# Appendix F Geotechnical Engineering

### TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS MIAMI-DADE COUNTY, FLORIDA

## REPORT OF SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATIONS

PREPARED FOR: FLORIDA TRANSPORTATION ENGINEERING, INC.

PREPARED BY: GEOSOL, INC.

**AUGUST 25, 2011** 



Florida Transportation Engineering, Inc. 7955 NW 12<sup>th</sup> Street, Suite 418 Doral, Florida 33126

Attention:

Mr. Juan Calderon, PE, PTOE

Vice President

Re:

Report of Subsurface Exploration and Geotechnical Engineering Evaluations

Town of Surfside Parking Lot Improvements

Miami-Dade County, Florida GEOSOL Project No. 211151

Dear Mr. Calderon:

Geosol, Inc. (GEOSOL) is pleased to submit this report presenting the results of our geotechnical services for the above-referenced project. The services were provided in accordance with our proposal No. P-211177 dated July 25, 2011. You provided authorization to perform our services on July 25, 2011 by means of a subconsultant agreement.

The results of our field exploration and laboratory testing programs for the proposed parking lot improvements as well as our geotechnical engineering evaluations are presented in the accompanying report.

GEOSOL appreciates the opportunity to work on this interesting project. If you have any question or need additional information, please do not hesitate to call our office.

Sincerely.

Senior Geotechnical En

Reinaldo Villa, P.E.

Project Geotechnical Engineer

Florida License No. 72242

cc:

Addressee (4) File (1)



5795-A NW 151st Street Miami Lakes, FL 33014 Phone (305) 828-4367; Fax (305) 828-4235 E-mail: geosolusa@bellsouth.net

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Town of Surfside Parking Lot Improvements Miami-Dade County, Florida GEOSOL Project No.: 211151

#### INTRODUCTION

#### **Project Information**

Based on information provided by Florida Transportation Engineering, Inc. (FTE), we understand that parking lot improvements will be required, which will consist of milling and resurfacing improvements as well as drainage improvements. Parking lot improvements will be required at the following locations:

❖ Town Hall Lot: NE corner of 93<sup>rd</sup> Street and Harding Avenue
 ❖ Collins Lot: SW corner of 93<sup>rd</sup> Street and Collins Avenue
 ❖ 94<sup>th</sup> Street Lot: SE corner of 94<sup>th</sup> Street and Harding Avenue

❖ Post Office Lot: SW corner of 95<sup>th</sup> Street and Collins Avenue (eliminated from scope)

Shul Lot: NW corner of 95th Street and Collins Avenue

Abbott Lot: East side of 9500 Abbott Avenue

Based on discussions with Mr. Bill Evans, Town of Surfside Capital Improvements Director, we understand that improvements to the existing Post Office Lot (located on the southwest corner of 95<sup>th</sup> Street and Collins Avenue) have been eliminated. We understand that the parking lot has been recently resurfaced.

Specifically, the geotechnical services required the performance of borehole percolation testing for use in drainage evaluations and design. Additionally, pavement cores were required in order to determine the thickness, condition and composition of the existing pavement. The field exploration and laboratory testing programs were required to investigate the subsurface and groundwater conditions and to provide geotechnical engineering recommendations for the proposed parking lot improvements. The design of temporary ground support systems for the installation of drainage structures in not part of our scope of services and we are assuming it will be performed by others.

#### Purpose

The purpose of this study was to evaluate the underground conditions (i.e. subsurface and groundwater) in light of the proposed construction. This report presents the results of our field exploration, laboratory testing, geotechnical engineering evaluations, and considerations for the proposed construction.



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#### SCOPE OF SERVICES

The scope of services consisted of providing the following services:

- 1. Performing site reconnaissance, locating and coordinating for existing utilities.
- 2. Obtaining eleven (11) asphalt pavement cores from the existing pavement for determination of asphalt pavement condition, thickness and composition.
- 3. Performing eleven (11) Standard Penetration Test (SPT) borings to depths of 2 feet below existing grades to determine the type and thickness of the base and subbase materials.
- 4. Performing six (6) borehole percolation tests at depths of 15 feet below existing grades for use in drainage evaluations and design.
- 5. Measuring groundwater levels at the boring locations.
- Backfilling the boreholes using grout, patching the surface of the coring locations with cold-mix asphalt, and restoring the sites to their original conditions.
- Visually examining and classifying all recovered soil samples from in the laboratory using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System without the aid of laboratory classification testing
- 8. Visually examining and classifying all recovered asphalt pavement core specimens.
- 9. Evaluating the results of the SPT boring information.
- 10. Deriving hydraulic conductivity (k) values from the percolation test field data.
- 11. Providing discussions of critical design or construction considerations based on the subsurface and groundwater conditions developed from the results of the geotechnical investigations.
- 12. Preparing a geotechnical engineering report summarizing the field testing data, subsurface and groundwater conditions, geotechnical evaluations and recommendations.



#### SITE CONDITIONS

Our understanding of the site conditions is based on our initial field review and our observations during the performance of the field exploration program. We have appended a Site Vicinity Map that identifies the location of the study area, which is presented in Sheet 1 of the Appendix. Test location plans are presented in Sheets 2 through 5 of the Appendix of this report. The existing conditions at the site generally consist of commercial areas. The existing roadway pavement consists of a flexible asphaltic concrete structure and is in relatively poor condition with rutting and many cracks visible at the surface of the pavement.

#### FIELD EXPLORATION

#### General

The field exploration program for this study included the performance of asphalt pavement coring, Standard Penetration Test (SPT) borings and borehole percolation testing. Specifically, the asphalt pavement coring program included collecting a total of eleven (11) asphalt pavement cores (designated as "C" series) for evaluation of milling and resurfacing improvements. The asphalt pavement coring program included the performance of SPT borings at each coring location to depths of 2 feet below the asphalt to determine the type and thickness of the base and subbase materials. Also, a total of six (6) borehole percolation tests were performed at depths of 15 feet below existing grades in each location for use in drainage evaluations and design. We understand that improvements to the Post Office Lot have been eliminated; therefore, the field exploration program for this lot (i.e. core No. C-7 and percolation test P-4) was not completed. At the time we were notified that the Post Office lot had been eliminated pavement core C-8 had already been obtained at this site.

The test locations were marked in the field by a representative of GEOSOL utilizing existing landmarks and standard taping procedures. The "as-drilled" locations for each test were obtained by utilizing a hand-held Global Positioning System (GPS) device and should be considered approximate to within a few feet. The latitude and longitude coordinates obtained with the GPS device were converted to northing and easting coordinates utilizing the software "Corpscon" developed by the United States Army Corps of Engineers. The ground surface elevations at each test location have not been provided to us at this point. A summary of the approximate test locations is presented in Table 1 and in the Test Location Plan sheets presented in the Appendix of this report.



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#### **Asphalt Payement Coring**

The asphalt pavement cores were obtained using a 6-inch diameter core barrel that was attached to an AWJ diameter drilling rod and to a truck mounted drill rig. The core barrel was advanced by slowly drilling through the asphalt pavement. Water was used to aid the drilling process and to keep the core barrel cool. Upon reaching the surface of the base materials, the coring process was terminated and the pavement core was retrieved. The total thickness of the asphalt pavement was measured and recorded. Measurements of the rut depth and cross slope were measured prior to the performance of the asphalt pavement coring program. We have prepared a "Pavement Evaluation Coring and Condition Data" sheet and is presented in the Appendix along with asphalt pavement core and site photographs. The approximate location of the pavement cores is presented in Table 1 and on the Test Location Plan sheets in the Appendix of this report.

#### Standard Penetration Test (SPT) Borings

The SPT boring procedures were conducted in general conformance with ASTM D-1586. All SPT borings were performed utilizing a truck-mounted drill rig (Foremost Mobile B-53) using a recently calibrated automatic hammer. After seating the sampler 6 inches, the number of successive blows required to drive the sampler 12 inches into the soil constitutes the test result commonly referred to as the "N"-value. The "N"-value has been empirically correlated with various soil properties and is considered to be indicative of the relative density of cohesionless soils and the consistency of cohesive soils. The N-value information for each SPT boring is presented in the Test Boring Records that are included in the Appendix of this report.

#### **Borehole Percolation Testing**

The percolation testing was performed in general accordance with the South Florida Water Management District (SFWMD) "Usual Open-Hole" constant head method. The tests were performed to determine the hydraulic conductivity values (k) of the subsurface materials at depths 15 feet below the existing ground surface. The boreholes were drilled by means of a 4 ¾ -inch diameter tri-cone bit and water. Upon drilling each borehole, a 4-inch diameter perforated PVC pipe was inserted in the ground and used a pump for purging the well prior the start of the test. After completion of the percolation tests, the boreholes were backfilled with grout and the site was restored as required. The hydraulic conductivity values (k) were determined from the results obtained during the field testing. The hydraulic conductivity values are reported in units of cubic feet per second per square foot of seepage area per foot of head (cfs/ft²-ft.). The test results are presented in Table 2 in the Appendix of this report.

#### Water Level Measurements

Water level depths were obtained during the performance of the test boring operations. They are noted on Table 2 of the Appendix of this report. In relatively pervious soils, such as sandy (granular) soils, the indicated depths are usually reliable groundwater levels. Seasonal variations, tidal conditions, temperature variations, land uses, and recent rainfall conditions may influence the depth of groundwater levels.



Town of Surfside Parking Lot Improvements Miami-Dade County, Florida GEOSOL Project No.: 211151

#### LABORATORY TESTING PROGRAM

#### General

Representative samples collected from the test borings were visually reviewed in the laboratory by a Geotechnical Engineer to confirm the field classifications. The soil samples were classified using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System in general accordance with the American Society of Testing and Materials (ASTM) test designation D-3282, titled "Classification of Soils and Soils-Aggregate Mixtures for Highway Construction Purposes." The classification was based on visual observations without the aid of laboratory classification testing.

#### SITE SUBSURFACE CONDITIONS

#### General

The subsurface materials generally disclosed granular fill materials based on the shallow SPT borings performed at the coring locations. Detailed information is presented in the Test Boring Records and Table 2 in the Appendix of this report. The stratification is based on visual examination of the recovered soil/rock samples, laboratory testing and interpretation of the field boring logs by a Geotechnical Engineer. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated for clarity. The borings present the subsurface conditions at the particular test location and slight variations do occur among the borings.

Specifically, we have identified two (2) strata along the project alignment (except the asphalt pavement) and they are described in Table "A" below.

TABLE "A" – SUMMARY OF SUBSURFACE STRATIGRAPHY

STRATUM No.	MATERIAL DESCRIPTION	AASHTO SYMBOL
0	Asphalt Pavement	N/A
1	Brown Slightly Silty Fine to Medium SAND with Some Limerock Fragments (FILL; BASE)	A-1-b
2	Brown Fine to Medium SAND with Shell Fragments (SUBBASE)	A-3



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#### **Groundwater Conditions**

Groundwater levels were measured in the completed boreholes during the drilling operations. Measurements made in the test locations disclosed the water table to be at depths ranging from 3.8 to 7.9 feet below the ground surface. It is to be noted that borings were performed during the start of the wet season. Therefore, during the peak of the wet season the groundwater may be 12 to 18 inches higher than the levels measured at the test boring locations.

### ENGINEERING EVALUATIONS AND RECOMMENDATIONS FOR ROADWAY IMPROVEMENTS

#### General

As we understand it the roadway improvements will consist of milling and resurfacing of the existing five (5) parking lots pavements. The results of the field testing program indicate that the project alignment is generally suitable for the proposed roadway improvements when viewed from a geotechnical perspective. The following sections provide discussions regarding geotechnical recommendations for milling and resurfacing and roadway reconstruction alternatives.

#### Milling and Resurfacing Recommendations

The results of the field exploration program revealed that the asphalt pavement had thicknesses ranging from 0.8 to 3.8 inches. Based on visual inspection of the cores, all specimens obtained for this project revealed cracking of the asphalt pavement throughout the full length of the cores. It should be noted that the pavement cores obtained from this project are only representative of the locations sampled and that FTE and the Town of Surfside shall be aware that it is possible that the pavement may be cracked the full depth in other locations not explored.

We understand that milling and resurfacing of the existing parking lot pavements is being considered for the improvements. However, we are of the opinion that milling and resurfacing is not the most efficient or cost effective pavement improvement alternative for the proposed improvements since nearly all of the pavement cores revealed cracks extending throughout the full length of the cores. Furthermore, we are of the opinion that the milling and resurfacing option will serve as a temporary solution and due to the reason previously discussed, future milling and resurfacing cycles may occur more frequently. Milling of the existing pavement will leave behind cracks and over time these cracks will propagate and reflect into the new asphalt pavement overlay. For these reasons, we recommend reconstruction of the existing pavements as an alternative for roadway improvement.

If the Town of Surfside ultimately decides to implement the milling and resurfacing option, we recommend milling and resurfacing the existing roadways in accordance with the following list based on the results of our field exploration program:



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❖ Town Hall Lot: mill and resurface 1 inch
 ❖ Collins Lot: mill and resurface 2 inches
 ❖ 94<sup>th</sup> Street Lot: mill and resurface a ½ inch

Post Office Lot: not applicable (parking lot improvements have been eliminated)

❖ Shul Lot: mill and resurface a ½ inch
 ❖ Abbott Lot: mill and resurface a ½ inch

The above recommendations provide a minimum of a ½-inch thick section of existing pavement be left behind in order to avoid potentially exposing and wetting the existing base materials. However, based on the pavement cores collected for the Shul and Abbott lots, less than ½ inch pavement may be left behind. As noted previously, with milling and resurfacing alternative, it is anticipated that reflective cracking will reappear in the near future. At this point there is no way to estimate the time at which these reflective cracking will re-appear.

#### Recommendations for Pavement Reconstruction

If the pavement reconstruction alternative is implemented, site preparation shall be in accordance with Sections 110 and 120 of the FDOT "Standard Specifications for Road and Bridge Construction" and FDOT Standard Indices 500 and 505.

#### Site Preparation

The following are our discussions regarding the utilization and the site preparation requirements of the subsurface soils.

- The material from Stratum Number 0 is the asphalt pavement.
- The materials from Strata Numbers 1 and 2 (A-1-b and A-3) are considered to be select and should be utilized in accordance with FDOT Standard Index 505.

#### Fill Material

The embankment fill should consist of select material, meeting the requirements of Standard Index 505 and shall be constructed in general accordance of Section 120.8 of the FDOT "Standard Specifications for Road and Bridge Construction".



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#### **Pavement Design Suggestions**

Based on the results of our SPT borings, it does not appear that the existing subgrade soils have an LBR value of 40, which is typically used for pavement design. If a pavement reconstruction alternative is selected, we recommend that the flexible pavement section consist of (from top to bottom) an asphaltic concrete layer, a limerock base layer and stabilized subgrade layer having a minimum LBR Value of 40.

We recommend that after placement of the first 12 inches of new fill after final subgrade elevations have been achieved, that Limerock Bearing Ratio (LBR) tests be performed per every 10,000 square feet of subgrade. If the LBR values for the stabilized subgrade materials are less than 40, we recommend that the subgrade be stabilized to depths of 12 inches to achieve minimum Limerock Bearing Ratio (LBR) value of 40. The subgrade should be compacted to at least 95 percent of maximum dry density as determined by the Modified Proctor test (ASTM D-1557).

#### REPORT LIMITATIONS

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data. No other warranties are expressed or implied.

The scope of the investigation was intended to specifically evaluate subsurface conditions within the influence of the proposed parking lot improvements. The analyses and recommendations submitted in this report are based upon the data obtained from the test borings performed at the locations indicated. If any subsoil variations become evident during the course of this project, a re-evaluation of the recommendations contained in this report will be necessary after we have been informed and had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client.

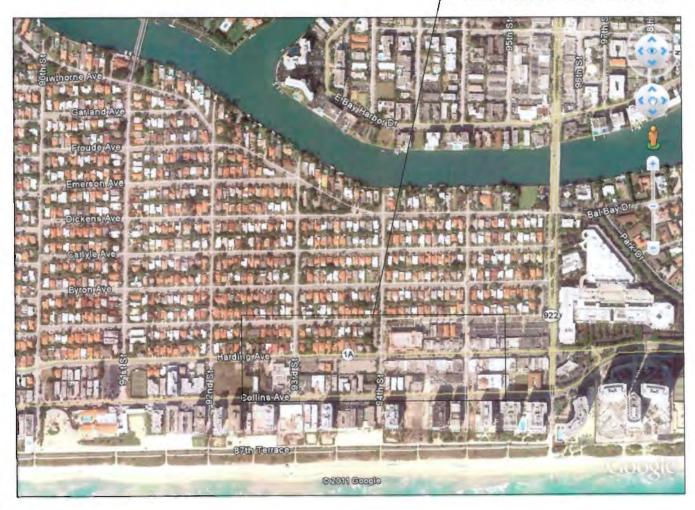


#### **APPENDIX**

Sheet 1: Site Vicinity Map
Table 1 – Summary of Test Locations
Sheets 2 through 5: Test Location Plans
Pavement Evaluation Coring and Condition Data
Asphalt Pavement and Site Photographs
Test Boring Records (Pavement Cores)
Table 2 – Summary of Borehole Percolation Test Results
Schematics of SFWMD Usual "Open-Hole" Test Procedure



- APPROXIMATE SITE LOCATION



### SITE VICINITY MAP



COUNTY: MIAMI-DADE COUNTY, FLORIDA

REFERENCE: GOOGLE EARTH, 2011

DATE: AUGUST, 2011

SITE VICINITY MAP TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS MIAMI-DADE COUNTY, FLORIDA

	117 = 3	
	GEOS	OL. INC.
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AWN	SCALE	

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CHECKED OR	AUG., 2011	SHEET I

TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS MIAMI-DADE COUNTY, FLORIDA GEOSOL PROJECT No. 211151



**TABLE 1 - SUMMARY OF TEST BORING LOCATIONS** 

BORING	LOCATION	APPROXIM LOCATIO	GROUND SURFAC ELEVATION		
No.		NORTHING	EASTING		
C-1/P-1	TOWN HALL LOT	563504.9	944745.6	N/A	
C-2	TOWN HALL LOT	563580.1	944740.8	N/A	
C-3/P-2	COLLINS LOT	563701.1	944515.3	N/A	
C-4	COLLINS LOT	563782.7	944558.6	N/A	
C-5/P-3	94TH ST. LOT	564025.8	944539.4	N/A	
C-6	94TH ST. LOT	564210.3	944477.4	N/A	
C-8	POST OFFICE LOT	564771.2	944541.3	N/A	
C-9	SHUL LOT	565011.3	944599.1	N/A	
C-10/P-5	SHUL LOT	565012.5	944513.4	N/A	
C-11/P-6	ABBOTT LOT	564993.3	944120.2	N/A	
C-12	ABBOTT LOT	565125.4	944163.8	N/A	

Notes: 1) Test locations C-7 and P-4 were eliminated from this project.





#### <u>LEGEND</u>

- ( ) C-I: APPROXIMATE PAVEMENT CORE LOCATION
- P-I: APPROXIMATE PERCOLATION TEST LOCATION



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#### **LEGEND**

- C-I: APPROXIMATE PAVEMENT CORE LOCATION
- P-I: APPROXIMATE PERCOLATION TEST LOCATION



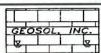
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#### **LEGEND**

- C-I: APPROXIMATE PAVEMENT CORE LOCATION
- P-I: APPROXIMATE PERCOLATION TEST LOCATION



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CHECKED	AUG., 2011	SHEET 4





#### <u>LEGEND</u>

- C-I: APPROXIMATE PAVEMENT CORE LOCATION
- P-I: APPROXIMATE PERCOLATION TEST LOCATION



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CHECKED	AUG., 2011	SHEET 5

### State of Florida Department of Transportation PAVEMENT EVALUATION AND CONDITION DATA

Cored by:	GEOSOL, INC.	Date:	8/12/2011 -	8/17/2011	Page:	1 OF 1	Typical Se	ction No.:				_							
GEOSOL Project No.:		Name: S.R. No.:	TOWN OF	SURFSIDE F	PARKING L	OT IMPROVEMEN		ype & Cond	N/A (PARKING	LOT)									
Median Curbed?	N/A (NO MEDIÁN)			Lawn?	N		Inside: Outside: Other?		N/A N/A Curb & Gu	tter?	N								
		47.4			Payem	ent Layer (inches)				Base	Sub Base	Z. T. S.	Cra	7 - 7 7	Cutant	Pavement Condition	Rut Depth	Cross	Comments
Core	Parking Lot	Wheel	Тор				T.02.0	Binder	Core	(inches)	(inches)	Depth (inches)	Type	Class	Extent	Condition	(in.)	(ft / 6 ft)	
No.	Location	Path	FC-2	FC-4	S-III	S-I S-I	Type-I 2.8	Binder	Length (inches) 3.8	8.2	(inches) ≥15.8	3.8	-			Р	1/4	0.038	
C-1	COLLINS LOT	X		>				-	1 7 7 7 7 7	77.0		5-11			-	-	-		
C-2	Grand Street	X	-	- 5	141	1.0	2.0	7	3.0	9.0	≥15	5				F	1/8	0.049	
C-3	TOWN HALL LOT	×				1.5 -		-	1.5	10.5	≥13.5	1.5	20.)	L.dec.		P	1/16	0.017	
C-4	TOWN HALL LOT	X			-	1.8 -	×	-	1.8	10,2	≥13.8	1.8	-		÷	Р	1/8	0.007	
C-5	Tourise 122	×	1 2002			1.0 -		76	1.0	9.0	≥15	1.0	•	-	4	Р	1/8	0.014	
C-6	94TH ST. LOT	×	10.2	- 0	- 3-	1.3 -		-	1.3	10.7	≥13.3	1.3	7	-	9	P	1/16	0.003	
C-8	POST OFFICE LOT	×		19		1.0 -	1.6	-	2.6	13.0	≥11	2.7	-3		÷	P	1/8	0.007	
C-9	1	×	-		~	0.8 -		197	0.8	13.6	≥10.4	-4	1	-1-	-	F	1/16	0.003	
C-10	SHUL LOT	x	11-	(+)		1.0 -	1 2	1	1.0	11.0	≥13	1.0	4			Р	1/8	0.007	
C-11	1000	X			2.	0.8 -		12	0.8	11.2	≥12.8	0.8	8	-	41	P	1/32	0.003	
C-12	ABBOTT LOT	x		13:	÷	1.0 -		-	1.0	17.0	≥7	1.0		-	-51	Р	1/32	0.010	1

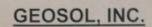
#### NOTES:

<sup>1)</sup> THE BASE MATERIALS CONSIST OF SLIGHTLY SILTY FINE TO MEDIUM SAND WITH SOME LIMEROCK FRAGMENTS (A-1-b).

<sup>2)</sup> THE SUBBASE MATERIALS CONSIST OF NATURAL FINE TO MEDIUM SAND WITH SHELLS (A-3)

<sup>3)</sup> CORE No. C-7 WAS ELIMINATED FROM THIS PROJECT.



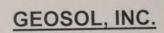


GEOSOL Project No.: 211151

C-1

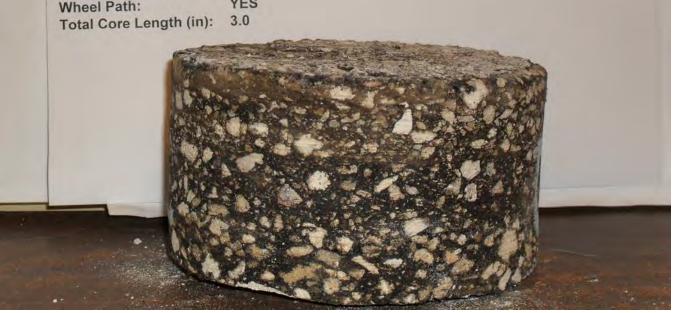




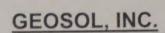


County: MIAMI-DADE GEOSOL Project No.: 211151

C-2 Core No.: YES Wheel Path:







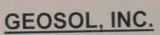
TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS PROJECT NAME:

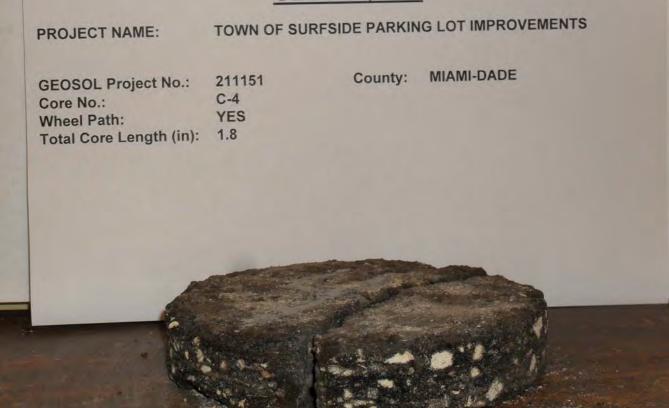
County: MIAMI-DADE GEOSOL Project No.: 211151

C-3 Core No .: Wheel Path:

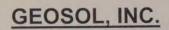






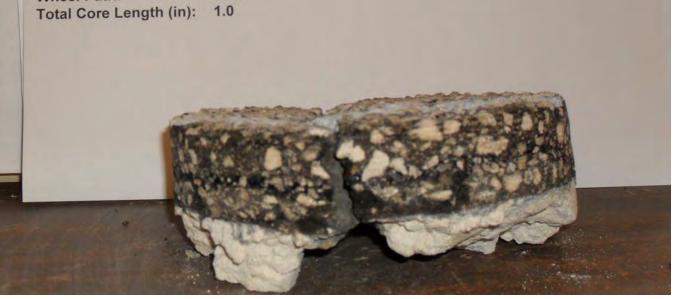






GEOSOL Project No.: 211151

Core No.: C-5
Wheel Path: YES
Total Core Length (in): 1.0





### GEOSOL, INC.

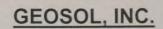
PROJECT NAME: TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS

GEOSOL Project No.: 211151

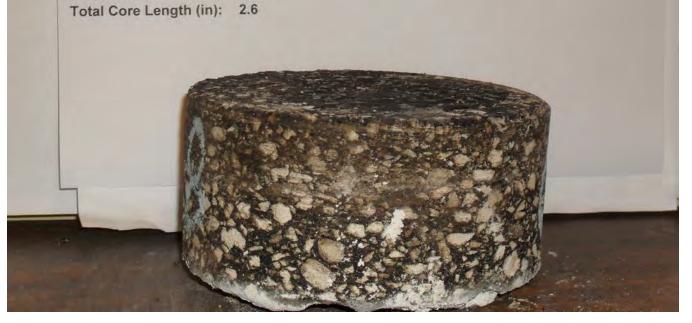
Core No.: C-6
Wheel Path: YES
Total Core Length (in): 1.3







GEOSOL Project No.: 211151 Core No.: C-8 Wheel Path: YES





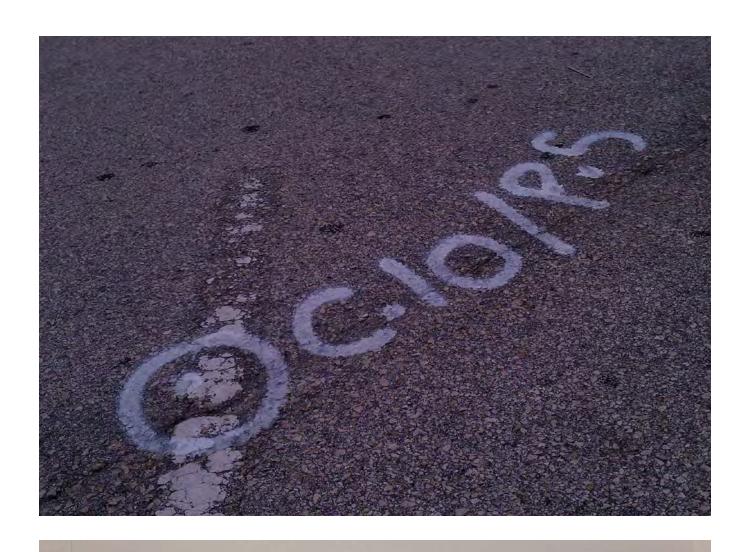
### GEOSOL, INC.

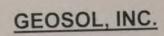
PROJECT NAME: TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS

GEOSOL Project No.: 211151

Core No.: C-9
Wheel Path: YES
Total Core Length (in): 0.8





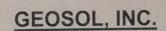


GEOSOL Project No.: 211151 Core No.: C-10

Core No.: C-10
Wheel Path: YES
Total Core Length (in): 1.0





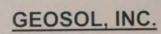


GEOSOL Project No.: 211151

Core No.: C-11
Wheel Path: YES
Total Core Length (in): 0.8







GEOSOL Project No.: 211151 County: MIAMI-DADE

Core No.: C-12 Wheel Path:



GEOSOL, Inc.					i		TEST BOI	BORING No. C-1					
_	AKES, F		or over	DE S	Divi	IC I CT II IST	(AST						
PROJECT NAME: TOWN OF SURFSIDE PARKIN CLIENT: FLORIDA TRANSPORTATION ENGINE								Arekey is to		SHEET No. 1 OF 1			
				N ENC	SINE			OFFSET (ft.)		GEOSOL PROJECT	No. 211151		
_		ION: NO		_	_	EASTING:		VATION (ft):					
		R (FEET): DEPTH (fi		TY	PE	CASING NW	SAMPLE	CORE	TUBE	DATUM (ft): DATE START:	N/A 8/12/2011		
MIL	THAL	DEI TITYI	L (ft)	DIA.		3	1 - 3/8 ID			DATE FINISH:	8/12/2011		
				WT.(			140 30			DRILLER: EQUIP./HAMMER:	R. Morales B-53/ AUTO.		
-		_		FALI	-(in)		30			EQUIF THAMIMEN:	D-03/ A010.		
оертн, п	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL			_ DESCRIPTIO	)N	RE	MARKS		
		1	-			0 to 3.8": Asp	halt Pavement	to Madi on SAND with	Come Limernek Er	rements (BASE: A 1 h)			
-1			12	16	***	3.8" to 1": Brown	Slightly Silty Fine	to Medium SAND with	n Some Limerock Fr	agments (BASE; A-1-b)			
2			7 5				own Fine to Medi agments (SUBBA			BORING TERMINA DEPTH OF 2.32 ft			
3										BOREHOLE GRO	UTED		
				1									
4		4		1						181 0			
5				1	П								
6				1									
				1	ı								
/				1	ı								
8	N H V												
9				1	1								
				1	П					4			
10					ш	1							
11				-	1	1							
12				1	L								
				1	1					1			
13				1	L					1			
14				1	1					AW I			
15				1	1								
16				1	1	1							
17				1									
18				1		1							
19													
20													
21				1	ı					1			
22					1	1				1			
23				1									
24				1	1	1							
25 BLOV	WS/FT	D	ENSITY	BLO	WS/FT	CONSISTENCY		SAMPLE IDENTIFIC	ATION	+			
8 24	0-3 3-8 1-24 4-40	Very Loose Loose Medium De Dense Very Dens	e ense	E 1	0-1 1-3 3-6 3-12 2-24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	0.000	- H - Hand Auger - S - Split Spoon - T - Thin Wall Tu - U - Undisturbed - C - Diamond Col	ube Piston re	FILL SAND ORGANIC S SILT CLIAY CLIAY SANDSTON SANDSTON			

GEOSOL, Inc. MIAMI LAKES, FL							TEST BOI	BORING No. C-2					
_			OF SURES	DE PA	RKIN	IG LOT IMPRO		SHEET No. 1 OF 1					
								GEOSOL PROJECT					
		ION: NOF		-175		EASTING:		OFFSET (ft.) VATION (ft):					
ROUNI	DWATER	R (FEET):	N/A			CASING	SAMPLE	CORE	TUBE	DATUM (ft):	N/A		
		DEPTH (ft	CASING			NW	SS 1 - 3/8 ID			DATE START: DATE FINISH:	8/12/2011 8/12/2011		
			L (ft)	DIA.		3	140	i -		DRILLER:	R. Morales		
				FALI			30			EQUIP./HAMMER:	B-53/ AUTO.		
DEPTH, ft	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL	O to 3" Applie	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	L DESCRIPTIO	N	RE	MARKS		
			10		***	0 to 3": Aspha 3" to 1': Brown \$	Slightly Silty Fine to	Medium SAND with S	Some Limerock Frag	ments (BASE; A-1-b)			
2			7 6 4	13		1' to 2.25': Bro	own Fine to Med agments (SUBBA	ium SAND		BORING TERMINATED AT DEPTH OF 2.25 ft.			
3		1116								BOREHOLE GRO	OILD		
4													
5										1			
,			1	1	1								
6				1						1			
7				1	1					4			
8				1						1			
0													
9				4		1				1			
10				1						N.			
11				-									
12										1			
13					1								
				-	1					A .			
14				1		1				H .			
15	3			1						Y.			
16	5			1						1			
				1		1							
17				-		1							
18	3												
19	9												
20	0				1								
2	1												
22				1		1							
23	3				1					4			
2	4			-									
2	5	1					4	241-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-2-					
	)WS/FT		DENSITY		WS/F1			SAMPLE IDENTIFIC	CATION	OXXX PH			
2	0-3 3-8 8-24 24-40 > 40	Very Loose Loose Medium D Dense Very Dens	ense		0-1 1-3 3-6 6-12 12-24 > 24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	W W	- H - Hand Auger - S - Split Spoon - T - Thin Wall Ti - U - Undisturbed - C - Diamond Co	Piston	### FILL  SAND  ORGANICS  SILT  CLAY  HIMESTON	SOILS / MUCK		

	OL, Ir AKES, F						(AS	TM D-1586)			
ROJEC	T NAME	: TOWN C	F SURFS	DE PA	RKIN	G LOT IMPR	OVEMENTS			SHEET No. 1 OF 1	
IENT:	FLORIE	A TRANS	PORTATIO	N ENG	SINEE	RING, INC.	STATION (ft.)	OFFSET (ft.)		GEOSOL PROJECT No	. 211151
DRING	LOCAT	ION: NOR	THING:			EASTING:	ELE	EVATION (ft):			
		R (FEET):				CASING	SAMPLE	CORE	TUBE	DATUM (ft):	N/A
ATE	TIME	DEPTH (ft)	CASING L (ft)	DIA.		NW 3	SS 1 - 3/8 ID			DATE START: DATE FINISH:	8/12/2011 8/12/2011
			2 114	WT.(	lbs)		140			DRILLER:	R. Morales
			5-	FALI	_(in)		30			EQUIP./HAMMER:	B-53/ AUTO.
DEPTH, ft	SAMPLE No.	STRATUM No.	BLOWS / 6""	N Value (bpf)	SYMBOL	T					
DEP	SAN	STR	BLO	> 2				L DESCRIPTION	ON	REM	IARKS
			14		****	0 to 1.5": Asp	halt Pavement in Slightly Silty Fine	to Medium SAND wit	th Some Limerock I	Fragments (BASE; A-1-b)	
1	l al		9	21	****				at egine annered		
2			12 10				own Fine to Med agments (SUBBA			BORING TERMINAT DEPTH OF 2.13 ft.	ED AT
			10		888	With Shell 118	aginenta (OODD)	(OL, A-3)		BOREHOLE GROUT	TED
3				1							
4				1							
5				1							
				1							
6		0.00		1							
7				1	ш					1	
8				1							
O				-							
9				1						I)	
10				1	П						
- 44				1	1						
11				1							
12											
13				1							
				1							
14	1			1							
15			-	1	U						
16				1	П						
10		1		1							
17				1	1					1	
18				1	1						
30				1							
19	1									N/	
20				1							
21				1							
22	2	1			1						
23	3										
	1										
24	1				W					5	
BLO	WS/FT.	DE	NSITY	BLO	WS/FT	CONSISTENCY		SAMPLE IDENTIFI	CATION		
	0-3	Very Loose			0-1	Very Soft	1/1	// - H - Hand Auger		₩₩ - FILL	
	3-8	Loose Medium Der	nhe.		1-3	Soft Medium Stiff	1 11	- S - Split Spoon	ube	SAND ORGANIC SOI	LS / MUCK
	3-24	Medium Del	13-6					- U - Undisturbed		IIII - SILT	

	OL, Ir							RING RECOR	D	BORING No.	C-4
	AKES, F		XE 0. (BE0)	DE D	DIVIS	IC LOT HARDS		M D-1586)		0.0557.11.1.05.4	
						IG LOT IMPRO		OFFCET (A)		SHEET No. 1 OF 1	- nuise
50-07-0		ION: NOF		IN EN	JINE	ERING, INC.		OFFSET (ft.) VATION (ft):		GEOSOL PROJECT	10. 211151
	1 100	R (FEET):		-		CASING.	SAMPLE	CORE	TUBE	DATUM (ft):	N/A
		DEPTH (ft)	CASING	TY		NW	SS	CORE	TODE	DATE START:	8/13/2011
			L (ft)	DIA		3	1 - 3/8 ID			DATE FINISH:	8/13/2011 R. Morales
				WT.			140 30			DRILLER: EQUIP./HAMMER:	B-53/ AUTO.
ОЕРТН, А	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL		MATERIAL	. DESCRIPTIO	ON.	DE	MARKS
۵	Ś	in	- 0	Z	S	0 to 1.8": Asph		DESCRIPTION	JIV	, , ,	MARKO
1			9	1	***	1.8" to 1": Brown	Slightly Silty Fine t	o Medium SAND wit	th Some Limerock F	ragments (BASE, A-1-b)	
2			5 4 3	9			own Fine to Mediographics (SUBBAS			BORING TERMINA DEPTH OF 2.15 ft. BOREHOLE GROU	
3				}							
4	h 1			}							
5				1							
6											
7				1							
8											
9	1				1						
10			-		Ш						
11											
12										A .	
13											
7.3											
14				1	П						
15				-		l .					
16				1							
17				1	1						
18				1	ı					1	
19											
20				1							
21				1							
22											
23											
24											
BLOV	NS/FT	DE	NSITY	BLO	NS/FT	CONSISTENCY		SAMPLE IDENTIFIC	CATION	+	
8 24	0-3 3-8 24 1-40 40	Very Loose Loose Medium Der Dense Very Dense	ise	3 6	0-1 1-3 3-6 1-12 2-24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	////   	- H - Hand Auger - S - Split Spoon - T - Thin Wall Ts - U - Undisturbed - C - Diamond Co	ube Pistori ore	- FILL - SAND - ORGANIC SC - SILT - CLAY - LIMESTONE - SANDSTONE	

	OL, Ir							ING RECORD  D-1586)		BORING No. C-5			
_	_	_	DE SUBESI	DE PA	RKIN	I NG LOT IMPRO		n D-1360)		SHEET No. 1 OF 1			
						ERING, INC.		OFFSET (ft.)		GEOSOL PROJECT No. 211151			
		ION. NOF		211-011		EASTING:		ATION (ft):					
ROUNI	DWATE	R (FEET):	N/A			CASING	SAMPLE	CORE	TUBE	DATUM (ft): N/A			
		DEPTH (ft	CASING	TYI		NW	SS 1 - 3/8 ID			DATE START: 8/13/2011  DATE FINISH: 8/13/2011			
-			L (ft)	DIA.		3	140			DRILLER: R. Morales			
_				FALI			30			EQUIP./HAMMER: B-53/ AUTO.			
<b>DEPTH, ft</b>	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL		MATERIAL	DESCRIPTION	N	REMARKS			
		- "	-			0 to 1": Aspha	It Pavement						
1			7	12	***	1" to 1". Brown S	Slightly Silty Fine to M	Medium SAND with So	ome Limerock Frag	gments (BASE; A-1-b)			
2			5	1			own Fine to Mediu			BORING TERMINATED AT			
			4	$\vdash$		with Shell Frag	gments (SUBBAS	E; A-3)		DEPTH OF 2.08 ft.  BOREHOLE GROUTED			
3		1 1								2000 100 10 000 000 00 100 00			
4				1	1								
5				1						1			
				1						1			
6				1	١.					1			
7				1						Mal.			
8					1					A Company			
		1		1	l	1				N/C			
.9				1									
10				1	l								
11				1	ı								
12			1	1	1					· P			
-				1	1								
13				1									
14			-	-	1								
15				1	1								
				1	ı								
16				1	1	1							
17													
18				1						ľ			
19													
			-			1							
20				-									
21		1											
22				1									
23				1									
24													
BLOV	NS/FT	DE	ENSITY	BLO	WS/FT	CONSISTENCY	1	SAMPLE IDENTIFICA	TION				
8 24	0-3 3-8 24 4-40 40	Very Loose Loose Medium De Dense Very Dense	nse	6	0-1 1-3 3-6 3-12 2-24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	ш	- H - Hand Auger	e	- FILL - SAND - ORGANIC SOILS / MUCK - SILT - CLAY - LIMESTONE - SANDSTONE			

	OL, Ir						TEST BOF	BORING No. C-6			
_			OF SURFSI	IDE PA	RKIN	NG LOT IMPRO				SHEET No. 1 OF 1	
					2.00	100 No. V 100		OFFSET (ft.)		GEOSOL PROJECT I	
ORING	LOCAT	ION: NO	RTHING:			EASTING:		/ATION (ft):			
ROUN	DWATE	R (FEET):	N/A			CASING	SAMPLE	CORE	TUBE	DATUM (ft):	N/A
DATE	TIME	DEPTH (ft		TY		NW	SS			DATE START:	8/13/2011
			L (ft)	DIA.	_	3	1 - 3/8 ID 140			DATE FINISH: DRILLER:	8/13/2011 R. Morales
				FALI			30			EQUIP./HAMMER:	B-53/ AUTO.
ОЕРТН, А	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL			DESCRIPTIO	DN .	RE	MARKS
			8		****		halt Pavement	a Madisum SAND with	n Come Limerack Ern	gments (BASE, A-1-b)	
1			6	10	***	1,3 to 1; Brown	Signly Sity Fine to	o Medium SAND With	Some Limerock Fra	gments (BASE, A-1-b)	
2			4	1			own Fine to Mediu			BORING TERMINA	
		_	3			with Shell Frag	gments (SUBBAS	SE, A-3)		DEPTH OF 2.11 ft. BOREHOLE GROU	
3				1							
4				1	1						
5				1							
			-	1						5	
6				1						I .	
7				1	ı						
8				1	П						
0				1	Ш						
9				1							
10				1							
10.0				1							
11				1							
12				1	1						
13			2	1	П						
100											
14				1	П						
15			-		ı					I.	
16			-	1	ı					1	
				1						l	
17				1	ı	1					
18				-	1						
19				1	ı						
15				1	1	1					
20	4 1			1	L						
21					1						
00				1						1	
22						1				1	
23				1							
24				1							
25				-							
	VS/FT	DE	NSITY	BLOV	VS/FT,	CONSISTENCY		SAMPLE IDENTIFIC	ATION		
3 8- 24	-3 -8 24 -40 40	Very Loose Loose Medium Der Dense Very Dense		1 3 6- 12	-1 -3 -6 -12 -24 -24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	3//// 1111 8888	- U - Undisturbed F - C - Diamond Core	Piston e	- FILL - SAND - ORGANIC SC - SILT - CLAY - CLIMESTONE SANDSTONE	

	OL, In							RING RECORD	)	BORING No. C-8		
	AKES, F		OF PURES	DE D	Divir	IC LOT HISE:		M D-1586)		CUEST No. 4 CS 4		
	-	dia -				NG LOT IMPRO		OCCOST VA V		SHEET No. 1 OF 1		
		ION: NO		IN EN	JINE	EASTING:		OFFSET (ft.)  /ATION (ft):		GEOSOL PROJECT No. 211151		
		R (FEET):	and market	_		CASING.	SAMPLE	CORE	TUBE	DATUM (R): N/A		
		DEPTH (f		TY	PE	NW	SS	CORE	TUBE	DATE START: 8/13/2011		
			L (ft)	DIA		3	1 - 3/8 ID			DATE FINISH: 8/13/2011		
	-			WT.			140 30			DRILLER: R. Morales EQUIP./HAMMER: B-53/ AUTO.		
#	No.	N N	19	(pbb)	2							
рертн, п	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL		MATERIAL	DESCRIPTIO	N	REMARKS		
۵	vs .	S		Z	S		halt Pavement			KLIMAKKS		
1	1.5		14 9	15	$\otimes$		rown Slightly Silty nerock Fragment	Fine to Medium S	SAND			
2			6	13	***		Brown Fine to Me			BORING TERMINATED AT		
2			5				gments (SUBBAS			DEPTH OF 2.22 ft.		
3			-							BOREHOLE GROUTED		
4				1		/						
F												
5												
6				1								
7				1								
8				1								
0				1	1							
9												
10				1	П							
11				1								
				1	L							
12				1						1		
13				1	1	1						
14				1	ı							
4.5	0		-	1	ı							
15				1	П	1						
16				1	ı							
17				1		1						
18				1								
10					1					1		
19						1				1		
20												
21				1								
			-									
22				1	T							
23												
24				1								
25				-								
BLOV	_	DE	NSITY	BLOV	VS/FT	CONSISTENCY		SAMPLE IDENTIFICA	ATION			
3 8- 24	1-3 1-8 -24 1-40 40	Very Loose Loose Medium Der Dense Very Dense	nse	0 1 3 6 12	0-1 -3 0-6 -12 2-24 24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	- 2//// 	- H - Hand Auger - S - Split Spoon - T - Thin Wall Tub - U - Undisturbed P - C - Diamond Core	oe Piston	- FILL - SAND - ORGANIC SOILS / MUCK - SILT - CLAY - LIMESTONE		

	OL, Ir							RING RECORI	D	BORING No. C-9		
ROJEC	T NAME	: TOWN	OF SURFSI	DE PA	RKIN	IG LOT IMPRO	OVEMENTS			SHEET No. 1 OF 1		
LIENT:	FLORID	A TRANS	PORTATIO	N EN	SINE	ERING, INC.	STATION (ft.)	OFFSET (ft.)		GEOSOL PROJECT No. 211151		
ORING	LOCAT	ION: NOF	RTHING:			EASTING:	ELEV	/ATION (ft):				
		R (FEET):				CASING	SAMPLE	CORE	TUBE	DATUM (ft): N/A		
DATE	TIME	DEPTH (ft	) CASING L (ft)	DIA.		NW 3	SS 1 - 3/8 ID			DATE START: 8/15/2011  DATE FINISH: 8/15/2011		
			54 (10)	WT.	(lbs)		140			DRILLER: R. Morales		
				FALI	L(in)		30			EQUIP./HAMMER: B-53/ AUTO.		
DЕРТН, ft	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL		MATERIAL	DESCRIPTIO	ON .	REMARKS		
			-				halt Pavement	F 1 11	OANID			
1		1 2	10 7	11	₩		rown Slightly Silty merock Fragment		SAND			
2			4	1		1.2' to 2.07': F	Brown Fine to Med	dium SAND		BORING TERMINATED AT		
1.6		_	3	-	H	with Shell Fra	agments (SUBBAS	SE; A-3)		DEPTH OF 2.07 ft.  BOREHOLE GROUTED		
3				1						001/2/1022 0/100/20		
4												
5	i i	1		1	П							
				1	Н							
6				1								
7				1	L							
8			A	1	l	1						
9				1	ш							
10				1	ш					1		
				1	Ш					11.		
11				1	П					III.		
12				1						1		
13				1	1							
				1	1							
14	2			1	ш							
15		Ü	-	1	1							
16				1						N.		
				1								
17		1		1								
18				1	П							
19	N			1	1					1		
10				-						1		
20				1	L							
21				1	ı					OI I		
20				1	П							
22				1	1					1		
23				1	1							
24				1	1							
25				-	1							
_	WS/FT	DE	ENSITY	BLOV	NS/FT	CONSISTENCY		SAMPLE IDENTIFIC	CATION			
8 24	0-3 3-8 -24 4-40 40	Very Loose Loose Medium De Dense Very Dense	nse	3 6 12	0-1 1-3 3-6 -12 2-24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	·////	- H - Hand Auger - S - Split Spoon - T - Thin Wall Tu - U - Undisturbed - C - Diamond Cor - W - Wash Samp	Piston	FILL SAND ORGANIC SOILS / MUCK SILT CLAY LIMESTONE SANDSTONE		

GEOS					1			RING RECORD	b	BORING No.	C-10
79. 11.95			OF SURES	IDF PA	RKIN	IG LOT IMPRO		D-1300)		SHEET No. 1 OF 1	
					_	ERING, INC.		OFFSET (ft.)		GEOSOL PROJECT NO	244454
		TION: NO		7, 12,14		EASTING:		ATION (ft):		GEOGGE PROJECT NO	2. 211131
GROUNI	DWATE	R (FEET)	N/A			CASING	SAMPLE	CORE	TUBE	DATUM (ft):	N/A
		DEPTH (ft	CASING			NW	SS			DATE START:	8/16/2011
-			L (ft)	WT.		3	1 - 3/8 ID 140			DATE FINISH: DRILLER:	8/16/2011 R. Morales
				FALI			30			EQUIP./HAMMER:	B-53/ AUTO,
<b>DEPTH, ft</b>	SAMPLE No.	STRATUM No.	BLOWS / 5"	N Value (bpf)	SYMBOL		MATERIAL	DESCRIPTIO	N	REM	IARKS
	11	-	-			0 to 1": Aspha					
1			6	10	***	1" to 1': Brown S	Slightly Silty Fine to N	Medium SAND with S	ome Limerock Frag	ments (BASE; A-1-b)	
2			4	, ,			own Fine to Mediu gments (SUBBAS			BORING TERMINAT DEPTH OF 2.08 ft.	ED AT
3										BOREHOLE GROUT	TED
4											
5											
7										1	
8										1	
9		5.5									
10											
11				1							
12				}							
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25											
BLOW	S/FT.	DE	NSITY	BLOV	/S/FT.	CONSISTENCY		SAMPLE IDENTIFICAT	TION		
0- 3- 8-2 24- > 4	8 24 40	Very Loose Loose Medium Den Dense Very Dense	ise.	3 6- 12	-1 -3 -6 12 -24 24	Very Soft Soft Medium Stiff Stiff Very Stiff Hand	**************************************	H - Hand Auger S - Splil Spoon T - Thin Wall Tube U - Undisturbed Pis C - Diamond Core W - Wash Sample		### FILL SAND  ORGANIC SOIL  ORGANIC SOIL  SILT  CLAY  LIMESTONE  SANDSTONE	S/MUCK

	OL, Ir							RING RECORI	)	BORING No.	C-11
			DE SURES	IDE PA	RKIN	NG LOT IMPRO		TWI D-1300)		CHEET No. 4 OF 4	
							STATION (ft.)	OFFRET (# )		SHEET No. 1 OF 1	
		ION: NOF		EIN LIN	211412	EASTING:		OFFSET (ft.) EVATION (ft):		GEOSOL PROJECT N	10. 211151
		R (FEET):		_	_	CASING	SAMPLE	CORE	Time	5.7111.00	
		DEPTH (ft		TY	PE	NW	SS	CORE	TUBE	DATUM (ft): DATE START:	N/A 8/17/2011
			L (ft)	DIA	_	3	1 - 3/8 ID			DATE FINISH:	8/17/2011
-				WT.			140 30			DRILLER: EQUIP./HAMMER:	R. Morales B-53/ AUTO.
	-	T				1				Egon windingto	D-30/ A010.
#	No.	N No.	.9	(pdq)	,						
рертн, п	SAMPLE	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL	Y	MATERIA	L DESCRIPTIO	N	RE	MARKS
	- 02				0.5	0 to 0.8": Asp	halt Pavement	- DEGGIIII TIO		KL	MARKO
1			13	10	***	0.8" to 1" Brown	n Slightly Silty Fine	to Medium SAND with	Some Limerock Fra	agments (BASE; A-1-b)	
2		h 16	4	10		1' to 2.07': Br	own Fine to Med	ium SAND		BORING TERMINA	TED AT
2			3	_			igments (SUBBA			DEPTH OF 2.07 ft.	TEBAT
3						7				BOREHOLE GROU	TED
4		1									
7		L									
5				1							
6				1							
		1 10									
7											
8											
6											
9		1 1		1		8					
10											
11											
- 1											
12				1							
13				1							
-31											
14				1							
15											
40				1							
16				1							
17	1									1	
18		1									
19		9									
20											
21		100									
22											
- 74										E	
23											
24				1						18	
25											
BLOW	S/FT	DEN	ISITY	BLOW	S/FT	CONSISTENCY		SAMPLE IDENTIFICA	TION		
0-		Very Loose		0-		Very Soft	1///	- H - Hand Auger		₩₩ - FILL	
3-		Loose Medium Dens	e	1-		Soft Medium Stiff		- S - Split Spoon - T - Thin Wall Tube		- SAND - ORGANIC SOIL	S/MUCK
B-2					200						and the second state of th
24- >4	40	Dense Very Dense		6-12-		Stiff Very Stiff		<ul> <li>U - Undisturbed Pit</li> <li>C - Diamond Core</li> </ul>		SILT CLAY	

1000	SOL, II							ORING RECOR	D	BORING No. C-12
PROJEC	CT NAME	E: TOWN	OF SURFS	IDE PA	ARKIN	NG LOT IMPR				SHEET No. 1 OF 1
						ERING, INC.	STATION (ft.)	OFFSET (ft.)		GEOSOL PROJECT No. 211151
BORING	LOCAT	TON: NO	RTHING:			EASTING:	EL	EVATION (ft):		
		R (FEET):				CASING	SAMPLE	CORE	TUBE	DATUM (ft): N/A
DATE	TIME	DEPTH (fi	A CONTRACTOR OF THE PROPERTY O		PE	NW	SS			DATE START: 8/13/2011
			L (ft)	DIA WT.	_	3	1 - 3/8 ID 140			DATE FINISH: 8/13/2011 DRILLER: R. Morales
				FAL			30			EQUIP./HAMMER: B-53/ AUTO.
рертн, ң	SAMPLE No.	STRATUM No.	BLOWS / 6"	N Value (bpf)	SYMBOL	0 to 1". 0 1		L DESCRIPTIO	ON	REMARKS
4			14		***	0 to 1": Aspha		Fine to Medium SA	AND	
	1		10	17	$\bowtie$	with Some Li	merock Fragmer	nts (BASE; A-1-b)	1110	The second second second
2			7 5			1.5' to 2.08': I	Brown Fine to Magments (SUBB)	edium SAND		BORING TERMINATED AT DEPTH OF 2.08 ft.
3	1				-	Gridii i Te	-3.1161116 (OODD)			BOREHOLE GROUTED
		1								
4	1									
5										
6	1 3									1
7										
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9										1
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10		D 13								
11		11.19	-							1
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17				-1						
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19										
20										
21	41									
22			-							
23										
24	5 1 1	1.77								
25	DIET		OUT!							
BLOW			ISITY	BLOW		CONSISTENCY	د د د د	SAMPLE IDENTIFICA	TION	70000
0- 3- 8-2 24- > 4	8 24 40	Very Loose Loose Medium Dens Dense Very Dense	se	0-1-3-4 3-4 6-1 12-2 > 2	3 5 2 24	Very Soft Soft Medium Stiff Stiff Very Stiff Hard	Ш	H - Hand Auger S = Split Spoon T - Thin Wall Tub U - Undisturbed Pi C - Diamond Core W - Wash Sample	istan	FILL SAND ORGANIC SOILS / MUCK SILT CLAY LIMESTONE SANDSTONE

#### TABLE 2 - SUMMARY OF CONSTANT HEAD PERCOLATION TEST RESULTS

TOWN OF SURFSIDE PARKING LOT IMPROVEMENTS MIAMI-DADE COUNTY, FLORIDA GEOSOL PROJECT No. 211151



Test	Date	Dia	neter	Depth of	Depth to Grou	indwater Level	SATURATED	Corrected	Average	K, Hydraulic
No.	Performed	Casing	Hole	Hole	Below Ground	Surface (Feet)	HOLE DEPTH	Depth of	Flow Rate	Conductivity
		(Inches)	(Inches)	(Feet)	Prior to Test	During Test	Ds (Feet)	Hole (Feet)	(gpm)	(cfs/ft^2-Ft Head)
P-1	08/12/11	4	4.75	15	7.9	0.00	7.10	15.00	0.5	1.21E-05
P-2	08/12/11	4	4.75	15	3.9	0.00	11.10	15.00	0.5	2.08E-05
P-3	08/13/11	4	4.75	15	4.7	0.00	10.30	15.00	0.5	1.78E-05
P-5	08/16/11	4	4.75	15	4.9	0.00	10.10	15.00	0.5	1.72E-05
P-6	08/17/11	4	4.75	15	3.8	0.00	11.20	15.00	0.5	2.12E-05

#### NOTES:

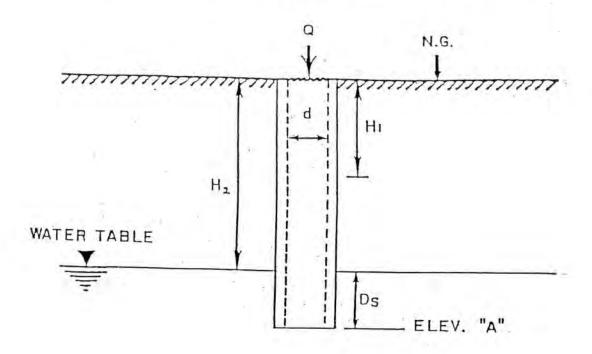
- (1) The above hydraulic conductivity values are for French drains installed to the same depths as the borehole tests. The values represent an ultimate value. The designer should decide on the required factor of safety.
- (2) The hydraulic conductivity values were calculated based on the South Florida Water Management Districts's USUAL OPEN HOLE CONSTANT HEAD percolation test procedure as shown on the following page.
- (3) The diameter of the CASING was used in the computation of the hydraulic conductivity values presented in the above table.
- (4) No loss of circulation was encountered during the performance of the borehole percolation tests.
- (5) Test location P-4 was eliminated from this project.

#### SUMMARY OF SUBSURFACE STRATIFICATION

Test	DEPTH	(FEET)	GENERAL MATERIAL DESCRIPTION	
No.	FROM	TO		
	0.00	0.32	Asphalt Pavement	
P-1	0.32	1.00	Brown Slightly Silty Fine to Medium SAND with Limerock Fragments (FILL)	
	1.00	15.00	Brown Fine to Medium SAND with Shell Fragments	
Ten 17 17 18	0.00	0.13	Asphalt Pavement	
P-2	0.13	2.90	Brown Slightly Silty Fine to Medium SAND with Limerock Fragments (FILL)	
	2.90	15.00	Brown Fine to Medium SAND with Shell Fragments	
33 2 32	0.00	0.08	Asphalt Pavement	
P-3	0.08	0.83	Brown Slightly Silty Fine to Medium SAND with Limerock Fragments (FILL)	
	0.83	15.00	Brown Fine to Medium SAND with Shell Fragments	
	0.00	0.08	Asphalt Pavement	
P-5	0.08	1.00	Brown Slightly Silty Fine to Medium SAND with Limerock Fragments (FILL)	
	1.00	15.00	Brown Fine to Medium SAND with Shell Fragments	
100	0.00	0.07	Asphalt Pavement	
P-6	0.07	4.00	Brown Slightly Silty Fine to Medium SAND with Limerock Fragments (FILL)	
	4.00	15.00	Brown Fine to Medium SAND with Shell Fragments	

8/24/2011 211151PE.xls

### USUAL OPEN - HOLE TEST



$$K = \frac{4Q}{\pi d(2H_2^2 + 4H_2D_S + H_2d)}$$

K . HYDRAULIC CONDUCTIVITY (CFS/FT. - FT. HEAD)

Q = "STABILIZED" FLOW RATE (CFS)

d = DIAMETER OF TEST HOLE (FEET)

H2 = DEPTH TO WATER TABLE (FEET)

Ds = SATURATED HOLE DEPTH (FEET)

ELEV. "A" . PROPOSED TRENCH BOTTOM ELEV.

H . = AVERAGE HEAD ON UNSATURATED HOLE SURFACE (FT. HEAD)

Reference: SFWMD Management and Storage of Surface Waters Permit Information Manual Vol. IV, Figure 3, Page 12.