EXCELON VICTORIA COL PROJECT - BORING B-2180; 83.5' - 85' SAMPLE
HAMMER ID: MEC-02 (D. WHITE CME-55LC)
OP: KBM
Test date: 4-Dec-2007

AR: 1.19 in^2
LE: 90.00 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000.0 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
3	0.00	19.9	14.2	24	14.1	61.7	0.76	0.234	84	0.294
4	0.00	20.4	13.5	24	12.6	51.7	0.73	0.236	84	0.296
5	0.00	19.4	16.4	23	13.4	51.2	0.81	0.231	83	0.291
6	0.00	20.3	15.5	24	12.7	51.7	0.90	0.232	83	0.292
7	0.00	19.5	15.5	23	14.3	51.5	0.77	0.233	84	0.294
8	0.00	20.6	13.3	24	12.5	51.3	0.71	0.233	84	0.294
9	0.00	20.2	15.5	24	13.9	51.8	0.77	0.237	85	0.298
10	0.00	20.7	13.8	25	12.8	51.3	0.91	0.235	84	0.294
11	0.00	20.5	12.7	24	12.9	51.4	0.72	0.237	85	0.297
12	0.00	19.8	10.5	24	13.2	51.2	0.84	0.233	83	0.291
13	0.00	19.7	8.1	24	12.5	51.3	0.70	0.230	82	0.287
14	0.00	19.1	8.9	23	12.5	51.5	0.84	0.233	82	0.288
15	0.00	18.7	8.8	22	12.7	51.3	0.83	0.232	85	0.298
16	0.00	20.1	8.8	24	12.8	51.8	0.69	0.232	84	0.293
17	0.00	19.4	9.8	23	12.9	51.3	0.84	0.236	84	0.294
18	0.00	19.9	8.7	24	12.8	51.3	0.68	0.233	84	0.295
19	0.00	19.3	10.1	23	13.0	51.6	0.80	0.233	83	0.291
20	0.00	20.3	10.5	24	12.6	51.5	0.82	0.234	83	0.290
21	0.00	19.1	11.2	23	12.6	51.4	0.85	0.234	85	0.297
22	0.00	19.8	9.0	24	12.4	51.3	0.89	0.229	82	0.287
23	0.00	20.9	10.8	25	12.8	51.5	0.77	0.236	82	0.287
24	0.00	19.4	11.2	23	13.1	51.7	0.78	0.235	85	0.298
25	0.00	20.7	11.5	25	13.0	51.5	0.70	0.236	84	0.295
26	0.00	20.7	11.9	25	13.7	51.5	0.73	0.233	84	0.293
27	0.00	20.6	9.9	25	13.9	51.4	0.75	0.238	86	0.301
28	0.00	20.1	9.9	24	13.1	51.4	0.76	0.238	87	0.304
29	0.00	20.2	9.3	24	13.6	51.4	0.83	0.239	85	0.299
30	0.00	19.5	8.2	23	12.7	51.6	0.77	0.230	83	0.291
31	0.00	20.6	8.1	25	12.8	51.4	0.73	0.236	86	0.300
	Average	20.0	11.2	24	13.0	51.8	0.78	0.234	84	0.294

Total number of blows analyzed: 29

Time Summary

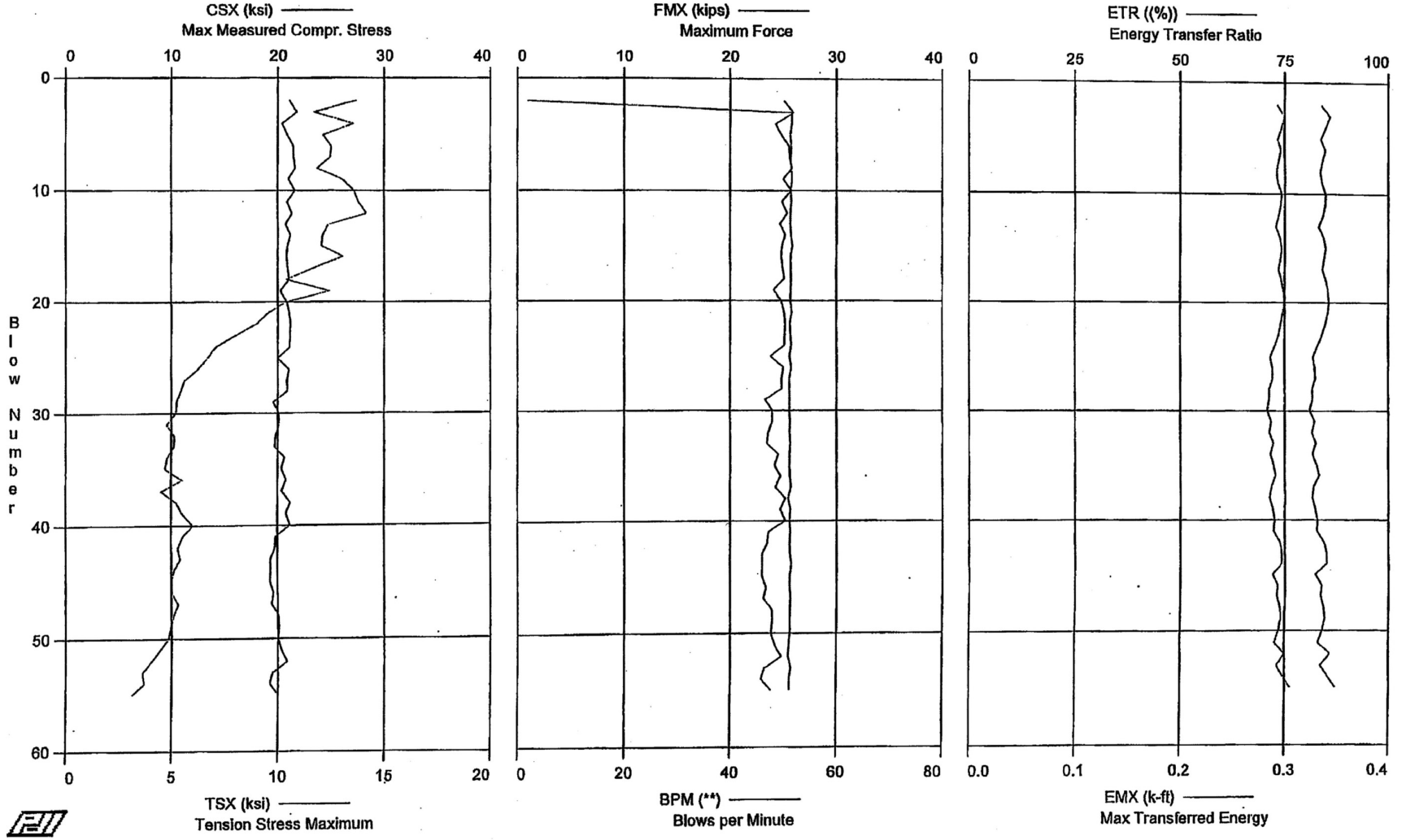
Drive 33 seconds 10:17:57 AM - 10:18:30 AM (12/4/2007) BN 3 - 31

MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 4-Dec-2007

EXCELON VICTORIA COL PROJECT - BORING B-2180; 88.5' - 90' SAMPLE



EXCELON VICTORIA COL PROJECT - BORING B-2180; 88.5' - 90' SAMPLE
OP: KBM

HAMMER ID: MEC-02; (D. WHITE CME-55LC)
Test date: 4-Dec-2007

AR: 1.19 in^2
LE: 95.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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	21.1	13.7	25	13.4	1.9	0.70	0.240	84	0.293
3	0.00	21.8	11.7	26	14.0	51.6	0.70	0.243	86	0.300
4	0.00	20.4	13.5	24	14.5	51.6	0.79	0.241	85	0.297
5	0.00	20.9	12.1	25	13.6	51.3	0.79	0.242	84	0.293
6	0.00	21.5	12.5	26	13.6	51.5	0.89	0.241	85	0.296
7	0.00	21.5	12.5	26	13.5	51.4	0.89	0.240	84	0.294
8	0.00	21.7	11.9	26	12.8	51.5	0.95	0.241	83	0.292
9	0.00	21.0	13.0	25	13.2	51.6	0.79	0.240	84	0.293
10	0.00	21.6	13.6	26	13.6	51.4	0.70	0.238	85	0.297
11	0.00	20.9	13.8	25	13.5	51.5	0.87	0.237	85	0.296
12	0.00	21.3	14.2	25	13.6	51.3	0.70	0.238	84	0.294
13	0.00	20.7	12.4	25	13.3	51.3	0.87	0.233	83	0.291
14	0.00	21.2	12.1	25	13.5	51.4	0.78	0.237	84	0.295
15	0.00	20.9	12.1	25	14.0	51.7	0.74	0.236	85	0.297
16	0.00	20.8	13.1	25	14.1	51.4	0.83	0.233	84	0.296
17	0.00	20.9	11.7	25	13.8	51.4	0.85	0.236	84	0.294
18	0.00	21.1	10.4	25	13.7	51.4	0.73	0.233	85	0.297
19	0.00	20.2	12.4	24	13.6	51.4	0.77	0.233	85	0.299
20	0.00	20.8	10.4	25	13.0	51.3	0.90	0.233	86	0.300
21	0.00	21.1	9.5	25	13.8	51.6	0.86	0.233	85	0.298
22	0.00	21.2	9.0	25	13.4	51.2	0.88	0.234	85	0.296
23	0.00	21.1	8.0	25	13.0	51.3	0.73	0.232	84	0.294
24	0.00	21.1	7.1	25	12.8	51.5	0.72	0.232	83	0.290
25	0.00	20.0	6.7	24	13.2	51.1	0.79	0.230	82	0.286
26	0.00	21.0	6.2	25	12.8	51.5	0.74	0.228	82	0.288
27	0.00	20.9	5.6	25	12.4	51.1	0.94	0.229	82	0.288
28	0.00	20.9	5.4	25	12.6	51.1	0.75	0.224	82	0.285
29	0.00	19.6	5.2	23	13.3	51.1	0.83	0.223	82	0.285
30	0.00	20.1	5.2	24	12.9	51.1	0.87	0.226	81	0.283
31	0.00	20.1	4.8	24	13.4	51.2	0.85	0.223	82	0.287
32	0.00	19.8	5.1	24	13.3	51.1	0.80	0.225	81	0.285
33	0.00	19.7	5.1	23	13.4	51.3	0.83	0.226	82	0.289
34	0.00	20.6	4.8	25	12.4	51.1	0.73	0.223	82	0.286
35	0.00	20.3	4.7	24	12.6	51.1	0.91	0.227	83	0.289
36	0.00	20.8	5.5	25	12.8	51.2	0.78	0.226	83	0.291
37	0.00	20.4	4.5	24	13.1	51.4	0.87	0.223	82	0.287
38	0.00	21.2	5.2	25	13.1	50.9	0.90	0.226	82	0.285
39	0.00	20.8	5.5	25	12.7	51.3	0.78	0.226	82	0.288
40	0.00	21.2	6.0	25	13.4	51.1	0.89	0.225	83	0.290
41	0.00	19.8	5.5	24	13.8	51.3	0.81	0.223	83	0.289
42	0.00	19.7	5.3	23	14.4	51.1	0.77	0.226	84	0.295
43	0.00	19.3	5.4	23	14.0	51.2	0.78	0.224	85	0.297
44	0.00	19.3	5.1	23	13.6	51.5	0.77	0.228	85	0.297
45	0.00	19.3	5.0	23	13.1	51.1	0.82	0.223	82	0.288
46	0.00	19.6	5.0	23	13.3	51.1	0.79	0.226	84	0.293
47	0.00	19.4	5.3	23	13.7	51.3	0.80	0.225	84	0.292
48	0.00	20.1	5.1	24	14.3	51.2	0.79	0.226	84	0.295
49	0.00	20.1	5.0	24	14.4	51.2	0.78	0.226	85	0.296
50	0.00	20.0	4.9	24	13.3	51.2	0.85	0.227	84	0.294
51	0.00	20.3	4.4	24	14.1	51.0	0.80	0.228	83	0.290
52	0.00	20.9	4.0	25	14.0	50.9	0.83	0.229	86	0.300
53	0.00	19.5	3.6	23	14.0	51.4	0.78	0.225	84	0.292
54	0.00	19.2	3.7	23	13.7	51.1	0.79	0.228	85	0.298
55	0.00	20.0	3.1	24	14.7	51.1	0.77	0.226	87	0.305
	Average	20.5	7.9	24	13.5	50.4	0.81	0.230	84	0.293

Total number of blows analyzed: 54

Time Summary

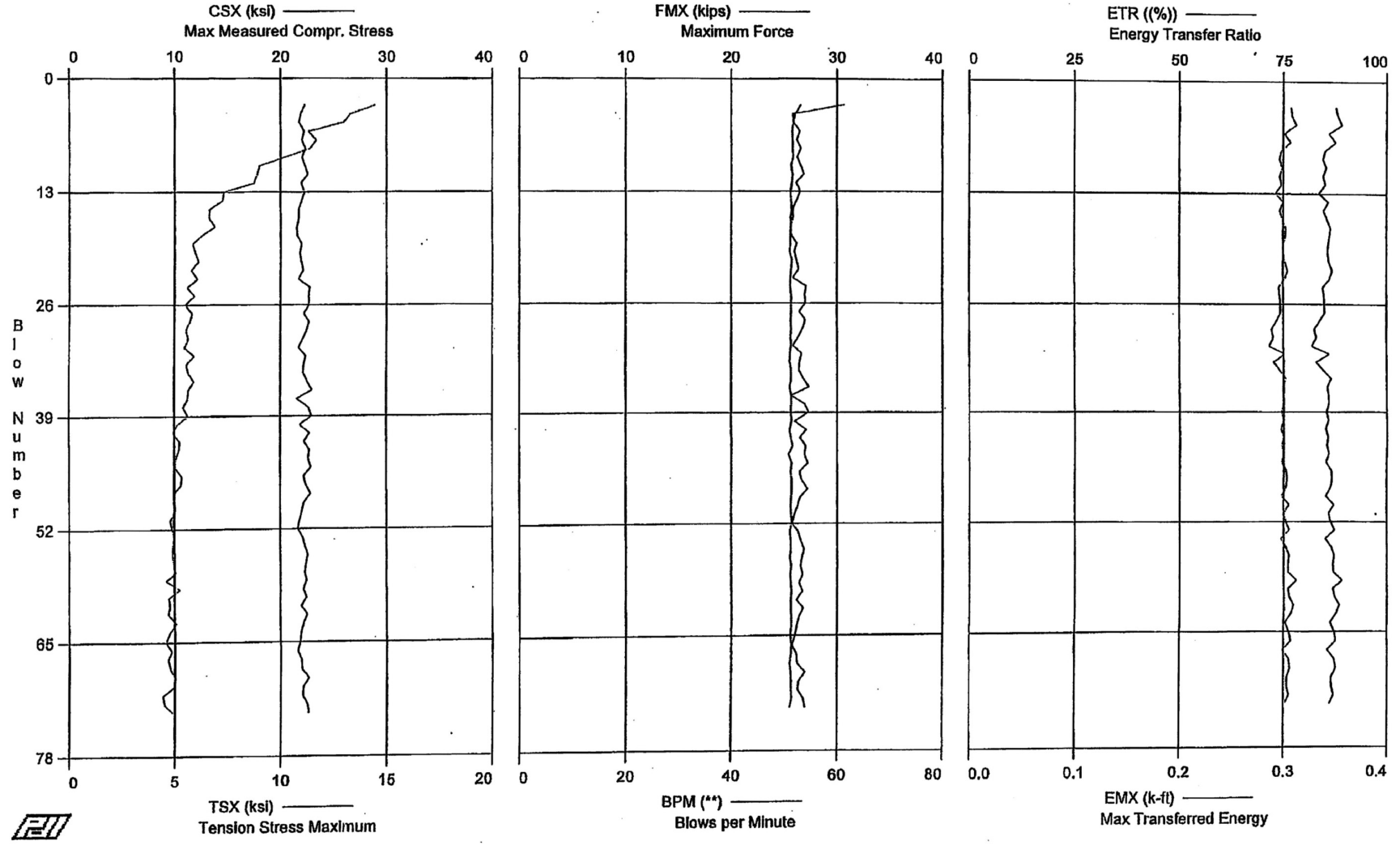
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MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 4-Dec-2007

EXCELON VICTORIA COL PROJECT - BORING B-2180; 93.5' - 95' SAMPLE



EXCELON VICTORIA COL PROJECT - BORING B-2180; 93.5' - 95' SAMPLE
OP: KBM

HAMMER ID: MEC-02; (D. WHITE CME-55LC)
Test date: 4-Dec-2007

AR: 1.19 in^2
LE: 100.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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
3	0.00	22.3	14.5	27	12.6	61.3	0.76	0.253	88	0.307
4	0.00	21.9	13.3	26	12.5	51.6	0.98	0.253	88	0.308
5	0.00	21.7	13.0	26	13.0	51.7	0.92	0.253	89	0.312
6	0.00	22.2	11.3	26	13.5	51.5	0.82	0.249	86	0.301
7	0.00	22.0	11.7	26	12.4	51.6	0.96	0.251	88	0.307
8	0.00	22.4	11.4	27	13.7	51.6	0.81	0.252	85	0.298
9	0.00	22.0	10.2	26	12.2	51.7	0.98	0.250	85	0.296
10	0.00	22.3	9.0	27	13.4	51.3	0.81	0.248	85	0.299
11	0.00	22.6	8.9	27	12.8	51.6	0.79	0.250	85	0.296
12	0.00	21.9	8.8	26	12.3	51.5	1.00	0.251	85	0.298
13	0.00	22.3	7.3	27	13.3	51.2	0.81	0.247	83	0.292
14	0.00	22.0	7.3	26	13.5	51.3	0.84	0.248	86	0.300
15	0.00	21.7	6.7	26	13.1	51.4	0.89	0.249	85	0.296
16	0.00	21.7	6.6	26	12.6	51.2	0.97	0.251	85	0.299
17	0.00	21.5	6.9	26	12.8	51.3	0.95	0.248	86	0.302
18	0.00	21.5	6.3	26	13.6	51.1	0.85	0.249	86	0.302
19	0.00	22.0	5.8	26	13.4	51.2	0.86	0.251	86	0.300
20	0.00	21.8	6.0	26	12.9	51.0	0.95	0.255	86	0.300
21	0.00	22.0	6.1	26	13.6	51.5	0.83	0.249	86	0.301
22	0.00	22.2	5.8	26	12.8	51.3	0.74	0.251	87	0.304
23	0.00	21.7	6.1	26	12.6	51.2	0.97	0.248	86	0.301
24	0.00	22.8	5.6	27	12.7	51.1	0.86	0.253	84	0.295
25	0.00	22.6	5.9	27	12.9	51.3	0.85	0.250	85	0.296
26	0.00	22.7	5.5	27	12.8	51.3	0.87	0.250	85	0.297
27	0.00	22.2	5.8	26	12.8	51.3	0.95	0.252	85	0.297
28	0.00	22.7	5.7	27	12.6	51.2	1.01	0.250	84	0.293
29	0.00	22.5	5.5	27	12.7	51.3	0.99	0.243	82	0.288
30	0.00	22.1	5.7	26	12.7	51.2	0.98	0.246	83	0.290
31	0.00	21.7	5.5	26	12.5	51.3	0.97	0.244	82	0.286
32	0.00	22.4	5.9	27	12.4	51.1	1.01	0.250	86	0.301
33	0.00	22.2	5.6	26	12.9	51.0	0.87	0.245	83	0.290
34	0.00	22.2	5.7	26	12.7	51.3	0.98	0.248	85	0.296
35	0.00	22.5	5.9	27	12.6	51.3	1.00	0.253	86	0.302
36	0.00	23.0	5.7	27	12.9	51.0	1.00	0.253	85	0.299
37	0.00	21.5	5.6	26	13.2	51.3	0.92	0.251	86	0.300
38	0.00	22.6	5.4	27	12.5	51.3	1.02	0.252	86	0.300
39	0.00	22.9	5.7	27	12.8	51.2	1.01	0.254	85	0.298
40	0.00	21.8	5.1	26	12.8	51.4	0.96	0.253	86	0.300
41	0.00	22.8	4.9	27	12.8	51.0	0.76	0.253	85	0.297
42	0.00	22.2	5.2	26	13.0	51.2	0.91	0.255	86	0.300
43	0.00	22.7	5.2	27	13.1	51.6	0.78	0.253	85	0.298
44	0.00	22.6	5.1	27	12.8	50.8	0.92	0.255	86	0.300
45	0.00	22.9	5.0	27	12.9	51.4	0.79	0.253	85	0.298
46	0.00	22.2	5.4	26	13.0	51.2	0.91	0.254	86	0.302
47	0.00	22.4	5.3	27	12.8	51.4	0.98	0.254	87	0.303
48	0.00	22.9	5.0	27	12.8	51.4	1.01	0.253	86	0.302
49	0.00	22.2	5.0	26	12.8	51.3	0.93	0.254	85	0.298
50	0.00	22.1	5.0	26	13.6	51.2	0.85	0.255	87	0.305
51	0.00	21.8	4.8	26	13.5	51.3	0.86	0.251	86	0.300
52	0.00	21.6	4.9	26	13.5	51.4	0.90	0.254	86	0.302
53	0.00	22.1	5.0	26	13.7	51.0	0.82	0.254	87	0.305
54	0.00	22.3	4.9	27	12.9	51.2	0.97	0.249	85	0.297
55	0.00	22.6	4.9	27	13.0	51.2	0.97	0.255	86	0.302
56	0.00	22.4	4.9	27	13.0	51.0	0.97	0.253	87	0.305
57	0.00	22.3	5.1	27	13.6	51.3	0.82	0.253	87	0.304
58	0.00	22.5	4.6	27	13.6	51.1	0.78	0.254	87	0.304
59	0.00	22.2	5.3	26	13.8	51.2	0.82	0.256	89	0.312
60	0.00	22.4	4.7	27	13.5	51.3	0.76	0.255	87	0.304
61	0.00	22.0	4.8	26	13.7	51.2	0.82	0.254	87	0.305
62	0.00	22.5	4.7	27	13.6	51.2	0.80	0.257	88	0.309
63	0.00	22.2	5.1	26	13.6	51.3	0.82	0.255	88	0.307
64	0.00	22.0	4.8	26	13.5	51.3	0.84	0.253	86	0.301
65	0.00	21.9	4.6	26	13.5	51.2	0.87	0.253	87	0.305
66	0.00	21.6	4.9	26	13.1	51.3	0.91	0.254	88	0.307
67	0.00	22.0	4.7	26	13.1	51.3	0.94	0.252	85	0.299

EXCELON VICTORIA COL PROJECT - BORING B-2180; 93.5' - 95' SAMPLE
OP: KBM

HAMMER ID: MEC-02; (D. WHITE CME-55LC)
Test date: 4-Dec-2007

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
68	0.00	22.0	4.8	26	12.7	51.0	0.97	0.254	87	0.305
69	0.00	22.7	5.0	27	13.0	51.2	0.98	0.256	88	0.306
70	0.00	22.1	5.0	26	13.6	51.3	0.81	0.253	86	0.303
71	0.00	22.1	4.4	26	12.9	51.3	0.96	0.254	86	0.303
72	0.00	22.5	4.5	27	13.2	51.4	0.78	0.254	87	0.305
73	0.00	22.6	4.9	27	13.0	51.0	0.75	0.254	86	0.301
	Average	22.2	6.2	26	13.0	51.4	0.89	0.252	86	0.301

Total number of blows analyzed: 71

Time Summary

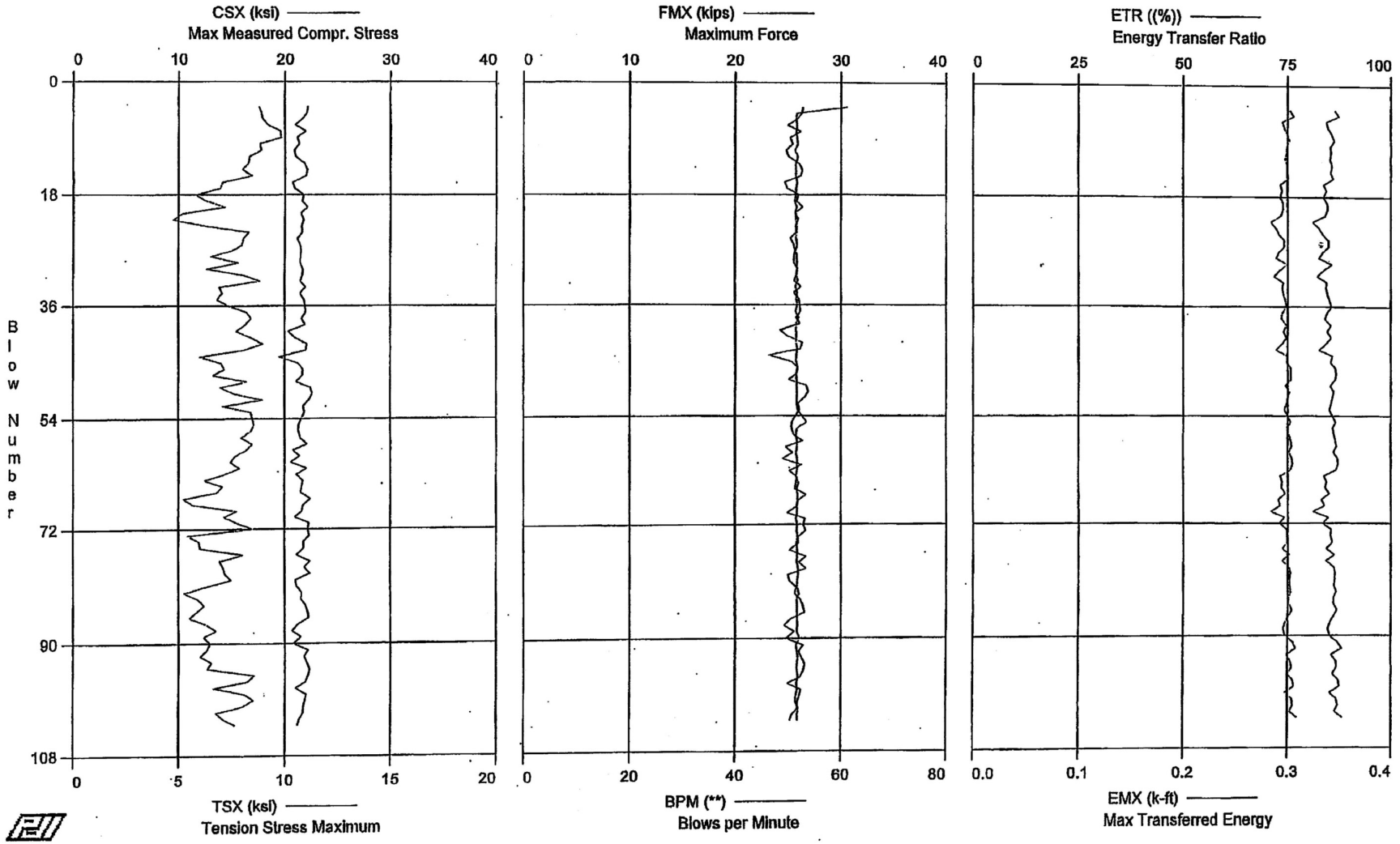
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MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 4-Dec-2007

EXCELON VICTORIA COL PROJECT - BORING B-2180; 98.5' - 100' SAMPLE



EXCELON VICTORIA COL PROJECT - BORING B-2180; 98.5' - 100' SAMPLE
OP: KBM

HAMMER ID: MEC-02; (D. WHITE CME-55LC)
Test date: 4-Dec-2007

AR: 1.19 in^2
LE: 105.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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
4	0.00	22.2	8.8	26	14.5	61.2	0.72	0.257	86	0.302
5	0.00	22.1	8.9	26	14.1	51.7	0.70	0.258	87	0.306
6	0.00	21.7	9.0	26	13.9	51.5	0.69	0.253	84	0.295
7	0.00	21.0	9.2	25	13.4	51.7	0.88	0.257	85	0.297
8	0.00	22.0	9.8	26	14.4	51.6	0.71	0.252	86	0.300
9	0.00	21.2	9.8	25	13.4	51.7	0.84	0.255	86	0.302
10	0.00	21.4	8.8	25	13.4	51.9	0.84	0.255	85	0.299
11	0.00	20.9	8.9	25	13.7	51.3	0.85	0.255	85	0.299
12	0.00	21.1	8.4	25	13.3	51.9	0.89	0.254	85	0.298
13	0.00	21.9	8.3	26	13.7	51.5	0.70	0.253	86	0.300
14	0.00	22.2	8.0	26	13.7	51.5	0.72	0.254	85	0.299
15	0.00	22.0	8.5	26	14.0	51.5	0.77	0.253	86	0.301
16	0.00	20.7	7.1	25	13.9	51.7	0.80	0.250	84	0.293
17	0.00	20.9	7.0	25	13.2	51.5	0.89	0.249	84	0.295
18	0.00	21.8	5.8	26	13.1	51.5	0.81	0.249	84	0.293
19	0.00	21.7	6.3	26	13.2	51.2	0.69	0.252	85	0.296
20	0.00	22.2	7.2	26	13.9	51.6	0.74	0.251	85	0.296
21	0.00	21.6	5.2	26	13.2	51.4	0.84	0.252	84	0.294
22	0.00	21.8	4.8	26	13.6	51.4	0.71	0.247	81	0.284
23	0.00	21.6	6.4	26	13.4	51.7	0.91	0.247	83	0.289
24	0.00	21.7	8.3	26	13.9	51.5	0.71	0.246	83	0.292
25	0.00	21.2	8.1	25	13.3	51.5	0.90	0.253	85	0.297
26	0.00	21.5	8.0	26	13.7	51.7	0.72	0.248	85	0.297
27	0.00	21.6	7.5	26	13.7	51.5	0.72	0.248	83	0.292
28	0.00	21.5	6.5	26	13.5	51.6	0.66	0.250	83	0.289
29	0.00	21.5	7.8	26	13.9	51.7	0.70	0.248	86	0.300
30	0.00	21.7	6.3	26	14.0	51.7	0.71	0.248	83	0.292
31	0.00	21.7	8.0	26	13.1	51.5	0.78	0.247	82	0.287
32	0.00	21.5	8.8	26	13.7	51.8	0.73	0.248	84	0.296
33	0.00	22.0	6.9	26	13.7	51.4	0.75	0.250	84	0.295
34	0.00	21.5	7.1	26	13.5	51.7	0.78	0.248	85	0.296
35	0.00	21.8	6.8	26	13.7	51.5	0.75	0.250	85	0.298
36	0.00	21.9	7.3	26	13.7	51.8	0.74	0.250	86	0.299
37	0.00	22.0	8.2	26	13.5	51.4	0.70	0.251	84	0.295
38	0.00	21.6	8.4	26	13.4	52.0	0.78	0.248	84	0.294
39	0.00	21.9	8.2	26	13.4	51.5	0.70	0.249	85	0.299
40	0.00	20.3	7.7	24	13.9	51.5	0.82	0.247	85	0.296
41	0.00	21.0	8.4	25	13.8	51.6	0.83	0.249	85	0.299
42	0.00	22.1	9.0	26	13.1	51.5	0.70	0.254	84	0.295
43	0.00	22.0	8.0	26	13.3	51.7	0.93	0.250	83	0.289
44	0.00	19.5	6.0	23	14.7	51.6	0.73	0.244	86	0.300
45	0.00	21.2	7.0	25	13.3	51.5	0.84	0.251	85	0.299
46	0.00	21.8	7.2	26	13.6	51.8	0.71	0.248	87	0.303
47	0.00	21.7	6.6	26	13.7	51.5	0.81	0.253	87	0.303
48	0.00	21.1	8.2	25	13.8	51.6	0.86	0.250	86	0.303
49	0.00	22.5	7.0	27	14.0	51.6	0.74	0.253	85	0.298
50	0.00	22.6	7.6	27	13.7	51.7	0.74	0.252	86	0.302
51	0.00	22.3	9.0	27	13.5	51.7	0.75	0.252	86	0.300
52	0.00	21.8	7.1	26	13.3	51.6	0.84	0.252	85	0.299
53	0.00	21.9	8.4	26	13.3	51.8	0.73	0.253	85	0.297
55	0.00	21.3	8.6	25	13.7	53.5	0.82	0.252	87	0.303
56	0.00	21.3	8.4	25	13.6	51.7	0.88	0.254	86	0.300
57	0.00	21.5	8.0	26	13.4	51.5	0.90	0.255	86	0.301
58	0.00	22.2	8.5	26	13.4	51.7	0.70	0.252	87	0.303
59	0.00	20.8	8.2	25	13.7	51.7	0.85	0.252	87	0.304
60	0.00	21.4	7.7	25	14.0	51.5	0.86	0.251	86	0.301
61	0.00	20.6	7.4	24	13.9	51.7	0.83	0.252	87	0.304
62	0.00	22.1	7.9	26	13.3	51.7	0.70	0.253	87	0.305
63	0.00	21.1	7.2	25	13.5	51.7	0.82	0.251	87	0.303
64	0.00	21.7	6.2	26	13.5	51.5	0.90	0.243	84	0.293
65	0.00	21.6	7.1	26	13.4	52.0	0.91	0.242	84	0.295
66	0.00	21.5	6.8	26	13.1	51.6	0.92	0.247	84	0.294
67	0.00	22.4	5.2	27	13.5	51.8	0.74	0.250	85	0.298
68	0.00	21.8	5.7	26	13.2	51.8	0.92	0.242	83	0.291
69	0.00	21.7	7.7	26	13.1	51.7	0.78	0.244	84	0.293

EXCELON VICTORIA COL PROJECT - BORING B-2180; 98.5' - 100' SAMPLE
HAMMER ID: MEC-02; (D. WHITE CME-55LC)
OP: KBM
Test date: 4-Dec-2007

BL#	depth ft	CSX ksi	TSX ksi	FMX kips	VMX f/s	BPM **	FVP []	EF2 k-ft	ETR (%)	EMX k-ft
70	0.00	21.0	7.2	25	13.1	51.7	0.89	0.242	81	0.284
71	0.00	22.3	7.8	27	13.5	51.5	0.73	0.248	85	0.297
72	0.00	22.2	8.5	26	13.4	51.7	0.76	0.245	83	0.292
73	0.00	22.4	5.4	27	13.6	51.6	0.75	0.250	85	0.299
74	0.00	21.8	6.0	26	13.1	51.8	0.93	0.250	85	0.299
75	0.00	21.8	6.1	26	13.4	51.6	0.91	0.253	86	0.300
76	0.00	21.1	8.1	25	13.2	51.7	0.86	0.247	84	0.295
77	0.00	22.4	6.9	27	13.6	51.7	0.73	0.250	86	0.302
78	0.00	21.9	7.1	26	13.0	51.6	0.81	0.250	84	0.295
79	0.00	22.4	7.2	27	13.4	51.9	0.72	0.251	86	0.301
80	0.00	21.0	7.5	25	13.6	51.9	0.85	0.252	86	0.303
81	0.00	21.1	6.3	25	13.6	51.7	0.87	0.254	86	0.302
82	0.00	21.7	5.3	26	13.9	51.7	0.87	0.254	86	0.302
83	0.00	21.5	5.9	26	13.9	52.1	0.81	0.251	87	0.303
84	0.00	22.0	6.2	26	13.8	51.6	0.68	0.252	86	0.301
85	0.00	22.2	5.9	26	14.1	51.7	0.70	0.252	86	0.301
86	0.00	22.3	5.5	27	14.1	51.7	0.71	0.253	87	0.304
87	0.00	21.3	6.3	25	14.0	51.7	0.80	0.250	86	0.301
88	0.00	20.7	6.8	25	13.4	51.8	0.86	0.250	85	0.298
89	0.00	21.5	6.2	26	13.1	51.6	0.67	0.250	85	0.296
90	0.00	20.8	6.5	25	13.4	52.2	0.88	0.249	85	0.298
91	0.00	22.2	6.4	26	14.3	51.5	0.73	0.254	87	0.305
92	0.00	21.9	6.0	26	14.3	51.7	0.77	0.255	88	0.308
93	0.00	22.1	6.6	26	14.2	51.9	0.74	0.254	86	0.299
94	0.00	22.4	6.3	27	14.5	51.7	0.70	0.255	87	0.303
95	0.00	22.2	8.6	26	13.9	51.7	0.72	0.250	87	0.304
96	0.00	22.0	8.2	26	13.8	51.9	0.72	0.252	86	0.300
97	0.00	21.0	6.6	25	13.6	51.6	0.86	0.257	87	0.305
98	0.00	22.0	8.1	26	14.6	51.8	0.70	0.253	87	0.306
99	0.00	21.9	8.5	26	13.7	51.5	0.69	0.250	85	0.298
100	0.00	21.8	8.0	26	13.4	51.4	0.67	0.255	87	0.304
101	0.00	21.8	6.8	26	14.0	52.0	0.75	0.253	87	0.305
102	0.00	21.3	7.1	25	13.5	51.7	0.88	0.252	86	0.302
103	0.00	21.2	7.6	25	13.5	51.8	0.83	0.254	88	0.309
Average		21.6	7.4	26	13.6	51.8	0.78	0.251	85	0.298

Total number of blows analyzed: 99

Time Summary

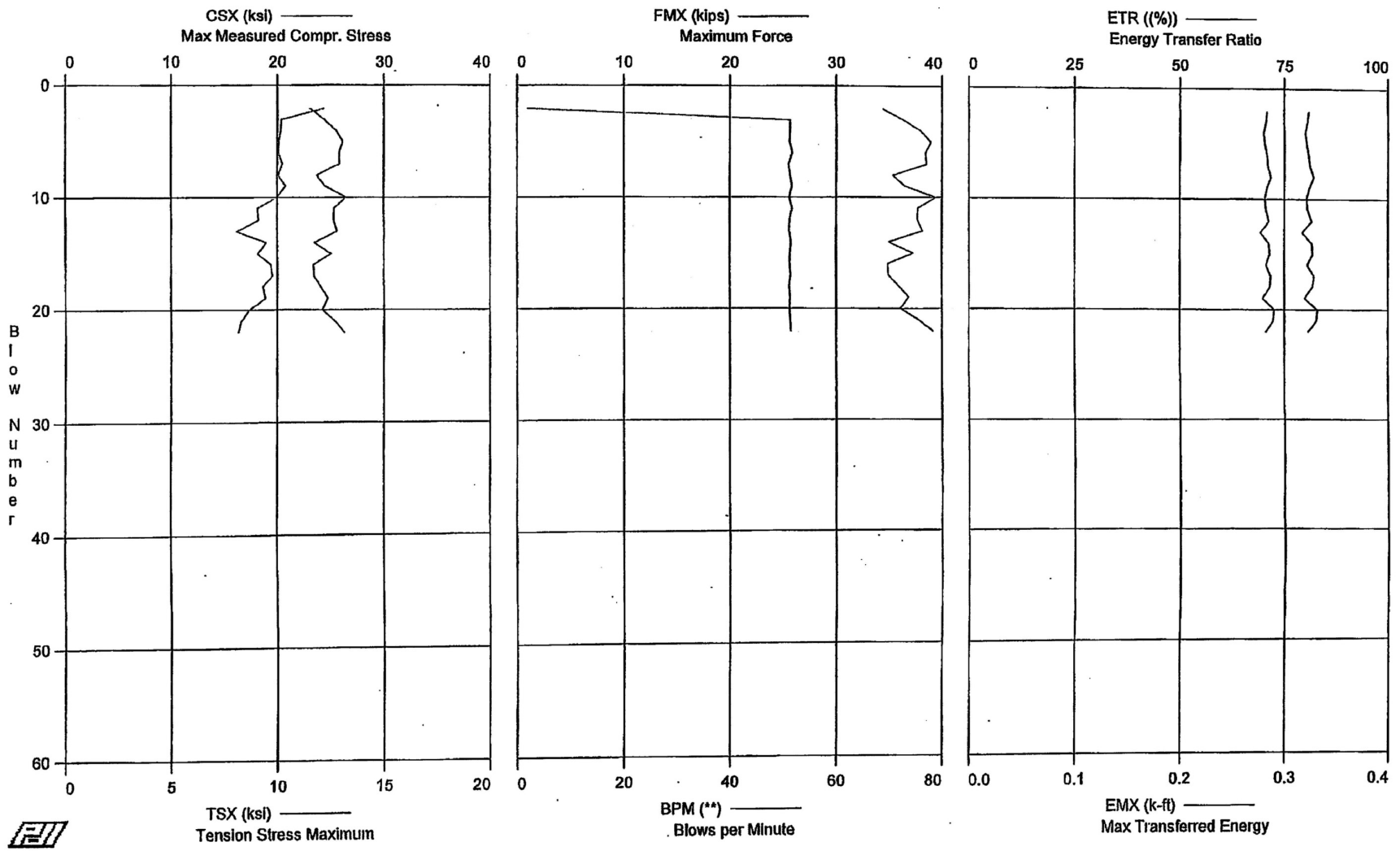
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MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 18-Dec-2007

EXELON VICTORIA COL PROJECT - BORING B-2301; 18.5' - 20' SAMPLE



EXELON VICTORIA COL PROJECT - BORING B-2301; 18.5' - 20' SAMPLE
OP: SEK

HAMMER ID: MEC-02; (D. WHITE CME 55LC)
Test date: 18-Dec-2007

AR: 1.49 in^2
LE: 24.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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	23.1	12.2	34	13.1	1.9	1.08	0.286	81	0.283
3	0.00	24.4	10.2	36	12.1	51.3	1.02	0.291	80	0.282
4	0.00	25.5	10.2	38	11.3	51.3	1.27	0.289	80	0.280
5	0.00	26.1	10.1	39	11.5	51.2	1.29	0.291	80	0.281
6	0.00	25.8	10.1	38	12.3	51.8	0.97	0.294	81	0.283
7	0.00	25.9	10.2	39	11.6	51.0	1.26	0.291	81	0.284
8	0.00	23.7	10.0	35	11.8	51.3	1.14	0.291	82	0.287
9	0.00	24.5	10.4	36	12.0	51.7	1.03	0.292	81	0.283
10	0.00	26.4	10.0	39	11.5	51.1	1.29	0.287	80	0.281
11	0.00	25.3	9.1	38	11.4	51.7	1.24	0.285	81	0.282
12	0.00	25.3	9.1	38	11.5	51.2	1.23	0.290	82	0.285
13	0.00	25.6	8.1	38	11.3	51.1	1.26	0.285	79	0.277
14	0.00	23.5	9.5	35	12.4	51.5	1.07	0.287	82	0.285
15	0.00	25.0	9.1	37	11.6	51.3	1.22	0.288	82	0.286
16	0.00	23.4	9.7	35	12.1	51.2	1.06	0.287	80	0.282
17	0.00	23.4	9.8	35	11.8	51.4	1.11	0.294	82	0.287
18	0.00	24.1	9.3	36	12.3	51.1	1.11	0.286	82	0.286
19	0.00	24.7	9.4	37	12.0	51.3	1.01	0.288	80	0.279
20	0.00	24.2	8.7	36	12.1	51.2	1.12	0.289	83	0.290
21	0.00	25.4	8.3	38	11.6	51.3	1.24	0.285	83	0.289
22	0.00	26.3	8.2	39	11.5	51.5	1.29	0.284	81	0.282
	Average	24.8	9.6	37	11.8	49.0	1.16	0.289	81	0.284

Total number of blows analyzed: 21

Time Summary

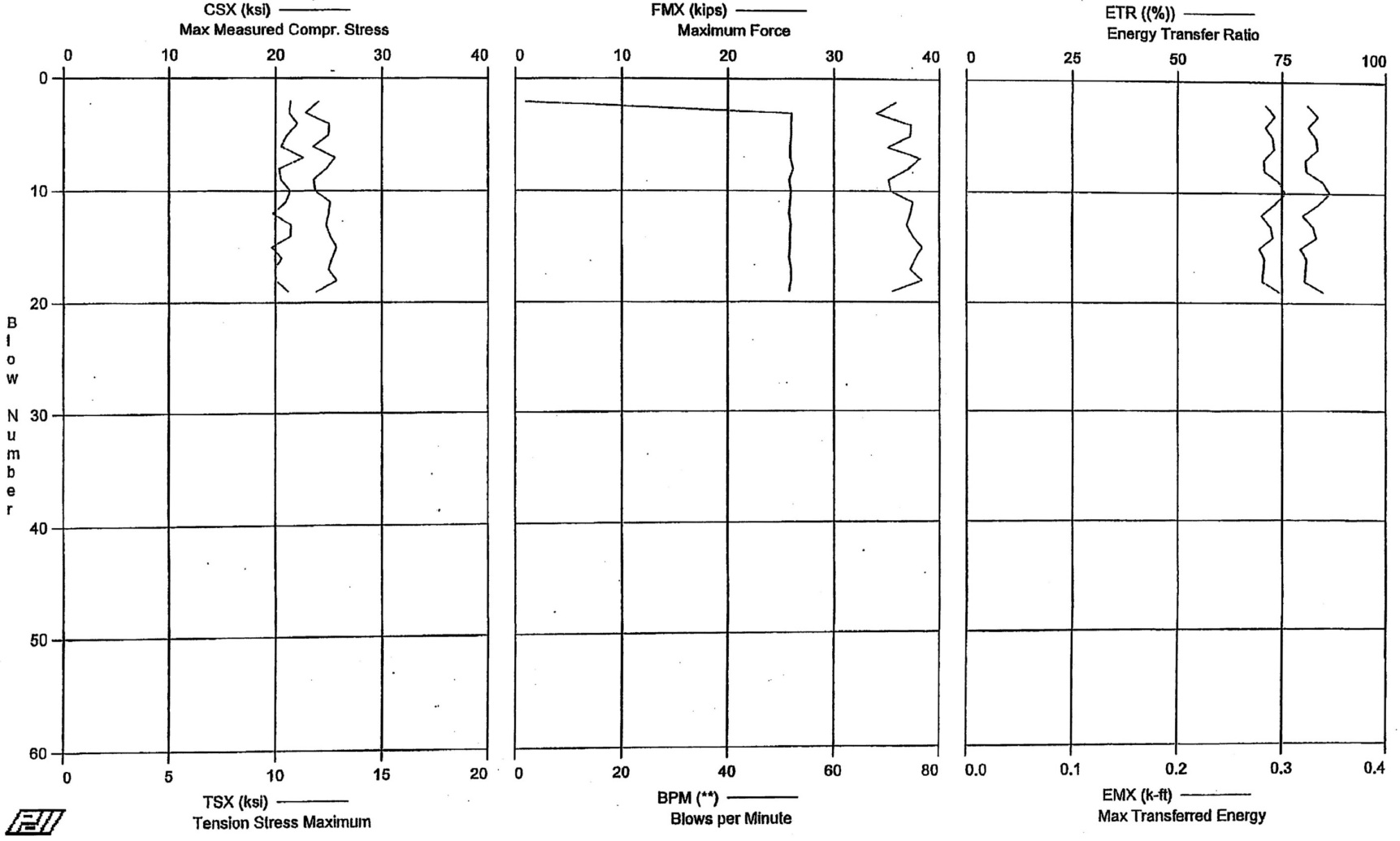
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MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 18-Dec-2007

EXELON VICTORIA COL PROJECT - BORING B-2301; 23.5' - 25' SAMPLE



EXELON VICTORIA COL PROJECT - BORING B-2301; 23.5' - 25' SAMPLE
OP: SEK

HAMMER ID: MEC-02; (D. WHITE CME 55LC)
Test date: 18-Dec-2007

AR: 1.49 in^2
LE: 29.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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	24.1	10.7	36	12.2	1.9	1.12	0.299	81	0.284
3	0.00	22.8	10.6	34	12.5	52.0	1.05	0.306	84	0.293
4	0.00	25.0	11.0	37	11.7	51.9	1.27	0.305	81	0.284
5	0.00	25.0	10.5	37	11.9	51.9	0.97	0.309	83	0.291
6	0.00	23.5	10.3	35	12.0	51.8	1.10	0.307	83	0.292
7	0.00	25.6	11.3	38	11.4	51.8	1.26	0.302	81	0.282
8	0.00	24.8	10.2	37	11.3	52.3	0.95	0.304	81	0.283
9	0.00	23.6	10.2	35	11.8	51.6	1.11	0.308	85	0.297
10	0.00	23.7	10.7	35	11.8	51.9	0.98	0.321	86	0.303
11	0.00	25.1	10.5	37	12.0	51.8	0.98	0.311	84	0.293
12	0.00	25.0	9.9	37	11.8	51.6	0.96	0.306	80	0.280
13	0.00	24.8	10.7	37	11.3	51.9	1.22	0.312	82	0.289
14	0.00	25.1	10.7	37	11.5	51.7	1.23	0.310	83	0.291
15	0.00	25.7	9.8	38	11.2	51.7	1.27	0.309	79	0.278
16	0.00	25.3	10.3	38	11.2	51.6	1.27	0.303	81	0.283
17	0.00	25.0	10.0	37	11.1	51.9	1.26	0.301	81	0.282
18	0.00	25.7	10.0	38	11.4	51.9	1.27	0.305	80	0.281
19	0.00	23.9	10.6	36	12.0	51.6	0.99	0.318	85	0.298
	Average	24.7	10.4	37	11.7	49.0	1.13	0.308	82	0.288

Total number of blows analyzed: 18

Time Summary

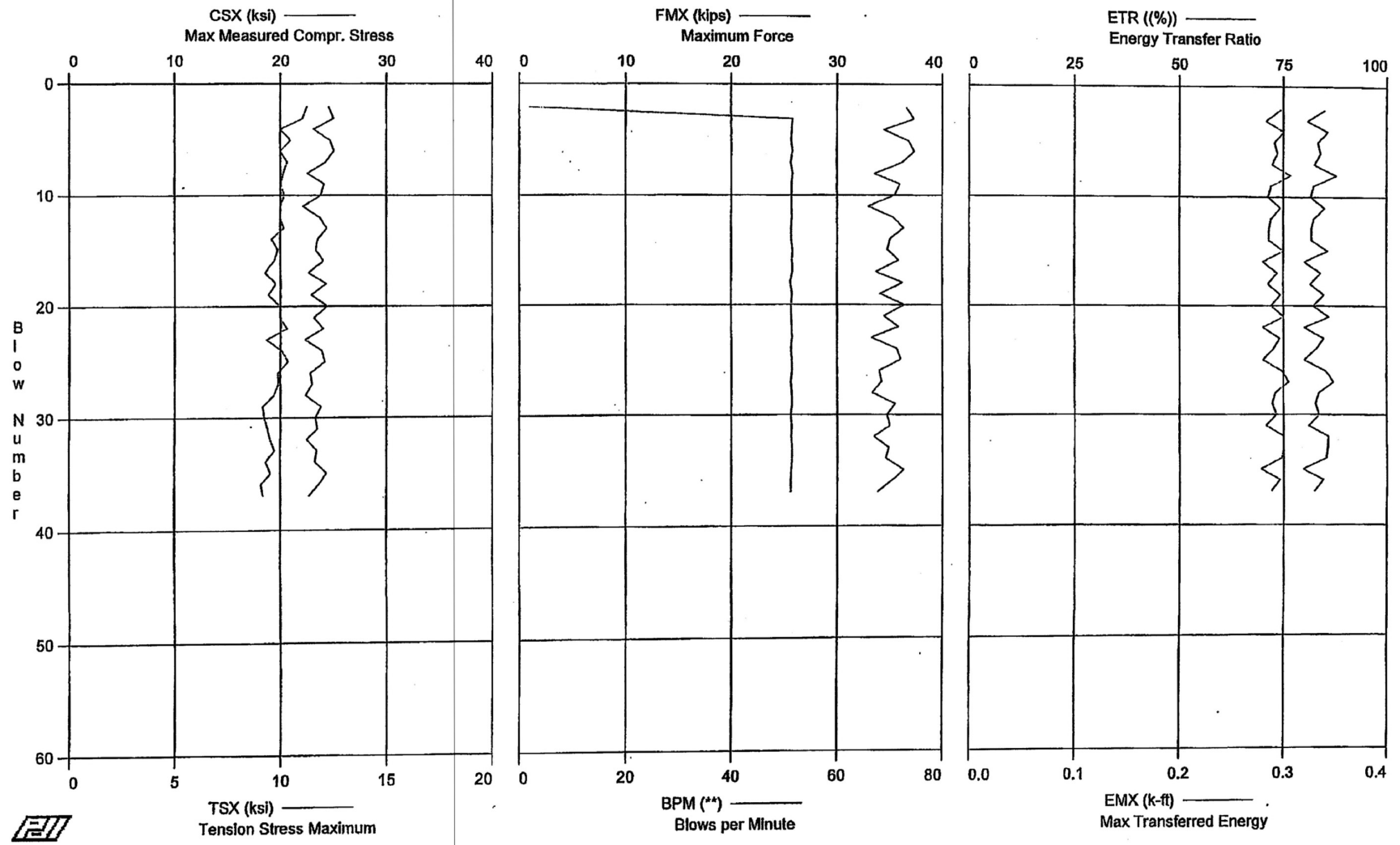
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MACTEC Engineering and Consulting, Inc. - Case Method Results

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

Test date: 18-Dec-2007

EXELON VICTORIA COL PROJECT - BORING B-2301; 28.5' - 30' SAMPLE



EXELON VICTORIA COL PROJECT - BORING B-2301; 28.5' - 30' SAMPLE
OP: SEK

HAMMER ID: MEC-02; (D. WHITE CME 55LC)
Test date: 18-Dec-2007

AR: 1.49 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000.0 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	24.6	11.2	37	12.2	1.9	1.20	0.306	85	0.297
3	0.00	25.0	11.0	37	11.3	51.6	1.23	0.300	81	0.283
4	0.00	23.1	10.0	34	12.3	51.4	0.92	0.311	86	0.300
5	0.00	24.7	10.5	37	12.1	51.3	1.15	0.311	83	0.291
6	0.00	25.1	10.0	37	12.4	51.6	1.14	0.315	84	0.294
7	0.00	24.3	10.3	36	11.9	51.2	1.14	0.313	82	0.289
8	0.00	22.5	10.1	34	12.8	51.6	0.96	0.313	88	0.307
9	0.00	24.1	10.0	36	11.5	51.4	1.17	0.298	82	0.288
10	0.00	23.8	10.2	35	11.9	51.4	1.12	0.307	82	0.285
11	0.00	22.1	10.0	33	12.2	51.4	1.03	0.306	85	0.297
12	0.00	23.7	10.0	35	12.0	51.5	1.11	0.306	82	0.288
13	0.00	24.4	10.2	36	12.1	51.3	1.13	0.309	82	0.286
14	0.00	23.5	9.6	35	12.1	51.3	1.09	0.303	82	0.286
15	0.00	23.3	9.9	35	11.9	51.6	0.87	0.300	86	0.300
16	0.00	24.1	9.7	36	11.7	51.5	1.15	0.292	80	0.280
17	0.00	22.6	9.3	34	12.2	51.6	0.96	0.302	84	0.294
18	0.00	24.3	9.8	36	12.1	51.1	1.13	0.300	81	0.285
19	0.00	22.9	9.4	34	13.0	51.5	0.98	0.307	85	0.297
20	0.00	24.4	10.0	36	11.9	51.3	1.15	0.303	82	0.288
21	0.00	23.1	10.0	34	12.4	51.3	0.89	0.301	86	0.300
22	0.00	24.1	10.3	36	11.8	51.4	1.14	0.292	80	0.280
23	0.00	22.3	9.3	33	12.2	51.5	0.94	0.295	85	0.296
24	0.00	23.9	10.1	36	11.8	51.2	1.13	0.294	83	0.290
25	0.00	24.2	10.3	36	11.9	51.4	1.13	0.302	80	0.280
26	0.00	22.8	9.9	34	12.2	51.5	0.88	0.300	85	0.298
27	0.00	23.0	9.9	34	12.3	51.2	0.90	0.299	87	0.305
28	0.00	22.4	9.7	33	12.2	51.4	0.94	0.296	83	0.292
29	0.00	23.8	9.2	36	12.3	51.5	1.09	0.303	83	0.289
30	0.00	23.3	9.2	35	12.3	51.2	1.07	0.299	84	0.293
31	0.00	23.5	9.4	35	11.5	51.4	1.14	0.299	81	0.283
32	0.00	22.5	9.5	33	12.6	51.3	0.87	0.293	86	0.300
33	0.00	23.4	9.7	35	11.8	51.5	1.12	0.296	86	0.300
34	0.00	23.2	9.3	35	12.9	51.5	1.01	0.304	85	0.298
35	0.00	24.4	9.5	36	11.9	51.3	1.14	0.300	80	0.278
36	0.00	23.6	9.1	35	13.0	51.2	1.03	0.299	84	0.296
37	0.00	22.7	9.2	34	11.8	51.2	1.07	0.298	82	0.288
	Average	23.6	9.9	35	12.1	50.0	1.06	0.302	83	0.292

Total number of blows analyzed: 36

Time Summary

Drive 41 seconds 5:20:30 PM - 5:21:11 PM (12/18/2007) BN 2 - 37

March 14, 2008

Memorandum to File
From: Steve Kiser
Reviewed By: Kathryn White KAW 3/14/08

Subject: **Report of SPT Energy – MACTEC Atlanta CME 550 ATV**
Hammer Serial No. MEC-03 Automatic Hammer
WORK INSTRUCTION 19
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

Kyle Miller, 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 December 5, 2007, during drilling of Boring B-2283 at the referenced site. The testing was performed from approximately 9:35 to 10:15 AM under sunny skies and a temperature of about 60 degrees Fahrenheit. The borings were drilled with personnel and equipment from the Atlanta office of MACTEC. 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 EXE 315.

14 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 305 foot-pounds to

322 foot-pounds. These average energy transfers correspond to energy transfer ratios (ETR) of 87% to 92% 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 317.4 foot-pounds, with an average ETR of 90.7%.

Attachments: Page 4 Table 1 - Summary of SPT Energy Measurements – 1 Page
Page 5 Work Instruction – DCN EXE 19 – 1 Page
Page 6 Record of SPT Energy Measurement – 1 Page
Pages 7 - 14 PDIPLOT Output – 8 Pages

TABLE 1
SUMMARY OF SPT ENERGY MEASUREMENTS (ASTM D4633-05)
Exelon COL Project
Victoria County, Texas
MACTEC Project No. 6468-07-1777

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-2283	AW-J	12/5/2007	19.7 - 21.2	3 - 4 - 5	13	315	90.0%
						24.7 - 26.2	2 - 5 - 7	14	305	87.1%
						29.7 - 31.2	5 - 7 - 11	19	322	92.0%
						34.7 - 36.2	7 - 8 - 10	26	322	92.0%
								Average for Rig:	317.4	90.7%

[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: STEVE KISER	Date: 3-14-08	Checked By: KAW	Date: 3/14/08

Work Instruction No. 19
Exelon COL Project
MACTEC Engineering and Consulting, Inc.
MACTEC Project 6468-07-1777

Issued To: Stephen E. Kiser, Kyle B. Miller **Rev. No.** 0
Issued By: Kathryn A. White **Date:** 8-19-07
Valid From: 8-19-07 **To:** 8-19-08

Task Description: Perform SPT Hammer Energy Measurements

Applicable Technical Procedures or Plans, or other reference: Geotechnical Work Plan (current revision), Bechtel Engineering Specification 25352-102-3PS-CY00-00001, Rev 000, and ASTM D 4633-05. Copies of the Work Plan and Bechtel Engineering Specification are provided in the Site Office. A copy of ASTM procedure are attached.

Specific Instructions (note attachments where necessary): Energy measurement will be performed in accordance with ASTM D 4633-05 at borings and depths selected by Bechtel. For drill rigs using both AW and NW drill rods, energy measurements must be made for both rod types as indicated in assignment sheet provided by Site Coordinator prior to start of work. Prepare and submit an energy measurement report containing information described in Section 8 of ASTM D 4633-05.

Special Instructions (note attachments where necessary): If changed conditions are encountered contact Project Manager and Project Principal Engineer immediately.

Report Format: Standard MACTEC forms provided by Project Manager and Project Principal Engineer.

Specific Quality Assurance Procedures Applicable: MACTEC QA Manual, QAPD, HASP and QAP-25-1; current revisions apply.

Hold Points or Witness Points:

- Calibration information is submitted to Bechtel
- Deviations from QAPD/HASP/Work Plan

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: _____
Site Manager/Coordinator: _____ Date: 8-20-07

Pages: 8 **DCN:** EXE

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