GEOTECHNICAL EXPLORATION

MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER/FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

UES PROJECT NO. 0130.2200455.0000
UES REPORT NO. 1995329

PREPARED FOR:

Woodard & Curran
210 South Florida Avenue
Lakeland, Florida 33401

Attention: Mr. Stefan Oliver Thoenes, PE, Sr. Project Manager

PREPARED BY:

Universal Engineering Sciences, LLC
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January 6, 2023

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Building Envelope

January 6, 2023

Woodard & Curran
210 South Florida Avenue
Lakeland, Florida 33401

Attention: Mr. Stefan Oliver Thoenes, PE, Sr. Project Manager
sthoenes@woodardcurran.com

Reference: **Geotechnical Exploration**
Montverde Roadway & Drainage Improvements
Porter/Franklin Avenue, Lakeside Drive & First Street
Montverde, Lake County, Florida
UES Project No. 0130.2200455.0000
UES Report No. 1995329

Dear Mr. Thoenes:

Universal Engineering Sciences, LLC (UES) has completed a geotechnical exploration at the above referenced site in Montverde, Florida. The scope of our exploration was planned in conjunction with and authorized by you. This exploration was performed in accordance with UES Proposal No. 1984189 dated October 19, 2022 and generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

The following report presents the results of our field exploration with a geotechnical engineering interpretation of those results with respect to the project characteristics as provided to us. We have included soil and groundwater conditions at the boring locations, and geotechnical recommendations for roadway widening, milling/resurfacing, subgrade preparation and stormwater pond design.

We appreciate the opportunity to have worked with 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 No. 549

Ricardo C. Kiriakidis, PhD., P.E.
Geotechnical Department Manager

ANDREW S. WILDEROTTER LICENSE NO. 65727 STATE OF FLORIDA PROFESSIONAL ENGINEER

Andrew S. Wilderotter, P.E.
Geotechnical Project Manager
Date: 1/6/23
Florida Registration No. 65727

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1.0 PROJECT DESCRIPTION

We understand that the proposed project will include the roadway, stormwater and drainage improvements along Porter/Franklin Avenue, Lakeside Drive and First Street in Montverde, Florida. We were provided with aerial photographs showing the subject roadway corridors. The improvements will include roadway widening, pavement resurfacing and stormwater management systems.

The recommendations presented within this report are based upon the above assumptions. If any of these assumptions are incorrect, please contact UES immediately so that we may review, and possibly amend the recommendations contained herein.

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.

2.0 PURPOSE

The purposes of this exploration were:

- to explore and evaluate the subsurface conditions at the site with special attention to potential problems that may impact the proposed development,
- to provide our estimates of the seasonal high groundwater level at the boring locations and
- to provide geotechnical engineering recommendations for roadway widening, milling/resurfacing, subgrade preparation and stormwater pond design.

This report presents an evaluation of site conditions on the basis of geotechnical procedures for site characterization. The recovered samples were not examined, either visually or analytically, for chemical composition or environmental hazards. We would be glad to provide you with a proposal for these services at your request.

Our exploration was not designed to specifically 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 those performed in this study. We would be pleased to conduct an exploration to evaluate the probable effect of the regional geology upon the proposed construction, if you so desire.

3.0 SITE DESCRIPTION

The subject site is located within Sections 1 & 2, Township 22 South, Range 26 East in Lake County, Florida. More specifically, the site is located along Porter Avenue, Franklin Avenue, Lakeside Drive and First Street, between Lake Florence and Lake Apopka, as shown on the attached Figures A-1 and B-1. At the time of drilling, the site was occupied by existing roadways and residential/commercial development.

3.1 SOIL SURVEY

There are two (2) native soil types mapped within the site area according to the USDA NRCS Soil Survey of Lake County. A brief summary of the mapped surficial soil types is presented in Table I.

TABLE I
SUMMARY OF PUBLISHED SOIL DATA

Soil Symbol	Soil Type	Hydrologic Group	Drainage Characteristics	Depth of Published Seasonal High GWT (feet)
20	Lake sand, 0 to 5 percent slopes	A	Excessively drained	6+
21	Lake sand, 5 to 12 percent slopes	A	Excessively drained	6+

3.2 TOPOGRAPHY

According to information obtained from the United States Geologic Survey (USGS) "Clermont East, Florida" quadrangle map, the native ground surface elevation across the site area ranges from approximately +100 to +120 feet National Geodetic Vertical Datum (NGVD). The site is located between Lake Florence and Lake Apopka. Based on review of the USGS map, the normal high water elevations of these lakes are approximately +74 and +66 feet NGVD, respectively. A copy of a portion of the USGS Map is included in Appendix A.

4.0 SCOPE OF SERVICES

The services conducted by UES during our geotechnical exploration were as follows:

- Drilled a total of twenty-three (23) Standard Penetration Test (SPT) borings along the proposed roadway alignments and stormwater pond areas to depths of 10 and 20 feet below existing land surface (bls).
- Advanced two (2) hand auger borings within Truskett Park (inaccessible to our drill rig) to depths of 5 and 10 feet bls.
- Performed nine (9) pavement cores along Porter Avenue, Franklin Avenue, Lakeside Drive and First Street to determine the existing pavement section components.
- Secured samples of representative soils encountered in the soil borings for review, laboratory analysis and classification by a Geotechnical Engineer.
- Measured the existing site groundwater levels and provide an estimate of the seasonal high groundwater level at the boring locations.
- Conducted laboratory testing on selected soil samples obtained in the field to determine their engineering properties.
- Assessed the existing soil conditions with respect to the proposed construction.
- Prepared a report which documents the results of our exploration and analysis with geotechnical engineering recommendations.

5.0 FIELD EXPLORATION

The SPT soil borings were performed with an ATV mounted drilling rig. The auger borings were performed using hand equipment. UES located the test locations by using the provided site plan, measuring from existing on-site landmarks shown on an aerial photograph, and by using handheld GPS devices. No survey control was provided. Hence, the indicated test locations should be considered accurate to the degree of the methodologies used. The approximate boring locations and are shown in Appendix B.

The SPT borings, designated R-01, R-02, R-03, R-05 through R-19, P-01 and P-03 through P-06 on the attached Boring Location Plan in Appendix B, were performed in general accordance with the procedures of ASTM D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils”. SPT sampling was performed continuously in the top 10 feet to detect variations in the near surface soil profile and on 5 feet centers thereafter.

The hand auger borings, designated R-04 and P-02, were performed in general accordance with ASTM D 1452. These borings were located within Truskett Park which is inaccessible to our drilling rig.

The nine (9) pavement cores, designated C-01 through C-09 on the attached Core Location Plan in Appendix B, were performed with a 6-inch nominal diameter diamond bit core drill, advancing through the asphaltic pavement into the underlying base course materials. Afterwards the core holes were backfilled and the surfacing patched with an asphaltic “cold patch” mixture and the core samples returned to our laboratory for subsequent visual examination.

6.0 LABORATORY TESTING

The soil samples recovered from the test borings were returned to our laboratory and visually classified in general accordance with ASTM D 2487 “Standard Classification of Soils for Engineering Purposes” (Unified Soil Classification System). We selected representative soil samples from the borings for laboratory testing to aid in classifying the soils and to help to evaluate the general engineering characteristics of the site soils. The results of these tests are shown on the boring logs in Appendix B. A summary of the tests performed is shown in Table II.

TABLE II
LABORATORY METHODOLOGIES

Test Performed	Number Performed	Reference
Moisture Content	11	ASTM D 2216 “Laboratory Determination of Water (Moisture) Content of Soil by Mass”
Soil Sieve Analysis	11	ASTM D 6913 “Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis”

7.0 SUBSURFACE CONDITIONS

The results of our field exploration and laboratory analysis, together with pertinent information obtained from the SPT borings, such as soil profiles, penetration resistance and groundwater levels are shown on the boring logs included in Appendix B. The Key to Boring Logs, Soil Classification Chart is also included in Appendix B. The soil profiles were prepared from field logs after the recovered soil samples were examined by a Geotechnical Engineer. 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 encountered at our boring

locations is presented in Table III. For detailed soil profiles, please refer to the attached boring logs.

TABLE III
GENERALIZED SOIL PROFILE

Typical Depth (feet, bls)		Soil Description	Range of SPT "N" Values (blows/ft)
From	To		
Surface	20*	Very loose to loose fine SAND [SP]	2 to10
* Denotes termination depth of borings			

8.0 GROUNDWATER CONDITIONS

8.1 EXISTING GROUNDWATER LEVEL

No groundwater was encountered within the drilled depths at our boring locations at the time of our exploration. Fluctuations in groundwater levels should be anticipated throughout the year, primarily due to seasonal variations in rainfall, surface runoff, and other factors that may vary from the time the borings were conducted.

8.2 SEASONAL HIGH GROUNDWATER LEVEL

Based on historical data, the rainy season in Central Florida is between June and October of the year. In order to estimate the seasonal high water level at the boring locations, many factors are examined, including the following:

- Measured groundwater level
- Drainage characteristics of existing soil types
- Current & historical rainfall data
- Natural relief points (such as lakes, rivers, wetlands, etc.)
- Man-made drainage systems (ditches, canals, retention basins, etc.)
- On-site types of vegetation
- Review of available data (soil surveys, USGS maps, etc.)
- Redoximorphic features (mottling, stripping, etc.)

Based on the results of our field exploration and the factors listed above, we estimate that the normal seasonal high groundwater level at the boring locations should form below a depth of 20 feet.

It should be noted that the estimated seasonal high water levels provided should be considered accurate to about ½ foot +/- and 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 duration, or total rainfall quantities, exceed the normally anticipated rainfall quantities, groundwater levels might exceed our seasonal high estimates. Further, it should be understood that changes in the surface hydrology and subsurface drainage from on-site and/or off-site improvements could have significant effects on the normal and seasonal high groundwater levels.

9.0 PAVEMENT RECOMMENDATIONS

9.1 GENERAL

We understand that the proposed roadways will consist of a flexible pavement section with typical residential/commercial traffic. In addition, concrete driveways will be constructed. At the time of this exploration, specific traffic loading information was not provided to us. All streets to be established in the subdivision should be designed in accordance with Lake County Standards. Our recommendations for design of the roadways are listed in the following sections.

9.2 ASPHALTIC PAVEMENTS

9.2.1 Layer Components

We recommend using a three-layer pavement section for the proposed roadways consisting of compacted subgrade (sub-base), base course, and surface course. Lake County specifications have divided the pavement requirements for residential development into categories as a function of average daily traffic (ADT). Table IV summarizes the minimum pavement component thicknesses for residential roadway design.

TABLE IV
MINIMUM ASPHALTIC PAVEMENT COMPONENT THICKNESSES

ADT (vpd)	Layer Component (inches)		
	Surface Course	Base Course	Subgrade
<500	1½	6	12
500 to 1,500	2	6	12
1,500 to 4,000	2	8	12

9.2.2 Stabilized Subgrade

The subgrade immediately beneath the base course (sub-base) should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) value. The upper 12 inches of subgrade should be stabilized to a minimum LBR of 40 as specified by FDOT.

Stabilized subgrade can be imported materials or a blend of on-site and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions.

Compaction testing of the subgrade should be performed to full depth at a frequency of at least one (1) test per 5,000 square feet, or every 300 lineal feet of roadway, whichever is greater.

9.2.3 Base Course

Limerock and recycled crushed concrete are all deemed suitable materials for the pavement base course at this project. However, local municipalities often limit the use of certain base course materials or may require more stringent standards. We recommend the civil engineer consult with the local municipalities prior to selecting the base course material for this project.

For a limerock base, the base course should be compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 100. The

limerock material should comply with the latest edition of the Florida Department of Transportation (FDOT) Road and Bridge Construction specifications.

Recycled concrete aggregate (RCA) may provide a cost-effective alternative material in lieu of limerock or soil cement base courses. Local availability, along with municipality standards, typically governs the use of crushed concrete use as an alternative base course material. The advantages of using crushed concrete as a pavement base course include its high strength (stronger than limerock), resistance to groundwater related distress, and lack of reflection cracking caused by thermal expansion and contraction.

If RCA base is used, the base course material should be sourced from an FDOT approved supplier. The base should be compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 150. The base material should comply with the requirements listed in the latest edition of the FDOT Road and Bridge Construction Specifications.

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 every 300 lineal feet of roadway, whichever is greater.

9.2.4 Surface Course

For the roadways, we recommend that the surfacing consist of FDOT SuperPave (SP) asphaltic concrete. The surface course should consist of FDOT SP-9.5 fine mix for light-duty areas and FDOT SP-12.5 and/or SP-9.5 fine mix for heavy duty areas. Note that the SP-9.5 mix can also be used to top the SP-12.5 for smother finish. The asphalt concrete should be placed within the allowable lift thicknesses for fine Type SP mixes per the latest edition of FDOT, Standard Specifications for Road and Bridge Construction.

The asphaltic concrete should be compacted to an average field density of 93 percent of the laboratory maximum density determined from specific gravity (G_{mm}) methods, with an individual test tolerance of **+2 percent and -1.2% of the design G_{mm}**. Specific requirements for the SuperPave asphaltic concrete structural course are outlined in the latest edition of FDOT, Standard Specifications for Road and Bridge Construction.

Please note, if the Designer (or Contract Documents) limits compaction to the static mode only or lifts are placed one-inch thick, then the average field density should be 92 percent, with an individual test tolerance of + 3 percent, and -1.2% of the design G_{mm}.

After placement and field compaction, the wearing surface 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, every 300 feet of lineal roadway, or a minimum of two (2) cores per day's production.

9.2.5 Effects of Groundwater

One of the most critical influences on the pavement performance in Central Florida is the relationship between the pavement base course and the seasonal high groundwater level. Sufficient separation will need to be maintained between the bottom of base course and the anticipated seasonal high groundwater level. We recommend that the seasonal high groundwater and the bottom of the base course be separated by at least 18 inches. ***Based on the anticipated groundwater conditions at this site, the required separation should not be an issue for pavements constructed near existing grades.***

9.4 EXISTING PAVEMENT SECTION

In order to help determine the existing pavement section components and thicknesses along the roadways, UES performed nine (9) pavement cores at locations requested by the client. In general, the existing roadways consisted of 1.7 to 2.7 inches of asphalt, 0 to 12 inches of limerock base and 4 to 8 inches of stabilized subgrade. No aggregate base course was encountered below the surface course at any of the core locations with the exception of C-02 and C-3. The results of the pavement cores along with the estimated structural number are presented in Table VI.

TABLE VI
RESULTS OF PAVEMENT CORES

Core Location (Roadway)	Thickness of Each Component (inches)			Estimated Structural Number
	Asphalt	Base Course	Stabilized Subgrade	
C-01 (Porter Ave.)	2.0	N.E.	8	1.32
C-02 (First St.)	2.3	12" Limerock	4	3.26
C-03 (First St.)	2.0	9" Limerock	8	2.94
C-04 (Franklin Ave.)	1.5	N.E.	8	1.15
C-05 (Franklin Ave.)	1.5	N.E.	4	0.83
C-06 (Franklin Ave.)	2.7	N.E.	4	1.24
C-07 (Lakeside Dr.)	2.5	N.E.	4	1.17
C-08 (Lakeside Dr.)	2.5	N.E.	6	1.33
C-09 (Lakeside Dr.)	1.7	N.E.	4	0.90

N.E. Denotes base course not encountered at core location
A reduced structural coefficient of 0.34 was used for the existing asphalt (good condition)

Based on the results of the roadway cores, the existing pavement section has structural numbers ranging from 0.83 to 3.26. The minimum structural number required to meet the Lake County standards is 2.70. With the exception of C-02 and C-03 (performed along First Street), none of the pavement sections meet the minimum required structural number. In addition, none of the core locations outside of C-02 and C-03 encountered any aggregate base course. Therefore, if the roadways need to meet Lake County minimum standards, complete reconstruction would be necessary for a majority of the roadways (with the exception of C-02 and C-03). If milling and resurfacing was an option, a minimum of 4.5 inches of new asphalt would be needed to reach the required structural number (assuming ½ inch milling).

10.0 SITE PREPARATION FOR NEW ROADWAYS

We recommend normal, good practice site preparation procedures for the new roadway construction areas. These procedures include: stripping/clearing of the site to remove vegetation, roots, organic topsoils, debris, etc. Following stripping, the exposed subgrade soils should be proof-rolled, and all subgrade and subsequent fill/backfill soils should be properly densified. A more detailed description of this work is as follows:

1. Strip the proposed construction limits of vegetation, organic soils, roots, existing improvements, debris and other deleterious materials within and 5 feet beyond the perimeter of the new roadway areas. Expect clearing and grubbing to depths of 3 to 6 inches. We strongly recommend that the stripped/excavated surfaces be observed and probed by representatives of UES.

2. Proof-roll the exposed subsurface soils under the observation of UES, to locate any soft areas of unsuitable soils, and to increase the density of the shallow loose fine sand soils. If deemed necessary by UES, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill.

3. In the areas to be raised, place fill in maximum 12-inch loose, uniform lifts and compact each lift at least 95 percent of the Modified Proctor maximum dry density. All fill should consist of clean sand with less than 12 percent soil fines and be free of organics, debris and other deleterious materials. Fill soils containing between 5 and 12 percent fines may require strict moisture control.

4. Within the at or below grade roadway areas, subgrade compaction of at least 95 percent of the Modified Proctor should be achieved to a depth of at least 1 foot below bottom of stabilized subgrade elevation.

5. The upper 12 inches of subgrade beneath the base course should be compacted and stabilized as recommended in Section 9.2.2.

6. Test the subgrade and each lift of fill for compaction at a frequency of not less than one test per 5,000 square feet in the roadway areas, or every 300 lineal feet of roadway, whichever is greater.

Stability of the compacted soils is essential and independent of compaction and density control. If the near surface soils or the structural fill experience “pumping” conditions, terminate all earthwork activities in that area. Pumping conditions occur when there is too much water present in the soil-water matrix. Earthwork activities are actually attempting to compact the water and not the soil. The disturbed soils should be dried in place by scarification and aeration prior to any additional earthwork activities.

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. UES can provide vibration monitoring services to help document and evaluate the effects of the surface compaction operation on existing structures. It is recommended that large vibratory rollers remain a minimum of 50 feet from existing structures. Within this zone, the use of a static roller or small hand guided plate compactors is recommended.

10.3 CONCRETE "RIGID" PAVEMENTS

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement; therefore, requiring less subgrade preparation. Concrete pavement is recommended in truck court areas, under the dumpster areas, and 10 feet in front of the trash enclosures, at a minimum.

We recommend using the existing surficial sands or approved structural fill densified to at least 98 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 prepared as recommended in the *Site Preparation* section 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.

Based on the results of our exploration and review of the FDOT Rigid Pavement Design Manual, our recommended minimum concrete pavement design is shown in Table V.

TABLE V
MINIMUM CONCRETE PAVEMENT THICKNESSES

Service Level	Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Saw Cut Depth
Light Duty	6 inches	12 feet x 12 feet	2 inches
Heavy Duty	7 inches	14 feet x 14 feet	2⅓ inches

We recommend using concrete with a minimum 28-day compressive strength of at least 4,000 pounds per square inch. Layout of the Saw cut control joints should form square panels, and the depth of saw cut joints should be ⅓ of the concrete slab thickness.

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

11.0 STORMWATER POND DESIGN PARAMETERS

We understand that the drainage improvements will include new stormwater ponds/swales and/or exfiltration systems to collect runoff. Six (6) borings were performed within the potential stormwater facility areas. The following tables present our recommended stormwater system design parameters for the project.

TABLE V
STORMWATER DESIGN PARAMETERS

Design Parameter	Estimated Values
Relevant Boring Logs	P-01 through P-06
Estimated Depth to Base of Surficial Aquifer (feet)	20+
Estimated Fillable Porosity of Surficial in-situ sands (percent)	25
Estimated Seasonal High Groundwater Level (feet)	20+
Estimated Horizontal Saturated Hydraulic Conductivity of Upper Sands (ft/day)	40
Estimated Vertical Unsaturated Hydraulic Conductivity of Upper Sands (ft/day)	27

Please note that survey control was not provided at our boring locations. The estimated depths are referenced to the existing ground surface at the time of our exploration. Appropriate factors of safety should be included in the design. UES can provide the drawdown/recovery analysis once the system configurations and treatment volumes have been finalized.

12.0 DEWATERING AND EXCAVATION CONSIDERATIONS

Based on the groundwater level conditions encountered, dewatering will probably not be required for the successful construction of this project. The actual method(s) of dewatering should be determined by the contractor. The design and discharge of the dewatering system must be performed in accordance with applicable regulatory criteria (i.e. water management district, etc.) and compliance with such criteria is the sole responsibility of the contractor.

Excavations should be sloped as necessary to prevent slope failure and to allow backfilling. As a minimum, temporary excavations below 4-foot depth should be sloped in accordance with OSHA regulations. Where lateral confinement will not permit slopes to be laid back, the excavation should be shored in accordance with OSHA requirements. During excavation, excavated material should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth. Provisions for maintaining workman safety within excavations is the sole responsibility of the contractor.

13.0 CONSTRUCTION RELATED SERVICES

We recommend the owner retain UES to provide inspection services during the site preparation procedures for confirmation of the adequacy of the earthwork operations. Field tests and observations include verification of foundation and pavement subgrades by monitoring

earthwork operations and performing quality assurance tests of the placement of compacted structural fill and pavement courses.

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 site problems or construction changes, which may arise during construction, in a timely and cost-effective manner.

14.0 LIMITATIONS

This report has been prepared for the exclusive use of ***Woodard & Curran*** and other designated members of their design/construction team associated with the proposed construction for the specific project discussed in this report. No other site or project facilities should be designed using the soil information contained in this report. As such, UES will not be responsible for the performance of any other site improvement designed using the data in this report.

This report should not be relied upon for final design recommendations or professional opinions by unauthorized third parties without the expressed written consent of UES. Unauthorized third parties that rely upon the information contained herein without the expressed written consent of UES assume all risk and liability for such reliance.

The recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated on the Boring Location Plan and from other information as referenced. This report does not reflect any variations which may occur between the boring locations. The nature and extent of such variations may not become evident until the course of construction. If variations become evident, it will then be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of the variations.

Borings for a typical geotechnical report are widely spaced and generally not 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 for estimation of material quantities unless our contracted services ***specifically*** include sufficient exploration for such purpose(s) and within the report we so state that the level of exploration provided should be sufficient to detect anomalous conditions or estimate such quantities. Therefore, 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.

All users of this report are cautioned that there was no requirement for UES to attempt to locate any man-made buried objects or identify any other potentially hazardous conditions that may exist at the site during the course of this exploration. Therefore, no attempt was made by UES to locate or identify such concerns. UES cannot be responsible for any buried man-made objects or environmental hazards which may be subsequently encountered during construction that are not discussed within the text of this report. We can provide this service if requested.

During the early stages of most construction projects, 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. A Geotechnical Business Council of the Geoprofessional Business Association (GBC) publication,

"Important Information about This 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.

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APPENDIX A

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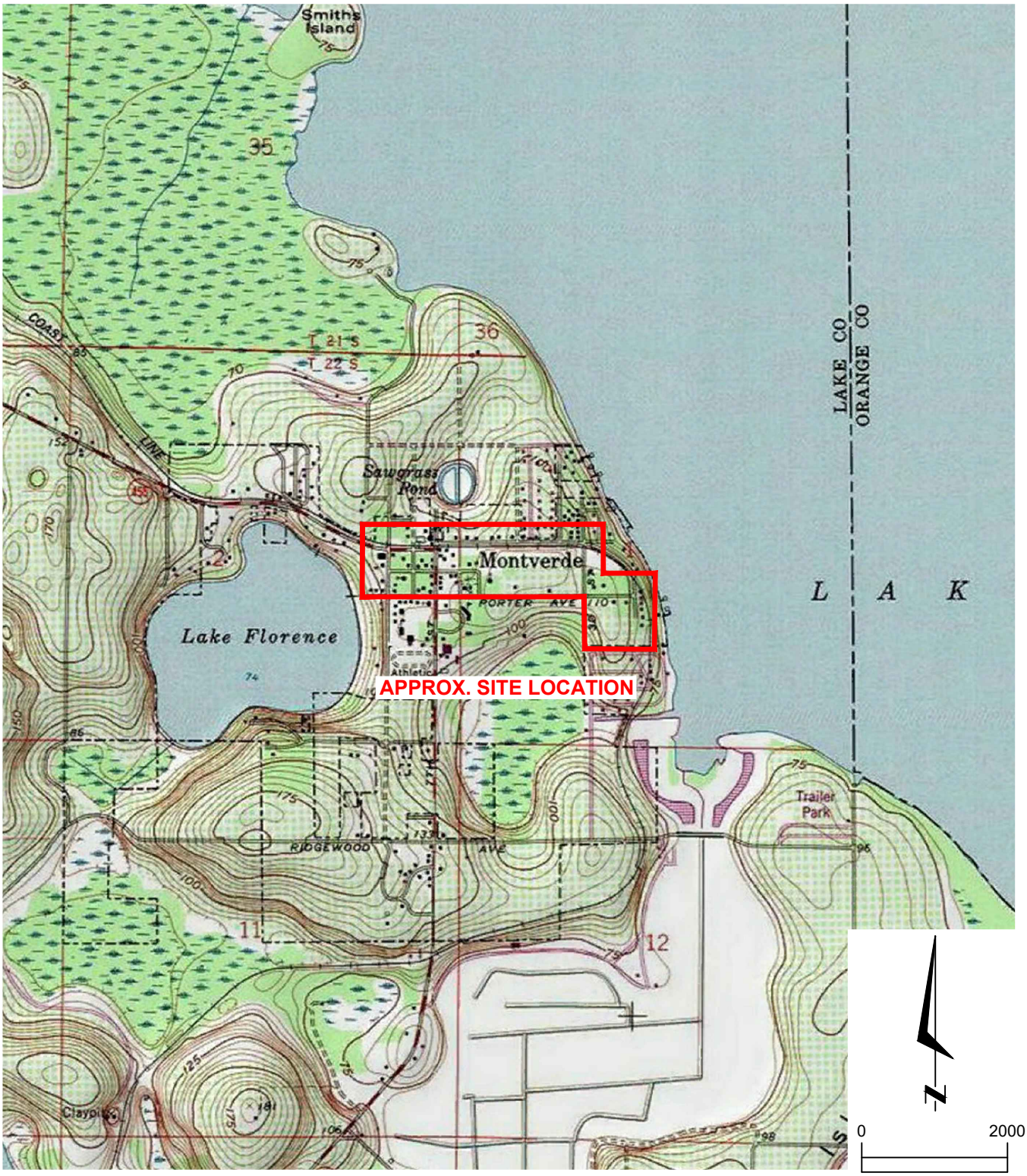

SOURCE: USGS QUADRANGLE MAP OF "CLERMONT EAST, FLORIDA".

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GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER / FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

USGS TOPOGRAPHIC MAP

DRAWN BY:	N.F.	**DATE:**	12 - 13 - 2022	**CHECKED BY:**	A.S.W.	**DATE:**	12 - 27 - 2022
SCALE:	AS SHOWN	**PROJECT NO:**	0130.2200455.0000	**REPORT NO:**	1995329	**PAGE NO:**	A-1

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APPENDIX B

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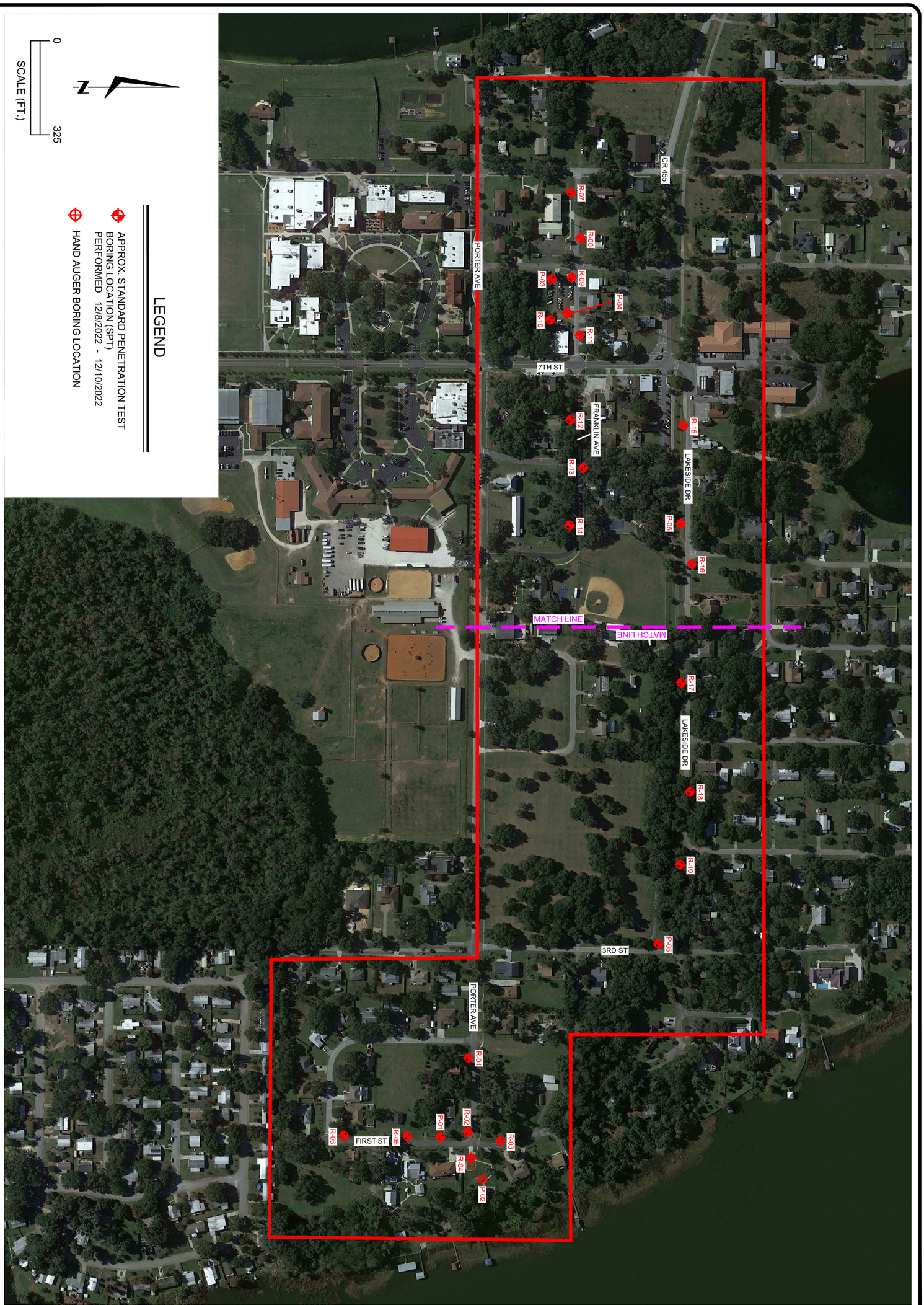
22-0657-01



AERIAL PHOTO SOURCE: GOOGLE EARTH

PAGE NO: B-1.1

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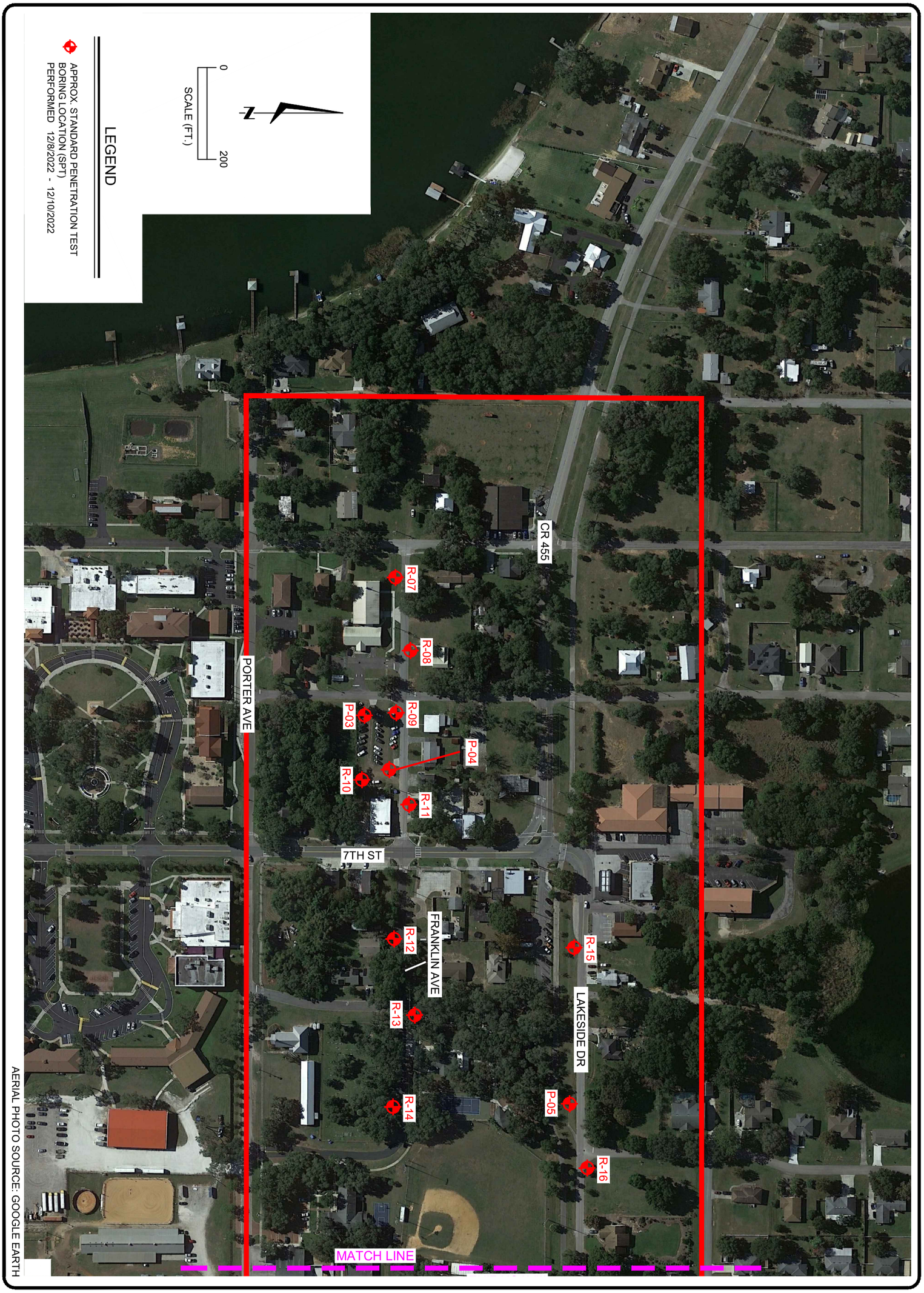
GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER / FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

BORING LOCATION PLAN (OVERVIEW)

FOR: WOODARD & CURRAN

DRAWN BY:	N.F.	DATE:	12 - 13 - 2022
CHECKED BY:	A.S.W.	DATE:	12 - 27 - 2022
REPORT NO:	1995329	SCALE:	AS SHOWN
PROJECT NO:	0130.2200455.0000		

22-0657-01



PAGE NO: B-1.2

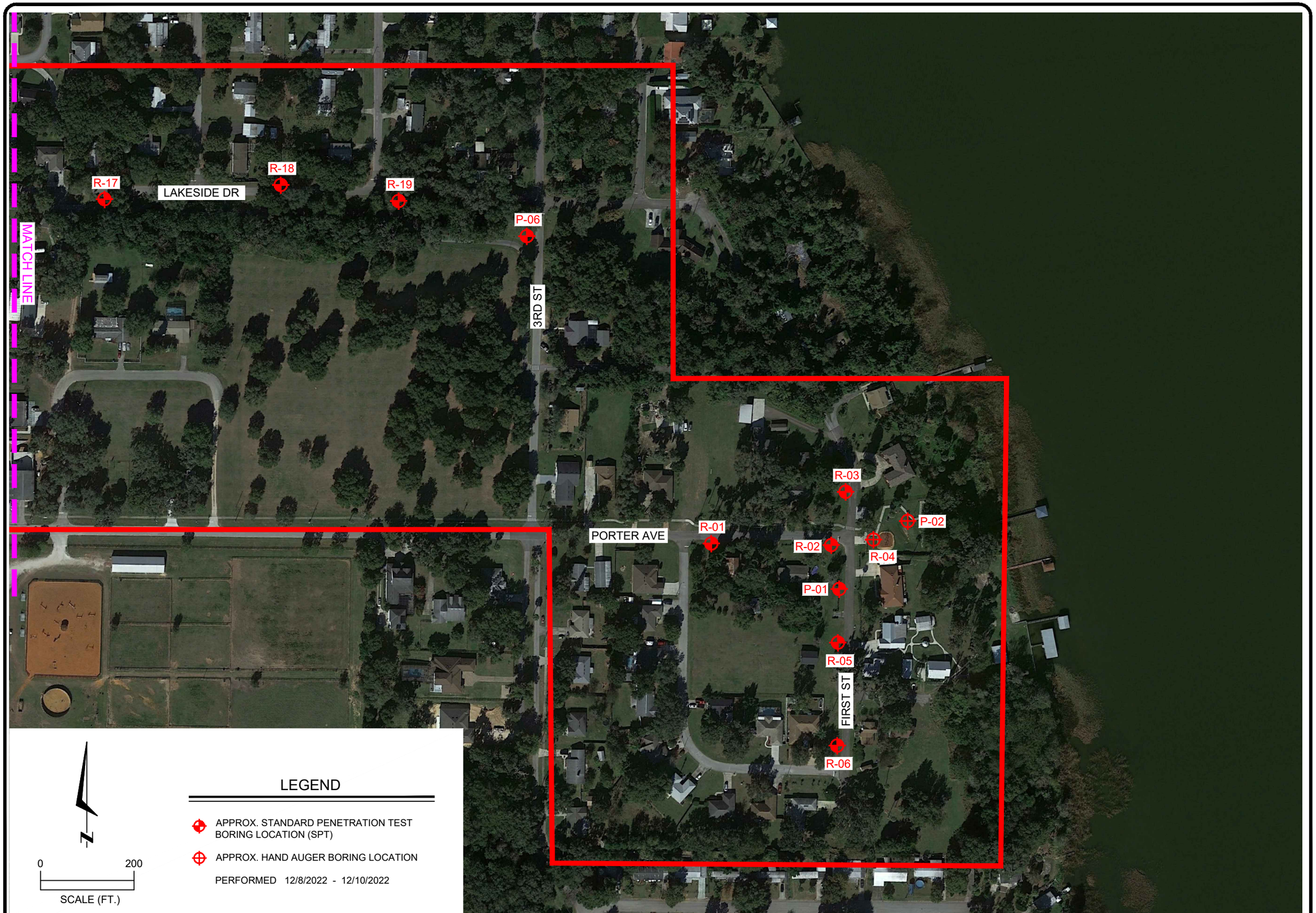
UNIVERSAL ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER / FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

BORING LOCATION PLAN (WEST)

FOR: WOODARD & CURRAN

DRAWN BY:	N.F.	DATE:	12 - 13 - 2022
CHECKED BY:	A.S.W.	DATE:	12 - 27 - 2022
REPORT NO:	1995329	SCALE:	AS SHOWN
PROJECT NO:	0130.2200455.0000		



AERIAL PHOTO SOURCE: GOOGLE EARTH

22-0657-01

FOR: WOODARD & CURRAN

GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER / FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

BORING LOCATION PLAN (EAST)

DRAWN BY:	N.F.	DATE:	12 - 13 - 2022
CHECKED BY:	A.S.W.	DATE:	12 - 27 - 2022
REPORT NO:	1995329	SCALE:	AS SHOWN
PROJECT NO:	0130.2200455.0000		

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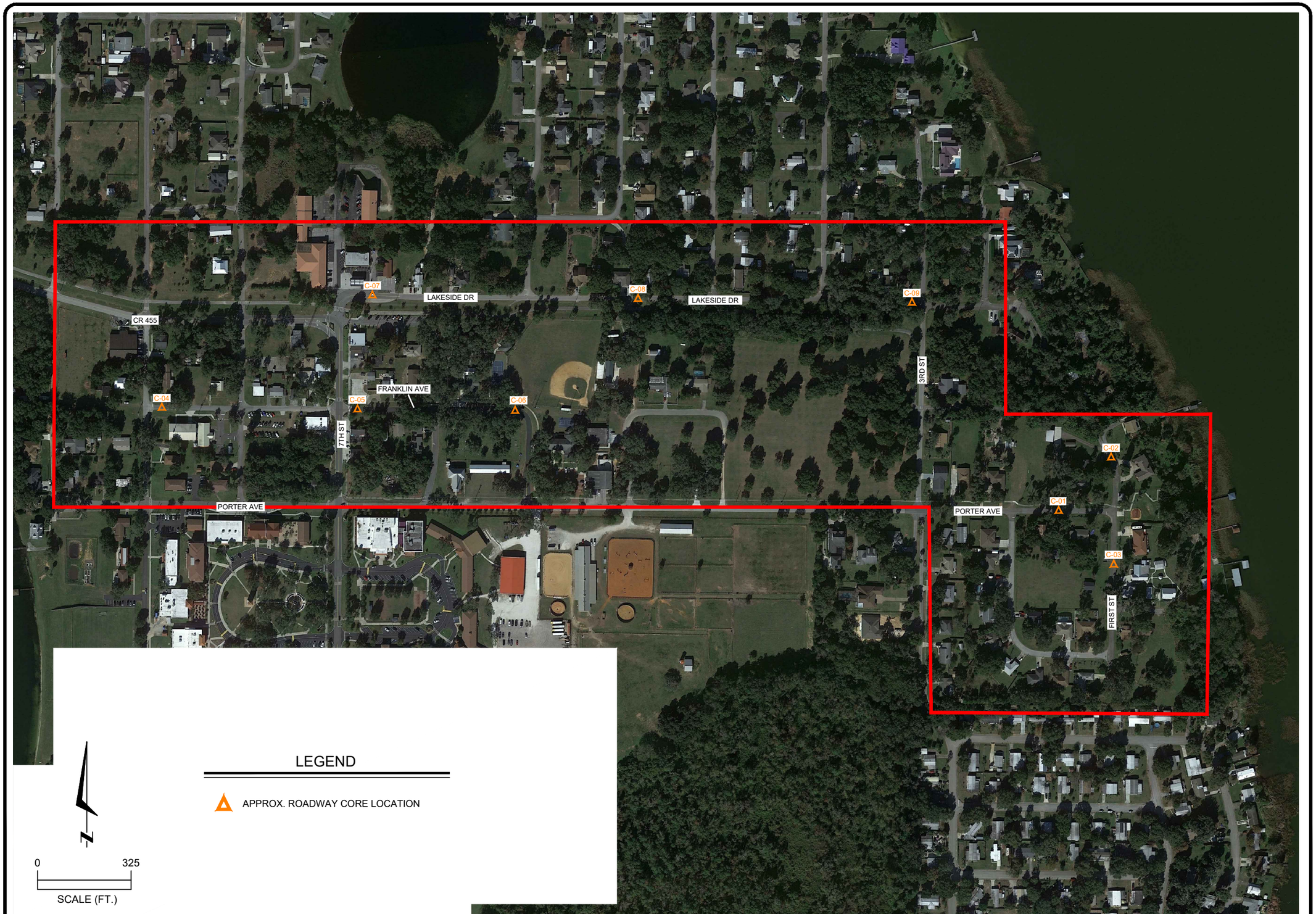

AERIAL PHOTO SOURCE: GOOGLE EARTH

22-0657-01

GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
PORTER / FRANKLIN AVENUE, LAKESIDE DRIVE & FIRST STREET
MONTVERDE, LAKE COUNTY, FLORIDA

ROADWAY CORE LOCATION PLAN

FOR: WOODARD & CURRAN

DRAWN BY:	N.F.	DATE:	12 - 13 - 2022
CHECKED BY:	A.S.W.	DATE:	12 - 27 - 2022
REPORT NO:	1995329	SCALE:	AS SHOWN
PROJECT NO:	0130.2200455.0000		

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BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.1

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-01** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Orange fine SAND [SP]						
5						-- loose	3	5				43
		2-2-2	4									
		3-2-3	5									
10		3-2-2	4									
15		3-3-3	6				2	5				50
20		3-3-3	6			BORING TERMINATED AT 20.0 FEET						
25												

W-12556.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.2

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-02** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Orange brown brown fine SAND [SP]						
						-- orange						
5							4	6			40	
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.3

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-03** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Medium dense orange fine SAND [SP]						
		6-6-5	11			-- loose						
		4-4-3	7			-- very loose						
5		1-1-1	2				4	4				50
		1-1-2	3									
		2-2-1	3			-- loose						
10		2-2-2	4									
15		2-3-3	6				4	4				50
20		3-2-3	5			BORING TERMINATED AT 20.0 FEET						
25												

W-12556.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.4

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-04** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		3-3-3	6									
		3-3-3	6									
5		3-2-2	4				4	4				50
		2-2-2	4									
		2-2-2	4									
10		2-2-3	5									
15		3-2-3	5				5	5				34
20		3-3-3	6			BORING TERMINATED AT 20.0 FEET						
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
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PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-05** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		2-2-2	4									
		2-2-2	4			-- very loose						
5							5	10				45
		2-1-1	2									
		1-1-1	2									
		1-1-1	2			-- loose						
10		1-2-2	4				5	5				18
15		3-3-3	6									
20		3-3-3	6			BORING TERMINATED AT 20.0 FEET						
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
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PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **P-06** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/10/2022
EST. SHGWT (ft):

DATE STARTED: 12/10/22
DATE FINISHED: 12/10/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		4-4-4	8									
		4-3-3	6			-- very loose						
5		2-1-1	2									
		1-1-2	3			-- loose						
		2-2-2	4				5	4				38
		2-3-3	6									
10												
15		3-3-3	6									
20		3-4-3	7				5	7				32
						BORING TERMINATED AT 20.0 FEET						
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.7

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-01** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Orange fine SAND [SP]						
5						-- loose						
		2-2-2	4									
		2-3-3	6									
10		3-2-3	5			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.8

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-02** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND with wood [SP]						
		4-4-4	8									
		2-2-2	4			-- very loose						
5		0-1-1	2			-- loose						
		2-2-2	4									
		2-2-2	4									
		2-2-2	4									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.9

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-03** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose dark orange fine SAND [SP]						
		3-3-3	6									
		3-2-2	4			-- very loose						
5		2-2-1	3			-- loose						
		2-2-2	4									
		2-3-3	6									
10		3-3-3	6			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.10

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-04** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Orange brown fine SAND [SP]						
						-- orange						
5						BORING TERMINATED AT 5.0 FEET						
10												
15												
20												
25												

W-12556.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.11

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-05** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose dark orange fine SAND [SP]						
		3-2-3	5									
		3-3-2	5									
5		2-2-2	4									
		3-2-3	5									
		2-3-3	6									
10		3-3-3	6			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
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PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-06** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark orange brown fine SAND [SP]						
5						-- loose						
		2-2-3	5									
		3-3-2	5									
10		3-3-3	6			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

W-12556.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.13

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-07** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		5-5-5	10									
		4-3-4	7									
5		2-2-2	4									
		2-2-3	5									
		3-3-2	5									
10		2-2-3	5			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.14

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-08** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		5-4-4	8									
		4-3-4	7									
5		3-2-2	4									
		2-2-2	4									
		2-2-2	4									
10		2-2-3	5			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

W-12556.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.15

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-09** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		3-3-2	5									
		3-2-3	5			-- very loose						
5		2-1-1	2			-- loose						
		2-2-2	4									
		2-2-2	4									
10		2-2-2	4			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.16

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-10** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Very loose orange fine SAND [SP]						
		2-2-1	3			-- loose						
		2-2-2	4									
5		2-2-2	4			-- very loose						
		2-1-1	2			-- loose						
		2-2-2	4									
10		2-3-2	5			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.17

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-11** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Orange fine SAND [SP]						
5						-- loose						
		2-2-2	4									
		2-2-3	5									
10		3-3-3	6			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.18

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-12** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		4-4-3	7									
		3-3-2	5			-- very loose						
5		2-1-1	2			-- loose						
		2-2-2	4									
		2-3-2	5									
		3-3-3	6									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.19

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-13** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange brown fine SAND [SP]						
		2-3-3	6			-- orange						
		3-3-3	6			-- very loose						
5		3-2-1	3									
		1-1-2	3			-- loose						
		2-2-2	4									
		3-2-3	5									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.20

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-14** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/8/2022
EST. SHGWT (ft):

DATE STARTED: 12/8/22
DATE FINISHED: 12/8/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose dark orange fine SAND [SP]						
		3-3-2	5			-- very loose						
		3-2-1	3									
5		1-1-2	3			-- loose						
		2-2-2	4									
		2-2-2	4									
10		2-2-2	4			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.21

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-15** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/9/2022
EST. SHGWT (ft):

DATE STARTED: 12/9/22
DATE FINISHED: 12/9/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		3-2-3	5									
		2-2-2	4			-- very loose						
5		2-1-2	3			-- loose						
		2-3-3	6									
		3-2-3	5									
		3-3-3	6									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.22

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-16** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/10/2022
EST. SHGWT (ft):

DATE STARTED: 12/10/22
DATE FINISHED: 12/10/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		4-4-4	8									
		4-3-2	5			-- very loose						
5		2-1-1	2			-- loose						
		2-2-2	4			-- very loose						
		2-1-2	3			-- loose						
10		2-2-2	4			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.23

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-17** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/10/2022
EST. SHGWT (ft):

DATE STARTED: 12/10/22
DATE FINISHED: 12/10/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Medium dense orange fine SAND [SP]						
		6-6-5	11			-- loose						
		4-4-4	8			-- very loose						
5		3-1-1	2									
		1-1-2	3			-- loose						
		2-2-2	4									
10		2-2-3	5			BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.24

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-18** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/10/2022
EST. SHGWT (ft):

DATE STARTED: 12/10/22
DATE FINISHED: 12/10/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		3-4-3	7									
		2-2-2	4			-- very loose						
5		2-1-2	3									
		1-1-2	3			-- loose						
		2-2-2	4									
		2-2-2	4									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.2200455.0000
REPORT NO.:	1995329
PAGE:	B-2.25

PROJECT: GEOTECHNICAL EXPLORATION
MONTVERDE ROADWAY & DRAINAGE IMPROVEMENTS
MONTVERDE, LAKE COUNTY, FLORIDA

BORING I.D.: **R-19** SHEET: **1 of 1**
SECTION: 1,2 TOWNSHIP: 22 RANGE: 26

CLIENT: WOODARD & CURRAN
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, NE = NOT ENCOUNTERED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): NE
DATE OF READING: 12/10/2022
EST. SHGWT (ft):

DATE STARTED: 12/10/22
DATE FINISHED: 12/10/22
DRILLED BY: ORL - AI/MW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose orange fine SAND [SP]						
		3-3-3	6									
		3-2-3	5									
5		2-2-2	4									
		2-2-2	4									
		2-2-2	4									
		2-2-3	5									
10						BORING TERMINATED AT 10.0 FEET						
15												
20												
25												

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UNIVERSAL
ENGINEERING SCIENCES

KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
RQD	Rock Quality Designation
	Stabilized Groundwater Level
	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
NP	Non-Plastic (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 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 and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SIOLS 50% or more passes the 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, 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 diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve
** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY
(Sands and Gravels)
Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY
(Silts and Clays)
Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Firm – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS
(Limestone)
Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample
Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample
Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

APPENDIX C

UNIVERSAL
ENGINEERING SCIENCES

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.

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 constructor — 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 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 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.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many 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;
- 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. *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 geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this 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 geotechnical-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 confirmation-dependent recommendations included in your report. *Confirmation-dependent 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 confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront 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. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical 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 Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors 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 constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors 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 constructors fail to 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.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* 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 environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental 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, many 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 GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of 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. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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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.

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