REPORT OF THE GEOTECHNICAL INVESTIGATION

FESTIVAL ARTISTIC SHADE STRUCTURE
CLEARWATER, FLORIDA

November 20, 2020

The City of Clearwater
100 S. Myrtle Avenue, Suite220
Clearwater, Florida 33756

Attn: Catherine Corcoran, RLA

RE: Report of the Geotechnical Investigation
Festival Artistic Shade Structure
Gulf to Bay Boulevard and Cleveland Street
Clearwater, Florida
Purchase Order No. 900792
Our File: DES 208630

Dear Catherine:

In accordance with your authorization, **DRIGGERS ENGINEERING SERVICES, INC.** has completed the requested geotechnical investigation for the proposed shade structure. Presented herein are the results of our field and laboratory testing together with our analyses and geotechnical recommendations.

FIELD INVESTIGATION PROGRAM

Plate I of the report attachments identifies the respective positioning of five (5) requested Standard Penetration Test (SPT) borings that were conducted at locations which you directed and survey staked in the field. The Standard Penetration Test method of sampling was utilized in accordance with ASTM D-1586. Logs of the test borings are presented in the report attachments reflecting visual together with estimated Unified 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 lines connecting the graphically plotted penetration resistance values is for ease of visualization and do not imply linear variation in soil or limestone properties. A brief description of this method of testing is included in the report attachments.

LABORATORY TESTING

A limited laboratory testing program was also undertaken to aid in characterizing the engineering properties of the subsurface soils. Our laboratory tests included grainsize analyses, Atterberg Limits determinations and natural moisture content testing. The results of our laboratory tests are included on the Summary of Laboratory Results in the report appendix.

GENERALIZED SUBSURFACE CONDITIONS

Plate II of the report illustrations presents a profile of subsurface conditions encountered in our investigation program. Below the current asphalt pavement and shell base, the test borings generally encountered an upper unit of predominantly fine sands with variable silt and clay fines locally containing traces of gravel and cemented sand. These upper sandy soils generally comprise the SP to SM and SC Unified Soil Classification and typically had a thickness varying from about 3 to 6 feet. Below 3 to 6 feet, the test borings generally encountered interbedded sandy to very sandy clays and clayey sands that were generally stiff to very stiff or medium dense in consistency. These interbedded clays comprise the CH, CL and SC Unified Soil Classification, whereas the clayey sands comprise the SC Unified Soil Classification. It should be noted that the sandy clays typically within the upper 10 feet were relatively dry or desiccated.

Typically, below 23 feet very stiff high plasticity clay was penetrated that generally overlay hard and variably cemented clays below 33 to 38 feet beneath present grade.

In 3 of the 5 borings, the cemented clays overlay the limestone formation evidenced in the depth range of 48 to 53 feet below present grade.

Test borings B-4 and B-5 encountered silty to slightly clayey fines sands below 43 feet which in turn, overlay the limestone formation encountered in the depth range of 51 to 53 feet. All of the test borings were terminated within the limestone formation.

Groundwater was not evidenced above the shallow clayey soils during the course of our investigation. This is probably due to the fact that the entire area is paved with positive surface runoff and so there is minimal opportunity for any recharge to the thin surficial sandy soils. Naturally, if the pavements were removed and the subgrade exposed, then groundwater levels during rainfall would probably be perched close to existing grade.

EVALUATION AND GEOTECHNICAL RECOMMENDATIONS

STRUCTURE TYPE AND LOADING CONDITIONS – The proposed artistic canopy would generally be primarily supported by six (6) tripod configuration columns and two (2) isolated single columns. Based upon information provided by the project structural engineer, Mr. Jeremy Case, P.E. with Pennoni, the worst case simultaneous loads on a tripod would be 121 kips compression, 85 kips tension and a combined lateral load of 30 kips. The isolated column loads approach 16 kips in compression with lateral loads of 3 kips.

Although we have not been provided with any specific grading information, we would anticipate that a slab-on-grade would be utilized for this structure which would probably be supported relatively close to existing grade.

FOUNDATION RECOMMENDATIONS – Based upon various discussions and analyses with the project structural engineer, we have concluded that the most efficient foundation system to support the tripod column configuration would include utilization of 24-inch diameter drilled shafts. A single shaft would be constructed at each tripod column base with the 3 shafts connected with a shallow grade beam to distribute loads. Based upon our analyses, we would recommend installing each of the drilled shafts to a tip elevation of EL. -5 ft. (NAVD88) which corresponds to a nominal shaft penetration of about 35 feet below existing grade. Based upon utilizing a relatively conservative analysis, we would not anticipate the need for any costly load testing program.

With the utilization of the small diameter drilled shaft foundations together with the grade beam configuration, foundations can easily carry the anticipated maximum lateral loads with minimal deflection. Appended are the results of lateral load analyses performed based upon structural loading information provided by Mr. Case. You will note that this information was previously provided to Mr. Case to expedite his foundation design drawing.

The locations where single columns are being utilized would be subjected to worst case loadings of 3 kips lateral load, 0 tension and a maximum compression of 16 kips. One could consider utilizing a spread footing designed based upon an allowable bearing pressure of up to 1,500 pounds per square foot (psf). The following soil parameters are recommended for evaluating the lateral resistance:

Buoyant Soil Unit Weight:	60 pcf
Active Earth Pressure Coefficient:	K_a=0.33
Passive Earth Pressure Coefficient:	K_p=3.0
Coefficient of sliding friction:	$\tan\delta$=0.45

Naturally an appropriate factor of safety should be utilized to account for mobilized passive resistance.

Alternatively, these columns could also be shaft supported and we would anticipate that a shaft penetrating in a nominal depth of 10 feet should provide sufficient axial and lateral capacity with the lateral deflection of less than ½ inch. Results of lateral load analyses are also appended.

Currently, test borings have been performed at four (4) of the six (6) primary tripod column locations. In order to confirm the penetration requirements for the drilled shafts at the remaining two (2) tripod locations, a Standard Penetration Test (SPT) boring will ultimately be required at each of those staked locations.

The drilled shafts should be installed under the continuous inspection by a representative of the project geotechnical engineer to check for specification compliance and also to sample concrete for laboratory compression testing.

SLAB-ON-GRADE – Subgrade preparation for slab-on-grade construction would necessitate the removal of the existing pavements and proof-rolling the subgrade so as to develop a Uniform Density of not less than 98% of the Modified Proctor, maximum dry density per ASTM D-1557. With proper subgrade compaction, we would recommend utilization of a Modulus of subgrade reaction K=150 pounds per cubic inch (pci) for the design of the slab-on-grade that may be subjected to point or vehicular loading.

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

Respectfully submitted,
DRIGGERS ENGINEERING SERVICES, INC.

F. Jaime. Driggers, P.E.
President
FL Registration No. 16989

F. JAIME DRIGGERS
LICENSE
No. 16989
11/20/2020
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

FJD/REP- 208630
Copies submitted: Email

APPENDIX

PLATE I - BORING LOCATION PLAN

PLATE II – SOIL BORING PROFILE

STANDARD PENETRATION TEST BORING LOGS

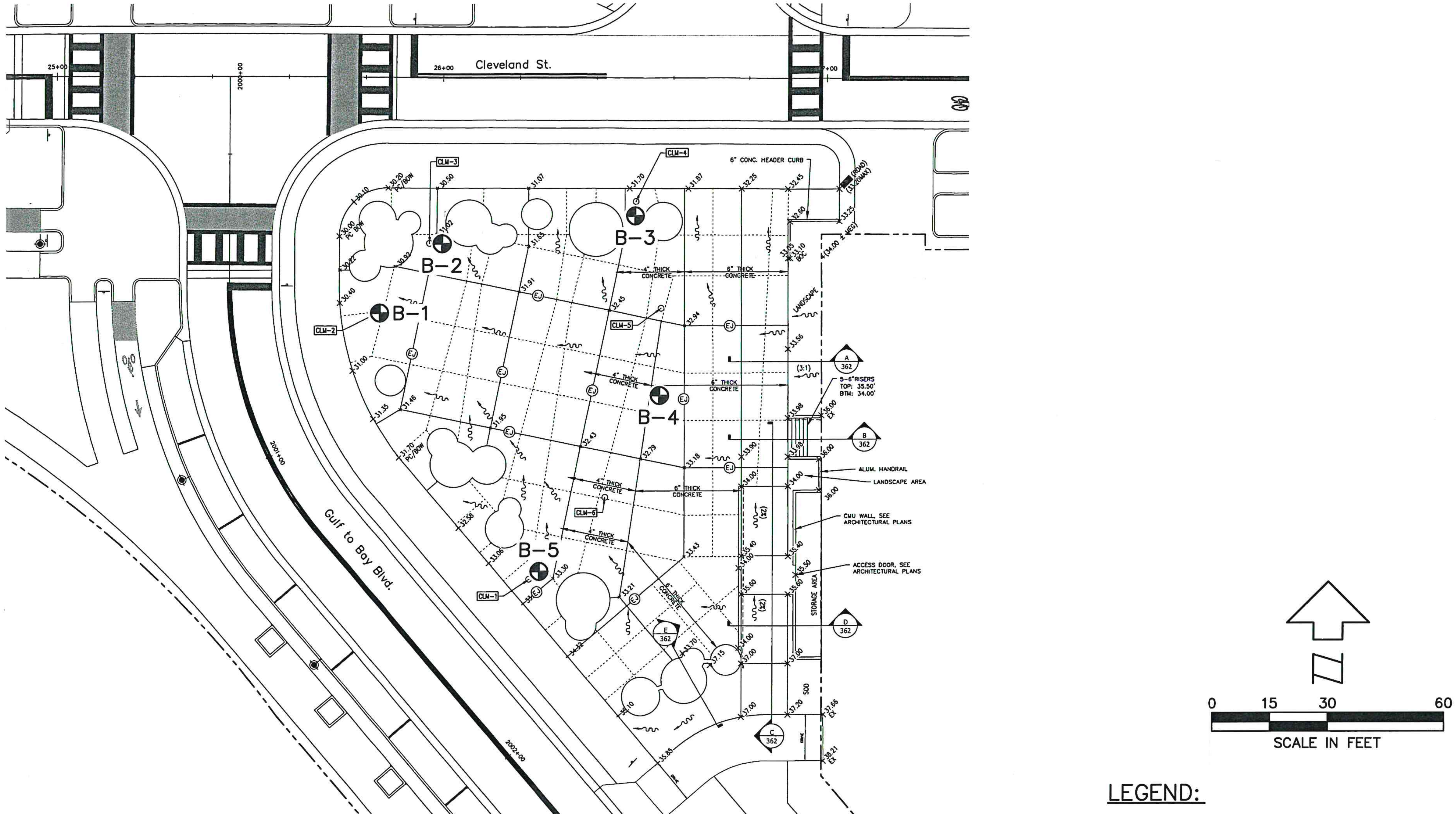
HAND AUGER BORING / HAND CONE SOUNDING LOGS

SUMMARY OF LABORATORY TEST RESULTS

LATERAL LOADING ANALYSES

METHOD OF TESTING

PLATE I – BORING LOCATION PLAN



LEGEND:

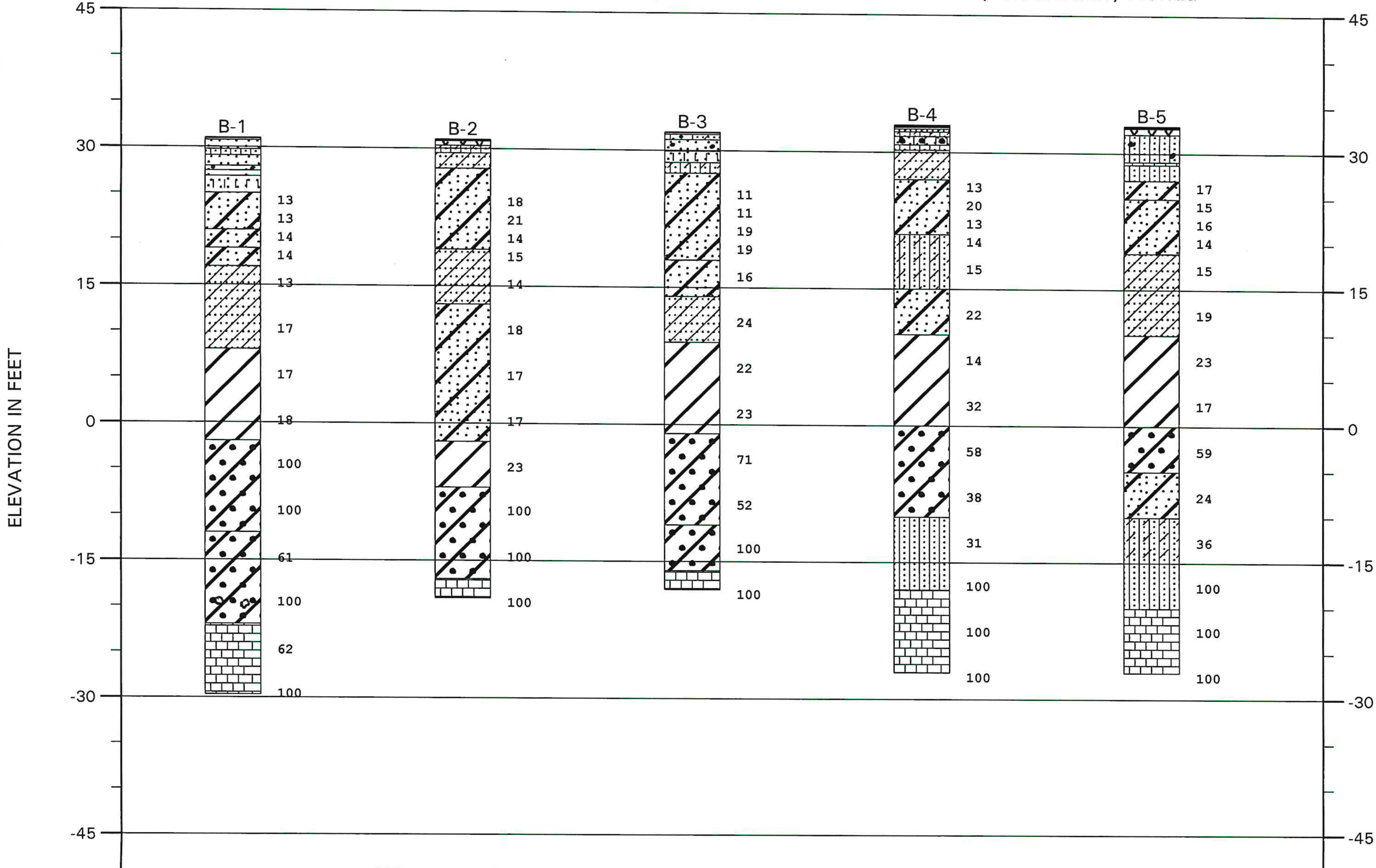
STANDARD PENETRATION TEST BORING/ HAND CONE SOUNDING LOCATION

CAD / ENGINEER	SHEET TITLE	PROJECT NO.	DATE
R.D.B. / F.J.D.	BORING LOCATION PLAN	DES 208630	10/29/20
PREPARED BY	PROJECT NAME	SCALE	SHEET NO.
desi DRIGGERS ENGINEERING SERVICES, INCORPORATED	PROPOSED SHADE STRUCTURE GULF TO BAY BOULEVARD & CLEVELAND STREET CLEARWATER, FLORIDA	AS SHOWN	PLATE 1

PLATE II – SOIL BORING PROFILE

SOIL BORING PROFILE

Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida



strata symbols

Asphaltic Concrete

Shell Base

Fine SAND

Silty Fine SAND

Slightly silty Fine SAND

Sandy CLAY

Clayey Fine SAND

CLAY

Cemented CLAY

LIMESTONE

Silty, slightly clayey Fine SAND

PLATE II

DRIGGERS ENGINEERING SERVICES, INC.

STANDARD PENETRATION TEST BORING LOGS

DESI

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-1

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

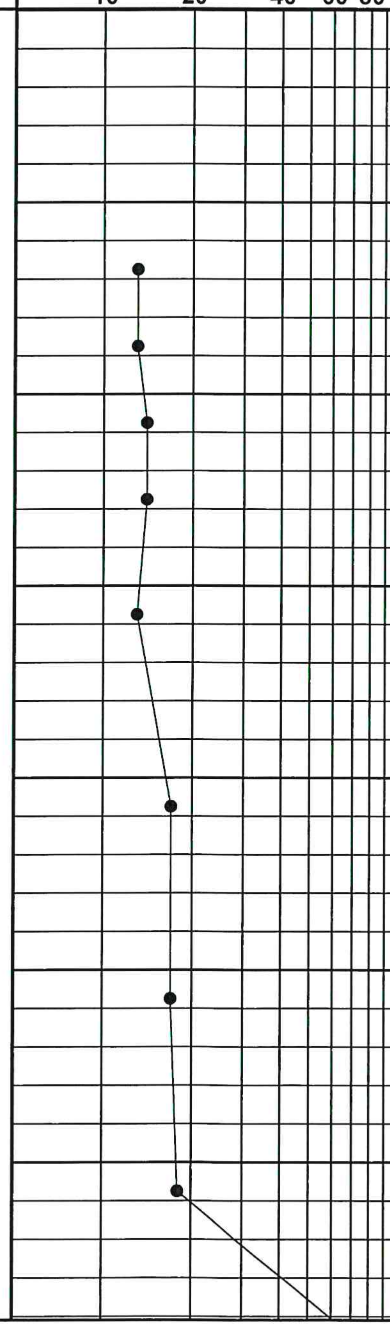
Location See Plate I **Foreman** J.G.

Completion Depth 60.7' **Date** 10/27/20 **Depth To Water** ** **Time** ______ **Date** 10/27/20

SOIL DESCRIPTION (SURF. EL: +31.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.
1" Asphalt Pavement	
2" Shell Base	
Brown Fine SAND with trace of gravel (SP)	
Dark brown silty Fine SAND (SM)	
Light brown Fine SAND (SP)	
Tan Fine SAND with trace of cemented sand (SP)	
Light grayish-tan Fine SAND (SP)	
Light grayish-tan slightly silty Fine SAND (SP-SM)	6/7/6
Stiff grayish-green sandy CLAY (CH)	5/6/7
Stiff green very sandy CLAY (CH-CL)	4/7/7
Stiff green sandy CLAY (CH)	6/8/6
Medium dense grayish-green clayey Fine SAND (SC)	6/6/7 5/6/11
Very stiff dark green CLAY (CH)	7/8/9 6/8/10
Hard green cemented CLAY (CL)	

Depth, ft: 0, 5, 10, 15, 20, 25, 30

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)



Remarks ** Water Table not encountered above depth of 6.0'
Borehole Grouted

Casing Length 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-1

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 60.7' **Date** 10/27/20 **Depth To Water** ** **Time** **Date** 10/27/20

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION (SURF. EL: +31.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)
35			Hard green cemented CLAY (CL)	36/50*	* 0.4' Penetration
40				26/34/50*	* 0.2' Penetration
			Hard grayish-green cemented CLAY (CL)		
45				21/30/31	
50			- trace of cream colored LIMESTONE at depth 50.0'	37/50*	* 0.2' Penetration
			Cream colored LIMESTONE		
55				21/32/30	
60				36/50*	* 0.2' Penetration
65					

Remarks ** Water Table not encountered above depth of 6.0'

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-2

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 50.1' **Date** 10/27/20 **Depth To Water** ** **Time** **Date** 10/27/20

DEPTH, FT	SOIL DESCRIPTION	BLOWS ON SAMPLER PER 6" OR PEN. STR.
	SURF. EL: +31.0+/-'	
0	2" Asphalt Pavement	
	6" Shell Base	
	Grayish-tan silty, slightly clayey Fine SAND (SM)	
	Grayish-green clayey Fine SAND (SC)	
5	Grayish-green sandy CLAY (CH)	
	Medium dense grayish-green clayey Fine SAND (SC)	9/8/10
	Very stiff to stiff grayish-green sandy CLAY (CH)	7/9/12
10		5/7/7
	Medium dense light grayish-green clayey Fine SAND (SC)	6/7/8
15		5/7/7
	Very stiff green to grayish-green sandy CLAY (CH)	
20		7/8/10
25		9/8/9
30		7/8/9
	Very stiff dark green CLAY (CH)	

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)

10 20 40 60 80

Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-2

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 50.1' **Date** 10/27/20 **Depth To Water** ** **Time** **Date** 10/27/20

DEPTH, FT	SYMBOL	SAMPLES	SOIL DESCRIPTION SURF. EL: +31.0+/-'	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER) 10 20 40 60 80
35			Very stiff dark green CLAY (CH)	9/12/11	
40			Hard dark green cemented CLAY (CL)	34/50*	* 0.3' Penetration
45				26/31/50*	* 0.2' Penetration
50			Cream colored LIMESTONE	50*	* 0.1' Penetration
55					
60					
65					

Remarks ** Water Table not encountered above shallow clayey soils
Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-3

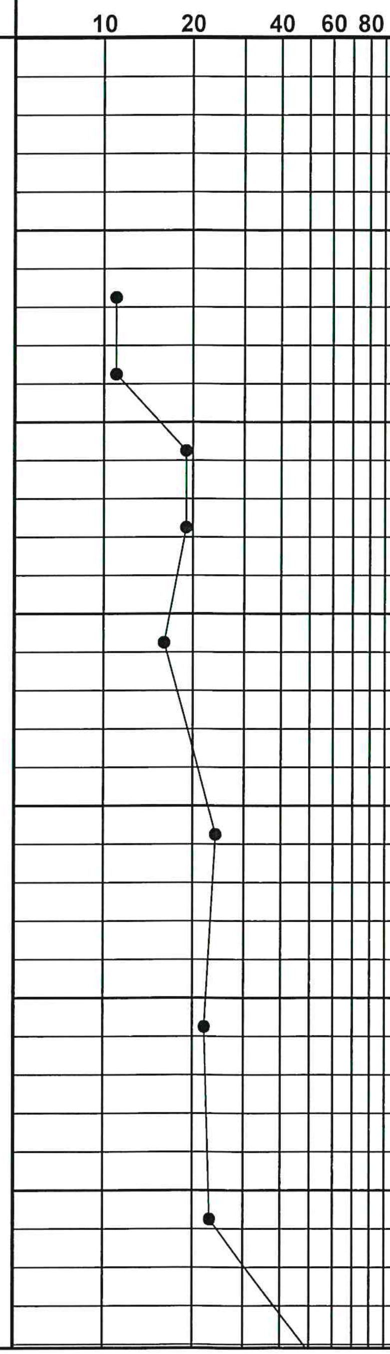
Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 50.1' **Date** 10/27/20 **Depth To Water** ** **Time** **Date** 10/27/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +32.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.
0	1" Asphalt Pavement	
	2" Shell Base	
	Brown slightly silty Fine SAND with clayey Fine SAND and trace of cemented sand (SP-SM/SC)	
	Light brown Fine SAND with trace of cemented sand (SP)	
5	Light grayish-tan slightly silty Fine SAND (SP-SM)	
	Light brown silty, slightly clayey Fine SAND (SM)	3/5/6
	Stiff to very stiff grayish-green sandy CLAY (CH)	5/6/5
10		6/9/10
		6/7/12
15	Very stiff grayish-green very sandy CLAY (CH-CL)	5/7/9
	Medium dense grayish-green very clayey Fine SAND (SC)	
20		6/10/14
	Very stiff dark green CLAY (CH)	
25		8/10/12
30		7/9/14
	Hard grayish-green cemented CLAY (CL)	

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)



Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-3

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 50.1' **Date** 10/27/20 **Depth To Water** ** **Time** **Date** 10/27/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +32.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)
35	Hard grayish-green cemented CLAY (CL)	39/31/40	
40		26/21/31	
	Hard dark green cemented CLAY (CL)		
45		37/50*	* 0.3' Penetration
	Cream colored LIMESTONE		
50		50*	* 0.1' Penetration
55			
60			
65			

Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-4

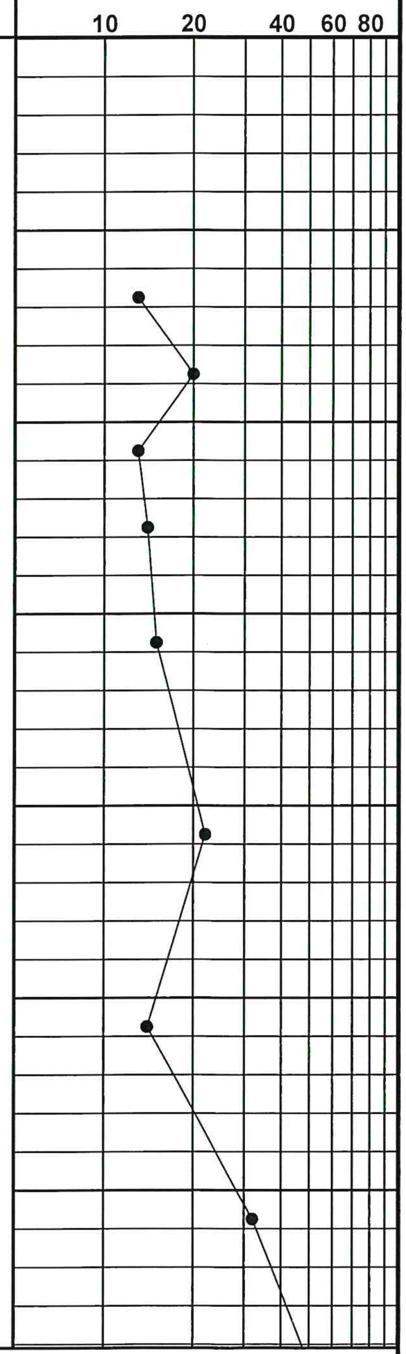
Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 60.0' **Date** 10/28/20 **Depth To Water** ** **Time** **Date** 10/28/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +33.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.
0	3" Asphalt Pavement	
	2" Shell Base	
	Dark gray clayey Fine SAND with gravel (SC)	
	Gray and brown silty, slightly clayey Fine SAND (SM)	
5	Grayish-brown slightly silty Fine SAND with cemented sand (SP-SM)	
	Light grayish-brown silty Fine SAND (SM)	
	Light green clayey Fine SAND (SC)	4/6/7
	Stiff to very stiff grayish-green to light grayish-green sandy CLAY (CH)	6/8/12
10		4/6/7
	Medium dense light grayish-green silty, slightly clayey Fine SAND (SM)	6/7/7
15		6/6/9
	Very stiff green sandy CLAY (CH)	
20		8/10/12
	Stiff to hard dark green CLAY (CH) to (CL)	
25		5/7/7
30		5/12/20
	Hard dark green cemented CLAY (CL)	

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)



Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-4

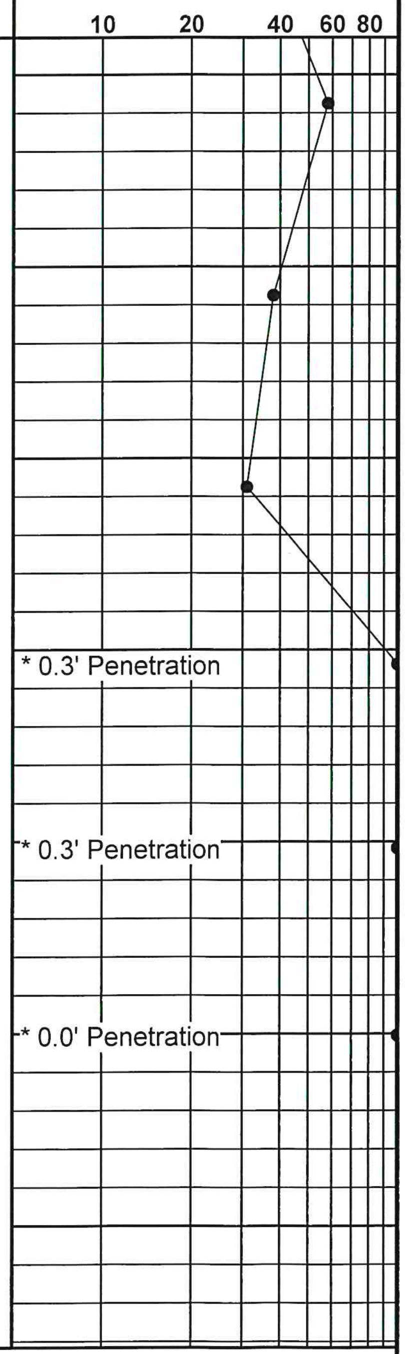
Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 60.0' **Date** 10/28/20 **Depth To Water** ** **Time** **Date** 10/28/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +33.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.
35	Hard dark green cemented CLAY (CL)	14/20/38
40		8/15/23
45	Dense green silty Fine SAND (SM)	6/12/19
50		19/50*
55	Cream colored LIMESTONE	50*
60		50*
65		

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)



Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-5

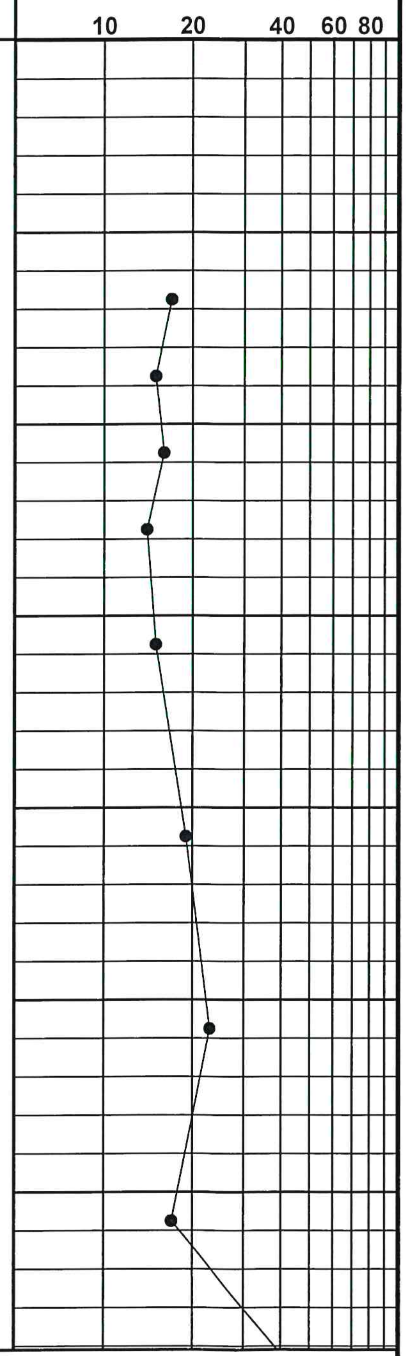
Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 60.0' **Date** 10/26/20 **Depth To Water** ** **Time** **Date** 10/26/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +33.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.
0	3" Asphalt Pavement	
	8" Shell Base	
	Light brown silty Fine SAND with trace of cemented sand (SM)	
5	Light grayish-tan slightly silty Fine SAND (SP-SM)	
	Light grayish-green silty, clayey Fine SAND (SM-SC)	7/7/10
	Very stiff grayish-green sandy CLAY (CH)	
	Very stiff to stiff green sandy CLAY (CH)	5/7/8
10		6/7/9
		4/6/8
15	Medium dense green clayey Fine SAND (SC)	4/7/8
20		7/8/11
25	Very stiff dark green CLAY (CH)	7/11/12
30		5/7/10
	Hard green cemented CLAY (CL)	

STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER)



Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

DRIGGERS ENGINEERING SERVICES INCORPORATED

Project No. DES 208630 **BORING NO.** B-5

Project Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida

Location See Plate I **Foreman** J.G.

Completion Depth 60.0' **Date** 10/26/20 **Depth To Water** ** **Time** **Date** 10/26/20

DEPTH, FT	SOIL DESCRIPTION (SURF. EL: +33.0+/-')	BLOWS ON SAMPLER PER 6" OR PEN. STR.	STANDARD PENETRATION TEST BLOWS/FT. ON 2" O.D. SAMPLER-140 LB. HAMMER, 30" DROP (AUTOMATIC HAMMER) 10 20 40 60 80
35	Hard green cemented CLAY (CL)	12/24/35	
40	Very stiff brownish-green sandy CLAY (CH)	10/10/14	
45	Dense grayish-green silty, slightly clayey Fine SAND (SM)	8/16/20	
50	Very dense grayish-green silty Fine SAND (SM)	7/11/50*	* 0.3' Penetration
55	Cream colored LIMESTONE	50*	* 0.0' Penetration
60		50*	* 0.0' Penetration
65			

Remarks ** Water Table not encountered above shallow clayey soils

Borehole Grouted **Casing Length** 25.0'

HAND AUGER BORING / HAND CONE SOUNDING LOGS

DRIGGERS ENGINEERING SERVICES INCORPORATED

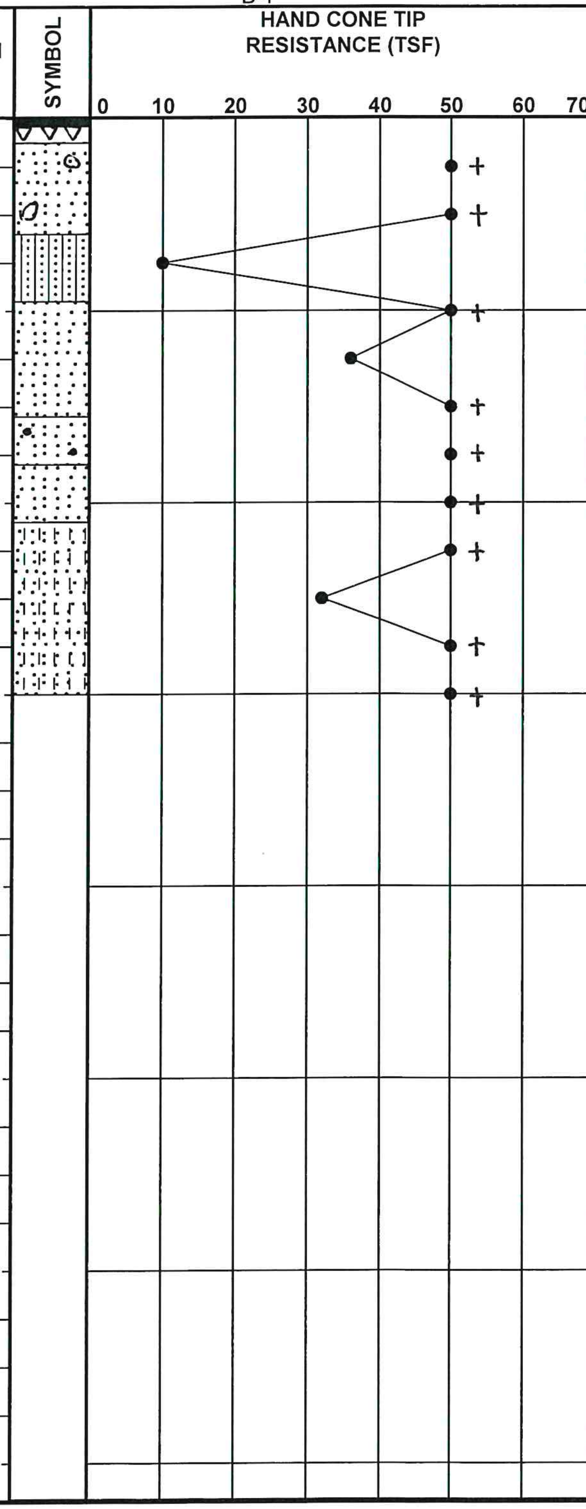
HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Proposed Shade Structure Gulf To Bay Boulevard & Cleveland Street Clearwater, Florida Project No.: DES 208630	**CLIENT:** City of Clearwater
	WATER TABLE: See "Note" — **DATE:** 10/27/20
TECHNICIAN: J.G./K.M.	**DATE:** 10/27/20 — **COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I	**TEST NUMBER:** B-1

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	1" Asphalt Pavement	0
	2" Shell Base	
30	Brown Fine SAND with trace of gravel (SP)	
	Dark brown silty Fine SAND (SM)	
	Light brown Fine SAND (SP)	2
28	Tan Fine SAND with trace of cemented sand (SP)	
	Light grayish-tan Fine SAND (SP)	4
26	Light grayish-tan slightly silty Fine SAND (SP-SM)	
		6
24		
		8
22		
		10
20		
		12
18		
		14

Surface Elevation: +31.0+/-'

Note: Water Table not encountered within depth of 6.0'.



LEGEND:

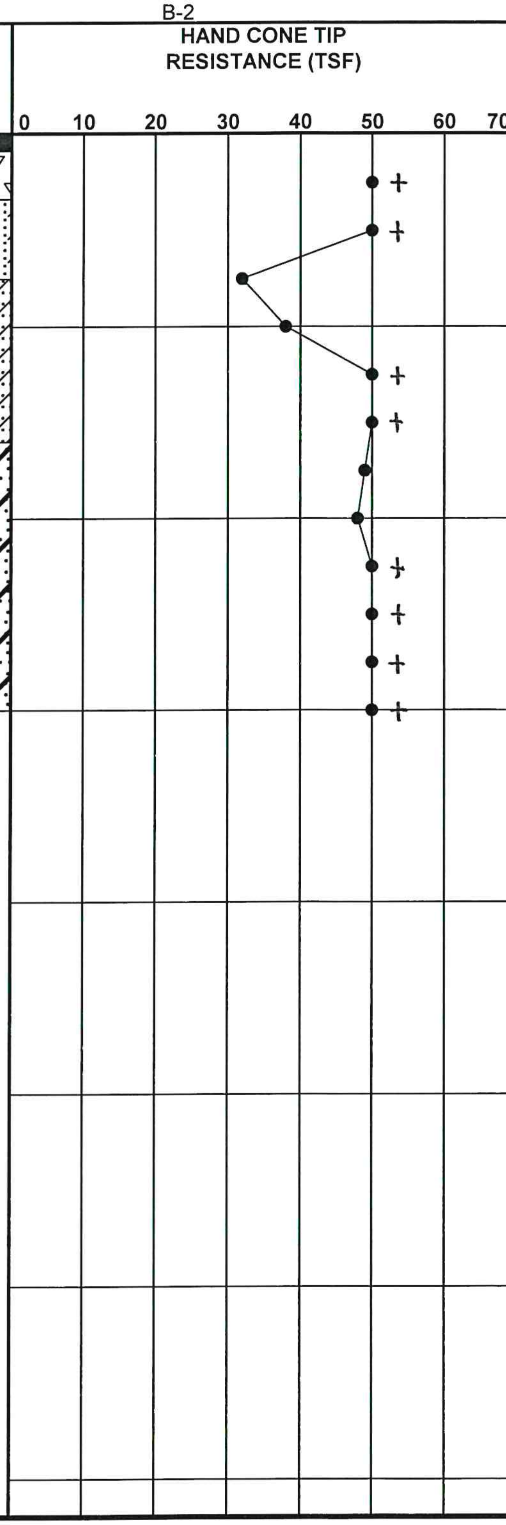
● + Denotes Penetration Resistance in excess of 50 TSF

DRIGGERS ENGINEERING SERVICES INCORPORATED

HAND AUGER BORING/HAND CONE SOUNDING LOG

PROJECT: Proposed Shade Structure, Gulf To Bay Boulevard & Cleveland Street, Clearwater, Florida, Project No.: DES 208630	**CLIENT:** City of Clearwater
	WATER TABLE: See "Note" — **DATE:** 10/27/20
TECHNICIAN: J.G./K.M.	**DATE:** 10/27/20 — **COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I	**TEST NUMBER:** B-2

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
31.0	2" Asphalt Pavement	0
	6" Shell Base	
30	Grayish-tan silty, slightly clayey Fine SAND (SM)	
	Grayish-green clayey Fine SAND (SC)	2
28	Grayish-green sandy CLAY (CH)	
		4
26		
25		6



Surface Elevation: +31.0+/-'

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: Proposed Shade Structure Gulf To Bay Boulevard & Cleveland Street Clearwater, Florida Project No.: DES 208630	**CLIENT:** City of Clearwater
	WATER TABLE: See "Note" — **DATE:** 10/27/20
TECHNICIAN: J.G./K.M.	**DATE:** 10/27/20 — **COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I	**TEST NUMBER:** B-3

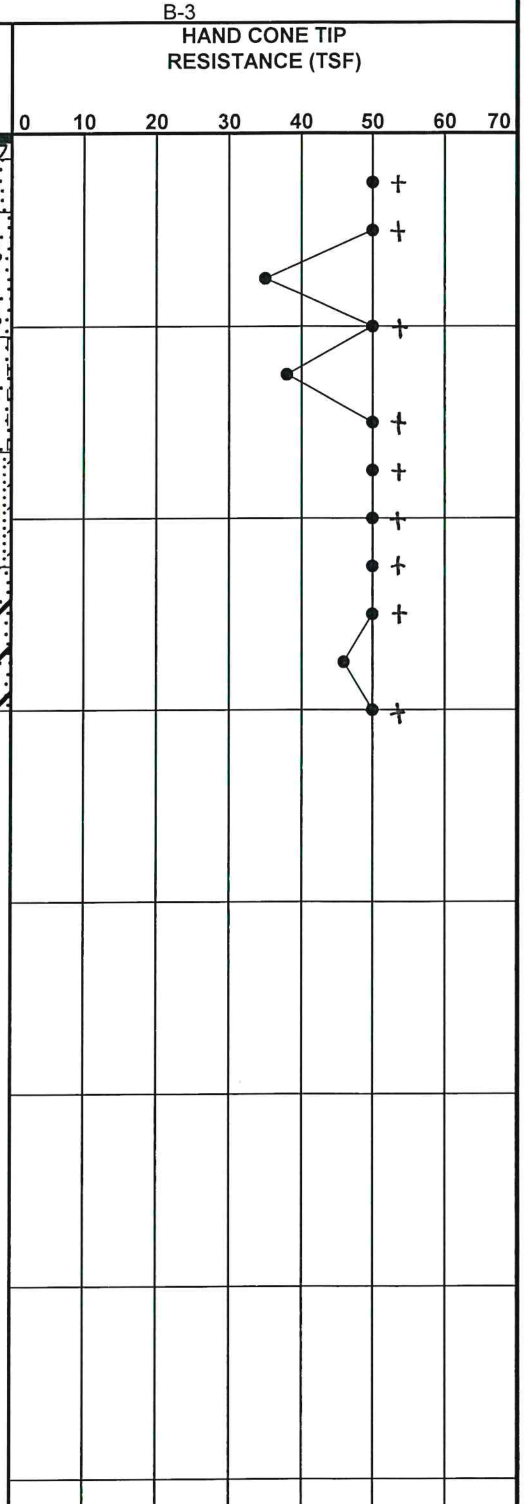
ELEV. (FT)	DESCRIPTION	DEPTH (FT)
32	1" Asphalt Pavement	0
	2" Shell Base	
	Brown slightly silty Fine SAND with clayey Fine SAND and trace of cemented sand (SP-SM/SC)	
30	Light brown Fine SAND with trace of cemented sand (SP)	2
	Light grayish-tan slightly silty Fine SAND (SP-SM)	
28	Light brown silty, slightly clayey Fine SAND (SM)	4
	Grayish-green sandy CLAY (CH)	
26		6
24		8
22		10
20		12
18		14

Surface Elevation: +32.0+/-'

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: Proposed Shade Structure Gulf To Bay Boulevard & Cleveland Street Clearwater, Florida Project No.: DES 208630	**CLIENT:** City of Clearwater
	WATER TABLE: See "Note" — **DATE:** 10/26/20
TECHNICIAN: J.G./K.M.	**DATE:** 10/26/20 — **COMPLETION DEPTH:** 6.0'
LOCATION: See Plate I	**TEST NUMBER:** B-5

ELEV. (FT)	DESCRIPTION	DEPTH (FT)
	3" Asphalt Pavement	0
	8" Shell Base	
32	Light brown silty Fine SAND with trace of cemented sand (SM)	
		2
30		
	Light grayish-tan slightly silty Fine SAND (SP-SM)	4
28	Light grayish-green silty Fine SAND (SM)	
		6
26		
		8
24		
		10
22		
		12
20		
		14

Surface Elevation: +33.0+/-'

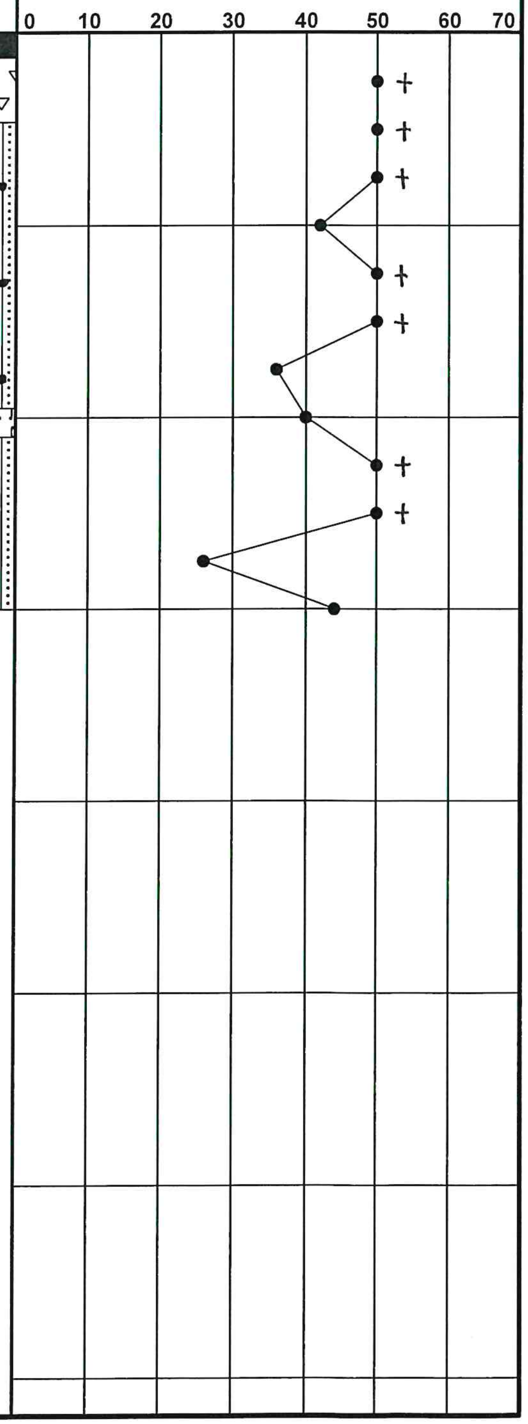
Note: Water Table not encountered within depth of 6.0'.

LEGEND:

●+ Denotes Penetration Resistance in excess of 50 TSF

SYMBOL

HAND CONE TIP RESISTANCE (TSF)



SUMMARY OF LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	DEPTH (ft)	DESCRIPTION	W %	γ_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	6.0-7.5	Grayish-green sandy CLAY	36.7			74	27	47				** 64.2					
B-1	8.0-9.5	Grayish-green sandy CLAY	27.3														
B-2	6.0-7.5	Grayish-green clayey Fine SAND	21.5			43	21	22				** 44.0					
B-2	8.0-9.5	Grayish-green sandy CLAY	17.9														
B-2	10.0-11.5	Grayish-green sandy CLAY	22.1														
B-3	6.0-7.5	Grayish-green sandy CLAY	23.2			77	31	46				** 56.9					
B-3	8.0-9.5	Grayish-green sandy CLAY	30.8														
B-3	10.0-11.5	Grayish-green sandy CLAY	20.5			39	21	18				** 52.9					
B-4	12.0-13.5	Light grayish-green silty, slightly clayey Fine SAND	22.9			NP	NP					** 18.8					
B-5	4.3-6.0	Light grayish-green silty, clayey Fine SAND				37	23	14				** 34.9					
B-5	8.0-9.5	Grayish-green sandy CLAY	25.3			66	28	38				** 59.4					
B-5	10.0-11.5	Grayish-green sandy CLAY	23.3														
B-5	12.0-13.5	Grayish-green sandy CLAY	21.3														

W % = Water Content
γ_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
SO_4 (ppm) = Total Sulfate
RES. (ohm-cm) = Lab Resistivity
* = See Test Curves
** = Percent Passing No. 200 Sieve

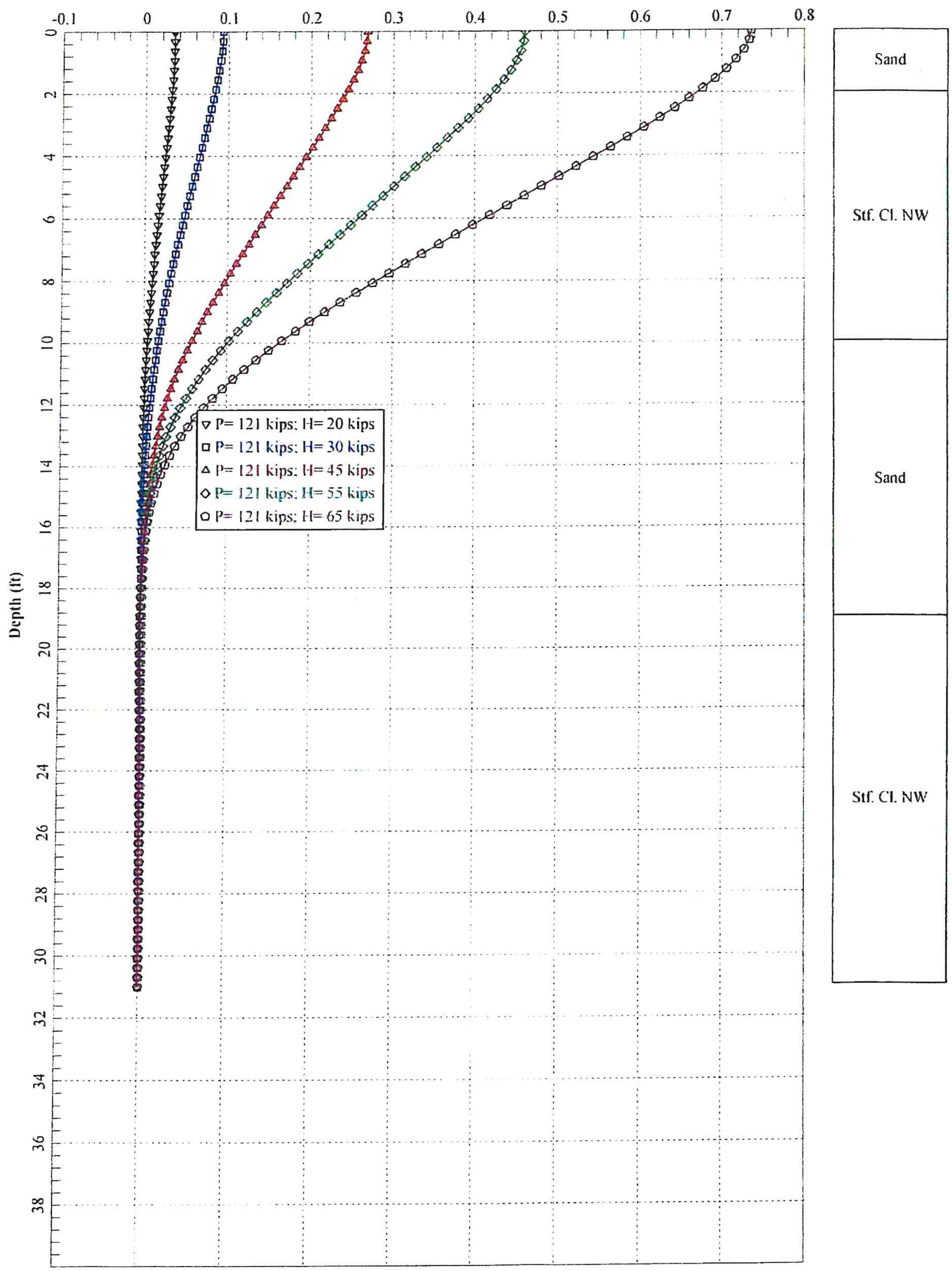
CLIENT: City of Clearwater

PROJECT: Proposed Shade Structure,
Gulf To Bay Boulevard & Cleveland Street, Clearwater,

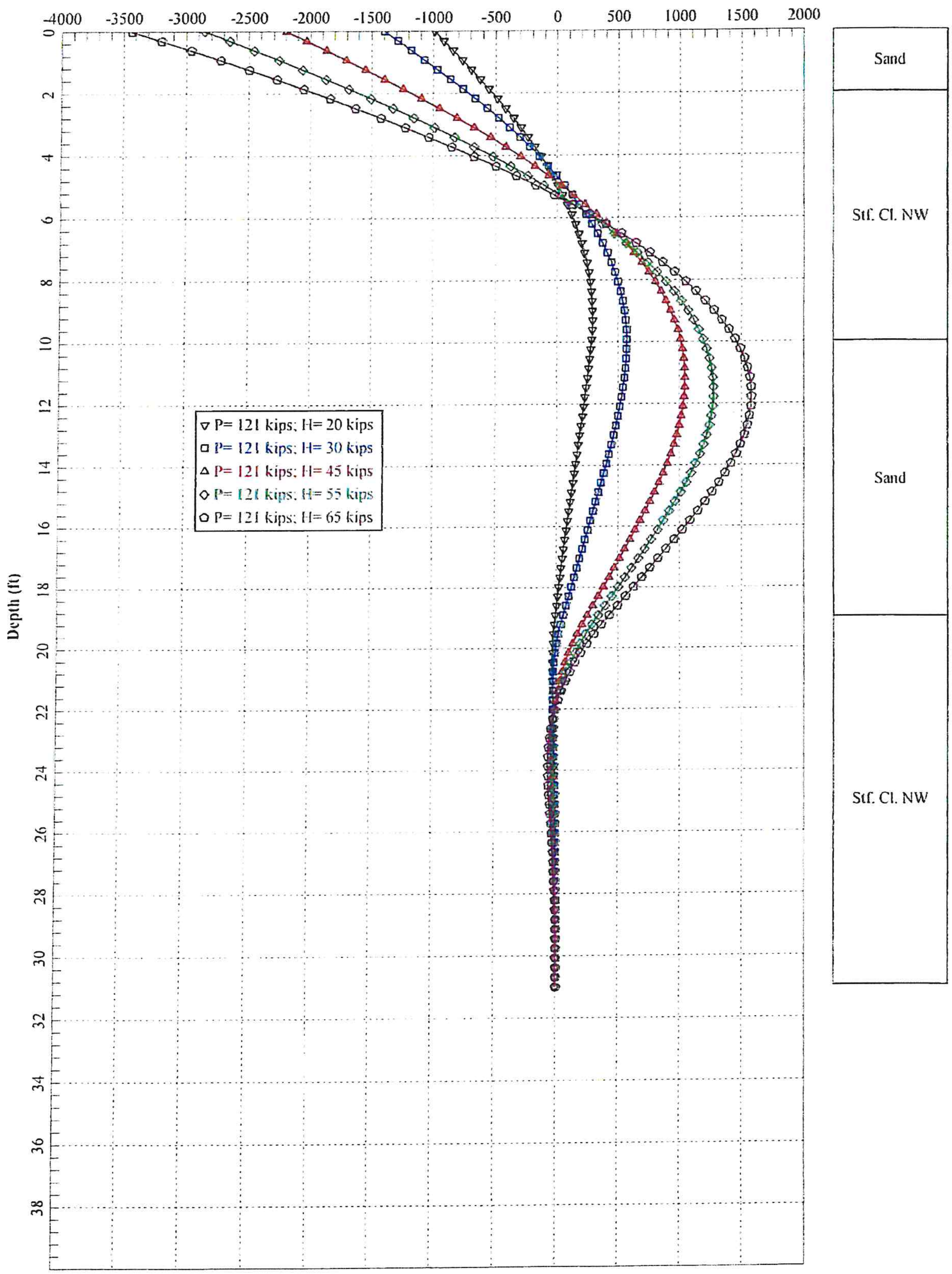
FILE: DES 208630

LATERAL LOADING ANALYSES

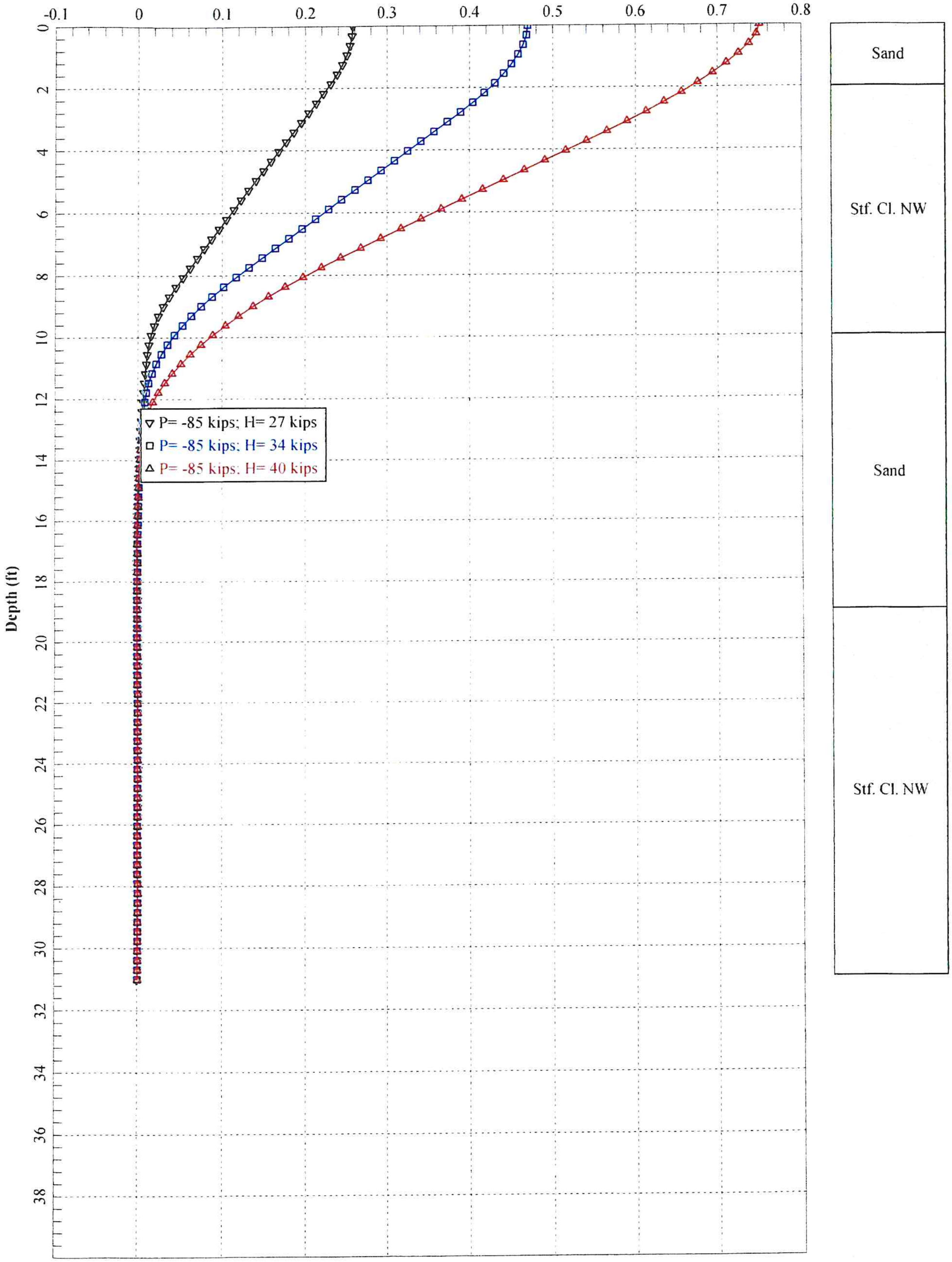
Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.85
Lateral Pile Deflection (inches)

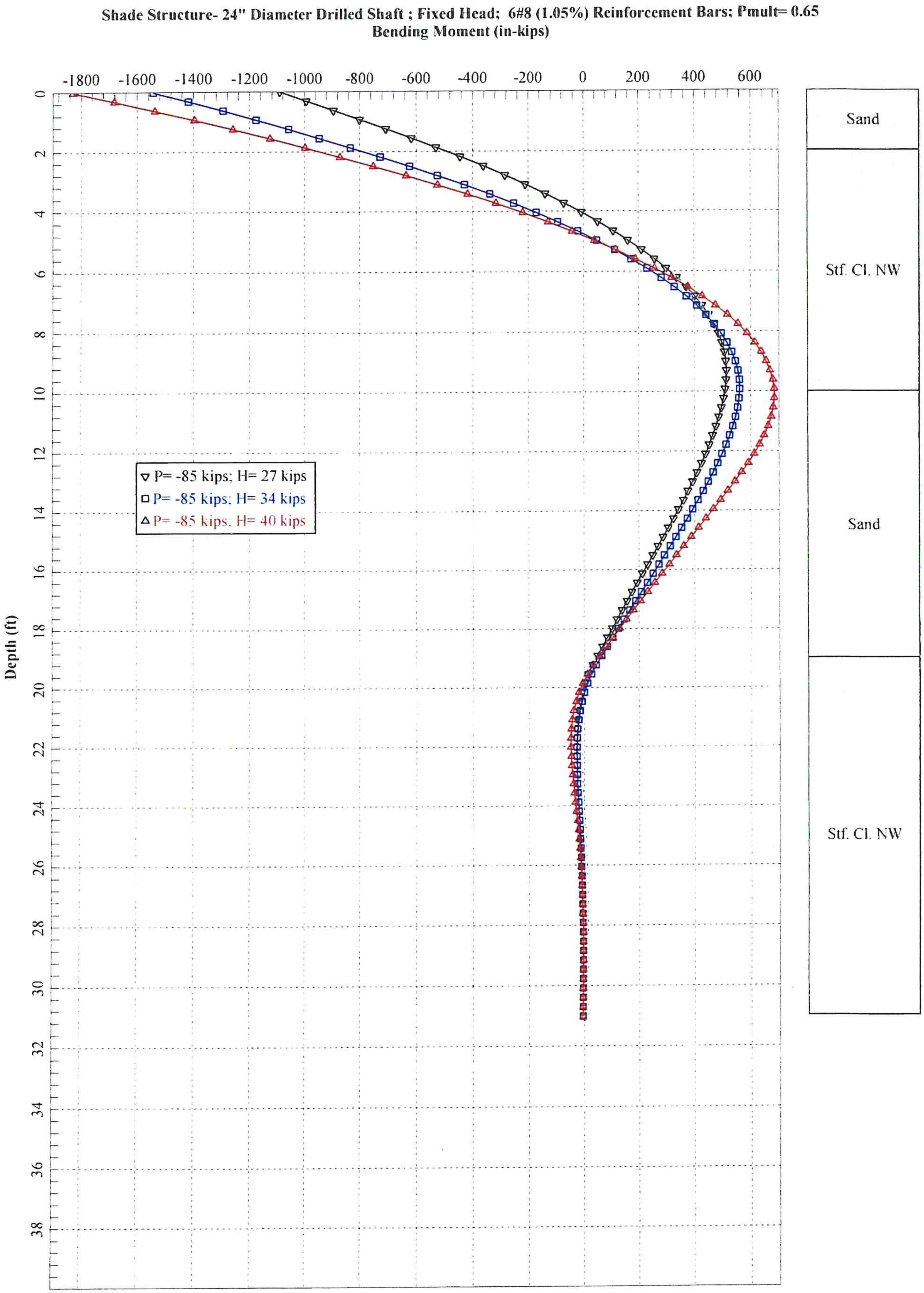


Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.85
Bending Moment (in-kips)

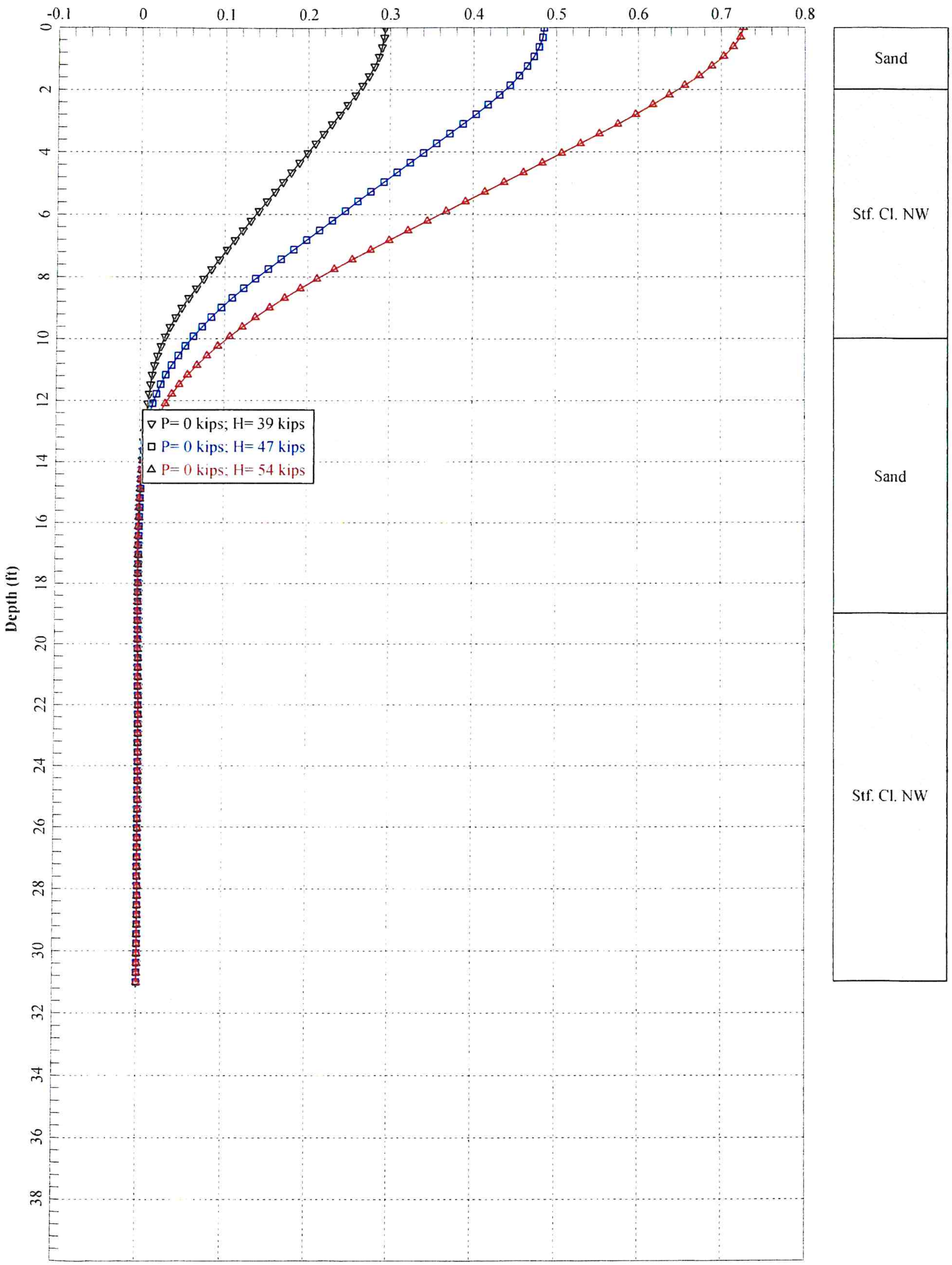


Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.65
Lateral Pile Deflection (inches)

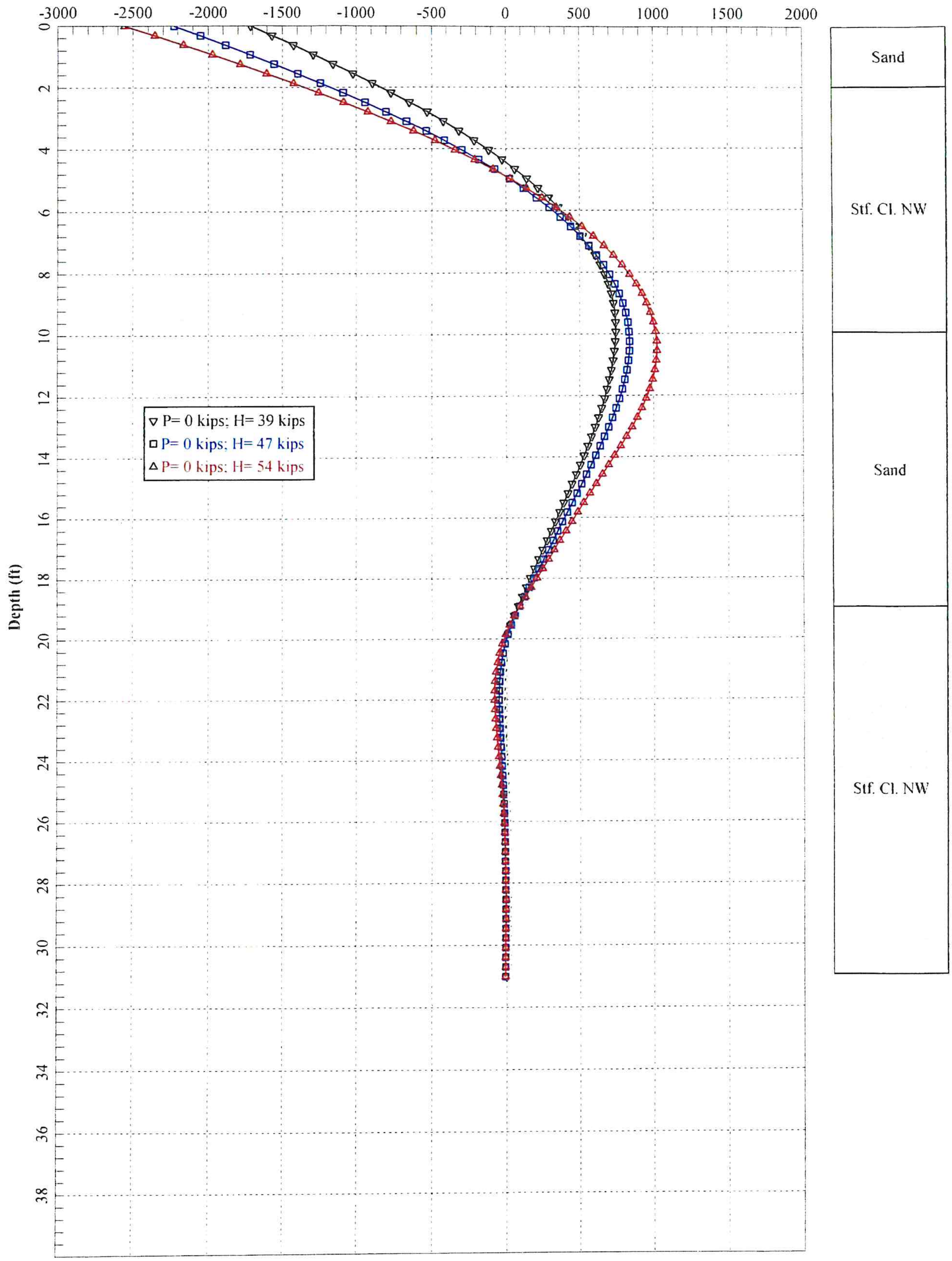



Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.65
Bending Moment (in-kips)
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400
600
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
P= -85 kips; H= 27 kips
P= -85 kips; H= 34 kips
P= -85 kips; H= 40 kips
Sand
Stf. Cl. NW
Sand
Stf. Cl. NW

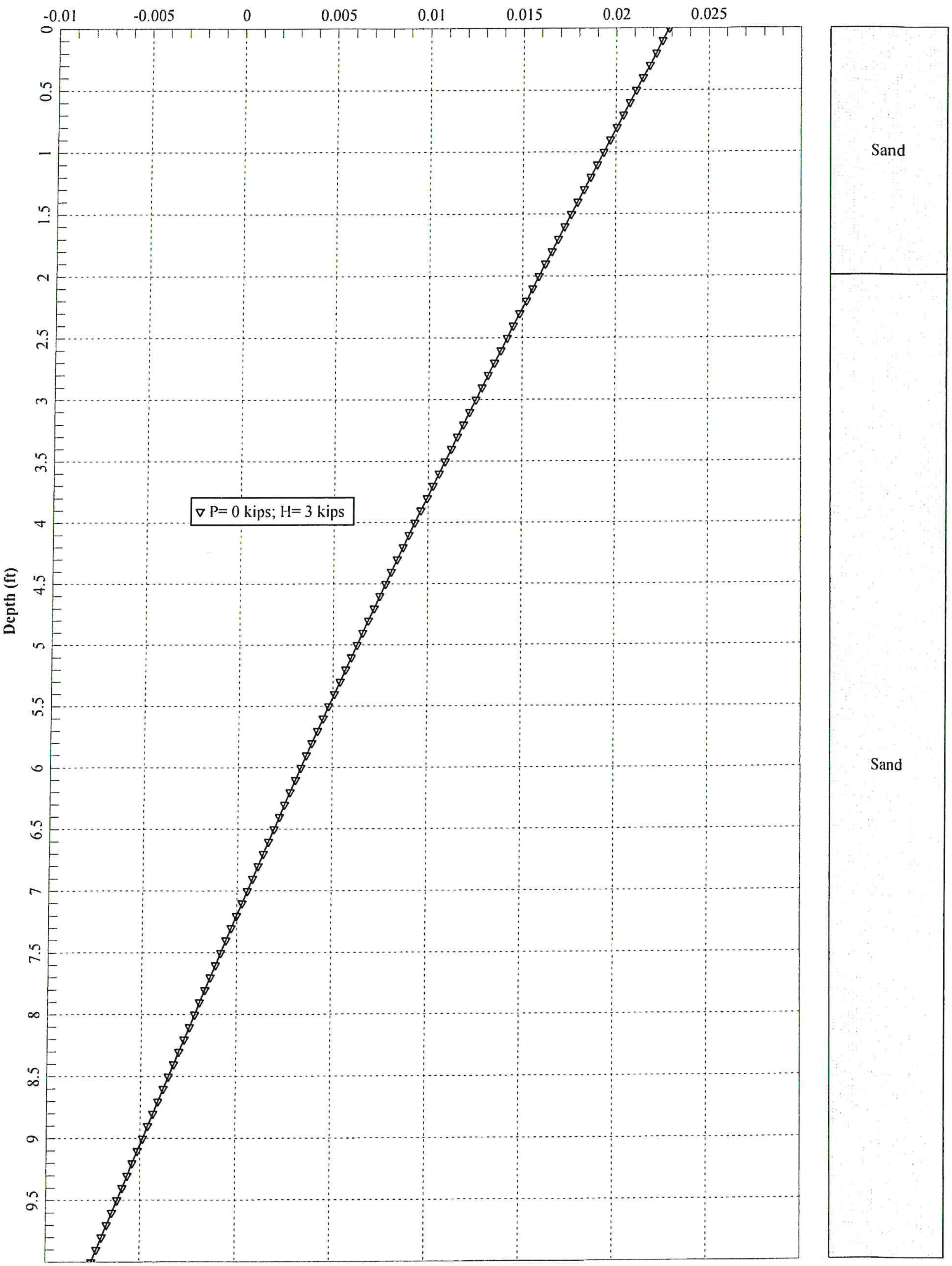
Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.85
Lateral Pile Deflection (inches)



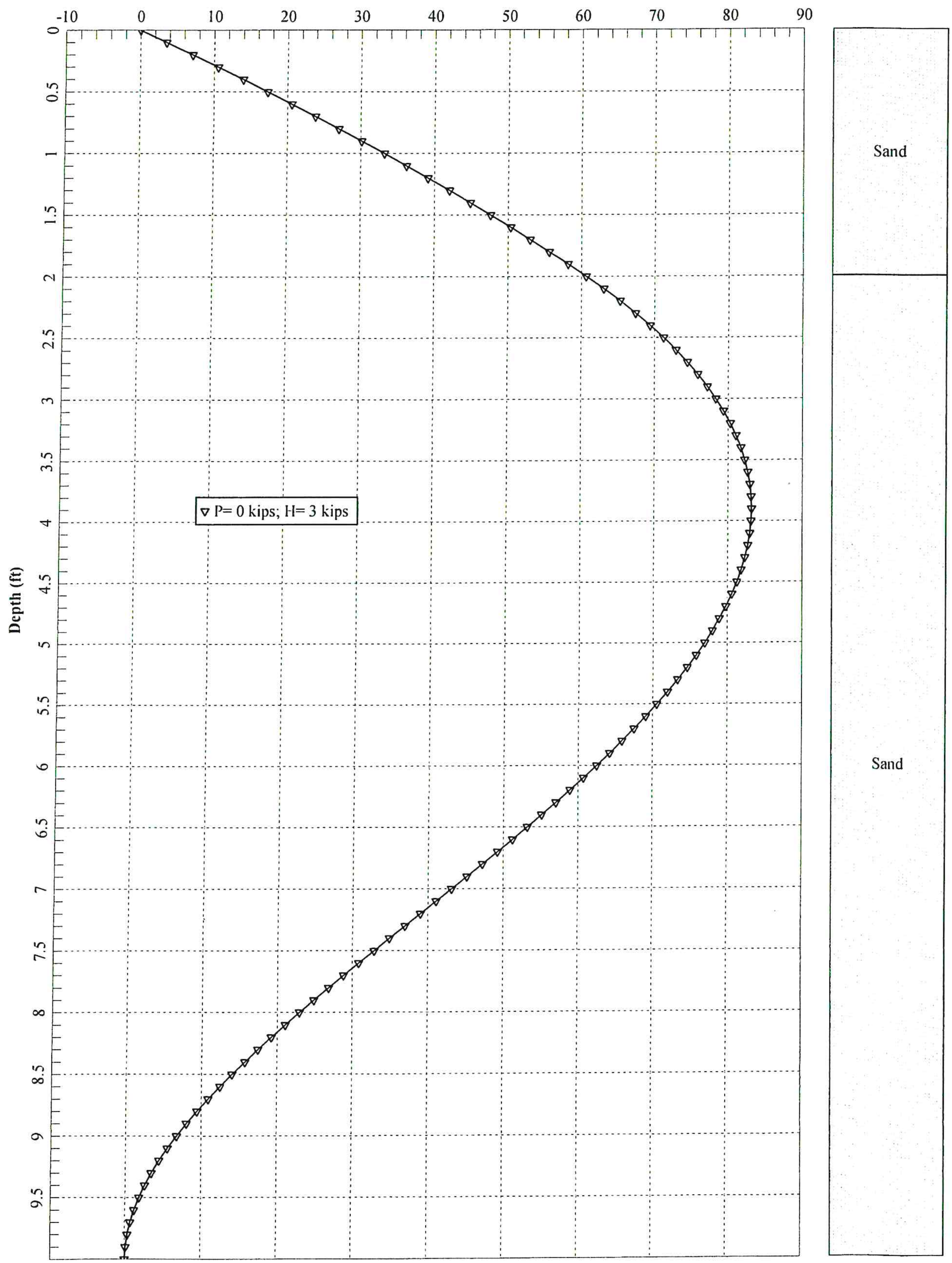
Shade Structure- 24" Diameter Drilled Shaft ; Fixed Head; 6#8 (1.05%) Reinforcement Bars; Pmult= 0.85
Bending Moment (in-kips)



Shade Structure- 24" Diameter Drilled Shaft ; Free Head; 4#6 (0.5%) Reinforcement Bars; Pmult= 1.0
Lateral Pile Deflection (inches)



Shade Structure- 24" Diameter Drilled Shaft ; Free Head; 4#6 (0.5%) Reinforcement Bars; Pmult= 1.0
Bending Moment (in-kips)



METHOD OF TESTING

STANDARD PENETRATION TEST WITH AUTOMATIC HAMMER 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 automatic 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 an automated lifting mechanism. 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.

HAND CONE PENETRATION TEST

The cone penetration test was performed using a DGSI Model S-215 double rod Static Cone Penetrometer.

Dual rods enable the cone stress to be measured directly. Soil friction on the outer rod does not influence the reading. Depending upon the application, either the maximum bearing for an increment of push or the least bearing for an increment can be reported. If you were investigating for soft spots, you would take the least reading. In typical use, you would force the cone into the soil 6 inches, retract the cone slightly until the gauge reads zero, then advance an additional 6 inch increment. If you meet with refusal, the cone can be removed and the hole opened with a hand auger to permit a continuation of measurements against depth.

The tool has been designed to allow a maximum force of 250 lbs. to be applied, somewhat more than the average weight of an operator. The unit can be operated in a vertical or horizontal position. The cone tip has an included angle of 60E. The cone has a section area of 1.5 cm^2. The maximum total bearing (Q_c) is 70 kg/cm^2.

The reading (Q_c) is in kg/cm^2 which is essentially equal to ton/ft^2.

The cone index (Q_c) is read directly. The correlation between the cone index and soil constants is not absolute. Generally, the following results have been determined through extensive field use of the unit. Further verification of correlation in your local soil types is essential.

Standard Penetration (Sands)	**Strength and Cohesion**
Test AN@ Value Q_c = 4 AN@	Q_u - Unconfined compression (kg/cm^2) c - Cohesion (kg/cm2) Uniform clay and silty clays: $Q_c = 5\ Q_u$ $Q_c = 10\ c$ Clayey Silts: $Q_c = (10 \text{ to } 20)\ Q_u$ $Q_c = (20 \text{ to } 40)\ c$