Final Report of Geotechnical Exploration

For

JEA Chilled Water Main

MAE Project No. 0103-0020
October 13, 2020

Prepared for:

MOTT MACDONALD

Building Community®

Prepared by:

Meskel & Associates Engineering
Geotechnical • Environmental • Inspection • Testing

3728 Philips Highway, Suite 208
Jacksonville, Florida 32207
Phone (904) 519-6990
Fax (904) 519-6992

JBJ 2020 50 FASTEST GROWING COMPANIES

Meskel & Associates Engineering
Geotechnical ⌜ Environmental ⌜ Inspection ⌜ Testing

October 13, 2020

Mott MacDonald Florida, LLC
10245 Centurion Parkway North, Suite 320
Jacksonville, Florida 32256

Attention: Mr. Bruce A. Neu, P.E.

Reference: Final Report of Geotechnical Exploration
JEA Chilled Water Main
Jacksonville, Florida
MAE Project No. 0103-0020

Dear Mr. Neu:

Meskel & Associates Engineering, PLLC (MAE) has completed a geotechnical exploration for the subject project. Our work was performed in general accordance with our revised proposal dated June 9, 2020. The purpose of the geotechnical exploration was to evaluate the general subsurface conditions encountered along the proposed chilled water main route, and to provide recommendations for pipe bedding and backfilling, and site preparation.

In general, the borings encountered a pavement section, underlain by loose to medium dense fine sands to fine sands with silt (A-3) in the upper 8 to 13.5 feet, followed by loose to medium dense A-3 sands often bisected by intermittent layers of very loose to medium dense silty and clayey to very clayey fine sands (A-2-4 and A-2-6 to A-6, respectively), to the boring termination depths of up to 40 feet below the existing grade (i.e., pavement surface). We note, the deeper borings encountered sands containing limestone fragments starting at an approximate depth of 33.5 feet, and boring B-2 encountered soft, highly weathered limestone at an approximate depth of 38.5 feet and terminated in this stratum at 40 feet below the pavement surface. Groundwater was encountered at most of the borings ranging in depths between 5 feet and 10 feet 11 inches.

Based on our exploration and laboratory testing, it is our opinion that the subsurface conditions along the planned pipe route is adaptable for support of the planned pipeline, provided the recommendations in this report are followed.

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, PLLC
MAE FL Registry No. 28142

P. Rodney Mank, State of Florida, Professional Engineer, License No. 41986. This item has been electronically signed and sealed by P. Rodney Mank, P.E. on 10/13/2020 using a Digital Signature. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

W. Josh Mele, E.I.
Staff Engineer

Philip R Mank Digitally signed by Philip R Mank Date: 2020.10.13 14:56:33 -04'00'

P. Rodney Mank, P.E.
Principal Engineer
Licensed, Florida No. 41986

Distribution: Mr. Bruce A. Neu, P.E. – Mott MacDonald Florida, LLC 1 PDF

TABLE OF CONTENTS

Subject **Page No.**

FIGURES

APPENDICES

1.0 PROJECT INFORMATION

1.1 General

Project information was provided to us by Mr. Bruce A. Neu, P.E. with Mott MacDonald Florida, LLC via several emails and telephone conversations. We were provided the following documents for our review and reference:

- An annotated copy of a Duval Properties Map, Dated March 16, 2020, revised on June 2, 2020, which denotes the general locations for the requested borings and provides approximate measurements from roadway intersections along the planned chilled water main alignment.
- An annotated aerial titled Downtown Chiller Plant, prepared by JEA, dated February 2020.
- Several sheets of an As-Built Plan and Profile set titled, JEA Chilled Water Distribution Pipe Installation, prepared by Metroplex, dated February 17, 2004.
- An email from Mr. Neu dated September 15, 2020 that confirmed the final pipe material to be used and the method of installation.

1.2 Project Description

The site for the subject project is located within the proximity of the city block bounded by Pearl Street North, Monroe Street West, Julia Street North, and West Duval Street in downtown Jacksonville, Florida. The general site location is shown on Figure 1.

Based on the provided information at the time of this report and our discussions with Mr. Neu, the proposed chilled water mains will be connecting to the existing 36-inch High Density Poly Ethylene (HDPE) pipelines approximately mid-block on West Duval Street, between Pearl Street North and Julia Street North. We understand the pipeline extensions will be ductile iron (DI) pipe with rigid closed cell insulation, held in place and protected by a HDPE jacket. At the intersection of West Duval Street and Julia Street North, valved 16-inch DI pipe stubs will be provided northwards, and 16-inch insulated DI pipe will continue south along Julia Street North to its intersection with Monroe Street West. At the Julia Street North/Monroe Street West intersection, 12-inch insulated DI pipe will head east along Monroe Street West to approximately mid-block where the pipes will end at the City of Jacksonville (COJ) Edward Ball Building Chilled Water connection points. Going west from the Julia Street North/Monroe Street West intersection, 10-inch insulated DI pipes will run to the new JEA headquarters building chilled water connection points, just west of the Monroe Street West and Pearl Street North intersection. At this time, we understand that all chilled water pipe construction is proposed to be by open cut and cover methods within the COJ paved urban streets. Trench backfill and compaction with patch and curb-to-curb pavement milling, overlay, and stripping is proposed for COJ roadway restoration.

If actual project information varies from these conditions, then the recommendations in this report may need to be re-evaluated. Any changes in these conditions should be provided so the need for re-evaluation of our recommendations can be assessed prior to final design.

2.0 FIELD EXPLORATION

A field exploration was performed during the period of August 1 through 8, 2020. Using the provided

annotated map for reference, a MAE representative located each of the requested pavement core/boring locations and marked the locations with white paint for easy identification. Prior to starting our field exploration, a utility locate request was submitted to the Sunshine State One-Call Center. Once the site utilities were marked or cleared, our field crew mobilized to the site. Copies of the corresponding sheets of the plan set provided to us, which shows the proposed and approximate final boring locations, is included as the *Boring and Pavement Core Location Plan*, Figures 2A through 2D.

It should be noted that all of the boring locations, except location B-3, were moved due to the presence of underground utilities. Boring locations B-5 and B-6 were moved to locations B-5A and B-6A as the field crew encountered shallow utilities that were unmarked during the hand auger portion of borings 5 and 6. Boring location B-4 was moved to location B-4A under the assumption that the underground utility encountered at B-5 was also present at location B-4. Lastly, boring B-5A did encounter an obstacle (possible deep utility) that terminated the boring at 13.5 feet below existing grade.

2.1 Standard Penetration Test Borings

To explore the subsurface conditions within the area of the proposed route for the chilled water main, we located and performed 6 Standard Penetration Test (SPT) borings, drilled to depths of approximately 15 and 40 feet below the existing pavement surface, in general accordance with the methodology outlined in ASTM D 1586. Split-spoon soil samples recovered during performance of the borings were visually described in the field and representative portions of the samples were transported to our laboratory for further testing and classification. A summary of the field procedures is included in Appendix A.

2.2 Pavement Cores with Hand Auger Borings

Eight core samples of the existing pavement section (asphalt surface and base course where encountered) were obtained. Each core location was drilled using a 4-inch diameter diamond coated core barrel connected to free standing mechanical drill equipment. Water was used during core sampling to cool the core barrel and to limit dust and debris generated from the coring process. To determine the subgrade conditions at each core location, we advanced each core hole using a hand auger to a depth of up to 6 feet beneath the encountered pavement section 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 testing and classification.

The thickness of the asphalt surface and underlying base courses were measured in the field by the field crew. The core samples of the asphalt surface were transported to our laboratory. Once the cores were complete, the holes were backfilled with soil cuttings up to the bottom of the pavement section and then topped with an asphalt cold-patch material in compacted lifts to slightly above the adjacent pavement surface. Descriptions of the pavement cores and base course materials (where encountered) are provided in Section 4.5 below, and photographs of the recovered core samples are included in Appendix C.

3.0 LABORATORY TESTING

Representative soil samples obtained during our field exploration were visually classified by a geotechnical engineer using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification system in general accordance with ASTM D 3282. A *Key to the Soil Classification System* is included in Appendix A.

3.1 Soil Index Testing

Quantitative laboratory testing was performed on selected samples of the soils encountered during the field exploration to better define their composition and to provide data for correlation to their anticipated strength and compressibility characteristics. The laboratory testing determined the natural moisture content and the percent of material passing a U.S. No. 200 sieve (percent fines) of the selected soil samples. The results of the laboratory testing are shown in the *Summary of Laboratory Test Results* table included in Appendix B, on the *Generalized Soil Profiles* sheets (Figures 3 through 6), and on the soil boring logs at the respective depths from which the tested samples were recovered.

3.2 Corrosion Series Tests

Bulk soil samples were obtained from borings B-2 (PC) and B-5A (PC), between depths of 2 to 4 feet for corrosion potential testing. The testing included soil pH, resistivity, and chloride and sulfate contents. The test results are discussed in Section 5.3 below, and included in Appendix B.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

Graphical presentation of the generalized subsurface conditions is presented on the *Generalized Soil Profiles* sheets, Figures 3 through 6. Detailed boring records are included in Appendix A. When reviewing the soil profiles sheets and boring records, it should be understood that the soil conditions will vary between the boring locations. The following table summarizes the soil conditions encountered.

GENERAL SOIL PROFILE: CHILLED WATER MAIN ALIGNMENT			
TYPICAL DEPTH (ft)		**SOIL DESCRIPTION**	**AASHTO[1]**
FROM	**TO**		
Pavement surface	0.6 to 1.5	Pavement section – e.g., asphalt, brick pavers, and an underlying base course, where applicable.	---
0.6 to 1.5	8 to 13.5	Loose to medium dense fine sands to fine sands with silt, often containing little to some amounts of rock and brick fragments within the upper 2 feet of the near surface soils.	A-3
8 to 13.5	38.5	Very loose to medium dense fine sands with silt, bisected by intermittent layers of very loose to medium dense silty and clayey fine sands. Sands containing limestone fragments were encountered starting at a depth of about 33.5 feet.	A-3, A-2-4, A-2-6, A-6
38.5	40	Soft, highly weathered limestone[2]	---

[1] American Association of State Highway and Transportation Officials
[2] The upper layers of the apparent regional limestone stratum was only encountered at boring B-2.

4.2 Groundwater Level

The groundwater level was encountered at each of the SPT boring locations and recorded at the time of drilling at depths varying from 5 feet to 10 feet and 11 inches below the existing ground surface. However,

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 remeasured prior to construction. Measured groundwater levels are shown the boring profiles and boring logs.

4.3 Review of the USDA Web Soil Survey Map

A review of the USDA Soil Conservation Service (SCS) Web Soil Survey of Duval County shows that the project site is primarily Urban land, (i.e., land that is mostly covered by streets, parking lots, buildings, and other structures of urban areas). The Soil Survey typically does not report the predevelopment soil type, drainage class, hydrologic group, and estimated seasonal high groundwater levels for the Urban land classification.

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 one to two feet above the water levels measured at the time of our field work. It should be understood that this estimate is predominately based on the time of year of our field exploration with respect to the typical rainy season and the assumption that rainfall patterns are typical for this year. We recommend that piezometers be installed along the project route to measure groundwater levels and their fluctuations to better estimate current seasonal high levels.

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.

4.5 Pavement Core Samples

The pavement layers (surface course and base course, where applicable) within the existing paved areas at locations requested by Mott MacDonald, were cored to sample the materials and measure the layer thicknesses. The encountered pavement courses were measured and described in the field by the field crew, and samples were obtained and returned to the laboratory for further evaluation. The surface course samples were remeasured to verify the thickness of the asphalt and brick layers as measured in the field, and to observe the overall condition of the core samples. The measured surface course thickness, the observed base course material and measured thickness, the observed subgrade soil classification and the measured groundwater level where encountered at each of the pavement core locations are shown in the following table:

Pavement Core No.	Pavement Layer		Base[1]		Subgrade Soil Classification	Groundwater Level	
	Material Type(s)	Thickness (in.)	Material Type	Thickness (in.)		(Y/N)	Depth (ft)
Pearl Street North							
B-1 (PC)	Asphalt	3 ¾	Limerock	6 ½	A-3	Y	5
Parking Lot Adjacent to the intersection of Pearl Street North and West Monroe Street							
B-1A[2]	Asphalt	2	Limerock	6	A-3	Y	7.8
West Monroe Street							
B-2 (PC)	Asphalt	9 ¼	Limerock	6	A-3	N	---
B-3 (PC)	Asphalt	5 ½	Brick [3]	3 ½ [3]	A-3	N	---
Julia Street North							
B-4A (PC)	Asphalt over Brick	8 ¾	Limerock/Sand	5	A-3	N	---
B-5 (PC)	Asphalt	9 ¾	Crushed Gravel (rock)	6	N	Y	---
B-5A (PC)	Asphalt	7 ¼	Crushed Gravel (rock, brick)	5	A-3	N	---
West Duval Street							
B-6 (PC)	Asphalt	3 ¾	Crushed Gravel (rock)	7	A-3	N	---
B-6A (PC)	Asphalt	4	Limerock	11	A-3	N	---

(1) The base course material appeared to be relatively dry at the time of our exploration.
(2) A pavement core was not collected at boring location B-1A; however, approximate pavement and base course thicknesses were measured in the field.
(3) No discernible base course material was observed below the encountered brick-pave layer.

Based on our observations, descriptions of the obtained surface course core samples are as follows:

Core No.	Comments
B-1 (PC)	The core measured at 3 ¾ inches of asphalt consisting of an apparent fine aggregate Marshal Mix. The core was cracked along sides and bottom. The pavement core overlay an apparent crushed concrete base course.
B-2 (PC)	The core was measured at 9 ¼ inches. The upper 5 ¾ inches of the core appeared to be a fine aggregate Marshal Mix asphalt, underlain by 2 ½ inches of Sand Asphalt Hot Mix (SAHM), and then 1-inch of an Aggregate Base Course (ABC) Mix asphalt. No apparent cracks or voids were observed in the core. The pavement core overlay an apparent

Core No.	Comments
	commercially produced limerock base course.
B-3 (PC)	The core measured at 5 ½ inches of asphalt consisting of an apparent fine aggregate Marshal Mix. No apparent cracks or voids were observed in the core. It was reported that the aforementioned pavement layers were underlain by a brick-paved layer; however, this portion of the core was not returned to our laboratory for visual inspection. No discernable base course was observed at this location.
B-4A (PC)	The core was measured at 8 ¾ inches. The upper 3 ¾ inches of the core appeared to be a fine aggregate Marshal Mix asphalt, underlain by 2 inches of SAHM, 1-inch of an ABC Mix asphalt, and then 2 inches of brick pavers. Small voids were observed within the Marshal Mix layers and chipping was observed along the top of the core. A discernible base course was not observed; however, the immediate 5-inches of subgrade soils contained significant rock and brick fragments.
B-5 (PC)	The core was measured at 9 ¾ inches. The core appeared to be a fine aggregate Marshal Mix asphalt. The core was cracked in half starting at approximately 3 ½ inches from the pavement surface. The cracked portion of the core was not intact when the core was collected; however, a shear crack leading to the missing portion is visible - likely due to destressed conditions in the pavement section. The pavement core overlay an apparent crushed concrete base course.
B-5A (PC)	The core was measured at 9 ¼ inches. The upper 4 inches of the core appeared to be a fine aggregate Marshal Mix asphalt, underlain by 1 ¾ inches of SAHM, 2 inches of an ABC Mix asphalt, and then 2 inches of brick pavers. No apparent cracks or voids were observed in the core. A discernible base course was not observed at this location; however, the immediate 5-inches of subgrade soils contained significant rock and brick fragments.
B-6 (PC)	The core measured at 3 ¾ inches of asphalt consisting of an apparent fine aggregate Marshal Mix. No apparent cracks or voids were observed in the core. The pavement core overlay an apparent crushed concrete base course.
B-6A (PC)	The core measured at 4 inches of asphalt consisting of an apparent fine aggregate Marshal Mix. No apparent cracks or voids were observed in the core. The pavement core overlay an apparent commercially produced limerock base course.

5.0 DESIGN RECOMMENDATIONS

5.1 General

The following geotechnical engineering evaluation and recommendations are based on the results of the field and laboratory testing performed, our experience with similar soil conditions, and our understanding of the provided project information. If the project information presented in this report is incorrect, or if the project details change prior to final design, then MAE should be contacted so that these recommendations can be reviewed. Also, the discovery of any site or subsurface conditions during construction that deviate from the data presented herein should be reported to us for evaluation. We recommend that we be provided the opportunity to review the plans and earthwork specifications before

construction to verify that our recommendations have been properly interpreted and implemented.

5.2 Open-Cut Pipeline Support Recommendations

We understand that the planned chilled water mains will be constructed under pavement within COJ roadway right-of-way. Detailed cross sections have not been provided at the time of this report; however, we expect the chilled water mains will have an invert elevation of 3 to 5 feet below the bottom of the roadway sections allowing for the minimum JEA cover requirement of 36 inches. Based on the results of the subsurface exploration and laboratory testing as discussed in this report, we consider the subsurface conditions encountered in the borings to be adaptable for supporting this portion of the proposed pipeline when constructed by open-cut methods upon properly prepared subgrade soils.

As discussed earlier in the report, the borings encountered surficial pavement sections underlain by fine sands and fine sands with silt (A-3) to a depth of at least 8 feet below the pavement surface. These soils are suitable for use as pipe bedding and backfill soil; however, we note that soils containing significant amounts of rock and brick fragments were encountered within the upper 2 feet at boring locations B-1A, B-4A (PC), B-5A (PC), B-6 (PC), and B6A (PC). In order to reasonably protect the HDPE jacket, planned for use as pipe insulation for the proposed chilled water mains, from damage, soils containing rock or brick fragments are not suitable for use pipe bedding or backfill soils. These soils should be completely removed and stockpiled a safe distance from the construction area, separately from the soils intended for reuse, and removed from the site. The A-3 soils intended for reuse (i.e., soils without angular aggregate, clumps of clay, sticks, debris, etc.) should be placed and compacted as discussed in Section 6.0 below.

Clayey fine sands (A-2-6, A-6) were encountered at boring location B-2 beginning at a depth of approximately 8 feet below the existing pavement surface, and at boring locations B-3, B-4A, and B-6A beginning at a depth of 13.5 feet below the existing grade. Given the expected pipe embedment depth and depth where these soils were encountered, it is not expected that these A-2-6 and A-6 soils will be encountered during excavation. If A-2-6 or A-6 soils are encountered, they are not considered suitable for use as pipe bedding or backfill, and should be excavated to a depth of at least 24 inches below the pipe invert elevations and replaced with compacted structural fill soil as described in Section 6.4. The purpose of this recommendation is to provide more uniform bearing conditions, and to reduce the potential for post construction settlements of the pipeline. A-2-6 soils and A-6, if encountered, should be stockpiled separately from the A-3 soils for disposal, and should be replaced with suitable structural backfill soil as described in Section 6.0 below.

Assuming the project information as understood at the beginning 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 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 three was used for the above values. It is assumed the block structures are surrounded by well compacted suitable backfill, as described in Section 6.4 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

5.2.2 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. Underground structures should be designed to resist hydrostatic uplift pressures appropriate for their depth below final grade and the 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.

5.2.3 Thrust Block Soil Bearing Pressure

The maximum allowable net soil bearing pressure for use in design of thrust blocks should not exceed 2,000 psf. Net bearing pressure is defined as the soil bearing pressure at the foundation bearing level in excess of the natural overburden pressure at that level. The structure should be designed based on the maximum load that could be imposed by all loading conditions.

The structures should bear in either compacted suitable natural soils or compacted suitable fill. The bearing level soils, after compaction, should exhibit densities equivalent to 95 percent of the modified Proctor maximum dry density (AASHTO T-180), to a depth of at least one foot below the bearing level.

5.3 Environmental Classification

Bulk soil samples were obtained from borings B-2 (PC) and B-5A (PC) performed within the planned pipeline alignment, between depths of 2 to 4 feet. The purpose of these samples was to run soil corrosion potential tests to determine the environmental classification of the soils for ductile iron pipes. The samples were to be classified in accordance with FDOT procedures contained in Chapter 1.3.2.1 of the January 2020 edition of the FDOT *Structures Design Guidelines*. Based on the results of these tests, the encountered soils were classified as Slightly Aggressive for both steel and concrete substructures. Sample

locations and test results are shown on the *Summary of Corrosion Series Test Results* table in Appendix B.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

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

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.

During the excavation process, pavement section materials such as asphalt, limerock, and crushed gravel should be stockpiled a safe distance from the construction areas to be removed from the site. We do not recommend use of any of the pavement materials as pipe bedding or backfill within the pipeline excavations.

6.2 Temporary Groundwater & Surface Water Control

The groundwater level was encountered at the boring locations at depths varying from 5 feet to 10 feet 11 inches below the existing ground surface at the time of our exploration. Because of the need for excavation to the pipeline invert 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.

Groundwater control measures 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 2 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 structures to prevent uplift. It should be anticipated that well point installation into the dense to very dense soils encountered at several of the borings may be difficult, and additional efforts may be necessary to adequately dewater excavations in these soils. During excavation of the pipe trenches, surface water during rainfall events should be diverted or captured and re-routed to avoid impacts to the excavation.

6.3 Preparation of Pipe Bedding Soils

The borings primarily encountered loose to medium dense fine sands and fine sands with silt (A-3) along the planned chilled water main alignment. These soils are suitable for reuse as pipe bedding and backfill material.

Clayey fine sands (A-2-6) were encountered at boring locations B-2 beginning at a depth of about 8 feet. Clayey sands (A-2-6, A-6) were also encountered at boring locations B-3, B-4A, and B-6A beginning at depths of about 13.5 and 18.5 feet below existing grade. Given the expected pipe embedment depth and depths where these soils were encountered, it is not expected that these A-2-6 and A-6 soils will be encountered during excavation. If A-2-6 or A-6 soils are encountered, they should be removed to a depth

of at least 24 inches below the pipe invert elevation and replaced with compacted structural fill soil as described in Section 6.4 below.

Where the pipeline will bear in sand soils (A-3), these soils should be excavated to the proposed bearing elevation and the exposed excavation surface should be compacted as outlined in Section 6.4 below.

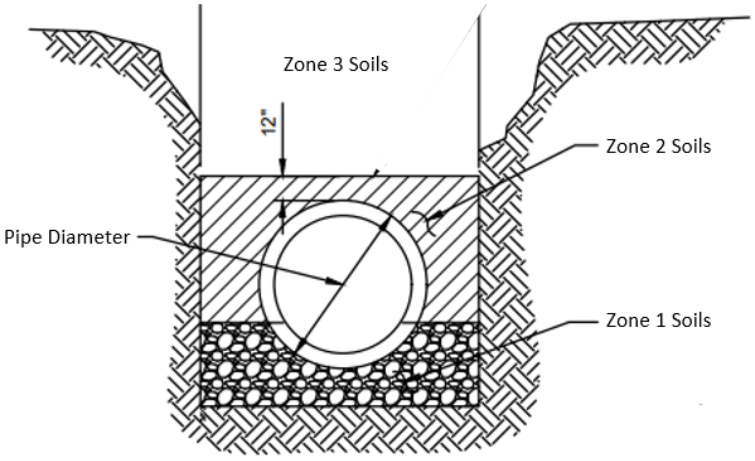
6.4 Compaction of Pipe Backfill

After installing the temporary groundwater control measures, achieving the required depth of excavation, and removing any unsuitable soil as described in Section 6.3, the exposed sand soil surface (Zone 1 soils) should be evaluated by the Contractor to ensure the undisturbed soil is A-3 material.

Zone 1 consists of undisturbed soils or suitable backfill below the pipe.

Zone 2 consists of backfill soils from below the pipe to 1 foot above the top of pipe.

Zone 3 consists of backfill soils from 1 foot above the top of pipe to the ground surface or bottom of stabilized subgrade for a pavement section.



Open Cut Trench Detail

Typically, the backfill soils should exhibit moisture contents within ±2 percent of the Proctor optimum moisture content during the compaction operations. Compaction criteria should meet the requirements shown in the table below.

Location	Material Type	Minimum Compaction Requirement		Maximum Lift Thickness
		Test Type	Requirement	
CITY OF JACKSONVILLE EASEMENTS (UNDER PAVEMENT - CITY/COUNTY ROAD) [1]				
Zone 1: Below Pipe	Undisturbed Soil (A-3)	* [2]	* [2]	* [2]
	Backfill Soil (A-3)	ASTM D 1557	95% Max. Dry Density	6 inches
Zone 2: Up to 1-Foot Over Top of Pipe	Backfill Soil (A-3)	ASTM D 1557	98% Max. Dry Density	6 inches
Zone 3: Over 1-Foot From Top of Pipe to Grade	Backfill Soil (A-3)	ASTM D 1557	95% Max. Dry Density	12 inches

[1] West Duval Street, Julia Street North, Monroe Street West, and Pearl Street North are considered City roadways.
[2] Undisturbed Soil below the pipe must not consist of unsuitable soil as described in Section 6.3. If unsuitable soil is present, this material should be over-excavated and replaced as described in Section 6.3.

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.

Structural backfill placed within the pipeline excavation, and in areas in which over-excavation of unsuitable soils is required below the pipeline elevation (if applicable), should be placed in loose lifts not exceeding the lift thicknesses shown in the table above and compacted using hand or mechanically-operated compaction equipment.

Structural backfill placed around structures should be placed in 6-inch lifts and compacted with hand-operated compaction equipment. Heavy compaction equipment should not be used within 5 feet of structures to prevent overstressing of the structure walls.

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 sand soils (A-3) meeting the properties given above, without angular aggregate, clumps of clay, sticks, or debris, as encountered in the borings, may be used as backfill.

The backfill soils should exhibit moisture contents within ±2 percent of the Proctor optimum moisture content during the compaction operations. Compaction should continue until density requirements in the table above 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.

Care should be exercised to avoid damaging any nearby structures while the compaction operations are underway. Compaction should cease if deemed detrimental to adjacent structures.

6.5 Excavation Protection

Excavation work for the Pipeline construction should meet OSHA Excavation Standard Subpart P regulations for Type C Soils. The use of excavation support systems for trenches that are 5 feet in depth or deeper will be necessary where there is not sufficient space to allow the side slopes of the excavation to be laid back to at least 1.5H:1V (1.5 horizontal to 1 vertical) to provide a safe and stable working area and to facilitate adequate compaction along the sides of the excavation. Trenches that are less than 5 feet deep may have unsupported, vertical walls if a competent person as defined by OSHA determines that a protective system is not required. In addition, an excavation support system may be necessary to protect any adjacent existing structures, pavements and/or utilities that are located along the proposed pipeline alignment.

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 system should be designed according to OSHA sheeting and bracing requirements by a Florida licensed Professional Engineer. Where pipeline excavations and the construction of excavation support systems are within 50 feet of existing structures, the existing structures should be monitored for adverse reactions to construction vibrations and dewatering activities.

7.0 QUALITY CONTROL TESTING

A representative number of field in-place density tests should be made in the upper two feet of compacted natural soils, in each lift of compacted backfill and fill, and in the upper 12 inches below the bearing levels in the footing excavations. 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 150 feet of pipeline in open-cut trenches.

8.0 REPORT LIMITATIONS

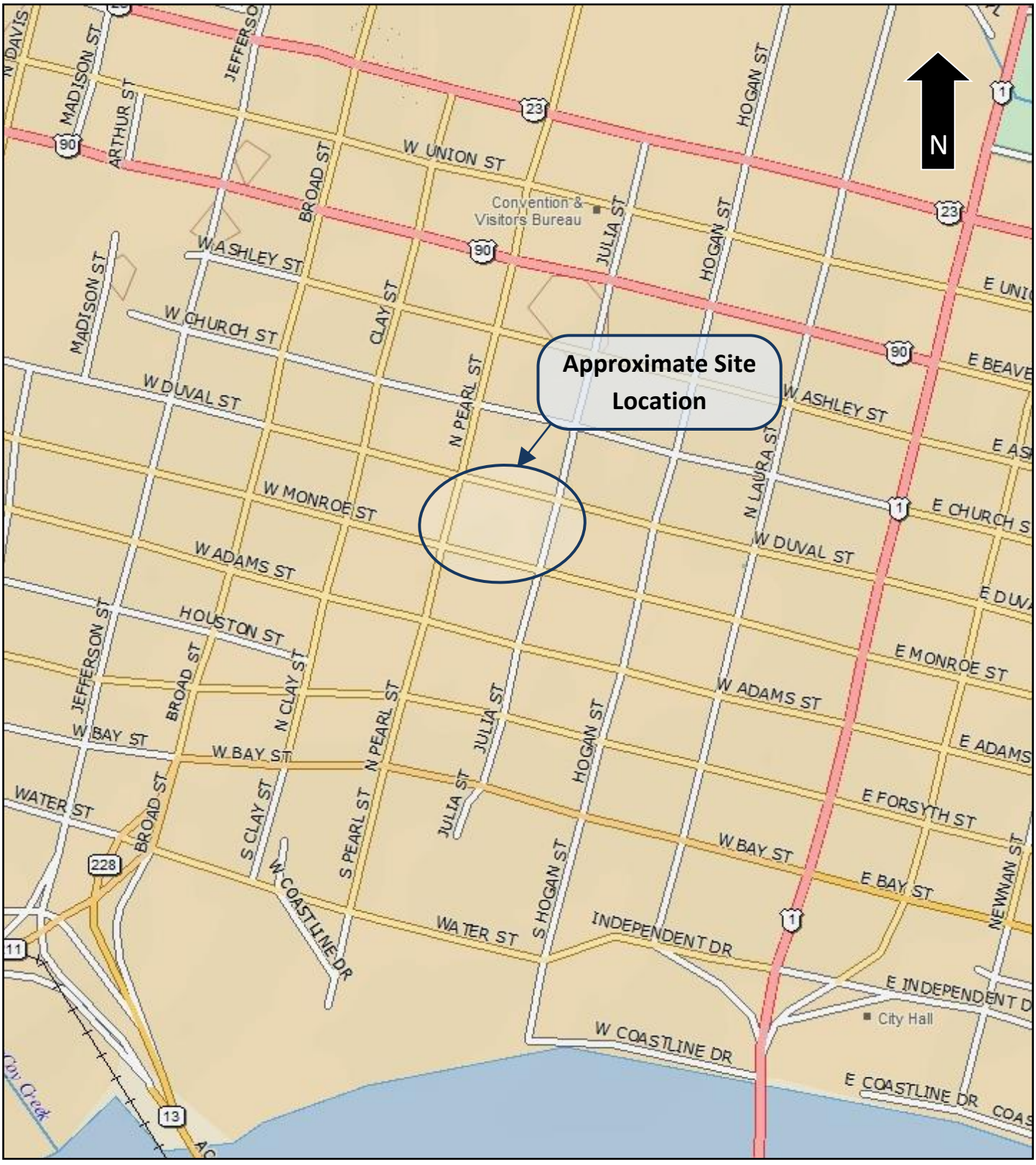
This report has been prepared for the exclusive use of Mott MacDonald Florida, LLC and JEA for specific application to the design and construction of the *JEA Chilled Water Main* project. An electronically signed and sealed version, and a version of our report that is signed and sealed in blue ink, may 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, express or implied, is made.

The analyses and recommendations contained in this report are based on the data obtained from this project. 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 alignment of the planned water main 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



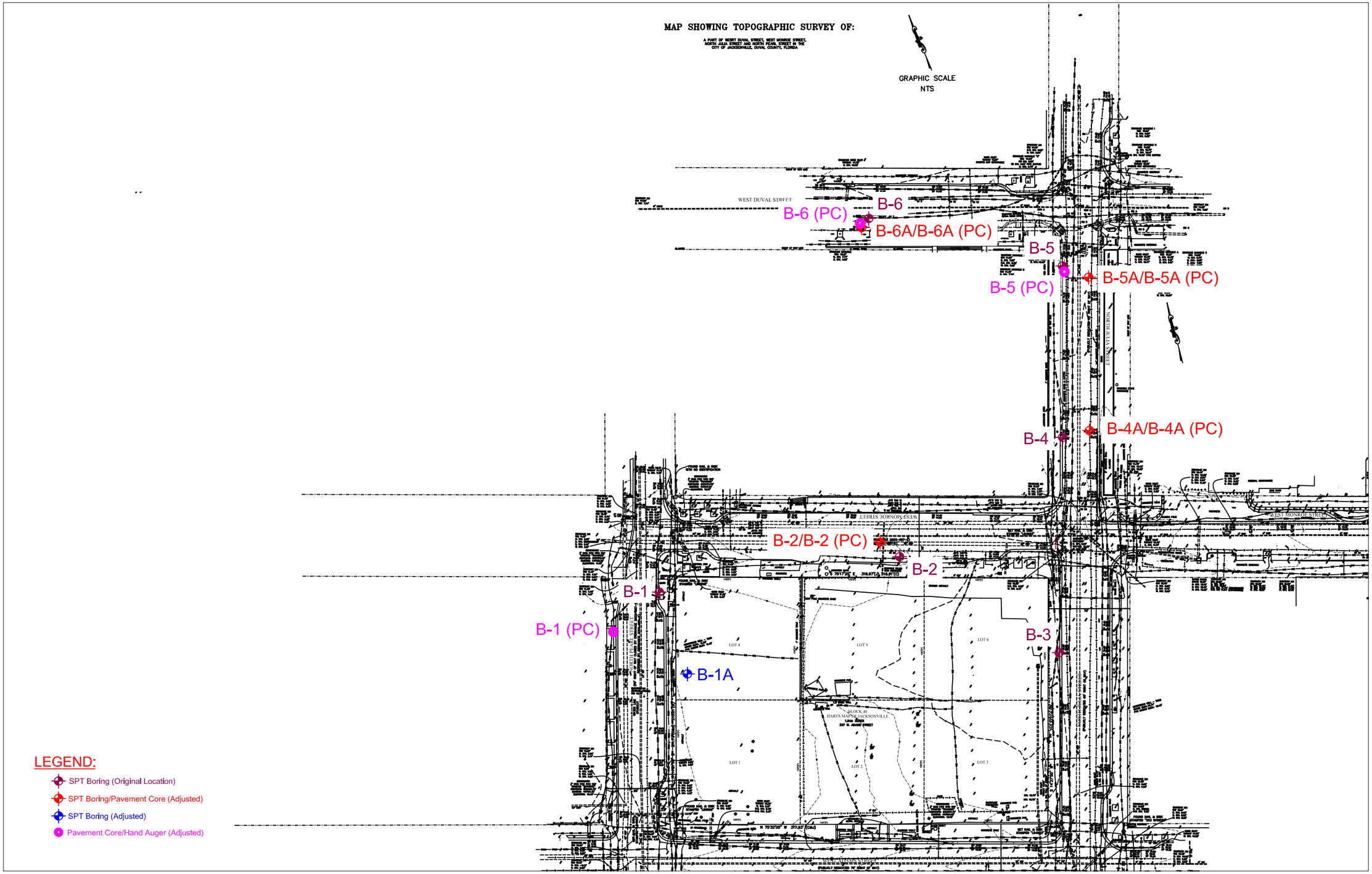
Site Location Map

PREPARED BY	PROJECT NAME	
Meskel & Associates Engineering	**JEA Downtown Chilled Water Main Jacksonville, Florida**	
	REFERERENCE	SCALE
	Delorme XMap 7.0	NTS
PREPARED FOR	MAE PROJECT NO.	**FIGURE NO.**
Mott MacDonald Florida, LLC	0103-0020	1

MAP SHOWING TOPOGRAPHIC SURVEY OF:

A PART OF WEST DUVAL STREET, WEST MONROE STREET, NORTH JULIA STREET AND NORTH PEARL STREET IN THE CITY OF JACKSONVILLE, DUVAL COUNTY, FLORIDA

GRAPHIC SCALE
NTS



LEGEND:

- SPT Boring (Original Location)
- SPT Boring/Pavement Core (Adjusted)
- SPT Boring (Adjusted)
- Pavement Core/Hand Auger (Adjusted)

NOTE: Survey Map dated May 30, 2020 as provided by Mott MacDonald Florida, LLC.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
MAE
Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

CLIENT: Mott MacDonald Florida, LLC

DATE: 10/2/2020

MAE PROJECT NO. 0103-0020

SHEET TITLE: BORING AND PAVEMENT CORE LOCATION PLAN

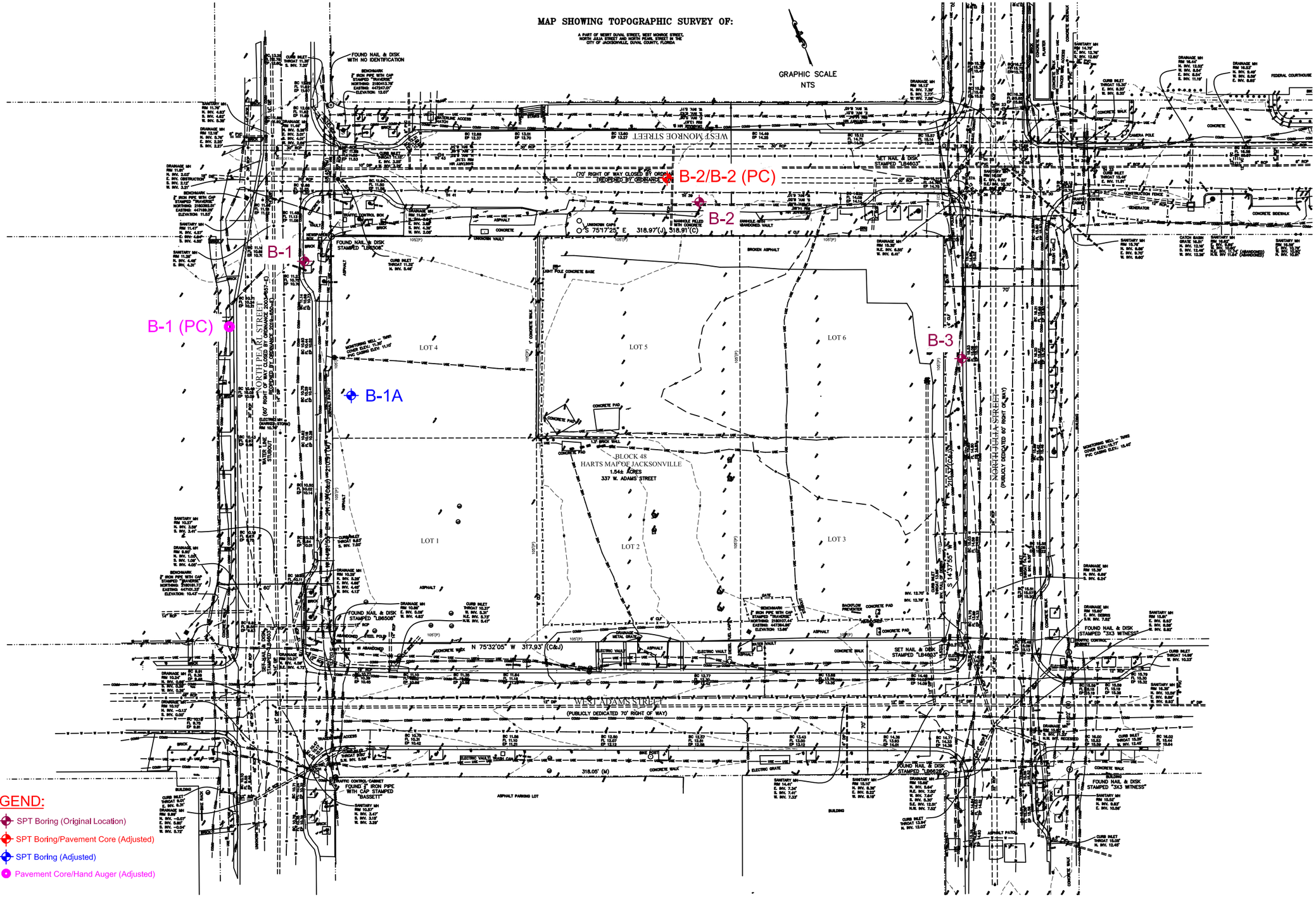
PROJECT NAME: JEA Downtown Chilled Water Main
Jacksonville, Florida

FIGURE NO. 2A

MAP SHOWING TOPOGRAPHIC SURVEY OF:

A PART OF WEST DUVAL STREET, WEST MONROE STREET, NORTH JULIA STREET AND NORTH PEARL STREET IN THE CITY OF JACKSONVILLE, DUVAL COUNTY, FLORIDA

GRAPHIC SCALE
NTS



LEGEND:

- SPT Boring (Original Location)
- SPT Boring/Pavement Core (Adjusted)
- SPT Boring (Adjusted)
- Pavement Core/Hand Auger (Adjusted)

NOTE: Survey Map dated May 30, 2020 as provided by Mott MacDonald Florida, LLC.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
MAE
Meskel & Associates Engineering
FL. Registry No. 28142
3728 Phillips Highway, Suite 208, Jacksonville, FL 32207

CLIENT: Mott MacDonald Florida, LLC

DATE: 10/2/2020

MAE PROJECT NO.: 0103-0020

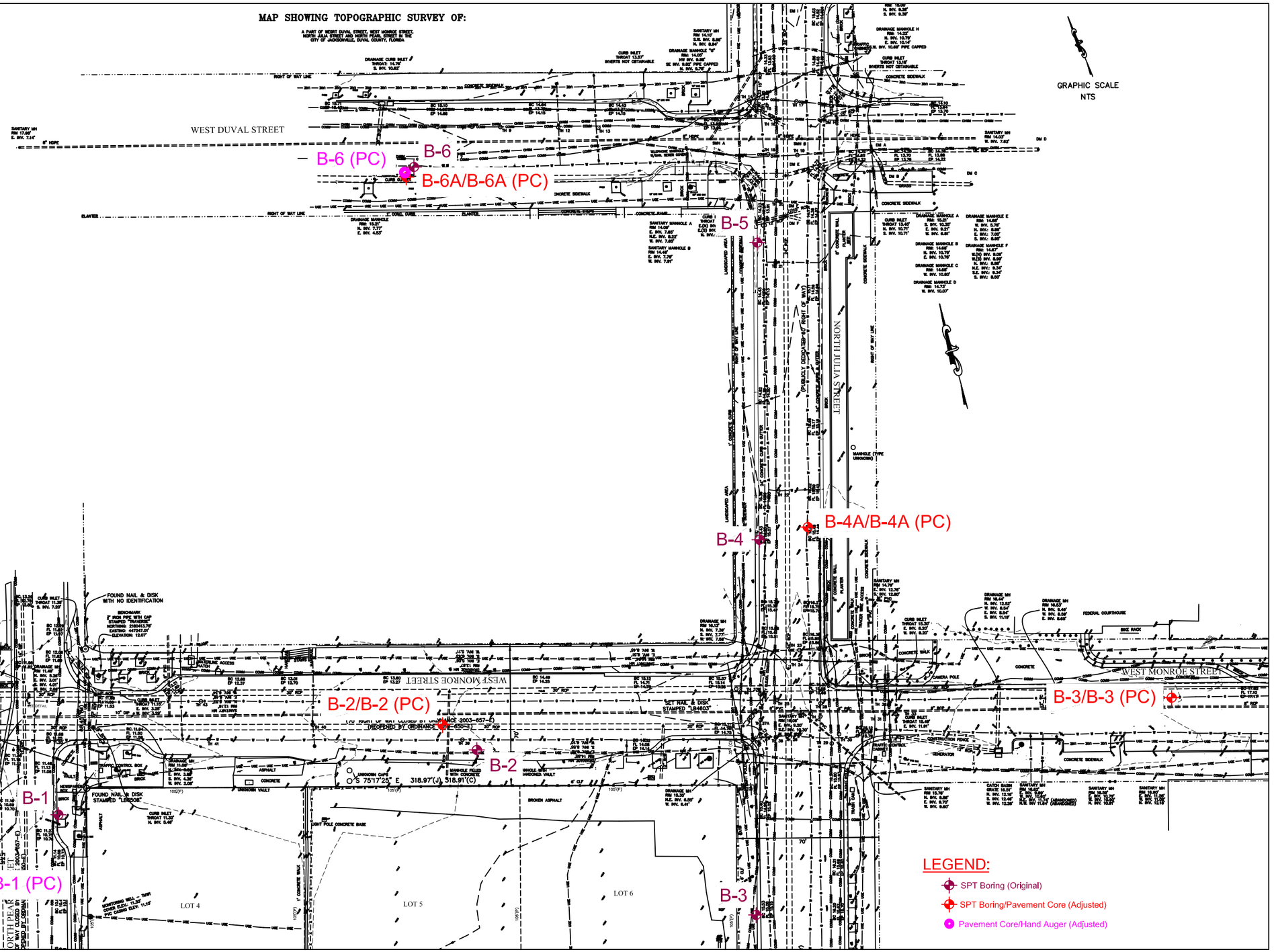
SHEET TITLE: BORING AND PAVEMENT CORE LOCATION PLAN

PROJECT NAME: JEA Downtown Chilled Water Main
Jacksonville, Florida

FIGURE NO.: 2B

MAP SHOWING TOPOGRAPHIC SURVEY OF:

A PART OF WEST DUVAL STREET, WEST MONROE STREET, NORTH JULIA STREET AND NORTH PEARL STREET IN THE CITY OF JACKSONVILLE, DUVAL COUNTY, FLORIDA



NOTE: Survey Map dated May 30, 2020 as provided by Mott MacDonald Florida, LLC.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
Meskel & Associates Engineering
FL. Registry No. 28142
3728 Phillips Highway, Suite 208, Jacksonville, FL 32207

CLIENT: Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: BORING AND PAVEMENT CORE LOCATION PLAN

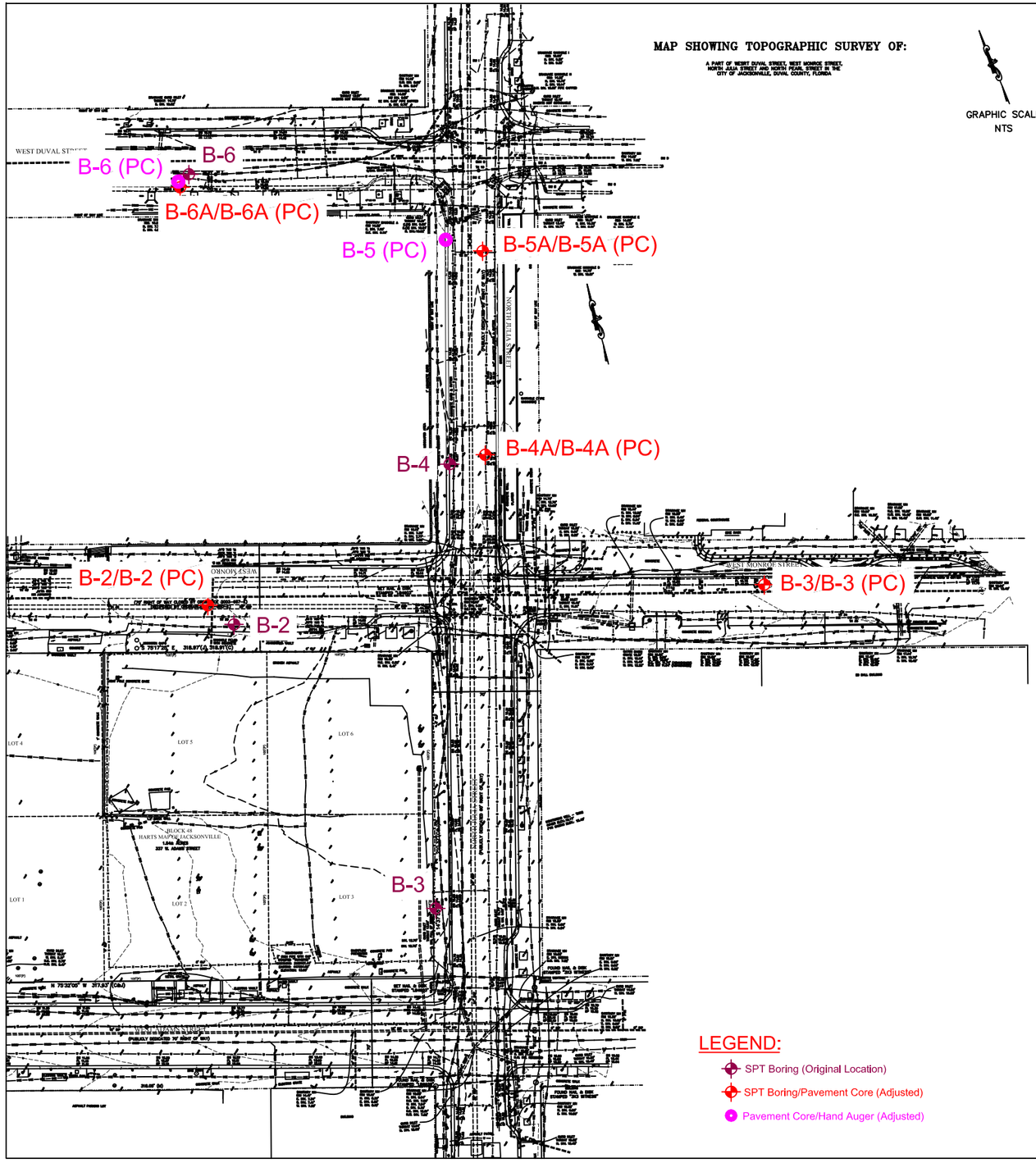
PROJECT NAME: JEA Downtown Chilled Water Main
Jacksonville, Florida

FIGURE NO. 2C

MAP SHOWING TOPOGRAPHIC SURVEY OF:

A PART OF WEST DUVAL STREET, WEST MONROE STREET, NORTH JULIA STREET AND NORTH PEARL STREET IN THE CITY OF JACKSONVILLE, DUVAL COUNTY, FLORIDA

GRAPHIC SCALE
NTS



LEGEND:

- SPT Boring (Original Location)
- SPT Boring/Pavement Core (Adjusted)
- Pavement Core/Hand Auger (Adjusted)

NOTE: Survey Map dated May 30, 2020 as provided by Mott MacDonald Florida, LLC.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

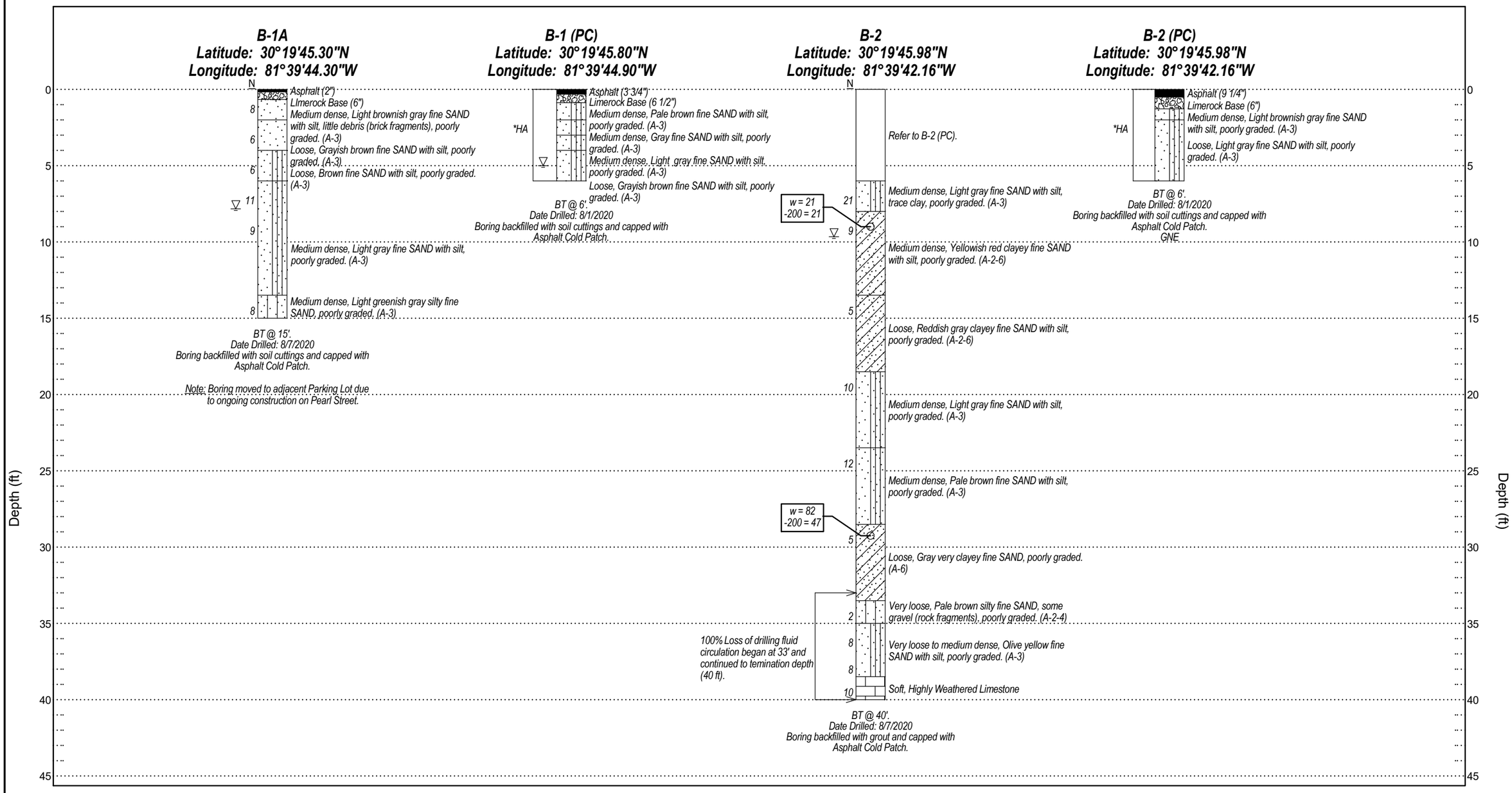
CLIENT: Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: BORING AND PAVEMENT CORE LOCATION PLAN

PROJECT NAME: JEA Downtown Chilled Water Main
Jacksonville, Florida

FIGURE NO. 2D



Legend

- Asphalt
- Limestone
- Wash Drilled
- Limerock Base
- Fine Sand
- Clayey Fine Sand
- Fine Sand with Silt
- Silty Fine Sand

N — Standard Penetration Resistance, Blows/Foot

BT — Boring Terminated at Depth Below Existing Grade

(A-3) — AASHTO Soil Classification System

▽ — Depth to Groundwater at Time of Drilling

GNE — Groundwater Level Not Encountered at Time of Drilling

w — Natural Moisture Content (%)

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

HA — Hand Augered to 6 feet due to potential underground utilities.

* — Hand Cone Penetrometer was used to measure relative density, values shown on boring logs.

→ — 100% Loss of Drilling Fluid Circulation

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *JEA Downtown Chilled Water Main Jacksonville, Florida*

FIGURE NO. 3

B-3
Latitude: 30°19'45.22"N
Longitude: 81°39'38.17"W

N

Refer to B-3 (PC).

10 — Medium dense, Brownish gray fine SAND with silt, poorly graded. (A-3)

8 — Medium dense, Very pale brown fine SAND with silt, poorly graded. (A-3)

13 — Medium dense, Light gray clayey fine SAND, poorly graded. (A-2-6)

BT @ 15'.
Date Drilled: 8/8/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

B-3 (PC)
Latitude: 30°19'45.21"N
Longitude: 81°39'38.17"W

*HA — Asphalt (5 1/2")
Brick (3 1/2")
Medium dense, Grayish brown fine SAND with silt, poorly graded. (A-3)
Medium dense to loose, Very pale brown fine SAND with silt, poorly graded. (A-3)

BT @ 6'.
Date Drilled: 8/1/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
GNE

Note: Boring encountered debris @ 6 feet.

B-4A
Latitude: 30°19'46.46"N
Longitude: 81°39'39.91"W

N

Refer to B-4A (PC).

7 — Loose, Very pale brown fine SAND with silt, poorly graded. (A-3)

11 — Medium dense, Very pale brown fine SAND with silt, trace clay nodules, poorly graded, (A-3)

8 — Medium dense, Reddish yellow fine SAND with silt, poorly graded. (A-3)

w = 28
-200 = 23

5 — Loose, Reddish yellow clayey fine SAND with silt, poorly graded. (A-2-6)

7 — Loose, Very pale brown fine SAND with silt, trace clay, poorly graded. (A-3)

5 — Loose, Pale brown fine SAND with silt, poorly graded. (A-3)

WOR — Very loose, Very pale brown silty fine SAND, trace clay, poorly graded. (A-2-4)

5 — Loose, Very pale brown clayey fine SAND with silt, few gravel (limerock fragments), poorly graded. (A-2-6)

7 — Loose to medium dense, Light yellowish brown silty fine SAND, trace gravel (limerock fragments), trace clay, poorly graded. (A-2-4)

9

BT @ 40'.
Date Drilled: 8/8/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

B-4A (PC)
Latitude: 30°19'46.46"N
Longitude: 81°39'39.90"W

*HA — Asphalt / Brick (8 3/4")
Limerock / Sand (5")
Grayish brown fine SAND, some rock and brick fragments, poorly graded. (A-3)
Loose, Grayish brown fine SAND with silt, poorly graded. (A-3)
Loose, Light gray fine SAND with silt, poorly graded. (A-3)
Loose, Very pale brown fine SAND with silt, poorly graded. (A-3)

BT @ 6'.
Date Drilled: 8/1/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
GNE

Note: Boring B-4moved to B-4A approximately 29' East to outside lane due to underground utilities @ B-4 location.

Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35, 40, 45

Legend

- Wash Drilled
- Asphalt, Asphalt / Brick
- Fine Sand
- Fine Sand with Silt
- Silty Fine Sand
- Limerock / Sand
- Clayey Fine Sand
- Silty Fine Sand

N — Standard Penetration Resistance, Blows/Foot
BT — Boring Terminated at Depth Below Existing Grade
(A-3) — AASHTO Soil Classification System
▽ — Depth to Groundwater at Time of Drilling
GNE — Groundwater Level Not Encountered at Time of Drilling
w — Natural Moisture Content (%)
-200 — % Passing No. 200 U.S. Standard Sieve
HA — Hand Augered to 6 feet due to potential underground utilities.
* — Hand Cone Penetrometer was used to measure relative density, values shown on boring logs.
WOR — Sampler advanced by weight of rod only

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
MAE Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: Generalized Soil Profiles

PROJECT NAME: JEA Downtown Chilled Water Main
Jacksonville, Florida

FIGURE NO. 4

B-5A
Latitude: 30°19'47.72"N
Longitude: 81°39'39.55"W

N

Refer to B-5A (PC).

6 — Loose, Very pale brown fine SAND with silt, poorly graded. (A-3)

9 ▽

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

BT @ 13.5'.
Date Drilled: 8/8/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
Boring Terminated due to unknown utility.

B-5 (PC)
Latitude: 30°19'47.86"N
Longitude: 81°39'39.77"W

Asphalt (9 3/4")

*HA — Crushed Gravel (rock fragments) (6")

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

BT @ 3'.
Date Drilled: 8/1/2020
(Boring terminated due to unknown utility.)
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
GNE
Note: Boring moved to location 5A approximately 33' East to outside lane.

B-5A (PC)
Latitude: 30°19'47.72"N
Longitude: 81°39'39.55"W

Asphalt (7 1/4")

Crushed Gravel (rock and brick fragments) (5")

Light gray fine SAND, some rock and brick fragments, poorly graded. (A-3)

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

*HA — Loose, Light gray fine SAND with silt, trace wood fragments, poorly graded. (A-3)

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

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

BT @ 6'.
Date Drilled: 8/1/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
GNE

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14

Legend

- Asphalt
- Wash Drilled
- Crushed Gravel
- Fine Sand with Silt
- Fine Sand
- N — Standard Penetration Resistance, Blows/Foot
- BT — Boring Terminated at Depth Below Existing Grade
- (A-3) — AASHTO Soil Classification System
- ▽ — Depth to Groundwater at Time of Drilling
- HA — Hand Augered to 6 feet due to potential underground utilities.
- GNE — Groundwater Level Not Encountered at Time of Drilling
- * — Hand Cone Penetrometer was used to measure relative density, values shown on boring logs.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
MAE Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *JEA Downtown Chilled Water Main Jacksonville, Florida*

FIGURE NO. 5

B-6A
Latitude: 30°19'48.60"N
Longitude: 81°39'41.58"W

N

7

8

10

Refer to B-6A (PC).

Loose to medium dense, Brownish yellow fine SAND with silt, poorly graded. (A-3)

Medium dense, Yellowish red very clayey fine SAND, poorly graded. (A-6)

BT @ 15'.
Date Drilled: 8/8/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

B-6 (PC)
Latitude: 30°19'48.63"N
Longitude: 81°39'41.58"W

*HA

Asphalt (3 3/4")

Crushed Gravel (rock fragments) (7")

Grayish brown fine SAND with silt, some gravel (rock fragments), poorly graded. (A-3)

BT @ 3'.
Date Drilled: 8/1/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
Boring terminated due to unknown utility.
GNE
Note: Boring moved to location 6A approximately 3' South.

B-6A (PC)
Latitude: 30°19'48.60"N
Longitude: 81°39'41.57"W

*HA

Asphalt (4")

Limerock Base (11")

Loose, Grayish brown fine SAND with silt, some rock and brick fragments, poorly graded. (A-3)

Loose, Very pale brown fine SAND with silt, trace clay nodules, poorly graded. (A-3)

Loose, Very pale brown fine SAND with silt, trace clay and root fragments, poorly graded. (A-3)

BT @ 6'.
Date Drilled: 8/1/2020
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.
GNE

Depth (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16

Legend

- Asphalt
- Wah Drilled
- Limerock Base
- Crushed Gravel
- Fine Sand with Silt
- Fine Sand
- Clayey Fine Sand

N — Standard Penetration Resistance, Blows/Foot
BT — Boring Terminated at Depth Below Existing Grade
(A-3) — AASHTO Soil Classification System
▽ — Depth to Groundwater at Time of Drilling
HA — Hand Augered to 6 feet due to potential underground utilities.
GNE — Groundwater Level Not Encountered at Time of Drilling
* — Hand Cone Penetrometer was used to measure relative density, values shown on boring logs.

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

P. RODNEY MANK, P.E. P.E. NO.: 41986
MAE Meskel & Associates Engineering
FL. Registry No. 28142
3728 Philips Highway, Suite 208, Jacksonville, FL 32207

Mott MacDonald Florida, LLC

DATE:	MAE PROJECT NO.
10/2/2020	0103-0020

SHEET TITLE: *Generalized Soil Profiles*

PROJECT NAME: *JEA Downtown Chilled Water Main Jacksonville, Florida*

FIGURE NO. 6

Appendix A

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-1A

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/7/2020 **COMPLETED** 8/7/2020 **LATITUDE** 30°19'45.30"N **LONGITUDE** 81°39'44.30"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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		Asphalt (2") Limerock Base (6")												
	1	Medium dense, Light brownish gray fine SAND with silt, little debris (brick fragments), poorly graded.	A-3		3 3 5 4	8								
	2	Loose, Grayish brown fine SAND with silt, poorly graded.	A-3		2 3 3 4	6								
5	3	Loose, Brown fine SAND with silt, poorly graded.	A-3		2 3 3 3	6								
	4	▽			3 5 6 6	11								
	5	Medium dense, Light gray fine SAND with silt, poorly graded.	A-3		3 4 5 4	9								
10														
	6	Medium dense, Light greenish gray silty fine SAND, poorly graded.	A-3		3 4 4	8								
15		Bottom of borehole at 15 feet. Note: Boring moved to adjacent Parking Lot due to ongoing construction on Pearl Street.												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 7 ft 10 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-2

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/7/2020 **COMPLETED** 8/7/2020 **LATITUDE** 30°19'45.98"N **LONGITUDE** 81°39'42.16"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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		Refer to B-2 (PC).					21	21						
5	4	Medium dense, Light gray fine SAND with silt, trace clay, poorly graded.	A-3		17 16 5 5	21								
10	5	▽ Medium dense, Yellowish red clayey fine SAND with silt, poorly graded.	A-2-6		5 5 4 5	9								
15	6	Loose, Reddish gray clayey fine SAND with silt, poorly graded.	A-2-6		2 2 3	5								
20	7	Medium dense, Light gray fine SAND with silt, poorly graded.	A-3		3 5 5	10								

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 8 in *▽ **END OF DAY** ---

(Continued Next Page)

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-2

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

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
20		Medium dense, Light gray fine SAND with silt, poorly graded.	A-3											
25	8	Medium dense, Pale brown fine SAND with silt, poorly graded.	A-3		6 6 6	12								
30	9	Loose, Gray very clayey fine SAND, poorly graded.	A-6		1 2 3	5	82	47						
35	10	Very loose, Pale brown silty fine SAND, some gravel (rock fragments), poorly graded.	A-2-4		3 1 1	2								100% Loss of drilling fluid circulation began at 33' and continued to termination deoth (40ft).
	11	Very loose to medium dense, Olive yellow fine SAND with silt, poorly graded.	A-3		5 4 4 8	8								
	12				5 4 4	8								
40	13	Soft, Highly Weathered Limestone			46 5 5	10								
		Bottom of borehole at 40 feet.												

NOTES Boring backfilled with grout and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 8 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-3

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/8/2020 **COMPLETED** 8/8/2020 **LATITUDE** 30°19'45.22"N **LONGITUDE** 81°39'38.17"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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		Refer to B-3 (PC).												
5	4	Medium dense, Brownish gray fine SAND with silt, poorly graded.	A-3		4 4 6 3	10								
10	5	▽ Medium dense, Very pale brown fine SAND with silt, poorly graded.	A-3		3 3 5 3	8								
15	6	Medium dense, Light gray clayey fine SAND, poorly graded.	A-2-6		6 6 7	13								
		Bottom of borehole at 15 feet.												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 10 ft 11 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-4A

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/8/2020 **COMPLETED** 8/8/2020 **LATITUDE** 30°19'46.46"N **LONGITUDE** 81°39'39.91"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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														
		Refer to B-4A (PC).												
5														
	4	Loose, Very pale brown fine SAND with silt, poorly graded.	A-3		2 3 4 4	7								
10	5	▽ Medium dense, Very pale brown fine SAND with silt, trace clay nodules, poorly graded,	A-3		4 5 6 6	11								
15	6	Medium dense, Reddish yellow fine SAND with silt, poorly graded.	A-3		5 4 4	8								
20	7	Loose, Reddish yellow clayey fine SAND with silt, poorly graded.	A-2-6		3 2 3	5	28	23						

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

(Continued Next Page)

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-4A

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

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
20		Loose, Reddish yellow clayey fine SAND with silt, poorly graded.	A-2-6											
25	8	Loose, Very pale brown fine SAND with silt, trace clay, poorly graded.	A-3		2 3 4	7								
30	9	Loose, Pale brown fine SAND with silt, poorly graded.	A-3		2 2 3	5								
35	10	Very loose, Very pale brown silty fine SAND, trace clay, poorly graded.	A-2-4		WOR ↓	WOR								
	11	Loose, Very pale brown clayey fine SAND with silt, few gravel (limerock fragments), poorly graded.	A-2-6		1 2 3 2	5								
	12	Loose to medium dense, Light yellowish brown silty fine SAND, trace gravel (limerock fragments), trace clay, poorly graded.	A-2-4		3 3 4	7								
40	13				4 3 6	9								

Bottom of borehole at 40 feet.

NOTES
WOR-Sampler advanced by weight of Rod only.
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-5A

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/8/2020 **COMPLETED** 8/8/2020 **LATITUDE** 30°19'47.72"N **LONGITUDE** 81°39'39.55"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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		Refer to B-5A (PC).												
5	4	Loose, Very pale brown fine SAND with silt, poorly graded.	A-3		2 3 3 4	6								
10	5	▽ Medium dense, Light gray fine SAND with silt, poorly graded.	A-3		3 5 4 4	9								
		Bottom of borehole at 13.5 feet. Boring Terminated due to unknown utility.												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 8 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-6A

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/8/2020 **COMPLETED** 8/8/2020 **LATITUDE** 30°19'48.60"N **LONGITUDE** 81°39'41.58"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Standard Penetration Test

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

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														
5		Refer to B-6A (PC).												
	4				2 3 4 4	7								
10	5	▽ Loose to medium dense, Brownish yellow fine SAND with silt, poorly graded.	A-3		3 4 4 4	8								
15	6	Medium dense, Yellowish red very clayey fine SAND, poorly graded.	A-6		3 4 6	10								
		Bottom of borehole at 15 feet.												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 9 ft 10 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-1 (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'45.80"N **LONGITUDE** 81°39'44.90"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (3 3/4")												* Static Cone Penetrometer 18" - 24" : 46/6" 24" - 30" : 41/6" 30" - 36" : 39/6" 36" - 42" : 42/6" 42" - 48" : 44/6" 48" - 52" : 38/6" 52" - 58" : 37/6" 58" - 62" : 33/6" 62" - 68" : 38/6" 68" - 72" : 40/6"
		Limerock Base (6 1/2")												
	1	Medium dense, Pale brown fine SAND with silt, poorly graded.	A-3		*									
2.5	2	Medium dense, Gray fine SAND with silt, poorly graded.	A-3											
	3	Medium dense, Light gray fine SAND with silt, poorly graded.	A-3											
	4													
5.0		▽ Loose, Grayish brown fine SAND with silt, poorly graded.	A-3											
	5													
		Bottom of borehole at 6 feet.												

NOTES Static Cone Penetrometer was used to measure relative density. Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

▽ **AT TIME OF DRILLING** 5 ft 0 in *▽ **END OF DAY** ---

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-2 (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'45.98"N **LONGITUDE** 81°39'42.16"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (9 1/4")												* Static Cone Penetrometer 18" - 24" : 50/3" 24" - 30" : 46/4" 30" - 36" : 40/5" 36" - 42" : 30/6" 42" - 48" : 27/6" 48" - 52" : 39/6" 52" - 58" : 28/6" 58" - 62" : 30/6" 62" - 68" : 36/6" 68" - 72" : 20/6"
	1	Limerock Base (6")												
	2	Medium dense, Light brownish gray fine SAND with silt, poorly graded.	A-3		*									
2.5	3													
	4	Loose, Light gray fine SAND with silt, poorly graded.	A-3											
	5													
5.0	6													
		Bottom of borehole at 6 feet.												

NOTES Static Cone Penetrometer was used to measure relative density. Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-3 (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'45.21"N **LONGITUDE** 81°39'38.17"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (5 1/2")												* Static Cone Penetrometer 18" - 24" : 60/6" 24" - 30" : 55/6" 30" - 36" : 54/6" 36" - 42" : 49/6" 42" - 48" : 53/6" 48" - 52" : 50/6" 52" - 58" : 57/6" 58" - 62" : 50/6" 62" - 68" : 40/6" 68" - 72" : 30/6"
		Brick (3 1/2")												
	1	Medium dense, Grayish brown fine SAND with silt, poorly graded.	A-3		*									
	2													
2.5	3													
	4	Medium dense to loose, Very pale brown fine SAND with silt, poorly graded.	A-3											
	5													
5.0	6													
		Bottom of borehole at 6 feet. Note: Boring encountered debris @ 6 feet.												

NOTES Static Cone Penetrometer was used to measure relative density.
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-4A (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'46.46"N **LONGITUDE** 81°39'39.90"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt / Brick (8 3/4")												* Static Cone Penetrometer 18" - 24" : 30/6" 24" - 30" : 20/6" 30" - 36" : 23/6" 36" - 42" : 28/6" 42" - 48" : 20/6" 48" - 52" : 35/6" 52" - 58" : 23/6" 58" - 62" : 28/6" 62" - 68" : 26/6"
	1	Limerock / Sand (5")												
	2	Grayish brown fine SAND, some rock and brick fragments, poorly graded.	A-3		*									
2.5	3	Loose, Grayish brown fine SAND with silt, poorly graded.	A-3											
	4	Loose, Light gray fine SAND with silt, poorly graded.	A-3											
	5													
5.0	6	Loose, Very pale brown fine SAND with silt, poorly graded.	A-3											
		Bottom of borehole at 6 feet.												

Note: Boring B-4moved to B-4A approximately 29' East to outside lane due to underground utilities @ B-4 location.

NOTES Static Cone Penetrometer was used to measure relative density. Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-5 (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'47.86"N **LONGITUDE** 81°39'39.77"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (9 3/4")												
	1	Crushed Gravel (rock fragments) (6")												
	2	Loose, Grayish brown fine SAND, poorly graded.	A-3											
2.5	3													
		Bottom of borehole at 3 feet. Boring Terminated due to unknown utility Note: Boring moved to location 5A approximately 33' East to outside lane.												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-5A (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'47.72"N **LONGITUDE** 81°39'39.55"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (7 1/4")												* Static Cone Penetrometer 18" - 24" : 36/2" 24" - 30" : 25/6" 30" - 36" : 25/6" 36" - 42" : 21/6" 42" - 48" : 25/6" 48" - 52" : 20/6" 52" - 58" : 20/6" 58" - 62" : 22/6" 62" - 68" : 21/6" 68" - 72" : 20/6"
	1	Crushed Gravel (rock fragments) (5")												
		Light gray fine SAND, some rock and brick fragments, poorly graded.	A-3											
	2	Loose, Light gray fine SAND with silt, poorly graded.	A-3		*									
2.5	3	Loose, Light gray fine SAND with silt, trace wood fragments, poorly graded.	A-3											
	4	Loose, Very pale brown fine SAND with silt, poorly graded.	A-3											
	5													
5.0	6	Loose, Light gray fine SAND with silt, poorly graded.	A-3											
		Bottom of borehole at 6 feet.												

NOTES Static Cone Penetrometer was used to measure relative density. Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-6 (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'48.63"N **LONGITUDE** 81°39'41.58"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (3 3/4")												
	1	Crushed Gravel (rock fragments) (7")												
	2	Loose, Grayish brown fine SAND with silt, some gravel (rock fragments), poorly graded.	A-3											
2.5		Bottom of borehole at 3 feet. Boring Terminated due to unknown utility. Note: Boring moved to location 6A approximately 3' South,												

NOTES Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

BORING B-6A (PC)

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

PROJECT LOCATION Jacksonville, Florida **CLIENT** Mott MacDonald Florida, LLC

DATE STARTED 8/1/2020 **COMPLETED** 8/1/2020 **LATITUDE** 30°19'48.60"N **LONGITUDE** 81°39'41.57"W

DRILLING CONTRACTOR MAE, PLLC **DRILLING METHOD** Core/Hand 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		Asphalt (4")												* Static Cone Penetrometer 18" - 24" : 35/6" 24" - 30" : 47/6" 30" - 36" : 31/6" 36" - 42" : 35/6" 42" - 48" : 20/6" 48" - 52" : 23/6" 52" - 58" : 14/6" 58" - 62" : 16/6"
	1	Limerock Base (11")												
	2	Loose, Grayish brown fine SAND with silt, some rock and brick fragments, poorly graded.	A-3		*									
2.5	3	Loose, Very pale brown fine SAND with silt, trace clay nodules, poorly graded.	A-3											
	4													
	5	Loose, Very pale brown fine SAND with silt, trace clay and root fragments, poorly graded.	A-3											
5.0	6													
		Bottom of borehole at 6 feet.												

NOTES Static Cone Penetrometer was used to measure relative density.
Boring backfilled with soil cuttings and capped with Asphalt Cold Patch.

GROUND WATER LEVELS

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

FIELD EXPLORATION PROCEDURES

Standard Penetration Test (SPT) Borings

The Standard Penetration Test (SPT) boring(s) were performed 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 drilling techniques. A split-barrel sampler was inserted to the borehole bottom and driven 18 to 24 inches into the soil using a 140 pound hammer falling an average of 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration (18" sample) or for the sum of the middle 12 inches of penetration (24" sample) is termed the "penetration resistance, blow count, or N-value." This value is an index to several in-situ geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler, it 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 the laboratory where they were examined by our engineer in order to verify the field descriptions.

Hand Auger Boring

The auger boring(s) were performed manually by the use of a hand auger and 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 placed in sealed containers and transported to our laboratory where they were examined by our engineer to verify the driller's field descriptions.

Static Cone Penetrometer

A Static Cone Penetrometer was used to evaluate the consistency or relative density of soils encountered in the soil boring. The penetrometer consists of two rods that are connected to a pressure gauge located at the top of the assembly. The inner rod is independent of the outer sleeve and is fitted with a 60-degree (included angle) conical tip having an area of 1.5 cm2. The penetrometer was advanced six inches into the soil and the reading of total bearing was obtained. Then the penetrometer was slightly retracted in order to return the gauge to a zero reading and then advanced an additional six inches. If refusal of the cone was encountered, the cone was removed and the hole was opened with a hand auger to the depth of refusal to permit continuation of measurements versus depth.

At each penetrometer test location, an auger boring was performed to determine the nature of the material corresponding to the penetration depths of the penetrometer. The auger boring was performed manually by the use of a hand-held bucket auger and in general accordance with the latest revision of ASTM D 1452, "Standard Practice for Soil Exploration and Sampling by Auger Borings." Representative samples of the soils brought to the ground surface by the auger were placed in sealed containers and transported to our laboratory where they were examined by a geotechnical engineer to verify the field descriptions and classify the soil, and to select samples for laboratory testing.

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. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

BORING LOG LEGEND

Symbol	Description
N	Standard Penetration Resistance, the number of blows required to advance a standard spoon sampler 12" when driven by a 140-lb hammer dropping 30".
WOR	Split Spoon sampler advanced under the weight of the drill rods
WOH	Split Spoon sampler advanced under the weight of the SPT hammer
50/2"	Indicates 50 hammer blows drove the split spoon 2 inches; 50 Hammer blows for less than 6-inches of split spoon driving is considered "Refusal".
(SP)	Unified Soil 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
Few	3% to 5%
Little	5% to 10%
With	Greater than 10%

MINOR COMPONENTS
(Shell, Rock, Debris, Roots, etc.)

Trace	Less than 5%
Few	5% to 10%
Little	15% to 25%
Some	30% to 45%

RELATIVE DENSITY (Coarse-Grained Soils)

Relative Density	N-Value *
Very Loose	Less than 3
Loose	3 to 8
Medium Dense	8 to 24
Dense	24 to 40
Very Dense	Greater than 40

CONSISTENCY (Fine-Grained Soils)

Consistency	N-Value *
Very Soft	Less than 1
Soft	1 to 3
Firm	3 to 6
Stiff	6 to 12
Very Stiff	12 to 24
Hard	Greater than 24

RELATIVE HARDNESS (Limestone)

Relative Hardness	N-Value *
Soft	Less than 50
Hard	Greater than 50

* Using Automatic Hammer

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*

Meskel & Associates Engineering

Appendix B

Meskel & Associates Engineering, PLLC
FL. Registry No. 28142
3728 Philips Highway, Suite 208
Jacksonville, FL 32207
P: (904)519-6990 F: (904)519-6992

Meskel & Associates Engineering

SUMMARY OF LABORATORY INDEX TEST RESULTS

PROJECT NO. 0103-0020

PROJECT NAME JEA Downtown Chilled Water Main

DATE. 9/14/2020

PROJECT LOCATION Jacksonville, Florida

CLIENT Mott MacDonald Florida, LLC

Borehole	Sample No.	Approx. Depth (ft)	%<#200 Sieve	Water Content (%)	Organic Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	ASSHTO Classification	Comments
B-2	5	9	21	21	---	---	---	---	A-2-6	
B-2	9	19	47	82	---	---	---	---	A-6	
B-4A	7	19	23	28	---	---	---	---	A-2-6	

Note: "---" Untested Parameter

Summary of Laboratory Corrosivity Tests
JEA Chilled Water Main
MAE Project No. 0103-0020

Sample	GPS Coordinates		Approximate Test Depth[(1)] (ft)	AASHTO Soil Classification	pH	Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	Environmental Classification	
	Latatude	Longitude							Steel Substructure	Concrete Substructure
B-2	30°19'45.98"N	81°39'42.16"W	2 to 4	A-3	7.3	25,000	0	60	Slightly Aggressive	Slightly Aggressive
B-6	30°19'48.63"N	81°39'41.58"W	2 to 4	A-3	7.4	21,000	0	69	Slightly Aggressive	Slightly Aggressive

(1) Feet below the existing ground surface.

LABORATORY TEST PROCEDURES

Percent Fines Content

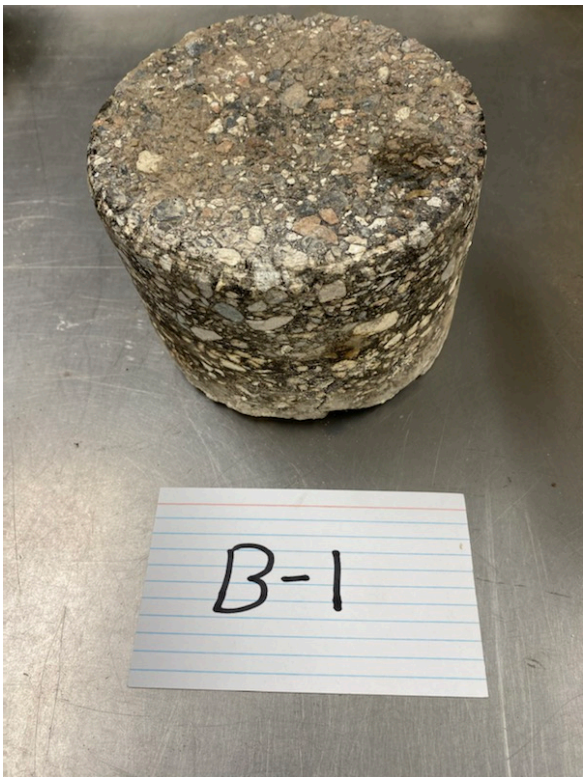
The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

Natural Moisture Content

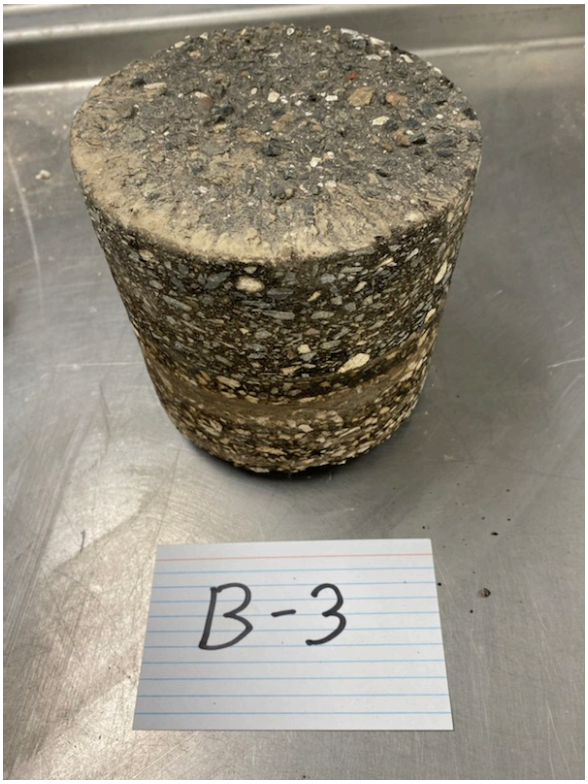
The water content of the tested sample was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of “pore” or “free” water in a given mass of material to the mass of solid material particles.

Appendix C

Pavement Core Photographs



Pavement Core Photographs



Pavement Core Photographs

Pavement Core Photographs