



1112 Manatee Ave. West
Bradenton, FL 34205
purchasing@mymanatee.org

Solicitation Addendum

Addendum No.: 1
Solicitation No.: 20-TA003199BB
Solicitation Title: Force Main 27A Rehabilitation
Addendum Date: December 11, 2019
Procurement Contact: Brooke Baker

20-TA003199BB is amended as set forth herein. Responses to questions posed by prospective bidders are provided below. This addendum is hereby incorporated in and made a part of IFBC No. 20-TA003199BB.

CHANGE:

DATE, TIME AND PLACE DUE

The Due Date and Time for submission of Bids in response to this IFBC is December 19, 2019 at 3:00 P.M. ET. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., Suite 803, Bradenton, FL 34205 prior to the Due Date and Time.

CHANGE:

SECTION A, INFORMATION FOR BIDDERS, A.01 BID DUE DATE

The Due Date and Time for submission of Bids in response to this Invitation for Bid (IFBC) is December 19, 2019 at 3:00 P.M. ET. Bids must be delivered to the following location: Manatee County Administration Building, 1112 Manatee Ave. W., Suite 803, Bradenton, FL 34205 and time stamped by a Procurement representative prior to the Due Date and Time.

CHANGE:

SECTION A, INFORMATION FOR BIDDERS, A.51 SOLICITATION SCHEDULE

The following schedule has been established for this Solicitation process. Refer to the County's website (www.mymanatee.org > Business > Bids & Proposals) for meeting locations and updated information pertaining to any revisions to this schedule.

Scheduled Item	Scheduled Date
No Solicitation Information Conference is scheduled for this solicitation	
Question and Clarification Deadline	December 4, 2019
Final Addendum Posted	<u>December 12, 2019</u>
Bid Response Due Date and Time	<u>December 19, 2019</u> , 3:00 PM, ET
Due Diligence Review Completed	December 23, 2019
Projected Award	January 2020

NOTE: Any statements contained in the Scope of Work, Bid Summary, Construction Agreement, General Conditions of the Construction Agreement and/or Exhibits which vary from the information in Section A, Information for Bidders, shall have precedence over the Information for Bidders.

ADD:

BID ATTACHMENT 4, GEOTECHNICAL REPORT

The attached, Bid Attachment 4, Geotechnical Report, is hereby incorporated into the IFBC.

ADD:

BID ATTACHMENT 5, FDEP PERMIT

The attached, Bid Attachment 5, FDEP Permit, is hereby incorporated into the IFBC.

ADD:

BID ATTACHMENT 6, MCCROMETER ULTRA MAG SPECIFICATIONS

The attached, Bid Attachment 6, McCrometer Ultra Mag Specifications, is hereby incorporated into the IFBC.

QUESTIONS AND RESPONSES:

Q1. What is the engineer's estimated opinion of cost?

R1. The engineer's estimated opinion of cost is \$2,809,685.60.

Q2. Can the County provide soil borings?

R2. Please see Bid Attachment 4 issued with this Addendum No. 1.

Q3. Will the County provide a MOT plan?

R3. No, the MOT plan must be provided by the Contractor, so the plan will coincide with the Contractor's means and methods and proposed project progression.

- Q4. Bid Attachment 3, Plans, Sheet 3: Station 11+12 and 11+95, existing 20" sewer valve to be removed. This line is to be grout filled. Can you clarify?**
- R4. Please reference Bid Attachment 2, Technical Specifications, Section 02064, Part 3, 3.04, B: The ends of the pipe sections to be grout-filled shall be capped or plugged with suitable pipe fittings. The grout material shall be of suitable properties and the pumping pressure shall be such that the pipe sections are filled completely with grout. All above ground features shall be removed: hydrants, meters, valve & meter boxes, pads, vaults, etc. Existing tees, crosses, and valves left in service shall be plugged and restrained.
- Q5. Appendix J, Bid Pricing Form, Bid Item No. 20: Can you provide peak max. flow (gpm) and max. tdh for the master lift station?**
- R5. The design point for the MLS 27A is 2,950 gpm at 58 TDH.
- Q6. Appendix J, Bid Pricing Form, Bid Item No. 31: This Bid Item refers to existing LS piping/fitting demolition (removal). I don't see where there is a separate bid item for installation of the proposed piping/fittings. Can you clarify?**
- R6. Bid Items 32 through 35 all pertain to the installation of pipe and fittings in the MLS.
- Q7. I see that there are clear specification details for high build epoxy to be Tnemec material. Will the County allow Warren Environmental 100% solids high build epoxy inside of pipes?**
- R7. No, the interior coating shall be: green, factory applied dry film thickness 40-mil Tnemec Series 431 Perma-Shield PL or Permox CTF coating only.
- Q8. The bid documents on the County website do not include the FDEP Permit or the Geotech Report. Can you provide these documents?**
- R8. Yes, please see Bid Attachment 4 and Bid Attachment 5 issued with this Addendum No. 1.
- Q9. Can you provide the anticipated sewer peak flows and TDH? This information is required to properly size the Bypass Pumping Equipment.**
- R9. The design point for the MLS 27A is 2,950 gpm at 58 TDH. Per the specification, the provided by-pass pumps shall provide 150% of the operating capacity.
- Q10. Bid Attachment 1, Insurance and Bond Requirements: Considering this project does not include the addition of a permanent building, is Builder's Risk Insurance required?**
- R10. Yes.
- Q11. Bid Attachment 2, Technical Specifications, Section 01150, Measurement and Payment, Bid Item No. 19, Flow Meter: States that the cost shall include analog monitor for connection to telemetry; however, there is no information included in the Plans or Specifications regarding this analog monitor. Can you clarify?**

R11. Please see Bid Attachment 6, issued with this Addendum No. 1. The “analog monitor for connection to telemetry” is referring to the “Converter” per the manufacturer. Please note, the signal cable between mag meter and converter cannot be spliced. It must be ordered to proper length, excess can be coiled at the converter. By the direction of lift station staff, 100 LF of signal cable shall be provided for possible relocation of the converter.

NOTE: Items that are ~~struck through~~ are deleted. Items that are underlined have been added or changed. All other terms and conditions remain as stated in the IFBC.

END OF ADDENDUM

INSTRUCTIONS:

Receipt of this addendum must be acknowledged as instructed in the solicitation document. Failure to acknowledge receipt of this Addendum may result in the response being deemed non-responsive.

AUTHORIZED FOR RELEASE

**REPORT OF THE
GEOTECHNICAL INVESTIGATION
(REVISED)
FORCE MAIN 27A REHABILITATION
53RD AVENUE WEST
MANATEE COUNTY, FLORIDA**



April 6, 2015

Manatee County Public Works Department
Project Management Division
1022 26th Avenue East
Bradenton, Florida 34208

Attention: Mr. Jim Stockwell, P.E.

**RE: Report of the Geotechnical Investigation
Force Main 27A Rehabilitation
53rd Avenue West
Manatee County, Florida
County Project No. 6023180
Our File: DES 157562 (Revised)
WA # 44**

Dear Mr. Stockwell:

In accordance with your authorization, **DRIGGERS ENGINEERING SERVICES, INC.** has conducted an investigation of subsurface conditions along the alignment of the proposed force main. The results of our field and laboratory studies are included in this report together with a discussion of our findings and associated geotechnical design and construction considerations. This revised report includes results of boring B-2A which was offset across 53rd Avenue from boring B-2, which encountered an obstruction and was terminated shallower than the required depth.

FIELD INVESTIGATION PROGRAM

Four (4) Standard Penetration Test (SPT) borings were performed along the alignment of the proposed force main. Test borings B-1, B-2 and B-3 were initially positioned along the south side of 53rd Avenue West. Boring B-2A was subsequently located on the north side of 53rd Avenue, across from boring B-2. The approximate boring locations depicted on the attached Plate I.

Sarasota
Phone: 941.371.3949
Fax: 941.371.8962
saroffice@driggers-eng.com

Clearwater
P.O. Box 17839 • Clearwater, Florida 33762
Phone: 727.571.1313 • Fax: 727.572.4090
clwoffice@driggers-eng.com

Tampa
Phone: 813.948.6027
Fax: 727.572.4090
tpaoffice@driggers-eng.com

The Standard Penetration Test borings were performed in general accordance with ASTM D-1586 and generally advanced to a nominal depth of 25 feet. Note however, that boring B-2 was terminated at a depth of about 14 feet upon encountering an obstruction. The upper 6 feet of each boring was advanced with a hand auger to minimize the potential for any damage to utilities that may not have been identified by the utility locate service. The classification borings also had the advantage of providing a virtually continuous log of subsurface conditions within the upper 6 feet. A static hand cone penetrometer was utilized in advance of the hand auger to provide a measure of the relative density or consistency of the soils penetrated.

Logs of the Standard Penetration Test borings are included in the report attachments reflecting visual soil descriptions together with estimated Unified and AASHTO Soil Classifications. The test boring logs also present tabulated and graphically plotted Standard Penetration or hand cone resistance values corresponding to each sample interval. The graphical plotting of penetration resistance values is for the purpose of providing a visual aid for reviewing the test boring results. The lines connecting the data points are for ease of interpretation and do not imply a linear variation in soil properties. A brief description of the Standard Penetration Test method of sampling is appended for your reference.

LABORATORY INVESTIGATION

A limited laboratory testing program was undertaken to aid in characterizing the engineering properties of the subsurface soils. Our laboratory tests included grainsize analyses, natural moisture content, Atterberg limits and organic contents, where applicable. The results of our laboratory tests are included in the report attachments.

GENERALIZED SUBSURFACE CONDITIONS

As seen from the attached test boring logs, sandy soils were identified to the completion depths of the borings. These consisted of predominantly fine sands with variable silt and organic fines content typically comprising the SP and SP-SM Unified Soil Classifications or the A-3 AASHTO Soil Classification. Seams of silty fine sand (SM, or A-2-4 soils) were identified between about 3 and 5 feet at boring locations B-1 and B-2. Results of Standard Penetration Testing suggest a generally medium dense relative density, with some loose and dense zones.

At boring location B-3, seams of sand with elevated organic content occurred principally within the depth range of 3.6 to 10 feet. Visual examination of the recovered samples and results of laboratory testing suggest that the organic content is typically less than 5 percent, by weight. However, the soils between about 3.6 and 4.3 feet had an organic content of 6.2 percent.

While not evidenced at the boring locations, the Soil Survey of Manatee County reflects the presence of Parkwood Variant, Broward Variant and Hallandale soils in the project vicinity. Each of these typical soil profiles indicate shallow depth limestone seams. Accordingly, the potential exists that localized shallow depth limestone or cemented layers could exist along the alignment.

Groundwater was measured in the boreholes at depths of 5.6 to 8.3 feet below grade. Our groundwater observations for borings B-1 through B-3 were obtained in early February of 2015, with boring B-2A performed in early April. Since the borings were conducted during the typical dry season, we would conservatively estimate that the normal wet season groundwater levels would probably occur within the upper 2 to 3 feet below existing grade. Naturally, groundwater levels can be influenced by drainage features and development and often occur at greater depths than suggested by the Soil Survey.

GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

PLANNED CONSTRUCTION – We understand that the project will involve the construction of a 20 to 24-inch force main extending along 53rd Avenue West between 34th Street West and 25th Street West. The total distance will be approximately 3,300 feet.

In general, the pipe will be installed utilizing horizontal directional drilling beneath the existing roadway. Approximately 5 entry-exit pits are anticipated. We anticipate a minimum of 4 to 5 feet of cover. However, greater depths would be considered especially in areas of more significant existing utility conflicts.

DIRECTIONALLY DRILLED CONSTRUCTION - Directionally drilled construction methods should generally conform to the Section 555 of the most current Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

Care must certainly 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, roadways or structures. Conversely, one must avoid over-pressuring the drilling slurry, particularly within the very loose sands or soft clays and organic soils at shallow depths that could result in unacceptable discharge of drilling slurry to the ground surface.

SUITABILITY OF EXCAVATED SOILS FOR USE AS BACKFILL – The borings suggest that in general the soils excavated for the entry-exit pits would be suitable for re-use as compacted backfill with proper moisture control and compaction. Commonly, these soils consisted of fine sands with some silty sands with small amounts of organic fines. The borings suggest that thin organic seams could likely be blended with suitable overlying and underlying soils so as to produce a blended mixture with an effective organic content of less than 5% by weight. We envision that appropriate blending would represent a practical and economical approach to avoid the need for off-site disposal and corresponding importation of fill.

Soils excavated below the pre-construction groundwater table may occur in an elevated moisture content even with the utilization of construction dewatering. These soils will typically require aeration or adjustment to the moisture contents to facilitate placement and compaction to project specification requirements. We would suggest that the moisture contents be controlled within $\pm 2\%$ of the optimum moisture content as established by the Modified Proctor moisture density relationship of AASHTO T-180.

Soils containing appreciable silt and even trace amounts of organic fines tend to be weather sensitive and thus, will require appropriate earthwork management to control moisture contents to levels suitable for placement and compaction. Generally, these types of soil will require some spreading and mechanical aeration as they commonly do not effectively drain and dry efficiently within a stockpile.

GEOTECHNICAL CONSTRUCTION CONSIDERATIONS – At the entry-exit points, it is likely that shoring of the excavations or a trench box may be necessary. Techniques should be utilized so as to minimize any vibrations and disturbance of previously placed piping or existing utilities during installation and removal of the trench box or shoring. Naturally, the contractor must also comply with applicable OSHA trench safety requirements.

Groundwater is likely to occur within the planned excavation depths and will necessitate proper control and management during construction. We recommend that groundwater be lowered to a depth no less than 12 inches below the excavation bottom. In general, this will necessitate the utilization of shallow well-points that should be installed with appropriate filter media to facilitate dewatering. Considering the variable fines content and stratified nature of these subsurface soils, we would strongly recommend the contractor retain a qualified dewatering consultant to assist in developing an effective dewatering plan.

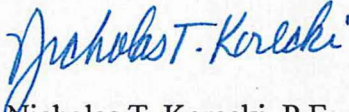
The pipeline alignment may occur in close proximity to existing utilities. The contractor must, therefore, exercise due care in the protection of these facilities so as to avoid any deformation or damage. We would certainly recommend that elevations be established on the existing utilities and that elevations be carefully monitored during all excavation and construction activities to detect any movements that might signal a need for a modification in the ways and means of construction. Clearly, techniques that would involve significant vibration such as vibratory sheeting installation and extraction or heavy vibratory compaction equipment should be avoided. Compaction of backfill in such areas should be performed utilizing relatively light hand-guided vibratory compaction equipment in thin lifts not in excess of 6 inches so as to achieve uniform compaction consistent with the equipment selected for compaction.

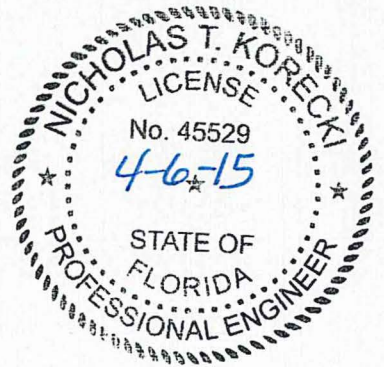
In view of the generally widely spaced pattern of test borings, careful geotechnical inspection will be critical during the construction stage. Accordingly, it is our recommendation that a representative of the project geotechnical engineer be retained to monitor the pipeline construction activity to detect areas that may warrant special treatment or remediation. Appropriate compaction tests should also be performed as required by project specification requirements that should comply with applicable Manatee County specifications.

Our geotechnical investigation was conducted for the purpose of investigating generalized subsurface conditions to assist in the design of the planned facility and to provide general information for use in construction. Our investigation may not have included development of all subsurface soils information that may be needed by the prospective contractor in the development of his construction procedures. The contractor is certainly encouraged to conduct such additional investigation as they may deem necessary to qualify their bid proposal.

DRIGGERS ENGINEERING SERVICES, INC. appreciates the opportunity to serve you and we trust, if you have any questions concerning our report, you will not hesitate to contact this office at your convenience.

Respectfully submitted,
DRIGGERS ENGINEERING SERVICES, INC.


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



NTK-REP\157562a

Copies submitted: (3)

Jim.stockwell@mymanatee.org

APPENDIX

PLATE I - BORING LOCATION PLAN

STANDARD PENETRATION TEST BORINGS

HAND AUGER BORING LOGS

SUMMARY OF LABORATORY TEST RESULTS

GRAINSIZE ANALYSES

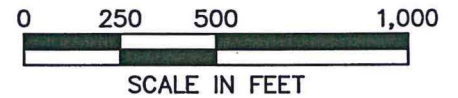
METHOD OF TESTING

PLATE I - BORING LOCATION PLAN



LEGEND:

- ⊕ STANDARD PENETRATION TEST BORING/
HAND CONE SOUNDING LOCATION



PROJECT NUMBER: DES 157562 DATE: 4/2/15

SHEET TITLE	PREPARED BY
BORING LOCATION PLAN	 DRIGGERS ENGINEERING SERVICES, INCORPORATED
PROJECT NAME	SHEET NO.
FORCE MAIN 27A REHABILITATION (COUNTY PROJECT NO. 6023180) MANATEE COUNTY, FLORIDA	PLATE I

STANDARD PENETRATION TEST BORINGS

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-1**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate I Foreman R.K.
 Completion Depth 26.5' Date 2/3/15 Depth To Water 7.3' Time _____ Date 2/3/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP					
					10	20	40	60	80	
0			SURF. EL:							
			Grayish-brown Fine SAND with pieces of shell (SP) (A-3)							
			Gray Fine SAND (SP) (A-3)							
			Light brown Fine SAND (SP) (A-3)							
			Light tannish-brown Fine SAND (SP) (A-3)							
5			Tan Fine SAND with light grayish-brown silty Fine SAND (SP/SM) (A-3/A-2-4)							
			Tan Fine SAND with abundant shell (SP) (A-3)	7/8/10						
			Medium dense light grayish-tan Fine SAND with abundant shell fragments (SP) (A-3)							
10			Dense to medium dense grayish-tan Fine SAND with shell fragments (SP) (A-3)	9/15/16						
				11/13/14						
			Medium dense light brownish-gray to brownish-gray Fine SAND with shell fragments and phosphate (SP) (A-3)	6/10/12						
15				4/5/8						
			Loose light grayish-brown Fine SAND with abundant shell fragments and phosphate (SP) (A-3)	2/3/3						
20										
25				2/4/4						
30										

Remarks _____ Casing Length _____

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-2**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate I Foreman R.K.
 Completion Depth 14.0' ** Date 2/3/15 Depth To Water 7.8' Time _____ Date 2/3/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP				
					10	20	40	60	80
			SURF. EL:						
0			Dark brown Fine SAND with some roots and fine shell fragments (SP) (A-3)						
			Dark brown and light brown Fine SAND with trace of roots (SP) (A-3)						
			Brown Fine SAND (SP) (A-3)						
5			Light grayish-brown Fine SAND (SP) (A-3)						
			Tan Fine SAND (SP) (A-3)						
			Brown silty Fine SAND (SM) (A-2-4)	1/2/3					
			Dark brown Fine SAND (SP) (A-3)						
			Brown and light brown Fine SAND (SP) (A-3)						
			Loose tannish-brown Fine SAND with trace of orange veins (SP) (A-3)	1/2/2					
10			Very loose brown Fine SAND (SP) (A-3)	4/7/8					
			Medium dense to loose grayish-brown to light brown Fine SAND with abundant shell fragments (SP) (A-3)	6/4/4					
15									
20									
25									
30									

Remarks ****** Encountered plastic pipe at depth 14.0' - terminated boring.

Casing Length _____

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-3**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate I Foreman R.K.
 Completion Depth 26.5' Date 2/3/15 Depth To Water 5.6' Time _____ Date 2/3/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP			
					10	20	40	60 80
			SURF. EL:					
0			Dark brown Fine SAND with shell and some roots (SP) (A-3)					
			Brown Fine SAND (SP) (A-3)					
			Dark brown Fine SAND with trace of Limestone Gravel (SP) (A-3)					
5			Light gray Fine SAND with trace of brown seams (SP) (A-3)					
			Dark brown organic Fine SAND (SP-SM/Pt) (A-8)	4/6/8				
			Grayish-brown Fine SAND (SP) (A-3)					
			Dark grayish-brown Fine SAND (SP) (A-3)					
10			Dark brown slightly organic Fine SAND with trace of cemented sand fragments (SP) (A-3)	9/8/11				
			Medium dense dark brown Fine SAND with finely divided organic material (SP) (A-3)	8/10/11				
			Medium dense brown and dark brown Fine SAND (SP) (A-3)	6/7/9				
15			Medium dense brown to tannish-brown Fine SAND (SP) (A-3)	4/7/10				
20				6/10/10				
25			Loose brownish-gray Fine SAND with some shell fragments (SP) (A-3)	1/3/5				
30								

Remarks _____ Casing Length _____

HAND AUGER BORING LOGS

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG											
PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180) Manatee County, Florida Project No.: DES 157562			CLIENT: Manatee County WATER TABLE: See "Note" DATE: 2/3/15								
TECHNICIAN: R.K./M.F.			DATE: 2/3/15		COMPLETION DEPTH: 6.0'						
LOCATION: See Plate I			TEST NUMBER: B-2								
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	HAND CONE TIP RESISTANCE (TSF)							
				0	10	20	30	40	50	60	70
	Dark brown Fine SAND with some roots and fine shell fragments (SP) (A-3)	0	[Symbol]								
	Dark brown and light brown Fine SAND with trace of roots (SP) (A-3)	1	[Symbol]								
	Brown Fine SAND (SP) (A-3)		[Symbol]								
	Light grayish-brown Fine SAND (SP) (A-3)	2	[Symbol]								
	Tan Fine SAND (SP) (A-3)		[Symbol]								
	Brown silty Fine SAND (SM) (A-2-4)	3	[Symbol]								
			[Symbol]								
		4	[Symbol]								
	Dark brown Fine SAND (SP) (A-3)		[Symbol]								
		5	[Symbol]								
	Brown and light brown Fine SAND (SP) (A-3)		[Symbol]								
		6	[Symbol]								
			[Symbol]								
		7	[Symbol]								
	Note: Water Table not encountered within depth of 6.0'. LEGEND: • + Denotes Penetration Resistance in excess of 50 TSF										

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG											
PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180) Manatee County, Florida Project No.: DES 157562			CLIENT: Manatee County WATER TABLE: See "Note" DATE: 4/1/15 COMPLETION DEPTH: 6.0'								
TECHNICIAN: R.K./J.W.			TEST NUMBER: B-2A								
LOCATION: See Plate I											
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	HAND CONE TIP RESISTANCE (TSF)							
				0	10	20	30	40	50	60	70
	Dark brownish-gray Fine SAND with surficial roots (SP) (A-3)	0	[Symbol]				35				
	Light brown Fine SAND (SP) (A-3)	1	[Symbol]				45				
	Light brownish-gray slightly silty Fine SAND (SP-SM) (A-3)	2	[Symbol]				48				
	Light brown Fine SAND with limestone fragments (SP) (A-3)	3	[Symbol]				35				
		4	[Symbol]				50				
	Light brown slightly silty Fine SAND (SP-SM) (A-3)	5	[Symbol]				40				
		6	[Symbol]				50				
		7	[Symbol]				50				
Note: Water Table not encountered within depth of 6.0'. LEGEND: • + Denotes Penetration Resistance in excess of 50 TSF											

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG										
PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180) Manatee County, Florida Project No.: DES 157562				CLIENT: Manatee County WATER TABLE: 5.6' DATE: 2/3/15 COMPLETION DEPTH: 6.0'						
TECHNICIAN: R.K./M.F. LOCATION: See Plate I				TEST NUMBER: B-3						
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	HAND CONE TIP RESISTANCE (TSF)						
				0	10	20	30	40	50	60
	Dark brown Fine SAND with shell and some roots (SP) (A-3)	0	▽							
	Brown Fine SAND (SP) (A-3)		•						•+	
	Dark brown Fine SAND with trace of Limestone Gravel (SP) (A-3)	1	○						•+	
	Light gray Fine SAND with trace of brown seams (SP) (A-3)	2	•						•+	
			•						•+	
		3	•						•+	
			•						•+	
	Dark brown organic Fine SAND (SP-SM/Pt) (A-8)	4	•						•+	
	Grayish-brown Fine SAND (SP) (A-3)		•						•+	
	Dark grayish-brown Fine SAND (SP) (A-3)	5	•						•+	
	Dark brown slightly organic Fine SAND with trace of cemented sand fragments (SP) (A-3)		•						•+	
		6	•						•+	
			•						•+	
		7	•						•+	

LEGEND:
 •+ Denotes Penetration Resistance in excess of 50 TSF

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	PI									
B-1	1.3-2.3	Light brown Fine SAND	3.2														
B-1	2.3-2.9	Light tannish-brown Fine SAND										*					
B-1	2.9-4.8	Tan Fine SAND with light grayish-brown silty Fine SAND					NP	NP				*					
B-1	8.0-9.5	Grayish-tan Fine SAND with shell fragments	24.3														
B-1	10.0-11.5	Grayish-tan Fine SAND with shell fragments															
B-1	12.0-13.5	Light brownish-gray Fine SAND with shell fragments and phosphate	21.3														
B-1	15.0-16.5	Brownish-gray Fine SAND with shell fragments and phosphate	25.5														
B-1	20.0-21.5	Light grayish-brown Fine SAND with abundant shell fragments and phosphate	20.8														
B-2	1.1-1.8	Brown Fine SAND	6.2														
B-2	1.8-2.3	Light grayish-brown Fine SAND	1.8														
B-2	2.3-2.9	Tan Fine SAND	2.6														
B-2	2.9-4.1	Brown silty Fine SAND					NP	NP				*					
B-2	4.1-5.3	Dark brown Fine SAND										*					
B-2	5.3-6.0	Brown and light brown Fine SAND	15.9														
B-2	6.0-7.5	Tannish-brown Fine SAND with trace of orange veins	25.4														

W % = Water Content
 Y_d (pcf) = Dry Density
 G_s = Specific Gravity
 LL = Liquid Limit
 PL = Plastic Limit
 PI = Plasticity Index
 P.P. (tsf) = Pocket Penetrometer
 U.C. = Unconfined Compression
 = Consolidation Test
 = Grainsize Analysis (Hydrometer)
 = Organic Content
 = Total Chloride
 = Total Sulfate
 = Lab Resistivity
 = See Test Curves
 = Percent Passing No. 200 Sieve

CLIENT: Manatee County
PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180), Manatee County, Florida
FILE: DES 157562

SUMMARY OF LABORATORY TEST RESULTS

BID ATTACHMENT 4: IFBC NO. 20-TA003199BB

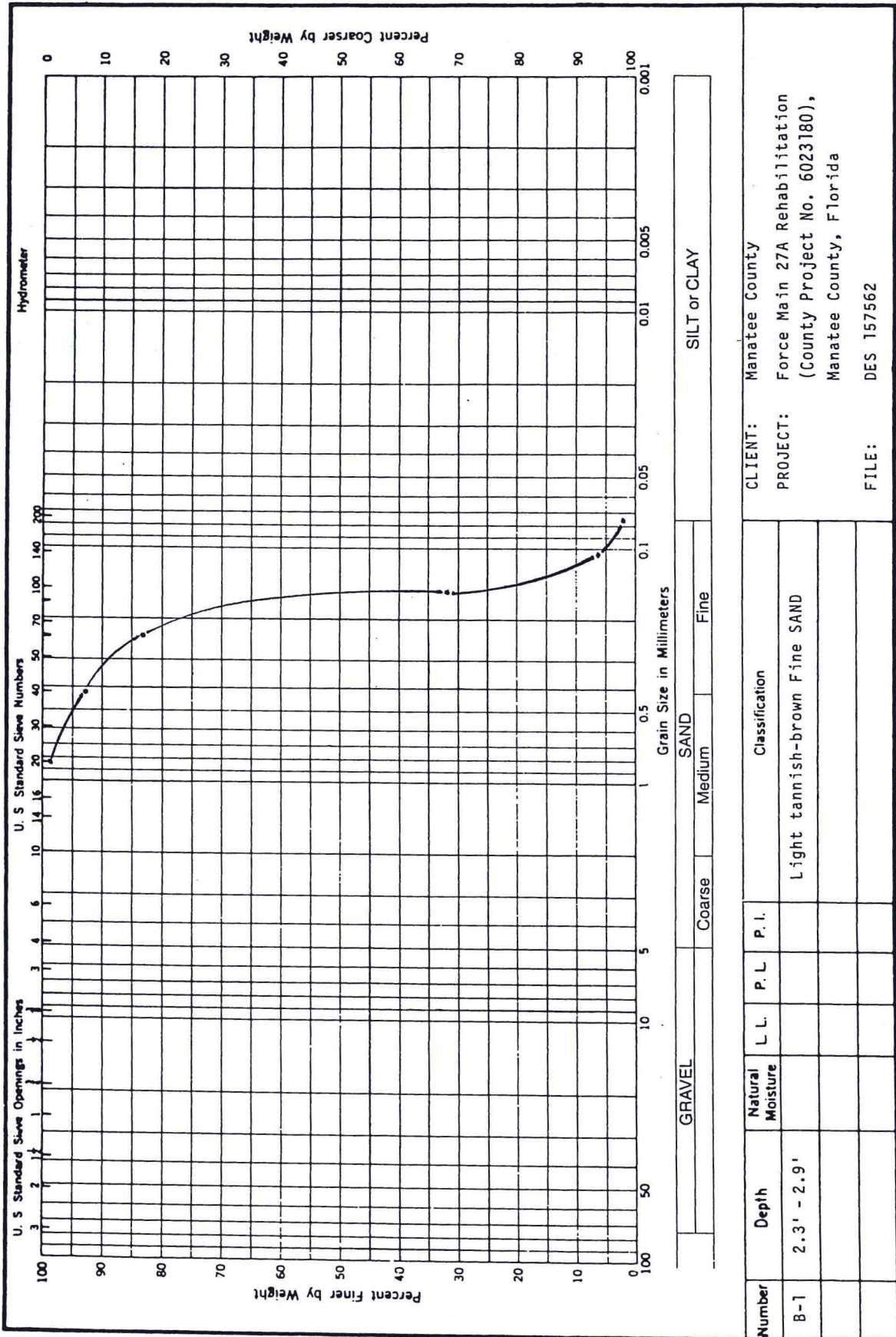
BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y _d (pcf)	G _s	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON.	G.S.	ORG. (%)	pH	Cl. (ppm)	SO ₄ (ppm)	RES. (ohm-cm)
						LL	PL	PI									
B-2	8.0-9.5	Brown Fine SAND										*					
B-2	12.0-13.5	Light brown Fine SAND with abundant shell fragments	26.7														
B-3	1.6-3.6	Light gray Fine SAND with trace of brown seams										*					
B-3	3.6-4.3	Dark brown organic Fine SAND											6.2				
B-3	4.3-4.8	Grayish-brown Fine SAND	23.1														
B-3	4.8-5.3	Dark grayish-brown fine SAND	19.8														
B-3	5.3-6.0	Dark brown slightly organic Fine SAND with trace of cemented sand fragments											4.8				
B-3	6.0-7.5	Dark brown Fine SAND with finely divided organic material											3.6				
B-3	8.0-9.5	Dark brown Fine SAND with trace of finely divided organic material											1.8				
B-3	10.0-11.5	Brown and dark brown Fine SAND	25.4														
B-3	12.0-13.5	Brown Fine SAND										*					
B-3	15.0-16.5	Brown Fine SAND	25.3														
B-3	20.0-21.5	Tannish-brown Fine SAND															
B-3	25.0-26.5	Brownish-gray Fine SAND with some shell fragments										*					

W %	=	Water Content	Con.	
Y _d (pcf)	=	Dry Density	G.S. (+1)	
G _s	=	Specific Gravity	ORG. (%)	
LL	=	Liquid Limit	Cl. (ppm)	
PL	=	Plastic Limit	SO ₄ (ppm)	
PI	=	Plasticity Index	RES. (ohm-cm)	
P.P. (tsf)	=	Pocket Penetrometer	*	
U.C.	=	Unconfined Compression	**	

CLIENT: Manatee County
PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180), Manatee County, Florida
FILE: DES 157562

GRAINSIZE ANALYSES

DRIGGERS ENGINEERING SERVICES, INC.

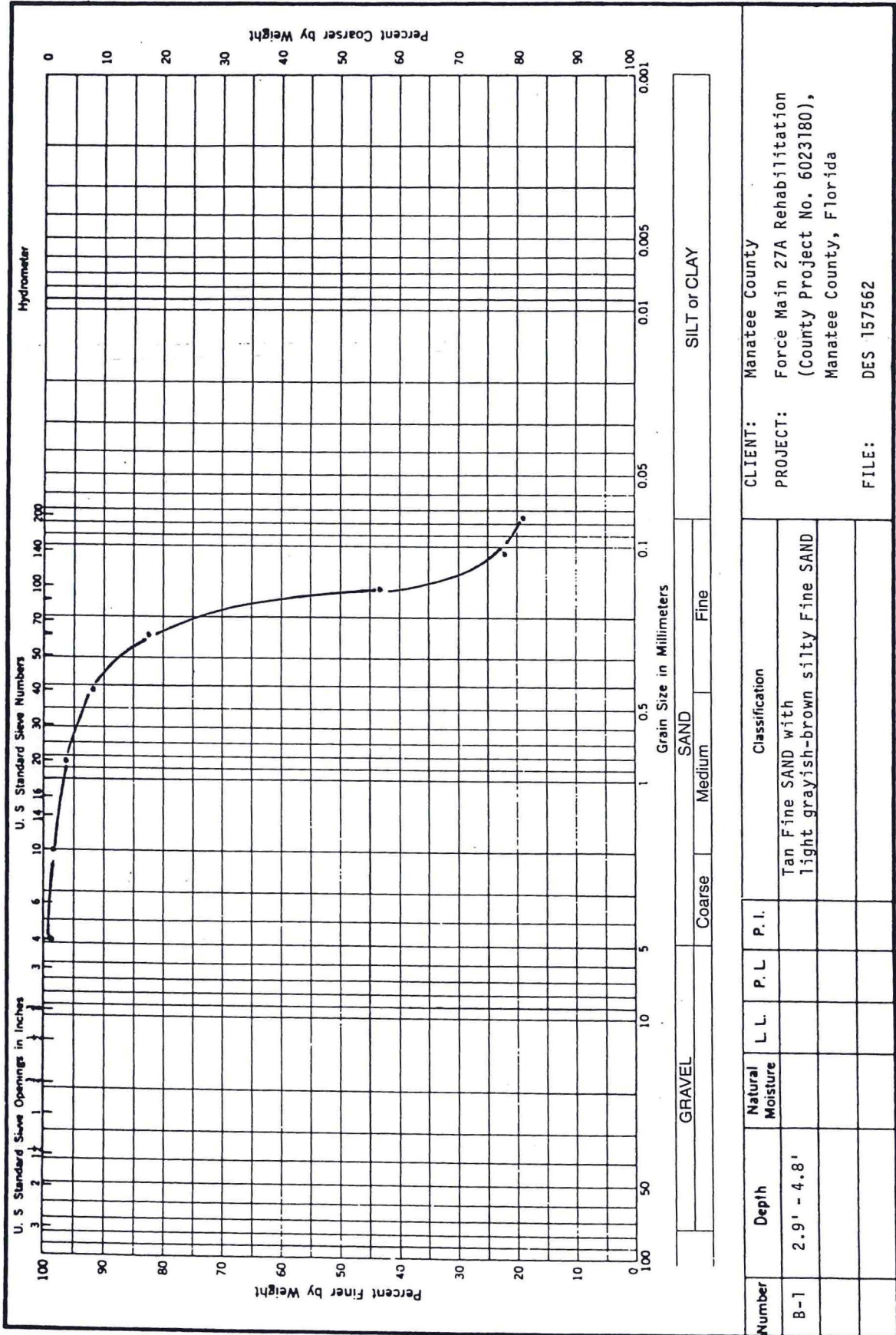


CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180),
 Manatee County, Florida
 FILE: DES 157562

Number	Depth	Natural Moisture	Classification		
			L.L.	P.L.	P.I.
B-1	2.3' - 2.9'				

GRAVEL: _____ SAND: Medium Fine SILT or CLAY: _____

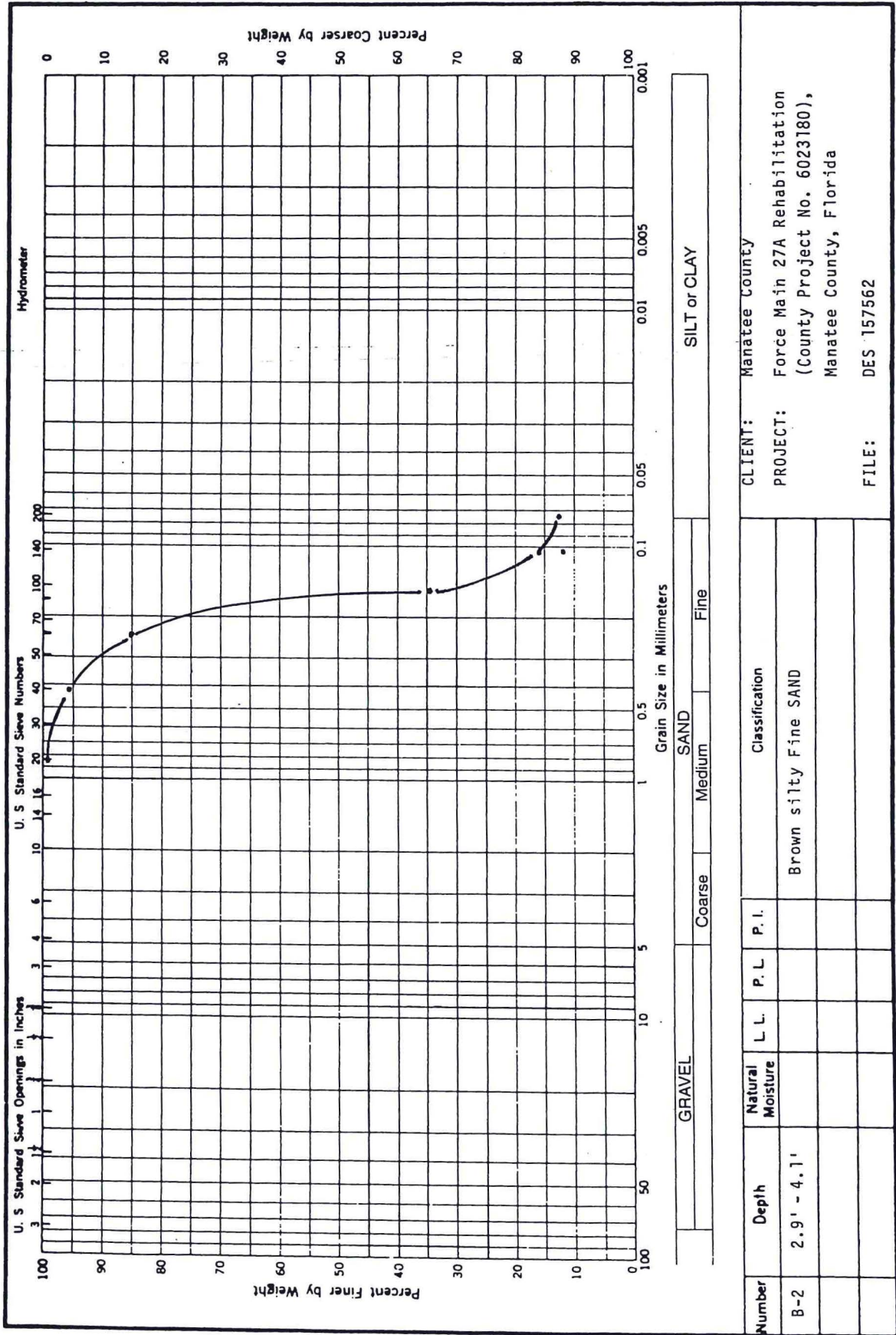
DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-1	2.9' - 4.8'					Tan Fine SAND with light grayish-brown silty Fine SAND

CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 FILE: DES 157562

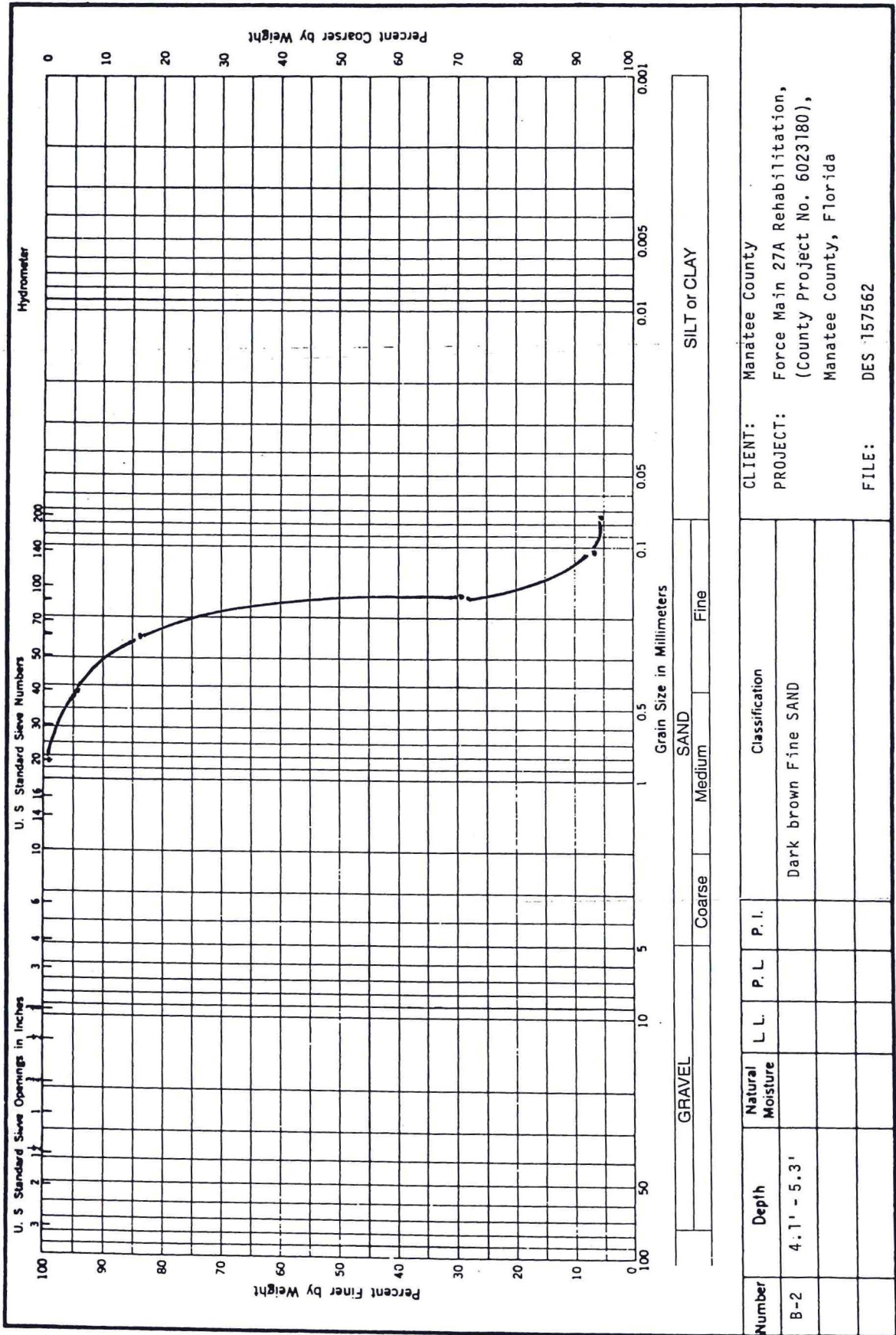
DRIGGERS ENGINEERING SERVICES, INC.



CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180),
 Manatee County, Florida
 FILE: DES 157562

Number	Depth	Natural Moisture	L.L.	P.L.	P. I.	Classification
B-2	2.9' - 4.1'					Brown silty Fine SAND

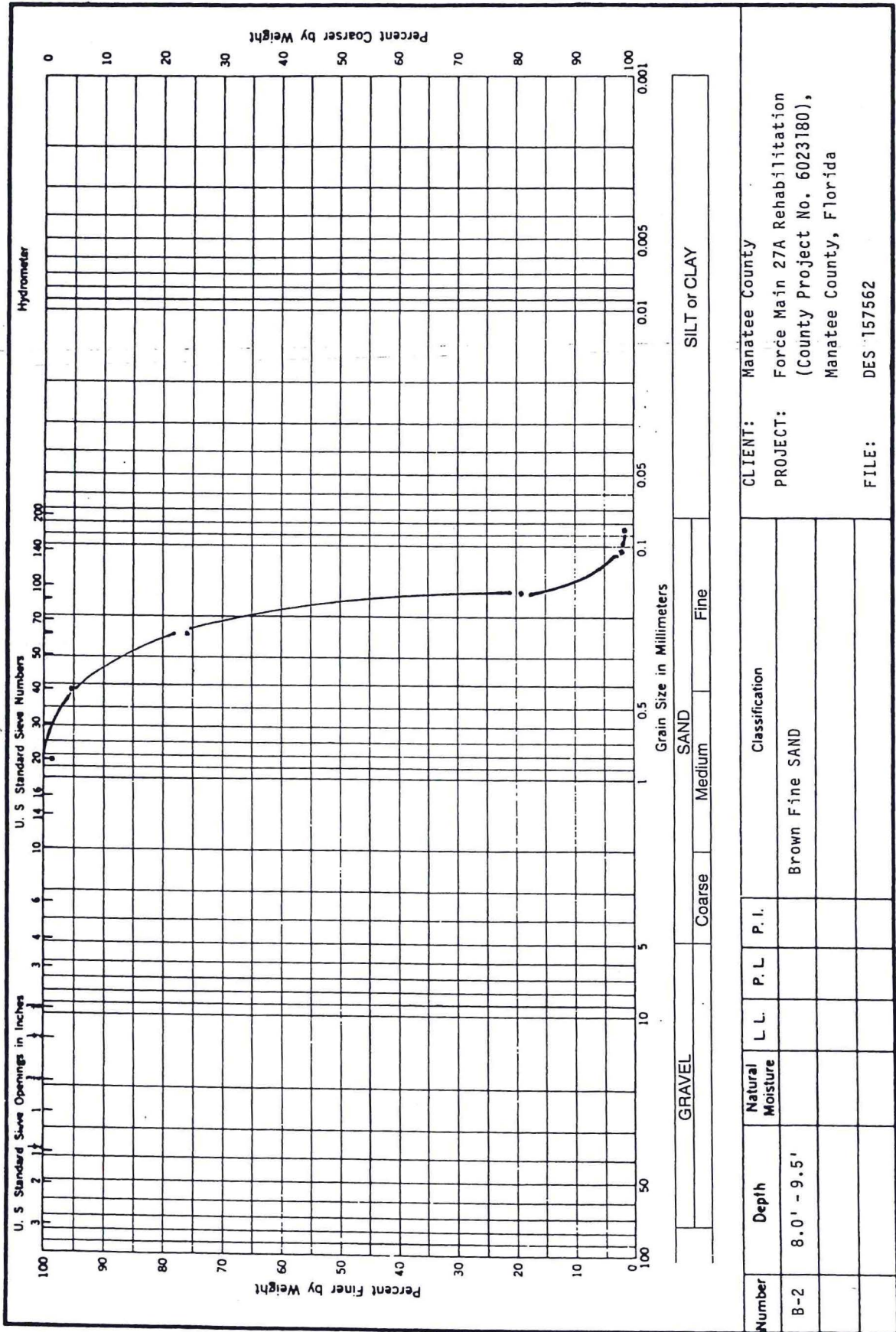
DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-2	4.1' - 5.3'					Dark brown Fine SAND

CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation, (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

DRIGGERS ENGINEERING SERVICES, INC.

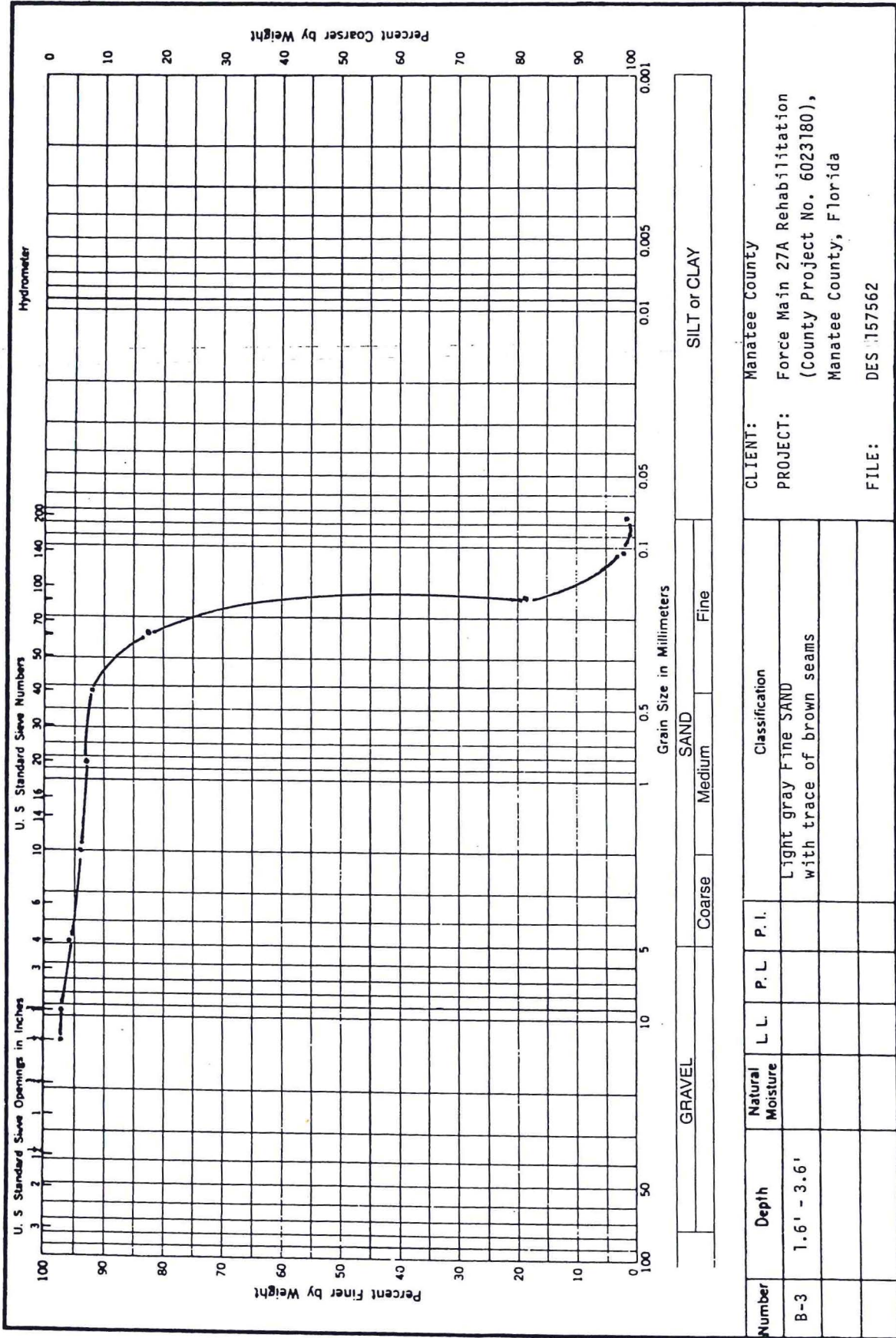


Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-2	8.0' - 9.5'					Brown Fine SAND

GRAVEL	SAND	SILT or CLAY
Coarse	Medium	Fine

CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

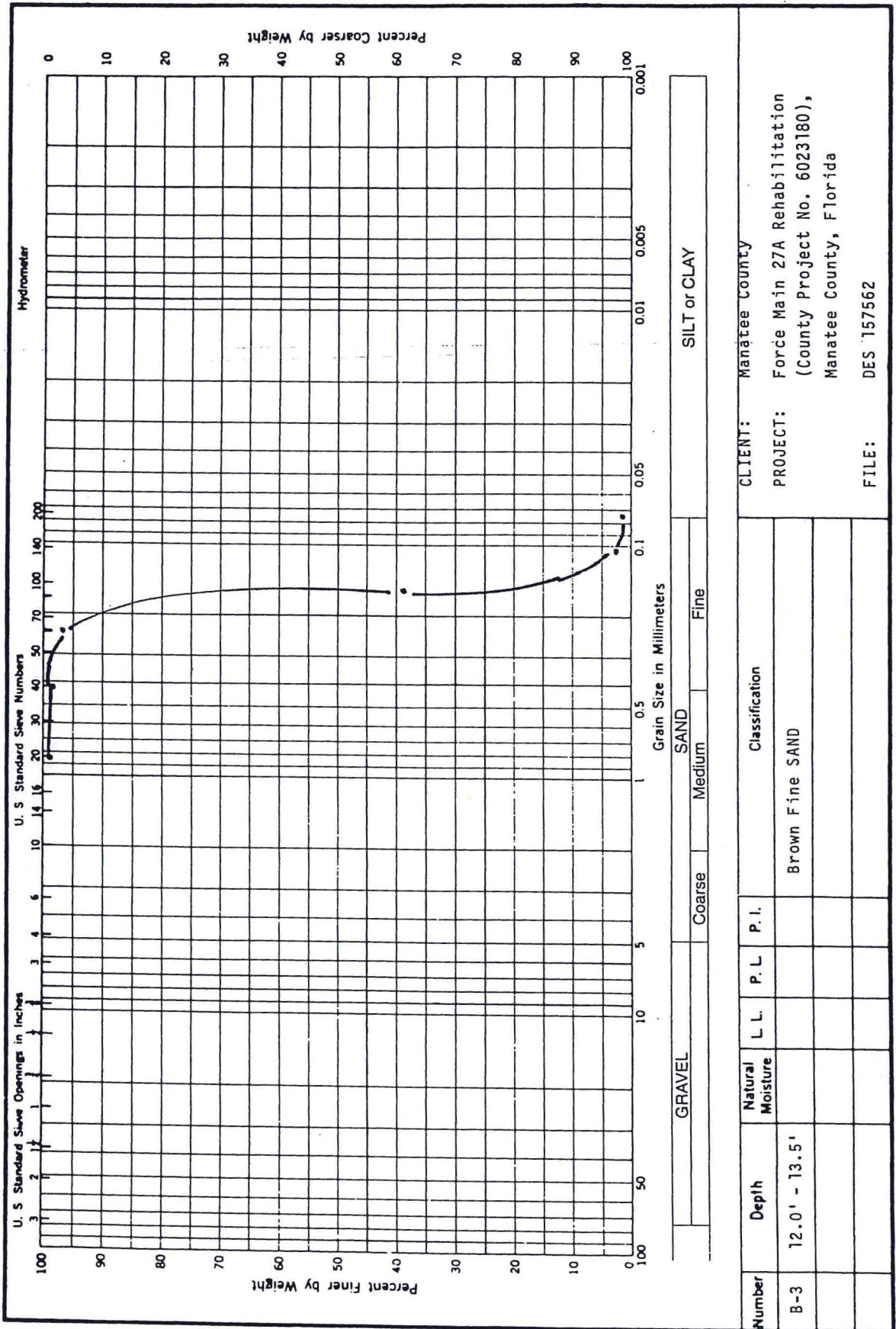
DRIGGERS ENGINEERING SERVICES, INC.



CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180),
 Manatee County, Florida
 FILE: DES 1157562

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-3	1.6' - 3.6'					Light gray Fine SAND with trace of brown seams

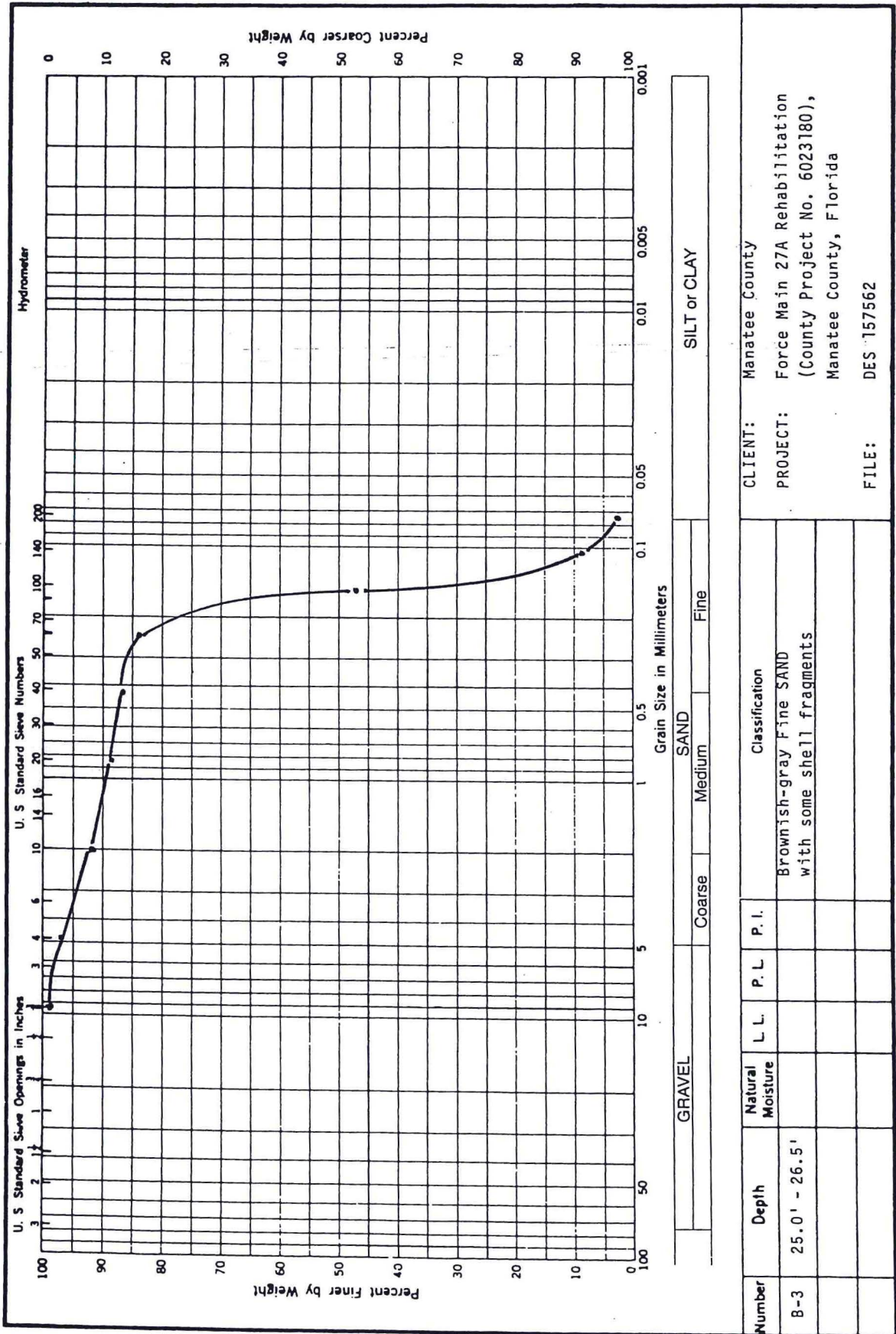
DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-3	12.0' - 13.5'					Brown Fine SAND

CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

DRIGGERS ENGINEERING SERVICES, INC.



CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180),
 Manatee County, Florida
 FILE: DES 157562

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-3	25.0' - 26.5'					Brownish-gray Fine SAND with some shell fragments

METHOD OF TESTING

STANDARD PENETRATION TEST AND SOIL CLASSIFICATION

STANDARD PENETRATION TEST (ASTM D-1586)

In the Standard Penetration Test borings, a rotary drilling rig is used to advance the borehole to the desired test depth. A viscous drilling fluid is circulated through the drill rods and bit to stabilize the borehole and to assist in removal of soil and rock cuttings up and out of the borehole.

Upon reaching the desired test depth, the 2 inch O.D. split-barrel sampler or "split-spoon", as it is sometimes called, is attached to an N-size drill rod and lowered to the bottom of the borehole. A 140 pound hammer, attached to the drill string at the ground surface, is then used to drive the sampler into the formation. The hammer is successively raised and dropped for a distance of 30 inches using a rope and "cathead" assembly. The number of blows is recorded for each 6 inch interval of penetration or until virtual refusal is achieved. In the above manner, the samples are ideally advanced a total of 18 inches. The sum of the blows required to effect the final 12 inches of penetration is called the blowcount, penetration resistance or "N" value of the particular material at the sample depth.

After penetration, the rods and sampler are retracted to the ground surface where the core sample is removed, sealed in a glass jar and transported to the laboratory for verification of field classification and storage.

SOIL SYMBOLS AND CLASSIFICATION

Soil and rock samples secured in the field sampling operation were visually classified as to texture, color and consistency. The Unified Soil Classification was assigned to each soil stratum per ASTM D-2487. Soil classifications are presented descriptively and symbolically for ease of interpretation. The stratum identification lines represent the approximate boundary between soil types. In many cases, this transition may be gradual.

Consistency of the soil as to relative density or undrained shear strength, unless otherwise noted, is based upon Standard Penetration resistance values of "N" values and industry-accepted standards. "N" values, or blowcounts, are presented in both tabular and graphical form on each respective boring log at each sample interval. The graphical plot of blowcount versus depth is for illustration purposes only and does not warrant continuity in soil consistency or linear variation between sample intervals.

The borings represent subsurface conditions at respective boring locations and sample intervals only. Variations in subsurface conditions may occur between boring locations. Groundwater depths shown represent water depths at the dates and time shown only. The absence of water table information does not necessarily imply that groundwater was not encountered.

**REPORT OF THE SUPPLEMENTAL
GEOTECHNICAL INVESTIGATION**

**FORCE MAIN 27A REHABILITATION
53RD AVENUE WEST
MANATEE COUNTY, FLORIDA**



February 8, 2016

Manatee County Public Works Department
 Project Management Division
 1022 26th Avenue East
 Bradenton, Florida 34208

Attention: Mr. Michael L. Sturm, P.E.

**RE: Report of the Supplemental Geotechnical Investigation
 Force Main 27A Rehabilitation
 53rd Avenue West
 Manatee County, Florida
 County Project No. 6023180
 Our File: DES 157562
 WA # 63**

Dear Mr. Sturm:

In accordance with your authorization, **DRIGGERS ENGINEERING SERVICES, INC.** has conducted an investigation of subsurface conditions along the alignment of the proposed force main. The results of our field and laboratory studies are included in this report together with a discussion of our findings and associated geotechnical design and construction considerations. This report includes results of the most recent borings (B-4 through B-6) as well as results of our previous borings, borings B-1 through B-3 and boring 2A.

FIELD INVESTIGATION PROGRAM

Three (3) supplemental Standard Penetration Test (SPT) borings were requested and performed near the alignment of the proposed force main. Borings were positioned as requested along the south side of 53rd Avenue West. Our previous test borings B-1, B-2 and B-3 were also positioned along the south side of 53rd Avenue West. Boring B-2A was located on the north side of 53rd Avenue, across from boring B-2, when boring B-2 encountered an obstruction (a suspected plastic pipe) at a depth of about 14 feet. The approximate boring locations depicted on the attached Plate I.

Sarasota
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 Fax: 941.371.8962
 saroffice@driggers-eng.com

Clearwater
 P.O. Box 17839 • Clearwater, Florida 33762
 Phone: 727.571.1313 • Fax: 727.572.4090
 clwoffice@driggers-eng.com

Tampa
 Phone: 727.571.1313
 Fax: 727.572.4090
 tpaoffice@driggers-eng.com

The Standard Penetration Test borings were performed in general accordance with ASTM D-1586 and generally advanced to a nominal depth of 25 feet. While a utility locate was requested, the upper 6 feet of each boring was advanced with a hand auger to minimize the potential for damage to shallow depth utilities that may not have been identified by the utility locate service. The classification borings also had the advantage of providing a virtually continuous log of subsurface conditions within the upper 6 feet. A static hand cone penetrometer was utilized in advance of the hand auger to provide a measure of the relative density or consistency of the soils penetrated.

Logs of the Standard Penetration Test borings are included in the report attachments reflecting visual soil descriptions together with estimated Unified and AASHTO Soil Classifications. The test boring logs also present tabulated and graphically plotted Standard Penetration or hand cone resistance values corresponding to each sample interval. The graphical plotting of penetration resistance values is for the purpose of providing a visual aid for reviewing the test boring results. The lines connecting the data points are for ease of interpretation and do not imply a linear variation in soil properties. A brief description of the Standard Penetration Test method of sampling is appended for your reference.

LABORATORY INVESTIGATION

A limited laboratory testing program was undertaken to aid in characterizing the engineering properties of the subsurface soils. Our laboratory tests included grainsize analyses, natural moisture contents and organic contents, where applicable. The results of our current laboratory tests are included in the report attachments.

GENERALIZED SUBSURFACE CONDITIONS

As seen from the attached test boring logs, sandy soils were typically identified to the completion depths of the borings. These consisted of predominantly fine sands with variable silt and organic fines content typically comprising the SP and SP-SM Unified Soil Classifications or the A-3 AASHTO Soil Classification. Seams of silty fine sand (SM, or A-2-4 soils) were identified between about 3 and 5 feet at previous boring locations B-1 and B-2 and about 10 and 12 feet current boring location B-5. Results of Standard Penetration Testing suggest a generally medium dense relative density, with some loose and dense zones.

At previous boring location B-3 and current boring B-6, seams of sand with elevated organic content occurred principally within the depth range of 3 to 10 feet. Visual examination of the recovered samples and results of laboratory testing suggest that the organic content is typically less than 5 percent, by weight. However, the soils between about 3.6 and 4.3 feet in boring B-3 had an organic content of 6.2 percent. At boring location B-6, an organic sandy silt with an organic content in excess of 13 percent was penetrated between depths of about 14 to 18 feet.

While not evidenced at the boring locations, the Soil Survey of Manatee County reflects the presence of Parkwood Variant, Broward Variant and Hallandale soils in the project vicinity. Each of these typical soil profiles indicate shallow depth limestone seams. Accordingly, the potential exists that localized shallow depth limestone or cemented layers could exist along the alignment.

Groundwater was measured in the current boreholes at depths of 3.9 to 6.6 feet below grade. Groundwater in our previous borings in early February of 2015 was measured at depths of 5.6 to 8.3 feet. Since all of the borings were conducted during the typical dry season, we would conservatively estimate that the normal wet season groundwater levels would probably occur within the upper 2 to 3 feet below existing grade. Naturally, groundwater levels can be influenced by drainage features and development and often occur at greater depths than suggested by the Soil Survey.

GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

PLANNED CONSTRUCTION – We understand that the project will involve the construction of a 20 to 24-inch force main extending along the south side of 53rd Avenue West between 34th Street West and 25th Street West. The total distance will be approximately 3,300 feet.

In general, the pipe will be installed utilizing horizontal directional drilling beneath the existing roadway. Approximately 5 entry-exit pits are anticipated. We anticipate a minimum of 4 to 5 feet of cover. However, greater depths would be considered especially in areas of more significant existing utility conflicts.

DIRECTIONALLY DRILLED CONSTRUCTION - Directionally drilled construction methods should generally conform to the Section 555 of the most current Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction.

Care must certainly 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, roadways or structures. Conversely, one must avoid over-pressuring the drilling slurry, particularly within the very loose sands or soft clays and organic soils at shallow depths that could result in unacceptable discharge of drilling slurry to the ground surface.

SUITABILITY OF EXCAVATED SOILS FOR USE AS BACKFILL – The borings suggest that in general the soils excavated for the entry-exit pits would be suitable for re-use as compacted backfill with proper moisture control and compaction. Commonly, these soils consisted of fine sands with some silty sands with small amounts of organic fines. The borings suggest that thin organic seams could likely be blended with suitable overlying and underlying soils so as to produce a blended mixture with an effective organic content of less than 5% by weight. We envision that appropriate blending would represent a practical and economical approach to avoid the need for off-site disposal and corresponding importation of fill.

Soils excavated below the pre-construction groundwater table may occur in an elevated moisture content even with the utilization of construction dewatering. These soils will typically require aeration or adjustment to the moisture contents to facilitate placement and compaction to project specification requirements. We would suggest that the moisture contents be controlled within $\pm 2\%$ of the optimum moisture content as established by the Modified Proctor moisture density relationship of AASHTO T-180.

Soils containing appreciable silt and even trace amounts of organic fines tend to be weather sensitive and thus, will require appropriate earthwork management to control moisture contents to levels suitable for placement and compaction. Generally, these types of soil will require some spreading and mechanical aeration as they commonly do not effectively drain and dry efficiently within a stockpile.

GEOTECHNICAL CONSTRUCTION CONSIDERATIONS – At the entry-exit points, it is likely that shoring of the excavations or a trench box may be necessary. Techniques should be utilized so as to minimize any vibrations and disturbance of previously placed piping or existing utilities during installation and removal of the trench box or shoring. Naturally, the contractor must also comply with applicable OSHA trench safety requirements.

Groundwater is likely to occur within the planned excavation depths and will necessitate proper control and management during construction. We recommend that groundwater be lowered to a depth no less than 12 inches below the excavation bottom. In general, this will necessitate the utilization of shallow well-points that should be installed with appropriate filter media to facilitate dewatering. Considering the variable fines content and stratified nature of these subsurface soils, we would strongly recommend the contractor retain a qualified dewatering consultant to assist in developing an effective dewatering plan.

The pipeline alignment may occur in close proximity to existing utilities. The contractor must, therefore, exercise due care in the protection of these facilities so as to avoid any deformation or damage. We would certainly recommend that elevations be established on the existing utilities and that elevations be carefully monitored during all excavation and construction activities to detect any movements that might signal a need for a modification in the ways and means of construction. Clearly, techniques that would involve significant vibration such as vibratory sheeting installation and extraction or heavy vibratory compaction equipment should be avoided. Compaction of backfill in such areas should be performed utilizing relatively light hand-guided vibratory compaction equipment in thin lifts not in excess of 6 inches so as to achieve uniform compaction consistent with the equipment selected for compaction.

In view of the generally widely spaced pattern of test borings, careful geotechnical inspection will be critical during the construction stage. Accordingly, it is our recommendation that a representative of the project geotechnical engineer be retained to monitor the pipeline construction activity to detect areas that may warrant special treatment or remediation. Appropriate compaction tests should also be performed as required by project specification requirements that should comply with applicable Manatee County specifications.

Our geotechnical investigation was conducted for the purpose of investigating generalized subsurface conditions to assist in the design of the planned facility and to provide general information for use in construction. Our investigation may not have included development of all

subsurface soils information that may be needed by the prospective contractor in the development of his construction procedures. The contractor is certainly encouraged to conduct such additional investigation as they may deem necessary to qualify their bid proposal.

DRIGGERS ENGINEERING SERVICES, INC. appreciates the opportunity to serve you and we trust, if you have any questions concerning our report, you will not hesitate to contact this office at your convenience.

Respectfully submitted,

DRIGGERS ENGINEERING SERVICES, INC.



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



NTK-REP\157562b

Copies submitted: (3)

Michael.Sturm@mymanatee.org

APPENDIX

PLATE I - BORING LOCATION PLAN

**STANDARD PENETRATION TEST BORINGS
(THIS STUDY)**

**STANDARD PENETRATION TEST BORINGS
(PREVIOUS STUDIES)**

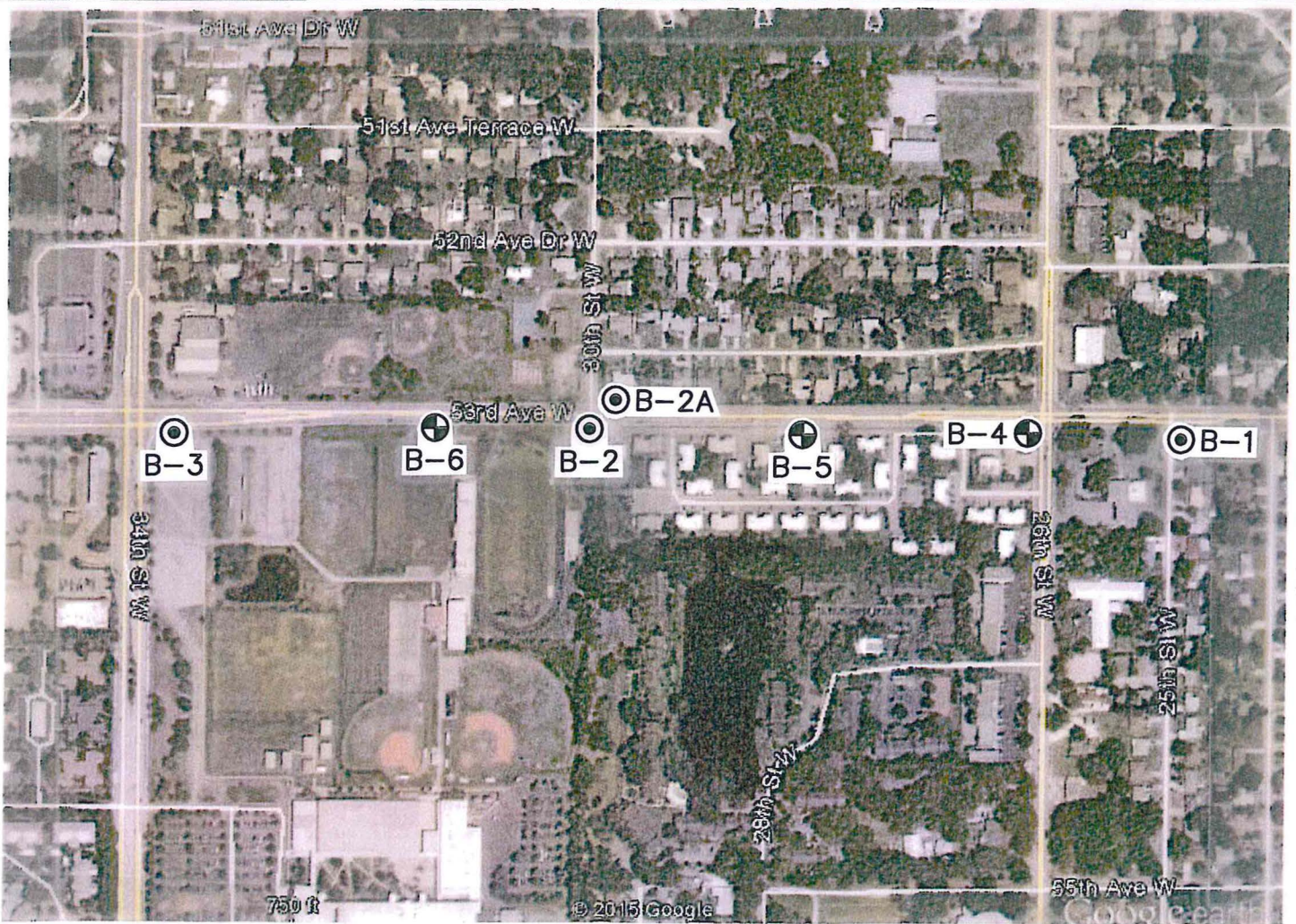
HAND AUGER BORING LOGS

SUMMARY OF LABORATORY TEST RESULTS

GRAINSIZE ANALYSES

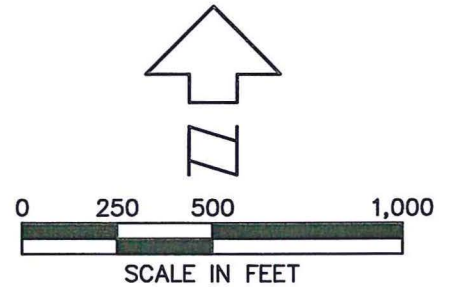
METHOD OF TESTING

PLATE I - BORING LOCATION PLAN



LEGEND:

- ⊙ STANDARD PENETRATION TEST BORING/
HAND CONE SOUNDING LOCATION
(PREVIOUS STUDY)
- ⊕ STANDARD PENETRATION TEST BORING/
HAND CONE SOUNDING LOCATION
(CURRENT STUDY)



PROJECT NUMBER: DES 157562 DATE: 1/29/16

SHEET TITLE	PREPARED BY
BORING LOCATION PLAN	 DRIGGERS ENGINEERING SERVICES, INCORPORATED
PROJECT NAME	SHEET NO.
FORCE MAIN 27A REHABILITATION (COUNTY PROJECT NO. 6023180) MANATEE COUNTY, FLORIDA	PLATE I

**STANDARD PENETRATION TEST BORINGS
(THIS STUDY)**

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-4**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate I Foreman B.D.
 Completion Date 1/26/16 Depth To Water 6.2' Time Date 1/26/16

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP				
					10	20	40	60	80
SURF. EL:									
0			Brown Fine SAND with shell fragments and surficial roots (SP) (A-3)						
			Grayish-brown Fine SAND with shell (SP) (A-3)						
			Tan Fine SAND with abundant shell fragments (SP) (A-3)						
5			Grayish-tan Fine SAND with shell fragments (SP) (A-3)						
			Very light tan Fine SAND with shell fragments and large piece of cemented sand (SP) (A-3)	7/6/5					
			Medium dense to loose gray to tan Fine SAND with abundant shell fragments (SP) (A-3)	4/3/6					
10				5/7/6					
			Dense to medium dense gray Fine SAND with phosphate and abundant shell fragments (SP) (A-3)	16/18/19					
15				9/10/8					
			Loose brown slightly silty Fine SAND with shell (SP-SM) (A-3)						
20				5/5/5					
25				5/5/4					
30									

Remarks Borehole Grouted Casing Length

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO.** B-5
Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
Location See Plate I **Foreman** B.D.
Completion **Depth To**
Depth 26.5' **Date** 1/27/16 **Water** 6.6' **Time** _____ **Date** 1/27/16

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP				
					10	20	40	60	80
0			SURF. EL: 2" Asphalt Pavement						
			Brown Fine SAND with some shell fragments (SP) (A-3)						
			Tannish-brown Fine SAND with shell fragments (SP) (A-3)						
5			Dark grayish-brown slightly silty Fine SAND (SP-SM) (A-3)						
			Light brown Fine SAND (SP) (A-3)						
			Medium dense tan Fine SAND with shell fragments (SP) (A-3)	11/11/10					
			Medium dense light brownish-gray weakly cemented, slightly silty Fine SAND with shell fragments (SP-SM) (A-3)	14/9/15					
10			Medium dense light brown silty Fine SAND with shell fragments (SM) (A-2-4)	8/7/19					
			Dense to medium dense gray Fine SAND with phosphate and abundant shell fragments (SP) (A-3)	16/20/22					
15				10/8/9					
			Medium dense grayish-brown slightly silty Fine SAND with shell (SP-SM) (A-3)						
20				8/7/5					
			Loose light brown Fine SAND with abundant shell fragments (SP) (A-3)						
25				5/3/4					
30									

Remarks Borehole Grouted **Casing Length** _____

**STANDARD PENETRATION TEST BORINGS
(PREVIOUS STUDIES)**

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-1**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate I Foreman R.K.
 Completion Depth 26.5' Date 2/3/15 Depth To Water 7.3' Time _____ Date 2/3/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP				
					10	20	40	60	80
0			SURF. EL: Grayish-brown Fine SAND with pieces of shell (SP) (A-3)						
			Gray Fine SAND (SP) (A-3)						
			Light brown Fine SAND (SP) (A-3)						
			Light tannish-brown Fine SAND (SP) (A-3)						
5			Tan Fine SAND with light grayish-brown silty Fine SAND (SP/SM) (A-3/A-2-4)						
			Tan Fine SAND with abundant shell (SP) (A-3)	7/8/10					
			Medium dense light grayish-tan Fine SAND with abundant shell fragments (SP) (A-3)	9/15/16					
10			Dense to medium dense grayish-tan Fine SAND with shell fragments (SP) (A-3)	11/13/14					
			Medium dense light brownish-gray to brownish-gray Fine SAND with shell fragments and phosphate (SP) (A-3)	6/10/12					
15				4/5/8					
			Loose light grayish-brown Fine SAND with abundant shell fragments and phosphate (SP) (A-3)	2/3/3					
20									
				2/4/4					
25									
30									

Remarks _____

Casing Length _____

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO. B-2**
 Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 Location See Plate 1 Foreman R.K.
 Completion Depth 14.0' ** Date 2/3/15 Depth To Water 7.8' Time _____ Date 2/3/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP			
					10	20	40	60.80
			SURF. EL:					
0			Dark brown Fine SAND with some roots and fine shell fragments (SP) (A-3)					
			Dark brown and light brown Fine SAND with trace of roots (SP) (A-3)					
			Brown Fine SAND (SP) (A-3)					
5			Light grayish-brown Fine SAND (SP) (A-3)					
			Tan Fine SAND (SP) (A-3)					
			Brown silty Fine SAND (SM) (A-2-4)	1/2/3				
			Dark brown Fine SAND (SP) (A-3)					
			Brown and light brown Fine SAND (SP) (A-3)					
10			Loose tannish-brown Fine SAND with trace of orange veins (SP) (A-3)	1/2/2				
			Very loose brown Fine SAND (SP) (A-3)	4/7/8				
			Medium dense to loose grayish-brown to light brown Fine SAND with abundant shell fragments (SP) (A-3)	6/4/4				
15								
20								
25								
30								

Remarks ** Encountered plastic pipe at depth 14.0' - terminated boring. Casing Length _____

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 157562 **BORING NO.** B-2A
Project Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
Location See Plate I **Foreman** R.K.
Completion **Depth To**
Depth 26.5' **Date** 4/1/15 **Water** 8.3' **Time** _____ **Date** 4/1/15

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER; 30" DROP
			SURF. EL:		10 20 40 60 80
0			Dark brownish-gray Fine SAND with surficial roots (SP) (A-3)		
			Light brown Fine SAND (SP) (A-3)		
			Light brownish-gray slightly silty Fine SAND (SP-SM) (A-3)		
5			Light brown Fine SAND with limestone fragments (SP) (A-3)		
			Light brown slightly silty Fine SAND (SP-SM) (A-3)	11/15/12	
			Medium dense light brown Fine SAND with shell (SP) (A-3)	6/9/9	
10			Loose dark brown Fine SAND with shell fragments (SP) (A-3)	3/3/3	
			Medium dense brown Fine SAND with abundant shell fragments (SP) (A-3)	6/10/10	
15			- loose seam at depth 15.0'	6/4/6	
20				6/8/6	
25				6/8/6	
30					

Remarks _____
Casing Length _____

HAND AUGER BORING LOGS

SUMMARY OF LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y _d (pcf)	G _s	ATTERBERG LIMITS				U.C.	CON.	G.S.	ORG. (%)	pH	Cl. (ppm)	SO ₄ (ppm)	RES. (ohm-cm)
						LL	PL	PI									
B-4	2.8-4.1	Grayish-tan Fine SAND with shell fragments	13.4														
B-4	4.1-6.0	Very light tan Fine SAND with shell fragments and large piece of cemented sand									*						
B-4	6.0-7.5	Tan Fine SAND with abundant shell fragments	21.8														
B-4	8.0-9.5	Gray Fine SAND with abundant shell fragments	23.5														
B-4	12.0-13.5	Gray Fine SAND with phosphate and abundant shell fragments	19.0														
B-4	15.0-16.5	Gray Fine SAND with phosphate and abundant shell fragments	28.7														
B-4	20.0-21.5	Brown slightly silty Fine SAND with shell									*						
B-4	25.0-26.5	Brown slightly silty Fine SAND with shell									*						
B-5	0.9-2.4	Dark grayish-brown slightly silty Fine SAND	6.4								*						
B-5	2.4-4.1	Light brown Fine SAND															
B-5	4.1-6.0	Tan Fine SAND with shell fragments	12.4														
B-5	6.0-7.5	Tan Fine SAND with shell fragments															
B-5	8.0-9.5	Light brownish-gray weakly cemented, slightly silty Fine SAND with shell fragments	15.3														
B-5	10.0-11.5	Light brown silty Fine SAND with shell fragments															
B-5	12.0-13.5	Gray Fine SAND with phosphate and abundant shell fragments	21.6														
B-5	15.0-16.5	Gray Fine SAND with phosphate and abundant shell fragments	28.9														

W % = Water Content
 Y_d (pcf) = Dry Density
 G_s = Specific Gravity
 LL = Liquid Limit
 PL = Plastic Limit
 PI = Plasticity Index
 P.P. (tsf) = Pocket Penetrometer
 U.C. = Unconfined Compression

= Consolidation Test
 = Grainsize Analysis (Hydrometer)
 = Organic Content
 = Total Chloride
 = Total Sulfate
 = Lab Resistivity
 = See Test Curves
 = Percent Passing No. 200 Sieve

Con. G.S. (+1)
 ORG. (%)
 Cl. (ppm)
 SO₄ (ppm)
 RES. (ohm-cm)
 *
 **

CLIENT: Manatee County
PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180), Manatee County, Florida
FILE: DES 157562

BID ATTACHMENT 4: IFBC NO. 20-TA003199BB

SUMMARY OF LABORATORY TEST RESULTS

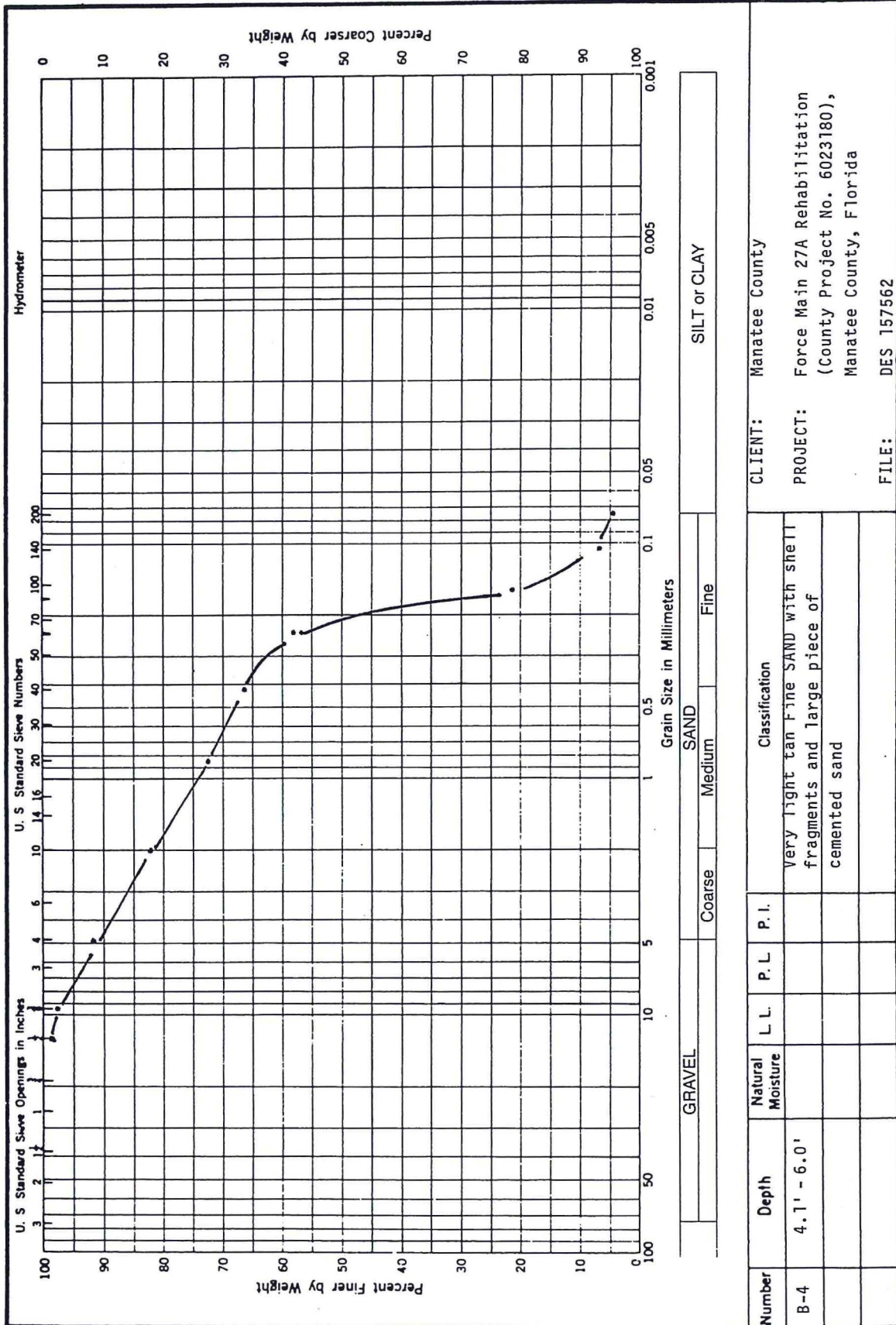
BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y _d (pcf)	G _s	ATTERBERG LIMITS				U.C.	CON.	G.S.	ORG. (%)	pH	Cl. (ppm)	SO ₄ (ppm)	RES. (ohm-cm)
						LL	PL	PI									
B-5	20.0-21.5	Grayish-brown slightly silty Fine SAND with shell fragments															
B-5	25.0-26.5	Light brown Fine SAND with abundant shell fragments	29.0														
B-6	0.4-1.2	Dark brownish-gray Fine SAND	4.5														
B-6	1.2-2.8	Light gray Fine SAND	5.1														
B-6	2.8-3.2	Dark brown slightly organic Fine SAND										4.3					
B-6	3.2-6.0	Dark brown slightly organic Fine SAND with trace of cemented sand										4.9					
B-6	6.0-7.5	Dark brown Fine SAND with finely divided organic material										3.3					
B-6	8.0-9.5	Brown Fine SAND															
B-6	10.0-11.5	Dark brown Fine SAND	24.0														
B-6	12.0-13.5	Dark brown Fine SAND															
B-6	15.0-16.5	Dark brown highly organic, sandy SILT													13.1		
B-6	20.0-21.5	Light grayish-brown Fine SAND															
B-6	25.0-26.5	Light brown Fine SAND with shell	20.2														

W % = Water Content
 Y_d (pcf) = Dry Density
 G_s = Specific Gravity
 LL = Liquid Limit
 PL = Plastic Limit
 PI = Plasticity Index
 P.P. (tsf) = Pocket Penetrometer
 U.C. = Unconfined Compression
 Con. = Consolidation Test
 G.S. (+1) = Grainsize Analysis (Hydrometer)
 ORG. (%) = Organic Content
 Cl. (ppm) = Total Chloride
 SO₄ (ppm) = Total Sulfate
 RES. (ohm-cm) = Lab Resistivity
 * = See Test Curves
 ** = Percent Passing No. 200 Sieve

CLIENT: Manatee County
PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180), Manatee County, Florida
FILE: DES 157562

GRAINSIZE ANALYSES

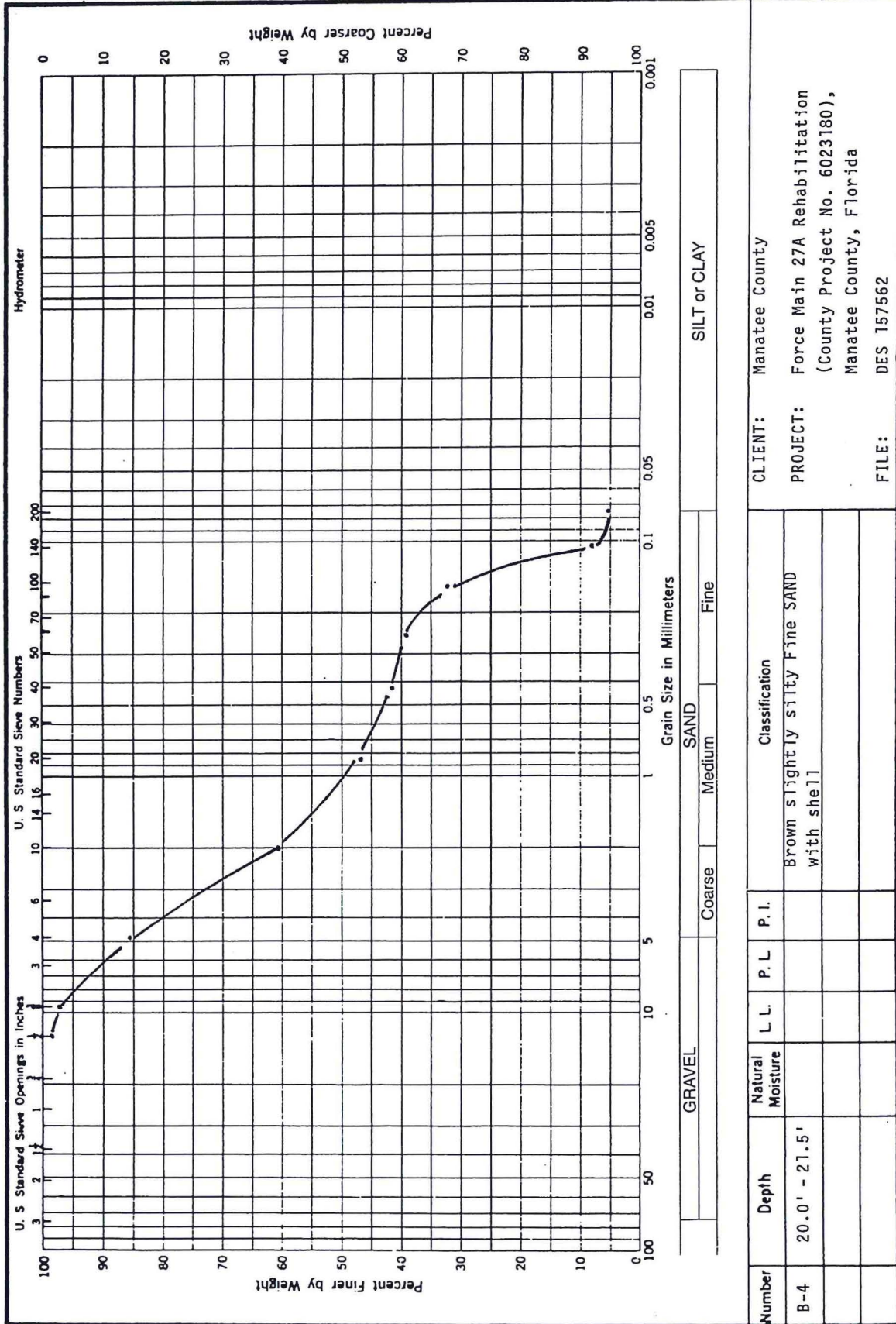
DRIGGERS ENGINEERING SERVICES, INC.



CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation
 (County Project No. 6023180),
 Manatee County, Florida
 FILE: DES 157562

Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-4	4.1' - 6.0'					Very light tan fine SAND with shell fragments and large piece of cemented sand

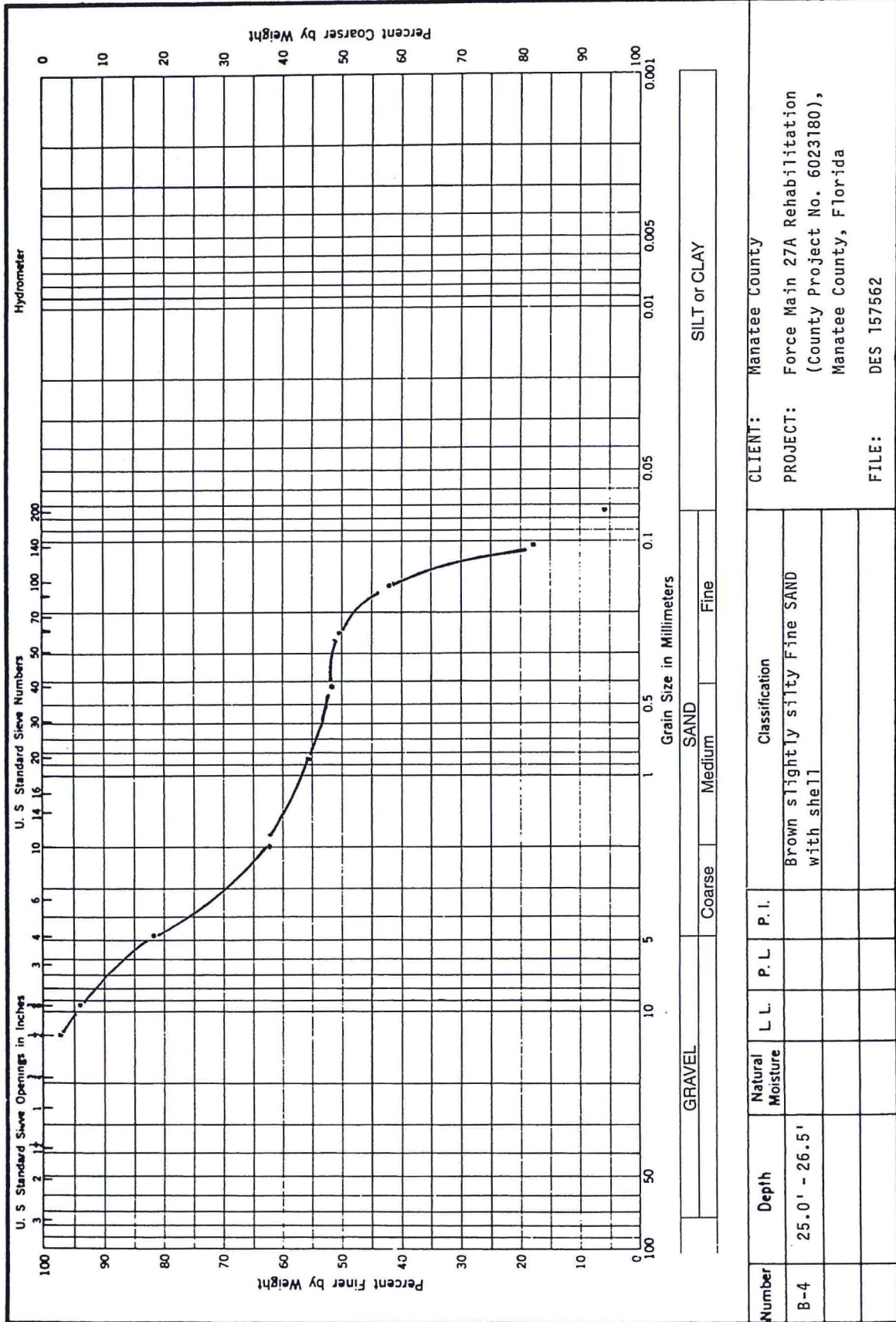
DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-4	20.0' - 21.5'					Brown slightly silty fine sand with shell

CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 FILE: DES 157562

DRIGGERS ENGINEERING SERVICES, INC.

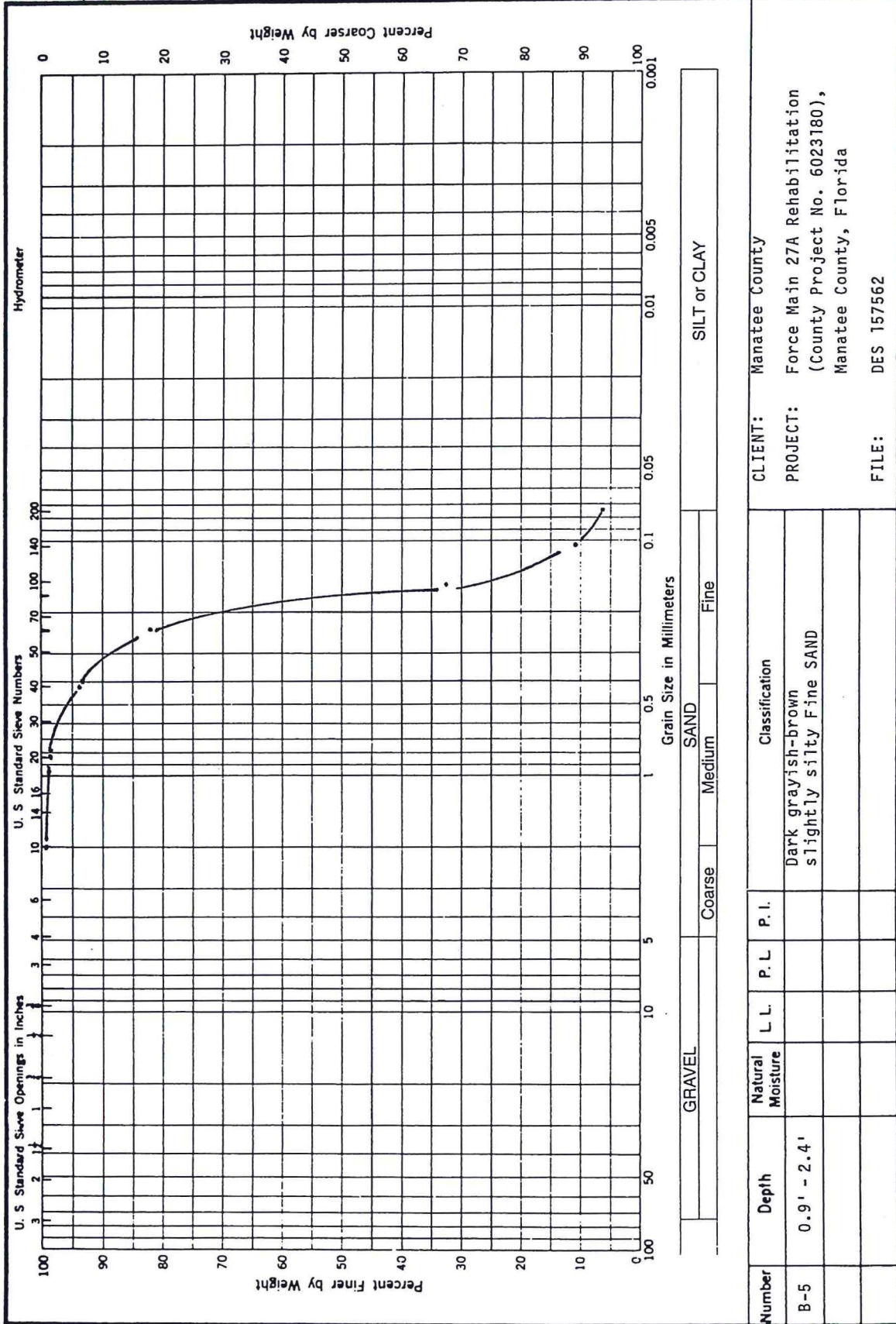


Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-4	25.0' - 26.5'					Brown slightly silty fine sand with shell

GRAVEL		
SAND	Coarse	Medium
		Fine
SILT or CLAY		

CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

DRIGGERS ENGINEERING SERVICES, INC.

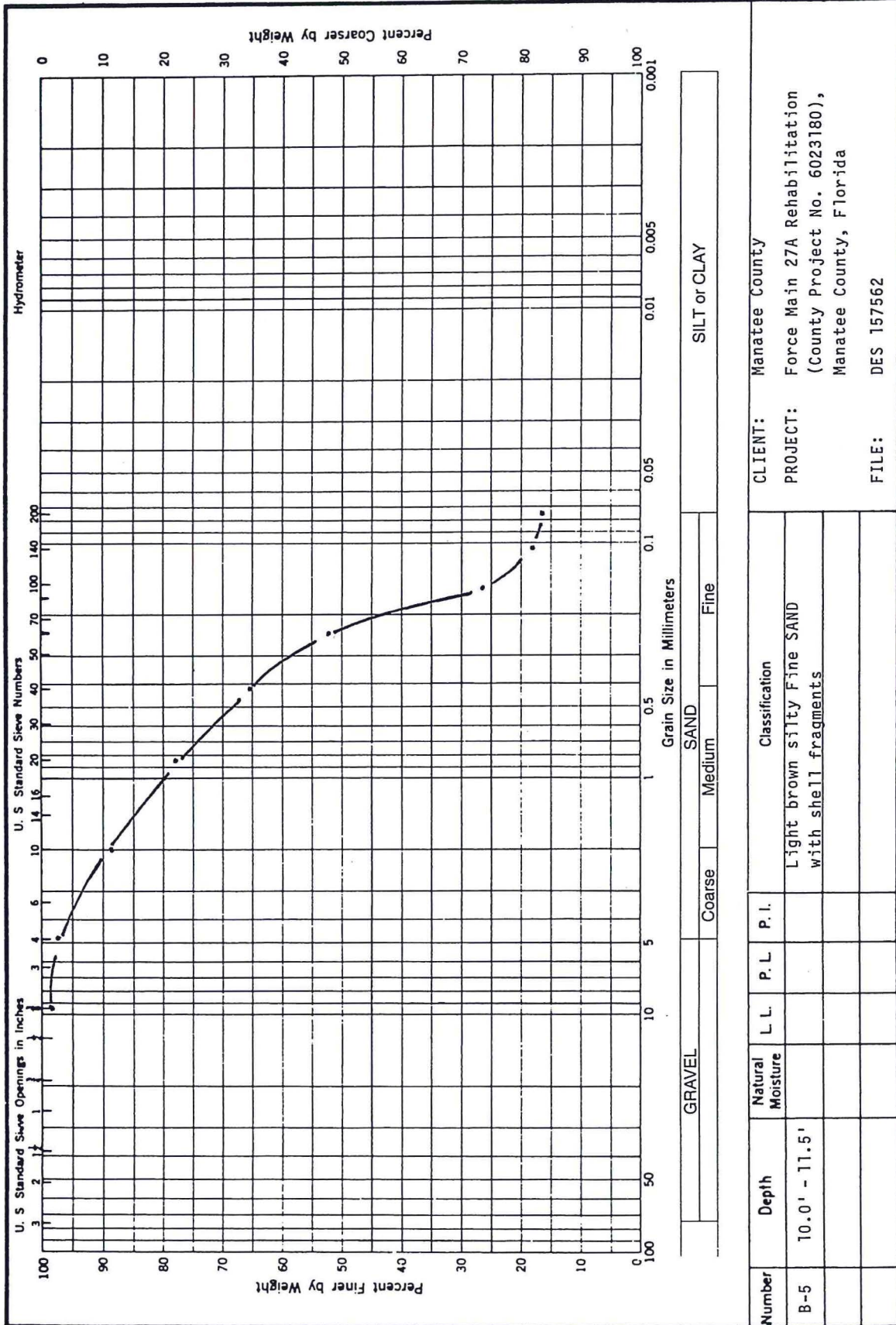


Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-5	0.9' - 2.4'					Dark grayish-brown slightly silty Fine SAND

GRAVEL	SAND	Fine	SILT or CLAY
	Coarse	Medium	

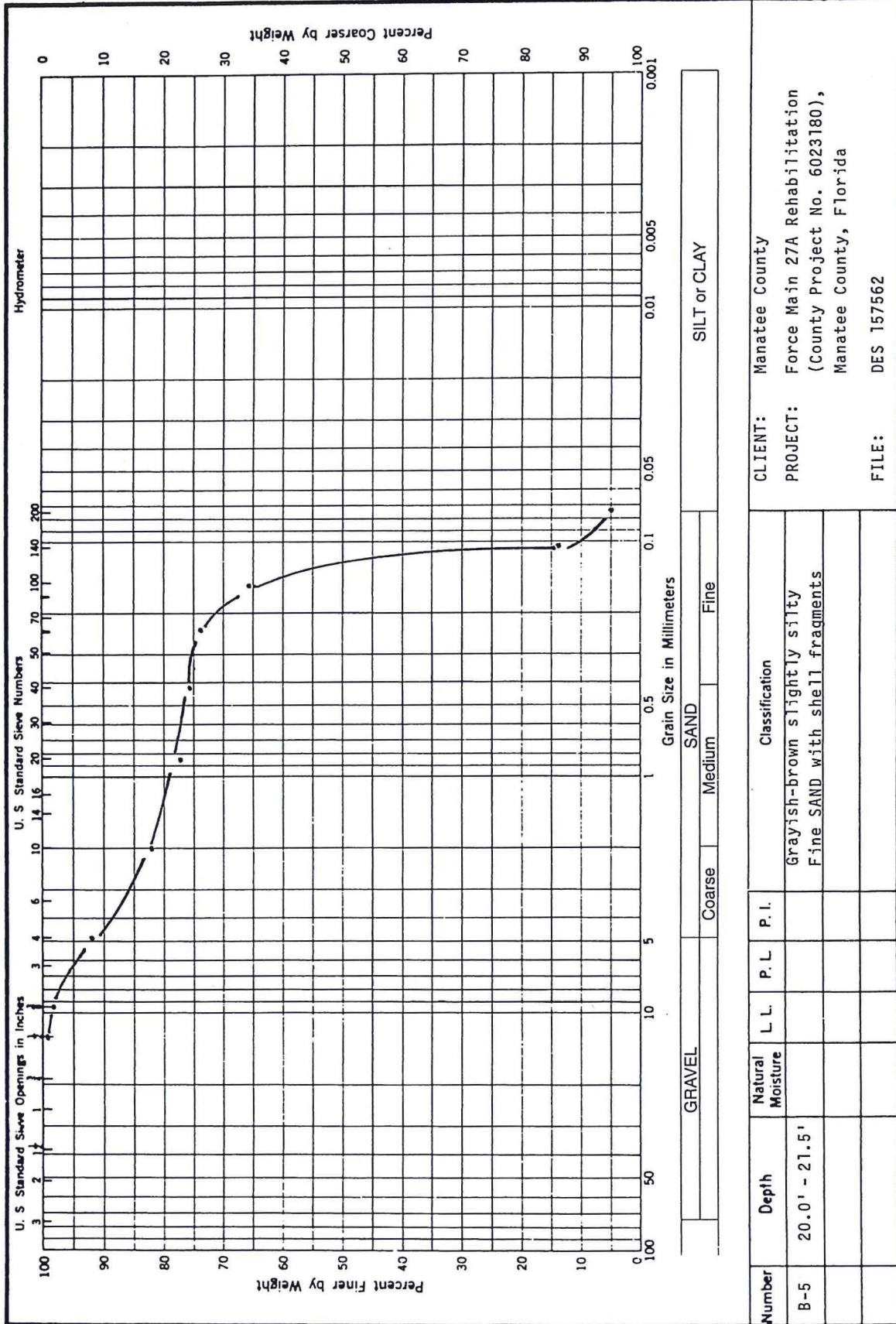
CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

DRIGGERS ENGINEERING SERVICES, INC.



CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
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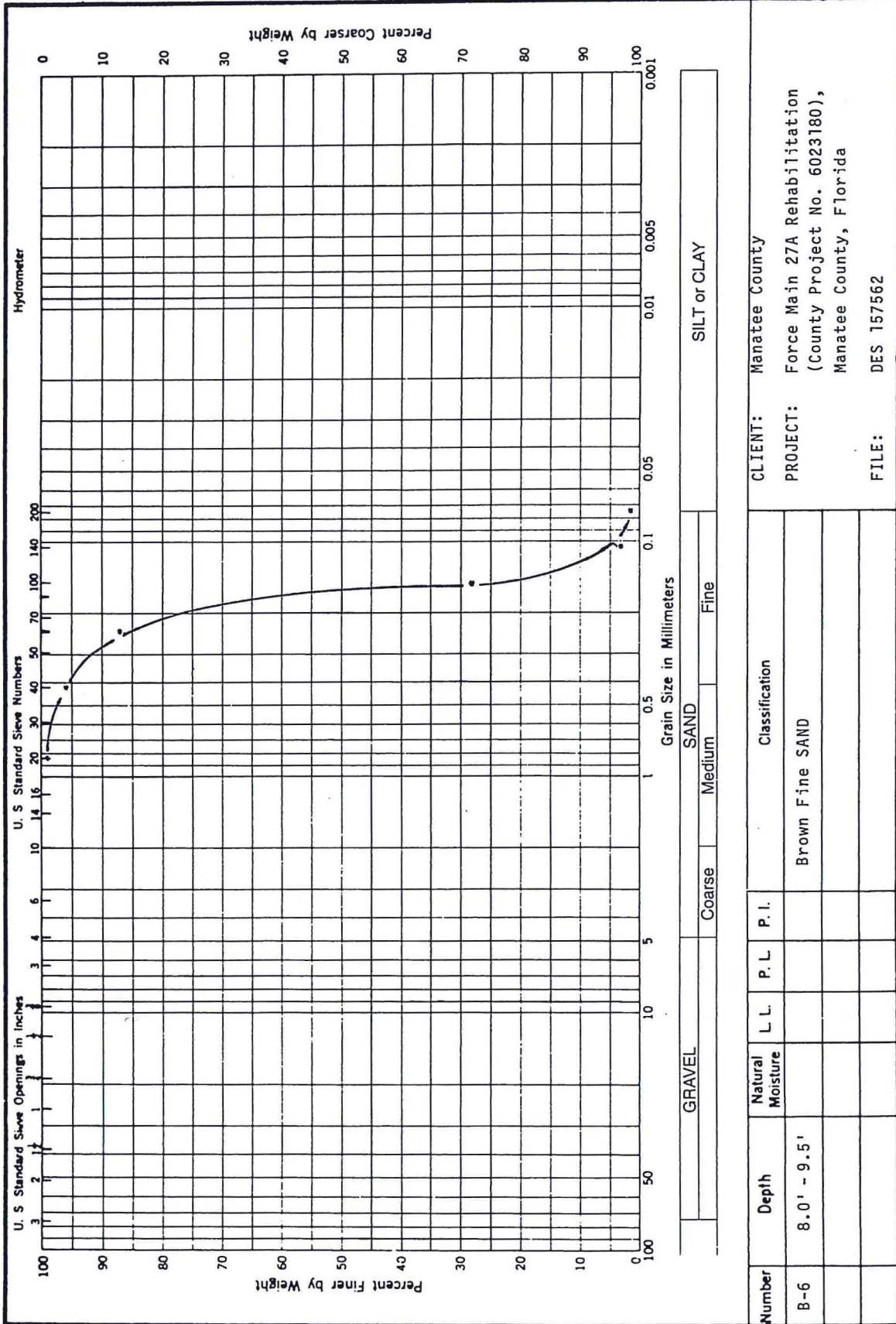
DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-5	20.0' - 21.5'					Grayish-brown slightly silty Fine SAND with shell fragments

CLIENT: Manatee County
 PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
 FILE: DES 157562

DRIGGERS ENGINEERING SERVICES, INC.

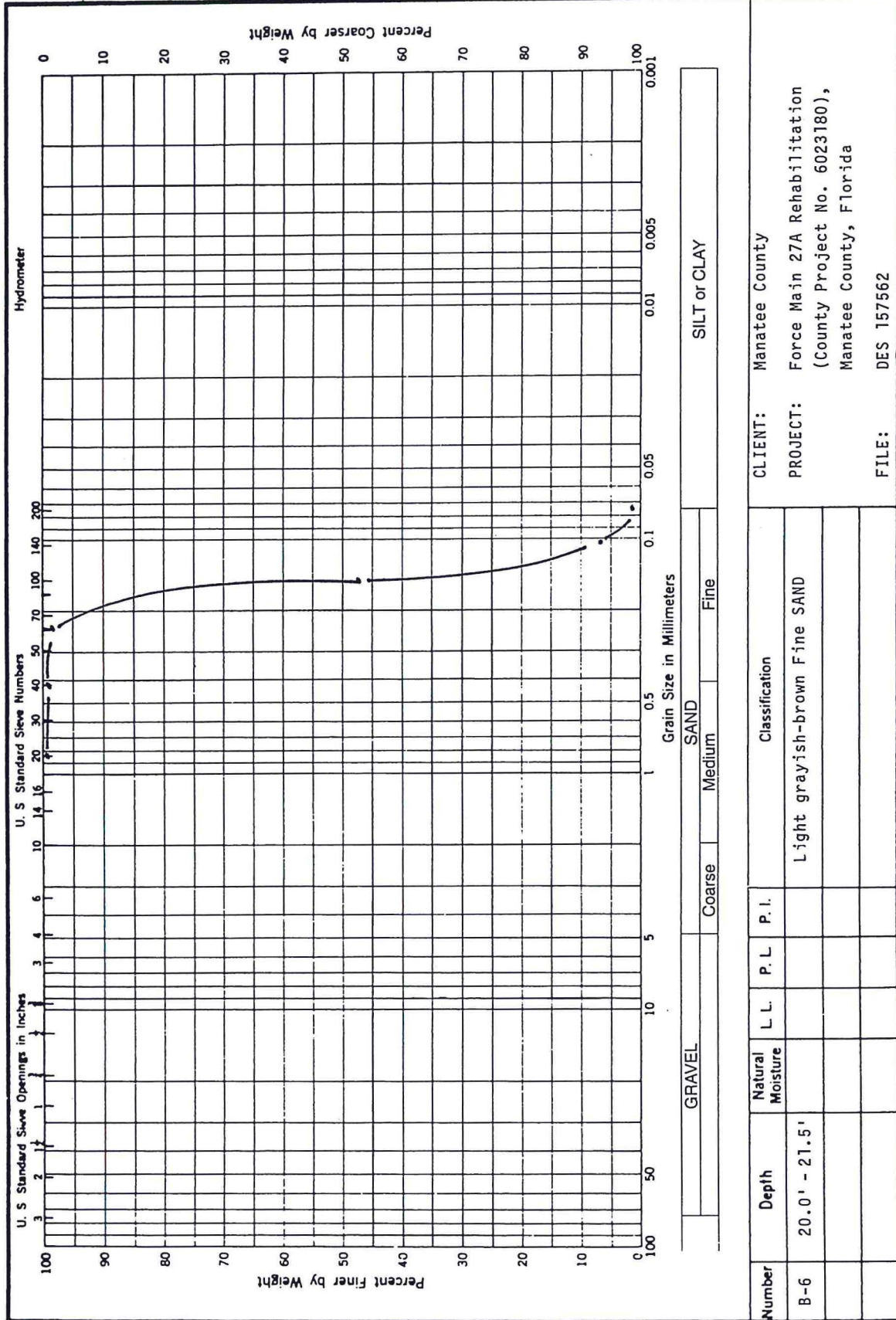


Number	Depth	Natural Moisture	L.L.	P.L.	P.I.	Classification
B-6	8.0' - 9.5'					Brown Fine SAND

GRAVEL	Coarse	Medium	Fine	SILT or CLAY
--------	--------	--------	------	--------------

CLIENT:	Manatee County
PROJECT:	Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
FILE:	DES 157562

DRIGGERS ENGINEERING SERVICES, INC.



Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification	CLIENT:
B-6	20.0' - 21.5'					Light grayish-brown Fine SAND	Manatee County
							PROJECT: Force Main 27A Rehabilitation (County Project No. 6023180), Manatee County, Florida
							FILE: DES 157562

METHOD OF TESTING

STANDARD PENETRATION TEST AND SOIL CLASSIFICATION

STANDARD PENETRATION TEST (ASTM D-1586)

In the Standard Penetration Test borings, a rotary drilling rig is used to advance the borehole to the desired test depth. A viscous drilling fluid is circulated through the drill rods and bit to stabilize the borehole and to assist in removal of soil and rock cuttings up and out of the borehole.

Upon reaching the desired test depth, the 2 inch O.D. split-barrel sampler or "split-spoon", as it is sometimes called, is attached to an N-size drill rod and lowered to the bottom of the borehole. A 140 pound hammer, attached to the drill string at the ground surface, is then used to drive the sampler into the formation. The hammer is successively raised and dropped for a distance of 30 inches using a rope and "cathead" assembly. The number of blows is recorded for each 6 inch interval of penetration or until virtual refusal is achieved. In the above manner, the samples are ideally advanced a total of 18 inches. The sum of the blows required to effect the final 12 inches of penetration is called the blowcount, penetration resistance or "N" value of the particular material at the sample depth.

After penetration, the rods and sampler are retracted to the ground surface where the core sample is removed, sealed in a glass jar and transported to the laboratory for verification of field classification and storage.

SOIL SYMBOLS AND CLASSIFICATION

Soil and rock samples secured in the field sampling operation were visually classified as to texture, color and consistency. The Unified Soil Classification was assigned to each soil stratum per ASTM D-2487. Soil classifications are presented descriptively and symbolically for ease of interpretation. The stratum identification lines represent the approximate boundary between soil types. In many cases, this transition may be gradual.

Consistency of the soil as to relative density or undrained shear strength, unless otherwise noted, is based upon Standard Penetration resistance values of "N" values and industry-accepted standards. "N" values, or blowcounts, are presented in both tabular and graphical form on each respective boring log at each sample interval. The graphical plot of blowcount versus depth is for illustration purposes only and does not warrant continuity in soil consistency or linear variation between sample intervals.

The borings represent subsurface conditions at respective boring locations and sample intervals only. Variations in subsurface conditions may occur between boring locations. Groundwater depths shown represent water depths at the dates and time shown only. The absence of water table information does not necessarily imply that groundwater was not encountered.



Florida Department of Environmental Protection

Southwest District Office
13051 North Telecom Parkway
Temple Terrace, FL 33637-0926

Rick Scott
Governor

Carlos Lopez-Cantera
Lt. Governor

Jonathan P. Steverson
Secretary

July 21, 2016

PERMITTEE:

Sia Mollanazar, P.E., Deputy Director, Engineering
Manatee County Public Works
1022 26th Avenue East
Bradenton, FL 34208
sia.mollanazar@mymanatee.org

PERMIT NUMBER: CS41-182063-178-DWC/CG
ISSUE DATE: July 21, 2016
EXPIRATION DATE: July 20, 2021
COUNTY: Manatee
PROJECT NAME: Force Main Replacement – 27A
WWTF NAME: MC Southwest
FACILITY ID: FLA012619

NOTIFICATION OF ACCEPTANCE OF USE OF A GENERAL PERMIT

Dear Mr. Mollanazar,

This letter acknowledges receipt of your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System for the subject project. Our Office received the Notice on July 18, 2016.

This is to advise you that the Department does not object to your use of this general permit for the following: 24-inch diameter force main.

Please note the attached requirements apply to your use of this general permit for constructing the proposed domestic wastewater collection/transmission system.

You are further advised that the construction activity must conform to the description contained in your Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System and that any deviation may subject the permittee to enforcement action and possible penalties.

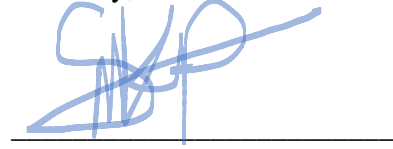
Mr. Sia Mollanazar, P.E.

Page 2

July 21, 2016

If you have any questions, please contact David Ayala at (813) 470-5946 or via email at David.Ayala@dep.state.fl.us.

Sincerely,

A handwritten signature in blue ink, appearing to be "P. Vazquez", written over a horizontal line.

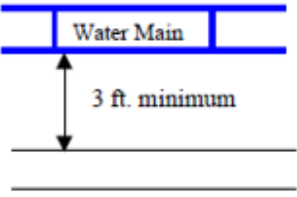
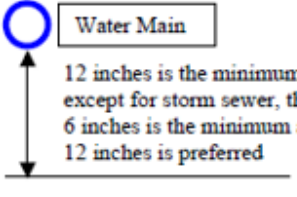
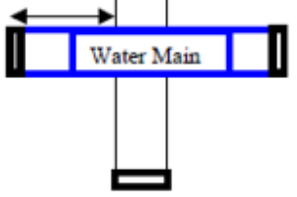
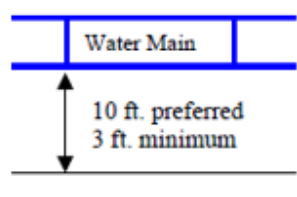
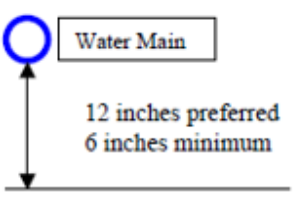
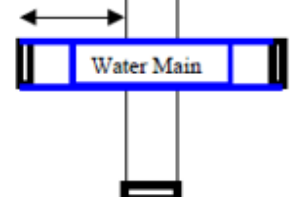
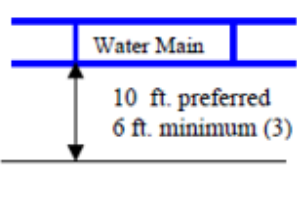
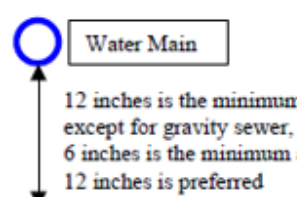
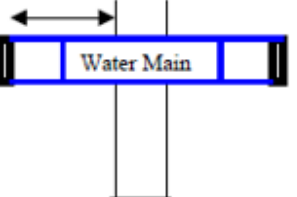
For Pamala Vazquez
Program Administrator
Permitting & Waste Cleanup Program
Southwest District

cc: Kenneth Labarr, Manatee County Public Works Dept., Kenneth.Labarr@mymanatee.org
Jim Stockwell, P.E., Manatee County Public Works Dept., Jim.Stockwell@mymanatee.org

REQUIREMENTS FOR USE OF THE GENERAL PERMIT FOR DOMESTIC WASTEWATER COLLECTION/TRANSMISSION SYSTEMS:

1. This general permit is subject to the general permit conditions of Rule 62-4.540, F.A.C., as applicable. This rule is available at the Department's Internet site at:
<http://www.dep.state.fl.us/water/rulesprog.htm#ww> [62-4.540]
2. This general permit does not relieve the permittee of the responsibility for obtaining a dredge and fill permit where it is required. [62-604.600(6)(b)1]
3. This general permit cannot be revised, except to transfer the permit. [62-604.600(6)(b)2]
4. This general permit will expire five years from the date of issuance. If the project has been started and not completed by that time, a new permit must be obtained before the expiration date in order to continue work on the project. [62-4.030]
5. Upon completion of construction of the collection/transmission system project, and before placing the facilities into operation for any purpose other than testing for leaks or testing equipment operation, the permittee shall submit to the Department's Southwest District Office Form 62-604.300(8)(b), Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation. This form is available at the Department's Internet site at:
<http://www.dep.state.fl.us/water/wastewater/forms.htm> [62-604.700(2)]
6. The new or modified collection/transmission facilities shall not be placed into service until the Department clears the project for use. [62-604.700(3)]
7. Abnormal events shall be reported to the Department's Southwest District Office in accordance with Rule 62-604.550, F.A.C. For unauthorized spills of wastewater in excess of 1000 gallons per incident, or where information indicates that public health or the environment may be endangered, oral reports shall be provided to the STATE WATCH OFFICE TOLL FREE NUMBER (800) 320-0519 as soon as practical, but no later than 24 hours from the time the permittee or other designee becomes aware of the circumstances. Unauthorized releases or spills less than 1000 gallons per incident are to be reported orally to the Department's Southwest District Office within 24 hours from the time the permittee, or other designee becomes aware of the circumstances. [62-604.550]

LOCATION OF PUBLIC WATER SYSTEM MAINS IN ACCORDANCE WITH F.A.C. RULE 62-555.314

Other Pipe	Horizontal Separation	Crossings (1)	Joint Spacing @ Crossings (Full Joint Centered)
Storm Sewer, Stormwater Force Main, Reclaimed Water (2)			<p>Alternate 3 ft. minimum</p> 
Vacuum Sanitary Sewer			<p>Alternate 3 ft. minimum</p> 
Gravity or Pressure Sanitary Sewer, Sanitary Sewer Force Main, Reclaimed Water (4)			<p>Alternate 6 ft. minimum</p> 
On-Site Sewage Treatment & Disposal System	10 ft. minimum	---	---

- (1) Water main should cross above other pipe. When water main must be below other pipe, the minimum separation is 12 inches.
- (2) Reclaimed water regulated under Part III of Chapter 62-610, F.A.C.
- (3) 3 ft. for gravity sanitary sewer where the bottom of the water main is laid at least 6 inches above the top of the gravity sanitary sewer.
- (4) Reclaimed water not regulated under Part III of Chapter 62-610, F.A.C.

Disclaimer – This document is provided for your convenience only. Please refer to F.A.C. Rule 62-555.314 for additional construction requirements.



Ultra Mag And SIGNAL CONVERTER

DESCRIPTION

MODELS UM06 AND UM08 FLANGED TUBE *Ultra Mag* meters are manufactured to the highest standard available for magmeters. They incorporate microprocessor technology to offer very low flows and broad rangeability. The flanged end tube design permits use in a wide range of applications with up to 300 PSI working pressure. Flanged ends are Class "D" flat face flanges (150 PSI) or Class "F" raised face flanges (300 PSI). The fabricated tube is stainless steel with steel or stainless steel flanges and is lined with UltraLiner™, an NSF approved, fusion bonded epoxy material.

INSTALLATION is made similar to placing a short length of flanged end pipe in the line. The meter can be installed vertically, horizontally, or inclined on suction or discharge lines. The meter must have a full pipe of liquid for proper operation. Fluid must be grounded to the downstream flange of the sensor either via internal grounding electrodes (4 - 12") or using McCrometer 316 SS Grounding Rings. For best performance, grounding rings are recommended for all sizes. Any 90 or 45 degree elbows, valves, partially opened valves, etc. should not be placed closer than one pipe diameters upstream and zero pipe diameters downstream. All blending and chemical injection should be done early enough so the flow media is thoroughly mixed prior to entering the measurement area.

SIGNAL CONVERTER: The signal converter is the reporting, input and output control device for the sensor. The converter allows the measurements, functional programming, control of the sensor and data recording to be communicated through the display and inputs/outputs. The microprocessor-based signal converter has a curve-fitting algorithm to improve accuracy, dual 4-20mA analog outputs, an RS485 communication port, an 8 line graphical backlit LCD display with 3-key touch programming, and a rugged enclosure that meets IP67. In addition to a menu-driven self-diagnostic test mode, the converter continually monitors the microprocessor's functionality. The converter will output rate of flow and total volume. The converter also comes standard with password protection and many more features.

ISOLATED POWER AND SIGNAL: The power and signal between the converter and sensor are isolated and placed in separate cables giving superior resistance to electrical signal noise compared to single cable designs. An added benefit from the dual cable design is a maximum cable length of up to 500ft.

OPTIONAL:

DC powered converter (10-35 VDC, 21 W)

Meter mounted converter

Extended warranty

Hastelloy® electrodes

ANSI or DIN flanges

Quick Connect cable fittings

Special lay lengths, including ISO standard lay lengths

Converter sun shield

Modbus Protocol RS485 converter; HART® Converter; Profibus Converter

(No Dual 4-20mA on HART & Profibus); Panel mount converter (Not CSA approved)

MODEL UM06 AND UM08
ULTRA MAG® ELECTROMAGNETIC FLOW METER
 150 PSI FLANGED TUBE METER, SIZES 2" thru 48"
 300 PSI FLANGED TUBE METER, SIZES 2" thru 48"

SPECIFICATIONS

WARRANTY	2 Years
ACCURACY TESTS	5-point wet flow calibration of every complete flow tube with its signal converter. If desired, the tests can be witnessed by the customer. The McCrometer test facilities are traceable to the National Institute of Standards & Technology. Uncertainty relative to flow is ±0.15%
ACCURACY	Plus or minus 0.5% of actual flow
REPEATABILITY	±0.05% or ±.0008ft/s (±0.25mm/s), whichever is greater
HEAD LOSS	None. No obstruction in line and no moving parts
PRESSURE RANGE	150 PSI maximum working pressure (UM06) 300 PSI maximum working pressure (UM08)
TEMPERATURE RANGE	Sensor Operating: -10 to 77°C (14 to 170°F) Sensor Storage: -15 to 77°C (5 to 170° F) Electronics: Operating and storage temperature: -4° to 140° F (-20° to 60° C)
VELOCITY RANGE	.2 to 32 FPS
BI-DIRECTIONAL FLOW	Forward and reverse flow indication and forward, reverse, net totalization are standard with all meters
CONDUCTIVITY	5 µs/cm
LINER	UltraLiner NSF approved, fusion bonded epoxy
ELECTRODES	Type 316 stainless steel, others optional
POWER SUPPLY	AC: 90-265VAC/45-66 Hz (20W/25VA) or DC: 10-35VDC (21W). AC or DC must be specified at time of ordering.
OUTPUTS	Dual 4-20mA Outputs (Not available for Profibus or HART Converters): Galvanically isolated and fully programmable for zero and full scale (0-21mA). Four separate digital programmable outputs: open collector transistor usable for pulse, frequency, or alarm settings. <ul style="list-style-type: none"> • Volumetric Pulse • Flow Rate (Frequency) • Directional Indication • High/Low Flow Alarms • Hardware Alarm • Empty Pipe • Range Indication
CABLE LENGTH	Includes 20' of submersible and UV resistant cable. Additional cable up to 500' is available
EMPTY PIPE SENSING	Zero return when electrodes are uncovered
ALARMS	Programmable alarm outputs
DIGITAL TOTALIZER	Cubic Meter; Cubic Centimeter; Milliliter; Liter; Cubic Decimeter; Decaliter; Hectoliter; Cubic Inches; US Gallons; Imperial Gallons; Cubic Feet; Kilo Cubic Feet; Standard Barrel; Oil Barrel; US Kilogallon; Ten Thousands of Gallons; Imperial Kilogallon; Acre Feet; Megagallon; Imperial Megagallon; Hundred Cubic Feet, Megaliter
RATINGS	• Metering Tube: NEMA 6P/IP68 with remote converter (six foot depth continuous submersion) • Electronics enclosure: IP67
CERTIFICATIONS	• CE Certified (Converter only) • Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 and CSA C22.2 No.61010-1-04 • ISO 9001:2008 certified quality management system



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MODEL UM06 AND UM08

ULTRA MAG® ELECTROMAGNETIC FLOW METER
WITH M-SERIES CONVERTER

150 PSI FLANGED TUBE METER, SIZES 2" thru 48"
300 PSI FLANGED TUBE METER, SIZES 2" thru 48"

SUGGESTED SPECIFICATIONS

METER shall be a velocity sensing electromagnetic type flanged tube meter with sealed housing for 150 PSI working pressure (UM06) or 300 PSI working pressure (UM08). The meter shall be a _____ inch Ultra Mag™ MODEL UM06/UM08 with a digital indicator having a range of 0 to _____ and shall be equipped with a 9 digit digital totalizer reading in units of _____ and shall be accurate within 0.5% of actual flow. The meter assembly shall operate within a range of 0.2 FPS to 32 FPS and be constructed as follows:

METER TUBE (SENSOR) shall be fabricated stainless steel pipe and use 150 lb. AWWA Class "D" flat face steel flanges (UM06) or 300 lb. AWWA Class "F" raised face steel flanges (UM08). The internal and external of the meter tube shall be blasted and lined with a NSF approved fusion bonded epoxy UltraLiner™, applied by the fluidized bed method. Meter tubes shall have a constant nominal inside diameter offering no obstruction to the flow. Electrodes shall be 316 stainless steel.

MAG SHIELD shall be welded to the tube providing a completely sealed environment for all coils, electrode connections and wiring harness capable of NEMA 6P/IP68 operation.

SIGNAL CONVERTER shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The converter shall be integrally mounted and remotely mounted up to 500 feet from the sensor, and shall be supplied in a sealed IP67 rated enclosure. Calibration will be completed at the manufacturer's location in accordance with customer supplied application-based requirements.

GROUNDING RINGS shall be 316 stainless steel and shall be supplied with the meter tube. Exception: On sensor models which use grounding electrodes, grounding rings are optional. For best performance, grounding rings are recommended for all sizes.

POWER AND SIGNAL ISOLATION: The power supplied between the converter and the meter tube (sensor) and signal between the meter tube and the converter shall be isolated and placed in separate submersible cables.

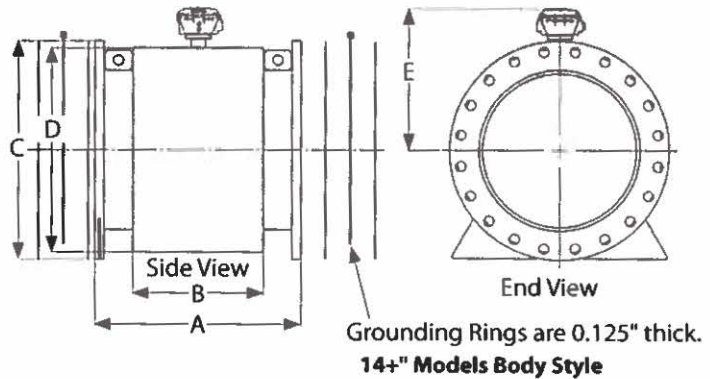
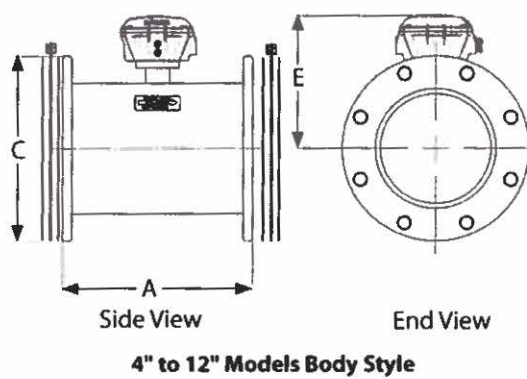
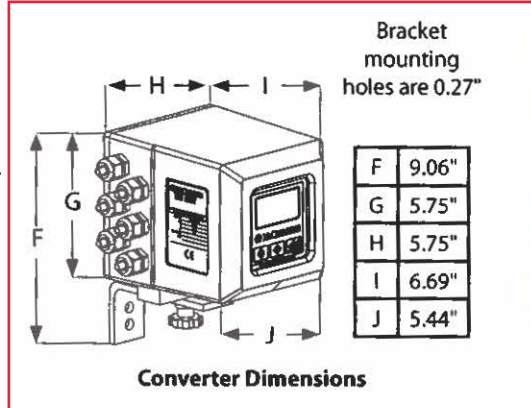
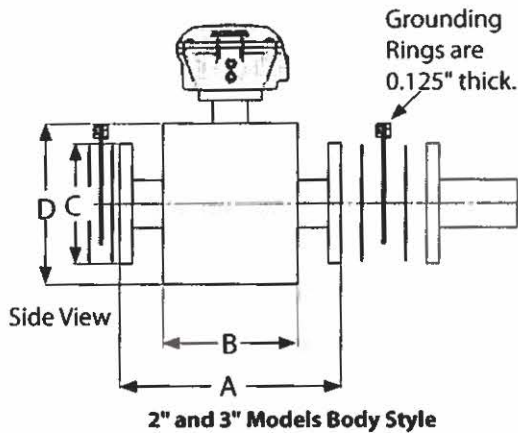
SERVICE & SUPPORT: Supplier must have flow calibration laboratories and personnel to perform testing and certify calibration. Personnel must also provide instruction or training as required assuring meters are supported and maintained throughout the guarantee period.

VOLUMETRIC TESTING of all meters must be performed and approved prior to shipment. The complete meter assembly and signal converter must be wet accuracy tested and calibrated. The test facility must be rigorously traceable to an accuracy of $\pm 0.15\%$ with the National Institute of Standards and Technology. If desired, the test shall be witnessed by the customer or their selected agent. A copy of the certified accuracy test record must be furnished at no charge to the customer.

ONE MANUFACTURER shall make all meter sizes and styles required for this contract. The meters shall be manufactured and tested in the U.S.A.



MODEL UM06 AND UM08
ELECTROMAGNETIC FLOW METER



Pipe Size (Nominal)	Meter Pipe ID	Flow Ranges GPM Standard .2 to 32 FPS Min - Max	DIMENSIONS (Lay Lengths)							Estimated Shipping Weight (lbs.)	
			A*		B	C		D	E	UM06	UM08
			UM06	UM08		UM06	UM08				
2"	2.117	2 - 340	11.00	11.00	6.70	6.00	6.50	7.90	9.26	93	107
3"	3.220	5 - 730	13.40	13.40	6.70	7.50	8.25	9.40	10.01	97	111
4"	3.720	8 - 1,140	13.40	13.40	n/a	9.00	10.00	n/a	8.06	78	108
6"	5.692	19 - 2,660	14.60	14.60	n/a	11.00	12.50	n/a	9.06	82	138
8"	7.692	33 - 4,870	16.10	17.25	n/a	13.50	15.00	n/a	10.06	115	195
10"	9.682	52 - 7,670	18.50	18.50	n/a	16.00	17.50	n/a	10.46	144	247
12"	11.682	74 - 11,180	19.70	19.70	n/a	19.00	20.50	n/a	12.31	193	342
14"	13.440	90 - 16,070	21.70	22.75	12.00	21.00	23.00	20.30	15.46	321	476
16"	15.440	118 - 20,900	23.60	25.25	14.20	23.50	25.50	21.10	16.21	390	645
18"	17.440	150 - 26,480	23.60	25.25	14.20	25.00	28.00	21.10	17.21	446	750
20"	19.440	185 - 32,720	25.60	28.25	16.20	27.50	30.50	24.80	18.26	588	874
24"	23.440	270 - 47,180	30.70	35.75	21.70	32.00	36.00	29.60	20.11	769	1,568
30"	29.190	420 - 73,620	35.80	41.75	26.50	38.75	43.00	35.90	23.26	1,261	2,317
36"	35.190	610 - 105,930	46.10	46.10	28.20	46.00	50.00	42.70	26.66	1,696	2,915
42"	41.190	830 - 144,370	48.05	**	32.10	52.75	**	48.35	29.99	**	**
48"	47.190	1,080 - 188,430	50.00	**	36.00	59.50	**	54.00	33.31	**	**

* Laying lengths for meters with ANSI Class 150 Flanges are equal to UM08 laying lengths

** Consult factory



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McCrometer's team of application engineers, researchers, and designers are involved in a variety of activities geared towards sharing with you our knowledge and expertise in providing complete flow measurement solutions. Technical support is readily available to help you evaluate your specific application.



The V-Cone® flow meter is designed to satisfy some of today's most challenging applications and operate in some of the harshest environments. This advanced differential pressure-type (DP) flow meter offers high accuracy and repeatability, wide rangeability, flexible installation, and little to no maintenance for the widest range of fluids.



The VM V-Cone is a flow meter specifically designed to save space by reducing the need for upstream and downstream straight pipe runs in water applications. Ready to install out of the box, the VM V-Cone allows you to accurately measure flow in no time. And with no recalibration and easy installation, the VM V-Cone helps keep operating costs down.



The Wafer-Cone® flow meter, with its unique design element, can be machined in different materials, including corrosion-resistant plastics and metals. It uses the same revolutionary principles found in the V-Cone and is an ideal solution for difficult installations or situations where long-term reliability is a must.



McCrometer's Water Specialties Propeller Meters™ are designed and manufactured with precise techniques and high quality components to deliver superior performance, low maintenance, and unsurpassed durability. They offer the latest in technology and simplicity of design and are perfect for measuring clean water flows.



McCrometer's Ultra Mag® is an advanced electromagnetic flow meter designed specifically to meet the needs of the water and wastewater industry. With innovative features, such as the UltraLiner™ fusion-bonded epoxy liner and a state-of-the-art microprocessor, it delivers exceptional accuracy, reliability, rangeability, and durability, even in harsh environments.



The FPI Mag® (Full Profile Insertion) and SPI Mag™ (Single Point Insertion) flow meters offer the ease of hot tap installation in a full profile and single point solution for a variety of applications within the municipal and industrial marketplace. These electromagnetic insertion flow meters install without interrupting service. The FPI Mag is the only insertion flow meter with multiple electrodes across the pipe diameter delivering an accurate measurement of the full profile. The SPI Mag is an economical choice for clean and dirty water applications with solids and can be easily re-located to various line sizes.



The Mc® Propeller line of flow meters offers economical, dependable solutions for the widest range of water management applications. Designed to operate in corrosive and erosive environments, these flow meters can handle turbulent flows and fluids containing debris, suspended solids, and other contaminants with superior accuracy.



McCrometer's award-winning Mc Mag³⁰⁰⁰™ provides growers and irrigators with a new alternative for flow measurement. With a guaranteed 5-year battery life and saddle mount design, the Mc Mag³⁰⁰⁰ delivers the dependability and ease-of-installation McCrometer has provided to the agricultural market for nearly 60 years. The electromagnetic sensor offers +/-1% accuracy while being designed to naturally shed debris. It is available in common ag irrigation line sizes ranging from 4 to 12 inch diameter pipe and is telemetry ready for remote meter reading.



McCrometer CONNECT® Wireless Monitoring for irrigation management. McCrometer CONNECT offers the widest selection of technologies and turn-key solutions available on the market today. By partnering with the best in the business, we are able to deliver high quality, local service and support. The combined product offerings brought to you with McCrometer CONNECT provide a broad system and sensor portfolio, including: cellular, satellite and radio systems.



MODEL UM06 AND UM08
ULTRA MAG® ELECTROMAGNETIC FLOW METER
WITH M-SERIES CONVERTER
150 PSI FLANGED TUBE METER, SIZES 2" thru 48"
300 PSI FLANGED TUBE METER, SIZES 2" thru 48"

SUGGESTED SPECIFICATIONS

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MAG SHIELD shall be welded to the tube providing a completely sealed environment for all coils, electrode connections and wiring harness capable of NEMA 6P/IP68 operation.

SIGNAL CONVERTER shall be pulsed DC coil excitation type with auto zeroing. The converter shall indicate direction of flow and provide a flow rate indication and a totalization of flow volume for both forward and reverse directions. Both forward and reverse totalizers shall be electronically resettable. The flow meter converter shall be microprocessor based with a keypad for instrument set up and LCD displays for totalized flow, flow rate engineering units and velocity. The converter shall power the flow sensing element and provide galvanically isolated dual 4-20mA outputs. It shall be possible, in the test mode, to easily set the converter outputs to any desired value within the range. The 4-20mA scaling, time constants, pipe size, flow proportional output, engineering units and test mode values shall be easily set via the keypad and display. Four separate fully programmable alarm outputs shall be provided to indicate empty pipe, forward/reverse polarity (normally open/close), analog over-range, fault conditions, high/low flow rates, percent of range and pulse cutoff. The converter shall periodically perform self-diagnostics and display and resulting error messages. All set up and data and totalizer values may be protected by a password. The converter shall be integrally mounted or remotely mounted up to 500 feet from the sensor, and shall be supplied in a sealed IP67 rated enclosure. Calibration will be completed at the manufacturer's location in accordance with customer supplied application-based requirements.

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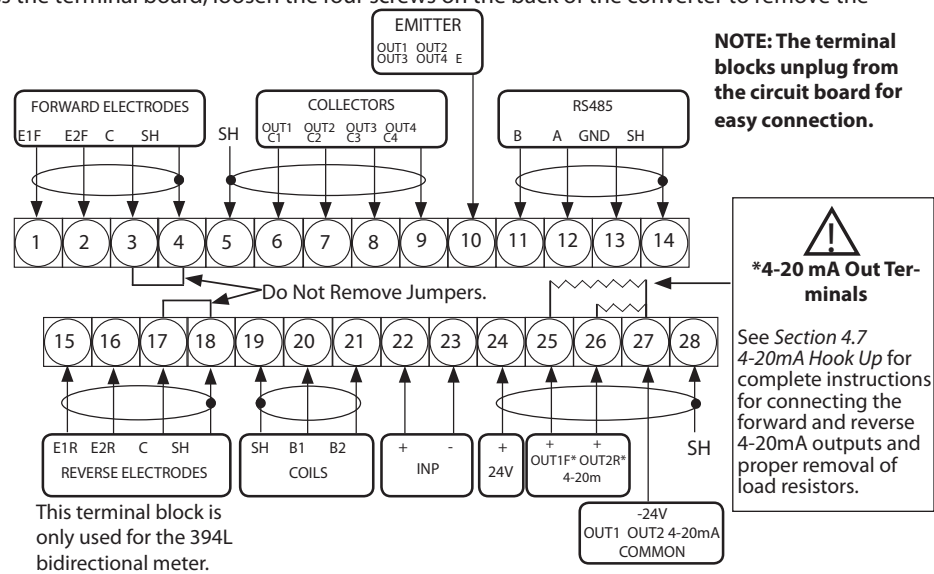
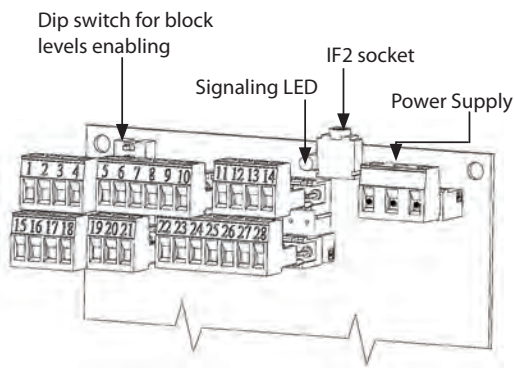
ONE MANUFACTURER shall make all meter sizes and styles required for this contract. The meters shall be manufactured and tested in the U.S.A.

TERMINAL BOARD (M-SERIES CONVERTER)

All electrical cables enter the converter through compression fittings located on the side of the converter. Ensure that all compression glands are properly tightened and all unused fittings are plugged so the case remains sealed.

All connections are made on the terminal board. To access the terminal board, loosen the four screws on the back of the converter to remove the rear cover.

CAUTION! Always disconnect the power cord before attempting any electrical connections.



Instructions apply to both:



Electromagnetic Flow Meter

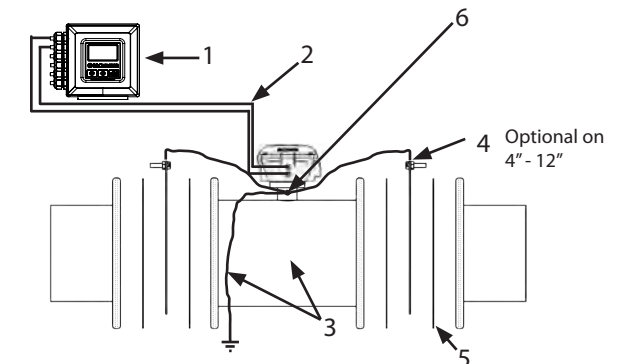
Quick Start Guide

30120-71 Rev. 1.4
August, 2015



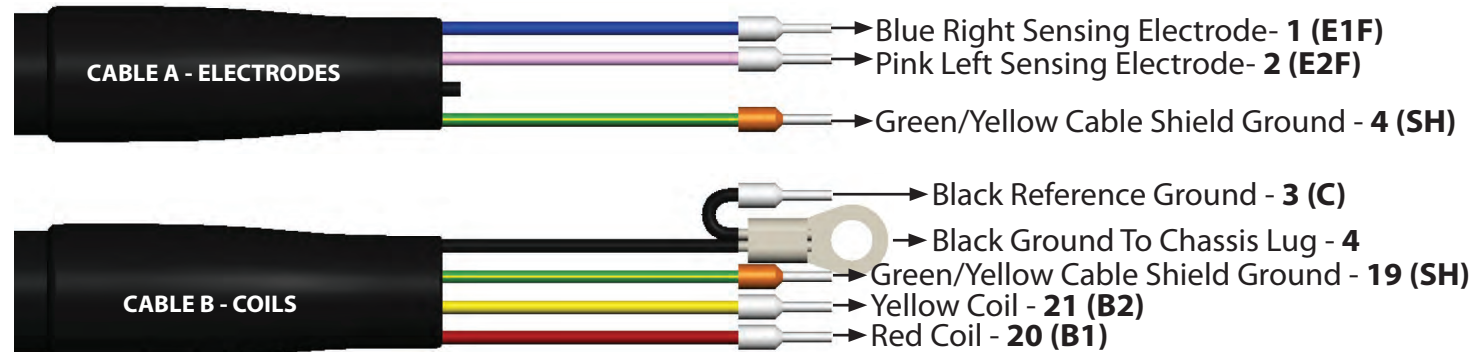
1 CONTENTS / PARTS DIAGRAM

Item No.	Part Name
1	M-Series Converter
2	Converter Cable (attached to meter)
3	Electromagnetic Meter Assembly with grounding wire attached
4	Grounding Rings, Stainless Steel (optional on 4"-12")
5	Gaskets (Optional)
6	Nut, Hex, Brass

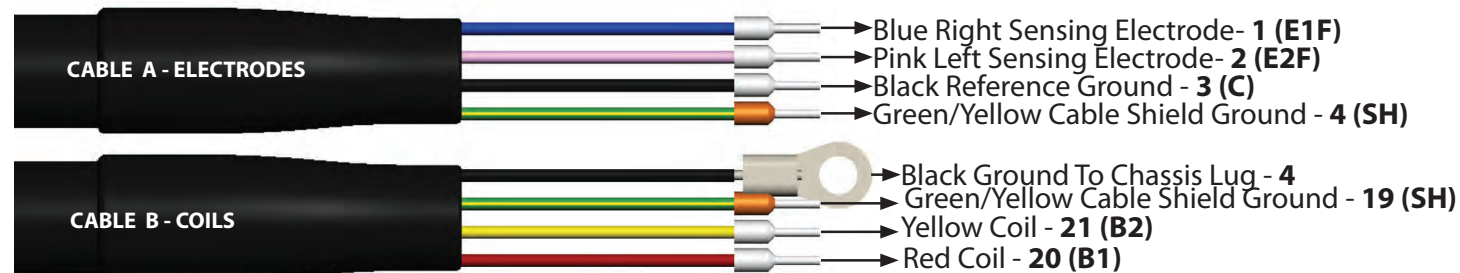


Also Included:
1 - Ultra Mag Installation, Operation and Maintenance Manual
1 - Converter Installation, Operation and Maintenance Manual

9 ULTRA MAG AND MX ULTRA MAG WIRING DIAGRAM



Ultra Mag and Mx Ultra Mag Body Style 1 - 2", 3" And 14+"

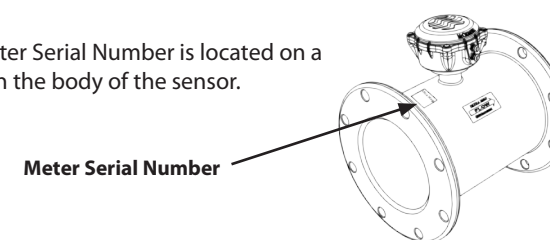


Ultra Mag and Mx Ultra Mag Body Style 2 - 4" through 12"

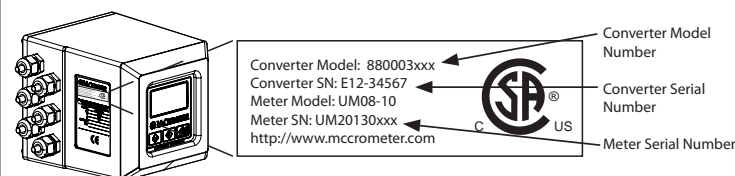
2 SERIAL NUMBERS

Verify the system serial numbers on both the sensor and converter match to ensure a properly calibrated system.

The Meter Serial Number is located on a plate on the body of the sensor.



The tag on the side of the converter has the Converter Model Number, the Converter Serial Number and the Meter Serial Number.



3 SAFETY WARNINGS

- WARNING!** Installation and maintenance must only be carried out by suitably trained personnel.
- WARNING!** Hazardous area designation on the equipment label must be suitable for the intended duty and location. All relevant sections in this guide must be read before selecting a location.
- WARNING!** Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.
- WARNING!** The installation and use of this equipment must be in accordance with relevant national and local standards.
- WARNING!** Carefully read all safety warning tags attached to the meter.

10 CONTACT INFORMATION



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4 SENSOR INSTALLATION CONSIDERATIONS

Electrical Noise And Sensor

For flow measurement free of electrical noise interference, the sensor body must have electrical contact with the media and be connected to an earth ground. This is normally achieved via a grounding ring or grounding button.

Fluid Conductivity

To eliminate rapid changes in fluid conductivity, it is recommended that all blending and chemical injecting be done downstream of the meter to avoid possible measurement error and/or issues. If blending or chemical injecting is performed upstream of the meter, it should be done upstream of the meter early enough so the flow media is thoroughly mixed prior to entering the measurement area.

Meter Mounted Converter Location

Adjoining pipe must be adequately supported, and the area around the sensor should provide sufficient drainage to prevent flooding the converter or conduits.

The location chosen should provide room to read the display and be free from harsh electrical noise from adjacent equipment, cables, R.F.I., or E.M.I. The signal converter should not be subjected to intense, prolonged sunlight and/or vibrations. Unit should also be protected from heat.

Remote Mount

The signal converter may be installed in a desired location provided that free access is available to allow the display to be viewed as required. The unit can be either wall mounted or panel mounted with masonry fixings or nuts and bolts respectively via the fixing holes provided. The maximum distance between the meter and the converter is 500 feet. For applications with extended lengths, consult factory.

Grounding Ring And Gaskets

With the grounding ring installed, gaskets must be used to ensure a positive seal at the flanges, and to ensure fluid is properly grounded to sensor. The grounding ring is optional on the 4" through 12" models as these models utilize grounding buttons. For best performance, grounding rings are recommended for all sizes.

Converter/transmitter Connections

Connections to the sensor must be made with cable supplied by McCrometer specifically for that purpose. Do not substitute the supplied cable with other types of cable, even for short runs. For repairs or added lengths of cable, the entire cable between the sensor and the converter must be replaced. (Consult factory for replacement cable.)

6 POSITIONING THE SENSOR

Pipe Diameters

For proper accuracies any 90 or 45 degree elbows, valves, partially opened valves, etc. should be placed not closer than one pipe diameters upstream and zero pipe diameters downstream.

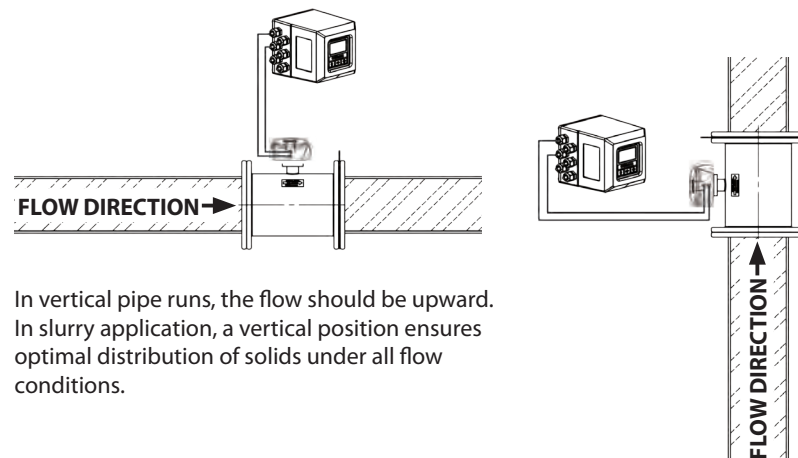
Flow Direction

The flow of the medium should correspond to the direction shown by the arrow on the sensor.

Sensor Orientation

The following installation recommendations should be followed:

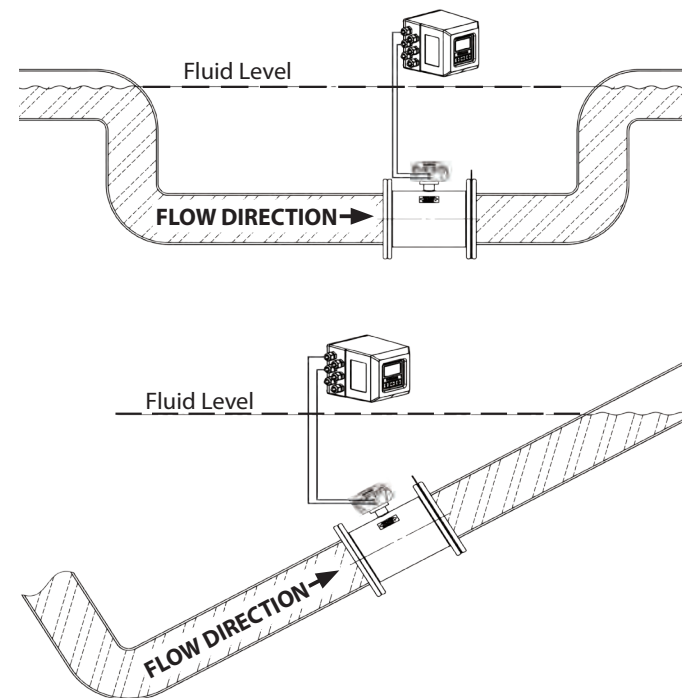
In horizontal pipe runs, the meter should be installed so that the junction box is vertical ensuring the electrodes are positioned to prevent coating by sediments or loss of electrode contact due to air bubbles.



In vertical pipe runs, the flow should be upward. In slurry application, a vertical position ensures optimal distribution of solids under all flow conditions.

In pipes which may encounter less than a full pipe of fluid, the meter must be positioned in a trap to ensure that the sensor is always completely filled with liquid.

Traps To Ensure Fluid Level



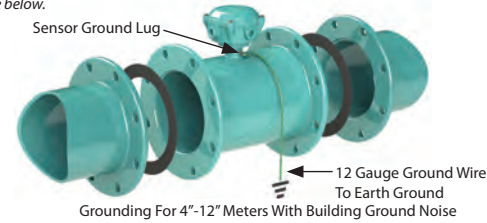
5 SENSOR GROUNDING

The following grounding examples show grounding options to use when the installation location is in an electrically noisy environment.

i IMPORTANT: Nothing in this manual supersedes local building codes.

Sensor Grounding for 4"-12" Meters With Building Minimal Ground Noise Using Internal Ground Button. NOTE: For best performance, grounding rings are recommended.

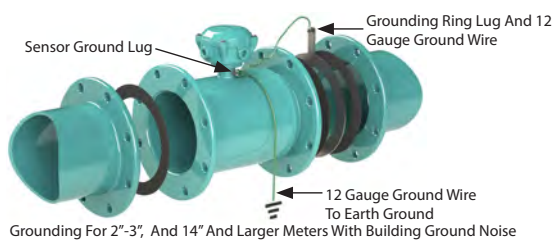
Attach the provided 12 gauge wire, or equivalent, to the ground lug and an isolated grounding rod. See below.



Sensor Grounding for 2"-3", And 14" And Larger Meters With Building Ground Noise

Attach the provided 12 gauge wire, or equivalent, to the ground lug and an isolated grounding rod. Next, attach the provided 12 gauge wire, or equivalent, to the sensor ground lug and the grounding ring lug. See below.

NOTE: The grounding ring must be installed on the inlet side of the sensor.

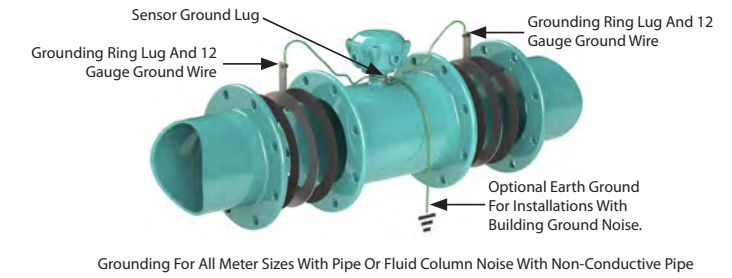


i Information For All Installations
 1: Gaskets must be used on either side of the grounding ring to provide a proper seal on the flanges. One gasket is used on flanges without a grounding ring.
 2: Rings & gaskets must align concentrically with the pipe so they do not obstruct or affect flow through the tube.

Sensor Grounding For All Meter Sizes With Pipe Or Fluid Column Noise With Non-Conductive Pipe

Attach the provided 12 gauge wire, or equivalent, to the sensor ground lug and to the TWO grounding ring lugs. See below.

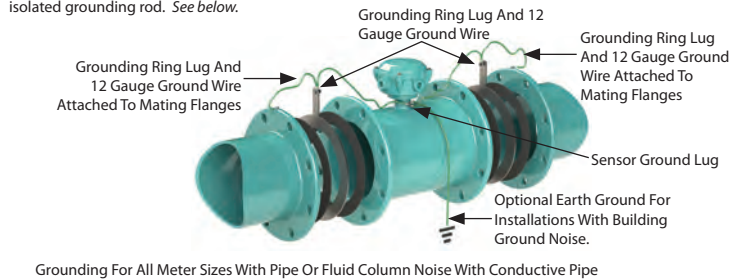
NOTE: If building ground noise is also present, attach the provided 12 gauge wire, or equivalent, to the ground lug and an isolated grounding rod. See Figure 8.



Sensor Grounding For All Meter Sizes With Pipe Or Fluid Column Noise With Conductive Pipe (Including PVC And Plastic Pipe)

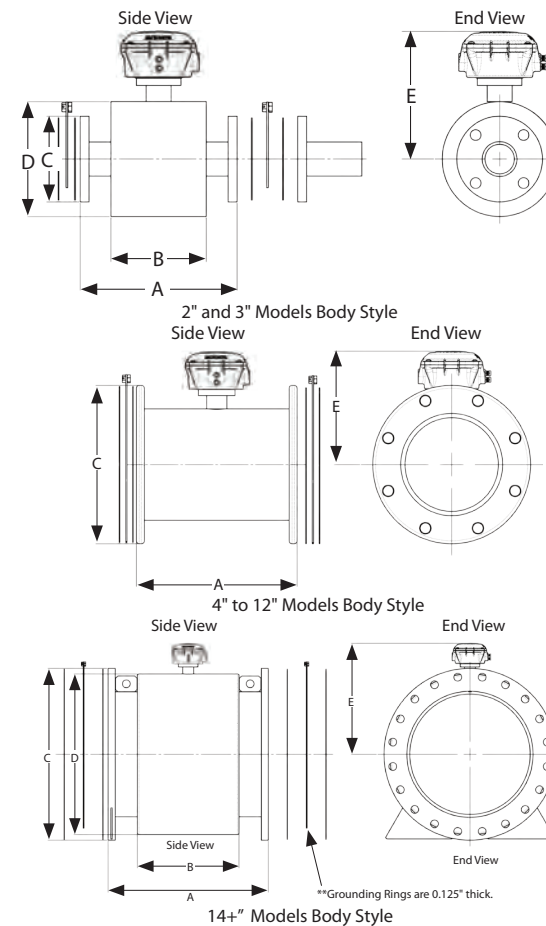
Attach the provided 12 gauge wire, or equivalent, to the sensor ground lug and to the TWO grounding ring lugs. See Figure 8. Next, using a 12 gauge wire, connect both grounding rings to the mating flanges. See below.

NOTE: If building ground noise is also present, attach the provided 12 gauge wire, or equivalent, to the ground lug and an isolated grounding rod. See below.



Grounding For All Meter Sizes With Pipe Or Fluid Column Noise With Conductive Pipe

7 DIMENSIONS



Meter Body Dimensions

Pipe Size (Nominal)	Meter Pipe ID	Flow Ranges GPM Standard .2 to 32 FPS Min - Max	DIMENSIONS (Lay Lengths)						
			A*	B	C	D	E		
2"	2.117	2 - 340	UM06	UM08	6.70	6.00	6.50	7.90	9.26
3"	3.220	5 - 730	13.40	13.40	6.70	7.50	8.25	9.40	10.01
4"	3.720	8 - 1,140	13.40	13.40	n/a	9.00	10.00	n/a	8.06
6"	5.692	19 - 2,660	14.60	14.60	n/a	11.00	12.50	n/a	9.06
8"	7.692	33 - 4,870	16.10	17.25	n/a	13.50	15.00	n/a	10.06
10"	9.682	52 - 7,670	18.50	18.50	n/a	16.00	17.50	n/a	10.46
12"	11.682	74 - 11,180	19.70	19.70	n/a	19.00	20.50	n/a	12.31
14"	13.440	90 - 16,070	21.70	22.75	12.00	21.00	23.00	20.30	15.46
16"	15.440	118 - 20,900	23.60	25.25	14.20	23.50	25.50	21.10	16.21
18"	17.440	150 - 26,480	23.60	25.25	14.20	25.00	28.00	21.10	17.21
20"	19.440	185 - 32,720	25.60	28.25	16.20	27.50	30.50	24.80	18.26
24"	23.440	270 - 47,180	30.70	35.75	21.70	32.00	36.00	29.60	20.11
30"	29.190	420 - 73,620	35.80	41.75	26.50	38.75	43.00	35.90	23.26
36"	35.190	610 - 105,930	46.10	46.10	28.20	46.00	50.00	42.70	26.66
42"	41.190	830 - 144,370	48.05	**	32.10	52.75	**	48.35	29.99
48"	47.190	1,080 - 188,430	50.00	**	36.00	59.50	**	54.00	33.31

* Laying lengths for meters with ANSI Class 150 Flanges are equal to UM08 laying lengths
 ** Consult factory



**ELECTROMAGNETIC
FLOWMETERS**

**INSTALLATION, OPERATION AND
MAINTENANCE MANUAL**

30119-03 Rev. 5.4
January, 2016



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1. INTRODUCTION

1.1 Description

Ultra Mag meters are available with integral or remote mount converters. Standard display features include forward, reverse and net flow totalizers, flow rate, alarm monitoring, and automatic self diagnostics to ensure integrity. All data and values are in selectable units of measurement. System compatibility is assured with a choice of current, pulse and serial data. Please refer to the converter manual provided with your meter.

Ultra Mag operating parameters are set via the electronics keypad. The software features multilevel password protection capability to prevent inadvertent program or setting changes. Data is stored in nonvolatile memory.

The flanged end tube design permits use in a wide range of applications. The fabricated tube is stainless steel with steel or stainless steel flanges and incorporates the UltraLiner, an NSF approved fusion-bonded epoxy liner.

1.2 Uncrating

The shipping crate contains the following items:

- Electromagnetic Meter Assembly with grounding wire attached
- Converter Cable (attached to meter)
- Signal Converter
- Grounding Rings
- Ground Wires (2)
- Installation, Operation and Maintenance Manuals for both the sensor and converter

When uncrating the Ultra Mag, any damage due to rough or improper handling should be reported to the transportation firm and McCrometer. If for any reason it is determined that the unit or parts of the unit should be returned to the factory, please contact McCrometer for clearance prior to shipment. Each unit must be properly crated to prevent any further damage. The factory assumes no responsibility for equipment damaged in return shipment due to improper packaging.



Warning:

- **Installation and maintenance must only be carried out by suitably trained personnel.**
- **HAZARDOUS AREA DESIGNATION ON THE EQUIPMENT LABEL MUST BE SUITABLE FOR THE INTENDED DUTY AND LOCATION.**
- **All relevant sections in this O & M Manual must be read before selecting a location.**
- **Safety requirements of this equipment, any associated equipment and the local environment must be taken into consideration.**
- **The installation and use of this equipment must be in accordance with relevant national and local standards.**

1.3. Parts List With Remote Mount Converter

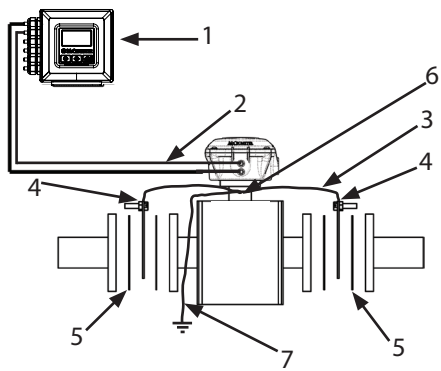


Figure 1: 2" - 3" Model

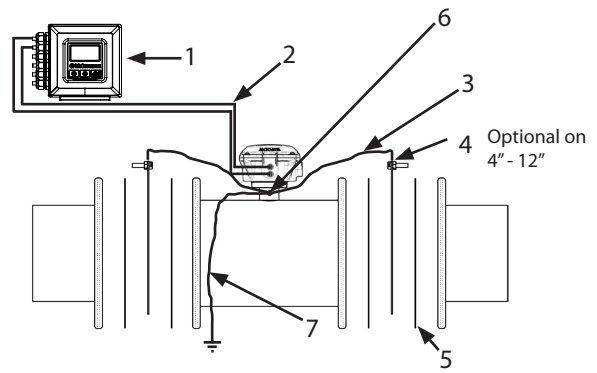


Figure 2: 4" - 12" Model

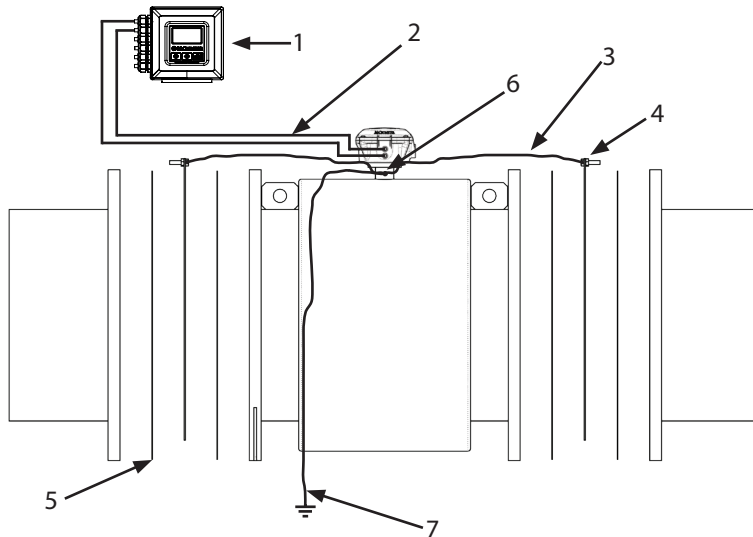


Figure 3: 14" And Larger Model

NO.	PART NUMBER	DESCRIPTION
1	880003032	AC Converter (Dual 4-20mA Output)
1	880003042	DC Converter (Dual 4-20mA Output)
1	880003043	AC Converter w/ Modbus RS485 Communications Protocol
2	1-1701-11	Dual Cables - Submersible
3	3-2757-##	Grounding Wire Assembly
4	3-2781-*	Grounding Rings, Stainless Steel (Optional on 4"-12")
5	1-1557-*	Gaskets (Optional)
6	1-1201-10	Nut, Hex, Brass
7	15029	Earth Ground Wire

* INSERT METER SIZE TO COMPLETE PART NUMBER - INSERT -02 FOR 2", -04 FOR 4", -06 FOR 6", ETC.
 ## 2" - 6" INSERT -02; 8" - 12", INSERT -08; 14" - 20", INSERT -14; 24" - 30", INSERT -24; 36", INSERT -36

When ordering replacement parts, please specify: Meter Size • Meter Model • Meter Serial Number

1.4 Serial Numbers

The converter and sensor are supplied as a matched system. Verify the meter serial numbers on both the converter and sensor match. This will insure a properly calibrated system.

The tag on the side of the converter has the Converter Model Number, the Converter Serial Number and the Meter Serial number, which is calibrated to the converter. An example is Shown below.

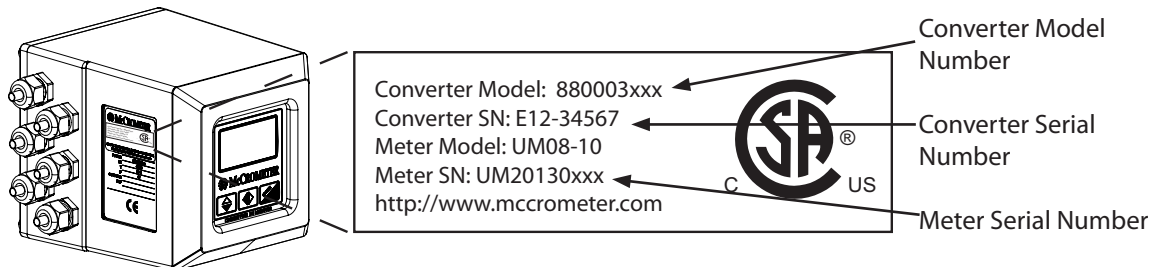


Figure 4: Converter Serial Number Tag



IMPORTANT: Verify the Meter Serial Numbers on both the converter and sensor match. This will insure a properly calibrated system. The Meter Serial Number is located on a plate on the body of the sensor, and the Converter Serial Number and the Meter Serial Number are located on a label on the side of the converter. Insure the Meter Serial Number on the sensor and the converter tags match.

2. SENSOR INSTALLATION



IMPORTANT: Nothing in this manual subsides local building codes.

2.1 Installation Considerations

2.1.1 Grounding And Electrical Interference

The sensor body must have electrical contact with the media. This is achieved via a grounding ring or grounding button. NOTE: The grounding ring is optional only on 4" through 12" models. For best performance, grounding rings are recommended for all sizes.

Always ensure that the converter and the sensor are grounded (earthed) correctly. The grounding of the sensor and converter ensures that the equipment and liquid have an equal potential. For most installations the quality of grounding by the provided cabling assures the sensor is properly grounded and additional grounding of the sensor is not required. However, in instances where this is not the case, i.e. the equipment and fluid do not have an equal potential, such as where the installation location and/or media is subjected to electrical interference, additional grounding steps may be required. Consult an electrician experienced with instrumentation installations to determine if electrical interference is present. For further information on installation environments and sensor grounding, please contact McCrometer Technical Support.

2.1.2 Lines With Cathodic Protection

On meters installed on a line with cathodic protection it may be necessary to insulate the meter from the line. Consult your cathodic protection vendor for instructions.

2.1.3 Fluid Conductivity

The fluid to be measured must have a minimum conductivity of 5 μ S/cm for an electromagnetic flow meter to operate. Systems with such low conductivity require that the system is well grounded with no electrical

2. SENSOR INSTALLATION - Cont.

interference. Also, In low conductivity fluids (less than 50 $\mu\text{S}/\text{cm}$) long cable lengths may affect flow meter's ability to read the flow signal.

To eliminate rapid changes in fluid conductivity, it is recommended that all blending and chemical injecting be done downstream of the meter to avoid possible measurement error and/or issues. If blending or chemical injecting is performed upstream of the meter, it should be done upstream of the meter early enough so the flow media is thoroughly mixed prior to entering the measurement area.

2.1.4 Meter Mounted Converter Location

Adjoining pipe must be adequately supported, and the area around the sensor should provide sufficient drainage to prevent flooding the converter or conduits.

The location chosen should provide room to read the display and be free from harsh electrical noise from adjacent equipment, cables, R.F.I., or E.M.I. The signal converter should not be subjected to intense, prolonged sunlight and/or vibrations. Unit should also be protected from heat.

2.1.5 Remote Mount

The signal converter may be installed in a desired location provided that free access is available to allow the display to be viewed as required. The unit can be either wall mounted or panel mounted with masonry fixings or nuts and bolts respectively via the fixing holes provided. The maximum distance between the meter and the converter is 200 feet. For applications with extended lengths, consult factory.

2.1.6 Grounding Ring And Gaskets

The grounding rings and gaskets must be used to ensure a positive seal at the flanges, and to ensure fluid is properly grounded to sensor. The grounding ring is optional on the 4" through 12" models as these models utilize grounding buttons. For best performance, grounding rings are recommended for all sizes.

- When installing into a PVC or plastic pipe system, grounding rings are required for all sizes.



Information For All Installations

- 1: Gaskets must be used on either side of the grounding ring to provide a proper seal on the flanges. One gasket is used on flanges without a grounding ring.
- 2: Rings & gaskets must align concentrically with the pipe so they do not obstruct or affect flow through the tube.

2.1.7 Converter/transmitter Connections

Connections to the sensor must be made with cable supplied by McCrometer specifically for that purpose. Do not substitute the supplied cable with other types of cable, even for short runs. For repairs or added lengths of cable, the entire cable between the sensor and the converter must be replaced. (Consult factory for replacement cable.)

2.2 Positioning The Sensor

2.2.1 Pipe Diameters

For proper accuracies any 90 or 45 degree elbows, valves, partially opened valves etc. should be placed not closer than one pipe diameter upstream and zero pipe diameters downstream.

2. SENSOR INSTALLATION - Cont.

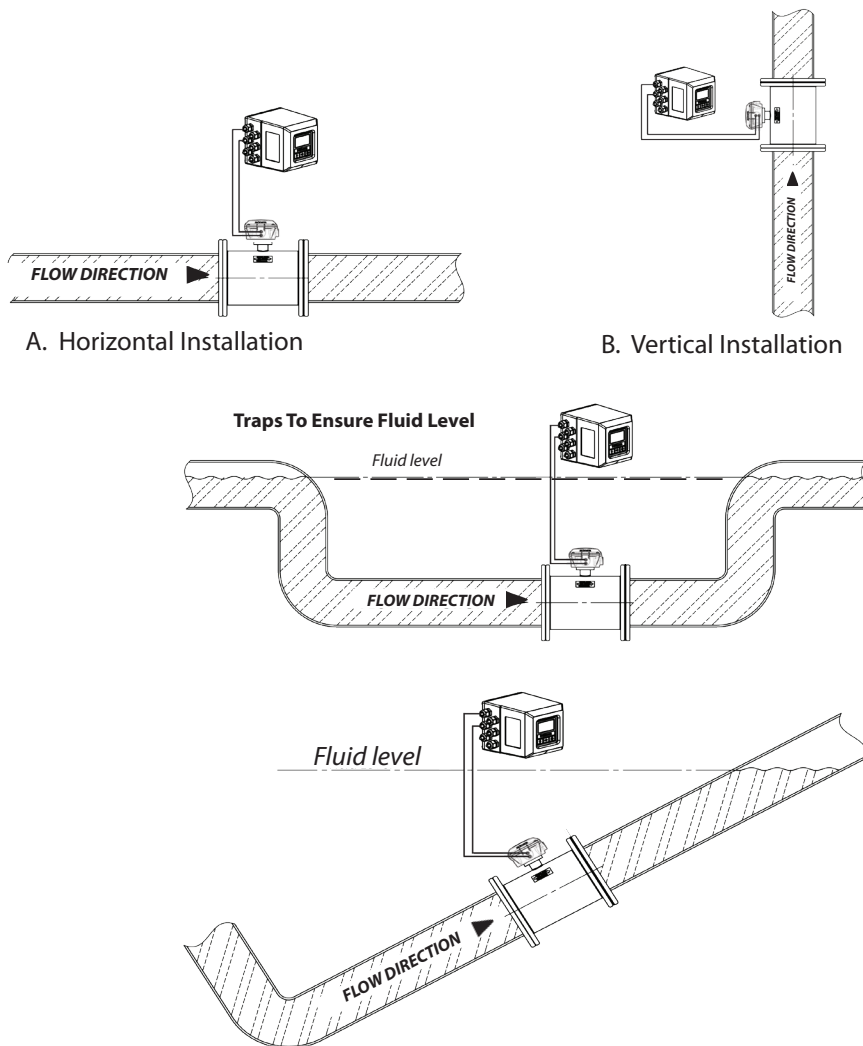
2.2.2 Flow Direction

The flow of the medium should correspond to the direction shown by the arrow on the sensor.

2.2.3 Sensor Orientation

The following installation recommendations should be followed (see Figure 2 for installation diagrams):

- A. In horizontal pipe runs, the meter should be installed so that the junction box is vertical insuring the electrodes are positioned to prevent coating by sediments or loss of electrode contact due to air bubbles.
- B. In vertical pipe runs, the flow should be upward. In slurry application, a vertical position ensures optimal distribution of solids under all flow conditions.
- C. In pipes which may encounter less than a full pipe of fluid, the meter must be positioned in a trap to ensure that the sensor is always completely filled with liquid.



C. Traps To Ensure Full Pipe Fluid Level

Figure 5: Sensor Orientation Options

3. QUICK CONNECT CABLE ENDS (OPTIONAL)

Quick Connect cable end fittings are optional. If selected at the time of order, follow the instructions below:

1. Remove the protective caps from both the receiving ports and the cable ends.
2. Insert the cable end into the port until fully seated, then turn the knurled collar on the cable to the right until the cable is tight.
3. With both cables properly attached to the meter, connect the meter-end protective cap to the cable-end protective cap. This insures that the protective caps remain free from dirt.



IMPORTANT NOTE: When the cables are not attached to the meter insure that the protective caps are properly secured to cable ends and the receiving ports to insure all connections remain free from dirt.

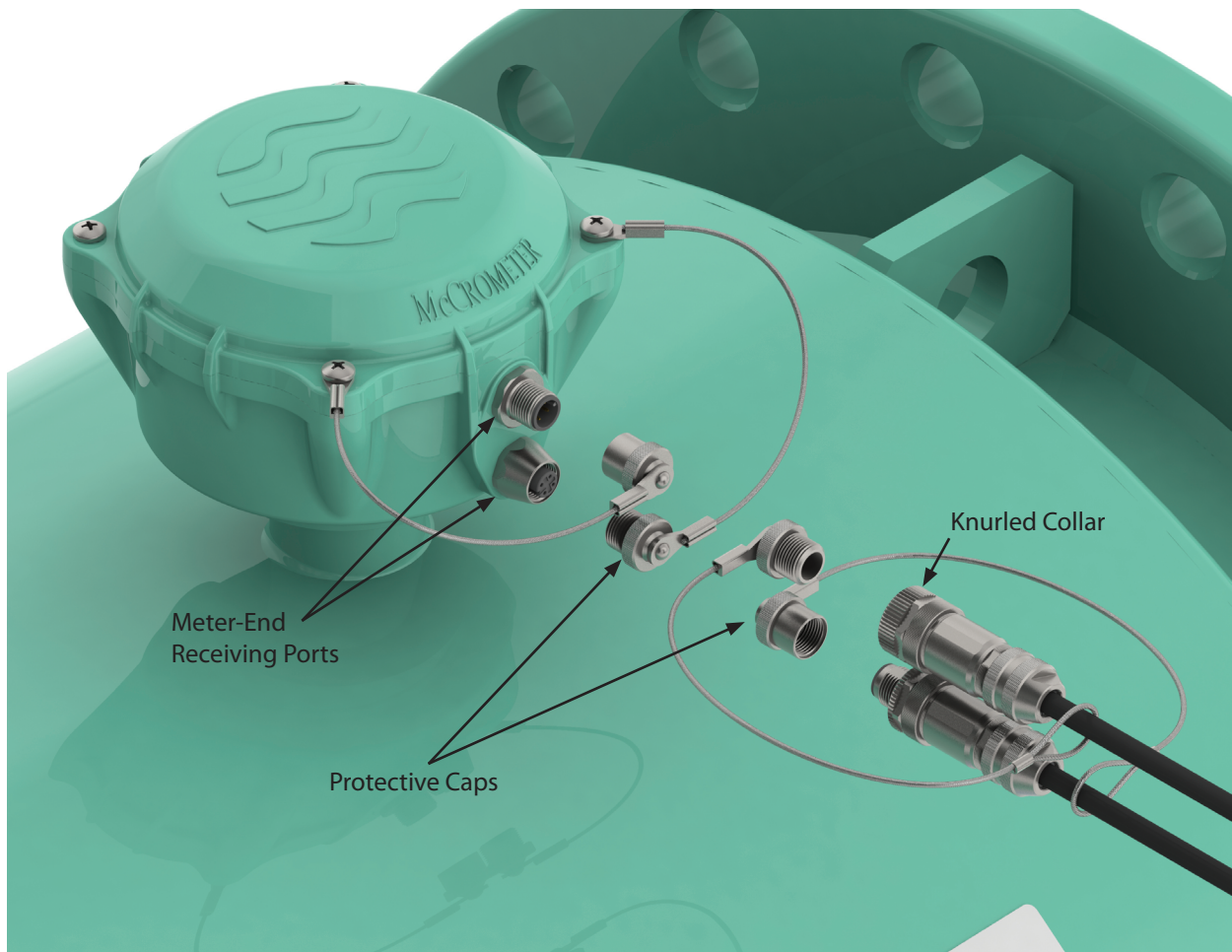


Figure 11: Optional Quick Connect Cable Ends

4. DIMENSIONS

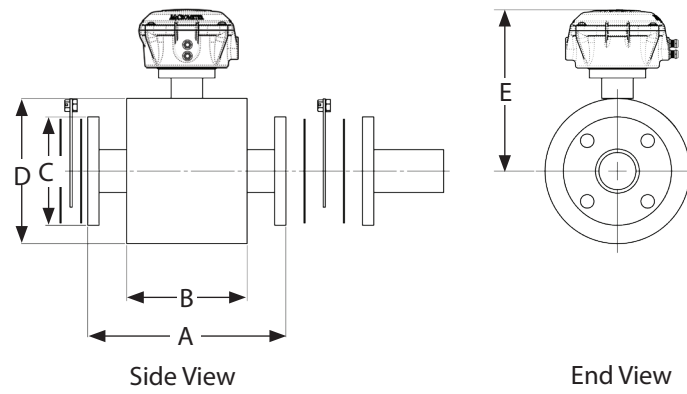


Figure 12: 2" and 3" Models Body Style

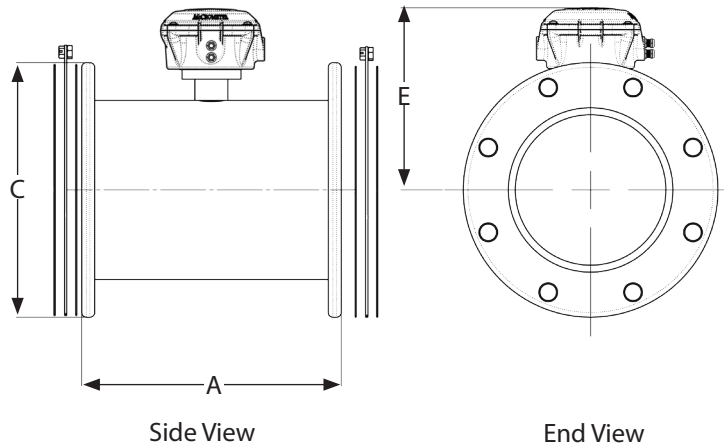


Figure 13: 4" to 12" Models Body Style

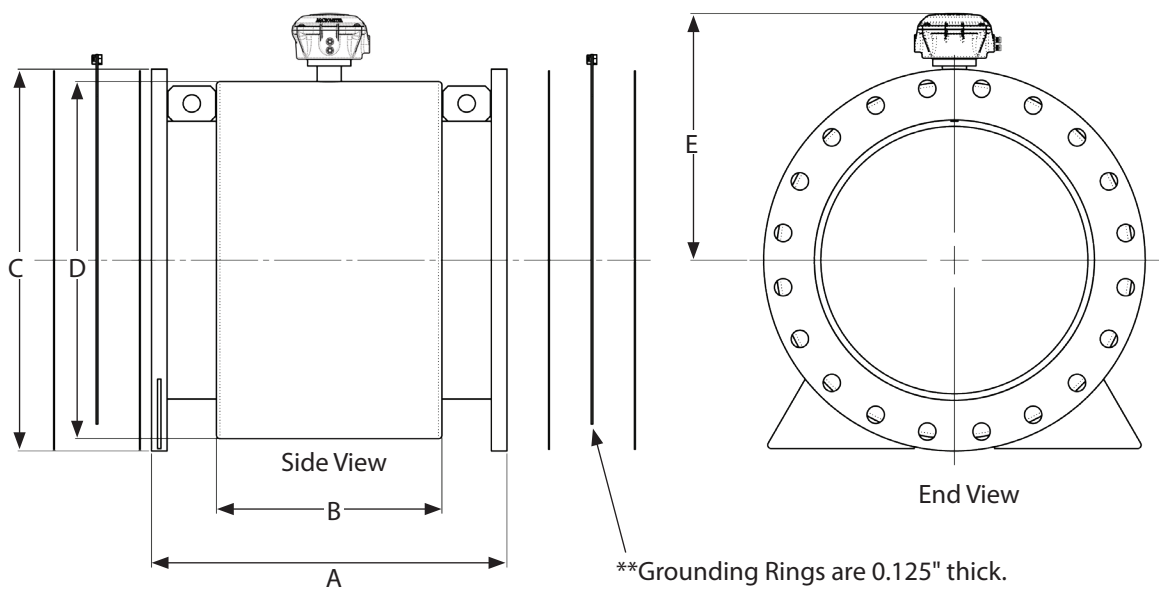


Figure 14: 14+\"/>

4. DIMENSIONS - Cont.

Meter Body Dimensions And Weights

Pipe Size (Nominal)	Meter Pipe ID	Flow Ranges GPM Standard .2 to 32 FPS Min - Max	DIMENSIONS (Lay Lengths)							†Estimated Shipping Weight (lbs.)	
			A*		B	C		D	E	UM06	UM08
			UM06	UM08		UM06	UM08				
2"	2.117	2 - 340	11.00	11.00	6.70	6.00	6.50	7.90	9.26	110	140
3"	3.220	5 - 730	13.40	13.40	6.70	7.50	8.25	9.40	10.01	115	150
4"	3.720	8 - 1,140	13.40	13.40	n/a	9.00	10.00	n/a	8.06	120	165
6"	5.692	19 - 2,660	14.60	14.60	n/a	11.00	12.50	n/a	9.06	125	170
8"	7.692	33 - 4,870	16.10	17.25	n/a	13.50	15.00	n/a	10.06	130	195
10"	9.682	52 - 7,670	18.50	18.50	n/a	16.00	17.50	n/a	10.46	165	250
12"	11.682	74 - 11,180	19.70	19.70	n/a	19.00	20.50	n/a	12.31	230	345
14"	13.440	90 - 16,070	21.70	22.75	12.00	21.00	23.00	20.30	15.46	350	480
16"	15.440	118 - 20,900	23.60	25.25	14.20	23.50	25.50	21.10	16.21	410	645
18"	17.440	150 - 26,480	23.60	25.25	14.20	25.00	28.00	21.10	17.21	495	750
20"	19.440	185 - 32,720	25.60	28.25	16.20	27.50	30.50	24.80	18.26	570	880
24"	23.440	270 - 47,180	30.70	35.75	21.70	32.00	36.00	29.60	20.11	825	1600
30"	29.190	420 - 73,620	35.80	41.75	26.50	38.75	43.00	35.90	23.26	1200	2350
36"	35.190	610 - 105,930	46.10	46.10	28.20	46.00	50.00	42.70	26.66	1750	2950
42"	41.190	830 - 144,370	48.05	**	32.10	52.75	**	48.35	29.99	**	**
48"	47.190	1,080 - 188,430	50.00	**	36.00	59.50	**	54.00	33.31	**	**

† Shipping weights are estimated and may change due to specific order packaging.

* Laying lengths for meters with ANSI Class 150 Flanges are equal to UM08 laying lengths

** Consult factory

5. SPECIFICATIONS

Accuracy: (under reference conditions): $\pm 0.5\%$ of actual flow from .2 to 32 FPS

Accuracy Tests: 5-point wet flow calibration of every complete flow tube with its signal converter. If desired, the tests can be witnessed by the customer. The McCrometer test facilities are traceable to the National Institute of Standards & Technology. The test facility uncertainty relative to flow is $\pm 0.15\%$

Repeatability: $\pm 0.05\%$ or $\pm 0.0008\text{ft/s}$ ($\pm 0.25\text{mm/s}$), whichever is greater

Bi-directional Flow: Forward and reverse flow indication and forward and reverse net totalization are standard with all meters

Head Loss: None. No obstruction in line and no moving parts.

Pressure Range:

150 PSI maximum working pressure (UM06)

300 PSI maximum working pressure (UM08)

Sensor Temperature Range:

Operating: -10 to 77°C (14 to 170°F)

Storage: -15 to 77°C (5 to 170°F)

Conductivity: Liquids and slurries having a conductivity of not less than $5\mu\text{S/cm}$ ($5\mu\text{mho/cm}$). For slurry applications please contact the factory for special converter programming.

Liner: UltraLiner NSF approved, fusion bonded epoxy

Electrodes: Stainless steel (Hastelloy® optional)

Sensor Cable: 20' McCrometer supplied submersible standard

Converter/sensor Separation: ≤ 500 feet; for longer lengths consult factory

Calibration: Wet flow calibrated in McCrometer flow lab traceable to the National Institute of Standards and Technology.

Sensor Cable Connection: Provided wired.

Ratings: Metering tube with remote converter is NEMA 6P/IP68

Certifications:

Safety: Listed by CSA to 61010-1: Certified by CSA to UL 61010-1 and CSA C22.2 No.61010-1-04

Options:

- DC Powered converter (10-35 VDC, 21W)
- Meter mounted converter
- Extended warranty
- Hastelloy® electrodes
- ANSI or DIN flanges
- Special lay lengths, including ISO standard lay lengths
- Converter sun shield
- Modbus Protocol RS485
- HART®, Profibus - No Dual 4-20mA
- Panel mount converter (Non-CSA)

5. Returning A Unit For Repair

13.3 Returning A Unit For Repair

If the unit needs to be returned to the factory for repair, please do the following:

- Prior to calling for a return authorization number, determine the model number, serial number, and reason for return.
- Call the McCrometer Customer Service Department and ask for a Return Authorization (RA) number.
- Ship the meter in the original packaging, if possible. Do not ship manuals, power cords, or other parts with your unit unless required for repair.
- Please make sure the meter is clean and free from foreign debris prior to shipping.
- Write the RA number on the outside of the shipping box. All return shipments should be insured.
- Address all shipments to:

McCrometer, Inc.
RMA #
3255 W. Stetson Avenue
Hemet, CA 92545

WARRANTY

This Warranty shall apply to and be limited to the original purchaser consumer of any McCrometer product. Meters or instruments defective because of faulty material or workmanship will be repaired or replaced, at the option of McCrometer, free of charge, FOB the factory in Hemet, California, within a period of two (2) years from the date of delivery.

Repairs or modifications by others than McCrometer or their authorized representatives shall render this Warranty null and void in the event that factory examination reveals that such repair or modification was detrimental to the meter or instrument. Any deviations from the factory calibration require notification in writing to McCrometer of such recalibrations or this Warranty shall be voided.

In case of a claim under this Warranty, the claimant is instructed to contact McCrometer, 3255 W. Stetson Ave., Hemet, California 92545, and to provide an identification or description of the meter or instrument, the date of delivery, and the nature of the problem.











The Warranty provided above is the only Warranty made by McCrometer with respect to its products or any parts thereof and is made expressly in lieu of any other warranties, by course of dealing, usages of trade or otherwise, expressed or implied, including but not limited to any implied warranties of fitness for any particular purpose or of merchantability under the uniform commercial code. It is agreed this Warranty is in lieu of and buyer hereby waives all other warranties, guarantees or liabilities arising by law or otherwise. Seller shall not incur any other obligations or liabilities or be liable to buyer, or any customer of buyer for any anticipated or lost profits, incidental or consequential damages, or any other losses or expenses incurred by reason of the purchase, installation, repair, use or misuse by buyer or third parties of its products (including any parts repaired or replaced); and seller does not authorize any person to assume for seller any other liability in connection with the products or parts thereof. This Warranty cannot be extended, altered or varied except by a written instrument signed by seller and buyer.

This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

McCrometer reserves the right to make improvements and repairs on product components which are beyond the Warranty period at the manufacturer's option and expense, without obligation to renew the expired Warranty on the components or on the entire unit. Due to the rapid advancement of meter design technology, McCrometer reserves the right to make improvements in design and material without prior notice to the trade.

All sales and all agreements in relation to sales shall be deemed made at the manufacturer's place of business in Hemet, California and any dispute arising from any sale or agreement shall be interpreted under the laws of the State of California.

OTHER McCROMETER PRODUCTS INCLUDE:

	Propeller Flowmeters
	Propeller Flowmeters
	Magnetic Flowmeters
	Magnetic Flowmeters
	Magnetic Flowmeters
	Magnetic Flowmeters
	Magnetic Flowmeters
	Wireless Monitoring Systems
	Differential Pressure Flowmeters
	Differential Pressure Flowmeters
	Differential Pressure Flowmeters

FOR MORE INFORMATION CONTACT:



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