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REPORT OF
GEOTECHNICAL EXPLORATION
KINLOCK FM REPLACEMENT – NEW MANHOLE STRUCTURE
JACKSONVILLE, FLORIDA
ECS PROJECT NO. 35-26187-A
CLIENT ID: 0199

Prepared for:

JEA
21 West Church Street
Jacksonville, Florida 32202

Prepared by:

ECS Florida, LLC
7064 Davis Creek Road
Jacksonville, Florida 32257

May 24, 2018

May 24, 2018

Mr. Brian Gaines, E.I.
JEA
21 West Church Street
Jacksonville, Florida 32202

Reference: Report of Geotechnical Exploration
Kinlock FM Replacement – New Manhole Structure
Jacksonville, Florida
ECS Project No. 35-26187-A
Client ID: 0199

Dear Mr. Gaines:

As requested and authorized by you, ECS Florida, LLC (ECS) has completed a geotechnical exploration for the subject project. This exploration was performed in accordance with our proposal dated April 17, 2018. The exploration was performed to evaluate the general subsurface conditions below the proposed manhole structure and to provide foundation design, site preparation and earthwork recommendations.

We appreciate this opportunity to be of service as your geotechnical consultant on this phase of the project, and we look forward to providing the materials testing and observation that will be required during the construction phase. If you have any questions, or if we may be of any further service, please contact us.

Very truly yours,
ECS FLORIDA, LLC

Robert W. Clark, P.E.
Sr. Geotechnical Engineer
Registered, Florida No. 52210

Digitally signed by Robert W Clark
DN: c=US, o=IdenTrust ACES Business Representative, ou=ELLIS AND ASSOCIATES, cn=Robert W Clark, 0.9.2342.19200300.100.1.1=A010980 0000014D0050B4BA000015FB
Date: 2018.05.24 16:19:47 -04'00'

Anis Elkaz, E.I.
Staff Engineer

Robert Clark, P.E.
Senior Project Engineer
Registered, Florida No. 19985

Distribution: Mr. Brian Gaines, E.I. – JEA 1 pdf
Mr. Claro Magpantay, P.E. – C&ESC, Inc. 1 pdf

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1.0 PROJECT INFORMATION

1.1 Site Location and Project Description

The project site is located at the northeast corner of the intersection of US 1 and North Canal Street in Jacksonville, Florida. The site is developed with several existing buildings and associated roadways. The general site location is shown on Figure 1.

At the time of our exploration, the site was partially developed, with surface cover consisting of grass. Surface water was not observed near planned structural areas at the time of our exploration.

Claro Magpantay with Construction & Engineering Services Consultants, Inc. provided project information via an email dated April 12, 2018. We were provided with a copy of a site plan for the subject site prepared by JEA, dated February 2018. This plan indicated the boundary limits for the construction, the layout of the proposed construction, and the requested boring location. We understand that a manhole is proposed to be installed to attach to the existing sanity sewer line as shown in the provided plans. It is our understanding the bottom of the manhole structure will be at approximately 18 feet below the existing ground surface.

If actual planed construction varies from these conditions, then the recommendations in this report may need to be re-evaluated. We should be contacted if any of the above project information is incorrect so that we may reevaluate our recommendations.

2.0 FIELD EXPLORATION

We performed a field exploration on May 17, 2018. The approximate boring location is indicated on the attached Field Exploration Plan (Figure 3). Our personnel determined the boring location using paced measurements from existing roadways and survey controls adjacent to the site. The boring location on the referenced Field Exploration Plan should be considered accurate only to the degree implied by the method of measurement used.

2.1 SPT BORINGS

We located and performed one Standard Penetration Test (SPT) boring, drilled to a depth of approximately 25 feet below the existing ground surface, in general accordance with the methodology outlined in ASTM D 1586 to explore the subsurface conditions within the area of the proposed manhole structure. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory for further evaluation.

3.0 VISUAL CLASSIFICATION

A geotechnical engineer classified representative soil samples obtained during our field exploration using the Unified Soil Classification System (USCS) in general accordance with ASTM D 2488. A Key to the Soil Classification System is included in Appendix A.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

The detailed boring record is included in Appendix A. The following tables summarize the soil conditions encountered within the proposed construction.

GENERAL SOIL PROFILE: MANHOLE LOCATION			
TYPICAL DEPTH (ft)			
FROM	**TO**	**SOIL DESCRIPTION**	**USCS(1)**
0	17	Loose to Medium Dense Fine Sand, Fine Sand with Silt, Fine Sand with Clay	SP, SP-SM, SP-SC
17	25	Very Loose to Loose Clayey Fine Sand	SC
(1) Unified Soil Classification System			

4.2 Groundwater Level

Groundwater was encountered at the boring location and recorded at the time of drilling at a depth of 1 foot below the existing ground surface. We note that groundwater levels will fluctuate due to seasonal climatic variations, surface water runoff patterns, construction operations, and other interrelated factors. The groundwater depth at the boring location is noted on the Generalized Subsurface Profiles and on the Log of Boring records.

5.0 DESIGN RECOMMENDATIONS

5.1 General

Our geotechnical engineering evaluation of the site and subsurface conditions at the property, with respect to the planned construction and our recommendations for site preparation and foundation support, are based on (1) our site observations, (2) the field data obtained, (3) our understanding of the project information and structural conditions as presented in this report, and (4) our experience with similar soil and loading conditions.

If the stated project conditions are incorrect, or should the location of the construction changed, please contact us so that we can review our recommendations. Also, the discovery of any site or subsurface conditions during construction that deviate from the data obtained during this geotechnical exploration should also be reported to us for our evaluation.

The recommendations in the subsequent sections of this report present design and construction techniques that are appropriate for the planned construction. We recommend that ECS be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

5.2 Manhole Structure Recommendations

As discussed in Section 4.1, layers of very loose to loose clayey fine sand were encountered in our boring from a depth of approximately 17 to 25 feet below the existing ground surface. Depending on the manhole base elevation, we recommend the over-excavation of the very loose soils to a depth of 2 feet below the structure bearing elevations to reduce the potential for pumping and yielding of the bearing level soils.

Based on the results of our exploration and provided the site preparation and earthwork recommendations in Section 6.0 are followed, we consider the subsurface conditions at the site adaptable for support of the proposed manhole structure.

5.2.1 General Construction Considerations

The need for dewatering systems should be anticipated for below-ground construction. The water table should be maintained at least 2 feet below the required excavation depth. The dewatering system should not be decommissioned until sufficient deadweight exists on the structure to prevent uplift or the uplift protection system as described below, if necessary, is in place.

5.2.2 Uplift Pressure

Based on the results of the boring performed within the proposed manhole structure area, we anticipate the structure will exert little or no net downward pressure on the soils; rather, the structures may be subject to hydrostatic uplift pressure when the structures are empty. Below grade structures should be designed to resist lateral earth pressures and hydrostatic uplift pressures appropriate for their depth below existing grade and the normal seasonal high groundwater table.

The walls of the manhole should be designed to resist at-rest lateral earth pressures, with equivalent fluid densities above and below the water table being as follows:

Above Water Table - Equivalent Fluid Density	60 pcf
Below Water Table - Equivalent Fluid Density	90 pcf

The above design values assume granular backfill around the pipelines and to a minimum distance of 5 feet around the structure. Lateral pressure distributions in accordance with the above do not take into account forces from construction equipment, wheel loads or other surcharge loads.

5.2.3 Uplift Protection

When the water within the manhole structure is maintained at or above the surrounding groundwater level, no net buoyancy will occur to the structure. However, in other conditions, a positive means of uplift protection may be necessary. Hydrostatic uplift forces can be resisted in several ways including:

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

We can assist you in evaluating uplift protection requirements, at your request.

5.3 Settlement

Post-construction settlements of the structure will be influenced by several interrelated factors, such as: (1) subsurface stratification and strength/compressibility characteristics; (2) bearing level, applied loads, and resulting bearing pressures beneath the foundations; and (3) site preparation and earthwork construction techniques used by the contractor.

Based on the results of our boring and provided the site preparation and earthwork construction recommendations presented in Section 6.0 are performed, and since the proposed structure will exert little downward pressure on the soils, it is our opinion that settlement should be within tolerable magnitudes. The following sections present our recommendations for construction of the manhole structure.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

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

6.1 Clearing and Stripping

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

The "footprint" of the proposed construction plus a minimum additional margin of 3 feet should be stripped of all surface vegetation, stumps, debris, organic topsoil, or other deleterious materials. During grubbing operations, roots with a diameter greater than 0.5-inch, stumps, or small roots in a concentrated state, should be grubbed and completely removed.

6.2 Temporary Groundwater Control

The boring encountered groundwater at a depth of 1 foot below the existing ground surface at the time of our exploration. Temporary groundwater control measures will be required to facilitate site work and excavation. Dewatering methods should be determined by the contractor. The dewatering method should be maintained until backfilling has reached a height of 2 feet above the groundwater level at the time of construction. The site should be graded to direct surface water runoff from the construction area.

Note that discharge of produced groundwater to surface waters of the state from dewatering operations or other site activities is regulated and requires a permit from the State of Florida Department of Environmental Protection (FDEP). This permit is termed a *Generic Permit for the Discharge of Produced Groundwater From Any Non-Contaminated Site Activity*. If discharge of produced groundwater is anticipated, we recommend sampling and testing of the groundwater early in the site design phase to prevent project delays during construction. ECS can provide the sampling, testing, and professional consulting required to evaluate compliance with the regulations.

6.3 Excavation Protection

Excavation work for the project will be required to meet OSHA Excavation Standard Subpart P regulations, Type C Soils. A braced sheet pile structure is anticipated for excavation support. Use of an open cut for deeper excavations is not considered practical because it will require a large excavation to preclude slope sloughing. The support structure should be designed according to OSHA sheeting and bracing requirements. We recommend a Florida registered Professional Engineer design the sheeting/bracing system.

6.4 Preparation of Lift Station Foundation Soils

After installing the temporary groundwater control measures and achieving the required depth of excavation, the excavation bottom should be densified using hand-operated compaction equipment prior to the placement of replacement fill soils. Typically, the material to be compacted should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper one foot below the exposed surface within the manhole structure excavation.

If the structure is founded in the very loose clayey sands compaction of the material should not be attempted. Instead the very loose soils should be over-excavated to 2 feet below the proposed bearing

level and replacement with compacted structural fill to the final bearing levels. We also recommend that a medium duty woven geotextile such as a Mirafi 600X, or equivalent, be used as barrier between compacted fill and clayey materials. The geotextile should be placed in the excavation bottom and sides above the clayey soils creating a barrier between the clayey soils and structural backfill to preclude contamination of the backfill. A compacted structural fill material should then be used to backfill to the final bearing elevation and around and above structures and pipelines to final grade.

6.5 Compaction of Lift Station Structural Backfill

Structural backfill which will also be required around the lift station structure should be placed in loose lifts not exceeding 6 inches in thickness and should be compacted with a light hand-operated compactor to a density of 95 percent of the Modified Proctor maximum dry density (ASTM D 1557). Heavy equipment should not be allowed within 5 feet of the structure to prevent overstressing of the structure walls.

6.6 Structural Backfill

Structural fill is defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4 percent organic material. The fine sand and fine sand with silt, without roots, as encountered in the borings, are suitable as fill materials and, with proper moisture control, should densify using conventional compaction methods. Soils with more than 10 to 12 percent passing the No. 200 sieve will be more difficult to compact, due to their nature to retain soil moisture, and may require drying. Typically, the material should exhibit moisture contents within ±2 percent of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within each lift of the compacted structural fill.

7.0 QUALITY CONTROL TESTING

ECS should be retained to perform the construction material testing and observations required for this project, to verify that our recommendations have been satisfied. We are the most qualified to address problems that may arise during construction, since we are familiar with the intent of our engineering design. Field in-place density tests should be made in each lift of compacted backfill and fill. Density tests are recommended to verify that satisfactory compaction operations have been performed.

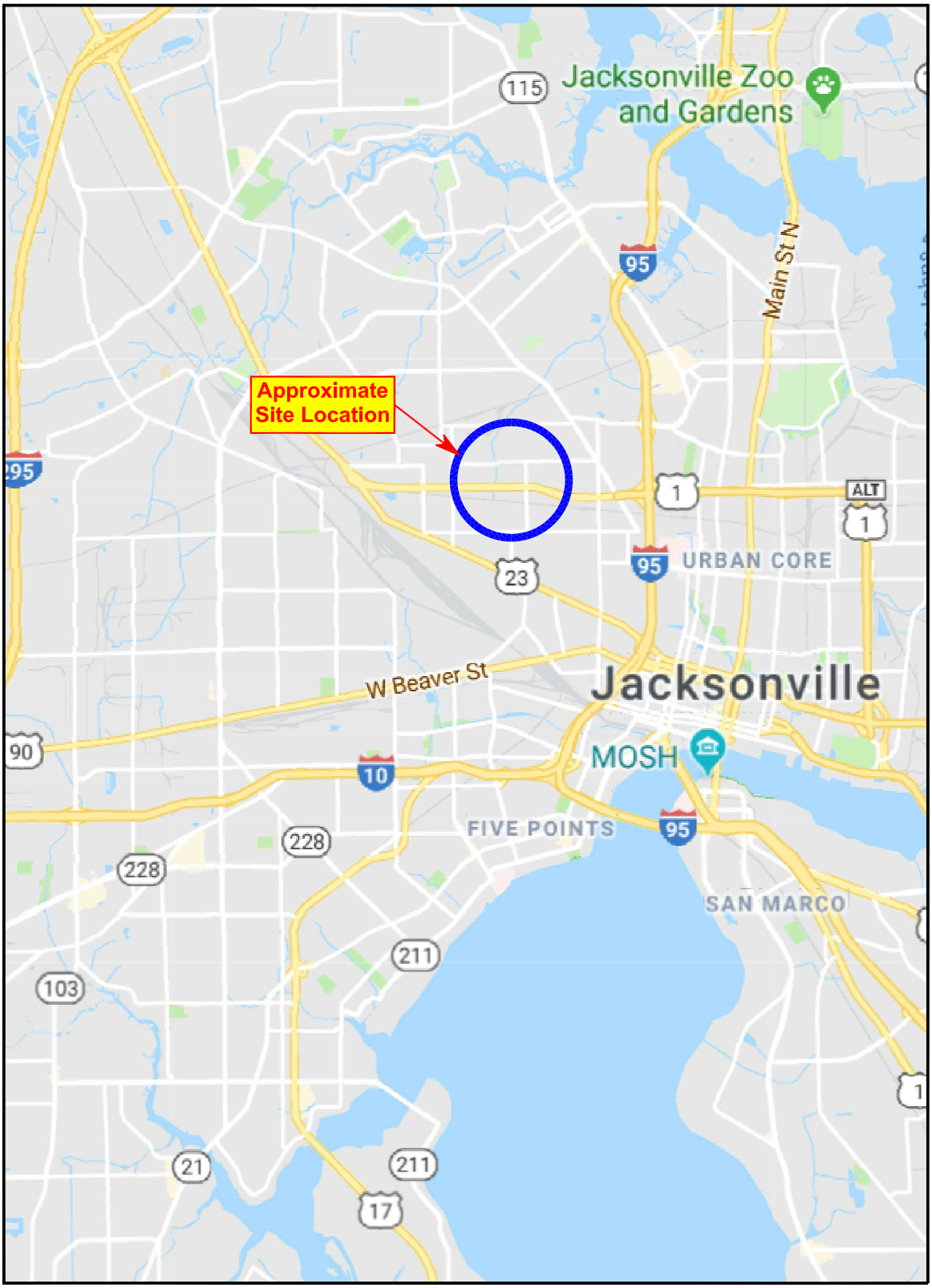
8.0 REPORT LIMITATIONS

Our geotechnical exploration has been performed, our findings obtained, and our recommendations prepared, in accordance with generally accepted geotechnical engineering principles and practices. ECS is not responsible for any independent conclusions, interpretation, opinions, or recommendations made by others based on the data contained in this report.

Our scope of services was intended to evaluate the soil conditions within the zone of soil influenced by the foundation system. Our scope of services does not address geologic conditions, such as sinkholes or soil conditions existing below the depth of the soil borings.

This report does not reflect any variations that may occur adjacent to or between soil borings. The discovery of any site or subsurface condition during construction that deviates from the data obtained during this geotechnical exploration should be reported to us for our evaluation. Also, in the event of any change to the supplied/assumed structural conditions or the location of the manhole changes please contact us so that we can review our recommendations. We recommend that we be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

FIGURES



JAS - 35-26187-A

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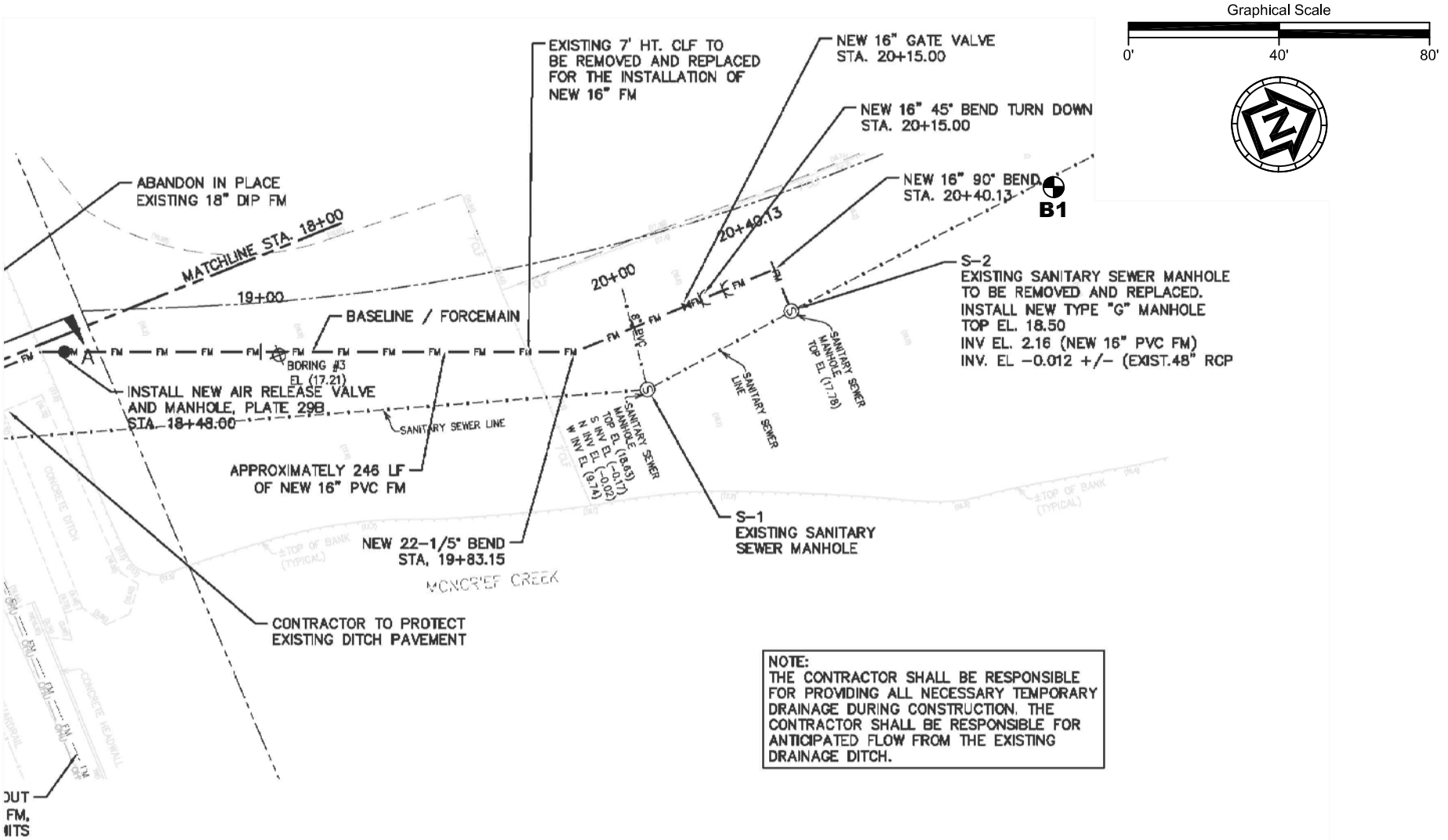
Site Location Plan

Kinlock FM Replacement
New Manhole Structure

Jacksonville, Florida

Date: 05/24/18	Project No.: 35-26187-A	Figure 1



LEGEND

Approximate Location of Standard Penetration Test (SPT) Boring

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Field Exploration Plan

Kinlock FM Replacement
New Manhole Structure

Jacksonville, Florida

Date: 05/24/18	Project No.: 35-26187-A	Figure 2

JAS - 35-26187-A

APPENDIX A

SOIL BORING LOGS
FIELD EXPLORATION PROCEDURES
KEY TO SOIL CLASSIFICATION

Project No.: 35-26187-A
Boring No.: B1
Sheet 1 of 1

LOG OF BORING

Project: Kinlock FM Replacement - New Manhole Structure
Client: Construction & Engineering Services Consultants, Inc.
Drill Rig: ATV
Driller: M. Letchworth
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 1 ft Time: Drilling Date: 5/17/18
Boring Begun: 5/17/18
Boring Completed: 5/17/18

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
1	0		LOOSE Brown Fine SAND, Trace Clay (SP) ▼	2 4 5 6	9				
2			LOOSE Brown Fine SAND With Clay (SP-SC)	5 5 4 5	9				
3	5		MEDIUM DENSE to LOOSE Gray Fine SAND (SP)	5 9 12 11	21				
4				10 11 11 9	22				
5	10			7 3 1 2	4				
			LOOSE Gray Fine SAND With Silt (SP-SM)						
6	15			2 3 2	5				
			VERY LOOSE to LOOSE Gray Clayey Fine SAND With Shell Fragments (SC)						
7	20			1/12" 2	2				
8	25			2 3 4	7				

Boring Terminated @ 25 ft.

Remarks

SHEAR STRENGTH (ksf)
Pocket Penetrometer Undisturbed Sample
Pocket Penetrometer Disturbed Sample
Torvane
Unconfined Compression
Triaxial Compression

LOG OF BORING 35-26187-A.GPJ ELLIS ASSOCIATES.GDT 5/24/18

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KEY TO SOIL CLASSIFICATION

Description of Compactness or Consistency in Relation
To Standard Penetration Resistance

Granular Materials		
Relative Density	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Loose	Less than 4	Less than 3
Loose	4 – 10	3 – 8
Medium Dense	10 – 30	8 – 24
Dense	30 – 50	24 – 40
Very Dense	Greater than 50	Greater than 40

Silts and Clays		
Consistency	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Soft	Less than 2	Less than 1
Soft	2 – 4	1 – 3
Firm	4 – 8	3 – 6
Stiff	8 – 15	6 – 12
Very Stiff	15 – 30	12 – 24
Hard	Greater than 30	Greater than 24

DESCRIPTION OF SOIL COMPOSITION**

(Unified Soil Classification System)

MAJOR DIVISION		Group Symbol	LABORATORY CLASSIFICATION CRITERIA		SOIL DESCRIPTION
			FINER THAN 200 SIEVE %	SUPPLEMENTARY REQUIREMENTS	
Coarse grained (over 50% by weight coarser than No. 200 sieve)	Gravelly soils (over half of coarse fraction larger than No. 4)	GW	<5*	D_{60}/D_{10} greater than 4, $D_{30}^2/(D_{60} \times D_{10})$ between 1 & 3	Well graded gravels, sandy gravels
		GP	<5*	Not meeting above gradation for GW	Gap graded or uniform gravels, sandy gravels
		GM	>12*	PI less than 4 or below A-line	Silty gravels, silty sandy gravels
		GC	>12*	PI over 7 above A-line	Clayey gravels, clayey sandy gravels
	Sandy soils (over half of coarse fraction finer than No. 4)	SW	<5*	D_{60}/D_{10} greater than 6, $D_{30}^2/(D_{60} \times D_{10})$ between 1 & 3	Well graded sands, gravelly sands
		SP	<5*	Not meeting above gradation requirements	
		SM	>12*	PI less than 4 or below A-line	Silty sands, silty gravelly sands
		SC	>12*	PI over 7 and above A-line	Clayey sands, clayey gravelly sands
Fine grained (over 50% by weight finer than No. 200 sieve)	Low compressibility (liquid limit less than 50)	ML	Plasticity chart		Silts, very fine sands, silty or clayey fine sands, micaceous silts
		CL	Plasticity chart		Low plasticity clays, sandy or silty clays
		OL	Plasticity chart, organic odor or color		Organic silts and clays of low plasticity
	High compressibility (liquid limit more than 50)	MH	Plasticity chart		Micaceous silts, diatomaceous silts, volcanic ash
		CH	Plasticity chart		Highly plastic clays and sandy clays
		OH	Plasticity chart, organic odor or color		Organic silts and clays of high plasticity
Soils with fibrous organic matter		PT	Fibrous organic matter; will char, burn or glow		Peat, sandy peats, and clayey peat

***** For soils having 5 to 12 percent passing the No. 200 sieve, use a dual symbol such as SP-SM.
****** Standard Classification of Soils for Engineering Purposes (ASTM D 2487)

SAND/GRAVEL DESCRIPTION MODIFIERS	
Modifier	**Sand/Gravel Content**
Trace	<15%
With	15% to 29%
Sandy/Gravelly	>29%

ORGANIC MATERIAL MODIFIERS	
Modifier	**Organic Content**
Trace	1% to 2%
Few	2% to 4%
Some	4% to 8%
Many	>8%

SILT/CLAY DESCRIPTION MODIFIERS	
Modifier	**Silt/Clay Content**
Trace	<5%
With	5% to12%
Silty/Clayey	13% to 35%
Very	>35%

FIELD EXPLORATION PROCEDURES

Standard Penetration Test (SPT) Borings

The Standard Penetration Test (SPT) borings were made in general accordance with the latest revision of ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils". The borings were advanced by rotary (or "wash-n-chop") drilling techniques. At 2 ½ to 5 foot intervals, a split-barrel sampler inserted to the borehole bottom and driven 18 inches into the soil using a 140 pound hammer falling on the average 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less if in hard rock-like material), the sampler was retrieved from the borehole and representative samples of the material within the split-barrel were containerized and sealed. After completing the drilling operations, the samples for each boring were transported to our laboratory where they were examined by our engineer in order to verify the driller's field classification. The retrieved samples will be kept in our facility for a period of six (6) months unless directed otherwise.