MACTEC
2801 YORKMONT ROAD, SUITE 100 □ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	550 on Marsh Buggy
PROJECT NO.:	6468-07-1950	SERIAL NO.:	136893
DATE:	4/5/2008	HAMMER TYPE:	Automatic
WEATHER:	Partly Cloudy Mid 80s	ROPE CONDITION:	N/A
INSPECTOR: HC 4/5/08	~~Steve Riser~~ Jay Cereo	ROD SIZE:	AWJ
DRILLING COMPANY:	MACTEC	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-737		
DEPTH DRILLED:	96.8', 111.8', 121.8', 131.8'		
TIME DRIVEN:	9:36 am, 11:20, 12:15, 2:30 pm		
RIG OPERATOR:	F. Cox		
HAMMER OPERATOR:	R. Hall		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.19		
ACCEL. SERIAL NOS.:	K1050 & P5992		
STRAIN SERIAL NOS.:	75AW-1 & 75AW-2 HC 4/5/08		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	~~DEPTH~~ LE ~~cont.~~ (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
96.8-98.3	31-13-27	103									
111.8-113.3	6-3-6	121									
121.8-123.3	5-5-11	131									
131.8-133.3	5-5-9	141									

REMARKS:

MACTEC
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RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	550 MARSH BUGGY
PROJECT NO.:	6468-07-1950	SERIAL NO.:	136893
DATE:	3-10-08	HAMMER TYPE:	Automatic
WEATHER:	CLOUDY 70°	ROPE CONDITION:	N/A
INSPECTOR:	Steve Kiser	ROD SIZE:	AW-J
DRILLING COMPANY:	MACTEC RALEIGH	NO. OF SHEAVES:	N/A

BORING DATA			
BORING NUMBER:	B-BOB		
DEPTH DRILLED:	125' PLANNED		
TIME DRIVEN:	VARIOUS - SEE DATA		
RIG OPERATOR:	DAVID WHITE		
HAMMER OPERATOR:	N.R.		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	4.19 in²		
ACCEL. SERIAL NOS.:	K1050 / P5992		
STRAIN SERIAL NOS.:	75 AW #1/2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
12'-13.5'	7-9-15										
15'-16.5' SAL ~~14.5'-16'~~	19-21-50/6"										
19.6'-21.1'	6-6-5										
	SAL										
24.1'-25.6'	~~50/0.1"~~	50/0.1'									

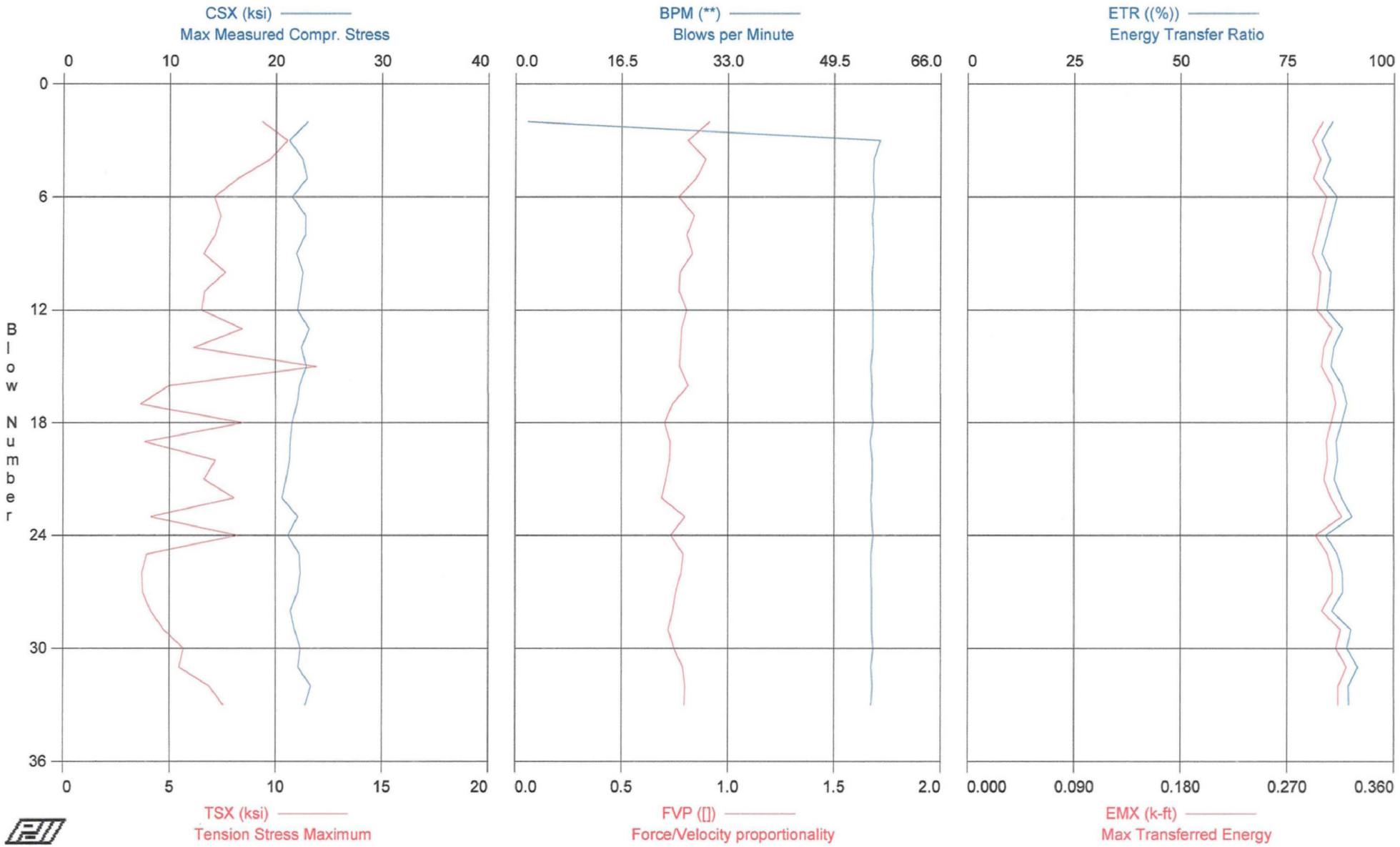
REMARKS:

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 10-Mar-2008

TURKEY POINT COL PROJECT - BORING B-808; 12' - 13.5' Sample



TURKEY POINT COL PROJECT - BORING B-808; 12' - 13.5' Sample
OP: SEK

HAMMER ID 893 (D. WHITE
Test date: 10-Mar-2008

AR: 1.19 in^2
LE: 16.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.0	9.4	27	14.6	1.9	0.91	0.241	86	0.300
3	0.00	21.3	10.5	25	14.7	56.6	0.81	0.230	83	0.291
4	0.00	22.5	9.7	27	14.1	55.6	0.90	0.240	85	0.298
5	0.00	22.9	8.2	27	15.1	55.5	0.85	0.235	83	0.292
6	0.00	21.6	7.1	26	15.6	55.7	0.77	0.225	87	0.303
7	0.00	22.8	7.4	27	15.1	55.4	0.84	0.230	86	0.299
8	0.00	22.8	7.2	27	15.9	55.5	0.81	0.228	84	0.295
9	0.00	21.9	6.6	26	14.8	55.6	0.83	0.224	83	0.291
10	0.00	22.6	7.6	27	16.3	55.4	0.78	0.228	85	0.298
11	0.00	22.3	6.7	27	16.2	55.4	0.77	0.226	85	0.297
12	0.00	22.1	6.5	26	15.3	55.5	0.81	0.226	84	0.295
13	0.00	23.2	8.4	28	16.6	55.5	0.78	0.235	88	0.308
14	0.00	22.4	6.1	27	15.4	55.5	0.78	0.229	86	0.301
15	0.00	22.9	11.9	27	16.6	55.2	0.77	0.228	85	0.299
16	0.00	22.3	5.0	27	15.3	55.4	0.82	0.226	88	0.308
17	0.00	22.0	3.6	26	16.7	55.3	0.74	0.221	89	0.311
18	0.00	21.5	8.5	26	17.2	55.5	0.70	0.216	88	0.307
19	0.00	21.4	3.8	25	16.4	55.1	0.73	0.219	86	0.303
20	0.00	21.3	7.2	25	16.4	55.4	0.73	0.219	87	0.304
21	0.00	21.0	6.6	25	16.6	55.4	0.71	0.218	86	0.301
22	0.00	20.6	8.0	25	16.6	55.2	0.69	0.225	88	0.307
23	0.00	22.1	4.1	26	15.6	55.3	0.80	0.223	90	0.316
24	0.00	21.1	8.2	25	16.1	55.5	0.73	0.220	84	0.294
25	0.00	22.2	3.9	26	15.7	55.2	0.79	0.226	87	0.304
26	0.00	22.3	3.7	27	16.1	55.2	0.78	0.216	88	0.308
27	0.00	22.1	3.7	26	16.4	55.3	0.76	0.218	88	0.308
28	0.00	21.4	4.1	25	16.1	55.3	0.74	0.218	85	0.299
29	0.00	21.8	4.7	26	17.0	55.3	0.72	0.220	90	0.315
30	0.00	22.3	5.7	27	16.8	55.5	0.75	0.218	89	0.311
31	0.00	22.1	5.5	26	15.3	55.2	0.79	0.226	92	0.320
32	0.00	23.3	6.9	28	16.3	55.4	0.80	0.224	89	0.313
33	0.00	22.8	7.5	27	16.0	55.2	0.80	0.218	89	0.313
	Average	22.1	6.7	26	15.9	53.8	0.78	0.225	87	0.303

Total number of blows analyzed: 32

Time Summary

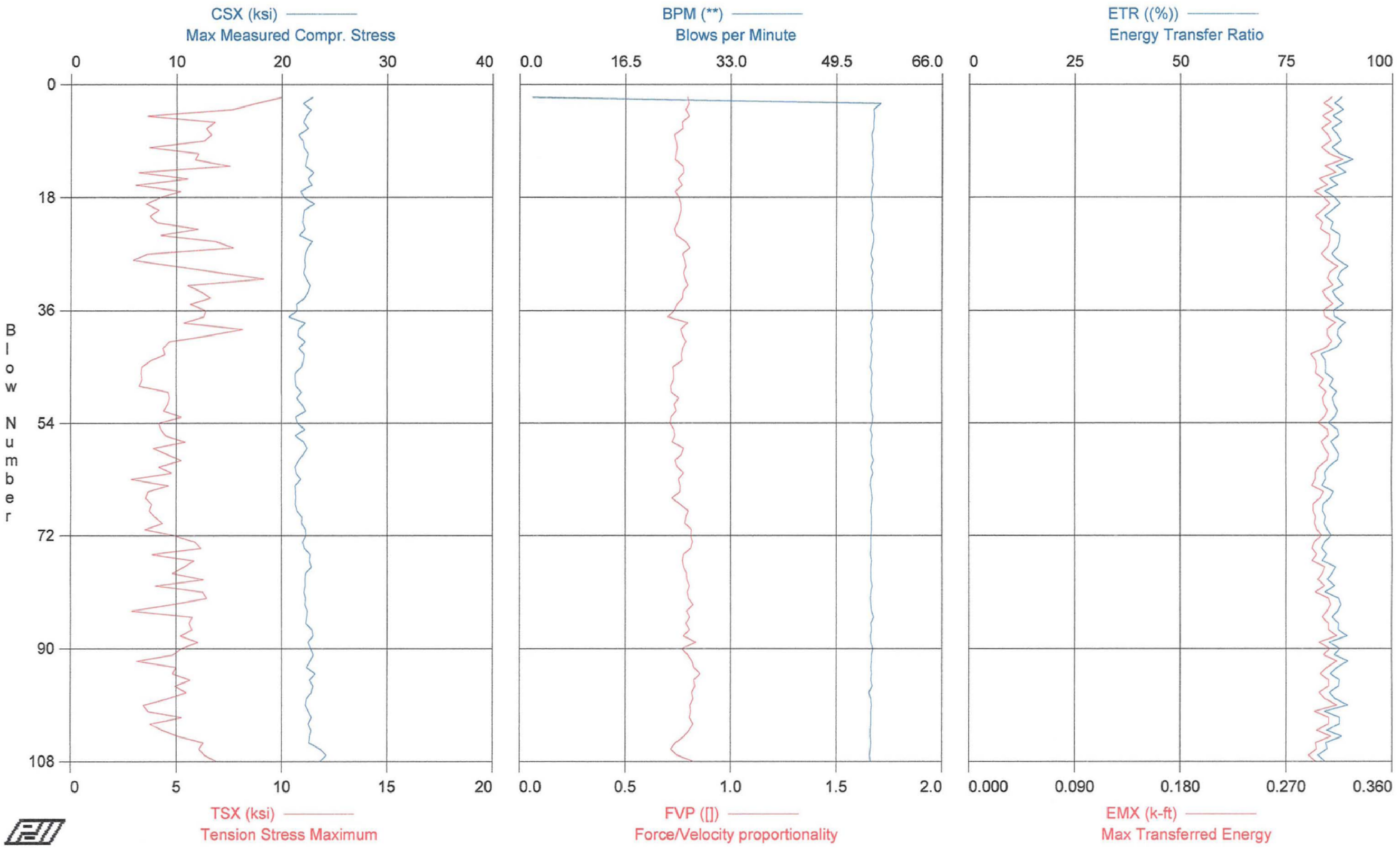
Drive 34 seconds 12:34:26 PM - 12:35:00 PM (3/10/2008) BN 2 - 33

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 10-Mar-2008

TURKEY POINT COL PROJECT - BORING B-808; 15' - 16.5' Sample



TURKEY POINT COL PROJECT - BORING B-808; 15' - 16.5' Sample
OP: SEK

HAMMER ID 893 (D. WHITE
Test date: 10-Mar-2008

AR: 1.19 in^2
LE: 20.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.9	10.0	27	16.1	1.9	0.79	0.253	88	0.309
3	0.00	22.0	8.7	26	15.4	56.4	0.80	0.249	86	0.302
4	0.00	22.7	7.6	27	16.2	55.3	0.79	0.249	88	0.310
5	0.00	22.3	3.6	27	15.6	55.4	0.80	0.245	86	0.301
6	0.00	22.0	6.8	26	15.6	55.3	0.77	0.237	88	0.308
7	0.00	22.5	6.4	27	16.2	55.3	0.77	0.238	86	0.300
8	0.00	21.6	6.6	26	16.0	55.0	0.73	0.233	87	0.305
9	0.00	22.0	6.3	26	16.6	55.1	0.74	0.232	88	0.308
10	0.00	22.1	3.7	26	16.5	55.2	0.75	0.234	86	0.300
11	0.00	22.5	6.1	27	17.0	55.1	0.74	0.231	87	0.306
12	0.00	22.4	5.9	27	17.0	55.2	0.74	0.237	91	0.318
13	0.00	22.2	7.5	26	16.1	55.2	0.77	0.234	87	0.303
14	0.00	23.0	3.2	27	16.6	55.1	0.78	0.241	89	0.312
15	0.00	22.5	5.5	27	16.8	55.0	0.75	0.233	85	0.298
16	0.00	22.9	3.1	27	16.6	55.2	0.77	0.239	87	0.305
17	0.00	21.8	5.2	26	15.9	55.0	0.74	0.234	84	0.294
18	0.00	22.1	4.2	26	16.3	54.9	0.75	0.240	86	0.302
19	0.00	23.1	3.6	27	16.9	55.1	0.76	0.239	88	0.307
20	0.00	22.1	4.2	26	15.9	55.1	0.76	0.236	86	0.301
21	0.00	22.0	3.7	26	16.3	55.2	0.76	0.232	84	0.295
22	0.00	22.0	4.1	26	16.4	55.0	0.75	0.234	86	0.301
23	0.00	22.2	6.0	26	17.0	55.0	0.73	0.233	86	0.299
24	0.00	21.7	4.3	26	15.5	55.3	0.74	0.232	88	0.307
25	0.00	22.9	6.9	27	16.3	55.3	0.78	0.237	88	0.307
26	0.00	22.5	7.7	27	15.6	55.1	0.81	0.237	87	0.305
27	0.00	22.2	3.6	26	16.2	54.9	0.77	0.234	86	0.300
28	0.00	22.2	2.9	26	15.9	55.2	0.78	0.236	87	0.305
29	0.00	22.2	5.1	26	15.8	54.9	0.79	0.236	90	0.314
30	0.00	22.1	7.1	26	16.0	55.2	0.78	0.233	88	0.307
31	0.00	22.3	9.2	27	15.9	55.0	0.78	0.235	87	0.305
32	0.00	22.7	5.5	27	16.0	55.2	0.80	0.235	88	0.310
33	0.00	22.5	6.2	27	16.2	55.1	0.78	0.232	86	0.301
34	0.00	22.2	6.6	26	16.1	55.0	0.77	0.234	87	0.304
35	0.00	21.4	5.7	25	16.1	55.1	0.75	0.231	89	0.310
36	0.00	21.5	6.4	26	16.4	55.1	0.73	0.227	86	0.302
37	0.00	20.7	6.3	25	16.2	55.2	0.70	0.223	86	0.303
38	0.00	22.2	5.4	26	15.7	54.9	0.80	0.233	89	0.312
39	0.00	21.6	8.2	26	15.8	55.1	0.76	0.233	87	0.305
40	0.00	21.6	6.5	26	15.5	54.9	0.77	0.234	87	0.305
41	0.00	22.2	4.7	26	15.8	55.1	0.79	0.235	88	0.309
42	0.00	21.6	4.4	26	15.4	54.9	0.77	0.231	87	0.304
43	0.00	22.1	4.5	26	16.1	55.1	0.77	0.231	83	0.291
44	0.00	22.1	3.8	26	16.0	55.0	0.77	0.232	84	0.295
45	0.00	21.9	3.4	26	16.9	54.8	0.73	0.229	84	0.296
46	0.00	21.3	3.3	25	16.2	55.1	0.73	0.230	84	0.295
47	0.00	21.3	3.4	25	16.4	55.0	0.73	0.231	86	0.302
48	0.00	21.4	3.2	25	16.7	55.1	0.72	0.229	85	0.298
49	0.00	21.9	4.6	26	17.0	54.9	0.72	0.229	87	0.304
50	0.00	21.4	4.7	25	15.8	55.0	0.75	0.232	86	0.301
51	0.00	21.9	4.6	26	16.7	54.9	0.73	0.233	86	0.302
52	0.00	22.3	4.4	26	16.8	55.0	0.74	0.234	87	0.305
53	0.00	21.3	5.2	25	16.7	55.2	0.72	0.231	87	0.303
54	0.00	21.5	4.2	26	16.9	55.1	0.71	0.229	85	0.297
55	0.00	22.2	4.3	26	17.0	54.8	0.73	0.235	87	0.305
56	0.00	21.3	4.5	25	16.0	55.1	0.74	0.233	87	0.306
57	0.00	22.1	5.4	26	17.1	54.9	0.72	0.233	86	0.300
58	0.00	22.4	3.9	27	16.2	55.0	0.78	0.237	87	0.303
59	0.00	22.0	4.6	26	16.1	55.0	0.77	0.235	87	0.306
60	0.00	21.6	5.2	26	16.5	55.3	0.74	0.231	87	0.305
61	0.00	21.3	4.2	25	15.9	54.9	0.75	0.232	85	0.298
62	0.00	21.4	4.8	25	15.4	55.2	0.78	0.233	84	0.295
63	0.00	21.8	2.9	26	16.3	54.9	0.75	0.231	84	0.295
64	0.00	21.3	4.6	25	15.6	54.8	0.76	0.232	83	0.292
65	0.00	21.3	3.6	25	15.8	55.0	0.76	0.233	86	0.302
66	0.00	21.3	3.6	25	16.7	55.1	0.72	0.227	85	0.299

TURKEY POINT COL PROJECT - BORING B-808; 15' - 16.5' Sample

HAMMER ID 893 (D. WHITE

OP: SEK

Test date: 10-Mar-2008

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
67	0.00	21.3	3.8	25	15.7	55.0	0.76	0.227	84	0.293
68	0.00	21.5	3.7	26	15.0	54.9	0.80	0.230	84	0.293
69	0.00	21.9	4.0	26	15.7	55.0	0.79	0.229	84	0.295
70	0.00	21.9	4.4	26	15.7	55.0	0.78	0.229	84	0.294
71	0.00	22.3	3.5	26	15.3	55.0	0.81	0.235	85	0.296
72	0.00	22.3	4.9	27	15.5	54.9	0.81	0.233	86	0.300
73	0.00	22.0	5.9	26	15.0	54.9	0.82	0.234	84	0.294
74	0.00	22.1	6.2	26	15.3	54.9	0.81	0.234	83	0.292
75	0.00	22.7	3.8	27	16.4	54.8	0.78	0.235	85	0.296
76	0.00	22.6	5.8	27	16.3	55.0	0.77	0.233	83	0.292
77	0.00	22.8	5.4	27	16.5	54.9	0.78	0.238	87	0.303
78	0.00	22.3	4.8	26	15.8	54.9	0.79	0.483	86	0.301
79	0.00	22.2	6.3	26	15.6	54.9	0.79	0.480	85	0.297
80	0.00	22.2	4.0	26	15.5	55.1	0.80	0.235	87	0.303
81	0.00	22.1	6.3	26	15.7	54.9	0.79	0.232	84	0.295
82	0.00	22.3	6.4	26	15.6	54.8	0.80	0.239	87	0.306
83	0.00	22.2	4.8	26	15.1	54.9	0.82	0.241	88	0.308
84	0.00	22.4	2.9	27	15.9	55.0	0.79	0.236	87	0.305
85	0.00	22.4	5.8	27	15.6	55.3	0.81	0.236	86	0.301
86	0.00	22.3	5.6	26	15.8	54.9	0.79	0.236	87	0.306
87	0.00	22.9	5.7	27	16.0	55.0	0.80	0.235	87	0.306
88	0.00	23.0	5.2	27	16.6	54.8	0.78	0.238	89	0.313
89	0.00	22.5	6.0	27	15.1	54.9	0.83	0.238	85	0.298
90	0.00	22.7	5.2	27	16.6	55.2	0.77	0.237	88	0.307
91	0.00	23.0	4.8	27	16.1	55.0	0.80	0.238	86	0.302
92	0.00	22.7	3.1	27	15.1	55.0	0.82	0.238	90	0.313
93	0.00	22.3	5.0	27	15.2	54.9	0.83	0.233	87	0.305
94	0.00	23.1	4.8	28	15.1	55.0	0.86	0.235	85	0.299
95	0.00	22.7	5.7	27	15.3	54.9	0.83	0.237	88	0.306
96	0.00	22.9	4.9	27	15.5	55.1	0.83	0.235	87	0.306
97	0.00	22.8	5.5	27	15.6	54.6	0.82	0.235	85	0.298
98	0.00	22.3	4.6	27	15.0	54.9	0.82	0.234	87	0.303
99	0.00	22.2	3.4	26	15.5	55.0	0.81	0.234	90	0.313
100	0.00	22.5	3.7	27	15.5	54.9	0.81	0.232	84	0.294
101	0.00	22.8	5.3	27	15.9	54.9	0.81	0.235	88	0.306
102	0.00	22.5	3.8	27	15.4	54.9	0.82	0.231	88	0.306
103	0.00	22.8	4.4	27	15.8	54.8	0.80	0.234	85	0.296
104	0.00	22.7	5.1	27	16.4	54.8	0.78	0.234	88	0.308
105	0.00	22.6	6.3	27	16.5	54.9	0.74	0.225	84	0.295
106	0.00	23.7	6.1	28	17.1	54.8	0.72	0.228	85	0.296
107	0.00	24.2	6.3	29	16.5	54.7	0.75	0.228	83	0.289
108	0.00	23.6	6.9	28	15.3	54.8	0.82	0.238	84	0.295
	Average	22.2	5.1	26	16.0	54.5	0.77	0.239	86	0.302

Total number of blows analyzed: 107

Time Summary

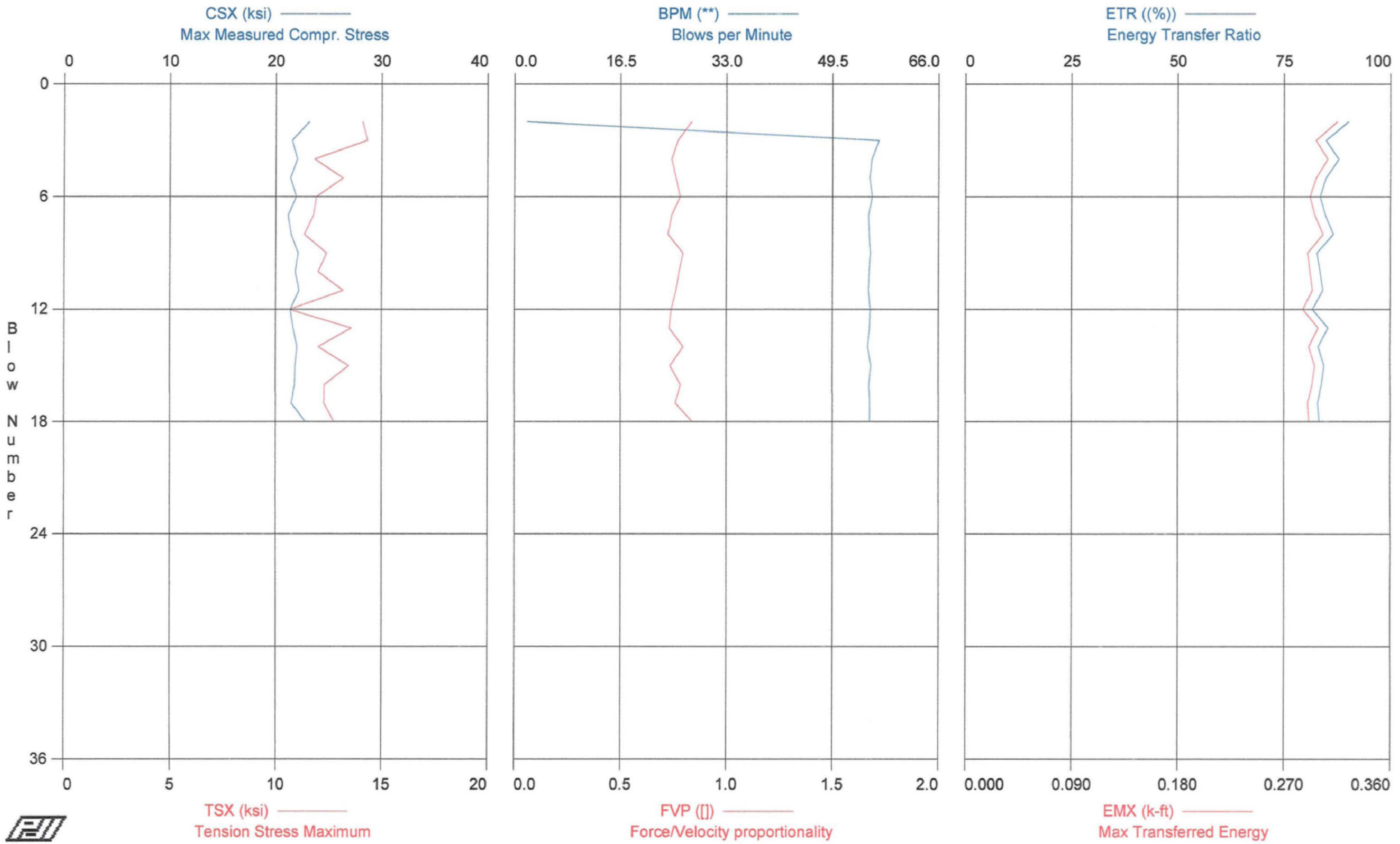
Drive 1 minute 56 seconds 1:15:29 PM - 1:17:25 PM (3/10/2008) BN 2 - 108

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 10-Mar-2008

TURKEY POINT COL PROJECT - BORING B-808; 19.6' - 21.1' Sample



TURKEY POINT COL PROJECT - BORING B-808; 19.6' - 21.1' Sample

HAMMER ID 136893 (D. WHITE

OP: SEK

Test date: 10-Mar-2008

AR: 1.19 in^2
LE: 25.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.2	14.1	28	15.6	1.9	0.84	0.268	90	0.315
3	0.00	21.5	14.3	26	15.7	56.7	0.77	0.261	85	0.297
4	0.00	22.0	11.8	26	15.8	55.6	0.74	0.261	88	0.307
5	0.00	21.4	13.2	25	15.8	55.3	0.76	0.251	85	0.297
6	0.00	21.9	11.9	26	15.7	55.7	0.78	0.252	84	0.292
7	0.00	21.2	11.8	25	16.0	55.1	0.74	0.249	85	0.296
8	0.00	21.5	11.4	26	16.6	55.2	0.72	0.252	87	0.303
9	0.00	22.1	12.4	26	15.6	55.4	0.80	0.249	83	0.290
10	0.00	21.9	12.0	26	15.8	55.2	0.78	0.252	83	0.292
11	0.00	22.2	13.2	26	16.3	55.1	0.76	0.252	84	0.294
12	0.00	21.4	10.6	25	16.2	55.4	0.74	0.247	82	0.286
13	0.00	21.7	13.6	26	16.6	55.3	0.73	0.249	85	0.299
14	0.00	22.0	12.0	26	15.5	55.0	0.80	0.252	83	0.291
15	0.00	21.8	13.5	26	16.7	55.5	0.74	0.248	84	0.296
16	0.00	21.8	12.3	26	15.6	55.2	0.79	0.248	84	0.294
17	0.00	21.5	12.3	26	15.8	55.3	0.76	0.244	83	0.290
18	0.00	22.8	12.7	27	15.2	55.3	0.84	0.256	83	0.291
	Average	21.9	12.5	26	15.9	52.2	0.77	0.252	85	0.296

Total number of blows analyzed: 17

Time Summary

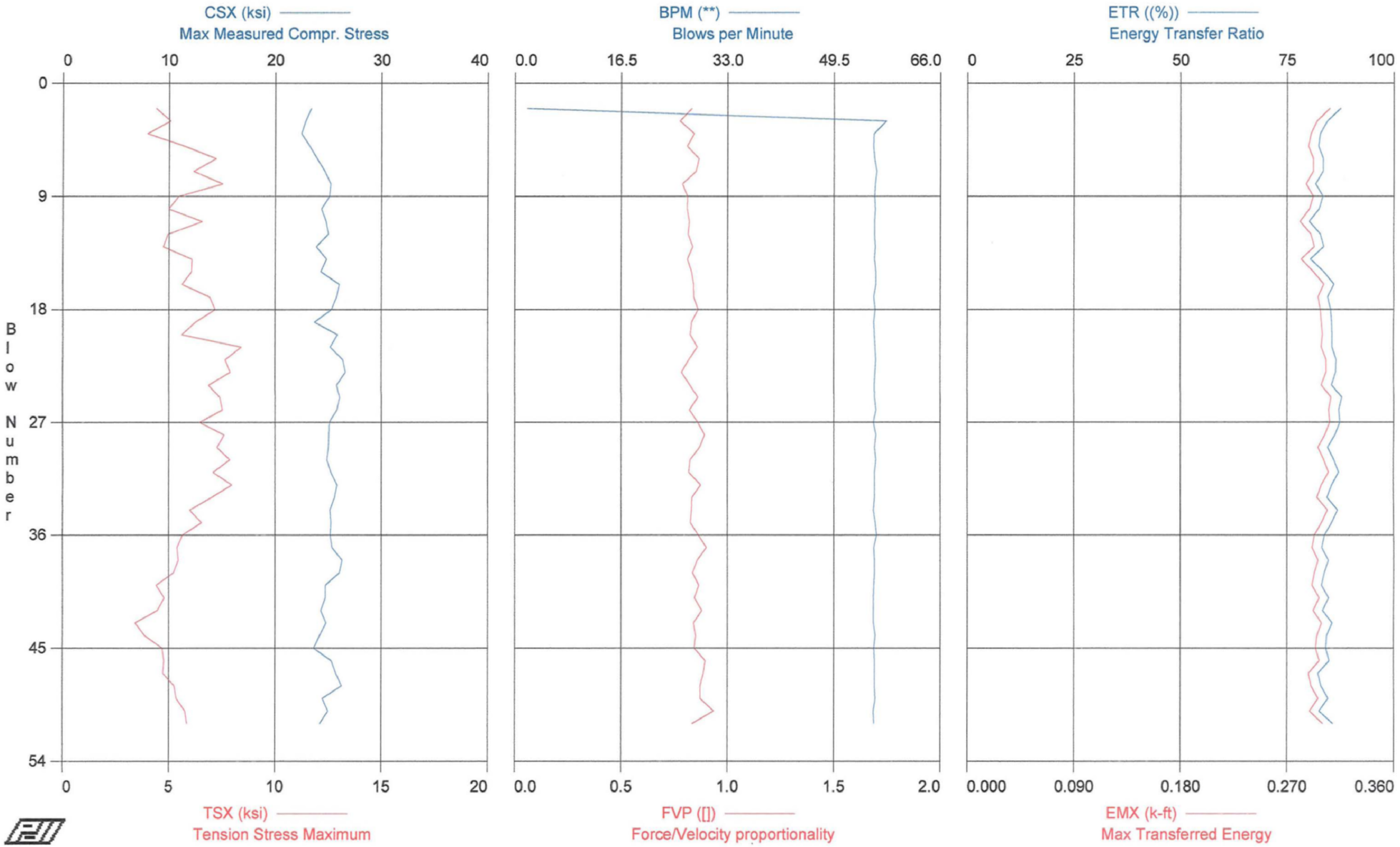
Drive 17 seconds 1:52:25 PM - 1:52:42 PM (3/10/2008) BN 2 - 18

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 10-Mar-2008

TURKEY POINT COL PROJECT - BORING B-808; 24.1' - 25.6' Sample



TURKEY POINT COL PROJECT - BORING B-808; 24.1' - 25.6' Sample
OP: SEK

HAMMER ID 136893 (D. WHITE
Test date: 10-Mar-2008

AR: 1.19 in^2
LE: 30.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.4	4.4	28	15.7	1.9	0.83	0.281	88	0.306
3	0.00	22.9	5.1	27	16.5	57.6	0.78	0.272	84	0.295
4	0.00	22.5	4.0	27	14.9	55.7	0.84	0.273	83	0.290
5	0.00	23.2	5.7	28	16.0	55.6	0.81	0.588	82	0.288
6	0.00	23.9	7.2	28	15.0	55.8	0.87	0.605	83	0.292
7	0.00	24.7	6.2	29	15.2	56.1	0.85	0.620	83	0.292
8	0.00	25.2	7.5	30	15.8	55.9	0.79	0.621	82	0.286
9	0.00	25.1	5.5	30	16.0	55.8	0.81	0.627	83	0.292
10	0.00	24.4	5.0	29	15.6	55.9	0.81	0.627	83	0.289
11	0.00	24.8	6.6	30	15.2	55.8	0.82	0.629	80	0.281
12	0.00	25.0	4.9	30	15.9	55.8	0.81	0.652	83	0.290
13	0.00	23.9	4.7	28	15.3	55.9	0.84	0.623	84	0.293
14	0.00	24.8	6.1	30	15.3	55.8	0.81	0.643	80	0.282
15	0.00	24.3	6.1	29	15.7	56.0	0.83	0.639	84	0.292
16	0.00	26.0	5.6	31	15.7	56.0	0.84	0.668	86	0.301
17	0.00	25.8	6.9	31	14.7	55.7	0.84	0.650	84	0.296
18	0.00	25.3	7.2	30	15.2	55.9	0.86	0.658	85	0.298
19	0.00	23.7	6.3	28	15.6	55.7	0.83	0.642	85	0.299
20	0.00	25.9	5.6	31	15.4	55.8	0.83	0.669	86	0.300
21	0.00	25.2	8.4	30	14.7	55.9	0.86	0.669	86	0.299
22	0.00	26.4	7.7	31	14.7	56.0	0.82	0.684	87	0.303
23	0.00	26.6	7.9	32	15.6	55.9	0.78	0.679	86	0.303
24	0.00	25.8	6.9	31	15.6	55.8	0.82	0.673	85	0.299
25	0.00	26.1	7.4	31	15.6	55.8	0.86	0.671	88	0.307
26	0.00	25.8	7.5	31	15.5	56.0	0.82	0.663	87	0.305
27	0.00	25.1	6.4	30	15.4	55.6	0.86	0.662	87	0.306
28	0.00	25.1	7.6	30	14.6	56.0	0.89	0.653	86	0.302
29	0.00	25.0	7.3	30	15.0	55.8	0.87	0.662	85	0.296
30	0.00	24.9	7.9	30	15.7	56.0	0.82	0.656	86	0.301
31	0.00	25.2	7.1	30	15.9	55.8	0.82	0.647	87	0.305
32	0.00	25.8	8.0	31	15.2	55.8	0.87	0.663	85	0.299
33	0.00	25.6	7.0	30	15.1	55.8	0.83	0.665	84	0.295
34	0.00	25.2	6.0	30	15.6	55.6	0.83	0.659	87	0.304
35	0.00	25.2	6.5	30	15.6	55.9	0.83	0.658	85	0.299
36	0.00	25.2	5.6	30	15.0	56.1	0.86	0.632	84	0.293
37	0.00	25.4	5.4	30	14.5	55.7	0.90	0.642	83	0.291
38	0.00	26.3	5.4	31	15.4	55.8	0.86	0.637	85	0.296
39	0.00	26.0	5.2	31	15.4	55.8	0.84	0.639	84	0.293
40	0.00	24.7	4.4	29	15.0	55.7	0.87	0.616	83	0.291
41	0.00	24.7	4.8	29	14.9	55.6	0.85	0.605	85	0.297
42	0.00	24.3	4.5	29	14.9	55.6	0.88	0.613	83	0.292
43	0.00	24.8	3.4	29	14.8	55.6	0.84	0.611	86	0.299
44	0.00	24.2	3.9	29	15.0	55.9	0.85	0.600	84	0.295
45	0.00	23.6	4.7	28	15.3	55.7	0.84	0.597	84	0.294
46	0.00	25.3	4.8	30	14.5	55.8	0.90	0.606	85	0.297
47	0.00	25.7	4.7	31	14.0	55.8	0.89	0.603	82	0.288
48	0.00	26.3	5.2	31	14.6	55.8	0.87	0.617	83	0.290
49	0.00	24.4	5.4	29	15.0	55.9	0.87	0.601	85	0.296
50	0.00	25.0	5.8	30	13.9	55.6	0.94	0.609	82	0.289
51	0.00	24.2	5.8	29	15.0	55.7	0.83	0.594	86	0.300
	Average	25.0	6.0	30	15.2	54.8	0.84	0.615	84	0.296

Total number of blows analyzed: 50

Time Summary

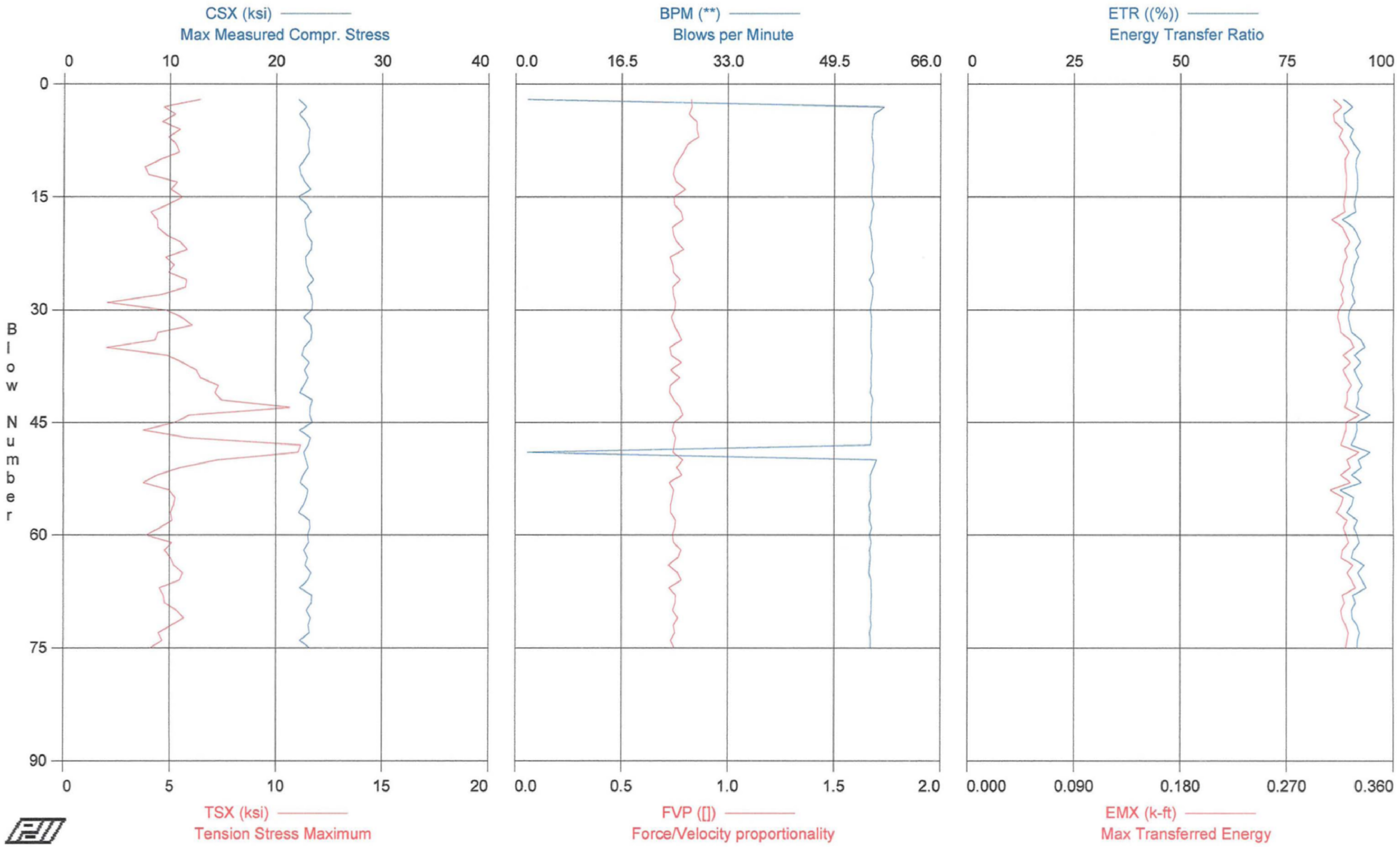
Drive 53 seconds 2:24:45 PM - 2:25:38 PM (3/10/2008) BN 2 - 51

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 5-Apr-2008

TURKEY POINT COL PROJECT - BORING B-737; 96.8' - 98.3' Sample



TURKEY POINT COL PROJECT - BORING B-737; 96.8' - 98.3' Sample
OP: HJC

HAMMER ID 893 (F. COX)
Test date: 5-Apr-2008

AR: 1.19 in^2
LE: 103.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.1	6.4	26	15.0	1.9	0.83	0.283	88	0.309
3	0.00	22.8	4.7	27	15.4	57.2	0.83	0.287	90	0.316
4	0.00	22.2	5.2	26	15.2	55.7	0.82	0.285	88	0.309
5	0.00	22.8	4.6	27	15.0	55.4	0.85	0.283	89	0.310
6	0.00	23.2	5.5	28	15.2	55.4	0.85	0.284	91	0.317
7	0.00	23.1	4.9	27	15.0	55.3	0.86	0.283	90	0.314
8	0.00	23.0	5.3	27	15.9	55.5	0.81	0.283	91	0.318
9	0.00	23.1	5.4	28	16.4	55.5	0.79	0.285	92	0.322
10	0.00	22.7	4.6	27	16.5	55.4	0.77	0.282	91	0.319
11	0.00	22.2	3.8	26	16.4	55.6	0.75	0.281	91	0.319
12	0.00	22.3	4.0	27	16.4	55.4	0.74	0.280	91	0.320
13	0.00	22.7	5.3	27	16.8	55.4	0.76	0.281	91	0.320
14	0.00	23.3	5.1	28	16.3	55.3	0.80	0.284	92	0.320
15	0.00	22.1	5.6	26	16.6	55.3	0.75	0.281	91	0.319
16	0.00	22.9	4.9	27	17.1	55.6	0.75	0.277	91	0.318
17	0.00	23.3	4.1	28	16.8	55.3	0.78	0.279	91	0.319
18	0.00	22.7	4.4	27	16.1	55.3	0.79	0.278	88	0.308
19	0.00	22.8	4.4	27	16.4	55.0	0.74	0.281	91	0.317
20	0.00	22.9	4.8	27	16.4	55.2	0.75	0.282	92	0.320
21	0.00	23.4	5.5	28	17.3	55.4	0.76	0.281	92	0.323
22	0.00	23.3	5.8	28	16.5	55.4	0.79	0.284	91	0.319
23	0.00	22.8	4.8	27	16.8	55.2	0.73	0.283	92	0.321
24	0.00	22.9	5.2	27	17.3	55.5	0.74	0.282	91	0.318
25	0.00	23.1	5.0	27	17.4	55.6	0.74	0.277	91	0.317
26	0.00	23.5	5.8	28	17.0	55.0	0.78	0.282	90	0.315
27	0.00	23.0	5.7	27	17.4	55.5	0.74	0.280	91	0.318
28	0.00	23.3	4.6	28	17.5	55.5	0.74	0.279	90	0.316
29	0.00	23.5	2.1	28	17.4	55.3	0.76	0.280	91	0.318
30	0.00	23.4	4.8	28	17.4	55.1	0.75	0.279	90	0.314
31	0.00	22.6	5.6	27	16.6	55.3	0.74	0.278	89	0.313
32	0.00	23.3	6.1	28	17.4	55.3	0.75	0.279	90	0.315
33	0.00	23.4	4.4	28	17.1	55.2	0.77	0.280	90	0.316
34	0.00	23.3	4.3	28	16.8	55.2	0.78	0.280	93	0.324
35	0.00	22.7	2.0	27	16.7	55.2	0.73	0.280	93	0.327
36	0.00	22.5	4.9	27	17.1	55.4	0.74	0.278	91	0.318
37	0.00	23.2	5.6	28	16.6	55.3	0.78	0.279	92	0.324
38	0.00	22.7	6.3	27	17.3	55.3	0.73	0.280	91	0.318
39	0.00	23.1	6.5	27	16.7	55.2	0.78	0.280	92	0.321
40	0.00	22.7	7.3	27	17.4	55.3	0.73	0.278	93	0.325
41	0.00	22.3	7.1	27	17.2	55.1	0.73	0.281	92	0.321
42	0.00	23.4	7.4	28	17.5	55.5	0.75	0.283	92	0.321
43	0.00	23.2	10.7	28	16.8	55.3	0.78	0.282	91	0.319
44	0.00	23.2	5.9	28	16.5	55.3	0.79	0.284	95	0.331
45	0.00	23.4	5.2	28	17.5	55.2	0.75	0.281	91	0.320
46	0.00	22.3	3.8	26	16.9	55.2	0.74	0.279	91	0.320
47	0.00	23.3	5.9	28	17.3	55.3	0.76	0.276	91	0.318
48	0.00	23.1	11.2	27	17.3	55.1	0.75	0.278	90	0.316
49	0.00	22.6	11.0	27	16.4	1.9	0.74	0.290	95	0.331
50	0.00	22.8	7.3	27	16.2	56.1	0.79	0.287	92	0.321
51	0.00	23.1	5.5	27	17.0	55.6	0.76	0.283	93	0.324
52	0.00	22.6	4.4	27	16.2	55.1	0.78	0.281	90	0.316
53	0.00	22.3	3.8	27	16.7	55.1	0.73	0.282	93	0.324
54	0.00	23.0	5.0	27	17.3	55.1	0.75	0.276	88	0.307
55	0.00	22.9	5.3	27	17.4	55.2	0.74	0.276	91	0.318
56	0.00	22.6	5.2	27	17.3	54.9	0.73	0.281	90	0.316
57	0.00	22.2	5.1	26	16.9	55.1	0.73	0.280	89	0.312
58	0.00	23.2	5.1	28	17.2	55.0	0.76	0.280	92	0.321
59	0.00	23.2	4.5	28	17.3	55.3	0.75	0.279	91	0.318
60	0.00	23.0	3.9	27	17.4	55.0	0.74	0.279	91	0.320
61	0.00	23.1	5.1	27	17.4	55.2	0.75	0.278	92	0.322
62	0.00	22.6	4.8	27	16.2	55.0	0.78	0.280	91	0.317
63	0.00	23.0	5.1	27	16.9	55.1	0.77	0.277	90	0.316
64	0.00	22.8	5.2	27	16.5	55.0	0.72	0.282	93	0.326
65	0.00	23.3	5.6	28	17.1	54.9	0.76	0.283	92	0.321
66	0.00	23.0	5.5	27	16.6	55.2	0.78	0.282	93	0.325

TURKEY POINT COL PROJECT - BORING B-737; 96.8' - 98.3' Sample

HAMMER ID 893 (F. COX)

OP: HJC

Test date: 5-Apr-2008

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
67	0.00	22.3	4.5	26	17.0	55.2	0.72	0.280	94	0.328
68	0.00	23.4	4.7	28	17.3	55.3	0.76	0.280	91	0.317
69	0.00	23.4	4.8	28	17.3	55.2	0.75	0.279	91	0.319
70	0.00	22.9	5.3	27	17.3	55.2	0.74	0.276	90	0.316
71	0.00	23.3	5.7	28	17.0	55.1	0.77	0.278	90	0.317
72	0.00	23.1	5.1	27	17.3	55.2	0.75	0.277	92	0.320
73	0.00	23.2	4.5	28	17.3	55.0	0.75	0.276	92	0.322
74	0.00	22.3	4.7	27	17.1	55.1	0.73	0.277	92	0.321
75	0.00	23.2	4.1	28	17.3	55.1	0.75	0.277	91	0.320
	Average	22.9	5.3	27	16.8	53.9	0.76	0.281	91	0.319

Total number of blows analyzed: 74

Time Summary

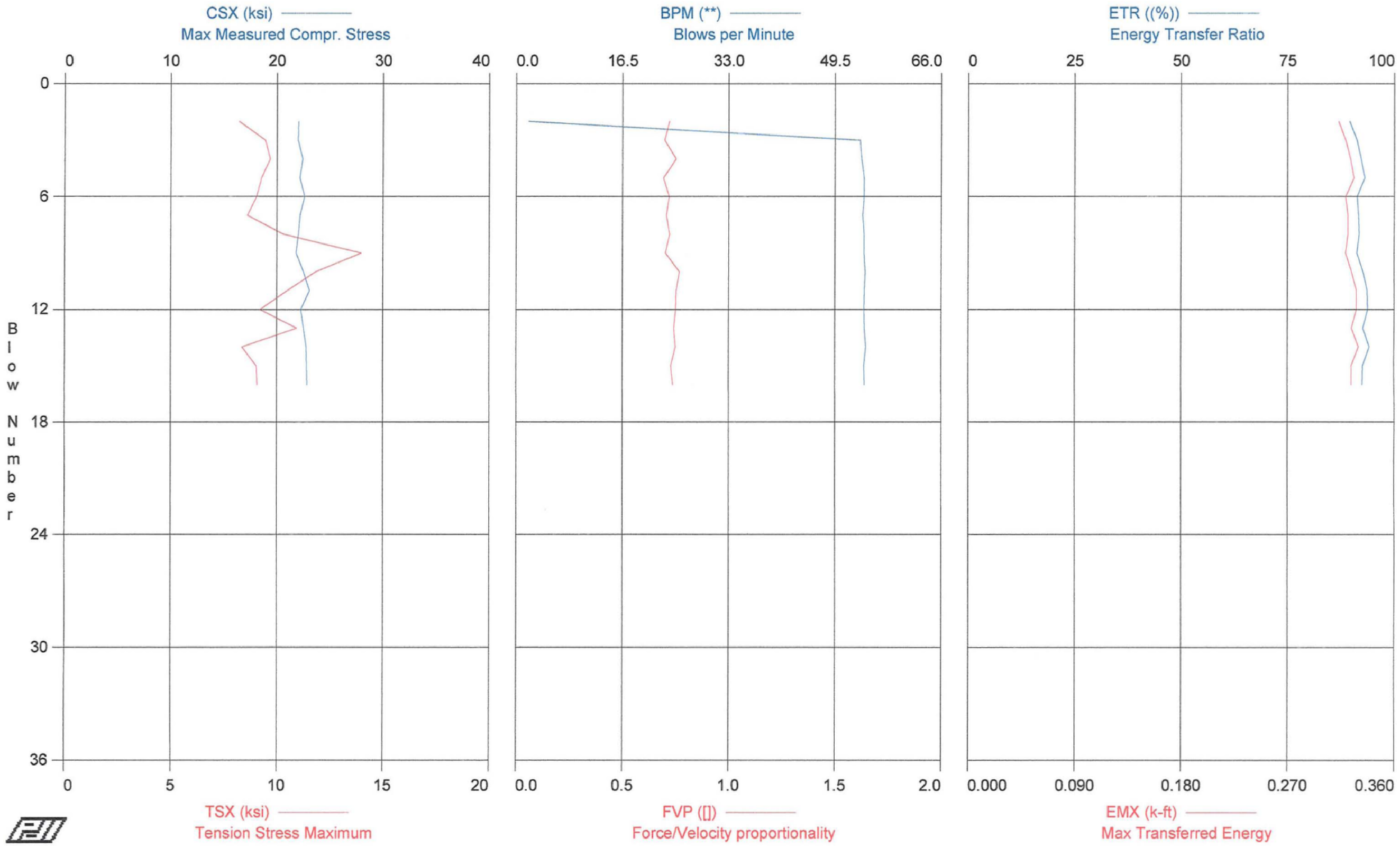
Drive 2 minutes 15 seconds 8:50:22 AM - 8:52:37 AM (4/5/2008) BN 2 - 75

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 5-Apr-2008

TURKEY POINT COL PROJECT - BORING B-737; 111.8' - 113.3' Sample



TURKEY POINT COL PROJECT - BORING B-737; 111.8' - 113.3' Sample
OP: HJC

HAMMER ID 893 (F. COX)
Test date: 5-Apr-2008

AR: 1.19 in^2
LE: 121.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	22.0	8.2	26	17.1	1.9	0.72	0.262	89	0.313
3	0.00	22.0	9.5	26	17.6	53.4	0.70	0.285	91	0.319
4	0.00	22.4	9.7	27	16.8	53.6	0.75	0.285	92	0.323
5	0.00	22.2	9.3	26	17.0	54.0	0.69	0.286	93	0.326
6	0.00	22.6	9.0	27	17.5	54.0	0.72	0.290	91	0.319
7	0.00	22.2	8.6	26	17.6	53.8	0.71	0.284	92	0.321
8	0.00	22.0	10.3	26	16.8	54.0	0.72	0.287	92	0.321
9	0.00	21.8	14.0	26	17.4	54.0	0.70	0.287	91	0.319
10	0.00	22.5	11.8	27	16.4	54.2	0.77	0.281	93	0.324
11	0.00	23.1	10.5	27	17.3	54.1	0.75	0.289	94	0.328
12	0.00	22.3	9.2	27	16.5	54.0	0.75	0.280	94	0.328
13	0.00	22.5	10.9	27	17.0	54.1	0.74	0.281	93	0.324
14	0.00	22.8	8.4	27	17.1	54.3	0.75	0.283	94	0.330
15	0.00	22.8	9.0	27	17.5	54.0	0.73	0.286	93	0.324
16	0.00	22.9	9.1	27	17.4	54.1	0.74	0.286	93	0.324
	Average	22.4	9.8	27	17.1	50.5	0.73	0.283	92	0.323

Total number of blows analyzed: 15

Time Summary

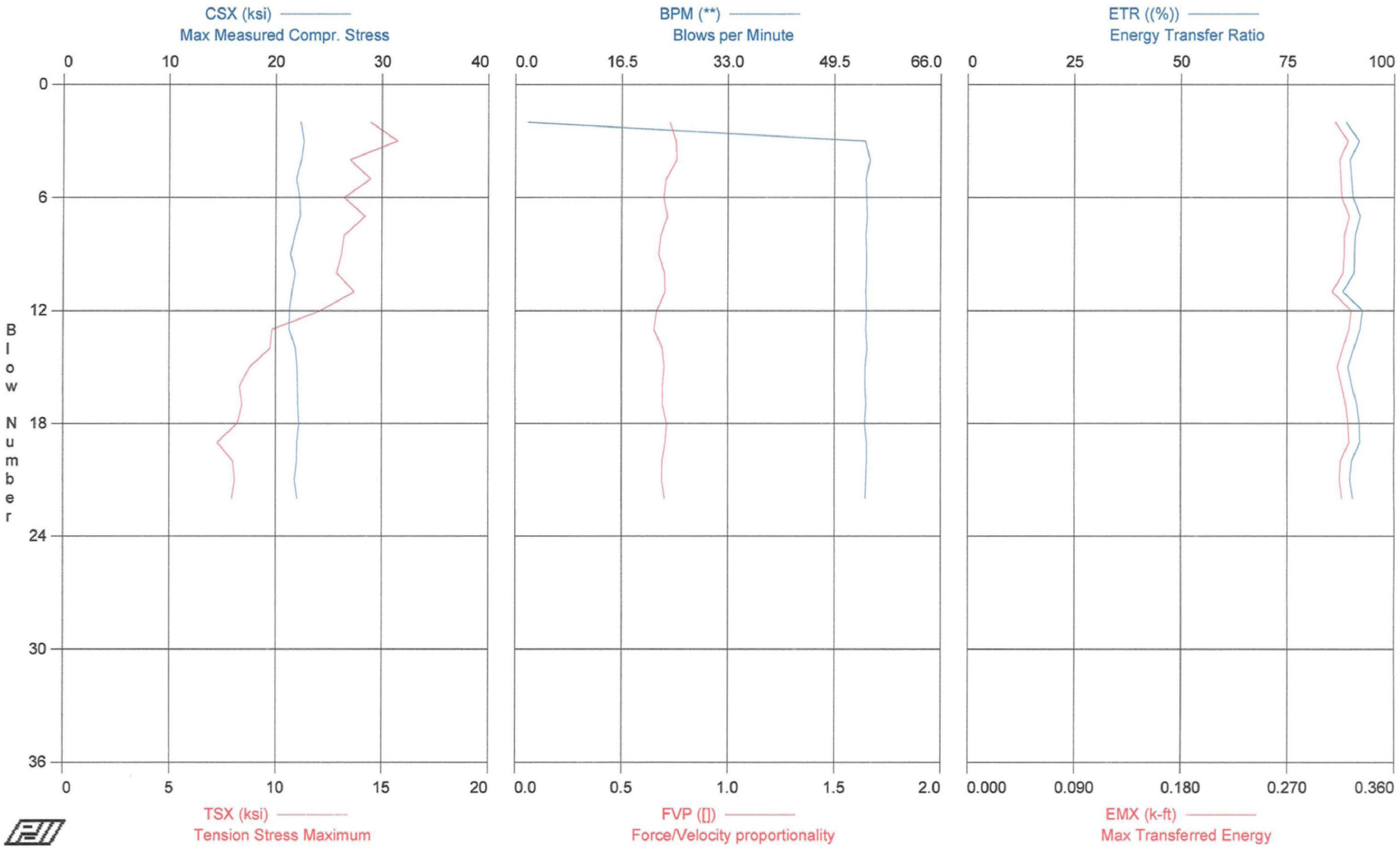
Drive 16 seconds 10:22:24 AM - 10:22:40 AM (4/5/2008) BN 2 - 16

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 5-Apr-2008

TURKEY POINT COL PROJECT - BORING B-737; 121.8' - 123.3' Sample



TURKEY POINT COL PROJECT - BORING B-737; 121.8' - 123.3' Sample
OP: HJC

HAMMER ID 893 (F. COX)
Test date: 5-Apr-2008

AR: 1.19 in^2
LE: 131.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.3	14.5	27	17.3	1.9	0.73	0.259	89	0.310
3	0.00	22.6	15.7	27	16.7	54.3	0.76	0.270	92	0.321
4	0.00	22.4	13.5	27	16.6	55.0	0.76	0.270	90	0.314
5	0.00	21.9	14.5	26	16.8	54.4	0.71	0.270	90	0.315
6	0.00	22.3	13.2	26	17.8	54.5	0.70	0.272	90	0.316
7	0.00	22.3	14.2	27	17.5	54.6	0.72	0.270	92	0.322
8	0.00	21.8	13.2	26	16.8	54.4	0.68	0.289	91	0.318
9	0.00	21.4	13.1	25	17.4	54.5	0.67	0.268	91	0.318
10	0.00	21.8	12.9	26	17.5	54.5	0.70	0.287	91	0.317
11	0.00	21.5	13.7	26	17.1	54.4	0.71	0.286	88	0.308
12	0.00	21.3	12.1	25	17.7	54.5	0.67	0.270	93	0.324
13	0.00	21.3	9.8	25	18.3	54.4	0.65	0.270	92	0.322
14	0.00	21.9	9.7	26	17.6	54.6	0.69	0.269	91	0.317
15	0.00	22.1	8.8	26	17.6	54.3	0.70	0.284	89	0.312
16	0.00	22.1	8.3	26	17.9	54.3	0.69	0.267	90	0.316
17	0.00	22.1	8.4	26	17.8	54.4	0.69	0.266	91	0.319
18	0.00	22.2	8.2	26	17.5	54.2	0.71	0.289	92	0.321
19	0.00	22.0	7.3	26	17.5	54.5	0.71	0.267	92	0.322
20	0.00	22.0	8.0	26	17.9	54.5	0.69	0.266	90	0.315
21	0.00	21.8	8.1	26	17.7	54.4	0.69	0.269	90	0.314
22	0.00	22.0	7.9	26	17.6	54.3	0.70	0.271	90	0.316
	Average	22.0	11.2	26	17.5	51.9	0.70	0.273	91	0.317

Total number of blows analyzed: 21

Time Summary

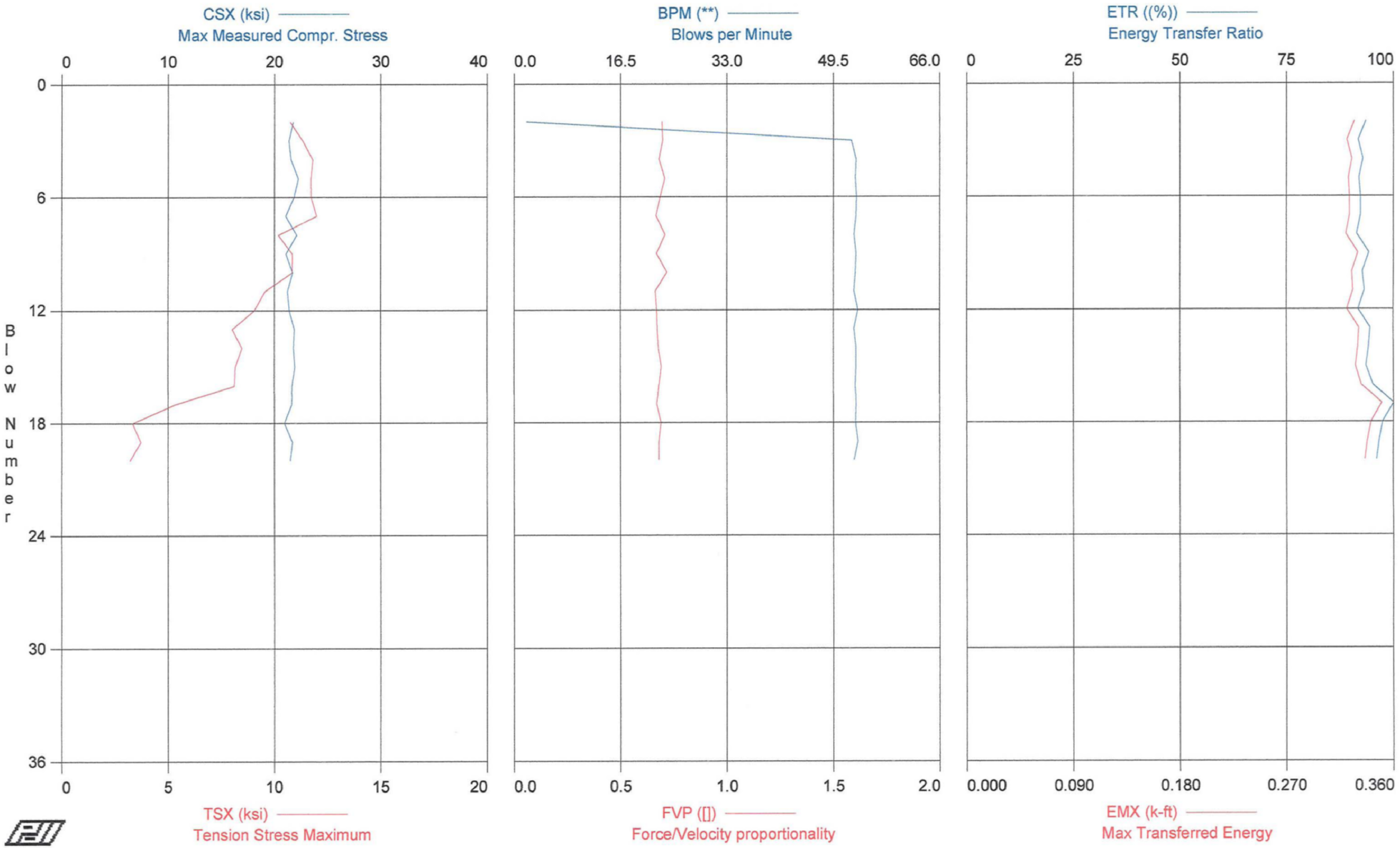
Drive 22 seconds 11:19:44 AM - 11:20:06 AM (4/5/2008) BN 2 - 22

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 29-May-2008

Test date: 5-Apr-2008

TURKEY POINT COL PROJECT - BORING B-737; 131.8' - 133.3' Sample



TURKEY POINT COL PROJECT - BORING B-737; 131.8' - 133.3' Sample
OP: HJC

HAMMER ID 893 (F. COX)
Test date: 5-Apr-2008

AR: 1.19 in^2
LE: 141.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
2	0.00	21.7	10.7	26	17.5	1.9	0.70	0.271	94	0.327
3	0.00	21.4	11.3	25	17.1	52.3	0.70	0.269	92	0.321
4	0.00	21.6	11.8	26	16.8	53.0	0.68	0.270	93	0.325
5	0.00	22.3	11.7	26	17.5	52.9	0.71	0.272	92	0.322
6	0.00	21.8	11.7	26	17.8	53.1	0.69	0.268	92	0.323
7	0.00	21.1	12.0	25	17.7	53.0	0.67	0.272	92	0.323
8	0.00	22.1	10.2	26	17.4	52.7	0.71	0.278	91	0.320
9	0.00	21.1	10.8	25	17.4	53.0	0.67	0.276	94	0.330
10	0.00	21.7	10.8	26	17.0	52.9	0.72	0.268	93	0.325
11	0.00	21.2	9.5	25	17.9	52.7	0.66	0.265	93	0.326
12	0.00	21.4	9.1	25	17.1	53.3	0.67	0.263	92	0.321
13	0.00	21.9	8.0	26	18.3	52.7	0.67	0.266	95	0.331
14	0.00	21.8	8.5	26	18.0	53.0	0.68	0.272	94	0.330
15	0.00	21.9	8.2	26	17.7	53.0	0.69	0.263	94	0.328
16	0.00	21.7	8.1	26	17.8	52.9	0.68	0.261	95	0.333
17	0.00	21.6	5.3	26	18.1	53.0	0.67	0.263	100	0.350
18	0.00	20.9	3.3	25	16.9	52.9	0.69	0.260	97	0.341
19	0.00	21.7	3.7	26	17.9	53.3	0.68	0.258	97	0.338
20	0.00	21.5	3.2	26	17.7	52.7	0.68	0.261	96	0.336
	Average	21.6	8.8	26	17.6	50.2	0.68	0.267	94	0.329

Total number of blows analyzed: 19

Time Summary

Drive 21 seconds 1:31:05 PM - 1:31:26 PM (4/5/2008) BN 2 - 20

MACTEC

engineering and constructing a better tomorrow

June 30, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Tom McDaniel

Subject: **Report of SPT Energy – MACTEC Atlanta CME 550 ATV**
Hammer Serial No. MEC-03 Automatic Hammer
WORK INSTRUCTION TUR-055
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Steve Kiser, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on March 21, 2008, during drilling of Borings B-603 at the referenced site. The testing was performed by Steve Kiser from approximately 9:00 to 11:40 AM under cloudy and drizzly skies and a temperature of about 68 degrees Fahrenheit. The boring was drilled with personnel and equipment from MACTEC Atlanta. The drilling equipment consisted of a CME 550 model ATV-mounted drill rig with an SPT automatic hammer. The drilling tools consisted of AW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Larry Carter. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. P5953 and P5992) and strain gages (Serial Nos. AW #75/1 and AW#75/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.19 square inches and an outside diameter of approximately 1.75 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 1.75 and 1.375 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN TUR054.

12 Pages Total

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 270 foot-pounds to 288 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 77% to 82% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 278.5 foot-pounds, with an average ETR of 79.6%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN TUR-055 – 1 Page
Pages 6 Record of SPT Energy Measurement – 1 Page
Pages 7 – 12 PDIPLOT Output – 6 Pages

Work Instruction No. 9
Turkey Point COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1950

Issued To: Steve Kiser and Jay Cerceo **Rev. No.** 1

Issued By: Tom McDaniel **Date:** 3-24-08

Valid From: 3-24-08 **To:** 4-30-08

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision; available at Site Office), Bechtel Specification 25409-102-3PS-CY00-00001, Rev. 000 or later revision, section 4.3, ASTM D 4633-05 (copy attached.).

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Confirm that automatic hammer system is being operated within manufacturer's recommendations or in a typical operating fashion as observed from watching one or two SPT measurements prior to measuring energy. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, and can be directed by Becthel in accordance with the specification. Site profile consists of very soft soils to about 5 feet followed by high-N-value soft rock to about 20 feet where coring begins. Sands are present below about 100 to 125 feet. Energy measurements should be made in the deeper sand zone as often as can be done, consistent with the drilling depths at the time of the measurements. See Site Coordinator for current boring logs of holes drilled and use these to plan most effective field measurement program.

Submit copies of calibration records for equipment to Project Principal for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Manager that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Coordinator, Project Principal (Tom McDaniel) or Sr. Project Principal (Al Tice) immediately.

Report Format: Standard report in accordance with ASTM D 4633 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 306 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)

Project Manager: _____ Date: _____

Project Principal Engineer: _____ Date: 3/24/08

Site Manager/Coordinator: _____ Date: _____

Pages: 1 plus attachment **DCN:** TUR-055

Attachments: ASTM D 4633-05

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Hammer Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Rod Size	Date Tested	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
MEC-03 (CME 550 ATV)	MACTEC Atlanta	Larry Carter	B-603	AW-J	2/21/2008	120.5 - 122.0	6 - 12 - 10	28	282	80.6%
						124.7 - 126.2	6 - 12 - 10	28	270	77.1%
						131.7 - 133.2	4 - 5 - 6	15	288	82.3%
								Average for Rig:	**278.5**	**79.6%**

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).

The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

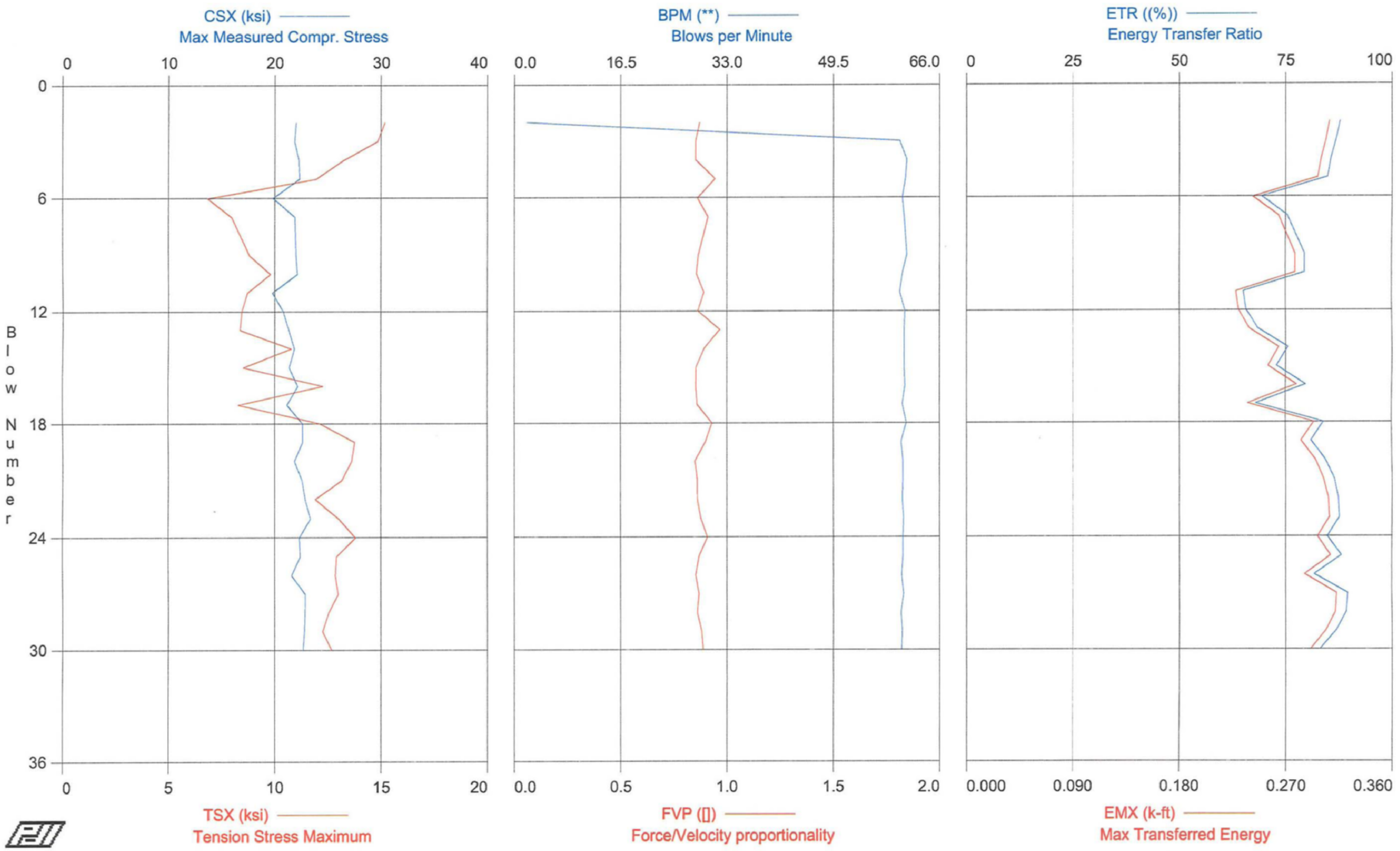
Prepared By:	Date: 5-30-08	Checked By:	Date: 6-4-08

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 28-May-2008

Test date: 21-Feb-2008

TURKEY POINT COL PROJECT - BORING B-603; 120.5' - 122' Sample



TURKEY POINT COL PROJECT - BORING B-603; 120.5' - 122' Sample
OP: SEK

HAMMER ID 196380 (CARTER)
Test date: 21-Feb-2008

AR: 1.19 in^2
LE: 125.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0 70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.0	15.2	26	13.7	1.9	0.87	0.283	88	0.307
3	0.00	21.8	14.8	26	13.8	59.8	0.85	0.267	87	0.304
4	0.00	22.3	13.2	26	13.2	60.9	0.85	0.269	86	0.300
5	0.00	22.3	11.9	27	13.2	60.7	0.94	0.268	85	0.297
6	0.00	19.8	6.8	24	11.4	60.2	0.86	0.206	69	0.242
7	0.00	21.9	8.0	26	13.5	60.5	0.91	0.237	75	0.264
9	0.00	22.0	8.8	26	13.1	60.9	0.87	0.268	79	0.278
10	0.00	22.1	9.8	26	12.8	60.2	0.86	0.266	79	0.278
11	0.00	19.8	8.7	24	12.1	59.8	0.89	0.211	65	0.228
12	0.00	20.8	8.4	25	12.1	60.6	0.86	0.220	66	0.230
13	0.00	21.3	8.4	25	12.3	60.5	0.97	0.227	68	0.239
14	0.00	21.8	10.8	26	13.1	60.5	0.89	0.254	75	0.264
15	0.00	21.3	8.5	25	12.7	60.5	0.86	0.240	73	0.255
16	0.00	22.2	12.3	26	12.8	60.6	0.85	0.268	80	0.279
17	0.00	21.1	8.3	25	12.3	60.2	0.86	0.220	68	0.238
18	0.00	22.6	12.1	27	13.7	60.8	0.93	0.281	84	0.294
19	0.00	22.6	13.8	27	14.1	60.0	0.90	0.262	81	0.283
20	0.00	21.9	13.6	26	14.3	60.3	0.85	0.283	84	0.295
21	0.00	22.6	13.2	27	14.7	60.3	0.86	0.283	86	0.302
22	0.00	22.9	11.9	27	14.9	60.2	0.86	0.280	87	0.306
23	0.00	23.4	13.0	28	14.9	60.4	0.88	0.290	88	0.307
24	0.00	22.3	13.8	27	13.8	60.3	0.91	0.277	85	0.297
25	0.00	22.4	12.9	27	14.5	60.3	0.87	0.289	88	0.308
26	0.00	21.6	12.9	26	13.9	60.1	0.85	0.266	82	0.286
27	0.00	22.9	13.0	27	14.8	60.4	0.87	0.285	90	0.313
28	0.00	22.9	12.5	27	14.9	60.0	0.86	0.279	89	0.312
29	0.00	22.8	12.3	27	14.5	60.2	0.88	0.283	87	0.304
30	0.00	22.7	12.7	27	14.3	60.1	0.89	0.279	83	0.291
	Average	22.0	11.5	26	13.6	58.3	0.88	0.262	81	0.282

Total number of blows analyzed: 28

Time Summary

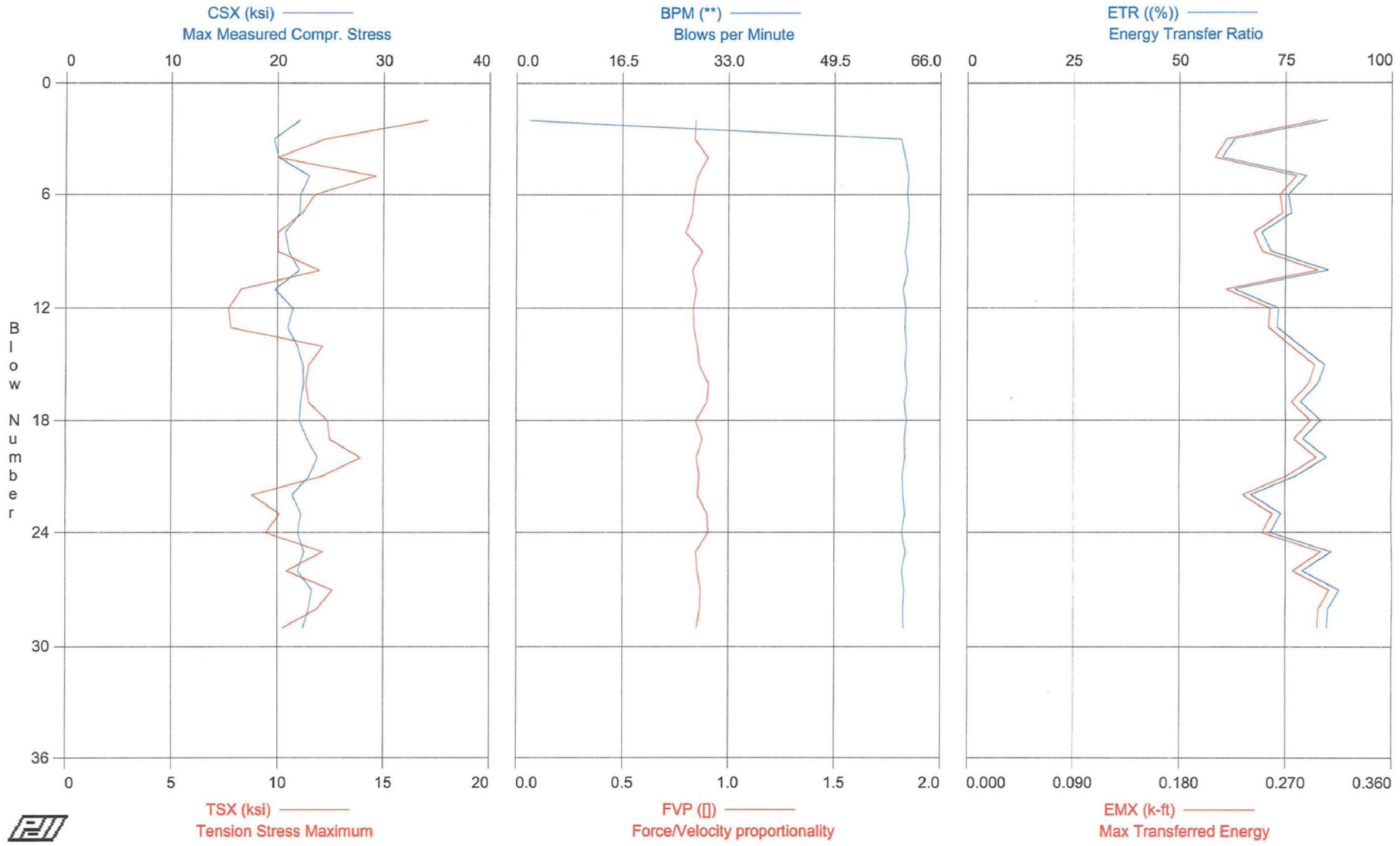
Drive 28 seconds 9:02:13 AM - 9:02:41 AM (2/21/2008) BN 2 - 30

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 28-May-2008

Test date: 21-Feb-2008

TURKEY POINT COL PROJECT - BORING B-603; 124.7' - 126.2' Sample



TURKEY POINT COL PROJECT - BORING B-603; 124.7' - 126.2' Sample
OP: SEK
AR: 1.19 in^2
LE: 128.00 ft
WS: 16,807.9 f/s

HAMMER ID 196380 (CARTER)
Test date: 21-Feb-2008
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.1	17.1	26	14.6	1.9	0.85	0.283	85	0.296
3	0.00	19.6	12.2	23	12.1	59.9	0.84	0.208	63	0.220
4	0.00	20.1	10.0	24	12.4	60.5	0.90	0.195	60	0.210
5	0.00	23.0	14.6	27	15.0	61.0	0.85	0.276	80	0.279
6	0.00	22.1	11.7	26	14.9	60.8	0.84	0.252	76	0.265
7	0.00	22.1	11.1	26	13.9	61.1	0.83	0.258	76	0.267
8	0.00	20.7	10.0	25	14.5	60.9	0.80	0.229	69	0.243
9	0.00	21.1	10.0	25	13.5	60.5	0.88	0.231	72	0.250
10	0.00	22.0	12.0	26	15.0	60.9	0.83	0.280	85	0.297
11	0.00	19.8	8.3	24	12.7	60.2	0.85	0.197	63	0.220
12	0.00	21.5	7.7	26	13.8	60.6	0.84	0.244	73	0.257
13	0.00	21.0	7.8	25	14.0	60.5	0.84	0.239	73	0.256
14	0.00	21.9	12.1	26	14.3	60.7	0.85	0.266	79	0.275
15	0.00	22.4	11.5	27	14.6	60.5	0.86	0.281	84	0.295
16	0.00	22.5	11.3	27	13.9	60.8	0.91	0.275	83	0.290
17	0.00	22.2	11.5	26	13.8	60.4	0.90	0.263	79	0.275
18	0.00	22.1	12.4	26	14.3	60.7	0.85	0.281	83	0.291
19	0.00	22.8	12.5	27	14.5	60.4	0.88	0.277	79	0.277
20	0.00	23.8	13.9	28	15.6	60.5	0.85	0.292	85	0.296
21	0.00	23.0	12.1	27	15.0	60.1	0.86	0.262	78	0.271
22	0.00	21.4	8.8	25	13.9	60.2	0.86	0.224	67	0.234
23	0.00	22.2	10.1	26	13.7	60.5	0.90	0.251	74	0.259
24	0.00	21.9	9.5	26	13.6	60.0	0.91	0.242	71	0.250
25	0.00	22.5	12.1	27	13.7	60.6	0.85	0.286	86	0.300
26	0.00	21.9	10.4	26	14.3	60.0	0.85	0.263	79	0.276
27	0.00	23.3	12.6	28	15.0	60.4	0.87	0.287	88	0.307
28	0.00	22.9	11.9	27	14.9	60.2	0.87	0.272	85	0.298
29	0.00	22.4	10.3	27	14.4	60.3	0.85	0.290	85	0.297
	Average	21.9	11.3	26	14.1	58.4	0.86	0.257	77	0.270

Total number of blows analyzed: 28

Time Summary

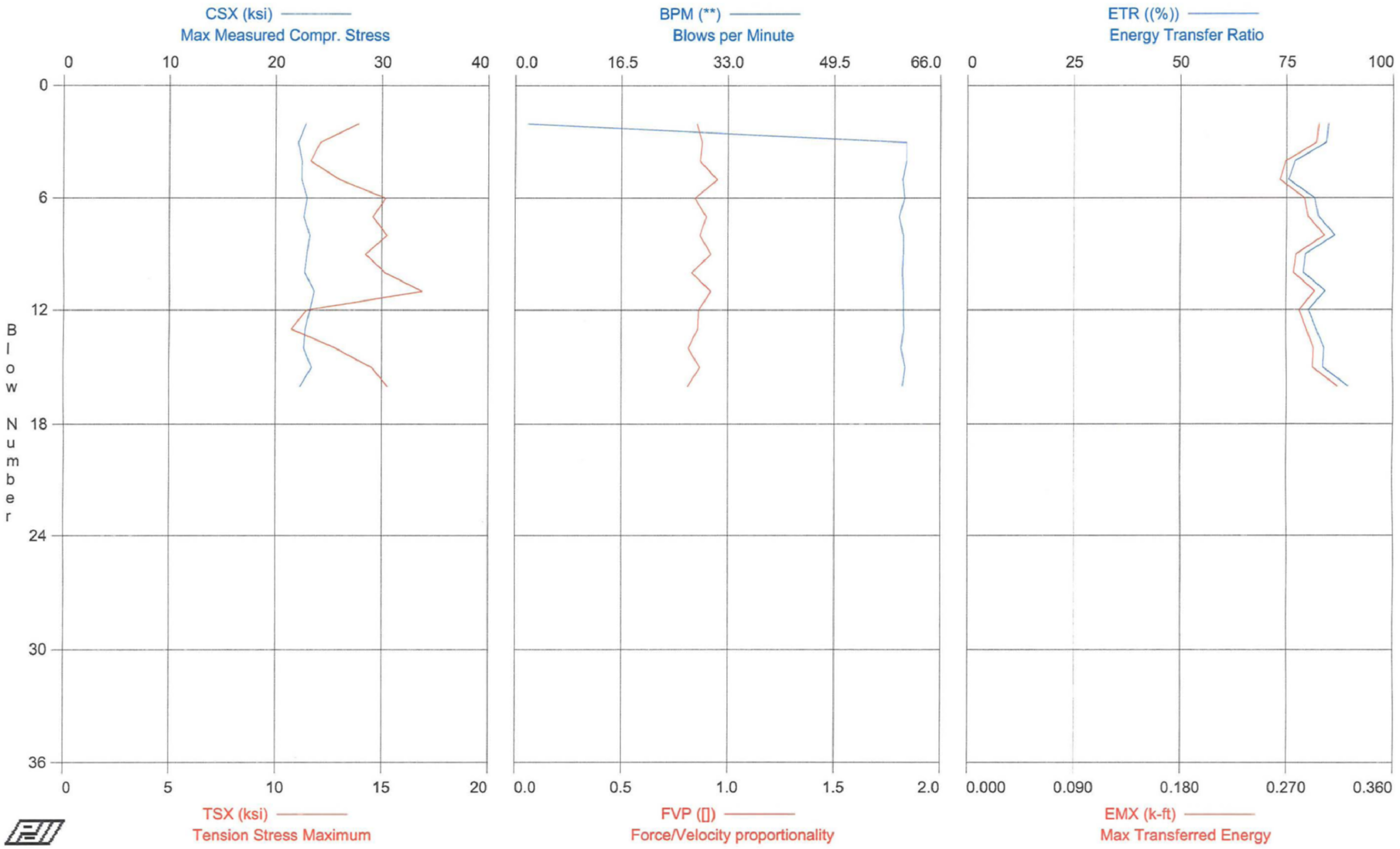
Drive 27 seconds 9:52:42 AM - 9:53:09 AM (2/21/2008) BN 2 - 29

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 28-May-2008

Test date: 21-Feb-2008

TURKEY POINT COL PROJECT - BORING B-603; 131.7' - 133.2' Sample



TURKEY POINT COL PROJECT - BORING B-603; 131.7' - 133.2' Sample

HAMMER ID 196380 (CARTER)

OP: SEK

Test date: 21-Feb-2008

AR: 1.19 in^2

SP: 0.492 k/ft3

LE: 135.00 ft

EM: 30,000 ksi

WS: 16,807.9 f/s

JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	22.8	13.9	27	14.9	1.9	0.85	0.247	85	0.297
3	0.00	22.1	12.1	26	13.8	60.7	0.88	0.259	84	0.295
4	0.00	22.4	11.6	27	13.1	60.7	0.87	0.255	77	0.269
5	0.00	22.4	13.0	27	13.2	60.1	0.95	0.247	75	0.264
6	0.00	23.0	15.2	27	13.2	60.4	0.84	0.278	82	0.285
7	0.00	22.6	14.6	27	14.2	59.6	0.90	0.269	82	0.288
8	0.00	23.2	15.2	28	14.9	60.2	0.87	0.289	86	0.302
9	0.00	23.0	14.2	27	14.0	60.2	0.92	0.261	79	0.278
10	0.00	22.7	15.1	27	14.4	60.1	0.83	0.273	79	0.276
11	0.00	23.6	16.9	28	14.4	60.2	0.92	0.287	84	0.294
12	0.00	23.2	11.4	28	15.1	60.2	0.86	0.264	80	0.281
13	0.00	22.8	10.7	27	13.5	60.3	0.86	0.273	82	0.287
14	0.00	22.6	12.8	27	14.2	59.9	0.82	0.269	84	0.293
15	0.00	23.4	14.5	28	15.1	60.5	0.87	0.280	84	0.292
16	0.00	22.3	15.3	27	14.4	60.1	0.81	0.290	89	0.313
	Average	22.8	13.8	27	14.2	56.3	0.87	0.269	82	0.288

Total number of blows analyzed: 15

Time Summary

Drive 14 seconds 11:39:54 AM - 11:40:08 AM (2/21/2008) BN 2 - 16

MACTEC

engineering and constructing a better tomorrow

August 15, 2008

Memorandum to File
From: Steve Kiser SK 8-15-08
Reviewed By: Tom McDaniel TM 8/19/08

Subject: **Report of SPT Energy – MACTEC Raleigh CME 55 ATV**
Hammer Serial No. MEC-425 Automatic Hammer
WORK INSTRUCTION TUR-055
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Jay Cerceo, of MACTEC Engineering and Consulting, Inc. (MACTEC), performed energy measurements on the drill rig at the subject site per the referenced Work Instructions. This memorandum summarizes the field testing activities and presents the results of the energy measurements.

SPT Energy Field Measurements

SPT energy measurements were made on April 23, 2008, during drilling of Borings B-636 at the referenced site. The testing was performed by Jay Cerceo from approximately 12:30 to 3:20 PM under clear skies and a temperature of about 90 degrees Fahrenheit. The boring was drilled with personnel and equipment from MACTEC Atlanta. The drilling equipment consisted of a CME 55 model drill rig with an SPT automatic hammer mounted on a marsh buggy. The drilling tools consisted of NW-J-sized drilling rods and a 2-foot long split tube sampler. Mud rotary drilling techniques were used to advance the borings below the depth at which groundwater was encountered at the time of energy testing. The drill rig operator during sampling was Mr. Phil Pitts. Energy measurements were recorded during sampling at the depth intervals shown in Table 1.

The energy measurements were performed with a Pile Driving Analyzer (PDA) model PAX (Serial No. 3622L), and calibrated accelerometers (Serial Nos. K1050 and P5992) and strain gages (Serial Nos. NW #146/1 and NW#146/2). A steel drill rod, 2 feet long and instrumented with dedicated strain gages, was inserted at the top of the drill rod string immediately below the SPT hammer. The inserted rod was also instrumented with two piezoresistive accelerometers that were bolted to the outside of the rod. The instrumented rod insert had a cross-sectional area of approximately 1.49 square inches and an outside diameter of approximately 2.625 inches at the gage location. The drill rods included in the drill rod string were hollow rods in 5 to 10 foot long sections, with an outside and inside diameter of approximately 2.625 and 2.25 inches, respectively. The recommended operation rate of the hammer is not known. Due to the closed hammer system, the hammer lubrication condition and anvil dimensions could not be observed.

Calibration Records

The calibration records for all the above are filed in DCN TUR054.

15 Pages Total

MACTEC Engineering and Consulting, Inc.
3301 Atlantic Avenue • Raleigh, NC 27604 • Phone: 919.876.0416 • Fax: 919.831.8136
www.mactec.com

Calculations for EFV

The work was done in general accordance with ASTM D 4633-05. The strain and acceleration signals were converted to force and velocity by the PDA, and the data was interpreted by the PDA according to the Case Method equation. The maximum energy transmitted to the drill rod string (as measured at the location of the strain gages and accelerometers) was calculated by the PDA using the EFV method equation, as shown below:

$$EFV = \int F(t) * V(t) * dt$$

Where: EFV = Transferred energy (EFV equation), or Energy of FV
F(t) = Calculated force at time t
V(t) = Calculated velocity at time t

The EFV method of energy calculation is recommended in ASTM Standard D4633-05. The EFV equation, integrated over the complete wave event, measures the total energy content of the event using both force and velocity measurements. The EFV values associated with each blow analyzed are tabulated in the attached PDIPLOT tables and are also shown graphically in the PDIPLOT charts.

Calculations for ETR

The ratio of the measured transferred energy (EFV) to the theoretical potential energy of the SPT system (140 lb weight with the specified 30 inch fall) is the ETR. The ETR values (as percent of the theoretical value) are shown in Table 1.

Comparison of ETR to Typical Energy Transfer Ratio Range

Based on a research report published by the Florida Department of Transportation (FDOT) (Report WPI No. 0510859, 1999), the average ETR measured for automatic hammers is 79.6%. The standard deviation was 7.9%; therefore, the range of ETRs within one standard deviation of the average was reported to be 71.7% to 87.5%. This range of ETRs was also consistent with other research that was cited in the FDOT research paper; however, maximum and minimum ETR values of up to 98% and 56%, respectively, were reported in the literature. The ETR values shown in Table 1 are generally within the range of typical values for automatic hammers as reported in the literature.

Discussion

Based on the field testing results, observations from the SPT energy measurements are summarized below:

- The data obtained by the PDA are consistent between individual hammer blows and between the sample depths tested. In general, the first and last one (and sometimes two) hammer blow records recorded by the PDA produced poor quality data (which is relatively common) and, as such, the record(s) was(were) not used in the data reduction.

- The average energy transferred from the hammer to the drill rods for each individual depth interval using the EFV method ranged from 266 foot-pounds to 320 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 76% to 91% of the theoretical energy (350 foot-pounds) of the SPT hammer.

- The average at each depth interval was calculated as the transferred energy for each analyzed blow of the depth intervals divided by the total number of hammer blows analyzed. The overall average energy transfer of the SPT system (for all the depth intervals tested) was 305.9 foot-pounds, with an average ETR of 87.4%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN TUR-055 - 1 Page
Pages 6 Record of SPT Energy Measurement -- 1 Page
Pages 7 – 15 PDIPLOT Output – 9 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Turkey Point COL Project
Dade County, Florida
MACTEC Project No. 6468-07-1950

Hammer Serial No.	Rig Owner	Rig Operator	Boring No. Tested	Rod Size	Date Tested	Sample Depth (feet)	SPT Blow Count (blows per six inches)	No. of Blows Analyzed	Average Measured Energy (Average EFV) (ft-lbs)[a]	Energy Transfer Ratio (%)[b] (Average ETR)
MEC-425 (CME 55 Marsh Buggy)	MACTEC Raleigh	Philip Pitts	B-636	NW-J	4/23/2008	7.2 - 8.7	13 - 11 - 9	34	312	89.1%
						9.8 - 11.3	4 - 5 - 5	14	266	76.0%
						16.3 - 17.1	31 - 50 / 0.3'	82	320	91.4%
						18.9 - 20.4	5 - 15 - 17	37	284	81.1%
								Average for Rig:	305.9	87.4%

[a]Measured Energy is energy based on the EFV method, as outlined in ASTM D4633-05, for each blow recorded by the PDA. In some cases, the initial and final one to two blows produced poor quality data, and were not used to calculate the Average Measured Energy.

EFV = EMX * 1000 lbs/kip, where EMX equals the maximum transferred energy measured by the PDA (see attached PDA data).

[b]Energy Transfer Ratio is the Measured Energy divided by the theoretical SPT energy of 350 foot-pounds (140 pound hammer falling 2.5 feet).

The average ETR values may differ slightly and insignificantly from those in the PDIPLOT tables due to roundoff.

Prepared By: SLV	Date: 8-15-08	Checked By: [signature]	Date: 8/19/08

Work Instruction No. 9
Turkey Point COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1950

Issued To: Steve Kiser and Jay Cerceo **Rev. No.** 1

Issued By: Tom McDaniel **Date:** 3-24-08

Valid From: 3-24-08 **To:** 4-30-08

Task Description: Perform SPT Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision; available at Site Office), Bechtel Specification 25409-102-3PS-CY00-00001, Rev. 000 or later revision, section 4.3, ASTM D 4633-05 (copy attached.).

Specific Instructions (note attachments where necessary): Perform energy measurements for each drill rig on site in accordance with ASTM D-4633-05. Consult with Site Coordinator as to schedule for rigs that may be planned for use that are not yet present. Hammer weights have been checked by site personnel, and records will be available on site. All rigs are using automatic hammer systems. Confirm that automatic hammer system is being operated within manufacturer's recommendations or in a typical operating fashion as observed from watching one or two SPT measurements prior to measuring energy. Be sure to check each drill rig using all hammer/rod combinations that it will be using. Depths for measurements should be coordinated with the Site Coordinator, and can be directed by Becthel in accordance with the specification. Site profile consists of very soft soils to about 5 feet followed by high-N-value soft rock to about 20 feet where coring begins. Sands are present below about 100 to 125 feet. Energy measurements should be made in the deeper sand zone as often as can be done, consistent with the drilling depths at the time of the measurements. See Site Coordinator for current boring logs of holes drilled and use these to plan most effective field measurement program.

Submit copies of calibration records for equipment to Project Principal for review prior to beginning work on site.

Special Instructions (note attachments where necessary): Confirm with Site Manager that approval of equipment calibration records has been received prior to beginning field testing. If unexpected conditions are encountered that affect measurements, contact Site Coordinator, Project Principal (Tom McDaniel) or Sr. Project Principal (Al Tice) immediately.

Report Format: Standard report in accordance with ASTM D 4633 requirements.

Specific Quality Assurance Procedures Applicable: QAP 20-1; QAP 25-1; QAP for Reporting Nuclear-Related Defects, or Noncompliances, per Federal Regulation 10CFR21 and Section 306 of the Energy Reorganization Act of 1974. Current revisions apply.

Hold Points or Witness Points: None

Records: All records generated shall be considered QA Records.

Reviewed and Approved by: (Note: Only one signature is required for issuance)

Project Manager: _____ Date: _____

Project Principal Engineer: _____ Date: 3/24/08

Site Manager/Coordinator: _____ Date: _____

Pages: 1 plus attachment **DCN:** TUR-055

Attachments: ASTM D 4633-05

MACTEC
2801 YORKMONT ROAD, SUITE 100 ~ CHARLOTTE, NC 28208
Telephone: (704) 357-8600 / Facsimile: (704) 357-8638

RECORD OF SPT ENERGY MEASUREMENT

GENERAL INFORMATION		DRILL RIG DATA	
PROJECT:	Turkey Point COL Project	MAKE:	CME
LOCATION:	Florida City, Florida	MODEL:	55
PROJECT NO.:	6468-07-1950	SERIAL NO.:	72425
DATE:	4/23/2008	HAMMER TYPE:	Automatic
WEATHER:	clear 90s	ROPE CONDITION:	N/A
INSPECTOR:	~~Steve Kiser~~ J. Carcco	ROD SIZE:	NWJ
DRILLING COMPANY:	MACTEC ATLANTA	NO. OF SHEAVES:	N/A

BORING DATA

BORING NUMBER:	B-636		
DEPTH DRILLED:	7.5' 10' 15.5' 18.9'		
TIME DRIVEN:	11:30 / 1:15 2:30 / 3:15		
RIG OPERATOR:	P. Pitts		
HAMMER OPERATOR:	B. Carassco		
PDA PAK SERIAL NO.:	3622L	3622L	3622L
INSTR. ROD AREA:	1.49 in^2		
ACCEL. SERIAL NOS.:	P5992 & K1050		
STRAIN SERIAL NOS.:	146NW 1 & 2		

SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	~~DEPTH~~ cont. (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont (feet)	SPT N-VALUE (bpf)	SAMPLE DEPTH (feet)	SPT N-VALUE (bpf)	DEPTH cont. (feet)	SPT N-VALUE (bpf)
8-9	8-11-9	17									
10.5-11.5	4-55	18									
16-17	31-50/3"	26									
19.4-20.4	5-15-17	29									

idle

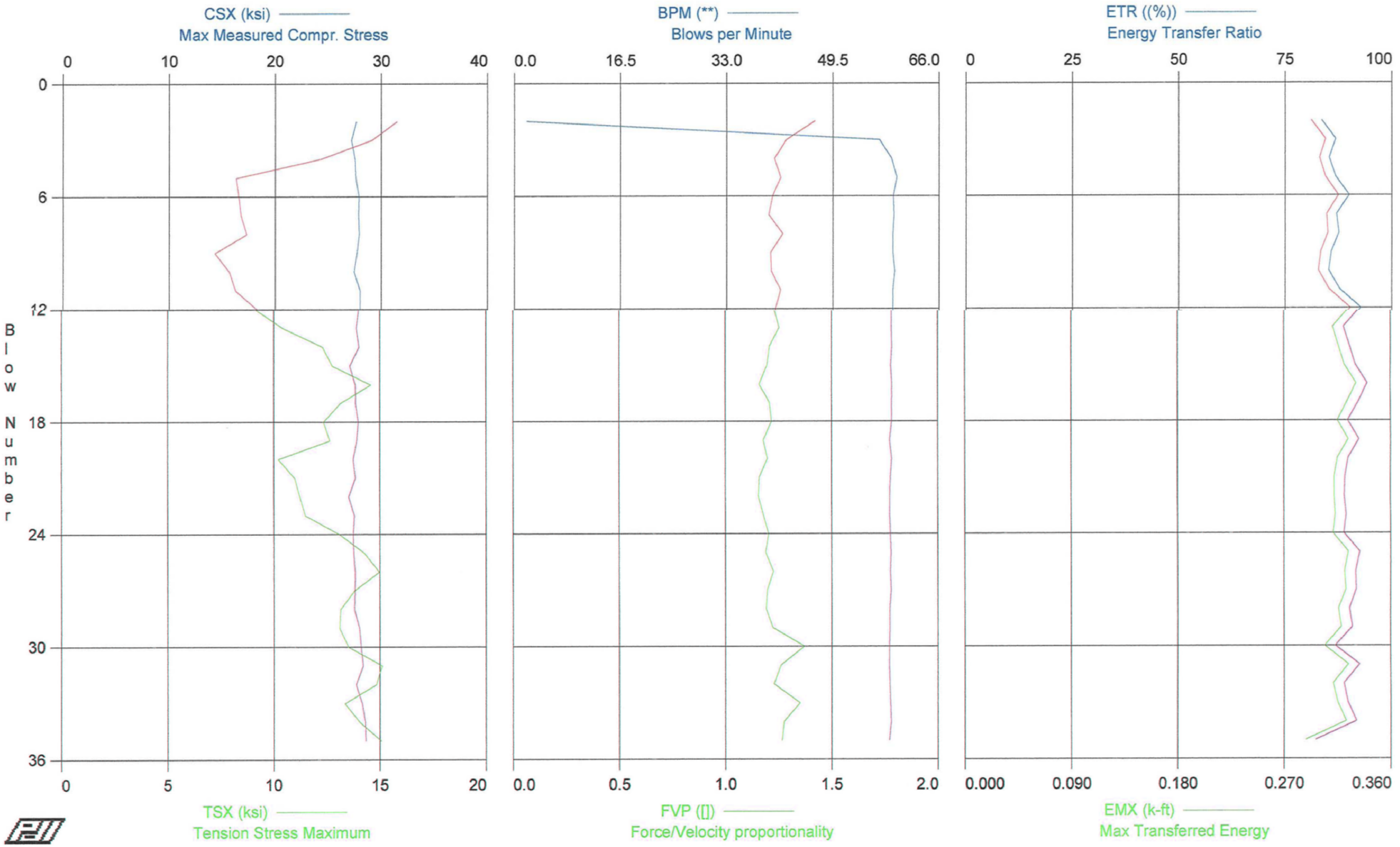
REMARKS: file ~~19.4~~ 20.5-21.5
was for 19.4-20.4'

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 23-Apr-2008

TURKEY POINT COL PROJECT - BORING B-636; 7.2 - 8.7 Sample



TURKEY POINT COL PROJECT - BORING B-636; 7.2 - 8.7 Sample
OP: HJC

HAMMER ID 72425 (P.PITTS)
Test date: 23-Apr-2008

AR: 1.49 in^2
LE: 17.00 ft
WS: 16,807.9 f/s

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

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	27.7	15.7	41	13.3	1.9	1.42	0.325	84	0.292
3	0.00	27.2	14.5	41	12.4	56.7	1.28	0.331	87	0.304
4	0.00	27.5	12.1	41	12.0	58.6	1.23	0.335	85	0.299
5	0.00	27.6	8.2	41	12.1	59.4	1.25	0.337	87	0.304
6	0.00	27.9	8.3	42	12.9	58.9	1.22	0.335	90	0.315
7	0.00	27.9	8.4	42	13.0	59.0	1.20	0.332	87	0.305
8	0.00	27.9	8.7	42	12.3	58.8	1.26	0.340	88	0.306
9	0.00	27.7	7.2	41	12.9	58.8	1.21	0.337	86	0.300
10	0.00	27.4	7.8	41	12.7	59.1	1.21	0.333	85	0.298
11	0.00	28.0	8.1	42	12.4	58.8	1.25	0.340	88	0.307
12	0.00	28.0	9.1	42	12.8	58.8	1.23	0.341	93	0.325
13	0.00	27.8	10.4	41	12.5	58.8	1.25	0.335	89	0.311
14	0.00	28.0	12.3	42	13.0	58.9	1.21	0.338	90	0.316
15	0.00	27.2	12.8	41	12.7	58.7	1.20	0.338	92	0.321
16	0.00	27.7	14.6	41	13.4	58.9	1.16	0.333	95	0.331
17	0.00	27.7	13.1	41	12.9	58.8	1.21	0.336	92	0.323
18	0.00	28.0	12.3	42	12.8	58.8	1.22	0.341	90	0.315
19	0.00	27.8	12.6	41	13.3	58.5	1.18	0.338	93	0.324
20	0.00	27.5	10.2	41	12.9	58.8	1.20	0.330	90	0.315
21	0.00	27.7	11.0	41	13.3	58.6	1.16	0.336	89	0.312
22	0.00	27.0	11.2	40	12.8	58.5	1.15	0.331	89	0.312
23	0.00	27.6	11.5	41	13.2	58.5	1.18	0.328	90	0.313
24	0.00	27.5	13.1	41	12.9	58.6	1.20	0.332	89	0.311
25	0.00	27.5	14.3	41	13.3	58.7	1.19	0.333	93	0.324
26	0.00	27.7	15.0	41	13.3	58.6	1.23	0.328	92	0.321
27	0.00	27.6	13.8	41	12.8	58.7	1.20	0.333	92	0.322
28	0.00	27.6	13.1	41	12.8	58.5	1.19	0.334	90	0.316
29	0.00	28.1	13.1	42	12.9	58.5	1.22	0.332	91	0.318
30	0.00	28.2	13.5	42	12.4	58.4	1.37	0.336	87	0.304
31	0.00	28.4	15.1	42	13.8	58.4	1.26	0.337	93	0.324
32	0.00	27.8	14.8	41	14.6	58.5	1.23	0.333	89	0.311
33	0.00	28.3	13.3	42	12.6	58.6	1.35	0.337	90	0.315
34	0.00	28.6	14.1	43	12.9	58.7	1.28	0.338	92	0.322
35	0.00	28.7	15.1	43	13.5	58.4	1.27	0.336	82	0.288
	Average	27.8	12.0	41	12.9	57.0	1.23	0.335	89	0.312

Total number of blows analyzed: 34

Time Summary

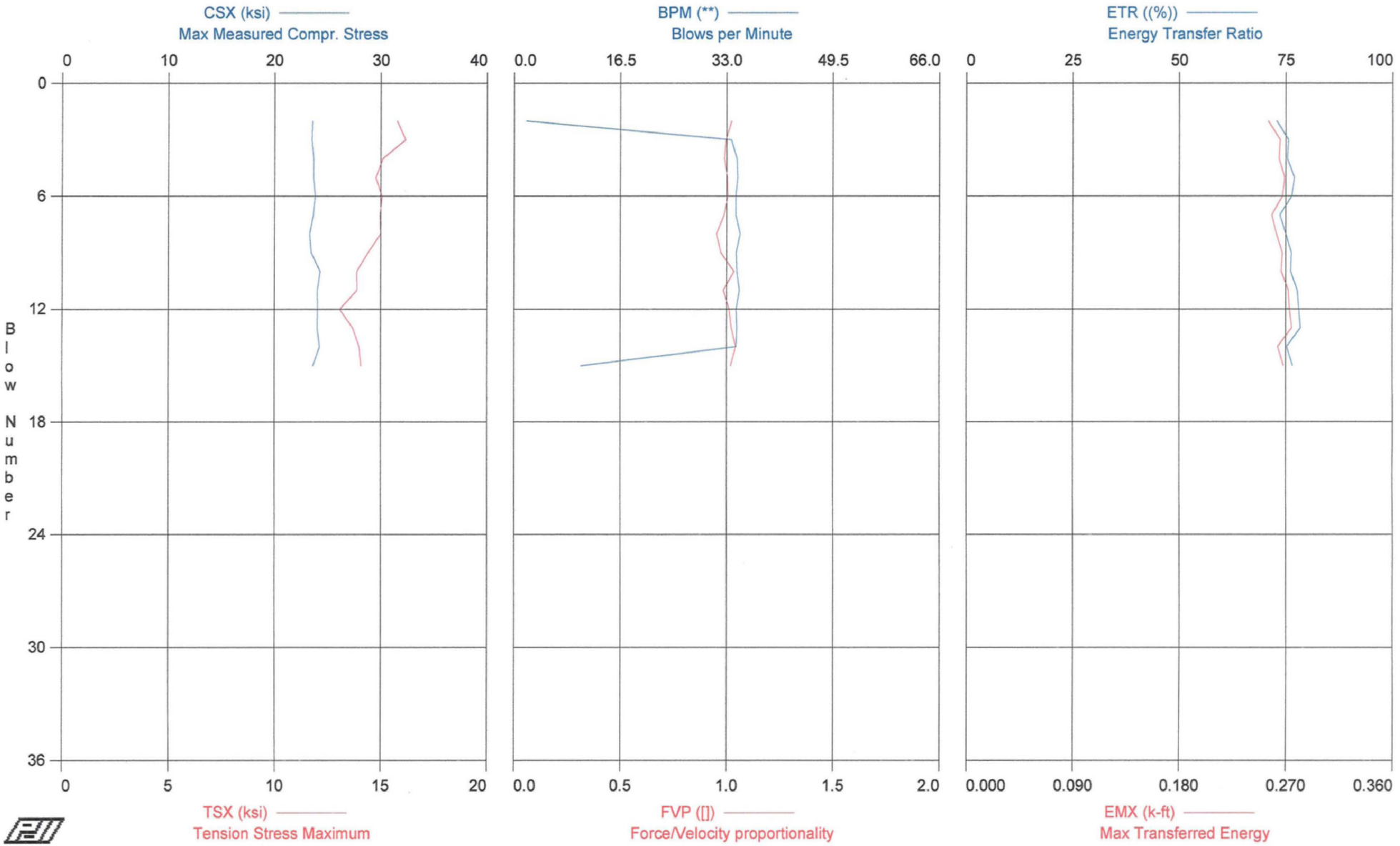
Drive 34 seconds 12:34:38 PM - 12:35:12 PM (4/23/2008) BN 2 - 35

MACTEC Engineering and Consulting, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 30-May-2008

Test date: 23-Apr-2008

TURKEY POINT COL PROJECT - BORING B-636; 9.8 - 11.3 Sample



TURKEY POINT COL PROJECT - BORING B-636; 9.8 - 11.3 Sample
OP: HJC

HAMMER ID 72425 (P.PITTS)
Test date: 23-Apr-2008

AR: 1.49 in^2
LE: 19.00 ft
WS: 16,800.0 f/s

SP: 0.492 k/ft3
EM: 29,972 ksi
JC: 0.70

CSX: Max Measured Compr. Stress
TSX: Tension Stress Maximum
FMX: Maximum Force
VMX: Maximum Velocity
BPM: Blows per Minute

FVP: Force/Velocity proportionality
EF2: Energy of F^2
ETR: Energy Transfer Ratio
EMX: Max Transferred Energy

BL#	depth	CSX	TSX	FMX	VMX	BPM	FVP	EF2	ETR	EMX
	ft	ksi	ksi	kips	f/s	**	[]	k-ft	(%)	k-ft
2	0.00	23.6	15.8	35	13.8	1.9	1.02	0.302	73	0.255
3	0.00	23.5	16.2	35	13.9	33.7	1.00	0.304	76	0.265
4	0.00	23.7	15.1	35	13.4	34.6	0.99	0.310	75	0.264
5	0.00	23.7	14.8	35	13.4	34.7	1.00	0.309	77	0.269
6	0.00	23.8	15.1	35	13.4	34.4	1.01	0.311	76	0.267
7	0.00	23.6	15.0	35	13.4	34.4	0.99	0.304	74	0.258
8	0.00	23.3	15.0	35	13.7	35.1	0.95	0.302	75	0.262
9	0.00	23.5	14.4	35	13.5	34.5	0.97	0.305	76	0.267
10	0.00	24.3	13.9	36	13.2	34.6	1.03	0.309	76	0.266
11	0.00	24.0	13.9	36	13.3	35.0	0.99	0.303	78	0.272
12	0.00	24.1	13.1	36	13.3	34.5	1.01	0.306	78	0.273
13	0.00	24.0	13.7	36	13.2	34.6	1.02	0.311	78	0.275
14	0.00	24.2	14.0	36	13.1	34.5	1.04	0.310	75	0.263
15	0.00	23.6	14.1	35	13.0	10.4	1.02	0.307	77	0.268
	Average	23.8	14.6	35	13.4	30.5	1.00	0.307	76	0.266

Total number of blows analyzed: 14

Time Summary

Drive 26 seconds 1:21:20 PM - 1:21:46 PM (4/23/2008) BN 2 - 15