Report of Geotechnical Exploration

For

St. Johns Parkway – Race Track Road to Espada Lane
8-inch Reclaimed Water Main
St. Johns County, FL

MAE Project No. 0106-0005
June 14, 2017

Prepared for:

CPH, Inc.
5200 Belfort Road, Suite 220
Jacksonville, FL 32256

Prepared by:

Meskel & Associates Engineering
Geotechnical ◤ Environmental ◤ Inspection ◤ Testing

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June 14, 2017

CPH, Inc.
5200 Belfort Road, Suite 220
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Attention: Mr. Wade P. Olszewski, P.E.

Reference: Report of Geotechnical Exploration
St. Johns Parkway – Race Track Road to Espada Lane 8-inch Reclaimed Water Main
St. Johns County, Florida
MAE Project No. 0106-0005

Dear Mr. Olszewski:

Meskel & Associates Engineering, LLC has completed a geotechnical exploration for the subject project. Our work was authorized through your Subconsultant Agreement dated April 20, 2017 (CPH Project Number J6608) and was performed in general accordance with our revised proposal dated March 16, 2017. The geotechnical exploration was performed to evaluate the encountered subsurface conditions along the proposed pipeline route and to provide recommendations to support design of the proposed pipeline construction. A summary of our findings is presented below for your convenience; however, we recommend that this report be considered in its entirety.

The soil borings encountered a surficial topsoil layer measuring 2 to 3-inches in thickness, underlain by fine sands and find sands with silt (A-3) to the boring termination depths of 10 feet below existing grade. Exceptions are at boring A-3, where organic soils (A-8) were encountered between 4 and 5-feet depth and silty fine sands (A-2-4) were encountered between depths of 9 and 10-feet below existing grade. The groundwater level was encountered at 3 boring locations (A-1, A-9, and A-10) at depths ranging from 9-feet 5-inches to 13-feet 9-inches below existing ground surface. Provided site preparation is performed in accordance with the recommendations presented in this report, it is our opinion that the soils encountered at the boring locations are suitable for support of the proposed pipeline construction.

We appreciate this opportunity to be of service as your geotechnical consultant on this phase of the project. If you have any questions, or if we may be of any further service, please contact us.

Sincerely,
MESKEL & ASSOCIATES ENGINEERING, LLC
MAE FL Certificate of Authorization No. 28142

Joey J Broussard
Digitally signed by Joey J Broussard
Date: 2017.06.15 09:50:24 -04'00'

W. Josh Mele, E.I.
Staff Engineer

Joey Broussard, P.E.
Director of Geotechnical Engineering
Registered, Florida No. 58233

Distribution: Mr. Wade P. Olszewski, P.E. 1 pdf

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1.0 PROJECT INFORMATION

1.1 General

Project information was provided to us by Mr. Wade P. Olszewski, P.E. with CPH, Inc. through several emails and telephone conversations. We were also provided with the following documents:

- Technical Memorandum (Index Number 417-40 – St. Johns Pkwy – Racetrack Rd to Espada Ln – Trans – New – R)
- JEA GIS Web Map
- As-Built Sewer, Force Main & Reuse Water plans for Durbin Crossing CDD Roadways County Road 2209 dated December 20, 2006 and approved on February 20, 2007

1.2 Project Description

The site for the subject project is located along St. Johns Parkway between Race Track Road and Espada Lane in northern St. Johns County, Florida. The general site location is shown on the *Site Location Map*, Figure 1.

Based on the provided information and our discussions with Mr. Olszewski, it is our understanding that the project includes the construction of approximately 4,600 linear feet of 8-inch diameter reclaimed water main to be installed along the eastern side Right-of-Way of St. Johns Parkway. It is understood that our services were to only include geotechnical field exploration and engineering services to support design of the proposed pipeline construction.

2.0 FIELD EXPLORATION

A field exploration was performed on May 22, 2017. The approximate boring locations are included on the *Boring Location Plan*, Figure 2. The boring location GPS coordinates were determined by us and then located in the field by our personnel using a hand-held GPS receiver; therefore, the boring locations should be considered approximate.

2.1 Auger Borings

To explore the subsurface conditions along the proposed pipeline alignment, we located and performed 10 auger borings. Boring A-9 was advanced to a depth of 15 feet, and the remaining borings were advanced to a depth of 10 feet in general accordance with the methodology outlined in ASTM D 1452. Representative soil samples also were recovered from the auger borings and returned to our laboratory for further evaluation. A summary of the field procedures is included in Appendix A.

3.0 LABORATORY TESTING

3.1 Visual Classification

Representative soil samples obtained during our field exploration were visually classified by a geotechnical engineer using the AASHTO Soil Classification System in general accordance with ASTM D 3282. A Key to the Soil Classification System is included in Appendix A.

3.2 Soil Index Tests

Quantitative laboratory testing was performed on selected samples of the soils encountered during the field exploration to better define the composition of the soils encountered and to provide data for correlation to their anticipated strength and compressibility characteristics. The laboratory testing determined the percent fines, natural moisture and organic content of selected soil samples. The results of the laboratory testing are shown in the *Summary of Laboratory Test Data* included in Appendix B. Also, these results are shown on the *Generalized Soil Profiles* (Figures 3 through 5) and on the Log of Boring records at the respective depths from which the tested samples were recovered.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

Graphical presentation of the generalized subsurface conditions is presented on Figures 3 through 5. Detailed boring records are included in Appendix A. When reviewing these records, it should be understood that the soil conditions will vary between the boring locations.

In general, the borings encountered a surficial topsoil layer measuring 2 to 3-inches in thickness, underlain by fine sands and fine sands with silt (A-3) to the boring termination depths of 10 feet below existing grades.

Exceptions to the relatively uniformed soil profile described above are as follows:

- Boring A-3 encountered organic soils (A-8) between 4 and 5-feet depth. Silty fine sands (A-2-4) was also encountered at this location, from about 9 feet to the boring termination depth of 10 feet below existing grade.
- Boring A-9 was continued to a depth of 15 feet below existing grade to determine the groundwater level at that location.

4.2 Groundwater Level

The groundwater level was encountered three of the boring locations (A-1, A-9, A-10) and recorded at the time of drilling at depths ranging from 9-feet 5-inches to 13-feet 9-inches below the existing ground surface. Groundwater was not encountered at the other 7 boring locations; however, that does not mean that groundwater does not exist at those locations, or that groundwater would not be encountered within the vertical reach of the borings at another date. It should be anticipated that the groundwater levels will fluctuate seasonally and with changes in climate. As such, we recommend that the water table be verified prior to construction. Measured groundwater levels are shown the boring profiles and boring logs.

4.3 Review of the USDA Web Soil Survey Map

The results of a review of the USDA Soil Survey Conservation Service (SCS) Web Soil Survey of St. Johns County are shown in the table below. The soil drainage class, hydrological group, and estimated seasonal high groundwater levels reported in the Soil Survey are as follows:

Soil No.	Soil Type	Drainage Class	Hydrologic Group	Depth to the Water Table(1) (inches)
5	St. Johns fine sand, depressional	Very Poorly Drained	B/D	0
8	Zolfo fine sand	Somewhat Poorly Drained	A	24 to 42
12	Ona-Ona, wet, fine sand, 0 to 2 percent slopes	Poorly Drained	B/D	0 to 18
13	St. Johns fine sand	Poorly Drained	B/D	0 to 6

(1) The "Water table" above refers to a saturated zone in the soil which occurs during specified months, typically the summer wet season. Estimates of the upper limit shown in the Web Soil Survey are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

4.4 Seasonal High Groundwater Level

In estimating seasonal high groundwater level, a number of factors are taken into consideration including antecedent rainfall, soil redoximorphic features (i.e., soil mottling), stratigraphy (including presence of hydraulically restrictive layers), vegetative indicators, effects of development, and relief points such as drainage ditches, low-lying areas, etc.

Based on our interpretation of the current site conditions, including the boring logs and review of published data, we estimate the seasonal high groundwater levels at the site to be generally 2 to 3 feet above the water levels measured at the time of our field work.

It is possible that higher groundwater levels may exceed the estimated seasonal high groundwater level as a result of significant or prolonged rains. Therefore, we recommend that design drawings and specifications account for the possibility of groundwater level variations, and construction planning should be based on the assumption that such variations will occur.

5.0 DESIGN RECOMMENDATIONS

5.1 General

The following evaluation and recommendations are based on the provided project information as presented in this report, results of the field exploration and laboratory testing performed, and the construction techniques recommended in Section 6.0 below. If the described project conditions are incorrect or changed after this report, or subsurface conditions encountered during construction are different from those reported, MAE should be notified so these recommendations can be re-evaluated and revised, if necessary. We recommend that MAE review the plans and earthwork specifications to verify that the recommendations contained in this report have been properly interpreted and implemented.

5.2 Pipeline Support Recommendations

It is our understanding that the 8-inch diameter pipeline will have an invert elevation that is about 4 feet or less below the existing ground surface to allow for the minimum cover requirement of 30 to 36 inches. Based on the results of the subsurface exploration and laboratory testing as discussed in this report, we consider the subsurface conditions at the site adaptable for supporting the proposed pipeline when constructed upon properly prepared subgrade soils.

As discussed earlier in the report, fine sands to fine sands with silt (A-3), were encountered in each of the borings advanced as part of this exploration (with the exception of A-3) to the boring termination depths. These soils are considered suitable for support of the pipe as well as for pipe backfill. These soils should be placed and compacted as discussed in Section 6.0 below.

Boring A-3, encountered organic soils (A-8) between depths of 4 to 5 feet below the existing ground surface. It should be expected that these soils will be encountered at or near the planned pipe invert elevation at this location. These soils are not considered suitable for support of the pipeline, nor as pipe backfill. We recommend the organic soils that are within 12 inches of the pipe invert should be removed, and replaced with suitable structural fill soil as described in Section 6.0 below. Our personnel should observe this removal process to confirm whether all organic soils are removed prior to backfilling.

Organic soils should not be used as pipe backfill. These soils should be separated from the other soils during excavation and stockpiled for removal from the site.

Assuming the project information as described in previous sections of this report is correct, and provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed, the following parameters may be used for design.

5.2.1 Lateral Pressure Design Parameters

Underground walls for the manhole structures that are backfilled on one side and restrained against rotation at the top, should be designed to resist lateral pressures from soil and groundwater based on the following equivalent fluid unit weights:

- Above Water Table - Equivalent Fluid Density 60 lb/ft^3
- Below Water Table - Equivalent Fluid Density 90 lb/ft^3

For the design of lateral loads on below-grade walls, we recommend that the groundwater level be assumed to be at the ground surface. Lateral pressure distributions in accordance with the above do not take into account forces from construction equipment, wheel loads or other surcharge loads. To account for this loading, a pressure equal to 0.5 times the anticipated surface surcharge should be applied over the full height of all walls.

5.2.2 Resisting Lateral Forces

Horizontal forces that act on pipeline structures such as thrust and anchor blocks can be resisted to some extent by the earth pressures that develop in contact with the buried perpendicular face of the block structure, and by shearing resistance mobilized along the block structures base and subgrade interface. Allowable passive earth pressure resistance may be determined using the following equivalent fluid densities:

- Above Water Table - Equivalent Fluid Density 100 lb/ft^3
- Below Water Table - Equivalent Fluid Density 60 lb/ft^3

A factor of safety of 3 was used for the above values. It is assumed the block structures are surrounded by well compacted structural backfill, as described in Section 6.6 below, extending at least 5 feet horizontally beyond the vertical bearing face. In addition, it is presumed that the block structures can withstand horizontal movements on the order of 0.5-inch before mobilizing full passive resistance.

The allowable sliding shearing resistance mobilized along the base of the block structure may be determined by the following formula:

$$P = {}^{1}/_{3} V \tan({}^{2}/_{3}\,\phi)$$

Where: P = Allowable shearing resistance force
V = Net vertical force (total weight of block and soil overlying the structure minus hydrostatic uplift forces)
ϕ = Angle of internal friction = 30°

The following unit weights can be used to calculate the weight of the overburden soil:

- Compacted Moist Soil 110 lb/ ft^3
- Saturated Soil 120 lb/ ft^3

5.2.3 Hydrostatic Uplift Resistance

It is anticipated that the buried structures will exert little or no net downward pressure on the soils, rather, the structures may be subject to hydrostatic uplift pressure when empty. Below grade structures should be designed to resist hydrostatic uplift pressures appropriate for their depth below existing grade and the normal seasonal high groundwater table. Hydrostatic uplift forces can be resisted in several ways including:

- Addition of dead weight to the structure.
- Mobilizing the dead weight of the soil surrounding the structure through extension of footings outside the perimeter of the structure.

A moist compacted soil unit weight of 110 lb/ft^3 may be used in designing structures to resist buoyancy.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

Site preparation as outlined in this section should be performed to provide more uniform pipe bearing conditions, and to reduce the potential for post-construction settlements of the planned pipelines and associated structures.

6.1 Clearing

Prior to construction, the location of existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of overlying structures.

The soil borings encountered a topsoil layer that ranged in thickness from 2 to 3 inches along the pipeline route. Therefore, it should be anticipated that up to about 3 inches of topsoil and soils containing significant amounts of organic materials may be encountered along the planned pipeline

route. The actual depths of topsoil should be determined by MAE using visual observation and judgment during earthwork operations. These unsuitable materials should not be reused as backfill material within the pipeline or structure excavations. However, topsoil may be stockpiled and used subsequently in areas to be grassed.

6.2 Temporary Groundwater Control

The groundwater level was encountered at three of the boring locations (A-1, A-9, A-10) at depths varying from 9-feet 5-inches to 13-feet 9-inches below the existing ground surface at the time of our exploration. Groundwater was not encountered at the other boring locations within the depths explored at the time of our exploration; however, that does not mean that groundwater does not exist at this location, or that groundwater would not be encountered within the vertical reach of the borings at another date. Because of the need for excavation to the pipeline invert and manhole bottom elevations, followed by compaction of the bedding and backfill soils, it may be necessary to install temporary groundwater control measures to dewater the area to facilitate the excavation and compaction processes.

The groundwater control measures (if needed) should be determined by the contractor but can consist of sumps or wellpoints (or a combination of these or other methods) capable of lowering the groundwater level to at least 3 feet below the required depth of excavation. The dewatering system should not be decommissioned until excavation, compaction, and fill placement is complete, and sufficient deadweight exists on the pipe and associated structures to prevent uplift.

6.3 Preparation of Pipe Bedding Soils

As discussed earlier in the report, fine sands to fine sands with silt (A-3), were encountered in each of the borings advanced as part of this exploration to the boring termination depths (with the exception of A-3). These soils are considered suitable for support of the pipe as well as for pipe backfill. These soils should be placed and compacted as discussed in section 6.4 below.

However, at boring A-3, organic soils (A-8) were encountered between depths of 4 to 5-feet below ground surface. It should be expected that these soils will be encountered during excavation for the pipeline as well as at or near the planned pipe invert elevation at and near this location. These soils are not considered suitable for support of the pipeline at the invert elevation (pipe bedding) or at the structure bottom elevation, respectively, nor as backfill for the pipe excavation. Organic soils as encountered at this boring location that are within 12 inches of the pipe invert should be removed to a depth of at least 12 inches below the pipe invert elevation, and should be replaced with suitable structural fill soil as described in Section 6.6 below. The intent of this recommendation is to provide more uniform bearing conditions, and to reduce the potential for post construction settlements of the pipeline.

6.4 Compaction of Pipe Bedding Soil

After installing the temporary groundwater control measures (if needed), and achieving the required depth of excavation, the exposed sandy soil surface should be compacted using hand-operated equipment. Typically, the material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 98 percent of the modified Proctor maximum dry density (AASHTO T-180) have been achieved within the upper one foot below the exposed surface within the pipeline excavation.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils that are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate before recompacting.

6.5 Excavation Protection

Excavation work for pipeline construction will be required to meet OSHA Excavation Standard Subpart P regulations for Type C Soils. The use of excavation support systems will be necessary where there is not sufficient space to allow the side slopes of the excavation to be laidback to at least 2H:1V (2 horizontal to 1 vertical) to provide a safe and stable working area and to facilitate adequate compaction along the sides of the excavation.

The method of excavation support should be determined by the contractor but can consist of a trench box, drilled-in soldier piles with lagging, interlocking steel sheeting or other methods. The support structure should be designed according to OSHA sheeting and bracing requirements by a Florida registered Professional Engineer.

6.6 Pipe Backfill Placement and Compaction

Structural backfill placed within the pipeline excavation, and in areas in which over-excavation of unsuitable soils is required below the pipeline invert elevation, should be placed in loose lifts not exceeding six inches in thickness and compacted using hand-operated compaction equipment. This procedure should continue until the backfill elevation is 12 inches above the top of the pipe. At elevations greater than 12 inches above the top of pipe, structural backfill may be placed in loose lifts not exceeding 12 inches in thickness and compacted by hand-operated compaction equipment.

Structural backfill is defined as a non-plastic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The sandy soils (A-3) meeting the properties given above, as encountered in the borings, may be used as backfill. Typically, the backfill material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 98 percent of the modified Proctor maximum dry density (AASHTO T-180) have been achieved within each lift of compacted structural backfill.

We recommend that soil excavated from the pipeline trenches that will be reused as backfill be stockpiled a safe distance from the excavations and in such a manner that promotes runoff away from the open trenches and limits saturation of the excavated soil.

7.0 QUALITY CONTROL TESTING

A representative number of field in-place density tests should be made in the upper 2 feet of compacted pipe and in each lift of compacted backfill. The density tests are considered necessary to verify that satisfactory compaction operations have been performed. We recommend density testing be performed at a minimum of one location for every 300 feet of pipeline.

8.0 REPORT LIMITATIONS

This report has been prepared for the exclusive use of CPH, Inc. and the JEA for specific application to the design and construction of the St. Johns Parkway – Race Track Road to Espada Lane – 8 inch Reclaimed Water Main as described in this report. A version of our report that is signed and sealed

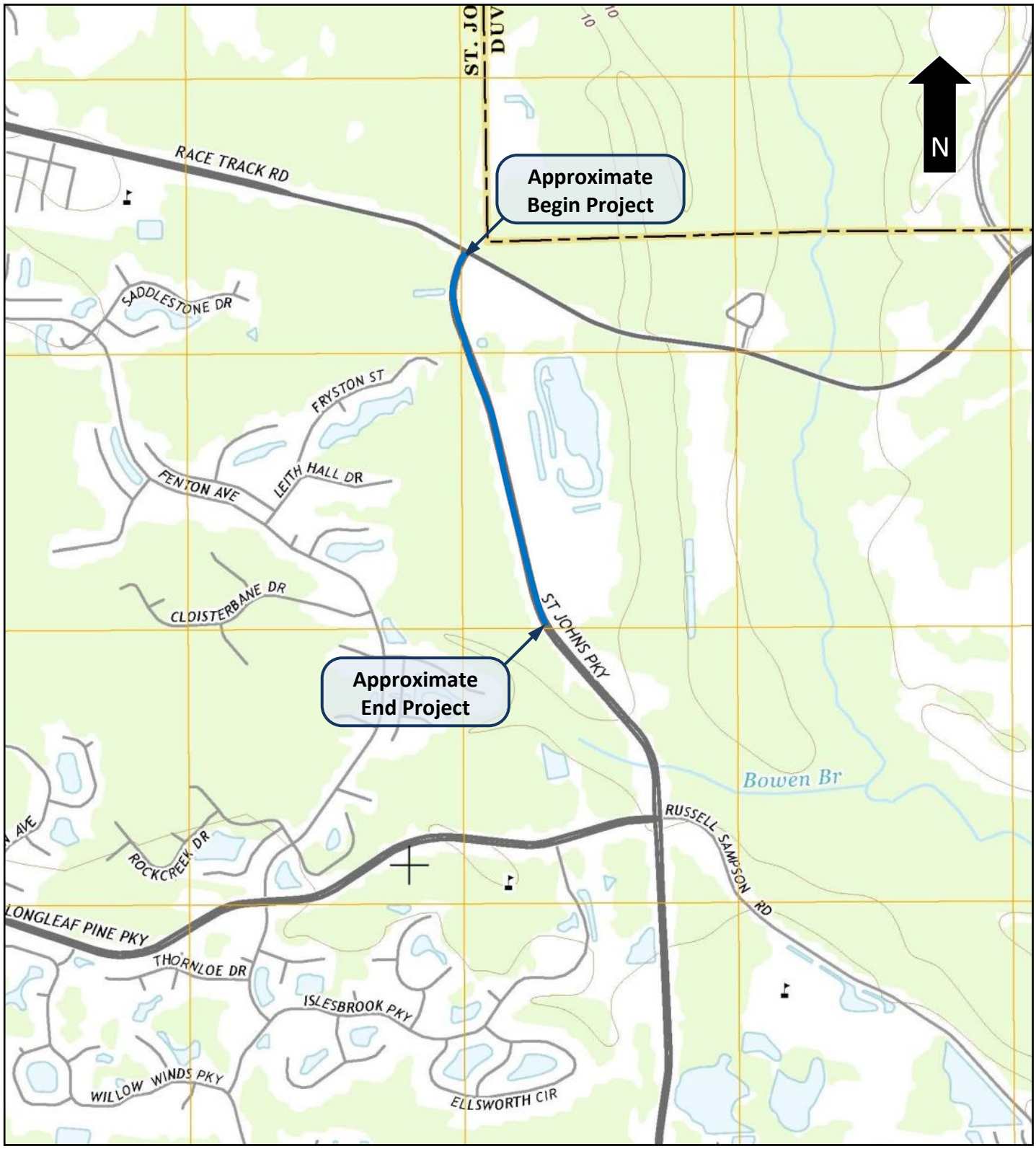
in blue ink may be considered an original of the report. Copies of an original should not be relied on unless specifically allowed by MAE in writing. Our work for this project was performed in accordance with generally accepted geotechnical engineering practice. No warranty, expressed or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from the borings performed for the proposed reclaimed water main. This testing indicates subsurface conditions only at the specific locations and times, and only to the depths explored. These results do not reflect subsurface variations that may exist away from the boring locations and/or at depths below the boring termination depths. Subsurface conditions and water levels at other locations may differ from conditions occurring at the tested locations. In addition, it should be understood that the passage of time may result in a change in the conditions at the tested locations. If variations in subsurface conditions from those described in this report are observed during construction, the recommendations in this report must be re-evaluated.

The scope of our services did not include any environmental assessment or testing for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the subject site. Any statements made in this report, and/or notations made on the generalized soil profiles or boring logs, regarding odors or other potential environmental concerns are based on observations made during execution of our scope of services and as such are strictly for the information of our client. No opinion of any environmental concern of such observations is made or implied. Unless complete environmental information regarding the site is already available, an environmental assessment is recommended.

If changes in the design or location of the structure occur, the conclusions and recommendations contained in this report may need to be modified. We recommend that these changes be provided to us for our consideration. MAE is not responsible for conclusions, interpretations, opinions or recommendations made by others based on the data contained in this report.

Figures



Site Location Map

PREPARED BY	PROJECT NAME	
MAE Meskel & Associates Engineering	St. Johns Parkway-Racetrack Road to Espada Lane 8" Reclaimed WM St. Johns County, Florida	
	REFERENCE	SCALE
	USGS 7.5" Orangedale Quadrangle	NTS
PREPARED FOR	MAE PROJECT NO.	**FIGURE NO.**
CPH, Inc.	0106-0004	1

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

JOEY BROUSSARD, P.E. P.E. NO.: 58233

MAE

Meskel & Associates Engineering, LLC

FL Certificate of Authorization No. 28142

8936 Western Way, Suite 12, Jacksonville, FL 32256

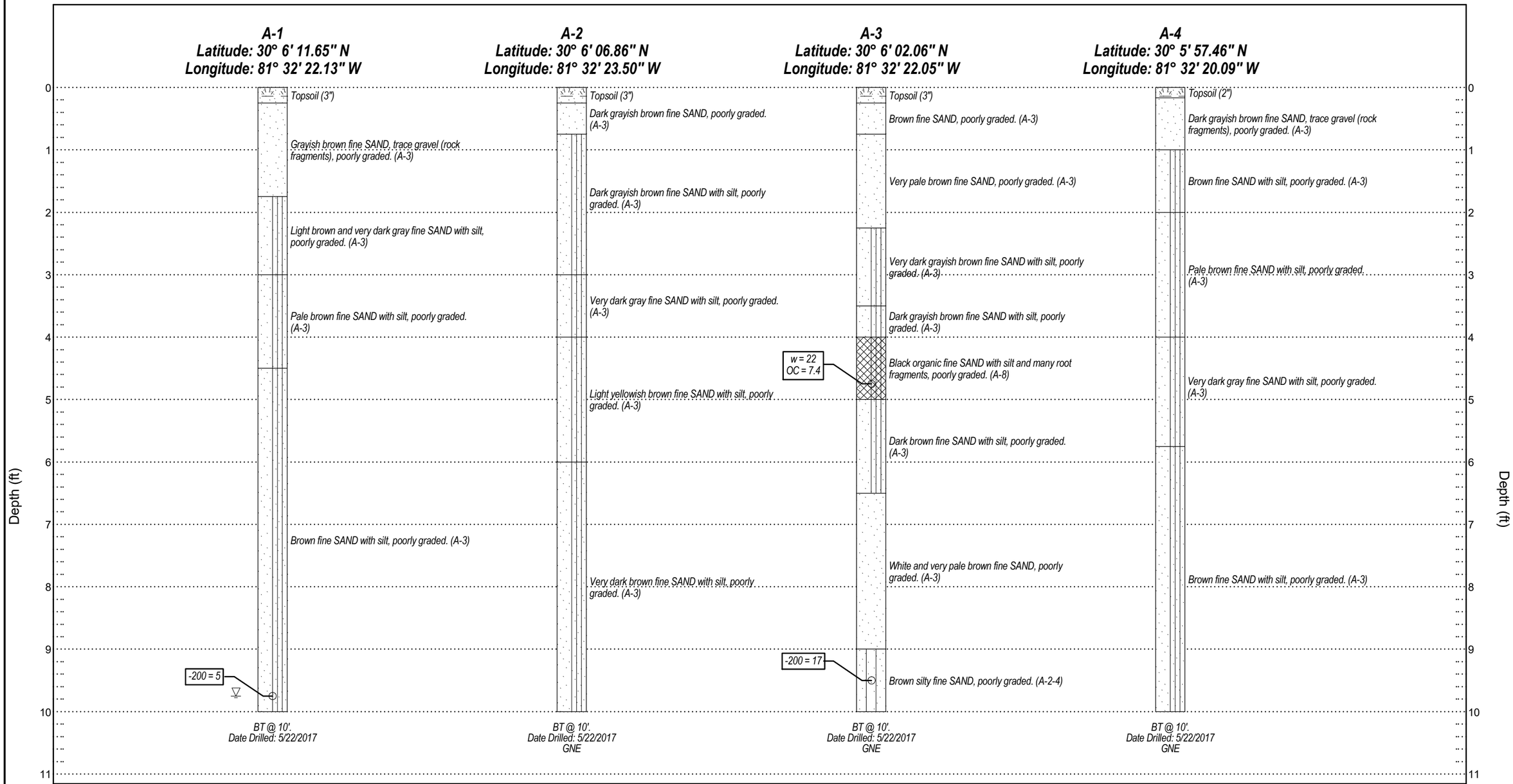
CLIENT: CPH, Inc.

DATE:	MAE PROJECT NO.
6/13/2017	0156-0001

SHEET TITLE: BORING LOCATION PLAN

PROJECT NAME: St. Johns Parkway-Racetrack Road to Espada Lane-8" Reclaimed WM
St. Johns County, Florida

FIGURE NO. 2



Legend

Topsoil
Fine Sand
Fine Sand with Silt
Silty Fine Sand
Organic Sand with Silt

(A-3) *AASHTO Soil Classification System*
▽ *Depth to Groundwater at Time of Drilling*
w *Natural Moisture Content (%)*
OC *Organic Content (%)*
BT *Boring Terminated at Depth Below Existing Grade*
-200 *% Passing No. 200 U.S. Standard Sieve*
GNE *Groundwater Level Not Encountered at Time of Drilling*

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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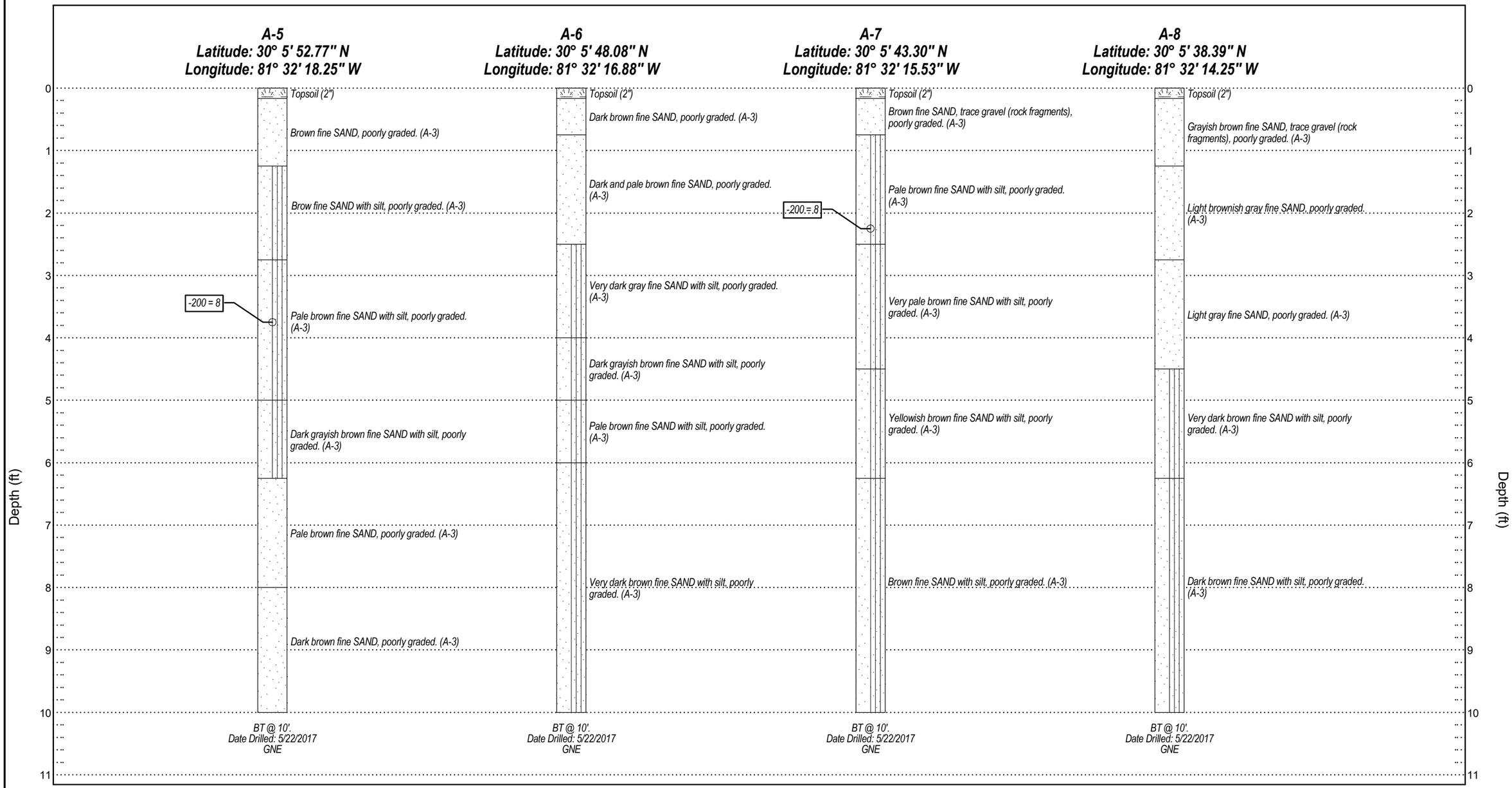
CPH, Inc.

DATE:	MAE PROJECT NO.
6/13/2017	0106-0005

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM*
St. Johns County, Florida

FIGURE NO. 3



Legend

Topsoil

Fine Sand

Fine Sand with Silt

(A-3) *AASHTO Soil Classification System*

GNE *Groundwater Level Not Encountered at Time of Drilling*

BT *Boring Terminated at Depth Below Existing Grade*

-200 *% Passing No. 200 U.S. Standard Sieve*

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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CPH, Inc.

DATE:	MAE PROJECT NO.
6/13/2017	0106-0005

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM*
St. Johns County, Florida

FIGURE NO. 4

A-9
Latitude: 30° 5' 33.68" N
Longitude: 81° 32' 12.99" W

Topsoil (2")

Dark grayish brown fine SAND, trace gravel (rock fragments), poorly graded. (A-3)

Brown fine SAND with silt, poorly graded. (A-3)

Dark grayish brown fine SAND with silt, poorly graded. (A-3)

Light brownish gray fine SAND, poorly graded. (A-3)

Pale brown fine SAND, poorly graded. (A-3)

Very dark brown fine SAND with silt, poorly graded. (A-3)

Dark brown fine SAND with silt, poorly graded. (A-3)

Brown fine SAND with silt, poorly graded. (A-3)

BT @ 15'.
Date Drilled: 5/22/2017

A-10
Latitude: 30° 5' 29.14" N
Longitude: 81° 32' 11.12" W

Topsoil (2")

Dark grayish brown fine SAND, trace root fragments, poorly graded. (A-3)

Brown fine SAND with silt, poorly graded. (A-3)

Dark grayish brown fine SAND with silt, poorly graded. (A-3)

-200 = 6

Light brownish gray fine SAND with silt, poorly graded. (A-3)

Dark grayish brown fine SAND with silt, poorly graded. (A-3)

Very dark brown fine SAND with silt, poorly graded. (A-3)

BT @ 10'.
Date Drilled: 5/22/2017

Depth (ft)

0 2 4 6 8 10 12 14 16

Legend

Topsoil

Fine Sand

Fine Sand with Silt

(A-3) *AASHTO Soil Classification System*

BT *Boring Terminated at Depth Below Existing Grade*

▽ *Depth to Groundwater at Time of Drilling*

-200 *% Passing No. 200 U.S. Standard Sieve*

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

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SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM*
St. Johns County, Florida

FIGURE NO. 5

Appendix A

Meskel & Associates Engineering, LLC
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Meskel & Associates Engineering

BORING A-1

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 6' 11.65" N **LONGITUDE** 81° 32' 22.13" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (3")												
	1	Grayish brown fine SAND, trace gravel (rock fragments), poorly graded.	A-3											
2.5	2	Light brown and very dark gray fine SAND with silt, poorly graded.	A-3											
	3	Pale brown fine SAND with silt, poorly graded.	A-3											
5.0	4													
7.5	5	Brown fine SAND with silt, poorly graded.	A-3											
10.0	6	▽						5						

Bottom of borehole at 10 feet.

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 9 in *▽ **END OF DAY** ---

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Meskel & Associates Engineering

BORING A-2

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 6' 06.86" N **LONGITUDE** 81° 32' 23.50" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (3")												
	1	Dark grayish brown fine SAND, poorly graded.	A-3											
	2	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
2.5	3													
	4	Very dark gray fine SAND with silt, poorly graded.	A-3											
5.0	5	Light yellowish brown fine SAND with silt, poorly graded.	A-3											
7.5	6	Very dark brown fine SAND with silt, poorly graded.	A-3											
10.0	7													

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-3

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 6' 02.06" N **LONGITUDE** 81° 32' 22.05" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (3")												
	1	Brown fine SAND, poorly graded.	A-3											
	2	Very pale brown fine SAND, poorly graded.	A-3											
2.5	3	Very dark grayish brown fine SAND with silt, poorly graded.	A-3											
	4	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
5.0	5	Black organic fine SAND with silt and many root fragments, poorly graded.	A-8				22		7.4					
	6	Dark brown fine SAND with silt, poorly graded.	A-3											
7.5	7	White and very pale brown fine SAND, poorly graded.	A-3											
10.0	8	Brown silty fine SAND, poorly graded.	A-2-4					17						

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-4

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 57.46" N **LONGITUDE** 81° 32' 20.09" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Dark grayish brown fine SAND, trace gravel (rock fragments), poorly graded.	A-3											
	2	Brown fine SAND with silt, poorly graded.	A-3											
2.5	3	Pale brown fine SAND with silt, poorly graded.	A-3											
5.0	4	Very dark gray fine SAND with silt, poorly graded.	A-3											
7.5	5	Brown fine SAND with silt, poorly graded.	A-3											
10.0	6													

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-5

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 52.77" N **LONGITUDE** 81° 32' 18.25" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Brown fine SAND, poorly graded.	A-3											
2.5	2	Brow fine SAND with silt, poorly graded.	A-3											
	3	Pale brown fine SAND with silt, poorly graded.	A-3					8						
5.0	4	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
7.5	5	Pale brown fine SAND, poorly graded.	A-3											
	6	Dark brown fine SAND, poorly graded.	A-3											
10.0		Bottom of borehole at 10 feet.												

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-6

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 48.08" N **LONGITUDE** 81° 32' 16.88" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Dark brown fine SAND, poorly graded.	A-3											
	2	Dark and pale brown fine SAND, poorly graded.	A-3											
2.5														
	3	Very dark gray fine SAND with silt, poorly graded.	A-3											
	4	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
5.0														
	5	Pale brown fine SAND with silt, poorly graded.	A-3											
	6	Very dark brown fine SAND with silt, poorly graded.	A-3											
7.5														
	7													
10.0														

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-7

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 43.30" N **LONGITUDE** 81° 32' 15.53" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Brown fine SAND, trace gravel (rock fragments), poorly graded.	A-3											
2.5	2	Pale brown fine SAND with silt, poorly graded.	A-3					8						
5.0	3	Very pale brown fine SAND with silt, poorly graded.	A-3											
	4	Yellowish brown fine SAND with silt, poorly graded.	A-3											
7.5	5	Brown fine SAND with silt, poorly graded.	A-3											
10.0	6													

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-8

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 38.39" N **LONGITUDE** 81° 32' 14.25" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Grayish brown fine SAND, trace gravel (rock fragments), poorly graded.	A-3											
2.5	2	Light brownish gray fine SAND, poorly graded.	A-3											
	3	Light gray fine SAND, poorly graded.	A-3											
5.0	4	Very dark brown fine SAND with silt, poorly graded.	A-3											
7.5	5	Dark brown fine SAND with silt, poorly graded.	A-3											
10.0	6													

Bottom of borehole at 10 feet.

NOTES GNE-Groundwater Level Not Encountered at Time of Drilling.

GROUND WATER LEVELS

AT TIME OF DRILLING --- GNE **END OF DAY** ---

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BORING A-9

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 33.68" N **LONGITUDE** 81° 32' 12.99" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Dark grayish brown fine SAND, trace gravel (rock fragments), poorly graded.	A-3											
2.5	2	Brown fine SAND with silt, poorly graded.	A-3											
	3	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
5.0	4	Light brownish gray fine SAND, poorly graded.	A-3											
	5	Pale brown fine SAND, poorly graded.	A-3											
7.5	6	Very dark brown fine SAND with silt, poorly graded.	A-3											
10.0	7													

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 13 ft 9 in *▽ **END OF DAY** ---

(Continued Next Page)

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BORING A-9

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
10.0														
	8	Dark brown fine SAND with silt, poorly graded.	A-3											
12.5														
	9	▽												
	10	Brown fine SAND with silt, poorly graded.	A-3											
15.0		Bottom of borehole at 15 feet.												

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 13 ft 9 in *▽ **END OF DAY** ---

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BORING A-10

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

DATE STARTED 5/22/17 **COMPLETED** 5/22/17 **LATITUDE** 30° 5' 29.14" N **LONGITUDE** 81° 32' 11.12" W

DRILLING CONTRACTOR MAE, LLC **DRILLING METHOD** Flight Auger

LOGGED BY P.R.Young **CHECKED BY** W. Josh Mele **GROUND ELEVATION** — **HAMMER TYPE** —

DEPTH (ft)	SAMPLE DEPTH NUMBER	MATERIAL DESCRIPTION	AASHTO	GRAPHIC LOG	BLOW COUNTS	N-VALUE	MOISTURE CONTENT (%)	FINES CONTENT (%)	ORGANIC CONTENT (%)	LIQUID LIMIT	PLASTICITY INDEX	POCKET PEN. (tsf)	RECOVERY % (RQD)	REMARKS
0.0		Topsoil (2")												
	1	Dark grayish brown fine SAND, trace root fragments, poorly graded.	A-3											
	2	Brown fine SAND with silt, poorly graded.	A-3											
2.5	3	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
	4	Light brownish gray fine SAND with silt, poorly graded.	A-3					6						
5.0	5	Dark grayish brown fine SAND with silt, poorly graded.	A-3											
	6													
7.5		Very dark brown fine SAND with silt, poorly graded.	A-3											
	7 ▽													
10.0														

Bottom of borehole at 10 feet.

NOTES

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 5 in *▽ **END OF DAY** ---

NEW MAE LOG AASTHO LAT_LONG -HA - NEW TEMPLATE 7-30-12.GDT - 6/6/17 16:17 - F:\GINT\GINT FILES\PROJECTS\0106-0005\JEA ST JOHNS PKWY.GPJ

FIELD EXPLORATION PROCEDURES

Flight Auger Boring

The auger boring(s) were performed mechanically by the use of a continuous-flight auger attached to a drill rig in general accordance with the latest revision of ASTM D 1452, "Soil Investigation and Sampling by Auger Borings." Representative samples of the soils brought to the ground surface by the augering process were visually described in the field, and representative portions of the samples were obtained for further evaluation by a geotechnical engineer.

KEY TO BORING LOGS – AASHTO

Soil Classification

Soil classification of samples obtained at the boring locations is based on the American Association of State Highway and Transportation Officials (AASHTO) Classification System. Coarse grained soils have more than 50% of their dry weight retained on a #200 sieve. Their principal descriptors are: sand, cobbles and boulders. Fine grained soils have less than 50% of their dry weight retained on a #200 sieve. They are principally described as clays if they are plastic and silts if they are slightly to non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

BORING LOG LEGEND	
Symbol	Description
(A-3)	AASHTO Classification System
-200	Fines content, % Passing No. 200 U.S. Standard Sieve
w	Natural Moisture Content (%)
OC	Organic Content (%)
LL	Liquid Limit
PI	Plasticity Index
NP	Non-Plastic
PP	Pocket Penetrometer in tons per square foot (tsf)

MODIFIERS	
SECONDARY CONSTITUENTS (Sand, Silt or Clay)	
Trace	Less than 5%
With	5% to 12%
Sandy, Silty or Clayey	12% to 35%
Very Sandy, Very Silty or Very Clayey	35% to 50%
ORGANIC CONTENT	
Trace	2% or less
With	3% to 5%
Organic Soils	5% to 20%
Highly Organic Soils (Muck)	20% to 75%
PEAT	Greater than 75%
MINOR COMPONENTS (Shell, Rock, Debris, Roots, etc.)	
Trace	Less than 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%

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AASHTO Soil Classification System
(from AASHTO M 145 or ASTM D 3282)

General Classification	***Granular Materials*** *(35% or less passing the 0.075 mm sieve)*							***Silt-Clay Materials*** *(>35% passing the 0.075 mm sieve)*			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5***** A-7-6*****
Sieve Analysis, % passing:											
2.00 mm (No. 10)	50 max	…	…	…	…	…	…	…	…	…	…
0.425 (No. 40)	30 max	50 max	51 min	…	…	…	…	…	…	…	…
0.075 (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40):											
Liquid Limit	…		…	40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity Index	6 max		N.P.	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min
Usual types of significant constituent materials	stone fragments, gravel and sand		fine sand	silty or clayey gravel and sand				silty soils		clayey soils	
General ***local***** rating as a subgrade	excellent to good			fair to poor							

* Plasticity index of A-7-5 subgroup is equal to or less than the LL - 30. Plasticity index of A-7-6 subgroup is greater than LL – 30

** *Northeast Florida*

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Appendix B

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SUMMARY OF LABORATORY TEST RESULTS

PROJECT NO. 0106-0005

PROJECT NAME St. Johns Parkway-Racetrack Rd to Espada Ln-8" Reclaimed WM **DATE.** 6/5/2017

PROJECT LOCATION St. Johns County, Florida **CLIENT** CPH, Inc.

Borehole	Sample No.	Approx. Depth (ft)	%<#200 Sieve	Water Content (%)	Organic Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	AASHTO Classification	Comments
A-1	6	9.5	5	---	---	---	---	---	A-3	
A-3	5	4.5	---	22	7.4	---	---	---	A-3	
A-3	8	9.5	17	---	---	---	---	---	A-2-4	
A-5	3	3.5	8	---	---	---	---	---	A-3	
A-7	2	2.0	8	---	---	---	---	---	A-3	
A-10	4	3.5	6	---	---	---	---	---	A-3	

Note: "---" Untested Parameter

LABORATORY TEST PROCEDURES

Percent Fines Content

The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

Natural Moisture Content

The water content of the tested sample was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of "pore" or "free" water in a given mass of material to the mass of solid material particles.

Organic Loss on Ignition (Percent Organics)

The organic loss on ignition or percent organic material in the sample tested was determined in general accordance with ASTM D 2974. The percent organics is the material, expressed as a percentage, which is burned off in a muffle furnace at 455±10 degrees Celsius.