Hillsborough County
Department of Solid Waste
Report of
Geotechnical Exploration,
Leachate Containment Area
Southeast Landfill
Hillsborough County, Florida

Ardaman & Associates, Inc.

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November 1, 1989
File Number 89-9671

Ardaman & Associates, Inc.

Consultants in Soils, Hydrogeology,
Foundations and Materials Testing

Hillsborough County
Department of Solid Waste
Post Office Box 1110
Tampa, Florida 33601

Attn: Daniel Cassalia

Subject: Report of Geotechnical Exploration, Proposed Leachate Containment Area, Southeast Landfill, Hillsborough County, Florida

Gentlemen:

Pursuant to your authorization given by revised work order No. TI-08-89-573, and in general accordance with our proposal of September 22, 1989, our firm has completed the exploration of subsurface soil conditions beneath the proposed leachate containment area, at the referenced site. The purpose of this exploration was to determine the stratification and engineering properties of subsurface soils, and to provide recommendations for foundation design and site preparation. This study covers foundation soils well within the influence of building loads, but does not cover deep soil or bedrock strata.

This report was prepared for the exclusive use of Hillsborough County, Department of Solid Waste and their consultants, for use in the design of a foundation system for the proposed leachate storage tanks, in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

SCOPE

The scope of our services has included the following items:

1. Performance of six (6) Standard Penetration Test borings (SPT) to determine the stratification and engineering properties of subsurface soils at the proposed leachate tank and treatment plant locations;

2. Review of each soil sample obtained in our field testing program, by a soils engineer in our laboratory, for verification of classification and assignment of laboratory tests, as required;

3. Performance of routine laboratory soils classification tests to aid in confirming the classification of soils returned to our laboratory;

4. Analysis of the existing building site soil and groundwater conditions as they relate to the proposed construction;

5. Preparation of this report to document the results of our field testing program, engineering analysis, and foundation design and site earthwork recommendations.

SITE LOCATION AND CONDITIONS

The proposed building site is located within a tract of land situated in Section 15, Township 31 S., Range 21 E., Hillsborough County, and more specifically at an area located approximately 250 feet west, southwest of the southwest corner of Basin "D" in the southeast landfill complex.

FIELD EXPLORATION

Our field operations consisted of conducting six (6) SPT borings using procedures similar to those outlined in ASTM D-1586, at the locations indicated on the attached Figure 1. Test locations and depths of the proposed borings were specified by SCS Engineers, and were performed to determine the stratification and engineering properties of the subsurface soils to a maximum depth of 25 feet below the existing ground surface. A continuous drilling and sampling procedure was performed within the upper 10.5 to 24.0 feet of the SPT boring to detect subtle changes in soil stratigraphy and pertinent engineering properties within this depth. The borings were located in the field by representatives of SCS Engineers and Hillsborough County. The accuracy of the boring locations is that implied by the measurement method used by them. Upon completion, each borehole was filled in with local soil. A brief summary of the drilling and testing procedures utilized in the SPT boring is included in the attached Appendix I.

LABORATORY TESTING

The field soil boring logs and recovered soil samples were returned to our Tampa office. At our soils laboratory, each soil sample was examined by a soils engineer to obtain an accurate definition of the soil profile, and to assign pertinent laboratory tests. The visual classification of the samples was performed in accordance with the current Unified Soil Classification System (ASTM D-2487).

Twenty-six (26) moisture content and percent fines tests (the percent by dry weight finer than the U.S. No. 200 sieve) were performed on selected soil samples obtained from all the borings. These indices are useful in estimating compressibility characteristics of the clayey soils, and confirming our visual classification of the soils. The results of the tests are plotted adjacent to the final soil boring logs in the attached Appendix II, at the depth of the individually tested soil sample.

SOIL CONDITIONS

Delineation of soil strata, engineering properties where applicable, and soil descriptions are given in the final soil boring logs contained in the attached Appendix II. The final logs were prepared by a geotechnical engineer after review of the field logs and examination and classification of the recovered soil samples and analysis of laboratory test data. The stratification lines shown are used to indicate a transition from one soil type to another; however, they are in no way intended to designate a depth of exact geological change. Furthermore, the recommendations contained in this report are based on the contents of the final logs. While the borings are representative of subsurface conditions at their respective locations and vertical reaches, local variations characteristic of the subsurface materials of the region may be encountered.

The subsurface soil profile, based on the data obtained from six (6) SPT borings, is generally described below:

The soils penetrated by the borings consist of a heterogeneous mixture of sand, silty sand, clayey sand, and occasional sandy clay layers, and are best described as randomly placed fill. The non-uniformity of the soils is a direct result of the phosphate mining operations performed in the past on this land. Furthermore, the distinction between fill soils and native undisturbed geologic materials, was not clear in the borings, because the fill soils are derived from the same general area. Because the borings did not penetrate any very soft phosphatic slimes, it appears that this location was not used as part of a settling basin.

The sands penetrated in the borings were found to range from very loose to relatively dense in consistency. Penetration resistances ranged from a low of zero blows per foot to as much as 26 blows per foot. Borings TH-1, TH-4 and TH-5, which were drilled on the east side of the explored area, contained the looser soils.

GROUNDWATER CONDITIONS

The groundwater level readings were obtained in the borehole upon completion of testing, where possible, and are plotted adjacent to the final logs. If a water table is not indicated, it does not necessarily mean that groundwater does not exist within the vertical reach of the borehole. It must be noted that fluctuations in the groundwater level may occur due to variations in rainfall and other environmental or physical factors at the time measurements are made.

The measured borehole groundwater table level ranged from 1.7 to 3.7 feet below land surface at the time of the field exploration.

EVALUATION AND RECOMMENDATIONS

Proposed Development

Based on information provided by SCS Engineers, it is our understanding that the proposed development will consist of the installation of 45 to 55 foot long, 55,000 gallon, leachate storage tanks. In addition, a containment system will be constructed to hold the leachate in the event of a spill. Each tank will be supported by a series of five (5) tank cradles, which will transmit a load of 92 kips each to the foundations. Differential movement of the cradle supports must be minimized to reduce the potential for added stress to the tanks.

A treatment plant, planned for the future, is to be located north of the proposed leachate containment area. We understand that light industrial structures will be located in this area.

Soil Evaluation

The SPT borings encountered a heterogeneous mixture of sand, silty sand, and clayey sand within the explored depths. Much of this soil was found to be extremely loose on the east side of the area. It is our opinion that these soils will be capable of supporting the anticipated loads on a conventionally designed shallow foundation system, after a program of site modification. The site modification program consists of densifying the surficial sand soils by using mechanical vibratory rollers to consolidate the material within the upper 3 to 5 feet of the site. This method will improve the load carrying capability of the surficial granular soils, but will have little effect on the underlying cohesive sand soils.

The results of our exploration indicate that the clayey sand soils, found in many of the borings, are moderately compressible. Although these soils were not discovered within the stress influence depth interval of the tank foundations in borings TH-1 and TH-2, their distribution within the soils in this vicinity appears to be random. Consequently, it is possible that this material may be located at or shortly below any individual foundation.

The presence of the compressible clayey sand below an individual foundation may lead to long term settlement of that support, which would result in differential settlement of the tank supports. This differential settlement can be minimized by excavating and removing the clayey sand soils within a depth of 4 feet below the foundations. We recommend that each foundation be checked by a soils engineer or his representative from Ardaman & Associates, Inc., Tampa office, for the presence of these soils prior to densification operations.

If the grade of the proposed leachate containment area will be raised more than 18 to 24 inches, the stress applied by the fill may trigger the consolidation of deeper clayey sand soils. Considering the apparent random distribution of these soils, the consolidation of these soils may be non-uniform. Again, this may result in differential movement of the tank supports. Ardaman & Associates, Inc. should be informed if more than 18 inches of fill will be constructed at this location, so that we can evaluate the consequences of the fill on the construction, and revise our recommendations, as necessary.

Site Preparation Recommendations

The existing surficial sandy fill soils should be prepared prior to placement of engineered fill and foundation construction on the soils, in accordance with the following site preparation recommendations. The recommended procedures should be covered in the project specifications, and completed prior to construction of the foundation system.

1. The containment area, plus a margin of 5 feet beyond the perimeter of the foundation system, should be cleared and grubbed of any vegetation, stumps, tree root systems, and sod. Organic topsoil should be excavated and removed. Strippings, debris, and organic soils should be disposed in accordance with the owner's instructions. Any hole larger than 3 feet in diameter resulting from the removal of any tree should be ramped to aid in compaction of the bottom and sides with mechanical equipment prior to filling.

2. The tank locations, plus a margin of 5 feet beyond the perimeter, should be excavated to the proposed bottom of foundation elevations. De-water the site as necessary to maintain groundwater at a level of at least 2 feet below the excavated surface;

3. Ardaman & Associates, Inc. should be contacted to examine the exposed subgrade and to check for the presence of compressible clayey sand soils within 4 feet below the foundations. Unsuitable clayey sand soils discoverd during this check, should be excavated and removed, as directed by a soils engineer from Ardaman & Associates, Inc.;

4. After clearing, grubbing, organic topsoil removal, and any excavation the exposed soils within the construction area plus the margin, should be thoroughly saturated with an ample supply of water and compacted with a steel-wheeled, self-propelled vibratory roller having a minimum drum centrifugal force of 25,000 pounds, to a depth of 24 inches below stripped grade or to a depth of 24 inches below bottom of foundation elevation, whichever is greater, to a minimum of 98 percent of the Standard Proctor (ASTM D-698) maximum dry density. The roller should apply a minimum of six (6) overlapping passes to all exposed areas. This density level should be measured by a qualified soils technician using procedures described by ASTM D-2937 or approved equal, prior to commencement of subsequent procedures. In the event that initial rolling results in unstable, yielding or pumping conditions, the soils engineer shall be contacted to determine the cause of the problem and make recommendations for remediation. As a minimum, soft, yielding, excessively wet, or otherwise unsuitable material shall be cut out and replaced with compacted clean sand. In the event that applied water does not penetrate sufficiently deep into natural soils to act as a lubricant in the compaction process, it will be necessary to disk or otherwise break up the soils before and during application of water;

5. After steps 1 through 4 are completed, fill necessary to raise the grade to finished slab subgrade, or any interim working grade, should then be placed in 1-foot thick layers, moisture-conditioned, and compacted to a minimum of 98 percent of the Standard Proctor maximum dry density. All fill should consist of clean sand which is free of roots and debris;

6. Individual footing pits should be excavated to footing line and bottom grade. Foundation soils should be saturated with water and compacted with suitable mechanical equipment to achieve the specified level of density to the required depth. Foundation bottom grade should be tested to confirm that a minimum density of 98 percent of the Standard Proctor maximum dry density exists to a depth of 12 inches below footing bottom. If necessary, the bottom of the footing excavation shall be over-excavated, refilled, and re-compacted with mechanical equipment to achieve the necessary minimum field density to the required depth;

7. Foundation backfill on sides of formed footings, and building slab subgrade fill should consist of clean sand, free of roots and debris, which is placed in 12-inch lifts and compacted to 98 percent of the Standard Proctor maximum dry density;

8. Ardaman & Associates, Inc., Tampa office, should be engaged by the owner prior to site preparation to provide field observation of site preparation steps, compaction operations on natural and fill soils, and conduct field in-place density testing to confirm that the specified requirements are met.

Foundation Recommendations

For foundations placed on the soils prepared as previously recommended, the foundations may be proportioned for a maximum net allowable soil bearing pressure of 2000 pounds per square foot. We anticipate the maximum settlement to be on the order of 0.25 inch for the individual pad footings. We also anticipate that the settlement would occur almost immediately as the loads are applied, due to the predominantly granular nature of the foundation soils.

A soil cover of 18 inches as measured from the bottom of the foundation system to finished grade should be provided. Spread footings should be at least 2.5 feet wide. The foundation should be designed for equal dead-load distribution in accordance with Standard Building Code requirements.

Field Observations

Site preparation, including preparation of foundation bearing surfaces and compaction of any structural fill, should be observed by a soils engineer or his representative from

Ardaman & Associates, Inc., to verify that conditions are as anticipated in the design and completed in accordance with the recommendations contained in this report.

Proposed Treatment Plant Area

Borings TH-3 through TH-6 were drilled in areas to the north of the proposed leachate containment area. Our exploration indicates that the subsurface conditions in this area are comparable to the leachate containment area. As with the leachate containment area, the performance of shallow foundations may be affected by the presence of randomly placed, moderately compressible clayey sand soils. Also, the density of the subsurface soils varies over a wide range in this area, which is similar to the leachate containment area.

Lightly loaded structures, such as those which are proposed for the plant area, can probably be supported using shallow foundations placed on properly prepared existing and/or fill soils. Heavier structures may require other ground improvement techniques. In any event, the evidence indicates that the existing unimproved soils cannot be relied upon to settle uniformly under foundation loads.

Further building site specific test borings should be performed in order to provide site earthwork and foundation design recommendations tailored to the actual structure locations and loading conditions, and to outline areas which may require special treatment. We would be pleased to assist you in the planning and performance of the site specific test borings and the development of final foundation and earthwork specifications for the treatment plant area.

Closure

The analyses and recommendations submitted in this report are based on the data obtained from six (6)SPT borings performed at the locations indicated on the attached Figure 1. This report does not reflect any variation which may occur in-between the borings. The nature and extent of variations may not become evident until during the course of construction. If variations then appear evident, it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of any variations.

When the final design and specifications are completed, we would like the opportunity to review them in order to determine whether changes in the original concept may have affected the validity of our recommendations, and whether these recommendations have been implemented in the design and specifications.

The recovered soil samples are available for examination at our Tampa office. Unless otherwise instructed in writing, the soil samples will be discarded 60 days after issuing this report.

It has been a pleasure assisting you with this phase of your project. If there are any questions or when we may be of further assistance, please contact the undersigned at 813/654-2336.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.

Dusan Jovanovic

Dusan Jovanovic
Project Engineer

Joseph A. Eduardo

Joseph A. Eduardo, P.E.
District Engineer
Florida Registration No. 33318

Thomas J. Leto

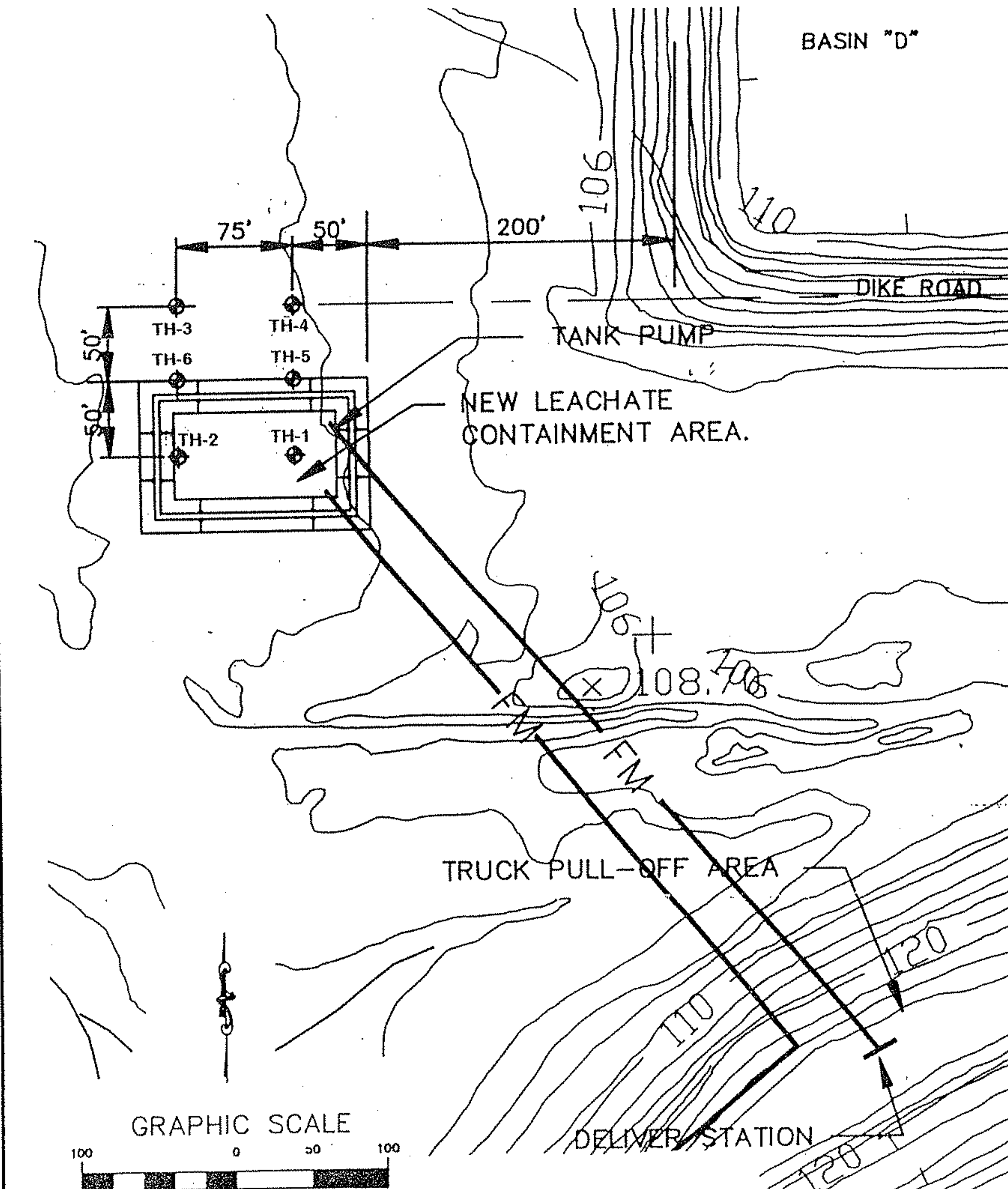
Thomas J. Leto, P.E.
Principal
Florida Registration No. 12458

DJ/JAE/TJL:paw

Enclosures

sse15/89-9671.sse

FIGURES



(IN FEET)
1 inch = 100 ft.

LEGEND

TH-1 STANDARD PENETRATION TEST BORING (ASTM D-1586)

"WHILE THE BORINGS ARE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT THEIR RESPECTIVE LOCATIONS AND FOR THEIR RESPECTIVE VERTICAL REACHES, LOCAL VARIATIONS CHARACTERISTIC OF THE SUBSURFACE MATERIALS OF THE REGION ARE ANTICIPATED AND MAY BE ENCOUNTERED. THE BORING LOGS AND RELATED INFORMATION ARE BASED ON THE DRILLER'S LOGS AND VISUAL EXAMINATION OF SELECTED SAMPLES IN THE LABORATORY. THE DELINEATION BETWEEN SOIL TYPES SHOWN ON THE LOGS IS APPROXIMATE AND THE DESCRIPTION REPRESENTS OUR INTERPRETATION OF SUBSURFACE CONDITIONS AT THE DESIGNATED BORING LOCATION AND ON THE PARTICULAR DATE DRILLED.

GROUNDWATER ELEVATIONS SHOWN ON THE BORING LOGS REPRESENT GROUNDWATER SURFACES ENCOUNTERED ON THE DATES SHOWN. FLUCTUATIONS IN WATER TABLE LEVELS SHOULD BE ANTICIPATED THROUGHOUT THE YEAR. ABSENCE OF WATER SURFACE DATA ON CERTAIN BORINGS IMPLIES THAT NO GROUNDWATER DATA IS AVAILABLE, BUT DOES NOT NECESSARILY MEAN THAT GROUNDWATER WILL NOT BE ENCOUNTERED AT THESE LOCATIONS OR WITHIN THE VERTICAL REACHES OF THESE BORINGS."

DATE DRILLED:

Ardaman & Associates, Inc.
Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing

PROPOSED LEACHATE CONTAINMENT AREA
SOUTHEAST LANDFILL NEAR BASIN "D"
HILLSBOROUGH COUNTY, FLORIDA

DRAWN BY: J.W.	CHECKED BY: JAE	DATE: 10/24/89
FILE NO. 89-9671	APPROVED BY: Joseph A. Edwardo	

N24568

APPENDIX I

STANDARD PENETRATION TEST

STANDARD PENETRATION TEST

The Standard Penetration Test is a widely accepted method of in-situ testing of foundation soils (ASTM D-1586). A two-foot long, two-inch outside diameter, split-barrel ("spoon") sampler, attached to the end of drilling rods, is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each six inches of penetration is recorded. The sum of the blows required for penetration of the second and third six-inch increments of penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load.

The tests are usually performed at five-foot intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. Usually, the circulating fluid, which is a bentonite drilling mud, also serves to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly previous ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or to prevent the loss of circulating fluid.

Representative split-spoon samples from soils at every five feet of drilled depth and from every different stratum are brought to our laboratory in air-tight jars for further evaluation and testing, if necessary. Samples not used in testing are stored for at least sixty (60) days prior to being discarded. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed if necessary, and backfilled.

APPENDIX II

BORING LOGS

LEGEND

GEOLOGICAL SYMBOLS

sp	fine SAND
sp	dark SAND with shell
sp	light SAND with shell
sc	clayey SAND
sp–sm	SAND with silt
sm	silty SAND
mh	elastic SILT

UNDISTURBED SHELBY SAMPLE

- GROUND WATER LEVEL

BUCKET AUGER

← – LOSS OF DRILLING FLUID

STANDARD PENETRATION TEST

CORE SIZE

CORE RECOVERY (%)

CONSISTENCY

COHESIONLESS SOIL

Very Loose	0–4 Blows per foot
Loose	4–10 Blows per foot
Firm	10–30 Blows per foot
Dense	30–50 Blows per foot
Very Dense	50–up Blows per foot

COHESIVE SOIL

Very Soft	0–2 Blows per foot
Soft	2–4 Blows per foot
Firm	4–8 Blows per foot
Stiff	8–15 Blows per foot
Very Stiff	15–30 Blows per foot
Hard	30–up Blows per foot

GRAIN SIZE IDENTIFICATION

Boulders	Larger than 6 inches
Cobbles	2 to 6 inches
Gravel	2 mm to 2 inches
Sand	0.074 mm to 2 mm
Silt	0.002 mm to 0.074 mm
Clay	Smaller than 0.002 mm

Ardaman & Associates, Inc.
Consulting Engineers in Soil Mechanics, Foundations, and Materials Testing

DRAWN BY: J.W. | CHECKED BY: JCE | DATE:
FILE NO. | APPROVED BY: Joseph A. Edwards

N82070

ARDAMAN & ASSOCIATES, INC.
105 N. FAULKENBURG ROAD, SUITE D
TAMPA, FLORIDA, 33619
(813) 654-2336

FINAL BORING LOG

SHEET 1 OF 1

PROJECT SOUTHEAST LANDFILL
CLIENT HILLSBOROUGH COUNTY
FILE NO. 89-9671
COUNTY/CITY HILLSBOROUGH
STATE FLORIDA

BORING NUMBER TH-1
BORING LOCATION AS PER PLAN
DATE STARTED 10/5/89
DATE COMPLETED 10/5/89
ELEVATION N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0					sp	dark brown SAND with traces of cemented SAND fragments					
	1	1-1-2	3								
	2	1-2-3	5								
	3	1-1-2	3				19	4.1			
5	4	1-0-1	1								
	5	1-1-1	2		sp	brown SAND with traces of cemented SAND fragments					
	6	1-0-1	1		sp/sm	dark brown to brown SAND with silt	16	9.3			
10	7	1-1-1	2				16	7.9			
					sp	dark brown and brown SAND with cemented SAND fragments with layers of brown clayey SAND					
15	8	2-2-3	5								
					sc	mixed brown clayey SAND					
20	9	1-1-1	2				33.1	33.7			
					sp/sm	dark brown SAND with silt with layers of brown clayey SAND					
25	10	1-1-2	3								
						NOTES: 1. BORING TERMINATED @25.0 FEET					

DRILLER/RIG GAVIN/CME 45
BORING TYPE SPT
LENGTH/TYPE CASING NONE

WATER TABLE DEPTH:
1st 1.67 DATE TIME 10/5/89
2nd DATE TIME

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FINAL BORING LOG

PROJECT SOUTHEAST LANDFILL
CLIENT HILLSBOROUGH COUNTY
FILE NO. 89-9671
COUNTY/CITY HILLSBOROUGH
STATE FLORIDA

BORING NUMBER TH-2
BORING LOCATION AS PER PLAN
DATE STARTED 10/5/89
DATE COMPLETED 10/5/89
ELEVATION N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0	1	1-2-2	4		sc	brown clayey SAND					
	2	4-7-7	14		sp/sm	yellowish-brown SAND with siltand cemented SAND fragments	14.4	8.6			
	3	5-4-5	9		sp	brown SAND					
5	4	4-6-7	13		sp	light brown SAND with roots					
	5	3-2-8	10		sp/sm	grayish-brown SAND with silt and roots					
	6	2-13-13	26		sp	brown SAND					
10	7	10-10-9	19								
	8	4-5-8	13								
	9	9-11-16	27								
	10	10-11-12	23		sm	gray silty SAND	14	16.9			
15	11	11-10-10	20								
	12	11-10-10	20								
	13	9-6-5	11		sp	brown SAND with seam of gray clayey sand	18.6	15.9			
20	14	1-2-2	4		sc	gray clayey SAND with phosphate	35.9	23.8			
	15	2-2-1	3				53.4	22.1			
	16	1-1-2 5-4	3				63.2	35.9			
25						NOTES: 1. BORING TERMINATED @25.0 FEET					

DRILLER/RIG GAVIN/CME 45
BORING TYPE SPT
LENGTH/TYPE CASING NONE

WATER TABLE DEPTH:
1st 2.08 DATE TIME 10/5/89
2nd DATE TIME

ARDAMAN & ASSOCIATES, INC.
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TAMPA, FLORIDA, 33619
(813) 654-2336

FINAL BORING LOG

SHEET 1 OF 1

PROJECT: SOUTHEAST LANDFILL
CLIENT: HILLSBOROUGH COUNTY
FILE NO.: 89-9671
COUNTY/CITY: HILLSBOROUGH
STATE: FLORIDA

BORING NUMBER: TH-3
BORING LOCATION: AS PER PLAN
DATE STARTED: 10/5/89
DATE COMPLETED: 10/5/89
ELEVATION: N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0	1	1-2-2	4		sm	dark brown and brown silty SAND					
					sp	gray SAND					
	2	3-2-2	4		sp/sm	brown SAND with silt and roots	16.1	7.3			
	3	1-1-1	2		sp/sc	brown SAND with clay and roots	22.7	11.5			
5	4	2-3-4	7								
	5	3-3-4	7								
	6	14-14-12	26		sp	brown SAND					
10	7	4-8-9	17								
	8	5-7-8	15		sc	brown clayey SAND					
	9	9-11-11	22		sp	light brown to brown SAND					
					sc	grayish-brown clayey SAND					
15	10	8-7-6	13				16.1	14.4			
	11	8-9-11	20		sc	brown clayey SAND					
	12	8-9-11	20		sp/sc	grayish-brown SAND with clay	18.1	11.8			
	13	15-13-10	23								
20	14	6-8-10	18								
25						NOTES: 1. BORING TERMINATED @21.0 FEET					

DRILLER/RIG: GAVIN/CME 45
BORING TYPE: SPT
LENGTH/TYPE CASING: NONE

WATER TABLE DEPTH:
1st: 2.33 DATE TIME: 10/5/89
2nd: DATE TIME:

ARDAMAN & ASSOCIATES, INC.
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FINAL BORING LOG

SHEET 1 OF 1

PROJECT SOUTHEAST LANDFILL
CLIENT HILLSBOROUGH COUNTY
FILE NO. 89-9671
COUNTY/CITY HILLSBOROUGH
STATE FLORIDA

BORING NUMBER TH-4
BORING LOCATION AS PER PLAN
DATE STARTED 10/5/89
DATE COMPLETED 10/5/89
ELEVATION N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0					sp	dark brown to grayish-brown SAND with traces of clayey SAND					
	1	1-2-5	7								
	2	5-4-4	8								
	3	5-5-4	9		sc	light brown clayey SAND					
5	4	3-2-2	4				33.1	31.1			
	5	3-2-3	5		sc	brown clayey SAND	42.3	40.7			
	6	0-1-2	3				53.4	50			
10	7	2-1-2	3				45.8	38.6			
	8	0-1-2	3		sc	brown and dark brown clayey SAND with traces of cemented SAND					
	9	1-0-0	0		sm	dark brown silty SAND with cemented SAND					
15	10	0-0-wash	0								
	11	2-1-1	2								
	12	4-2-2	4				27.1	17.8			
	13	1-1-1	2		sc	brown clayey SAND with phosphate	42.6	43.8			
20	14	1-1-1	2				47.1	54			
25						NOTES: 1. BORING TERMINATED @21.0 FEET					

DRILLER/RIG GAVIN/CME 45
BORING TYPE SPT
LENGTH/TYPE CASING NONE

WATER TABLE DEPTH:
1st 3.67 DATE TIME 10/5/89
2nd DATE TIME

ARDAMAN & ASSOCIATES, INC.
105 N. FAULKENBURG ROAD, SUITE D
TAMPA, FLORIDA, 33619
(813) 654-2336

FINAL BORING LOG

SHEET 1 OF 1

PROJECT SOUTHEAST LANDFILL
CLIENT HILLSBOROUGH COUNTY
FILE NO. 89-9671
COUNTY/CITY HILLSBOROUGH
STATE FLORIDA

BORING NUMBER TH-5
BORING LOCATION AS PER PLAN
DATE STARTED 10/6/89
DATE COMPLETED 10/6/89
ELEVATION N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0					sm	dark brown brown silty SAND					
	1	1-2-3	5								
	2	4-5-4	9				17.8	17.7			
	3	4-4-4	8								
5					sp/sm	very dark brown SAND with silt					
	4	2-3-2	5								
	5	1-1-2	3								
	6	1-0-0	0				24.4	5.9			
10	7	1-1-1	2								
					sp	brown SAND					
	8	1-1-1	2								
	9	1-2-1	3				20	4.1			
					sp/sm	dark reddish-brown SAND with silt and roots					
15	10	1-1-2	3								
	11	3-2-2	4								
	12	2-2-3	5				15.7	7.88			
	13	4-3-5	8								
20	14	3-2-4	6								
	15	2-3-3	6								
25						NOTES: 1. BORING TERMINATED @22.5 FEET					

DRILLER/RIG GAVIN/CME 45
BORING TYPE SPT
LENGTH/TYPE CASING NONE

WATER TABLE DEPTH:
1st 2.75 DATE TIME 10/6/89
2nd DATE TIME

ARDAMAN & ASSOCIATES, INC.
105 N. FAULKENBURG ROAD, SUITE D
TAMPA, FLORIDA, 33619
(813) 654-2336

FINAL BORING LOG

PROJECT SOUTHEAST LANDFILL
CLIENT HILLSBOROUGH COUNTY
FILE NO. 89-9671
COUNTY/CITY HILLSBOROUGH
STATE FLORIDA

BORING NUMBER TH-6
BORING LOCATION AS PER PLAN
DATE STARTED 10/6/89
DATE COMPLETED 10/6/89
ELEVATION N/A

DEPTH IN FEET	SAMPLES SAMPLE NO.	BLOW COUNT	N-VALUE	GRAPHIC LOG	USCS CLASS	SOIL DESCRIPTION	NATURAL MOISTURE %	-200 WASH %	ORGANIC CONTENT %	LIQUID LIMIT	PLASTICITY INDEX
0					sp	dark reddish-brown to reddish-brown SAND					
	1	1-1-1	2		sm	very dark brown silty SAND					
	2	1-2-4	6		sp	brown SAND					
	3	3-3-2	5		sp	brown SAND and cemented SAND nodules					
5	4	3-3-3	6		sp/sm	brown SAND with silt	20.8	9.3			
	5	4-6-8	14								
	6	2-4-5	9		sp/sm	dark brown SAND with silt					
10	7	3-5-4	9		sc	grayish-brown clayey SAND with layer of light brown SAND					
	8	5-5-5	10		sc	brown clayey SAND with layers of brown SAND					
	9	8-7-6	13		sp	grayish-brown SAND					
	10	4-4-5	9		sc	grayish-brown clayey SAND with layers of dark grayish-brown SAND					
15	11	9-9-11	20		sp	grayish-brown SAND					
	12	6-6-10	16		sc	bluish-gray and brown mottled clayey SAND with seam of gray sandy CLAY					
	13	13-9-8	17		sc	brown clayey SAND with trace of phosphate					
20	14	2-6-5	11								
	15	6-11-13	24		mh	light gray elastic SILT with traces of phosphate					
25						NOTES: 1. BORING TERMINATED @22.5 FEET					

DRILLER/RIG GAVIN/CME 45
BORING TYPE SPT
LENGTH/TYPE CASING NONE

WATER TABLE DEPTH:
1st 2.42 DATE TIME 10/6/89
2nd DATE TIME