Applied Foundation Testing

Alabama Certificate of Authorization CA3058-E

June 8, 2018
Revision 1: June 26, 2018
Revision 2: July 2, 2018

Report of High-Strain Dynamic Pile Testing
TP-04
I-10 over Mobile River and Bayway
Load Test Program
Mobile Country, Alabama
AFT Project No.: 118008

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Digitally signed by Donald T Robertson
DN: c=US, o=APPLIED FOUNDATION TESTING, ou=APPLIED FOUNDATION TESTING, cn=Donald T Robertson, 0.9.2342.19200300.100.1.1=A01097C000001617C717FAC0000EEB3
Date: 2018.07.02 17:15:46 -04'00'

For: **Mr. Davis Daniel**
Jordan Pile Driving, Inc.
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REVISION 2: Revision 2 includes placement of the approved inspector's pile driving log in Appendix A.

REVISION 1: Revision 1 dated June 26, 2018 to the original report dated June 8, 2018 included the following changes: The Generalized Soil Conditions section was changed to indicate that the groundwater depth, not elevation, noted in boring BW-04 was 0.0 feet. In the High-Strain Dynamic Pile Testing section, the pile tip elevation after jetting was changed so that it is based on the depth of the pile tip at start of impact driving. In Note 1 to Table 2 a typographical error referencing BW-23 was corrected to BW-04. In the Summary and Conclusions section a typographical error referencing TP-23A was corrected to TP-04.

INTRODUCTION

The proposed I-10 Mobile River Bridge and Bayway project includes the construction of a new six-lane bridge across the Mobile River and a new eight-lane Bayway. A load test program has been conducted in advance of the construction contract to optimize the foundation design. Foundation types included in the load test program include two HP14x89 steel H-piles, two 18-inch square prestressed concrete piles, one 30-inch square prestressed concrete pile, five 54-inch diameter spun-cast concrete cylinder piles, one 60-inch diameter steel pipe pile, and one 72-inch diameter drilled shaft.

This report summarizes the installation and testing of the 54-inch diameter, 6-inch wall thickness, 120-feet long spun-cast concrete cylinder pile at location TP-04. High-strain dynamic pile testing, also known as PDA, was performed during initial drive, 1 day restrike, and 14 day restrike. A summary of the test dates is included in Table 1 below.

Table 1: Summary of Test Dates

Test Pile	Test Description	Test Date
TP-04	Initial Drive	4/18/2018
	1 Day Restrike	4/19/2018
	14 Day Restrike	5/2/2018

The project plans indicate test pile TP-04 was located at station 574+00.00 offset left 150 feet, adjacent to the north of the existing I-10 Bayway. Please refer to the project source documents for a site plan of the actual location of the test piles.

Installation of test pile TP-04 was performed by Jordan Pile Driving, Inc. Applied Foundation Testing (AFT) was the specialty engineering firm performing the dynamic pile testing. Dynamic pile testing was performed by Mr. Michael Worsham, P.E. Data analysis and reporting was performed by Mr. Donald Robertson, P.E. and Mr. Michael Worsham, P.E.

This report contains a compilation of the results for the dynamic pile testing for TP-04. This report includes an overview of the testing program, tabular and graphical representations of the data and analysis, discussion of the results, and instrumentation calibrations.

GENERALIZED SOIL CONDITIONS

Thompson Engineering performed the subsurface exploration as part of this project. The subsurface exploration consisted of drilling a single Standard Penetration Test (SPT) boring near each of the proposed foundation load test locations identified for the project. The nearest soil boring to TP-04 is boring BW-04 located at station 575+29.02 offset right 26.77 feet.

A copy of soil boring BW-04 is included in Appendix D. Detailed descriptions of the subsurface conditions encountered are presented in this attached soil boring. A summary of the soil conditions given in Table 2 below represents a summary of conditions as indicated in the provided materials and is included only to assist in evaluation of the load test data. For further details regarding the soil conditions at the test site and elsewhere, the reader should reference the project source documents.

The ground water depth noted in boring log BW-04 was 0.0 feet. Table 2 below provides a summary of the subsurface conditions.

Table 2: Description of Subsurface Soil Conditions(1)

Average Elevation From - To(2)	Material Description	Typical N-Value Range
-3.0 to -7.5	Clay (CH)	0
-7.5 to -14.8	Silt with Sand (ML)	0
-14.8 to -24.8	Sandy Fat Clay (CH)	0
-24.8 to -29.8	Clayey Sand (SC)	1
-29.8 to -34.8	Fat Clay with Sand (CH)	NA
-34.8 to -39.8	Silty Sand (SM)	8
-39.8 to -67.5	Sand (SP)	5 to 33
-67.5 to -69.8	Sandy Lean Clay (CL)	5
-69.8 to -124.8	Sand (SP)	17 to 65
-124.8 to -139.8	Lean Clay; Lean Clay with Sand (CL)	17 to 25
-139.8 to -144.8	Silty Sand (SM)	42
-144.8 to -154.8	Lean Clay with Sand; Fat Clay with Sand (CL, CH)	14 to 26
-154.8 to -174.8	Silty Sand (SM)	58 to 90
-174.8 to -178.0	Lean Clay (CL)	24

Note 1: Table created from Thompson Engineering Test Boring Record BW-04 contained in the project plans.
Note 2: Elevations are referenced to North American Vertical Datum of 1988 (NAVD)

HIGH-STRAIN DYNAMIC PILE TESTING (PDA)

The test pile TP-04 was installed by Jordan Pile Driving, Inc. The test pile was prepared for high-strain dynamic testing by drilling holes and setting drop-in anchors for sensor attachment two pile diameters, or 108 inches, below the pile top.

Prior to driving pile TP-04, the pile was jetted until the pile tip was at approximate elevation -42 feet. Pile TP-04 was then was impact driven using a Pileco D180-32 open-ended diesel pile driving hammer. The Pileco D180-32 diesel hammer has a maximum rated energy of 443,500 foot-pounds (ram weight of 39,680 pounds at a stroke height of 11.18 feet). We understand the Pileco D180-32 hammer utilized a hammer cushion consisting of 12 inches of micarta and aluminum and a pile cushion consisting of 12 inches of pine plywood. A well compressed previously used pile cushion was utilized for the restrikes.

Applied Foundation Testing performed dynamic pile testing using a Pile Driving Analyzer Model PAX manufactured by Pile Dynamics, Inc. Dynamic testing was accomplished by externally attaching two piezo-electric accelerometers, two piezo-resistive accelerometers and four strain transducers and taking measurements during the initial drive and subsequent restrikes. During the 1 day restrike, the F1 strain transducer and A1 accelerometer did not function properly, therefore only the average from the F3, A3, F4, and A4 sensors, located 180 degrees apart, were used in the data output and analysis for this restrike. The data from the 1 day restrike utilizing the average of the F3, A3, F4, and A4 sensors was of high quality with good proportionality and should be considered highly reliable. Calibration information for the sensors utilized is included in Appendix E. The dynamic pile testing was performed in general accordance with the project plans and special provisions and ASTM D4945 *"Standard Test Method for High-Strain Dynamic Testing of Deep Foundations"*. During the initial drive, TP-04 was driven to where the sensor attachment points were approximately 1 foot above the waterline.

Plots and tabular summaries of the dynamic testing results are included in Appendix B. In general, these summaries include blows per foot (BLC), penetration depth below reference, maximum Case method resistance, auto capacity method resistance for friction piles (RA2), maximum compressive stress (CSX), compressive stress at the bottom of pile (CSB), maximum tensile stress (TSX), stroke (STK), maximum transfer energy (EMX), and beta pile integrity factor (BTA). The top of the pile driving template was used as a reference for measuring penetration depth during the initial drive and restrikes. The top of the pile driving template was located at elevation 12.5 feet. The mudline elevation was measured as -6.7 feet. After driving the elevation of the top of soil inside the cylinder pile was measured as -25.2 feet. A summary of the test pile installation is provided in Tables 3 and 4 below.

Table 3: Summary of Pile Driving Information

Test Pile	Hammer Model	Approximate Reference Elevation (feet)	Approximate Ground Elevation (feet)	Approximate Final Pile Top Elevation (feet)	Approximate Final Tip Elevation[(1)] (feet)
TP-04	Pileco D180-32	+12.5	-6.7	+11.5	-108.5

Note 1: Approximate reference elevation based on contractor survey measurement. Approximate final pile tip elevation based on depth below reference, pile movements during restrikes, and load test permanent displacement.

Table 4: Summary of Dynamic Pile Testing Results

Test Pile	EOD or BOR(1)	Blows per Foot at EOD or Blows per Inch for Restrike	Max. CSX Stress (ksi)	Avg. CSX Stress (ksi)	Max. TSX Stress (ksi)	Avg. TSX Stress (ksi)	Max. CSB Stress (ksi)	Avg. CSB Stress (ksi)	Avg. Transfer Energy (k-ft) / Approx. Stroke (ft.)
TP-04	EOD	42 Blows/1'	4.73	2.72	1.11	0.40	2.81	1.64	76.7/7.08
	1 Day RS	5 Blows/1", 2 Blows/1", 5 Blows/1", 3 Blows/1", 5 Blows/1"	6.80	4.95	1.24	0.57	4.30	3.47	136.9/9.08
	17 Day RS	9 Blows/1", 3 Blows/1", 3 Blows/1", 4 Blows/1", 3 Blows/1", 3 Blows/1"	5.94	5.14	1.31	0.62	4.22	3.48	144.3/9.29

Note 1: EOD – End of Initial Drive; RS – Restrike

Allowable maximum driving stresses for the spun-cast concrete cylinder piles are defined by the formulas located in the project special provisions. The maximum allowable compressive stress limit is defined as $0.85\sqrt{(f'_c)}$ – effective prestress. The maximum allowable tensile stress limit is defined as $3\sqrt{(f'_c)}$ + effective prestress.

In the above formula f'c is defined as the minimum concrete compressive strength for the piles, which is 10,000 psi per Plan Sheet 13. Per Plan Sheet 13, the strands shall be stressed to an initial tension of 30,900 lbs. Assuming a loss of 20 percent from initial tension provides an effective prestress value of 546 psi (0.55 ksi). The maximum allowable compressive stress is calculated as 7.95 ksi, and the maximum allowable tensile stress is calculated as 0.85 ksi.

The dynamic pile testing measurements indicate the maximum tensile stress (TSX) exceeded allowable stress limits for portions of the initial drive and restrikes. In general, these high tensile stresses for some blows occurred early in the initial drive in softer driving conditions. During restrikes, maximum tensile stress (TSX) values exceeding the allowable stress limits were measured. These high tensile stresses during restrikes were due to the use of a previously used conditioned pile cushion and the hammer at a high fuel setting of 3 or 4 in order to transfer maximum energies to the pile to attempt to fully mobilize resistance. Given the purposes of the load test program, it is important to attempt to fully mobilize resistance during testing. In a production pile driving situation, additional pile cushion material or driving procedures to avoid these high tensile stresses would be needed. It is not recommended letting driving stresses reach levels exceeding allowable stress limits during production pile driving and restrikes.

The dynamic test data does not show any signs of integrity problems for TP-04.

SIGNAL MATCHING ANALYSIS

Signal matching analyses were performed using the computer program CAPWAP (version 2014) to further evaluate the field measurements. Summaries of these analyses are presented in Table 5 below. The complete analyses are included in Appendix C. Signal matching analysis is considered a standard procedure to estimate the total ultimate resistance as well as estimate

the resistance distribution (shaft and toe) from the dynamic pile testing data. The signal matching approach is used to back calculate various soil parameters. The program uses the data measured during a single blow as a boundary condition and the user performs many iterations on soil parameters to make a calculated wave-up match the measured one.

Table 5: Signal Matching Results Summary

Test Pile	EOD or Restrike	Blow No.	R_{ult} (kips)	R_{shaft} (kips)	R_{end} (kips)	Max. Case Method JC Damping Factor	EMX (k-ft)/Stroke (feet)	Qs (in)	Qt (in)	Ss (s/ft)	St (s/ft)	Match Quality
TP-04	EOD	2481	1081	821	260	0.70	129.2/ 9.12	0.18	0.48	0.25	0.40	2.87
	1 Day Restrike	3	1300	1036	264	0.88	198.9/ 10.39	0.30	0.04	0.40	0.40	1.61
	14 Day Restrike	5	1500	1211	289	0.99	124.8/ 8.48	0.20	0.04	0.40	0.40	2.35

The results of the CAPWAP signal matching analyses generally have the most confidence in the total resistance value, and to a lesser extent the resistance distribution in side resistance along the length of the pile and end bearing resistance at the pile bottom. This is generally attributed to intricacies in separating side resistance and end bearing resistance from the total resistance using signal matching techniques. The side resistance values from the analyses are the combined side resistance from the exterior and interior of the cylinder piles.

The signal matching analysis for TP-04 indicated a total ultimate resistance of 1,081 kips at end of initial drive, 1,300 kips during the 1 day restrike; and 1,500 kips during the 14 day restrike. Based on the set measurements during EOD and restrikes for TP-23A, the resistance values presented in this report may be considered fully mobilized.

SUMMARY AND CONCLUSIONS

The load test program included the installation of a 54-inch diameter, 6-inch wall thickness, 120-feet long spun-cast concrete cylinder pile at location TP-04. TP-04 was subjected to dynamic pile testing during initial drive and 1 and 14 day restrikes. A summary of the test results is provided below:

TP-04 Testing Summary:

- The signal matching analysis of the dynamic testing data for TP-04 indicated a total ultimate resistance of 1,081 kips at end of initial drive, 1,300 kips for the 1 day restrike, and 1,500 kips for the 14 day restrike.

The purpose of this test pile program is to determine the pile bearing resistances (ultimate, side resistance, and end bearing) achievable for the pile type, size, and lengths installed. In addition, the designers may choose to use the results to optimize their foundation design and/or to minimize the risk of constructability issues. However, the design team would also need to consider the scope of the test pile program, the methods used for pile installation, and potential variability of soils along the bridge length when using the information gathered.

Some points to consider from the test pile program for the 54-inch diameter, 6-inch wall thickness, 120-feet long spun-cast concrete cylinder pile at location TP-04 are as follows:

- During production phase testing when keeping driving stress values below allowable limits during initial drives and restrikes is of the upmost importance, due to possibly lower transfer energies, less resistance may be mobilized than shown in this report.
- Dynamic pile testing on production piles is recommended to determine bearing resistances, measure pile driving stresses, and determine hammer driving system suitability. Driving criteria may be developed based on this testing with recommendations provided to control tensile and compressive stresses at or below allowable levels.
- Signal matching analyses of the production pile dynamic test data is recommended to confirm and/or to provide a better estimate of the ultimate pile bearing resistance.

Below is a summary of the Appendix contents:

- Appendix A – Inspector's Pile Driving Records
- Appendix B – Dynamic Pile Testing Data Summaries
- Appendix C – CAPWAP Signal Matching Analysis Output
- Appendix D – Relevant Project Documents
- Appendix E – Instrument Calibrations

CLOSURE

We want to thank you for the opportunity to be involved in this project. We also want to thank you for all your support in setting up the test. Please do not hesitate to call us if you have any questions regarding the information in this report.

LIMITATIONS

This report presents test measurements made by Applied Foundation Testing, Inc. Interpretations were made based upon the measurements made by AFT with the latest techniques available and currently accepted standards of care recognized by Geotechnical Engineering professionals. Applied Foundation Testing is an independent agency and is not the Geotechnical Engineer of Record. The Geotechnical Engineer of Record should ultimately make final recommendations for foundation design and construction.

Appendix A

Inspector's Pile Driving Records
TP-04

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

FORM C-15A
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
TEST PILE RECORD

Project Number: IM-I010(341)	County: Mobile	Division: Southwest Region
Bridge: Station 574+00 to Station 574+00		Bridge Identification Number:
Road Between: I-10 and I-10		Lane (if applicable): WB
Contractor: Jordan Pile Driving	Inspector: Donald Hector	
Date: 4/18/2018	Bent No.& Lane: TEST PILE	Pile No.: TP-04
Kind of Soil: Soft, Wet, Black, Fat Clay		
Kind of Pile: Spun Cast Cylinder	Size of Pile: 54"	Total Length (ft): 120
Elev. Ground Line at Pile: -2.2	Final Elev. At Top of Pile: 12.4	Tip Elevation: -107.6
Hammer Make: Pileco	Hammer Model: D180-32	Hammer Kind: Diesel
Hammer Type: Open	Hammer Action: Single	Rated Energy (ft.-lbs.): 443,500@11.1 Stroke
Weight of Hammer (lbs.): 39,680	Design Load (from plans) (tons):	
Hammer Cushion: Material: Aluminum and Micarta Alternating	Thickness (in.): 12	Area (sq. in.): 762
Pile Cushion (Before Driving): Material: Plywood	Thickness (in.): 12	Area (sq. in.): 904.32
Pile Cushion (After Driving): Material: Plywood	Thickness (in.):	Area (sq. in.):
Pile Cap Weight (lbs.): 25,868		

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
0	0	1	54	
8.15	323,392	12	55	
6.88	272,998	12	56	
5.74	227,763	18	57	

REMARKS

1. When using open type and gravity hammers, record weight of hammer and height of fall of hammer. Show rated energy when using closed type hammers.
2. Energy delivered to pile should be maintained practically constant once record keeping has begun unless specified otherwise by the Engineer.
3. Pile cushion is only required with concrete piling.
4. Pile cushion thickness after driving must be at least one-half the original thickness.
5. The bearing should be determined from the graph of Blows/Foot versus Bearing which is provided from the Wave Equation Analysis or Dynamic Formula of the driving system. If a graph is not provided, refer to Item 505.03(b)2 of the specifications to estimate the bearing capacity using the Dynamic Formula.
6. Driving should be continuous. Note any interruptions exceeding one hour.
7. Draw a sketch on back of this sheet showing location of test pile.
8. For continuation of test pile record, use Form C-15C-2.
9. Test pile (check one): Static Load Tested _____ Dynamic Load Test __x__ (If static load tested, load test report shall be attached to this report).

Correct _____
Project Manager

Approved _____
Area Operations Engineer

FORM C-15A-2
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	Southwest Region

Bridge: Station	to Station	Bridge Identification Number
574+00	574+00	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
4/18/2018	TEST PILE	TP-04	Soft, Wet, Black, Fat Clay

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft-lbs)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
5.51	218,637	18	58	
5.40	214,272	26	59	
5.72	226,970	21	60	
5.70	226,176	25	61	
5.79	229,747	26	62	
5.90	234,112	28	63	
5.96	236,493	31	64	
6.04	239,667	28	65	
6.03	239,270	34	66	
5.87	232,922	34	67	
5.87	232,922	38	68	
5.82	230,938	45	69	
6.03	239,270	35	70	
6.05	240,064	41	71	
6.10	242,048	43	72	
6.14	243,635	47	73	
6.19	245,619	36	74	
6.27	248,794	36	75	
6.30	249,984	44	76	
6.26	248,397	44	77	
6.33	251,174	44	78	
6.27	248,794	43	79	

FORM C-15A-2
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Mobile	SW Region

Bridge: Station	to Station	Bridge Identification Number
574+00	574+00	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
4/18/2018	TEST PILE	TP-04	Soft, Wet, Black, Fat Clay

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft. lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
6.21	246,413	44	80	
6.37	252,762	44	81	
6.48	257,126	49	82	
6.44	255,539	42	83	
6.50	257,920	43	84	
6.48	257,126	36	85	
6.43	255,142	41	86	
6.45	255,936	41	87	
6.47	256,730	44	88	
6.38	253,158	40	89	
6.41	254,349	48	90	
6.39	253,555	30	91	
6.40	253,952	44	92	
6.44	255,539	40	93	
6.52	258,714	45	94	
6.52	258,714	35	95	
6.59	261,491	58	96	
6.76	268,237	38	97	
6.83	271,014	61	98	
7.69	305,139	46	99	
7.86	311,885	47	100	

FORM C-15A-2
REVISED 08-07-95

ALABAMA DEPARTMENT OF TRANSPORTATION
CONTINUATION OF TEST PILE RECORD

Project Number	County	Division
IM-I010(341)	Baldwin	SW Region

Bridge: Station	to Station	Bridge Identification Number
574+00	574+00	N/A

Date	Bent No.& Lane	Pile No.	Kind of Soil
4/18/2018	TEST PILE	TP-04	Soft, Wet, Black, Fat Clay

Height Of Fall (feet)	Energy Delivered To Pile (E) (ft.-lbs.)	Blows Per Foot Of Penetration (N)	Total Penetration (feet)	Bearing (Ru) (tons)
7.86	311,885	49	101	
8.67	344,026	37	102	
8.65	343,232	32	103	
8.62	342,042	36	104	
8.62	342,042	44	105	
8.65	343,232	35	106	
8.63	342,438	45	107	
8.66	343,629	37	108	
8.75	347,200	44	109	
8.76	347,597	39	110	
8.88	352,358	38	111	
8.90	353,152	36	112	
9.02	357,914	27	113	
8.81	349,581	35	114	
8.92	353,946	38	115	
8.97	355,930	37	116	
8.91	353,549	29	117	
8.99	356,723	39	118	
8.94	354,739	39	119	
9.00	357,120	42	120	

Appendix B

Dynamic Pile Testing Data Summaries
TP-04

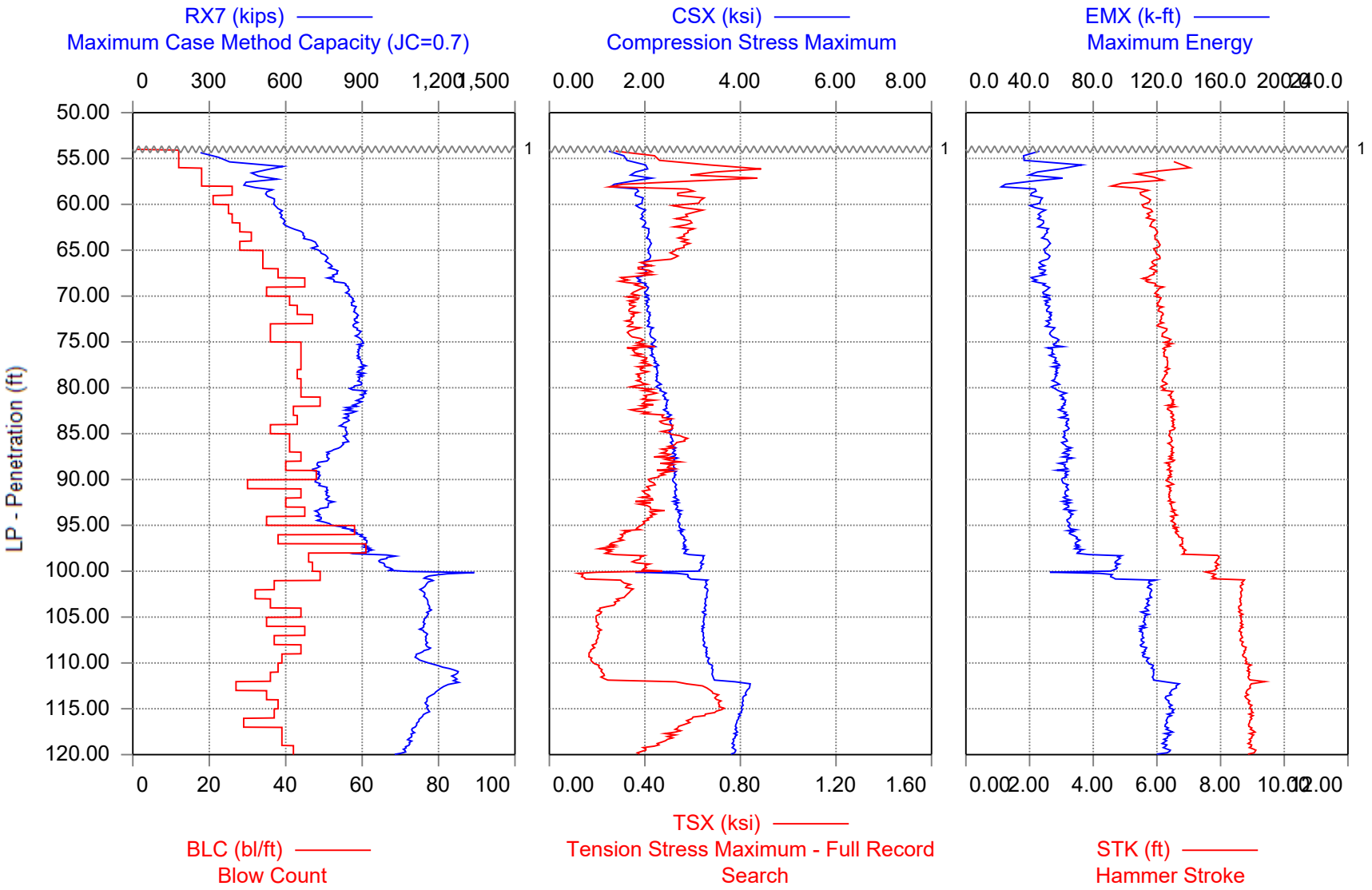
I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 06-June-2018 Test started: 18-April-2018

I-10 OVER MOBILE RIVER - TP-04 ID



1 - Template (Reference) El. = 12.48', Mudline El. = -6.7'

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

AR: 904.78 in² SP: 0.150 k/ft³
LE: 111.00 ft EM: 7,588.81 ksi
WS: 15,310.0 f/s JC: 0.70

RX7: Maximum Case Method Capacity (JC=0.7)
RX8: Maximum Case Method Capacity (JC=0.8)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
13	55.00	12	AV13	252	249	251	1.42	0.45	0.37	40.9	8.15	95
			STD	123	126	92	0.23	0.15	0.15	10.1	0.00	9
			MAX	345	344	355	1.65	0.62	0.51	72.0	8.15	100
			MIN	0	0	0	0.85	0.00	0.07	35.1	8.15	69
25	56.00	12	AV12	467	466	359	1.88	0.68	0.62	58.0	6.88	100
			STD	118	118	89	0.42	0.10	0.27	28.3	1.39	0
			MAX	653	653	497	2.55	0.84	1.11	103.2	8.44	100
			MIN	330	328	223	1.28	0.51	0.25	25.5	4.97	100
43	57.00	18	AV18	494	494	358	1.82	0.67	0.70	46.0	5.74	100
			STD	29	29	14	0.18	0.03	0.15	8.9	0.39	0
			MAX	538	538	378	2.08	0.72	0.90	59.0	6.28	100
			MIN	448	448	320	1.55	0.60	0.47	34.0	5.18	100
61	58.00	18	AV18	488	487	363	1.71	0.68	0.56	40.9	5.51	100
			STD	62	62	34	0.45	0.09	0.32	20.2	0.88	0
			MAX	586	586	425	2.38	0.81	1.03	72.5	6.85	100
			MIN	426	425	312	1.15	0.57	0.21	17.9	4.49	100
87	59.00	26	AV26	516	515	382	1.73	0.75	0.51	38.8	5.40	100
			STD	31	31	21	0.23	0.07	0.14	8.6	0.38	0
			MAX	552	552	397	1.97	0.80	0.68	48.5	5.83	100
			MIN	435	435	321	1.12	0.57	0.20	17.1	4.43	100
108	60.00	21	AV21	549	548	403	1.93	0.83	0.62	46.3	5.72	100
			STD	13	13	10	0.06	0.02	0.04	2.7	0.12	0
			MAX	568	567	424	2.04	0.86	0.71	51.8	5.96	100
			MIN	518	517	380	1.80	0.79	0.52	40.9	5.47	100
133	61.00	25	AV25	572	571	433	1.92	0.85	0.58	45.3	5.70	100
			STD	11	11	15	0.08	0.02	0.05	4.0	0.17	0
			MAX	595	594	465	2.09	0.90	0.71	54.3	6.06	100
			MIN	549	547	405	1.77	0.80	0.48	38.4	5.40	100
159	62.00	26	AV26	589	588	479	1.96	0.89	0.57	46.9	5.79	100
			STD	9	9	14	0.06	0.02	0.04	3.0	0.13	0
			MAX	600	600	505	2.09	0.93	0.67	53.4	6.09	100
			MIN	566	564	447	1.82	0.86	0.48	41.2	5.54	100
187	63.00	28	AV28	619	606	579	2.03	0.94	0.57	48.9	5.90	100
			STD	25	21	81	0.07	0.03	0.05	3.2	0.14	0
			MAX	666	649	666	2.14	0.99	0.64	54.0	6.12	100
			MIN	580	578	448	1.90	0.89	0.47	43.2	5.63	100

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth ft	BLC bl/ft	TYPE	RX7 kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
218	64.00	31	AV31	676	661	661	2.07	0.98	0.56	49.9	5.96	100
			STD	17	16	11	0.07	0.02	0.06	3.2	0.14	0
			MAX	721	703	689	2.23	1.04	0.68	58.2	6.34	100
			MIN	647	634	642	1.89	0.94	0.42	41.7	5.61	100
246	65.00	28	AV28	718	700	670	2.10	1.02	0.56	51.5	6.04	100
			STD	12	11	13	0.07	0.01	0.06	3.3	0.15	0
			MAX	735	719	689	2.19	1.05	0.64	56.1	6.28	100
			MIN	677	666	645	1.86	0.97	0.38	40.9	5.56	100
280	66.00	34	AV34	751	734	683	2.10	1.04	0.52	51.4	6.03	100
			STD	14	14	7	0.05	0.02	0.04	2.3	0.12	0
			MAX	779	762	705	2.20	1.08	0.61	57.3	6.28	100
			MIN	723	712	668	2.00	1.00	0.44	46.9	5.78	100
314	67.00	34	AV34	769	751	694	1.98	1.06	0.40	47.2	5.87	100
			STD	13	13	14	0.06	0.01	0.05	2.4	0.12	0
			MAX	789	771	715	2.10	1.08	0.55	52.2	6.12	100
			MIN	737	721	657	1.87	1.03	0.32	43.2	5.66	100
352	68.00	38	AV38	793	777	699	1.98	1.07	0.39	47.4	5.87	100
			STD	17	18	13	0.08	0.02	0.05	3.4	0.16	0
			MAX	824	809	722	2.09	1.10	0.50	51.7	6.09	100
			MIN	731	717	673	1.72	1.01	0.23	36.9	5.40	100
397	69.00	45	AV45	811	798	704	1.94	1.09	0.34	46.1	5.82	100
			STD	27	28	12	0.09	0.03	0.05	4.3	0.21	0
			MAX	859	846	726	2.19	1.17	0.48	58.4	6.42	100
			MIN	764	748	684	1.79	1.02	0.25	39.0	5.47	100
432	70.00	35	AV35	847	832	715	2.04	1.12	0.37	50.5	6.03	100
			STD	9	8	8	0.04	0.01	0.03	2.0	0.09	0
			MAX	867	851	733	2.11	1.15	0.42	54.1	6.17	100
			MIN	823	816	698	1.93	1.09	0.30	45.9	5.86	100
473	71.00	41	AV41	861	846	717	2.05	1.14	0.35	50.9	6.05	100
			STD	9	9	10	0.05	0.02	0.04	2.5	0.12	0
			MAX	887	869	742	2.17	1.18	0.46	56.9	6.37	100
			MIN	843	826	692	1.94	1.11	0.29	45.8	5.83	100
516	72.00	43	AV43	871	856	721	2.07	1.16	0.35	51.8	6.10	100
			STD	10	10	9	0.05	0.02	0.03	2.3	0.11	0
			MAX	888	874	738	2.19	1.20	0.42	57.9	6.37	100
			MIN	838	819	699	1.96	1.12	0.28	46.6	5.88	100
563	73.00	47	AV47	878	865	721	2.09	1.18	0.34	52.6	6.14	100
			STD	13	14	14	0.05	0.02	0.03	2.4	0.11	0
			MAX	905	893	760	2.19	1.22	0.44	57.1	6.42	100
			MIN	843	825	696	1.97	1.13	0.26	46.6	5.91	100
599	74.00	36	AV36	878	863	714	2.11	1.19	0.34	53.3	6.19	100
			STD	27	26	20	0.12	0.04	0.08	5.9	0.30	0
			MAX	928	917	754	2.45	1.28	0.65	71.0	7.21	100

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth ft	BLC bl/ft	TYPE	RX7 kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
			MIN	789	781	670	1.81	1.13	0.16	40.7	5.59	100
635	75.00	36	AV36	889	871	710	2.15	1.23	0.36	55.4	6.27	100
			STD	16	17	14	0.08	0.03	0.06	4.5	0.20	0
			MAX	932	915	748	2.38	1.31	0.54	69.0	6.91	100
			MIN	857	837	687	2.01	1.17	0.26	47.8	5.96	100
679	76.00	44	AV44	892	876	707	2.16	1.23	0.37	55.5	6.30	100
			STD	33	33	31	0.17	0.04	0.14	8.0	0.42	0
			MAX	962	945	770	2.54	1.32	0.73	73.9	7.32	100
			MIN	744	732	575	1.64	1.12	0.15	36.3	5.24	100
723	77.00	44	AV44	886	871	691	2.17	1.25	0.38	54.7	6.26	100
			STD	15	15	15	0.09	0.03	0.08	3.8	0.19	0
			MAX	920	904	732	2.34	1.30	0.56	62.1	6.63	100
			MIN	850	830	646	2.04	1.20	0.25	48.7	5.96	100
767	78.00	44	AV44	900	886	696	2.24	1.29	0.40	57.0	6.33	100
			STD	18	18	16	0.10	0.03	0.09	4.0	0.19	0
			MAX	942	936	767	2.41	1.34	0.53	63.7	6.66	100
			MIN	862	847	670	2.00	1.20	0.23	45.4	5.88	100
810	79.00	43	AV43	892	875	693	2.26	1.33	0.39	56.7	6.27	100
			STD	20	18	10	0.09	0.02	0.07	3.6	0.17	0
			MAX	932	920	714	2.47	1.39	0.54	66.2	6.69	100
			MIN	856	840	671	2.11	1.28	0.29	50.0	6.01	100
854	80.00	44	AV44	886	866	691	2.27	1.34	0.38	56.0	6.21	100
			STD	19	18	9	0.07	0.02	0.05	2.8	0.13	0
			MAX	920	897	710	2.43	1.40	0.47	61.3	6.48	100
			MIN	835	818	670	2.14	1.30	0.26	50.3	5.93	100
898	81.00	44	AV44	894	875	721	2.37	1.40	0.42	59.3	6.37	100
			STD	41	39	23	0.17	0.04	0.12	6.7	0.31	0
			MAX	953	925	759	2.65	1.47	0.63	70.9	6.91	100
			MIN	785	773	675	2.03	1.33	0.21	45.6	5.73	100
947	82.00	49	AV49	887	873	765	2.45	1.47	0.41	61.7	6.48	100
			STD	36	37	11	0.15	0.03	0.11	5.8	0.26	0
			MAX	956	946	804	2.76	1.53	0.69	72.9	7.01	100
			MIN	774	764	739	1.99	1.37	0.16	44.0	5.71	100
989	83.00	42	AV42	851	838	768	2.46	1.49	0.39	60.9	6.44	100
			STD	40	40	13	0.15	0.04	0.12	5.9	0.26	0
			MAX	924	908	806	2.73	1.57	0.62	71.5	6.95	100
			MIN	760	752	737	2.13	1.41	0.15	48.4	5.91	100
1032	84.00	43	AV43	837	801	818	2.53	1.54	0.48	63.2	6.50	100
			STD	24	31	18	0.09	0.03	0.07	3.9	0.17	0
			MAX	890	876	843	2.72	1.58	0.64	70.6	6.91	100
			MIN	789	736	763	2.21	1.43	0.30	49.5	5.93	100
1068	85.00	36	AV36	833	785	805	2.55	1.57	0.50	63.2	6.48	100

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
			STD	14	22	11	0.09	0.02	0.07	3.5	0.16	0
			MAX	856	837	826	2.71	1.60	0.63	70.1	6.82	100
			MIN	787	723	764	2.37	1.51	0.37	55.2	6.17	100
1109	86.00	41	AV41	837	778	809	2.56	1.52	0.55	62.3	6.43	100
			STD	11	12	14	0.09	0.02	0.08	3.6	0.15	0
			MAX	852	793	831	2.76	1.56	0.74	70.0	6.76	100
			MIN	808	745	765	2.39	1.47	0.41	54.3	6.14	100
1150	87.00	41	AV41	806	749	778	2.59	1.54	0.50	63.1	6.45	100
			STD	21	22	19	0.08	0.02	0.06	3.6	0.14	0
			MAX	832	779	806	2.77	1.59	0.63	70.2	6.76	100
			MIN	758	686	715	2.45	1.46	0.38	55.2	6.20	100
1194	88.00	44	AV44	766	737	729	2.62	1.54	0.49	63.6	6.47	100
			STD	27	32	15	0.11	0.03	0.08	4.5	0.19	0
			MAX	826	811	769	2.84	1.59	0.65	73.4	6.88	100
			MIN	706	679	689	2.31	1.48	0.27	51.0	5.98	100
1234	89.00	40	AV40	723	700	687	2.59	1.46	0.50	61.5	6.38	100
			STD	27	28	18	0.09	0.02	0.06	3.8	0.16	0
			MAX	768	752	728	2.74	1.49	0.62	67.6	6.63	100
			MIN	638	615	630	2.36	1.41	0.37	52.0	5.96	100
1282	90.00	48	AV48	728	721	657	2.62	1.48	0.47	62.4	6.41	100
			STD	21	21	20	0.10	0.02	0.08	4.0	0.16	0
			MAX	773	762	698	2.89	1.53	0.70	72.9	6.88	100
			MIN	649	640	616	2.35	1.43	0.31	50.9	5.98	100
1312	91.00	30	AV30	734	730	585	2.63	1.49	0.42	62.2	6.39	100
			STD	29	27	17	0.10	0.02	0.06	4.3	0.18	0
			MAX	786	776	623	2.84	1.54	0.57	71.2	6.79	100
			MIN	673	673	554	2.37	1.45	0.25	51.8	5.93	100
1356	92.00	44	AV44	764	760	558	2.64	1.52	0.40	62.8	6.40	100
			STD	17	16	20	0.06	0.02	0.04	2.6	0.11	0
			MAX	797	790	597	2.77	1.56	0.49	69.2	6.63	100
			MIN	735	732	512	2.50	1.48	0.31	57.8	6.20	100
1396	93.00	40	AV40	768	767	555	2.66	1.55	0.41	63.6	6.44	100
			STD	26	26	20	0.11	0.03	0.07	4.6	0.19	0
			MAX	822	816	593	2.91	1.60	0.58	75.0	6.91	100
			MIN	699	699	517	2.33	1.47	0.18	49.3	5.86	100
1441	94.00	45	AV45	730	729	621	2.70	1.54	0.43	65.0	6.52	100
			STD	26	26	28	0.11	0.03	0.08	4.9	0.20	0
			MAX	791	791	675	2.96	1.59	0.64	76.7	7.04	100
			MIN	676	674	557	2.45	1.45	0.27	54.6	6.12	100
1476	95.00	35	AV35	747	746	651	2.72	1.55	0.41	64.8	6.52	100
			STD	25	25	16	0.08	0.02	0.05	3.4	0.14	0
			MAX	805	803	678	2.88	1.60	0.49	71.8	6.82	100
			MIN	709	709	607	2.55	1.50	0.27	57.6	6.25	100

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth ft	BLC bl/ft	TYPE	RX7 kips	RX8 kips	RA2 kips	CSX ksi	CSB ksi	TSX ksi	EMX k-ft	STK ft	BTA (%)
1534	96.00	58	AV58	852	849	664	2.75	1.58	0.35	65.7	6.59	100
			STD	38	37	14	0.10	0.04	0.07	4.6	0.19	0
			MAX	907	898	694	2.94	1.64	0.52	75.4	6.95	100
			MIN	755	755	637	2.53	1.50	0.21	56.2	6.17	100
1572	97.00	38	AV38	908	906	726	2.82	1.70	0.29	69.4	6.76	100
			STD	27	26	27	0.09	0.04	0.06	4.3	0.18	0
			MAX	966	959	776	2.98	1.75	0.40	77.3	7.08	100
			MIN	838	838	665	2.61	1.62	0.18	59.0	6.31	100
1633	98.00	61	AV61	920	918	813	2.84	1.78	0.25	70.6	6.83	100
			STD	27	26	30	0.08	0.04	0.05	3.6	0.15	0
			MAX	960	956	880	3.00	1.88	0.38	77.1	7.11	100
			MIN	855	855	751	2.66	1.71	0.13	62.6	6.48	100
1679	99.00	46	AV46	973	962	966	3.13	2.03	0.35	90.6	7.69	100
			STD	63	60	59	0.22	0.10	0.11	12.8	0.54	0
			MAX	1,150	1,135	1,047	3.48	2.13	0.55	111.7	8.57	100
			MIN	850	849	838	2.71	1.82	0.16	65.9	6.66	100
1726	100.00	47	AV47	997	940	1,073	3.17	2.09	0.39	94.0	7.86	100
			STD	16	17	19	0.14	0.03	0.10	6.2	0.27	0
			MAX	1,030	999	1,114	3.44	2.16	0.58	106.4	8.40	100
			MIN	966	905	1,036	2.90	2.02	0.20	81.8	7.32	100
1775	101.00	49	AV49	1,192	1,104	1,245	2.80	2.07	0.18	89.0	7.86	100
			STD	93	94	112	0.43	0.17	0.12	17.5	0.40	0
			MAX	1,480	1,427	1,747	3.35	2.21	0.84	124.2	9.17	100
			MIN	887	800	910	1.17	1.06	0.11	22.7	7.14	100
1812	102.00	37	AV37	1,149	1,049	1,218	3.28	2.17	0.32	115.2	8.67	100
			STD	13	11	12	0.03	0.01	0.02	2.1	0.09	0
			MAX	1,168	1,067	1,239	3.34	2.20	0.36	118.4	8.79	100
			MIN	1,115	1,020	1,193	3.17	2.15	0.27	108.9	8.44	100
1844	103.00	32	AV32	1,143	1,051	1,217	3.30	2.18	0.32	116.0	8.65	100
			STD	7	8	13	0.03	0.01	0.02	1.8	0.07	0
			MAX	1,158	1,064	1,247	3.36	2.20	0.37	119.7	8.79	100
			MIN	1,127	1,030	1,195	3.24	2.17	0.27	111.2	8.48	100
1880	104.00	36	AV36	1,160	1,070	1,245	3.26	2.19	0.27	114.1	8.62	100
			STD	6	5	8	0.03	0.02	0.03	1.8	0.08	0
			MAX	1,170	1,079	1,261	3.34	2.22	0.32	119.0	8.84	100
			MIN	1,148	1,060	1,225	3.20	2.16	0.22	110.0	8.44	100
1924	105.00	44	AV44	1,161	1,071	1,255	3.25	2.22	0.21	112.9	8.62	100
			STD	9	7	14	0.04	0.02	0.01	2.5	0.09	0
			MAX	1,182	1,086	1,285	3.33	2.24	0.24	118.5	8.84	100
			MIN	1,149	1,058	1,228	3.18	2.18	0.19	108.6	8.44	100
1959	106.00	35	AV35	1,144	1,050	1,257	3.23	2.23	0.20	112.1	8.65	100
			STD	5	5	11	0.03	0.01	0.01	1.9	0.06	0

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
			MAX	1,157	1,062	1,278	3.28	2.25	0.22	115.1	8.75	100
			MIN	1,132	1,039	1,231	3.17	2.21	0.19	108.5	8.48	100
2004	107.00	45	AV45	1,143	1,051	1,286	3.21	2.23	0.21	110.6	8.63	100
			STD	11	9	20	0.03	0.02	0.01	1.9	0.08	0
			MAX	1,166	1,069	1,319	3.27	2.25	0.22	115.4	8.84	100
			MIN	1,121	1,032	1,251	3.15	2.20	0.19	106.4	8.44	100
2041	108.00	37	AV37	1,151	1,068	1,313	3.23	2.26	0.20	110.9	8.66	100
			STD	6	10	14	0.03	0.02	0.01	1.8	0.08	0
			MAX	1,162	1,089	1,340	3.30	2.29	0.21	114.7	8.84	100
			MIN	1,135	1,049	1,279	3.18	2.23	0.19	107.8	8.53	100
2085	109.00	44	AV44	1,149	1,095	1,343	3.28	2.30	0.18	112.0	8.75	100
			STD	16	8	10	0.04	0.01	0.01	2.3	0.09	0
			MAX	1,178	1,113	1,364	3.36	2.33	0.20	117.0	8.93	100
			MIN	1,103	1,077	1,327	3.18	2.28	0.15	106.7	8.53	100
2124	110.00	39	AV39	1,123	1,091	1,343	3.31	2.29	0.17	113.0	8.76	100
			STD	17	9	13	0.04	0.01	0.01	2.3	0.08	0
			MAX	1,168	1,113	1,369	3.38	2.31	0.19	117.1	8.93	100
			MIN	1,100	1,077	1,317	3.25	2.26	0.16	108.9	8.61	100
2162	111.00	38	AV38	1,226	1,151	1,383	3.40	2.26	0.21	117.2	8.88	100
			STD	37	31	12	0.04	0.02	0.01	2.3	0.09	0
			MAX	1,284	1,205	1,417	3.50	2.32	0.24	123.9	9.22	100
			MIN	1,155	1,103	1,346	3.29	2.24	0.18	112.2	8.70	100
2198	112.00	36	AV36	1,265	1,191	1,380	3.43	2.32	0.25	117.5	8.90	100
			STD	26	26	31	0.06	0.04	0.10	2.8	0.09	0
			MAX	1,297	1,221	1,422	3.67	2.40	0.82	122.8	9.12	100
			MIN	1,131	1,053	1,216	3.36	2.26	0.19	109.0	8.70	100
2225	113.00	27	AV27	1,232	1,139	1,300	4.16	2.58	0.62	131.8	9.02	100
			STD	34	29	34	0.31	0.11	0.14	16.5	0.45	0
			MAX	1,360	1,258	1,451	4.73	2.81	0.87	171.4	10.51	100
			MIN	1,197	1,110	1,274	2.83	2.14	0.14	66.7	8.31	100
2260	114.00	35	AV35	1,173	1,086	1,306	4.09	2.48	0.69	127.1	8.81	100
			STD	14	15	12	0.05	0.03	0.04	2.7	0.09	0
			MAX	1,196	1,111	1,330	4.17	2.53	0.78	132.1	9.03	100
			MIN	1,150	1,063	1,284	3.98	2.42	0.61	120.9	8.61	100
2298	115.00	38	AV38	1,153	1,085	1,332	4.04	2.43	0.72	128.0	8.92	100
			STD	7	15	13	0.06	0.02	0.05	3.2	0.14	0
			MAX	1,166	1,113	1,362	4.22	2.48	0.85	137.6	9.42	100
			MIN	1,134	1,054	1,310	3.91	2.39	0.61	122.0	8.66	100
2335	116.00	37	AV37	1,149	1,103	1,350	4.00	2.43	0.67	128.9	8.97	100
			STD	13	9	11	0.05	0.02	0.05	2.9	0.11	0
			MAX	1,172	1,120	1,368	4.10	2.49	0.76	134.9	9.17	100
			MIN	1,127	1,081	1,328	3.91	2.39	0.58	123.3	8.75	100

I-10 OVER MOBILE RIVER - TP-04 ID 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 18-April-2018

BL#	Depth	BLC	TYPE	RX7	RX8	RA2	CSX	CSB	TSX	EMX	STK	BTA
	ft	bl/ft		kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
2364	117.00	29	AV29	1,117	1,095	1,335	3.92	2.41	0.57	125.7	8.91	100
			STD	8	7	10	0.05	0.01	0.04	2.6	0.10	0
			MAX	1,139	1,115	1,359	3.99	2.43	0.63	130.3	9.07	100
			MIN	1,103	1,083	1,322	3.80	2.37	0.47	118.4	8.61	100
2403	118.00	39	AV39	1,097	1,094	1,331	3.91	2.44	0.52	127.2	8.99	100
			STD	10	9	16	0.05	0.02	0.04	3.1	0.12	0
			MAX	1,118	1,112	1,369	3.99	2.48	0.62	133.0	9.22	100
			MIN	1,076	1,075	1,296	3.77	2.40	0.43	120.7	8.70	100
2442	119.00	39	AV39	1,087	1,085	1,318	3.86	2.43	0.48	125.4	8.94	100
			STD	11	11	13	0.06	0.02	0.04	3.3	0.12	0
			MAX	1,125	1,121	1,354	4.00	2.47	0.58	133.1	9.22	100
			MIN	1,067	1,065	1,296	3.70	2.38	0.39	116.4	8.61	100
2484	120.00	42	AV42	1,063	1,058	1,299	3.86	2.49	0.40	125.4	9.00	100
			STD	25	38	57	0.08	0.04	0.05	6.0	0.19	0
			MAX	1,103	1,102	1,332	4.01	2.56	0.51	134.6	9.32	100
			MIN	933	834	943	3.54	2.37	0.30	94.0	8.11	100
			Average	910	879	878	2.72	1.64	0.40	76.7	7.08	100
			Std. Dev.	195	174	306	0.66	0.53	0.15	29.4	1.20	1
			Maximum	1,480	1,427	1,747	4.73	2.81	1.11	171.4	10.51	100
			Minimum	0	0	0	0.85	0.00	0.07	17.1	4.43	69

Total number of blows analyzed: 2484

BL# Sensors

1-2484 F1: [E655] 92.7 (1.00); F2: [J762] 93.9 (1.00); F3: [P454] 145.3 (1.00); F4: [P455] 145.8 (1.00); A1: [59379] 925.0 (1.00); A2: [59462] 1055.0 (1.00); A3: [K5647] 334.0 (1.00); A4: [K5943] 368.0 (1.00)

BL# Comments

1 Template (Reference) El. = 12.48', Mudline El. = -6.7'

Time Summary

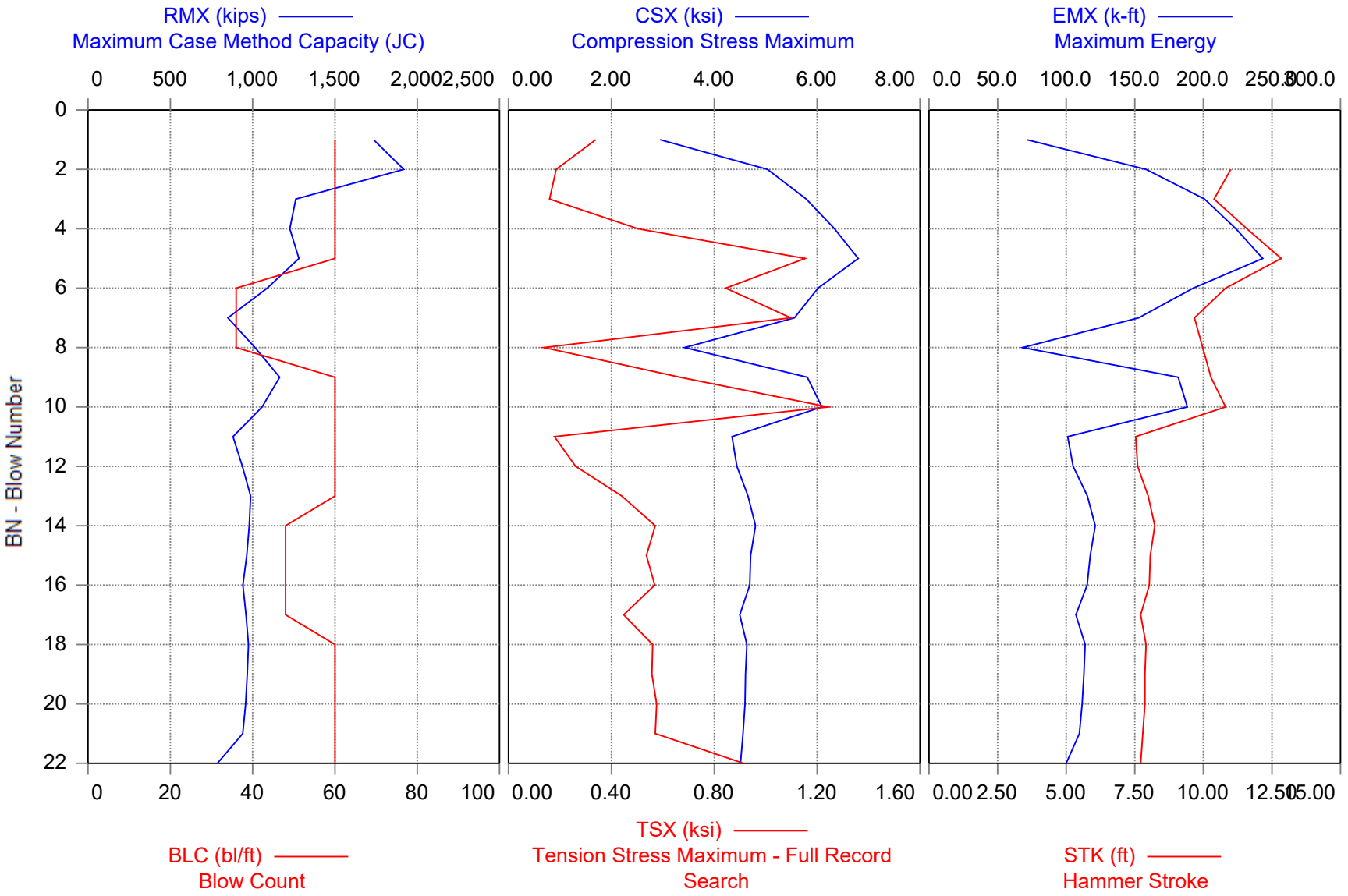
Drive	8 minutes 45 seconds	2:17 PM - 2:26 PM (4/18/2018) BN 1 - 10
Stop	1 hours 14 minutes 18 seconds	2:26 PM - 3:40 PM
Drive	43 minutes 58 seconds	3:40 PM - 4:24 PM BN 11 - 1728
Stop	1 hours 39 minutes 12 seconds	4:24 PM - 6:03 PM
Drive	11 minutes 38 seconds	6:03 PM - 6:15 PM BN 1729 - 2198
Stop	17 minutes 12 seconds	6:15 PM - 6:32 PM
Drive	7 minutes 11 seconds	6:32 PM - 6:39 PM BN 2199 - 2484

Total time [04:22:17] = (Driving [01:11:34] + Stop [03:10:43])

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 06-June-2018 Test started: 19-April-2018

I-10 OVER MOBILE RIVER - TP-04 1 DAY RESTRIKE



I-10 OVER MOBILE RIVER - TP-04 1 DAY RESTRIKE 54" DIA, 6" WALL, 120' LONG
OP: AFT Date: 19-April-2018

AR: 904.78 in² SP: 0.150 k/ft³
LE: 111.00 ft EM: 7,588.81 ksi
WS: 15,310.0 f/s JC: 0.88

RMX: Maximum Case Method Capacity (JC)
RX9: Maximum Case Method Capacity (JC=0.9)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX9	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	60	1,734	1,699	1,407	2.94	2.26	0.34	71.2	0.00	100
2	60	1,918	1,844	1,472	5.03	4.21	0.19	158.2	11.00	100
3	60	1,263	1,197	1,455	5.79	4.19	0.16	200.9	10.39	100
4	60	1,225	1,225	1,473	6.34	4.19	0.50	223.7	11.59	100
5	60	1,282	1,280	1,318	6.80	4.30	1.15	243.2	12.84	100
6	36	1,089	1,087	1,211	6.02	4.00	0.84	192.6	10.81	100
7	36	850	849	771	5.56	3.84	1.10	152.8	9.67	100
8	36	1,014	961	1,052	3.42	2.87	0.14	68.2	0.00	100
9	60	1,164	1,163	1,332	5.81	3.81	0.67	181.7	10.28	100
10	60	1,057	1,055	1,022	6.09	4.06	1.24	188.3	10.81	100
11	60	881	881	909	4.34	3.19	0.18	101.0	7.53	100
12	60	938	937	957	4.44	3.19	0.26	105.0	7.60	100
13	60	988	987	987	4.65	3.25	0.44	115.4	7.99	100
14	48	980	977	932	4.80	3.34	0.57	121.1	8.23	100
15	48	964	963	1,011	4.71	3.26	0.54	117.5	8.07	100
16	48	941	939	894	4.69	3.24	0.57	115.3	8.03	100
17	48	959	958	902	4.50	3.18	0.45	107.1	7.72	100
18	60	975	975	932	4.63	3.24	0.56	113.8	7.91	100
19	60	967	967	966	4.61	3.19	0.56	112.9	7.87	100
20	60	957	957	903	4.60	3.20	0.58	111.6	7.87	100
21	60	940	938	876	4.56	3.18	0.57	109.6	7.79	100
22	60	786	786	771	4.51	3.18	0.91	100.0	7.72	100
	Average	1,085	1,074	1,071	4.95	3.47	0.57	136.9	9.08	100
	Std. Dev.	266	251	228	0.90	0.51	0.31	47.2	1.61	0
	Maximum	1,918	1,844	1,473	6.80	4.30	1.24	243.2	12.84	100
	Minimum	786	786	771	2.94	2.26	0.14	68.2	7.53	100

Total number of blows analyzed: 22

BL# Sensors

1-22 F1: off; ; F2: off; ; F3: [P454] 145.3 (1.00); F4: [P455] 145.8 (1.00); A1: [59379] 925.0 (1.00); A2: [59462] 1055.0 (1.00); A3: [K5647] 334.0 (1.00); A4: [K5943] 368.0 (1.00)

BL# Comments

7 STOP TO LOWER FUEL SETTING FROM 3 TO 2
22 5BL/1", 2BL/1", 5BL/1", 3BL/1", 5BL/1"

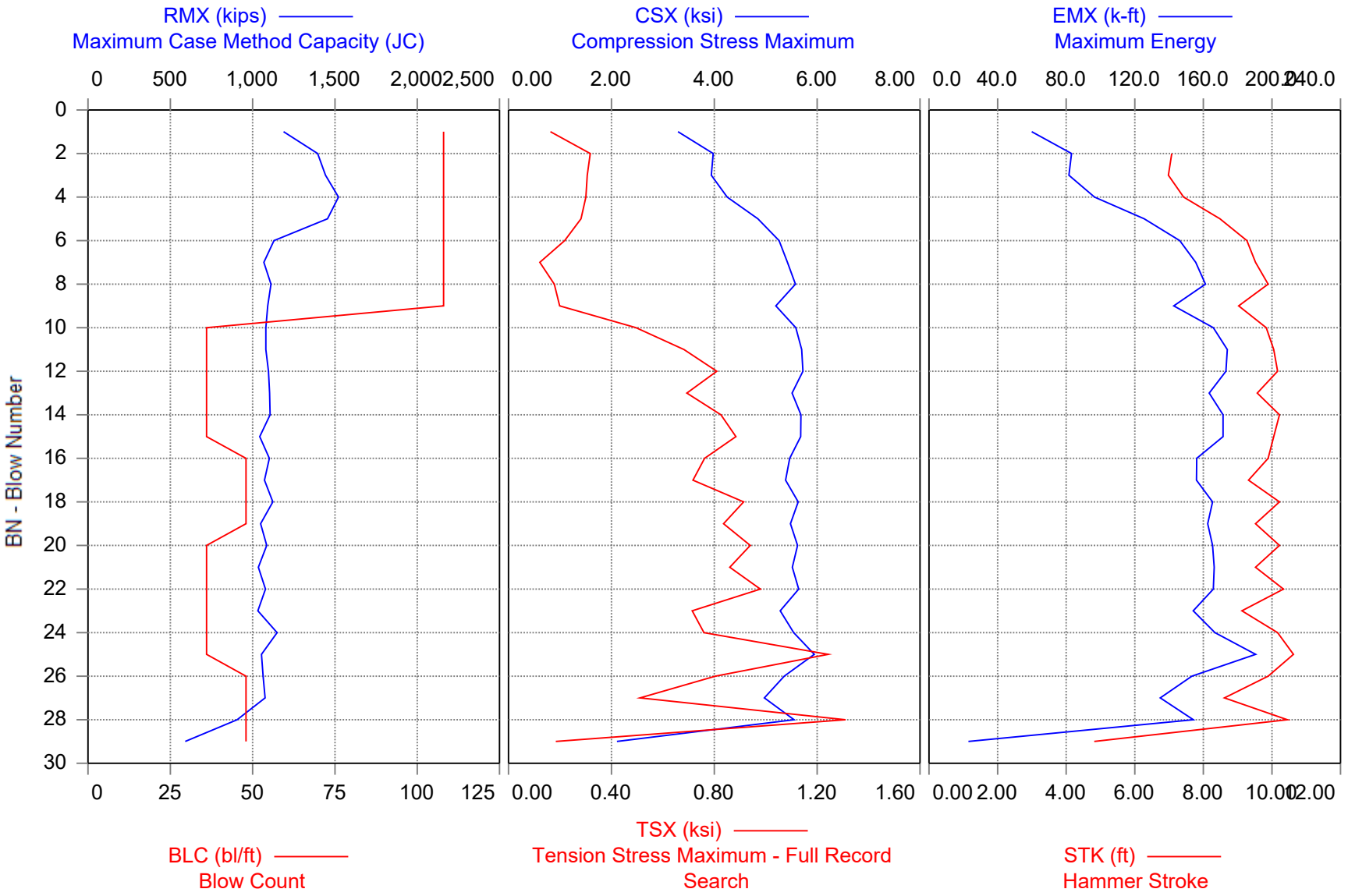
Time Summary

Drive 6 minutes 41 seconds 5:31 PM - 5:38 PM BN 1 - 22

Applied Foundation Testing, Inc. - PDIPLOT2 Ver 2017.2.58.3 - Case Method & iCAP® Results

Printed: 06-June-2018 Test started: 02-May-2018

I-10 MOBILE RIVER - TP-04 14 DAY RESTRIKE



I-10 MOBILE RIVER - TP-04 14 DAY RESTRIKE 54" CYL, 120' LONG
OP: AFT Date: 02-May-2018

AR: 904.78 in² SP: 0.150 k/ft³
LE: 111.00 ft EM: 7,588.81 ksi
WS: 15,310.0 f/s JC: 0.99

RMX: Maximum Case Method Capacity (JC)
RX10: Maximum Case Method Capacity (JC=1.0)
RA2: Auto Capacity Friction Piles
CSX: Compression Stress Maximum
CSB: Compression Stress at Bottom of Pile
TSX: Tension Stress Maximum - Full Record Search
EMX: Maximum Energy
STK: Hammer Stroke
BTA: Integrity Factor (1)

BL#	BLC	RMX	RX10	RA2	CSX	CSB	TSX	EMX	STK	BTA
	bl/ft	kips	kips	kips	ksi	ksi	ksi	k-ft	ft	(%)
1	108	1,188	1,165	1,027	3.29	2.71	0.16	59.9	0.00	100
2	108	1,395	1,367	978	3.98	3.27	0.32	83.1	7.08	100
3	108	1,442	1,415	1,018	3.94	3.29	0.31	81.6	6.98	100
4	108	1,521	1,491	1,069	4.25	3.57	0.30	96.5	7.42	100
5	108	1,455	1,419	1,148	4.85	3.93	0.28	125.4	8.48	100
6	108	1,130	1,089	1,177	5.26	4.16	0.22	146.2	9.27	100
7	108	1,068	1,066	1,189	5.42	4.22	0.12	155.5	9.52	100
8	108	1,111	1,111	1,136	5.58	4.01	0.18	161.2	9.89	100
9	108	1,091	1,090	1,119	5.20	3.69	0.20	142.7	9.03	100
10	36	1,080	1,079	1,067	5.59	3.70	0.50	165.8	9.83	100
11	36	1,080	1,080	1,281	5.70	3.63	0.68	174.0	10.05	100
12	36	1,096	1,095	1,026	5.72	3.72	0.81	173.2	10.16	100
13	36	1,103	1,103	1,335	5.51	3.53	0.69	163.4	9.57	100
14	36	1,106	1,106	1,111	5.68	3.64	0.83	171.5	10.22	100
15	36	1,043	1,043	1,235	5.68	3.56	0.88	171.5	10.05	100
16	48	1,102	1,101	1,072	5.46	3.50	0.76	156.1	9.89	100
17	48	1,072	1,072	1,249	5.39	3.39	0.72	156.0	9.32	100
18	48	1,123	1,122	1,094	5.63	3.54	0.91	165.4	10.22	100
19	48	1,049	1,048	1,313	5.48	3.39	0.84	162.5	9.52	100
20	36	1,085	1,085	1,077	5.62	3.52	0.94	165.4	10.22	100
21	36	1,034	1,033	1,351	5.52	3.36	0.86	166.3	9.52	100
22	36	1,078	1,078	1,069	5.64	3.46	0.98	165.8	10.33	100
23	36	1,032	1,031	1,317	5.28	3.30	0.71	154.1	9.12	100
24	36	1,149	1,148	1,338	5.54	3.44	0.76	166.7	10.16	100
25	36	1,053	1,053	1,300	5.94	3.61	1.24	190.5	10.63	100
26	48	1,063	1,063	1,076	5.36	3.38	0.80	153.3	9.89	100
27	48	1,075	1,075	1,150	4.97	3.20	0.51	134.9	8.61	100
28	48	906	906	922	5.55	3.49	1.31	154.2	10.45	100
29	48	591	589	849	2.11	1.67	0.18	23.0	4.82	100
Average		1,115	1,108	1,141	5.14	3.48	0.62	144.3	9.29	100
Std. Dev.		169	161	129	0.84	0.45	0.33	38.1	1.28	0
Maximum		1,521	1,491	1,351	5.94	4.22	1.31	190.5	10.63	100
Minimum		591	589	849	2.11	1.67	0.12	23.0	4.82	100

Total number of blows analyzed: 29

BL# Sensors

1-29 F1: [E655] 92.7 (1.00); F2: [J762] 93.9 (1.00); F3: [P454] 145.3 (1.00); F4: [P455] 145.8 (1.00); A1: [59379] 925.0 (1.00); A2: [59462] 1055.0 (1.00); A3: [K5647] 334.0 (1.00); A4: [K5943] 368.0 (1.00)

BL# Comments

29 9BL/1", 3BL/1", 3BL/1", 4BL/1", 3BL/1", 3BL/1"

Time Summary

Drive 43 seconds 9:17 AM - 9:18 AM BN 1 - 29

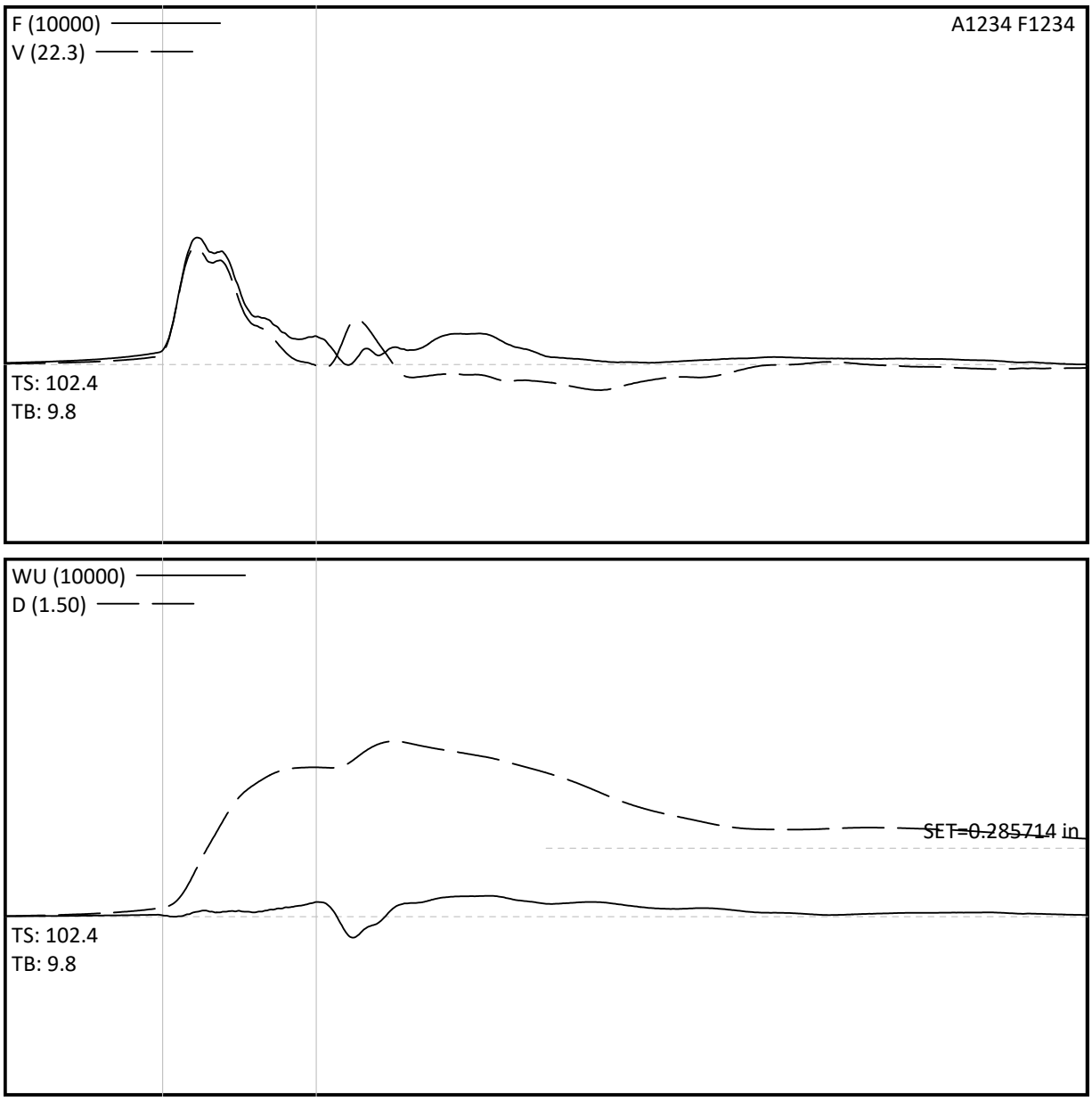
Appendix C

CAPWAP Signal Matching Analysis Output
TP-04

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

I-10 OVER MOBILE RIVER TP-04 ID



Project Information

PROJECT: I-10 OVER MOBILE RIVER
PILE NAME: TP-04 ID
DESCR: 54'' DIA, 6'' WALL, 120' LONG
OPERATOR: AFT
FILE: TP-04 ID ana
4/18/2018 6:39:54 PM
Blow Number 2481

Pile Properties

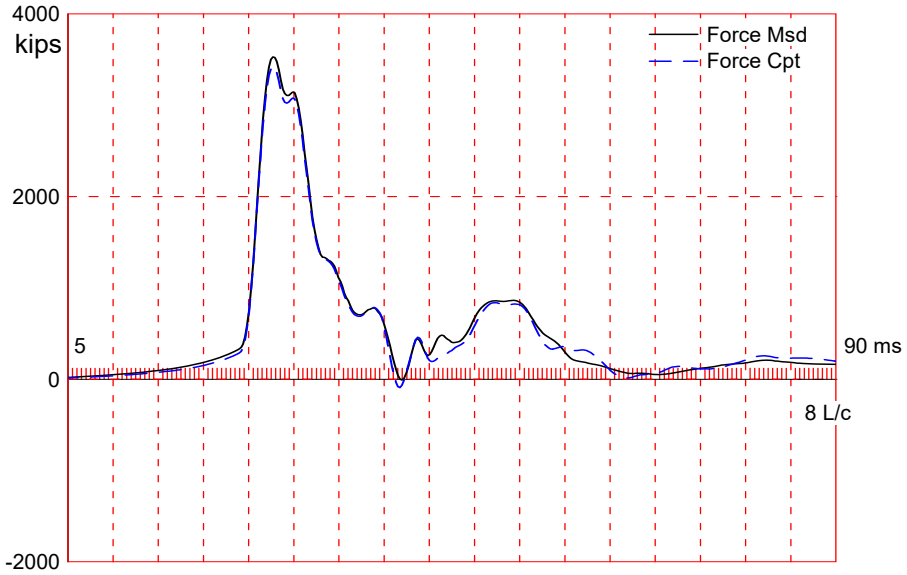
LE	111.00 ft
AR	904.78 in^2
EM	7588.81 ksi
SP	0.150 k/ft3
WS	15310.0 f/s
EA/C	448.5 ksec/ft
2L/C	14.50 ms
JC	0.70 []
LP	119.93 ft

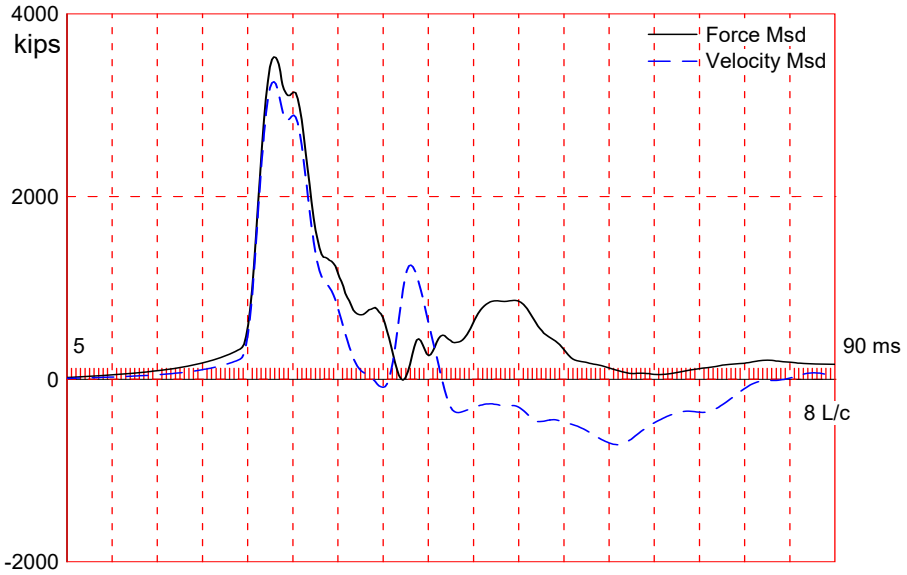
Quantity Results

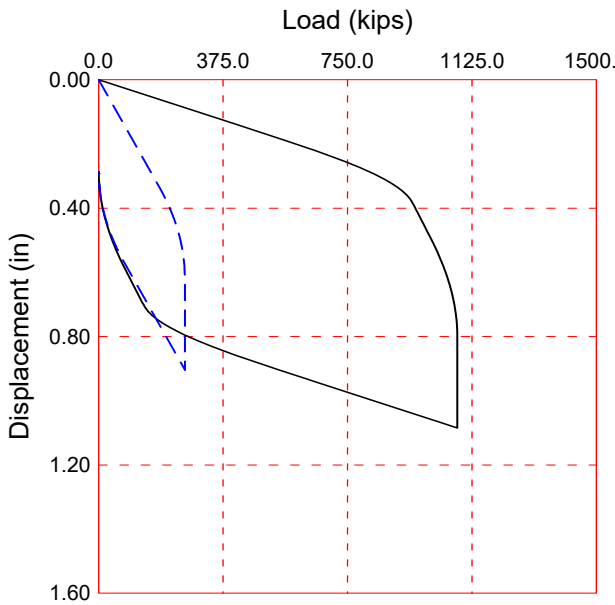
RX7	1084 kips
RX8	1081 kips
RA2	1312 kips
CSX	3.91 ksi
CSB	2.54 ksi
TSX	0.38 ksi
EMX	129.2 k-ft
STK	9.12 ft
BTA	100 (%)

Sensors

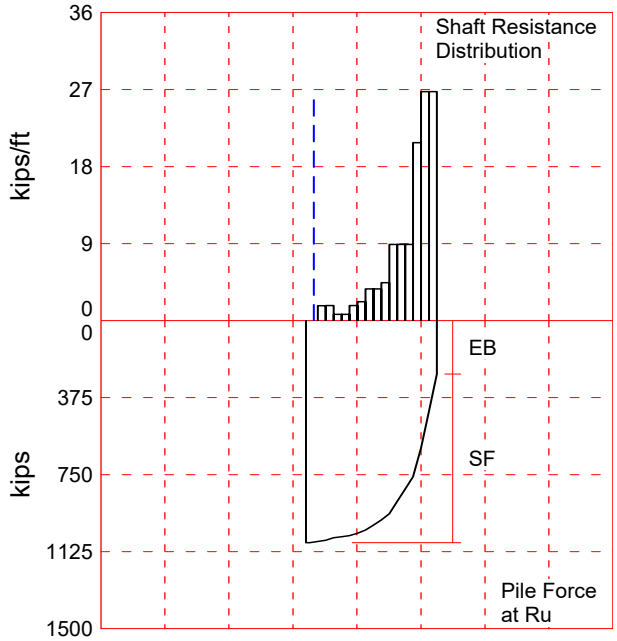
F1: [E655] 92.7 (1)
F2: [J762] 93.9 (1)
F3: [P454] 145.3 (1)
F4: [P455] 145.8 (1)
A1: [59379] 925 g's/v (1)
A2: [59462] 1055 g's/v (1)
A3: [K5647] 334 mv/5000g's (1)
A4: [K5943] 368 mv/5000g's (1)
CLIP: OK







RU =	1081.0 kips
SF =	821.0 kips
EB =	260.0 kips
Dy =	0.80 in
Dx =	1.09 in
SET/BI =	0.29 in



Length b. Sensors	111.0 ft
Embedment	101.0 ft
Top Area	6.28 ft²
End Bearing Area	15.90 ft²
Top Perimeter	14.14 ft
Top E-Modulus	7589 ksi
Top Spec. Weight	150.0 lb/ft³
Top Wave Spd.	15310 ft/s
Overall W.S.	15310 ft/s
Match Quality	2.87
Top Compr. Stress	3.8 ksi
Max Compr. Stress	3.8 ksi
Max Tension Stress	-0.38 ksi
Avg. Shaft Quake	0.18 in
Toe Quake	0.48 in
Avg. Shaft Smith Dpg.	0.25 s/ft
Toe Smith Damping	0.40 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 1081.0; along Shaft 821.0; at Toe 260.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf
				1081.0			
1	16.8	6.8	12.0	1069.0	12.0	1.76	0.12
2	23.5	13.5	12.0	1057.0	24.0	1.78	0.13
3	30.3	20.3	5.0	1052.0	29.0	0.74	0.05
4	37.0	27.0	5.0	1047.0	34.0	0.74	0.05
5	43.7	33.7	12.0	1035.0	46.0	1.78	0.13
6	50.5	40.5	15.0	1020.0	61.0	2.23	0.16
7	57.2	47.2	25.0	995.0	86.0	3.72	0.26
8	63.9	53.9	25.0	970.0	111.0	3.72	0.26
9	70.6	60.6	30.0	940.0	141.0	4.46	0.32
10	77.4	67.4	60.0	880.0	201.0	8.92	0.63
11	84.1	74.1	60.0	820.0	261.0	8.92	0.63
12	90.8	80.8	60.0	760.0	321.0	8.92	0.63
13	97.5	87.5	140.0	620.0	461.0	20.81	1.47
14	104.3	94.3	180.0	440.0	641.0	26.76	1.89
15	111.0	101.0	180.0	260.0	821.0	26.76	1.89
Avg. Shaft			54.7			8.13	0.57
Toe			260.0				16.35

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.25	0.40
Quake	(in)	0.18	0.48
Case Damping Factor		0.46	0.23
Damping Type		Viscous	Sm+Visc
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Soil Plug Weight	(kips)		1.800

CAPWAP match quality = 2.87 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.29 in; Blow Count = 42 b/ft
Computed: Final Set = 0.29 in; Blow Count = 42 b/ft

max. Top Comp. Stress = 3.8 ksi (T= 28.1 ms, max= 1.008 x Top)
max. Comp. Stress = 3.8 ksi (Z= 16.8 ft, T= 29.0 ms)
max. Tens. Stress = -0.38 ksi (Z= 13.5 ft, T= 41.5 ms)
max. Energy (EMX) = 129.2 kip-ft; max. Measured Top Displ. (DMX)= 0.73 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.4	3427.0	-200.1	3.8	-0.22	129.2	7.5	0.77
2	6.7	3433.0	-287.4	3.8	-0.32	129.1	7.5	0.77
4	13.5	3447.3	-339.8	3.8	-0.38	128.9	7.4	0.76
6	20.2	3425.8	-295.9	3.8	-0.33	127.2	7.4	0.75
8	26.9	3403.3	-218.7	3.8	-0.24	125.5	7.4	0.74
10	33.6	3404.0	-218.5	3.8	-0.24	124.6	7.3	0.74
12	40.4	3410.8	-194.8	3.8	-0.22	123.7	7.3	0.73
14	47.1	3406.6	-95.5	3.8	-0.11	121.9	7.2	0.72
16	53.8	3399.8	-42.4	3.8	-0.05	119.7	7.1	0.70
18	60.5	3374.6	-46.8	3.7	-0.05	116.3	7.1	0.69
20	67.3	3362.0	-48.9	3.7	-0.05	113.0	6.9	0.68
22	74.0	3347.2	-60.6	3.7	-0.07	109.1	6.8	0.67
24	80.7	3270.0	-62.2	3.6	-0.07	102.0	7.0	0.66
25	84.1	3317.3	-70.1	3.7	-0.08	101.9	7.4	0.66
26	87.5	3178.7	-61.2	3.5	-0.07	94.9	7.7	0.66
27	90.8	3157.7	-69.3	3.5	-0.08	94.8	7.9	0.66
28	94.2	2927.6	-59.0	3.2	-0.07	87.7	7.9	0.65
29	97.5	2771.6	-64.2	3.1	-0.07	87.7	7.9	0.65
30	100.9	2211.7	-31.8	2.4	-0.04	71.1	8.3	0.65
31	104.3	1936.8	-36.0	2.1	-0.04	71.0	8.6	0.65
32	107.6	1278.3	0.0	1.4	0.00	49.5	8.7	0.64
33	111.0	1322.1	0.0	1.5	0.00	27.8	8.7	0.64
Absolute	16.8			3.8			(T =	29.0 ms)
	13.5				-0.38		(T =	41.5 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	2853.3	2458.8	2064.2	1669.6	1275.0	880.4	485.9	91.3	0.0	0.0
RX	2853.3	2477.6	2153.5	1832.0	1538.0	1311.0	1135.7	1080.9	1080.4	1079.8
RU	2859.6	2465.7	2071.7	1677.8	1283.8	889.9	495.9	102.0	0.0	0.0

RAU = 1057.7 (kips); RA2 = 1321.1 (kips)

Current CAPWAP Ru = 1081.0 (kips); Corresponding J(RP)= 0.45; J(RX) = 0.70

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
7.3	27.90	3264.5	3534.6	3534.8	0.73	0.29	0.29	129.1	3050.8	547

PILE PROFILE AND PILE MODEL

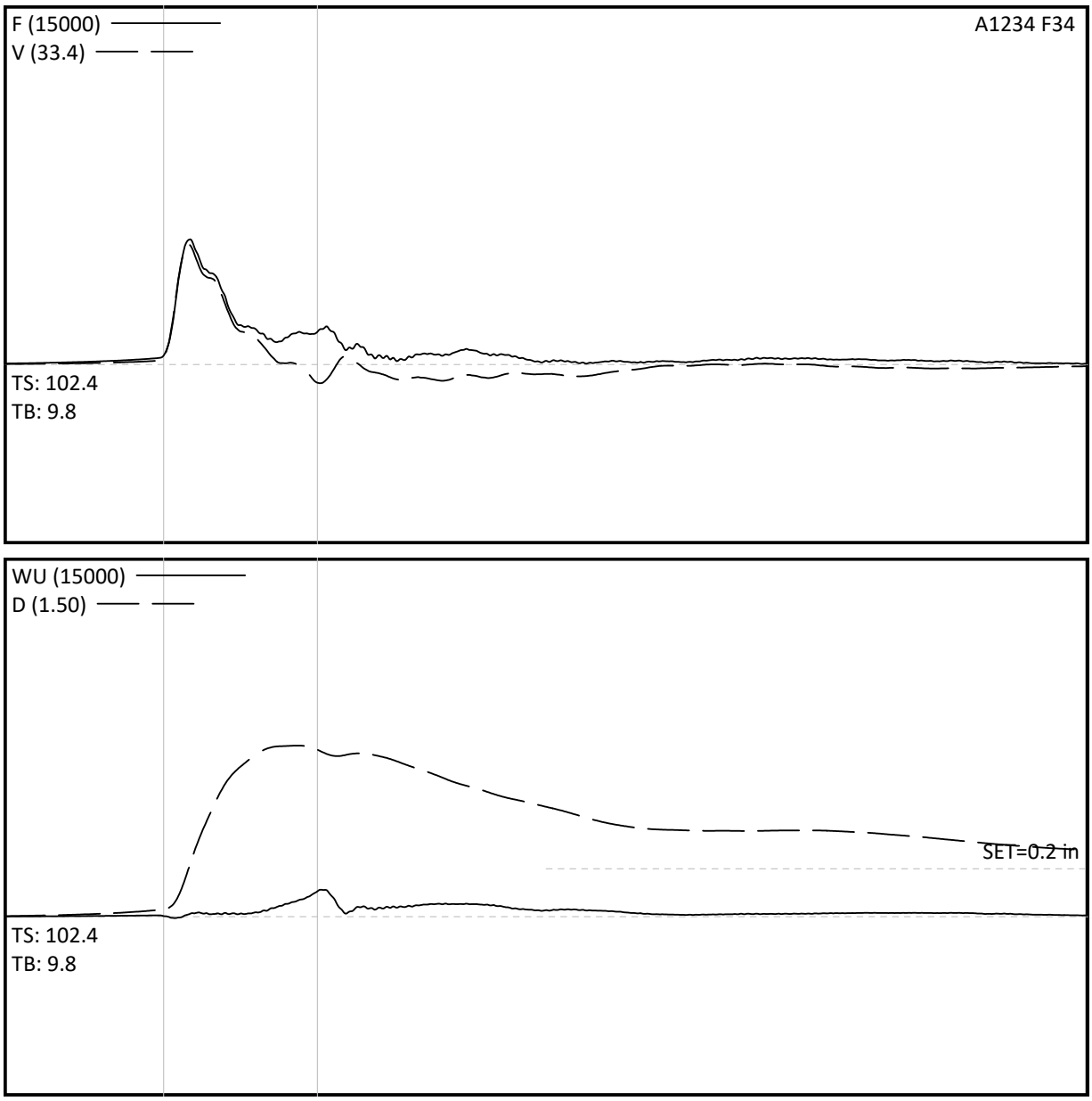
Depth ft	Area ft^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	6.28	7588.8	150.000	14.14
111.0	6.28	7588.8	150.000	14.14

Toe Area 15.90 ft^2

Top Segment Length 3.36 ft, Top Impedance 448 kips/ft/s

Wave Speed: Pile Top 15310.0, Elastic 15310.0, Overall 15310.3 ft/s
Pile Damping 2.00 %, Time Incr 0.220 ms, 2L/c 14.5 ms
Total volume: 697.434 ft^3; Volume ratio considering added impedance: 1.000

I-10 OVER MOBILE RIVER TP-04 1 DAY RESTRIKE



Project Information

PROJECT: I-10 OVER MOBILE RIVER
PILE NAME: TP-04 1 DAY RESTRIKE
DESCR: 54'' DIA, 6'' WALL, 120' LONG
OPERATOR: AFT
FILE: TP-04 1 DAY RESTRIKE ana
4/19/2018 5:31:51 PM
Blow Number 3

Pile Properties

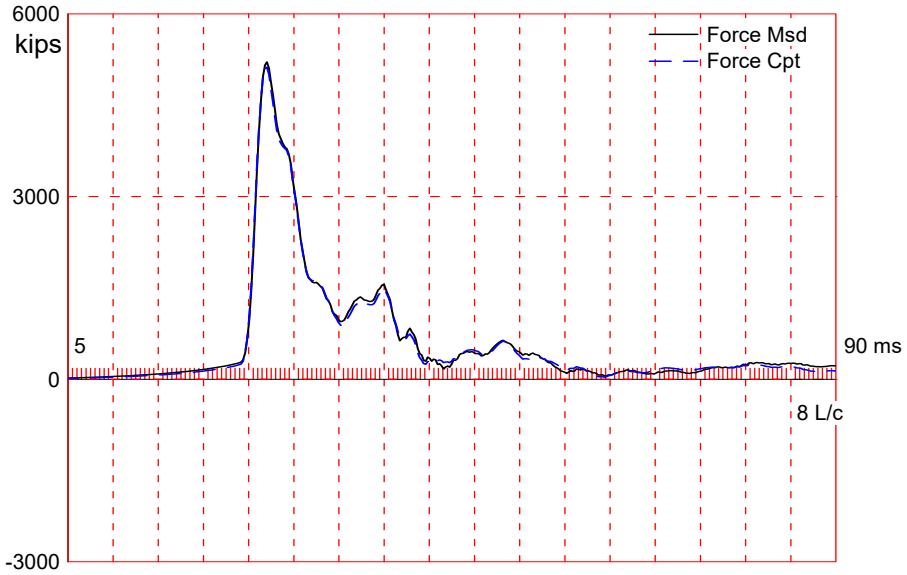
LE	111.00 ft
AR	904.78 in^2
EM	7588.81 ksi
SP	0.150 k/ft3
WS	15310.0 f/s
EA/C	448.5 ksec/ft
2L/C	14.50 ms
JC	0.88 []
LP	120.05 ft

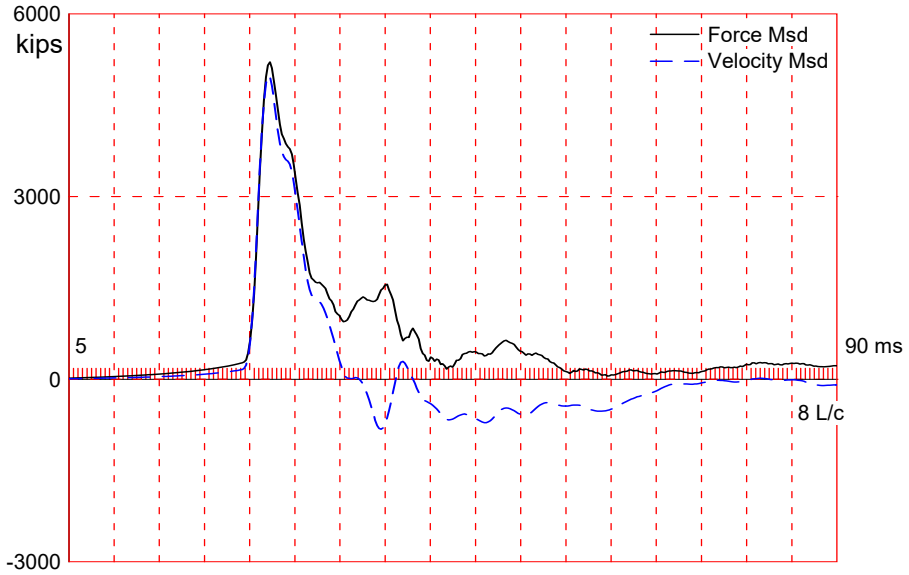
Quantity Results

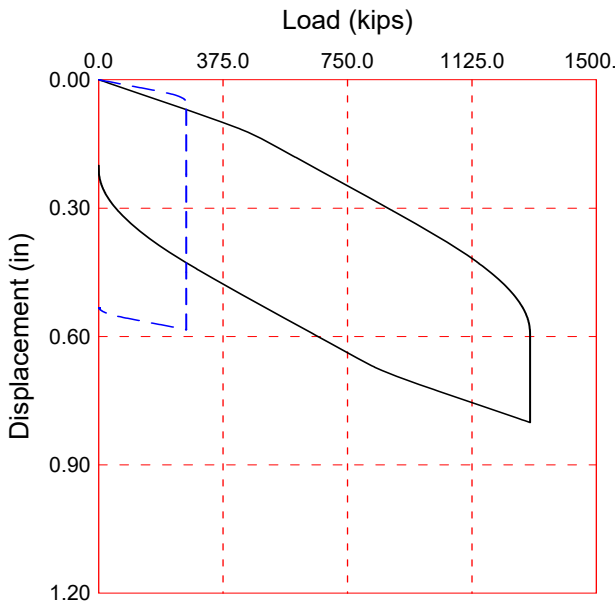
RMX	1263 kips
RX9	1197 kips
RA2	1455 kips
CSX	5.79 ksi
CSB	4.19 ksi
TSX	0.16 ksi
EMX	200.9 k-ft
STK	10.39 ft
BTA	100 (%)

Sensors

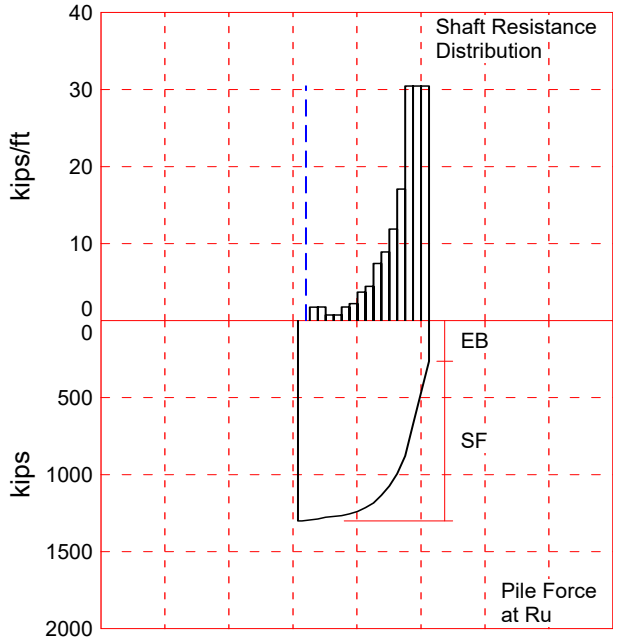
F3: [P454] 145.3 (1)
F4: [P455] 145.8 (1)
A1: [59379] 925 g's/v (1)
A2: [59462] 1055 g's/v (1)
A3: [K5647] 334 mv/5000g's (1)
A4: [K5943] 368 mv/5000g's (1)
CLIP: OK







RU =	1300.0 kips
SF =	1036.0 kips
EB =	264.0 kips
Dy =	0.60 in
Dx =	0.80 in
SET/Bl =	0.20 in



Length b. Sensors	111.0 ft
Embedment	101.0 ft
Top Area	6.28 ft^2
End Bearing Area	15.90 ft^2
Top Perimeter	14.14 ft
Top E-Modulus	7589 ksi
Top Spec. Weight	150.0 lb/ft^3
Top Wave Spd.	15310 ft/s
Overall W.S.	15310 ft/s
Match Quality	1.61
Top Compr. Stress	5.7 ksi
Max Compr. Stress	5.7 ksi
Max Tension Stress	-0.10 ksi
Avg. Shaft Quake	0.30 in
Toe Quake	0.04 in
Avg. Shaft Smith Dpg.	0.40 s/ft
Toe Smith Damping	0.40 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

Generally the CAPWAP analysis is used to estimate the axial compressive pile capacity and the soil resistance distribution. The long-term capacity is best evaluated with restrike tests since they incorporate soil strength changes (set-up gains or relaxation losses) that occur after installation. The calculated load settlement graph does not consider creep or long term consolidation settlements. When uplift is a controlling factor in the design, use of the CAPWAP results to assess uplift capacity should be made only after very careful analysis of only good measurement quality, and further used only with longer pile lengths and with nominally higher safety factors.

CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 1300.0; along Shaft 1036.0; at Toe 264.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf
				1300.0			
1	16.8	6.8	12.0	1288.0	12.0	1.76	0.12
2	23.5	13.5	12.0	1276.0	24.0	1.78	0.13
3	30.3	20.3	5.0	1271.0	29.0	0.74	0.05
4	37.0	27.0	5.0	1266.0	34.0	0.74	0.05
5	43.7	33.7	12.0	1254.0	46.0	1.78	0.13
6	50.5	40.5	15.0	1239.0	61.0	2.23	0.16
7	57.2	47.2	25.0	1214.0	86.0	3.72	0.26
8	63.9	53.9	30.0	1184.0	116.0	4.46	0.32
9	70.6	60.6	50.0	1134.0	166.0	7.43	0.53
10	77.4	67.4	60.0	1074.0	226.0	8.92	0.63
11	84.1	74.1	80.0	994.0	306.0	11.89	0.84
12	90.8	80.8	115.0	879.0	421.0	17.09	1.21
13	97.5	87.5	205.0	674.0	626.0	30.47	2.16
14	104.3	94.3	205.0	469.0	831.0	30.47	2.16
15	111.0	101.0	205.0	264.0	1036.0	30.47	2.16
Avg. Shaft			69.1			10.26	0.73
Toe			264.0				16.60

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.40	0.40
Quake	(in)	0.30	0.04
Case Damping Factor		0.92	0.24
Damping Type		Viscous	Viscous
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Soil Plug Weight	(kips)		0.899

CAPWAP match quality = 1.61 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.20 in; Blow Count = 60 b/ft
Computed: Final Set = 0.23 in; Blow Count = 52 b/ft

max. Top Comp. Stress = 5.7 ksi (T= 27.5 ms, max= 1.010 x Top)
max. Comp. Stress = 5.7 ksi (Z= 16.8 ft, T= 28.3 ms)
max. Tens. Stress = -0.10 ksi (Z= 107.6 ft, T= 53.8 ms)
max. Energy (EMX) = 198.9 kip-ft; max. Measured Top Displ. (DMX)= 0.70 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.4	5133.8	-35.8	5.7	-0.04	198.9	11.3	0.71
2	6.7	5144.5	-35.7	5.7	-0.04	198.5	11.2	0.71
4	13.5	5173.6	-35.8	5.7	-0.04	197.9	11.2	0.69
6	20.2	5137.2	-35.9	5.7	-0.04	194.6	11.1	0.68
8	26.9	5094.7	-36.3	5.6	-0.04	191.1	11.0	0.66
10	33.6	5093.4	-36.3	5.6	-0.04	188.7	11.0	0.64
12	40.4	5104.0	-36.0	5.6	-0.04	186.1	10.9	0.63
14	47.1	5093.9	-35.4	5.6	-0.04	183.5	10.8	0.62
16	53.8	5087.1	-57.0	5.6	-0.06	180.6	10.6	0.62
18	60.5	5056.9	-68.1	5.6	-0.08	176.0	10.4	0.61
20	67.3	5034.7	-68.9	5.6	-0.08	170.8	10.1	0.59
22	74.0	4953.6	-61.2	5.5	-0.07	162.9	9.8	0.58
24	80.7	4882.9	-61.5	5.4	-0.07	154.0	9.4	0.57
25	84.1	5013.4	-72.0	5.5	-0.08	153.7	9.1	0.57
26	87.5	4840.0	-75.6	5.3	-0.08	142.6	8.8	0.56
27	90.8	4982.1	-81.2	5.5	-0.09	142.3	8.4	0.56
28	94.2	4646.2	-80.7	5.1	-0.09	126.7	8.1	0.55
29	97.5	4666.1	-81.0	5.2	-0.09	126.5	8.1	0.55
30	100.9	3799.4	-77.3	4.2	-0.09	99.0	8.6	0.55
31	104.3	3583.0	-76.4	4.0	-0.08	98.9	9.2	0.54
32	107.6	2474.4	-88.9	2.7	-0.10	70.6	9.8	0.54
33	111.0	2244.3	-76.0	2.5	-0.08	42.2	10.0	0.54
Absolute	16.8			5.7			(T =	28.3 ms)
	107.6				-0.10		(T =	53.8 ms)

CASE METHOD

J =	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
RP	5416.2	4937.8	4459.5	3981.1	3502.8	3024.4	2546.1	2067.7	1589.4	1111.1
RX	5416.2	4937.8	4459.5	3981.1	3502.8	3024.4	2546.1	2067.7	1589.4	1236.1
RU	5488.1	5016.9	4545.8	4074.6	3603.5	3132.3	2661.2	2190.0	1718.9	1247.7

RAU = 1069.0 (kips); RA2 = 1504.4 (kips)

Current CAPWAP Ru = 1300.0 (kips); Corresponding J(RP)= 0.86; J(RX) = 0.88

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
11.2	27.02	5008.6	5191.0	5236.5	0.70	0.20	0.20	199.2	5288.6	6706

PILE PROFILE AND PILE MODEL

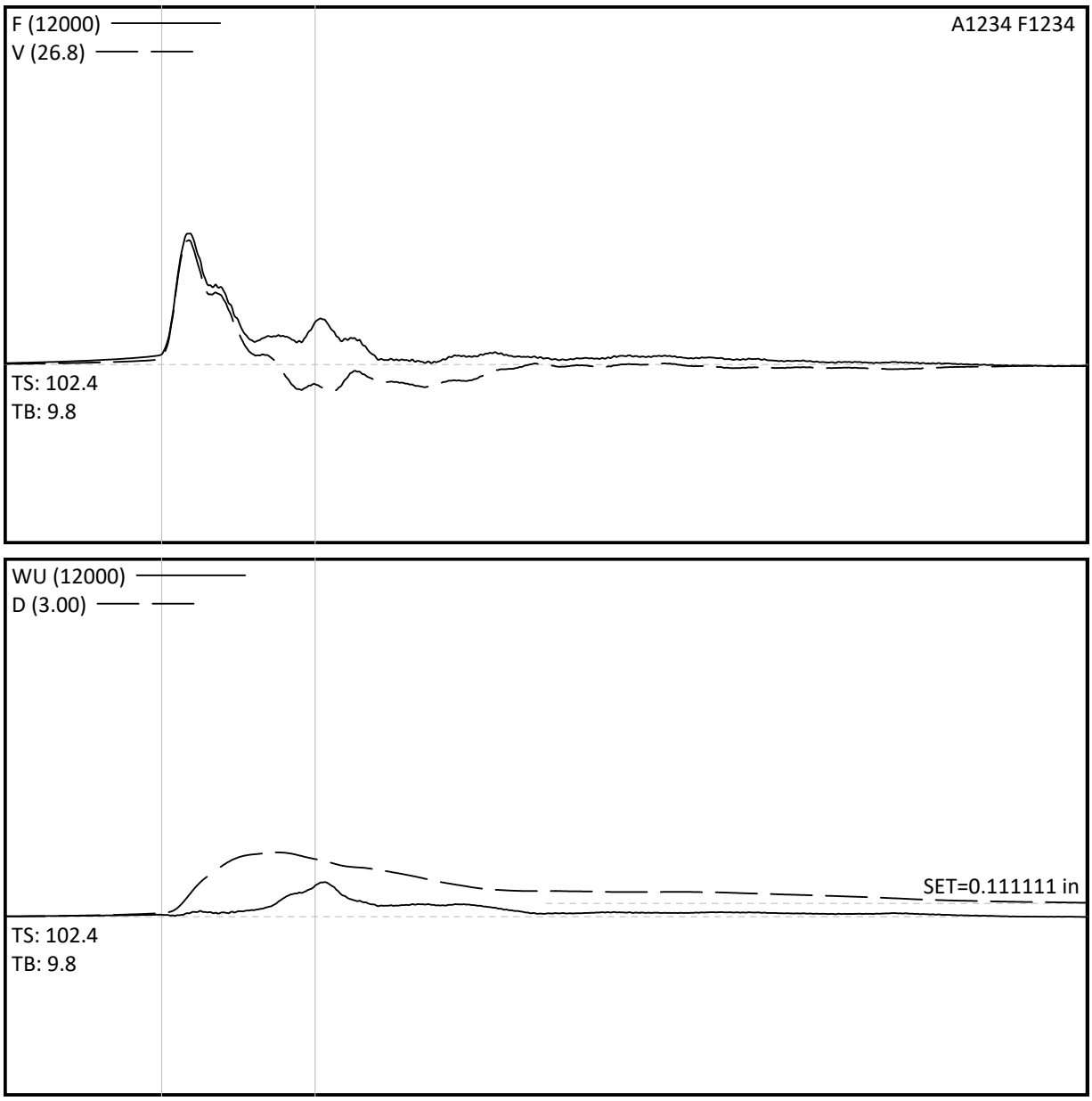
Depth ft	Area ft^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	6.28	7588.8	150.000	14.14
111.0	6.28	7588.8	150.000	14.14

Toe Area 15.90 ft^2

Top Segment Length 3.36 ft, Top Impedance 448 kips/ft/s

Wave Speed: Pile Top 15310.0, Elastic 15310.0, Overall 15310.3 ft/s
Pile Damping 2.00 %, Time Incr 0.220 ms, 2L/c 14.5 ms
Total volume: 697.434 ft^3; Volume ratio considering added impedance: 1.000

I-10 MOBILE RIVER TP-04 14 DAY RESTRIKE



Project Information

PROJECT: I-10 MOBILE RIVER
PILE NAME: TP-04 14 DAY RESTRIKE
DESCR: 54'' CYL, 120' LONG
OPERATOR: AFT
FILE: TP-04 14 DAY RESTRIKE ana
5/2/2018 9:17:51 AM
Blow Number 5

Pile Properties

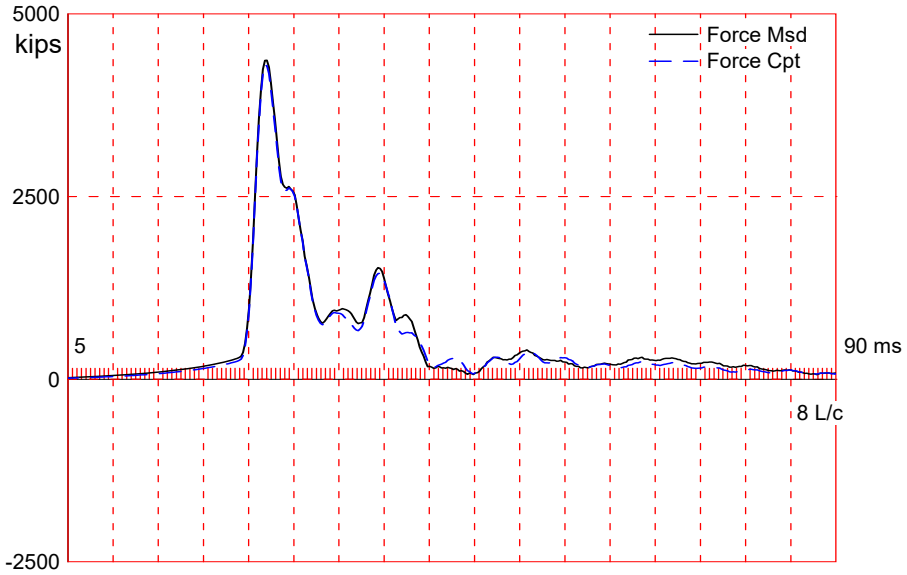
LE 111.00 ft
AR 904.78 in^2
EM 7588.81 ksi
SP 0.150 k/ft3
WS 15310.0 f/s
EA/C 448.5 ksec/ft
2L/C 14.50 ms
JC 0.99 []
LP 120.46 ft

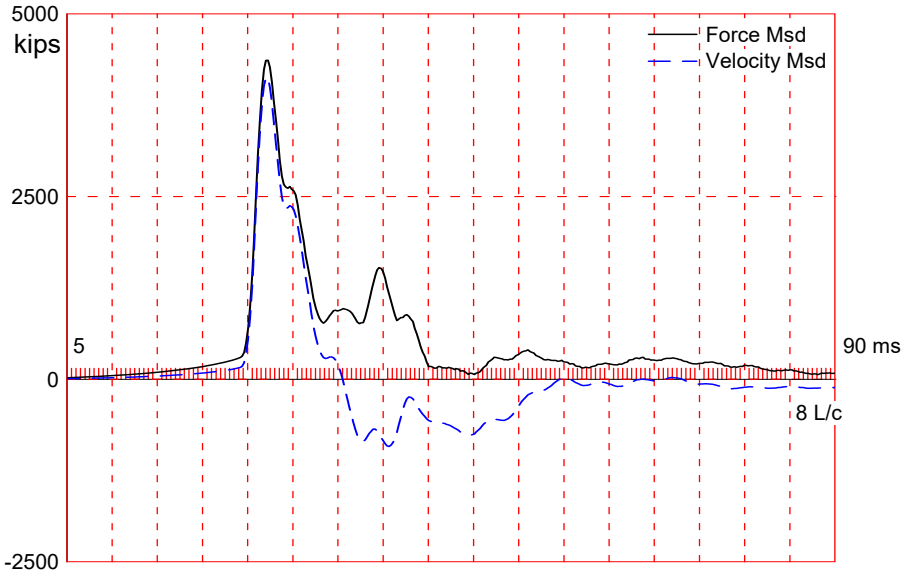
Quantity Results

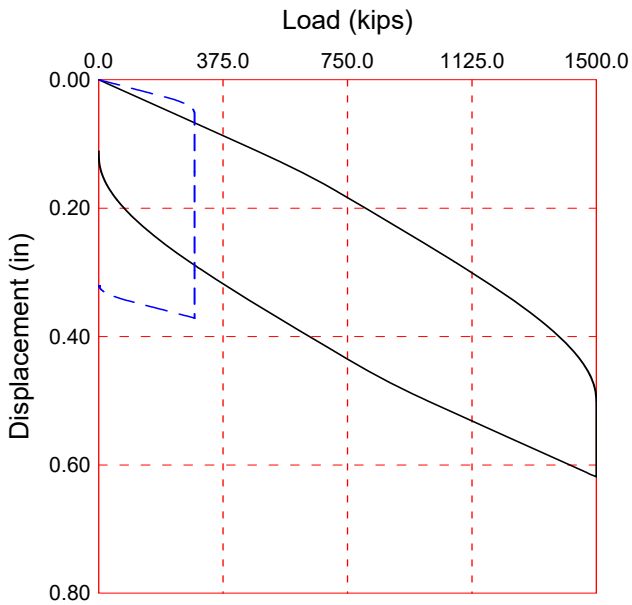
RMX 1455 kips
RX10 1419 kips
RA2 1148 kips
CSX 4.85 ksi
CSB 3.93 ksi
TSX 0.28 ksi
EMX 125.4 k-ft
STK 8.48 ft
BTA 100 (%)

Sensors

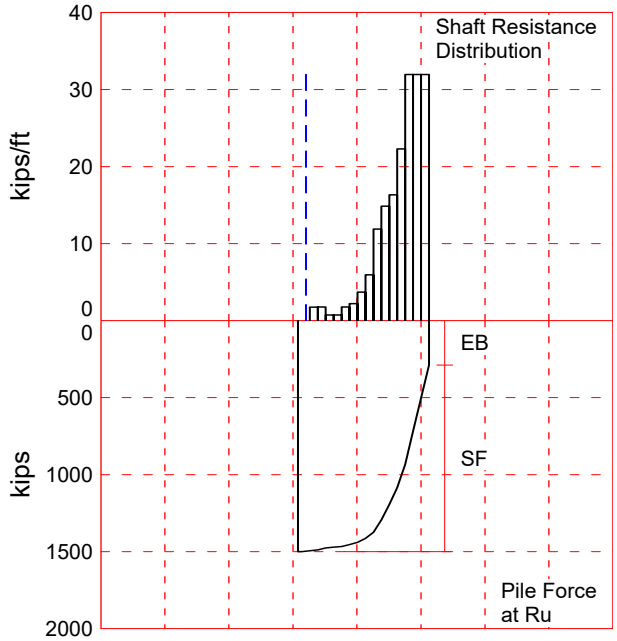
F1: [E655] 92.7 (1)
F2: [J762] 93.9 (1)
F3: [P454] 145.3 (1)
F4: [P455] 145.8 (1)
A1: [59379] 925 g's/v (1)
A2: [59462] 1055 g's/v (1)
A3: [K5647] 334 mv/5000g's (1)
A4: [K5943] 368 mv/5000g's (1)
CLIP: OK







RU =	1500.0 kips
SF =	1211.0 kips
EB =	289.0 kips
Dy =	0.51 in
Dx =	0.62 in
SET/Bl =	0.11 in



Length b. Sensors	111.0 ft
Embedment	101.0 ft
Top Area	6.28 ft^2
End Bearing Area	15.90 ft^2
Top Perimeter	14.14 ft
Top E-Modulus	7589 ksi
Top Spec. Weight	150.0 lb/ft^3
Top Wave Spd.	15310 ft/s
Overall W.S.	15310 ft/s
Match Quality	2.35
Top Compr. Stress	4.8 ksi
Max Compr. Stress	4.8 ksi
Max Tension Stress	-0.19 ksi
Avg. Shaft Quake	0.20 in
Toe Quake	0.04 in
Avg. Shaft Smith Dpg.	0.40 s/ft
Toe Smith Damping	0.40 s/ft

About the CAPWAP Results

The CAPWAP program performs a signal matching or reverse analysis based on measurements taken on a deep foundation under an impact load. The program is based on a one-dimensional mathematical model. Under certain conditions, the model only crudely approximates the often complex dynamic situations.

The CAPWAP analysis relies on the input of accurately measured dynamic data plus additional parameters describing pile and soil behavior. If the field measurements of force and velocity are incorrect or were taken under inappropriate conditions (e.g., at an inappropriate time or with too much or too little energy) or if the input pile model is incorrect, then the solution cannot represent the actual soil behavior.

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CAPWAP is also used to evaluate driving stresses along the length of the pile. However, it should be understood that the analysis is one dimensional and does not take into account bending effects or local contact stresses at the pile toe.

Furthermore, if the user of this software was not able to produce a solution with satisfactory signal “match quality” (MQ), then the associated CAPWAP results may be unreliable. There is no absolute scale for solution acceptability but solutions with MQ above 5 are generally considered less reliable than those with lower MQ values and every effort should be made to improve the analysis, for example, by getting help from other independent experts.

Considering the CAPWAP model limitations, the nature of the input parameters, the complexity of the analysis procedure, and the need for a responsible application of the results to actual construction projects, it is recommended that at least one static load test be performed on sites where little experience exists with dynamic behavior of the soil resistance or when the experience of the analyzing engineer with both program use and result application is limited.

Finally, the CAPWAP capacities are ultimate values. They MUST be reduced by means of an appropriate factor of safety to yield a design or working load. The selection of a factor of safety should consider the quality of the construction control, the variability of the site conditions, uncertainties in the loads, the importance of structure and other factors. The CAPWAP results should be reviewed by the Engineer of Record with consideration of applicable geotechnical conditions including, but not limited to, group effects, potential settlement from underlying compressible layers, soil resistances provided from any layers unsuitable for long term support, as well as effective stress changes due to soil surcharges, excavation or change in water table elevation.

The CAPWAP analysis software is one of many means by which the capacity of a deep foundation can be assessed. The engineer performing the analysis is responsible for proper software application and the analysis results. Pile Dynamics accepts no liability whatsoever of any kind for the analysis solution and/or the application of the analysis result.

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 1500.0; along Shaft 1211.0; at Toe 289.0 kips

Soil Sgmnt No.	Dist. Below Gages ft	Depth Below Grade ft	Ru kips	Force in Pile kips	Sum of Ru kips	Unit Resist. (Depth) kips/ft	Unit Resist. (Area) ksf
				1500.0			
1	16.8	6.8	12.0	1488.0	12.0	1.76	0.12
2	23.5	13.5	12.0	1476.0	24.0	1.78	0.13
3	30.3	20.3	5.0	1471.0	29.0	0.74	0.05
4	37.0	27.0	5.0	1466.0	34.0	0.74	0.05
5	43.7	33.7	12.0	1454.0	46.0	1.78	0.13
6	50.5	40.5	15.0	1439.0	61.0	2.23	0.16
7	57.2	47.2	25.0	1414.0	86.0	3.72	0.26
8	63.9	53.9	40.0	1374.0	126.0	5.95	0.42
9	70.6	60.6	80.0	1294.0	206.0	11.89	0.84
10	77.4	67.4	100.0	1194.0	306.0	14.86	1.05
11	84.1	74.1	110.0	1084.0	416.0	16.35	1.16
12	90.8	80.8	150.0	934.0	566.0	22.30	1.58
13	97.5	87.5	215.0	719.0	781.0	31.96	2.26
14	104.3	94.3	215.0	504.0	996.0	31.96	2.26
15	111.0	101.0	215.0	289.0	1211.0	31.96	2.26
Avg. Shaft			80.7			11.99	0.85
Toe			289.0				18.17

Soil Model Parameters/Extensions		Shaft	Toe
Smith Damping Factor		0.40	0.40
Quake	(in)	0.20	0.04
Case Damping Factor		1.08	0.26
Damping Type		Viscous	Sm+Visc
Unloading Quake	(% of loading quake)	89	30
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	0	
Soil Plug Weight	(kips)		4.900

CAPWAP match quality = 2.35 (Wave Up Match) ; RSA = 0
Observed: Final Set = 0.11 in; Blow Count = 108 b/ft
Computed: Final Set = 0.11 in; Blow Count = 108 b/ft

max. Top Comp. Stress = 4.8 ksi (T= 27.5 ms, max= 1.019 x Top)
max. Comp. Stress = 4.8 ksi (Z= 70.6 ft, T= 31.9 ms)
max. Tens. Stress = -0.19 ksi (Z= 63.9 ft, T= 54.3 ms)
max. Energy (EMX) = 124.8 kip-ft; max. Measured Top Displ. (DMX)= 0.53 in

EXTREMA TABLE

Pile Sgmnt No.	Dist. Below Gages ft	max. Force kips	min. Force kips	max. Comp. Stress ksi	max. Tens. Stress ksi	max. Trnsfd. Energy kip-ft	max. Veloc. ft/s	max. Displ. in
1	3.4	4299.8	-60.9	4.8	-0.07	124.8	9.4	0.55
2	6.7	4310.4	-60.9	4.8	-0.07	124.5	9.3	0.55
4	13.5	4338.1	-60.6	4.8	-0.07	123.8	9.3	0.53
6	20.2	4307.7	-60.0	4.8	-0.07	121.5	9.2	0.52
8	26.9	4272.6	-59.7	4.7	-0.07	119.3	9.2	0.50
10	33.6	4274.3	-59.6	4.7	-0.07	117.8	9.1	0.49
12	40.4	4286.6	-61.4	4.7	-0.07	116.1	9.0	0.47
14	47.1	4281.7	-58.1	4.7	-0.06	113.3	8.9	0.45
16	53.8	4289.0	-90.8	4.7	-0.10	109.9	8.7	0.43
18	60.5	4297.3	-152.5	4.7	-0.17	105.1	8.5	0.40
20	67.3	4292.7	-164.1	4.7	-0.18	100.1	8.1	0.39
22	74.0	4165.1	-145.2	4.6	-0.16	93.2	7.7	0.38
24	80.7	4006.9	-106.9	4.4	-0.12	85.3	7.3	0.37
25	84.1	4126.1	-117.1	4.6	-0.13	85.2	7.0	0.37
26	87.5	3891.6	-116.6	4.3	-0.13	77.3	6.8	0.37
27	90.8	4029.8	-129.5	4.5	-0.14	77.1	6.4	0.36
28	94.2	3700.6	-125.4	4.1	-0.14	66.9	6.1	0.36
29	97.5	3793.1	-132.8	4.2	-0.15	66.8	5.8	0.36
30	100.9	3208.3	-131.6	3.5	-0.15	52.7	5.8	0.35
31	104.3	3143.4	-131.4	3.5	-0.15	52.7	6.1	0.35
32	107.6	2378.1	-134.8	2.6	-0.15	38.5	6.7	0.35
33	111.0	2119.3	-122.3	2.3	-0.14	23.5	7.2	0.35
Absolute	70.6			4.8			(T =	31.9 ms)
	63.9				-0.19		(T =	54.3 ms)

CASE METHOD

J =	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8
RP	4991.9	4285.0	3578.0	2871.1	2164.1					
RX	4991.9	4285.0	3578.0	2871.1	2164.1	1457.2	839.3	819.6	810.1	810.1
RU	5105.3	4421.0	3736.7	3052.4	2368.2					

RAU = 810.1 (kips); RA2 = 1153.2 (kips)

Current CAPWAP Ru = 1500.0 (kips); Corresponding J(RP)= 0.00; J(RX) = 0.99

VMX	TVP	VT1*Z	FT1	FMX	DMX	DFN	SET	EMX	QUS	KEB
ft/s	ms	kips	kips	kips	in	in	in	kip-ft	kips	kips/in
9.3	27.02	4153.0	4373.7	4385.3	0.53	0.11	0.11	125.0	4654.0	7407

PILE PROFILE AND PILE MODEL

Depth ft	Area ft^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.0	6.28	7588.8	150.000	14.14
111.0	6.28	7588.8	150.000	14.14

Toe Area 15.90 ft^2

Top Segment Length 3.36 ft, Top Impedance 448 kips/ft/s

Wave Speed: Pile Top 15310.0, Elastic 15310.0, Overall 15310.3 ft/s
Pile Damping 2.00 %, Time Incr 0.220 ms, 2L/c 14.5 ms
Total volume: 697.434 ft^3; Volume ratio considering added impedance: 1.000

Appendix D

Relevant Project Documents
TP-04

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

REFERENCE PROJECT NO.	FISCAL YEAR	SHEET NO.
IM-1010(341)	2018	2

GENERAL PROJECT NOTES

200 THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS DIRECTLY TO THE MATERIALS AND TESTS ENGINEER OF ALL RAPID LOAD TESTS, SHAFT LOAD TESTS AND STATIC LOAD TESTS FOR APPROVAL.

201 THE CONTRACTOR SHALL PROVIDE REPORTS TO THE MATERIALS AND TESTS ENGINEER OF ALL STATIC LOAD TESTS, RAPID LOAD TESTS AND DYNAMIC TESTS, PREPARED BY SPECIALTY ENGINEERING FIRMS.

202 THE CONTRACTOR SHALL SUBMIT AN INSTALLATION PLAN FOR REVIEW AND APPROVAL FOR ALL TEST PILES IN THIS PROJECT.

301 LOCATION TP-10:

ALL FOUR TEST PILES SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO PLANNED TIP ELEVATION OR TO REFUSAL, WHICHEVER COMES FIRST (NO JETTING).
CONTRACTOR SHALL PLAN TO RESTRIKE MEASUREMENT ON EACH PILE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT APPROXIMATELY 1 DAY AFTER INITIAL DRIVE.
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON PILES TP-10A-1 AND TP-10B-1 FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT APPROXIMATELY 7 DAYS AFTER INITIAL DRIVE.
CONTRACTOR SHALL PERFORM STATIC LOAD TEST ON PILES TP-10A-2 AND TP-10B-2 IN ACCORDANCE WITH APPLICABLE SPECIAL PROVISIONS
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON PILES TP-10A-2 AND TP-10B-2 FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS WITHIN 7 DAYS AFTER STATIC LOAD TEST.

302 LOCATION TP-WPA STEEL PIPE PILE:

PILE MAY BE INSTALLED WITH ONE SPLICE, AND FINAL PIECE SHALL NOT BE LESS THAN 75 FT IN LENGTH.

VIBRATORY HAMMER MAY BE USED TO INSTALL FIRST PIECE, AFTER SPLICING THE PILE SHALL BE DRIVEN TO THE TARGET TIP ELEVATION USING IMPACT HAMMER.

CONTRACTOR TO PROVIDE HAMMER SUFFICIENT TO DRIVE PILE TO TIP WITH WAVE EQUATION ANALYSIS PER ALDOT SPECS, WITH TARGETED DRIVING RESISTANCE AT END OF INITIAL DRIVE NOT MORE THAN 10 BLOWS PER INCH.

DYNAMIC MONITORING OF PILE USING PDA DURING INSTALLATION AFTER SPLICE, WITH SIGNAL MATCHING ANALYSIS ON SELECTED BLOWS NEAR END OF INITIAL DRIVE.

RAPID LOAD TEST OF PILE USING 19MN RAPID LOAD TEST DEVICE BETWEEN 10 AND 21 DAYS AFTER INITIAL DRIVE.

RESTRIKE BLOWS FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS WITHIN ONE WEEK AFTER COMPLETION OF RAPID LOAD TEST (RLT).

303 LOCATION TP-WPB DRILLED SHAFT:

CONTRACTOR TO PERFORM LATERAL RAPID LOAD TESTS USING RAPD LOAD TEST DEVICE AFTER COMPLETION OF AXIAL LOAD TEST(S); LATERAL RLT SHALL BE CAPABLE TO APPLY A LATERAL FORCE OF AT LEAST 1000 KIPS. LATERAL RLT SHALL BE PERFORMED IN FOUR PROGRESSIVELY LARGER INCREMENTS UP TO MAXIMUM FORCE.

LATERAL RLT SHALL INCLUDE MEASUREMENTS OF FORCE AND TOP OF SHAFT DISPLACEMENT AND OF DISPLACEMENT AT NOT LESS THAN 6 ELEVATIONS BELOW TOP OF SHAFT.

TEST SHAFT SHALL BE CONSTRUCTED USING POLYMER BASED DRILLING FLUIDS, WITH ON-SITE SUPPORT FROM FLUID SUPPLIER.

304 LOCATION TP-04:

JETTING OF TP-04 ALLOWED (BUT NOT REQUIRED) TO ELEVATION -70FT
PILE SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO TIP ELEVATION -110FT OR TO REFUSAL, WHICHEVER COMES FIRST
CONTRACTOR SHALL PLAN FOR UP TO TWO RESTRIKE MEASUREMENTS ON THIS PILE AT APPROXIMATELY 1 DAY AND 14 DAYS AFTER INITIAL DRIVE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS.

305 LOCATION TP-23:

JETTING OF TP-23A SHOULD BE PERFORMED TO ELEVATION -100FT
JETTING OF TP-23B AND TP-23C ALLOWED (BUT NOT REQUIRED) TO ELEVATION -70FT
PILE SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO PLANNED TIP ELEVATION OR TO REFUSAL, WHICHEVER COMES FIRST. PLANNED TIP ELEVATION:
TP-23A: -130
TP-23B: -100
TP-23C: -100
CONTRACTOR SHALL PLAN FOR RESTRIKE MEASUREMENT ON EACH PILE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS AT ONE DAY AFTER INITIAL DRIVE AND WITHIN ONE WEEK AFTER COMPLETION OF RAPID LOAD TEST (RLT).
RAPID LOAD TEST OF EACH PILE USING 19MN RAPID LOAD TEST DEVICE NOT SOONER THAN 2 WEEKS AFTER INITIAL DRIVE.

306 LOCATION TP-111:

FOR TP-111A, JETTING IS ALLOWED (BUT NOT REQUIRED) TO ELEVATION -60FT
FOR TP-111B, JETTING SHALL BE PERFORMED TO ELEVATION -90FT
BOTH PILES SHALL BE IMPACT DRIVEN WITH PDA MONITORING TO TIP ELEVATION -120FT OR TO REFUSAL, WHICHEVER COMES FIRST
CONTRACTOR SHALL PLAN FOR UP TO TWO RESTRIKE MEASUREMENTS ON THESE PILES AT APPROXIMATELY 1 DAY AND 14 DAYS AFTER INITIAL DRIVE FOR DYNAMIC LOAD TESTING AND SIGNAL MATCHING ANALYSIS.

307 TEST PILES TP-WPA AND TP-WPB SHALL BE PLACED WITHIN THE LIMITS AN EXPLORATION TRENCH. IF REQUIRED SPACING IS NOT ADEQUATE IN ONE TRENCH, ONE OF THE PILES MAY BE PLACED IN AN ADJACENT EXPLORATION TRENCH.

308 THE CONTRACTOR SHALL CONTACT BILL TURNER (334-242-6144) WITH THE ENVIRONMENTAL TECHNICAL SECTION OF THE ALABAMA DEPARTMENT OF TRANSPORTATION NO LATER THAN TWO (2) WEEKS PRIOR TO STARTING WORK IN ORDER TO MAKE SURE THE EXPLORATION TRENCHES ARE MARKED AND VISIBLE.

800 IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE VARIOUS UTILITY OWNERS AND DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES ON THIS PROJECT WHETHER SHOWN ON THE PLANS OR NOT. THE LOCATION OF ANY REQUIRED GUARDRAIL, SIGNS, FOOTINGS OF ANY NATURE AND/OR ELECTRICAL/COMMUNICATIONS CONDUITS MAY BE ADJUSTED AS DIRECTED BY THE ENGINEER TO PREVENT ANY CONFLICTS WITH THESE UTILITIES. UTILITY LINE LOCATE REQUESTS WILL BE LIMITED TO INCREMENTS NOT TO EXCEED 2000 LINEAR FEET PER WORKING DAY OPERATIONS. MULTIPLE REQUESTS WILL BE REQUIRED FOR PROJECTS GREATER THAN 2000 LINEAR FEET IN LENGTH.

900 NPDES PERMIT COVERAGE NOT REQUIRED FOR THIS PROJECT.

901 THERE SHALL BE NO FUEL TANKS STORED ON THE RIGHT OF WAY. IN ADDITION, FUEL TRUCKS OR VEHICLES TRANSPORTING CHEMICALS, FERTILIZER, ETC., NOT SHALL BE LEFT UNATTENDED ON THE RIGHT OF WAY.

902 THE CONTRACTOR SHALL FOLLOW ALL REQUIREMENTS CONTAINED WITHIN THE ARMY CORPS OF ENGINEERS PERMIT AND ANY REQUIREMENTS FROM U.S. FISH AND WILDLIFE SERVICE.

903 THE CONTRACTOR SHALL FOLLOW THE ALDOT STANDARD MANTEE CONSTRUCTION CONDITIONS LISTED BELOW:

A. THE LEAD PROJECT PROPONENT/CONTRACTOR SHALL INSTRUCT ALL PERSONNEL ASSOCIATED WITH THE PROJECT OF THE POTENTIAL PRESENCE OF MANATEES AND THE NEED TO AVOID COLLISIONS WITH MANATEES. ALL CONSTRUCTION PERSONNEL ARE RESPONSIBLE FOR OBSERVING WATER-RELATED ACTIVITIES FOR THE PRESENCE OF MANATEES. THE U.S. FISH AND WILDLIFE SERVICE WOULD RECOMMEND HIRING AN INDIVIDUAL FAMILIAR WITH THIS SPECIES TO ACT AS A SPOTTER FOR MANATEES DURING IN-WATER ACTIVITIES.

B. THE LEAD PROJECT PROPONENT/CONTRACTOR SHALL ADVISE ALL CONSTRUCTION PERSONNEL THAT THERE ARE CIVIL AND CRIMINAL PENALTIES FOR HARMING, HARASSING, OR KILLING MANATEES WHICH ARE PROTECTED UNDER THE MARINE MAMMAL PROTECTION ACT OF 1972 AND THE ENDANGERED SPECIES ACT OF 1973.

C. SILTATION BARRIERS SHALL BE MADE OF MATERIAL IN WHICH MANATEES CANNOT BECOME ENTANGLED, ARE PROPERLY SECURED, AND ARE REGULARLY MONITORED TO AVOID MANATEE ENTRAPMENT. BARRIERS MUST NOT BLOCK MANATEE ENTRY TO, OR EXIT FROM, ESSENTIAL HABITAT.

D. ALL VESSELS ASSOCIATED WITH THE CONSTRUCTION PROJECT SHALL OPERATE AT "NO WAKE/IDLE" SPEEDS AT ALL TIMES WHILE IN THE CONSTRUCTION AREA AND WHILE IN WATER WHERE THE DRAFT OF THE VESSEL PROVIDES LESS THAN A FOUR-FOOT CLEARANCE FROM THE BOTTOM. ALL VESSELS WILL FOLLOW ROUTES OF DEEP WATER WHENEVER POSSIBLE.

E. IF MANATEES ARE SEEN WITHIN 100 YARDS OF THE ACTIVE DAILY CONSTRUCTION/DREDGING OPERATION OR VESSEL MOVEMENT, ALL APPROPRIATE PRECAUTIONS SHALL BE IMPLEMENTED TO ENSURE THEIR PROTECTION. THESE PRECAUTIONS SHALL INCLUDE THE OPERATION OF ALL MOVING EQUIPMENT NO CLOSER THAN 50 FEET OF A MANATEE. OPERATION OF ANY EQUIPMENT CLOSER THAN 50 FEET TO A MANATEE SHALL NECESSITATE IMMEDIATE SHUTDOWN OF THAT EQUIPMENT. ACTIVITIES WILL NOT RESUME UNTIL THE MANATEE(S) HAS DEPARTED THE PROJECT AREA OF ITS OWN VOLITION.

F. ANY COLLISION WITH AND/OR INJURY TO A MANATEE SHALL BE REPORTED IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE IN DAPHNE (251-441-5181).

G. TEMPORARY SIGNS CONCERNING THE MANATEES SHALL BE POSTED PRIOR TO AND DURING ALL CONSTRUCTION/DREDGING ACTIVITIES. ALL SIGNS ARE TO BE REMOVED BY THE LEAD PROJECT PROPONENT/CONTRACTOR UPON COMPLETION OF THE PROJECT. A SIGN MEASURING AT LEAST 3 FT. BY 4 FT. WHICH READS CAUTION: MANATEE AREA WILL BE POSTED IN A LOCATION PROMINENTLY VISIBLE TO WATER RELATED CONSTRUCTION CREWS. A SECOND SIGN SHOULD BE POSTED IF VESSELS ARE ASSOCIATED WITH THE CONSTRUCTION, AND SHOULD BE PLACED VISIBLE TO THE VESSEL OPERATOR. THE SECOND SIGN SHOULD BE AT LEAST 8" BY 11" WHICH READS CAUTION: MANATEE HABITAT. IDLE SPEED IS REQUIRED IF OPERATING A VESSEL IN THE CONSTRUCTION AREA. ALL EQUIPMENT MUST BE SHUTDOWN IF A MANATEE COMES WITHIN 50 FEET OF OPERATION. ANY COLLISION WITH AND/OR INJURY TO A MANATEE SHALL BE REPORTED IMMEDIATELY TO THE U.S. FISH AND WILDLIFE SERVICE IN DAPHNE (251-441-5181).

904-914 OMIT

915 BASIN BOOM SHALL BE REUSED AS NECESSARY AT EACH LOCATION (WATER).

CURRENT ALABAMA DEPARTMENT OF TRANSPORTATION

REVISIONS

ALABAMA DEPARTMENT OF TRANSPORTATION
1409 COLISEUM BOULEVARD
MONTGOMERY, AL 36130-3050

GENERAL PROJECT NOTES

DRAWN BY: _____
DATE DRAWN: _____

SPECIAL DRAWING NO.

INDEX NO.

PILE TIP ELEVATIONS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
IM-I010(341)	2018	2A

PILE TIP ELEVATIONS AND TARGETED NOMINAL RESISTANCE

TEST PILE	PILE TYPE	STATION	SIDE	OFFSET	PILE LENGTH (FT)	TARGETED NOMINAL RESISTANCE (kips)	ESTIMATED TIP ELEVATION (FT)	MINIMUM TIP ELEVATION (FT)
TP-10A-1	HP 14X89	STATION 469+20.00	RT	110	82	300	-65	
TP-10A-2	HP 14X89	STATION 469+20.00	RT	111	82	300	-65	
TP-10B-1	18" PPC SQUARE	STATION 469+60.00	RT	110	77	650	-60	
TP-10B-2	18" PPC SQUARE	STATION 469+60.00	RT	110	77	650	-60	
TP-WPA	60" STEEL PIPE	STATION 513+33.00	LT	100	175	3100	-170	
TP-WPB	72" DRILLED SHAFT	STATION 513+53.00	LT	100	177	N/A	-170	
TP-04	54" PPC CYLINDRICAL	STATION 574+00.00	LT	150	120	3100	-110	-80
TP-23A	54" PPC CYLINDRICAL	STATION 629+57.00	LT	150	140	3100	-130	
TP-23B	54" PPC CYLINDRICAL	STATION 630+00.00	LT	150	110	3100	-100	
TP-23C	30" PPC SQUARE	STATION 630+43.00	LT	150	110	1500	-100	
TP-111A	54" PPC CYLINDRICAL	STATION 897+50.00	RT	150	130	3100	-120	
TP-111B	54" PPC CYLINDRICAL	STATION 898+00.00	RT	150	130	3100	-120	

RESPONSIBLE PE:	SUPERVISOR:	DESIGNER:	PLAN SUBMITTAL	ALABAMA DEPARTMENT OF TRANSPORTATION		SHEET TITLE	ROUTE
DATE:	DATE:	DATE:				PILE TIP ELEVATIONS	I-10

PLAN SHEET

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
IM-I010(341)	2018	6

PROJECT NOTES

201, 303

TP-04
54" PPC
CYLINDRICAL
PILE LOAD
TEST

PRES ROW

575+00

WB I-10

580+00

585+00

STA 571+00

STA 586+00

EB I-10

400' ROW

PRES ROW

AT BAY

PRES ROW

POLECAT BAY

NOTE: SEE SHEET 2A FOR
PILE TIP ELEVATIONS

RESPONSIBLE PE:	SUPERVISOR:	DESIGNER:	PLAN SUBMITTAL	ALABAMA DEPARTMENT OF TRANSPORTATION	HORIZ 50 0 50 SCALE (FEET)	SHEET TITLE	ROUTE
DATE:	DATE:	DATE:				PLAN SHEET STA 571+00 TO STA 586+00	I-10

REFERENCE PROJECT NUMBER	FISCAL YEAR	SHEET NUMBER
IM-I010(341)	2018	22

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
0		Very soft, wet, black, FAT CLAY (CH)		0.0	SS-1	0	0	0	0	
	-5.0	Very soft, wet, black, with trace sand and trace organics, FAT CLAY (CH, A-7-5(146)), LL=174 PL=54 PI=120 NMC=209.0 %#200=98.5		1.5	SS-2	0	0	0	0	
		Very soft		3.0	SS-3	0	0	0	0	
5.0		Very soft, wet, dark gray, SILT with SAND (ML)		4.5	SS-4	0	0	0	0	
	-10.0	Very soft, with trace shells		6.0	SS-5	0	0	0	0	
10.0		Very soft, wet, gray, with trace organics, SANDY SILT (ML, A-4(0)), LL=NP PL=NP PI=NP NMC=31.5 %#200=58.9		8.5	SS-6	0	0	0	0	
	-15.0									
		Very soft, wet, gray, SANDY FAT CLAY (CH)		13.5	SS-7	0	0	0	0	
15.0										
	-20.0			18.0	ST-1					
20.0		Undisturbed sample obtained from 18.0 to 20.0 feet Approximately 24 inches of recovery Soft, wet, gray, SANDY FAT CLAY (CH, A-7-6(30)), LL=63 PL=18 PI=45 NMC=51.6 %#200=69.5								
	-25.0									
		Very loose, wet, dark gray, fine grained, CLAYEY SAND (SC, A-7-6(9)), LL=46 PL=18 PI=28 NMC=38.2 %#200=48.7		23.5	SS-8	0	0	1	1	
25.0	-30.0									
		Undisturbed sample obtained from 28.0 to 30.0 feet. Approximately 24 inches of recovery. Soft, moist, light gray and yellowish brown, FAT CLAY		28.0	ST-2					
30.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
30.0		with SAND (CH, A-7-6(35)), LL=65 PL=21 PI=44 NMC=29.6 %#200=78.3								
	-35.0									
		Loose, wet, reddish brown, fine grained, SILTY SAND (SM)		33.5	SS-9	3	4	4	8	
35.0	-40.0									
		Medium dense, wet, pale brown, fine grained, with trace silt, POORLY GRADED SAND (SP, A-3(0)), LL=NP PL=NP PI=NP NMC=25.1 %#200=4.2		38.5	SS-10	3	5	6	11	
40.0	-45.0									
		Medium dense		43.5	SS-11	6	8	10	18	
45.0	-50.0									
		Medium dense, reddish brown		48.5	SS-12	9	9	13	22	
50.0	-55.0									
		Dense, wet, pale brown, fine to medium grained, POORLY GRADED SAND (SP, A-3(0)), LL=NP PL=NP PI=NP NMC=21.7 %#200=3.4		53.5	SS-13	10	15	18	33	
55.0	-60.0									
		Medium dense		58.5	SS-14	13	16	13	29	
60.0										

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE (blows/foot) PL MC LL; FINES CONTENT (%) 10 20 30 40 50 60 70 80 90
60.0										
	-65.0	Top of spoon: Loose, reddish brown		63.5	SS-15	3	3	2	5	
65.0		Bottom of spoon: Firm, wet, gray, SANDY LEAN CLAY (CL)								
	-70.0									
70.0		Medium dense, wet, light brown, fine to medium grained, POORLY GRADED SAND (SP)		68.5	SS-16	6	10	17	27	
	-75.0									
75.0		Medium dense, pale brown		73.5	SS-17	8	7	14	21	
	-80.0									
80.0		Medium dense, with trace gravel		78.5	SS-18	11	14	13	27	
	-85.0									
85.0		Medium dense		83.5	SS-19	8	9	10	19	
	-90.0									
90.0		Medium dense		88.5	SS-20	6	7	10	17	

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

STRATA SYMBOLS

- SAND (SP)
- SILT (MH)
- FAT CLAY (CH)
- SILTY SAND (SM)
- POORLY GRADED SAND with SILT (SP-SM)
- ORGANIC SOILS (OL)
- Paving
- GRAVEL (GP)
- SANDY SILT (ML)
- LEAN CLAY (CL)
- TOPSOIL
- CLAYEY SAND (SC)
- CLAYEY SILTY SAND (SC-SM)
- WELL GRADED SAND with SILT and GRAVEL (SW-SM)
- SANDSTONE
- DOLOMITE
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
- SILTY CLAY (CL-ML)
- Ground Water, ATD
- 24 Hr./Delayed Ground Water
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- MR - Mud Rotary

NO - Not Obtained

NE - Not Encountered

REC Recovery

RQD Rock Quality Designation

pp - Pocket Penetrometer

SS - Split Spoon

ST - Shelby Tube

DCP - Dynamic Cone Penetrometer

AC - Auger Cuttings

GB - Grab Bag

NQ - Rock Core

Alabama Department of Transportation

Bridge Sheet of

thompson ENGINEERING
2970 COTTAGE HILL RD.
MOBILE, AL 36606

APPROVED : SAM STERNBERG III, P.E.

GEOTECHNICAL ENGINEER

DATE :

PROJECT NO. 17-1101-0145
I-10 MOBILE RIVER BRIDGE
LOAD TEST PROGRAM
MOBILE COUNTY, ALABAMA

Preliminary Project No:

TEST BORING RECORD

REFERENCE PROJECT NUMBER	FISCAL YEAR	SHEET NUMBER
IM-I010(341)	2018	23

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL; ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
90.0										
	-95.0									
95.0		Dense, with trace gravel		93.5	SS-21	25	23	26	49	●
	-100.0									
100.0		Very dense, with trace gravel		98.5	SS-22	21	25	30	55	●
	-105.0									
105.0		Dense, with trace gravel		103.5	SS-23	18	21	21	42	●
	-110.0									
110.0		Dense, with trace gravel		108.5	SS-24	18	25	25	50	●
	-115.0									
115.0		Dense		113.5	SS-25	12	18	28	46	●
	-120.0									
120.0		Very dense, wet, pale brown, medium to fine grained, with trace gravel, POORLY GRADED SAND (SP,		118.5	SS-26	21	32	33	85	▲ ○ ●

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL; ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
120.0		A-1-b(0)), LL=NP PL=NP PI=NP NMC=16.8 %#200=4.3								
	-125.0			123.5	SS-27	11	12	13	25	▲
125.0		Very stiff, wet, gray, with trace sand, LEAN CLAY (CL, A-6(14)), LL=33 PL=17 PI=16 NMC=22.0 %#200=92.7								
	-130.0			128.0	ST-3					
130.0		Undisturbed sample obtained from 128.0 to 130.0 feet. Approximately 24 inches of recovery. Moist, gray, LEAN CLAY with SAND (CL, A-6(12)), LL=32 PL=13 PI=20 NMC=29.8 %#200=74.6								
	-135.0									
135.0		Very stiff, wet		133.5	SS-28	5	8	9	17	●
	-140.0									
140.0		Dense, wet, greenish gray, fine grained, SILTY SAND (SM)		138.5	SS-29	17	22	20	42	●
	-145.0									
145.0		Very stiff, wet, green, LEAN CLAY with SAND (CL, A-6(10)), LL=34 PL=18 PI=16 NMC=27.5 %#200=73.8		143.5	SS-30	7	13	13	26	▲
	-150.0									
150.0		Stiff, greenish gray		148.5	SS-31	4	5	9	14	●

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

thompson ENGINEERING

RECORD OF TEST BORING

Site Description:	I-10 Mobile River Bridge and Bayway					**County:**	Mobile
Boring No.:	BW-04	**Boring Location:**	575+29.02	**Offset:**	26.77 RT	**Alignment:**	I-10 Bayway
ALDOT PE No.:	DPI-0030(005)	**TE Project No.:**	15-1101-0228			**Eng./Geo.:**	C.Tisher
Elev.:	-3.0 ft.	**Northing:**	251524.738	**Easting:**	1804834.329	**Date Started:**	1/17/2017
Total Depth:	175.0 ft.	**Soil Depth:**	175.0 ft.	**Core Depth:**	0.0 ft.	**Date Completed:**	1/24/2017
Bore Hole Diameter (in):	4-inch	**AASHTO / ASTM Sampling Methods:**	AASHTO T206 & T207				
Drill Machine:	CME 550X	**Drill Method:**	MR	**Hammer Type:**	Automatic	**Energy Ratio:**	
Core Size:	N/A	**Driller:**	Thompson Eng	**Groundwater:**	**TOB** 0.0 ft.	**24 HR**	0.0 ft.

Depth (ft)	Elevation (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft.)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	● SPT N VALUE (blows/foot) PL MC LL; ▲ FINES CONTENT (%) ▲ 10 20 30 40 50 60 70 80 90
150.0										
	-155.0									
155.0		Very stiff, wet, greenish gray, FAT CLAY with SAND (CH, A-7-6(35)), LL=65 PL=20 PI=46 NMC=27.6 %#200=77.3		153.5	SS-32	9	9	16	25	▲
	-160.0									
160.0		Very dense, wet, greenish gray, fine grained, SILTY SAND (SM)		158.5	SS-33	17	34	33	67	●
	-165.0									
165.0		Very dense, gray		163.5	SS-34	32	47	43	90	●
	-170.0									
170.0		Very dense, wet, gray, fine grained, with trace wood, SILTY SAND (SM, A-2-4(0)), LL=NP PL=NP PI=NP NMC=24.5 %#200=16.4		168.5	SS-35	23	29	29	58	▲ ○ ●
	-175.0									
175.0		Very stiff, wet, greenish grey, LEAN CLAY (CL)		173.5	SS-36	9	11	13	24	●
		Boring Terminated at 175.0 feet.								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	AC - Auger Cuttings	HSA - Hollow Stem Augers	MR - Mud Rotary Wash
ST - Shelby Tube	GB - Grab Bag	SSA - Solid Stem Augers	RC - Rock Coring
DCP - Dynamic Cone Penetrometer	NQ - Rock Core	HA - Hand Auger	

STRATA SYMBOLS

- SAND (SP)
- SILT (MH)
- FAT CLAY (CH)
- SILTY SAND (SM)
- POORLY GRADED SAND with SILT (SP-SM)
- ORGANIC SOILS (OL)
- Paving
- GRAVEL (GP)
- SANDY SILT (ML)
- LEAN CLAY (CL)
- TOPSOIL
- CLAYEY SAND (SC)
- CLAYEY SILTY SAND (SC-SM)
- WELL GRADED SAND with SILT and GRAVEL (SW-SM)
- SANDSTONE
- DOLOMITE
- CLAYEY GRAVEL (GC)
- POORLY GRADED GRAVEL with SILT and SAND (GP-GM)
- SILTY CLAY (CL-ML)
- Ground Water, ATD
- 24 Hr./Delayed Ground Water
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- MR - Mud Rotary

NO - Not Obtained

NE - Not Encountered

REC Recovery

RQD Rock Quality Designation

pp - Pocket Penetrometer

SS - Split Spoon

ST - Shelby Tube

DCP - Dynamic Cone Penetrometer

AC - Auger Cuttings

GB - Grab Bag

NQ - Rock Core

Alabama Department of Transportation

Bridge Sheet of

thompson ENGINEERING
2970 COTTAGE HILL RD.
MOBILE, AL 36606

APPROVED : SAM STERNBERG III, P.E.

GEOTECHNICAL ENGINEER

DATE :

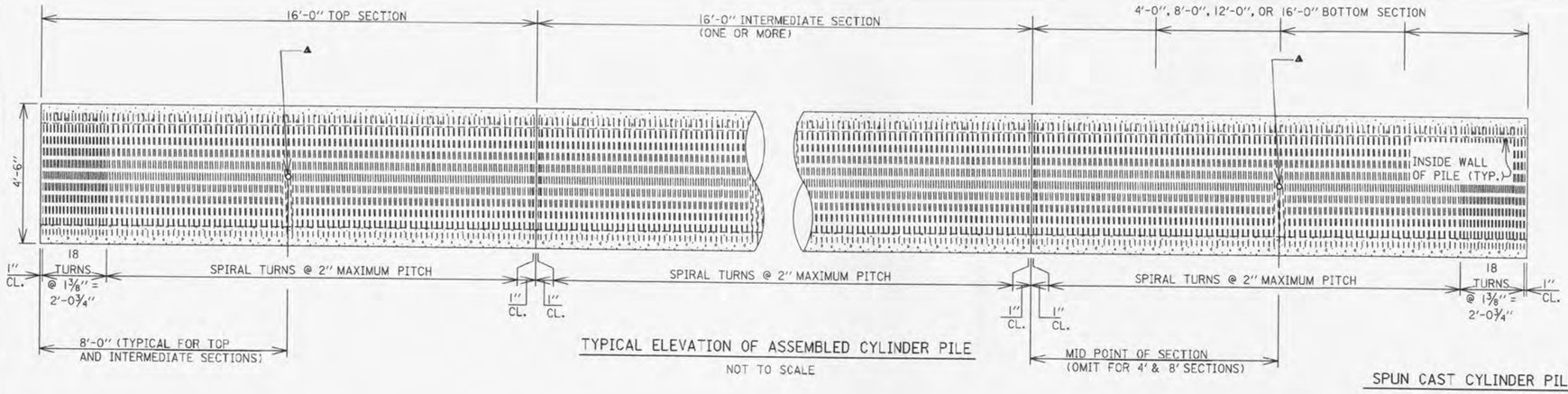
PROJECT NO. 17-1101-0145
I-10 MOBILE RIVER BRIDGE
LOAD TEST PROGRAM
MOBILE COUNTY, ALABAMA

Preliminary Project No:

TEST BORING RECORD
Sheet 8 of 12

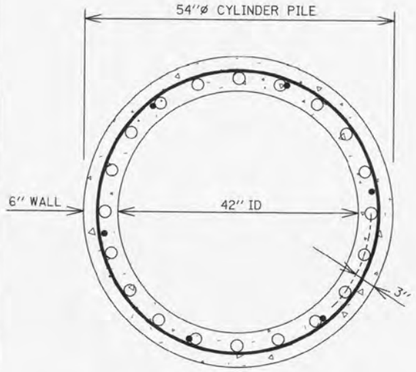
SPUN CYLINDER CONCRETE PILE DETAILS

REFERENCE PROJECT NO	FISCAL YEAR	SHEET NO
IM-I010(341)	2018	13



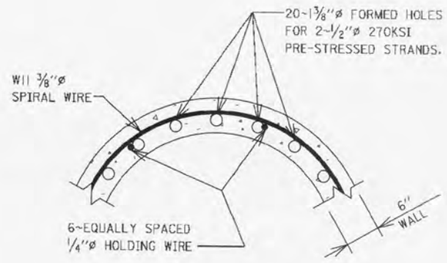
TYPICAL ELEVATION OF ASSEMBLED CYLINDER PILE

NOT TO SCALE



54" DIAMETER SECTION (20 CABLES)

NOT TO SCALE



TYPICAL REINFORCING DETAIL

NOT TO SCALE

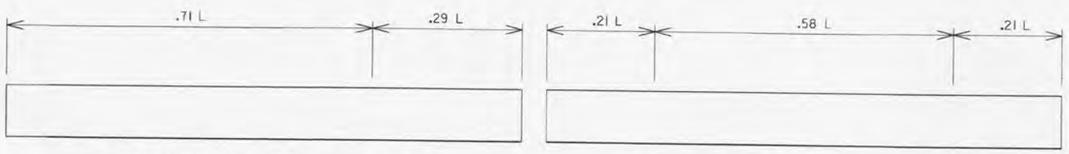
PRESTRESSED PILE SCHEDULE

QUANTITY	LENGTH	COMMENTS
1	120'-0"	TP-04
1	140'-0"	TP-23A
1	110'-0"	TP-23B
1	130'-0"	TP-111A
1	130'-0"	TP-111B
NO PILE SHALL BE PRODUCED WITHOUT WRITTEN APPROVAL OF THIS DRAWING		

SPUN CAST CYLINDER PILE GENERAL NOTES

1. STEEL FORMS FOR EACH SPUN CAST CYLINDER PILE SECTION SHALL NOT BE REMOVED UNTIL THE COMPRESSIVE STRENGTH OF THE CONCRETE HAS REACHED A MINIMUM OF 7,000 PSI.
2. THE CONCRETE IN THE SPUN CAST CYLINDER CONCRETE PILE SECTIONS SHALL HAVE A COMPRESSIVE STRENGTH OF 7,000 PSI PRIOR TO BEING ASSEMBLED INTO A SPUN CAST CYLINDER CONCRETE PILE UNIT AND RECEIVING THE PRESTRESSING FORCE.
3. SPUN CAST CYLINDER CONCRETE PILES SHALL NOT BE SHIPPED AND DRIVEN UNTIL THE MINIMUM 28-DAY COMPRESSIVE STRENGTH OF THE CONCRETE IS 10,000 PSI.
4. GROUT SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI PRIOR TO RELEASE OF STRANDS. REFER TO ALDOT-451 FOR GROUT TESTING.
5. THE ABUTTING JOINING SURFACES OF EACH SECTION SHALL BE COVERED BY A JOINT SEALING MATERIAL AND THE SPUN CAST CYLINDER CONCRETE PILES STRESSED TO 100 PSI AS DIRECTED IN ALDOT-451.
6. THE SPUN CAST CYLINDER CONCRETE PILES SHALL HAVE CABLES PLACED AS SHOWN IN THE SECTIONS ON THIS SHEET. EACH CABLE IS COMPOSED OF 2-1/2" ø, 270 KSI LOW RELAXATION STRANDS CONFORMING TO AASHTO M 203. THE STRANDS SHALL BE STRESSED TO AN INITAL TENSION OF 30,900 LBS IN THE SEQUENCE DESCRIBED IN ALDOT-451.
7. SPIRAL AND SPACER REINFORCING SHALL BE WII COLD DRAWN STEEL WIRE CONFORMING TO AASHTO DESIGNATION M 32. THE SPIRAL REINFORCING STEEL MAY BE WELDED TO THE WII LONGITUDINAL WIRE.

▲8. PROVIDE ONE(1) 2"ø VENT HOLE (@ ℄ PILE) ON TWO(2) OPPOSITE FACES OF PILES (TYPICAL EACH PILE SECTION.



1-POINT LIFT DETAIL(MAX. LEN. 124'-0")

2-POINT LIFT DETAIL(MAX. LEN. 173'-0")

RESPONSIBLE PE:	SUPERVISOR:	DESIGNER:	PLAN SUBMITTAL	ALABAMA DEPARTMENT OF TRANSPORTATION	NOT TO SCALE	SHEET TITLE	ROUTE
DATE:	DATE:	DATE:				SPUN CYLINDER CONCRETE PILE DETAILS	I-10

Appendix E

Instrument Calibrations
TP-04

I-10 over Mobile River Bridge Load Test Program

ALDOT Project No.: IM-I010(341)
Mobile County, Alabama
AFT Project No.: 118008

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: E655

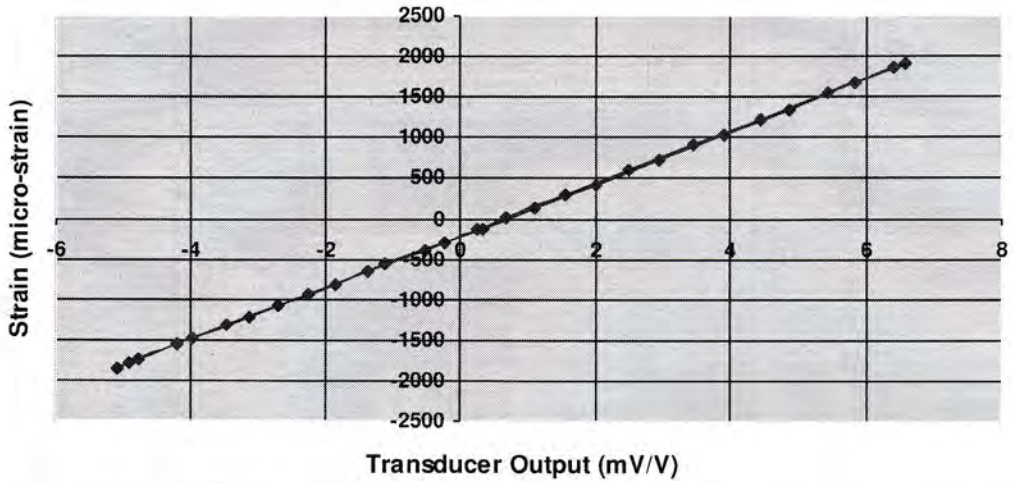
PDI Gage Factor: 92.7 με/V

General Gage Factor: 321.8 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: 0.149 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
-132	0.253	133	1.110
-286	-0.238	423	2.009
-565	-1.103	726	2.949
-808	-1.866	1035	3.901
-1075	-2.707	1349	4.878
-1324	-3.476	1671	5.850
-1558	-4.208	1915	6.567
-1790	-4.911	1868	6.416
-1856	-5.099	1549	5.441
-1741	-4.789	1226	4.447
-1486	-3.993	912	3.460
-1209	-3.125	599	2.486
-935	-2.243	301	1.568
-662	-1.365	9	0.670
-390	-0.510	-131	0.244
-125	0.319	-132	0.240

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999728E-1

LCC Standard Deviation: 2.690308E-6

Calibrated By: Kay Tol

Signature: Kay Tol

Date/Time: 2/28/2018 8:04 AM

Temperature (°C): 25.3

Specifications

PDI Automated Strain Transducer Calibration System (PDI-ASTCS)

ASTCS Calibration Information	
ASTCS Serial Number:	ASTCS-0005
ASTCS Software Version:	2.310
ASTCS Independent Verification Date:	11/5/2014 11:54 AM
Strain Transducer Gage Length:	3.0 inches (76.2 mm)
Applied Full Scale Displacement Range:	±7.500000E-3 inches
Method for Applying Displacement:	Precision Step Motor Coupled to Linear Stage
Excitation Voltage for Calibration:	2.5 VDC
Displacement Measurements:	Dual Precision AC LVDT's, Output Averaged
Displacement Certification:	NIST 274437-07
Linearity Verification Technique:	Linear Correlation Coefficient > 0.9999
Repeatability Verification Technique:	Standard Deviation < 0.5 % (of mean)
ASTCS System Check	
Reference Strain Transducer:	4367T
Reference General Gage Factor:	293.000 με/mV/V
LVDT #1 Sensitivity (inches/volt):	7.916500E-3
LVDT #2 Sensitivity (inches/volt):	8.042000E-3
Date/Time of Last System Check:	2/27/2018 3:17 PM
PDI Strain Transducer Connections	
Black:	+ Excitation
Green:	- Excitation
Red:	+ Signal
White:	- Signal
Grey:/BARE	Shield

NIST Reference:

PDI certifies the above PDI-ASTCS instrument meets or exceeds published specifications and has been verified using standards and instruments whose accuracies are traceable to the National Institute of Standards and Technology (NIST), an accepted value of a natural physical constant or a ratio calibration technique. The calibration of this instrument was performed in accordance with the PDI Quality Assurance program. Measurements and information provided on this report are valid at the time of calibration only.

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: J762

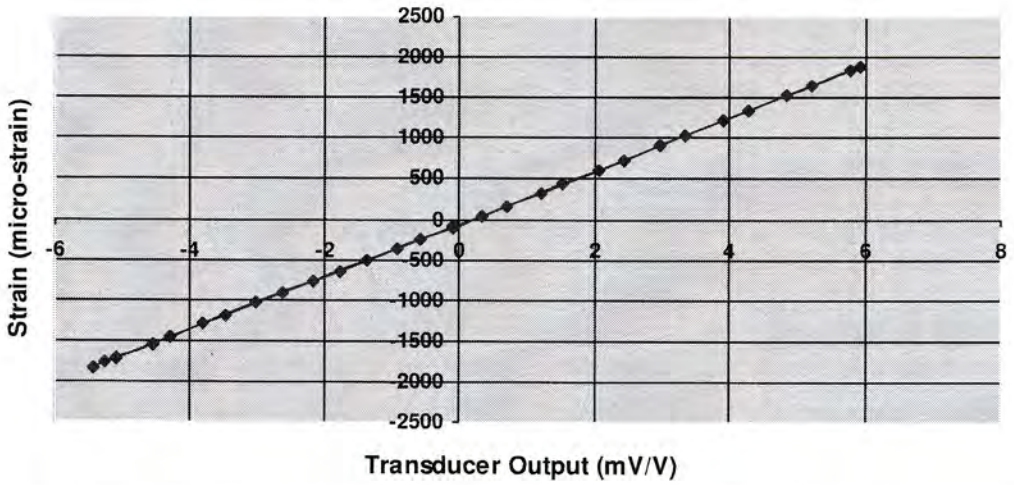
PDI Gage Factor: 93.9 με/V

General Gage Factor: 326.1 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: -0.006 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
-95	-0.099	158	0.710
-244	-0.569	430	1.538
-507	-1.370	723	2.430
-765	-2.165	1021	3.335
-1036	-3.005	1327	4.269
-1302	-3.817	1642	5.216
-1546	-4.563	1883	5.918
-1769	-5.256	1841	5.789
-1829	-5.427	1531	4.856
-1714	-5.105	1218	3.908
-1455	-4.308	914	2.976
-1190	-3.475	616	2.064
-920	-2.631	332	1.201
-648	-1.772	47	0.328
-369	-0.905	-95	-0.086
-94	-0.057	-93	-0.090

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999784E-1

LCC Standard Deviation: 1.747861E-6

Calibrated By: Kay Tol

Signature: Kay Tol

Date/Time: 2/28/2018 8:02 AM

Temperature (°C): 25.3

Specifications

PDI Automated Strain Transducer Calibration System (PDI-ASTCS)

ASTCS Calibration Information	
ASTCS Serial Number:	ASTCS-0005
ASTCS Software Version:	2.310
ASTCS Independent Verification Date:	11/5/2014 11:54 AM
Strain Transducer Gage Length:	3.0 inches (76.2 mm)
Applied Full Scale Displacement Range:	±7.500000E-3 inches
Method for Applying Displacement:	Precision Step Motor Coupled to Linear Stage
Excitation Voltage for Calibration:	2.5 VDC
Displacement Measurements:	Dual Precision AC LVDT's, Output Averaged
Displacement Certification:	NIST 274437-07
Linearity Verification Technique:	Linear Correlation Coefficient > 0.9999
Repeatability Verification Technique:	Standard Deviation < 0.5 % (of mean)
ASTCS System Check	
Reference Strain Transducer:	4367T
Reference General Gage Factor:	293.000 με/mV/V
LVDT #1 Sensitivity (inches/volt):	7.916500E-3
LVDT #2 Sensitivity (inches/volt):	8.042000E-3
Date/Time of Last System Check:	2/27/2018 3:17 PM
PDI Strain Transducer Connections	
Black:	+ Excitation
Green:	- Excitation
Red:	+ Signal
White:	- Signal
Grey:/BARE	Shield

NIST Reference:

PDI certifies the above PDI-ASTCS instrument meets or exceeds published specifications and has been verified using standards and instruments whose accuracies are traceable to the National Institute of Standards and Technology (NIST), an accepted value of a natural physical constant or a ratio calibration technique. The calibration of this instrument was performed in accordance with the PDI Quality Assurance program. Measurements and information provided on this report are valid at the time of calibration only.

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: P454

PDI Gage Factor: 145.3 με/V

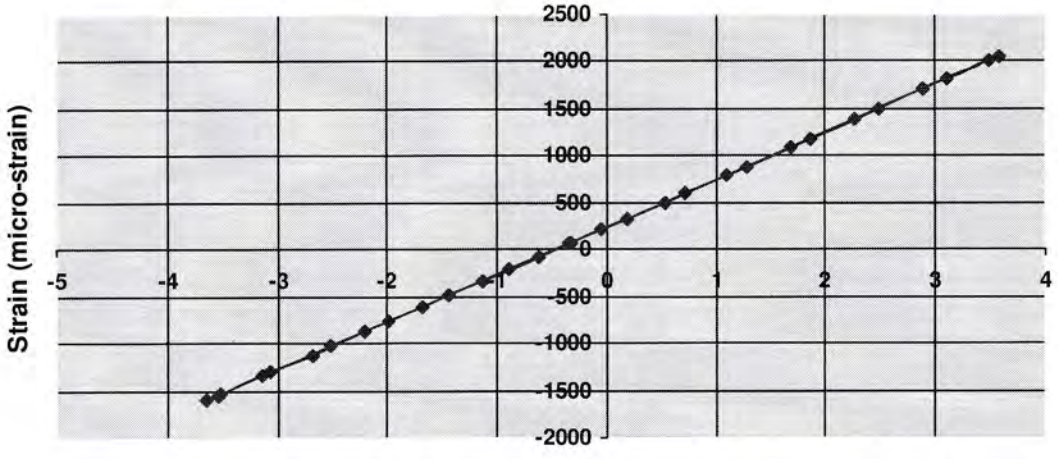
General Gage Factor: 504.7 $\mu\varepsilon/mV/V_{ext}$

Initial Offset Voltage: -0.113 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
65	-0.330	335	0.184
-83	-0.628	598	0.709
-331	-1.125	889	1.284
-607	-1.670	1188	1.872
-876	-2.202	1497	2.487
-1115	-2.687	1814	3.109
-1344	-3.136	2058	3.573
-1543	-3.541	2013	3.492
-1597	-3.646	1700	2.888
-1525	-3.515	1387	2.272
-1288	-3.058	1088	1.683
-1023	-2.521	794	1.100
-753	-1.982	502	0.529
-483	-1.439	210	-0.047
-210	-0.893	71	-0.319
70	-0.337	70	-0.321

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999805E-1

LCC Standard Deviation: 1.224288E-6

Calibrated By: Vanna Thach

Signature: Thach

Date/Time: 1/26/2018 8:12 AM

Temperature (°C): 24.3

Specifications

PDI Automated Strain Transducer Calibration System (PDI-ASTCS)

ASTCS Calibration Information	
ASTCS Serial Number:	ASTCS-0005
ASTCS Software Version:	2.310
ASTCS Independent Verification Date:	11/5/2014 11:54 AM
Strain Transducer Gage Length:	3.0 inches (76.2 mm)
Applied Full Scale Displacement Range:	±7.500000E-3 inches
Method for Applying Displacement:	Precision Step Motor Coupled to Linear Stage
Excitation Voltage for Calibration:	2.5 VDC
Displacement Measurements:	Dual Precision AC LVDT's, Output Averaged
Displacement Certification:	NIST 274437-07
Linearity Verification Technique:	Linear Correlation Coefficient > 0.9999
Repeatability Verification Technique:	Standard Deviation < 0.5 % (of mean)
ASTCS System Check	
Reference Strain Transducer:	4367T
Reference General Gage Factor:	293.000 με/mV/V
LVDT #1 Sensitivity (inches/volt):	7.916500E-3
LVDT #2 Sensitivity (inches/volt):	8.042000E-3
Date/Time of Last System Check:	1/26/2018 7:12 AM
PDI Strain Transducer Connections	
Black:	+ Excitation
Green:	- Excitation
Red:	+ Signal
White:	- Signal
Grey:/BARE	Shield

NIST Reference:

PDI certifies the above PDI-ASTCS instrument meets or exceeds published specifications and has been verified using standards and instruments whose accuracies are traceable to the National Institute of Standards and Technology (NIST), an accepted value of a natural physical constant or a ratio calibration technique. The calibration of this instrument was performed in accordance with the PDI Quality Assurance program. Measurements and information provided on this report are valid at the time of calibration only.

Pile Dynamics, Inc.

Certificate of Calibration

Transducer Model: BDI ST350

Serial Number: P455

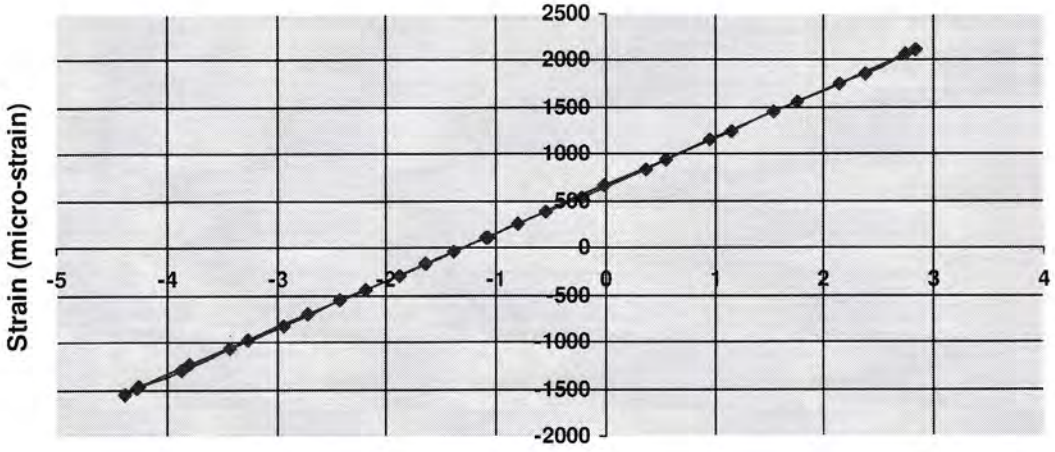
PDI Gage Factor: 145.8 με/V

General Gage Factor: 506.2 $\mu\varepsilon/mV/V_{ext}$
Initial Offset Voltage: -0.434 mV/V_{ext}

Table 1 – Representative Calibration Data

Applied Strain (με)	Transducer Output (mV/V_{ext})	Applied Strain (με)	Transducer Output (mV/V_{ext})
110	-1.082	389	-0.551
-42	-1.386	657	-0.021
-288	-1.881	947	0.552
-560	-2.418	1246	1.143
-828	-2.945	1556	1.751
-1070	-3.431	1869	2.371
-1290	-3.866	2115	2.834
-1489	-4.264	2069	2.749
-1547	-4.375	1752	2.143
-1473	-4.243	1446	1.542
-1238	-3.788	1147	0.958
-976	-3.260	845	0.360
-707	-2.726	548	-0.218
-440	-2.191	255	-0.796
-163	-1.641	114	-1.075
118	-1.086	114	-1.076

Calibration Curve



Mean Linear Correlation Coefficient (LCC): 9.999817E-1

LCC Standard Deviation: 3.891526E-7

Calibrated By: Vanna Thach

Signature: Thach

Date/Time: 1/26/2018 7:26 AM

Temperature (°C): 23.6

Specifications

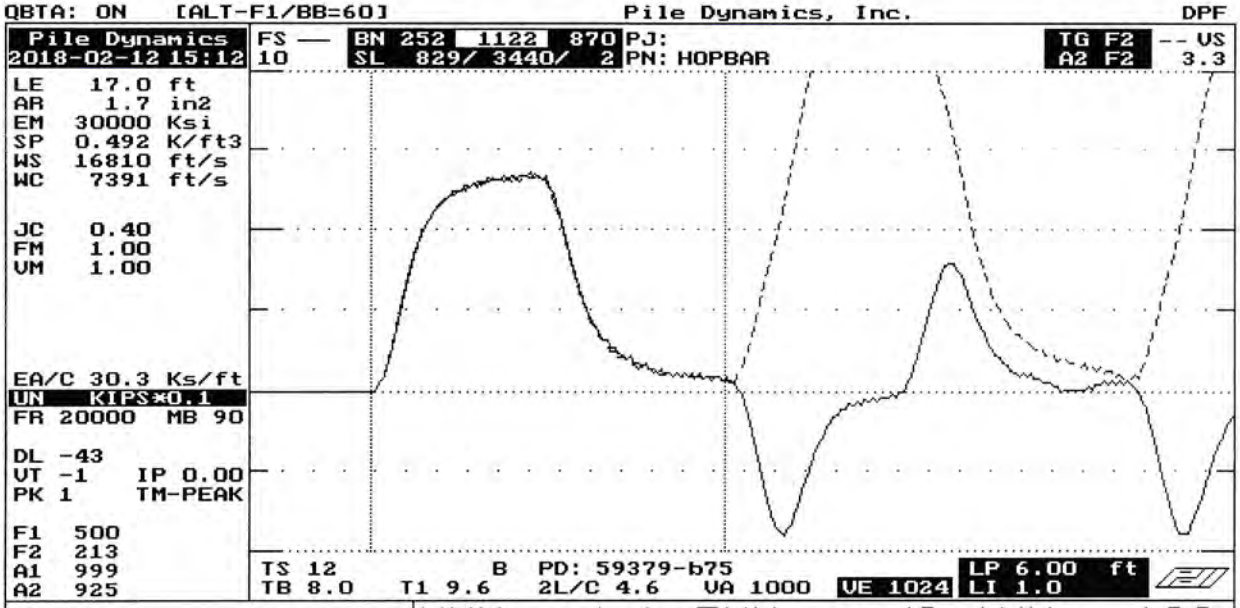
PDI Automated Strain Transducer Calibration System (PDI-ASTCS)

ASTCS Calibration Information	
ASTCS Serial Number:	ASTCS-0005
ASTCS Software Version:	2.310
ASTCS Independent Verification Date:	11/5/2014 11:54 AM
Strain Transducer Gage Length:	3.0 inches (76.2 mm)
Applied Full Scale Displacement Range:	±7.500000E-3 inches
Method for Applying Displacement:	Precision Step Motor Coupled to Linear Stage
Excitation Voltage for Calibration:	2.5 VDC
Displacement Measurements:	Dual Precision AC LVDT's, Output Averaged
Displacement Certification:	NIST 274437-07
Linearity Verification Technique:	Linear Correlation Coefficient > 0.9999
Repeatability Verification Technique:	Standard Deviation < 0.5 % (of mean)
ASTCS System Check	
Reference Strain Transducer:	4367T
Reference General Gage Factor:	293.000 με/mV/V
LVDT #1 Sensitivity (inches/volt):	7.916500E-3
LVDT #2 Sensitivity (inches/volt):	8.042000E-3
Date/Time of Last System Check:	1/26/2018 7:12 AM
PDI Strain Transducer Connections	
Black:	+ Excitation
Green:	- Excitation
Red:	+ Signal
White:	- Signal
Grey:/BARE	Shield

NIST Reference:

PDI certifies the above PDI-ASTCS instrument meets or exceeds published specifications and has been verified using standards and instruments whose accuracies are traceable to the National Institute of Standards and Technology (NIST), an accepted value of a natural physical constant or a ratio calibration technique. The calibration of this instrument was performed in accordance with the PDI Quality Assurance program. Measurements and information provided on this report are valid at the time of calibration only.

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. DPF



VMX= 4.4 FMX= 68 AMX= 139
EMX= 0.3 MEX= 133 FVP= 1.00

ACCEPT SQ-OFF FL-OFF PR-OFF

ACCEPT

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

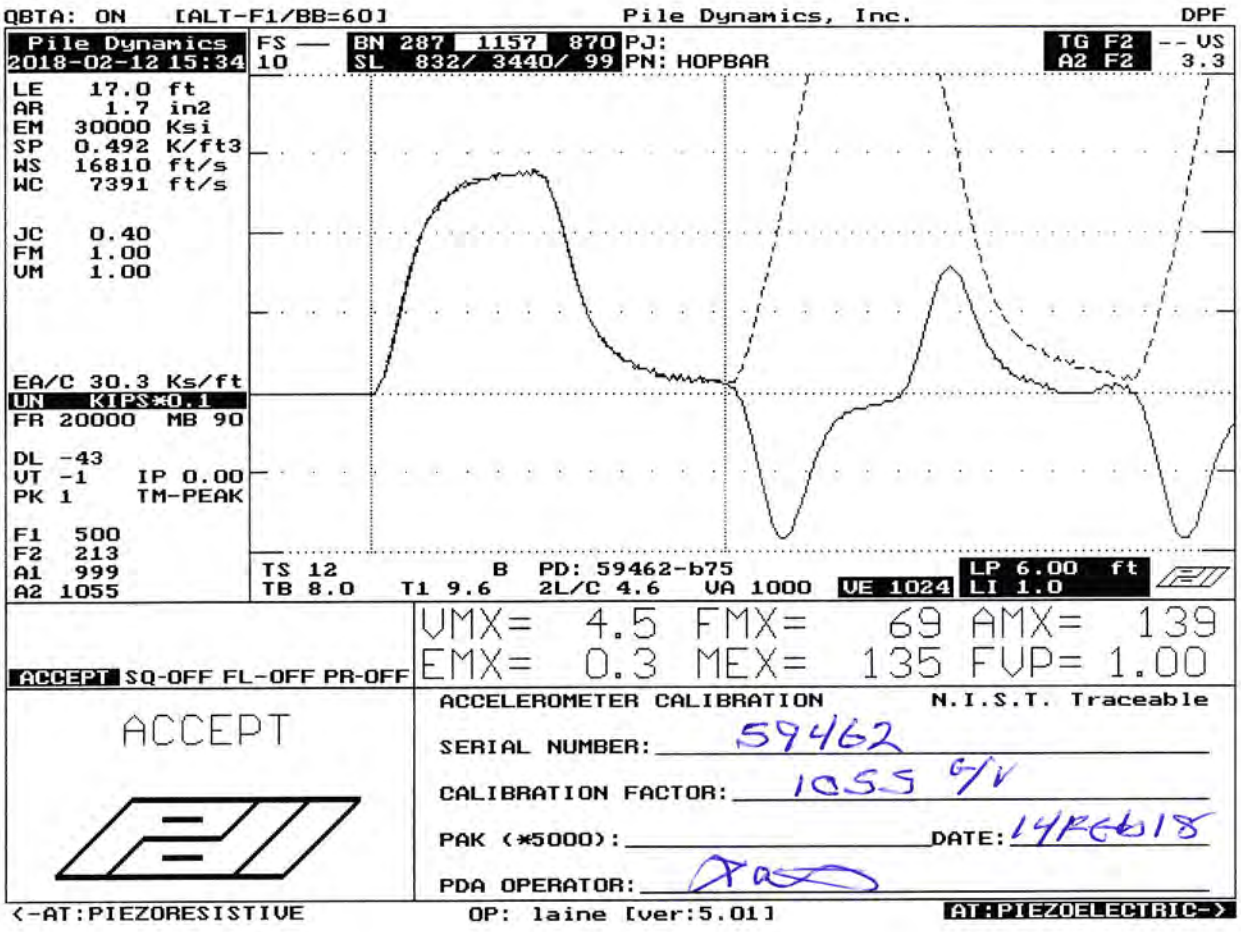
SERIAL NUMBER: 59379

CALIBRATION FACTOR: 925 e/v

PAK (*5000): _____ DATE: 14Feb18

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: laine [ver:5.01] AT:PIEZOELECTRIC->


QBTA: ON [ALT-F1/BB=60]
Pile Dynamics, Inc.
DPF
Pile Dynamics
2018-02-12 15:34
FS —
10
BN 287 1157 870
SL 832/ 3440/ 99
PJ:
PN: HOPBAR
TG F2
A2 F2
-- VS
3.3
LE 17.0 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 7391 ft/s
JC 0.40
FM 1.00
VM 1.00
EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 90
DL -43
VT -1 IP 0.00
PK 1 TM-PEAK
F1 500
F2 213
A1 999
A2 1055
TS 12
TB 8.0
T1 9.6
B
PD: 59462-b75
2L/C 4.6
VA 1000
VE 1024
LP 6.00 ft
LI 1.0
VMX= 4.5 FMX= 69 AMX= 139
EMX= 0.3 MEX= 135 FVP= 1.00
ACCEPT SQ-OFF FL-OFF PR-OFF
ACCEPT
ACCELEROMETER CALIBRATION
N.I.S.T. Traceable
SERIAL NUMBER: 59462
CALIBRATION FACTOR: 1055 G/V
PAK (*5000):
DATE: 14Feb18
PDA OPERATOR:
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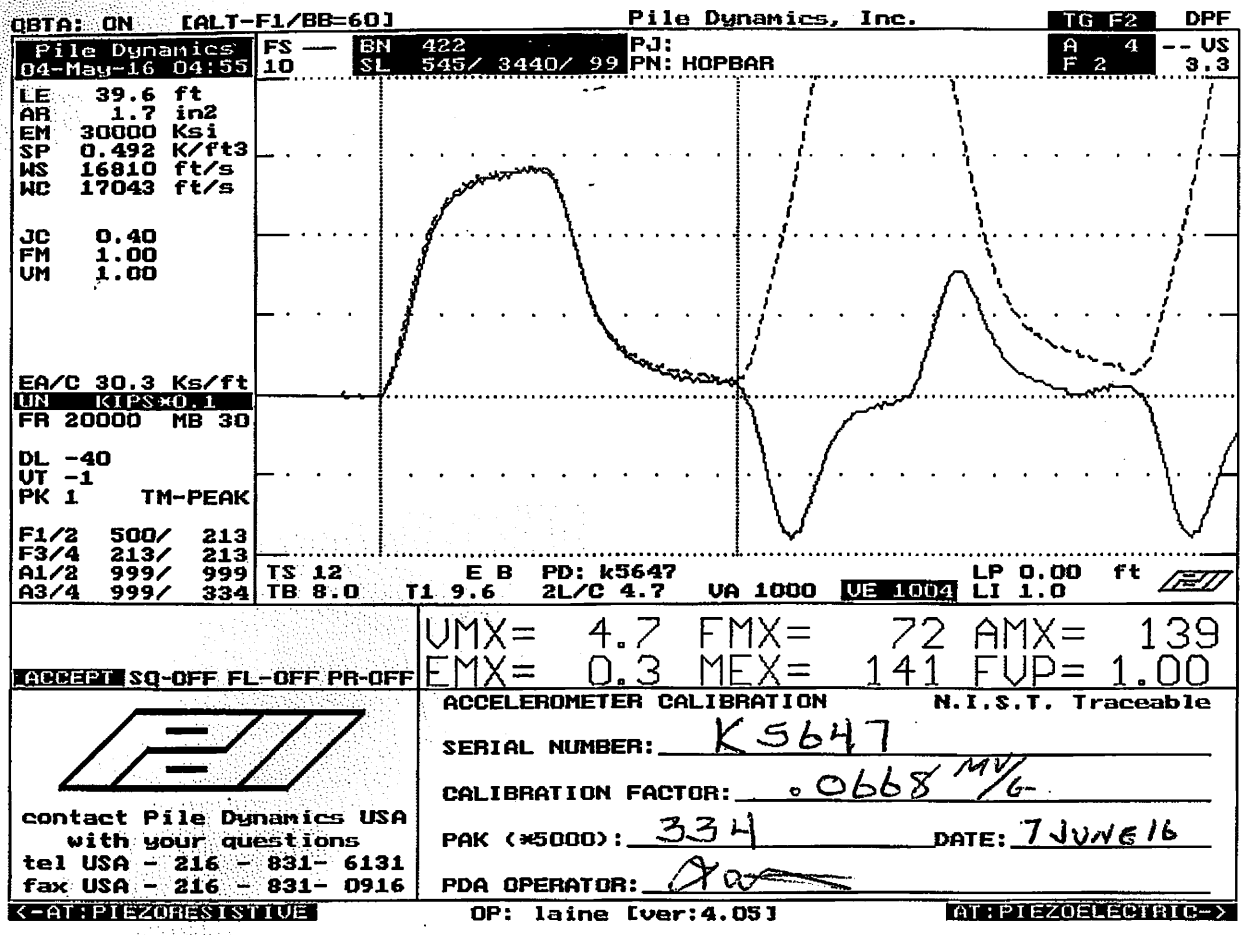
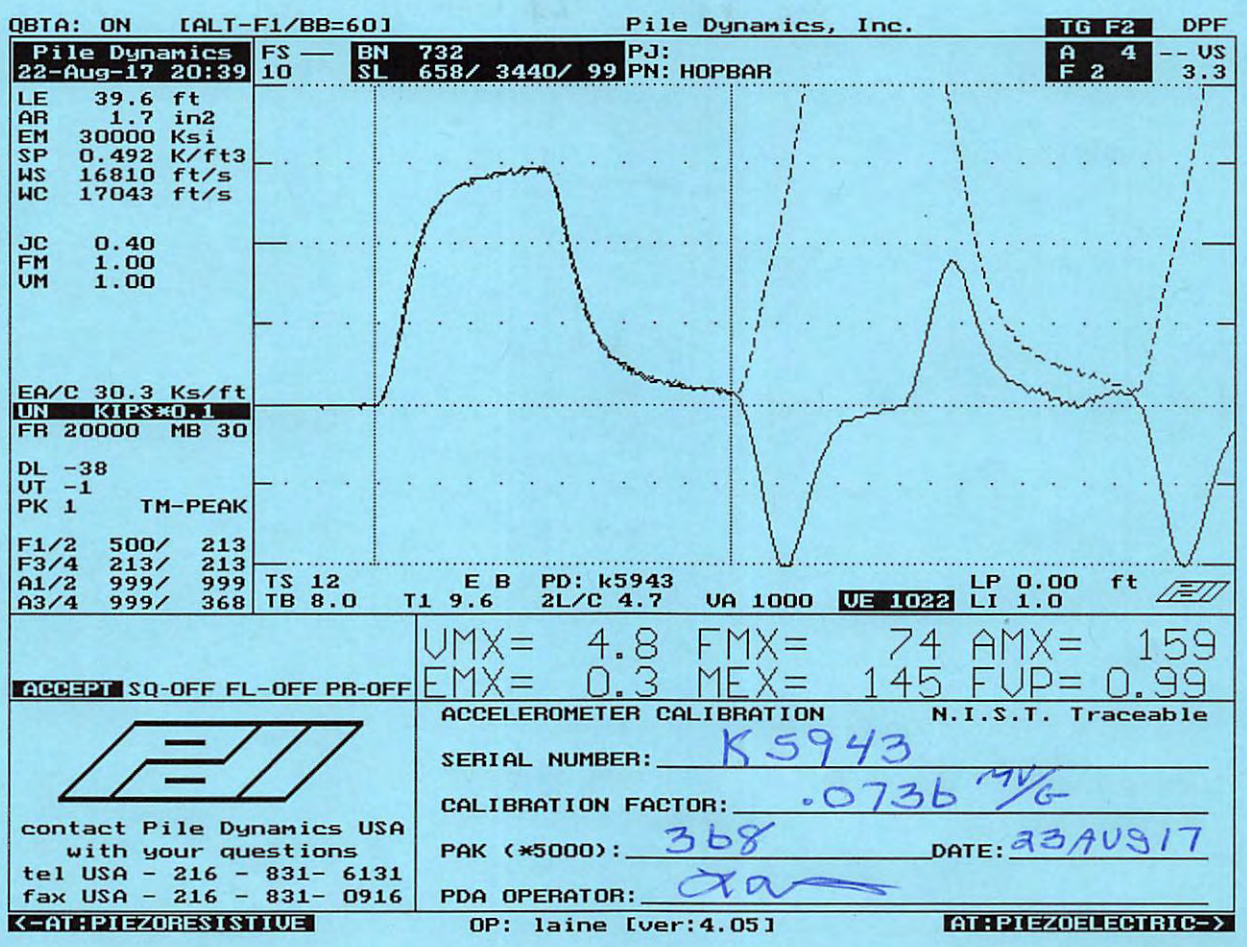
OP: laine [ver:5.01]
AT:PIEZOELECTRIC->



Smart Sensor

Smart Chip Programmed By M.W. **on** 7JUN16 **CRC Value** 34B5



Smart Sensor

Smart Chip Programmed By T.M.N. **on** 23AUG17 **CRC Value** BADD