MILLER CONSTRUCTION, INC.

P.O. BOX 86 ASCUTNEY BLVD WINDSOR, VERMONT 05089-0086
TELEPHONE (802) 674-5525 / FAX (802) 674-5245

TRANSMITTAL

TO: Kristin Higgins Vermont Agency of Transportation	DATE	PROJECT NO.
	7/16/2013	Jamaica ER-BRF 015-1 (23)

XX WE ENCLOSE THE FOLLOWING: _____ UNDER SEPARATE COVER WE ARE SENDING THE FOLLOWING

COPIES	NUMBER	DESCRIPTION	CODE
1		PDA Report	H

CODE:

A FOR INITIAL APPROVAL
B FOR FINAL APPROVAL
C APPROVED AS NOTED-RESUBMISSION REQUIRED
D APPROVED AS NOTED-RESUBMISSION NOT REQUIRED
E DISAPPROVED-RESUBMIT
F QUOTATION REQUESTED
G APPROVED
H FOR APPROVAL
I AS REQUESTED OR REQUIRED
J FOR USE IN ERECTION
K LETTER FOLLOWS
L FOR FIELD CHECK
M FOR YOUR USE

BY: Paul

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

July 16, 2013
File No. 0171491.00-C, PC

Mr. Paul Holloway
Miller Construction, Inc.
P.O. Box 86
Windsor, Vermont 05089

249 Vanderbilt Avenue
Norwood
Massachusetts
02062
781-278-3700
FAX 781-278-5701
http://www.gza.com

Re: Dynamic Pile Testing Results – Abutment 1
Jamaica ER-BRF 015-1(23)
Jamaica, Vermont

Dear Mr. Holloway:

This letter summarizes the results of dynamic pile testing performed by GZA GeoEnvironmental, Inc. (GZA) at the above referenced site on June 25, 2013. The dynamic pile testing was performed in general accordance with the project specifications and ASTM Method Designation D4945-89, "Standard Test Method for High-Strain Testing of Piles." Dynamic pile testing was performed to measure driving stresses, evaluate hammer performance, and estimate the ultimate "Case Method" pile capacity (i.e. nominal resistance) of all piles in the Abutment 1 substructure.

Testing was performed on seven (7) HP 12x84, Grade 50 steel piles. The required nominal resistance is 380 kips based upon dividing the maximum factored pile load of 247 kips by a performance factor of 0.65. The test piles were dynamically monitored during initial drive.

The Project specifications require that each pile in Abutment 1 develop a minimum penetration of 20 feet below cutoff elevation. Therefore a 30-inch diameter casing was installed through the overburden to an embedment depth of 20 feet below pile cutoff. If bedrock was encountered above 20 feet below cutoff, a 24-inch diameter hole was bored into the bedrock to develop the required minimum 20 feet embedment. The piles were then placed into the cased holes and backfilled with sand. The casing was then extracted and all piles in the Abutment 1 substructure were dynamically monitored to develop the required "Case Method" nominal resistance.

The test piles were impact driven with a Delmag D16-32 open-end diesel hammer with a ram weight of 3,520 lbs. and a maximum stroke of 11.2 feet yielding a maximum rated energy of 39,335 ft-lbs. The D16-32 is equipped with a ratchet style fuel pump with four settings. The fuel pump settings are designed to limit the ram stroke to 5.4 feet, 6.4 feet, 8.0 feet, and 11.2 feet (open) yielding rated energies of 18,890 ft-lbs, 22,420 ft-lbs., 28,320 ft-lbs., and 39,335 ft-lbs., respectively. Note that the test piles were installed with the Delmag D16-32 operating on fuel setting 3 (8.0 foot rated stroke).

The PDA was used to make dynamic force and acceleration measurements of the tested piles. These measurements were evaluated in the field to determine pile capacity, pile stresses and hammer performance. PDA summary sheets and plots of select averaged PDA parameters verses

Copyright© 2013 GZA GeoEnvironmental, Inc.

blow count are attached and summarized in Table 1. The pile driving logs, completed by others, are also attached.

Dynamic measurements during initial drive of each pile in Abutment 1 indicated a "Case Method" pile capacity in excess of 550 kips at a pile tip elevations ranging from +698.0 to +702.0 and reported penetration resistance of 10 blows per inch to 15 blows per half-inch of pile penetration with the Delmag D16-32 operating on fuel setting 3 and providing a minimum 6.5 foot ram stroke.

CAPWAP analyses performed on the dynamic test data from the end of drive of Abutment 1 Pile 1 indicated an ultimate pile capacity of 550 kips with 20 kips (4 percent) as skin friction and 530 kips (96 percent) as end bearing. CAPWAP analyses performed on the dynamic test data from the end of drive of Abutment 1 Pile 2 indicated an ultimate pile capacity of 590 kips with 30 kips (5 percent) as skin friction and 560 kips (96 percent) as end bearing.

Discussion

Pile take-up for the tested piles in Abutment 1 was relatively abrupt, indicating a predominately end bearing condition, which is substantiated by the dynamic test data presented above. Based on the Contractors installation methods and the above dynamic test results, the Engineer waived the restrike testing requirements.

LIMITATIONS

This report has been prepared for specific application to the Jamaica ER-BRF 015-1(23) project in Jamaica, Vermont in accordance with generally accepted soil and foundation practice. The static resistance values computed with the "Case Method" and from CAPWAP analysis are estimates of the mobilized axial compressive soil capacity at the time of testing. These soil resistance results are ultimate resistance values and they must be reduced by an appropriate factor of safety or resistance factor to obtain working or factored compressive loads. The driving criterion recommended above assumes consistent hammer performance in terms of both ram stroke and transfer energy. Piles demonstrating driving characteristics different from the tested piles may require additional testing to confirm the developed pile capacity. Services not provided on this project by GZA (such as logging pile resistance (blow counts during driving)) are reported herein only as it applies to the pile testing accomplished. No other warranty, expressed or implied, is made.

If you have any further questions, please contact either of the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Rayan Shamas
Geotechnical Engineer

Bradford W. Roberts
Consultant/Reviewer

John E. Regan
Principal

Attachments:
Table,
PDA Field Data,
CAPWAP,

TABLE 1

JAMAICA ER-BRF 015-1(23)
DYNAMIC PILE TESTING RESULTS
JAMAICA, VERMONT

STRUCTURE	PILE NO.	DATE TESTED	TEST TYPE [4]	BLOW COUNT [3] (bpi)	PILE PENETRATION (ft)	TIP ELEVATION (ft)	HAMMER STROKE (ft)	TRANSFER ENERGY [5] (kip-ft)	PILE STRESS [6]		PDA [7]	CAPWAP [8]		
									At Butt (ksi)	At Tip (ksi)	TOTAL CAPACITY (kips)	TOTAL CAPACITY (kips)	SKIN FRICTION (kips)	END BEARING (kips)
ABUTMENT 1	1	6/25/13	EOD	10 bpi	23.0	+ 698.0	7.6	13.4	27.1	27.1	550	550	20	530
	2	6/25/13	EOD	20 bpi	21.5	+ 699.5	7.3	12.6	26.3	27.4	630	590	30	560
	3	6/25/13	EOD	20 bpi	20.0	+ 701.0	7.4	12.1	26.3	32.6	690			
	4	6/25/13	EOD	15 bl/0.5"	19.5	+ 701.5	8.5	15.9	27.1	37.9	810			
	5	6/25/13	EOD	5 bl/0.25"	20.0	+ 701.0	7.7	13.9	27.5	32.7	740			
	6	6/25/13	EOD	10 bl/0.5"	19.0	+ 702.0	6.6	11.3	23.9	28.4	620			
	7	6/25/13	EOD	20 bpi	21.8	+ 699.3	6.5	11.0	24.9	28.3	630			

Notes :

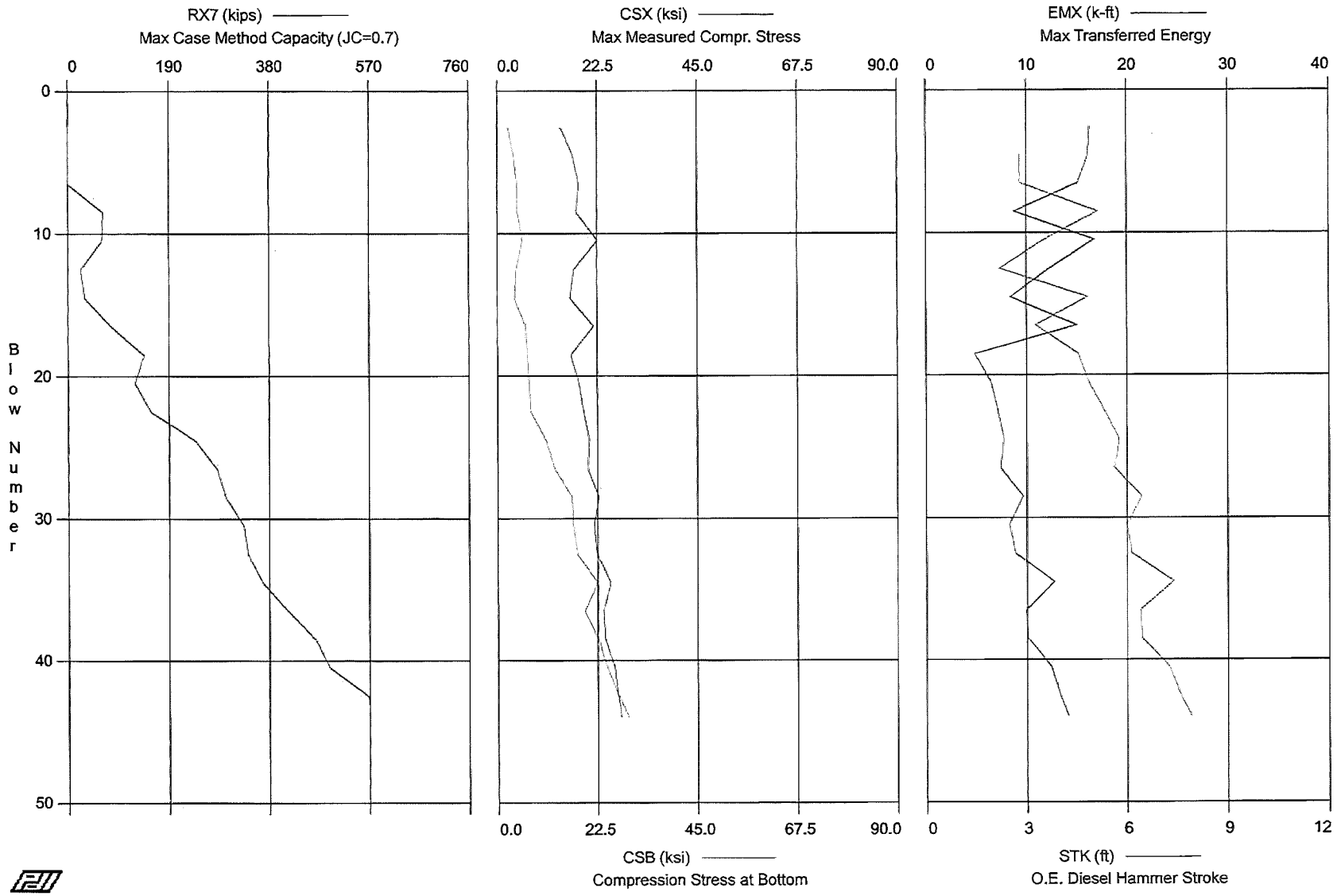
1. Test piles are HP12x84, Grade 50 steel H pile driven with a Delmag D16-32 diesel impact hammer operating on fuel setting 3.
2. Nominal resistance is 380 kips based upon applying a performance factor of 0.65 to the specified maximum factored load of 287 kips.
3. Blow counts were reported by others.
4. Test type is defined as: EOD = end of drive.
5. Transferred Energy is the delivered hammer energy to the pile measured at the PDA sensors.
6. Pile Stress is the maximum force delivered to the pile divided by the pile area, measured at the sensor location.
7. PDA Total Capacity is the ultimate pile capacity predicted at the time of testing including skin and endbearing resistance.
8. CAPWAP Total Capacity, Skin Friction and End Bearing are derived from CAPWAP analysis and are reported as ultimate pile capacity.
9. Pile penetration is referenced to the reported subgrade elevation of 721.0 ft.

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 1



GZA GeoEnvironmental Inc.
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 1
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 25.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

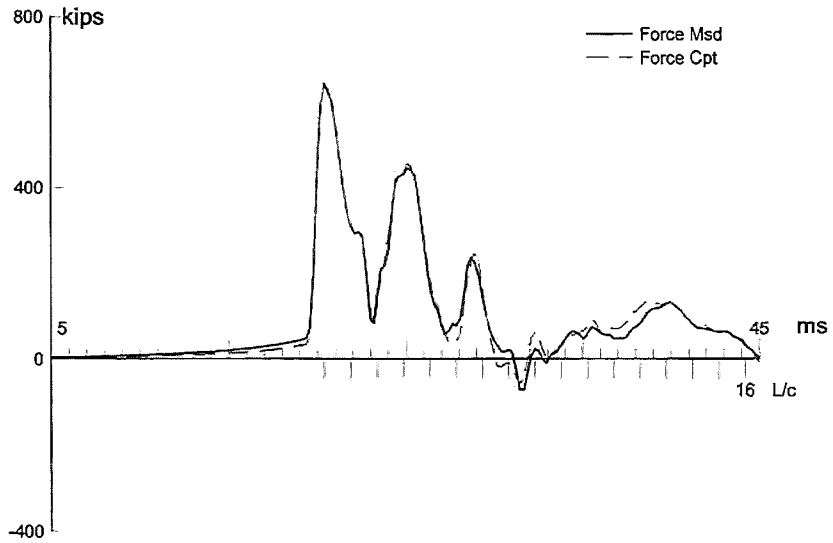
EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

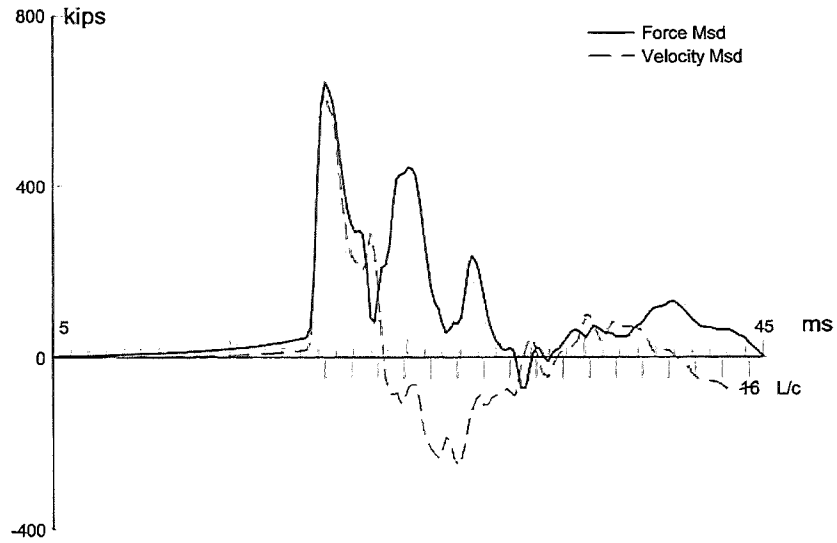
BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	0	13.6	2.2	10.6	0.00	0.95
3	0	14.9	2.7	22.0	0.00	0.96
4	0	17.2	3.5	12.1	5.59	1.00
5	0	16.9	3.6	20.3	0.00	0.97
6	0	18.9	4.5	11.5	5.61	0.99
7	0	17.8	4.5	18.9	0.00	0.99
8	83	23.0	5.8	14.1	6.48	1.03
9	50	12.6	3.4	3.4	3.80	1.01
10	60	19.8	5.1	15.6	0.00	1.01
11	69	25.2	6.2	18.0	7.11	1.04
12	48	15.4	3.9	6.0	4.40	1.01
13	0	19.1	4.8	18.7	0.00	1.02
14	35	23.0	5.4	14.4	6.40	1.02
15	28	9.8	2.3	2.4	3.29	1.03
16	43	19.1	4.5	18.2	0.00	1.02
17	121	24.2	8.1	11.8	6.57	1.03
18	136	18.0	7.3	5.8	4.95	1.05
19	151	15.2	6.3	3.8	4.16	1.05
20	133	16.5	7.1	5.1	4.40	1.05
21	120	20.2	7.3	7.9	5.33	1.04
22	144	19.0	7.3	6.9	5.20	1.05
23	169	19.7	7.7	7.5	5.47	1.05
24	233	21.2	9.6	8.5	6.01	1.05
25	248	20.1	12.3	7.1	5.54	1.03
26	288	19.9	11.8	6.9	5.47	1.04
27	275	20.8	13.8	7.9	5.78	1.05
28	308	22.8	16.3	9.8	6.48	1.03
29	288	22.9	17.2	9.5	6.40	1.03
30	323	22.0	16.8	8.5	6.09	1.04
31	340	21.4	17.2	8.1	5.91	1.04
32	319	21.8	18.3	8.4	5.96	1.04
33	360	22.9	17.5	9.4	6.31	1.03
34	427	24.1	21.3	10.8	6.76	1.02
35	308	26.8	23.6	14.6	8.03	1.03
36	386	24.9	18.7	11.0	6.76	1.02
37	445	22.7	20.2	8.9	6.04	1.02
38	468	23.6	22.4	9.6	6.28	1.03
39	467	24.7	22.8	10.7	6.60	1.03
40	482	26.0	23.6	12.1	7.15	1.03
41	508	26.6	25.6	12.8	7.35	1.02
42	550	27.1	27.1	13.4	7.60	1.03
43	587	27.0	27.3	13.3	7.57	1.02
44	571	27.8	29.5	14.1	7.91	1.02

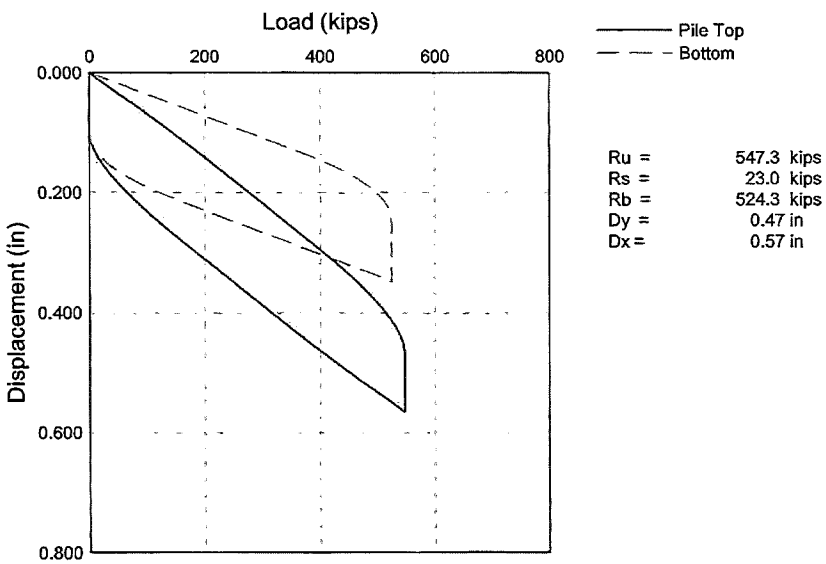
Total number of blows analyzed: 43

Time Summary

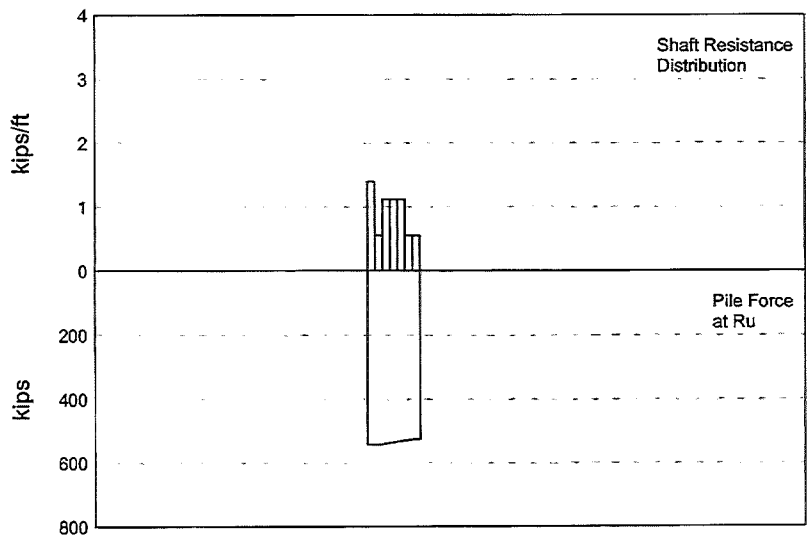
Drive 7 minutes 34 seconds 9:59:44 AM - 10:07:18 AM (6/25/2013) BN 1 - 45







Ru =	547.3 kips
Rs =	23.0 kips
Rb =	524.3 kips
Dy =	0.47 in
Dx =	0.57 in



JAMAICA ER-BRF 015-1(23) JAMAICA, VT; Pile: ABUTMENT 1 PILE 1 Test: 25-Jun-2013 10:07:
DELMAG D16-32 (HP 12X84); Blow: 42 CAPWAP(R) 2006-3
GZA GeoEnvironmental Inc. OP: RAYAN SHAMAS

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 547.3; along Shaft 23.0; at Toe 524.3 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	Smith Damping Factor s/ft
				547.3				
1	3.6	1.6	5.0	542.3	5.0	3.18	0.78	0.400
2	7.1	5.1	2.0	540.3	7.0	0.56	0.14	0.400
3	10.7	8.7	4.0	536.3	11.0	1.12	0.27	0.400
4	14.3	12.3	4.0	532.3	15.0	1.12	0.27	0.400
5	17.9	15.9	4.0	528.3	19.0	1.12	0.27	0.400
6	21.4	19.4	2.0	526.3	21.0	0.56	0.14	0.400
7	25.0	23.0	2.0	524.3	23.0	0.56	0.14	0.400
Avg. Shaft			3.3			1.00	0.24	0.400
Toe			524.3				500.05	0.040

Soil Model Parameters/Extensions		Shaft	Toe
Quake	(in)	0.090	0.190
Case Damping Factor		0.210	0.478
Unloading Quake	(% of loading quake)	50	50
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	20	
Resistance Gap (included in Toe Quake)	(in)		0.060

CAPWAP match quality = 2.99 (Wave Up Match) ; RSA = 0
Observed: final set = 0.100 in; blow count = 120 b/ft
Computed: final set = 0.094 in; blow count = 128 b/ft

max. Top Comp. Stress = 26.5 ksi (T= 20.8 ms, max= 1.009 x Top)
max. Comp. Stress = 26.7 ksi (Z= 25.0 ft, T= 22.5 ms)
max. Tens. Stress = -2.55 ksi (Z= 3.6 ft, T= 31.7 ms)
max. Energy (EMX) = 13.1 kip-ft; max. Measured Top Displ. (DMX)= 0.39 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	3.6	651.7	-62.7	26.5	-2.55	13.11	13.9	0.395
2	7.1	627.3	-42.1	25.5	-1.71	12.16	13.7	0.375
3	10.7	624.5	-43.5	25.4	-1.77	11.52	13.5	0.353
4	14.3	608.7	-33.8	24.7	-1.37	10.54	13.2	0.328
5	17.9	584.3	-44.1	23.7	-1.79	9.51	14.5	0.301
6	21.4	530.6	-52.2	21.6	-2.12	8.48	15.5	0.273
7	25.0	657.7	-43.1	26.7	-1.75	8.88	15.0	0.243
Absolute	25.0			26.7			(T =	22.5 ms)
	3.6				-2.55		(T =	31.7 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	599.3	531.3	463.2	395.2	327.1	259.1	191.0	123.0	55.0	0.0
RX	722.8	676.5	630.1	588.9	570.3	554.6	551.2	548.6	546.1	544.2
RU	599.3	531.3	463.2	395.2	327.1	259.1	191.0	123.0	55.0	0.0

RAU = 487.2 (kips); RA2 = 582.8 (kips)

Current CAPWAP Ru = 547.3 (kips); Corresponding J(RP)= 0.08; J(RX) = 0.75

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips
14.32	20.61	628.7	651.0	654.1	0.385	0.100	0.100	13.3	659.9

PILE PROFILE AND PILE MODEL

Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.00	24.60	29992.2	492.000	4.096
25.00	24.60	29992.2	492.000	4.096

Toe Area 1.048 ft^2

Top Segment Length 3.57 ft, Top Impedance 43.91 kips/ft/s

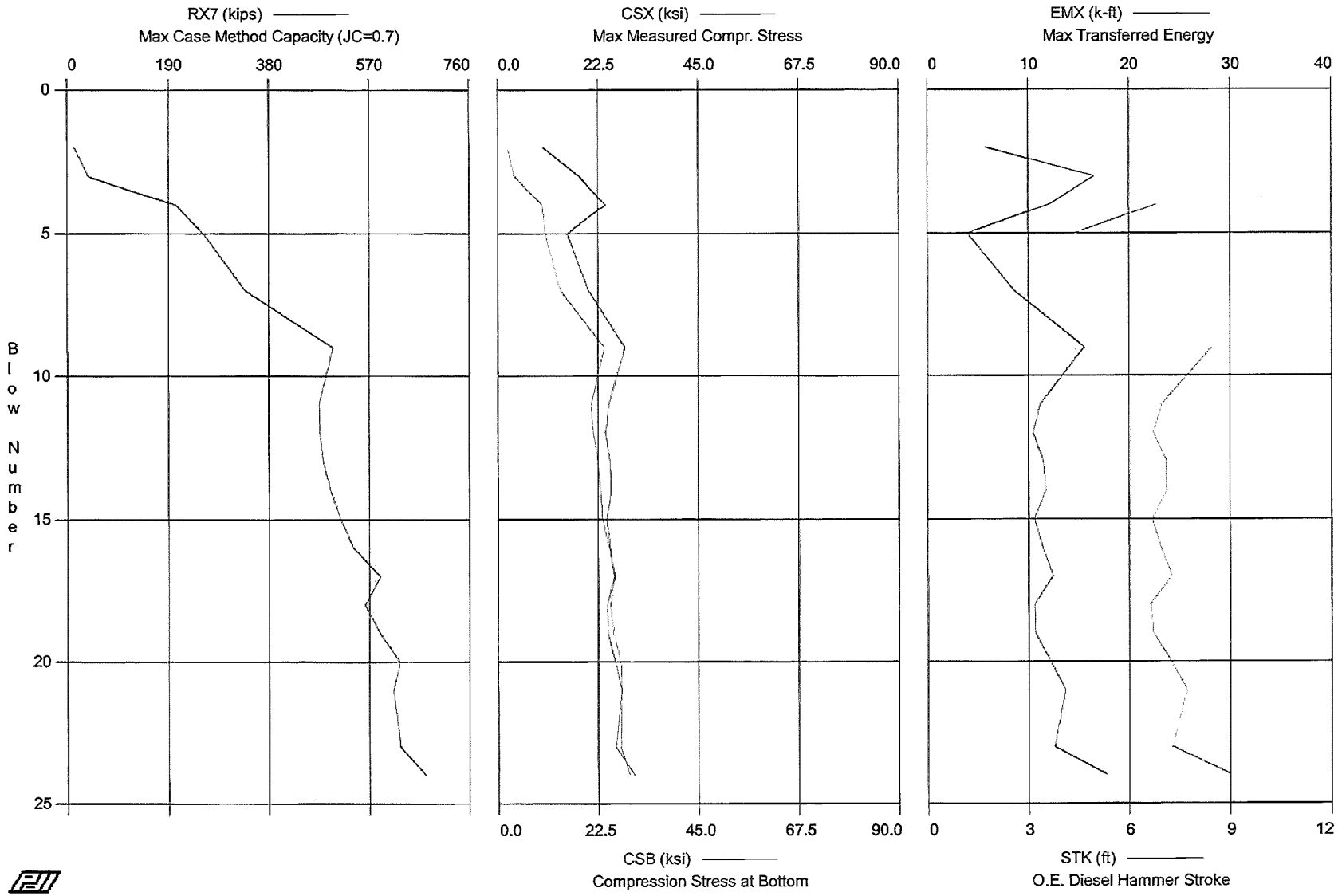
Pile Damping 1.0 %, Time Incr 0.212 ms, Wave Speed 16807.9 ft/s, 2L/c 3.0 ms

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 2



GZA GeoEnvironmental Inc.
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 2
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 29.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

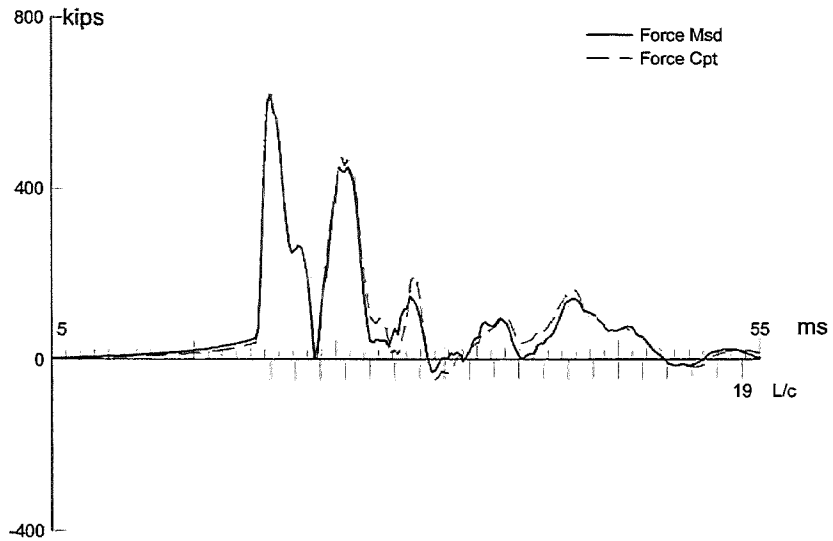
EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

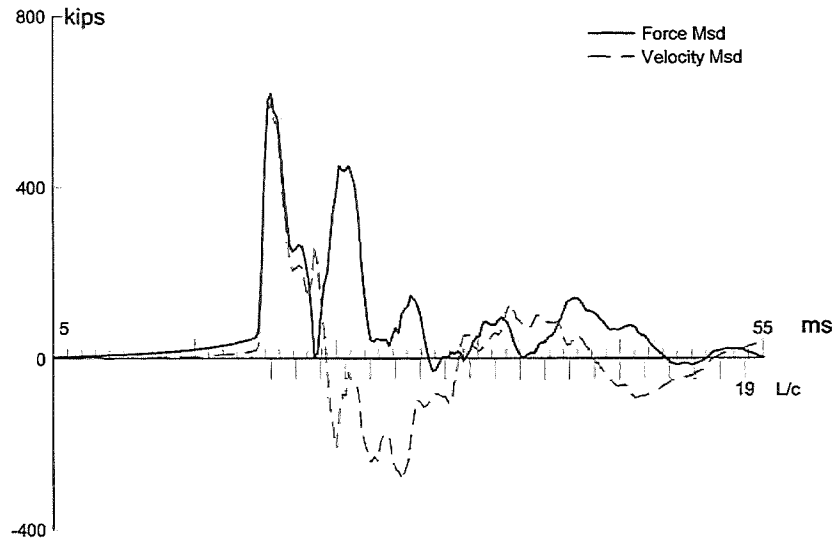
BL#	RX7 kips	CSX ksi	CSB ksi	EMX k-ft	STK ft	FVP []
2	14	10.2	2.2	5.7	0.00	0.89
3	40	18.3	3.8	16.5	0.00	0.96
4	205	24.1	10.0	12.0	6.82	1.01
5	257	15.6	10.7	3.9	4.40	0.99
7	336	20.4	14.1	8.6	0.00	1.00
9	501	28.6	23.9	15.6	8.48	1.00
11	475	24.9	20.8	11.2	6.98	1.01
12	476	24.2	21.3	10.5	6.72	1.00
13	483	25.1	22.5	11.5	7.11	1.01
14	497	25.4	23.0	11.7	7.11	1.01
15	516	24.4	23.4	10.6	6.69	0.99
16	540	25.2	25.0	11.4	6.95	1.00
17	591	26.1	26.3	12.5	7.28	0.99
18	562	24.5	25.3	10.6	6.63	0.99
19	590	24.7	26.0	10.7	6.72	0.98
20	628	26.2	27.6	12.2	7.25	0.97
21	616	27.6	27.6	13.7	7.72	0.97
23	629	26.3	27.4	12.6	7.28	0.97
24	677	30.5	29.5	17.8	9.03	0.98

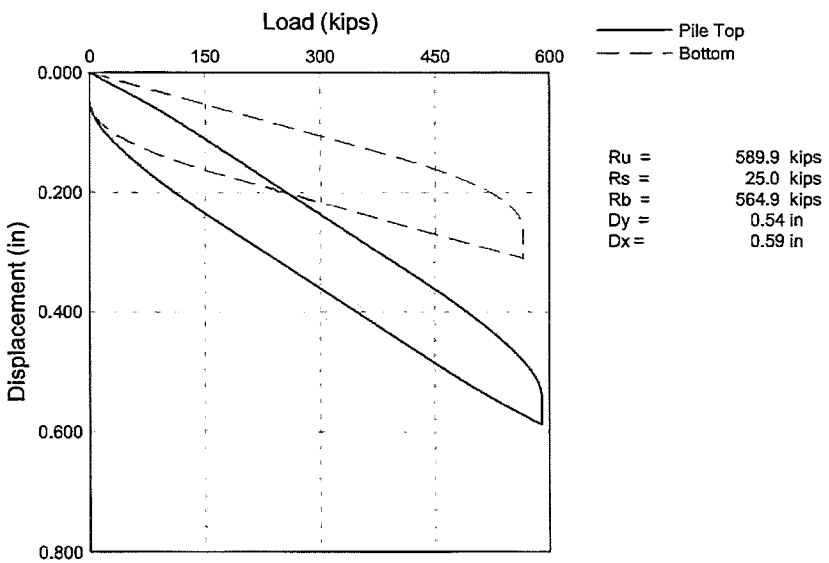
Total number of blows analyzed: 19

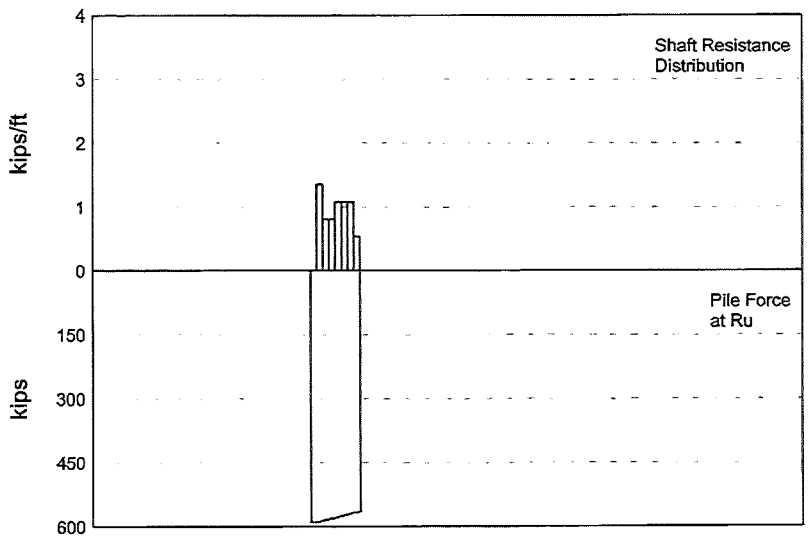
Time Summary

Drive 1 minute 52 seconds 9:45:38 AM - 9:47:30 AM (6/25/2013) BN 1 - 25


800 kips
400
0
-400
5
55 ms
19 L/c
Force Msd
Force Cpt


800 kips
400
0
-400
5
55 ms
19 L/c
Force Msd
Velocity Msd


Load (kips)
0
150
300
450
600
0.000
0.200
0.400
0.600
0.800
Displacement (in)
Pile Top
Bottom
Ru = 589.9 kips
Rs = 25.0 kips
Rb = 564.9 kips
Dy = 0.54 in
Dx = 0.59 in


kips/ft
4
3
2
1
0
Shaft Resistance
Distribution
kips
150
300
450
600
Pile Force
at Ru

JAMAICA ER-BRF 015-1(23) JAMAICA, VT; Pile: ABUTMENT 1 PILE 2 Test: 25-Jun-2013 09:47:
DELMAG D16-32 (HP 12X84); Blow: 23 CAPWAP(R) 2006-3
GZA GeoEnvironmental Inc. OP: RAYAN SHAMAS

CAPWAP SUMMARY RESULTS

Total CAPWAP Capacity: 589.9; along Shaft 25.0; at Toe 564.9 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	Smith Damping Factor s/ft	Quake in
				589.9					
1	7.4	-0.6	5.0	584.9	5.0	1.36*	0.33*	0.250	0.040
2	11.1	3.1	3.0	581.9	8.0	0.98	0.24	0.250	0.040
3	14.8	6.8	3.0	578.9	11.0	0.81	0.20	0.250	0.040
4	18.4	10.4	4.0	574.9	15.0	1.08	0.26	0.250	0.040
5	22.1	14.1	4.0	570.9	19.0	1.08	0.26	0.250	0.040
6	25.8	17.8	4.0	566.9	23.0	1.08	0.26	0.250	0.040
7	29.5	21.5	2.0	564.9	25.0	0.54	0.13	0.250	0.037
Avg. Shaft			3.6			1.16	0.24	0.250	0.040
Toe			564.9				538.77	0.035	0.200

*Guide friction or other non-soil resistance.

Soil Model Parameters/Extensions		Shaft	Toe
Case Damping Factor		0.142	0.450
Unloading Quake	(% of loading quake)	40	100
Reloading Level	(% of Ru)	100	100
Unloading Level	(% of Ru)	70	
Resistance Gap (included in Toe Quake) (in)			0.060

CAPWAP match quality = 4.44 (Wave Up Match) ; RSA = 0
Observed: final set = 0.050 in; blow count = 240 b/ft
Computed: final set = 0.043 in; blow count = 280 b/ft

max. Top Comp. Stress = 25.3 ksi (T= 20.8 ms, max= 1.065 x Top)
max. Comp. Stress = 26.9 ksi (Z= 29.5 ft, T= 23.0 ms)
max. Tens. Stress = -3.10 ksi (Z= 22.1 ft, T= 30.9 ms)
max. Energy (EMX) = 12.1 kip-ft; max. Measured Top Displ. (DMX)= 0.39 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	3.7	622.5	-50.6	25.3	-2.06	12.12	13.6	0.401
2	7.4	628.4	-59.6	25.5	-2.42	11.95	13.5	0.386
3	11.1	611.2	-64.7	24.8	-2.63	11.25	13.4	0.369
4	14.8	603.6	-55.7	24.5	-2.26	10.64	13.2	0.347
5	18.4	596.2	-62.9	24.2	-2.55	9.84	13.1	0.320
6	22.1	579.7	-76.4	23.6	-3.10	9.02	14.6	0.294
7	25.8	531.4	-62.2	21.6	-2.53	8.14	15.8	0.266
8	29.5	663.0	-52.9	26.9	-2.15	8.56	15.8	0.234
Absolute	29.5			26.9			(T =	23.0 ms)
	22.1				-3.10		(T =	30.9 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	587.4	521.1	454.8	388.6	322.3	256.0	189.7	123.4	57.2	0.0
RX	671.8	643.0	622.2	613.4	613.4	613.4	613.4	613.4	613.4	613.4
RU	587.4	521.1	454.8	388.6	322.3	256.0	189.7	123.4	57.2	0.0

RAU = 613.4 (kips); RA2 = 610.1 (kips)

Current CAPWAP Ru = 589.9 (kips); Corresponding J(RP)= 0.00; matches RX9 within 5%

VMX ft/s	TVP ms	VT1*Z kips	FT1 kips	FMX kips	DMX in	DFN in	SET in	EMX kip-ft	QUS kips
14.06	20.62	617.3	632.9	647.8	0.394	0.050	0.050	12.3	666.3

PILE PROFILE AND PILE MODEL

Depth ft	Area in^2	E-Modulus ksi	Spec. Weight lb/ft^3	Perim. ft
0.00	24.60	29992.2	492.000	4.096
29.50	24.60	29992.2	492.000	4.096

Toe Area 1.048 ft^2

Top Segment Length 3.69 ft, Top Impedance 43.91 kips/ft/s

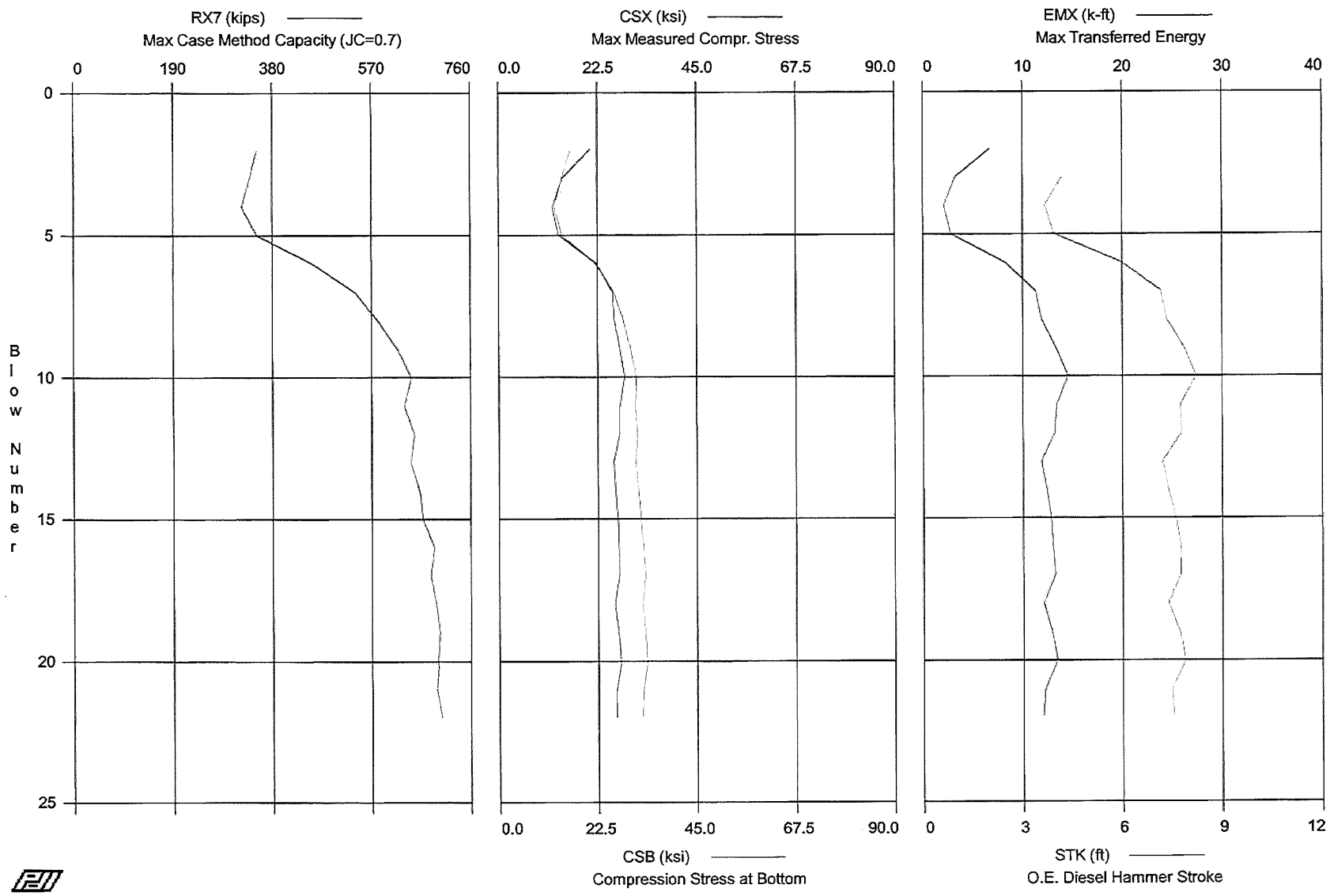
Pile Damping 1.0 %, Time Incr 0.219 ms, Wave Speed 16807.9 ft/s, 2L/c 3.5 ms

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 3 (ID)



JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 3 (ID)
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 25.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	350	20.8	16.4	6.8	0.00	1.01
3	337	14.6	14.4	3.2	4.19	1.01
4	321	12.2	12.7	2.1	3.68	1.03
5	351	13.7	14.4	2.8	3.96	1.03
6	458	22.3	22.1	8.3	5.98	1.02
7	540	25.9	26.3	11.3	7.18	1.03
8	583	26.4	28.4	11.9	7.35	1.03
9	620	27.6	30.0	13.4	7.87	1.02
10	647	28.6	31.3	14.6	8.23	1.02
11	633	27.5	31.1	13.4	7.75	1.02
12	653	27.4	31.5	13.2	7.79	1.02
13	645	26.1	31.0	11.9	7.21	1.01
14	662	26.5	31.8	12.4	7.39	1.01
15	668	27.0	32.3	12.8	7.60	1.00
16	690	27.2	32.8	13.0	7.75	1.00
17	683	27.3	33.2	13.2	7.75	1.00
18	694	26.3	32.6	12.1	7.39	1.00
19	700	27.1	33.2	12.9	7.72	1.00
20	697	27.7	33.6	13.5	7.91	0.99
21	694	26.6	32.7	12.2	7.49	0.99

Total number of blows analyzed: 21

Time Summary

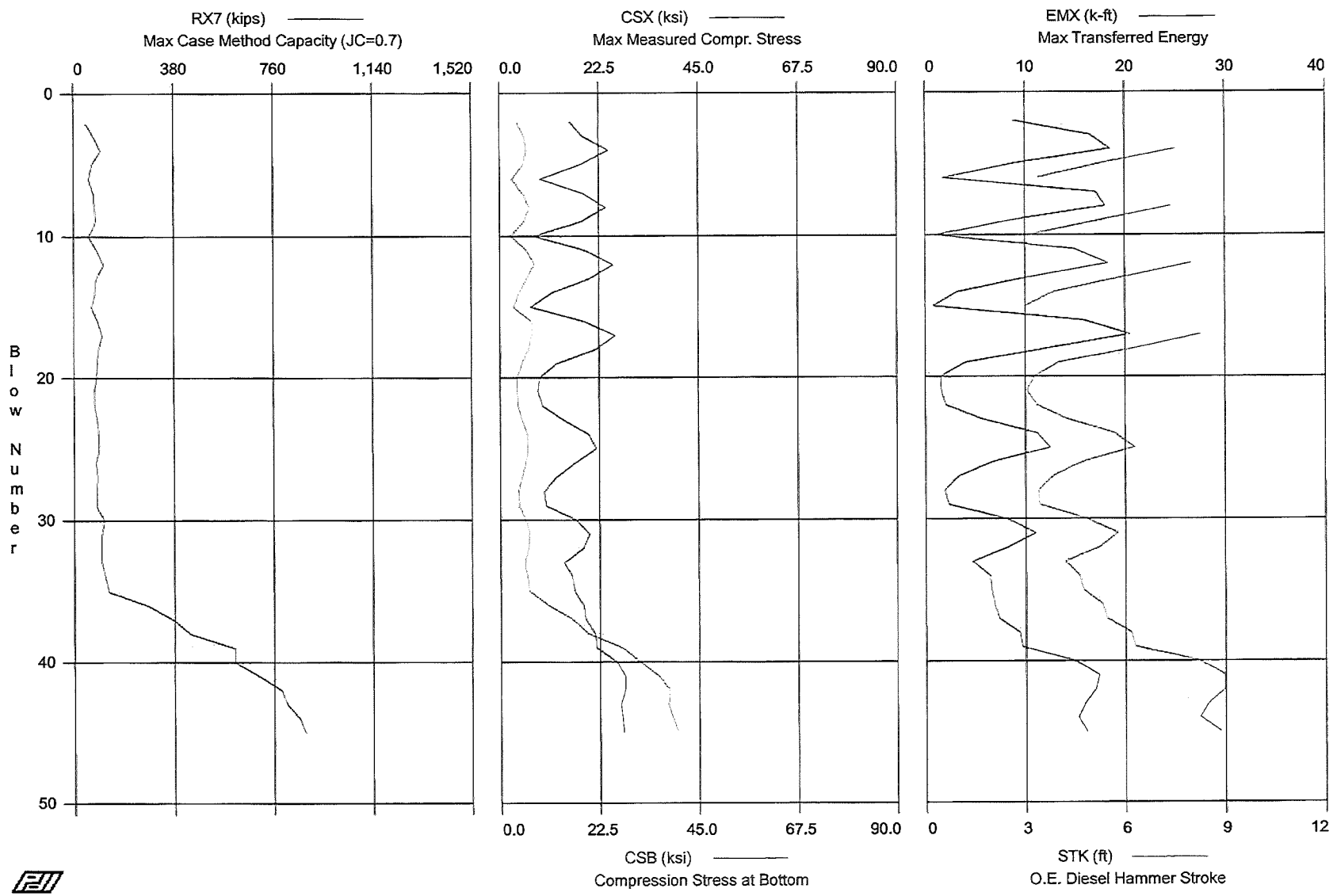
Drive 3 minutes 50 seconds 9:16:52 AM - 9:20:42 AM (6/25/2013) BN 1 - 22

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 4



JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 4
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 27.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	47	16.0	4.0	8.9	0.00	0.89
7	77	18.8	5.2	17.1	0.00	0.89
12	114	25.6	7.9	18.3	7.99	0.89
17	108	26.1	7.2	20.5	8.27	0.89
22	80	9.7	4.1	2.1	3.35	0.95
27	91	12.7	4.9	3.3	3.85	0.94
32	104	18.7	6.3	8.2	5.22	0.91
36	282	18.8	10.9	6.9	5.31	0.92
37	376	19.3	16.4	7.3	5.45	0.93
38	443	21.4	19.8	9.4	6.17	0.90
39	612	21.8	27.6	9.6	6.31	0.94
40	613	26.3	31.6	15.0	8.23	0.93
41	705	28.1	35.8	17.3	8.98	0.91
42	790	28.1	38.4	17.0	8.98	0.91
43	811	27.1	37.9	15.9	8.48	0.90
44	859	27.5	39.0	15.2	8.23	0.91
45	880	27.8	40.2	16.1	8.84	0.91

Total number of blows analyzed: 44

Time Summary

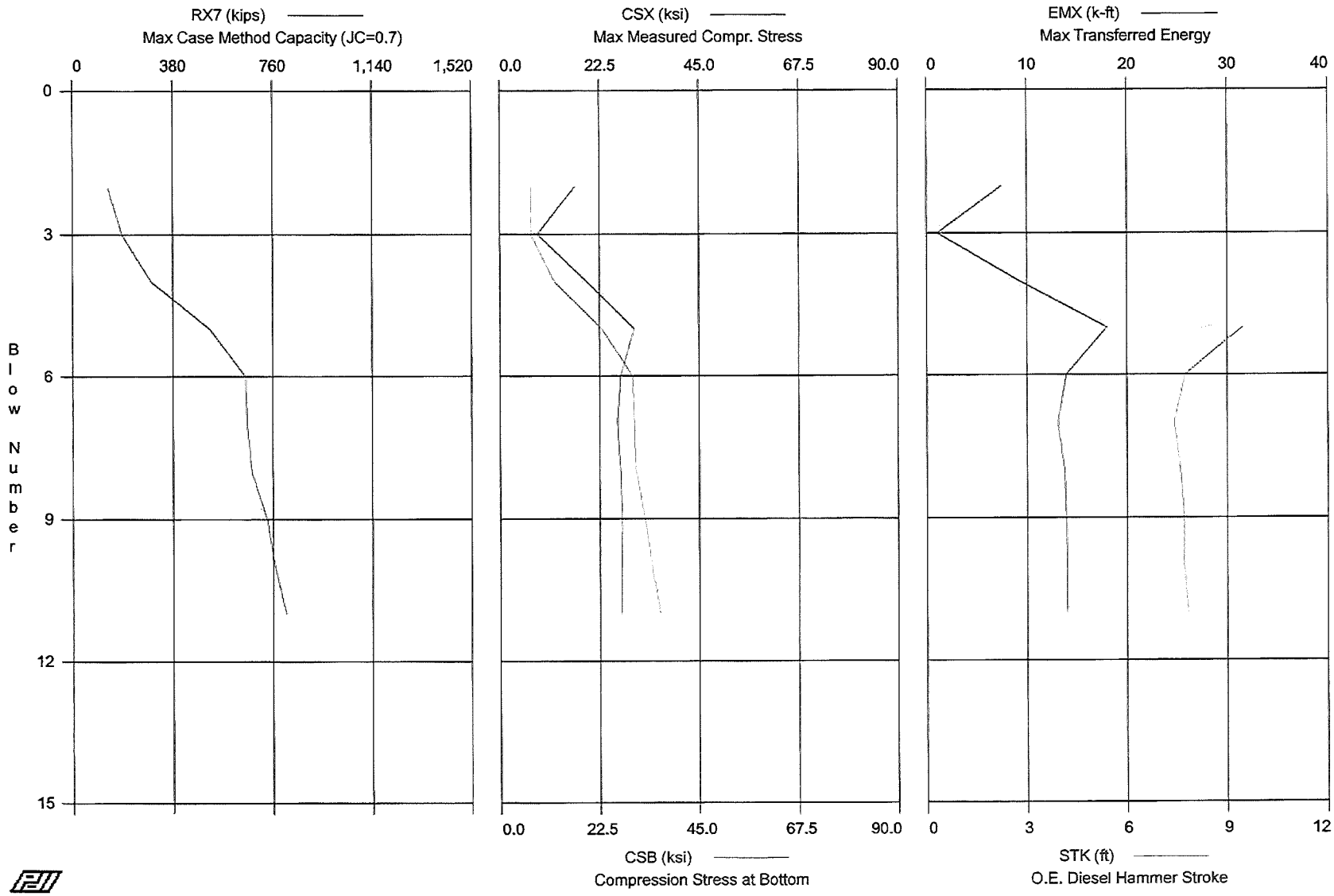
Drive 2 minutes 27 seconds 10:22:54 AM - 10:25:21 AM (6/25/2013) BN 1 - 45

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 5 (ID)



GZA GeoEnvironmental Inc.
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 5 (ID)
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 27.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	134	16.9	7.0	7.5	0.00	0.94
3	189	8.5	7.0	1.1	3.27	1.04
4	300	19.6	12.3	9.2	0.00	1.00
5	522	30.3	23.0	18.0	9.47	1.02
6	656	27.3	30.0	14.0	7.75	1.00
7	662	26.5	30.4	13.1	7.42	1.00
8	680	27.2	30.7	13.8	7.60	1.00
9	738	27.5	32.7	13.9	7.72	0.98
10	768	27.4	34.3	14.0	7.72	0.99
11	811	27.4	36.2	14.0	7.83	0.99

Total number of blows analyzed: 10

Time Summary

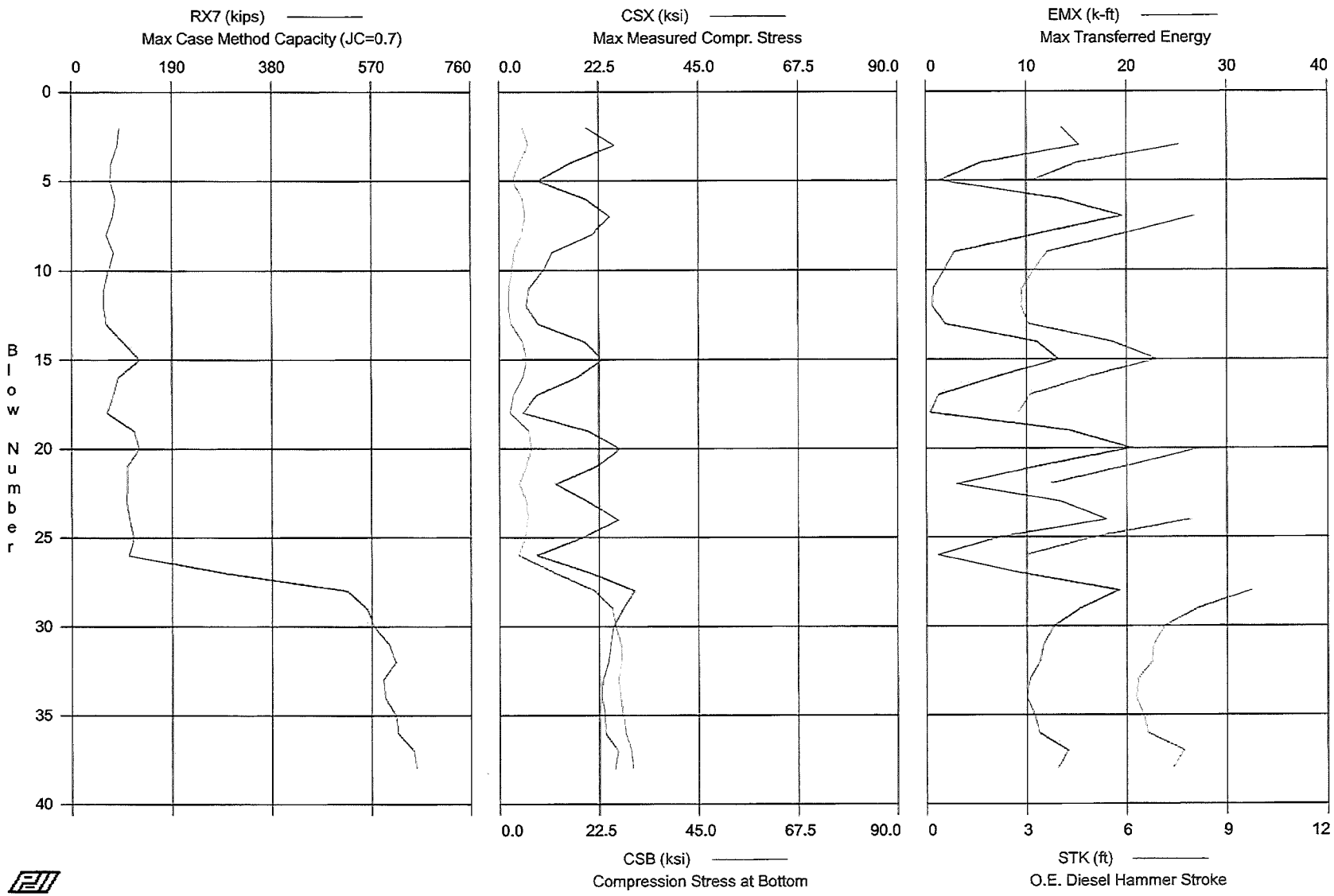
Drive 1 minute 18 seconds 10:39:44 AM - 10:41:02 AM (6/25/2013) BN 1 - 11

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 6 (ID)



GZA GeoEnvironmental Inc.
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 6 (ID)
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 26.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	90	19.5	5.3	13.5	0.00	0.98
3	86	26.0	6.6	15.2	7.57	0.95
4	75	16.1	4.7	5.4	4.52	0.98
5	73	8.8	3.1	1.4	3.19	1.00
6	83	19.7	5.4	13.4	0.00	0.97
7	77	24.9	5.8	19.6	8.03	0.97
8	65	20.9	5.1	11.2	5.91	0.95
9	79	11.8	3.4	2.8	3.63	0.97
10	70	10.0	2.9	1.8	3.25	0.99
11	62	6.7	2.3	0.7	2.89	1.00
12	61	6.1	2.0	0.6	2.84	1.01
13	66	8.9	2.8	1.9	3.06	1.00
14	98	19.4	5.4	11.1	5.56	0.97
15	129	23.3	6.2	13.2	6.91	0.97
16	89	17.6	5.3	6.9	4.85	0.96
17	79	8.4	3.1	1.2	3.12	1.00
18	68	5.3	2.4	0.4	2.77	1.02
19	119	20.1	6.6	14.3	0.00	0.96
20	128	27.2	7.3	20.5	8.23	0.97
21	105	21.9	6.1	11.2	6.01	0.95
22	106	12.8	4.6	3.0	3.74	0.98
23	105	20.3	6.2	13.4	0.00	0.94
24	110	26.7	6.4	18.0	7.95	0.96
25	118	18.9	5.9	7.3	5.08	0.95
26	107	8.5	4.3	1.1	3.03	1.02
27	293	20.6	12.6	9.2	0.00	0.95
28	524	30.6	21.5	19.2	9.73	0.96
29	562	28.0	25.6	15.4	8.15	0.96
30	575	25.8	26.3	12.7	7.15	0.96
31	604	25.1	27.4	11.7	6.82	0.94
32	616	24.5	27.5	11.3	6.76	0.95
33	592	23.3	26.9	10.3	6.34	0.98
34	596	23.1	27.4	10.0	6.28	0.99
35	617	23.7	27.9	10.8	6.51	0.98
36	621	23.9	28.4	11.3	6.63	0.98
37	651	26.8	29.7	14.1	7.72	0.98
38	656	26.1	30.1	13.2	7.39	0.98

Total number of blows analyzed: 37

Time Summary

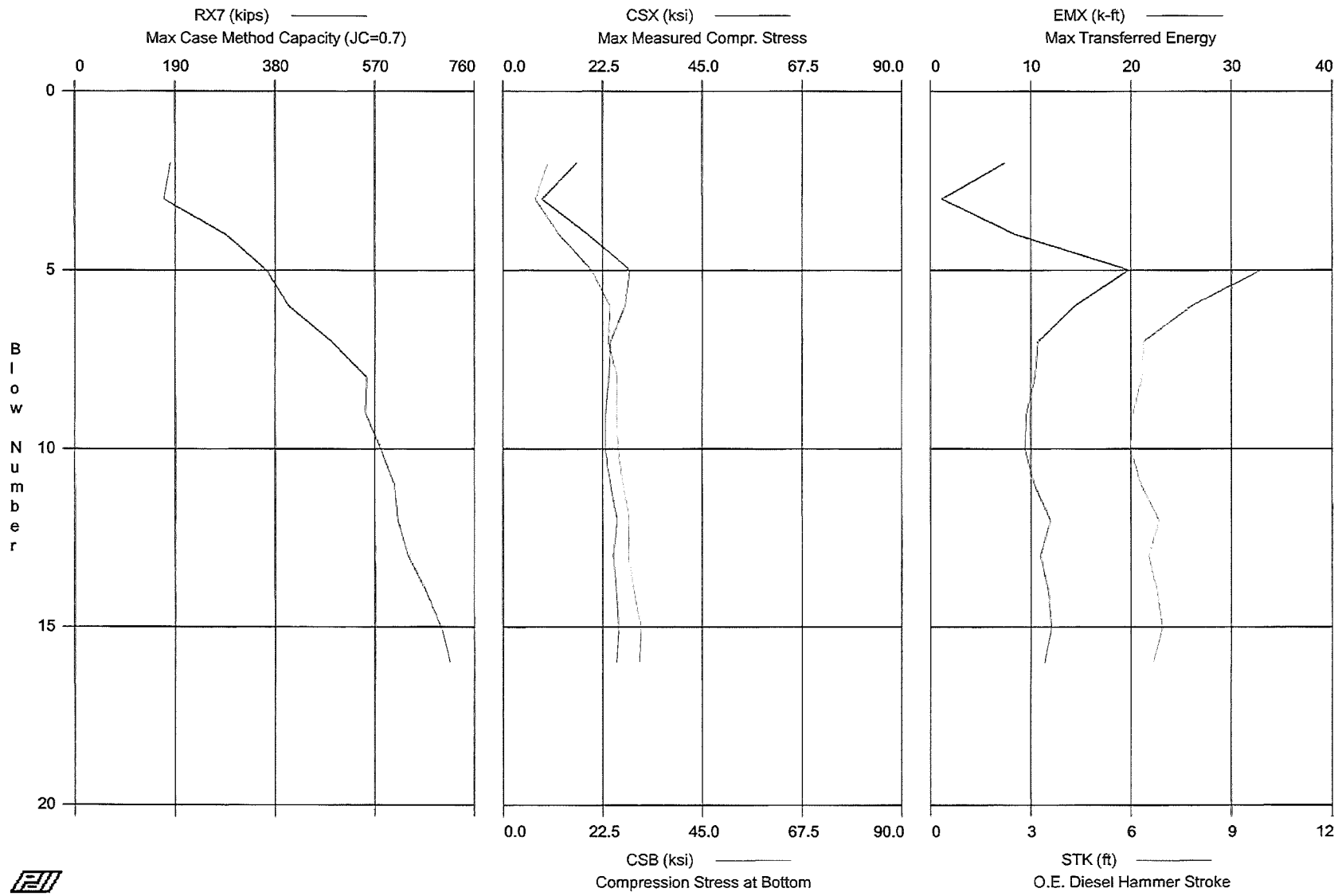
Drive 2 minutes 25 seconds 10:54:50 AM - 10:57:15 AM (6/25/2013) BN 1 - 39

GZA GeoEnvironmental Inc. - Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

Test date: 25-Jun-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 7 (ID)



GZA GeoEnvironmental Inc.
Case Method & iCAP® Results

PDIPLOT Ver. 2012.2 - Printed: 12-Jul-2013

JAMAICA ER-BRF 015-1(23) JAMAICA, VT - ABUTMENT 1 PILE 7 (ID)
OP: RAYAN SHAMAS

DELMAG D16-32 (HP 12X84)
Test date: 25-Jun-2013

AR: 24.60 in^2
LE: 30.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

RX7: Max Case Method Capacity (JC=0.7)
CSX: Max Measured Compr. Stress
CSB: Compression Stress at Bottom

EMX: Max Transferred Energy
STK: O.E. Diesel Hammer Stroke
FVP: Force/Velocity proportionality

BL#	RX7	CSX	CSB	EMX	STK	FVP
	kips	ksi	ksi	k-ft	ft	[]
2	180	16.7	10.2	7.5	0.00	0.97
3	168	8.9	7.3	1.2	3.19	1.05
4	287	19.3	12.7	8.5	0.00	0.98
5	364	28.6	20.0	19.8	9.89	0.97
6	407	27.5	24.2	14.4	7.83	1.00
7	489	24.3	23.8	10.7	6.37	1.01
8	555	23.9	25.8	10.5	6.34	1.01
9	552	23.2	25.7	9.6	6.06	1.00
10	582	23.2	26.0	9.4	5.98	1.01
11	607	24.2	27.1	10.4	6.31	1.02
12	614	25.8	28.5	12.0	6.85	1.02
13	634	24.9	28.3	11.0	6.54	1.00
14	668	25.7	29.6	11.8	6.79	1.01
15	697	26.1	31.1	12.1	6.95	0.99
16	713	25.5	30.7	11.4	6.66	1.02

Total number of blows analyzed: 15

Time Summary

Drive 1 minute 31 seconds 11:07:39 AM - 11:09:10 AM (6/25/2013) BN 1 - 16