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SUPPLEMENTAL GEOTECHNICAL EXPLORATION

Maitland Concourse North – Stormwater Ponds SP-31
511 West Maitland Boulevard (SR 414)
Maitland, Orange County, Florida

UES Project No. 0130.1600128.0000
UES Report No. 1330024

PREPARED FOR:

Related Group
4767 New Broad Street
Orlando, Florida 32814

PREPARED BY:

Universal Engineering Sciences
3532 Maggie Boulevard
Orlando, Florida 32811
(407) 423-0504

April 29, 2016

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- Sarasota
- Tampa
- West Palm Beach

April 29, 2016

Related Group
4767 New Broad Street
Orlando, Florida 32814

Attention: Mr. Jeffrey Robbins
jrobbins@relatedgroup.com

Reference: **Supplemental Geotechnical Exploration**
Maitland Concourse North – Stormwater Ponds SP-31
511 West Maitland Boulevard (SR 414)
Maitland, Orange County, Florida
UES Project No. 0130.1600128.0001
UES Report No. 1330024

Dear Mr. Robbins:

As requested by Kimley-Horn & Associates, Inc. (Kimley-Horn), Universal Engineering Sciences, Inc. (Universal) has completed an additional geotechnical exploration at the referenced site in Orange County, Florida. The scope of our exploration was planned in conjunction with Kimley-Horn and authorized by you. This exploration was performed in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

PROJECT DESCRIPTION

We understand that the proposed project will include the construction of a new mixed-use (residential and commercial) development in Maitland, FL. Universal has previously performed geotechnical explorations at this project and submitted four (4) engineering reports (UES Reports No. 1222610, 1223626, 1223755 and 1278329 dated April 28 & 30, 2015 and October 27, 2015). Since the issuance of these reports, Kimley-Horn has requested additional borings and laboratory testing to aid in the stormwater design for the project.

FIELD METHODOLOGIES

As part of this additional exploration, five (5) SPT borings, designated P-1 through P-5 on the attached Boring Location Plan, were performed to a depth of 25 feet below existing land surface (bls). The SPT borings were performed in general accordance with the procedures of ASTM D 1586.

Horizontal survey control was not provided for the test locations prior to our field exploration program. Ground surface elevations were provide by Kimley-Horn. Universal located the test borings by using the provided site plan, measuring from existing on-site landmarks shown on an aerial photograph, and by using handheld GPS devices. The indicated test locations should be considered accurate to the degree of the methodologies used. The approximate boring locations are shown in Appendix B.

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. A summary of the tests performed is shown in Table I.

TABLE I
LABORATORY METHODOLOGIES

Test Performed	Number Performed	Reference
Grain Size Analysis (#200 wash only)	10	ASTM D 1140 "Amount of Material in Soils Finer than the No. 200 (75 - µm) sieve"
Moisture Content	10	ASTM D 2216 "Laboratory Determination of Water (Moisture) Content of Soil by Mass"
Permeability Test	5	ASTM D 2434 "Standard Test Method for Permeability of Granular Soils (Constant Head)"

SOIL PROFILES

The results of our additional exploration, together with pertinent information obtained from the SPT borings are shown on the attached boring logs in Appendix A. The soil profiles were prepared from the field logs after the recovered soil samples were examined by a Geotechnical Engineer.

The majority of the soils encountered at the boring locations consist mostly of very loose to medium dense fine sands [SP] to the maximum depth of drilling, 20 feet bls. Notable exceptions to the soil profile were a layer of silty fine sand [SM] encountered at boring P-1 from about 13½ to 25 feet. For more detailed soils profiles, see the attached boring logs.

GROUNDWATER CONDITIONS

We measured the water level in the boreholes after the completion of drilling on April 22, 2016. The encountered groundwater levels were measured at approximately 11 and 18 feet below grade. The large variation in groundwater levels can be attributed to topographic relief across the site area. 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.

Based upon historical rainfall data, review of U.S.G.S. maps, the Orange County Lake Index, NRCS Soils Survey, and site boring data, we estimate that the seasonal high groundwater level may form roughly 8½ to 15 feet bls at the boring locations. The estimated seasonal high groundwater level at each boring is shown on the individual boring logs in Appendix A.

STORMWATER POND DESIGN PARAMETERS

A total of five (5) SPT borings were performed within the proposed pond footprints. Borings P-1, P-2 and P-3 were performed within the north pond area. Borings P-4 and P-5 were performed within the south pond area. Our recommended stormwater management design parameters are shown in Table II.

TABLE II
STORMWATER MANAGEMENT DESIGN PARAMETERS

Design Parameter	Estimated Values	
Pond Designation	North	South
Relevant Boring Logs	P-1, P-2, P-3	P-4, P-5
Estimated Base of Surficial Aquifer Elevation (feet, NAVD)	+58	+57
Estimated Fillable Porosity of Surficial in-situ sands (percent)	25	25
Estimated Seasonal High Groundwater Elevation (feet, NAVD)	+68	+68½
Estimated Seasonal Low Groundwater Elevation (feet, NAVD)	+64	+64½
Estimated Horizontal Saturated Hydraulic Conductivity of Surficial Aquifer (feet per day)	28	27
Estimated Vertical Unsaturated Hydraulic Conductivity of Surficial Aquifer (feet per day)	19	18

Please note that the seasonal high/low water table and base of aquifer values presented in Table II were estimated based on ground surface elevations provided by Kimley-Horn. The hydraulic conductivity values were based on average results of laboratory permeability tests. Appropriate factors of safety should be included in the design.

CLOSURE

We appreciate the opportunity to be working with you on this project and look forward to a continued association. Please note that all other provisions and recommendations listed in our previous reports, which were not changed in this supplemental report, still remain in effect. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Sincerely yours,
UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No. 549

Andrew S. Wilderotter, P.E.
Geotechnical Project Manager

GUY H. RABENS LICENSE No 60917 STATE OF FLORIDA PROFESSIONAL ENGINEER

Guy H. Rabens, M.S., P.E.
Geotechnical & Environmental Manager
Date: 4-29-2016
Florida Registration No. 60917

Distribution: Mr. Max Cruz (MCruz@relatedgroup.com)
Mr. Brent Lenzen, P.E. w/ Kimley-Horn (Brent.Lezen@kimley-horn.com)
Mr. Jonathan Martin, P.E. w/ Kimley-Horn (Jonathan.Martin@kimley-horn.com)

Appendices: Appendix A: USGS Topo Map
Appendix B: Boring Plan and Logs

APPENDIX A

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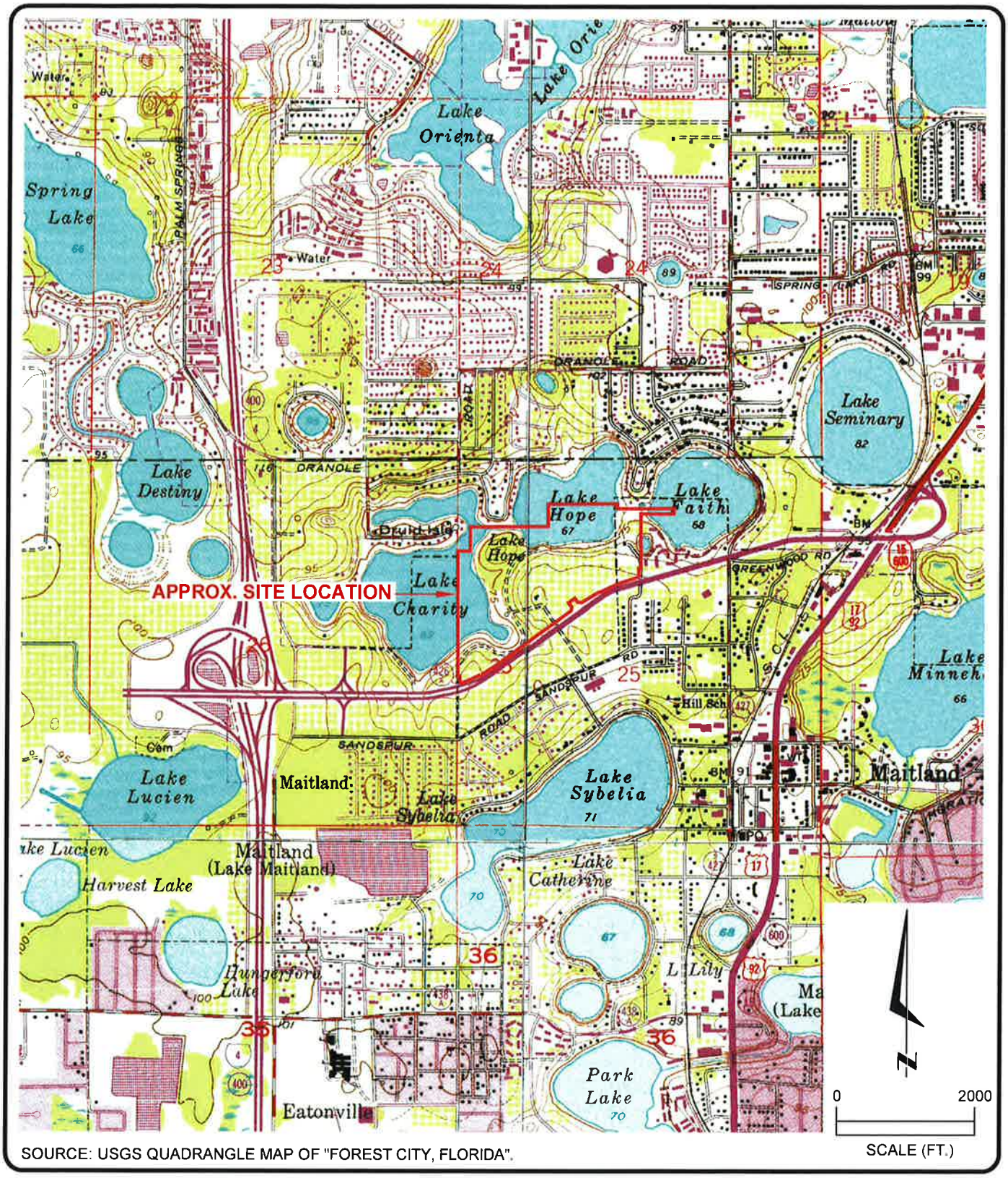

SOURCE: USGS QUADRANGLE MAP OF "FOREST CITY, FLORIDA".

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SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH
POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY:	R.K.S.	DATE:	4 - 25 - 16	CHECKED BY:	A.S.W.	DATE:	4 - 26 - 16
SCALE:	AS SHOWN	PROJECT NO:	0130.1600128.0000	REPORT NO:	1330024	PAGE NO:	A-1

16-0162-01

APPENDIX B

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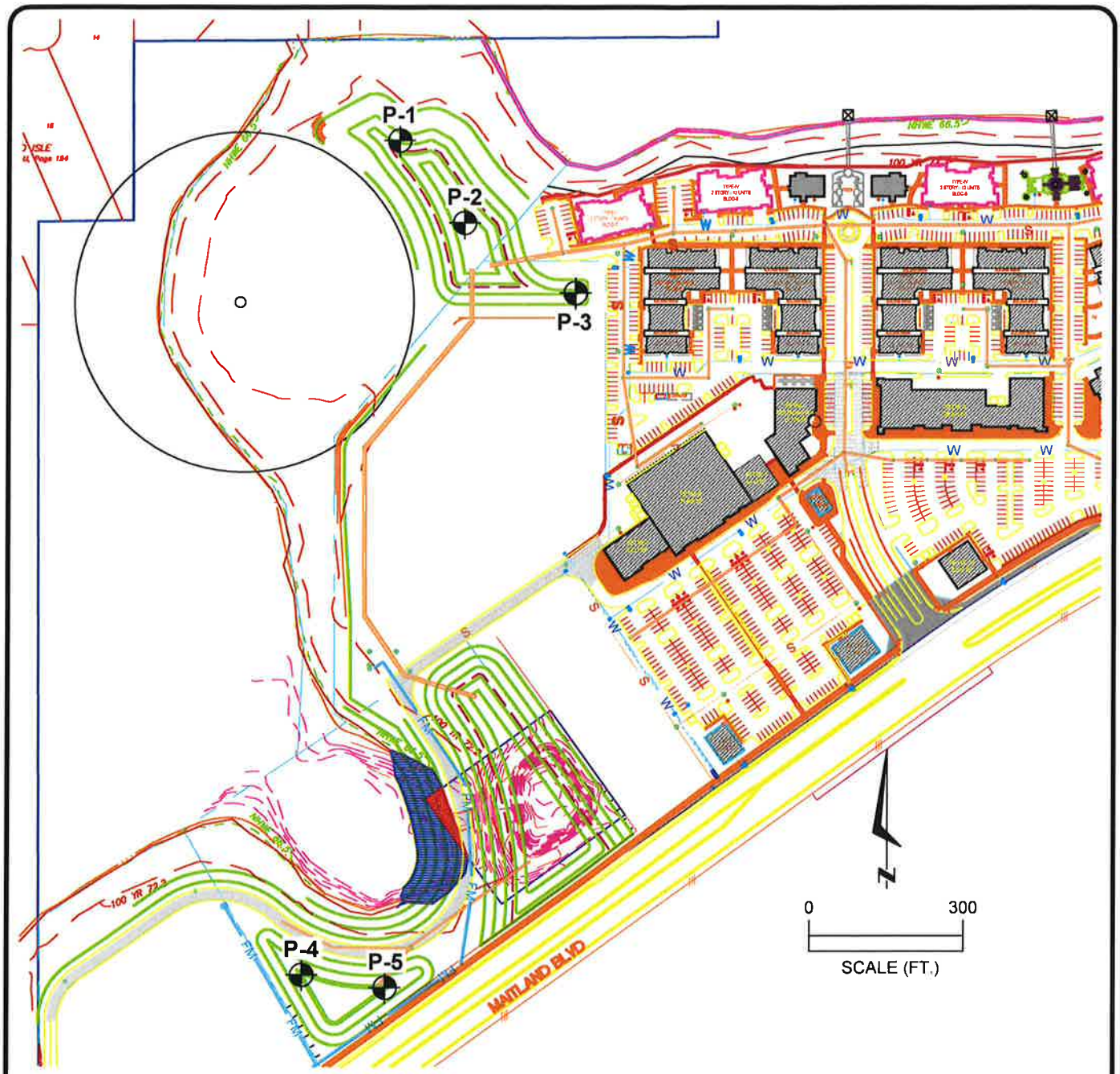

LEGEND

APPROX. STANDARD PENETRATION TEST BORING LOCATION (SPT)

BORINGS PERFORMED 4/21 & 4/22/16

THIS DRAWING CREATED USING PLAN PROVIDED BY CLIENT.

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SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH
POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING LOCATION PLAN

DRAWN BY:	R.K.S.	**DATE:**	4 - 25 - 16	**CHECKED BY:**	A.S.W.	**DATE:**	4 - 26 - 16
SCALE:	AS SHOWN	**PROJECT NO:**	0130.1600128.0000	**REPORT NO:**	1330024	**PAGE NO:**	B-1

16-0162-01

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BORING LOG

PROJECT NO.:	0130.1600128.0000
REPORT NO.:	1330024
PAGE:	B-2.1

PROJECT: SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-1** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 S RANGE: 29 E

CLIENT: RELATED GROUP

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, *G.S. ELEVATIONS PROVIDED BY KIMLEY-HORN

G.S. ELEVATION (ft): 75.7* DATE STARTED: 4/21/16
WATER TABLE (ft): 11.0 DATE FINISHED: 4/21/16
DATE OF READING: 4/22/16 DRILLED BY: ORL - DH/DN/CM
EST. SHGWT (ft): 8 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 dark brown fine SAND [SP]						
		1-1-2	3									
		2-1-1	2			-- brown						
5		1-2-1	3									
		2-3-2	5			-- loose						
		2-2-2	4	▽		-- very loose -- light brown	2	5			27	
		2-2-2	4									
10				▼								
						Very loose light brown silty fine SAND [SM]						
		3-2-2	4				15	34				
15												
						-- medium dense						
20		4-5-6	11									
						-- loose						
25		6-4-5	9			BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1600128.0000
REPORT NO.:	1330024
PAGE:	B-2.2

PROJECT: SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-2** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 S RANGE: 29 E

CLIENT: RELATED GROUP
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, *G.S. ELEVATIONS PROVIDED BY KIMLEY-HORN

G.S. ELEVATION (ft): 77.3* DATE STARTED: 4/21/16
WATER TABLE (ft): 12.5 DATE FINISHED: 4/21/16
DATE OF READING: 4/22/16 DRILLED BY: ORL - DH/DN/CM
EST. SHGWT (ft): 9.5 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 dark brown fine SAND [SP]						
		1-2-2	4									
		1-1-1	2									
5						-- shade lighter						
		1-2-2	4			-- brown						
		2-2-2	4			-- loose, red brown						
		2-2-3	5				2	8			33	
		2-2-2	4	▽		-- very loose						
10												
				▼								
		3-2-3	5			-- loose						
15												
		7-7-10	17			-- medium dense	2	23				
20												
		5-6-13	19									
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1600128.0000
REPORT NO.:	1330024
PAGE:	B-2.3

PROJECT: SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-3** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 S RANGE: 29 E

CLIENT: RELATED GROUP
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, *G.S. ELEVATIONS PROVIDED BY KIMLEY-HORN

G.S. ELEVATION (ft): 83.6* DATE STARTED: 4/22/16
WATER TABLE (ft): 18.0 DATE FINISHED: 4/22/16
DATE OF READING: 4/22/16 DRILLED BY: ORL - DH/DN/CM
EST. SHGWT (ft): 15 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 brown fine SAND [SP]						
		3-2-3	5			-- very loose, brown						
		1-1-1	2			-- orange brown						
5		1-2-1	3									
		2-1-1	2			-- light orange brown						
		2-2-2	4			-- loose, light brown						
10		2-2-3	5				2	4			23	
15		3-4-3	7	▽								
				▼								
						Loose dark brown fine SAND with silt [SP-SM]						
20		4-4-3	7				6	24				
						-- medium dense						
25		12-8-10	18			BORING TERMINATED AT 25.0 FT.						
30												

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BORING LOG

PROJECT NO.:	0130.1600128.0000
REPORT NO.:	1330024
PAGE:	B-2.4

PROJECT: SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-4** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 S RANGE: 29 E

CLIENT: RELATED GROUP

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, *G.S. ELEVATIONS PROVIDED BY KIMLEY-HORN

G.S. ELEVATION (ft): 83.2* DATE STARTED: 4/22/16
WATER TABLE (ft): 17.5 DATE FINISHED: 4/22/16
DATE OF READING: 4/22/16 DRILLED BY: ORL - DH/DN/CM
EST. SHGWT (ft): 14.5 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 dark brown fine SAND [SP]						
		2-2-1	3									
		1-1-2	3			-- orange brown						
5		1-1-1	2									
		1-1-1	2									
		2-1-2	3			-- very loose, light brown						
		3-2-2	4			-- light gray brown	1	5			27	
10												
		3-3-3	6	▽		-- loose						
15												
				▼								
		2-4-5	9				3	24				
20												
		5-6-9	15			-- medium dense						
25						BORING TERMINATED AT 25.0 FT.						
30												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1600128.0000
REPORT NO.:	1330024
PAGE:	B-2.5

PROJECT: SUPPLEMENTAL GEOTECHNICAL EXPLORATION
MAITLAND CONCOURSE NORTH, POND OPTION SP-31
MAITLAND, ORANGE COUNTY, FLORIDA

BORING I.D.: **P-5** SHEET: **1 of 1**
SECTION: 25 TOWNSHIP: 21 S RANGE: 29 E

CLIENT: RELATED GROUP

LOCATION: SEE BORING LOCATION PLAN

REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, *G.S. ELEVATIONS PROVIDED BY KIMLEY-HORN

G.S. ELEVATION (ft): 80.3* DATE STARTED: 4/22/16
WATER TABLE (ft): 14.5 DATE FINISHED: 4/22/16
DATE OF READING: 4/22/16 DRILLED BY: ORL - DH/DN/CM
EST. SHGWT (ft): 12 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 brown fine SAND [SP]						
		4-3-3	6									
		2-1-1	2			-- very loose -- brown						
5		2-2-2	4									
		2-2-2	4									
		3-2-2	4			-- red brown						
10		3-2-2	4				1	5			27	
				▽								
		3-4-5	9	▼		-- loose, dark red brown						
15												
						-- light red brown						
20		4-4-6	10									
							2	22				
						-- medium dense, brown						
25		5-6-12	18			BORING TERMINATED AT 25.0 FT.						
30												

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