

Attachment 4

**REPORT OF THE
GEOTECHNICAL INVESTIGATION**

**SUBURBAN PIPELINE PROJECT - PHASE II
WATER DISTRIBUTION SYSTEM
MANATEE COUNTY, FLORIDA**

December 16, 2009

Manatee County Government
1022 - 26th Avenue East
Bradenton, Florida 34208

Attention: Mr. Chuck Froman
Project Manager

**RE: Report of the Geotechnical Investigation
Suburban Pipeline Project - Phase II
Water Distribution System
Manatee County, Florida
Our File: DES 096393
Work Assignment #9
IFAS # WO900254**

Dear Chuck:

Pursuant to prior authorization and the above referenced Work Assignment #9, **DRIGGERS ENGINEERING SERVICES, INC.** has completed the geotechnical investigation for Phase II of the subject project. Presented herein are the results of our field and laboratory studies together with a general discussion of subsurface soil and groundwater conditions along the proposed pipeline alignments. Results of our geotechnical studies for Phase I of the project were submitted in our report dated July 8, 2009.

GEOTECHNICAL INVESTIGATION PROGRAM

A program of shallow depth exploratory borings and laboratory classification testing was undertaken to characterize the general nature of the subsurface soils and potential impacts with respect to the planned potable water distribution system.

FIELD INVESTIGATION - Plates I-A through I-DD of the report attachments identify the respective positioning of forty-two (42) shallow classification borings which were generally spaced at the requested nominal 500 feet apart to investigate soil and groundwater conditions. The classification borings were typically advanced to the requested depth of 8 feet below existing grade. The locations of the classification borings were selected in the field by our personnel utilizing the 60% Design Submittal pipeline alignment plans, dated September, 2009, recently provided by CH₂M Hill, and the marked locations of existing buried utility lines. The boring locations depicted are considered approximate since they were not surveyed. While some ground surface spot elevations are shown on the plans provided to us, ground surface elevations at the boring locations were not provided and no estimates were made from the available data.

The classification borings were conducted utilizing hand auger equipment wherein the soils were classified virtually continuously below existing grades to the termination depth. Logs of the classification borings are presented in the report attachments reflecting visual together with estimated Unified Soil Classification. Groundwater depths measured during the course of our field investigation are noted on each respective boring log.

LABORATORY CLASSIFICATION TESTS - A limited laboratory classification testing program was undertaken to aid in characterizing the engineering properties of the subsurface soils. Our laboratory tests included grainsize analyses, Atterberg liquid and plastic limits and organic content tests. Selected samples were also tested for corrosivity potential. Results are presented on the Summary of Laboratory Test Results in the appendix. Results of the grainsize analyses are included in the report attachments reflecting the percent finer (by weight) versus the equivalent grain diameter or U.S. Standard Sieve size.

GENERALIZED SUBSURFACE CONDITIONS

The results of our classification borings indicate that the subsurface soils typically consist of fine sands comprising the SP to SP-SM Unified Soil Classifications. Also penetrated were occasional zones of silty to clayey sands (SM to SC soils) interbedded with the relatively cleaner sands. Based upon our laboratory testing program, the fine sands typically contain minimal silt and clay fines, less than 10% by weight. However, some of the silty to clayey sand seams exhibited fines contents of up to nearly 40 percent, with the clayey sands exhibiting low to moderate plasticity characteristics. Some of the sands also contained traces to various concentrations of shell and occasional rock fragments.

Note also that thin seams of organic sands and peat (muck) were encountered within a depth range of about 1.5 to 5.5 feet at boring locations HA-2-7 and HA-2-9. Results of organic content testing suggest that these soils have organic contents in the range of 9.7 to 11.9 percent, by weight. Other zones of organic stained sands with organic contents less than 5 percent were also penetrated at boring locations HA-2-10, HA-2-11, HA-2-27, HA-2-32 through HA-2-38 and HA-2-40.

An exception to the general trend occurred at boring location HA-2-3 where refusal to hand auger penetration was encountered at a depth of 4.0 feet. Note that at several boring locations in Phase I of the project, a discontinuous, thin rock unit was first encountered at varying depths ranging from about 0.8 to 5 feet beneath present grades. Review of the Manatee County Soil Survey indicates some areas of Broward and Wabasso Variant soils within the project limits. The typical profile of these soil types indicates that shallow depth limestone, limestone boulders or gravel may exist.

Groundwater was typically measured within a depth range of 3.3 to 7.9 feet below existing grade at the time of our geotechnical studies. At several locations, groundwater was not evident within the boring completion depth of 8 feet beneath present grade. It should be noted that these classification borings were conducted from the middle of November to early December, following the typical wet season. There is certainly the potential for groundwater to occur at shallower depths in response to more frequent or prolonged rainfall. Water may also occur in a temporarily perched state above the low permeability silty to clayey sand zones.

The Soil Survey indicates the presence of EauGallie-Myakka, Felda, Chobee, Okeelanta and Canova soils, in addition to the aforementioned Broward and Wabasso Variant soils, in the project area. Under natural conditions, seasonal high groundwater levels for EauGallie-Myakka soils would be between 0.5 and 1.5 feet below grade. Seasonal high groundwater for Felda, Chobee and Okeelanta soils may occur within a foot of the ground surface. Depressional soils such as Canova soils may, under natural conditions, have water levels above the ground surface. It should be noted that the Soil Survey estimates do not consider the effects of development and drainage improvements, all of which can affect groundwater levels. It appears that any depressional areas were filled during development of the area. In consideration of the time of year, the antecedent rainfall and the Soil Survey information, we would anticipate no more than a nominal 1.5 foot rise in groundwater above current water levels during the normal wet season. Confirmation of potential seasonal fluctuations would necessitate installing shallow piezometers and monitoring groundwater levels during the wet season.

GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

PLANNED CONSTRUCTION - The project area is west of U. S. 41 and is bounded roughly by 26th Street West on the west, 53rd Avenue West on the north and 58th Avenue Drive on the South. We understand that the project will include the construction of 6-inch and 8-inch diameter HDPE potable water mains. Based upon plans provided and discussions with Mr. Bob Cannarella, P.E. with CH₂M Hill, the water mains will generally be constructed utilizing either directional drilling or standard cut and cover construction, with a minimum of 3 feet of cover and a burial depth of no more than about 5 feet in order to facilitate service and other connections. The main pipelines will generally be located outside of existing pavements, with services crossing beneath the existing streets.

PIPELINE SUBGRADE CONDITIONS - Our geotechnical studies suggest that the subgrade soils within the depth of exploration typically consist of fine sands containing some to minimal silt fines. These soil types should generally be suitable for pipe support provided that the subgrade is prepared in accordance with project specifications. In general, this will necessitate appropriate compaction at the bottom of excavation and throughout backfill soils required to re-establish existing grades in accordance with Manatee County specifications.

SUITABILITY OF EXCAVATED SOILS FOR USE AS BACKFILL - Fine sands indicated in our geotechnical studies will represent suitable materials for replacement and compaction as backfill following pipeline installation. These fine sands comprising the SP to SP-SM Unified Soil Classification should respond effectively to conventional vibratory compaction. Results of corrosivity testing suggest that the soils along the pipeline routes fall within the "Moderately Aggressive" FDOT corrosivity classification.

Where silty to clayey sands were evidenced, these soils typically occurred in relatively thin layers. Accordingly, the soils with increased fines and some plasticity can probably be mixed with the cleaner sands during the excavation and backfilling process to improve the workability of these soils. Similarly, the thin organic zones evidenced in several of the borings can probably be mixed with the overlying and underlying sands and incorporated in the backfill. Where highly organic soils or plastic soils may exist near the bottom of the excavation or in greater thickness than suggested by the program of borings, it may be necessary to undercut the highly organic or plastic soils at least 2 feet and replace these materials with properly compacted granular backfill or gravel so as to produce a firm and unyielding subgrade for subsequent pipeline construction and backfilling operations.

While refusal to hand auger penetration was encountered at only a single location, the exploratory borings conducted for Phase I of the project and the Soil Survey information indicate that shallow depth limestone, limestone boulders and limestone gravel could be present in some areas. Gravel sized material may be incorporated within the sandy backfill soils. Rocks larger than about 3 inches should be excluded. Of course, rocks and oversize materials should be excluded from the pipe zone to minimize the potential for damage to the pipe.

It is important to recognize that the soils may exist in a very low natural moisture content depending upon the rainfall occurring at the time of construction or at high moisture contents when excavated below the water table. Accordingly, the soils may require some adjustment in moisture content to achieve efficient and effective compaction. In general, it is beneficial to adjust moisture contents to within $\pm 2\%$ of the optimum moisture as established by the Standard Proctor moisture-density relationship as set forth in AASHTO T-99.

CONSTRUCTION CONSIDERATIONS - We understand that much of the pipeline may be installed utilizing directional drilling. Care must be exercised during the directional drilling process in order to appropriately stabilize the horizontal borehole with drilling slurry so as to avoid potential caving of overlying soils that could cause unacceptable settlements to overlying or adjacent utilities, structures and pavements. Conversely, one must avoid over-pressuring the drilling slurry that could result in unacceptable discharge of drilling slurry to the ground surface. Shallow depth rock zones, which the Soil Survey suggests may exist in some areas, could also affect directionally drilled pipeline construction.

Portions of the pipeline, and certainly connections, will be constructed utilizing open-cutting and backfilling following pipeline installation. Depending on the depth of the cut, it may be necessary to adjust the excavation slope ratios to no steeper than about 1.5 horizontal to 1.0 vertical in order to minimize sloughing or caving during the backfilling operations. Utilization of this slope ratio will necessitate proper dewatering, where necessary, and protection of the slope with respect to erosion and sloughing. Alternatively, trench-box construction would be considered in lieu of a sloped excavation. Naturally, the contractor must comply with applicable OSHA requirements with respect to trench safety.

In anticipation of cut depths typically 4 to 5 feet or less, we would not anticipate the need for a significant amount of construction dewatering throughout the project. Of course, abnormal rainfall could produce higher than expected groundwater levels and necessitate some local management of groundwater during pipeline construction. In that event, we would envision that the dewatering could be effectively

accomplished by the application of a nominal 12 inch gravel drainage blanket of durable, washed limerock, granite or crushed concrete having a grading of no coarser than an FDOT No. 89. The gravel drainage blanket could then be used in conjunction with interior sumping in order to control groundwater levels below the invert of the pipeline and allow appropriate placement and compaction of the subgrade and backfill.

CONSTRUCTION INSPECTION AND TESTING - The authorized geotechnical investigation consisted of a series of relatively widely spaced, hand advanced classification borings intended to identify generalized subsurface conditions that may be expected throughout the project limits. Clearly, the potential exists that localized variations or unexpected conditions may occur that would warrant modifications in construction procedures. Accordingly, it will be important to implement an appropriate program of geotechnical inspection of any open cuts during the construction stage to assist in identifying any such anomalous conditions and to provide economical recommendations for any necessary remediation. Inspection should be performed by a qualified geotechnical inspector familiar with the detailed contents of this report.

Additionally, additional more closely spaced borings are suggested particularly in the vicinity of boring HA-2-3 where refusal to hand auger penetration was encountered, to aid in identifying the limits of the shallow depth rock zone. As noted, the Soil Survey suggests that this rock zone could be more widespread than suggested by the authorized soil boring program.

Compaction testing will also be required during the subgrade preparation and backfilling operations to check that the soils are being compacted in accordance with Manatee County compaction requirements. The compaction tests should be conducted in such a manner so as to check that all of the backfill soils are being uniformly densified to project specification requirements.

LIMITATIONS - The geotechnical investigation program was undertaken to provide general information to assist in the design and construction of the planned facilities. Our investigation may not have included all information that the prospective contractor may require in the preparation of his bid proposal. The contractor is certainly encouraged to conduct such additional studies as he may deem necessary to qualify his proposal.

Our geotechnical investigation was limited to an examination of subsurface soil and groundwater conditions so as to address geotechnical design and construction issues. Studies relative to environmental issues or impacts was not within the authorized scope of services.

DRIGGERS ENGINEERING SERVICES, INC. appreciates the opportunity to serve you during this phase of the design stage of the water distribution system. Should you have any questions concerning our report, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

DRIGGERS ENGINEERING SERVICES, INC.

Nicholas T. Korecki

Nicholas T. Korecki, P.E.
Senior Geotechnical Engineer
FL Registration No. 45529



F. Jaime Driggers

F. Jaime Driggers, P.E.
President

FL Registration No. 16989

NTK

NTK-REP\096393-II

Copies submitted: (3) Manatee County Government.; Attn: Chuck Froman
(2) CH₂M Hill.; Attn: Mr. Bob Cannarella, P.E.

APPENDIX

PLATES I-A THROUGH 1-DD - TEST BORING LOCATION PLANS

HAND AUGER BORING LOGS

SUMMARY OF LABORATORY TEST RESULTS

GRAINSIZE ANALYSES

PLATES I-A THROUGH 1-DD - TEST BORING LOCATION PLANS

HAND AUGER BORING LOGS



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
	WATER TABLE: 6.8'	DATE: 11/30/09
TECHNICIAN: M.B.	DATE: 11/30/09	COMPLETION DEPTH: 8.0'
LOCATION: See Plate I-DD	TEST NUMBER: HA2-1	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brown Fine SAND with trace of shell and limestone fragments (SP)	0	▽ ○	
	Brown and light brown Fine SAND with trace of shell fragments (SP)		▽ ▽	
	Tan and light gray Fine SAND with trace of roots (SP)	2	▽ /	
	Gray slightly silty Fine SAND with shell fragments (SP-SM)		▽ ▽	
	Very light gray Fine SAND with trace of shell fragments (SP)	4	▽ ▽	
	Dark grayish-brown slightly silty Fine SAND (SP-SM)	6	▽ ▽	
	Dark grayish-brown clayey Fine SAND (SC)		▽ ▽	
	Brown Fine SAND (SP)	8	▽ ▽	
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.M.		WATER TABLE: See "Note"	DATE: 11/17/09
LOCATION: See Plate I-A		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-2	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with some roots (SP)	0		
	Gray Fine SAND with limestone fragments (SP)			
	Brown Fine SAND (SP)	2		
	Brownish-gray slightly silty Fine SAND with shell and limestone fragments (SP-SM)			
		4		
	Brown Fine SAND (SP)			
	Brownish-gray Fine SAND with some shell fragments and trace of dark brown Fine SAND (SP)			
		6		
		8		
		10		
		12		
		14		

Note: Water Table not encountered within depth of 8.0'.



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HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.R.		WATER TABLE: See "Note"		DATE: 11/17/09
LOCATION: See Plate I-X		DATE: 11/17/09	COMPLETION DEPTH: 4.0' *	
		TEST NUMBER: HA2-3		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brownish-gray Fine SAND with some roots and shell fragments (SP)	0		
	Dark gray Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
	Light brown clayey Fine SAND with light orange veins (SC)			
	Light brownish-gray slightly silty, slightly clayey Fine SAND (SP-SM)	4		
				* Encountered refusal at depth 4.0'. Attempted Boring at 4 Locations.
				Note: Water Table not encountered within depth of 4.0'.
		6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.M.		WATER TABLE: 6.0'	DATE: 11/17/09
LOCATION: See Plate I-B		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-4	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with roots (SP)	0		
	Dark gray Fine SAND with some pockets of weakly cemented, clayey Fine SAND (SP/SC)	2		
	Brown Fine SAND with seams of dark gray clayey Fine SAND (SP/SC)			
	Grayish-brown silty, slightly clayey Fine SAND (SM)	4		
		6		
	Tan and light brown Fine SAND (SP)			
	Light grayish-brown Fine SAND with shell fragments (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: M.M.		WATER TABLE: 5.6'	DATE: 11/17/09	
LOCATION: See Plate I-B		DATE: 11/17/09	COMPLETION DEPTH: 8.0'	
		TEST NUMBER: HA2-5		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Dark brown Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
		4		
	Dark brown Fine SAND (SP)			
		6		
	Light brown Fine SAND (SP)			
		8		
		10		
	12			
	14			



HAND AUGER BORING LOG					
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393			CLIENT: Manatee County		
			WATER TABLE: 4.9'		DATE: 11/17/09
TECHNICIAN: M.M.			DATE: 11/17/09		COMPLETION DEPTH: 8.0'
LOCATION: See Plate I-C			TEST NUMBER: HA2-6		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS	
	Brown Fine SAND with roots (SP)	0			
	Dark reddish-brown Fine SAND (SP)	2			
	Light brown Fine SAND (SP)				
	Brown Fine SAND (SP)	4			
	Light brown Fine SAND (SP)				
		6			
	Tan Fine SAND (SP)				
		8			
		10			
		12			
		14			

Suburban Pipeline Project - Phase II
Manatee County, Florida
Project No.: DES 096393

Manatee County

4.9'

11/17/09

M.M.

11/17/09

8.0'

See Plate I-C

HA2-6

REMARKS



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
TECHNICIAN: M.M.	WATER TABLE: 5.7'	DATE: 11/17/09
LOCATION: See Plate I-C	DATE: 11/17/09	COMPLETION DEPTH: 8.0'
TEST NUMBER: HA2-7		

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark grayish-brown Fine SAND with roots (SP)	0		
	Very dark brown organic, slightly silty Fine SAND (SP-SM/Pt)	2		
	Dark brown Fine SAND with some roots (SP)	4		
		6		
		8		
		10		
		12		
		14		



HAND AUGER BORING LOG				
PROJECT:		CLIENT:		
Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		Manatee County		DATE:
TECHNICIAN:		WATER TABLE:		11/17/09
M.M.		5.8'		COMPLETION DEPTH:
LOCATION:		DATE:		8.0'
See Plate I-D		11/17/09		
		TEST NUMBER:		
		HA2-8		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brown Fine SAND with roots (SP)	0		
	Grayish-brown Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
	Mottled gray and brown Fine SAND (SP)			
		4		
	Brown Fine SAND (SP)			
		6		
		8		
		10		
		12		
		14		

PROJECT:

Suburban Pipeline Project - Phase II
Manatee County, Florida
Project No.: DES 096393

CLIENT:

Manatee County

WATER TABLE:

5.8'

DATE:

11/17/09

TECHNICIAN:

M.M.

DATE:

11/17/09

COMPLETION DEPTH:

8.0'

LOCATION:

See Plate I-D

TEST NUMBER:

HA2-8

ELEV.
(FT)

DESCRIPTION

DEPTH
(FT)

SYMBOL

REMARKS

Brown Fine SAND with roots (SP)

0

Grayish-brown Fine SAND (SP)

2

Brown Fine SAND (SP)

Mottled gray and brown Fine SAND (SP)

4

Brown Fine SAND (SP)

6

8

10

12

14



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.M.		WATER TABLE: 7.1'	DATE: 11/17/09
LOCATION: See Plate I-D		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-9	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brown Fine SAND (SP)	0		
	Brownish-gray Fine SAND (SP)	2		
	Light gray Fine SAND (SP)			
	Very dark brown organic Fine SAND with trace of roots (SP-SM/Pt)	4		
	Dark reddish-brown Fine SAND (SP)	6		
	Very dark brown slightly organic Fine SAND (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 7.7'	DATE: 11/17/09
LOCATION: See Plate I-F		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-10	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with some roots (SP)	0		
	Gray Fine SAND (SP)	2		
	Very dark brown slightly organic Fine SAND (SP)			
		4		
	Dark reddish-brown Fine SAND (SP)			
	Dark brown Fine SAND (SP)	6		
	Reddish-brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.R.		WATER TABLE: 5.3'		DATE: 11/17/09
LOCATION: See Plate I-F		DATE: 11/17/09		COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-11		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with some roots (SP)	0		
	Light brown Fine SAND (SP)	2		
	Tan Fine SAND (SP)			
		4		
	Dark brown slightly silty Fine SAND with finely divided organic material (SP-SM)			
		6		
	Brown Fine SAND (SP)			
	Light brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 5.5'	DATE: 11/17/09
LOCATION: See Plate I-E		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-12	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Mottled gray and brown Fine SAND with trace of roots (SP)	0		
	Tan Fine SAND (SP)			
		2		
	Grayish-brown Fine SAND (SP)	4		
	Dark grayish-brown Fine SAND (SP)			
		6		
	Brown Fine SAND (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.R.		WATER TABLE: 6.0'		DATE: 11/17/09
LOCATION: See Plate I-G		DATE: 11/17/09		COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-13		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brown Fine SAND with trace of roots (SP)	0		
	Light grayish-brown Fine SAND (SP)			
		2		
	Light brown slightly silty Fine SAND with light orange veins (SP-SM)			
		4		
	Light brown Fine SAND (SP)			
		6		
	8			
	10			
	12			
14				



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
	WATER TABLE: 6.6'	DATE: 11/17/09
TECHNICIAN: M.M.	DATE: 11/17/09	COMPLETION DEPTH: 8.0'
LOCATION: See Plate I-H	TEST NUMBER: HA2-14	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Light brown Fine SAND with trace of roots (SP)	0	/ \	
	Tan Fine SAND with limestone fragments (SP)		o o o o	
		2		
	Tan Fine SAND (SP)		o o o o	
	Light brown slightly silty Fine SAND (SP-SM)			
	Light grayish-brown Fine SAND (SP)	4	o o o o	
	Tan Fine SAND (SP)			
			o o o o	
		6		
			o o o o	
		8		
			o o o o	
		10		
			o o o o	
		12		
			o o o o	
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
TECHNICIAN: M.M.	WATER TABLE: 7.8'	DATE: 11/17/09
LOCATION: See Plate I-J	DATE: 11/17/09	COMPLETION DEPTH: 8.0'
TEST NUMBER: HA2-15		

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark grayish-brown Fine SAND with roots (SP)	0		
	Light brown Fine SAND (SP)			
		2		
		4		
	Tan Fine SAND (SP)			
		6		
	Light grayish-brown slightly silty Fine SAND with shell fragments (SP-SM)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 7.4'	DATE: 11/17/09
LOCATION: See Plate I-J		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-16	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brownish-gray Fine SAND with some roots (SP)	0		
	Light brown Fine SAND (SP)	2		
	Light brown clayey Fine SAND with light orange veins (SC)			
		4		
	Light brown Fine SAND (SP)			
	Tan Fine SAND (SP)	6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 6.3'	DATE: 11/17/09
LOCATION: See Plate I-I		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-17	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brownish-gray Fine SAND with some roots (SP)	0		
	Light brown Fine SAND (SP)			
	Light brown Fine SAND with some shell fragments (SP)	2		
		4		
	Light brown Fine SAND with thin seams of dark brown Fine SAND (SP)	6		
	Light brown Fine SAND with abundant shell fragments (SP)			
	Light grayish-brown Fine SAND (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.M.		WATER TABLE: 7.2'	DATE: 11/17/09
LOCATION: See Plate I-K		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-18	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with some roots (SP)	0		
	Light gray Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
	Light brown Fine SAND (SP)			
	Light brown silty, slightly clayey Fine SAND with light orange veins (SM)	4		
	Light brown Fine SAND (SP)			
	Tan Fine SAND with abundant shell fragments (SP)	6		
	Light brownish-gray Fine SAND with shell fragments (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.R.		WATER TABLE: 7.5'	DATE: 11/17/09	
LOCATION: See Plate I-L		DATE: 11/17/09	COMPLETION DEPTH: 8.0'	
		TEST NUMBER: HA2-19		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brownish-gray Fine SAND with trace of roots (SP)	0		
	Light grayish-brown Fine SAND (SP)			
		2		
	Light brown Fine SAND (SP)	4		
	Light tan Fine SAND (SP)	6		
	Grayish-brown Fine SAND (SP)			
		8		
		10		
		12		
	14			



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: M.M.		WATER TABLE: See "Note"		DATE: 11/17/09
LOCATION: See Plate I-N		DATE: 11/17/09	COMPLETION DEPTH: 8.0'	
		TEST NUMBER: HA2-20		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with trace of roots (SP)	0	[Symbol: Dotted pattern with diagonal lines]	Note: Water Table not encountered within depth of 8.0'.
	Mottled light brown and tan Fine SAND (SP)	2	[Symbol: Dotted pattern]	
			[Symbol: Dotted pattern]	
	Brown slightly silty Fine SAND (SP-SM)	4	[Symbol: Dotted pattern with vertical lines]	
			[Symbol: Dotted pattern with vertical lines]	
	Brown Fine SAND (SP)	6	[Symbol: Dotted pattern with vertical lines]	
	Light brown Fine SAND (SP)		[Symbol: Dotted pattern with vertical lines]	
	Tan Fine SAND with abundant shell fragments (SP)	8	[Symbol: Dotted pattern with triangles]	
		10	[Symbol: Dotted pattern with triangles]	
		12	[Symbol: Dotted pattern with triangles]	
		14	[Symbol: Dotted pattern with triangles]	



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 7.3'	DATE: 11/17/09
LOCATION: See Plate I-N		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-21	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with trace of roots (SP)	0		
		2		
	Brown silty, slightly clayey Fine SAND (SM)	4		
	Light brown Fine SAND (SP)			
	Tan Fine SAND (SP)	6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.R.		WATER TABLE: 6.9'	DATE: 11/17/09
LOCATION: See Plate I-M		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-22	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brownish-gray Fine SAND with trace of roots (SP)	0		
	Light brown Fine SAND (SP)	2		
	Light brownish-gray slightly clayey Fine SAND (SP-SM)			
	Tan Fine SAND (SP)	4		
	Tan Fine SAND with abundant shell fragments (SP)	6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.M.		WATER TABLE: 7.3'	DATE: 11/17/09
LOCATION: See Plate I-O		DATE: 11/17/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-23	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brown Fine SAND with trace of roots (SP)	0		
	Mottled brown and gray Fine SAND with trace of cemented sand (SP)	2		
	Dark brown clayey Fine SAND (SC)			
	Light brownish-gray CLAY with seams of brown Fine SAND (CH/SP)	4		
	Light brownish-gray clayey Fine SAND with trace of roots (SC)			
		6		
	Light brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
	WATER TABLE: 7.4'	DATE: 11/17/09
TECHNICIAN: J.R.	DATE: 11/17/09	COMPLETION DEPTH: 8.0'
LOCATION: See Plate I-P	TEST NUMBER: HA2-24	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark grayish-brown Fine SAND with some roots (SP)	0		
	Brown Fine SAND (SP)			
		2		
	Light brown and brown clayey Fine SAND (SC)			
	Tannish-brown slightly silty Fine SAND (SP-SM)			
		4		
	Brown and light brown Fine SAND (SP)			
		6		
	Tan Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT:		CLIENT:		
Suburban Pipeline Project - Phase II		Manatee County		
Manatee County, Florida		WATER TABLE:		DATE:
Project No.: DES 096393		See "Note"		11/17/09
TECHNICIAN:		DATE:	COMPLETION DEPTH:	
M.M.		11/17/09	8.0'	
LOCATION:		TEST NUMBER:		
See Plate I-P		HA2-25		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Brownish-gray Fine SAND with trace of roots (SP)	0		Note: Water Table not encountered within depth of 8.0'.
	Brownish-gray Fine SAND (SP)			
		2		
	Light gray Fine SAND (SP)			
		4		
	Dark reddish-brown Fine SAND (SP)			
	Dark brown Fine SAND (SP)			
		6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.B.		WATER TABLE: 7.9'	DATE: 11/30/09
LOCATION: See Plate I-R		DATE: 11/30/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-26	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Tan and light brown Fine SAND with trace of roots (SP)	0		
		2		
	Dark brown slightly silty Fine SAND (SP-SM)	4		
	Brown and light brown Fine SAND (SP)			
	Tan and light brown Fine SAND (SP)	6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.B.		WATER TABLE: 7.9'	DATE: 11/30/09
LOCATION: See Plate I-Q		DATE: 11/30/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-27	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brown Fine SAND with roots and trace of finely divided organic material (SP)	0		
	Light grayish-brown Fine SAND with trace of roots (SP)			
		2		
	Tan silty Fine SAND with cemented sand fragments (SM)			
	Tan clayey Fine SAND (SC)	4		
	Tan Fine SAND with shell fragments (SP)			
		6		
	Tan Fine SAND with shell fragments and trace of cemented sand fragments (SP)			
	Light gray Fine SAND (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: M.B.		WATER TABLE: 6.9'	DATE: 11/30/09
LOCATION: See Plate I-S		DATE: 11/30/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-28	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Gray Fine SAND with roots (SP)	0		
	Light gray Fine SAND (SP)			
	Brown Fine SAND (SP)			
	Brown and light brown silty, slightly clayey Fine SAND (SM)	2		
	Light brown slightly silty, slightly clayey Fine SAND (SP-SM)			
	Light brown Fine SAND with shell fragments (SP)	4		
	Tan and light brown Fine SAND (SP)			
	Light tan and light brown Fine SAND with trace of shell fragments (SP)	6		
	Light brown Fine SAND with shell fragments (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: M.B.		WATER TABLE: 6.8'		DATE: 11/30/09
LOCATION: See Plate I-T		DATE: 11/30/09		COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-29		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brown and light gray Fine SAND (SP)	0		
	Light tan Fine SAND (SP)			
	Brown silty, slightly clayey Fine SAND (SM)			
	Light brown Fine SAND (SP)	2		
	Tan Fine SAND with shell fragments (SP)			
	Light gray Fine SAND with trace of shell fragments (SP)	4		
		6		
	Gray Fine SAND with shell fragments (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: S.F.		WATER TABLE: 6.3'	DATE: 11/30/09
LOCATION: See Plate I-AA		DATE: 11/30/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-30	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS	
	Dark gray and brown Fine SAND with roots (SP)	0			
	Gray and tan slightly silty, slightly clayey Fine SAND (SP-SM)	2			
	Tan and light gray Fine SAND with brown veins (SP)	4			
		6			
		8			
		10			
	12				



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
TECHNICIAN: S.F.	WATER TABLE: 5.3'	DATE: 11/30/09
LOCATION: See Plate I-T	DATE: 11/30/09	COMPLETION DEPTH: 8.0'
TEST NUMBER: HA2-31		

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brown and gray slightly silty Fine SAND with roots (SP-SM)	0		
	Brown slightly silty Fine SAND with rock and shell fragments (SP-SM)			
	Orangish-brown Fine SAND with trace of shell fragments (SP)			
	Light tan Fine SAND (SP)	2		
	Brown silty, slightly clayey Fine SAND (SM)	4		
	Tan Fine SAND with trace of shell fragments (SP)			
		6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: S.F.		WATER TABLE: 6.0'	DATE: 11/30/09
LOCATION: See Plate I-S		DATE: 11/30/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-32	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray slightly organic Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Dark brown slightly silty Fine SAND (SP-SM)			
	Brown Fine SAND (SP)	2		
		4		
	Dark brown slightly silty Fine SAND (SP-SM)			
	Gray and tan Fine SAND (SP)			
		6		
		8		
		10		
		12		
		14		

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.D.		WATER TABLE: 4.9'	DATE: 12/4/09	
LOCATION: See Plate I-U		DATE: 12/4/09	COMPLETION DEPTH: 8.0'	
TEST NUMBER: HA2-33				
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brown Fine SAND with trace of roots (SP)	0		
	Light brown Fine SAND with shell (SP)			
	Gray Fine SAND (SP)			
	Dark brown Fine SAND with finely divided organic material (SP)	2		
	Brown slightly silty Fine SAND (SP-SM)			
	Light brown Fine SAND (SP)			
		4		
	Brown Fine SAND (SP)			
		6		
	Very light grayish-brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.D.		WATER TABLE: 5.9'	DATE: 12/4/09
LOCATION: See Plate I-U		DATE: 12/4/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-34	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Light gray Fine SAND (SP)			
		2		
	Dark brown Fine SAND with finely divided organic material (SP)			
	Dark reddish-brown Fine SAND (SP)	4		
		6		
	Dark brown slightly silty Fine SAND (SP-SM)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
TECHNICIAN: J.D.	WATER TABLE: 7.3'	DATE: 12/4/09
LOCATION: See Plate I-AA	DATE: 12/4/09	COMPLETION DEPTH: 8.0'
TEST NUMBER: HA2-35		

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark grayish-brown slightly silty Fine SAND with trace of roots and gravel (SP-SM)	0		
	Gray Fine SAND with trace of roots (SP)			
		2		
	Dark brown Fine SAND with finely divided organic material (SP)			
		4		
	Reddish-brown Fine SAND (SP)			
		6		
	Light brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.D.		WATER TABLE: 6.9'	DATE: 12/4/09	
LOCATION: See Plate I-AA		DATE: 12/4/09	COMPLETION DEPTH: 8.0'	
		TEST NUMBER: HA2-36		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark brown Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Dark brown Fine SAND with roots and finely divided organic material (SP)	2		
	Brown to light brown Fine SAND (SP)			
	Light brown Fine SAND (SP)			
		4		
	Brown Fine SAND (SP)			
		6		
		8		
	10			
	12			
	14			



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.D.		WATER TABLE: 5.9'	DATE: 12/4/09
LOCATION: See Plate I-W		DATE: 12/4/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-37	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Gray and brown Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Dark brown Fine SAND with finely divided organic material (SP)	2		
	Brown Fine SAND (SP)			
	Light brown Fine SAND (SP)			
		4		
		6		
	Very light grayish-brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.D.		WATER TABLE: 4.0'	DATE: 12/4/09
LOCATION: See Plate I-V		DATE: 12/4/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-38	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark grayish-brown Fine SAND with roots (SP)	0		
	Gray Fine SAND (SP)			
	Dark brown Fine SAND with trace of finely divided organic material (SP)	2		
	Light brown Fine SAND with trace of roots (SP)			
		4		
	Orangish-brown slightly silty Fine SAND (SP-SM)			
		6		
	Very light grayish-brown Fine SAND (SP)			
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393	CLIENT: Manatee County	
TECHNICIAN: J.D.	WATER TABLE: 3.5'	DATE: 12/4/09
LOCATION: See Plate I-V	DATE: 12/4/09	COMPLETION DEPTH: 8.0'
TEST NUMBER: HA2-39		

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with roots (SP)	0		
	Grayish-brown Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
	Light brown Fine SAND (SP)			
		4		
		6		
		8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG				
PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County		
TECHNICIAN: J.D.		WATER TABLE: 5.5'	DATE: 12/4/09	
LOCATION: See Plate I-W		DATE: 12/4/09	COMPLETION DEPTH: 8.0'	
		TEST NUMBER: HA2-40		
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray Fine SAND with roots and finely divided organic material (SP)	0		
	Gray Fine SAND (SP)			
	Light gray Fine SAND (SP)			
	Dark brown slightly silty Fine SAND with finely divided organic material (SP-SM)	2		
	Brown Fine SAND (SP)	4		
	Light brown Fine SAND (SP)			
	Very light grayish-brown Fine SAND (SP)	6		
		8		
		10		
	12			
	14			



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.D.		WATER TABLE: 3.3'	DATE: 12/4/09
LOCATION: See Plate I-BB		DATE: 12/4/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-41	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Grayish-brown Fine SAND with trace of roots (SP)	0		
	Light brown Fine SAND with shell (SP)			
	Gray Fine SAND (SP)			
	Brown Fine SAND (SP)	2		
	Orangish-brown clayey Fine SAND (SC)			
	Light brown slightly silty Fine SAND with shell (SP-SM)	4		
	Very light grayish-brown Fine SAND (SP)	6		
	Brown Fine SAND (SP)	8		
		10		
		12		
		14		



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING LOG

PROJECT: Suburban Pipeline Project - Phase II Manatee County, Florida Project No.: DES 096393		CLIENT: Manatee County	
TECHNICIAN: J.D.		WATER TABLE: 3.9'	DATE: 12/4/09
LOCATION: See Plate I-CC		DATE: 12/4/09	COMPLETION DEPTH: 8.0'
		TEST NUMBER: HA2-42	

ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	REMARKS
	Dark gray slightly silty Fine SAND with trace of roots and gravel (SP-SM)	0		
	Grayish-brown Fine SAND with Crushed Limestone and pieces of asphalt (SP)			
	Gray Fine SAND (SP)	2		
	Dark brown slightly silty Fine SAND (SP-SM)			
	Orangish-brown clayey Fine SAND (SC)	4		
	Light tan cemented Fine SAND and shell (SP)			
	Light brown Fine SAND with shell (SP)			
	Light grayish-brown Fine SAND with trace of shell (SP)	6		
		8		
		10		
		12		
		14		

SUMMARY OF LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y _d (pcf)	G _s	ATTERBERG LIMITS				P.P. (tsf)	U.C.	CON	G.S.	ORG (%)	pH	Cl. (ppm)	SO ₄ (ppm)	RES. (Ohm-cm)
						LL	PL	SL										
HA-2-2	3.0' - 4.3'	Brownish-gray slightly silty Fine SAND with shell and limestone fragments											*					
HA-2-4	3.9' - 6.2'	Grayish-brown silty, slightly clayey Fine SAND											*					
HA-2-5	2.0' - 4.5'	Brown Fine SAND											*		6.3	38.9	60	17,000
HA-2-7	1.8' - 3.3'	Very dark brown organic slightly silty Fine SAND												11.9				
HA-2-8	3.1' - 4.2'	Mottled grayish-brown Find SAND											*					
HA-2-9	4.5' - 5.7'	Very dark brown organic Fine SAND with trace roots												9.7				
HA-2-10	3.0' - 4.7'	Very dark brown slightly organic Find SAND												3.9				
HA-2-11	4.0' - 6.0'	Dark brown slightly silty Fine SAND with finely divided organic material											*	1.2				
HA-2-12	1.0' - 3.5'	Tan Fine SAND											*					
HA-2-14	1.0' - 2.5'	Tan Fine SAND with limestone fragments											*					
HA-2-16	3.0' - 4.0'	Light brown clayey Fine SAND with light orange veins	8.8					28	20				*					
HA-2-18	3.7' - 4.3'	Light brown silty, slightly clayey Fine SAND with light orange veins	7.6					NP	NP				*					
HA-2-20	4.0' - 5.2'	Brown slightly silty Fine SAND											*					3,400
HA-2-21	0.0' - 3.5'	Grayish-brown Fine SAND with trace roots											*					
HA-2-23	4.5' - 6.3'	Light brownish-gray clayey Fine SAND with trace roots	16.3					25	11				*					
HA-2-26	0.0' - 3.7'	Light tan and brown Fine SAND with trace roots											*					
HA-2-27	0.0' - 0.8'	Dark brown Fine SAND with trace finely divided organic material and roots												2.9				
HA-2-27	2.8' - 4.0'	Tan silty Fine SAND with cemented sand fragments											*					

W %	=	Water Content	Con.	=	Consolidation Test	CLIENT:	Manatee County Government
Y _d (pcf)	=	Dry Density	G.S. (H)	=	Grainsize Analysis (Hydrometer)		
G _s	=	Specific Gravity	ORG. (%)	=	Organic Content		
LL	=	Liquid Limit	Cl. (ppm)	=	Total Chloride	PROJECT:	Suburban Pipeline, Phase II Manatee County, Florida
PL	=	Plastic Limit	SO ₄ (ppm)	=	Total Sulfate		
SL	=	Shrinkage Limit	RES. (ohm-cm)	=	Lab Resistivity		
P.P. (tsf)	=	Pocket Penetrometer	*	=	See Test Curves	FILE:	DES 09G393
U.C.	=	Unconfined Compression	**	=	Percent Passing No. 200 Sieve		

SUMMARY OF LABORATORY TEST RESULTS

[illegible]

W %	=	Water Content	Con.	=	Consolidation Test	CLIENT: Manatee County Government
Y _d (pcf)	=	Dry Density	G.S. (H)	=	Grainsize Analysis (Hydrometer)	
G _s	=	Specific Gravity	ORG. (%)	=	Organic Content	
LL	=	Liquid Limit	Cl. (ppm)	=	Total Chloride	PROJECT: Suburban Pipeline, Phase II Manatee County, Florida
PL	=	Plastic Limit	SO ₄ (ppm)	=	Total Sulfate	
SL	=	Shrinkage Limit	RES. (ohm-cm)	=	Lab Resistivity	
P.P. (tsf)	=	Pocket Penetrometer	*	=	See Test Curves	FILE: DES 096393
U.C.	=	Unconfined Compression	**	=	Percent Passing No. 200 Sieve	

GRAINSIZE ANALYSES

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -2	3.0'-4.3'					Brownish-gray silty fine sand with shell and limestone fragments

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

Manatee County, Florida

FILE: DES 096393

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2	3.9 ft - 6.2 ft					Grayish-brown silty, slightly clayey Fine SAND
4						

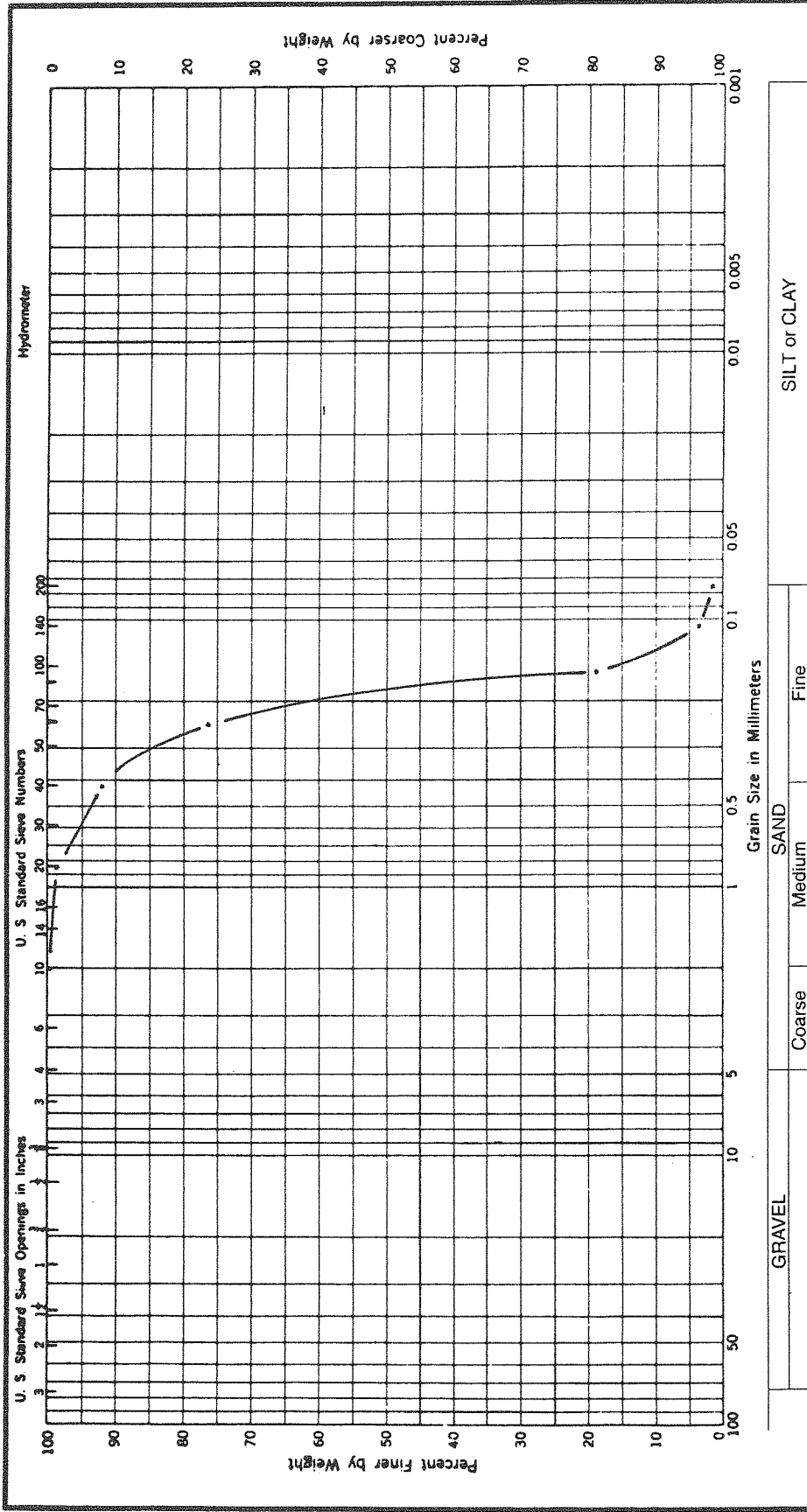
CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Manatee County, Florida

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2	2.0'-4.5'					Brown Fine SAND
-5						

GRAVEL

SAND

SILT or CLAY

Coarse

Medium

Fine

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
HA-2 -8	3.1'-4.2'					Mottled grayish-brown Fine SAND

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

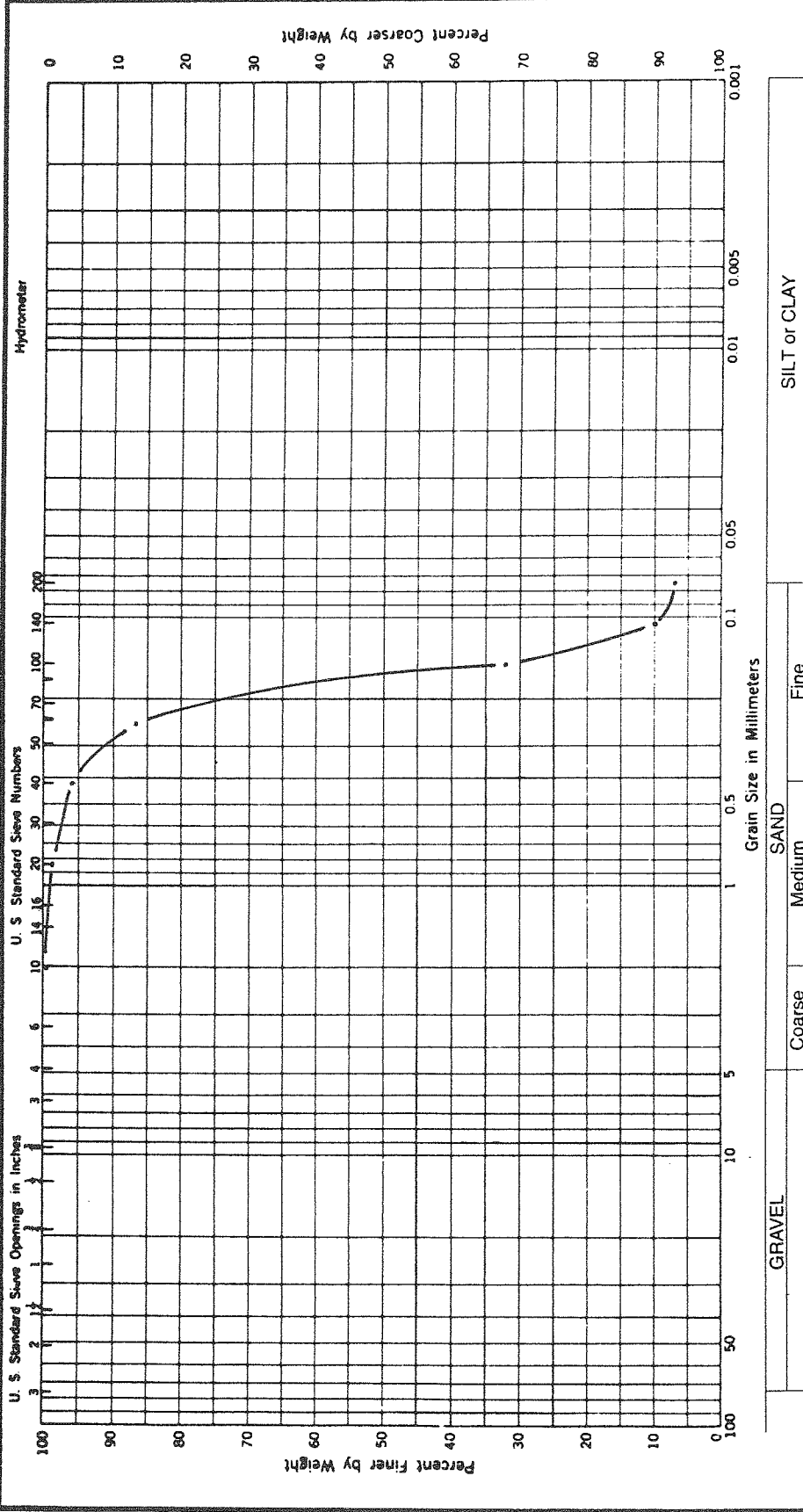
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CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

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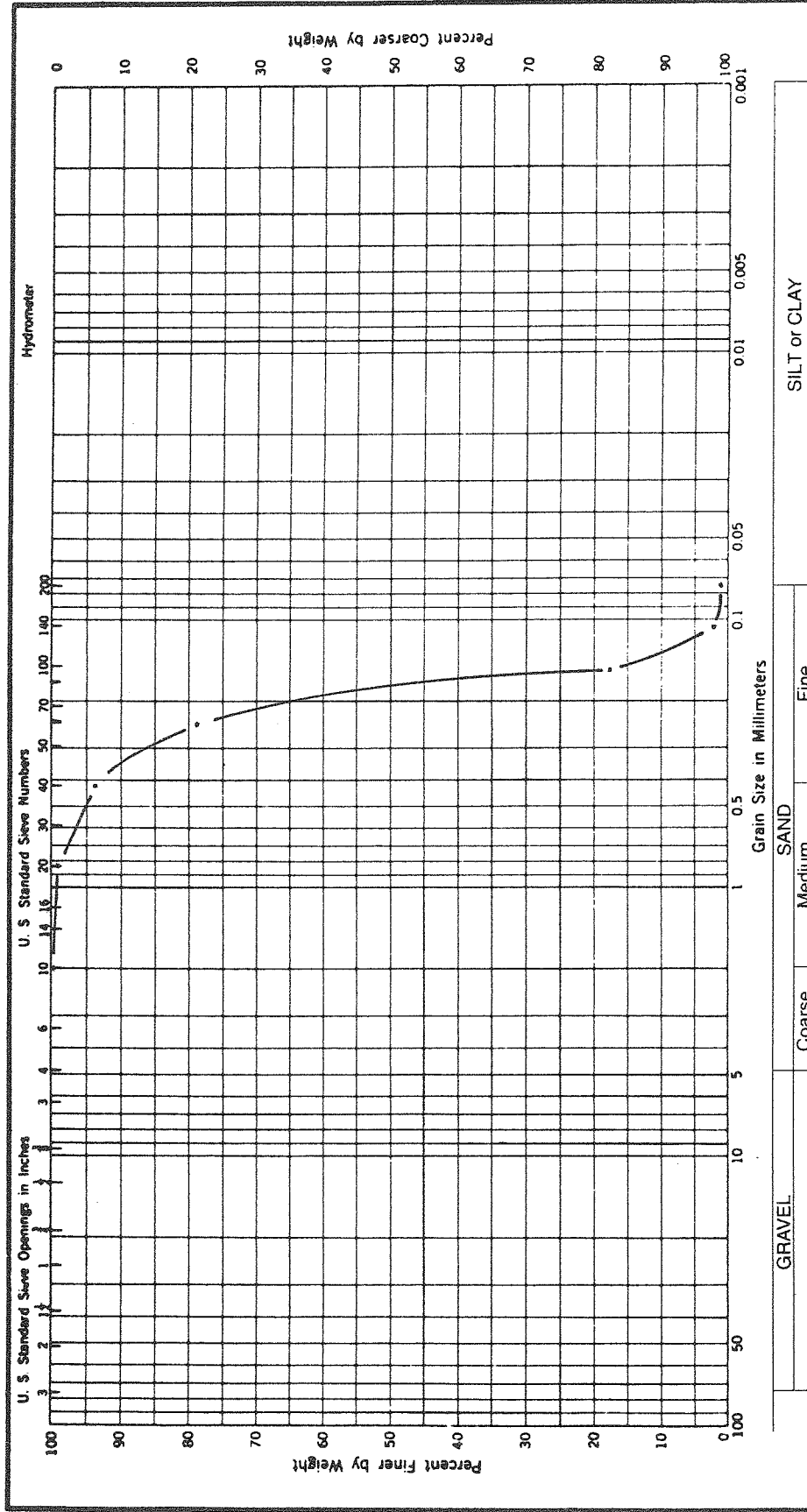
DRIGGERS ENGINEERING SERVICES, INC.



GRAVEL		SAND		SILT or CLAY	
Coarse	Medium	Fine			
Number	Depth	Natural Moisture	L.L.	P.L.	P.I.
HAT-2	4.0'-6.0'				
CLIENT: Manatee County Government PROJECT: Suburban Pipeline, Phase II FILE: DES 096393					

Classification
Dark brown slightly silty Fine SAND
with finely divided organic materials

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -12	1.0' - 3.5'					Tan Fine SAND

CLIENT:	Manatee County Government
PROJECT:	Suburban Pipeline, Phase II
FILE:	DES 096393

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2-14	1.0'-2.5'					Tan Fine SAND with limestone fragments

U. S. Standard Sieve Openings in Inches

100
3
2
1 1/2
1
3/4
3/8
1/4
1/8
3/16
1/16

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Percent Finer by Weight

100
90
80
70
60
50
40
30
20
10
0

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

U.S. Standard Sieve Numbers

10 20 30 40 50 60 70 80 100 120 140 160 200

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.6 1.18 2.5 5 10 20 40 75 150 300

GRAVEL

Coarse Medium Fine

SAND

Coarse Medium Fine

PERCENT COARSER BY WEIGHT

100
90
80
70
60
50
40
30
20
10
0

SILT or CLAY

100
90
80
70
60
50
40
30
20
10
0

U. S. Standard Sieve Numbers

10
20
30
40
50
60
70
80
100
120
140
160
200

Grain Size in Millimeters

0.075 0.15 0.3 0.

Number	Depth	Natural Moisture	L L.	P. L.	P. I.	Classification	CLIENT:	PROJECT:	FILE:
HA-2 -14	1.0'-2.5'					Tan Fine SAND with limestone fragments	Manatee County Government	Suburban Pipeline, Phase II	DES 096393
							Manatee County, Florida		

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -20	4.0'±-5.2'					Brown slightly silty Fine SAND

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Number	Depth	Natural Moisture	L L.	P. L.	P. I.	Classification
HA-2 -20	4.0'-5.2'					Brown slightly silty Fine SAND

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

Manatee County, Florida

FILE: DES 096393

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -21	0.0' - 3.5'					Grayish-brown Fine SAND with trace roots

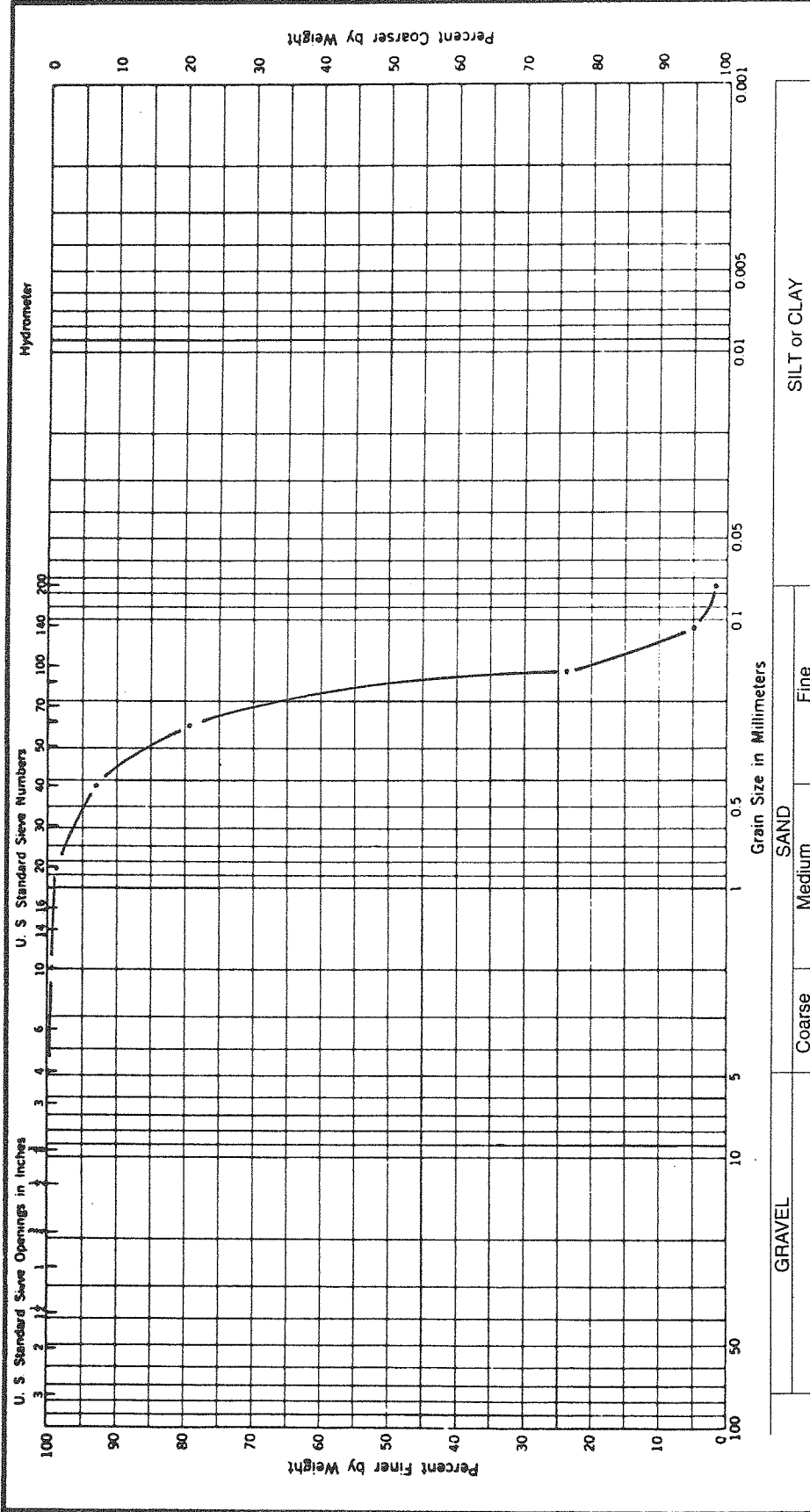
CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

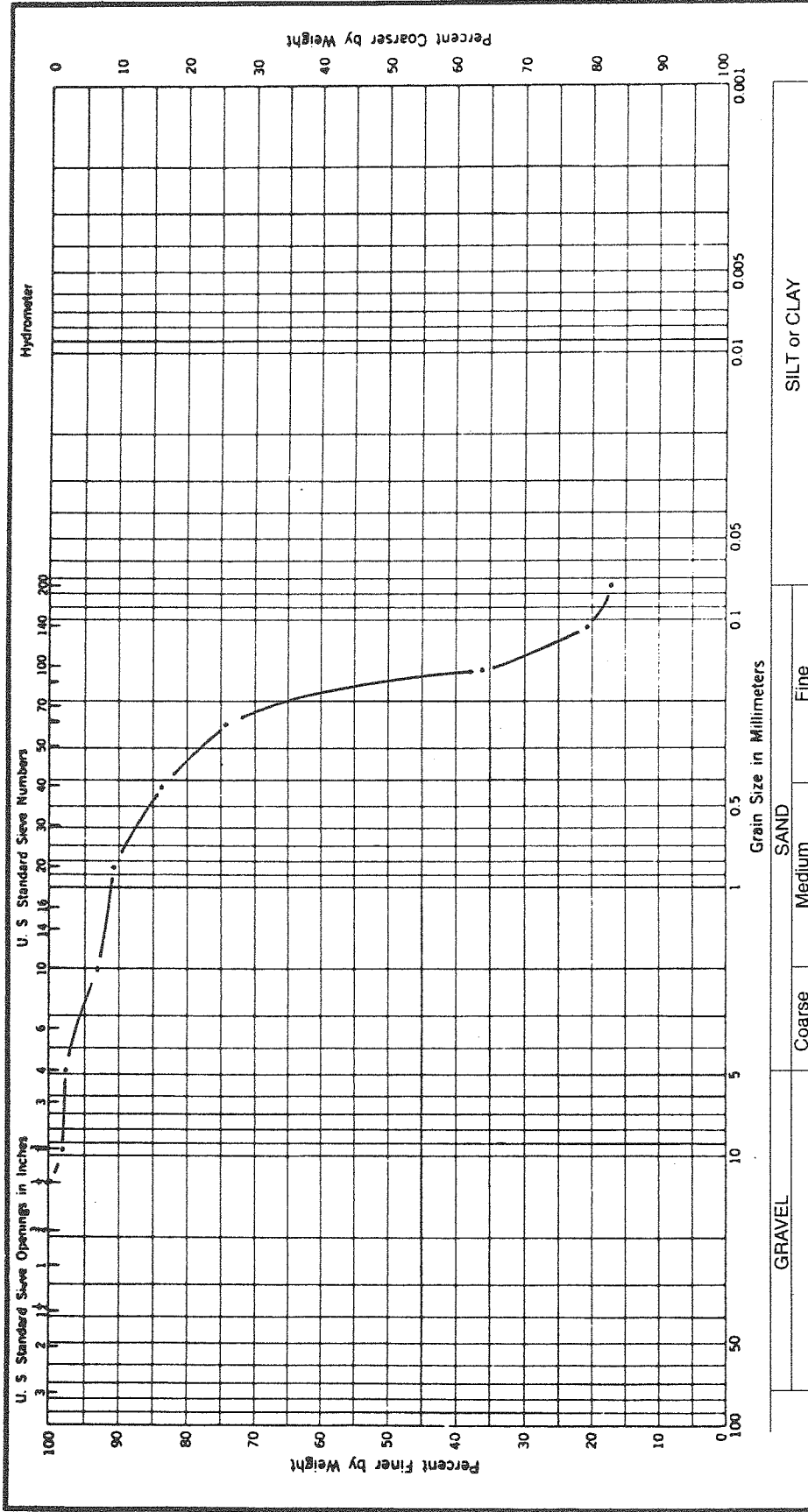
Manatee County, Florida

DRIGGERS ENGINEERING SERVICES, INC.



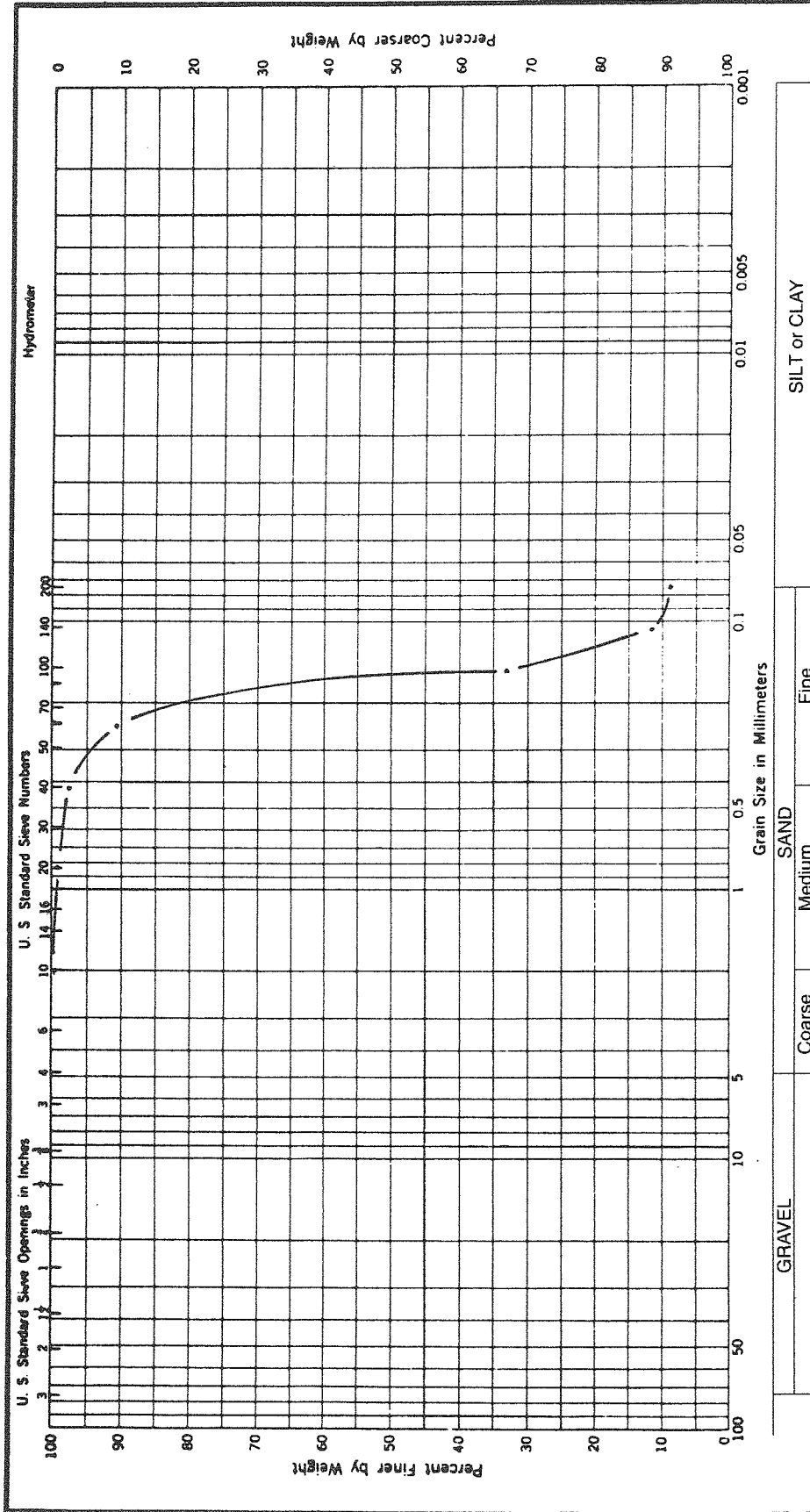
GRAVEL		SAND		SILT or CLAY	
Coarse		Medium		Fine	
Number	Depth	Natural Moisture	L.L.	P.L.	P.I.
HA-2 -26	0.0' - 3.7'				
Classification					
Light tan and brown Fine SAND with trace roots					
CLIENT: Manatee County Government					
PROJECT: Suburban Pipeline, Phase II					
Manatee County, Florida					
FILE: DES 096393					

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification	CLIENT:	PROJECT:	FILE:
HA-2 -27	2.8'-4.0'					Tan silty Fine SAND with cemented sand fragments	Manatee County Government	Suburban Pipeline, Phase II	DES 096393
							Manatee County, Florida		

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification	CLIENT:	PROJECT:	FILE:
HA-2 -28	3.01-3.81					Light brown slightly silty, slightly clayey Fine SAND	Manatee County Government	Suburban Pipeline, Phase II	DES 096393
							Manatee County, Florida		

Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
HA-2 -30	4.0'-8.0'					Tan and light gray Fine SAND with brown veins

U. S. Standard Sieve Openings in Inches

U. S. Standard Sieve Numbers

Hydrometer

Percent Finer by Weight

Percent Coarser by Weight

GRAVEL

SAND

SILT or CLAY

Coarse

Medium

Fine

Grain Size in Millimeters

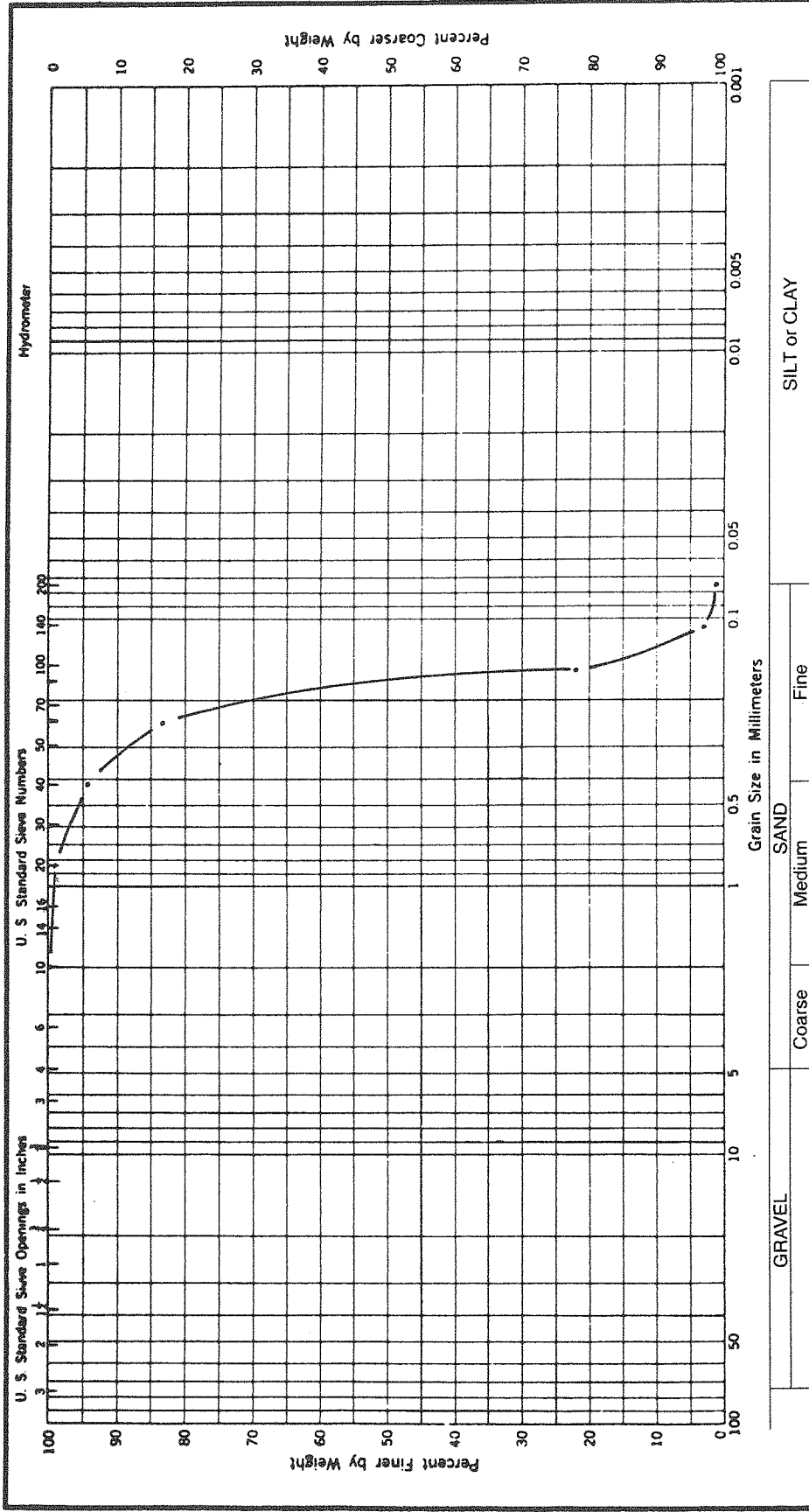
CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Manatee County, Florida

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2	1.9'-3.5'					Light tan Fine SAND
-31						

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -33	2.5'-4.5'					Light brown Fine SAND

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Manatee County, Florida

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -35	2.4' - 3.0'					Dark brown Fine SAND with finely divided organic materials

CLIENT: Manatee County Government

PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

Manatee County, Florida

Number	Depth	Natural Moisture	Classification				CLIENT:	PROJECT:	FILE:
			L. L.	P. L.	P. I.				
HA-2 -38	1.5'-2.5'					Manatee County Government Suburban Pipeline, Phase II Manatee County, Florida	DES 096393		

Grain size distribution curve for HA-2-38. The curve shows approximately 95% finer at 0.075 mm, 85% finer at 0.075 mm, 75% finer at 0.075 mm, 65% finer at 0.075 mm, 55% finer at 0.075 mm, 45% finer at 0.075 mm, 35% finer at 0.075 mm, 25% finer at 0.075 mm, 15% finer at 0.075 mm, and 5% finer at 0.075 mm.

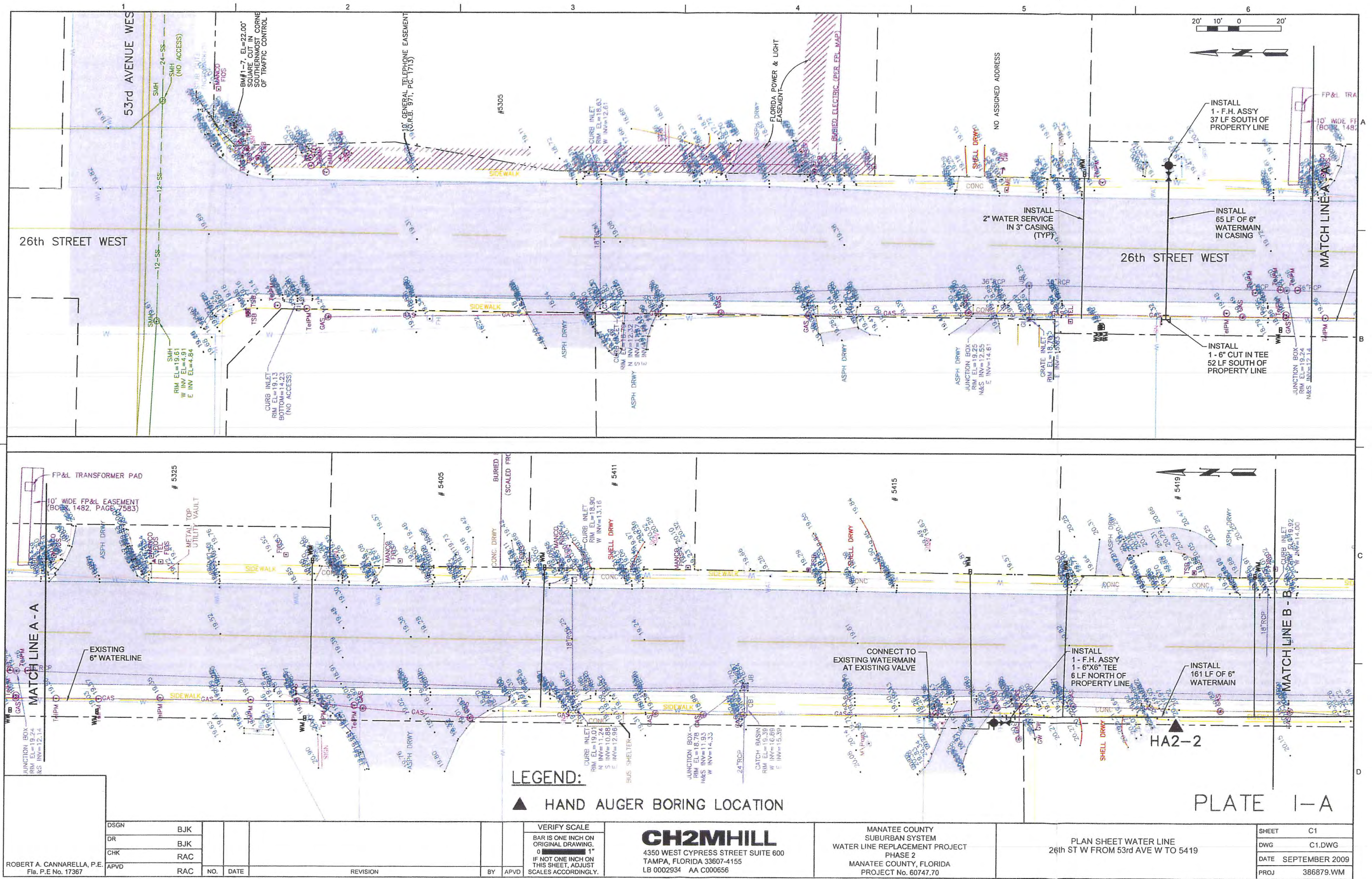
Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
HA-2 -39	3.0'-4.8'					Light brown Fine SAND

CLIENT: Manatee County Government

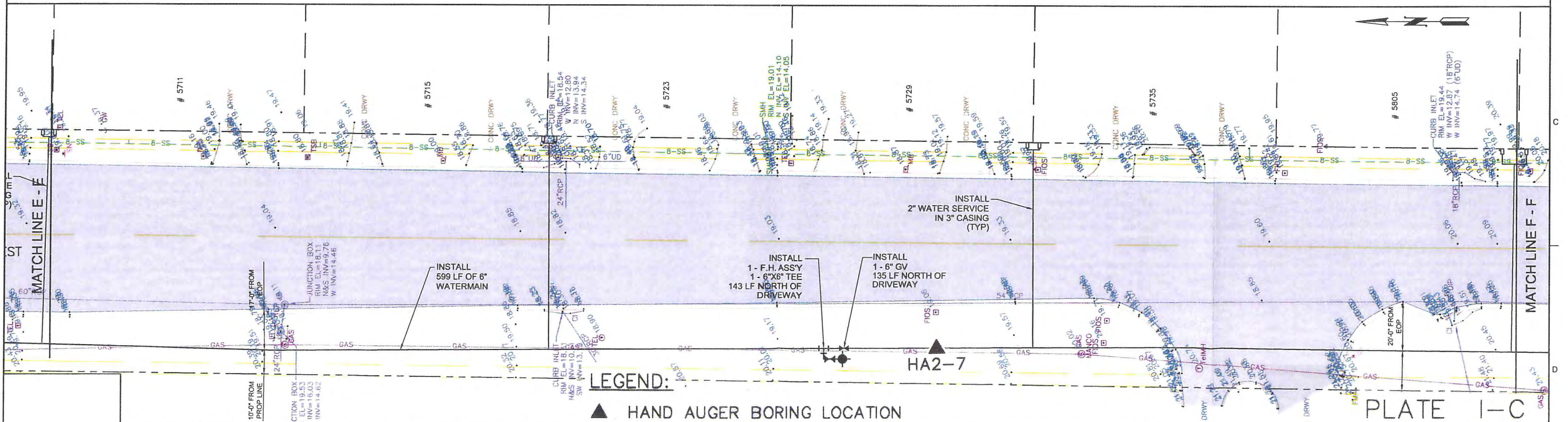
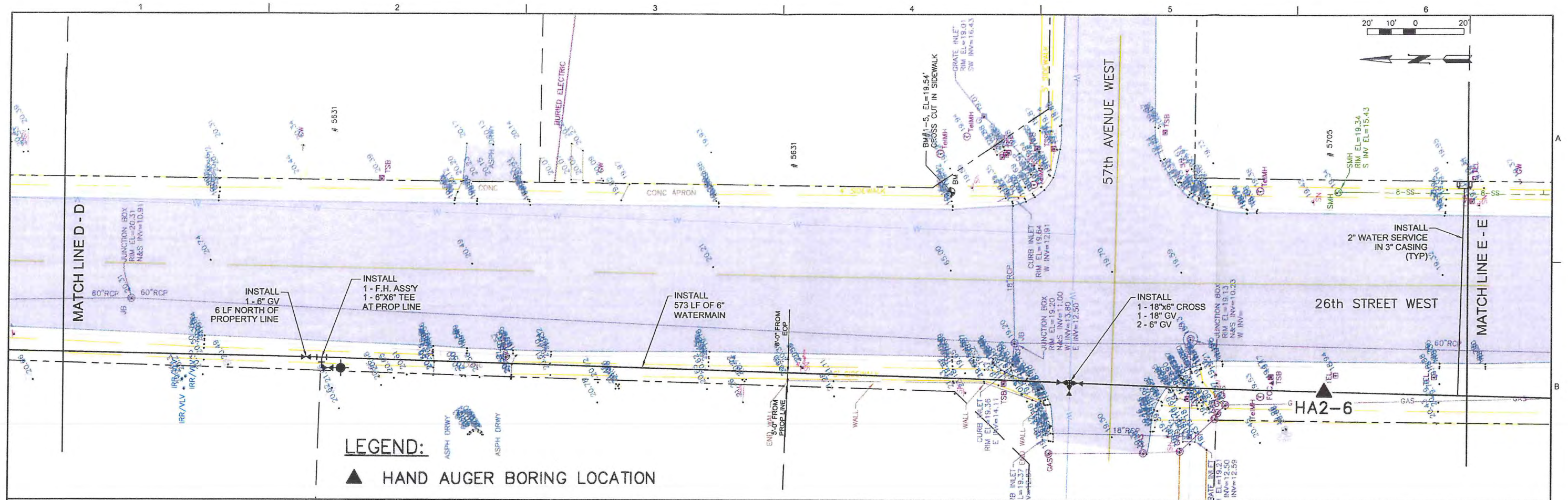
PROJECT: Suburban Pipeline, Phase II

FILE: DES 096393

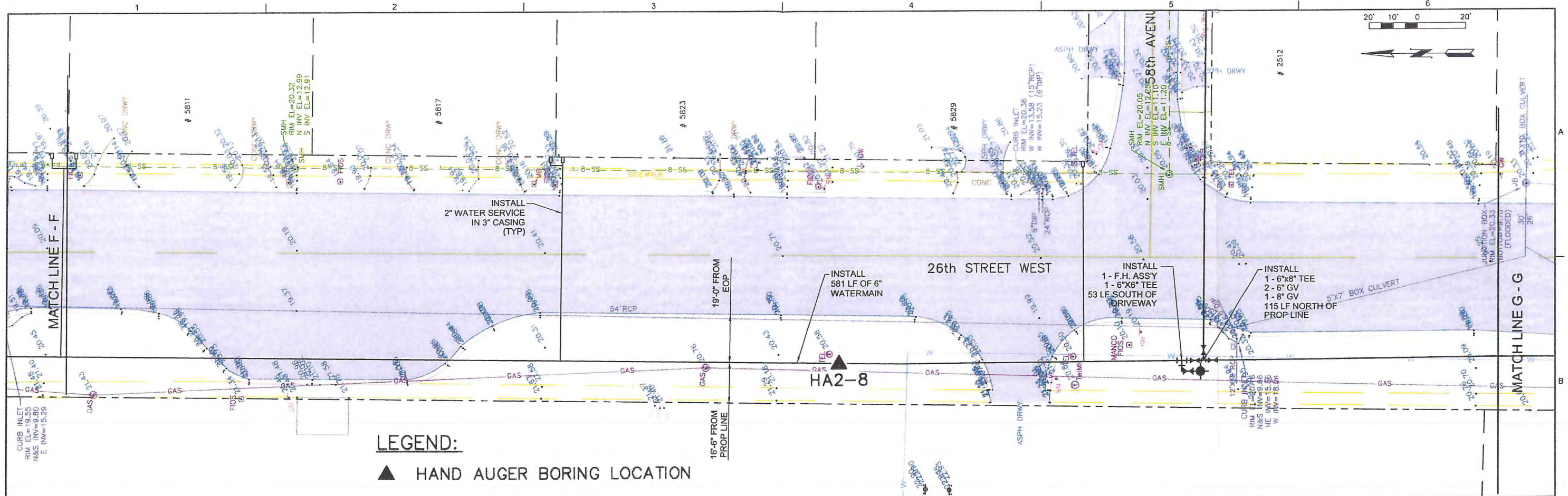
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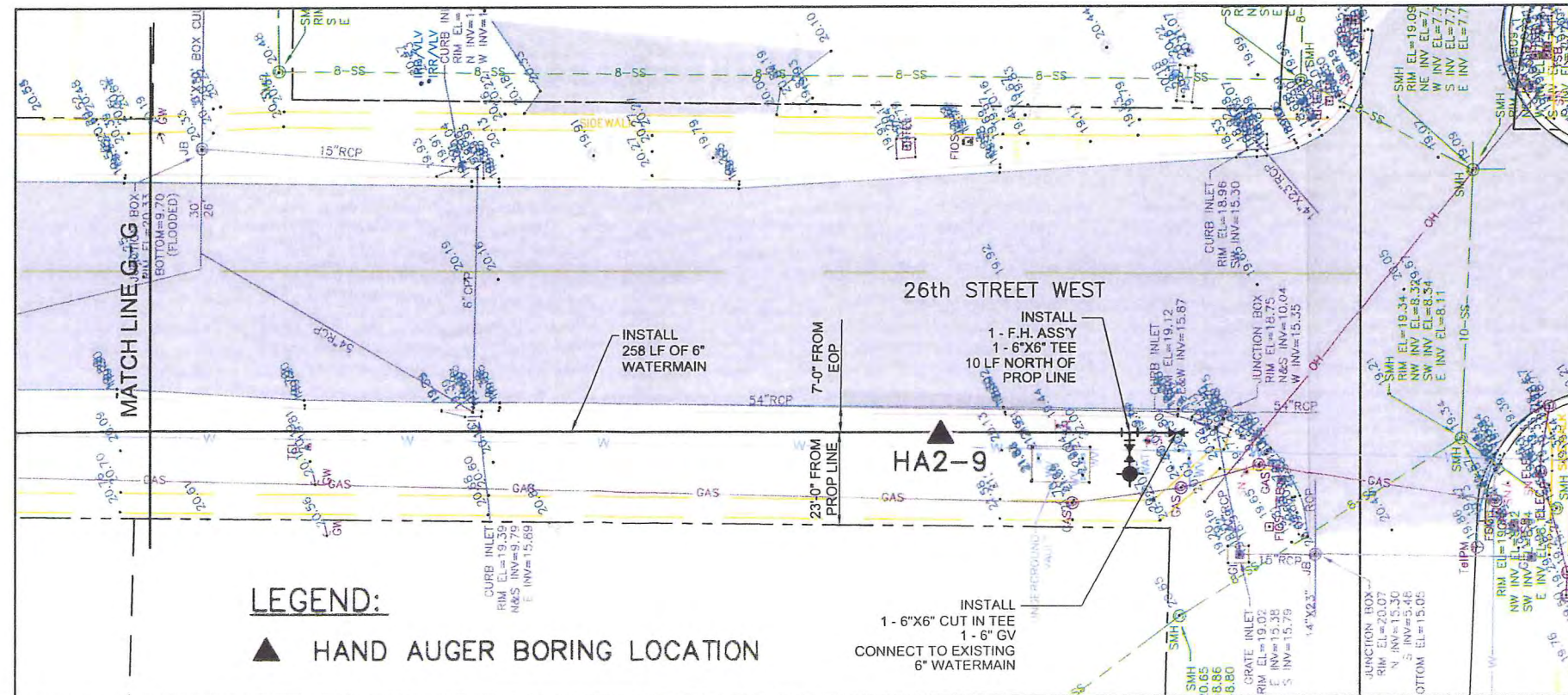
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ROBERT A. CANNARELLA, P.E. Fla. P.E. No. 17367		DESIGN BJK CHECKED BJK APPROVED RAC		NO. DATE		REVISION		BY APVD		VERIFY SCALE BAR IS ONE INCH ON ORIGINAL DRAWING. 0" = 1' IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.		CH2MHILL 4350 WEST CYPRESS STREET SUITE 600 TAMPA, FLORIDA 33607-4155 LB 0002934 AA C000656		MANATEE COUNTY SUBURBAN SYSTEM WATER LINE REPLACEMENT PROJECT PHASE 2 MANATEE COUNTY, FLORIDA PROJECT No. 60747.70		PLAN SHEET WATER LINE 26th ST W FROM 5615 TO 5805		SHEET C3 DWG C3.DWG DATE SEPTEMBER 2009 PROJ 386879.WM	
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LEGEND:
▲ HAND AUGER BORING LOCATION

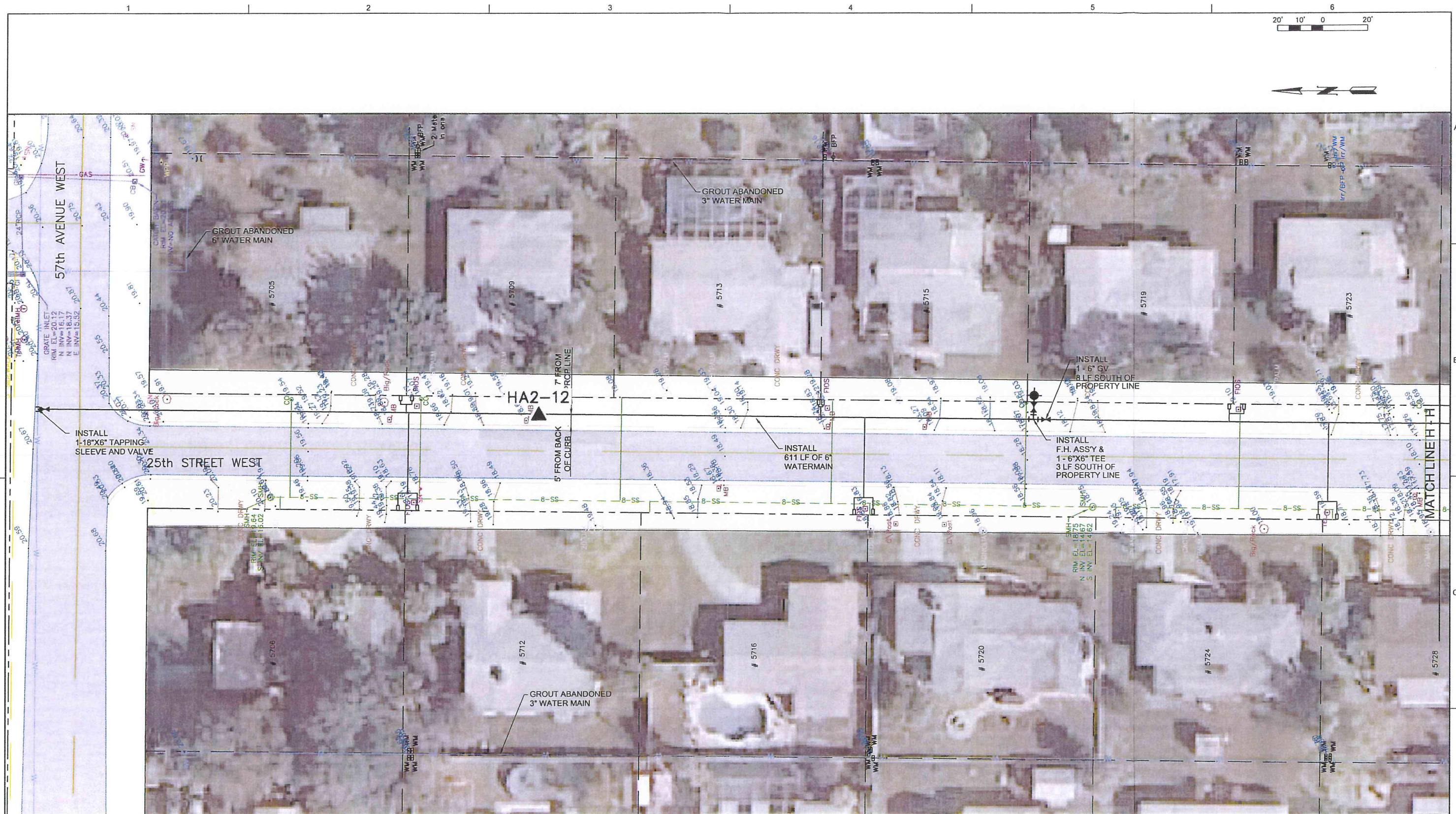


LEGEND:
▲ HAND AUGER BORING LOCATION

PLATE I-D

ROBERT A. CANNARELLA, P.E. Fla. P.E. No. 17367		DSGN BJK DR BJK CHK RAC APVD RAC		NO. DATE		REVISION		BY APVD		VERIFY SCALE BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.		CH2MHILL 4350 WEST CYPRESS STREET SUITE 600 TAMPA, FLORIDA 33607-4155 LB 0002934 AA C000656		MANATEE COUNTY SUBURBAN SYSTEM WATER LINE REPLACEMENT PROJECT PHASE 2 MANATEE COUNTY, FLORIDA PROJECT No. 60747.70		PLAN SHEET WATER LINE 26th ST W FROM 5811 TO		SHEET C4 DWG C4.DWG DATE SEPTEMBER 2009 PROJ 386879.WM	
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\\manatee-county\waterline\Drawings\Tl\cover.dwg Plotted 2/18/2009 0:13 pm By bklein Model Plot Scale: 1"=10' Xref Dwg's:



LEGEND:

▲ HAND AUGER BORING LOCATION

PLATE I-E

ROBERT A. CANNARELLA, P.E. Fla. P.E. No. 17367		DSGN BJK DR BJK CHK RAC APVD RAC		NO. DATE		REVISION		BY APVD		VERIFY SCALE BAR IS ONE INCH ON ORIGINAL DRAWING. 0 1" IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.		CH2MHILL 4350 WEST CYPRESS STREET SUITE 600 TAMPA, FLORIDA 33607-4155 LB 0002934 AA C000656		MANATEE COUNTY SUBURBAN SYSTEM WATER LINE REPLACEMENT PROJECT PHASE 2 MANATEE COUNTY, FLORIDA PROJECT No. 60747.70		PLAN SHEET WATER LINE 25th ST W FROM 57th AVE W TO 5724		SHEET C5 DWG C5.DWG DATE SEPTEMBER 2009 PROJ 386879.WM	
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