



# CITY OF CLEARWATER

ENGINEERING DEPARTMENT  
MUNICIPAL SERVICES BUILDING, 100 S. MYRTLE AVENUE  
CLEARWATER, FLORIDA 33756  
TELEPHONE (727) 562-4750 FAX (727) 562-4755

## PUBLIC NOTICE

### ADDENDUM ONE

Date: February 5, 2021

Project: Cleveland St. Streetscape Phase III & Festival Core

For: All concerned parties

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**NOTICE IS HERBY GIVEN** that the following addendum serves to provide the report of the geotechnical investigation referred to as Attachment A.

**END OF NOTICE**

Mark Bunker, Councilmember  
Kathleen Beckman, Councilmember

Frank Hibbard, Mayor



David Allbritton, Councilmember  
Hoyt Hamilton, Councilmember

"Equal Employment and Affirmative Action Employer"

**REPORT OF THE  
GEOTECHNICAL INVESTIGATION**

**CLEVELAND STREET PHASE III  
CLEARWATER, FLORIDA**



City of Clearwater  
Engineering Department  
100 S. Myrtle Avenue, #220  
Clearwater, Florida 33756

July 28, 2017

Attention: Mrs. Jennifer Shannon, P.E.  
Senior Professional Engineer

**RE: Report of the Geotechnical Investigation  
Cleveland Street – Phase III  
Clearwater, Florida  
Purchase Order No.: ST113947  
Our File: DES 178064**

Dear Mrs. Shannon:

In accordance with your authorization, **DRIGGERS ENGINEERING SERVICES, INC.** has conducted an investigation of subsurface conditions along the alignment of the proposed improvements. The results of our field and laboratory studies are included herein together with a discussion of our findings and associated geotechnical design and construction considerations.

#### **FIELD INVESTIGATION PROGRAM**

A program of twenty-three (23) Standard Penetration Test (SPT) borings (B-1 through B-23) was performed along the alignment of the proposed improvements. Please refer to Plate I of the attachments for a depiction of the boring locations. In general, the borings were positioned about 200 to 300 feet apart. Typically, test borings were conducted to a depth of 15 feet below grade. Borings performed at potential baffle box locations on either side of the existing culvert crossing were advanced to a depth of about 25 feet. Approximate elevations at each test boring location were estimated based on the general topographic information provided to this office.

The Standard Penetration Test borings were performed in general accordance with ASTM D-1586. Please note that the upper 6 feet of the soil profile most locations was hand augered to minimize the potential for any damage to utilities that may not have been identified by the utility locate service or identified on the preliminary plan set provided for our use. The classification borings also had the advantage of providing a virtually continuous log of subsurface conditions within the upper 6 feet. Where hand augers were conducted, a hand cone sounding was also performed to provide relative penetration resistance data.

Individual logs of the Standard Penetration Test borings are included in the report attachments reflecting visual together with estimated Unified Soil Classification (USCS) and AASHTO Soil Classification. The test boring logs also present tabulated and graphically plotted Standard Penetration resistance values corresponding to each sample interval. Please note that 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 the interested reader.

Following completion of the Standard Penetration Test borings the boreholes were grouted to provide positive protection against any future pavement subsidence.

### LABORATORY INVESTIGATION

A laboratory classification testing program was undertaken to aid in characterizing the engineering properties of the subsurface soils. Our laboratory tests included grainsize analyses, organic content tests and Atterberg limits determinations. Also performed were determinations of the total combined silt and clay size fraction (percent finer than No. 200 sieve). The results of our laboratory tests are included in the report attachments. Also provided in the attachments are the graphical representations of the individual grainsize analyses.

A series of laboratory constant head permeability tests (ASTM D2434) was also conducted on undisturbed Shelby tube samples retrieved in a vertical orientation at several borings locations within the project limits. The purpose of the testing was to check the potential infiltration characteristics of the subgrade soils where drainage areas are planned. The following table presents the results of our findings.

Boring No.	Depth (ft)	Soil Description	Vertical Hydraulic Conductivity (cm/sec)
B-1	2 – 3.2	Light Gray Fine SAND	$4.51 \times 10^{-3}$
B-4	2 – 3.5	Light Gray Fine SAND	$6.53 \times 10^{-3}$
B-7	2 – 3.3	Dark Brown slightly silty Fine SAND	$2.65 \times 10^{-4}$
B-9	2 – 3.1	Gray Fine SAND	$5.05 \times 10^{-3}$
B-11	2 – 3.8	Green CLAY*	NA*
B-16	2 – 4	No Recovery (Fine SAND)	No Test
B-18	2 – 3.4	Light Gray Fine SAND	$2.1 \times 10^{-3}$
B-21	2 – 3.5	Light Gray Fine SAND	No Test (sample disturbed)

\*ASTM D2434 not able to be conducted on soils with very low permeability

#### GENERALIZED SURFACE AND SUBSURFACE CONDITIONS

**SITE TOPOGRAPHY** - The topography along the Phase III portion of the varies somewhat throughout the length of the segment. The grades decrease beginning at the western end of the project along Cleveland Street at about EL+24± feet down to about EL +18± feet near the culvert crossing near Station 20+00. From the culvert, the grades generally increased to about EL+45± feet progressing east towards the end of the project limits at about Station 30+60. The project alignment also splits off of Cleveland Street continuing southeast along Gulf Boulevard from EL+44± feet to EL +74± feet at the end of the project limits.

**PAVEMENT SECTION** - The borings were conducted within the travel lanes of Cleveland Avenue and Gulf to Bay Boulevard. In general, the pavement consisted of asphaltic concrete with thicknesses ranged from about 2 to 5 inches with typical thicknesses of 3 to 4 inches. However, boring B-23 noted an asphalt thickness of 10 inches. The materials beneath the asphalt varied significantly along the stretch along Cleveland Street from Station 0+00 to about 26+00 which identified materials ranging from a sand with cemented fragments (possibly weak soil

cement), to crushed limestone base, to no apparent base material. For most of the segment along Gulf to Bay and from Station 26+00 on Cleveland Street extending eastward, a crushed limestone base was identified. The limestone base material thickness typically ranged from about 6.5 to 13 inches thick. However, along Gulf to Bay from about Station 16+00 progressing southeastward, a sand with cemented fragments (possibly weak soil cement) was again identified with the exception of the last boring (B-23) which encountered 7 inches of concrete beneath the asphalt. Please refer to the attached boring logs which present the pavement section at each boring location.

**SOIL CONDITIONS** - The boring logs reveal variable conditions throughout the areas explored. The soils throughout many of the borings identified predominantly sandy soils representing the SP to SP-SM Unified Soil Classification System (USCS) designation or the A-3 AASHTO Soil Classification with occasional silty sand seams noted. However, many of the borings also sampled slightly clayey to clayey sands (SM to SC or A-2-4 to A-2-6) as well as high plasticity clays (CH or A-7-6) within the borings. You will also note that seams or layers of variably organic sands were penetrated with organic contents typically ranging from about 2.5 to 6% by weight, which is not considered excessive. However, a layer with excessive organic content of 15.5% was encountered at boring B-13.

Standard Penetration resistance data revealed predominantly a loose to medium dense relative density throughout the sandy soils within the boring profiles. The clay soils exhibited primarily a firm to very stiff consistency.

**GROUNDWATER CONDITIONS** - Plate II of the attachments presents a summary of the depth and approximate elevations at which groundwater was encountered during the course of our investigation. You will note that our groundwater observations were generally obtained during a period of variable rainfall near the early portion of the typical wet season months. Groundwater levels are influenced throughout the year in response to rainfall intensity. However, along the subject alignment, groundwater response to rainfall would be expected to be more limited due the urbanized nature of the surrounding area and well developed drainage. Indeed, the soils throughout the project limits are depicted in the USDA Natural Resources Conservation Service (NRCS) maps as being represented by the Urban Land soil series. These soils as characterized as having been significantly regraded and reshaped historically including varying amounts of cutting and filling which do not lend themselves to seasonal high groundwater prediction based on soil stratification. Nevertheless, we have depicted on Plate II our estimates of the normal seasonal seasonal high groundwater elevations at each boring location along the alignment. However,

groundwater could certainly temporarily rise above these predicted normal seasonal high groundwater levels following very heavy rainfall during the wet season.

### **GEOTECHNICAL EVALUATION AND RECOMMENDATIONS**

**PLANNED IMPROVEMENTS** - The project section improvements studied herein consist of streetscape and stormwater improvements. Stormwater improvements will include the addition of rain gardens, stormwater baffle boxes and the potential replacement of stormwater piping. Details relative to planned embedment depths have not yet been established, nor have details relative to any planned pavement improvements.

**BAFFLE BOX AND STORM SEWER SUBGRADE CONDITIONS** - Baffle boxes are planned in the vicinity of borings B-9 and B-10 to collect stormwater and treat prior to emptying into Stevenson Creek. It is our understanding that new storm piping is also contemplated for all or portions of the subject project.

**Baffle Box Subgrade Conditions** - We would anticipate that the baffle boxes may be embedded up to 10 feet below present grade. Our soil borings in the area of the baffle boxes indicate the soils below the baffle boxes will principally consist of fine sands with variable silt fines content. These sandy soil types will generally be suitable for subgrade support provided that the subgrade is prepared and compacted in accordance with the project specification requirements.

In areas where baffle boxes or other underground structures embedded within clayey sands or clays, we recommend undercutting the excavation a minimum of 18 inches and replacing the subgrade materials with a compacted gravel corresponding to a grading no coarser than an FDOT No. 67. We further recommend that the gravel be completely wrapped (bottom, sides and top) with a geotextile fabric corresponding to a Mirafi 140N or equivalent. This fabric should be overlapped a minimum of 24 inches. The gravel bedding is warranted to minimize the potential for disturbance of the excavation bottom during the baffle box construction and also to act as a drainage blanket for the collection of any minor seepage or rainfall that may enter the excavation and to help avoid remolding and disturbance of the subgrade.

**Pipeline Subgrade Conditions** - We have not been provided with profile sheets indicating the planned embedment depths of potential stormwater piping. However, we have assumed the pipe invert would not exceed 10 to 12 feet below grade. Accordingly, we would expect that much of the soils below the invert of the piping will generally consist of predominantly sandy soils. Portions, however, will be embedded within clays. In all cases, subgrade preparation should conform to project specification requirements. We would anticipate this would include placement of at least 6 to 12 inches of compacted select backfill per project specifications. Highly organic soils present beneath proposed piping should be removed and replaced. The width of the over-excavation will be dependent on the depth of the excavation to remove the materials with excessive organic content such as occurs at boring B-13.

During pipeline construction, the contractor should avoid any remolding or disturbance of the subgrade soils that would then necessitate undercutting and replacement with a suitable compacted backfill material per project specification requirements.

**Need for Geotechnical Inspection** - It is recommended that the excavations for construction of the below grade structure and piping be carefully inspected and probed by a representative of the project geotechnical engineer. The purpose of this inspection would be to identify any weak or compressible zones that may warrant deeper undercutting and replacement, or specialized subgrade preparation.

With proper inspection and subgrade preparation, we anticipate minimal settlement of piping or structures. Indeed, we would expect that maximum settlements would be less than 1 inch with a majority of this movement occurring during dewatering and construction activities. Following placement and compaction of backfill and the re-establishment of normal groundwater levels, the net stress increase below manholes and piping will be negligible.

**Suitability of Excavated Soils For Use As Backfill** - Fine sands with minimal fines would represent an excellent materials for replacement and compaction as backfill. These fine sands comprising the SP to SP-SM Unified Soil Classification and the AASHTO A-3 Soil designation should respond effectively to conventional vibratory compaction. Of course, all backfill soils must comply with project specification requirements.

Soils with moderate silt and clay fines content representing the SM or A-2-4 designations may also be suitable from a geotechnical perspective provided they are permitted by project specifications. These non-plastic to low plasticity silty to slightly clayey sands having more than about 12 and less than 35 percent fines may also be suitable from an engineering standpoint depending on the project specifications. If permitted to be utilized, these soils will likely require aeration to reduce the moisture content of the soils to levels suitable for compaction and as such will be weather sensitive. In this regard, it is recommended that the moisture contents be controlled to within  $\pm 2\%$  of optimum moisture as established by the Modified Proctor moisture-density relationship.

Soils with increased silt and clay fines content representing the SC to CH or A-2-6 to A-7-6 designations would not be considered suitable as backfill soils. Further, highly organic soils (Pt) would not be considered suitable as backfill.

It is important to recognize that some of the soils excavated above the water table may exist in a very low natural moisture content depending upon the rainfall occurring at the time of construction and may require addition of water. Further, soils excavated below the water table may require processing to reduce the moisture content to help facilitate compaction. Accordingly, these soil types may require some adjustment in moisture content to achieve efficient and effective compaction. In general, it is beneficial to adjust moisture contents to within  $\pm 2\%$  of the optimum moisture as established by the Modified Proctor moisture-density relationship as set forth in ASTM D-1557 or AASHTO T-180. All backfill soils should be compacted to applicable project specifications.

**Construction Considerations** - We would anticipate that the majority of the pipeline construction would incorporate trenchbox construction. Portions below the practical depth capability of trench boxes will likely be constructed within a sheeted and braced excavation. Depending on the depth of the pipe invert, portions of the pipeline may also be constructed utilizing open-cutting and rapid backfilling following pipeline installation. Depending on the depth of the cut, it may be necessary to adjust the slope ratios to no steeper than about 1.5 horizontal to 1.0 vertical in order to minimize sloughing or caving during the backfilling operations. Utilization of this slope ratio will necessitate proper dewatering and protection of the slope with respect to erosion and sloughing. Naturally, the contractor must comply with applicable OSHA requirements with respect to trench safety.

Some of the very shallow embedded portions of the alignment may not require dewatering depending on the time of year of construction. However, portions of the alignment will most certainly require dewatering to lower groundwater to depths suitable for placement and compaction of backfill soils. Of course, abnormal rainfall could produce higher than expected groundwater levels and necessitate some local management of groundwater along any portion during pipeline construction.

The implementation of appropriate dewatering is a critical aspect of construction so as to allow proper preparation of the subgrade and appropriate backfilling and compaction of surrounding soils. Improper implementation of dewatering can result in de-stabilization of the subgrade soils disturbance and enhanced total and differential settlement. It is recommended that the dewatering system consist of a properly designed wellpoint system. Due to the potentially stratified nature of the soils and the required depth of dewatering, we would strongly recommend that the contractor retain the services of a qualified dewatering consultant to appropriately design and monitor performance of the dewatering system. As a minimum, the wellpoint should be fully slotted encased in properly designed filter media and more than likely incorporate drawdown tubes for more effective dewatering.

We recommend piezometer observation wells be installed to permit checking the effectiveness of the dewatering system prior to initiation of excavation activities within critical areas. The dewatering system should be installed so as to maintain groundwater levels to no less than 1 foot below the bottom of the excavation.

Care should be exercised by the contractor in his ways and means of construction to avoid significant vibrations that could result in settlement or damage to neighboring residential structures or appurtenant utilities. This, of course, would include the contractor's selection of means and methods for installation and removal of sheetpiling that may be required for deep excavation as well as the selection of equipment for compaction activities. The contractor should certainly consider appropriate vibration monitoring to check that the vibratory accelerations or displacements are within acceptable limits.

**ROADWAY IMPROVEMENTS** - The existing pavement sections are depicted on the individual boring logs. It is our understanding that the majority of the roadway along Cleveland and Gulf to Bay will be reduced to two (2) lanes with the addition of landscape areas and roadside parking. Obviously this will necessitate removal of some pavement. Also, complete reconstruction will likely be necessary in areas where below grade utility construction is planned. We have not been provided with information regarding pavement areas not impacted by below grade construction. The majority of the subgrade soils are considered suitable for support of pavements subjected to vehicular traffic. However, where complete reconstruction is planned, it is our recommendation that the shallow clay soils be undercut at least 3 feet below the bottom of pavement section, where they occur, followed by replacement with fine sands representing the SP to SP-SM designation.

With respect to the soil support value of the probable backfill soils, we would recommend utilization of a Limerock Bearing Ratio (LBR) of 15. It has been our experience that this LBR value is generally available with local fine sands comprising the SP to SP-SM Unified Soil Classification. Where critical to the design of the pavement structure, Limerock Bearing Ratio (LBR) testing should be planned during the construction stage as borrow materials are developed and the embankment is brought to the anticipated subgrade elevation.

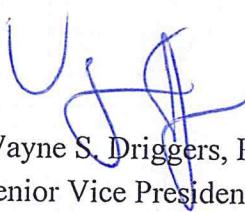
Compaction testing will also be required during the subgrade preparation and backfilling operations to check that the soils are being compacted in accordance with project specification requirements. The compaction tests should be conducted in such a manner so as to check that all of the backfill soils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

**LIMITATIONS** - At this stage, there are limited details as to the planned construction, once the plans become more solidified, we should be contacted to provide additional information where warranted. Also, the geotechnical investigation program was undertaken to provide general information to assist in the design and construction of the planned facilities. Our investigation may not have included all information that the prospective contractor may require in the preparation of his bid proposal. Further, studies relative to environmental issues or impacts was not within the authorized scope of services of our firm.

**DRIGGERS ENGINEERING SERVICES, INC.** appreciates the opportunity to be of service to you on this project. Should you have any questions concerning our report, please do not hesitate to contact this office at your convenience.

Respectfully submitted,

**DRIGGERS ENGINEERING SERVICES, INC.**

  
Wayne S. Driggers, P.E.  
Senior Vice President  
FL Registration No. 58013



WSD-REP\178064

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**APPENDIX**

**PLATE IA TO IJ - BORING LOCATION PLAN**

**PLATE II - SUMMARY OF GROUNDWATER LEVELS**

**STANDARD PENETRATION TEST BORINGS**

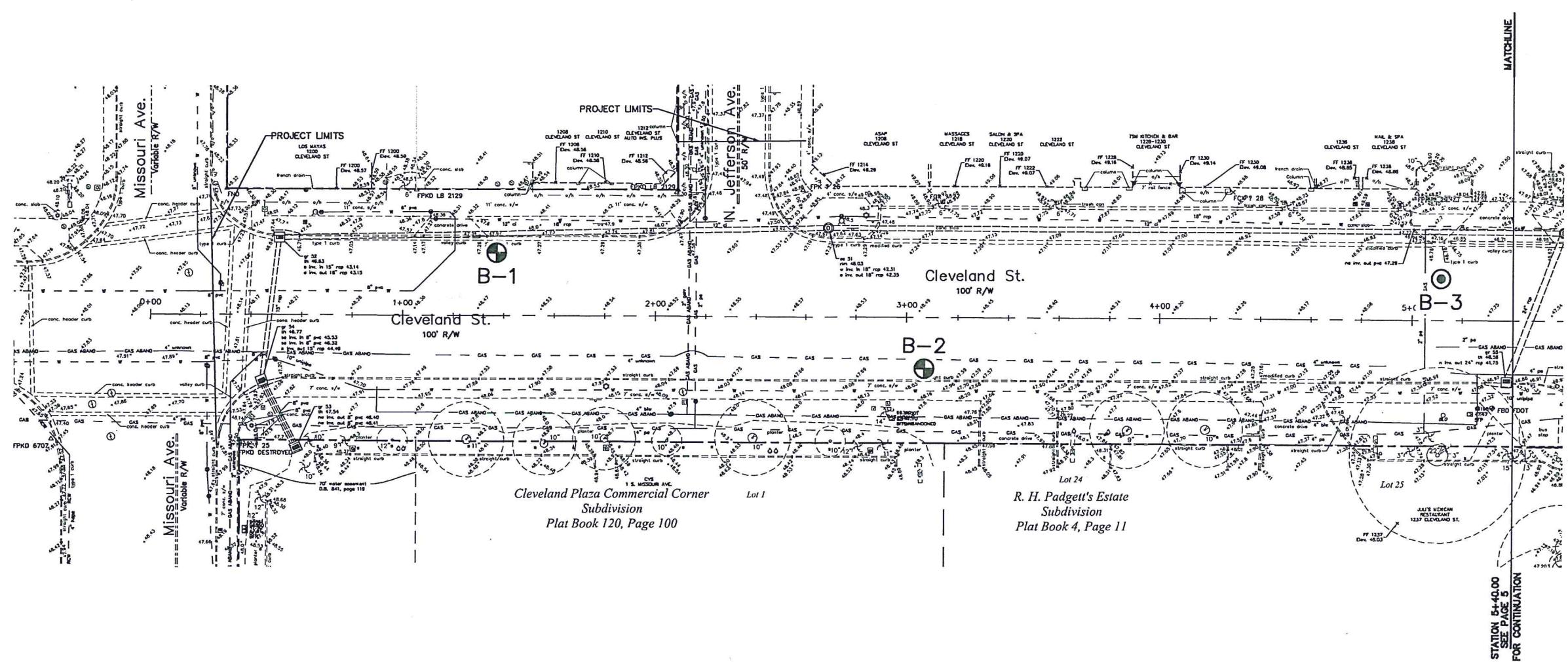
**HAND AUGER BORING / HAND CONE SOUNDING LOGS**

**SUMMARY OF LABORATORY TEST RESULTS**

**GRAINSIZE ANALYSES**

**METHOD OF TESTING**

**PLATE IA TO IJ - BORING LOCATION PLAN**

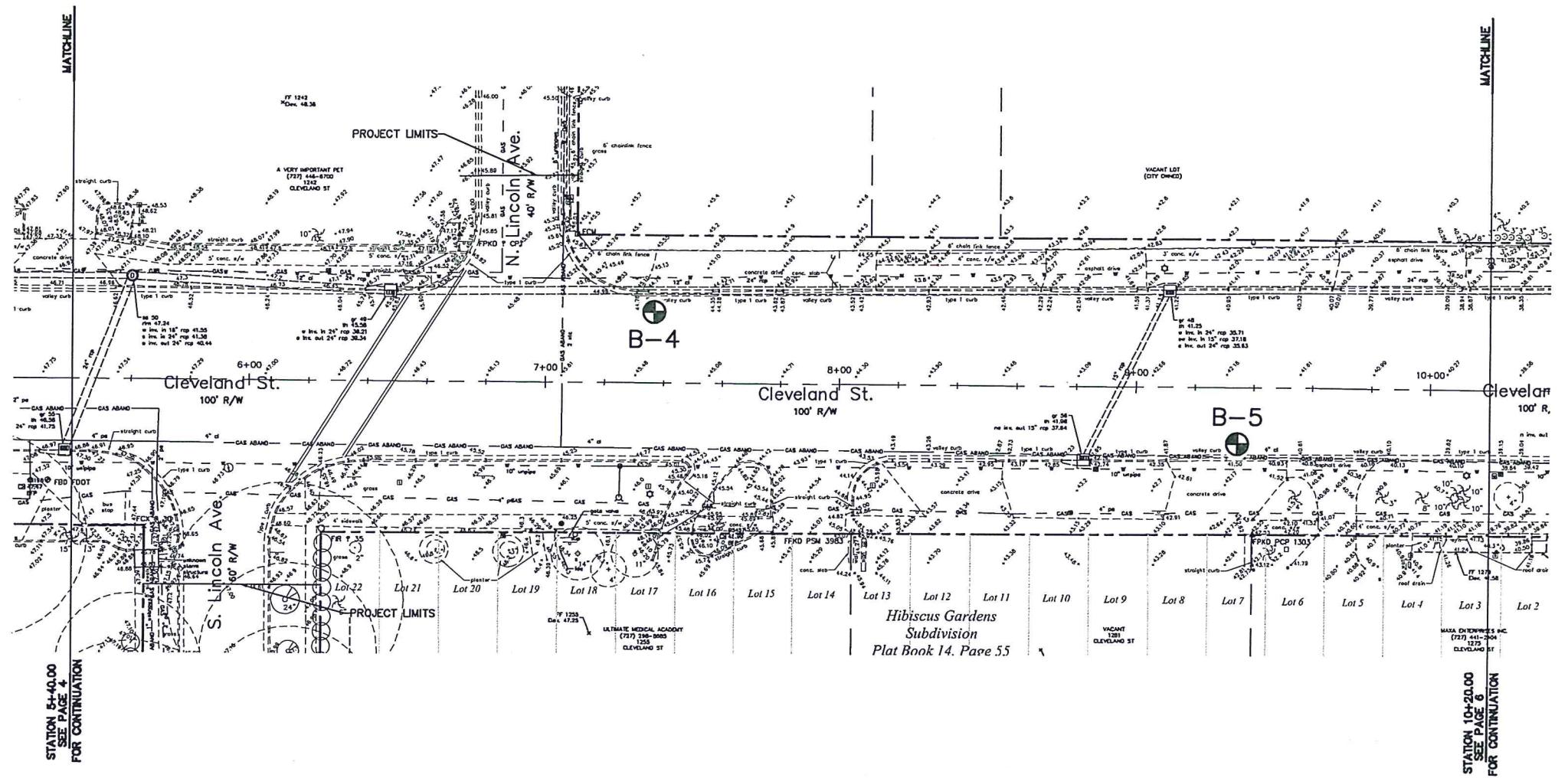


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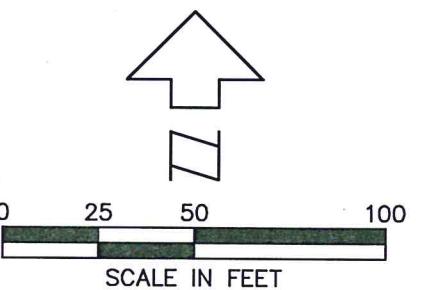
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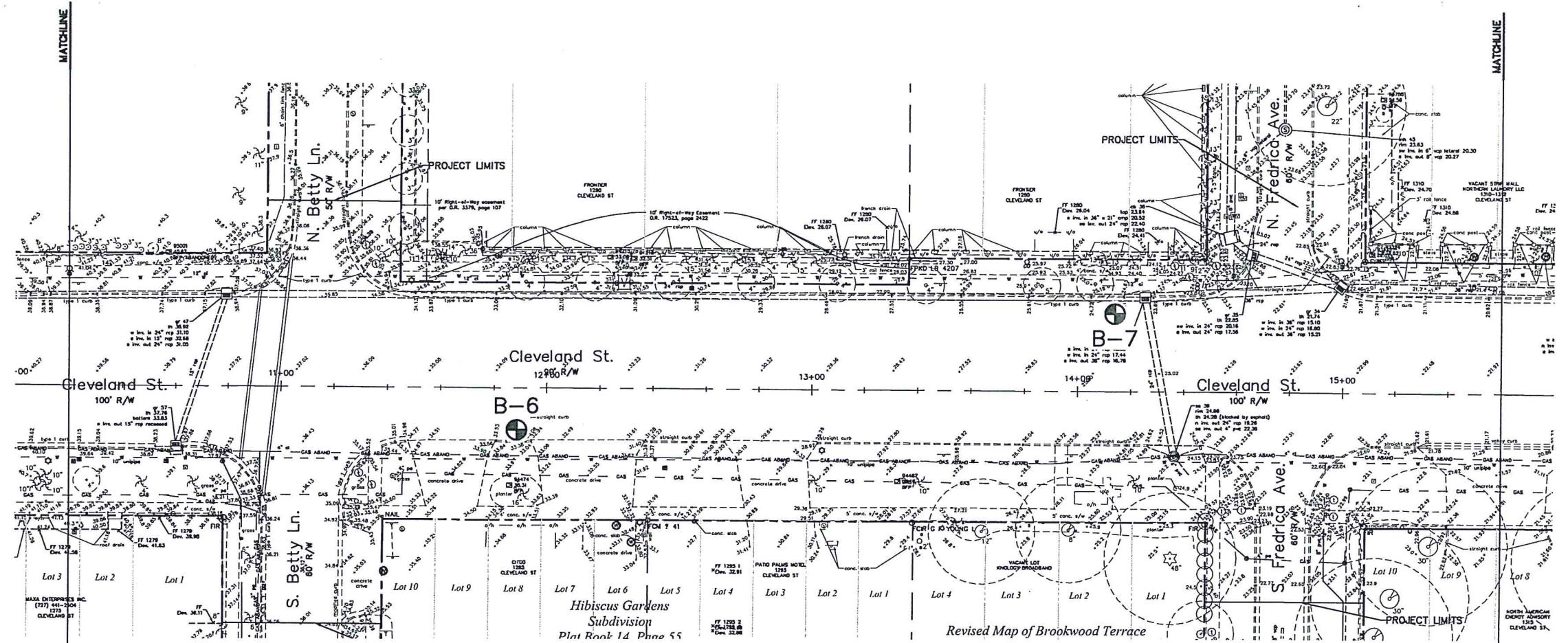


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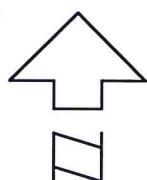


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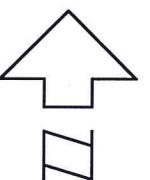
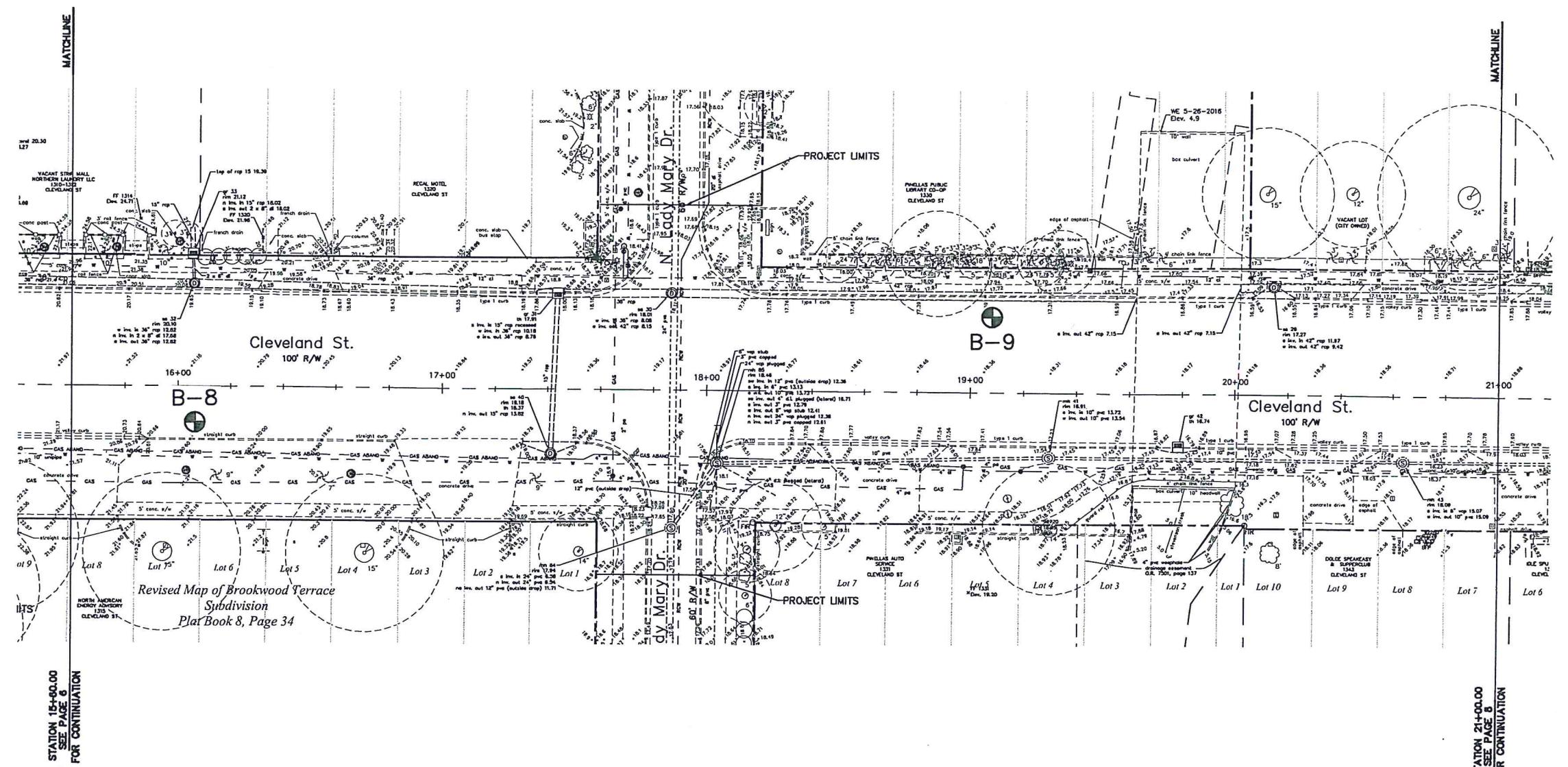


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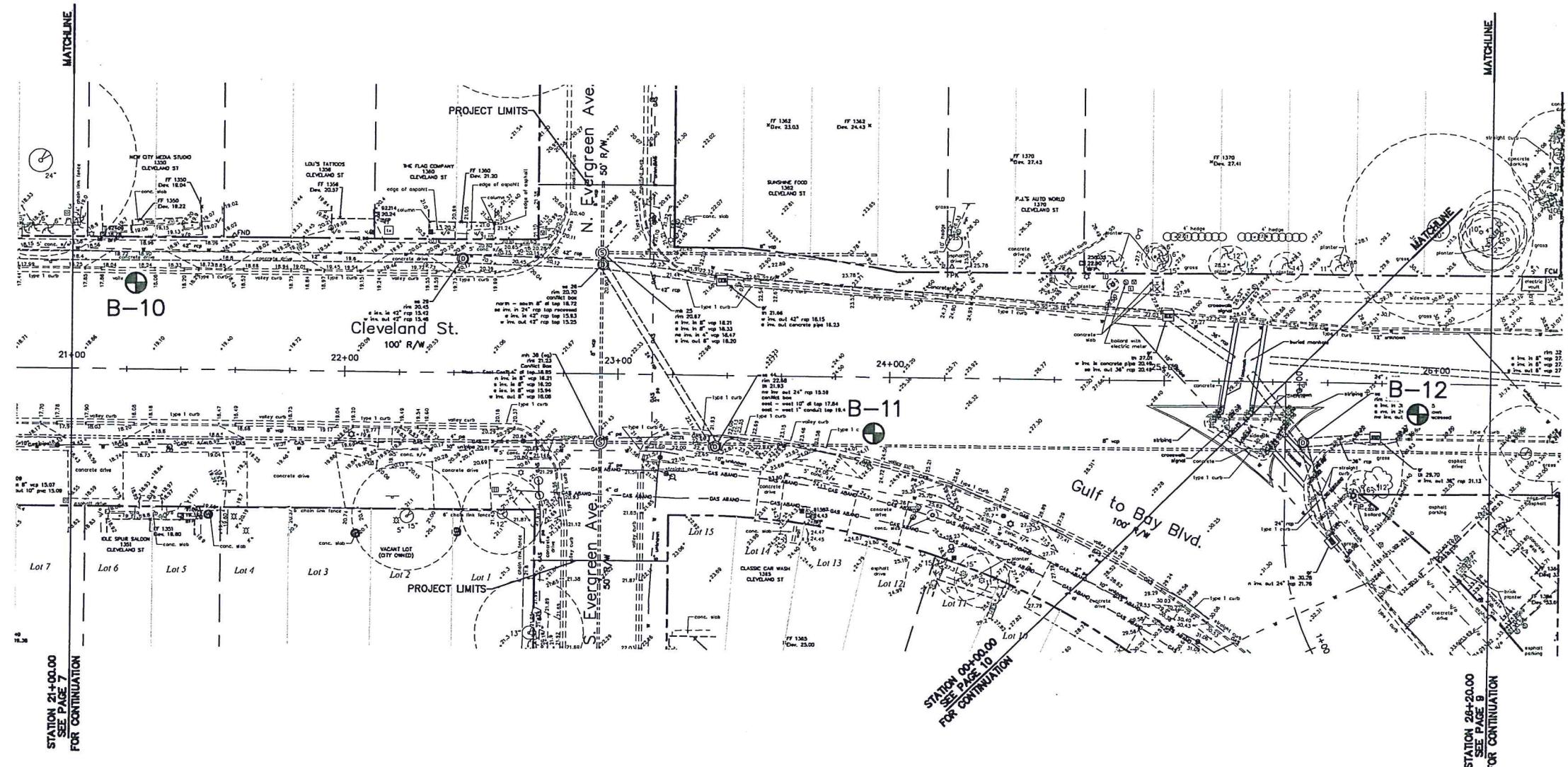
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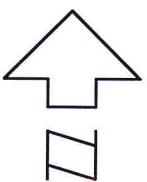
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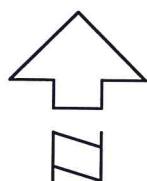
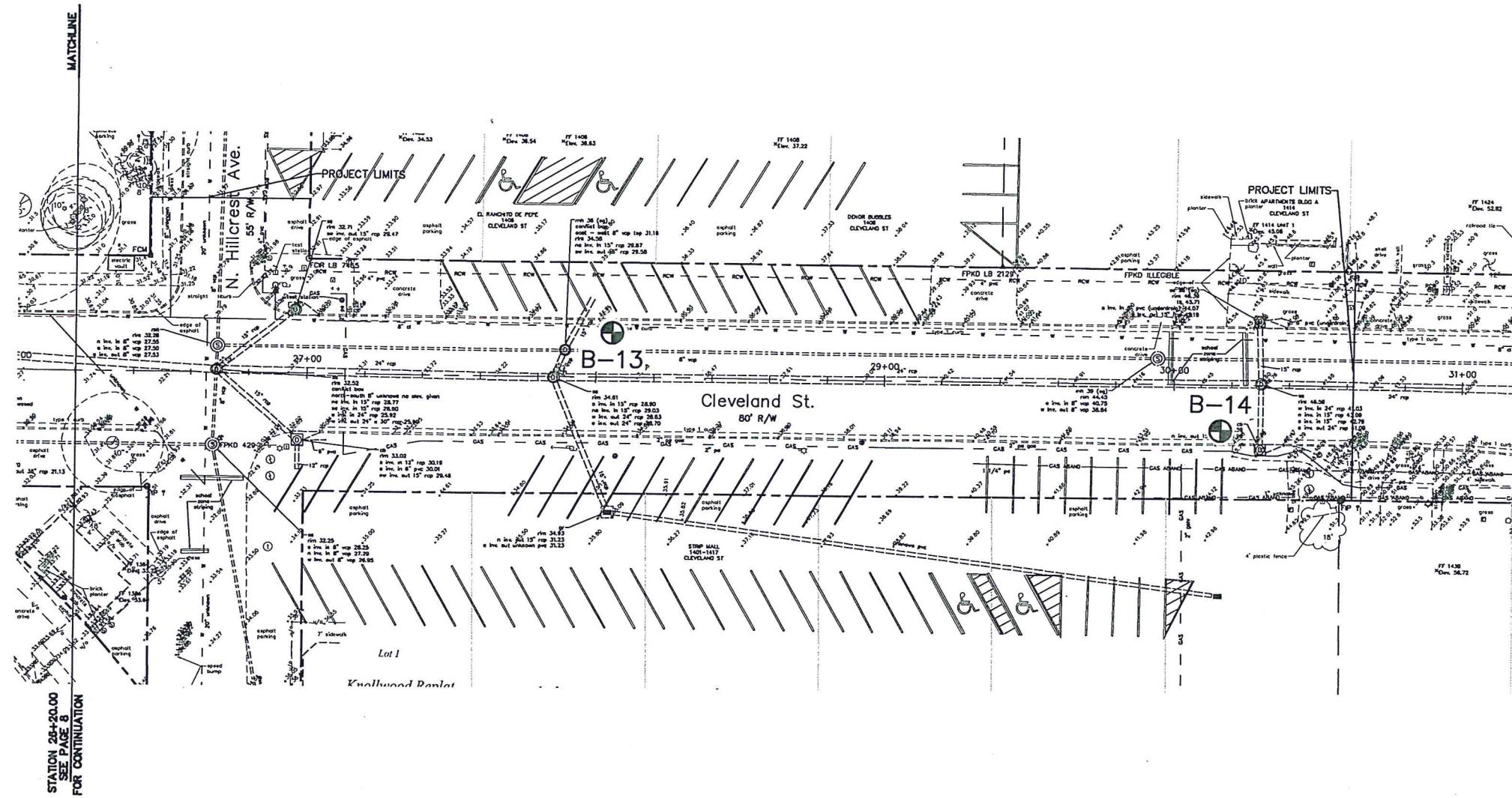
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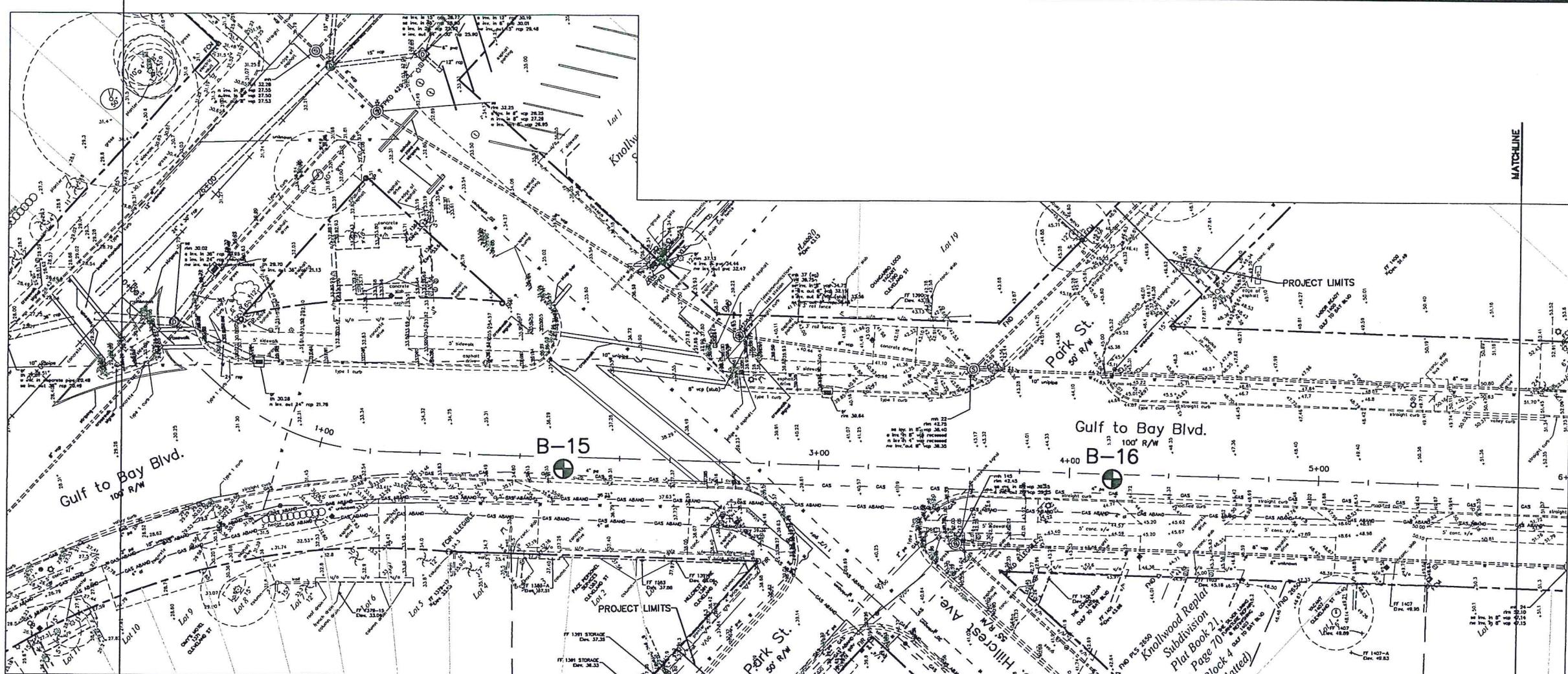


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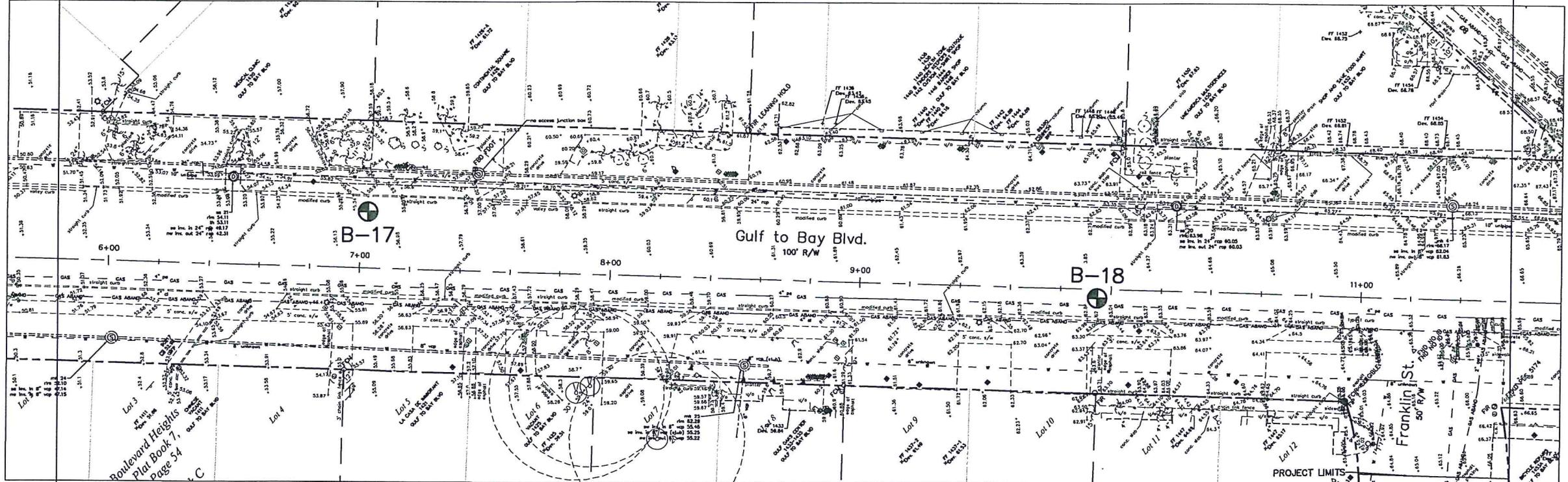
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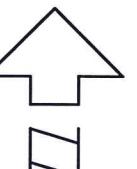
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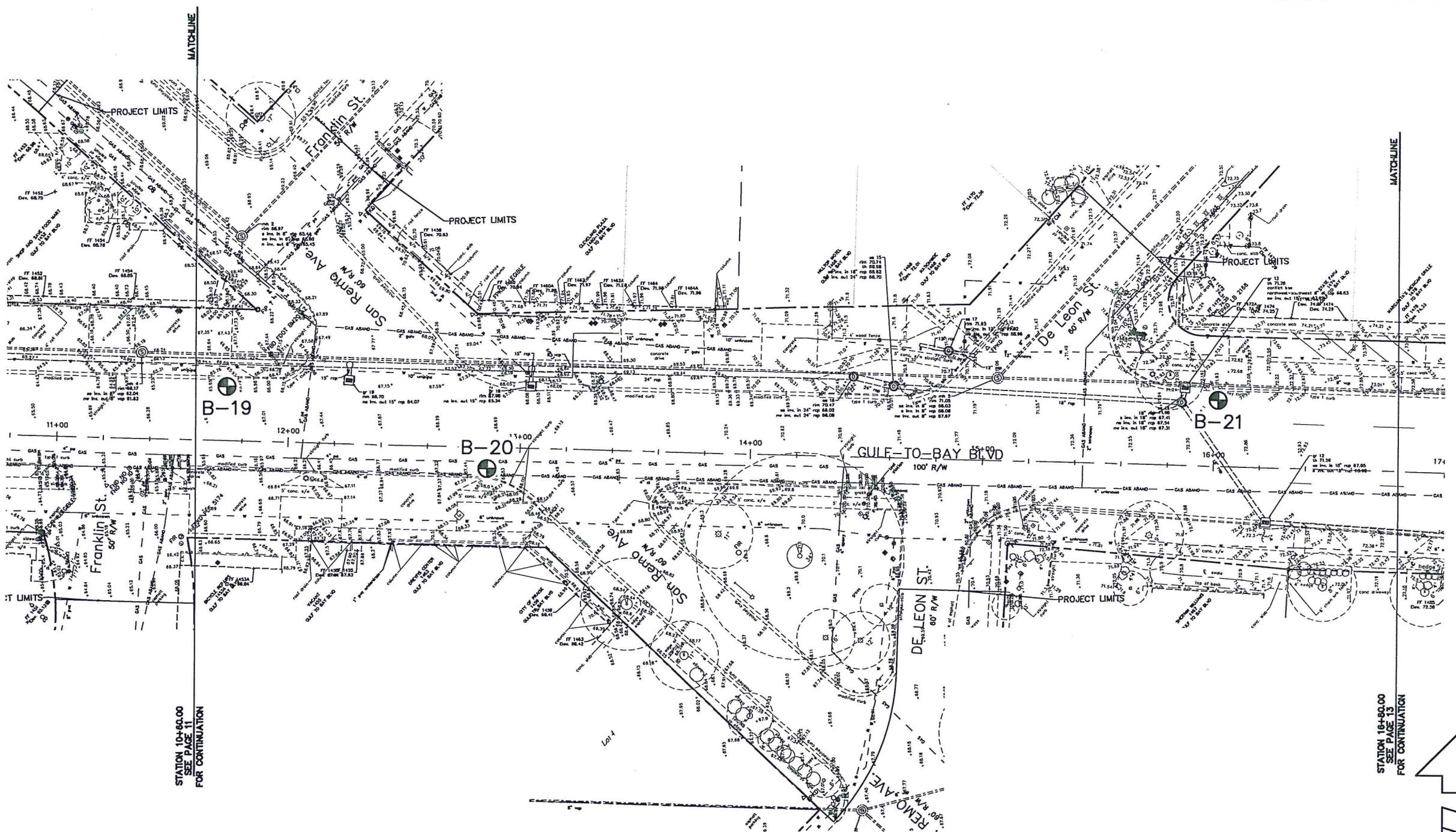


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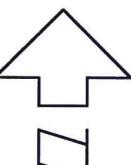
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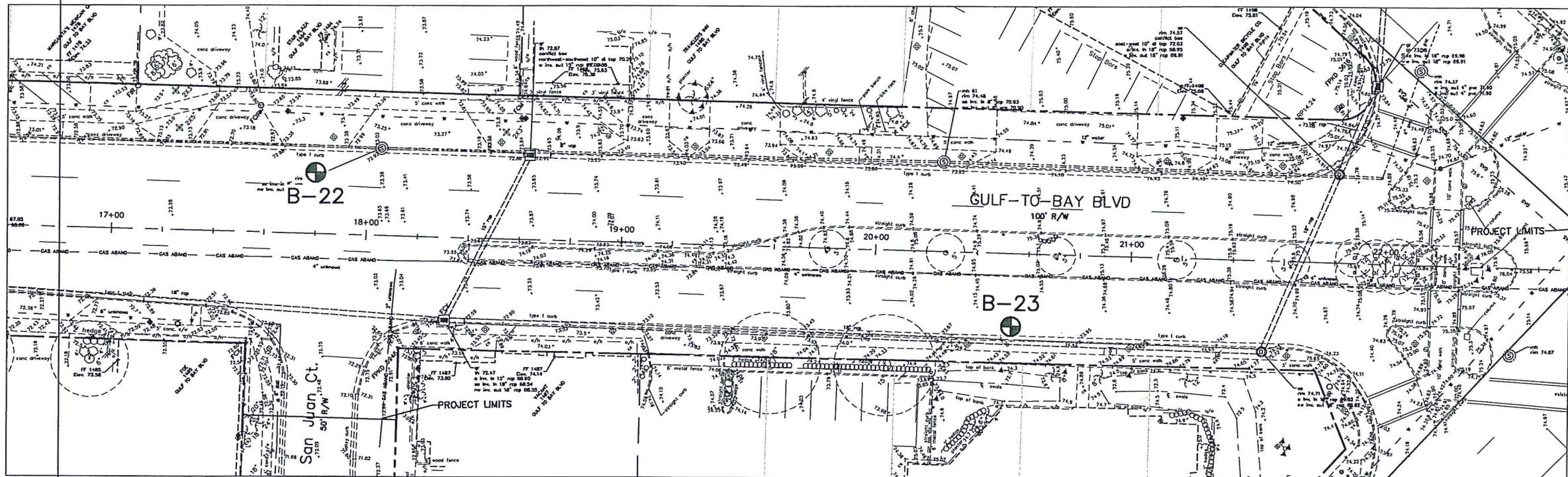
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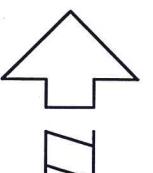


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CAD / ENGINEER	SHEET TITLE	PROJECT NO.	DATE
R.D.B. / W.S.D.	BORING LOCATION PLAN	DES 178064	7/19/17
PREPARED BY	PROJECT NAME	SCALE	SHEET NO.
<b>DEETI</b> DRIGGERS ENGINEERING SERVICES, INCORPORATED	CLEVELAND STREET – PHASE III CLEARWATER, FLORIDA	AS SHOWN	PLATE I-J

## **PLATE II - SUMMARY OF GROUNDWATER OBSERVATIONS**

## SUMMARY OF GROUNDWATER OBSERVATIONS

Test Location	Approximate Ground Elevation (ft)	Depth to Groundwater (ft)	Current Groundwater Elevation (ft)	Estimated Normal Seasonal High Groundwater Elevation (ft)
B-1	47.3	6.8	40.5	42.0
B-2	47.6	8.7	38.9	40.5
B-3	47.3	9.8	37.5	39.0
B-4	44.7	9.3	35.4	37.5
B-5	41.3	7.4	33.9	35.5
B-6	33.3	3.2	30.1	31.5
B-7	24.3	--	--	--
B-8	20.3	5.9	14.4	16.0
B-9	17.3	8.4	8.9	10.5
B-10	18.0	10.4	7.6	10.0
B-11	24.3	--	--	--
B-12	30.5	--	--	--
B-13	34.6	2.8	31.8	33.0
B-14	44.5	3.1	41.4	43.0
B-15	35.6	--	--	--
B-16	44.5	5.8	38.7	40.5
B-17	55.4	4.7	50.7	52.5
B-18	62.9	10.5	52.4	55.0
B-19	65.7	4.2	61.5	63.0
B-20	67.6	4.6	63.0	64.5
B-21	71.9	3.4	68.5	70.0
B-22	73.0	4.2	68.8	70.5
B-23	73.8	4.8	69.0	70.5

PLATE II

## **STANDARD PENETRATION TEST BORINGS**

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-1**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-A

Foreman J.R.

Completion

Depth 16.5'

Date 7/6/17

Depth To  
Water 6.8'

Time \_\_\_\_\_

Date 7/6/17

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: +47.3+/-'						
0			5" Asphalt Pavement						
			Dark brown Fine SAND (SP) (A-3)						
			Very light gray Fine SAND (SP) (A-3)						
5									
			Medium dense very light gray Fine SAND (SP) (A-3)		7/10/10				
			Medium dense dark brown Fine SAND with finely divided organic material (SP) (A-3)		8/11/14				
10			Medium dense to loose dark brown Fine SAND (SP) (A-3)		3/5/9				
			Dense very dark brown cemented, organic, silty Fine SAND (SM/Pt) (A-2-4/A-8)		4/3/7				
15					14/19/23				
20									
25									
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-2**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-A

Foreman B.D.

Completion

Depth 16.5' Date 6/26/17 Depth To Water 8.7' Time \_\_\_\_\_ Date 6/26/17

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: +47.6+/-  2" Asphalt Pavement 8" Crushed Limestone and Shell Base Very light gray Fine SAND (SP) (A-3)						
5			Medium dense very light gray Fine SAND (SP) (A-3)						
10			Medium dense dark brown slightly silty Fine SAND (SP-SM) (A-3)						
15			Medium dense brownish-gray Fine SAND (SP) (A-3)						
			Medium dense to dense dark brown slightly silty Fine SAND with finely divided organic material (SP-SM) (A-3)						
20									
25									
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-3**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-A

Foreman J.R.

Completion

Depth 16.5'

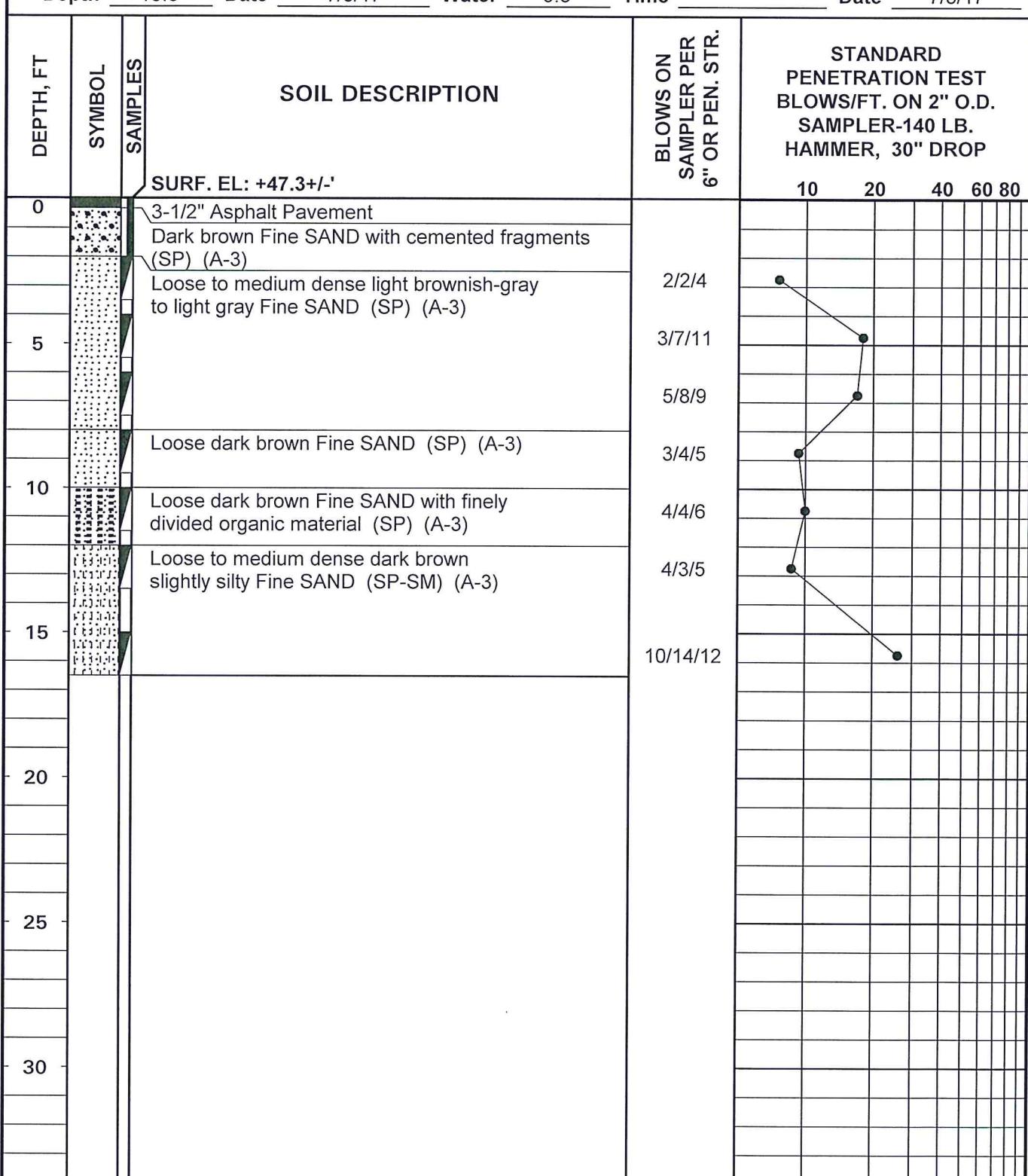
Date 7/5/17

Depth To

Water 9.8'

Time \_\_\_\_\_

Date 7/5/17



Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

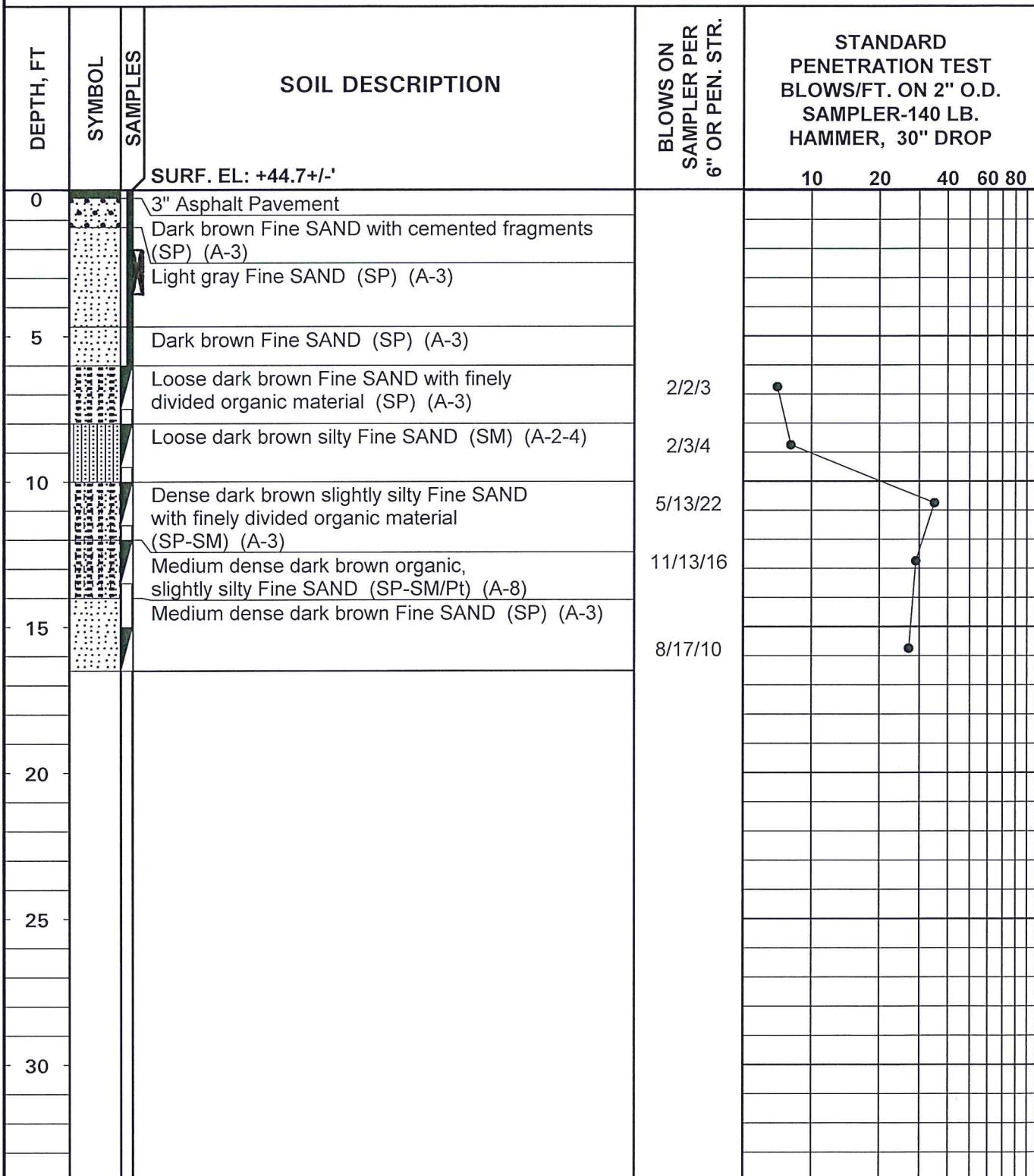
Project No. DES 178064

**BORING NO. B-4**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-B Foreman J.R.

Completion Depth 16.5' Date 7/5/17 Depth To Water 9.3' Time \_\_\_\_\_ Date 7/5/17



Remarks Borehole Grouted

Casing Length \_\_\_\_\_


**DRIGGERS ENGINEERING SERVICES INCORPORATED**
Project No. DES 178064**BORING NO. B-5**Project Cleveland Street - Phase III, Clearwater, FloridaLocation See Plate I-B Foreman B.D.Completion Depth 16.5' Date 6/27/17 Depth To Water 7.4' Time \_\_\_\_\_ Date 6/27/17

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: +41.3+/-'						
			4" Asphalt Pavement						
			Dark brown Fine SAND (SP) (A-3)						
			Very light gray Fine SAND (SP) (A-3)						
5			Brown slightly silty Fine SAND (SP-SM) (A-3)						
			Dark brown slightly silty Fine SAND (SP-SM) (A-3)						
			Loose dark brown slightly organic, slightly silty Fine SAND (SP-SM) (A-3)						
10			Medium dense dark brown Fine SAND with finely divided organic material (SP) (A-3)						
			Medium dense dark brown Fine SAND (SP) (A-3)						
15									
20									
25									
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-6**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-C

Foreman B.D.

Completion

Depth

16.5'

Date

6/27/17

Depth To

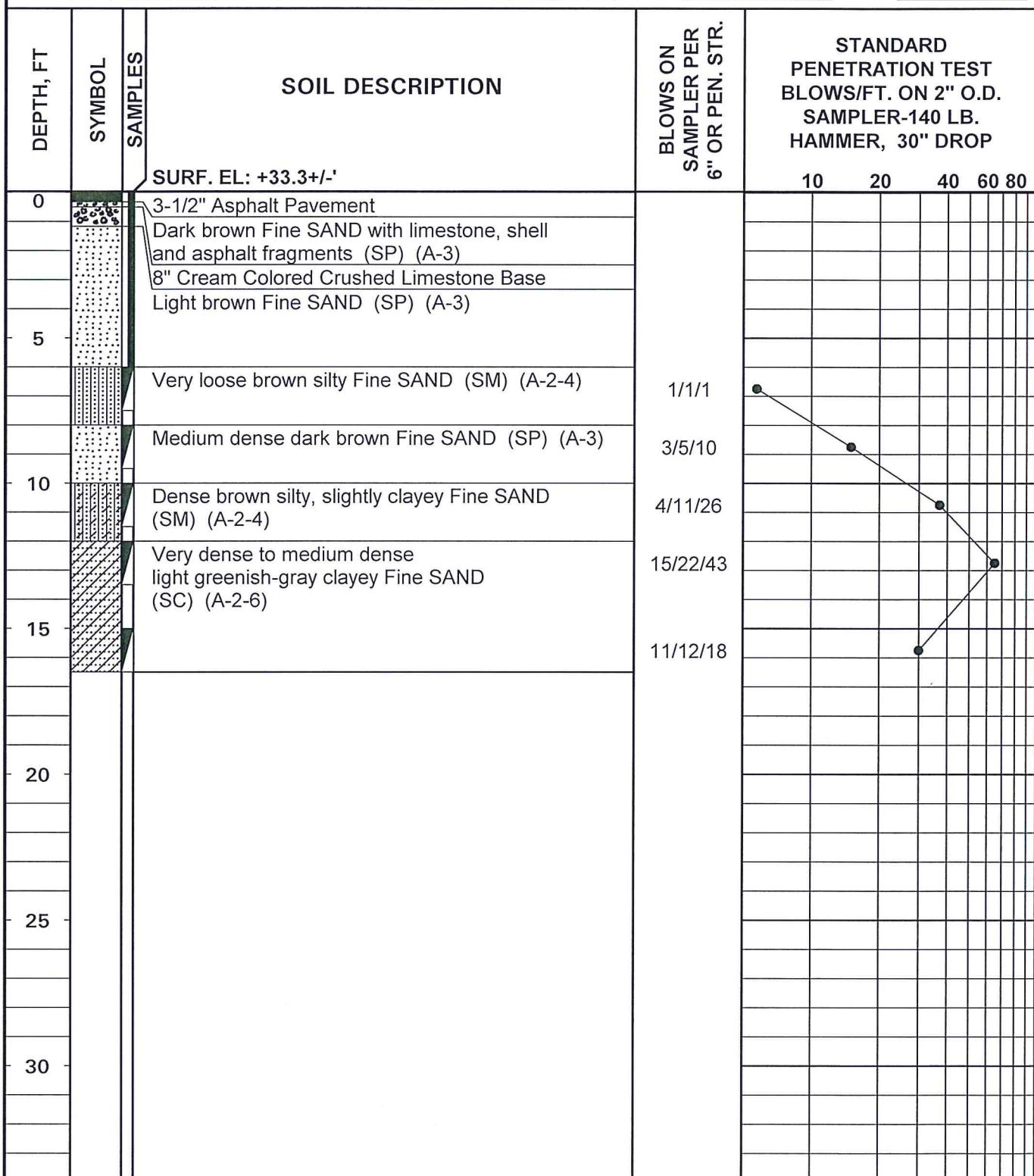
Water

3.2'

Time

Date

6/27/17



Remarks Borehole Grouted

Casing Length \_\_\_\_\_



DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 178064

## **BORING NO. B-7**

**Project** Cleveland Street - Phase III, Clearwater, Florida

**Location** See Plate I-C      **Foreman** J.R.

**Completion Depth** 16.5'   **Date** 7/5/17   **Depth To Water** \_\_\_\_\_   **Time** \_\_\_\_\_   **Date** 7/5/17

**Remarks** Borehole Grouted

---

## Casing Length



DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 178064		BORING NO. B-8			
Project Cleveland Street - Phase III, Clearwater, Florida		Foreman _____ B.D.			
Location See Plate I-D		Completion Depth _____ Date _____			
Depth	16.5'	Date	6/27/17		
Depth To Water	5.9'	Time			
			Date 6/27/17		
DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR OPEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP
			SURF. EL: +20.3+/-'		10 20 40 60 80
0			4" Asphalt Pavement		
			Gray Fine SAND with trace of Crushed Limestone (SP) (A-3)		
			8" Cream Colored Crushed Limestone Base		
5			Light gray Fine SAND with trace of limestone fragments (SP) (A-3)		
			Dark brown Fine SAND (SP) (A-3)		
			Light brown Fine SAND (SP) (A-3)		
			Very loose light brown silty Fine SAND (SM) (A-2-4)		
10			Very loose grayish-brown silty, slightly clayey Fine SAND (SM) (A-2-4)		
			Medium dense light brown silty Fine SAND (SM) (A-2-4)		
			Firm to stiff light green CLAY (CH) (A-7-6)		
15					
20					
25					
30					

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-9**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-D

Foreman J.R.

Completion

Depth 26.5'

Date 7/5/17

Depth To  
Water 8.4'

Time \_\_\_\_\_

Date 7/5/17

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
<b>SURF. EL: +17.3+/-'</b>									
0			3-1/2" Asphalt Pavement						
			Dark brown Fine SAND with cemented fragments (SP) (A-3)						
			Dark brown Fine SAND with trace of limestone fragments (SP) (A-3)						
5			Gray Fine SAND (SP) (A-3)						
			Dark brown Fine SAND (SP) (A-3)						
			Brownish-gray Fine SAND (SP) (A-3)						
			Loose dark grayish-brown Fine SAND (SP) (A-3)						
10			Medium dense grayish-brown silty, slightly clayey Fine SAND (SM) (A-2-4)						
			Medium dense light brown Fine SAND (SP) (A-3)						
			Medium dense dark gray silty Fine SAND (SM) (A-2-4)						
15			Dense dark grayish-brown slightly silty Fine SAND (SP-SM) (A-3)						
			Stiff greenish-gray CLAY (CH) (A-7-6)						
20									
25									
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_



DRIGGERS ENGINEERING SERVICES INCORPORATED

**Project No.** DES 178064

**BORING NO. B-10**

**Project** Cleveland Street - Phase III, Clearwater, Florida

**Location** See Plate I-E

Foreman B.D.

### Completion

## Completion Depth

Date

## Depth To Water

10.

Time

B.P.

**Remarks** Borehole Grouted

## Casing Length

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-11**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-E

Foreman B.D.

Completion

Depth

16.5'

Date

6/27/17

Depth To Water

\*\*

Time

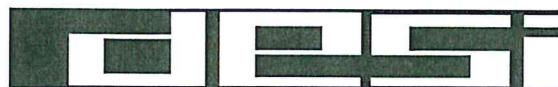
Date 6/27/17

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR OPEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP				
					10	20	40	60	80
<b>SURF. EL: +24.3+/-'</b>									
0			4" Asphalt Pavement Greenish-gray silty, clayey Fine SAND with trace of limestone fragments (SM-SC) (A-2-6) Green and gray CLAY (CH) (A-7-6)						
5			Green and gray CLAY with trace of limestone fragments (CH) (A-7-6)						
10			Medium dense to loose light grayish-brown to light greenish-gray clayey Fine SAND (SC) (A-2-6)	4/5/9					
15			Medium dense light gray clayey Fine SAND (SC) (A-2-6) Medium dense light greenish-gray clayey Fine SAND to very stiff light greenish-gray sandy CLAY (SC) to (CH) (A-2-6) to (A-7-6) Medium dense light green silty, slightly clayey to clayey Fine SAND (SM) to (SC) (A-2-4) to (A-2-6)	2/3/5	7/8/13				
20				8/13/16					
25				5/8/10					
30									

Remarks Borehole Grouted

\*\* No Water Table recorded within CLAYS.

Casing Length



DRIGGERS ENGINEERING SERVICES INCORPORATED

**Project No.** DES 178064

**BORING NO. B-12**

**Project** Cleveland Street - Phase III, Clearwater, Florida

**Location** See Plate I-E

Foreman B.D.

### Completion

Completion Depth 16.5' Date 6/30/17

## Depth To Water

\*.

Time

Date 6/30/17

## **Remarks Borehole Grouted**

\*\* No Water Table recorded within CLAYs.

## Casing Length

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-13**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-F

Foreman B.D.

Completion

Depth

16.5'

Date

7/3/17

Depth To

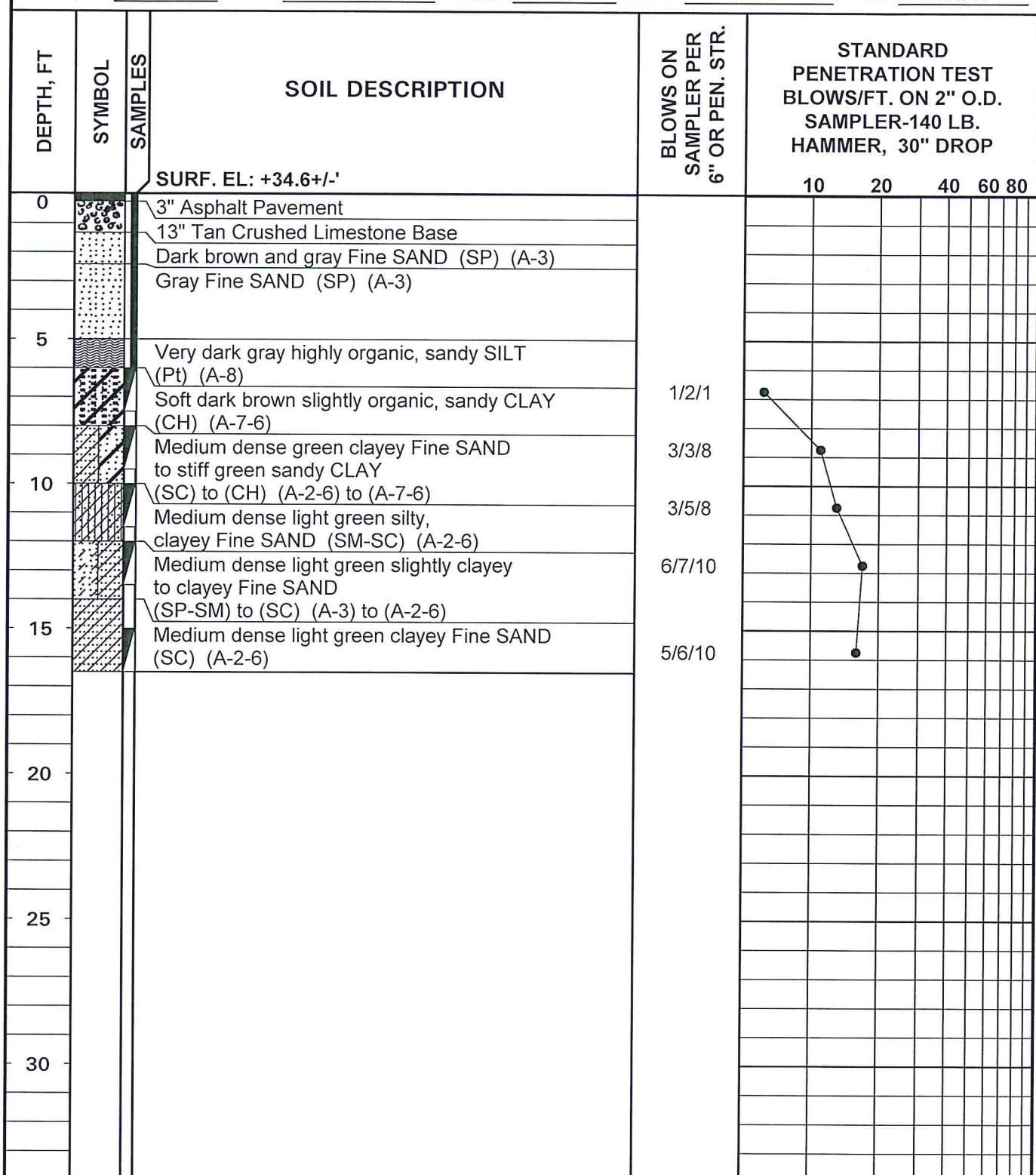
Water

2.8'

Time

Date

7/3/17



Remarks Borehole Grouted

Casing Length

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-14**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-F

Foreman B.D.

Completion

Depth 16.5'

Date 7/3/17

Depth To  
Water 3.1'

Time \_\_\_\_\_

Date 7/3/17

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: +44.5+/-'  3" Asphalt Pavement 8" Tan Crushed Limestone Base Dark brown Fine SAND with trace of limestone fragments (SP) (A-3)						
5			Brown Fine SAND (SP) (A-3)  Very stiff green to light greenish-gray sandy CLAY (CH) (A-7-6)	4/7/9					
10				5/7/10					
15			Very stiff light green sandy CLAY (CH) (A-7-6)  Medium dense light green clayey Fine SAND (SC) (A-2-6)	5/8/12					
20				5/10/11					
25				7/6/7					
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-15**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-G

Foreman B.D.

Completion

Depth

16.5'

Date

6/28/17

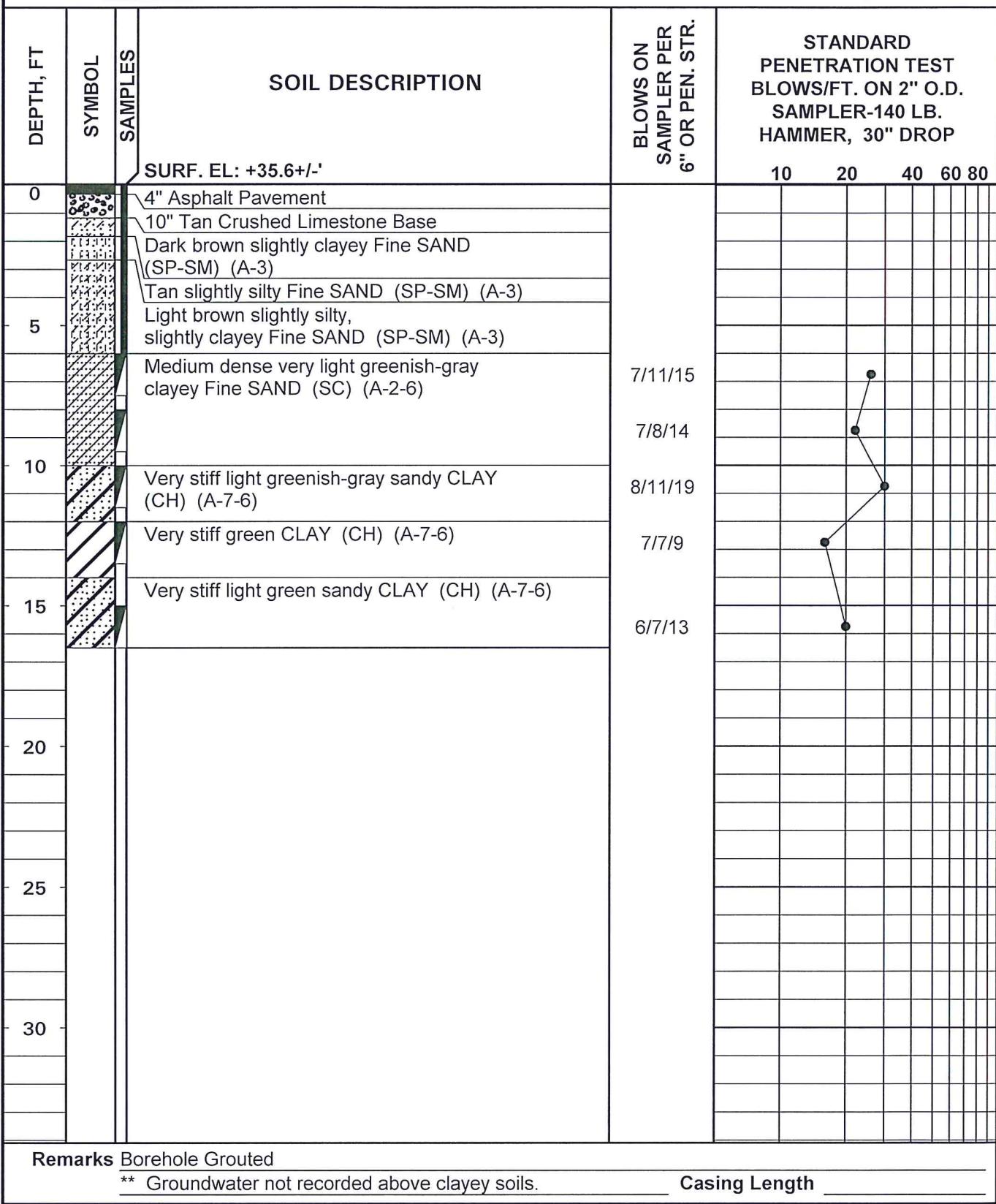
Depth To Water

\*\*

Time

Date

6/28/17





DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 178064

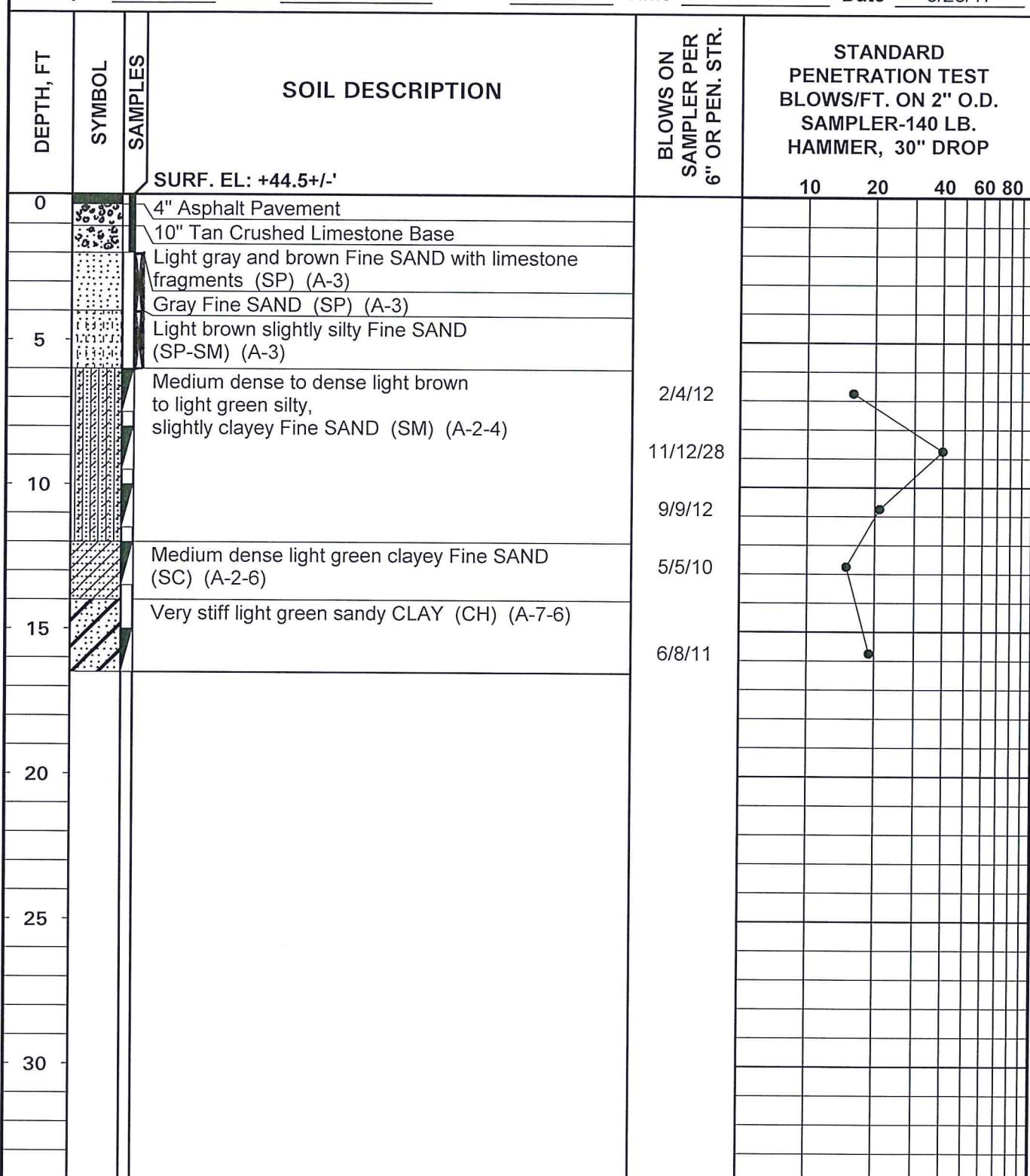
BORING NO. B-16

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-G Foreman B.D.

Completion Depth To Water Date Time Date

Depth 16.5' Date 6/28/17 Water 5.8' Time \_\_\_\_\_ Date 6/28/17



Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-17**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-H

Foreman B.D.

Completion

Depth 16.5'

Date 6/30/17

Depth To  
Water 4.7'

Time

Date 6/30/17

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: +55.4+/-' 4-1/2" Asphalt Pavement 6-1/2" Cream Colored Crushed Limestone Base Light brown Fine SAND (SP) (A-3)						
5			Loose brown Fine SAND (SP) (A-3)	2/2/3					
10			Medium dense light brown slightly silty Fine SAND (SP-SM) (A-3) Medium dense light brown Fine SAND (SP) (A-3)	4/11/14					
15			Medium dense brown slightly silty Fine SAND (SP-SM) (A-3) Medium dense dark brown silty Fine SAND (SM) (A-2-4)	5/7/11					
20				4/9/21					
25				6/8/5					
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-18**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-H

Foreman B.D.

Completion

Depth 16.5' Date 6/28/17 Depth To Water 10.5' Time \_\_\_\_\_ Date 6/28/17

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
<b>SURF. EL: +62.9+/-'</b>									
0			3-1/2" Asphalt Pavement						
			7-1/2" Gray Crushed Limestone Base						
			Brownish-gray Fine SAND with trace of limestone fragments (SP) (A-3)						
			Light gray Fine SAND (SP) (A-3)						
5			Light gray Fine SAND (SP) (A-3)						
			Very loose dark brown Fine SAND (SP) (A-3)						
			Loose light brown Fine SAND (SP)						
10			Medium dense brown and dark brown Fine SAND (SP) (A-3)						
			Medium dense dark brown slightly silty Fine SAND (SP-SM) (A-3)						
15			Medium dense brown Fine SAND (SP) (A-3)						
20									
25									
30									

Remarks Borehole Grouted

Casing Length \_\_\_\_\_


**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-19**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-I

Foreman B.D.

Completion

Depth

16.5'

Date

6/30/17

Depth To  
Water

4.2'

Time

Date 6/30/17

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: +65.7+/- 4-1/2" Asphalt Pavement 6-1/2" Cream Colored Crushed Limestone Base Very light gray Fine SAND with trace of limestone fragments (SP) (A-3) Dark brown Fine SAND (SP) (A-3)						
5		Loose brown Fine SAND (SP) (A-3)						
10		Dense to very dense dark brown to dark grayish-brown Fine SAND (SP) (A-3)	2/2/6					
15		Very dense dark brown weakly cemented, organic Fine SAND (SP-SM/Pt) (A-8)	4/12/20					
20			11/23/34					
25			15/37/44					
30			27/38/45					

Remarks Borehole Grouted

Casing Length

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-20**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-I

Foreman B.D.

Completion

Depth 16.0'

Date 6/29/17

Depth To Water

4.6'

Time

Date 6/29/17

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: +67.6+/-'						
			4" Asphalt Pavement						
			9" Cream Colored Crushed Limestone Base						
			Light gray Fine SAND (SP) (A-3)						
			Dark brown Fine SAND (SP) (A-3)						
5			Medium dense brown Fine SAND (SP) (A-3)						
			Dense brown silty Fine SAND (SM) (A-2-4)	3/6/10					
10			Very dense dark brown slightly silty Fine SAND with finely divided organic material (SP-SM) (A-3)	8/11/22					
			Very dense brown Fine SAND with finely divided organic material (SP) (A-3)	13/25/39					
15			Very dense dark grayish-brown Fine SAND (SP) (A-3)	15/25/41					
				29/50*					
20									
25									
30									

Remarks Borehole Grouted

Casing Length



DRIGGERS ENGINEERING SERVICES INCORPORATED

**Project No.** DES 178064

BORING NO. B-21

**Project** Cleveland Street - Phase III, Clearwater, Florida

**Location** See Plate I-1

Foreman B.D.

### Completion

Completion Depth 16.5' Date 6/29/17

## Depth To Water

34'

Time

Date 6/29/17

**Remarks** Borehole Grouted

## Casing Length

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

Project No. DES 178064

**BORING NO. B-22**

Project Cleveland Street - Phase III, Clearwater, Florida

Location See Plate I-J

Foreman B.D.

Completion

Depth 16.5' Date 6/29/17 Depth To Water 4.2' Time \_\_\_\_\_ Date 6/29/17

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	
<b>SURF. EL: +73.0+/-'</b>									
0		3-1/2" Asphalt Pavement							
		Brown Fine SAND with cemented fragments (SP) (A-3)							
		Light gray Fine SAND with pockets of dark gray clayey Fine SAND (SP/SC) (A-3/A-2-6)							
5		Light gray Fine SAND (SP) (A-3)							
		Medium dense light grayish-brown Fine SAND (SP) (A-3)	3/6/8						
		Dense dark brown Fine SAND with finely divided organic material (SP) (A-3)	8/15/18						
10		Very dense dark brown slightly silty Fine SAND (SP-SM) (A-3)	11/28/43						
		Very dense dark brown slightly silty Fine SAND with finely divided organic material (SP-SM) (A-3)	12/23/32						
15			15/24/39						
20									
25									
30									

Remarks Borehole Grouted

Casing Length

DRIGGERS ENGINEERING SERVICES INCORPORATED

**Project No.** DES 178064

BORING NO. B-23

## **Project** Cleveland Street - Phase III, Clearwater, Florida

**Location** See Plate I-J

**Foreman** B.D.

## Completion

Depth 16.5' Date 6/29/17

**Depth To Water**

4.8'

## Time

Date 6/29/17

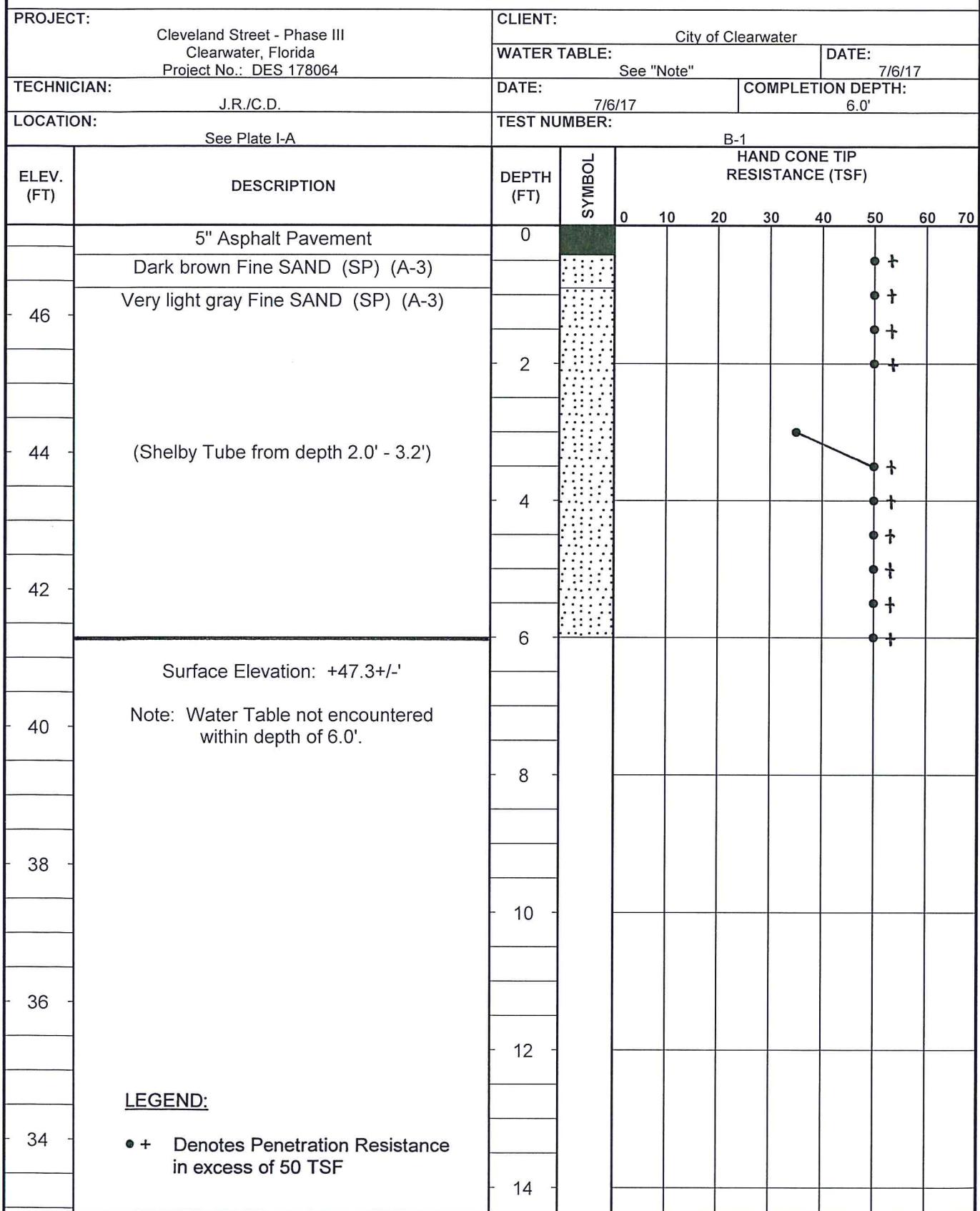
### **Remarks Borehole Grouted**

## Casing Length

## **HAND AUGER BORING / HAND CONE SOUNDING LOGS**

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**





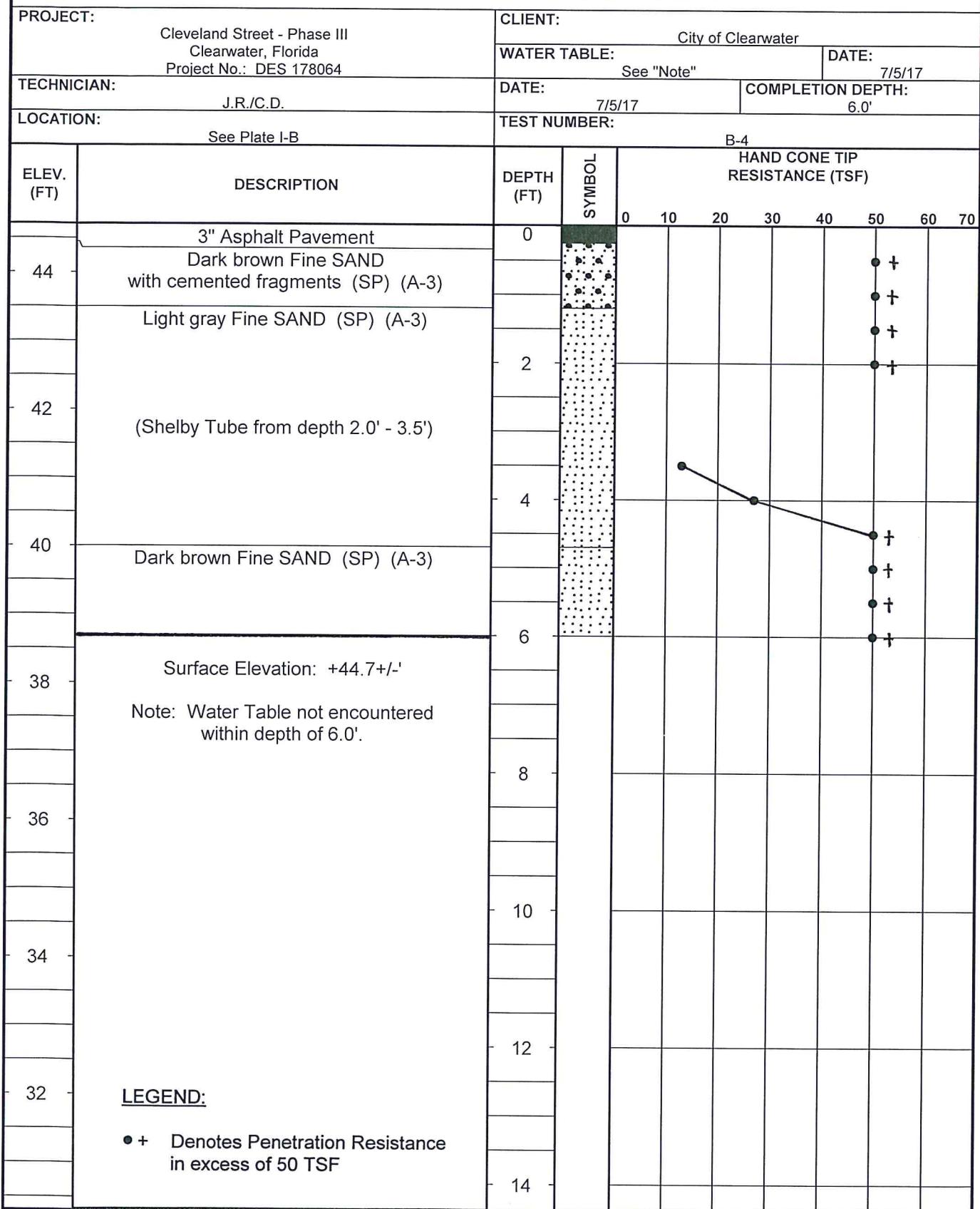
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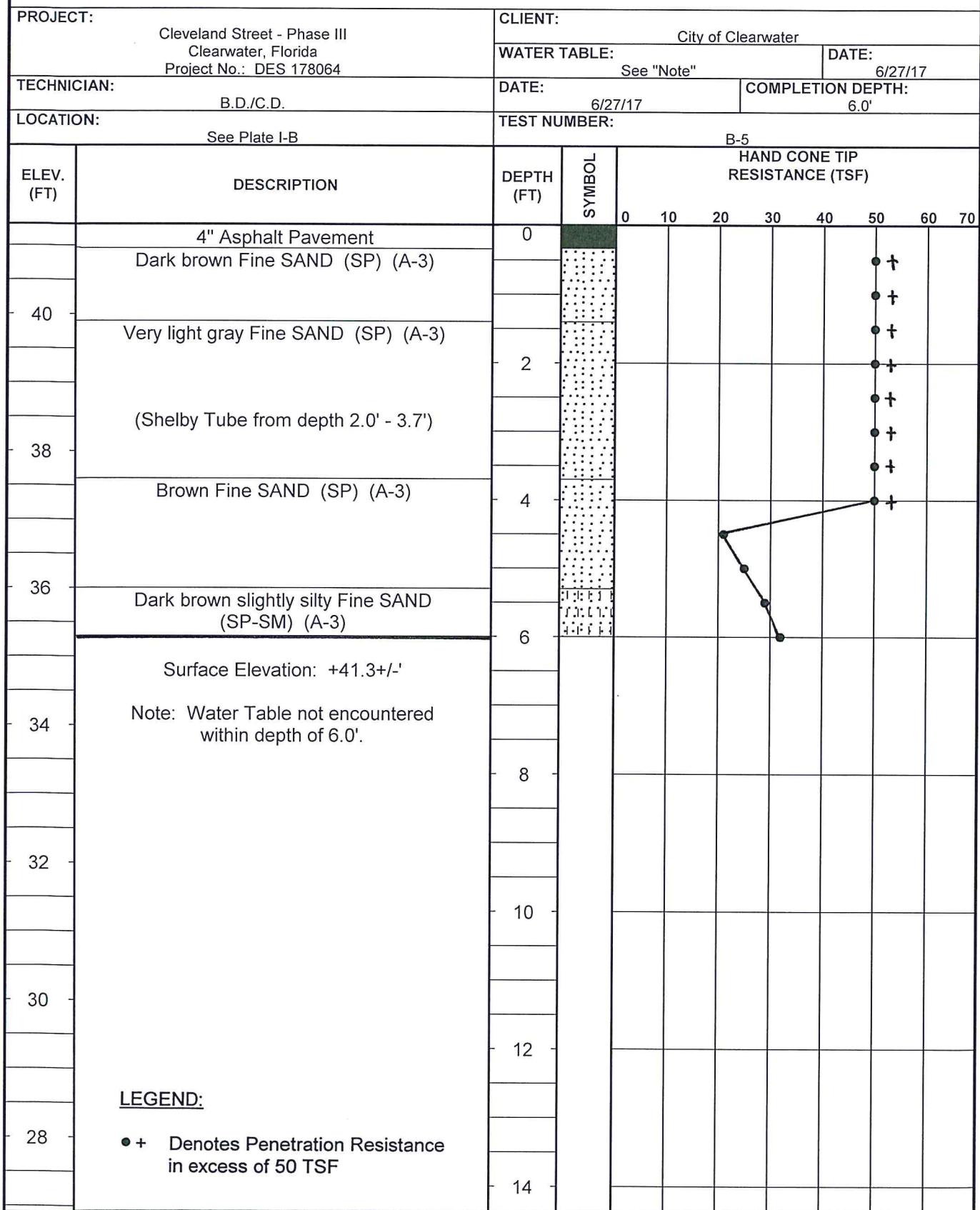
## HAND AUGER BORING/HAND CONE SOUNDING LOG

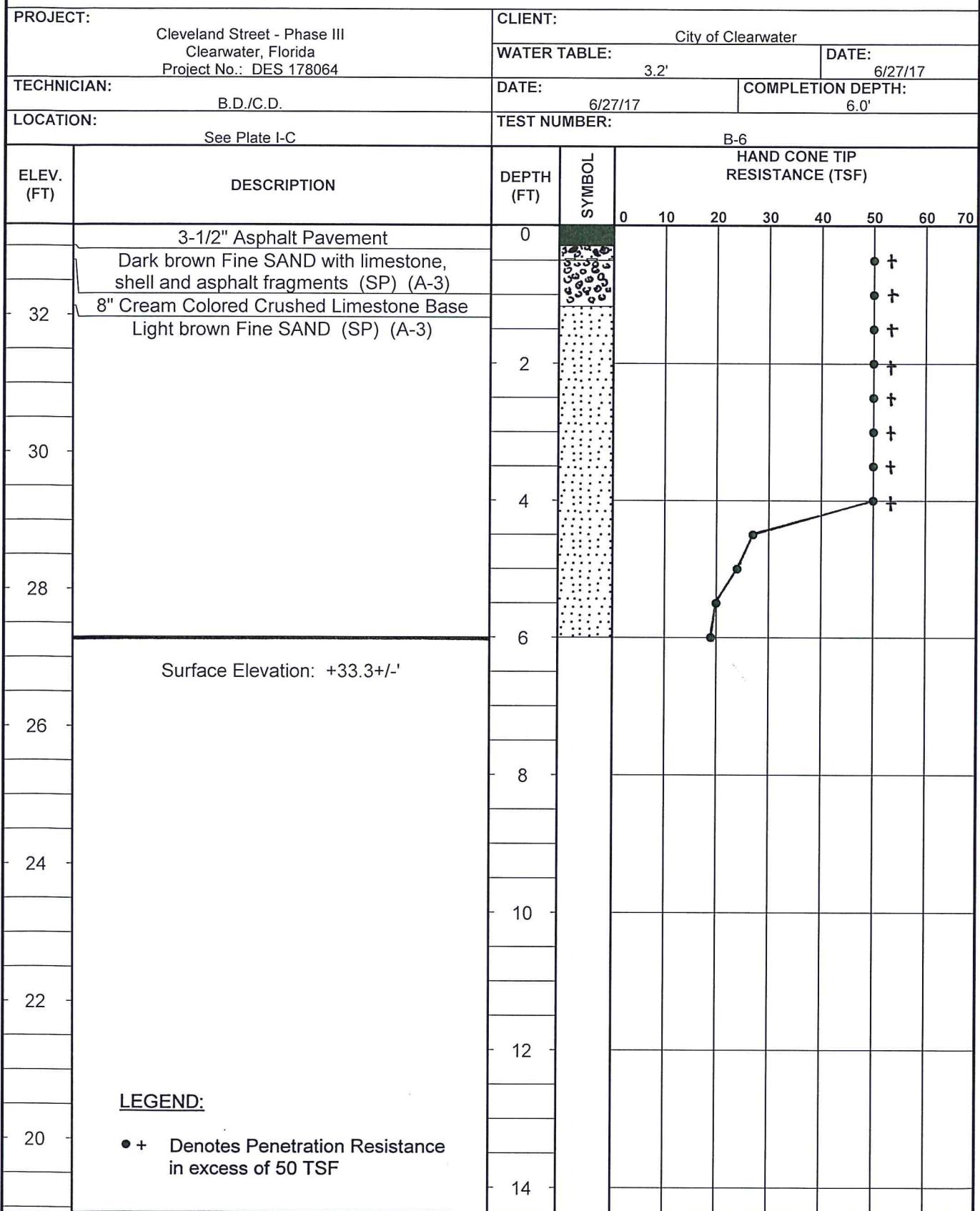
PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater										
TECHNICIAN: B.D./C.D.		WATER TABLE: See "Note"										
LOCATION: See Plate I-A		DATE: 6/26/17										
		TEST NUMBER: B-2										
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL	HAND CONE TIP RESISTANCE (TSF)								
	2" Asphalt Pavement	0		0	10	20	30	40	50	60	70	
	8" Gray Crushed Limestone and Shell Base											
46	Very light gray Fine SAND (SP) (A-3)	2										
44		4										
42		6										
	Surface Elevation: +47.6+/-'	8										
40	Note: Water Table not encountered within depth of 6.0'.	10										
38		12										
36		14										
<u>LEGEND:</u>	<ul style="list-style-type: none"> <li>• + Denotes Penetration Resistance in excess of 50 TSF</li> </ul>											

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**



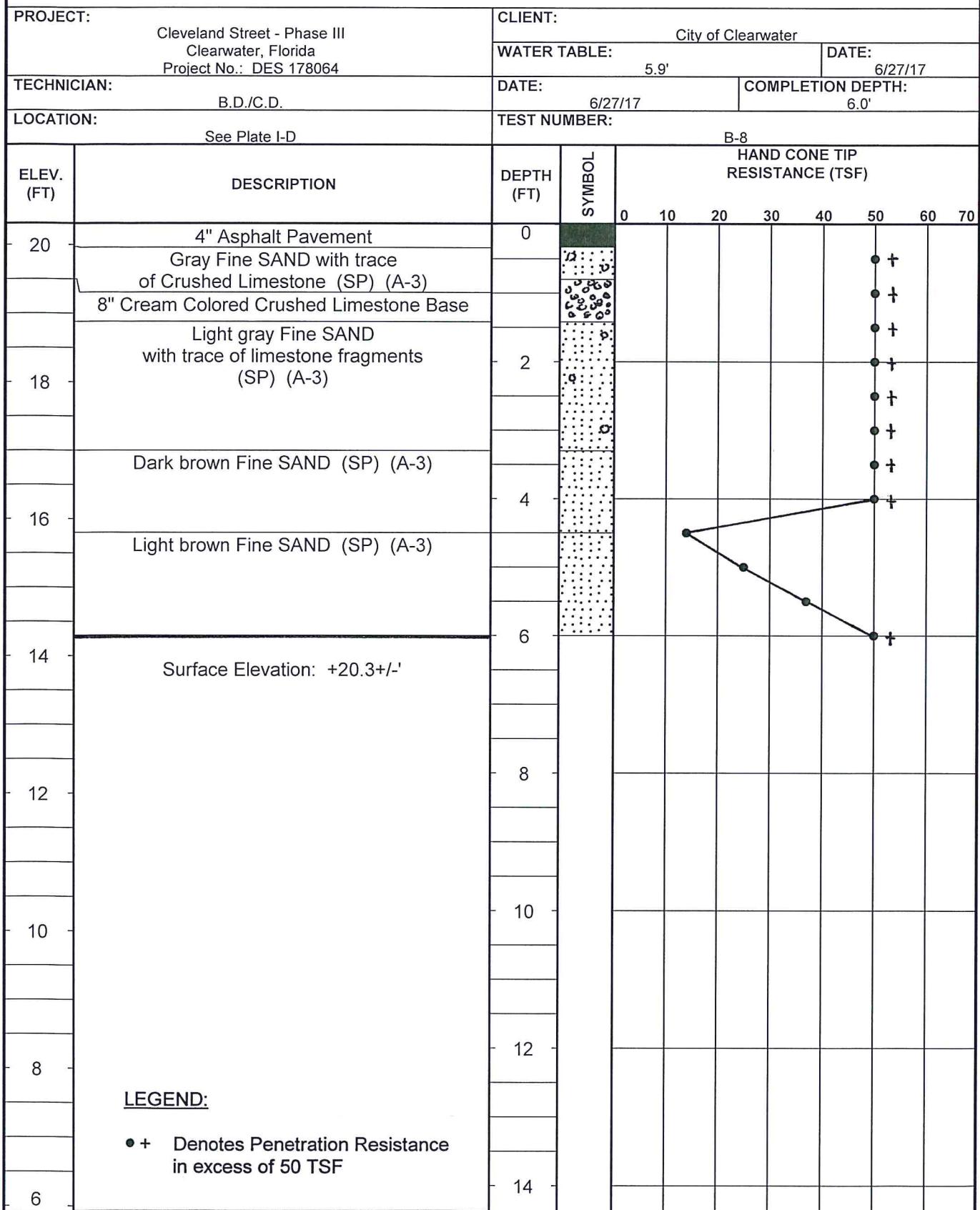

**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**



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**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**

PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater	
		WATER TABLE: See "Note"	DATE: 7/5/17
TECHNICIAN:	J.R./C.D.	DATE:	COMPLETION DEPTH: 6.0'
LOCATION:	See Plate I-C	TEST NUMBER:	B-7
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
24	3" Asphalt Pavement	0	
	Dark brown Fine SAND with cemented fragments (SP) (A-3)		
	Dark brownish-gray Fine SAND with green CLAY and cemented fragments (SP/CH) (A-3/A-7-6)	2	
22	(Shelby Tube from depth 2.0' - 3.1')		
	Dark brown slightly silty Fine SAND (SP-SM) (A-3)		
20	Dark brown Fine SAND with finely divided organic material and cemented fragments (SP) (A-3)	4	
	Light brown silty, slightly clayey Fine SAND with cemented fragments (SM) (A-2-4)		
18	Surface Elevation: +24.3+/-'  Note: Water Table not encountered within depth of 6.0'.	6	
16		8	
14		10	
12		12	
10		14	
<u>LEGEND:</u>		<ul style="list-style-type: none"> <li>• + Denotes Penetration Resistance in excess of 50 TSF</li> </ul>	


**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**




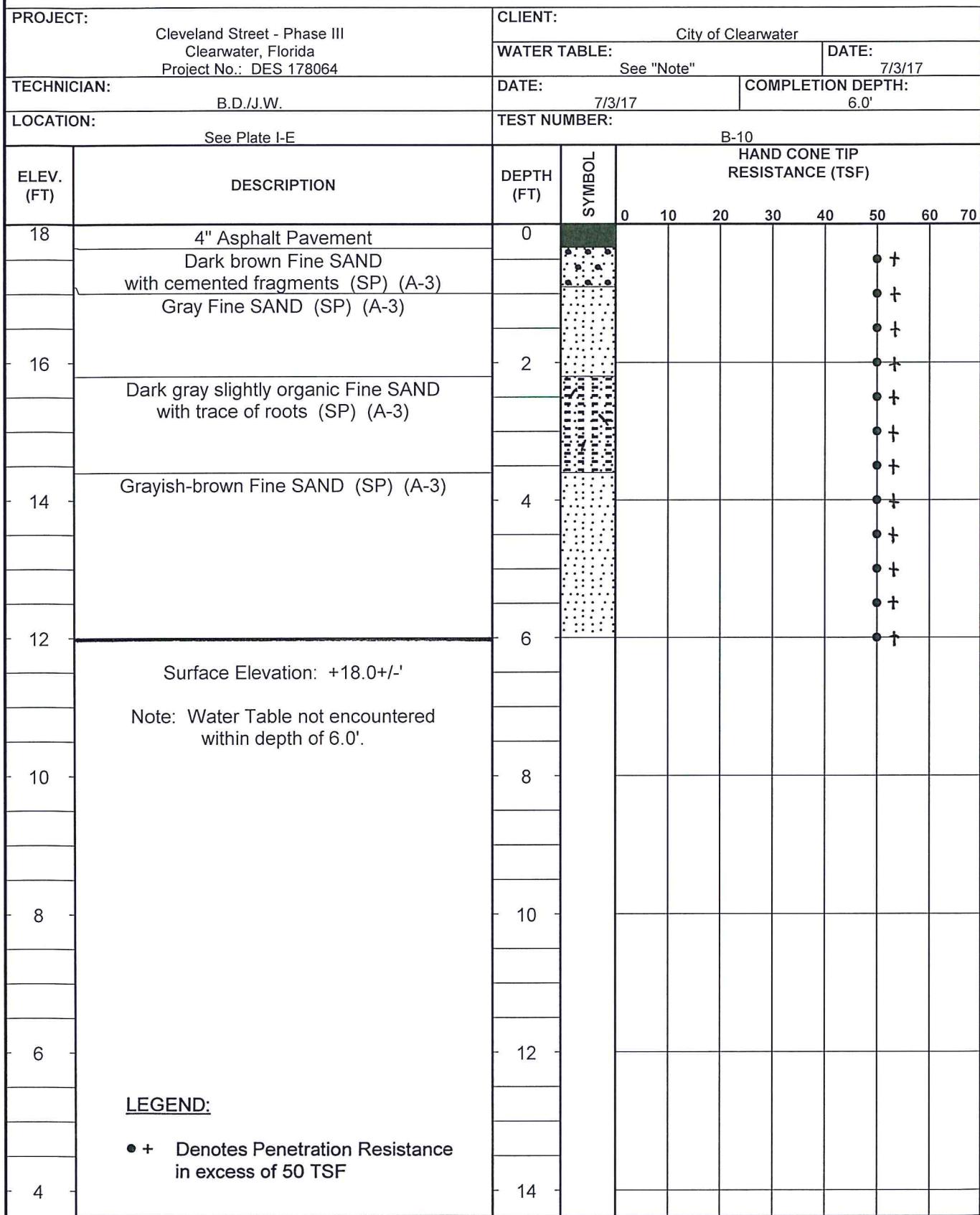
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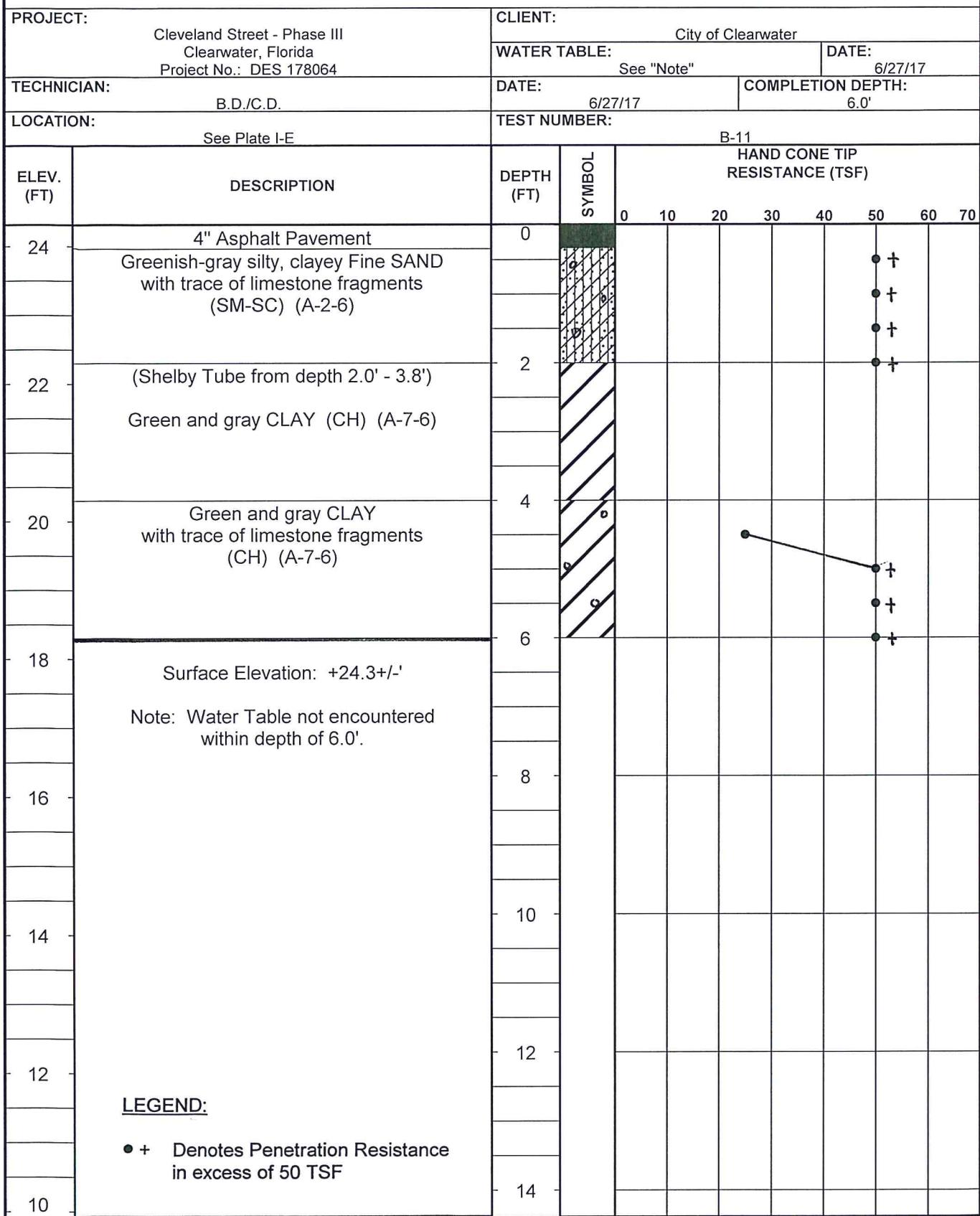
HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT:		CLIENT:	
Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		City of Clearwater	
TECHNICIAN:		WATER TABLE: See "Note"	DATE: 7/5/17
J.R./C.D.		DATE: 7/5/17	COMPLETION DEPTH: 6.0'
LOCATION: See Plate I-D		TEST NUMBER:	B-9
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
	3-1/2" Asphalt Pavement	0	
16	Dark brown Fine SAND with cemented fragments (SP) (A-3)	2	
	(Shelby Tube from depth 2.0' - 3.1')	4	
14	Gray Fine SAND (SP) (A-3)	6	
	Dark brown Fine SAND (SP) (A-3)	8	
	Brownish-gray Fine SAND (SP) (A-3)	10	
12		12	
		14	
Surface Elevation: +17.3+/-'			
Note: Water Table not encountered within depth of 6.0'.			
<u>LEGEND:</u>			
● + Denotes Penetration Resistance in excess of 50 TSF			

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**




**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**


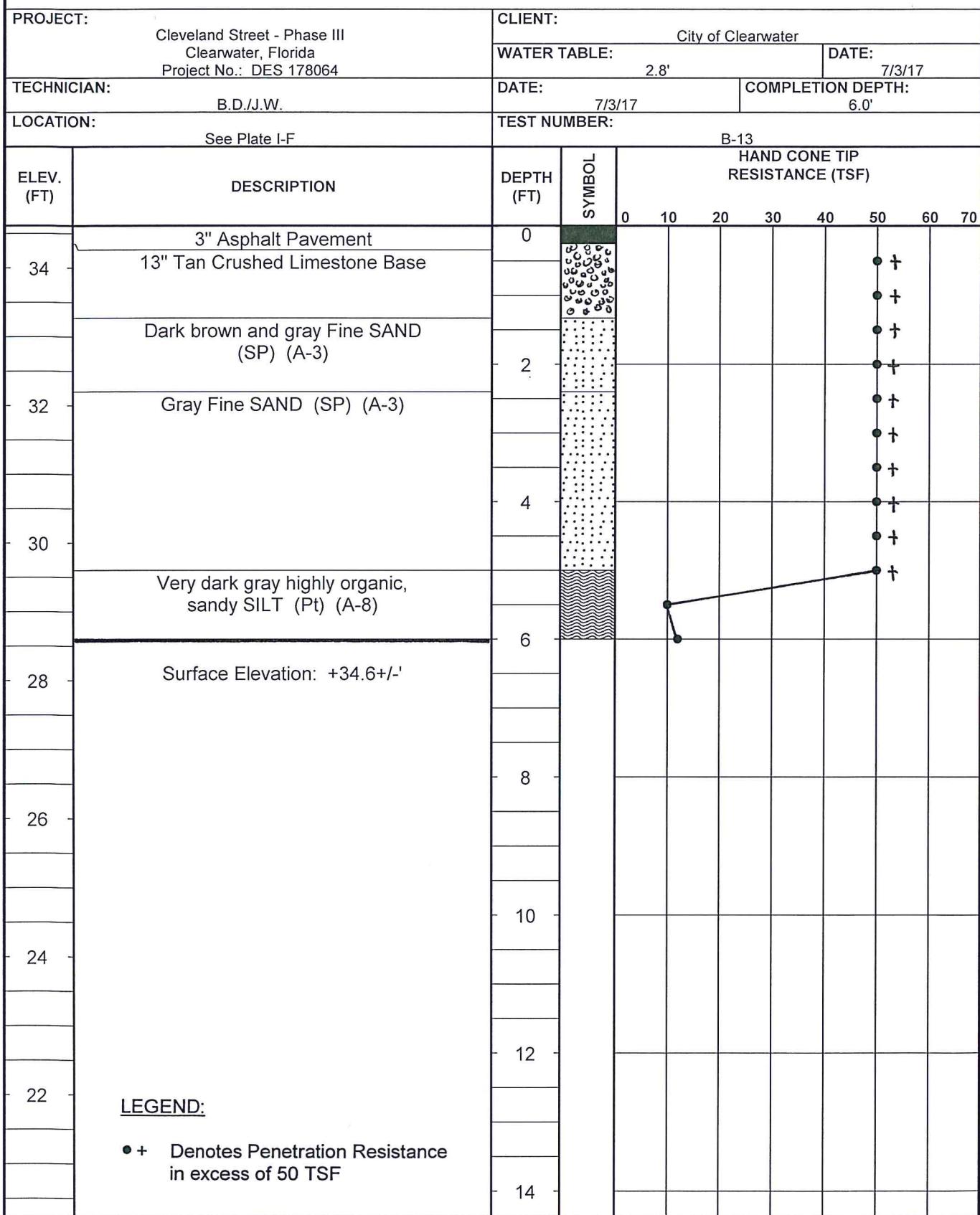
**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**

PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater	
		WATER TABLE: See "Note"	DATE: 6/30/17
TECHNICIAN:	B.D.	DATE: 6/30/17	COMPLETION DEPTH: 6.0'
LOCATION:	See Plate I-E	TEST NUMBER:	B-12
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
30	3" Asphalt Pavement	0	
	7" Gray Clayey Crushed Limestone Base		
	Gray, green and brown clayey Fine SAND with pockets of dark gray Fine SAND (SC/SP) (A-2-6/A-3)		
	Green sandy CLAY (CH) (A-7-6)	2	
28			
26			
24	Surface Elevation: +30.5+/-'  Note: No Water Table recorded within CLAYs.	6	
22		8	
20		10	
18		12	
	<u>LEGEND:</u>		
	● + Denotes Penetration Resistance in excess of 50 TSF	14	

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**



**DRIGGERS ENGINEERING SERVICES INCORPORATED**

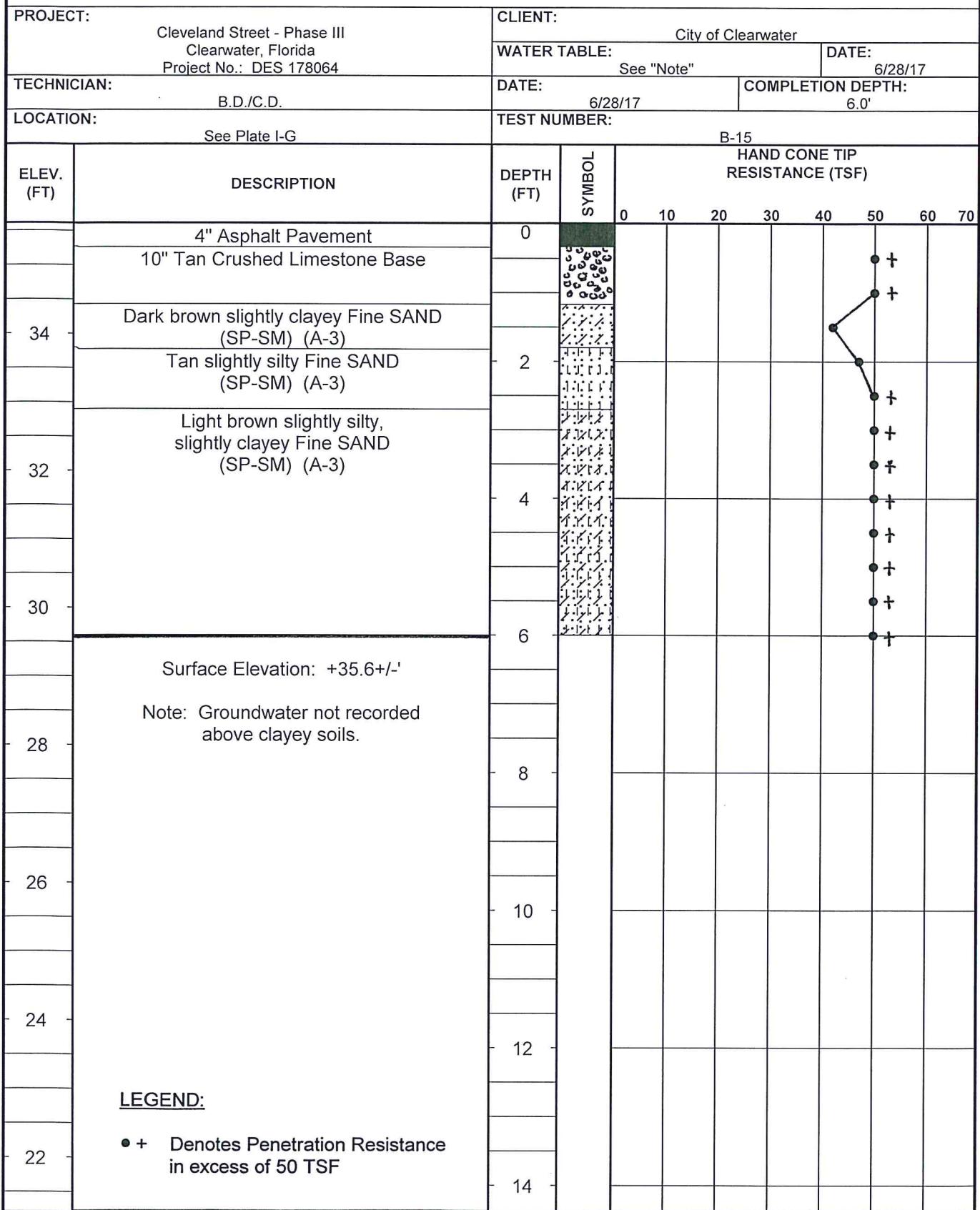
**HAND AUGER BORING/HAND CONE SOUNDING LOG**

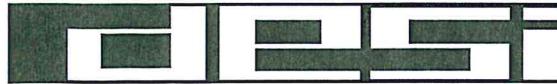
PROJECT:		CLIENT:	
Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		City of Clearwater	
TECHNICIAN:		WATER TABLE: 3.1'	
B.D./J.W.		DATE: 7/3/17	
LOCATION:		TEST NUMBER: B-14	
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
44	3" Asphalt Pavement	0	● +
	8" Tan Crushed Limestone Base		
	Dark brown Fine SAND with trace of limestone fragments (SP) (A-3)	2	● +
42			● +
			● +
40		4	● +
	Brown Fine SAND (SP) (A-3)		● +
			● +
38	Surface Elevation: +44.5+/-'	6	● +
			● +
36		8	
34		10	
32		12	
	<u>LEGEND:</u>		
	● + Denotes Penetration Resistance in excess of 50 TSF		
		14	



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG



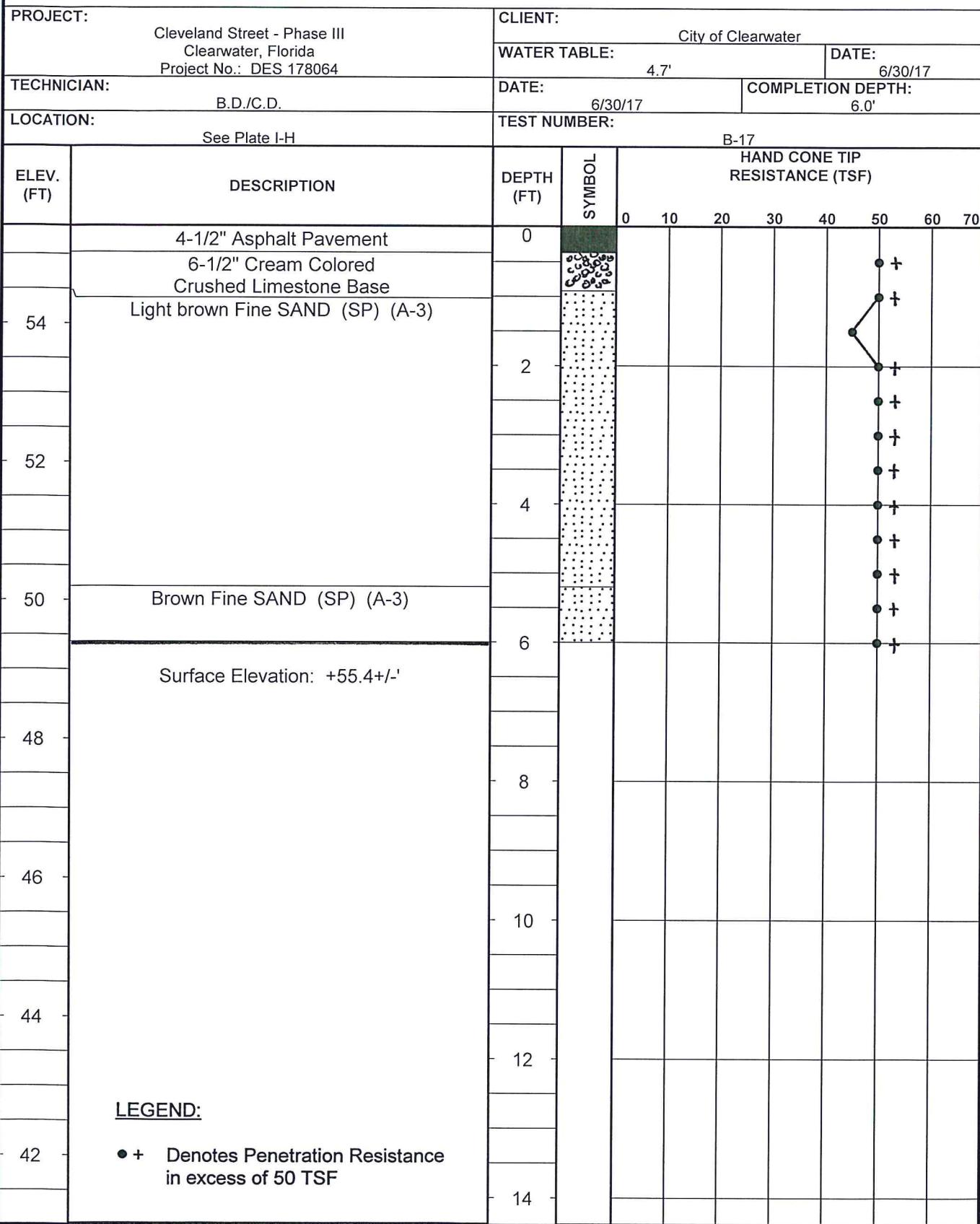

**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**

PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater	
		WATER TABLE:	DATE: 5.8' 6/28/17
TECHNICIAN:	B.D./C.D.	DATE:	COMPLETION DEPTH: 6/28/17 6.0'
LOCATION:	See Plate I-G	TEST NUMBER:	B-16
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
	4" Asphalt Pavement	0	
44	9" Tan Crushed Limestone Base		
	Light gray and brown Fine SAND with limestone fragments (SP) (A-3)		
42	(Shelby Tube from depth 2.0' - 4.0')	2	
	Gray Fine SAND (SP) (A-3)		
40	(Shelby Tube from depth 4.0' - 6.0')	4	
	Light brown slightly silty Fine SAND (SP-SM) (A-3)		
38	Surface Elevation: +44.5+/-'	6	
		8	
36		10	
34		12	
32		14	
<u>LEGEND:</u>			
• + Denotes Penetration Resistance in excess of 50 TSF			



DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG





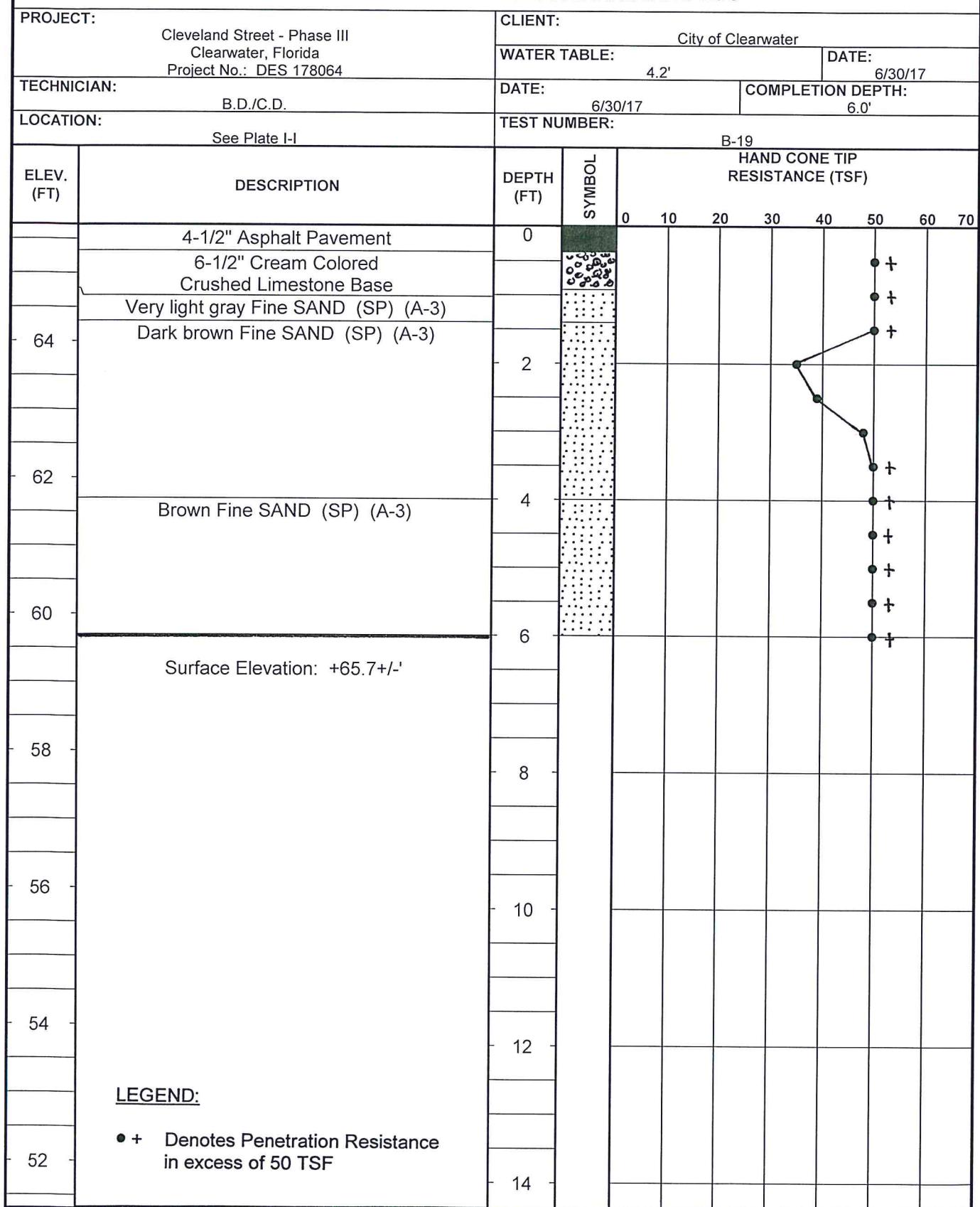
DRIGGERS ENGINEERING SERVICES INCORPORATED

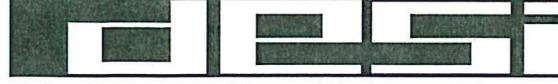
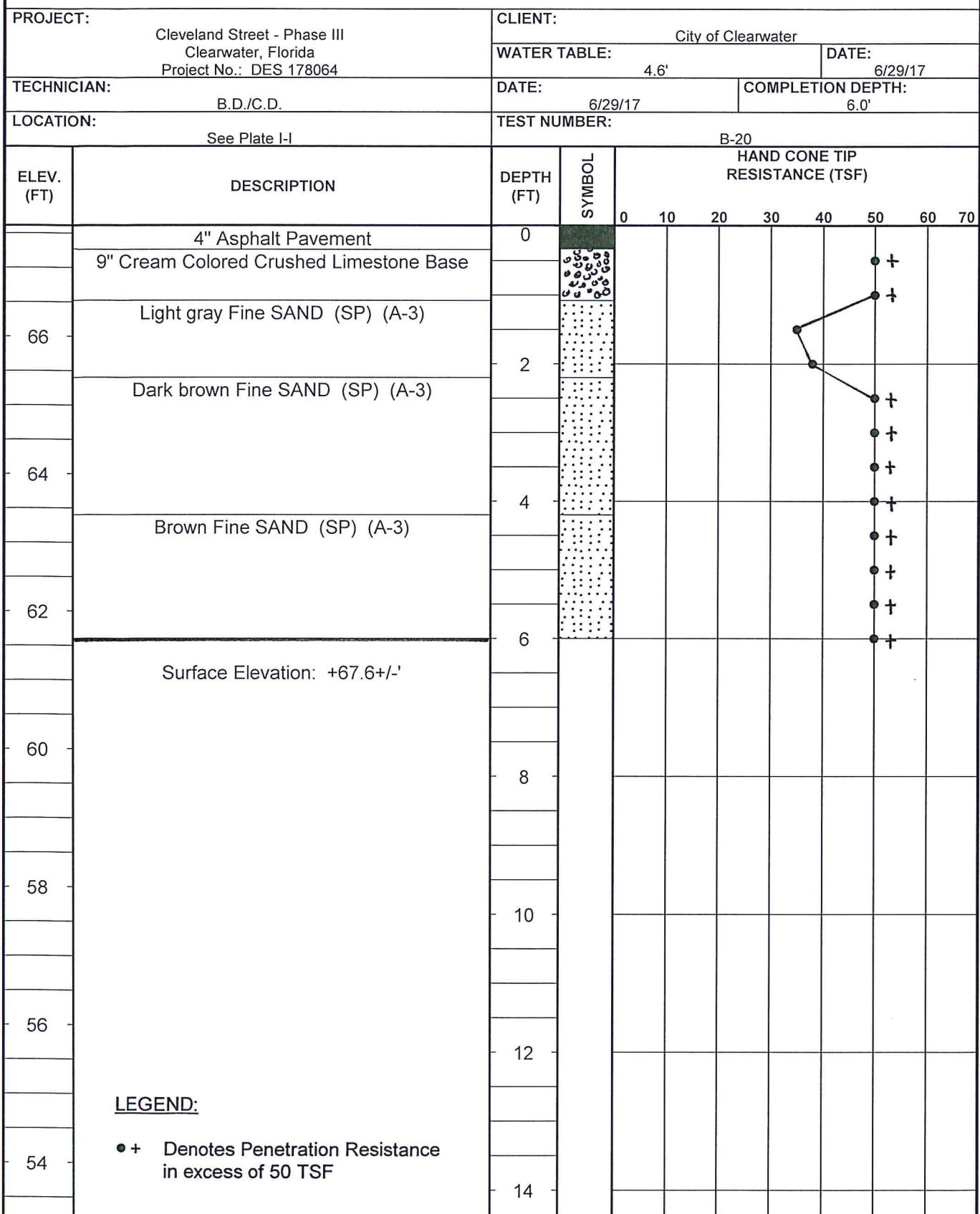
HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater	
		WATER TABLE: See "Note"	
TECHNICIAN: B.D./C.D.		DATE: 6/28/17	DATE: 6/28/17
LOCATION: See Plate I-H		COMPLETION DEPTH: 6.0'	
		TEST NUMBER: B-18	
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL
	3-1/2" Asphalt Pavement	0	
62	7-1/2" Gray Crushed Limestone Base		
	Brownish-gray Fine SAND (SP) (A-3)		
	(Shelby Tube from depth 2.0' - 3.4')	2	
60	Light gray Fine SAND (SP) (A-3)		
		4	
58			
		6	
56	Surface Elevation: +62.9+/-'  Note: Water Table not encountered within depth of 6.0'.		
		8	
54			
		10	
52			
		12	
50			
	<u>LEGEND:</u> • + Denotes Penetration Resistance in excess of 50 TSF	14	

**DRIGGERS ENGINEERING SERVICES INCORPORATED**

**HAND AUGER BORING/HAND CONE SOUNDING LOG**



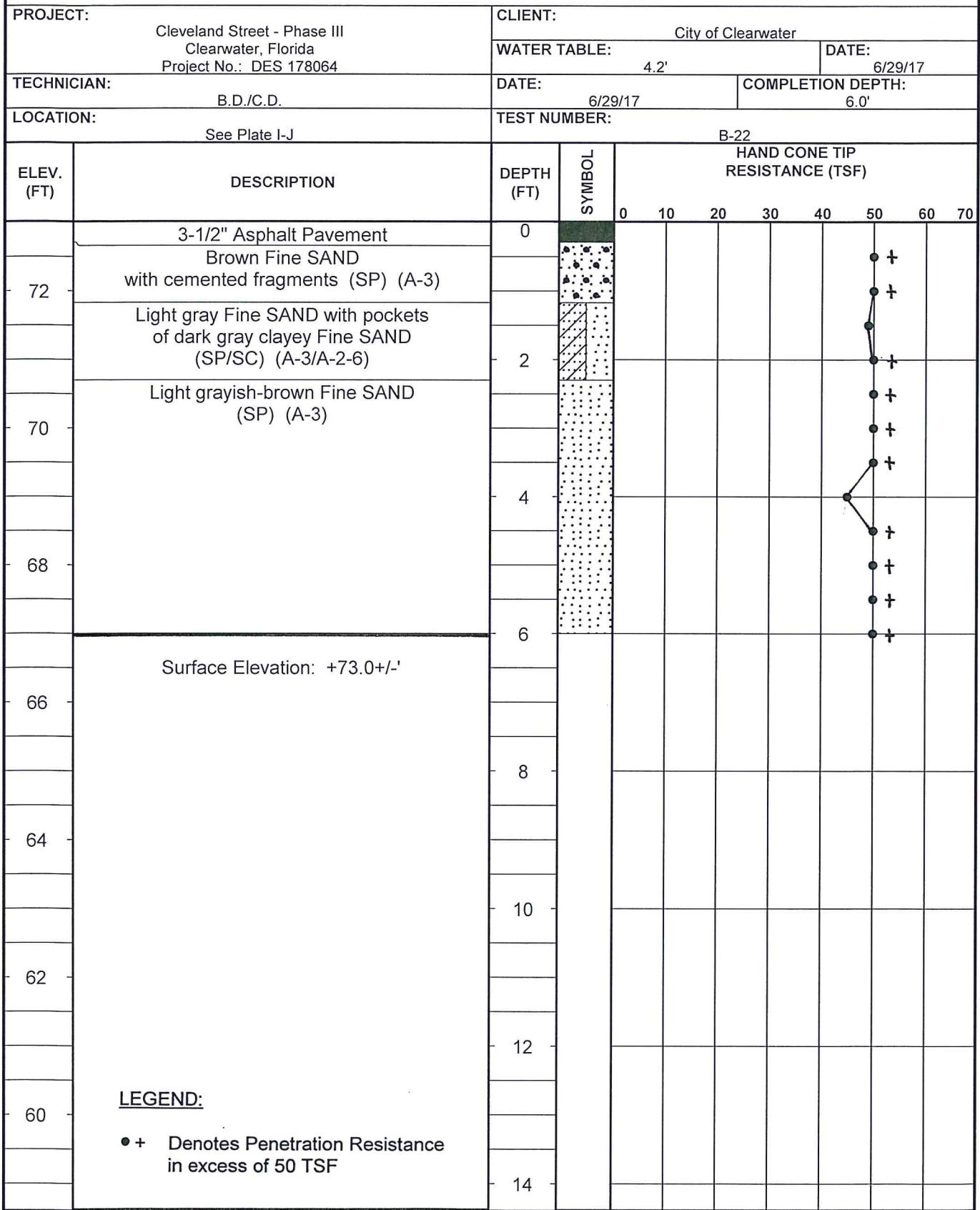

**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**




DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT:		CLIENT:							
Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		City of Clearwater							
TECHNICIAN:		WATER TABLE:							
B.D./C.D.		3.4'							
LOCATION:		DATE:	6/29/17						
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL						
	4" Asphalt Pavement	0							
	Dark brown Fine SAND with cemented fragments (SP) (A-3)								
	Light gray Fine SAND (SP) (A-3)	2							
70									
	(Shelby Tube from depth 2.0' - 3.5')								
68	Light grayish-brown Fine SAND with trace of roots (SP) (A-3)	4							
66		6							
	Surface Elevation: +71.9+/-'								
64		8							
62		10							
60		12							
58	<u>LEGEND:</u>  • + Denotes Penetration Resistance in excess of 50 TSF	14							
HAND CONE TIP RESISTANCE (TSF)									
		0	10	20	30	40	50	60	70


**DRIGGERS ENGINEERING SERVICES INCORPORATED**
**HAND AUGER BORING/HAND CONE SOUNDING LOG**




DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Cleveland Street - Phase III Clearwater, Florida Project No.: DES 178064		CLIENT: City of Clearwater							
		WATER TABLE: 4.8'							
TECHNICIAN: B.D./C.D.		DATE: 6/29/17	DATE: 6/29/17						
LOCATION: See Plate I-J		TEST NUMBER: B-23							
ELEV. (FT)	DESCRIPTION	DEPTH (FT)	SYMBOL						
	10" Asphalt Pavement	0							
	7" Concrete								
72	Very light gray Fine SAND (SP) (A-3)	2							
70	Gray and brown Fine SAND with shell and limestone fragments (SP) (A-3)	4							
68	Light gray Fine SAND (SP) (A-3)	6							
	Surface Elevation: +73.8+/-'								
66		8							
64		10							
62		12							
60		14							
<u>LEGEND:</u> • + Denotes Penetration Resistance in excess of 50 TSF		HAND CONE TIP RESISTANCE (TSF)							
		0	10	20	30	40	50	60	70

## **SUMMARY OF LABORATORY TEST RESULTS**

## SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y <sub>d</sub> (pcf)	G <sub>s</sub>	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON.	G.S.	ORG. (%)	pH	Cl. (ppm)	SO <sub>4</sub> (ppm)	RES. (ohm-cm)
						LL	PL	PI									
B-1 (Tube)	2.0-3.2	Very light gray Fine SAND										*					
B-1	10.0-11.5	Dark brown Fine SAND with finely divided organic material										2.5					
B-2	0.8-6.0	Very light gray Fine SAND										*					
B-3	10.0-11.5	Dark brown Fine SAND with finely divided organic material										*					
B-5 (Tube)	2.0-3.7	Very light gray Fine SAND										*					
B-5	8.0-9.5	Very dark brown slightly organic, silty Fine SAND										3.1					
B-7 (Tube)	2.0-3.1	Dark brown slightly silty Fine SAND										*					
B-7	10.0-11.5	Light green silty, slightly clayey Fine SAND	22.7						27	24	3						22.9
B-8	6.0-7.5	Light brown silty Fine SAND										*					
B-8	12.0-13.5	Light green CLAY															90.5
B-9 (Tube)	2.0-3.1	Gray Fine SAND										*					
B-10	2.2-3.6	Dark gray slightly silty Fine SAND with trace of roots										*					
B-11	0.3-2.0	Greenish-gray silty, clayey Fine SAND with trace of limestone fragments	25.6						40	26	14						44.6
B-11	8.0-9.5	Light gray clayey Fine SAND	22.0						31	22	9						23.9
B-12	0.3-1.3	Gray, green and brown clayey Fine SAND with pockets of dark gray Fine SAND	22.6						43	28	15						39.5

W % = Water Content  
 Y<sub>d</sub> (pcf) = Dry Density  
 G<sub>s</sub> = 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. (H) = Grainsize Analysis (Hydrometer)  
 ORG. (%) = Organic Content  
 Cl. (ppm) = Total Chloride  
 SO<sub>4</sub> (ppm) = Total Sulfate  
 RES. (ohm-cm) = Lab Resistivity  
 \* = See Test Curves  
 \*\* = Percent Passing No. 200 Sieve

**CLIENT:** City of Clearwater  
**PROJECT:** Cleveland Street – Phase III,  
Clearwater, Florida  
**FILE:** DES 178064

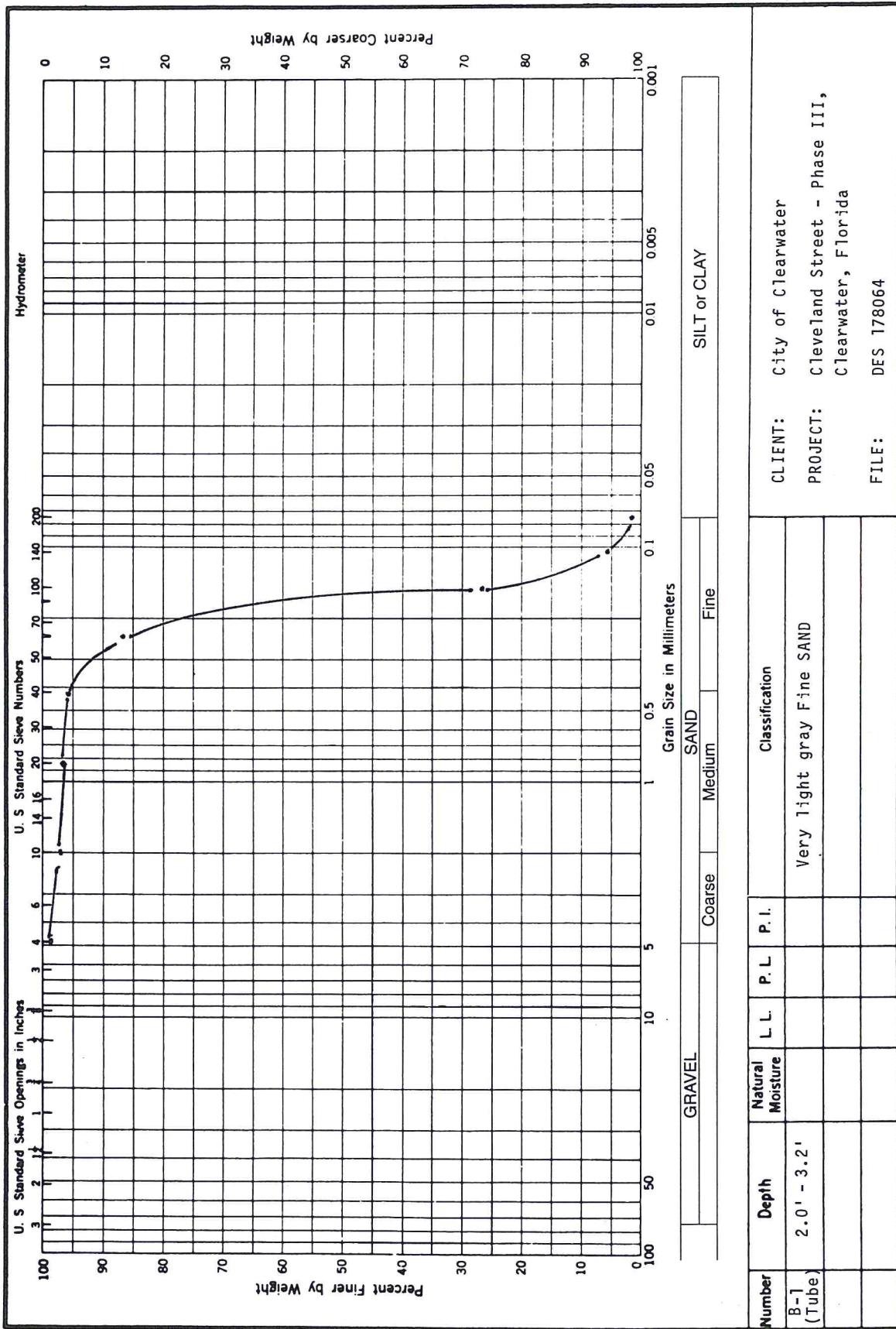
## SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	Y <sub>d</sub> (pcf)	G <sub>s</sub>	ATTERBERG LIMITS			P.P. (tsf)	U.C.	CON.	G.S.	ORG. (%)	Cl. (ppm)	pH	SO <sub>4</sub> (ppm)	RES. (ohm·cm)
						L.L.	P.L.	P.I.									
B-12	10.0-11.5	Gray clayey Fine SAND	18.5			25	17	8					**	30.8			
B-13	5.0-6.0	Very dark gray highly organic, sandy SILT															
B-13	6.0-7.5	Dark brown slightly organic, sandy CLAY														15.5	
B-13	8.0-9.5	Green clayey Fine SAND to sandy CLAY	23.8			45	19	26					**	49.1			
B-14	8.0-9.5	Green sandy CLAY	26.7			47	20	27					**	67.1			
B-14	15.0-16.5	Light green clayey Fine SAND	21.9			34	15	19					**	35.5			
B-15	6.0-7.5	Light greenish-gray clayey Fine SAND	20.2			34	17	17					**	37.6			
B-16	8.0-9.5	Light green silty, slightly clayey Fine SAND	24.6			NP	NP						**	26.3			
B-18 (Tube)	2.0-3.4	Light gray Fine SAND											*				
B-19	1.4-4.0	Dark brown Fine SAND											*				
B-19	12.0-13.5	Dark brown weakly cemented, organic Fine SAND												5.9			
B-21 (Tube)	2.0-3.5	Light gray Fine SAND											*				
B-21	6.0-7.5	Dark brown slightly silty Fine SAND											*				

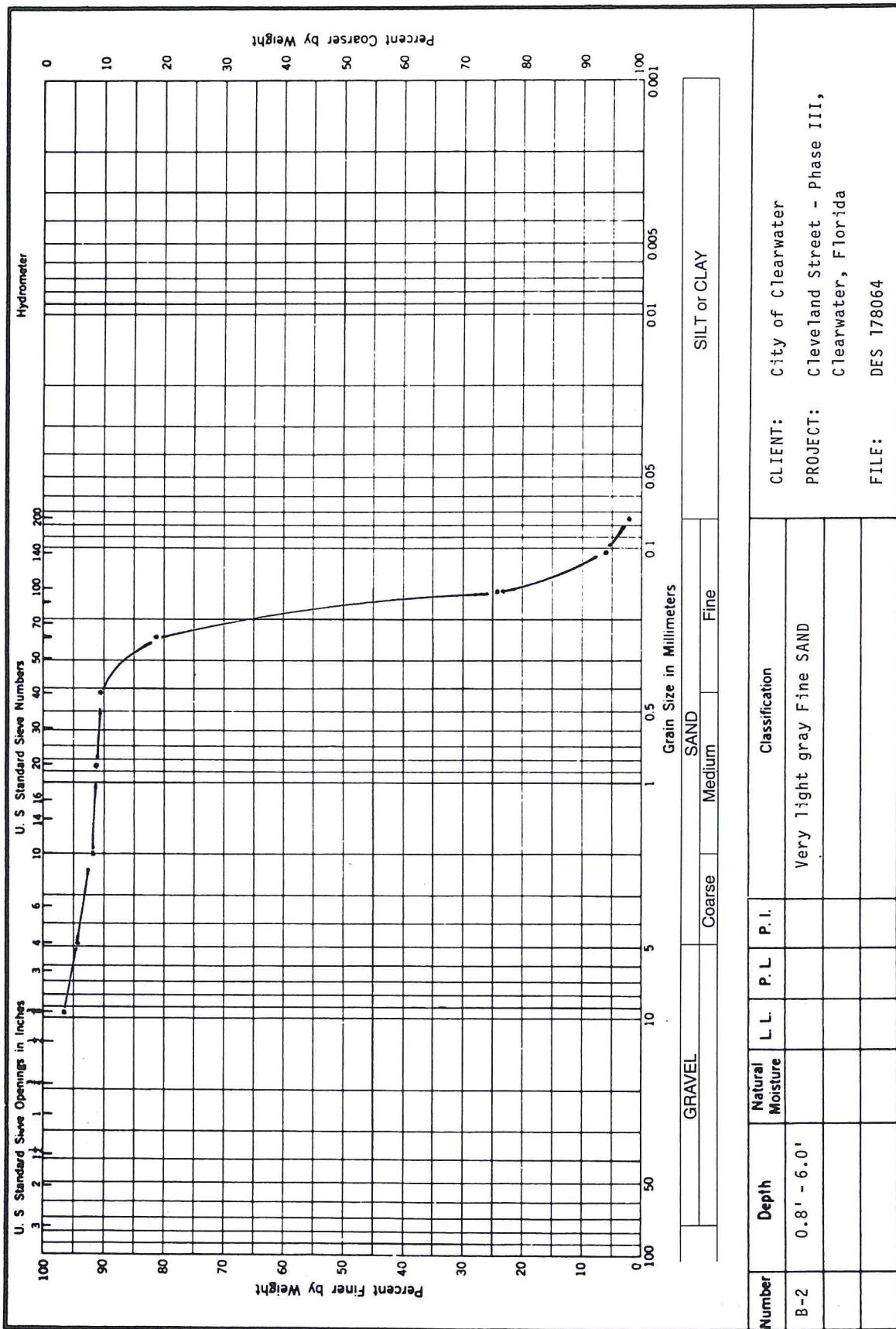
W.%	=	Con.	=	Consolidation Test
Y d (pcf)	=	G.S. (H)	=	Grainsize Analysis (Hydrometer)
Gs	=	ORG. (%)	=	Organic Content
L.L.	=	Cl. (ppm)	=	Total Chloride
PL	=	SO <sub>4</sub> (ppm)	=	Total Sulfate
PI	=	RES. (ohm-cm)	=	Lab Resistivity
P.P. (tsf)	=	*	=	See Test Curves
U.C.	=	**	=	Percent Passing No. 200 Sieve
Unconfined Compression				

## **GRAINSIZE ANALYSES**

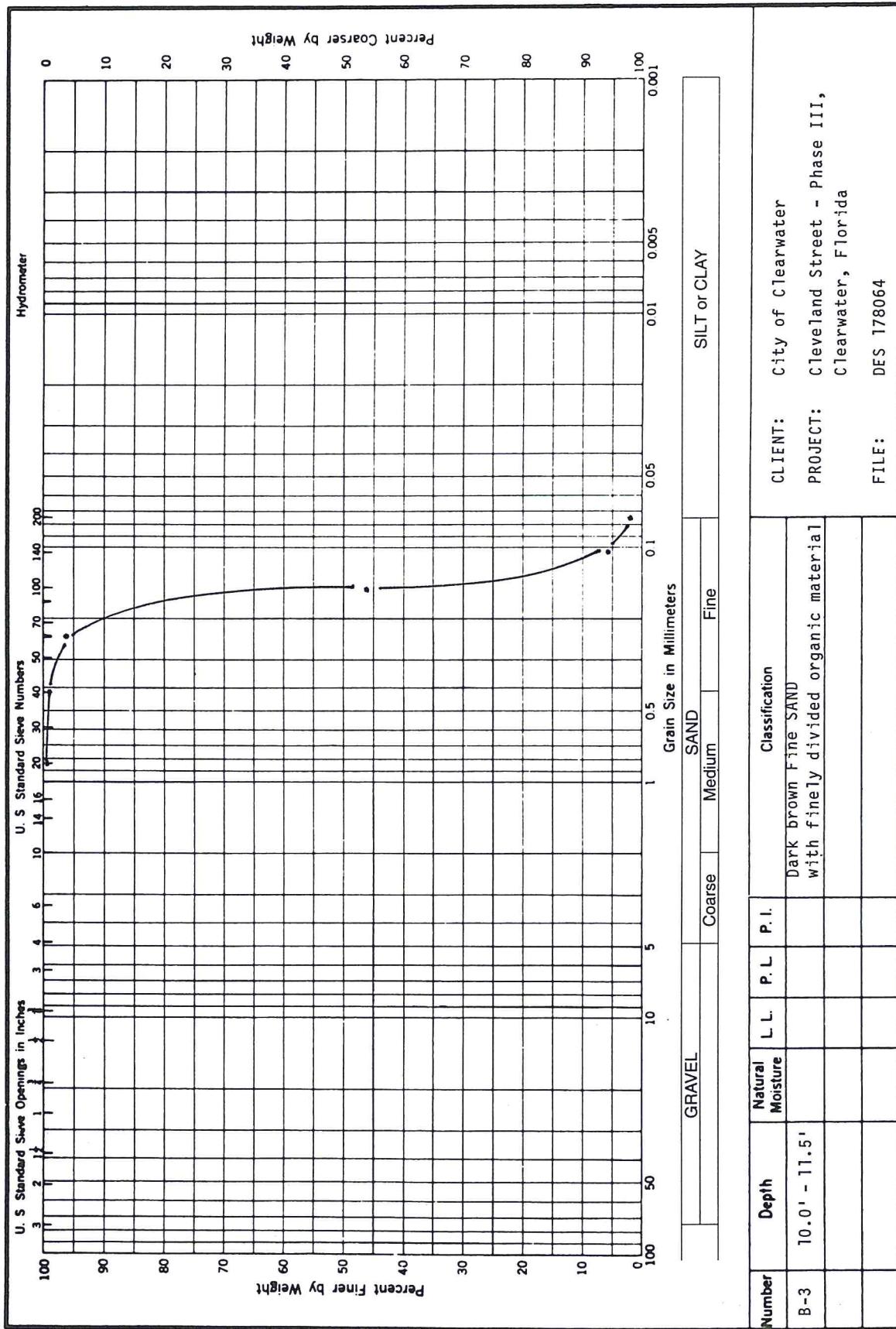
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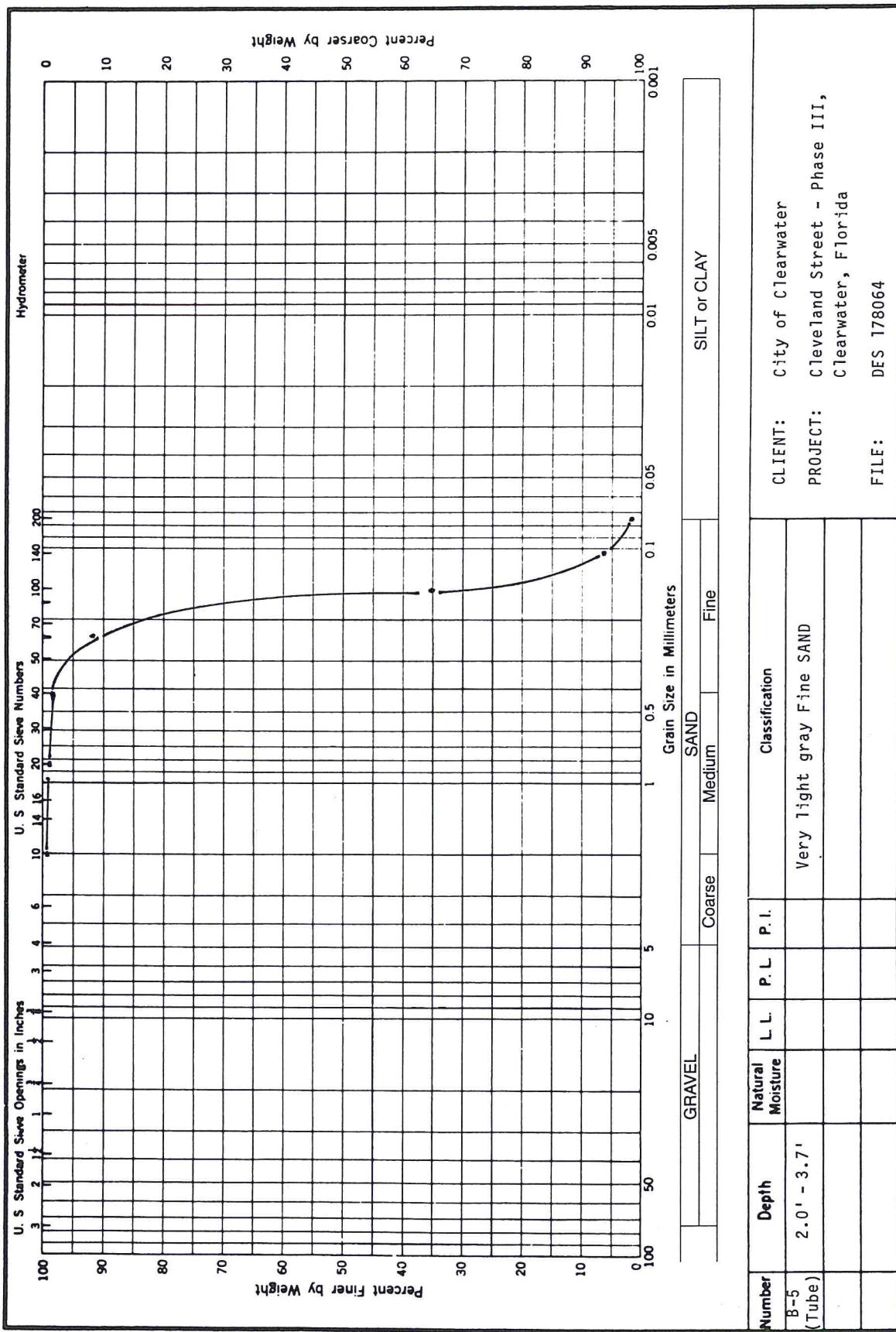
DRIGGERS ENGINEERING SERVICES, INC.



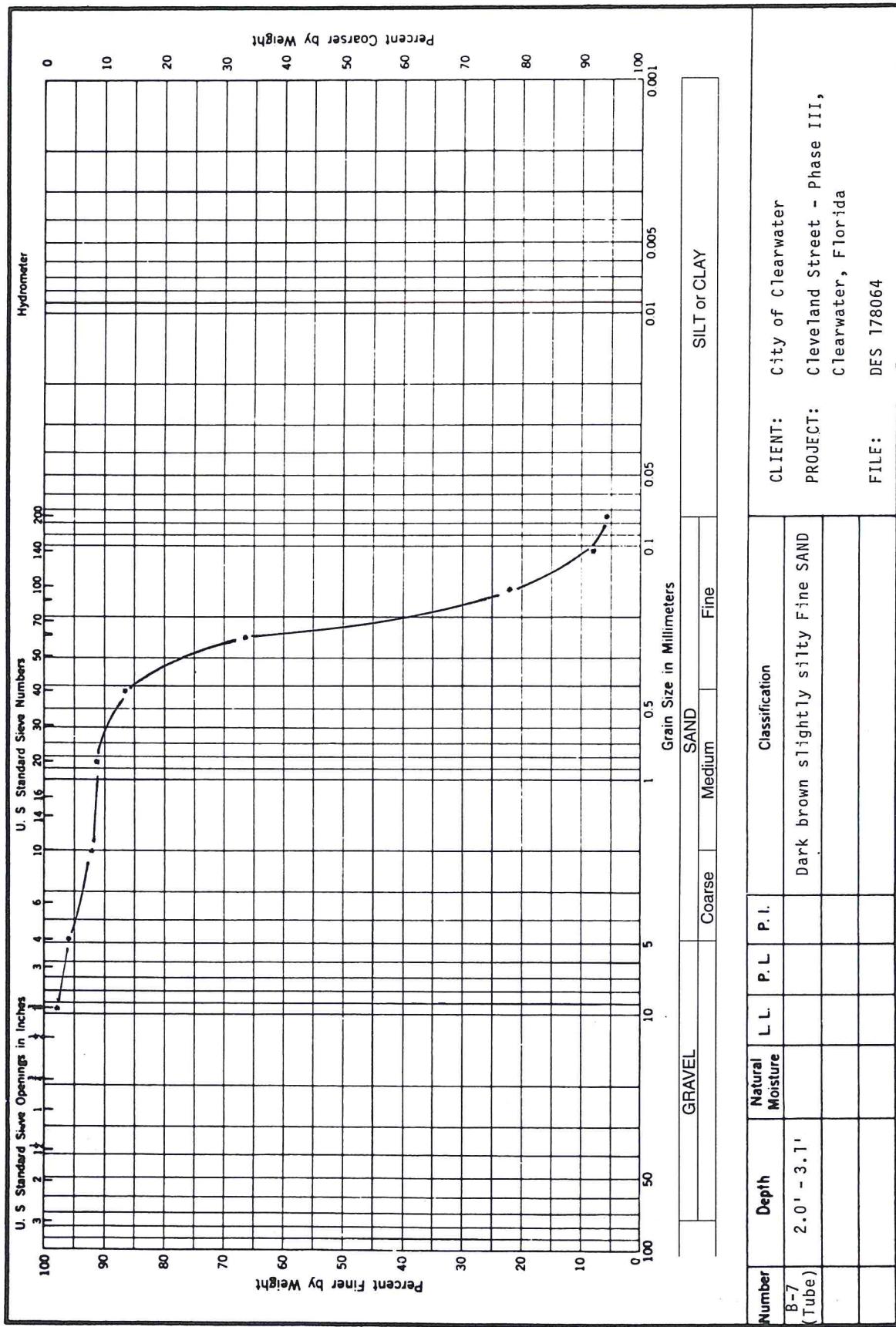
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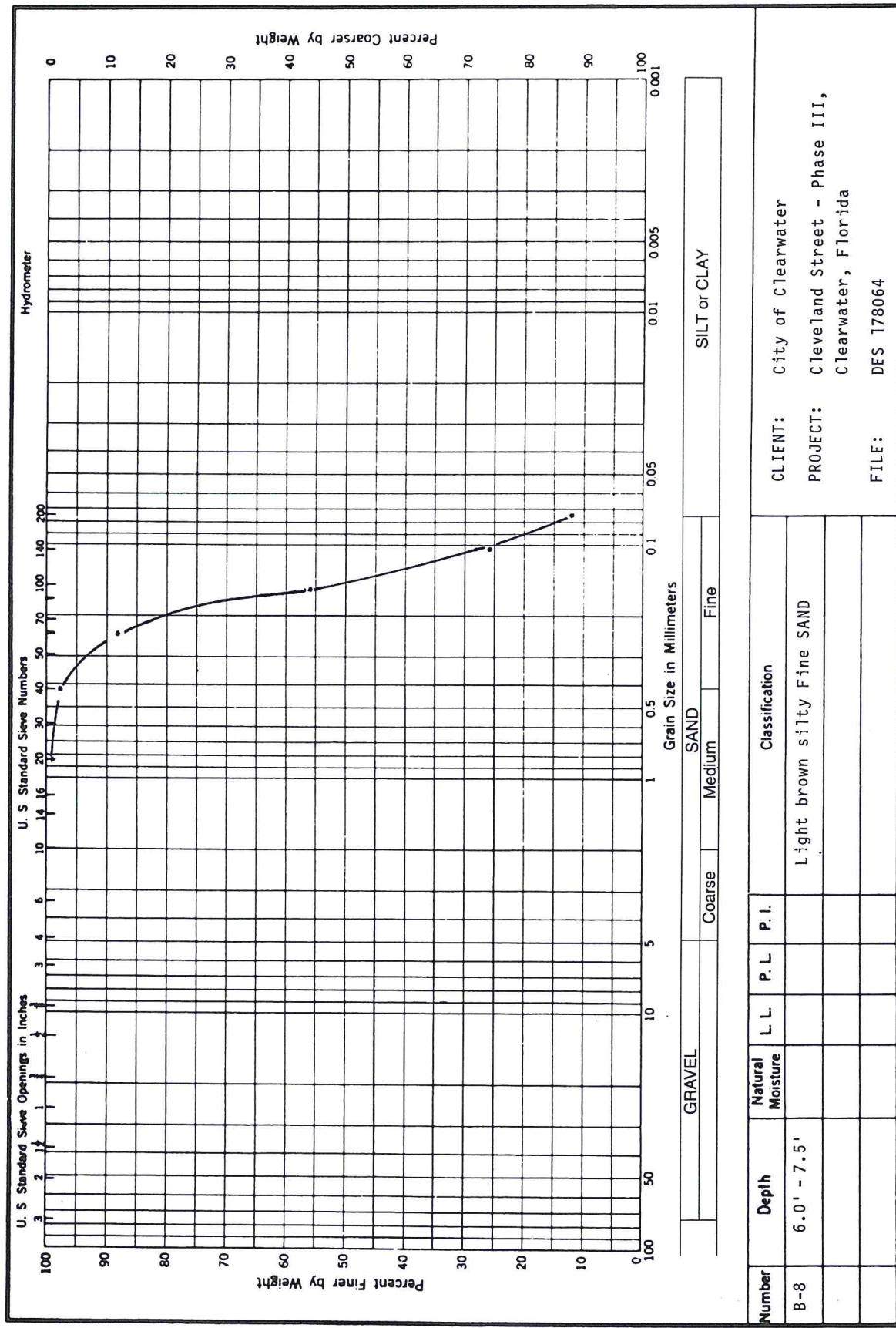
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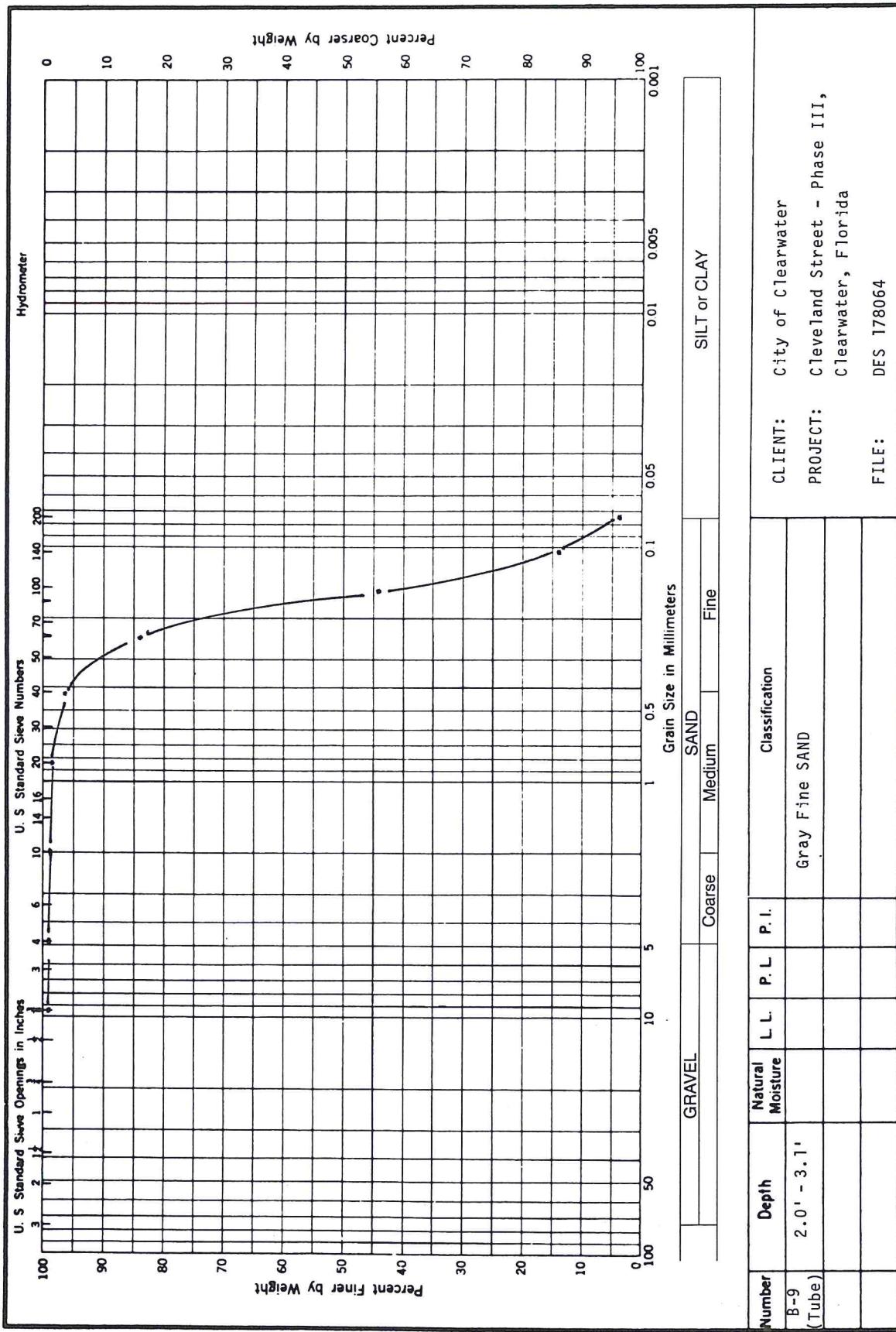
**DRIGGERS ENGINEERING SERVICES, INC.**



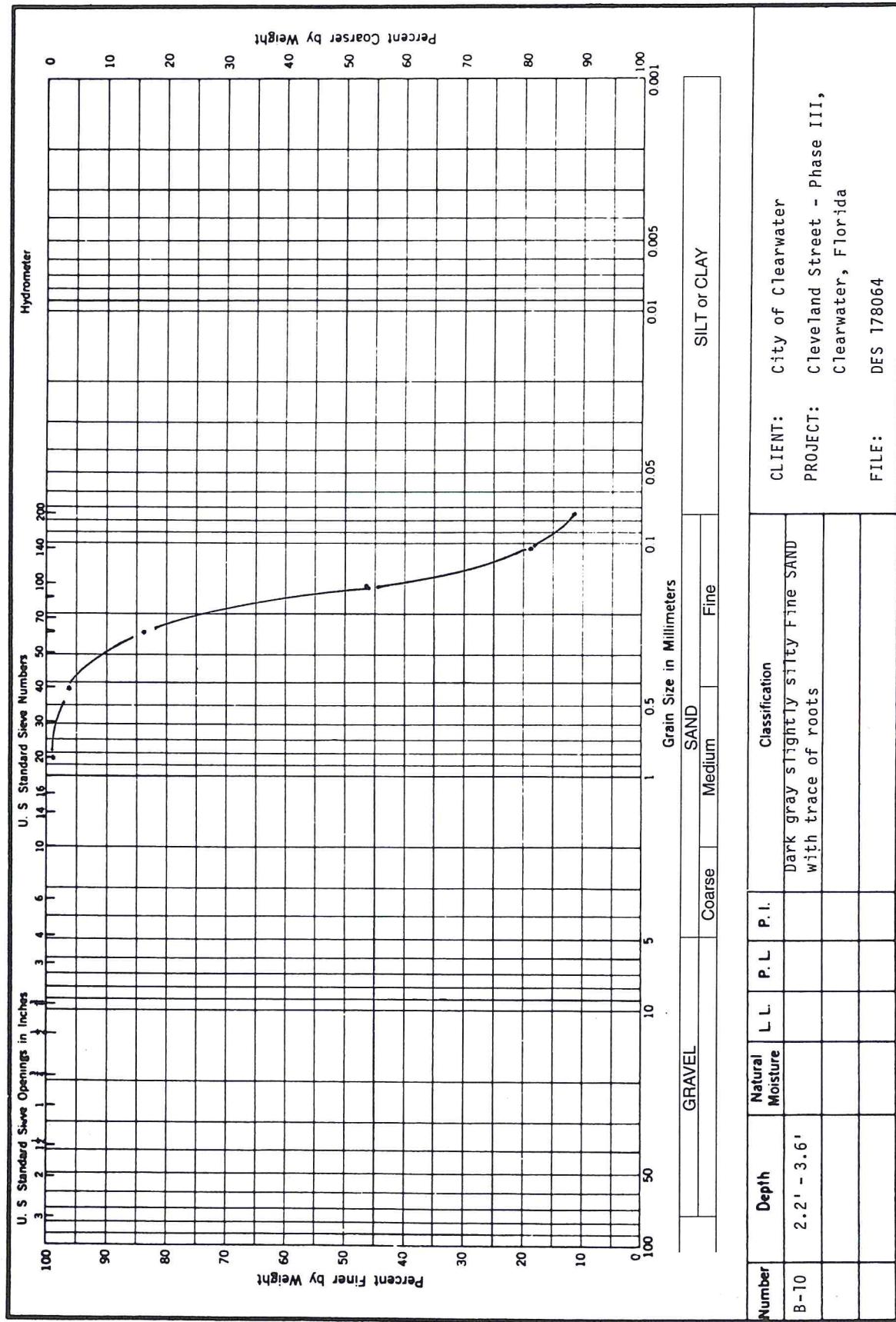
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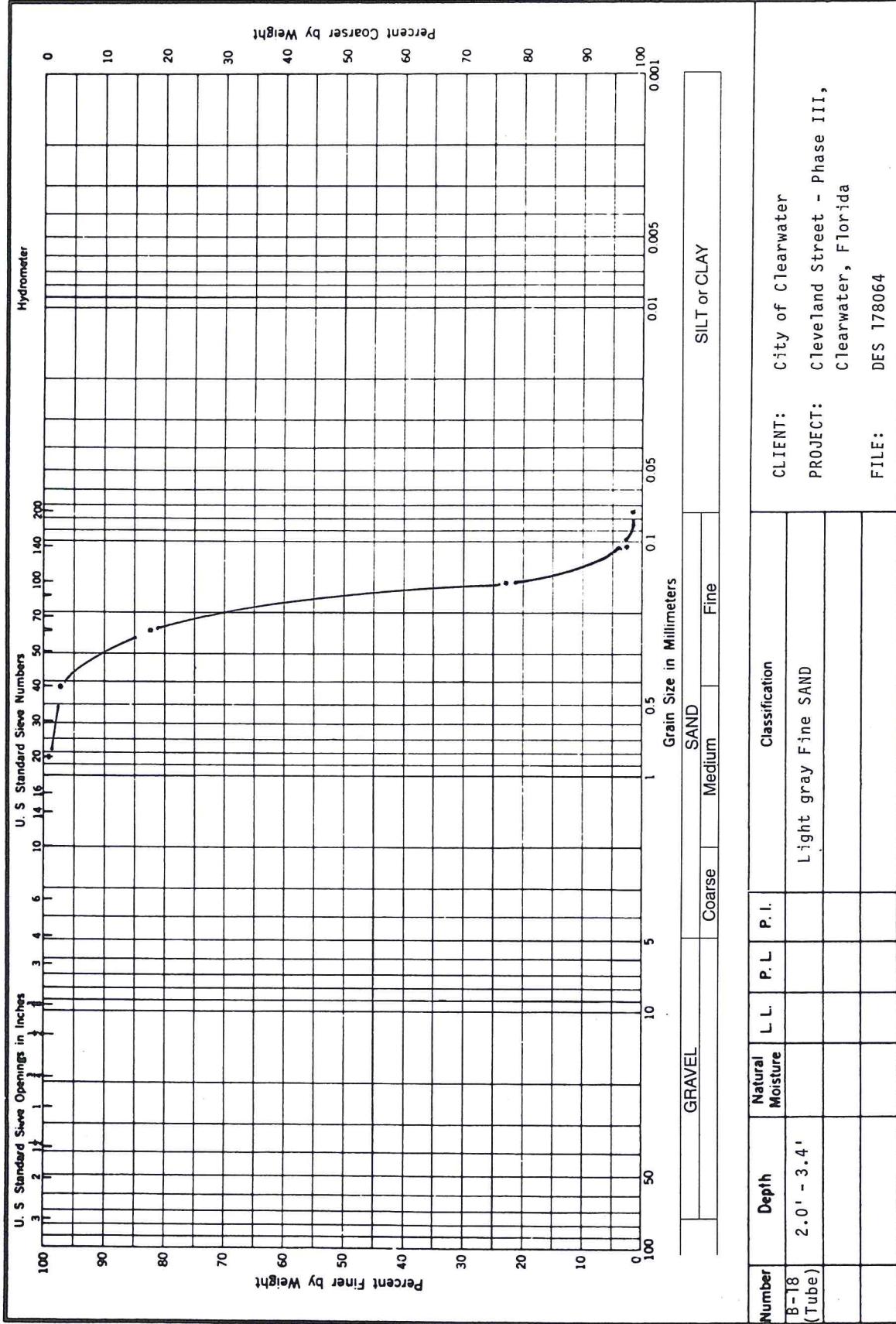
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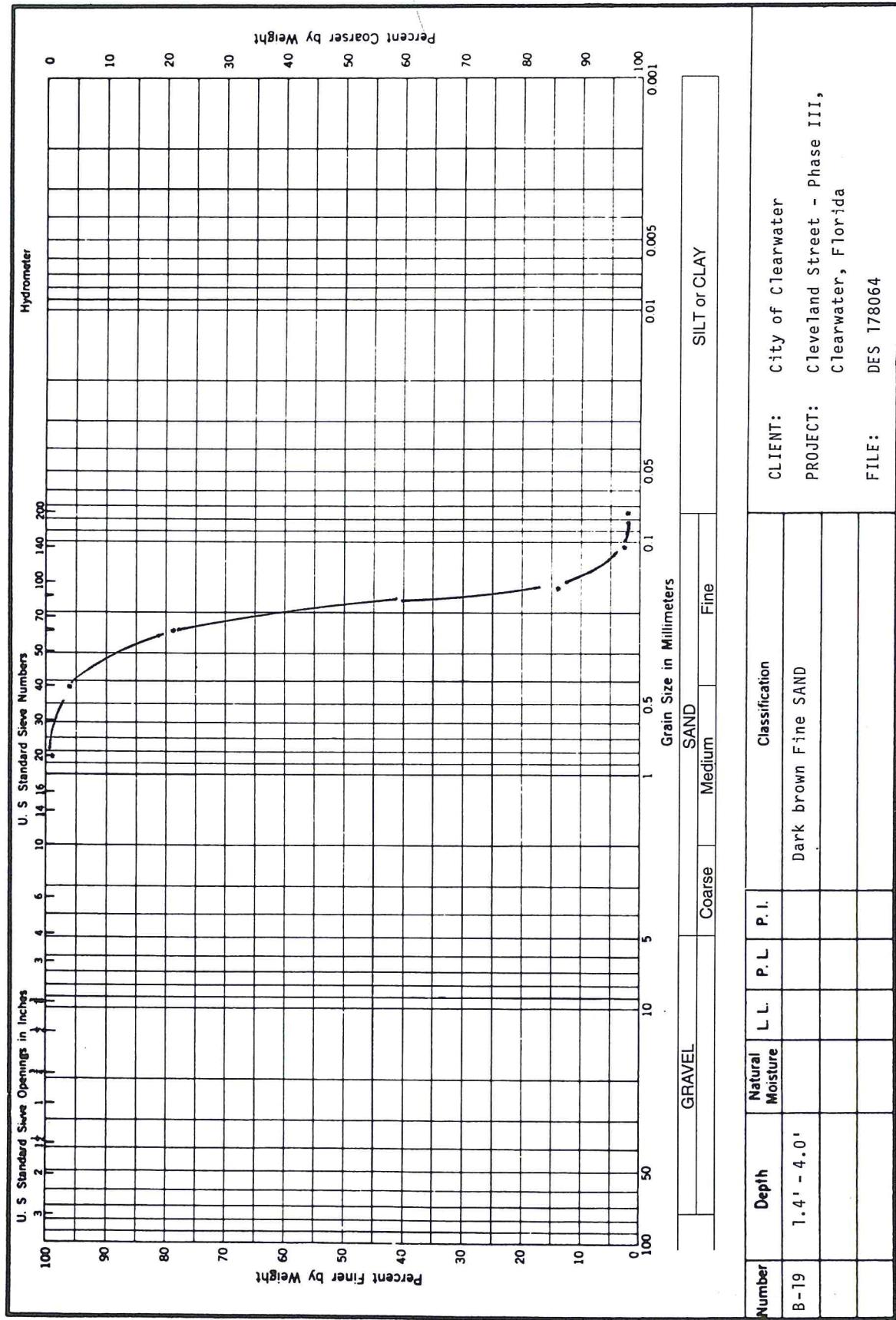


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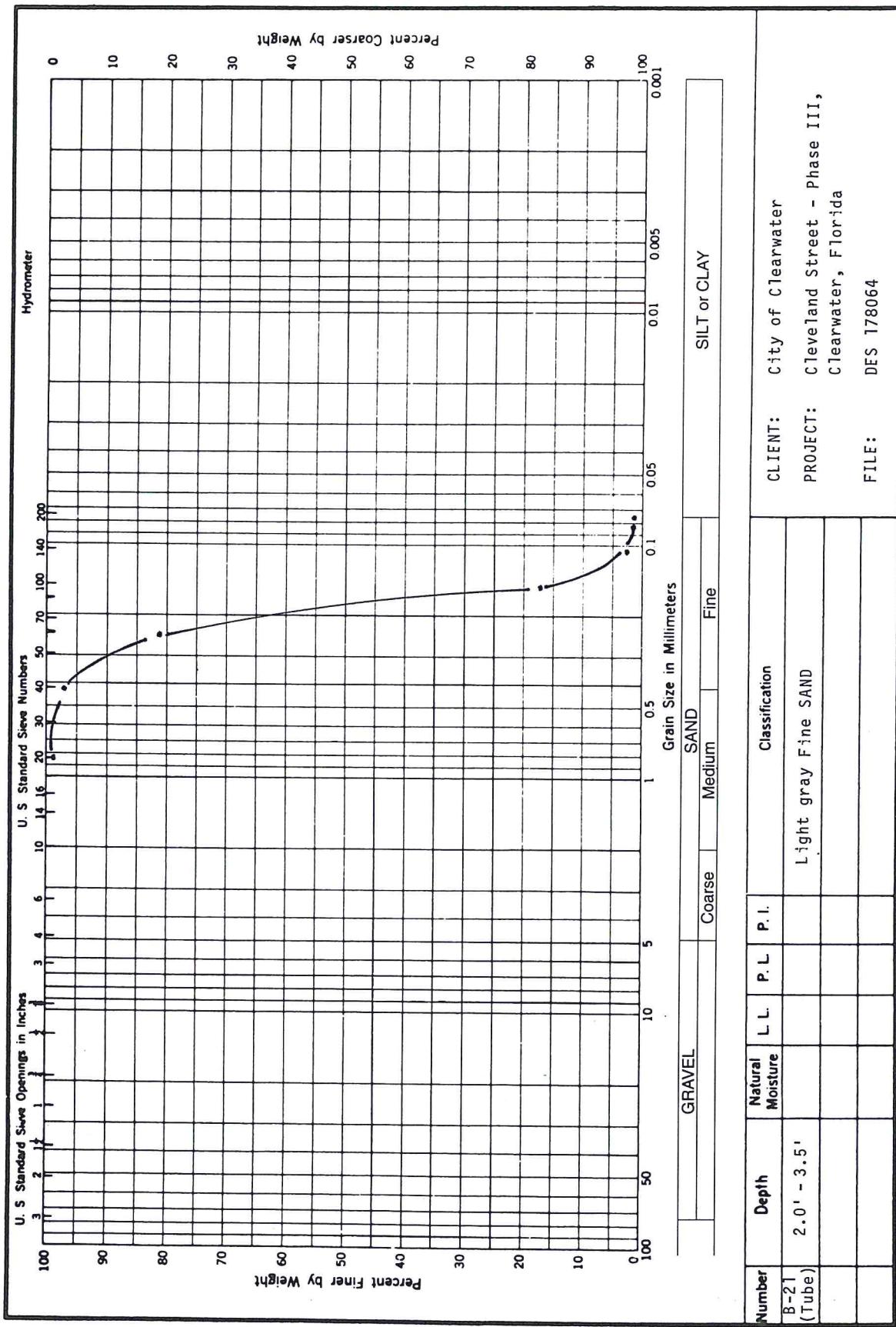


Number	Depth	Natural Moisture	L. L.	P. L.	P. I.	Classification
B-18 (Tube)	2.0' - 3.4'					Light gray Fine SAND

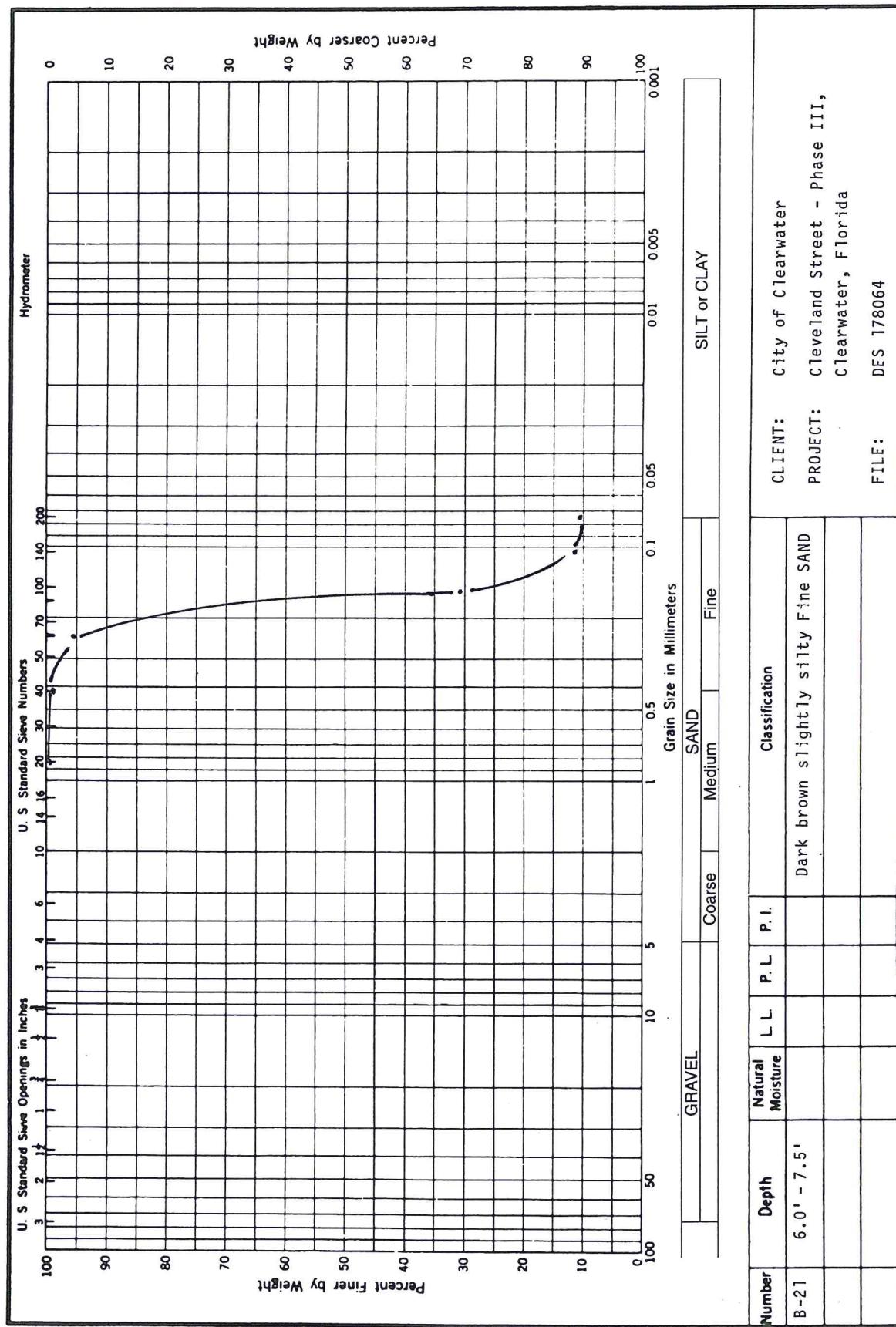
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## **METHOD OF TESTING**

# **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.