AREHNA | Engineering, Inc.

REPORT OF GEOTECHNICAL EXPLORATION

CAPE HAZE RESTORATION
CHARLOTTE COUNTY, FLORIDA

AREHNA PROJECT NO. B-22-057

December 14, 2022

Prepared For:
Johnson, Mirmiran & Thompson, Inc.
2000 East 11th Avenue, Suite 300
Tampa, Florida 33605

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December 14, 2022

Steven Collins
Johnson, Mirmiran & Thompson, Inc.
2000 East 11th Avenue, Suite 300
Tampa, Florida 33605

Subject: **Report of Geotechnical Exploration**
Cape Haze Restoration
Charlotte County, Florida
AREHNA Project B-22-057

AREHNA Engineering, Inc. (AREHNA) is pleased to submit this report of our geotechnical exploration for the proposed project. Services were conducted in general accordance with AREHNA Proposal B.Prop-21-144 revised on August 30, 2022. The purpose of our geotechnical study was to obtain information on the general subsurface conditions for the project site.

This report presents our understanding of the project, outlines our exploratory procedures, documents the field data obtained.

AREHNA appreciates the opportunity to have assisted Johnson, Mirmiran & Thompson, Inc. on this project. Should you have any questions with regards to this report, or if we can be of any further assistance, please contact this office.

Best Regards,
AREHNA ENGINEERING, INC.
FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION NO. 28410

Andy Tao, P.E.
Geotechnical Engineer
Florida Registration 88520

This item has been digitally signed and sealed by:

Kevin M Hill:A01410D00000177FDB9AE9A00017C13
2022.12.14 16:31:01 -05'00'

Kevin M. Hill, P.E.
Sr. Geotechnical Engineer
Florida Registration 72949
On the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies

Distribution: 1 – Addressee - Electronic
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LIST OF APPENDICES

1.0 PROJECT INFORMATION AND SCOPE OF WORK

1.1 SITE DESCRIPTION AND PROJECT CHARACTERISTICS

The project site is located near 4912 4th Street North and is bounded by Boundary Road to the north, Cape Haze Pioneer Trail to the east, and wetlands to the west and south in Placida, Charlotte County, Florida. We understand that the site was previously planned as a residential development but is now planned as an ecological restoration with proposed trails.

1.2 SCOPE OF WORK

The purpose of our geotechnical study was to obtain information on the general subsurface conditions at the proposed project site. The subsurface materials encountered were evaluated with respect to the available project characteristics. In this regard, engineering assessments for the following items were formulated:

- Identification of the existing groundwater levels and estimated normal seasonal high groundwater fluctuations.
- General location and description of potentially deleterious materials encountered in the borings which may have an impact on the proposed construction.
- Infiltration rates based on the permeability tests.

The following services were performed to achieve the above-outlined objectives:

- Requested utility location services from Sunshine811.
- Performed 16 hand auger borings to depths of 2 to 5 feet on berms at locations provided by the client.
- Collected four (4) undisturbed samples at a depth of approximately 1 foot below ground surface for permeability testing in the lab.
- Visually classified, lab tested and stratified soil samples in the laboratory using the Unified Soil Classification System (USCS).
- Reported the results of the field exploration data. The results of the subsurface exploration are presented in this report, signed, and sealed by a professional engineer specializing in geotechnical engineering.

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 FIELD EXPLORATION

A total of 16 hand auger borings (B-01 through B-16) were completed to depths ranging from 2 to 5 feet below the existing ground surface. The majority of the borings were terminated due to shallow water table. Four Shelby tubes were collected approximately 1-foot below existing ground surface for permeability testing. Boring and test locations were selected by the client.

The hand auger borings were performed by manually advancing a 3-inch diameter, 6-inch-long sampler into the soil until the sampler was full. The sampler was then retrieved and the soils in the sampler removed and visually classified. The soil sampling was performed in general accordance with ASTM Test Designation D1452, entitled "Soil Investigation and Sampling by Auger Borings." Samples will be retained for 90 days after the date of the report and then disposed, unless other arrangements have been made.

Additional soil samples (approximate depth of 1 foot) were collected at each hand auger boring location for total phosphorus and total Nitrogen testing by Pace Analytical Services.

Four Shelby tube (undisturbed, thin-walled) samples were collected at an approximate depths of 0.5 to 1 foot at borings B-02, B-10, B-11 and B-13 for constant head permeability testing and other analyses.

The **Boring Location Plan** on **Sheets 2A and 2B** in **Appendix A** provides a boring location site plan showing the approximate relationship of existing and proposed features to the test locations. The test locations were located in the field by using GPS coordinates.

2.2 LABORATORY TESTING

Laboratory testing, consisting of natural moisture content, single sieve (#200) gradation testing, and organic content were performed on representative soil samples from the hand auger borings. The results of the laboratory testing are presented on the **Soil Boring Profiles** on **Sheets 3A** and **3B** in **Appendix A** and are summarized on **Table 1** in **Appendix B**. Constant head permeability testing was performed on the undisturbed Shelby tube sample collected at boring locations B-02, B-10, B-11, and B-13 location shown on **Sheets 2A and 2B** in **Appendix A**. The **Permeability Test Results** follow Table 1 in **Appendix B**. Total phosphorus and total nitrogen testing was provided by Pace Analytical Services, LLC and these test results (**Report of Laboratory Analysis**) are provided after the Permeability Test Results in **Appendix B**.

3.0 SUBSURFACE CONDITIONS

3.1 USGS TOPOGRAPHIC DATA

The topographic survey map published by the United States Geological Survey was reviewed for ground surface features at the proposed project location (**Sheet 1** in **Appendix A**). Based on this review, the natural ground surface elevations at the project site are approximately between 0 to +7 feet National Geodetic Vertical Datum of 1929 (NGVD). Elevations referenced in this report should be considered very approximate only and should not be used for design purposes. No surveying was performed.

3.2 USDA NATURAL RESOURCES CONSERVATION SERVICE DATA

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) survey for Charlotte County indicates that the soil at the project site consist of the following soil units:

Table 3.2 Summary of USDA Soil Survey

Soil Unit Number	Soil Name	Depth Below Natural Grade to High Water Table (feet)
6	Brynwood fine sand, wet, 0 to 2 percent slopes	0.3 – 1.5
11	Myakka fine sand, 0 to 2 percent slopes	0.5 – 1.5
28	Immokalee sand, 0 to 2 percent slopes	0.5 – 1.5
43	Smyrna fine sand, 0 to 2 percent slopes	0.5 – 1.5
53	Myakka fine sand, frequently ponded, 0 to 1 percent slopes	0

We note that map unit 43 encompasses most of the site. The other map units are mostly along the northern portion of the site. It should be noted that water table depths reported by the Soil Survey do not include fill that may have been added to the site during previous development including the existing berms.

3.3 SUBSURFACE CONDITIONS

A pictorial representation of the subsurface conditions encountered in the borings is shown on the Soil Boring Profiles in **Sheets 3A** and **3B** in **Appendix A**. These profiles and the following soil conditions highlight the general subsurface stratification. When reviewing the boring records and the subsurface soil profiles, it should be understood that soil conditions may vary between, and away from, boring locations.

Borings generally encountered fine sand (SP) to slightly silt sand (SP-SM) from the ground surface to termination depths of 2 to 5 feet below the ground surface. Organics were typically found in trace amounts. Roots (typically live roots) were more prevalent at the surface.

3.4 ON-SITE SOIL SUITABILITY

Sandy shallow soils present at the site were classified as sand (SP) and slightly silty sand (SP-SM) and are generally suitable for use directly below foundations and pavement, or for re-use as structural fill. No deleterious, clayey or highly organic soils were encountered at the boring locations within the depth of exploration.

Soil excavated from below the groundwater level will be above the optimum moisture content required for compaction and will need to be dried before placement. Suitable structural fill materials should consist of fine to medium sand with less than 12 percent passing the No. 200 sieve and be free of rubble, organics, clay, debris and other unsuitable material. Any off-site materials used as fill should be approved by AREHNA prior to acquisition. We note that there was a stockpile of soil at this site and very minimal testing was done in that area. Stockpile soils may be acceptable but should be tested at the time of construction to verify acceptability for the intended usage.

3.5 PERMEABILITY TEST RESULTS

Four undisturbed vertical soil samples were collected in a 6-inch-long Shelby tube at approximately 0.5 to 1 foot below existing grades at boring locations B-02, B-10, B-11, and B-13. These samples were tested in our laboratory with a constant head test. The saturated vertical permeability rate ranged from 2.3 in/hr (4.6 ft/day) to 10.9 in/hr (21.8 ft/day). No factor of safety has been applied to this ultimate value. We estimate that the horizontal saturated rates are about 3 to 13 in/hr (6 to 26 ft/day) based on the vertical rates (we recommend a 1.2 multiplier for estimating horizontal rates from vertical rate tests). A summary of the lab permeability test results is attached in **Appendix B**.

3.6 GROUNDWATER CONDITIONS

The groundwater level was recorded at 0.5 to 3.9 feet below ground surface at the boring locations. Groundwater was not encountered with the depth of exploration of borings B-04 and B-09. Standing water was observed in many places at this site, including within the many canals present at this site as well as within low areas of the site. Groundwater depth is dependent on boring locations in relation to the existing berms and berm heights. Fluctuation in groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors.

3.7 ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL

We understand that the majority of this site floods as this is mostly a wetland site. Based on the information obtained from the site, the time of year the borings were completed, and our experience in the area, we recommend a design water level at a depth at or above the existing ground surface between the berms. Berm height will affect depth to water table within the berms.

4.0 BASIS FOR RECOMMENDATIONS

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions at other locations will be different from those at the specific boring locations and that conditions will not be as anticipated by the designers or contractors. In addition, the construction process itself may alter soil conditions. AREHNA is not responsible for the conclusions, opinions or recommendations made by others based on the data presented in this report.

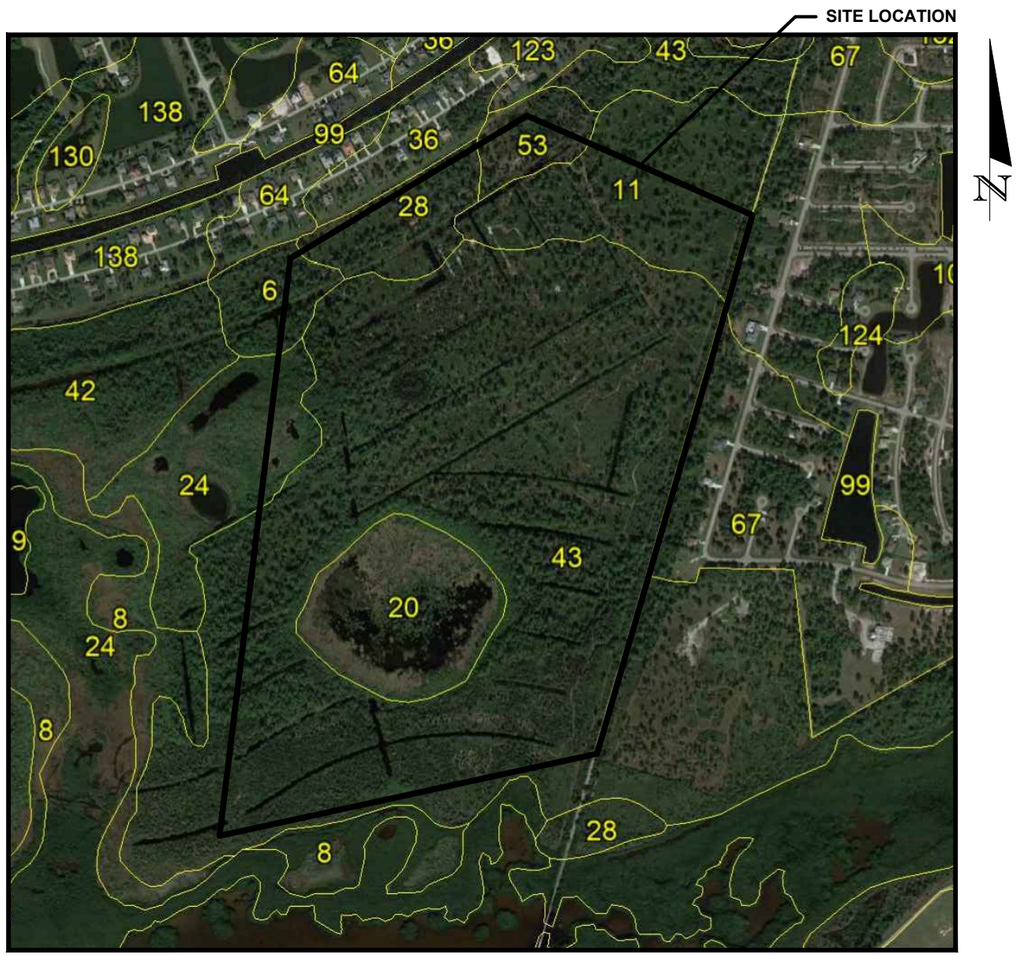
Appendix A

USDA & USGS Vicinity Maps – Sheet 1

Boring Location Plan – Sheets 2A to 2B

Soil Boring Profiles – Sheets 3A to 3B

USDA SOIL SURVEY MAP



REFERENCE: USDA SOIL SURVEY OF CHARLOTTE COUNTY, FLORIDA

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Feet

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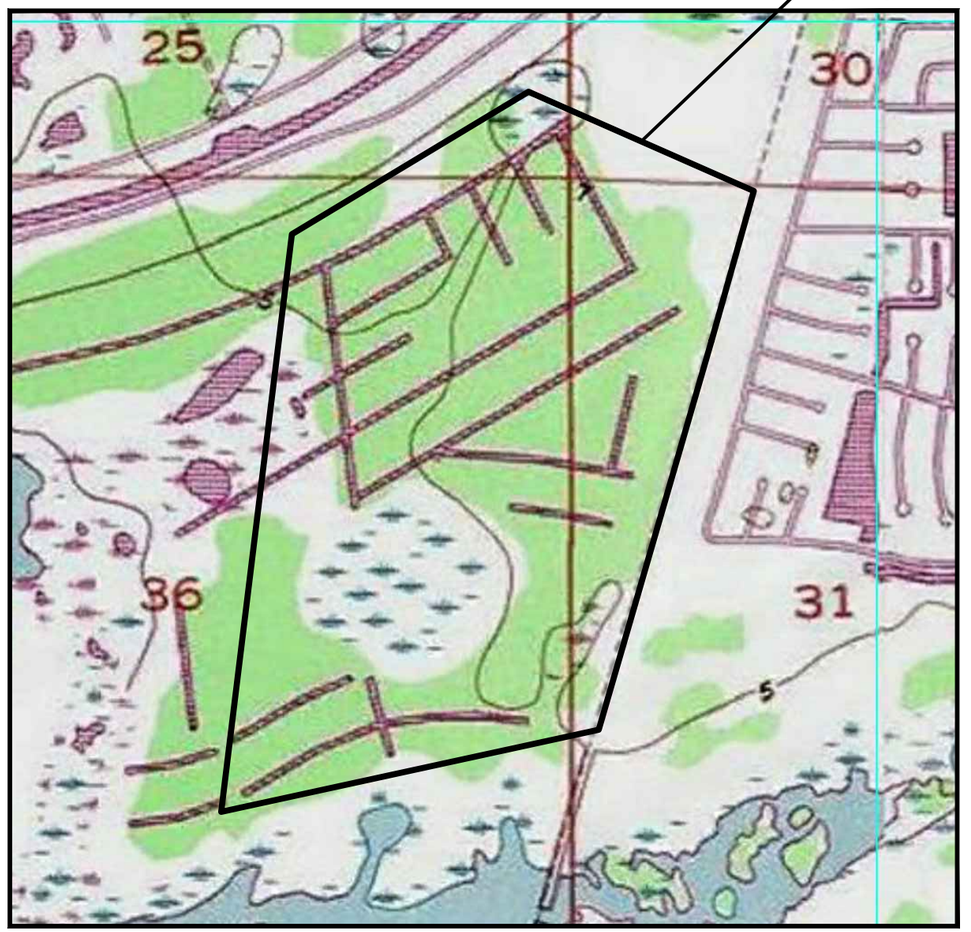
RANGE:	20 E	21 E
SECTION:	25, 36	30, 31

USGS TOPOGRAPHIC MAP



REFERENCE: "PLACIDA, FLORIDA" USGS QUADRANGLE MAP

0 250 1000
Feet

TOWNSHIP:	41 S	41 S
RANGE:	20 E	21 E
SECTION:	25, 36	30, 31

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

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USDA & USGS VICINITY MAPS

	NAME	DATE
DESIGNED BY:	AT	12/2022
DRAWN BY:	DG	12/2022
CHECKED BY:	KH	12/2022
SUPERVISED BY:	Kevin M. Hill, P.E.	

PROJECT NAME	PROJECT NO.	SHEET NO.
CAPE HAZE RESTORATION CHARLOTTE COUNTY, FLORIDA	B-22-057	1

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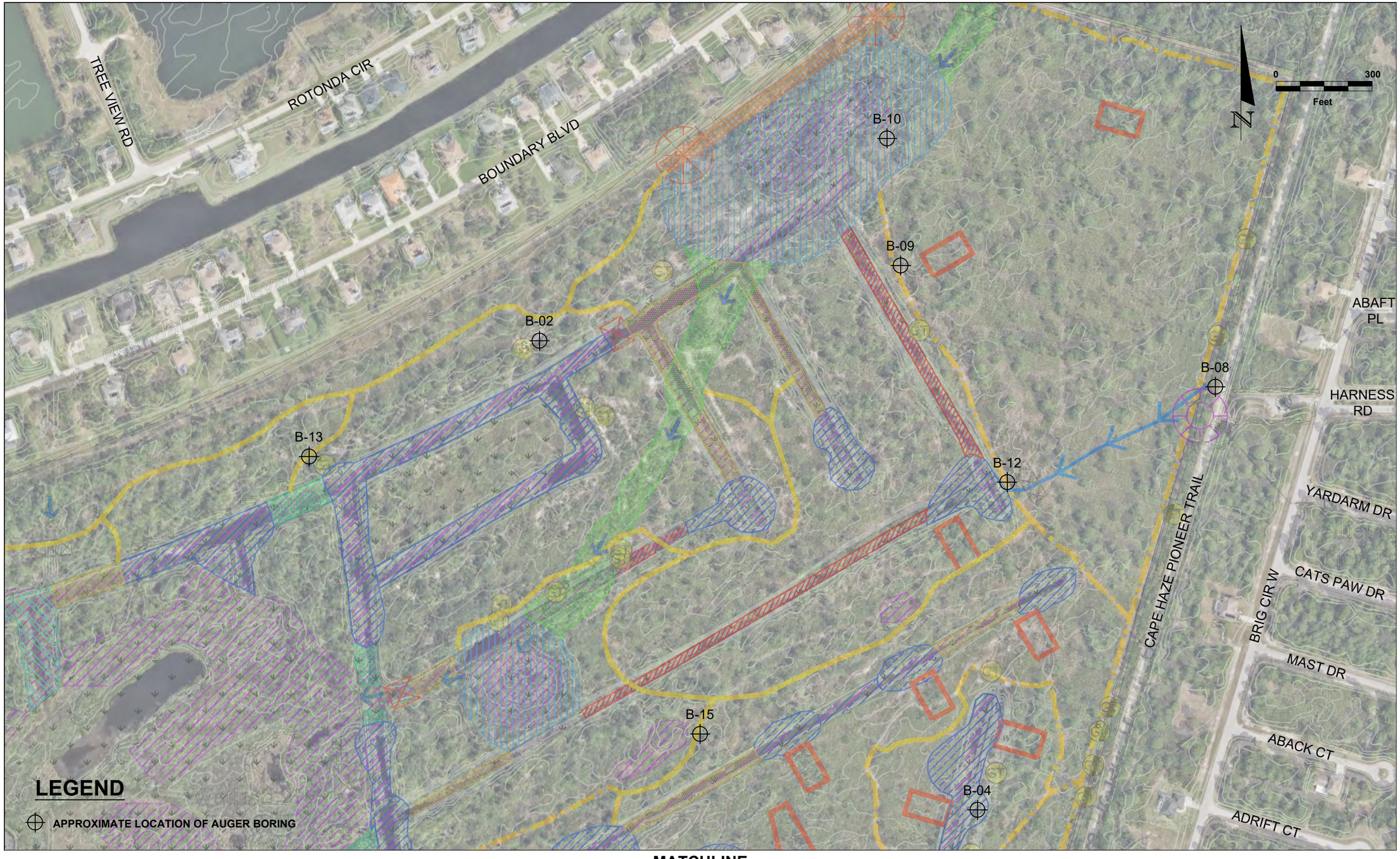

MATCHLINE

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

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Phone 954.417.8412 | Fax 813.944.4959
Certificate of Authorization No. 28410

BORING LOCATION PLAN

	NAME	DATE
DESIGNED BY:	AT	12/2022
DRAWN BY:	DG	12/2022
CHECKED BY:	KH	12/2022
SUPERVISED BY:	Kevin M. Hill, P.E.	

PROJECT NAME	PROJECT NO.	SHEET NO.
CAPE HAZE RESTORATION CHARLOTTE COUNTY, FLORIDA	B-22-057	2A

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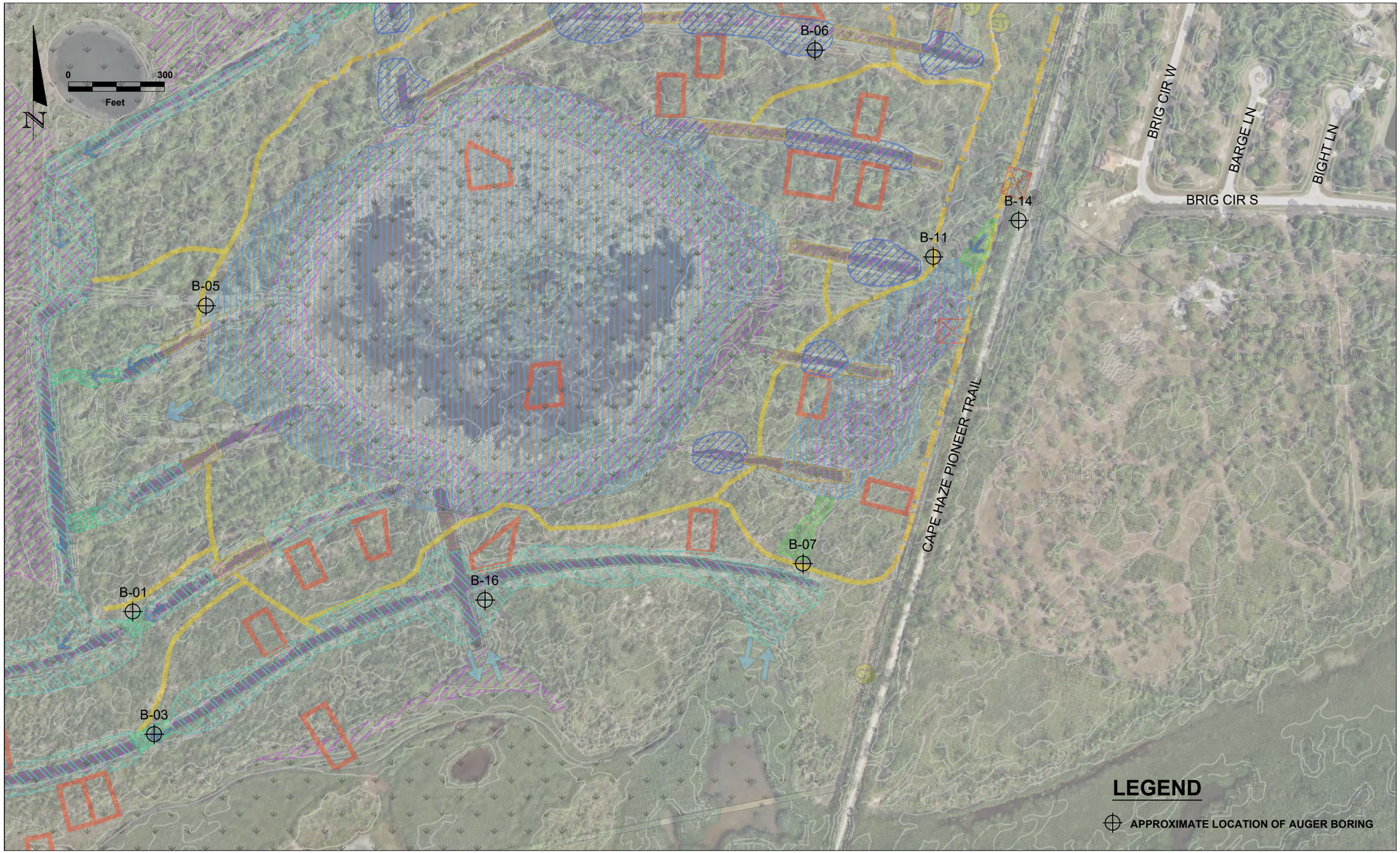

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SUPERVISED BY:	Kevin M. Hill, P.E.	

PROJECT NAME	PROJECT NO.	SHEET NO.
CAPE HAZE RESTORATION CHARLOTTE COUNTY, FLORIDA	B-22-057	2B

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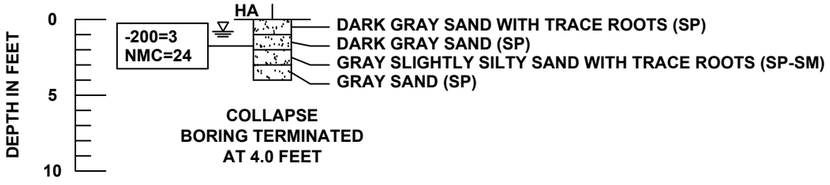

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B-02

11/21/22

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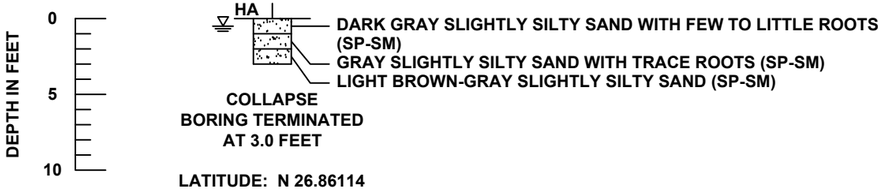
11/21/22



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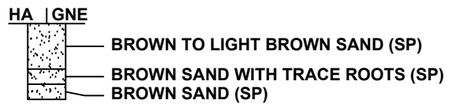

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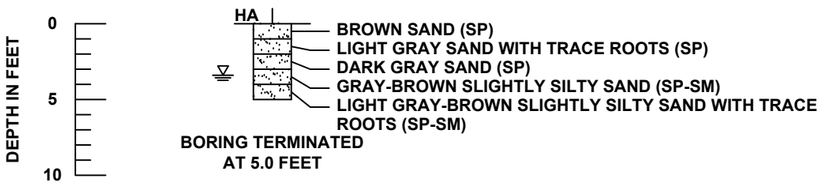

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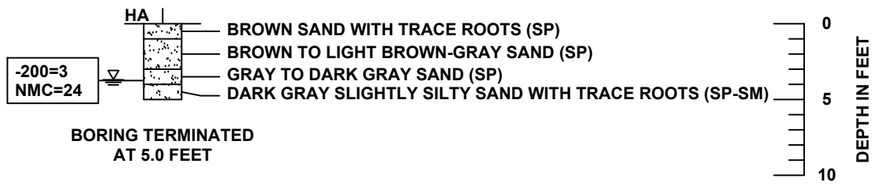

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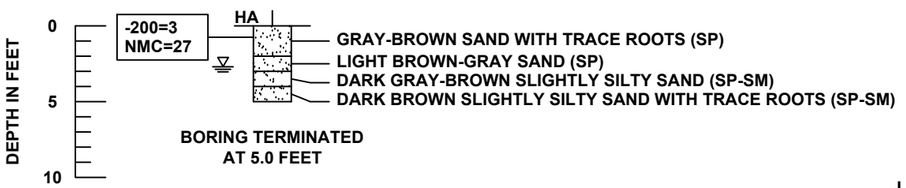

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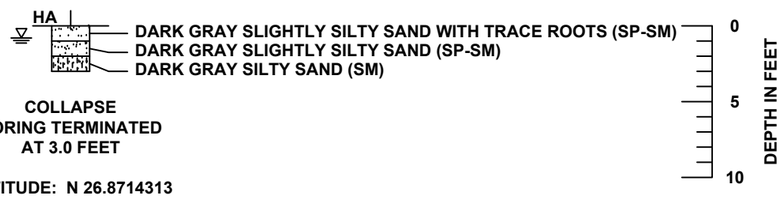
11/21/22



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LEGEND

FINE SAND (SP/SP-SM)

SILTY SAND (SM)

SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING

GROUNDWATER TABLE AT THE TIME OF DRILLING

GNE GROUNDWATER TABLE NOT ENCOUNTERED

HA HAND AUGER

-200 FINES PASSING THE #200 STANDARD SIEVE (%)

NMC NATURAL MOISTURE CONTENT (%)

OC ORGANIC CONTENT (%)

Soil Profile Notes:

1. The profiles depicted are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles include soil description, stratifications and penetration resistances. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.
2. Groundwater levels generally fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels or temporary perched conditions are normally recorded in rainy seasons.
3. The Boring Locations Presented are Approximate and Based on Hand Held GPS with an Accuracy of +/- 10 Feet.

REVISIONS			
NO.	DATE	DESCRIPTIONS	APPROVED

PREPARED BY:

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SOIL BORING PROFILES

	NAME	DATE
DESIGNED BY:	AT	12/2022
DRAWN BY:	DG	12/2022
CHECKED BY:	KH	12/2022
SUPERVISED BY:	Kevin M. Hill, P.E.	

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CAPE HAZE RESTORATION CHARLOTTE COUNTY, FLORIDA	B-22-057	3A

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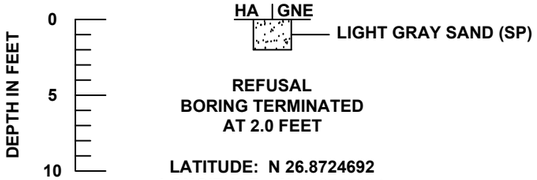

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B-10

11/21/22

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AT 2.0 FEET

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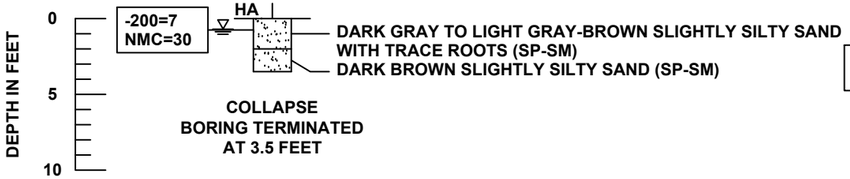
11/21/22



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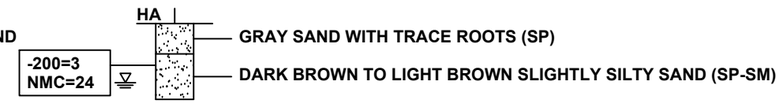
11/21/22



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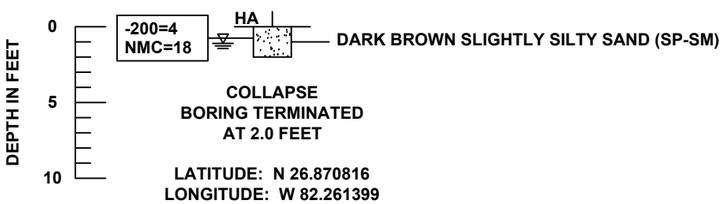

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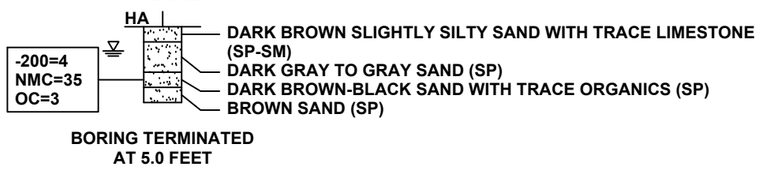
11/21/22



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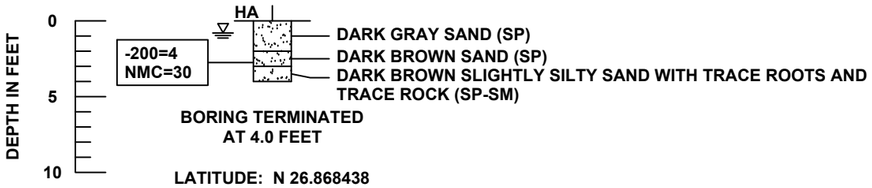
11/21/22



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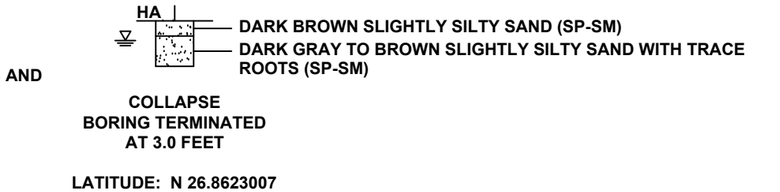
11/21/22



COLLAPSE
BORING TERMINATED
AT 3.0 FEET

LATITUDE: N 26.8623007
LONGITUDE: W 82.2596913

LEGEND

SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND/OR LABORATORY TESTING
▽	GROUNDWATER TABLE AT THE TIME OF DRILLING
GNE	GROUNDWATER TABLE NOT ENCOUNTERED
HA	HAND AUGER
-200	FINES PASSING THE #200 STANDARD SIEVE (%)
NMC	NATURAL MOISTURE CONTENT (%)
OC	ORGANIC CONTENT (%)

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3. The Boring Locations Presented are Approximate and Based on Hand Held GPS with an Accuracy of +/- 10 Feet.

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SOIL BORING PROFILES

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PROJECT NAME	PROJECT NO.	SHEET NO.
CAPE HAZE RESTORATION CHARLOTTE COUNTY, FLORIDA	B-22-057	3B

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Appendix B

Summary of Laboratory Results – Table 1

Permeability Test Results

Report of Laboratory Analysis by Pace Analytical Services, LLC

Field & Laboratory Procedures

TABLE 1
SUMMARY OF LABORATORY TEST RESULTS
Cape Haze Restoration
Charlotte County, Florida
AREHNA Project B-22-057

Boring No.	Sample Depth (feet)	USCS Classification	Sieve Gradation (% Passing)	Organic Content	Natural Moisture Content (%)
			#200		
B - 02	0.5 - 1	SP	2	-	6
B - 10	0.5 - 1	SP	2	-	20
B - 11	0.5 - 1	SP-SM	7	-	30
B - 13	0.5 - 1	SP	5	-	18
B - 01	1.5 - 2	SP	3	-	24
B - 06	3.5 - 4	SP	3	-	24
B - 07	0.5 - 1	SP	3	-	27
B - 10	1.5 - 2	SP	2	-	24
B - 12	2.5 - 3	SP	3	-	24
B - 13	0.5 - 1	SP-SM	7	-	26
B - 14	3.5 - 4	SP	4	3	35
B - 15	2.5 - 3	SP	4	-	30

Permeability Test Results

AREHNA | Engineering, Inc.

Project Name:	Cape Haze	Project No.:	B-22-057
Lab No.:	B-02 (Vertical)	Date:	11/30/2022
Soil Description:	Light brown sand	Technician:	B. Brown/D. Greene
Soil Classification:	SP	Checked By:	KH

Permeability Test ASTM D5856 Method A

Field Information

Date Sampled:	11/21/2022	Sampling Technician:	Paul D.		
Method of Compaction:	In-Situ	Boring:	B-02	Depth:	0.5' - 1.0'
Location of Sample:				Orientation:	Vertical
Notes:					

Lab Test Data

Permeant Liquid Used:	Tap Water	Specific Gravity of Soilds (assumed):	2.65
Permeameter Type:	Shelby Tube Permeameter	Void Ratio, e:	0.71
Ring Base:	Single	Porosity %:	41.6
Duration of Testing (min):	N/A	Fillable Porosity (Field Capacity) %:	32.7
Initial Length of Soil (cm):	13.19	Area of Soil (cm^2):	41.74
Diameter of Soil (cm):	7.29	Final Volume of Soil (cm^3):	550.5
Final Length of Soil (cm):	13.19	Initial Volume of Soil (cm^3):	550.5

Initial Specimen				**Final Specimen**			
Tare (g):	441.6	Water Content %:	5.8	Tare (g):	441.6	Water Content %:	24.6
Total Mass (g):	1342.6	% Passing 200:	2.3	Total Mass (g):	1504.4	% Passing 200:	2.3
Soil Mass (g):	901	Dry Density (pcf):	96.524	Soil mass (g):	1062.8	Dry Density (pcf):	96.678
Dry Soil Mass:	851.6	Wet Density (pcf):	102.122	Dry Soil Mass:	853.0	Wet Density (pcf):	120.461
		Degree of Saturation %:	21.6			Degree of Saturation %:	91.8

Constant Head Permeability Test

Test No.	H (cm)	Q (mL)	Time Elapsed (s)	Temperature (Celcius)	Q/At	Hydraulic Gradient, h/L	k (cm/s)	Rt	k 20 (cm/s)
1	90	100	41	24.0	0.058	6.82	0.0086	0.910	0.0078
2	90	100	43	24.0	0.056	6.82	0.0082	0.910	0.0074
3	90	100	41	24.0	0.058	6.82	0.0086	0.910	0.0078
4	90	100	41	24.0	0.058	6.82	0.0086	0.910	0.0078
5	90	100	42	24.0	0.057	6.82	0.0084	0.910	0.0076
6	90	100	42	24.0	0.057	6.82	0.0084	0.910	0.0076
			Average Test Temperature	24	**Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (cm/s)**				**0.0077**
					Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (in/hr)				**10.9**

AREHNA | Engineering, Inc.

Project Name:	Cape Haze	Project No.:	B-22-057
Lab No.:	B-10 (Vertical)	Date:	11/30/2022
Soil Description:	Light grayish-brown sand	Technician:	B. Brown/D. Greene
Soil Classification:	SP	Checked By:	KH

Permeability Test ASTM D5856 Method A

Field Information

Date Sampled:	11/21/2022	Sampling Technician:	Paul D.		
Method of Compaction:	In-Situ	Boring:	B-10	Depth:	0.5' - 1.0'
Location of Sample:				Orientation:	Vertical
Notes:					

Lab Test Data

Permeant Liquid Used:	Tap Water	Specific Gravity of Soilds (assumed):	2.65
Permeameter Type:	Shelby Tube Permeameter	Void Ratio, e:	0.83
Ring Base:	Single	Porosity %:	45.3
Duration of Testing (min):	N/A	Fillable Porosity (Field Capacity) %:	16.7
Initial Length of Soil (cm):	13.17	Area of Soil (cm^2):	41.51
Diameter of Soil (cm):	7.27	Final Volume of Soil (cm^3):	546.7
Final Length of Soil (cm):	13.17	Initial Volume of Soil (cm^3):	546.7

Initial Specimen				**Final Specimen**			
Tare (g):	438.8	Water Content %:	19.7	Tare (g):	438.8	Water Content %:	25.8
Total Mass (g):	1387.4	% Passing 200:	1.6	Total Mass (g):	1413.1	% Passing 200:	1.6
Soil Mass (g):	948.6	Dry Density (pcf):	90.454	Soil mass (g):	974.3	Dry Density (pcf):	88.400
Dry Soil Mass:	792.5	Wet Density (pcf):	108.274	Dry Soil Mass:	774.5	Wet Density (pcf):	111.207
		Degree of Saturation %:	63.0			Degree of Saturation %:	78.5

Constant Head Permeability Test

Test No.	H (cm)	Q (mL)	Time Elapsed (s)	Temperature (Celcius)	Q/At	Hydraulic Gradient, h/L	k (cm/s)	Rt	k 20 (cm/s)
1	90	20	19	24.5	0.025	6.83	0.0037	0.899	0.0033
2	90	20	19	24.5	0.025	6.83	0.0037	0.899	0.0033
3	90	20	21	24.5	0.023	6.83	0.0034	0.899	0.0030
4	90	20	20	24.5	0.024	6.83	0.0035	0.899	0.0032
5	90	20	19	24.5	0.025	6.83	0.0037	0.899	0.0033
6	90	20	19	24.5	0.025	6.83	0.0037	0.899	0.0033
			Average Test Temperature	24.5	**Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (cm/s)**				**0.0032**
					Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (in/hr)				**4.6**

AREHNA | Engineering, Inc.

Project Name:	Cape Haze	Project No.:	B-22-057
Lab No.:	B-11 (Vertical)	Date:	11/30/2022
Soil Description:	Light grayish-brown sand	Technician:	B. Brown/D. Greene
Soil Classification:	SP-SM	Checked By:	KH

Permeability Test ASTM D5856 Method A

Field Information

Date Sampled:	11/21/2022	Sampling Technician:	Paul D.		
Method of Compaction:	In-Situ	Boring:	B-11	Depth:	0.5' - 1.0'
Location of Sample:				Orientation:	Vertical
Notes:					

Lab Test Data

Permeant Liquid Used:	Tap Water	Specific Gravity of Soilds (assumed):	2.65
Permeameter Type:	Shelby Tube Permeameter	Void Ratio, e:	0.93
Ring Base:	Single	Porosity %:	48.1
Duration of Testing (min):	N/A	Fillable Porosity (Field Capacity) %:	6.8
Initial Length of Soil (cm):	12.38	Area of Soil (cm^2):	41.74
Diameter of Soil (cm):	7.29	Final Volume of Soil (cm^3):	516.7
Final Length of Soil (cm):	12.38	Initial Volume of Soil (cm^3):	516.7

Initial Specimen				**Final Specimen**			
Tare (g):	483.1	Water Content %:	30	Tare (g):	483.1	Water Content %:	26.4
Total Mass (g):	1407.2	% Passing 200:	7.3	Total Mass (g):	1421	% Passing 200:	7.3
Soil Mass (g):	924.1	Dry Density (pcf):	85.841	Soil mass (g):	937.9	Dry Density (pcf):	89.604
Dry Soil Mass:	710.8	Wet Density (pcf):	111.593	Dry Soil Mass:	742.0	Wet Density (pcf):	113.260
		Degree of Saturation %:	85.8			Degree of Saturation %:	82.7

Constant Head Permeability Test

Test No.	H (cm)	Q (mL)	Time Elapsed (s)	Temperature (Celcius)	Q/At	Hydraulic Gradient, h/L	k (cm/s)	Rt	k 20 (cm/s)
1	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
2	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
3	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
4	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
5	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
6	90	30	16	24.5	0.045	7.27	0.0062	0.899	0.0056
			Average Test Temperature	24.5	**Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (cm/s)**				**0.0056**
					Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (in/hr)				**7.9**

AREHNA | Engineering, Inc.

Project Name:	Cape Haze	Project No.:	B-22-057
Lab No.:	B-13 (Vertical)	Date:	11/30/2022
Soil Description:	Light brown sand	Technician:	B. Brown/D. Greene
Soil Classification:	SP	Checked By:	KH

Permeability Test ASTM D5856 Method A

Field Information

Date Sampled:	11/21/2022	Sampling Technician:	Paul D.		
Method of Compaction:	In-Situ	Boring:	B-13	Depth:	0.5' - 1.0'
Location of Sample:				Orientation:	Vertical
Notes:					

Lab Test Data

Permeant Liquid Used:	Tap Water	Specific Gravity of Soilds (assumed):	2.65
Permeameter Type:	Shelby Tube Permeameter	Void Ratio, e:	0.61
Ring Base:	Single	Porosity %:	37.7
Duration of Testing (min):	N/A	Fillable Porosity (Field Capacity) %:	8.2
Initial Length of Soil (cm):	12.58	Area of Soil (cm^2):	41.62
Diameter of Soil (cm):	7.28	Final Volume of Soil (cm^3):	523.6
Final Length of Soil (cm):	12.58	Initial Volume of Soil (cm^3):	523.6

Initial Specimen				**Final Specimen**			
Tare (g):	441.9	Water Content %:	17.9	Tare (g):	441.9	Water Content %:	22.8
Total Mass (g):	1460.9	% Passing 200:	4.3	Total Mass (g):	1485.4	% Passing 200:	4.3
Soil Mass (g):	1019	Dry Density (pcf):	102.994	Soil mass (g):	1043.5	Dry Density (pcf):	101.262
Dry Soil Mass:	864.3	Wet Density (pcf):	121.430	Dry Soil Mass:	849.8	Wet Density (pcf):	124.349
		Degree of Saturation %:	78.3			Degree of Saturation %:	95.5

Constant Head Permeability Test

Test No.	H (cm)	Q (mL)	Time Elapsed (s)	Temperature (Celcius)	Q/At	Hydraulic Gradient, h/L	k (cm/s)	Rt	k 20 (cm/s)
1	90	10	18	24.0	0.013	7.15	0.0019	0.910	0.0017
2	90	10	19	24.0	0.013	7.15	0.0018	0.910	0.0016
3	90	10	19	24.0	0.013	7.15	0.0018	0.910	0.0016
4	90	10	20	24.0	0.012	7.15	0.0017	0.910	0.0015
5	90	10	19	24.0	0.013	7.15	0.0018	0.910	0.0016
6	90	10	17	24.0	0.014	7.15	0.0020	0.910	0.0018
			Average Test Temperature	24	**Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (cm/s)**				**0.0016**
					Average Hydraulic Conductivity at Standard Temperature (last 4 runs) (in/hr)				**2.3**

Report of Laboratory Analysis by Pace Analytical Services, LLC

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

December 05, 2022

Kevin Hill
Arehna Engineering
5012 W. Lemon Street
Tampa, FL 33609

RE: Project: Nutrient Testing
Pace Project No.: 35761850

Dear Kevin Hill:

Enclosed are the analytical results for sample(s) received by the laboratory on November 23, 2022. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Ormond Beach

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

LA Palmer

Lori Palmer
lori.palmer@pacelabs.com
813-855-1844
Project Manager

Enclosures

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

CERTIFICATIONS

Project: Nutrient Testing
Pace Project No.: 35761850

Pace Analytical Services Ormond Beach
8 East Tower Circle, Ormond Beach, FL 32174

Alaska DEC- CS/UST/LUST
Alabama Certification #: 41320
Colorado Certification: FL NELAC Reciprocity
Connecticut Certification #: PH-0216
Delaware Certification: FL NELAC Reciprocity
Florida Certification #: E83079
Georgia Certification #: 955
Guam Certification: FL NELAC Reciprocity
Hawaii Certification: FL NELAC Reciprocity
Illinois Certification #: 200068
Indiana Certification: FL NELAC Reciprocity
Kansas Certification #: E-10383
Kentucky Certification #: 90050
Louisiana Certification #: FL NELAC Reciprocity
Louisiana Environmental Certificate #: 05007
Maine Certification #: FL01264
Maryland Certification: #346
Massachusetts Certification #: M-FL1264
Michigan Certification #: 9911
Mississippi Certification: FL NELAC Reciprocity
Missouri Certification #: 236
Montana Certification #: Cert 0074
Nebraska Certification: NE-OS-28-14
New Hampshire Certification #: 2958
New Jersey Certification #: FL022
New York Certification #: 11608
North Carolina Environmental Certificate #: 667
North Carolina Certification #: 12710
North Dakota Certification #: R-216
Ohio DEP 87780
Oklahoma Certification #: D9947
Pennsylvania Certification #: 68-00547
Puerto Rico Certification #: FL01264
South Carolina Certification: #96042001
Tennessee Certification #: TN02974
Texas Certification: FL NELAC Reciprocity
US Virgin Islands Certification: FL NELAC Reciprocity
Virginia Environmental Certification #: 460165
West Virginia Certification #: 9962C
Wisconsin Certification #: 399079670
Wyoming (EPA Region 8): FL NELAC Reciprocity

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

SAMPLE SUMMARY

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	Matrix	Date Collected	Date Received
35761850001	**B.01**	Solid	11/21/22 14:45	11/23/22 09:21
35761850002	**B.02**	Solid	11/21/22 14:00	11/23/22 09:21
35761850003	**B.03**	Solid	11/21/22 15:15	11/23/22 09:21
35761850004	**B.04**	Solid	11/21/22 11:45	11/23/22 09:21
35761850005	**B.05**	Solid	11/21/22 14:15	11/23/22 09:21
35761850006	**B.06**	Solid	11/22/22 09:30	11/23/22 09:21
35761850007	**B.07**	Solid	11/21/22 16:20	11/23/22 09:21
35761850008	**B.08**	Solid	11/21/22 09:30	11/23/22 09:21
35761850009	**B.09**	Solid	11/21/22 13:00	11/23/22 09:21
35761850010	**B.10**	Solid	11/21/22 12:30	11/23/22 09:21
35761850011	**B.11**	Solid	11/22/22 10:30	11/23/22 09:21
35761850012	**B.12**	Solid	11/21/22 13:20	11/23/22 09:21
35761850013	**B.13**	Solid	11/21/22 11:15	11/23/22 09:21
35761850014	**B.14**	Solid	11/22/22 12:30	11/23/22 09:21
35761850015	**B.15**	Solid	11/22/22 13:45	11/23/22 09:21
35761850016	**B.16**	Solid	11/22/22 15:45	11/23/22 09:21

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

SAMPLE ANALYTE COUNT

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	Method	Analysts	Analytes Reported
35761850001	**B.01**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850002	**B.02**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850003	**B.03**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850004	**B.04**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850005	**B.05**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850006	**B.06**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850007	**B.07**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850008	**B.08**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1

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SAMPLE ANALYTE COUNT

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	Method	Analysts	Analytes Reported
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850009	**B.09**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850010	**B.10**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850011	**B.11**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850012	**B.12**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850013	**B.13**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850014	**B.14**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1
35761850015	**B.15**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1

Pace Analytical Services, LLC
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Oldsmar , FL 34677
(813)881-9401

SAMPLE ANALYTE COUNT

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	Method	Analysts	Analytes Reported
		EPA 365.4	CLL	1
35761850016	**B.16**	ASTM D2974-87	BMA	1
		TKN+NOx Calculation	NMT	1
		EPA 351.2	CLL	1
		EPA 353.2	KW1	1
		EPA 365.4	CLL	1

PASI-O = Pace Analytical Services - Ormond Beach

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.01 **Lab ID: 35761850001** Collected: 11/21/22 14:45 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**18.3**	%	0.10	0.10	1		11/30/22 10:51		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**141**	mg/kg	24.5	13.5	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**141**	mg/kg	121	66.6	1	11/28/22 08:48	12/04/22 18:39	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.31 U**	mg/kg	0.61	0.31	1	11/26/22 13:17	11/26/22 16:36		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**31.5 U**	mg/kg	36.3	31.5	1	11/28/22 08:48	12/04/22 18:39	7723-14-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.02 **Lab ID: 35761850002** Collected: 11/21/22 14:00 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**8.1**	%	0.10	0.10	1		11/30/22 10:51		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**12.0 U**	mg/kg	21.8	12.0	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**59.5 U**	mg/kg	108	59.5	1	11/28/22 08:48	12/04/22 18:55	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.27 U**	mg/kg	0.54	0.27	1	11/26/22 13:17	11/26/22 15:48		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**28.1 U**	mg/kg	32.4	28.1	1	11/28/22 08:48	12/04/22 18:55	7723-14-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.03 **Lab ID: 35761850003** Collected: 11/21/22 15:15 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**22.3**	%	0.10	0.10	1		11/30/22 10:51		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**95.0**	mg/kg	25.7	14.2	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**95.0 I**	mg/kg	128	70.5	1	11/28/22 08:48	12/04/22 18:56	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.32 U**	mg/kg	0.64	0.32	1	11/26/22 13:17	11/26/22 15:49		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**33.3 U**	mg/kg	38.5	33.3	1	11/28/22 08:48	12/04/22 18:56	7723-14-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.04 **Lab ID: 35761850004** Collected: 11/21/22 11:45 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**6.5**	%	0.10	0.10	1		11/30/22 10:51		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**127**	mg/kg	21.4	11.8	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**127**	mg/kg	107	58.7	1	11/28/22 08:48	12/04/22 18:58	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.27 U**	mg/kg	0.54	0.27	1	11/26/22 13:17	11/26/22 15:50		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**70.1**	mg/kg	32.0	27.8	1	11/28/22 08:48	12/04/22 18:58	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.05 **Lab ID: 35761850005** Collected: 11/21/22 14:15 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**7.3**	%	0.10	0.10	1		11/30/22 10:51		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**80.7**	mg/kg	21.6	11.9	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**80.7 I**	mg/kg	107	58.9	1	11/28/22 08:48	12/04/22 18:59	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.27 U**	mg/kg	0.54	0.27	1	11/26/22 13:17	11/26/22 15:51		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**27.8 U**	mg/kg	32.1	27.8	1	11/28/22 08:48	12/04/22 18:59	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.06 **Lab ID: 35761850006** Collected: 11/22/22 09:30 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**6.8**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**162**	mg/kg	21.5	11.8	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**162**	mg/kg	107	58.7	1	11/28/22 08:48	12/04/22 19:00	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.27 U**	mg/kg	0.53	0.27	1	11/26/22 13:17	11/26/22 16:19		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**37.7**	mg/kg	32.0	27.8	1	11/28/22 08:48	12/04/22 19:00	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.07 **Lab ID: 35761850007** Collected: 11/21/22 16:20 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**23.2**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**143**	mg/kg	26.0	14.3	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**143**	mg/kg	129	71.2	1	11/28/22 08:48	12/04/22 19:01	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.33 U**	mg/kg	0.66	0.33	1	11/26/22 13:17	11/26/22 16:37		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**33.7 U**	mg/kg	38.8	33.7	1	11/28/22 08:48	12/04/22 19:01	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.08 **Lab ID: 35761850008** Collected: 11/21/22 09:30 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**20.4**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**227**	mg/kg	25.1	13.8	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**227**	mg/kg	125	68.9	1	11/28/22 08:48	12/04/22 19:04	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.31 U**	mg/kg	0.62	0.31	1	11/26/22 13:17	11/26/22 16:21		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**33.2 I**	mg/kg	37.6	32.6	1	11/28/22 08:48	12/04/22 19:04	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.09 **Lab ID: 35761850009** Collected: 11/21/22 13:00 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**5.3**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**11.6 U**	mg/kg	21.1	11.6	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**57.6 U**	mg/kg	105	57.6	1	11/28/22 08:48	12/04/22 19:05	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.26 U**	mg/kg	0.53	0.26	1	11/26/22 13:17	11/26/22 16:22		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**27.2 U**	mg/kg	31.4	27.2	1	11/28/22 08:48	12/04/22 19:05	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.10 **Lab ID: 35761850010** Collected: 11/21/22 12:30 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**22.6**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**80.6**	mg/kg	25.8	14.2	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**80.6 I**	mg/kg	129	70.9	1	11/28/22 08:48	12/04/22 19:06	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.33 U**	mg/kg	0.65	0.33	1	11/26/22 13:17	11/26/22 16:23		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**33.5 U**	mg/kg	38.7	33.5	1	11/28/22 08:48	12/04/22 19:06	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.11 **Lab ID: 35761850011** Collected: 11/22/22 10:30 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**19.1**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**76.6**	mg/kg	24.7	13.6	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**76.6 I**	mg/kg	123	67.4	1	11/28/22 08:48	12/04/22 19:08	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.31 U**	mg/kg	0.62	0.31	1	11/26/22 13:17	11/26/22 16:38		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**31.9 U**	mg/kg	36.8	31.9	1	11/28/22 08:48	12/04/22 19:08	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.12 **Lab ID: 35761850012** Collected: 11/21/22 13:20 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**10.3**	%	0.10	0.10	1		11/30/22 10:52		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**303**	mg/kg	22.3	12.3	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**303**	mg/kg	111	61.1	1	11/28/22 08:48	12/04/22 19:09	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.28 U**	mg/kg	0.56	0.28	1	11/26/22 13:17	11/26/22 16:28		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**28.9 U**	mg/kg	33.3	28.9	1	11/28/22 08:48	12/04/22 19:09	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.13 **Lab ID: 35761850013** Collected: 11/21/22 11:15 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**19.8**	%	0.10	0.10	1		11/30/22 12:11		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**194**	mg/kg	25.0	13.7	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**194**	mg/kg	124	68.3	1	11/28/22 08:48	12/04/22 19:10	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.31 U**	mg/kg	0.63	0.31	1	11/26/22 13:17	11/26/22 16:29		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**32.3 U**	mg/kg	37.2	32.3	1	11/28/22 08:48	12/04/22 19:10	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.14 **Lab ID: 35761850014** Collected: 11/22/22 12:30 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**16.1**	%	0.10	0.10	1		11/30/22 12:11		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**190**	mg/kg	23.8	13.1	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**190**	mg/kg	118	64.9	1	11/28/22 08:48	12/04/22 19:11	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.30 U**	mg/kg	0.60	0.30	1	11/26/22 13:17	11/26/22 16:32		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**61.4**	mg/kg	35.4	30.7	1	11/28/22 08:48	12/04/22 19:11	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.15 **Lab ID: 35761850015** Collected: 11/22/22 13:45 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**17.5**	%	0.10	0.10	1		11/30/22 12:11		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**13.3 U**	mg/kg	24.2	13.3	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**66.5 U**	mg/kg	121	66.5	1	11/28/22 08:48	12/04/22 19:12	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.30 U**	mg/kg	0.61	0.30	1	11/26/22 13:17	11/26/22 16:33		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**31.4 U**	mg/kg	36.3	31.4	1	11/28/22 08:48	12/04/22 19:12	7723-14-0	

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Nutrient Testing
Pace Project No.: 35761850

Sample: B.16 **Lab ID: 35761850016** Collected: 11/22/22 15:45 Received: 11/23/22 09:21 Matrix: Solid

Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
Percent Moisture	Analytical Method: ASTM D2974-87 Pace Analytical Services - Ormond Beach								
Percent Moisture	**25.8**	%	0.10	0.10	1		11/30/22 12:11		
Total Nitrogen Calculation	Analytical Method: TKN+NOx Calculation Pace Analytical Services - Ormond Beach								
Total Nitrogen Soil	**256**	mg/kg	26.9	14.8	1		12/05/22 18:28		
351.2 Total Kjeldahl Nitrogen	Analytical Method: EPA 351.2 Preparation Method: EPA 351.2 Pace Analytical Services - Ormond Beach								
Nitrogen, Kjeldahl, Total	**256**	mg/kg	134	73.4	1	11/28/22 08:48	12/04/22 19:13	7727-37-9	
353.2 Nitrogen, NOx	Analytical Method: EPA 353.2 Preparation Method: EPA 353.2 Pace Analytical Services - Ormond Beach								
Nitrogen, NO2 plus NO3	**0.33 U**	mg/kg	0.67	0.33	1	11/26/22 13:17	11/26/22 16:34		
365.4 Phosphorus, Total	Analytical Method: EPA 365.4 Preparation Method: EPA 365.4 Pace Analytical Services - Ormond Beach								
Phosphorus, Total (as P)	**34.7 U**	mg/kg	40.1	34.7	1	11/28/22 08:48	12/04/22 19:13	7723-14-0	

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA

Project: Nutrient Testing
Pace Project No.: 35761850

QC Batch: 875438
QC Batch Method: ASTM D2974-87
Analysis Method: ASTM D2974-87
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Ormond Beach
Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012

SAMPLE DUPLICATE: 4816852

Parameter	Units	35759343001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	13.1	12.5	5	10	

SAMPLE DUPLICATE: 4816853

Parameter	Units	35759343011 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	15.0	15.6	4	10	

SAMPLE DUPLICATE: 4816854

Parameter	Units	35759345009 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	10.1	10.3	1	10	

SAMPLE DUPLICATE: 4816855

Parameter	Units	35761850003 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	22.3	21.0	6	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA

Project: Nutrient Testing
Pace Project No.: 35761850

QC Batch: 875480
QC Batch Method: ASTM D2974-87
Analysis Method: ASTM D2974-87
Analysis Description: Dry Weight/Percent Moisture
Laboratory: Pace Analytical Services - Ormond Beach
Associated Lab Samples: 35761850013, 35761850014, 35761850015, 35761850016

SAMPLE DUPLICATE: 4817017

Parameter	Units	35761850013 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	19.8	19.8	0	10	

SAMPLE DUPLICATE: 4817018

Parameter	Units	35762403005 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	20.3	21.4	6	10	

SAMPLE DUPLICATE: 4817019

Parameter	Units	35762403015 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	15.5	15.5	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA

Project: Nutrient Testing
Pace Project No.: 35761850

QC Batch: 874664 — Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2 — Analysis Description: 351.2 TKN
Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

METHOD BLANK: 4813224 — Matrix: Solid

Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	43.5 U	79.1	43.5	12/04/22 18:33	

LABORATORY CONTROL SAMPLE: 4813225

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/kg	3470	3330	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4813227 — 4813226

Parameter	Units	35761820002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	38000	14600	14600	54800	53700	115	108	90-110	2	20	J(M1)

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4813229 — 4813228

Parameter	Units	35761850001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, Kjeldahl, Total	mg/kg	141	4870	4880	4780	4770	95	95	90-110	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA

Project: Nutrient Testing
Pace Project No.: 35761850

QC Batch: 874484 — Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 — Analysis Description: 353.2 Nitrogen, NOx
Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

METHOD BLANK: 4812886 — Matrix: Solid

Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	0.25 U	0.50	0.25	11/26/22 15:41	

LABORATORY CONTROL SAMPLE: 4812887

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/kg	20.1	18.6	92	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4812889 — 4812888

Parameter	Units	35761820002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	3.1	72.8	72.4	64.8	64.0	85	84	80-120	1	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4812891 — 4812890

Parameter	Units	35761850010 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Nitrogen, NO2 plus NO3	mg/kg	0.33 U	26	25.8	25.5	26.0	98	101	80-120	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA

Project: Nutrient Testing
Pace Project No.: 35761850

QC Batch: 874666
QC Batch Method: EPA 365.4
Analysis Method: EPA 365.4
Analysis Description: 365.4 Total Phosphorus
Laboratory: Pace Analytical Services - Ormond Beach
Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

METHOD BLANK: 4813230 Matrix: Solid
Associated Lab Samples: 35761850001, 35761850002, 35761850003, 35761850004, 35761850005, 35761850006, 35761850007, 35761850008, 35761850009, 35761850010, 35761850011, 35761850012, 35761850013, 35761850014, 35761850015, 35761850016

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Phosphorus, Total (as P)	mg/kg	20.6 U	23.7	20.6	12/04/22 19:14	

LABORATORY CONTROL SAMPLE: 4813231

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus, Total (as P)	mg/kg	694	693	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4813233 4813232

Parameter	Units	35761820002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus, Total (as P)	mg/kg	0.82 % (w/w)	2920	2910	12000	11900	132	127	80-120	1	20	J(M1)

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4813235 4813234

Parameter	Units	35761850001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
Phosphorus, Total (as P)	mg/kg	31.5 U	975	976	975	992	98	100	80-120	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALIFIERS

Project: Nutrient Testing
Pace Project No.: 35761850

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

ANALYTE QUALIFIERS

I	The reported value is between the laboratory method detection limit and the laboratory practical quantitation limit.
U	Compound was analyzed for but not detected.
J(M1)	Estimated Value. Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
35761850001	**B.01**	ASTM D2974-87	875438		
35761850002	**B.02**	ASTM D2974-87	875438		
35761850003	**B.03**	ASTM D2974-87	875438		
35761850004	**B.04**	ASTM D2974-87	875438		
35761850005	**B.05**	ASTM D2974-87	875438		
35761850006	**B.06**	ASTM D2974-87	875438		
35761850007	**B.07**	ASTM D2974-87	875438		
35761850008	**B.08**	ASTM D2974-87	875438		
35761850009	**B.09**	ASTM D2974-87	875438		
35761850010	**B.10**	ASTM D2974-87	875438		
35761850011	**B.11**	ASTM D2974-87	875438		
35761850012	**B.12**	ASTM D2974-87	875438		
35761850013	**B.13**	ASTM D2974-87	875480		
35761850014	**B.14**	ASTM D2974-87	875480		
35761850015	**B.15**	ASTM D2974-87	875480		
35761850016	**B.16**	ASTM D2974-87	875480		
35761850001	**B.01**	TKN+NOx Calculation	876782		
35761850002	**B.02**	TKN+NOx Calculation	876782		
35761850003	**B.03**	TKN+NOx Calculation	876782		
35761850004	**B.04**	TKN+NOx Calculation	876782		
35761850005	**B.05**	TKN+NOx Calculation	876782		
35761850006	**B.06**	TKN+NOx Calculation	876782		
35761850007	**B.07**	TKN+NOx Calculation	876782		
35761850008	**B.08**	TKN+NOx Calculation	876782		
35761850009	**B.09**	TKN+NOx Calculation	876782		
35761850010	**B.10**	TKN+NOx Calculation	876782		
35761850011	**B.11**	TKN+NOx Calculation	876782		
35761850012	**B.12**	TKN+NOx Calculation	876782		
35761850013	**B.13**	TKN+NOx Calculation	876782		
35761850014	**B.14**	TKN+NOx Calculation	876782		
35761850015	**B.15**	TKN+NOx Calculation	876782		
35761850016	**B.16**	TKN+NOx Calculation	876782		
35761850001	**B.01**	EPA 351.2	874664	EPA 351.2	876479
35761850002	**B.02**	EPA 351.2	874664	EPA 351.2	876479
35761850003	**B.03**	EPA 351.2	874664	EPA 351.2	876479
35761850004	**B.04**	EPA 351.2	874664	EPA 351.2	876479
35761850005	**B.05**	EPA 351.2	874664	EPA 351.2	876479
35761850006	**B.06**	EPA 351.2	874664	EPA 351.2	876479
35761850007	**B.07**	EPA 351.2	874664	EPA 351.2	876479
35761850008	**B.08**	EPA 351.2	874664	EPA 351.2	876479
35761850009	**B.09**	EPA 351.2	874664	EPA 351.2	876479
35761850010	**B.10**	EPA 351.2	874664	EPA 351.2	876479
35761850011	**B.11**	EPA 351.2	874664	EPA 351.2	876479
35761850012	**B.12**	EPA 351.2	874664	EPA 351.2	876479
35761850013	**B.13**	EPA 351.2	874664	EPA 351.2	876479
35761850014	**B.14**	EPA 351.2	874664	EPA 351.2	876479
35761850015	**B.15**	EPA 351.2	874664	EPA 351.2	876479

REPORT OF LABORATORY ANALYSIS

Pace Analytical Services, LLC
110 South Bayview Blvd.
Oldsmar , FL 34677
(813)881-9401

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Nutrient Testing
Pace Project No.: 35761850

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
35761850016	**B.16**	EPA 351.2	874664	EPA 351.2	876479
35761850001	**B.01**	EPA 353.2	874484	EPA 353.2	874524
35761850002	**B.02**	EPA 353.2	874484	EPA 353.2	874524
35761850003	**B.03**	EPA 353.2	874484	EPA 353.2	874524
35761850004	**B.04**	EPA 353.2	874484	EPA 353.2	874524
35761850005	**B.05**	EPA 353.2	874484	EPA 353.2	874524
35761850006	**B.06**	EPA 353.2	874484	EPA 353.2	874524
35761850007	**B.07**	EPA 353.2	874484	EPA 353.2	874524
35761850008	**B.08**	EPA 353.2	874484	EPA 353.2	874524
35761850009	**B.09**	EPA 353.2	874484	EPA 353.2	874524
35761850010	**B.10**	EPA 353.2	874484	EPA 353.2	874524
35761850011	**B.11**	EPA 353.2	874484	EPA 353.2	874524
35761850012	**B.12**	EPA 353.2	874484	EPA 353.2	874524
35761850013	**B.13**	EPA 353.2	874484	EPA 353.2	874524
35761850014	**B.14**	EPA 353.2	874484	EPA 353.2	874524
35761850015	**B.15**	EPA 353.2	874484	EPA 353.2	874524
35761850016	**B.16**	EPA 353.2	874484	EPA 353.2	874524
35761850001	**B.01**	EPA 365.4	874666	EPA 365.4	876480
35761850002	**B.02**	EPA 365.4	874666	EPA 365.4	876480
35761850003	**B.03**	EPA 365.4	874666	EPA 365.4	876480
35761850004	**B.04**	EPA 365.4	874666	EPA 365.4	876480
35761850005	**B.05**	EPA 365.4	874666	EPA 365.4	876480
35761850006	**B.06**	EPA 365.4	874666	EPA 365.4	876480
35761850007	**B.07**	EPA 365.4	874666	EPA 365.4	876480
35761850008	**B.08**	EPA 365.4	874666	EPA 365.4	876480
35761850009	**B.09**	EPA 365.4	874666	EPA 365.4	876480
35761850010	**B.10**	EPA 365.4	874666	EPA 365.4	876480
35761850011	**B.11**	EPA 365.4	874666	EPA 365.4	876480
35761850012	**B.12**	EPA 365.4	874666	EPA 365.4	876480
35761850013	**B.13**	EPA 365.4	874666	EPA 365.4	876480
35761850014	**B.14**	EPA 365.4	874666	EPA 365.4	876480
35761850015	**B.15**	EPA 365.4	874666	EPA 365.4	876480
35761850016	**B.16**	EPA 365.4	874666	EPA 365.4	876480

WO# : 35761850

35761850

Pace

CHAIN-OF-CUSTODY / Analytical Request D

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must b

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https://info.pacel

Section A	Section B	Section C
Required Client Information:	Required Project Information:	Invoice Information:
Company: AREHNA Engineering, Inc.	Report To: Kevin Hill	Attention:
Address: 5012 W. Lemon Street	Copy To:	Company Name:
Tampa, FL 33609		Address:
Email: khill@arehna.com	Purchase Order #:	Pace Quote:
Phone: (813)404-2082 Fax:	Project Name: Nutrient Testing	Pace Project Manager: lori.palmer@pacelabs.com
Requested Due Date:	Project #:	Pace Profile #: 17959-1

Regulatory Agency
State / Location
FL

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Requested Analysis Filtered (Y/N): Y/N	Analyses Test: Tot Nit / Tot Phos	Residual Chlorine (Y/N)
1	B-01	SL	G	11/21/22	2:45	11/21/22			1									Y	Y	
2	B-02	SL	G	11/21/22	12:00	11/21/22			1									Y	Y	
3	B-03	SL	G	11/21/22	3:15	11/21/22			1									Y	Y	
4	B-04	SL	G	11/22/22	11:45	11/22/22			1									Y	Y	
5	B-05	SL	G	11/21/22	2:15	11/21/22			1									Y	Y	
6	B-06	SL	G	11/22/22	9:30	11/22/22			1									Y	Y	
7	B-07	SL	G	11/21/22	4:20	11/21/22			1									Y	Y	
8	B-08	SL	G	11/21/22	9:30	11/21/22			1									Y	Y	
9	B-09	SL	G	11/21/22	1:00	11/21/22			1									Y	Y	
10	B-10	SL	G	11/21/22	12:30	11/21/22			1									Y	Y	
11	B-11	SL	G	11/22/22	10:30	11/22/22			1									Y	Y	
12	B-12	SL	G	11/21/22	1:20	11/21/22			1									Y	Y	

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
Bottle Kit	Leatha Schiffer Pace	9/15/2022	8:55				[illegible]			
	[illegible]	11/23/22	0921	DS Pace	11-23-22	921	5.6	Y	N	Y

SAMPLER NAME AND SIGNATURE		
PRINT Name of SAMPLER:		
SIGNATURE of SAMPLER:	DATE Signed:	

B-22-057

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace Terms and Conditions found at https://info.pacelabs.com/hubfs/pas-standard-terms.pdf

Page: 2 Of 2

Section A Required Client Information:		Section B Required Project Information:		Section C Invoice Information:	
Company:	AREHNA Engineering, Inc.	Report To:	Kevin Hill	Attention:	
Address:	5012 W. Lemon Street	Copy To:		Company Name:	
Tampa, FL 33609				Address:	
Email:	khill@arehna.com	Purchase Order #:		Pace Quote:	
Phone:	(813)404-2082 Fax:	Project Name:	Nutrient Testing	Pace Project Manager:	lori.palmer@pacelabs.com
Requested Due Date:		Project #:		Pace Profile #:	17959-1

Regulatory Agency
State / Location
FL

ITEM #	SAMPLE ID One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB C=COMP)	COLLECTED START DATE	COLLECTED START TIME	COLLECTED END DATE	COLLECTED END TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H2SO4	HNO3	HCl	NaOH	Na2S2O3	Methanol	Other	Analyses Test Y/N	Tot Nit / Tot Phos	Residual Chlorine (Y/N)
13	B-13	SL	G	11/21/22	11:05	11/2			1										y	
14	B-14	SL	G	11/22/22	12:30	11/22/22			1										y	
15	B-15	SL	G	11/21/22	1:45	11/21/22			1										y	
16	B-16	SL	G	11/21/22	3:45	11/21/22			1										y	
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

ADDITIONAL COMMENTS	RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS: TEMP in C	Received on Ice (Y/N)	Custody Sealed Cooler (Y/N)	Samples Intact (Y/N)
Bottle Kit	Leatha Shaffer Pace	9/15/2022	8:55				TOC			
	Paul Rotha	11/23/22	921	DS pace	11-23-22	921	5.6	y	N	y

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed:

WO#: 35761850 (R)

PM: LAP Due Date: 12/06/22
CLIENT: 37-AREENG

Project #
Project Manager:
Client:

Date and Initials of person:
Examining contents: EC 11-23-22
Label:
Deliver:
pH:

Thermometer Used: T202 Date: 11-23-22 Time: 921 Initials: DS

State of Origin: FL ☐ For WV projects, all containers verified to ≤6 °C

Cooler #1 Temp.°C 5.4	**(Visual)** +0.2	**(Correction Factor)** 5.6	**(Actual)**	☑ Samples on ice, cooling process has begun
Cooler #2 Temp.°C	**(Visual)**	**(Correction Factor)**	**(Actual)**	☐ Samples on ice, cooling process has begun
Cooler #3 Temp.°C	**(Visual)**	**(Correction Factor)**	**(Actual)**	☐ Samples on ice, cooling process has begun
Cooler #4 Temp.°C	**(Visual)**	**(Correction Factor)**	**(Actual)**	☐ Samples on ice, cooling process has begun
Cooler #5 Temp.°C	**(Visual)**	**(Correction Factor)**	**(Actual)**	☐ Samples on ice, cooling process has begun
Cooler #6 Temp.°C	**(Visual)**	**(Correction Factor)**	**(Actual)**	☐ Samples on ice, cooling process has begun

Recheck for OOT °C _____ **(Visual)** _____ **(Correction Factor)** _____ **(Actual) Time:** _____ **Initials:** _____

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☑ Client ☐ Commercial ☐ Pace ☐ Other _____

Shipping Method: ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ International Priority ☐ Other _____

Billing: ☐ Recipient ☐ Sender ☐ Third Party ☐ Credit Card ☐ Unknown

Tracking # _____

Custody Seal on Cooler/Box Present: ☐ Yes ☑ No **Seals intact:** ☐ Yes ☐ No **Ice:** Wet Blue Melted None

Packing Material: ☑ Bubble Wrap ☑ Bubble Bags ☐ None ☐ Other _____

Samples shorted to lab (If Yes, complete) Shorted Date: _____ Shorted Time: _____ Qty: _____

		Comments:
Chain of Custody Present	☑Yes ☐ No ☐N/A	
Chain of Custody Filled Out	☑Yes ☐ No ☐N/A	
Relinquished Signature & Sampler Name COC	☑Yes ☐ No ☐N/A	
Samples Arrived within Hold Time	☑Yes ☐ No ☐N/A	
Rush TAT requested on COC	☐Yes ☑ No ☐N/A	
Sufficient Volume	☑Yes ☐ No ☐N/A	
Correct Containers Used	☑Yes ☐ No ☐N/A	
Containers Intact	☑Yes ☐ No ☐N/A	
Sample Labels match COC (sample IDs & date/time of collection)	☑Yes ☐ No ☐N/A	
All containers needing acid/base preservation have been checked. All Containers needing preservation are found to be in compliance with EPA recommendation: Exceptions: Vials, Microbiology, O&G, PFAS	☐Yes ☐ No ☑N/A ☐Yes ☐ No ☑N/A	Preservation Information: Preservative: _____ Lot #/Trace #: _____ Date: _____ Time: _____ Initials: _____
Headspace in VOA Vials? (>6mm):	☐Yes ☐ No ☑N/A	
Trip Blank Present:	☐Yes ☐ No ☑N/A	

Comments/ Resolution (use back for additional comments): _____

FIELD PROCEDURES

Auger Boring

The auger borings are performed in general accordance with ASTM D-1452, "Standard Practice for Soil Investigation and Sampling by Auger Borings". Auger borings are advanced manually using a bucket-type hand auger. The soils encountered are identified, in the field, from cuttings brought to the surface by the augering process. Representative soil samples from the auger borings are placed in glass jars and transported to our laboratory where they are examined by an engineer for classification.

Shelby Tubes

Shelby tubes were performed by advancing a 3-inch diameter, 6-inch long think wall tube, vertically and/or horizontally into the soil until the tube is full at the desired depth.

LABORATORY PROCEDURES

Water Content

The water content is the ratio, expressed as a percentage, of the weight of water in a given mass of soil to the weight of the solid particles. This test is conducted in general accordance with AASHTO T-265/ASTM D-2974.

Percent Organics (Organic Loss on Ignition)

The amount of organic material in a sample is determined in this test. The sample is first dried and weighed, then ignited and reweighed. The amount of organic material is expressed as a percentage of the total dry weight of the sample prior to ignition. This test is conducted in general accordance with FM 1-T267.

Fines Content

In this test, the sample is dried and then washed over a No. 200 mesh sieve. The percentage of soil by weight passing the sieve is the percentage of fines or portion of the sample in the silt and clay size range. This test is conducted in general accordance with AASHTO T-11/ASTM D-1140.