REPORT OF GEOTECHNICAL CONSULTING SERVICES

Lake Deaton Park Pier Decking Renovation
5300 County Road 133
Wildwood, Sumter County, Florida

UES Project No. 0230.2300061.0000
UES Report No. 2024867

Prepared for:

City of Wildwood
743 Huey Street
Wildwood, FL 34785

Prepared by:

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July 5, 2023

July 5, 2023

City of Wildwood
743 Huey Street
Wildwood, FL 34785

Attention: Mr. Jeremy Hockenbury
Public Works Director

Reference: **Report of Geotechnical Consulting Services**
Lake Deaton Park Pier Decking Renovation
5300 County Road 133
Wildwood, Sumter County, Florida
UES Project No.: 0230.2300061.0000 UES Report No.: 2024867

Dear Mr. Hockenbury:

Universal Engineering Sciences, LLC (UES) has completed the geotechnical engineering services for the subject project in Wildwood, Sumter County, Florida. This geotechnical Report is submitted in satisfaction of the contracted scope of services as summarized in UES Proposal No. 2005665v2, dated May 19, 2023.

This Report presents the results of our field subsurface exploration and laboratory soil testing programs, and recommendations for geotechnical site preparation, pavement design, and pier boardwalk structure foundation design and construction.

We appreciate the opportunity to have assisted you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, LLC
Certificate of Authorization 549

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This item has been electronically signed and sealed by Eduardo Suarez, PE on the date adjacent to the seal using Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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EXECUTIVE SUMMARY

We have prepared this executive summary solely to provide a general overview. Do not rely on this executive summary for any purpose except that for which it was prepared. Rely on the full report for information about findings, recommendations, and other concerns.

Project Location and Description

The subject property is located at Lake Deaton Park at 5300 County Road 133 in Wildwood, Sumter County, Florida. Our office was provided with drawings titled, “Site Grading and Erosion Protection Plan,” and “Fishing Pier Boardwalk Structural Framing Plan,” prepared by CPH Corp., LLC. We understand that the proposed project will consist of removing a section of the existing sidewalk and replacing with a pier boardwalk structure, and pavement improvements, at Lake Deaton Park.

Soil and Groundwater Considerations

The soil test borings generally encountered a surficial layer of sand with silt to silty sand [SP-SM/SM] to depths of 1.5 to 5 feet overlying a muck/peat [PT], organic soils layer to depths of 4 to 7 feet. Below the muck/peat, organic soil layers, soil borings generally encountered sand to silty sand [SP/SP-SM/SM] to depths of 8.5 to 10 feet followed by interbedded layers of clayey sand to sandy clay [SC/CH] to the maximum boring termination depth of 30 feet below existing grades.

The groundwater levels were measured at depths of 1.5 to 4.5 feet below existing grades. Fluctuations of groundwater level conditions along the project alignment should be expected to occur seasonally as result of rainfall, surface runoff, nearby construction activities, and other factors.

Recommendations:

A driven pile foundation system was considered for the pier board structure, and following proper installation procedures should provide satisfactory foundation support for the proposed construction. The structural engineer should determine the minimum depth of pile embedment.

1.0 INTRODUCTION

1.1 GENERAL

In this report, we present the results of the subsurface exploration of the site for the improvements in Wildwood, Sumter County, Florida. We have divided this report into the following sections:

- SCOPE OF SERVICES - Defines what we did
- FINDINGS - Describes what we found
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- APPENDICES - Presents support materials referenced in this report

2.0 SCOPE OF SERVICES

2.1 PROJECT INFORMATION

The subject property is located at Lake Deaton Park at 5300 County Road 133 in Wildwood, Sumter County, Florida. Our office was provided with drawings titled, “Site Grading and Erosion Protection Plan,” and “Fishing Pier Boardwalk Structural Framing Plan,” prepared by CPH Corp., LLC. We understand that the proposed project will consist of removing a section of the existing sidewalk and replacing with a pier boardwalk structure, and pavement improvements, at Lake Deaton Park.

Our office was not provided with Foundation Plans or any other construction-related information other than that discussed herein. If our understandings and assumptions of project issues are incorrect our conclusions and recommendations will not be considered valid until we have had the opportunity to review all pertinent issues. The above constitutes all of the project information provided to our office at the time of this Report preparation.

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 foundation and grading plans, including 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 the structures.

2.2 PURPOSE

The purposes of this exploration were:

- To explore the prevailing site subsurface conditions within the suggested areas to gather information concerning the near-surface soil conditions,

- To perform a series of laboratory tests on selected subsurface soil specimens, recovered from the field exploration program to assist with engineering soil classifications,

- To classify and stratify the various soil strata encountered in the soil test borings,

- To evaluate the groundwater level in the area of exploration and make appropriate recommendations,

- To prepare foundation and construction recommendations for the proposed dock/boardwalk structures,

- To prepare pavement design parameters for the proposed parking improvements.

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. Universal Engineering Sciences would be pleased to perform these services, if you desire.

2.3 FIELD EXPLORATION

The field geotechnical testing activities were started and completed on June 12, 2023. Field testing for the geotechnical study included two (2) soil test borings within the limits of the proposed dock/boardwalk areas to depths of 30 feet, and four (4) soil test borings to depths of 10 feet within the proposed parking improvement areas. The test quantities and locations for the proposed structure were selected by the Design Team. The test locations were staked in the field by UES personnel. The soil test boring locations are shown in the attached Boring Location Plan drawing.

Representative portions of the subsurface soil samples recovered were transported to our Gainesville soils laboratory. The soil samples were visually classified by an experienced Geotechnical Engineer. It should be noted that soil conditions might vary between soil test boring locations, and between the subsurface soil strata interfaces which have been shown on the Boring Logs. The soil test boring data reflect information from the specific test locations only.

2.3.1 Standard Penetration Test (SPT) Borings

Penetration tests were performed in accordance with ASTM Procedure D-1586, *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*. This test procedure generally involves driving a 1.4-inch I.D. split-tube sampler into the soil profile in six inch increments for a minimum distance of 18 inches using a 140-pound hammer free-falling 30 inches. The total number of blows required to drive the sampler the second and third 6-inch increments is designated as the N-value, and provides an indication of in-place soil strength, density, and consistency.

2.3.2 Auger Borings

The auger borings were performed in accordance with ASTM Procedure D-1452, *Standard Practice for Soil Investigation and Sampling by Auger Borings*. This test procedure advances a solid stem auger into the soil in a manner which reduces soil disturbance. At the selected depth, the auger advance and rotation are stopped, and the auger flight retracted from the borehole. The in-place soil profile is determined by visual inspection of the soils recovered in the auger flights.

2.4 LABORATORY TESTING

2.4.1 Visual Classification

The soil samples recovered from the soil test borings were returned to our laboratory where an engineer visually reviewed the field descriptions in accordance with ASTM D-2488. Using the results of the laboratory tests, our visual observation, and our review of the field boring logs we classified the soil borings in accordance with the current Unified Soil Classification System (USCS). We then selected representative soil samples for laboratory testing.

2.4.2 Index Testing

Laboratory testing was performed on selected samples of the soils encountered in the field exploration to evaluate soil composition and properties. Testing was performed in accordance to ASTM procedures and included Percent passing No. 200 Sieve (ASTM D-1140), natural moisture content (ASTM D-2216), organic content (ASTM D-2974), and Atterberg Limits (ASTM D-4318). The test results have been presented on the attached Boring Logs.

3.0 FINDINGS

3.1 REGIONAL GEOLOGY

The general geology of Sumter County is characterized by a surface veneer of Pleistocene and Pliocene sands and sandy clays overlying the Miocene age Hawthorn Group. The Hawthorn Group includes a highly variable mixture of interbedded quartz sands, clays, carbonates, pebbles and grains occurring in thickness of up to 150 feet. The surface of the upper Floridan Aquifer in the general project site area is estimated in the elevation range of +50 to +60 feet, NGVD.

3.2 KARST TOPOGRAPHY

About 10% of the earth's land (and 15% of the United States) crust is composed of, or underlain by, soluble limestone. When limestone interacts with underground water, over time, the water dissolves the limestone to form karst topography, a mix of caves, underground channels, and rough and undulating ground surfaces. The underground water of karst topography carves channels and caves that become susceptible to collapse from the surface. When enough limestone is eroded from underground, a sinkhole may develop. Sinkholes can range in size and depth from a few feet to over 300 feet. The topography of North Central Florida is characteristic of karst terrain, with sinkholes caused by natural climatic variability, as well as, man-made activities, such as, the drop in groundwater levels from well pumping.

Per contract scope of services, our exploration was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for surface expression of deep geological conditions, such as sinkhole development related to karst activity. This evaluation requires a more extensive range of field services than performed in this study.

3.3 SURFACE CONDITIONS

UES engineering personnel visited the project site prior to and during the performance of the field portion of this geotechnical study. At the time of our exploration the proposed improvement area was developed with an existing boardwalk and dock. Surface soils were observed to be sandy with traces of organics, and dry. Surface debris or unusual ground depressions were not observed on the project site.

3.4 SUBSURFACE CONDITIONS

The soil test borings performed beneath the proposed structures were reviewed to evaluate the subsurface soil strata lateral continuity and uniformity, both parameters that would have an impact in foundation system selection and performance. Soil classifications and descriptions for this geotechnical study are based both on the results of the laboratory soil testing programs and on visual examinations of soil specimens by the Geotechnical Engineer. The subsurface soil conditions encountered in the soil test borings have been summarized in the attached Boring Logs and described below.

The soil test borings generally encountered a surficial layer of sand with silt to silty sand [SP-SM/SM] to depths of 1.5 to 5 feet overlying a muck/peat [PT], organic soils layer to depths of 4 to 7 feet. Below the muck/peat, organic soil layers, soil borings generally encountered sand to silty sand [SP/SP-SM/SM] to depths of 8.5 to 10 feet followed by interbedded layers of clayey sand to sandy clay [SC/CH] to the maximum boring termination depth of 30 feet below existing grades.

3.5 GROUNDWATER DEPTH

The groundwater levels were measured at depths of 1.5 to 4.5 feet below existing grades at the time of our field exploration. Fluctuations of groundwater level conditions along the project alignment should be expected to occur seasonally as result of rainfall, surface runoff, nearby construction activities, and other factors.

3.6 LABORATORY TESTING

The soil samples recovered from the field exploration program were placed in containers and returned to our soils laboratory, where the Geotechnical Engineer visually examined and classified the samples. Laboratory soil tests are performed to aid in the classification of the soils, and to help in the evaluation of engineering characteristics of the soils. Representative soil samples were selected for percent fines determination, moisture content, organic content, and Atterberg Limits testing. The test results have been presented on the attached Boring Logs and summarized in Table 1.

3.6.1 Percent Passing No. 200 Sieve

Certain recovered soil samples were selected to determine the percentage of fines. In these tests the soil sample was dried and washed over a U.S. No. 200 mesh sieve. The percent of soil by weight passing the sieve was the percentage of fines or portion of the sample in the silt and clay size range. This test was conducted in accordance with ASTM Procedure D-1140, *Standard Test Methods for Amount of Material in Soils Finer than the No. 200 Sieve.*

3.6.2 Moisture Content

Certain recovered soil samples were selected to determine their moisture content. The moisture content was the ratio expressed as a percentage of the weight of water in a given mass of soil to the weight of the solid particles. These tests were conducted in accordance with ASTM Procedure D-2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock.

3.6.3 Atterberg Limits

Certain recovered soil samples were selected for Atterberg Limits testing to evaluate the soil plasticity characteristics. The soil's Plasticity Index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The LL is the moisture content at which the soil will flow as a heavy viscous fluid. The PL is the lowest moisture content at which the soil is sufficiently plastic so as to be manually rolled into a 1/8-inch diameter thread. The test was conducted in general accordance with ASTM Procedure D-4318, *Standard Test Methods for LL, PL and Plasticity Index of Soils*.

3.6.4 Organic Content

Certain soil samples were selected to determine the organic content. This test was conducted in accordance with ASTM Procedure D-2974 *Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils*. This test method evaluates the moisture content, ash content, and organic matter in peats and other organic soils, such as organic clay, silt, and sand. The soil specimens were first dried to measure the initial moisture content, and then transferred to a high temperature kiln that burns off the organic materials. The organic content was then calculated as the ratio of the weight loss to the dry weight of the soil measured from the low temperature oven; it was expressed as a percent.

Table 1 – Laboratory Soil Test Results

Soil Test Boring	Sample Depth	Type of Test	Results	Soil Description
B-1	4.5 feet	Organic Content	33 %	Muck
		Moisture Content	210 %	
B-1	24 feet	% Finer #200	50 %	Sandy Clay
		Moisture Content	24 %	
		Atterberg Limits	LL = 35 , PI = 21	
B-2	6 feet	Organic Content	31 %	Muck
		Moisture Content	188 %	
B-2	19 feet	% Finer #4	100 %	Clayey Sand
		% Finer #10	100 %	
		% Finer #40	89 %	
		% Finer #60	67 %	
		% Finer #100	48 %	
		% Finer #200	35 %	
		Moisture Content	15 %	
A-1	2 feet	Organic Content	24 %	Muck
		Moisture Content	152 %	
A-3	4.5 feet	% Finer #200	14 %	Organic Silty Sand

4.0 RECOMMENDATIONS

4.1 GENERAL

In this section of the report, we present our recommendations for groundwater control and boardwalk/pier/dock structures foundations. The following recommendations are made based upon a review of the attached soil test data, our understanding of the proposed construction, and experience with similar projects and subsurface conditions.

4.2 GROUNDWATER CONDITIONS

The groundwater level will fluctuate seasonally depending upon local rainfall. The rainy seasons in North Central Florida are normally between June and September and December and February. Based upon our review of regional hydrogeology and the Sumter County Soil Survey, we estimate the normal seasonal high groundwater level will be between 0 to 2 feet below the ground surface in the general area of the project site.

It should be noted that the normal estimated seasonal high water levels do not provide any assurance that groundwater levels will not exceed these estimated levels during any given year in the future. Should the impediments to surface water drainage be present, or should rainfall intensity and during, or total rainfall quantities, exceed the normally anticipated rainfall quantities, groundwater levels might once again exceed our seasonal high estimated. We recommend positive drainage be established and maintained on the site during construction. We further recommend permanent measures be constructed to maintain positive drainage from the site throughout the life of the project.

4.3 PIER/ BOARWALK FOUNDATION DESIGN RECOMENDATIONS

We understand that the proposed project will consist of renovation of the existing pier boardwalk at Lake Deaton Park.

Based on the results of our geotechnical exploration program, we recommend that the pier/dock structure be supported on a foundation system bearing in the medium dense clayey sand to stiff sandy clay formation encountered in the soil borings. The type of foundation system to be used on this project should be a decision made by the building designer, the structural engineer, and the project owner, and should consider input from foundation installation contractors with experience with similar site subsurface conditions in the general project site area. The piles should be topped with grade beams that support the structures.

4.3.1 Timber Driven Piles

A deep foundation system alternative for this project may consists of timber driven piles. Wood or timber piles shall be driven with a protective driving cap or ring when necessary to prevent brooming or splitting of the butt. When brooming or splitting occurs, such piles shall be cut back to solid wood before the final resistance to penetrations is measured. The timber piles on this project should be treated with a wood preservative, since it will be subjected to alternate wetting and drying. After driving to the necessary penetration, the broomed end is cut square and any exposed scars, as well as the fresh end cut, should be coated with a generous application of preservative.

Piles may me jetted under the supervision of a professional engineer. Care must exercised that the jetting does not lower the point bearing capacity. Immediately after completion of jetting,

piles shall be driven below the depth jetted to the required resistance, but not less than 5 feet, or to nominal refusal whichever comes first. The installation of the pile foundation must be in accordance with Florida Building Code for High Velocity Hurricane Zones, and under the supervision of an Engineer.

An 8 by 8 timber pile was considered for this project. Wood piles shall be driven until the required bearing has been continuously maintained for five feet, or to practical or absolute refusal. The pile contractor should use an appropriate pile driving formula to determine the driving criteria on this project. The number of blows required to achieve the required pile capacity should be determined by the appropriate pile driving formula prior to pile driving operations. Because soils vary in an unexpected manner, we recommend the pile driving operations be continuously monitored by a geotechnical engineer or their authorized representative.

Since the depth to medium dense clayey sand (pile tip elevation) ranged from approximately 12 to 25 feet below existing grades, you should expect the depth of the piles to vary in that range. Note that there is a muck/peat layer between 2 and 7 feet. Our estimated pile allowable compression and tension capacities are shown on Table 2. The estimated pile lengths have been based on pile cut off elevations of approximately +64 feet, NAVD.

Table 2 – Allowable Pile Capacities

Embedment Depth Below Existing Grade (feet)	Working Compression Capacities (kips)	Working Tension Capacities (kips)	Estimated Tip Elevation (NAVD)
15	15	4	49
20	26	15	44
25	33	23	39

Care should be exercised by the pile contractor so as not to overdrive and possibly damage the pile sections. A minimum pile center-to-center spacing equal to 3 times the least pile section dimension shall be maintained for this project. The structural engineer should determine the minimum depth of pile embedment.

4.3.2 Driven Piles Construction Techniques

The installation of the pile foundation system must be in accordance with the latest edition of the FDOT Standard Specification for Road and Bridge Construction (Section 455), and under the supervision of a qualified and experienced Geotechnical Engineer.

Piles should be driven with a small air or diesel hammer, or a drop hammer delivering a minimum energy per blow as determined in accordance with the latest edition of the FDOT Standard Specification. The hammer should be operated according to manufacturer's recommendations at all times.

Pile driving should be as continuous as possible and should proceed without stopping over the last 5 feet of penetration. The hammer acceptance criteria should be established prior to construction once the type and size of hammer are furnished by the contractor.

The installation of the pile foundation system must be in accordance with the Florida Building Code requirements for High Velocity Hurricane Zones, and under the supervision of a qualified and experienced Geotechnical Engineer.

We recommend that the requirements of the Florida Building Code concerning pile load testing be reviewed and complied with. We recommend that the Geotechnical Engineer and/or his qualified representative should observe and document all pile foundation installation activities on this project.

4.3.3 Driven Piles Hammer Selection

To help prevent over-driving, we recommend the final driving criteria be carefully specified with respect to the pile type, pile size, and hammer size. The pile driving hammer should therefore be properly selected with relation to the size, weight, and type of pile specified. The ratio of the pile hammer or ram weight (for air and diesel hammers) to the weight of the pile typically should not be less than 0.5 and should preferably be on the order of 0.75 to 1.0. Proper selection of the pile hammer based upon pile type and ram weight and the use of proper anvil and cushioning material and thickness should result in compressive and tensile driving stresses in the piles that are within tolerable magnitudes.

4.3.4 Driven Piles Quality Control

An engineering technician familiar with the installation of driven piles into subsurface soil conditions similar to those at this site and acting under the direction and supervision of the geotechnical engineer should witness the installation of the remaining production piles. His duties should include, but not be limited to, the following:

- Keep an accurate record of pile installation and driving procedures.
- Verify that all piles are installed to the proper driving resistance and to a depth indicative of the piles bearing in the desired bearing formation.
- Confirm the pile driving equipment is operating properly.
- Inspect the piles prior to installation for defects and confirm that the piles are not damaged during installation.

4.3.5 General Pile Installation Notes

The following pile installation notes should be included in the project plans:

- Minimum Tip Elevations may be required for lateral stability. All piles shall be driven to the minimum tip elevation shown in the project plans. If a minimum tip elevation is not shown on the project plans, then all piles shall be driven until the required bearing has been continuously maintained for five feet, or to practical or absolute refusal.
- No jetting will be allowed without the approval of the engineer.
- The Contractor’s hammer/ driving system shall be in accordance with Section 455-5 of the FDOT Standard Specifications.

4.4 NEW PAVEMENT AREAS

4.4.1 General

A rigid or flexible pavement section could be used on this project. Flexible pavement combines the strength and durability of several layer components to produce an appropriate and cost-effective combination of available construction materials. Concrete pavement has the advantage of the ability to “bridge” over isolated soft areas, it requires less security lighting, and it typically has a longer service life than asphalt pavement. Disadvantages of rigid pavement include an

initial higher cost and more difficult patching of distressed areas than occurs with flexible pavement.

We assume that a combination of flexible asphaltic and rigid concrete pavement sections will be used for the new pavement areas on this project. Our recommendations for both pavement types are listed in the following sections. The following recommendations are based on the pavement areas being prepared as recommended in this report.

At the time of this exploration, specific traffic loading information was not provided to us. We have assumed the following conditions for our recommended minimum pavement design.

- the subgrade soils are prepared as described in this report
- a twenty (20) year design life
- terminal serviceability index (P_t) of 2.5
- reliability level of 95 percent
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 100,000 for light duty pavements – primarily car and pickup truck traffic (parking stalls)
- total equivalent 18 kip single axle loads (E_{18}SAL) up to 250,000 for heavy duty pavements – occasional heavy truck traffic (entrance drives, services lanes, etc.)

The available subsurface data suggests that the subgrade soils in these areas consist of relatively clean sands, underlain by organic soils. The clean sandy soils may require some moisture control to facilitate compaction. Positive drainage around the roadway area should be established to prevent irrigation and stormwater from migrating into the pavement area. It should be noted that soil borings A-1 through A-3 encountered organic materials [A-8] which should be removed in accordance with FDOT Standard Plans Index 120-002.

Removal/replacing of organic soils can be expensive; removal operations should include the costs and environmental impact of dewatering during construction. If removal of organic soil is not a viable option, we recommend considering biaxial geogrid/geofabric layers into the existing pavement areas to reduce the risk of settlement. The geogrid should be placed parallel to the direction of traffic flow, and at the base/subgrade interface.

4.4.2 Asphalt (Flexible) Pavements

Based on the results of our soil borings, the assumed traffic loading information and review of the FDOT Flexible Pavement Design Manual, our minimum recommended pavement component thicknesses for new construction are presented in Table 3.

Table 3 – Minimum Asphaltic Pavement Component Thickness

Service Level	Maximum Traffic Loading	Layer Component		Estimated Structural Number *
		Surface Course (inches)	Base Course (inches)	
Light Duty	up to 100,000 E_{18}SAL	1½	6	2.7
Heavy Duty	up to 250,000 E_{18}SAL	2	8	3.2

* Estimated structural number is based on 12 inches of stabilized subgrade below the base course.

4.4.2.1 Stabilized Subgrade

We recommend that subgrade materials be compacted in place according to the requirements in the “Site Preparation for Pavement Areas” section of this report. Further, beneath the limerock base course, stabilize the subgrade materials to a minimum Limerock Bearing Ratio

(LBR) of 40, as specified by Florida Department of Transportation (FDOT) requirements for Type B Stabilized Subgrade. The subgrade material should be compacted to at least 98 percent of the modified Proctor maximum dry density (AASHTO T-180).

The stabilized subgrade can be a blend of existing soil and imported material such as limerock. If a blend is proposed, we recommend that the Contractor perform a mix design to find the optimum mix proportions.

The primary function of stabilized subgrade beneath the base course is to provide a stable and firm subgrade so that the limerock can be properly and uniformly placed and compacted. Depending upon the soil type, the subgrade material may have sufficient stability to provide the needed support without additional stabilizing material. Generally, sands with silt or clay should have sufficient stability and may not require additional stabilizing material. Conversely, relatively "clean" sand will not provide sufficient stability to adequately construct the limerock base course. Universal Engineering Sciences should observe the soils exposed on the finish grades to evaluate whether or not additional stabilization will be required beneath the base course.

4.4.2.2 Base Course

We recommend the base course material for the new pavement areas be limerock. The limerock should have a minimum LBR of 100 and should be mined from an FDOT-approved source. Place limerock in maximum 6-inch lifts and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density. Compaction testing of the base course should be performed to full depth at a frequency of at least one (1) test per 5,000 square feet, or at least 2 tests, whichever is greater.

As an alternative base course, crushed concrete could be used. An advantage to using crushed concrete is a lower sensitivity to water than what occurs with limerock. The main disadvantage is that crushed concrete may not be available at the time of construction.

Crushed concrete should be supplied by an FDOT approved plant with appropriate quality control procedures. The crushed concrete stockpile should be free of sandy pockets, foreign materials, or uncrushed particles. We recommend the following specifications be enforced.

1. Crushed concrete shall not contain extremely hard pieces, lumps, balls or pockets of sand or clay sized material in sufficient quantity as to be detrimental to the proper binding, finishing or strength of the crushed concrete base.

2. Samples of base course materials shall be supplied to the Engineer prior to use in the work. Additional samples shall be furnished during construction, as necessary.

3. At least 97 percent (by weight) of the material shall pass a 3-1/2 inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust or fracture. All crushing or breaking-up which might be necessary in order to meet such size requirements shall be done before the material is placed within the area to be paved.

4. The base shall be bladed and shaped to conform to the typical sections shown on the plans. Then the base shall be compacted by rolling with a combination of steel wheel and rubber tired rollers until a minimum density of at least 98 percent of the maximum density obtainable under AASHTO T-180 is reached. The base shall have an average LBR of not less than 100. The LBR value of material produced at a particular source shall be determined in accordance with an approved quality control procedure.

5. Testing shall be performed at the following frequencies:

    - Perform in-place density on crushed concrete base at a frequency of 1 test per 300 linear foot of roadway or 5,000 square feet of pavement.

    - Perform Limerock Bearing Ratio tests at a frequency of 1 test per visual change in material and a minimum of 1 test per 15,000 square feet of pavement.

    - Engineer should perform a final visual base inspection prior to placement of prime or tack coat and paving.

4.4.2.3 Wearing Surface

For the new pavement areas, we recommend that the surfacing consist of FDOT SuperPave (SP) asphaltic concrete, FDOT SP-9.5 fine mix, for both light-duty areas and heavy duty areas. The asphaltic concrete should be compacted to a field density of 90 to 95 percent of the laboratory maximum density determined from specific gravity (Gmm) methods. Specific requirements for the SuperPave asphaltic concrete structural course are outlined in the latest edition of FDOT, Standard Specifications for Road and Bridge Construction.

After placement and field compaction, the surfacing should be cored to evaluate material thickness and density. Cores should be obtained at frequencies of at least one (1) core per 5,000 square feet of placed pavement or a minimum of two (2) cores per day's production.

4.4.3 Effects of Groundwater

One of the most critical factors influencing pavement performance in North Central Florida is the relationship between the pavement subgrade and the normal seasonal high groundwater level. Many roadways and parking areas have been damaged as a result of deterioration of the base conditions and/or the base/surface course bond. We recommend that the normal seasonal high groundwater level and the bottom of the flexible pavement limerock base course be separated by at least 24 inches. If this separation cannot be established and maintained by grading and surface drainage improvements, permanent groundwater control measures (underdrains) will be required.

4.4.4 Curbing

Typical curbing is extruded and placed atop the asphaltic concrete surface. This type of curbing does not act as a horizontal cutoff for lateral migration of storm and irrigation water into the base material and as a result of this it is not uncommon for base and subgrade materials adjacent to these areas to become saturated, promoting subsequent localized pavement deterioration. Consequently, we recommend that most pavements abutting irrigated landscape areas be equipped with an underdrain system that penetrates a minimum depth equivalent to the bottom of the stabilized subgrade to intercept trapped shallow water and discharge it into a closed system or other acceptable discharge point.

Alternatively, curbing around landscaped sections adjacent to the parking lots and driveways could be constructed with full-depth curb sections to reduce horizontal water migration. However, underdrains may still be recommended dependent upon the soil type and spatial relationships. UES should review final grading plans to evaluate the need and placement of pavement and landscape underdrains.

4.4.5 Concrete (Rigid) Pavement

Concrete pavement is a rigid pavement that is strong, durable and handles the heavy loads more effectively than asphalt pavement.

We recommend using the existing surficial sands or approved structural fill densified to at least 95 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization under concrete pavement, with the following stipulations:

1. Prior to placement of concrete, the subgrade soils should be densified as recommended in Section 4.4.7 of this report.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to the thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the seasonal high groundwater level by at least 12 Inches.

6. We do not recommend the use of a limerock base course directly below the concrete pavement area.

Based on review of the FDOT Rigid Pavement Design Manual and provided that the site is prepared as recommended in this report, we recommend using the minimum design shown in Table 4 for concrete pavements.

Table 4 – Minimum Concrete Pavement Thickness

Maximum Traffic Loading	Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Saw Cut Depth
Standard Duty	5 inches	10 feet x 10 feet	$1^{2}/_{3}$ inches
Heavy Duty	6 inches	12 feet x 12 feet	2 inches

For loading conditions greater than those presented in Table 4, we recommend that you have a complete pavement design performed based on projected traffic data.

We recommend using concrete with a minimum 28-day compressive strength of at least 4000 pounds per square inch. Layout of the saw cut control joints should form square panels, and the depth of Saw cut joints should be made to a depth of ⅓ of the concrete slab thickness. We recommend allowing UESI to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing of Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Association, Inc., and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

Specimens should be obtained to verify the compressive strength of the pavement concrete at least every 50 cubic yards, or at least once for each day's placement, whichever is greater.

4.4.6 Construction Traffic

Light duty roadways and incomplete pavement sections will not perform satisfactorily under construction traffic loadings. We recommend that construction traffic (construction equipment, concrete trucks, sod trucks, garbage trucks, dump trucks, etc.) be re-routed away from these roadways or that the pavement section is designed for these loadings.

4.4.7 Site Preparation for the New Pavement Areas

Following is a list of our recommended site preparation procedures to prepare the new pavement areas for the proposed construction.

1. Strip the pavement areas of any roots, vegetation, debris, organics, etc. Stripping should be performed at least 3 feet beyond pavement edges. We recommend that the stripped surface be observed and probed by representatives of UES.

2. Following site clearing, grubbing and rough grading, the pavement areas should be proof-rolled using a large, fully loaded rubber-tired vehicle (dump truck) or similar equipment. Proof-rolling will help locate any surficial zones of especially loose or soft or unsuitable soils not encountered in the soil test borings, and should help provide more uniformity in the sandy subsurface soil profile. Unusual or unanticipated conditions identified during this process must be immediately brought to the attention of the UES Geotechnical Engineer. Where encountered organic materials [A-8] should be removed in accordance with FDOT Standard Plans Index 120-002. Field density testing is not required during proof-rolling operations.

3. *If removal of organic soil is not a viable option, we recommend incorporating a biaxial geogrid/geofabric layer into the existing pavement areas.* A layer of bi-axial geogrid should be placed over the excavated subgrade for constructability purposes to allow for a platform to start placing the backfill. The fill will need to be reinforced with geotextile fabrics along all edges of the site in order to prevent horizontal consolidation of very soft soils. *The geogrid should be placed parallel to the direction of traffic flow, and at the base/subgrade interface. Within the pavement areas, compact the exposed soils to at least 95 percent of the Modified Proctor test maximum dry density (ASTM D 1557) to a depth of at least 1 foot below the stripped surface and full depth of fill, or at least 2 feet below the bottom of base course (or concrete pavement) level, whichever is greater.* Please note that Installation of the geogrid are intended to treat, in a practical and cost-effective manner and to reduce future deflections in the existing parking areas.

   Please note that the surficial soils within the new parking areas may contain varying quantities of silt and clay. These silty/clayey soils tend to readily hold moisture and may require more stringent compactive efforts than clean fine sands.

4. Soil density testing to verify the uniformity of compactive efforts should be performed at a frequency of at least one (1) test for every 5,000 square feet per foot of compacted increment, or at a minimum of two test locations, whichever is greater.

5. Prior to the placement of the base course within the asphaltic pavement areas, stabilize the subgrade to a depth of 12 inches by "pounding" limerock into the soils to provide a stable and firm surface so that the base course can be properly and uniformly placed.

The subgrade should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557).

Positive drainage around the roadway areas must be established to prevent irrigation and stormwater from migrating into the pavement area. If needed underdrains should be installed to prevent water from migrating beneath the pavement.

Vibrations produced during vibratory compaction operations at the site may be significantly noticeable within 100 feet and may cause distress to adjacent structures if not properly regulated. Provisions should be made to monitor these vibrations so that any necessary modifications in the compaction operations can be made in the field before potential damages occur.

5.0 REPORT LIMITATIONS

This Report has been prepared for the exclusive use of City of Wildwood, and members of the Design/Construction Team for the specific project discussed in this Report. This Report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied.

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. A GBA publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix B, and will help explain the nature of geotechnical issues. Additional limitations are presented in General Conditions also included in Appendix B.

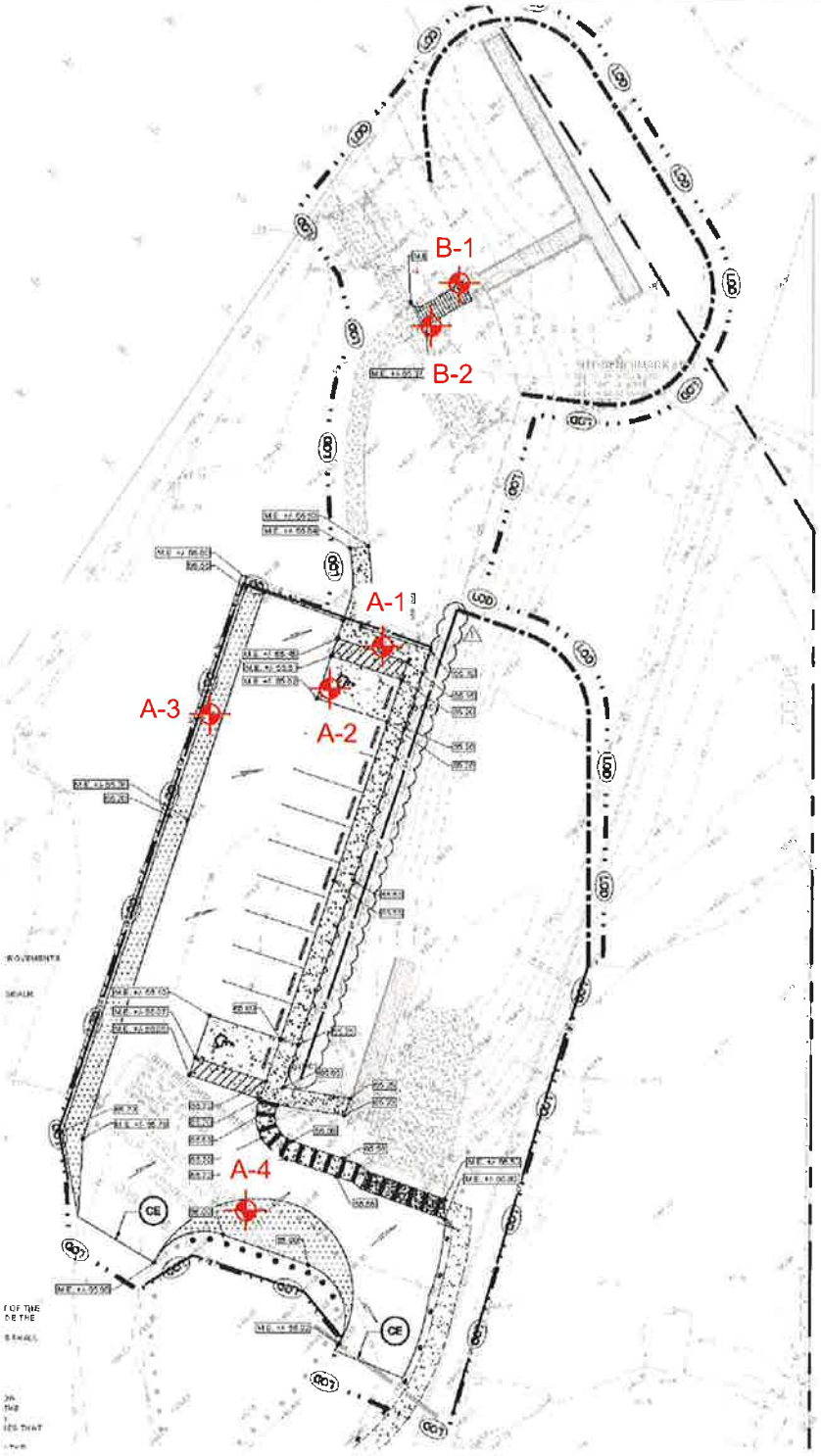
Further, we present documents in Appendix B: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

APPENDIX A

Boring Location Plan

Boring Logs

Key to Boring Logs



LEGEND

BORING LOCATION

NOTE: ALL SOIL TEST BORING LOCATIONS SHOWN ARE APPROXIMATE.

N

UES

0230.2300061-A

LAKE DEATON BOAT RAMP

5300 CR 155

WILDWOOD, SUMTER COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY:	KD	DATE:	6/30/23	CHECKED BY:	ES	DATE:	6/30/23
SCALE:	1"=50'	PROJECT NO:0230.2300061.0000		REPORT NO:	2024867	PAGE NO:	A - 1

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-2

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

BORING DESIGNATION: **B-1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.5
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0												
1				▼		Very loose gray silty SAND [SM]						
2		1-1-1	2									
3						Very soft brown Muck / Peat [PT]						
4		1-1-1	2									
5		WOH	WOH					210				33
6												
7		WOH-1	1			Medium dense brown silty SAND [SM]						
8		5-5-6	11									
9						Medium dense gray clayey SAND [SC]						
10		5-8-12	20									
11												
12												
13												
14												
15		9-12-13	25									
16												
17												
18												
19												
20		12-13-13	26									
21												
22												
23												
24						Stiff red sandy CLAY [CL]						
25		5-5-5	10				50	24	35	21		
26												
27												
28												
29												
30		5-6-6	12									
						Boring Terminated at 30'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-3

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: **B-2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 1.5
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0												
1				▼		Very loose gray silty SAND [SM]						
2		1-1-1	2									
3						Very soft dark brown Muck / Peat [PT]						
4		1-1-1	2									
5		WOH	WOH					188				31
6												
7		WOH	WOH									
8		3-6-7	13			Medium dense brown silty SAND [SM]						
9						Medium dense gray clayey SAND [SC]						
10		7-8-8	16									
11												
12												
13												
14												
15		10-10-11	21									
16												
17												
18												
19						Medium dense tan and red very clayey SAND [SC]						
20		10-11-14	25				35	15				
21												
22												
23												
24						Stiff red sandy CLAY [CL]						
25		4-6-6	12									
26												
27												
28												
29												
30		5-5-6	11									
						Boring Terminated at 30'						

NEW LOGO BORING LOG LAKE DEATON BOAT RAMP.GPJ GAINESVILLE TEMPLATE.GDT 6/30/23

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-4

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

BORING DESIGNATION: **A-1** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.5
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0						8" Asphaltic Concrete						
1						Gray SAND [SP] (A-3)						
2	X					Dark brown organic silty SAND / Peat [PT] (A-8)						
3				▼				152				24
4												
5	X					Gray silty SAND [SM] (A-2-4)						
6												
7												
8												
9												
10						Boring Terminated at 10'						

NEW LOGO BORING LOG LAKE DEATON BOAT RAMP.GPJ GAINESVILLE TEMPLATE.GDT 6/30/23

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-5

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

BORING DESIGNATION: **A-2** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.5
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0						8" Asphaltic Concrete						
1	X					Gray silty SAND [SM] (A-2-4)						
2												
3												
4				▼								
5	X					Black organic silty SAND [SM] (A-8)						
6												
7	X					Brown SAND, with silt [SP-SM] (A-3)						
8												
9												
10						Boring Terminated at 10'						

NEW LOGO BORING LOG LAKE DEATON BOAT RAMP.GPJ GAINESVILLE TEMPLATE.GDT 6/30/23

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-6

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

BORING DESIGNATION: **A-3** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 4
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0						Dark brown silty SAND [SM], with organics						
1						Gray SAND, with silt [SP-SM] (A-3)						
2						Dark brown organic silty SAND, with peat [PT] (A-8)						
3												
4				▼		Black organic silty SAND [SM/PT] (A-8)	14					
5												
6						Brown SAND, with silt [SP-SM] (A-3)							
7												
8						Gray silty clayey SAND [SM-SC] (A-2-4)						
9												
10						Boring Terminated at 10'						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0230.2300061.0000
REPORT NO.:	2024867
PAGE:	A-7

PROJECT: LAKE DEATON BOAT RAMP
5300 CR 155
WILDWOOD, SUMTER COUNTY, FLORIDA

BORING DESIGNATION: **A-4** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: CPH CORP. / CITY OF WILDWOOD

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

G.S. ELEVATION (ft):
WATER TABLE (ft): 4.5
DATE OF READING: 6/12/23
EST. W.S.W.T. (ft):

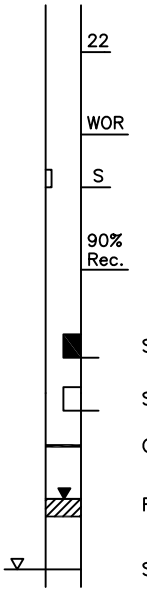
DATE STARTED: 6/12/23
DATE FINISHED: 6/12/23
DRILLED BY: R. PEREZ
TYPE OF SAMPLING: ASTM D-1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N VALUE	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORGANIC CONTENT (%)
0												
1	X					Gray SAND, with silt [SP-SM] (A-3)						
2												
3												
4				▼								
5	X					Brown SAND, with silt [SP-SM] (A-3)						
6												
7												
8	X					Light tan SAND [SP] (A-3)						
9												
10						Boring Terminated at 10'						

NEW LOGO BORING LOG LAKE DEATON BOAT RAMP.GPJ GAINESVILLE TEMPLATE.GDT 6/30/23

KEY TO BORING LOGS

SYMBOLS



22	Number of Blows of a 140–lb Weight Falling 30 in. Required to Drive Standard Spoon One Foot
WOR	Weight of Drill Rods
S	Thin–Wall Shelby Tube Undisturbed Sampler Used
90% Rec.	Percent Core Recovery from Rock Core–Drilling Operations
	Sample Taken at this Level
	Sample Not Taken at this Level
	Change in Soil Strata
	Free Ground Water Level
	Seasonal High Ground Water Level

GRANULAR MATERIALS

Relative Density	Safety Hammer SPT N (Blows/Ft.)	Automatic Hammer SPT N (Blows/Ft.)
Very Loose	Less than 4	Less than 3
Loose	4–10	3–8
Medium Dense	10–30	8–24
Dense	30–50	24–40
Very Dense	>50	>40

COHESIVE MATERIALS

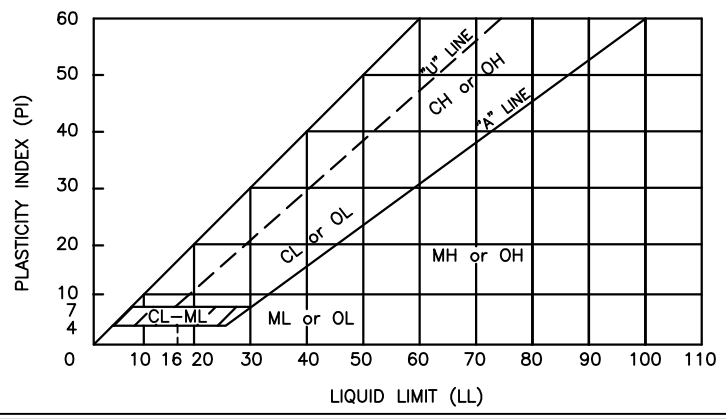
Consistency	Safety Hammer SPT N (Blows/Ft.)	Automatic Hammer SPT N (Blows/Ft.)
Very Soft	Less than 2	Less than 1
Soft	2–4	1–3
Firm	4–8	3–6
Stiff	8–15	6–12
Very Stiff	15–30	12–24
Hard	>30	>24

UNIFIED CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 200 sieve	CLEAN GRAVELS	GW	Well–graded gravels and gravel–sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel–sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel–sand–silt mixtures
			GC	Clayey gravels, gravel–sand–clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well–graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand–silt mixtures
			SC	Clayey sands, sand–clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomacaceous fine sands or silts, elastic silts
			CH	Inorganic clays or high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3–in. (75mm) sieve.

PLASTICITY CHART



APPENDIX B

Important Information About Your Geotechnical Engineering Report
Constraint and Restrictions

Important Information about This

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.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering 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 given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- 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;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the 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. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include 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 personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

Universal Engineering Sciences 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 Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences 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

Universal Engineering Sciences 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 Universal Engineering Sciences.

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 Universal Engineering Sciences.

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. Universal Engineering Sciences 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 Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences 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 exploration. 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.

UES™

Universal Engineering Sciences, LLC
GENERAL CONDITIONS

SECTION 1: RESPONSIBILITIES **1.1** *Universal Engineering Sciences, LLC*, and its subsidiaries and affiliated companies ("UES"), is responsible for providing the services described under the Scope of Services. The term "UES" as used herein includes all of UES'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, plans and specifications, 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 in writing.

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** 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 work is 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.

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 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 Scope of Services. **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: BILLING AND PAYMENT **4.1** UES will submit invoices to Client monthly or upon completion of services. Invoices will show charges for different personnel and expense classifications. **4.2** 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. **4.3** 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 5: OWNERSHIP AND USE OF DOCUMENTS **5.1** 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. Neither Client nor any other entity shall change or modify UES's instruments of service. **5.2** 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. **5.3** UES will retain all pertinent records relating to the services performed for a period of five years following submission of the report or completion of the Scope of Services, during which period the records will be made available to the Client in a reasonable time and manner. **5.4** 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 entity, or used or relied upon by any other entity, without the express written consent of UES. Client is the only entity to which UES owes any duty or duties, in contract or tort, pursuant to or under this Agreement.

SECTION 6: DISCOVERY OF UNANTICIPATED HAZARDOUS MATERIALS **6.1** Client represents that a reasonable effort has been made to inform UES of known or suspected hazardous materials on or near the project site. **6.2** Under this agreement, the term hazardous materials include hazardous materials, hazardous wastes, hazardous substances (40 CFR 261.31, 261.32, 261.33), petroleum products, polychlorinated biphenyls, asbestos, and any other material defined by the U.S. EPA as a hazardous material. **6.3** Hazardous materials may exist at a site where there is no reason to believe they are present. The discovery of unanticipated hazardous materials constitutes a changed condition mandating a renegotiation of the scope of work. 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 materials. **6.4** UES will notify Client when unanticipated hazardous materials or suspected hazardous materials are encountered. Client will make any disclosures required by law to the appropriate governing agencies. Client will hold UES harmless for 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 it is the Client's responsibility to inform the property owner of the discovery of unanticipated hazardous materials or suspected hazardous materials. **6.5** 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 7: RISK ALLOCATION **7.1** Client agrees that UES's liability for any damage on account of any breach of contract, error, omission, or 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 UES's proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $400.00, whichever is greater. If Client prefers a $2,000,000.00 limit on contractual or professional liability, UES agrees to increase the limits up to a maximum of $2,000,000.00 upon Client's written request at the time of accepting UES's proposal provided that Client agrees to pay an additional consideration of four percent of the total fee, or $800.00, 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. **7.2** Client shall not be liable to UES and UES shall not be liable to Client for any incidental, special, or consequential damages (including lost profits, loss of use, and lost savings) incurred by either party due to the fault of the other, regardless of the nature of the fault, or whether it was committed by Client or UES, their employees, agents, or subcontractors; or whether such liability arises in breach of contract or warranty, tort (including negligence), statutory, or any other cause of action. **7.3** As used in this Agreement, the terms "claim" or "claims" mean any claim in contract, tort, or statute alleging negligence, errors, omissions, strict liability, statutory liability, breach of contract, breach of warranty, negligent misrepresentation, or any other act giving rise to liability.

SECTION 8: INSURANCE **8.1** UES represents it and its agents, staff and consultants employed by UES, 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 7, 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 agents, staff, and others employed by Client. **8.2** Under no circumstances will UES indemnify Client from or for Client's own actions, negligence, or breaches of contract. **8.3**

To the extent damages are covered by property insurance, Client and UES waive all rights against each other and against the contractors, consultants, agents, and employees of the other for damages, except such rights as they may have to the proceeds of such insurance.

SECTION 9: DISPUTE RESOLUTION **9.1** 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 mediation or non-binding arbitration, before and as a condition precedent to other remedies provided by law. **9.2** If a dispute arises and that dispute is not resolved by mediation or non-binding arbitration, then: (a) the claim will be brought in the state or federal courts having jurisdiction where the UES office which provided the service is located; and (b) the prevailing party will be entitled to recovery of all reasonable costs incurred, including staff time, court costs, attorneys' fees, expert witness fees, and other claim related expenses.

SECTION 10: TERMINATION **10.1** 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, or in the case of a force majeure event such as terrorism, act of war, public health or other emergency. Such termination shall not be effective if such substantial failure or force majeure 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. **10.2** 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 11: REVIEWS, INSPECTIONS, TESTING, AND OBSERVATIONS **11.1** Plan review, private provider inspections, and building inspections are performed for the purpose of observing compliance with applicable building codes. Threshold inspections are performed for the purpose of observing compliance with an approved threshold inspection plan. Construction materials testing ("CMT") is performed to document compliance of certain materials or components with applicable testing standards. UES's performance of plan reviews, private provider inspections, building inspections, threshold inspections, or CMT, or UES's presence on the site of Client's project while performing any of the foregoing activities, is not a representation or warranty by UES that Client's project is free of errors in either design or construction. **11.2** If UES is retained to provide construction monitoring or observation, UES will report to Client any observed work which, in UES's opinion, does not conform to the plans and specifications provided to UES. UES shall have no authority to reject or terminate the work of any agent or contractor of Client. No action, statements, or communications of UES, or UES's site representative, can be construed as modifying any agreement between Client and others. UES's performance of construction monitoring or observation is not a representation or warranty by UES that Client's project is free of errors in either design or construction. **11.3** Neither the activities of UES pursuant to this Agreement, nor the presence of UES or its employees, representatives, or subcontractors on the project site, shall be construed to impose upon UES any responsibility for means or methods of work performance, superintendence, sequencing of construction, or safety conditions at the project site. Client acknowledges that Client or its contractor is solely responsible for project jobsite safety. **11.4** Client is responsible for scheduling all inspections and CMT activities of UES. All testing and inspection services will be performed on a will-call basis. UES will not be responsible for tests and inspections that are not performed due to Client's failure to schedule UES's services on the project, or for any claims or damages arising from tests and inspections that are not scheduled or performed.

SECTION 12: ENVIRONMENTAL ASSESSMENTS Client acknowledges that an Environmental Site Assessment ("ESA") is conducted solely to permit UES to render a professional opinion about the likelihood or extent of regulated contaminants being present on, in, or beneath the site in question at the time services were conducted. No matter how thorough an ESA study may be, findings derived from the study are limited and UES cannot know or state for a fact that a site is unaffected by reportable quantities of regulated contaminants as a result of conducting the ESA study. Even if UES states that reportable quantities of regulated contaminants are not present, Client still bears the risk that such contaminants may be present or may migrate to the site after the ESA study is complete.

SECTION 13: SUBSURFACE EXPLORATIONS **13.1** Client acknowledges that subsurface conditions may vary from those observed at locations where borings, surveys, samples, 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 or provided by UES. **13.2** Subsurface explorations may result in unavoidable cross-contamination of certain subsurface areas, as when a probe or boring device moves through a contaminated zone and links it to an aquifer, underground stream, or other hydrous body not previously contaminated. UES is unable to eliminate totally cross-contamination risk despite use of due care. Since subsurface explorations may be an essential element of UES's services indicated herein, Client shall, to the fullest extent permitted by law, waive any claim against UES, and indemnify, defend, and hold UES harmless from any claim or liability for injury or loss arising from cross-contamination allegedly caused by UES's subsurface explorations. 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 14: SOLICITATION OF EMPLOYEES Client agrees not to hire UES's employees except through UES. In the event Client hires a UES employee within one year following any project through which Client had contact with said employee, Client shall pay UES an amount equal to one-half of the employee's annualized salary, as liquidated damages, without UES waiving other remedies it may have.

SECTION 15: ASSIGNS Neither Client nor UES may delegate, assign, sublet, or transfer its duties or interest in this Agreement without the written consent of the other party.

SECTION 16: GOVERNING LAW AND SURVIVAL **16.1** This Agreement shall be governed by and construed in accordance with the laws of the jurisdiction in which the UES office performing the services hereunder is located. **16.2** In any of the provisions of this Agreement are held illegal, invalid, or unenforceable, the enforceability of the remaining provisions will not be impaired and will survive. Limitations of liability and indemnities will survive termination of this agreement for any cause.

SECTION 17: INTEGRATION CLAUSE **17.1** 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. **17.2** 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.

SECTION 18: WAIVER OF JURY TRIAL Both Client and UES waive trial by jury in any action arising out of or related to this Agreement.

SECTION 19: INDIVIDUAL LIABILTY PURSUANT TO FLORIDA STAT. 558.0035, AN INDIVIDUAL EMPLOYEE OR AGENT OF UES MAY NOT BE HELD INDIVIDUALLY LIABLE FOR NEGLIGENCE.