.063	0.72	432.00	801.29	0.18
Point 2	SM	60	4	0.036	0.54	909.64	873.65	0.03
Point 3	CL		10	0.440	1.25	1277.24	873.65	0.44
Point 4	SC	95	2	0.007	0.33	1590.34	873.65	0.00
							total	0.65 ft
								7.77 in

Point 3A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	4.23	0.063	0.72	240.00	3674.33	0.19
Point 2	SM	60	13	0.036	0.54	1133.37	3637.37	0.19
Point 3	CL		5	0.440	1.25	1673.57	3637.37	0.49
Point 4	SC	95	2	0.007	0.33	1867.67	3637.37	0.00
							total	0.87 ft
								10.47 in

HARDEE COUNTY
ESTIMATED SETTLEMENTS

Point 3B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	2.81	0.063	0.72	240.00	3091.37	0.12
Point 2	SM	60	13	0.036	0.54	1133.37	2987.21	0.17
Point 3	CL		5	0.440	1.25	1673.57	2987.21	0.43
Point 4	SC	95	2	0.007	0.33	1867.67	2987.21	0.00
							total	0.73 ft
								8.73 in

Point 3C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	0.86	0.063	0.72	240.00	1914.77	0.03
Point 2	SM	60	13	0.036	0.54	1133.37	1716.05	0.12
Point 3	CL		5	0.440	1.25	1673.57	1716.05	0.30
Point 4	SC	95	2	0.007	0.33	1867.67	1716.05	0.00
							total	0.45 ft
								5.45 in

Point 3D

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	2.73	0.063	0.72	240.00	812.33	0.06
Point 2	SM	60	13	0.036	0.54	1133.37	707.83	0.06
Point 3	CL		5	0.440	1.25	1673.57	707.83	0.15
Point 4	SC	95	2	0.007	0.33	1867.67	707.83	0.00
							total	0.28 ft
								3.35 in

Point 4

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	1.13	0.063	0.72	240.00	1911.53	0.04
Point 2	SM	60	13	0.036	0.54	1133.37	1725.77	0.12
Point 3	CL		5	0.440	1.25	1673.57	1725.77	0.30
Point 4	SC	95	2	0.007	0.33	1867.67	1725.77	0.00
							total	0.47 ft
								5.59 in

Point 5A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	4.6	0.063	0.72	240.00	3812.09	0.21
Point 2	SM	45	5	0.050	0.63	733.75	3792.89	0.12
Point 3	CL		13	0.440	1.25	1317.94	3793.42	1.50
Point 4	SC	95	1.4	0.007	0.33	1679.91	3793.42	0.00
							total	1.83 ft
								21.94 in

HARDEE COUNTY
ESTIMATED SETTLEMENTS

Point 5B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	4.6	0.063	0.72	240.00	3812.09	0.21
Point 2	SM	45	5	0.050	0.63	733.75	3792.89	0.12
Point 3	CL		13	0.440	1.25	1317.94	3793.42	1.50
Point 4	SC	95	1.4	0.007	0.33	1679.91	3793.42	0.00
							total	1.83 ft
								21.94 in

Point 5C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	0.2	0.063	0.72	240.00	1944.89	0.01
Point 2	SM	45	5	0.050	0.63	733.75	1714.49	0.08
Point 3	CL		13	0.440	1.25	1317.94	1715.02	0.92
Point 4	SC	95	1.4	0.007	0.33	1679.91	1715.02	0.00
							total	1.01 ft
								12.12 in

Point 6

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	45	11.04	0.050	0.63	659.75	999.42	0.14
Point 2	CL		10	0.440	1.25	1433.68	899.95	0.41
Point 3	SM	45	7	0.050	0.63	1886.23	899.95	0.04
							total	0.59 ft
								7.03 in

Point 7

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	45	11.23	0.050	0.63	659.75	877.66	0.13
Point 2	CL		10	0.440	1.25	1433.68	786.43	0.37
Point 3	SM	45	7	0.050	0.63	1886.23	786.43	0.03
							total	0.53 ft
								6.37 in

Point 8A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	14.1	0.063	0.72	864.00	1043.77	0.18
Point 2	CL		10	0.440	1.25	1681.38	873.29	0.36
Point 3	SC	95	7	0.007	0.33	2182.23	873.29	0.01
							total	0.54 ft
								6.46 in

HARDEE COUNTY
ESTIMATED SETTLEMENTS

Point 8B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	15.44	0.063	0.72	864.00	1944.41	0.29
Point 2	CL		10	0.440	1.25	1681.38	1821.53	0.62
Point 3	SC	95	7	0.007	0.33	2182.23	1821.53	0.01
							total	0.92 ft
								11.07 in

Point 8C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	13.649	0.063	0.72	864.00	2900.01	0.32
Point 2	CL		10	0.440	1.25	1681.38	2716.19	0.82
Point 3	SC	95	7	0.007	0.33	2182.23	2716.19	0.01
							total	1.15 ft
								13.79 in

Point 8D

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	14.839	0.063	0.72	864.00	3869.01	0.40
Point 2	CL		10	0.440	1.25	1681.38	3719.99	0.99
Point 3	SC	95	7	0.007	0.33	2182.23	3719.99	0.02
							total	1.41 ft
								16.90 in

Point 9A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	14.8	0.063	0.72	648.00	1853.69	0.32
Point 2	CL		6.5	0.440	1.25	1294.90	1915.71	0.50
							total	0.82 ft
								9.83 in

Point 9B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	9.3	0.063	0.72	648.00	1919.69	0.20
Point 2	CL		6.5	0.440	1.25	1294.90	1717.71	0.47
							total	0.67 ft
								8.04 in

HARDEE COUNTY
ESTIMATED SETTLEMENTS

Point 9C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	7.8	0.063	0.72	648.00	1569.71	0.15
Point 2	CL		6.5	0.440	1.25	1294.90	1291.53	0.38
							total	0.53 ft
								6.41 in

Point 10

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	15.69	0.063	0.72	984.00	949.58	0.17
Point 2	CL		10	0.440	1.25	1902.06	724.53	0.27
							total	0.44 ft
								5.31 in

Point 11A

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	18.04	0.063	0.72	864.00	4673.21	0.53
Point 2	CL		10	0.440	1.25	1681.38	4675.13	1.13
Point 3	SC	95	7	0.007	0.33	2182.23	4675.13	0.02
							total	1.68 ft
								20.17 in

Point 11B

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	13.74	0.063	0.72	864.00	4623.25	0.40
Point 2	CL		10	0.440	1.25	1681.38	4442.33	1.10
Point 3	SC	95	7	0.007	0.33	2182.23	4442.33	0.02
							total	1.52 ft
								18.23 in

Point 11C

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	SM	30	12.74	0.063	0.72	864.00	4434.15	0.37
Point 2	CL		10	0.440	1.25	1681.38	4215.53	1.07
Point 3	SC	95	7	0.007	0.33	2182.23	4215.53	0.02
							total	1.45 ft
								17.41 in

Point 12

	Soil Type	Dr (%)	H (ft)	Cc	eo	Po (psf)	Delta P (psf)	Settlement (ft)
Point 1	(SM)	30	15.39	0.063	0.72	984.00	1144.01	0.19
Point 2	(CL)		10	0.440	1.25	1902.06	926.79	0.34
							total	0.53 ft
								6.31 in

PIPELINE SETTLEMENT
CROSS SLOPE SETTLEMENT

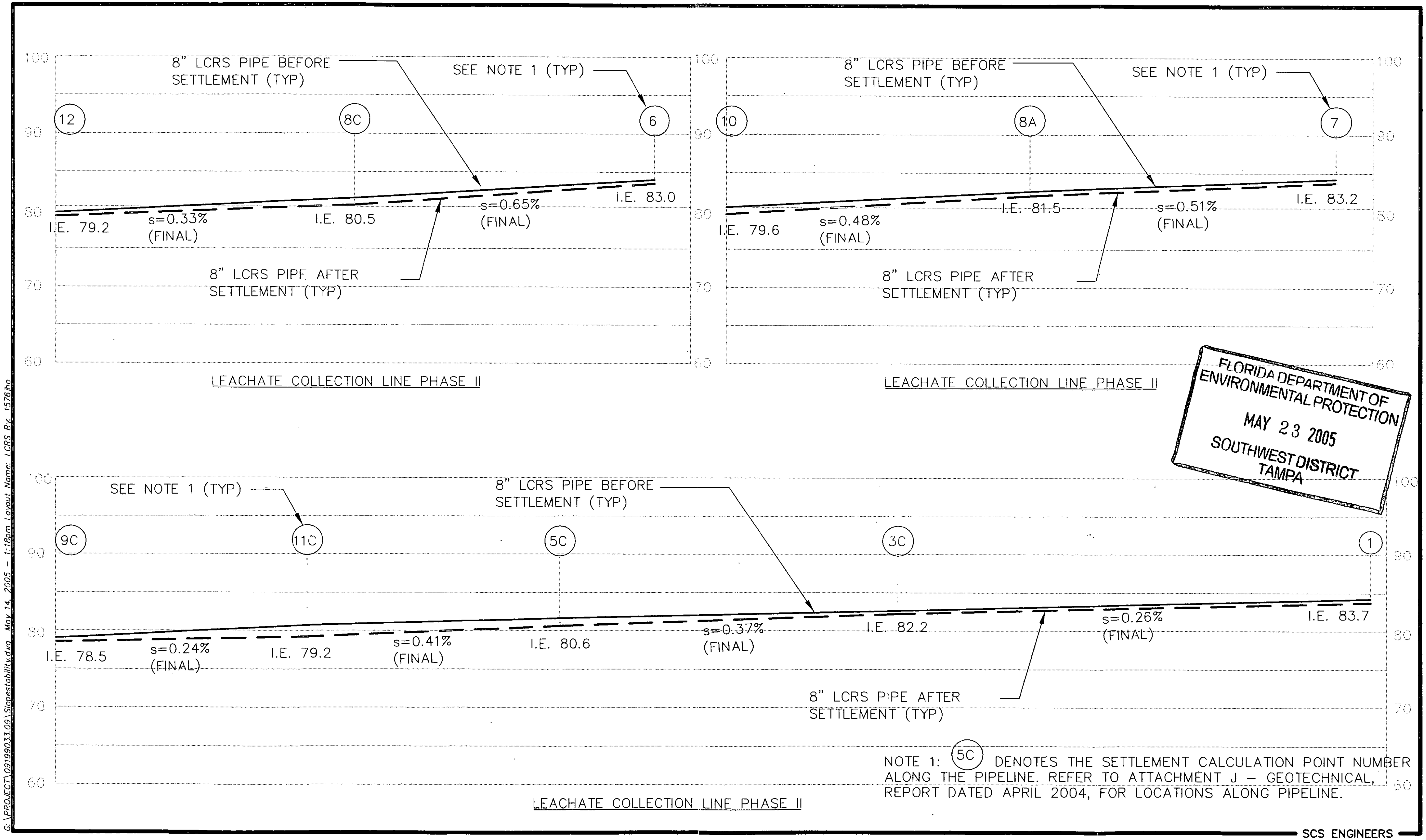


Figure. Pipeline Alignment on Westside of Existing Landfill, Hardee County, Florida

Hardee County Landfill
<u>Settlement</u>
Cross Slope

	Initial Conditions				**Final Conditions**			
Points	Initial Elevation (ft NGVD)	Difference (ft)	Distance (ft)	Slope (%)	Settlement (ft)	Elevation (ft NGVD)	Difference (ft)	Slope (%)
8A	82.1				0.54	81.5		
		1.3	47.2	2.84			1.0	2.02
8B	83.4				0.92	82.5		
		1.8	63.7	2.81			2.0	3.17
8C	81.6				1.15	80.5		
		1.2	44.0	2.70			0.9	2.11
8D	82.8				1.41	81.4		
		2.1	67.0	3.13			2.1	3.20
11C	80.7				1.45	79.2		
		1.0	45.6	2.19			0.9	2.04
11B	81.7				1.52	80.2		
3B	84.6				0.73	83.9		
		2.0	70.8	2.75			1.7	2.37
3C	82.6				0.45	82.2		
		1.9	68.1	2.75			2.0	3.00
3D	84.5				0.28	84.2		
2A	85.8				1.56	84.2		
		2.1	77.3	2.75			1.7	2.14
2B	83.7				1.09	82.6		
		2.0	73.9	2.75			2.5	3.34
2C	85.7				0.65	85.1		

Hardee County Landfill
<u>Settlement</u>
Leachate Collection/Detection Pipelines

	Initial Conditions			**Final Conditions**		
Points	Initial Elevation (ft NGVD)	Distance Between Points (ft)	Initial Slope (%)	Settlement (ft)	Long Term Elevation (ft NGVD)	Long Term Slope (%)
9C	79.0			0.53	78.5	
		324.9	0.52			0.24
11C	80.7			1.45	79.2	
		326.2	0.28			0.41
5C	81.6			1.01	80.6	
		433.0	0.24			0.37
3C	82.6			0.45	82.2	
		597.9	0.26			0.26
1	84.2			0.48	83.7	
12	79.7			0.53	79.2	
		385.9	0.49			0.33
8C	81.6			1.15	80.5	
		386.1	0.50			0.65
6	83.5			0.59	83.0	
10	80.0			0.44	79.6	
		408.9	0.50			0.48
8A	82.1			0.54	81.5	
		332.0	0.50			0.51
7	83.7			0.53	83.2	
10	80.0			0.44	79.6	
		90.0	0.33			0.43
12	79.7			0.53	79.2	
		116.0	0.60			0.61
9C	79.0			0.53	78.5	

ATTACHMENT G

EFFECT OF EXPANSION ON EXISTING LANDFILL (PHASE I) LEACHATE COLLECTION SYSTEM

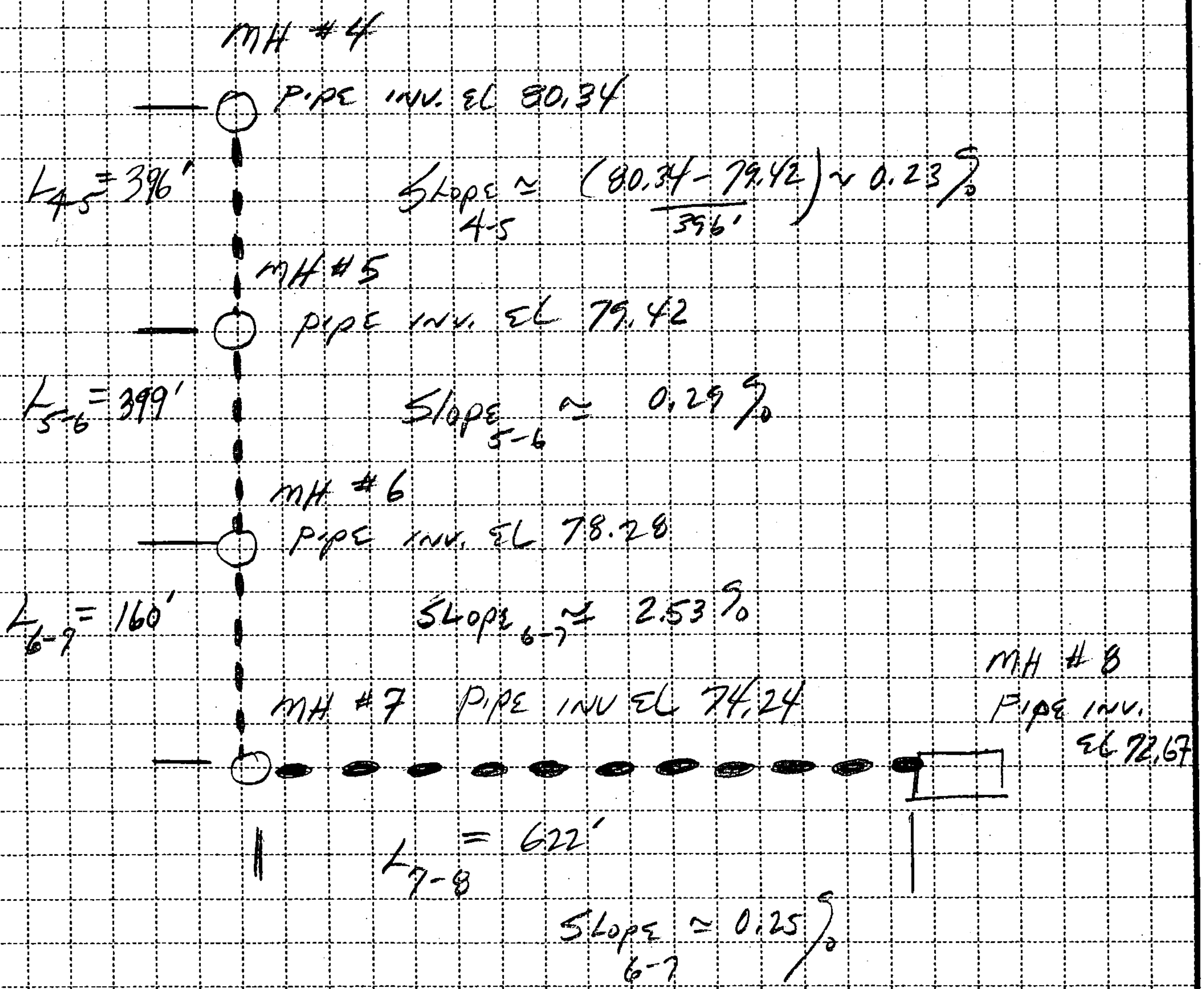
SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County Landfill Expan	JOB NO. 09195033.05	
SUBJECT Existing Leachate Collection System		BY JHB	DATE
		CHECKED	DATE

ESTIMATE THE EFFECTS OF SETTLEMENT DUE TO ADDITIONAL WASTE LOADING ON WEST/SOUTH SIDE OF LANDFILL

EXISTING MANHOLES/PIPELINES



Hardee County Landfill
<u>Settlement</u>
Existing Leachate Collection System

Manholes	Pipe Length (ft)	Existing Invert Elevations (ft NGVD)	Difference (ft)	Slope (%)	Settlement (in)	Settlement (ft)	Long-term Elevations (ft NGVD)	Difference (ft)	Slope (%)
MH-4		80.34			0.00	0.00	80.34		
	396		0.92	0.23				2.14	0.54
MH-5		79.42			14.61	1.22	78.20		
	399		1.14	0.29				1.75	0.44
MH-6		78.28			21.94	1.83	76.45		
	160		4.04	2.53				4.04	2.53
MH-7		74.24			21.94	1.83	72.41		
	622		1.57	0.25				-0.26	-0.04
MH-8		72.67			0.00	0.00	72.67		

Notes:
1) Settlement for MH-5 the average of Points 2A and 3A
2) Settlement for MH-6 the average of Points 5B
3) Settlement for MH-7 the average of Points 5A
4) Settlement for MH-4 & MH-8 no loads; no anticipated settlement

Proposed Pipeline Addition

Manholes	Pipe Length (ft)	Proposed Invert Elevations (ft NGVD)	Difference (ft)	Slope (%)	Settlement (in)	Settlement (ft)	Long-term Elevations (ft NGVD)	Difference (ft)	Slope (%)
MH-6		78.28			21.94	1.83	76.45		
	156.00		2.78	1.78				2.78	1.78
Point 1		75.50			21.94	1.83	73.67		
	590.00		2.83	0.48				1.00	0.17
MH-8		72.67			0.00	0.00	72.67		
Total	746								

Notes:
1) Point 1 immediately northeast of MH-7

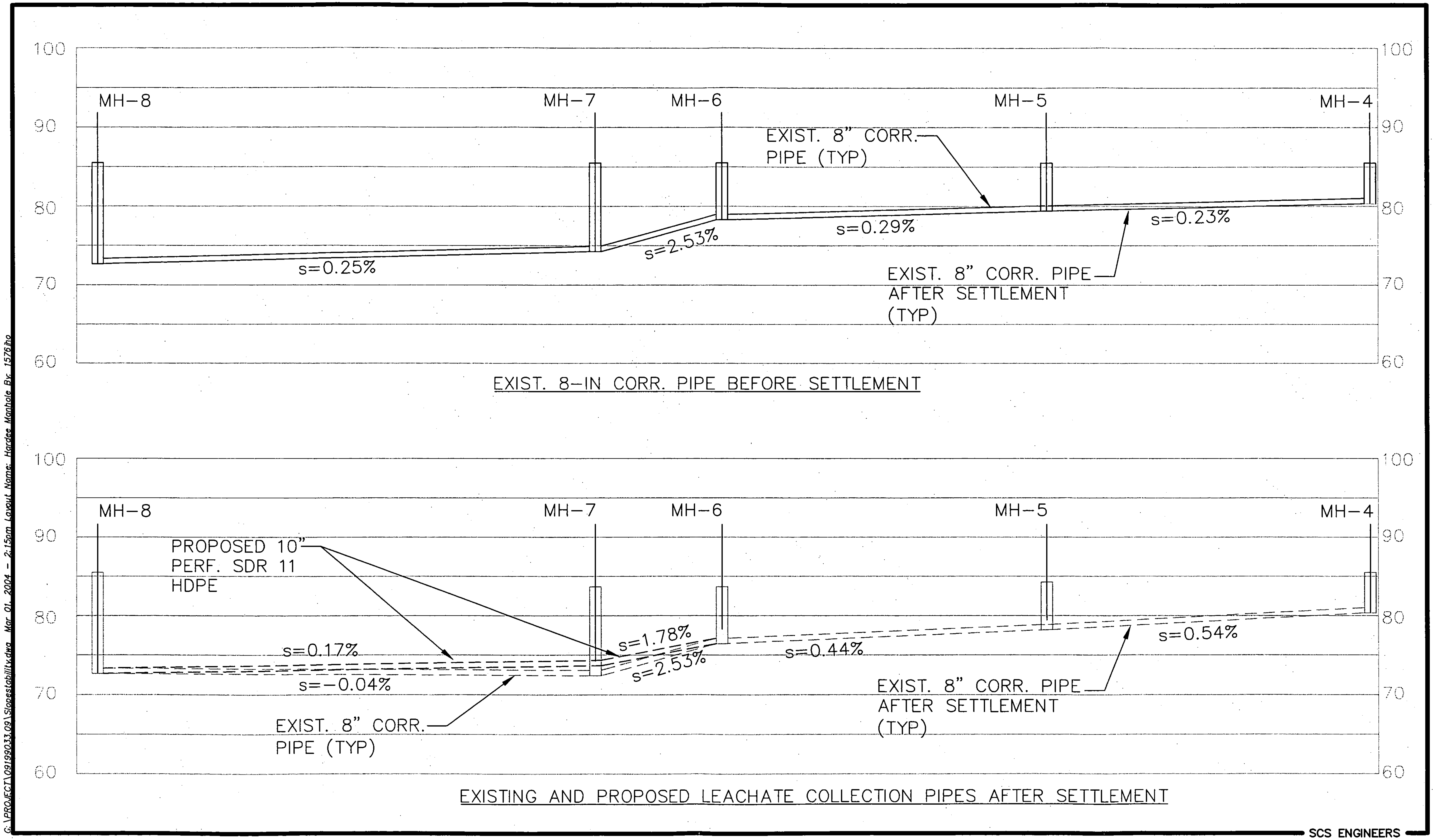


Figure. Pipeline Alignment on Westside of Existing Landfill, Hardee County, Florida

Proposed 10-in pipe in exist cell
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\hardee.fm2
Worksheet	Existing Leachate Collection Pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.011	
Channel Slope	0.001600	ft/ft
Depth	0.33	ft
Diameter	10.00	in

slope (after settlement)

Results		
Discharge	150	gal/min
Flow Area	0.20	ft²
Wetted Perimeter	1.13	ft
Top Width	0.82	ft
Critical Depth	0.25	ft
Percent Full	39.60	
Critical Slope	0.004271	ft/ft
Velocity	2	ft/s
Velocity Head	0.05	ft
Specific Energy	0.38	ft
Froude Number	0.61	
Maximum Discharge	1.11	cfs
Full Flow Capacity	1.04	cfs
Full Flow Slope	0.000175	ft/ft
Flow is subcritical.		

RATING ON ONE PUMP IN LIFT STATION

Proposed 10-in pipe in exist cell
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\hardee.fm2
Worksheet	Existing Leachate Collection Pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.011	
Channel Slope	0.001600	ft/ft
Depth	0.49	ft
Diameter	10.00	in

Slope (after settlement)

Results		
Discharge	300	gal/min
Flow Area	0.33	ft²
Wetted Perimeter	1.46	ft
Top Width	0.82	ft
Critical Depth	0.36	ft
Percent Full	58.80	
Critical Slope	0.004455	ft/ft
Velocity	2	ft/s
Velocity Head	0.06	ft
Specific Energy	0.55	ft
Froude Number	0.56	
Maximum Discharge	1.11	cfs
Full Flow Capacity	1.04	cfs
Full Flow Slope	0.000679	ft/ft
Flow is subcritical.		

max. anticipated rate (two pump in lift station pumping at the same time)

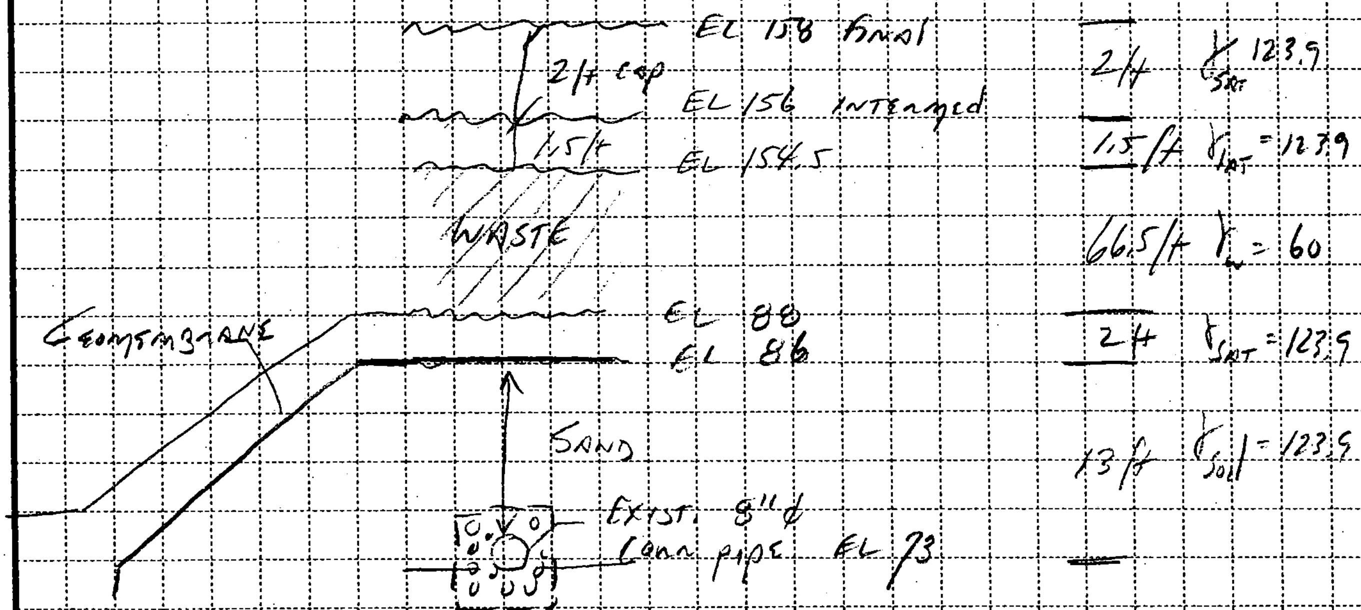
SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill Expan.	JOB NO. 09199033.09
SUBJECT Existing Leachate Collection System – Pipe Crushing	BY HHO	DATE
	CHECKED	DATE

PROBLEM: Determine if additional waste loading will effect existing system

GIVEN: Maximum proposed Buildout @ Stress point 11A (see settlement



Solution: Determine stress on pipe and use pipe deflection crushing spreadsheet by ADS pipe

Stress on pipe

$$\sigma_v = 2\,ft(123.9\ lb/ft^3) + 1.5(123.9) + 66.5(60) + 2(123.9) + 13(123.9)$$

$$= 6282.15\ psf \quad (43.6\ psi)$$

Very conservative saturated unit weights used and waste assumed saturated

Burns and Richard Solution

8" ADS SW

2/23/2004

PIPE PARAMETERS - AASHTO M294, Type C

effective radius (in), R = 4.39
outside diameter (in), D = 9.45
thickness (in), t = 0.655
unit area of wall (in^2/in)*, A* = 0.128
unit moment of inertia (in^4/in)*, I* = 0.0066
flexural modulus (psi), E_f = 110,000
ring compression modulus (psi), E_{rc} = 110,000
flexural stiffness (psi), $K_f = 6E_fI/R^3$ = 52
ring compression stiffness (psi), $K_{rc} = E_{rc}A/R$ = 3,209
distance from inner wall to n.a. (in), c = 0.32

SOIL PARAMETERS - good granular soil

mod of soil reaction at 5' of cover (psi), E'_5 = 700
modulus of soil reaction (psi), E' = 1,416
Poisson's ratio, u = 0.30
constr mod (psi), $M^*=E^*(1-u)/((1+u)(1-2u))$= 1906.16
lateral stress ratio = K = $u/(1-u)$ = 0.429
sym lateral stress ratio = B = (1/2)(1+K) = 0.714
antisym lat stress ratio = C = (1/2)(1-K) = 0.286

SOIL/STRUCTURE PARAMETERS (full slippage)

ring flexibility ratio, UF = $(1+K)M^*/K_{rc}$ = 0.85
bending flexibility ratio, VF = $(1-K)M^*/K_f$ = 21.1

STRESS FUNCTION COEFFICIENTS

constant term, a_0^* = -0.045
cos(2*theta), a_2^{**} = 0.938
sin(2*theta), b_2^{**} = 0.908

LOAD PARAMETERS

unit weight of soil (lb/ft^3) = 120
height of fill above crown (ft) = 52.5
surcharge pressure (psi), P = 43.8

RESPONSE OF PIPE WALL

deg c.c.w. from horiz	radial soil press P_r(psi)	radial defl w(in)	tang defl v(in)	circum wall thrust N(#/in)	wall bend mom(M) (#-lb/in)	ring comp stress (psi)	inner bend stress (psi)	outer bend stress (psi)	total stress inner (psi)	total stress outer (psi)
0	30.4	-0.086	0.000	147	17	-1146	-796	843	-1942	-303
10	30.5	-0.079	0.023	146	16	-1145	-752	797	-1897	-347
20	30.9	-0.056	0.042	146	13	-1140	-628	666	-1768	-474
30	31.5	-0.021	0.057	145	9	-1133	-438	465	-1571	-668
40	32.3	0.022	0.065	144	4	-1124	-205	217	-1329	-907
50	33.1	0.067	0.065	143	-1	-1115	43	-45	-1072	-1161
60	33.8	0.110	0.057	142	-6	-1107	276	-293	-830	-1399
70	34.4	0.145	0.042	141	-10	-1099	466	-494	-633	-1593
80	34.8	0.168	0.023	140	-12	-1095	590	-625	-505	-1720
90	35.0	0.176	0.000	140	-13	-1093	633	-671	-460	-1764
100	34.8	0.168	-0.023	140	-12	-1095	590	-625	-505	-1720
110	34.4	0.145	-0.042	141	-10	-1099	466	-494	-633	-1593
120	33.8	0.110	-0.057	142	-6	-1107	276	-293	-830	-1399
130	33.1	0.067	-0.065	143	-1	-1115	43	-45	-1072	-1161
140	32.3	0.022	-0.065	144	4	-1124	-205	217	-1329	-907
150	31.5	-0.021	-0.057	145	9	-1133	-438	465	-1571	-668
160	30.9	-0.056	-0.042	146	13	-1140	-628	666	-1768	-474
170	30.5	-0.079	-0.023	146	16	-1145	-752	797	-1897	-347
180	30.4	-0.086	0.000	147	17	-1146	-796	843	-1942	-303

CALCULATION OF RING SHORTENING

deg c.c.w. from horiz	ring comp stress (psi)	ring comp strain (in/in)	ring shortening (in)
0	-1146	-0.010419	-0.0080
10	-1145	-0.0104	-0.0080
20	-1140	-0.010363	-0.0079
30	-1133	-0.010299	-0.0079
40	-1124	-0.010221	-0.0078
50	-1115	-0.010138	-0.0078
60	-1107	-0.010059	-0.0077
70	-1099	-0.009995	-0.0077
80	-1095	-0.009954	-0.0076
90	-1093	-0.009939	-0.0076
100	-1095	-0.009954	-0.0076
110	-1099	-0.009995	-0.0077
120	-1107	-0.010059	-0.0077
130	-1115	-0.010138	-0.0078
140	-1124	-0.010221	-0.0078
150	-1133	-0.010299	-0.0079
160	-1140	-0.010363	-0.0079
170	-1145	-0.0104	-0.0080
180	-1146	-0.010419	-0.0080
		SUM (l/2 circle) =	-0.1483

COMMENTS

1. *This is 8" diameter ADS Single Wall*
2. *Flexural and compressive modulus are taken as 110,000 psi.*
3. *Typical* E'_5 *values (in psi) for various soils are listed in the table below:*

Type of soil	Standard AASHTO Relative Compaction		
	85%	90%	95%
Fine-grained soils with less than 25% sand (CL, ML, DL-ML)	500	700	1000
Coarse-grained soils with fines (SM, SC)	600	1000	1200
Coarse-grained soils with little or no fines (SP, SW, GP, GW)	700	1000	1600

MISC CALCS

Vertical deflection (%) = 4.00
Horizontal deflection (%) = -3.94
Critical Buckling Pressure (psi), P_{cr}= 103.4
Radial Soil Pressure at Crown (psi), P_{act}= 35.0
Arc length of each sector (in) = 0.7659

CIRCUMFERENCE SHORTENS= -0.30 inches

Max. Compressive Stress
-1941.6 OK (< -3000)

Max. Tensile Stress
-303.07 OK (< 1000)

Circumfence Shortening % (2% Max)
-0.0099 OK

Surcharge Pressure = 42.8 psi > Stress on Pipe = 43.6 psi

Calculations by: LEK
Engineer

ATTACHMENT H

SLOPE STABILITY

SLOPE STABILITY MODEL PROCEDURES

PCSTABL6 FOR DOS

VERSION 6.0

USER'S MANUAL

EDITED BY:

Paola Bandini
Research Assistant, Purdue University

and

Rodrigo Salgado
Associate Prof., Purdue University

March 1999

BOUNDARY LOADS

Uniformly distributed boundary loads applied to the ground surface are specified by defining their extent, intensity, and direction of application (Figure 8). The limit equilibrium model used for analysis treats the boundary loads as strip loads of infinite length. The major axis of each strip load is normal to the two-dimensional X-Y plane within which the geometry of slope stability problems is solved. Therefore, the extent of a boundary load is its width in the two-dimensional plane.

Data for each boundary load consist of the left and right X coordinates which defines the horizontal extent of load application, the intensity of the loading, and its inclination. The intensity specified should be in terms of the load acting on a horizontal projection of the ground surface rather than the true length of the ground surface. Inclination is specified positive counterclockwise from the vertical. The boundaries must be ordered from left to right and are not allowed to overlap.

A boundary load whose intensity varies with position can be approximated by substituting a group of statically equivalent uniformly distributed loads which abut one another. The sum of the widths of the substitute loads should equal the width of the load being approximated. The inclinations should be equivalent, and the intensities of substitute loads should vary, as does the load being approximated.

SEARCHING ROUTINES

STABL can generate any specified number of trial failure surfaces in random fashion. The only limitation is computation time. Usually 100 surfaces are adequate. Each surface must meet specified requirements. As each acceptable surface is generated, the corresponding factor of safety is calculated. The ten most critical are accumulated and sorted by the values of their factors of safety. After all the specified number of surfaces are successfully generated and analyzed, the ten most critical surfaces are plotted so that the pattern may be studied.

Circular and Irregular Surfaces

The searching routines, which generate circular and irregularly shaped trial failure surfaces, are basically similar in use and are, therefore, discussed together.

Trial failure surfaces are generated from the left to the right. Each surface is composed of a series of straight-line segments of equal length, except for the last segment, which will most likely be shorter. The length used for the line segments is specified by the user and should be sufficiently small for the accuracy desired.

Generation of an individual trial failure surface begins at an initiation point on the ground surface. The direction of the first line segment of the trial failure surface is chosen randomly between two direction limits. An angle of 5° less than the inclination of the ground surface to the right of the initiation point is one limit, while an angle of -45° to the horizontal is another limit (Figure 12). The first line segment can fall anywhere between these two limits, but the technique of choosing its position is biased so that it will lie closer to the -45° limit more often than to the other.

By specifying zero values for both of the direction limits, the direction limits as described above are implicitly selected. However, the counterclockwise and clockwise direction limits may also be specified. After a preliminary search for the critical surface, it is usually found that all or most of the ten most critical surfaces have about the same angle of inclination for the initial line segments. By restricting the initial line segment within direction limits having a directional range smaller than that which would be used automatically by **PCSTABL6**, and at inclinations which would bracket the initial line segments of surfaces previously determined to be critical, subsequent searches can be conducted more efficiently.

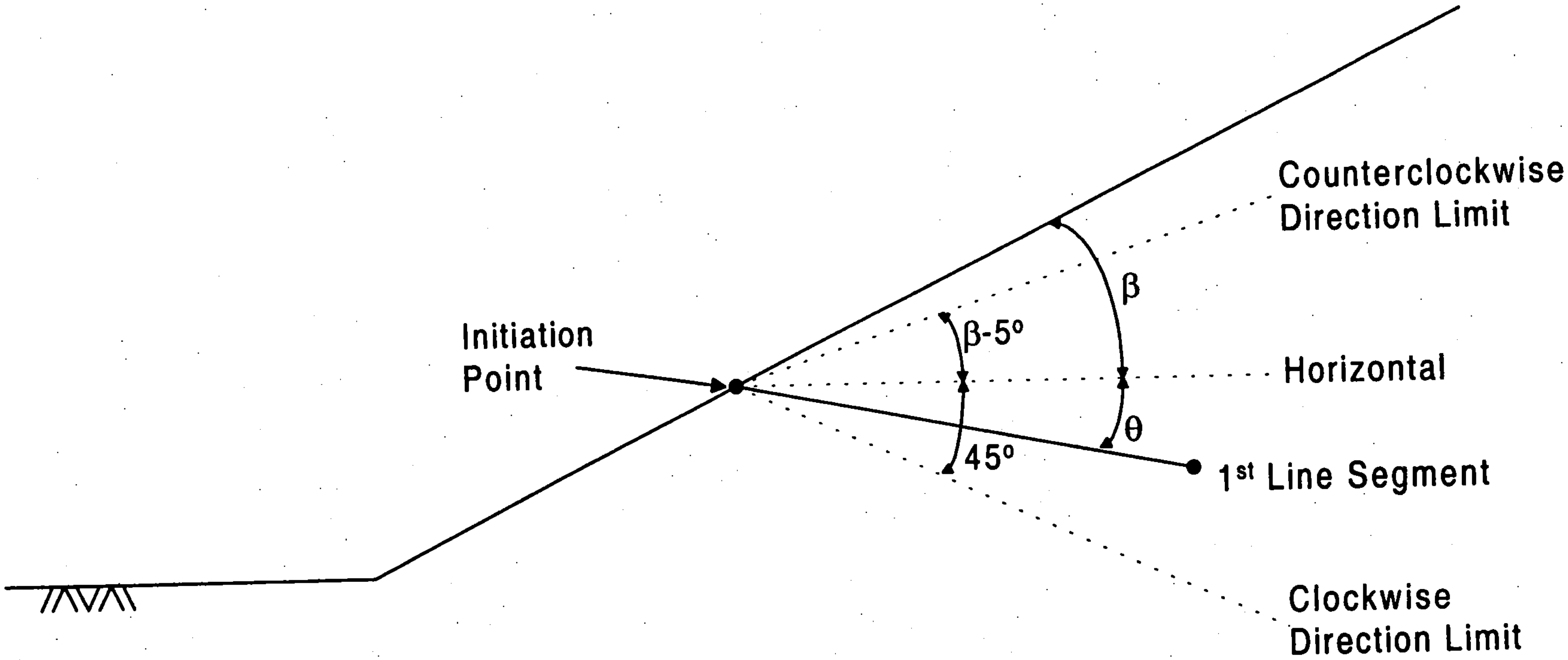


Figure 12. Generation of the first line segment to define a trial failure surface.

After establishment of the first line segment, a circular shaped trial failure surface is generated by changing the direction of each succeeding line segment by some constant angle (Figure 13) until an intersection of the trial failure surface with the ground surface occurs. In effect, the chords of a circle are generated rather than the circle itself. The constant angle of deflection is obtained randomly.

An irregular shaped surface is generated somewhat differently after establishment of the first line segment. The direction of each succeeding line segment is chosen randomly within limits determined by the direction of the preceding line segment. Surfaces with reverse curvature are likely, and if a very short length is used for the line segments, a significant amount of kinkiness in the surfaces will be inevitable. Some reverse curvature is desirable but extreme kinkiness is not. To avoid the second case the length of the line segment selected should in general not be shorter than 1/4 to 1/3 the height of the slope.

When using either of these generation techniques to search for a critical failure surface, the following scheme is employed. **STABL** directs computation of a specified number of initiation points along the ground surface. The initiation points are equally spaced horizontally between two specified points, which are the leftmost and rightmost initiation points. Only the X-coordinates of these two points, specified in left-right order, are required. From each initiation point, a specified number of trial failure surfaces are generated. If the left point coincides with the right, a single initiation point results, from which all surfaces are generated. The total number of surfaces generated will equal the product of the number of initiation points and the number of surfaces generated from each.

Termination limits are specified to minimize the chance of proceeding with a calculation of the factor of safety for an unlikely failure surface. If a generated trial failure surface terminates at the ground surface short of the left initiation limit (Figure 14), the surface is rejected prior to calculation of a factor of safety and a replacement is generated. If a generating surface goes beyond the right termination limit, it will be rejected requiring a replacement. The termination limits are also specified in left-right order.

A depth limitation is imposed by specifying an elevation below which no surface is allowed to extend. This is used, for example, to eliminate calculation of the factor of safety for generated surfaces that would extend into a strong horizontal bedrock layer. When a shallow failure surface is expected, the use of the depth limitation prevents generation and analysis of deep trial failure surfaces.

An additional type of search limitation may be imposed to handle situations such as variable elevation of bedrock or delimitating a weak zone and confining the search for a critical surface to that area. This type of limitation will be discussed later.

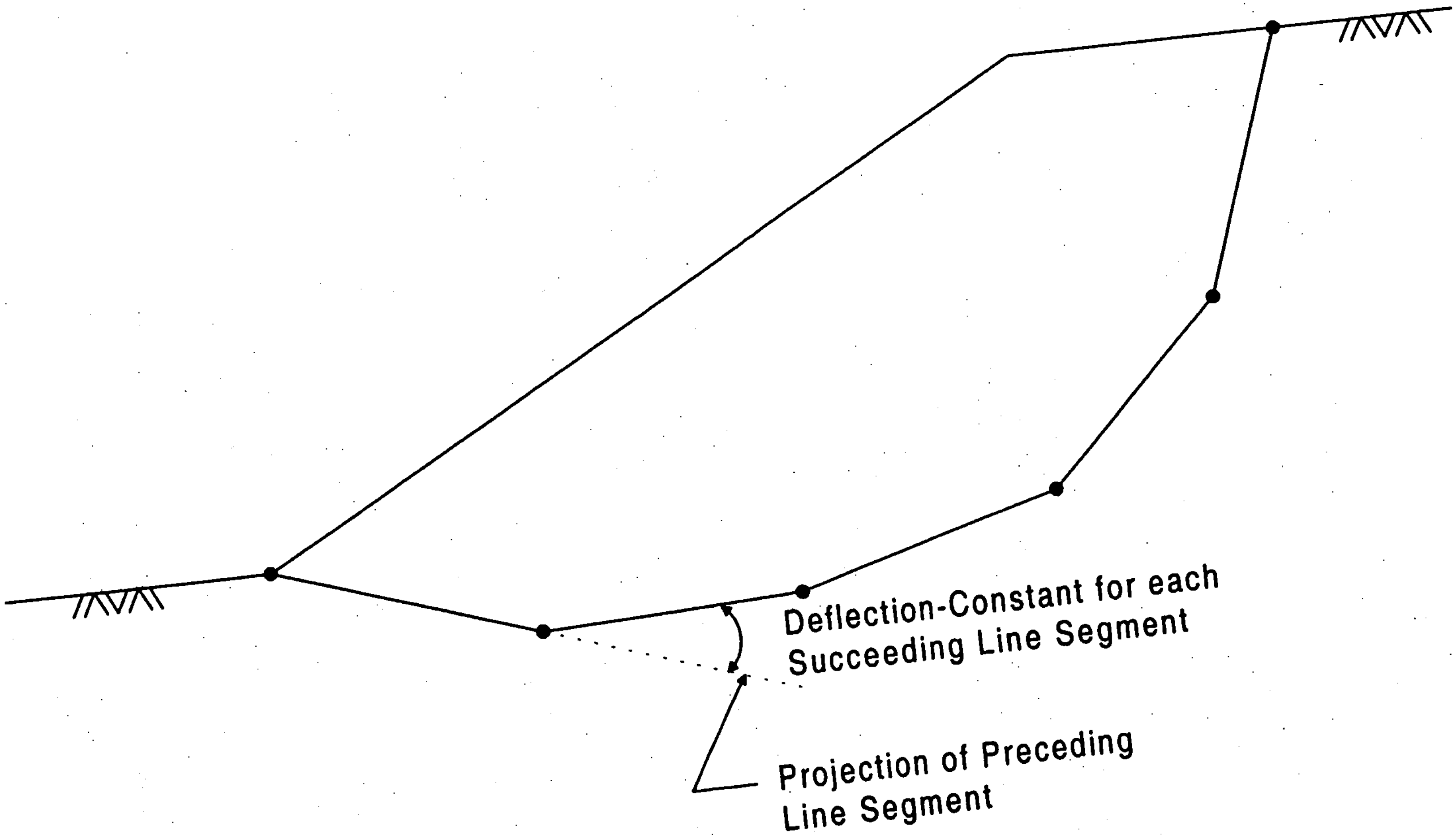


Figure 13. Circular surface generation.

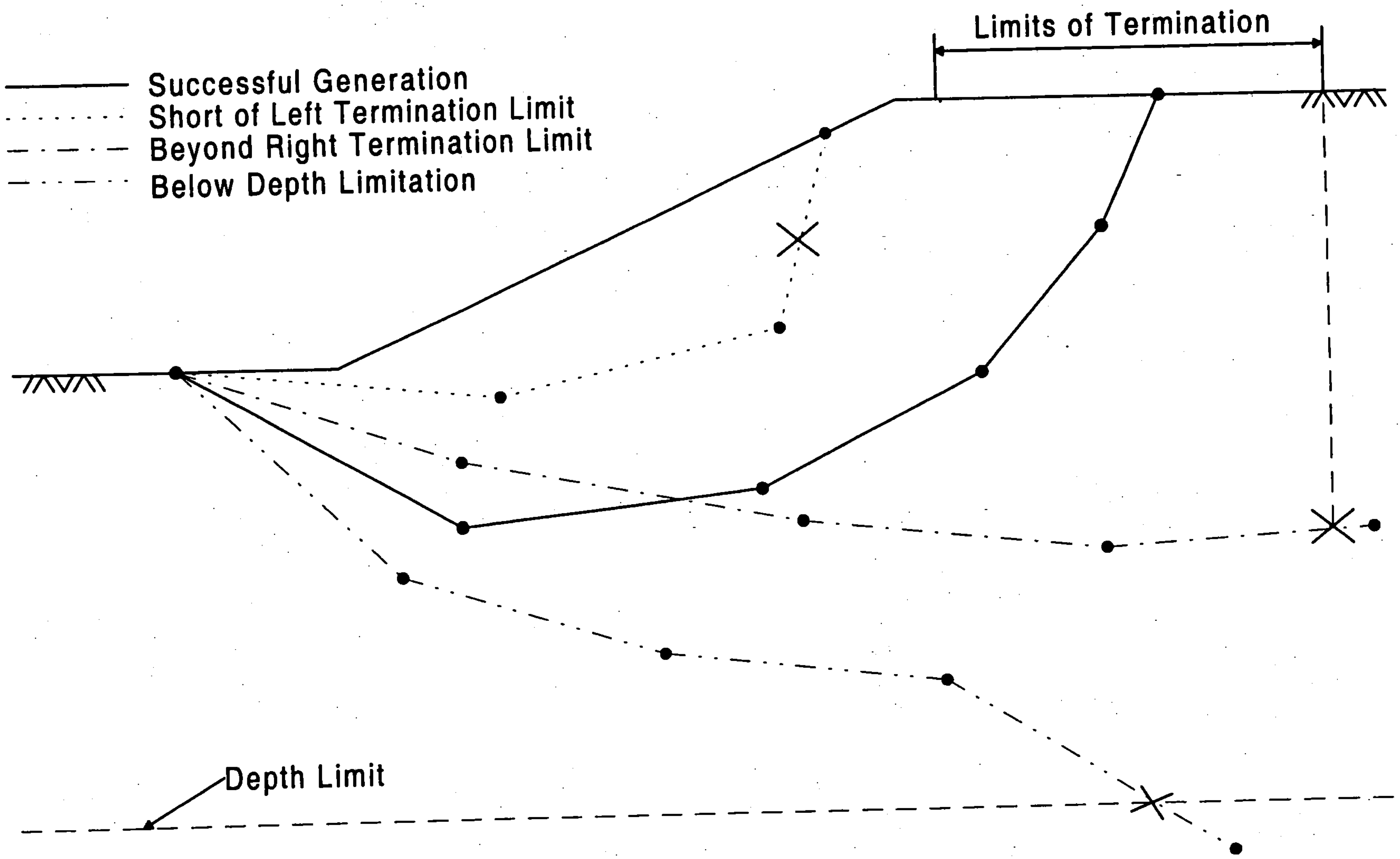


Figure 14. Trial failure surface acceptance criteria.

Sliding Block Surfaces

A sliding block trial failure surface generator provides a means through which a concentrated search for the critical failure surface may be performed within a well-defined weak zone of a soil profile.

In a simple problem involving a sliding block shaped failure face (Figure 15), the following procedure is used. Two boxes are established within the weak layer with the intent that from within each, a point will be chosen randomly. The two points once chosen define a line segment that is then used as the base of the central block of the sliding mass. Any point within each box has equal likelihood of being chosen. Therefore, a random orientation, position and width of the central block is obtained. The boxes are required to be parallelograms with vertical sides. The top and bottom of a box may have any common inclination. Each box is specified by the length of its vertical sides and two coordinate points that define the intersections of its centerline with its vertical sides (Figure 16).

After the base of the central block is created, the active and passive portions of the trial failure surface are generated using line segments of equal specified length by techniques similar to those used by the circle and irregular trial failure surface generators.

Starting at the left end of the central block base, a line segment of specified length is randomly directed between the limits of 0° and 45° with respect to the horizontal (Figure 17). The chosen direction is biased towards selection of an angle closer to 45°. This process is repeated as necessary until intersection of a line segment with the ground surface occurs, completing the passive portion of the trial surface.

For the active portion of the trial failure surface, a similar process is used with the limits for selection of the random direction being 0° and 45° with respect to the vertical (Figure 17). The chosen direction is biased towards selection of an angle nearer 45°.

A modified version of the sliding block surface generator, named BLOCK2, generates active and passive portions of the sliding block surface according to the Rankine's theory. To avoid the problem of the active or passive wedges terminating out of the defined slope boundaries, sketches should be drawn.

STABL allows the use of more than two boxes for the formation of the central block (Figure 18). The search may be limited to an irregularly shaped weak zone in this way. Another

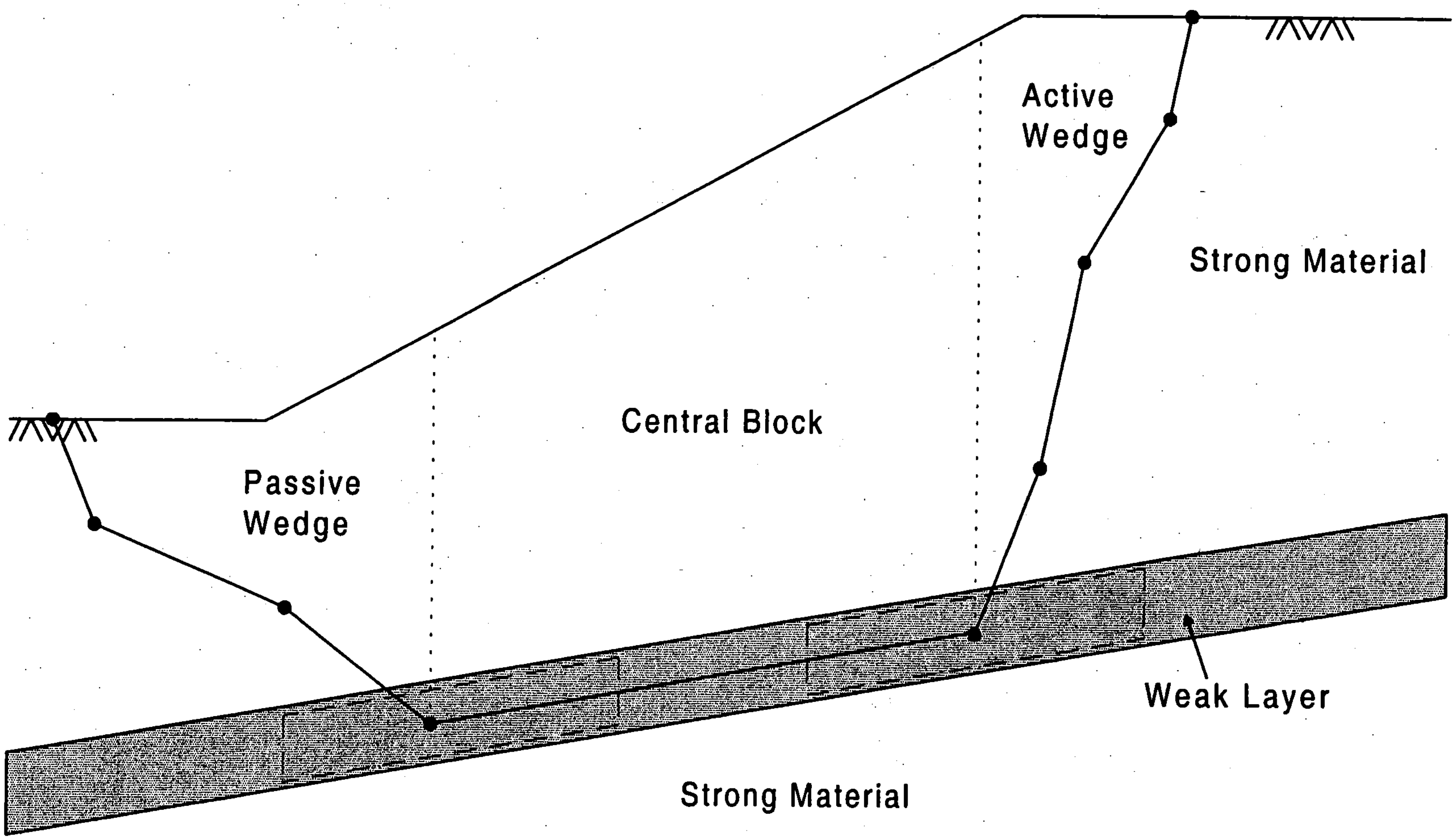


Figure 15. Simple sliding block problem.

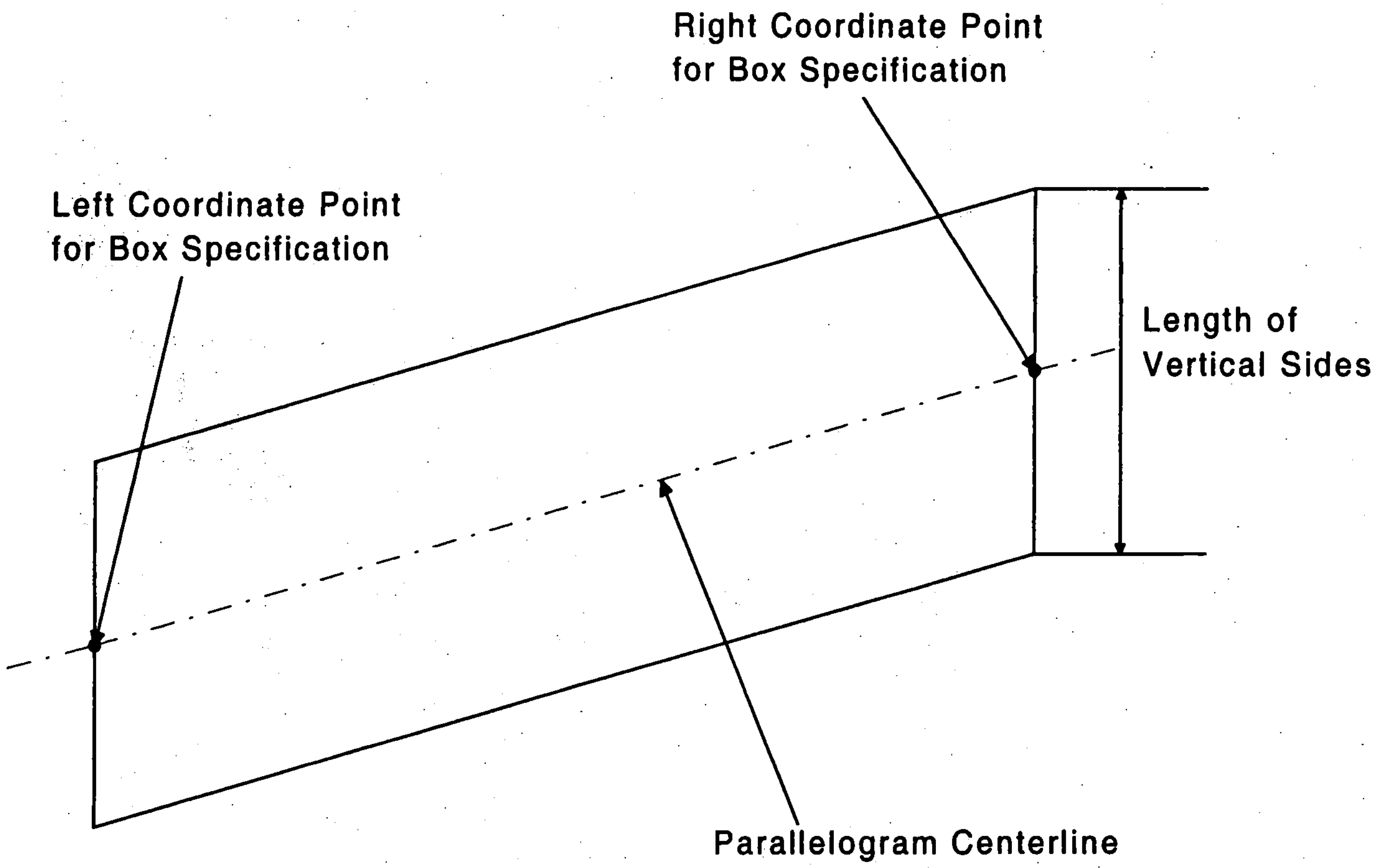


Figure 16. Sliding block box specifications.

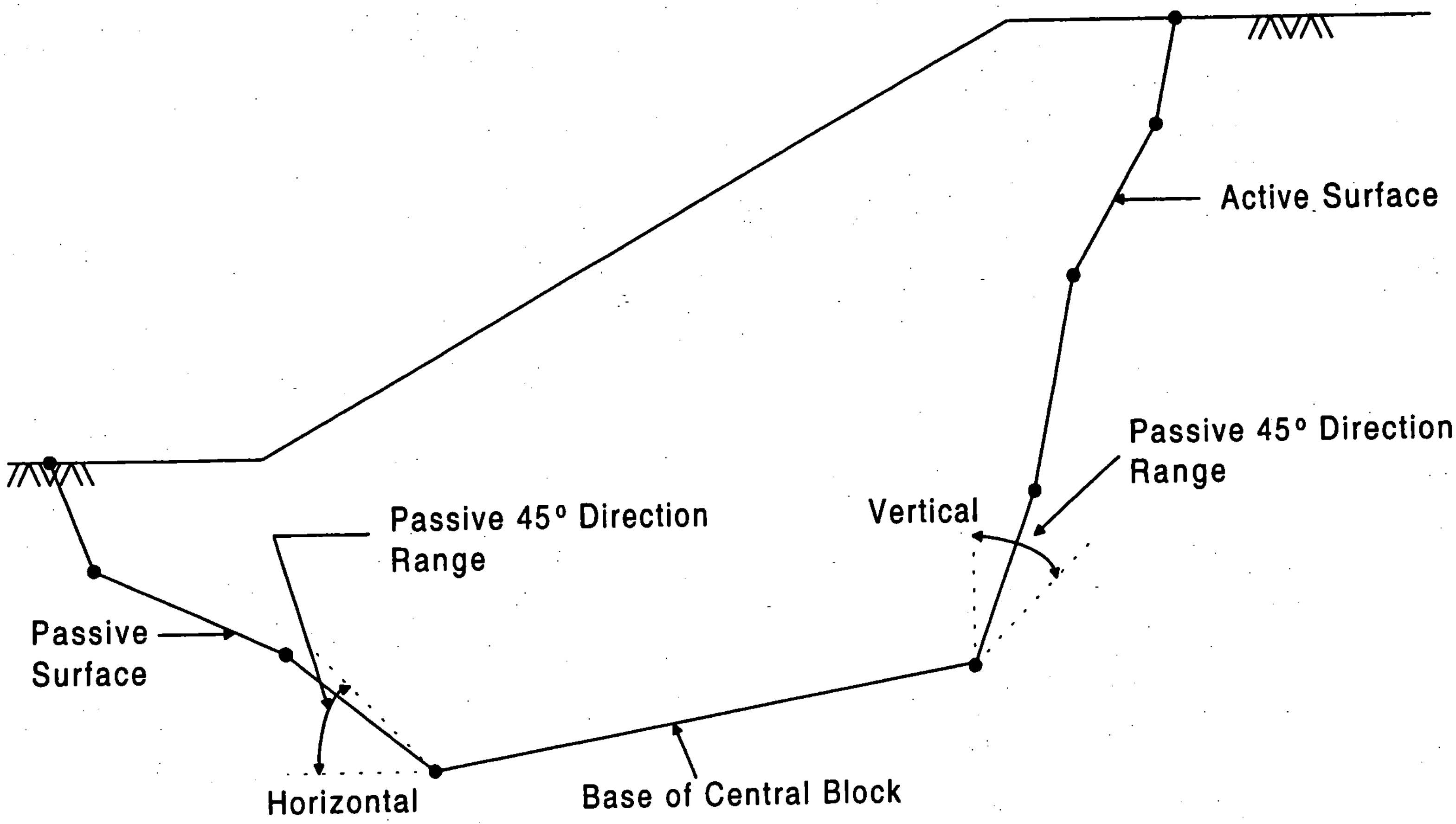
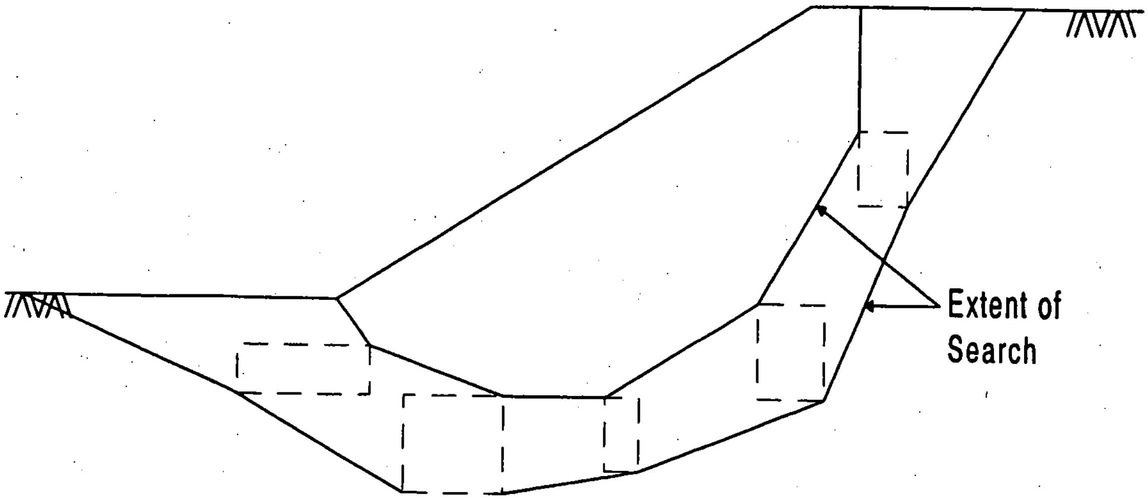
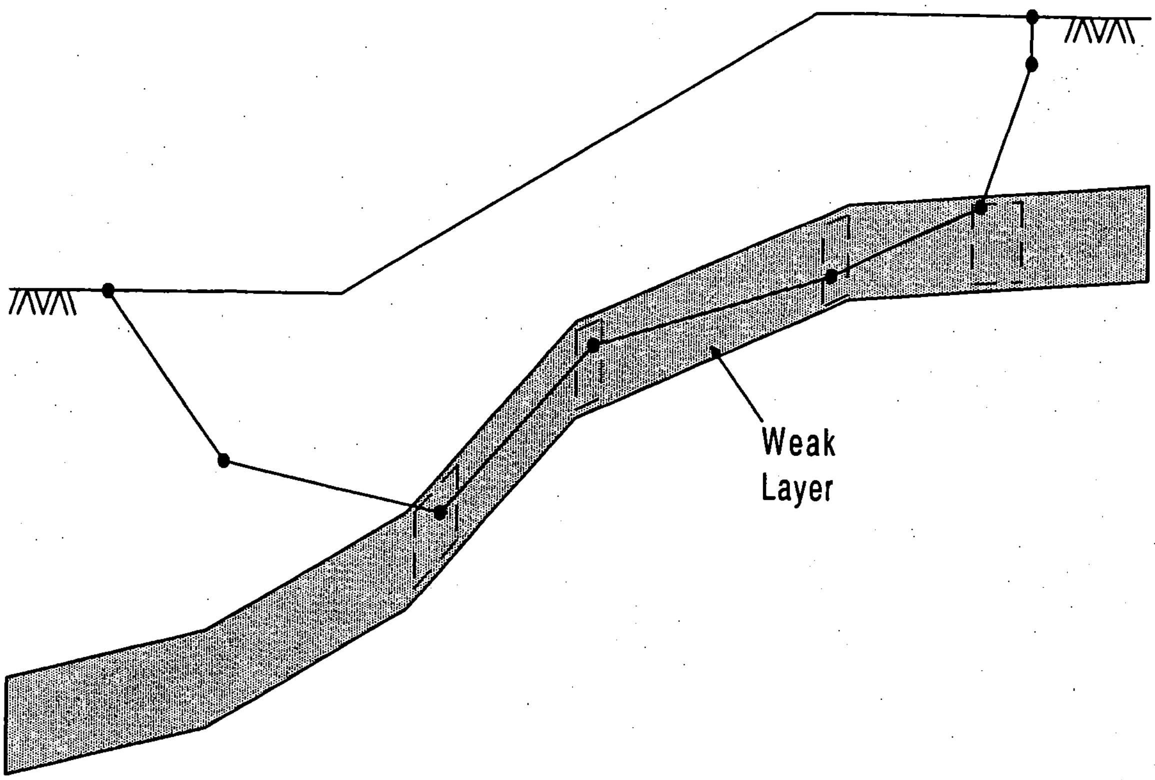


Figure 17. Generation of active and passive sliding surface.



a. Intensive search of critical zone previously defined by CIRCLE or RANDOM.



b. Search in irregular weak layer.

Figure 18. Sliding block generator using more than two boxes.

application might be to conduct a search within a zone previously defined as being critical by use of the analysis command RANDOM.

Degenerate cases of parallelogram boxes are permitted. For example, if both points specified as the intersections of a parallelogram centerline with its vertical sides are identical, and the length of the parallelograms vertical sides is non-zero, then a vertical line segment, in effect, is defined. When a trial failure surface is generated, each point along the vertical line segment's length has an equal likelihood of becoming a point defining the surface. The vertical line segment could further degenerate into a point if a zero value is specified for the length of the parallelogram vertical sides. Then all surfaces generated would pass through the single point. One more case of a degenerate parallelogram is a line segment whose inclination and position is that of the parallelogram's centerline. For this case, the length of the vertical sides is zero but the intersections of the parallelogram centerline with its vertical sides are not identical. Again, any point along the length of the line segment has equal likelihood of becoming a point defining a generated trial failure surface.

Surface Generation Boundaries

As an additional criterion for acceptance of generated trial failure surfaces, an ability to establish boundaries through which a surface may NOT pass has been provided. Such boundaries may be used with all surface- generating routines except BLOCK2. Each generation boundary specified is defined by two coordinate points. If a generating surface intersects the line segment defined by the pair of coordinate points, it will either be rejected and a replacement surface will be generated, or the surface will be deflected so that it may be successfully completed. The amount of deflection permitted for a trial failure surface is limited, and when it is insufficient to clear the surface generation boundary intersected, the surface is rejected.

When specifying surface generation boundaries the coordinate points of the left end point should precede those of the right end point. For the case of vertical boundaries, the order is not important. Along with the total number of boundaries, the number of vertical boundaries that deflects generating surfaces upward is specified. The data for these boundaries are required to precede the data for boundaries that deflect downward.

As mentioned previously, a variable elevation bedrock surface can be bounded so that no generated surfaces will pass through the rock. For this case, all the surface generation boundaries defining the bedrock surface would be specified to deflect intersecting trial failure surfaces upward. Another use might occur after a critical zone has been roughly defined by a searching technique.

This zone could be bound so that the subsequent search will be completely confined to it. Surface generation boundaries above the zone would be specified to deflect downward, and those below the zone would be specified to deflect upward.

An important consideration that should be given whenever any type of limitation is imposed for conducting a search for a critical surface is how many generating surfaces are likely to be rejected. A rejected surface is lost effort regardless of how efficiently it was generated by **STABL**. Perhaps for example, a multiple box search using the command BLOCK would be more efficient than using the command RANDOM with strict limitations.

Individual Failure Surface

If the failure of the slope is being studied and the location of the actual failure surface is known, **STABL** offers the option of specifying the known surface as an individual surface for analysis. Another situation for which this option would be useful is when the geologic pattern and shear strength data indicate one or more well-defined weak paths along which failure would be expected to occur.

An individual failure surface is approximated by straight-line segments defined by a series of points. The end points of the specified trial failure surface are checked for proper location within the horizontal extent of the defined ground surface. The Y-coordinates for these two points need not be correctly specified. **STABL** directs the calculation of the Y-coordinate, for each of these two points, from the intersection of a vertical line defined by the specified X-coordinate and the ground surface. Data for the coordinate points must be ordered from left to right.

SLOPE STABILITY MODEL RESULTS FOR EXISTING LANDFILL AS OF MARCH 2003

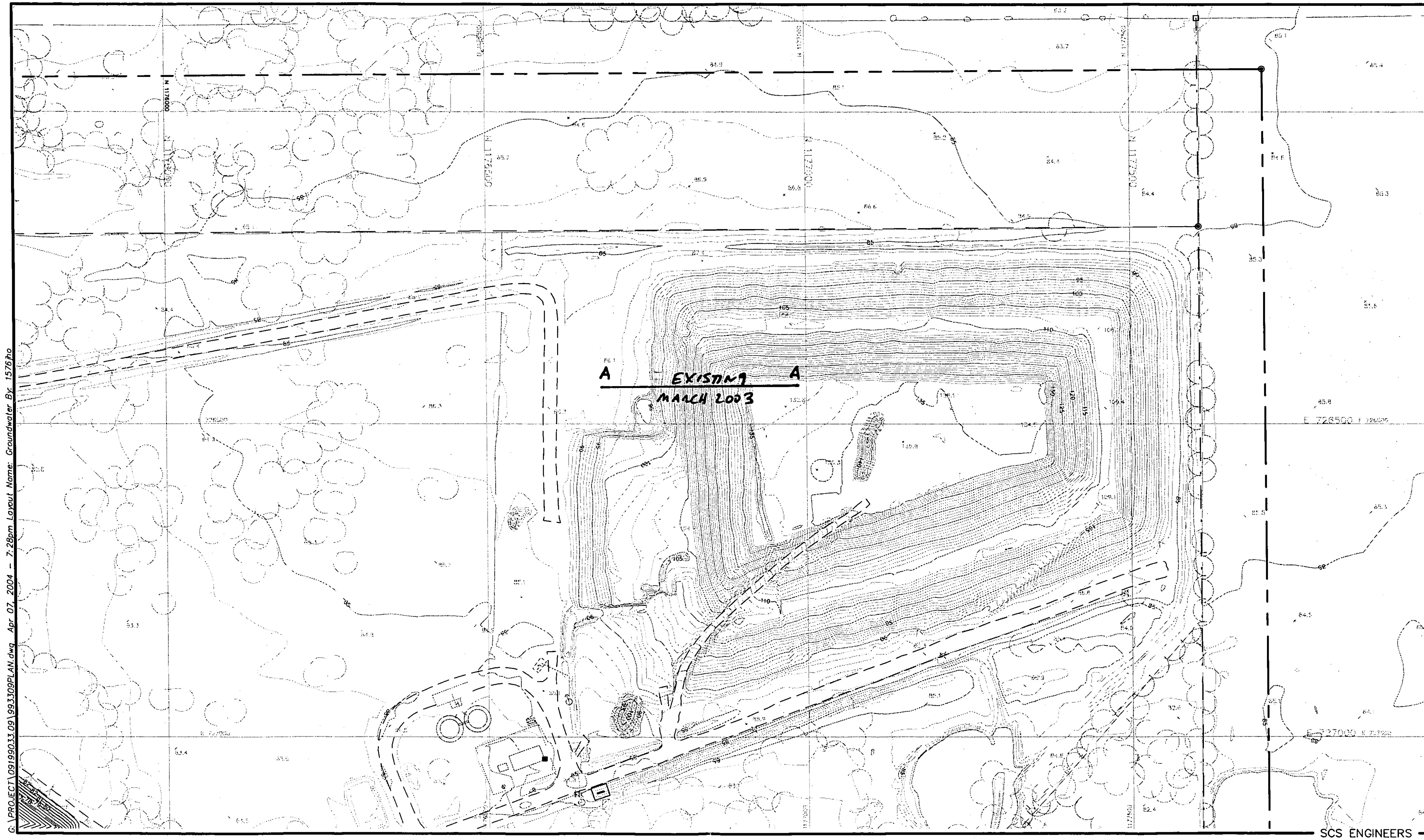


Figure 1 – Slope Stability Section Locations, Hardee County Landfill Expansion

SCS ENGINEERS

SHEET ______ OF ______

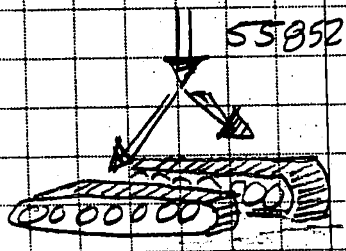
CLIENT Hardee County	PROJECT Hardee County Landfill	JOB NO. 09199033.09
SUBJECT Equipment Loading		BY [illegible] / DATE
		CHECKED / DATE

Equipment Loads

Existing Equipment Dozer CAT D7R Series II

operating weight 55,852 lb

Length of track on ground = 9'-5" = 9.4167 ft
width of track = 22 inches (1.83 feet)



2 tracks
27,926 lb per track

Surface Area
A = (Length of track)(width track)

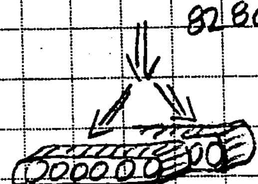
$$\text{Stress} = F/A = \frac{27926 \text{ lb}}{(9.41)(1.833)\text{ SF}}$$

Pressure = 1617.6 psf (11.23 psi)

Alternative Equipment

~~CAT D8R WHA Series II~~
~~operating weight = 82,880 lb~~

~~Length of track on ground = 10'-6" (10.5 ft)~~
~~width of track = 22 in (1.833 ft)~~



~~2 tracks~~
~~41,440 lb per track~~

$$\cancel{\text{Stress} = F/A = \frac{41,440 \text{ lb}}{(10.5)(1.8333)\text{ SF}}}$$

~~Pressure = 2152.8 psf (14.95 psi)~~

Not Used

Track-Type Tractors

D7R Series II Other Models: D7R Series II

Printer Friendly

Engineered for demanding work. The D7R Series II is designed to be productive in a variety of applications. It keeps material moving with the reliability and low operating costs you expect from Cat machines.

Features & Benefits

Standard Equipment

Optional Equipment

Specification Graphics
(PDF: 167K)

Related Industries: Agriculture, Construction, Forestry, Heavy Construction, Industrial, Quarry/Aggregate, Waste

Detailed Specifications

Engine

Engine Model	Cat 3176C
Flywheel Power	179 kW / 240 hp

Maximum Flywheel Power	192 kW / 258 hp
Net Power - Caterpillar	179 kW / 240 hp
Net Power - ISO 9249	179 kW / 240 hp
Net Power - SAE J1349	177 kW / 238 hp
Net Power - EU 80/1269	179 kW / 240 hp
Net Power - DIN 70020	248 PS
Bore	125 mm / 4.9 in
Stroke	140 mm / 5.5 in
Displacement	10.3 L / 629 in3
Weights	
Operating Weight - Std.	24758 kg / 54582 lb
Shipping Weight - Std.	20084 kg / 44278 lb
Operating Weight - XR	25334 kg / 55852 lb
Shipping Weight - XR	20660 kg / 45548 lb
Operating Weight - LGP	26897 kg / 59299 lb
Shipping Weight - LGP	22176 kg / 48890 lb
Transmission	
1 Forward	3.52 kph / 2.19 mph
2 Forward	6.1 kph / 3.79 mph
3 Forward	10.54 kph / 6.55 mph
1 Reverse	4.54 kph / 2.82 mph
2 Reverse	7.85 kph / 4.88 mph
3 Reverse	13.58 kph / 8.44 mph
Undercarriage - Std.	
Shoe Type	Extreme Service
Pitch	216 mm / 8.5 in
Number Shoes/Side	40
Grouser Height	71.5 mm / 3 in
Track Rollers/side	7
Width of Shoe	600 mm / 22 in
Track on Ground	2870 mm / 9.4 ft
Track Gauge	1981 mm / 78 in
Ground Contact Area	3.21 m2 / 4972 in2
Ground Pressure (Std.)	7.58 kPa / 11 psi

Ground Clearance	414 mm / 16.3 in

Service Refill Capacities

Fuel Tank	479 L / 126.5 gal
Cooling System	77.4 L / 20.4 gal
Engine Crankcase	31 L / 8.2 gal
Power Train	178 L / 47 gal
Final Drives (each)	13 L / 3.4 gal
Roller Frames (each)	24.6 L / 6.5 gal
Attachment Hydraulic System Tank Only	54 L / 14.3 gal
Pivot Shaft Compartment	1.9 L / 0.5 gal

Hydraulic Controls - Maximum Operating Pressure

Bulldozer	22800 kPa / 3307 psi
Tilt Cylinder	17225 kPa / 2498 psi
Ripper (Lift)	22750 kPa / 3300 psi
Ripper (Pitch)	22750 kPa / 3300 psi
Steering	38000 kPa / 5511 psi

Hydraulic Controls - Pump

Pump Capacity at	7000 kPa / 1015 psi
RPM at Rated Engine Speed	2231 RPM / 2231 RPM
Pump Output (Clutch Brake)	222 L/min / 58.6 gal/min
Pump Output (Differential Steering)	295 L/min / 77.9 gal/min
Lift Cylinder Flow	180 L/min / 47.6 gal/min
Tilt Cylinder Flow	80 L/min / 21.1 gal/min
Ripper Cylinder Flow	180 L/min / 47.6 gal/min

Hydraulic Controls - Main Relief Valve Settings

Clutch Brake Models	27000 kPa / 3916 psi
Differential Steering Models	42000 kPa / 6092 psi

Winch Specifications

Winch Model	PA110VS Variable Speed
Weight	1894 kg / 4176 lb
Winch and Bracket Length	1461 mm / 57.5 in
Winch Case Width	1171 mm / 46.1 in
Increased Tractor Length - STD	742 mm / 29.2 in
Increased Tractor Length - XR	587 mm / 23.1 in

Hardee County Landfill - Existing 2003 Hardee County, Florida

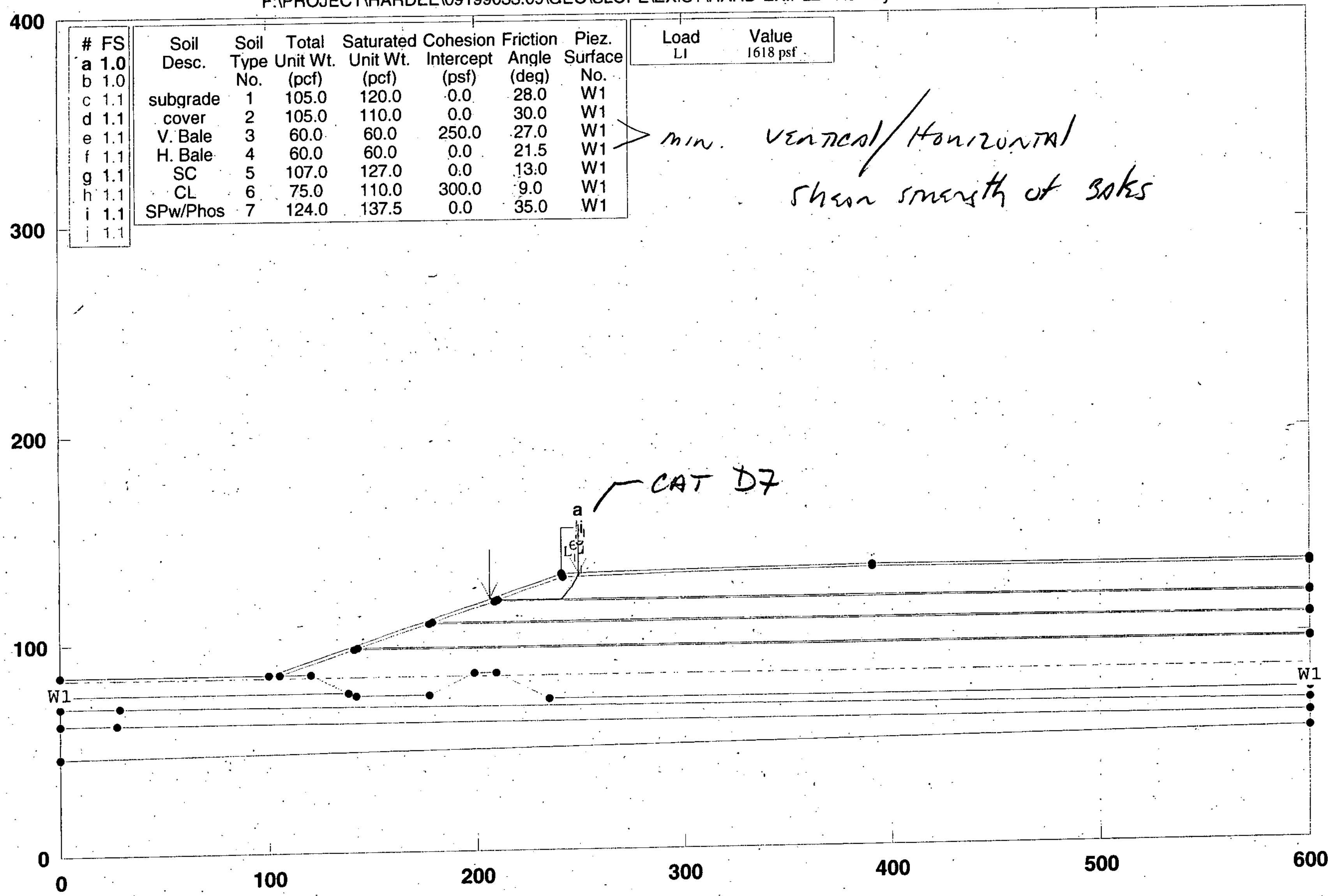
F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXIST\HARD-EX.PL2 Run By: JHO 2/19/2004 2:03PM

#	FS
a	1.0
b	1.0
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
cover	2	105.0	110.0	0.0	30.0	W1
V. Bale	3	60.0	60.0	250.0	27.0	W1
H. Bale	4	60.0	60.0	0.0	21.5	W1
SC	5	107.0	127.0	0.0	13.0	W1
CL	6	75.0	110.0	300.0	9.0	W1
SPw/Phos	7	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 psf

min. vertical/horizontal shear strength of bales



PCSTABL5M/si FSmin=1.0

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/19/2004
Time of Run:	2:03PM
Run By:	JHO
Input Data Filename:	F:hard-ex.
Output Filename:	F:hard-ex.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:hard-ex.PLT

PROBLEM DESCRIPTION **Hardee County Landfill - Existing 2003**
Hardee County, Florida

BOUNDARY COORDINATES

4 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	100.00	85.00	1
2	100.00	85.00	241.00	132.00	2
3	241.00	132.00	391.00	135.00	2
4	391.00	135.00	600.00	135.00	2
5	100.00	85.00	104.74	85.00	1
6	104.74	85.00	140.74	97.00	3
7	140.74	97.00	142.24	97.50	4
8	142.24	97.50	176.74	109.00	3
9	176.74	109.00	178.24	109.50	3
10	178.24	109.50	208.24	119.50	3
11	208.24	119.50	209.74	120.00	4
12	209.74	120.00	241.27	130.50	3
13	241.27	130.50	391.00	133.50	3
14	391.00	133.50	600.00	133.50	3
15	209.74	120.00	600.00	120.00	4
16	208.24	119.50	600.00	119.50	3
17	178.24	109.50	600.00	109.50	4
18	176.74	109.00	600.00	109.00	3
19	142.24	97.50	600.00	97.50	4
20	140.74	97.00	600.00	97.00	3
21	104.74	85.00	120.00	85.00	1
22	120.00	85.00	138.00	76.00	1
23	.00	76.00	138.00	76.00	1
24	138.00	76.00	142.00	74.00	1
25	142.00	74.00	177.00	74.00	1
26	177.00	74.00	199.00	85.00	1
27	199.00	85.00	209.00	85.00	1
28	209.00	85.00	235.00	72.00	1
29	235.00	72.00	600.00	72.00	1
30	.00	70.00	28.56	70.00	5
31	28.56	70.00	600.00	67.00	5
32	.00	61.43	27.00	61.43	6
33	27.00	61.43	600.00	61.00	6
34	.00	46.07	600.00	53.50	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	105.0	110.0	.0	30.0	.00	.0	1
3	60.0	60.0	250.0	27.0	.00	.0	1
4	60.0	60.0	.0	21.5	.00	.0	1
5	107.0	127.0	.0	13.0	.00	.0	1
6	75.0	110.0	300.0	9.0	.00	.0	1
7	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.00
2	600.00	83.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	241.00	250.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 8.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	210.00	119.75	225.00	119.75	.20
2	230.00	119.75	250.00	119.75	.20

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	206.15	120.38
2	213.45	119.76
3	241.00	119.81
4	245.89	126.14
5	248.97	132.16

FACTOR OF SAFETY = 1.0 (With Equipment Load - This Model only used to estimate minimum waste strength parameters)

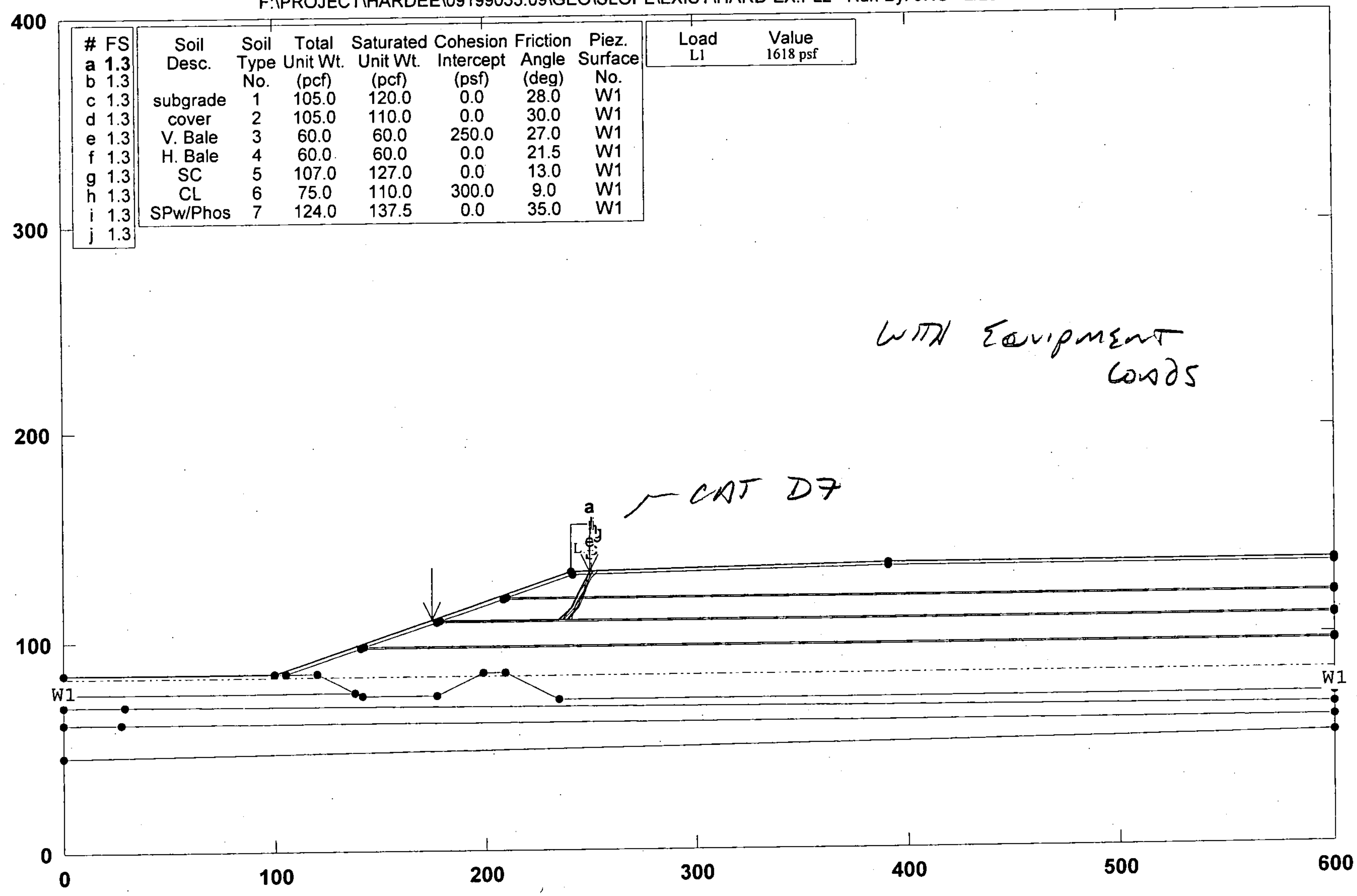
Hardee County Landfill - Existing 2003 Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXIST\HARD-EX.PL2 Run By: JHO 2/23/2004 11:48AM

#	FS
a	**1.3**
b	1.3
c	1.3
d	1.3
e	1.3
f	1.3
g	1.3
h	1.3
i	1.3
j	1.3

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
cover	2	105.0	110.0	0.0	30.0	W1
V. Bale	3	60.0	60.0	250.0	27.0	W1
H. Bale	4	60.0	60.0	0.0	21.5	W1
SC	5	107.0	127.0	0.0	13.0	W1
CL	6	75.0	110.0	300.0	9.0	W1
SPw/Phos	7	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 psf



PCSTABL5M/si FSmin=1.3

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/23/2004
Time of Run:	11:48AM
Run By:	JHO
Input Data Filename:	F:hard-ex.
Output Filename:	F:hard-ex.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:hard-ex.PLT

PROBLEM DESCRIPTION **Hardee County Landfill - Existing 2003**
Hardee County, Florida

BOUNDARY COORDINATES

4 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	100.00	85.00	1
2	100.00	85.00	241.00	132.00	2
3	241.00	132.00	391.00	135.00	2
4	391.00	135.00	600.00	135.00	2
5	100.00	85.00	104.74	85.00	1
6	104.74	85.00	140.74	97.00	3
7	140.74	97.00	142.24	97.50	4
8	142.24	97.50	176.74	109.00	3
9	176.74	109.00	178.24	109.50	3
10	178.24	109.50	208.24	119.50	3
11	208.24	119.50	209.74	120.00	4
12	209.74	120.00	241.27	130.50	3
13	241.27	130.50	391.00	133.50	3
14	391.00	133.50	600.00	133.50	3
15	209.74	120.00	600.00	120.00	4
16	208.24	119.50	600.00	119.50	3
17	178.24	109.50	600.00	109.50	4
18	176.74	109.00	600.00	109.00	3
19	142.24	97.50	600.00	97.50	4
20	140.74	97.00	600.00	97.00	3
21	104.74	85.00	120.00	85.00	1
22	120.00	85.00	138.00	76.00	1
23	.00	76.00	138.00	76.00	1
24	138.00	76.00	142.00	74.00	1
25	142.00	74.00	177.00	74.00	1
26	177.00	74.00	199.00	85.00	1
27	199.00	85.00	209.00	85.00	1
28	209.00	85.00	235.00	72.00	1
29	235.00	72.00	600.00	72.00	1
30	.00	70.00	28.56	70.00	5
31	28.56	70.00	600.00	67.00	5
32	.00	61.43	27.00	61.43	6
33	27.00	61.43	600.00	61.00	6
34	.00	46.07	600.00	53.50	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	105.0	110.0	.0	30.0	.00	.0	1
3	60.0	60.0	250.0	27.0	.00	.0	1
4	60.0	60.0	.0	21.5	.00	.0	1
5	107.0	127.0	.0	13.0	.00	.0	1
6	75.0	110.0	300.0	9.0	.00	.0	1
7	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.00
2	600.00	83.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	241.00	250.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 8.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	173.25	109.25	177.00	109.25	.25
2	234.00	109.25	260.00	109.25	.25

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

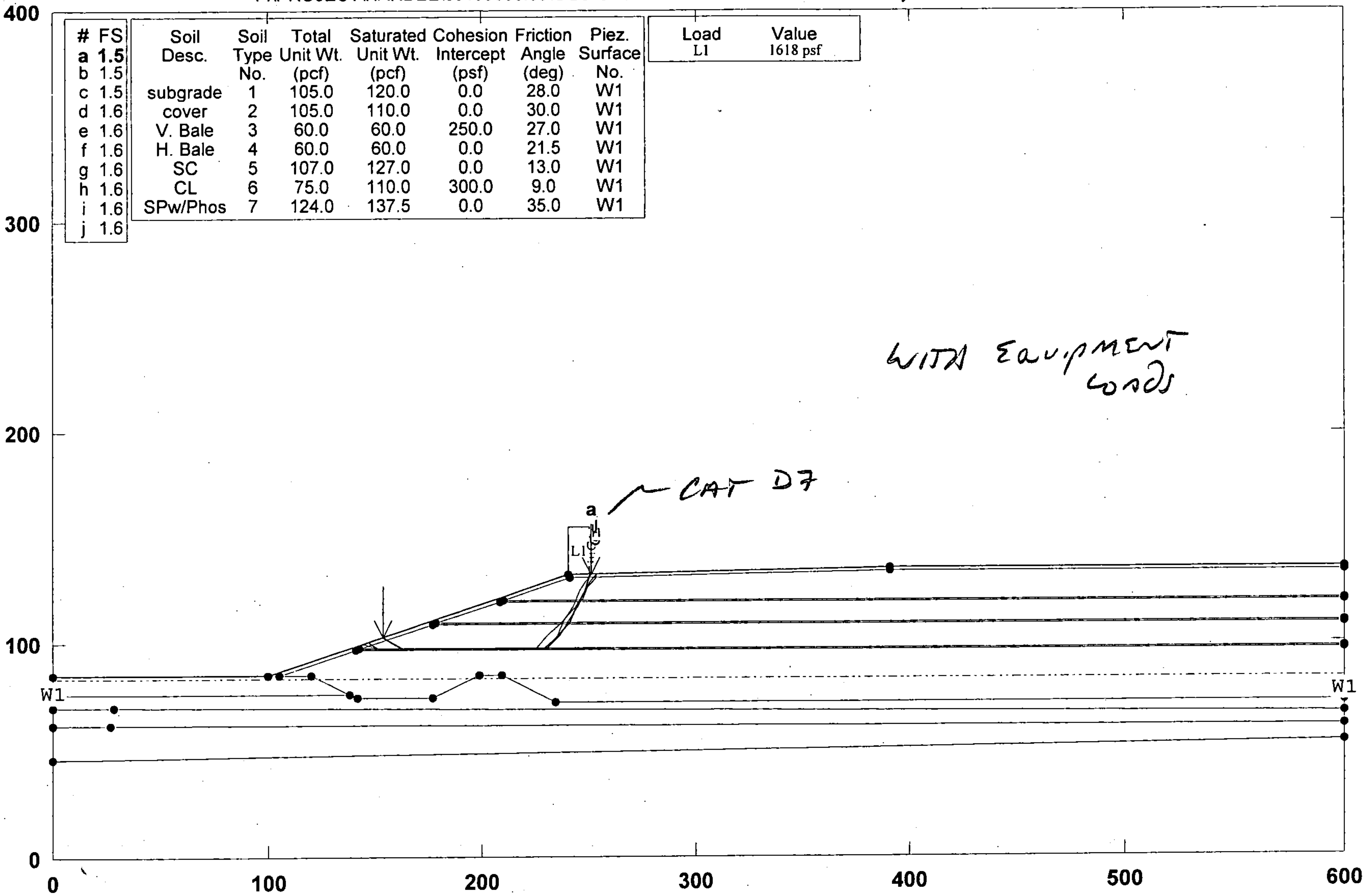
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	174.63	109.88
2	175.64	109.21
3	235.09	109.34
4	240.73	115.01
5	244.46	122.09
6	248.36	129.08
7	249.55	132.17

FACTOR OF SAFETY = 1.3 (With Equipment Loads - This model used only to estimate minimum waste strength parameters)

Hardee County Landfill - Existing 2003 Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXIST\HARD-EX.PL2 Run By: JHO 2/23/2004 12:09PM



PCSTABL5M/si FSmin=1.5

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/23/2004
Time of Run:	12:09PM
Run By:	JHO
Input Data Filename:	F:hard-ex.
Output Filename:	F:hard-ex.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:hard-ex.PLT

PROBLEM DESCRIPTION **Hardee County Landfill - Existing 2003**
Hardee County, Florida

BOUNDARY COORDINATES

4 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	100.00	85.00	1
2	100.00	85.00	241.00	132.00	2
3	241.00	132.00	391.00	135.00	2
4	391.00	135.00	600.00	135.00	2
5	100.00	85.00	104.74	85.00	1
6	104.74	85.00	140.74	97.00	3
7	140.74	97.00	142.24	97.50	4
8	142.24	97.50	176.74	109.00	3
9	176.74	109.00	178.24	109.50	3
10	178.24	109.50	208.24	119.50	3
11	208.24	119.50	209.74	120.00	4
12	209.74	120.00	241.27	130.50	3
13	241.27	130.50	391.00	133.50	3
14	391.00	133.50	600.00	133.50	3
15	209.74	120.00	600.00	120.00	4
16	208.24	119.50	600.00	119.50	3
17	178.24	109.50	600.00	109.50	4
18	176.74	109.00	600.00	109.00	3
19	142.24	97.50	600.00	97.50	4
20	140.74	97.00	600.00	97.00	3
21	104.74	85.00	120.00	85.00	1
22	120.00	85.00	138.00	76.00	1
23	.00	76.00	138.00	76.00	1
24	138.00	76.00	142.00	74.00	1
25	142.00	74.00	177.00	74.00	1
26	177.00	74.00	199.00	85.00	1
27	199.00	85.00	209.00	85.00	1
28	209.00	85.00	235.00	72.00	1
29	235.00	72.00	600.00	72.00	1
30	.00	70.00	28.56	70.00	5
31	28.56	70.00	600.00	67.00	5
32	.00	61.43	27.00	61.43	6
33	27.00	61.43	600.00	61.00	6
34	.00	46.07	600.00	53.50	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	105.0	110.0	.0	30.0	.00	.0	1
3	60.0	60.0	250.0	27.0	.00	.0	1
4	60.0	60.0	.0	21.5	.00	.0	1
5	107.0	127.0	.0	13.0	.00	.0	1
6	75.0	110.0	300.0	9.0	.00	.0	1
7	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.00
2	600.00	83.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	241.00	250.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 8.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	140.00	97.25	180.00	97.25	.25
2	210.00	97.25	260.00	97.25	.25

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	154.11	103.04
2	155.86	101.29
3	162.69	97.13
4	231.02	97.32
5	236.25	103.37
6	241.72	109.21
7	244.24	116.80
8	248.31	123.69
9	250.61	131.35
10	251.46	132.21

FACTOR OF SAFETY = 1.5 (With Equipment Loads - This model only used to estimate minimum waste strength

parameters)

Hardee County Landfill - Existing 2003 Hardee County, Florida

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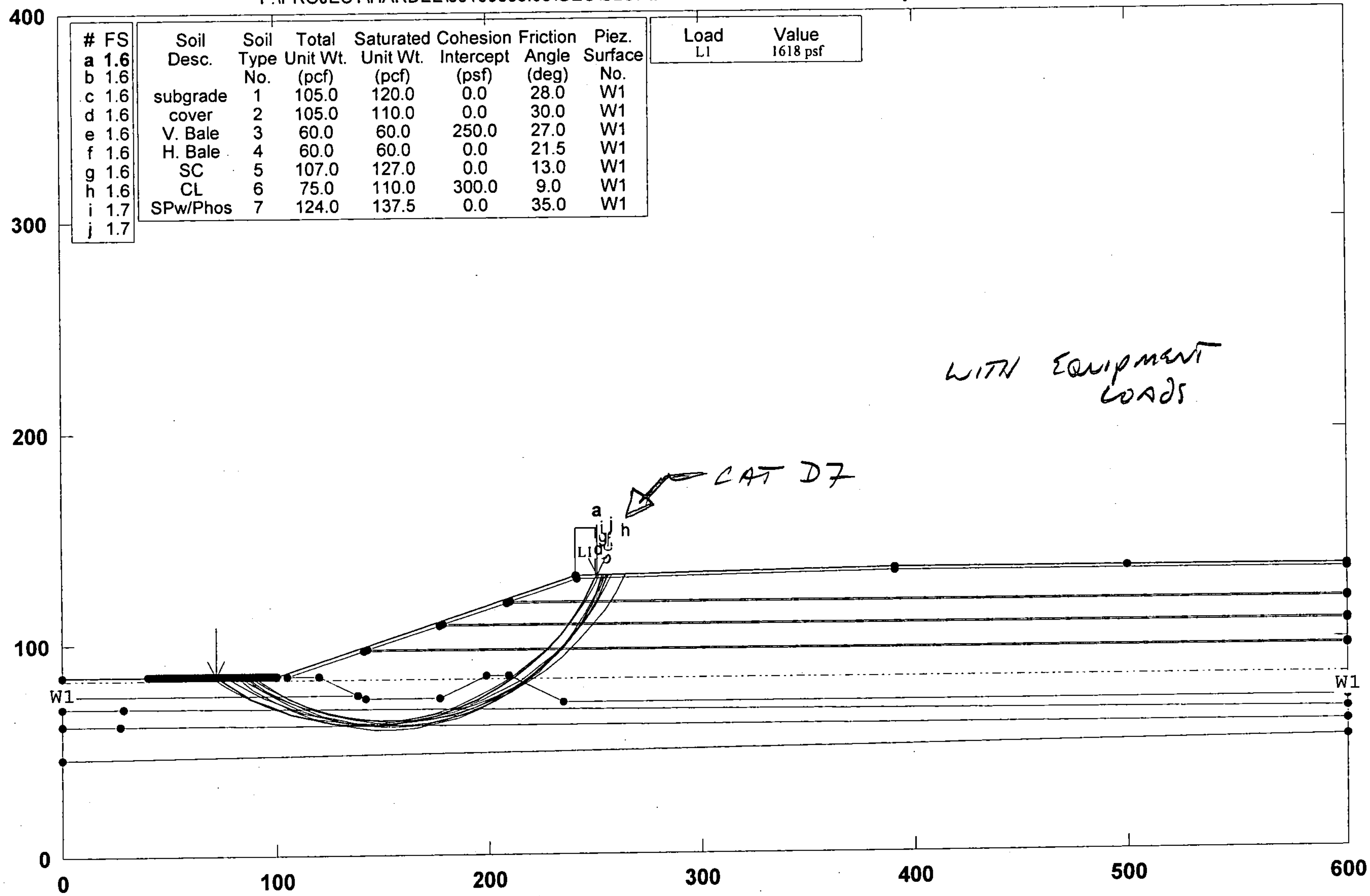


#	FS
a	**1.6**
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
cover	2	105.0	110.0	0.0	30.0	W1
V. Bale	3	60.0	60.0	250.0	27.0	W1
H. Bale	4	60.0	60.0	0.0	21.5	W1
SC	5	107.0	127.0	0.0	13.0	W1
CL	6	75.0	110.0	300.0	9.0	W1
SPw/Phos	7	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 psf

PCSTABL5M/si FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/23/2004
Time of Run:	12:16PM
Run By:	JHO
Input Data Filename:	F:hard-ex.
Output Filename:	F:hard-ex.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:hard-ex.PLT

PROBLEM DESCRIPTION **Hardee County Landfill - Existing 2003**
Hardee County, Florida

BOUNDARY COORDINATES

4 Top Boundaries
34 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	100.00	85.00	1
2	100.00	85.00	241.00	132.00	2
3	241.00	132.00	391.00	135.00	2
4	391.00	135.00	600.00	135.00	2
5	100.00	85.00	104.74	85.00	1
6	104.74	85.00	140.74	97.00	3
7	140.74	97.00	142.24	97.50	4
8	142.24	97.50	176.74	109.00	3
9	176.74	109.00	178.24	109.50	3
10	178.24	109.50	208.24	119.50	3
11	208.24	119.50	209.74	120.00	4
12	209.74	120.00	241.27	130.50	3
13	241.27	130.50	391.00	133.50	3
14	391.00	133.50	600.00	133.50	3
15	209.74	120.00	600.00	120.00	4
16	208.24	119.50	600.00	119.50	3
17	178.24	109.50	600.00	109.50	4
18	176.74	109.00	600.00	109.00	3
19	142.24	97.50	600.00	97.50	4
20	140.74	97.00	600.00	97.00	3
21	104.74	85.00	120.00	85.00	1
22	120.00	85.00	138.00	76.00	1
23	.00	76.00	138.00	76.00	1
24	138.00	76.00	142.00	74.00	1
25	142.00	74.00	177.00	74.00	1
26	177.00	74.00	199.00	85.00	1
27	199.00	85.00	209.00	85.00	1
28	209.00	85.00	235.00	72.00	1
29	235.00	72.00	600.00	72.00	1
30	.00	70.00	28.56	70.00	5
31	28.56	70.00	600.00	67.00	5
32	.00	61.43	27.00	61.43	6
33	27.00	61.43	600.00	61.00	6
34	.00	46.07	600.00	53.50	7

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	105.0	110.0	.0	30.0	.00	.0	1
3	60.0	60.0	250.0	27.0	.00	.0	1
4	60.0	60.0	.0	21.5	.00	.0	1
5	107.0	127.0	.0	13.0	.00	.0	1
6	75.0	110.0	300.0	9.0	.00	.0	1
7	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.00
2	600.00	83.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	241.00	250.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

2500 Trial Surfaces Have Been Generated.

50 Surfaces Initiate From Each Of 50 Points Equally Spaced
Along The Ground Surface Between X = 40.00 ft.
and X = 100.00 ft.

Each Surface Terminates Between X = 241.00 ft.
and X = 500.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

The Following is the Ten Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Bishop Method

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	71.84	85.00
2	80.10	79.37
3	88.81	74.45
4	97.90	70.28
5	107.31	66.90
6	116.97	64.32
7	126.81	62.56
8	136.77	61.64
9	146.77	61.56
10	156.74	62.33
11	166.61	63.93

12	176.31	66.36
13	185.77	69.61
14	194.92	73.63
15	203.71	78.42
16	212.05	83.92
17	219.91	90.11
18	227.21	96.95
19	233.91	104.37
20	239.96	112.33
21	245.32	120.77
22	249.95	129.64
23	251.02	132.20

Circle Center At X = 142.7 ; Y = 180.0 and Radius, 118.5

FACTOR OF SAFETY = 1.6 (With Equipment Loads - This model is only used to estimate minimum waste parameters)

COMPARISON TO TYPICAL WASTE SHEAR STRENGTH VALUES

SHEET 1/2

Geotechnics of WASTE FILLS

Theory and Practice

Landva/Knowles, editors

ASTM

STP 1070

Landva/Knowles Geotechnics of Waste Fills Theory and Practice STP 1070 ASTM

Source "Same As Sheet 1/2"

SHEET 2 of 2

of 15 was used by Dames & Moore (20) after rejecting values larger than 50 that may represent the encounter of obstructions. Earth Tech Corporation (9) reported the results of a vane shear test and a standard penetration test. These results are shown in Figure 3.

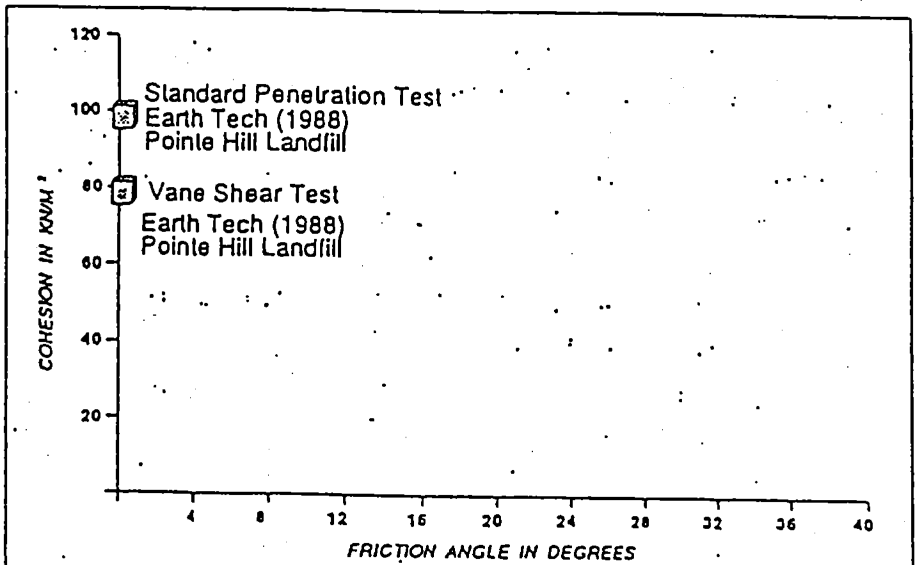
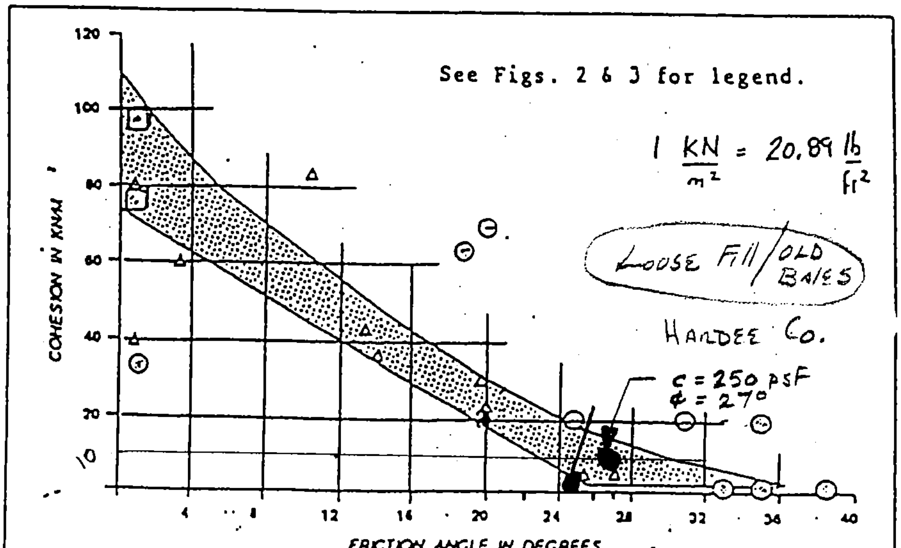


Fig. 3 - Strength Parameters from In-Situ Testing

Finally, the results of all the foregoing tests are plotted in Figure 4. Because of the scatter and scarcity of the data, it is difficult to draw any definitive conclusions on the shear strength characteristics of sanitary fill material.



MSW TYPICAL VALUES

Fig. 4 - Summary Plot for All Tests with Recommended Parameters Shaded

EXPANSION NORTH/SOUTH SECTION
FINAL BUILDOUT

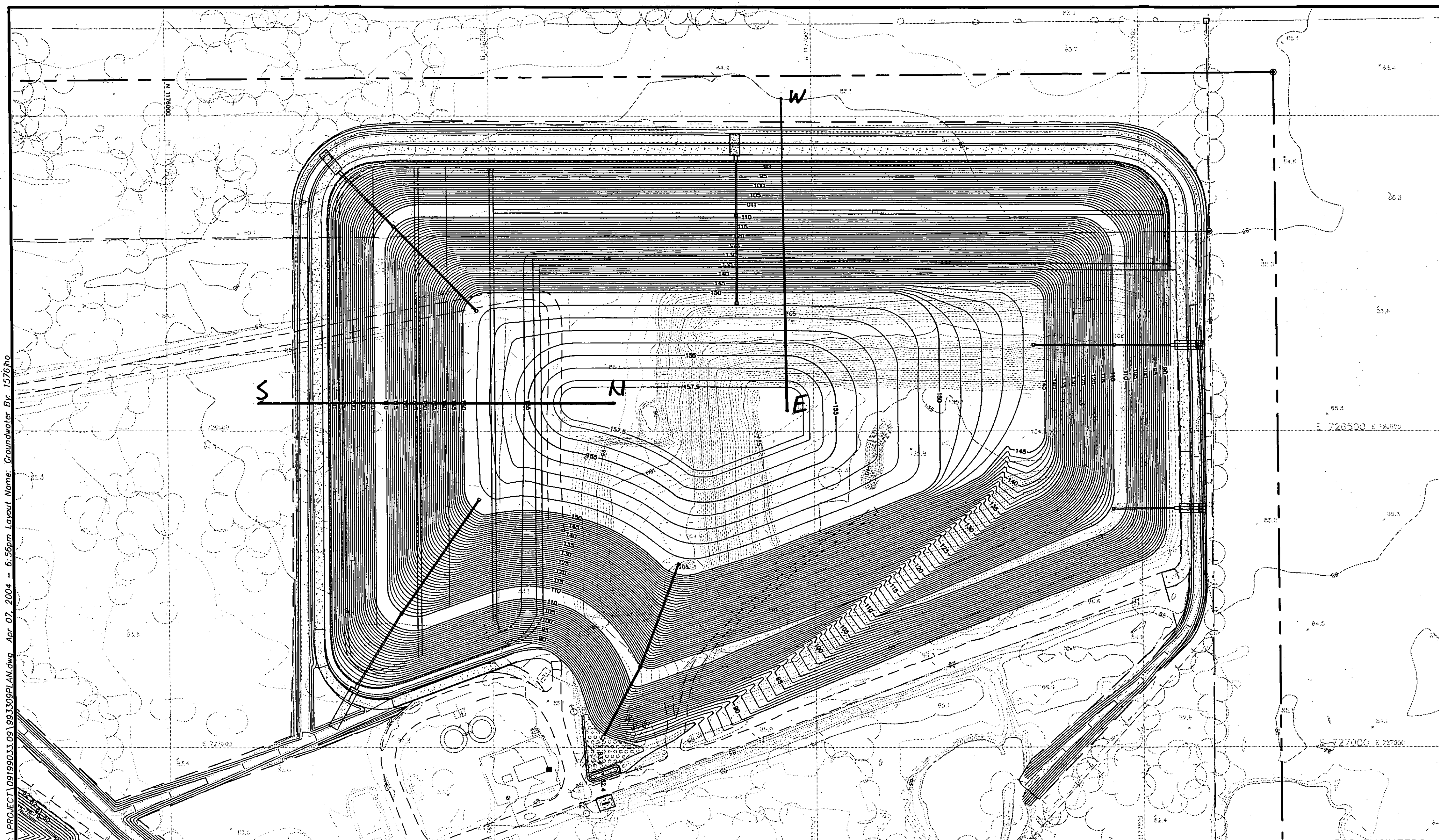


Figure 1 – Slope Stability Section Locations, Hardee County Landfill Expansion

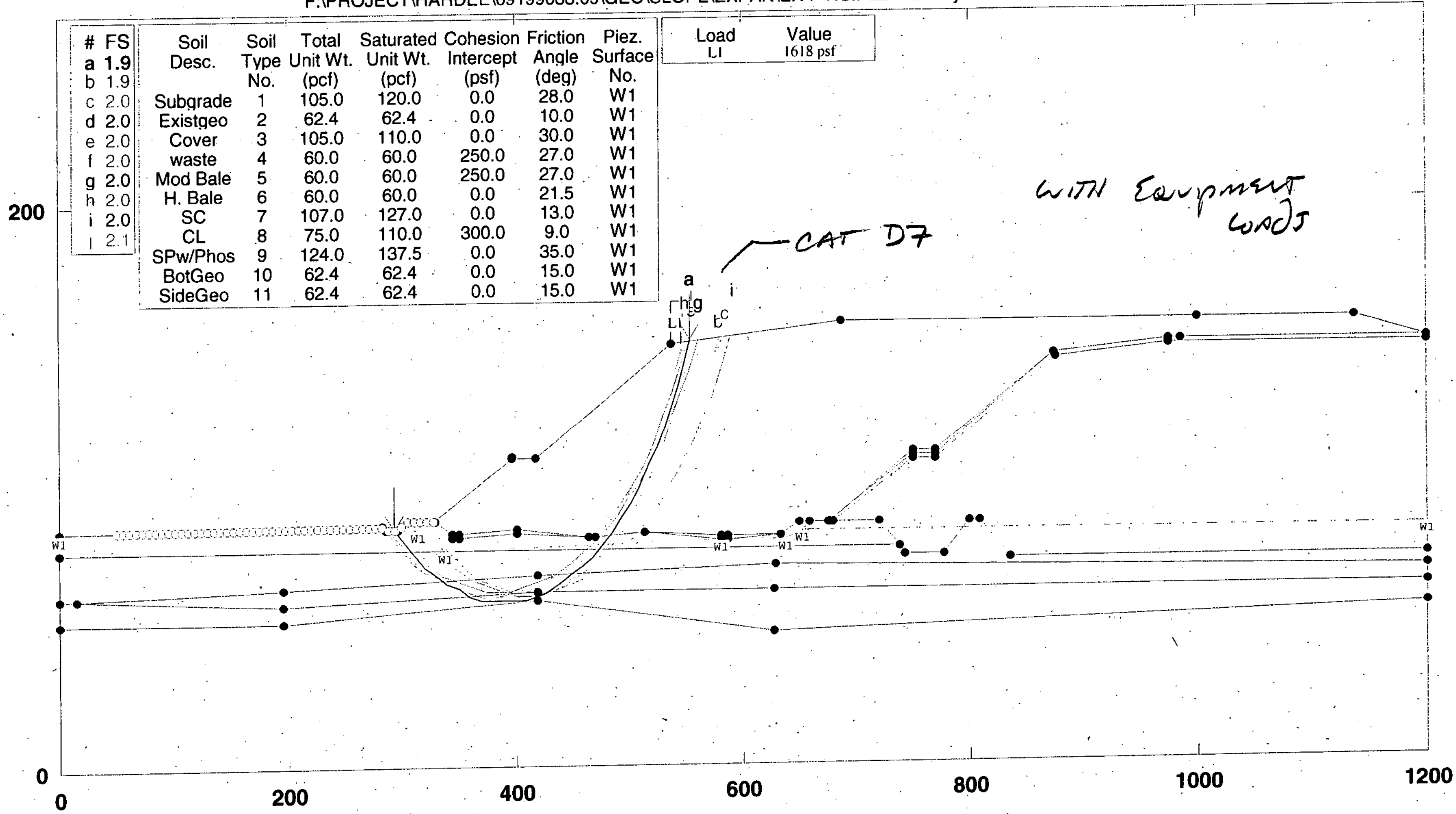
Expansion Operations - Final - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-NS.PL2 Run By: LEK 2/11/2004 4:14PM

#	FS
a	**1.9**
b	1.9
c	2.0
d	2.0
e	2.0
f	2.0
g	2.0
h	2.0
i	2.0
j	2.1

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
BotGeo	10	62.4	62.4	0.0	15.0	W1
SideGeo	11	62.4	62.4	0.0	15.0	W1

Load	Value
L1	1618 psf



PCSTABL5M/si FSmin=1.9

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date: 2/11/2004
Time of Run: 4:14PM
Run By: LEK
Input Data Filename: F:ex-f-ns.
Output Filename: F:ex-f-ns.OUT
Unit: ENGLISH
Plotted Output Filename: F:ex-f-ns.PLT

PROBLEM DESCRIPTION **Expansion Operations - Final - N/S**
Hardee County, Florida

BOUNDARY COORDINATES

12 Top Boundaries
84 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	84.00	281.90	85.00	1
2	281.90	85.00	284.90	84.00	1
3	284.90	84.00	294.90	84.00	1
4	294.90	84.00	303.90	87.00	1
5	303.90	87.00	326.90	87.00	1
6	326.90	87.00	327.32	87.00	1
7	327.32	87.00	396.32	110.00	4
8	396.32	110.00	416.32	110.00	4
9	416.32	110.00	536.32	150.00	4
10	536.32	150.00	686.32	157.50	4
11	686.32	157.50	1136.32	157.50	4
12	1136.32	157.50	1200.00	150.00	4
13	327.32	87.00	328.90	87.00	10
14	328.90	87.00	343.72	82.06	10
15	343.72	82.06	349.72	82.06	10
16	349.72	82.06	400.60	83.40	10
17	400.60	83.40	463.60	81.60	10
18	463.60	81.60	469.60	81.60	10
19	469.60	81.60	513.60	82.80	10
20	513.60	82.80	580.60	80.70	10
21	580.60	80.70	586.60	80.70	10
22	586.60	80.70	632.80	81.70	10
23	632.80	81.70	650.00	86.00	10
24	650.00	86.00	676.42	86.00	11
25	676.42	86.00	749.92	110.50	11
26	749.92	110.50	769.92	110.50	11
27	769.92	110.50	874.91	145.50	11
28	874.91	145.50	974.98	150.50	11
29	974.98	150.50	985.00	150.00	11
30	326.90	87.00	327.01	86.53	1
31	327.01	86.53	328.74	86.53	1
32	328.74	86.53	343.72	81.56	1
33	343.72	81.56	349.72	81.56	1
34	349.72	81.56	400.61	82.90	1
35	400.61	82.90	463.60	81.10	1
36	463.60	81.10	469.60	81.10	1
37	469.60	81.10	513.59	82.30	1
38	513.59	82.30	580.60	80.20	1
39	580.60	80.20	586.60	80.20	1
40	586.60	80.20	632.82	81.20	1
41	632.82	81.20	650.00	85.50	1
42	650.00	85.50	676.50	85.50	1
43	658.00	85.00	658.56	85.00	2
44	658.56	85.00	675.00	85.00	1
45	675.00	85.00	750.00	110.00	3
46	750.00	110.00	770.00	110.00	3

47	770.00	110.00	875.00	145.00	3
48	875.00	145.00	975.00	150.00	3
49	975.00	150.00	1200.00	150.00	3
50	.00	76.00	640.00	76.00	1
51	640.00	76.00	658.00	85.00	2
52	640.00	76.00	640.46	76.00	2
53	640.46	76.00	658.56	85.00	1
54	675.00	85.00	679.74	85.00	1
55	679.74	85.00	750.24	108.50	4
56	750.24	108.50	770.24	108.50	4
57	770.24	108.50	875.28	143.51	4
58	875.28	143.51	975.00	148.50	4
59	975.00	148.50	1200.00	148.50	4
60	675.00	85.00	720.00	85.00	1
61	720.00	85.00	738.00	76.00	1
62	640.56	76.00	738.00	76.00	1
63	738.00	76.00	742.00	74.00	1
64	742.00	74.00	777.00	74.00	1
65	777.00	74.00	799.00	85.00	1
66	799.00	85.00	809.00	85.00	1
67	809.00	85.00	835.00	72.00	1
68	835.00	72.00	1200.00	72.00	1
69	.00	60.31	15.00	60.31	8
70	15.00	60.31	195.00	63.66	7
71	195.00	63.66	418.00	67.96	7
72	418.00	67.96	628.00	70.00	7
73	628.00	70.00	640.00	76.00	2
74	628.00	70.00	628.56	70.00	7
75	628.56	70.00	640.56	76.00	1
76	628.56	70.00	1200.00	67.00	7
77	15.00	60.31	195.12	57.66	8
78	195.12	57.66	418.12	61.96	8
79	418.12	61.96	627.00	61.40	8
80	627.00	61.40	1200.00	61.40	8
81	.00	50.31	195.12	50.31	9
82	195.12	50.31	418.12	57.96	9
83	418.12	57.96	627.00	46.40	9
84	627.00	46.40	1200.00	53.50	9

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	10.0	.00	.0	1
3	105.0	110.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1
5	60.0	60.0	250.0	27.0	.00	.0	1
6	60.0	60.0	.0	21.5	.00	.0	1
7	107.0	127.0	.0	13.0	.00	.0	1
8	75.0	110.0	300.0	9.0	.00	.0	1
9	124.0	137.5	.0	35.0	.00	.0	1
10	62.4	62.4	.0	15.0	.00	.0	1
11	62.4	62.4	.0	15.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 7 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	313.05	83.50
3	337.75	77.00
4	580.60	79.00
5	638.17	79.00
6	652.00	82.00
7	1200.00	82.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	536.32	545.82	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

2500 Trial Surfaces Have Been Generated.

50 Surfaces Initiate From Each Of 50 Points Equally Spaced Along The Ground Surface Between X = 50.00 ft. and X = 327.00 ft.

Each Surface Terminates Between X = 396.32 ft. and X =1000.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

The Following Is The Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Bishop Method

Failure Surface Specified By 31 Coordinate Points

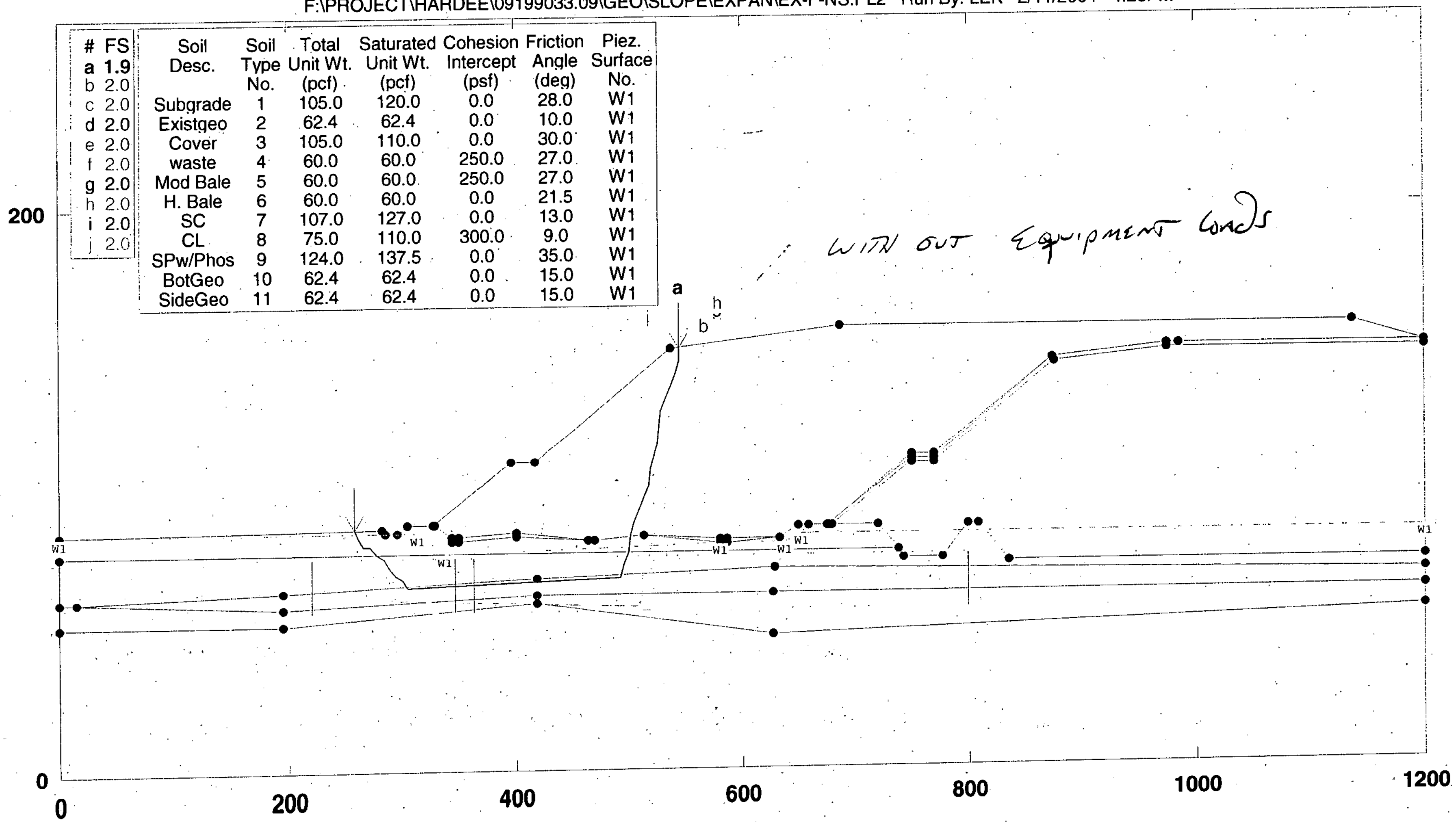
Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.08	84.00
2	301.86	79.20
3	310.87	74.87
4	320.09	71.01
5	329.51	67.63
6	339.08	64.75
7	348.79	62.37
8	358.62	60.50
9	368.53	59.15
10	378.49	58.31
11	388.49	57.99
12	398.48	58.20
13	408.46	58.92
14	418.38	60.16
15	428.23	61.92
16	437.97	64.18
17	447.57	66.95
18	457.03	70.22
19	466.29	73.97
20	475.35	78.20
21	484.18	82.90
22	492.75	88.05
23	501.05	93.64
24	509.04	99.66
25	516.70	106.08
26	524.02	112.89
27	530.98	120.07
28	537.55	127.61
29	543.73	135.48
30	549.48	143.65
31	554.02	150.89

Circle Center At X = 389.6 ; Y = 250.0 and Radius, 192.0

FACTOR OF SAFETY = 1.9 (With Equipment Load)

Expansion Operations - Final - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-NS.PL2 Run By: LEK 2/11/2004 4:26PM



#	FS
a	**1.9**
b	2.0
c	2.0
d	2.0
e	2.0
f	2.0
g	2.0
h	2.0
i	2.0
j	2.0

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
BotGeo	10	62.4	62.4	0.0	15.0	W1
SideGeo	11	62.4	62.4	0.0	15.0	W1

PCSTABL5M/si FSmin=1.9

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

Expansion Operations - Final - N/S Hardee County, Florida

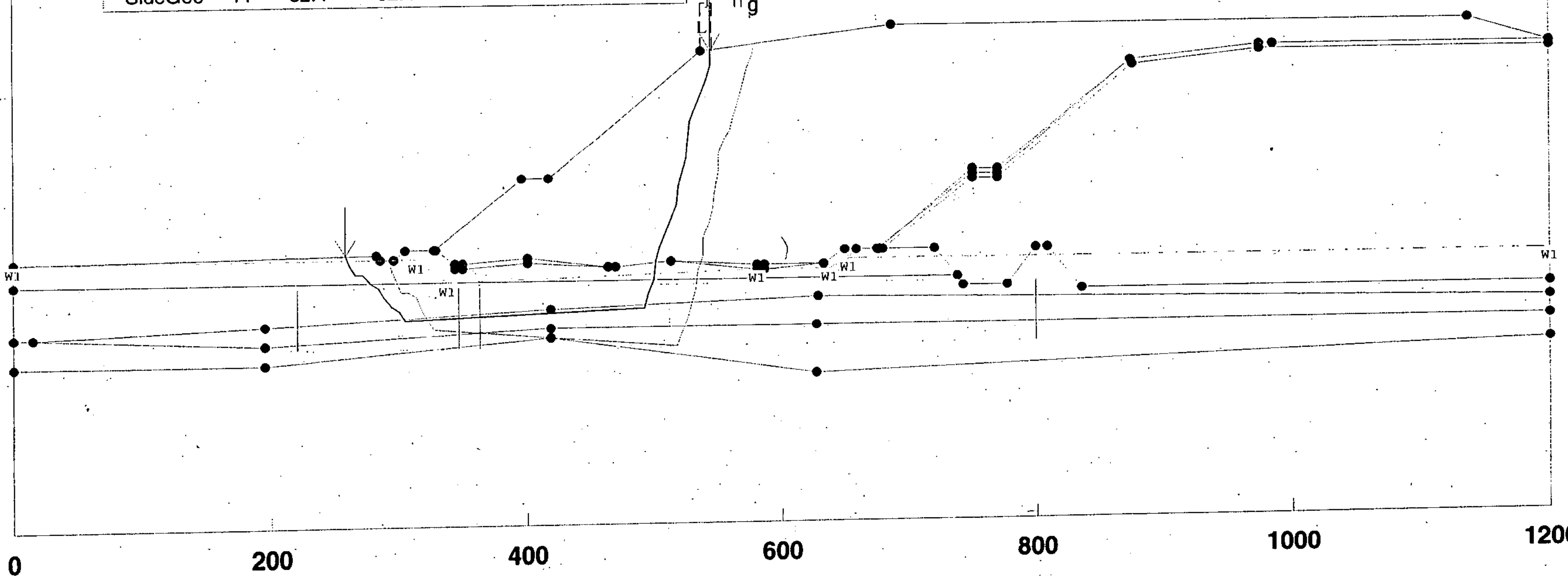
F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-NS.PL2 Run By: LEK 2/11/2004 4:23PM

#	FS
a	1.7
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
BotGeo	10	62.4	62.4	0.0	15.0	W1
SideGeo	11	62.4	62.4	0.0	15.0	W1

Load	Value
L1	1618 psf

WITH - EQUIPMENT LOADS



PCSTABL5M/si FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date: 2/11/2004
Time of Run: 4:26PM
Run By: LEK
Input Data Filename: F:ex-f-ns.
Output Filename: F:ex-f-ns.OUT
Unit: ENGLISH
Plotted Output Filename: F:ex-f-ns.PLT

PROBLEM DESCRIPTION **Expansion Operations - Final - N/S**
Hardee County, Florida

BOUNDARY COORDINATES

12 Top Boundaries
84 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	84.00	281.90	85.00	1
2	281.90	85.00	284.90	84.00	1
3	284.90	84.00	294.90	84.00	1
4	294.90	84.00	303.90	87.00	1
5	303.90	87.00	326.90	87.00	1
6	326.90	87.00	327.32	87.00	1
7	327.32	87.00	396.32	110.00	4
8	396.32	110.00	416.32	110.00	4
9	416.32	110.00	536.32	150.00	4
10	536.32	150.00	686.32	157.50	4
11	686.32	157.50	1136.32	157.50	4
12	1136.32	157.50	1200.00	150.00	4
13	327.32	87.00	328.90	87.00	10
14	328.90	87.00	343.72	82.06	10
15	343.72	82.06	349.72	82.06	10
16	349.72	82.06	400.60	83.40	10
17	400.60	83.40	463.60	81.60	10
18	463.60	81.60	469.60	81.60	10
19	469.60	81.60	513.60	82.80	10
20	513.60	82.80	580.60	80.70	10
21	580.60	80.70	586.60	80.70	10
22	586.60	80.70	632.80	81.70	10
23	632.80	81.70	650.00	86.00	10
24	650.00	86.00	676.42	86.00	11
25	676.42	86.00	749.92	110.50	11
26	749.92	110.50	769.92	110.50	11
27	769.92	110.50	874.91	145.50	11
28	874.91	145.50	974.98	150.50	11
29	974.98	150.50	985.00	150.00	11
30	326.90	87.00	327.01	86.53	1
31	327.01	86.53	328.74	86.53	1
32	328.74	86.53	343.72	81.56	1
33	343.72	81.56	349.72	81.56	1
34	349.72	81.56	400.61	82.90	1
35	400.61	82.90	463.60	81.10	1
36	463.60	81.10	469.60	81.10	1
37	469.60	81.10	513.59	82.30	1
38	513.59	82.30	580.60	80.20	1
39	580.60	80.20	586.60	80.20	1
40	586.60	80.20	632.82	81.20	1
41	632.82	81.20	650.00	85.50	1
42	650.00	85.50	676.50	85.50	1
43	658.00	85.00	658.56	85.00	2
44	658.56	85.00	675.00	85.00	1
45	675.00	85.00	750.00	110.00	3
46	750.00	110.00	770.00	110.00	3

47	770.00	110.00	875.00	145.00	3
48	875.00	145.00	975.00	150.00	3
49	975.00	150.00	1200.00	150.00	3
50	.00	76.00	640.00	76.00	1
51	640.00	76.00	658.00	85.00	2
52	640.00	76.00	640.46	76.00	2
53	640.46	76.00	658.56	85.00	1
54	675.00	85.00	679.74	85.00	1
55	679.74	85.00	750.24	108.50	4
56	750.24	108.50	770.24	108.50	4
57	770.24	108.50	875.28	143.51	4
58	875.28	143.51	975.00	148.50	4
59	975.00	148.50	1200.00	148.50	4
60	675.00	85.00	720.00	85.00	1
61	720.00	85.00	738.00	76.00	1
62	640.56	76.00	738.00	76.00	1
63	738.00	76.00	742.00	74.00	1
64	742.00	74.00	777.00	74.00	1
65	777.00	74.00	799.00	85.00	1
66	799.00	85.00	809.00	85.00	1
67	809.00	85.00	835.00	72.00	1
68	835.00	72.00	1200.00	72.00	1
69	.00	60.31	15.00	60.31	8
70	15.00	60.31	195.00	63.66	7
71	195.00	63.66	418.00	67.96	7
72	418.00	67.96	628.00	70.00	7
73	628.00	70.00	640.00	76.00	2
74	628.00	70.00	628.56	70.00	7
75	628.56	70.00	640.56	76.00	1
76	628.56	70.00	1200.00	67.00	7
77	15.00	60.31	195.12	57.66	8
78	195.12	57.66	418.12	61.96	8
79	418.12	61.96	627.00	61.40	8
80	627.00	61.40	1200.00	61.40	8
81	.00	50.31	195.12	50.31	9
82	195.12	50.31	418.12	57.96	9
83	418.12	57.96	627.00	46.40	9
84	627.00	46.40	1200.00	53.50	9

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	10.0	.00	.0	1
3	105.0	110.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1
5	60.0	60.0	250.0	27.0	.00	.0	1
6	60.0	60.0	.0	21.5	.00	.0	1
7	107.0	127.0	.0	13.0	.00	.0	1
8	75.0	110.0	300.0	9.0	.00	.0	1
9	124.0	137.5	.0	35.0	.00	.0	1
10	62.4	62.4	.0	15.0	.00	.0	1
11	62.4	62.4	.0	15.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 7 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	313.05	83.50
3	337.75	77.00
4	580.60	79.00
5	638.17	79.00
6	652.00	82.00
7	1200.00	82.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	536.32	545.82	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

SURCHARGE BOUNDARY LOAD DATA HAS BEEN SUPPRESSED

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 6.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	220.00	64.87	347.00	64.87	20.00
2	363.00	64.87	800.00	64.87	20.00

The Following Is The Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	258.65	84.92
2	260.80	82.78
3	265.86	79.55
4	271.82	78.87
5	277.00	75.85
6	282.79	74.26
7	288.35	72.00
8	293.40	68.76
9	299.25	67.45
10	304.48	64.51
11	491.32	67.58
12	494.97	72.34
13	499.01	76.79
14	500.53	82.59
15	504.70	86.90
16	508.91	91.18
17	512.95	95.61
18	516.76	100.25
19	518.73	105.91
20	522.39	110.67
21	524.96	116.09
22	526.14	121.97
23	528.67	127.41
24	532.90	131.67
25	536.93	136.12
26	541.13	140.40
27	543.90	145.72
28	545.00	150.43

FACTOR OF SAFETY = 1.9 (Without Equipment Loads = Critical Failure plane along geosynthetic interface)

FACTOR OF SAFETY = 1.7 (With Equipment Loads = Critical Failure plane along geosynthetic interface)

EXPANSION EAST/WEST SECTION
FINAL BUILDOUT

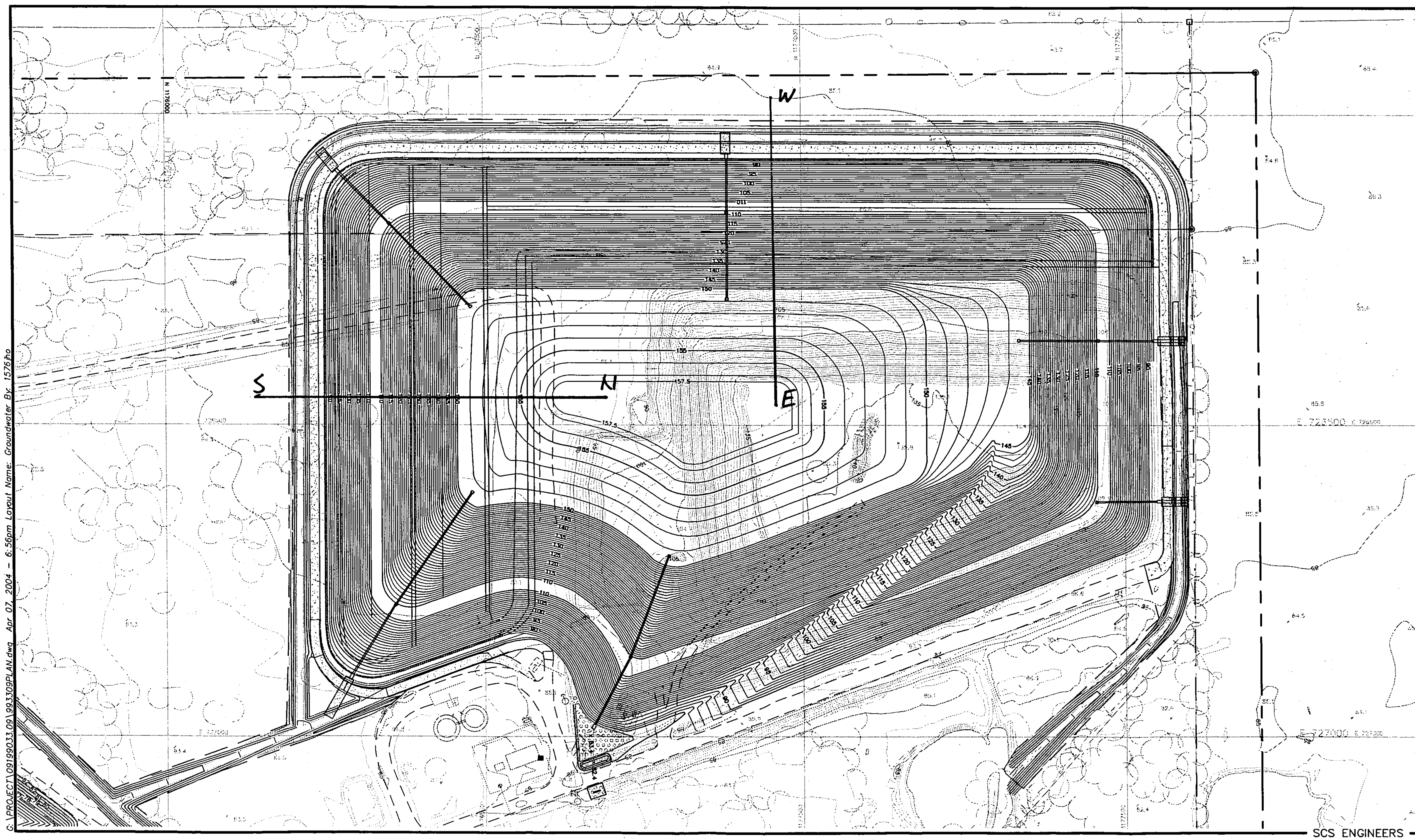


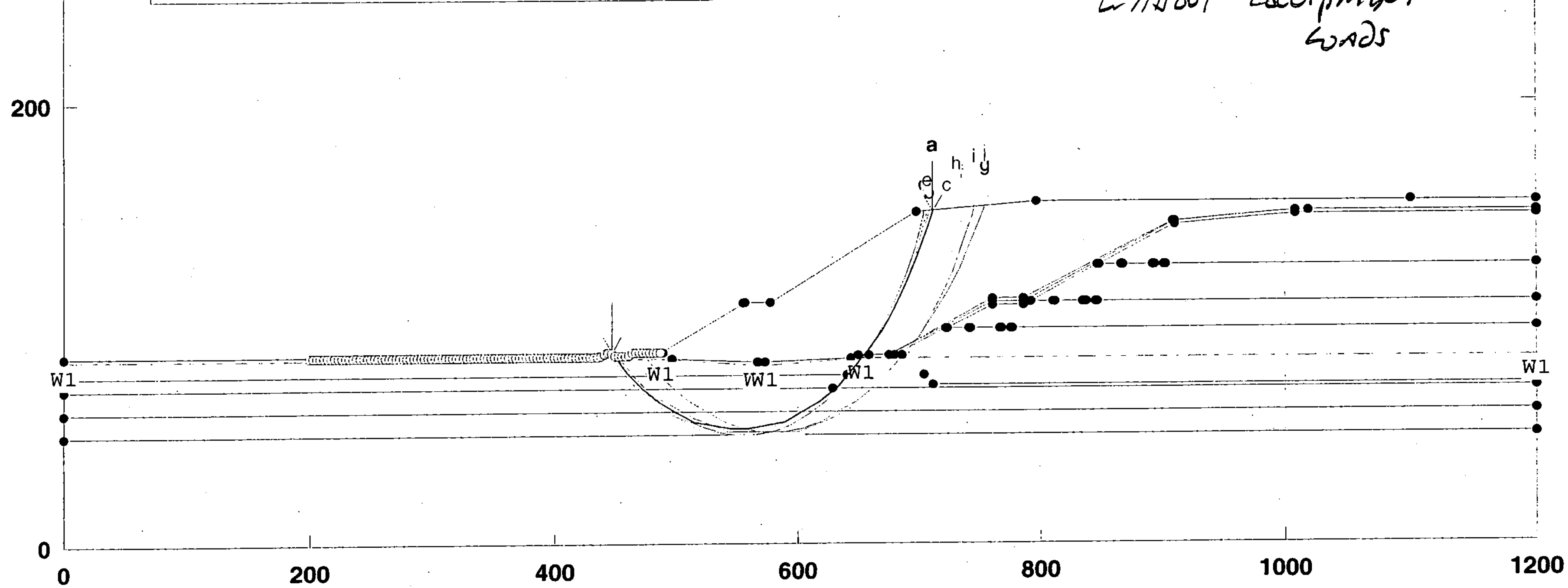
Figure 1 – Slope Stability Section Locations, Hardee County Landfill Expansion

Hardee County Landfill Expansion Final Buildout - East/West Slope

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 10:32PM

#	FS
a	**1.7**
b	1.7
c	1.7
d	1.7
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1



STABL6H FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

Hardee County Landfill Expansion Final Buildout - East/West Slope

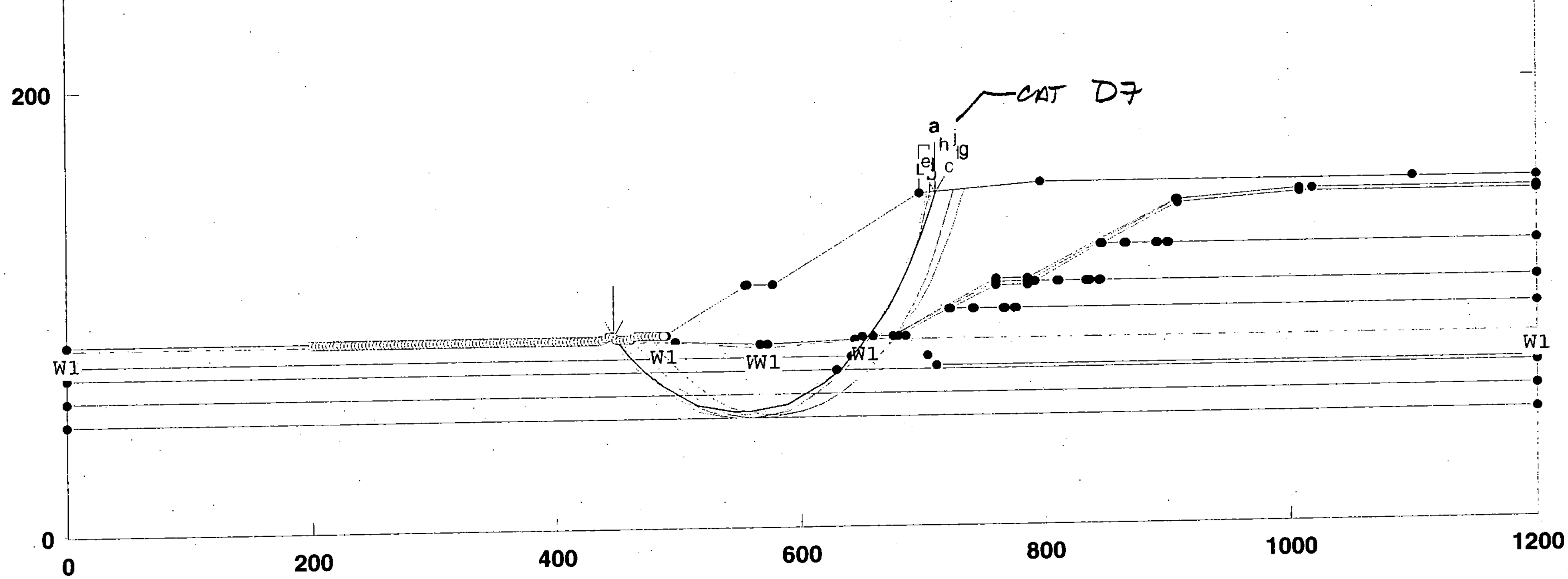
F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 10:29PM

#	FS
a	**1.6**
b	1.6
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 lb/sqft

WITH EQUIPMENT LOADS



STABL6H FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** STABL6H **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/9/2004
Time of Run:	10:32PM
Run By:	JHO
Input Data Filename:	F:ex-f-ew.
Output Filename:	F:ex-f-ew.OUT
Plotted Output Filename:	F:ex-f-ew.PLT

PROBLEM DESCRIPTION **Hardee County Landfill Expansion**
Final Buildout - East/West Slope

BOUNDARY COORDINATES

13 Top Boundaries
99 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	436.50	85.00	1
2	436.50	85.00	442.50	87.00	1
3	442.50	87.00	445.50	87.00	1
4	445.50	87.00	450.00	85.50	1
5	450.00	85.50	460.00	85.50	1
6	460.00	85.50	464.50	87.00	1
7	464.50	87.00	487.50	87.00	1
8	487.50	87.00	487.92	87.00	3
9	487.92	87.00	556.92	110.00	2
10	556.92	110.00	576.92	110.00	2
11	576.92	110.00	696.92	150.00	2
12	696.92	150.00	796.92	155.00	2
13	796.92	155.00	1200.00	155.00	2
14	487.92	87.00	489.50	87.00	3
15	489.50	87.00	497.00	84.50	3
16	497.00	84.50	567.50	82.60	3
17	567.50	82.60	573.51	82.60	3
18	573.51	82.60	644.07	84.50	3
19	644.07	84.50	650.00	86.00	3
20	650.00	86.00	675.00	86.00	3
21	675.00	86.00	760.75	110.50	4
22	760.75	110.50	785.75	110.50	4
23	785.75	110.50	908.24	145.50	4
24	908.24	145.50	1008.24	150.50	4
25	1008.24	150.50	1018.24	150.00	4
26	1018.24	150.00	1200.00	150.00	5
27	487.50	87.00	487.61	86.50	1
28	487.61	86.50	489.42	86.50	1
29	489.42	86.50	496.91	84.00	1
30	496.91	84.00	567.49	82.10	1
31	567.49	82.10	573.51	82.10	1
32	573.51	82.10	644.07	84.00	1
33	644.07	84.00	650.06	85.50	1
34	650.06	85.50	675.07	85.50	1
35	675.07	85.50	760.82	110.00	5
36	760.82	110.00	785.82	110.00	5
37	785.82	110.00	908.32	145.00	5
38	908.32	145.00	1008.26	150.00	5
39	1008.26	150.00	1018.24	150.00	5
40	1008.34	148.50	1200.00	148.50	6
41	908.56	143.51	1008.34	148.50	6
42	847.28	126.00	908.56	143.51	6

43	845.53	125.50	847.28	126.00	6
44	847.28	126.00	867.16	126.00	6
45	867.16	126.00	892.16	126.00	7
46	892.16	126.00	902.16	126.00	6
47	902.16	126.00	1200.00	126.00	7
48	845.53	125.50	865.66	125.50	6
49	865.66	125.50	867.16	126.00	7
50	865.66	125.50	890.66	125.50	6
51	890.66	125.50	892.16	126.00	6
52	892.16	125.50	900.66	125.50	6
53	900.66	125.50	902.16	126.00	7
54	900.66	125.50	1200.00	125.50	6
55	791.28	110.00	845.53	125.50	6
56	789.53	109.50	791.28	110.00	6
57	791.28	110.00	811.16	110.00	6
58	811.16	110.00	836.16	110.00	7
59	836.16	110.00	846.16	110.00	6
60	846.16	110.00	1200.00	110.00	7
61	789.53	109.50	809.66	109.50	6
62	809.66	109.50	811.16	110.00	7
63	809.66	109.50	834.66	109.50	6
64	834.66	109.50	836.66	110.00	6
65	834.66	109.50	844.66	109.50	6
66	844.66	109.50	846.16	110.00	7
67	844.66	109.50	1200.00	109.50	6
68	786.09	108.50	789.03	109.50	6
69	761.03	108.50	786.03	108.50	6
70	722.53	97.50	761.03	108.50	6
71	720.78	97.00	722.53	97.50	6
72	722.53	97.50	742.41	97.50	6
73	742.41	97.50	767.41	97.50	7
74	767.41	97.50	777.41	97.50	6
75	777.41	97.50	1200.00	97.50	7
76	720.78	97.00	740.91	97.00	6
77	740.91	97.00	742.41	97.50	7
78	740.91	97.00	765.91	97.00	6
79	765.91	97.00	767.41	97.50	6
80	765.91	97.00	775.91	97.00	6
81	775.91	97.00	777.41	97.50	6
82	775.91	97.00	1200.00	97.00	6
83	678.78	85.00	720.78	97.00	6
84	658.00	85.00	658.56	85.00	8
85	658.56	85.00	678.78	85.00	1
86	678.78	85.00	685.00	85.00	1
87	.00	76.00	640.00	76.00	1
88	640.00	76.00	658.00	85.00	8
89	640.00	76.00	640.56	76.00	1
90	640.56	76.00	658.56	85.00	1
91	685.00	85.00	703.00	76.00	1
92	703.00	76.00	711.00	72.00	1
93	711.00	72.00	1200.00	72.00	1
94	.00	70.00	628.00	70.00	9
95	628.00	70.00	640.00	76.00	8
96	628.00	70.00	628.56	70.00	9
97	628.56	70.00	1200.00	70.00	9
98	.00	60.00	1200.00	60.00	10
99	.00	49.00	1200.00	49.00	11

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	60.0	60.0	250.0	27.0	.00	.0	1
3	62.4	62.4	.0	15.0	.00	.0	1
4	62.4	62.4	.0	15.0	.00	.0	1
5	105.0	110.0	.0	30.0	.00	.0	1
6	60.0	60.0	250.0	27.0	.00	.0	1
7	60.0	60.0	.0	21.5	.00	.0	1
8	62.4	62.4	.0	10.0	.00	.0	1
9	107.0	127.0	.0	13.0	.00	.0	1
10	75.0	110.0	300.0	9.0	.00	.0	1
11	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	487.50	83.50
3	567.50	81.60
4	573.50	81.60
5	652.00	83.50
6	1200.00	83.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	696.92	706.42	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

SURCHARGE BOUNDARY LOAD DATA HAS BEEN SUPPRESSED

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

10000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 100 Points Equally Spaced
Along The Ground Surface Between X = 200.00 ft.
and X = 487.00 ft.

Each Surface Terminates Between X = 555.00 ft.
and X =1100.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

15.00 ft. Line Segments Define Each Trial Failure Surface.

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Bishop Method

Failure Surface Specified By 22 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	446.41	86.70
2	458.85	78.31

3	471.96	71.01
4	485.63	64.85
5	499.78	59.86
6	514.30	56.08
7	529.08	53.55
8	544.02	52.27
9	559.02	52.26
10	573.97	53.51
11	588.76	56.02
12	603.28	59.78
13	617.44	64.75
14	631.12	70.89
15	644.23	78.17
16	656.69	86.53
17	668.39	95.92
18	679.26	106.26
19	689.21	117.48
20	698.18	129.50
21	706.11	142.23
22	710.42	150.67

Circle Center At X = 551.7 ; Y = 229.5 and Radius, 177.4

FACTOR OF SAFETY = 1.7 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 1.6 (With Equipment Loads - Critical failure plane along geosynthetic interface)

** STABL6H **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/9/2004
Time of Run:	10:21PM
Run By:	JHO
Input Data Filename:	F:ex-f-ew.
Output Filename:	F:ex-f-ew.OUT
Plotted Output Filename:	F:ex-f-ew.PLT

PROBLEM DESCRIPTION **Hardee County Landfill Expansion**
Final Buildout - East/West Slope

BOUNDARY COORDINATES

13 Top Boundaries
99 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	436.50	85.00	1
2	436.50	85.00	442.50	87.00	1
3	442.50	87.00	445.50	87.00	1
4	445.50	87.00	450.00	85.50	1
5	450.00	85.50	460.00	85.50	1
6	460.00	85.50	464.50	87.00	1
7	464.50	87.00	487.50	87.00	1
8	487.50	87.00	487.92	87.00	3
9	487.92	87.00	556.92	110.00	2
10	556.92	110.00	576.92	110.00	2
11	576.92	110.00	696.92	150.00	2
12	696.92	150.00	796.92	155.00	2
13	796.92	155.00	1200.00	155.00	2
14	487.92	87.00	489.50	87.00	3
15	489.50	87.00	497.00	84.50	3
16	497.00	84.50	567.50	82.60	3
17	567.50	82.60	573.51	82.60	3
18	573.51	82.60	644.07	84.50	3
19	644.07	84.50	650.00	86.00	3
20	650.00	86.00	675.00	86.00	3
21	675.00	86.00	760.75	110.50	4
22	760.75	110.50	785.75	110.50	4
23	785.75	110.50	908.24	145.50	4
24	908.24	145.50	1008.24	150.50	4
25	1008.24	150.50	1018.24	150.00	4
26	1018.24	150.00	1200.00	150.00	5
27	487.50	87.00	487.61	86.50	1
28	487.61	86.50	489.42	86.50	1
29	489.42	86.50	496.91	84.00	1
30	496.91	84.00	567.49	82.10	1
31	567.49	82.10	573.51	82.10	1
32	573.51	82.10	644.07	84.00	1
33	644.07	84.00	650.06	85.50	1
34	650.06	85.50	675.07	85.50	1
35	675.07	85.50	760.82	110.00	5
36	760.82	110.00	785.82	110.00	5
37	785.82	110.00	908.32	145.00	5
38	908.32	145.00	1008.26	150.00	5
39	1008.26	150.00	1018.24	150.00	5
40	1008.34	148.50	1200.00	148.50	6
41	908.56	143.51	1008.34	148.50	6
42	847.28	126.00	908.56	143.51	6

43	845.53	125.50	847.28	126.00	6
44	847.28	126.00	867.16	126.00	6
45	867.16	126.00	892.16	126.00	7
46	892.16	126.00	902.16	126.00	6
47	902.16	126.00	1200.00	126.00	7
48	845.53	125.50	865.66	125.50	6
49	865.66	125.50	867.16	126.00	7
50	865.66	125.50	890.66	125.50	6
51	890.66	125.50	892.16	126.00	6
52	892.16	125.50	900.66	125.50	6
53	900.66	125.50	902.16	126.00	7
54	900.66	125.50	1200.00	125.50	6
55	791.28	110.00	845.53	125.50	6
56	789.53	109.50	791.28	110.00	6
57	791.28	110.00	811.16	110.00	6
58	811.16	110.00	836.16	110.00	7
59	836.16	110.00	846.16	110.00	6
60	846.16	110.00	1200.00	110.00	7
61	789.53	109.50	809.66	109.50	6
62	809.66	109.50	811.16	110.00	7
63	809.66	109.50	834.66	109.50	6
64	834.66	109.50	836.66	110.00	6
65	834.66	109.50	844.66	109.50	6
66	844.66	109.50	846.16	110.00	7
67	844.66	109.50	1200.00	109.50	6
68	786.09	108.50	789.03	109.50	6
69	761.03	108.50	786.03	108.50	6
70	722.53	97.50	761.03	108.50	6
71	720.78	97.00	722.53	97.50	6
72	722.53	97.50	742.41	97.50	6
73	742.41	97.50	767.41	97.50	7
74	767.41	97.50	777.41	97.50	6
75	777.41	97.50	1200.00	97.50	7
76	720.78	97.00	740.91	97.00	6
77	740.91	97.00	742.41	97.50	7
78	740.91	97.00	765.91	97.00	6
79	765.91	97.00	767.41	97.50	6
80	765.91	97.00	775.91	97.00	6
81	775.91	97.00	777.41	97.50	6
82	775.91	97.00	1200.00	97.00	6
83	678.78	85.00	720.78	97.00	6
84	658.00	85.00	658.56	85.00	8
85	658.56	85.00	678.78	85.00	1
86	678.78	85.00	685.00	85.00	1
87	.00	76.00	640.00	76.00	1
88	640.00	76.00	658.00	85.00	8
89	640.00	76.00	640.56	76.00	1
90	640.56	76.00	658.56	85.00	1
91	685.00	85.00	703.00	76.00	1
92	703.00	76.00	711.00	72.00	1
93	711.00	72.00	1200.00	72.00	1
94	.00	70.00	628.00	70.00	9
95	628.00	70.00	640.00	76.00	8
96	628.00	70.00	628.56	70.00	9
97	628.56	70.00	1200.00	70.00	9
98	.00	60.00	1200.00	60.00	10
99	.00	49.00	1200.00	49.00	11

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	60.0	60.0	250.0	27.0	.00	.0	1
3	62.4	62.4	.0	15.0	.00	.0	1
4	62.4	62.4	.0	15.0	.00	.0	1
5	105.0	110.0	.0	30.0	.00	.0	1
6	60.0	60.0	250.0	27.0	.00	.0	1
7	60.0	60.0	.0	21.5	.00	.0	1
8	62.4	62.4	.0	10.0	.00	.0	1
9	107.0	127.0	.0	13.0	.00	.0	1
10	75.0	110.0	300.0	9.0	.00	.0	1
11	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	487.50	83.50
3	567.50	81.60
4	573.50	81.60
5	652.00	83.50
6	1200.00	83.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	696.92	706.42	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

5000 Trial Surfaces Have Been Generated.

100 Surfaces Initiate From Each Of 50 Points Equally Spaced Along The Ground Surface Between X = 200.00 ft. and X = 487.00 ft.

Each Surface Terminates Between X = 696.92 ft. and X =1100.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

15.00 ft. Line Segments Define Each Trial Failure Surface.

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Bishop Method

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	434.29	85.00
2	446.99	77.02
3	460.26	70.04
4	474.03	64.09

5	488.22	59.22
6	502.74	55.44
7	517.50	52.79
8	532.42	51.27
9	547.42	50.90
10	562.40	51.68
11	577.27	53.61
12	591.96	56.67
13	606.37	60.84
14	620.41	66.10
15	634.02	72.43
16	647.09	79.77
17	659.57	88.10
18	671.37	97.36
19	682.43	107.49
20	692.69	118.44
21	702.07	130.14
22	710.53	142.53
23	715.37	150.92

Circle Center At X = 544.7 ; Y = 246.7 and Radius, 195.8

FACTOR OF SAFETY = 1.6 (With Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 1.7 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

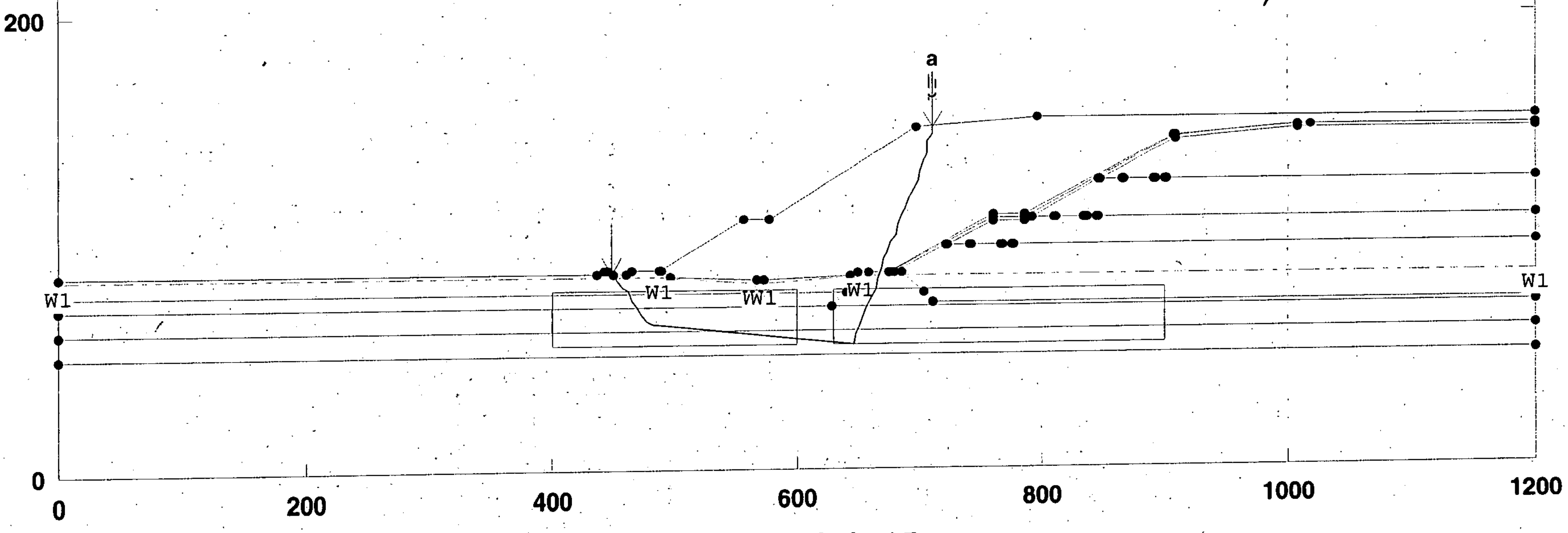
Hardee County Landfill Expansion Final Buildout - East/West Slope

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 9:52PM

#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1

WITHOUT EQUIPMENT LOADS



STABL6H FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

Hardee County Landfill Expansion Final Buildout - East/West Slope

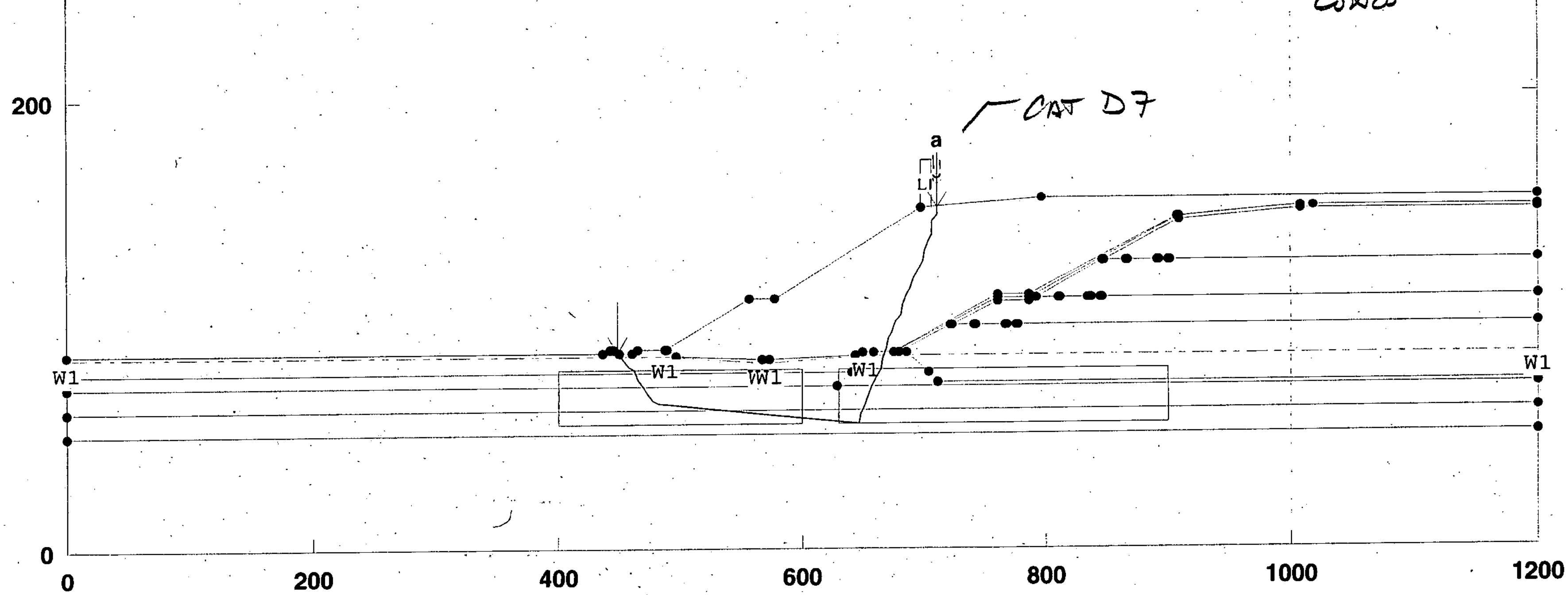
F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 9:50PM

#	FS
a	**1.6**
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 lb/sqft

WITH EQUIPMENT LOADS



STABL6H FSmin=1.6

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** STABL6H **
by
Purdue University
--Slope Stability Analysis--

Run Date: 2/9/2004
Time of Run: 9:53PM
Run By: JHO
Input Data Filename: F:ex-f-ew.
Output Filename: F:ex-f-ew.OUT
Plotted Output Filename: F:ex-f-ew.PLT

PROBLEM DESCRIPTION **Hardee County Landfill Expansion**
Final Buildout - East/West Slope

BOUNDARY COORDINATES

13 Top Boundaries
99 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	436.50	85.00	1
2	436.50	85.00	442.50	87.00	1
3	442.50	87.00	445.50	87.00	1
4	445.50	87.00	450.00	85.50	1
5	450.00	85.50	460.00	85.50	1
6	460.00	85.50	464.50	87.00	1
7	464.50	87.00	487.50	87.00	1
8	487.50	87.00	487.92	87.00	3
9	487.92	87.00	556.92	110.00	2
10	556.92	110.00	576.92	110.00	2
11	576.92	110.00	696.92	150.00	2
12	696.92	150.00	796.92	155.00	2
13	796.92	155.00	1200.00	155.00	2
14	487.92	87.00	489.50	87.00	3
15	489.50	87.00	497.00	84.50	3
16	497.00	84.50	567.50	82.60	3
17	567.50	82.60	573.51	82.60	3
18	573.51	82.60	644.07	84.50	3
19	644.07	84.50	650.00	86.00	3
20	650.00	86.00	675.00	86.00	3
21	675.00	86.00	760.75	110.50	4
22	760.75	110.50	785.75	110.50	4
23	785.75	110.50	908.24	145.50	4
24	908.24	145.50	1008.24	150.50	4
25	1008.24	150.50	1018.24	150.00	4
26	1018.24	150.00	1200.00	150.00	5
27	487.50	87.00	487.61	86.50	1
28	487.61	86.50	489.42	86.50	1
29	489.42	86.50	496.91	84.00	1
30	496.91	84.00	567.49	82.10	1
31	567.49	82.10	573.51	82.10	1
32	573.51	82.10	644.07	84.00	1
33	644.07	84.00	650.06	85.50	1
34	650.06	85.50	675.07	85.50	1
35	675.07	85.50	760.82	110.00	5
36	760.82	110.00	785.82	110.00	5
37	785.82	110.00	908.32	145.00	5
38	908.32	145.00	1008.26	150.00	5
39	1008.26	150.00	1018.24	150.00	5
40	1008.34	148.50	1200.00	148.50	6
41	908.56	143.51	1008.34	148.50	6
42	847.28	126.00	908.56	143.51	6

43	845.53	125.50	847.28	126.00	6
44	847.28	126.00	867.16	126.00	6
45	867.16	126.00	892.16	126.00	7
46	892.16	126.00	902.16	126.00	6
47	902.16	126.00	1200.00	126.00	7
48	845.53	125.50	865.66	125.50	6
49	865.66	125.50	867.16	126.00	7
50	865.66	125.50	890.66	125.50	6
51	890.66	125.50	892.16	126.00	6
52	892.16	125.50	900.66	125.50	6
53	900.66	125.50	902.16	126.00	7
54	900.66	125.50	1200.00	125.50	6
55	791.28	110.00	845.53	125.50	6
56	789.53	109.50	791.28	110.00	6
57	791.28	110.00	811.16	110.00	6
58	811.16	110.00	836.16	110.00	7
59	836.16	110.00	846.16	110.00	6
60	846.16	110.00	1200.00	110.00	7
61	789.53	109.50	809.66	109.50	6
62	809.66	109.50	811.16	110.00	7
63	809.66	109.50	834.66	109.50	6
64	834.66	109.50	836.66	110.00	6
65	834.66	109.50	844.66	109.50	6
66	844.66	109.50	846.16	110.00	7
67	844.66	109.50	1200.00	109.50	6
68	786.09	108.50	789.03	109.50	6
69	761.03	108.50	786.03	108.50	6
70	722.53	97.50	761.03	108.50	6
71	720.78	97.00	722.53	97.50	6
72	722.53	97.50	742.41	97.50	6
73	742.41	97.50	767.41	97.50	7
74	767.41	97.50	777.41	97.50	6
75	777.41	97.50	1200.00	97.50	7
76	720.78	97.00	740.91	97.00	6
77	740.91	97.00	742.41	97.50	7
78	740.91	97.00	765.91	97.00	6
79	765.91	97.00	767.41	97.50	6
80	765.91	97.00	775.91	97.00	6
81	775.91	97.00	777.41	97.50	6
82	775.91	97.00	1200.00	97.00	6
83	678.78	85.00	720.78	97.00	6
84	658.00	85.00	658.56	85.00	8
85	658.56	85.00	678.78	85.00	1
86	678.78	85.00	685.00	85.00	1
87	.00	76.00	640.00	76.00	1
88	640.00	76.00	658.00	85.00	8
89	640.00	76.00	640.56	76.00	1
90	640.56	76.00	658.56	85.00	1
91	685.00	85.00	703.00	76.00	1
92	703.00	76.00	711.00	72.00	1
93	711.00	72.00	1200.00	72.00	1
94	.00	70.00	628.00	70.00	9
95	628.00	70.00	640.00	76.00	8
96	628.00	70.00	628.56	70.00	9
97	628.56	70.00	1200.00	70.00	9
98	.00	60.00	1200.00	60.00	10
99	.00	49.00	1200.00	49.00	11

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	60.0	60.0	250.0	27.0	.00	.0	1
3	62.4	62.4	.0	15.0	.00	.0	1
4	62.4	62.4	.0	15.0	.00	.0	1
5	105.0	110.0	.0	30.0	.00	.0	1
6	60.0	60.0	250.0	27.0	.00	.0	1
7	60.0	60.0	.0	21.5	.00	.0	1
8	62.4	62.4	.0	10.0	.00	.0	1
9	107.0	127.0	.0	13.0	.00	.0	1
10	75.0	110.0	300.0	9.0	.00	.0	1
11	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	487.50	83.50
3	567.50	81.60
4	573.50	81.60
5	652.00	83.50
6	1200.00	83.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	696.92	706.42	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

2000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	400.00	66.00	600.00	66.00	25.00
2	630.00	66.00	900.00	66.00	25.00

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	448.88	85.87
2	449.39	85.67
3	453.52	82.86
4	457.42	79.72
5	461.88	77.47

6	465.42	73.94
7	469.18	70.64
8	472.79	67.18
9	476.93	64.37
10	481.82	63.37
11	645.94	53.88
12	648.44	58.21
13	651.41	62.24
14	654.56	66.11
15	656.87	70.55
16	660.40	74.10
17	663.89	77.67
18	666.07	82.17
19	668.81	86.36
20	669.91	91.23
21	673.38	94.83
22	676.87	98.41
23	680.36	102.00
24	682.42	106.55
25	685.69	110.33
26	688.46	114.49
27	691.82	118.19
28	695.09	121.98
29	698.35	125.77
30	700.92	130.06
31	703.37	134.42
32	706.21	138.53
33	706.77	143.50
34	710.30	147.04
35	710.76	150.69

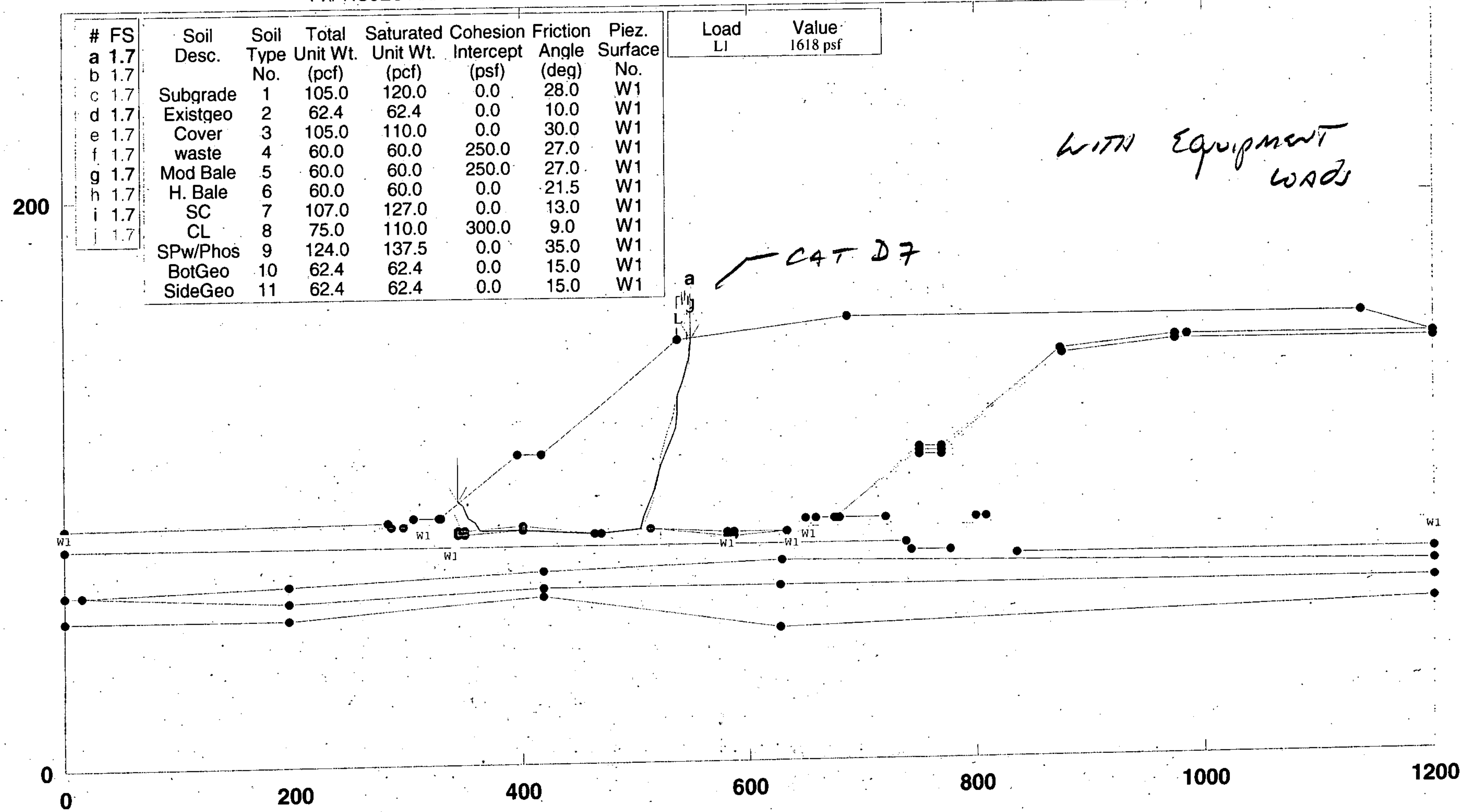
FACTOR OF SAFETY = 1.6 (With Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 1.7 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

EXPANSION GEOMEMBRANE INTERFACE
NORTH/SOUTH SECTION

Expansion Operations - Final - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-NS.PL2 Run By: LEK 2/11/2004 6:14PM



#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
BotGeo	10	62.4	62.4	0.0	15.0	W1
SideGeo	11	62.4	62.4	0.0	15.0	W1

Load	Value
L1	1618 psf

PCSTABL5M/si FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

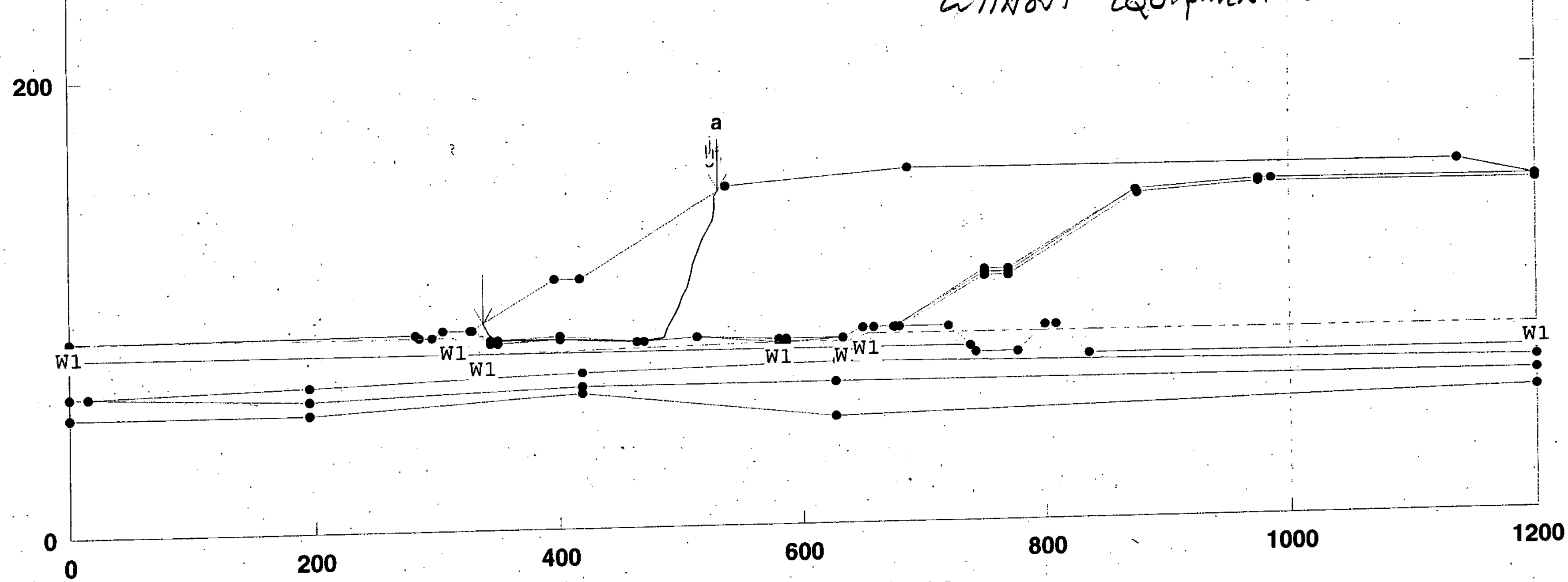
Expansion Operations - Final - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-NS.PL2 Run By: JHO 2/19/2004 4:42PM

#	FS
a	**1.9**
b	1.9
c	1.9
d	1.9
e	1.9
f	1.9
g	1.9
h	1.9
i	1.9
j	1.9

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
BotGeo	10	62.4	62.4	0.0	15.0	W1
SideGeo	11	62.4	62.4	0.0	15.0	W1

WITHOUT EQUIPMENT LOADS



PCSTABL5M/si FSmin=1.9

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University

--Slope Stability Analysis--

Run Date: 2/19/2004
Time of Run: 4:43PM
Run By: JHO
Input Data Filename: F:ex-f-ns.
Output Filename: F:ex-f-ns.OUT
Unit: ENGLISH
Plotted Output Filename: F:ex-f-ns.PLT

PROBLEM DESCRIPTION **Expansion Operations - Final - N/S**
Hardee County, Florida

BOUNDARY COORDINATES

12 Top Boundaries
84 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	84.00	281.90	85.00	1
2	281.90	85.00	284.90	84.00	1
3	284.90	84.00	294.90	84.00	1
4	294.90	84.00	303.90	87.00	1
5	303.90	87.00	326.90	87.00	1
6	326.90	87.00	327.32	87.00	1
7	327.32	87.00	396.32	110.00	4
8	396.32	110.00	416.32	110.00	4
9	416.32	110.00	536.32	150.00	4
10	536.32	150.00	686.32	157.50	4
11	686.32	157.50	1136.32	157.50	4
12	1136.32	157.50	1200.00	150.00	4
13	327.32	87.00	328.90	87.00	10
14	328.90	87.00	343.72	82.06	10
15	343.72	82.06	349.72	82.06	10
16	349.72	82.06	400.60	83.40	10
17	400.60	83.40	463.60	81.60	10
18	463.60	81.60	469.60	81.60	10
19	469.60	81.60	513.60	82.80	10
20	513.60	82.80	580.60	80.70	10
21	580.60	80.70	586.60	80.70	10
22	586.60	80.70	632.80	81.70	10
23	632.80	81.70	650.00	86.00	10
24	650.00	86.00	676.42	86.00	11
25	676.42	86.00	749.92	110.50	11
26	749.92	110.50	769.92	110.50	11
27	769.92	110.50	874.91	145.50	11
28	874.91	145.50	974.98	150.50	11
29	974.98	150.50	985.00	150.00	11
30	326.90	87.00	327.01	86.53	1
31	327.01	86.53	328.74	86.53	1
32	328.74	86.53	343.72	81.56	1
33	343.72	81.56	349.72	81.56	1
34	349.72	81.56	400.61	82.90	1
35	400.61	82.90	463.60	81.10	1
36	463.60	81.10	469.60	81.10	1
37	469.60	81.10	513.59	82.30	1
38	513.59	82.30	580.60	80.20	1
39	580.60	80.20	586.60	80.20	1
40	586.60	80.20	632.82	81.20	1

41	632.82	81.20	650.00	85.50	1
42	650.00	85.50	676.50	85.50	1
43	658.00	85.00	658.56	85.00	2
44	658.56	85.00	675.00	85.00	1
45	675.00	85.00	750.00	110.00	3
46	750.00	110.00	770.00	110.00	3
47	770.00	110.00	875.00	145.00	3
48	875.00	145.00	975.00	150.00	3
49	975.00	150.00	1200.00	150.00	3
50	.00	76.00	640.00	76.00	1
51	640.00	76.00	658.00	85.00	2
52	640.00	76.00	640.46	76.00	2
53	640.46	76.00	658.56	85.00	1
54	675.00	85.00	679.74	85.00	1
55	679.74	85.00	750.24	108.50	4
56	750.24	108.50	770.24	108.50	4
57	770.24	108.50	875.28	143.51	4
58	875.28	143.51	975.00	148.50	4
59	975.00	148.50	1200.00	148.50	4
60	675.00	85.00	720.00	85.00	1
61	720.00	85.00	738.00	76.00	1
62	640.56	76.00	738.00	76.00	1
63	738.00	76.00	742.00	74.00	1
64	742.00	74.00	777.00	74.00	1
65	777.00	74.00	799.00	85.00	1
66	799.00	85.00	809.00	85.00	1
67	809.00	85.00	835.00	72.00	1
68	835.00	72.00	1200.00	72.00	1
69	.00	60.31	15.00	60.31	8
70	15.00	60.31	195.00	63.66	7
71	195.00	63.66	418.00	67.96	7
72	418.00	67.96	628.00	70.00	7
73	628.00	70.00	640.00	76.00	2
74	628.00	70.00	628.56	70.00	7
75	628.56	70.00	640.56	76.00	1
76	628.56	70.00	1200.00	67.00	7
77	15.00	60.31	195.12	57.66	8
78	195.12	57.66	418.12	61.96	8
79	418.12	61.96	627.00	61.40	8
80	627.00	61.40	1200.00	61.40	8
81	.00	50.31	195.12	50.31	9
82	195.12	50.31	418.12	57.96	9
83	418.12	57.96	627.00	46.40	9
84	627.00	46.40	1200.00	53.50	9

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	10.0	.00	.0	1
3	105.0	110.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1
5	60.0	60.0	250.0	27.0	.00	.0	1
6	60.0	60.0	.0	21.5	.00	.0	1
7	107.0	127.0	.0	13.0	.00	.0	1
8	75.0	110.0	300.0	9.0	.00	.0	1
9	124.0	137.5	.0	35.0	.00	.0	1
10	62.4	62.4	.0	15.0	.00	.0	1
11	62.4	62.4	.0	15.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 7 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	313.05	83.50
3	337.75	77.00
4	580.60	79.00
5	638.17	79.00
6	652.00	82.00
7	1200.00	82.00

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	536.32	545.82	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

4 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 6.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	343.72	81.81	397.60	83.07	.25
2	399.95	83.13	401.35	83.13	.25
3	465.93	81.35	468.25	81.35	.25
4	468.26	81.35	514.25	82.53	.25

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.60	92.43
2	347.68	91.23
3	351.93	86.99
4	357.87	86.18
5	362.30	82.14
6	400.88	83.04
7	466.27	81.43
8	503.46	82.28
9	507.18	86.99
10	511.37	91.28
11	515.42	95.71
12	518.87	100.62
13	522.75	105.20
14	526.87	109.56

15	531.07	113.84
16	534.82	118.52
17	536.40	124.31
18	537.56	130.20
19	541.23	134.94
20	545.24	139.41
21	548.14	144.66
22	548.99	150.60
23	548.99	150.63

FACTOR OF SAFETY = 1.7 (With Equipment Loads - Critical Failure Plane along geosynthetic interface)

FACTOR OF SAFETY = 1.9 (Without Equipment Loads - Critical Failure Plane along geosynthetic interface)

EXPANSION EAST/WEST SECTION

GEOMEMBRANE INTERFACE

Hardee County Landfill Expansion Final Buildout - East/West Slope

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 8:32PM

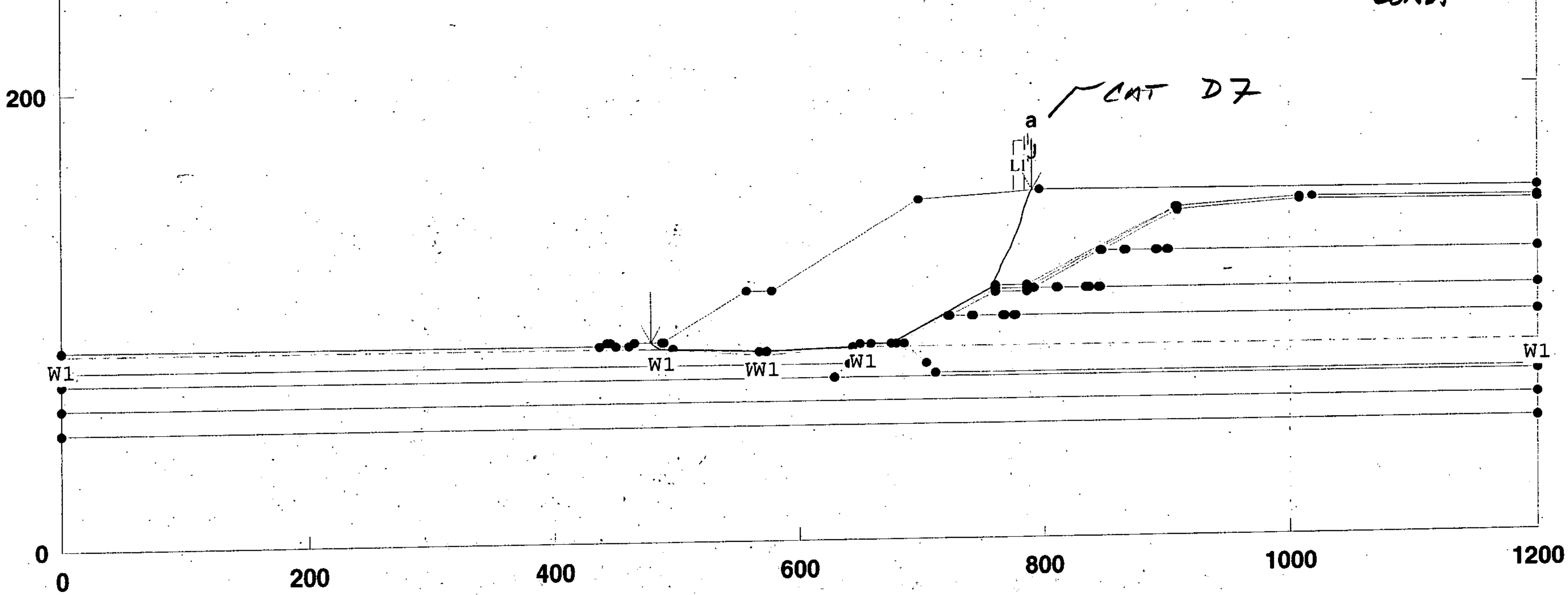
#	FS
a	**1.5**
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.6
i	1.6
j	1.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1

Load	Value
L1	1618 lb/sqft

WITH EQUIPMENT LOADS

CAT D7



STABL6H FSmin=1.5

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

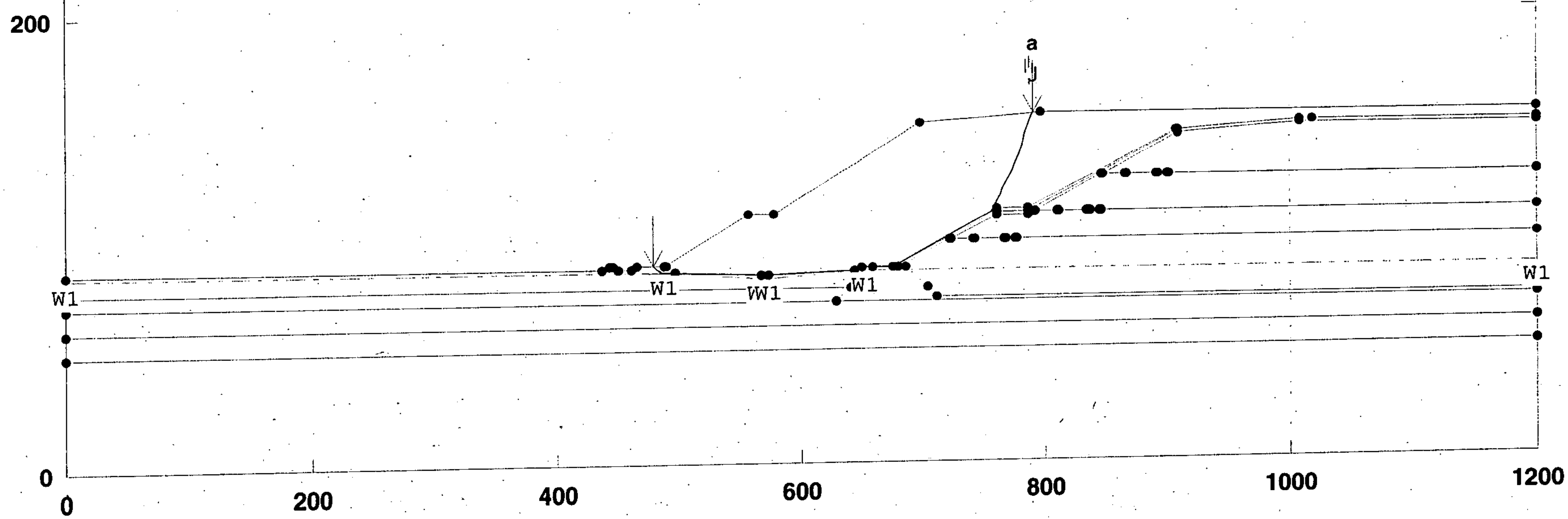
Hardee County Landfill Expansion Final Buildout - East/West Slope

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EX-F-EW.PL2 Run By: JHO 2/9/2004 8:41PM

#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.8
i	1.8
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
subgrade	1	105.0	120.0	0.0	28.0	W1
waste	2	60.0	60.0	250.0	27.0	W1
Botgeo	3	62.4	62.4	0.0	15.0	W1
Sidegeo	4	62.4	62.4	0.0	15.0	W1
Cover	5	105.0	110.0	0.0	30.0	W1
ModBale	6	60.0	60.0	250.0	27.0	W1
H.Bale	7	60.0	60.0	0.0	21.5	W1
Exgeo	8	62.4	62.4	0.0	10.0	W1
SC	9	107.0	127.0	0.0	13.0	W1
CL	10	75.0	110.0	300.0	9.0	W1
SPw/Phos	11	124.0	137.5	0.0	35.0	W1

Without Equipment Loads



STABL6H FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** STABL6H **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/9/2004
Time of Run:	8:32PM
Run By:	JHO
Input Data Filename:	F:ex-f-ew.
Output Filename:	F:ex-f-ew.OUT
Plotted Output Filename:	F:ex-f-ew.PLT

PROBLEM DESCRIPTION **Hardee County Landfill Expansion**
Final Buildout - East/West Slope

BOUNDARY COORDINATES

13 Top Boundaries
99 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	436.50	85.00	1
2	436.50	85.00	442.50	87.00	1
3	442.50	87.00	445.50	87.00	1
4	445.50	87.00	450.00	85.50	1
5	450.00	85.50	460.00	85.50	1
6	460.00	85.50	464.50	87.00	1
7	464.50	87.00	487.50	87.00	1
8	487.50	87.00	487.92	87.00	3
9	487.92	87.00	556.92	110.00	2
10	556.92	110.00	576.92	110.00	2
11	576.92	110.00	696.92	150.00	2
12	696.92	150.00	796.92	155.00	2
13	796.92	155.00	1200.00	155.00	2
14	487.92	87.00	489.50	87.00	3
15	489.50	87.00	497.00	84.50	3
16	497.00	84.50	567.50	82.60	3
17	567.50	82.60	573.51	82.60	3
18	573.51	82.60	644.07	84.50	3
19	644.07	84.50	650.00	86.00	3
20	650.00	86.00	675.00	86.00	3
21	675.00	86.00	760.75	110.50	4
22	760.75	110.50	785.75	110.50	4
23	785.75	110.50	908.24	145.50	4
24	908.24	145.50	1008.24	150.50	4
25	1008.24	150.50	1018.24	150.00	4
26	1018.24	150.00	1200.00	150.00	5
27	487.50	87.00	487.61	86.50	1
28	487.61	86.50	489.42	86.50	1
29	489.42	86.50	496.91	84.00	1
30	496.91	84.00	567.49	82.10	1
31	567.49	82.10	573.51	82.10	1
32	573.51	82.10	644.07	84.00	1
33	644.07	84.00	650.06	85.50	1
34	650.06	85.50	675.07	85.50	1
35	675.07	85.50	760.82	110.00	5
36	760.82	110.00	785.82	110.00	5
37	785.82	110.00	908.32	145.00	5
38	908.32	145.00	1008.26	150.00	5
39	1008.26	150.00	1018.24	150.00	5
40	1008.34	148.50	1200.00	148.50	6
41	908.56	143.51	1008.34	148.50	6
42	847.28	126.00	908.56	143.51	6

43	845.53	125.50	847.28	126.00	6
44	847.28	126.00	867.16	126.00	6
45	867.16	126.00	892.16	126.00	7
46	892.16	126.00	902.16	126.00	6
47	902.16	126.00	1200.00	126.00	7
48	845.53	125.50	865.66	125.50	6
49	865.66	125.50	867.16	126.00	7
50	865.66	125.50	890.66	125.50	6
51	890.66	125.50	892.16	126.00	6
52	892.16	125.50	900.66	125.50	6
53	900.66	125.50	902.16	126.00	7
54	900.66	125.50	1200.00	125.50	6
55	791.28	110.00	845.53	125.50	6
56	789.53	109.50	791.28	110.00	6
57	791.28	110.00	811.16	110.00	6
58	811.16	110.00	836.16	110.00	7
59	836.16	110.00	846.16	110.00	6
60	846.16	110.00	1200.00	110.00	7
61	789.53	109.50	809.66	109.50	6
62	809.66	109.50	811.16	110.00	7
63	809.66	109.50	834.66	109.50	6
64	834.66	109.50	836.66	110.00	6
65	834.66	109.50	844.66	109.50	6
66	844.66	109.50	846.16	110.00	7
67	844.66	109.50	1200.00	109.50	6
68	786.09	108.50	789.03	109.50	6
69	761.03	108.50	786.03	108.50	6
70	722.53	97.50	761.03	108.50	6
71	720.78	97.00	722.53	97.50	6
72	722.53	97.50	742.41	97.50	6
73	742.41	97.50	767.41	97.50	7
74	767.41	97.50	777.41	97.50	6
75	777.41	97.50	1200.00	97.50	7
76	720.78	97.00	740.91	97.00	6
77	740.91	97.00	742.41	97.50	7
78	740.91	97.00	765.91	97.00	6
79	765.91	97.00	767.41	97.50	6
80	765.91	97.00	775.91	97.00	6
81	775.91	97.00	777.41	97.50	6
82	775.91	97.00	1200.00	97.00	6
83	678.78	85.00	720.78	97.00	6
84	658.00	85.00	658.56	85.00	8
85	658.56	85.00	678.78	85.00	1
86	678.78	85.00	685.00	85.00	1
87	.00	76.00	640.00	76.00	1
88	640.00	76.00	658.00	85.00	8
89	640.00	76.00	640.56	76.00	1
90	640.56	76.00	658.56	85.00	1
91	685.00	85.00	703.00	76.00	1
92	703.00	76.00	711.00	72.00	1
93	711.00	72.00	1200.00	72.00	1
94	.00	70.00	628.00	70.00	9
95	628.00	70.00	640.00	76.00	8
96	628.00	70.00	628.56	70.00	9
97	628.56	70.00	1200.00	70.00	9
98	.00	60.00	1200.00	60.00	10
99	.00	49.00	1200.00	49.00	11

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.

1	105.0	120.0	.0	28.0	.00	.0	1
2	60.0	60.0	250.0	27.0	.00	.0	1
3	62.4	62.4	.0	15.0	.00	.0	1
4	62.4	62.4	.0	15.0	.00	.0	1
5	105.0	110.0	.0	30.0	.00	.0	1
6	60.0	60.0	250.0	27.0	.00	.0	1
7	60.0	60.0	.0	21.5	.00	.0	1
8	62.4	62.4	.0	10.0	.00	.0	1
9	107.0	127.0	.0	13.0	.00	.0	1
10	75.0	110.0	300.0	9.0	.00	.0	1
11	124.0	137.5	.0	35.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 6 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	487.50	83.50
3	567.50	81.60
4	573.50	81.60
5	652.00	83.50
6	1200.00	83.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (lb/sqft)	Deflection (deg)
1	775.00	784.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

6 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	469.99	84.25	567.07	82.36	.25
2	567.50	82.35	573.50	82.35	.25
3	643.00	84.22	644.00	84.25	.25
4	648.97	85.48	650.00	84.74	.25
5	674.00	85.75	675.44	85.74	.25
6	675.45	85.74	760.91	110.32	.25

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	478.57	87.00

2	481.42	85.23
3	486.27	83.99
4	573.42	82.35
5	643.88	84.27
6	649.04	85.52
7	674.74	85.86
8	756.34	108.91
9	759.47	112.81
10	763.00	116.35
11	765.59	120.62
12	769.09	124.20
13	772.60	127.76
14	775.98	131.44
15	778.90	135.50
16	781.88	139.51
17	782.89	144.41
18	785.44	148.71
19	788.75	152.46
20	790.82	154.69

FACTOR OF SAFETY = 1.5 (With Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 1.7 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

SLOPE STABILITY
EQUIPMENT LOADS ON
SIDESLOPES

SCS ENGINEERS

SHEET 1 OF 4

CLIENT Hardee County	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT Conversion for Soil Stability Worksheet		BY SRF	DATE 2/19/04
		CHECKED HAO	DATE

Thickness of cover Soil = h

$h = 2ft * \frac{12in}{ft} * \frac{mm}{0.0393in}$

$\underline{\underline{h = 610.69\ mm}}$

Soil slope angle beneath geomembrane = β (Given)

$\underline{\underline{\beta = 18.4^\circ}}$

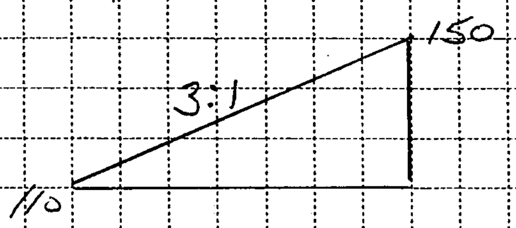
Finish cover Soil Slope = ω (Given)

$\underline{\underline{\omega = 18.4^\circ}}$

Length of Slope along geomembrane = L

$EL_2 = 150\ ft \quad EL_1 = 110\ ft$

Side Slope = 3 : 1



$L = (EL_2 - EL_1) * Slope = (150 - 110) * (3)$

$L = 120\ ft$

$120\ ft * 0.3048 \frac{m}{ft} \Rightarrow \underline{\underline{L = 36.6\ m}}$

SCS ENGINEERS

CLIENT Hardee Co	PROJECT Hardee Co Landfill		JOB NO. 09199033.09
SUBJECT Conversions for Soil Stability Worksheet		BY SRF	DATE 2/18/04
		CHECKED JMU	DATE

Unit weight of cover soil = γ

$\gamma_{sand} = 110 \frac{lbs}{ft^3}$ (Given)

Conversion factor:

$$\frac{157.09 \frac{N}{m^3}}{\frac{lb}{ft^3}} \Rightarrow \frac{0.15709 \frac{KN}{m^3}}{\frac{lb}{ft^3}}$$

$$\gamma_{sand} = 110 \frac{lbs}{ft^3} * \frac{0.15709 \frac{KN}{m^3}}{\frac{lb}{ft^3}}$$

$$\underline{\underline{\gamma_{sand} = 17.28 \frac{KN}{m^3}}}$$

Friction angle of cover soil = C

$\underline{\underline{C = 30^\circ}}$ (Given)

SCS ENGINEERS

CLIENT Hardee Co	PROJECT Hardee Co Landfill		JOB NO 09199033009
SUBJECT Conversions for Soil Stability Worksheet		BY SMF	DATE 2/19/04
		CHECKED	DATE

Cohesion of cover soil = c (Given)

$C = 0 \frac{kN}{m^2}$

Adhesion between cover soil & geomembrane = ca (Given)

$Ca = 0 \frac{kN}{m^2}$

acceleration/deceleration of dozer = a

$a = \frac{5\,Km}{hr} * \frac{mile}{1.609\,Km}$

$a = 3.1075 \frac{miles}{hr}$

SCS ENGINEERS

CLIENT Hardee Co	PROJECT Hardee Co Landfill		JOB NO. 09199033.09
SUBJECT Conversions for Soil Stability Worksheet		BY SRF	DATE 2/17/04
		CHECKED JAO	DATE

Length of Equipment track = ω

D5N = 7.83 ft = 2.3866 m

D6RXW = 9.2 ft = 2.8042 m

D7R Series II = 9.4167 ft = 2.8702 m

D8R WHA Series II = 10.5 ft = 3.2004 m

Width of Equipment track = b

D5N = 1.83 ft = 0.5578 m = 557.784 mm

D6RXW = 2.5 ft = 0.7620 m = 762.0 mm

D7R Series II = 1.83 ft = 0.5578 m = 557.784 mm

D8R WHA Series II = 1.833 ft = 0.5587 m = 558.69 mm

Influence factor @ geomembrane interface = I

Based on track width in mm (See above + attached table on Spreadsheet)

D5N = 0.7

D6RXW = 0.7

D7R Series II = 0.7

D8R WHA Series II = 0.7

SCS ENGINEERS

SHEET 1 OF 1

CLIENT Hardee Co	PROJECT Hardee Co Landfill	JOB NO 09199032.09
SUBJECT Conversions for Soil Stability Worksheet	BY SRF	DATE 2/15/04
	CHECKED	DATE

Equipment ground pressure = ?

$$D5N = 983.84 \frac{lbs}{ft^2} * 0.04788 \frac{kN}{m^2} \cdot \frac{ft^2}{lb}$$

$$= 47.1 \frac{kN}{m^2}$$

$$D6R\ XW = 945.39 \frac{lbs}{ft^2} * 0.04788 \frac{kN}{m^2} \cdot \frac{ft^2}{lb}$$

$$= 45.3 \frac{kN}{m^2}$$

$$D7R\ Series\ II = 1617.6 \frac{lbs}{ft^2} * 0.04788 \frac{kN}{m^2} \cdot \frac{ft^2}{lb}$$

$$= 77.5 \frac{kN}{m^2}$$

$$D8R\ WHA\ Series\ II = 2,152.8 \frac{lbs}{ft^2} * 0.04788 \frac{kN}{m^2} \cdot \frac{ft^2}{lb}$$

$$= 103.1 \frac{kN}{m^2}$$

DREXEL
UNIVERSITY

Geosynthetic Research Institute
33rd & Lancaster Walk
Rush Building - West Wing
Philadelphia, PA 19104
TEL 215 895-2343
FAX 215 895-1437

Geotextiles Geomembranes Geogrids Geocomposites Geosynthetic Clay Liners Geopipes Geonets

FOR GSI/GRI MEMBER ORGANIZATIONS ONLY!

COVER SOIL SLOPE STABILITY INVOLVING GEOSYNTHETIC INTERFACES

by

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and

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Drexel University
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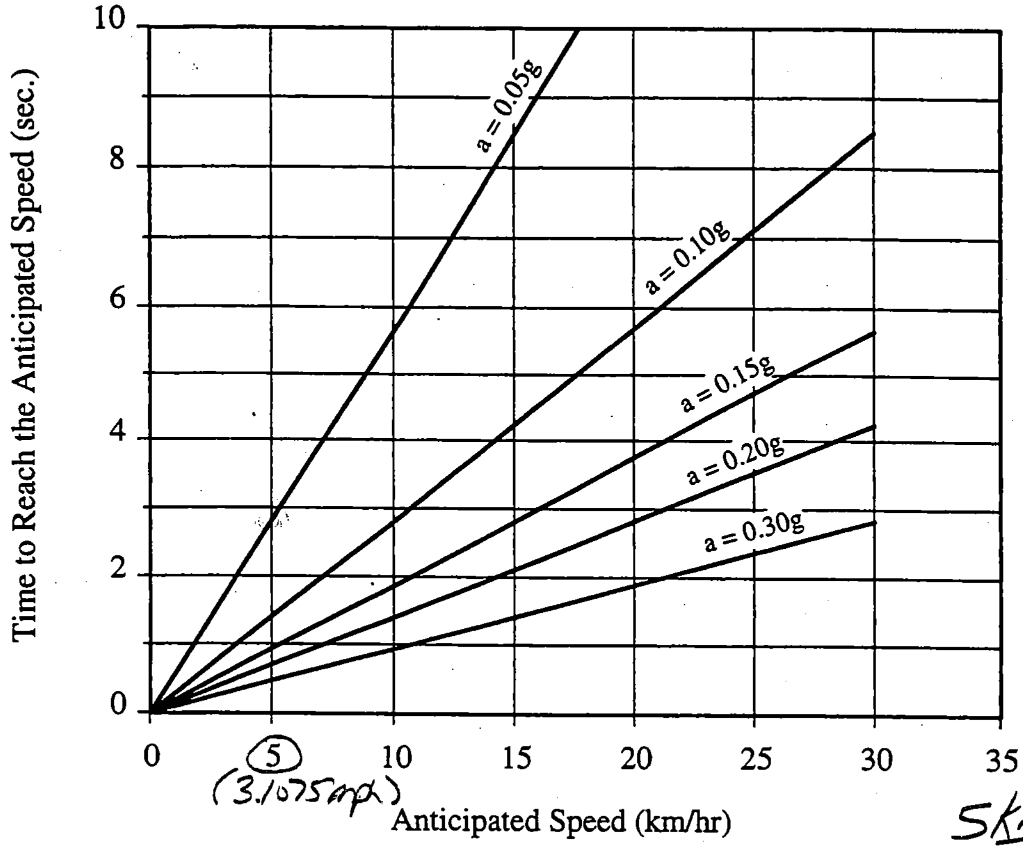
Philadelphia, PA 19104

GRI Report #18

December 9, 1996



$\frac{5\,km}{hr}$

$\frac{1.609\,km}{mile}$

$\frac{5\,km}{hr} \times \frac{mile}{1.609\,km} \Rightarrow \frac{3.1075\,mile}{hr}$

Figure 9 - Graphic relationship of construction equipment speed and rise time to obtain equipment acceleration

The acceleration of the bulldozer, coupled with an influence factor "I" (from Figure 7), results in the dynamic force per unit width at the cover soil to geomembrane interface, "F_e". The relationship is as follows:

$$F_e = W_e \left(\frac{a}{g} \right) I \tag{17}$$

where

F_e = dynamic force per unit width parallel to the slope at the geomembrane interface,

W_e = equivalent equipment (bulldozer) force per unit width at geomembrane interface, recall Equation (16).

β = soil slope angle beneath geomembrane

a = acceleration of the bulldozer

g = acceleration due to gravity

I = influence factor at the geomembrane interface, see Figure 7

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT Equipment Loading		BY SRF	DATE 2/18/04
		CHECKED JHO	DATE

Equipment Loads

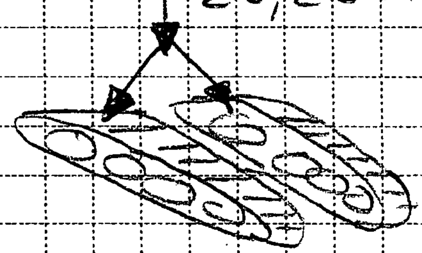
Construction Equipment Dozer CAT D5N

Operating Weight Power Shift FTC-XL = 28,258 lbs

Length of track on ground = 94 in = 7.83 ft

Width of track on ground = 22 in = 1.83 ft

28,258 lbs



$$2 \text{ Tracks} \Rightarrow \frac{28{,}258 \text{ lbs}}{2 \text{ tracks}} = 14{,}129 \frac{\text{lbs}}{\text{track}}$$

Surface Area of track = A

$$A = \left(\begin{array}{c}\text{length of track}\\ \text{on ground}\end{array}\right) * \left(\begin{array}{c}\text{width of track}\\ \text{on ground}\end{array}\right)$$

$$A = (7.83 \text{ ft}) * (1.83 \text{ ft})$$

$$A = 14.36 \text{ ft}^2/\text{track}$$

$$\text{Stress} = \frac{\text{force}}{\text{Area}} = \frac{F}{A} = \frac{14{,}129 \text{ lbs}/\text{track}}{14.36 \text{ ft}^2/\text{track}}$$

$$\Rightarrow \text{Pressure} = 983.84 \frac{\text{lbs}}{\text{ft}^2} \approx 6.83 \text{ psi}$$

Track-Type Tractors

Choose a Different Product Family

D5N Other Models: D5N

Back to Track-Type Tractors

Printer Friendly

Engineered to excel on the most demanding work sites. Combining power, rugged components and superior balance, the versatile D5N is designed for tough working conditions. It keeps material moving with the reliability and durability you expect from Caterpillar Machines.

Features & Benefits

Standard Equipment

Specification Graphics
(PDF: 85K)

Related Industries: Construction, Forestry, Industrial, Quarry/Aggregate, Waste

Detailed Specifications

Engine

Engine Model	Cat 3126B

Flywheel Power	86 kW / 115 hp
Maximum Flywheel Power	88 kW / 119 hp
Net Power - Caterpillar	86 kW / 115 hp
Net Power - ISO 9249	86 kW / 115 hp
Net Power - SAE J1349	86 kW / 115 hp
Net Power - EU 80/1269	86 kW / 115 hp
Bore	110 mm / 4.33 in
Stroke	127 mm / 5 in
Displacement	7.2 L / 439 in3
Transmission	
1 Forward	3.1 kph / 1.9 mph
2 Forward	5.4 kph / 3.3 mph
3 Forward	9.1 kph / 5.6 mph
1 Reverse	3.8 kph / 2.3 mph
2 Reverse	6.7 kph / 4.1 mph
3 Reverse	11.3 kph / 6.9 mph
Undercarriage - Std.	
Number Shoes Side - XL	41
Number Shoes Side - LGP	44
Track Rollers/Side - XL	7
Track Rollers/Side - LGP	8
Width of Shoe - XL	560 mm / 22 in
Width of Shoe - LGP	760 mm / 30 in
Track on Ground - XL	2388 mm / 94 in
Track on Ground - LGP	2604 mm / 103 in
Track Gauge - XL	1770 mm / 70 in
Track Gauge - LGP	2000 mm / 79 in
Ground Contact Area - XL	2.67 m2 / 4146 in2
Ground Contact Area - LGP	3.96 m2 / 6135 in2
Ground Pressure (Std.) - XL	47 kPa / 6.81 psi
Ground Pressure (Std.) - LPG	32.8 kPa / 4.76 psi
Service Refill Capacities	
Fuel Tank	257 L / 67.9 gal
Cooling System	48 L / 12.6 gal

Final Drives (each)	6 L / 1.6 gal
Hydraulic Tank	29.5 L / 7.7 gal

Winch Specifications

Winch Model	PA 55
Weight	1180 kg / 2602 lb
Winch and Bracket Length	1120 mm / 44.1 in
Winch Case Width	975 mm / 38.4 in
Flange Diameter	504 mm / 19.8 in
Drum Width	330 mm / 13 in
Drum Diameter	254 mm / 10 in
Drum Capacity - 22 mm (.88 in)	88 m / 289 ft
Ferrule Size (O.D. X Length)	54 x 65 mm 2.13 x 2.56 in
Oil Capacity	74.1 L / 19.6 gal

Blades

Blade Type	V PAT
XL PAT Blade Capacity	2.6 m3 / 3.4 yd3
XL PAT Blade Width	3077 mm / 10 ft
LGP PAT Blade Capacity	2.6 m3 / 3.4 yd3
LGP PAT Blade Width	3360 mm / 11 ft

Multi-Shank Ripper

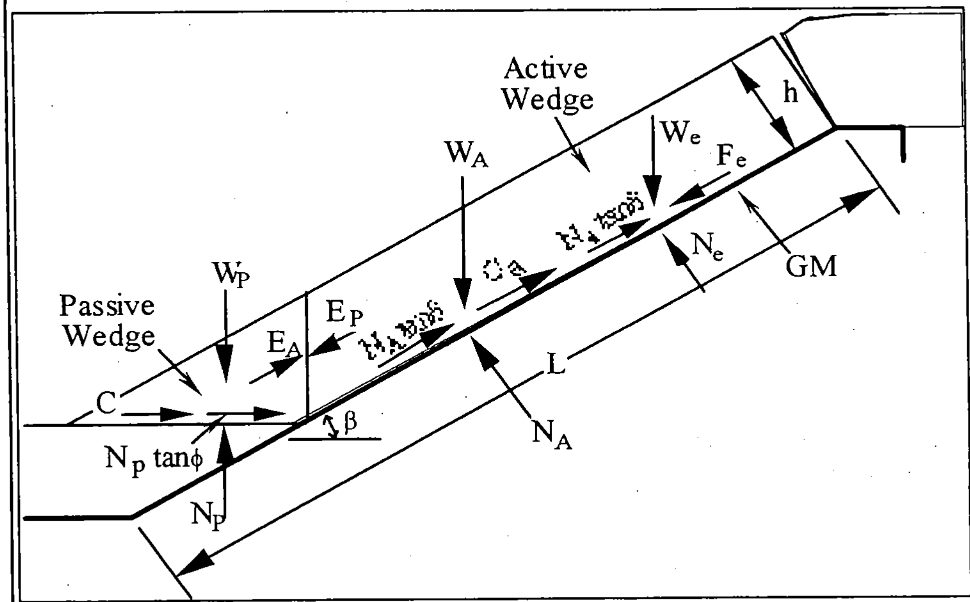
Type	Fixed Radial
Beam width	1951 mm / 76.8 in
Beam cross section	165 x 211 mm 6.5 x 8.3 in
Maximum Penetration - XL	350 mm / 13.8 in
Maximum Penetration - LGP	298 mm / 11.7 in
Number of pockets	3
Weight - each additional shank	34 kg / 75 lb

Weights

Operating Weight Power Shift FTC - XL	12818 kg / 28258 lb
Operating Weight Power Shift FTC - LGP	13665 kg / 30131 lb
Shipping Weight FTC - XL	12541 kg / 27647 lb
Shipping Weight FTC - LGP	12975 kg / 28606 lb

Cover Soil Stability Worksheet for Example #2

Uniform Cover Soil Thickness with the Incorporation of Equipment Loads (Moving Up or Down Slope)



Calculation of FS

Active Wedge:

Wa= 363.9 kN

Na= 345.3 kN

Passive Wedge:

Wp= 10.7 kN

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

a= 136.3

b= -229

c= 37.8

FS= 1.50

thickness of cover soil = h =	0.61	m		
soil slope angle beneath the geomembrane = β =	18.4	°	*= 0.32 (rad.)*	
finished cover soil slope angle = ω =	18.4	°	*= 0.32 (rad.)*	
length of slope measured along the geomembrane = L =	36.6	m		
unit weight of the cover soil = γ =	17.3	kN/m^3		
friction angle of the cover soil = ϕ =	30.0	°	*= 0.52 (rad.)*	
cohesion of the cover soil = c =	0.0	kN/m^2		*C= 0 kN*
interface friction angle between cover soil and geomembrane = δ =	26.3	°	*= 0.46 (rad.)*	
adhesion between cover soil and geomembrane = ca =	0.0	kN/m^2		*Ca= 0 kN*

thickness of cover soil = h =	0.61	m	*b/h= 0.9*
equipment ground pressure (= wt. of equipment/(2wb)) = q =	47.1	kN/m^2	*We=q w I= 78.7*
length of each equipment track = w =	2.4	m	*Ne=Wecos β= 74.7*
width of each equipment track = b =	0.6	m	*Fe=We (a/g) = 3.9*
influence factor* at geomembrane interface = I =	0.70		
acceleration/deceleration of the bulldozer = a =	0.05	g	

*Influence Factor Default Values

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
² 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
³ 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

numbers in Italics are calculated values

CAT D5N

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill	JOB NO. 091 990330
SUBJECT Equipment Loading	BY SRF	DATE 2/18/04
	CHECKED	DATE

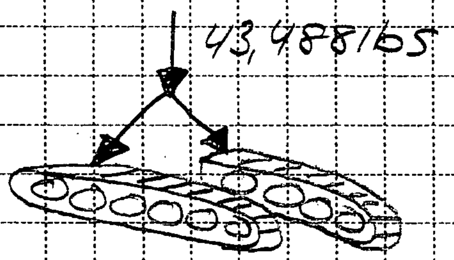
Equipment Loads

Construction Equipment Dozer CAT D6R XW

Operating Weight + XW = 43888 lbs

Length of Track on ground = 9.2 ft

Width of Track = 30 inches = 2.5 ft



2 Tracks $\Rightarrow \dfrac{43{,}488\ \text{lbs}}{2\ \text{tracks}} = 21{,}744\ \dfrac{\text{lbs}}{\text{track}}$

Surface Area of Track = A

A = (Length of track on ground) * (width of track on ground)

$A = (9.2\ \text{ft}) * (2.5\ \text{ft})$

$A = 23.0\ \text{ft}^2/\text{track}$

$\text{Stress} = \dfrac{\text{Force}}{\text{Area}} = \dfrac{F}{A} = \dfrac{21{,}744\ \text{lbs}/\text{track}}{23.0\ \text{ft}^2/\text{track}}$

$\Rightarrow \text{Pressure} = 945.39\ \dfrac{\text{lbs}}{\text{ft}^2} \approx 6.57\ \text{psi}$

Track-Type Tractors

Choose a Different Product Family

D6R II XW Other Models: D6R II XW

Back to Track-Type Tractors

Printer Friendly

The D6R Series II XW arrangement is best suited for steep slope applications or where customers need additional flotation and the ability to work in a mixture of soft to moderate dozing conditions.

Features & Benefits

Related Industries: Construction, Heavy Construction

Detailed Specifications

Engine

Engine Model	Cat C-9
Flywheel Power	138 kW / 185 hp

Net Power - Caterpillar	138 kW / 185 hp
Net Power - ISO 9249	138 kW / 185 hp
Net Power - SAE J1349	136 kW / 183 hp
Net Power - EU 80/1269	138 kW / 185 hp
Net Power - DIN 70020	192 PS
Bore	112 mm / 4.4 in
Stroke	149 mm / 5.9 in
Displacement	8.8 L / 537 in3

Transmission

1 Forward	3.8 kph / 2.4 mph
2 Forward	6.6 kph / 4.1 mph
3 Forward	11.5 kph / 7.1 mph
1 Reverse	4.8 kph / 3 mph
2 Reverse	8.4 kph / 5.2 mph
3 Reverse	14.6 kph / 9.1 mph

Undercarriage - Std.

Track Rollers/side	7
Width of Shoe	762 mm / 30 in
Track on Ground	2822 mm / 9.2 ft
Track Gauge	2032 mm / 80 in
Ground Pressure (Std.)	47.82 kPa / 6.94 psi
Ground Clearance	383 mm / 14.8 in
Ground Contact Area w/Shoe	4.33 m2 / 6661 in2

Service Refill Capacities

Cooling System	76.8 L / 20.3 gal
Engine Crankcase	28 L / 7.4 gal
Power Train	145.7 L / 38.5 gal
Final Drives (each)	13.6 L / 3.6 gal
Roller Frames (each)	24.6 L / 6.5 gal
Hydraulic Tank	47.3 L / 12.5 gal
Pivot Shaft Compartment	1.9 L / 0.5 gal

Hydraulic Controls - Maximum Operating Pressure

Bulldozer	19300 kPa / 2799 psi
Bulldozer Tilt	19300 kPa / 2799 psi

Tilt Cylinder	19300 kPa / 2799 psi
Ripper (Lift)	19300 kPa / 2799 psi
Ripper (Pitch)	19300 kPa / 2799 psi
Steering	38000 kPa / 5511 psi

Hydraulic Controls - Pump

Pump Capacity at	6900 kPa / 1001 psi
RPM at Rated Engine Speed	2125 RPM / 2125 RPM
Pump Output (Clutch Brake)	212 L/min / 56 gal/min
Pump Output (Differential Steering)	217 L/min / 57.3 gal/min
Lift Cylinder Flow	190 L/min / 50.2 gal/min
Tilt Cylinder Flow	80 L/min / 21.1 gal/min
Ripper Cylinder Flow	160 L/min / 42.3 gal/min

Hydraulic Controls - Main Relief Valve Settings

Clutch Brake Models	19300 kPa / 2799 psi
Differential Steering Models	42000 kPa / 6092 psi

Winch Specifications

Winch Model	PA 56
Weight	1179 kg / 2600 lb
Winch and Bracket Length	1210 mm / 47.6 in
Winch Case Length	1210 mm / 47.6 in
Winch Case Width	975 mm / 38.4 in
Flange Diameter	504 mm / 19.8 in
Drum Width	330 mm / 13 in
Drum Diameter	254 mm / 10 in
Drum Capacity - 22 mm (.88 in)	88 m / 290 ft
Drum Capacity - 25 mm (1.0 in)	67 m / 220 ft
Drum Capacity - 29 mm (1.13 in)	67 m / 220 ft
Ferrule Size (O.D. X Length)	54 x 67 mm (2.10 x 2.63 in)
Oil Capacity	67 L / 17.7 gal

Dimensions

Height	2380 mm / 7.8 ft
Height ROPS/Canopy	3190 mm / 10.4 ft
Length w/Blade	5.71 m / 18.75 ft
Overall Length w/o Blade	4.08 m / 13.3 ft

Blades

Blade Type	SU, A, PAT
XW SU Blade Capacity	5.62 m3 / 7.35 yd3
XW SU Blade Width	3556 mm / 11.7 ft
XW A Blade Capacity	4.3 m3 / 5.62 yd3
XW A Blade Width	4200 mm / 13.78 ft
XW PAT Blade Capacity	5.08 m3 / 6.65 yd3
XW PAT Blade Width	3794 mm / 12.45 ft

Multi-Shank Ripper

Type	Fixed Parallelogram
Beam width	2202 mm / 87 in
Beam cross section	216 x 254 mm (8.5 x 10.0 in)
Maximum penetration	500 mm / 19.7 in
Maximum clearance raised (shank tip)	511 mm / 20.1 in
Number of pockets	3
Maximum penetration force	6603 kg / 14557 lb
Maximum pryout force	9134 kg / 20137 lb
Weight - with one shank	1634 kg / 3603 lb
Weight - each additional shank	74 kg / 163 lb

Weights

Operating Weight Power PSDS	19960 kg / 44000 lb
Operating Weight - XW	19904 kg / 43888 lb
Shipping Weight - XW	16043 kg / 35374 lb

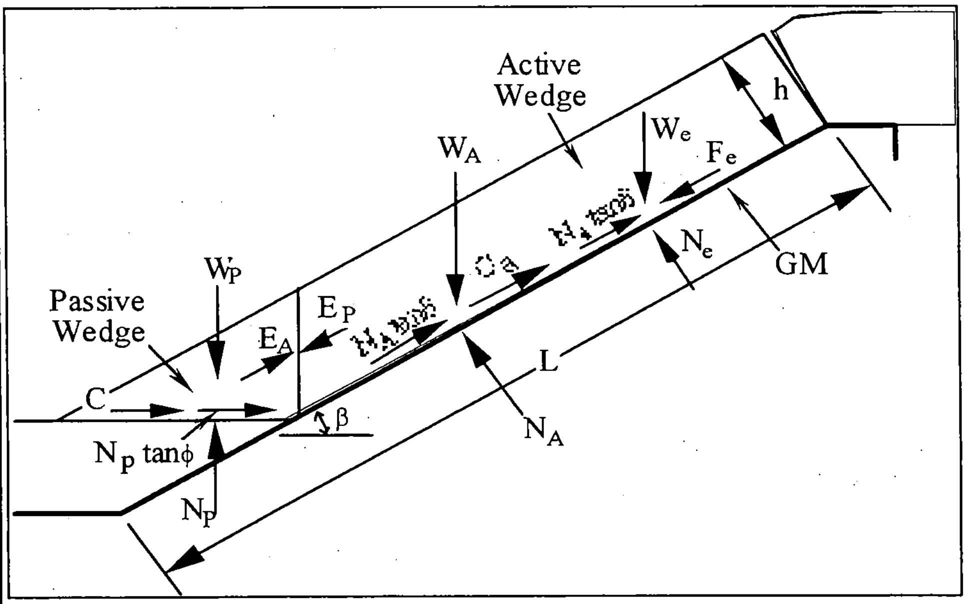
Fuel Tank

Fuel Tank Capacity	383 L / 101 gal

Back to Top

Cover Soil Stability Worksheet for Example #2

Uniform Cover Soil Thickness with the Incorporation of Equipment Loads (Moving Up or Down Slope)



Calculation of FS

Active Wedge:
Wa= 363.9 kN
Na= 345.3 kN

Passive Wedge:
Wp= 10.7 kN

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

a= 139.8
b= -236
c= 39.0

FS= 1.50

thickness of cover soil = h =	0.61	m		
soil slope angle beneath the geomembrane = β =	18.4	°	*= 0.32 (rad.)*	
finished cover soil slope angle = ω =	18.4	°	*= 0.32 (rad.)*	
length of slope measured along the geomembrane = L =	36.6	m		
unit weight of the cover soil = γ =	17.3	kN/m^3		
friction angle of the cover soil = φ =	30.0	°	*= 0.52 (rad.)*	
cohesion of the cover soil = c =	0.0	kN/m^2		*C= 0 kN*
interface friction angle between cover soil and geomembrane = δ =	26.5	°	*= 0.46 (rad.)*	
adhesion between cover soil and geomembrane = ca =	0.0	kN/m^2		*Ca= 0 kN*

thickness of cover soil = h =	0.61	m	*b/h= 1.3*
equipment ground pressure (= wt. of equipment/(2wb)) = q =	45.3	kN/m^2	*We=q w I= 88.9*
length of each equipment track = w =	2.8	m	*Ne=Wecos β= 84.3*
width of each equipment track = b =	0.8	m	*Fe=We (a/g) = 4.4*
influence factor* at geomembrane interface = I =	0.70		
acceleration/deceleration of the bulldozer = a =	0.05	g	

*Influence Factor Default Values

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
≤ 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
≥ 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

numbers in Italics are calculated values

CAT D6R XW

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill	JOB NO. 09199033.05	
SUBJECT Equipment Loading		BY [initials]	DATE
		CHECKED	DATE

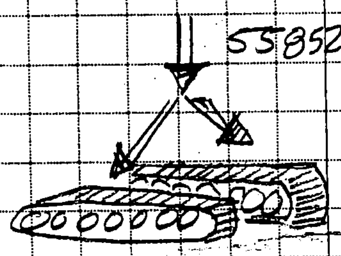
Equipment Loads

Existing Equipment Dozer CAT D7R Series II

Operating weight 55,852 lb

Length of track on ground = 9'-5" = 9.467 ft
Width of track = 22 inches (1.83 feet)

55852 lbs



2 tracks
27,926 lb per track

Surface area
A = (Length of track)(Width track)

$$\text{Stress} = F/A = \frac{27926 \text{ lb}}{(9.44)(1.833) \text{ SF}}$$

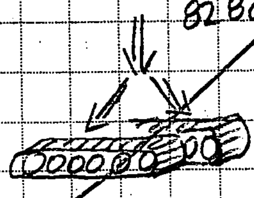
Pressure = 1617.6 psf (11.23 psi)

Alternative Equipment

CAT D8R WHA Series II
Operating weight = 82,880 lb

Length of track on ground = 10'-6" = (10.5 ft)
Width of track = 22 in (1.833 ft)

82800 lb



2 tracks
41440 lb per track

$$\text{Stress} = F/A = \frac{41,440 \text{ lb}}{(10.5)(1.8333) \text{ SF}}$$

Pressure = 2152.8 psf (14.95 psi)

NOT USED

Track-Type Tractors

D7R Series II Other Models: D7R Series II

Printer Friendly

Engineered for demanding work. The D7R Series II is designed to be productive in a variety of applications. It keeps material moving with the reliability and low operating costs you expect from Cat machines.

Features & Benefits

Standard Equipment

Optional Equipment

Specification Graphics
(PDF: 167K)

Related Industries: Agriculture, Construction, Forestry, Heavy Construction, Industrial, Quarry/Aggregate, Waste

Detailed Specifications

Engine

Engine Model	Cat 3176C
Flywheel Power	179 kW / 240 hp

Maximum Flywheel Power	192 kW / 258 hp
Net Power - Caterpillar	179 kW / 240 hp
Net Power - ISO 9249	179 kW / 240 hp
Net Power - SAE J1349	177 kW / 238 hp
Net Power - EU 80/1269	179 kW / 240 hp
Net Power - DIN 70020	248 PS
Bore	125 mm / 4.9 in
Stroke	140 mm / 5.5 in
Displacement	10.3 L / 629 in3
Weights	
Operating Weight - Std.	24758 kg / 54582 lb
Shipping Weight - Std.	20084 kg / 44278 lb
Operating Weight - XR	25334 kg / 55852 lb
Shipping Weight - XR	20660 kg / 45548 lb
Operating Weight - LGP	26897 kg / 59299 lb
Shipping Weight - LGP	22176 kg / 48890 lb
Transmission	
1 Forward	3.52 kph / 2.19 mph
2 Forward	6.1 kph / 3.79 mph
3 Forward	10.54 kph / 6.55 mph
1 Reverse	4.54 kph / 2.82 mph
2 Reverse	7.85 kph / 4.88 mph
3 Reverse	13.58 kph / 8.44 mph
Undercarriage - Std.	
Shoe Type	Extreme Service
Pitch	216 mm / 8.5 in
Number Shoes/Side	40
Grouser Height	71.5 mm / 3 in
Track Rollers/side	7
Width of Shoe	600 mm / 22 in
Track on Ground	2870 mm / 9.4 ft
Track Gauge	1981 mm / 78 in
Ground Contact Area	3.21 m2 / 4972 in2
Ground Pressure (Std.)	7.58 kPa / 11 psi

Ground Clearance	414 mm / 16.3 in
Service Refill Capacities	
Fuel Tank	479 L / 126.5 gal
Cooling System	77.4 L / 20.4 gal
Engine Crankcase	31 L / 8.2 gal
Power Train	178 L / 47 gal
Final Drives (each)	13 L / 3.4 gal
Roller Frames (each)	24.6 L / 6.5 gal
Attachment Hydraulic System Tank Only	54 L / 14.3 gal
Pivot Shaft Compartment	1.9 L / 0.5 gal
Hydraulic Controls - Maximum Operating Pressure	
Bulldozer	22800 kPa / 3307 psi
Tilt Cylinder	17225 kPa / 2498 psi
Ripper (Lift)	22750 kPa / 3300 psi
Ripper (Pitch)	22750 kPa / 3300 psi
Steering	38000 kPa / 5511 psi
Hydraulic Controls - Pump	
Pump Capacity at	7000 kPa / 1015 psi
RPM at Rated Engine Speed	2231 RPM / 2231 RPM
Pump Output (Clutch Brake)	222 L/min / 58.6 gal/min
Pump Output (Differential Steering)	295 L/min / 77.9 gal/min
Lift Cylinder Flow	180 L/min / 47.6 gal/min
Tilt Cylinder Flow	80 L/min / 21.1 gal/min
Ripper Cylinder Flow	180 L/min / 47.6 gal/min
Hydraulic Controls - Main Relief Valve Settings	
Clutch Brake Models	27000 kPa / 3916 psi
Differential Steering Models	42000 kPa / 6092 psi
Winch Specifications	
Winch Model	PA110VS Variable Speed
Weight	1894 kg / 4176 lb
Winch and Bracket Length	1461 mm / 57.5 in
Winch Case Width	1171 mm / 46.1 in
Increased Tractor Length - STD	742 mm / 29.2 in
Increased Tractor Length - XR	587 mm / 23.1 in

Increased Tractor Length - LGP	742 mm / 29.2 in
Flange Diameter	610 mm / 24 in
Drum Width	337 mm / 13.3 in
Drum Diameter	318 mm / 12.5 in
Drum Capacity - 24 mm (1 in)	885 m / 418 ft
Drum Capacity - 29 mm (1.13 in)	584 m / 276 ft
Drum Capacity - 32 mm (1.25 in)	409 m / 193 ft
Ferrule Size (O.D. X Length)	2.38 in x 2.56 in / 60 mm x 65 mm
Oil Capacity	15.1 L / 4 gal

Blades

U Blade Capacity	8.34 m3 / 10.91 yd3
U Blade Width	3988 mm / 13.08 ft
SU Blade Capacity	6.86 m3 / 8.98 yd3
SU Blade Width	3693 mm / 12.12 ft
S Blade Capacity	5.16 m3 / 6.75 yd3
S Blade Width	3904 mm / 12.81 ft
LGP S Blade Capacity	5.89 m3 / 7.7 yd3
LGP S Blade Width	4545 mm / 14.91 ft
A Blade Capacity	3.89 m3 / 5.08 yd3
A Blade Width	4503 mm / 14.77 ft

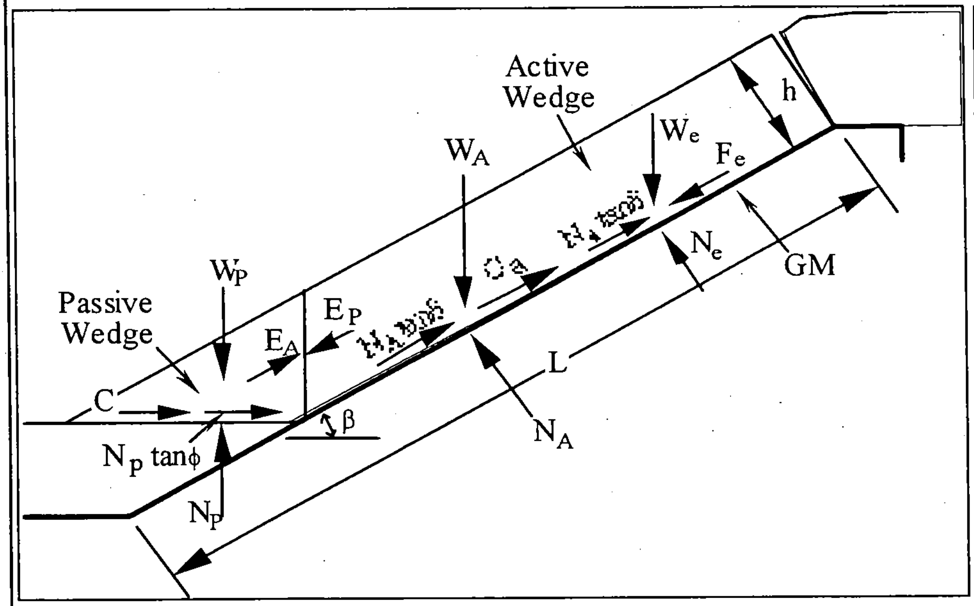
Multi-Shank Ripper

Type	Adjustable Parallelogram
Beam width	2210 mm / 87 in
Beam cross section	343 x 279 mm 13.5 x 11 in
Maximum penetration	748 mm / 29.4 in
Maximum clearance raised (shank tip)	757 mm / 29.8 in
Number of pockets	3
Maximum penetration force	8664 kg / 19100 lb
Maximum pryout force	17138 kg / 38513 lb
Weight - with one shank	3307 kg / 7431 lb
Weight - each additional shank	150 kg / 330 lb

Back to Top

Cover Soil Stability Worksheet for Example #2

Uniform Cover Soil Thickness with the Incorporation of Equipment Loads (Moving Up or Down Slope)



Calculation of FS

Active Wedge:

Wa= 363.9 kN

Na= 345.3 kN

Passive Wedge:

Wp= 10.7 kN

$$FS = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

a= 163.0

b= -275

c= 45.6

FS= 1.50

thickness of cover soil = h =	0.61	m		
soil slope angle beneath the geomembrane = β =	18.4	°	*= 0.32 (rad.)*	
finished cover soil slope angle = ω =	18.4	°	*= 0.32 (rad.)*	
length of slope measured along the geomembrane = L =	36.6	m		
unit weight of the cover soil = γ =	17.3	kN/m^3		
friction angle of the cover soil = φ =	30.0	°	*= 0.52 (rad.)*	
cohesion of the cover soil = c =	0.0	kN/m^2		*C= 0 kN*
interface friction angle between cover soil and geomembrane = δ =	26.9	°	*= 0.47 (rad.)*	
adhesion between cover soil and geomembrane = ca =	0.0	kN/m^2		*Ca= 0 kN*

thickness of cover soil = h =	0.61	m	*b/h= 0.9*
equipment ground pressure (= wt. of equipment/(2wb)) = q =	77.5	kN/m^2	*We=q w I= 155.8*
length of each equipment track = w =	2.9	m	*Ne=Wecos β= 147.7*
width of each equipment track = b =	0.6	m	*Fe=We (a/g)= 7.8*
influence factor* at geomembrane interface = I =	0.70		
acceleration/deceleration of the bulldozer = a =	0.05	g	

*Influence Factor Default Values

Cover Soil Thickness	Equipment Track Width		
	Very Wide	Wide	Standard
² 300 mm	1.00	0.97	0.94
300-1000 mm	0.97	0.92	0.70
³ 1000 mm	0.95	0.75	0.30

Note: numbers in boxes are input values

numbers in Italics are calculated values

CAT D7R Series II

INITIAL FILLING
GEOMEMBRANE INTERFACE
SLOPE STABILITY ANALYSIS

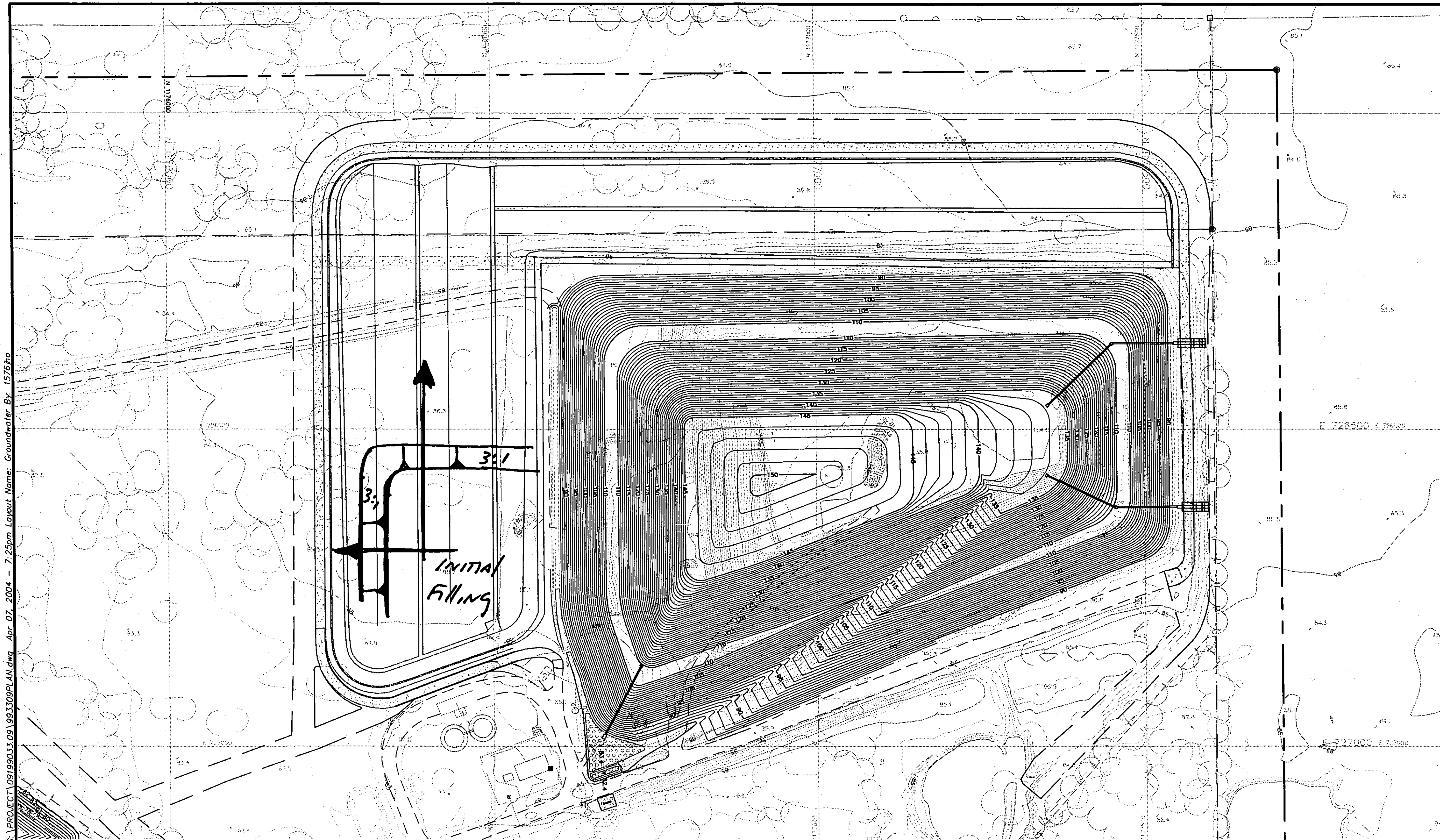
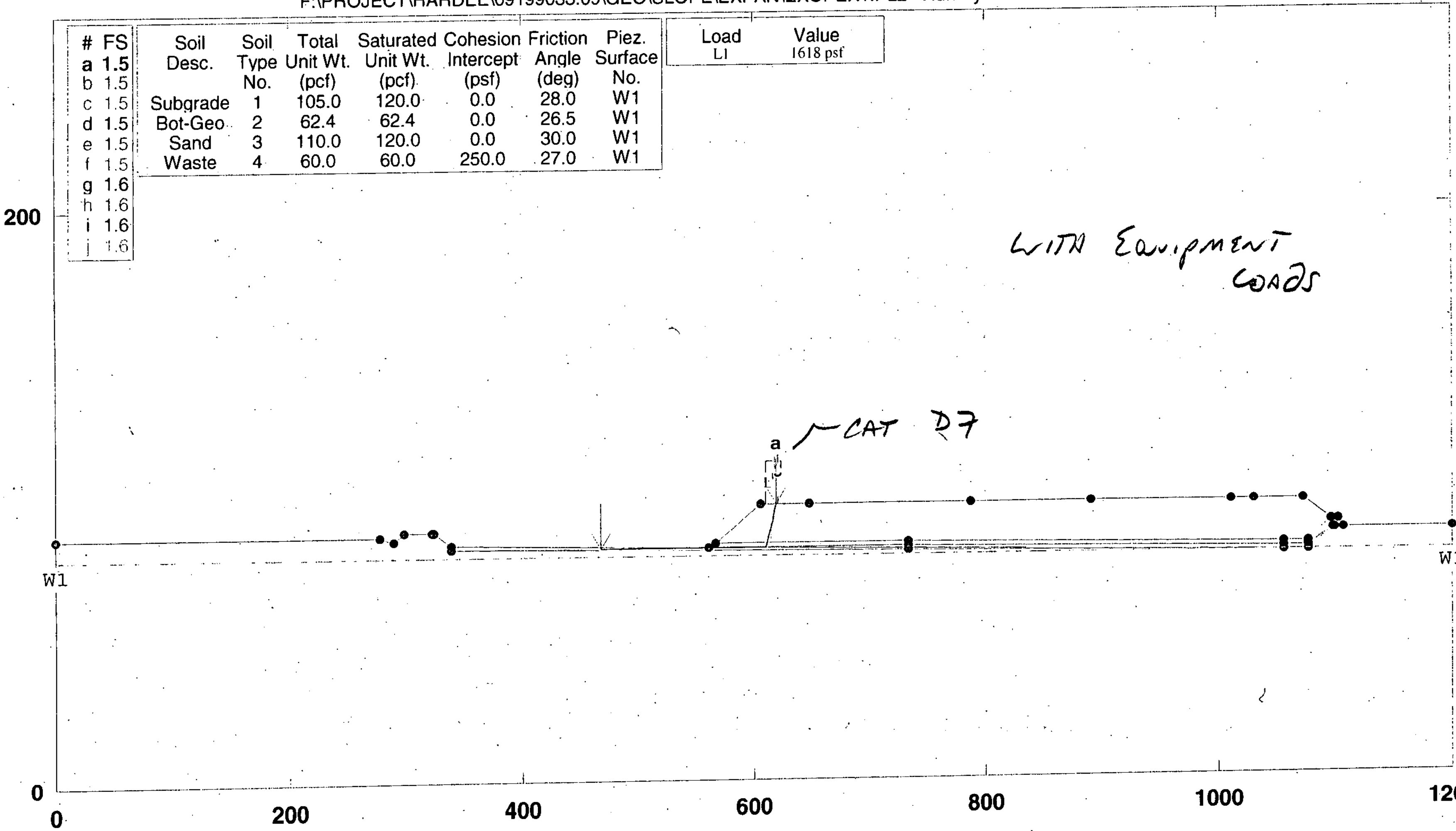


Figure 1 — Slope Stability Section Locations, Hardee County Landfill Expansion

Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 3:47PM



PCSTABL5M/si FSmin=1.5

Safety Factors Are Calculated By The Modified Janbu Method

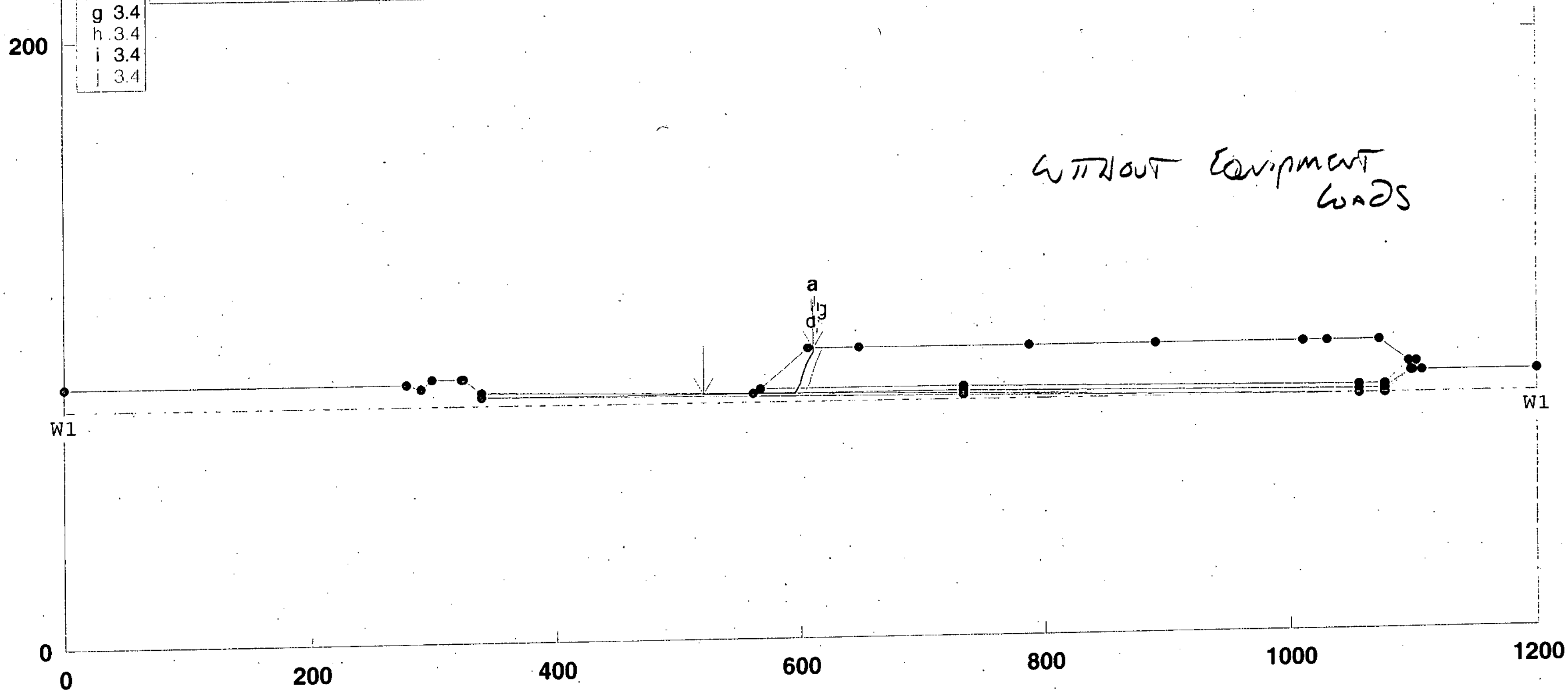
SCS ENGINEERS

Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 4:05PM

#	FS
a	3.2
b	3.2
c	3.4
d	3.4
e	3.4
f	3.4
g	3.4
h	3.4
i	3.4
j	3.4

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Bot-Geo	2	62.4	62.4	0.0	26.5	W1
Sand	3	110.0	120.0	0.0	30.0	W1
Waste	4	60.0	60.0	250.0	27.0	W1



PCSTABL5M/si FSmin=3.2

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/22/2004
Time of Run:	4:08PM
Run By:	JHO
Input Data Filename:	F:EXOPEX1.
Output Filename:	F:EXOPEX1.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:EXOPEX1.PLT

PROBLEM DESCRIPTION **Expansion - East/West Phase II Section I Hardee County Landfill**

BOUNDARY COORDINATES

20 Top Boundaries
38 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	276.92	85.00	1
2	276.92	85.00	289.92	84.00	1
3	289.92	84.00	298.92	87.00	1
4	298.92	87.00	321.92	87.00	1
5	321.92	87.00	322.34	87.00	2
6	322.34	87.00	323.92	87.00	2
7	323.92	87.00	339.52	81.80	2
8	339.52	81.80	561.57	81.12	2
9	561.57	81.12	567.52	83.11	3
10	567.52	83.11	606.20	96.00	4
11	606.20	96.00	648.20	96.00	4
12	648.20	96.00	788.20	96.00	4
13	788.20	96.00	890.58	96.00	4
14	890.58	96.00	1010.58	96.00	4
15	1010.58	96.00	1030.58	96.00	4
16	1030.58	96.00	1072.58	96.00	4
17	1072.58	96.00	1096.88	87.90	4
18	1096.88	87.90	1101.88	87.90	3
19	1101.88	87.90	1107.58	86.00	3
20	1107.58	86.00	1200.00	86.00	1
21	567.52	83.11	733.72	82.60	3
22	733.72	82.60	1056.53	81.00	3
23	1056.53	81.00	1076.53	81.00	3
24	1076.53	81.00	1096.88	87.90	3
25	561.51	81.12	733.72	80.60	2
26	733.72	80.60	1056.52	79.00	2
27	1056.52	79.00	1076.52	79.00	2
28	1076.52	79.00	1097.52	86.00	2
29	1097.52	86.00	1099.85	86.00	2
30	321.92	87.00	322.03	86.53	1
31	322.03	86.53	323.76	86.53	1
32	323.76	86.53	339.51	81.30	1
33	339.51	81.30	733.71	80.10	1
34	733.71	80.10	1056.51	78.50	1
35	1056.51	78.50	1076.51	78.50	1
36	1076.51	78.50	1097.52	85.50	1
37	1097.52	85.50	1099.52	85.50	1
38	1099.52	85.50	1099.85	86.00	1

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	26.5	.00	.0	1
3	110.0	120.0	.0	30.0	.00	.0	1

4	60.0	60.0	250.0	27.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	77.50
2	1200.00	77.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	611.00	620.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	339.51	81.55	583.83	80.81	.05
2	583.93	80.81	836.07	79.84	.05

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	468.36	81.41
2	468.47	81.31
3	473.47	81.13
4	611.25	80.72
5	612.94	85.43
6	616.02	89.37
7	617.62	94.10
8	618.81	96.00

FACTOR OF SAFETY = 1.5 (With Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 3.2 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

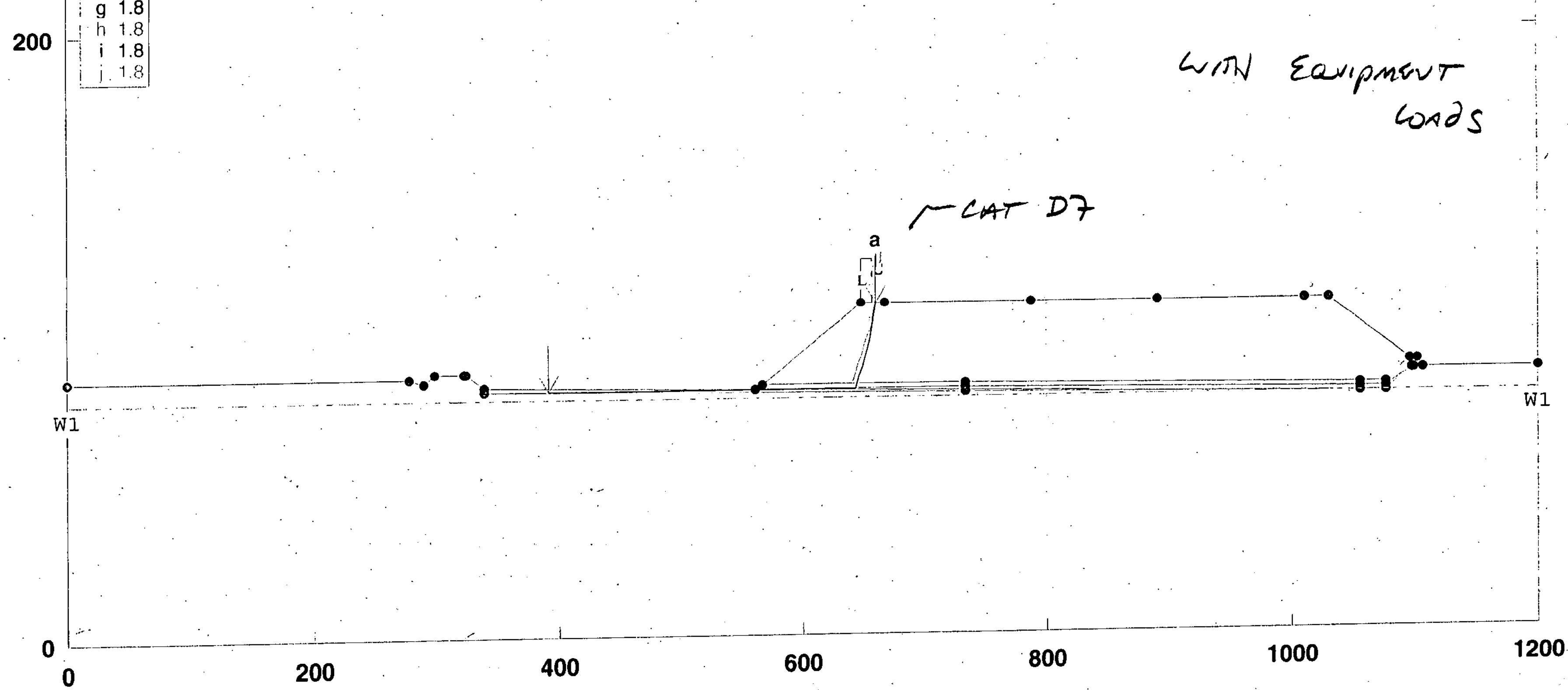
Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 4:28PM

#	FS
a	**1.8**
b	1.8
c	1.8
d	1.8
e	1.8
f	1.8
g	**1.8**
h	1.8
i	**1.8**
j	1.8

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Bot-Geo	2	62.4	62.4	0.0	26.5	W1
Sand	3	110.0	120.0	0.0	30.0	W1
Waste	4	60.0	60.0	250.0	27.0	W1

Load	Value
L1	1618 psf



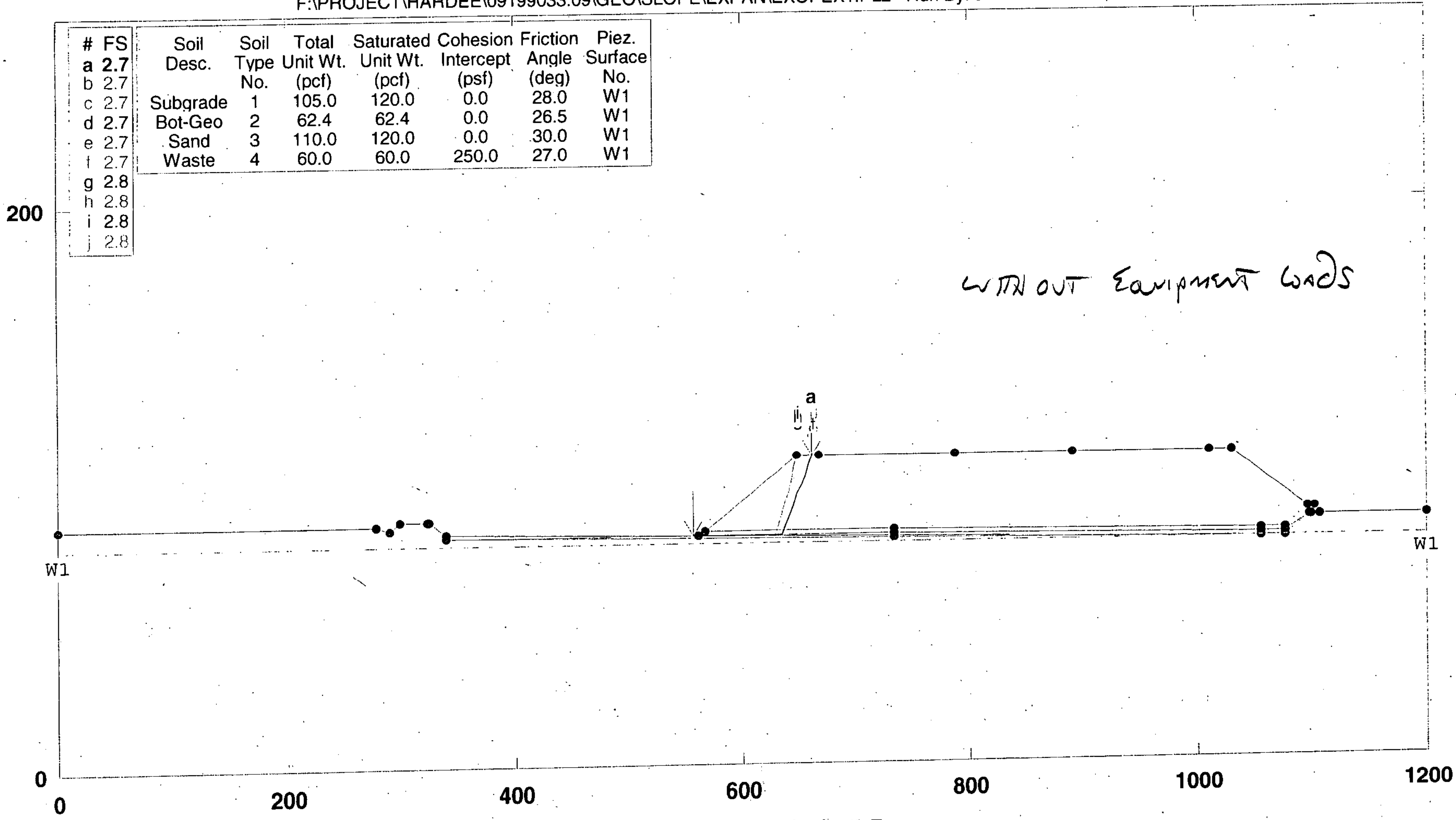
PCSTABL5M/si FSmin=1.8

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 4:30PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Bot-Geo	2	62.4	62.4	0.0	26.5	W1
Sand	3	110.0	120.0	0.0	30.0	W1
Waste	4	60.0	60.0	250.0	27.0	W1

PCSTABL5M/si FSmin=2.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/22/2004
Time of Run:	4:31PM
Run By:	JHO
Input Data Filename:	F:EXOPEX1.
Output Filename:	F:EXOPEX1.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:EXOPEX1.PLT

PROBLEM DESCRIPTION **Expansion - East/West Phase II Section I**
Hardee County Landfill

BOUNDARY COORDINATES

19 Top Boundaries
37 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	276.92	85.00	1
2	276.92	85.00	289.92	84.00	1
3	289.92	84.00	298.92	87.00	1
4	298.92	87.00	321.92	87.00	1
5	321.92	87.00	322.34	87.00	2
6	322.34	87.00	323.92	87.00	2
7	323.92	87.00	339.52	81.80	2
8	339.52	81.80	561.57	81.12	2
9	561.57	81.12	567.52	83.11	3
10	567.52	83.11	648.20	110.00	4
11	648.20	110.00	668.20	110.00	4
12	668.20	110.00	788.20	110.00	4
13	788.20	110.00	890.58	110.00	4
14	890.58	110.00	1010.58	110.00	4
15	1010.58	110.00	1030.58	110.00	4
16	1030.58	110.00	1096.88	87.90	4
17	1096.88	87.90	1101.88	87.90	3
18	1101.88	87.90	1107.58	86.00	3
19	1107.58	86.00	1200.00	86.00	1
20	567.52	83.11	733.72	82.60	3
21	733.72	82.60	1056.53	81.00	3
22	1056.53	81.00	1076.53	81.00	3
23	1076.53	81.00	1096.88	87.90	3
24	561.51	81.12	733.72	80.60	2
25	733.72	80.60	1056.52	79.00	2
26	1056.52	79.00	1076.52	79.00	2
27	1076.52	79.00	1097.52	86.00	2
28	1097.52	86.00	1099.85	86.00	2
29	321.92	87.00	322.03	86.53	1
30	322.03	86.53	323.76	86.53	1
31	323.76	86.53	339.51	81.30	1
32	339.51	81.30	733.71	80.10	1
33	733.71	80.10	1056.51	78.50	1
34	1056.51	78.50	1076.51	78.50	1
35	1076.51	78.50	1097.52	85.50	1
36	1097.52	85.50	1099.52	85.50	1
37	1099.52	85.50	1099.85	86.00	1

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	26.5	.00	.0	1
3	110.0	120.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	77.50
2	1200.00	77.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	648.20	657.70	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	339.51	81.55	583.83	80.81	.05
2	583.93	80.81	836.07	79.84	.05

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	390.80	81.64
2	391.09	81.41
3	643.93	80.60
4	645.83	85.22
5	649.35	88.78
6	652.46	92.69
7	654.97	97.02
8	656.74	101.69
9	657.91	106.55
10	660.70	110.00

FACTOR OF SAFETY = 1.8 (With Equipment Loads - Critical failure plane along geosynthetic interface)

FACTOR OF SAFETY = 2.7 (Without Equipment Loads - Critical failure plane along geosynthetic interface)

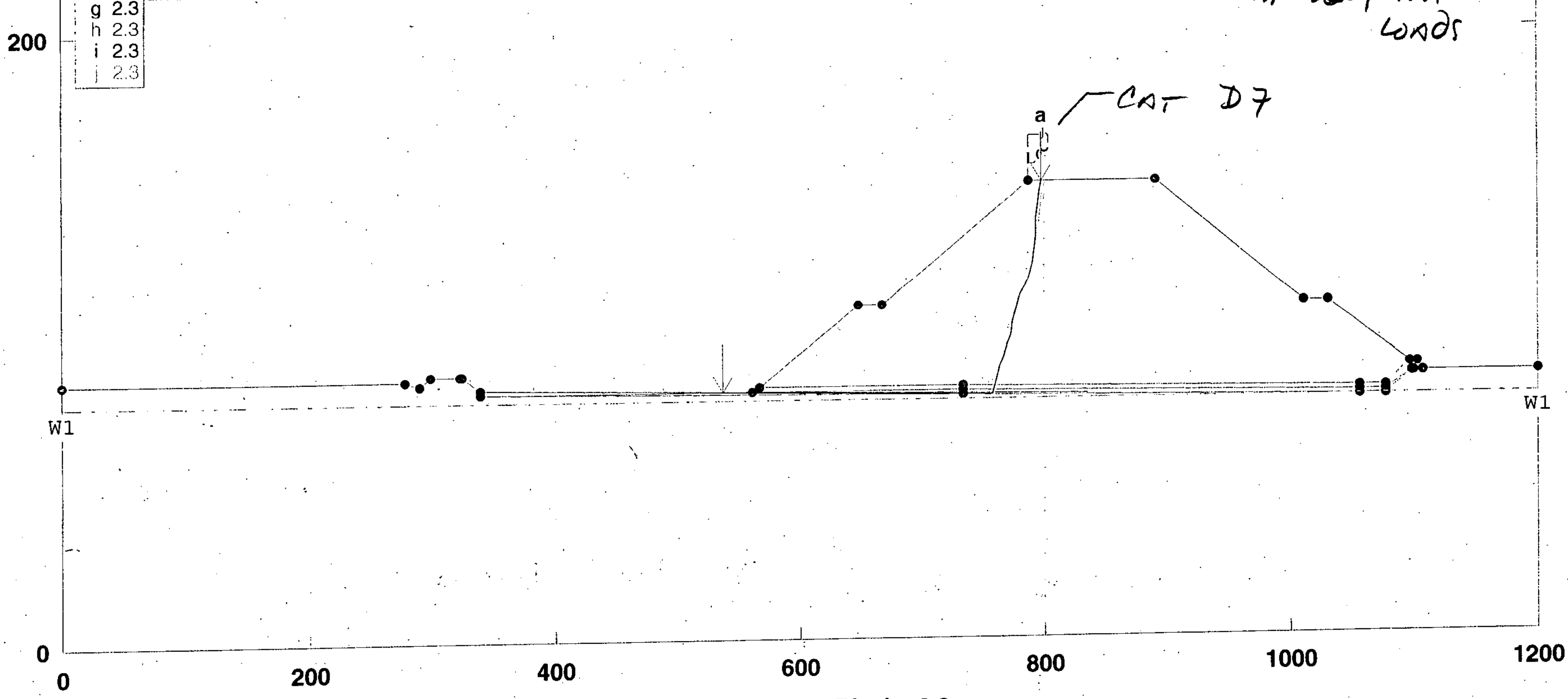
Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 4:38PM

#	FS
a	**2.2**
b	2.2
c	2.2
d	2.2
e	2.3
f	2.3
g	2.3
h	2.3
i	2.3
j	2.3

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Bot-Geo	2	62.4	62.4	0.0	26.5	W1
Sand	3	110.0	120.0	0.0	30.0	W1
Waste	4	60.0	60.0	250.0	27.0	W1

Load	Value
L1	1618 psf



PCSTABL5M/si FSmin=2.2

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

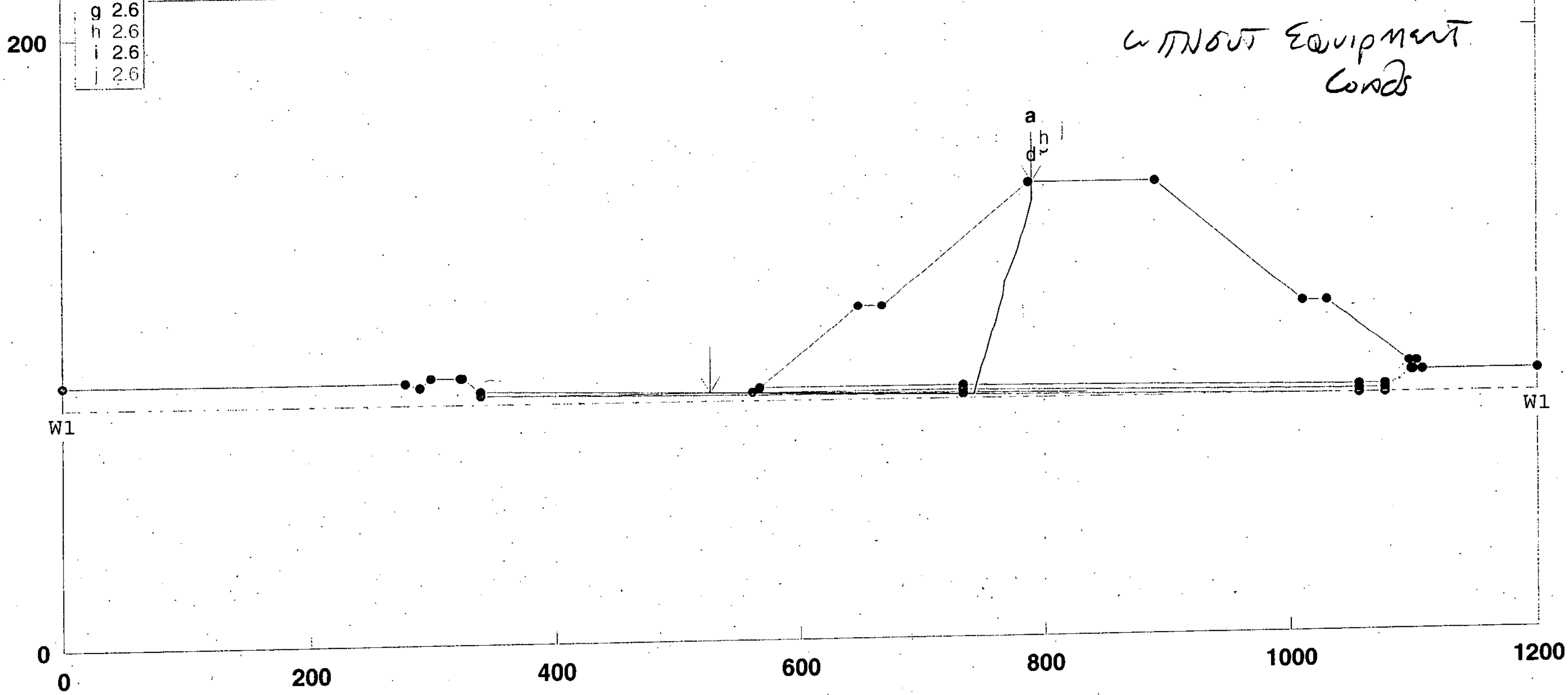
Expansion - East/West Phase II Section IHardee County Landfill

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\EXOPEX1.PL2 Run By: JHO 2/22/2004 4:38PM

#	FS
a	2.5
b	2.5
c	2.5
d	2.5
e	2.6
f	2.6
g	2.6
h	2.6
i	2.6
j	2.6

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Bot-Geo	2	62.4	62.4	0.0	26.5	W1
Sand	3	110.0	120.0	0.0	30.0	W1
Waste	4	60.0	60.0	250.0	27.0	W1

Without Equipment Loads



PCSTABL5M/si FSmin=2.5
Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/22/2004
Time of Run:	4:38PM
Run By:	JHO
Input Data Filename:	F:EXOPEX1.
Output Filename:	F:EXOPEX1.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:EXOPEX1.PLT

PROBLEM DESCRIPTION Expansion - East/West Phase II Section I
Hardee County Landfill

BOUNDARY COORDINATES

19 Top Boundaries
37 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	85.00	276.92	85.00	1
2	276.92	85.00	289.92	84.00	1
3	289.92	84.00	298.92	87.00	1
4	298.92	87.00	321.92	87.00	1
5	321.92	87.00	322.34	87.00	2
6	322.34	87.00	323.92	87.00	2
7	323.92	87.00	339.52	81.80	2
8	339.52	81.80	561.57	81.12	2
9	561.57	81.12	567.52	83.11	3
10	567.52	83.11	648.20	110.00	4
11	648.20	110.00	668.20	110.00	4
12	668.20	110.00	788.20	150.00	4
13	788.20	150.00	890.58	150.00	4
14	890.58	150.00	1010.58	110.00	4
15	1010.58	110.00	1030.58	110.00	4
16	1030.58	110.00	1096.88	87.90	4
17	1096.88	87.90	1101.88	87.90	3
18	1101.88	87.90	1107.58	86.00	3
19	1107.58	86.00	1200.00	86.00	1
20	567.52	83.11	733.72	82.60	3
21	733.72	82.60	1056.53	81.00	3
22	1056.53	81.00	1076.53	81.00	3
23	1076.53	81.00	1096.88	87.90	3
24	561.51	81.12	733.72	80.60	2
25	733.72	80.60	1056.52	79.00	2
26	1056.52	79.00	1076.52	79.00	2
27	1076.52	79.00	1097.52	86.00	2
28	1097.52	86.00	1099.85	86.00	2
29	321.92	87.00	322.03	86.53	1
30	322.03	86.53	323.76	86.53	1
31	323.76	86.53	339.51	81.30	1
32	339.51	81.30	733.71	80.10	1
33	733.71	80.10	1056.51	78.50	1
34	1056.51	78.50	1076.51	78.50	1
35	1076.51	78.50	1097.52	85.50	1
36	1097.52	85.50	1099.52	85.50	1
37	1099.52	85.50	1099.85	86.00	1

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	26.5	.00	.0	1
3	110.0	120.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	77.50
2	1200.00	77.50

BOUNDARY LOAD(S)

1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	788.00	797.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed Force Acting On A Horizontally Projected Surface.

SURCHARGE BOUNDARY LOAD DATA HAS BEEN SUPPRESSED

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.

1000 Trial Surfaces Have Been Generated.

2 Boxes Specified For Generation Of Central Block Base

Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	339.51	81.55	583.83	80.81	.05
2	583.93	80.81	836.07	79.84	.05

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Janbu Method

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	527.17	81.23
2	527.69	80.96
3	742.55	80.21
4	745.85	83.96
5	748.71	88.06
6	751.62	92.13
7	753.81	96.62
8	757.21	100.29
9	760.34	104.18
10	763.37	108.17
11	765.78	112.55
12	768.01	117.02
13	771.54	120.56
14	774.92	124.25
15	778.31	127.92
16	781.60	131.69
17	784.88	135.46
18	787.00	139.99
19	790.35	143.71
20	790.83	148.68
21	791.16	150.00

FACTOR OF SAFETY = 2.5 (Without Equipment Loads - Critical failure plane along geosynthetic

interface)

FACTOR OF SAFETY = 2.2 (With Equipment Loads - Critical failure plane along geosynthetic interface)

SLOPE STABILITY
WITH CONSTRUCTION AND OPERATING EQUIPMENT

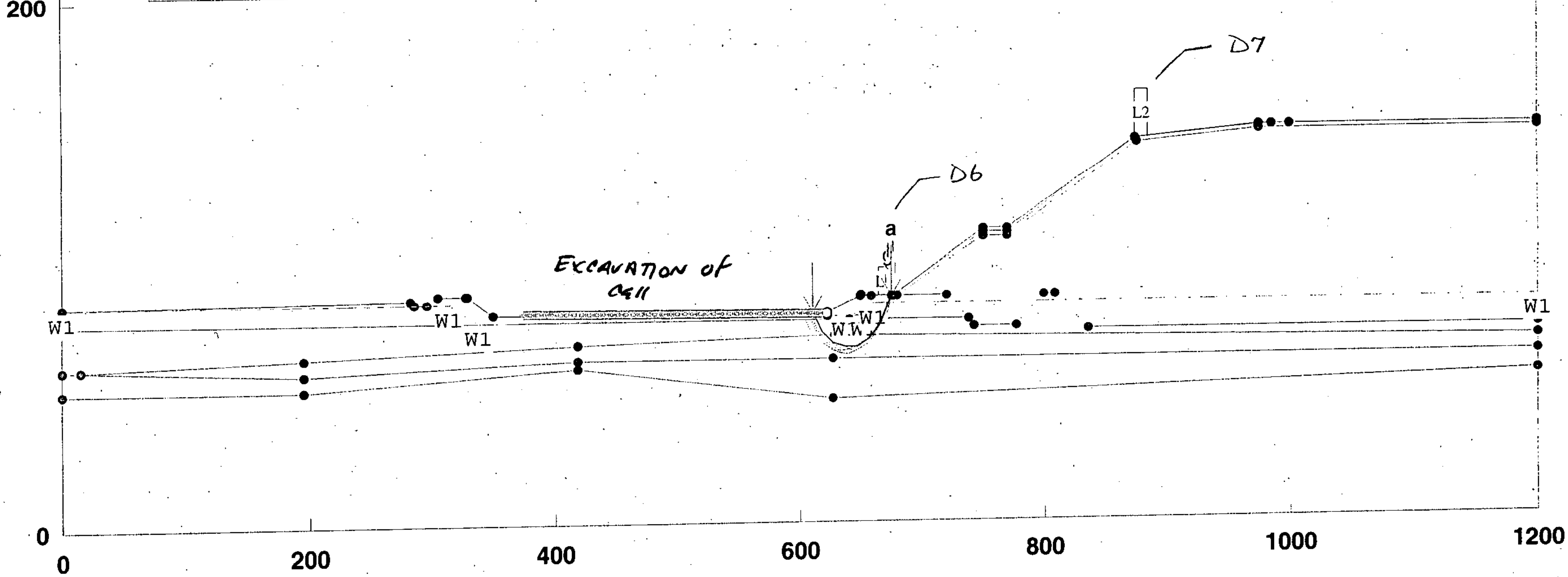
Expansion Excavation - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\NS-SUMP.PL2 Run By: JHO 2/22/2004 7:08PM

#	FS
a	1.6
b	1.6
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
subbase	10	105.0	120.0	0.0	28.0	W1
sidesub	11	105.0	120.0	0.0	28.0	W1

Load	Value
L1	950 psf
L2	1618 psf



PCSTABL5M/si FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

SCS ENGINEERS

** PCSTABL5M **
by
Purdue University
--Slope Stability Analysis--

Run Date:	2/22/2004
Time of Run:	7:08PM
Run By:	JHO
Input Data Filename:	F:NS-SUMP.
Output Filename:	F:NS-SUMP.OUT
Unit:	ENGLISH
Plotted Output Filename:	F:NS-SUMP.PLT

PROBLEM DESCRIPTION **Expansion Excavation - N/S**
Hardee County, Florida

BOUNDARY COORDINATES

17 Top Boundaries
65 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	84.00	281.90	85.00	1
2	281.90	85.00	284.90	84.00	1
3	284.90	84.00	294.90	84.00	1
4	294.90	84.00	303.90	87.00	1
5	303.90	87.00	326.90	87.00	1
6	326.90	87.00	327.32	87.00	1
7	327.32	87.00	328.90	87.00	10
8	328.90	87.00	349.90	80.00	10
9	349.90	80.00	622.00	79.00	10
10	622.00	79.00	650.00	86.00	10
11	650.00	86.00	676.42	86.00	11
12	676.42	86.00	749.92	110.50	11
13	749.92	110.50	769.92	110.50	11
14	769.92	110.50	874.91	145.50	11
15	874.91	145.50	974.98	150.50	11
16	974.98	150.50	985.00	150.00	11
17	985.00	150.00	1200.00	150.00	3
18	326.90	87.00	327.01	86.53	1
19	327.01	86.53	328.74	86.53	1
20	328.74	86.53	349.93	79.50	1
21	343.93	79.50	622.00	78.50	1
22	622.00	78.50	650.00	85.50	1
23	650.00	85.50	676.50	85.50	1
24	658.00	85.00	658.56	85.00	2
25	658.56	85.00	675.00	85.00	1
26	675.00	85.00	750.00	110.00	3
27	750.00	110.00	770.00	110.00	3
28	770.00	110.00	875.00	145.00	3
29	875.00	145.00	975.00	150.00	3
30	975.00	150.00	985.00	150.00	3
31	.00	76.00	640.00	76.00	1
32	640.00	76.00	658.00	85.00	2
33	640.00	76.00	640.46	76.00	2
34	640.46	76.00	658.56	85.00	1
35	675.00	85.00	679.74	85.00	1
36	679.74	85.00	750.24	108.50	4
37	750.24	108.50	770.24	108.50	4
38	770.24	108.50	875.28	143.51	4
39	875.28	143.51	975.00	148.50	4
40	975.00	148.50	1200.00	148.50	4
41	675.00	85.00	720.00	85.00	1

42	720.00	85.00	738.00	76.00	1
43	640.56	76.00	738.00	76.00	1
44	738.00	76.00	742.00	74.00	1
45	742.00	74.00	777.00	74.00	1
46	777.00	74.00	799.00	85.00	1
47	799.00	85.00	809.00	85.00	1
48	809.00	85.00	835.00	72.00	1
49	835.00	72.00	1200.00	72.00	1
50	.00	60.31	15.00	60.31	8
51	15.00	60.31	195.00	63.66	7
52	195.00	63.66	418.00	67.96	7
53	418.00	67.96	628.00	70.00	7
54	628.00	70.00	640.00	76.00	2
55	628.00	70.00	628.56	70.00	7
56	628.56	70.00	640.56	76.00	1
57	628.56	70.00	1200.00	67.00	7
58	15.00	60.31	195.12	57.66	8
59	195.12	57.66	418.12	61.96	8
60	418.12	61.96	627.00	61.40	8
61	627.00	61.40	1200.00	61.40	8
62	.00	50.31	195.12	50.31	9
63	195.12	50.31	418.12	57.96	9
64	418.12	57.96	627.00	46.40	9
65	627.00	46.40	1200.00	53.50	9

ISOTROPIC SOIL PARAMETERS

11 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	105.0	120.0	.0	28.0	.00	.0	1
2	62.4	62.4	.0	10.0	.00	.0	1
3	105.0	110.0	.0	30.0	.00	.0	1
4	60.0	60.0	250.0	27.0	.00	.0	1
5	60.0	60.0	250.0	27.0	.00	.0	1
6	60.0	60.0	.0	21.5	.00	.0	1
7	107.0	127.0	.0	13.0	.00	.0	1
8	75.0	110.0	300.0	9.0	.00	.0	1
9	124.0	137.5	.0	35.0	.00	.0	1
10	105.0	120.0	.0	28.0	.00	.0	1
11	105.0	120.0	.0	28.0	.00	.0	1

PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 7 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	83.50
2	313.05	83.50
3	337.75	77.00
4	638.17	77.50
5	652.00	77.50
6	660.00	82.00
7	1200.00	82.00

BOUNDARY LOAD(S)

2 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	665.00	674.20	950.0	.0
2	875.00	884.50	1618.0	.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

10000 Trial Surfaces Have Been Generated.

50 Surfaces Initiate From Each Of200 Points Equally Spaced
Along The Ground Surface Between X = 375.00 ft.
and X = 622.00 ft.

Each Surface Terminates Between X = 650.00 ft.
and X =1000.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

The Following is the Most Critical Of The Trial Failure Surfaces Examined.

Safety Factors Are Calculated By The Modified Bishop Method

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	610.83	79.04
2	618.44	72.55
3	627.42	68.16
4	637.22	66.16
5	647.21	66.66
6	656.75	69.64
7	665.25	74.91
8	672.16	82.14
9	674.33	86.00

Circle Center At X = 640.2 ; Y = 105.8 and Radius, 39.7

FACTOR OF SAFETY = 1.6 (With Constructon and County Equipment Loads - During excavation of the sump)

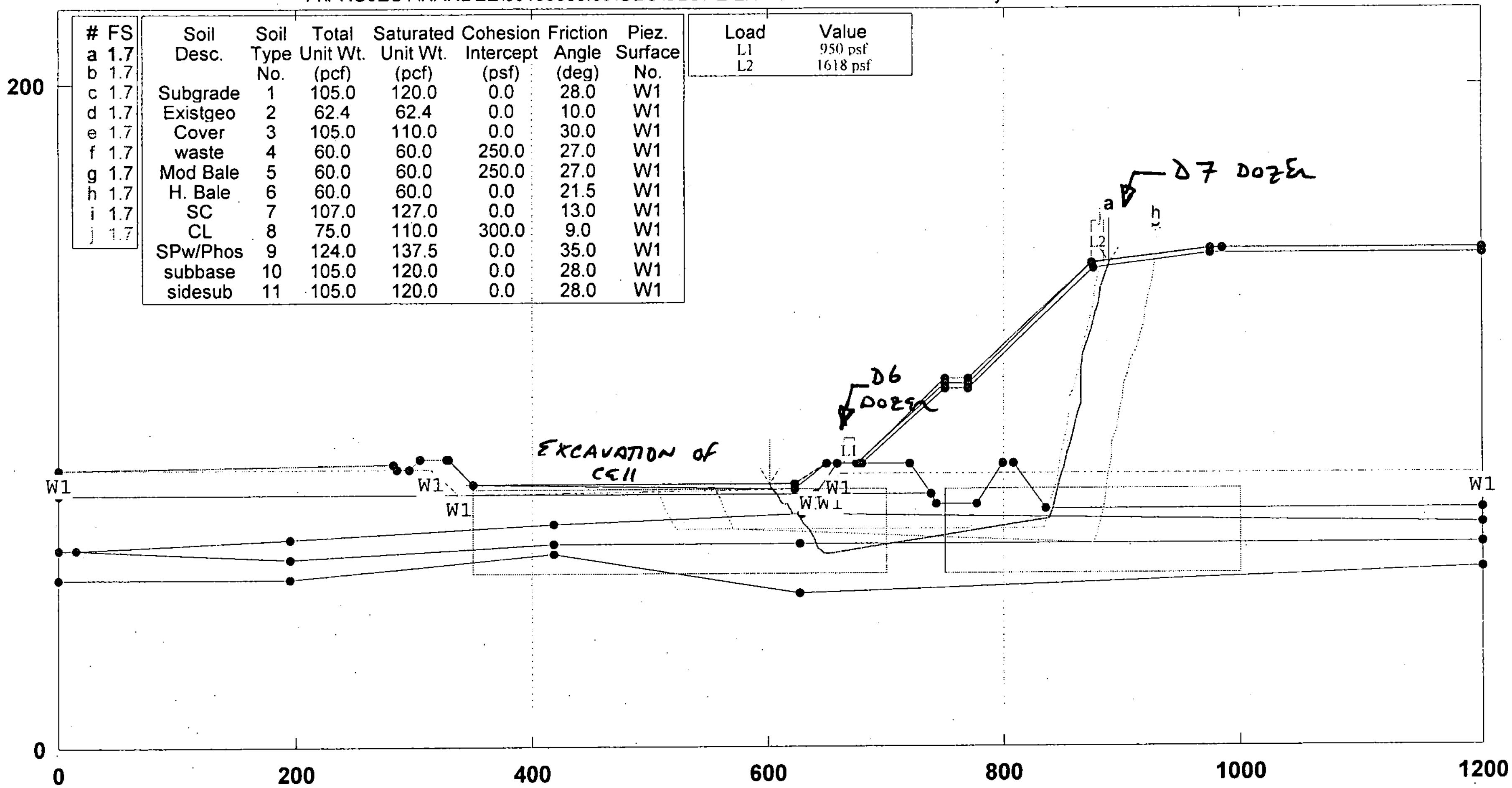
Expansion Excavation - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\NS-SUMP.PL2 Run By: JHO 2/23/2004 7:49PM

#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
subbase	10	105.0	120.0	0.0	28.0	W1
sidesub	11	105.0	120.0	0.0	28.0	W1

Load	Value
L1	950 psf
L2	1618 psf



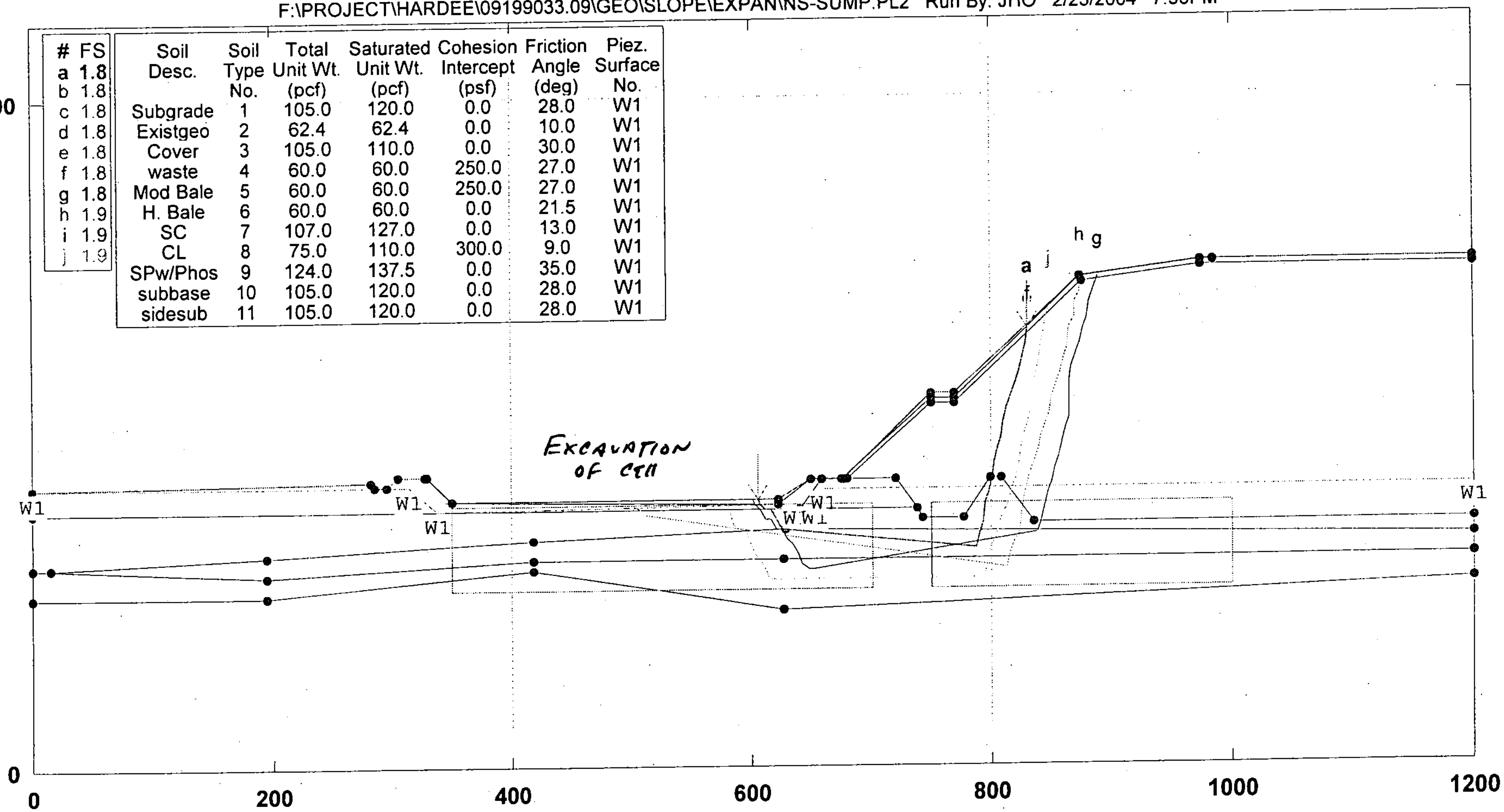
PCSTABL5M/si FSmin=1.7

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

Expansion Excavation - N/S Hardee County, Florida

F:\PROJECT\HARDEE\09199033.09\GEO\SLOPE\EXPAN\NS-SUMP.PL2 Run By: JHO 2/23/2004 7:53PM



Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	105.0	120.0	0.0	28.0	W1
Existgeo	2	62.4	62.4	0.0	10.0	W1
Cover	3	105.0	110.0	0.0	30.0	W1
waste	4	60.0	60.0	250.0	27.0	W1
Mod Bale	5	60.0	60.0	250.0	27.0	W1
H. Bale	6	60.0	60.0	0.0	21.5	W1
SC	7	107.0	127.0	0.0	13.0	W1
CL	8	75.0	110.0	300.0	9.0	W1
SPw/Phos	9	124.0	137.5	0.0	35.0	W1
subbase	10	105.0	120.0	0.0	28.0	W1
sidesub	11	105.0	120.0	0.0	28.0	W1

PCSTABL5M/si FSmin=1.8

Safety Factors Are Calculated By The Modified Janbu Method

SCS ENGINEERS

ATTACHMENT I

GROUNDWATER CONTROL SYSTEM CALCULATIONS

Copy No. 070757

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

1985 GREAT SEAL

DRAINAGE MANUAL

VOLUME 2B—Procedures

DRAINAGE DESIGN OFFICE 1987
Tallahassee, Florida

value of k_p may be very significant for porous pavements, but since no criteria are available, k_p values established by carefully controlled field or laboratory tests must be adjusted to reflect long-term effects of clogging.

A value for I_c of 2.4 ft³/day/ft of crack is recommended for most design applications. The value may be increased if local observations of infiltration and pavement performance indicate that an extra margin of safety is warranted.

For normal cracking or joints on new pavements, the value of N_c should be expressed as:

$$N_c = (N + 1) \tag{15-14}$$

where:

N_c = Number of contributing longitudinal cracks

N = Number of traffic lanes

Where pavement drainage is designed for other than normal cracking, N_c should represent the equivalent number of continuous longitudinal cracks.

Values for C_s should equal the regular transverse joint spacing (for new portland cement concrete pavements), or the anticipated average transverse crack spacing (for continuously reinforced portland cement concrete and bituminous concrete pavements). A C_s value of 40 feet has been suggested for new bituminous concrete pavements.

Transverse cracking caused by thermal and moisture changes can be extremely variable. Design values of C_s should be based on local observations of regular transverse cracking for the type of pavement under consideration.

15.4.2 <u>GROUNDWATER INFLOW</u>

The two possible sources of groundwater inflow that should be considered are gravity drainage and artesian flow.

Gravity Drainage

The following method (USDOT, FHWA, FHWA-TS-80-224, 1980) provides an estimate of gravity drainage by first determining the "radius of influence", or drawdown influence distance. This can be estimated, for practical purposes, by means of the expression:

$$L_i = 3.8\ (H - H_o) \qquad (15\text{-}15)$$

where:

L_i = Influence distance, in ft

$(H - H_o)$ = Amount of drawdown, in ft (see Figure 15-1)

With L_i, Figure 15-1 can be used to determine the total quantity of upward flow into the drainage blanket. The average inflow rate can then be computed from the equation:

$$q_g = \frac{q_2}{0.5\ W} \qquad (15\text{-}16)$$

where:

q_g = Groundwater inflow rate from gravity drainage, $ft^3/day/ft^2$ of drainage layer

q_2 = Total upward flow into one-half of the drainage blanket, in ft^3/day/linear foot of roadway

W = Width of the drainage layer, in ft

Figure 15-1 is based on a symmetrical configuration of gravity flow, but there is minimal error if flow conditions are slightly asymmetrical. Under these conditions, average values of H, H_o, and L_i can be used satisfactorily in Figure 15-1.

Some gravity seepage in addition to q_g should be considered. This flow is designated as q_1 in Figure 15-1, and is expressed as:

$$q_1 = \frac{k(H - H_o)^2}{2L_i} \tag{15-17}$$

where:

q_1 = Flow from gravity seepage, in ft³/day/linear foot of roadway

k = Hydraulic conductivity, in ft/day

$(H - H_o)$ = Amount of drawdown, in ft (see Figure 15-1)

L_i = Influence distance, in ft

Artesian Flow

Flow nets or Darcy's Law can be used to estimate the effect of artesian flow on groundwater inflow. The modification of Darcy's Law is expressed as:

$$q_a = k \frac{\Delta H}{H_o} \tag{15-18}$$

where:

q_a = Artesian groundwater inflow, in ft³/day/ft² of drainage layer

k = Hydraulic conductivity, in ft/day

ΔH = Excess artesian head, in ft

H_o = Thickness of subgrade soil between the artesian aquifer and the drainage layer, in ft

15.4.3 NET INFLOW

The net inflow (q_n) is the sum of inflow from all possible sources, with an allowance for vertical outflow if significant. Procedures for determining vertical outflow may be found in the report FHWA-TS-80-224 (USDOT, FHWA, 1980).

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT Groundwater Intercept		BY JHO	DATE
Procedure for Pipe Spacing		CHECKED GJS	DATE 4/1/04

Procedure:
- Estimate a width of influence (W) ← Initial pipe spacing
- Use F.D.O.T Drainage Manual Volume 2B Chapter 15 to estimate flow rate into drainage layer
- Use Figure 15-1 for determining q_1 & q_2 (infiltration rate into pipes)
- Using $q_1 + q_2$ & use USDA Drainage of Agricultural Land (1973) to estimate pipe spacing ← Actual computed spacing
- If initial pipe spacing and actual pipe spacing equal or close then OK
- If not re-guess initial pipe spacing

References:

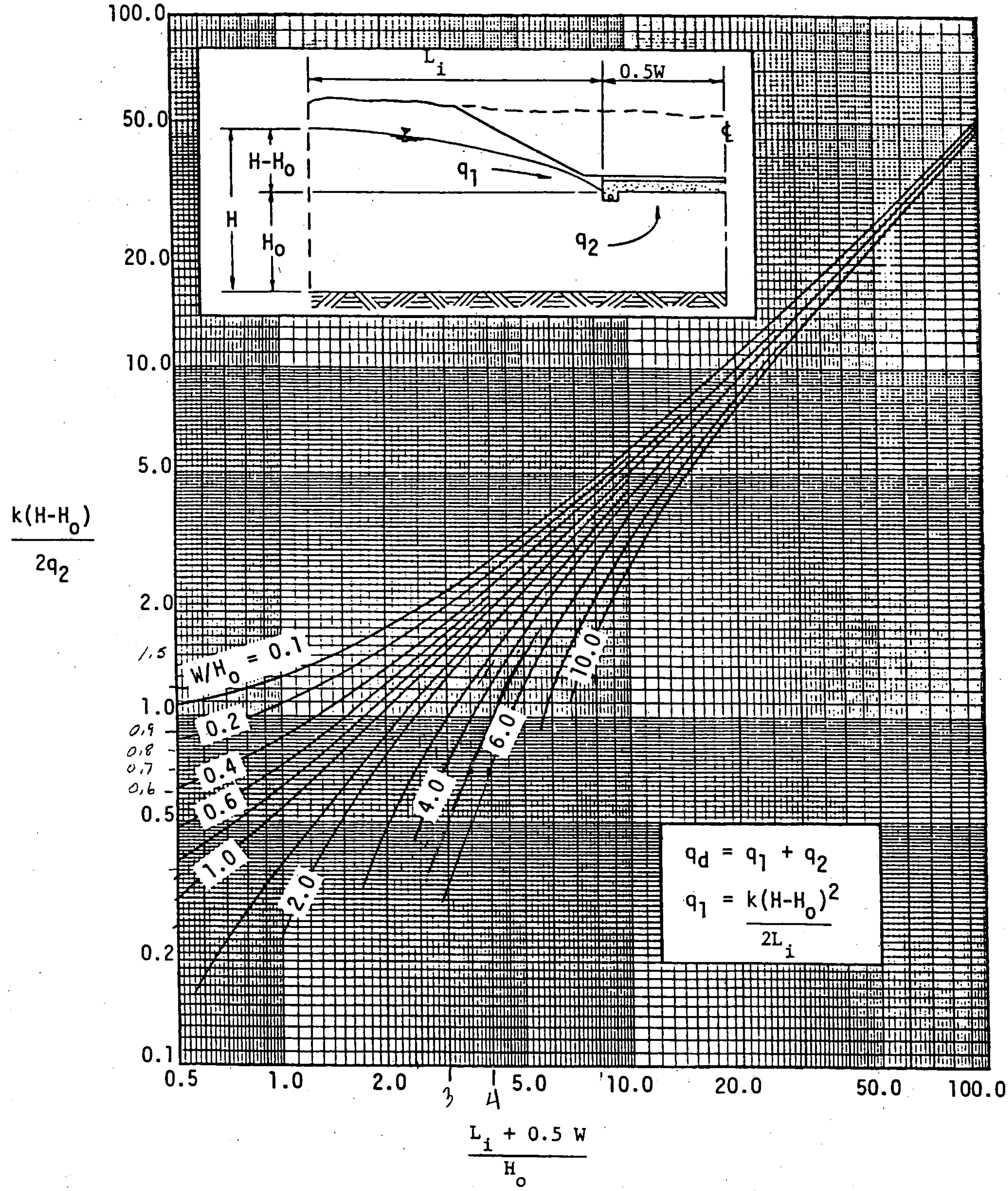
1) F.D.O.T. "Drainage Manual Volume 2B" Chapter 15, Subsurface Drainage

2) USDA "Drainage of Agricultural Land" Chapter 4, Subsurface Drainage

Permeability of sand from PSI 2003 Lab report sample taken from 4-5 BLS

$$K = 7.4\times10^{-4}\ cm/s \left(\frac{60\,s}{1\,min}\right)\left(\frac{60\,min}{1\,hr}\right)\left(\frac{24\,hr}{1\,day}\right)\left(\frac{1\,in}{2.54\,cm}\right)\left(\frac{1\,ft}{12\,in}\right)$$

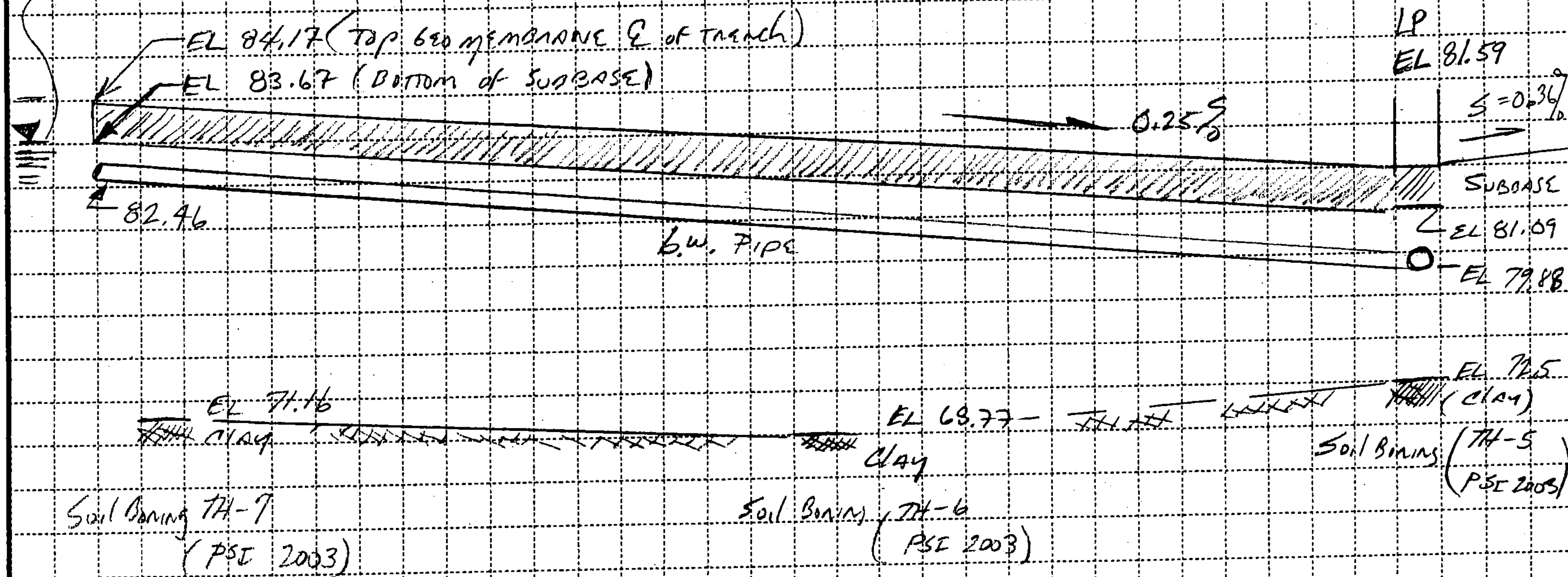
$$\Rightarrow 2.1\ ft/day$$



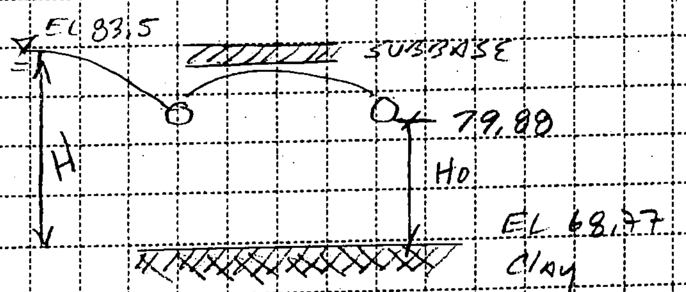
Reference: USDOT, FHWA, FHWA-TS-80-224 (1980).

FIGURE 15-1
Chart for Determining Flow in Horizontal Drainage Blanket

AT THE SOUTH END OF THE EAST-WEST LEACHATE COLLECTION TRENCH



- NOTE GROUNDWATER PIPE ELEVATION MAY CHANGE SLIGHTLY DEPENDING ON SPACING.
- USE EL 83.5 AS HIGH GROUNDWATER THROUGHOUT WESTSIDE (DEC 2002 VALUES)
- SPACE PIPES TO KEEP GROUNDWATER BELOW SUBBASE
- USE TH-6 AS MOST CONSERVATIVE TOP OF CLAY (I.E. GREATEST AQUIFER THICKNESS MOST GROUNDWATER INTERCEPTED)



$H = EL\ 83.5 - 68.77 = 14.73\ ft$

$H_0 = EL\ 68.77 - 79.88 = 11.11\ ft$

$H\ H_0 = 3.62\ ft$

SCS ENGINEERS

CLIENT Hardee Co

SUBJECT Groundwater Interceptor Pipes Westside of Landfill

PROJECT Hardee County Landfill Expansion

BY VTD

CHECKED

JOB NO. 09199027.05

DATE Nov 22 2003

DATE 9/1/04

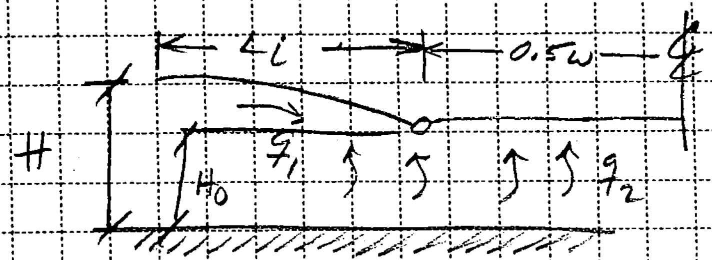
SHEET ____ OF ____

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill	JOB NO. 09199037.09
SUBJECT Groundwater Intercept	BY JHO	DATE
Westside of Landfill	CHECKED	DATE 1/1/04

USE Figure 15-1 FDOT Manual



$H = 14.73$ ft
$H_o = 11.11$ ft
$H - H_o = 3.62$ ft

$L_i = 3.8(H - H_o)$ — Equation 15-15 FDOT Manual
$= 3.8(14.73 - 11.11)$
$= 3.8(3.62)$
$= 13.76$

Initial guess of $w = 45$ ft

$\dfrac{L_i + 0.5(w)}{H_o} \Rightarrow \dfrac{13.76 + 0.5(45)}{11.11}$

$\Rightarrow 3.26$

$w/H_o \Rightarrow 45/11.11$

$\Rightarrow 4.05$

(From PSI 2003 Report) from Figure 15-1

$\# = 0.84$

$K = 7 \times 10^{-4}$ cm/s

$\# = \dfrac{K(H - H_o)}{2 q_2} \Rightarrow \dfrac{q}{2} = \dfrac{K(H - H_o)}{2(\#)}$

$= 0.99$ in/hr

$\dfrac{q}{2} = \dfrac{1.98(3.62)}{2(0.84)}$

$= 1.98$ ft/day

$= 4.267$ ft³/day/width

$q_1 = \dfrac{K(H - H_o)^2}{2 L_i} = \dfrac{1.98(3.62)^2}{2(13.76)} \Rightarrow q_1 = 0.943$ ft³/day/width

$= 5.210$ ft³/day/width

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co.	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT Ground Water Intercept		BY JHO	DATE
Westside of Landfill		CHECKED DJF	DATE 9/1/04

Compute Drainage Coefficient

$$q = \frac{q_{total}}{\text{Contributing Area}}$$

Definition: USDA "Drainage of Agricultural Land"

- Drainage coefficient is the rate of water removal
- Units are flow rate per unit area

Therefore

- q is flow rate in
- Area is contributing area

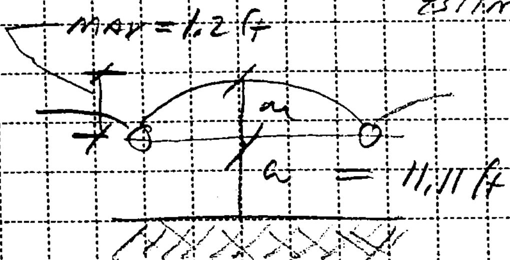
A = Width × 1 ft ← unit width of pipe

Initial guess W = 45 feet

$$= \frac{q_{total}}{\text{Area}} \Rightarrow \frac{5.210\ ft^3/day}{(45\ ft \times 1\ ft)}$$

$$\Rightarrow 0.1158\ ft/day \text{ (into pipes)}$$

Use USDA pipe spacing equation to estimate pipe spacing and mounding



$$S = \sqrt{\frac{4K}{q}(m^2 + 2am)}$$

$$S = \sqrt{\frac{4\ (1.99\ ft/day)}{0.1158\ ft/day}(1.2^2 + 2(11.11)(1.2))}$$

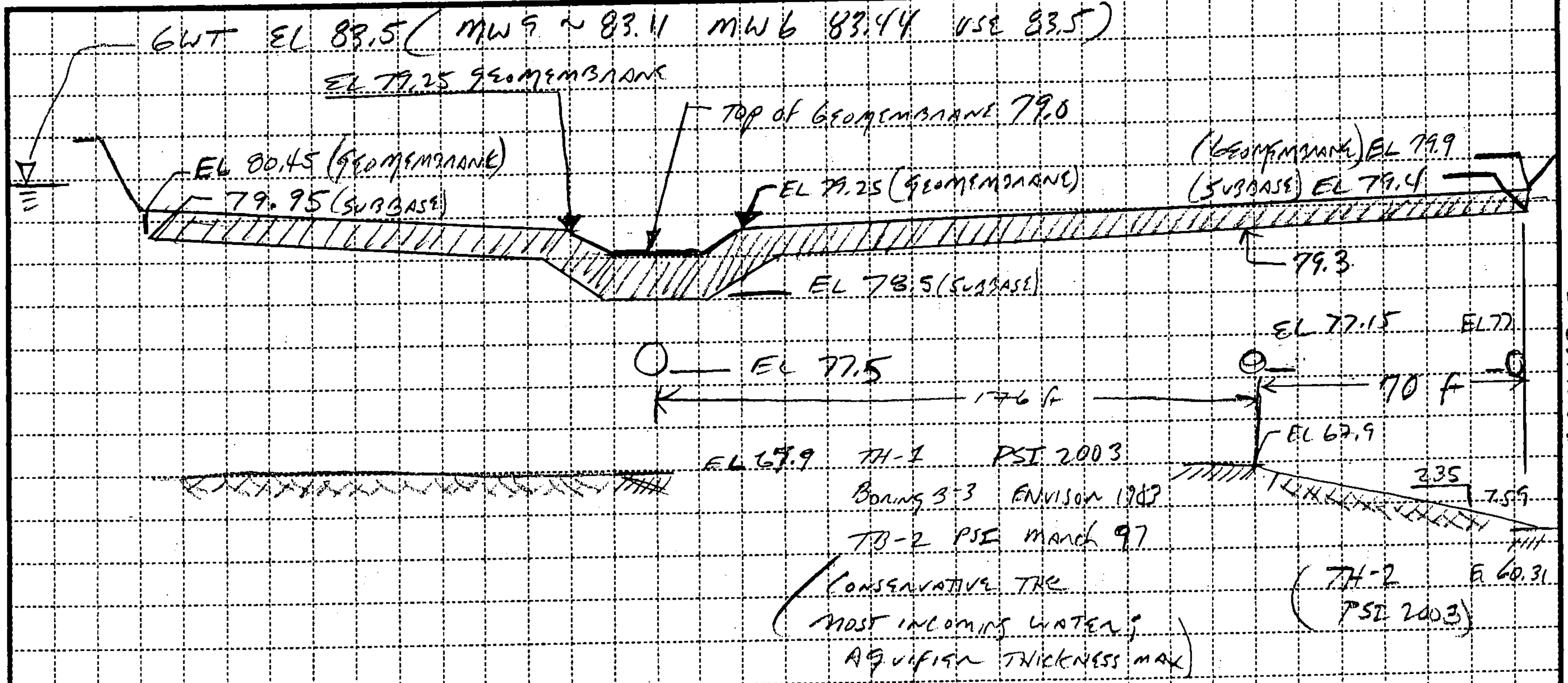
$$S = 43.8\ ft$$ Retry

Guess W = 43 ft

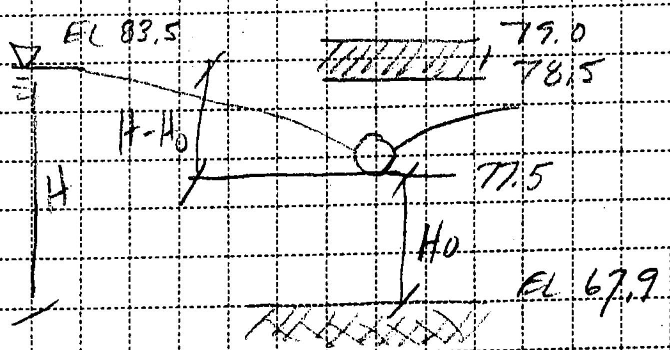
Results ⇒ S = 43 ft m = 1.185 ft

SCS ENGINEERS

CLIENT Hardee County
PROJECT Hardee County Landfill
JOB NO. 09199023.09
SUBJECT Groundwater Intercept Sunnyside
BY JHD
DATE
CHECKED
DATE 4/1/09
SHEET ___ OF ___



AT THE SUMP (LOW POINT OF CELL)



$H = 83.5 - 67.9 = 15.6\ ft$

$H_0 = 77.5 - 67.9 = 9.6\ ft$

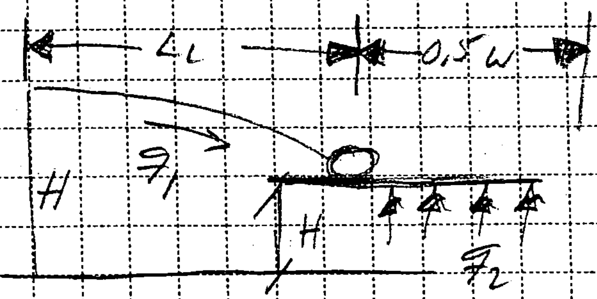
$H - H_0 = 15.6 - 9.6 \Rightarrow 6.0\ ft$

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County LF Expansion	JOB NO. 09199133.09
SUBJECT Groundwater Intercept	BY HAO	DATE
Southside	CHECKED	DATE 9/1/09

USE FIGURE 15-1



$H = 15.6$ ft

$H_0 = 9.6$ ft

$H - H_0 = 6.0$ ft

$L_1 = 3.8\,(H - H_0)$

$= 3.8\,(6.0)$

$= 22.8$ ft

INITIAL GUESS 40 ft

$\dfrac{L_L + 0.5(W)}{H_0} \Rightarrow \dfrac{22.8 + 0.5(40)}{9.6} = 4.46$

$W/H_0 \Rightarrow 40 / 9.6 = 4.17$

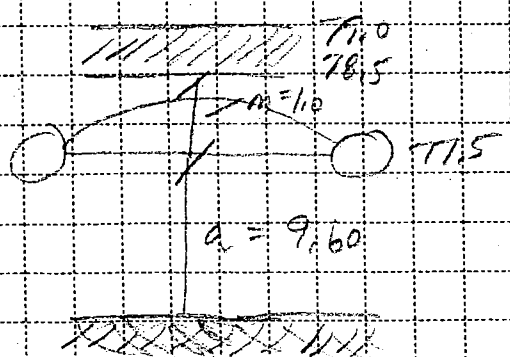
FROM FIGURE 15-1

$\# = 1.4$

$q_2 = 4.24$ ft³/day / width

$q_1 = 1.56$ ft³/day / width

$q_{TOTAL} = 5.76$ ft³/day / width of pipe



$S = 40$

$m = 1.43$ ft

TOO high WATER IN SURFACE

TRY 30 ft

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County Landfill Expansion	JOB NO. 09199033.09
SUBJECT Groundwater Intercept	BY JHD	DATE
Southside	CHECKED	DATE 7/1/09

Try $w = 30\,ft$

$\frac{L_1 + 0.5w}{H_0} \Rightarrow 3.938$

$w/H_0 \Rightarrow 3.125$

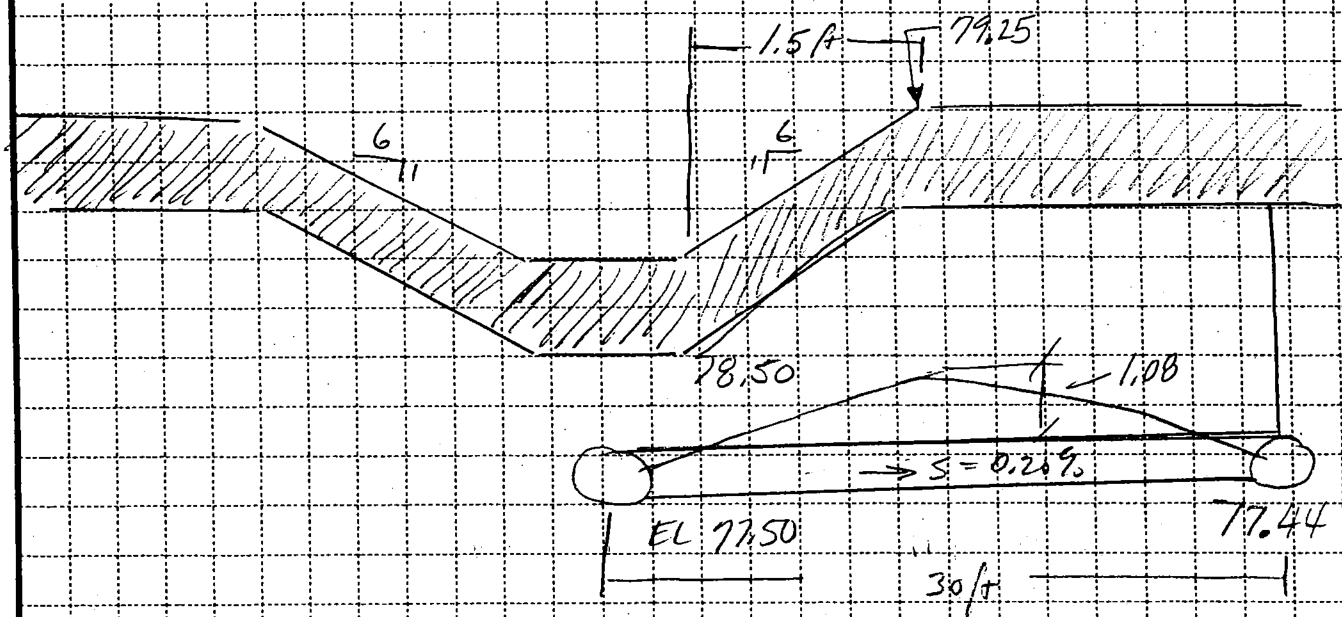
$q_2 = 4.55\ ft^3/day/\text{width of pipe}$
$q_1 = \underline{1.66}\ ft^3/day/\text{width of pipe}$

$q_{TOTAL} = 6.21\ ft^3/day/\text{width of pipe}$

USE USDA PIPE SPACING EQUATION

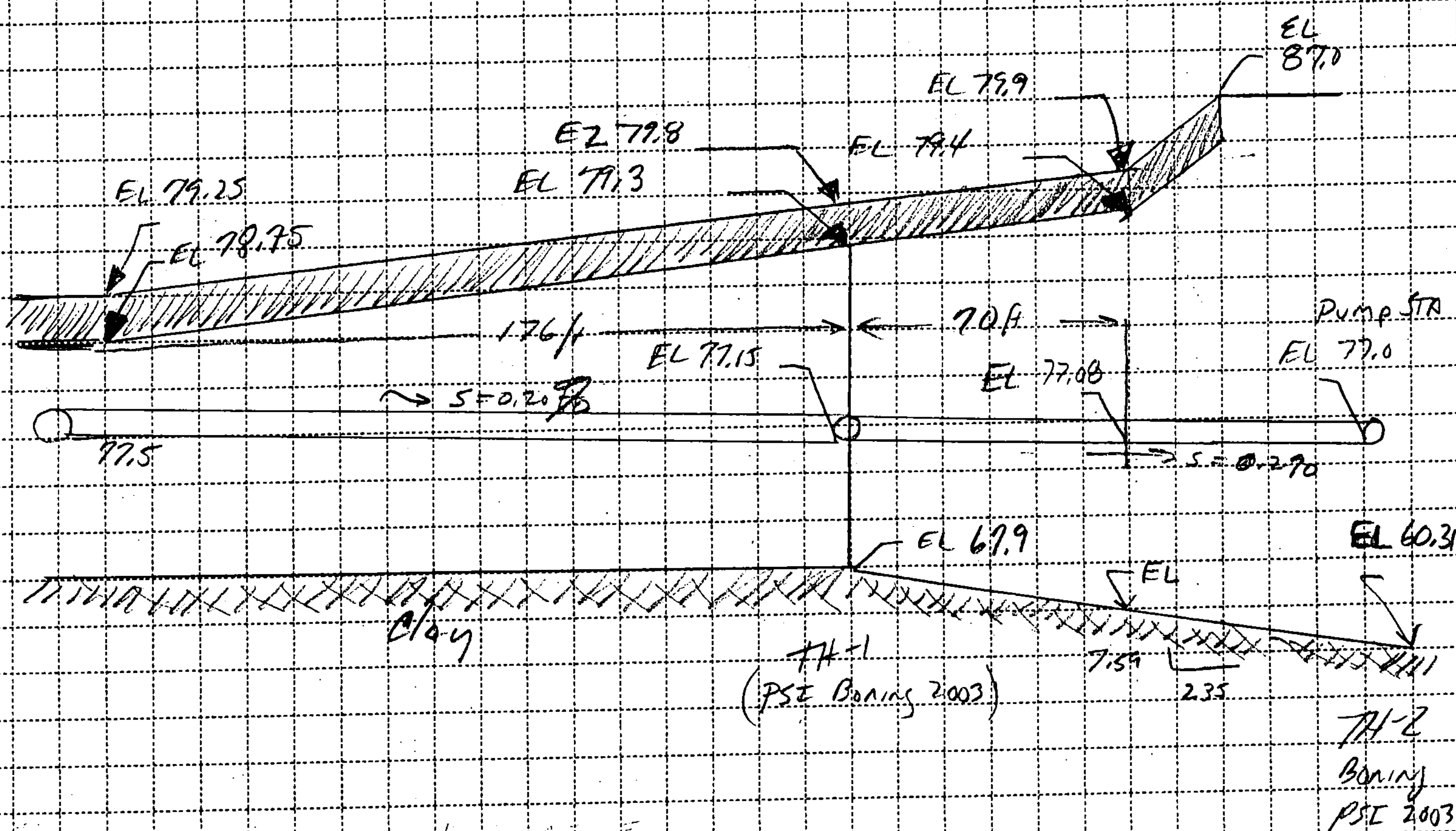
Elev of subbase	78.5	$S = 30$
+	1.08	$m = 1.08\,ft$
Elev of pipe	77.42	

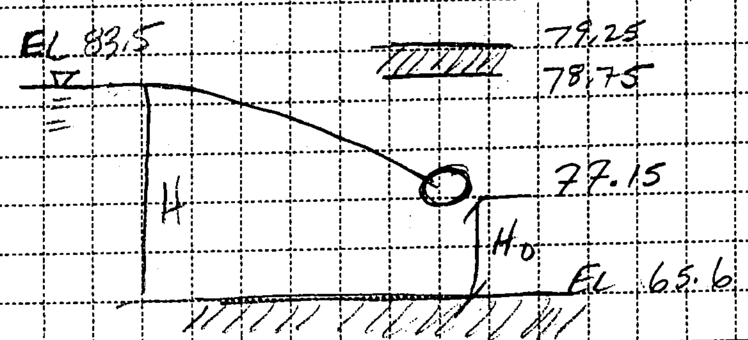
OK



SCS ENGINEERS

CLIENT: Hardee Co
PROJECT: Hardee County LF Expansion
SUBJECT: Groundwater Interceptor South Side
BY: JDD
CHECKED: JHS
JOB NO. 09199033.07
DATE: 9/1/04
SHEET ___ OF ___





$$H = 83.5 - 67.9 = 15.6$$

$$H_o = 77.15 - 67.9 = 9.25$$

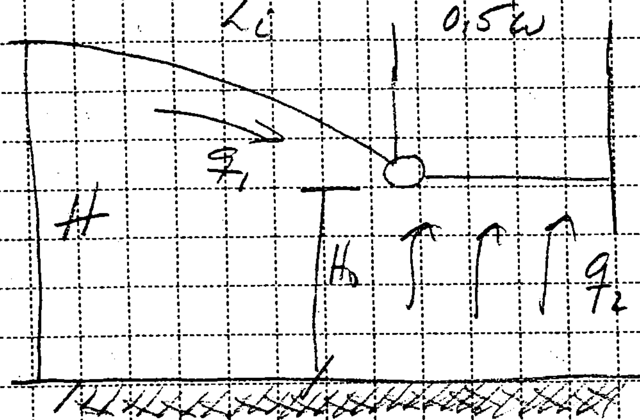
$$H - H_o = 83.5 - 77.15 = 6.35$$

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County LF Expansion		JOB NO. 09199033.09
SUBJECT Groundwater Intercept		BY JHU	DATE
Southside		CHECKED [illegible]	DATE 9/1/04

Use Figure 15-1



$H = 15.6$ ft

$H_0 = 9.25$ ft

$H - H_0 = 6.35$ ft

$L_i = 3.8(H - H_0)$

$= 3.8(6.35)$

$= 24.13$ ft

Initial guess 35 ft

$(L_i + 0.5w)/H_0 \Rightarrow 4.5$

$w/H_0 \Rightarrow 3.79$

Figure 15-1

$\# = 1.53$

$q_2 \rightarrow 4.46$ ft³/day/width

$q_1 \Rightarrow \underline{1.75}$ ft³/day/width

6.21 ft³/day

Using USDA equation
solve for pipe spacing

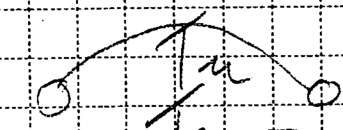
Subbase 79.5

$\underline{-1.29}$

Pipe 78.21

Pipe @ 77.2

OK



$a = 9.25$ ft

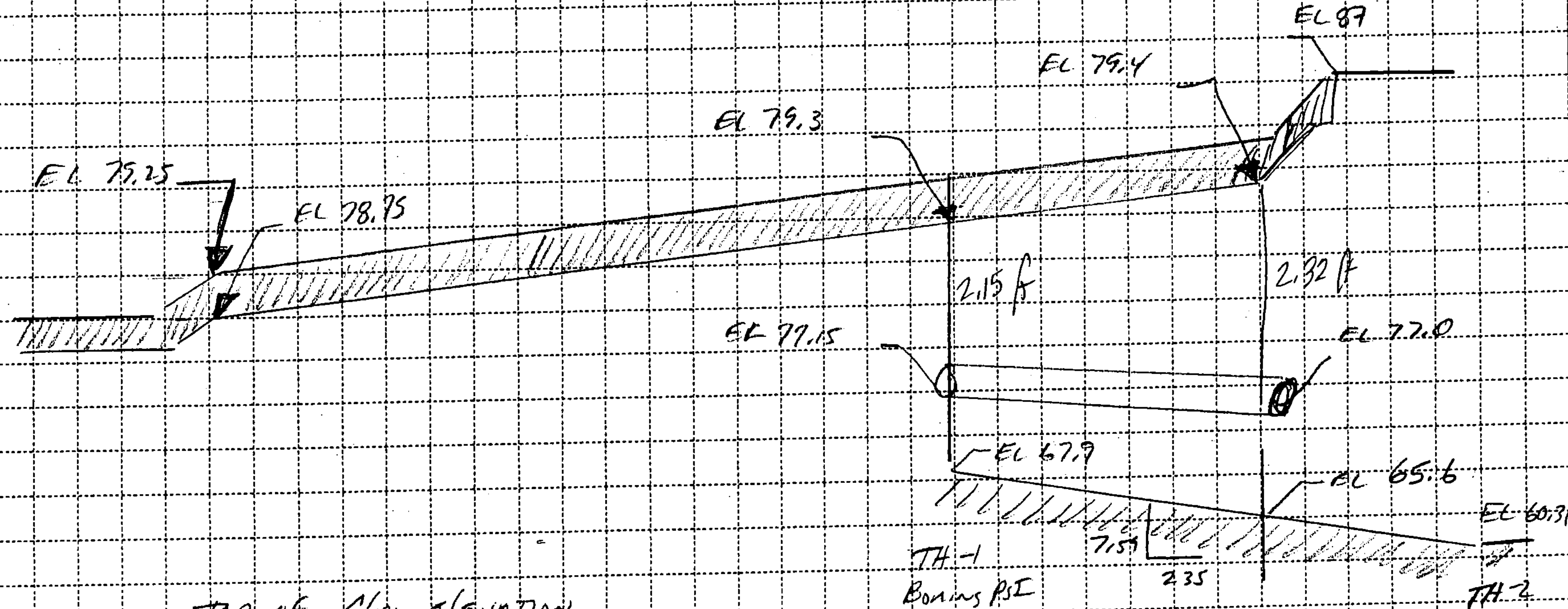
$S = 35$ ft

$a = 9.25$

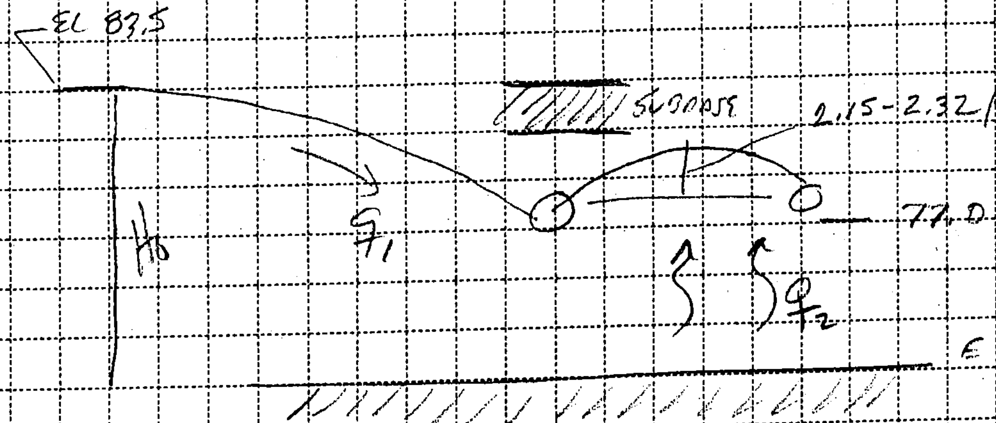
$m = 1.29$ ft

SCS ENGINEERS

CLIENT: Hardee Co
SUBJECT: Groundwater Intercept, Southside
PROJECT: Hardee County Landfill Expansion
JOB NO: 0194033.05
BY: JHO
DATE: 4/1/04
CHECKED:
SHEET ___ OF ___



TOP OF CLAY ELEVATION
~67.9 − 70(7.59/235) = 65.6



$H = 83.5 - 65.6 = 17.9$
$H_0 = 77 - 65.6 = 11.4$
$H - H_0 = 6.5$

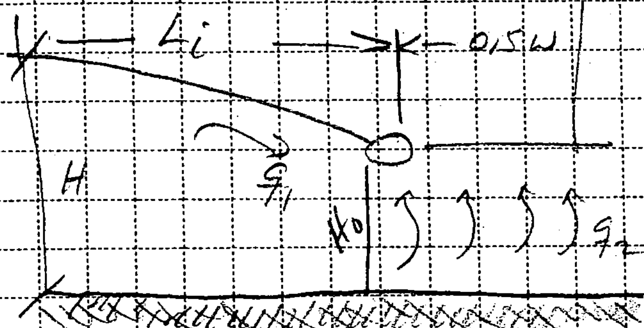
EL 65.6 MAX AQUIFER THICKNESS
MAX q INTO PIPES

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill Expansion		JOB NO. 09199033.04
SUBJECT Groundwater Intercept		BY JHO	DATE
Southside		CHECKED [illegible]	DATE 4/1/04

USE FIGURE 15-H



$H = 17.9$ ft

$H_o = 11.4$ ft

$H - H_o = 6.50$ ft

$L_i = 3.8(H - H_o)$

$= 3.8(6.50)$

$= 24.7$ ft

INITIAL GUESS 40 ft

$\frac{L_i + 0.5(W)}{H_o} \Rightarrow 3.92$

$W/H_o \Rightarrow 3.5$

FIGURE 15-1

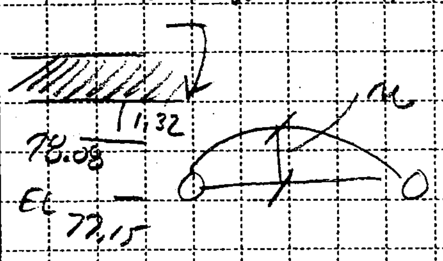
$\cancel{A} = 1.4$

$q_2 = 4.88$ ft³/day

$q_1 = \underline{1.79}$

$q_{TOTAL} = 6.67$ ft³/day/width pipe

SUBBASE EL 75.4



USING USDA EQUATION

$S = 40$ ft

$a = 1.32$ ft

OK

Groundwater Interception Pipes
Hardee County Landfill Expansion

	Westside of Expansion			Southside of Expansion			Southside of Expansion			Southside of Expansion	
High GWT	83.5		High GWT	83.5		High GWT	83.5		High GWT	83.5	
Pipe Invert	79.88		Pipe Invert	77.5		Pipe Invert	77.15		Pipe Invert	77	
Top of Clay	68.77		Top of Clay	67.9		Top of Clay	67.9		Top of Clay	65.6	
H =	14.73		H =	15.6		H =	15.6		H =	17.9	
Ho =	11.11		Ho =	9.6		Ho =	9.25		Ho =	11.4	
H-Ho =	3.62		H-Ho =	6		H-Ho =	6.35		H-Ho =	6.5	
Li =	13.756	ft	Li =	22.8	ft	Li =	24.13	ft	Li =	24.7	ft
Guess w =	43		Guess w =	30		Guess w =	35		Guess w =	40	
Li+0.5(w)/Ho	3.173357		Li+0.5(w)/Ho	3.9375		Li+0.5(w)/Ho	4.500541		Li+0.5(w)/Ho	3.921053	
w/ho	3.870387		w/ho	3.125		w/ho	3.783784		w/ho	3.508772	
# fig 15-1	0.86		# fig 15-1	1.4		# fig 15-1	1.53		# fig 15-1	1.4	
k =	2.1	ft/day	k =	2.1	ft/day	k =	2.1	ft/day	k =	2.1	ft/day
q2 =	4.419767	ft^3/day/width	q2 =	4.5	ft^3/day/width	q2 =	4.357843	ft^3/day/width	q2 =	4.875	ft^3/day/width
q1 =	1.000263	ft^3/day/width	q1 =	1.657895	ft^3/day/width	q1 =	1.754605	ft^3/day/width	q1 =	1.796053	ft^3/day/width
q total	5.420031	ft^3/day/width	q total	6.157895	ft^3/day/width	q total	6.112448	ft^3/day/width	q total	6.671053	ft^3/day/width
q =	0.126047	ft/day	q =	0.205263	ft/day	q =	0.174641	ft/day	q =	0.166776	ft/day
k =	2.1	ft/day	k =	2.1	ft/day	k =	2.1	ft/day	k =	2.1	ft/day
q =	0.126047	ft/day	q =	0.205263	ft/day	q =	0.174641	ft/day	q =	0.166776	ft/day
m =	1.185	ft	m =	1.0845	ft	m =	1.29	ft	m =	1.32	ft
a =	11.11	ft	a =	9.6	ft	a =	9.25	ft	a =	11.4	ft
s =	42.99189	ft	s =	30.00413	ft	s =	35.04159	ft	s =	40.04498	ft

Groundwater Interception Pipes

Hardee County Landfill Expansion

Pipes 10-12

Westside of Expansion

High GWT	83.5	
Pipe Invert	79.88	
Top of Clay	68.77	
H =	14.73	
Ho =	11.11	
H-Ho =	3.62	
Li =	13.756	ft
Guess w =	43	
Li+0.5(w)/Ho	3.173357	
w/ho	3.870387	
# fig 15-1	0.9	
k =	2.1	ft/day
q2 =	4.419767	ft^3/day/width
q1 =	1.000263	ft^3/day/width
q total	5.420031	ft^3/day/width
q =	0.126047	ft/day
k =	2.1	ft/day
q =	0.126047	ft/day
m =	1.185	ft
a =	11.11	ft
Computed		
s =	43	ft

Pipes 7-9

Southside of Expansion

High GWT	83.5	
Pipe Invert	77.5	
Top of Clay	67.9	
H =	15.6	
Ho =	9.6	
H-Ho =	6	
Li =	22.8	ft
Guess w =	30	
Li+0.5(w)/Ho	3.9375	
w/ho	3.125	
# fig 15-1	1.4	
k =	2.1	ft/day
q2 =	4.666667	ft^3/day/width
q1 =	1.657895	ft^3/day/width
q total	6.324561	ft^3/day/width
q =	0.210819	ft/day
k =	2.1	ft/day
q =	0.210819	ft/day
m =	1.0845	ft
a =	9.6	ft
Computed		
s =	30	ft

Pipes 4-6

Southside of Expansion

High GWT	83.5	
Pipe Invert	77.15	
Top of Clay	67.9	
H =	15.6	
Ho =	9.25	
H-Ho =	6.35	
Li =	24.13	ft
Guess w =	35	
Li+0.5(w)/Ho	4.500541	
w/ho	3.783784	
# fig 15-1	1.5	
k =	2.1	ft/day
q2 =	4.551195	ft^3/day/width
q1 =	1.754605	ft^3/day/width
q total	6.3058	ft^3/day/width
q =	0.180166	ft/day
k =	2.1	ft/day
q =	0.180166	ft/day
m =	1.29	ft
a =	9.25	ft
Computed		
s =	35	ft

Pipes 1-3

Southside of Expansion

High GWT	83.5	
Pipe Invert	77	
Top of Clay	65.6	
H =	17.9	
Ho =	11.4	
H-Ho =	6.5	
Li =	24.7	ft
Guess w =	40	
Li+0.5(w)/Ho	3.921053	
w/ho	3.508772	
# fig 15-1	1.4	
k =	2.1	ft/day
q2 =	4.875	ft^3/day/width
q1 =	1.796053	ft^3/day/width
q total	6.671053	ft^3/day/width
q =	0.166776	ft/day
k =	2.1	ft/day
q =	0.166776	ft/day
m =	1.32	ft
a =	11.4	ft
Computed		
s =	40	ft

GROUNDWATER CONTROL SYSTEM

PIPE CRUSHING CONSTRUCTION

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	0	123.9	0.0
Intermediate Cover	0	123.9	0.0
Waste	0	60.0	0.0
Drainage Sand	0	123.9	0.0
Rock	1	140.0	140.0

TOTAL SOIL PRISM LOAD: 140.0 lb/ft^2

Total Depth = 1 ft

Soil Arching, $P_m = C_D w B$

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \dfrac{1 - e^{-2Ku'H/B}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = $\tan \phi$

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.00	0
Intermediate Cover	0.165	0.00	0
Waste	0.191	0.00	0
Drainage Sand	0.165	0.00	0
Rock	0.190	0.00	0

TOTAL SOIL ARCHING LOAD: 0.0 lb/ft^2

LARGEST OVERBURDEN LOAD: 140.0 lb/ft^2

Load on Pipe (Equipment D6R IIXW)

Equipment Weight = 44,000 lbs

Number of Tracks = 2 tracks

Track Load = 42,300 lb * 0.5 = 22,000 lbs per track

Ground Contact Area = 23.0 ft^2

Length of Track = L = 110 in

Track Width = b = 30 in

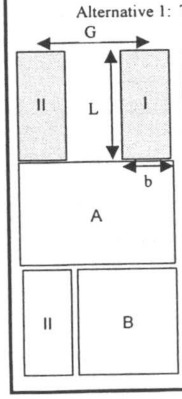
Track Gauge = G = 80 in

Live Load = $q*I_c$

q = track load 957 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	2.50	9.2	1	2.50	9.20	-0.006	0.244	0.244
A	9.17	9.2	1	9.17	9.20	0.000	0.250	0.250
B	6.67	9.2	1	6.67	9.20	0.000	0.250	0.250

Live Load$_1$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 233.85 lb/ft^2

$q_I(I_I)$ = 233.66

$q_A(I_A)$ = 238.90

$q_B(I_B)$ = 238.71

Load on Pipe (Equipment) = 233.85 lb/ft^2

SCS ENGINEERS

SHEET 2 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe	LEK	1/27/2004
	CHECKED	DATE
	JHo	

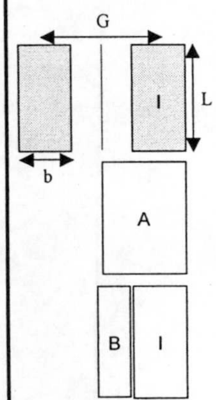
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 957 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



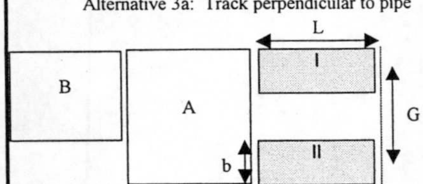
	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * (q_AI_A - q_BI_B) = 47.50 lb/ft^2

$q_A(I_A)$ =	229.98
$q_B(I_B)$ =	206.23

Load on Pipe (Equipment) = 47.50 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 189.06 lb/ft^4

$q_I(I_I)$ =	188.59
$q_A(I_A)$ =	237.15
$q_B(I_B)$ =	236.68

Load on Pipe (Equipment) = 189.06 lb/ft^2

LARGEST EQUIPEMENT LOAD = 189.06 lb/ft^2

VERTICAL OVERBURDEN LOAD = 140 lb/ft^2

VERTICAL EQUIPMENT LOAD = 189.06 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 373.85 lb/ft^2 = 2.60 lb/in^2

SCS ENGINEERS			
		SHEET 3	of 8
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe	BY LEK	DATE 2/17/2004	
	CHECKED	DATE	

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. of acres = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 700 gal/min

1.5597 cfs
0.1560 cfs/acre
9.3583 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s

2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 1.560 cfs
   = 93.58 cfm

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 9.3583 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe	LEK	2/17/2004
	CHECKED	DATE

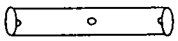
Effective pressure on pipe due to perforations:

$P_{EFF} = \dfrac{P_T \times 12}{(12-L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

L_P = 0.375" x 4 = 1.5 inch



P_T = 2.60 psi

P_{EFF} = 3.0 psi

P_{EFF} = 427 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 24 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
24	<	800

Pipe passes wall compressive stress perforation calculations TRUE

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SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE
		JHD	

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$$P_{WC} = \frac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)		
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)		
H' = groundwater height above pipe (ft)	1	ft
H = cover above pipe (ft)	1	ft
B' = elastic support factor $=(1+4*e^{-0.065H})^{-1}$		
E' = soil reaction modulus (lb/in^2)	3000	lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2)	23,000	lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = $t^3/12$	0.011	in^4
D_o = pipe outer diameter (in)	8.625	inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
t = pipe wall thickness (in)	0.507	inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t	17	SDR 171 pipe to be used
D_I = pipe inner diameter = D_o-2t (in)	7.55	inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
N = safety factor	2	recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	1	1	0.21	0.67	4.14

P_{WC} = 4.14 lb/in^2

P_{EFF} = 2.97 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

SCS ENGINEERS

SHEET 6 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE
		JHS	

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 427 lb/ft^2

D_o = pipe outside diameter (in) 8.625 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)

t = pipe wall thickness (in) 0.507 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 25.2 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
25	<	800

Pipe passes wall compressive stress calculations TRUE

SCS ENGINEERS

SHEET 7 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations		LEK	2/17/2004
Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 8" Diameter Groundwater Intercept Pipe		CHECKED JHo	DATE

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor
K = bedding constant   0.1 typical value
W_c = Marston's load per unit length of pipe (lb/in)
r = mean radius of the pipe (in)
E = modulus of elasticity (lb/in^2)
I = moment of inertia of the pipe wall per unit length (in^3)
e = modulus of passive resistance fo the side fill (lb/in^2(in))

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E' r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)
D_L = deflection lag factor   1.5 Marston Load
Typical Value for Marston Load   1.5
Typical Value for Prism Load   1.0
K = bedding constant   0.1 typical value
P_T = Vertical load on pipe w/ perfs   2.97 lb/in^2 427 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in)   25.59 lb/in
D_o = pipe outer diameter (in)   8.625   FALSE
t = pipe wall thickness (in)   0.507 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in)   7.55 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t   8.09 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
r_m = mean radius of the pipe (in)   4.04 inches for a 8 inch diameter SDR 17 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2)   23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length   0.011 in^4
E' = modulus of soil reaction (See Source No. 1)   3000 lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E' r_m^3} =$ 0.020887 inch

% Ring Deflection = $(\Delta X/D_m) \times 100 =$ 0.258 %   Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)
f_D = deformation shape factor   6 non-elliptical shape
D_M = mean diameter (in)
C = outer fiber wall centroid = 0.5 (1.06t)   0.269 Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$ 0.003

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M} =$ 0.103 %   Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

SCS ENGINEERS SHEET 8 of 8			
CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT.D6R IIXW 8" Diameter Groundwater Intercept Pipe		BY LEK	DATE 2/17/2004
		CHECKED [signature]	DATE

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

SCS ENGINEERS

SHEET 1 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW	CHECKED	DATE
12" Diameter Groundwater Intercept Pipe	JHD	

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	0	123.9	0.0
Intermediate Cover	0	123.9	0.0
Waste	0	60.0	0.0
Drainage Sand	0	123.9	0.0
Rock	1	140.0	140.0

TOTAL SOIL PRISM LOAD: 140.0 lb/ft^2

Total Depth = 1 ft

Soil Arching, $P_m = C_D wB$

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \frac{1 - e^{-2Ku'HB}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = tan ϕ

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.00	0
Intermediate Cover	0.165	0.00	0
Waste	0.191	0.00	0
Drainage Sand	0.165	0.00	0
Rock	0.190	0.00	0

TOTAL SOIL ARCHING LOAD: 0.0 lb/ft^2

LARGEST OVERBURDEN LOAD: 140.0 lb/ft^2

Load on Pipe (Equipment D6R IIXW)

Equipment Weight = 44,000 lbs

Number of Tracks = 2 tracks

Track Load = 42,300 lb * 0.5 = 22,000 lbs per track

Ground Contact Area/track = 23.0 ft^2

Length of Track = L = 110 in

Track Width = b = 30 in

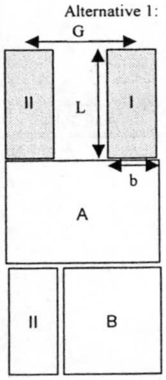
Track Gauge = G = 80 in

Live Load = $q*I_c$

q = track load 957 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	2.50	9.2	1	2.50	9.20	-0.006	0.244	0.244
A	9.17	9.2	1	9.17	9.20	0.000	0.250	0.250
B	6.67	9.2	1	6.67	9.20	0.000	0.250	0.250

Live Load$_1$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 233.85 lb/ft^2

$q_I(I_I)$ = 233.66

$q_A(I_A)$ = 238.90

$q_B(I_B)$ = 238.71

Load on Pipe (Equipment) = 233.85 lb/ft^2

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SCS ENGINEERS

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	1/27/2004
Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW	CHECKED	DATE
12" Diameter Groundwater Intercept Pipe		

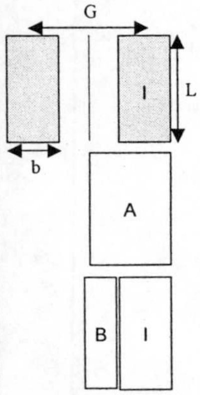
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 957 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



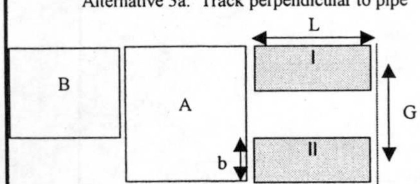
	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * ($q_A I_A$ - $q_B I_B$) = 47.50 lb/ft^2

$q_A(I_A)$ =	229.98
$q_B(I_B)$ =	206.23

Load on Pipe (Equipment) = 47.50 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 189.06 lb/ft^4

$q_I(I_I)$ =	188.59
$q_A(I_A)$ =	237.15
$q_B(I_B)$ =	236.68

Load on Pipe (Equipment) = 189.06 lb/ft^2

LARGEST EQUIPEMENT LOAD = 189.06 lb/ft^2

VERTICAL OVERBURDEN LOAD = 140 lb/ft^2

VERTICAL EQUIPMENT LOAD = 189.06 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 373.85 lb/ft^2 = 2.60 lb/in^2

SCS ENGINEERS			
		SHEET 3	of 8
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	BY LEK	DATE 2/17/2004	
	CHECKED JWD	DATE	

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. of acres = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 700 gal/min

1.5597 cfs
0.1560 cfs/acre
9.3583 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s

2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
= 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 1.560 cfs
= 93.58 cfm

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
= 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 9.3583 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	LEK	2/17/2004
	CHECKED	DATE

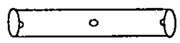
Effective pressure on pipe due to perforations:

$P_{EFF} = \dfrac{P_T \times 12}{(12 - L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

L_P = 0.375" x 4 = 1.5 inch



P_T = 2.60 psi

P_{EFF} = 3.0 psi

P_{EFF} = 427 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 24 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
24	<	800

Pipe passes wall compressive stress perforation calculations TRUE

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SCS ENGINEERS

SHEET 5 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	CHECKED	DATE

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$$P_{WC} = \frac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)
H' = groundwater height above pipe (ft) 1 ft
H = cover above pipe (ft) 1 ft
B' = elastic support factor =$(1+ 4*e^{-0.065H})^{-1}$
E' = soil reaction modulus (lb/in^2) 3000 lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2) 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = $t^3/12$ 0.035 in^4
D_o = pipe outer diameter (in) 12.750 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)
t = pipe wall thickness (in) 0.750 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t 17 SDR 17 pipe to be used
D_I = pipe inner diameter = D_o-2t (in) 7.55 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)
N = safety factor 2 recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	1	1	0.21	0.67	7.45

P_{WC} = 7.45 lb/in^2
P_{EFF} = 2.97 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

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SCS ENGINEERS

SHEET 6 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	LEK	2/17/2004
	CHECKED	DATE
	JHD	

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 427 lb/ft^2

D_o = pipe outside diameter (in) 12.75 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

t = pipe wall thickness (in) 0.75 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 25.2 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
25	<	800

Pipe passes wall compressive stress calculations TRUE

f:\project\Hardee\09199033.09\calcs\pipecalcs\GWconstructionD6RIIXW.xls

SCS ENGINEERS

SHEET 7 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	CHECKED [signature]	DATE

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)

D_L = deflection lag factor

K = bedding constant 0.1 typical value

W_c = Marston's load per unit length of pipe (lb/in)

r = mean radius of the pipe (in)

E = modulus of elasticity (lb/in^2)

I = moment of inertia of the pipe wall per unit length (in^3)

e = modulus of passive resistance fo the side fill ($lb/in^2(in)$)

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)

D_L = deflection lag factor 1.5 Marston Load

Typical Value for Marston Load 1.5

Typical Value for Prism Load 1.0

K = bedding constant 0.1 typical value

P_T = Vertical load on pipe w/ perfs 2.97 lb/in^2 427 lb/ft^2

W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in) 37.83 lb/in

D_o = pipe outer diameter (in) 12.750 FALSE

t = pipe wall thickness (in) 0.750 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

D_I = pipe inner diameter = D_o-2t (in) 7.55 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

D_m = pipe mean diameter = D_o - 1.06t 11.96 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

r_m = mean radius of the pipe (in) 5.98 inches for a 12 inch diameter SDR 17 pipe (Driscopipe)

E = modulus of elasticity (lb/in^2) 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1

I = moment of inertia of the pipe wall per unit length 0.035 in^4

E' = modulus of soil reaction (See Source No. 1) 3000 lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ = 0.030876 inch

% Ring Deflection = $(\Delta X/D_m) \times 100$ = 0.258 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)

f_D = deformation shape factor 6 non-elliptical shape

D_M = mean diameter (in)

C = outer fiber wall centroid = 0.5 (1.06t) 0.398 Eq'n 7-41 See Source No. 1

ΔX = ring deflection = $\Delta X/D_m$ 0.003

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M}$ = 0.103 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

SCS ENGINEERS			
		SHEET 8 of 8	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 1.0 ft for Construction w/ CAT D6R IIXW 12" Diameter Groundwater Intercept Pipe	BY LEK	DATE 2/17/2004	
	CHECKED JH	DATE	

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

GROUNDWATER CONTROL SYSTEM

PIPE CRUSHING
DURING FINAL BUILDOUT

SCS ENGINEERS

SHEET 1 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe	CHECKED JHa	DATE

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	2	123.9	247.7
Intermediate Cover	1.5	123.9	185.8
Waste	69.5	60.0	4170.0
Drainage Sand	2	123.9	247.7
Rock	1	140.0	140.0

TOTAL SOIL PRISM LOAD: 4991.3 lb/ft^2

Total Depth = 76 ft

Soil Arching, $P_m = C_D wB$

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \dfrac{1 - e^{-2Ku'HB}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = tan ϕ

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
Saturated Top Soil	0.150
Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.32	196
Intermediate Cover	0.165	0.24	149
Waste	0.191	2.58	775
Drainage Sand	0.165	0.32	196
Rock	0.190	0.31	219

TOTAL SOIL ARCHING LOAD: 1,534.4 lb/ft^2

LARGEST OVERBURDEN LOAD: 4,991.3 lb/ft^2

Load on Pipe (Equipment D6R IIXW)

Equipment Weight = 54,582 lbs

Number of Tracks = 2 tracks

Track Load = 42,300 lb * 0.5 = 27,913 lbs per track

Ground Contact Area = 17.2 ft^2

Length of Track = L = 113 in

Track Width = b = 22 in

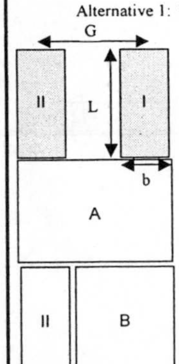
Track Gauge = G = 78 in

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I*	I**	I
						Eq'n 7.4 See Source No. 2	Eq'n 7.5 See Source No. 2	
I	1.83	9.4	76	0.02	0.12	0.001	0.250	0.001
A	8.33	9.4	76	0.11	0.12	0.006	0.252	0.006
B	6.50	9.4	76	0.09	0.12	0.005	0.252	0.005

Live $Load_I = I + II = q_I(I_I) + q_A(I_A) - q_B(I_B) =$ 4.50 lb/ft^2

$q_I(I_I) =$ 2.28

$q_A(I_A) =$ 10.25

$q_B(I_B) =$ 8.03

Load on Pipe (Equipment) = 4.50 lb/ft^2

SCS ENGINEERS

SHEET 2 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe	CHECKED JHo	DATE

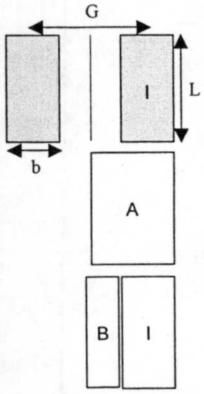
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



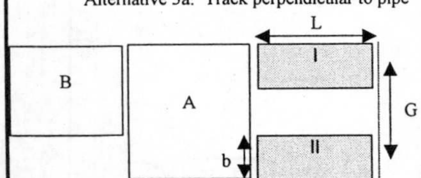
	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * ($q_A I_A$ - $q_B I_B$) = 80.44 lb/ft^2

$q_A(I_A)$ =	389.43
$q_B(I_B)$ =	349.21

Load on Pipe (Equipment) = 80.44 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	Eq'n 7.4 See Source No. 2 I*	Eq'n 7.5 See Source No. 2 I**	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 320.14 lb/ft^2

$q_I(I_I)$ =	319.33
$q_A(I_A)$ =	401.57
$q_B(I_B)$ =	400.77

Load on Pipe (Equipment) = 320.14 lb/ft^2

LARGEST EQUIPEMENT LOAD = 320.14 lb/ft^2

VERTICAL OVERBURDEN LOAD = 4991.285 lb/ft^2

VERTICAL EQUIPMENT LOAD = 320.14 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 5311.42 lb/ft^2 = 36.88 lb/in^2

SCS ENGINEERS

CLIENT	PROJECT		JOB NO.	
Hardee County	Landfill Expansion		09199033.09	
SUBJECT		BY	DATE	
Pipe Crushing Calculations		LEK	2/17/2004	
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe		CHECKED VJB	DATE	

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. of acres = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 700 gal/min

1.5597 cfs
0.1560 cfs/acre
9.3583 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s

2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
   = 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 1.560 cfs
   = 93.58 cfm

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
   = 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 9.3583 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED JH	DATE

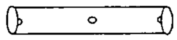
Effective pressure on pipe due to perforations:

$P_{EFF} = \frac{P_T \times 12}{(12-L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

$L_P = 0.375" \times 4$ = 1.5 inch



P_T = 36.88 psi

P_{EFF} = 42.2 psi

P_{EFF} = 6,070 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

$S_A = 0.5 \times (SDR - 1) \times P(eff)$ = 211 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
211	<	800

Pipe passes wall compressive stress perforation calculations TRUE

SCS ENGINEERS

SHEET 5 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe	CHECKED JH	DATE

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)

R = buoyancy reduction factor = 1 - 0.33 * (H'/H)

H' = groundwater height above pipe (ft) 1 ft

H = cover above pipe (ft) 76 ft

B' = elastic support factor $=(1+ 4*e^{-0.065H})^{-1}$

E' = soil reaction modulus (lb/in^2) 3000 lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1

E = elastic modulus (lb/in^2) 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1

I = moment of inertia = $t^3/12$ 0.040 in^4

D_o = pipe outer diameter (in) 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

t = pipe wall thickness (in) 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

DR = pipe dimension ratio = D_o/t 11 SDR 11 pipe to be used

D_i = pipe inner diameter = D_o-2t (in) 7.057 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

N = safety factor 2 recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	76	1	0.97	1.00	42.23

P_{WC} = 42.23 lb/in^2

P_{EFF} = 42.15 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

SCS ENGINEERS			
		SHEET 6 of 8	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe	BY LEK	DATE 2/17/2004	
	CHECKED	DATE	

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$S = \frac{P_T D_o}{228t}$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 6070 lb/ft^2

D_o = pipe outside diameter (in) 8.625 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

t = pipe wall thickness (in) 0.784 inches for a 8 inch diameter SDR 11 pipe (Driscopipe)

$S = \frac{P_T D_o}{228t} =$ 231.9 lb/in^2

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
232	<	800

Pipe passes wall compressive stress calculations TRUE

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SCS ENGINEERS

SHEET 7 of 8

CLIENT	PROJECT		JOB NO.	
Hardee County	Landfill Expansion		09199033.09	
SUBJECT		BY	DATE	
Pipe Crushing Calculations		LEK	2/17/2004	
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe		CHECKED JHO	DATE	

Iowa Formula

$\Delta X = \dfrac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)

D_L = deflection lag factor

K = bedding constant 0.1 typical value

W_c = Marston's load per unit length of pipe (lb/in)

r = mean radius of the pipe (in)

E = modulus of elasticity (lb/in^2)

I = moment of inertia of the pipe wall per unit length (in^3)

e = modulus of passive resistance fo the side fill ($lb/in^2(in)$)

Modified Iowa Formula

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)		
D_L = deflection lag factor	1.5	Marston Load
Typical Value for Marston Load 1.5		
Typical Value for Prism Load 1.0		
K = bedding constant	0.1	typical value
P_T = Vertical load on pipe w/ perfs	42.15	lb/in^2 6070 lb/ft^2
W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in)	363.58	lb/in
D_o = pipe outer diameter (in)	8.625	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in)	0.784	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_I = pipe inner diameter = D_o-2t (in)	7.057	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
D_m = pipe mean diameter = D_o - 1.06t	7.79	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
r_m = mean radius of the pipe (in)	3.90	inches for a 8 inch diameter SDR 11 pipe (Driscopipe)
E = modulus of elasticity (lb/in^2)	23,000	lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia of the pipe wall per unit length	0.040	in^4
E' = modulus of soil reaction (See Source No. 1)	3000	lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \dfrac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3} =$ 0.278809 inch

% Ring Deflection = $(\Delta X/D_m) \times 100$ = 3.577 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)		
f_D = deformation shape factor	6	non-elliptical shape
D_M = mean diameter (in)		
C = outer fiber wall centroid = 0.5 (1.06t)	0.416	Eq'n 7-41 See Source No. 1
ΔX = ring deflection = $\Delta X/D_m$	0.036	

$\varepsilon = \dfrac{f_D \Delta X 2C}{D_M} =$ 2.289 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

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CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 8" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE
		HRO	

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

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SCS ENGINEERS

SHEET 1 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II	CHECKED	DATE
12" Diameter Groundwater Intercept Pipe	JHo	

Load on Pipe (Overburden)

Prism Loads, $P_E = wH$ Eq'n 7.1 See Source No. 1

w = unit weight

H = depth

	Depth (ft)	Unit Weight (lb/ft^3)	P_E (lb/ft^2)
Cover Soil	2	123.9	247.7
Intermediate Cover	1.5	123.9	185.8
Waste	69.5	60.0	4170.0
Drainage Sand	2	123.9	247.7
Rock	1	140.0	140.0

TOTAL SOIL PRISM LOAD: 4991.3 lb/ft^2

Total Depth = 76 ft

Soil Arching, $P_m = C_D wB$

NOTE: The waste unit weight represents the combined unit weight of waste, daily cover, and moisture.

Pm = vertical soil pressure

B = trench width at pipe crown 5 ft

C_D = load coefficient $= \frac{1 - e^{-2Ku'H/B}}{2Ku'}$ Eq'n 7.3 See Source No. 1

e = natural log base number

K = Rankine earth pressure coefficient = $\tan^2(45-0.5*\phi)$

ϕ = internal soil friction angle = 27 degrees for waste

u' = friction coefficient between backfill and trench sides = $\tan \phi$

Soil Type	Ku'
Saturated Clay	0.110
Ordinary Clay	0.130
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Sand and Gravel	0.165
Clean Granular Soil	0.192

	Ku'	C_D	P_m (lb/ft^2)
Cover Soil	0.150	0.32	196
Intermediate Cover	0.165	0.24	149
Waste	0.191	2.58	775
Drainage Sand	0.165	0.32	196
Rock	0.190	0.31	219

TOTAL SOIL ARCHING LOAD: 1,534.4 lb/ft^2

LARGEST OVERBURDEN LOAD: 4,991.3 lb/ft^2

Load on Pipe (Equipment D6R IIXW)

Equipment Weight = 54,582 lbs

Number of Tracks = 2 tracks

Track Load = 42,300 lb * 0.5 = 27,913 lbs per track

Ground Contact Area/track = 17.2 ft^2

Length of Track = L = 113 in

Track Width = b = 22 in

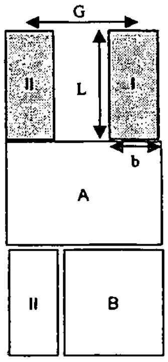
Track Gauge = G = 78 in

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 1: Track adjacent and parallel to pipe



	b (ft)	L (ft)	z (ft)	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	76	0.02	0.12	0.001	0.250	0.001
A	8.33	9.4	76	0.11	0.12	0.006	0.252	0.006
B	6.50	9.4	76	0.09	0.12	0.005	0.252	0.005

Live Load$_1$ = I + II = $q_I(I_I) + q_A(I_A) - q_B(I_B)$ = 4.50 lb/ft^2

$q_I(I_I)$ = 2.28

$q_A(I_A)$ = 10.25

$q_B(I_B)$ = 8.03

Load on Pipe (Equipment) = 4.50 lb/ft^2

SCS ENGINEERS

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE
		JHo	

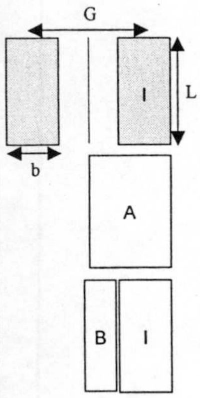
Load on Pipe (Equipment) *Continued*

Live Load = $q*I_c$

q = track load 1620 lb/ft^2

I_c = Influence coefficient

Alternative 2: Track stradling and parallel to pipe



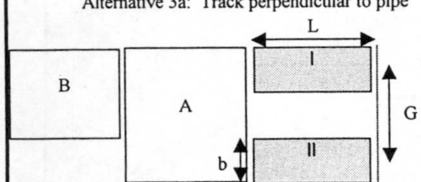
	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
A	4.17	9.4	2	2.08	4.70	-0.010	0.240	0.240
B	2.33	9.4	2	1.17	4.70	-0.034	0.216	0.216

Live Load$_2$ = 2 * (A - B) = 2 * ($q_A I_A$ - $q_B I_B$) = 80.44 lb/ft^2

$q_A(I_A)$ =	389.43
$q_B(I_B)$ =	349.21

Load on Pipe (Equipment) = 80.44 lb/ft^2

Alternative 3a: Track perpendicular to pipe



	b	L	z	m = b/z	n = L/z	I* (Eq'n 7.4 See Source No. 2)	I** (Eq'n 7.5 See Source No. 2)	I
I	1.83	9.4	2	0.92	4.70	0.197	0.217	0.197
A	8.33	9.4	2	4.17	4.70	-0.002	0.248	0.248
B	7.42	9.4	2	3.71	4.70	-0.003	0.247	0.247

Live Load$_3$ = I + II = $q_I(I_I)$ + $q_A(I_A)$ - $q_B(I_B)$ = 320.14 lb/ft^2

$q_I(I_I)$ =	319.33
$q_A(I_A)$ =	401.57
$q_B(I_B)$ =	400.77

Load on Pipe (Equipment) = 320.14 lb/ft^2

LARGEST EQUIPEMENT LOAD = 320.14 lb/ft^2

VERTICAL OVERBURDEN LOAD = 4991.285 lb/ft^2

VERTICAL EQUIPMENT LOAD = 320.14 lb/ft^2

TOTAL VERTICAL LOAD APPLIED TO PIPE, P_T = 5311.42 lb/ft^2 = 36.88 lb/in^2

SCS ENGINEERS		SHEET 3 of 8	
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe		BY LEK CHECKED [illegible]	DATE 2/17/2004 DATE

Verify that perforations in the LCRS are adequate for the peak leachate flow.

Use discharge equation:

$Q = (Cd)(Ao)(2gh)^{0.5}$

C_d = coeffiecient of discharge = 0.6 for short tube discharge with fluid/wall separation; conservative value.

A_o = Area of orifice

g = gravitational acceleration (32.3 ft^2/s)

h = static head (ft)

Assumptions and Givens:

1. No. of acres = 10 acres
2. Length of pipe per acre = 240 ft/acre
3. Perforation diameter = 0.375 inch
4. No. perforations/ft pipe = 6 perforations/ft of pipe length
5. Maximum head over pipe = 1 ft
6. Maximum leachate flow/acre = 700 gal/min

1.5597 cfs
0.1560 cfs/acre
9.3583 cfm/acre

Solution:

$A_o = 0.25(\Pi)(d)^2 =$ 0.00077 ft^2

1. Flow per orifice, $Q = (Cd)(Ao)(2gh)^{0.5}$ = 0.0037 ft^3/s

2. Flow per ft of pipe = (Q)(# perfs/ft) = 0.02 ft^3/s per ft of pipe
= 1.33 cfm/ft of pipe

3. Peak flow = (max flow per acre)(no. acres) = 1.560 cfs
= 93.58 cfm

4. Perforated flow capacity per acre = (flow/ft of pipe) x (length of pipe per acre)
= 319.1 cfm/acre

Conclusion:

Design capacity exceeds estimated generation

319.1 cfm/acre >>> 9.3583 cfm/acre

Perforations are adequate to handle the maximum leachate flow.

SCS ENGINEERS

SHEET 4 of 8

CLIENT	PROJECT	JOB NO.	
Hardee County	Landfill Expansion	09199033.09	
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED JHO	DATE

Effective pressure on pipe due to perforations:

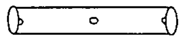
$P_{EFF} = \dfrac{P_T \times 12}{(12 - L_P)}$ (per EPA SW-870, p. 382)

L_P = Total accumulated length of perforations in one foot of pipe.

Since each perforation is 0.375" diameter and spaced at 6" on center,

L_P = 0.375" x 4 = 1.5 inch

P_T = 36.88 psi



P_{EFF} = 42.2 psi

P_{EFF} = 6,070 psf

Check actual compressive pressure (S_A) per Driscopipe manual:

S_A = 0.5 x (SDR - 1) x P(eff) = 211 psi

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S_A (psi):		Y_s (psi):
211	<	800

Pipe passes wall compressive stress perforation calculations TRUE

f:\project\Hardee\09199033.09\calcs\pipecalcs\GWoperationD7R.xls

SCS ENGINEERS

SHEET 5 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED JWB	DATE

Constrained Pipe Wall Buckling (for Driscoplex OD controlled pipe)

$P_{WC} = \dfrac{5.65 * \{RB'E' EI*[12(DR-1)^3]^{-1}\}^{0.5}}{N}$ Eq'n 7-30 See Source No. 1

P_{WC} = allowable constrained buckling pressure (lb/in^2)		
R = buoyancy reduction factor = 1 - 0.33 * (H'/H)		
H' = groundwater height above pipe (ft)	1	ft
H = cover above pipe (ft)	76	ft
B' = elastic support factor =(1+ 4*e$^{-0.065H}$)$^{-1}$		
E' = soil reaction modulus (lb/in^2)	3000	lb/in^2 for moderate compaction/crushed rock, Table 7-7/Source No. 1
E = elastic modulus (lb/in^2)	23,000	lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1
I = moment of inertia = t^3/12	0.130	in^4
D_o = pipe outer diameter (in)	12.750	inches for a 12 inch diameter SDR 11 pipe (Driscopipe)
t = pipe wall thickness (in)	1.159	inches for a 12 inch diameter SDR 11 pipe (Driscopipe)
DR = pipe dimension ratio = D_o/t	11	SDR 11 pipe to be used
D_I = pipe inner diameter = D_o-2t (in)	10.432	inches for a 12 inch diameter SDR 11 pipe (Driscopipe)
N = safety factor	2	recommended by CPChem manual

	H (ft)	H' (ft)	B'	R	P_{WC} (lb/in^2)
3 ft Cover	76	1	0.97	1.00	75.90

P_{WC} = 75.90 lb/in^2

P_{EFF} = 42.15 lb/in^2

Pipe passes contrained wall buckling calculations TRUE

SCS ENGINEERS

SHEET 6 of 8

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Pipe Crushing Calculations	LEK	2/17/2004
Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe	CHECKED JHO	DATE

Constrained Pipe Wall Compressive Stress (for Driscoplex OD controlled pipe)

$$S = \frac{P_T D_o}{228t}$$ Eq'n 7-23 See Source No. 1

S = pipe wall compressive stress (lb/in^2)

P_T = vertical load applied to pipe w/ perfs (lb/ft^2) 6070 lb/ft^2

D_o = pipe outside diameter (in) 12.75 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

t = pipe wall thickness (in) 1.159 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

$$S = \frac{P_T D_o}{228t} = 231.9 \text{ lb/in}^2$$

The recommended, long-term compressive strength (Y_s) design value for Driscoplex polyethylene pipe is 800 lb/in^2.

S (psi):		Y_s (psi):
232	<	800

Pipe passes wall compressive stress calculations TRUE

f:\project\Hardee\09199033.09\calcs\pipecalcs\GWoperationD7R.xls

SCS ENGINEERS

SHEET 7 of 8

CLIENT	PROJECT		JOB NO.
Hardee County	Landfill Expansion		09199033.09
SUBJECT		BY	DATE
Pipe Crushing Calculations Depth above pipe is 76 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe		LEK	2/17/2004
		CHECKED	DATE
		JRD	

Iowa Formula

$\Delta X = \frac{D_L K W_c r^3}{EI + 0.06er^4}$ Eq'n 3.4 See Source No. 3

ΔX = horizontal deflection (in)

D_L = deflection lag factor

K = bedding constant 0.1 typical value

W_c = Marston's load per unit length of pipe (lb/in)

r = mean radius of the pipe (in)

E = modulus of elasticity (lb/in^2)

I = moment of inertia of the pipe wall per unit length (in^3)

e = modulus of passive resistance fo the side fill ($lb/in^2(in)$)

Modified Iowa Formula

$\Delta X = \frac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3}$ Eq'n 3.5 See Source No. 3

ΔX = horizontal deflection (in)

D_L = deflection lag factor 1.5 Marston Load

Typical Value for Marston Load 1.5

Typical Value for Prism Load 1.0

K = bedding constant 0.1 typical value

P_T = Vertical load on pipe w/ perfs 42.15 lb/in^2 6070 lb/ft^2

W_c = Marston's load per unit length of pipe = $P_T * D_o$ (lb/in) 537.47 lb/in

D_o = pipe outer diameter (in) 12.750 FALSE

t = pipe wall thickness (in) 1.159 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

D_I = pipe inner diameter = D_o-2t (in) 10.432 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

D_m = pipe mean diameter = D_o - 1.06t 11.52 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

r_m = mean radius of the pipe (in) 5.76 inches for a 12 inch diameter SDR 11 pipe (Driscopipe)

E = modulus of elasticity (lb/in^2) 23,000 lb/in^2 for 50 years at 100°F, Table 5-1/Source No. 1

I = moment of inertia of the pipe wall per unit length 0.130 in^4

E' = modulus of soil reaction (See Source No. 1) 3000 lb/in^2 for moderate compaction and fine grained soils

$\Delta X = \frac{D_L K W_c r_m^3}{EI + 0.06E'r_m^3} =$ 0.412149 inch

% Ring Deflection = ($\Delta X/D_m$) x 100 = 3.577 % Eq'n 7-38 See Source No. 1

Ring Bending Strain

$\varepsilon = \frac{f_D \Delta X 2C}{D_M^2}$

ε = wall strain (%)

f_D = deformation shape factor 6 non-elliptical shape

D_M = mean diameter (in)

C = outer fiber wall centroid = 0.5 (1.06t) 0.614 Eq'n 7-41 See Source No. 1

ΔX = ring deflection = $\Delta X/D_m$ 0.036

$\varepsilon = \frac{f_D \Delta X 2C}{D_M} =$ 2.289 % Eq'n 7-37 See Source No. 1

The maximum ring bending strain for high performance polyethylene non-pressure pipe is 4.2%

Pipe passes ring bending strain calculations TRUE

SCS ENGINEERS			
		SHEET 8	of 8
CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09	
SUBJECT Pipe Crushing Calculations Depth above pipe is 7.6 ft for Operations w/ CAT D7R Series II 12" Diameter Groundwater Intercept Pipe	BY LEK	DATE 2/17/2004	
	CHECKED JHD	DATE	

Sources:

1 : CPCHEM, The Performance Pipe Engineering Manual
Book 2, Chapter 7 : Buried Pipe Design
2002

2 : Foundation Design Principles and Practices
Second Edition
Donald P. Coduto
Chapter 7, Section 7.3 : Induced Stresses Beneath Shallow Foundations

3: Buried Pipe Design
A.P. Moser
Chapter 3

GROUNDWATER CONTROL SYSTEM
PIPE FLOW RATES

Groundwater Intercept Pipe (12-IN)
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\hardee.fm2
Worksheet	Subsurface drain pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.011	
Channel Slope	0.002000	ft/ft
Depth	0.63	ft
Diameter	12.00	in

Additional
No Load on pipe No settlement

Header pipe

Results		
Discharge	607	gal/min
Flow Area	0.52	ft²
Wetted Perimeter	1.83	ft
Top Width	0.97	ft
Critical Depth	0.49	ft
Percent Full	62.70	
Critical Slope	0.004366	ft/ft
Velocity	3	ft/s
Velocity Head	0.11	ft
Specific Energy	0.73	ft
Froude Number	0.63	
Maximum Discharge	2.03	cfs
Full Flow Capacity	1.88	cfs
Full Flow Slope	0.001031	ft/ft
Flow is subcritical.		

Flow in Header

Groundwater Intercept Pipe (8-IN)
Worksheet for Circular Channel

Project Description	
Project File	c:\haestad\fmw\hardee.fm2
Worksheet	Subsurface drain pipe
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data			
Mannings Coefficient	0.011		
Channel Slope	0.002400	ft/ft	← slope after settlement
Depth	0.37	ft	
Diameter	8.00	in	← 8-in Laterals

Results			
Discharge	190	gal/min	← Flow rate into Pipe 9
Flow Area	0.20	ft²	
Wetted Perimeter	1.12	ft	
Top Width	0.66	ft	
Critical Depth	0.30	ft	
Percent Full	55.50		
Critical Slope	0.004851	ft/ft	
Velocity	2	ft/s	
Velocity Head	0.07	ft	
Specific Energy	0.44	ft	
Froude Number	0.67		
Maximum Discharge	0.75	cfs	
Full Flow Capacity	0.70	cfs	
Full Flow Slope	0.000848	ft/ft	
Flow is subcritical.			

HARDEE COUNTY LANDFILL EXPANSION
GROUNDWATER CONTROL SYSTEM

Estimated Flowrates into Groundwater Interception System

Hardee County Landfill Expansion

Pipeline No	Pipe Length (ft)	Flow Rate Rightside (ft^3/day/length)	Flow Rate Leftside (ft^3/day/length)	Total Flowrate (ft^3/day/length)	Total Flowrate (ft^3/day)	Total Flowrate (gpm)	Total Flowrate (cfs)
1	852	6.67	0.00	6.67	5,682.8	29.5	0.07
2	853	6.67	6.67	13.34	11,379.0	59.1	0.13
3	845	6.67	6.67	13.34	11,272.3	58.6	0.13
4	834	6.31	6.31	12.62	10,525.1	54.7	0.12
5	820	6.31	6.31	12.62	10,348.4	53.8	0.12
6	807	6.31	6.31	12.62	10,184.3	52.9	0.12
7	794	6.32	6.32	12.65	10,042.5	52.2	0.13
8	782	6.32	6.32	12.64	9,883.2	51.3	0.11
9	769	6.32	6.32	12.64	9,717.6	50.5	0.11
10	1,032	5.40	5.40	10.80	11,145.6	57.9	0.13
11	1,027	5.40	5.40	10.80	11,091.6	57.6	0.13
12	999	5.40	0.00	5.40	5,394.6	28.0	0.06
Total	10,414	ft		Total	116,667.1	606.1	1.36

Pipe Network Combined Pipe Flow

Pipes From	To	Flow Rate (gpm)	Flow Rate (cfs)
10		57.9	0.13
11		57.6	0.13
12		28.0	0.06
	Total	143.5	0.32

10,11,12		143.5	0.32
	9	50.5	0.11
	Total	194.0	0.43

Highest Flow in Laterals

10,11,12,9	Header	194.0	0.43
8	Header	51.3	0.11
7	Header	52.2	0.13
6	Header	52.9	0.12
5	Header	53.8	0.12
4	Header	54.7	0.12
3	Header	58.6	0.13
2	Header	59.1	0.13
1	Header	29.5	0.07
Header	Pump Sta	606.1	1.36

Pipe Network Elevations

Header Start ID	Elevation	Slope (%)	Distance (ft)	Elevation
9	77.6	0.20	32.1	77.5
8	77.5	0.20	32.1	77.5
7	77.5	0.20	37.6	77.4
6	77.4	0.20	37.6	77.3
5	77.3	0.20	37.6	77.2
4	77.2	0.20	32.1	77.2
3	77.2	0.20	42.9	77.1
2	77.1	0.20	26.1	77.0
1	77.0	0.20	80.0	76.9
Lift Station	76.9	0.20		
		Total	358.1 ft	

Pipeline	Start Elevation	Distance (ft)	Slope (%)	End Elevation
7	77.5	794.0	0.50	81.4
6	77.4	807.0	0.50	81.4
5	77.3	820.0	0.50	81.4
4	77.2	834.0	0.50	81.4
3	77.2	845.0	0.50	81.4
2	77.1	853.0	0.50	81.4
1	77.0	852.0	0.50	81.3

Pipeline	Start Elevation	Distance (ft)	Slope (%)	Intersection Elevation
8	77.5	354.7	0.50	79.3
	79.3	427.2	0.25	80.4
9	77.6	343.3	0.50	79.3
	79.3	302.0	0.25	80.1
	80.1	45.0	0.25	80.2
	80.2	45.0	0.25	80.3
	80.3	33.5	0.25	80.4
10	80.1	1032.0	0.25	82.7
11	80.2	1027.0	0.25	82.8
12	80.3	999.0	0.25	82.8

HARDEE COUNTY LANDFILL EXPANSION
GROUNDWATER CONTROL SYSTEM

PIPE SCHEDULE

	Start El	Finish EL	Length	Fittings
	(NGVD)	(NGVD)	(ft)	
1	77.0	81.3	852.0	8x12 Reducer
2	77.1	81.4	853.0	12x12x8 Tee
3	77.2	81.4	845.0	12x12x8 Tee
4	77.2	81.4	834.0	12x12x8 Tee
5	77.3	81.4	820.0	12x12x8 Tee
6	77.4	81.4	807.0	12x12x8 Tee
7	77.5	81.4	794.0	12x12x8 Tee
8	77.5	79.3	354.7	12x12x8 Tee
	79.3	80.4	427.2	
9	77.6	79.3	343.3	12 Fab 90 degree Elbow, 8x12 reducer
	79.3	80.1	302.0	8x8 Wye
	80.1	80.2	45.0	8x8 Wye
	80.2	80.3	45.0	8x8 Wye
	80.3	80.4	33.5	
10	80.1	82.7	1032.0	8 Fab 90 degree Elbow
11	80.2	82.8	1027.0	8 Fab 90 degree Elbow
12	80.3	82.8	999.0	8 Fab 90 degree Elbow
13	77.0	76.9	80.0	12x12 Wye; 12 Fab 90 degre Elbow

SECTION K

VERTICAL EXPANSION OF LANDFILLS

K.1 LEACHATE LEAKAGE

The existing leachate collection system and forcemain are within the footprint of the landfill expansion. Calculations were conducted to ensure that the existing leachate collection pipes can withstand the waste and equipment loads that will accompany the expansion.

The landfill expansion will not impede the current leachate collection system. An additional leachate collection and removal system will be installed for the proposed cell. This collection system will be operated in tandem with the existing leachate collection system. The expansion shall not contribute to leachate leakage from the existing landfill.

K.2 VERTICAL EXPANSION OVER UNLINED LANDFILLS

The northern portion of the existing landfill cell is unlined. In accordance with Rule62-701.430(1)(c), FAC, the western and southern sideslopes will be lined with a single HDPE geomembrane liner that is 60 mil thick and textured.

The vertical expansion will also include a leachate removal and collection system comprised of a 24-inch drainage sand layer, a double-sided bi-planar geocomposite, a 60 mil textured geomembrane liner, and a 24 inch protective bedding sand layer. The drainage sand not only promotes leachate percolation, but it also acts as a protective buffer for the geomembrane liner. The vertical expansion is graded to slope to the new cell.

Per 62-701.430(1)(c)(2), FAC, the 60 mil textured liner will have a maximum water vapor transmission rate of 0.24 grams per square meters per day (g/m^2 x day).

K.3 FOUNDATION AND SETTLEMENT ANALYSIS

See Attachment J-2 for settlement calculations

K.4 TOTAL SETTLEMENT CALCULATIONS

See Attachment J-2 for settlement calculations

K.5 LANDFILL STABILITY

See Section J for landfill stability discussion.

K.6 SURFACE WATER MANAGEMENT SYSTEM

The stormwater management plan will divert stormwater from the expansion area to the existing stormwater detention pond. Temporary stormwater devices will be in place during construction to prevent stormwater infiltration into the existing landfill and to minimize erosion of cover materials. See Section H, Attachment H-9 for the stormwater management system calculations.

K.7 LANDFILL GAS CONTROL SYSTEM

See Section O for a discussion of landfill gas accumulation under the liner for the vertical expansion.

SECTION L

LANDFILL OPERATION REQUIREMENTS

The information required for Section L of the permit application will be included with the modified fill sequence plans and Landfill Operations plan upon approval of the construction permit application.

See Separate Binder

SECTION M

WATER QUALITY AND LEACHATE MONITORING REQUIREMENTS

This Groundwater Monitoring Plan is being submitted concurrently with the Hardee County Construction Application for Expansion Plan to fulfill the requirement of Chapter 62-701.510 of the Florida Administrative Code.

Please see Groundwater Monitoring Plan submitted separately.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

REVISED GROUNDWATER MONITORING PLAN

ATTACHMENT M-1
TO THE

CONSTRUCTION PERMIT APPLICATION
FOR
HARDEE COUNTY LANDFILL EXPANSION

Prepared for:

Hardee County
Board of County Commissioners
412 West Orange Street
Wauchula, Florida
863-773-5089

Prepared by:

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File No. 09199033.09
November 15, 2004

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LICENSE
NO. 117
STATE OF
FLORIDA
PROFESSIONAL GEOLOGIST
11/15/04

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SECTION M

GROUNDWATER MONITORING PLAN

This Groundwater Monitoring Plan is being submitted concurrently with the Hardee County Construction Application for Expansion Plan to fulfill the requirement of Chapter 62-701.510 of the Florida Administrative Code.

BACKGROUND

Currently the water quality monitoring for the Phase I disposal area at the Hardee County Landfill is conducted under the Department of Environmental Protection (FDEP) Permit Number 38414-002-SO, Modification 38414-006. Groundwater sampling is required semi-annually at six surficial aquifer monitoring wells (MW-1, MW-2, MW-4, MW-5, MW-8, and MW-9), one leachate site (Manhole 1), and one surface water site (SW-1). Additionally, water level measurements are collected at the six monitoring wells and eleven piezometers semi-annually. All current and proposed monitoring points are listed in Table M-1 and shown on Figure M-1.

GROUNDWATER MONITORING PLAN

The Hardee County landfill expansion will include an additional 10 acres; 5 acres, designated as Phase II, Section I, to the south of the Phase I area; and 5 acres, designated as Phase II Section II, to the west Phase I area. The expansion will require additional wells and piezometers to be constructed and the abandonment of monitoring points located in the expansion area. The placement of the monitoring points was based on Chapter 62-701.510, F.A.C. and the findings of the Hardee County Hydrogeological Investigation submitted concurrently with the Hardee County Construction Application for Expansion Plan.

GROUNDWATER MONITORING WELLS

The proposed Hardee County groundwater-monitoring program will consist of the monitoring wells listed in Table M-1. During the filling of Phase II Section I the monitoring plan will include two background (MW-1 and MW–4) and six-detection groundwater monitoring wells (MW-2, MW-5, MW-8, MW-10, MW-11, and MW–12)~~-~~. The background wells are screened in the surficial aquifer and will allow for the monitoring of ambient groundwater conditions at the site. The detection monitoring well MW-2 is located 62.05 feet from the edge of waste. MW-5 is located 64.96 from the edge of waste and MW-8 is 44.55 feet from the edge of waste. Site conditions made it impractical to place MW-2 and MW-5 within 50 feet of the edge of waste. The proposed detection monitoring wells, MW-10, MW-11, and MW-12 will be located within 50 feet of the edge of waste.

Prior to construction of Phase II Section II monitoring wells MW-5 and MW-8 will be abandoned. Additional detection wells, designated as MW-13, MW-14, and MW–15) will be installed. These detection wells will be located no more than 50 feet from the edge of Phase II Section II~~waste~~. Upon construction of the Phase II Section II cell, the overall site groundwater monitoring plan will include two background (MW-1 and MW-4) and seven detection groundwater monitoring wells (MW-2, MW-10, MW-11, MW-12, MW-13, MW-14, and MW-15). However, construction of MW-13, 14, and 15 is not anticipated until a subsequent permitting period.

The detection wells are located~~were placed~~ no greater than 500 feet apart across the downgradient direction of groundwater flow and no greater than 1500 feet apart across the upgradient direction of groundwater flow.

All groundwater monitoring wells included in the monitoring plan are shown in Figure M-2.

TABLE M-1. GROUNDWATER MONITORING WELLS AT THE HARDEE COUNTY LANDFILL

Well Number	Aquifer Monitored	Permit Designation
MW-1	Surficial	Background
MW-2	Surficial	Detection
MW-4	Surficial	Background
MW-5[1]	Surficial	Detection
MW-8[1]	Surficial	Detection
MW-10[2]	Surficial	Detection
MW-11[2]	Surficial	Detection
MW-12[2]	Surficial	Detection
MW-13[3]	Surficial	Detection
MW-14[3]	Surficial	Detection
MW-15[3]	Surficial	Detection

[1] = Wells to be abandoned prior to the construction of Phase II Section II
[2] = Proposed Monitoring Wells for Phase II Section I, to be installed for this permitting period.
[3] = Proposed Monitoring Wells for Phase II Section II, to be installed during a subsequent permitting period.

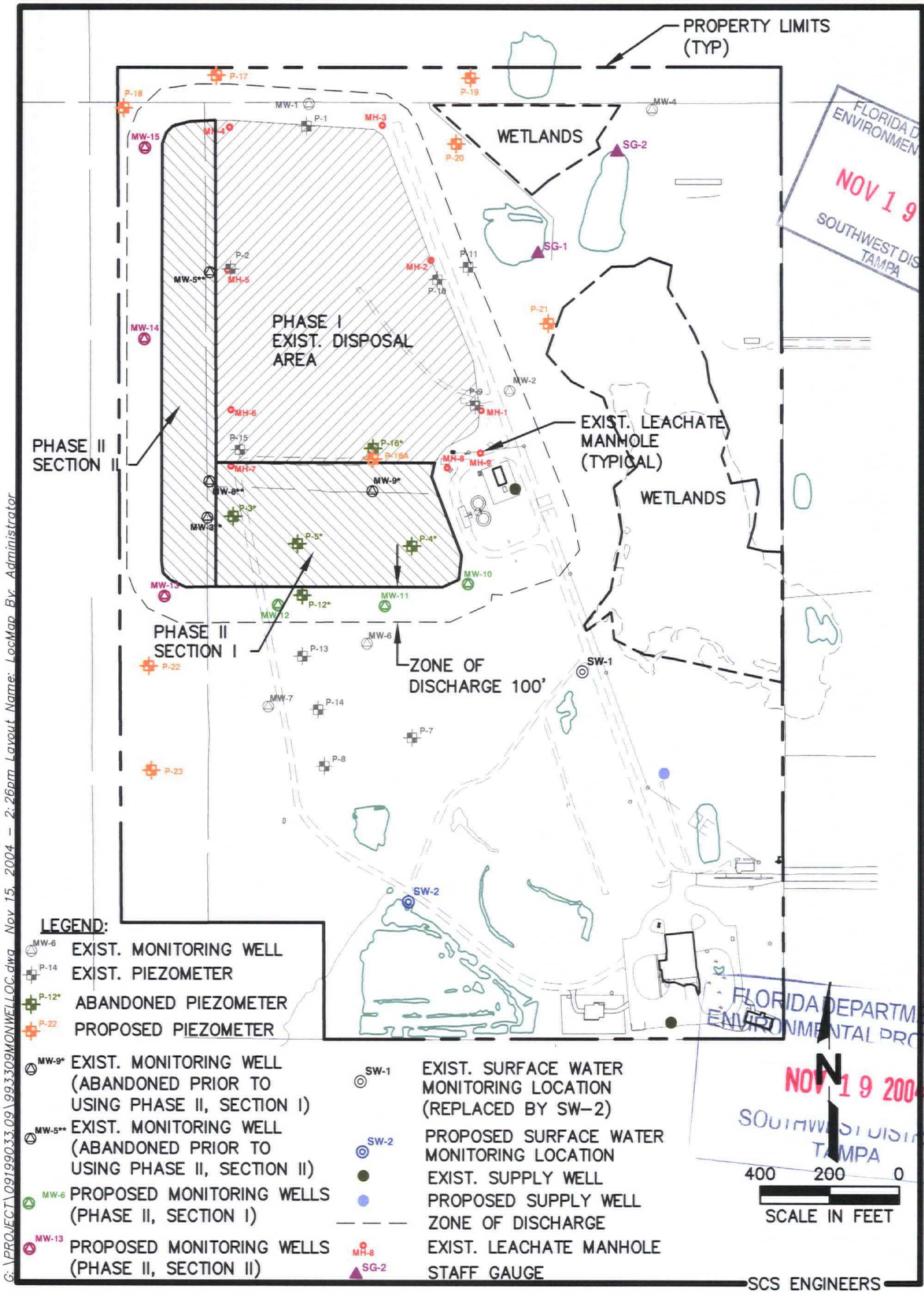

Figure M–1. Hardee County Solid Waste, Groundwater, Surface Water, and Leachate Monitoring Location Points, Hardee County, Florida.

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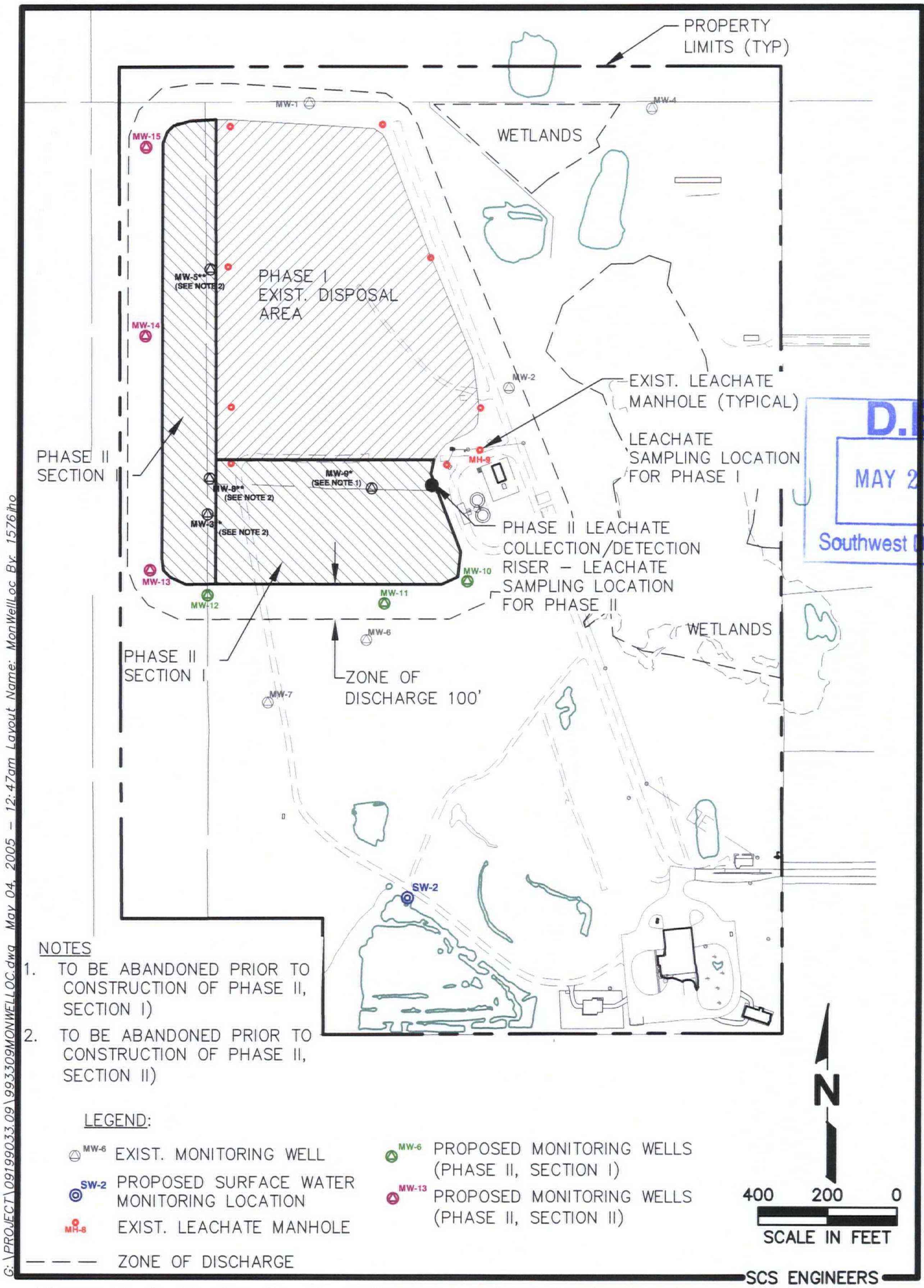


Figure M–2. Hardee County Solid Waste, Groundwater Monitoring Plan Sampling Locations Map, Hardee County, Florida.

The Groundwater monitoring wells will be sampled semi-annually for the parameters listed below.

FIELD PARAMETERS

- Static water level before purging
- Specific Conductivity
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Color and Sheen by observation

LABORATORY PARAMETERS (UNFILTERED)

- Total Ammonia -N
- Biological Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Chlorides
- Iron
- Magnesium
- Mercury
- Nitrate
- Sodium
- Sulfate
- Total Organic Carbon (TOC)
- Total Dissolved Solids (TDS)
- Parameters listed in 40 CFR part 258, Appendix I

GROUNDWATER MONITORING WELL CONSTRUCTION/ABANDONMENT

The monitoring wells listed above include six proposed wells. The construction specifications for these wells are shown in Table M-2. A typical monitoring well construction diagram is shown in Figure M-3. The construction specifications are based on the water level measurements observed at nearby monitoring wells and piezometers. The construction specifications may vary slightly based on field conditions.

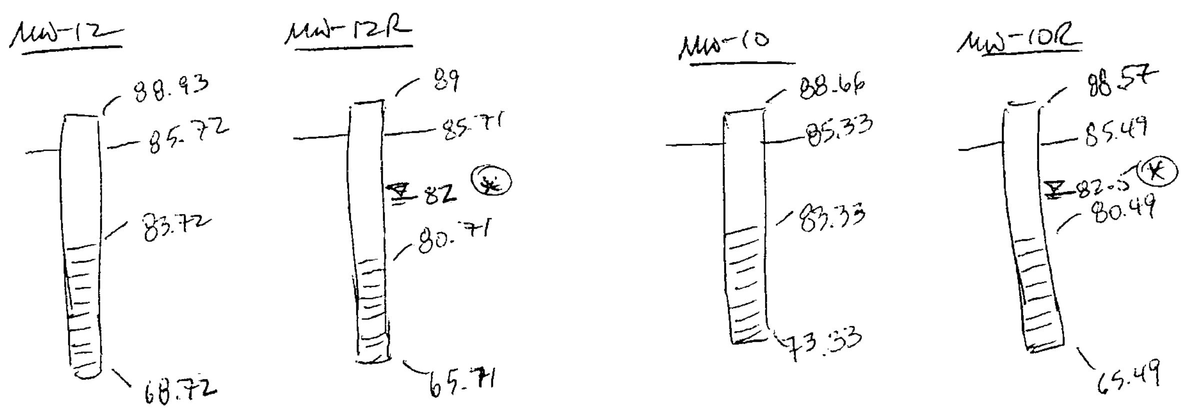
The following documentation will be submitted for each well installed:

- Well Identification
- Aquifer Monitored
- Screen type and slot size
- Screen length
- Screen Diameter
- Elevation at top of casing
- Boring Logs
- Total depth of wells
- Casing Diameter
- Casing type and length
- SWFWMD well construction permit Number
- Elevation at ground surface
- Latitude and longitude of well locations

TABLE M-2. REVISED WELL CONSTRUCTION DETAILS

Well ID	Well Diameter	Current Permit Designation	Permit Designation Phase II Section I	Permit Designation Phase II Section II	Total Depth (bls)	Casing Length (ft bls)	Screen Length	TOC Elevation (NGVD)	Ground Surface Elevation (Ft-NGVD)	Screen top/bottom (ft. bls)	screen top/bottom (NGVD)	Maximum Water Level (NGVD)	Minimum Water Level (NGVD)
MW-1	4"	Detection	Background	Background	11.00'	7.80'	5'	87.92	86.24	6.0/11.0	80.24/75.24	85.44 (Feb 95)	78.27 (June 00)
MW-2	4"	Detection	Detection	Detection	10.50'	7.80'	5'	85.75	83.75	5.5/10.5	78.25/73.25	82.46 (Dec 02)	75.56 (June 00)
MW-3	2"	Piezometer	Piezometer	Abandoned	unknown	unknown	unknown	87.74	unknown	unknown	unknown	unknown	unknown
MW-4	2"	Background	Background	Background	18.90'	12.20'	10'	87.17	84.09	8.9/18.9	75.19/65.19	83.06 (Dec 02)	76.56 (June 00)
MW-5	2"	Detection	Detection	Abandoned	18.10'	11.00'	10'	88.67	85.83	8.1/18.1	77.73/67.73	82.91 (Dec 97)	76.46 (June 00)
MW-6	2"	Piezometer	Piezometer	Piezometer	13.50'	3.50'	10'	88.00	84.59	3.5/13.5	82.40/72.40	83.11 (Dec 02)	75.31 (June 01)
MW-7	2"	Piezometer	Piezometer	Piezometer	13.50'	3.50'	10'	87.56	85.90	3.5/13.5	82.40/72.40	83.11 (Dec 02)	75.31 (June 01)
MW-8	2"	Detection	Detection	Abandoned	13.50'	3.50'	10'	89.07	85.80	3.5/13.5	82.30/72.30	83.18 (Dec 02)	75.58 (June 01)
MW-9	2"	Detection	Abandoned	Abandoned	13.50'	3.50'	10'	88.71	85.90	3.5/13.5	82.40/72.40	83.11 (Dec 02)	75.31 (June 01)
MW-10*	2"	Proposed	Detction	Detection	12.00'	2.00'	10'	88.0**	85.0**	3.8/12.0	81.2/71.2**	82.5***	74.5 (MW-6 Jun 00)***
MW-11*	2"	Proposed	Detection	Detection	12.00'	2.00'	10'	86.1**	83.1**	2.0/12.0	81.1/71.1**	82***	74.5 (MW-6 Jun 00)***
MW-12*	2"	Proposed	Detection	Detection	17.00'	2.00'	15'	88.3**	85.3**	2.0/17.0	83.3/68.3**	82***	74.4 (MW-7 Jun 00)***
MW-13**	2"	Proposed	Phase II Section II	Detection	17.00'	2.00'	15'	87.4**	84.4**	2.0/17.0	82.4/67.4**	83***	74.4 (MW-7 Jun 00)***
MW-14**	2"	Proposed	Phase II Section II	Detection	12.00'	2.00'	10'	88.5**	85.5**	2.0/12.0	83.5/73.5**	82***	76.6 (MW-5 Jun 00)***
MW-15**	2"	Proposed	Phase II Section II	Detection	12.00'	2.00'	10'	87.0**	84**	2.0/12.00	82.0/72.0**	83.5***	76.6 (MW-5 Jun 00)***
Maintenance Supply Well	4"	Supply Well	To Be Abandoned	To Be Abandoned	197'	63'	NA	unknown	unknown	NA	NA	NM	NM
Material Recover Facilty Supply Well	4"	Supply Well	Supply Well	Supply Well	200'	67'	NA	unknown	unknown	NA	NA	NM	NM
Proposed Supply Well*	4"	Proposed	Supply Well	Supply Well	197'	63'	NA	TBD	TBD	NA	NA	NM	NM

NOTES:
* = Proposed Locations: Construction specifications based on top of clay and maximum water levels observed on the site
** = Approximate Elevation based upon March 2003 Aerial Topography Survey of the Site by I.F. Rooks and Associates
*** =Approximate based on potentiometric flow maps (Refer to Geotechnical Report attached to this Permit application)
TBD =To Be Determined
NA =Not Applicable
NM = Not Measured



* ESTIMATED W/L MAX

* ESTIMATED W/L MAX

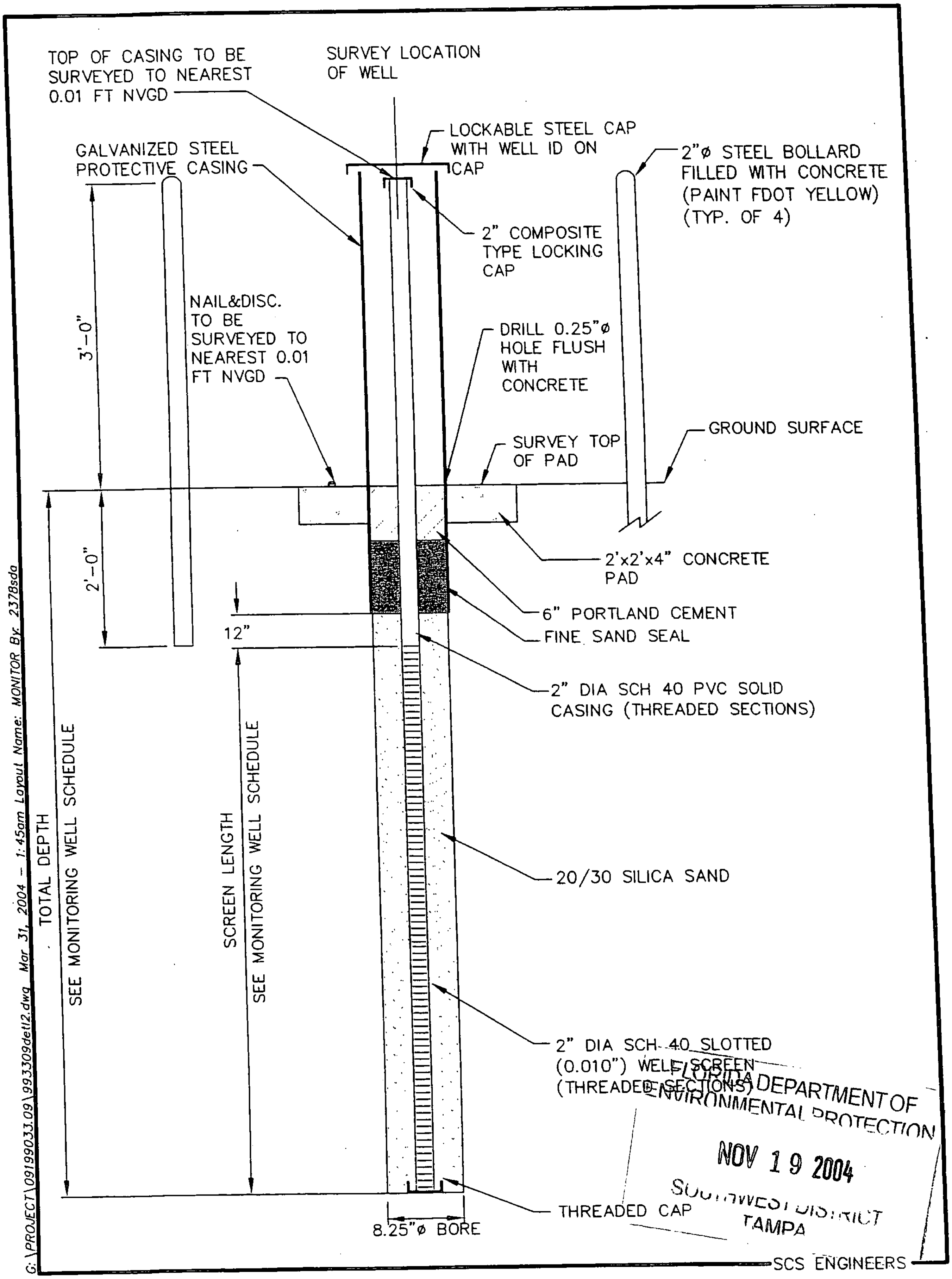


Figure M-3 – Typical Monitoring Well Construction Detail

Within one week following well completion and development, each new well will be sampled for parameters listed in F.A.C. Rules 62-701.510 (8)(a) and (d).

Groundwater monitoring well MW-9 and piezometers P-12 are ~~is~~ located within the Phase II Section I Expansion Area and will be abandoned during construction of the Phase II Section I cell. ~~and~~M~~m~~onitoring wells MW-3, MW-5 and MW-8 will be abandoned prior to the construction of Phase II Section II. -These wells/piezometers -and all wells not included in the approved Groundwater Monitoring Plan will be plugged and abandoned by filling the casing from bottom to top with cement grout in accordance with Rule 62-532.500(4), F.A.C., and the applicable rules of Southwest Florida Water Management District before construction of the expansion area. Documentation of abandonment will be provided to the Department.

SURFACE WATER MONITORING

Surface water samples will be collected semi-annually at SW-2. The location is shown on Figure M-2. A staff gage will be installed and the elevation will be surveyed and the position located by a registered Florida land surveyor. Additional staff gauges, SG-1 and SG-2 will be installed for water level monitoring only

The surface water at SW-2 will be sampled and analyzed semi-annually for the parameters listed below unless no surface water is present for the entire semi-annual period. If during the semi-annual sampling event the site is dry a sample will be taken at a later date, during the semi-annual period if possible, when surface water is present. Hardee County personnel will prepare a daily log (excluding Sundays) in order to document the the occurrence or absence of water at SW-2. ~~If during the semi-annual sampling event the site is dry a sample will be taken at a later date, during the semi-annual period if possible, when surface water is present.~~

FIELD PARAMETERS

- Specific Conductivity
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Color and Sheen by observation

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LABORATORY PARAMETERS (UNFILTERED)

- Zinc
- Unionized Ammonia
- Total Hardness
- Biochemical Oxygen Demand (BOD)
- Copper
- Iron
- Mercury
- Nitrate
- Total Nitrogen
- Total Dissolved Solids (TDS)
- Total Organic Carbon (TOC)
- Fecal Coliform
- Total Phosphates~~orous~~
- Chlorophyll A
- Chemical Oxygen Demand (COD)
- Total Suspended Solids (TSS)
- Those Parameters listed in 40 CFR part 258, Appendix I

LEACHATE MONITORING

Leachate samples will be collected annually at Manhole 9 (MH-9) for Phase I. Leachate samples for Phase II will be collected at the labcock valve on the sideslope riser for the leachate collection system from the leachate sump of the expansion area as shown on Figure M-2. The required parameters are listed below.

FIELD PARAMETERS

- Specific Conductivity
- pH
- Dissolved Oxygen
- Color and Sheen by observation

LABORATORY PARAMETERS (UNFILTERED)

- Total Ammonia –N
- Biochemical Oxygen Demand (BOD)
- Chemical Oxygen Demand (COD)
- Bicarbonate
- Chlorides
- Hardness
- Iron
- Magnesium
- Mercury
- Nitrate
- Sulfate
- Sodium
- Total Dissolved Solids (TDS)
-

In addition to the above-mentioned parameters, leachate will be sampled annually for parameters listed in 40 CFR part 258, Appendix II.

GROUNDWATER LEVEL MONITORING

The groundwater and surface water elevations will be recorded monthly at all points listed in Table M-3 and shown on Figure M-1 for the first year of implementation of the monitoring plan and quarterly thereafter to include all semi-annual sampling sites. Water levels will be recorded prior to purging or sample collection. The information recorded will [illegible] well casing elevation, land surface elevation, and groundwater elevation at each well site at an accuracy of plus or minus 0.01 foot (NGVD).

PIEZOMETERS

Additional piezometers will be installed to further define the groundwater flow on site. The locations of the proposed piezometers are shown on Figure M-4. The construction details are outlined in Table M-4 and typical construction diagram is shown on Figure M-5. The construction specifications may vary slightly based on field conditions. The proposed piezometers will be constructed to monitoring well specifications because they may be converted to monitoring wells in the future if additional sampling locations are required.

TABLE M-3.
REVISED GROUNDWATER AND SURFACE WATER LEVEL MONITORING POINTS

Monitoring Location	Current Permit Designation	Permit Designation Phase II Section I	Permit Designation Phase II Section II
MW-1	Background	Background	Background
MW-2	Detection	Detection	Detection
MW-3	Piezometer	Piezometer	Abandoned
MW-4	Background	Background	Background
MW-5	Detection	Detection	Abandoned
MW-6	Piezometer	Piezometer	Piezometer
MW-7	Piezometer	Piezometer	Piezometer
MW-8	Detection	Detection	Abandoned
MW-9	Detection	Abandoned	Abandoned
MW-10	Proposed Detection Phase II Section I	Detection	Detection
MW-11	Proposed Detection Phase II Section I	Detection	Detection
MW-12	Proposed Detection Phase II Section I	Detection	Detection
MW-13	Proposed Detection Phase II Section II	Proposed Detection Phase II Section II	Detection
MW-14	Proposed Detection Phase II Section II	Proposed Detection Phase II Section II	Detection
MW-15	Proposed Detection Phase II Section II	Proposed Detection Phase II Section II	Detection
P-1	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-2	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-3	Piezometer	Abandoned	Abandoned
P-4	Piezometer	Abandoned	Abandoned
P-5	Piezometer	Abandoned	Abandoned
P-6	Abandoned	Abandoned	Abandoned
P-7	Piezometer	Piezometer	Piezometer
P-8	Piezometer	Piezometer	Piezometer
P-9	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-10	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-11	Piezometer	Piezometer	Piezometer
P-12	Piezometer	Abandoned	Abandoned
P-13	Piezometer	Piezometer	Piezometer
P-14	Piezometer	Piezometer	Piezometer
P-15	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-16	Leachate Level Monitoring	Abandoned	Abandoned
P-16A	Proposed Leachate Monitoring	Leachate Level Monitoring	Leachate Level Monitoring
P-17	Proposed Piezometer	Piezometer	Piezometer
P-18	Proposed Piezometer	Piezometer	Piezometer
P-19	Proposed Piezometer	Piezometer	Piezometer
P-20	Proposed Piezometer	Piezometer	Piezometer
P-21	Proposed Piezometer	Piezometer	Piezometer
P-22	Proposed Piezometer	Piezometer	Piezometer
P-23	Proposed Piezometer	Piezometer	Piezometer
SW-2	Proposed	Surface Water	Surface Water
SG-1	Proposed	Staff Gauge	Staff Gauge
SG-2	Proposed	Staff Gauge	Staff Gauge

TABLE M-4. REVISED PIEZOMETER CONSTRUCTION DETAILS

Piezometer	Diameter	Current Permit Designation	Permit Designation Phase II Section I	Permit Designation Phase II Section II	Total Depth (bls)	Casing Length (ft bls)	Screen Length	TOC Elevation (NGVD)	Ground Surface Elevation (Ft-NGVD)	Screen top/bottom (ft. bls)	screen top/bottom (NGVD)	Maximum Water Level (NGVD)	Minimum Water Level (NGVD)	Average Water Level (NGVD)
P-1	2"	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring	unknown	unknown	unknown	90.14	89.89	unknown	unknown	unknown	unknown	unknown
P-2	2"	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring	unknown	unknown	unknown	90.64	unknown	unknown	unknown	unknown	unknown	unknown
P-3	2"	Piezometer	Abandoned	Abandoned	13.50'	3.50'	10'	89.40	85.90	3.5/13.5	unknown	unknown	unknown	unknown
P-4	2"	Piezometer	Abandoned	Abandoned	14.00'	3.50'	10'	88.36	85.90	4.0/13.5	unknown	unknown	unknown	unknown
P-5	2"	Piezometer	Abandoned	Abandoned	13.50'	3.50'	10'	89.30	85.90	3.5/13.5	unknown	unknown	unknown	unknown
P-6	2"	Abandoned	Abandoned	Abandoned	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
P-7	2"	Piezometer	Piezometer	Piezometer	unknown	unknown	unknown	84.16	unknown	unknown	unknown	unknown	unknown	unknown
P-8	2"	Piezometer	Piezometer	Piezometer	unknown	unknown	unknown	84.98	unknown	unknown	unknown	unknown	unknown	unknown
P-9	2"	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring	unknown	unknown	unknown	87.17	85.12	unknown	unknown	unknown	unknown	unknown
P-10	2"	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring	unknown	unknown	unknown	88.66	87.01	unknown	unknown	unknown	unknown	unknown
P-11	2"	Piezometer	Piezometer	Piezometer	unknown	unknown	unknown	88.25	85.03	unknown	unknown	unknown	unknown	unknown
P-12	2"	Piezometer	Abandoned	Abandoned	15.00'	3.50'	10'	88.75	NA	3.50'/13.5	unknown	unknown	unknown	unknown
P-13	2"	Piezometer	Piezometer	Piezometer	unknown	unknown	unknown	87.65	unknown	unknown	unknown	unknown	unknown	unknown
P-14	2"	Piezometer	Piezometer	Piezometer	unknown	unknown	unknown	86.99	unknown	unknown	unknown	unknown	unknown	unknown
P-15	2"	Leachate Level Monitoring	Leachate Level Monitoring	Leachate Level Monitoring	13.50'	3.50'	NA	89.23	85.90	3.5/13.5	unknown	unknown	unknown	unknown
P-16	2"	Leachate Level Monitoring	Abandoned	Abandoned	13.50'	3.50'	NA	88.92	85.90	3.5/13.5	unknown	unknown	unknown	unknown
P-16A	2"	Proposed	Leachate Level Monitoring	Leachate Level Monitoring	20.00	2.00'	18'	95	92.00	2.0/20.0	90.0/72.0**	unknown	unknown	unknown
P-17*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	88.2**	85.2**	2.0/12.0	83.2/73.2**	83.5***	78.3 (MW-1 Jun00)	81***
P-18*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	87.1**	84.1**	2.0/12.0	82.1/72.1**	83.5***	78.3 (MW-1 Jun00)	81***
P-19*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	87.7**	84.7**	2.0/12.0	82.7/72.7**	82***	76.6 (MW-4 Jun00)	80***
P-20*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	86.6**	83.6**	2.0/12.0	81.6/71.6**	81.5***	76.6 (MW-4 Jun00)	79.5***
P-21*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	84.3**	81.3**	2.0/12.0	79.3/69.3**	80.5***	75.6 (MW-2 Jun00)	78***
P-22*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	87.2**	84.2**	2.0/12.0	82.2/72.2**	81.5***	74.4 (MW-7 Jun00)	78.5***
P-23*	2"	NA	Piezometer	Piezometer	12.00'	2.00'	10'	86.7**	83.7**	2.0/12.0	81.7/71.7**	83***	74.4 (MW-7 Jun00)	77.5***

NOTES:
* = Proposed Monitoring Locations- Construction specifications based on average water levels observed on the site.
** = Approximate Elevation based upon March 2003 Aerial Topography Survey of the Site by I.F. Rooks and Associates
*** =Approximate based on potentiometric flow maps (Refer to Geotechnical Report attached to this Permit application)
TBD=To Be Determined
NA=Not Applicable
NM=Not Measured
bls = below land surface
NGVD = National Geodetic Vertical Datum

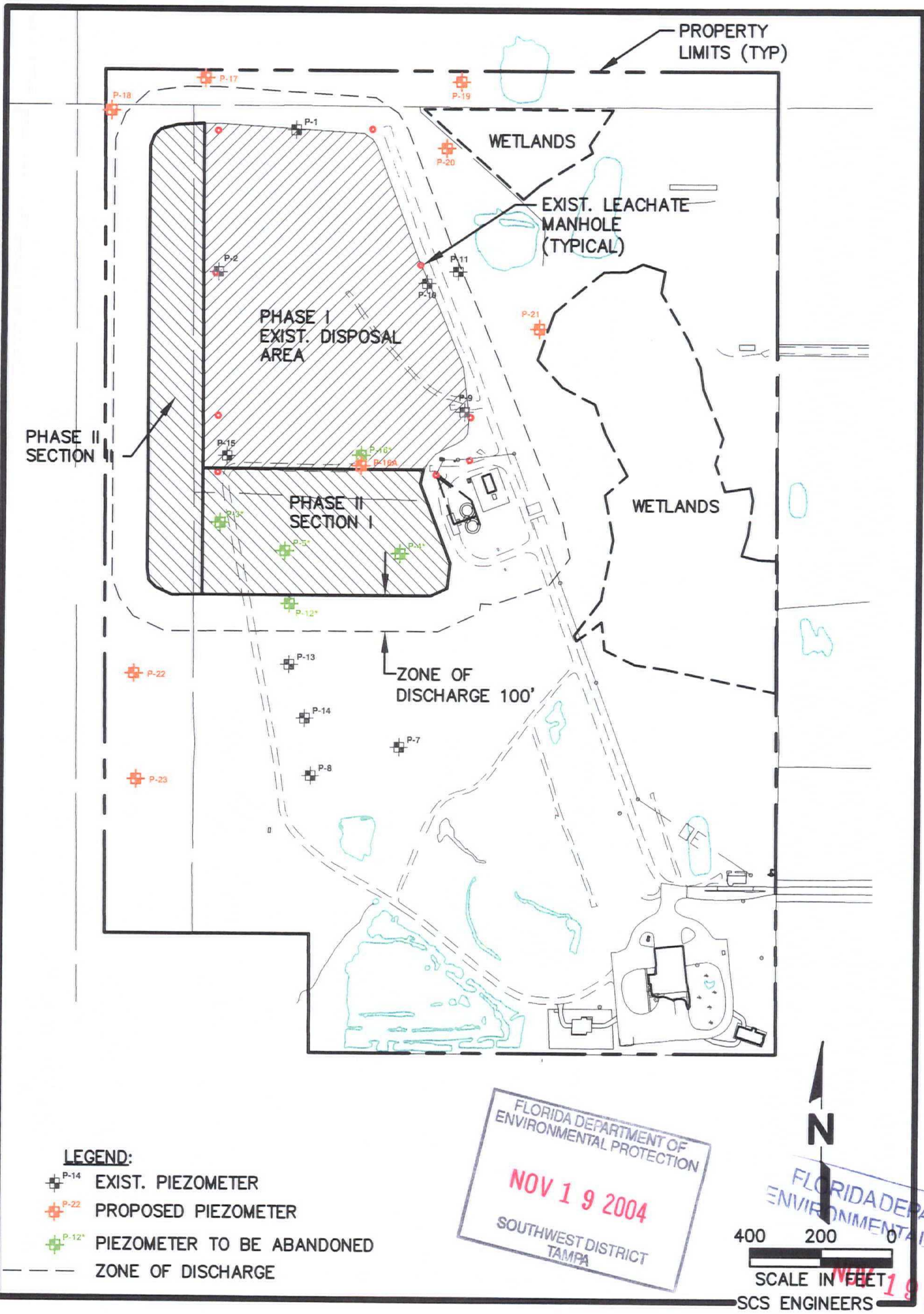
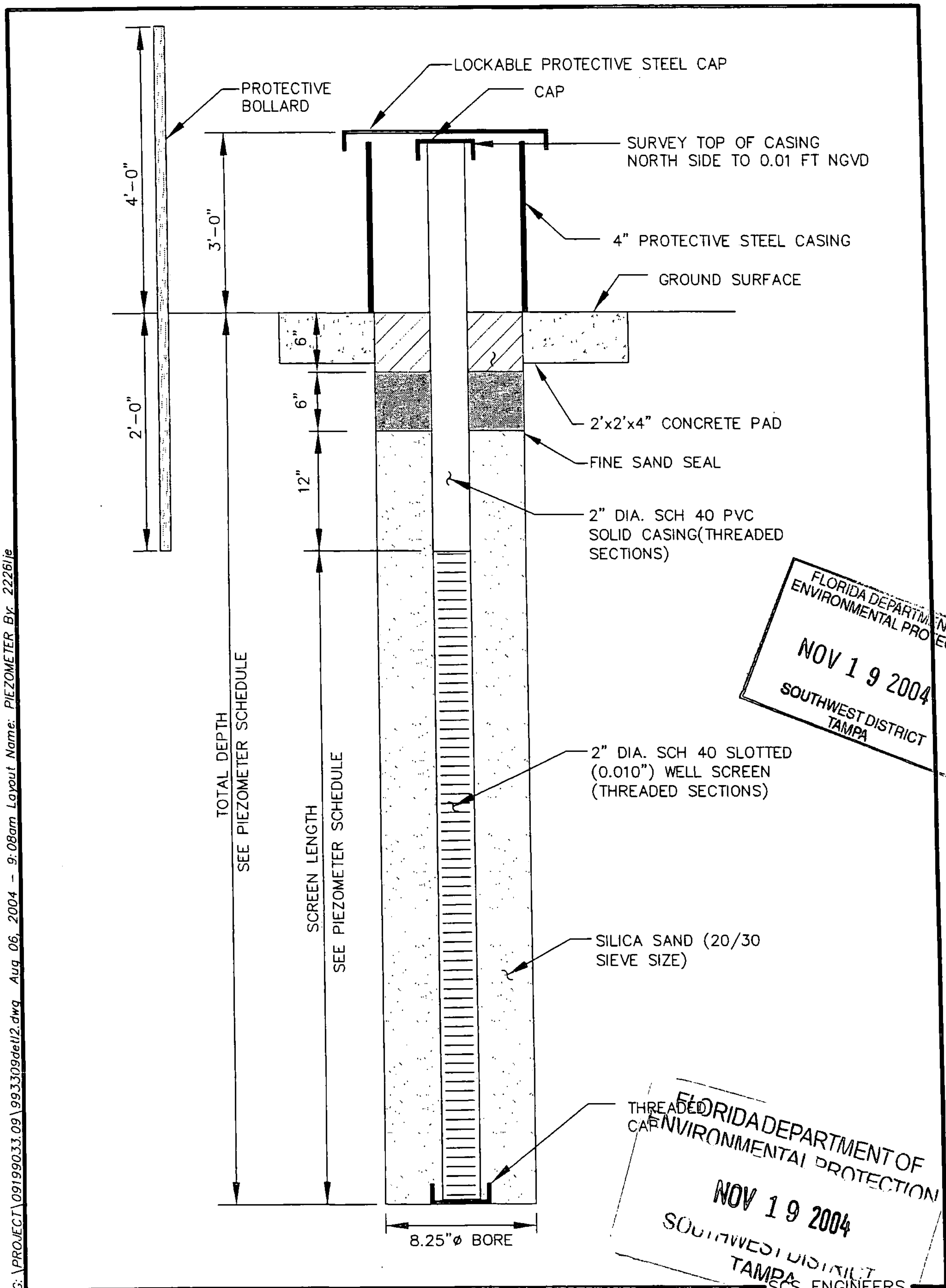


Figure M-4. Hardee County Solid Waste, Piezometer Location Map.



Revised Figure M-5 – Typical Piezometer Construction Detail

The following documentation will be submitted for each piezometer ~~well~~ constructed:

- Well Identification
- Aquifer Monitored
- Screen type and slot size
- Screen length
- Screen Diameter
- Elevation at top of casing
- Boring Logs
- Total depth of wells
- Casing Diameter
- Casing type and length
- SWFWMD well construction permit Number
- Elevation at ground surface
- Latitude and longitude

Piezometers P-3, P-4, and P-5 are located within the Phase II Section I Expansion Area. Piezometer P16 will be abandoned and replaced with Piezometer 16A when the access on the southside of Phase I is constructed. These piezometers are to be plugged and abandoned in accordance with Rule 62-532.440, F.A.C. and applicable rules of the Southwest Florida Water Management District before construction of the expansion area.

WATER QUALITY SAMPLING AND ANALYSIS

Groundwater monitoring wells included in this plan will be sampled semi-annually for the first year of the permitting period and the groundwater level in each well will be recorded. During the first year, slug testing will be performed on MW-10, 11, and 12 for purposes of evaluating the sampling frequency for the remainder of the permit period. Results of the evaluation will be submitted to the FDEP. The field testing, sample collection, and preservation will~~shall~~ be conducted in accordance with ~~methods approved by~~ the FDEP Standard Operating Procedures (SOP) FS 22000 (Ground Water Sampling) ~~in accordance with Rule 62-4.246 and Chapter 62-160, F.A.C~~. All sample analyses ~~field and laboratory work~~ will be conducted by a firm that ~~possessing a~~ is certified by the Departement of Health's Environmental Laboratory Certification Program. Quality Assurance Project Plan or a Comprehensive Quality Assurance plan approved by the FDEP to meet the requirements of Chapter 62-160, F.A.C.

Measures will be taken to lower turbidity by eliminating the use of bailers for sampling or purging monitoring wells. Additionally a low flow pump will be used for purging and sample collection. Due to three well volumes will be purged from each well before a sample will be collected. The volume of water removed from each well will be recorded in the field notes.

In addition, immediately following all sampling events, the following measures will be taken:

- All wells will be locked and the keys retained by the Hardee County Solid Waste Director.

- The Solid Waste Director or appointee will immediately review all Chains of Custody, and field notes to assure all required data has been recorded.

WATER QUALITY MONITORING REPORTING REQUIREMENTS

The Water Quality Monitoring Report will summarize and interpret the water quality and leachate monitoring results and will be signed and sealed by a professional geologist or professional engineer and submitted to FDEP semi-annually and will include the following:

- A cover letter summarizing water quality standards and water quality exceedances.
- Leachate, surface water, and groundwater quality monitoring results reported on the Department Form 62-522.900(2). Groundwater Monitoring Report. The report will include all items listed in Rule 62-701.510 (9) (a), F.A.C. The analytical report provided by the contract laboratory will include the above referenced form along with field parameters, water level reading, and field observations in addition to applicable groundwater standards.
- A potentiometric surface map indicating groundwater flow and elevation.

Biennial Review of the Water Quality Report

A Biennial Report will be prepared every two years and upon permit renewal. The Biennial report will be prepared by and signed and seal by a professional geologist or professional engineer with experience in hydrgeologic investigations. The report shall summarize and interpret the water quality data and water level measuremnets collected during the past two years (minimum). The report shall contain, at a minium, the following:

1. Tabular and Graphical displays of the dat, including hydrographs for all monitor wells ;
2. Trend Analyses
3. Comparisions among shallow, middle and deep zone wells, if applicplicable
4. Comparison between upgradient and downgradiennt wells:
5. Correlations between related parameters such as total dissolved solids and specific conductance
6. Duscussion of erratic and/or poorly correlated data, and
7. A summary groundwatrer table contour map and an interpretation of the quaterly groundwater contour maps

All field and laboratory records specified in Chapter 62-701.510., shall be made availbae to the Deapartmenbt and shall be reatained for the design period of the landfill.

Preventative Measures and Corrective Action

If indicator parameters are detected in detection wells in concentrations which are significantly above background water quality, or which are at levels above the FDEP's water quality standards or criteria specified in Chapter 62-520, F.A.C., the permittee shall resample the wells within 30 days after the sampling data is received, to confirm the data. If the data is confirmed, the permittee shall notify the FDEP in writing within 14 days of this finding. Upon notification by the FDEP, the permittee shall initiate assessment monitoring as follows:

1. Routine monitoring of all monitoring wells, surface water monitoring locations and leachate sampling locations shall continue according to the requirements of section 3.0 of this plan.

2. Within go days of initiating assessment monitoring and annually thereafter, the permittee shall sample and analyze a representative sample of the background wells and all affected detection wells for the parameters listed in 40 CFR Part 258, Appendix II. Any new parameters detected and confirmed in the affected downgradient wells shall be added to the routine ground water monitoring parameter lists required in section 3.0 of this plan.

3. Within 90 days of initiating assessment monitoring, the permittee shall install and sample compliance monitoring wells at the compliance line of the zone of discharge and downgradient from the affected detection monitoring wells. These wells shall be installed according to the requirements of Chapter 62- 701.510 (3)(d), and samples shall be analyzed for the parameters listed in section 3.0 of this plan and also 40 CFR Part 258, Appendix II.

4. Within 180 days of initiating assessment monitoring, the permittee shall submit a contamination assessment plan to the FDEP. This plan shall be designed to delineate the extent and cause of the contamination, to predict the likelihood that FDEP water quality standards will be violated outside the zone of discharge, and to evaluate methods to prevent any such violations. Upon approval by the FDEP, the permittee shall implement this plan and submit a contamination assessment report in accordance with the plan. All reasonable efforts shall be made by the permittee to prevent further degradation of water quality from the landfill activities.

5. If for two (2) consecutive sampling events the concentrations of all indicator parameters and the parameters listed in 40 CFR Part 258, Appendix II are at or below background values, the permittee, upon approval by the FDEP, may discontinue assessment monitoring and return to the routine monitoring requirements in Section 3.0 of this plan.

B. Corrective Actions

If the contamination assessment report indicates that water quality standards are likely to be violated outside the zone of discharge, the permittee shall, within 90 days, submit a remedial action plan to the FDEP. Upon approval, the permittee shall initiate corrective actions to prevent such violations.

2. If any contaminants are detected and confirmed in compliance wells in concentrations which exceed both background levels and FDEP water quality standards or criteria, are detected and confirmed in detection wells in concentrations which are above FDEP water quality minimum criteria, the permittee shall notify

the Department within 14 days of this finding and shall initiate corrective actions. Assessment monitoring shall continue according to the requirements of this section.

SUPPLY WELLS

As referenced in the Hardee County Hydrgeological Investigation, two supply wells are located within 500 feet of the Hardee County Landfill Disposal Unit. The locations of the wells are shown on Figure M-6. The SWFWMD well completion reports are provided as Appendix A. These wells are constructed into the intermediate aquifer at approximately 200 feet below land surface.

The maintenance supply well will be plugged and abandoned in accordance with Rule 62-532.500(4), F.A.C. by filling the well with grout from the bottom to the top within 120 days of permit issuance. ~~and the applicable rules of the Southwest Florida Water Management District.~~ Before abandonment of this well, a replacement supply well will be constructed. The location of the proposed supply well is shown on Figure M-6 and the construction characteristics are outlined in Table M-2.

G:\PROJECT\09199033.08\aerial2.dwg Nov 13, 2004 - 6:14pm Layout Name: well limits M-6 By: 2378sda

Figure M-6. Supply Well Location Map, Hardee County Landfill, Hardee County, Florida

SECTION N

SPECIAL WASTE HANDLING REQUIREMENTS
(62-701.520 FAC)

N.1 PROCEDURES FOR MANAGING MOTOR VEHICLE DISPOSAL

The Hardee County Landfill does not accept motor vehicles, therefore this section does not apply and the application has been marked "Not Applicable".

N.2 PROCEDURES FOR LANDFILLING SHREDDED WASTE

The Hardee County Landfill does not landfill shredded waste, therefore, this section does not apply and the application has been marked "Not Applicable".

N.3 PROCEDURES FOR ASBESTOS WASTE DISPOSAL

Asbestos Containing Materials (ACM) are accepted at the Hardee County Landfill under certain provision outlined by 40 CFR Part 61 (as referenced in 62-701.520(4)(a), FAC) and the Hardee County Solid Waste Department. The County has notified all known potential asbestos disposers of the required procedures, which must be followed by any person desiring to dispose of ACM. Accepted asbestos material is disposed of using the following procedures (these procedures are also outlined in Appendix B of Attachment L-1):

- Excavate a hole three feet in depth and adequate diameter to meet the estimated quantity to be received.
- Cover immediately with one foot of soil and compact with dozer, adding more cover material with each pass.
- Attach a site map with location and depth of each disposal site and attached in a file with the Waste Shipment Record and record weight ticket.

N.4 PROCEDURES FOR CONTAMINATED SOIL DISPOSAL

The County accepts contaminated soils on the condition that they are not hazardous. It is a requirement that all incoming contaminated soils be TCLP tested first before being accepted at this facility for disposal. Depending on the known or suspected contaminant, additional analyses may be required. Records of tests and analyses are kept on file at the landfill facility. Accepted contaminated soils are disposed of in the currently active disposal cell. Disposal of contaminated soil is accomplished by adding the contaminated soil to the daily cover used for the solid waste only within the lined and bermed working face. The location of contaminated soil can be determined based on the contaminated soil's date of arrival and the filling sequence at the landfill.

If the TCLP testing shows the soil cannot be accepted at the landfill the hauler will be notified. A front-end loader will place the soil in a barrel at the Household Hazardous Waste Collection Center. Hardee County will contact the person/entity who dumped the load and request removal within 48 hours. If the 48 hours expire the County will contact an independent waste hauler for proper disposal of the contaminated soil at a permitted hazardous waste management facility.

N.5 BIOLOGICAL WASTES

Biological waste includes sludges and medical waste. Sludges are not accepted at the landfill for disposal. Medical waste is not accepted at the landfill for disposal.

SECTION O

GAS MANAGEMENT SYSTEM REQUIREMENTS

O.1 DESIGN OF THE GAS MANAGEMENT SYSTEM

Landfill gas (LFG) that is generated by the anaerobic decomposition of the waste buried within the landfill is allowed to vent to the atmosphere. The LFG management system in place at the Hardee County Landfill consists of 11 LFG monitoring probes located around the perimeter of the existing landfill footprint and at the property boundary. The existing LFG monitoring plan includes quarterly monitoring of these probes, as well as on-site structures in order to demonstrate compliance with Rule 62-701.530(1), FAC.

When the final closure cover and sideslope cover systems are installed over the Phase I disposal area, a passive vent system will be installed as shown on the permit drawings attached to this applications. The passive gas vent system is designed to reduce gas pressures within the Phase I existing disposal area, from under the cover system on the south and west sideslopes, and control possible subsurface migration of LFG. Once constructed, LFG will be permitted to vent freely to the atmosphere through a number of deep vertical vents and horizontal vent trenches. Because the proposed design capacity of the landfill is below 2.5 million megagrams or 2.5 million cubic meters, the Hardee County Landfill is not subject to the LFG collection and control requirements of the federal New Source Performance Standards (NSPS), nor Title V air permitting. Therefore an active LFG collection system is not proposed for the Phase I and II areas, at this time. The LFG gas venting system for the Phase II expansion area will be designed and permitted upon submittal of the closure application for the Phase II area.

Because the proposed landfill expansion will be to the west and south of the existing landfill, it will be necessary to relocate several of the existing LFG monitoring probes outside of the expansion area. Hardee County proposes to abandon and replace existing LFG monitoring probes GP-4, GP-5, GP-6, GP-7, and GP-8, and install replacement LFG monitoring wells designated as GP-4R, GP-5R, GP-6R, GP-7R, and GP-8R, as shown on the attached permit drawings. The replacement LFG monitoring wells are located along the west side of the property. The existing LFG monitoring well, GP-1,GP-2, and GP-3, will be used to detect possible subsurface migration of LFG toward the northside of the property. In addition, Hardee County is proposing to install two more LFG monitoring probes, GP-12 and GP-13, located immediately north of the proposed stormwater management area shown on the attached permit drawings. A typical detail for construction of the probes is included in these drawings.

O.1.a <u>Combustible Gas Control</u>

Rule 62-701.530(1), FAC, requires that the gas management system be designed to control gas migration in order to meet the following criteria:

- The combustible gas concentration may not exceed 25 percent of the lower explosive limit (LEL) in on- or off-site structures, excluding gas control or recovery equipment. Because the LEL for methane is five percent by volume, this corresponds to a maximum concentration of 1.25 percent by volume.

- The combustible gas concentration may not exceed the LEL (i.e., five percent by volume) at the property boundary.

The proposed passive vent system that will be installed in conjunction with the landfill expansion will relieve internal landfill gas pressures, thereby reducing the potential for lateral migration of LFG through the surrounding subsurface. Monitoring will continue to be conducted on a quarterly basis, consistent with the existing LFG monitoring plan.

O.1.b Site Specific Conditions Considerations

The design of the proposed venting system and the replacement LFG monitoring probes are consistent with industry standards and include considerations for site-specific conditions. The vertical passive vents are spaced at a rate of greater than one vent per acre of landfill, and are designed to terminate a sufficient distance above the bottom of refuse. The replacement LFG monitoring probes were designed based on the landfill configuration, base grades, and groundwater conditions at the site.

O.1.c Reduction of Gas Pressure Within the Landfill

The LFG venting system will consist of 11 vertical vents and five horizontal vent trenches. These vents will provide greater than the industry-standard coverage of one vent per acre typically installed for closed landfills. The 11 vents will be constructed of boreholes that will extend to at least 75 percent of the waste depth in order to maximize the effectiveness of the vents to allow for escape of LFG generated by the waste located near the bottom of the landfill. The gas venting trenches will tie in to the leachate collection system manholes on the west side of the landfill in order to vent LFG that may collect in the LCRS on the west side.

O.1.d Interaction with Liner, Leachate Collection System, and Final Cover

The LFG management system was designed to not impact the bottom of the landfill nor the LCRS. The vent boreholes were designed to terminate above the bottom of the landfill. Any future vents/wells will be installed with a buffer between the bottom of the boreholes and the liner and LCRS components. The LFG vent system is designed to maintain the integrity of the final cover system by minimizing the gas pressure internal to the landfill.

O.2 GAS MONITORING PROGRAM

The proposed LFG monitoring network includes 13 LFG monitoring probes located along the perimeter of the landfill. The County monitors these 13 probes, as well as on-site structures for the presence of methane on a quarterly basis, and the results of the monitoring are reported to FDEP. The on-site structures that are monitored are as follows:

- Maintenance Building
- Materials Recovery Facility
- Scalehouse/Administrative Offices
- Kennel

As a result of the landfill expansion, five of the existing probes (i.e., GP-4 through GP-8) will be relocated outside the limits of the new landfill footprint. The locations of the proposed replacement probes, as well as proposed construction details, are shown on the attached permit drawings. The new probes will be constructed similar to the existing probes, taking into consideration site-specific conditions such as:

- Soil characteristics
- Hydrogeologic conditions surrounding the facility
- Hydraulic conditions surrounding the facility
- Location of facility structures and property boundaries

O.3 GAS REMEDIATION PLAN

Per Rule 62-701.530(3)(a), FAC, a gas remediation plan will be instituted if either of the following occurs:

- Monitoring of the LFG monitoring probes demonstrates that combustible gas concentrations exceed the LEL of five percent methane at the property boundary.

- The on-site structures contain gas concentrations that exceed 25 percent of the LEL, which is equivalent to 1.25 percent methane.

Should the LEL be exceeded, the County will immediately take all necessary steps to ensure protection of human health and notify FDEP. Within seven days of detection, a gas remediation plan shall be submitted to FDEP for approval. The plan will describe the nature and extent of the problem and the proposed remedy, which will be taken within 60 days of the detection.

In accordance with Rule 62-701.530(3)(b), FAC, should objectionable odors be detected beyond the landfill property, an odor monitoring and/or remediation plan will be implemented. The County will implement a routine odor-monitoring program to determine the timing and extent of any off-site odors. If this monitoring program confirms the existence of objectionable odors that are attributable to the landfill, an odor remediation plan shall be submitted to FDEP for approval. The plan will describe the nature and extent of the problem and the proposed remedy, which will be initiated within 30 days of approval of the plan.

O.4 LANDFILL GAS RECOVERY FACILITIES

A LFG recovery facility for purposes of energy recovery or similar end uses is not proposed at this time. Therefore, Rule 62-701.530(5), FAC, is not applicable to this permit application.

FLORIDA DEPARTMENT OF
ENVIRONMENTAL PROTECTION

NOV 19 2004

SOUTHWEST DISTRICT
TAMPA

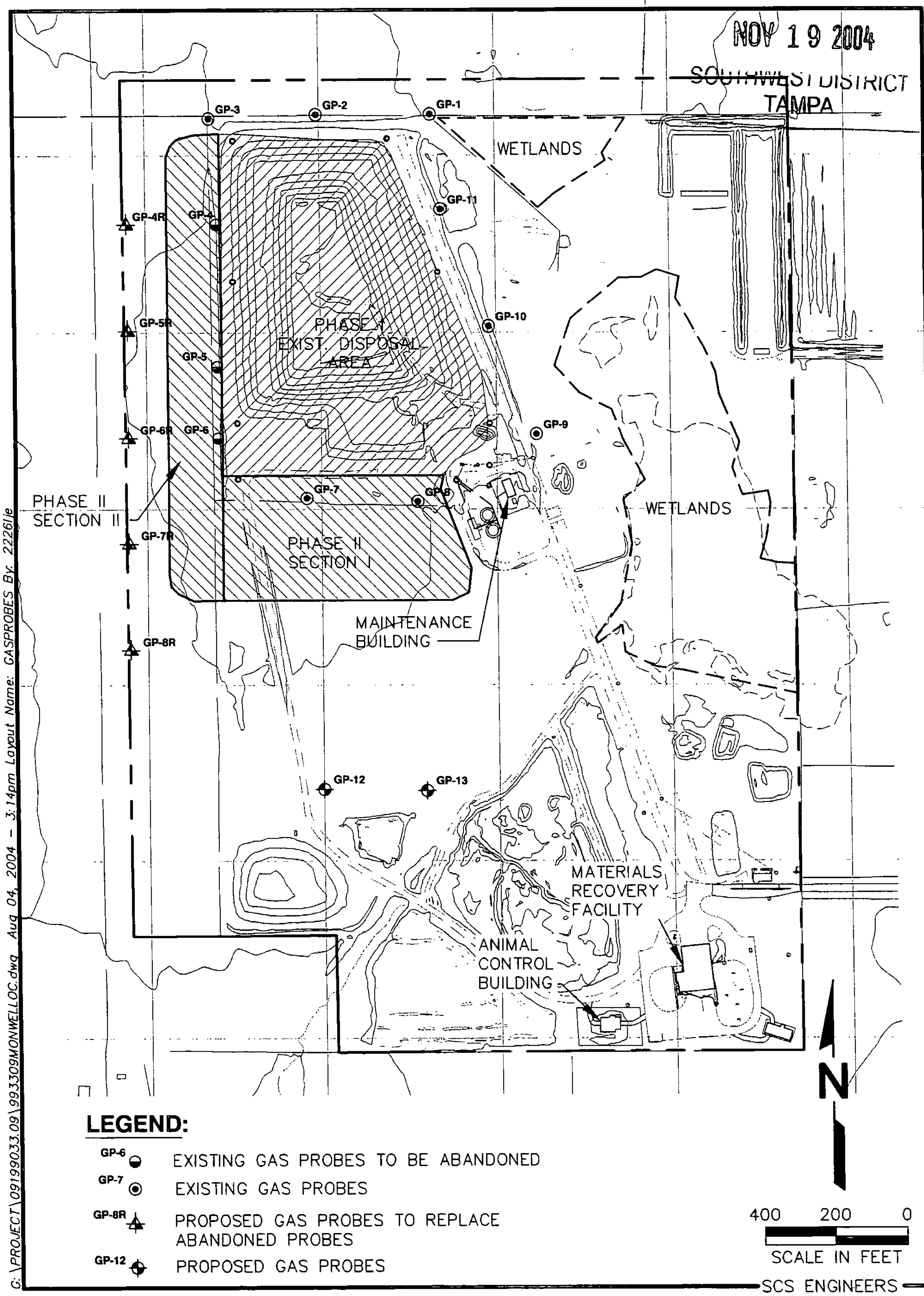


Figure O–1. Gas Probe Locations, Hardee County Landfill Expansion, Hardee County, Florida

ATTACHMENT O-1

LANDFILL GAS MANAGEMENT SYSTEM CALCULATIONS

LANDFILL GAS VENT SYSTEM
DESIGN CALCULATIONS

SCS ENGINEERS

CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT LFG Vent System Design		BY D. Perozzi	DATE 12/19/03
		CHECKED	DATE

Objective: Design of passive landfill gas (LFG) vent system for existing Hardee County Landfill

Approach:
1. Identify closure areas to receive gas vents
2. Standard vent spacing ≈ 1 vent/acre
3. Deep vent design
4. Supplemental vent trenches
5. wind-assisted passive venting

Solution:

1. Existing Hardee Co. LF ≈ 11 acres

2. Industry Standard for vent spacing = 1 vent/ac.
To be consistent w/this generally accepted practice, choose 11 vertical passive vents
   - Design vertical vents at 120-180' spacing
   - Design deep vents, similar to extraction wells used in active LFG extraction system.
   - Vertical vents to be concentrated on top plateau and on north and east side slopes.

3. Augment LFG venting using horizontal passive vent trenches beneath the geomembrane cap on the west & north side slopes.
   - Horizontal trenches to be installed at 150' spacing
   - 7 horizontal trenches total
   - Vent pipes for horizontal trenches to be constructed with wind-driven rotary turbine ventilators.
     - Typical ventilation capability of wind turbines ≈ 100+ cfm of air
     - At 2 mph wind, 4"Ø wind turbine can exhaust 123 cfm
     - Total LFG generation rate in LF ≈ 140 scfm for existing LF
     - Use 6 wind-assisted turbines

SCS ENGINEERS

SHEET 2 OF 2

CLIENT Hardee County	PROJECT Landfill Expansion	JOB NO. 09199033.09
SUBJECT LFG Vent System Design	BY D. Peroyn	DATE 12/19/03
	CHECKED	DATE

4. LFG generation estimate - See Attachment 2

Year	Expected LFG Generation Rate (scfm)
2004	140
2005	145
2006	149
2007	143

5. Tie-ins to the leachate collection system manholes on west side of existing LF
   - 3 manholes to tie in to horizontal vent trenches

6. Horizontal collector pipes to be 4" Ø HDPE SDR 11.

Conclusions:

The proposed design for the LFG vent system calls for a total of 17 vent pipes for an 11-acre LF area. This is over 50% more coverage than conventional passive vent designs. Therefore, the system is considered conservative with an acceptable factor of safety.

ATTACHMENT 1

Wind-assisted Turbine Information

Attachment 1
Page 1 of 2

				2 mph			4 mph			5 mph			6 mph										
	OUTDOOR WIND VELOCITY KM/HR			3.2			6.4			8.0			9.6			12.8			16.0			SHIPPED APPROX WEIGHTS KG	
	Temp. Diff. °C			5	10	15	5	10	15	5	10	15	5	10	15	5	10	15	5	10	15		
	Model No.	Throat Size (mm)	Ht. above Intake (m)	APPROXIMATE EXHAUST CAPACITY IN LITRES PER SECOND																		VENTS	BASES
6"Ø	WR-150	152	3	54	59	61	99	104	107	126	131	133	148	153	156	201	206	208	252	257	259	3	1.3
			6	58	64	68	103	109	113	129	135	140	152	158	162	205	211	215	256	262	266		
			9	61	68	74	106	113	119	133	140	145	155	162	168	208	215	221	259	266	272		
			12	64	72	78	109	117	124	136	143	150	158	166	173	211	219	226	262	270	276		
8"Ø	WR-200	203	3	74	83	90	135	144	151	170	179	186	201	210	217	271	280	240	342	350	358	4	1.8
			6	83	92	100	143	153	161	178	189	197	209	220	228	278	289	250	349	360	368		
			9	88	100	110	149	161	171	184	197	206	215	228	237	284	297	306	355	368	377		
			12	92	107	118	153	168	179	189	203	215	220	234	246	289	304	315	360	375	386		
	WR-250	254	3	99	105	129	175	181	205	218	225	249	257	263	288	343	350	374	432	438	462	6	2.4
			6	110	127	142	186	203	218	230	247	262	269	285	300	355	372	387	443	460	475		
			9	120	142	155	196	218	231	240	262	275	278	300	313	365	387	400	453	475	488		
			12	127	150	167	203	226	243	247	270	287	285	308	326	372	395	412	460	483	500		
	WR-300	305	3	126	145	158	217	236	249	271	290	302	316	335	348	420	439	451	525	544	557	7	3.5
			6	142	166	184	233	257	275	287	310	328	332	356	374	436	459	477	542	565	583		
			9	156	184	206	246	275	297	300	328	351	345	374	396	449	477	500	555	583	605		
			12	166	199	225	257	290	315	310	343	369	356	389	414	459	492	518	565	598	624		
	WR-350	356	3	157	181	199	263	287	305	336	350	368	379	403	421	501	525	543	625	648	667	9	4.7
			6	177	209	234	284	316	340	346	378	403	400	432	456	521	553	578	645	677	701		
			9	195	234	264	301	340	370	364	403	433	417	456	486	539	578	608	662	701	732		
			12	209	254	290	316	360	396	378	423	459	432	476	512	553	598	633	677	722	757		
	WR-380	381	3	172	201	219	285	314	333	351	381	399	409	438	457	539	568	586	671	700	718	10	5.3
			6	196	233	260	309	341	374	376	412	440	433	470	498	563	600	627	695	732	759		
			9	216	260	295	329	374	409	395	440	475	453	498	533	583	627	662	715	759	794		
			12	233	284	324	346	398	437	412	464	504	470	522	561	600	651	691	732	783	823		
	WR-400	406	3	188	221	243	309	342	363	379	412	434	441	474	496	579	612	634	720	753	775	12	5.8
			6	216	258	289	336	378	409	407	449	480	468	510	542	607	649	680	748	790	821		
			9	239	289	329	359	409	449	430	480	520	492	542	582	630	680	720	771	821	861		
			12	258	316	362	378	436	482	449	507	553	510	569	615	649	707	753	790	848	894		
	WR-450	457	3	225	266	294	356	398	426	436	477	505	505	547	575	660	701	729	819	861	889	15	6.4
			6	259	312	352	391	444	484	470	524	564	540	593	633	694	746	768	854	907	947		
			9	288	352	402	420	484	534	500	564	614	569	633	683	7247	788	838	883	947	997		
			12	312	386	444	444	518	576	524	598	655	593	667	725	748	822	879	907	981	1039		
	WR-500	508	3	258	310	344	410	452	496	500	551	585	575	627	661	742	800	834	927	979	1013	20	8.4
			6	300	366	415	452	518	567	542	608	657	617	683	732	791	857	906	969	1035	1084		
			9	336	415	476	488	567	628	577	657	718	653	732	793	826	906	967	1005	1084	1145		
			12	366	457	528	518	609	680	608	699	769	683	774	845	857	948	1018	1035	1126	1197		
	WR-600	610	3	338	412	461	519	594	643	626	700	750	718	792	842	926	1000	1050	1138	1212	1261	27	10.8
			6	398	493	564	580	675	746	686	782	852	778	874	944	986	1082	1152	1198	1293	1364		
			9	450	564	653	632	746	834	738	852	941	830	944	1033	1038	1152	1241	1250	1364	1453		
			12	493	625	727	675	806	909	782	913	1016	874	1005	1108	1082	1213	1316	1293	1425	1527		
	WR-760	762	3	537	653	729	811	927	1002	976	1092	1168	1122	1238	1314	1447	1563	1639	1778	1894	1969	55	14.3
			6	633	781	892	907	1054	1165	1072	1220	1331	1218	1366	1476	1543	1691	1801	1874	2021	2132		
			9	714	892	1031	988	1165	1304	1153	1331	1470	1299	1476	1616	1624	1801	1941	1955	2132	2271		
			12	781	986	1146	1054	1259	1420	1220	1425	1585	1366	1571	1731	1691	1896	2056	2021	2226	2387		
	WR-900	914	3	761	928	1038	1167	1334	1445	1409	1576	1687	1612	1779	1890	2082	2249	2359	2560	2727	2838	65	20.5
			6	897	1110	1270	1303	1517	1676	1545	1759	1918	1748	1962	2121	2218	2432	2591	2696	2910	3069		
			9	1013	1270	1469	1420	1676	1876	1662	1918	2118	1865	2121	2321	2334	2591	2791	2813	3069	3269		
			12	1110	1406	1637	1517	1813	2043	1759	2055	2285	1962	2258	2488	2432	2727	2958	2910	3206	3436		
	WR-1050	1067	3	1038	1256	1414	1580	1809	1967	1909	2135	2293	2191	2417	2575	2830	3057	3215	3474	3700	3858	82	24
			6	1221	1511	1730	1774	2064	2283	2100	2390	2609	2382	2672	2892	3021	3311	3531	3665	3955	4175		
			9	1318	1730	2001	1934	2283	2554	2260	2609	2881	2542	2892	3163	3182	3531	3802	3825	4175	4446		
			12	1511	1914	2228	2064	2467	2781	2390	2793	3107	2672	3075	3389	3311	3715	4028	3955	4358	4672		
	WR-1200	1219	3	1358	1651	1851	2084	2379	2580	2504	2802	3002	2867	3165	3366	3700	3998	4198	4546	4844	5045	100	36.2
			6	1593	1974	2257	2322	2702	2985	2744	3125	3408	3108	3488	3771	3940	4321	4604	4787	5167	5450		
			9	1800	2257	2611	2528	2985	3339	2951	3408	3762	3315	3771	4125	4147	4604	4958	4996	5450	5804		
			12	1974	2500	2913	2702	3228	3641	3125	3651	4064	3488	4014	4427	4321	4847	5259	5167	5693	6106		

Convert from L/s → cfm $\quad (L/s)\left(\frac{60\,s}{min}\right)\left(\frac{ft^3}{28.32\,L}\right) = 2.1186 \frac{ft^3}{min}\frac{s}{L}$

← conversion factor

At 2 miles/hr wind speed, Exhaust capacity ≈ 58 L/s

$\left(58 \frac{L}{s}\right)(2.1186) = 123$ cfm

http://www.australmonsoon.com/western/rotary/table2.jpg

Attachment 1
page 2 of 2

Roof-Mount Ventilators, Bases & Duct Fans

For information about roof-mount ventilators, see page 552.

Wind-Driven Rotary-Turbine Ventilators

These turbines spin freely with the slightest breeze, creating a vacuum to suck out stale air and fumes from buildings and ventilating systems. Extra-long fins catch the air more efficiently than other ventilators and are not obstructed by external supports. Mount ventilators on your roof away from wind obstructions.

Steel ventilators have a zinc and aluminum coating for added corrosion resistance, unless noted. Maximum temperature is 150° F, except where noted.

Dia.	cfm ♦	O'all Ht.	Steel	Each	Type 304 Stainless Steel	Each
4"	160	11½"	1992K11●♣	$57.59	1992K42♣	$98.31
6"	170	11¾"	1992K12	43.15	1992K43	92.12
8"	303	13"	1992K14	41.40	1992K45	95.50
10"	472	14½"	1992K16	49.70	1992K47	104.53
12"	680	15½"	1992K17	52.63	1992K48	121.55
14"	927	17½"	1992K18	58.95	1992K49	147.40
16"	1212	20"	1992K21	75.05	1992K52	177.43
18"	1533	22½"	1992K22	88.47	1992K53	217.48
20"	1888	24⅝"	1992K23	93.95	1992K54	234.85
24"	2719	29"	1992K24	123.60	1992K55	309.02
30"	4252	39"	1992K25●	298.47	1992K56	746.17
36"	6123	37"	1992K27●	406.68		

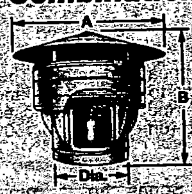
♦ Based on 8 mph wind velocity. ● Galvanized steel, painted gray.
♣ Maximum temperature is 165° F.

Adjustable Ventilator Bases

Use on flat and single-slope roofs up to ... pitch. To install, place the ventilator flange flush with the roof. Then rotate the top section until it is horizontal with the ground. Integral locking ... maintains the slope adjustment. Made of galvanized steel.

(A)	(B)	Ht.		Each
6"	14" Dia.	10"	2231K55	$14[illegible]
8"	16" Dia.	10"	2231K56	14[illegible]
10"	18" Dia.	10"	2231K57	14[illegible]
12"	20" Octagonal	10"	2231K58	14[illegible]
14"	22" Dia.	10"	2231K59	21[illegible]

Combination Power/Siphon Ventilators



Built-in fan provides powerful ventilation. When fan is off and air rushes past, the siphon effect continues to draw air up and out. Conical cap sheds rain and snow. Install on a stack or base. All are direct-drive, galvanized steel with an access door for servicing. Motors are totally enclosed fan-cooled and rpm is 172[illegible]. Units run on ¼ hp (unless noted), 115 VAC, single phase, 60 Hz. Max. temp. is 165° F.

Dia.	Max. cfm	(A)	(B)	Sones	Amps	Ventilators	Each	Bird Screens	Each
12"	1050	24"	22"	3.0	4.7	1981K31	$538.63	1981K41	$59[illegible]
14"	1540	28"	26"	5.0	4.7	1981K37	537.75	1981K47	53[illegible]
24"	5300	48"	40"	5.0	4.7	1981K34	1025.14	1981K44	12[illegible]
30"	6500	60"	45"	5.0	5.2	1981K35★	1253.75	1981K45	1[illegible]

★ Operates on ⅓ hp.

Ventilator Bases

Constructed of galvanized steel, these bases have a square bottom and round top. Slope and flat bases have a 4" wide flashing flange to simplify installation.

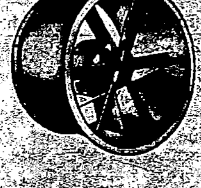
To Order: For slope bases, please specify pitch. To determine pitch, calculate rise over run. To do so, measure the run in any increment of 12". Then measure the rise (see illustration above). For example, if rise = 70" and run = 120", the pitch of your roof is 70/120, or 7/12.

(A)	(B)	Ht.	Slope Bases	Each	
8"	10"	10"	2003K31	$41.18	2003K[illegible]
10"	12"	10"	2003K32	43.14	200[illegible]
12"	14"	10"	2003K33	45.10	2[illegible]
14"	16"	10"	2003K34	64.71	
16"	18"	10"	2003K35	92.16	
18"	22"	10"	2003K36	98.0[illegible]	
20"	24"	10"	2003K37	109.8[illegible]	
24"	30"	12"	2003K38	133.3[illegible]	
30"	36"	12"	2003K39	198.0[illegible]	
36"	42"	14"	2003K41	229.41	

About Duct Fan Sound Levels

Sound levels of duct fans serve as a starting point in determining how loud a fan will actu... experience will be significantly impacted by your ventilation system. For example, you can re... room by as much as 20 decibels (dB) if the inlet and outlet are ducted outside of that room.

Direct-Drive Axial Duct Fans



These direct-drive fans have spark-resistant cast-aluminum propellers and heavy duty ste... have eight evenly spaced 7/16" mounting holes for easy installation (hardware not included). Moto... fan-cooled and operate on 60 Hz. Maximum temperature is 104° F.

Also Available: Fans with hazardous-location motors for Class I, Group D, and Class II, Group F a... Please ask for 1927K73 and specify duct dia.: 12", 15", 18", or 24"; and power supply: 115/230 VAC, 230/460 VAC, 3 phase.

cfm @ Static Pressure (SP) ⅛"	Max. SP	For Duct Dia.	O'all Lg.	Flange OD	dB @ 10 ft.	hp	rpm	115/230 VAC, Single Phase Amps		Each	230/46[illegible] 3 Phase Amps		
2031	1442 @ ⅞"	12"	20"	14½"	86	½	3450	7.0/3.5	1927K51	$428.81	2.0/1.0	1927K52	[illegible]
2850	2390 @ ⅜"	15"	20"	17½"	81	½	1750	7.4/3.7	1927K53	508.06	2.0/1.0	1927K54	4[illegible]
4135	3730 @ ¼"	18"	20"	20½"	80	¾	1750	8.2/4.1	1927K14	558.46	3.0/1.5	1927K56	52[illegible]
5980	3600 @ ⅝"	24"	21"	27¼"	84	¾	1750	8.2/4.1	1927K16	654.24	3.0/1.5	1927K57	61[illegible]

Compact Direct-Drive DC Axial Duct Fans

These compact fans slip directly into a duct run. Reinforced plastic construction resists corrosion. Fans measure 6... Lg. x 5¼" Wd. x 4⅜" Ht. and have a maximum temperature of 130° F. Mount them to any flat surface—each foot has ... 3/16" x ⅜" hole for mounting (hardware not included). Motors are 60 watt and operate on 12 VDC, 5 amps.

cfm @ 0" Static Pressure (SP)	For Duct Dia.	dB		Ea...
140	3"	68	19665K11	$39[illegible]
240	4"	68	19665K21	44[illegible]

Belt-Drive Axial ...

These dependable fans are ... fan-cooled and run on 60 Hz...

Steel/Aluminum Fans—Th... pellers are spark-resistant ca...

Also Available: Fans with ... Please ask for 2097K85 and s... or 230/460 VAC, 3 phase. P...

Stainless Steel Fans—With... vironments better than the s...

cfm @ Static Pressure (SP) ⅛"	Max. SP
Steel/Aluminum Fans	
1,564	1428 @ ¼"
3,113	2526 @ ½"
3,626	2886 @ ⅝"
4,837	3735 @ ⅝"
7,581	1494 @ 1"
14,688	9845 @ 1"
Type 304 Stainless St...	
1,866	1497
4,802	385[illegible]
7,955	[illegible]

Direc...

Duct-Reel Exhausters

Keep exhaust duct off the floor and out of your way... Exhausters have spring-operated reels that mount ... the ceiling or wall. They come with 20 ft. of duct that locks when pulled out; rewinds when pulled again. Ideal for removing vehicle exhaust fumes. Intake nozzle is 6" dia. Blower motor operates on 115 VAC and has connections for hard wiring. Units come with a hose reel, flexible duct, hose clamp, tailpipe adapter with clip assembly, blower and blower mounting kit. Overall size is 25" Wd. x 28" Dp. x 31" Ht.

cfm @ 0" SP	hp	Duct Dia.	Lg.		Each
600	⅓	4"	20'	2272K21	$1816.79
600	⅓	5"	20'	2272K22	1995.70
825	1	6"	20'	2272K23	2462.93

Accessories
Swivel wall bracket
Swivel wall bracket fo...

cfm @ 0" SP	hp	Inlet Dia.
115/208/230 VAC, 60 Hz, 1 Ph		
370	1½	4"
485	2	5"
630	1½	5"
800	2	6"
208/230/460 VAC, 60 Hz, 3 Ph		
630	1½	5"
800	2	6"

★ Furnished with a cord, plug, and switch.

Attachment 2

Landfill Gas Generation Estimate

SCS ENGINEERS

SHEET 1 of 2

CLIENT	PROJECT	JOB NO.
Hardee County	Vertical Landfill Expansion Landfill Gas Vent System Design	09199033.09 Task 3

SUBJECT	BY	DATE
LFG Generation Estimate for the Existing Landfill	D. Penoyer	12/12/2003
	CHECKED AMB	DATE 2/20/04

OBJECTIVE: Estimate LFG generation rate for use in designing a passive vent system for the existing landfill to accommodate the landfill expansion liner system.

APPROACH:

1. Compile disposal rates for Hardee County Landfill from date of site opening through present.
2. Using the U.S. EPA Landfill Gas Emission Model (LandGEM), estimate the projected LFG generation rate.

KNOWN:

1. Waste density (in-place) = 43 lb/cu ft (based on past aerial surveys, volume consumption calculations, and waste receipts)
2. Waste filling began in 1983
3. Existing topography dated April 2003
4. Assume that daily and intermediate cover soils consume approximately 10% of gross volume.

SOLUTION:

1. **Current Volume of Waste in Place** Page 3 of 8
   a. See attached calculations by J. O'Neill. (~~Attachment~~ 1)
   b. Based on site records, assume that the original landfill configuration consisted of a pit with 1:1 side slopes.
   c. Knowing that the top of the subsurface clay layer is at El. 72', assume that the bottom of the landfill was excavated to this depth (ie, bottom of landfill is at El. 72')
   d. Existing ground surface is approx. 82.4'
   e. Using AutoCAD to calculate the volume between the assumed bottom surface of the landfill and the existing contours as of April 2003: Pg 3 of 8
      In-Place Volume of waste = 775,000 cu yd (See ~~Attachment~~ 1)
2. **Estimated Current Tonnage of Waste in Place**
   a. Assume that cover soils consume approximately 10% of volume. Remaining is refuse.
      Tonnage = (775,000 cu yd)(1 - 0.10)(27 cu ft/cu yd)(43 lb/cu ft)(1 ton/2000 lb) = 404,899 tons in place
3. **Known Waste Disposal Rates (1996-2002)**
   a. Based on site life calculations by L. Kennelly dated 9/5/03, the known waste disposal rates for 1996 thru 2002 are: (See ~~Attachment 2~~)
      Page 7 of 8

Year	Tons	Mg
1996	14,281	12,956
1997	13,896	12,606
1998	14,699	13,335
1999	16,061	14,570
2000	16,165	14,665
2001	18,844	17,095
2002	20,051	18,190
Total	113,997	103,417

SCS ENGINEERS

SHEET 2 of 2

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Gas Vent System Design	09199033.09 Task 3

SUBJECT	BY	DATE
LFG Generation Estimate for the Existing Landfill	D. Penoyer	12/12/2003
	CHECKED AMB	DATE 2/20/04

3. Assumed Historical Filling Rate (1983-1995)

- Assume an equal filling rate over the 13-year period from 1983-1995

Total estimated tons in place =	404,899
Waste Disposed 1996 through present =	113,997
Total estimated tons disposed 1983-2002 =	290,902

Assumed annual waste disposal rate (1983-1995) = 290,902 tons / 13 yrs = 22,377 tons/year

4. Future Waste Projections

- Assume an annual increase in waste receipts based on the projected population growth and per capita waste generation rate. (See ~~Attachment 3~~ Page 7 of 8)

- Based on preliminary schedule for cell construction and closure, Hardee County anticipates continuing waste disposal in the existing landfill until the end of 2005.

Year	Tons	Mg
2002	20,051	18,190
2003	20,387	18,495
2004	20,809	18,878
2005	21,236	19,265
Total	82,483	74,828

- Because waste filling will end in 2005 in the existing landfill, and because we are only interested in LFG venting for the existing landfill at this time, do not model LFG generation for waste that will be buried in the expansion area.

CONCLUSION

Based on the EPA LandGEM, the estimated LFG generation rates from the existing landfill are as follows.

Year	LFG Generation (scfm)
2004	140
2005	145
2006	149
2007	143
2008	138

← (See Page 8 of 8)

Therefore, the passive vent system needs to be designed to handle a maximum LFG generation rate of 149 scfm, which is expected to occur in 2006.

Attachment 2

SCS ENGINEERS

SHEET 3 OF 8

CLIENT Hardee Co	PROJECT EXPANSION PROJECT	JOB NO. 09199033.09
SUBJECT Title V WASTE IN PLACE	BY JHo	DATE
	CHECKED D. Peroyer	DATE 10/24/03

ESTIMATED IN-PLACE WASTE

CURRENT

1) – First placement of waste 1983 to exist (2003) — 775,000 cy ✓
– Liner EL ~ 82.4 1:1 sideslopes
– Assumed depth of waste EL 72
– Existing topography from survey dated (April 2003)

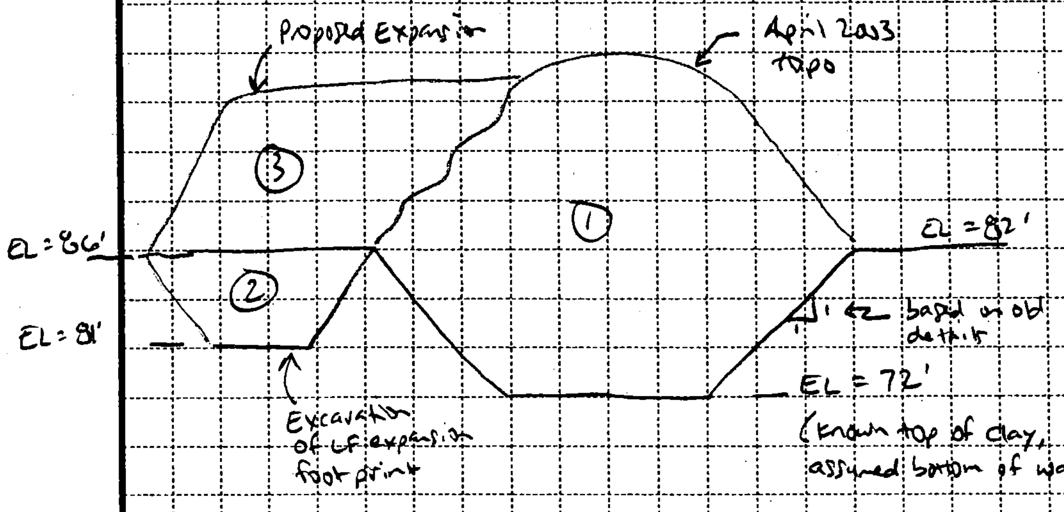
EXPANSION

2) – From ground surface (~EL 86) to expansion bottom (~EL 81) (3:1 sideslope 10 AC) — 51,000 cy ✓

3) – From ground surface (EL 86) to top of intermediate cover Final Buildout EL 155 3:1 slopes — 1,060,400 cy ✓

1,886,400 cy ✓

(Inplace waste + cover + intermed cover soils)



Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
finalbuild							
	final	exist2003	finalbuildout	800	1057971	1057171 (F)	Grid
				894	1059878	1058984 (F)	Composite
				879	1061266	1060387 (F)	Prismoidal

Attachment 2
page 4 of 8

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
pond							
	titlev-pond	bottomcollect-finalrev	temp-pond bottom				
				0	50541	50541 (F)	Grid
				0	50878	50878 (F)	Composite
				0	50819	50819 (F)	Prismoidal

Site Volume Table: Unadjusted

Site	Stratum	Surf1	Surf2	Cut yards	Fill yards	Net yards	Method
lineredge							
	titlev-exist	bottomtitlev	exist2003				
				0	773857	773857 (F)	Grid
				0	774955	774955 (F)	Composite
				0	774878	774878 (F)	Prismoidal

Attachment 2
Page 6 of 8

Attachment 2
Sheet 7 of 8

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Site Life Estimates	LEK	9/5/2003
	CHECKED D. Perry	DATE 10/24/03

- DHP 10/24/03

YEAR	POPULATION[1]	WASTE DISPOSED OF IN CLASS I LANDFILL (tons/yr)	ANNUAL WASTE TONNAGE PER CAPITA
1996	24,958	14,281.20	0.572
1997	25,408	13,895.88	0.547
1998	26,134	14,699.13	0.562
1999	26,407	16,061.17	0.608
2000	26,938	16,165.36	0.600
2001	26,921	18,843.71	0.700
2002	27,152	20,051.17	0.738

Recent historical filling rates

Mandatory collection started

TONS PER CAPITA[2]: 0.738

	Existing Landfill Footprint		Landfill Expansion Footprint	
Gross Airspace Available[3] =	173,894	CY	1,060,387	CY
Area of Footprint =	570,636	SF	435,600	SF
Intermediate Cover Depth =	18	inches	18	inches
Volume of Intermediate Cover =	31,702	CY	24,200	CY
Net Airspace with Intermediate Cover =	142,192	CY	1,036,187	CY
Estimated Percent of Daily Cover =	5%		5%	
Net Airspace Available =	135,082	CY	984,378	CY
Waste Density[5] =	43	lb/CF	52.5	lb/CF

Projected Outside Waste
301.5 tons/day
94,068 tons/year
163,652 CY/year

YEAR	POPULATION[1]	WASTE DISPOSED OF IN CLASS I LANDFILL (tons/yr)[5]	AIRSPACE CONSUMED MSW (CY)	AIRSPACE CONSUMED OUTSIDE WASTE (CY)	AVAILABLE AIRSPACE W/OUT EXPANSION (CY)	AVAILABLE AIRSPACE W/ EXPANSION (CY)
2002	27,152	20,051	34,541	--	135,082	--
2003	27,607	20,387	35,120	--	99,962	--
2004	28,178	20,809	35,846	--	64,116	--
2005	28,756	21,236	36,582	--	27,534	1,011,912
2006	29,270	21,615	37,236	163,652	-9,701	811,024
2007	29,712	21,942	37,798	163,652	-47,499	609,574
2008	30,111	22,236	38,305	163,652	-85,805	407,617
2009	30,484	22,512	38,780	163,652	-124,585	205,185
2010	30,866	22,794	39,266	163,652	-163,851	2,267

Projected future MSW acceptance rates

CONCLUSION
The landfill will use the available airspace by 2011.

[1] Source : Florida Legislative Office of Economic and Demographic Research

[2] The 2002 quantity represents the tonnage received when mandatory collection was instated; therefore, the 2002 data point is the only representative annual waste tonnage per capita point.

[3] Airspace computed using March 2003 topography versus the permitted final buildout.

[4] Waste density for baled waste is based upon average bale weight (2150 lb)/(bale size 2.6' x 3.8' x 5.1')

[5] Waste quantity disposed in landfill (baled and loose, respectively) provided by Hardee County.

f:\project\hardee\calcs\Expansionsitelife1.xls

Attachment 2, pg 8 of 8
-D. Peragon revised 12/12/03

PROJECTED LFG GENERATION RATE, EXISTING LANDFILL ONLY
Hardee County Landfill, Hardee County, Florida

Year	Disposal Rate (tons/yr)	Refuse In-Place (tons)	Disposal Rate (Mg/yr)	Refuse In-Place (Mg)	Methane Generation Rates (m^3/yr)	LFG Generation Rates (cfm)
1983	22,377	0	20,300	0	0.000E+00	0
1984	22,377	22,377	20,300	20,300	8.120E+04	11
1985	22,377	44,754	20,300	40,600	1.592E+05	21
1986	22,377	67,131	20,300	60,900	2.342E+05	31
1987	22,377	89,508	20,300	81,200	3.062E+05	41
1988	22,377	111,885	20,300	101,500	3.754E+05	50
1989	22,377	134,262	20,300	121,800	4.419E+05	59
1990	22,377	156,639	20,300	142,101	5.057E+05	68
1991	22,377	179,016	20,300	162,401	5.671E+05	76
1992	22,377	201,393	20,300	182,701	6.261E+05	84
1993	22,377	223,770	20,300	203,001	6.827E+05	92
1994	22,377	246,147	20,300	223,301	7.372E+05	99
1995	22,377	268,524	20,300	243,601	7.895E+05	106
1996	14,281	290,901	12,956	263,901	8.397E+05	113
1997	13,896	305,182	12,606	276,856	8.586E+05	115
1998	14,699	319,078	13,335	289,463	8.754E+05	118
1999	16,061	333,777	14,570	302,797	8.944E+05	120
2000	16,165	349,838	14,665	317,368	9.176E+05	123
2001	18,844	366,003	17,095	332,032	9.403E+05	126
2002	20,051	384,847	18,190	349,127	9.718E+05	131
2003	20,387	404,898	18,495	367,317	1.006E+06	135
2004	20,809	425,285	18,878	385,812	1.041E+06	140
2005	21,236	446,094	19,265	404,690	1.076E+06	145
2006	0	467,330	0	423,955	1.111E+06	149
2007	0	467,330	0	423,955	1.067E+06	143
2008	0	467,330	0	423,955	1.025E+06	138
2009	0	467,330	0	423,955	9.849E+05	132
2010	0	467,330	0	423,955	9.463E+05	127
2011	0	467,330	0	423,955	9.092E+05	122
2012	0	467,330	0	423,955	8.736E+05	117
2013	0	467,330	0	423,955	8.393E+05	113
2014	0	467,330	0	423,955	8.064E+05	108
2015	0	467,330	0	423,955	7.748E+05	104
2016	0	467,330	0	423,955	7.444E+05	100

ESTIMATED NMOC CONCENTRATION IN LFG:	4000	ppmv
ASSUMED METHANE CONTENT OF LFG:	50%	
SELECTED DECAY RATE CONSTANT:	0.04	
SELECTED ULTIMATE METHANE RECOVERY RATE:	3,203.7	ft3/ton
METRIC EQUIVALENT:	100	cu m/Mg

Conversions:	**35.314667**	**cu ft per cu m**
	1.1023113	**ton per Mg**
	32.037	**cu ft/ton per cu m/Mg**

NOTE:
This model assumes that waste disposal in the existing landfill will end in late 2005, at which time waste filling will move to the expansion area.

SECTION P

LANDFILL FINAL CLOSURE REQUIREMENTS

It is Hardee County's intention to perform the closure of the currently permitted Class I landfill unit once it meets its designed and permitted capacity. Sheet 5 of the permit drawing shows the proposed final elevations of the Class I landfill after closure construction, the landfill gas system layout, and the closure cap design. According to Rule 62-701.600(2) FAC, Hardee County will perform the closure of the Class I landfill according to the following schedule.

P.1 CLOSURE SCHEDULE REQUIREMENTS

P.1(a) Notice of Closure to FDEP

At least one year prior to the projected date when waste will no longer be accepted, and/or when any portions of the landfill reaches design dimensions, Hardee County will notify the FDEP. The written notification to the FDEP will include a formal closure schedule.

P.1(b) Notice to Users

At least 120 days prior to the date when wastes will no longer be accepted, the following steps will be taken:

1. All users will be notified of the intent to close, date of closing, alternative disposal sites, and the person responsible for the closing.

2. Signs will be posted at the landfill containing the above information.

P.1(c) Notice to Public

Ten (10) days prior to the date when wastes will no longer be accepted, a notice of the closing will be published in the legal advertising section of a newspaper of general circulation in Hardee County. Proof of that publication will be provided to the FDEP within 7 days of publication.

P.2 CLOSURE PERMIT GENERAL REQUIREMENTS

P.2(a) Closure Application

At least 90 days before the date when wastes will no longer be accepted, Hardee County will submit an application for final closure to the FDEP.

P.2(b) Closure Plan

The conceptual temporary final grading plan is shown on the drawings.

When applicable, the closure permit application will contain:

1. A closure report
2. A closure design plan
3. A closure operation plan
4. Closure procedures
5. A plan for long-term care
6. Demonstration of proof of financial responsibility for long term care

P.3 CLOSURE REPORT REQUIREMENTS

At least 90 days before the date when wastes will no longer be accepted, Hardee County will submit a report for final closure to the FDEP.

P.3(a) General Information

The report of final closure will address the following:

1. Identification of the landfill
2. Location, description, and vicinity map
3. Total acreage of waste disposal areas and total acreage of landfill property
4. Legal description of property on which the landfill is located
5. History of the landfill to include dates of construction and a description of the location and sequence of fill operations
6. Identification of the types of wastes disposed of in the completed landfill based on records, composition studies, operator memory, major waste depositors, special handling records, and other services.

P.3(b) Geotechnical Report and Water Quality Monitoring Plan

A water quality monitoring plan and a geotechnical report will be prepared for submittal with the closure permit application.

P.3(c) Land Use

An updated land use information report will be prepared for submittal with the closure permit application.

P.3(d) Gas Migration

A report on actual or potential gas migration including detailed descriptions of test and investigational methods used will be submitted to the FDEP at least 90 days before the date when wastes will no longer be accepted.

Investigational methods utilized will include, but not be limited to, the following:

1. Gas migration test points will be located along property boundaries, as needed, within 100 feet of the property boundary.
2. Each test well will extend at least three (3) feet below ground surface.
3. If sand, gravel, or more gas permeable soil strata interconnects the waste deposit with the property boundary, multiple depth sampling will be performed.
4. Methane concentrations will be determined as a percent of the lower explosive limit.

P.3(e) Effectiveness of Landfill Design

A report assessing the effectiveness of the landfill design and operations will be submitted at least 90 days before the date when wastes will no longer be accepted. It will include:

1. Results of geotechnical investigation.
2. Effects of surface water runoff, drainage patterns, and stormwater controls.
3. Extent and effects of methane gas migration, lower explosive limit percentage readings in migration paths, and description of the gas venting system.
4. Condition of existing cover, thickness and types of soils or materials used for cover, and effectiveness of cover material as a leachate control mechanism.
5. The nature and characteristics of the waste disposed of at the landfill.

P.4 CLOSURE DESIGN REQUIREMENTS

A closure design plan consisting of engineering plans and a report on closing procedures that apply to the final closing of the waste disposal units will be submitted at least 90 days before the date when wastes will no longer be accepted. The design will include:

1. Plan drawing showing phases of site closing.

2. Drawings showing existing topography as proposed final grades.

3. Provisions to close units when they reach approved final dimensions.

4. Final elevations before settlement.

5. Final Side Slope Design.

6. Final cover installation plan to including:

   (a) CQA plan for installing and testing final cover.

   (b) Schedule for installing final cover after final receipt of waste.

   (c) Description of drought-resistant species to be used in the vegetative cover.

   (d) Top gradient design to maximize runoff and minimize erosion.

   (e) Provisions for cover material to be used for final cover maintenance.

7. Final Cover Design - the final cover design will comply with Chapter 62-701.600(5)(g). The design will address:

   (a) Protective soil layer design.

   (b) Barrier soil layer design.

   (c) Erosion control vegetation.

   (d) Geomembrane/soil barrier layer design.

   (e) Geosynthetic clay liner design if used.

   (f) Stability analysis of the cover system and the disposed waste.

8. Proposed method of storm water control according to Chapter 62-25 F.A.C.

9. Proposed method of access control.

10. Description of proposed final use of the closed landfill if applicable.

11. Description of the proposed gas management system, which complies with the current Rule.

P.5 CLOSURE OPERATION PLAN

A Closure Plan will be submitted at least 90 days before the date when wastes will no longer be accepted. The plan will include:

1. Detailed description of actions that will be taken to close the landfill.
2. Time schedule for completion of closing and long term care.
3. Description of method for demonstrating financial responsibility.
4. Listing of any additional equipment and/or personnel needed to complete closure.
5. Development and implementation of the water quality monitoring plan required by the Rule.
6. Development and implementation of a routine gas monitoring program as required in the Rule.

SECTION Q

CLOSURE PROCEDURES

This application is for landfill expansion at the Hardee County Landfill. This section is not applicable.

SECTION R

LONG TERM CARE REQUIREMENTS

R.1 GAS COLLECTION AND MONITORING

A passive gas collection and venting system will be constructed before closure. The gas venting system and the existing gas monitoring system will be maintained for the duration of the long-term care period as required by Rule 62-701.620(5), FAC.

R.2 RIGHT OF PROPERTY ACCESS

In accordance with Rule 62-701.620 (6), FAC, Hardee County will retain the right of entry to the landfill property for the long-term care period, after termination of solid waste operations, for inspection, monitoring and maintenance of the site.

R.3 SUCCESSORS IN INTEREST

If any person or entity, other than the County, acquires the ownership or operation of the landfill, they shall be subject to all requirements of the landfill permit and applicable regulations, including maintenance, and provide proof of financial responsibility as required by Rule 62-701.620(7), FAC.

R.4 REPLACEMENT OF MONITORING DEVICES

If a monitoring well or monitoring point cited by the permit is destroyed or becomes inoperable, Hardee County will notify the FDEP in writing. Inoperative monitoring devices shall be replaced with functioning devices within 60 days of the discovery or as required by Rule 62-701.620(9), FAC.

R.5 COMPLETION OF LONG-TERM CARE

Following completion of the long-term care period, the County will notify the FDEP that the long term care has been completed in accordance with the closure permit and that a certification to that effect, signed and sealed by a professional engineer, has been placed in the operating record.

SECTION S

FINANCIAL RESPONSIBILITY REQUIREMENTS

S.1 COST ESTIMATES

Each year, closure and long-term care cost estimates are prepared for the facility in accordance with Rule 62-701.630(3) and (4), FAC. In preparing the closure cost estimates, the following assumptions are made:

- The closure cost estimates include the permitted areas of the landfill.
- Construction of the closure will be performed under contract by a private contractor.
- The cost estimates are prepared for the time period during the landfill operation when the extent and manner of the landfill's operation make closing the most expensive.
- The closure cost estimate assumes a geomembrane cover system over the entire Class I disposal area.
- Long-term care costs include land surface care, landfill gas control, leachate control, groundwater and surface water monitoring, and administration.
- The current estimate of closure and post-closure costs is included in Attachment S-1.

S.2 ANNUAL COST ESTIMATES

Annual cost adjustment statements are provided to FDEP in accordance with Rule 62-701.630(4), FAC. The statement addresses closure and long-term care costs.

S.3 FUNDING MECHANISMS

The County will continue to use an escrow account for funding closure and post-closure of the landfill.

ATTACHMENT S-1

FINANCIAL ASSURANCE

DEP Form #	62-701.900(28)
Form Title	Financial Assurance Cost Estimate Form
Effective Date	05-27-01
DEP Application No.	(Filled by DEP)

Florida Department of Environmental Protection

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, FL 32399-2400

FINANCIAL ASSURANCE COST ESTIMATE FORM

Date: April 8, 2004 Date of FDEP Approval: ________

I. GENERAL INFORMATION:

Facility Name: Hardee County Landfill WACS or GMSID #.: ________
Permit / Application No.: 38414-002-SO Expiration Date: 11/19/2003
Facility Address: 685 Airport Road, Wauchula, FL 33873
Permittee: Hardee County
Mailing Address: 685 Airport Road, Wauchula, FL 33873

Latitude: 27°34'10" Longitude: 81°47'01" or UTM: ________

Solid Waste Disposal Units Included in Estimate:

Phase / Cell	Acres	Date Unit Began Accepting Waste	Design Life of Unit From Date of Initial Receipt of Waste
Phase I	12.5	1983	23
Phase II Section I	5	2006	5

Total Landfill Acreage included in this estimate. ______ Closure ______ Long-Term Care

Type of Landfill: X Class I ______ Class III ______ C&D Debris

II. TYPE OF FINANCIAL ASSURANCE DOCUMENT (Check Type)

______ Letter of Credit *
______ Performance Bond *
______ Guaranty Bond *
______ Insurance Certificate
X Escrow Account
______ Trust Fund Agreement

*Indicates mechanisms that require use of a Standby Trust Fund Agreement

III. ESTIMATE ADJUSTMENT

40 CFR Part 264 Subpart H as adopted by reference in Rule 62-701.630, Florida Administrative Code sets forth the method of annual cost estimate adjustment. Cost estimates may be adjusted by using an inflation factor or by recalculating the maximum costs of closure in current dollars. Select on of the methods of cost estimate adjustment below.

☐ **(a) Inflation Factor Adjustment**

Inflation adjustment using an inflation factor may only be made when a Department approved closure cost estimate exists and no changes have occurred in the facility operation which would necessitate modification to the closure plan. The inflation factor is derived from the most recent Implicit Price Deflator for Gross National Product published by the U.S. Department of Commerce in its survey of Current Business. The inflation factor is the result of dividing the latest published annual Deflator by the Deflator for the previous year. The inflation factor may also be obtained from the Solid Waste Financial Coordinator at (850)-488-0300.

This adjustment is based on the Department approved closure cost estimate dated: ____________________

Latest Department Approved Closure Cost Estimate:		Current Year Inflation Factor		Inflation Adjusted Closure Cost Estimate:
____________	x	____________	=	$0.00

This adjustment is based on the Department approved long-term care cost estimate dated: ____________________

Latest Department Approved Annual Long-Term Care Cost Estimate:		Current Year Inflation Factor		Inflation Adjusted Annual Long-Term Care Cost Estimate
____________	x	____________	=	$0.00
Number of Years of Long Term Care Remaining:			x	____________
Inflation Adjusted Long-Term Care Cost Estimate:			=	$0.00

☒ **(b) Recalculate Estimates** (see section V)

IV. CERTIFICATION BY ENGINEER

This is to certify that the Financial Assurance Cost Estimates pertaining to the engineering features of the this solid waste management facility have been examined by me and found to conform to engineering principals applicable to such facilities. In my professional judgement, the cost Estimates are a ture, correct and complete representation of the financial liabilities for closing and long-term care of the facility and comply with the requirements of Florida Administrative Code (F.A.C.), Rule 62-701.630 and all other Department of Environmental Protection rules, and statutes of the State of Florida. It is understood that the Financial Assurance Cost Estimates shall be submitted to the Department annually, revised or adjusted as required by Rule 62-701.630(4), F.A.C.

Signature of Engineer

Joseph H. O'Neill, P.E., Project Manager
Name & Title (please type)

052049
Florida Registration Number (affix seal)

SCS Engineers
3012 U.S. Highway 301 North, Suite 700
Tampa, Florida 33619
Mailing Address

813-621-0080
Telephone Number

Signature of Owner/Operator

Janice Williamson, Solid Waste Director
Name & Title (please type)

(863)773-5089
Telephone Number

V. RECALCULATE ESTIMATED CLOSING COST

For the time period in the landfill operation when the extent and manner of its operation makes closing **most expensive**.

**** Third Party Estimate / Quote must be provided for each item**
**** Costs must be for a third party providing all material and labor**

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
1. Proposed Monitoring Wells	(Do not include wells already in existence.)			
	EA	0.00	0.00	$0.00
			Subtotal Monitoring Wells:	$0.00
2. Slope and Fill (bedding layer between waste and barrier layer):				
Excavation	CY	0.00	0.00	$0.00
Placement and Spreading	CY	29,400	0.85	$24,990.00
Compaction	CY	29,400	1.00	$29,400.00
Off Site Material	CY	29,400	4.59	$134,946.00
Delivery	CY	0.00	0.00	$0.00
			Subtotal Slope and Fill:	$189,336.00
3. Cover Material (Barrier Layer):				
Off-Site Clay	CY	0.00	0.00	$0.00
Synthetics - 40 mil	SY	65,100	4.13	$268,863.00
Synthetics - GCL	SY	0.00	0.00	$0.00
Synthetics - Geonet Biplanar Geocomposite	SY	89,800	4.17	$374,466.00
Synthetics - Other 60-mil	SY	24,700	4.82	$119,054.00
			Subtotal Barrier Layer Cover:	$762,383.00
4. Top Soil Cover:				
Off-Site Material	CY	58,800	4.59	$269,892.00
Delivery	CY	0.00	0.00	$0.00
Spread	CY	58800.00	1.57	$92,316.00
			Subtotal Top Soil Cover	$362,208.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
5. Vegetative Layer				
Sodding	SY	88,033	1.67	$147,015.11
Hydroseeding	AC	0.00	0.00	$0.00
Fertilizer	AC	0.00	0.00	$0.00
Mulch	AC	0.00	0.00	$0.00
Other	SY	0.00	0.00	$0.00
			Subtotal Vegetative Layer:	$147,015.11
6. Stormwater Control System:				
Earthwork	CY	3,100	6.34	$19,654.00
Erosion Control	SF	0	0.00	$0.00
Piping	LS	1.00	32,700.00	$32,700.00
Ditches	LS	0.00	0.00	$0.00
FDOT Structures	LS	1.00	21,900.00	$21,900.00
Other	LS	1.00	3,500.00	$3,500.00
			Subtotal Stormwater Controls:	$77,754.00
7. Gas Controls: Passive				
Wells	VF	368	231.00	$84,892.50
Pipe and Fittings	LF	0.00	0.00	$0.00
Monitoring Probes	EA	0.00	0.00	$0.00
NSPS/Title V requireme	LS	0.00	0.00	$0.00
			Subtotal Passive Gas Control:	$84,892.50

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
8. Gas Control: Active Extraction				
Traps	EA	0.00	0.00	$0.00
Sump	EA	0.00	0.00	$0.00
Flare Assembly	EA	0.00	0.00	$0.00
Flame Arrestor	EA	0.00	0.00	$0.00
Mist Eliminator	EA	0.00	0.00	$0.00
Flow Meter	EA	0.00	0.00	$0.00
Blowers	EA	0.00	0.00	$0.00
Collection System	LF	0.00	0.00	$0.00
Other (describe)		0.00	0.00	$0.00
			Subtotal Active Gas Extraction:	$0.00
9. Security System				
Fencing	LF	0.00	0.00	$0.00
Gate(s)	EA	0.00	0.00	$0.00
Sign(s)	EA	0.00	0.00	$0.00
			Subtotal Security System:	$0.00
10. Engineering:				
Closure Plan report	LS	1.00	47,200.00	$47,200.00
Certified Engineer	LS	0.00	0.00	$0.00
NSPS/Title V Air Permit	LS	0.00	0.00	$0.00
Final Survey	LS	1.00	11,000.00	$11,000.00
Certification of Closure	LS	1.00	13,500.00	$13,500.00
Other (detail) (Bidding Services)	LS	1.00	12,300.00	$12,300.00
			Subtotal Engineering:	$84,000.00

11. Professional Services

	Contract Management		Quality Assurance		
	Hours	LS	Hours	LS	TOTAL
P.E. Supervisor	160	15,680.00	0	0.00	$15,680.00
On-Site Engineer	1950	87,750.00	0	0.00	$87,750.00
Office Engineer	0	0.00	0	0.00	$0.00
On-Site Technician	0	0.00	655	29,475.00	$29,475.00
Administrative	80	3,200.00	0	0.00	$3,200.00
Reimbursables	1	30,200.00	1	20,900.00	$51,100.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	TOTAL
Quality Assurance Testing/Labor	LS	1	43,750.00	$43,750.00

Subtotal Professional Services: $230,955.00

Subtotal of 1-11 Above: $1,938,543.61

12. Contingency   % of Total   15%

Closing Cost Subtotal: $2,229,325.15

13. Site Specific Costs (explain)

Waste Tire Facility	$1,200.00
Materials Recovery Facility	$16,300.00
Household Hazardous Wastes	$12,100.00
	$0.00
Other	$0.00
	$0.00

Subtotal Site Specific Costs: $30,000.00

TOTAL CLOSING COSTS: $2,259,325.15

VI. ANNUAL COST FOR LONG-TERM CARE (Check Term Length)

_____ 5 years _____ 20 years __X__ 30 years _____ Other

See 62-701.600(1)a.1., 62-701.620(1), 62-701.630(3)a. and 62-701.730(11)b. F.A.C. for required term length. For landfills certified closed and Department accepted, enter the remaining long-term care length as "Other" and provide years remaining.

**** Third Party Estimate / Quote must be provided for each item**
**** Costs must be for a third party providing all material and labor**

All items must be addressed. Attach a detailed explanation for all items marked not applicable (N/A).

DESCRIPTION	Sampling Frequency (events/yr.)	Number of Wells	$/Well/Event	$ / Year
1. Groundwater Monitoring (62-701.510(6), and (8)(a))				
Monthly	12	0	0.00	$0.00
Quarterly	4	0	0.00	$0.00
Semi-Annual	2	8	425.00	$6,800.00
Annual	1	0	0.00	$0.00
		Subtotal Groundwater Monitoring:		$6,800.00
2. Surface Water Monitoring (62-701.510(4), and (8)(b))				
Monthly	12	0	0.00	$0.00
Quarterly	4	0	0.00	$0.00
Semi-Annual	2	1	605.00	$1,210.00
Annual	1	0	0.00	$0.00
		Subtotal Surface Water Monitoring:		$1,210.00
3. Gas Monitoring				
Monthly	12	0	0.00	$0.00
Quarterly	4	1	750.00	$3,000.00
Semi-Annual	2	0	0.00	$0.00
Annual	1	0	0.00	$0.00
		Subtotal Gas Monitoring:		$3,000.00

DESCRIPTION	Sampling Frequency (events/yr.)	Number of Wells	$/Well/Event	$ / Year
4. Leachate Monitoring (62-701.510(5), (6)(b) and 62-701.510(8)(c))				
Monthly	12	0	0.00	$0.00
Quarterly	4	0	0.00	$0.00
Semi-Annual	2	1	445.00	$890.00
Annual	1	1	1,275.00	$1,275.00
Other		0	0.00	$0.00
		Subtotal Leachate Monitoring:		$2,165.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
5. Leachate Collection/Treatment Systems Maintenance				
Maintenance				
Collection Pipes	LF	0	0.00	$0.00
Sumps, Traps	EA	9	72.00	$648.00
Lift Stations	EA	0	0.00	$0.00
Cleaning	LS	0.2	23,000.00	$4,600.00
Tanks	EA	2	1,650.00	$3,300.00
Impoundments				
Liner Repair	SY	0	0.00	$0.00
Sludge Removal	CY	0	0.00	$0.00
Aeration Systems	CY	0	0.00	$0.00
Floating Aerators	EA	0	0.00	$0.00
Spray Aerators	EA	0	0.00	$0.00
Disposal				
Off-site (Include Transportation and Disposal)	LS	1	134,200.00	$134,200.00

6. Leachate Collection/Treatment Systems Operation

Operation		Hours	$/Hour	Total
P.E. Supervisor	HR	0	0.00	$0.00
On-Site Engineer	HR	0	0.00	$0.00
Office Engineer	HR	0	0.00	$0.00
On-site Technician	LS	0	0.00	$0.00
Materials	LS	0	0.00	$0.00
Subtotal Leachate Collection/Treatment System Maintenance & Operation:				$142,748.00

7. Maintenance of Groundwater Monitoring Wells

Monitoring Wells	LS	1	180.00	$180.00
Replacement	EA	0.2	2,000.00	$400.00
Abandonment	EA	0	0.00	$0.00
Subtotal Groundwater Monitoring Well Maintenance:				$580.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
8. Gas System Maintenance				
Piping, Vents	LF	0	0.00	$0.00
Blowers	EA	0	0.00	$0.00
Flaring Units	EA	0	0.00	$0.00
Meters, Valves	EA	0	0.00	$0.00
Compressors	EA	0	0.00	$0.00
Flame Arrestors	EA	0	0.00	$0.00
Operation	LS	1	460.00	$460.00
Subtotal Gas System:				$460.00
9. Landscape				
Mowing	AC	105.0	121.50	$12,757.50
Fertilizer	AC	0	0.00	$0.00
Subtotal Landscape Maintenance:				$12,757.50

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
10. Erosion Control & Cover Maintenance				
Sodding	SY	1210.00	1.67	$2,020.70
Regrading	AC	0	0.00	$0.00
Liner Repair	SY	56	8.30	$464.80
Clay	CY	0	0.00	$0.00
		Subtotal Erosion Control and Cover Maintenance:		$2,485.50
11. Storm Water Management System Maintenance				
Conveyance Maintenance	LS	0	0.00	$0.00
		Subtotal Storm Water System Maintenance:		$0.00
12. Security System Maintenance				
Fences	LF	50	21.32	$1,066.00
Gate(s)	EA	1.0	301.00	$301.00
Sign(s)	EA	0	0.00	$0.00
			Subtotal Security System:	$1,367.00
13. Utilities	LS	1	500.00	$500.00
14. Administrative				
P.E. Supervisor	LS	1	1568.00	$1,568.00
On-Site Engineer	HR	0	0.00	$0.00
Office Engineer	HR	0	0.00	$0.00
On-site Technician	LS	1	8640.00	$8,640.00
Other (explain)		0	0.00	$0.00
			Subtotal Administrative:	$10,208.00
15. Contingency	% of Total	$184,281.00	10%	$18,428.10
			Subtotal Contingency:	$18,428.10

16. Site Specific Costs (explain)

	UNIT COST	
	LS	$0.00
	LS	$0.00
	LS	$0.00

ANNUAL LONG-TERM CARE COST ($/Year):	**$202,709.10**
NUMBER OF YEARS OF LONG-TERM CARE	30
TOTAL LONG-TERM CARE COST ($):	**$6,081,273.00**

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT		JOB NO. 09199033.09
SUBJECT Hardee County Landfill		BY JHD	DATE
		CHECKED	DATE

Closure Cost

ITEM (1) Monitoring wells

Quantities	Pricing
Monitoring wells (to be installed during construction no new wells)	NONE

SCS ENGINEERS

SHEET ____ OF ____

CLIENT Hardee County	PROJECT	JOB NO. 09199033.09
SUBJECT Hardee County Landfill	BY JHD	DATE
	CHECKED	DATE

Closure Cost

Item (2) Slope and Fill

Quantities

See Figure

Note: Area (2) will have 60mil (text)/ geocomposite installed as part of vertical expansion

The closure cost will include this material therefore the estimate is conservative

Top area	(1)	95,300 SF	× 1.0	=	95,300 SF
(From CHD)	(2)	210,365 SF	× 1.04	=	218,780 SF
	(3)	203,700 SF	× 1.05	=	213,885 SF
	(4)	168,350 SF	× 1.0	=	168,350 SF
	(5)	92,000 SF	× 1.05	=	96,600 SF
					792,915 SF

Total plan area = 769,715 SF (17.6 AC)

Slope factor

3.16 / 1 / 3 — Increase $\frac{3.16}{3} = 1.05$

3.64 / 1 / 3.5 — $\frac{3.64}{3.5} = 1.04$

Assume 12" across area

$V = 792{,}915\ SF \times \frac{12\ in}{12\ in}(1\ ft) \times \frac{1\ cy}{27\ ft^3}$

$= 29{,}367.2$ cy

Say 29,400 cy

Pricing

Price quote from Hardee Co purchasing

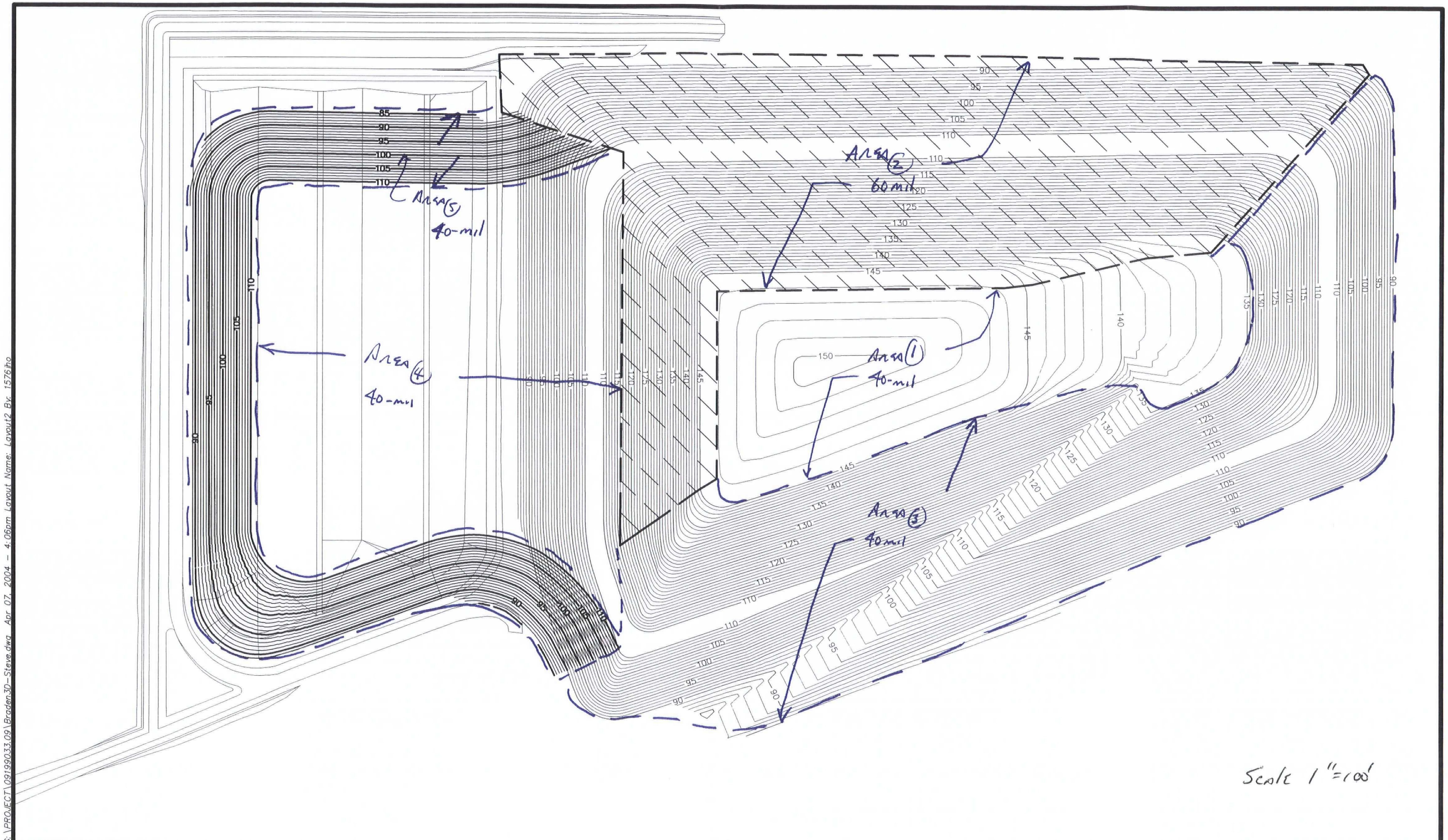
Materials Delivered	\$4.50/cy
Inflation	1.02
	4.59/cy
Spread	0.85/cy
MEANS 02315 120 3020	
Compact	
MEANS	\$0.49/cy
02315 310 5040	\$0.49/cy
Per 6-in layer	
	\$6.42/cy

Compare to FDOT

FDOT

5.98/cy < \$6.42/cy

OK



SCS ENGINEERS

Figure __ – Buildout of Phase II Section I to Elevation 110.0

HARDEE COUNTY PURCHASING DEPT

205 HANCHEY ROAD
WAUCHULA, FL 33873
863/773-5014 Fax 863/773-0322

PURCHASE ORDER: 44681

***** VENDOR *****
T & C FILL DIRT
456 CYPRESS STREET
WAUCHULA FL 33873

***** DELIVER TO *****
HARDEE COUNTY
SOLID WASTE & RECYCLE
685 AIRPORT ROAD
WAUCHULA, FL. 33873

Ordered	Due	Ship Via	FOB	Terms	Customer#
01/02/03	01/02/03			Upon Receipt	

Requisition No.	Vendor No.	Vendor Phone	Vendor Fax	
50320	10186-1	863/773-9446	863/773-3599	

No	Quantity	U/M	Description	Unit Price	Extended	G/L Account
1	1,000.00	YD	FILL DIRT $\boxed{1{,}000 \text{ yd}^3 @ 4.^{50} \text{ per yd}^3}$ INFLATION 1.02 $4^{50} \times 1.02 \Rightarrow \$4.59/\text{cy}$	4.5000	4,500.00	104-534-034-0
				** TOTAL **	4,500.00	

VENDOR INSTRUCTIONS:
1. Mail Invoices to: Hardee County Clerk to BOCC
   Accounting Dept
   412 W Orange St Rm A-205
   Wauchula, Fl 33873
2. Invoices and Packages must bear the P.O. No. Above.
3. Purchases may not exceed the total amount of this order without prior approval by the Purchasing Dept.
4. [A]cceptance of this order includes acceptance of all terms, [pr]ices, delivery instructions, specifications and conditions.
5. State Tax Exempt#: 35-02889-53C EIN: 59-6000632
6. If you have questions, please call 863/773-5014

SPECIAL INSTRUCTIONS:
CONFIRMING ORDER W/TIM, DO NOT DUPLICATE.

Dee Newgent

RSMeans

Heavy Construction Cost Data

18th Annual Edition

Also available on CD-ROM!
(See inside for details)

2004

02300 | Earthwork

02305 | Equipment

			CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2004 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
250	1100	Small equipment, placed in rear of, or towed by pickup truck R01590 -100	A-3A	8	1	Ea.		25.50	10.25	35.75	50.50	250
	1150	Equip up to 70 HP, on flatbed trailer behind pickup truck	A-3D	4	2			51.50	42.50	94	126	
	00	Crane, truck-mounted, up to 75 ton (costs incl both mob & demob)	1 EQHV	3.60	2.222			77.50		77.50	116	
	2100	Crane, truck-mounted, over 75 ton	A-3E	2.50	6.400			196	33	229	335	
	2200	Crawler-mounted, up to 75 ton	A-3F	2	8			245	278	523	675	
	2300	Over 75 ton	A-3G	1.50	10.667			325	390	715	925	
	2500	For each additional 5 miles haul distance, add						10%	10%			
	3000	For large pieces of equipment, allow for assembly/knockdown										
	3001	For mob/demob of vibrofloatation equip, see section 02250-900										
	3100	For mob/demob of micro-tunneling equip, see section 02441-400										
	3200	For mob/demob of pile driving equip, see section 02455-650										
	3300	For mob/demob of caisson drilling equip, see section 02465-950										

02310 | Grading

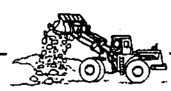
			CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
100	0010	**FINISH GRADING**										100
	0012	Finish grading area to be paved with grader, small area	B-11L	400	.040	S.Y.		1.19	1.08	2.27	3.01	
	0100	Large area		2,000	.008			.24	.22	.46	.60	
	0200	Grade subgrade for base course, roadways		3,500	.005			.14	.12	.26	.35	
	1020	For large parking lots	B-32C	5,000	.010			.29	.30	.59	.77	
	1050	For small irregular areas	"	2,000	.024			.72	.74	1.46	1.92	
	1100	Fine grade for slab on grade, machine	B-11L	1,040	.015			.46	.42	.88	1.16	
	1150	Hand grading	B-18	700	.034			.91	.06	.97	1.49	
	1200	Fine grade granular base for sidewalks and bikeways	B-62	1,200	.020			.56	.12	.68	.99	
	2550	Hand grade select gravel	2 Clab	60	.267	C.S.F.		6.95		6.95	10.80	
	3000	Hand grade select gravel, including compaction, 4" deep	B-18	555	.043	S.Y.		1.15	.07	1.22	1.88	
	3100	6" deep		400	.060			1.60	.10	1.70	2.60	
	3120	8" deep		300	.080			2.13	.14	2.27	3.47	
	3300	Finishing grading slopes, gentle	B-11L	8,900	.002			.05	.05	.10	.13	
	3310	Steep slopes	"	7,100	.002			.07	.06	.13	.17	

02315 | Excavation and Fill

			CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
110	0010	**BACKFILL, GENERAL** R02315 -300										110
	0015	By hand, no compaction, light soil	1 Clab	14	.571	C.Y.		14.85		14.85	23	
	0100	Heavy soil		11	.727			18.90		18.90	29.50	
	0300	Compaction in 6" layers, hand tamp, add to above		20.60	.388			10.10		10.10	15.75	
	0400	Roller compaction operator walking, add	B-10A	100	.120			3.73	1.31	5.04	7.15	
	0500	Air tamp, add	B-9D	190	.211			5.55	.97	6.52	9.70	
	0600	Vibrating plate, add	A-1D	60	.133			3.47	.48	3.95	5.90	
	0800	Compaction in 12" layers, hand tamp, add to above	1 Clab	34	.235			6.10		6.10	9.55	
	0900	Roller compaction operator walking, add	B-10A	150	.080			2.49	.87	3.36	4.74	
	1000	Air tamp, add	B-9	285	.140			3.71	.56	4.27	6.35	
	1100	Vibrating plate, add	A-1E	90	.089			2.31	.46	2.77	4.11	
	3000	For flowable fill, see div. 03310-220										
120	0010	**BACKFILL, STRUCTURAL** Dozer or F.E. loader										120
	0020	From existing stockpile, no compaction										
	2000	75 H.P., 50' haul, sand & gravel	B-10L	1,100	.011	C.Y.		.34	.27	.61	.82	
	2020	Common earth		975	.012			.38	.31	.69	.92	
	2040	Clay		850	.014			.44	.35	.79	1.06	
	2200	150' haul, sand & gravel		550	.022			.68	.55	1.23	1.63	
	2220	Common earth		490	.024			.76	.61	1.37	1.83	
	2240	Clay		425	.028			.88	.71	1.59	2.12	
	2400	300' haul, sand & gravel		370	.032			1.01	.81	1.82	2.42	
	2420	Common earth		330	.036			1.13	.91	2.04	2.72	
	2440	Clay		290	.041			1.29	1.04	2.33	3.10	
	3000	105 H.P., 50' haul, sand & gravel	B-10W	1,350	.009			.28	.32	.60	.77	

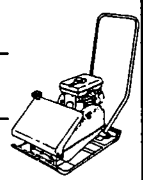
02315 | Excavation and Fill

			CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2004 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P
120	3020	Common earth	B-10W	1,225	.010	C.Y.		.30	.35	.65	.85
	3040	Clay		1,100	.011			.34	.39	.73	.95
	3200	150' haul, sand & gravel		670	.018			.56	.65	1.21	1.56
	3220	Common earth		610	.020			.61	.71	1.32	1.71
	3240	Clay		550	.022			.68	.79	1.47	1.90
	3300	300' haul, sand & gravel		465	.026			.80	.93	1.73	2.25
	3320	Common earth		415	.029			.90	1.05	1.95	2.52
	3340	Clay		370	.032			1.01	1.17	2.18	2.82
	4000	200 H.P., 50' haul, sand & gravel	B-10B	2,500	.005			.15	.35	.50	.61
	4020	Common earth		2,200	.005			.17	.39	.56	.69
	4040	Clay		1,950	.006			.19	.44	.63	.78
	4200	150' haul, sand & gravel		1,225	.010			.30	.71	1.01	1.24
	4220	Common earth		1,100	.011			.34	.79	1.13	1.38
	4240	Clay		975	.012			.38	.89	1.27	1.55
	4400	300' haul, sand & gravel		805	.015			.46	1.07	1.53	1.89
	4420	Common earth		735	.016			.51	1.17	1.68	2.06
	4440	Clay		660	.018			.57	1.31	1.88	2.30
	5000	300 H.P., 50' haul, sand & gravel	B-10M	3,170	.004			.12	.35	.47	.56
	5020	Common earth		2,900	.004			.13	.38	.51	.62
	5040	Clay		2,700	.004			.14	.41	.55	.66
	5200	150' haul, sand & gravel		2,200	.005			.17	.50	.67	.81
	5220	Common earth		1,950	.006			.19	.56	.75	.91
	5240	Clay		1,700	.007			.22	.65	.87	1.04
	5400	300' haul, sand & gravel		1,500	.008			.25	.73	.98	1.19
	5420	Common earth		1,350	.009			.28	.81	1.09	1.32
	5440	Clay		1,225	.010			.30	.90	1.20	1.45
	6000	For compaction, see div. 02315-310									
	6010	For trench backfill, see div. 02315-610 & 02315-620									
210	0010	**BORROW, LOADING AND/OR SPREADING**									
	4000	Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	C.Y.	7.15	.61	1.01	8.77	9.90
	4010	1-1/2 C.Y. bucket	B-12O	1,135	.014		7.15	.45	.86	8.46	9.50
	4020	3 C.Y. bucket	B-12T	1,800	.009		7.15	.28	.73	8.16	9.10
	4030	Front end loader, wheel mounted									
	4050	3/4 C.Y. bucket	B-10R	550	.022	C.Y.	7.15	.68	.35	8.18	9.25
	4060	1-1/2 C.Y. bucket	B-10S	970	.012		7.15	.38	.24	7.77	8.70
	4070	3 C.Y. bucket	B-10T	1,575	.008		7.15	.24	.19	7.58	8.40
	4080	5 C.Y. bucket	B-10U	2,600	.005		7.15	.14	.26	7.55	8.35
	5000	Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		7.50	.55	.92	8.97	10.10
	5010	1-1/2 C.Y. bucket	B-12O	1,250	.013		7.50	.41	.78	8.69	9.75
	5020	3 C.Y. bucket	B-12T	1,980	.008		7.50	.26	.66	8.42	9.35
	5030	Front end loader, wheel mounted									
	5050	3/4 C.Y. bucket	B-10R	800	.015	C.Y.	7.50	.47	.24	8.21	9.20
	5060	1-1/2 C.Y. bucket	B-10S	1,065	.011		7.50	.35	.22	8.07	9
	5070	3 C.Y. bucket	B-10T	1,735	.007		7.50	.22	.17	7.89	8.75
	5080	5 C.Y. bucket	B-10U	2,850	.004		7.50	.13	.24	7.87	8.70
	6000	Clay, till, or blasted rock, shovel, 1 C.Y. bucket	B-12N	715	.022		5.30	.72	1.19	7.21	8.20
	6010	1-1/2 C.Y. bucket	B-12O	965	.017		5.30	.53	1.02	6.85	7.70
	6020	3 C.Y. bucket	B-12T	1,530	.010		5.30	.33	.85	6.48	7.25
	6030	Front end loader, wheel mounted									
	6035	3/4 C.Y. bucket	B-10R	465	.026	C.Y.	5.30	.80	.41	6.51	7.45
	6040	1-1/2 C.Y. bucket	B-10S	825	.015		5.30	.45	.29	6.04	6.80
	6045	3 C.Y. bucket	B-10T	1,340	.009		5.30	.28	.22	5.80	6.45
	6050	5 C.Y. bucket	B-10U	2,200	.005		5.30	.17	.31	5.78	6.40
	6060	Front end loader, track mounted									
	6065	1-1/2 C.Y. bucket	B-10N	715	.017	C.Y.	5.30	.52	.42	6.24	7.05
	6070	3 C.Y. bucket	B-10P	1,190	.010		5.30	.31	.64	6.25	7



02315 | Excavation and Fill

		02315 Excavation and Fill	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
							2004 BARE COSTS					
210	6075	5 C.Y. bucket	B-10Q	1,835	.007	C.Y.	5.30	.20	.58	6.08	6.75	210
	7000	Topsoil or loam from stockpile, shovel, 1 C.Y. bucket	B-12N	840	.019		20	.61	1.01	21.62	24	
	7010	1-1/2 C.Y. bucket	B-12O	1,135	.014		20	.45	.86	21.31	23.50	
	7020	3 C.Y. bucket	B-12T	1,800	.009	↓	20	.28	.73	21.01	23	
	7030	Front end loader, wheel mounted										
	7050	3/4 C.Y. bucket	B-10R	550	.022	C.Y.	20	.68	.35	21.03	23.50	
	7060	1-1/2 C.Y. bucket	B-10S	970	.012		20	.38	.24	20.62	23	
	7070	3 C.Y. bucket	B-10T	1,575	.008		20	.24	.19	20.43	22.50	
	7080	5 C.Y. bucket	B-10U	2,600	.005	↓	20	.14	.26	20.40	22.50	
	8900	For larger hauling units, deduct from above								30%		
	9000	Hauling only, excavated or borrow material, see div. 02315-490										
	9200	For flowable fill, see section 03310-220										
310	0010	**COMPACTION, GENERAL** R02315-300										310
	5000	Riding, vibrating roller, 6" lifts, 2 passes	B-10Y	3,000	.004	C.Y.		.12	.11	.23	.31	
	5020	3 passes		2,300	.005			.16	.14	.30	.40	
	5040	4 passes		1,900	.006			.20	.17	.37	.49	
	5060	12" lifts, 2 passes		5,200	.002			.07	.06	.13	.18	
	5080	3 passes		3,500	.003			.11	.09	.20	.26	
	5100	4 passes	↓	2,600	.005			.14	.12	.26	.36	
	5600	Sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10G	2,400	.005			.16	.32	.48	.59	
	5620	3 passes		1,735	.007			.22	.44	.66	.81	
	5640	4 passes		1,300	.009			.29	.59	.88	1.09	
	5680	12" lifts, 2 passes		5,200	.002			.07	.15	.22	.27	
	5700	3 passes		3,500	.003			.11	.22	.33	.40	
	5720	4 passes	↓	2,600	.005			.14	.29	.43	.54	
	6000	Towed sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10D	10,000	.001			.04	.09	.13	.16	
	6020	3 passes		2,000	.006			.19	.47	.66	.80	
	6030	4 passes		1,500	.008			.25	.63	.88	1.07	
	6050	12" lifts, 2 passes		6,000	.002			.06	.16	.22	.26	
	6060	3 passes		4,000	.003			.09	.24	.33	.40	
	6070	4 passes	↓	3,000	.004			.12	.31	.43	.54	
	6200	Vibrating roller, 6" lifts, 2 passes	B-10C	2,600	.005			.14	.57	.71	.84	
	6210	3 passes		1,735	.007			.22	.85	1.07	1.26	
	6220	4 passes		1,300	.009			.29	1.13	1.42	1.69	
	6250	12" lifts, 2 passes		5,200	.002			.07	.28	.35	.42	
	6260	3 passes		3,465	.003			.11	.42	.53	.63	
	6270	4 passes	↓	2,600	.005			.14	.57	.71	.84	
	7000	Walk behind, vibrating plate 18" wide, 6" lifts, 2 passes	A-1D	200	.040			1.04	.14	1.18	1.78	
	7020	3 passes		185	.043			1.12	.15	1.27	1.92	
	7040	4 passes	↓	140	.057			1.49	.20	1.69	2.53	
	7200	12" lifts, 2 passes	A-1E	560	.014			.37	.07	.44	.66	
	7220	3 passes		375	.021			.55	.11	.66	.98	
	7240	4 passes	↓	280	.029			.74	.15	.89	1.32	
	7500	Vibrating roller 24" wide, 6" lifts, 2 passes	B-10A	420	.029			.89	.31	1.20	1.69	
	7520	3 passes		280	.043			1.33	.47	1.80	2.54	
	7540	4 passes		210	.057			1.78	.62	2.40	3.39	
	7600	12" lifts, 2 passes		840	.014			.44	.16	.60	.85	
	7620	3 passes		560	.021			.67	.23	.90	1.27	
	7640	4 passes	↓	420	.029			.89	.31	1.20	1.69	
	8000	Rammer tamper, 6" to 11", 4" lifts, 2 passes	A-1F	130	.062			1.60	.27	1.87	2.79	
	8050	3 passes		97	.082			2.14	.37	2.51	3.74	
	8100	4 passes		65	.123			3.20	.55	3.75	5.60	
	8200	8" lifts, 2 passes		260	.031			.80	.14	.94	1.40	
	8250	3 passes		195	.041			1.07	.18	1.25	1.86	
	8300	4 passes	↓	130	.062			1.60	.27	1.87	2.79	
	8400	13" to 18", 4" lifts, 2 passes	A-1G	390	.021	↓		.53	.09	.62	.93	



Florida Department of Transportation
Item Average Unit Cost
From 2002/01/01 to 2003/11/30

Contract Type: CC STATEWIDE
Displaying: VALID ITEMS WITH HITS
From: 0000 To: 1999999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0120 72	4	$61.80	$80,770.00	1,307.000	CY	N	FILL GRAVEL
0121 70	14	$105.93	$183,591.28	1,733.100	CY	N	FLOWABLE FILL
0125 1	3	$18.67	$2,793.00	149.600	CY	N	EXCAVATION FOR STRUCTURES
0125 3	2	$7.30	$51,539.15	7,063.000	CY	N	BEDDING MATL (SELECT)
0141 70	2	$638.64	$7,025.00	11.000	AS	N	SETTLEMENT PLATE ASSEMBLY
0142 70	4	$5.98	$325,664.70	54,423.000	CY	N	FILL SAND
0144 1 1	1	$19.00	$3,610.00	190.000	LF	N	DIGITAL INCLINOMETER CASING (VERTICAL)
0144 71	1	$1,160.00	$5,800.00	5.000	EA	N	PORE-PRESSURE TRANSDUCER (PIEZOMETER)
0144 72	1	$15.00	$5,625.00	375.000	LF	N	TUBING FOR PIEZOMETER
0145 1	4	$4.13	$637,898.50	154,382.000	SF	N	GEOSYNTHETIC REINFORCED SOIL SLOPES
0145 2	2	$2.23	$52,889.76	23,706.000	SY	N	GEOSYNTHETIC REINF FND OVER SOFT SOILS
0160 3	1	$30.30	$80,628.30	2,661.000	CY	N	STABILIZING MATERIAL COMMERCIAL
0160 4	74	$2.00	$10,204,293.15	5,108,489.380	SY	N	STABILIZATION TYPE B
0162 3101	55	$.60	$1,886,683.18	3,155,588.500	SY	N	FINISH SOIL LAYER(GRASSING OPR) (6")
0162 4	3	$2.00	$65,941.45	32,977.000	SY	N	ORGANIC SOIL LAYER
0173 71	2	$664.54	$1,442,719.44	2,171.000	EA	N	DRILLING HOLES FOR PRESSURE GROUTING
0173 74	1	$198.40	$51,980.80	262.000	CY	N	PRESSURE GROUTING (CEMENT)
0173 76	1	$43.75	$277,593.75	6,345.000	LF	N	PIPE FOR GROUT INSTALLATION
0174 1	1	$7.50	$225,000.00	30,000.000	LB	N	SOIL STABILIZATION(HIGH-DENSITY POLY)
0175 1	1	$2.00	$60,958.00	30,479.000	SY	N	RESEAT CONC PAVT
0176002	1	$26.00	$47,554.00	1,829.000	CY	N	FILLER AGGREGATE
0200 70	2	$4.64	$13,841.00	2,983.000	CY	N	LIMEROCK MATL
0210 1 5	1	$8.51	$25,464.47	2,992.300	SY	N	BASE REWORK LIMEROCK (5")
0220 70 1	2	$2.46	$13,661.00	5,556.000	SY	N	BASE SHAPE & COMPACT EXIST (6")
0230 2	1	$15.00	$5,370.00	358.000	CY	N	LIMEROCK MATL
0285701	39	$6.93	$3,042,256.26	439,257.400	SY	N	BASE OPTIONAL (BASE GROUP 01)
0285702	3	$4.98	$616,862.68	123,776.000	SY	N	BASE OPTIONAL (BASE GROUP 02)
0285703	8	$5.73	$510,828.25	89,130.000	SY	N	BASE OPTIONAL (BASE GROUP 03)
0285704	31	$6.78	$5,069,010.09	747,183.480	SY	N	BASE OPTIONAL (BASE GROUP 04)
0285705	4	$6.98	$78,811.88	11,283.400	SY	N	BASE OPTIONAL (BASE GROUP 05)
0285706	24	$6.27	$3,073,540.03	490,019.070	SY	N	BASE OPTIONAL (BASE GROUP 06)
0285707	4	$10.12	$504,452.71	49,850.000	SY	N	BASE OPTIONAL (BASE GROUP 07)
0285708	1	$55.00	$11,990.00	218.000	SY	N	BASE OPTIONAL (BASE GROUP 08)
0285709	35	$8.66	$10,651,646.92	1,229,683.300	SY	N	BASE OPTIONAL (BASE GROUP 09)
0285710	12	$9.78	$3,827,980.57	391,478.490	SY	N	BASE OPTIONAL (BASE GROUP 10)

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT	JOB NO. 09199033.09
SUBJECT Hardee County Landfill	BY JHW	DATE
	CHECKED	DATE

Closure Cost

ITEM 3 Synthetics

Quantities | Pricing

40 mil

Area 1 95,300 SF × 1.0 = 95,300
(CAD) 3 203,700 SF × 1.05 = 213,885
4 168,350 SF × 1.0 = 168,350
5 92,000 SF × 1.05 = 96,600
574,135 SF

Anchor trench (bottom)

2' ‾|_ 2' = 4/ft

Length of trench = 2860 LF

Area = 2860 × 4 ⇒ 11,440 SF
Total 585,575 SF
(65,064 SY)
65,100 SY 40 mil

60 mil

Area 2 210,365 SF × 1.04 = 218,780 SF

Anchor trench

2' ‾|_ 2'

Length = 940 LF
Area = 940 × 4 = 3760 SF
222,540 SF
24,726.6 SY
(24,700 SY) 60 mil

Geocomposite
Same area as 60 + 40 mil

65,100 + 24,700 ⇒ 89,800 SY

Quote GSE
60 mil text
$0.536/SF
($4.82/SY)

Quote (GSE)
40-mil text
$0.459/SF
($4.13/SY)

Biplanar (Hillsborough)
Geocomposite
$0.45/SF B.D. 2002

PW Forp

2002		2003
0.45 × 1.01 =		0.455/SF

2003		2004
0.455 × 1.02 =		0.464/SF
		$4.17/SY

GSI
GEO-SYNTHETICS, INC.

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
WAUKESHA

FAX TRANSMITTAL SHEET

FAX: 262-524-7961
TEL: 262-524-7979

TO: Joe O'Neil
COMPANY: SCS
LOCATION:
FAX: 813-623-6757
FROM: Joe Irwin
DATE: 4-7-04
RE: Budget Pricing for Hardy Road

The following ___4___ pages (including transmittal sheet) are priority. Please notify the intended recipient immediately. If all pages are not received, please call sender for verification.

COMMENTS:

Attached is GSI's budget pricing for Hardy Road. If you have any questions please call.

Joe Irwin

GEO-SYNTHETICS, INC.

BUDGETARY PROPOSAL

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
PHOENIX
WAUKESHA

GSI proposes to sell to the Purchaser the materials and services herein in accordance with the terms, conditions, specifications and prices set forth or referred to on the face hereof and the pages attached hereto. Acceptance of this proposal is limited to the terms and conditions contained in this proposal.

PROJECT NAME: Hardy Road
PROJECT LOCATION: Hardy County, FL
ESTIMATE #:
DATE: 4-7-04

GSI will furnish and install the following material(s):

ITEM	DESCRIPTION	Total $/SF	EST. QTY.	UNITS	UNIT PRICE	AMOUNT
	Material Supply					
1	300 mil DS 8 oz geocomposite		217,800	SF	$0.552	$120,225.60
2	Tenax 770-2		217,800	SF	$0.706	$153,766.80
3	60 mil textured		479,160	SF	$0.324	$155,247.84
4	20 mil rain cover		130,680	SF	$0.129	$16,857.72
	Installation					
5	300 mil DS 8 oz geocomposite	0.552 + .195 = 0.747	217,800	SF	$0.195	$42,471.00
6	Tenax 770-2	0.706 + .253 = 0.959	217,800	SF	$0.253	$55,103.40
7	60 mil textured	0.324 + .212 = 0.536	479,160	SF	$0.212	$101,581.92
8	20 mil rain cover	0.129 + .200 = 0.329	130,680	SF	$0.200	$26,136.00

Total Budgetary Price = $\boxed{\$671,390.28}$

VERY IMPORTANT - PLEASE NOTE:

- Refer to the attached Scope of Work by GSI, Scope of Work by Others, General Conditions and Special Conditions which are included as part of this Proposal.
- Taxes are not included.
- Bonds are not included but can be provided at $20.00 per $1,000.00 of total bid amount
- Budget prices will be valid for 30 days. After 30 days, pricing may be subject to increases in resin and installation costs. These prices are for budget purposes only.
- Prices are F.O.B. job site.
- Prices based on establishing an acceptable line of credit.
- **The above budget numbers do not include mobilization.**

Regional Sales Manager: Joe Irwin
Estimator: Dan Garlow

APPROVED BY: Dan Garlow
Dan Garlow, Estimator

hardy road BUDGET.doc

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GEO-SYNTHETICS, INC.

SCOPE OF WORK TO BE PERFORMED BY GSI

GSI proposes to supply and install the liner as follows:

1. GSI will promptly prepare and submit shop drawings to be approved by Project Engineer and returned in advance of installation.
2. Panels will be deployed (from high end to low end), overlapped and welded to form a continuous cover over the area to be lined using double wedge fusion welding as the primary method of welding field seams between adjacent panels. Extrusion welding will be used as a secondary method for seaming between adjacent panels and as a primary method of welding for detail and repair work.
3. Heavy equipment for use in deploying the liner materials.
4. All on-site testing of field seams.
5. Manufactures standard material and certifications per their standard test methods and frequencies.
6. At the conclusion of each day's work GSI will execute a subgrade acceptance form by which it accepts the surface of the subgrade lined that day. GSI will not accept the subgrade in advance of it being lined.

SCOPE OF WORK TO BE PERFORMED BY OTHERS

The following is to be performed or provided by the Purchaser:

1. Preparation and maintenance of the subgrade in a condition suitable for the installation of the liner using standard installation methods. Continuous removal of rainwater, groundwater, snow and ice from the underlying liner material, subgrade and anchor trenches sufficient to permit installation to continue without interruption. The subgrade must be free of rocks, sharp stones, sticks, roots, vegetation and sharp objects and debris of any type which may damage the liner. The subgrade must be prepared so as to be sufficiently stable to permit use of motorized or mechanized rubber tired equipment to deploy the sheet. All sediment buildup on the liner surface shall be removed.
2. Subterranean inspections or tests of the subgrade. (GSI will not be responsible for conditions existing below the surface of the subgrade.)
3. Adequate access to and sufficient operating room about the work area to be lined to permit operation of equipment used to deploy liner. Adequate access can be partially defined as follows: 1) Ability to turn a Case 821B rubber tired loader 360 degrees while suspending a 23' wide roll of liner from the bucket. 2) Ability to access all 4 sides of the cell or all sides and top of the closure area with 2 wheel drive pickups and heavy equipment. 3) Building and maintaining temporary roads accessible by a Case 821B loader requiring a minimum width clearance of 45 feet.
4. Excavation, backfill and compaction of all anchor trenches in accordance with the project specifications.
5. Concrete and pipe work.
6. Access to sanitation facilities for GSI forces.
7. Access to dumpsters for the disposal of GSI construction waste materials.
8. Adequate control of dust to permit welding without excessive or unusual cleaning of the liner.
9. All independent laboratory destructive testing seam testing, conformance testing, friction angle testing and on-site third-party QA consultant.
10. As-built drawings and/or surveys.
11. Procure site specific soils to the independent laboratory for friction angle testing.
12. Exposing, cleaning and maintaining all existing liner tie in locations in a condition suitable for welding including controlling all leachate and run off at the tie-in location.
13. Plywood liner protection/marker sheets.
14. Unloading and storing materials prior to mobilization.
15. Sand for sandbags.
16. Water leakage testing and/or electrical leak location survey.

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GSI GEO-SYNTHETICS, INC.

GENERAL CONDITIONS

1. GSI's proposal assumes working in favorable seasonal conditions. GSI reserves the right to renegotiate pricing or apply stand by charges if the project is either accelerated or delayed into a non-favorable season.
2. Once the project is commenced, installation must proceed in a continuous and uninterrupted fashion. GSI forces will work 6 days per week, 10 hours per day in order to meet project deadlines.
3. GSI will be responsible for the safety of its employees and protection of the liner until acceptance or demobilization. GSI will not be responsible for the overall safety of the job site, and the safety of individuals not employed by GSI. The Owner and General Contractor should caution its employees that liner is slippery, particularly when wet. Care must be exercised when walking on the liner.
4. GSI will not be responsible for any damages to the liner resulting from work performed by others.
5. GSI is not responsible for ground water or gas that accumulates beneath the liner.
6. General contractor shall provide 2 full sets of plans and specifications.
7. Upon request, GSI will provide purchaser with Certificates of Insurance. The insurance shall include General Liability Coverage for personal injury and property damage in the amount of $2,000,000 and Worker's Compensation coverage in the amount required by law.
8. Items which may constitute a claim for contract extras include:
   - Any changes in scope of work
   - Upon arrival, site is not prepared or ready as was verbally stated by the owner/contractor's representative prior to GSI's mobilization to the site.
   - Delays caused by owner, contractor, or other subcontractors which have a direct effect on GSI's ability to complete its work in a timely fashion.
9. Changes to the work must be authorized in writing by the owner/contractor before additional work will commence.
10. Payment terms are as follows: Material - Net 30 days from date of shipment.
    Installation - Net 30 days from date of invoice or completion.

SPECIAL CONDITIONS

1. GSI used verbal information.
2. GSI reserves the right to modify this proposal upon review of complete plans and specifications for this work.
3. GSI to be a non-union subcontractor and pay non-prevailing wages.
4. Proposal based on the work being performed under OSHA Level D conditions. GSI will provide hard-hats and safety glasses for its employees. Soft soled shoes (as required for work upon the geomembrane liner) will be worn by all employees working on the liner. If an upgrade to modified Level D or Level C is encountered, then any additional or site specific personal protective equipment shall be supplied by others.
5. A 5 year pro-rated material warranty and a 1 year installation and workmanship warranty shall be provided.
6. GSI has made no provisions for penetrations since none were indicated on the drawings. Standard pipe penetration boots can be provided at $150.00/each.
7. Any stainless steel battening required will be furnished and installed at an additional price of $30.00/l.f. Quantities are to be determined by field measuring.
8. Geomembrane, geocomposite are quoted supplied and installed as a package.
9. Quantities for payment shall be on actual measured in place quantities which include quantities in anchor trenches.
10. As an authorized fabricator and installer of the liner manufacturer, GSI will provide a full time approved technical representative of the manufacturer on site throughout the installation of the liner in lieu of an actual employee of the manufacturer.

CLARIFICATIONS

1. Clarification: GSI intends to deploy subsequent liner materials via an ATV. (i.e. driving on liner materials to deploy the next layer).

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GEO-SYNTHETICS, INC.

FAX TRANSMITTAL SHEET

FAX: 262-524-7961
TEL: 262-524-7979

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
WAUKESHA

TO: Joe O'Neil
COMPANY: SCS
LOCATION:
FROM: Joe Irwin FAX: 813-623-6757
DATE: 4-8-04
RE: Budget Pricing for Hardy Road Cap

The following __4____ pages (including transmittal sheet) are priority. Please notify the intended recipient immediately. If all pages are not received, please call sender for verification.

COMMENTS:

Attached is GSI's budget pricing for Hardy Road Cap. If you have any questions please call.

Joe Irwin

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GSI GEO-SYNTHETICS, INC.

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
PHOENIX
WAUKESHA

BUDGETARY PROPOSAL

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PROJECT NAME: Hardy Road Cap
PROJECT LOCATION: Hardy County, FL
ESTIMATE #:
DATE: 4-8-04

GSI will furnish and install the following material(s):

ITEM	DESCRIPTION	EST. QTY.	UNITS	UNIT PRICE	AMOUNT
	Material Supply				
1	40 mil textured LLDPE	217,800	SF	$0.259	$56,410.20
	Installation				
2	40 mil textured LLDPE	217,800	SF	$0.20	$43,560.00

Total Budgetary Price = $99,970.20

material install
0.259 + 0.20 = $0.459/sF = $4.13/sy

VERY IMPORTANT - PLEASE NOTE:

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Regional Sales Manager: Joe Irwin
Estimator: Dan Garlow

APPROVED BY: Dan Garlow
Dan Garlow, Estimator

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"More Protection, Less Process"

Categories

Solid Waste Financial Responsibility

Annual Adjustment of Cost Estimates

Owners or operators of facilities regulated by the Solid Waste Financial Assurance office shall annually adjust their facility closure cost estimates for inflation and submit updated information to the Department. Outlined below are Rule 62-701.630 (4), Florida Administrative Code (F.A.C.), requirements for submission of closure cost estimates.

- Form 62-701.900(28) is used to prepare and submit closure cost estimates. Contact your permitting office for assistance with the form.
- Annual cost estimate adjustments may be made either by recalculating the maximum cost of closure or by using the current year inflation factor.
- For owners or operators using an escrow account to demonstrate financial assurance, cost estimates must be submitted between July 1 and September 1 of each year.
- For owners or operators using an alternate financial mechanism to demonstrate financial assurance, cost estimates must be submitted between January 1 and March 1 of each year.
- Please submit Form 62-701.900(28) to the appropriate permitting office with a copy to:

  Solid Waste Financial Coordinator
  Department of Environmental Protection
  2600 Blair Stone Road MS 4565
  Tallahassee, Florida 32399-2400
  (850) 245-8732 FAX (850) 245-8811

Calculation of the Inflation Factor

- The annual inflation factor is derived from the most recent Implicit Price Deflator for Gross National Product published by the U.S. Department of Commerce in its Survey of Current Business, pursuant to Rule 62-701.630(4)(b)(2), F.A.C.
- To calculate the current inflation factor, divide the latest published annual Deflator by the Deflator for the previous year.
- Implicit Price Deflator data is published by the U.S. Department of Commerce, Bureau of Economic Analysis on their website, http://www.bea.doc.gov .

Current Year Inflation Factor*: 1.010

Inflation Factors 2000 - 2003

1999 Cost Estimate x 1.015 = 2000 Cost Estimate
2000 Cost Estimate x 1.020 = 2001 Cost Estimate
2001 Cost Estimate x 1.020 = 2002 Cost Estimate
2002 Cost Estimate x 1.010 = 2003 Cost Estimate

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*** - The data necessary to calculate the inflation factor is released by the U.S. Department of Commerce in April. Therefore, it is necessary and appropriate to use the previous year's factor when inflation adjusting cost estimates between January 1 and April 1. Once the new factor becomes available, it will be posted for immediate use.**

|Rules | Forms | Solid Waste Financial Responsibility Main Page |
Cost Estimates | Workshop | Solid Waste Section Main Page |

Last Updated: 02/02/04

HILLSBOROUGH COUNTY SOUTH EAST LANDFILL
SECTION I LANDFILL EXPANSION

Item No.	CONTRACTOR / Item Description	Units	Bid Quantity	ADVANCE Bid Unit Price	ADVANCE Bid Unit Total	CHERRY HILL Bid Unit Price	CHERRY HILL Bid Unit Total	DOLPHIN Bid Unit Price	DOLPHIN Bid Unit Total	ENVIRONMENTAL SPEC. Bid Unit Price	ENVIRONMENTAL SPEC. Bid Unit Total	HANDEX Bid Unit Price	HANDEX Bid Unit Total	HUBBARD Bid Unit Price	HUBBARD Bid Unit Total	KIMMINS Bid Unit Price	KIMMINS Bid Unit Total
1	Mobilization (complete)	LS	1	$ 200,000.00	$ 200,000.00	$ 244,136.00	$ 244,136.00	$ 332,430.00	$ 332,430.00	$ 357,911.00	$ 357,911.00	$ 15,718.24	$ 15,718.24	$ 500,000.00	$ 500,000.00	$ 116,225.00	$ 116,225.00
2	Site Clearing	AC	14	$ 1,850.00	$ 25,900.00	$ 2,000.00	$ 28,000.00	$ 3,000.00	$ 42,000.00	$ 1,700.00	$ 23,800.00	$ 1,060.41	$ 14,845.74	$ 15,000.00	$ 210,000.00	$ 500.00	$ 7,000.00
3	Survey	LS	1	$ 85,000.00	$ 85,000.00	$ 12,000.00	$ 12,000.00	$ 65,000.00	$ 65,000.00	$ 37,250.00	$ 37,250.00	$ 65,732.46	$ 65,732.46	$ 75,000.00	$ 75,000.00	$ 50,000.00	$ 50,000.00
4	Temporary Erosion Control	LS	1	$ 10,000.00	$ 10,000.00	$ 5,000.00	$ 5,000.00	$ 10,000.00	$ 10,000.00	$ 4,900.00	$ 4,900.00	$ 17,689.56	$ 17,689.56	$ 20,000.00	$ 20,000.00	$ 5,000.00	$ 5,000.00
5	Excavation	CY	216,000.00	$ 1.80	$ 388,800.00	$ 3.30	$ 712,800.00	$ 1.75	$ 378,000.00	$ 1.32	$ 285,120.00	$ 1.63	$ 352,080.00	$ 4.00	$ 864,000.00	$ 4.00	$ 864,000.00
6	Backfill and Fill	CY	436,000.00	$ 5.40	$ 2,354,400.00	$ 4.81	$ 2,097,160.00	$ 4.75	$ 2,071,000.00	$ 5.02	$ 2,188,720.00	$ 4.81	$ 2,097,160.00	$ 7.50	$ 3,270,000.00	$ 6.00	$ 2,616,000.00
7	Subase	SF	583,500.00	$ 0.20	$ 116,700.00	$ 0.14	$ 81,690.00	$ 0.89	$ 519,315.00	$ 0.37	$ 217,412.10	$ 0.11	$ 64,185.00	$ 0.40	$ 233,400.00	$ 0.36	$ 210,060.00
8	60 Mil Liner	SF	1,167,000.00	$ 0.40	$ 466,800.00	$ 0.34	$ 396,780.00	$ 0.39	$ 455,130.00	$ 0.36	$ 423,504.30	$ 0.37	$ 431,790.00	$ 0.30	$ 350,100.00	$ 0.34	$ 396,780.00
9	Geocomposite	SF	1,167,000.00	$ 0.40	$ 466,800.00	$ 0.40	$ 466,800.00	$ 0.45	$ 525,150.00	$ 0.35	$ 410,900.70	$ 0.44	$ 513,480.00	$ 0.30	$ 350,100.00	$ 0.39	$ 455,130.00
10	12 - inch Drainage Sand	SF	583,500.00	$ 0.30	$ 175,050.00	$ 0.70	$ 408,450.00	$ 0.72	$ 420,120.00	$ 0.47	$ 272,202.75	$ 0.20	$ 116,700.00	$ 0.80	$ 466,800.00	$ 0.32	$ 186,720.00
11	12 - inch Processed Tire Drainage Layer	SF	447,000.00	$ 1.00	$ 447,000.00	$ 0.10	$ 44,700.00	$ 0.20	$ 89,400.00	$ 0.06	$ 26,820.00	$ 0.09	$ 40,230.00	$ 0.20	$ 89,400.00	$ 0.13	$ 58,110.00
12	Pipe	LF	3,740.00	$ 26.00	$ 97,240.00	$ 38.00	$ 142,120.00	$ 28.00	$ 104,720.00	$ 29.75	$ 111,265.00	$ 21.37	$ 79,923.80	$ 48.00	$ 179,520.00	$ 30.00	$ 112,200.00
13	8 - inch dia.HDPE Header Piping	LF	660.00	$ 27.00	$ 17,820.00	$ 68.00	$ 44,880.00	$ 40.00	$ 26,400.00	$ 37.05	$ 24,453.00	$ 26.28	$ 17,344.80	$ 61.00	$ 40,260.00	$ 45.00	$ 29,700.00
14	Pump, Controls, Piping, etc.	LS	1.00	$ 48,000.00	$ 48,000.00	$ 56,847.00	$ 56,847.00	$ 55,000.00	$ 55,000.00	$ 36,009.00	$ 36,009.00	$ 35,956.52	$ 35,956.52	$ 60,000.00	$ 60,000.00	$ 44,775.00	$ 44,775.00
15	3 - inch dia., HDPE Piping	LF	465.00	$ 28.00	$ 13,020.00	$ 53.00	$ 24,645.00	$ 25.00	$ 11,625.00	$ 25.32	$ 11,773.80	$ 7.14	$ 3,320.10	$ 34.00	$ 15,810.00	$ 30.00	$ 13,950.00
16	Access Ramp and Road	SY	1,000.00	$ 19.00	$ 19,000.00	$ 50.00	$ 50,000.00	$ 12.00	$ 12,000.00	$ 14.00	$ 14,000.00	$ 20.40	$ 20,400.00	$ 20.00	$ 20,000.00	$ 12.00	$ 12,000.00
17	Stormwater Pipe and Mitered Ends	LF	386.00	$ 80.00	$ 30,880.00	$ 84.53	$ 32,628.58	$ 60.00	$ 23,160.00	$ 67.75	$ 26,151.50	$ 39.73	$ 15,335.78	$ 100.00	$ 38,600.00	$ 100.00	$ 38,600.00
18	Seeding and Mulching	SY	59,000.00	$ 0.40	$ 23,600.00	$ 0.29	$ 17,110.00	$ 0.30	$ 17,700.00	$ 0.35	$ 20,650.00	$ 0.32	$ 18,880.00	$ 0.10	$ 5,900.00	$ 0.35	$ 20,650.00
19	Sodding	SY	27,000.00	$ 2.00	$ 54,000.00	$ 1.32	$ 35,640.00	$ 1.55	$ 41,850.00	$ 2.14	$ 57,780.00	$ 1.94	$ 52,380.00	$ 1.20	$ 32,400.00	$ 1.25	$ 33,750.00
					$ -		$ -							$ -			$ -
	Subtotal				$ 5,040,010.00		$ 4,901,386.58		$ 5,200,000.00		$ 4,550,623.15		$ 3,973,152.00	$ -	$ 6,821,290.00		$ 5,270,650.00
	Bid Allowance				$ 200,000.00		$ 200,000.00		$ 200,000.00		$ 200,000.00		$ 200,000.00		$ 200,000.00		$ 200,000.00
	Total Bid Price				$ 5,240,010.00		$ 5,101,386.58		$ 5,400,000.00		$ 4,750,623.15		$ 4,173,152.00	$ -	$ 7,021,290.00		$ 5,470,650.00
	Alternate I				$ 500,000.00		$ 625,000.00		$ 709,750.00		$ 1,244,027.00		$ 800,000.00	$ -	$ 1,400,000.00		$ 362,969.00
	Alternate I Bid Total				$ 4,740,010.00		$ 4,476,386.58		$ 4,690,250.00		$ 3,506,596.15		$ 3,373,152.00		$ 5,621,290.00		$ 5,107,681.00

Bi-planar Geocomposit

Bi-planar Geocomposite

Highest Bid $0.45/sf ($4.05/sy)

(Bid award 1/2002)

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT		JOB NO. 09199073.05
SUBJECT Hardee County Landfill		BY JHO	DATE
		CHECKED	DATE

Closure cost

ITEM (4) TOP PROTECTIVE SOIL

Quantity	Pricing
See Figure for ITEM (2)	Price quote from Hardee County purchasing
Area = 792,915 sf total	Materials (delivered) \$4.50/cy; inflation 1.02; \$4.59/cy
Coversoil (18-in	Spread MEANS 02315 120 3020 \$0.85/cy
$792{,}915 \text{ sf} \times \frac{24 \text{ in}}{12 \text{ in}}(1\text{ft}) \frac{1 \text{ cy}}{27 \text{ ft}^3}$	Compact MEANS 02315 310 5100 \$0.36/cy
= 58734.4 cy	\$0.36/cy 12-in lifts x 2 lifts = 24 inches \$0.36/cy
Say 58 800 cy	\$6.16/cy
	Compare to FDOT \$5.98/cy < \$6.16/cy
	OK

HARDEE COUNTY PURCHASING DEPT

205 HANCHEY ROAD
WAUCHULA, FL 33873
863/773-5014 Fax 863/773-0322

PURCHASE ORDER: 44681

Page: 1 of 1

***** VENDOR *****
T & C FILL DIRT
456 CYPRESS STREET
WAUCHULA FL 33873

***** DELIVER TO *****
HARDEE COUNTY
SOLID WASTE & RECYCLE
685 AIRPORT ROAD
WAUCHULA, FL. 33873

Ordered	Due	Ship Via	FOB	Terms	Customer#
01/02/03	01/02/03			Upon Receipt	

Requisition No.	Vendor No.	Vendor Phone	Vendor Fax
50320	10186-1	863/773-9446	863/773-3599

No	Quantity	U/M	Description	Unit Price	Extended	G/L Account
1	1,000.00	YD	FILL DIRT	4.5000	4,500.00	104-534-034.0
				** TOTAL **	4,500.00	

1,000 yd^3 @ 4^{50} per yd^3

INFLATION 1.02
$4^{50} \times 1.02 \Rightarrow 4.59$/cy

VENDOR INSTRUCTIONS:
1. Mail Invoices to: Hardee County Clerk to BOCC
Accounting Dept
412 W Orange St Rm A-205
Wauchula, Fl 33873
2. Invoices and Packages must bear the P.O. No. Above.
3. Purchases may not exceed the total amount of this order without prior approval by the Purchasing Dept.
4. Acceptance of this order includes acceptance of all terms, prices, delivery instructions, specifications and conditions.
5. State Tax Exempt#: 35-02689-53C EIN: 59-6000632
6. If you have questions, please call 863/773-5014

SPECIAL INSTRUCTIONS:
CONFIRMING ORDER W/TIM, DO NOT DUPLICATE.

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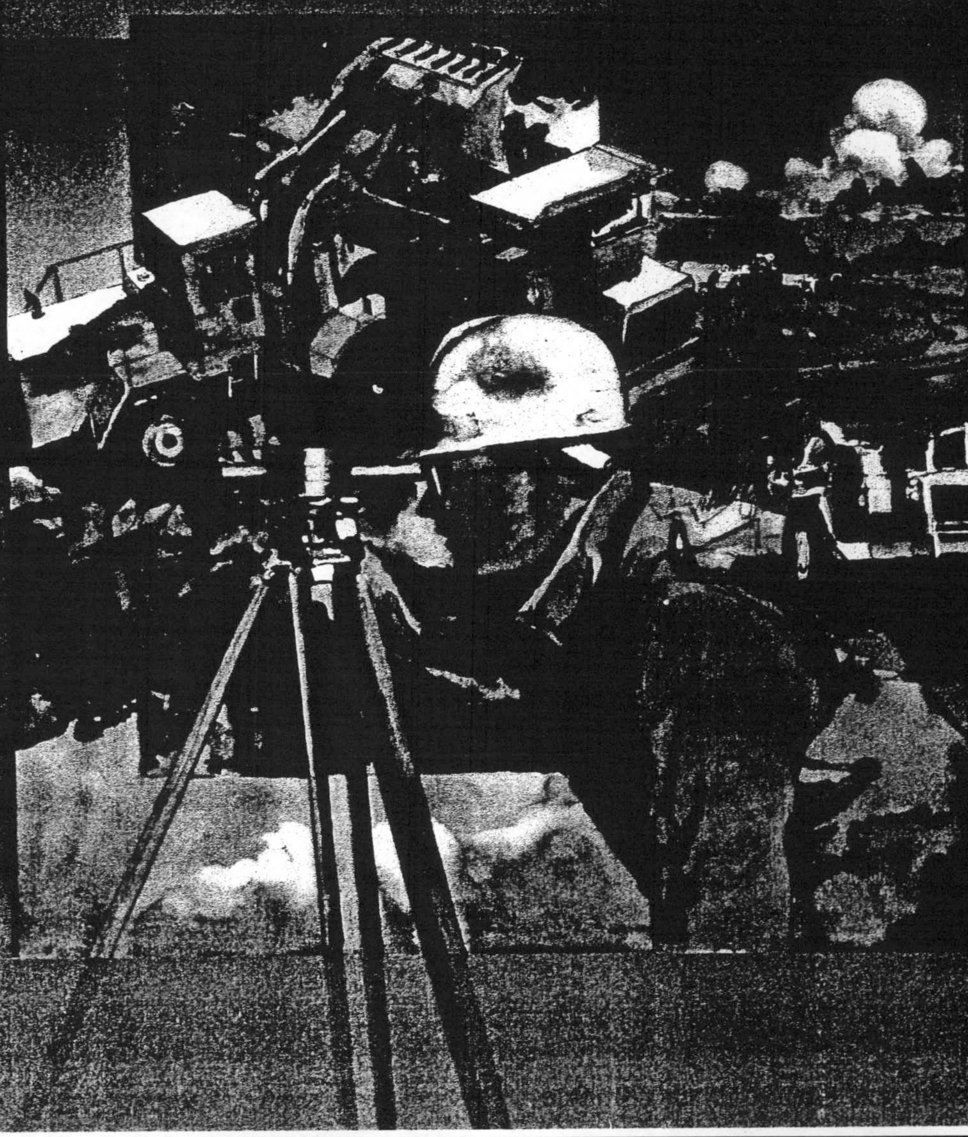
18th Annual Editio

Also available on CD-ROM!
(See inside for details)

2004



02305 | Equipment

	Line	Description	Crew	Daily Output	Labor-Hours	Unit	Mat. (2004 Bare Costs)	Labor	Equip.	Total	Total Incl O&P	
250	1100	Small equipment, placed in rear of, or towed by pickup truck R01590-100	A-3A	8	1	Ea.		25.50	10.25	35.75	50.50	250
	[illegible]	Equip up to 70 HP, on flatbed trailer behind pickup truck	A-3D	4	2			51.50	42.50	94	126	
	[illegible]	Crane, truck-mounted, up to 75 ton (costs incl both mob & demob)	1 EQHV	3.60	2.222			77.50		77.50	116	
	2100	Crane, truck-mounted, over 75 ton	A-3E	2.50	6.400			196	33	229	335	
	2200	Crawler-mounted, up to 75 ton	A-3F	2	8			245	278	523	675	
	2300	Over 75 ton	A-3G	1.50	10.667			325	390	715	925	
	2500	For each additional 5 miles haul distance, add						10%	10%			
	3000	For large pieces of equipment, allow for assembly/knockdown										
	3001	For mob/demob of vibrofloatation equip, see section 02250-900										
	3100	For mob/demob of micro-tunneling equip, see section 02441-400										
	3200	For mob/demob of pile driving equip, see section 02455-650										
	3300	For mob/demob of caisson drilling equip, see section 02465-950										

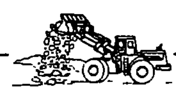
02310 | Grading

	Line	Description	Crew	Daily Output	Labor-Hours	Unit	Mat.	Labor	Equip.	Total	Total Incl O&P	
100	0010	**FINISH GRADING**										100
	0012	Finish grading area to be paved with grader, small area	B-11L	400	.040	S.Y.		1.19	1.08	2.27	3.01	
	0100	Large area		2,000	.008			.24	.22	.46	.60	
	0200	Grade subgrade for base course, roadways		3,500	.005			.14	.12	.26	.35	
	1020	For large parking lots	B-32C	5,000	.010			.29	.30	.59	.77	
	1050	For small irregular areas	"	2,000	.024			.72	.74	1.46	1.92	
	1100	Fine grade for slab on grade, machine	B-11L	1,040	.015			.46	.42	.88	1.16	
	1150	Hand grading	B-18	700	.034			.91	.06	.97	1.49	
	1200	Fine grade granular base for sidewalks and bikeways	B-62	1,200	.020			.56	.12	.68	.99	
	2550	Hand grade select gravel	2 Clab	60	.267	C.S.F.		6.95		6.95	10.80	
	3000	Hand grade select gravel, including compaction, 4" deep	B-18	555	.043	S.Y.		1.15	.07	1.22	1.88	
	3100	6" deep		400	.060			1.60	.10	1.70	2.60	
	3120	8" deep		300	.080			2.13	.14	2.27	3.47	
	3300	Finishing grading slopes, gentle	B-11L	8,900	.002			.05	.05	.10	.13	
	3310	Steep slopes	"	7,100	.002			.07	.06	.13	.17	

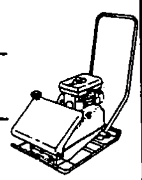
02315 | Excavation and Fill

	Line	Description	Crew	Daily Output	Labor-Hours	Unit	Mat.	Labor	Equip.	Total	Total Incl O&P	
110	0010	**BACKFILL, GENERAL** R02315-300										110
	0015	By hand, no compaction, light soil	1 Clab	14	.571	C.Y.		14.85		14.85	23	
	0100	Heavy soil		11	.727			18.90		18.90	29.50	
	0300	Compaction in 6" layers, hand tamp, add to above		20.60	.388			10.10		10.10	15.75	
	0400	Roller compaction operator walking, add	B-10A	100	.120			3.73	1.31	5.04	7.15	
	0500	Air tamp, add	B-9D	190	.211			5.55	.97	6.52	9.70	
	0600	Vibrating plate, add	A-1D	60	.133			3.47	.48	3.95	5.90	
	0800	Compaction in 12" layers, hand tamp, add to above	1 Clab	34	.235			6.10		6.10	9.55	
	0900	Roller compaction operator walking, add	B-10A	150	.080			2.49	.87	3.36	4.74	
	1000	Air tamp, add	B-9	285	.140			3.71	.56	4.27	6.35	
	1100	Vibrating plate, add	A-1E	90	.089			2.31	.46	2.77	4.11	
	3000	For flowable fill, see div. 03310-220										
120	0010	**BACKFILL, STRUCTURAL** Dozer or F.E. loader										120
	0020	From existing stockpile, no compaction										
	2000	75 H.P., 50' haul, sand & gravel	B-10L	1,100	.011	C.Y.		.34	.27	.61	.82	
	2020	Common earth		975	.012			.38	.31	.69	.92	
	2040	Clay		850	.014			.44	.35	.79	1.06	
	2200	150' haul, sand & gravel		550	.022			.68	.55	1.23	1.63	
	2220	Common earth		490	.024			.76	.61	1.37	1.83	
	2240	Clay		425	.028			.88	.71	1.59	2.12	
	2400	300' haul, sand & gravel		370	.032			1.01	.81	1.82	2.42	
	2420	Common earth		330	.036			1.13	.91	2.04	2.72	
	2440	Clay		290	.041			1.29	1.04	2.33	3.10	
	3000	105 H.P., 50' haul, sand & gravel	B-10W	1,350	.009			.28	.32	.60	.77	

	02315	Excavation and Fill	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P
							2004 BARE COSTS				
120	3020	Common earth	B-10W	1,225	.010	C.Y.		.30	.35	.65	.85
	3040	Clay		1,100	.011			.34	.39	.73	.95
	3200	150' haul, sand & gravel		670	.018			.56	.65	1.21	1.56
	3220	Common earth		610	.020			.61	.71	1.32	1.71
	3240	Clay		550	.022			.68	.79	1.47	1.90
	3300	300' haul, sand & gravel		465	.026			.80	.93	1.73	2.25
	3320	Common earth		415	.029			.90	1.05	1.95	2.52
	3340	Clay		370	.032			1.01	1.17	2.18	2.82
	4000	200 H.P., 50' haul, sand & gravel	B-10B	2,500	.005			.15	.35	.50	.61
	4020	Common earth		2,200	.005			.17	.39	.56	.69
	4040	Clay		1,950	.006			.19	.44	.63	.78
	4200	150' haul, sand & gravel		1,225	.010			.30	.71	1.01	1.24
	4220	Common earth		1,100	.011			.34	.79	1.13	1.38
	4240	Clay		975	.012			.38	.89	1.27	1.55
	4400	300' haul, sand & gravel		805	.015			.46	1.07	1.53	1.89
	4420	Common earth		735	.016			.51	1.17	1.68	2.06
	4440	Clay		660	.018			.57	1.31	1.88	2.30
	5000	300 H.P., 50' haul, sand & gravel	B-10M	3,170	.004			.12	.35	.47	.56
	5020	Common earth		2,900	.004			.13	.38	.51	.62
	5040	Clay		2,700	.004			.14	.41	.55	.66
	5200	150' haul, sand & gravel		2,200	.005			.17	.50	.67	.81
	5220	Common earth		1,950	.006			.19	.56	.75	.91
	5240	Clay		1,700	.007			.22	.65	.87	1.04
	5400	300' haul, sand & gravel		1,500	.008			.25	.73	.98	1.19
	5420	Common earth		1,350	.009			.28	.81	1.09	1.32
	5440	Clay		1,225	.010			.30	.90	1.20	1.45
	6000	For compaction, see div. 02315-310									
	6010	For trench backfill, see div. 02315-610 & 02315-620									
210	0010	**BORROW, LOADING AND/OR SPREADING**									
	4000	Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	C.Y.	7.15	.61	1.01	8.77	9.90
	4010	1-1/2 C.Y. bucket	B-12O	1,135	.014		7.15	.45	.86	8.46	9.50
	4020	3 C.Y. bucket	B-12T	1,800	.009		7.15	.28	.73	8.16	9.10
	4030	Front end loader, wheel mounted									
	4050	3/4 C.Y. bucket	B-10R	550	.022	C.Y.	7.15	.68	.35	8.18	9.25
	4060	1-1/2 C.Y. bucket	B-10S	970	.012		7.15	.38	.24	7.77	8.70
	4070	3 C.Y. bucket	B-10T	1,575	.008		7.15	.24	.19	7.58	8.40
	4080	5 C.Y. bucket	B-10U	2,600	.005		7.15	.14	.26	7.55	8.35
	5000	Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		7.50	.55	.92	8.97	10.10
	5010	1-1/2 C.Y. bucket	B-12O	1,250	.013		7.50	.41	.78	8.69	9.75
	5020	3 C.Y. bucket	B-12T	1,980	.008		7.50	.26	.66	8.42	9.35
	5030	Front end loader, wheel mounted									
	5050	3/4 C.Y. bucket	B-10R	800	.015	C.Y.	7.50	.47	.24	8.21	9.20
	5060	1-1/2 C.Y. bucket	B-10S	1,065	.011		7.50	.35	.22	8.07	9
	5070	3 C.Y. bucket	B-10T	1,735	.007		7.50	.22	.17	7.89	8.75
	5080	5 C.Y. bucket	B-10U	2,850	.004		7.50	.13	.24	7.87	8.70
	6000	Clay, till, or blasted rock, shovel, 1 C.Y. bucket	B-12N	715	.022		5.30	.72	1.19	7.21	8.20
	6010	1-1/2 C.Y. bucket	B-12O	965	.017		5.30	.53	1.02	6.85	7.70
	6020	3 C.Y. bucket	B-12T	1,530	.010		5.30	.33	.85	6.48	7.25
	6030	Front end loader, wheel mounted									
	6035	3/4 C.Y. bucket	B-10R	465	.026	C.Y.	5.30	.80	.41	6.51	7.45
	6040	1-1/2 C.Y. bucket	B-10S	825	.015		5.30	.45	.29	6.04	6.80
	6045	3 C.Y. bucket	B-10T	1,340	.009		5.30	.28	.22	5.80	6.45
	6050	5 C.Y. bucket	B-10U	2,200	.005		5.30	.17	.31	5.78	6.40
	6060	Front end loader, track mounted									
	6065	1-1/2 C.Y. bucket	B-10N	715	.017	C.Y.	5.30	.52	.42	6.24	7.05
	6070	3 C.Y. bucket	B-10P	1,190	.010		5.30	.31	.64	6.25	7



	02315 Excavation and Fill		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2004 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
	6075	5 C.Y. bucket	B-10Q	1,835	.007	C.Y.	5.30	.20	.58	6.08	6.75	210
	7000	Topsoil or loam from stockpile, shovel, 1 C.Y. bucket	B-12N	840	.019		20	.61	1.01	21.62	24	
	7010	1-1/2 C.Y. bucket	B-12O	1,135	.014		20	.45	.86	21.31	23.50	
	7020	3 C.Y. bucket	B-12T	1,800	.009		20	.28	.73	21.01	23	
	7030	Front end loader, wheel mounted										
	7050	3/4 C.Y. bucket	B-10R	550	.022	C.Y.	20	.68	.35	21.03	23.50	
	7060	1-1/2 C.Y. bucket	B-10S	970	.012		20	.38	.24	20.62	23	
	7070	3 C.Y. bucket	B-10T	1,575	.008		20	.24	.19	20.43	22.50	
	7080	5 C.Y. bucket	B-10U	2,600	.005		20	.14	.26	20.40	22.50	
	8900	For larger hauling units, deduct from above								30%		
	9000	Hauling only, excavated or borrow material, see div. 02315-490										
	9200	For flowable fill, see section 03310-220										
310	0010	COMPACTION, GENERAL R02315-300										310
	5000	Riding, vibrating roller, 6" lifts, 2 passes	B-10Y	3,000	.004	C.Y.		.12	.11	.23	.31	
	5020	3 passes		2,300	.005			.16	.14	.30	.40	
	5040	4 passes		1,900	.006			.20	.17	.37	.49	
	5060	12" lifts, 2 passes		5,200	.002			.07	.06	.13	.18	
	5080	3 passes		3,500	.003			.11	.09	.20	.26	
	5100	4 passes		2,600	.005			.14	.12	.26	.36	
	5600	Sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10G	2,400	.005			.16	.32	.48	.59	
	5620	3 passes		1,735	.007			.22	.44	.66	.81	
	5640	4 passes		1,300	.009			.29	.59	.88	1.09	use
	5680	12" lifts, 2 passes		5,200	.002			.07	.15	.22	.27	
	5700	3 passes		3,500	.003			.11	.22	.33	.40	
	5720	4 passes		2,600	.005			.14	.29	.43	.54	
	6000	Towed sheepsfoot or wobbly wheel roller, 6" lifts, 2 passes	B-10D	10,000	.001			.04	.09	.13	.16	
	6020	3 passes		2,000	.006			.19	.47	.66	.80	
	6030	4 passes		1,500	.008			.25	.63	.88	1.07	
	6050	12" lifts, 2 passes		6,000	.002			.06	.16	.22	.26	
	6060	3 passes		4,000	.003			.09	.24	.33	.40	
	6070	4 passes		3,000	.004			.12	.31	.43	.54	
	6200	Vibrating roller, 6" lifts, 2 passes	B-10C	2,600	.005			.14	.57	.71	.84	
	6210	3 passes		1,735	.007			.22	.85	1.07	1.26	
	6220	4 passes		1,300	.009			.29	1.13	1.42	1.69	
	6250	12" lifts, 2 passes		5,200	.002			.07	.28	.35	.42	
	6260	3 passes		3,465	.003			.11	.42	.53	.63	
	6270	4 passes		2,600	.005			.14	.57	.71	.84	
	7000	Walk behind, vibrating plate 18" wide, 6" lifts, 2 passes	A-1D	200	.040			1.04	.14	1.18	1.78	
	7020	3 passes		185	.043			1.12	.15	1.27	1.92	
	7040	4 passes		140	.057			1.49	.20	1.69	2.53	
	7200	12" lifts, 2 passes	A-1E	560	.014			.37	.07	.44	.66	
	7220	3 passes		375	.021			.55	.11	.66	.98	
	7240	4 passes		280	.029			.74	.15	.89	1.32	
	7500	Vibrating roller 24" wide, 6" lifts, 2 passes	B-10A	420	.029			.89	.31	1.20	1.69	
	7520	3 passes		280	.043			1.33	.47	1.80	2.54	
	7540	4 passes		210	.057			1.78	.62	2.40	3.39	
	7600	12" lifts, 2 passes		840	.014			.44	.16	.60	.85	
	7620	3 passes		560	.021			.67	.23	.90	1.27	
	7640	4 passes		420	.029			.89	.31	1.20	1.69	
	8000	Rammer tamper, 6" to 11", 4" lifts, 2 passes	A-1F	130	.062			1.60	.27	1.87	2.79	
	8050	3 passes		97	.082			2.14	.37	2.51	3.74	
	8100	4 passes		65	.123			3.20	.55	3.75	5.60	
	8200	8" lifts, 2 passes		260	.031			.80	.14	.94	1.40	
	8250	3 passes		195	.041			1.07	.18	1.25	1.86	
	8300	4 passes		130	.062			1.60	.27	1.87	2.79	
	8400	13" to 18", 4" lifts, 2 passes	A-1G	390	.021			.53	.09	.62	.93	



SITE CONSTRUCTION 2

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County LF Expansion	JOB NO.
SUBJECT Hardee County Closure Cost	BY JHO	DATE
	CHECKED	DATE

Closure Cost

Item 5 Vegetative Cover

Quantity	Pricing
See figure for Item 2	Price Quote Hardee County
Area = 792,915 SF	$ 1.67/SY
(88,102 SY)	Material (Delivered Installation)
	Compare to FDOT
	\$1.38/SY < \$1.67/SY
	OK

ROAD MATERIALS - LAID IN PLACE

BID TABULATION - BEGINNING OCT 3, 2003 ENDING SEPT 30, 2004

	AJAX PAVING	APAC - MACASPHALT	BETTER ROADS**	CENTRAL FL HOT MIX
ASPHALTIC CONCRETE	PRICE/TON	PRICE/TON	PRICE/TON	PRICE/TON
TYPE III LEVELING COURSE	$60.10	$43.35	$49.50	$65.00
TYPE S1 SURFACE COURSE	$58.70	$40.65	$49.50	$65.00
TYPE SIII SURFACE COURSE	$58.90	$42.85	$49.50	$65.00
	PRICE/GL	PRICE/GL	PRICE/GL	PRICE/GL
PRIME COAT	$4.00	$0.90	$0.35	$2.00
			(SY)	
	PRICE/SY	PRICE/SY	PRICE/SY	PRICE/SY
TYPE III ASPHALTIC BASE COURSE	$22.00	$38.75	$24.00	$25.00
RE-WORK SHOULDERS	$0.58	$1.06	$0.60	$2.00
SEED & MULCH	$0.45	$0.95	$0.35	$0.75
SOD	$1.38	$1.95	$1.60	$1.75
BASE COURSE 4" SHELL	$3.90	$1.22	$4.00	$1.50
BASE COURSE 4" SHELL	$2.90	$0.81	$4.00	$1.50
BASE COURSE 6" SHELL	$4.70	$1.19	$5.00	$1.50
BASE COURSE 6" SHELL	$3.70	$0.81	$5.00	$1.50
FINISH & WATER	$2.50	$1.62	$1.65	$1.00
FINISH & WATER	$1.50	$1.08	$1.35	$1.00
PRIME & SAND	$0.60	$0.28	$0.35	$0.65
PRIME & SAND	$0.50	$0.28	$0.35	$0.45
STRIPING	PRICE/LF	PRICE/LF	PRICE/LF	PRICE/LF
CENTER LINES - YELLOW skip	$0.40	$0.22	$0.60	$0.30
CENTER LINES - YELLOW SOLID	$0.37	$0.22	$0.90	$0.30
EDGE LINES - WHITE solid	$0.37	$0.22	$0.90	$0.30
RR CROSSINGS	$60.00	$110.00	$300.00	$150.00
STOP BARS	$60.00	$22.04	$250.00	$35.00
OVERALL TOTAL	**$347.55**	**$310.45**	**$749.50**	**$421.50**

Avg $ 1.67 /sy
High $ 1.95/sy
Low $ 1.38/sy

**Priced Prime coat per SY rather than GL

Florida Department of Transportation
Item Average Unit Cost
From 2002/01/01 to 2003/11/30

Contract Type: CC STATEWIDE
Displaying: VALID ITEMS WITH HITS
From: 0000 To: 1999999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0120 72	4	$61.80	$80,770.00	1,307.000	CY	N	FILL GRAVEL
0121 70	14	$105.93	$183,591.28	1,733.100	CY	N	FLOWABLE FILL
0125 1	3	$18.67	$2,793.00	149.600	CY	N	EXCAVATION FOR STRUCTURES
0125 3	2	$7.30	$51,539.15	7,063.000	CY	N	BEDDING MATL (SELECT)
0141 70	2	$638.64	$7,025.00	11.000	AS	N	SETTLEMENT PLATE ASSEMBLY
0142 70	4	$5.98	$325,664.70	54,423.000	CY	N	FILL SAND
0144 1 1	1	$19.00	$3,610.00	190.000	LF	N	DIGITAL INCLINOMETER CASING (VERTICAL)
0144 71	1	$1,160.00	$5,800.00	5.000	EA	N	PORE-PRESSURE TRANSDUCER (PIEZOMETER)
0144 72	1	$15.00	$5,625.00	375.000	LF	N	TUBING FOR PIEZOMETER
0145 1	4	$4.13	$637,898.50	154,382.000	SF	N	GEOSYNTHETIC REINFORCED SOIL SLOPES
0145 2	2	$2.23	$52,889.76	23,706.000	SY	N	GEOSYNTHETIC REINF FND OVER SOFT SOILS
0160 3	1	$30.30	$80,628.30	2,661.000	CY	N	STABILIZING MATERIAL COMMERCIAL
0160 4	74	$2.00	$10,204,293.15	5,108,489.380	SY	N	STABILIZATION TYPE B
0162 3101	55	$.60	$1,886,683.18	3,155,588.500	SY	N	FINISH SOIL LAYER(GRASSING OPR) (6")
0162 4	3	$2.00	$65,941.45	32,977.000	SY	N	ORGANIC SOIL LAYER
0173 71	2	$664.54	$1,442,719.44	2,171.000	EA	N	DRILLING HOLES FOR PRESSURE GROUTING
0173 74	1	$198.40	$51,980.80	262.000	CY	N	PRESSURE GROUTING (CEMENT)
0173 76	1	$43.75	$277,593.75	6,345.000	LF	N	PIPE FOR GROUT INSTALLATION
0174 1	1	$7.50	$225,000.00	30,000.000	LB	N	SOIL STABILIZATION(HIGH-DENSITY POLY)
0175 1	1	$2.00	$60,958.00	30,479.000	SY	N	RESEAT CONC PAVT
0176002	1	$26.00	$47,554.00	1,829.000	CY	N	FILLER AGGREGATE
0200 70	2	$4.64	$13,841.00	2,983.000	CY	N	LIMEROCK MATL
0210 1 5	1	$8.51	$25,464.47	2,992.300	SY	N	BASE REWORK LIMEROCK (5")
0220 70 1	2	$2.46	$13,661.00	5,556.000	SY	N	BASE SHAPE & COMPACT EXIST (6")
0230 2	1	$15.00	$5,370.00	358.000	CY	N	LIMEROCK MATL
0285701	39	$6.93	$3,042,256.26	439,257.400	SY	N	BASE OPTIONAL (BASE GROUP 01)
0285702	3	$4.98	$616,862.68	123,776.000	SY	N	BASE OPTIONAL (BASE GROUP 02)
0285703	8	$5.73	$510,828.25	89,130.000	SY	N	BASE OPTIONAL (BASE GROUP 03)
0285704	31	$6.78	$5,069,010.09	747,183.480	SY	N	BASE OPTIONAL (BASE GROUP 04)
0285705	4	$6.98	$78,811.88	11,283.400	SY	N	BASE OPTIONAL (BASE GROUP 05)
0285706	24	$6.27	$3,073,540.03	490,019.070	SY	N	BASE OPTIONAL (BASE GROUP 06)
0285707	4	$10.12	$504,452.71	49,850.000	SY	N	BASE OPTIONAL (BASE GROUP 07)
0285708	1	$55.00	$11,990.00	218.000	SY	N	BASE OPTIONAL (BASE GROUP 08)
0285709	35	$8.66	$10,651,646.92	1,229,683.300	SY	N	BASE OPTIONAL (BASE GROUP 09)
0285710	12	$9.78	$3,827,980.57	391,478.490	SY	N	BASE OPTIONAL (BASE GROUP 10)

Florida Department of Transportation
Item Average Unit Cost
From 2001/01/01 to 2003/05/30

Contract Type: CC STATEWIDE
From: 0001 To: 1999999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0573 2					LB	N	SEED GRASS (FOR HYDRO-SEEDING)
0573 3					LB	N	FERTILIZER (FOR HYDRO-SEEDING)
0573 4					LB	N	MULCH FIBER (FOR HYDRO-SEEDING)
0575 1	80	$1.33	$3,347,957.32	2,517,036.100	SY	N	SODDING $1.33/sy
0575 1 1	44	$1.17	$2,853,300.55	2,440,085.200	SY	N	SODDING (BAHIA) $1.17/sy
0575 1 2	4	$2.60	$32,445.17	12,501.000	SY	N	SODDING (CENTIPEDE)
0575 1 3	13	$1.23	$652,540.11	532,009.000	SY	N	SODDING (ARGENTINE BAHIA) $1.23/sy
0575 1 4	25	$2.42	$337,606.95	139,519.340	SY	N	SODDING (SAINT AUGUSTINE)
0575 1 5	3	$1.65	$4,091.50	2,487.000	SY	N	SODDING (OVERLAPPED) $1.65/sy
0575 1 6	24	$1.53	$1,375,974.22	899,459.000	SY	N	SODDING (BERMUDA) $1.53/sy
0577 70	26	$.97	$977,148.80	1,012,517.000	SY	N	SHOULDER REWORK
0579 70					SY	N	SOIL STERILIZATION TREAT
0580173	10	$3.61	$570,498.85	157,904.500	SY	N	BED PREPARATION & MULCHING
0580192					TN	N	COQUINA ROCK BOULDERS
0580258					TN	N	ROCK BOULDERS
0580278 1					TN	N	CHATTAHOOCHEE RIVER GRAVEL
0580278 2					TN	N	BROWN GRAVEL
0580278 3					TN	N	WHITE WATER WASHED STONE
0580281	1	$95.00	$1,520.00	16.000	LF	N	MOWING STRIP CONC
0580301 1	19	$11.75	$69,627.76	5,926.000	EA	N	STAKING & GUYING (TREES)
0580301 2	14	$28.51	$74,131.79	2,600.000	EA	N	STAKING & GUYING (PALMS)
0580326 1	6	$2.69	$22,353.02	8,315.500	SY	N	MULCH PINE BARK
0580326 2	2	$1.45	$16,692.70	11,530.000	SY	N	MULCH PINE NEEDLE
0580326 3					SY	Y	MULCH SHREDDED CYPRUS BARK
0580326 4	4	$2.36	$74,217.76	31,507.000	SY	N	MULCH WOOD CHIP
0580327 1	15	$280.92	$115,457.71	411.000	EA	N	TREE RELOCATION (PALM)
0580327 2	8	$852.55	$57,973.66	68.000	EA	N	SMALL TREE,SHRUBS,GRD COVER RELOCATION
0580327 4	1	$15.45	$2,039.40	132.000	EA	N	PLANT ONLY PLANT MATL PROVIDED BY OTHS
0580332 1					EA	N	TREE REMOVAL (TREE SPADE)
0580332 2	10	$343.12	$47,693.40	139.000	EA	N	TREE REMOVAL (CUT AND REMOVE)
0580333					LF	N	CURB LANDSCAPE STEEL
0580334	1	$50.00	$250.00	5.000	EA	N	TREE PLANTING PIT COVER
0580336	10	$142.21	$32,281.20	227.000	EA	N	PRUNING AND TRIMMING (EXISTING TREES)
0580340 1	12	$2.66	$39,324.86	14,801.000	LF	N	TREE PROTECTION (BATTERBOARD)
0580340 2	1	$4.00	$3,400.00	850.000	LF	N	TREE PROTECTION (TRENCHING)
0580342					EA	N	MONITORING REPORT

Avg $1.38/sy

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT Expansion		BY JHO	DATE
Closure Cost		CHECKED	DATE

Closure Cost

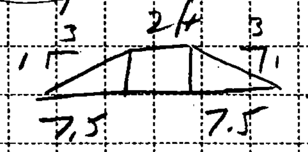
ITEM (6) STORMWATER

QUANTITY	PRICING

Earthwork
See Figure

Berms

Top

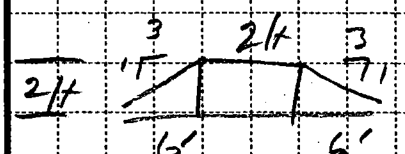


Area =
$2\{\tfrac{1}{2}\,7.5(2.5)\}$
$+ 2(2)$
$= 22.75\ ft^2$

Length = 1420 LF

$V = 1420 \times 22.75$
$32\,305\ ft^3$
(1196.5 cy)

Terrace



Area =
$2\{\tfrac{1}{2}(6)(2)\} +$
$2(2)$
$= 16\ ft^2$

Length = 3100 LF

$V = (3100)(16)$
$= 49600\ ft^3$
(1837 cy)

1196.5 + 1837
TOTAL = 3033.5 cy

Pricing
Hardee Co. Purchasing

Materials $ 4.50/cy
Delivered
X 1.02
$ 4.59/cy

Means
02315 120 3020 $ 0.85/cy

Means
02315 310 5100
$ 0.36/cy
$0.36/cy
12 in lift $ 0.36/cy
x 2.5 lifts
30 inches $ 0.18/cy

$ 6.34/cy

SCS ENGINEERS

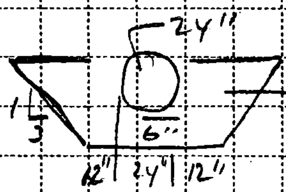
SHEET ______ OF ______

CLIENT Hardee County	PROJECT Hardee County Landfill		JOB NO. 09199033.09
SUBJECT		BY	DATE
Closure Cost		CHECKED	DATE

Closure Cost

Item (6) Stormwater (cont)

Quantity	Pricing
Drop Inlets	Drop Inlets
FDOT Type "C"	FDOT price item 0425
7 inlets	1521
	$1,754.78/EA
	Total = (7)1754.78 ⇒ $12,283.60
Energy Dissipators	FDOT price item 0430
	61029
FDOT	(4) $2400 = $9,600
4 Energy Dissipators	Total = 12,283.60 + 9600
	= 21,883.60
Pipes (slope increase)	Price quote from ADS
(1A) 170 LF × 1.05 ≈ 179	Price 24"ø $10.50/LF
(1) 120 LF × 1.05 = 126	Inflation 1.02 $10.71/LF
(2) 115 LF × 1.05 = 121	materials
(3) 95 LF × 1.05 = 100	
(4) 135 LF × 1.05 = 142	
(5) 95 LF × 1.05 = 100	Installation
(8) 130 LF × 1.05 = 137	Means 02530 770 3140 { 3.36/LF
905 LF	Labor 0.64/LF
	Equipment
	$14.71/LF



Area = 20 ft² CAD

Volume	Backfill
	Means 02315 110 $28.90/CY
	0015 + 0500
905 LF × 20 ft² = 18100 ft³	Piping total = 14.71 × 905 +
(670 CY)	28.90 (670)
	= 32,675.55 ($32700)

SCS ENGINEERS

SHEET ______ OF ______

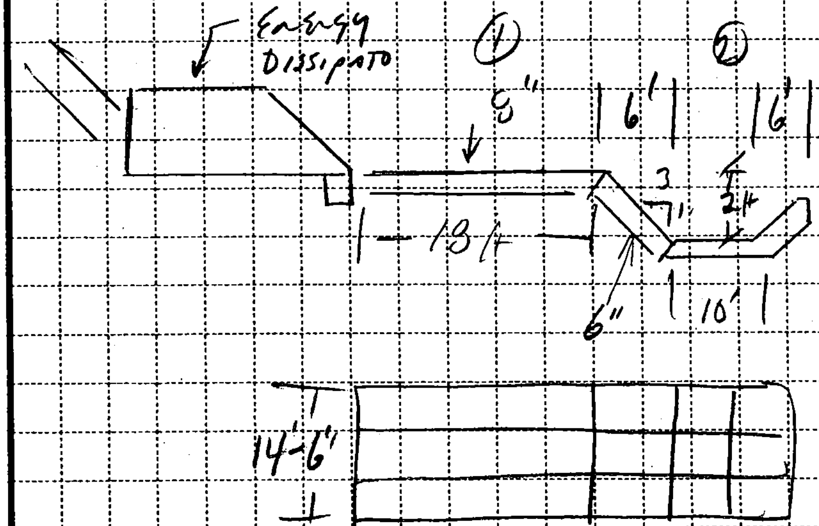
CLIENT Hardee County	PROJECT Hardee County LF	JOB NO. 07199033.01
SUBJECT Closure Cost	BY JM	DATE
	CHECKED	DATE

Closure Cost

ITEM (6) Stormwater (cont)

Quantity | Pricing

Concrete pads



Concrete (1) = $\left(\frac{8}{12}\right)(18)(14\text{-}6'')/27$

= 6.44 /cy

(2) = $\left(\frac{6}{12}\right)\{6+10+6\}\,14\text{-}6'/27$

= 5.91 /cy

Total = 12.54 /cy

say 13 /cy /pad

4 Energy Dissipators

Total 4 x 13/cy = 52 cy

Pricing Quote from Hardee County

\$64 /cy

\$64/cy x 52 cy

= \$3328

Say \$3500

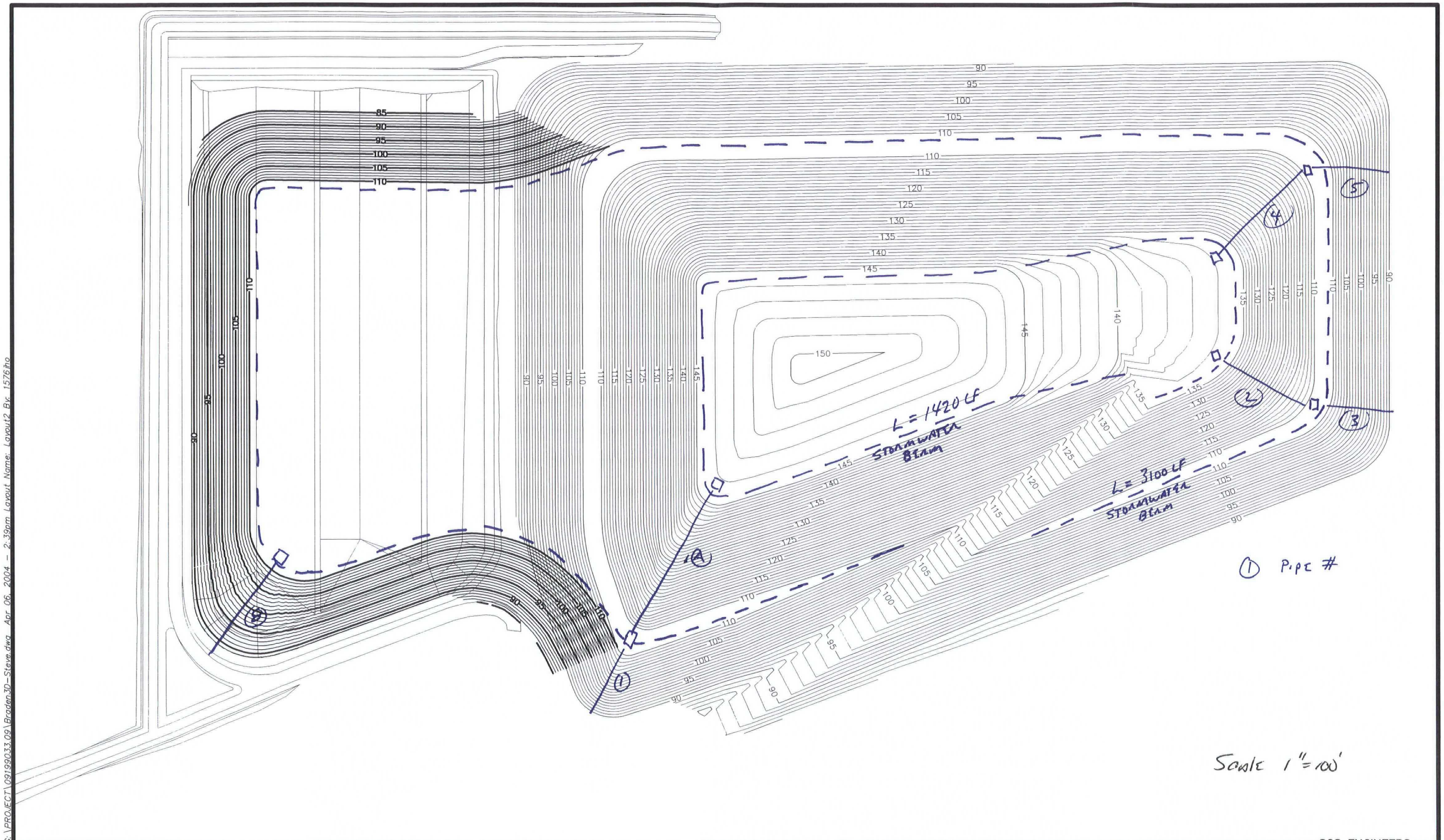


Figure __ – Buildout of Phase II Section I to Elevation 110.0

Florida Department of Transportation
Item Average Unit Cost
From 2001/01/01 to 2003/05/30

Contract Type: CC STATEWIDE
From: 0001 To: 1999999999

Item	No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0430190401					LF	N	PI RELAY EXIST (METAL ARCH) (17" X 13")
0430190404					LF	N	PI RELAY EXIST (METAL ARCH) (28" X 20")
0430200 21	1	$500.00	$500.00	1.000	EA	N	FLARED END SECTION (CONCRETE) (12")
0430200 23					EA	N	FLARED END SECTION (CONCRETE) (15")
0430200 25	3	$882.17	$5,293.00	6.000	EA	N	FLARED END SECTION (CONCRETE) (18")
0430200 29	2	$1,100.00	$2,200.00	2.000	EA	N	FLARED END SECTION (CONCRETE) (24")
0430200 33					EA	N	FLARED END SECTION (CONCRETE) (30")
0430200 38	1	$1,600.00	$6,400.00	4.000	EA	N	FLARED END SECTION (CONCRETE) (36")
0430200 40					EA	N	FLARED END SECTION (CONCRETE) (42")
0430200 41	1	$1,900.00	$3,800.00	2.000	EA	N	FLARED END SECTION (CONCRETE) (48")
0430200 42					EA	N	FLARED END SECTION (CONCRETE) (54")
0430200 43					EA	N	FLARED END SECTION (CONCRETE) (60")
0430200 44	1	$3,000.00	$3,000.00	1.000	EA	N	FLARED END SECTION (CONCRETE) (66")
0430200 45					EA	N	FLARED END SECTION (CONCRETE) (72")
0430610 23	2	$2,965.00	$5,930.00	2.000	EA	N	U-ENDWALL WITH GRATE (15")
0430610 25					EA	N	U-ENDWALL WITH GRATE (18")
0430610 29	1	$2,400.00	$2,400.00	1.000	EA	N	U-ENDWALL WITH GRATE (24") ← Energy Dissipation
0430610 33	1	$3,000.00	$3,000.00	1.000	EA	N	U-ENDWALL WITH GRATE (30")
0430611125					EA	N	U-ENDWALL /BAFFLES(STD 261)1:4 SLP(18")
0430620 02					EA	N	CMP FLASHBOARD RISER (21" X 15")
0430620 29					EA	N	CMP FLASHBOARD RISER (24")
0430620 33					EA	N	CMP FLASHBOARD RISER (30")
0430620 38					EA	N	CMP FLASHBOARD RISER (36")
0430620 40					EA	N	CMP FLASHBOARD RISER (42")
0430620 41					EA	N	CMP FLASHBOARD RISER (48")
0430620 42					EA	N	CMP FLASHBOARD RISER (54")
0430620 45					EA	N	CMP FLASHBOARD RISER (72")
0430710 21					LF	N	PIPE STEEL CULV (12")
0430710 25					LF	N	PIPE STEEL CULV (18")
0430710 29					LF	N	PIPE STEEL CULV (24")
0430710 33					LF	N	PIPE STEEL CULV (30")
0430710 38	1	$1,300.00	$23,400.00	18.000	LF	N	PIPE STEEL (36")
0430710 43	1	$1,800.00	$16,200.00	9.000	LF	N	PIPE STEEL (60")
0430721123					LF	Y	PI SLOT OR PERF CULV (CONC) (15" SS)
0430721125					LF	Y	PI SLOT OR PERF CULV (CONC) (18" SS)
0430721129					LF	Y	PI SLOT OR PERF CULV (CONC) (24" SS)

CESP005 06/03/2003-10 18.30

Florida Department of Transportation
Item Average Unit Cost
From 2001/01/01 to 2003/05/30

Contract Type: GC STATEWIDE
From: 0001 To: 1999999999

Item		No. of Conts	Weighted Average	Total Amount	Total Quantity	Unit Meas	Obs?	Description
0425	1508					EA	N	INLET (DT BOT)(TYP A)(J BOT, >10', SPE)
0425	1511	9	$2,567.95	$161,780.97	63.000	EA	N	INLETS (DT BOT) (TYPE B) (<10')
0425	1512	1	$3,586.41	$7,172.82	2.000	EA	N	INLETS (DT BOT) (TYPE B) (>10')
0425	1513	4	$4,302.73	$17,210.92	4.000	EA	N	INLETS (DT BOT) (TYPE B) (J BOT, <10')
0425	1514					EA	N	INLETS (DT BOT) (TYPE B) (J BOT, >10')
0425	1515	3	$1,912.40	$91,795.00	48.000	EA	N	INLETS (DT BOT) (TYPE B) (PARTIAL)
0425	1518					EA	N	INLET (DT BOT) (TYP B)(J BOT>10',SPE)
0425	1519					EA	N	INLETS (DT BOT) (TYPE B) (MODIFY)
0425	1521	49	$1,754.78	$470,279.79	268.000	EA	N	INLETS (DT BOT) (TYPE C) (<10') — Drop Inlets
0425	1522	2	$1,762.50	$3,525.00	2.000	EA	N	INLETS (DT BOT) (TYPE C) (>10')
0425	1523	7	$3,404.38	$54,470.00	16.000	EA	N	INLETS (DT BOT) (TYPE C) (J BOT, <10')
0425	1524	1	$3,150.77	$3,150.77	1.000	EA	N	INLETS (DT BOT) (TYPE C) (J BOT, >10')
0425	1525	3	$1,732.69	$45,050.00	26.000	EA	N	INLETS (DT BOT) (TYPE C) (PARTIAL)
0425	1527	2	$10,375.00	$20,750.00	2.000	EA	N	INLET (DT BOT)(TYP C)(J BOT, <10', SPE)
0425	1529	4	$2,383.33	$14,300.00	6.000	EA	N	INLETS (DT BOT) (TYPE C) (MODIFY)
0425	1531	13	$1,477.78	$113,788.90	77.000	EA	N	INLETS (DT BOT) (TYPE C MODIFIED) (<10')
0425	1532					EA	N	INLETS (DT BOT) (TYPE C MODIFIED) (>10')
0425	1533	1	$3,200.00	$73,600.00	23.000	EA	N	INLET (DT BOT) (TYP C MOD) (J BOT, <10')
0425	1534	1	$4,000.00	$12,000.00	3.000	EA	N	INLET (DT BOT) (TYP C MOD) (J BOT, >10')
0425	1535	1	$840.00	$840.00	1.000	EA	N	INLETS (DT BOT) (TYP C MOD) (PARTIAL)
0425	1537					EA	N	INLET(DT BOT)(TYP C MOD)(J BOT,<10'SPEC)
0425	1538					EA	N	INLET(DT BOT)(TYP C MOD)(J BOT,>10'SPEC)
0425	1541	34	$1,995.48	$365,172.64	183.000	EA	N	INLETS (DT BOT) (TYPE D) (<10')
0425	1542	1	$2,771.25	$2,771.25	1.000	EA	N	INLETS (DT BOT) (TYPE D) (>10')
0425	1543	5	$3,827.06	$38,270.56	10.000	EA	N	INLETS (DT BOT) (TYPE D) (J BOT, <10')
0425	1544	2	$4,813.33	$14,440.00	3.000	EA	N	INLETS (DT BOT) (TYPE D) (J BOT, >10')
0425	1545	2	$1,584.00	$7,920.00	5.000	EA	N	INLETS (DT BOT) (TYPE D) (PARTIAL)
0425	1547					EA	N	INLET (DT BOT)(TYP D)(J BOT, <10', SPE)
0425	1549	4	$3,026.43	$21,185.00	7.000	EA	N	INLETS (DT BOT) (TYPE D) (MODIFY)
0425	1551	17	$1,941.81	$205,831.61	106.000	EA	N	INLETS (DT BOT) (TYPE E) (<10')
0425	1552					EA	N	INLETS (DT BOT) (TYPE E) (>10')
0425	1553	1	$2,050.00	$2,050.00	1.000	EA	N	INLETS (DT BOT) (TYPE E) (J BOT, <10')
0425	1554					EA	N	INLETS (DT BOT) (TYPE E) (J BOT, >10')
0425	1555	1	$1,200.00	$1,200.00	1.000	EA	N	INLETS (DT BOT) (TYPE E) (PARTIAL)
0425	1557					EA	N	INLET (DT BOT)(TYP E)(J BOT, <10', SPE)
0425	1559	1	$3,640.00	$3,640.00	1.000	EA	N	INLETS (DT BOT) (TYPE E) (MODIFY)

QUOTATION

ADVANCED DRAINAGE SYSTEMS, INC.
115 W. Crown Point Rd.
Winter Garden, FL 34787
Ph: 800-733-0535
Fax: 407-654-6662

TO PLACE ORDERS:
PH: 800-733-9987
FAX: 800-733-1974

JOB NAME:
LOCATION:
COUNTY:
QUOTE DATE: September 25, 2003
CONTRACTOR (S):
BID DATE:
CUSTOMER: SCS Engineers
ENGINEER: SCS Engineers
SALESMAN: Emil Campillo # 11425
CONTACT: Lindsey Kennelly
PHONE: [1] 813-621-0080
FAX: [1] 813-623-6757

SUBJECT TO THE FOLLOWING CONDITIONS:

Budget Pricng

(Note: The quantities shown are estimated. Please verify product quantities for accuracy before ordering.)

ITEM#	QTY.	UNIT	DESCRIPTION	PRODUCT #	UNIT PRICE	TOTAL
1	600	l.f	24" N-12 Pipe, Solid, ST, Integral Bell, 20' Stick	2485-0020IB	$ 10.50	$ 6,300.00
2						
3						
4						
5						
6						
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19					TOTAL PAGE 1	$ 6,300.00

P.O. #:
REQUESTED SHIP DATE:
BILL TO:
SHIP TO:

FIELD CONTACT:
FIELD PHONE #:
COMMENTS:

Next Sheet 4H

	02530 | Sanitary Sewerage		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2004 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
730	2800	Add for rubber joints, R02510-810				L.F.	12%					730
	040	Vitrified plate lined, add to above, 30″ to 36″ diameter				SFCA	3.50			3.50	3.85	
	50	42″ to 54″ diameter, add					3.75			3.75	4.13	
	3060	60″ to 72″ diameter, add					4.39			4.39	4.83	
	3070	Over 72″ diameter, add					4.68			4.68	5.15	
	3080	Radius pipe, add to pipe prices, 12″ to 60″ diameter				L.F.	50%					
	3090	Over 60″ diameter, add				″	20%					
	3500	Reinforced elliptical, 8′ lengths, C507 class 3										
	3520	14″ x 23″ inside, round equivalent 18″ diameter	B-21	82	.341	L.F.	22	10.25	1.94	34.19	42.50	
	3530	24″ x 38″ inside, round equivalent 30″ diameter	B-13	58	.966		39	27	10.75	76.75	96.50	
	3540	29″ x 45″ inside, round equivalent 36″ diameter		52	1.077		50.50	30	12	92.50	115	
	3550	38″ x 60″ inside, round equivalent 48″ diameter		38	1.474		77.50	41.50	16.45	135.45	167	
	3560	48″ x 76″ inside, round equivalent 60″ diameter		26	2.154		118	60.50	24	202.50	250	
	3570	58″ x 91″ inside, round equivalent 72″ diameter		22	2.545		168	71.50	28.50	268	325	
	3780	Concrete slotted pipe, class 4 mortar joint										
	3800	12″ diameter	B-21	168	.167	L.F.	12.90	5	.95	18.85	23	
	3840	18″ diameter	″	152	.184	″	19.95	5.55	1.05	26.55	31.50	
	3900	Class 4 O-ring										
	3940	12″ diameter	B-21	168	.167	L.F.	13.50	5	.95	19.45	23.50	
	3960	18″ diameter	″	152	.184	″	18.10	5.55	1.05	24.70	29.50	
	6200	Gasket, conc. pipe joint, 12″				Ea.	3.10			3.10	3.41	
	6220	24″					5.65			5.65	6.25	
	6240	36″					8.25			8.25	9.05	
	6260	48″					13			13	14.30	
	6270	60″					18.55			18.55	20.50	
	6280	72″					20.50			20.50	22.50	
770	0010	**SEWAGE COLLECTION, PLASTIC PIPE**										770
	20	Not including excavation & backfill										
	0	Piping, DWV Sch 40 ABS, 4″ diameter	B-20	375	.064	L.F.	1.27	1.87		3.14	4.31	
	1110	6″ diameter		350	.069	″	6.95	2		8.95	10.75	
	1120	Fitting, 1/4 bend, 4″		19	1.263	Ea.	10.25	37		47.25	69	
	1130	6″		15	1.600		6.95	47		53.95	80.50	
	1140	Tee, 4″		12	2		10.25	58.50		68.75	102	
	3000	Piping, HDPE Corrugated Type S with watertight gaskets, 4″ diameter		425	.056	L.F.	.82	1.65		2.47	3.47	
	3020	6″ diameter		400	.060		1.89	1.75		3.64	4.80	
	3040	8″ diameter		380	.063		3.62	1.85		5.47	6.85	
	3060	10″ diameter		370	.065		5	1.90		6.90	8.45	
	3080	12″ diameter		340	.071		5.60	2.06		7.66	9.35	
	3100	15″ diameter		300	.080		7.60	2.34		9.94	12	
	3120	18″ diameter	B-21	275	.102		10.80	3.06	.58	14.44	17.25	
II	3140	24″ diameter		250	.112		16.75	3.36	.64	20.75	24.50	USE
	3160	30″ diameter		200	.140		26.50	4.20	.80	31.50	36.50	
	3180	36″ diameter		180	.156		33.50	4.67	.88	39.05	45	
	3200	42″ diameter		175	.160		47	4.80	.91	52.71	60	
	3220	48″ diameter		170	.165		61	4.94	.94	66.88	75.50	
	3240	54″ diameter		160	.175		94	5.25	.99	100.24	113	
	3260	60″ diameter		150	.187		110	5.60	1.06	116.66	131	
	3300	Watertight elbows 12″ diam	B-20	11	2.182	Ea.	61.50	64		125.50	167	
	3320	15″ diam	″	9	2.667		95	78		173	226	
	3340	18″ diam	B-21	9	3.111		157	93.50	17.65	268.15	335	
	3360	24″ diam		9	3.111		335	93.50	17.65	446.15	530	
	3380	30″ diam		8	3.500		535	105	19.90	659.90	770	
	3400	36″ diam		8	3.500		685	105	19.90	809.90	940	
	20	42″ diam		6	4.667		865	140	26.50	1,031.50	1,200	
	40	48″ diam		6	4.667		1,325	140	26.50	1,491.50	1,700	
	3460	Watertight tee 12″ diam	B-20	7	3.429		139	100		239	310	

2 SITE CONSTRUCTION

02305 | Equipment

		02305 Equipment	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
							2004 BARE COSTS					
250	1100	Small equipment, placed in rear of, or towed by pickup truck R01590 -100	A-3A	8	1	Ea.		25.50	10.25	35.75	50.50	250
	0	Equip up to 70 HP, on flatbed trailer behind pickup truck	A-3D	4	2			51.50	42.50	94	126	
	0	Crane, truck-mounted, up to 75 ton (costs incl both mob & demob)	1 EQHV	3.60	2.222			77.50		77.50	116	
	2100	Crane, truck-mounted, over 75 ton	A-3E	2.50	6.400			196	33	229	335	
	2200	Crawler-mounted, up to 75 ton	A-3F	2	8			245	278	523	675	
	2300	Over 75 ton	A-3G	1.50	10.667			325	390	715	925	
	2500	For each additional 5 miles haul distance, add						10%	10%			
	3000	For large pieces of equipment, allow for assembly/knockdown										
	3001	For mob/demob of vibrofloatation equip, see section 02250-900										
	3100	For mob/demob of micro-tunneling equip, see section 02441-400										
	3200	For mob/demob of pile driving equip, see section 02455-650										
	3300	For mob/demob of caisson drilling equip, see section 02465-950										

02310 | Grading

		02310 Grading	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
100	0010	**FINISH GRADING**										100
	0012	Finish grading area to be paved with grader, small area	B-11L	400	.040	S.Y.		1.19	1.08	2.27	3.01	
	0100	Large area		2,000	.008			.24	.22	.46	.60	
	0200	Grade subgrade for base course, roadways		3,500	.005			.14	.12	.26	.35	
	1020	For large parking lots	B-32C	5,000	.010			.29	.30	.59	.77	
	1050	For small irregular areas	"	2,000	.024			.72	.74	1.46	1.92	
	1100	Fine grade for slab on grade, machine	B-11L	1,040	.015			.46	.42	.88	1.16	
	1150	Hand grading	B-18	700	.034			.91	.06	.97	1.49	
	1200	Fine grade granular base for sidewalks and bikeways	B-62	1,200	.020			.56	.12	.68	.99	
	2550	Hand grade select gravel	2 Clab	60	.267	C.S.F.		6.95		6.95	10.80	
	3000	Hand grade select gravel, including compaction, 4" deep	B-18	555	.043	S.Y.		1.15	.07	1.22	1.88	
	3100	6" deep		400	.060			1.60	.10	1.70	2.60	
	3120	8" deep		300	.080			2.13	.14	2.27	3.47	
	[illegible]	Finishing grading slopes, gentle	B-11L	8,900	.002			.05	.05	.10	.13	
	10	Steep slopes	"	7,100	.002			.07	.06	.13	.17	

02315 | Excavation and Fill

		02315 Excavation and Fill	CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
110	0010	**BACKFILL, GENERAL** R02315 -300										110
	0015	By hand, no compaction, light soil	1 Clab	14	.571	C.Y.		14.85		14.85	23	USE
	0100	Heavy soil		11	.727			18.90		18.90	29.50	
	0300	Compaction in 6" layers, hand tamp, add to above		20.60	.388			10.10		10.10	15.75	
	0400	Roller compaction operator walking, add	B-10A	100	.120			3.73	1.31	5.04	7.15	
	0500	Air tamp, add	B-9D	190	.211			5.55	.97	6.52	9.70	
	0600	Vibrating plate, add	A-1D	60	.133			3.47	.48	3.95	5.90	USE
	0800	Compaction in 12" layers, hand tamp, add to above	1 Clab	34	.235			6.10		6.10	9.55	
	0900	Roller compaction operator walking, add	B-10A	150	.080			2.49	.87	3.36	4.74	# 28.90 /cy
	1000	Air tamp, add	B-9	285	.140			3.71	.56	4.27	6.35	
	1100	Vibrating plate, add	A-1E	90	.089			2.31	.46	2.77	4.11	
	3000	For flowable fill, see div. 03310-220										
120	0010	**BACKFILL, STRUCTURAL** Dozer or F.E. loader										120
	0020	From existing stockpile, no compaction										
	2000	75 H.P., 50' haul, sand & gravel	B-10L	1,100	.011	C.Y.		.34	.27	.61	.82	
	2020	Common earth		975	.012			.38	.31	.69	.92	
	2040	Clay		850	.014			.44	.35	.79	1.06	
	2200	150' haul, sand & gravel		550	.022			.68	.55	1.23	1.63	
	2220	Common earth		490	.024			.76	.61	1.37	1.83	
	2240	Clay		425	.028			.88	.71	1.59	2.12	
	2400	300' haul, sand & gravel		370	.032			1.01	.81	1.82	2.42	
	[illegible]	Common earth		330	.036			1.13	.91	2.04	2.72	
	2440	Clay		290	.041			1.29	1.04	2.33	3.10	
	3000	105 H.P., 50' haul, sand & gravel	B-10W	1,350	.009			.28	.32	.60	.77	

READY MIX CONCRETE

BID TABULATION - BEGINNING OCT 3 2003 ENDING SEPT 30, 2004

PRICED PER CUBIC YD	JAHNA	SINGELTARY	
4000 PSI	$64.40	$64.00	
3500 PSI (CLASS AA)	$62.30	$62.00	
3000 PSI (CLASS A	$60.25	$60.00	
2500 PSI	$58.15	$58.00	
2000 PSI	$56.15	$54.00	
FIBER	$4.50	$4.00	
ACCELERATOR	$1.00	$1.00	
DELIVERY	12 hrs	11 hrs	

USE

RECOMMENDATION: SINGELTARY

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT Hardee County Expansion	JOB NO. 09199037.04
SUBJECT Hardee County LF	BY JH	DATE
	CHECKED	DATE

Closure Cost

Item 7 Passive Gas System

Quantity	Pricing
Phase I = 12.5 ac Phase II Section I = 5.0 ac Total 17.5 ac Passive gas vents 1 vent/ac 17.5 ac / 1 vent/ac ≅ 17.5 18 vents Per sheet 25 of Permit Drawings 11 passive gas vents installed w/ construction Remaining 18 − 11 Install closure 7 vents Max height Phase II Section I EL 150 equal to Phase I Depth of Vent ~ 3/4 Landfill depth Top EL 150 Bottom EL 80 70 ft × 3/4 = 52.5 ft/vent Total vent = 7 vents × 52.5 ft/vent = 367.5 VLF	Pricing use quote from Orange County High bid $110/LF in 2001-2002 Inflation 2002 → 2003 $110/LF × 1.01 = 111.10 2003 → 2004 111.10 × 1.02 = $113.3/VLF Price = 113.32 × 367.5 VLF = $41,645.84 Mobilization 42,000 × 1.01 × 1.02 = $43,268.4 Total = $84,914.24 Price/LF = $231./VLF

35 acres

5B

THIS IS THE BID EVALUATION FROM THE CLASS III LFG SYSTEM THAT IS BEING CONSTRUCTED BY ERC IN LATE 2001.

Engineer's Cost Estimate
Class III Landfill Gas Collection and Control System
Orange County Landfill, IFB No. Y1-777-PH

USE

Item No.	Item Description	Units	Estimated Quantity	Engineer's Estimate		ERC		SEI Environmental		OWT		CJ Langenfelder		WET		Average
				Unit Price	Total Cost	Unit Price	Total Cost	Unit Price	Total Cost	Unit Price	Total Cost	Unit Price	Total Cost	Unit Price	Total Cost	Unit Price
001	Mobilization/Demobilization	LS	1	$40,000.00	$40,000	$31,000.00	$31,000.00	$6,000.00	$6,000.00	$35,000.00	$35,000.00	$42,500.00	$42,500.00	$25,000.00	$25,000.00	$27,900.00
002	Project Survey	LS	1	$12,000.00	$12,000	$10,000.00	$10,000.00	$15,000.00	$15,000.00	$32,250.00	$32,250.00	$15,000.00	$15,000.00	$47,500.00	$47,500.00	$23,950.00
003	LFG Extraction Well Installation:															
003a	~~24" Bore w/6" PVC Casing (Class III Landfill)~~	[illegible]	395	$70.00	$27,650	$110.00	$43,450.00	$81.00	$31,995.00	$57.25	$22,613.75	$110.00	$43,450.00	$85.00	$33,575.00	[illegible]
003b	24" Bore w/6" PVC Casing (Pre-1985 Landfill)	LF	252	$60.00	$15,120	$110.00	$27,720.00	$81.00	$20,412.00	$57.25	$14,427.00	$110.00	$27,720.00	$85.00	$21,420.00	$88.65
003c	Boring Refusal	LF	100	$50.00	$5,000	$110.00	$11,000.00	$60.00	$6,000.00	$31.00	$3,100.00	$60.00	$6,000.00	$70.00	$7,000.00	$66.20
004	Passive Vent Abandonment/Retrofit															
004a	Abandon Passive Vents	EA	14	$100.00	$1,400	$650.00	$9,100.00	$75.00	$1,050.00	$100.00	$1,400.00	$120.00	$1,680.00	$500.00	$7,000.00	$289.00
004b	Downslope Passive Vent Retrofit to Extr. Well	EA	10	$500.00	$5,000	$700.00	$7,000.00	$100.00	$1,000.00	$165.00	$1,650.00	$450.00	$4,500.00	$800.00	$8,000.00	$443.00
005	Horizontal Collector Installation	LF	2,480	$25.00	$62,000	$40.00	$99,200.00	$14.00	$34,720.00	$23.50	$58,280.00	$26.00	$64,480.00	$54.00	$133,920.00	$31.50
006	LFG Extraction Wellheads															
006a	Class III Landfill Gas Wells	EA	26	$425.00	$11,050	$1,400.00	$36,400.00	$145.00	$3,770.00	$475.00	$12,350.00	$700.00	$18,200.00	$400.00	$10,400.00	$624.00
006b	Horizontal Collectors	EA	3	$425.00	$1,275	$1,400.00	$4,200.00	$150.00	$450.00	$1,150.00	$3,450.00	$1,000.00	$3,000.00	$600.00	$1,800.00	$860.00
006c	Pre-1985 Landfill Gas Wells	EA	10	$425.00	$4,250	$1,400.00	$14,000.00	$150.00	$1,500.00	$475.00	$4,750.00	$725.00	$7,250.00	$600.00	$6,000.00	$670.00
007	HDPE Pipe Installation, Class III Landfill															
007a	4" HDPE SDR 17	LF	3,900	$12.10	$47,190	$4.00	$15,600.00	$15.00	$58,500.00	$12.25	$47,775.00	$9.00	$35,100.00	$24.00	$93,600.00	$12.85
007b	6" HDPE SDR 17	LF	2,650	$15.00	$39,750	$7.00	$18,550.00	$19.00	$50,350.00	$14.25	$37,762.50	$9.60	$25,440.00	$28.00	$74,200.00	$15.57
007c	8" HDPE SDR 17	LF	3,240	$19.75	$63,990	$13.00	$42,120.00	$21.00	$68,040.00	$16.50	$53,460.00	$14.00	$45,360.00	$32.00	$103,680.00	$19.30
007d	10" HDPE SDR 17	LF	740	$24.00	$17,760	$20.00	$14,800.00	$26.00	$19,240.00	$25.00	$18,500.00	$24.00	$17,760.00	$42.00	$31,080.00	$27.40
007e	2" HDPE SDR 11 Air Supply Line (common trench)	LF	3,800	$2.00	$7,600	$2.00	$7,600.00	$12.00	$45,600.00	$2.00	$7,600.00	$3.50	$13,300.00	$2.00	$7,600.00	$4.30
007f	2" HDPE SDR 11 Forcemain (Dual-contained)	LF	500	$5.00	$2,500	$17.00	$8,500.00	$16.00	$8,000.00	$7.65	$3,825.00	$19.00	$9,500.00	$24.00	$12,000.00	$16.73
008	HDPE Pipe Installation, Pre-1985 Landfill															
008a	4" HDPE SDR 17	LF	7,055	$12.10	$85,366	$5.00	$35,275.00	$15.00	$105,825.00	$15.00	$105,825.00	$10.00	$70,550.00	$28.00	$197,540.00	$14.60
008b	2" HDPE SDR 11 Forcemain (Dual-contained)	LF	1,070	$5.00	$5,350	$17.00	$18,190.00	$16.00	$17,120.00	$12.00	$12,840.00	$13.00	$13,910.00	$30.00	$32,100.00	$17.60
009	LFG System Appurtenances:															
009a	Header Road Crossing	LF	170	$40.00	$6,800	$25.00	$4,250.00	$55.00	$9,350.00	$47.00	$7,990.00	$90.00	$15,300.00	$150.00	$25,500.00	$73.40
009a1	10" Header Isolation Valve	EA	2		$0	$1,900.00	$3,800.00	$4,000.00	$8,000.00	$3,000.00	$6,000.00	$1,400.00	$2,800.00	$4,800.00	$9,600.00	$3,020.00
009b	8" Header Isolation Valve	EA	3	$2,500.00	$7,500	$1,800.00	$5,400.00	$3,500.00	$10,500.00	$2,500.00	$7,500.00	$3,500.00	$10,500.00	$3,200.00	$9,600.00	$2,900.00
009c	4" Header Isolation Valve	EA	2	$1,800.00	$3,600	$1,500.00	$3,000.00	$2,700.00	$5,400.00	$2,250.00	$4,500.00	$2,500.00	$5,000.00	$800.00	$1,600.00	$1,950.00
009d	Self-Draining Condensate Trap	EA	2	$6,600.00	$13,200	$4,000.00	$8,000.00	$4,500.00	$9,000.00	$8,500.00	$17,000.00	$6,000.00	$12,000.00	$5,000.00	$10,000.00	$5,600.00
009e	Condensate Sump w/Pump	EA	3	$8,000.00	$24,000	$7,500.00	$22,500.00	$9,600.00	$28,800.00	$17,500.00	$52,500.00	$43,000.00	$129,000.00	$8,000.00	$24,000.00	$17,120.00
009f	Condensate Forcemain Discharge Tie-in	EA	2	$1,000.00	$2,000	$1,500.00	$3,000.00	$1,000.00	$2,000.00	$1,250.00	$2,500.00	$470.00	$940.00	$1,000.00	$2,000.00	$1,044.00
009g	Tie-in to Existing 18" LFG Transmission Main	LS	1		$0	$2,000.00	$2,000.00	$7,000.00	$7,000.00	$500.00	$500.00	$9,000.00	$9,000.00	$5,000.00	$5,000.00	$4,700.00
010	Blower/Flare Station	LS	1	$125,000.00	$125,000	$120,000.00	$120,000.00	$138,495.00	$138,495.00	$161,335.00	$161,335.00	$215,000.00	$215,000.00	$185,000.00	$185,000.00	$163,966.00
011	Record Documentation	LS	1	$7,500.00	$7,500	$2,000.00	$2,000.00	$1,000.00	$1,000.00	$12,500.00	$12,500.00	$500.00	$500.00	$7,500.00	$7,500.00	$4,700.00
012	Indemnification	LS	1	$100.00	$100	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00
				Subtotal	$643,950.50	**Subtotal**	$627,755.00	**Subtotal**	$714,217.00	**Subtotal**	$749,283.25	**Subtotal**	$864,840.00	**Subtotal**	$1,133,315.00	

MANPOWER AND FEE ESTIMATE - ITEMS 10 AND 11, FINANCIAL ASSURANCE
HARDEE COUNTY REGIONAL LANDFILL CLOSURE

<u>Task Key</u>

10 a - Closure Plan Report | **10 d - Final Survey** | **11 a - Contract Management**
10 b - FDEP Coordination | **10 e - Construction Certification** | **11 b - CQA**
10 c - Bidding

	Engineering					Professional Services		Total	Rate	Total
Personnel	**10 a**	**10 b**	**10 c**	**10 d**	**10 e**	**11 a**	**11 b**	(hours)	($)	($)
Project Director	10	16	8	0	4	40	0	78	140	10,920
Senior Project Professional	40	80	40	0	16	160	0	336	98	32,928
Project Professional	60	0	0	0	0	0	0	60	80	4,800
Staff Professional	120	120	40	24	120	0	0	424	70	29,680
Designer/Drafter	60	40	24	0	16	0	0	140	55	7,700
Contract Management Technician	0	0	0	0	0	1,950	0	1,950	45	87,750
Quality Assurance Technician	0	0	0	0	0	0	655	655	45	29,475
Administrative Assistant	40	0	24	0	10	80	0	154	40	6,160
Subtotal Labor (hours)	330	256	136	24	166	2,230	655	3,797		
Subtotal Labor ($)	23,420	20,680	10,120	1,680	11,808	112,230	29,475			209,413
Reimbursables (See Table 2)	1,704	979	1,836	8,000	1,434	26,227	51,390			91,570
G&A, 15 percent reimbursables	256	147	275	1,200	215	3,934	7,709			13,736
Total reimbursables	1,960	1,126	2,111	9,200	1,649	30,161	59,099			105,306
Subtotal, Fee Estimate	**25,380**	**21,806**	**12,231**	**10,880**	**13,457**	**142,391**	**88,574**			**314,719**
	Closure Application Total = 47,186		**Construction Costs** Total = 267,533					Say ==>		**$314,700**
			Total 10a,b,c,d.		83,754	Total 11a&11b	230,965			

#84,000 | 230965
ITEM (10) | ITEM (11)

MANPOWER AND FEE ESTIMATE - ITEMS 10 AND 11, FINANCIAL ASSURANCE
HARDEE COUNTY REGIONAL LANDFILL CLOSURE

REIMBURSABLES ESTIMATE (Task Amounts)

Task Key

10 a - Closure Plan Report
10 b - FDEP Coordination
10 c - Bidding
10 d - Final Survey
10 e - Construction Certification
11 a - Contract Management
11 b - CQA

Reimbursable Total = 91,570

Reimbursable	Unit Cost ($)	Unit	10 a	10 b	10 c	10 d	10 e	11 a	11 b		Total Units	Total ($)
Subconsultants, Topographic survey	1	LS				8,000					8,000	8,000
Subcontractors/Drillers	1	LS									0	0
Outside Lbr/Temp Svcs	1	LS									0	0
Laboratory Services	1	EA									0	0
Vehicle Mileage (Auto)	0.36	MI									0	0
Vehicle Mileage (Truck)	0.50	MI									0	0
Company Vehicle	50	DA									0	0
Rental Truck, Engineer	1050	MO						6.5			7	6,825
Rental Truck, Technician	0	MO									0	0
Parking & Tolls	1	LS									0	0
Air Fare	1	EA									0	0
Meals	26	DA						210	80		290	7,540
Lodging, Hotel	50	DA						210	80		290	14,500
Cell Phone for Engineer	5	DA						390			390	1,950
Faxes	3	PG	32	16	72		48	312			480	1,440
Postage & Freight	1	LS			240		50				290	290
Reproduction (Xerox)	0.1	EA	640	80	2,400		2,000	1,560			6,680	668
Reproduction (Graphics) CADD	3	EA	48	41	180		90				359	1,077
Equipment/Supplies	1	LS					400		1,560		1,960	1,960
Draeger Tubes	5	EA									0	0
Gas Meters	50	DA									0	0
Equipment Rental	1	LS									0	0
Computer (Word Process)	5	HR	40	0	24	0	10	80	0		154	770
Computer (CADD)	20	HR	60	40	24	0	16	0	0		140	2,800
Quality Assurance Testing	1	LS							43,750			43,750
Licenses/Permits	1	LS	0								0	0

SCS ENGINEERS

Sheet ________ of ________

Client Hardee County	Project Landfill Expansion		Job No. 09199033.09
Subject Closing Costs		By LEK	Date 4/8/2004
		Checked	Date

TASK

Calculate and provide reasoning for Items 10 and 11 of Estimated Closing Costs

ATTACHMENTS

Manpower and Fee Estimate
Includes: Manpower and Fee Estimate by Task Dollars and Reimbursables Estimate.

NOTE

For a 17.5-acre (surface area) closure, manpower and fee estimate is attached.
Use 6.5 work months for entire closure process.
(6.5 work months)(4 wk/1 mo)(6 days/wk)(10 hr/day)= 1,560 hours (On-Site Engineer)
(65.5 works days) (10 hrs/day) = 655 hours (CQA Tech)

Item 10 - Engineering

10 a - Closure Plan Report

Manpower	Hours	Reasoning
Staff Engineer	120	Design closure and write specs
Drafting	60	Complete and reproduce closure design drawings
Sr. Proj Engineer	40	Oversee Closure Design, Review Specs & Project Management
Admin	40	Word process support
Project Director	10	Check, sign, & seal

Reimbursables	Quantity Estimate
Faxes	(2 pgs/fax)(1 fax/wk)(4 wk/mo)(2 work months)(2 file copies)= 32 pages
Xerox Reproduction	(5 pgs/letter)(4 ltrs/wk)(4 wk/mo)(2 work months)(4 copies) = 640 pages
CADD Reproductions	(4 pages)(9 copies) + 12 draft copies= 48 sheets
Computer Time- CADD	Manpower = 60 hours
Computer Time- Word Process	Manpower = 40 hours
Licenses/Permit	$0
Aerial Topographic Survey	$8,000

10 b - FDEP Coordination

Manpower	Hours	Reasoning
Staff Engineer	120	Response to FDEP comments
Drafting	40	For changes to drawings
Sr. Proj Engineer	80	Response to FDEP comments, checking & project management
Project Director	16	Response to FDEP comments

Reimbursables	Quantity Estimate
Faxes	(2 pgs/fax)(1 fax/week)(4 wk/mo)(1 work months)(2 file copies) = 16 pgs
Xerox Reproduction	(5pgs/letter)(1 ltr/wk)(4 wk/mo)(1 work months)(4 copies) = 80 pages
CADD Reproductions	Estimate at: (3 pages)(7 copies) + 20 draft copies= 41 sheets
Computer Time- CADD	Manpower = 40 hours

SCS ENGINEERS

Sheet ______ of ______

Client	Project	Job No.
Hardee County	Landfill Expansion	09199033.09

Subject	By	Date
Closing Costs	LEK	4/8/2004
	Checked	Date

10 c - Bidding

Manpower	Hours	Reasoning
Staff Engineer	40	Response to bidder's questions
Sr. Proj Engineer	40	Response to bidder's questions and Project Management
Project Director	8	Check, sign, seal packages
Drafting	24	Reproduce bid package drawings
Admin	24	Reproduce and assemble bid package

Reimbursables	Quantity Estimate
Faxes	(2 pgs/fax)(12 faxes)(3 file copies) = 72 pgs
Xerox Reproduction	Bid package: (200 pgs)(12 bidders) = 2400 pages
Graphics Reproduction	Bid package: (15 pgs)(12 bidders) = 180 pages
Word Processing	Computer time from Admin manpower = 24 hours
Shipping	(12 Bid packages)($20/Bid Package) = $240

10 d - Final Survey

Manpower	Hours	Reasoning
Staff Engineer	24	Coordination with surveyor

10 e - Construction Certification

Manpower	Hours	Reasoning
Staff Engineer	120	Complete within 30 days
Drafting	16	Any redesigns/as builts
Sr. Proj Engineer	16	Project management & Checking
Admin. Asst.	10	Production support
Project Director	4	Check, sign, and seal

Reimbursables	Quantity Estimate
Faxes	(1 faxes/wk)(2 pgs/fax)(8 wk)(3 file copies) = 48 pages
Postage	Certification distribution; estimate at $50
Xerox Reproduction	(250 pages)(8 copies) = 2000 pages
Graphics Reproduction	As builts: (15 sheets)(6 copies/sheet) = 90 sheets
Equipment/Supplies	Binders, inserts, etc., estimate at $400
Computer Time:	
Word Processing	Administrative manpower = 10 hours
CADD	CADD time from manpower = 16 hours

SCS ENGINEERS

Sheet ______ of ______

Client	Project	Job No.
Hardee County	Landfill Expansion	09199033.09

Subject	By	Date
Closing Costs	LEK	4/8/2004
	Checked	Date

Item 11 - Professional Services

11 a - Contract Management **Full-time during construction**

Manpower	Hours	Reasoning
Sr. Proj Engineer	160	Project management
Equals PE Supervisor =	160	Use Sr. Project Engineer rate
Resident Technician	1,950	On site full-time
Administration	80	Office assistance
Equals on-site tech =	80	Use Secreterial/Clerical Rate

Reimbursables	Quantity Estimate
Rental Truck for Eng	(6.5 work months)($1050/month) = $ 6,825)
Cell Phone for Eng	(195 work days*2 phones)($5/day) = $1,950
Meals	210 days (6.5 months)
Lodging	210 days (6.5 month)
Faxes	(2 pgs/fax)(2 faxes/wk)(26 wks)(3 file copies) = 312 pgs
Xerox Reproduction	Meeting Minutes, letters: (10 pgs/wk)(26 wks)(6 copies) = 1,560 pages

11 b - Quality Assurance **During placement of fill & top soil**

To cover liner, manpower and testing assume $2500/acre of closure
$2500/acre x 17.5 acres = $43,750

A resident technician will need to be onsite for 655 hours during the liner process.
Liner oversite will be 65.5 work days (76.5 total days assuming working 6 days/wk)

	Hours	
Resident Technician	655	Liner Quality Assurance

Reimbursables	Quantity Estimate
Cell Phone for Eng	Included in Contract Management Costs
Rental Truck for Eng	Included in Contract Management Costs
Meals	80 days (2.5 months)
Lodging	80 days (2.5 months)
Equipment & Supplies	Estimate at $1,500

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT	JOB NO. 09199077.09
SUBJECT Hardee County LF	BY	DATE
Closure Cost	CHECKED	DATE

11) CONSTRUCTION TIME ESTIMATE

17.5 acres total

ESTIMATED TIME

Geomembrane / Deployment rate $\frac{17.5 \text{ acres}}{0.5 \text{ acres/day}} = 35$ days

Geocomposite Deployment rate $\frac{17.5 \text{ acres}}{1 \text{ acre/day}} = 17.5$ days

52.5 days (work)
+ 1 day mobilization
+ 1 day demobilization
+ 6 weather
+ 5 delays

65.5 days works — Geosynthetic

65.5 work days × 10 hrs/day = 655 hrs CQA Technician

Earthwork

Bedding 17.5 acres × 12 inch ~ 30000 cy
Cover 17.5 acres × 24 inch ~ 59,000 cy
Berms ~ 2600 cy

Production Means
02315 120 3020 Output ~1200 cy/day

Bedding 30,000 cy /1200 ~ 25 day
Cover 59,000 cy /1200 ~ 50 day
Berms 2600 cy /1200 ~ 2 days

77 days

SCS ENGINEERS

SHEET ______ OF ______

CLIENT	PROJECT	JOB NO.
SUBJECT	BY	DATE
	CHECKED	DATE

11) CONSTRUCTION (CONT)

EARTHWORK

77 day
+ 1 day MOB
+ 1 day DEMOB
+ 5 day DELAYS
+ 6 day WEATHER

90 days

PIPE WORK

24"ϕ ADS pipe + rock + Textile
pipe = 905 LF TOTAL

SAY 3 days per pipe SEGMENT

6 pipes SEGMENTS 6 days
+ 6 day 1 day manhole
12 days

GAS VENTS

INSTALL 7 VENTS @ 22.5 LF
157.5 LF

SAY 2 day / VENT = 14 days

TOTAL = 65.5 + 90 + 12 + 14 ⇒ 181.5 days
× 7.5% WEATHER / DELAYS / MOB / DEMOB
= 195 day (6.5 MONTHS)

195 day × 10 hr/day = 1950 hrs ON SITE ENGINEER

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT	JOB NO. 09199033.09
SUBJECT Hardee County LF Closure	BY HW	DATE
	CHECKED	DATE

Closure Cost

ITEM 13 SITE Specific COST

QUANTITY	PRICING
WASTE TIRE Facility MAXIMUM QUANTITY STORED 10 TNS ONSITE PERMIT	Hardee County PRICE QUOTE \$119.50/TN TOTAL = 10 TNS \$119.5/TN = \$1,195 1200
MRF MAXIMUM QUANTITY STORED TOTAL 180 TNS (UNPROCESSED MATERIAL, ALUMINUM CANS CANS, PLASTIC, CARDBOARD) ALL OTHER WASTE STORED IN VENDOR TRAILERS	HAULING COST OVERLAND SERVICES TO SARASOTA \$10.50/TN PLUS DISPOSAL @ SARASOTA \$63.77/TN TOTAL = \$74.27/TN DISPOSAL
QUANTITY TO LOAD ONTO TRAILERS $180 \text{ TNS} \cdot \frac{1}{600 \text{ lb/cy}} \cdot \frac{2000 \text{ lb}}{1 \text{ TN}} = 600 \text{ cy}$ TYP PACKER TRUCK PRODUCTION MEANS 02315 210 6035 ~465/cy/day TOTAL $\frac{600}{435} = 1.4$ SAY 2 days	HAUL FRONT END LOADER Hardee County QUOTE \$710/day + 250 MOB

SCS ENGINEERS

SHEET ______ OF ______

CLIENT	PROJECT		JOB NO.
SUBJECT		BY	DATE
		CHECKED	DATE

Closure Cost

Item 13 Site Specific Cost

Quantity	Price
MRF	
Power wash Floors	Rental MEANS 01590 400 6310 235/wk
Approx 2 weeks to clean	
5 day / week x 2 week = 10 days	Operation 70.20/day

Total MRF Closure Cost

Waste 180 TNS 74.27 $/TN
$13,368.60

Load 2 days 710 $/day
Waste $1420
+250 $
$250

Wash 2 week @ 235/wk
$470

Operation 10 days @ 70.2/day
$702

Total = $16,210.60
$16,300

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee County	PROJECT	JOB NO. 09199033.09
SUBJECT Hardee County Landfill	BY JHO	DATE
	CHECKED	DATE

Closure Cost

Item 13 Site Specific Cost

QUANTITY		PRICING
Household Hazardous Waste		Quote Clean Harbors
Used oil	700 gallons	55 gal Drum 700 gallons ⇒ 12.7 Drums 12.7 Drums × 200$/Drum = $2545
Paints	100 gallons	55 gal Drum 100 gallons ⇒ 2 drums 2 drums @ $125/Drum = $250
Batteries	140 batteries	55 gal Drum 10 Battery/Drum = 14 drums 14 Drums × 500/Drum = $7000
Light Bulbs	400	1 Container 100 lbs 4 containers @ 30 ea $120
Liquid	50 gallons	1 Drum @ 200 $200
Pesticide	250 lb	1 drum @ $225 $225

Current operations plan & permit

Total chemical Cost
2545 + 250 + 7000 + 120 + 200
+ 225 ⇒ $10,340

1 Day Labor 8 hrs

$211.875/hr × 8 hrs

= $1695

Total = $12,035

SPECIFIC CONDITIONS:

7. **Processing and Storage Requirements.** All waste tires shall be processed and stored in accordance with F.A.C. 62-711.530 and 62-711.540.

- Storage at the facility as shown on Figure No. 1 (attached) is limited to 10 tons of waste tires (with no more than 1000 whole tires).

- If the facility has reached its permitted storage capacity, the permittee shall not accept additional waste tires until sufficient capacity has been restored.

- At least 75 percent of the whole tires, used tires, and processed tires that are delivered to or are contained on the site of the waste tire processing facility at the beginning of each calendar year shall be processed or removed for disposal or recycling from the facility during the year, or disposed of at a permitted solid waste management facility.

8. **Operation Plan and Operation Record.** A copy of the Department approved permit, operational plan, record drawings, and supporting information shall be kept at the facility at all times for reference and inspections.

9. **Operating Personnel.** A trained supervisor or foreman shall be responsible for maintaining the facility in an orderly, safe, and sanitary manner. Sufficient personnel shall be employed to adequately operate the facility.

10. **Reporting Requirements.** Waste Tire Processing Facility Quarterly Report, Form #62-711.900(4) attached, summarizing facility operations shall be submitted **quarterly** to the Department by January 20th, April 20th, July 20th, and October 20th each year, pursuant to FAC Rule 62-711.530(5).

11. **Fire Safety.** A fire safety survey shall be conducted at least **annually** which includes a statement from the local fire protection authorities that the site meets the requirements of the local fire protection authorities. This report shall be submitted upon request. This report shall indicate that all noted deficiencies have been corrected and approved by the local fire protection authorities.

12. **Stormwater System Management.** Stormwater shall be managed as required by F.A.C. 62-711.540(3)(a). The site shall be managed to divert stormwater around and away from the storage piles.

13. **Emergency Preparedness Manual.** A copy of the facility's emergency preparedness manual shall be kept at the site and a copy shall be kept at an off-site location.

Florida Tire Recycling, Inc.

9675 RANGELINE RD
PORT ST. LUCIE, FL 34987
PHONE (772) 465-0477
FAX (772) 489-2124

PAGE NO.	INVOICE NO.	APPLY TO	INVOICE DATE
1	86500		03/24/04 HAREE

INVOICE

WORK ORDER NO. B.O.

SOLD TO
HARDEE COUNTY LANDFILL
685 AIRPORT RD.
WAUCHULA, FL 33873

SHIP TO
HARDEE COUNTY LANDFILL
685 AIRPORT RD.
WAUCHULA, FL 33873

Tire Disposal
$ 639.33 / 5.35 Tons = $ 119.50 / TN

24/04 DAYS

BUYER | DATE | LOC | SALESPERSON | TERRITORY

03/ MARCO

OLD | DESCRIPTION

5.35 TONS TIRE DISPOSAL
TRANS. 00130650-0

34-131

PLEASE PAY FROM INVOICE

INVOICE NO.
86500

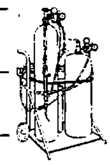
639.33

PLEASE REMIT THIS AMOUNT

GENERAL REQUIREMENTS

01590 | Equipment Rental

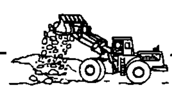
			UNIT	HOURLY OPER. COST	RENT PER DAY	RENT PER WEEK	RENT PER MONTH	CREW EQUIPMENT COST/DAY
400 5740	Accessories for above	R01590 -100	Ea.	.11	18	54	162	11.70 400
5750	Sander, floor			.70	16.35	49	147	15.40
5760	Edger	R02250 -400		.60	20	60	180	16.80
5800	Saw, chain, gas engine, 18" long			1.15	16	48	144	18.80
5900	36" long	R02065 -300		.55	48.50	145	435	33.40
5950	60" long			.55	50	150	450	34.40
6000	Masonry, table mounted, 14" diameter, 5 H.P.			1.30	56	168	505	44
6050	Portable cut-off, 8 H.P.			1.20	25.50	76	228	24.80
6100	Circular, hand held, electric, 7-1/4" diameter		Ea.	.20	10	30	90	7.60
6200	12" diameter			.27	14	42	126	10.55
6250	Wall saw, w/hydraulic power, 10 H.P			2.08	97.50	292.40	875	75.10
6275	Shot blaster, walk behind, 20" wide			1.04	445	1,330	4,000	274.30
6300	Steam cleaner, 100 gallons per hour			2.20	63.50	190	570	55.60
6310	200 gallons per hour			2.90	78.50	235	705	70.20 Just
6340	Tar Kettle/Pot, 400 gallon			2.69	51.50	155	465	52.50
6350	Torch, cutting, acetylene-oxygen, 150' hose			1.50	13.35	40	120	20
6360	Hourly operating cost includes tips and gas			8.10				64.80
6410	Toilet, portable chemical			.10	17.35	52	156	11.20
6420	Recycle flush type			.13	21.50	64	192	13.85
6430	Toilet, fresh water flush, garden hose,			.14	24	72	216	15.50
6440	Hoisted, non-flush, for high rise			.13	21	63	189	13.65
6450	Toilet, trailers, minimum			.22	36	108	325	23.35
6460	Maximum			.65	108	324	970	70
6465	Tractor, farm with attachment			9.30	225	675	2,025	209.40
6470	Trailer, office, see division 01520-500							
6500	Trailers, platform, flush deck, 2 axle, 25 ton capacity		Ea.	4.20	91.50	275	825	88.60
6600	40 ton capacity			5.45	128	385	1,150	120.60
6700	3 axle, 50 ton capacity			5.90	142	425	1,275	132.20
6800	75 ton capacity			7.40	185	555	1,675	170.20
6810	Trailer mounted cable reel for H.V. line work			4.38	209	626	1,875	160.25
6820	Trailer mounted cable tensioning rig			8.61	410	1,230	3,700	314.90
6830	Cable pulling rig			54.46	2,325	6,980	20,900	1,832
6850	Trailer, storage, see division 01520-500							
6900	Water tank, engine driven discharge, 5000 gallons		Ea.	5.50	123	370	1,100	118
6925	10,000 gallons			7.65	175	525	1,575	166.20
6950	Water truck, off highway, 6000 gallons			49.05	715	2,150	6,450	822.40
7010	Tram car for H.V. line work, powered, 2 conductor			5.68	113	340	1,025	113.45
7020	Transit (builder's level) with tripod			.09	14.65	44	132	9.50
7030	Trench box, 3000 lbs. 6'x8'			.42	70	210	630	45.35
7040	7200 lbs. 6'x20'			.82	136	409	1,225	88.35
7050	8000 lbs., 8' x 16'			.87	145	436	1,300	94.15
7060	9500 lbs., 8'x20'			1.17	195	584	1,750	126.15
7065	11,000 lbs., 8'x24'			1.31	218	654	1,950	141.30
7070	12,000 lbs., 10' x 20'			1.63	272	817	2,450	176.45
7100	Truck, pickup, 3/4 ton, 2 wheel drive			5.35	55	165	495	75.80
7200	4 wheel drive			5.50	63.50	190	570	82
7250	Crew carrier, 9 passenger			5.53	108	324.40	975	109.10
7290	Tool van, 24,000 G.V.W.			9.09	94.50	283.20	850	129.35
7300	Tractor, 4 x 2, 30 ton capacity, 195 H.P.			13.90	173	520	1,550	215.20
7410	250 H.P.			18.90	272	815	2,450	314.20
7500	6 x 2, 40 ton capacity, 240 H.P.			17.50	272	815	2,450	303
7600	6 x 4, 45 ton capacity, 240 H.P.			21.45	267	800	2,400	331.60
7620	Vacuum truck, hazardous material, 2500 gallon			6.72	315	943	2,825	242.35
7625	5,000 gallon			9.09	420	1,256.80	3,775	324.10
7640	Tractor, with A frame, boom and winch, 225 H.P.			14.30	233	700	2,100	254.40
7650	Vacuum, H.E.P.A., 16 gal., wet/dry			.27	24	72	216	16.55
7655	55 gal, wet/dry			.60	36	108	325	26.40
7660	Water tank, portable			1	9.35	28	84	13.60



02300 | Earthwork

02315 | Excavation and Fill

			CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2004 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P	
120	3020	Common earth	B-10W	1,225	.010	C.Y.		.30	.35	.65	.85	120
	3040	Clay		1,100	.011			.34	.39	.73	.95	
	3200	150' haul, sand & gravel		670	.018			.56	.65	1.21	1.56	
	3220	Common earth		610	.020			.61	.71	1.32	1.71	
	3240	Clay		550	.022			.68	.79	1.47	1.90	
	3300	300' haul, sand & gravel		465	.026			.80	.93	1.73	2.25	
	3320	Common earth		415	.029			.90	1.05	1.95	2.52	
	3340	Clay		370	.032			1.01	1.17	2.18	2.82	
	4000	200 H.P., 50' haul, sand & gravel	B-10B	2,500	.005			.15	.35	.50	.61	
	4020	Common earth		2,200	.005			.17	.39	.56	.69	
	4040	Clay		1,950	.006			.19	.44	.63	.78	
	4200	150' haul, sand & gravel		1,225	.010			.30	.71	1.01	1.24	
	4220	Common earth		1,100	.011			.34	.79	1.13	1.38	
	4240	Clay		975	.012			.38	.89	1.27	1.55	
	4400	300' haul, sand & gravel		805	.015			.46	1.07	1.53	1.89	
	4420	Common earth		735	.016			.51	1.17	1.68	2.06	
	4440	Clay		660	.018			.57	1.31	1.88	2.30	
	5000	300 H.P., 50' haul, sand & gravel	B-10M	3,170	.004			.12	.35	.47	.56	
	5020	Common earth		2,900	.004			.13	.38	.51	.62	
	5040	Clay		2,700	.004			.14	.41	.55	.66	
	5200	150' haul, sand & gravel		2,200	.005			.17	.50	.67	.81	
	5220	Common earth		1,950	.006			.19	.56	.75	.91	
	5240	Clay		1,700	.007			.22	.65	.87	1.04	
	5400	300' haul, sand & gravel		1,500	.008			.25	.73	.98	1.19	
	5420	Common earth		1,350	.009			.28	.81	1.09	1.32	
	5440	Clay		1,225	.010			.30	.90	1.20	1.45	
	6000	For compaction, see div. 02315-310										
	6010	For trench backfill, see div. 02315-610 & 02315-620										
210	0010	**BORROW, LOADING AND/OR SPREADING**										210
	4000	Common earth, shovel, 1 C.Y. bucket	B-12N	840	.019	C.Y.	7.15	.61	1.01	8.77	9.90	
	4010	1-1/2 C.Y. bucket	B-12O	1,135	.014		7.15	.45	.86	8.46	9.50	
	4020	3 C.Y. bucket	B-12T	1,800	.009		7.15	.28	.73	8.16	9.10	
	4030	Front end loader, wheel mounted										
	4050	3/4 C.Y. bucket	B-10R	550	.022	C.Y.	7.15	.68	.35	8.18	9.25	
	4060	1-1/2 C.Y. bucket	B-10S	970	.012		7.15	.38	.24	7.77	8.70	
	4070	3 C.Y. bucket	B-10T	1,575	.008		7.15	.24	.19	7.58	8.40	
	4080	5 C.Y. bucket	B-10U	2,600	.005		7.15	.14	.26	7.55	8.35	
	5000	Select granular fill, shovel, 1 C.Y. bucket	B-12N	925	.017		7.50	.55	.92	8.97	10.10	
	5010	1-1/2 C.Y. bucket	B-12O	1,250	.013		7.50	.41	.78	8.69	9.75	
	5020	3 C.Y. bucket	B-12T	1,980	.008		7.50	.26	.66	8.42	9.35	
	5030	Front end loader, wheel mounted										
	5050	3/4 C.Y. bucket	B-10R	800	.015	C.Y.	7.50	.47	.24	8.21	9.20	
	5060	1-1/2 C.Y. bucket	B-10S	1,065	.011		7.50	.35	.22	8.07	9	
	5070	3 C.Y. bucket	B-10T	1,735	.007		7.50	.22	.17	7.89	8.75	
	5080	5 C.Y. bucket	B-10U	2,850	.004		7.50	.13	.24	7.87	8.70	
	6000	Clay, till, or blasted rock, shovel, 1 C.Y. bucket	B-12N	715	.022		5.30	.72	1.19	7.21	8.20	
	6010	1-1/2 C.Y. bucket	B-12O	965	.017		5.30	.53	1.02	6.85	7.70	
	6020	3 C.Y. bucket	B-12T	1,530	.010		5.30	.33	.85	6.48	7.25	
	6030	Front end loader, wheel mounted										
	6035	3/4 C.Y. bucket	B-10R	465	.026	C.Y.	5.30	.80	.41	6.51	7.45	
	6040	1-1/2 C.Y. bucket	B-10S	825	.015		5.30	.45	.29	6.04	6.80	
	6045	3 C.Y. bucket	B-10T	1,340	.009		5.30	.28	.22	5.80	6.45	
	6050	5 C.Y. bucket	B-10U	2,200	.005		5.30	.17	.31	5.78	6.40	
	6060	Front end loader, track mounted										
	6065	1-1/2 C.Y. bucket	B-10N	715	.017	C.Y.	5.30	.52	.42	6.24	7.05	
	6070	3 C.Y. bucket	B-10P	1,190	.010		5.30	.31	.64	6.25	7	



EQUIPMENT RENTALS

BID TABULATION - BEGINNING OCT 3, 2003 ENDING SEPT 30 2004

PER DAY	APAC - MACASPHALT			G S EQUIPMENT			HERTZ EQUIPMENT*		
	W/OPER	W/O OPER	MOBIL	W/OPER	W/O OPER	MOBIL/EA WAY	W/OPER	W/O OPER	MOBIL/EA WAY
ASPHALT PAVER	$950.00	N/B	$250.00	N/B	N/B	N/B	N/B	N/B	N/B
D/L 1 CY	N/B	N/B	N/B	N/B	N/B	N/B	N/B	N/B	N/B
GRADER	$480.00	N/B	$250.00	N/B	N/B	N/B	N/B	4000.00 MO 1550.00 WK 600.00 DAY	$50.00
LOADER	$710.00	N/B	$250.00	N/B	3200.00 MO 1066.66 WK 355.55 DAY	$150.00	N/B	3200.00 MO 1300.00 WK 550.00 DAY	$50.00
DUMP TRUCK	N/B	N/B	N/B	N/B	N/B	N/B	N/B	4800.00 MO 1800.00 WK 655.00 DAY	$50.00
MIXER	$1,300.00	N/B	$250.00	N/B	12500.00 MO 4166.66 WK 1388.88 DAY	$150.00	N/B	N/B	N/B
BACKHOE	N/B	N/B	N/B	N/B	3500.00 MO 1166.66 WK 388.88 DAY	$150.00	N/B	1200.00 MO 525.00 WK 210.00 DAY	$50.00
DOZIER - WIDE TRACK	N/B	N/B	N/B	N/B	N/B	N/B	N/B	6200.00 MO 2200.00 WK 810.00 DAY	$50.00

RECOMMENDATIONS: W/OPER - PAVER, GRADER, LOADER, MIXER - APAC
W/O OPER - MIXER - GS EQUIP
W/O OPER - GRADER, LOADER, DUMP TRUCK, BACKHOE, DOZIER - HERTZ

SERVICE WORK ORDER (final copy)

SWO: 508-94517 Sales: (009433) TIM LESTER Date: 01/23/03

..ckup: 02/08/03 Client PO: JANICE County: HARDEE
Disposal PO:
Transportation PO:
Manifest(s): N/A
Transporter: N/A
IC Project:
Revenue Proj #: 490

BILLING ADDRESS
931779 (PSCUSTNO: 8021059)
HARDEE COUNTY BOARD OF COUNTY COMM.
ROOM A-204 COURTHOUSE ANNEX
412 WEST ORANGE STREET
WAUCHULA FL 33873-

PICKUP ADDRESS
BTHHW
CLEAN HARBORS ENVIRONMENTAL SV
C/O HARDEE COUNTY SOLID WASTE
HARDEE COUNTY SANITARY LANDFIL
ON AIRPORT ROAD
WAUCHULA FL 33873
J.R. PRESTRIDGE
(941) 773-5089

GR	PROFILE/LABPAK	DESCRIPTION	QTY	UM	PRICE	TOTAL PRICE
	BTHHW-001	DIS-LP/FLAMMABLE LIQUIDS/LOW CL/55	1.00	55	200.000	200.00
	BTHHW-002	DIS-BULK/AEROSOL CANS/55	1.00	55	160.000	160.00
	BTHHW-010A	DIS-BULK/FLUORESCENT LAMPS/FT	1255.00	LHT	0.060	75.30
	BTHHW-012	DIS-BULK/FLAMMABLE LIQUID/LOW CL/55	1.00	55	105.000	105.00
	BTHHW-023	DIS-BULK/FLAMMABLE LIQUID/LOW CL/55	1.00	55	105.000	105.00
	BTHHW-024	DIS-BULK/LATEX PAINT/55	2.00	55	125.000	250.00
	BTHHW-025	DIS-BULK/NI-CAD BATTERY WET CELL/55	3.00	55	500.000	1500.00
	BTHHW-026	DIS-BULK/ALKALINE BATTERY/DRY/30	1.00	30	130.000	130.00
	BTHHW-LP	DIS-LP/OXIDIZER SOLIDS/30	1.00	30	205.000	205.00
	BTHHW-LP	DIS-LP/CORROSIVE LIQUIDS/ACIDIC/5	1.00	5	60.000	60.00
	BTHHW-LP	DIS-LP/CORROSIVE SOLIDS/ACIDIC/5	1.00	5	60.000	60.00
	BTHHW-LP	DIS-LP/CORROSIVE SOLIDS/ALKALINE/30	1.00	30	150.000	150.00
	BTHHW-LP	DIS-LP/CORROSIVE LIQUID/ALKALINE/30	1.00	30	150.000	150.00
	BTHHW-LP	DIS-LP/FLAMMABLE SOLIDS/55	3.00	55	200.000	600.00
	BTHHW-LP	DIS-LP/PESTICIDE LIQUIDS/55	2.00	55	225.000	450.00
	BTHHW-LP	DIS-LP/PESTICIDE SOLIDS/55	3.00	55	225.000	675.00
	BTHHW-LP	DIS-LP/PCB LIQUIDS/5	1.00	5	120.000	120.00
	BTHHW-LP	DIS-LP/CORROSIVE LIQUID/ALKALINE/5	1.00	5	60.000	60.00
	BTHHW-LP	DIS-LP/CORROSIVES/MERCURY DEBRIS/5	1.00	5	80.000	80.00
					Disposal sub:	5135.30
		LABOR FOR 4 HR COLLECTION	1.00	HR	847.500	847.50 — 211.875/hr
					Labor sub:	847.50
		8' FLUORESCENT LAMP CONTAINERS	1.00	EA	30.000	30.00
					Materials sub:	30.00
		3% POLK COUNTY HAZ WASTE FEE				0.00
		Total Container Count: 0			TOTAL:	6012.80

Invoice Notes:

L.1.g Scrap Metal and White Goods Storage Site

When scrap metals and white goods arrive at the landfill, a spotter escort the loads to the area designated for scrap metals and white goods storage as shown on the Operations Drawings. Incoming loads of scrap metal, appliances, and white goods (with and without Freon) are segregated and temporarily stored in this area. The storage area has a stable base comprised of compacted shell to minimize rutting due to traffic. Clean, unused, recyclable metal cans are also transported to the scrap metal site for temporary storage. Propane tanks are accepted only if they are empty and the valves has been removed.

Lawnmowers are also stored at the scrap metal site. However, lawn mowers are not accepted at the facility unless any oil or gasoline has been removed prior to their delivery. If the scalehouse attendant spots a lawnmower, the attendant will question the driver concerning the gasoline and oil content of the lawnmower; if the lawnmower contains gas or oil, the scalehouse attendant will not accept it. If a lawnmower is found in a load delivered to the MRF for processing, the operating personnel inspect the lawnmower to ensure that it is free of gasoline and oil prior to taking it to the scrap metal site. Gasoline and oil, removed from lawnmowers and other yard tools, will be taken to the Household Hazardous Waste Collection Center for storage.

White goods and appliances with Freon are stored separately from the rest of the scrap pile. These items are stored in an upright position to prevent the Freon from discharging to the atmosphere. An independent contractor is hired to remove the scrap metal and white goods from the site. The contractor is required to provide certification of qualification for removal of any chloro-fluoro-hydrocarbons (i.e., Freon or CFCs) from the white goods. Up to 400 tons of scrap metal and white goods (a maximum of 200 individual pieces of white goods) can be stored in this area. The minimum frequency for scrap metal and white good removal is 12 months.

L.1.h Household Hazardous Waste Collection Center

A Household Hazardous Waste Collection Center (HHWCC) is located southeast of the MRF. The HHWCC is comprised of a roofed building with a curb in order to promote spill containment. The HHWCC is used for the temporary storage of special wastes such as used oil, paint, lead acid batteries, florescent lightbulbs, and household hazardous wastes. Used oil is consolidated into two double-walled oil storage tanks. Lead acid batteries are stacked three high on pallets, with cardboard placed between each layer, and then shrink wrapped when pallets are full. Private contractors are hired for the removal of the special wastes such as the used oil, paint, lead acid batteries, and fluorescent light bulbs. The maximum onsite storage and frequency for removing these recyclable from the site is as follows:

- Used oil (up to 700 gallons) is removed monthly,
- Paints (up to 100 gallons) removed quarterly,
- Batteries (up two 140 batteries) removed quarterly,
- Light bulbs (Up to 400) are to be removed at least every 6 months, and

USE

- Household Hazardous Waste (up to 50 gallons and 250 pound bags of chemicals) to be removed quarterly.

USE

Household hazardous waste is defined as discarded, small quantity residential waste (less than 220 lbs.) which is either listed by the U.S. Environmental Protection Agency (EPA) in its hazardous waste regulations or exhibits one of the four (4) following hazardous characteristics:

- Ignitability - It may catch fire.
- Corrosivity - It can damage other materials (including human tissue) on contact.
- Reactivity - It reacts violently with water and may catch fire or explode.
- Toxicity - It may cause illness or health problems if handled incorrectly.

Amnesty days are held four times per year in which residents can deliver their household hazardous wastes (including cans of paint) at no charge. The contractor removes these wastes from the site that same day. Only empty dried out paint cans are accepted throughout the year. If a can of paint or a propane tank with a valve is found by landfill personnel it is taken to the Household Hazardous Waste Collection Center for temporary storage in hazardous waste storage sheds until removed from the site by the qualified contractor. The HHWCC is also used to temporarily hold any unacceptable wastes found at any of the other on-site disposal or storage areas. Currently, Clean Harbors is contracted to remove and properly dispose of the household hazardous wastes. The Household Hazardous Waste Haulers Agreement is contained in Appendix B.

L.1.i Maintenance Building

The onsite maintenance building is within the southeast corner of the lined area of the Class I landfill. Routine maintenance and inspection of landfill equipment is performed in this building. Fuel for the landfill equipment is pumped from a fuel tank, with a containment wall, located immediately adjacent to the maintenance building. Fuel and fluids (engine oil, transmission oil, hydraulic oil, or radiator fluid) are added to the equipment in the maintenance building as needed. If repairs on the equipment are necessary, the equipment is sent to the County's central maintenance shop, located off-site, or to the dealer's authorized maintenance facility.

L.1.j Borrow Area

A borrow area is located northwest of the MRF. The County utilizes this on-site borrow area as well as contracting with off-site borrow pits for cover material. County personnel conduct portions of the excavation with the dozer and loader. If offsite borrow material is needed for additional cover soils or for other operational uses, then contracted independent contractor will haul in soils.

SCS ENGINEERS

SHEET 9A OF ____

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

1. Groundwater Monitoring

Monitored Semi-annually for the following parameters

Field Parameters

- Static water levels (prior to purging)
- Specific conductivity
- pH
- Dissolved Oxygen
- Turbidity
- Temperature
- Sheens & Colors

Lab Parameters

- Total Ammonia-N
- BOD
- COD
- Chlorides
- Iron
- Magnesium
- Nitrate
- Sodium
- Sulfate
- TOC
- TDS
- 40 CFR part 258, Appendix I
- Mercury

Monitoring Wells

MW-1	BACKGROUND
MW-2	DETECTION
MW-4	BACKGROUND
MW-5	DETECTION
MW-8	DETECTION
MW-10	DETECTION
MW-11	DETECTION
MW-12	DETECTION

upon completion of PHASE II SECTION I

A total of 8 wells are to be test as well as 2 samples for QA/QC (i.e. field equipment rinse blank and field duplicate which the lab does not charge for).

$\boxed{\text{GW Sampling Quantity = 8 wells}}$

SCS ENGINEERS

SHEET 9B OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
	JHO	
Long-Term Care	CHECKED	DATE

1. Groundwater Monitoring (Cont.)

Cost

Short Environmental Laboratories Groundwater Costs:

Semi-Annual GW Sampling = $400/well

Sample Collection = $25/hour

Assume 1 hour/well

$$\text{Semi-annual Cost} = \frac{1\text{ hr}}{\text{well}} \times \frac{\$25}{\text{hr}} + \frac{\$400}{\text{well}} = \frac{\$425}{\text{well}}$$

$$\boxed{\text{GW Sampling Cost} = \$425/\text{well}}$$

SCS ENGINEERS

SHEET 10A OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long - Term Care	Jth	
	CHECKED	DATE

2. Surface Water Monitoring

Monitored semi-annually for the following parameters

Field Parameters
- Specific Conductivity
- pH
- Dissolved Oxygen
- Temperature
- Sheen & Colors

Lab Parameters
- Zinc
- Unionized Ammonia
- Total Hardness
- BOD
- Copper
- Iron
- Mercury
- Nitrate
- TDS
- TOC
- Fecal Coliform
- Total Phosphorus
- COD
- TSS
- 40 CFR part 258, Appendix I

One surface water monitoring point, SW-2, is monitored

Surface Water Sampling Quantity = 1 sample

SCS ENGINEERS

SHEET 10B OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	JHO	
	CHECKED	DATE

2. Surface Water Monitoring (cont.)

Cost

Short Environmental Laboratories Surface Water Costs:

Semi-annual surface water monitoring = \$580/sample

Sample Collection = \$25/hr

Assume 1 hour/sample

$$\text{Semi-Annual Cost} = \frac{1\text{ hr}}{\text{sample}} \times \frac{\$25}{\text{hr}} + \frac{\$580}{\text{sample}} = \frac{\$605}{\text{sample}}$$

$\boxed{\text{Surface Water Sampling Cost} = \$605/\text{sample}}$

SCS ENGINEERS

SHEET 11 OF ____

CLIENT: Hardee County	PROJECT: Landfill Expansion	JOB NO. 09199033.09
SUBJECT: Long-Term Care	BY: JND	DATE:
	CHECKED:	DATE:

3. Gas Monitoring

Gas probes GP-1 through GP-13 shall be monitored every quarterly

$\boxed{\text{Gas Monitoring Quantity = 13 probes}}$

Cost

SCS Field Services Quote

- 8 hr of a technician's time @ $45/hr

  8 hr × $45/hr = $360 — $360

- GEM rental @ $60/day

  1 day × $60/day = $60 — $60

- 2 hour Staff engineer's time @ $70/hr (report writing)

  2 hr × $70/hr = $140 — $140

- Vehicle rental for 1 day @ $50/day

  1 day × $50/day = $50 — $50

- 1 hour project manager's time @ $140/hr (report review)

  1 hour × $140/hr = $140 — $140

Total = $750

$\boxed{\text{Gas Monitoring Cost = \$750}}$

→ for 13 probes on a quarterly basis

SCS ENGINEERS

SHEET 12A OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	JHD	
	CHECKED	DATE

4. Leachate Monitoring

Monitored semi-annually at Manhole 9 for the following parameters:

Field Parameters
- Specific conductivity
- pH
- Dissolved Oxygen
- Sheen & Color

Lab Parameters
- Total Ammonia - N
- BOD
- COD
- Bicarbonate
- Chlorides
- Hardness
- Iron
- Magnesium
- Mercury
- Nitrate
- Sulfate
- Sodium
- TDS
- 40 CFR Part 258, Appendix I

$\boxed{\text{Leachate Monitoring Quantity = 1 Manhole}}$

Manhole 9 will be monitored annually for 40 CFR part 258, Appendix II.

Semi annual $420 + $25 = $445

sampling

Annual $1,250 + 25 sampling = $1275

SCS ENGINEERS

SHEET 12B OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	JHB	
	CHECKED	DATE

4. Leachate Monitoring (cont.)

Cost

Short Environmental Laboratory Leachate Costs:

Semi Annual Leachate Monitoring $420/manhole

Annual Leachate Monitoring $1250/manhole

Sample Collection $25/hr

Assume 1 hr.

$$\text{Semi-Annual Cost} = \frac{1\text{ hr}}{\text{Manhole}} \times \frac{\$25}{\text{hr}} + \frac{\$420}{\text{Manhole}} = \$445/\text{manhole}$$

$$\text{Annual Cost} = \frac{1\text{ hr}}{\text{Manhole}} \times \frac{\$25}{\text{hr}} + \frac{\$1250}{\text{manhole}} = \$1275/\text{manhole}$$

$$\boxed{\text{Semi-Annual Leachate Cost} = \$445/\text{manhole}}$$

$$\boxed{\text{Annual Leachate Cost} = \$1275/\text{manhole}}$$

Sheet 9C of

SHORT ENVIRONMENTAL LABORATORIES, INC.
10405 US 27 South
Sebring, Florida 33870
1-800-833-4022 HRS# 85344 & E85458, FDEP QAP# 880516 ~~(941)~~ 863 655-4022

07-21-99

For: Attn: J.R. Prestridge
Hardee County Solid Waste Department
685 Airport Road
Wauchula, FL 33873

Dear Mr. Prestridge:

Please find below a revised fee schedule for the Hardee County Landfill:

Semi-annual groundwater monitoring;	$ 400.00/sample
Semi-annual leachate monitoring;	$ 420.00/sample
Semi-annual surface water monitoring;	$ 580.00/sample
Annual leachate monitoring;	$1250.00/sample
Semi-annual water levels;	$ 5.00/each
Quarterly methane readings;	10.00 $ ~~25.00~~/sample
Sample collection / hr:	$ 25.00/hr

We have been able to reduce some of our costs related to sampling and analysis at the landfill, therefore, we are able to extend a better discount for this project.

We appreciate the opportunity to continue providing the County with our services. Should you have any questions, please feel free to call me. Thank you.

All duplicates are paid for by Short. (per Bruce Cummings, 4/4/03, 3:30 pm)

Sincerely,

Bruce Cummings
Laboratory Director

DESCRIPTION	Sampling Frequency (events/yr.)	Number of Wells	$/Well/Event	$ / Year
4. Leachate Monitoring (62-701.510(5), (6)(b) and 62-701.510(8)(c))				
Monthly	12	0	0.00	$0.00
Quarterly	4	0	0.00	$0.00
Semi-Annual	2	1	445.00	$890.00
Annual	1	1	1,275.00	$1,275.00
Other	____	0	0.00	$0.00
			Subtotal Leachate Monitoring:	$2,165.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
5. Leachate Collection/Treatment Systems Maintenance				
Maintenance				
Collection Pipes	LF	0	0.00	$0.00
Sumps, Traps	EA	9	72.00	$648.00
Lift Stations	EA	0	0.00	$0.00
Cleaning	LS	0.2	23,000.00	$4,600.00
Tanks	EA	0	0.00	$0.00
Impoundments				
Liner Repair	SY	0	0.00	$0.00
Sludge Removal	CY	0	0.00	$0.00
Aeration Systems	CY	0	0.00	$0.00
Floating Aerators	EA	0	0.00	$0.00
Spray Aerators	EA	0	0.00	$0.00
Disposal				
Off-site (Include Transportation and Disposal)	LS	1	134,200.00	$134,200.00

6. Leachate Collection/Treatment Systems Operation

Operation		Hours	$/Hour	Total
P.E. Supervisor	HR	0	0.00	$0.00
On-Site Engineer	HR	0	0.00	$0.00
Office Engineer	HR	0	0.00	$0.00
On-site Technician	LS	0	0.00	$0.00
Materials	LS	0	0.00	$0.00
Subtotal Leachate Collection/Treatment System Maintenance & Operation:				$139,448.00

7. Maintenance of Groundwater Monitoring Wells

Monitoring Wells	LS	1	180.00	$180.00
Replacement	EA	0.2	2,000.00	$400.00
Abandonment	EA	0	0.00	$0.00
Subtotal Groundwater Monitoring Well Maintenance:				$580.00

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
8. Gas System Maintenance				
Piping, Vents	LF	0	0.00	$0.00
Blowers	EA	0	0.00	$0.00
Flaring Units	EA	0	0.00	$0.00
Meters, Valves	EA	0	0.00	$0.00
Compressors	EA	0	0.00	$0.00
Flame Arrestors	EA	0	0.00	$0.00
Operation	LS	1	460.00	$460.00
Subtotal Gas System:				$460.00
9. Landscape				
Mowing	AC	105.0	121.50	$12,757.50
Fertilizer	AC	0	0.00	$0.00
Subtotal Landscape Maintenance:				$12,757.50

DESCRIPTION	UNIT	QUANTITY	UNIT COST	ANNUAL COST
10. Erosion Control & Cover Maintenance				
Sodding	SY	1210.00	1.67	$2,020.70
Regrading	AC	0	0.00	$0.00
Liner Repair	SY	56	8.22	$460.32
Clay	CY	0	0.00	$0.00
	Subtotal Erosion Control and Cover Maintenance:			$2,481.02
11. Storm Water Management System Maintenance				
Conveyance Maintenance	LS	0	0.00	$0.00
	Subtotal Storm Water System Maintenance:			$0.00
12. Security System Maintenance				
Fences	LF	50	21.32	$1,066.00
Gate(s)	EA	1.0	301.00	$301.00
Sign(s)	EA	0	0.00	$0.00
			Subtotal Security System:	$1,367.00
13. Utilities	LS	1	500.00	$500.00
14. Administrative				
P.E. Supervisor	LS	1	1568.00	$1,568.00
On-Site Engineer	HR	0	0.00	$0.00
Office Engineer	HR	0	0.00	$0.00
On-site Technician	LS	1	8640.00	$8,640.00
Other (explain)		0	0.00	$0.00
			Subtotal Administrative:	$10,208.00
15. Contingency	% of Total	$180,976.52	10%	$18,097.65
			Subtotal Contingency:	$18,097.65

16. Site Specific Costs (explain)

	UNIT COST	
	LS	$0.00
	LS	$0.00
	LS	$0.00

ANNUAL LONG-TERM CARE COST ($/Year):	**$199,074.17**
NUMBER OF YEARS OF LONG-TERM CARE	30
TOTAL LONG-TERM CARE COST ($):	**$5,972,225.16**

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT	JOB NO. 09199033.09
SUBJECT Hardee County LF	BY JHO	DATE
Long Term Care	CHECKED	DATE

LONG TERM CARE

ITEM (5) LEACHATE COLLECTION/TREATMENT SYSTEM

QUANTITY	PRICING
CLEAN MANHOLES ESTIMATE 3 manholes per day 8 hr day	QUOTE FROM CBI TO VACUUM MANHOLES
TOTAL 9 MANHOLES ÷ 9/3 = 3 days @ 8 hrs/day	\$135/hr × 8 × 3 = \$3240/every 5 years
CLEAN MANHOLES EVERY 5 YEARS (per year 1/5 = 0.20)	= \$648/yr = 648/yr / 9 manholes = 72/yr
CLEAN PIPELINES	QUOTE FROM FLORIDA JET CLEAN
EXISTING PHASE I 3100 LF PRIMARY PHASE II SECT I 2100 LF SECONDARY PHASE II SECTION I 235 LF GROUNDWATER 10,400 LF 15,835 LF	\$1.45/LF \$1.45/LF × 15835 LF = \$22,960.75
CLEAN PIPES EVERY 5 YEARS (per year 1/5 = 0.20)	\$4592.15/yr

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT	JOB NO. 09199032.09
SUBJECT Hardee County LF Long Term Care	BY JHu	DATE
	CHECKED	DATE

Long Term Care

Item (5) Leachate Collection / Treatment System

Quantity	Pricing
Leachate Generation Rate	Price Quote Overland Services
Existing Cell 4.8×10^6 gallon/yr	$\$83.50$ / load
Phase II Sect I 1.2×10^6 gallon/yr	5,000 gallon/load
2 ac open 6.0×10^6 gallon/yr	$\frac{\$83.50}{5{,}000\text{ gal}} = 0.0167\ \$/\text{gallon}$
Leachate Hauling	Hauling
6.0×10^6 gallon/yr	$= 6.0 \times 10^6 \frac{\text{gallon}}{\text{yr}}\ 0.0167 \frac{\$}{\text{gallon}}$
	$= \$100{,}200$/yr
Treatment 6.0×10^6 gallon/yr	Price Quote Hardee Co WWTP
	217.76 First 6,000 gal
	4.49 each 1000 gal
	$\left\{\$217.76 + (6 \times 10^6 - 6{,}000)\frac{4.49}{1000}\right\} 1.25$ surcharge
	$\left\{217.76 + (5.994 \times 10^6)\frac{4.49}{1000}\right\} 1.25$
	$\$33{,}913.53$
	Total = 100,200 + 33,913.53
	134,113.53
	Say 134,200

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee Co	PROJECT	JOB NO. 09199033.05
SUBJECT Hardee County Landfill	BY JHO	DATE
	CHECKED	DATE

Long Term Care

Item 5 Leachate Collection / Treatment System

Quantity	Pricing
Tanks → 2 tanks	Cleaning Purchase Order 44895 Hardee County $3,130 / tank Inspection Purchase Order 46361 $1,500 / tank Maintenance / Repair Purchase Order $3,500 / tank Total = 3,130 + 1500 + 3500 = $8130 / tank x 2 tanks x2 $16,260 Every 5 years 1/5 (16,260) = $3252 2 tanks = 1626 1 tank Say $1650 / tank / yr

Sheet 14B-

CBI

Cliff Berry, Incorporated
Environmental Services

Cliff Berry, Inc.
5218 St. Paul St.
Tampa, FL 33619
(813) 626-6533

Hardee County
Department of Solid Waste
Material Recovery Facility
Animal Services
685 Airport Road
Wauchula, FL 33873-8663

Attn: Janice Williamson

VIA FACSIMILE

14 April 2003

Re: Vacuum services.

Dear Ms. Williamson,

Cliff Berry, Inc. is please to quote you with a rate of $135/hour for a 27" vacuum truck, operator and technician to clean out three manholes to facilitate the jetting of the leachate lines. The following should be noted;

1) Your facility will provide any lockout/tagout of electrical, mechanical, pumps, valves or any other device, which may impede the safety of the job evolution.
2) The attached rates are based on a Monday thru Friday 0800 – 1700 workweek. If weekend work and/or second/third shift work is required and authorized, overtime rates will be charge at one and a half straight time rates and double on observed government holidays.
3) CBI will be permitted to leave all waste on site.

Thank you for the opportunity to submit this quote and we look forward to conducting business with you. If you have any questions, please do not hesitate to contact me.

Regards,

Dan Stone

Dan Stone
Tampa Facility Manager
Cliff Berry, Inc.

Previous Sheet 14A
Next Sheet 15A

13c

FLORIDA JETCLEAN INC.

P.O. 45516

HIGH PRESSURE WATER JETTING-PIPELINE TV INSPECTION-PIPE LOCATING

37 Windward Island
Clearwater Fl 33767

TEL : 727-462-5516
800-226-8013
FAX : 727-442-2222

FAX/MEMORANDUM

DATE : 4/8/2003
TO : Janice Williamson, Hardee County
FROM : Graeme Towns
SUBJECT : leachate Collection System Maintenance

Thank you for your inquiry.

We understand that there is approx. 3100' of 8" leachate piping and on this basis, we quote as follows:

To jetclean and video inspect the above pipes: $\boxed{\$4450.00}$

$\frac{4450 \$}{3100 \text{ LF}} = 1.45 \$/\text{LF}$

subject to:

- An adequate no charge on site water supply
- Water/debris/silt generated by any cleaning will be flushed through to pump station. No debris pumping/removal included in this bid..
- 2 wheel drive vehicle access within 10'-15' of each cleanout
- Continuity of access allowing work to be carried out on a single mobilization
- Exposed and opened cleanouts at ground level
- Standby time chargeable at $100.00 per hour should delays not of our making delay progress e.g. bad weather, access problems, high leachate flow levels etc.
- Current technology limitations **may** preclude the use of tractor video systems (range 1000') in 8" lines restricted to cleanout access. If a push video system has to be used, we will be limited to a maximum 500' from each point of entry.
- Our equipment and procedures fully meet OSHA and DEP requirements. In particular our video inspection equipment is certified Class 1, Division 1, Groups C & D (i.e. explosion proof). This is required in methane piping per OSHA.
- All pricing subject to both jetting and video work being carried out by this company.
- Pricing is unrelated to actual or achieved footages but on the number of setups required and the time we anticipate being on site.
- Payment : net 30 days -

Regards,

Graeme Towns

130

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.	
Hardee County	Operations Permit Renewal	09199033.08	
SUBJECT		BY	DATE
Response for Financial Assurance Leachate Quantities		LEK	1/7/2004
		CHECKED	DATE

Goal: Determine the anticipated annual leachate quantities for financial assurance.

Year	Leachate Quantity Treated	Annual Rainfall	Comments
	gallons	inches	
1997	4,955,000	65.94	Operations included the open storage ditch.
1998	5,793,532	66.05	Operations included the open storage ditch.
1999	1,910,230	38.27	Operations included the open storage ditch.
2000	2,002,320	30.46	TOTAL leachate generated for 2000.
	1,158,750		Gallons treated from the open storage ditch.
	843,570		Gallons treated from the tanks.
2001*	5,969,149	50.12	TOTAL leachate generated for 2001.
	3,733,782		Gallons treated from the open storage ditch.
	1,549,387		Gallons treated from the tanks.
2002	7,394,876	62.21	Open storage ditch was filled in on April 20, 2002.
2003**	4,836,780	51.04	

*Disaster declared in September 2001 due to Hurricane Gabriel (14" of rainfall in two days). Delta Pioneer was contracted to haul 1,002,000 gallons of leachate to Manatee Wastewater Treatment Plant under the Emergency Declaration.

**Disaster declared in June of 2003 due to flood (6" of rainfall in two days).

Represents the annual quantities of leachate treated.

Conclusion: The 2003 quantity of 4,836,780 gal/year represents the most accurate leachate quantity that the site could expect to receive upon closure. The leachate quantities prior to 2003 are not representative of current quantities due to the open storage ditch. The previous leachate quantities include dewatering of the open storage ditch.

Data provided by Hardee County, Janice Williamson (863-773-5089)

SCS ENGINEERS

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
HELP Model Summary Annual Average Values	LEK	2/11/2004
	CHECKED	DATE

Case 1, Waste Depth = 0 feet

	Collection System, k = 17.7 cm/s				Detection System, k = 26.2 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)
Length = 45.6 ft Slope = 2.19%	0.001	77,435	1.10	0.002	0.000	1,264	0.02	0.000
Length = 67.0 ft Slope = 3.13%	0.001	77,149	1.10	0.002	0.000	1,278	0.02	0.000
Length = 63.7 ft Slope =2.81%	0.001	76,754	1.09	0.002	0.000	1,310	0.02	0.000

Case 2 - Waste Depth = 10 feet

	Collection System, k = 6.8 cm/s				Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)
Length = 47.2 ft Slope = 2.02%	0.003	67,002	0.95	0.002	0.000	2,054	0.03	0.000
Length = 77.3 ft Slope = 2.14%	0.005	65,761	0.94	0.002	0.000	2,524	0.04	0.000

Case 3 - Waste Depth = 40 feet

	Collection System, k = 6.8 cm/s				Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)
Length = 77.3 ft Slope = 2.14%	0.005	66,825	0.95	0.002	0.001	4,994	0.07	0.000

Case 4 - Waste Depth = 69.5 feet

	Collection System, k = 6.8 cm/s				Detection System, k = 13.4 cm/s			
	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)	Maximum Head on Liner (inch)	Leachate Collected (ft^3/yr)	Leachate Collected (gal/min)	Leachate Collected (cf/s)
Length = 77.3 ft Slope = 2.14%	0.005	65,690	0.93	0.002	0.000	2,604	0.04	0.000

Note: All flowrates are based on a per acre basis.

Leachate Generation $= 1.12 \frac{gal}{min\text{-}acre} \times 2\ ac \times \frac{1440\ min}{day} \times \frac{365\ day}{yr} = 1.18\ 10^6 \frac{gal}{yr}$

P.O. Box 13869
Fort Pierce, FL 34979
(772) 467-1200
Fax: (772) 465-4678

OVERLAND SERVICES, INC.

5020 Santa Fe Road
Tampa, FL 33619
(813) 248-6524
Fax: (813) 248-6539

PROPOSAL

SUBMITTED TO:	SCS Engineers/Hardy County LF 3012 US Hwy 301 N. Suite 700 Tampa, FL 33619	**DATE:** **PHONE:**	January 5, 2004 813-621-0080
ATTENTION:	Joe O'Neal	**FAX:**	813-623-6757

WE HEREBY SUBMIT OUR QUOTE FOR THE FOLLOWING:

Transportation from Hardy County Landfill to the City of Wauchula Waste Water Treatment Plant at a rate of $83.50 per load, based on a 6 load per day minimum, includes Tractor and Class A Driver, plus a rate of $50.00 per hour for any hours over ten (10) hours per day.

If fuel prices exceed $1.50 per gallon, a fuel surcharge will be implemented in accordance with the Department of Energy's (D.O.E.) national fuel average.

Increases shall not exceed the percentage increase in the Southern region, Consumer Price Index (CPI – Transportation) over the preceding twelve months.

TERMS & CONDITIONS
1. Equipment ordered not used will be priced on a case by case basis.
2. Customer is responsible for all applicable taxes.

****** **PLEASE SIGN AND RETURN IF AGREED** ******

WE PROPOSE hereby to furnish transportation only - complete in accordance with above specifications for the sum of:
– listed above – ____________________ dollars ($__________)

Payment to be made as follows: from date of invoice: net 21 days

All material is guaranteed to be as specified. All work to be completed in a substantial workman like manner according to specifications submitted, per standard practices. Any alteration or deviation from above specifications involving extra costs will be executed only upon written orders, and will become an extra charge over and above the estimate. All agreements contingent upon strikes, accidents, or delays beyond our control. Note: This proposal may be withdrawn by us if not accepted within 30 days.

Salvatore R. Merola, Vice President

ACCEPTANCE OF PROPOSAL:

Date of Acceptance: ________________ Signature: ______________________________

The above prices, specifications and conditions are satisfactory to generator and are hereby accepted by generator. Transporter is hereby authorized to do the work as specified above. Payment will be made as specified above. Generator will be responsible for all costs, expenses and reasonable counsel fees incurred by or on behalf of transporter as a result of generators failure to remit payment as specified above. By my signature above, I certify that I am an authorized corporate officer or duty authorized representative of the above referenced company, and that I have the authority to agree to the acceptance of this proposal and to bind the above company to the prices and conditions stated herein.

ORDINANCE NO. 2001-05

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF WAUCHULA, FLORIDA, AMENDING ORDINANCE NUMBER 734 TO INCREASE RESIDENTIAL AND COMMERCIAL MINIMUM AND EXCESS SEWER RATES BY REVISING THE RATES ESTABLISHED IN ORDINANCE NUMBER 734, SECTION 1, SUBSECTION RESIDENTIAL SEWER RATES, PARAGRAPHS 1 AND 2, AND SECTION 1, SUBSECTION COMMERCIAL SEWER RATES, PARAGRAPHS 1 AND 2; AMENDING ORDINANCE NUMBER 702 SETTING RATES AND CHARGES FOR WATER; PROVIDING FOR SEMI-ANNUAL REVIEW OF SEWER AND WATER RATES; AND PROVIDING FOR AN EFFECTIVE DATE.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF WAUCHULA, FLORIDA AS FOLLOWS:

Section 1. Section 1, subsection entitled Residential Sewer Rates, paragraphs 1. and 2., is amended as follows:

1. Each residential sewer customer connected to the City Sewer System located within or beyond the corporate limits of the City of Wauchula, Florida, shall be billed based on the customer's water meter size and water consumption. The rates of charges are as follows:

(a) Minimum Charge. The minimum charge for each customer's sewer service shall be as listed below based on the size of the customer's water meter. This is a minimum charge and will be separate and above the gallonage charge levied for sewer service based on the water consumption as registered through the water meter each month.

Size of Service Meter (Inches)	Minimum Charge
¾	$26.94
1	51.06
1½	53.89
2	56.32
3	56.32
4	56.32

(b) Gallonage Charge. The rates for all sewer usage based on the customer's water consumption as registered through the customer's water meter shall be due and payable on a monthly basis at the rate of Four Dollars and 49/100 ($4.49) per unit of each one thousand (1,000) gallons. or portion thereof, in excess of six thousand (6,000) gallons. The gallonage charge will be in addition to the customer's minimum charge.

2. When a customer is not connected to the City's water system, but connected to the sewer system. there shall be a charge of $26.94 per month for sewer service.

3. In addition to the charges outlined in paragraphs 1(a) and 1(b). customers outside the city limits of the City of Wauchula, Florida, shall be charged a twenty-five percent (25%) surcharge.

Section 2. Section 1, subsection entitled Commercial Sewer Rates, paragraphs 1. and 2., is amended as follows:

1. Each commercial sewer customer connected to the City Sewer System located within or beyond the corporate limits of the City of Wauchula. Florida, shall be billed based on the customer's water meter size and water consumption. The rates of charges are as follows:

(a) Minimum Charge. The minimum charge for each customer's sewer service shall be as listed below based on the size of the customer's water meter. This is a minimum charge and will be separate and above the gallonage charge levied for sewer service based on the water consumption as registered through the water meter each month.

Size of Service Meter (Inches)	Minimum Charge
¾	$ 26.94
1	31.06
1½	53.89
2	77.00
3	139.18
4	217.76

(b) Gallonage Charge. The rates for all sewer usage based on the customer's water consumption as registered through the customer's water meter shall be due and payable on a monthly basis at the rate of Four Dollars and 49/100 ($4.49) per unit of each one thousand (1,000) gallons or portion thereof, in excess of six thousand (6,000) gallons. The gallonage charge will be in addition to the customer's minimum charge.

2. When a customer is not connected to the City's water system but connected to the sewer system, there shall be a charge of $26.94 per month for sewer service.

3. In addition to the charges outlined in paragraphs 1(a) and 1(b), customers outside the city limits of the City of Wauchula, Florida, shall be charged a twenty-five percent (25%) surcharge.

Section 3. That portion of Section 1 of Ordinance Number 702 entitled Water Rates is hereby amended as follows:

City Water Rates:

1. The rates for all water used through a customer's water service shall be due and payable on a monthly basis and will consist of a flat-rate service charge based on the size of the customer's water meter, plus a flat-rate for each unit of one thousand (1,000) gallons, or portion thereof, of water consumed.

The rates are as follows:

a. **Monthly Service Charge:** The monthly service charge for each customer's water meter shall be at the rates tabulated below. This is a service charge and will include the first six thousand (6,000) gallons of water used through the customer's water meter.

Size of Service Meter (Inches)	Minimum Charge
¾	10.30
1	14.12
1½	24.50
2	35.03
3	63.27
4	98.98
6	190.79

b. Each separate residential living unit, or separate commercial business unit, or professional office unit shall be served by an individual water service which shall be metered individually, and shall pay the above-listed monthly service charge as a single customer plus the gallonage charge.

c. **Gallonage Charge:** The rates for all water used through a customer's water meter shall be due and payable on a monthly basis at the rate of $2.04 per unit of each one thousand (1,000) gallons, or portion thereof, in excess of six thousand (6,000) gallons. The gallonage charge will be in addition to the customer's monthly service charge.

d. For existing buildings served by one water meter and occupied by more than one residential living unit and/or commercial unit, a monthly service charge at the applicable rate for each unit, plus the gallonage charge, shall be billed to the owner, or at the discretion of the City Clerk, may be billed to the renter, leaseholder or occupant for each unit.

Rural Water Rates:

All water customers located beyond the corporate limits of the City of Wauchula, Florida, and connected to and served by the City Water System, shall pay a monthly charge for all water used through the customer's water meter equal to one hundred twenty-five percent (125%) of the above-listed City Water Rates. Bills for rural water service shall be due and payable on a monthly basis.

Other Water Charges:

1. There shall be an installation and tapping charge for water services as follows:

Size of Meter <u>to be installed</u>	Installation and <u>Tapping Charge</u>
¾ inch tap	$550.00
1 inch tap	700.00
1½ inch tap	City's cost
2 inch tap	City's cost
3 inch tap	City's cost

When over three (3) inch services are required, estimates will be furnished upon application for service.

In addition to the above charges, a charge for a lawn or irrigation service which is in addition to the service for the structure shall include actual cost of materials for the tap and meter installation and shall not be considered a separate service for the purpose of impact fees.

Such installation and tapping charges shall be paid before water service will be furnished by the City of Wauchula.

The above rates shall apply except where casing is required under state highways, railroad, etc. Then the actual cost of labor, equipment and materials shall be charged for the installation which shall be installed in accordance with state highway, railroad or other governing bodies' specifications.

2. There shall be a charge for a temporary water connection of Fifty Dollars ($50.00).

<u>Section 4</u>. **Cost of Living Adjustments.** On or before December 1 and May 1 of each calendar year, beginning December 1 of 2001, the City Clerk, City Administrator, and department heads shall meet for the purpose of determining the need for a sewer/water rate increase and shall make recommendations to the City Council at its next regularly scheduled meeting with respect to whether or not there exists a need for an increase at that time.

<u>Section 5</u>. If any provision of this ordinance is for any reason held to be invalid or unconstitutional by any court of competent jurisdiction, such provision and such holding shall not affect the validity of any other provision, and to that end the provisions of this ordinance are hereby declared to be severable.

<u>Section 6</u>. All ordinances or parts of ordinances in conflict herewith are hereby repealed to the extent of such conflict.

<u>Section 7</u>. This ordinance shall take effect upon adoption by the Council as provided by law and signed by the Mayor and City Clerk as provided by ordinance, or upon adoption without said Mayor's approval.

This ordinance was read and approved at the regular session of the City Council on the 26th day of February, 2001. The final reading was held on the 12th day of March, BL

2001, and upon motion by Baxter and seconded by Spiech this ordinance was adopted.

5 members of the Council voted for adoption

0 members of the Council voted against adoption

2 members of the Council were absent

(SEAL)

ATTEST:

By: James A Braddock
James Braddock, City Clerk

CITY OF WAUCHULA, FLORIDA

By: D J B R
David B. Royal,
Chairman of City Council

APPROVED AS TO FORM

By: Kenneth B. Evers
Kenneth B. Evers,
City Attorney

THIS ORDINANCE APPROVED BY ME,
this 12th day of March, 2001

Kenneth A. Lambert, Mayor

WAUCHULA\05-o.nl

6

BEST AVAILABLE COPY

HARDEE COUNTY PURCHASING DEPT

205 HANCHEY ROAD
WAUCHULA, FL 33873
863/773-5014 Fax 863/773-0322

PURCHASE ORDER: 44845

Page: 1 of 1

***** VENDOR *****
CLIFF BERRY, INC.
5218 ST. PAUL STREET
TAMPA FL 33619

***** DELIVER TO *****
HARDEE COUNTY
SOLID WASTE & RECYCLE
685 AIRPORT ROAD
WAUCHULA, FL 33873

Ordered	Due	Ship Via	FOB	Terms	Customer#
02/06/03	02/06/03			Upon Receipt	

Requisition No.	Vendor No.	Vendor Phone	Vendor Fax	
48520	2161-1	813/626-6533	813/626-9012	

No	Quantity	U/M	Description	Unit Price	Extended	G/L Account
1	2.00	EA	LABOR, MATERIAL AND EQUIPMENT TO CLEAN (2) TWO 79,000 GAL. LEACHATE TANKS AND THEIR CONTAINMENT. ALL WASTE WILL BE LEFT ON SITE PER VERBAL DISCUSSION. *** HARDEE COUNTY SOLID WASTE WILL PROVIDE ANY LOCKOU/TAGOUT OF ELECTRIC, MECHANICAL, PUMPS VALVES OR ANY OTHER DEVICE WHICH MAY IMPEDE THE SAFETY OF PERSONNEL AND EQUIPMENT. CLIFF BERRY, INC. WILL NOT BE RESPONSIBLE FOR TANK CLOSURE UPON ACCEPTANCE OF THE TANKS AND THE COMPLETION OF GAS FREE EVOLUTION. ACCEPTANCE REQUIRES APPROVAL FROM JANICE WILLIAMSON OR HER DESIGNEE. *** CLIFF BERRY, INC. WILL OPEN THE MANWAYS. ** CLIFF BERRY, INC. REQUIRES AT LEAST (2) TWO DAYS ADVANCED NOTICE TO COORDINATE SCHEDULED CLEANING OF A TANK AT A TIME.	3,130.0000	6,260.00	104-534-031-0
				** TOTAL **	6,260.00	CLEAN

VENDOR INSTRUCTIONS:
1. Mail Invoices to: Hardee County Clerk to BOCC
   Accounting Dept
   412 W Orange St Rm A-205
   Wauchula, Fl 33873
2. Invoices and Packages must bear the P.O. No. Above.
3. Purchases may not exceed the total amount of this order without prior approval by the Purchasing Dept.
4. cceptance of this order includes acceptance of all terms, ices, delivery instructions, specifications and conditions.
5. State Tax Exempt#: 35-02889-53C EIN: 59-6000632
6. If you have questions, please call 863/773-5014

SPECIAL INSTRUCTIONS:
CONFIRMING QUOTE BY DAN STONE, DO NOT DUPLICATE.

Dee Newgent

Originator

01/29/1994 03:02 9417733907 HARDEE COUNTY S.W. PAGE 03

HARDEE COUNTY PURCHASING DEPT

205 HANCHEY ROAD
WAUCHULA, FL 33873
863/773-5014 Fax 863/773-0322

PURCHASE ORDER: 46361

***** VENDOR *****
TANK ENGINEERING & MGMT. CORP.
1419 W. WATER AVENUE
SUITE 114
TAMPA FL 33604

***** DELIVER TO *****
HARDEE COUNTY
SOLID WASTE & RECYCLE
685 AIRPORT ROAD
WAUCHULA, FL. 33873

Ordered	Due	Ship Via	FOB	Terms	Customer#
07/18/03	07/18/03			Upon Receipt	

Requisition No.	Vendor No.	Vendor Phone	Vendor Fax	
53386	10006-1	813/935-6697	813/931-8458	

No	Quantity	U/M	Description	Unit Price	Extended	G/L Account
2	2.00	EA	ASSESSMENT INSPECTION OF TWO (2) LEACHATE STORAGE TANKS, PER QUOTE. D.E.P. PERMIT REQUIREMENT.	1,500.0000	3,000.00	104-534-031-0
7	1.00	EA	PROVIDE REPAIR & MAINTENANCE SERVICE RECOATING TANK #2 travel,labor,materials	3,500.0000	3,500.00	104-534-031-0
10	.00			.0000	.00	104-534-031-0
				** TOTAL **	6,500.00	

INSPECTION

Repair

Change Order
SEP 03 2003

VENDOR INSTRUCTIONS:
1. Mail Invoices to: Hardee County Clerk to BOCC
   Accounting Dept
   PO Drawer 1749
   Wauchula, Fl 33873
2. Invoices and Packages must bear the P.O. No. Above.
3. Purchases may not exceed the total amount of this order without prior approval by the Purchasing Dept.
4. Acceptance of this order includes acceptance of all terms, prices, delivery instructions, specifications and conditions.
5. State Tax Exempt#: 35-02889-53C EIN: 59-6000632
6. If you have questions, please call 863/773-5014

SPECIAL INSTRUCTIONS:
CONFIRMING ORDER W/JEFF. DO NOT DUPLICATE.

Dee Newgent

Originator

SCS ENGINEERS

SHEET ______ OF ______

CLIENT Hardee	PROJECT	JOB NO. 09199033.05
SUBJECT Hardee County Landfill	BY Otto	DATE
Long Term Care	CHECKED	DATE

Long Term Care

Item (7) Maintenance of Groundwater wells

Quantity	Pricing
Assume 1 well damaged protective casing & pad	PSI Quote
Assume technician repair 4 hrs x 45 $/hr = $180	1 protective casing 175 1 concrete pad 60 235
	Total = 180 + 235 = $415
	PSI Quote
Assume 1 well to be replace every 5 years	

Mob	$350	= 350
Decon	$150	= 150
30 ft well	30 x 35	= 1050
Casing	175	= 175
Concrete	60	= 60
Bollards	60	= 60
Permit	75	= 75
Develop well	75	= 75
		$1995

Say $2000 / every 5 years

$400/yr

ATTACHMENT A
SCHEDULE OF SERVICES AND ESTIMATED FEES
SCS ENGINEERS-HARDEE COUNTY SITE
PSI PROJECT/DOCUMENT NO. 778-42015

ITEM	EST. QTY.	UNIT RATE	TOTAL FEES
Mobilization			
Truck/Trailer Mounted Equipment, ea. CME 75/D-120/CME-45 Truck/Trailer Mounted Drill Rig and Crew	1	$350.00	$350.00
Support Vehicle/Steam Cleaner	1	$150.00	$150.00
Monitoring Wells/Pelzometers			
2" Diameter Monitoring Well/Pelzometer Installation (0-50 feet), lf (Installed using 4-1/4 or 6-1/4" HSA or 7-7/8" mud rotary bit) (Per foot includes up to 15' of 2" PVC Schedule 40 Casing, up to 45' of PVC Schedule 40 Screen (0.010" slot), PVC Point, 20/30 Sand Pack, 60/140 fine sand seal, Portland Grout, up to 0.50 hr. for well development per each well)	188	$35.00	$6,580.00
Additional Items Not Covered In Above Well/Peizometer Installation Prices			
Protective Steel Casing	11	$175.00	$1,925.00
Concrete Pad, ea.	3	$60.00	$180.00
2" Steel Bollards, Painted and Filled w/Concrete	12	$60.00	$720.00
Monitoring well and Peizometer Abandonment (l.f.)	60	$17.00	$1,020.00
(Decontamination or Decon Station Setup, lf. (Includes decontamination of equipment and tools, does not include material costs for decon station, add $250.00 per decon station)	0	$150.00	$0.00
Drill Crew Standby, hr. (Includes standby for site meetings, boring layout and staking, difficult access, hauling of water, site cleanup and repairs, safety orientation, and other standby at site for reasons other than for equipment failure or inclement weather)	0	$150.00	$0.00
Well Development, hr. (Estimate based on over 0.50 hr. per well)	0	$150.00	$0.00
Regulatory Permit - SFWMD, ea.	3	$75.00	$225.00
55 Gallon Drums with Lids - (Unit price does not include handling or transportation of drums on or off-site)	0	$45.00	$0.00
Hotel and Per Diem (3-man Crew), Per Day	4	$180.00	$720.00
TOTAL PROJECT COST			$11,870.00

Actual
151

188
151
37
$ 35
1295

11,870 - 1295
$ 10,575

psi

DRILLING SERVICES PROPOSAL

For the

SCS ENGINEERS PROJECT NO. 09199033.09
HARDEE COUNTY, FLORIDA

Prepared for

SCS Engineers
3012 U.S. Highway 301 N.
Suite 700
Tampa, Florida 33619

Prepared by

Professional Service Industries, Inc.
5801 Benjamin Center Drive
Suite 112
Tampa, Florida 33634
Telephone (813) 886-1075
Fax (813) 888-6514
Engineering Business No. 3684

PSI Proposal No. 778-42015

April 2, 2004

psi *Information To Build On*
Engineering • Consulting • Testing

April 2, 2004

SCS Engineers
3012 U.S. Highway 301 N.
Suite 700
Tampa, Florida 33619

Attention: Mr. Joseph O'neill

RE: Drilling Services Proposal
SCS Project No. 09199033.09
Hardee County, Florida
PSI Project / Document No. 778- 42015

Dear Mr. O'neill:

Professional Service Industries, Inc. (PSI) is pleased to submit this proposal for Drilling Services for the above referenced project. We understand the property is readily accessible to truck-mounted equipment.

SCOPE OF SERVICES

It is our understanding that the requested services will consist of constructing three (3) shallow monitoring wells installed to approximate depths of 17 feet. Seven (7) peizometers will be installed to depths of approximately 12 feet. One (1) peizometer will be installed within a landfill area to a depth of approximately 20 feet. The shallow monitoring wells will be installed with 4¼ hollow stem augers and constructed with 15 feet of 2-inch diameter 0.010" slot screen flush threaded to 5 feet of riser. Each monitoring well will be finished with a galvanized protective steel covering, locking caps, locks and a 2'x2'x4" concrete pad. Each monitoring well location will also included the placement of 2" steel bollards filled with concrete and painted with FDOT Yellow colored paint. Seven (7) of the proposed peizometers will be installed with 4 ¼ hollow stem augers and constructed with 10 feet of 2-inch diameter 0.010" slot screen flush threaded to 5 feet of riser. The proposed peizometer to be located within the landfill area will be constructed with 18 feet of 2-inch diameter 0.010" slot screen flush threaded to 5 feet of riser. Each peizometer will be finished 4" protective steel casing, locking caps and locks.

In addition to the installation of the monitoring wells and the peizometers, one (1) 15 feet deep monitoring well and three (3) 15 feet deep peizometers will be abandoned per Southwest Florida Water Management District guidelines.

It is our understanding that SCS Engineers will locate the well and peizometer locations and will provide a field geologist to log the soils encountered and to direct the field crew. PSI will provide materials necessary for the installation of the proposed wells and peizometers including all well and backfill materials. This proposal is based on the site being free of harmful contaminants that may be encountered during the installation of the wells and peizometers. If contaminants are known to exist at this site or are encountered during the installation procedures, then additional environmental services will be required to complete the proposed scope of work. These additional services would include, but not be limited to, wearing of personal protective equipment by the field crew during the field work, air , soil and water screening for excessive amounts of contaminants during the drilling and oversight by environmental personnel. If contaminated conditions are known or are encountered during the field work, PSI would prepare a separate fee proposal for the additional environmental services required to complete the scope of work addressed in this proposal prior to proceeding. We understand that drumming of cuttings will not be required. We also understand that no environmental site assessment or geotechnical engineering recommendations or guidance on boring depths are required. PSI can provide these services if desired at an additional fee.

PROVISIONS

1. This proposal is based on PSI installing a total of three (3) wells with concrete pads, protective casing, and bollards and locking caps.

2. Soils excavated for the wells will be left at the site. Drumming of soils or waste is not included in this proposal.

3. PSI will invoice on a unit rate basis in accordance with Attachment A for actual work completed.

SERVICE FEES

Enclosed in Attachment A, you will find a preliminary breakdown of our proposal unit fee schedule for the above referenced scope of work. This proposal is prepared based on general site conditions normally associated with this type of project. However, due to unknown conditions that can be encountered during any field exploration, any items or services performed in the field as requested and/or required that are not shown on Attachment A, will be billed in accordance with the unit rates as shown in our 2003 Master Subcontract Agreement between SCS Engineers and PSI or as otherwise agreed to by PSI and SCS Engineers.

It is proposed that the fee for the performance of the above-outlined services be determined on a unit price basis, in accordance with our attached Schedule of Services and Fees, and that the work be performed pursuant to our General Conditions. On the basis of the estimated quantities and the Schedule of Services and Fees, it is estimated that the total fee will be **$11,870.00.**

We appreciate the opportunity to offer our services and look forward to working with you. Should you have any questions in regard to this proposal, please do not hesitate to contact this office.

Sincerely,

PROFESSIONAL SERVICE INDUSTRIES, INC.

Kevin H. Scott, E.I.
Department Manager, Tampa, FL
Geotechnical/Environmental Drilling Services

KHS/mb:778-42015

Attachments: Attachment A - Summary of Services and Fees
Attachment B – Authorization Form
General Conditions

GENERAL CONDITIONS

1. PARTIES AND SCOPE OF WORK: Professional Service Industries Inc. (hereinafter referred to as "PSI") shall include said company or its particular division, subsidiary or affiliate performing the work. "Work" means the specific geotechnical, analytical, testing or other service to be performed by PSI as set forth in PSI's proposal, Client's acceptance thereof and these General Conditions. Additional work ordered by Client shall also be subject to these General Conditions. "Client" refers to the person or business entity ordering the work to be done by PSI. If Client is ordering the work on behalf of another, Client represents and warrants that it is the duly authorized agent of said party for the purpose of ordering and directing said work. Unless otherwise stated in writing, Client assumes sole responsibility for determining whether the quantity and the nature of the work ordered by the client is adequate and sufficient for Client's intended purpose. Client shall communicate these General Conditions to each and every third party to whom Client transmits any part of PSI's work. PSI shall have no duty or obligation to any third party greater than that set forth in PSI's proposal, Client's acceptance thereof and these General Conditions. The ordering of work from PSI, or the reliance on any of PSI's work, shall constitute acceptance of the terms of PSI's proposal and these General Conditions, regardless of the terms of any subsequently issued document.

2. TESTS AND INSPECTIONS: Client shall cause all tests and inspections of the site, materials and work performed by PSI or others to be timely and properly performed in accordance with the plans, specifications and contract documents and PSI's recommendations. No claims for loss, damage or injury shall be brought against PSI by Client or any third party unless all tests and inspections have been so performed and unless PSI's recommendations have been followed. Client agrees to indemnify, defend and hold PSI, its officers, employees and agents harmless from any and all claims, suits, losses, costs and expenses, including, but not limited to, court costs and reasonable attorney's fees in the event that all such tests and inspections are not so performed or PSI's recommendations are not so followed except to the extent that such failure is the result of the negligence, willful or wanton act or omission of PSI, its officers, agents or employees, subject to the limitation contained in paragraph 9.

3. SCHEDULING OF WORK: The services set forth in PSI's proposal and Client's acceptance will be accomplished in a timely, workmanlike and professional manner by PSI personnel at the prices quoted. If PSI is required to delay commencement of the work or if, upon embarking upon its work, PSI is required to stop or interrupt the progress of its work as a result of changes in the scope of the work requested by Client, to fulfill the requirements of third parties, interruptions in the progress of construction, or other causes beyond the direct reasonable control of PSI, additional charges will be applicable and payable by Client.

4. ACCESS TO SITE: Client will arrange and provide such access to the site as is necessary for PSI to perform the work. PSI shall take reasonable measures and precautions to minimize damage to the site and any improvements located thereon as the result of its work or the use of its equipment; however, PSI has not included in its fee the cost of restoration of damage which may occur. If Client desires or requires PSI to restore the site to its former condition, upon written request PSI will perform such additional work as is necessary to do so and Client agrees to pay to PSI for the cost.

5. CLIENT'S DUTY TO NOTIFY ENGINEER: Client represents and warrants that it has advised PSI of any known or suspected hazardous materials, utility lines and pollutants at any site at which PSI is to do work hereunder, and unless PSI has assumed in writing the responsibility of locating subsurface objects, structures, lines or conduits, Client agrees to defend, indemnify and save PSI harmless from all claims, suits, losses, costs and expenses, including reasonable attorney's fees as a result of personal injury, death or property damage occurring with respect to PSI's performance of its work and resulting to or caused by contact with subsurface or latent objects, structures, lines or conduits where the actual or potential presence and location thereof were not revealed to PSI by Client.

6. RESPONSIBILITY: PSI's work shall not include determining, supervising or implementing the means, methods, techniques, sequences or procedures of construction. PSI shall not be responsible for evaluating, reporting or affecting job conditions concerning health, safety or welfare. PSI's work or failure to perform same shall not in any way excuse any contractor, subcontractor or supplier from performance of its work in accordance with the contract documents. PSI has no right or duty to stop the contractor's work.

7. SAMPLE DISPOSAL: Unless otherwise agreed in writing, test specimens or samples will be disposed immediately upon completion of the test. All drilling samples or specimens will be disposed sixty (60) days after submission of PSI's report.

8. PAYMENT: Client shall be invoiced once each month for work performed during the preceding period. Client agrees to pay each invoice within thirty (30) days of its receipt. Client further agrees to pay interest on all amounts invoiced and not paid or objected to for valid cause in writing within said thirty (30) day period at the rate of eighteen (18) percent per annum (or the maximum interest rate permitted under applicable law), until paid. Client agrees to pay PSI's cost of collection of all amounts due and unpaid after sixty (60) days, including court costs and reasonable attorney's fees. PSI shall not be bound by any provision or agreement requiring or providing for arbitration of disputes or controversies arising out of this agreement, any provision wherein PSI waives any rights to a mechanics' lien, or any provision conditioning PSI's right to receive payment for its work upon payment to Client by any third party. These General Conditions are notice, where required, that PSI shall file a lien whenever necessary to collect past due amounts. Failure to make payment within 30 days of invoice shall constitute a release of PSI from any and all claims which Client may whether in tort, contract or otherwise, and whether known or unknown at the time.

9. WARRANTY: PSI'S SERVICES WILL BE PERFORMED, ITS FINDINGS OBTAINED AND ITS REPORTS PREPARED IN ACCORDANCE WITH ITS PROPOSAL, CLIENT'S ACCEPTANCE THEREOF, THESE GENERAL CONDITIONS, AND WITH GENERALLY ACCEPTED PRINCIPLES AND PRACTICES. IN PERFORMING ITS PROFESSIONAL SERVICES, PSI WILL USE THAT DEGREE OF CARE AND SKILL ORDINARILY EXERCISED UNDER SIMILAR CIRCUMSTANCES BY MEMBERS OF ITS PROFESSION. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR REPRESENTATIONS, EITHER EXPRESS OR IMPLIED. STATEMENTS MADE IN PSI REPORTS ARE OPINIONS BASED UPON ENGINEERING JUDGMENT AND ARE NOT TO BE CONSTRUED AS REPRESENTATIONS OF FACT.

SHOULD PSI OR ANY OF ITS PROFESSIONAL EMPLOYEES BE FOUND TO HAVE BEEN NEGLIGENT IN THE PERFORMANCE OF ITS WORK, OR TO HAVE MADE AND BREACHED ANY EXPRESS OR IMPLIED WARRANTY, REPRESENTATION OR CONTRACT, CLIENT, ALL PARTIES CLAIMING THROUGH CLIENT AND ALL PARTIES CLAIMING TO HAVE IN ANY WAY RELIED UPON PSI'S WORK AGREE THAT THE MAXIMUM AGGREGATE AMOUNT OF THE LIABILITY OF PSI, ITS OFFICERS, EMPLOYEES AND AGENTS SHALL BE LIMITED TO $25,000.00 OR THE TOTAL AMOUNT OF THE FEE PAID TO PSI FOR ITS WORK PERFORMED WITH RESPECT TO THE PROJECT, WHICHEVER AMOUNT IS GREATER.

IN THE EVENT CLIENT IS UNWILLING OR UNABLE TO LIMIT PSI'S LIABILITY IN ACCORDANCE WITH THE PROVISIONS SET FORTH IN THIS PARAGRAPH, CLIENT MAY, UPON WRITTEN REQUEST OF CLIENT RECEIVED WITHIN FIVE DAYS OF CLIENT'S ACCEPTANCE HEREOF, INCREASE THE LIMIT OF PSI'S LIABILITY TO $250,000.00 OR THE AMOUNT OF PSI'S FEE, WHICHEVER IS THE GREATER, BY AGREEING TO PAY PSI A SUM EQUIVALENT TO AN ADDITIONAL AMOUNT OF 5% OF THE TOTAL FEE TO BE CHARGED FOR PSI'S SERVICES. THIS CHARGE IS NOT TO BE CONSTRUED AS BEING A CHARGE FOR INSURANCE OF ANY TYPE, BUT IS INCREASED CONSIDERATION FOR THE GREATER LIABILITY INVOLVED. IN ANY EVENT, ATTORNEY'S FEES EXPENDED BY PSI IN CONNECTION WITH ANY CLAIM SHALL REDUCE THE AMOUNT AVAILABLE, AND ONLY ONE SUCH AMOUNT WILL APPLY TO ANY PROJECT.

NO ACTION OR CLAIM, WHETHER IN TORT, CONTRACT, OR OTHERWISE, MAY BE BROUGHT AGAINST PSI, ARISING FROM OR RELATED TO PSI'S WORK, MORE THAN TWO YEARS AFTER THE CESSATION OF PSI'S WORK HEREUNDER.

10. INDEMNITY: Subject to the foregoing limitations, PSI agrees to indemnify and hold Client harmless from and against any and all claims, suits, costs and expenses including reasonable attorney's fees and court costs arising out of PSI's negligence to the extent of PSI's negligence. Client shall provide the same protection to the extent of its negligence. In the event that Client or Client's principal shall bring any suit, cause of action, claim or counterclaim against PSI, the party initiating such action shall pay to PSI the costs and expenses incurred by PSI to investigate, answer and defend it, including reasonable attorney's and witness fees and court costs to the extent that PSI shall prevail in such suit.

11. TERMINATION: This Agreement may be terminated by either party upon seven days' prior written notice. In the event of termination, PSI shall be compensated by Client for all services performed up to and including the termination date, including reimbursable expenses, and for the completion of such services and records as are necessary to place PSI's files in order and/or protect its professional reputation.

12. EMPLOYEES/WITNESS FEES: PSI's employees shall not be retained as expert witnesses except by separate, written agreement. Client agrees to pay PSI's legal expenses, administrative costs and fees pursuant to PSI's then current fee schedule for PSI to respond to any subpoena. Client agrees not to hire PSI's employees except through PSI. In the event Client hires a PSI employee, Client shall pay PSI an amount equal to one-half of the employee's annualized salary, without PSI waiving other remedies it may have.

13. HAZARDOUS MATERIALS: Nothing contained within this agreement shall be construed or interpreted as requiring PSI to assume the status of an owner, operator, generator, storer, transporter, treater or disposal facility as those terms appear within RCRA or within any Federal or State statute or regulation governing the generation, transportation, treatment, storage and disposal of pollutants. Client assumes full responsibility for compliance with the provisions of RCRA and any other Federal or State statute or regulation governing the handling, treatment, storage and disposal of pollutants.

ROVISIONS SEVERABLE: The parties have entered into this agreement in good faith, and it is the specific intent of the parties that the terms of these General Conditions be enforced as writ-... In the event any of the provisions of these General Conditions should be found to be unenforceable, it shall be stricken and the remaining provisions shall be enforceable.

15. ENTIRE AGREEMENT: This agreement constitutes the entire understanding of the parties, and there are no representations, warranties or undertakings made other than as set forth herein. This agreement may be amended, modified or terminated only in writing, signed by each of the parties hereto.

ATTACHMENT B
SCS ENGINEERS
HARDEE COUNTY SITE
AUTHORIZATION/NOTICE TO PROCEED
SCHEDULE OF DRILLING SERVICES
PSI PROJECT / DOCUMENT: 778-42015

Project Name:____

Project Location____

Purchase Order/Work Order No. (Verbal/Letter/PO):________________

Project Contact:____

Phone Number:____

Fax Number:____

Site Phone:____

INVOICING INFORMATION

Company Name:____

Address:____

City, State, Zip:____

Attention:____

AUTHORIZATION

Please execute and return a copy of this agreement
(MUST BE COMPLETED AND EXECUTED PRIOR TO MOBILIZATION TO SITE)

AGREED TO THIS___________DAY OF_________________________________

BY:____

TITLE:____

FIRM:____

SCS ENGINEERS

SHEET 16 OF

CLIENT Hardee County	PROJECT Landfill Expansion		JOB NO. 09199033.09
SUBJECT		BY	DATE
Long-Term Care		CHECKED	DATE

8. Gas System Maintenance

Estimate one passive vent will need to be repaired every year

Cost
SCS Field Services Quote

Requires 8hrs of a technician's time at \$45/hr

$$8\ hrs \times \frac{\$45}{hr} = \$360$$

Mat'l to repair passive vent is \$100

$$\boxed{\text{Repair Cost} = \$460}$$

SCS ENGINEERS

SHEET 17 OF

CLIENT	PROJECT	JOB NO.
Hardee County	Permit Renewal	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

9. Landscape

Assume the landfill is mowed 6 times a year

Mowing Area 17.5 ac × 6 = 105 ac

$\boxed{\text{Mowing Area} = 105 \text{ ac}}$

Cost

Per Janice Williamson & Hardee County Public Works

$$\text{Cost} = \frac{\$12{,}150}{100 \text{ acres}} = \$121.50/\text{ac}$$

$\boxed{\text{Mowing Cost} = \$121.5/\text{acre-yr}}$ × 105 ac

= 12,757.50 \$

HILLSBOROUGH COUNTY SOUTH EAST LANDFILL
SECTION 1 LANDFILL EXPANSION

Item No.	CONTRACTOR / Item Description	Units	Bid Quantity	ADVANCE Bid Unit Price	ADVANCE Bid Unit Total	CHERRY HILL Bid Unit Price	CHERRY HILL Bid Unit Total	DOLPHIN Bid Unit Price	DOLPHIN Bid Unit Total
1	Mobilization (complete)	LS	1	$ 200,000.00	$ 200,000.00	$ 244,136.00	$ 244,136.00	$ 332,430.00	$ 332,430.00
2	Site Clearing	AC	14	$ 1,850.00	$ 25,900.00	$ 2,000.00	$ 28,000.00	$ 3,000.00	$ 42,000.00
3	Survey	LS	1	$ 85,000.00	$ 85,000.00	$ 12,000.00	$ 12,000.00	$ 65,000.00	$ 65,000.00
4	Temporary Erosion Control	LS	1	$ 10,000.00	$ 10,000.00	$ 5,000.00	$ 5,000.00	$ 10,000.00	$ 10,000.00
5	Excavation	CY	216,000.00	$ 1.80	$ 388,800.00	$ 3.30	$ 712,800.00	$ 1.75	$ 378,000.00
6	Backfill and Fill	CY	436,000.00	$ 5.40	$ 2,354,400.00	$ 4.81	$ 2,097,160.00	$ 4.75	$ 2,071,000.00
7	Subase	SF	583,500.00	$ 0.20	$ 116,700.00	$ 0.14	$ 81,690.00	$ 0.89	$ 519,315.00
8	60 Mil Liner	SF	1,167,000.00	$ 0.40	$ 466,800.00	$ 0.34	$ 396,780.00	$ 0.39	$ 455,130.00
9	Geocomposite	SF	1,167,000.00	$ 0.40	$ 466,800.00	$ 0.40	$ 466,800.00	$ 0.45	$ 525,150.00
10	12 - inch Drainage Sand	SF	583,500.00	$ 0.30	$ 175,050.00	$ 0.70	$ 408,450.00	$ 0.72	$ 420,120.00
11	12 - inch Processed Tire Drainage Layer	SF	447,000.00	$ 1.00	$ 447,000.00	$ 0.10	$ 44,700.00	$ 0.20	$ 89,400.00
12	Pipe	LF	3,740.00	$ 26.00	$ 97,240.00	$ 38.00	$ 142,120.00	$ 28.00	$ 104,720.00
13	8 - inch dia.HDPE Header Piping	LF	660.00	$ 27.00	$ 17,820.00	$ 68.00	$ 44,880.00	$ 40.00	$ 26,400.00
14	Pump, Controls, Piping, etc.	LS	1.00	$ 48,000.00	$ 48,000.00	$ 56,847.00	$ 56,847.00	$ 55,000.00	$ 55,000.00
15	3 - inch dia., HDPE Piping	LF	465.00	$ 28.00	$ 13,020.00	$ 53.00	$ 24,645.00	$ 25.00	$ 11,625.00
16	Access Ramp and Road	SY	1,000.00	$ 19.00	$ 19,000.00	$ 50.00	$ 50,000.00	$ 12.00	$ 12,000.00
17	Stormwater Pipe and Mitered Ends	LF	386.00	$ 80.00	$ 30,880.00	$ 84.53	$ 32,628.58	$ 60.00	$ 23,160.00
18	Seeding and Mulching	SY	59,000.00	$ 0.40	$ 23,600.00	$ 0.29	$ 17,110.00	$ 0.30	$ 17,700.00
19	Sodding	SY	27,000.00	$ 2.00	$ 54,000.00	$ 1.32	$ 35,640.00	$ 1.55	$ 41,850.00
					$ -		$ -		
	Subtotal				$ 5,040,010.00		$ 4,901,386.58		$ 5,200,000.00
	Bid Allowance				$ 200,000.00		$ 200,000.00		$ 200,000.00
	Total Bid Price				$ 5,240,010.00		$ 5,101,386.58		$ 5,400,000.00
	Alternate 1				$ 500,000.00		$ 625,000.00		$ 709,750.00
	Alternate 1Bid Total				$ 4,740,010.00		$ 4,476,386.58		$ 4,690,250.00

Item No.	Item Description	ENVIRONMENTAL SPEC. Bid Unit Price	ENVIRONMENTAL SPEC. Bid Unit Total	HANDEX Bid Unit Price	HANDEX Bid Unit Total	HUBBARD Bid Unit Price	HUBBARD Bid Unit Total	KIMMINS Bid Unit Price	KIMMINS Bid Unit Total
1	Mobilization (complete)	$ 357,911.00	$ 357,911.00	$ 15,718.24	$ 15,718.24	$ 500,000.00	$ 500,000.00	$ 116,225.00	$ 116,225.00
2	Site Clearing	$ 1,700.00	$ 23,800.00	$ 1,060.41	$ 14,845.74	$ 15,000.00	$ 210,000.00	$ 500.00	$ 7,000.00
3	Survey	$ 37,250.00	$ 37,250.00	$ 65,732.46	$ 65,732.46	$ 75,000.00	$ 75,000.00	$ 50,000.00	$ 50,000.00
4	Temporary Erosion Control	$ 4,900.00	$ 4,900.00	$ 17,689.56	$ 17,689.56	$ 20,000.00	$ 20,000.00	$ 5,000.00	$ 5,000.00
5	Excavation	$ 1.32	$ 285,120.00	$ 1.63	$ 352,080.00	$ 4.00	$ 864,000.00	$ 4.00	$ 864,000.00
6	Backfill and Fill	$ 5.02	$ 2,188,720.00	$ 4.81	$ 2,097,160.00	$ 7.50	$ 3,270,000.00	$ 6.00	$ 2,616,000.00
7	Subase	$ 0.37	$ 217,412.10	$ 0.11	$ 64,185.00	$ 0.40	$ 233,400.00	$ 0.36	$ 210,060.00
8	60 Mil Liner	$ 0.36	$ 423,504.30	$ 0.37	$ 431,790.00	$ 0.30	$ 350,100.00	$ 0.34	$ 396,780.00
9	Geocomposite	$ 0.35	$ 410,900.70	$ 0.44	$ 513,480.00	$ 0.30	$ 350,100.00	$ 0.39	$ 455,130.00
10	12 - inch Drainage Sand	$ 0.47	$ 272,202.75	$ 0.20	$ 116,700.00	$ 0.80	$ 466,800.00	$ 0.32	$ 186,720.00
11	12 - inch Processed Tire Drainage Layer	$ 0.06	$ 26,820.00	$ 0.09	$ 40,230.00	$ 0.20	$ 89,400.00	$ 0.13	$ 58,110.00
12	Pipe	$ 29.75	$ 111,265.00	$ 21.37	$ 79,923.80	$ 48.00	$ 179,520.00	$ 30.00	$ 112,200.00
13	8 - inch dia.HDPE Header Piping	$ 37.05	$ 24,453.00	$ 26.28	$ 17,344.80	$ 61.00	$ 40,260.00	$ 45.00	$ 29,700.00
14	Pump, Controls, Piping, etc.	$ 36,009.00	$ 36,009.00	$ 35,956.52	$ 35,956.52	$ 60,000.00	$ 60,000.00	$ 44,775.00	$ 44,775.00
15	3 - inch dia., HDPE Piping	$ 25.32	$ 11,773.80	$ 7.14	$ 3,320.10	$ 34.00	$ 15,810.00	$ 30.00	$ 13,950.00
16	Access Ramp and Road	$ 14.00	$ 14,000.00	$ 20.40	$ 20,400.00	$ 20.00	$ 20,000.00	$ 12.00	$ 12,000.00
17	Stormwater Pipe and Mitered Ends	$ 67.75	$ 26,151.50	$ 39.73	$ 15,335.78	$ 100.00	$ 38,600.00	$ 100.00	$ 38,600.00
18	Seeding and Mulching	$ 0.35	$ 20,650.00	$ 0.32	$ 18,880.00	$ 0.10	$ 5,900.00	$ 0.35	$ 20,650.00
19	Sodding	$ 2.14	$ 57,780.00	$ 1.94	$ 52,380.00	$ 1.20	$ 32,400.00	$ 1.25	$ 33,750.00
						$ -			$ -
	Subtotal		$ 4,550,623.15		$ 3,973,152.00	$ -	$ 6,821,290.00		$ 5,270,650.00
	Bid Allowance		$ 200,000.00		$ 200,000.00		$ 200,000.00		$ 200,000.00
	Total Bid Price		$ 4,750,623.15		$ 4,173,152.00	$ -	$ 7,021,290.00		$ 5,470,650.00
	Alternate 1		$ 1,244,027.00		$ 800,000.00	$ -	$ 1,400,000.00		$ 362,969.00
	Alternate 1Bid Total		$ 3,506,596.15		$ 3,373,152.00		$ 5,621,290.00		$ 5,107,681.00

Bi-planar Geocomposite

Bi-planar Geocomposite Highest Bid $0.45/sf (4.05/sy)

(Bid award 1/2002)

2002 → 2003
4.05/sy × 1.01 → 4.09/sy
FDEP inflation factor

2003 → 2004
4.09/sy × 1.02 → 4.17/sy
FDEP inflation factor

SCS ENGINEERS

SHEET 18 OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

10. Erosion Control & Cover Maintenance

Estimate 0.25 acres of erosion washout w/ 500 sf (56 sy) geosynthetic liner damage

- Sod Cost
  FDOT Cost History 2003
  Bahia Sod (Item 575-11) =

Sod Quantity = 0.25 acre $\times \frac{43{,}560 \text{ sf}}{\text{acre}} \times \frac{\text{sy}}{9 \text{ sf}}$ = 1210 sy

Sod Quantity = **1210** sy
Sod Cost = $1.67/sy

- Geosynthetic Repair Cost
  Assume repair costs

Geomem Geocomposite

40-mil Installed Cost = $4.13/sy + $4.17/sy

Liner Repair Cost = $8.30/sy

Liner Repair Quantity = 56 sy
Liner Repair Cost = 8.30/sy

Note: Regrading will be done by an on-site technician
(see Admin Cost, Sheet 22)

GEO-SYNTHETICS, INC.

FAX TRANSMITTAL SHEET

FAX: 262-524-7961
TEL: 262-524-7979

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
WAUKESHA

TO: Joe O'Neil
COMPANY: SCS
LOCATION:
FROM: Joe Irwin FAX: 813-623-6757
DATE: 4-8-04
RE: Budget Pricing for Hardy Road Cap

The following __4____ pages (including transmittal sheet) are priority. Please notify the intended recipient immediately. If all pages are not received, please call sender for verification.

COMMENTS:

Attached is GSI's budget pricing for Hardy Road Cap. If you have any questions please call.
Joe Irwin

GEO-SYNTHETICS, INC.

CHICAGO
MADISON
MINNEAPOLIS
MUNISING
PHOENIX
WAUKESHA

BUDGETARY PROPOSAL

GSI proposes to sell to the Purchaser the materials and services herein in accordance with the terms, conditions, specifications and prices set forth or referred to on the face hereof and the pages attached hereto. Acceptance of this proposal is limited to the terms and conditions contained in this proposal.

PROJECT NAME: Hardy Road Cap
PROJECT LOCATION: Hardy County, FL
ESTIMATE #:
DATE: 4-8-04

GSI will furnish and install the following material(s):

ITEM	DESCRIPTION	EST. QTY.	UNITS	UNIT PRICE	AMOUNT
	Material Supply				
1	40 mil textured LLDPE	217,800	SF	$0.259	$56,410.20
	Installation				
2	40 mil textured LLDPE	217,800	SF	$0.20	$43,560.00

Total Budgetary Price = $99,970.20

material install
0.259 + 0.20 = $0.459/SF = $4.13/SY

VERY IMPORTANT - PLEASE NOTE:

- Refer to the attached Scope of Work by GSI, Scope of Work by Others, General Conditions and Special Conditions which are included as part of this Proposal.
- Taxes are not included.
- Bonds are not included but can be provided at $20.00 per $1,000.00 of total bid amount
- Budget prices will be valid for 30 days. After 30 days, pricing may be subject to increases in resin and installation costs. These prices are for budget purposes only.
- Prices are F.O.B. job site.
- Prices based on establishing an acceptable line of credit.
- **The above budget numbers do not include mobilization.**

Regional Sales Manager: Joe Irwin
Estimator: Dan Garlow

APPROVED BY: Dan Garlow
Dan Garlow, Estimator

hardy road cap BUDGET.doc

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GEO-SYNTHETICS, INC.

SCOPE OF WORK TO BE PERFORMED BY GSI

GSI proposes to supply and install the liner as follows:

1. GSI will promptly prepare and submit shop drawings to be approved by Project Engineer and returned in advance of installation.
2. Panels will be deployed (from high end to low end), overlapped and welded to form a continuous cover over the area to be lined using double wedge fusion welding as the primary method of welding field seams between adjacent panels. Extrusion welding will be used as a secondary method for seaming between adjacent panels and as a primary method of welding for detail and repair work.
3. Heavy equipment for use in deploying the liner materials.
4. All on-site testing of field seams.
5. Manufactures standard material and certifications per their standard test methods and frequencies.
6. At the conclusion of each day's work GSI will execute a subgrade acceptance form by which it accepts the surface of the subgrade lined that day. GSI will not accept the subgrade in advance of it being lined.

SCOPE OF WORK TO BE PERFORMED BY OTHERS

The following is to be performed or provided by the Purchaser:

1. Preparation and maintenance of the subgrade in a condition suitable for the installation of the liner using standard installation methods. Continuous removal of rainwater, groundwater, snow and ice from the underlying liner material, subgrade and anchor trenches sufficient to permit installation to continue without interruption. The subgrade must be free of rocks, sharp stones, sticks, roots, vegetation and sharp objects and debris of any type which may damage the liner. The subgrade must be prepared so as to be sufficiently stable to permit use of motorized or mechanized rubber tired equipment to deploy the sheet. All sediment buildup on the liner surface shall be removed.
2. Subterranean inspections or tests of the subgrade. (GSI will not be responsible for conditions existing below the surface of the subgrade.)
3. Adequate access to and sufficient operating room about the work area to be lined to permit operation of equipment used to deploy liner. Adequate access can be partially defined as follows: 1) Ability to turn a Case 821B rubber tired loader 360 degrees while suspending a 23' wide roll of liner from the bucket. 2) Ability to access all 4 sides of the cell or all sides and top of the closure area with 2 wheel drive pickups and heavy equipment. 3) Building and maintaining temporary roads accessible by a Case 821B loader requiring a minimum width clearance of 45 feet.
4. Excavation, backfill and compaction of all anchor trenches in accordance with the project specifications.
5. Concrete and pipe work.
6. Access to sanitation facilities for GSI forces.
7. Access to dumpsters for the disposal of GSI construction waste materials.
8. Adequate control of dust to permit welding without excessive or unusual cleaning of the liner.
9. All independent laboratory destructive testing seam testing, conformance testing, friction angle testing and on-site third-party QA consultant.
10. As-built drawings and/or surveys.
11. Procure site specific soils to the independent laboratory for friction angle testing.
12. Exposing, cleaning and maintaining all existing liner tie in locations in a condition suitable for welding including controlling all leachate and run off at the tie-in location.
13. Plywood liner protection/marker sheets.
14. Unloading and storing materials prior to mobilization.
15. Sand for sandbags.
16. Water leakage testing and/or electrical leak location survey.

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GSI GEO-SYNTHETICS, INC.

GENERAL CONDITIONS

1. GSI's proposal assumes working in favorable seasonal conditions. GSI reserves the right to renegotiate pricing or apply stand by charges if the project is either accelerated or delayed into a non-favorable season.
2. Once the project is commenced, installation must proceed in a continuous and uninterrupted fashion. GSI forces will work 6 days per week, 10 hours per day in order to meet project deadlines.
3. GSI will be responsible for the safety of its employees and protection of the liner until acceptance or demobilization. GSI will not be responsible for the overall safety of the job site, and the safety of individuals not employed by GSI. The Owner and General Contractor should caution its employees that liner is slippery, particularly when wet. Care must be exercised when walking on the liner.
4. GSI will not be responsible for any damages to the liner resulting from work performed by others.
5. GSI is not responsible for ground water or gas that accumulates beneath the liner.
6. General contractor shall provide 2 full sets of plans and specifications.
7. Upon request, GSI will provide purchaser with Certificates of Insurance. The insurance shall include General Liability Coverage for personal injury and property damage in the amount of $2,000,000 and Worker's Compensation coverage in the amount required by law.
8. Items which may constitute a claim for contract extras include:
   - Any changes in scope of work
   - Upon arrival, site is not prepared or ready as was verbally stated by the owner/contractor's representative prior to GSI's mobilization to the site.
   - Delays caused by owner, contractor, or other subcontractors which have a direct effect on GSI's ability to complete its work in a timely fashion.
9. Changes to the work must be authorized in writing by the owner/contractor before additional work will commence.
10. Payment terms are as follows: Material - Net 30 days from date of shipment.
    Installation - Net 30 days from date of invoice or completion.

SPECIAL CONDITIONS

1. GSI used verbal information.
2. GSI reserves the right to modify this proposal upon review of complete plans and specifications for this work.
3. GSI to be a non-union subcontractor and pay non-prevailing wages.
4. Proposal based on the work being performed under OSHA Level D conditions. GSI will provide hard-hats and safety glasses for its employees. Soft soled shoes (as required for work upon the geomembrane liner) will be worn by all employees working on the liner. If an upgrade to modified Level D or Level C is encountered, then any additional or site specific personal protective equipment shall be supplied by others.
5. A 5 year pro-rated material warranty and a 1 year installation and workmanship warranty shall be provided.
6. GSI has made no provisions for penetrations since none were indicated on the drawings. Standard pipe penetration boots can be provided at $150.00/each.
7. Any stainless steel battening required will be furnished and installed at an additional price of $30.00/l.f. Quantities are to be determined by field measuring.
8. Geomembrane, geocomposite are quoted supplied and installed as a package.
9. Quantities for payment shall be on actual measured in place quantities which include quantities in anchor trenches.
10. As an authorized fabricator and installer of the liner manufacturer, GSI will provide a full time approved technical representative of the manufacturer on site throughout the installation of the liner in lieu of an actual employee of the manufacturer.

CLARIFICATIONS

1. Clarification: GSI intends to deploy subsequent liner materials via an ATV. (i.e. driving on liner materials to deploy the next layer).

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SCS ENGINEERS

SHEET 19 OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

11. Stormwater Management System Maintenance

The maintenance of the stormwater management system has been covered under Items 9 & 10 of the long-term care plan. These two items address mowing and earthwork required to maintain the stormwater control features.

SCS ENGINEERS

SHEET 20A OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

12. Security System Maintenance

- Estimate 50 ft of fence requires replacement every year

Cost
FDOT Contract History (2001)
8' Type B Fence (Item 550-2-7) = \$20.70/ft

2004 Cost = $\frac{\$20.70}{ft} \times 1.03 = \$21.32/ft$

Fence Repair Quantity = 50 ft
Fence Repair Cost = \$21.32/ft

- Estimate that 1 gate needs to be replaced every 5 years

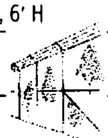
Cost
2002 RS Means Site Work & Landscape Data
Gate 8' High, 20' Opening (02820 528 5070) = \$1475/gate

2004 Cost = $\frac{\$1475}{gate} \times 1.02 = \$1,505/gate \div 5 years = \$301/yr\text{-}gate$

Gate Repair Quantity = 1 gate/yr
Gate Repair Cost = \$301/gate-yr

20B

02800 | Site Improvements and Amenities



	02820 | Fences & Gates		CREW	DAILY OUTPUT	LABOR-HOURS	UNIT	2002 BARE COSTS MAT.	LABOR	EQUIP.	TOTAL	TOTAL INCL O&P
500	0200	Galv. steel, 12 ga., 2" x 4" mesh, posts 5' O.C., 3' high	B-80	300	.107	L.F.	1.62	2.75	1.87	6.24	8.0
	0300	5' high		300	.107		2.16	2.75	1.87	6.78	8.6
	0400	14 ga., 1" x 2" mesh, 3' high		300	.107		1.73	2.75	1.87	6.35	8.1
	0500	5' high		300	.107		2.38	2.75	1.87	7	8.9
	1000	Kennel fencing, 1-1/2" mesh, 6' long, 3'-6" wide, 6'-2" high	2 Clab	4	4	Ea.	270	94		364	445
	1050	12' long		4	4		325	94		419	500
	1200	Top covers, 1-1/2" mesh, 6' long		15	1.067		55	25		80	99.5
	1250	12' long		12	1.333		88	31.50		119.50	145
	1300	For kennel doors, see division 08344-350									
	4500	Security fence, prison grade, set in concrete, 12' high	B-80	25	1.280	L.F.	22	33	22.50	77.50	99.5
	4600	16' high		20	1.600		26.50	41	28	95.50	124
	5300	Tubular picket, steel, 6' sections, 1-9/16" posts, 4' high		300	.107		16.80	2.75	1.87	21.42	24.5
	5400	2" posts, 5' high		240	.133		23.50	3.43	2.33	29.26	33.5
	5600	2" posts, 6' high		200	.160		26.50	4.12	2.80	33.42	38.5
	5700	Staggered picket 1-9/16" posts, 4' high		300	.107		15.15	2.75	1.87	19.77	23
	5800	2" posts, 5' high		240	.133		25	3.43	2.33	30.76	35.5
	5900	2" posts, 6' high		200	.160		26	4.12	2.80	32.92	38
	6200	Gates, 4' high, 3' wide	B-1	10	2.400	Ea.	146	58		204	251
	6300	5' high, 3' wide		10	2.400		189	58		247	298
	6400	6' high, 3' wide		10	2.400		195	58		253	305
	6500	4' wide		10	2.400		227	58		285	340
528	0010	**FENCE, CHAIN LINK INDUSTRIAL**, schedule 40									
	0020	3 strands barb wire, 2" post @ 10' O.C., set in concrete, 6' H									
	0200	9 ga. wire, galv. steel	B-80	240	.133	L.F.	7.80	3.43	2.33	13.56	16.
	0300	Aluminized steel		240	.133		10.05	3.43	2.33	15.81	18.
	0500	6 ga. wire, galv. steel		240	.133		12.65	3.43	2.33	18.41	21.
	0600	Aluminized steel		240	.133		14.50	3.43	2.33	20.26	24
	0800	6 ga. wire, 6' high but omit barbed wire, galv. steel		250	.128		12.25	3.30	2.24	17.79	21
	0900	Aluminized steel		250	.128		17.15	3.30	2.24	22.69	26.
	0920	8' H, 6 ga. wire, 2-1/2" line post, galv. steel		180	.178		19.95	4.58	3.11	27.64	32.
	0940	Aluminized steel		180	.178		24.50	4.58	3.11	32.19	37.
	1400	Gate for 6' high fence, 1-5/8" frame, 3' wide, galv. steel		10	3.200	Ea.	98.50	82.50	56	237	297
	1500	Aluminized steel		10	3.200	"	120	82.50	56	258.50	320
	2000	5'-0" high fence, 9 ga., no barbed wire, 2" line post,									
	2010	10' O.C., 1-5/8" top rail									
	2100	Galvanized steel	B-80	300	.107	L.F.	6.50	2.75	1.87	11.12	13.
	2200	Aluminized steel		300	.107	"	7.85	2.75	1.87	12.47	14.
	2400	Gate, 4' wide, 5' high, 2" frame, galv. steel		10	3.200	Ea.	108	82.50	56	246.50	310
	2500	Aluminized steel		10	3.200	"	119	82.50	56	257.50	320
	3100	Overhead slide gate, chain link, 6' high, to 18' wide		38	.842	L.F.	97	21.50	14.75	133.25	157
	3105	8' high		30	1.067		97	27.50	18.70	143.20	170
	3108	10' high		24	1.333		81	34.50	23.50	139	167
	3110	Cantilever type		48	.667		41	17.15	11.65	69.80	84
	3120	8' high		24	1.333		59.50	34.50	23.50	117.50	144
	3130	10' high		18	1.778		70.50	46	31	147.50	182
	5000	Double swing gates, incl. posts & hardware									
	5010	5' high, 12' opening	B-80	3.40	9.412	Opng.	290	242	165	697	870
	5020	20' opening		2.80	11.429		395	294	200	889	1,100
	5060	6' high, 12' opening		3.20	10		490	258	175	923	1,125
	5070	20' opening		2.60	12.308		675	315	216	1,206	1,475
	5080	8' high, 12' opening		2.13	15.002		760	385	263	1,408	1,725
	5090	20' opening		1.45	22.069		1,000	570	385	1,955	2,400
	5100	10' high, 12' opening		1.31	24.427		865	630	430	1,925	2,375
	5110	20' opening		1.03	31.068		1,300	800	545	2,645	3,250
	5120	12' high, 12' opening		1.05	30.476		1,275	785	535	2,595	3,175

SCS ENGINEERS

SHEET 21A OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

13 Utilities

Estimate a utility cost of $500/yr for the leachate pumps & other electrical requirements.

Lindsey Eldridge

From: Williamson, Janice [janice.williamson@hardeecounty.net]

Sent: Friday, April 11, 2003 10:01 AM

To: lkennelly@scsengineers.com

Subject: Requested Information

Good Morning Lindsey:

The Accounting Department has estimated an average of $500 per year for utilities, for the leachate pumps and loading station.

Thanks and have a great weekend.
Janice

Sheet 21B

SCS ENGINEERS

SHEET 22 OF

CLIENT	PROJECT	JOB NO.
Hardee County	Landfill Expansion	09199033.09

SUBJECT	BY	DATE
Long-Term Care	CHECKED	DATE

14 Administrative

- Account for a quarterly site visit from a PE supervisor for 4 hours @ $98/hr

$$\text{PE Supervisor Cost} = \frac{4\ \text{hr}}{\text{visit}} \times \frac{\$98}{\text{hr}} \times \frac{4\ \text{visits}}{\text{yr}} = \frac{\$1568}{\text{yr}}$$

- Account for an on-site technician for 2 days a month @ $45/hr

$$\text{Technician Cost} = \frac{2\ \text{day}}{\text{month}} \times \frac{8\ \text{hr}}{\text{day}} \times \frac{12\ \text{month}}{\text{yr}} \times \frac{\$45}{\text{hr}} = \frac{\$8640}{\text{yr}}$$

$\boxed{\text{PE Supervisor} = \$1568}$

$\boxed{\text{Technician} = \$8,640}$