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GEOTECHNICAL ENGINEERING REPORT
PROPOSED 260-FT COMMUNICATION TOWER
DR. MARTIN LUTHER KING BOULEVARD
AND FLORIDA'S TURNPIKE
POMPANO BEACH, FLORIDA

UES PROJECT NO. 0110.1500688
UES REPORT NO. 13376
FPID: 431987-1-52-01

Prepared For:

Mr. Wing Heung, P.E.
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Prepared By:

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November 23, 2015

Mr. Wing Heung, P.E.
Florida's Turnpike Enterprise
P.O. Box 9828
Ft. Lauderdale, Florida 33310

Reference: Geotechnical Engineering Report
Proposed 260-Ft Communication Tower
Dr. Martin Luther King Boulevard and Florida's Turnpike Junction
Pompano Beach, Broward County, Florida
UES Project No. 0110.1500688
UES Report No. 13376

Dear Mr. Heung:

Universal Engineering Sciences, Inc. (UES) has completed a geotechnical exploration and engineering report for the proposed 260-ft communication tower in Pompano Beach, Broward County, Florida. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made.

The following report presents the results of the field exploration, and our geotechnical engineering interpretation of those results with respect to the project characteristics provided to us. General recommendations have been included for foundation design parameters, groundwater considerations and other concerns as appropriate.

We appreciate the opportunity to work with you on this project and look forward to a continued association. If you have any questions, please contact the undersigned.

Respectfully submitted,
UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No. 549

PETER G. READ LICENSE No. 35604 STATE OF FLORIDA PROFESSIONAL ENGINEER

Peter G. Read
2015.11.23
17:09:32 -05'00'

Allan G. Abubakar, P.E.
Project Engineer

Peter G. Read, P.E.
Regional Manager
Florida Professional Engineer No. PE 35604

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APPENDICES

1.0 INTRODUCTION

1.1 GENERAL

This report contains the results of the subsurface exploration conducted for the proposed 260-ft communication tower in Pompano Beach, Broward County, Florida. This report includes the following sections:

- SCOPE OF SERVICES - Defines what services were completed
- FINDINGS - Describes what was encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- SUMMARY - Reviews the material in this report
- APPENDICES - Presents support materials referenced in this report.

1.2 PROJECT DESCRIPTION

Our understanding of the proposed construction was based on review of a site plan and project data provided by Florida Department of Transportation. We understand that the proposed tower will be supported on drilled shaft foundation. A Site Location Map is included as Page A-1 in Appendix A. The proposed site layout is shown on the Boring Location Plan, Page B-1 in Appendix B.

We note that since the applicability of geotechnical recommendations is very dependent upon project characteristics, most specifically: improvement locations, grade alterations, and actual structural loads applied, UES must review the preliminary and final site and grading plans, and structural design loads to validate all recommendations rendered herein. Without such review our recommendations should not be relied upon for final design or construction of any site improvements.

2.0 SCOPE OF SERVICES

2.1 PURPOSE

The purposes of this geotechnical exploration were:

- to explore and evaluate the subsurface conditions at the site with special attention to potential geotechnical considerations that may affect the proposed design, construction or serviceability of the proposed improvements; and

- to provide geotechnical engineering recommendations for foundation design.

This report presents an evaluation of site conditions on the basis of traditional geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. UES would be pleased to perform these services, if you desire.

2.2 FIELD EXPLORATION

The subsurface condition for the proposed tower foundations were explored with Standard Penetration test borings designated B-A, B-B, and B-C. Boring B-A was drilled to a depth of 90 feet and borings B-B and B-C were drilled to a depth of 75 feet at the approximate locations shown on the Boring Location Plan included in Sheet No. B-1 in Appendix B. Consider the indicated location and depths approximate.

The SPT boring was advanced using the rotary wash method; samples were collected while performing the SPT at regular intervals. We completed the SPT in general accordance with ASTM D-1586 guidelines, with continuous sampling from 0 to 10 feet, and additional samples at intervals of 2.5 feet-on-center. The SPT test consists of driving a standard split-barrel sampler (split-spoon) into the subsurface using a 140-pound automatic hammer free-falling 30 inches. The number of hammer blows required to drive the sampler 12 inches, after first seating it 6 inches, is designated the penetration resistance, or SPT-N value. This value is used as an index to soil strength and consistency.

2.3 LABORATORY TESTING

The soil samples recovered from the split-barrel sampler were classified in general accordance with ASTM D 2488. Representative soil samples were then selected from the retained soils and tested in our laboratory for sample specific classification in general accordance with the guidelines of ASTM D 2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System). The samples will be retained for a period of 90 days from date of completion of field work. The following is a summary of the laboratory tests performed for this study:

- Nine (9) Wash #200 fines content determinations - ASTM D 1140 (Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve).

- Nine (9) Moisture content tests – ASTM D 2216 (Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass).

These tests were performed to aid in classifying the recovered samples and to help in evaluating the general engineering characteristics of the site soils. All laboratory data is summarized and report sheets included in Appendix B.

3.0 FINDINGS

3.1 SOIL SURVEY

The subject site was located near the northwest corner of the intersection of Dr. Martin Luther King Boulevard and Florida's Turnpike access road. Based on the Soil Survey for Broward County, Florida, as prepared by the US Department of Agriculture, Natural Resources Conservation Service (NRCS), maps the site within Hallandale fine sand, and Immokalee fine sand, 0 to 2 percent slopes. The published general description of these soil types are presented in Table 1 below.

TABLE 1
Summary of NRCS Soil Survey Information

Soil Type	Constituents		Hydrologic Group	Natural Drainage	Soil Permeability (Inches/Hr)		Seasonal High Water Table
Hallandale fine sand (12)	0 – 4" 4 – 10" 10 – 14" 14 – 16" 16''	Fine sand Fine sand, sand Fine sand, sand Fine sand, sand Weathered bedrock	B/D	Poorly Drained	0 – 4" 4 – 10" 10 – 14" 14 – 16" 16''	6.0 – 20.0 6.0 – 20.0 0.6 – 6.0 6.0 – 20.0 ---	0 – 1.0
Immokalee fine sand, 0 to 2 percent slopes (15)	0 – 6" 6 – 40" 40 – 65" 65 – 80"	Fine sand Fine sand, sand Fine sand, sand Fine sand, sand	B/D	Poorly Drained	0 – 6" 6 – 40" 40 – 65" 65 – 80''	6.0 – 20.0 6.0 – 20.0 0.6 – 6.0 6.0 – 20.0	0 – 1.0

3.2 TOPOGRAPHY

Based on the applicable United States Geologic Survey (USGS) quadrangle map, the average ground surface elevation near the site appears to be approximately +15 feet National Geodetic Vertical Datum (NGVD). A reproduction of a portion of the USGS Map for the site area is included in Appendix A.

3.3 SUBSURFACE CONDITIONS

Soil profiles, penetration resistance and groundwater levels are shown on the boring logs included in Appendix B. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, and may not depict exact subsurface soil conditions. The actual soil boundaries may be more transitional than depicted. A generalized profile of the soils found at our boring locations is presented in Tables 2 through 4. The soil profile was prepared from field logs after the recovered soil samples were visually classified by a member of our geotechnical staff.

TABLE 2: GENERAL SOIL PROFILE (B-A)	
Typical Depth (feet)	**Soil Description**
0 – 20	Very loose to loose, light gray to brown sand, silty sand, sand with shell fragments and rocks [SP, SM]
20 – 35	Loose to medium dense, brown to light gray sand [SP]
35 – 90*	Medium dense to very dense, gray sand with cemented sand [SP]
* Boring Termination depth Water table at 6 feet below grade	

TABLE 3: GENERAL SOIL PROFILE (B-B)	
Typical Depth (feet)	**Soil Description**
0 – 10	Very loose to medium dense, brown sand, sand with silt, sand with limestone [SP, SP-SM]
10 – 20	Medium dense, light gray to brown sand [SP]
20 – 75*	Medium dense to very dense, light gray to gray sand with silt, sand, and sand with cemented sand [SP, SP-SM]
* Boring Termination depth Water table at 6 feet below grade	

TABLE 4: GENERAL SOIL PROFILE (B-C)	
Typical Depth (feet)	**Soil Description**
0 – 10	Very loose to loose, light gray to brown sand, silty sand with roots [SP, SM]
10 – 20	Medium dense, light gray to tan sand [SP]
20 – 75*	Medium dense to very dense, light gray to brown sand, silty sand, and sand with trace cemented sand [SP, SM]
* Boring Termination depth Water table at 6 feet below grade	

4.0 RECOMMENDATIONS

4.1 GENERAL

In this section of the report, detailed recommendations are presented for groundwater considerations, deep foundations and construction related services. The following recommendations are based upon the attached soil test data, our stated understanding of the proposed construction, and experience with similar projects and subsurface conditions. UES should be retained to observe the proposed construction, and provide updated recommendations as required.

We note that since the applicability of geotechnical recommendations is very dependent upon project characteristics, most specifically: improvement locations, grade alterations, and actual structural loads applied, UES must review the preliminary and final site and grading plans, and structural design loads to validate all recommendations rendered herein. Without such review our recommendations should not be relied upon for final design or construction of any site improvements.

4.2 GROUNDWATER CONSIDERATIONS

The groundwater table will fluctuate seasonally depending upon local rainfall. The rainy season in South Florida is normally between May and October. Based upon the test boring data, a reasonable estimate for the seasonal high groundwater table is approximately 4 feet below existing grade or +11 feet NGVD. The existing groundwater table at each location appears on the boring logs in Appendix B.

Note that our estimate of seasonal high groundwater level is based on limited data and does not provide any assurance that groundwater levels will not exceed the estimated level during any given year in the future. If the rainfall intensity and duration or total rainfall quantities exceed those normally anticipated, then groundwater levels will likely exceed the seasonal high estimate.

The estimate of seasonal high groundwater level is made for the site at the present time. Future development of adjoining or nearby properties and development on a regional scale may affect the local seasonal high groundwater table. Universal makes no warranty on the estimate of the seasonal high groundwater table.

UES recommends that all foundation and pavement design incorporate assumption of the seasonal high groundwater condition. We recommend that positive drainage be established and maintained on the site during construction. UES further recommends that permanent measures be implemented to maintain positive drainage throughout the life of the project.

The performance of site improvements may be sensitive to their post-construction relationship to site groundwater levels, seepage zones, or soil/rock characteristics exposed at final grades. Since horizontal and vertical control of our site borings was not provided, we do not recommend the use of our boring stratigraphy or groundwater information for final grading and improvement design purposes. Such use could result in potentially unacceptable performance of site improvements and/or additional costs for unanticipated construction modifications. UES will not be responsible or liable for the consequences of such use. UES recommends that use of boring information for final design of all site improvements be predicated on proper horizontal and vertical control of borings.

4.3 GEOTECHNICAL PARAMETERS

Table Nos. 5 through 7 show typical geotechnical design parameters for the materials found in the borings. Note that the specific parameters used for axial and lateral capacity analysis are dependant upon estimated soil density and effective stress conditions. Those estimates are based on Standard Penetration Test (SPT) 'N' values.

TABLE 5: RECOMMENDED SOIL DESIGN PARAMETERS (Boring B-A)

Layer Depth (Feet)	Friction Angle (degrees)	Cohesion (psf)	Recommended Earth Pressure Coefficients			Unit Weight (pcf)	
			Active k_a	Passive k_p	At Rest K_o	Saturated	Submerged
0 – 20	28	0	0.36	2.77	0.53	115	52.6
20 – 35	29	0	0.35	2.88	0.52	115	52.6
35 – 90	32	0	0.31	3.26	0.47	115	52.6

TABLE 6: RECOMMENDED SOIL DESIGN PARAMETERS (Boring B-B)

Layer Depth (Feet)	Friction Angle (degrees)	Cohesion (psf)	Recommended Earth Pressure Coefficients			Unit Weight (pcf)	
			Active k_a	Passive k_p	At Rest K_o	Saturated	Submerged
0 – 10	29	0	0.35	2.88	0.52	115	52.6
10 – 20	32	0	0.31	3.26	0.47	115	52.6
20 – 75	33	0	0.29	3.39	0.46	115	52.6

TABLE 7: RECOMMENDED SOIL DESIGN PARAMETERS (Boring B-C)							
Layer Depth (Feet)	Friction Angle (degrees)	Cohesion (psf)	Recommended Earth Pressure Coefficients			Unit Weight (pcf)	
			Active k_a	Passive k_p	At Rest K_o	Saturated	Submerged
0 – 10	28	0	0.36	2.77	0.53	115	52.6
10 – 20	32	0	0.31	3.26	0.47	115	52.6
20 – 75	33	0	0.29	3.39	0.46	115	52.6

4.4 DRILLED SHAFT FOUNDATIONS

In general, the subsurface soils encountered are suitable for supporting the proposed communication tower foundations using drilled shaft construction techniques in accordance with FDOT Standard 455 Specifications.

For design purposes we recommend that seasonal high groundwater table be assumed at the existing ground surface. The installation of the shafts should be accomplished using the wet method referencing FDOT Standard 455 Specifications. Shaft concrete should be tremie-placed or pumped from the bottom up, maintaining a positive concrete head above the bottom of the tremie/pump line throughout the pour at all times. Insertion of the tremie into the excavation below water/drilling slurry sealing the bottom of the tremie/pump line is required during the pour.

It should be noted that dense to very dense layer of sand and sand with cemented sand were encountered at depths ranging from 35 feet to 90 feet at boring B-A, from 18 feet to 75 feet at boring B-B, and from 33 feet to 75 feet at boring B-C. **The contractor should be aware that areas of difficult excavations will be encountered where these dense to very dense materials are present.**

Axial Capacity Estimates

Drilled shafts develop axial capacity through a combination of side shear (skin friction) and end bearing at the base of the shaft. Shaft movement (i.e. settlement) required to mobilize side friction is generally considerably less than the movement needed to mobilize end bearing; therefore end bearing capacity is typically reserved as an additional factor of safety.

Ultimate Unit Side Resistance

We estimated the ultimate unit side resistance for each layer of borings B-A through B-C referencing the methodology provided in FDOT's *Soil and Foundation Handbook* 2015 (Beta Method) page 162. Tables 8 through 10 show estimated ultimate unit side resistance using the recommended soil design parameters. The estimated ultimate side resistance calculations are enclosed in Appendix B.

TABLE 8: ULTIMATE UNIT SIDE RESISTANCE (Boring B-A)			
Layer Depth (Ft)	**Ave. Depth (Ft)**	γ_b **(pcf)**	**Estimated Ultimate Unit Side Resistance (ksf)**
0 – 20	10	52.6	0.11
20 – 35	27.5	52.6	0.54
35 – 50	42.5	52.6	1.39
50 – 70	60	52.6	1.42
70 – 90	80	52.6	1.22

TABLE 9: ULTIMATE UNIT SIDE RESISTANCE (Boring B-B)			
Layer Depth (Ft)	**Ave. Depth (Ft)**	γ_b **(pcf)**	**Estimated Ultimate Unit Side Resistance (ksf)**
0 – 10	5	52.6	0.17
10 – 20	15	52.6	0.77
20 – 40	30	52.6	1.20
40 – 55	47.5	52.6	1.42
55 – 75	65	52.6	1.40

TABLE 10: ULTIMATE UNIT SIDE RESISTANCE (Boring B-C)			
Layer Depth (Ft)	**Ave. Depth (Ft)**	γ_b **(pcf)**	**Estimated Ultimate Unit Side Resistance (ksf)**
0 – 10	5	52.6	0.11
10 – 20	15	52.6	0.77
20 – 40	30	52.6	1.20
40 – 55	47.5	52.6	1.42
55 – 75	65	52.6	1.40

Lateral Capacity

Lateral capacity is generally calculated based on the predicted stress/strain relationship of the shaft and surrounding soils (P-Y). Table No. 11 shows typical parameters for lateral analysis based on the soil materials found in the borings. These parameters may be revised based on the results of additional field and laboratory testing, in addition to information such as grout capacity and reinforcement provided by the design engineer.

If requested UES can perform a pile lateral load capacity using the "LPILE plus 5.0" program, using parameters provided by the tower designer.

TABLE 11: TYPICAL SOIL PARAMETERS FOR LATERAL CAPACITY

Layer Depth (ft)	Material	Density (N)	Modulus (k) (pci)	Friction Angle (deg.)	Compressive Strength (psi)
0 – 10	Sand	Loose	25	28	--
10 – 35	Sand	Medium dense	60	29	--
35 – 90	Sand	Dense to very dense	125	32	

4.5 CONSTRUCTION RELATED SERVICES

We recommend that the owner retain UES to perform construction materials tests and observations on this project. Field tests and observations could include inspections during shaft drilling, sampling and testing of concrete, and confirmation of reinforcement. The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

5.0 LIMITATIONS

Our field exploration did not find unsuitable or unexpected materials at the time of occurrence. The test boring completed for this report is not considered sufficient for reliably detecting the presence of isolated, anomalous surface or subsurface conditions, or reliably estimating unsuitable or suitable material quantities.

Accordingly, UES does not recommend relying on our boring information to negate the presence of anomalous materials or for estimation of material quantities, and UES will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended.

Geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix C, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix C: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

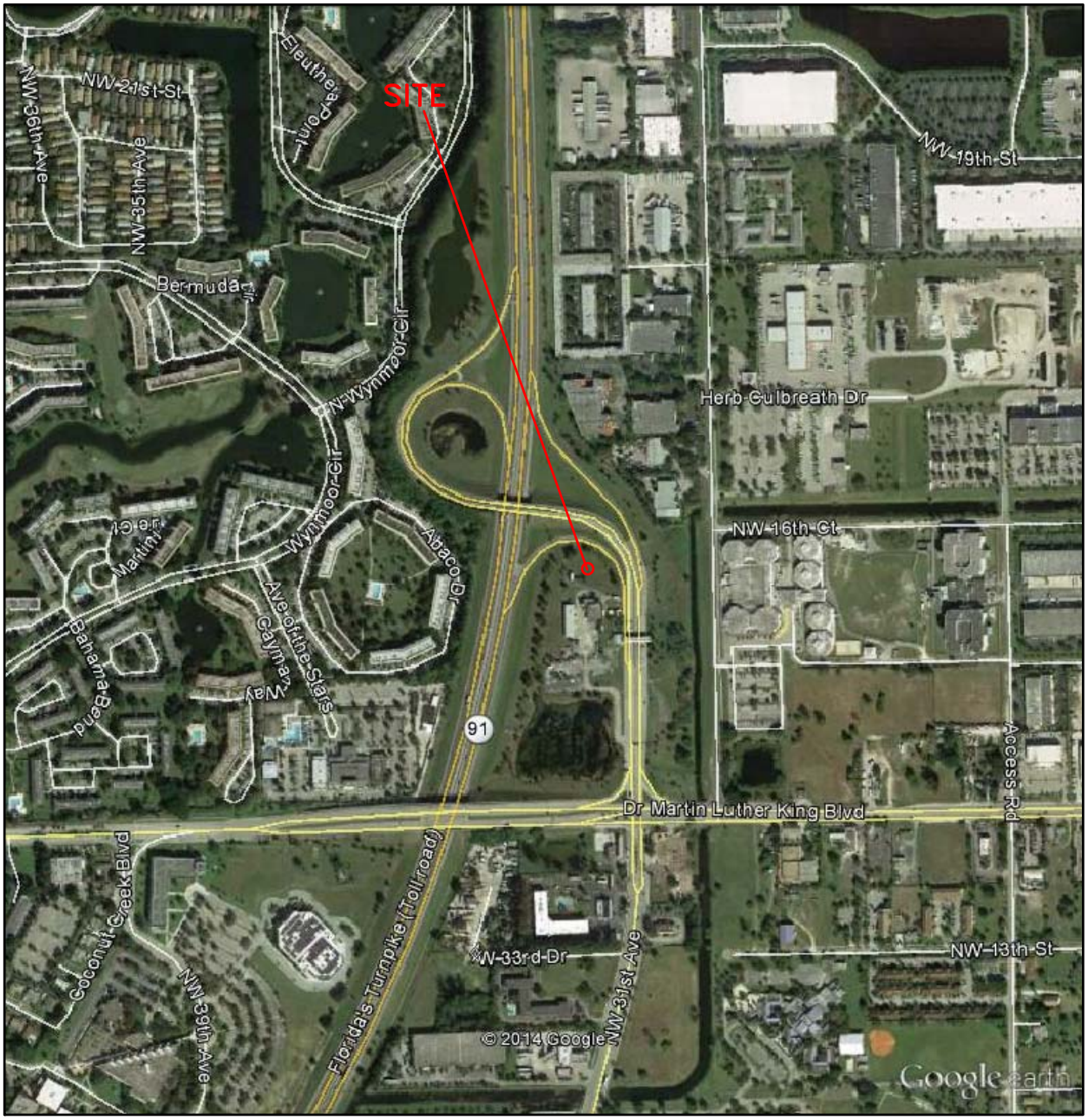
6.0 SUMMARY

In summary, we understand that you propose to construct a 260-ft communication tower in Pompano Beach, Broward County, Florida. Field and laboratory tests have been performed to provide geotechnical engineering recommendations for foundation design.

The soils found generally consist of very loose to medium dense, sand, silty sand, sand with silt [SP, SP-SM] to a depth of about 10 feet below the existing land surface, followed by very loose to very dense, sand, sand with silt, silty sand [SP, SP-SM, SM] to a depth of about 70 feet. The test borings continued with medium dense to very dense, sand with cemented sand to the boring termination depth of 90 feet. Groundwater was encountered at a depth of approximately 6 feet below ground surface in the test borings.

Geotechnical design parameters for the proposed drilled shaft foundation are covered in detail within the body of this report. ***No site or project facilities/improvements, other than those described herein, should be designed using the soil information presented in this report. Moreover, UES will not be responsible for the performance of any site improvement so designed and constructed.***

APPENDIX A



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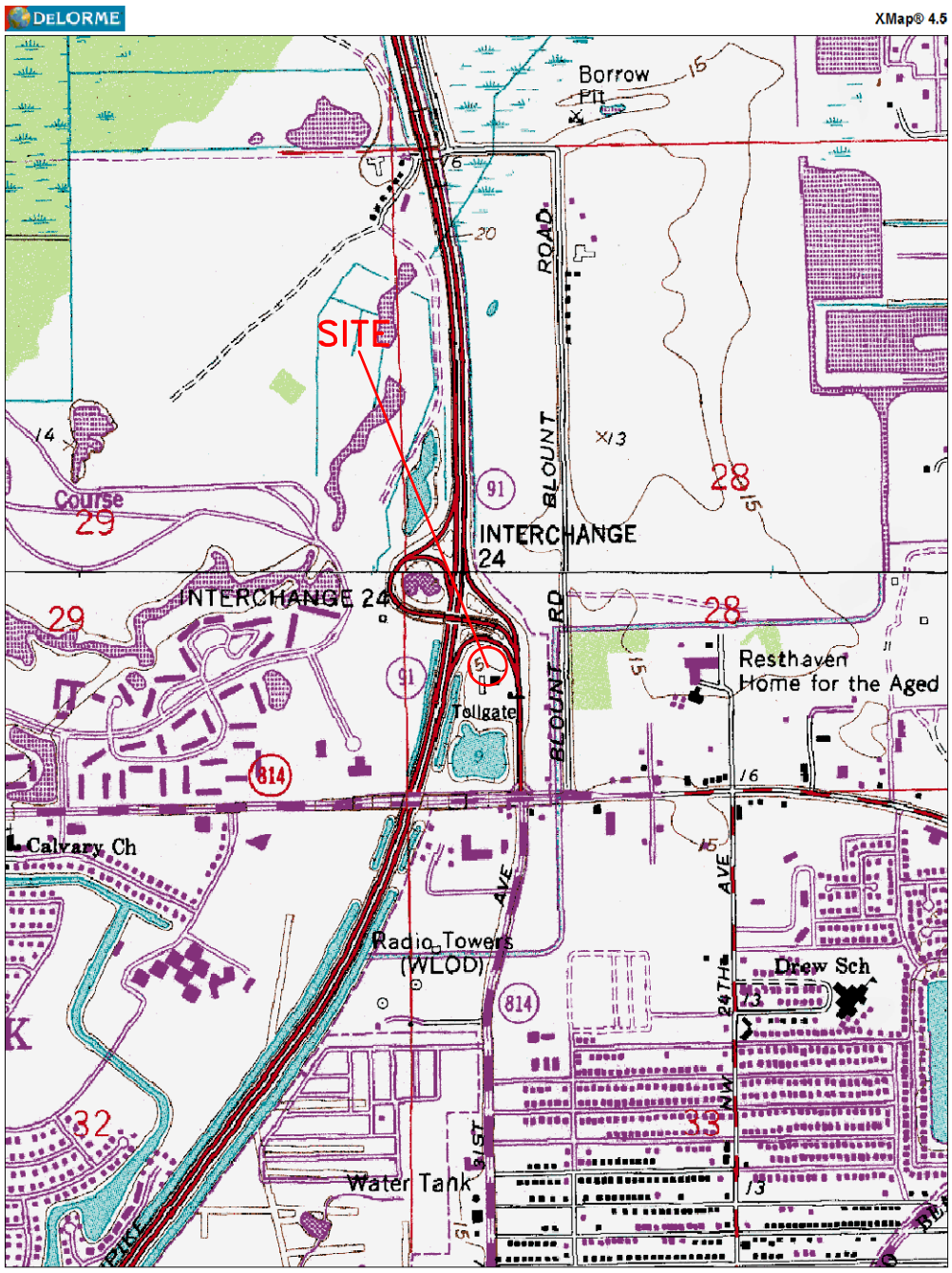
GEOTECHNICAL EXPLORATION SERVICES
260-FT COMMUNICATION TOWER
POMPANO BEACH, BROWARD COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY:	A.G.A.	DATE:	11/09/15	CHECKED BY:	P.G.R.	DATE:	11/09/15
SCALE:	NTS	PROJECT NO:	0110.1500688	REPORT NO:	13376	PAGE NO:	A–1



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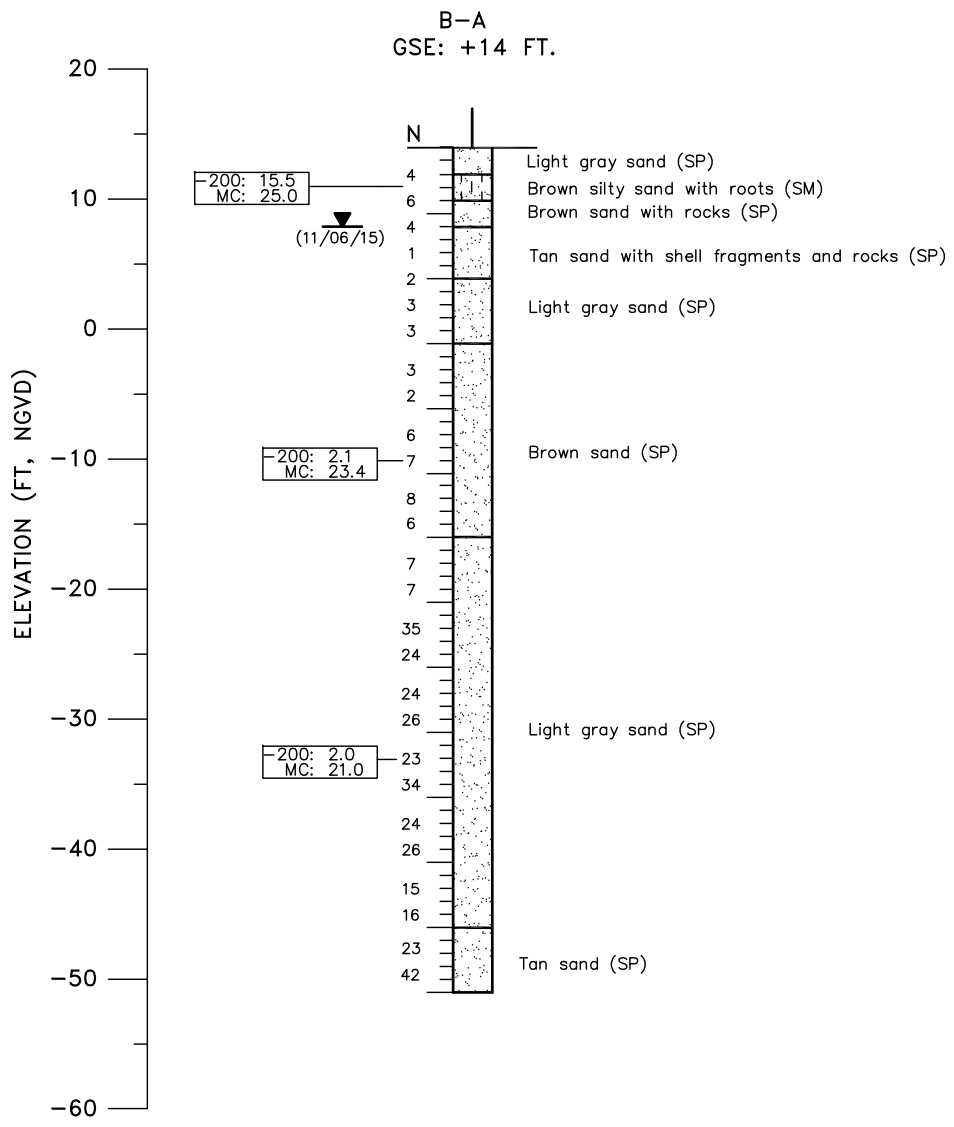
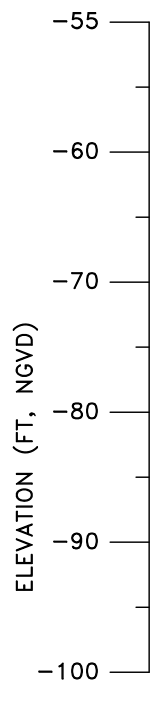
GEOTECHNICAL EXPLORATION SERVICES
260-FT COMMUNICATION TOWER
POMPANO BEACH, BROWARD COUNTY, FLORIDA

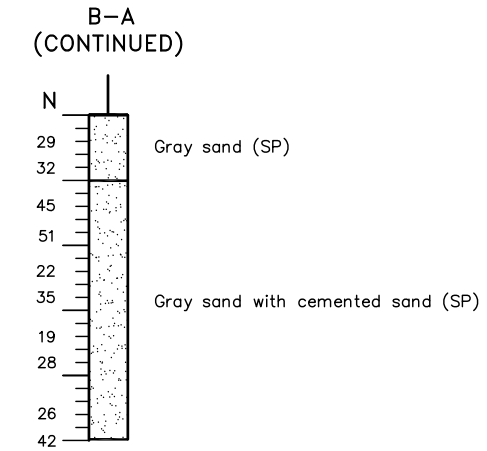
USGS MAP

DRAWN BY:	A.G.A.	DATE:	11/09/15	CHECKED BY:	P.G.R.	DATE:	11/09/15
SCALE:	AS SHOWN	PROJECT NO:	0110.1500688	REPORT NO:	13376	PAGE NO:	A–2

APPENDIX B







BORING TERMINATED AT ELEV. –76 FT.

KEY TO BORING LOGS

CHANGE IN SOIL STRATA | SAND | SAND WITH SILT | SILTY SAND | ORGANIC SILT | PEAT | SILT | LIMESTONE | SAND WITH LIMESTONE

- STANDARD PENETRATION TEST BORING LOCATION
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (18" SPOON – ASTM D–1586)
- GSE: GROUND SURFACE ELEVATION
- (SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- 100/4" NUMBER OF BLOWS FOR 4" OF PENETRATION
- WATER TABLE LEVEL (DATE)
- LL LIQUID LIMIT
- PI PLASTICITY INDEX
- –200 PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- WOR SPOON ADVANCED DUE TO WEIGHT OF RODS & HAMMER
- TOTAL LOSS OF DRILLING FLUID CIRCULATION

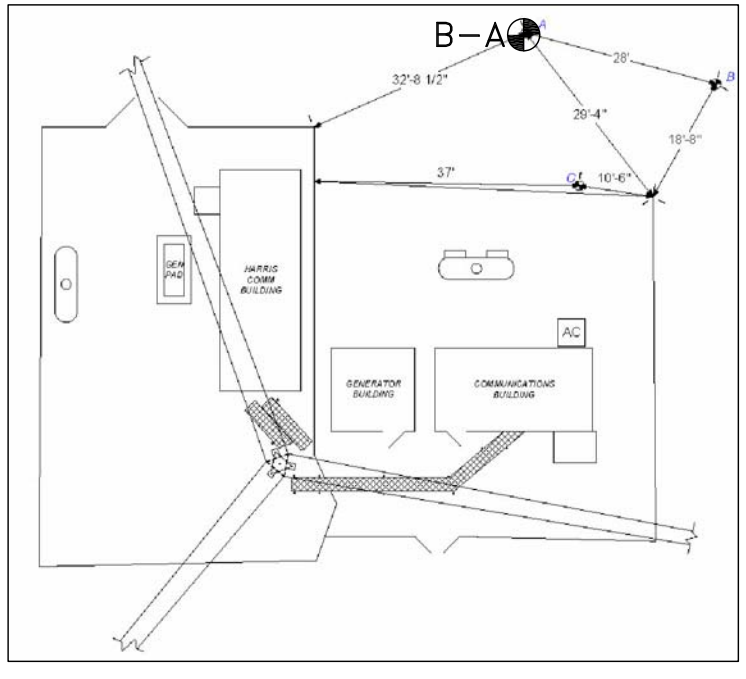
CONSISTENCY OF SOILS

GRANULAR MATERIALS (SILTS, SANDS & GRAVELS)		COHESIVE SOILS (CLAYS)	
CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)	CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)
VERY LOOSE	0–3	VERY SOFT	0–1
LOOSE	3–8	SOFT	1–3
MEDIUM DENSE	8–24	FIRM	3–6
DENSE	24–40	STIFF	6–12
VERY DENSE	40+	VERY STIFF	12–24
		HARD	24+

NOTES:

SPT BORINGS PERFORMED WITH 140 LB AUTOMATIC HAMMER

GSE OBTAINED FROM GOOGLE EARTH



BORING LOCATION PLAN (NOT TO SCALE)

N

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates	
Drawn by	J.A.G.	11/09/15	PETER G. READ, P.E.
Checked by	P.G.R.	11/09/15	P.E. LICENSE NUMBER 35604
Designed by	A.G.A.	11/09/15	UNIVERSAL ENGINEERING SCIENCES
Checked by	A.G.A.	11/17/15	1818 7TH AVENUE NORTH, UNIT 1
Approved by	P.G.R.	11/17/15	LAKE WORTH, FLORIDA 33461
			CERTIFICATE OF AUTHORIZATION #549

FLORIDA'S TURNPIKE ENTERPRISE

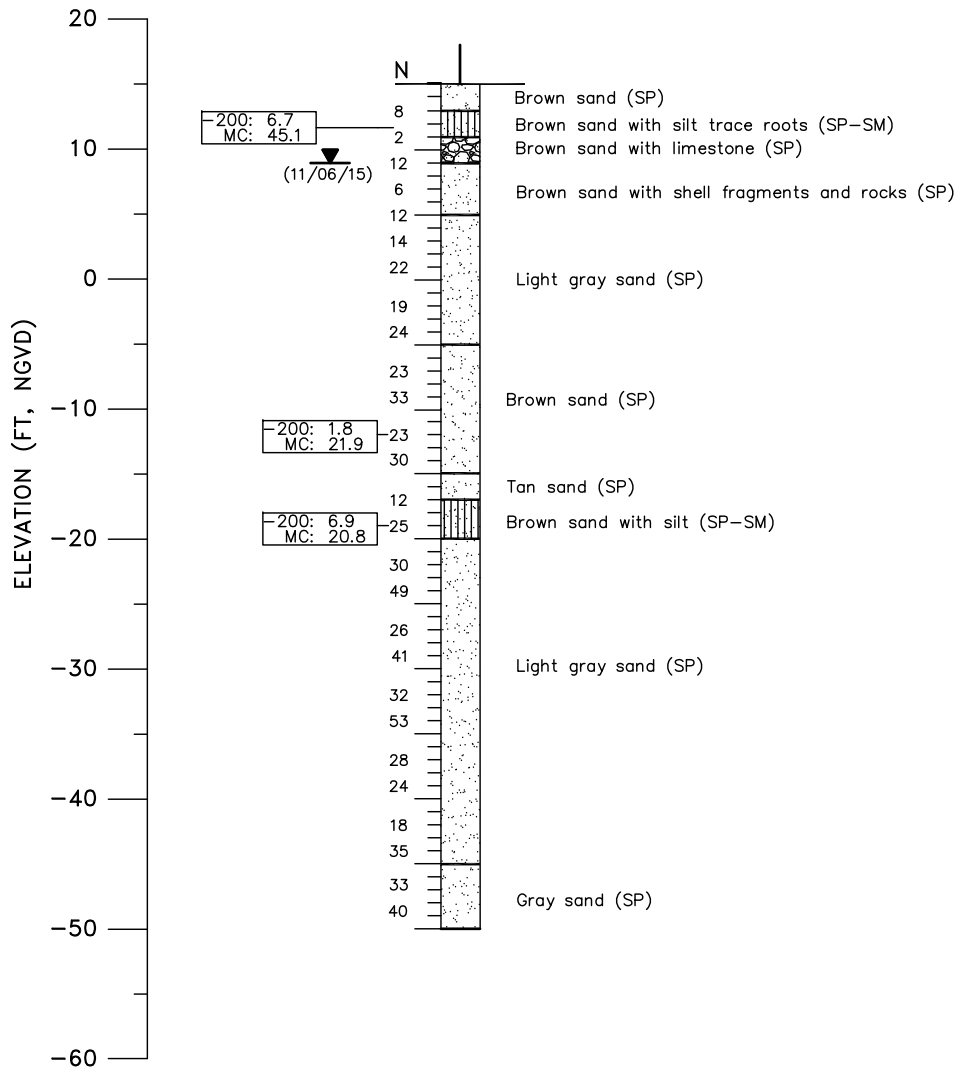
ROAD NO.	COUNTY	PROJECT NO.
	BROWARD	0110.1500688

SHEET TITLE: SPT BORINGS FOR STRUCTURE

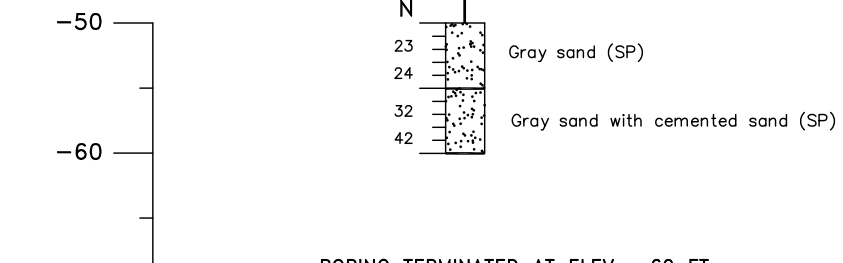
PROJECT NAME: GEOTECHNICAL REPORT FOR STRUCTURE
260–FT COMMUNICATION TOWER
POMPANO BEACH, BROWARD COUNTY, FLORIDA

SHEET NO. B–1

B–B
GSE: +15 FT.



B–B
(CONTINUED)



BORING TERMINATED AT ELEV. −60 FT.

KEY TO BORING LOGS

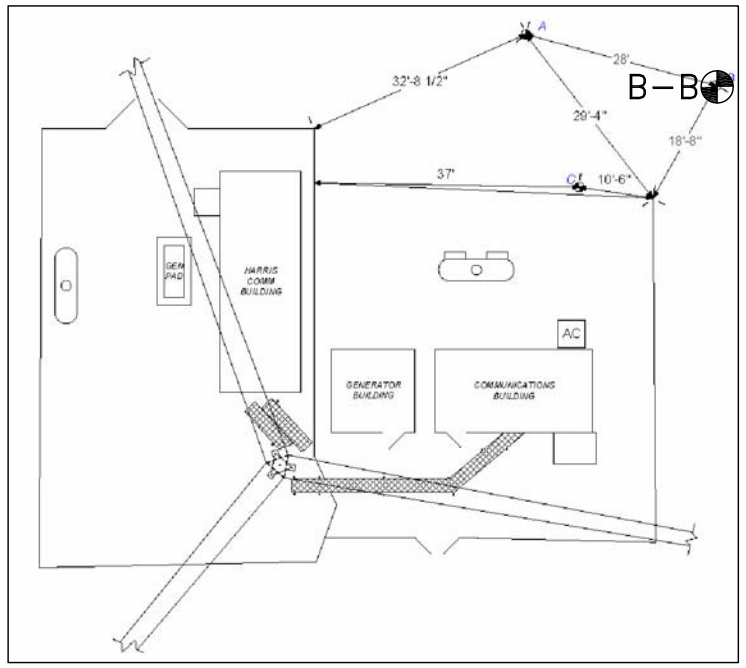
CHANGE IN SOIL STRATA | SAND | SAND WITH SILT | SILTY SAND | ORGANIC SILT | PEAT | SILT | LIMESTONE | SAND WITH LIMESTONE

- STANDARD PENETRATION TEST BORING LOCATION
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (18" SPOON – ASTM D–1586)
- GSE: GROUND SURFACE ELEVATION
- (SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- 100/4" NUMBER OF BLOWS FOR 4" OF PENETRATION
- WATER TABLE LEVEL (DATE)
- LL LIQUID LIMIT
- PI PLASTICITY INDEX
- −200 PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- WOR SPOON ADVANCED DUE TO WEIGHT OF RODS & HAMMER
- TOTAL LOSS OF DRILLING FLUID CIRCULATION

CONSISTENCY OF SOILS

GRANULAR MATERIALS (SILTS, SANDS & GRAVELS)		COHESIVE SOILS (CLAYS)	
CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)	CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)
VERY LOOSE	0–3	VERY SOFT	0–1
LOOSE	3–8	SOFT	1–3
MEDIUM DENSE	8–24	FIRM	3–6
DENSE	24–40	STIFF	6–12
VERY DENSE	40+	VERY STIFF	12–24
		HARD	24+

NOTES:
SPT BORINGS PERFORMED WITH 140 LB AUTOMATIC HAMMER
GSE OBTAINED FROM GOOGLE EARTH



BORING LOCATION PLAN (NOT TO SCALE)

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	J.A.G	11/10/15
Checked by	P.G.R.	11/10/15
Designed by	A.G.A.	11/09/15
Checked by	A.G.A.	11/17/15
Approved by	P.G.R.	11/17/15

PETER G. READ, P.E.
P.E. LICENSE NUMBER 35604
UNIVERSAL ENGINEERING SCIENCES
1818 7TH AVENUE NORTH, UNIT 1
LAKE WORTH, FLORIDA 33461
CERTIFICATE OF AUTHORIZATION #549

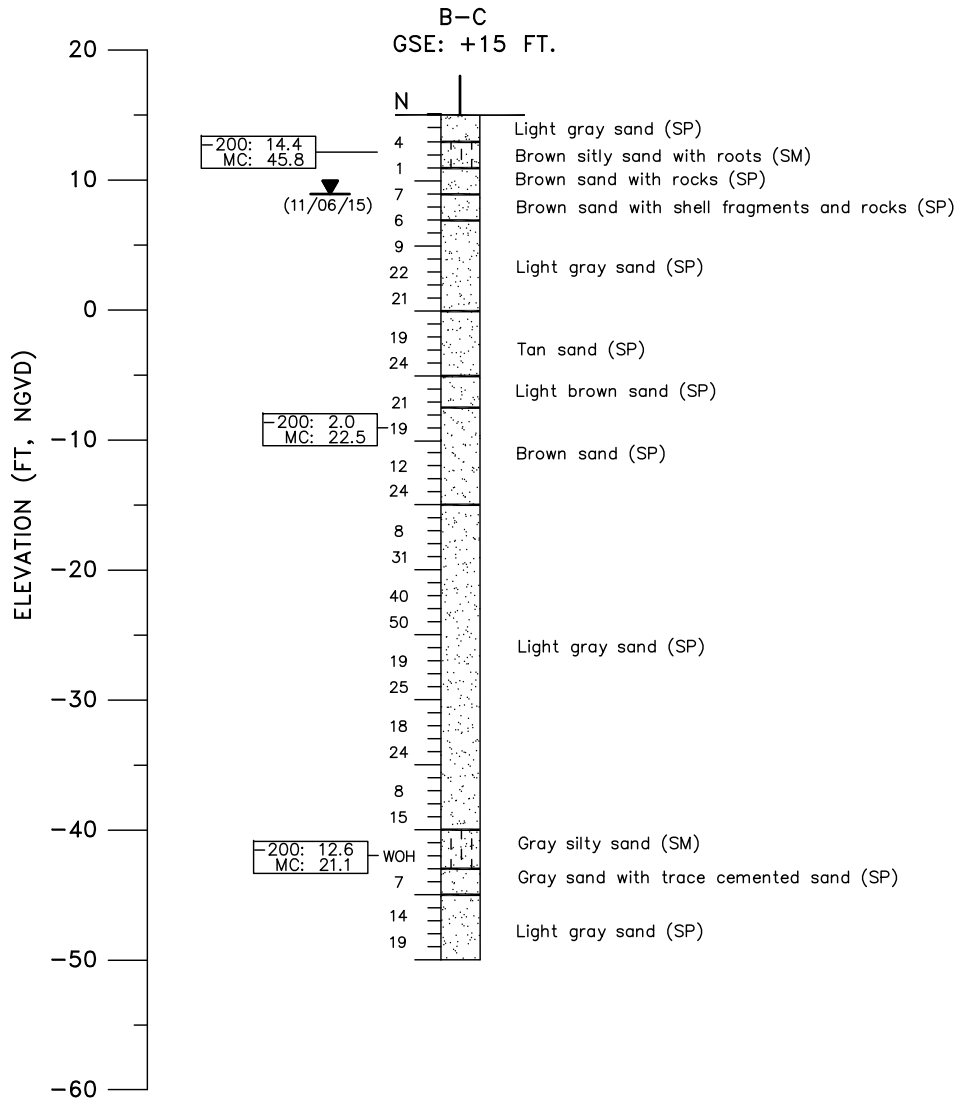
FLORIDA'S TURNPIKE ENTERPRISE

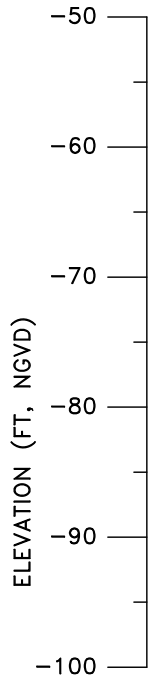
ROAD NO.	COUNTY	PROJECT NO.
	BROWARD	0110.1500688

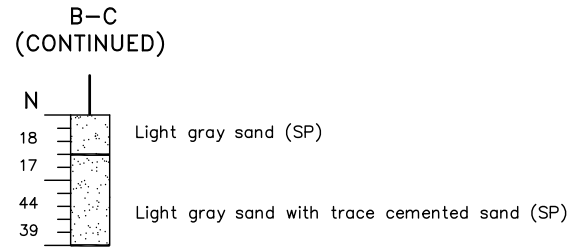
SHEET TITLE: SPT BORINGS FOR STRUCTURE

PROJECT NAME: GEOTECHNICAL REPORT FOR STRUCTURE
260–FT COMMUNICATION TOWER
POMPANO BEACH, BROWARD COUNTY, FLORIDA

SHEET NO. B–2







BORING TERMINATED AT ELEV. –60 FT.

KEY TO BORING LOGS

CHANGE IN SOIL STRATA | SAND | SAND WITH SILT | SILTY SAND | ORGANIC SILT | PEAT | SILT | LIMESTONE | SAND WITH LIMESTONE

- STANDARD PENETRATION TEST BORING LOCATION
- N STANDARD PENETRATION RESISTANCE IN BLOWS PER FOOT (18" SPOON – ASTM D–1586)
- GSE: GROUND SURFACE ELEVATION
- (SP) UNIFIED SOIL CLASSIFICATION SYSTEM GROUP SYMBOL
- 100/4" NUMBER OF BLOWS FOR 4" OF PENETRATION
- WATER TABLE LEVEL (DATE)
- LL LIQUID LIMIT
- PI PLASTICITY INDEX
- –200 PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- WC NATURAL MOISTURE CONTENT (%)
- WOR SPOON ADVANCED DUE TO WEIGHT OF RODS & HAMMER
- WOH WEIGHT OF HAMMER
- TOTAL LOSS OF DRILLING FLUID CIRCULATION

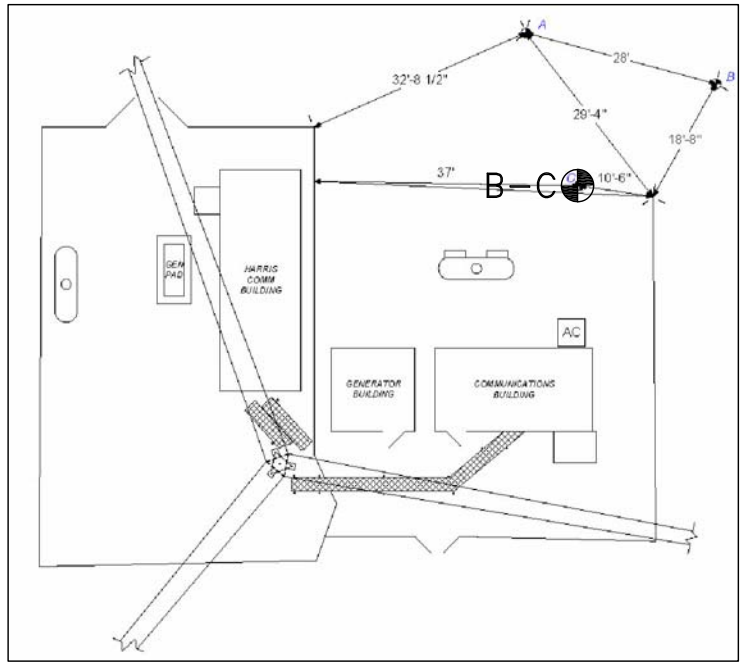
CONSISTENCY OF SOILS

GRANULAR MATERIALS (SILTS, SANDS & GRAVELS)		COHESIVE SOILS (CLAYS)	
CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)	CONSISTENCY DESIGNATION	SPT N (BLOWS/FT.)
VERY LOOSE	0–3	VERY SOFT	0–1
LOOSE	3–8	SOFT	1–3
MEDIUM DENSE	8–24	FIRM	3–6
DENSE	24–40	STIFF	6–12
VERY DENSE	40+	VERY STIFF	12–24
		HARD	24+

NOTES:

SPT BORINGS PERFORMED WITH 140 LB AUTOMATIC HAMMER

GSE OBTAINED FROM GOOGLE EARTH



BORING LOCATION PLAN (NOT TO SCALE)

REVISIONS					
Date	By	Description	Date	By	Description

	Names	Dates
Drawn by	J.A.G	11/10/15
Checked by	P.G.R.	11/10/15
Designed by	A.G.A.	11/09/15
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FLORIDA'S TURNPIKE ENTERPRISE

ROAD NO.	COUNTY	PROJECT NO.
	BROWARD	0110.1500688

SHEET TITLE: SPT BORINGS FOR STRUCTURE

PROJECT NAME: GEOTECHNICAL REPORT FOR STRUCTURE
260–FT COMMUNICATION TOWER
POMPANO BEACH, BROWARD COUNTY, FLORIDA

SHEET NO. B–3

Summary of Laboratory Testing

Boring No.	Sample Depth (feet, BEG)	Percent Fines (%)	Natural Moisture Content (%)	Organic Content (%)	Unit Weight		USCS Classification
					Wet (pcf)	Saturated (pcf)	
B-A	2 – 4	15.5	25.0	---	---	---	SM
B-A	23 – 25	2.1	23.4	---	---	---	SP
B-A	46 – 48	2.0	21.0	---	---	---	SP
B-B	2 – 4	6.7	45.1	---	---	---	SP-SM
B-B	26 – 28	1.8	21.9	---	---	---	SP
B-B	33 – 35	6.9	20.8	---	---	---	SP-SM
B-C	2 – 4	14.4	45.8	---	---	---	SM
B-C	23 – 25	2.0	22.5	---	---	---	SP
B-C	56 – 58	12.6	21.1	---	---	---	SM

Proposed 260-Ft Communication Tower
Dr. Martin Luther King Boulevard and Florida's Turnpike Junction
Pompano Beach, Broward County, Florida

ULTIMATE UNIT SIDE RESISTANCE (BORING B-A)

Layer Depth (Ft)	Ave. Depth z (Ft)	γ_b (pcf)	Ave. Vertical Eff. Stress P_V' (psf)	Ave. N_{60}	β $1.5 - 0.135(z)^{0.5}$	β_c Corrected β for $N_{60} < 15$ $\beta * N/15$	Estimated Ultimate Unit Side Resistance (ksf) $f_s = P_V'\beta$
0 – 20	10	52.6	$\frac{0+1052}{2} = 526$	3	$1.5 - 0.135(10)^{0.5}$ $= 1.07$	$1.07 * 3/15$ $= 0.21$	$f_s = 526 \times 0.21$ $= 0.11$
20 – 35	27.5	52.6	$\frac{1052+1841}{2} = 1447$	7	$1.5 - 0.135(27.5)^{0.5}$ $= 0.79$	$0.79 * 7/15$ $= 0.37$	$f_s = 1447 \times 0.37$ $= 0.54$
35 – 50	42.5	52.6	$\frac{1841+2630}{2} = 2236$	28	$1.5 - 0.135(42.5)^{0.5}$ $= 0.62$	---	$f_s = 2236 \times 0.62$ $= 1.39$
50 – 70	60	52.6	$\frac{2630+3682}{2} = 3156$	32	$1.5 - 0.135(60)^{0.5}$ $= 0.45$	---	$f_s = 3156 \times 0.45$ $= 1.42$
70 – 90	80	52.6	$\frac{3682+4734}{2} = 4208$	34	$1.5 - 0.135(80)^{0.5}$ $= 0.29$	---	$f_s = 4208 \times 0.29$ $= 1.22$

ULTIMATE UNIT SIDE RESISTANCE (BORING B-B)

Layer Depth (Ft)	Ave. Depth z (Ft)	γ_b (pcf)	Ave. Vertical Eff. Stress P_V' (psf)	Ave. N_{60}	β $1.5 - 0.135(z)^{0.5}$	β_c Corrected β for $N_{60} < 15$ $\beta * N/15$	Estimated Ultimate Unit Side Resistance (ksf) $f_s = P_V'\beta$
0 – 10	5	52.6	$\frac{0+526}{2} = 263$	8	$1.5 - 0.135(5)^{0.5}$ $= 1.2$	$1.2 * 8/15$ $= 0.64$	$f_s = 263 \times 0.64$ $= 0.17$
10 – 20	15	52.6	$\frac{526+1052}{2} = 789$	20	$1.5 - 0.135(15)^{0.5}$ $= 0.98$	---	$f_s = 789 \times 0.98$ $= 0.77$
20 – 40	30	52.6	$\frac{1052+2104}{2} = 1578$	28	$1.5 - 0.135(30)^{0.5}$ $= 0.76$	---	$f_s = 1578 \times 0.76$ $= 1.20$
40 – 55	47.5	52.6	$\frac{2104+2893}{2} = 2499$	34	$1.5 - 0.135(47.5)^{0.5}$ $= 0.57$	---	$f_s = 2499 \times 0.57$ $= 1.42$
55 – 75	65	52.6	$\frac{2893+3945}{2} = 3419$	31	$1.5 - 0.135(65)^{0.5}$ $= 0.41$	---	$f_s = 3419 \times 0.41$ $= 1.40$

ULTIMATE UNIT SIDE RESISTANCE (BORING B-C)

Layer Depth (Ft)	Ave. Depth z (Ft)	γ_b (pcf)	Ave. Vertical Eff. Stress P_V' (psf)	Ave. N_{60}	β $1.5 - 0.135(z)^{0.5}$	β_c Corrected β for $N_{60} < 15$ $\beta * N/15$	Estimated Ultimate Unit Side Resistance (ksf) $f_s = P_V'\beta$
0 – 10	5	52.6	$\frac{0+526}{2} = 263$	5	$1.5 - 0.135(5)^{0.5}$ $= 1.2$	$1.2 * 5/15$ $= 0.4$	$f_s = 263 \times 0.4$ $= 0.11$
10 – 20	15	52.6	$\frac{526+1052}{2} = 789$	22	$1.5 - 0.135(15)^{0.5}$ $= 0.98$	---	$f_s = 789 \times 0.98$ $= 0.77$
20 – 40	30	52.6	$\frac{1052+2104}{2} = 1578$	26	$1.5 - 0.135(30)^{0.5}$ $= 0.76$	---	$f_s = 1578 \times 0.76$ $= 1.20$
40 – 55	47.5	52.6	$\frac{2104+2893}{2} = 2499$	18	$1.5 - 0.135(47.5)^{0.5}$ $= 0.57$	---	$f_s = 2499 \times 0.57$ $= 1.42$
55 – 75	65	52.6	$\frac{2893+3945}{2} = 3419$	20	$1.5 - 0.135(65)^{0.5}$ $= 0.41$	---	$f_s = 3419 \times 0.41$ $= 1.40$

APPENDIX C

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE THE GEOPROFESSIONAL BUSINESS ASSOCIATION

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

IIGER03135.0MRP

CONSTRAINTS AND RESTRICTIONS

WARRANTY

UES has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and UES of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of UES to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

UES is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of UES.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by UES.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations. Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. UES cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for UES to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by UES to locate any such buried objects. UES cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

APPENDIX D

Universal Engineering Sciences, Inc.

GENERAL CONDITIONS

SECTION 1: RESPONSIBILITIES

1.1 *Universal Engineering Sciences, Inc*., ("UES"), has the responsibility for providing the services described under the Scope of Services section. The work is to be performed according to accepted standards of care and is to be completed in a timely manner. The term "UES" as used herein includes all of *Universal Engineering Sciences, Inc's* agents, employees, professional staff, and subcontractors.

1.2 The Client or a duly authorized representative is responsible for providing UES with a clear understanding of the project nature and scope. The Client shall supply UES with sufficient and adequate information, including, but not limited to, maps, site plans, reports, surveys and designs, to allow UES to properly complete the specified services. The Client shall also communicate changes in the nature and scope of the project as soon as possible during performance of the work so that the changes can be incorporated into the work product.

1.3 The Client acknowledges that UES's responsibilities in providing the services described under the Scope of Services section is limited to those services described therein, and the Client hereby assumes any collateral or affiliated duties necessitated by or for those services. Such duties may include, but are not limited to, reporting requirements imposed by any third party such as federal, state, or local entities, the provision of any required notices to any third party, or the securing of necessary permits or permissions from any third parties required for UES's provision of the services so described, unless otherwise agreed upon by both parties.

1.4 Universal will not be responsible for scheduling our services and will not be responsible for tests or inspections that are not performed due to a failure to schedule our services on the project or any resulting damages.

1.5 **PURSUANT TO FLORIDA STATUTES §558.0035, ANY INDIVIDUAL EMPLOYEE OR AGENT OF UES MAY NOT BE HELD INDIVIDUALLY LIABLE FOR NEGLIGENCE.**

SECTION 2: STANDARD OF CARE

2.1 Services performed by UES under this Agreement will be conducted in a manner consistent with the level of care and skill ordinarily exercised by members of UES's profession practicing contemporaneously under similar conditions in the locality of the project. No other warranty, express or implied, is made.

2.2 The Client recognizes that subsurface conditions may vary from those observed at locations where borings, surveys, or other explorations are made, and that site conditions may change with time. Data, interpretations, and recommendations by UES will be based solely on information available to UES at the time of service. UES is responsible for those data, interpretations, and recommendations, but will not be responsible for other parties' interpretations or use of the information developed.

2.3 Execution of this document by UES is not a representation that UES has visited the site, become generally familiar with local conditions under which the services are to be performed, or correlated personal observations with the requirements of the Scope of Services. It is the Client's responsibility to provide UES with all information necessary for UES to provide the services described under the Scope of Services, and the Client assumes all liability for information not provided to UES that may affect the quality or sufficiency of the services so described.

2.4 Should UES be retained to provide threshold inspection services under Florida Statutes §553.79, Client acknowledges that UES's services thereunder do not constitute a guarantee that the construction in question has been properly designed or constructed, and UES's services do not replace any of the obligations or liabilities associated with any architect, contractor, or structural engineer. Therefore it is explicitly agreed that the Client will not hold UES responsible for the proper performance of service by any architect, contractor, structural engineer or any other entity associated with the project.

SECTION 3: SITE ACCESS AND SITE CONDITIONS

3.1 Client will grant or obtain free access to the site for all equipment and personnel necessary for UES to perform the work set forth in this Agreement. The Client will notify any and all possessors of the project site that Client has granted UES free access to the site. UES will take reasonable precautions to minimize damage to the site, but it is understood by Client that, in the normal course of work, some damage may occur, and the correction of such damage is not part of this Agreement unless so specified in the Proposal.

3.2 The Client is responsible for the accuracy of locations for all subterranean structures and utilities. UES will take reasonable precautions to avoid known subterranean structures, and the Client waives any claim against UES, and agrees to defend, indemnify, and hold UES harmless from any claim or liability for injury or loss, including costs of defense, arising from damage done to subterranean structures and utilities not identified or accurately located. In addition, Client agrees to compensate UES for any time spent or expenses incurred by UES in defense of any such claim with compensation to be based upon UES's prevailing fee schedule and expense reimbursement policy.

SECTION 4: SAMPLE OWNERSHIP AND DISPOSAL

4.1 Soil or water samples obtained from the project during performance of the work shall remain the property of the Client.

4.2 UES will dispose of or return to Client all remaining soils and rock samples 60 days after submission of report covering those samples. Further storage or transfer of samples can be made at Client's expense upon Client's prior written request.

4.3 Samples which are contaminated by petroleum products or other chemical waste will be returned to Client for treatment or disposal, consistent with all appropriate federal, state, or local regulations.

SECTION 5: BILLING AND PAYMENT

5.1 UES will submit invoices to Client monthly or upon completion of services. Invoices will show charges for different personnel and expense classifications.

5.2 Payment is due 30 days after presentation of invoice and is past due 31 days from invoice date. Client agrees to pay a finance charge of one and one-half percent (1 ½ %) per month, or the maximum rate allowed by law, on past due accounts.

5.3 If UES incurs any expenses to collect overdue billings on invoices, the sums paid by UES for reasonable attorneys' fees, court costs, UES's time, UES's expenses, and interest will be due and owing by the Client.

SECTION 6: OWNERSHIP AND USE OF DOCUMENTS

6.1 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, as instruments of service, shall remain the property of UES.

6.2 Client agrees that all reports and other work furnished to the Client or his agents, which are not paid for, will be returned upon demand and will not be used by the Client for any purpose.

6.3 UES will retain all pertinent records relating to the services performed for a period of five years following submission of the report, during which period the records will be made available to the Client at all reasonable times.

6.4 All reports, boring logs, field data, field notes, laboratory test data, calculations, estimates, and other documents prepared by UES, are prepared for the sole and exclusive use of Client, and may not be given to any other party or used or relied upon by any such party without the express written consent of UES.

SECTION 7: DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS

7.1 Client warrants that a reasonable effort has been made to inform UES of known or suspected hazardous materials on or near the project site.

7.2 Under this agreement, the term hazardous materials include hazardous materials (40 CFR 172.01), hazardous wastes (40 CFR 261.2), hazardous substances (40 CFR 300.6), petroleum products, polychlorinated biphenyls, and asbestos.

7.3 Hazardous materials may exist at a site where there is no reason to believe they could or should be present. UES and Client agree that the discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work. UES and Client also agree that the discovery of unanticipated hazardous materials may make it necessary for UES to take immediate measures to protect health and safety. Client agrees to compensate UES for any equipment decontamination or other costs incident to the discovery of unanticipated hazardous waste.

7.4 UES agrees to notify Client when unanticipated hazardous materials or suspected hazardous materials are encountered. Client agrees to make any disclosures required by law to the appropriate governing agencies. Client also agrees to hold UES harmless for any and all consequences of disclosures made by UES which are required by governing law. In the event the project site is not owned by Client, Client recognizes that it is the Client's responsibility to inform the property owner of the discovery of unanticipated hazardous materials or suspected hazardous materials.

7.5 Notwithstanding any other provision of the Agreement, Client waives any claim against UES, and to the maximum extent permitted by law, agrees to defend, indemnify, and save UES harmless from any claim, liability, and/or defense costs for injury or loss arising from UES's discovery of unanticipated hazardous materials or suspected hazardous materials including any costs created by delay of the project and any cost associated with possible reduction of the property's value. Client will be responsible for ultimate disposal of any samples secured by UES which are found to be contaminated.

SECTION 8: RISK ALLOCATION

8.1 Client agrees that UES's liability for any damage on account of any breach of contract, error, omission or other professional negligence will be limited to a sum not to exceed $50,000 or UES's fee, whichever is greater. If Client prefers to have higher limits on contractual or professional liability, UES agrees to increase the limits up to a maximum of $1,000,000.00 upon Client's written request at the time of accepting our proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $400.00, whichever is greater. The additional charge for the higher liability limits is because of the greater risk assumed and is not strictly a charge for additional professional liability insurance.

SECTION 9: INSURANCE

9.1 UES represents and warrants that it and its agents, staff and consultants employed by it, is and are protected by worker's compensation insurance and that UES has such coverage under public liability and property damage insurance policies which UES deems to be adequate. Certificates for all such policies of insurance shall be provided to Client upon request in writing. Within the limits and conditions of such insurance, UES agrees to indemnify and save Client harmless from and against loss, damage, or liability arising from negligent acts by UES, its agents, staff, and consultants employed by it. UES shall not be responsible for any loss, damage or liability beyond the amounts, limits, and conditions of such insurance or the limits described in Section 8, whichever is less. The Client agrees to defend, indemnify and save UES harmless for loss, damage or liability arising from acts by Client, Client's agent, staff, and other UESs employed by Client.

SECTION 10: DISPUTE RESOLUTION

10.1 All claims, disputes, and other matters in controversy between UES and Client arising out of or in any way related to this Agreement will be submitted to alternative dispute resolution (ADR) such as mediation or arbitration, before and as a condition precedent to other remedies provided by law, including the commencement of litigation.

10.2 If a dispute arises related to the services provided under this Agreement and that dispute requires litigation instead of ADR as provided above, then:

(a) the claim will be brought and tried in judicial jurisdiction of the court of the county where UES's principal place of business is located and Client waives the right to remove the action to any other county or judicial jurisdiction, and

(b) The prevailing party will be entitled to recovery of all reasonable costs incurred, including staff time, court costs, attorneys' fees, and other claim related expenses.

SECTION 11: TERMINATION

11.1 This agreement may be terminated by either party upon seven (7) days written notice in the event of substantial failure by the other party to perform in accordance with the terms hereof. Such termination shall not be effective if that substantial failure has been remedied before expiration of the period specified in the written notice. In the event of termination, UES shall be paid for services performed to the termination notice date plus reasonable termination expenses.

11.2 In the event of termination, or suspension for more than three (3) months, prior to completion of all reports contemplated by the Agreement, UES may complete such analyses and records as are necessary to complete its files and may also complete a report on the services performed to the date of notice of termination or suspension. The expense of termination or suspension shall include all direct costs of UES in completing such analyses, records and reports.

SECTION 12: ASSIGNS

12.1 Neither the Client nor UES may delegate, assign, sublet or transfer their duties or interest in this Agreement without the written consent of the other party.

SECTION 13. GOVERNING LAW AND SURVIVAL

13.1 The laws of the State of Florida will govern the validity of these Terms, their interpretation and performance.

13.2 If any of the provisions contained in this Agreement are held illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired. Limitations of liability and indemnities will survive termination of this Agreement for any cause.

SECTION 14. INTEGRATION CLAUSE

14.1 This Agreement represents and contains the entire and only agreement and understanding among the parties with respect to the subject matter of this Agreement, and supersedes any and all prior and contemporaneous oral and written agreements, understandings, representations, inducements, promises, warranties, and conditions among the parties. No agreement, understanding, representation, inducement, promise, warranty, or condition of any kind with respect to the subject matter of this Agreement shall be relied upon by the parties unless expressly incorporated herein.

14.2 This Agreement may not be amended or modified except by an agreement in writing signed by the party against whom the enforcement of any modification or amendment is sought.