SUBSURFACE SOIL EXPLORATION
HANCOCK BRIDGE PARKWAY WATER MAIN IMPROVEMENTS
HANCOCK BRIDGE PARKWAY AND MOODY ROAD
NORTH FORT MYERS, LEE COUNTY, FLORIDA

Ardaman & Associates, Inc.

OFFICES

Orlando - 8008 S. Orange Avenue, Orlando, FL 32809 - Phone: 407-855-3860
Bartow - 1525 Centennial Blvd., Bartow, FL 33830 - Phone: 863-533-0858
Baton Rouge - 316 Highlandia Drive, Baton Rouge, LA 70810 - Phone: 225-752-4790
Cocoa - 1300 N. Cocoa Blvd., Cocoa, FL 32922 - Phone: 321-632-2503
Fort Myers - 9970 Bavaria Road, Fort Myers, FL 33913 - Phone: 239-768-6600
Miami - 2608 W. 84th Street, Hialeah, FL 33016 - Phone: 305-825-2683
Monroe - 338 Fontana Road, Monroe, LA 71203 - Phone: 318-343-0900
New Orleans - 1305 Distributors Row, Suite I, Jefferson, LA 70123 - Phone: 504-835-2593
Port St. Lucie - 460 NW Concourse Place, Unit #1, Port St. Lucie, FL 34986 - Phone: 772-878-0072
Sarasota - 78 Sarasota Center Blvd., Sarasota, FL 34240 - Phone: 941-922-3526
Shreveport - 7222 Greenwood Road, Shreveport, LA 71119 - Phone: 318-636-3673
Tallahassee - 3175 West Tharpe Street, Tallahassee, FL 32303 - Phone: 850-576-6131
Tampa - 3925 Coconut Palm Drive, Suite 115, Tampa, FL 33619 - Phone: 813-620-3389
West Palm Beach - 2200 N. Florida Mango Road, Suite 101, West Palm Beach, FL 33409 - Phone: 561-687-8200

MEMBERS:
American Concrete Institute
American Council of Engineering Companies
ASTM International
Geo-Institute
Geoprofessional Business Association
Society of American Military Engineers

Ardaman Project No. 17-33-4571
May 21, 2018

GREELEY AND HANSEN LLC
5260 Summerlin Commons Way, Suite 104
Fort Myers, FL 33907

Attention: Ms. Alexandra Terral, P.E.

SUBJECT: Subsurface Soil Exploration
Hancock Bridge Parkway Water Main Improvements
Hancock Bridge Parkway and Moody Road
North Fort Myers, Lee County, Florida

Dear Ms. Terral:

As requested and authorized by **Greeley and Hansen, LLC**, Ardaman & Associates, Inc. (Ardaman) has completed the subsurface soil exploration program for the subject project. The purposes of this program were to evaluate the general subsurface conditions in the project study area and discuss our findings.

This report documents our findings and conclusions. It has been prepared for the exclusive use of **Greeley and Hansen, LLC** for specific application to the subject project in accordance with generally accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

SCOPE

The scope of our services was limited to the following items:

1. Conducting four Standard Penetration Test (SPT) borings to 50 feet to determine the nature and condition of the subsurface soils at the location of proposed directional drilling at the two

creek crossings, and two SPT borings to 20 feet at the location of a jack-and-bore under Hancock Bridge Parkway on the west side of Moody Road.

2. Conducting 19 hand auger borings to a minimum depth of 6 feet to define subsurface conditions along the route of the proposed water main within the roadway right-of-way.

3. Reviewing each soil sample obtained in our field testing program by a geotechnical engineer in our laboratory for further identification and assignment of laboratory tests.

4. Performing the appropriate laboratory tests on select samples.

5. Analyzing the existing soil conditions with respect to the proposed construction.

6. Preparing this report to document the results of our field exploration and laboratory testing programs, and discuss our findings.

SITE LOCATION AND PROJECT DESCRIPTION

The Hancock Bridge Parkway Water Main Improvements project includes the installation of a new water main in the right-of-way of Hancock Bridge Parkway from Palm Avenue to Moody Road and in the right-of-way of Moody Road from Hancock Bridge Parkway to Aqua Cove Lane in North Fort Myers, Lee County, Florida. Installation is also to be performed along Seaworthy Road and Anchor Way. We understand the majority of the installation will consist of cut-and-cover techniques; however, you are planning to directional drill under the creek crossing Hancock Bridge Parkway east of Moody Road and the small creek crossing Moody Road north of Hancock Bridge Parkway. You are also planning to jack-and-bore under Hancock Bridge Parkway at both Moody Road and Palm Avenue.

The hand auger borings along the proposed water main line alignment began on Moody Road, south of Aqua Cove Lane, to Hancock Bridge Parkway and then along Hancock Bridge Parkway to Palm Avenue. Hand auger borings were also performed along Seaworthy Road and Anchor Way. SPT borings were performed on both sides of the proposed directional drills at the two creek crossings and the jack-and-bore under

Hancock Bridge Parkway on the west side of Moody Road. The boring locations are shown on the attached **Boring Location Plan** (**Figure 1**).

FIELD EXPLORATION PROGRAM

Our field exploration consisted of performing six Standard Penetration Test (SPT) borings labeled SPT-1 thru SPT-6 at the proposed directional drilling/jack-and-bore locations and 19 hand auger borings labeled A-1 thru A-19 at select locations along the proposed water main line route. The four SPT borings at the directional drill locations were drilled to a depth of 50 feet below the existing ground surface, and the two SPT borings at the jack-and-bore location west of Moody Road were drilled to a depth of 20 feet. The SPT borings were conducted using methods consistent with ASTM D-1586. A hand-held bucket auger was used to advance each hand auger boring to a depth minimum depth of 6 feet, with the exception of A-18 that encountered a possible utility conflict. The equipment and procedures used in the SPT and hand auger borings are described in detail in the **Appendix**.

The locations of the borings are shown on the attached **Boring Location Plan** (**Figure 1**). They were located by reference to the project Geotechnical Survey Map Provided by **Greeley and Hansen, LLC** and by measurement from the site features shown on an aerial photograph of the site obtained from Google Earth Pro©. Therefore, the locations indicated should be considered accurate only to the degree implied by the method of measurement used. If a more precise location of the borings is desired, then we recommend that a registered land surveyor be employed to locate the borings on site. GPS coordinates of each boring location are provided on the boring logs.

GENERAL SUBSURFACE CONDITIONS

The general subsurface conditions encountered during the field exploration are shown on the attached soil boring logs. Soil stratification is based on examination of recovered soil samples and interpretation of the field boring logs. The stratification lines represent the approximate boundaries between the soil types, the actual transitions may be gradual.

In general, the hand auger borings along the proposed alignment typically encountered fine sands (SP/SP-SM or A-3) from the ground surface to depths ranging from 3 to 6 feet below the existing ground surface. Below the fine sands, the hand auger borings typically encountered clayey or silty fine sands (SC/A-2-6 or SM/A-2-4) extending to the termination of the hand auger borings at a depth of 6 feet. Notable exceptions to the generalized subsurface soil conditions occurred in auger borings A-2, A-14 and A-15, which encountered Peat (PT or A-8) material at depths of 5 to 5.5 feet extending to depths ranging from 6.5 to 8 feet below the existing ground surface. Another notable exception was encountered in hand auger boring A-16, which encountered silty to very silty fine sands (SM or A-2-4/A-4) from the surface to the termination of the boring at a depth of 6 feet.

In general, the borings SPT-1 through 4 encountered 1-foot of asphalt and rock base at the surface. Below the pavement section, the borings typically encountered fine sands (SP/SP-SM or A-3) to depths ranging from about 12.5 to 17.5 feet below the existing road surface. Borings SPT-1 and SPT-4 encountered clayey fine sands (SC or A-2-6) at depths of 4 and 5 feet extending to depths of 5 and 7.5 feet below the existing surface. Below the fine sands, the SPT borings typically encountered stratums of silty or silty clayey fine sands (SM/SC-SM or A-2-4) and clayey fine sands or sandy lean clays (SC/CL or A-2-6/A-6) extending to a depth of 37.5 feet underlain by sandy fat clays (CH/A-7-6) to the termination of the borings at a depth of 50 feet below the existing surface.

In general, the borings SPT-5 and 6 encountered fine sands (SP/SP-SM or A-3) to depths of 9 to 12.5 feet below the existing ground surface underlain by silty clayey fine sands (SC-SM/A-2-4) with trace to some gravel size limerock and shell fragments to the termination of the borings at a depth of 20 feet.

The groundwater depths shown on the boring logs represent the groundwater surface encountered on the dates shown (October 18 and 20, November 1 and 2, 2017 for borings SPT-1 through 4 and A-1 through 19, and May 16, 2018 for borings SPT-5 and 6). Fluctuations in groundwater level should be anticipated throughout the year due to seasonal variations in rainfall, and other factors.

LABORATORY TESTING PROGRAM

Representative soil samples obtained during our field sampling operation were packaged and transferred to our office and, thereafter, examined by a geotechnical engineer to obtain more accurate descriptions of the existing soil strata. Laboratory testing was performed on selected samples as deemed necessary to aid in soil classification and to further define the engineering properties of the soils. The laboratory tests included Natural Moisture Content, Percent Finer than the U.S. No. 200 Sieve (percent silt and clay) and Organic Content.

The test results are presented on the attached soil boring logs at the depths from which the samples were recovered. The soil descriptions shown on the logs are based upon visual-manual procedures in accordance with local practice. Soil classification is in general accordance with the Unified Soil Classification System (ASTM D-2487) and is also based on visual-manual procedures. The soils recovered from the hand auger borings were also classified in accordance with AASHTO M-145 Recommended Procedure for the Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes.

DISCUSSION

The majority of the borings performed along the route encountered fine sands (SP/SP-SM or A-3 soils) from the surface to depths ranging from 3 to 6 feet in the hand auger borings and 12.5 to 17.5 feet in the SPT borings. These fine sands are suitable for use as backfill materials and suitable for pipe bedding. However, the pipe should be bedded in fine gravel such as FDOT No. 89 Stone if unsuitable soil types are encountered at pipe invert such as silty sand or sandy silts (SM/ML or A-2-4/A-4) or clayey sands (SC or A-2-6). In addition, borings A-2, A-14 and A-15 encountered peat (PT or A-8) at depths of 5 to 5.5 feet extending to depths ranging from 6.5 to 8 feet below the existing ground surface. This material is unsuitable and should be removed to its vertical extent below pipes and any structures and replaced with suitable fill materials or fine gravel.

GENERAL COMMENTS

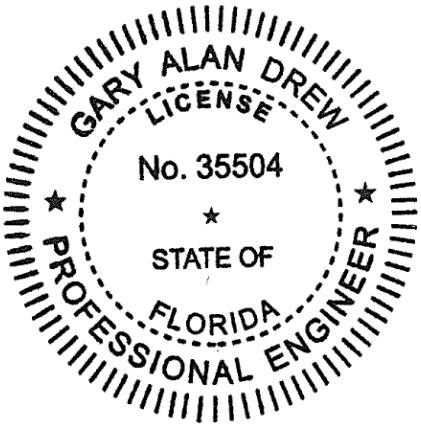
While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the subsurface materials of the region are anticipated and may be encountered. The boring logs and related information are based on the driller's logs and visual examination of selected sample in the laboratory. The delineation between soil types shown on the logs is approximate and the description represents our interpretation of subsurface conditions at the designated boring locations and on the particular date drilled.

If you have any questions about this report, please contact this office.

Very truly yours,

Ardaman & Associates, Inc.
Florida Certificate of Authorization No. 00005950

Matthew R. Elmore, E.I.
Project Engineer



This document has been digitally signed and sealed by:

Gary A Drew
2018.05.21 14:31:44 -04'00'

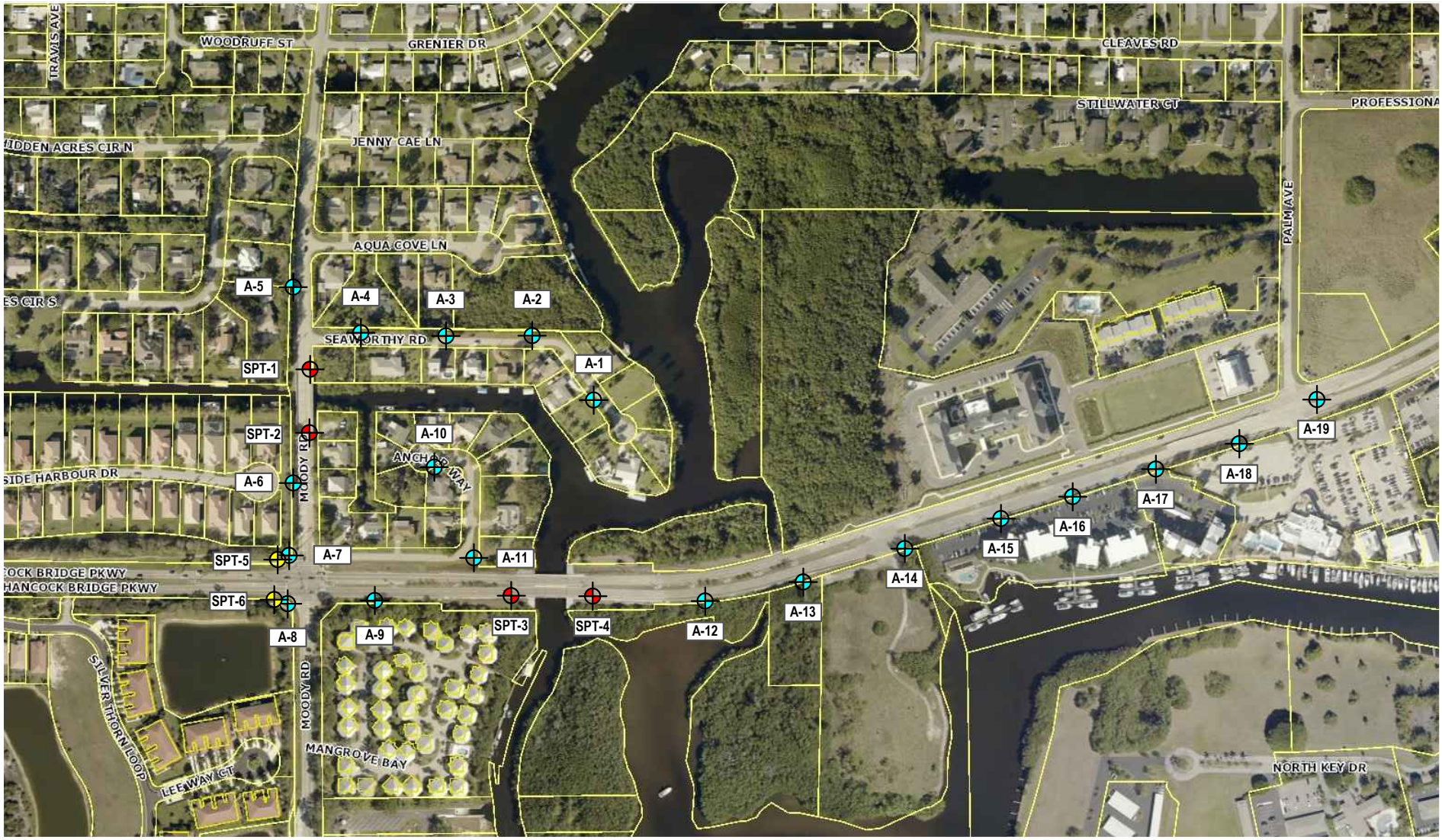
Printed copies of this document are not considered signed and sealed.
The signature must be verified on the electronic documents.

Gary A. Drew, P.E. No. 35504
Vice President/Branch Manager

MRE:GAD/cmb

ATTACHMENTS

- **BORING LOCATION PLAN (FIGURE 1)**
- **BORING LOGS (SPT-1 THRU SPT-6 AND A-1 THRU A-19)**



= 50' SPT Borings

= 20' SPT Borings

= Auger Borings

N
W E
S

FIGURE 1
BORING LOCATION PLAN

SOURCE: LEEPA.ORG

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

Proposed Water Main Improvements
Hancock Bridge Pkwy and Moody Rd
North Fort Myers, Lee County, FL

Drawn By:	Checked By:	Date:
ME	GD	5/18/17
File No.	Approved By:	Figure No.
17-33-4571	Gary Drew, P.E.	1

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'41.4" **LONGITUDE:** W 81°53'59.0"
DATE DRILLED: 11/02/17 & 5/15/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): EST. 11' **DATE:** 11/02/17 & 5/15/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: CME-55 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0				Asphalt and Rock Base.	Hand augered to 4.5' Auto hammer from 4.5'-TERM					
	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand.						
	2		SC	Clayey Sand - Brown clayey fine sand.						
5			SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand.						
	3									
	4									
10	5		SP	Poorly Graded Sand - Gray and brown fine sand.						
			SM	Silty Sand - Light brown silty fine sand, trace to some gravel (cemented sands).						
15	6					25.1	33.8			
			SC	Clayey Sand - Light gray clayey fine sand.						
20	7									
			SC	Clayey Sand - Light gray clayey fine sand, trace to some gravel (cemented sands).						
25	8									
			SC	Clayey Sand - Gray clayey fine sand.						
30	9				Hole terminated at 30.5' on 11/2/17. Hole washed to 34' on 5/15/18 and advanced to 50.5'	43.9	38.1			
35	10									

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
			CH	Sandy Fat Clay - Greenish gray sandy clay, high plasticity.						
40	11									
45	12									
50	13									
				TERMINATED AT 50.5'						
55										
60										
65										
70										
75										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'39.6" **LONGITUDE:** W 81°53'58.9"
DATE DRILLED: 11/02/17 & 5/15/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): EST. 11' **DATE:** 11/02/17 & 5/15/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: CME-55 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0				Asphalt and Rock Base.	Hand augered to 6' Auto hammer from 6'-TERM					
	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand.						
	2									
5										
	3									
	4		SP	Poorly Graded Sand - Brown and gray fine sand.						
10	5									
			SC	Clayey Sand - Gray clayey fine sand.						
15	6									
20	7									
			SC	Clayey Sand - Gray clayey fine sand, trace to some gravel (cemented sands).						
25	8					24.6	41.4			
			CL	Sandy Lean Clay - Gray sandy lean clay.						
30	9				Hole terminated at 30.5' on 11/2/17. Hole washed to 34' on 5/15/18 and advanced to 50.5'	52.7	52.4			
35	10									

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
			CH	Sandy Fat Clay - Greenish gray sandy clay, high plasticity.						
40	11									
45	12									
50	13									
				TERMINATED AT 50.5'						
55										
60										
65										
70										
75										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'35.1" **LONGITUDE:** W 81°53'52.8"
DATE DRILLED: 11/01/17 & 5/14/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): EST. 13' **DATE:** 11/01/17 & 5/14/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: CME-55 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0				Asphalt and Rock Base.	Hand augered to 4.5' Auto hammer from 4.5'- TERM					
	1		SP	Poorly Graded Sand - Brown fine sand.						
	2									
5	3									
			SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand, trace to some gravel (rock fragments and shell fragments).						
	4									
			SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand.						
10	5									
			SP	Poorly Graded Sand - Brown and gray fine sand.						
15	6									
			SC	Clayey Sand - Gray clayey fine sand.						
20	7									
			CL	Sandy Lean Clay - Gray sandy lean clay.						
25	8					38.3	72.2			
			SC	Clayey Sand - Gray clayey fine sand, trace to some gravel (cemented sands).						
30	9				Hole terminated AT 30.5' on 11/1/17. Hole washed to 34' on 5/14/18 and advanced to 50.5'					
35	10									

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
			CH	Sandy Fat Clay - Greenish gray sandy clay, high plasticity.						
40	11									
45	12									
50	13									
				TERMINATED AT 50.5'						
55										
60										
65										
70										
75										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'35.2" **LONGITUDE:** W 81°53'50.1"
DATE DRILLED: 11/01/17 & 5/14/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): EST. 12' **DATE:** 11/01/17 & 5/14/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: CME-55 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0				Asphalt and Rock Base.	Hand augered to 4.5' Auto hammer from 4.5'-TERM					
	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand, trace to some gravel (rock fragments and shell fragments).						
	2									
5			SC	Clayey Sand - Brown clayey fine sand.						
	3									
			SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand.						
	4									
10	5									
			SC	Clayey Sand - Gray clayey fine sand.						
15	6									
			SC-SM	Silty Clayey Sand - Dark brown silty clayey fine sand.						
20	7					25.1	12.8			
			SC	Clayey Sand - Light gray clayey fine sand.						
25	8									
			SC	Clayey Sand - Gray clayey fine sand, trace to some gravel (cemented sands).						
30	9				Hole terminated at 30.5' on 11/1/17. Hole washed to 34' on 5/14/18 and advanced to 50.5'	21.7	36.5			
35	10									

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
			CH	Sandy Fat Clay - Greenish gray sandy clay, high plasticity.						
40	11									
45	12									
50	13									
				TERMINATED AT 50.5'						
55										
60										
65										
70										
75										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: W 26°39'36.03" **LONGITUDE:** W 81°53'59.83"
DATE DRILLED: 5/16/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5.5' **DATE:** 5/16/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: LOCKLEY / BENAVIDES / SKEWIS **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: MOBILE B-57 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** SUN / CLOUDS / RAIN

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Dark brown to brown fine sand.						
	2									
	3									
5	4									
	5									
	6									
	7		SC-SM	Silty Clayey Sand - Brown silty clayey fine sand.						
10										
	8		SC-SM	Silty Clayey Sand - Gray silty clayey fine sand, trace to some gravel (limerock and shell fragments).						
15										
	9									
20				TERMINATED AT 20.5'						
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: W 26°39'34.75" **LONGITUDE:** W 81°53'59.50"
DATE DRILLED: 5/16/18 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5.0' **DATE:** 5/16/18

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: LOCKLEY / BENAVIDES / SKEWIS **LOGGED BY:** M. ELMORE, E.I.

DRILL MAKE & MODEL: MOBILE B-57 W/ AUTO **BIT:** 2-15/16" DIA. TRICONE ROLLER **DRILLING RODS:** AW
DRILLING METHOD: ROTARY WASH WITH DRILLING FLUID **WEATHER CONDITIONS:** SUN / CLOUDS / RAIN

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Dark brown to brown fine sand.						
	2									
	3									
5	4									
	5									
	6									
	7		SP-SM	Poorly Graded Sand with Silt - Gray slightly silty fine sand.						
10										
	8		SC-SM	Silty Clayey Sand - Gray silty clayey fine sand, trace to some gravel (limerock and shell fragments).						
15										
20	9			TERMINATED AT 20.5'						
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'40.4" **LONGITUDE:** W 81°53'49.8"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 2' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Dark brown slightly silty fine sand. (A-3)						
	2		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'42.3" **LONGITUDE:** W 81°53'51.9"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 3' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5	2		PT	Peat - Dark brown peat. (A-8)		241.7		28.9		
				TERMINATED AT 6.5'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'42.2" **LONGITUDE:** W 81°53'54.2"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 4' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown to gray slightly silty fine sand. (A-3)						
	2		SP	Poorly Graded Sand - Dark brown fine sand. (A-3)						
5				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'42.3" **LONGITUDE:** W 81°53'57.1"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Brown and gray to gray fine sand. (A-3)						
5	2			TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

REVIEWED BY: GARY A. DREW, P.E. **FILE NO:** 17-33-4571 **BORING NO.:** A-4

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'43.1" **LONGITUDE:** W 81°53'59.4"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 4' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand. (A-3)						
5	2		SC	Clayey Sand - Brown and gray clayey fine sand. (A-2-6)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'38.1" **LONGITUDE:** W 81°53'59.2"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 4.5' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand. (A-3)						
5	2		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'36.1" **LONGITUDE:** W 81°53'59.4"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand. (A-3)						
			SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5	2			TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'34.8" **LONGITUDE:** W 81°53'59.5"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 3.5' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5	2			TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'35.8" **LONGITUDE:** W 81°53'56.9"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand. (A-3)						
	2		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'38.9" **LONGITUDE:** W 81°53'54.6"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown to gray slightly silty fine sand. (A-3)						
5	2		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'36.3" **LONGITUDE:** W 81°53'53.9"
DATE DRILLED: 10/18/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 2' **DATE:** 10/18/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
	2		SP-SM	Poorly Graded Sand with Silt - Dark brown slightly silty fine sand. (A-3)						
5				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'35.1" **LONGITUDE:** W 81°53'45.9"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand. (A-3)						
			SM	Silty Sand - Gray silty fine sand. (A-2-4)						
	2					10.7	18.1			
5			GW	Well Graded Gravel - Gray coarse to fine gravel. (A-1-a)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'35.3" **LONGITUDE:** W 81°53'43.6"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand. (A-3)						
5	2		SM	Silty Sand - Gray silty fine sand. (A-2-4)		20.8	22.6			
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'36.4" **LONGITUDE:** W 81°53'40.1"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand. (A-3)						
5	2		PT	Peat - Dark brown peat. (A-8)						
				TERMINATED AT 8'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'37.2" **LONGITUDE:** W 81°53'37.6"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand. (A-3)						
5 ▼	2		PT	Peat - Dark brown peat. (A-8)		197.1		26.7		
				TERMINATED AT 7'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'37.9" **LONGITUDE:** W 81°53'34.7"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): 5' **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SM	Silty Sand - Brown and gray to gray slightly silty fine sand. (A-2-4)						
	2		SM	Silty Sand - Brown very silty fine sand. (A-4)		32.2	42.2			
5				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

REVIEWED BY: GARY A. DREW, P.E. **FILE NO:** 17-33-4571 **BORING NO.:** A-16

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'38.7" **LONGITUDE:** W 81°53'23.3"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown and gray slightly silty fine sand. (A-3)						
5	2		ML	Sandy Silt - Gray sandy silt. (A-4)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'39.4" **LONGITUDE:** W 81°53'30.1"
DATE DRILLED: 10/20/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 10/20/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP-SM	Poorly Graded Sand with Silt - Brown slightly silty fine sand. (A-3)						
				TERMINATED AT 2.5' DUE TO POSSIBLE UTILITY CONFLICT						
5										
10										
15										
20										
25										
30										
35										

BORING LOCATION: SEE BORING LOCATION PLAN
LATITUDE: N 26°39'40.4" **LONGITUDE:** W 81°53'27.3"
DATE DRILLED: 11/13/17 **START:** **FINISH:**
GROUND SURFACE ELEVATION: **TIME:**
WATER TABLE DEPTH (ft): NE **DATE:** 11/13/17

CLIENT: GREELEY AND HANSEN LLC
PROJECT: HANCOCK BRIDGE PARKWAY WATER MAIN IMP.
LOCATION: N. FT. MYERS, LEE CO., FL
DRILL CREW: WOOTEN / BENAVIDES **LOGGED BY:** M. ELMORE

DRILL MAKE & MODEL: N/A **BIT:** N/A **DRILLING RODS:** N/A
DRILLING METHOD: HAND-HELD BUCKET AUGER **WEATHER CONDITIONS:** PARTLY CLOUDY / HOT

DEPTH, FT.	SAMPLE NO.	GRAPHIC LOG	USCS	SOIL DESCRIPTION	REMARKS	% WATER CONTENT	PERCENT FINES	% ORGANIC CONTENT	LIQUID LIMIT	PLAST. INDEX
0	1		SP	Poorly Graded Sand - Brown fine sand. (A-3)						
5	2		SP-SM	Poorly Graded Sand with Silt - Gray slightly silty fine sand. (A-3)						
				TERMINATED AT 6'						
10										
15										
20										
25										
30										
35										

APPENDIX

- **SOIL BORING, SAMPLING AND TESTING METHODS**
  PROJECT SOIL DESCRIPTION PROCEDURE – UNIFIED & AASHTO

SOIL BORING, SAMPLING AND TESTING METHODS

STANDARD PENETRATION TEST

The Standard Penetration Test (SPT) is a widely accepted method of in-situ testing of foundation soils (ASTM D-1586). A 2-foot (0.6 m) long, 2-inch (50 mm) O.D. split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches (0.45 m) into the ground by successive blows of a 140-pound (63.5 Kg) hammer freely dropping 30 inches (0.76 m). The number of blows needed for each 6 inches (0.15 m) of penetration is recorded. The sum of the blows required for penetration of the second and third 6-inch (0.15 m) increments penetration constitutes the test result or N-value. After the test, the sampler is extracted from the ground and opened to allow visual description of the retained soil sample. The N-value has been empirically correlated with various soil properties allowing a conservative estimate of the behavior of soils under load. The following tables relate N-values to a qualitative description of soil density and, for cohesive soils, an approximate unconfined compressive strength (Qu):

Cohesionless Soils:

N-Value Safety Hammer	N-Value Auto Hammer	Description	Relative Density
< 4	< 3	Very loose	0 - 15%
4 - 10	3 - 8	Loose	15 - 35%
10 - 30	8 - 24	Medium dense	35 - 65%
30 - 50	24 - 40	Dense	65 - 85%
> 50	> 40	Very dense	85 - 100%

Cohesive Soils:

N-Value Safety Hammer	N-Value Auto Hammer	Description	Unconfined Compressive Strength, Qu
< 2	< 1	Very soft	< 0.25 tsf (25 kPa)
2 - 4	1 - 3	Soft	0.25 - 0.50 tsf (25 - 50 kPa)
4 - 8	3 - 6	Firm	0.50 - 1.0 tsf (50 - 100 kPa)
8 - 15	6 - 12	Stiff	1.0 - 2.0 tsf (100 - 200 kPa)
15 - 30	12 - 24	Very stiff	2.0 - 4.0 tsf (200 - 400 kPa)
> 30	> 24	Hard	> 4.0 tsf (400 kPa)

The tests are usually performed at 5-foot (1.5 m) intervals. However, more frequent or continuous testing is done by our firm through depths where a more accurate definition of the soils is required. The test holes are advanced to the test elevations by rotary drilling with a cutting bit, using circulating fluid to remove the cuttings and hold the fine grains in suspension. The circulating fluid, which is bentonitic drilling mud, is also used to keep the hole open below the water table by maintaining an excess hydrostatic pressure inside the hole. In some soil deposits, particularly highly pervious ones, flush-coupled casing must be driven to just above the testing depth to keep the hole open and/or prevent the loss of circulating fluid. After completion of a test boring, the hole is kept open until a steady state groundwater level is recorded. The hole is then sealed by backfilling with neat cement.

Representative split-spoon samples from each sampling interval and from different strata are brought to our laboratory in air-tight jars for classification and testing, if necessary. Afterwards, the samples are discarded unless prior arrangements have been made.

POWER AUGER BORINGS

Auger borings are used when a relatively large, continuous sampling of soil strata close to the ground surface is desired. A 4-inch (100 mm) diameter, continuous flight, helical auger with a cutting head at its end is screwed into the ground in 5-foot (1.5 m) sections. It is powered by the rotary drill rig. The sample is recovered by withdrawing the auger out of the ground without rotating it. The soil sample so obtained, is described and representative samples put in bags or jars and returned to the laboratory for classification and testing, if necessary.

HAND AUGER BORINGS

Hand auger borings are used, if soil conditions are favorable, when the soil strata are to be determined within a shallow (approximately 5-foot [1.5 m]) depth or when access is not available to power drilling equipment. A 3-inch (75 mm) diameter hand bucket auger with a cutting head is simultaneously turned and pressed into the ground. The bucket auger is retrieved at approximately 6-inch (0.15 m) intervals and its contents emptied for inspection. Sometimes post-hole diggers are used, especially in the upper 3 feet (1 m) or so. The soil sample obtained is described and representative samples put in bags or jars and transported to the laboratory for classification and testing, if necessary.

UNDISTURBED SAMPLING

Undisturbed sampling implies the recovery of soil samples in a state as close to their natural condition as possible. Complete preservation of in-situ conditions cannot be realized; however, with careful handling and proper sampling techniques, disturbance during sampling can be minimized for most geotechnical engineering purposes. Testing of undisturbed samples gives a more accurate estimate of in-situ behavior than is possible with disturbed samples.

Normally, we obtain undisturbed samples by pushing a 2.875-inch (73 mm) I.D., thin wall seamless steel tube 24 inches (0.6 m) into the soil with a single stroke of a hydraulic ram. The sampler, which is a Shelby tube, is 30 (0.8 m) inches long. After the sampler is retrieved, the ends are sealed in the field and it is transported to our laboratory for visual description and testing, as needed. Undisturbed sampling is noted on the boring logs as thus "U-".

LABORATORY TEST METHODS

Soil samples returned to our laboratory are looked at again by a geotechnical engineer or geotechnician to obtain more accurate descriptions of the soil strata. Laboratory testing is performed on selected samples as deemed necessary to aid in soil classification and to help define engineering properties of the soils. The test results are presented on the soil boring logs at the depths at which the respective sample was recovered, except that grain-size distributions or selected other test results may be presented on separate tables, figures or plates as discussed in this report, the results of which will be located in an Appendix. The soil descriptions shown on the logs are based upon visual-manual procedures in accordance with local practice. Soil classification is in general accordance with the Unified Soil Classification System (ASTM D-2487) and is also based on visual-manual procedures. Following is a list of abbreviations that may appear in the Remarks column on the boring logs indicating additional laboratory testing was performed, the results of which will usually be located in an Appendix.

DD: Unit Weight/Classification of Undisturbed "Shelby Tube" samples

PP: Pocket Penetrometer reading on cohesive samples in tons per sq. ft. (tsf)

k: Hydraulic Conductivity

Qu: Unconfined Compression Strength; ASTM D-2166

UU: Unconsolidated-Undrained Triaxial Test; ASTM D 2850

Consol: One-Dimensional Consolidation test performed on subsample from undisturbed sample; ASTM D-2435

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA[1]
For use with the ASTM D 2487 Unified Soil Classification System
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

BOULDERS (>12" [300 mm]) and COBBLES (3" [75 mm] TO 12" [300 mm]):

GRAVEL: Coarse Gravel: 3/4" (19 mm) to 3" (75 mm)
Fine Gravel: No. 4 (4.75 mm) Sieve to 3/4" (19 mm)

Descriptive adjectives:

0 – 5%	---	no mention of gravel in description
5 – 15%	---	trace
15 – 29%	---	some
30 – 49%	---	gravelly (shell, limerock, cemented sands)

SANDS

COARSE SAND: No. 10 (2 mm) Sieve to No. 4 (4.75 mm) Sieve
MEDIUM SAND: No. 40 (425 μm) Sieve to No. 10 (2 mm) Sieve
FINE SAND: No. 200 (75 μm) Sieve to No. 40 (425 μm) Sieve

Descriptive adjectives:

0 – 5%	---	no mention of sand in description
5 – 15%	---	trace
15 – 29%	---	some
30 – 49%	---	sandy

SILT/CLAY: < #200 (75 μm) sieve

SILTY OR SILT: PI < 4
SILTY CLAYEY OR SILTY CLAY: 4 ≤ PI ≤ 7
CLAYEY OR CLAY: PI > 7

Descriptive adjectives:

0 – 5%	--- clean (no mention of silt or clay in description)
5 – 12% to 15%	--- slightly
16 – 35%	--- clayey, silty, or silty clayey
36 – 49%	--- very

ORGANIC SOILS

Organic Content	Descriptive adjectives	Classification
0 – 2.5%	no mention of organics in description	See above
2.6 – 5%	slightly organic	See above
5 – 20%	organic	Add "with organic fines" to group name

THE PROJECT SOIL DESCRIPTION PROCEDURE FOR SOUTHWEST FLORIDA(1)
For use with the ASTM D 2487 Unified Soil Classification System
CLASSIFICATION OF SOILS FOR ENGINEERING PURPOSES

HIGHLY ORGANIC SOILS AND MATTER

Organic Content	Description	Classification
20-75%	highly organic sand or muck	Peat (PT)
	sandy peat	Peat (PT)
>75%	amorphous or fibrous peat	Peat (PT)

STRATIFICATION AND STRUCTURE

Descriptive Term with interbedded	Thickness
seam:	less than 1/2-inch (13 mm) thick
layer:	1/2 to 12-inches (13 to 300 mm) thick
stratum:	more than 12-inches (300 mm) thick
pocket:	small, erratic deposit, usually less than 1-foot
occasional:	one or less per foot of thickness
frequent:	more than one per foot of thickness
calcareous:	containing calcium carbonate (reaction to diluted HCL)
hardpan:	spodic horizon usually medium dense
marl:	mixture of carbonate clays, silts, shells and sands.

ROCK CLASSIFICATION

Description
Hard Limestone or Caprock – N-values >50 bpf
Soft Weathered Limestone – N values <50 bpf

---

(1) This soil description procedure was developed specifically for projects in southwest Florida because it is believed that the terminology will be better understood as a result of local practice. It is not intended to supplant other visual-manual classification procedures for description and identification of soils such as ASTM D 2488. BY: G.A. DREW, P.E. (1995) (Revised 2016).

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D2487)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K,L,M,N] / Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K,L,M,P] / Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.