BOREHOLE GEOPHYSICS REPORT

Borehole Geophysical Logging
Borings B773, B-786B and B-821A
GEOVision, Inc.
February 13, 2009

FINAL REPORT

BORING GEOPHYSICAL LOGGING
BORINGS B-773, B-786B AND B-821A

CALVERT CLIFFS NUCLEAR POWER PLANT
COMBINED OPERATING LICENSE APPLICATION
CALVERT COUNTY, MARYLAND

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INTRODUCTION

Boring geophysical measurements were collected in three uncased borings located at the Calvert Cliffs Nuclear Power Plant, located in Calvert County, Maryland. Geophysical data acquisition was performed between July 29 and November 13, 2008 by Charles Carter of **GEO***Vision*. The work was performed under subcontract with Schnabel Engineering, LLC (Schnabel) with Brian Banks serving as the point of contact for Schnabel.

This report describes the field measurements, data analysis, and results of this work.

SCOPE OF WORK

This report presents the results of boring geophysical measurements collected between July 29 and November 13, 2008, in three uncased borings, as detailed below. The purpose of these studies was to supplement stratigraphic information obtained during Schnabel's soil sampling program and to acquire shear wave velocities and compressional wave velocities as a function of depth, as a component of the Calvert Cliffs Nuclear Power Plant (CCNPP) Combined Operating License Application (COLA) Project.

BORING DESIGNATION	DATES LOGGED	ELEVATION NGVD 29	COORDINATES - FEET MARYLAND STATE PLANE (NAD 1927)	
			NORTH	EAST
B-773	7/29/08	7.90	219241.30	961045.90
B-786B	11/10/08	54.20	217914.60	960460.70
B-821A	11/13/08	25.40	218571.30	960962.80

Table 1 Boring locations and logging dates

The OYO/Robertson suspension logging system was used to obtain in-situ horizontal shear and compressional wave velocity measurements at 1.6 foot intervals. The acquired data was analyzed and a profile of velocity versus depth was produced for both compressional and horizontally polarized shear waves.

A detailed reference for the velocity measurement techniques used in this study is:

> Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

INSTRUMENTATION

Suspension Instrumentation

Suspension soil velocity measurements were performed using the suspension logging system, manufactured by OYO Corporation and their subsidiary, Robertson Geologging, Ltd. This system directly determines the average velocity of a 3.3 foot high segment of the soil column surrounding the boring of interest by measuring the elapsed time between arrivals of a wave propagating upward through the soil column. The receivers that detect the wave, and the source that generates the wave, are moved as a unit in the boring producing relatively constant amplitude signals at all depths.

Winch Geovision 4-conductor
Sheave - Measuring wheel Geovision S/N 103
OYO/Robertson Suspension telemetry unit Model 3403 S/N 160024
OYO PS Logger Borehole Probe, includes:
Isolation tube, 1m Model 3387B S/N 28068, 300083
Weight Model 3302W S/N 12007
OYO PS 170 Source Model 3304 S/N 19043
Receiver/Sensor Model 3385, S/N 20042, 30086
Driver Model 3386A S/N 27073

Table 2 Suspension logging Equipment

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave source (S_H) and compressional-wave source (P), joined to two biaxial receivers by a flexible isolation cylinder, as shown in Figure 1. The separation of the two receivers is 3.3 feet, allowing average wave velocity in the region between the receivers to be determined by inversion of the wave travel time between the two receivers. The total length of the probe as used in these surveys is 19 feet, with the center point of the receiver pair 12.1 feet above the bottom end of the probe.

The probe receives control signals from, and sends the amplified receiver signals to, instrumentation on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder.

The entire probe is suspended in the boring by the cable, therefore, source motion is not coupled directly to the boring walls; rather, the source motion creates a horizontally propagating impulsive pressure wave in the fluid filling the boring and surrounding the source. This pressure wave is converted to P and S_H-waves in the surrounding soil and rock as it passes through the casing and grout annulus and impinges upon the wall of the boring. These waves propagate through the soil and rock surrounding the boring, in turn causing a pressure wave to be generated in the fluid surrounding the receivers as the soil waves pass their location. Separation of the P and S_H-waves at the receivers is performed using the following steps:

1. Orientation of the horizontal receivers is maintained parallel to the axis of the source, maximizing the amplitude of the recorded S_H -wave signals.
2. At each depth, S_H-wave signals are recorded with the source actuated in opposite directions, producing S_H-wave signals of opposite polarity, providing a characteristic S_H-wave signature distinct from the P-wave signal.
3. The 6.3 foot separation of source and receiver 1 permits the P-wave signal to pass and damp significantly before the slower S_H-wave signal arrives at the receiver. In faster soils or rock, the isolation cylinder is extended to allow greater separation of the P- and S_H-wave signals.

4. In saturated soils, the received P-wave signal is typically of much higher frequency than the received S_H-wave signal, permitting additional separation of the two signals by low pass filtering.
5. Direct arrival of the original pressure pulse in the fluid is not detected at the receivers because the wavelength of the pressure pulse in fluid is significantly greater than the dimension of the fluid annulus surrounding the probe (meter versus centimeter scale), preventing significant energy transmission through the fluid medium.

In operation, a distinct, repeatable pattern of impulses is generated at each depth as follows:

1. The source is fired in one direction producing dominantly horizontal shear with some vertical compression, and the signals from the horizontal receivers situated parallel to the axis of motion of the source are recorded.
2. The source is fired again in the opposite direction and the horizontal receiver signals are recorded.
3. The source is fired again and the vertical receiver signals are recorded. The repeated source pattern facilitates the picking of the P and S_H-wave arrivals; reversal of the source changes the polarity of the S_H-wave pattern but not the P-wave pattern.

The data from each receiver during each source activation is recorded as a different channel on the recording system. The Suspension PS system has six channels (two simultaneous recording channels), each with a 1024 sample record. The recorded data is displayed on a CRT or LCD display as six channels with a common time scale. Data is stored on disk for further processing. Up to 8 sampling sequences can be summed to improve the signal to noise ratio of the signals.

Review of the displayed data on the CRT, LCD or allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and summing number to optimize the quality of the data before recording. Verification of the calibration of the Suspension PS digital recorder is performed every twelve months using a NIST traceable frequency source and counter, as outlined in Appendix C.

Caliper / Natural Gamma Instrumentation

Caliper and natural gamma data were collected using a Model 3ACS 3-leg caliper probe, serial number 5368, manufactured by Robertson Geologging, Ltd. With the short arm configuration used in these surveys, the probes permitted measurement of boring diameters between 1.6 and 16 inches. Caliper measurements were collected concurrent with measurement of natural gamma emission from the boring walls. The probe is 6.82 feet long, and 1.5 inches in diameter.

This probe is useful in the following studies:

- Measurement of boring diameter and volume
- Location of hard and soft formations
- Location of fissures, caving, pinching and casing damage
- Bed boundary identification
- Strata correlation between borings

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

The caliper consists of three arms, each with a toothed quadrant at their base, pivoted in the lower probe body. A toothed rack engages with each quadrant, thus constraining the arms to move together. Linear movement of the rack is converted to opening and closing of the arms. Springs hold the arms open in the operating position. A motor drive is provided to retract the arms, allowing the probe to be lowered into the boring. The rack is coupled to a potentiometer which converts movement into a voltage sensed by the probe's microprocessor.

Natural gamma measurements rely upon small quantities of radioactive material contained in all rocks to emit gamma radiation as they decay. Trace amounts of Uranium and Thorium are present in a few minerals, where potassium-bearing minerals such as feldspar, mica and clays will include traces of a radioactive isotope of Potassium. These emit gamma radiation as they decay with an extremely long half-life. This radiation is detected by scintillation - the production of a tiny flash of light when gamma rays strike a crystal of sodium iodide. The light is converted into an electrical pulse by a photomultiplier tube. Pulses above a threshold value of 60 KeV are counted by the probe's microprocessor. The measurement is useful because the radioactive elements are concentrated in certain rock types e.g. clay or shales, and depleted in others e.g. sandstone or coal.

Resistivity / Spontaneous Potential / Natural Gamma Instrumentation

Resistivity, spontaneous potential and natural gamma data were collected using a Model ELXG electric log probe, S/N 5490, manufactured by Robertson Geologging, Ltd. This probe measures Single Point Resistance (SPR), short normal (16”) resistivity, long normal (64”) resistivity, Spontaneous Potential (SP) and natural gamma. The probe is 8.20 feet long, and 1.73 inches in diameter.

This probe is useful in the following studies:

- Bed boundary identification
- Strata correlation between borings
- Strata geometry and type (shale indication)

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

The resistivity section of the probe operates by driving an alternating current into the formation from the central SPR/DRIVE electrode. The current returns via the logging cable armor. To ensure adequate penetration of the formation the logging cable is insulated for approximately 30 feet from the cablehead. Voltages are measured between the 16" and 64" electrodes and the remote earth connection at surface, as noted below:

- Single Point Resistance (SPR): The current flowing to the cable armor is measured along with the voltage at the SPR electrode. The voltage divided by current gives resistance.

- Spontaneous Potential (SP): This is the DC bias of the 16" electrode with respect to the voltage return at the surface (ground stake).

Data quality depends upon good grounding at the surface. This is achieved with a metal stake driven into the mud-pit.

Natural gamma data was also collected during the caliper data run.

Boring Deviation Instrumentation

Boring deviation data were collected using a High Resolution Acoustic Televiewer probe (HiRAT), serial number 5174, manufactured by Robertson Geologging, Ltd. This probe is generally used to acquire acoustic images of the boring wall, but may also be used to collect boring deviation data. The probe is 7.58 feet long, and 1.9 inches in diameter, and is fitted with upper and lower four-arm centralizers.

In this application, this probe is useful in the following studies:

- Measurement of boring inclination and deviation from vertical
- Determination of need to correct soil and geophysical log depths to true vertical depths

The probe receives control signals from, and sends the digitized measurement values to, a Robertson Micrologger II, on the surface via an armored 4 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured to provide probe depth data, using a 3.28 foot circumference sheave fitted with a digital rotary encoder. The probe and depth data are transmitted by USB link from the Micrologger unit to a laptop computer where it is displayed and stored on hard disk.

MEASUREMENT PROCEDURES

Suspension Measurement Procedures

All three borings were logged uncased, filled with bentonite or polymer based drilling mud. Measurements followed the **GEO***Vision* Procedure for P-S Suspension Seismic Velocity Logging, revision 1.31, as presented in Appendix E. These procedures were supplied and approved in advance of the work. Prior to use on site, the suspension system was validated using a client supplied NIST traceable frequency source and frequency counter to repeat the Geovision calibration procedure on site.

In each boring, the probe was positioned with the top of the probe at the top of the mud box, and the electronic depth counter was set to 8.2 feet, the distance between the mid-point of the receiver and the top of the probe, minus the height of the mud box, as verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, and then returned to the surface, stopping at 1.6 foot intervals to collect data, as summarized in Table 2, below.

At each measurement depth the measurement sequence of two opposite horizontal records and one vertical record was performed, and the gains were adjusted as required. The data from each depth was checked and recorded on disk before moving to the next depth.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring.

Caliper / Natural Gamma Measurement Procedures

All three borings were logged uncased, filled with bentonite or polymer based drilling mud. Measurements followed the ASTM D6167 "Conducting Borehole Geophysical Logging – Mechanical Caliper".

Prior to and following each logging run, the caliper tool was verified, using the manufacturer's supplied three point calibration jig, which is a circular plate with a series of holes in the top surface into which the tips of the caliper arms fit. This has circles of diameters from 2 to 12 inches. The calibration jig is placed over a bucket with the probe standing upright with its nose section passing through the jig's central hole. The caliper probe arms are opened under program control, and a log is recorded as the tips of the arms are placed in the holes on the calibration jig. The measured dimensions, as displayed on the recording computer screen, were recorded on the field log sheet, as well as in the digital record, and compared with the calibration jig dimensions. The digital records are provided in LAS 2.0 format files in the boring specific directories of report 8299-04 (CD-R) that accompanies this report. These test values were additionally validated using a client supplied NIST traceable 4 inch PVC coupling used as a test ring. If the verification records did not fall within +/- 0.05 inches of the calibration jig values, the caliper tool was re-calibrated, using the three point calibration jig, and the log repeated. As with the verification, the tips of the caliper arms are placed in the holes marked with the required diameter. During calibration, the value of the current calibration point, as stamped on the jig, is entered via the control computer. The system counts for 15 seconds to make an average of the response. The procedure is repeated for the second and third required openings.

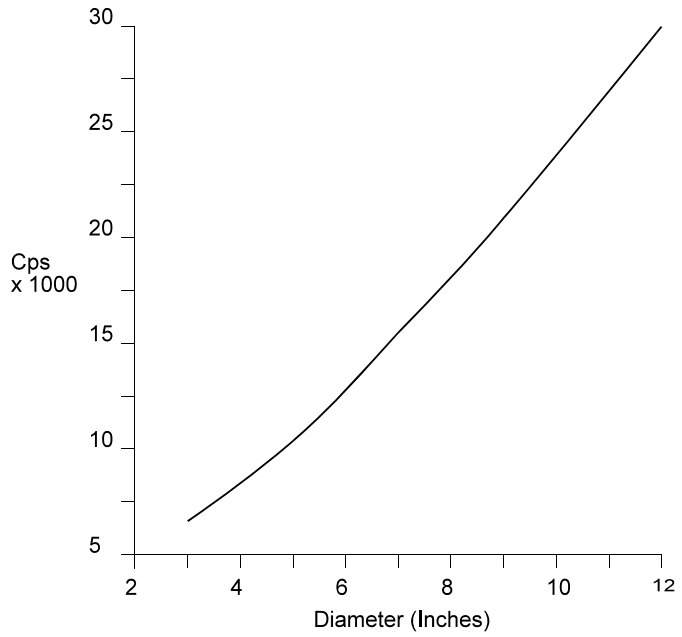


Figure 1. Example Calibration Curve for Caliper Probe

The computation and generation of the calibration coefficient file is entirely automatic. The calibration file is simply the set of coefficients of a quadratic curve which fits the three data points. Figure 1 shows the response of a caliper probe using data gathered during calibration.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274, "Conducting Borehole Geophysical Logging – Gamma". Natural gamma response is validated by comparison of natural gamma data collected with the ELOG probe.

In each boring, the probe was positioned with the top of the probe at the top of the mud box, and the electronic depth counter was set to 6.82 feet, the specified length of the probe, minus the height of the mud box, as verified with a tape measure, and recorded on the field logs. The probe was lowered to the bottom of the boring, where the caliper legs were opened, and data collection begun. The probe was then returned to the surface at 9.8 feet/sec, collecting data continuously at 0.05 foot spacing, as summarized in Table 2.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, as summarized in Table 4.

Resistivity / Spontaneous Potential Measurement Procedures

All three borings were logged uncased, filled with bentonite or polymer based drilling mud. The probe was connected to the logging cable using a 32.8 foot long insulating cable section or "yoke". The probe head was insulated by wrapping all exposed metal of the cablehead and probe with self-amalgamating insulation tape. The 32.8 foot insulating yoke was checked for any damage, and repaired with self-amalgamating insulation tape as needed.

The reference ground stake was driven firmly into the mud pit, and connected to the ground socket on the winch switch box.

This sonde was not calibrated in the field, as it is used to provide qualitative measurements, not quantitative values, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D5753, "Planning and Conducting Borehole Geophysical Surveys". Prior to each logging run, the resistivity and SP functions were verified, using the manufacturer's supplied ELOG test fixture, which connects fixed resistance values across the probe electrodes to mimic soil resistivities of 10, 100, 1000 and 10000 ohm-meters, and an SP of 100 millivolts. These test values were additionally validated using a client supplied NIST traceable multimeter. The measured dimensions, as displayed on the recording computer screen, were recorded on the field log sheet, as well as a digital record, and compared with the test box values. The digital records are provided in LAS 2.0 format files in the boring specific directories of report 8299-04 (CD-R) that accompanies this report.

Natural gamma was not calibrated in the field, as it is a qualitative measurement, not a quantitative value, and is used only to assist in picking transitions between stratigraphic units, as described in ASTM D6274, "Conducting Borehole Geophysical Logging – Gamma". Natural

gamma response is validated by comparison of natural gamma data collected with the Caliper probe.

In each boring, the probe was positioned with the top of the probe at the top of the mud box, and the electronic depth counter was set to 8.2 feet, the specified length of the probe, minus the height of the mud box, as verified with a tape measure. When logging on the smaller drill rigs, the depth was zeroed to the top of the yoke, and 32.8 feet was added to the zero depth, as recorded in the field logs. The probe was lowered to the bottom of the boring, where data collection was begun. The probe was then returned to the surface at 10 feet/sec, collecting data continuously at 0.05 foot spacing, as summarized in Table 3.

Normally, when the un-insulated section of the logging cable leaves the boring fluid, the log is terminated, as the electrical measurements do not function under these conditions. However, in these surveys, the log was continued, in order to collect as much natural gamma data as possible before the yoke connector reached the measuring wheel.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, as summarized in Table 4.

Boring Deviation Measurement Procedures

All three borings were logged uncased, filled with bentonite or polymer based drilling mud. Measurements followed the **GEO***Vision* standard field procedures, as presented in Appendix E.

Prior to use, the HiRAT or deviation probe tiltmeter and compass functions were checked by hanging from the drill rig and by comparison with a Brunton surveyors' compass. These test values were additionally validated using an additional client supplied compass.

In each boring logged with the Robertson HiRAT, the probe was positioned with the top of the probe at the top of the mud box, and the electronic depth counter was set to 4.71 feet, the specified length of the probe, minus the height of the mud box, as verified with a tape measure, and recorded on the field logs. The probe was then returned to the surface at 9.8 feet/sec, collecting data continuously, as summarized in Table 3.

Upon completion of the measurements, the probe zero depth indication at the depth reference point was verified prior to removal from the boring, as summarized in Table 4.

BORING NUMBER	TOOL AND RUN NUMBER	DEPTH RANGE (FEET)	OPEN HOLE (FEET)	DEPTH TO BOTTOM OF CASING (FEET)	SAMPLE INTERVAL (FEET)	DATE LOGGED
B-773	SUSPENSION 1	6.6 – 150.9	-	9.5	1.6	7/29/08
B-773	DEVIATION 1	165.3 –3.2	-	9.5	.040	7/29/08
B-773	ELOG/GAMMA 1	166.8 – 36.3	166.8	9.5	0.05	7/29/08
B-773	CALIPER 1	165.1 – 4.3	-	9.5	0.05	7/29/08
B-786B	ELOG/GAMMA 1	114.8 – 23.8	114.8	NONE	0.05	11/10/08
B-786B	SUSPENSION 1	1.6 – 100.1	-	NONE	1.6	11/10/08
B-786B	DEVIATION 1	101.2 - 0	-	NONE	0.40	11/10/08
B-786B	CALIPER 1	103.2 – 0.3	-	NONE	0.05	11/10/08
B-821A	ELOG/GAMMA 1	115.1 – 24.4	115.1	NONE	0.05	11/13/08
B-821A	SUSPENSION 1	1.6 – 100.1	-	NONE	1.6	11/13/08
B-821A	DEVIATION 1	102.3 – 0	-	NONE	0.40	11/13/08
B-821A	CALIPER 1	105.3 – 0.1	-	NONE	0.05	11/13/08

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 3. Logging dates and depth ranges

BORING NUMBER	TOOL AND RUN NUMBER	TOOL HIT BOTTOM DEPTH (FEET)	DRILLER DEPTH (FEET)	STARTING DEPTH REF. (FEET)	ENDING DEPTH REF. (FEET)	ASDE (FEET)
B-773	SUSPENSION 1	-	165	6.6	6.6	0
B-773	DEVIATION 1	-	165	3.1	3.1	0
B-773	ELOG/GAMMA 1	166.8	165	39.4	39.3	0.1
B-773	CALIPER 1	-	165	5.2	5.1	0.1
B-786B	ELOG/GAMMA 1	114.8	115	39.5	39.7	0.2
B-786B	SUSPENSION 1	-	115	6.7	6.7	0
B-786B	DEVIATION 1	-	115	3.2	3.2	0
B-786B	CALIPER 1	-	115	5.3	5.4	0.1
B-821A	ELOG/GAMMA 1	115.1	115	39.9	39.9	0
B-821A	SUSPENSION 1	-	115	7.1	7.1	0
B-821A	DEVIATION 1	-	115	3.6	3.6	0
B-821A	CALIPER 1	-	115	5.7	5.7	0

- PROBE DID NOT TOUCH BOTTOM OF BORING

Table 4. Boring Bottom Depths and After Survey Depth Error (ASDE)

DATA ANALYSIS

Suspension Analysis

Using the proprietary OYO program PSLOG.EXE version 1.0, included in report 8299-04 (CD-R) that accompanies this report, the recorded digital waveforms were analyzed to locate the most prominent first minima, first maxima, or first break on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between receiver 1 and receiver 2 (R1-R2) arrivals was used to calculate the P-wave velocity for that 3.3 foot segment of the soil column. When observable, P-wave arrivals on the horizontal axis records were used to verify the velocities determined from the vertical axis data. The time picks were then transferred into an EXCEL template (EXCEL version 2003 SP2) to complete the velocity calculations based upon the arrival time picks made in PSLOG. The PSLOG pick files and the EXCEL analysis files are included in the boring specific directories of report 8299-04 (CD-R) that accompanies this report.

The P-wave velocity over the 6.3 foot interval from source to receiver 1 (S-R1) was also picked using PSLOG, and calculated and plotted in EXCEL, for quality assurance of the velocity derived from the travel time between receivers. In this analysis, the depth values as recorded were increased by 4.8 feet to correspond to the mid-point of the 6.3 foot S-R1 interval, as illustrated in Figure 2. Travel times were obtained by picking the first break of the P-wave signal at receiver 1 and subtracting 0.3 milliseconds, the calculated and experimentally verified delay from source trigger pulse (beginning of record) to source impact. This delay corresponds to the duration of acceleration of the solenoid before impact.

As with the P-wave records, using PSLOG, the recorded digital waveforms were analyzed to locate the presence of clear S_H-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the S_H-wave signals from the 'normal' and 'reverse' source pulses are very nearly inverted images of each other. Digital FFT - IFFT lowpass filtering was used to remove the higher frequency P-wave signal from the S_H-wave

signal. Different filter cutoffs were used to separate P- and S_H-waves at different depths, ranging from 600 Hz in the slowest zones to 2000 Hz in the regions of highest velocity. At each depth, the filter frequency was selected to be at least twice the fundamental frequency of the S_H-wave signal being filtered.

Generally, the first maxima were picked for the 'normal' signals and the first minima for the 'reverse' signals, although other points on the waveform were used if the first pulse was distorted. The absolute arrival time of the 'normal' and 'reverse' signals may vary by +/- 0.2 milliseconds, due to differences in the actuation time of the solenoid source caused by constant mechanical bias in the source or by boring inclination. This variation does not affect the R1-R2 velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

As with the P-wave data, S_H-wave velocity calculated from the travel time over the 6.3 foot interval from source to receiver 1 was calculated and plotted for verification of the velocity derived from the travel time between receivers. In this analysis, the depth values were increased by 4.8 foot to correspond to the mid-point of the 6.3 foot S-R1 interval. Travel times were obtained by picking the first break of the S_H-wave signal at the near receiver and subtracting 0.3 milliseconds, the calculated and experimentally verified delay from the beginning of the record at the source trigger pulse to source impact.

These data and analysis were reviewed by John Diehl as a component of **GEO***Vision*'s in-house QA-QC program.

Figure 3 shows an example of R1 - R2 measurements on a sample filtered suspension record. In Figure 3, the time difference over the 3.3 foot interval of 1.88 milliseconds for the horizontal signals is equivalent to an S_H-wave velocity of 1745 feet/second. Whenever possible, time differences were determined from several phase points on the S_H-waveform records to verify the data obtained from the first arrival of the S_H-wave pulse. Figure 4 displays the same record before filtering of the S_H-waveform record with a 1400 Hz FFT - IFFT digital lowpass filter,

illustrating the presence of higher frequency P-wave energy at the beginning of the record, and distortion of the lower frequency S_H-wave by residual P-wave signal.

Caliper / Natural Gamma Analysis

No analysis is required with the caliper or natural gamma data, however depths to identifiable boring features were compared to verify compatible depth readings on all logs. These data were combined with the resistivity, ELOG based natural gamma and spontaneous potential (SP) logs, and converted to LAS and PDF formats for transmittal to the client.

Resistivity / Natural Gamma / Spontaneous Potential Analysis

No analysis is required with the resistivity, natural gamma or spontaneous potential data, however depths to identifiable boring features were compared to verify compatible depth readings on all logs. These data were combined with the caliper and caliper-based natural gamma logs, and converted to LAS and PDF formats for transmittal to the client.

Boring Deviation Analysis

The collected Acoustic Televiewer data was processed with Robertson Geologging's RGLDIP program, version 6.2, to extract the deviation data and produce an ASCII file and plots of deviation data.

RESULTS

Suspension Results

Suspension R1-R2 P- and S_H-wave velocities are plotted in Figures 5, 8 and 11. The suspension velocity data presented in these figures are presented in Tables 6 through 8. The PSLOG and EXCEL analysis files for each boring are included in the boring specific directories in report 8299-04 (CD-R) that accompanies this report, along with the raw and filtered waveforms.

P- and S_H-wave velocity data from R1-R2 analysis and quality assurance analysis of S-R1 data are plotted together in Figures A-1 through A-3 to aid in visual comparison. It must be noted that R1-R2 data is an average velocity over a 3.3 foot segment of the soil column; S-R1 data is an average over 6.3 feet, creating a significant smoothing relative to the R1-R2 plots. S-R1 data are presented in Tables A-1 through A-3, and included in the EXCEL analysis files for each boring in report 8299-04 (CD-R) that accompanies this report.

Calibration procedures and records for the suspension measurement system are presented in Appendix C.

The **GEO***Vision* standard field log sheets for all borings are reproduced in Appendix D.

The **GEO***Vision* standard field procedures are reproduced in Appendix E.

Caliper/ Natural Gamma Results

Caliper and natural gamma data is presented in combined log plots with resistivity and spontaneous potential as single page logs in Figures 6, 9 and 12, as well as multi-page logs in Appendix B. LAS 2.0 data and Acrobat files of the plots for each boring are included in the boring specific sub-directories of report 8299-04 (CD-R) that accompanies this report.

Resistivity / Spontaneous Potential Results

Resistivity and spontaneous potential data is presented in combined log plots with caliper and natural gamma data as single page logs in Figures 6, 9 and 12, as well as multi-page logs in Appendix B. LAS 2.0 data and Acrobat files for each boring are included in the boring specific sub-directories of report 8299-04 (CD-R) that accompanies this report.

Boring Deviation Results

Boring deviation data is presented graphically in Figures 7, 10 and 13, and summarized in Table 5. Deviation data plots in Acrobat format and deviation data at 1.0 foot stations are presented in text format in the boring specific sub-directories of report 8299-04 (CD-R) that accompanies this report.

SUMMARY

Discussion of Suspension Results

Suspension PS velocity data is ideally collected in an uncased fluid filled boring, drilled with rotary mud (rotary wash) methods. All of these borings were well suited for collection of Suspension PS velocity data, with minor exceptions due to some wash-outs of the borings, as shown in the caliper logs. Despite these washouts, the quality of these data ranged from good to excellent. Each boring is discussed in more detail below.

Suspension PS velocity data quality is judged based upon 5 criteria:

1. Consistent data between receiver to receiver (R1 – R2) and source to receiver (S – R1) data.
2. Consistent relationship between P-wave and S_H -wave (excluding transition to saturated soils)
3. Consistency between data from adjacent depth intervals.
4. Clarity of P-wave and S_H-wave onset, as well as damping of later oscillations.
5. Consistency of profile between adjacent borings, if available.

B-773: These data show excellent correlation between R1 – R2 and S – R1 data, as well as excellent correlation between P-wave and S_H-wave velocities. P-wave and S_H-wave onsets are generally clear, and later oscillations are well damped. This is an excellent velocity data set.

B-786B: These data show good correlation between R1 – R2 and S – R1 data, as well as good correlation between P-wave and S_H-wave velocities. P-wave and S_H-wave onsets are generally clear, and later oscillations are well damped. This is a good velocity data set.

B-821A. These data show good correlation between R1 – R2 and S – R1 data, as well as good correlation between P-wave and S_H-wave velocities. P-wave and S_H-wave onsets are generally clear, and later oscillations are well damped. This is a good velocity data set.

Discussion of Caliper / Natural Gamma Results

B-773: Caliper data shows a very even gauge in this boring, with minor erosion out to a maximum of 6 inches, from the surface to 16 feet. A small step in diameter is seen at 111 feet, which corresponds with a change in the resistivity and natural gamma logs as well. Natural gamma shows several different transitions in this boring, most notable a peak at 96.5 feet.

B-786B: Caliper data shows erosion of the upper 30 feet of the boring, and one large washout to greater than 12 inches diameter. Below 30 feet, boring gauge is consistent.

B-821A: Caliper data shows erosion of the upper 30 feet of the boring, and one large washout to greater than 12 inches diameter. Below 30 feet, boring gauge is consistent.

Discussion of Resistivity / Spontaneous Potential Results

B-773: These data show good correlation between the different logs below 49 feet. The electrical data is degraded above this depth, as the upper yoke electrode moves into the surface casing at this depth. The remainder of the boring shows only one significant transition, at 111 feet.

B-786B: These data show good correlation between the different logs below 40 feet. The electrical data is degraded above this depth, as the upper yoke electrode moves out of the boring fluid at this depth.

B-821A: These data show good correlation between the different logs below 40 feet. The electrical data is degraded above this depth, as the upper yoke electrode moves out of the boring fluid at this depth. The remainder of the boring shows a transition at 74 feet.

Discussion of Boring Deviation Results

All three borings were inclined at less than 1 degree from vertical, and the maximum error in depth value was less than 0.1 foot, as presented in Table 4. This error is significantly less than depth errors from other causes, and no adjustment of log depths are indicated.

BORING NUMBER	MEAN DEVIATION AND AZIMUTH (DEGREES)	SURVEY DEPTH (FEET)	VERTICAL DEPTH (FEET)	DEPTH ERROR (FEET)	HORIZONTAL OFFSET (FEET)
B-773	0.6 - N162.6	165.3	165.3.0	0.0	1.7
B-786B	0.9 – N244.4	100.0	100.0	0.0	1.6
B-821A	0.8 – N72.3	100.1	100.1	0.0	1.4

Table 5. Boring Deviation Data Summary

Quality Assurance

These boring geophysical measurements were performed using industry-standard or better methods for measurements and analyses. All work was performed under **GEO***Vision* quality assurance procedures, which include:

- Use of NIST-traceable calibrations, where applicable, for field and laboratory instrumentation
- Use of standard field data logs
- Use of independent verification of velocity data by comparison of receiver-to-receiver and source-to-receiver velocities
- Independent review of calculations and results by a registered professional engineer, geologist, or geophysicist.

Suspension Data Reliability

P- and S_H-wave velocity measurement using the Suspension Method gives average velocities over a 3.3 foot interval of depth. This high resolution results in the scatter of values shown in the graphs. Individual measurements are very reliable with estimated precision of +/- 5%. Standardized field procedures and quality assurance checks contribute to the reliability of these data.

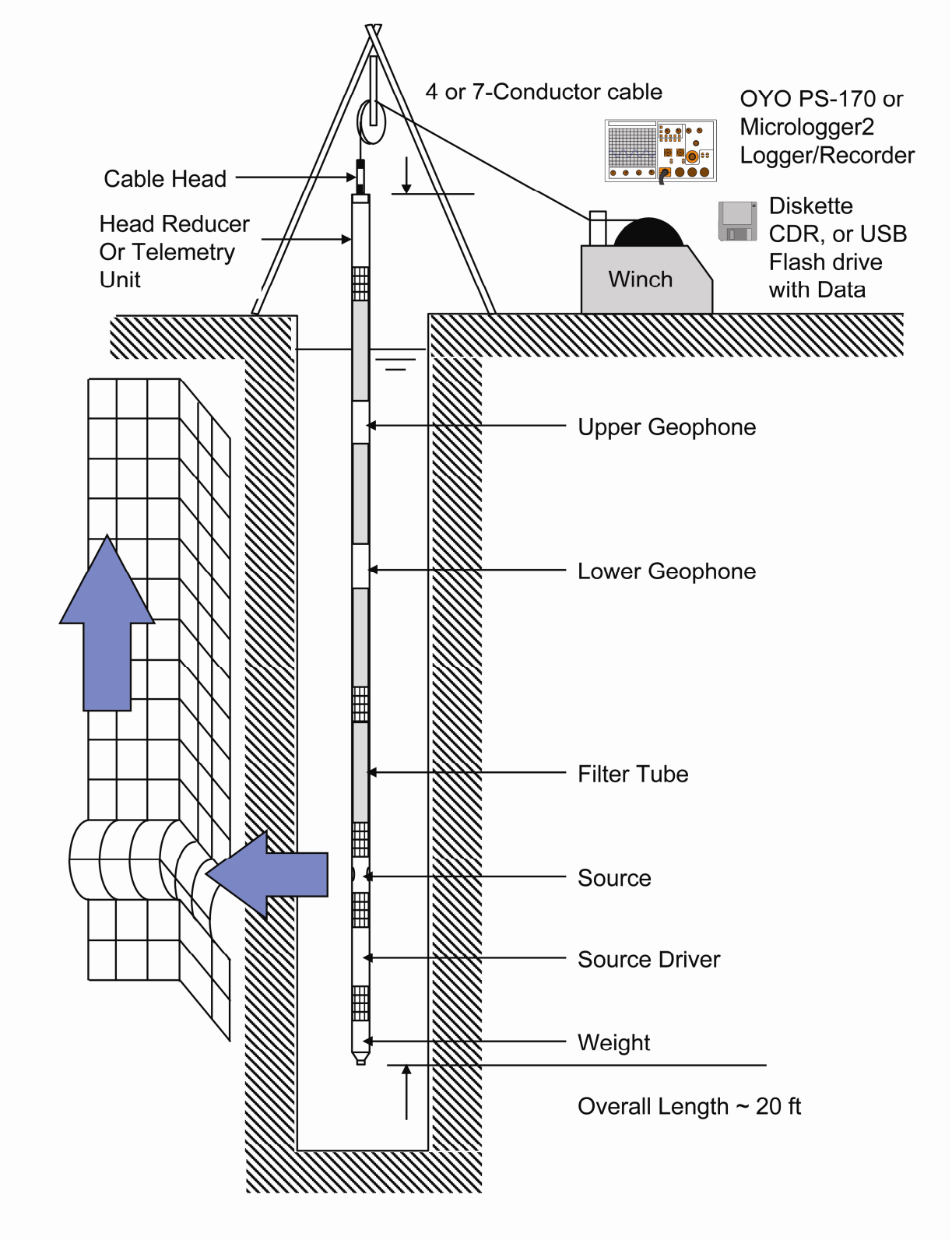


Figure 2: Concept illustration of P-S logging system

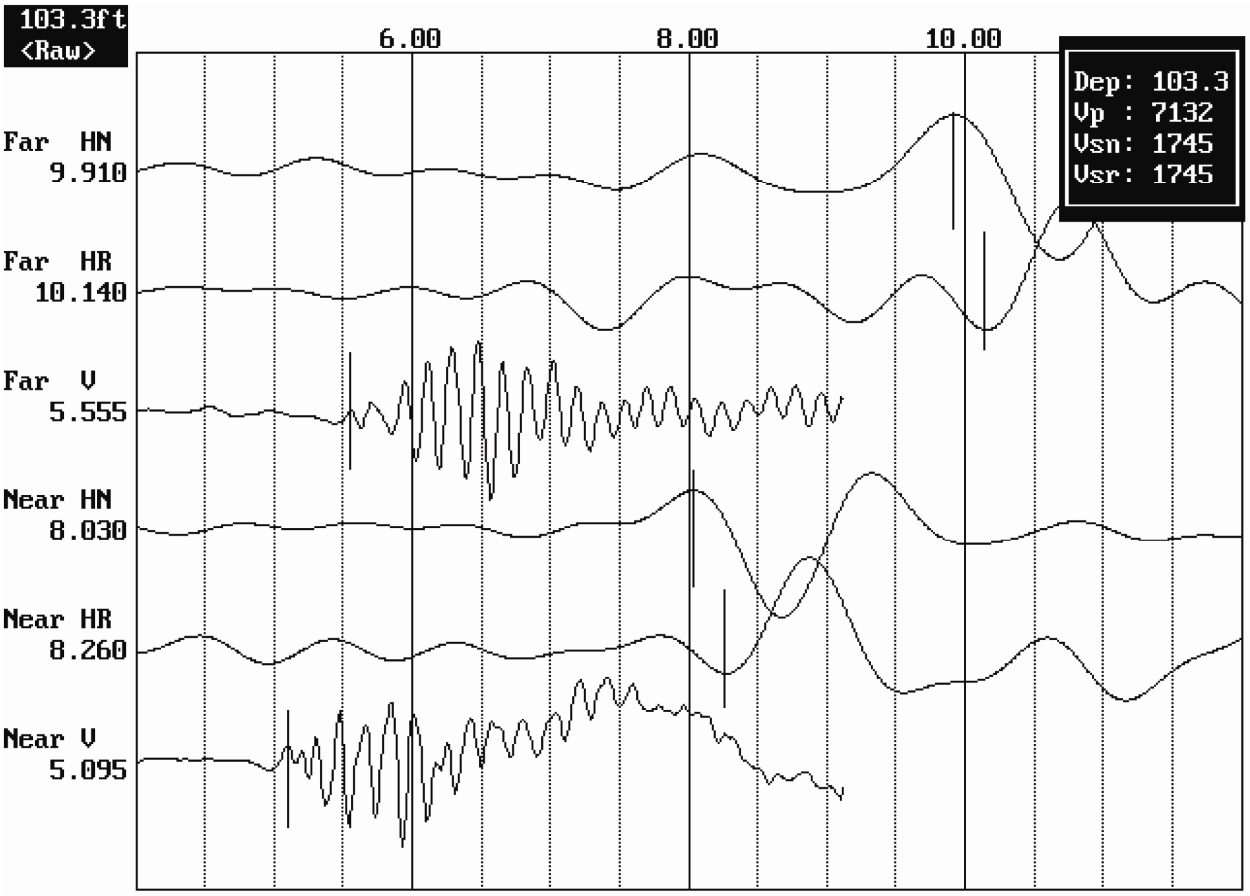


Figure 3: Example of filtered (1400 Hz lowpass) record

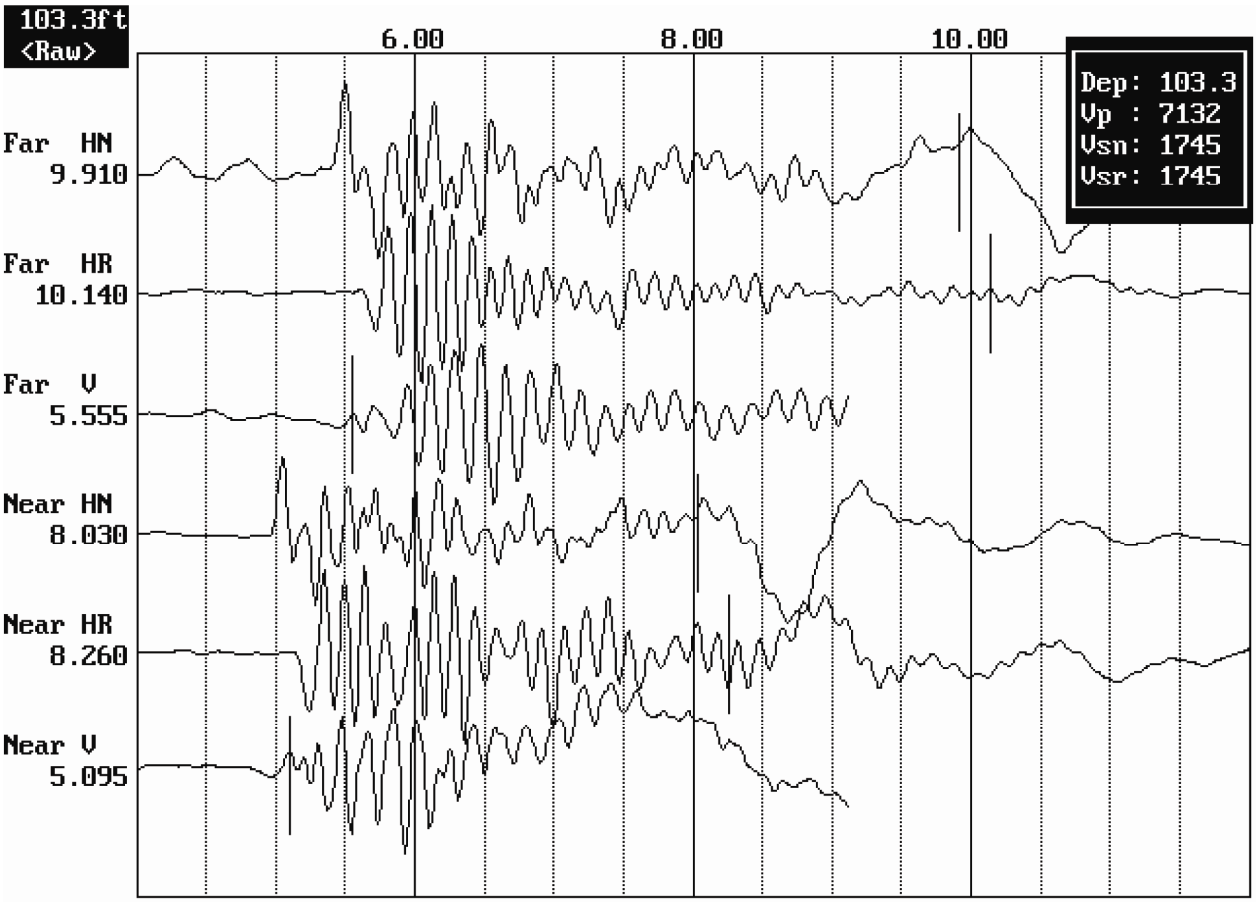


Figure 4. Example of unfiltered record

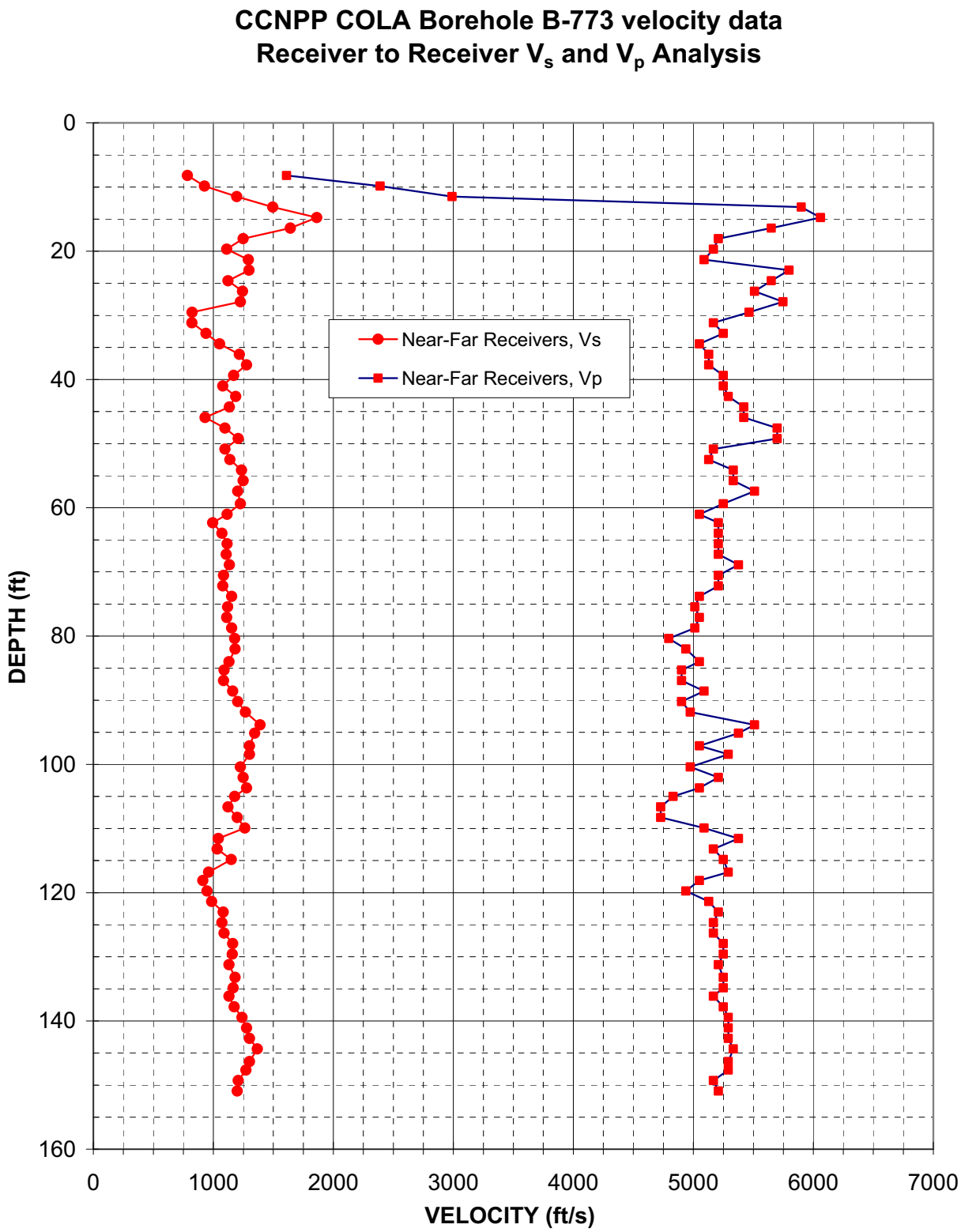


Figure 5: Boring B-773, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
6.6	-	-
8.2	780	1610
9.8	930	2390
11.5	1190	2990
13.1	1490	5900
14.8	1860	6060
16.4	1640	5650
18.0	1250	5210
19.7	1110	5170
21.3	1290	5090
23.0	1300	5800
24.6	1120	5650
26.3	1240	5510
27.9	1230	5750
29.5	820	5460
31.2	820	5170
32.8	940	5250
34.5	1050	5050
36.1	1220	5130
37.7	1280	5130
39.4	1170	5250
41.0	1080	5250
42.7	1190	5290
44.3	1130	5420
45.9	930	5420
47.6	1100	5700
49.2	1210	5700
50.9	1100	5170
52.5	1140	5130
54.1	1230	5330
55.8	1250	5330
57.4	1200	5510
59.4	1230	5250
61.0	1110	5050
62.3	1000	5210
64.0	1070	5210
65.6	1110	5210
67.3	1110	5210
68.9	1130	5380
70.5	1090	5210
72.2	1080	5210
73.8	1150	5050
75.5	1120	5010
77.1	1110	5050
78.7	1150	5010
80.4	1180	4800
82.0	1180	4940
84.0	1130	5050
85.3	1090	4900
86.9	1090	4900

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
88.6	1160	5090
90.2	1200	4900
91.9	1270	4980
93.8	1390	5510
95.1	1340	5380
97.1	1300	5050
98.4	1300	5290
100.4	1230	4980
102.0	1250	5210
103.7	1280	5050
105.0	1180	4830
106.6	1120	4730
108.3	1200	4730
109.9	1260	5090
111.6	1040	5380
113.2	1030	5170
114.8	1150	5250
116.8	960	5290
118.1	910	5050
119.8	950	4940
121.4	990	5130
123.0	1080	5210
124.7	1070	5170
126.3	1090	5170
128.0	1160	5250
129.6	1160	5250
131.2	1130	5210
133.2	1180	5250
134.8	1170	5250
136.2	1130	5170
137.8	1170	5250
139.4	1240	5290
141.1	1280	5290
142.7	1300	5290
144.4	1370	5330
146.3	1300	5290
147.6	1270	5290
149.3	1210	5170
150.9	1200	5210

Table 6. Boring B-773, Suspension R1-R2 depths and P- and S_H-wave velocities

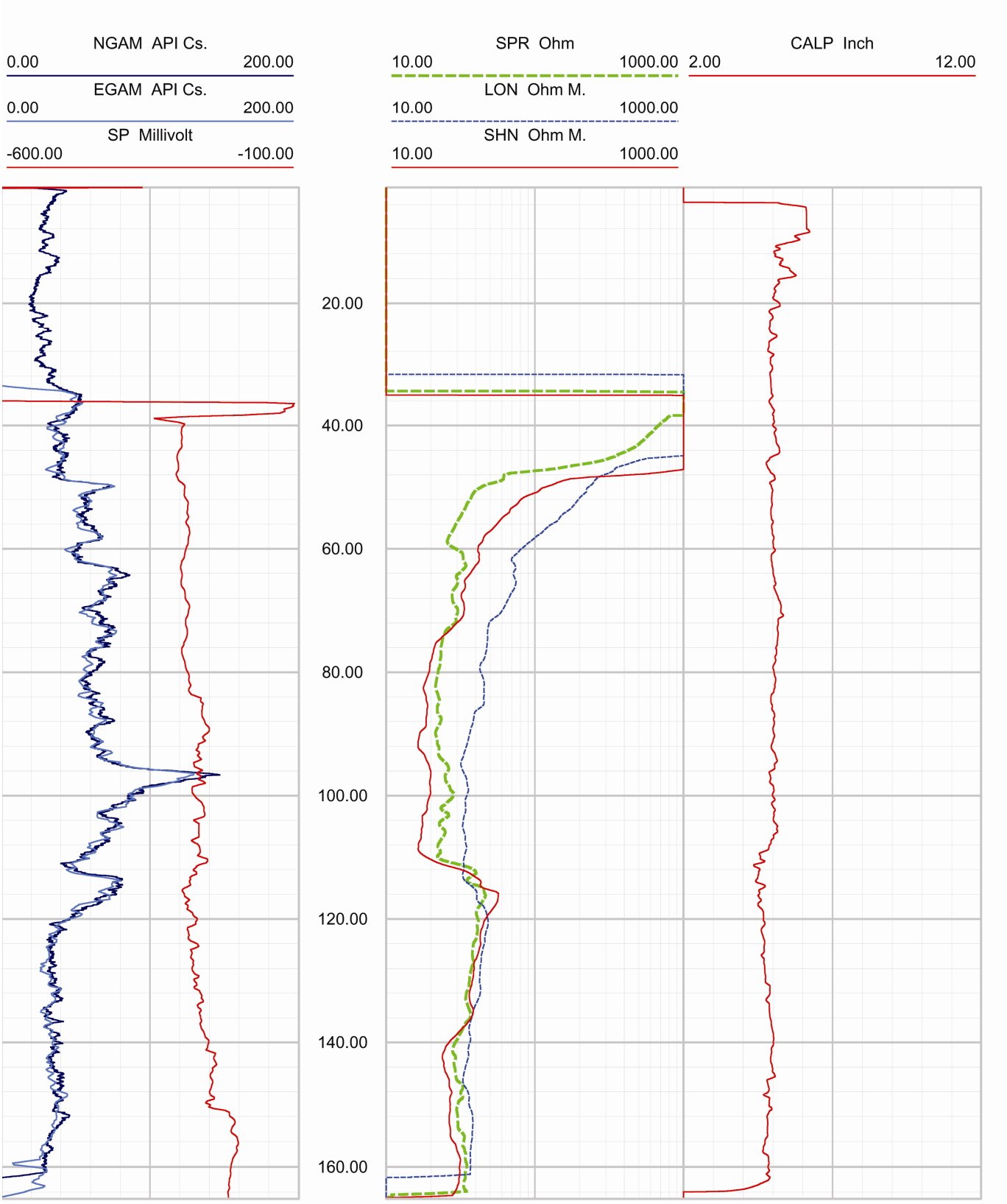


Figure 6. Boring B-773, Caliper, Natural gamma, Resistivity and SP logs

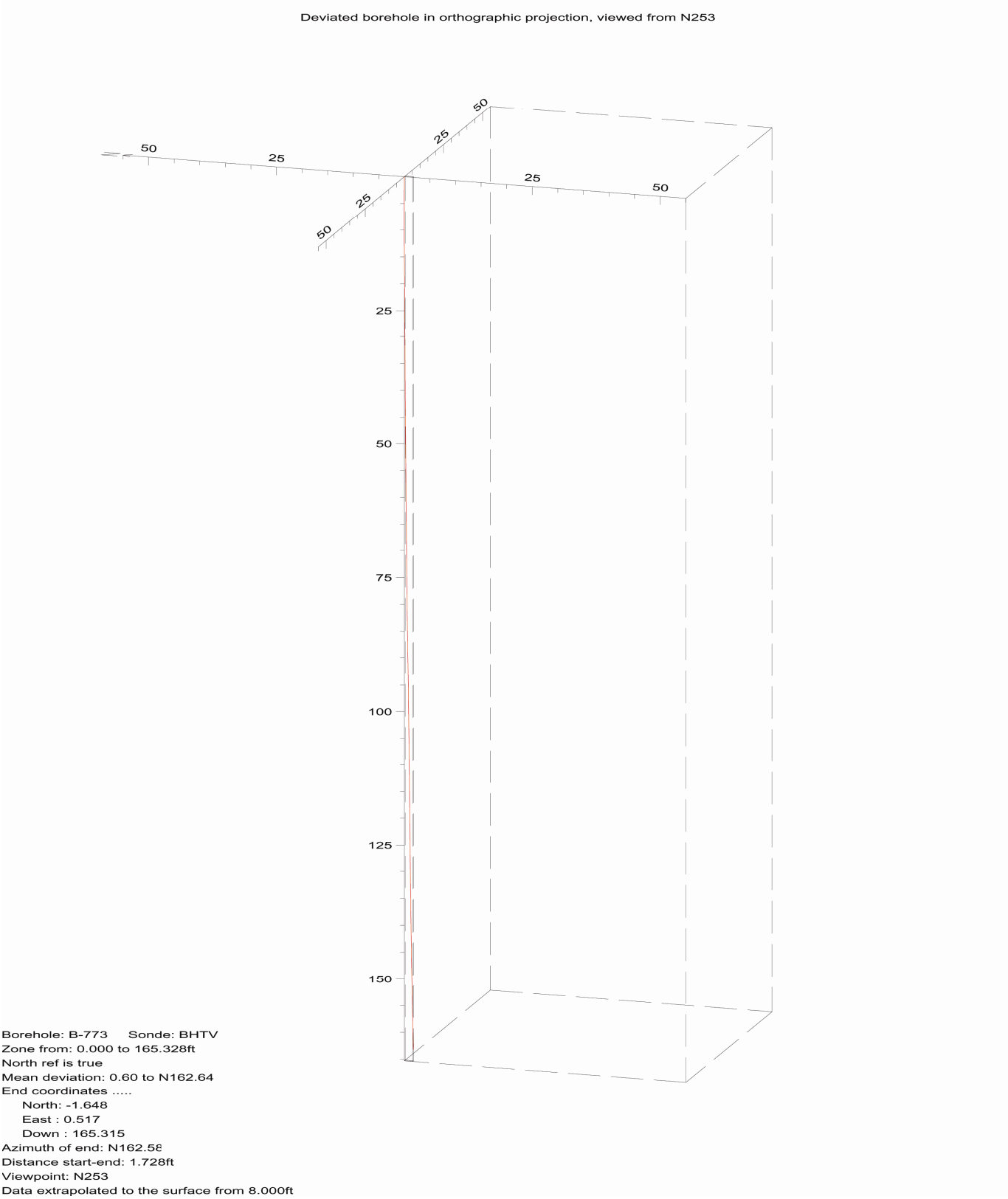


Figure 7. Boring B-773, Deviation Projection (dimensions in feet)

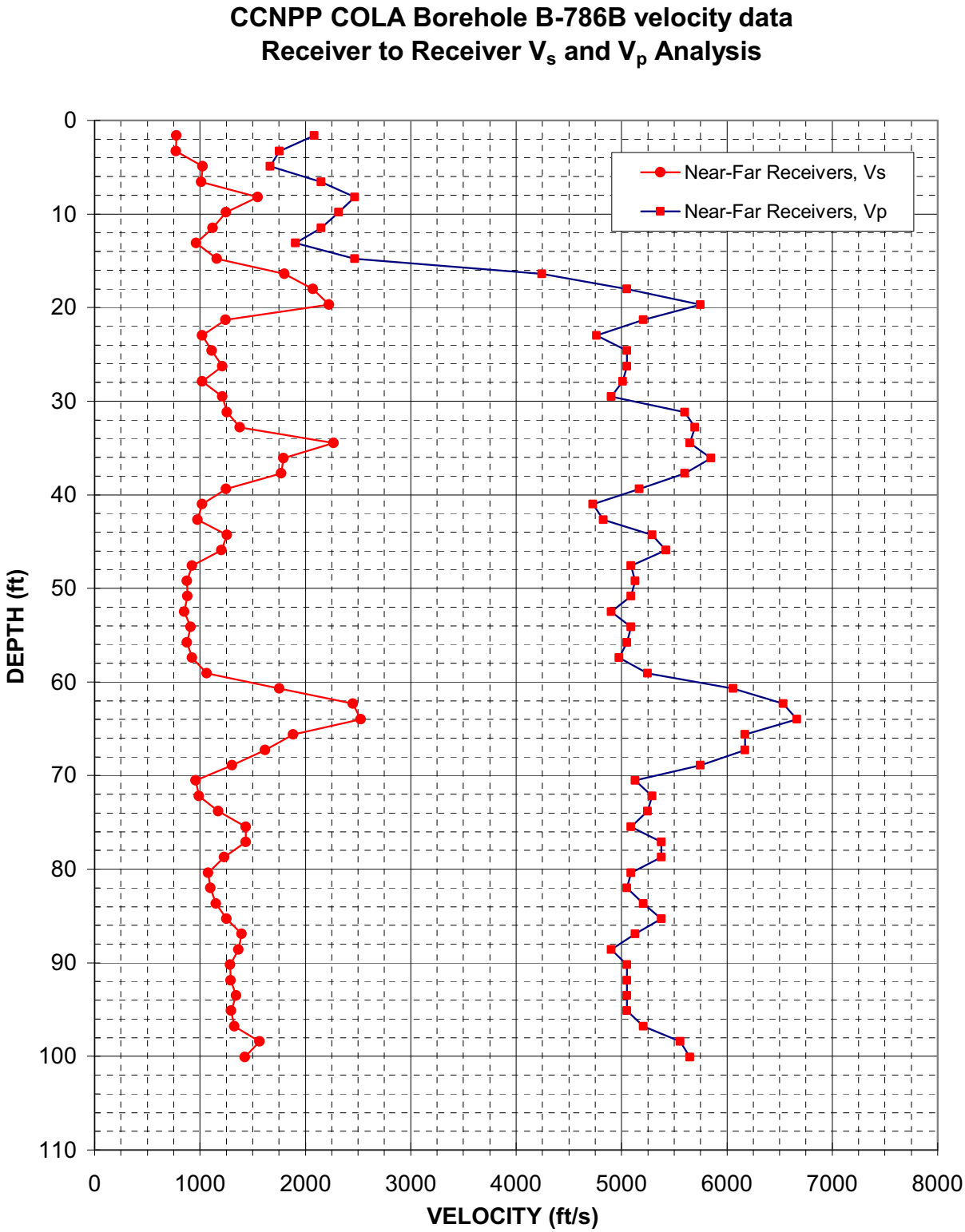


Figure 8: Boring B-786B, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
1.6	780	2080
3.3	770	1750
4.9	1030	1670
6.6	1010	2150
8.2	1550	2470
9.8	1250	2310
11.5	1120	2150
13.1	960	1900
14.8	1160	2470
16.4	1800	4250
18.0	2070	5050
19.7	2230	5750
21.3	1240	5210
23.0	1020	4760
24.6	1110	5050
26.3	1210	5050
27.9	1020	5010
29.5	1210	4900
31.2	1260	5600
32.8	1380	5700
34.5	2270	5650
36.1	1790	5850
37.7	1770	5600
39.4	1250	5170
41.0	1020	4730
42.7	980	4830
44.3	1260	5290
45.9	1200	5420
47.6	920	5090
49.2	870	5130
50.9	880	5090
52.5	850	4900
54.1	910	5090
55.8	870	5050
57.4	930	4980
59.1	1060	5250
60.7	1750	6060
62.3	2450	6540
64.0	2530	6670
65.6	1880	6170
67.3	1620	6170
68.9	1300	5750
70.5	960	5130
72.2	990	5290
73.8	1170	5250
75.5	1440	5090
77.1	1440	5380
78.7	1230	5380
80.4	1080	5090
82.0	1100	5050

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
83.7	1150	5210
85.3	1250	5380
86.9	1390	5130
88.6	1370	4900
90.2	1290	5050
91.9	1290	5050
93.5	1340	5050
95.1	1300	5050
96.8	1330	5210
98.4	1560	5560
100.1	1420	5650

Table 7. Boring B-786B, Suspension R1-R2 depths and P- and S_H-wave velocities

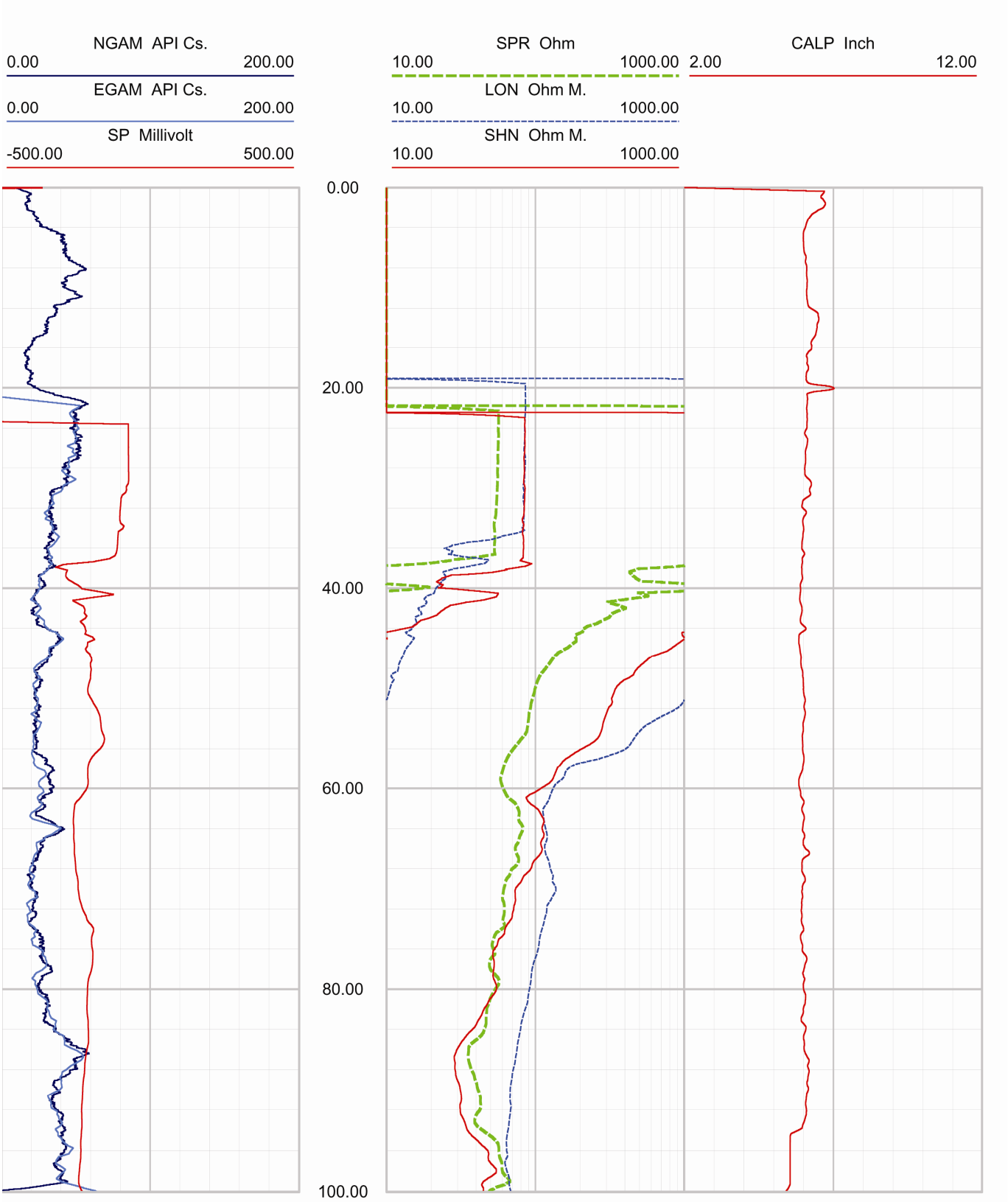


Figure 9. Boring B-786B, Caliper, Natural gamma, Resistivity and SP logs

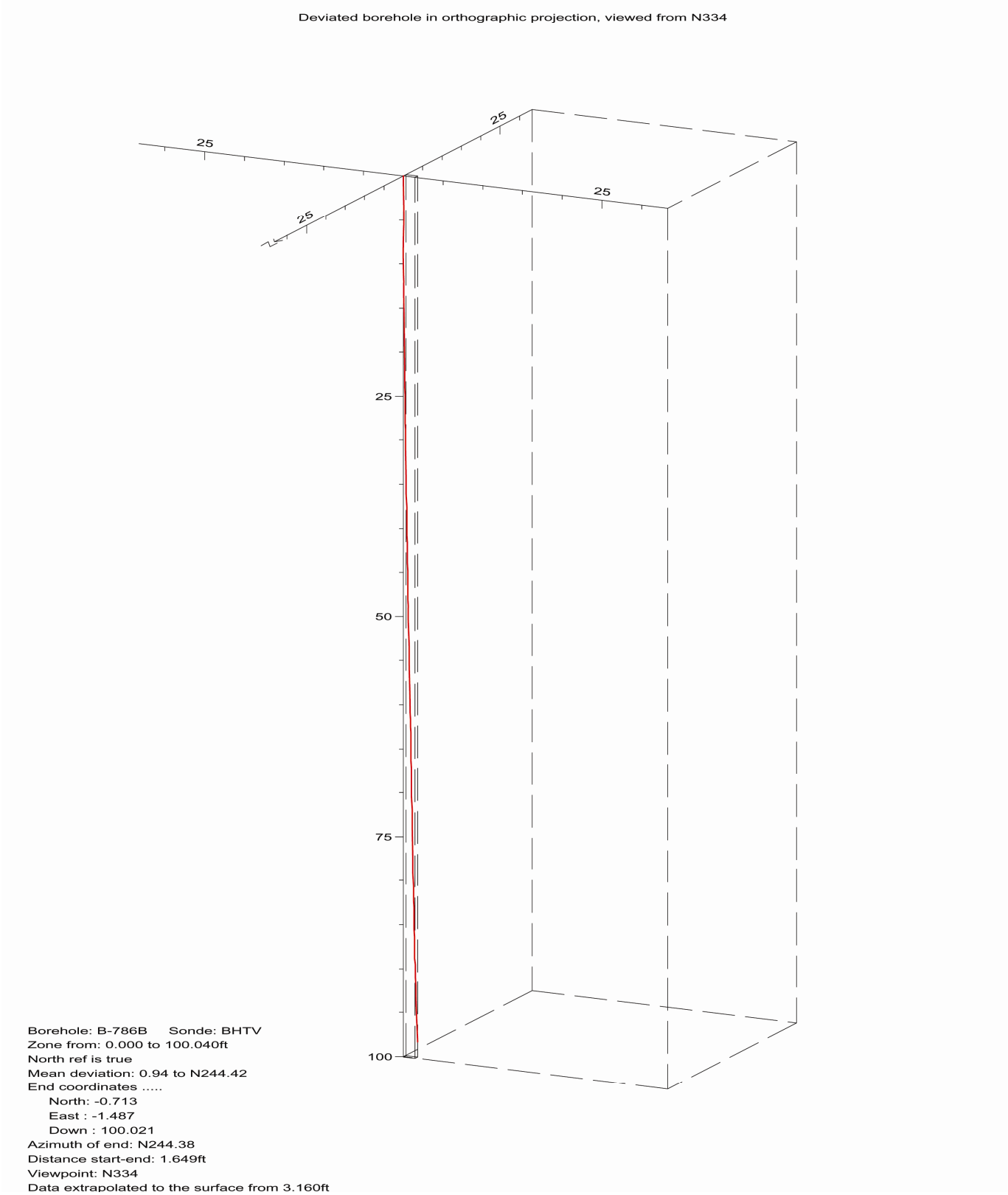


Figure 10. Boring B-786B, Deviation Projection (dimensions in feet)

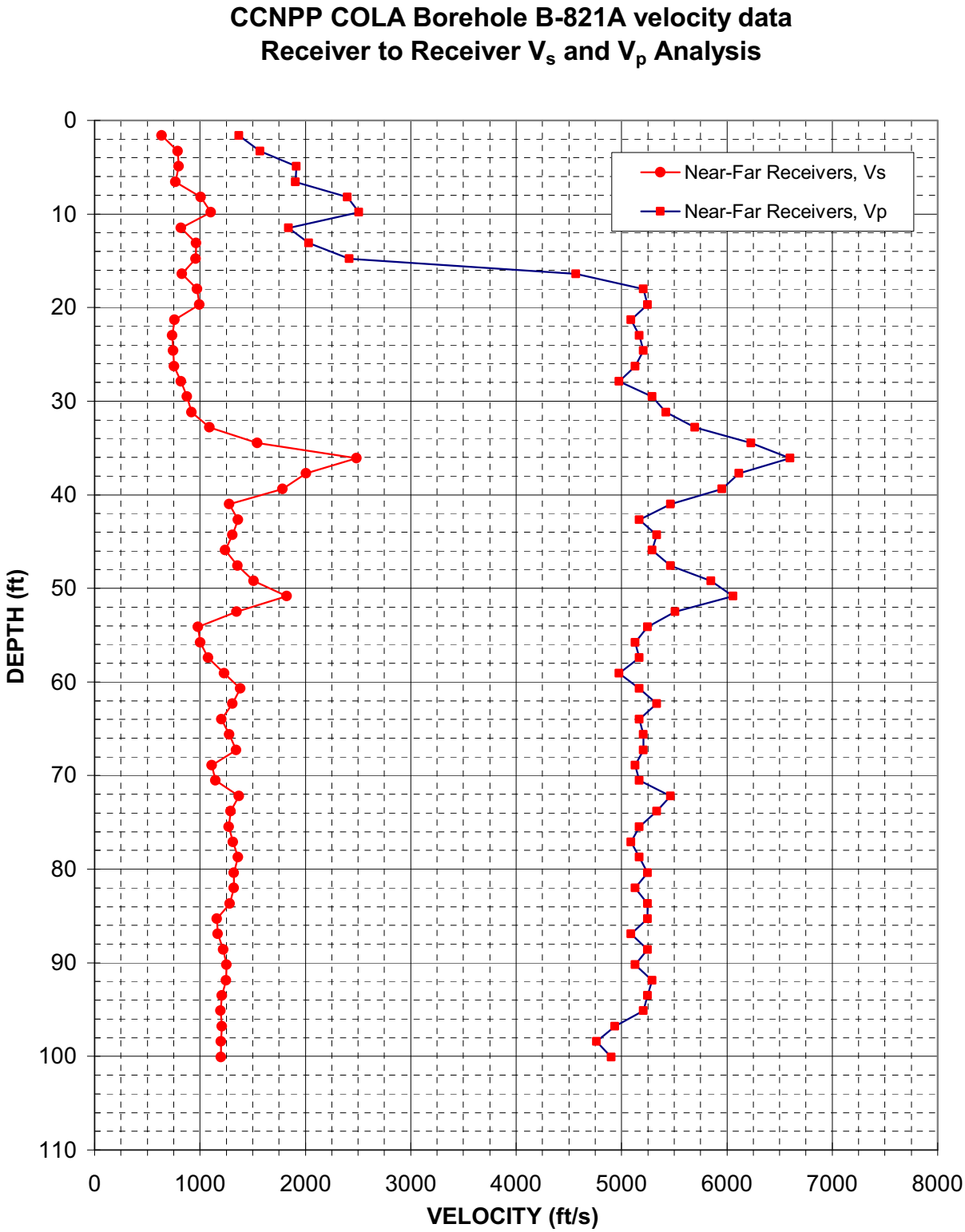


Figure 11: Boring B-821A, Suspension R1-R2 P- and S_H-wave velocities

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
1.6	630	1370
3.3	790	1570
4.9	800	1920
6.6	770	1900
8.2	1010	2400
9.8	1100	2510
11.5	820	1840
13.1	970	2030
14.8	960	2420
16.4	830	4570
18.0	970	5210
19.7	1000	5250
21.3	760	5090
23.0	740	5170
24.6	750	5210
26.3	760	5130
27.9	820	4980
29.5	880	5290
31.2	920	5420
32.8	1090	5700
34.5	1540	6230
36.1	2490	6600
37.7	2010	6120
39.4	1780	5950
41.0	1280	5460
42.7	1360	5170
44.3	1310	5330
45.9	1240	5290
47.6	1360	5460
49.2	1510	5850
50.9	1820	6060
52.5	1350	5510
54.1	980	5250
55.8	1000	5130
57.4	1080	5170
59.1	1230	4980
60.7	1380	5170
62.3	1310	5330
64.0	1200	5170
65.6	1280	5210
67.3	1340	5210
68.9	1110	5130
70.5	1150	5170
72.2	1370	5460
73.8	1290	5330
75.5	1270	5170
77.1	1310	5090
78.7	1360	5170
80.4	1320	5250
82.0	1320	5130

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
83.7	1280	5250
85.3	1160	5250
86.9	1170	5090
88.6	1220	5250
90.2	1250	5130
91.9	1250	5290
93.5	1210	5250
95.1	1190	5210
96.8	1210	4940
98.4	1200	4760
100.1	1200	4900

Table 8. Boring B-821A, Suspension R1-R2 depths and P- and S_H-wave velocities

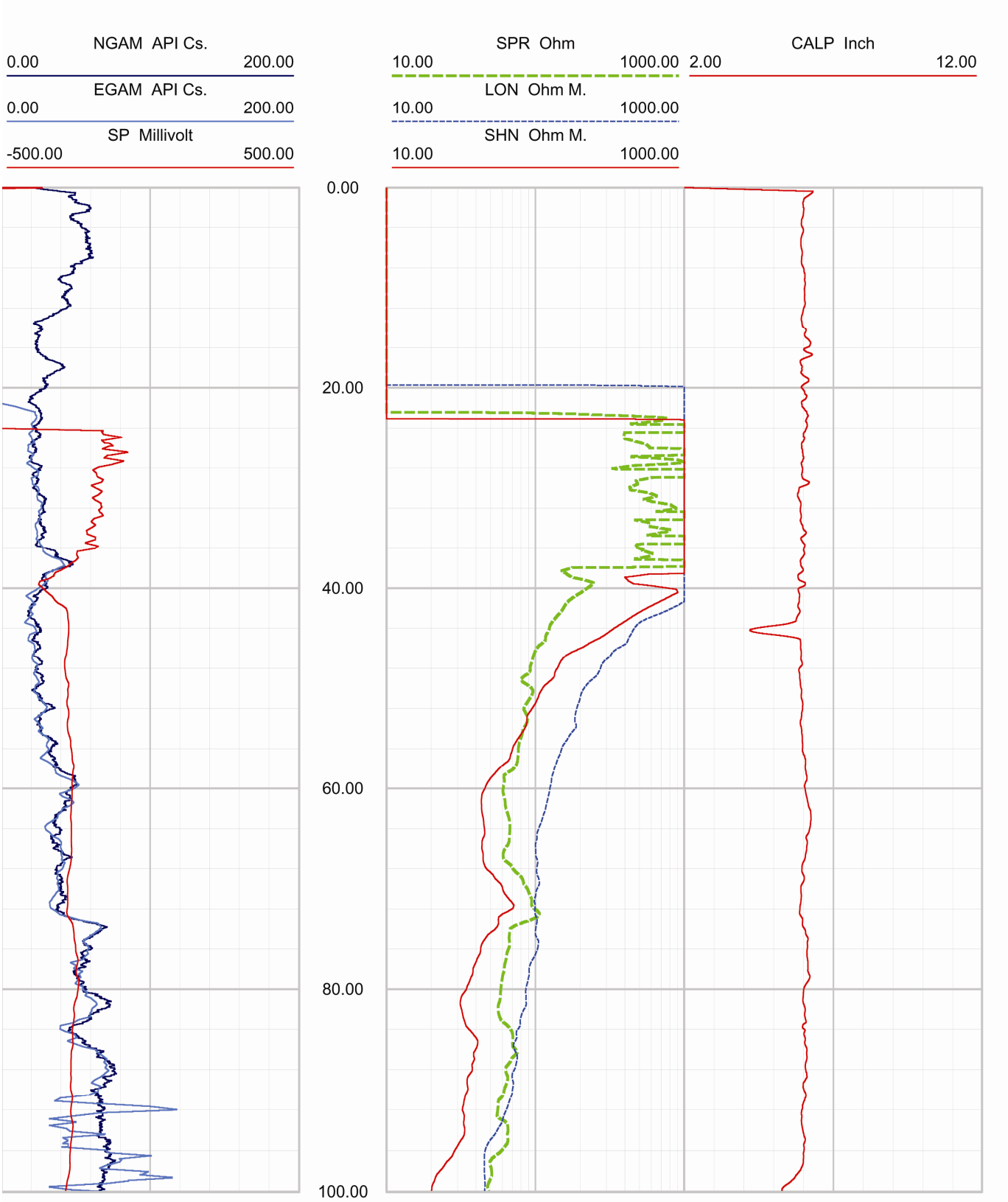


Figure 12. Boring B-821A, Caliper, Natural gamma, Resistivity and SP logs

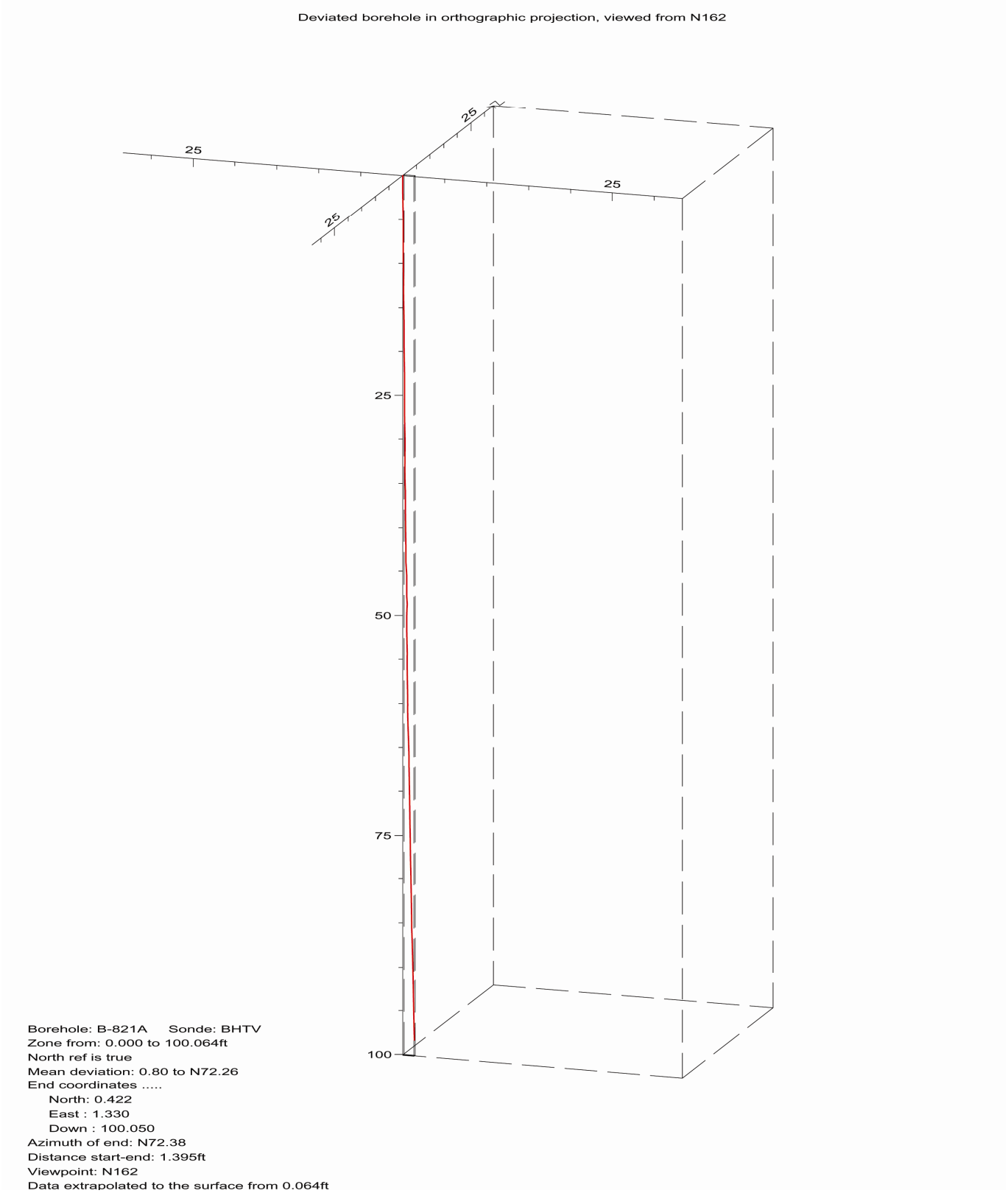


Figure 13. Boring B-821A, Deviation Projection (dimensions in feet)

APPENDIX A

SUSPENSION VELOCITY MEASUREMENT QUALITY ASSURANCE SUSPENSION SOURCE TO RECEIVER ANALYSIS RESULTS

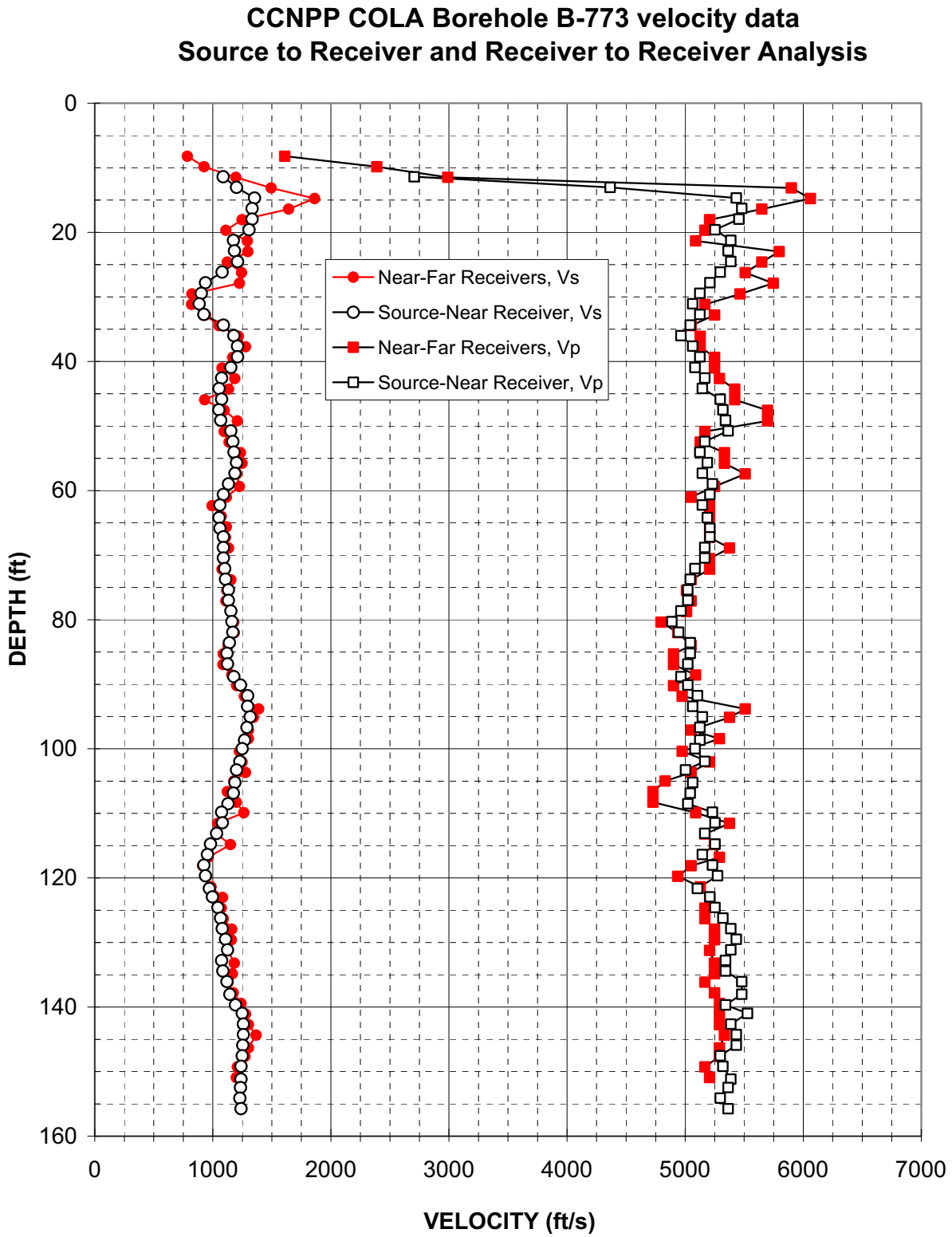


Figure A-1. Boring B-773, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
11.4	1090	2710
13.0	1200	4370
14.7	1350	5430
16.3	1330	5480
18.0	1330	5460
19.6	1310	5250
21.2	1170	5390
22.9	1180	5360
24.5	1210	5390
26.2	1080	5300
27.8	940	5210
29.4	900	5130
31.1	890	5060
32.7	920	5130
34.4	1090	5040
36.0	1180	4960
37.6	1210	5060
39.3	1210	5130
40.9	1150	5080
42.6	1070	5170
44.2	1050	5150
45.8	1070	5300
47.5	1050	5320
49.1	1070	5340
50.8	1150	5360
52.4	1170	5170
54.0	1180	5130
55.7	1200	5190
57.3	1190	5150
59.0	1130	5230
60.6	1090	5210
62.2	1060	5150
64.2	1050	5190
65.9	1060	5210
67.2	1090	5210
68.8	1090	5170
70.5	1090	5170
72.1	1100	5080
73.7	1110	5040
75.4	1130	5020
77.0	1130	5020
78.7	1150	4960
80.3	1160	4890
81.9	1170	4950
83.6	1140	5040
85.2	1120	5040
86.9	1120	5020
88.8	1180	4960
90.1	1230	5020
91.8	1290	5100

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
93.4	1290	5060
95.1	1320	5150
96.7	1290	5130
98.7	1270	5130
100.0	1250	5080
101.9	1230	5170
103.3	1200	5000
105.2	1190	5060
106.9	1170	5040
108.5	1130	5020
109.8	1070	5230
111.5	1080	5250
113.1	1030	5170
114.7	980	5250
116.4	950	5150
118.0	920	5230
119.7	940	5280
121.6	970	5100
122.9	1000	5210
124.6	1040	5250
126.2	1070	5320
127.9	1080	5390
129.5	1110	5430
131.1	1120	5390
132.8	1070	5340
134.4	1090	5340
136.1	1120	5480
138.0	1140	5480
139.7	1190	5340
141.0	1250	5530
142.6	1260	5390
144.3	1260	5430
145.9	1250	5430
147.6	1250	5300
149.2	1240	5320
151.2	1240	5390
152.5	1230	5360
154.1	1230	5300
155.8	1240	5360

Table A-1. Boring B-773, S - R1 quality assurance analysis P- and S_H-wave data

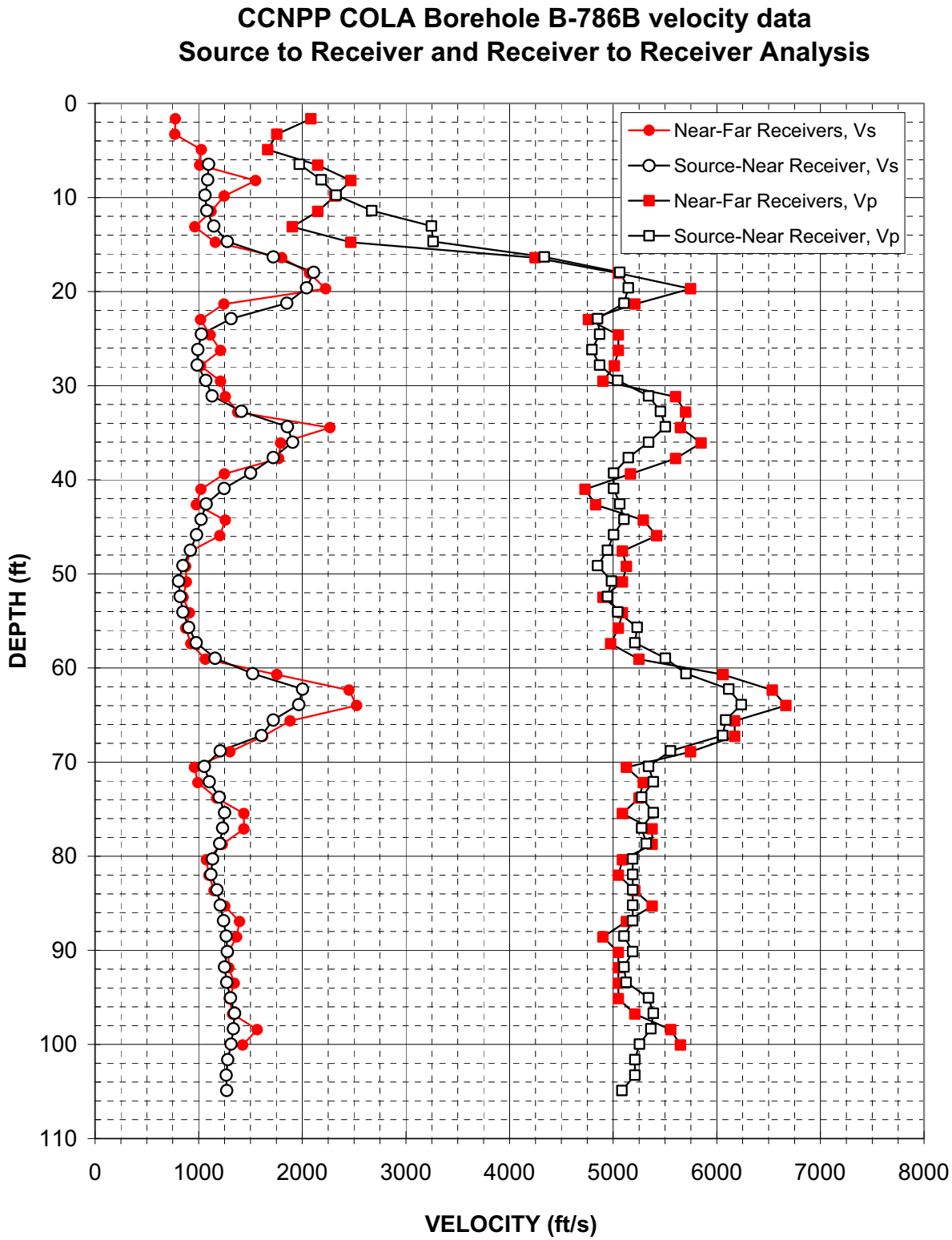


Figure A-2. Boring B-786B, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
6.5	1100	1970
8.1	1090	2180
9.8	1060	2330
11.4	1080	2670
13.0	1150	3250
14.7	1280	3260
16.3	1720	4340
18.0	2110	5060
19.6	2040	5150
21.2	1850	5100
22.9	1310	4850
24.5	1030	4870
26.2	990	4800
27.8	990	4870
29.4	1070	5040
31.1	1130	5340
32.7	1410	5460
34.4	1860	5500
36.0	1910	5340
37.6	1720	5150
39.3	1500	5000
40.9	1250	5000
42.6	1070	5060
44.2	1020	5100
45.8	980	5000
47.5	920	4950
49.1	850	4850
50.8	810	4980
52.4	820	4950
54.0	850	5040
55.7	900	5230
57.3	980	5210
59.0	1160	5500
60.6	1520	5700
62.2	2000	6120
63.9	1970	6240
65.5	1720	6090
67.2	1610	6060
68.8	1210	5550
70.5	1060	5340
72.1	1100	5390
73.7	1200	5280
75.4	1250	5390
77.0	1230	5280
78.7	1200	5320
80.3	1130	5190
81.9	1120	5190
83.6	1180	5190
85.2	1210	5190
86.9	1240	5190

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
88.5	1270	5100
90.1	1280	5190
91.8	1250	5100
93.4	1270	5130
95.1	1310	5340
96.7	1350	5390
98.3	1340	5360
100.0	1310	5250
101.6	1280	5210
103.3	1270	5210
104.9	1270	5080

Table A-2. Boring B-786B, S - R1 quality assurance analysis P- and S_H-wave data

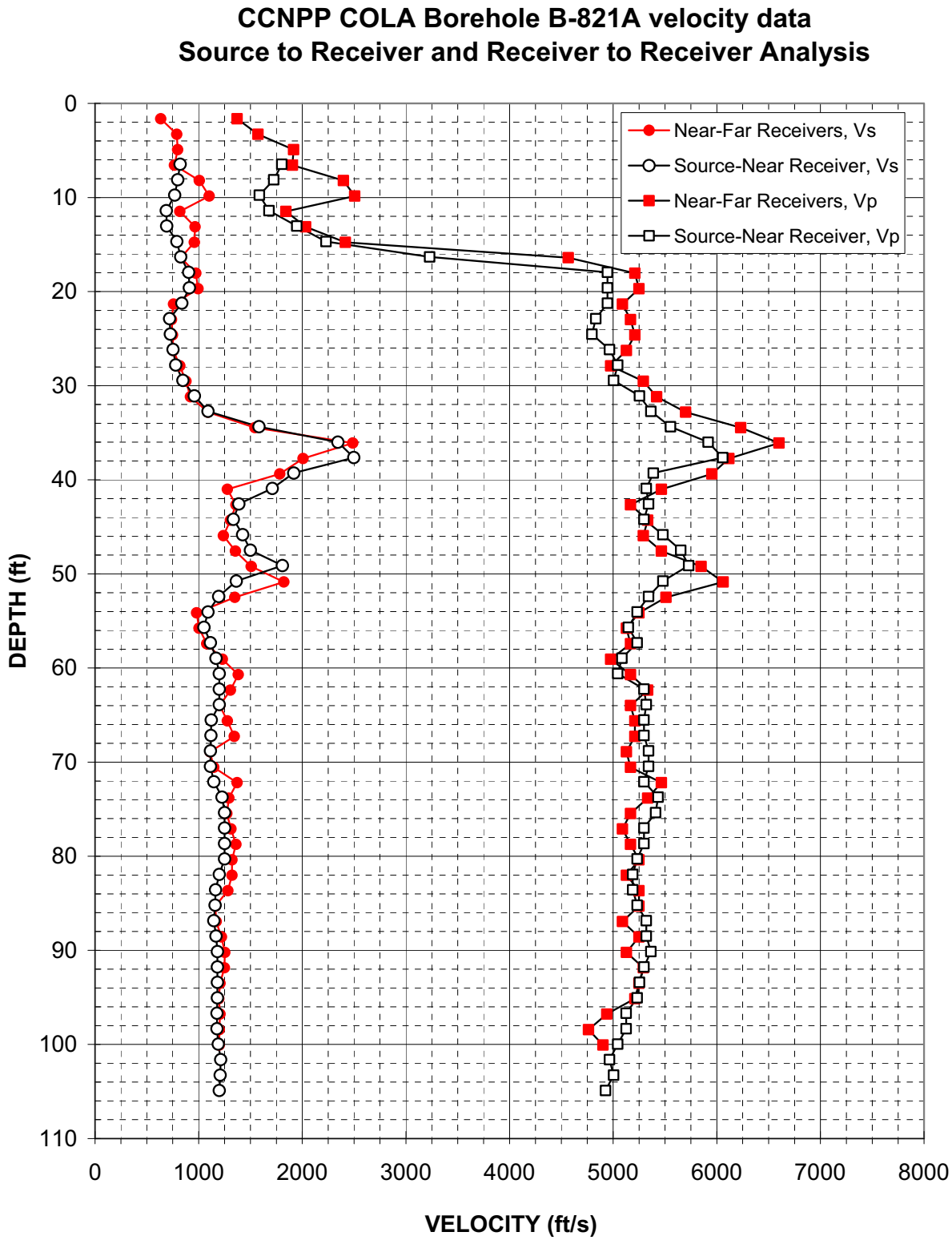


Figure A-3. Boring B-821A, R1 - R2 high resolution analysis and S - R1 quality assurance analysis P- and S_H-wave data

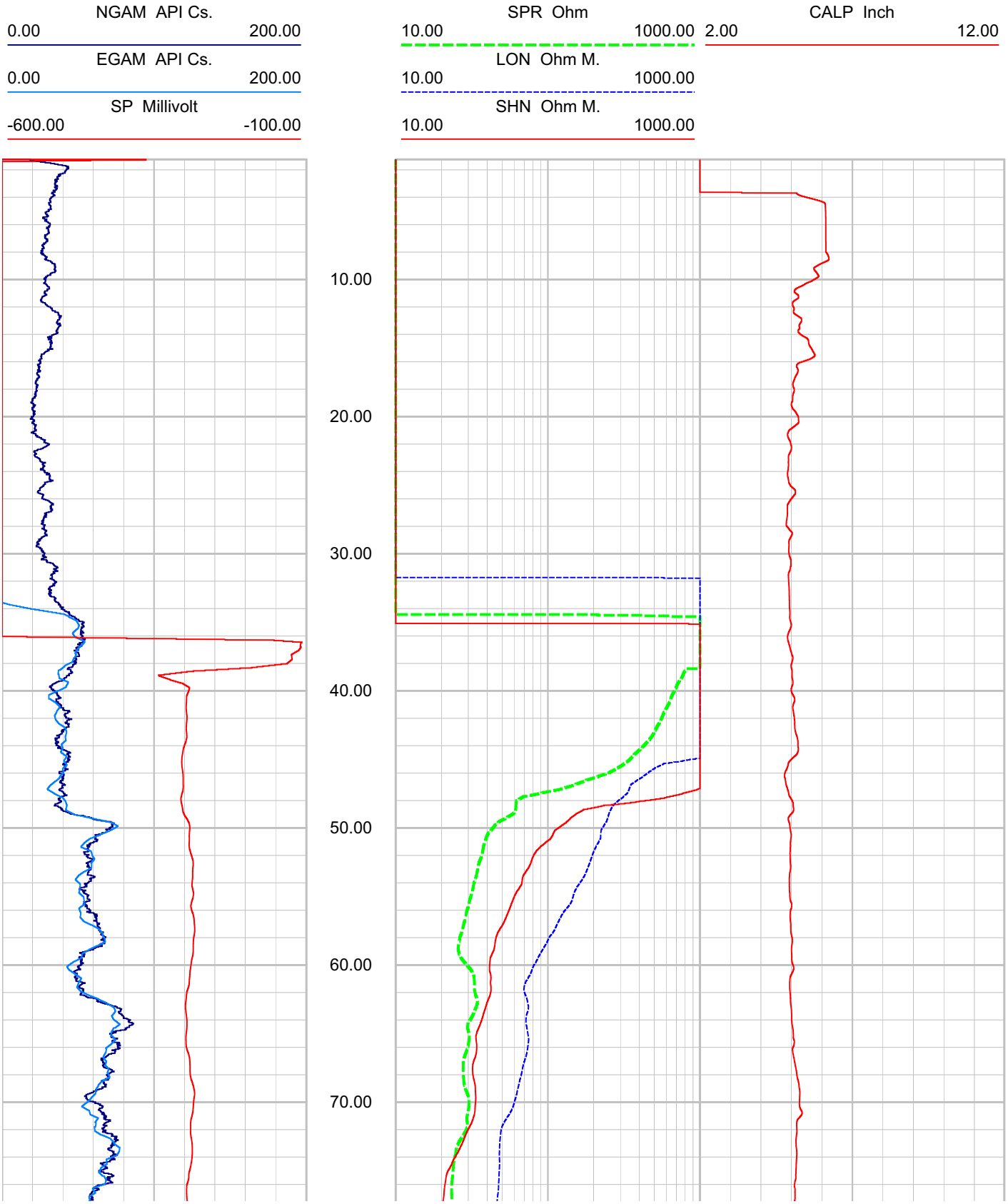
Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
6.5	820	1800
8.1	800	1720
9.8	770	1590
11.4	690	1680
13.0	690	1950
14.7	790	2230
16.3	830	3230
18.0	900	4950
19.6	910	4950
21.2	840	4950
22.9	720	4830
24.5	730	4800
26.2	750	4960
27.8	780	5040
29.4	850	5000
31.1	960	5250
32.7	1090	5360
34.4	1580	5550
36.0	2340	5920
37.6	2500	6060
39.3	1920	5390
40.9	1710	5320
42.6	1390	5340
44.2	1340	5300
45.8	1430	5480
47.5	1500	5650
49.1	1810	5730
50.8	1360	5480
52.4	1190	5340
54.0	1090	5230
55.7	1050	5150
57.3	1110	5230
59.0	1170	5080
60.6	1200	5040
62.2	1200	5300
63.9	1200	5320
65.5	1120	5300
67.2	1120	5300
68.8	1110	5340
70.5	1110	5340
72.1	1150	5300
73.7	1230	5430
75.4	1250	5410
77.0	1250	5300
78.7	1250	5300
80.3	1250	5230
81.9	1200	5190
83.6	1160	5190
85.2	1160	5230
86.9	1150	5320

Depth (feet)	V_s (feet/sec)	V_p (feet/sec)
88.5	1170	5320
90.1	1180	5360
91.8	1180	5300
93.4	1180	5250
95.1	1180	5230
96.7	1180	5130
98.3	1180	5130
100.0	1190	5040
101.6	1210	4960
103.3	1210	5000
104.9	1200	4930

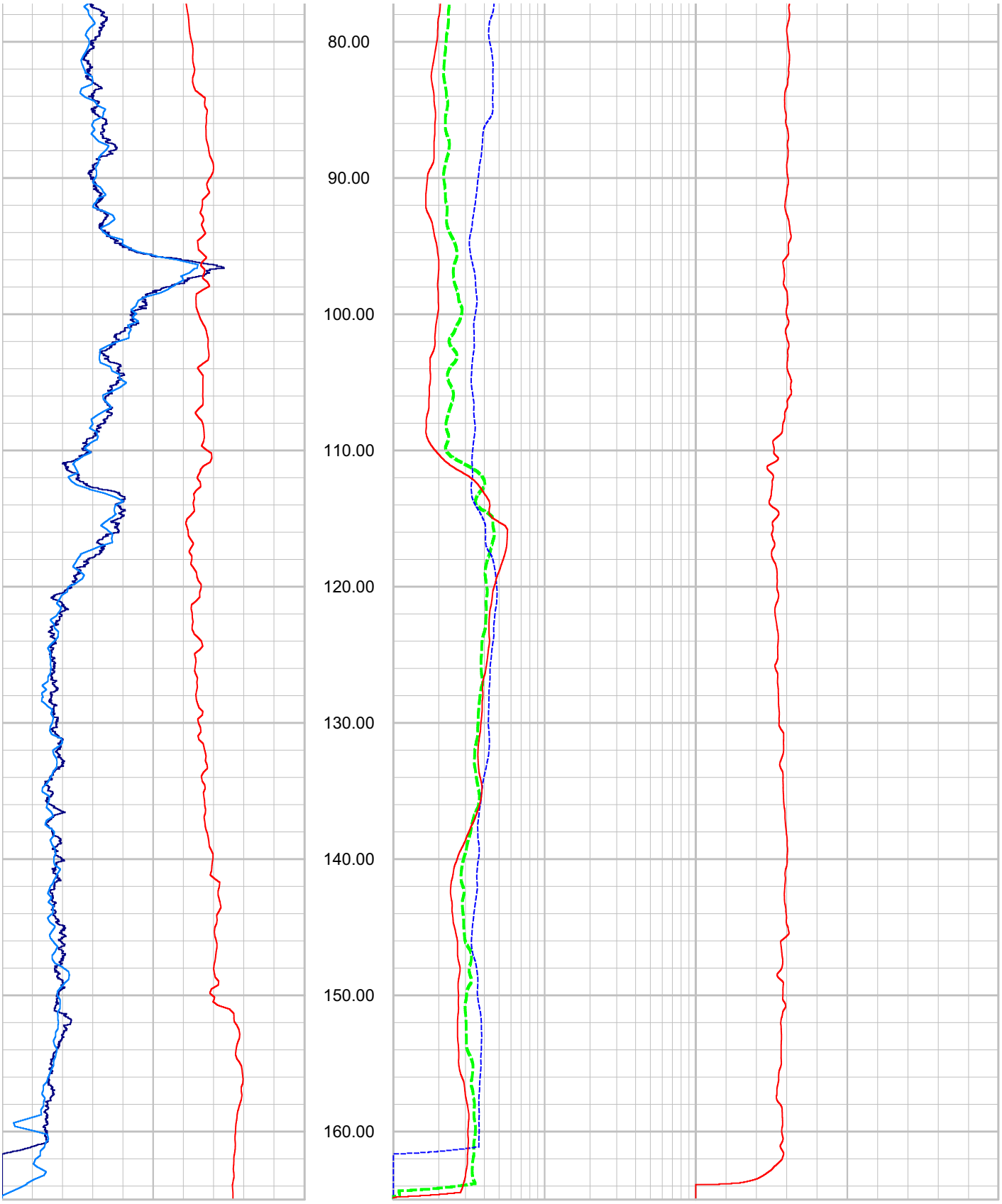
Table A-3. Boring B-821A, S - R1 quality assurance analysis P- and S_H-wave data

APPENDIX B

CALIPER, NATURAL GAMMA, RESISTIVITY, AND SPONTANEOUS POTENTIAL LOGS



CCNPP COLA Boring B-773 ELOG, Caliper and Natural Gamma rev 1.1 Sheet 1 of 3



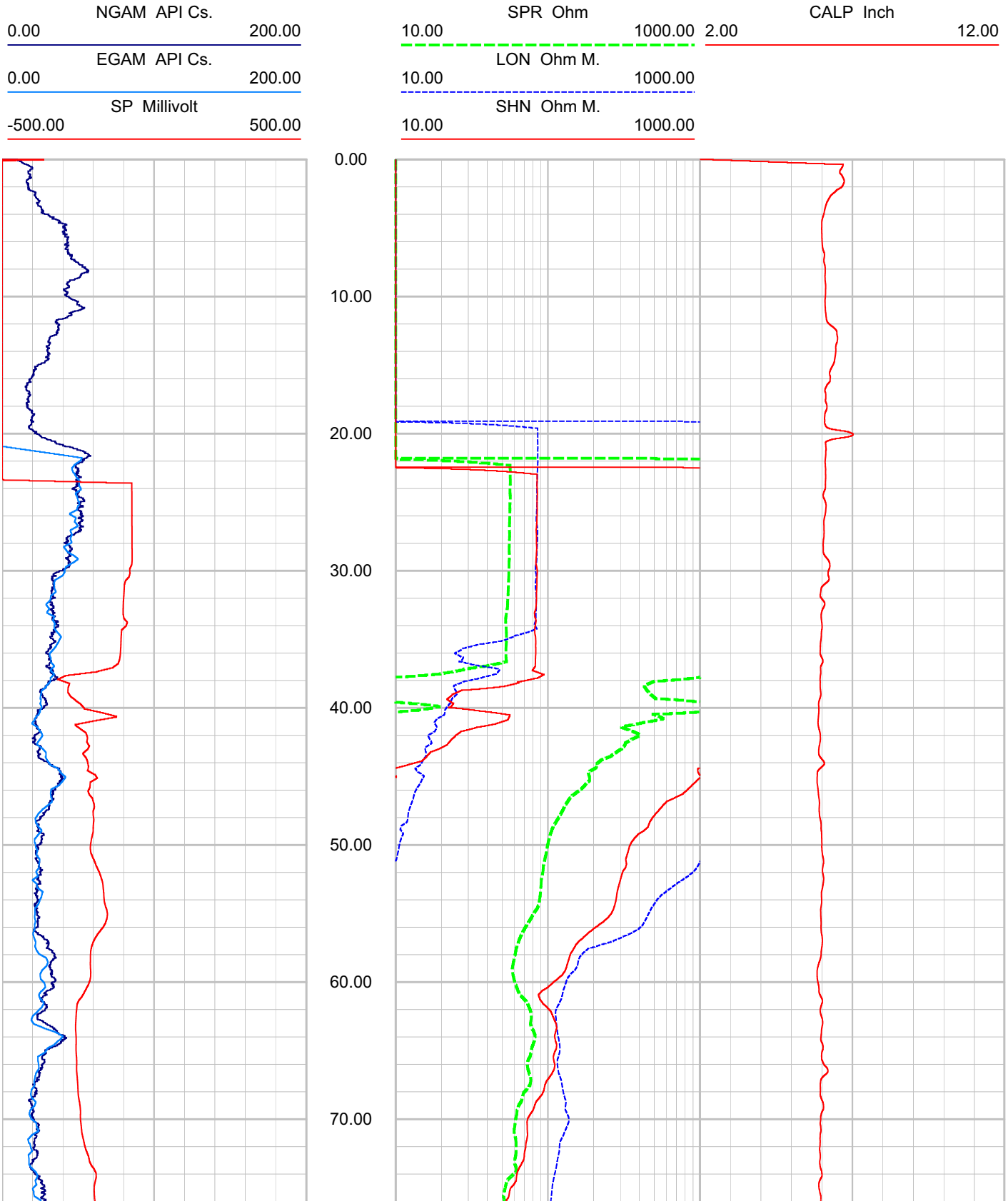
CCNPP COLA Boring B-773 ELOG, Caliper and Natural Gamma rev 1.1 Sheet 2 of 3

NGAM API Cs.	0.00	200.00
EGAM API Cs.	0.00	200.00
SP Millivolt	-600.00	-100.00

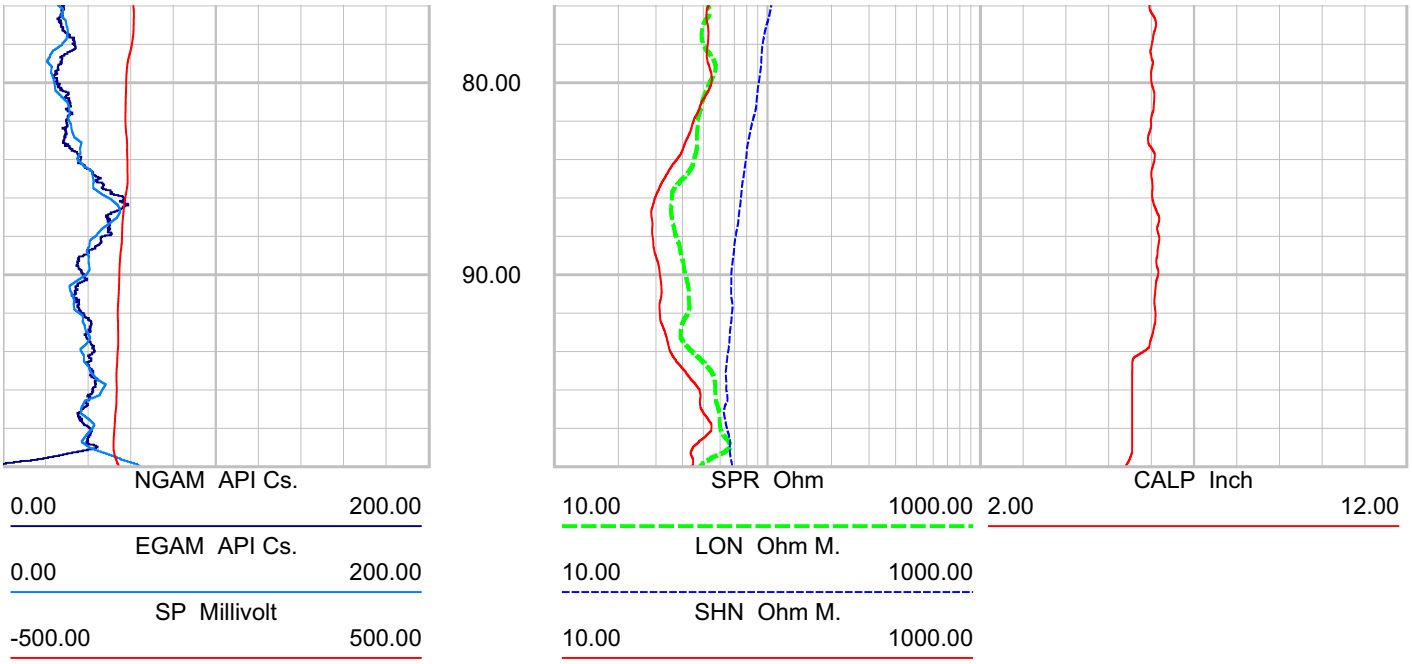
SPR Ohm	10.00	1000.00
LON Ohm M.	10.00	1000.00
SHN Ohm M.	10.00	1000.00

CALP Inch	2.00	12.00

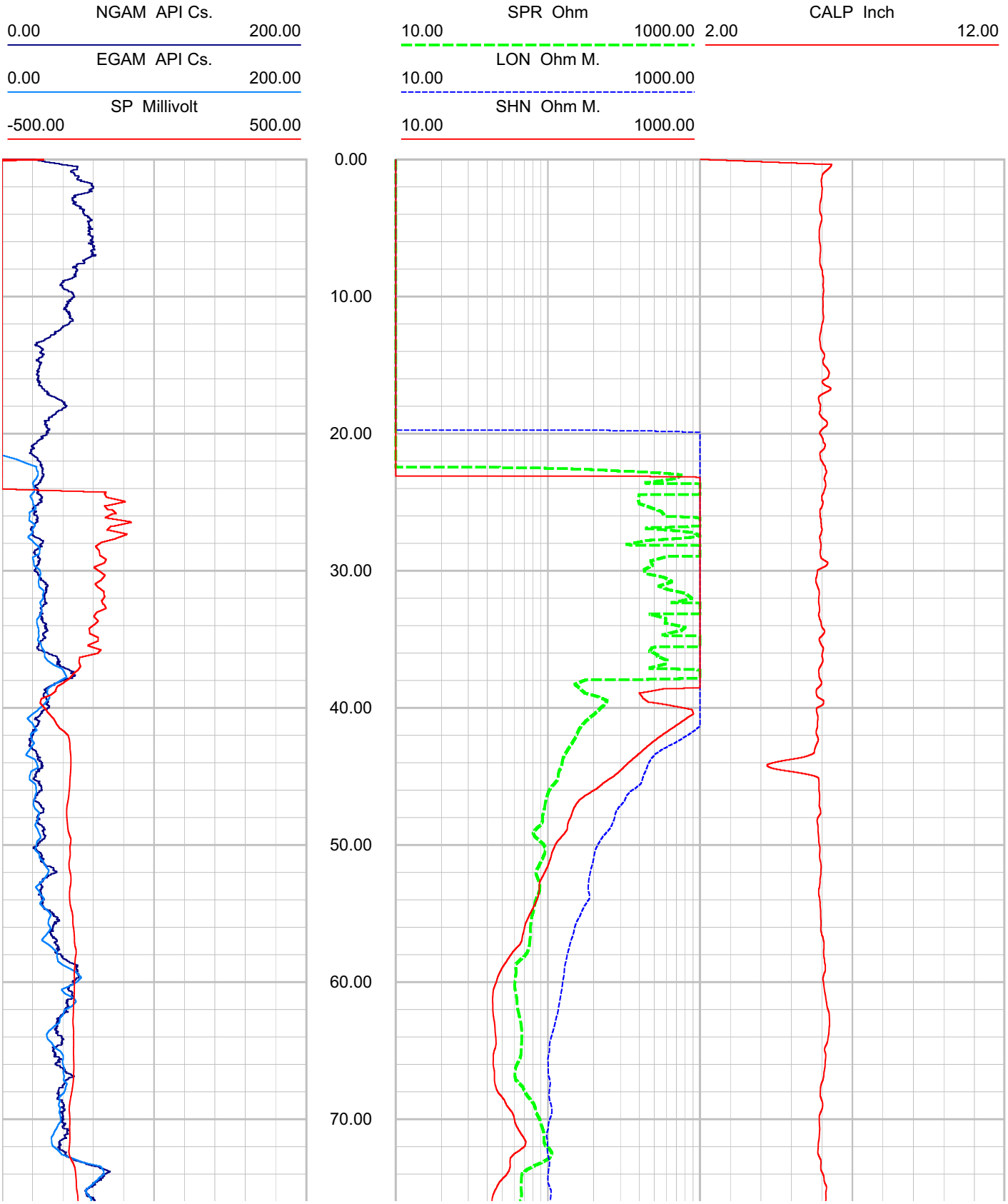
CCNPP COLA Boring B-773 ELOG, Caliper and Natural Gamma rev 1.1 Sheet 3 of 3



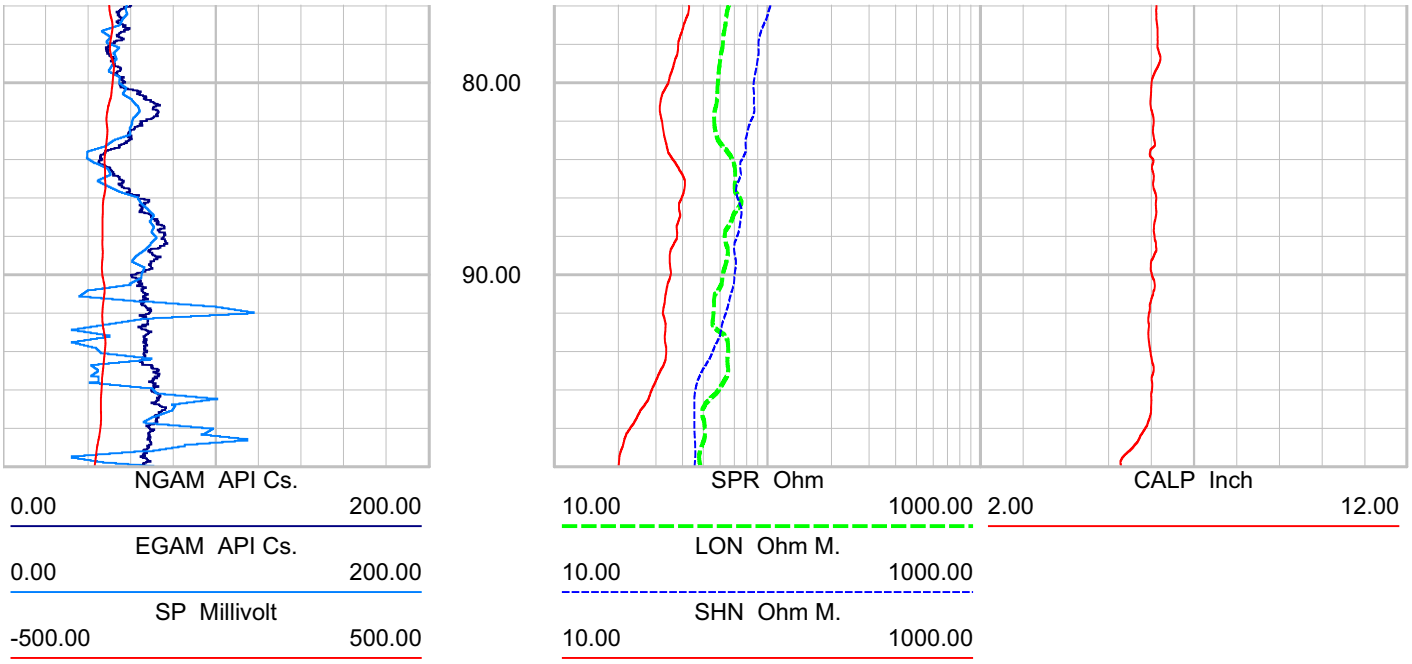
CCNPP COLA Boring B-786B ELOG, Caliper and Natural Gamma rev 1 Sheet 1 of 2



CCNPP COLA Boring B-786B ELOG, Caliper and Natural Gamma rev 1 Sheet 2 of 2



CCNPP COLA Boring B-821A ELOG, Caliper and Natural Gamma rev 1 Sheet 1 of 2



CCNPP COLA Boring B-821A ELOG, Caliper and Natural Gamma rev 1 Sheet 2 of 2

APPENDIX C

BORING GEOPHYSICAL LOGGING SYSTEMS - NIST TRACEABLE CALIBRATION PROCEDURES AND CALIBRATION RECORDS

CALIBRATION PROCEDURE FOR

GEOVision SEISMIC RECORDER/LOGGER

Reviewed 4/6/06

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole Seismic Velocity Logging, and P-S Suspension Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170, OYO/Robertson Model 3403, Geometrics Strataview or Geometrics Geode. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismograph Calibration Data Sheet with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as OYO Model 170) using test cable
3. Connect the function generator to the frequency counter using test cable.

4. Set up generator to produce a 100.0 Hz, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on logger display) peak square wave or sine wave. Verify frequency using the counter and initial space on the data sheet.

5. Initialize data logger and record a data record of at least 0.1 second using a 100 microsecond or less sample period.

6. Measure the recorded square wave frequency by measuring the duration of 9 cycles of data. This measurement can be made using the data logger display device, or by printing out a paper tape. If a paper tape can be printed, the resulting printout must be attached to this procedure. Record the data in the space provided.

7. Repeat steps 5 and 6 three more times using separate files.

Criteria

The duration for 9 cycles in any file must be 90.0 milliseconds plus or minus 0.9 milliseconds, corresponding to an average frequency for the nine cycles of 100.0 Hz plus or minus 1 Hz (obtained by dividing 9 cycles by the duration in milliseconds).

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl	President
Name	Title
	April 6, 2006
Signature	Date

Client Approval (if required):

Name	Title
Signature	Date

EDISON ESI™

A SOUTHERN CALIFORNIA EDISON® Company

Metrology
7300 Fenwick Lane
Westminster, CA 92683
Phone: 866-723-2257

Calibration Report

NVLAP Accredited
Calibration

GEOVision Geophysical Services
1151 Pomona Road, Unit P
Corona, CA 92882

TEST NUMBER
550394

NVLAP®
Lab Code:105014-0

Manufacturer: Oyo
Model Number: 3403
Description: Unit, Suspension Telemetry,
Asset Number: 160024
Serial Number: 160024
PO Number: 8200-080122-01

Condition As Found: In Tolerance
Condition As Left: In Tolerance
Calibration Date: 01/25/2008
Calibration Due Date: 01/25/2009
Calibration Interval: 12 Months

Remarks:

The UUT (unit under test) was calibrated using the customer's procedure. The UUT was operated by the customer's personnel and data collection was observed by SCE personnel. The UUT was found to be in tolerance to customer supplied specifications. The reference standards used are in compliance with ISO/IEC 17025:1999 and laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0. Frequency is accredited. Measurement uncertainity is 0.2 x E-12 Hz. Please see attached data.

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal,	12/28/2007	06/28/2008
S1-01347	Hewlett Packard	3325A	Generator, Function, Synthesizer	10/09/2007	04/09/2008
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/22/2008	01/22/2009

Procedure: Customer
Temperature: 23° C
Humidity: 37% RH
Test No.: 550394

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A (CAB)	Metrologist	714-895-0714	[signature]	1/25/08
Name	Title	Phone	Name	Date

This report may not be reproduced, except in full, without written permission of this laboratory. This report may not be used to claim product endorsement by NVLAP or any agency of the US Government. The results stated in this report relate only to the items tested or calibrated. Measurements reported herein are traceable to SI units via national standards maintained by NIST. This calibration is in compliance with NVLAP laboratory accreditation criteria established by NIST/NVLAP under the specific scope of accreditation for lab code 105014-0.

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Page 1 of 2

GEOVision geophysical services

SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3403
SERIAL NO.:	160024	CALIBRATION DATE:	01/25/2008
BY:	ROBERT STELLER	DUE DATE:	01/25/2009
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	12/28/2007
BY:	SCE #S1-01252	DUE DATE:	6/28/2008
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325A
SERIAL NO.:	2652A25647	CALIBRATION DATE:	10/9/2007
BY:	SCE #S1-01347	DUE DATE:	4/9/2008

SYSTEM SETTINGS:

GAIN:	10
FILTER:	20 KHZ
RANGE:	100 MILLISEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	01/25/2008, 12:20PM

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 AS LEFT 100.0

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	401	100.0	90.0	90.0	90.0	100.0
SQUARE	402	100.0	90.0	90.0	90.0	100.0
SINE	403	100.0	90.0	90.0	90.0	100.0
SINE	404	100.0	90.1	90.0	90.0	100.0

CALIBRATED BY: ROBERT STELLER 1/25/2008 Robt Steller

NAME DATE SIGNATURE

Page 2 of 2

Seismic recorder/Logger Calibration Data Sheet Rev 1.30 4-6-06

GEOVision SUSPENSION PS SEISMIC LOGGER/RECORDER

CALIBRATION PROCEDURE

Reviewed 7/21/08

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole P-S Seismic Velocity Logging, and Suspension P-S Seismic Velocity Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the OYO Model 170 or OYO/Robertson Model 3403. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic logger/recorders, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Suspension P-S Seismic Logger/Recorder Calibration Data Form with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as OYO Model 170) using test cable
3. Connect the function generator to the frequency counter using test cable.
4. Set signal generator to target frequency specified on data form, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on

logger display) peak sine wave. Verify frequency using the counter and note actual frequency on the data form.

5. Set data logger to file length specified on data form and record a data file to disk. Note file name on data form.

6. Measure the duration of 9 complete sine wave cycles on the data file. This measurement must be made using the analysis program PSLOG.EXE version 1.00, and saved as a .sps pick file. Note the duration in milliseconds in the spaces provided on the data form. Calculate average recorded sine wave frequency for each channel pair (Hn, Hr, V) by dividing the duration by 9. Note the average frequency of each channel pair on the data form.

7. Repeat steps 4 through 6 until all target frequencies have been recorded, producing 6 separate data and pick files.

Criteria

The average frequency for the nine cycles (obtained by dividing 9 cycles by the duration in seconds) must be within plus or minus 1% of the actual frequency for each of the 6 records.

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl	President
Name	Title
	July 21, 2008
Signature	Date

Calibration Laboratory Approval (if required):

Name	Title
Signature	Date

EDISON ESI℠

A SOUTHERN CALIFORNIA EDISON® Company

Metrology
7300 Fenwick Lane
Westminster, CA 92683
Phone: 866-723-2257

Calibration Report

NVLAP Accredited
Calibration

GEOVision Geophysical Services
1124 Olympic Drive
Corona, CA 92881-3390

TEST NUMBER
558549

NVLAP®
Lab Code:105014-0

Manufacturer:	Oyo	**Condition As Found:**	In Tolerance
Model Number:	3403	**Condition As Left:**	In Tolerance
Description:	Unit, Suspension Telemetry,	**Calibration Date:**	08/01/2008
Asset Number:	160024	**Calibration Due Date:**	08/01/2009
Serial Number:	160024	**Calibration Interval:**	12 Months
PO Number:	8200-080122-01		

Remarks:

This unit was calibrated with the customer's old procedure and specifications which have been reviewed by Metrology Engineering and documented in SCE Document M013684. The data can be found on page 2 of this report with the original observation data on page 3. The unit was then calibrated with the customer's new procedure and specification's which have been reviewed by Metrology Engineering and documented in SCE Document M013987. The data can be found on pages 4 and 5 of this report with the original observation data on page 6 of this report. Corrected Copy: This record created to add missing maximum error calculations on page 6 of 6. CAB 8-5-08

Standards Utilized

I.D. No.	Mfg.	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal,	07/17/2008	01/17/2009
S1-01347	Hewlett Packard	3325A	Generator, Function, Synthesizer	04/24/2008	10/24/2008
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/22/2008	01/22/2009

Procedure: Customer
Temperature: 23° C
Humidity: 52% RH
Test No.: 558549

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A	Metrologist	714-895-0714		8-5-08
Name	Title	Phone	Name	Date

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Test No. 558549
Asset No. 160024

Custom Specification Report

Oyo 3403 Unit, Suspension Telemetry,

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH HN Frequency Square Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	Sine Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	CH HR Frequency Square Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	Sine Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	CH V Frequency Square Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	Sine Wave	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500 Hz]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {4A70366A-164D-4E33-8F79-34E3FDFFA198} (c)
Doc DUI: {293A3A00-D536-43A0-A1E5-945133CD4CF7} (o)

ATTACHMENT 1
Page 1 of 1

Customer

GEOVision geophysical services PAGE 3 OF 6

SEISMOGRAPH CALIBRATION DATA SHEET REV 4/6/06

INSTRUMENT DATA

SYSTEM MFR:	OYO	MODEL NO.:	3403
SERIAL NO.:	160024	CALIBRATION DATE:	8/1/2008
BY:	CRAIG BRANSON	DUE DATE:	8/1/2009
COUNTER MFR:	HEWLETT PACKARD	MODEL NO.:	5335A
SERIAL NO.:	2626A09881	CALIBRATION DATE:	7/17/2008
BY:	SCE #S1-01252	DUE DATE:	1/17/2009
FCTN GEN MFR:	HEWLETT PACKARD	MODEL NO.:	3325A
SERIAL NO.:	2652A25647	CALIBRATION DATE:	4/24/2008
BY:	SCE #S1-01347	DUE DATE:	10/24/2008

SYSTEM SETTINGS:

GAIN:	2
FILTER:	10 KHZ
RANGE:	100 MILLISEC
DELAY:	0
STACK: 1 (STD)	1
PULSE:	1.6
DISPLAY:	NA
SYSTEM: DATE = CORRECT DATE & TIME	8/1/2008 715

PROCEDURE:

SET FREQUENCY TO 100.0HZ SQUAREWAVE WITH AMPLITUDE APPROXIMATELY 0.25 VOLT PEAK. RECORD BOTH ON DISK AND PAPER TAPE, IF AVAILABLE. ANALYZE AND PRINT WAVEFORMS FROM ANALYSIS UTILITY. ATTACH PAPER COPIES OF PRINTOUT AND PAPER TAPES, IF AVAILABLE, TO THIS FORM. AVERAGE FREQUENCY MUST BE BETWEEN 99.0 AND 101.0 HZ.

AS FOUND 100.0 HZ AS LEFT 100.0 HZ

WAVEFORM	FILE NO	FREQUENCY	TIME FOR 9 CYCLES Hn	TIME FOR 9 CYCLES Hr	TIME FOR 9 CYCLES V	AVERAGE FREQ.
SQUARE	501	100.0	90.00 MS	90.00 MS	90.00 MS	100.0 HZ
SQUARE	502	100.0	90.00 MS	90.00 MS	90.00 MS	100.0 HZ
SINE	503	100.0	90.00 MS	90.00 MS	90.00 MS	100.0 HZ
SINE	504	100.0	90.00 MS	90.00 MS	90.00 MS	100.0 HZ

CALIBRATED BY: CRAIG BRANSON 8/1/2008 Craig Branson

NAME DATE SIGNATURE

Seismic recorder/Logger Calibration Data Sheet Rev 1.30 4-6-06

Test No. 558549
Asset No. 160024

Custom Specification Report

Oyo 3403 Logger/Recorder, Seismic, PS Suspension

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH HN Frequency Sine Wave	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500]
	|	200.0 Hz	200.0	Same		198.0 to 202.0 Hz [EMU 0.001000]
	|	500.0 Hz	500.0	Same		495.0 to 505.0 Hz [EMU 0.002500]
	|	1000 Hz	1000	Same		990 to 1010 Hz [EMU 0.005000]
	|	2000 Hz	2000	Same		1980 to 2020 Hz [EMU 0.010000]
	CH HR Frequency Sine Wave	50.00 Hz	49.95	Same		49.50 to 50.50 Hz [EMU 0.000250]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500]
	|	200.0 Hz	200.2	Same		198.0 to 202.0 Hz [EMU 0.001000]
	|	500.0 Hz	500.0	Same		495.0 to 505.0 Hz [EMU 0.002500]
	|	1000 Hz	1001	Same		990 to 1010 Hz [EMU 0.005000]
	|	2000 Hz	2000	Same		1980 to 2020 Hz [EMU 0.010000]
	CH V Frequency Sine Wave	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	|	100.0 Hz	100.0	Same		99.0 to 101.0 Hz [EMU 0.000500]
	|	200.0 Hz	199.8	Same		198.0 to 202.0 Hz [EMU 0.001000]
	|	500.0 Hz	500.0	Same		495.0 to 505.0 Hz [EMU 0.002500]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {9548AF3D-C74D-4C9F-AEEF-21EF560BC451} (c)
Doc DUI: {AAAE8731-399D-47BC-98B7-62728C8250BE} (o)

ATTACHMENT 2
Page 1 of 2

Customer

Test No. 558549
Asset No. 160024

Custom Specification Report

Oyo 3403 Logger/Recorder, Seismic, PS Suspension

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH V Frequency Sine Wave	1000 Hz	1000	Same		990 to 1010 Hz [EMU 0.005000]
	|	2000 Hz	1998	Same		1980 to 2020 Hz [EMU 0.010000]

Remarks:

MulCals CPM: Version 2.2.2 (Professional)
Src DUI: {9548AF3D-C74D-4C9F-AREF-21EF560BC451} (c)
Doc DUI: {AAAE8731-399D-47BC-98B7-62728C8250BE} (o)

ATTACHMENT 2
Page 2 of 2

Customer

GEOVision geophysical services PAGE 6 OF 6

SUSPENSION PS SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Oyo	Model no.:	3403
Serial no.:	160024	Calibration date:	8/1/2008
By:	Craig Branson	Due date:	8/1/2009
Counter mfg.:	Hewlett-Packard	Model no.:	5335A
Serial no.:	2626A09881	Calibration date:	7/17/2008
By:	SCE #S1-01252	Due date:	1/17/2009
Signal generator mfg.:	Hewlett-Packard	Model no.:	3325A
Serial no.:	2652A25647	Calibration date:	4/24/2008
By:	SCE #S1-01347	Due date:	10/24/2008

SYSTEM SETTINGS:

Gain:	2
Filter	10KHz
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	8/1/2008 728

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Note actual frequency on data form.
Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PSLOG.EXE program, note duration on data form, and save as .sps file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found 0.10% As left 0.10%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Hn (msec)	Average Frequency Hn (Hz)	Time for 9 cycles Hr (msec)	Average Frequency Hr (Hz)	Time for 9 cycles V (msec)	Average Frequency V (Hz)
50.00	50.00	200	505	180.0	50.00	180.2	49.95	180.0	50.00
100.0	100.0	100	506	90.00	100.0	90.00	100.0	90.00	100.0
200.0	200.0	50	507	45.00	200.0	44.95	200.2	45.05	199.8
500.0	500.0	20	508	18.00	500.0	18.00	500.0	18.00	500.0
1000	1000	10	509	9.000	1000	8.990	1001	9.000	1000
2000	2000	5	510	4.500	2000	4.500	2000	4.505	1998

Calibrated by: Craig Branson (Name) 8/1/2008 (Date) Craig Branson (Signature)

Witnessed by: Robert Steller (Name) 8/1/2008 (Date) R S (Signature)

Suspension PS Seismic Recorder/Logger Calibration Data Form Rev 2.0 July 21, 2008

GEOVision Borehole Geophysics depth wheel verification

Performed by Robert Steller

	Depth reading in #1	Depth reading out	Depth reading in #2
Depth wheel S/N 101 500 pulse/revolution (gear 1:5, encoder 100 ppr) Circumference = 983mm (3225.07 millifeet)	100.1 feet (30.51 m) September 23, 2006	99.95 feet (30.46 m) September 23, 2006	100.05 feet (30.50 m) September 23, 2006
Depth wheel S/N 102 500 pulse/revolution (gear 1:5, encoder 100 ppr) Circumference = 994mm (3261.15 millifeet)	100.00 feet (30.48) m September 23, 2006	100.05 feet (30.50 m) September 23, 2006	100.00 feet (30.48) m September 23, 2006
Aries winch 200 pulse/revolution (gear 1:1, encoder 200 ppr) Circumference = 305.9mm (1003.51 millifeet)	100.05 feet (30.50 m) September 23, 2006	100.05 feet (30.50 m) September 23, 2006	100.00 feet (30.48 m) September 23, 2006
Robertson Depth wheel For MiniWinch 1000 pulse/revolution (gear 1:1, encoder 1000 ppr) Circumference = 400mm (1312 millifeet)	99.92 feet (30.46 m) Re-verified June 7, 2007	100.10 feet (30.51 m) Re-verified June 7, 2007	99.90 feet (30.45 m) Re-verified June 7, 2007
Robertson Smartwinch 200 S/N 5802 5000 pulse/revolution (gear 1:4, encoder 1250 ppr) Circumference = 404mm (1326 millifeet)	99.99 feet (30.48 m) June 6, 2007	99.97 feet (30.47 m) June 6, 2007	100.00 feet (30.48 m) June 6, 2007
Comprobe winch 500 pulse/revolution (gear 1:1, encoder 500 ppr) Circumference = 1000mm (3.281 feet)	100.1 feet (30.5 m) Re-verified June 7, 2007	100.1 feet (30.5 m) Re-verified June 7, 2007	100.1 feet (30.5 m) Re-verified June 7, 2007

All measurements taken with a Stanley 100ft flexible stainless steel tape model number 34-130, and a Keeson 300 foot fiberglass tape, both marked in feet, inches and 1/8ths of inches. Enough cable was spooled off of the winch to allow the cable and tape measures to be laid flat on the parking lot surface side-by-side. A permanent marker was used to mark a 100.0 foot interval on the cable, and the marks were also tagged with electrical tape for visibility. The cable was then spooled back onto the winch. When the first mark was at the top of the measuring wheel, a matching permanent mark was placed, and the recording system (Robertson Micrologger) was set to 0.0 feet depth. The cable was spooled in to the second mark, and the distance was recorded. The recording system was set to 0.0 feet again, and the cable spooled out to the first mark again, and the distance was recorded. The process was repeated one more time to spool the cable back onto the winch, and the distance was recorded.

Estimated accuracy is of these measurements is +/- 0.1 foot or +/- 0.03m.

GEOVision Suspension PS probe Receiver 1–Receiver 2 (R1-R2) spacing verification

Performed by Robert Steller on September 23, 2006

	R2 center to R1 center hanging dry	R2 center to R1 center hanging submerged	R1 bottom to source center hanging submerged with 1m isolation tube S/N 280068	R1 center to source center hanging submerged with 1m isolation tube S/N 280068
Receiver S/N 30086	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m	83.5in 2.12m
Receiver S/N 20042	39.8in 1.01m	39.6in 1.01m	75.7in 1.92m	83.2in 2.11m
Receiver S/N 12008	40.2in 1.02m	40.0in 1.02m	76.0in 1.93m	83.5in 2.12m

All measurements taken with a Lufkin 3.7m flexible steel tape model number HV1034DM, marked in mm and 100th of feet. Probe suspended in 3-inch diameter clear PVC pipe, using chain clamp placed between bottom and center of Receiver 2 hard section (See Figure). Probe "bounced" to establish unrestricted hanging length before measurement. Probe allowed to relax for 5 minutes prior to each measurement. Water level set to submerge bottom of Receiver 2 hard section.. Estimated accuracy due to hysterisis in rubber section approximately +/- 0.01' or +/- 0.003m.

APPENDIX D

BORING GEOPHYSICAL LOGGING FIELD DATA LOGS

GEOVision
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B-773 BORING GEOPHYSICS FIELD LOG SUMMARY

Borehole*

SITE*: Calvert Cliffs
DATE*: 7/29/08
CLIENT*: Schnabel Engineering, LLC
JOB*: 8299
AUTHOR*: C. Carter
PAGE*: 1 OF 1

CONTACT:
PHONE:

BOREHOLE CONSTRUCTION: CASED UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 9.5 ft ; 5", 9.5' TO 165 ft
BOREHOLE TOTAL DEPTH AS DRILLED*: 165 ft
SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 9.5 ft ; NO
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER ; FRESH WATER MUD X ; SALT WATER MUD ;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
Caliper	B773CALTEST01		7/29/08	8:55 - 8:57 am
~~Caliper~~	PVC ~~CALTEST01~~			
Caliper	PVC TEST01		7/29/08	9:28 - 9:29 am
Caliper	PVC TEST02		7/29/08	9:33 - 9:33 am
ELOG	B773ELOGTEST01		7/29/08	9:50 - 9:52 am
ELOG	B773ELOGTEST02		7/29/08	11:55 - 11:57 am
ELOG	B773ELOGUP01	166.75 - 36.3 ft	7/29/08	2:00 - 2:14 pm
PS Velocity	B773SUSPDOWN01	6.56 - 150.92 ft	7/29/08	2:44 - 3:39 pm
Caliper	B773CALTEST02		7/29/08	4:09 - 4:11 pm
Caliper	B773CALUP01	165.05 - 4.3 ft	7/29/08	4:26 - 4:43 pm
Caliper	B773CALTEST03		7/29/08	4:51 - 4:52 pm
Deviation	B773AUUP01	165.3 - 3.2 ft	7/29/08	5:23 - 5:34 pm

cc 7/29/08
c 7/29/08

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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geophysical services

B-773 ELOG FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 7/29/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 9.5 ft ; 5", 9.5' TO 165 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 165 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 9.5 ft ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~ 5 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 12 pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 5:45 am
ARRIVED ON SITE: 6:30 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-773 ELOG FIELD LOG
Borehole*

SITE*:Calvert Cliffs
CLIENT*:Schnabel Engineering, LLC
AUTHOR*:C. Carter

DATE*: 7/29/08
JOB*:8299
PAGE: PAGE 2 OF 2

WINCH: COMPROBE ___ SILVER X OYO ___ RG ___ OTHER ___
MICROLOGGER* 5310 [ ] 5772 [X] OTHER ___
ELOG PROBE* 5490 [X] OTHER ___
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)*	32.8	
MINUS CASING STICK-UP*	-1.58	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	39.42	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	39.25	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.17	

LOG NAME*	START DEPTH*	START TIME	END DEPTH*	END TIME	
B773ELOGTEST01		9:50am		9:52am	w/GV test box
B773ELOGTEST02		11:55am		11:57am	w/RG test box
B773ELOGUP01	166.75 ft	2:00	36.3 ft	2:14	

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES: GV test box S/N B5309813
RG test box S/N 3153

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-773 Borehole

P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

SITE*: Calvert Cliffs NPP DATE*: 7/29/08
CLIENT*: Schnabel Engineering JOB*: 8299
AUTHOR*: C. Carter PAGE 1 OF * 5

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION*: CASED _____ UNCASED x
DIAMETERS AND DEPTH RANGES*: 6" 0 TO 9.5' ; 5", 9.5 TO 165 ft
BOREHOLE TOTAL DEPTH AS DRILLED*: 165 ft
SURFACE CASING?: X DEPTH TO BOTTOM OF CASING 9.5 ft; NO _____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~5 ft
BOREHOLE FLUID: WATER____; FRESH WATER MUD x ; SALT WATER MUD; _____
OTHER: _____
DEPTH TO BOREHOLE FLUID*: Ø TIME SINCE LAST CIRCULATION: 12pm

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-773 Borehole*

P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

SITE*:Calvert Cliffs DATE*: 7/24/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE 2 OF * 5

LOGGING CREW*: C. Carter
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 5:45 am
ARRIVED ON SITE: 6:30 am
STANDBY TIME: CAUSE:
LOGGING STARTED: 2:44 pm LOGGING COMPLETED: 3:39 pm

BATTERIES CHANGED BEFORE LOGGING: YES X ; NO ; STORED WITH NEW

WINCH	COMPROBE ☐		GREY ☒	OYO ☐	RG ☐	OTH		
INSTRUMENT*	OYO 12004 ☐	15014 ☐	19029 ☐	RG 160023 ☐	160024 ☒			
RECEIVER S/N*	12008 ☐	20042 ☒	26066 ☐	11001 ☐	23053 ☐	30086 ☐		
ISOLATION TUBE S/N*	300083 ☐	24053 ☐	28068 ☒	28072 ☐	2M			
SHEAVE*	COMPROBE ☐	OYO 101 ☐	102 ☐	103 ☒	RG ☐			
MICROLOGGER*	5310 ☐	5772 ☒	NOT APPLICABLE (OYO) ☐					
PROBE OFFSET*	OYO 2.0M ☐	RG 2.5M ☒						

MINUS CASING STICK-UP* .48
DEPTH REF. OFFSET AT START* 2.02
DEPTH REF. OFFSET AT END* 2.00
AFTER SURVEY DEPTH ERROR* .02
} REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B773SVSPDOWN07	6.56 ft	2:44 pm	150.92 ft	3:39 pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:
COMMENTS:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

B-773 **GEOVISION SUSPENSION LOGGING FIELD NOTES**

SITE*: Calvert Cliffs DATE*: 7/29/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 3 OF 5

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64			
1.0	3.28			
1.5	4.92			
2.0	6.56	001		2:44
2.5	8.20	2		
3.0	9.84	3		
3.5	11.48	4		
4.0	13.12	5		
4.5	14.76	6		
5.0	16.40	007		
5.5	18.04	8		
6.0	19.69	9		
6.5	21.33	10		
7.0	22.97	11		
7.5	24.61	12		
8.0	26.25	13		
8.5	27.89	14		
9.0	29.53	15		
9.5	31.17	16		
10.0	32.81	17		
10.5	34.45	18		
11.0	36.09	19		
11.5	37.73	20		
12.0	39.37	21		
12.5	41.01	22		
13.0	42.65	23		
13.5	44.29	24		
14.0	45.93	25		
14.5	47.57	26		
15.0	49.21	27		
15.5	50.85	28		
16.0	52.49	29		
16.5	54.13	30		
17.0	55.77	31		
17.5	57.41	32		
18.0	59.06	33		
18.5	60.70	34		
19.0	62.34	35		
19.5	63.98	36		
20.0	65.62	37		
20.5	67.26	38		

P-S FIELD LOG REV V1.31a

B-773 GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Calvert Cliffs DATE*: 7/29/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 4 OF 5

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
21.0	68.90	39		
21.5	70.54	40		
22.0	72.18	41		
22.5	73.82	42		
23.0	75.46	43		
23.5	77.10	44		
24.0	78.74	45		
24.5	80.38	46		
25.0	82.02	47		
25.5	83.66	48		
26.0	85.30	49		
26.5	86.94	50		
27.0	88.58	51		
27.5	90.22	52		
28.0	91.86	53		
28.5	93.50	54		
29.0	95.14	55		
29.5	96.78	56		
30.0	98.43	57		
30.5	100.07	58		
31.0	101.71	59		
31.5	103.35	60		
32.0	104.99	61		
32.5	106.63	62		
33.0	108.27	63		
33.5	109.91	64		
34.0	111.55	65		
34.5	113.19	66		
35.0	114.83	67		
35.5	116.47	68		
36.0	118.11	69		
36.5	119.75	70		
37.0	121.39	71		
37.5	123.03	72		
38.0	124.67	73		
38.5	126.31	74		
39.0	127.95	75		
39.5	129.59	76 cc 7/29/08		
40.0	131.23	~~67~~ 77		
40.5	132.87	78		
41.0	134.51	79		

P-S FIELD LOG REV V1.31a

B-713 GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Calvert Cliffs DATE*: 7/29/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 5 OF 5

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
41.5	136.15	80		
42.0	137.80	81		
42.5	139.44	82		
43.0	141.08	83		
43.5	142.72	84		
44.0	144.36	85		
44.5	146.00	86		
45.0	147.64	87		
45.5	149.28	88		
46.0	150.92	89		3:39
46.5	152.56			
47.0	154.20			
47.5	155.84			
48.0	157.48			
48.5	159.12			
49.0	160.76			
49.5	162.40			
50.0	164.04			
50.5	165.68			
51.0	167.32			
51.5	168.96			
52.0	170.60			
52.5	172.24			
53.0	173.88			
53.5	175.52			
54.0	177.17			
54.5	178.81			
55.0	180.45			
55.5	182.09			
56.0	183.73			
56.5	185.37			
57.0	187.01			
57.5	188.65			
58.0	190.29			
58.5	191.93			
59.0	193.57			
59.5	195.21			
60.0	196.85			
60.5	198.49			
61.0	200.13			
61.5	201.77			

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B-773 CALIPER FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 7/29/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 9.5 ft ; 5", 9.5 TO 165 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 165 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 9.5 ft; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: 15 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: ϕ TIME SINCE LAST CIRCULATION: 12 pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 5:45 am
ARRIVED ON SITE: 6:30 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-773 Borehole* CALIPER FIELD LOG

SITE*:Calvert Cliffs
CLIENT*:Schnabel Engineering, LLC
AUTHOR*:C. Carter

DATE*: 7/29/08
JOB*:8299
PAGE: PAGE 2 OF 2

WINCH: COMPROBE ___ SILVER X OYO ___ RG ___ OTHER ___
MICROLOGGER* 5310 [ ] 5772 [X] OTHER
CALIPER PROBE* 5368 [X] OTHER
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE OFFSET	2.08M(6.82 FT)	12 IN MAX
MINUS CASING STICK-UP*	1.58	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.24	
DEPTH REF. OFFSET AT END*	5.10	
AFTER SURVEY DEPTH ERROR*	.14	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*
B773CALTEST01		8:55a		8:57
B773CALTEST02		4:09pm		4:11pm
B773CALUP01	165.05 ft	4:26pm	4.3 ft	4:43pm
B773CALTEST03		4:51		4:52pm
PVCTEST01		9:28am		9:29am
PVCTEST02		9:33am		9:33am

CALIBRATION PLATE S/N 201

	FILE NAME	AS BUILT 1.968 IN (50 MM)	AS BUILT 3.937 IN (100 MM)	AS BUILT 8.000 IN (203.2 MM)	PVC FITTING ~~4.510 IN~~ (114.3 MM)	
AS MEAS.*	B773 CALTEST01	1.966	3.903	8.02		
AS MEAS.*	B773CALTEST02	1.949	3.901	8.01		
AS MEAS.	B773CALTEST03	1.964	3.919	8.02		
AS MEAS.						
AS MEAS.	PVCTEST01				4.479	*
AS MEAS.	PVC TEST02				4.50	*

cc 7/29/08 4.501

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)
Calibration plate S/N 201

SUGGESTIONS, ADDITIONS, CHANGES: * PVC Tests performed w/ Schnabel's PVC fitting. cc 7/29
1st test (01) w/ caliper arms inside fitting, 2nd test (02) w/ caliper arms near top ~~of~~ of fitting where the fitting was calibrated,

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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B-773 ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a

Borehole*

SITE*: Calvert Cliffs DATE*: 7/29/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 1 OF 2

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DRILLER _____ PHONE: Off Cell _____
COMPANY: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 9.5 ft ; 5", 9.5 TO 165 ft

BOREHOLE TOTAL DEPTH AS DRILLED*: 165 ft

SURFACE CASING?: YES X DEPTH TO BOTTOM OF CASING 9.5 ft ; NO ____
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~5 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X ; SALT WATER MUD ____;
OTHER: _____
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 12 pm

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE: _____
MOBILIZED FROM: _____ DEPARTURE TIME: 5:45 am
ARRIVED ON SITE: 6:30 am
STANDBY TIME: _____ CAUSE: _____

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B773 ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a

Borehole*

SITE*: Calvert Cliffs DATE*: 7/29/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 2 OF 2

WINCH: COMPROBE____ SILVER X OYO____ OTHER____
MICROLOGGER* 5310___ 5772 X
TELEVIEWER* ACOUSTIC #5174 X OTHER____
SHEAVE* COMPROBE____ OYO 101____ 102____ 103 X RG____

1 PROBE TILT TEST* 91.46 BRUNTON TILT* 91
2 PROBE TILT TEST* 21.05 BRUNTON TILT* 20
3 PROBE TILT TEST* 10.06 BRUNTON TILT* 10 AFTER LOG* yes
1 PROBE AZIMUTH TEST* 35.2 BRUNTON AZIMUTH* 37
2 PROBE AZIMUTH TEST* 125.2 BRUNTON AZIMUTH* 122
3 PROBE AZIMUTH TEST* 72.10 BRUNTON AZIMUTH* 74 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.58	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.14	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.10	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.04	REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B773AUUP01	165.3 ft	5:23 pm	3.2 ft	5:34 pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES: Brunton S/N: 5081006119

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B
Borehole*

BORING GEOPHYSICS FIELD LOG SUMMARY

SITE*: Calvert Cliffs
DATE*: 11/10/08
CLIENT*: Schnabel Engineering, LLC
JOB*: 8299
AUTHOR*: C. Carter
PAGE*: 1 OF 1

CONTACT:
PHONE:

BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft
SURFACE CASING?: YES____ DEPTH TO BOTTOM OF CASING____; NO X
DEPTH TO BEDROCK: NA
BOREHOLE FLUID: WATER____; FRESH WATER MUD X; SALT WATER MUD ____;

LOGGING CREW: C. Carter

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
ELOG	B786BELOGTEST01		11/10/08	11:42-11:45am
ELOG	B786BELOGUP01	114.8-23.75ft	11/10/08	12:28-12:37pm
P-S velocity	B786BSUSPDOWN01	0.5-30.5m	11/10/08	1:19-1:58pm
Deviation	B786BAUUP01	101.2-0	11/10/08	2:56-3:04pm
Caliper	B786BCALTEST01		11/10/08	3:24-3:26pm
Caliper	B786BCALUP01	103.2-0.3ft	11/10/08	3:42-3:55pm
Caliper	B786BCALTEST02		11/10/08	4:10-4:12pm

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B ELOG FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 11/10/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~12 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 11am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 10 am
ARRIVED ON SITE: 10:40 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B
Borehole*

ELOG FIELD LOG

SITE*:Calvert Cliffs
CLIENT*:Schnabel Engineering, LLC
AUTHOR*:C. Carter

DATE*: 11/10/08
JOB*:8299
PAGE: PAGE 2 OF 2

11/10/08

WINCH: COMPROBE ____ SILVER X OYO ____ RG ____ OTHER ____
MICROLOGGER* 5310 [ ] 5772 [X] OTHER ____
ELOG PROBE* 5490 [X] OTHER ____
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)*	32.8	
MINUS CASING STICK-UP*	1.50	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	39.5	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	39.7	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.2	

LOG NAME*	START DEPTH*	START TIME	END DEPTH*	END TIME
B786BELOGTEST01		11:42am		11:45am
B786BELOGUP01	114.8 ft	12:28pm	23.75 ft	12:37pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

Borehole

SITE*: Calvert Cliffs NPP DATE*: 11/10/08

CLIENT*: Schnabel Engineering JOB*: 8299

AUTHOR*: C. Carter PAGE 1 OF * 4

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____

BOREHOLE CONSTRUCTION*: CASED _____ UNCASED X

DIAMETERS AND DEPTH RANGES*: 6" 0 TO 115 ft ; _____, _____ TO _____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: _____ DEPTH TO BOTTOM OF CASING _____; NO X

DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~12 ft

BOREHOLE FLUID: WATER _____; FRESH WATER MUD X; SALT WATER MUD; _____

OTHER: _____

DEPTH TO BOREHOLE FLUID*: Ø TIME SINCE LAST CIRCULATION: 11am

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

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B-786B P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

Borehole*

SITE*:Calvert Cliffs DATE*: 11/10/08

CLIENT*:Schnabel Engineering, LLC JOB*:8299

AUTHOR*:C. Carter PAGE 2 OF *4

LOGGING CREW*: C. Carter

MOBILIZED FROM: Lexington Park DEPARTURE TIME: 10 am

ARRIVED ON SITE: 10:40 am

STANDBY TIME: CAUSE:

LOGGING STARTED: 1:19 pm LOGGING COMPLETED: 1:58 pm

BATTERIES CHANGED BEFORE LOGGING: YES____; NO X; STORED WITH NEW____

WINCH COMPROBE ☐ GREY ☒ OYO ☐ RG ☐ OTH ____

INSTRUMENT* OYO 12004 ☐ 15014 ☐ 19029 ☐ RG 160023 ☐ 160024 ☒

RECEIVER S/N* 12008 ☐ 20042 ☐ 26066 ☐ 11001 ☐ 23053 ☐ 30086 ☒

ISOLATION TUBE S/N* 300083 ☒ 24053 ☐ 28068 ☐ 28072 ☐ 2M ____

SHEAVE* COMPROBE ☐ OYO 101 ☐ 102 ☐ 103 ☒ RG ☐

MICROLOGGER* 5310 ☐ 5772 ☒ NOT APPLICABLE (OYO) ☐

PROBE OFFSET* OYO 2.0M ☐ RG 2.5M ☒

MINUS CASING STICK-UP* .46

DEPTH REF. OFFSET AT START* 2.04

DEPTH REF. OFFSET AT END* 2.04

AFTER SURVEY DEPTH ERROR* .00

} REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B786BSUSPDOWN01	~~0.5~~ 0.5m	1:19pm	30.5m	1:58pm
	cc 11/10/08			

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

B-786B GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Calvert Cliffs DATE*: 11/10/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 3 OF 4

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64	001		1:19pm
1.0	3.28	2		
1.5	4.92	3		
2.0	6.56	4		
2.5	8.20	5		
3.0	9.84	6		
3.5	11.48	7		
4.0	13.12	8		
4.5	14.76	9		
5.0	16.40	10		
5.5	18.04	11		
6.0	19.69	12		
6.5	21.33	13		
7.0	22.97	14		
7.5	24.61	15		
8.0	26.25	16		
8.5	27.89	17		
9.0	29.53	18		
9.5	31.17	19		
10.0	32.81	20		
10.5	34.45	21		
11.0	36.09	22		
11.5	37.73	23		
12.0	39.37	24		
12.5	41.01	25		
13.0	42.65	26		
13.5	44.29	27		
14.0	45.93	28		
14.5	47.57	29		
15.0	49.21	30		
15.5	50.85	31		
16.0	52.49	32		
16.5	54.13	33		
17.0	55.77	34		
17.5	57.41	35		
18.0	59.06	36		
18.5	60.70	37		
19.0	62.34	38		
19.5	63.98	39		
20.0	65.62	40		
20.5	67.26	41		

P-S FIELD LOG REV V1.31a

B-7868 **GEOVISION SUSPENSION LOGGING FIELD NOTES**

SITE*: Calvert Cliffs DATE*: 11/10/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 3-4 cc 11/10/08 OF 4

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
21.0	68.90	42		
21.5	70.54	43		
22.0	72.18	44		
22.5	73.82	45		
23.0	75.46	46		
23.5	77.10	47		
24.0	78.74	48		
24.5	80.38	49		
25.0	82.02	50		
25.5	83.66	51		
26.0	85.30	52		
26.5	86.94	53		
27.0	88.58	54		
27.5	90.22	55		
28.0	91.86	56		
28.5	93.50	56		
29.0	95.14	58		
29.5	96.78	59		
30.0	98.43	60		
30.5	100.07	61		1:58pm
31.0	101.71			
31.5	103.35			
32.0	104.99			
32.5	106.63			
33.0	108.27			
33.5	109.91			
34.0	111.55			
34.5	113.19			
35.0	114.83			
35.5	116.47			
36.0	118.11			
36.5	119.75			
37.0	121.39			
37.5	123.03			
38.0	124.67			
38.5	126.31			
39.0	127.95			
39.5	129.59			
40.0	131.23			
40.5	132.87			
41.0	134.51			

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B-786B ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a
Borehole*

SITE*: Calvert Cliffs DATE*: 11/10/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: ~12 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 11 am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 10 am
ARRIVED ON SITE: 10:40 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a
Borehole*

SITE*: Calvert Cliffs DATE*: 11/10/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 2 OF 2

WINCH: COMPROBE____ SILVER x OYO____ OTHER____
MICROLOGGER* 5310___ 5772 x
TELEVIEWER* ACOUSTIC #5174 x OTHER____
SHEAVE* COMPROBE____ OYO 101___ 102___ 103 x RG____

PROBE TILT TEST* 86.29 BRUNTON TILT* 86
PROBE TILT TEST* 28.33 BRUNTON TILT* 29
PROBE TILT TEST* 39.1 BRUNTON TILT* 39 AFTER LOG* yes
PROBE AZIMUTH TEST* 310.6 BRUNTON AZIMUTH* 305
PROBE AZIMUTH TEST* 39.9 BRUNTON AZIMUTH* 45
PROBE AZIMUTH TEST* 315.4 BRUNTON AZIMUTH* 312 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.5	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.22	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.17	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.05	

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B786B4UUP07	101.2	2:56pm	0	3:04pm

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B
Borehole*

CALIPER FIELD LOG

SITE*:Calvert Cliffs DATE*: 11/10/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: N/A DEPTH TO WATER TABLE: ~12 ft
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 11am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 10 am
ARRIVED ON SITE: 10:30 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-786B Borehole* CALIPER FIELD LOG

SITE*:Calvert Cliffs DATE*: 11/10/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: PAGE 2 OF 2

WINCH: COMPROBE ____ SILVER X OYO ____ RG ____ OTHER ____
MICROLOGGER* 5310 [ ] 5772 [X] OTHER
CALIPER PROBE* 5368 [X] OTHER
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 101 [X] RG [ ]

PROBE OFFSET	2.08M(6.82 FT)	12 IN MAX
MINUS CASING STICK-UP*	1.5	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.32	
DEPTH REF. OFFSET AT END*	5.40	
AFTER SURVEY DEPTH ERROR*	.08	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*
B786BCALTEST01		3:24pm		3:26pm
B786BCALUP01	103.2 ft	3:42pm	0.3 ft	3:55
B786BCALTEST02		4:10	cc 11/10/08	4:12

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.510 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.*	B786BCALTEST01	1.988	3.95	8.01	4.54
AS MEAS.*	B786BCALTEST02	2.00	3.94	8.03	4.59
AS MEAS.					
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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GEOVision
geophysical services

B-821A
Borehole*

BORING GEOPHYSICS FIELD LOG SUMMARY

SITE*: Calvert Cliffs
CLIENT*: Schnabel Engineering, LLC
AUTHOR*: C. Carter

DATE*: 11/13/08
JOB*: 8299
PAGE*: 1 OF 1

CONTACT:

PHONE:

BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____
BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft
SURFACE CASING?: YES____ DEPTH TO BOTTOM OF CASING____; NO X
DEPTH TO BEDROCK: N/A
BOREHOLE FLUID: WATER____; FRESH WATER MUD X; SALT WATER MUD ____;

LOGGING CREW: C. Carter

11/13/08

LOG TYPE*	FILE NAME*	DEPTH RANGE*	DATE*	TIMES*
~~B821AELO~~				
ELOG	B821AELOGTEST01		11/13/08	7:59 - 8:00 am
ELOG	B821AELOGUP01	115.1 - 24.4 ft	11/13/08	9:44 - 9:55 am
P-S velocity	B821ASUSPDOWN01	30.5 - 0.5 m	11/13/08	10:21 - 10:54 am
Deviation	B821AAUUP01	102.3 - 0 ft	11/13/08	11:42 - 11:49 am
Caliper	B821ACALTEST01		11/13/08	12:23 - 12:24 pm
Caliper	B821ACALUP01	105.3 - 0.1 ft	11/13/08	12:40 - 12:53 pm
Caliper	B821ACALTEST02		11/13/08	1:01 - 1:03 pm

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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B-821A ELOG FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 11/13/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 9 am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 5:30 am
ARRIVED ON SITE: 6:10 am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-821A ELOG FIELD LOG
Borehole*

SITE*:Calvert Cliffs
CLIENT*:Schnabel Engineering, LLC
AUTHOR*:C. Carter

DATE*: 11/13/08
JOB*:8299
PAGE: PAGE 2 OF 2

WINCH: COMPROBE ___ SILVER X OYO ___ RG ___ OTHER ___
MICROLOGGER* 5310 [ ] 5772 [X] OTHER ___
ELOG PROBE* 5490 [X] OTHER ___
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE LENGTH	2.50M(8.20 FT)	
PLUS YOKE 10.0M (32.8 FT)*	32.8	
MINUS CASING STICK-UP*	1.08	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	39.92	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	39.95	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.03	

LOG NAME*	START DEPTH*	START TIME	END DEPTH*	END TIME
B821AELOGTEST01		7:59 am		8:00 am
B821AELOGUP01	115.1 ft	9:44 am	24.4 ft	9:55

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-821A P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a
Borehole

SITE*: _____ DATE*: 11/13/08
CLIENT*: _____ JOB*: _____
AUTHOR*: _____ PAGE 1 OF * 4

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

CONTACT: _____ PHONE: Off Cell _____

DIRECTIONS TO SITE: _____

GENERAL SITE CONDITIONS/LOCATION: _____

COUNTY: _____ RANGE: _____ TOWNSHIP: _____ SECTION: _____
BOREHOLE CONSTRUCTION*: CASED _____ UNCASED X
DIAMETERS AND DEPTH RANGES*: 6" 0 TO 115' ; _____, _____ TO _____
BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft
SURFACE CASING?: _____ DEPTH TO BOTTOM OF CASING_____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER_____; FRESH WATER MUD X; SALT WATER MUD; _____
OTHER: _____
DEPTH TO BOREHOLE FLUID*: Ø TIME SINCE LAST CIRCULATION: 9am

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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GEOVision geophysical services

B-821A P-S SUSPENSION VELOCITY FIELD LOG REV 1.31a

Borehole*

SITE*:Calvert Cliffs DATE*: 11/13/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE 2 OF * 4

LOGGING CREW*: C. Carter
MOBILIZED FROM: DEPARTURE TIME:
ARRIVED ON SITE:
STANDBY TIME: CAUSE:
LOGGING STARTED: LOGGING COMPLETED:

BATTERIES CHANGED BEFORE LOGGING: YES____; NO X; STORED WITH NEW____

WINCH COMPROBE ☐ GREY ☒ OYO ☐ RG ☐ OTH ____
INSTRUMENT* OYO 12004 ☐ 15014 ☐ 19029 ☐ RG 160023 ☐ 160024 ☒
RECEIVER S/N* 12008 ☐ 20042 ☐ 26066 ☐ 11001 ☐ 23053 ☐ 30086 ☒
ISOLATION TUBE S/N* 300083 ☒ 24053 ☐ 28068 ☐ 28072 ☐ 2M ____
SHEAVE* COMPROBE ☐ OYO 101 ☐ 102 ☐ 103 ☒ RG ☐
MICROLOGGER* 5310 ☐ 5772 ☒ NOT APPLICABLE (OYO) ☐
PROBE OFFSET* OYO 2.0M ☐ RG 2.5M ☒

MINUS CASING STICK-UP* .33
DEPTH REF. OFFSET AT START* 2.17
DEPTH REF. OFFSET AT END* 2.17
AFTER SURVEY DEPTH ERROR* Ø
} REF TO GROUND SURFACE

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B821ASUSPDOWNNO1	0.5 m	10:24am	30.5 m	10:54am

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:
COMMENTS:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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P-S FIELD LOG REV V1.31a

B-821A

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Calvert Cliffs DATE*: 11/13/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 3 OF 4

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
0.5	1.64	001		10:24am
1.0	3.28	2		
1.5	4.92	3		
2.0	6.56	4		
2.5	8.20	5		
3.0	9.84	6		
3.5	11.48	7		
4.0	13.12	8		
4.5	14.76	9		
5.0	16.40	10		
5.5	18.04	11		
6.0	19.69	12		
6.5	21.33	13		
7.0	22.97	14		
7.5	24.61	15		
8.0	26.25	16		
8.5	27.89	17		
9.0	29.53	18		
9.5	31.17	19		
10.0	32.81	20		
10.5	34.45	21		
11.0	36.09	22		
11.5	37.73	23		
12.0	39.37	24		
12.5	41.01	25		
13.0	42.65	26		
13.5	44.29	27		
14.0	45.93	28		
14.5	47.57	29		
15.0	49.21	30		
15.5	50.85	31		
16.0	52.49	32		
16.5	54.13	33		
17.0	55.77	34		
17.5	57.41	35		
18.0	59.06	36		
18.5	60.70	37		
19.0	62.34	38		
19.5	63.98	39		
20.0	65.62	40		
20.5	67.26	41		

P-S FIELD LOG REV V1.31a

B-821A

GEOVISION SUSPENSION LOGGING FIELD NOTES

SITE*: Calvert Cliffs DATE*: 11/13/08

CLIENT*: Schnabel Engineering, LLC JOB*: 8299

AUTHOR*: C. Carter PAGE* 4 OF 4

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

DEPTH METERS	DEPTH FEET	UNFILTERED FILE NO*.	FILTERED FILE NO*. (if any)	COMMENTS CASING, WATER, ROCK, ETC
21.0	68.90	42		
21.5	70.54	43		
22.0	72.18	44		
22.5	73.82	45		
23.0	75.46	46		
23.5	77.10	47		
24.0	78.74	48		
24.5	80.38	49		
25.0	82.02	50		
25.5	83.66	51		
26.0	85.30	52		
26.5	86.94	53		
27.0	88.58	54		
27.5	90.22	55		
28.0	91.86	56		
28.5	93.50	57		
29.0	95.14	58		
29.5	96.78	59		
30.0	98.43	60		
30.5	100.07	61		10:54am
31.0	101.71			
31.5	103.35			
32.0	104.99			
32.5	106.63			
33.0	108.27			
33.5	109.91			
34.0	111.55			
34.5	113.19			
35.0	114.83			
35.5	116.47			
36.0	118.11			
36.5	119.75			
37.0	121.39			
37.5	123.03			
38.0	124.67			
38.5	126.31			
39.0	127.95			
39.5	129.59			
40.0	131.23			
40.5	132.87			
41.0	134.51			

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B-821A ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a
Borehole*

SITE*: Calvert Cliffs DATE*: 11/13/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: Ø TIME SINCE LAST CIRCULATION: 9am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: DEPARTURE TIME:
ARRIVED ON SITE:
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED, OTHER INFORMATION IS OPTIONAL*

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B-821A ACOUSTIC TELEVIEWER FIELD LOG Rev 1.0a
Borehole*

SITE*: Calvert Cliffs DATE*: 11/13/08
CLIENT*: Schnabel Engineering, LLC JOB*: 8299
AUTHOR*: C. Carter PAGE 2 OF 2

WINCH: COMPROBE____ SILVER X OYO____ OTHER____
MICROLOGGER* 5310___ 5772 X
TELEVIEWER* ACOUSTIC #5174 X OTHER____
SHEAVE* COMPROBE____ OYO 101____ 102____ 103 X RG____

PROBE TILT TEST* 41.3 BRUNTON TILT* 41
PROBE TILT TEST* 97.02 BRUNTON TILT* 97
PROBE TILT TEST* 18.24 BRUNTON TILT* 18 AFTER LOG* yes
PROBE AZIMUTH TEST* 350.1 BRUNTON AZIMUTH* 344
PROBE AZIMUTH TEST* 267.3 BRUNTON AZIMUTH* 256
PROBE AZIMUTH TEST* 307.1 BRUNTON AZIMUTH* 300 AFTER LOG* yes

PROBE OFFSET*	1.44M(4.72FT)	
MINUS CASING STICK-UP*	1.08	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	3.64	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT END*	3.59	REF TO GROUND SURFACE
AFTER SURVEY DEPTH ERROR*	.05	

LOG NAME*	START DEPTH*	START TIME	END DEPTH *	END TIME
B821AAUUP01	102.3 ft	11:42am	0 ft	11:49am

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-8214 CALIPER FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 11/12/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: 1 OF 2

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

CONTACT: PHONE: Off Cell

DRILLER PHONE: Off Cell
COMPANY:

GENERAL SITE CONDITIONS/LOCATION:

COUNTY: RANGE: TOWNSHIP: SECTION:
BOREHOLE CONSTRUCTION: CASED ____ UNCASED X
DIAMETERS AND DEPTH RANGES: 6" 0 TO 115 ft ; ____, ____ TO ____

BOREHOLE TOTAL DEPTH AS DRILLED*: 115 ft

SURFACE CASING?: YES ____ DEPTH TO BOTTOM OF CASING ____; NO X
DEPTH TO BEDROCK: NA DEPTH TO WATER TABLE: NA
BOREHOLE FLUID: WATER ____; FRESH WATER MUD X; SALT WATER MUD ____;
OTHER:
DEPTH TO BOREHOLE FLUID: TIME SINCE LAST CIRCULATION: 9am

LOGGING CREW: C. Carter
VEHICLE(S) USED AND MILEAGE:
MOBILIZED FROM: Lexington Park DEPARTURE TIME: 5:30am
ARRIVED ON SITE: 6:10am
STANDBY TIME: CAUSE:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-821A CALIPER FIELD LOG
Borehole*

SITE*:Calvert Cliffs DATE*: 11/13/08
CLIENT*:Schnabel Engineering, LLC JOB*:8299
AUTHOR*:C. Carter PAGE: PAGE 2 OF 2

WINCH: COMPROBE ___ SILVER X OYO ___ RG ___ OTHER ___
MICROLOGGER* 5310 [ ] 5772 [X] OTHER
CALIPER PROBE* 5368 [X] OTHER
SHEAVE* COMPROBE [ ] OYO 101 [ ] 102 [ ] 103 [X] RG [ ]

PROBE OFFSET	2.08M(6.82 FT)	12 IN MAX
MINUS CASING STICK-UP*	1.08	REF TO GROUND SURFACE
DEPTH REF. OFFSET AT START*	5.74	
DEPTH REF. OFFSET AT END*	5.70	
AFTER SURVEY DEPTH ERROR*	.04	

LOG NAME*	START DEPTH*	START TIME*	END DEPTH*	END TIME*
B821ACALTEST01		12:23		12:24pm
B821ACALUP01	105.3ft	12:40	0.1ft	12:53pm
B821ACALTEST02		1:01		1:03pm

CALIBRATION PLATE S/N 201

		AS BUILT			PVC FITTING
		1.968 IN	3.937 IN	8.000 IN	4.510 IN
	FILE NAME	(50 MM)	(100 MM)	(203.2 MM)	(114.3 MM)
AS MEAS.*	B821ACALTEST01	1.97	3.973.92	8.03	4.52
AS MEAS.*	B821ACALTEST02	1.98	3.93	7.98	4.48
AS MEAS.		CC	11/13/08		
AS MEAS.					
AS MEAS.					
AS MEAS.					

MAINTENANCE PERFORMED ON SITE*: N/A (N/A if none)

EQUIPMENT PROBLEMS OR FAILURES*: N/A (N/A if none)

SUGGESTIONS, ADDITIONS, CHANGES:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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APPENDIX E

BORING GEOPHYSICAL LOGGING FIELD MEASUREMENT PROCEDURES

PROCEDURE FOR

OYO P-S SUSPENSION SEISMIC VELOCITY LOGGING

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The OYO P-S Suspension Method is applied by generating shear and compressional waves in a borehole using the OYO P-S Suspension Logger borehole tool and measuring the travel time between two receiver geophones or hydrophones located in the same tool.

Objective

The outcome of this procedure is a plot and table of P and S_H wave velocity versus depth for each borehole. Standard analysis is performed on receiver to receiver data. Data is presented in report format, with digital data files transmitted in Excel, Word or ASCII format.

Instrumentation

1. OYO Model 170 Digital Logging Recorder or equivalent
2. OYO P-S Suspension Logger probe or equivalent, including two sets horizontal and vertical geophones, seismic source, and power supply for the source and receivers
3. Winch and winch controller, with logging cable
4. Batteries to operate P-S Logger and winch

The Suspension P-S Logger system, manufactured by OYO Corporation, or the Robertson Digital P-S Suspension Probe with the Robertson Micrologger2 are currently the only commercially available suspension logging systems. As shown in Figure 1, these systems consists of a borehole probe suspended by a cable and a recording/control electronics package on the surface.

The suspension system probe consists of a combined reversible polarity solenoid horizontal shear-wave generator (S_H) and compressional-wave generator (P), joined to

two biaxial geophones by a flexible isolation cylinder. The separation of the two geophones is one meter, allowing average wave velocity in the region between the geophones to be determined by inversion of the wave travel time between the two geophones. The total length of the probe is approximately 7 meters; the center point of the geophones is approximately 4 meters above the bottom end of the probe.

The probe receives control signals from, and sends the amplified geophone signals to, the instrumentation package on the surface via an armored 4 or 7 conductor cable. The cable is wound onto the drum of a winch and is used to support the probe. Cable travel is measured by a rotary encoder to provide probe depth data.

The entire probe is suspended by the cable and may be centered in the borehole by nylon "whiskers." Therefore, source motion is not coupled directly to the borehole walls; rather, the source motion creates a horizontally propagating pressure wave in the fluid filling the borehole and surrounding the source. This pressure wave produces a horizontal displacement of the soil forming the wall of the borehole. This displacement propagates up and down the borehole wall, in turn causing a pressure wave to be generated in the fluid surrounding the geophones as the soil displacement wave passes their location.

Environmental Conditions

The OYO P-S Suspension Logging Method can be used in either cased or uncased boreholes. For best results, the uncased borehole must be between 10 and 20 cm in diameter, or 4 to 8 inches. A cased borehole may be as small as 3 inches, if properly grouted (see below) and the grout annulus does not exceed 1 inch.

Uncased boreholes are preferred because the effects of the casing and grouting are removed. It is recommended that the borehole be drilled using the rotary mud method. This method does little damage to the borehole wall, and the drilling fluid coats and seals the borehole wall reducing fluid loss and wall collapse. The borehole fluid is required for the logging, and must be well circulated prior to logging.

If the borehole must be cased, the casing must be PVC and properly installed and grouted. Any voids in the grout will cause problems with the data. Likewise, large grout bulbs used to fill cavities will also cause problems. The grout must be set before testing. This means the grouting must take place at least 48 hours before testing.

For borehole casing, applicable preparation procedures are presented in ASTM Standard D4428/D4428M-91 Section 4.1 (see ASTM website for copy).

Calibration

Calibration of the digital recorder is required. Calibration is limited to the timing accuracy of the recorder. GEOVision's Seismograph Calibration Procedure or equivalent should be used. Calibration must be performed on an annual basis.

Measurement Procedure

The entire probe is lowered into the borehole to a specific measurement depth by the winch. A measurement sequence is then initiated by the operator from the instrumentation package control panel. No further operator intervention is then needed to complete the measurement sequence described below.

The system electronics activates the SH-wave source in one direction and records the output of the two horizontally oriented geophone axes which are situated parallel to the axis of motion of the source. The source is then activated in the opposite direction, and the horizontal output signals are again recorded, producing a SH-wave record of polarity opposite to the previous record. The source is finally actuated in the first direction again, and the responses of the vertical geophone axes to the resultant P-wave are recorded during this sampling.

The data from each geophone during each source activation is recorded as a different channel on the recording system. The seismograph has at least six channels (two simultaneous recording channels), each with at least a 12 bit 1024 sample record. Newer seismographs may have longer record lengths. The recorded data is displayed on a CRT or LCD display and possibly on paper tape output as six channels with a common time scale. Data is stored on digital media for further processing. Up to 8 sampling sequences can be stacked (averaged) to improve the signal to noise ratio of the signals.

Review of the data on the display or paper tape allows the operator to set the gains, filters, delay time, pulse length (energy), sample rate, and stacking number in order to optimize the quality of the data before recording. In the case of the Model 170, printed data is verified by the operator prior to moving the probe. In the case of the Robertson Micrologger2, storage on the hard disk should be verified from time-to-time, certainly before exiting the borehole.

Typical depth spacing for measurements is 1.0 meters, or 3.3 feet. Alternative spacing is 0.5 meter, or 1.6 feet.

Required Field Records

1) Field log for each borehole showing

    a) Borehole identification

    b) Date of test

    c) Tester or data recorder

d) Description of measurement

e) Any deviations from test plan and action taken as a result

f) QA Review

2) Paper output records are no longer required, since the Micrologger2 cannot generate them. However, data must be stored in at least 2 places prior to leaving the site

3) List of record ID numbers (for data on digital media) and corresponding depth

4) Diskettes, CDRom, or USB flash drives with backup copies of data on hard disk, labeled with borehole designation, record ID numbers, date, and tester name.

An example Field Log is attached to this procedure.

Analysis

Following completion of field work, the recorded digital records are processed by computer using the OYO Corporation software program PSLOG and interactively analyzed by an experienced geophysicist to produce plots and tables of P and S_H wave velocity versus depth.

The digital time series records from each depth are transferred to a personal computer for analysis. Figure 2 shows a sample of the data from a single depth. These digital records are analyzed to locate the first minima on the vertical axis records, indicating the arrival of P-wave energy. The difference in travel time between these arrivals is used to calculate the P-wave velocity for that 1-meter interval. When observable, P-wave arrivals on the horizontal axis records are used to verify the velocities determined from the vertical axis data. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

The digital records are studied to establish the presence of clear SH-wave pulses, as indicated by the presence of opposite polarity pulses on each pair of horizontal records. Ideally, the SH-wave signals from the ‘normal’ and ‘reverse’ source pulses are very nearly inverted images of each other. Digital FFT – IFFT lowpass filtering are used to remove the higher frequency P-wave signal from the SH-wave signal.

The first maxima are picked for the ‘normal’ signals and the first minima are picked for the 'reverse' signals. The absolute arrival time of the ‘normal’ and ‘reverse’ signals may vary by +/- 0.2 milliseconds, due to differences in actuation time of the solenoid source caused by constant mechanical bias in the source or by borehole inclination. This variation does not affect the velocity determinations, as the differential time is measured between arrivals of waves created by the same source actuation. The final velocity

value is the average of the values obtained from the 'normal' and 'reverse' source actuations.

In Figure 2, the time difference over the 1-meter interval of 1.70 millisecond is equivalent to a SH-wave velocity of 588 m/sec. Whenever possible, time differences are determined from several phase points on the S_H -wave pulse trains to verify the data obtained from the first arrival of the S_H -wave pulse. In addition, the soil velocity calculated from the travel time from source to first receiver is compared to the velocity derived from the travel time between receivers.

Figure 3 is a sample composite plot of the far normal horizontal geophone records for a range of depths. This plot shows the waveforms at each depth, clearly showing the S-wave arrivals. This display format is used during analysis to observe trends in velocity with changing depth.

Once the proper picks are entered in PSLOG, the picks are transferred to an Excel spreadsheet where Vs and Vp are calculated. The spreadsheet allows output for presentation in charts and tables.

Standard analysis is performed on receiver 1 to receiver 2 data, with separate analysis performed on source to receiver data as a quality assurance procedure.

Registered Geophysicist_____Date__9/11/06_____

QA Review____ _____Date__9/11/06_____

References:

1. "In Situ P and S Wave Velocity Measurement", Ohya, S. 1986. Proceedings of In-Situ '86, *Use of In-Situ Tests In Geotechnical Engineering*, an ASCE Specialty Conference sponsored by the Geotechnical Engineering Division of ASCE and co-sponsored by the Civil Engineering Dept of Virginia Tech.

2. Guidelines for Determining Design Basis Ground Motions, Report TR-102293, Electric Power Research Institute, Palo Alto, California, November 1993, Sections 7 and 8.

3. "Standard test Methods for Crosshole Seismic Testing", ASTM Standard D4428/D4428M-91, July 1991, Philadelphia, PA

OYO SUSPENSION P-S VELOCITY LOGGING SETUP

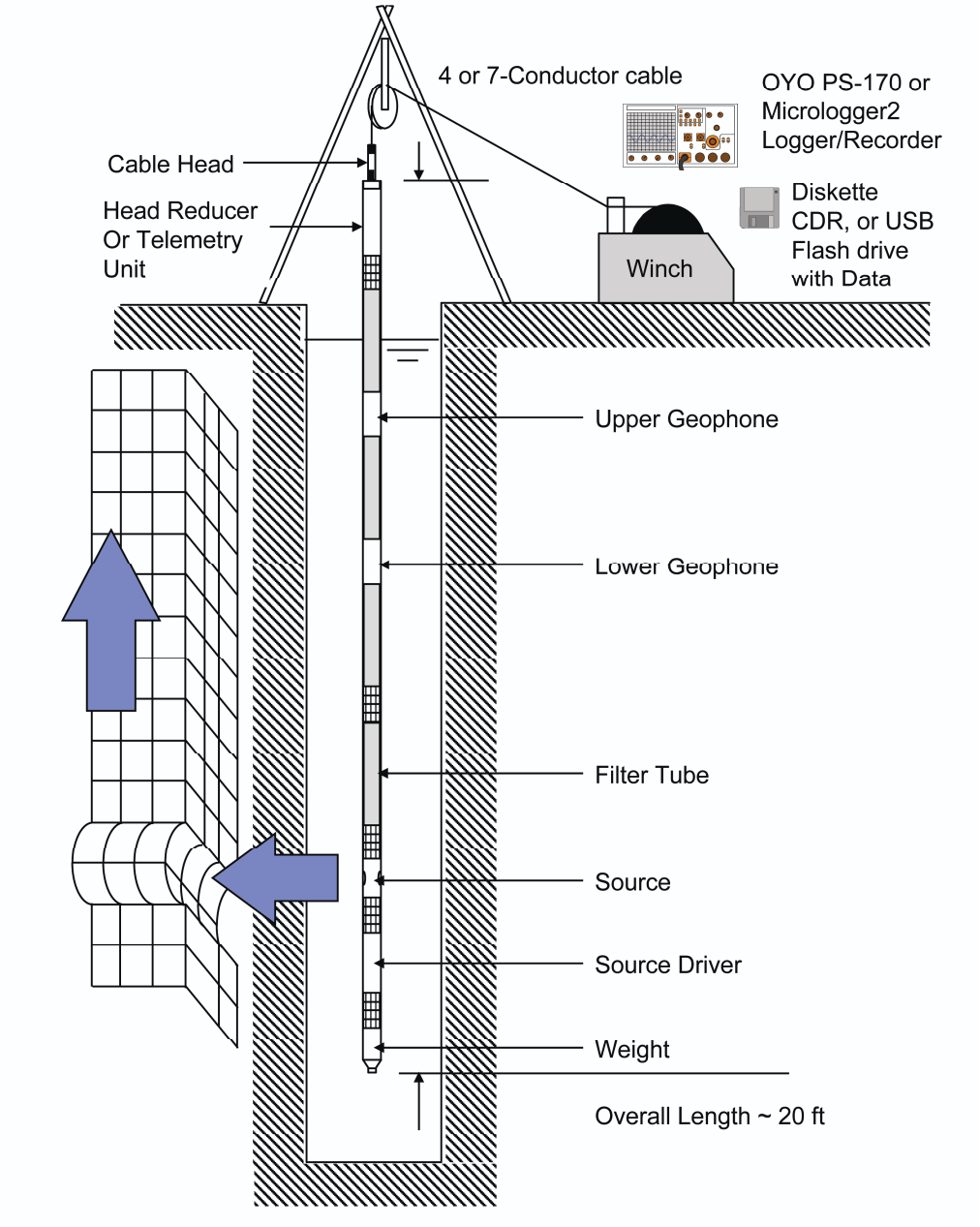


Figure 1. Suspension PS logging method setup

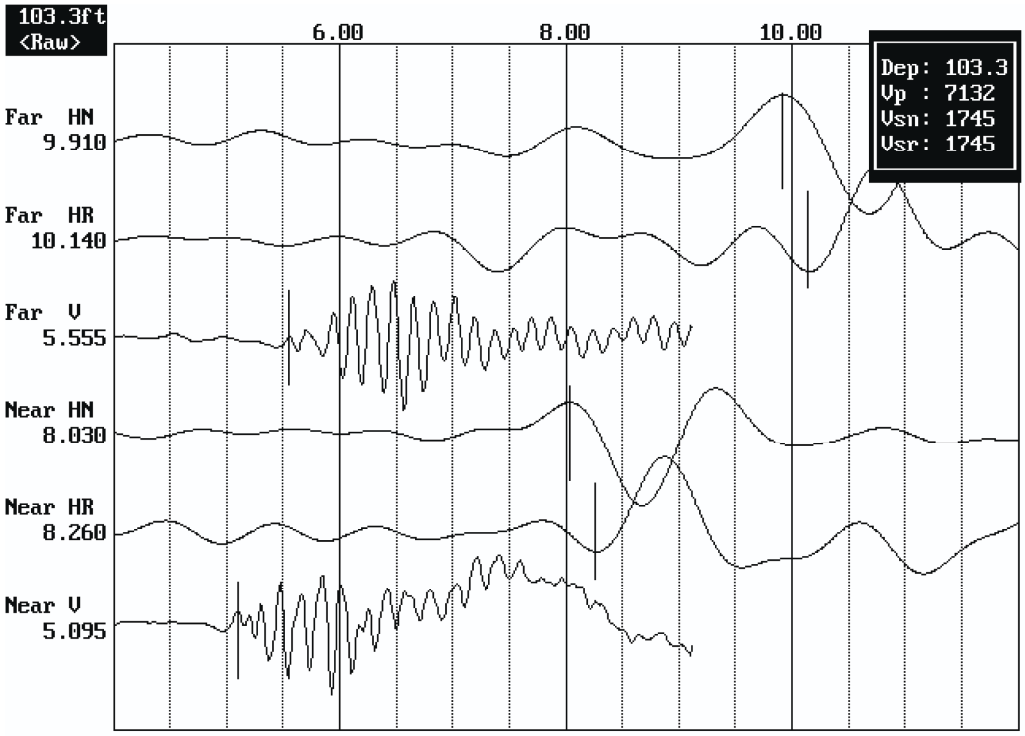


Figure 2. Sample suspension method waveform data showing horizontal normal and reversed (HR and HN), and vertical (V) waveforms received at the near (bottom 3 channels) and far (top 3 channels) geophones. The arrivals in milliseconds for each pick are shown on the left. The box in the upper right corner shows the depth in the borehole and the velocities calculated based on the picks.

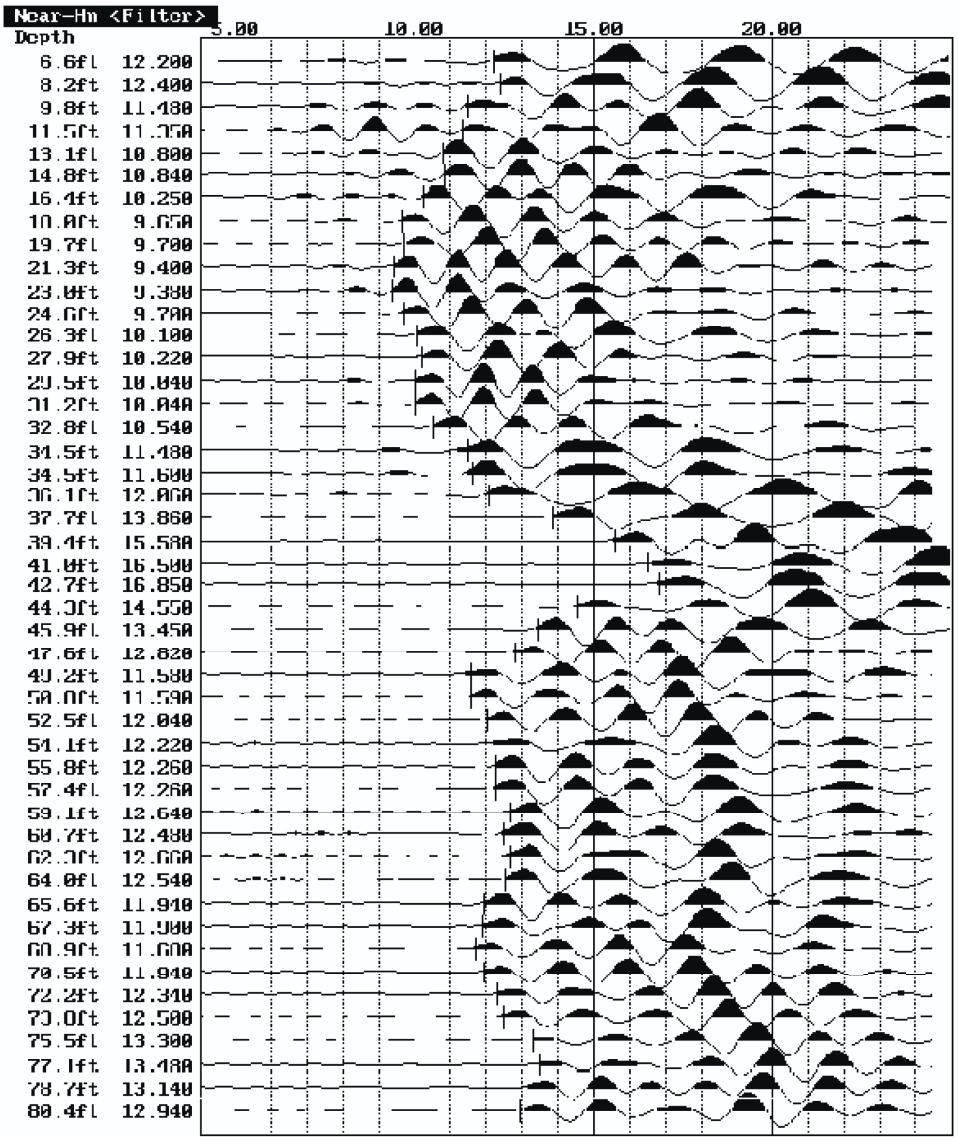


Figure 3. Sample composite waveform plot for normal shear waves received at the near geophone in a single borehole

PROCEDURE FOR USING THE ROBERTSON GEOLOGGING HI-RESOLUTION ACOUSTIC TELEVIEWER (HiRAT)

Reviewed 2/13/06

Background

The acoustic televiewer is a device for producing a qualitative image of the wall of a borehole. Because it uses ultrasound rather than visible light it is able to work in dirty or opaque borehole fluids, although heavy drilling mud will cause excessive dispersion of the acoustic beam. The picture below shows the sonde's lower nylon section, and one of the bowspring attachments which are used to centralize the sonde in the borehole.

Pulses of ultrasound (0.5 - 1.5MHz) are generated by a piezo-electric resonator. The pulses are transmitted through the oil in which the resonator is immersed, through the wall of the acoustic housing, then propagate through the borehole fluid and are reflected from the wall of the borehole. The reflected energy is picked up by the same transducer, from which is recorded both the ***amplitude*** of the returned pulse and the ***travel-time*** which have elapsed. Blanking must be applied to prevent the transducer from registering reflections from the inside surface of the acoustic housing. The material of the housing is chosen so that its acoustic properties are similar to the oil which fills it. The housing is not designed to withstand borehole fluid pressures, but has a piston device to allow equalization between inside and outside pressure.

The ***amplitude*** of the returned pulse is a function of the acoustic reflectivity of the borehole wall. If the beam strikes a hard borehole wall normally to the surface the energy will be returned to the transducer and a strong return will be recorded. If the formation is softer, then less energy will be reflected. Also, if the surface of the borehole is rough, or effectively missing because of the presence of a fracture or other structure, then energy will be dispersed and a poor return will be recorded.

The ***travel-time*** is a simple function of the diameter of the borehole and the velocity of sound in the borehole fluid (typically 1.5Km/sec). An A/D converter monitors the output from the transducer once the blanking period has expired and a comparator is used to detect the peak amplitude during the sampling window.

The coaxially-mounted transducer has a planar radiating surface, but the vibration characteristics are such that the acoustic pulse is emitted as a 'pencil' beam. The emitted beam is deflected by a planar mirror so that it leaves the acoustic housing at right angles to the sonde axis. The mirror is rotated to scan the borehole wall. The ultrasound pulses are synchronized with rotation of the mirror so that up to 360 pulses are emitted in every revolution. Because of the time which must elapse for the two-way transit of the borehole fluid, there is an upper limit upon the number of radial samples that may be acquired from a borehole of a particular radius. In larger boreholes, therefore, it may be necessary to reduce the number of radial samples. The sonde is able to operate at 90, 180 or 360 samples per revolution.

An image of the borehole wall is produced by moving the sonde along the borehole axis while it is scanning radially. By the same logic as shown above, it can be seen that any horizontal point will be imaged by more than one sweep of the acoustic beam so long as the axial movement of the sonde during one complete sweep is no greater than the beam diameter. An upper limit is therefore imposed upon the logging speed which will be a function of the rotational speed of the transducer, the radial sampling interval and borehole diameter.

Objective

The objective of this procedure is to provide a pseudo “core” of the borehole, and map the orientation and angles of cracks and voids in rock boreholes.

Instrumentation

This procedure is written specifically for the Robertson Geologging High-Resolution Acoustic Televiewer (HiRAT). The required equipment includes:

1. The Robertson High-Resolution Acoustic Televiewer (HiRAT) sonde with centralizers
2. A 4-conductor wire-line winch with cable at least 30m (100ft) longer than the depth of the borehole (RG Smart Winch or equivalent. GEOVision has adapted all our 4-conductor winches)
3. A sheave with depth encoder with minimum 500 pulse/revolution
4. A Robertson Geologging Micrologger II
5. A laptop with Winlogger installed and the following minimum system requirements:
   - Windows 98SE or above
   - 64M System memory
   - 800x600x24 SVGA Display with DirectX 8.0
   - 500Mhz CPU
   - USB 2.0 connection
6. Battery power supply with cables

Environmental Conditions

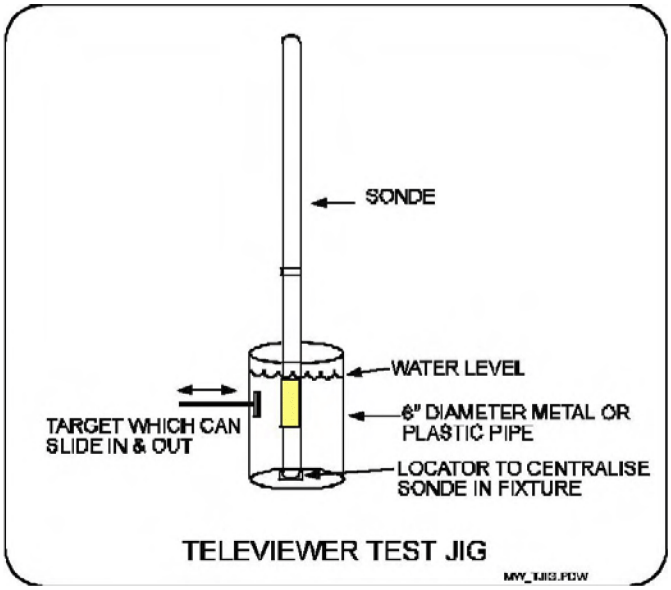
This tool is designed for fluid-filled boreholes between 67 and 150mm (3-6in) in rock. Since fine cracks are usually not visible in the walls of soil borings, the televiewers add very little information from a soil boring than a simple video. Now if the boring has soil AND rock, televiewer visuals in the soil may still be useful.

Calibration

The acoustic televiewer uses the variability in reflectance and the travel time to make an image of the borehole wall, mostly resulting from relative differences of materials and the physical characteristics of the wall. Since these are relative measurements, no field calibration of the sonde is required. However, it is important that the same location in the borehole be checked at the start and finish of the logging to make sure that the response or functionality haven't changed during the measurement.

A test fixture may be used to check function of the acoustic televiewer prior to use. This test fixture should comprise a plastic pipe, with a known internal diameter between 3 and 6 inches. This should be filled with water and the sonde stood upright in the fixture. A target made of metal or metal foil is glued on the inside of the container, or optionally on a seal and shaft so that it can be moved in and out on a line radial to the center-line of the pipe. A representation of this is shown in the figure below.

The purpose of this test fixture is to check the ability of the sonde to differentiate between materials of different acoustic reflectances, and different travel times, and to check the calibration of the caliper function of the sensor using the measured diameter of the pipe. However, if calibrated caliper measurements are required, it is recommended that a mechanical 3-arm caliper tool be used for this purpose because it can be calibrated in the field prior to use. The HiRAT will give very accurate results but this procedure does not cover calibration.

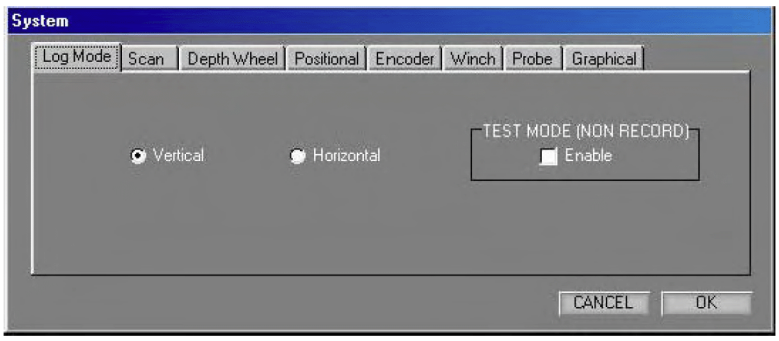


Hi-RAT Field Procedure

Because the logging software is a standalone module, there are a number of settings which must be initialized independently of the WinLogger software. These include the depth measurement subsystem and sonde operating modes. Click on 'System' on the menu bar to show the following dialog boxes:

1.0 Log Mode

The sonde can operate in three distinct modes:



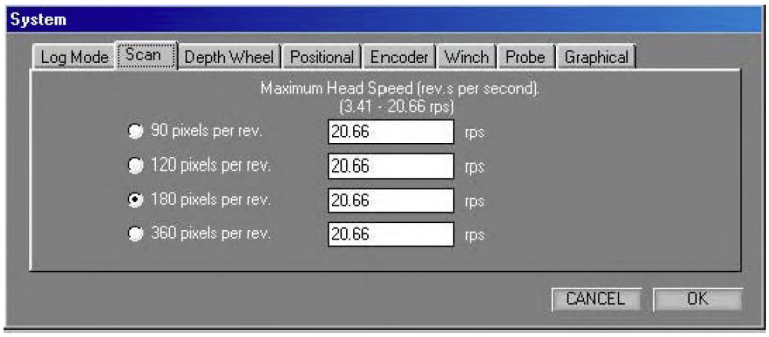
- Vertical mode is used for boreholes which are drilled from the surface and are deviated at less than 70 degrees from the vertical. Most exploration boreholes will fall into this class. In this mode the image is orientated according to compass directions (magnetic co-ordinates).

- Horizontal mode is used for boreholes which are sub-horizontal so their inclination will probably exceed 70 degrees from the vertical. Boreholes in this class would normally be drilled as part of ground investigations for tunneling and mining, drilling ahead of a drive to determine the nature and extent of fracturing. In this mode the image is orientated according to gravitational coordinates (up/down) since there is no unique point of the image circle which can be orientated to North with any precision.

- Test mode is used to exercise all sonde functions without creating a log. The image will scroll on the screen in the normal fashion, and orientation readouts will be refreshed continuously.

2.0 Scan Parameters

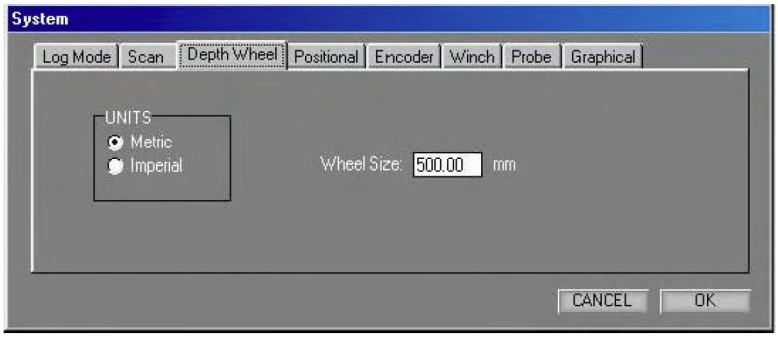
The scan parameters control the radial sampling of the borehole. The values will be retained between logging sessions, so the sonde will be initialized correctly at power-on. There are three parameters in the dialog:



- The radial sampling rate can be set to one of 90, 120, 180, 360 samples per revolution. There is a relationship between the logging speed and the radial sampling rate, since the time taken to send the dataset to the surface depends upon its length. The size of the log file is also determined by the radial sampling rate. The probe will always try to use the maximum head speed entered. If limited by a low Baud rate or a large 'window' setting then the probe will reduce its head speed automatically to compensate - see sonde operation section.

3.0 Depth Wheel Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. Two parameters are therefore required: depth wheel circumference and encoder pulse rate. The encoder parameters are covered in a subsequent topic.

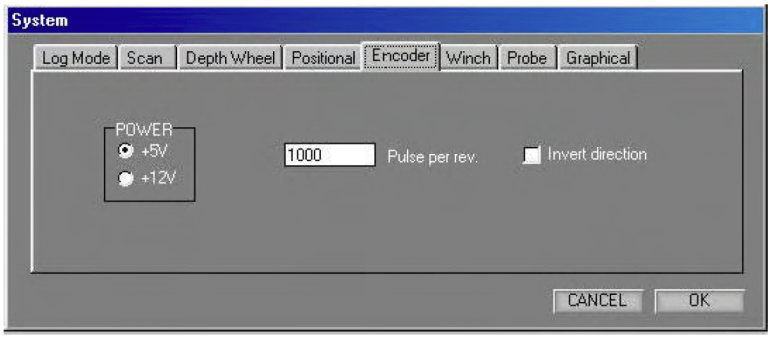


- Select Metric or Imperial depth measurement units from the left-hand pane.

- Type the circumference of the depth measurement wheel into the 'wheel size' box. The standard sizes of GEOVision wheels are 1000mm. If you are measuring in Imperial units (or changing back to metric units), the standard wheel size can be converted automatically by clicking the left mouse button and choosing the appropriate conversion. The size is always specified in units of 1/1000 of the depth unit i.e. millimetres (mm) or millifeet (mft).

4.0 Encoder Configuration

The depth measurement system is dependent upon the combination of depth measurement wheel with its calibrated groove, and the shaft encoder which translates rotation into pulses which are counted by the logging system controller. The depth wheel circumference is covered in a previous topic. In order to accommodate a variety of encoders, their operational characteristics can be configured in the software.



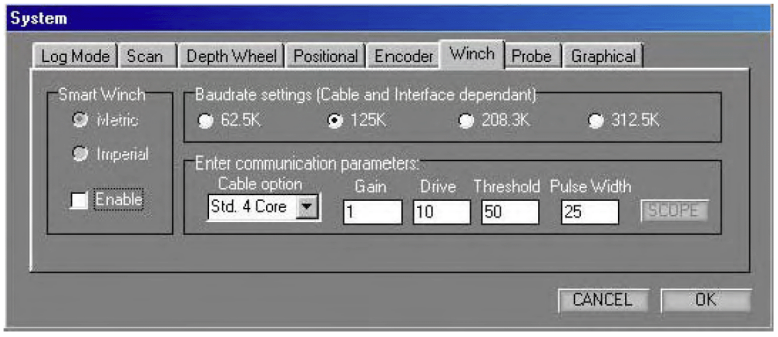
- Select supply voltage from the radio buttons in the left-hand pane. The options are 5 Volt and 12 Volt. GEOVision encoders are always specified for 5 Volt operation.

- Type the number of pulses emitted per revolution into the central box. The standard values for all GEOVision winches are 500 pulses/rev.

- The logical direction of movement can be reversed if required to accommodate the directional characteristics (phase lead or lag) of the different encoder types.

5.0 Winch and Cable Configuration

Support for remote control of the RG Smart Winch is provided, and can be enabled by checking the ***Enable*** control in the left-hand Smart Winch pane. If the Smart Winch control is enabled, it is also necessary to select the measure units in force - select ***Metric*** or ***Imperial*** from the radio buttons on offer.



The Baud settings can be chosen to match the *quality* of the communication channel. The channel will be effected by cable type and length. Typically a Baudrate of 312.5K is used. The remaining controls in the dialog relate to the communications parameters. The operation is entirely compatible with the WinLogger software operation and the values would be expected to be the same as those in force for logging six-channel type sondes with that software. (Certain probe types may be fitted with a digital interface that does not require set-up and in this case the parameter edit boxes will not appear.)

- ***Cable Option*** is used to select the logging cable type which is available on the winch. The options are *Not Connected*, *Std. 4 Core*, *Differential* and *Monocable*. The only cable types used in GEOVision systems is Std. 4 Core. Select the appropriate type from the drop-down menu box. Note this value can only be changed when the probe power is turned off.

- ***Gain*** is related to cable length and uphole signal attenuation. Gain values range from 0-3 and control the amplification applied to the incoming signal. Use the *Scope* dialog to visualize the incoming signals. Gain should be set so that the signal reaches between 70% and 100% of the height of the display, generally obtained with a setting of 0 for GEOVision winches. If the peak height exceeds this level, clipping will result in artifacts which will be detected erroneously. Click *Apply* to set the parameters before proceeding to the *Scope* dialog.

- ***Threshold*** is the level at which the incoming signals are detected. Gain and Threshold are related, and can be visualized using the *Scope* dialog. Set the gain so that the signal reaches between 70% and 100% of the height of the display. Then adjust the threshold so that it is between 50% and 70% of the height of the pulses displayed and clear of any region of 'overshoot' of the positive and negative pulses. This will ensure that peaks are detected and noise is ignored. Generally a setting of 25 is used for GEOVision winches. When the scope dialog is displayed, the position of the mouse is reported as a threshold value to make it simpler to infer the correct setting. The scope option is greyed out when the probe power is turned off.

- ***Drive*** sets the strength of the downhole signal. It is not possible to visualize the downhole signal, but the effect of insufficient drive is to disable downhole communication, which will result in the commands being ignored by the sonde. Values range from 0 -127, and for GEOVision winches will be around 10. Increase the drive for longer cables.

- ***Pulse Width*** This is the width of the transmitted communication pulses in 100nS steps. The default is 25 equivalent to 2.5uS. The range is from 8 to 64. The pulse width can be reduced to prevent signal overshoot on short cables. The default value is used in most cases. Note any changes only come into effect during a log. (Note setting too large a pulse width when using the highest Baud rates will automatically be prevented within the probe and the pulse width reduced.)

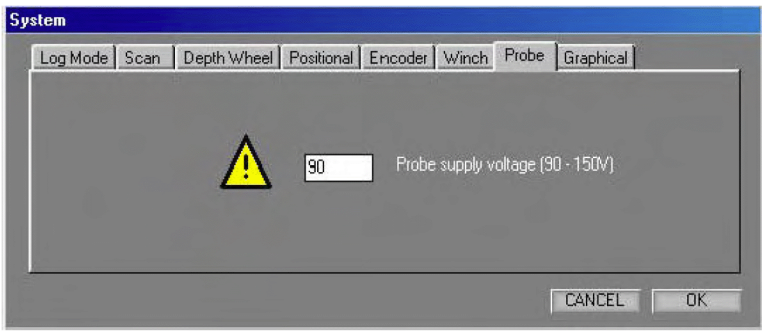
IMPORTANT Please note the effects of changing 'Baud' will not appear until the first new log is made. The setting for 'threshold' may be effected by an increase in the 'Baud' rate please recheck 'threshold' if 'Baud' is altered using the 'Scope' function after making a short test log.

The parameters which are entered will be applied automatically if you close the dialog with ***OK***. The above parameters once set correctly will be remembered by the system and should never need to be altered.

6.0 Probe Configuration

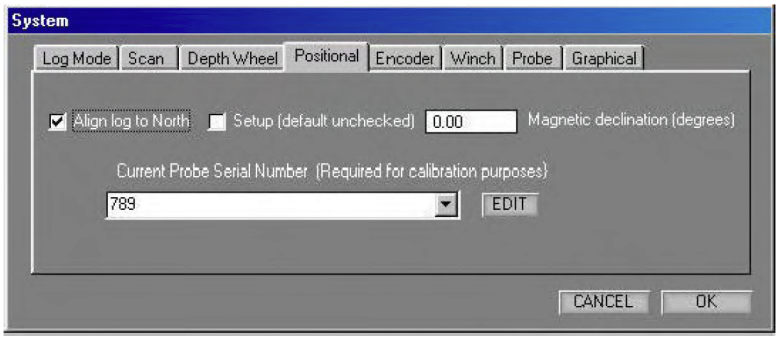
The probe is normally energized at 90 Volts from the surface. However, it may be necessary to compensate for voltage drop on longer cables due to the higher power draw of this sonde. The voltage at

the surface may be increased in order to deliver 90 Volts at the sonde. Simply type the value into the text box provided. The voltage should be set at 90V for all GEOVision winches. Values outside the indicated range will be rejected.



7.0 Positional Configuration

The probe includes a 3-axis orientation package, and is capable of producing a borehole image aligned to geographic North. This is achieved by determining and applying two image rotation parameters:



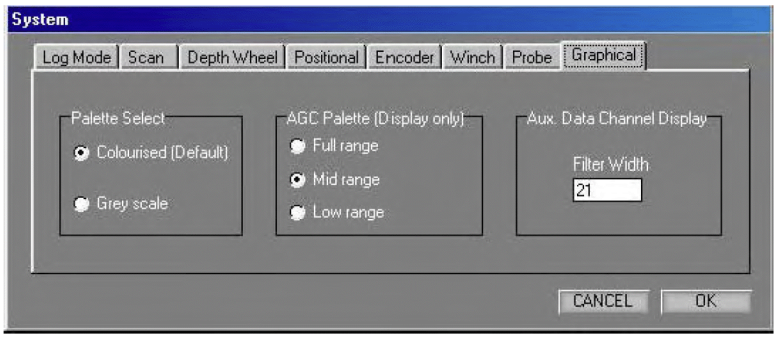
- ***Magnetic Declination*** is used to correct for the difference between Magnetic North and True North. The value varies from place to place, so the local value must be inserted here if you wish to perform this correction during data collection. This correction may also be made during processing. If the value is zero, the log will be referred to Magnetic North.
- ***Align to North*** is a check-box used to select image rotation to start at Magnetic North. If in addition a value is set for Magnetic Declination (see above) the image will be rotated to start at True North. If the box is not checked, the image will not be oriented to geographic co-ordinates, but will use the local co-ordinate frame of the sonde (X, Y, Z axis of the orientation module). This mode may be used to inspect the inside of magnetic casing, where an orientated image would be subjected to random effects caused by the metalwork.
- Set-up mode is selected by checking the ***Setup*** box, and is used to determine the required image rotation offset to correct for the angle between the axis of the orientation package and the index mark of the rotating transducer section. In set-up mode the normal sonde azimuth display is modified, and will instead show the 'relative bearing' which is measured between the high side of the borehole and the orientation sensor index. Check ***Setup***, then OK to close the dialog. The icon adjacent to the sonde azimuth readout at the top of the screen is modified with the legend CAL when the system is in set-up mode. The sonde must now be placed in a stand or jig so that it

is inclined at about 20 degrees to the vertical, and adjacent to a target fixed to the jig so that it is directly above the transducer in the vertical plane. Lower the sonde with its attachment into a large bucket of water so that the transducer and target are fully immersed. Start the radial amplitude display, when it will be possible to see the strong signal returning from the target. Rotate the sonde so that the image of the target moves to the top of the display. When the two are coincident, the 'relative bearing' reads out the image rotation offset. This value is fixed for the sonde unless it is disassembled and rebuilt, at which point the procedure MUST be repeated. Please see the additional topic on the Radial Amplitude Display for further details.

- The ***Serial Number*** list box is used to select the sonde which is in use. When the appropriate sonde is selected, the image rotation offset determined by the above procedure is selected. To edit the image offset click the '***Edit***' and enter the new offset. Several serial numbers and associated offsets can be stored and selected as required.

8.0 Graphical

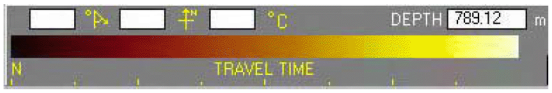
The palette can be changed between a colored and grey scale setting. The changes affect the log screen palette display and are also applied when replaying a log. Selecting Full range in the 'AGC Palette' will cause the software to spread the palette over the full 16bit signal. 'Mid range' will spread the palette over the first quarter of the 16bit range and 'Low range' will spread the palette over the first eighth of the 16 bit range. In most cases the 'Low range' selection is used. Note these settings do not affect the stored log data in any way. The 'Filter Width' is applied to the Natural Gamma trace data and is a simply running average filter. The range of the filter width is from 1 to 50 (x 10 millidepth units ie. mm or mft).



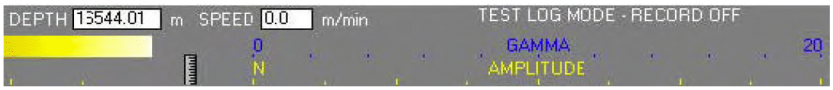
9.0 Sonde Operation

When the operations specified above have been reviewed and the correct settings have been selected, the system is ready for use. The main screen area is divided into 3 horizontal elements. At the top is the depth and orientation readout, together with the scale headings for the scrolling display of unwrapped borehole image.

On the left side of the depth track is the travel time display, with text boxes for sonde inclination, azimuth and head temperature.



On the right side is the display of amplitude and indication of current operating mode. Located in the center above the depth track are the text boxes for depth and cable speed (computed at the surface). The ranges for the 'Natural Gamma' channel overlay (optional) are shown above the Amplitude.



The central area is utilized for the scrolling display of unwrapped borehole data. The display is orientated with the left edge corresponding to North point of the aligned image data (if orientation is selected) according to the outputs of the sonde's orientation package.

The lower area has controls for the winch (applicable to RG Smart Winch only), depth initialization and sonde control.

The winch control area is only displayed when RG SmartWinch operation is enabled - see section 5 - and has four controls. Set Target Speed by typing the required speed into the window and pressing Enter.

Cable movement is initiated by clicking on either the UP or DOWN arrow control.

Cable movement is halted by clicking on the square STOP control.

Depth is initialized by typing the required value into the entry box and pressing Enter. The entry box is not available at times when the system is in logging mode and the depth should not be changed by user entry.

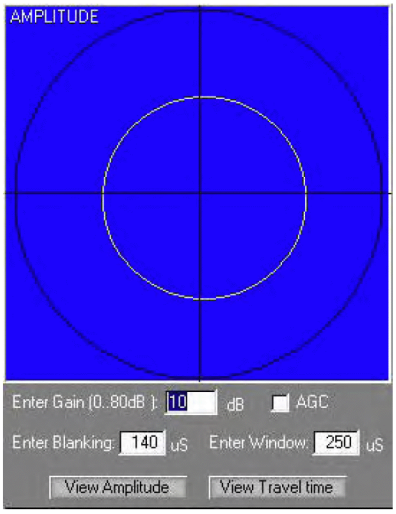
Sonde power is applied by clicking on the green-colored 1 button. Power is turned off by clicking on the red-colored 0 button. There is no indicator for the state of the power supply on the desktop, so the external indicators should be observed for this purpose.

To make a log ensure that the Test Mode is disabled - see section 1, Log Mode setting. Click File|New Log and select a filename. Old logs may be overwritten if necessary -TAKE CARE. The header editor will be started automatically. A previous set of header data may be loaded by clicking LOAD and choosing a template.

To start logging, click on the red Record (circle) control. The log data will start to scroll down the screen after a brief pause for synchronization. The messages "DSP2: Detecting data stream" and "Updating probe settings" will be observed at the bottom of the screen during this process. Note that the screen scrolling direction is not affected by the actual direction of movement of the sonde. To cease logging, click on the black STOP control (square). The data should be immediately backed up to a USB drive, CD, or other data storage prior to beginning another log.

If the data display from a probe which is properly connected appears to occupy only half of the track area,

with the remainder filled with random colors such as green which are not part of the regular palette, then it is most likely that the downhole data communication is not functioning properly. This symptom is due to the fact that the probe settings cannot be communicated properly, and it is operating in its default power-up mode. If this is the case, the Drive setting of the System|Winch dialog should be increased or decreased accordingly. See section 5 for full details.



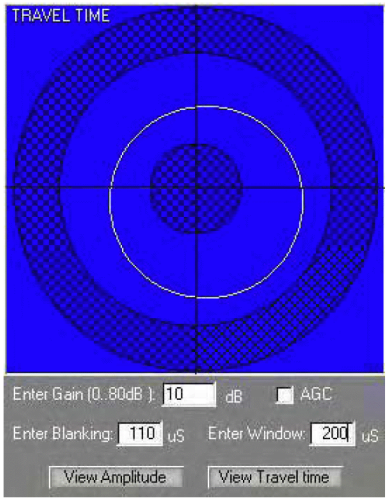
To adjust the sonde gain it is necessary to use the Radial Amplitude plot, which is enabled by clicking on the circle with cross-hairs symbol. When the dialog is active a new window will open on top of the unwrapped data display. In this display, the data is presented as a 'polar' plot. Press the 'View Amplitude' button to display the amplitude plot. This plot shows amplitude increasing towards the outside of the circle and the compass direction following the sweep of the transducer. The line indicating the data is drawn in the regular palette, so that high amplitudes are drawn in white and low amplitudes in black/brown. The picture here shows the image of the inside of a cylinder.

If the data is concentrated in a small circle at the center, the gain is too low and should be increased. If the data is obviously clipped at the outside of the circle, then the gain should be reduced. Type the new gain value into the entry box and press Enter. The ideal would be to set a gain value which allows the peak values to be displayed without clipping, with the majority of the data around the half-way level. It may also be necessary to adjust the blanking to ensure that internal reflections from the acoustic housing are not detected at the new gain value. This will be apparent in the unwrapped data display as pronounced patterning unrelated to the true target. The AGC option causes the probe to set gain automatically thus preventing signal saturation in most cases. (The gain is varied in 6dB steps

Blanking Period and window length can be set independently. Blanking is set to avoid reflections from the housing of the acoustic transducer or random reflections from a rugose borehole, and window length is set to accommodate the range of borehole radius that might be expected. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. The default value for the blanking period is 145 microseconds, which is the minimum required for the two-way transit from the transceiver to the outer surface of the acoustic housing. It is not advisable to reduce this value beyond the default setting, although it may be increased for larger boreholes at the rate of 1.5mm of one-way travel per microsecond.

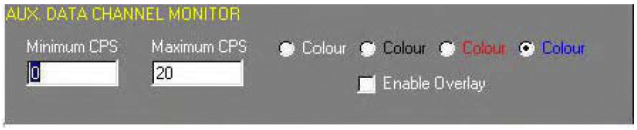
Window Length (sample time) defines the period during which the arrival gate remains open to detect the returned acoustic pulse. The acoustic pulse will travel in water at a speed of approximately 1.5mm per microsecond. The default window length is 150 microseconds, which is equivalent to 225 mm of (two-way) travel in the borehole fluid, or approximately 110mm of borehole diameter. If this is added to the default blanking period, which is equivalent to the outside diameter of the acoustic housing, it can be seen that the default set-up will be correct for boreholes up to 150mm. An error will be indicated if the sum of the blanking period and window length would be greater than 409 microseconds, which is the maximum range of the timer. Choose your window setting to best match the borehole diameter.

Pressing the 'View Travel time' button changes the display to that shown below:



The unhatched ring between the two cross hatched zones represents the sample window. The width of this ring will vary with window length value. The profile of a cylinder is represented here appearing as a circle in the sample window.

Pressing this button displays the following dialog box:



This box allows you to enable the Natural Gamma option by checking the 'Enable Overlay' check box. The Overlay appears as a trace upon the Amplitude plot. The trace range and color can also be set by this dialog. The level of filtering can also be altered (see section 8) (note that any displayed trace data is automatically aligned with the acoustic scan data but only when logging up. The Natural Gamma sensor occupies a higher position in the probe so sufficient data has to be prebuffered so that the acoustic data can depth aligned with gamma. The prebuffering results in a delay at the start of a log before correct gamma data appears this is normal.)

Data Analysis and Interpretation

RG-DIP, the manufacturer's image interpretation package, offers manual and automatic feature recognition options. Feature orientations (dip/strike and azimuth) are automatically calculated. Display options include stereographic projections of zone axes, orientation frequency plots and 'synthetic cores' for comparison with real core data. The last option is invaluable for orientating core samples, particularly in the case of incomplete recovery.

Reporting

The final report will include the objective and scope of the survey, location of the boreholes, discussion of instrumentation and procedures in the field and lab. For each borehole there will be a plot showing the dip/strike and azimuth of features. The next page shows an example.

Assumptions and limitations of the results will be discussed. Supporting references will be listed as necessary

Required Field Records

Field log for each borehole showing

a) Location and description of the borehole

b) Date of test

c) Field personnel

d) Instrumentation

e) Any deviations from test plan and action taken as a result

This procedure has been reviewed and approved by the undersigned:

Professional Geophysicist_____ Date__ Feb 13. 2006 __

QA Review _____ Date___ Feb 13. 2006 _

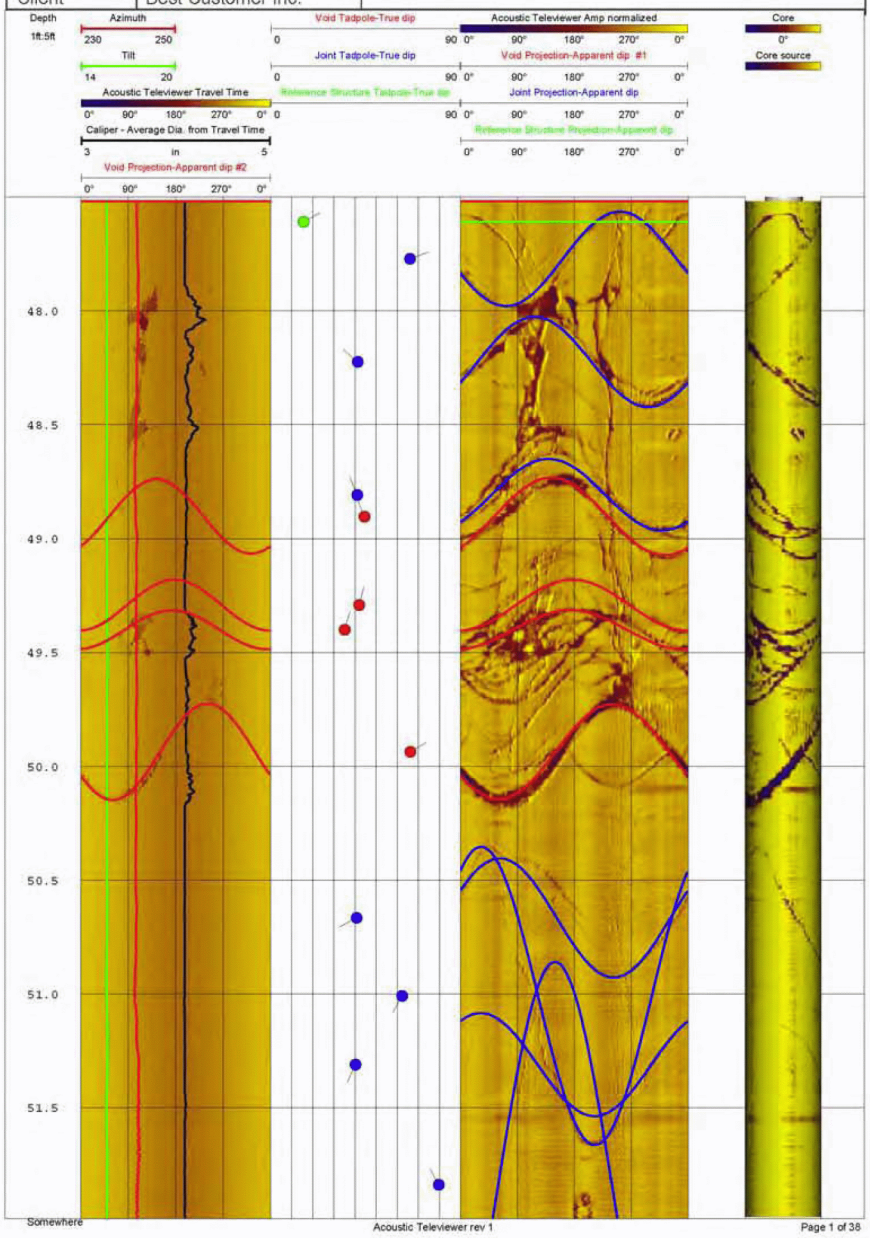
B-XXX	Company	Geovision Geophysical Services
	Location	Somewhere Dam

BH	B-XXX Acoustic Televiewer		
Date	7/8/05	BH Fluid	Air/Water
Casing	4" Steel to 15 ft		
File Name	BXXXdown1		
Depth Drilled	300 feet		
Depth Logged	299.3 feet		
Logged by	Rob Steller		
Client	Best Customer Inc.		

Notes:

1) All orientations referenced to True North

2) Tadpole tails indicate dip direction with True North as up.



APPENDIX I

SPT HAMMER ENERGY STUDY

SPT Hammer Energy Study Reports

SPT HAMMER ENERGY STUDY REPORT

GRL Engineers, Inc.
Standard Penetration Test Energy Measurements
July 25, 2008

GRL engineers, inc. Dynamic Measurements and Analyses

July 25, 2008

Mr. Brian Banks
Schnabel Engineering, Inc.
656 Quince Orchard Road, Suite 700
Gaithersburg, MD 20879 USA

Re: Standard Penetration Test Energy Measurements
Calvert Cliffs Nuclear Power Plant 2008 Subsurface Investigation
Schnabel Project Number: 06120048
GRL Job No. 089053

Dear Mr. Banks,

This report presents results of energy measurements obtained from June 23 to July 15, 2008 during Standard Penetration Tests (SPT) sampling for the above referenced project. A total of four automatic hammers mounted on four different drill rigs were tested. The four drill rigs were as follows; CME 75 ATV, CME 550-X ATV, Diedrich D-50 ATV, and a CME 75 truck rig. All dynamic tests were performed on AWJ drill rods. GRL Engineers, Inc. obtained the dynamic measurements with an instrumented AWJ subsection and a Model PAK Pile Driving Analyzer®. This report describes the testing procedures and summarizes the test results. Appendix A describes our measurement and analysis methods, Appendix B is a summary of the field data and Appendix C shows the calibration certificates of the Model PAK and the sensors employed in this test series, SPT Hammer Energy Measurement Checklists, and SPT Hammer Energy Measurement Logs.

PURPOSE AND SCOPE OF WORK

At the request of Schnabel Engineering, Inc., GRL has carried out SPT energy measurements at the Calvert Cliffs site. GRL performed SPT energy measurements according to ASTM D4633-05 and the project specific procedures. Specifically, we provided SPT energy measurements at intervals of 15 feet to the boring termination depths for four drill rigs. The boring termination depths varied between 100 and 250 feet. If necessary due to indications of poor quality dynamic test data or changes in the drilling procedure additional energy measurements were obtained at the next available sample depth. This was necessary on at least three occasions where one of the accelerometers provided inconsistent data. Once the accelerometer in question was identified (accelerometer K-611) it was no longer used. Therefore, GRL performed energy measurements at intervals of 15 feet sampling depths with the total number of tests varying between 7 and 17 depending upon the boring termination depth.

4535 Renaissance Parkway • Cleveland, OH 44128 USA • 216.831.6131 • fax 216.831.0916 • www.pile.com

California 661.259.2977 | Colorado 303.666.6127 | Florida 407.826.9539 | Illinois 847.670.7720 | North Carolina 704.593.0992 | Pennsylvania 610.459.0278

EQUIPMENT

Drilling and SPT Hammer Equipment

CME 75 ATV (Hammer # 1)

SPT energy measurements were made on an automatic hammer mounted on a CME 75 ATV drill rig. The drilling method used to advance the boring was the rotary mud method and it was reported to GRL that all production boring holes used the same method at this site. Energy measurements, for the above stated drill rig, were initially collected at borehole location B-357, a 250 foot borehole. However, the drill rig was moved due to multiple drilling related problems at this boring location. Energy measurements were then taken at borehole B-348, a 200 foot borehole. SPT energy measurement tests were performed at sampling penetrations of every 15 feet including the last sampling increment. In total, 7 energy measurement events were monitored at B-357, and 14 energy measurement events were monitored at B-348

CME 550-X ATV (Hammer # 2)

Automatic hammer #2 mounted on a CME 550-X ATV drill rig was also energy tested at this project site. Energy measurements, for the above stated drill rig, were collected at borehole location B-354, a 250 foot borehole. SPT energy measurements were performed at sampling penetrations of every 15 feet, including the last sampling increment. In total, 17 energy measurements were monitored at this borehole location.

Diedrich D-50 ATV (Hammer # 3)

Automatic hammer #3 mounted on a Diedrich D-50 ATV drill rig was also tested. Energy measurements, for this drill rig, were collected at a 100 foot borehole, location B-791. The SPT energy measurement tests were performed at sampling penetrations of 15 feet, including the last sampling increment. In total, 7 energy measurement events were monitored at this borehole location.

CME 75 Truck (Hammer # 4)

Automatic hammer #4 mounted on a CME 75 Truck drill rig was also energy tested for this site. Energy measurements, for the above stated drill rig, were collected at a 250 foot borehole, location B-356. The SPT energy measurement tests were performed at sampling penetrations of every 15 feet, including the last sampling increment. In total, 17 energy measurement events were monitored at this borehole location.

Instrumentation

A Model PAK Pile Driving Analyzer (PDA) data acquisition system was used to collect and process the dynamic measurements of force and velocity. A two foot long section of AWJ rod subsection was instrumented with two full bridge foil resistance strain gages and two piezoresistive accelerometers mounted in the midpoint location of the instrumented rod. Calibration certificates are included in Appendix C.

Analog signals from the strain gages and accelerometers were conditioned, digitized, stored and processed with the PDA. The sampling frequency used during the SPT testing was 10 kHz. Selected output from the PDA for each recorded impact included the maximum calculated rod top force (FMX), maximum rod top velocity (VMX), maximum energy transfer (EFV), and the hammer operating rate (BPM).

MEASUREMENTS AND CALCULATIONS

FV Method (EFV)

Energy transfer to the PDA gage location, EFV, was computed by the PDA using force, F(t), and velocity, v(t), records as follows:

$$EFV = \int_a^b F(t) \cdot v(t) dt$$

The time "a" corresponds to the start of the record when the energy transfer begins, and "b" is the time at which energy transferred to the rod reaches a maximum value. The FV Method is currently recognized in ASTM D4633-05, and is the theoretically correct result; therefore, no other energy calculation methods are reported.

Corrected SPT number (N_{60})

While the primary purpose of SPT energy testing is to calculate the maximum transfer energy (ETR) of each hammer blow, the overall average EMX value can be used to calculate the corrected SPT number (N_{60}). To adjust the SPT N-values for hammer performance, the following correction as suggested by Seed for N-value adjustment to 60% transfer efficiency (e.g. 210 ft-pounds) was used:

$$N_{60} = \left(\frac{E_m}{210} \right) N_m$$

Where:

N_{60} = Corrected N-value

E_m = overall average measured energy transfer (EMX)
N_m =number of blows for last 12 inches of sampler penetration

A general introduction to dynamic SPT testing methods is included in this report as Appendix A.

Any cross-sectional area difference between the GRL rod subsection and the drill rods, any loose connections or changes in area at section joints, or any cross-sectional area differences between the individual drill rod sections will result in stress wave reflections that can influence the energy transfer. The EFV transferred energy calculation method, utilizing both force and velocity records, is theoretically correct and gives energy transfer results that are not adversely affected by cross-sectional area changes or loose connectors. The EFV results are included in Appendix B for all records collected and accepted after checking them for consistency.

RESULTS

Upon return to the office, the records collected by the PDA were checked again for consistency and accuracy. For example, records from very weak startup or final impacts were not included in average results. Appendix B contains representative plots of force and normalized velocity versus time, as well as plots and tables of PDA results for all hammer blows at each dynamically monitored sampling depth. The PDA results include the EFV (transferred energy by the FV method, as recommended by ASTM D4633-05), ETR (energy transfer efficiency for the EFV method), BPM (hammer operating rate), FMX (maximum rod top force), and VMX (maximum rod top velocity). The plots show each calculated PDA results versus split-spoon penetration and blow number, while the tables show statistical summaries for each 6 inch increment and full printouts of every blow. At the end of each table is a statistical evaluation of the results which includes the average and standard deviation of the entire measurement sample.

Tables 1 through 5 summarize the average transferred energy values calculated by the EFV method. The records consist of averaged hammer blows from the last 12 inches (i.e. N value) at each dynamically monitored sampling depth. The “energy transfer ratio” (ETR) is defined as the ratio of maximum transferred energy EFV divided by the theoretical hammer potential energy of 350 ft-lbs (i.e., computed per the 140 lb SPT hammer and the standard 30 inch drop as specified by ASTM D1586-99). The average hammer operating rate is reported in blows per minute (BPM). A summary of the dynamic measurements of the energy transfer to the drill rods for each drill rig is provided in the table below.

Borehole and Drill Rig	Avg. EFV (ft-lbs)	Avg ETR (%)	Range of EFV (ft-lbs)	Range of ETR (%)
CME 75 ATV B-357	308	88	273 - 334	78 - 95
CME 75 ATV B-348	320	91	271 - 331	77 - 94
CME 550-X ATV B – 354	292	83	277 - 316	79 - 90
Diedrich D-50 ATV B-791	282	81	260 - 296	74 - 85
CME 75 TRUCK B-356	314	90	302 - 323	86 - 92

CONCLUSIONS

Based upon the dynamic test data obtained, the following conclusions are presented:

1. Loose connections and cross sectional area changes in the drill string were observed in the force and velocity records. However, energy transfer values calculated using the EFV equation are not adversely affected by the connectors and therefore are considered a better indication of transferred energy.

2. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 282 to 320 ft-lbs for all four of the drill rigs. This corresponds to a transfer efficiency ranging from 81 to 91% of the SPT hammer energy of 350 ft-lbs.

3. The average transferred energy (EFV) and energy transfer ratio (ETR) for each drill rig tested was as follows:

   CME 75 ATV (B-357): Average EFV = 308 ft-lbs, Average ETR = 88%

   CME 75 ATV (B-348): Average EFV = 320 ft-lbs, Average ETR = 91%

   CME 550-X ATV (B-354): Average EFV = 292 ft-lbs, Average ETR = 83%

   Diedrich D-50 ATV (B-791): Average EFV = 282 ft-lbs, Average ETR = 81%

   CME 75 Truck (B-356): Average EFV = 314 ft-lbs, Average ETR = 90%

Please review both ASTM D4633-05 and ASTM D1586-99 prior to applying these test results. The energy calibrations reported herein are valid for the same hammer/drill rig, with the same drill operator, same anvil dimensions, and same drilling methods.

We appreciate the opportunity to be of assistance to you on this project. Please contact our office should you have any questions regarding this submittal, require additional information, or if we may be of further service.

Sincerely,

GRL Engineers, Inc.

Darrell Fortune, E.I.

Scott Webster, P.E.

DF:SW:dms

TABLE 1: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
DRILL RIG 75, HAMMER #1, BORING 357

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency(1) (%)	Blow per Minute (bpm)	N_{60}
6/24/2008	13.5 - 15.0	18	3-6-9	15	309	88	59	22
6/24/2008	28.5 - 30.0	33	3-1-2	3	273	78	49	4
6/24/2008	43.5 - 45.0	48	3-6-6	12	297	85	52	17
6/25/2008	58.5 - 60.0	64	6-13-22	35	314	90	58	52
6/25/2008	73.5 - 75.0	79	2-4-8	12	313	89	54	18
6/30/2008	91.5 - 92.0	94	8-6-7	13	334	95	56	21
7/1/2008	103.5 - 105	107	3-3-3	6	319	91	58	9
Average(2)					**308**	**88**	**55**	
Standard Dev.(2)					**19**	**5**	**4**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

TABLE 2: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
DRILL RIG 75, HAMMER #1, BORING 348

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)	N_{60}
7/9/2008	14.5 - 16.0	19	2-3-5	8	271	77	48	10
7/9/2008	30.0 - 31.5	35	10-19-43	62	305	87	58	90
7/10/2008	45.0 - 46.5	50	13-5-6	11	316	90	58	17
7/10/2008	60.0 - 61.5	65	4-5-9	14	323	92	58	22
7/10/2008	75.0 - 76.5	80	3-2-6	8	320	92	57	12
7/10/2008	90.0- 91.5	95	6-10-13	23	314	90	58	34
7/11/2008	105.0 - 106.5	110	5-4-8	12	325	93	59	19
7/11/2008	120.0 - 121.5	126	4-7-9	16	323	92	59	25
7/14/2008	135.0 - 136.5	137	8-10-15	25	335	96	58	40
7/14/2008	150.0 - 151.5	152	5-6-10	16	332	95	59	25
7/14/2008	165.0 - 166.5	167	4-7-8	15	330	94	57	24
7/15/2008	180.0 - 181.5	181	7-10-14	24	331	94	58	38
7/15/2008	195.0 - 196.5	196	4-6-14	20	327	93	59	31
7/15/2008	198.5 - 200.0	201	4-5-8	13	324	92	59	20
Average(2)					**320**	**91**	**58**	
Standard Dev.(2)					**16**	**5**	**3**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

TABLE 3: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
DRILL RIG 550-X, HAMMER #2, BORING 354

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)	N_{60}
6/23/2008	15.0 - 16.5	18	4-9-11	20	278	80	53	26
6/24/2008	33.5 - 35.0	38	3-5-5	10	298	85	53	14
6/24/2008	45.0 - 46.5	48	6-7-8	15	298	85	52	21
6/24/2008	60.0 - 61.5	63	50/5"	50/5"	298	85	53	
6/24/2008	75.0 - 76.5	78	50/5"	50/5"	281	80	52	
6/24/2008	90.0 - 91.5	93	6-4-6	10	295	84	53	14
6/25/2008	105.0 - 106.5	108	12-23-22	45	296	85	53	63
6/25/2008	118.5 - 120.0	123	5-6-11	17	292	83	52	24
6/25/2008	143.5 - 145.0	148	8-7-12	19	285	81	53	26
6/25/2008	148.5 - 150.0	153	7-8-11	19	280	80	52	25
6/25/2008	163.5 - 165.0	168	5-7-9	16	282	81	53	21
6/25/2008	178.5 - 180.0	183	8-9-12	21	266	76	52	27
6/26/2008	193.5 - 195.0	198	6-7-10	17	277	79	52	22
6/30/2008	213.5 - 215.0	218	5-8-13	21	297	85	53	30
7/1/2008	223.5 - 225.0	228	5-6-10	16	315	90	53	24
7/2/2008	238.5 - 240.0	243	6-9-15	24	316	90	55	36
7/2/2008	250.0 - 251.5	255	6-11-15	26	307	88	53	38
Average(2)					**292**	**83**	**53**	
Standard Dev.(2)					**14**	**4**	**1**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

TABLE 4: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
DRILL RIG D-50, HAMMER #3, BORING 791

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)	N_{60}
6/23/2008	15.0 - 16.5	18	3-5-4	9	265	76	52	11
6/24/2008	28.5 - 30.0	32	3-4-5	9	260	74	53	11
6/24/2008	43.5 - 45.0	47	5-7-8	15	290	83	53	21
6/24/2008	58.5 - 60.0	62	50/5"	50/5"	292	84	53	
6/24/2008	73.5 - 75.0	77	7-5-8	13	292	84	52	18
6/24/2008	88.5 - 90.0	92	5-5-6	11	278	80	53	15
6/25/2008	98.5 - 100.0	101	9-13-14	27	296	85	51	38
Average(2)					**282**	**81**	**52**	
Standard Dev.(2)					**14**	**4**	**1**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

TABLE 5: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
DRILL RIG TRUCK 75, HAMMER #4, BORING 356

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)	N_{60}
7/8/2008	13.5 - 15.0	19	11-8-16	24	302	86	56	35
7/8/2008	28.5 - 30.0	34	7-8-10	18	313	89	56	27
7/8/2008	43.5 - 45.0	49	2-2-3	5	322	92	55	8
7/8/2008	60.5 - 62.0	66	3-3-5	8	319	91	54	12
7/8/2008	73.5 - 75.0	79	4-5-5	10	322	92	54	15
7/9/2008	88.5 - 90.0	94	50/4"	50/4"	309	88	55	
7/9/2008	103.5 - 105.0	109	6-9-11	20	308	88	57	29
7/9/2008	118.5 - 120.0	124	3-3-9	12	311	89	52	18
7/10/2008	133.5 - 135.0	139	5-8-13	21	321	92	57	32
7/10/2008	148.5 - 150.0	154	6-6-8	14	323	92	56	22
7/10/2008	163.5 - 165.0	169	4-5-7	12	316	90	54	18
7/10/2008	178.5 - 180.0	184	3-6-8	14	322	92	55	21
7/11/2008	193.5 - 195.0	199	4-7-8	15	308	88	55	22
7/11/2008	208.5 - 210.0	214	5-6-8	14	306	87	56	20
7/15/2008	225.0 - 226.0	228	5-8-9	17	308	88	53	25
7/15/2008	238.5 - 240.0	243	4-6-9	15	316	90	56	23
7/15/2008	250.0 - 251.5	258	4-5-6	11	318	91	56	17
Average(2)					**314**	**90**	**55**	
Standard Dev.(2)					**7**	**2**	**1**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

Appendix A

An Introduction into SPT Energy Measurement.

APPENDIX A
AN INTRODUCTION INTO SPT DYNAMIC PILE TESTING

The following has been written by GRL Engineers, Inc. and may only be copied with its written permission.

1. BACKGROUND

The Standard Penetration Test is frequently conducted as an in-situ assessment of soil strength. This test requires that a 140 lb weight is dropped 30 inches onto a drive rod at whose bottom a sampler is usually installed. The sampler is driven for 18 inches; the number of blows required for the last 12 inches of driving is the so-called N-value. The N-value may be used as a strength indicator for foundation design or as a means of assessing the liquefaction potential of soils.

Obviously, the SPT hammer efficiency is an important consideration when using the N-values for design purposes. Measurements have indicated that the energy in the drive rod is sometimes only 30% and and may reach 90% of the potential or rated energy of the SPT hammer (E-rated = 0.35 kip-ft or 0.475 kJ). The type of hammer used to drive the rod is the main reason for these variations. On the average, the energy in the drive rod is 60% of the standard rated energy.

Because of the variability of energy, methods based on N-values are considered unreliable. However, measurements during SPT testing using the Case Method can be done on a routine basis and these measurements yield the transferred energy values. With measured energy, EMX, known, an adjustment of the measured N-value, N_m, can be made as follows.

$$N_{60} = N_m [E_m / (0.6E_r)] \quad (1)$$

Thus, if the measured energy value is equal to the normally expected transferred energy of 60% of E-rated then the adjusted and measured N-values are identical. On the other hand, if the measured energy is only 30% then the adjusted blow count will be reduced by 50%.

2. DYNAMIC TESTING AND ANALYSIS METHODS APPLIED TO SPT

The Case Method of dynamic pile testing, named after the Case Institute of Technology where it was developed between 1964 and 1975, requires that a substantial ram mass (e.g. a pile driving hammer) impacts the pile top such that the pile undergoes at least a small permanent set. Thus, the method is also referred to as a “High Strain Method”. The Case Method requires dynamic measurements on the pile or shaft under the ram impact and then a calculation of various quantities. Conveniently, for SPT applications, the measurements and analyses are done by a single piece of equipment: the SPT Analyzer. The Pile Driving Analyzer® (PDA) is also suitable to perform these measurements and data processing.

A related analysis method is the “Wave Equation Analysis” which calculates a relationship between bearing capacity, pile stresses, transferred energy and field blow count. The GRLWEAP™ program performs this analysis and provides a complete set of helpful information and input data. This program can be used very effectively to simulate the SPT driving process.

3. MEASUREMENTS

GRL uses equipment manufactured by Pile Dynamics, Inc. The system includes either an SPT-Analyzer™ (SPTA) or a Pile Driving Analyzer® (PDA), an instrumented rod section and two accelerometers. SPT energy testing is very closely related to and borrows procedures from dynamic pile testing. Those interested in the basis of the SPT energy testing method may obtain extensive literature on dynamic pile testing from GRL Engineers, Inc.

3.1 SPT Analyzer or Pile Driving Analyzer

The basis for the results calculated by the SPTA or PDA are strain and acceleration measured in an instrumented rod section. These signals are converted to rod top force, F(t), and rod top velocity, v(t). The SPTA or PDA conditions, calibrates and displays these signals and immediately computes average pile force and velocity thereby eliminating bending effects. The product of these two

measurements is then integrated over time which yields the energy transferred to the instrumented section as a function of time (see Section 4.1).

For convenience and accuracy, strain measurements are usually taken on an instrumented section of SPT drive rod. Ideally, the section properties of the instrumented rod and those of the drive rod are the same, however, using subs, other sections can also be utilized.

For the instrumented section, PDI provides a force calibration in such a way that the output of the instrumented rod is directly calculated without the need for an accurate elastic modulus or cross sectional area of the rod section.

The acceleration measurements are often demanding in the SPT environment, because of high frequency and high acceleration motion components. An experienced measurement engineer, therefore, has to evaluate the quality of this data before final conclusions are drawn from the numerical results calculated by SPTA or PDA.

SPTA or PDA records are taken while the standard N-value is acquired in the conventional manner. This then allows a direct correlation between N-value and average transferred energy.

3.2 HPA

The SPT hammer's ram velocity may be directly obtained using radar technology in the Hammer Performance Analyzer™. The impact velocity results can be automatically processed with a PC or recorded on a strip chart. HPA measurements yield a hammer kinetic energy, but not the energy transferred to the drive rod.

4 RECORD EVALUATION BY SPTA OR PDA

4.1 HAMMER PERFORMANCE

The PDA calculates the energy transferred to the pile top from:

$$E(t) = \int_0^t F(\tau)v(\tau)\, d\tau \qquad (2)$$

The maximum of the E(t) curve is often called **ENTHRU or EMX;** it is the most important quantity for an overall evaluation of the performance of a hammer and driving system. **EMX** allows for a classification of the hammer's performance when presented as, e_T, the rated transfer efficiency, also called energy transfer ratio (**ETR**) or global efficiency.

$$e_T = EMX/E_R \qquad (3)$$

where E_R is the hammer manufacturer's rated energy value or 0.35 kip-ft (0.475 kJ) in the case of the SPT hammer.

Often in the SPT literature one finds also reference to the EF2 energy. This evaluation is based on assumed proportionality between force and velocity (see also Section 5):

$$v(t) = F(t) / Z \qquad (4)$$

where Z = EA/c is the pile impedance, E is the elastic modulus, A is the cross sectional area and c is the speed of the stress wave in the pile material..

Combining equations 2 and 4 leads to

$$EF(t) = \int_0^t F(\tau)^2 / Z\, d\tau \qquad (5)$$

The EF2 transferred energy value is the EF-value at the time t = 2L/c, where L is the drive rod length and c is the stress wave speed in steel (16,800 ft/s or 5,124 m/s). Since the force is easier to measure than both force and velocity, Equation 5 is preferred by some test engineers. However, the EF method is fraught with errors and certain correction factors have to be applied to make it approximately correct. Among the error sources are the following:

- Proportionality is often violated prior to time 2L/c. The proportionality between force and velocity in a downward traveling wave only holds if the wave does not encounter a disturbance prior to reflecting off the pile toe. Such disturbances include a change in cross sectional area, an open or loose splice or joint, or resistance along the shaft.

- Using only one force measurement precludes a data quality check based on the proportionality between force and velocity. Thus, a force measurement that is for some reason in error may not be detectable, which will lead to errors in the EF2 value. Data quality checks will be discussed further in Section 5.

The use if EF2 is therefore not recommended but it is often included in result presentations for the sake of completeness.

4.2 STRESSES

During SPT monitoring, it is also of interest to monitor compressive stresses at both the top of the drive rod and at its bottom.

At the pile top (location of sensors) the maximum compression stress averaged over the rod's cross section, **CSX**, is directly obtained from the measurements. Note that this stress value refers to the instrumented section. If the rod has a different cross sectional area then the stress in the rod will be different from CSX.

The SPTA or PDA can also calculate, in an approximate manner, the force at the rod bottom, **CFB**. To obtain the corresponding stress, this force value should be divided by the appropriate cross sectional area, e.g. by the rod area just above the sampler or by the sampler area itself. Of course, non-uniform stress components as they might occur at the sampler tip due to a sloping rock are not considered in this calculation.

5. DATA QUALITY CHECKS

Quality data is the first and foremost requirement for accurate dynamic testing results. It is therefore important that the measurement engineer performing SPTA or PDA tests has the experience necessary to recognize measurement problems and take appropriate corrective action should problems develop. Fortunately, dynamic pile testing allows for certain data quality checks because two independent measurements are taken that have to conform to the so-called proportionality relationship.

As long as there is only a wave traveling in one direction, as is the case during impact when only a downward traveling wave exists in the rod, force and velocity measured at its top are proportional

$$F = v\,Z \qquad (5)$$

where Z is again the pile impedance, Z = EA/c. This relationship can also be expressed in terms of stress

$$\sigma = F/A = v\,(E/c) \qquad (6)$$

or strain

$$\epsilon = \sigma/E = v / c \qquad (7)$$

This means that the early portion of strain times wave speed must be equal to the velocity unless the proportionality is affected by high friction near the pile top or by a pile cross sectional change not far below the sensors. Checking the proportionality is an excellent means of assuring meaningful measurements but is only truly meaningful for perfectly uniform rods. Open or loose splices, for example, will lead to a non-proportionality. For SPT rods it is fortunate that usually no soil resistance acts along the shaft and for that reason, proportionality can exist until the stress wave returns from sampler top or rod bottom unless connectors are not sufficiently tightened or have a significant mass.

Velocity data quality can also be checked by looking at the final displacement, DFN, which is calculated from the acceleration by double integration. If the calculated final displacement is much higher or lower than indicated by the N-value, the accelerometer attachment may be loose or the sensor may be faulty. If major drift in the velocity is observed, the EMX value may be in error, even though proportionality from impact to time 2L/c exists. In this case, it may be useful to evaluate the energy transferred to the drill rod at time 2L/c, which is calculated by the PDA or SPTA as the E2E quantity.

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Appendix B

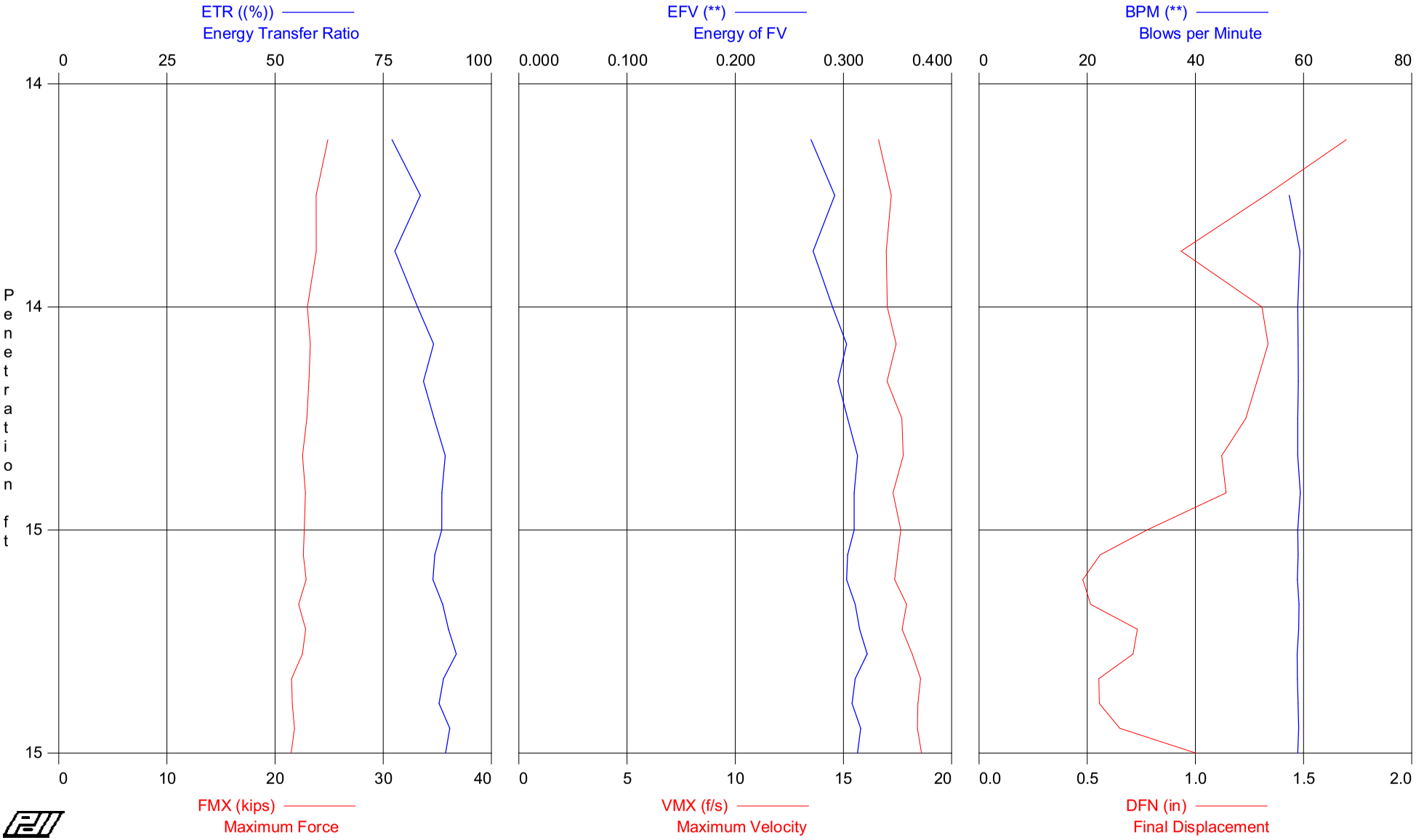
SPT Energy Measurement Results.

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 13.5-15
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 13.5-15
OP: DJF

HAMMER #1 AWJ B-357
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 18.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	14.00	8	AV4	20.1	20.2	0.281	80	59	17.0	23.9	1.3
			STD	0.6	0.5	0.010	3	1	0.2	0.7	0.3
			MAX	20.9	21.1	0.292	84	59	17.2	24.9	1.7
10	14.50	12	AV6	19.2	19.7	0.306	87	59	17.5	22.9	1.1
			STD	0.2	0.2	0.006	2	0	0.3	0.2	0.2
			MAX	19.5	20.0	0.313	89	59	17.8	23.3	1.3
19	15.00	18	AV9	18.6	19.0	0.311	89	59	18.1	22.2	0.6
			STD	0.5	0.5	0.006	2	0	0.4	0.5	0.2
			MAX	19.2	19.6	0.322	92	59	18.6	22.9	1.0
			Average	19.1	19.5	0.303	87	59	17.7	22.7	0.9
			Std. Dev.	0.7	0.7	0.014	4	0	0.6	0.8	0.4
			Maximum	20.9	21.1	0.322	92	59	18.6	24.9	1.7

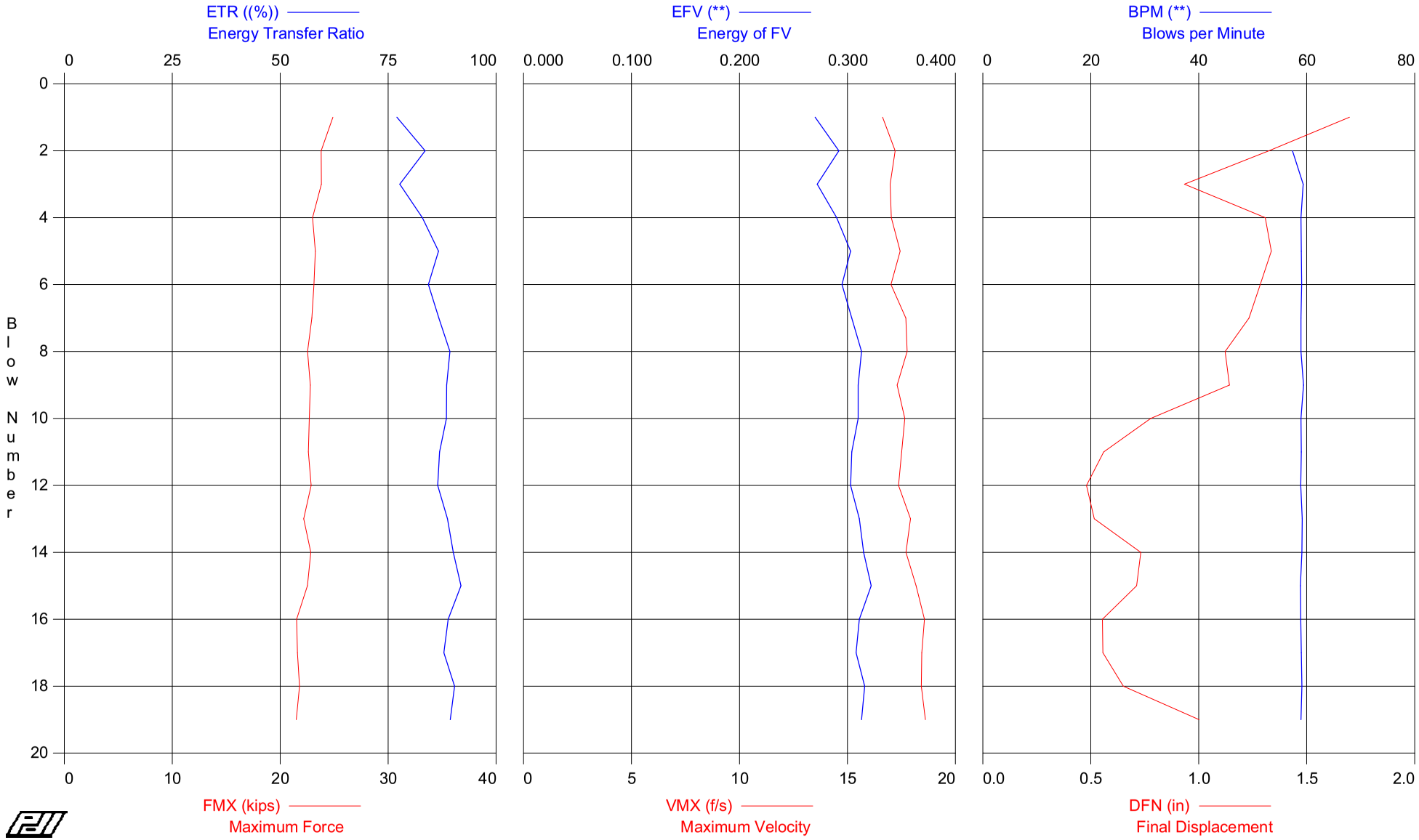
Total number of blows analyzed: 19

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 13.5-15
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 13.5-15
OP: DJF

HAMMER #1 AWJ B-357
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 18.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

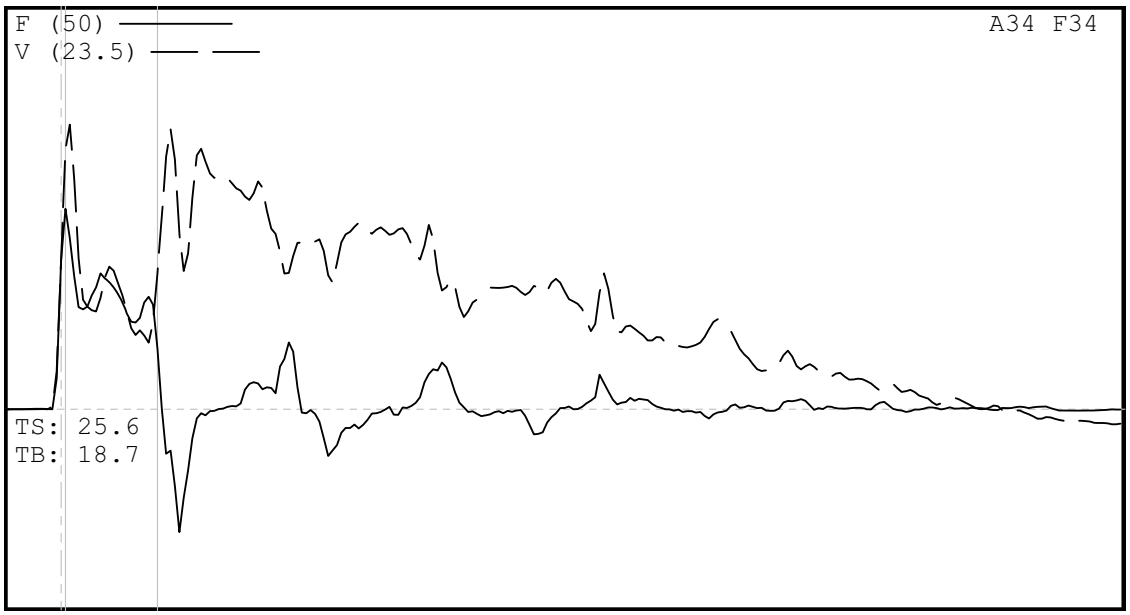
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.9	21.1	0.270	77	0	16.6	24.9	1.7
2	8	20.0	20.1	0.292	84	57	17.2	23.8	1.3
3	8	20.0	20.1	0.272	78	59	17.0	23.8	0.9
4	8	19.3	19.6	0.290	83	59	17.0	23.0	1.3
5	12	19.5	20.0	0.303	87	59	17.4	23.3	1.3
6	12	19.4	19.9	0.295	84	59	17.0	23.1	1.3
7	12	19.3	19.7	0.304	87	59	17.7	22.9	1.2
8	12	18.9	19.3	0.313	89	59	17.8	22.5	1.1
9	12	19.2	19.7	0.310	89	59	17.3	22.8	1.1
10	12	19.1	19.6	0.310	88	59	17.7	22.7	0.8
11	18	19.0	19.5	0.304	87	59	17.5	22.6	0.6
12	18	19.2	19.6	0.303	86	59	17.4	22.9	0.5
13	18	18.6	19.0	0.311	89	59	17.9	22.2	0.5
14	18	19.2	19.5	0.315	90	59	17.7	22.8	0.7
15	18	18.9	19.3	0.322	92	59	18.2	22.5	0.7
16	18	18.1	18.4	0.311	89	59	18.6	21.5	0.6
17	18	18.1	18.5	0.308	88	59	18.4	21.6	0.6
18	18	18.3	18.6	0.316	90	59	18.4	21.8	0.7
19	18	18.1	18.4	0.313	89	59	18.6	21.5	1.0
Average		19.1	19.5	0.303	87	59	17.7	22.7	0.9
Std. Dev.		0.7	0.7	0.014	4	0	0.6	0.8	0.4
Maximum		20.9	21.1	0.322	92	59	18.6	24.9	1.7

Total number of blows analyzed: 19

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 13 5-15



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 13 5-15
DESCR: HAMMER #1 AWJ B-357
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 13 5-15
6/24/2008 12:35:30 PM
Blow Number 41/1

Pile Properties

LE	18.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	2.10	ms
JC	0.50	[]

Quantity Results

CSXN	20.9	ksi
CSI	21.1	ksi
EFV	0.270	k-ft
ETR	77.0	(%)
BPM	0.0	bpm
VMX	16.6	f/s
FMX	25	kips
DFN	1.70	in
FVP	0.60	[]

Sensors

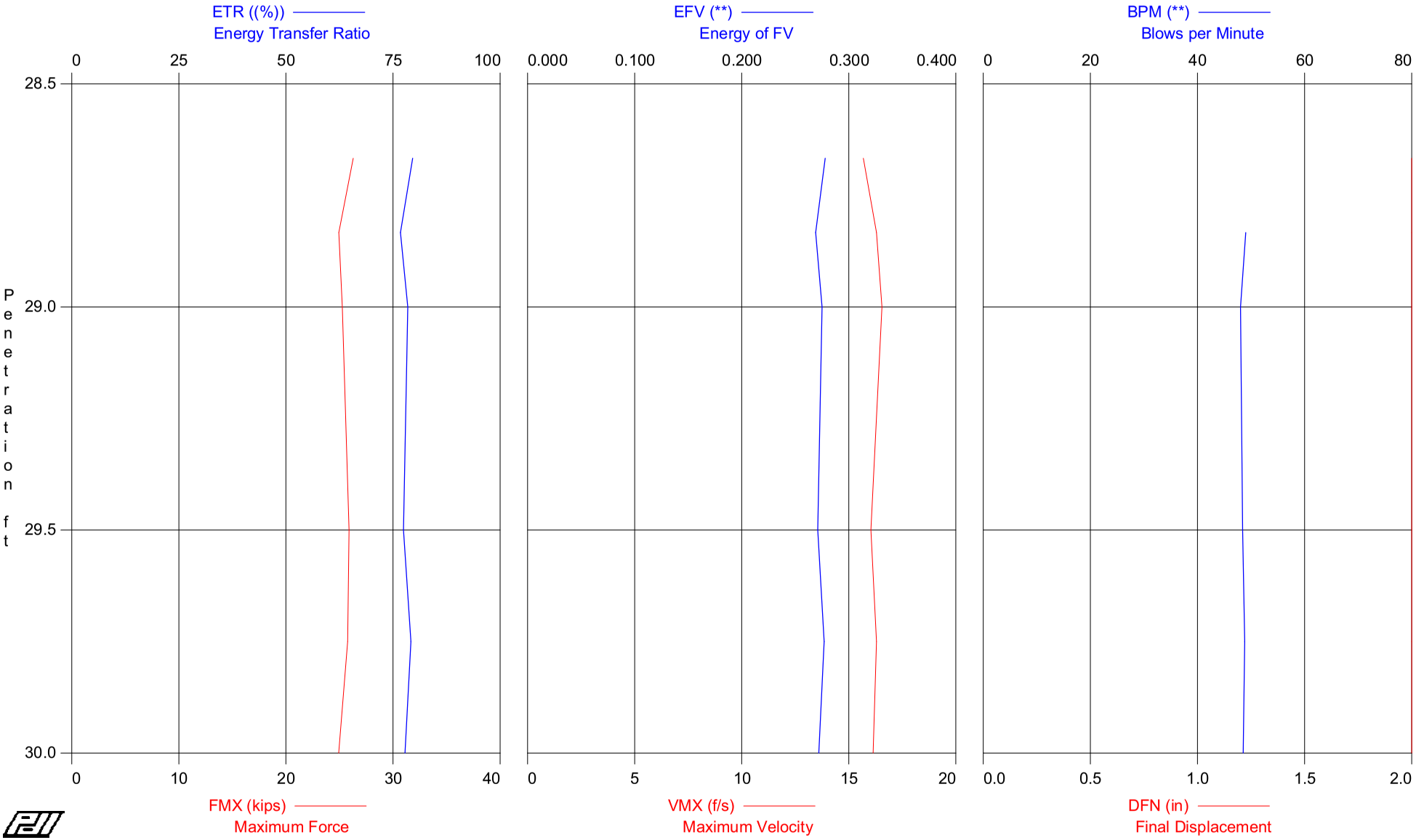
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.94

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 28.5-30
HAMMER #1 AWJ



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 28.5-30
OP: DJF

HAMMER #1 AWJ
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 33.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
3	29.00	6	AV3	21.4	21.6	0.274	78	49	16.2	25.5	2.4
			STD	0.5	0.5	0.004	1	0	0.4	0.6	0.4
			MAX	22.1	22.3	0.278	80	49	16.5	26.3	3.0
4	29.50	2	AV1	21.8	21.9	0.271	77	48	16.0	25.9	3.8
			MAX	21.8	21.9	0.271	77	48	16.0	25.9	3.8
6	30.00	4	AV2	21.3	21.5	0.275	78	49	16.2	25.3	2.7
			STD	0.4	0.2	0.002	1	0	0.1	0.4	0.5
			MAX	21.7	21.7	0.277	79	49	16.3	25.8	3.3
			Average	21.4	21.6	0.274	78	49	16.2	25.5	2.8
			Std. Dev.	0.4	0.4	0.003	1	0	0.3	0.5	0.7
			Maximum	22.1	22.3	0.278	80	49	16.5	26.3	3.8

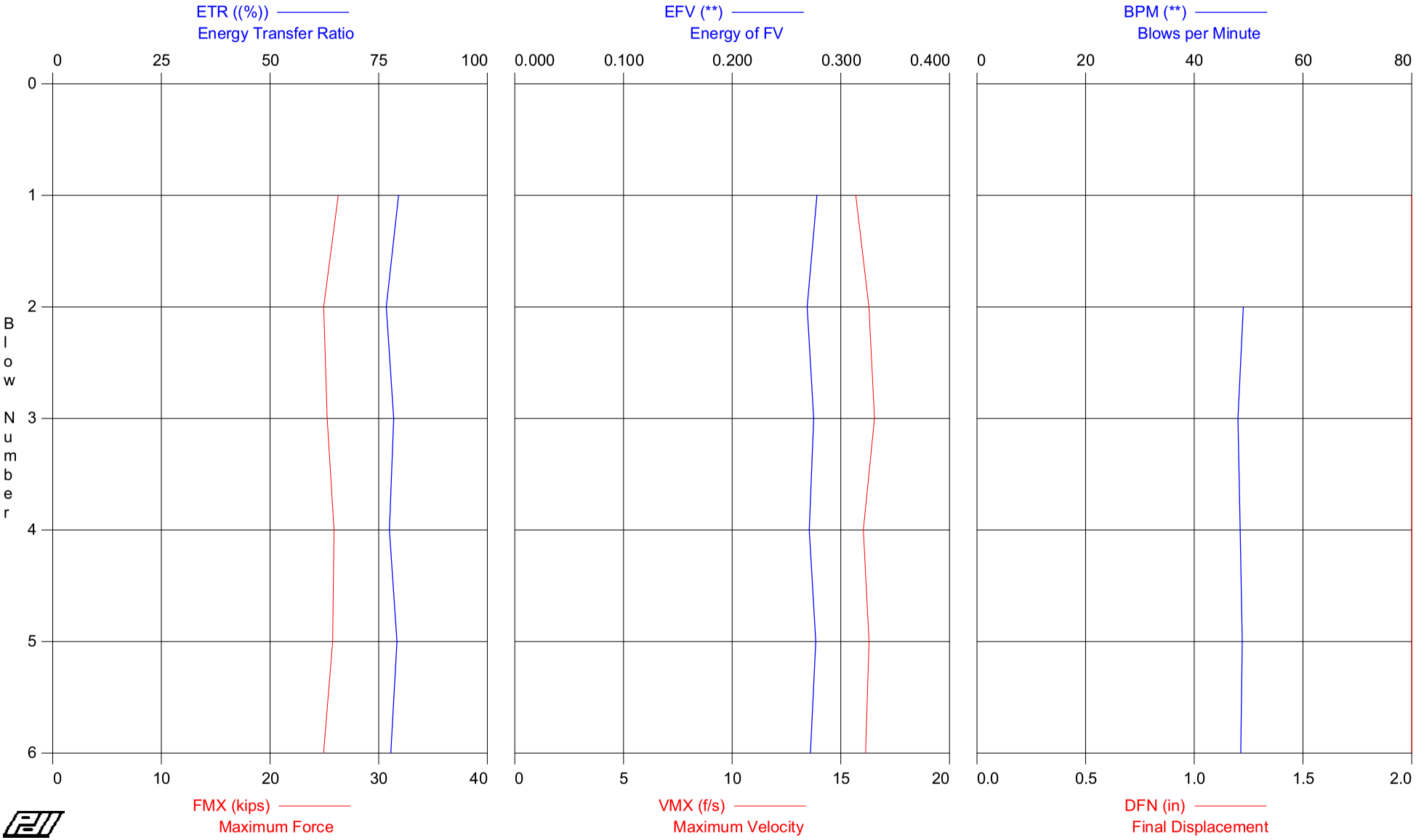
Total number of blows analyzed: 6

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 28.5-30
HAMMER #1 AWJ



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 28.5-30
OP: DJF

HAMMER #1 AWJ
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 33.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

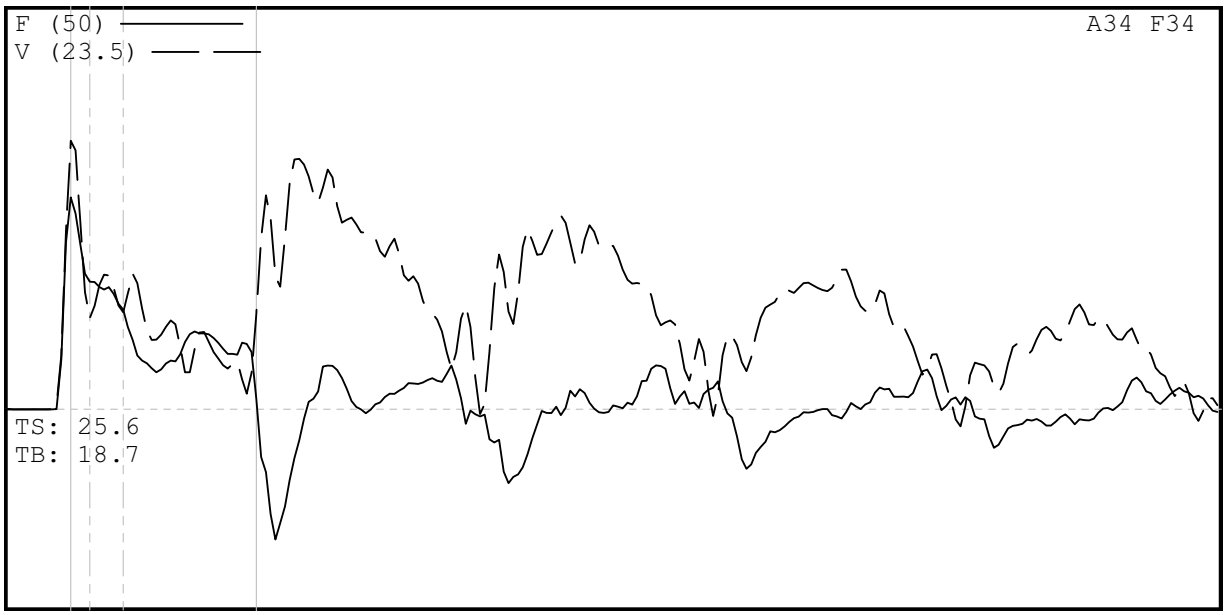
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	6	22.1	22.3	0.278	80	0	15.7	26.3	2.0
2	6	21.0	21.1	0.269	77	49	16.3	24.9	2.2
3	6	21.2	21.4	0.275	78	48	16.5	25.3	3.0
4	2	21.8	21.9	0.271	77	48	16.0	25.9	3.8
5	4	21.7	21.7	0.277	79	49	16.3	25.8	3.3
6	4	20.9	21.3	0.272	78	49	16.1	24.9	2.2
Average		21.4	21.6	0.274	78	49	16.2	25.5	2.8
Std. Dev.		0.4	0.4	0.003	1	0	0.3	0.5	0.7
Maximum		22.1	22.3	0.278	80	49	16.5	26.3	3.8

Total number of blows analyzed: 6

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 28 5-30



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 28 5-30
DESCR: HAMMER # 1 AWJ B-357
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 28 5-30
6/24/2008 5:49:53 PM
Blow Number 16/1

Pile Properties

LE	33.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	3.90	ms
JC	0.50	[]

Quantity Results

CSXN	22.1	ksi
CSI	22.3	ksi
EFV	0.291	k-ft
ETR	83.2	(%)
BPM	0.0	bpm
VMX	15.7	f/s
FMX	26	kips
DFN	2.06	in
FVP	0.79	[]

Sensors

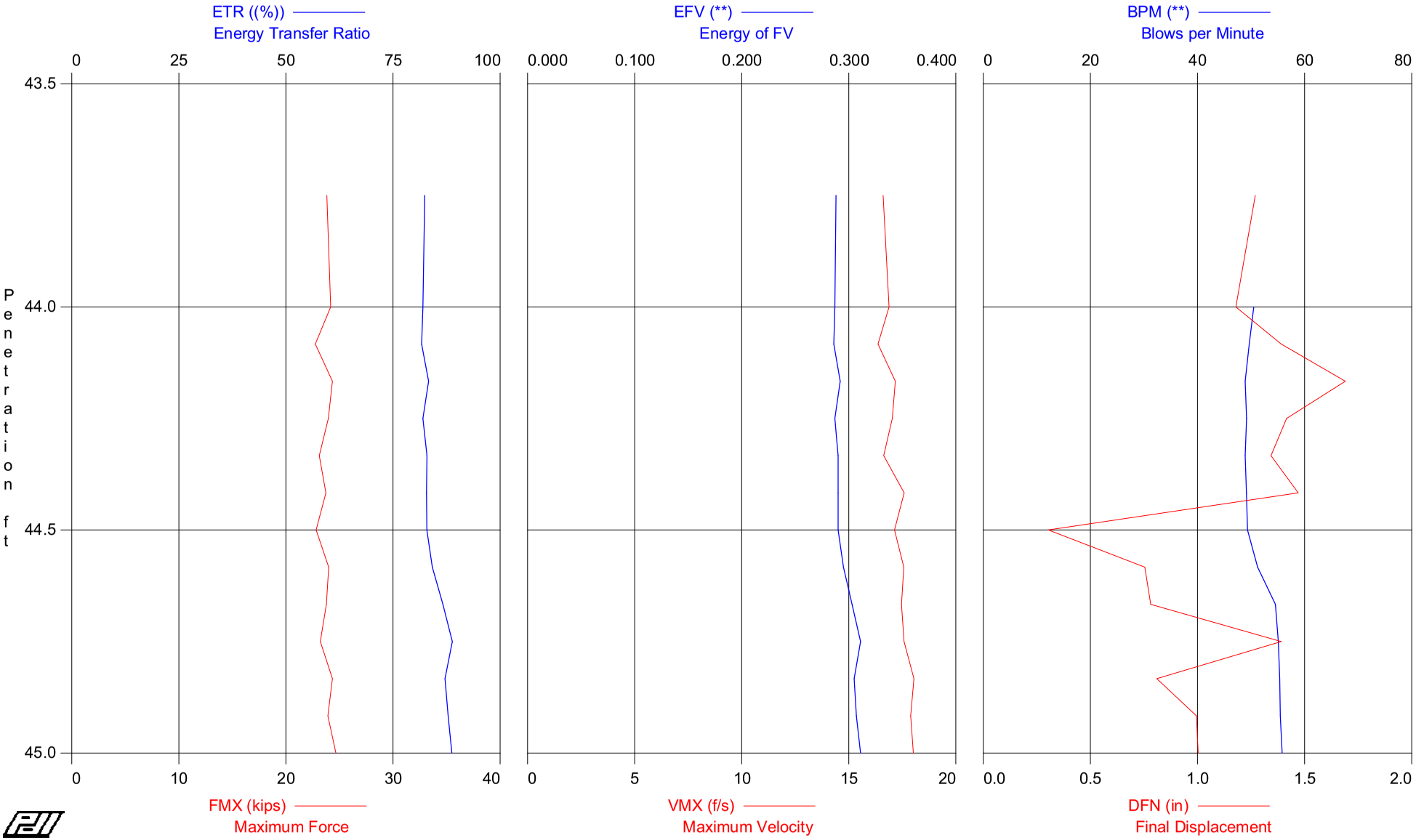
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.98
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 43.5-45
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 43.5-45
OP: DJF

HAMMER #1 AWJ B-357
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 48.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
2	44.00	4	AV2	20.2	20.4	0.287	82	51	16.7	24.0	1.2
			STD	0.2	0.1	0.000	0	0	0.1	0.2	0.0
			MAX	20.3	20.6	0.288	82	51	16.9	24.2	1.3
8	44.50	12	AV6	19.7	20.1	0.289	83	49	17.0	23.5	1.3
			STD	0.5	0.5	0.002	1	0	0.4	0.6	0.4
			MAX	20.5	20.8	0.292	83	50	17.6	24.3	1.7
14	45.00	12	AV6	20.2	20.6	0.305	87	55	17.8	24.0	1.0
			STD	0.4	0.3	0.005	2	2	0.2	0.5	0.2
			MAX	20.7	21.0	0.311	89	56	18.0	24.7	1.4
			Average	20.0	20.4	0.296	85	52	17.3	23.8	1.1
			Std. Dev.	0.5	0.4	0.009	3	3	0.5	0.6	0.4
			Maximum	20.7	21.0	0.311	89	56	18.0	24.7	1.7

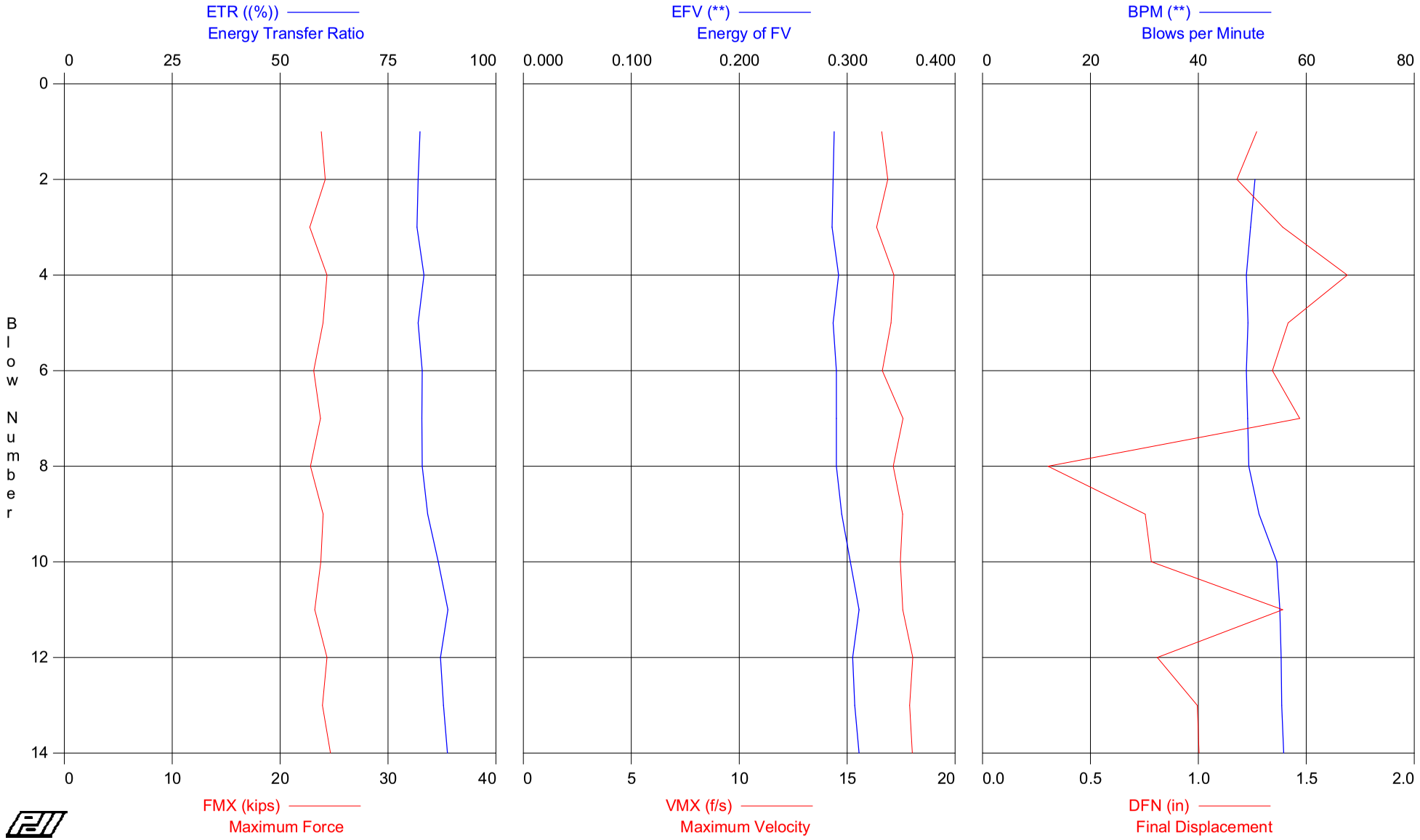
Total number of blows analyzed: 14

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 43.5-45
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 43.5-45
OP: DJF

HAMMER #1 AWJ B-357
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 48.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

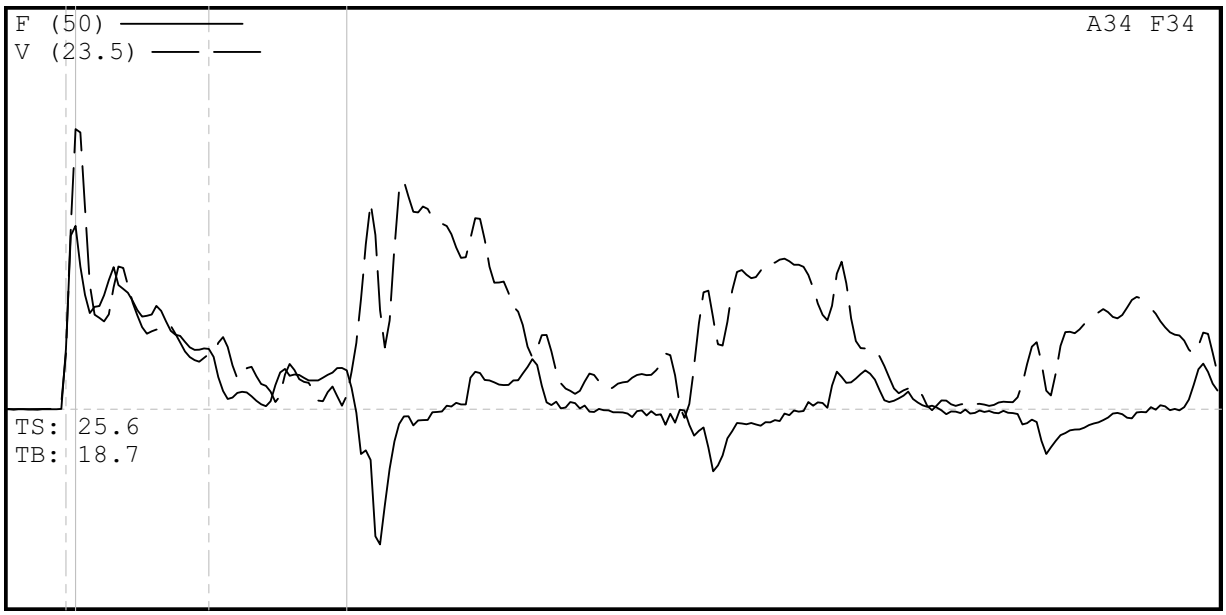
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	4	20.0	20.3	0.288	82	0	16.6	23.8	1.3
2	4	20.3	20.6	0.287	82	51	16.9	24.2	1.2
3	12	19.1	19.6	0.286	82	50	16.4	22.7	1.4
4	12	20.5	20.8	0.292	83	49	17.2	24.3	1.7
5	12	20.1	20.5	0.287	82	49	17.0	24.0	1.4
6	12	19.4	19.9	0.290	83	49	16.6	23.1	1.3
7	12	19.9	20.3	0.290	83	49	17.6	23.7	1.5
8	12	19.2	19.5	0.290	83	49	17.1	22.8	0.3
9	12	20.2	20.6	0.295	84	51	17.6	24.0	0.8
10	12	20.0	20.5	0.303	87	55	17.5	23.8	0.8
11	12	19.5	20.0	0.311	89	55	17.6	23.2	1.4
12	12	20.5	20.9	0.305	87	55	18.0	24.3	0.8
13	12	20.1	20.5	0.307	88	55	17.9	23.9	1.0
14	12	20.7	21.0	0.311	89	56	18.0	24.7	1.0
Average		20.0	20.4	0.296	85	52	17.3	23.8	1.1
Std. Dev.		0.5	0.4	0.009	3	3	0.5	0.6	0.4
Maximum		20.7	21.0	0.311	89	56	18.0	24.7	1.7

Total number of blows analyzed: 14

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 43 5-45



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 43 5-45
DESCR: HAMMER #1 AWJ B-357
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 43 5-45
6/24/2008 7:23:29 PM
Blow Number 5/3

Pile Properties

LE	48.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	5.70	ms
JC	0.50	[]

Quantity Results

CSXN	19.1	ksi
CSI	19.6	ksi
EFV	0.286	k-ft
ETR	81.7	(%)
BPM	49.7	bpm
VMX	16.4	f/s
FMX	23	kips
DFN	1.39	in
FVP	0.66	[]

Sensors

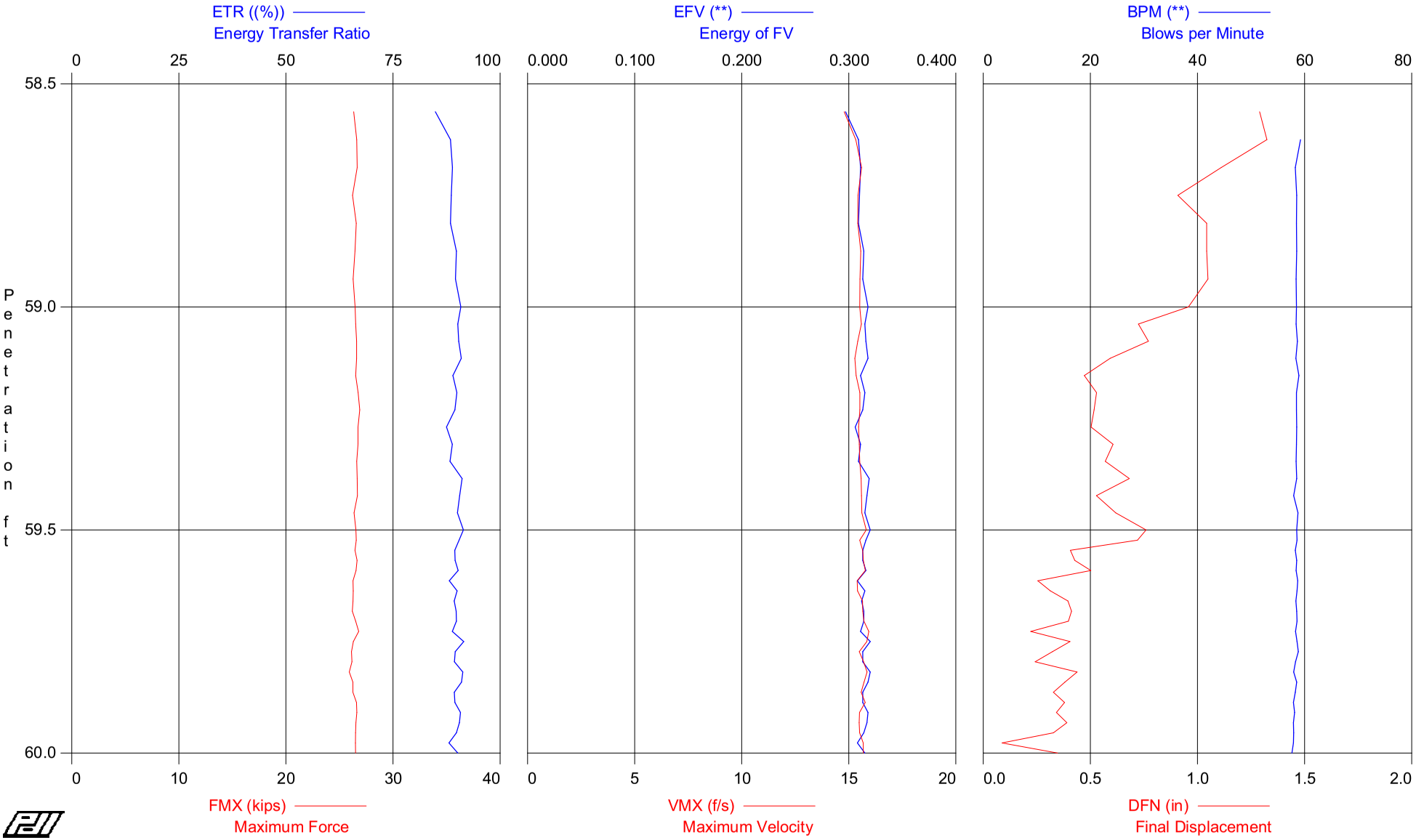
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.95
V3/V4: OK 0.95

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 58.5-60
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 58.5-60
OP: DJF

HAMMER #1 AWJ B-357
Test date: 25-Jun-2008

AR: 1.19 in^2
LE: 64.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	59.00	16	AV8	22.2	22.7	0.310	89	59	15.4	26.4	1.1
			STD	0.1	0.1	0.006	2	0	0.2	0.1	0.1
			MAX	22.4	23.0	0.318	91	59	15.6	26.7	1.3
21	59.50	26	AV13	22.4	22.8	0.314	90	59	15.5	26.6	0.6
			STD	0.1	0.1	0.004	1	0	0.1	0.1	0.1
			MAX	22.6	22.9	0.320	91	59	15.8	26.9	0.8
43	60.00	44	AV22	22.2	22.8	0.314	90	58	15.6	26.4	0.4
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	22.5	23.2	0.320	91	59	15.9	26.8	0.7
			Average	22.2	22.8	0.313	90	58	15.6	26.5	0.6
			Std. Dev.	0.2	0.1	0.004	1	0	0.2	0.2	0.3
			Maximum	22.6	23.2	0.320	91	59	15.9	26.9	1.3

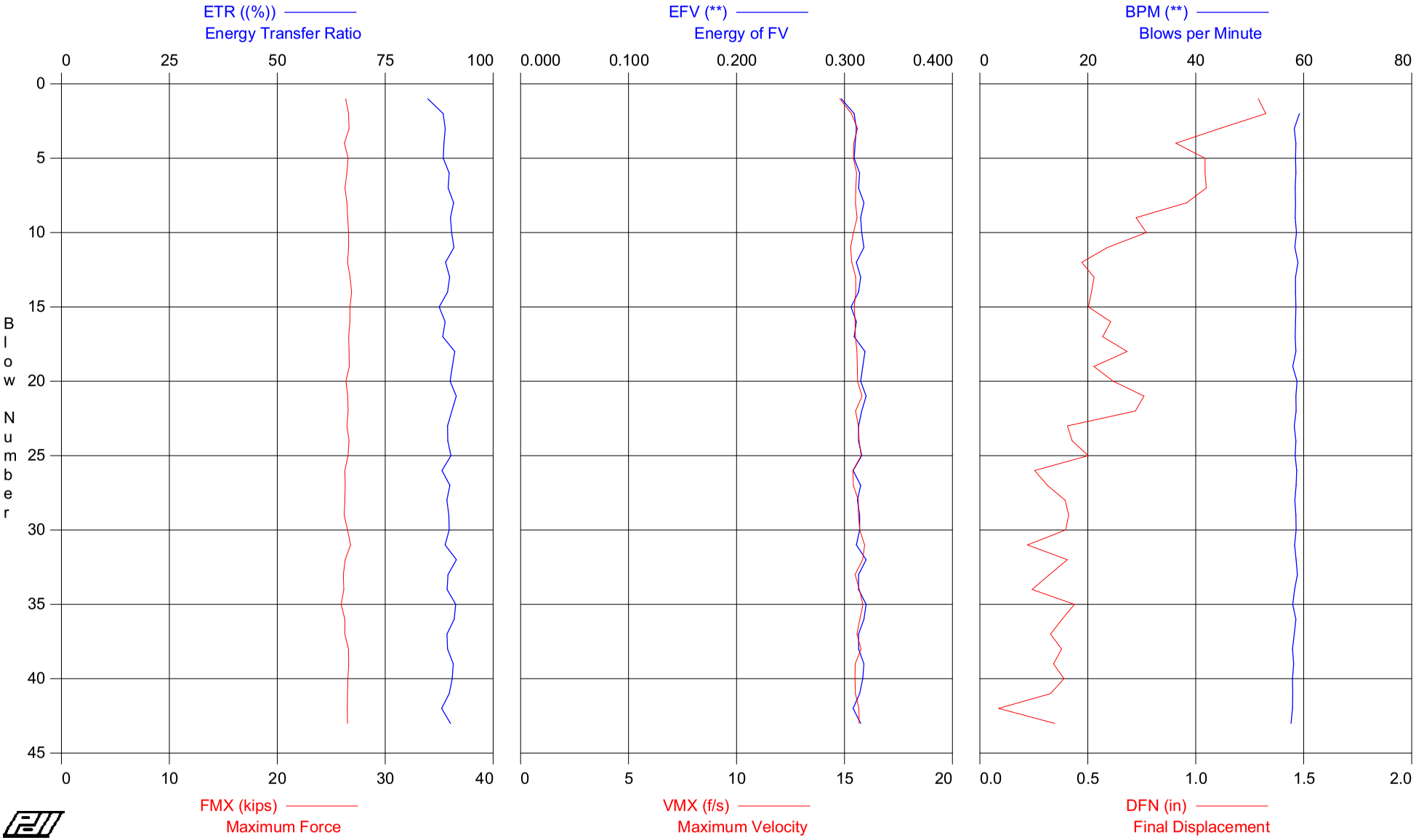
Total number of blows analyzed: 43

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 58.5-60
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 58.5-60
OP: DJF

HAMMER #1 AWJ B-357
Test date: 25-Jun-2008

AR: 1.19 in^2
LE: 64.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

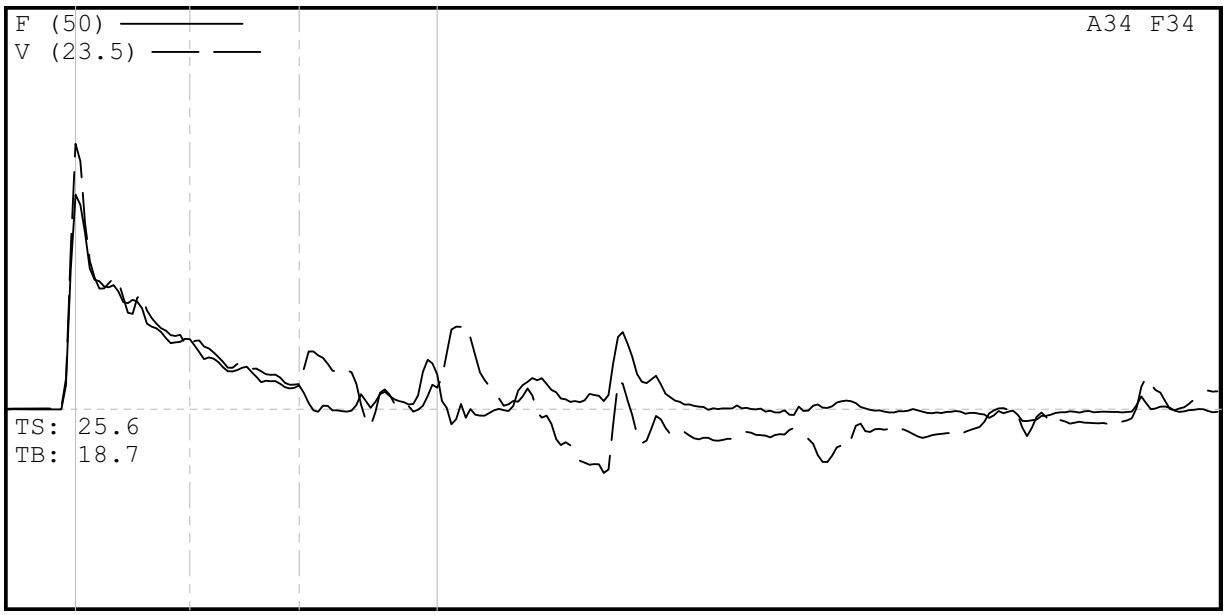
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	22.1	22.8	0.297	85	0	14.8	26.3	1.3
2	16	22.4	22.9	0.309	88	59	15.3	26.6	1.3
3	16	22.4	23.0	0.311	89	58	15.6	26.7	1.1
4	16	22.0	22.6	0.310	89	59	15.4	26.2	0.9
5	16	22.3	22.9	0.309	88	58	15.4	26.6	1.0
6	16	22.2	22.6	0.314	90	59	15.6	26.4	1.0
7	16	22.1	22.6	0.313	90	58	15.5	26.3	1.0
8	16	22.2	22.6	0.318	91	58	15.5	26.5	1.0
9	26	22.3	22.7	0.315	90	58	15.6	26.5	0.7
10	26	22.4	22.6	0.316	90	59	15.4	26.6	0.8
11	26	22.4	22.7	0.318	91	58	15.3	26.6	0.6
12	26	22.3	22.6	0.311	89	59	15.3	26.5	0.5
13	26	22.5	22.8	0.315	90	58	15.5	26.7	0.5
14	26	22.6	22.9	0.313	89	58	15.5	26.9	0.5
15	26	22.5	22.8	0.306	87	59	15.5	26.7	0.5
16	26	22.5	22.8	0.311	89	58	15.5	26.7	0.6
17	26	22.4	22.8	0.309	88	58	15.5	26.6	0.6
18	26	22.4	22.8	0.319	91	59	15.6	26.7	0.7
19	26	22.4	22.9	0.317	91	58	15.6	26.7	0.5
20	26	22.2	22.8	0.315	90	59	15.6	26.4	0.6
21	26	22.3	22.9	0.320	91	59	15.8	26.5	0.8
22	44	22.3	22.9	0.316	90	59	15.5	26.6	0.7
23	44	22.2	22.8	0.313	89	58	15.6	26.4	0.4
24	44	22.4	23.0	0.313	89	59	15.7	26.6	0.4
25	44	22.3	22.9	0.316	90	58	15.8	26.5	0.5
26	44	22.1	22.6	0.308	88	59	15.4	26.3	0.3
27	44	22.1	22.7	0.315	90	59	15.4	26.3	0.3
28	44	22.1	22.7	0.312	89	58	15.6	26.3	0.4
29	44	22.0	22.6	0.314	90	59	15.6	26.2	0.4
30	44	22.3	22.9	0.314	90	59	15.7	26.5	0.4
31	44	22.5	23.2	0.311	89	58	15.9	26.8	0.2
32	44	22.1	22.8	0.320	91	59	15.8	26.3	0.4
33	44	22.0	22.5	0.313	90	59	15.5	26.1	0.3
34	44	22.0	22.6	0.313	89	58	15.7	26.2	0.2
35	44	21.8	22.5	0.320	91	58	15.9	25.9	0.4
36	44	22.1	22.7	0.318	91	59	15.7	26.3	0.4
37	44	22.1	22.8	0.313	89	58	15.6	26.3	0.3
38	44	22.3	23.0	0.313	89	58	15.8	26.6	0.4
39	44	22.4	22.9	0.318	91	58	15.5	26.6	0.3
40	44	22.3	22.8	0.317	91	58	15.5	26.5	0.4
41	44	22.3	22.7	0.314	90	58	15.5	26.5	0.3
42	44	22.3	22.9	0.308	88	58	15.7	26.5	0.1
43	44	22.3	22.9	0.315	90	58	15.7	26.5	0.3
Average		22.2	22.8	0.313	90	58	15.6	26.5	0.6
Std. Dev.		0.2	0.1	0.004	1	0	0.2	0.2	0.3
Maximum		22.6	23.2	0.320	91	59	15.9	26.9	1.3

Total number of blows analyzed: 43

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 58 5-60



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 58 5-60
DESCR: HAMMER #1 AWJ B-357
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 58 5-60
6/25/2008 10:34:50 AM
Blow Number 43/39

Pile Properties

LE	64.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	7.60	ms
JC	0.50	[]

Quantity Results

CSXN	22.4	ksi
CSI	22.9	ksi
EFV	0.318	k-ft
ETR	90.8	(%)
BPM	58.1	bpm
VMX	15.5	f/s
FMX	27	kips
DFN	0.34	in
FVP	0.81	[]

Sensors

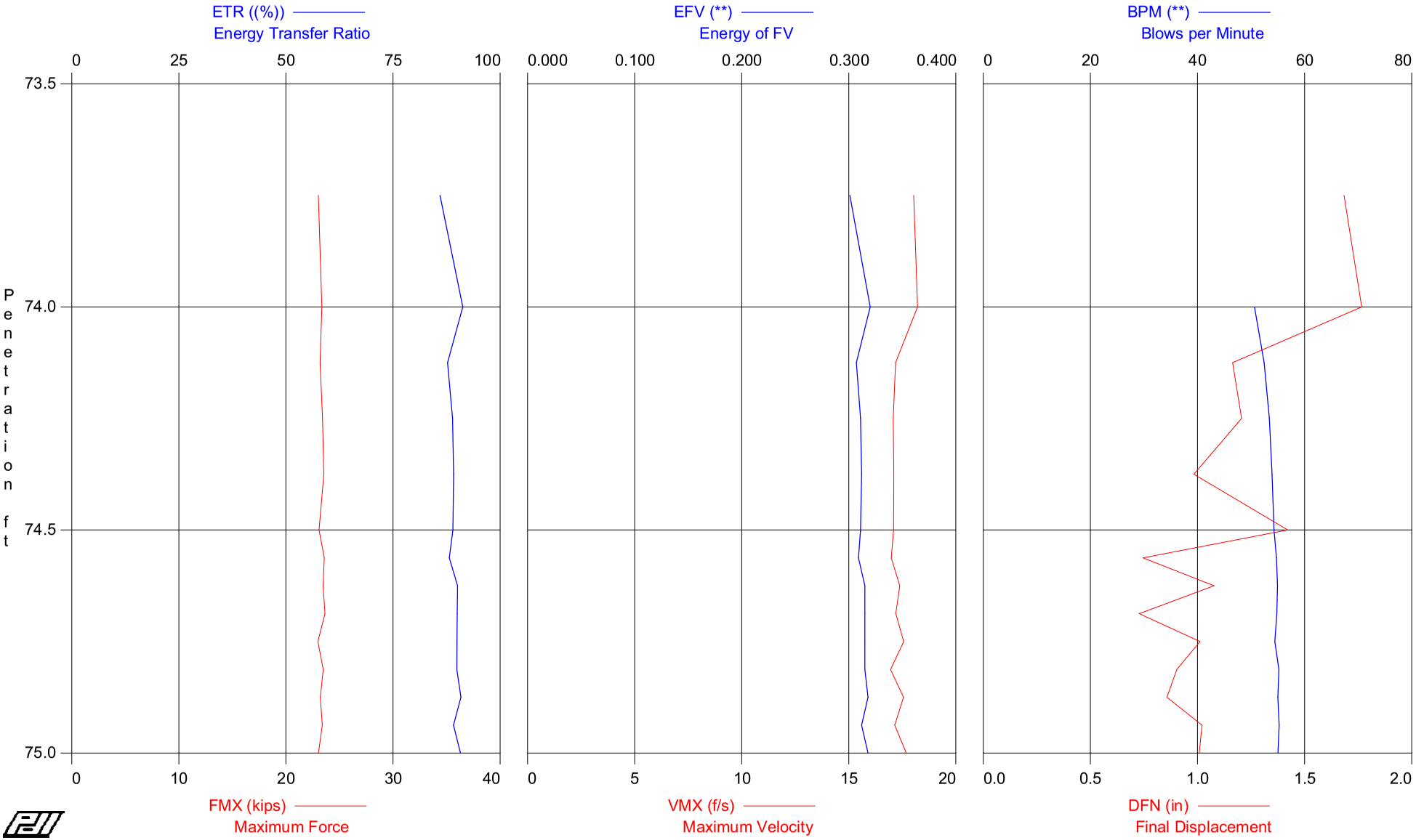
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [K0397] 370 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.95
V3/V4: OK 0.90

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 73.5-75
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 73.5-75
OP: DJF

HAMMER #1 AWJ B-357
Test date: 25-Jun-2008

AR: 1.19 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
2	74.00	4	AV2	19.5	19.6	0.310	89	51	18.1	23.2	1.7
			STD	0.1	0.2	0.009	3	0	0.1	0.2	0.0
			MAX	19.6	19.8	0.320	91	51	18.2	23.3	1.8
6	74.50	8	AV4	19.6	19.8	0.310	89	54	17.1	23.3	1.2
			STD	0.1	0.1	0.002	1	1	0.0	0.2	0.2
			MAX	19.8	20.0	0.312	89	54	17.2	23.5	1.4
14	75.00	16	AV8	19.6	19.9	0.315	90	55	17.3	23.4	0.9
			STD	0.2	0.1	0.003	1	0	0.3	0.2	0.1
			MAX	19.9	20.1	0.318	91	55	17.7	23.6	1.1
			Average	19.6	19.8	0.313	89	54	17.4	23.3	1.1
			Std. Dev.	0.2	0.2	0.005	1	1	0.4	0.2	0.3
			Maximum	19.9	20.1	0.320	91	55	18.2	23.6	1.8

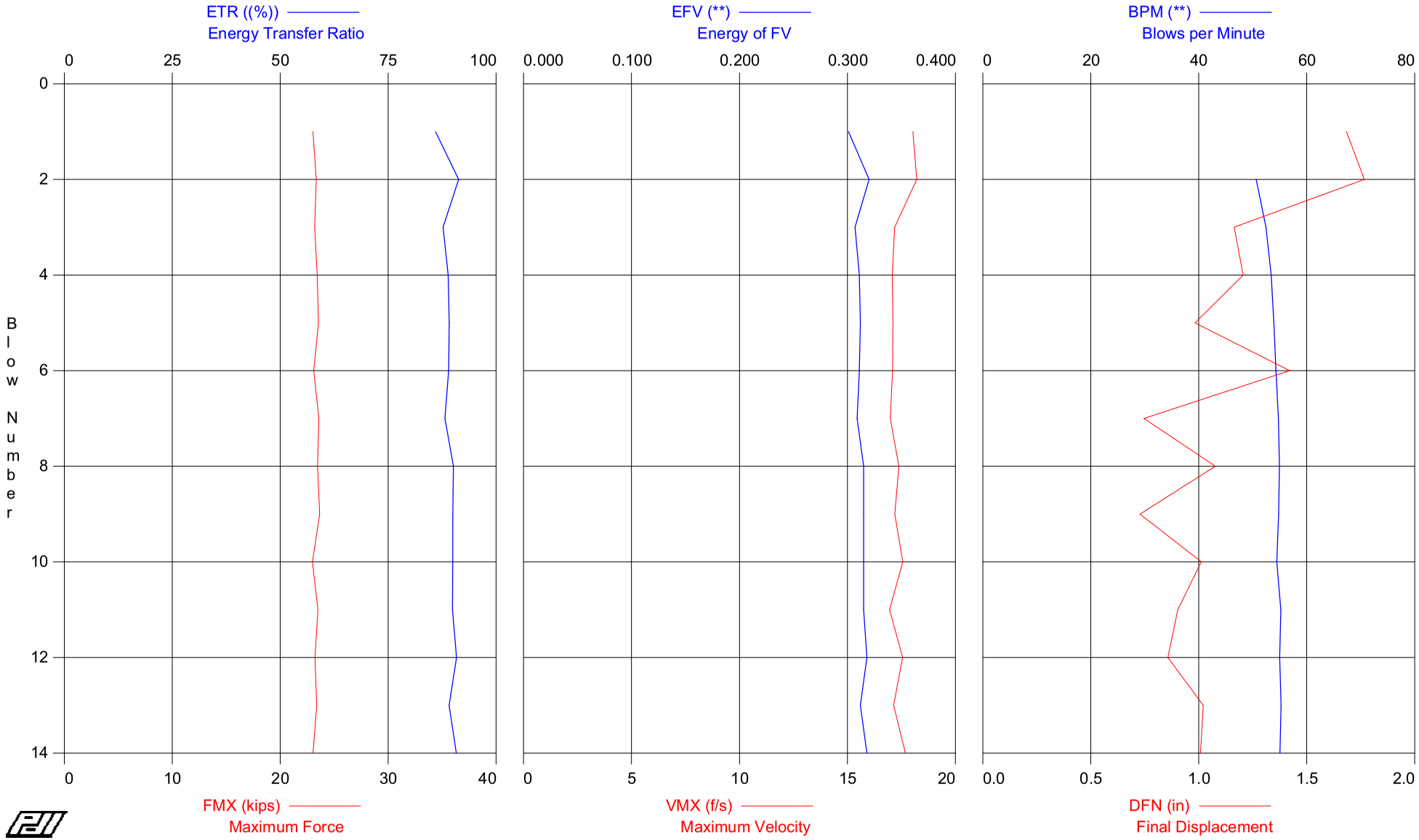
Total number of blows analyzed: 14

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 73.5-75
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 73.5-75
OP: DJF

HAMMER #1 AWJ B-357
Test date: 25-Jun-2008

AR: 1.19 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

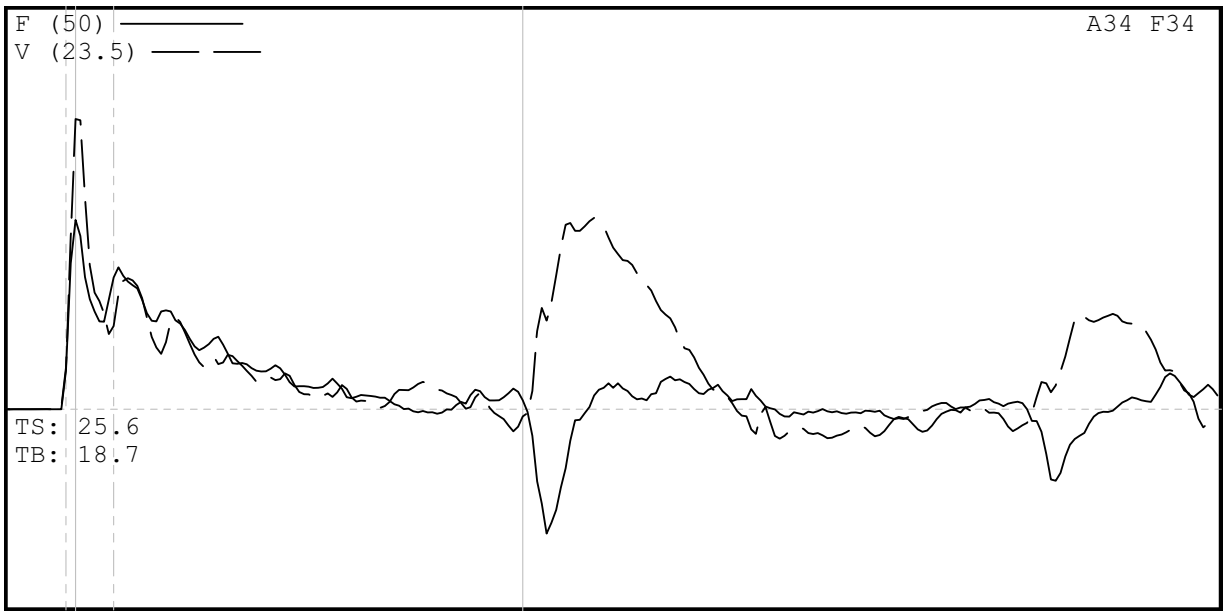
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	4	19.3	19.4	0.301	86	0	18.0	23.0	1.7
2	4	19.6	19.8	0.320	91	51	18.2	23.3	1.8
3	8	19.5	19.6	0.307	88	52	17.2	23.2	1.2
4	8	19.7	19.9	0.311	89	53	17.1	23.4	1.2
5	8	19.8	20.0	0.312	89	54	17.1	23.5	1.0
6	8	19.4	19.8	0.311	89	54	17.1	23.1	1.4
7	16	19.8	20.0	0.309	88	55	17.0	23.6	0.7
8	16	19.7	19.8	0.315	90	55	17.4	23.5	1.1
9	16	19.9	20.1	0.315	90	55	17.2	23.6	0.7
10	16	19.3	19.8	0.315	90	54	17.6	23.0	1.0
11	16	19.7	20.0	0.315	90	55	17.0	23.5	0.9
12	16	19.5	19.9	0.318	91	55	17.6	23.2	0.9
13	16	19.7	19.9	0.312	89	55	17.1	23.4	1.0
14	16	19.4	19.9	0.318	91	55	17.7	23.0	1.0
Average		19.6	19.8	0.313	89	54	17.4	23.3	1.1
Std. Dev.		0.2	0.2	0.005	1	1	0.4	0.2	0.3
Maximum		19.9	20.1	0.320	91	55	18.2	23.6	1.8

Total number of blows analyzed: 14

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 73 5-75



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 73 5-75
DESCR: HAMMER #1 AWJ B-357
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 73 5-75
6/25/2008 1:27:28 PM
Blow Number 12/11

Pile Properties

LE	79.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	9.40	ms
JC	0.50	[]

Quantity Results

CSXN	19.7	ksi
CSI	20.0	ksi
EFV	0.315	k-ft
ETR	89.9	(%)
BPM	55.2	bpm
VMX	16.9	f/s
FMX	23	kips
DFN	0.90	in
FVP	0.65	[]

Sensors

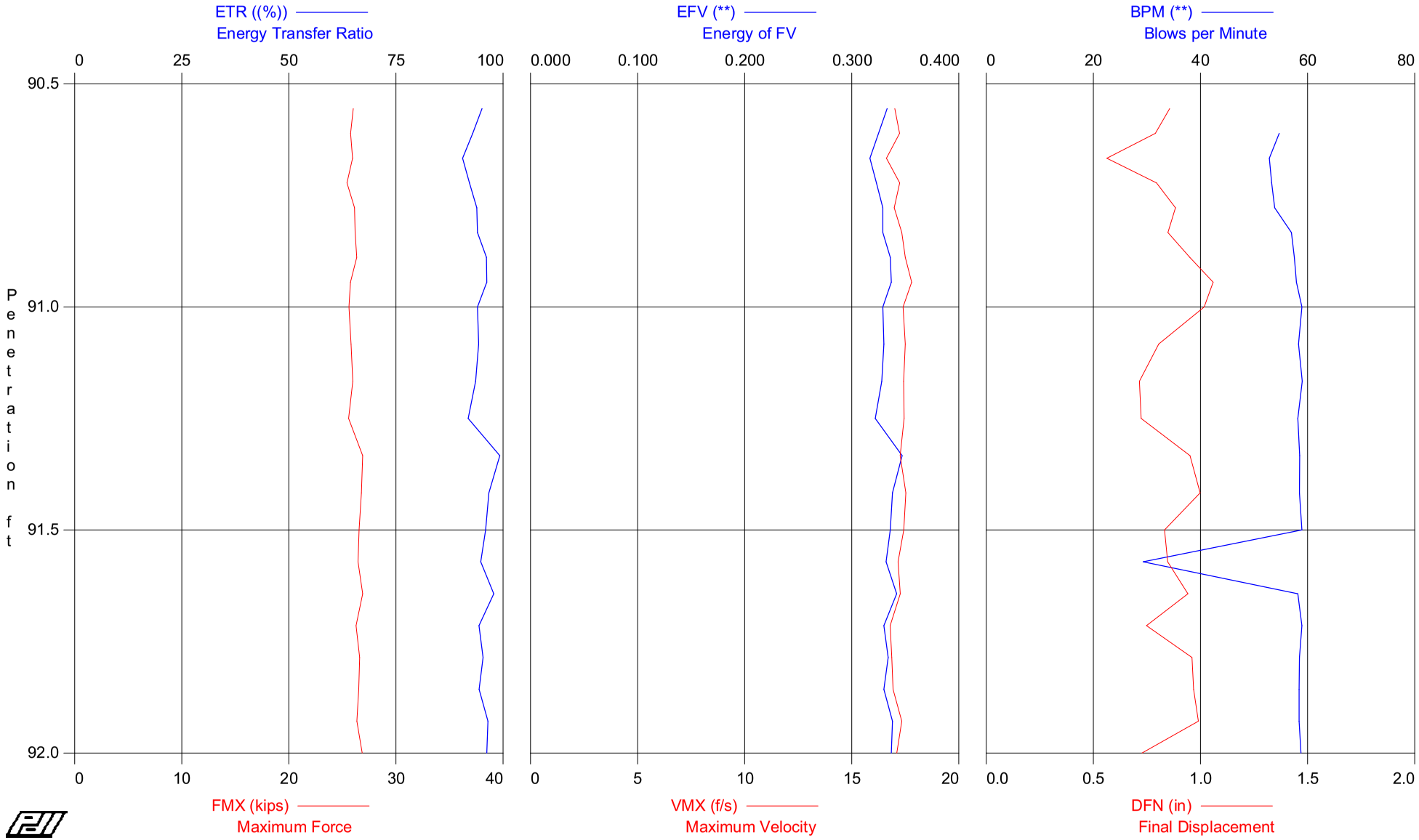
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [K0397] 370 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 30-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 91.5 - 92
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 91.5 - 92
OP: SDW

HAMMER #1 AWJ B-357
Test date: 30-Jun-2008

AR: 1.16 in^2
LE: 94.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
9	91.00	18	AV9	22.3	22.4	0.329	94	56	17.2	25.9	0.9
			STD	0.2	0.2	0.006	2	2	0.3	0.3	0.1
			MAX	22.7	22.7	0.337	96	59	17.8	26.3	1.1
15	91.50	12	AV6	22.6	22.8	0.333	95	59	17.4	26.3	0.8
			STD	0.4	0.5	0.008	2	0	0.1	0.5	0.1
			MAX	23.2	23.4	0.347	99	59	17.5	26.9	1.0
22	92.00	14	AV7	22.9	23.0	0.335	96	54	17.1	26.6	0.9
			STD	0.2	0.2	0.004	1	10	0.2	0.2	0.1
			MAX	23.2	23.3	0.342	98	59	17.3	26.9	1.0
			Average	22.6	22.7	0.332	95	56	17.2	26.2	0.9
			Std. Dev.	0.4	0.4	0.007	2	6	0.3	0.4	0.1
			Maximum	23.2	23.4	0.347	99	59	17.8	26.9	1.1

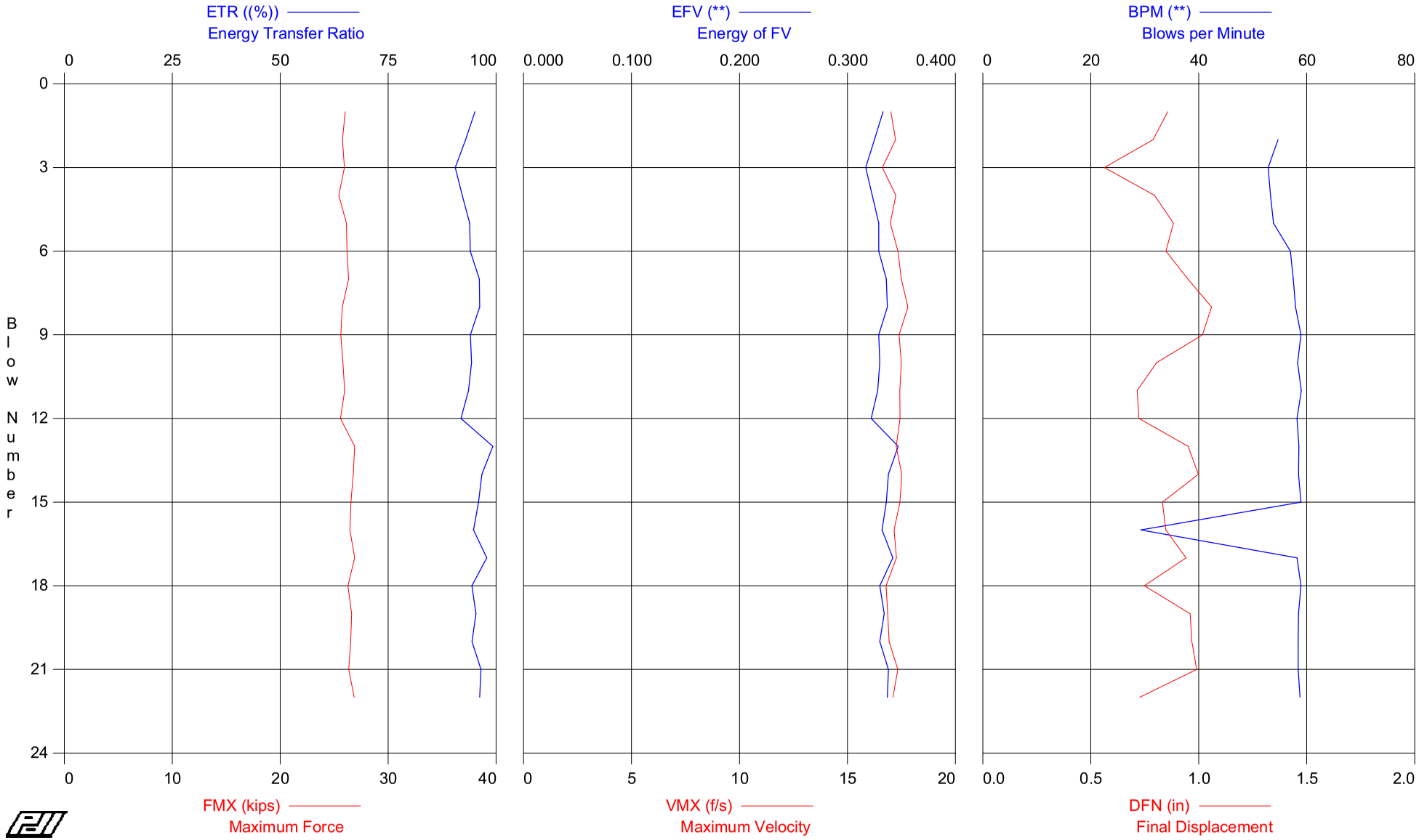
Total number of blows analyzed: 22

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 30-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 91.5 - 92
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 91.5 - 92
OP: SDW

HAMMER #1 AWJ B-357
Test date: 30-Jun-2008

AR: 1.16 in^2
LE: 94.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

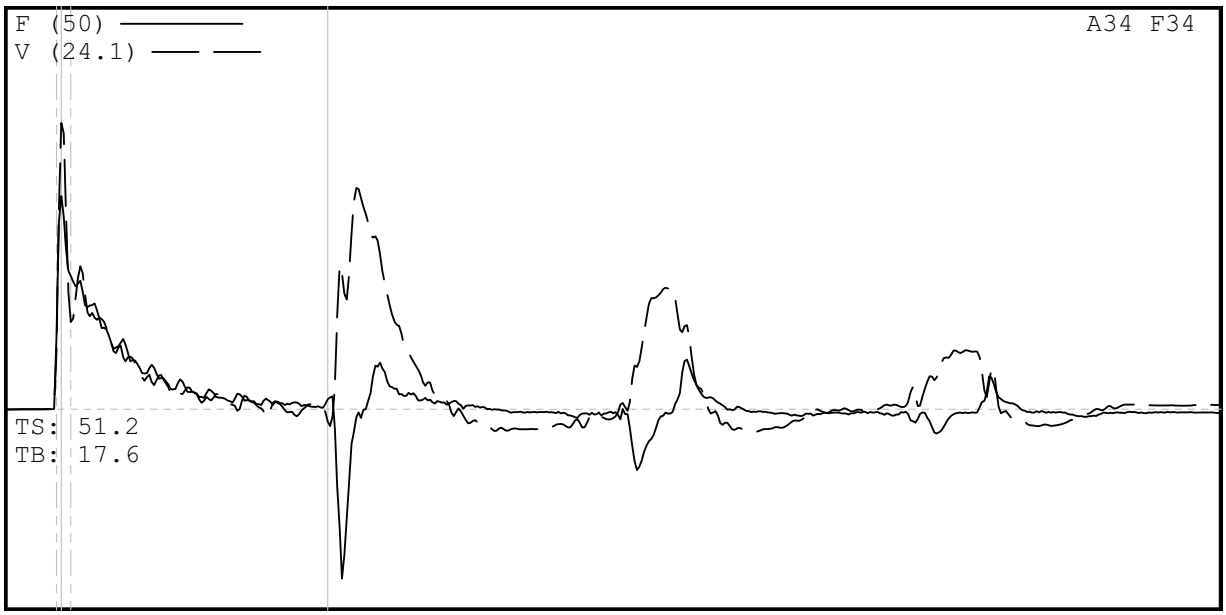
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	18	22.4	22.5	0.333	95	0	17.0	26.0	0.9
2	18	22.2	22.4	0.325	93	55	17.2	25.8	0.8
3	18	22.4	22.4	0.317	91	53	16.6	25.9	0.6
4	18	21.9	22.0	0.323	92	53	17.2	25.4	0.8
5	18	22.5	22.5	0.329	94	54	17.0	26.1	0.9
6	18	22.6	22.6	0.329	94	57	17.3	26.2	0.8
7	18	22.7	22.7	0.336	96	58	17.5	26.3	1.0
8	18	22.2	22.4	0.337	96	58	17.8	25.8	1.1
9	18	22.1	22.1	0.329	94	59	17.4	25.6	1.0
10	12	22.3	22.4	0.330	94	58	17.5	25.8	0.8
11	12	22.4	22.5	0.328	94	59	17.4	26.0	0.7
12	12	22.0	22.1	0.322	92	58	17.4	25.6	0.7
13	12	23.2	23.4	0.347	99	59	17.3	26.9	1.0
14	12	23.1	23.2	0.338	97	58	17.5	26.8	1.0
15	12	22.9	23.1	0.336	96	59	17.4	26.6	0.8
16	14	22.8	23.0	0.332	95	29	17.2	26.5	0.8
17	14	23.2	23.3	0.342	98	58	17.3	26.9	0.9
18	14	22.6	22.7	0.330	94	59	16.8	26.3	0.7
19	14	22.9	23.2	0.334	95	58	16.9	26.6	1.0
20	14	22.9	22.9	0.330	94	58	16.9	26.5	1.0
21	14	22.7	22.9	0.338	96	58	17.3	26.4	1.0
22	14	23.2	23.2	0.337	96	59	17.1	26.9	0.7
Average		22.6	22.7	0.332	95	56	17.2	26.2	0.9
Std. Dev.		0.4	0.4	0.007	2	6	0.3	0.4	0.1
Maximum		23.2	23.4	0.347	99	59	17.8	26.9	1.1

Total number of blows analyzed: 22

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 91 5 - 92



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 91 5 - 92
DESCR: HAMMER #1 AWJ B-357
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 91 5 - 92
6/30/2008 5:30:24 PM
Blow Number 18/16

Pile Properties

LE	94.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	11.19	ms
JC	0.50	[]

Quantity Results

CSXN	22.8	ksi
CSI	23.0	ksi
EFV	0.332	k-ft
ETR	94.8	(%)
BPM	29.3	bpm
VMX	17.2	f/s
FMX	26	kips
DFN	0.85	in
FVP	0.75	[]

Sensors

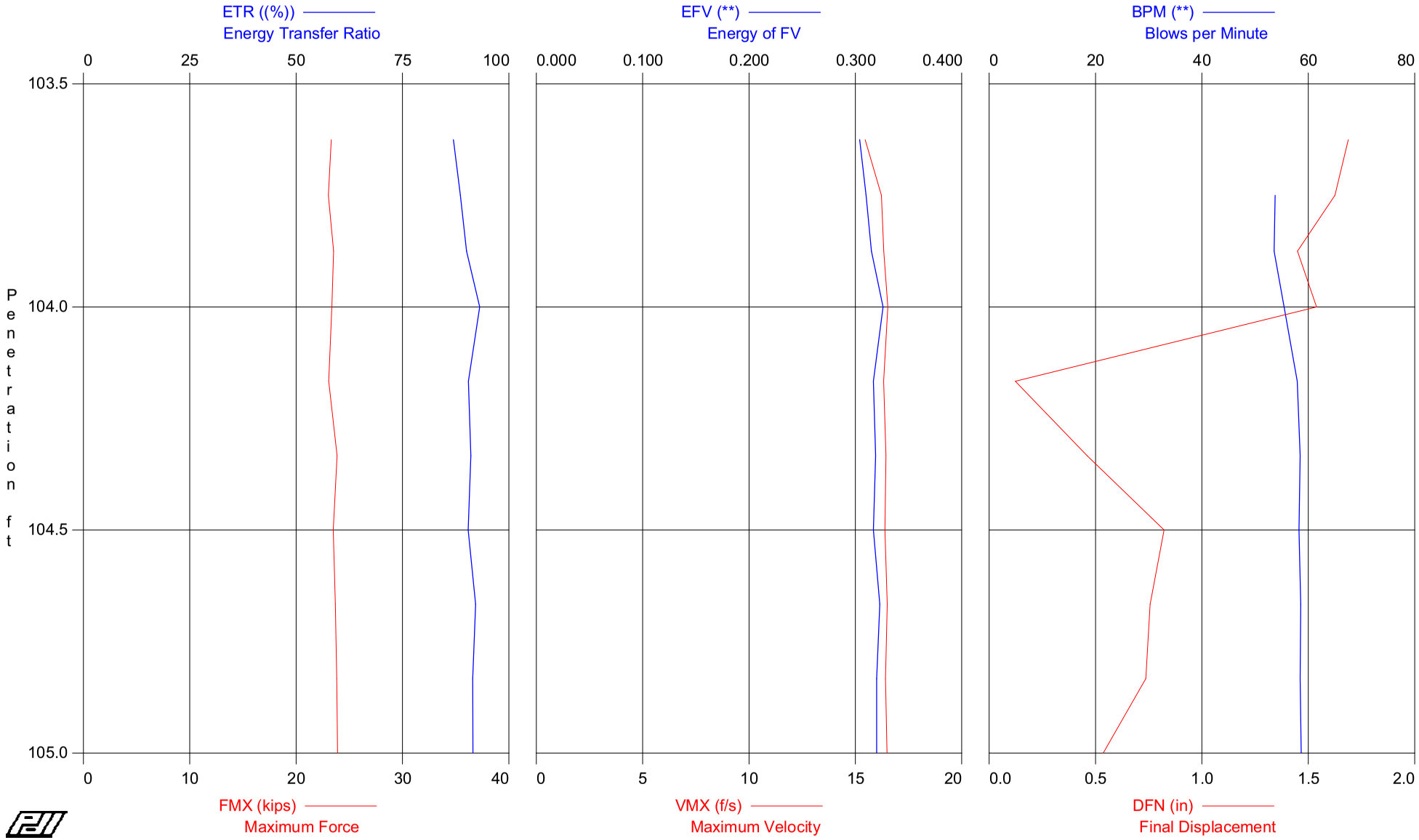
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.98
V3/V4: OK 0.91

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 1-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 103.5 - 105
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 103.5 - 105
OP: SDW

HAMMER #1 AWJ B-357
Test date: 1-Jul-2008

AR: 1.16 in^2
LE: 106.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	104.00	8	AV4	20.1	20.4	0.314	90	54	16.1	23.3	1.6
			STD	0.2	0.2	0.008	2	1	0.4	0.2	0.1
			MAX	20.3	20.6	0.326	93	55	16.5	23.5	1.7
7	104.50	6	AV3	20.2	20.5	0.318	91	58	16.4	23.5	0.5
			STD	0.3	0.1	0.001	0	0	0.0	0.3	0.3
			MAX	20.6	20.6	0.319	91	58	16.4	23.9	0.8
10	105.00	6	AV3	20.5	20.6	0.321	92	59	16.5	23.8	0.7
			STD	0.1	0.1	0.001	0	0	0.0	0.1	0.1
			MAX	20.6	20.7	0.323	92	59	16.5	23.9	0.8
			Average	20.3	20.5	0.317	91	57	16.3	23.5	1.0
			Std. Dev.	0.3	0.2	0.006	2	2	0.3	0.3	0.5
			Maximum	20.6	20.7	0.326	93	59	16.5	23.9	1.7

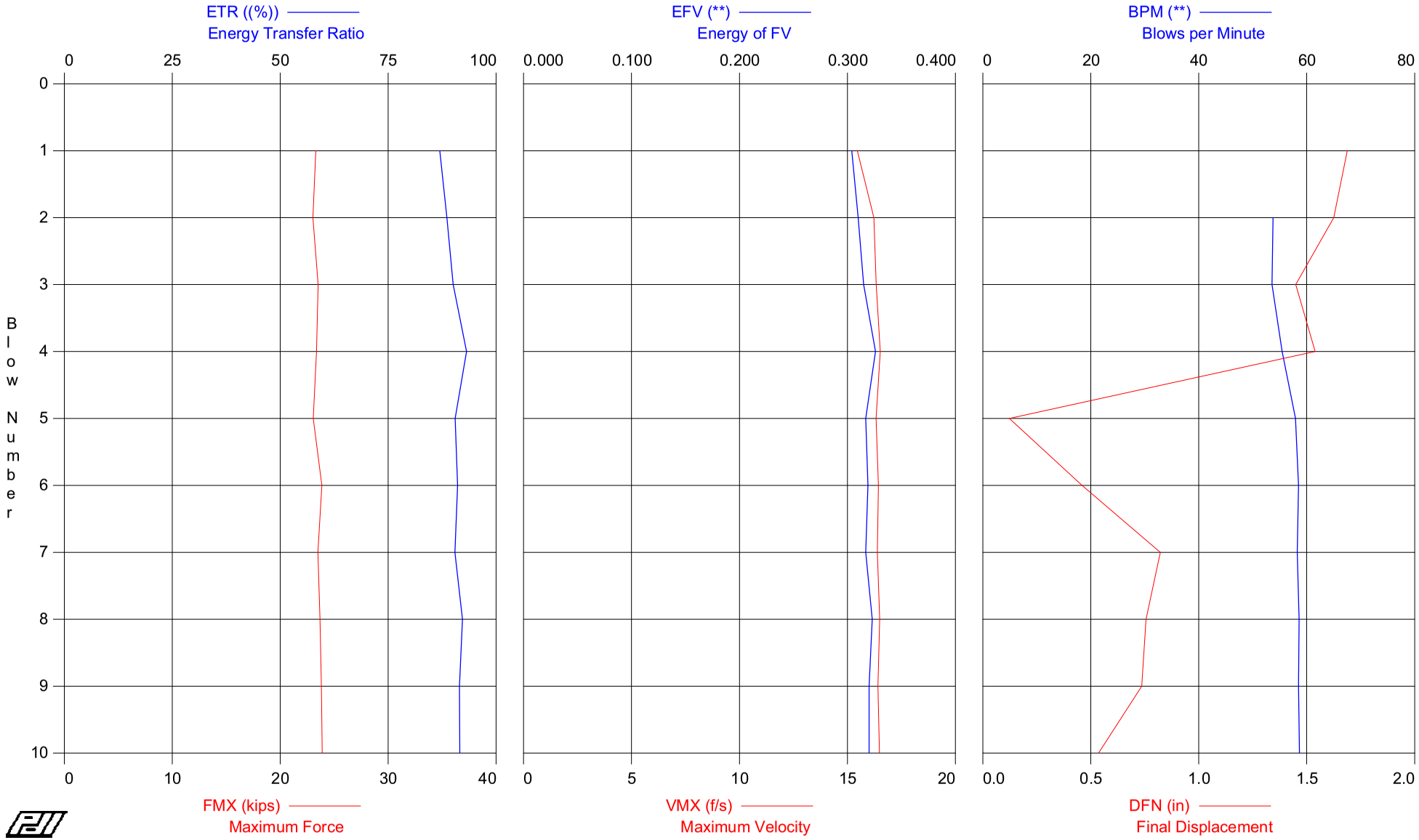
Total number of blows analyzed: 10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 1-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 103.5 - 105
HAMMER #1 AWJ B-357



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 103.5 - 105
OP: SDW

HAMMER #1 AWJ B-357
Test date: 1-Jul-2008

AR: 1.16 in^2
LE: 106.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

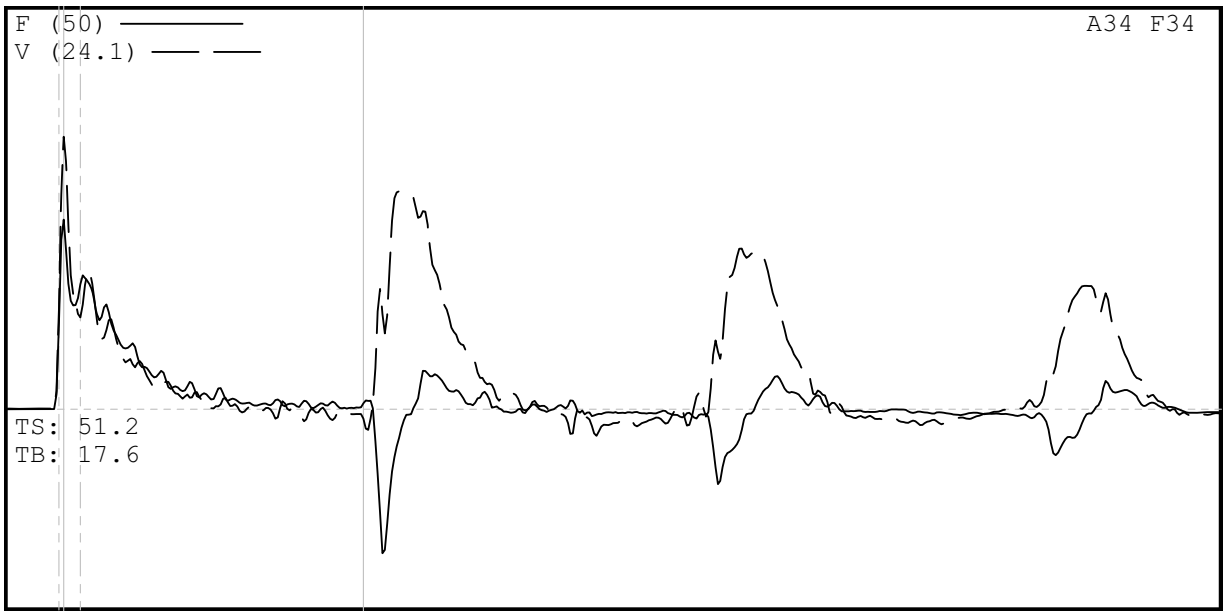
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.1	20.6	0.304	87	0	15.5	23.3	1.7
2	8	19.8	20.1	0.310	89	54	16.2	23.0	1.6
3	8	20.3	20.5	0.315	90	54	16.3	23.5	1.4
4	8	20.1	20.2	0.326	93	55	16.5	23.4	1.5
5	6	19.9	20.5	0.317	90	58	16.3	23.1	0.1
6	6	20.6	20.6	0.319	91	58	16.4	23.9	0.5
7	6	20.3	20.3	0.317	90	58	16.4	23.5	0.8
8	6	20.4	20.4	0.323	92	59	16.5	23.7	0.8
9	6	20.5	20.6	0.320	92	58	16.4	23.8	0.7
10	6	20.6	20.7	0.320	92	59	16.5	23.9	0.5
Average		20.3	20.5	0.317	91	57	16.3	23.5	1.0
Std. Dev.		0.3	0.2	0.006	2	2	0.3	0.3	0.5
Maximum		20.6	20.7	0.326	93	59	16.5	23.9	1.7

Total number of blows analyzed: 10

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 103 5 - 105



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 103 5 - 105
DESCR: HAMMER #1 AWJ B-357
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 103 5 - 105
7/1/2008 9:59:46 AM
Blow Number 5/3

Pile Properties

LE	106.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	12.61	ms
JC	0.50	[]

Quantity Results

CSXN	20.3	ksi
CSI	20.5	ksi
EFV	0.315	k-ft
ETR	90.0	(%)
BPM	53.6	bpm
VMX	16.3	f/s
FMX	24	kips
DFN	1.45	in
FVP	0.70	[]

Sensors

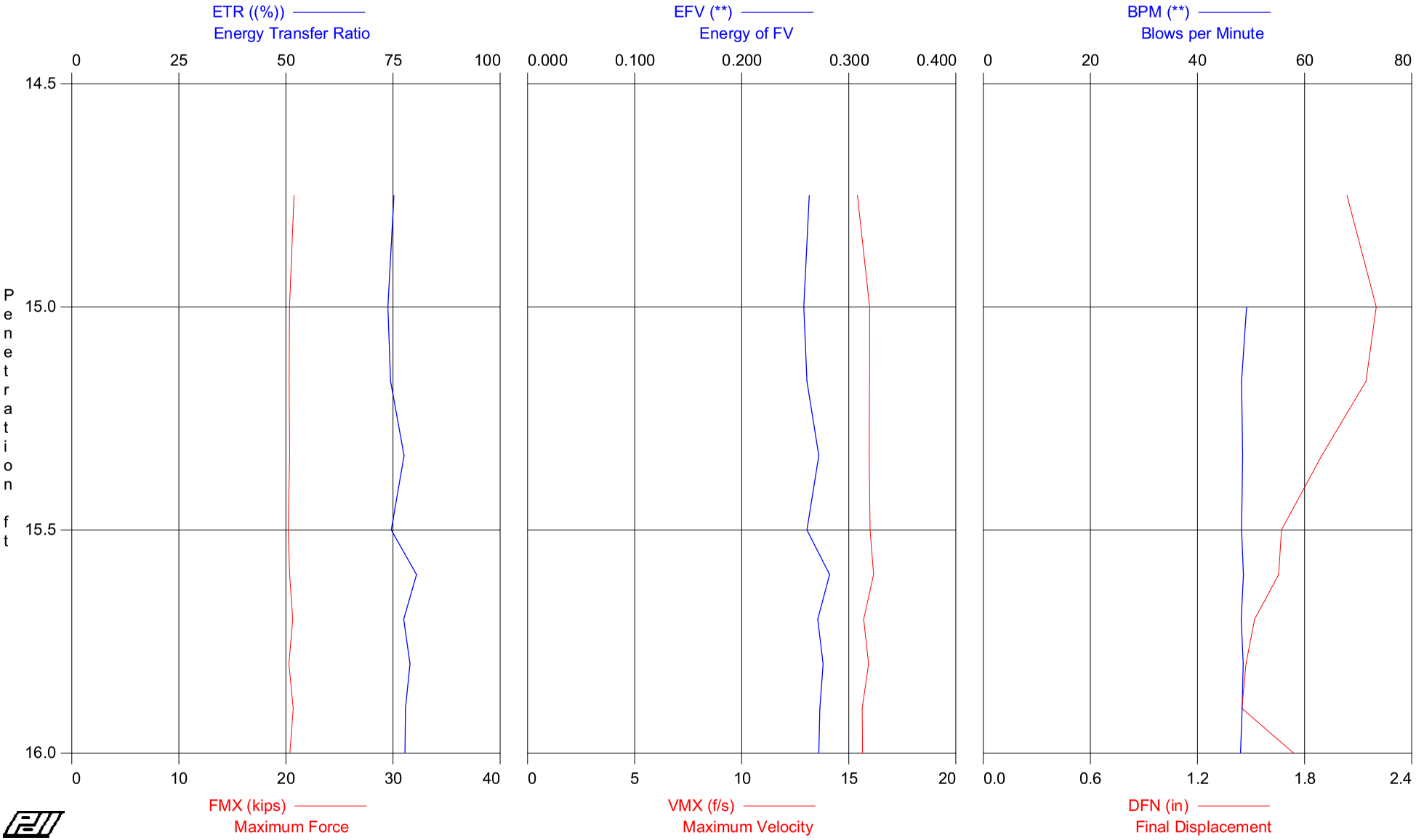
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 14.5 - 16
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 14.5 - 16
OP: SDW

HAMMER #1 AWJ B-348
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
2	15.00	4	AV2	17.7	17.9	0.261	75	49	15.7	20.6	2.1
			STD	0.2	0.2	0.002	1	0	0.3	0.2	0.1
			MAX	17.9	18.2	0.263	75	49	16.0	20.8	2.2
5	15.50	6	AV3	17.5	17.9	0.265	76	48	16.0	20.3	1.9
			STD	0.0	0.1	0.005	1	0	0.0	0.1	0.2
			MAX	17.5	18.0	0.272	78	48	16.0	20.3	2.1
10	16.00	10	AV5	17.6	18.0	0.275	79	48	15.8	20.5	1.6
			STD	0.1	0.2	0.004	1	0	0.2	0.2	0.1
			MAX	17.8	18.2	0.282	80	49	16.2	20.7	1.7
			Average	17.6	18.0	0.269	77	48	15.8	20.4	1.8
			Std. Dev.	0.2	0.2	0.007	2	0	0.2	0.2	0.3
			Maximum	17.9	18.2	0.282	80	49	16.2	20.8	2.2

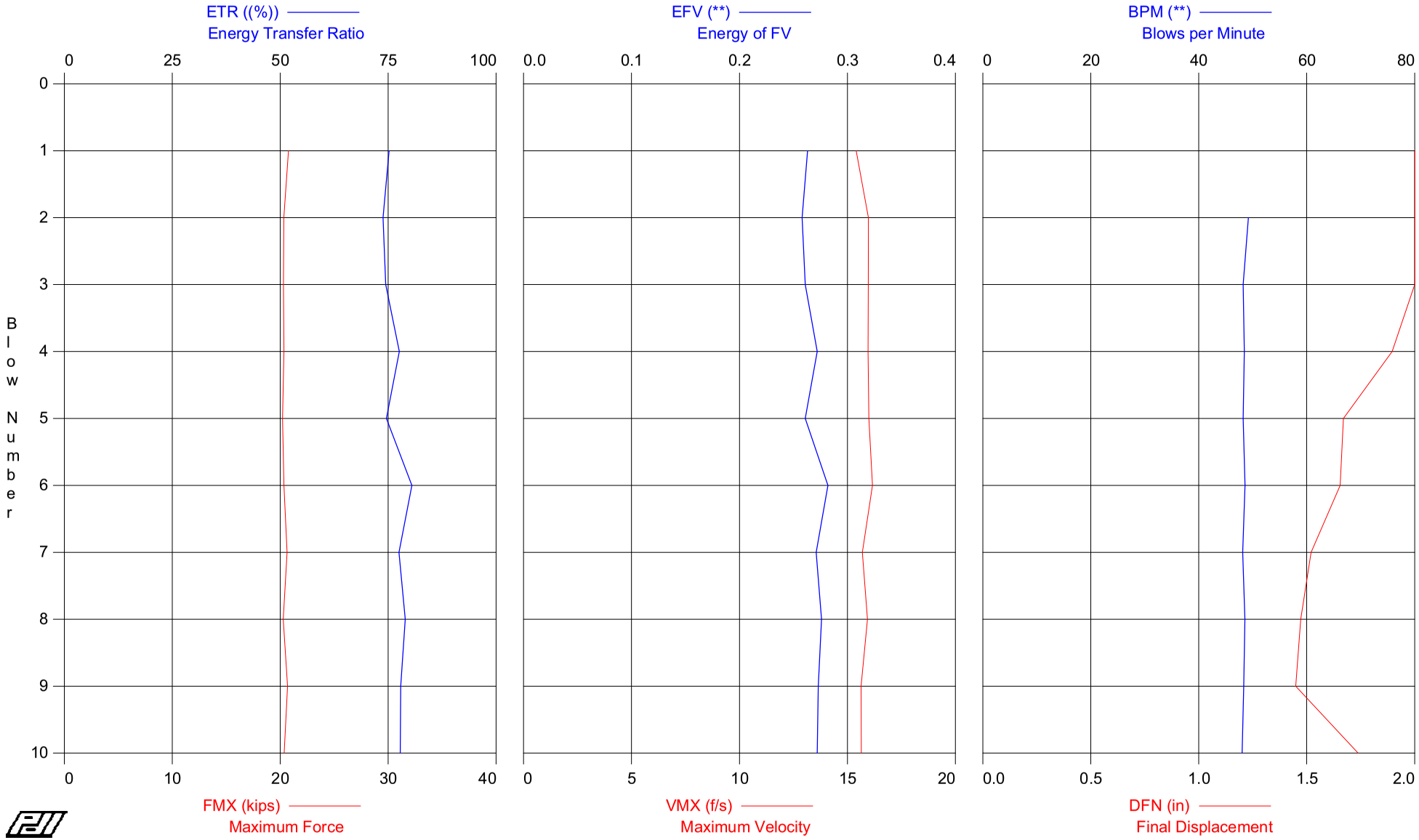
Total number of blows analyzed: 10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 14.5 - 16
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 14.5 - 16
OP: SDW

HAMMER #1 AWJ B-348
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

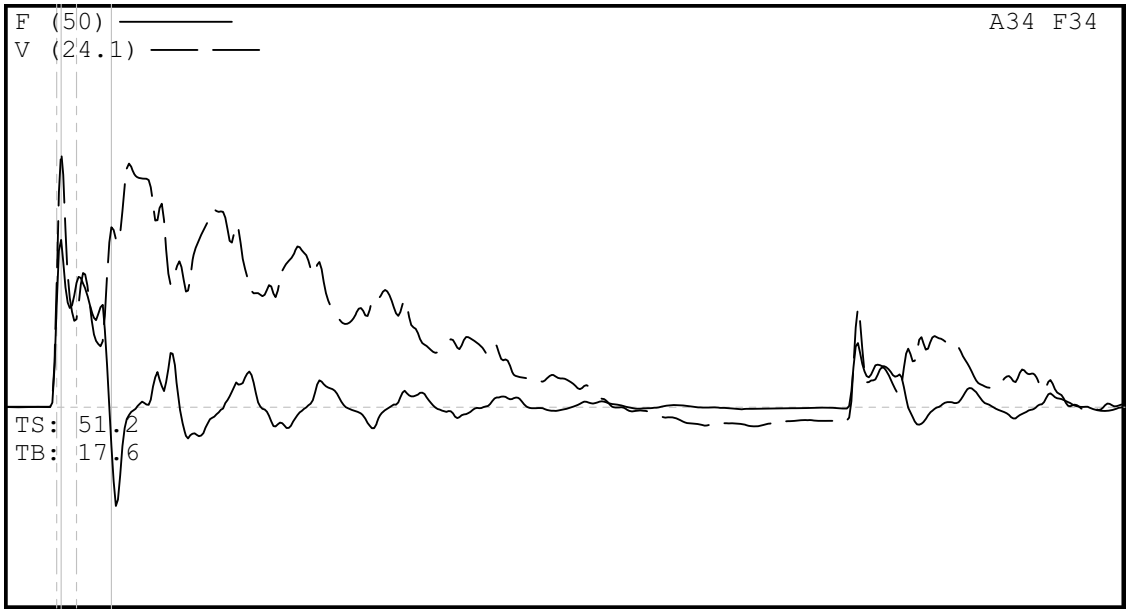
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	ksi	ksi	**	(%)	**	f/s	kips	in
1	17.9	18.2	0.263	75	0	15.4	20.8	2.0
2	17.5	17.7	0.258	74	49	16.0	20.3	2.2
3	17.5	17.8	0.261	74	48	16.0	20.3	2.1
4	17.5	18.0	0.272	78	48	16.0	20.3	1.9
5	17.4	17.8	0.261	75	48	16.0	20.2	1.7
6	17.5	18.0	0.282	80	49	16.2	20.3	1.7
7	17.8	18.1	0.271	77	48	15.7	20.6	1.5
8	17.5	17.7	0.276	79	49	15.9	20.3	1.5
9	17.8	18.2	0.273	78	48	15.6	20.7	1.4
10	17.6	18.0	0.272	78	48	15.6	20.4	1.7
Average	17.6	18.0	0.269	77	48	15.8	20.4	1.8
Std. Dev.	0.2	0.2	0.007	2	0	0.2	0.2	0.3
Maximum	17.9	18.2	0.282	80	49	16.2	20.8	2.2

Total number of blows analyzed: 10

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 14 5 - 16



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 14 5 - 16
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 14 - 15 5
7/9/2008 3:20:58 PM
Blow Number 2/1

Pile Properties

LE	19.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	2.26	ms
JC	0.50	[]

Quantity Results

CSXN	17.9	ksi
CSI	18.2	ksi
EFV	0.263	k-ft
ETR	75.2	(%)
BPM	0.0	bpm
VMX	15.4	f/s
FMX	21	kips
DFN	2.04	in
FVP	0.65	[]

Sensors

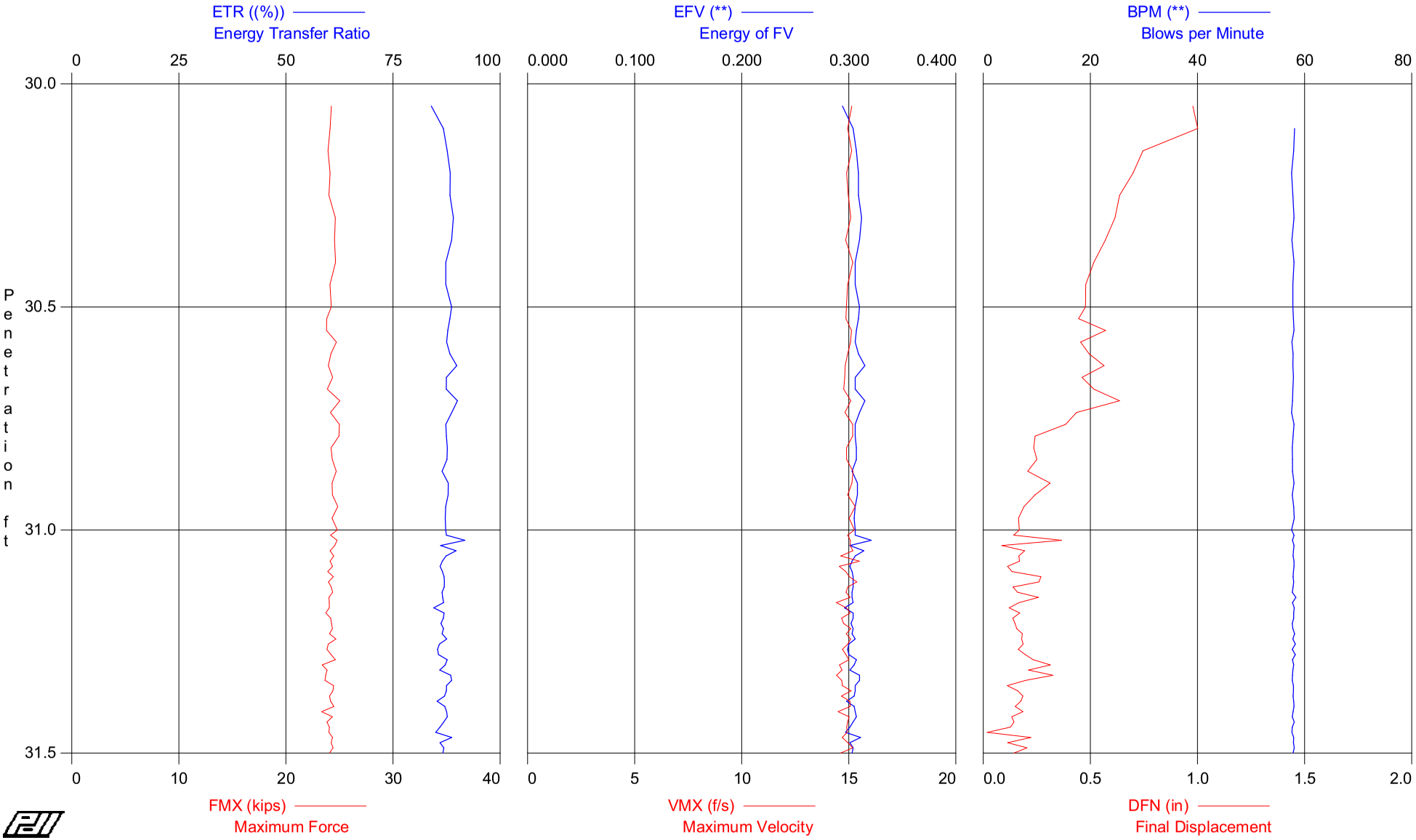
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 1.00

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 30 - 31.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 30 - 31.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 35.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
10	30.50	20	AV10	20.9	21.0	0.307	88	58	15.0	24.3	0.7
			STD	0.2	0.2	0.005	1	0	0.1	0.2	0.2
			MAX	21.2	21.3	0.312	89	58	15.2	24.6	1.0
29	31.00	38	AV19	21.0	21.1	0.308	88	58	15.0	24.4	0.4
			STD	0.3	0.3	0.003	1	0	0.2	0.4	0.1
			MAX	21.6	21.6	0.315	90	58	15.3	25.0	0.6
72	31.50	86	AV43	20.8	21.0	0.304	87	58	14.9	24.1	0.2
			STD	0.3	0.2	0.004	1	0	0.2	0.3	0.1
			MAX	21.4	21.4	0.321	92	58	15.5	24.8	0.4
			Average	20.9	21.0	0.305	87	58	14.9	24.2	0.3
			Std. Dev.	0.3	0.3	0.004	1	0	0.2	0.3	0.2
			Maximum	21.6	21.6	0.321	92	58	15.5	25.0	1.0

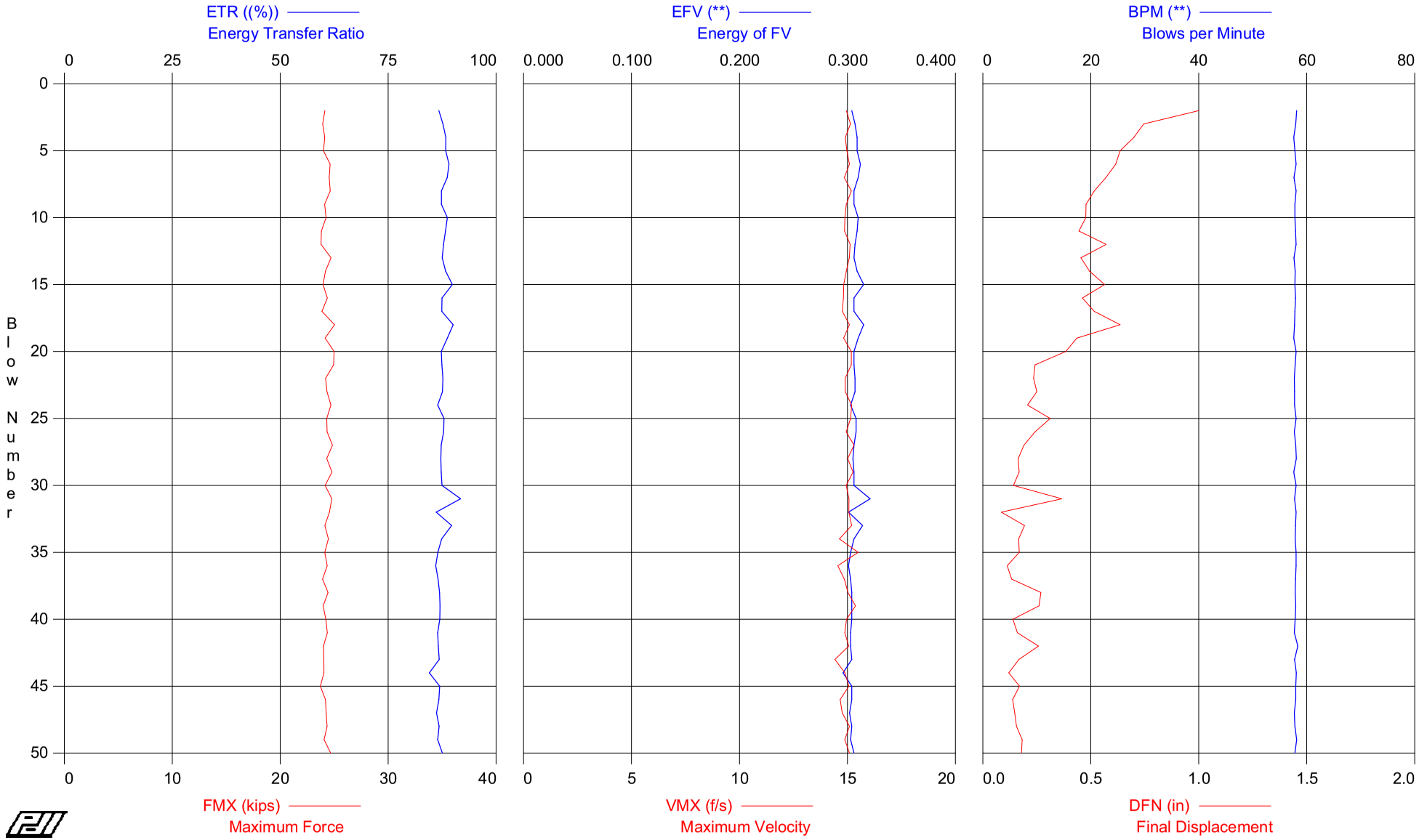
Total number of blows analyzed: 72

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 30 - 31.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 30 - 31.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 35.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
2	20	20.8	20.9	0.304	87	58	14.9	24.1	1.0
3	20	20.6	20.7	0.307	88	58	15.1	23.9	0.7
4	20	20.8	20.8	0.309	88	58	14.9	24.1	0.7
5	20	20.7	20.7	0.309	88	58	15.0	24.0	0.6
6	20	21.2	21.2	0.312	89	58	15.1	24.6	0.6
7	20	21.2	21.3	0.310	89	58	14.9	24.5	0.6
8	20	21.2	21.3	0.306	87	58	15.2	24.6	0.5
9	20	20.8	20.8	0.306	87	58	14.9	24.1	0.5
10	20	20.9	21.0	0.310	89	58	14.9	24.2	0.5
11	38	20.5	20.7	0.309	88	58	14.9	23.8	0.4
12	38	20.5	20.6	0.307	88	58	15.1	23.8	0.6
13	38	21.3	21.3	0.306	88	58	15.1	24.7	0.5
14	38	20.9	20.9	0.309	88	58	14.9	24.2	0.5
15	38	20.7	20.7	0.315	90	58	14.8	24.0	0.6
16	38	21.0	21.0	0.306	87	58	14.8	24.4	0.5
17	38	20.6	20.8	0.306	87	58	14.8	23.9	0.5
18	38	21.6	21.6	0.315	90	58	15.1	25.0	0.6
19	38	20.8	21.0	0.310	89	58	14.8	24.2	0.4
20	38	21.5	21.6	0.306	87	58	15.2	25.0	0.4
21	38	21.5	21.6	0.306	87	58	15.2	24.9	0.2
22	38	20.9	21.1	0.307	88	58	14.9	24.2	0.2
23	38	21.0	21.2	0.307	88	58	14.9	24.3	0.3
24	38	21.3	21.4	0.303	86	58	15.2	24.7	0.2
25	38	21.0	21.0	0.308	88	58	15.1	24.3	0.3
26	38	21.0	21.0	0.308	88	58	14.9	24.3	0.2
27	38	21.4	21.5	0.306	87	58	15.3	24.8	0.2
28	38	21.0	21.0	0.305	87	58	15.0	24.3	0.2
29	38	21.4	21.5	0.306	87	58	15.3	24.8	0.2
30	86	20.8	21.1	0.306	87	58	14.9	24.2	0.1
31	86	21.4	21.4	0.321	92	58	15.1	24.8	0.4
32	86	21.2	21.3	0.301	86	58	15.1	24.6	0.1
33	86	20.8	20.9	0.314	90	58	15.2	24.1	0.2
34	86	21.1	21.3	0.306	87	58	14.6	24.5	0.2
35	86	20.8	20.9	0.303	87	58	15.5	24.1	0.2
36	86	21.0	21.3	0.301	86	58	14.6	24.4	0.1
37	86	20.6	20.9	0.303	87	58	14.9	23.9	0.1
38	86	21.1	21.1	0.304	87	58	15.0	24.4	0.3
39	86	20.7	20.7	0.304	87	58	15.4	24.0	0.3
40	86	20.9	21.0	0.304	87	58	15.0	24.2	0.1
41	86	21.0	21.3	0.303	86	58	14.9	24.4	0.2
42	86	20.7	20.8	0.303	87	58	15.1	24.0	0.3
43	86	20.7	21.0	0.304	87	58	14.4	24.0	0.2
44	86	20.7	21.0	0.296	85	58	14.9	24.1	0.1
45	86	20.5	20.7	0.304	87	58	15.1	23.7	0.2
46	86	20.9	21.1	0.304	87	58	14.7	24.2	0.1
47	86	20.9	21.2	0.302	86	58	14.8	24.3	0.1
48	86	21.0	21.0	0.304	87	58	15.1	24.3	0.2
49	86	20.7	21.0	0.303	86	58	14.9	24.1	0.2
50	86	21.3	21.4	0.306	88	58	15.1	24.7	0.2
51	86	20.6	20.9	0.300	86	58	15.0	24.0	0.2
52	86	20.5	20.9	0.299	85	58	14.7	23.8	0.2
53	86	20.9	21.0	0.300	86	58	14.9	24.2	0.2
54	86	21.2	21.4	0.307	88	58	15.0	24.6	0.2
55	86	20.2	20.5	0.305	87	58	14.6	23.4	0.3
56	86	20.6	20.9	0.301	86	58	14.7	23.8	0.2
57	86	20.4	20.7	0.310	88	58	14.4	23.7	0.3
58	86	20.4	20.4	0.310	89	58	14.7	23.6	0.2
59	86	21.1	21.4	0.306	87	58	14.7	24.5	0.1
60	86	21.0	21.1	0.306	87	58	15.1	24.4	0.2
61	86	20.8	21.0	0.305	87	58	14.7	24.1	0.2
62	86	20.8	20.9	0.298	85	58	15.1	24.2	0.2
63	86	21.1	21.2	0.305	87	58	15.1	24.5	0.1
64	86	20.1	20.5	0.306	88	58	14.5	23.3	0.2
65	86	21.0	21.1	0.307	88	58	15.0	24.3	0.1
66	86	20.5	20.6	0.304	87	58	14.9	23.8	0.1
67	86	20.7	21.1	0.301	86	58	14.9	24.1	0.1

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 30 - 31.5

HAMMER #1 AWJ B-348

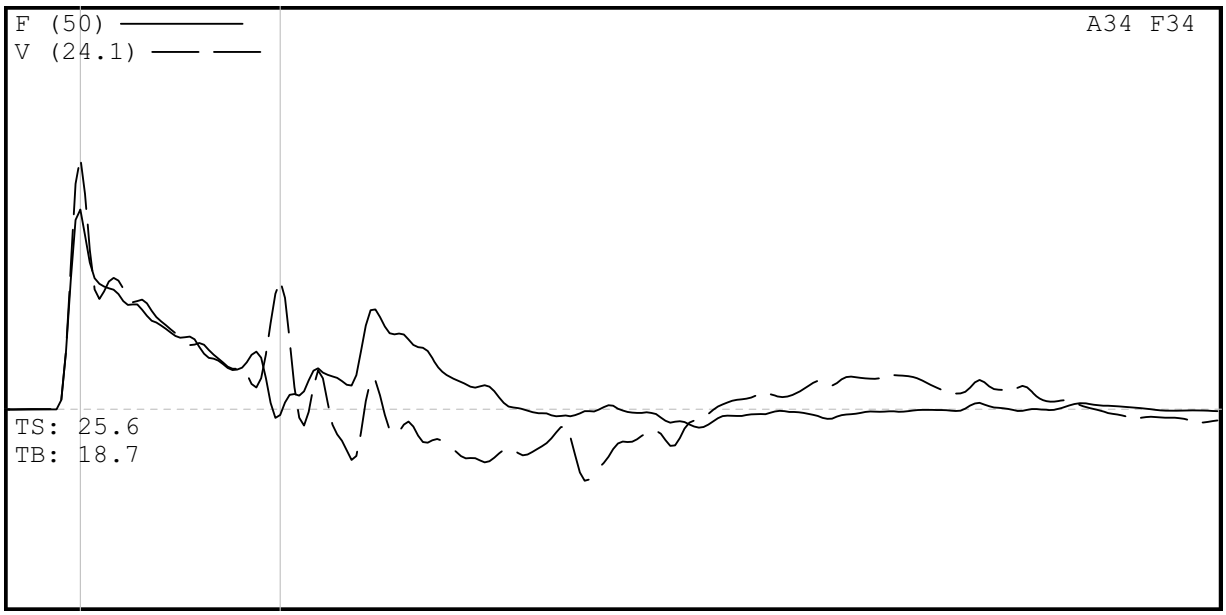
OP: SDW

Test date: 9-Jul-2008

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
68	86	20.7	21.0	0.297	85	58	14.9	24.0	0.0
69	86	21.0	21.3	0.311	89	58	14.7	24.4	0.2
70	86	20.9	21.0	0.301	86	58	15.0	24.2	0.1
71	86	21.0	21.2	0.304	87	58	15.2	24.4	0.2
Average		20.9	21.0	0.306	87	58	14.9	24.2	0.3
Std. Dev.		0.3	0.3	0.004	1	0	0.2	0.3	0.2
Maximum		21.6	21.6	0.321	92	58	15.5	25.0	1.0

Total number of blows analyzed: 70

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 30 - 31 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 30 - 31 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 30 - 31 5
7/9/2008 6:18:19 PM
Blow Number 32/31

Pile Properties

LE	35.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	4.16	ms
JC	0.50	[]

Quantity Results

CSXN	21.4	ksi
CSI	21.4	ksi
EFV	0.321	k-ft
ETR	91.8	(%)
BPM	57.7	bpm
VMX	15.1	f/s
FMX	25	kips
DFN	0.37	in
FVP	0.80	[]

Sensors

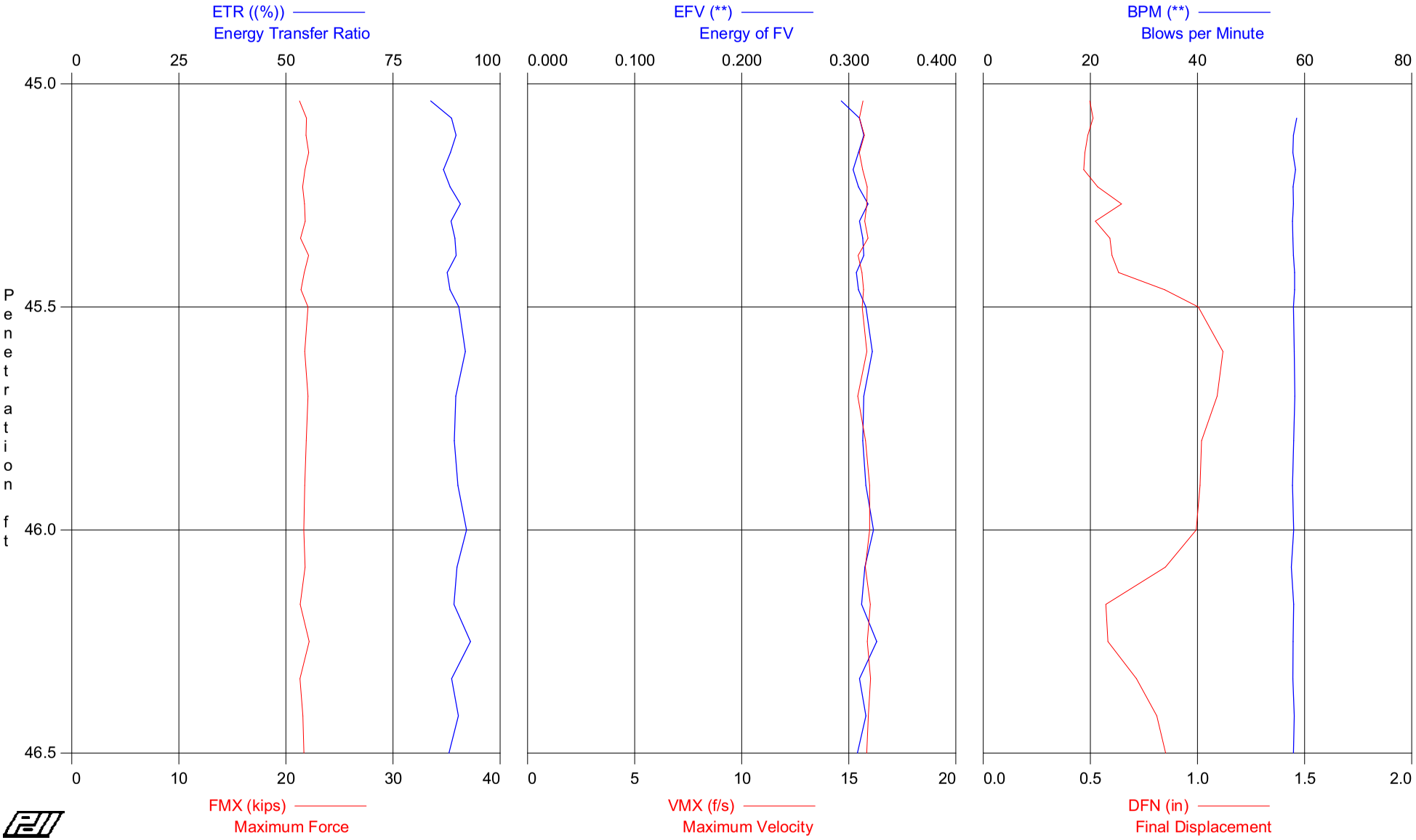
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 45 - 46.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 45 - 46.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 50.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
13	45.50	26	AV13	18.7	19.0	0.310	89	58	15.7	21.7	0.6
			STD	0.2	0.2	0.006	2	0	0.1	0.3	0.2
			MAX	19.1	19.3	0.318	91	59	15.9	22.1	1.0
18	46.00	10	AV5	18.8	19.0	0.318	91	58	15.8	21.8	1.0
			STD	0.1	0.1	0.004	1	0	0.2	0.1	0.0
			MAX	19.0	19.2	0.323	92	58	16.0	22.1	1.1
24	46.50	12	AV6	18.7	18.9	0.314	90	58	15.9	21.6	0.7
			STD	0.2	0.2	0.006	2	0	0.1	0.3	0.1
			MAX	19.1	19.3	0.326	93	58	16.0	22.2	0.9
			Average	18.7	19.0	0.313	89	58	15.8	21.7	0.7
			Std. Dev.	0.2	0.2	0.007	2	0	0.2	0.3	0.2
			Maximum	19.1	19.3	0.326	93	59	16.0	22.2	1.1

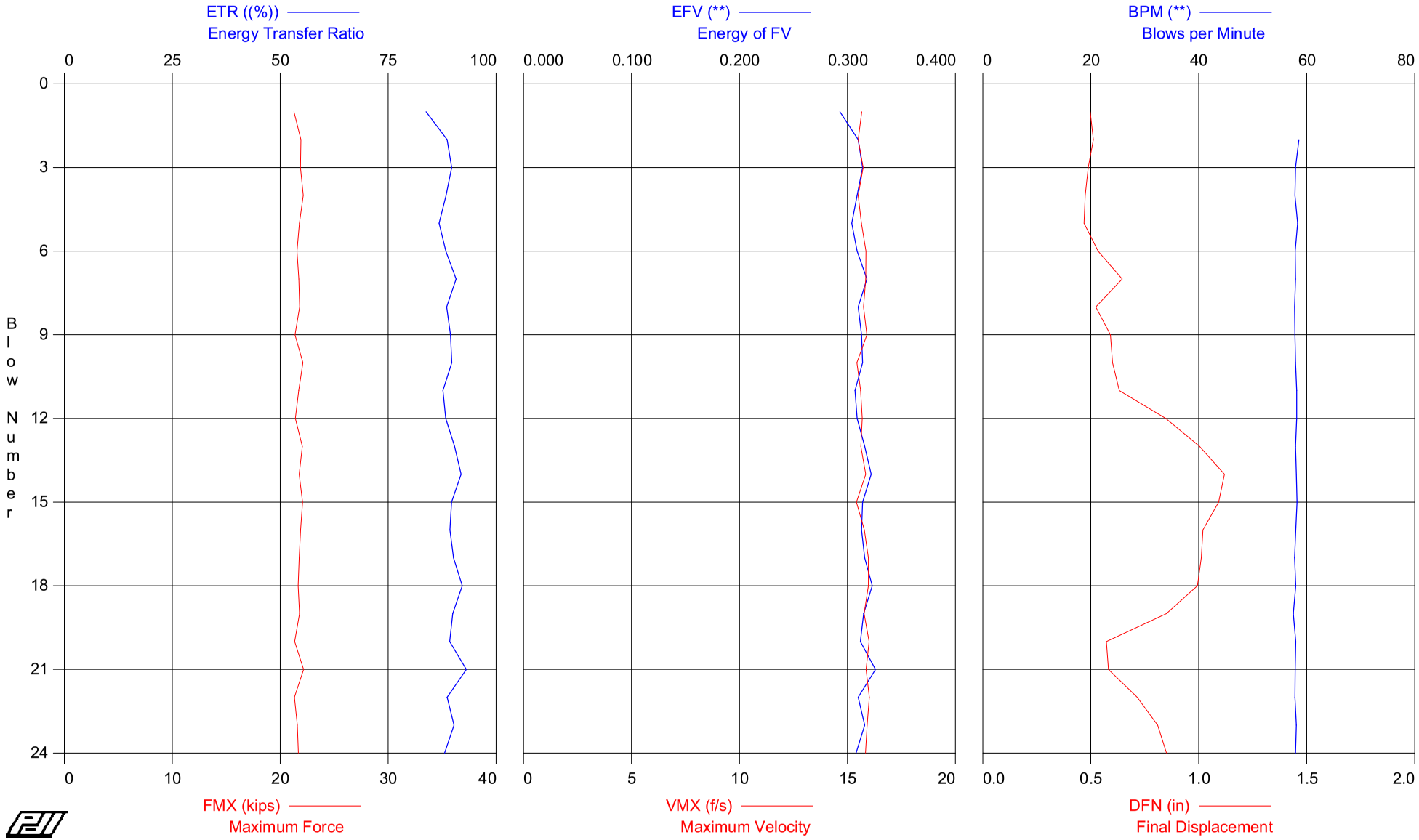
Total number of blows analyzed: 24

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 45 - 46.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 45 - 46.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 50.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

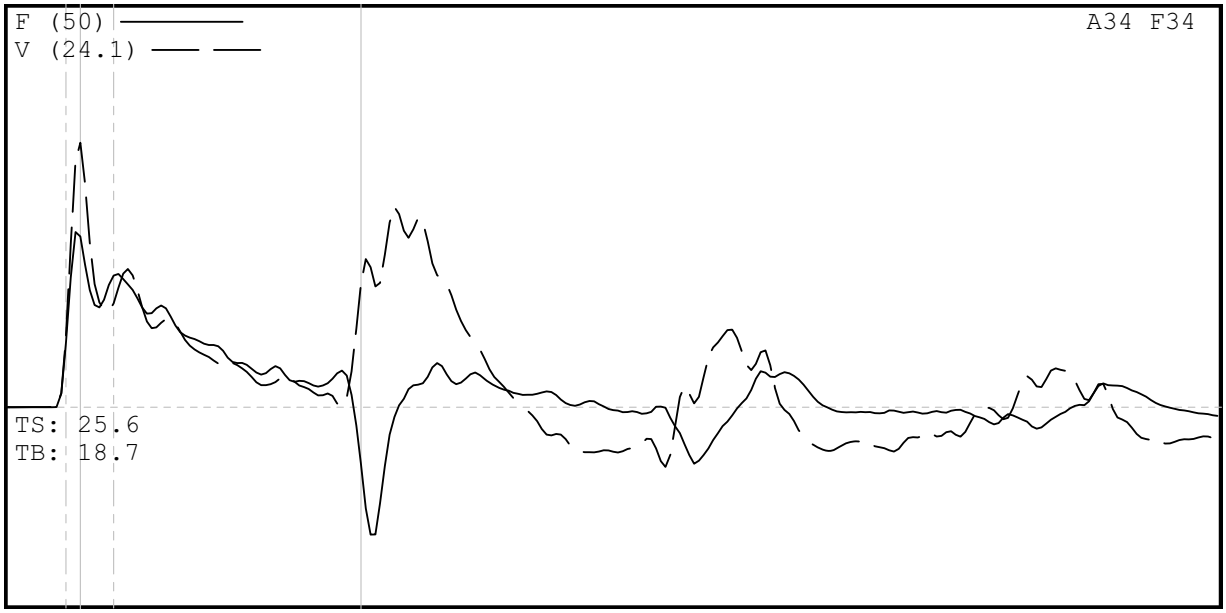
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	26	18.3	18.5	0.293	84	0	15.7	21.3	0.5
2	26	18.9	19.1	0.310	89	59	15.5	21.9	0.5
3	26	18.9	19.1	0.314	90	58	15.7	21.9	0.5
4	26	19.1	19.3	0.309	88	58	15.5	22.1	0.5
5	26	18.8	19.0	0.304	87	58	15.6	21.8	0.5
6	26	18.6	18.8	0.309	88	58	15.9	21.6	0.5
7	26	18.7	19.0	0.318	91	58	15.8	21.7	0.6
8	26	18.8	19.0	0.310	89	58	15.7	21.8	0.5
9	26	18.4	18.7	0.313	89	58	15.9	21.4	0.6
10	26	19.1	19.2	0.314	90	58	15.4	22.1	0.6
11	26	18.7	19.0	0.307	88	58	15.6	21.7	0.6
12	26	18.5	18.8	0.309	88	58	15.7	21.4	0.8
13	26	19.0	19.2	0.316	90	58	15.6	22.1	1.0
14	10	18.8	19.0	0.322	92	58	15.8	21.8	1.1
15	10	19.0	19.2	0.314	90	58	15.4	22.1	1.1
16	10	18.9	19.1	0.313	89	58	15.8	21.9	1.0
17	10	18.8	19.0	0.316	90	58	16.0	21.8	1.0
18	10	18.7	18.9	0.323	92	58	16.0	21.7	1.0
19	12	18.8	19.0	0.315	90	58	15.8	21.8	0.9
20	12	18.4	18.7	0.312	89	58	16.0	21.3	0.6
21	12	19.1	19.3	0.326	93	58	15.9	22.2	0.6
22	12	18.4	18.7	0.310	89	58	16.0	21.3	0.7
23	12	18.6	18.9	0.316	90	58	15.9	21.6	0.8
24	12	18.7	19.0	0.308	88	58	15.8	21.7	0.9
Average		18.7	19.0	0.313	89	58	15.8	21.7	0.7
Std. Dev.		0.2	0.2	0.007	2	0	0.2	0.3	0.2
Maximum		19.1	19.3	0.326	93	59	16.0	22.2	1.1

Total number of blows analyzed: 24

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 45 - 46 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 45 - 46 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 45 - 46 5
7/10/2008 9:36:17 AM
Blow Number 9/7

Pile Properties

LE	50.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	5.95	ms
JC	0.50	[]

Quantity Results

CSXN	18.7	ksi
CSI	19.0	ksi
EFV	0.318	k-ft
ETR	90.7	(%)
BPM	57.9	bpm
VMX	15.8	f/s
FMX	22	kips
DFN	0.65	in
FVP	0.65	[]

Sensors

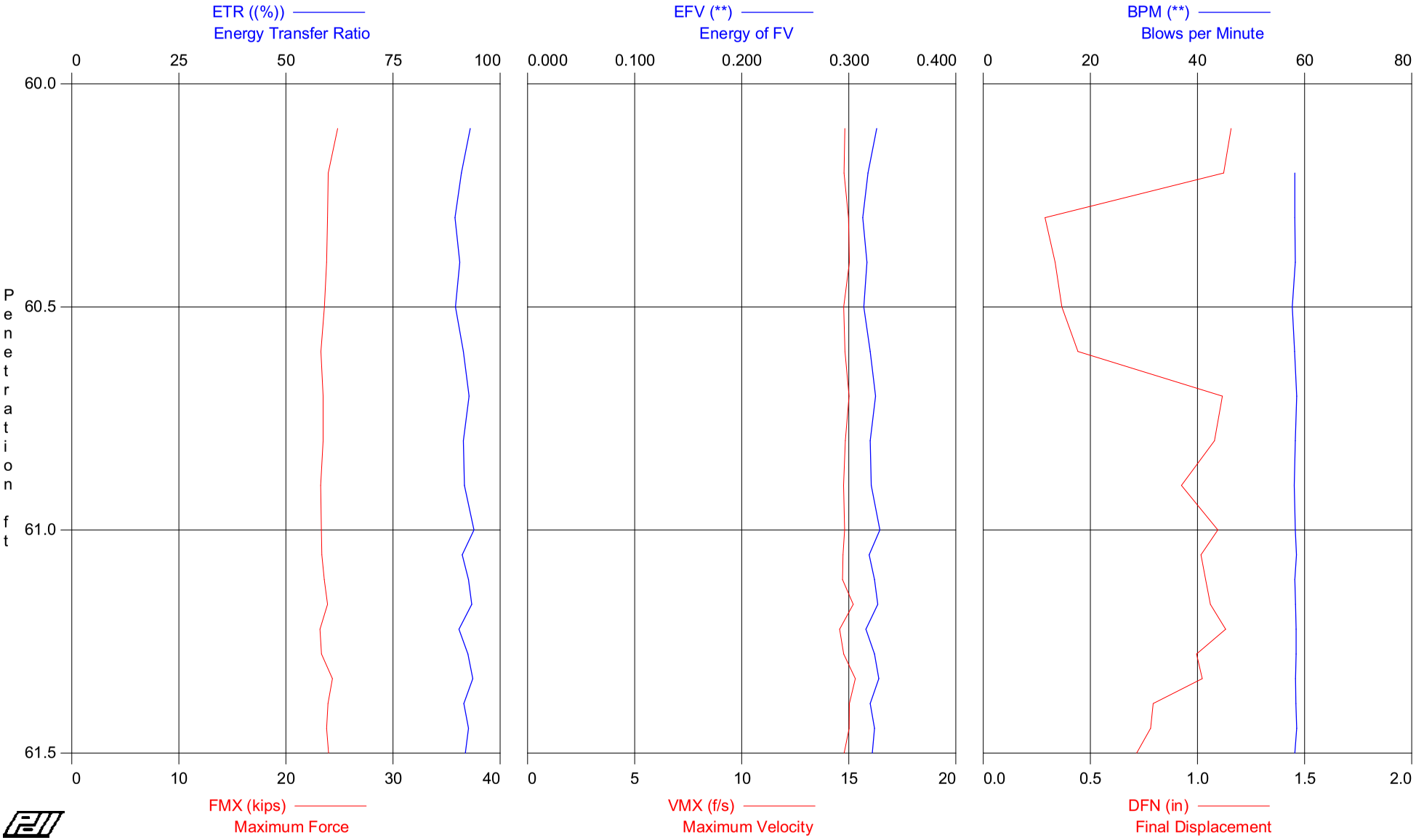
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 60 - 61.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 60 - 61.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 65.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	60.50	10	AV5	20.7	20.8	0.318	91	58	14.9	24.0	0.7
			STD	0.4	0.4	0.005	1	0	0.1	0.4	0.4
			MAX	21.4	21.6	0.326	93	58	15.0	24.8	1.2
10	61.00	10	AV5	20.1	20.3	0.323	92	58	14.8	23.3	0.9
			STD	0.1	0.1	0.004	1	0	0.1	0.1	0.3
			MAX	20.2	20.4	0.329	94	59	15.0	23.5	1.1
19	61.50	18	AV9	20.4	20.5	0.323	92	58	14.9	23.7	1.0
			STD	0.3	0.3	0.004	1	0	0.2	0.4	0.1
			MAX	21.0	21.0	0.328	94	59	15.3	24.3	1.1
			Average	20.4	20.6	0.321	92	58	14.9	23.7	0.9
			Std. Dev.	0.4	0.3	0.004	1	0	0.2	0.4	0.3
			Maximum	21.4	21.6	0.329	94	59	15.3	24.8	1.2

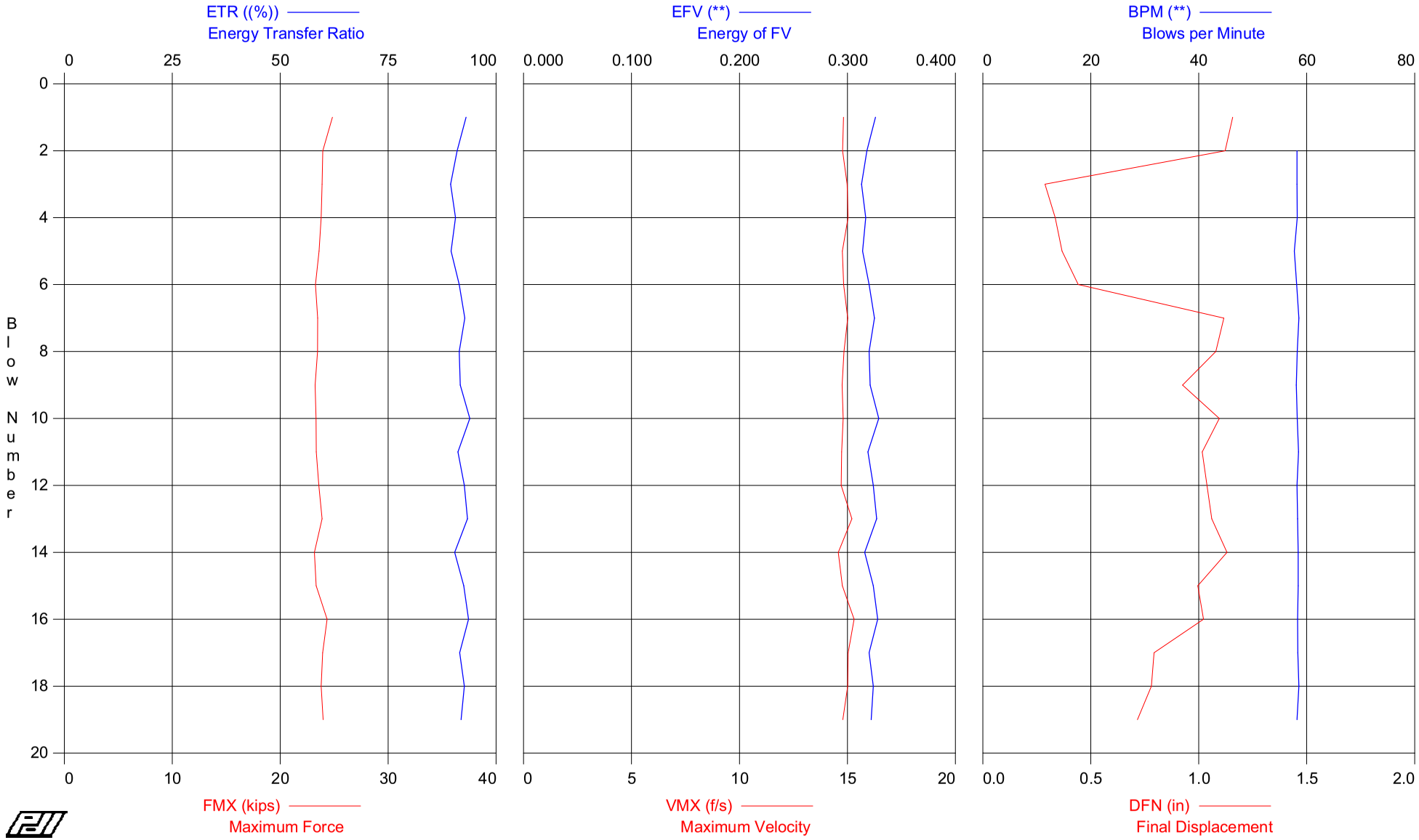
Total number of blows analyzed: 19

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 60 - 61.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 60 - 61.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 65.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

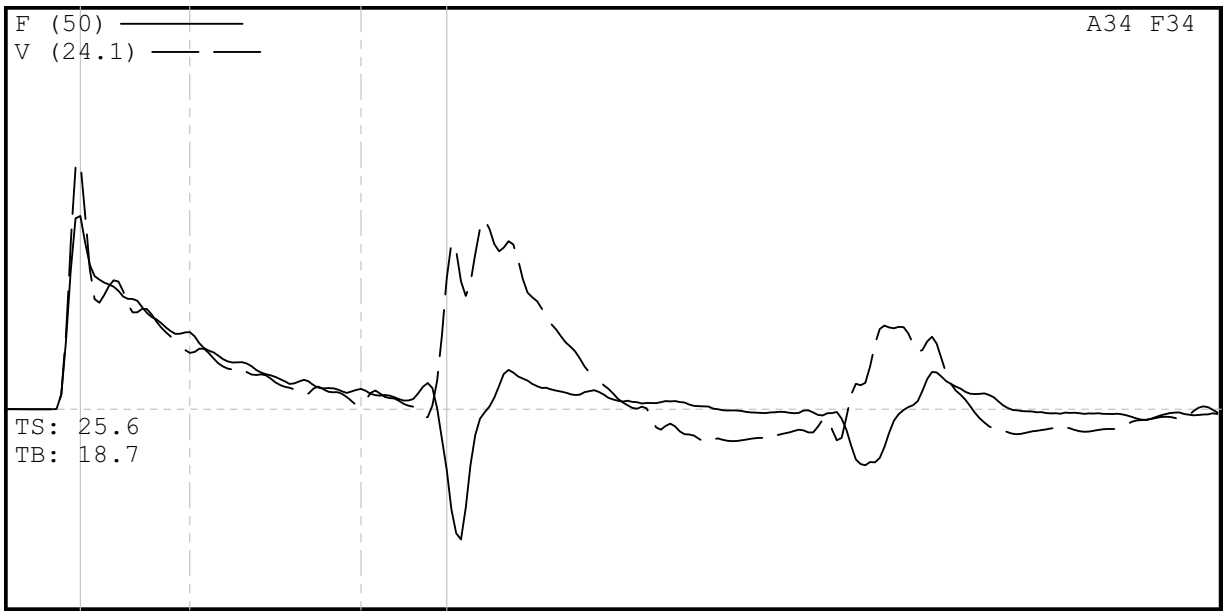
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	21.4	21.6	0.326	93	0	14.8	24.8	1.2
2	10	20.6	20.9	0.318	91	58	14.8	23.9	1.1
3	10	20.6	20.7	0.313	89	58	15.0	23.9	0.3
4	10	20.5	20.6	0.317	91	58	15.0	23.8	0.3
5	10	20.3	20.4	0.314	90	58	14.8	23.6	0.4
6	10	20.1	20.3	0.320	91	58	14.8	23.3	0.4
7	10	20.2	20.3	0.325	93	59	15.0	23.5	1.1
8	10	20.2	20.4	0.320	91	58	14.8	23.5	1.1
9	10	20.0	20.3	0.321	92	58	14.8	23.2	0.9
10	10	20.1	20.3	0.329	94	58	14.8	23.3	1.1
11	18	20.1	20.3	0.319	91	58	14.7	23.3	1.0
12	18	20.3	20.5	0.324	93	58	14.7	23.6	1.0
13	18	20.6	20.6	0.327	93	58	15.2	23.9	1.1
14	18	20.0	20.2	0.316	90	58	14.6	23.2	1.1
15	18	20.1	20.2	0.324	93	58	14.8	23.3	1.0
16	18	21.0	21.0	0.328	94	58	15.3	24.3	1.0
17	18	20.6	20.6	0.320	92	58	15.0	23.9	0.8
18	18	20.5	20.5	0.324	93	59	15.0	23.8	0.8
19	18	20.7	20.8	0.322	92	58	14.8	24.0	0.7
Average		20.4	20.6	0.321	92	58	14.9	23.7	0.9
Std. Dev.		0.4	0.3	0.004	1	0	0.2	0.4	0.3
Maximum		21.4	21.6	0.329	94	59	15.3	24.8	1.2

Total number of blows analyzed: 19

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 60 - 61 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 60 - 61 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 60 - 61 5
7/10/2008 12:07:11 PM
Blow Number 20/19

Pile Properties

LE	65.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	7.73	ms
JC	0.50	[]

Quantity Results

CSXN	20.7	ksi
CSI	20.8	ksi
EFV	0.322	k-ft
ETR	91.9	(%)
BPM	58.2	bpm
VMX	14.8	f/s
FMX	24	kips
DFN	0.72	in
FVP	0.78	[]

Sensors

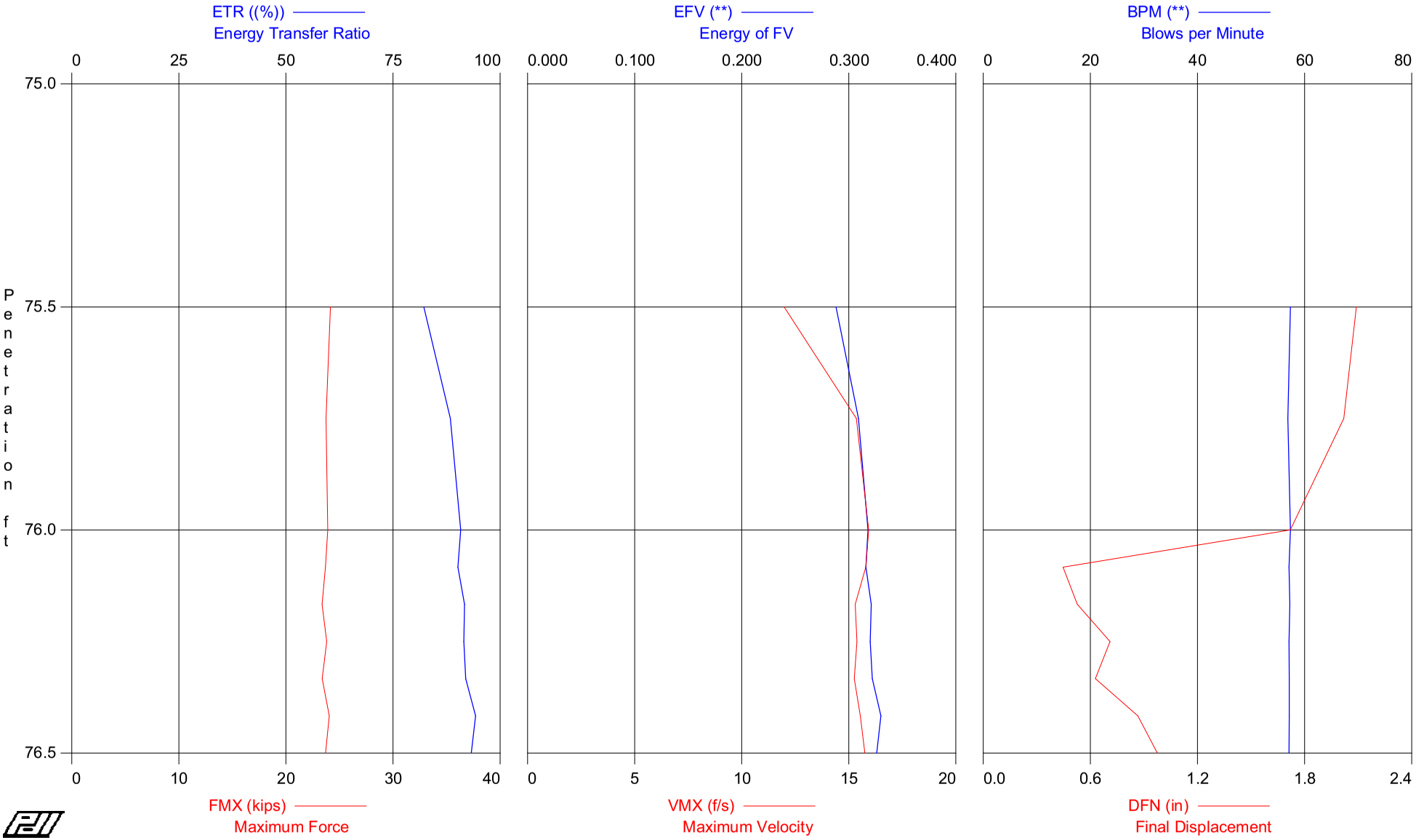
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.99
V3/V4: OK 0.98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 75 - 76.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 75 - 76.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 80.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
1	75.50	2	AV1	20.8	20.9	0.288	82	57	12.0	24.2	2.1
			MAX	20.8	20.9	0.288	82	57	12.0	24.2	2.1
3	76.00	4	AV2	20.5	20.6	0.313	90	57	15.6	23.8	1.9
			STD	0.1	0.1	0.004	1	0	0.3	0.1	0.2
			MAX	20.6	20.7	0.318	91	57	15.9	23.9	2.0
9	76.50	12	AV6	20.4	20.5	0.323	92	57	15.5	23.7	0.7
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.2
			MAX	20.7	20.8	0.330	94	57	15.8	24.0	1.0
			Average	20.5	20.6	0.317	90	57	15.1	23.8	1.1
			Std. Dev.	0.2	0.2	0.012	3	0	1.1	0.2	0.6
			Maximum	20.8	20.9	0.330	94	57	15.9	24.2	2.1

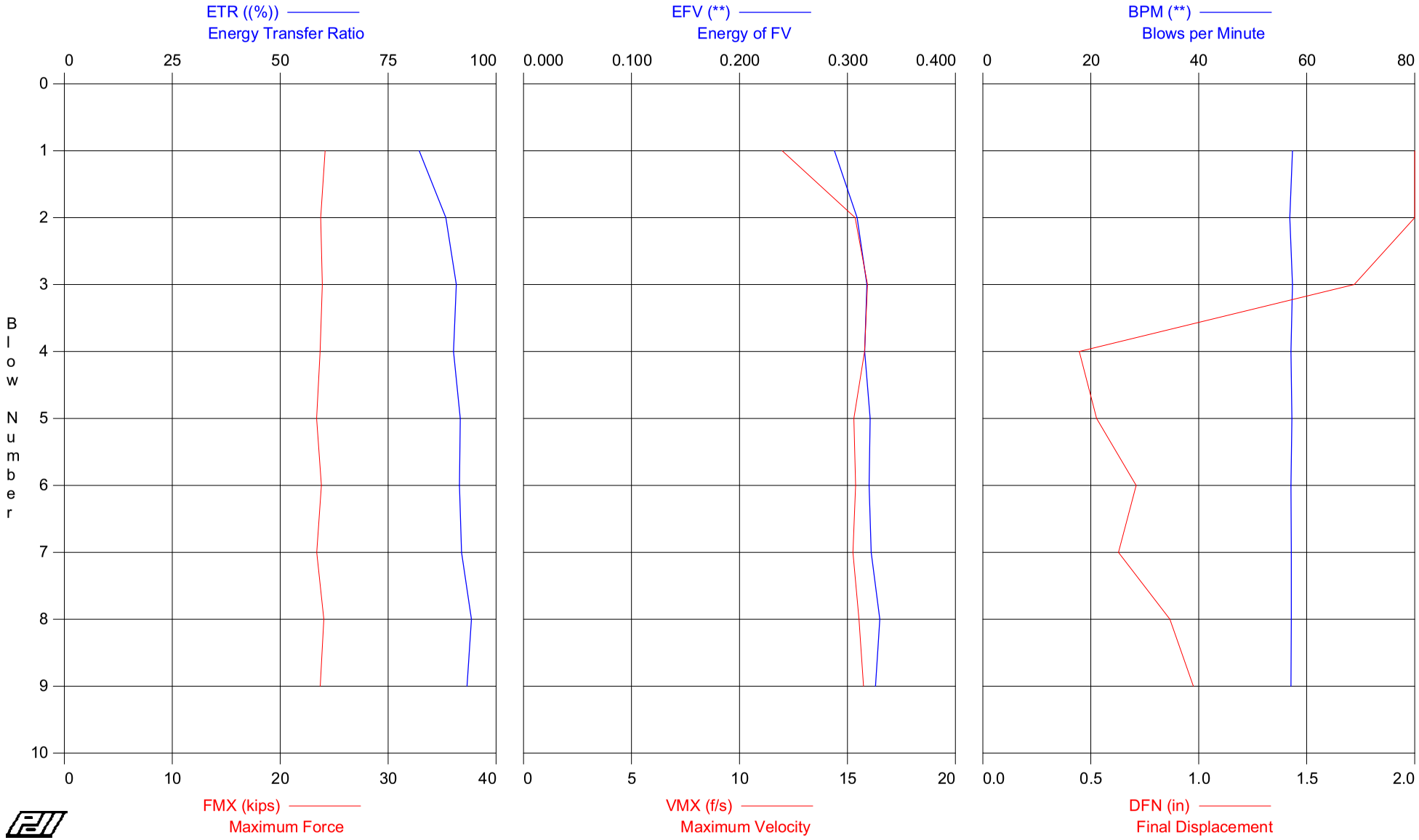
Total number of blows analyzed: 9

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 75 - 76.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 75 - 76.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 80.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

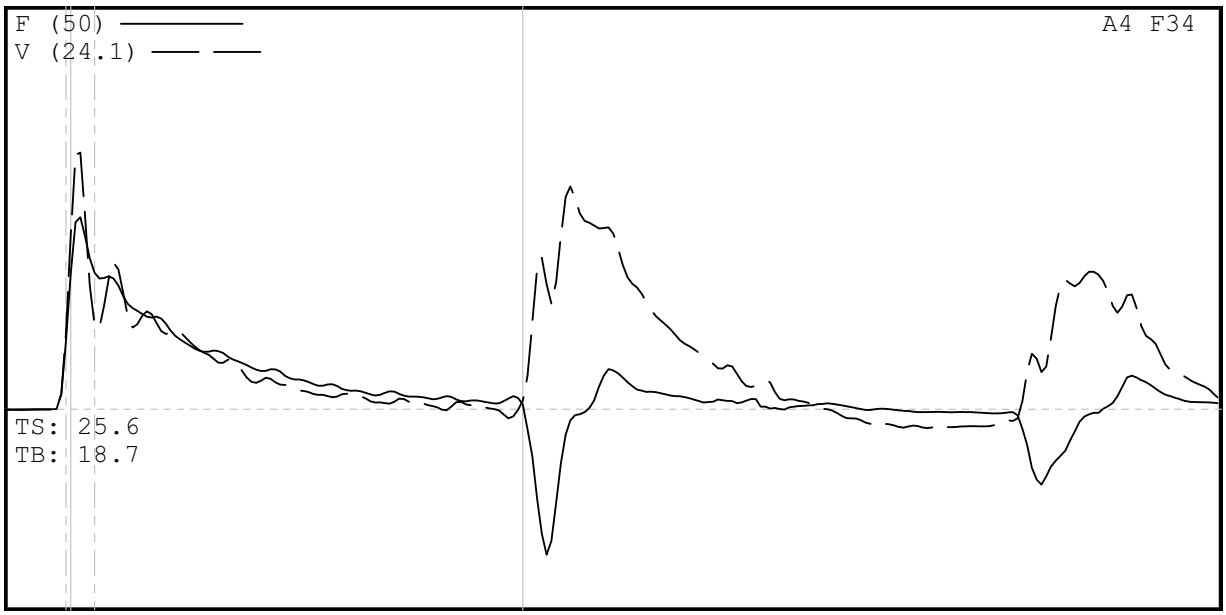
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	2	20.8	20.9	0.288	82	57	12.0	24.2	2.1
2	4	20.5	20.5	0.309	88	57	15.4	23.8	2.0
3	4	20.6	20.7	0.318	91	57	15.9	23.9	1.7
4	12	20.4	20.5	0.316	90	57	15.8	23.7	0.4
5	12	20.1	20.2	0.321	92	57	15.3	23.4	0.5
6	12	20.5	20.6	0.320	92	57	15.4	23.8	0.7
7	12	20.2	20.2	0.322	92	57	15.3	23.4	0.6
8	12	20.7	20.8	0.330	94	57	15.5	24.0	0.9
9	12	20.4	20.5	0.326	93	57	15.7	23.7	1.0
Average		20.5	20.6	0.317	90	57	15.1	23.8	1.1
Std. Dev.		0.2	0.2	0.012	3	0	1.1	0.2	0.6
Maximum		20.8	20.9	0.330	94	57	15.9	24.2	2.1

Total number of blows analyzed: 9

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 75 - 76 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 75 - 76 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 75 - 76 5
7/10/2008 2:53:45 PM
Blow Number 33/6

Pile Properties

LE	80.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	9.52	ms
JC	0.50	[]

Quantity Results

CSXN	20.5	ksi
CSI	20.6	ksi
EFV	0.320	k-ft
ETR	91.5	(%)
BPM	57.1	bpm
VMX	15.4	f/s
FMX	24	kips
DFN	0.71	in
FVP	0.75	[]

Sensors

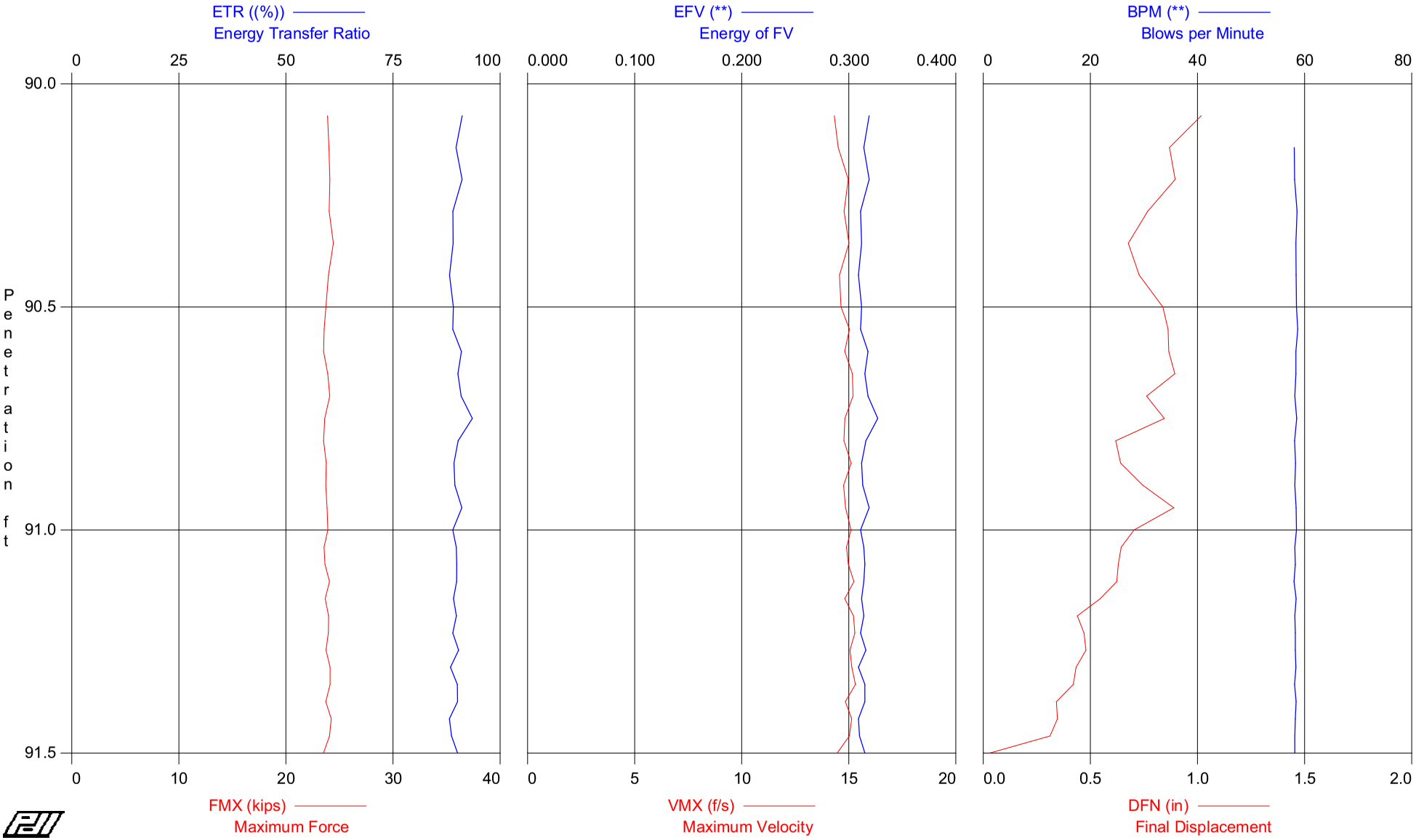
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V1/V2: USE 2 ACCELS

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 90 - 91.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 90 - 91.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 95.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
7	90.50	14	AV7	20.7	20.8	0.314	90	58	14.7	24.0	0.8
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.1
			MAX	21.1	21.2	0.319	91	59	15.0	24.4	1.0
17	91.00	20	AV10	20.5	20.6	0.316	90	58	15.0	23.7	0.8
			STD	0.2	0.2	0.005	1	0	0.2	0.2	0.1
			MAX	20.8	20.8	0.327	94	59	15.2	24.1	0.9
30	91.50	26	AV13	20.6	20.7	0.313	89	58	15.0	23.9	0.4
			STD	0.2	0.2	0.002	1	0	0.2	0.2	0.2
			MAX	20.9	21.0	0.316	90	58	15.3	24.2	0.6
			Average	20.6	20.7	0.314	90	58	14.9	23.9	0.6
			Std. Dev.	0.2	0.2	0.004	1	0	0.3	0.2	0.2
			Maximum	21.1	21.2	0.327	94	59	15.3	24.4	1.0

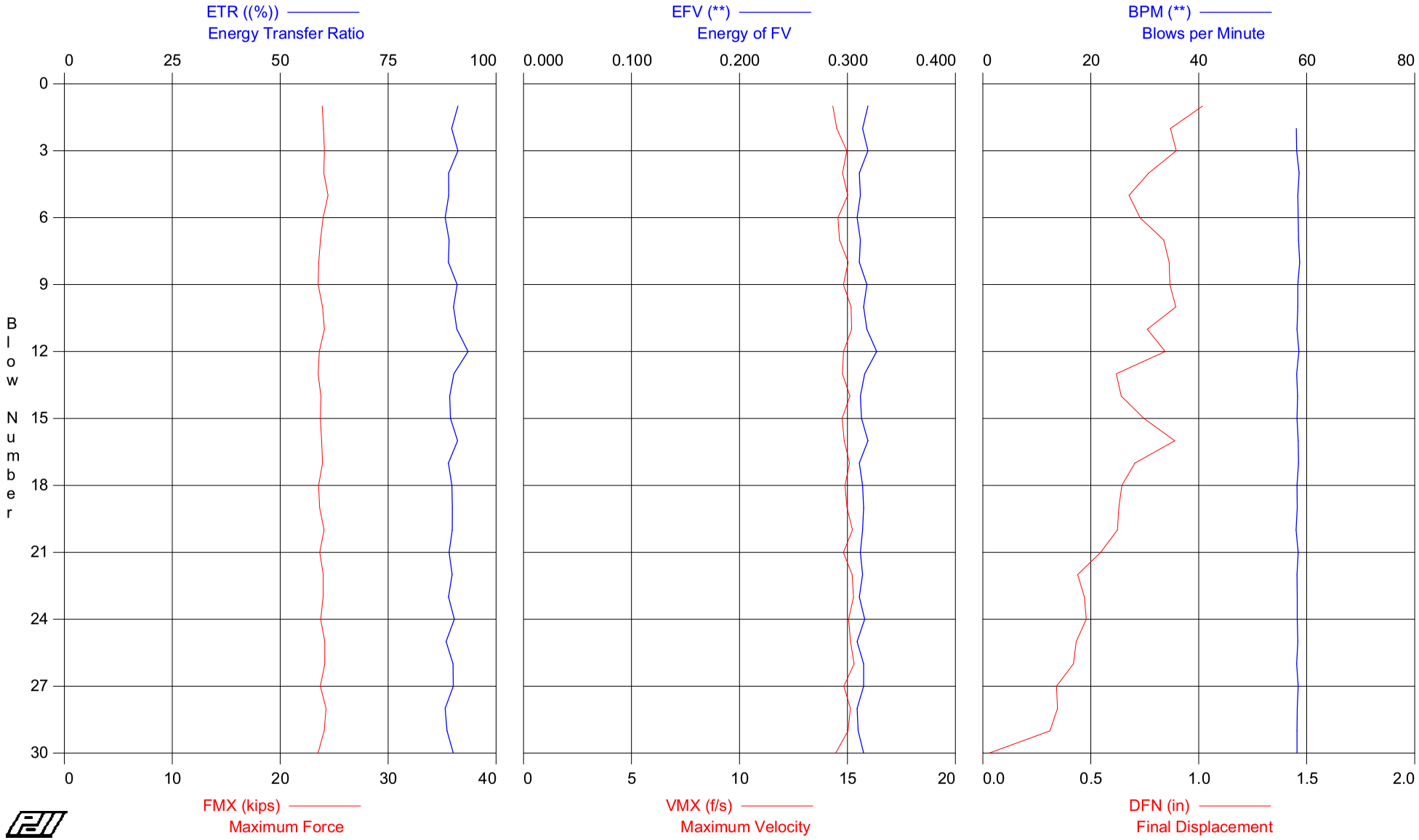
Total number of blows analyzed: 30

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 90 - 91.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 90 - 91.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 95.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

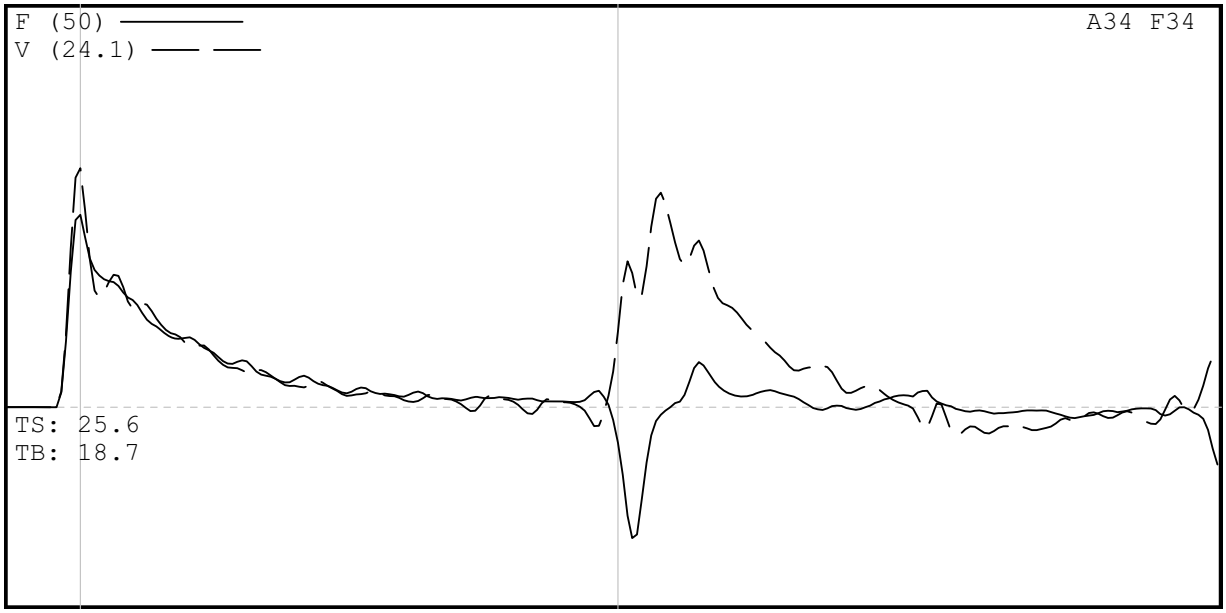
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	14	20.6	20.7	0.319	91	0	14.3	23.9	1.0
2	14	20.7	21.0	0.314	90	58	14.5	24.0	0.9
3	14	20.8	20.8	0.319	91	58	15.0	24.1	0.9
4	14	20.7	20.7	0.311	89	59	14.8	24.0	0.8
5	14	21.1	21.2	0.312	89	58	15.0	24.4	0.7
6	14	20.7	20.9	0.309	88	58	14.6	24.0	0.7
7	14	20.5	20.6	0.312	89	58	14.6	23.7	0.8
8	20	20.3	20.4	0.311	89	59	15.0	23.6	0.9
9	20	20.3	20.5	0.318	91	58	14.8	23.5	0.9
10	20	20.6	20.7	0.315	90	58	15.2	23.9	0.9
11	20	20.8	20.8	0.318	91	58	15.2	24.1	0.8
12	20	20.4	20.4	0.327	94	59	14.8	23.6	0.8
13	20	20.3	20.6	0.316	90	58	14.8	23.5	0.6
14	20	20.5	20.5	0.312	89	58	15.1	23.8	0.6
15	20	20.5	20.7	0.313	89	58	14.8	23.7	0.7
16	20	20.6	20.8	0.319	91	58	14.8	23.8	0.9
17	20	20.6	20.8	0.311	89	58	15.1	23.9	0.7
18	26	20.3	20.4	0.314	90	58	14.9	23.6	0.6
19	26	20.4	20.4	0.315	90	58	15.0	23.6	0.6
20	26	20.7	20.8	0.314	90	58	15.2	24.1	0.6
21	26	20.4	20.7	0.312	89	58	14.8	23.7	0.5
22	26	20.7	20.7	0.314	90	58	15.2	24.0	0.4
23	26	20.7	20.8	0.311	89	58	15.3	24.0	0.5
24	26	20.5	20.5	0.316	90	58	15.1	23.7	0.5
25	26	20.8	20.9	0.309	88	58	15.1	24.1	0.4
26	26	20.8	20.9	0.315	90	58	15.3	24.1	0.4
27	26	20.5	20.8	0.315	90	58	14.8	23.7	0.3
28	26	20.9	21.0	0.309	88	58	15.1	24.2	0.3
29	26	20.8	20.8	0.310	89	58	15.0	24.1	0.3
30	26	20.3	20.5	0.315	90	58	14.5	23.5	0.0
Average		20.6	20.7	0.314	90	58	14.9	23.9	0.6
Std. Dev.		0.2	0.2	0.004	1	0	0.3	0.2	0.2
Maximum		21.1	21.2	0.327	94	59	15.3	24.4	1.0

Total number of blows analyzed: 30

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 90 - 91 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 90 - 91 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 90 - 91 5
7/10/2008 5:59:47 PM
Blow Number 2/1

Pile Properties

LE	95.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	11.30	ms
JC	0.50	[]

Quantity Results

CSXN	20.6	ksi
CSI	20.7	ksi
EFV	0.319	k-ft
ETR	91.2	(%)
BPM	0.0	bpm
VMX	14.3	f/s
FMX	24	kips
DFN	1.02	in
FVP	0.81	[]

Sensors

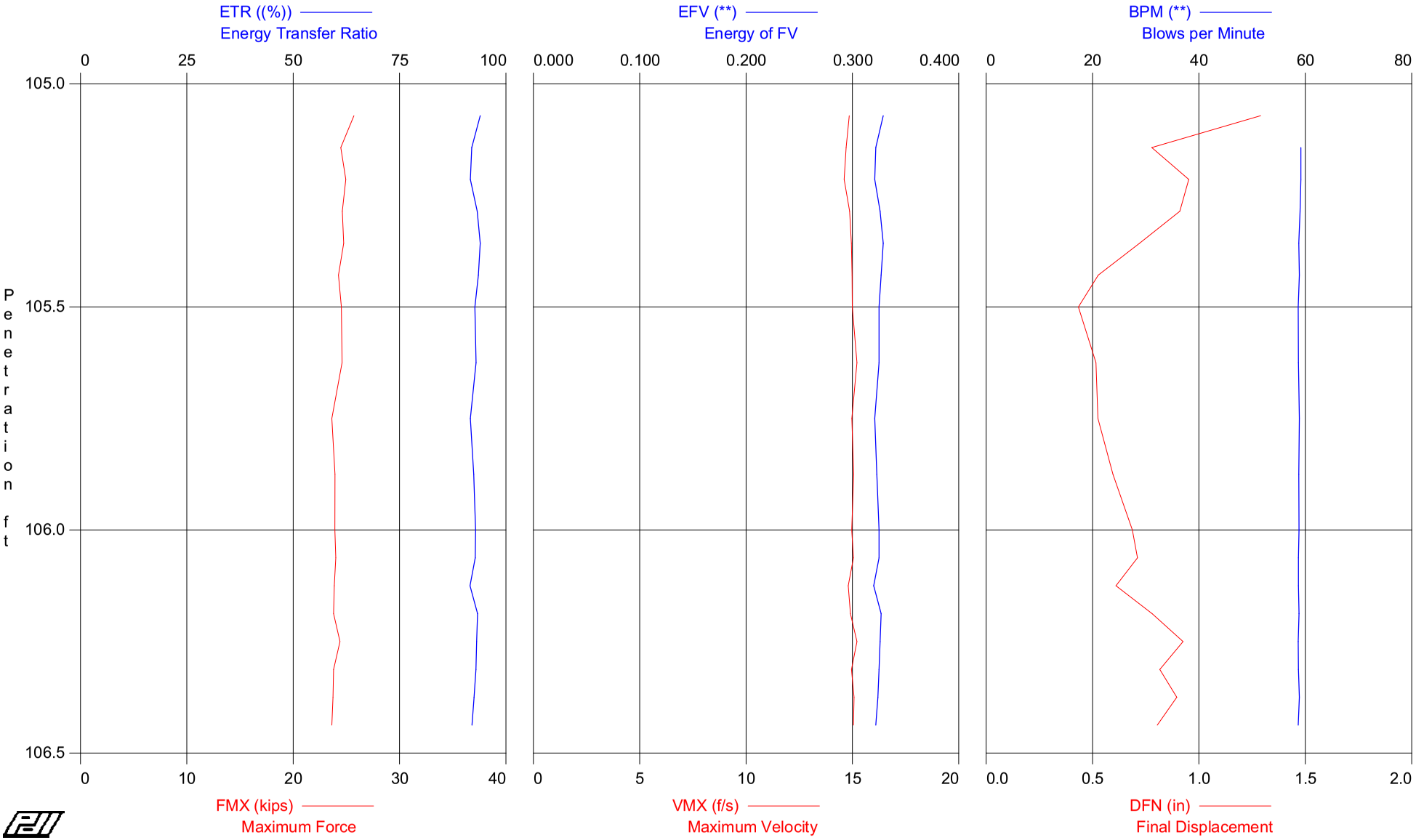
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 105 - 106.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 105 - 106.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 110.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
7	105.50	14	AV7	21.3	21.6	0.326	93	59	14.9	24.8	0.8
			STD	0.4	0.4	0.003	1	0	0.1	0.4	0.3
			MAX	22.2	22.5	0.329	94	59	15.0	25.7	1.3
11	106.00	8	AV4	20.7	20.9	0.324	92	59	15.1	24.0	0.6
			STD	0.3	0.3	0.002	1	0	0.1	0.4	0.1
			MAX	21.2	21.4	0.325	93	59	15.2	24.6	0.7
19	106.50	16	AV8	20.6	20.8	0.325	93	59	15.0	23.9	0.8
			STD	0.2	0.2	0.004	1	0	0.1	0.2	0.1
			MAX	21.0	21.2	0.335	96	59	15.2	24.4	1.0
			Average	20.9	21.1	0.325	93	59	15.0	24.2	0.8
			Std. Dev.	0.5	0.5	0.003	1	0	0.1	0.5	0.2
			Maximum	22.2	22.5	0.335	96	59	15.2	25.7	1.3

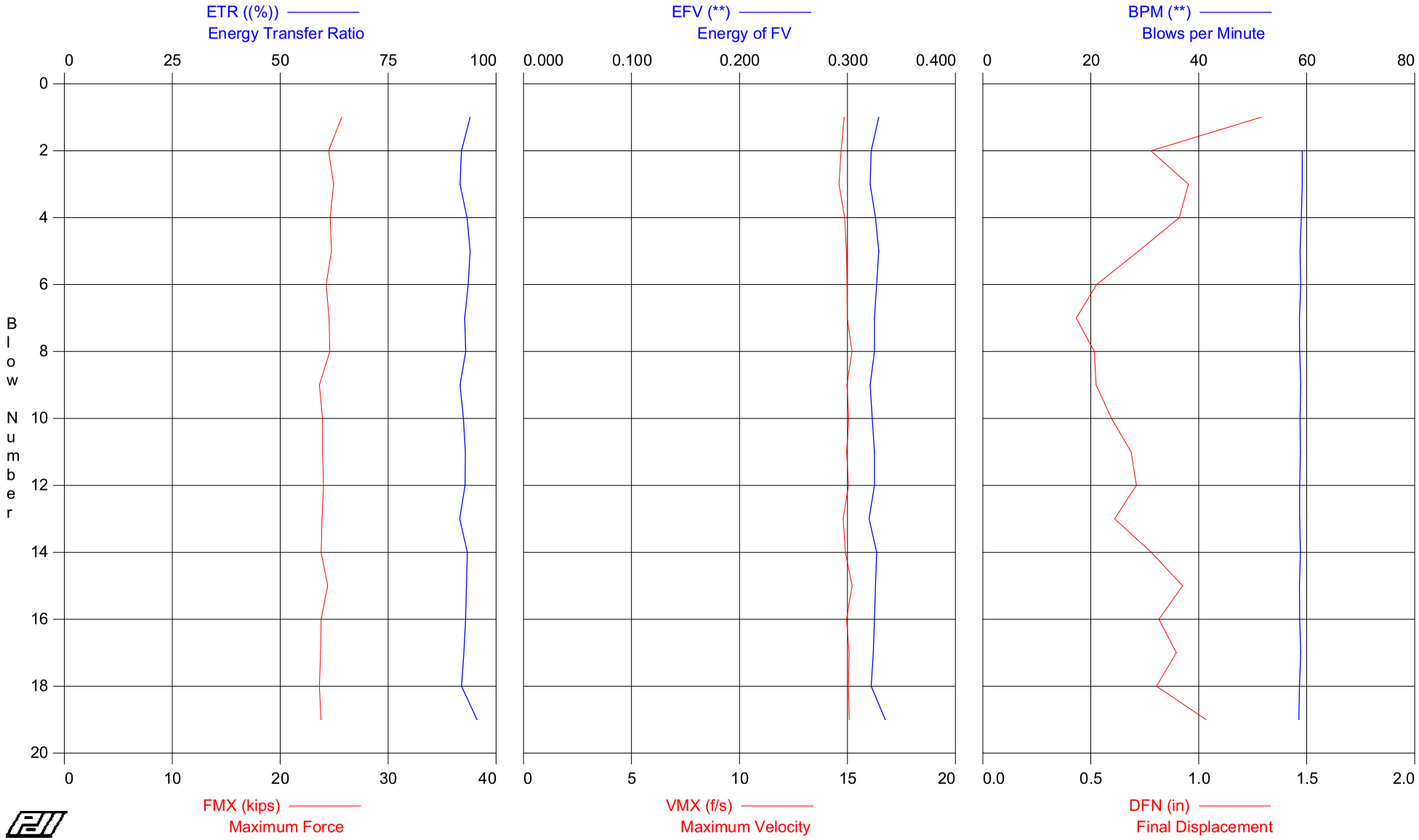
Total number of blows analyzed: 19

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 105 - 106.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 105 - 106.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 110.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

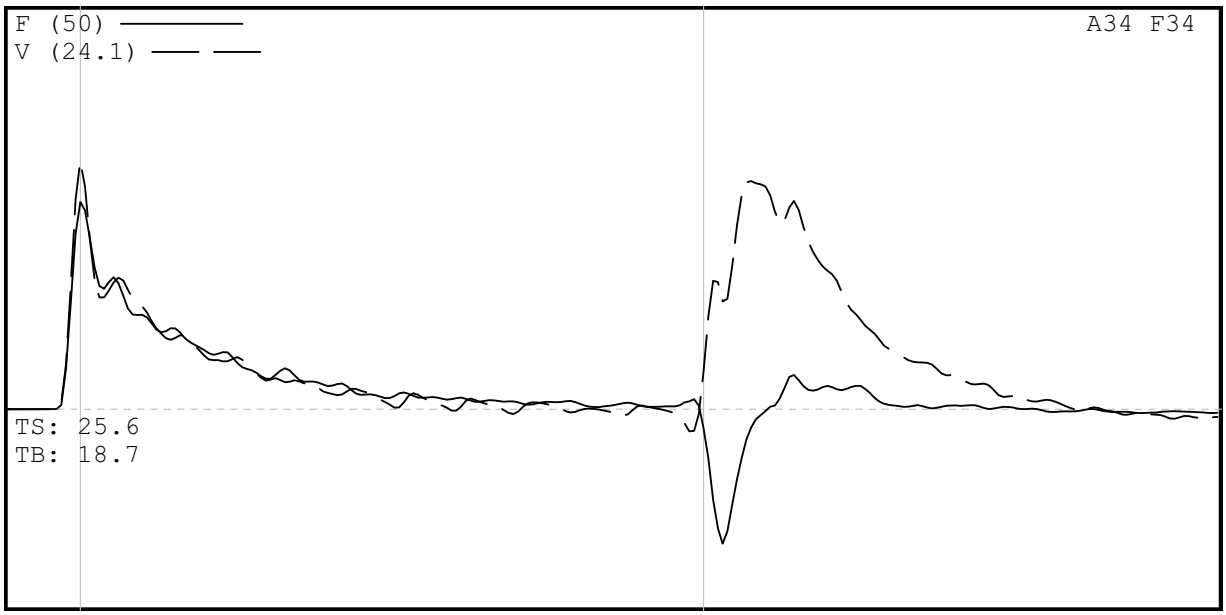
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	14	22.2	22.5	0.329	94	0	14.8	25.7	1.3
2	14	21.1	21.4	0.322	92	59	14.7	24.5	0.8
3	14	21.5	21.7	0.321	92	59	14.6	24.9	1.0
4	14	21.2	21.5	0.326	93	59	14.9	24.6	0.9
5	14	21.3	21.5	0.329	94	59	15.0	24.8	0.7
6	14	20.9	21.2	0.327	94	59	15.0	24.3	0.5
7	14	21.1	21.3	0.325	93	59	15.0	24.5	0.4
8	8	21.2	21.4	0.325	93	59	15.2	24.6	0.5
9	8	20.4	20.7	0.321	92	59	15.0	23.6	0.5
10	8	20.6	20.9	0.323	92	59	15.1	23.9	0.6
11	8	20.6	20.8	0.325	93	59	15.0	23.9	0.7
12	16	20.7	20.9	0.325	93	59	15.0	24.0	0.7
13	16	20.6	20.7	0.320	92	59	14.8	23.9	0.6
14	16	20.5	20.6	0.327	93	59	14.9	23.8	0.8
15	16	21.0	21.2	0.326	93	59	15.2	24.4	0.9
16	16	20.5	20.7	0.325	93	59	15.0	23.8	0.8
17	16	20.5	20.7	0.324	93	59	15.1	23.7	0.9
18	16	20.4	20.5	0.322	92	59	15.0	23.6	0.8
19	16	20.5	20.7	0.335	96	59	15.1	23.8	1.0
Average		20.9	21.1	0.325	93	59	15.0	24.2	0.8
Std. Dev.		0.5	0.5	0.003	1	0	0.1	0.5	0.2
Maximum		22.2	22.5	0.335	96	59	15.2	25.7	1.3

Total number of blows analyzed: 19

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 105 - 106 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 105 - 106 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 105 - 106 5
7/11/2008 10:47:22 AM
Blow Number 3/1

Pile Properties

LE	110.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	13.09	ms
JC	0.50	[]

Quantity Results

CSXN	22.2	ksi
CSI	22.5	ksi
EFV	0.329	k-ft
ETR	94.0	(%)
BPM	0.0	bpm
VMX	14.8	f/s
FMX	26	kips
DFN	1.29	in
FVP	0.84	[]

Sensors

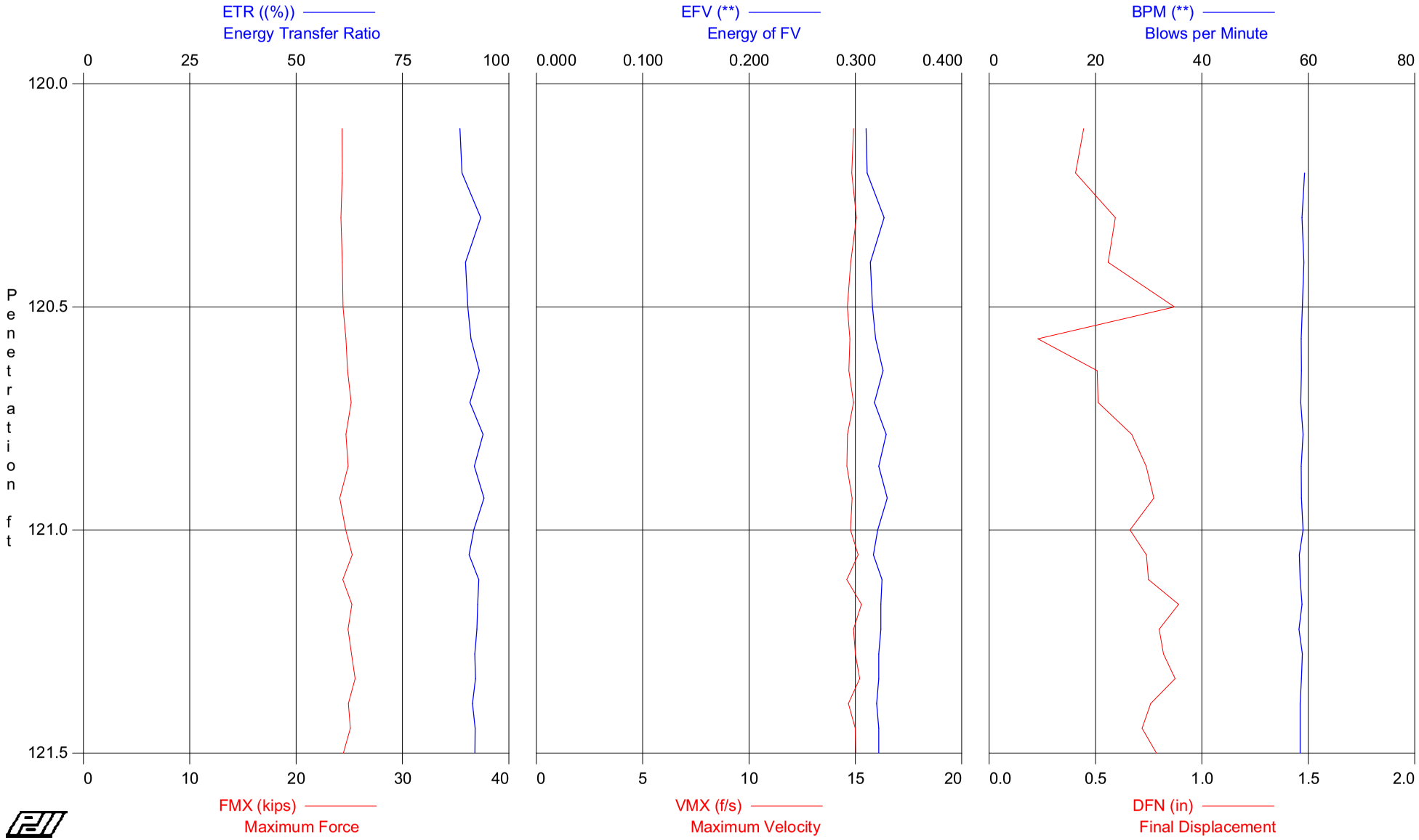
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.96

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 120 - 121.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 120 - 121.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 126.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	120.50	10	AV5	21.0	21.1	0.316	90	59	14.8	24.3	0.6
			STD	0.1	0.2	0.006	2	0	0.1	0.1	0.2
			MAX	21.0	21.4	0.327	93	59	15.0	24.4	0.9
12	121.00	14	AV7	21.3	21.5	0.324	92	59	14.7	24.7	0.6
			STD	0.3	0.3	0.004	1	0	0.1	0.3	0.2
			MAX	21.7	21.8	0.330	94	59	14.9	25.2	0.8
21	121.50	18	AV9	21.6	21.7	0.322	92	59	15.0	25.0	0.8
			STD	0.3	0.3	0.002	1	0	0.2	0.4	0.1
			MAX	22.0	22.1	0.325	93	59	15.3	25.5	0.9
			Average	21.3	21.5	0.321	92	59	14.9	24.7	0.7
			Std. Dev.	0.3	0.4	0.005	1	0	0.2	0.4	0.2
			Maximum	22.0	22.1	0.330	94	59	15.3	25.5	0.9

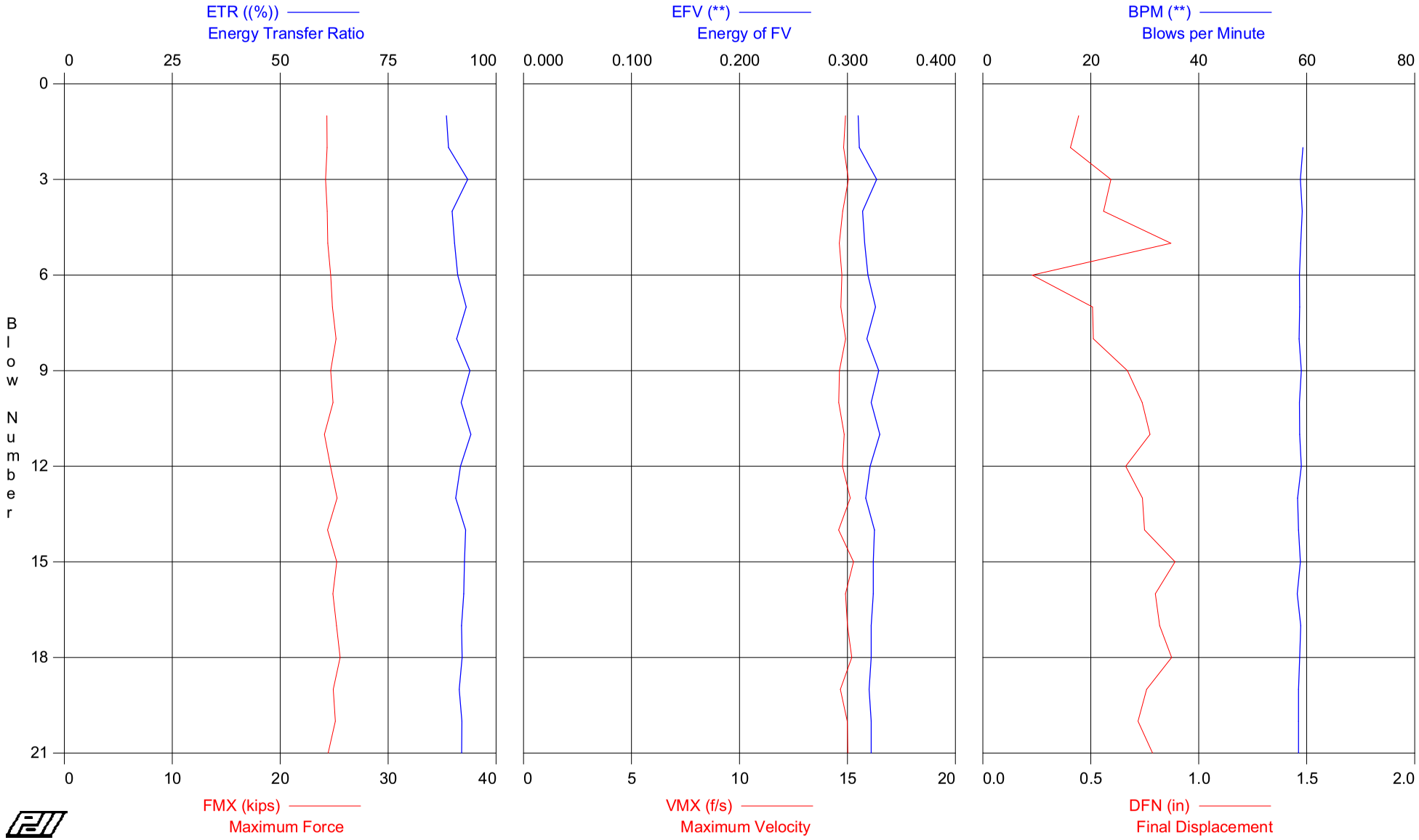
Total number of blows analyzed: 21

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 120 - 121.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 120 - 121.5
OP: SDW

HAMMER #1 AWJ B-348
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 126.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

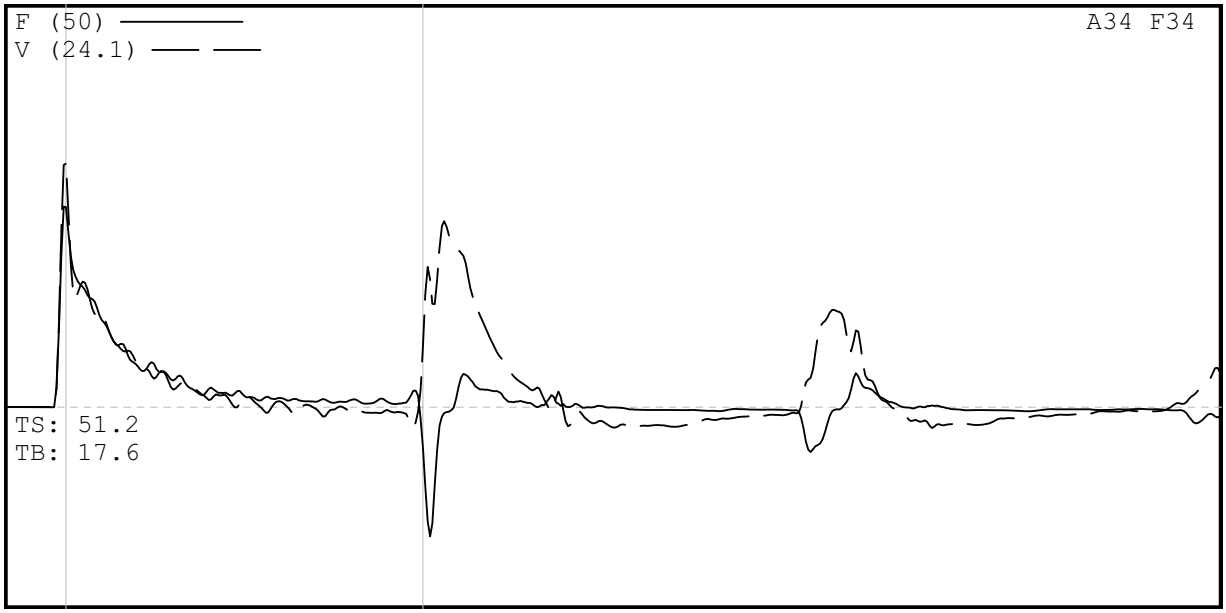
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	21.0	21.0	0.310	89	0	14.9	24.3	0.4
2	10	21.0	21.0	0.311	89	59	14.8	24.3	0.4
3	10	20.9	21.0	0.327	93	59	15.0	24.2	0.6
4	10	21.0	21.0	0.314	90	59	14.8	24.3	0.6
5	10	21.0	21.4	0.316	90	59	14.6	24.4	0.9
6	14	21.3	21.3	0.319	91	59	14.7	24.7	0.2
7	14	21.4	21.7	0.326	93	59	14.7	24.8	0.5
8	14	21.7	21.8	0.318	91	59	14.9	25.2	0.5
9	14	21.3	21.5	0.329	94	59	14.6	24.7	0.7
10	14	21.5	21.8	0.322	92	59	14.6	24.9	0.7
11	14	20.8	20.8	0.330	94	59	14.8	24.1	0.8
12	14	21.3	21.5	0.321	92	59	14.8	24.7	0.7
13	18	21.8	21.9	0.317	91	58	15.1	25.3	0.7
14	18	21.0	21.3	0.325	93	58	14.6	24.4	0.7
15	18	21.8	21.8	0.324	93	59	15.3	25.2	0.9
16	18	21.4	21.6	0.324	92	58	14.9	24.9	0.8
17	18	21.7	21.7	0.322	92	59	15.0	25.2	0.8
18	18	22.0	22.1	0.322	92	59	15.2	25.5	0.9
19	18	21.5	21.8	0.320	91	58	14.7	24.9	0.8
20	18	21.6	21.7	0.322	92	58	15.0	25.1	0.7
21	18	21.1	21.2	0.322	92	58	15.0	24.4	0.8
Average		21.3	21.5	0.321	92	59	14.9	24.7	0.7
Std. Dev.		0.3	0.4	0.005	1	0	0.2	0.4	0.2
Maximum		22.0	22.1	0.330	94	59	15.3	25.5	0.9

Total number of blows analyzed: 21

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 120 - 121 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 120 - 121 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: SDW
FILE: DRILL RIG 75 DEPTH 120 - 121 5
7/11/2008 12:41:23 PM
Blow Number 11/10

Pile Properties

LE	126.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	14.99	ms
JC	0.50	[]

Quantity Results

CSXN	21.5	ksi
CSI	21.8	ksi
EFV	0.322	k-ft
ETR	91.9	(%)
BPM	58.7	bpm
VMX	14.6	f/s
FMX	25	kips
DFN	0.74	in
FVP	0.82	[]

Sensors

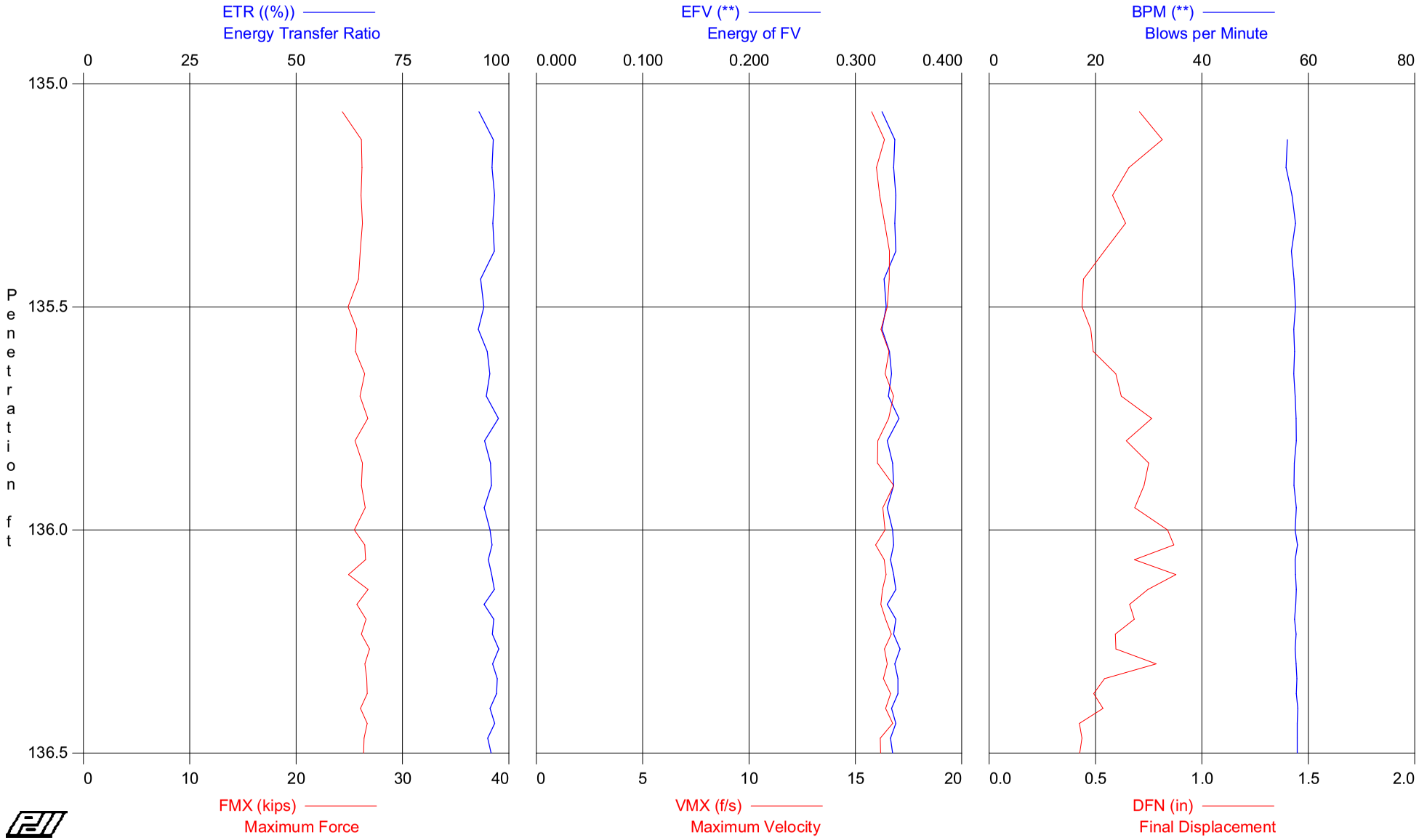
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 1.12

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 135 - 136.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 135 - 136.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 140.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	135.50	16	AV8	22.2	22.4	0.333	95	57	16.3	25.7	0.6
			STD	0.6	0.6	0.005	1	1	0.3	0.7	0.1
			MAX	22.6	22.8	0.338	97	58	16.6	26.2	0.8
18	136.00	20	AV10	22.4	22.6	0.333	95	57	16.4	26.0	0.7
			STD	0.4	0.4	0.004	1	0	0.3	0.4	0.1
			MAX	23.0	23.2	0.341	98	58	16.8	26.7	0.8
33	136.50	30	AV15	22.7	22.9	0.336	96	58	16.4	26.3	0.6
			STD	0.4	0.4	0.003	1	0	0.2	0.5	0.1
			MAX	23.2	23.4	0.342	98	58	16.8	26.9	0.9
			Average	22.5	22.7	0.335	96	57	16.4	26.1	0.6
			Std. Dev.	0.5	0.5	0.004	1	0	0.2	0.6	0.1
			Maximum	23.2	23.4	0.342	98	58	16.8	26.9	0.9

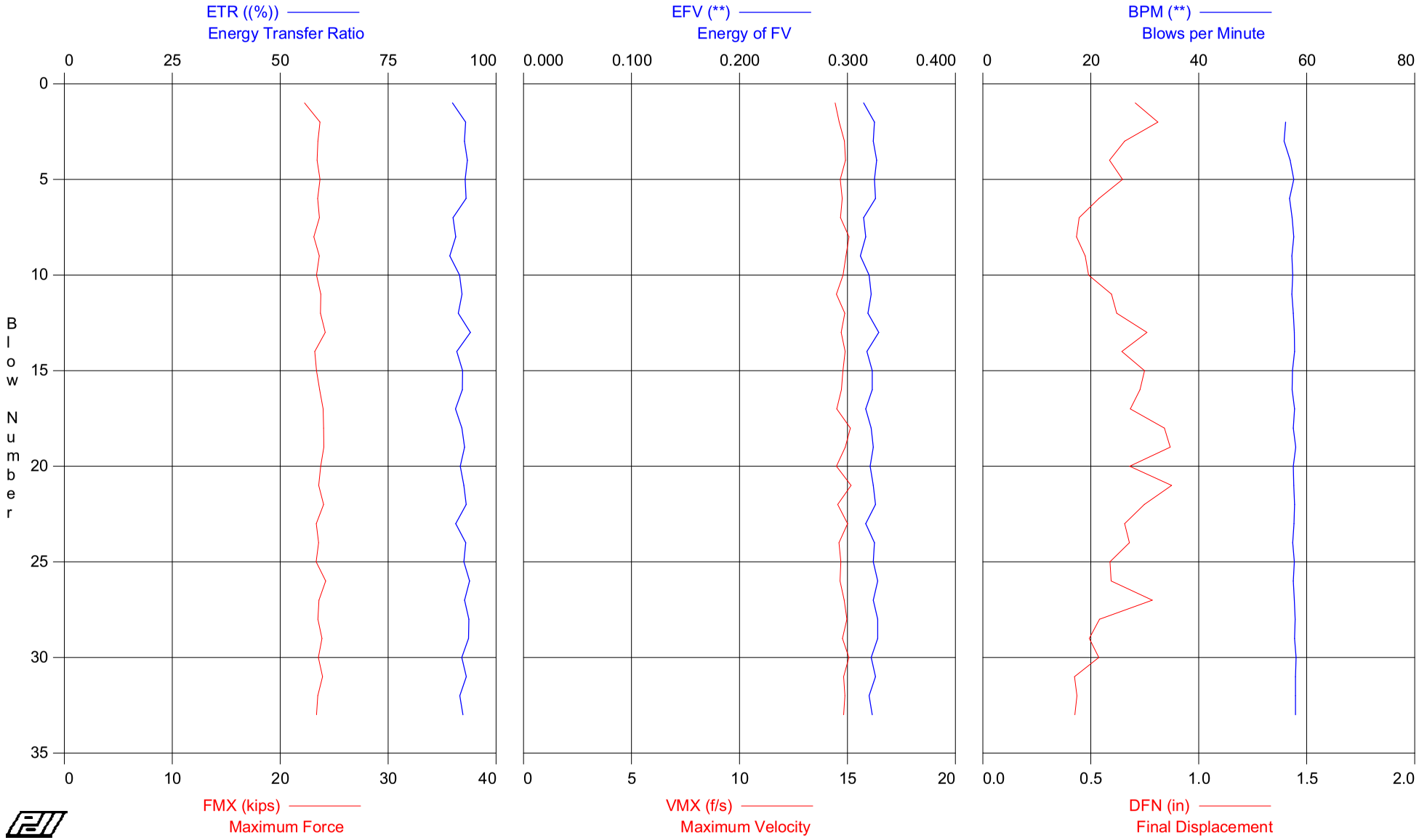
Total number of blows analyzed: 33

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 135 - 136.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 135 - 136.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 140.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

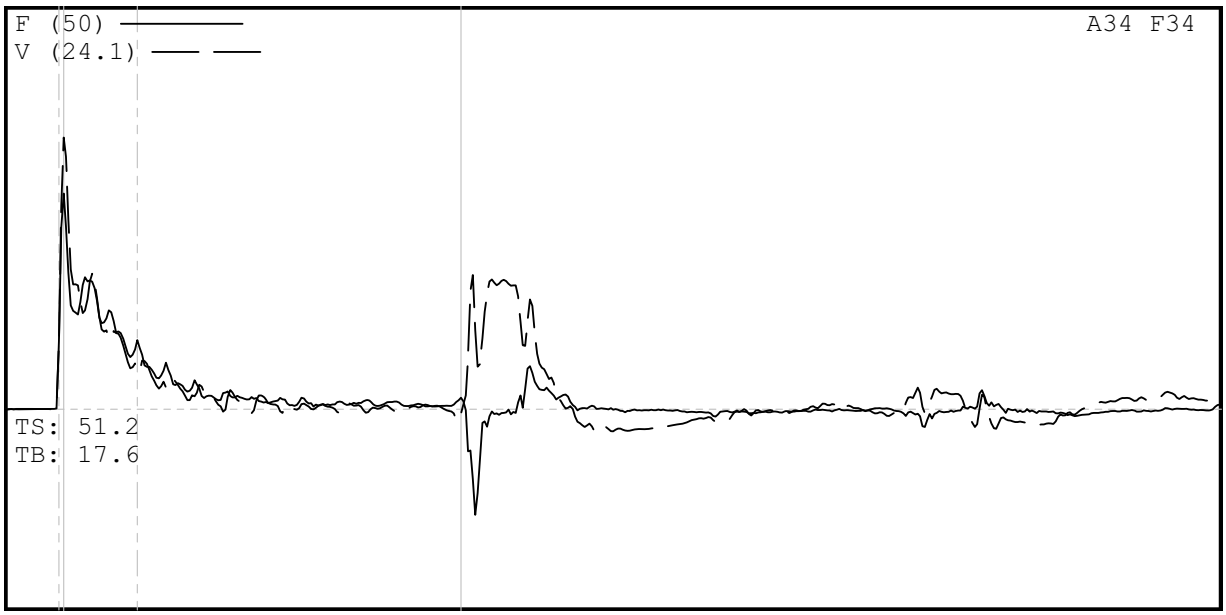
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	19.2	19.4	0.315	90	0	14.4	22.3	0.7
2	16	20.4	20.8	0.325	93	56	14.6	23.7	0.8
3	16	20.3	20.7	0.324	93	56	14.9	23.5	0.7
4	16	20.2	20.6	0.327	93	57	14.9	23.4	0.6
5	16	20.4	20.8	0.325	93	58	14.7	23.7	0.6
6	16	20.2	20.6	0.326	93	57	14.8	23.5	0.5
7	16	20.4	20.7	0.315	90	57	14.7	23.6	0.4
8	16	19.9	20.1	0.317	91	58	15.1	23.1	0.4
9	20	20.4	20.6	0.312	89	57	14.9	23.6	0.5
10	20	20.1	20.5	0.320	92	57	14.8	23.4	0.5
11	20	20.5	20.7	0.322	92	57	14.5	23.8	0.6
12	20	20.5	20.7	0.319	91	58	14.9	23.7	0.6
13	20	20.8	21.1	0.329	94	58	14.7	24.2	0.8
14	20	20.0	20.2	0.318	91	58	14.9	23.2	0.6
15	20	20.1	20.5	0.323	92	57	14.8	23.4	0.7
16	20	20.4	20.6	0.323	92	57	14.7	23.6	0.7
17	20	20.7	20.9	0.317	91	58	14.5	24.0	0.7
18	20	20.7	20.9	0.322	92	58	15.1	24.0	0.8
19	30	20.7	20.9	0.324	93	58	14.9	24.0	0.9
20	30	20.5	20.7	0.321	92	58	14.5	23.8	0.7
21	30	20.3	20.5	0.324	93	58	15.2	23.6	0.9
22	30	20.7	20.9	0.326	93	58	14.5	24.0	0.7
23	30	20.1	20.3	0.317	91	58	15.0	23.3	0.7
24	30	20.3	20.6	0.325	93	57	14.6	23.6	0.7
25	30	20.1	20.4	0.324	93	58	14.7	23.3	0.6
26	30	20.9	21.2	0.328	94	58	14.7	24.2	0.6
27	30	20.3	20.6	0.324	93	58	14.8	23.6	0.8
28	30	20.2	20.4	0.328	94	58	15.0	23.5	0.5
29	30	20.6	20.9	0.328	94	58	14.8	23.9	0.5
30	30	20.3	20.4	0.322	92	58	15.1	23.5	0.5
31	30	20.6	20.9	0.326	93	58	14.8	23.9	0.4
32	30	20.2	20.4	0.320	92	58	14.9	23.5	0.4
33	30	20.1	20.5	0.323	92	58	14.8	23.4	0.4
Average		20.3	20.6	0.322	92	57	14.8	23.6	0.6
Std. Dev.		0.3	0.3	0.004	1	0	0.2	0.4	0.1
Maximum		20.9	21.2	0.329	94	58	15.2	24.2	0.9

Total number of blows analyzed: 33

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 135 - 136 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 135 - 136 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 135 - 136 5
7/14/2008 12:37:09 PM
Blow Number 23/22

Pile Properties

LE	140.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	16.70	ms
JC	0.50	[]

Quantity Results

CSXN	23.1	ksi
CSI	23.3	ksi
EFV	0.338	k-ft
ETR	96.6	(%)
BPM	57.7	bpm
VMX	16.3	f/s
FMX	27	kips
DFN	0.75	in
FVP	0.79	[]

Sensors

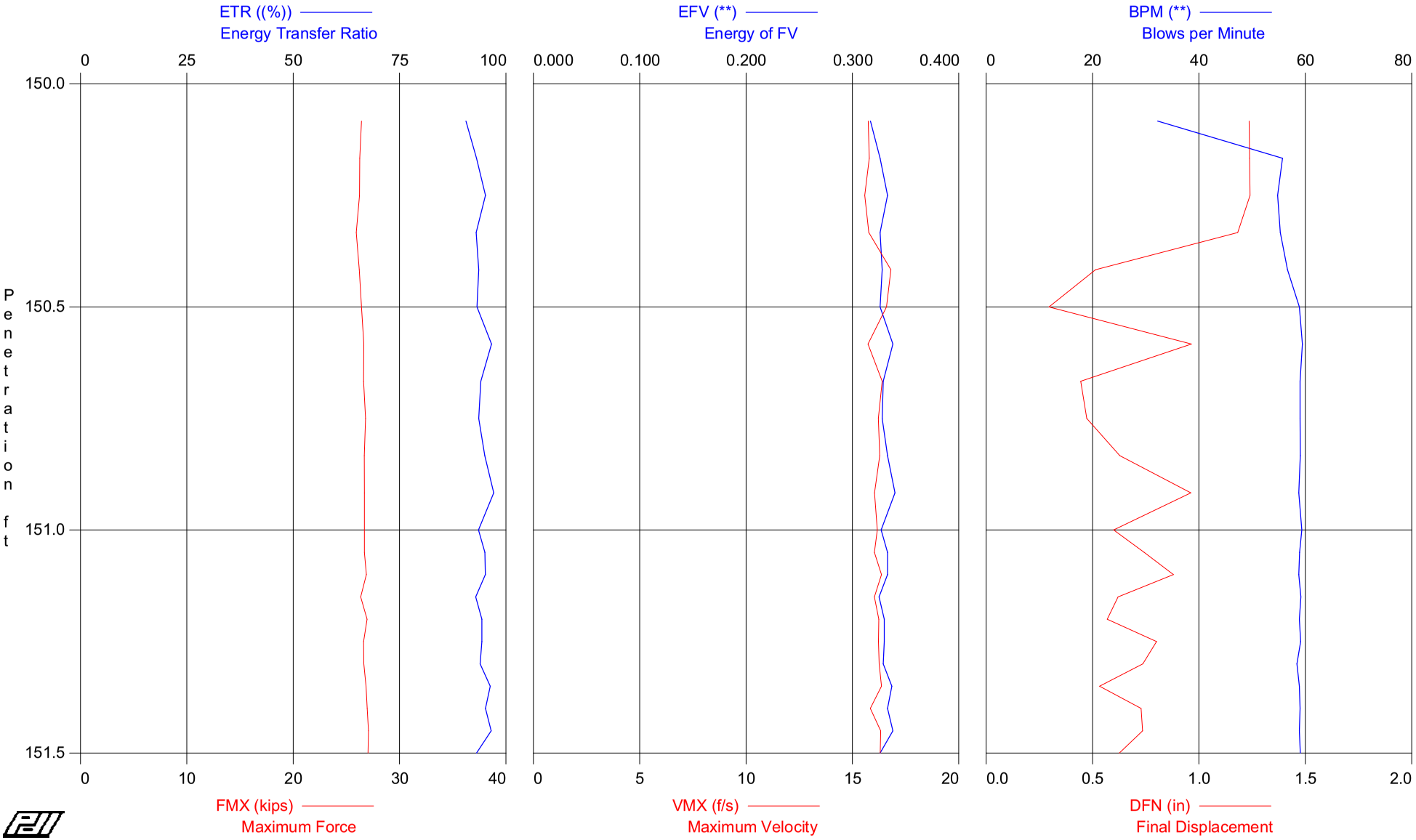
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 0.95

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 150 - 151.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 150 - 151.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 155.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	150.50	12	AV6	22.6	22.8	0.326	93	52	16.0	26.2	1.0
			STD	0.1	0.1	0.005	1	9	0.5	0.2	0.4
			MAX	22.8	23.0	0.333	95	59	16.8	26.4	1.2
12	151.00	12	AV6	23.0	23.2	0.333	95	59	16.1	26.7	0.7
			STD	0.1	0.1	0.005	1	0	0.2	0.1	0.2
			MAX	23.1	23.3	0.340	97	59	16.4	26.8	1.0
22	151.50	20	AV10	23.1	23.3	0.331	95	59	16.2	26.8	0.7
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.1
			MAX	23.3	23.5	0.338	97	59	16.4	27.1	0.9
			Average	23.0	23.1	0.330	94	57	16.1	26.6	0.8
			Std. Dev.	0.2	0.2	0.005	1	6	0.3	0.3	0.3
			Maximum	23.3	23.5	0.340	97	59	16.8	27.1	1.2

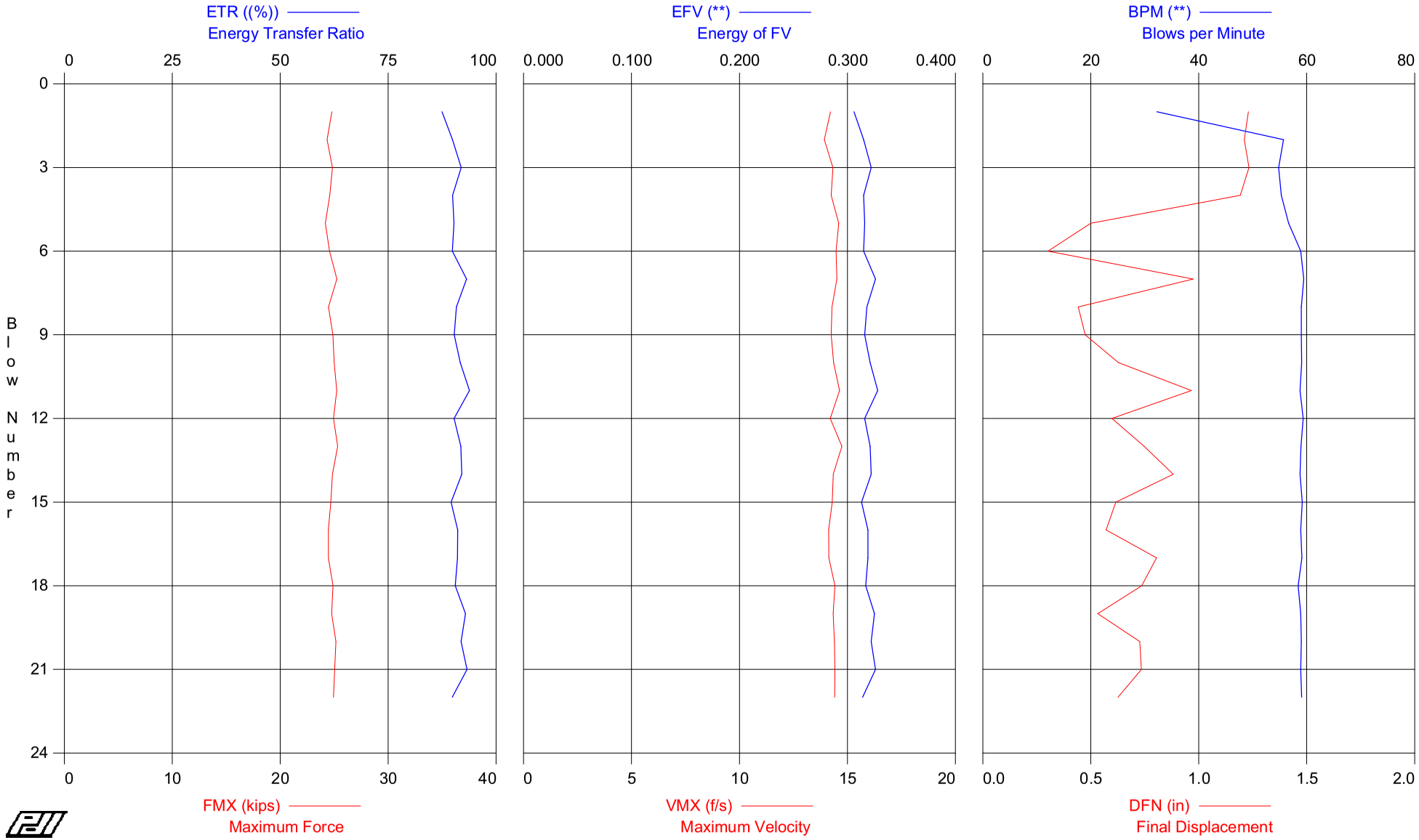
Total number of blows analyzed: 22

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 150 - 151.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 150 - 151.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 155.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

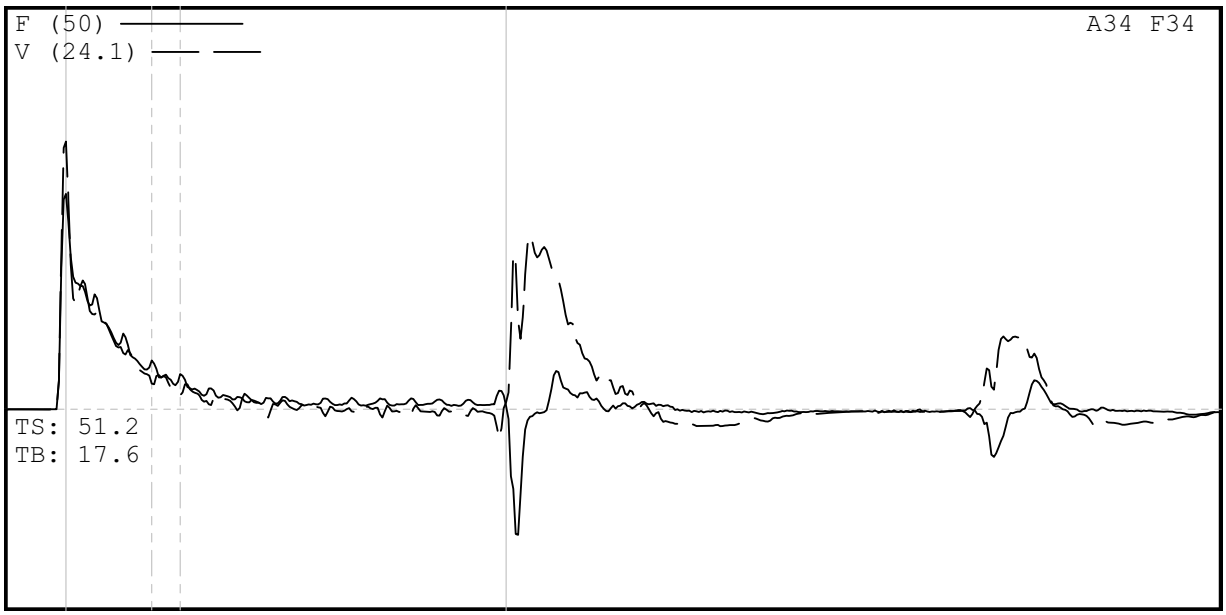
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	21.4	21.6	0.306	87	32	14.2	24.8	1.2
2	12	21.0	21.2	0.315	90	56	13.9	24.3	1.2
3	12	21.4	21.6	0.322	92	55	14.3	24.8	1.2
4	12	21.2	21.4	0.315	90	55	14.2	24.6	1.2
5	12	20.8	21.2	0.316	90	57	14.6	24.2	0.5
6	12	21.2	21.4	0.315	90	59	14.5	24.6	0.3
7	12	21.8	21.9	0.326	93	59	14.5	25.2	1.0
8	12	21.1	21.3	0.318	91	59	14.3	24.5	0.4
9	12	21.4	21.6	0.316	90	59	14.2	24.9	0.5
10	12	21.6	21.8	0.321	92	59	14.4	25.0	0.6
11	12	21.8	22.0	0.328	94	59	14.6	25.2	1.0
12	12	21.5	21.7	0.316	90	59	14.2	24.9	0.6
13	20	21.8	22.1	0.321	92	59	14.7	25.3	0.7
14	20	21.4	21.7	0.322	92	59	14.3	24.8	0.9
15	20	21.3	21.5	0.313	90	59	14.3	24.7	0.6
16	20	21.1	21.4	0.319	91	59	14.1	24.5	0.6
17	20	21.1	21.3	0.319	91	59	14.1	24.5	0.8
18	20	21.5	21.7	0.317	91	58	14.4	24.9	0.7
19	20	21.3	21.6	0.325	93	59	14.3	24.8	0.5
20	20	21.7	21.9	0.322	92	59	14.4	25.2	0.7
21	20	21.6	21.8	0.326	93	59	14.4	25.0	0.7
22	20	21.5	21.8	0.314	90	59	14.4	24.9	0.6
Average		21.4	21.6	0.319	91	57	14.3	24.8	0.8
Std. Dev.		0.3	0.2	0.005	1	6	0.2	0.3	0.3
Maximum		21.8	22.1	0.328	94	59	14.7	25.3	1.2

Total number of blows analyzed: 22

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 150 - 151 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 150 - 151 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 150 - 151 5
7/14/2008 3:14:33 PM
Blow Number 17/13

Pile Properties

LE	155.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	18.47	ms
JC	0.50	[]

Quantity Results

CSXN	23.0	ksi
CSI	23.4	ksi
EFV	0.333	k-ft
ETR	95.1	(%)
BPM	58.9	bpm
VMX	16.0	f/s
FMX	27	kips
DFN	0.74	in
FVP	0.80	[]

Sensors

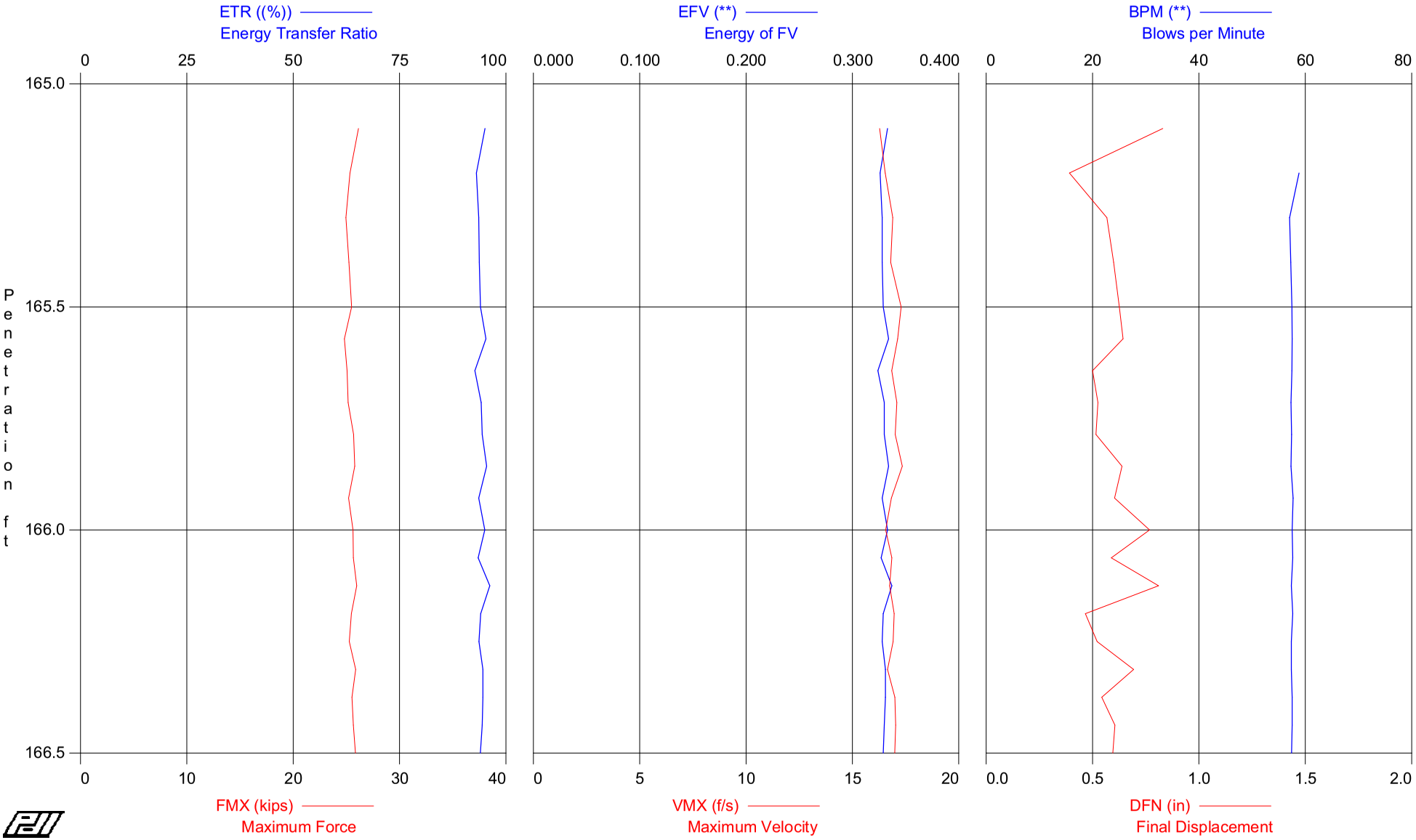
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 BEPTH 165 - 166.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 BEPTH 165 - 166.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 180.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	165.50	10	AV5	21.9	22.2	0.329	94	58	16.8	25.4	0.6
			STD	0.3	0.3	0.002	1	1	0.3	0.4	0.1
			MAX	22.5	22.8	0.333	95	59	17.3	26.1	0.8
12	166.00	14	AV7	21.8	22.2	0.330	94	57	17.0	25.3	0.6
			STD	0.3	0.3	0.003	1	0	0.2	0.3	0.1
			MAX	22.2	22.6	0.334	95	58	17.3	25.8	0.8
20	166.50	16	AV8	22.1	22.5	0.330	94	57	16.9	25.7	0.6
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	22.4	22.7	0.337	96	58	17.0	26.0	0.8
			Average	22.0	22.3	0.330	94	58	16.9	25.5	0.6
			Std. Dev.	0.3	0.3	0.003	1	0	0.2	0.3	0.1
			Maximum	22.5	22.8	0.337	96	59	17.3	26.1	0.8

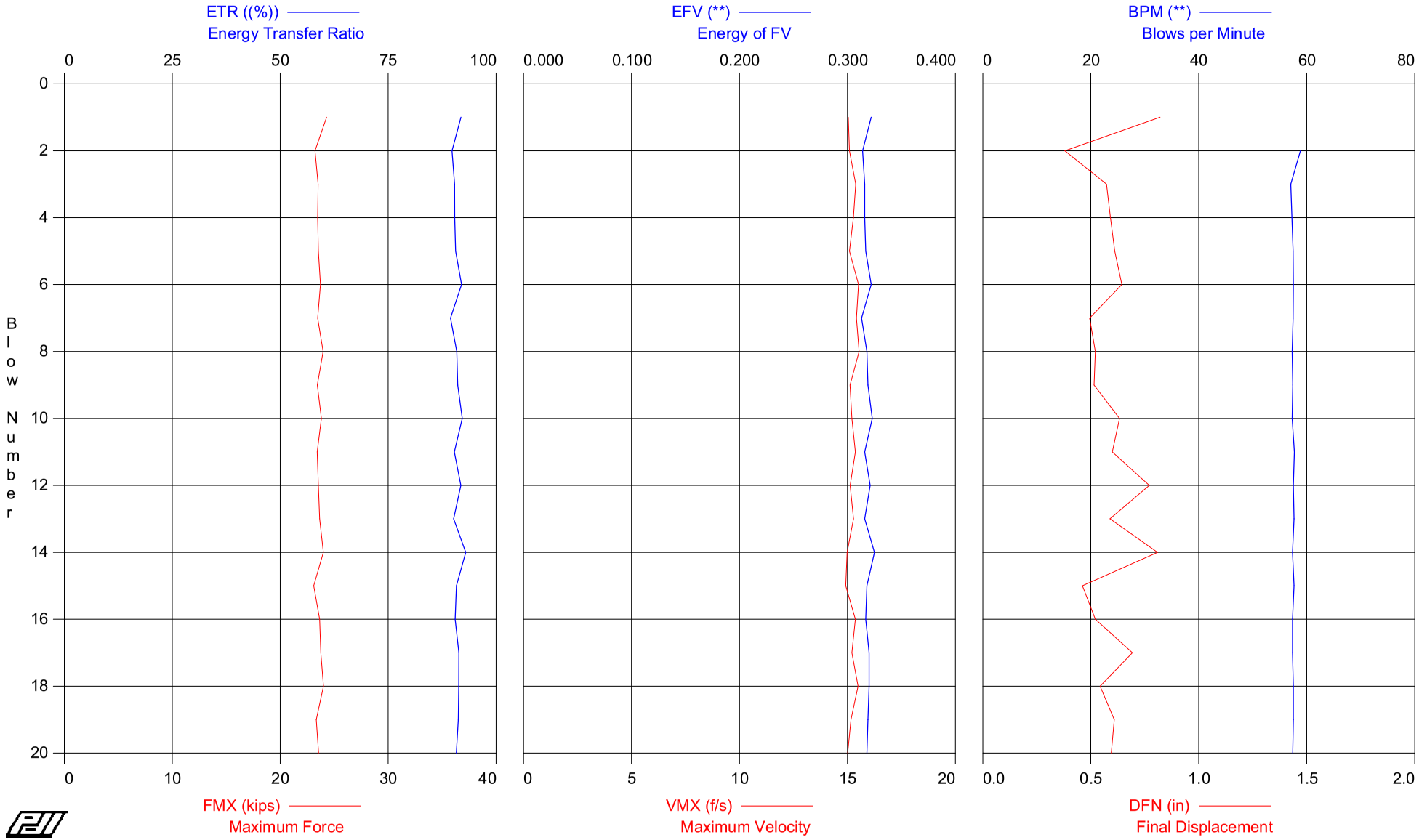
Total number of blows analyzed: 20

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 14-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 BEPTH 165 - 166.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 BEPTH 165 - 166.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 14-Jul-2008

AR: 1.16 in^2
LE: 180.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

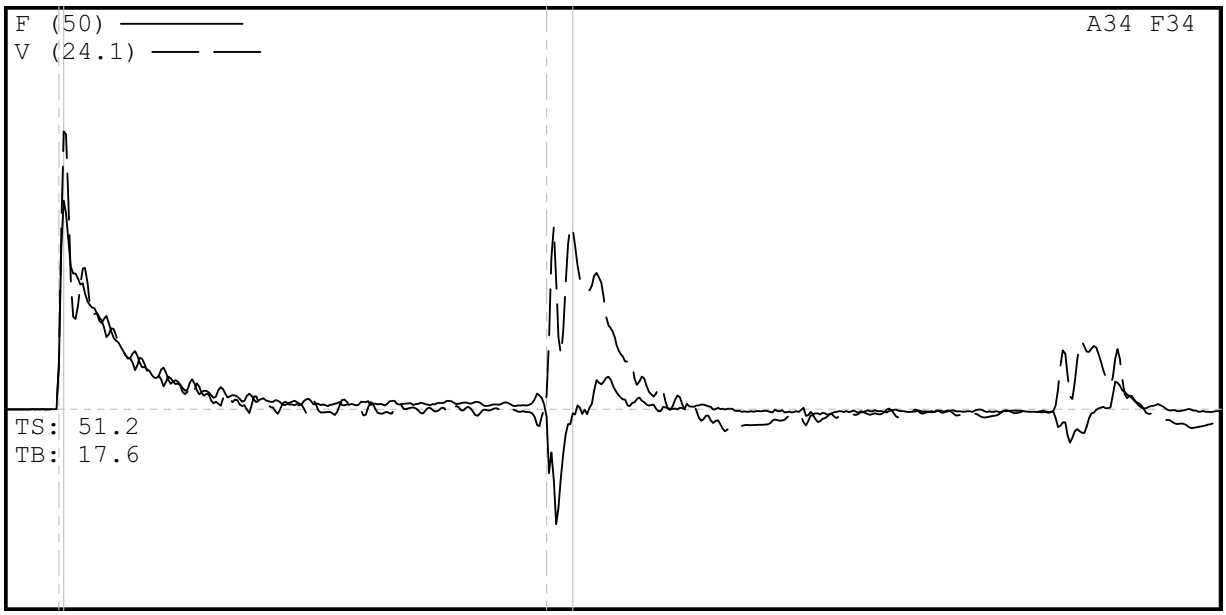
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	21.0	21.1	0.322	92	0	15.0	24.3	0.8
2	10	20.0	20.1	0.314	90	59	15.1	23.2	0.4
3	10	20.3	20.5	0.316	90	57	15.4	23.5	0.6
4	10	20.2	20.4	0.316	90	57	15.3	23.5	0.6
5	10	20.3	20.6	0.317	91	57	15.1	23.5	0.6
6	14	20.5	20.7	0.322	92	58	15.5	23.7	0.6
7	14	20.2	20.5	0.313	89	57	15.4	23.5	0.5
8	14	20.7	20.9	0.318	91	57	15.5	24.0	0.5
9	14	20.2	20.6	0.319	91	57	15.1	23.4	0.5
10	14	20.5	20.9	0.323	92	57	15.2	23.8	0.6
11	14	20.2	20.4	0.316	90	58	15.4	23.4	0.6
12	14	20.3	20.5	0.321	92	58	15.1	23.5	0.8
13	16	20.4	20.6	0.316	90	58	15.3	23.7	0.6
14	16	20.7	21.1	0.325	93	57	15.0	24.0	0.8
15	16	19.9	20.3	0.318	91	58	14.9	23.1	0.5
16	16	20.4	20.6	0.317	90	57	15.4	23.7	0.5
17	16	20.5	20.7	0.320	91	57	15.2	23.8	0.7
18	16	20.7	21.0	0.320	91	58	15.5	24.0	0.5
19	16	20.1	20.5	0.319	91	58	15.2	23.3	0.6
20	16	20.3	20.7	0.318	91	57	15.0	23.6	0.6
Average		20.4	20.6	0.318	91	58	15.2	23.6	0.6
Std. Dev.		0.2	0.3	0.003	1	0	0.2	0.3	0.1
Maximum		21.0	21.1	0.325	93	59	15.5	24.3	0.8

Total number of blows analyzed: 20

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 BEPTH 165 - 166 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 BEPTH 165 - 166 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 165 - 166 5
7/14/2008 5:53:12 PM
Blow Number 22/17

Pile Properties

LE	180.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	21.44	ms
JC	0.50	[]

Quantity Results

CSXN	22.3	ksi
CSI	22.7	ksi
EFV	0.331	k-ft
ETR	94.6	(%)
BPM	57.4	bpm
VMX	16.7	f/s
FMX	26	kips
DFN	0.69	in
FVP	0.75	[]

Sensors

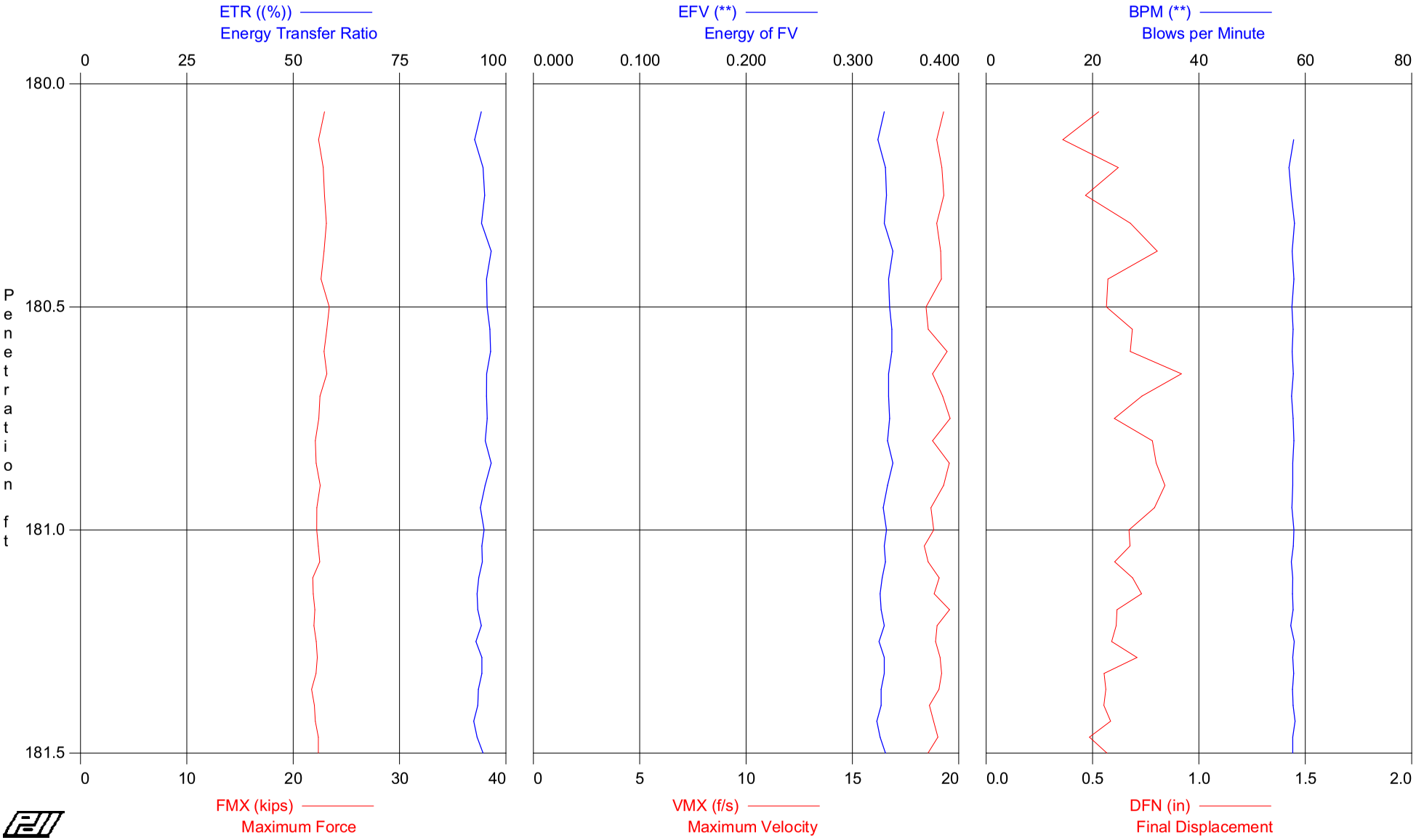
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.91

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 180 - 181.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 180 - 181.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 184.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	180.50	16	AV8	19.7	20.1	0.332	95	58	19.1	22.9	0.6
			STD	0.2	0.2	0.004	1	0	0.3	0.3	0.1
			MAX	20.2	20.5	0.338	97	58	19.3	23.4	0.8
18	181.00	20	AV10	19.4	19.7	0.334	95	58	19.1	22.5	0.7
			STD	0.3	0.3	0.003	1	0	0.4	0.4	0.1
			MAX	20.0	20.2	0.338	97	58	19.6	23.2	0.9
32	181.50	28	AV14	19.1	19.3	0.328	94	58	18.9	22.1	0.6
			STD	0.2	0.2	0.002	1	0	0.3	0.2	0.1
			MAX	19.4	19.7	0.331	95	58	19.6	22.5	0.7
			Average	19.3	19.7	0.331	95	58	19.0	22.4	0.6
			Std. Dev.	0.4	0.4	0.004	1	0	0.3	0.4	0.1
			Maximum	20.2	20.5	0.338	97	58	19.6	23.4	0.9

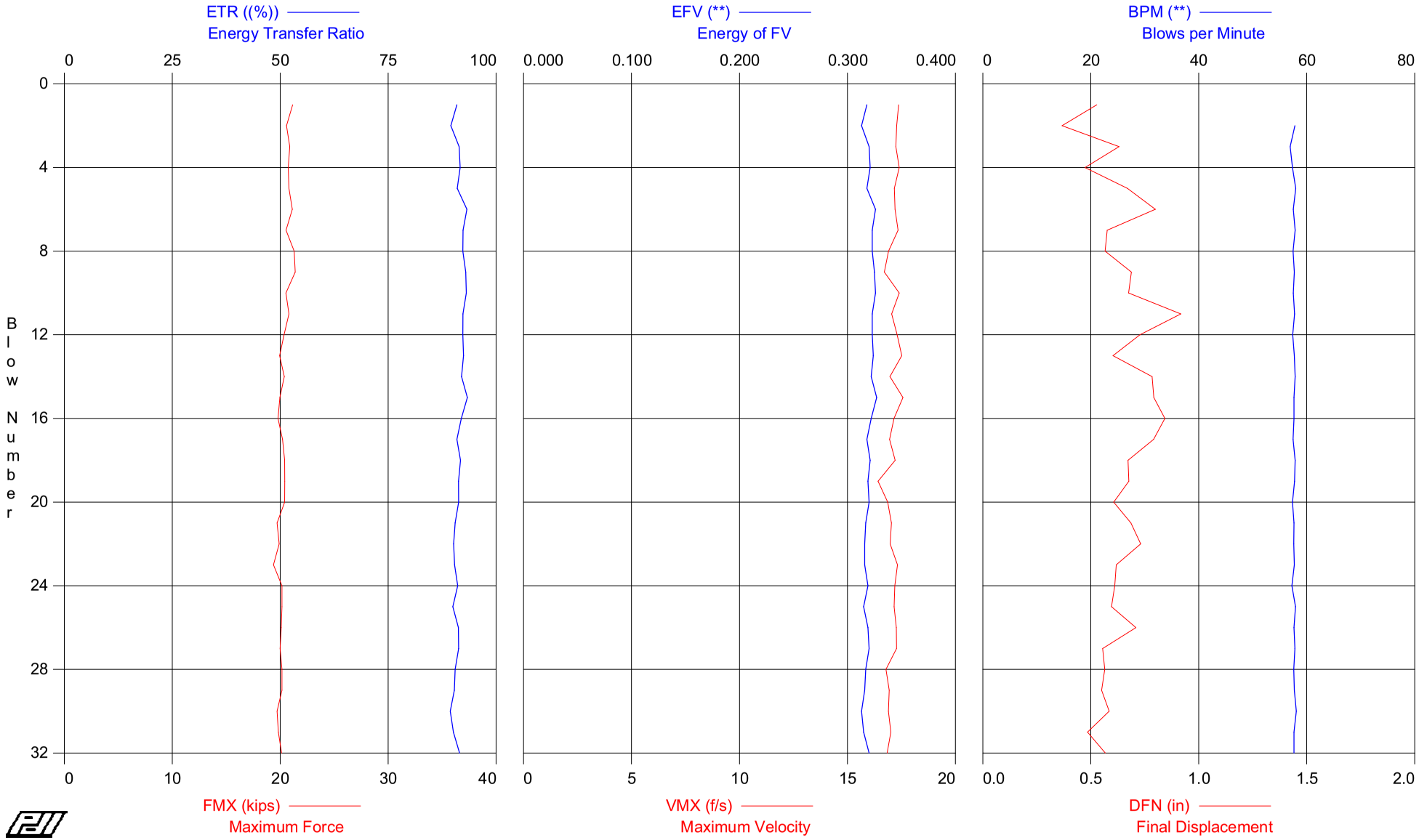
Total number of blows analyzed: 32

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 180 - 181.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 180 - 181.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 184.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

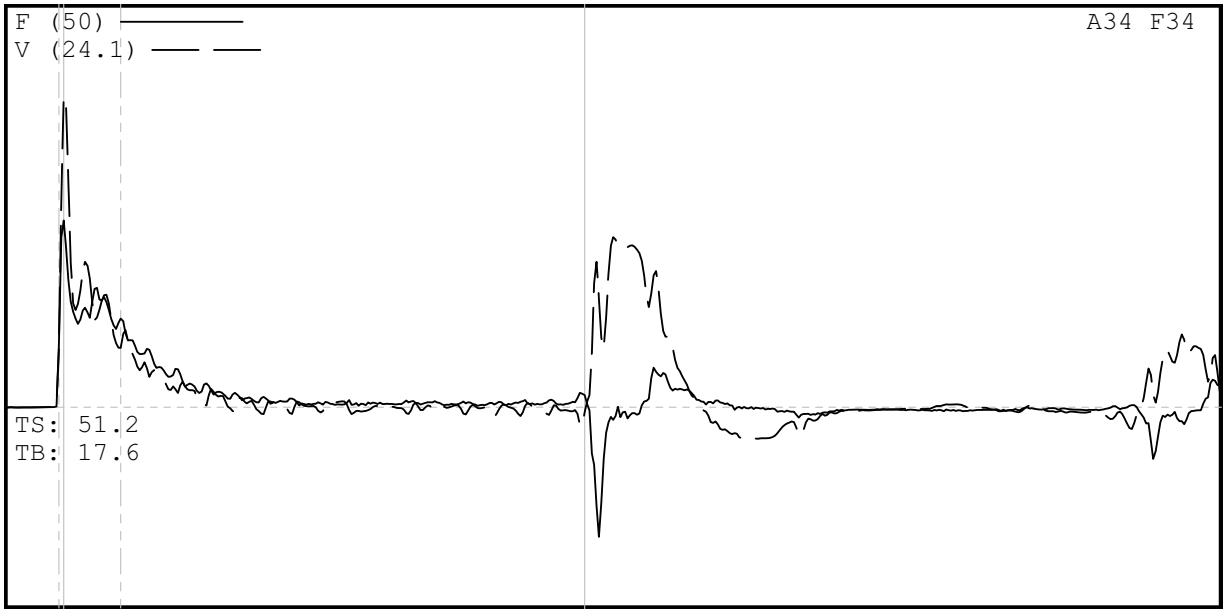
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	18.2	18.3	0.318	91	0	17.4	21.2	0.5
2	16	17.7	18.1	0.313	90	58	17.3	20.6	0.4
3	16	18.0	18.1	0.320	91	57	17.2	20.9	0.6
4	16	17.9	18.2	0.321	92	57	17.4	20.7	0.5
5	16	17.9	18.3	0.318	91	58	17.2	20.8	0.7
6	16	18.2	18.3	0.326	93	58	17.2	21.1	0.8
7	16	17.7	18.1	0.323	92	58	17.3	20.5	0.6
8	16	18.4	18.7	0.323	92	57	16.9	21.3	0.6
9	20	18.4	18.7	0.325	93	58	16.7	21.4	0.7
10	20	17.7	17.8	0.326	93	58	17.4	20.5	0.7
11	20	17.9	18.2	0.323	92	58	17.0	20.8	0.9
12	20	17.5	17.8	0.323	92	57	17.3	20.4	0.7
13	20	17.2	17.5	0.324	92	58	17.5	20.0	0.6
14	20	17.6	17.8	0.322	92	58	17.0	20.4	0.8
15	20	17.2	17.5	0.327	93	58	17.6	20.0	0.8
16	20	17.1	17.4	0.322	92	58	17.2	19.8	0.8
17	20	17.4	17.7	0.318	91	57	17.0	20.2	0.8
18	20	17.6	17.8	0.321	92	58	17.2	20.4	0.7
19	28	17.6	17.8	0.319	91	58	16.4	20.4	0.7
20	28	17.6	17.7	0.320	91	57	16.9	20.4	0.6
21	28	17.0	17.3	0.317	91	58	17.0	19.7	0.7
22	28	17.2	17.4	0.316	90	58	17.0	19.9	0.7
23	28	16.7	17.0	0.316	90	58	17.3	19.4	0.6
24	28	17.4	17.6	0.319	91	57	17.2	20.2	0.6
25	28	17.4	17.6	0.315	90	58	17.2	20.2	0.6
26	28	17.3	17.5	0.319	91	58	17.3	20.1	0.7
27	28	17.2	17.5	0.320	91	58	17.3	20.0	0.6
28	28	17.4	17.5	0.317	91	58	16.8	20.2	0.6
29	28	17.4	17.5	0.316	90	58	16.9	20.2	0.6
30	28	17.0	17.3	0.313	89	58	16.9	19.7	0.6
31	28	17.1	17.4	0.315	90	58	17.0	19.8	0.5
32	28	17.4	17.5	0.320	92	58	16.8	20.1	0.6
Average		17.5	17.8	0.320	91	58	17.1	20.3	0.6
Std. Dev.		0.4	0.4	0.004	1	0	0.2	0.5	0.1
Maximum		18.4	18.7	0.327	93	58	17.6	21.4	0.9

Total number of blows analyzed: 32

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 180 - 181 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 180 - 181 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 180 - 181 5
7/15/2008 9:45:12 AM
Blow Number 10/9

Pile Properties

LE	184.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	21.90	ms
JC	0.50	[]

Quantity Results

CSXN	20.0	ksi
CSI	20.2	ksi
EFV	0.337	k-ft
ETR	96.2	(%)
BPM	57.7	bpm
VMX	18.6	f/s
FMX	23	kips
DFN	0.69	in
FVP	0.60	[]

Sensors

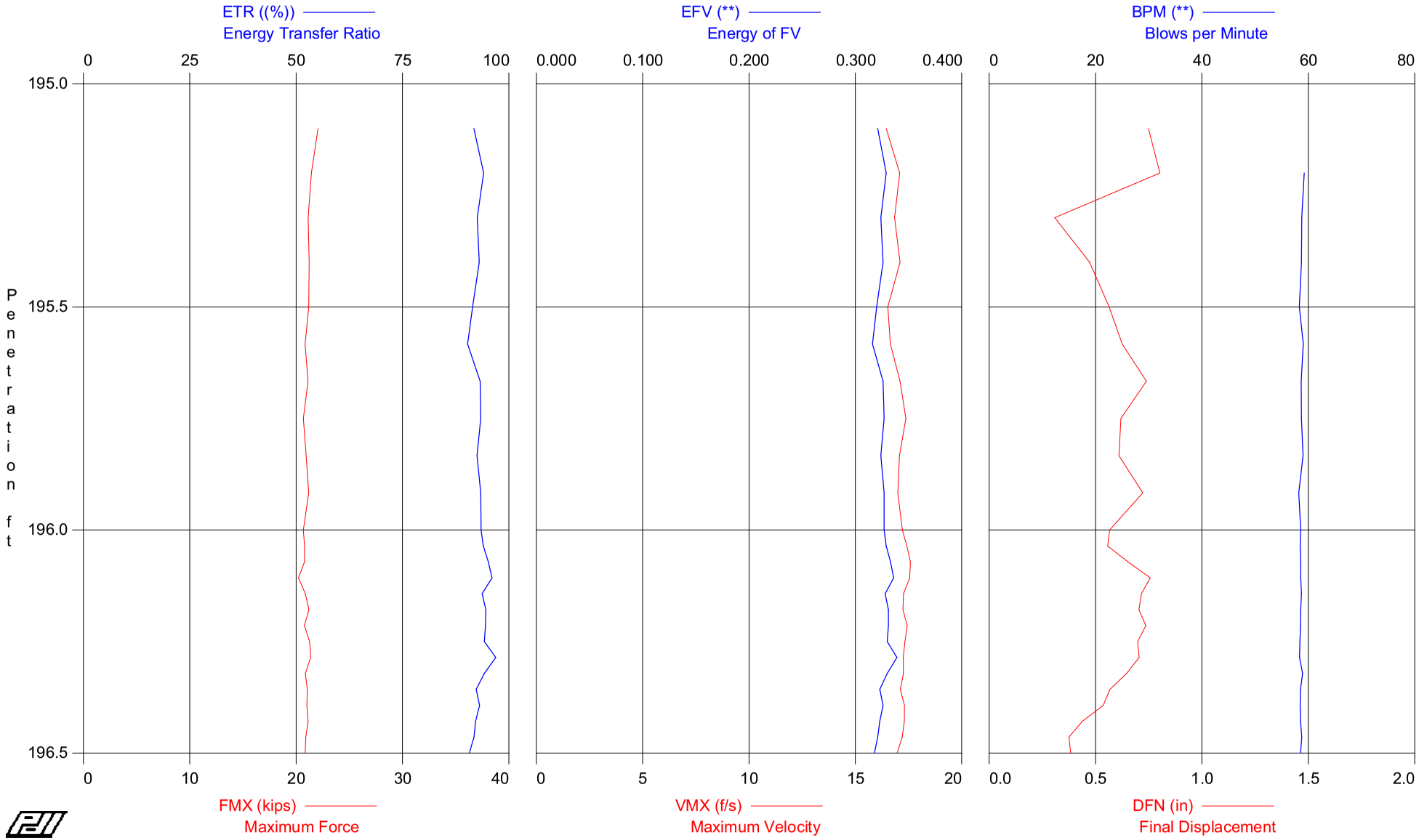
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.96

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 195 - 196.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 195 - 196.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 199.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	195.50	10	AV5	18.5	18.7	0.324	93	59	16.8	21.4	0.6
			STD	0.3	0.3	0.003	1	0	0.3	0.3	0.2
			MAX	19.0	19.3	0.329	94	59	17.1	22.1	0.8
11	196.00	12	AV6	18.0	18.2	0.325	93	59	17.1	20.9	0.6
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.1
			MAX	18.3	18.4	0.327	93	59	17.4	21.2	0.7
25	196.50	28	AV14	18.0	18.3	0.328	94	59	17.3	20.9	0.6
			STD	0.2	0.3	0.006	2	0	0.2	0.3	0.1
			MAX	18.4	18.7	0.339	97	59	17.6	21.4	0.8
			Average	18.1	18.4	0.327	93	59	17.1	21.0	0.6
			Std. Dev.	0.3	0.3	0.005	2	0	0.3	0.3	0.1
			Maximum	19.0	19.3	0.339	97	59	17.6	22.1	0.8

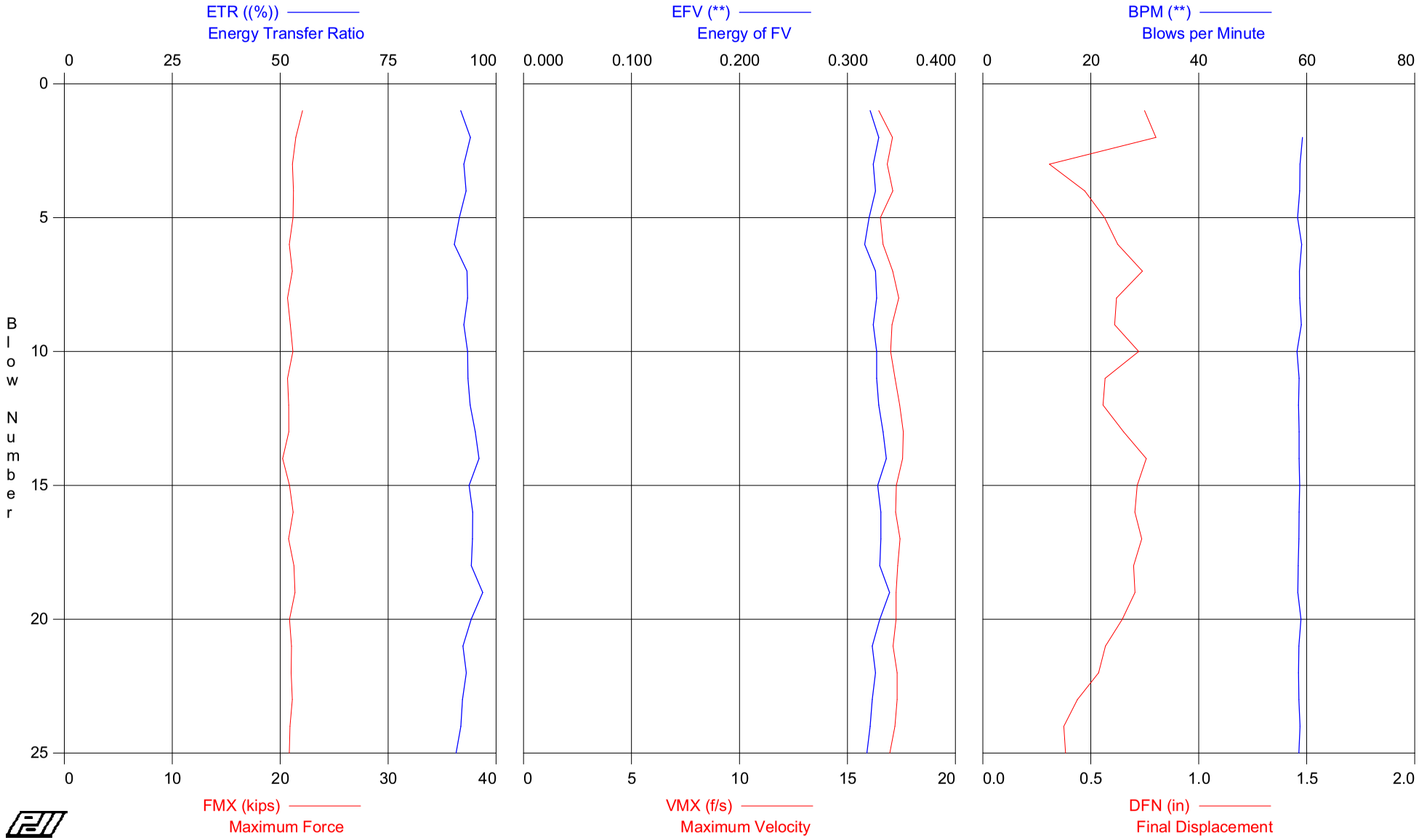
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 195 - 196.5
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 195 - 196.5
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 199.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

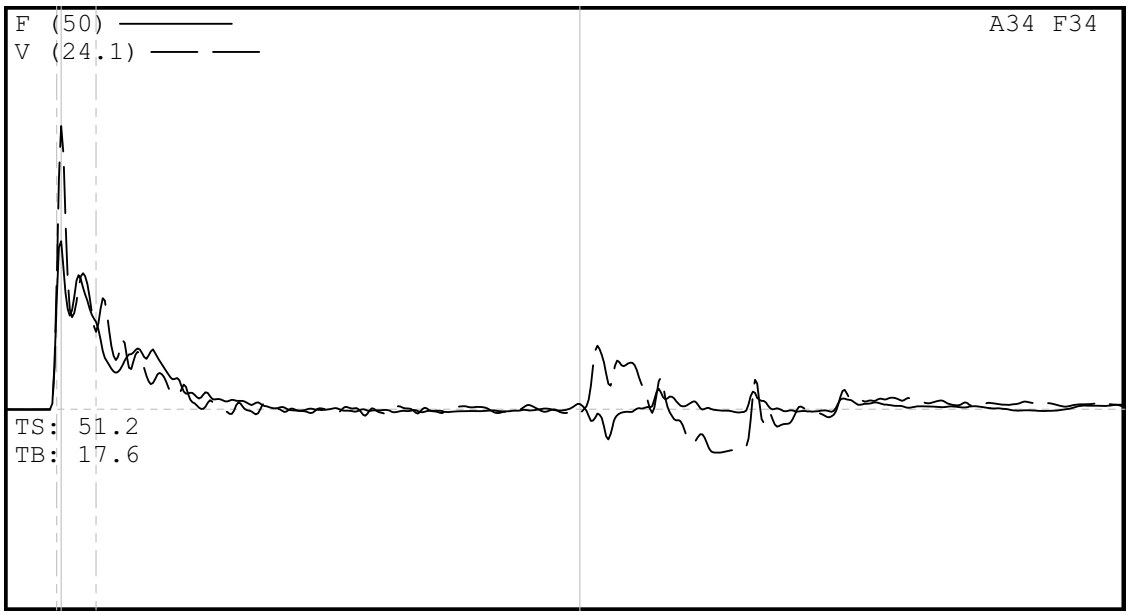
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	19.0	19.3	0.321	92	0	16.5	22.1	0.7
2	10	18.5	18.8	0.329	94	59	17.1	21.4	0.8
3	10	18.2	18.5	0.324	93	59	16.8	21.1	0.3
4	10	18.3	18.6	0.326	93	59	17.1	21.2	0.5
5	10	18.3	18.4	0.320	91	58	16.5	21.2	0.6
6	12	18.0	18.1	0.316	90	59	16.6	20.8	0.6
7	12	18.2	18.4	0.326	93	59	17.1	21.1	0.7
8	12	17.8	18.0	0.327	93	59	17.4	20.7	0.6
9	12	18.1	18.2	0.324	93	59	17.1	20.9	0.6
10	12	18.3	18.4	0.327	93	58	17.0	21.2	0.7
11	12	17.8	18.0	0.327	93	59	17.2	20.7	0.6
12	28	17.9	18.1	0.329	94	58	17.4	20.8	0.6
13	28	17.9	18.1	0.333	95	59	17.6	20.8	0.7
14	28	17.4	17.6	0.336	96	59	17.6	20.2	0.8
15	28	18.0	18.2	0.328	94	59	17.3	20.9	0.7
16	28	18.3	18.5	0.331	95	59	17.2	21.2	0.7
17	28	17.9	18.2	0.331	95	59	17.4	20.8	0.7
18	28	18.3	18.6	0.330	94	58	17.3	21.3	0.7
19	28	18.4	18.7	0.339	97	58	17.3	21.4	0.7
20	28	18.0	18.2	0.330	94	59	17.3	20.9	0.6
21	28	18.1	18.4	0.323	92	59	17.1	21.0	0.6
22	28	18.1	18.3	0.326	93	58	17.3	21.0	0.5
23	28	18.2	18.5	0.323	92	59	17.3	21.1	0.4
24	28	18.0	18.3	0.321	92	59	17.2	20.9	0.4
25	28	18.0	18.3	0.318	91	59	17.0	20.8	0.4
Average		18.1	18.4	0.327	93	59	17.1	21.0	0.6
Std. Dev.		0.3	0.3	0.005	2	0	0.3	0.3	0.1
Maximum		19.0	19.3	0.339	97	59	17.6	22.1	0.8

Total number of blows analyzed: 25

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 195 - 191 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 195 - 191 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 195 - 196 5.W01
7/15/2008 2:47:19 PM
Blow Number 28/25

Pile Properties

LE	199.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	23.70	ms
JC	0.50	[]
LP	196.50	ft

Quantity Results

CSXN	18.0	ksi
CSI	18.3	ksi
EFV	0.318	k-ft
ETR	90.7	(%)
BPM	58.5	bpm
VMX	17.0	f/s
FMX	21	kips
DFN	0.38	in
FVP	0.59	[]

Sensors

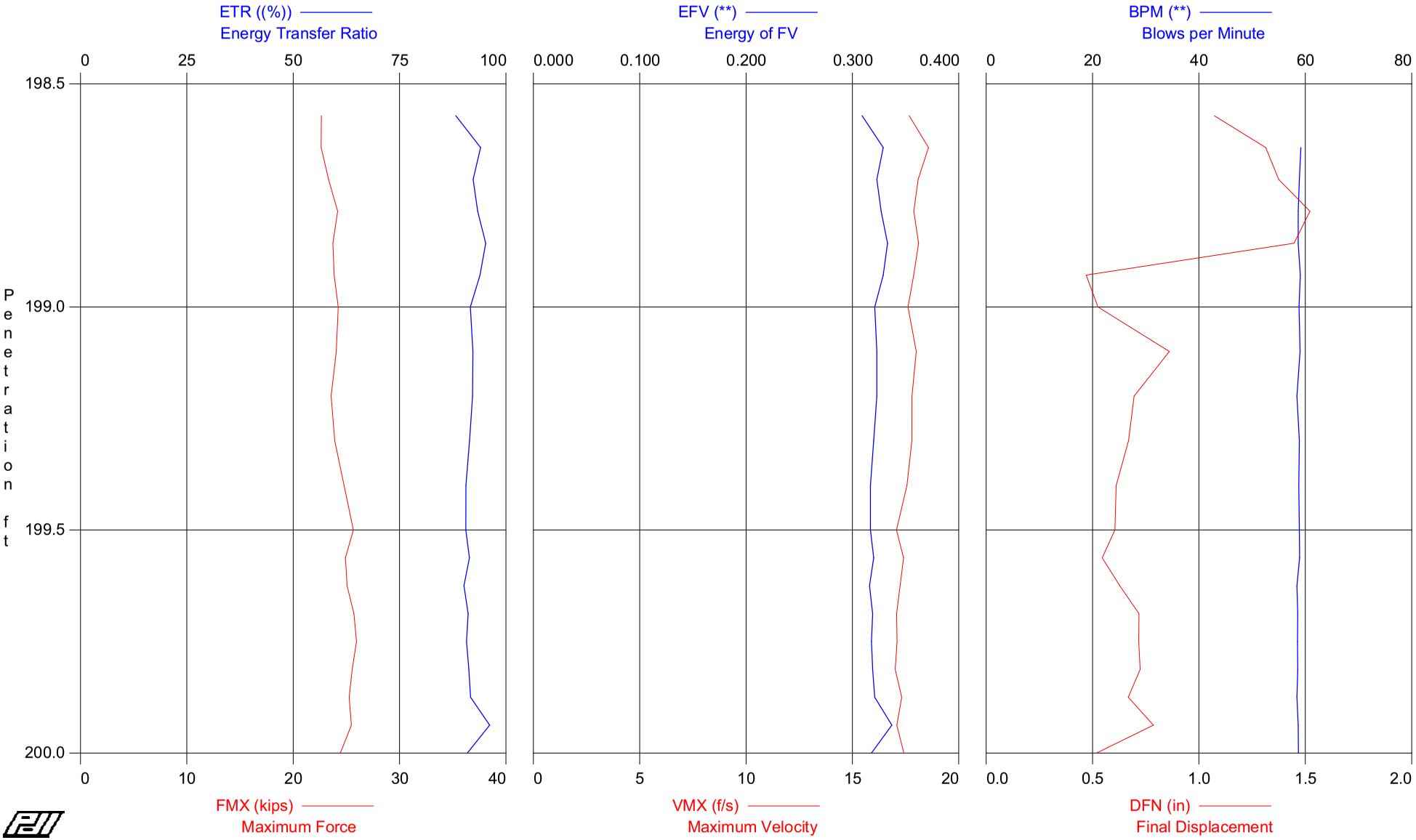
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 198.5 - 200
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 198.5 - 200
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 204.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
7	199.00	14	AV7	20.3	20.4	0.324	93	59	18.0	23.5	1.1
			STD	0.5	0.5	0.007	2	0	0.3	0.6	0.4
			MAX	20.9	21.1	0.333	95	59	18.6	24.2	1.5
12	199.50	10	AV5	21.0	21.2	0.320	91	59	17.6	24.4	0.7
			STD	0.6	0.6	0.003	1	0	0.3	0.8	0.1
			MAX	22.1	22.3	0.323	92	59	18.0	25.7	0.9
20	200.00	16	AV8	21.8	22.0	0.321	92	59	17.2	25.3	0.7
			STD	0.4	0.4	0.006	2	0	0.1	0.5	0.1
			MAX	22.4	22.4	0.337	96	59	17.4	26.0	0.8
			Average	21.1	21.2	0.322	92	59	17.6	24.4	0.8
			Std. Dev.	0.8	0.8	0.006	2	0	0.4	1.0	0.3
			Maximum	22.4	22.4	0.337	96	59	18.6	26.0	1.5

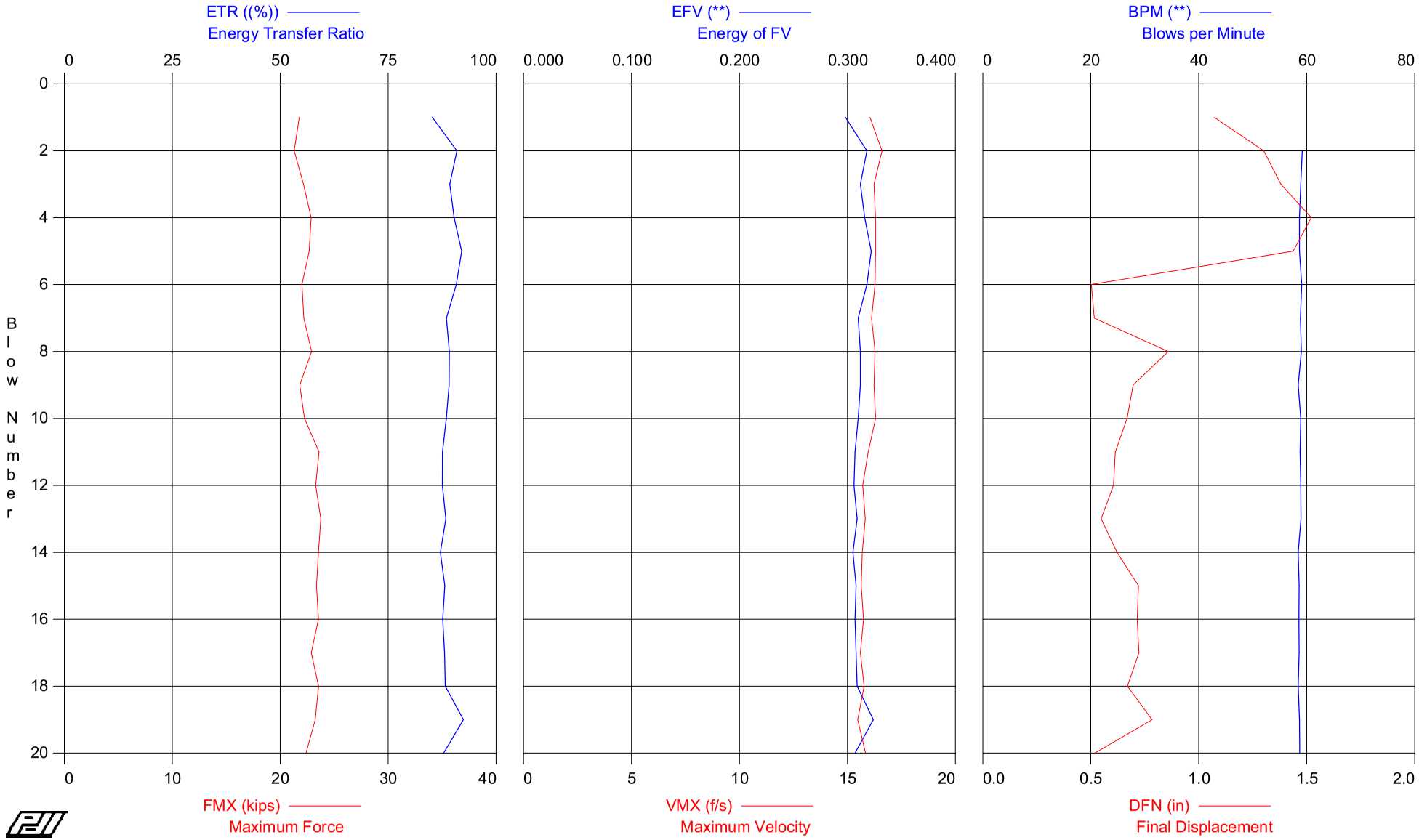
Total number of blows analyzed: 20

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 198.5 - 200
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 DEPTH 198.5 - 200
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 204.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

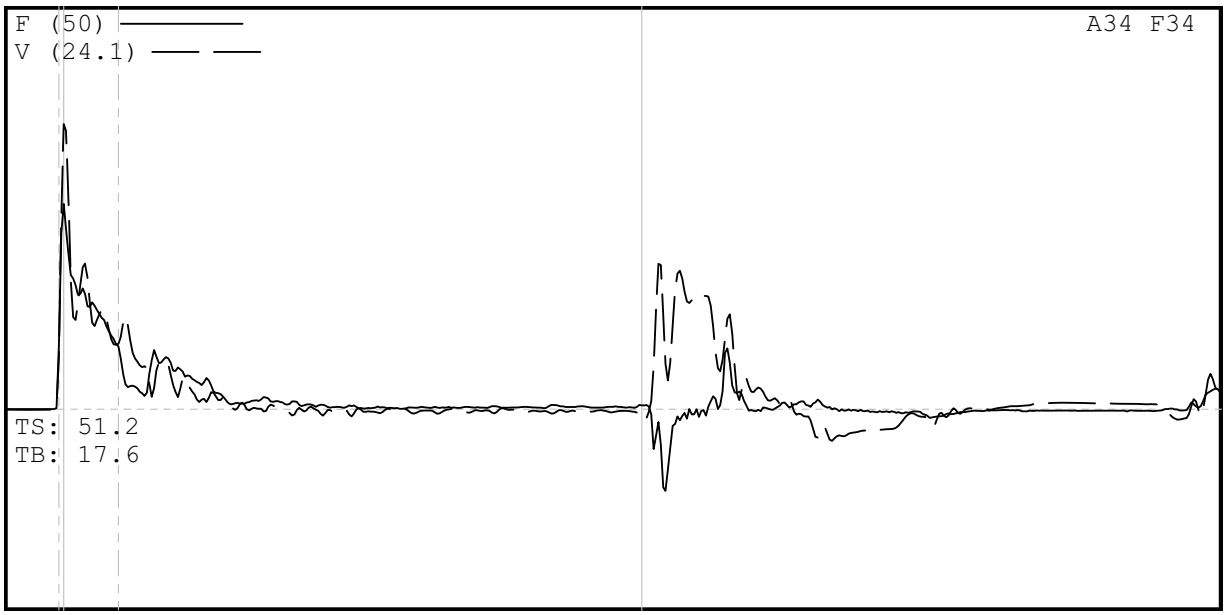
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	14	18.8	18.8	0.298	85	0	16.0	21.8	1.1
2	14	18.4	18.4	0.318	91	59	16.6	21.3	1.3
3	14	19.1	19.2	0.312	89	59	16.2	22.2	1.4
4	14	19.7	19.8	0.316	90	59	16.3	22.9	1.5
5	14	19.6	19.7	0.322	92	59	16.3	22.7	1.4
6	14	19.0	19.0	0.318	91	59	16.3	22.0	0.5
7	14	19.1	19.3	0.310	89	59	16.1	22.2	0.5
8	10	19.8	19.9	0.312	89	59	16.3	22.9	0.9
9	10	18.8	18.9	0.312	89	58	16.2	21.8	0.7
10	10	19.2	19.2	0.310	88	59	16.3	22.2	0.7
11	10	20.3	20.4	0.307	88	59	16.0	23.6	0.6
12	10	20.1	20.1	0.306	88	59	15.7	23.3	0.6
13	16	20.5	20.5	0.309	88	59	15.8	23.8	0.5
14	16	20.3	20.4	0.305	87	58	15.7	23.6	0.6
15	16	20.1	20.2	0.308	88	59	15.6	23.4	0.7
16	16	20.3	20.4	0.307	88	59	15.7	23.5	0.7
17	16	19.7	19.8	0.308	88	59	15.6	22.9	0.7
18	16	20.3	20.3	0.309	88	58	15.8	23.6	0.7
19	16	20.0	20.1	0.324	92	59	15.5	23.2	0.8
20	16	19.3	19.4	0.307	88	59	15.8	22.4	0.5
Average		19.6	19.7	0.311	89	59	16.0	22.8	0.8
Std. Dev.		0.6	0.6	0.006	2	0	0.3	0.7	0.3
Maximum		20.5	20.5	0.324	92	59	16.6	23.8	1.5

Total number of blows analyzed: 20

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 DEPTH 198 5 - 200



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 DEPTH 198 5 - 200
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 DEPTH 198 5 - 200
7/15/2008 3:33:57 PM
Blow Number 26/19

Pile Properties

LE	204.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	24.30	ms
JC	0.50	[]

Quantity Results

CSXN	22.0	ksi
CSI	22.1	ksi
EFV	0.337	k-ft
ETR	96.2	(%)
BPM	58.7	bpm
VMX	17.1	f/s
FMX	25	kips
DFN	0.79	in
FVP	0.72	[]

Sensors

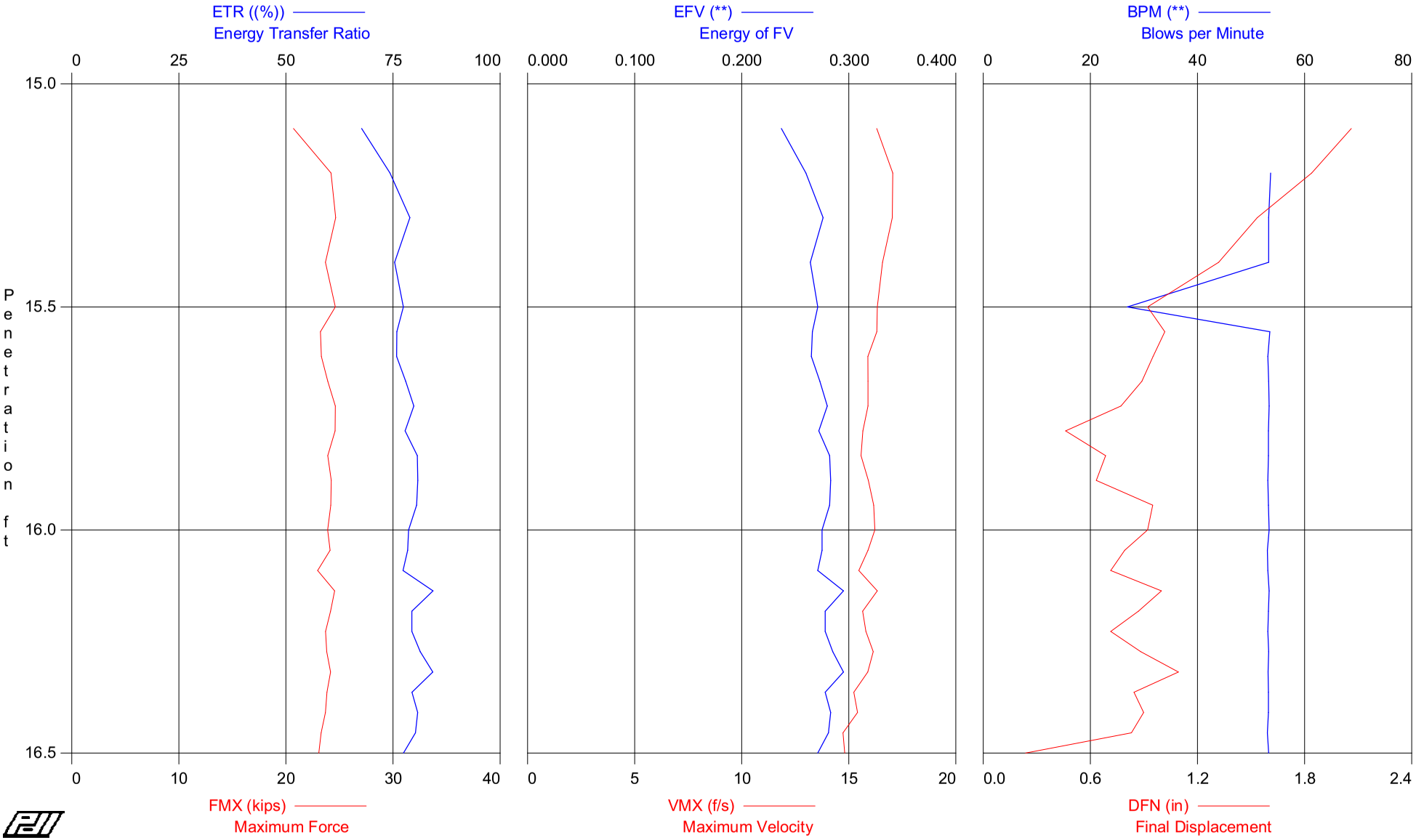
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.98
V3/V4: OK 0.91

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 23-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 15-16.5
HAMMER #2 AWJ



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 15-16.5

HAMMER #2 AWJ

OP: DJF

Test date: 23-Jun-2008

AR: 1.19 in^2
LE: 18.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	15.50	10	AV5	19.8	19.8	0.262	75	47	16.7	23.6	1.5
			STD	1.2	1.2	0.013	4	11	0.3	1.5	0.4
			MAX	20.7	20.7	0.276	79	54	17.1	24.6	2.1
14	16.00	18	AV9	20.2	20.2	0.275	79	53	15.9	24.0	0.8
			STD	0.4	0.4	0.006	2	0	0.2	0.5	0.2
			MAX	20.7	20.7	0.283	81	54	16.3	24.6	1.0
25	16.50	22	AV11	20.0	20.0	0.281	80	53	15.6	23.8	0.8
			STD	0.4	0.4	0.008	2	0	0.5	0.5	0.2
			MAX	20.6	20.7	0.295	84	53	16.3	24.5	1.1
			Average	20.0	20.0	0.275	79	52	15.9	23.8	1.0
			Std. Dev.	0.7	0.7	0.011	3	5	0.6	0.8	0.4
			Maximum	20.7	20.7	0.295	84	54	17.1	24.6	2.1

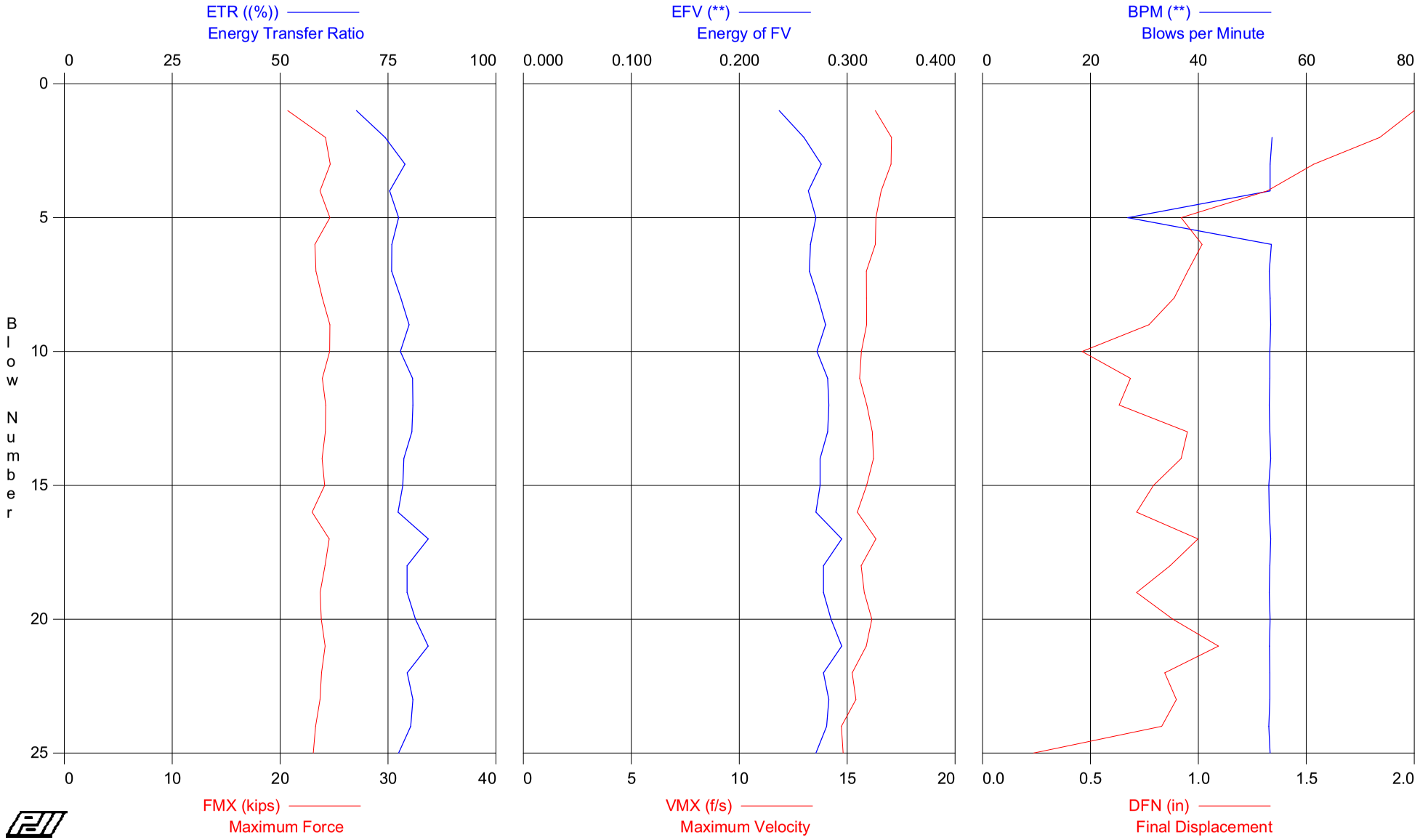
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 23-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 15-16.5
HAMMER #2 AWJ



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 15-16.5
OP: DJF

HAMMER #2 AWJ
Test date: 23-Jun-2008

AR: 1.19 in^2
LE: 18.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

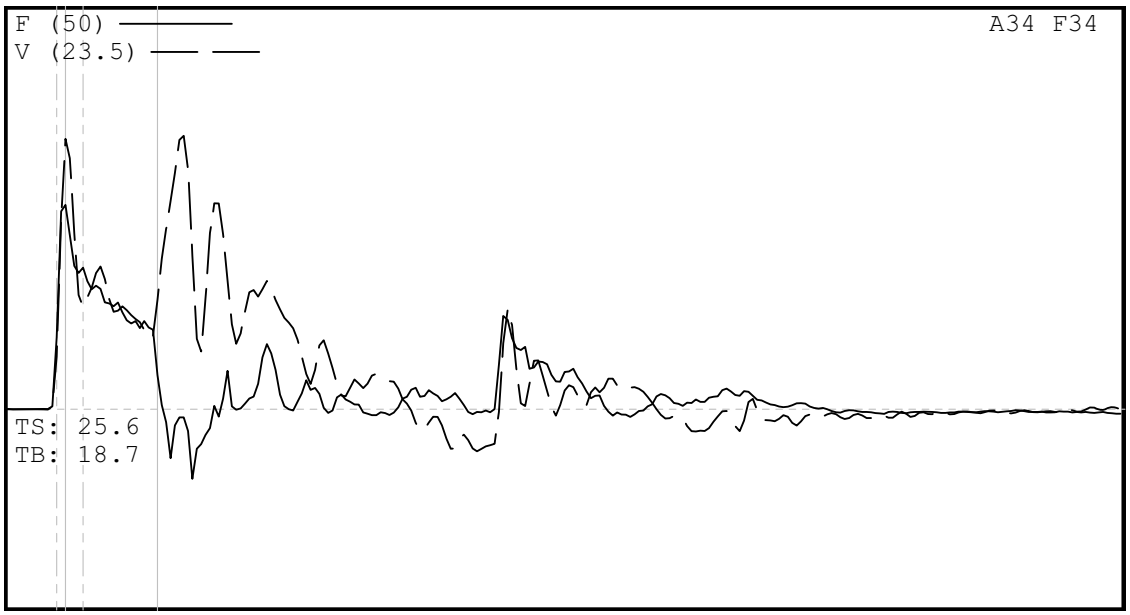
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	17.4	17.4	0.237	68	0	16.3	20.7	2.1
2	10	20.3	20.4	0.260	74	54	17.1	24.2	1.8
3	10	20.7	20.7	0.276	79	53	17.0	24.6	1.5
4	10	19.9	19.9	0.264	75	53	16.6	23.7	1.3
5	10	20.7	20.7	0.271	77	27	16.3	24.6	0.9
6	18	19.5	19.5	0.266	76	54	16.3	23.2	1.0
7	18	19.6	19.6	0.265	76	53	15.9	23.3	1.0
8	18	20.1	20.1	0.273	78	53	15.9	23.9	0.9
9	18	20.7	20.7	0.280	80	53	15.9	24.6	0.8
10	18	20.7	20.7	0.272	78	53	15.7	24.6	0.5
11	18	20.1	20.1	0.282	81	53	15.6	23.9	0.7
12	18	20.4	20.4	0.283	81	53	15.9	24.2	0.6
13	18	20.3	20.4	0.282	81	53	16.2	24.2	0.9
14	18	20.1	20.1	0.275	79	53	16.2	23.9	0.9
15	22	20.3	20.3	0.275	78	53	15.9	24.1	0.8
16	22	19.3	19.3	0.271	77	53	15.5	23.0	0.7
17	22	20.6	20.7	0.295	84	53	16.3	24.5	1.0
18	22	20.3	20.4	0.278	79	53	15.6	24.2	0.9
19	22	19.9	20.0	0.278	79	53	15.8	23.7	0.7
20	22	20.0	20.0	0.285	81	53	16.1	23.8	0.9
21	22	20.3	20.4	0.295	84	53	15.9	24.2	1.1
22	22	20.0	20.1	0.278	79	53	15.2	23.8	0.8
23	22	19.9	20.0	0.283	81	53	15.4	23.7	0.9
24	22	19.6	19.6	0.281	80	53	14.7	23.3	0.8
25	22	19.4	19.4	0.271	77	53	14.8	23.1	0.2
Average		20.0	20.0	0.275	79	52	15.9	23.8	1.0
Std. Dev.		0.7	0.7	0.011	3	5	0.6	0.8	0.4
Maximum		20.7	20.7	0.295	84	54	17.1	24.6	2.1

Total number of blows analyzed: 25

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 15-16 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 15-16 5
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 15-16 5
6/23/2008 5:17:17 PM
Blow Number 23/22

Pile Properties

LE	18.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	2.10	ms
JC	0.50	[]

Quantity Results

CSXN	21.3	ksi
CSI	21.3	ksi
EFV	0.291	k-ft
ETR	83.0	(%)
BPM	53.2	bpm
VMX	16.0	f/s
FMX	25	kips
DFN	0.84	in
FVP	0.76	[]

Sensors

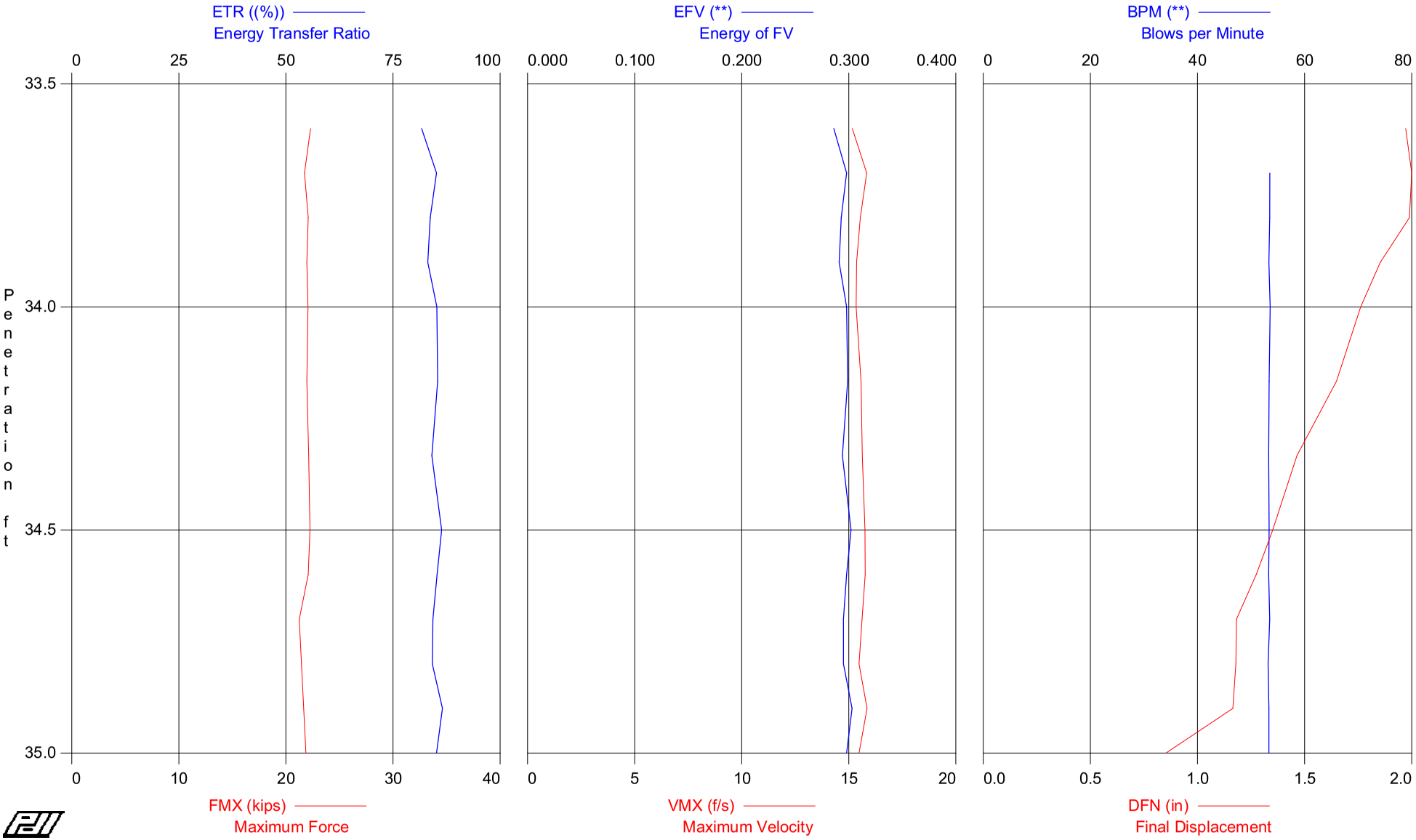
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 1.02

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 33.5-35
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 33.5-35
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 38.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	34.00	10	AV5	18.5	18.7	0.293	84	53	15.4	22.0	1.9
			STD	0.2	0.2	0.005	1	0	0.2	0.2	0.1
			MAX	18.7	18.9	0.298	85	54	15.8	22.3	2.1
8	34.50	6	AV3	18.6	18.9	0.298	85	53	15.7	22.1	1.5
			STD	0.1	0.1	0.003	1	0	0.1	0.1	0.1
			MAX	18.7	19.0	0.302	86	53	15.8	22.2	1.6
13	35.00	10	AV5	18.2	18.5	0.298	85	53	15.6	21.7	1.1
			STD	0.2	0.3	0.003	1	0	0.2	0.3	0.1
			MAX	18.6	18.9	0.303	87	53	15.9	22.1	1.3
			Average	18.4	18.7	0.296	85	53	15.6	21.9	1.5
			Std. Dev.	0.3	0.2	0.004	1	0	0.2	0.3	0.4
			Maximum	18.7	19.0	0.303	87	54	15.9	22.3	2.1

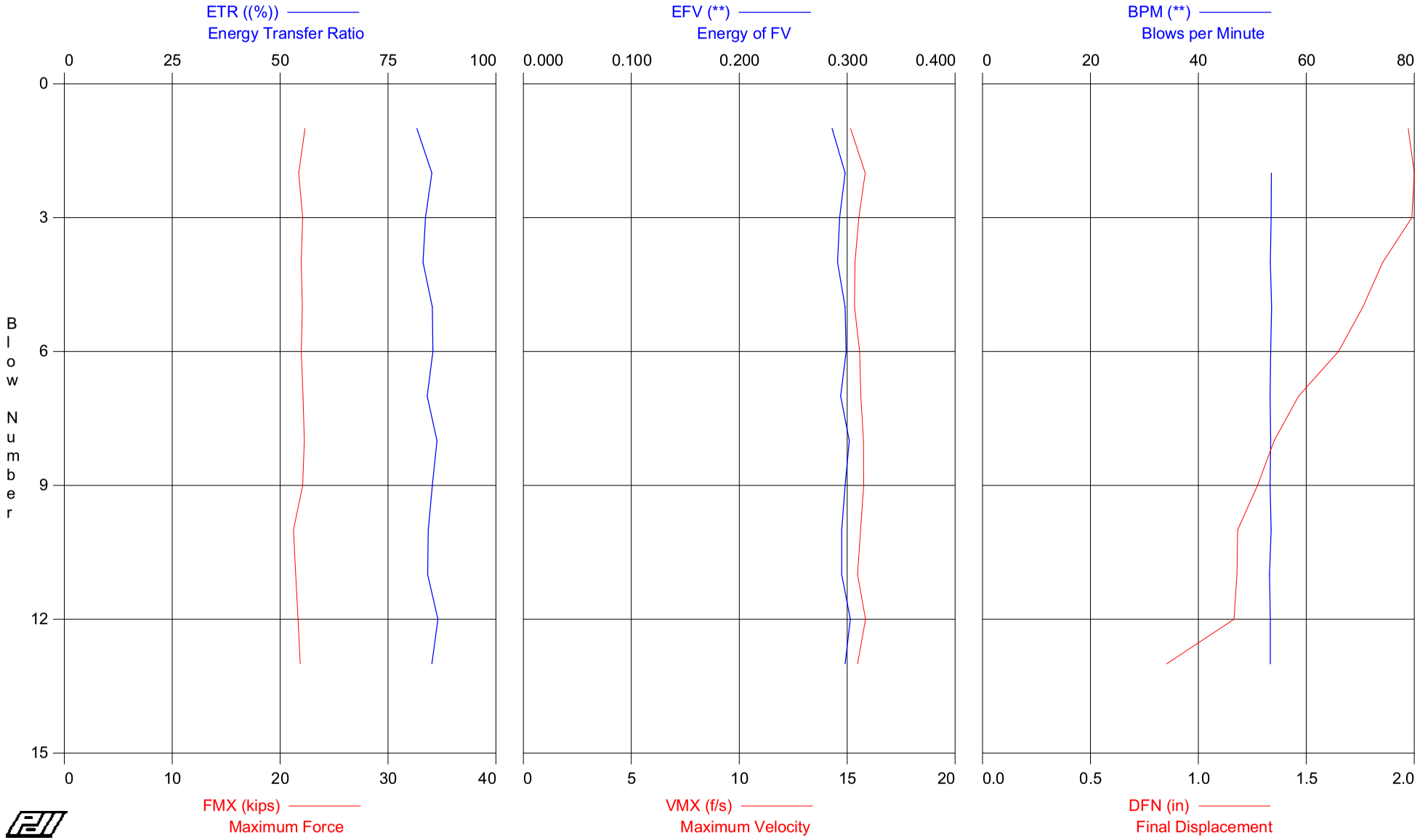
Total number of blows analyzed: 13

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 33.5-35
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 33.5-35
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 38.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

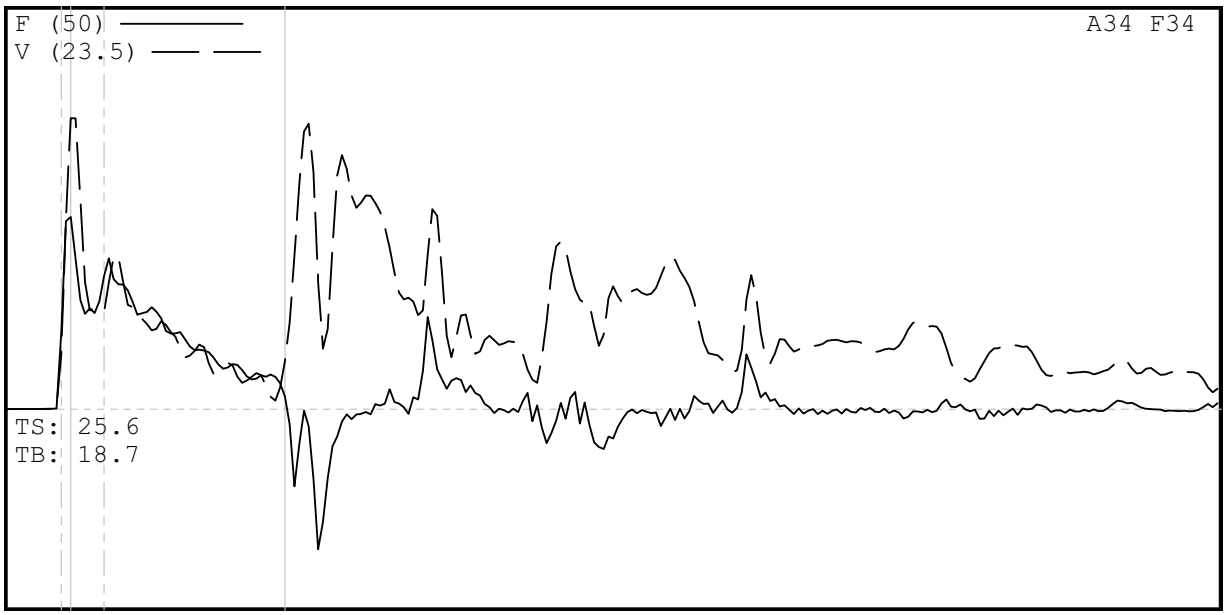
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	18.7	18.9	0.286	82	0	15.2	22.3	2.0
2	10	18.3	18.5	0.298	85	54	15.8	21.7	2.1
3	10	18.6	18.7	0.293	84	53	15.5	22.1	2.0
4	10	18.4	18.7	0.291	83	53	15.4	22.0	1.9
5	10	18.5	18.8	0.298	85	54	15.3	22.1	1.8
6	6	18.5	18.7	0.299	85	53	15.6	22.0	1.6
7	6	18.6	18.9	0.294	84	53	15.6	22.1	1.5
8	6	18.7	19.0	0.302	86	53	15.8	22.2	1.4
9	10	18.6	18.9	0.298	85	53	15.8	22.1	1.3
10	10	17.8	18.1	0.295	84	53	15.6	21.2	1.2
11	10	18.0	18.3	0.295	84	53	15.5	21.5	1.2
12	10	18.2	18.4	0.303	87	53	15.9	21.7	1.2
13	10	18.4	18.7	0.298	85	53	15.5	21.9	0.9
Average		18.4	18.7	0.296	85	53	15.6	21.9	1.5
Std. Dev.		0.3	0.2	0.004	1	0	0.2	0.3	0.4
Maximum		18.7	19.0	0.303	87	54	15.9	22.3	2.1

Total number of blows analyzed: 13

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 33 5-35



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 33 5-35
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 33 5-35
6/24/2008 11:59:13 AM
Blow Number 8/6

Pile Properties

LE	38.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	4.50	ms
JC	0.50	[]

Quantity Results

CSXN	20.0	ksi
CSI	20.4	ksi
EFV	0.310	k-ft
ETR	88.5	(%)
BPM	53.4	bpm
VMX	17.0	f/s
FMX	24	kips
DFN	1.65	in
FVP	0.66	[]

Sensors

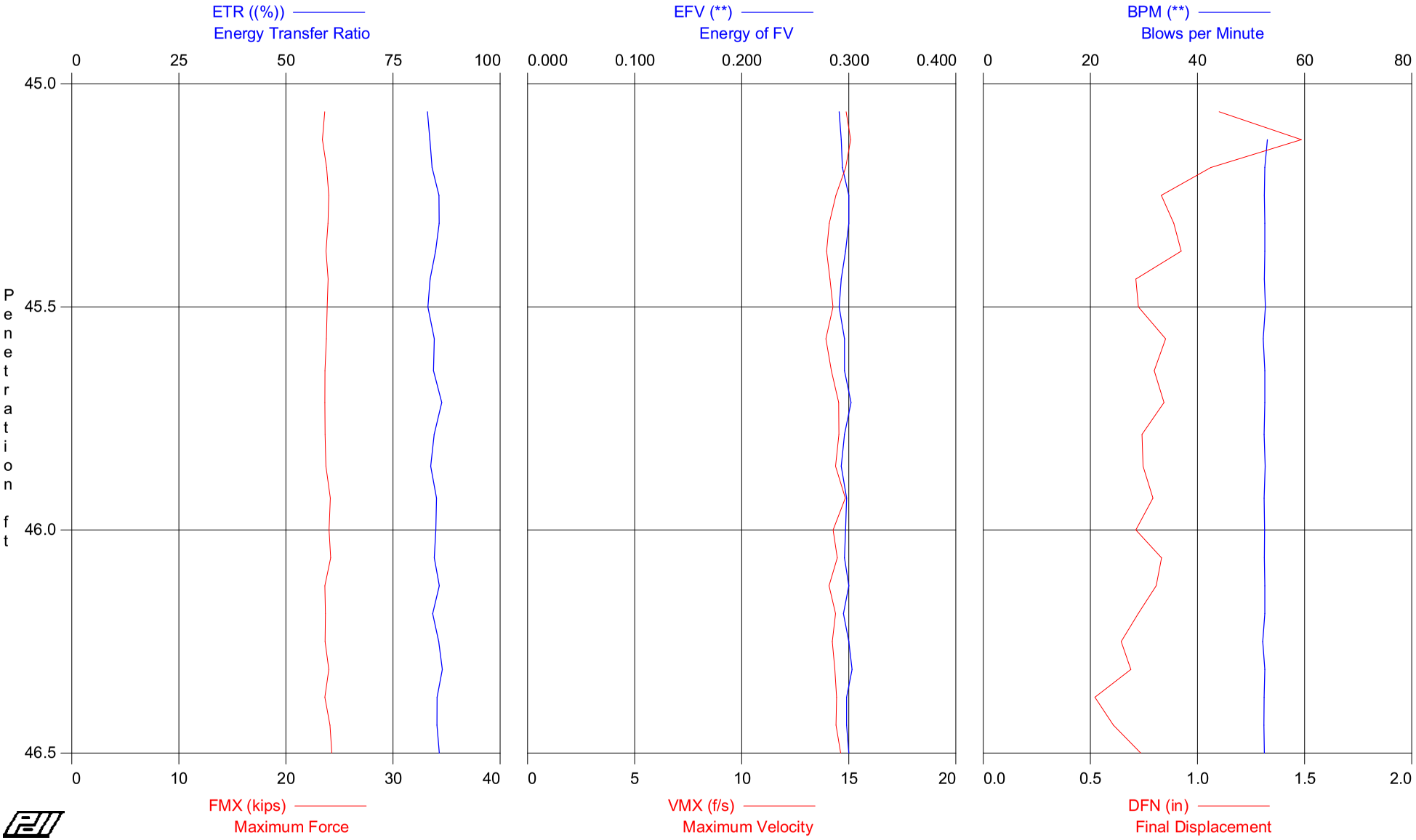
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.97
V3/V4: OK 0.93

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 45-46.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 45-46.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 48.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	45.50	16	AV8	20.0	20.3	0.295	84	53	14.5	23.8	1.0
			STD	0.2	0.1	0.003	1	0	0.4	0.2	0.2
			MAX	20.2	20.5	0.300	86	53	15.1	24.0	1.5
15	46.00	14	AV7	20.0	20.3	0.297	85	53	14.4	23.8	0.8
			STD	0.2	0.1	0.003	1	0	0.3	0.2	0.0
			MAX	20.3	20.5	0.302	86	53	14.8	24.1	0.9
23	46.50	16	AV8	20.1	20.4	0.299	85	52	14.4	23.9	0.7
			STD	0.2	0.2	0.002	1	0	0.2	0.3	0.1
			MAX	20.4	20.7	0.303	87	53	14.6	24.3	0.8
			Average	20.0	20.4	0.297	85	53	14.4	23.8	0.8
			Std. Dev.	0.2	0.2	0.003	1	0	0.3	0.2	0.2
			Maximum	20.4	20.7	0.303	87	53	15.1	24.3	1.5

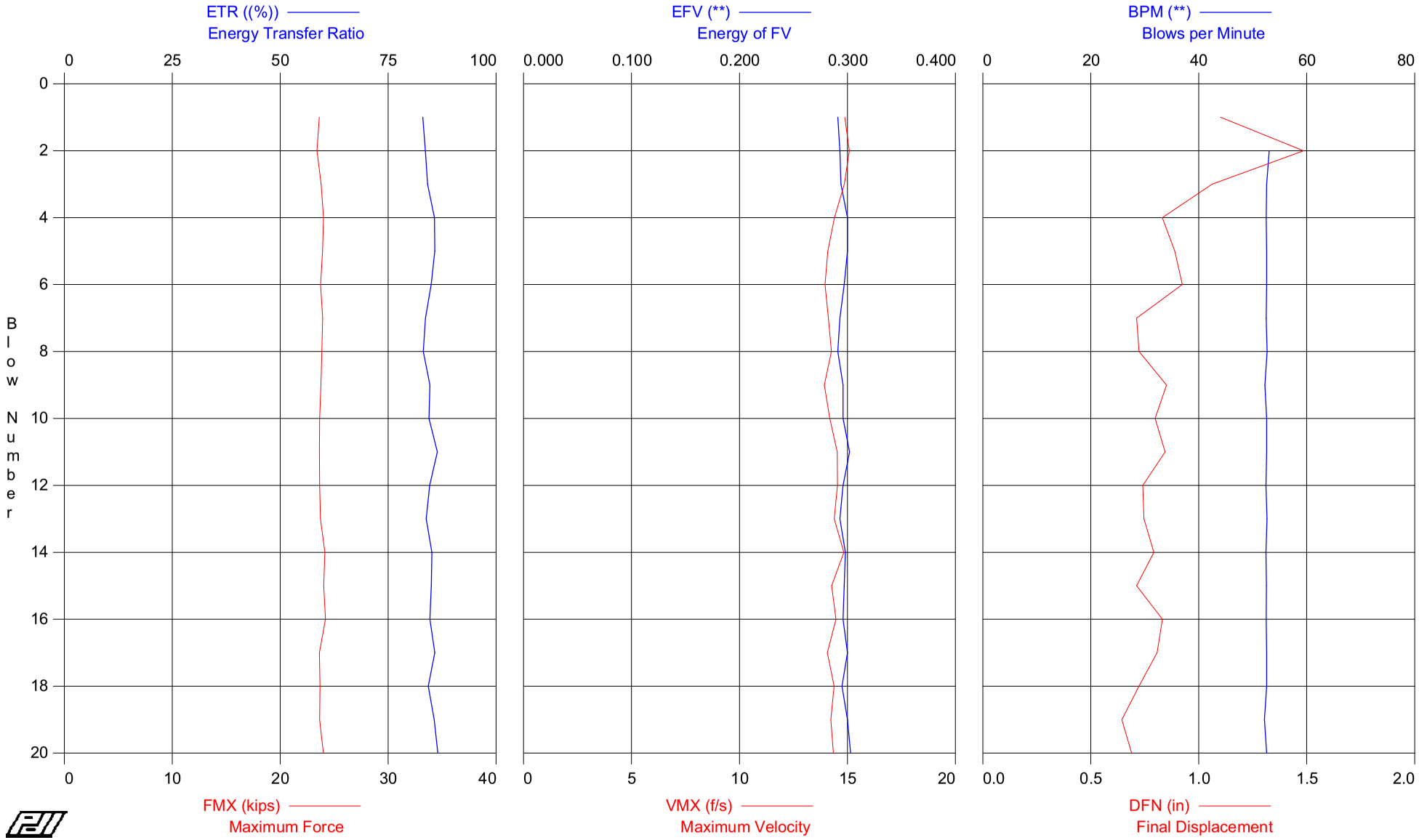
Total number of blows analyzed: 23

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 45 - 46.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 45 - 46.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 48.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

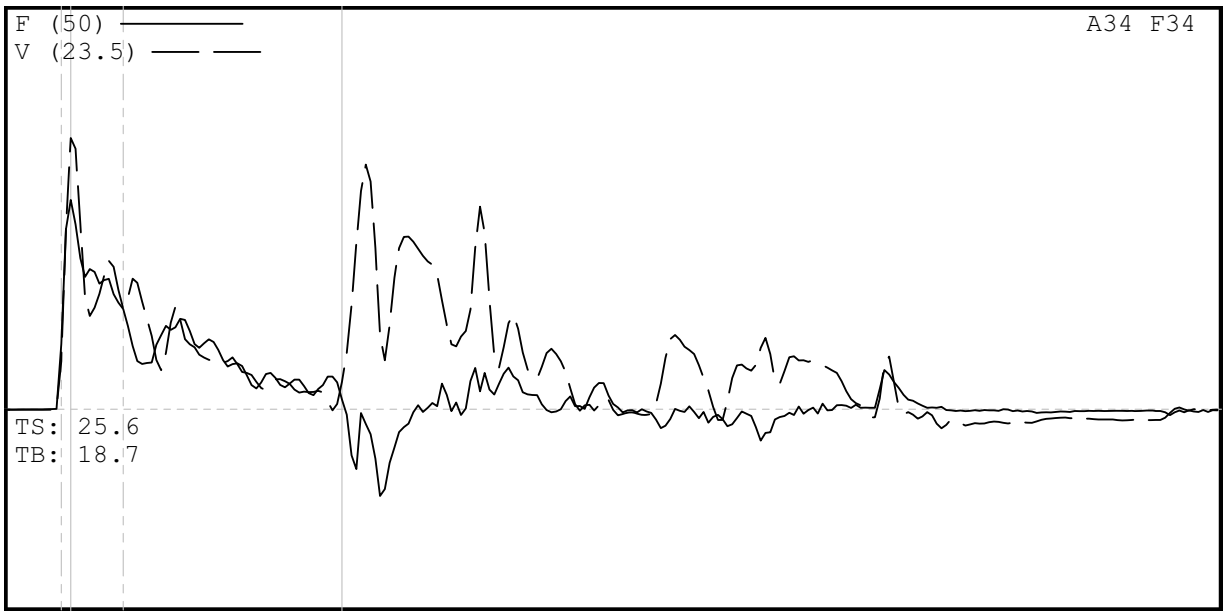
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	19.8	20.3	0.291	83	0	14.9	23.6	1.1
2	16	19.7	20.0	0.293	84	53	15.1	23.4	1.5
3	16	20.0	20.3	0.294	84	53	14.9	23.8	1.1
4	16	20.2	20.5	0.300	86	52	14.4	24.0	0.8
5	16	20.1	20.4	0.300	86	53	14.1	23.9	0.9
6	16	19.9	20.2	0.297	85	53	14.0	23.7	0.9
7	16	20.1	20.4	0.293	84	52	14.1	23.9	0.7
8	16	20.1	20.4	0.291	83	53	14.3	23.9	0.7
9	14	20.0	20.3	0.296	85	52	13.9	23.8	0.9
10	14	19.9	20.2	0.296	84	53	14.2	23.6	0.8
11	14	19.9	20.2	0.302	86	53	14.5	23.6	0.8
12	14	19.9	20.2	0.296	85	52	14.5	23.7	0.7
13	14	19.9	20.3	0.293	84	53	14.4	23.7	0.7
14	14	20.3	20.5	0.298	85	52	14.8	24.1	0.8
15	14	20.2	20.5	0.297	85	53	14.3	24.0	0.7
16	16	20.3	20.6	0.296	85	52	14.5	24.2	0.8
17	16	19.9	20.2	0.300	86	53	14.1	23.6	0.8
18	16	19.9	20.3	0.295	84	53	14.4	23.7	0.7
19	16	19.9	20.3	0.300	86	52	14.2	23.7	0.6
20	16	20.2	20.5	0.303	87	53	14.4	24.0	0.7
21	16	19.9	20.2	0.298	85	52	14.4	23.6	0.5
22	16	20.3	20.6	0.298	85	52	14.4	24.1	0.6
23	16	20.4	20.7	0.300	86	52	14.6	24.3	0.7
Average		20.0	20.4	0.297	85	53	14.4	23.8	0.8
Std. Dev.		0.2	0.2	0.003	1	0	0.3	0.2	0.2
Maximum		20.4	20.7	0.303	87	53	15.1	24.3	1.5

Total number of blows analyzed: 23

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 45-46 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 45-46 5
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 45-46 5
6/24/2008 12:57:37 PM
Blow Number 22/6

Pile Properties

LE	48.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	5.70	ms
JC	0.50	[]

Quantity Results

CSXN	21.8	ksi
CSI	22.3	ksi
EFV	0.308	k-ft
ETR	87.9	(%)
BPM	52.6	bpm
VMX	15.8	f/s
FMX	26	kips
DFN	0.92	in
FVP	0.77	[]

Sensors

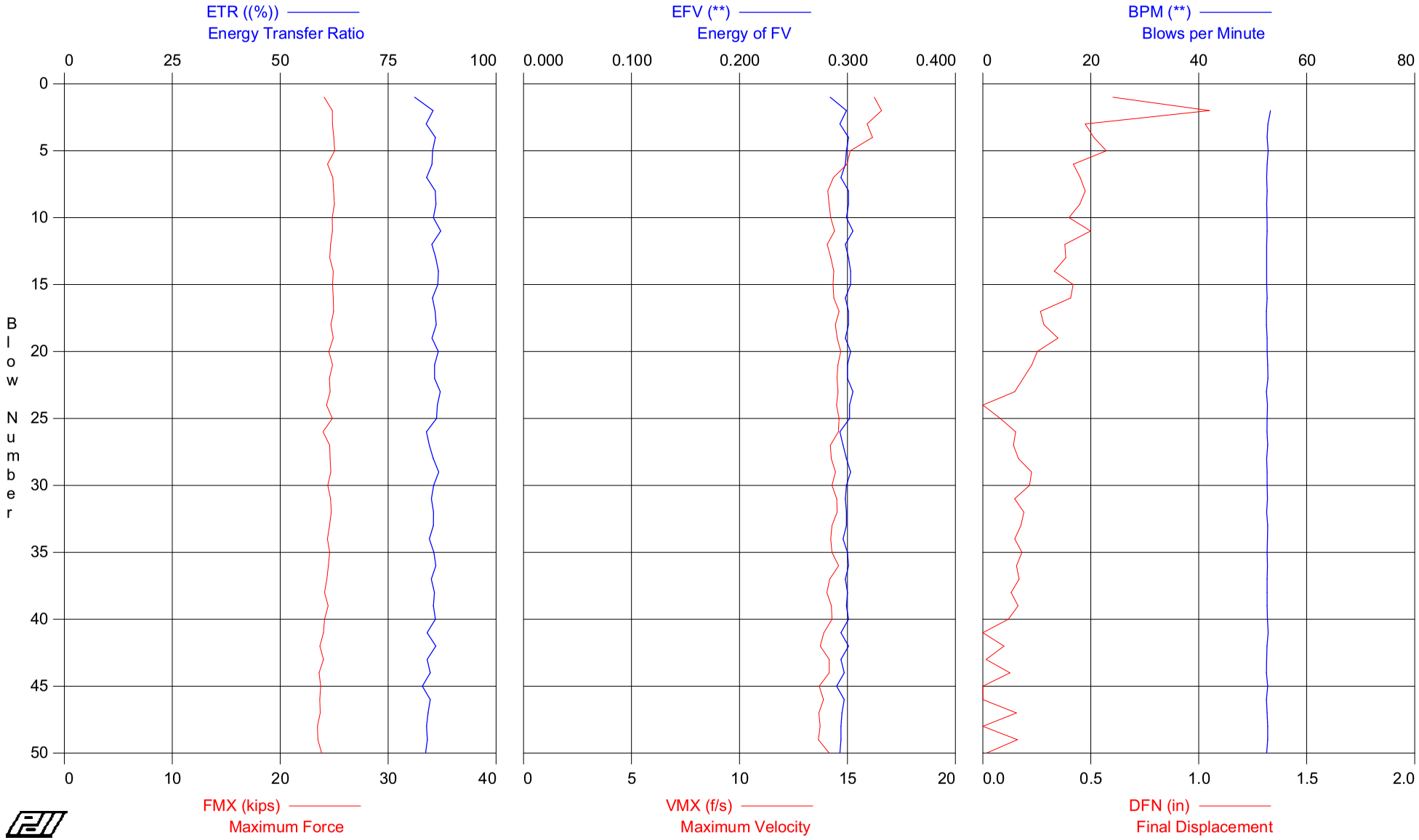
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.96
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 60-61.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 60-61.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 62.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

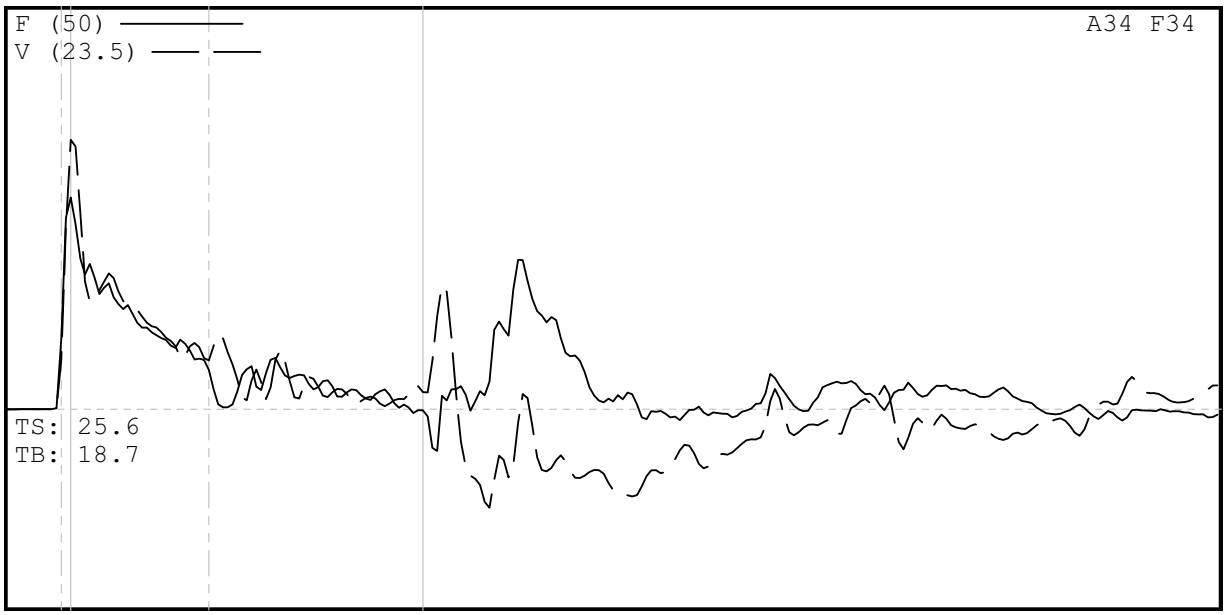
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	120	20.2	20.4	0.284	81	0	16.2	24.1	0.6
2	120	20.9	21.2	0.299	85	53	16.6	24.8	1.1
3	120	20.9	21.3	0.293	84	53	15.9	24.8	0.5
4	120	21.0	21.3	0.301	86	53	16.2	25.0	0.5
5	120	21.0	21.4	0.299	85	53	15.1	25.0	0.6
6	120	20.5	20.8	0.298	85	53	15.0	24.4	0.4
7	120	20.9	21.2	0.294	84	53	14.4	24.9	0.5
8	120	21.0	21.2	0.301	86	53	14.1	24.9	0.5
9	120	21.0	21.3	0.301	86	53	14.2	25.0	0.4
10	120	20.9	21.2	0.299	85	53	14.2	24.8	0.4
11	120	20.9	21.2	0.305	87	53	14.4	24.8	0.5
12	120	20.7	21.0	0.298	85	53	14.1	24.7	0.4
13	120	20.7	21.0	0.301	86	53	14.2	24.6	0.4
14	120	20.9	21.3	0.303	87	53	14.4	24.9	0.3
15	120	20.9	21.2	0.303	86	53	14.3	24.8	0.4
16	120	20.9	21.3	0.298	85	53	14.4	24.9	0.4
17	120	21.0	21.3	0.301	86	53	14.6	24.9	0.3
18	120	20.8	21.1	0.301	86	53	14.4	24.7	0.3
19	120	20.9	21.3	0.298	85	53	14.5	24.9	0.3
20	120	20.6	20.9	0.303	87	53	14.7	24.5	0.3
21	120	20.9	21.2	0.300	86	53	14.6	24.9	0.2
22	120	20.6	21.0	0.300	86	53	14.5	24.6	0.2
23	120	20.7	21.1	0.305	87	53	14.6	24.6	0.1
24	120	20.4	20.8	0.302	86	53	14.5	24.3	-0.1
25	120	20.9	21.2	0.302	86	53	14.6	24.8	0.1
26	120	20.1	20.5	0.293	84	53	14.6	24.0	0.2
27	120	20.7	21.0	0.296	85	53	14.2	24.6	0.1
28	120	20.7	21.0	0.299	85	53	14.3	24.6	0.2
29	120	20.8	21.1	0.303	87	53	14.4	24.7	0.2
30	120	20.5	20.9	0.299	86	53	14.3	24.4	0.2
31	120	20.7	21.0	0.298	85	53	14.5	24.7	0.1
32	120	20.8	21.2	0.299	85	53	14.5	24.7	0.2
33	120	20.6	21.0	0.299	85	53	14.3	24.6	0.2
34	120	20.5	20.9	0.296	85	53	14.2	24.4	0.1
35	120	20.7	21.0	0.300	86	53	14.3	24.6	0.2
36	120	20.6	20.9	0.301	86	53	14.6	24.5	0.2
37	120	20.4	20.8	0.298	85	53	14.2	24.3	0.2
38	120	20.3	20.6	0.300	86	53	14.1	24.1	0.1
39	120	20.5	20.8	0.299	85	53	14.3	24.4	0.2
40	120	20.3	20.5	0.301	86	53	14.3	24.1	0.1
41	120	20.2	20.5	0.294	84	53	13.9	24.0	0.0
42	120	19.9	20.2	0.301	86	53	13.7	23.7	0.1
43	120	20.2	20.4	0.294	84	53	14.2	24.0	0.0
44	120	19.8	20.1	0.297	85	53	14.2	23.6	0.1
45	120	20.0	20.3	0.290	83	53	13.7	23.7	-0.1
46	120	19.9	20.3	0.297	85	53	13.9	23.7	-0.1
47	120	19.9	20.2	0.295	84	53	13.7	23.7	0.2
48	120	19.7	20.0	0.294	84	53	13.7	23.5	0.0
49	120	19.7	20.0	0.294	84	53	13.7	23.5	0.2
50	120	20.0	20.3	0.293	84	53	14.2	23.8	0.0
Average		20.5	20.9	0.298	85	53	14.4	24.5	0.2
Std. Dev.		0.4	0.4	0.004	1	0	0.6	0.4	0.2
Maximum		21.0	21.4	0.305	87	53	16.6	25.0	1.1

Total number of blows analyzed: 50

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 60-61 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 60-61 5
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 60-61 5
6/24/2008 2:55:57 PM
Blow Number 39/37

Pile Properties

LE	62.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	7.40	ms
JC	0.50	[]

Quantity Results

CSXN	22.1	ksi
CSI	22.6	ksi
EFV	0.307	k-ft
ETR	87.8	(%)
BPM	52.7	bpm
VMX	15.7	f/s
FMX	26	kips
DFN	0.16	in
FVP	0.79	[]

Sensors

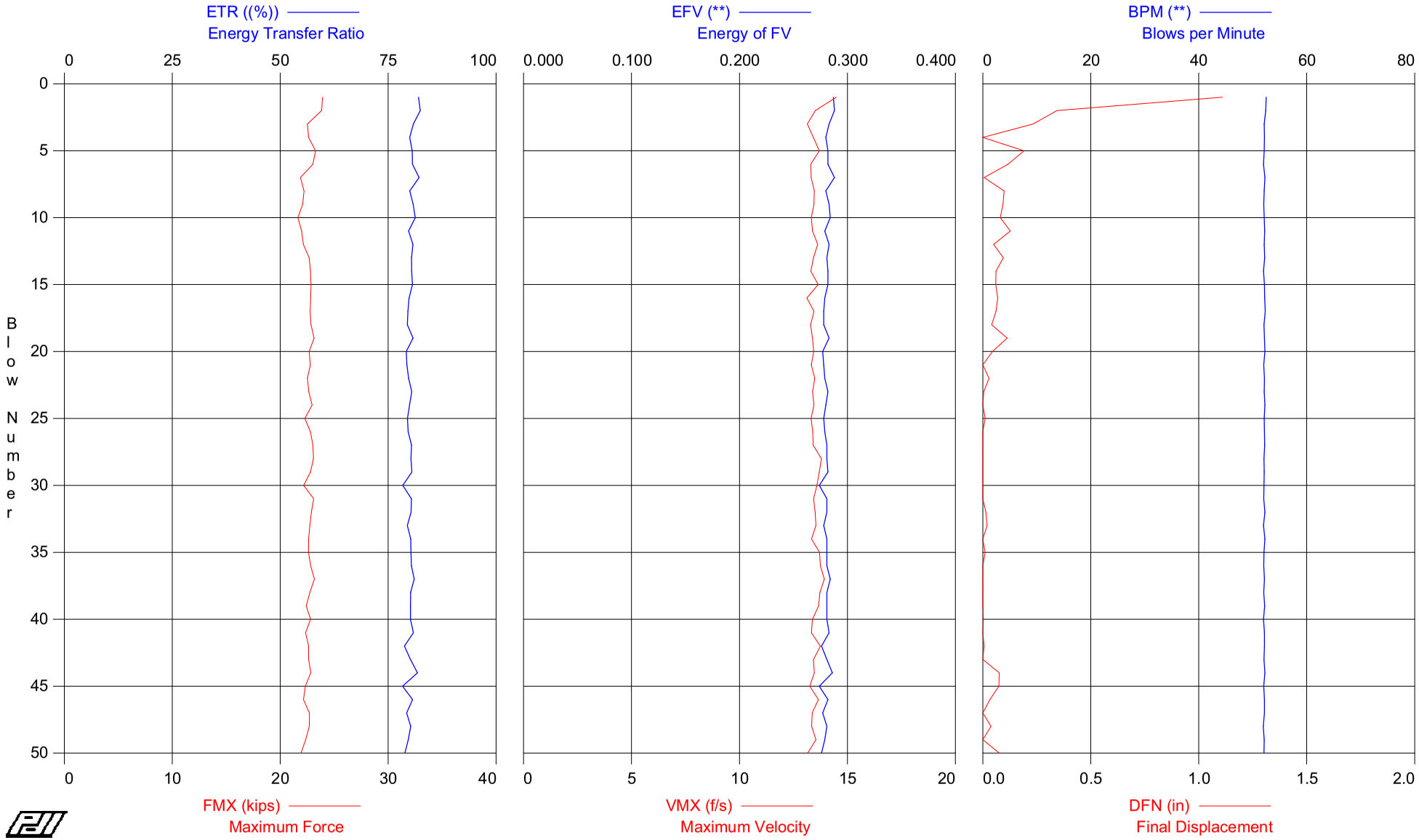
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.95
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 75-76.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 75-76.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 78.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

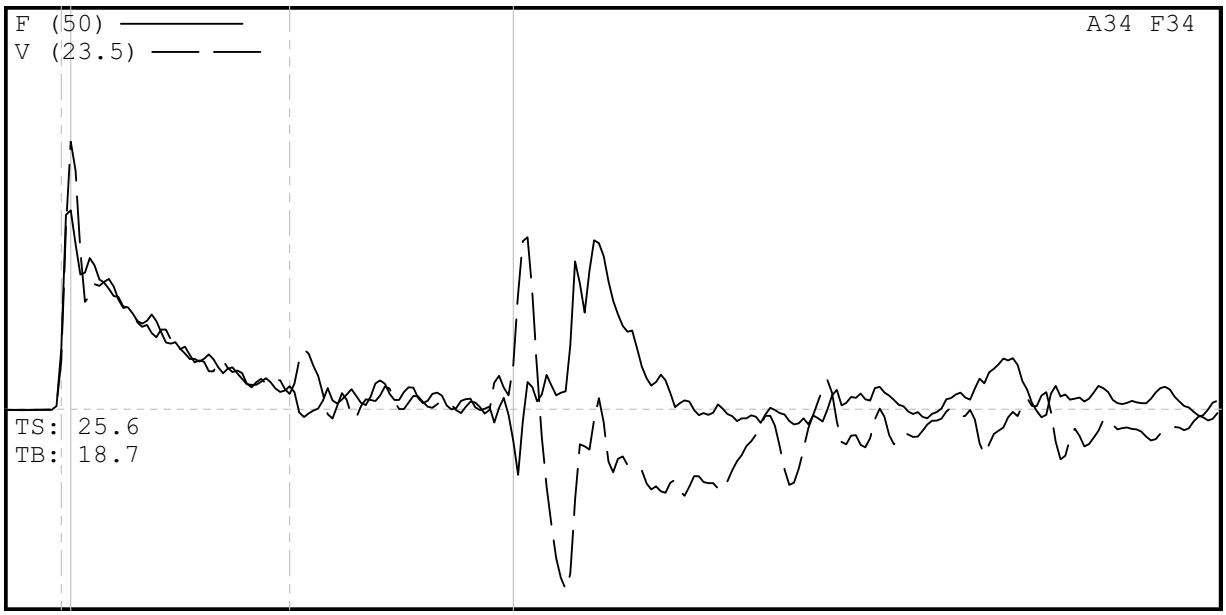
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	120	20.1	20.4	0.287	82	52	14.5	23.9	1.1
2	120	20.0	20.3	0.288	82	52	13.5	23.8	0.3
3	120	18.9	19.0	0.283	81	52	13.1	22.5	0.2
4	120	19.0	19.3	0.280	80	52	13.4	22.6	0.0
5	120	19.6	19.8	0.282	81	52	13.7	23.3	0.2
6	120	19.4	19.6	0.282	81	52	13.3	23.0	0.1
7	120	18.4	18.6	0.288	82	52	13.3	21.9	0.0
8	120	18.7	18.9	0.280	80	52	13.5	22.2	0.1
9	120	18.5	18.7	0.283	81	52	13.4	22.1	0.1
10	120	18.2	18.4	0.284	81	52	13.3	21.6	0.1
11	120	18.5	18.7	0.279	80	52	13.4	22.0	0.1
12	120	18.6	18.9	0.283	81	52	13.6	22.2	0.1
13	120	19.1	19.3	0.281	80	52	13.4	22.7	0.1
14	120	19.2	19.4	0.282	80	52	13.3	22.8	0.1
15	120	19.2	19.4	0.282	81	52	13.6	22.9	0.1
16	120	19.2	19.4	0.279	80	52	13.1	22.8	0.1
17	120	19.1	19.4	0.278	80	52	13.5	22.8	0.1
18	120	19.2	19.4	0.278	79	52	13.3	22.9	0.0
19	120	19.4	19.7	0.283	81	52	13.4	23.1	0.1
20	120	19.1	19.4	0.277	79	52	13.4	22.7	0.0
21	120	19.2	19.4	0.278	79	52	13.3	22.8	0.0
22	120	18.9	19.2	0.279	80	52	13.5	22.5	0.0
23	120	19.0	19.3	0.282	80	52	13.4	22.7	0.0
24	120	19.3	19.5	0.280	80	52	13.4	23.0	0.0
25	120	18.7	19.0	0.278	79	52	13.3	22.3	0.0
26	120	19.2	19.4	0.279	80	52	13.4	22.8	0.0
27	120	19.4	19.7	0.281	80	52	13.4	23.0	0.0
28	120	19.4	19.7	0.281	80	52	13.8	23.1	0.0
29	120	19.2	19.4	0.282	80	52	13.7	22.8	0.0
30	120	18.6	18.9	0.274	78	52	13.6	22.2	-0.1
31	120	19.4	19.7	0.281	80	52	13.4	23.1	0.0
32	120	19.2	19.5	0.281	80	52	13.5	22.9	0.0
33	120	19.1	19.4	0.278	79	52	13.5	22.8	0.0
34	120	19.0	19.3	0.281	80	52	13.3	22.6	0.0
35	120	19.0	19.3	0.281	80	52	13.7	22.6	0.0
36	120	19.2	19.4	0.281	80	52	13.7	22.8	0.0
37	120	19.5	19.8	0.284	81	52	13.9	23.2	0.0
38	120	19.1	19.4	0.281	80	52	13.7	22.7	0.0
39	120	18.8	19.1	0.281	80	52	13.7	22.4	0.0
40	120	19.2	19.5	0.281	80	52	13.4	22.8	0.0
41	120	18.8	19.0	0.283	81	52	13.3	22.3	0.0
42	120	19.0	19.3	0.276	79	52	13.8	22.6	0.0
43	120	19.0	19.4	0.281	80	52	13.4	22.6	0.0
44	120	19.2	19.5	0.286	82	52	13.5	22.8	0.1
45	120	18.8	19.1	0.274	78	52	13.3	22.3	0.1
46	120	18.6	18.9	0.282	81	52	13.7	22.2	0.0
47	120	19.1	19.4	0.277	79	52	13.4	22.7	0.0
48	120	19.1	19.4	0.281	80	52	13.3	22.7	0.0
49	120	18.8	19.1	0.279	80	52	13.5	22.4	0.0
50	120	18.4	18.7	0.276	79	52	13.2	21.9	0.1
Average		19.0	19.3	0.281	80	52	13.5	22.7	0.1
Std. Dev.		0.4	0.4	0.003	1	0	0.2	0.4	0.2
Maximum		20.1	20.4	0.288	82	52	14.5	23.9	1.1

Total number of blows analyzed: 50

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 75-76 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 75-76 5
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 75-76 5
6/24/2008 4:41:00 PM
Blow Number 33/32

Pile Properties

LE	78.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	9.30	ms
JC	0.50	[]

Quantity Results

CSXN	20.7	ksi
CSI	21.0	ksi
EFV	0.291	k-ft
ETR	83.1	(%)
BPM	52.0	bpm
VMX	15.6	f/s
FMX	25	kips
DFN	-0.01	in
FVP	0.74	[]

Sensors

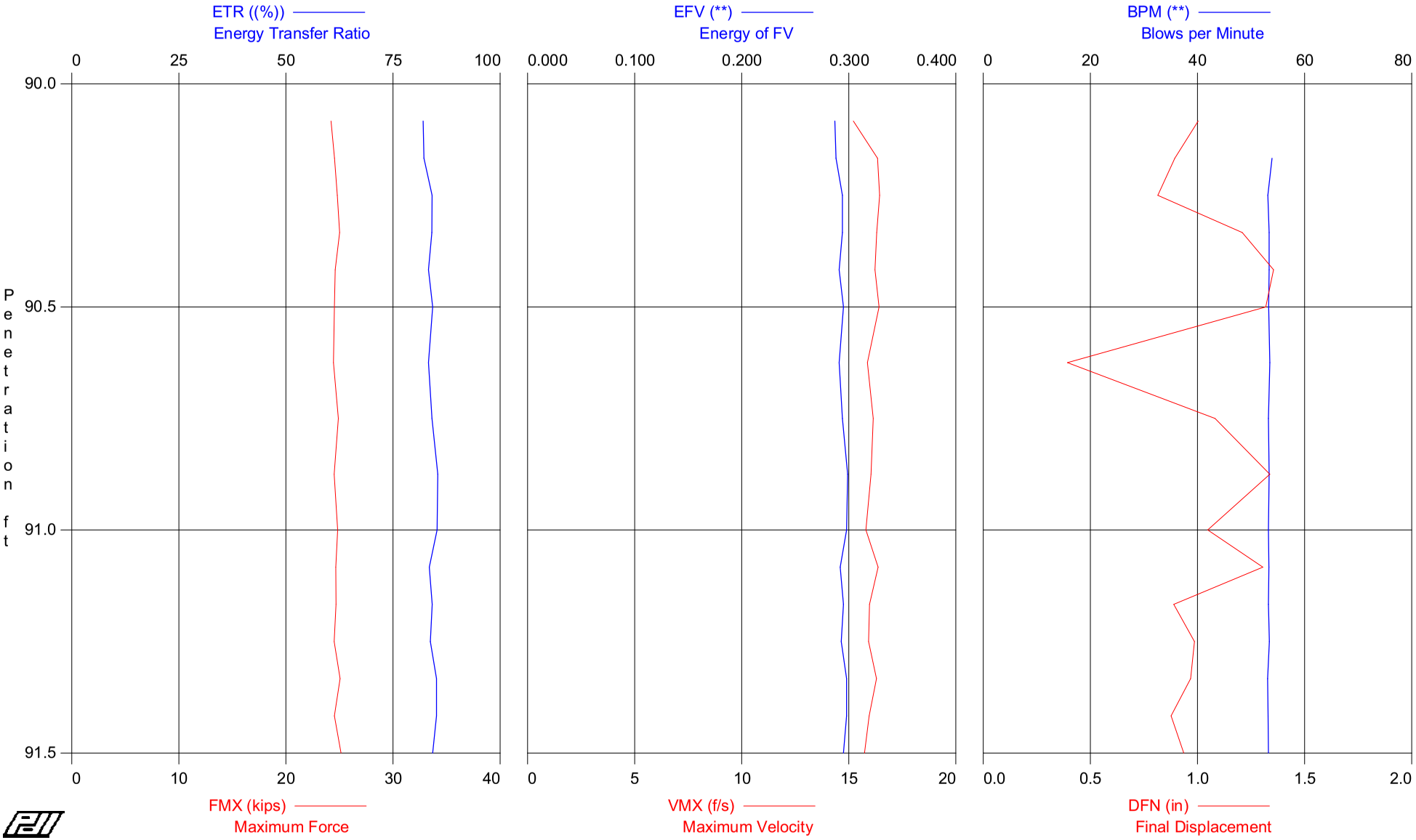
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.97
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 90-91.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 90-91.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 93.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	90.50	12	AV6	20.7	20.8	0.291	83	53	16.2	24.6	1.1
			STD	0.2	0.3	0.003	1	0	0.4	0.3	0.2
			MAX	21.0	21.3	0.295	84	54	16.4	25.0	1.4
10	91.00	8	AV4	20.7	20.9	0.296	85	53	16.0	24.7	1.0
			STD	0.2	0.1	0.003	1	0	0.1	0.2	0.3
			MAX	20.9	21.1	0.299	85	54	16.1	24.9	1.3
16	91.50	12	AV6	20.8	21.0	0.295	84	53	16.0	24.8	1.0
			STD	0.2	0.2	0.002	1	0	0.2	0.2	0.1
			MAX	21.1	21.3	0.298	85	53	16.4	25.1	1.3
			Average	20.7	20.9	0.294	84	53	16.1	24.7	1.0
			Std. Dev.	0.2	0.2	0.003	1	0	0.3	0.2	0.2
			Maximum	21.1	21.3	0.299	85	54	16.4	25.1	1.4

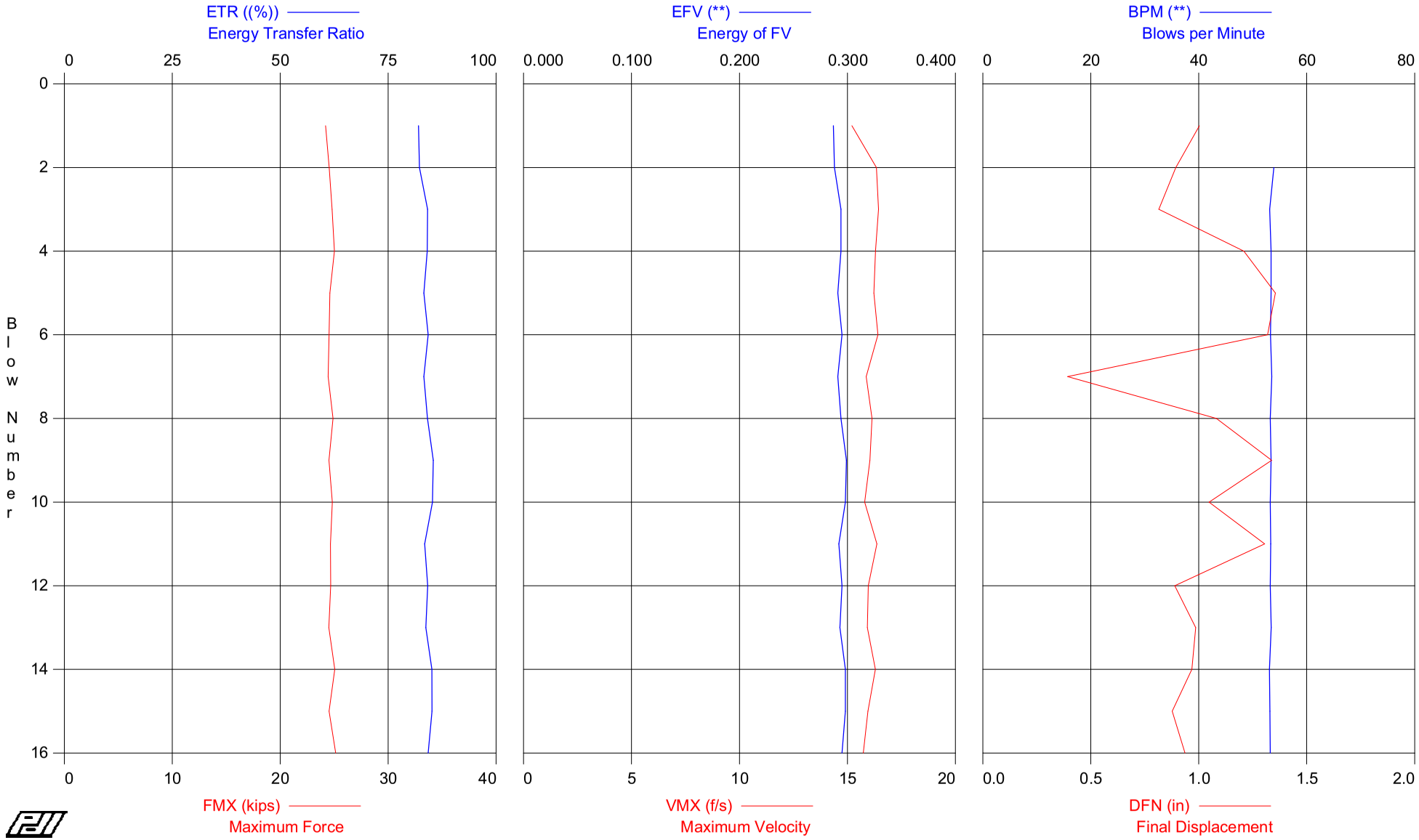
Total number of blows analyzed: 16

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 90-91.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 90-91.5
OP: DJF

HAMMER #2 AWJ B-354
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 93.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

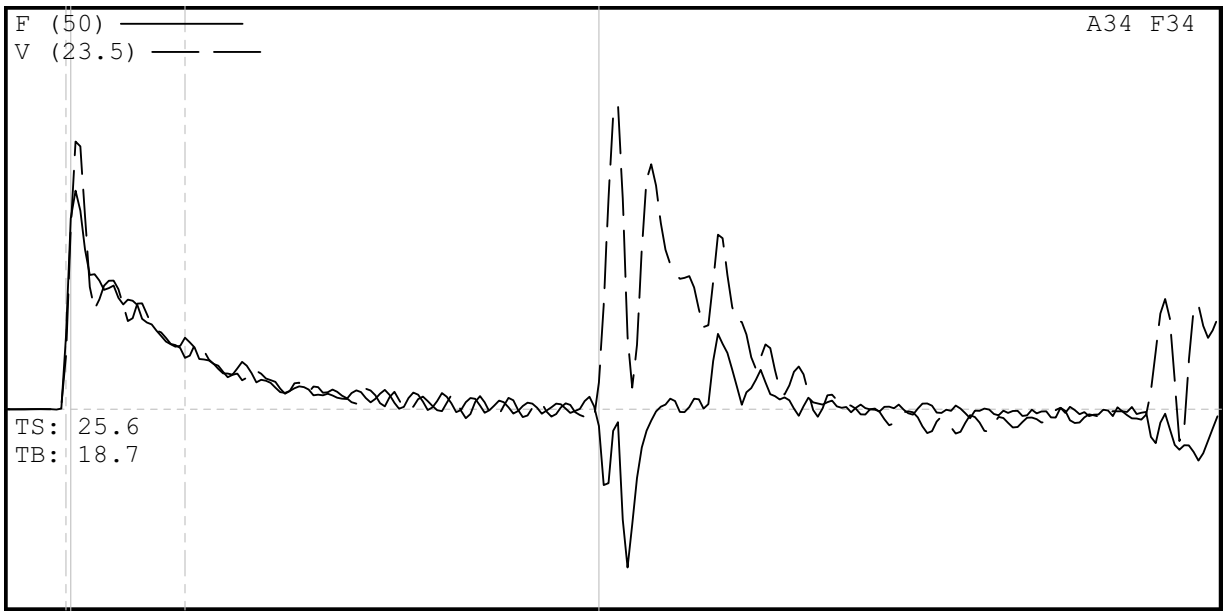
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	20.3	20.4	0.287	82	0	15.2	24.2	1.0
2	12	20.6	20.8	0.288	82	54	16.3	24.5	0.9
3	12	20.8	21.0	0.294	84	53	16.4	24.8	0.8
4	12	21.0	21.3	0.294	84	53	16.3	25.0	1.2
5	12	20.7	20.8	0.291	83	53	16.2	24.6	1.4
6	12	20.6	20.8	0.295	84	53	16.4	24.5	1.3
7	8	20.5	20.8	0.291	83	54	15.9	24.4	0.4
8	8	20.9	21.0	0.294	84	53	16.1	24.9	1.1
9	8	20.6	20.8	0.299	85	53	16.0	24.5	1.3
10	8	20.9	21.1	0.298	85	53	15.8	24.8	1.0
11	12	20.7	20.8	0.292	83	53	16.4	24.7	1.3
12	12	20.7	20.9	0.295	84	53	16.0	24.7	0.9
13	12	20.6	20.8	0.293	84	53	15.9	24.5	1.0
14	12	21.1	21.2	0.298	85	53	16.3	25.1	1.0
15	12	20.6	20.8	0.298	85	53	16.0	24.5	0.9
16	12	21.1	21.3	0.295	84	53	15.7	25.1	0.9
Average		20.7	20.9	0.294	84	53	16.1	24.7	1.0
Std. Dev.		0.2	0.2	0.003	1	0	0.3	0.2	0.2
Maximum		21.1	21.3	0.299	85	54	16.4	25.1	1.4

Total number of blows analyzed: 16

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 90-91 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 90-91 5
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 90-91 5
6/24/2008 5:56:25 PM
Blow Number 32/16

Pile Properties

LE	93.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	11.10	ms
JC	0.50	[]

Quantity Results

CSXN	22.8	ksi
CSI	23.0	ksi
EFV	0.306	k-ft
ETR	87.5	(%)
BPM	53.2	bpm
VMX	17.8	f/s
FMX	27	kips
DFN	0.94	in
FVP	0.82	[]

Sensors

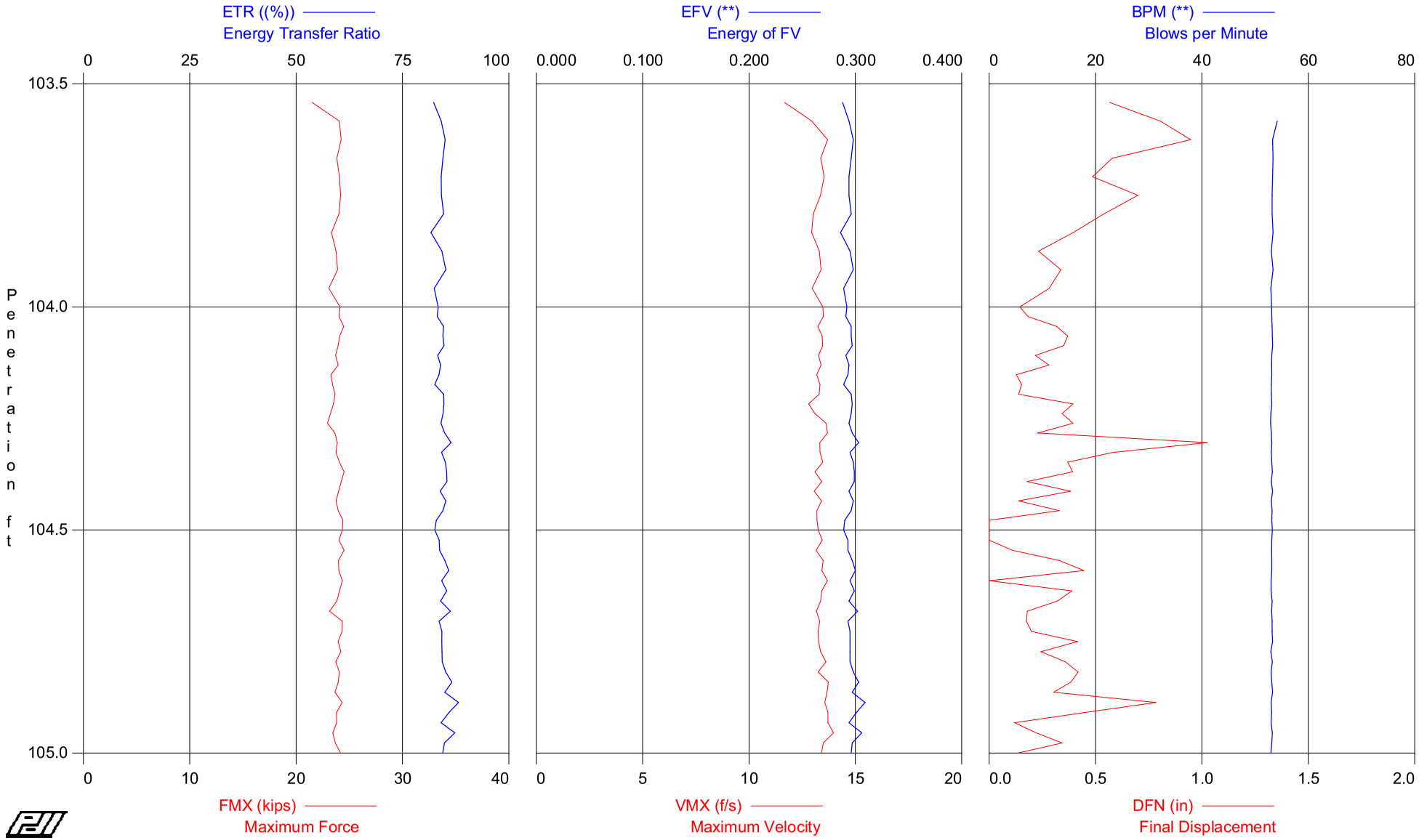
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.98
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 103.5-105
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 103.5-105
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 1.16 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
12	104.00	24	AV12	20.4	20.5	0.293	84	53	13.1	23.7	0.5
			STD	0.6	0.6	0.004	1	0	0.5	0.7	0.2
			MAX	20.9	21.1	0.298	85	54	13.7	24.2	0.9
35	104.50	46	AV23	20.6	20.7	0.295	84	53	13.3	23.9	0.3
			STD	0.3	0.3	0.003	1	0	0.2	0.4	0.2
			MAX	21.1	21.2	0.303	86	53	13.7	24.5	1.0
57	105.00	44	AV22	20.7	20.8	0.298	85	53	13.5	24.0	0.3
			STD	0.3	0.3	0.004	1	0	0.2	0.3	0.2
			MAX	21.1	21.2	0.309	88	53	14.0	24.5	0.8
			Average	20.6	20.7	0.296	84	53	13.3	23.9	0.3
			Std. Dev.	0.4	0.4	0.004	1	0	0.3	0.5	0.2
			Maximum	21.1	21.2	0.309	88	54	14.0	24.5	1.0

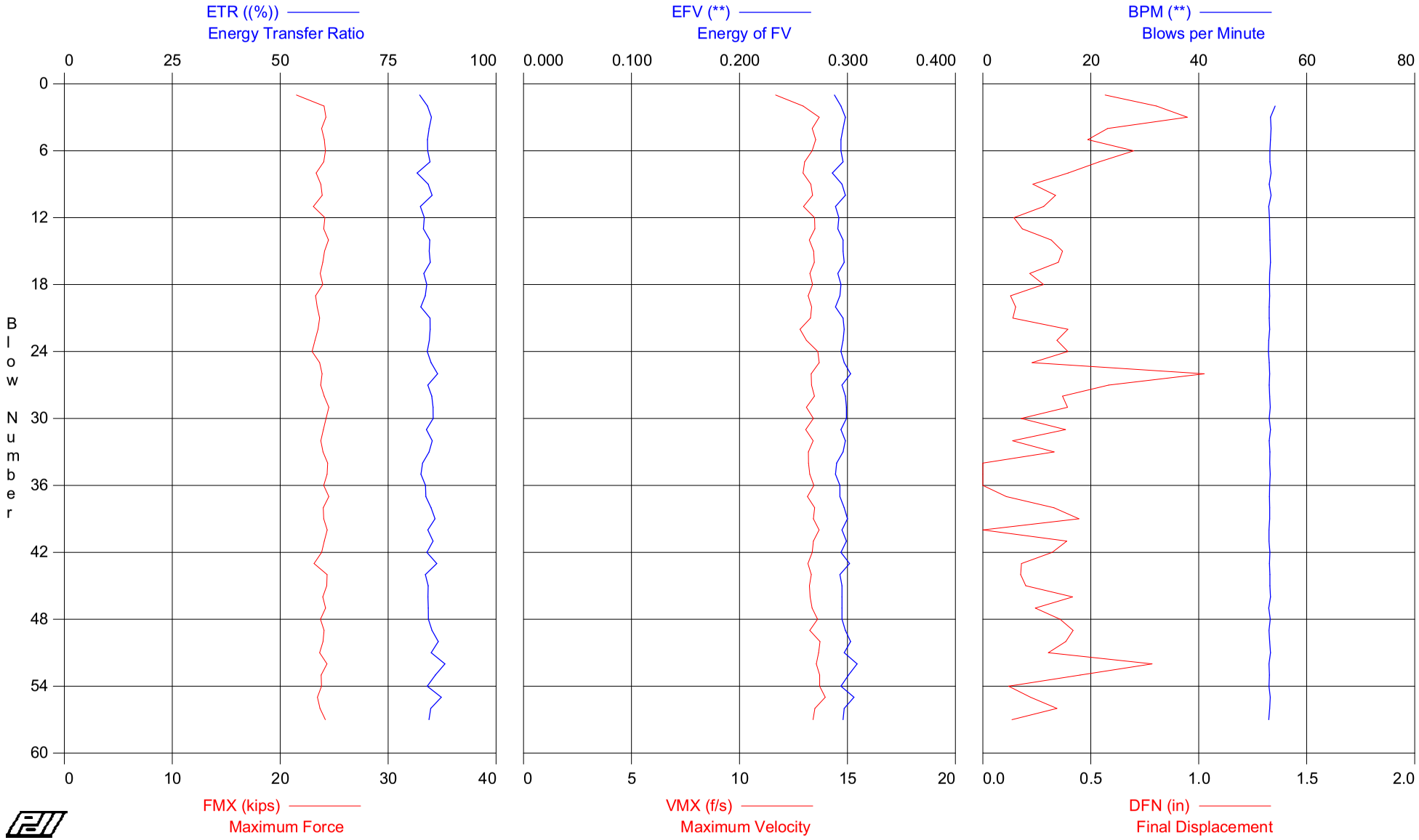
Total number of blows analyzed: 57

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 103.5-105
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 103.5-105
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 1.16 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

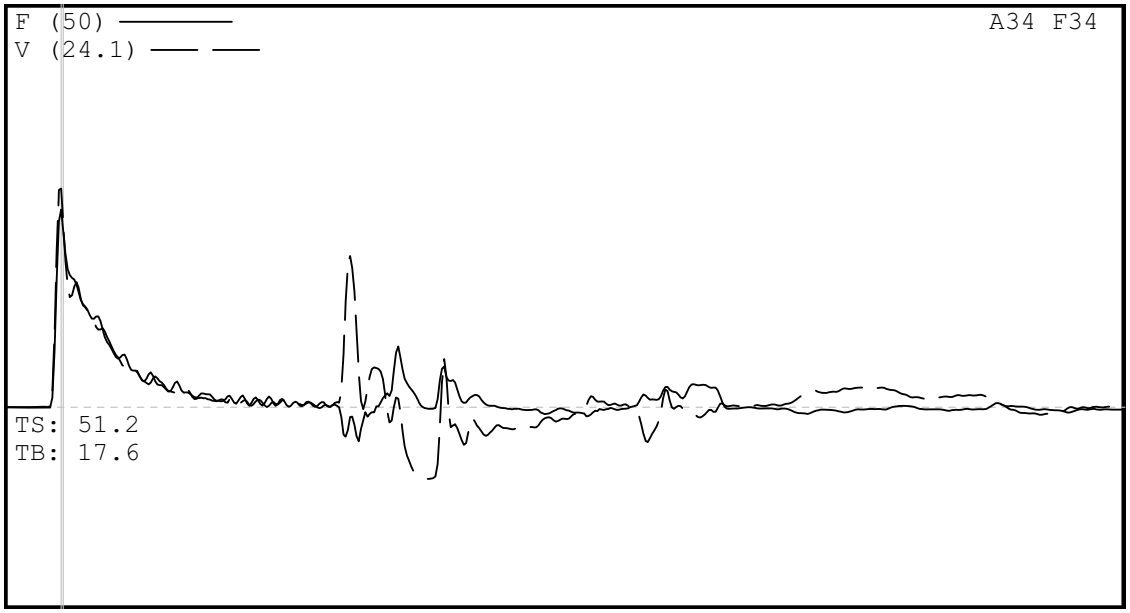
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	24	18.5	18.8	0.288	82	0	11.7	21.5	0.6
2	24	20.7	20.7	0.294	84	54	13.0	24.1	0.8
3	24	20.9	21.1	0.298	85	53	13.7	24.2	0.9
4	24	20.5	20.7	0.296	84	53	13.4	23.8	0.6
5	24	20.8	20.9	0.294	84	53	13.5	24.1	0.5
6	24	20.8	21.0	0.294	84	53	13.4	24.2	0.7
7	24	20.7	20.8	0.296	85	53	13.0	24.0	0.5
8	24	20.1	20.2	0.286	82	53	12.9	23.3	0.4
9	24	20.5	20.7	0.295	84	53	13.3	23.8	0.2
10	24	20.6	20.6	0.298	85	53	13.4	23.9	0.3
11	24	19.9	20.0	0.289	82	53	13.0	23.1	0.3
12	24	20.8	21.0	0.292	83	53	13.5	24.1	0.1
13	46	20.7	20.9	0.291	83	53	13.5	24.0	0.2
14	46	21.1	21.1	0.296	85	53	13.2	24.5	0.3
15	46	20.8	20.9	0.296	84	53	13.4	24.1	0.4
16	46	20.6	20.8	0.297	85	53	13.5	23.9	0.4
17	46	20.4	20.5	0.291	83	53	13.3	23.7	0.2
18	46	20.6	20.8	0.294	84	53	13.4	23.9	0.3
19	46	20.1	20.3	0.293	84	53	13.2	23.3	0.1
20	46	20.2	20.5	0.289	83	53	13.3	23.4	0.2
21	46	20.4	20.6	0.296	85	53	13.3	23.7	0.1
22	46	20.3	20.3	0.297	85	53	12.8	23.5	0.4
23	46	20.0	20.1	0.296	85	53	13.1	23.2	0.3
24	46	19.8	20.0	0.294	84	53	13.6	22.9	0.4
25	46	20.4	20.6	0.297	85	53	13.7	23.6	0.2
26	46	20.6	20.6	0.303	86	53	13.3	23.9	1.0
27	46	20.5	20.6	0.295	84	53	13.3	23.8	0.6
28	46	20.8	21.0	0.298	85	53	13.5	24.1	0.4
29	46	21.1	21.2	0.299	85	53	13.1	24.5	0.4
30	46	20.9	21.1	0.299	85	53	13.4	24.2	0.2
31	46	20.7	20.7	0.294	84	53	13.1	24.0	0.4
32	46	20.5	20.7	0.298	85	53	13.4	23.8	0.1
33	46	20.7	20.7	0.296	84	53	13.2	24.0	0.3
34	46	21.0	21.1	0.290	83	53	13.2	24.4	0.0
35	46	21.0	21.1	0.289	83	53	13.3	24.3	-0.1
36	44	20.7	21.0	0.293	84	53	13.4	24.0	-0.3
37	44	21.1	21.2	0.293	84	53	13.1	24.5	0.1
38	44	20.7	20.9	0.297	85	53	13.5	24.0	0.3
39	44	20.7	21.0	0.300	86	53	13.4	24.0	0.4
40	44	21.0	21.2	0.295	84	53	13.7	24.3	-0.1
41	44	20.8	20.8	0.299	85	53	13.4	24.1	0.4
42	44	20.5	20.6	0.294	84	53	13.4	23.8	0.3
43	44	19.9	20.0	0.302	86	53	13.2	23.1	0.2
44	44	21.0	21.1	0.293	84	53	13.3	24.3	0.2
45	44	21.0	21.0	0.295	84	53	13.2	24.3	0.2
46	44	20.6	20.7	0.295	84	53	13.3	23.9	0.4
47	44	20.9	21.0	0.295	84	53	13.4	24.2	0.2
48	44	20.5	20.7	0.295	84	53	13.6	23.7	0.4
49	44	20.7	20.8	0.298	85	53	13.3	24.1	0.4
50	44	20.7	20.9	0.303	87	53	13.7	24.0	0.4
51	44	20.4	20.6	0.297	85	53	13.7	23.7	0.3
52	44	21.0	21.0	0.309	88	53	13.6	24.3	0.8
53	44	20.5	20.7	0.301	86	53	13.7	23.8	0.5
54	44	20.5	20.7	0.294	84	53	13.7	23.8	0.1
55	44	20.2	20.4	0.306	87	53	14.0	23.4	0.2
56	44	20.4	20.5	0.297	85	53	13.5	23.7	0.3
57	44	20.8	20.9	0.296	84	53	13.4	24.2	0.1
Average		20.6	20.7	0.296	84	53	13.3	23.9	0.3
Std. Dev.		0.4	0.4	0.004	1	0	0.3	0.5	0.2
Maximum		21.1	21.2	0.309	88	54	14.0	24.5	1.0

Total number of blows analyzed: 57

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 103 5-105



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 103 5-105
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 103 5-105
6/25/2008 11:07:23 AM
Blow Number 30/29

Pile Properties

LE	1.16	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	0.10	ms
JC	0.50	[]
LP	104.37	ft

Quantity Results

CSXN	21.1	ksi
CSI	21.2	ksi
EFV	0.299	k-ft
ETR	85.4	(%)
BPM	53.2	bpm
VMX	13.1	f/s
FMX	25	kips
DFN	0.39	in
FVP	0.91	[]

Sensors

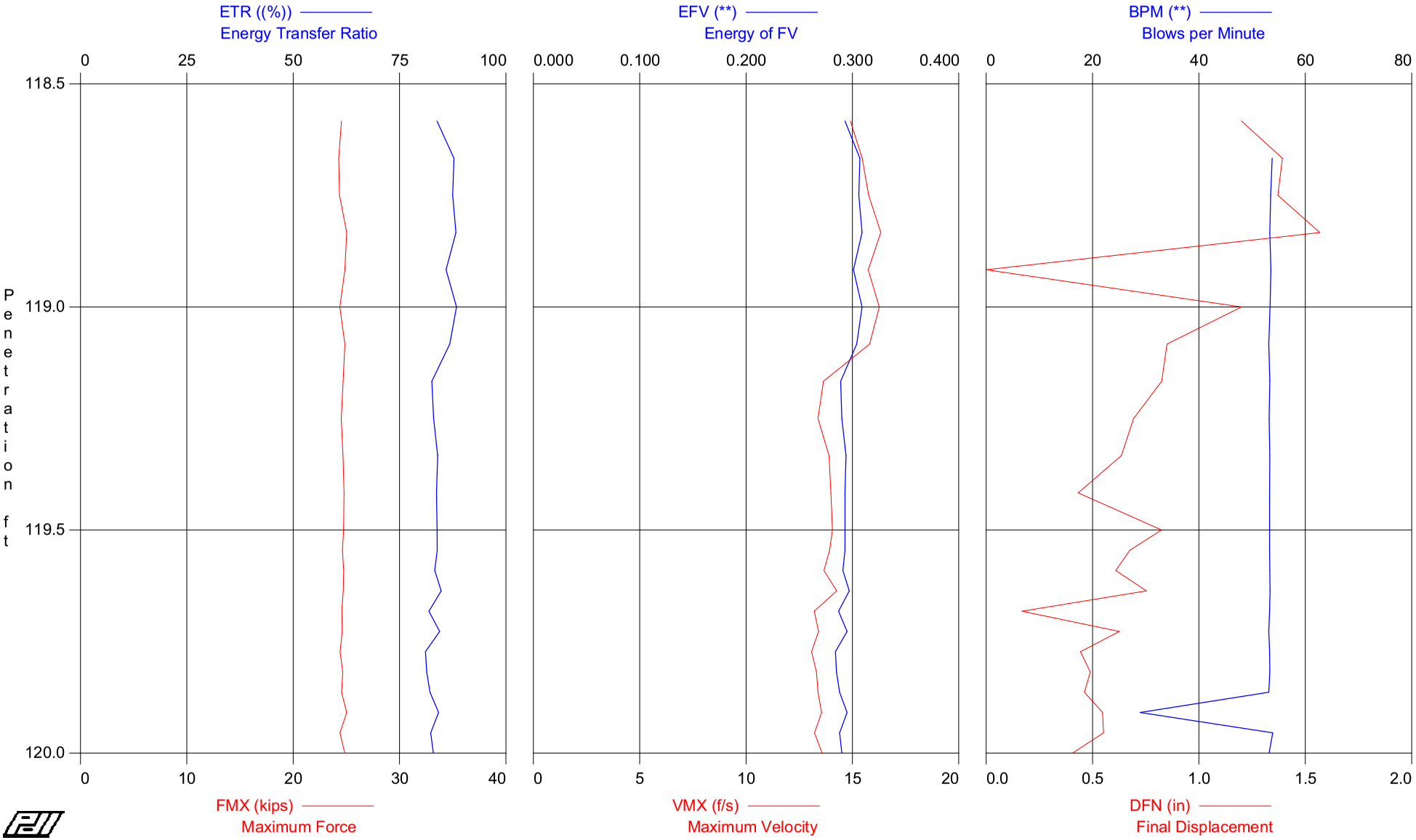
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [K0397] 370 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: HIGH 1.27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 118.5-120
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 118.5-120
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 123.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	119.00	12	AV6	21.2	21.3	0.304	87	53	15.7	24.6	1.1
			STD	0.2	0.2	0.006	2	0	0.5	0.3	0.6
			MAX	21.6	21.6	0.309	88	54	16.3	25.0	1.6
12	119.50	12	AV6	21.3	21.4	0.294	84	53	14.1	24.7	0.7
			STD	0.1	0.1	0.005	1	0	0.8	0.1	0.1
			MAX	21.4	21.7	0.304	87	53	15.8	24.9	0.9
23	120.00	22	AV11	21.3	21.4	0.290	83	51	13.5	24.7	0.5
			STD	0.2	0.2	0.004	1	7	0.3	0.2	0.1
			MAX	21.6	21.7	0.297	85	54	14.3	25.0	0.8
			Average	21.2	21.4	0.295	84	52	14.3	24.6	0.7
			Std. Dev.	0.2	0.2	0.007	2	5	1.1	0.2	0.4
			Maximum	21.6	21.7	0.309	88	54	16.3	25.0	1.6

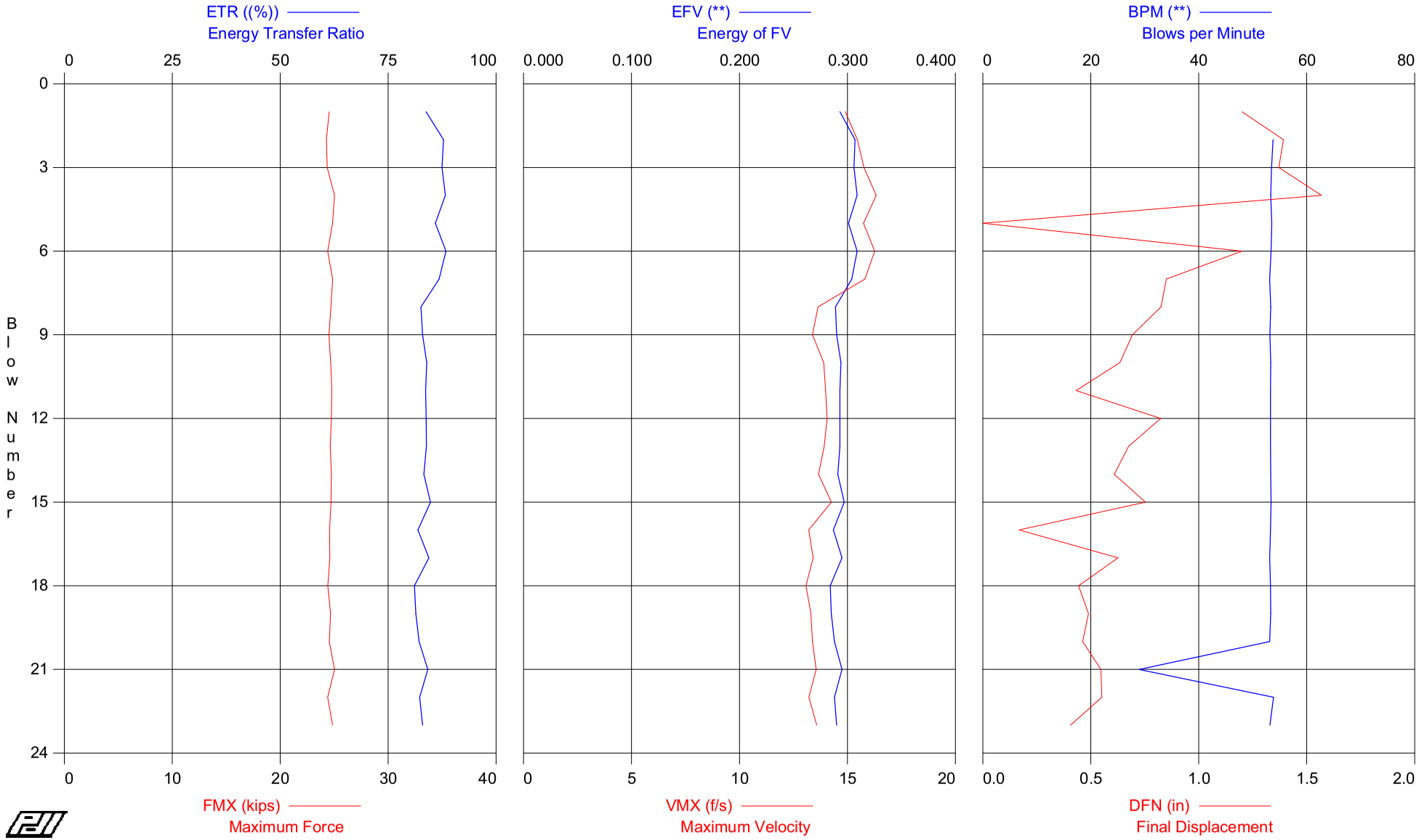
Total number of blows analyzed: 23

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 118.5-120
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 118.5-120
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 123.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

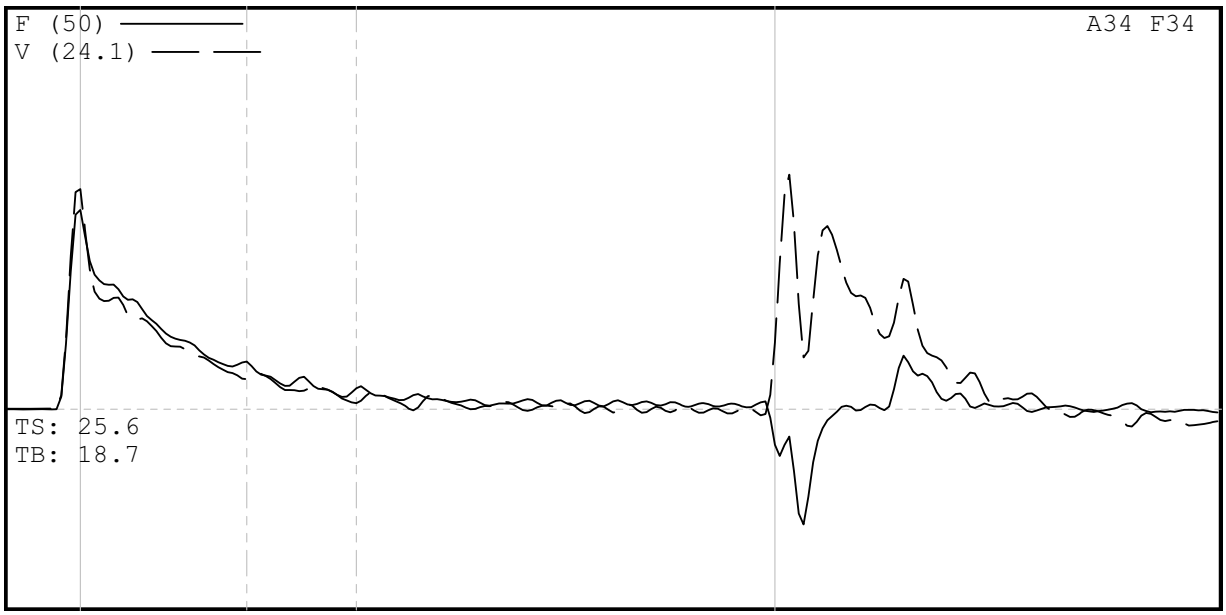
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	21.2	21.2	0.293	84	0	14.9	24.5	1.2
2	12	20.9	21.1	0.307	88	54	15.5	24.3	1.4
3	12	21.0	21.2	0.306	87	53	15.8	24.4	1.4
4	12	21.6	21.6	0.309	88	53	16.3	25.0	1.6
5	12	21.4	21.4	0.301	86	54	15.7	24.9	-0.3
6	12	21.0	21.2	0.309	88	53	16.3	24.4	1.2
7	12	21.4	21.7	0.304	87	53	15.8	24.9	0.9
8	12	21.3	21.5	0.289	83	53	13.6	24.7	0.8
9	12	21.1	21.4	0.290	83	53	13.4	24.5	0.7
10	12	21.3	21.3	0.294	84	53	13.9	24.7	0.6
11	12	21.4	21.4	0.293	84	53	14.0	24.8	0.4
12	12	21.3	21.4	0.293	84	53	14.1	24.7	0.8
13	22	21.2	21.5	0.293	84	53	13.9	24.6	0.7
14	22	21.3	21.6	0.291	83	53	13.7	24.7	0.6
15	22	21.3	21.4	0.297	85	53	14.3	24.7	0.8
16	22	21.2	21.2	0.287	82	53	13.2	24.6	0.2
17	22	21.2	21.3	0.295	84	53	13.4	24.6	0.6
18	22	21.0	21.2	0.284	81	53	13.1	24.4	0.4
19	22	21.3	21.3	0.285	81	53	13.3	24.7	0.5
20	22	21.2	21.4	0.288	82	53	13.4	24.5	0.5
21	22	21.6	21.7	0.295	84	29	13.6	25.0	0.5
22	22	21.0	21.1	0.288	82	54	13.2	24.4	0.6
23	22	21.4	21.5	0.290	83	53	13.6	24.9	0.4
Average		21.2	21.4	0.295	84	52	14.3	24.6	0.7
Std. Dev.		0.2	0.2	0.007	2	5	1.1	0.2	0.4
Maximum		21.6	21.7	0.309	88	54	16.3	25.0	1.6

Total number of blows analyzed: 23

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 118 5-120



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 118 5-12
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 118 5-120
6/25/2008 12:26:15 PM
Blow Number 13/12

Pile Properties

LE	123.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	14.60	ms
JC	0.50	[]
LP	119.50	ft

Quantity Results

CSXN	21.3	ksi
CSI	21.4	ksi
EFV	0.293	k-ft
ETR	83.8	(%)
BPM	53.3	bpm
VMX	14.1	f/s
FMX	25	kips
DFN	0.82	in
FVP	0.91	[]

Sensors

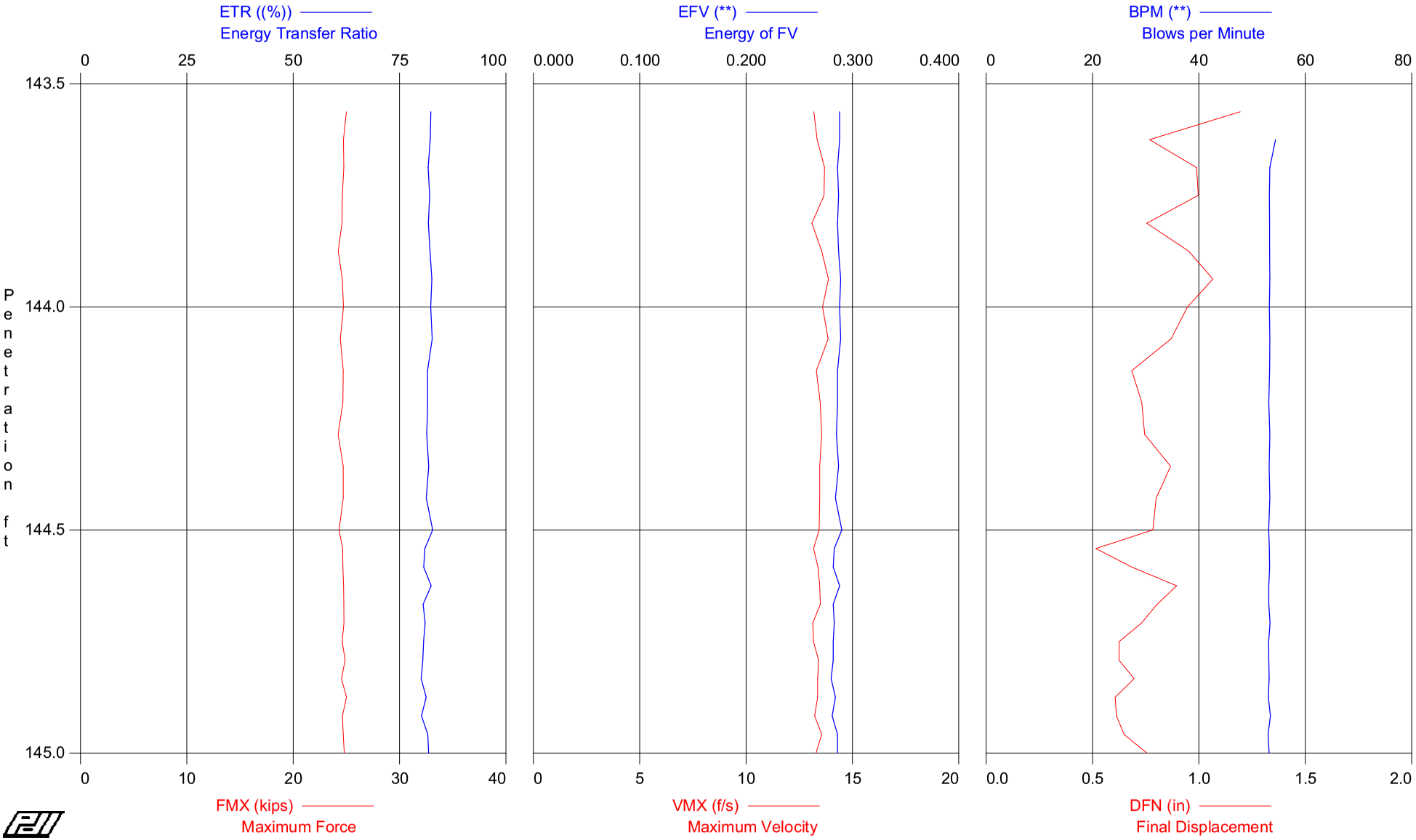
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [K0397] 370 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: HIGH 1.36

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 143.5-145
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 143.5-145
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 148.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	144.00	16	AV8	21.3	21.3	0.287	82	53	13.5	24.7	1.0
			STD	0.2	0.2	0.001	0	0	0.3	0.2	0.1
			MAX	21.6	21.8	0.289	83	54	13.9	25.0	1.2
15	144.50	14	AV7	21.2	21.2	0.287	82	53	13.5	24.5	0.8
			STD	0.2	0.2	0.002	1	0	0.2	0.2	0.1
			MAX	21.3	21.3	0.290	83	53	13.9	24.7	0.9
27	145.00	24	AV12	21.3	21.4	0.283	81	53	13.3	24.7	0.7
			STD	0.1	0.1	0.002	1	0	0.1	0.1	0.1
			MAX	21.6	21.6	0.288	82	53	13.6	25.0	0.9
			Average	21.3	21.3	0.285	82	53	13.4	24.7	0.8
			Std. Dev.	0.2	0.2	0.003	1	0	0.2	0.2	0.2
			Maximum	21.6	21.8	0.290	83	54	13.9	25.0	1.2

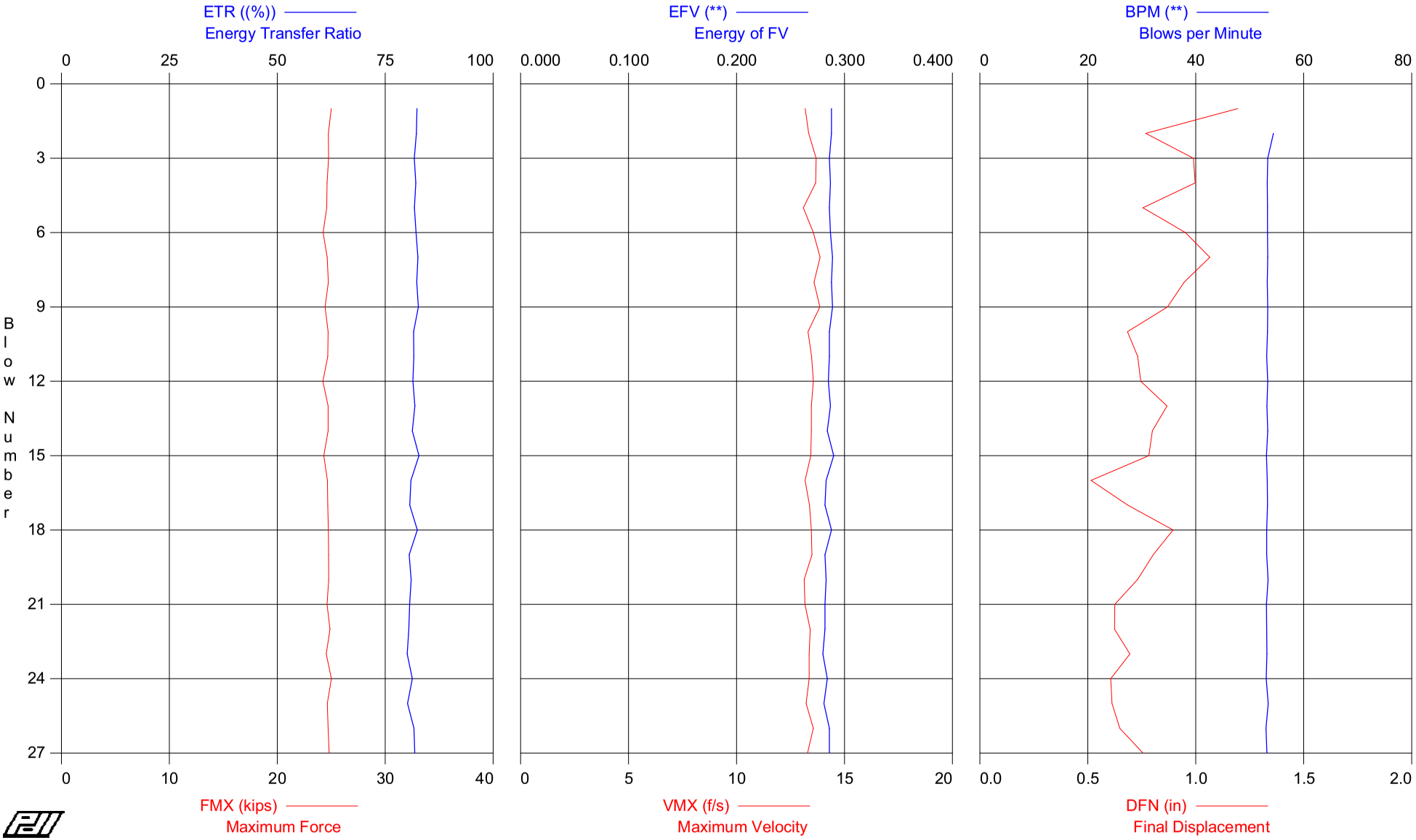
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 143.5-145
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 143.5-145
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 148.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

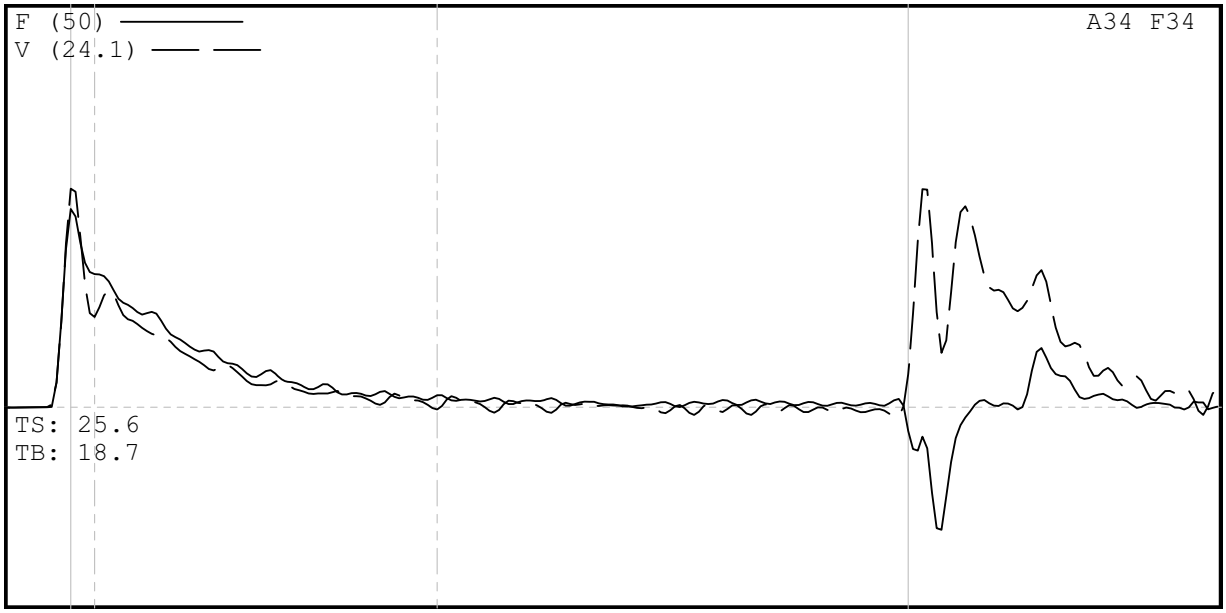
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	21.6	21.8	0.288	82	0	13.2	25.0	1.2
2	16	21.3	21.4	0.288	82	54	13.3	24.7	0.8
3	16	21.3	21.3	0.286	82	53	13.7	24.8	1.0
4	16	21.2	21.2	0.287	82	53	13.7	24.6	1.0
5	16	21.2	21.3	0.286	82	53	13.1	24.6	0.8
6	16	20.9	21.1	0.287	82	53	13.6	24.2	1.0
7	16	21.2	21.3	0.289	83	53	13.9	24.6	1.1
8	16	21.3	21.3	0.288	82	53	13.6	24.7	0.9
9	14	21.1	21.2	0.289	83	53	13.9	24.4	0.9
10	14	21.3	21.3	0.286	82	53	13.3	24.7	0.7
11	14	21.3	21.3	0.286	82	53	13.5	24.7	0.7
12	14	20.9	20.9	0.285	81	53	13.6	24.2	0.7
13	14	21.3	21.3	0.287	82	53	13.5	24.7	0.9
14	14	21.3	21.3	0.284	81	53	13.5	24.7	0.8
15	14	21.0	21.0	0.290	83	53	13.4	24.3	0.8
16	24	21.2	21.3	0.283	81	53	13.2	24.6	0.5
17	24	21.3	21.3	0.282	81	53	13.4	24.7	0.7
18	24	21.3	21.4	0.288	82	53	13.5	24.7	0.9
19	24	21.3	21.4	0.282	81	53	13.5	24.8	0.8
20	24	21.3	21.4	0.283	81	53	13.1	24.8	0.7
21	24	21.2	21.3	0.282	81	53	13.2	24.6	0.6
22	24	21.4	21.5	0.282	80	53	13.4	24.9	0.6
23	24	21.2	21.2	0.280	80	53	13.4	24.5	0.7
24	24	21.6	21.6	0.284	81	53	13.4	25.0	0.6
25	24	21.2	21.3	0.281	80	53	13.2	24.6	0.6
26	24	21.3	21.4	0.286	82	53	13.6	24.7	0.6
27	24	21.4	21.4	0.286	82	53	13.3	24.8	0.8
Average		21.3	21.3	0.285	82	53	13.4	24.7	0.8
Std. Dev.		0.2	0.2	0.003	1	0	0.2	0.2	0.2
Maximum		21.6	21.8	0.290	83	54	13.9	25.0	1.2

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 143 5-145



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 143 5-14
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 143 5-145
6/25/2008 3:55:27 PM
Blow Number 11/5

Pile Properties

LE	148.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	17.60	ms
JC	0.50	[]
LP	143.81	ft

Quantity Results

CSXN	21.2	ksi
CSI	21.3	ksi
EFV	0.286	k-ft
ETR	81.8	(%)
BPM	53.3	bpm
VMX	13.1	f/s
FMX	25	kips
DFN	0.75	in
FVP	0.91	[]

Sensors

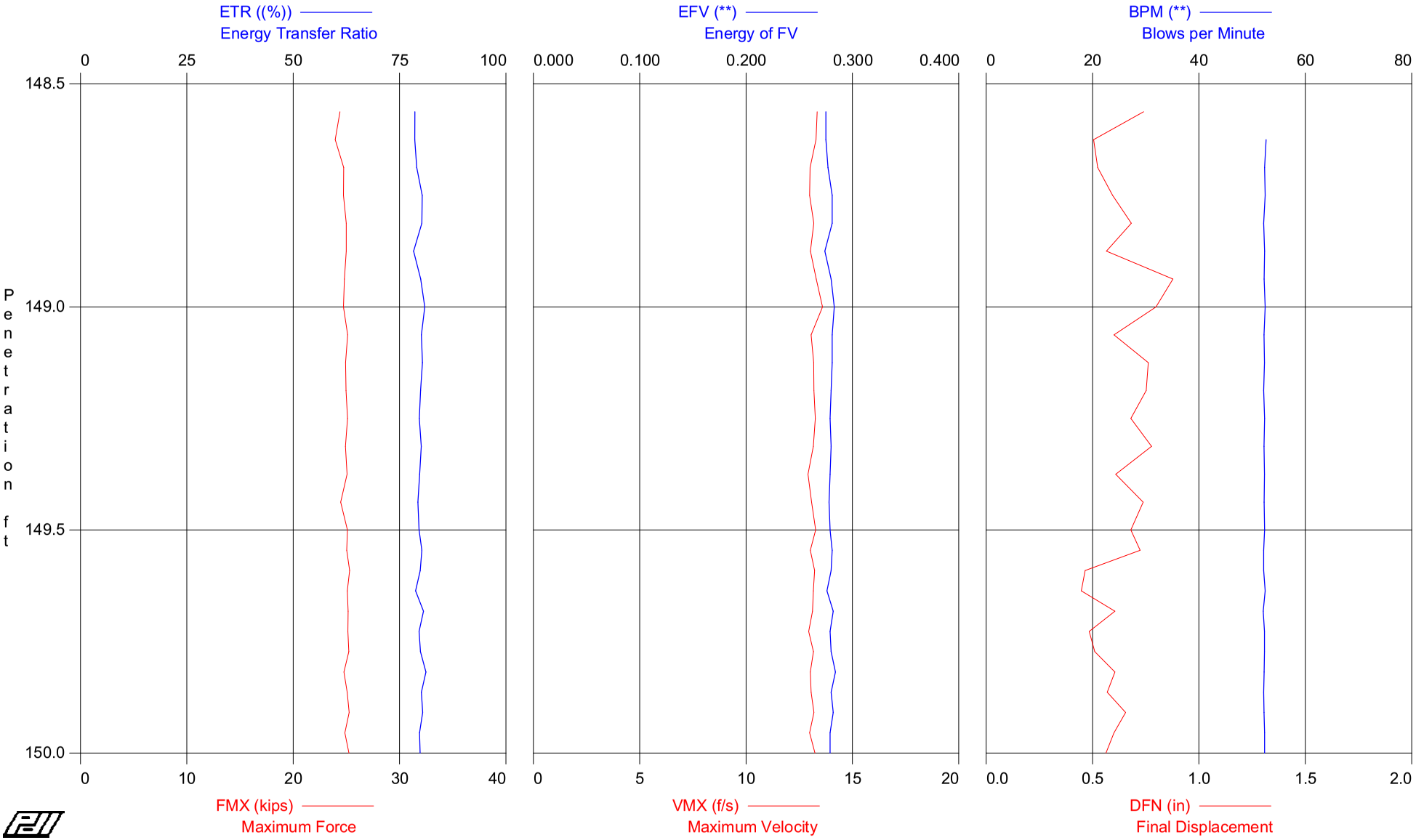
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K611] 380 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: LOW 0.77

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 148.5-150
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 148.5-150
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 153.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	149.00	16	AV8	21.3	21.4	0.278	79	52	13.2	24.7	0.7
			STD	0.3	0.2	0.003	1	0	0.2	0.3	0.1
			MAX	21.5	21.6	0.283	81	53	13.6	25.0	0.9
16	149.50	16	AV8	21.5	21.6	0.280	80	52	13.1	25.0	0.7
			STD	0.2	0.1	0.001	0	0	0.1	0.2	0.1
			MAX	21.7	21.7	0.281	80	52	13.3	25.1	0.8
27	150.00	22	AV11	21.6	21.7	0.280	80	52	13.1	25.1	0.6
			STD	0.1	0.1	0.002	1	0	0.1	0.2	0.1
			MAX	21.8	21.9	0.284	81	52	13.2	25.3	0.7
			Average	21.5	21.6	0.279	80	52	13.1	24.9	0.6
			Std. Dev.	0.3	0.2	0.002	1	0	0.1	0.3	0.1
			Maximum	21.8	21.9	0.284	81	53	13.6	25.3	0.9

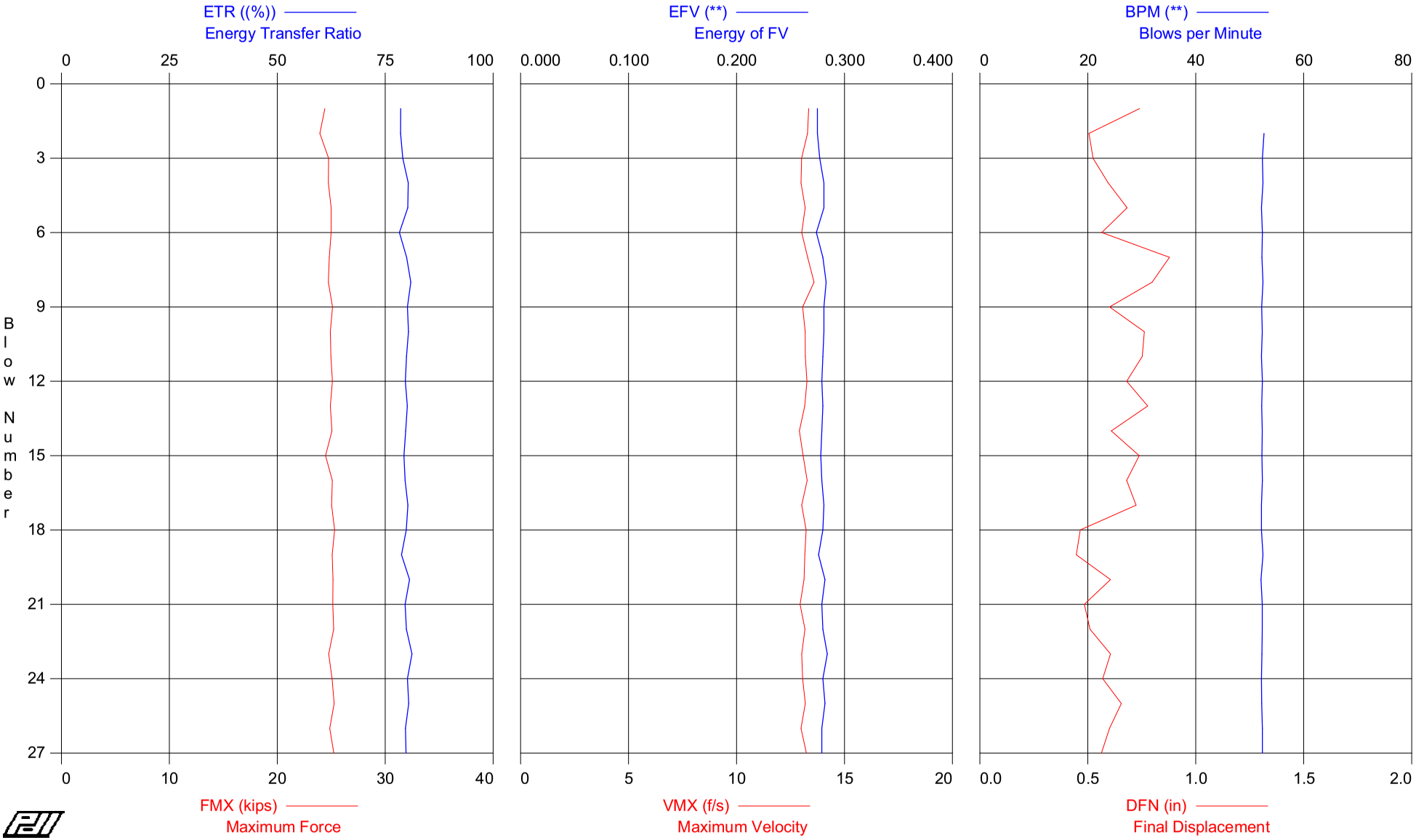
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 148.5-150
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 148.5-150
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 153.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

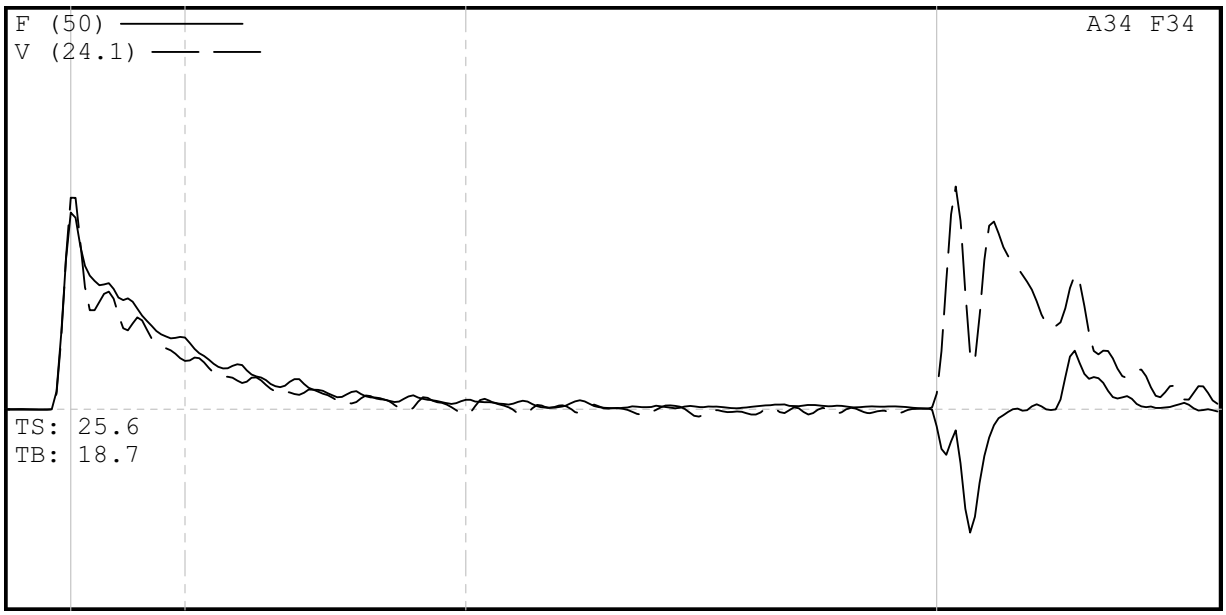
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	21.0	21.2	0.275	79	0	13.3	24.4	0.7
2	16	20.6	20.8	0.275	79	53	13.3	23.9	0.5
3	16	21.3	21.4	0.277	79	52	13.0	24.7	0.5
4	16	21.3	21.4	0.281	80	52	13.0	24.7	0.6
5	16	21.5	21.6	0.281	80	52	13.2	25.0	0.7
6	16	21.5	21.6	0.274	78	52	13.0	25.0	0.6
7	16	21.4	21.5	0.280	80	52	13.3	24.8	0.9
8	16	21.3	21.5	0.283	81	52	13.6	24.7	0.8
9	16	21.7	21.7	0.281	80	52	13.1	25.1	0.6
10	16	21.5	21.6	0.281	80	52	13.2	24.9	0.8
11	16	21.5	21.6	0.280	80	52	13.2	25.0	0.8
12	16	21.6	21.7	0.279	80	52	13.3	25.1	0.7
13	16	21.5	21.6	0.280	80	52	13.2	24.9	0.8
14	16	21.6	21.7	0.279	80	52	12.9	25.1	0.6
15	16	21.1	21.3	0.278	79	52	13.1	24.5	0.7
16	16	21.6	21.7	0.279	80	52	13.3	25.1	0.7
17	22	21.6	21.6	0.281	80	52	13.0	25.0	0.7
18	22	21.8	21.9	0.280	80	52	13.2	25.3	0.5
19	22	21.6	21.7	0.276	79	52	13.2	25.1	0.4
20	22	21.7	21.7	0.282	81	52	13.1	25.2	0.6
21	22	21.7	21.7	0.279	80	52	12.9	25.1	0.5
22	22	21.8	21.8	0.280	80	52	13.2	25.2	0.5
23	22	21.3	21.4	0.284	81	52	13.0	24.8	0.6
24	22	21.6	21.6	0.280	80	52	13.1	25.1	0.6
25	22	21.8	21.9	0.282	80	52	13.2	25.3	0.7
26	22	21.4	21.5	0.279	80	52	13.0	24.9	0.6
27	22	21.8	21.9	0.279	80	52	13.2	25.2	0.6
Average		21.5	21.6	0.279	80	52	13.1	24.9	0.6
Std. Dev.		0.3	0.2	0.002	1	0	0.1	0.3	0.1
Maximum		21.8	21.9	0.284	81	53	13.6	25.3	0.9

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 148 5-150



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 148 5-15(
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 148 5-150
6/25/2008 4:19:41 PM
Blow Number 15/1

Pile Properties

LE	153.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	18.20	ms
JC	0.50	[]
LP	148.56	ft

Quantity Results

CSXN	21.0	ksi
CSI	21.2	ksi
EFV	0.275	k-ft
ETR	78.6	(%)
BPM	0.0	bpm
VMX	13.3	f/s
FMX	24	kips
DFN	0.74	in
FVP	0.93	[]

Sensors

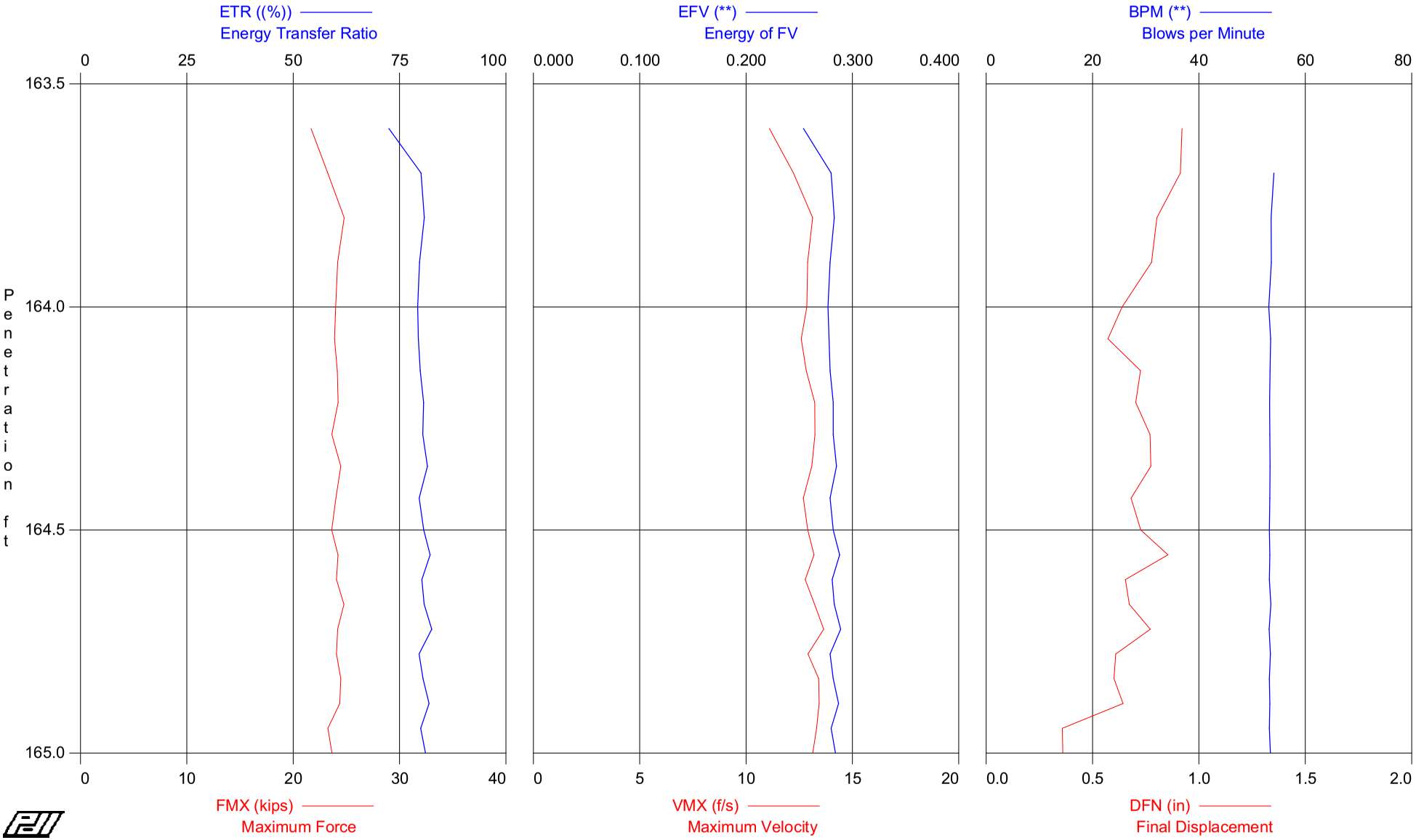
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K611] 380 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: LOW 0.75

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 163.5-165
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 163.5-165
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 168.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	164.00	10	AV5	20.3	20.4	0.275	78	54	12.4	23.6	0.8
			STD	0.9	0.9	0.010	3	0	0.7	1.1	0.1
			MAX	21.4	21.4	0.283	81	54	13.1	24.8	0.9
12	164.50	14	AV7	20.7	20.8	0.281	80	53	12.9	24.0	0.7
			STD	0.3	0.2	0.002	1	0	0.2	0.3	0.1
			MAX	21.1	21.2	0.285	82	53	13.2	24.5	0.8
21	165.00	18	AV9	20.8	20.9	0.284	81	53	13.2	24.1	0.6
			STD	0.4	0.3	0.003	1	0	0.3	0.4	0.2
			MAX	21.4	21.4	0.289	83	54	13.6	24.8	0.9
			Average	20.6	20.7	0.281	80	53	12.9	23.9	0.7
			Std. Dev.	0.6	0.6	0.007	2	0	0.5	0.6	0.1
			Maximum	21.4	21.4	0.289	83	54	13.6	24.8	0.9

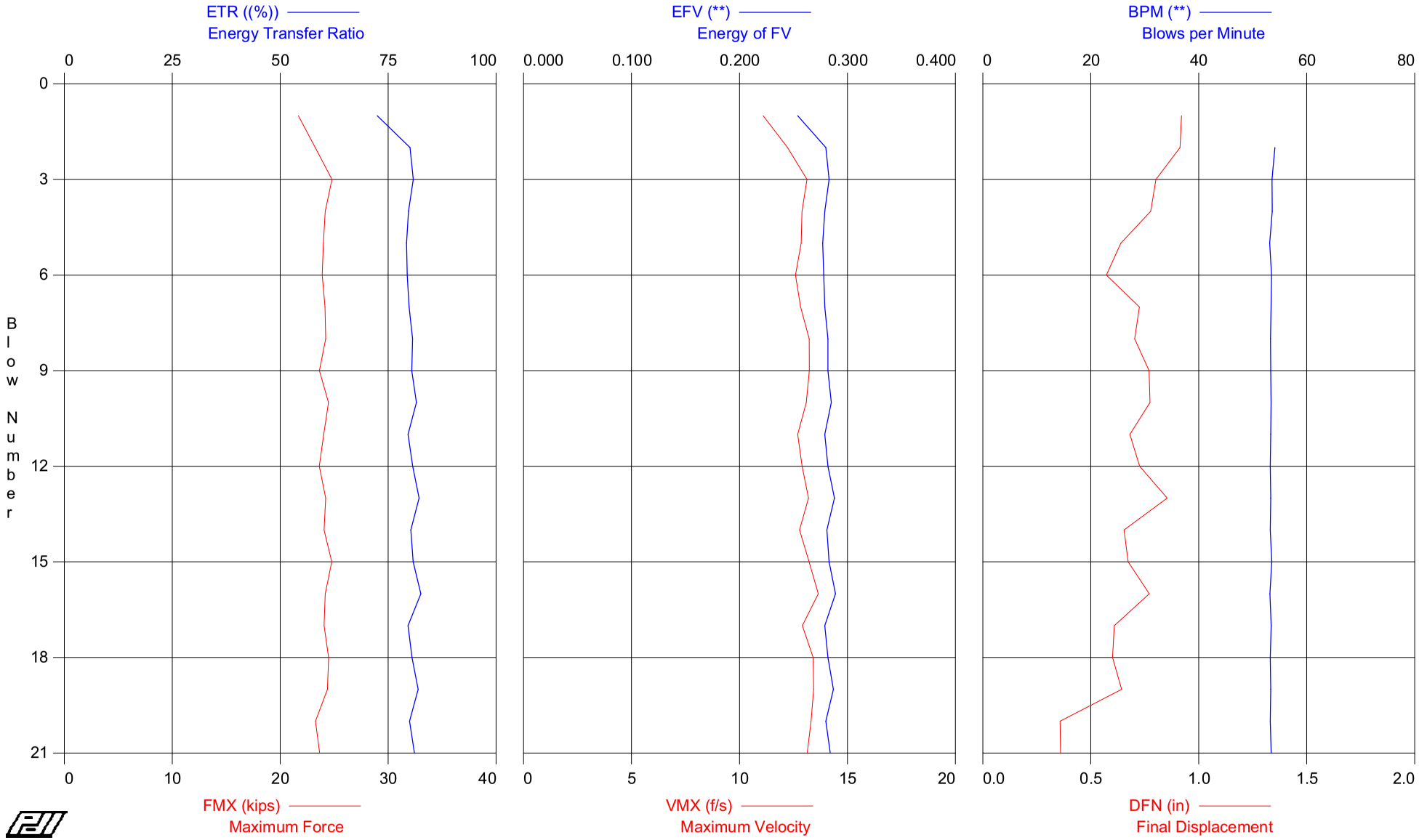
Total number of blows analyzed: 21

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 163.5-165
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 163.5-165
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 168.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

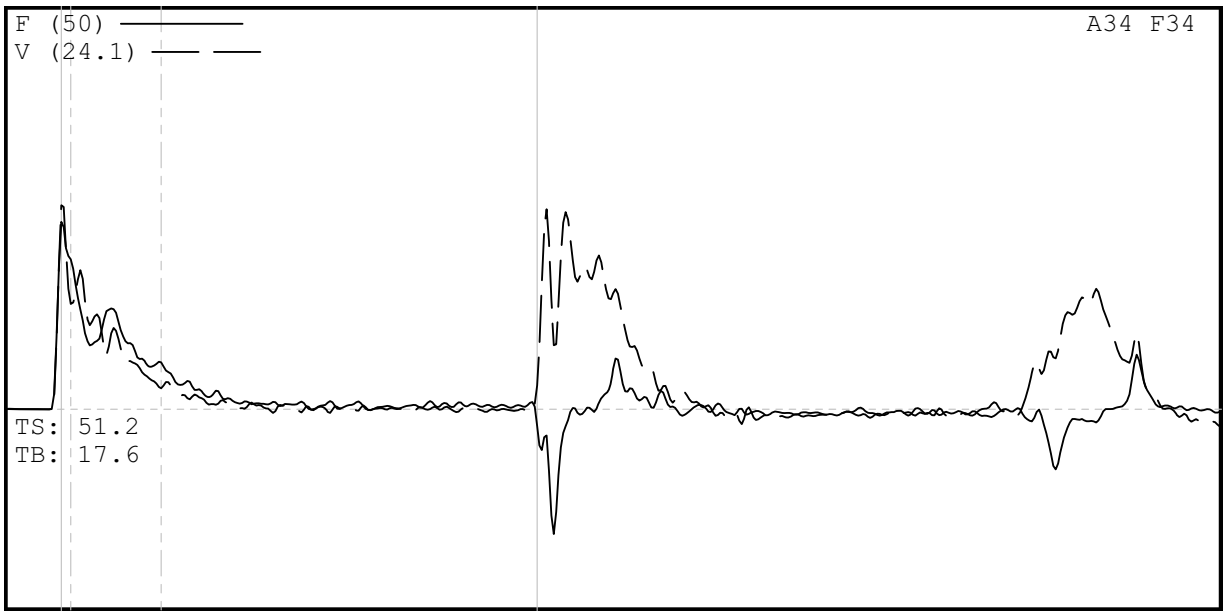
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	18.7	18.7	0.254	72	0	11.1	21.7	0.9
2	10	20.0	20.1	0.280	80	54	12.2	23.2	0.9
3	10	21.4	21.4	0.283	81	54	13.1	24.8	0.8
4	10	20.8	20.9	0.279	80	54	12.9	24.2	0.8
5	10	20.7	20.8	0.277	79	53	12.9	24.0	0.6
6	14	20.6	20.6	0.278	79	53	12.6	23.9	0.6
7	14	20.8	20.9	0.279	80	53	12.8	24.1	0.7
8	14	20.9	21.0	0.282	81	53	13.2	24.2	0.7
9	14	20.4	20.5	0.282	80	53	13.2	23.6	0.8
10	14	21.1	21.2	0.285	82	53	13.1	24.5	0.8
11	14	20.7	20.7	0.279	80	53	12.7	24.0	0.7
12	14	20.4	20.6	0.282	81	53	12.9	23.6	0.7
13	18	20.9	20.9	0.288	82	53	13.2	24.2	0.9
14	18	20.7	20.8	0.281	80	53	12.8	24.1	0.7
15	18	21.4	21.4	0.283	81	54	13.2	24.8	0.7
16	18	20.8	21.1	0.289	83	53	13.6	24.2	0.8
17	18	20.7	20.8	0.279	80	53	12.9	24.1	0.6
18	18	21.1	21.2	0.282	81	53	13.4	24.5	0.6
19	18	21.0	21.1	0.287	82	53	13.4	24.4	0.6
20	18	20.1	20.3	0.280	80	53	13.3	23.3	0.4
21	18	20.4	20.6	0.284	81	53	13.1	23.7	0.4
Average		20.6	20.7	0.281	80	53	12.9	23.9	0.7
Std. Dev.		0.6	0.6	0.007	2	0	0.5	0.6	0.1
Maximum		21.4	21.4	0.289	83	54	13.6	24.8	0.9

Total number of blows analyzed: 21

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 163 5-165



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 163 5-165
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 163 5-165
6/25/2008 5:30:30 PM
Blow Number 4/2

Pile Properties

LE	168.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	20.00	ms
JC	0.50	[]
LP	163.70	ft

Quantity Results

CSXN	20.0	ksi
CSI	20.1	ksi
EFV	0.280	k-ft
ETR	80.1	(%)
BPM	54.1	bpm
VMX	12.2	f/s
FMX	23	kips
DFN	0.91	in
FVP	0.92	[]

Sensors

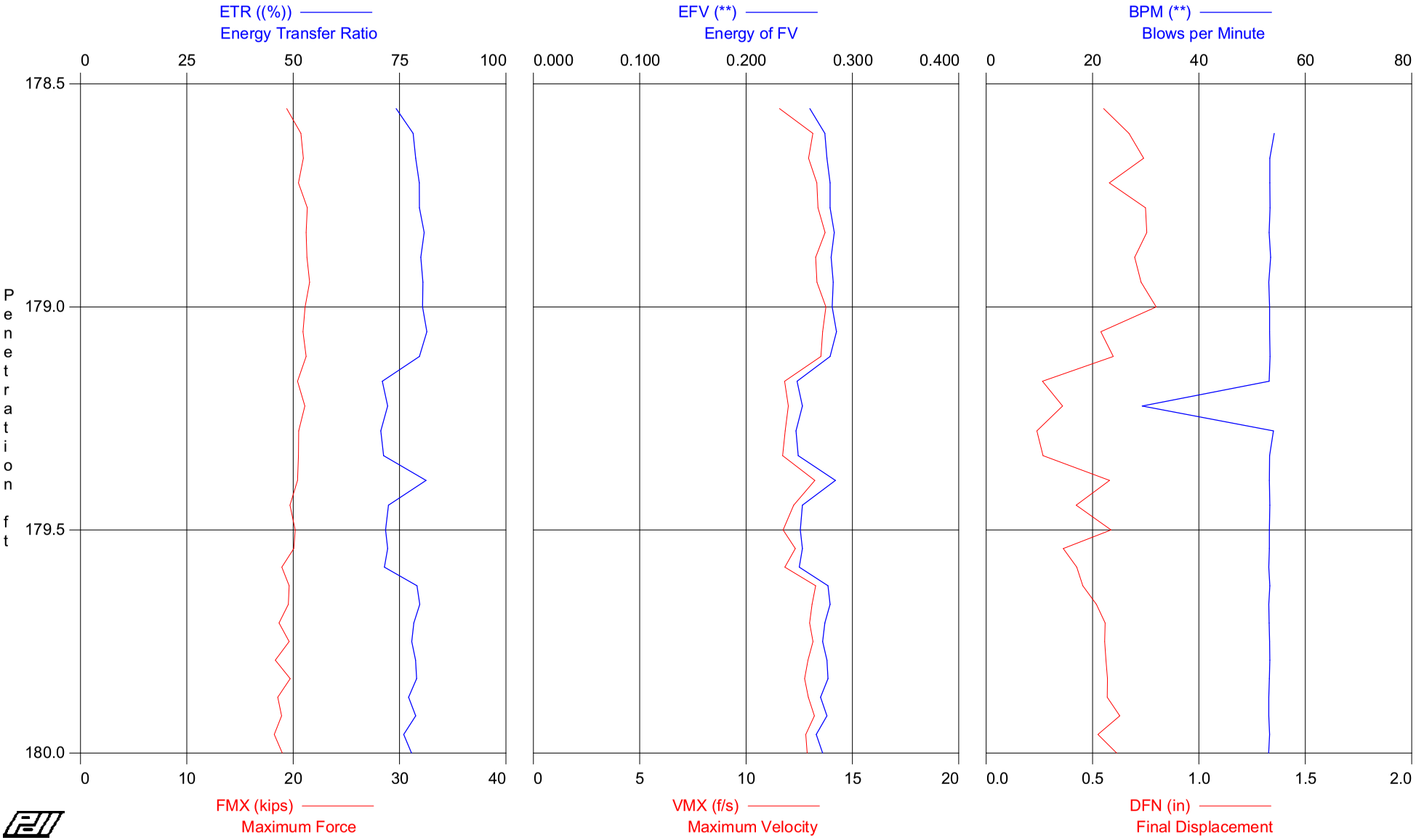
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K611] 380 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: LOW 0.72

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 178.5-180
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 178.5-180
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 183.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
9	179.00	18	AV9	18.0	18.1	0.277	79	53	13.2	20.9	0.7
			STD	0.5	0.5	0.007	2	0	0.6	0.6	0.1
			MAX	18.6	18.7	0.283	81	54	13.8	21.5	0.8
18	179.50	18	AV9	17.7	17.8	0.261	75	51	12.4	20.5	0.4
			STD	0.4	0.3	0.016	4	8	0.8	0.4	0.1
			MAX	18.3	18.3	0.285	81	54	13.6	21.2	0.6
30	180.00	24	AV12	16.5	16.7	0.270	77	53	12.8	19.1	0.5
			STD	0.5	0.4	0.009	3	0	0.4	0.6	0.1
			MAX	17.3	17.5	0.279	80	53	13.3	20.1	0.6
			Average	17.3	17.4	0.269	77	52	12.8	20.1	0.5
			Std. Dev.	0.8	0.8	0.013	4	4	0.7	1.0	0.1
			Maximum	18.6	18.7	0.285	81	54	13.8	21.5	0.8

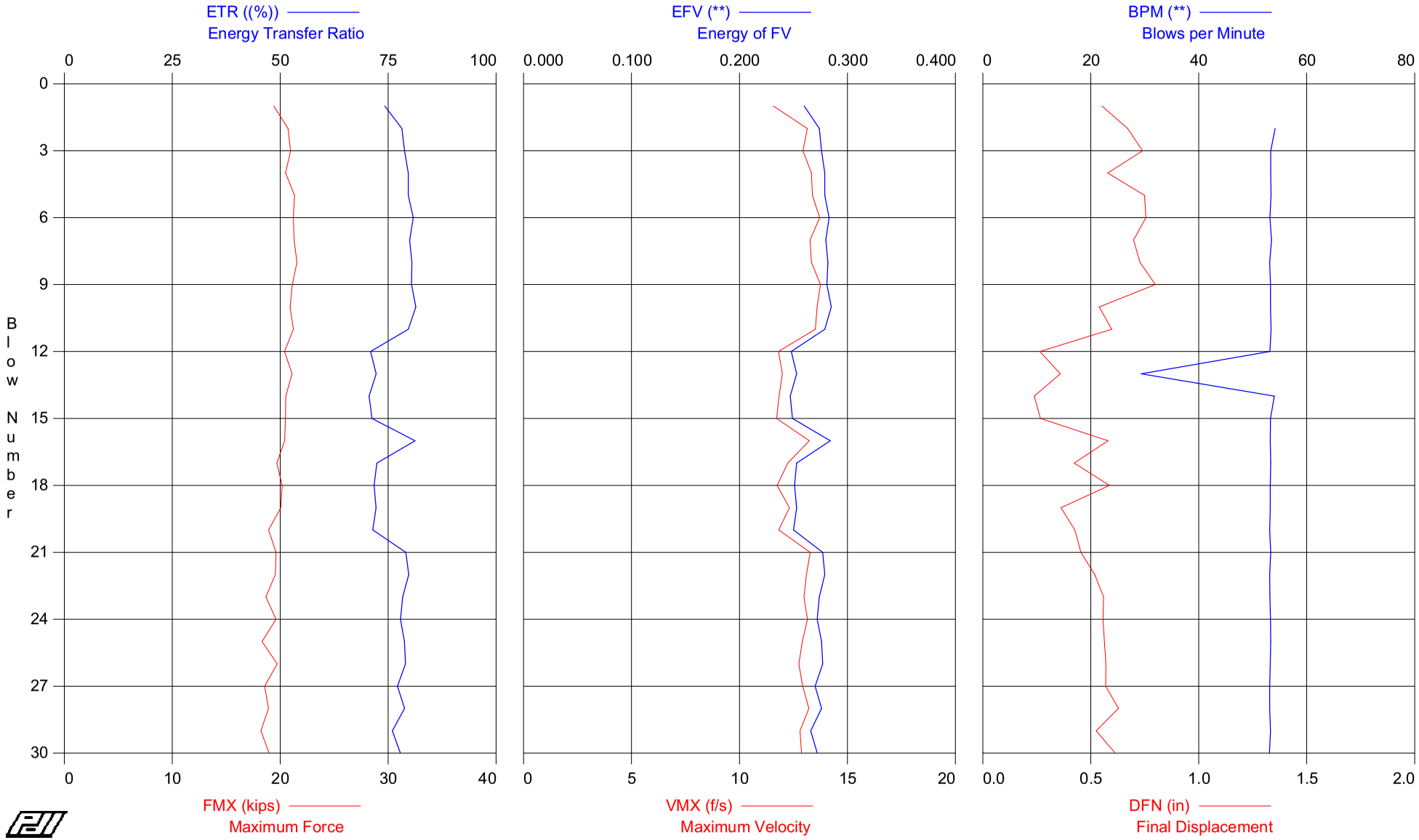
Total number of blows analyzed: 30

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 25-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 178.5-180
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 178.5-180
OP: DJF

HAMMER #2 AWJ B-354
Test date: 25-Jun-2008

AR: 1.16 in^2
LE: 183.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

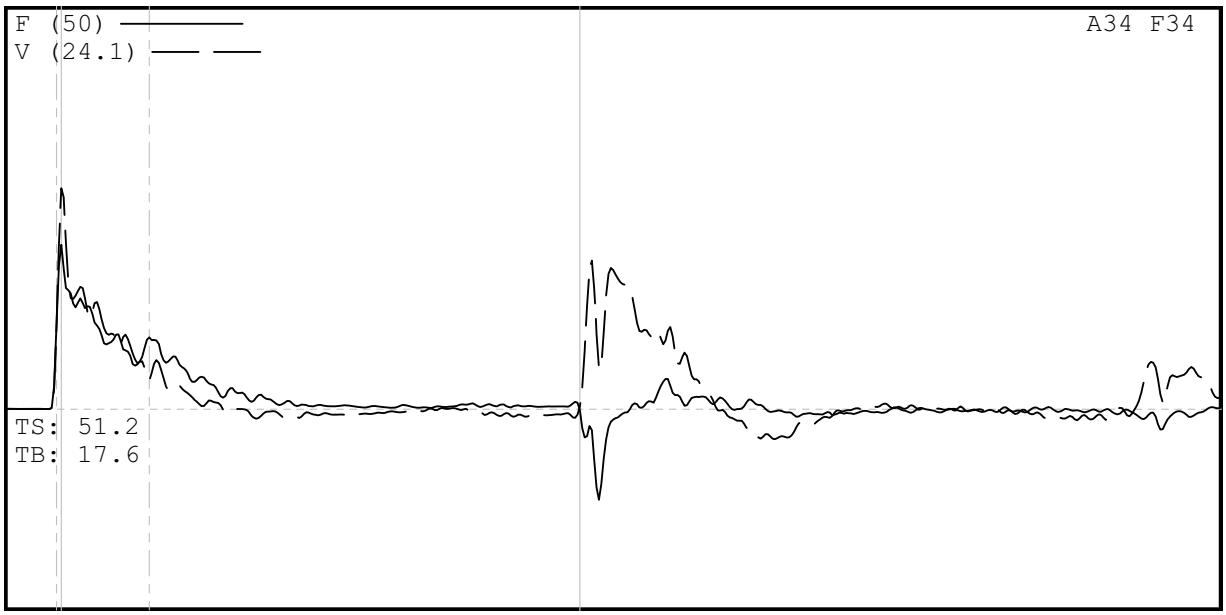
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	18	16.7	16.9	0.260	74	0	11.6	19.4	0.6
2	18	17.9	17.9	0.274	78	54	13.1	20.7	0.7
3	18	18.1	18.1	0.276	79	53	12.9	21.0	0.7
4	18	17.7	17.7	0.279	80	53	13.3	20.5	0.6
5	18	18.4	18.5	0.279	80	53	13.4	21.3	0.7
6	18	18.3	18.3	0.283	81	53	13.7	21.2	0.8
7	18	18.4	18.5	0.280	80	53	13.3	21.3	0.7
8	18	18.6	18.7	0.282	80	53	13.3	21.5	0.7
9	18	18.2	18.3	0.281	80	53	13.8	21.1	0.8
10	18	18.0	18.1	0.285	81	53	13.6	20.9	0.5
11	18	18.3	18.3	0.279	80	53	13.5	21.2	0.6
12	18	17.6	17.7	0.248	71	53	11.8	20.4	0.3
13	18	18.2	18.2	0.253	72	29	12.0	21.1	0.4
14	18	17.7	17.8	0.247	71	54	11.8	20.5	0.2
15	18	17.7	17.7	0.249	71	53	11.7	20.5	0.3
16	18	17.6	17.6	0.284	81	53	13.2	20.4	0.6
17	18	17.0	17.2	0.253	72	53	12.2	19.7	0.4
18	18	17.4	17.5	0.251	72	53	11.7	20.2	0.6
19	24	17.3	17.5	0.253	72	53	12.3	20.1	0.4
20	24	16.3	16.7	0.250	71	53	11.8	18.9	0.4
21	24	16.9	17.0	0.277	79	53	13.3	19.6	0.5
22	24	16.8	16.9	0.279	80	53	13.1	19.5	0.5
23	24	16.1	16.4	0.274	78	53	13.0	18.7	0.6
24	24	16.9	17.1	0.272	78	53	13.1	19.6	0.6
25	24	15.8	16.2	0.276	79	53	12.9	18.3	0.6
26	24	17.0	17.1	0.277	79	53	12.8	19.7	0.6
27	24	16.0	16.2	0.270	77	53	12.9	18.6	0.6
28	24	16.3	16.6	0.276	79	53	13.2	18.9	0.6
29	24	15.7	15.9	0.266	76	53	12.8	18.2	0.5
30	24	16.4	16.4	0.272	78	53	12.9	19.0	0.6
Average		17.3	17.4	0.269	77	52	12.8	20.1	0.5
Std. Dev.		0.8	0.8	0.013	4	4	0.7	1.0	0.1
Maximum		18.6	18.7	0.285	81	54	13.8	21.5	0.8

Total number of blows analyzed: 30

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 178 5-180



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 178 5-18
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 178 5-180
6/25/2008 7:12:05 PM
Blow Number 26/16

Pile Properties

LE	183.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	21.80	ms
JC	0.50	[]
LP	179.39	ft

Quantity Results

CSXN	17.6	ksi
CSI	17.6	ksi
EFV	0.284	k-ft
ETR	81.2	(%)
BPM	53.2	bpm
VMX	13.2	f/s
FMX	20	kips
DFN	0.58	in
FVP	0.74	[]

Sensors

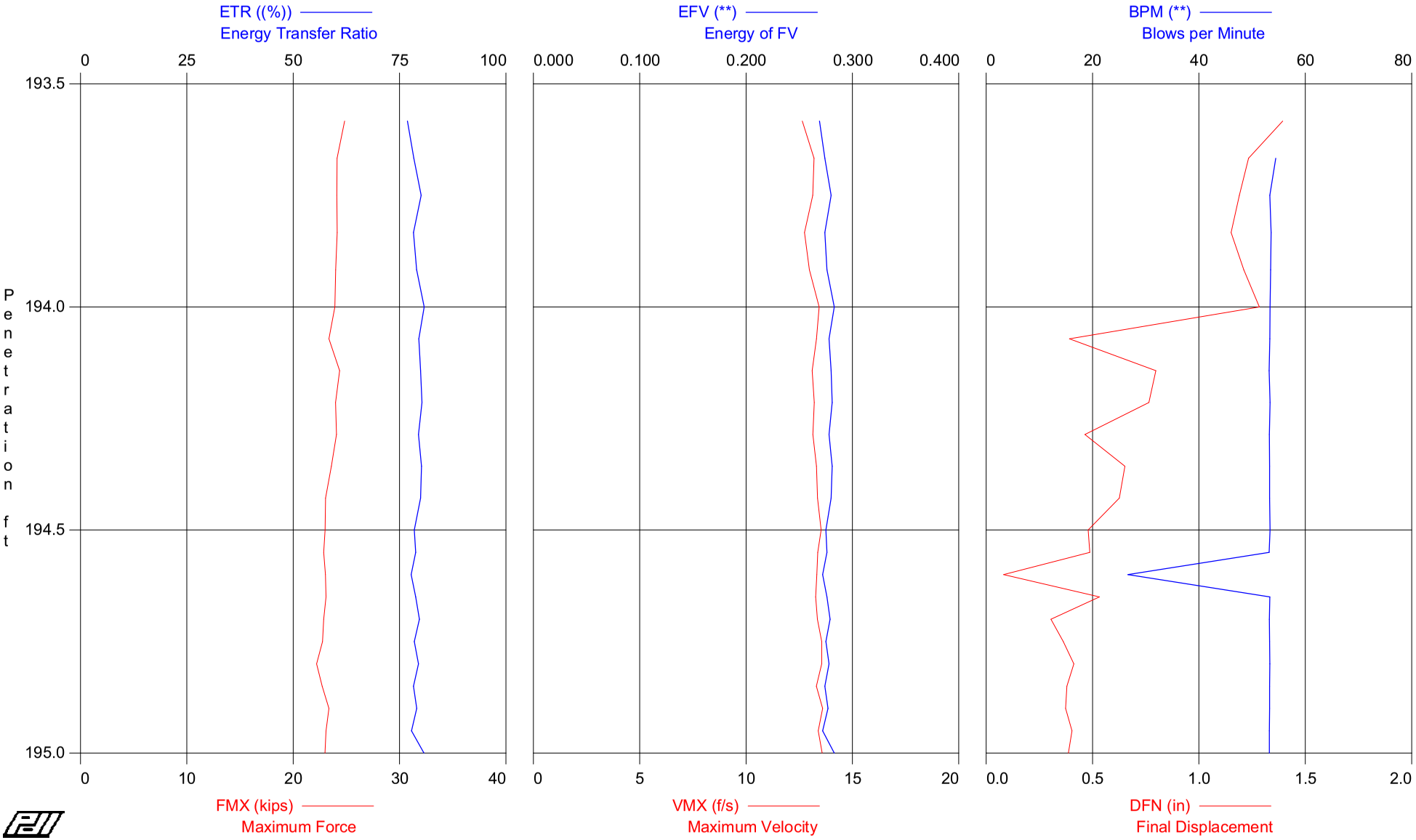
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K611] 380 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: LOW 0.76

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 26-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 193.5-195
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 193.5-195
OP: DJF

HAMMER #2 AWJ B-354
Test date: 26-Jun-2008

AR: 1.16 in^2
LE: 198.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	194.00	12	AV6	20.8	20.9	0.276	79	54	13.0	24.2	1.2
			STD	0.3	0.3	0.005	1	0	0.3	0.3	0.1
			MAX	21.4	21.5	0.283	81	54	13.4	24.8	1.4
13	194.50	14	AV7	20.4	20.4	0.279	80	53	13.3	23.6	0.6
			STD	0.4	0.4	0.002	1	0	0.1	0.5	0.1
			MAX	21.0	21.0	0.281	80	53	13.5	24.4	0.8
23	195.00	20	AV10	19.7	19.8	0.276	79	51	13.4	22.9	0.4
			STD	0.3	0.3	0.003	1	8	0.1	0.3	0.1
			MAX	20.1	20.2	0.283	81	53	13.6	23.4	0.5
			Average	20.2	20.3	0.277	79	52	13.3	23.5	0.7
			Std. Dev.	0.6	0.5	0.004	1	6	0.2	0.6	0.4
			Maximum	21.4	21.5	0.283	81	54	13.6	24.8	1.4

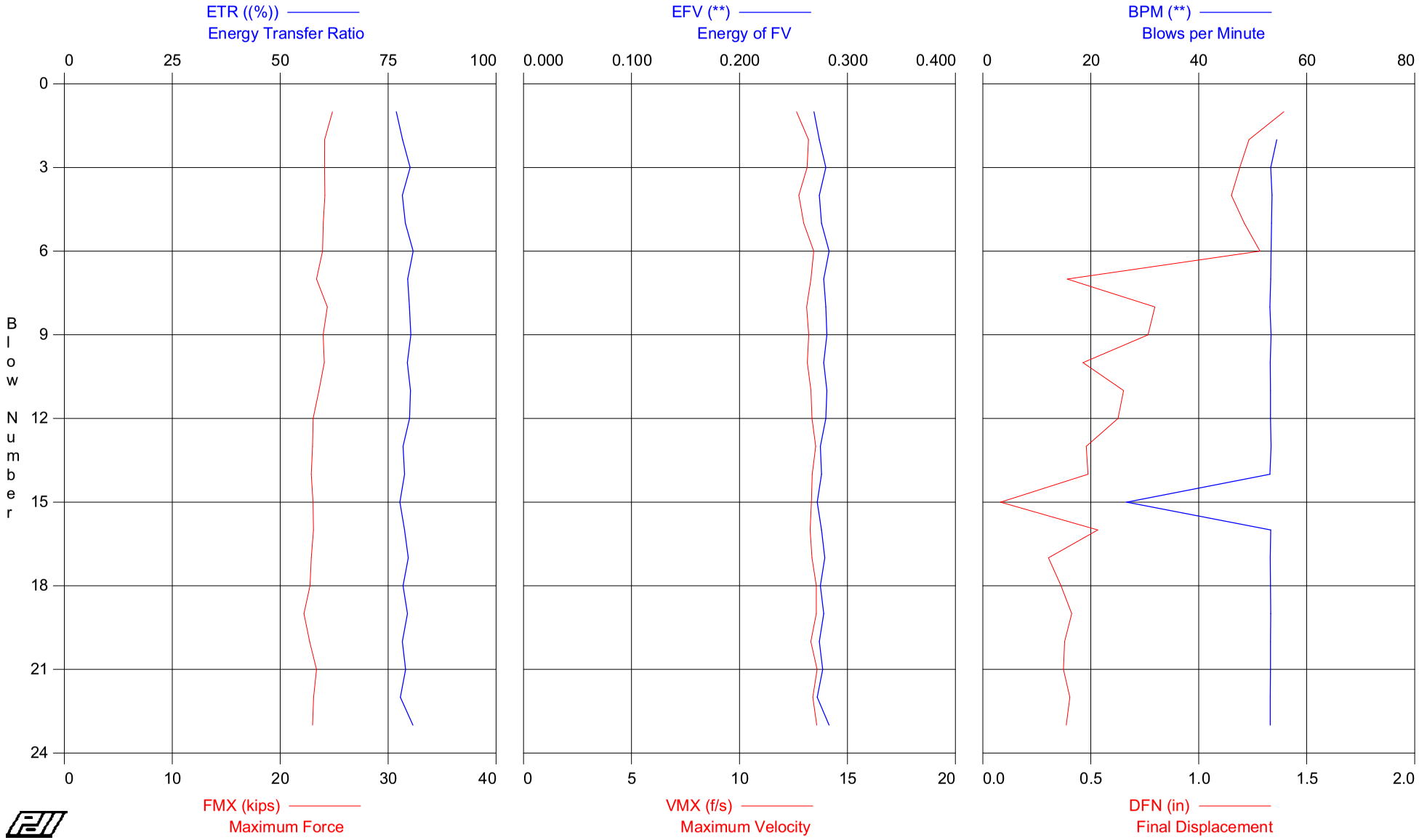
Total number of blows analyzed: 23

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 26-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 193.5-195
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 193.5-195
OP: DJF

HAMMER #2 AWJ B-354
Test date: 26-Jun-2008

AR: 1.16 in^2
LE: 198.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

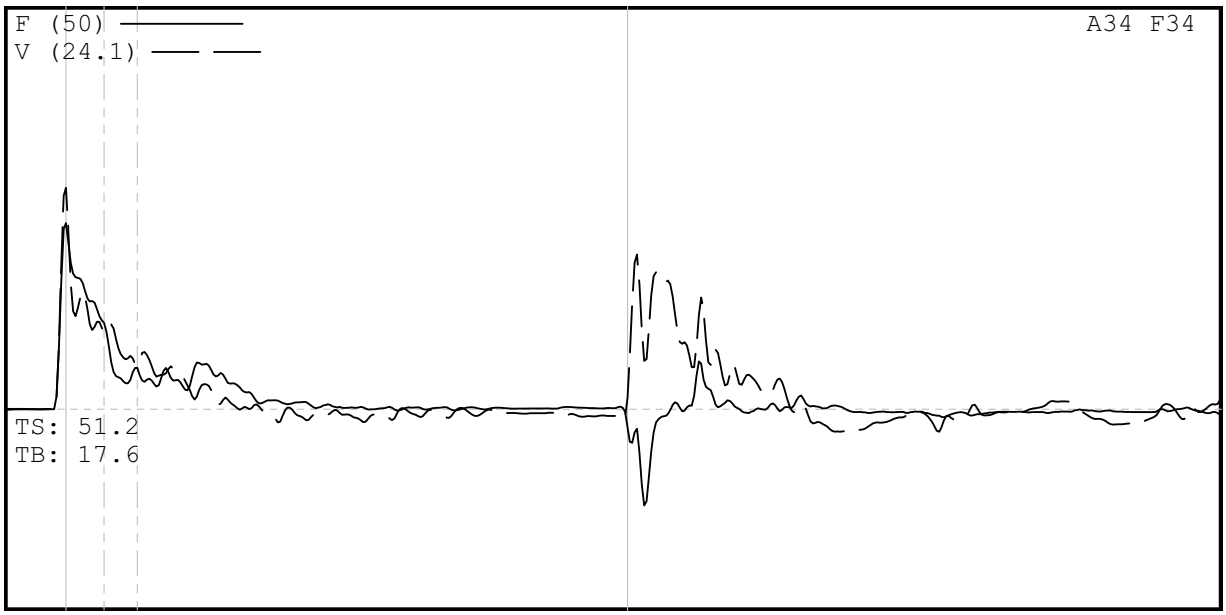
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	21.4	21.5	0.269	77	0	12.6	24.8	1.4
2	12	20.8	20.9	0.274	78	54	13.2	24.1	1.2
3	12	20.8	20.8	0.280	80	53	13.1	24.1	1.2
4	12	20.8	20.8	0.274	78	54	12.7	24.1	1.2
5	12	20.7	20.7	0.276	79	53	13.0	24.0	1.2
6	12	20.6	20.6	0.283	81	53	13.4	23.9	1.3
7	14	20.1	20.2	0.278	80	53	13.3	23.4	0.4
8	14	21.0	21.0	0.280	80	53	13.1	24.4	0.8
9	14	20.7	20.7	0.281	80	53	13.2	24.0	0.8
10	14	20.8	20.8	0.278	79	53	13.1	24.1	0.5
11	14	20.3	20.4	0.281	80	53	13.3	23.6	0.7
12	14	19.9	20.0	0.280	80	53	13.4	23.0	0.6
13	14	19.8	19.8	0.275	78	53	13.5	23.0	0.5
14	20	19.7	19.8	0.276	79	53	13.4	22.9	0.5
15	20	19.9	20.0	0.272	78	27	13.3	23.0	0.1
16	20	19.9	19.9	0.276	79	53	13.3	23.1	0.5
17	20	19.7	19.8	0.279	80	53	13.4	22.9	0.3
18	20	19.6	19.6	0.275	78	53	13.6	22.8	0.4
19	20	19.1	19.2	0.278	79	53	13.6	22.2	0.4
20	20	19.6	19.8	0.274	78	53	13.3	22.7	0.4
21	20	20.1	20.2	0.277	79	53	13.6	23.4	0.4
22	20	19.9	19.9	0.272	78	53	13.4	23.1	0.4
23	20	19.8	19.9	0.283	81	53	13.6	23.0	0.4
Average		20.2	20.3	0.277	79	52	13.3	23.5	0.7
Std. Dev.		0.6	0.5	0.004	1	6	0.2	0.6	0.4
Maximum		21.4	21.5	0.283	81	54	13.6	24.8	1.4

Total number of blows analyzed: 23

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 193 5-195



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 193 5-19
DESCR: HAMMER #2 AWJ B-354
OPERATOR: DJF
FILE: DRILL RIG 550-X DEPTH 193 5-195
6/26/2008 10:37:12 AM
Blow Number 21/16

Pile Properties

LE	198.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	23.60	ms
JC	0.50	[]
LP	194.65	ft

Quantity Results

CSXN	19.9	ksi
CSI	19.9	ksi
EFV	0.276	k-ft
ETR	78.8	(%)
BPM	53.3	bpm
VMX	13.3	f/s
FMX	23	kips
DFN	0.53	in
FVP	0.84	[]

Sensors

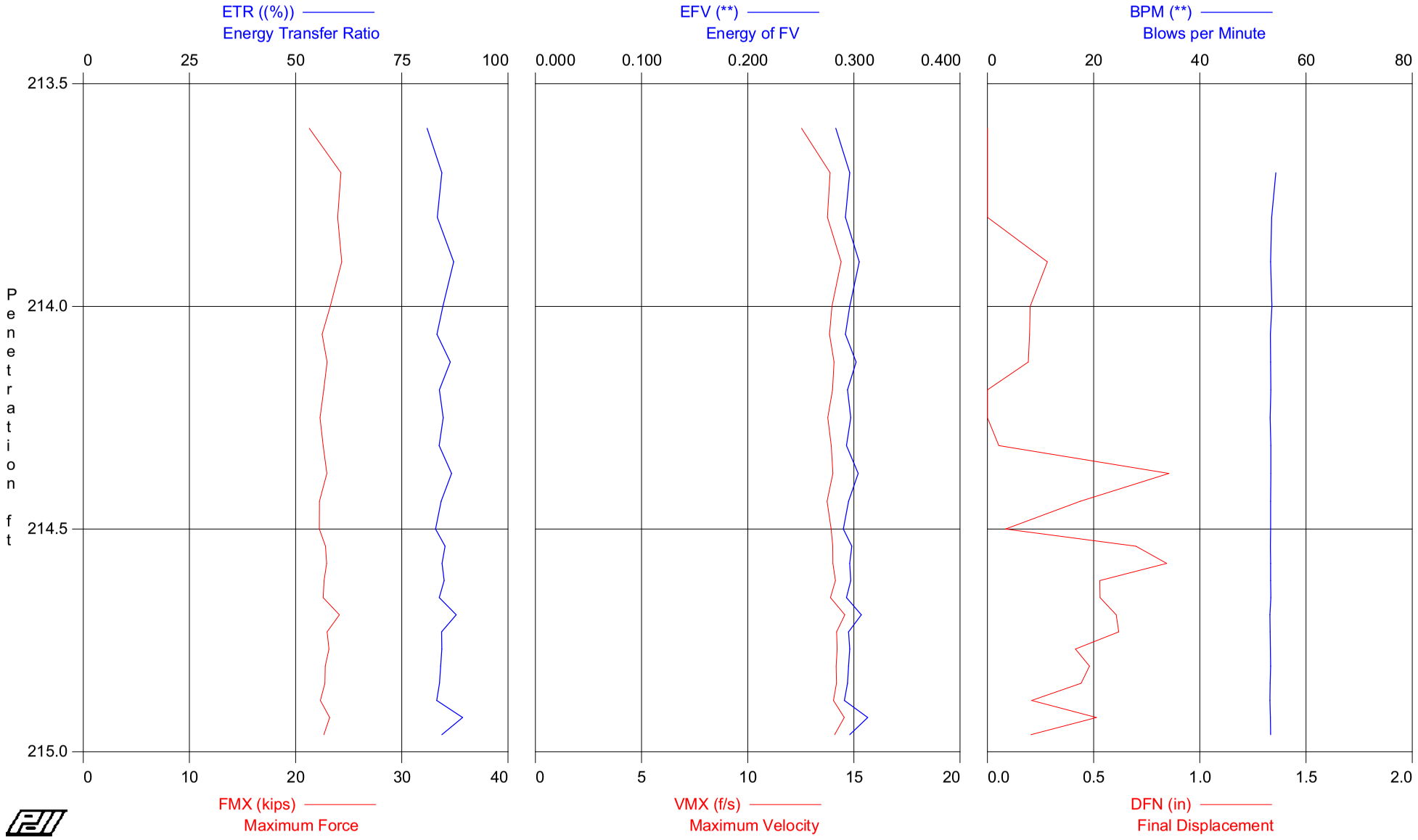
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [K611] 380 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.83

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 30-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 213.5 -215
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 213.5 -215
OP: SDW

HAMMER #2 AWJ B-354
Test date: 30-Jun-2008

AR: 1.16 in^2
LE: 218.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	214.00	10	AV5	20.2	20.4	0.294	84	54	13.7	23.4	-0.3
			STD	1.0	1.0	0.007	2	0	0.6	1.1	0.5
			MAX	21.0	21.2	0.305	87	54	14.4	24.3	0.3
13	214.50	16	AV8	19.4	19.7	0.296	85	53	13.9	22.6	0.2
			STD	0.2	0.3	0.005	1	0	0.1	0.3	0.3
			MAX	19.8	20.1	0.304	87	53	14.1	23.0	0.9
26	215.00	26	AV13	19.8	19.9	0.297	85	53	14.2	22.9	0.5
			STD	0.4	0.4	0.006	2	0	0.2	0.4	0.2
			MAX	20.8	20.9	0.313	89	53	14.6	24.1	0.8
			Average	19.7	20.0	0.296	85	53	14.0	22.9	0.2
			Std. Dev.	0.6	0.6	0.006	2	0	0.4	0.7	0.4
			Maximum	21.0	21.2	0.313	89	54	14.6	24.3	0.9

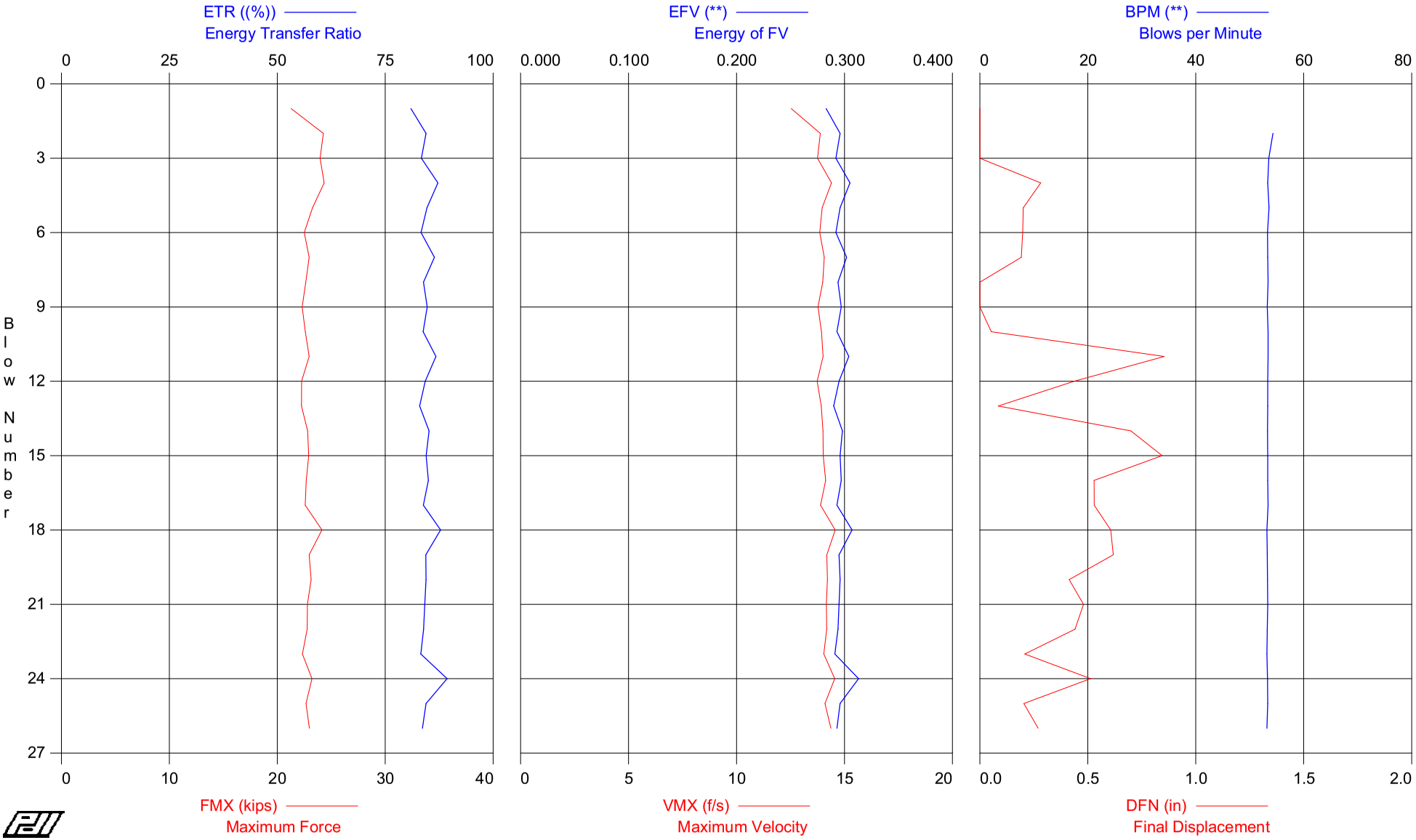
Total number of blows analyzed: 26

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Jul-2008

Test date: 30-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 213.5 -215
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 213.5 -215
OP: SDW

HAMMER #2 AWJ B-354
Test date: 30-Jun-2008

AR: 1.16 in^2
LE: 218.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

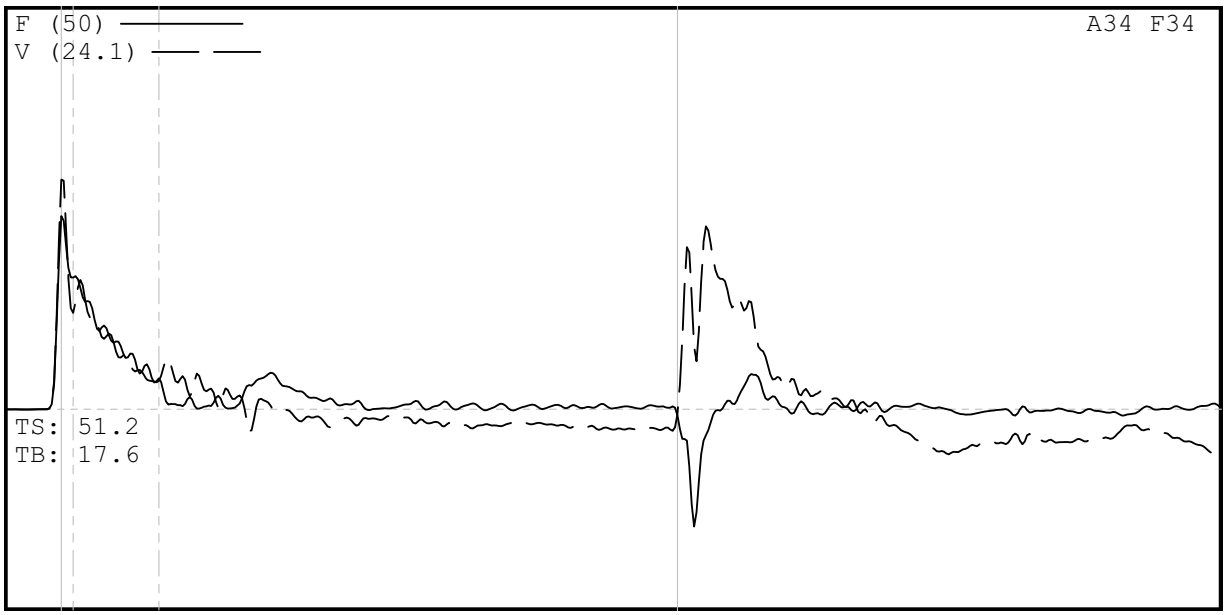
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	18.3	18.6	0.283	81	0	12.5	21.3	-1.0
2	10	20.9	21.1	0.296	84	54	13.9	24.3	-0.7
3	10	20.7	21.0	0.292	83	54	13.8	24.0	-0.5
4	10	21.0	21.2	0.305	87	53	14.4	24.3	0.3
5	10	20.1	20.3	0.296	85	54	14.0	23.3	0.2
6	16	19.4	19.7	0.292	83	53	13.9	22.5	0.2
7	16	19.8	20.1	0.302	86	53	14.1	23.0	0.2
8	16	19.5	19.7	0.294	84	53	14.0	22.6	0.0
9	16	19.2	19.4	0.297	85	53	13.8	22.3	-0.2
10	16	19.5	19.7	0.293	84	53	13.9	22.6	0.1
11	16	19.8	20.1	0.304	87	53	14.0	22.9	0.9
12	16	19.2	19.4	0.295	84	53	13.7	22.2	0.4
13	16	19.2	19.3	0.290	83	53	13.9	22.2	0.1
14	26	19.7	19.9	0.298	85	53	14.0	22.8	0.7
15	26	19.8	20.0	0.296	84	53	14.0	22.9	0.8
16	26	19.5	19.6	0.297	85	53	14.1	22.7	0.5
17	26	19.5	19.8	0.293	84	53	13.9	22.6	0.5
18	26	20.8	20.9	0.307	88	53	14.6	24.1	0.6
19	26	19.8	20.0	0.295	84	53	14.2	23.0	0.6
20	26	19.9	20.1	0.296	84	53	14.2	23.1	0.4
21	26	19.6	19.8	0.295	84	53	14.2	22.8	0.5
22	26	19.6	19.8	0.294	84	53	14.2	22.8	0.4
23	26	19.3	19.3	0.291	83	53	14.0	22.3	0.2
24	26	20.0	20.3	0.313	89	53	14.5	23.2	0.5
25	26	19.5	19.6	0.296	84	53	14.1	22.7	0.2
26	26	19.8	19.9	0.293	84	53	14.4	23.0	0.3
Average		19.7	20.0	0.296	85	53	14.0	22.9	0.2
Std. Dev.		0.6	0.6	0.006	2	0	0.4	0.7	0.4
Maximum		21.0	21.2	0.313	89	54	14.6	24.3	0.9

Total number of blows analyzed: 26

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 213.5 -215



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 213.5 -21
DESCR: HAMMER #2 AWJ B-354
OPERATOR: SDW
FILE: DRILL RIG 550-X DEPTH 213 5 -215
6/30/2008 3:00:57 PM
Blow Number 4/3

Pile Properties

LE	218.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	25.90	ms
JC	0.50	[]
LP	213.80	ft

Quantity Results

CSXN	20.7	ksi
CSI	21.0	ksi
EFV	0.292	k-ft
ETR	83.4	(%)
BPM	53.5	bpm
VMX	13.8	f/s
FMX	24	kips
DFN	-0.47	in
FVP	0.84	[]

Sensors

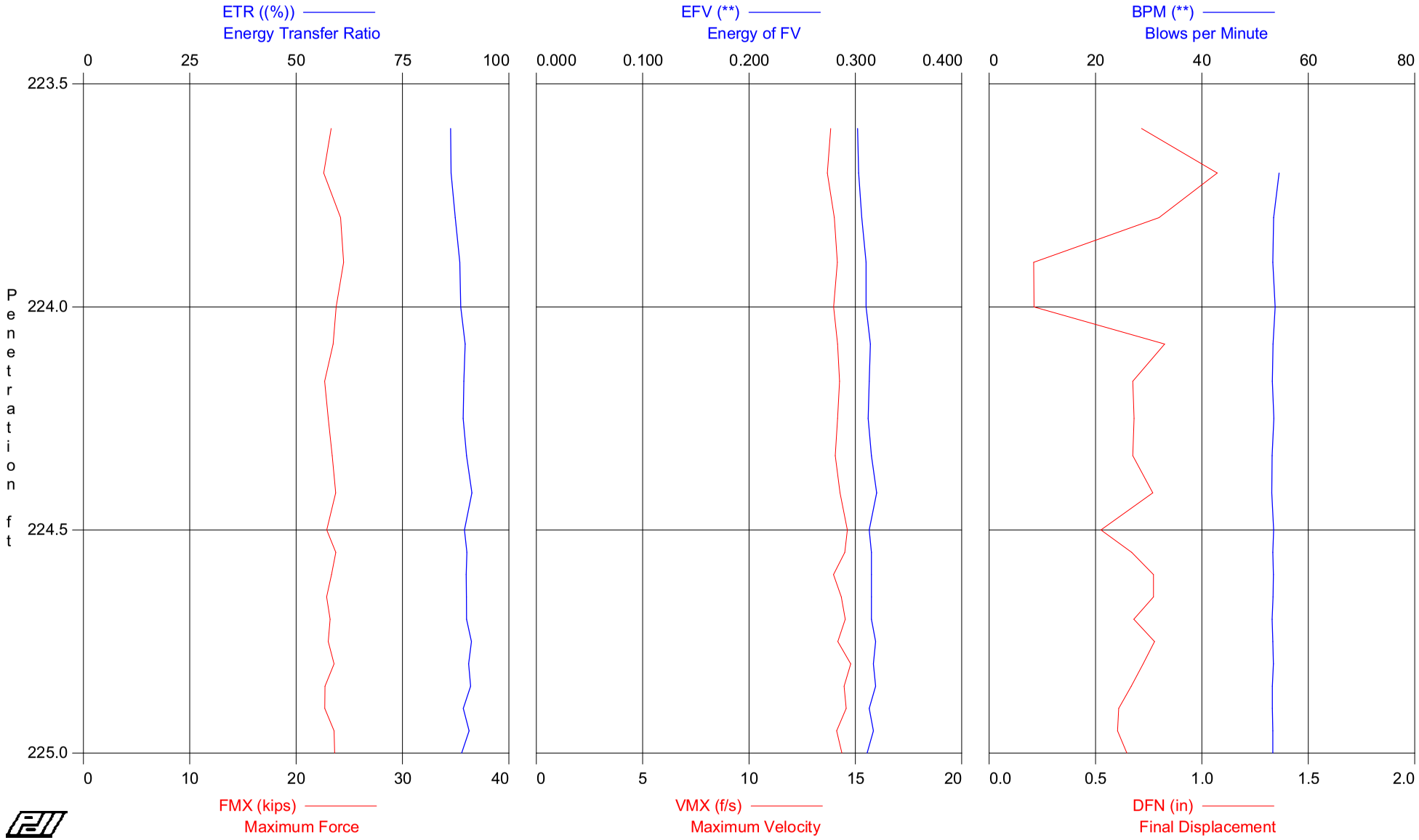
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 1-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 223.5 - 225
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 223.5 - 225
OP: SDW

HAMMER #2 AWJ B-354
Test date: 1-Jul-2008

AR: 1.16 in^2
LE: 228.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	224.00	10	AV5	20.4	20.6	0.306	87	54	13.9	23.7	0.6
			STD	0.6	0.6	0.003	1	0	0.2	0.7	0.3
			MAX	21.1	21.2	0.310	89	54	14.2	24.5	1.1
11	224.50	12	AV6	20.0	20.3	0.314	90	53	14.3	23.2	0.7
			STD	0.3	0.3	0.003	1	0	0.2	0.4	0.1
			MAX	20.4	20.7	0.320	91	54	14.6	23.7	0.8
21	225.00	20	AV10	20.0	20.2	0.316	90	53	14.4	23.2	0.7
			STD	0.3	0.3	0.002	1	0	0.2	0.4	0.1
			MAX	20.5	20.7	0.319	91	53	14.8	23.7	0.8
			Average	20.1	20.3	0.313	89	53	14.2	23.3	0.7
			Std. Dev.	0.4	0.4	0.005	1	0	0.3	0.5	0.2
			Maximum	21.1	21.2	0.320	91	54	14.8	24.5	1.1

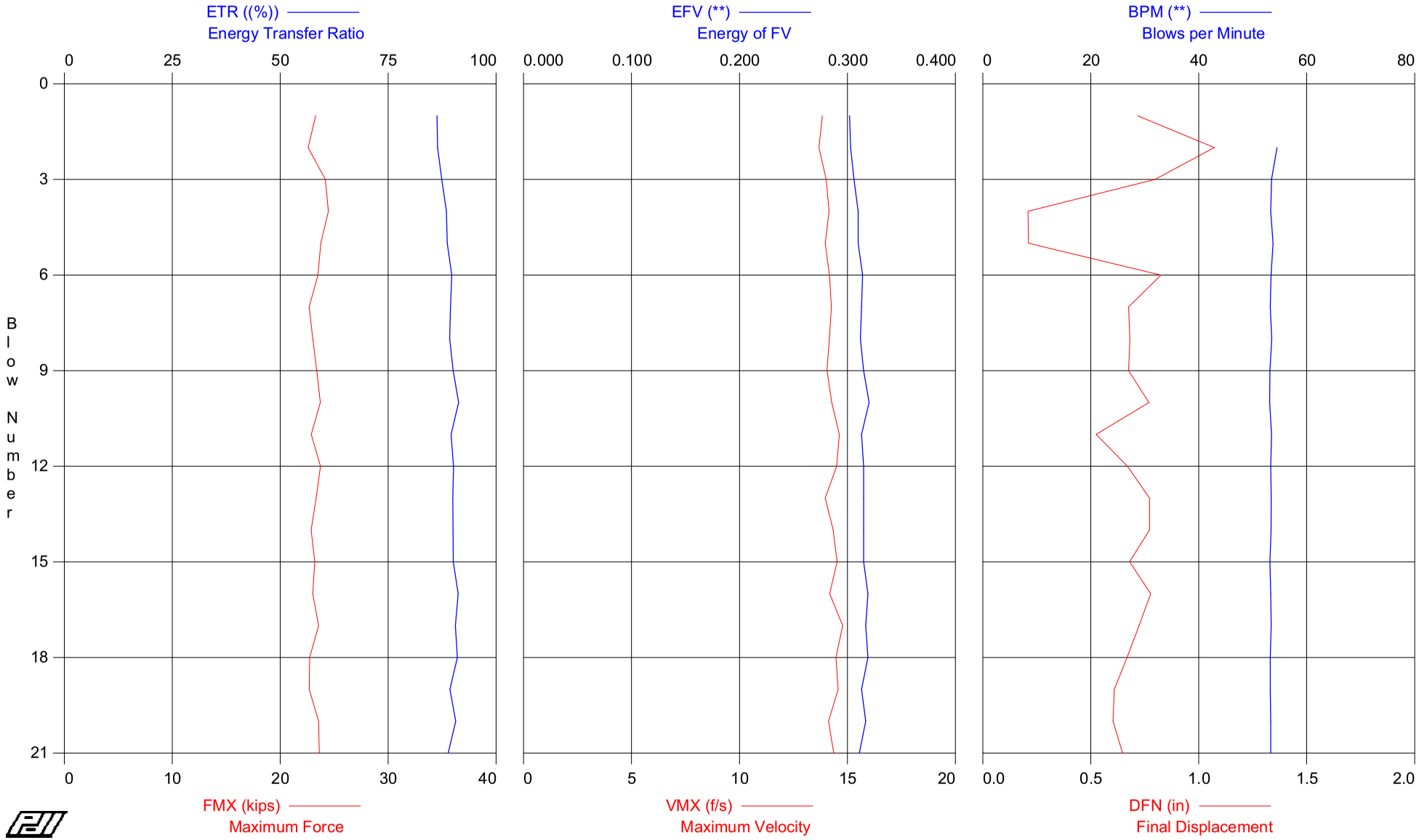
Total number of blows analyzed: 21

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 1-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 223.5 - 225
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 223.5 - 225
OP: SDW

HAMMER #2 AWJ B-354
Test date: 1-Jul-2008

AR: 1.16 in^2
LE: 228.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

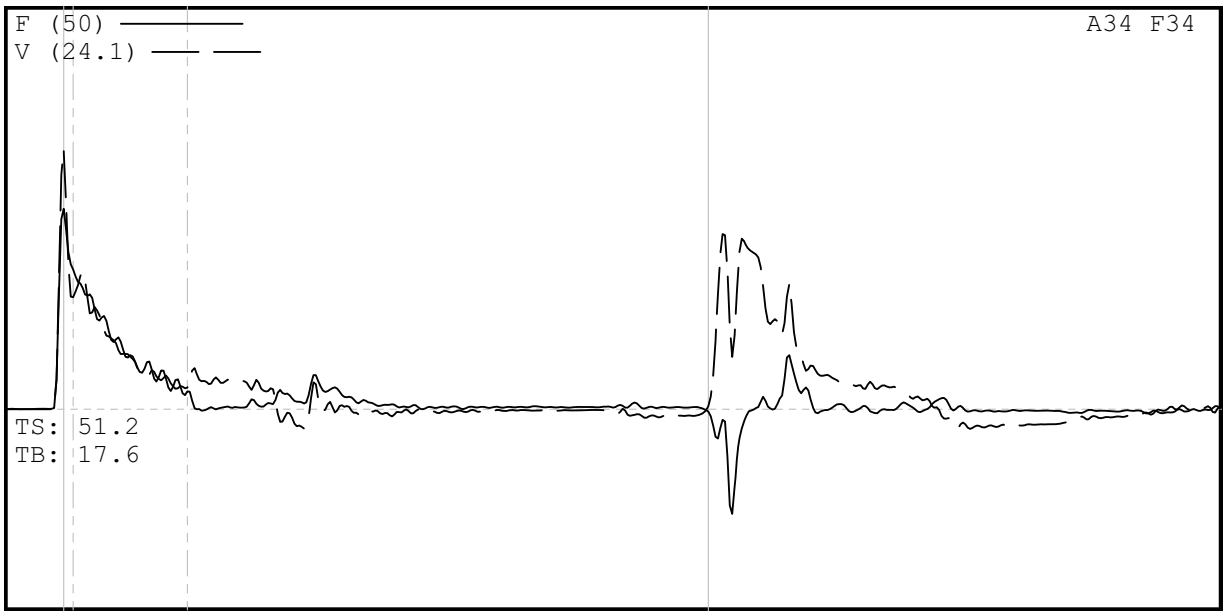
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	20.1	20.1	0.302	86	0	13.8	23.3	0.7
2	10	19.5	19.7	0.303	86	54	13.7	22.6	1.1
3	10	20.8	21.1	0.306	87	53	14.0	24.2	0.8
4	10	21.1	21.2	0.310	88	53	14.2	24.5	0.2
5	10	20.5	20.8	0.310	89	54	14.0	23.8	0.2
6	12	20.2	20.5	0.314	90	53	14.2	23.5	0.8
7	12	19.6	19.8	0.313	89	53	14.3	22.7	0.7
8	12	19.8	20.1	0.312	89	54	14.2	23.0	0.7
9	12	20.2	20.4	0.315	90	53	14.1	23.4	0.7
10	12	20.4	20.7	0.320	91	53	14.3	23.7	0.8
11	12	19.7	20.1	0.313	90	53	14.6	22.9	0.5
12	20	20.5	20.7	0.315	90	53	14.5	23.7	0.7
13	20	20.1	20.5	0.315	90	53	14.0	23.3	0.8
14	20	19.7	19.9	0.315	90	53	14.3	22.9	0.8
15	20	20.0	20.2	0.315	90	53	14.5	23.2	0.7
16	20	19.8	20.0	0.319	91	53	14.2	23.0	0.8
17	20	20.3	20.3	0.317	91	53	14.8	23.6	0.7
18	20	19.6	19.9	0.319	91	53	14.5	22.7	0.7
19	20	19.6	19.8	0.313	89	53	14.6	22.7	0.6
20	20	20.3	20.6	0.317	91	53	14.1	23.6	0.6
21	20	20.4	20.5	0.311	89	53	14.4	23.6	0.6
Average		20.1	20.3	0.313	89	53	14.2	23.3	0.7
Std. Dev.		0.4	0.4	0.005	1	0	0.3	0.5	0.2
Maximum		21.1	21.2	0.320	91	54	14.8	24.5	1.1

Total number of blows analyzed: 21

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 223 5 - 225



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 223 5 - 2
DESCR: HAMMER #2 AWJ B-354
OPERATOR: SDW
FILE: DRILL RIG 550-X DEPTH 223 5 - 225
7/1/2008 11:55:54 AM
Blow Number 11/10

Pile Properties

LE	228.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	27.10	ms
JC	0.50	[]

Quantity Results

CSXN	21.4	ksi
CSI	21.4	ksi
EFV	0.326	k-ft
ETR	93.1	(%)
BPM	53.1	bpm
VMX	15.5	f/s
FMX	25	kips
DFN	0.77	in
FVP	0.77	[]

Sensors

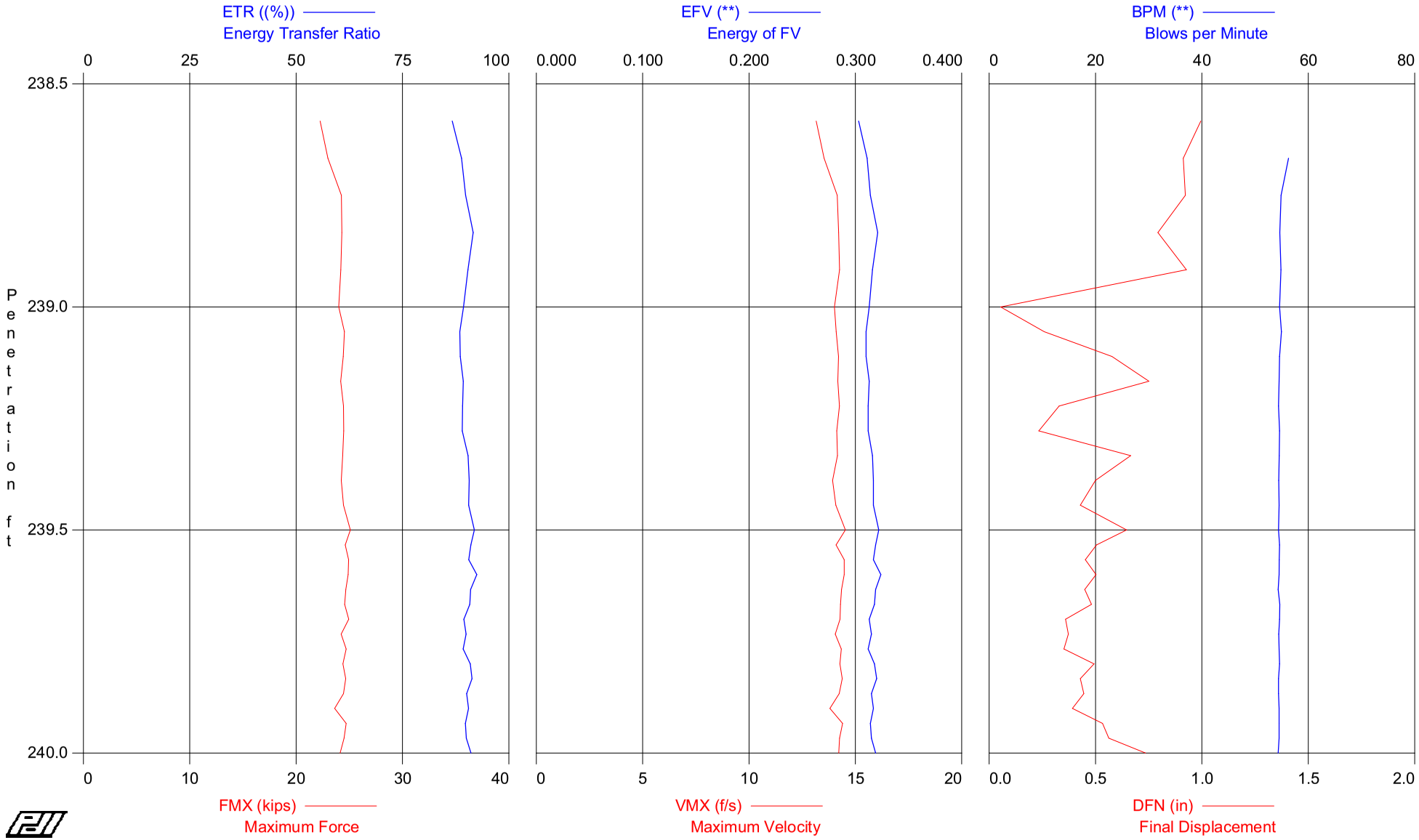
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 2-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 238.5 - 240
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 238.5 - 240
OP: SDW

HAMMER #2 AWJ B-354
Test date: 2-Jul-2008

AR: 1.16 in^2
LE: 243.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	239.00	12	AV6	20.4	20.6	0.313	89	55	13.9	23.7	0.8
			STD	0.7	0.6	0.005	2	1	0.4	0.8	0.3
			MAX	21.0	21.1	0.321	92	56	14.3	24.3	1.0
15	239.50	18	AV9	21.1	21.2	0.314	90	55	14.2	24.5	0.5
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.2
			MAX	21.6	21.7	0.322	92	55	14.5	25.1	0.8
30	240.00	30	AV15	21.2	21.3	0.317	91	54	14.3	24.5	0.5
			STD	0.3	0.3	0.003	1	0	0.2	0.3	0.1
			MAX	21.5	21.6	0.324	92	55	14.5	24.9	0.7
			Average	21.0	21.1	0.315	90	55	14.2	24.3	0.5
			Std. Dev.	0.5	0.4	0.004	1	0	0.3	0.6	0.2
			Maximum	21.6	21.7	0.324	92	56	14.5	25.1	1.0

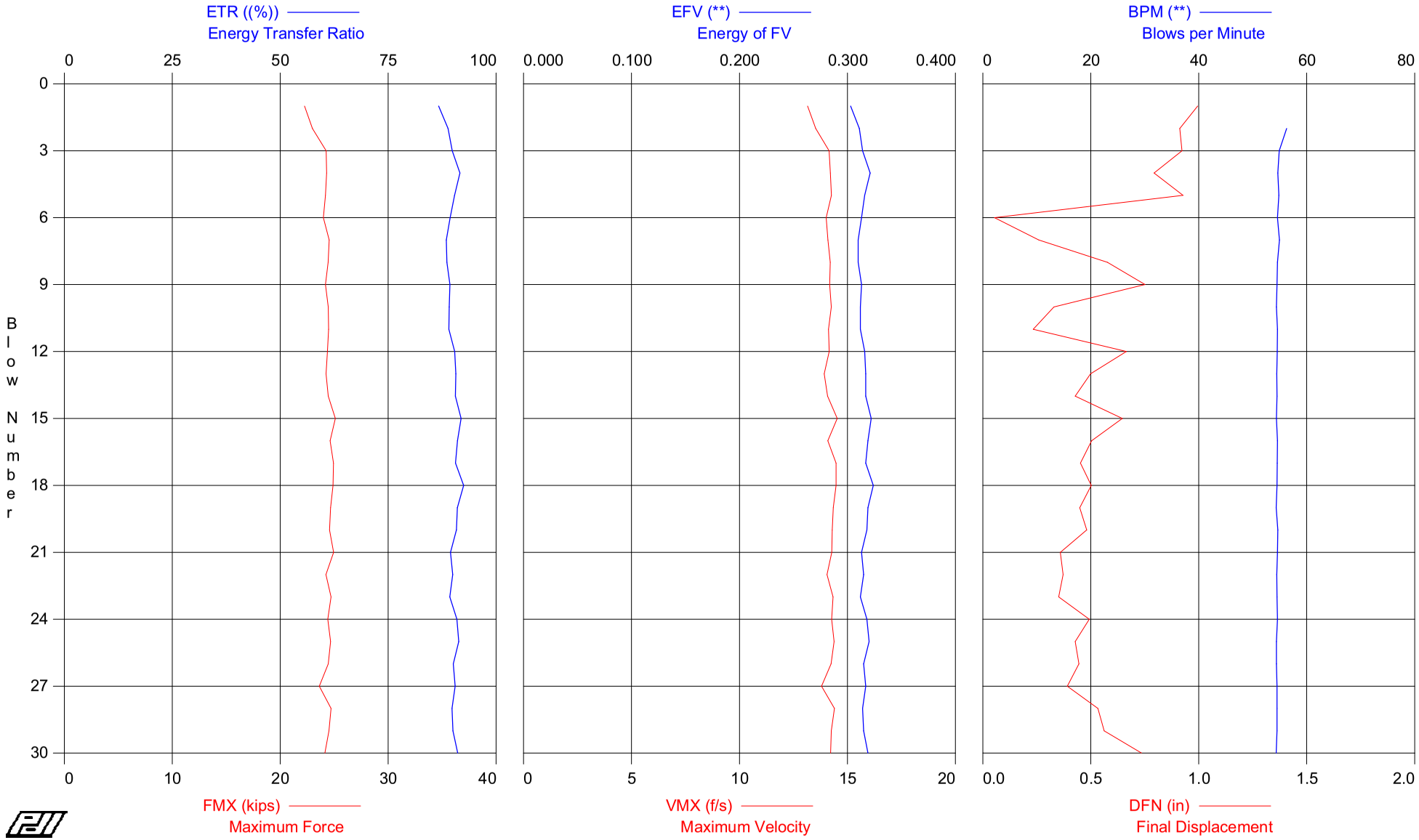
Total number of blows analyzed: 30

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 2-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 238.5 - 240
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 238.5 - 240
OP: SDW

HAMMER #2 AWJ B-354
Test date: 2-Jul-2008

AR: 1.16 in^2
LE: 243.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

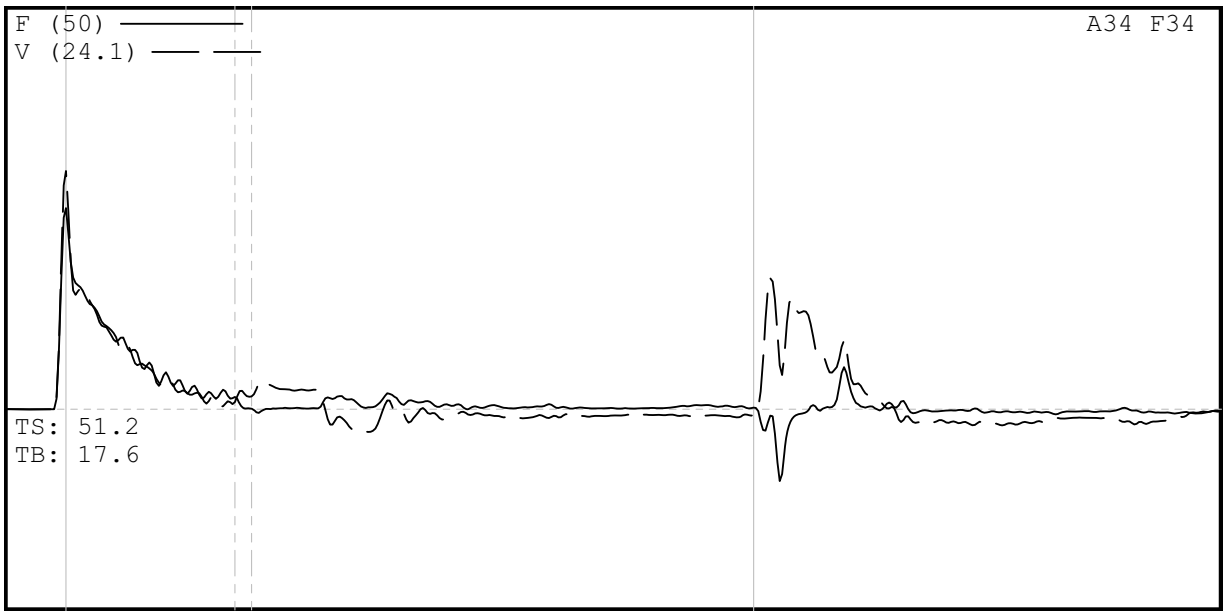
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	19.2	19.3	0.303	87	0	13.2	22.3	1.0
2	12	19.8	20.2	0.311	89	56	13.5	23.0	0.9
3	12	20.9	21.1	0.314	90	55	14.1	24.3	0.9
4	12	21.0	21.1	0.321	92	55	14.2	24.3	0.8
5	12	20.9	20.9	0.316	90	55	14.3	24.2	0.9
6	12	20.7	21.0	0.313	89	55	14.0	24.0	0.1
7	18	21.2	21.4	0.310	88	55	14.1	24.5	0.3
8	18	21.1	21.2	0.310	89	55	14.2	24.4	0.6
9	18	20.9	20.9	0.313	89	54	14.2	24.2	0.8
10	18	21.1	21.1	0.312	89	54	14.3	24.4	0.3
11	18	21.1	21.3	0.312	89	55	14.1	24.5	0.2
12	18	21.0	21.1	0.316	90	55	14.2	24.4	0.7
13	18	20.9	21.2	0.317	91	54	13.9	24.2	0.5
14	18	21.1	21.2	0.317	91	54	14.1	24.4	0.4
15	18	21.6	21.7	0.322	92	54	14.5	25.1	0.6
16	30	21.2	21.4	0.319	91	55	14.1	24.6	0.5
17	30	21.5	21.5	0.317	91	55	14.5	24.9	0.5
18	30	21.5	21.5	0.324	92	54	14.5	24.9	0.5
19	30	21.3	21.3	0.319	91	54	14.3	24.7	0.4
20	30	21.2	21.3	0.318	91	55	14.3	24.6	0.5
21	30	21.5	21.5	0.313	89	55	14.3	24.9	0.4
22	30	20.9	21.0	0.315	90	54	14.1	24.2	0.4
23	30	21.3	21.5	0.312	89	54	14.3	24.7	0.4
24	30	21.0	21.2	0.318	91	55	14.3	24.4	0.5
25	30	21.3	21.5	0.320	91	54	14.4	24.7	0.4
26	30	21.1	21.2	0.315	90	54	14.2	24.4	0.4
27	30	20.4	20.7	0.317	91	54	13.8	23.6	0.4
28	30	21.3	21.6	0.314	90	54	14.4	24.7	0.5
29	30	21.1	21.4	0.315	90	54	14.3	24.5	0.6
30	30	20.8	20.8	0.319	91	54	14.2	24.1	0.7
Average		21.0	21.1	0.315	90	55	14.2	24.3	0.5
Std. Dev.		0.5	0.4	0.004	1	0	0.3	0.6	0.2
Maximum		21.6	21.7	0.324	92	56	14.5	25.1	1.0

Total number of blows analyzed: 30

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 238 5 - 240



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 238 5 - 2
DESCR: HAMMER #2 AWJ B-354
OPERATOR: SDW
FILE: DRILL RIG 550-X DEPTH 238 5 - 240
7/2/2008 9:34:15 AM
Blow Number 23/21

Pile Properties

LE	243.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	28.90	ms
JC	0.50	[]

Quantity Results

CSXN	21.5	ksi
CSI	21.5	ksi
EFV	0.313	k-ft
ETR	89.4	(%)
BPM	54.6	bpm
VMX	14.3	f/s
FMX	25	kips
DFN	0.36	in
FVP	0.84	[]

Sensors

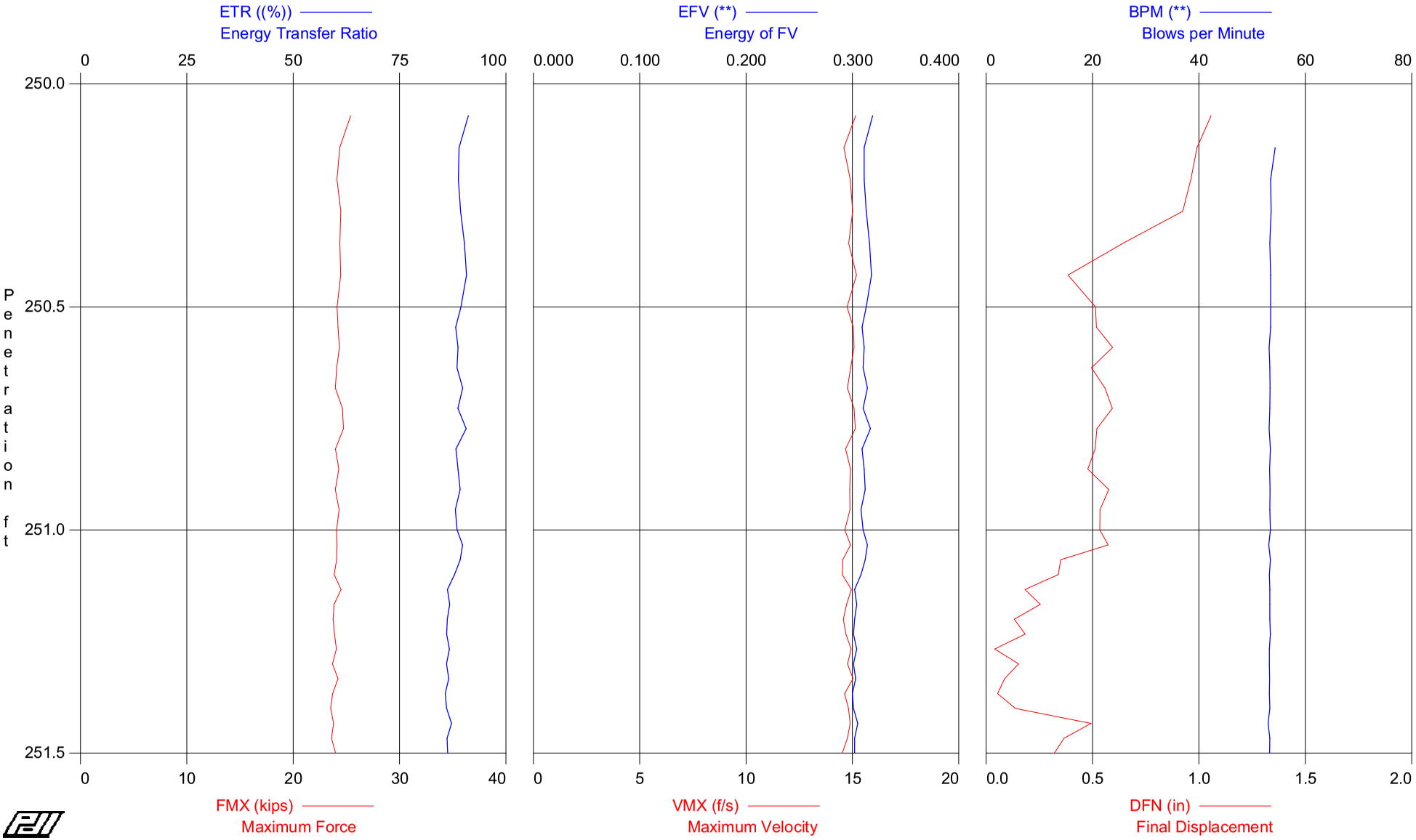
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 2-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 250 - 251.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 250 - 251.5
OP: SDW

HAMMER #2 AWJ B-354
Test date: 2-Jul-2008

AR: 1.16 in^2
LE: 255.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
7	250.50	14	AV7	21.1	21.2	0.314	90	54	14.9	24.5	0.8
			STD	0.3	0.4	0.003	1	0	0.2	0.4	0.2
			MAX	21.9	22.0	0.319	91	54	15.2	25.4	1.1
18	251.00	22	AV11	20.9	21.0	0.311	89	53	14.9	24.2	0.5
			STD	0.2	0.2	0.002	1	0	0.2	0.2	0.0
			MAX	21.3	21.4	0.317	91	53	15.1	24.7	0.6
33	251.50	30	AV15	20.6	20.8	0.304	87	53	14.8	23.9	0.2
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.2
			MAX	21.1	21.3	0.314	90	53	15.0	24.5	0.6
			Average	20.8	21.0	0.309	88	53	14.8	24.1	0.5
			Std. Dev.	0.3	0.3	0.005	2	0	0.2	0.4	0.3
			Maximum	21.9	22.0	0.319	91	54	15.2	25.4	1.1

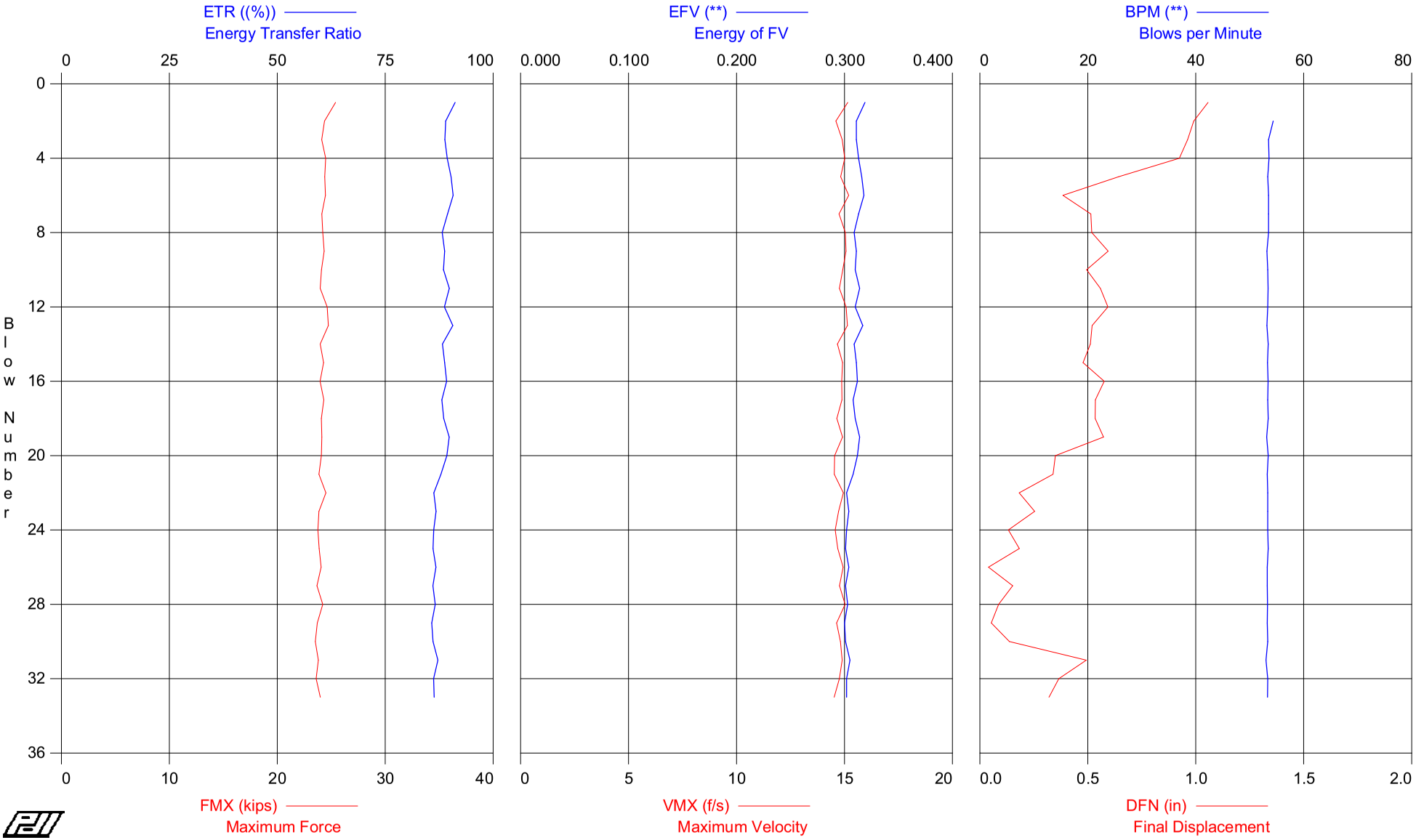
Total number of blows analyzed: 33

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 2-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 250 - 251.5
HAMMER #2 AWJ B-354



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 550-X DEPTH 250 - 251.5
OP: SDW

HAMMER #2 AWJ B-354
Test date: 2-Jul-2008

AR: 1.16 in^2
LE: 255.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

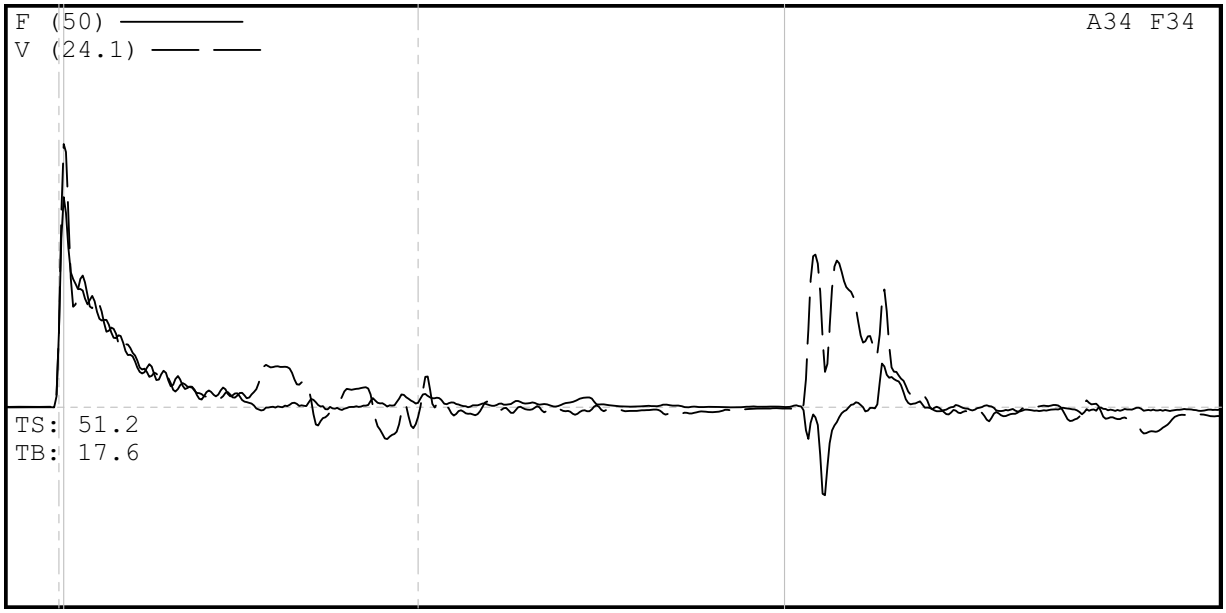
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	14	21.9	22.0	0.319	91	0	15.2	25.4	1.1
2	14	21.0	21.1	0.311	89	54	14.6	24.4	1.0
3	14	20.8	20.9	0.311	89	53	14.9	24.1	1.0
4	14	21.1	21.2	0.313	89	54	15.0	24.5	0.9
5	14	21.0	21.0	0.316	90	53	14.8	24.4	0.6
6	14	21.1	21.1	0.318	91	53	15.2	24.5	0.4
7	14	20.8	20.9	0.313	89	53	14.7	24.1	0.5
8	22	20.9	21.0	0.309	88	53	15.0	24.2	0.5
9	22	21.0	21.1	0.311	89	53	15.1	24.3	0.6
10	22	20.8	20.8	0.310	89	53	14.9	24.1	0.5
11	22	20.7	20.8	0.314	90	53	14.8	24.0	0.6
12	22	21.2	21.4	0.310	89	53	15.1	24.6	0.6
13	22	21.3	21.4	0.317	91	53	15.1	24.7	0.5
14	22	20.7	20.8	0.309	88	53	14.7	24.0	0.5
15	22	20.9	21.1	0.311	89	53	14.9	24.3	0.5
16	22	20.7	20.8	0.312	89	53	14.9	24.0	0.6
17	22	21.0	21.1	0.308	88	53	14.9	24.3	0.5
18	22	20.8	21.0	0.310	89	53	14.6	24.1	0.5
19	30	20.8	21.0	0.314	90	53	14.9	24.1	0.6
20	30	20.8	20.9	0.312	89	53	14.5	24.1	0.4
21	30	20.6	20.8	0.308	88	53	14.5	23.9	0.3
22	30	21.1	21.3	0.302	86	53	14.9	24.5	0.2
23	30	20.6	20.8	0.304	87	53	14.7	23.9	0.3
24	30	20.5	20.7	0.302	86	53	14.6	23.8	0.1
25	30	20.6	20.8	0.301	86	53	14.7	23.9	0.2
26	30	20.7	20.9	0.304	87	53	14.9	24.1	0.0
27	30	20.4	20.6	0.301	86	53	14.8	23.7	0.2
28	30	20.9	21.1	0.303	87	53	15.0	24.2	0.1
29	30	20.4	20.7	0.300	86	53	14.6	23.7	0.1
30	30	20.3	20.5	0.301	86	53	14.8	23.5	0.1
31	30	20.5	20.6	0.305	87	53	14.9	23.8	0.5
32	30	20.3	20.6	0.302	86	53	14.8	23.6	0.4
33	30	20.7	21.0	0.302	86	53	14.5	24.0	0.3
Average		20.8	21.0	0.309	88	53	14.8	24.1	0.5
Std. Dev.		0.3	0.3	0.005	2	0	0.2	0.4	0.3
Maximum		21.9	22.0	0.319	91	54	15.2	25.4	1.1

Total number of blows analyzed: 33

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 550-X DEPTH 250 - 251 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 550-X DEPTH 250 - 251
DESCR: HAMMER #2 AWJ B-354
OPERATOR: SDW
FILE: DRILL RIG 550-X DEPTH 250 - 251 5
7/2/2008 4:17:20 PM
Blow Number 14/13

Pile Properties

LE	255.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	30.30	ms
JC	0.50	[]

Quantity Results

CSXN	22.5	ksi
CSI	22.5	ksi
EFV	0.324	k-ft
ETR	92.6	(%)
BPM	53.2	bpm
VMX	15.8	f/s
FMX	26	kips
DFN	0.53	in
FVP	0.80	[]

Sensors

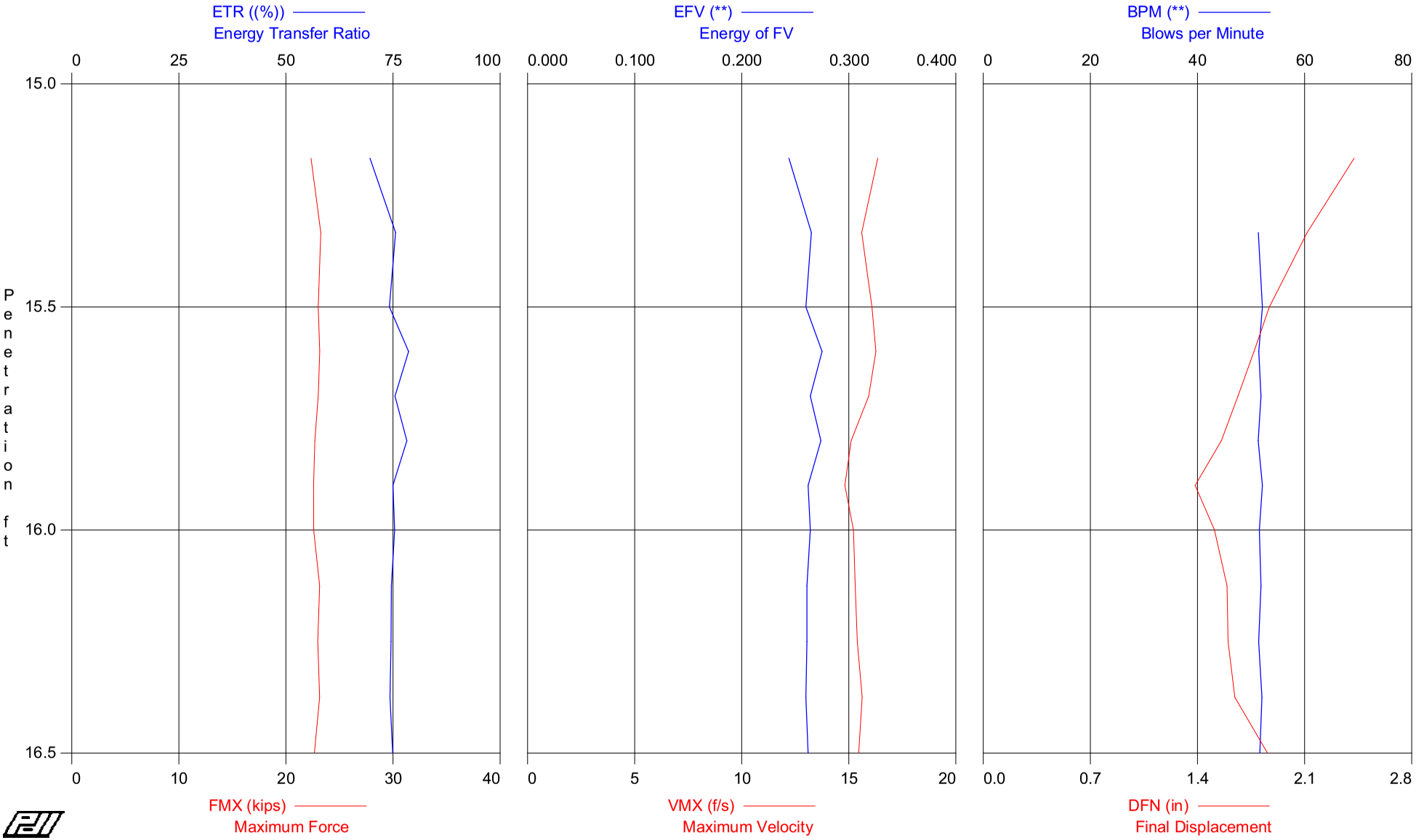
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.89

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 23-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 15-16.5
HAMMER #3 AWJ B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 15-16.5
OP: DJF

HAMMER #3 AWJ B-791
Test date: 23-Jun-2008

AR: 1.19 in^2
LE: 18.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
3	15.50	6	AV3	19.2	19.3	0.256	73	52	16.0	22.9	2.1
			STD	0.3	0.3	0.009	3	0	0.3	0.4	0.2
			MAX	19.5	19.6	0.265	76	52	16.4	23.2	2.4
8	16.00	10	AV5	19.2	19.2	0.268	77	52	15.5	22.8	1.6
			STD	0.2	0.2	0.006	2	0	0.5	0.2	0.1
			MAX	19.5	19.5	0.275	79	52	16.3	23.2	1.8
12	16.50	8	AV4	19.3	19.4	0.261	75	52	15.4	23.0	1.7
			STD	0.2	0.2	0.001	0	0	0.1	0.2	0.1
			MAX	19.4	19.5	0.262	75	52	15.6	23.1	1.9
			Average	19.2	19.3	0.263	75	52	15.6	22.9	1.7
			Std. Dev.	0.2	0.2	0.007	2	0	0.5	0.3	0.3
			Maximum	19.5	19.6	0.275	79	52	16.4	23.2	2.4

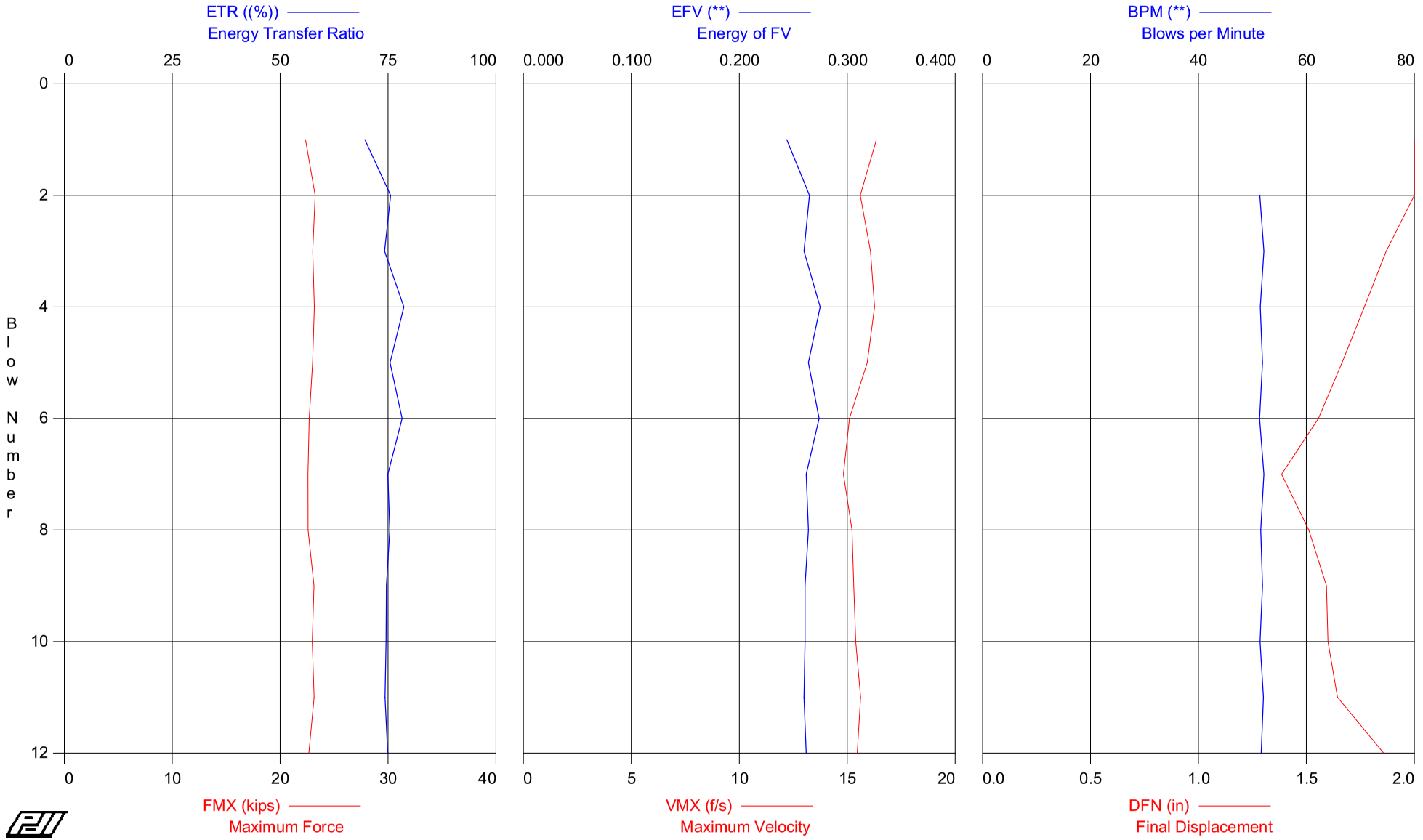
Total number of blows analyzed: 12

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 23-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 15-16.5
HAMMER #3 AWJ B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 15-16.5
OP: DJF

HAMMER #3 AWJ B-791
Test date: 23-Jun-2008

AR: 1.19 in^2
LE: 18.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

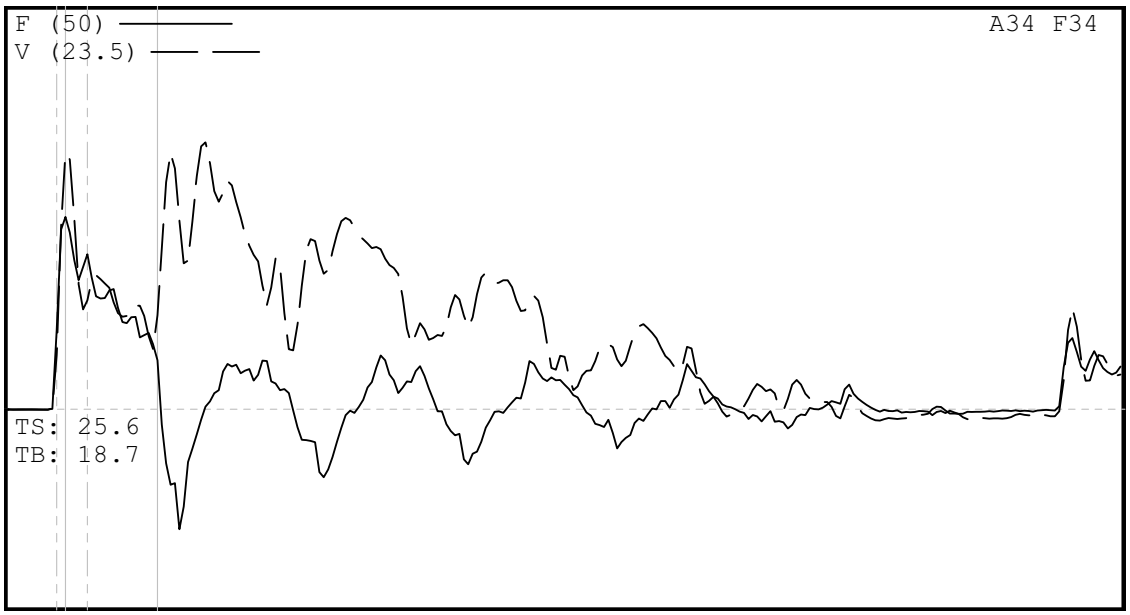
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	6	18.8	18.8	0.244	70	0	16.4	22.3	2.4
2	6	19.5	19.6	0.265	76	51	15.6	23.2	2.1
3	6	19.3	19.4	0.260	74	52	16.1	23.0	1.9
4	10	19.5	19.5	0.275	79	51	16.3	23.2	1.8
5	10	19.3	19.5	0.264	75	52	15.9	23.0	1.7
6	10	19.1	19.2	0.274	78	51	15.1	22.7	1.6
7	10	19.0	19.1	0.262	75	52	14.8	22.6	1.4
8	10	19.0	19.0	0.264	75	52	15.2	22.6	1.5
9	8	19.4	19.5	0.261	75	52	15.3	23.1	1.6
10	8	19.3	19.3	0.261	75	51	15.4	23.0	1.6
11	8	19.4	19.5	0.260	74	52	15.6	23.1	1.6
12	8	19.0	19.1	0.262	75	52	15.5	22.7	1.9
Average		19.2	19.3	0.263	75	52	15.6	22.9	1.7
Std. Dev.		0.2	0.2	0.007	2	0	0.5	0.3	0.3
Maximum		19.5	19.6	0.275	79	52	16.4	23.2	2.4

Total number of blows analyzed: 12

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 15-16 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 15-16 5
DESCR: HAMMER #3 AWJ B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 15-16 5
6/23/2008 6:27:52 PM
Blow Number 9/6

Pile Properties

LE	18.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	2.10	ms
JC	0.50	[]

Quantity Results

CSXN	20.0	ksi
CSI	20.1	ksi
EFV	0.282	k-ft
ETR	80.7	(%)
BPM	51.3	bpm
VMX	15.6	f/s
FMX	24	kips
DFN	1.56	in
FVP	0.75	[]

Sensors

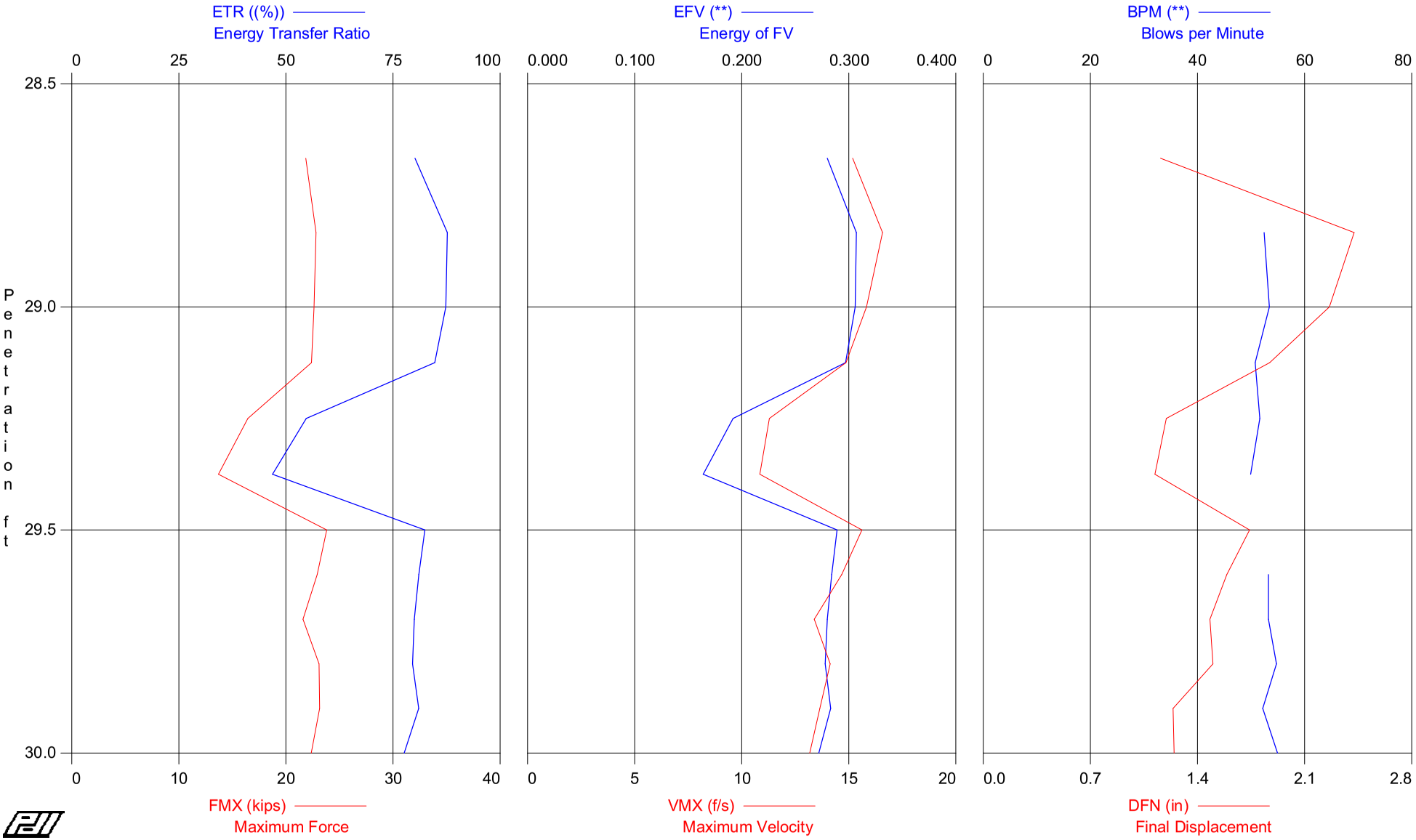
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.99
V3/V4: OK 1.03

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 28.5-30
HAMMER #3 AWJ B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 28.5-30
OP: DJF

HAMMER #3 AWJ B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 32.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
3	29.00	6	AV3	18.8	19.0	0.298	85	53	15.9	22.4	1.9
			STD	0.3	0.3	0.012	3	0	0.6	0.4	0.6
			MAX	19.2	19.3	0.307	88	53	16.6	22.8	2.4
7	29.50	8	AV4	16.0	16.1	0.236	67	51	13.2	19.1	1.5
			STD	3.5	3.5	0.058	17	1	2.1	4.2	0.3
			MAX	20.0	20.0	0.297	85	52	15.6	23.8	1.9
12	30.00	10	AV5	19.0	19.1	0.279	80	54	13.8	22.6	1.4
			STD	0.5	0.5	0.004	1	1	0.5	0.6	0.1
			MAX	19.5	19.6	0.284	81	55	14.7	23.2	1.6
			Average	18.0	18.1	0.269	77	53	14.1	21.4	1.6
			Std. Dev.	2.5	2.5	0.043	12	2	1.7	2.9	0.4
			Maximum	20.0	20.0	0.307	88	55	16.6	23.8	2.4

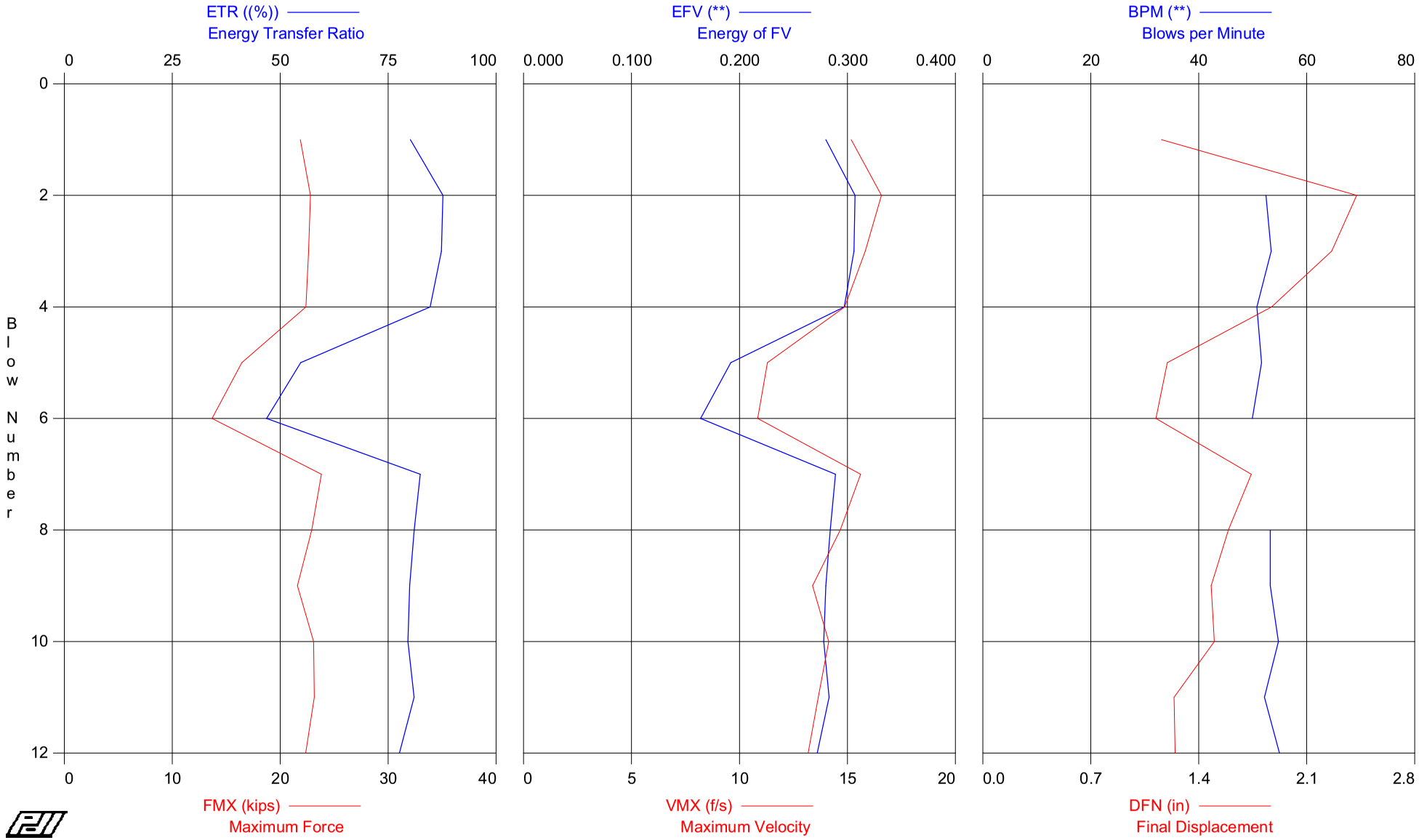
Total number of blows analyzed: 12

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 28.5-30
HAMMER #3 AWJ B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 28.5-30
OP: DJF

HAMMER #3 AWJ B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 32.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

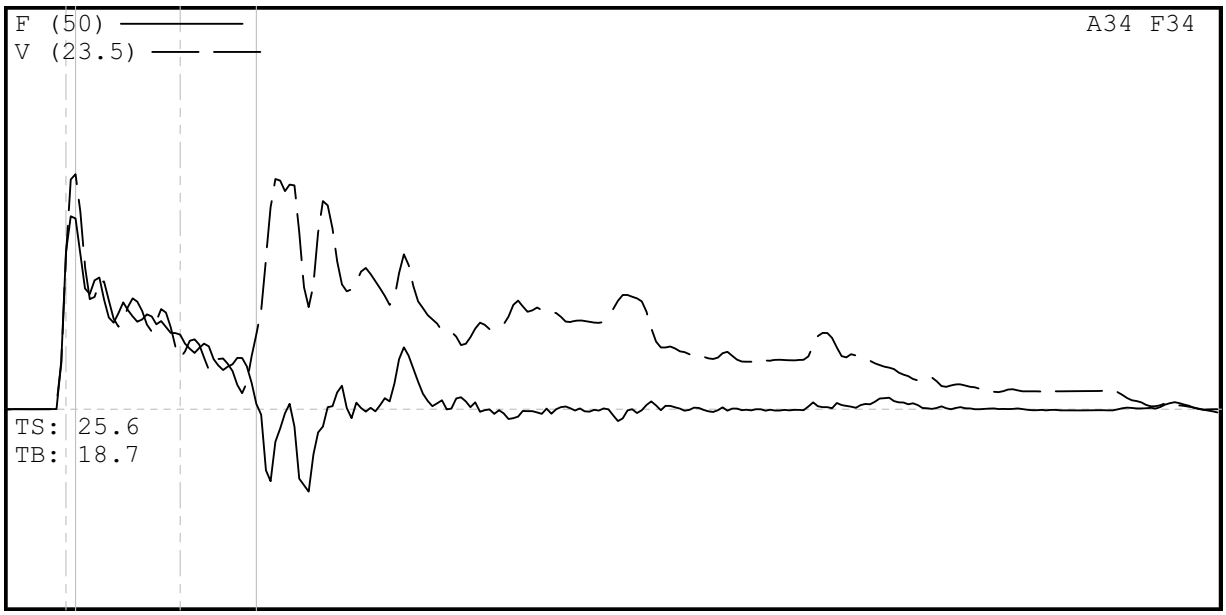
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	6	18.4	18.5	0.280	80	0	15.2	21.9	1.2
2	6	19.2	19.3	0.307	88	52	16.6	22.8	2.4
3	6	19.0	19.2	0.306	87	53	15.8	22.6	2.3
4	8	18.8	18.9	0.297	85	51	14.9	22.4	1.9
5	8	13.8	13.9	0.192	55	52	11.3	16.4	1.2
6	8	11.5	11.6	0.164	47	50	10.8	13.7	1.1
7	8	20.0	20.0	0.289	82	0	15.6	23.8	1.7
8	10	19.3	19.4	0.284	81	53	14.7	22.9	1.6
9	10	18.1	18.2	0.280	80	53	13.4	21.6	1.5
10	10	19.4	19.5	0.278	80	55	14.1	23.1	1.5
11	10	19.5	19.6	0.283	81	52	13.6	23.2	1.2
12	10	18.8	19.0	0.272	78	55	13.2	22.4	1.2
Average		18.0	18.1	0.269	77	53	14.1	21.4	1.6
Std. Dev.		2.5	2.5	0.043	12	2	1.7	2.9	0.4
Maximum		20.0	20.0	0.307	88	55	16.6	23.8	2.4

Total number of blows analyzed: 12

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 28 5-30



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 28 5-30
DESCR: HAMMER #3 AWJ B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 28 5-30
6/24/2008 11:52:25 AM
Blow Number 16/12

Pile Properties

LE	32.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	3.80	ms
JC	0.50	[]

Quantity Results

CSXN	20.1	ksi
CSI	20.3	ksi
EFV	0.280	k-ft
ETR	80.0	(%)
BPM	54.9	bpm
VMX	13.7	f/s
FMX	24	kips
DFN	1.25	in
FVP	0.81	[]

Sensors

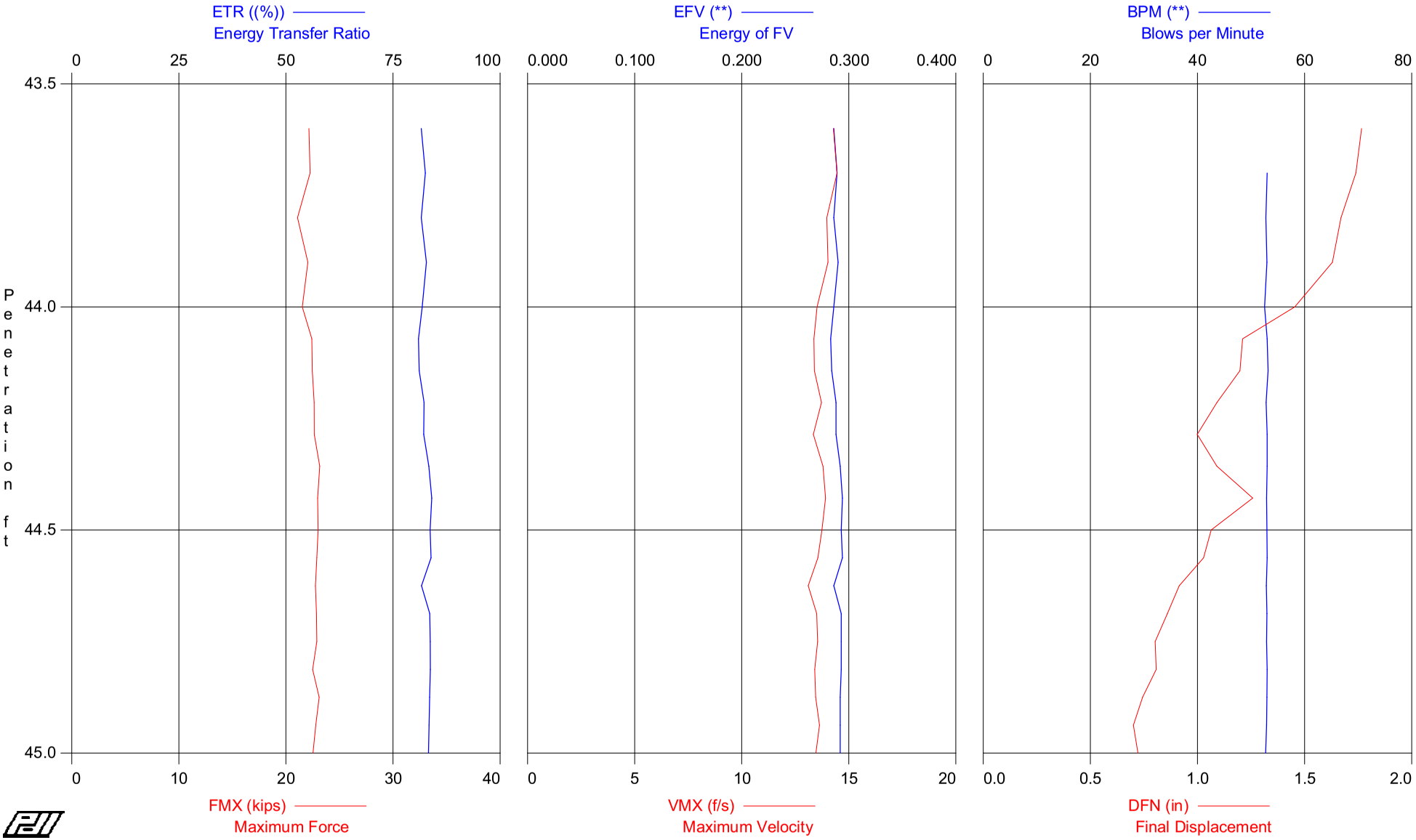
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 0.90

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 43.5-45
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 43.5-45
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 47.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	44.00	10	AV5	18.3	18.5	0.287	82	53	14.1	21.8	1.7
			STD	0.4	0.4	0.002	1	0	0.3	0.4	0.1
			MAX	18.7	18.9	0.290	83	53	14.4	22.3	1.8
12	44.50	14	AV7	19.1	19.4	0.289	83	53	13.6	22.8	1.1
			STD	0.2	0.2	0.004	1	0	0.2	0.3	0.1
			MAX	19.5	19.7	0.294	84	53	13.9	23.2	1.3
20	45.00	16	AV8	19.1	19.4	0.292	83	53	13.5	22.8	0.8
			STD	0.2	0.2	0.002	1	0	0.1	0.2	0.1
			MAX	19.4	19.7	0.294	84	53	13.6	23.1	1.0
			Average	18.9	19.2	0.290	83	53	13.7	22.5	1.1
			Std. Dev.	0.4	0.5	0.003	1	0	0.3	0.5	0.3
			Maximum	19.5	19.7	0.294	84	53	14.4	23.2	1.8

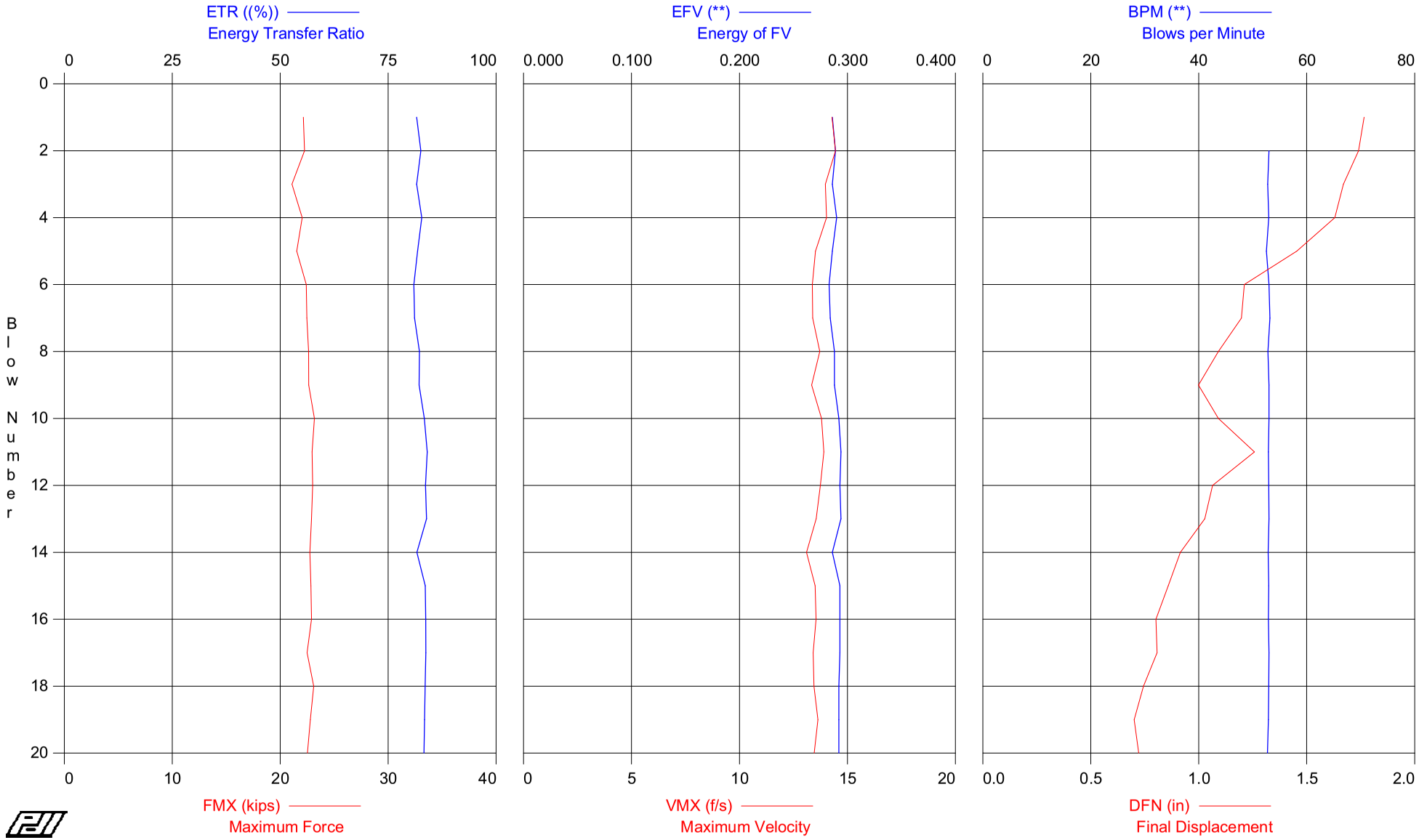
Total number of blows analyzed: 20

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 43.5-45
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 43.5-45
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 47.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

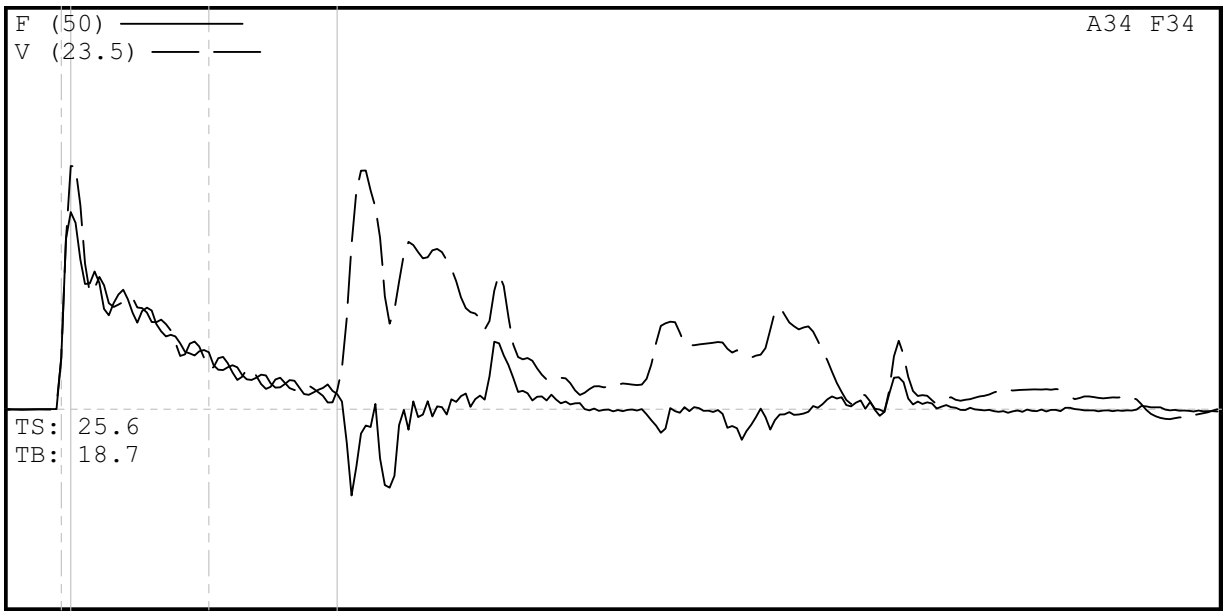
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	18.6	18.8	0.286	82	0	14.3	22.1	1.8
2	10	18.7	18.9	0.289	83	53	14.4	22.3	1.7
3	10	17.7	18.0	0.286	82	53	14.0	21.1	1.7
4	10	18.5	18.7	0.290	83	53	14.0	22.0	1.6
5	10	18.1	18.3	0.286	82	53	13.5	21.5	1.5
6	14	18.8	19.0	0.283	81	53	13.4	22.4	1.2
7	14	18.9	19.1	0.284	81	53	13.4	22.5	1.2
8	14	19.0	19.3	0.288	82	53	13.7	22.6	1.1
9	14	19.0	19.4	0.288	82	53	13.3	22.6	1.0
10	14	19.5	19.7	0.292	83	53	13.8	23.2	1.1
11	14	19.3	19.6	0.294	84	53	13.9	23.0	1.3
12	14	19.3	19.6	0.293	84	53	13.7	23.0	1.1
13	16	19.2	19.5	0.294	84	53	13.6	22.9	1.0
14	16	19.1	19.4	0.286	82	53	13.1	22.8	0.9
15	16	19.2	19.5	0.293	84	53	13.5	22.8	0.9
16	16	19.2	19.5	0.293	84	53	13.5	22.9	0.8
17	16	18.9	19.2	0.293	84	53	13.4	22.5	0.8
18	16	19.4	19.7	0.292	84	53	13.5	23.1	0.7
19	16	19.1	19.4	0.292	83	53	13.6	22.8	0.7
20	16	18.9	19.2	0.292	83	53	13.5	22.5	0.7
Average		18.9	19.2	0.290	83	53	13.7	22.5	1.1
Std. Dev.		0.4	0.5	0.003	1	0	0.3	0.5	0.3
Maximum		19.5	19.7	0.294	84	53	14.4	23.2	1.8

Total number of blows analyzed: 20

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 43 5-45



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 43 5-45
DESCR: HAMMER #3 B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 43 5-45
6/24/2008 12:45:04 PM
Blow Number 30/13

Pile Properties

LE	47.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	5.60	ms
JC	0.50	[]

Quantity Results

CSXN	20.6	ksi
CSI	21.1	ksi
EFV	0.303	k-ft
ETR	86.5	(%)
BPM	53.0	bpm
VMX	14.2	f/s
FMX	24	kips
DFN	1.03	in
FVP	0.81	[]

Sensors

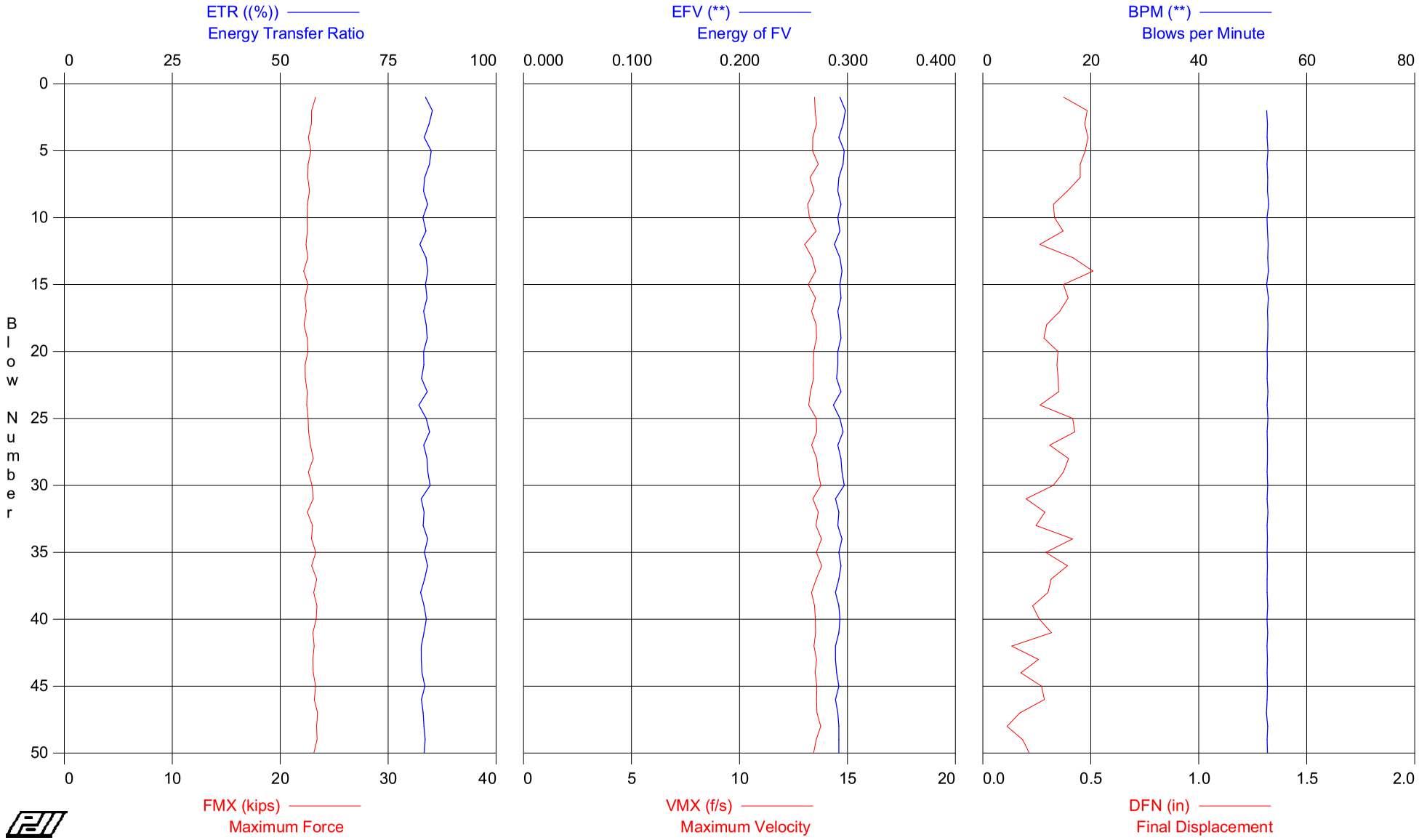
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.95
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 58.5-60
HAMMER#3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 58.5-60
OP: DJF

HAMMER#3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 62.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

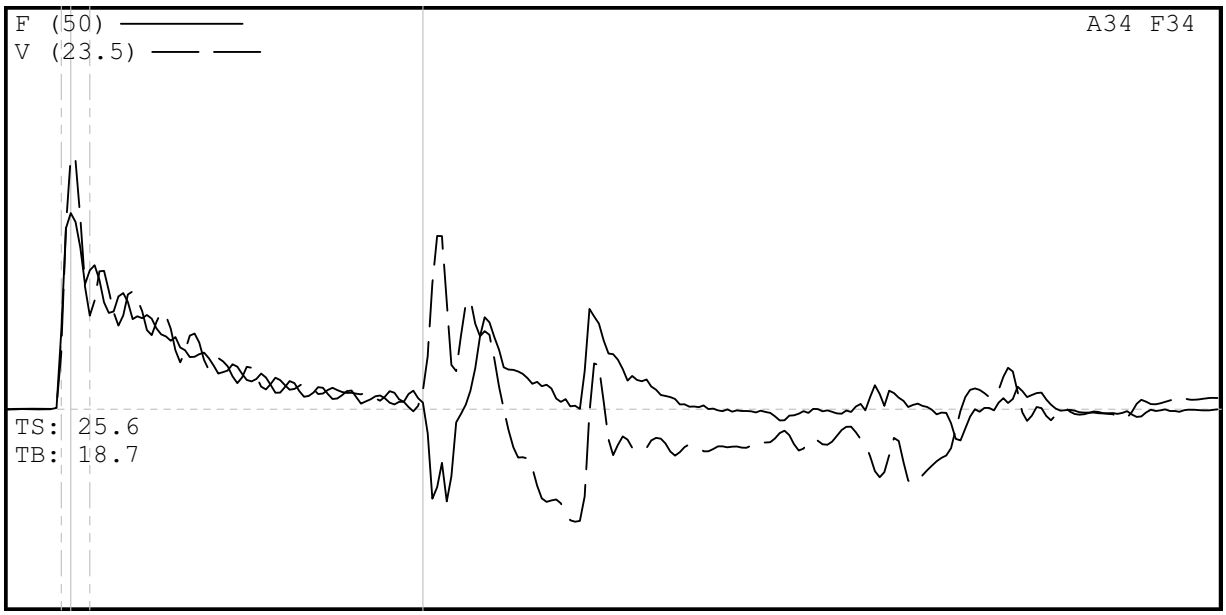
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	4	19.6	19.7	0.293	84	0	13.5	23.3	0.4
2	4	19.3	19.4	0.298	85	53	13.5	22.9	0.5
3	120	19.2	19.4	0.296	84	53	13.6	22.9	0.5
4	120	19.0	19.1	0.292	83	53	13.4	22.6	0.5
5	120	19.2	19.3	0.297	85	53	13.4	22.8	0.5
6	120	19.0	19.0	0.296	85	53	13.7	22.6	0.5
7	120	19.0	19.0	0.292	83	53	13.3	22.6	0.5
8	120	19.1	19.2	0.291	83	53	13.5	22.7	0.4
9	120	18.9	19.0	0.294	84	53	13.2	22.5	0.3
10	120	18.9	19.0	0.291	83	53	13.2	22.5	0.3
11	120	18.9	19.0	0.293	84	53	13.5	22.5	0.4
12	120	18.8	19.0	0.288	82	53	13.0	22.4	0.3
13	120	19.0	19.1	0.293	84	53	13.4	22.6	0.4
14	120	18.6	18.8	0.295	84	53	13.5	22.2	0.5
15	120	19.0	19.1	0.293	84	53	13.2	22.6	0.4
16	120	18.7	18.9	0.294	84	53	13.5	22.3	0.4
17	120	18.8	19.0	0.291	83	53	13.3	22.4	0.4
18	120	18.7	18.8	0.293	84	53	13.6	22.2	0.3
19	120	18.9	19.1	0.294	84	53	13.6	22.5	0.3
20	120	19.0	19.1	0.291	83	53	13.4	22.6	0.3
21	120	18.8	18.9	0.291	83	53	13.4	22.3	0.3
22	120	18.8	18.9	0.290	83	53	13.4	22.3	0.3
23	120	18.9	19.0	0.294	84	53	13.3	22.5	0.4
24	120	18.9	19.0	0.287	82	53	13.2	22.5	0.3
25	120	19.0	19.2	0.293	84	53	13.6	22.6	0.4
26	120	19.0	19.2	0.296	85	53	13.6	22.6	0.4
27	120	19.2	19.3	0.291	83	53	13.3	22.8	0.3
28	120	19.4	19.5	0.294	84	53	13.6	23.1	0.4
29	120	19.0	19.2	0.295	84	53	13.6	22.6	0.4
30	120	19.3	19.5	0.297	85	53	13.8	23.0	0.3
31	120	19.4	19.6	0.289	83	53	13.4	23.1	0.2
32	120	18.9	19.1	0.292	83	53	13.7	22.5	0.3
33	120	19.3	19.5	0.291	83	53	13.5	23.0	0.2
34	120	19.3	19.5	0.295	84	53	13.8	22.9	0.4
35	120	19.6	19.8	0.292	83	53	13.6	23.3	0.3
36	120	19.3	19.5	0.294	84	53	13.8	22.9	0.4
37	120	19.6	19.9	0.292	83	53	13.6	23.4	0.3
38	120	19.4	19.6	0.289	83	53	13.3	23.1	0.3
39	120	19.7	19.9	0.292	83	53	13.5	23.4	0.2
40	120	19.6	19.8	0.293	84	53	13.5	23.3	0.3
41	120	19.4	19.6	0.292	83	53	13.5	23.0	0.3
42	120	19.5	19.7	0.289	83	53	13.4	23.1	0.1
43	120	19.3	19.5	0.289	83	53	13.6	23.0	0.3
44	120	19.4	19.6	0.290	83	53	13.5	23.1	0.2
45	120	19.6	19.8	0.292	83	53	13.6	23.3	0.3
46	120	19.5	19.7	0.289	83	53	13.6	23.2	0.3
47	120	19.7	19.9	0.291	83	53	13.6	23.5	0.2
48	120	19.6	19.8	0.292	83	53	13.8	23.4	0.1
49	120	19.7	19.9	0.292	84	53	13.6	23.4	0.2
50	120	19.4	19.6	0.292	83	53	13.4	23.1	0.2
51	120	19.5	19.7	0.292	83	53	13.7	23.2	0.3
52	120	19.1	19.4	0.283	81	52	13.3	22.8	0.0
Average		19.2	19.4	0.292	83	53	13.5	22.8	0.3
Std. Dev.		0.3	0.3	0.003	1	0	0.2	0.4	0.1
Maximum		19.7	19.9	0.298	85	53	13.8	23.5	0.5

Total number of blows analyzed: 52

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 58 5-60



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 58 5-60
DESCR: HAMMER#3 B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 58 5-60
6/24/2008 2:05:27 PM
Blow Number 42/40

Pile Properties

LE	62.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	7.40	ms
JC	0.50	[]

Quantity Results

CSXN	20.4	ksi
CSI	20.8	ksi
EFV	0.302	k-ft
ETR	86.3	(%)
BPM	52.6	bpm
VMX	14.8	f/s
FMX	24	kips
DFN	0.26	in
FVP	0.77	[]

Sensors

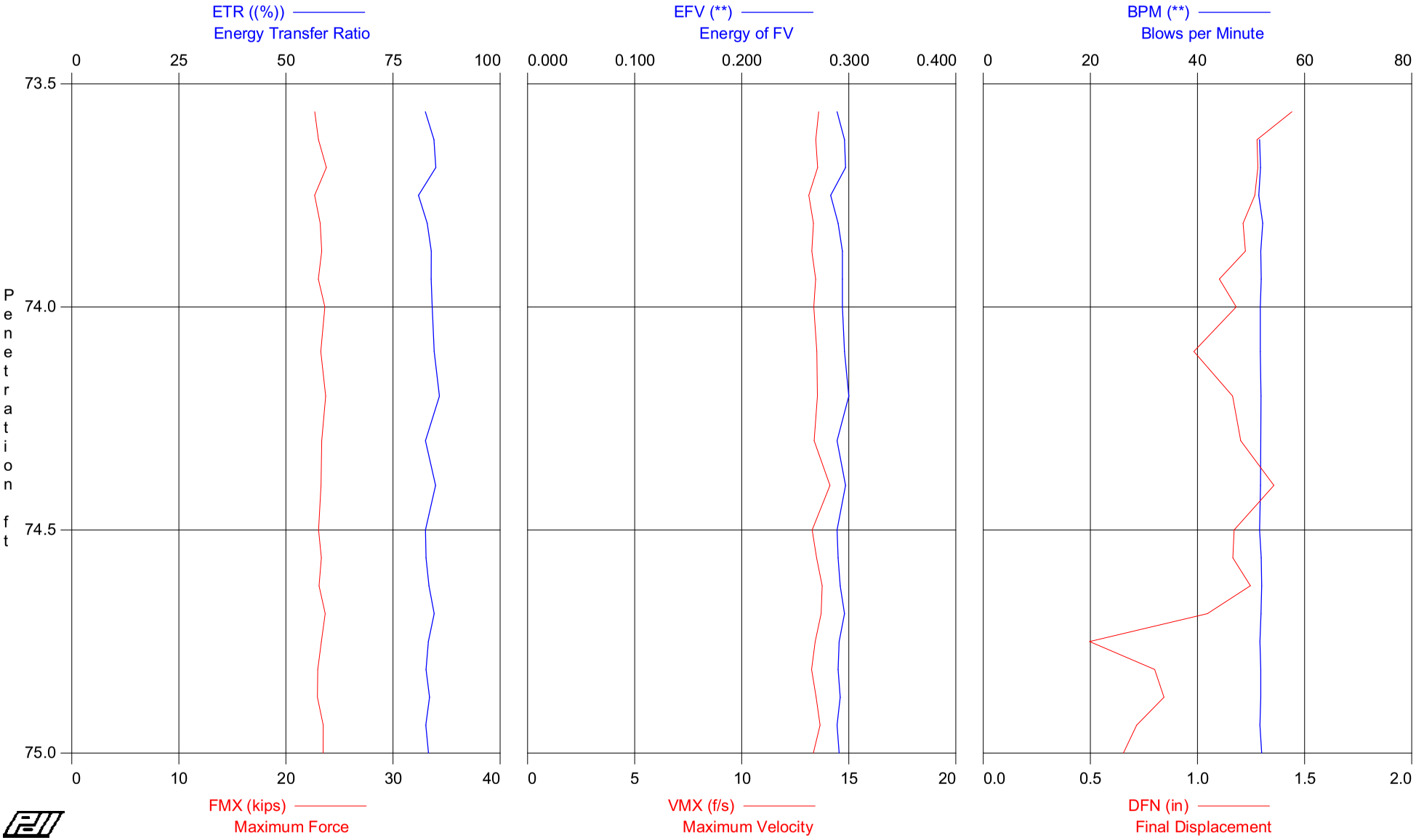
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.97
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 73.5-75
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 73.5-75
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 77.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
8	74.00	16	AV8	19.5	19.8	0.292	83	52	13.4	23.2	1.2
			STD	0.3	0.3	0.004	1	0	0.1	0.4	0.1
			MAX	20.0	20.3	0.297	85	52	13.6	23.8	1.4
13	74.50	10	AV5	19.6	19.9	0.294	84	52	13.6	23.3	1.2
			STD	0.2	0.2	0.004	1	0	0.3	0.2	0.1
			MAX	19.9	20.3	0.300	86	52	14.1	23.7	1.4
21	75.00	16	AV8	19.6	19.9	0.291	83	52	13.5	23.3	0.9
			STD	0.2	0.2	0.002	1	0	0.2	0.2	0.2
			MAX	19.9	20.2	0.296	85	52	13.8	23.7	1.2
			Average	19.5	19.8	0.292	84	52	13.5	23.3	1.1
			Std. Dev.	0.3	0.3	0.004	1	0	0.2	0.3	0.2
			Maximum	20.0	20.3	0.300	86	52	14.1	23.8	1.4

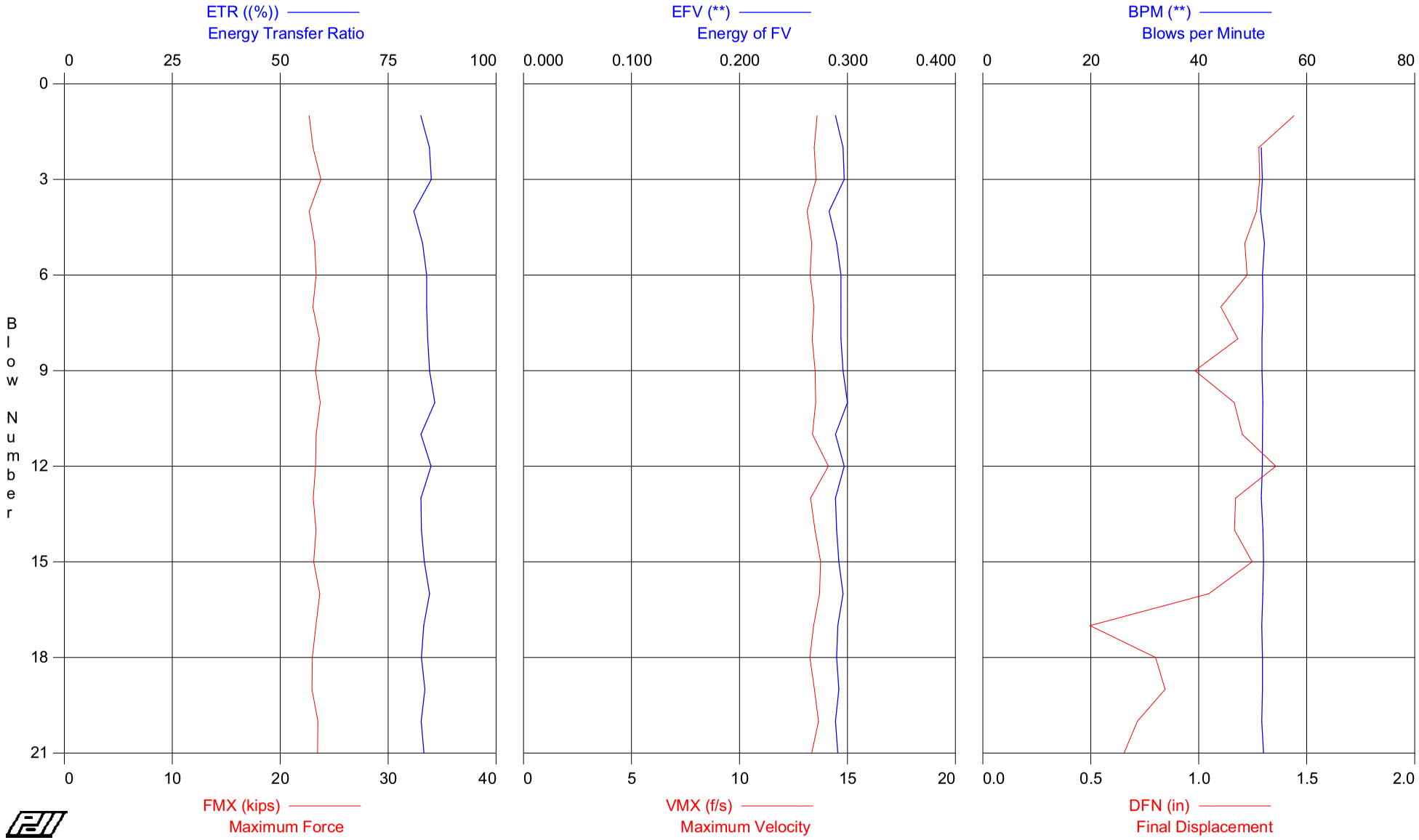
Total number of blows analyzed: 21

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 73.5-75
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 73.5-75
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 77.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

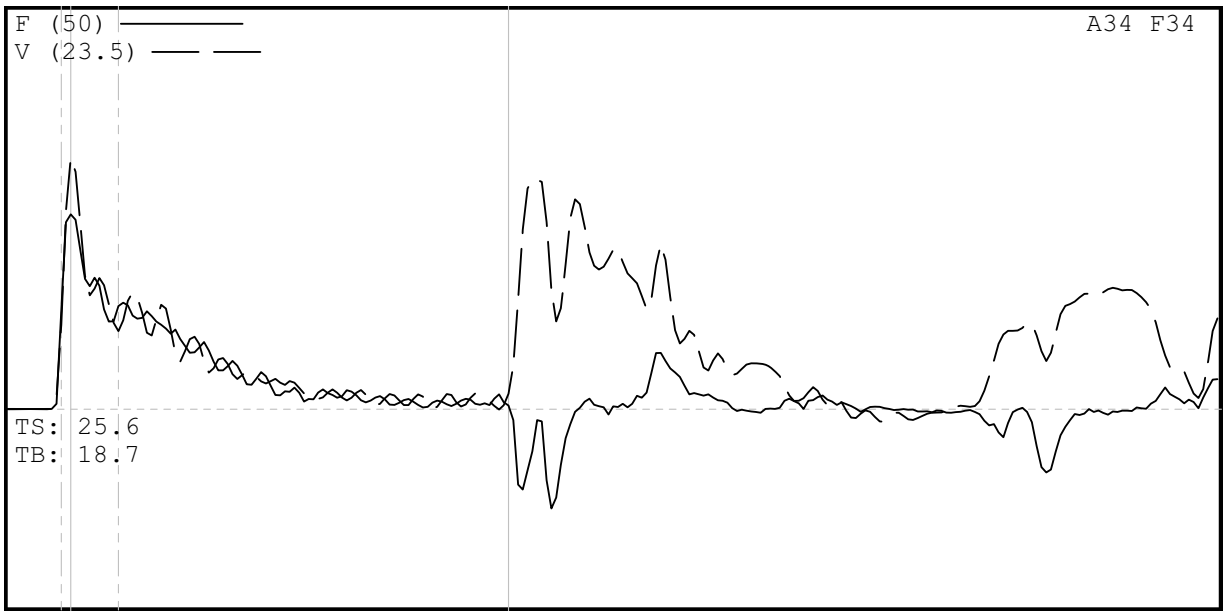
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	16	19.1	19.4	0.289	83	0	13.6	22.7	1.4
2	16	19.4	19.6	0.296	85	52	13.5	23.0	1.3
3	16	20.0	20.3	0.297	85	52	13.5	23.8	1.3
4	16	19.1	19.4	0.283	81	51	13.1	22.7	1.3
5	16	19.5	19.8	0.290	83	52	13.4	23.2	1.2
6	16	19.6	19.9	0.294	84	52	13.3	23.3	1.2
7	16	19.4	19.6	0.294	84	52	13.5	23.0	1.1
8	16	19.9	20.2	0.294	84	52	13.4	23.6	1.2
9	10	19.5	19.9	0.296	85	52	13.5	23.3	1.0
10	10	19.9	20.3	0.300	86	52	13.5	23.7	1.2
11	10	19.6	19.9	0.289	83	52	13.4	23.3	1.2
12	10	19.6	19.8	0.297	85	52	14.1	23.3	1.4
13	10	19.4	19.7	0.289	83	52	13.3	23.1	1.2
14	16	19.6	19.9	0.290	83	52	13.5	23.3	1.2
15	16	19.4	19.7	0.292	83	52	13.8	23.1	1.2
16	16	19.9	20.2	0.296	85	52	13.7	23.7	1.0
17	16	19.6	19.9	0.291	83	52	13.4	23.3	0.5
18	16	19.3	19.6	0.290	83	52	13.3	23.0	0.8
19	16	19.3	19.6	0.292	84	52	13.5	22.9	0.8
20	16	19.7	20.0	0.289	83	52	13.7	23.5	0.7
21	16	19.7	20.0	0.291	83	52	13.3	23.5	0.7
Average		19.5	19.8	0.292	84	52	13.5	23.3	1.1
Std. Dev.		0.3	0.3	0.004	1	0	0.2	0.3	0.2
Maximum		20.0	20.3	0.300	86	52	14.1	23.8	1.4

Total number of blows analyzed: 21

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 73 5-75



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 73 5-75
DESCR: HAMMER #3 B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 73 5-75
6/24/2008 3:04:08 PM
Blow Number 9/8

Pile Properties

LE	77.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	9.20	ms
JC	0.50	[]

Quantity Results

CSXN	20.3	ksi
CSI	20.8	ksi
EFV	0.303	k-ft
ETR	86.7	(%)
BPM	51.7	bpm
VMX	14.7	f/s
FMX	24	kips
DFN	1.19	in
FVP	0.78	[]

Sensors

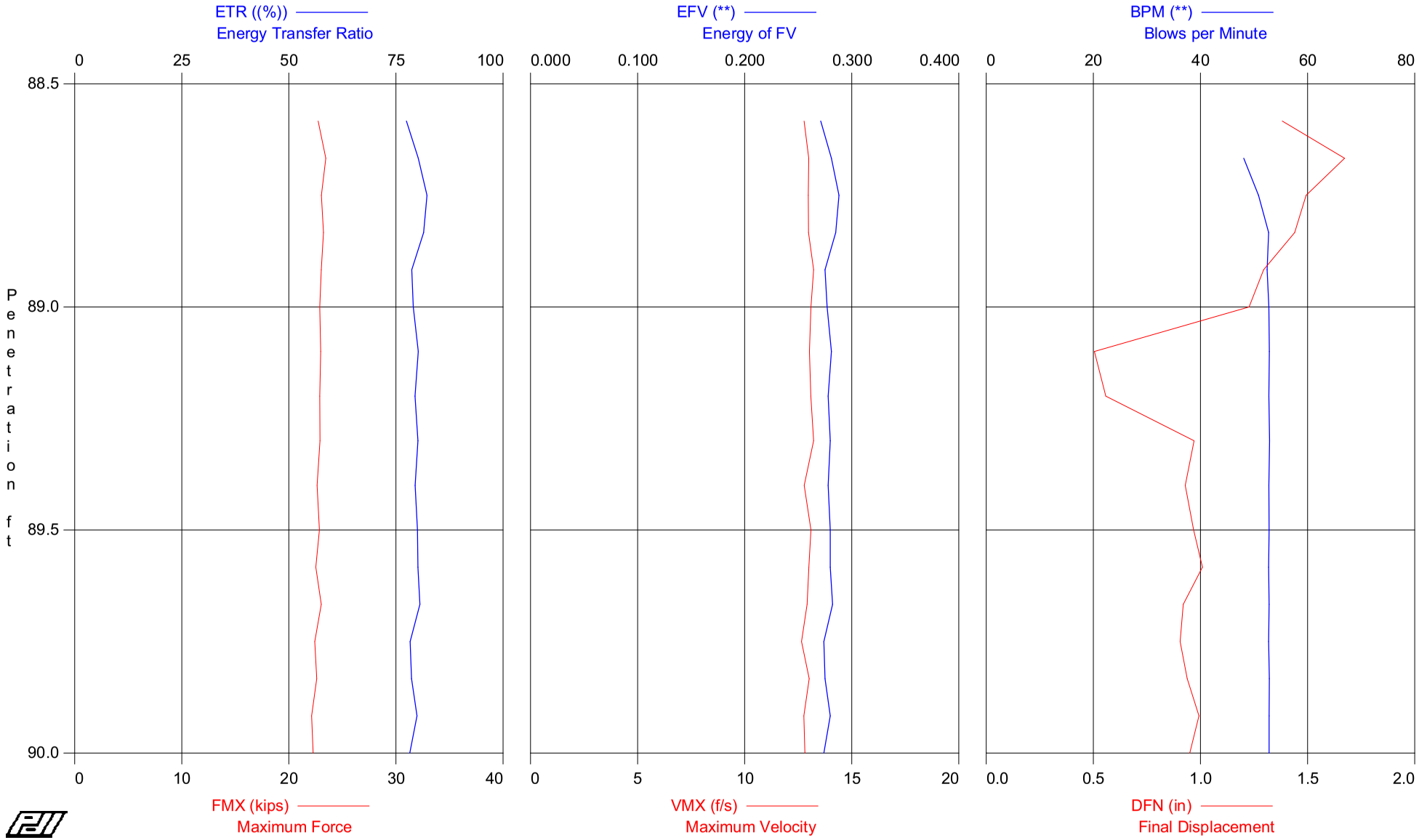
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.95
V3/V4: OK 1.08

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 88.5-90
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 88.5-90
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 92.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	89.00	12	AV6	19.4	19.4	0.280	80	51	13.0	23.1	1.4
			STD	0.2	0.2	0.006	2	2	0.1	0.2	0.1
			MAX	19.7	19.8	0.288	82	53	13.2	23.5	1.7
11	89.50	10	AV5	19.2	19.3	0.279	80	53	13.0	22.9	0.8
			STD	0.1	0.1	0.001	0	0	0.1	0.1	0.2
			MAX	19.3	19.4	0.281	80	53	13.2	23.0	1.0
17	90.00	12	AV6	18.9	19.0	0.277	79	53	12.9	22.5	1.0
			STD	0.2	0.3	0.003	1	0	0.1	0.3	0.0
			MAX	19.4	19.4	0.282	81	53	13.0	23.0	1.0
			Average	19.2	19.2	0.279	80	52	13.0	22.8	1.1
			Std. Dev.	0.3	0.3	0.004	1	1	0.2	0.3	0.3
			Maximum	19.7	19.8	0.288	82	53	13.2	23.5	1.7

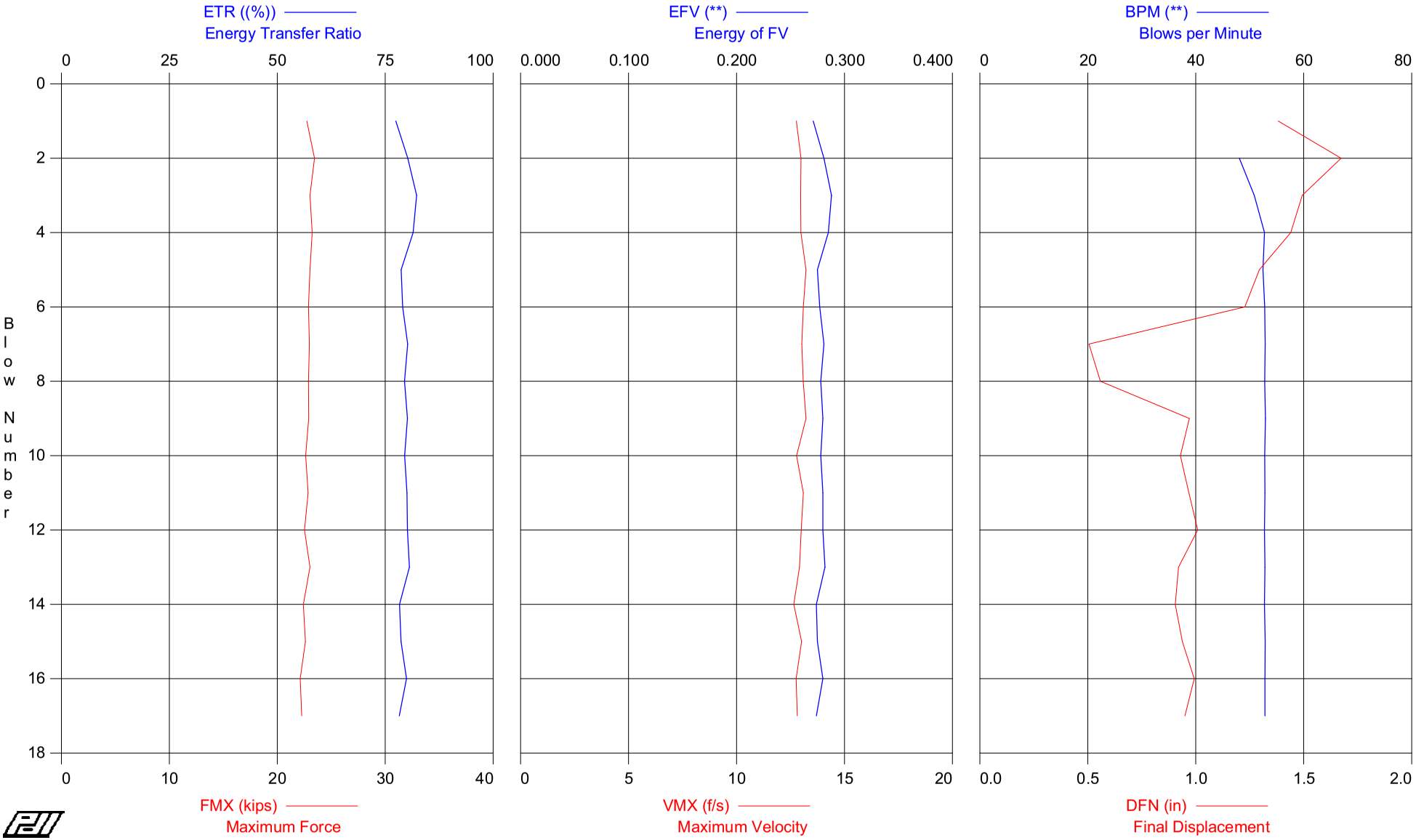
Total number of blows analyzed: 17

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 88.5-90
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 88.5-90
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 92.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

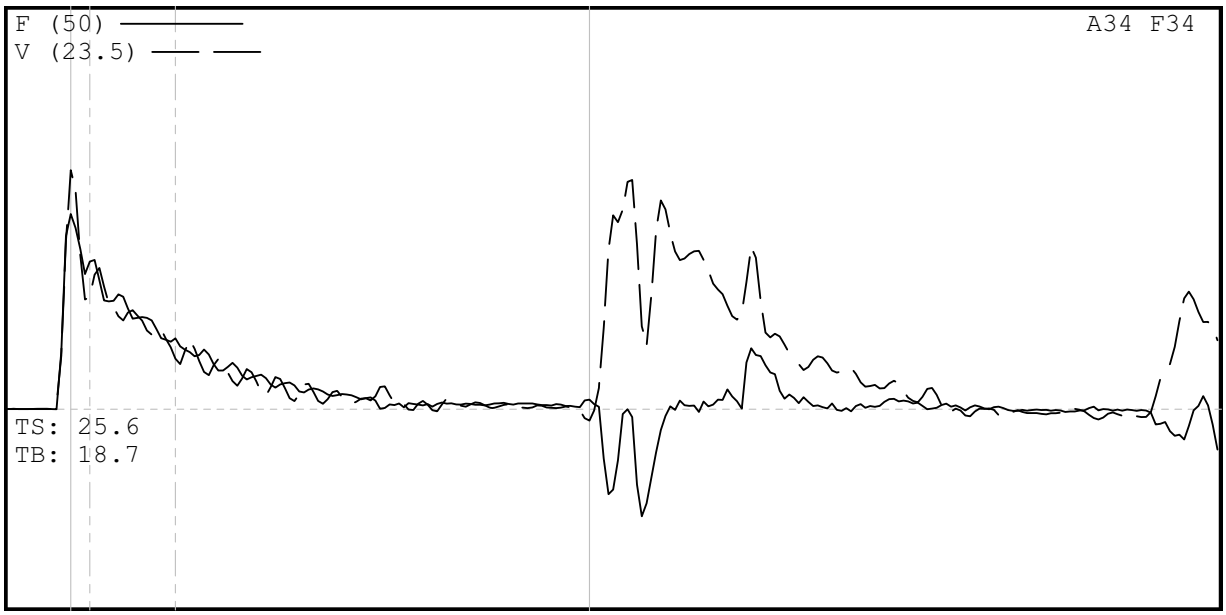
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	19.1	19.1	0.271	77	0	12.8	22.7	1.4
2	12	19.7	19.8	0.281	80	48	13.0	23.5	1.7
3	12	19.4	19.4	0.288	82	51	13.0	23.0	1.5
4	12	19.5	19.7	0.285	81	53	13.0	23.2	1.4
5	12	19.4	19.5	0.275	79	52	13.2	23.0	1.3
6	12	19.2	19.3	0.277	79	53	13.1	22.9	1.2
7	10	19.3	19.4	0.281	80	53	13.0	23.0	0.5
8	10	19.2	19.3	0.278	79	53	13.1	22.9	0.6
9	10	19.3	19.3	0.280	80	53	13.2	22.9	1.0
10	10	19.0	19.1	0.278	79	53	12.8	22.6	0.9
11	10	19.2	19.3	0.280	80	53	13.1	22.9	1.0
12	12	18.9	19.0	0.280	80	53	13.0	22.5	1.0
13	12	19.4	19.4	0.282	81	53	12.9	23.0	0.9
14	12	18.8	18.9	0.274	78	53	12.7	22.4	0.9
15	12	19.0	19.0	0.275	79	53	13.0	22.6	0.9
16	12	18.6	18.6	0.280	80	53	12.8	22.1	1.0
17	12	18.7	18.8	0.274	78	53	12.8	22.3	1.0
Average		19.2	19.2	0.279	80	52	13.0	22.8	1.1
Std. Dev.		0.3	0.3	0.004	1	1	0.2	0.3	0.3
Maximum		19.7	19.8	0.288	82	53	13.2	23.5	1.7

Total number of blows analyzed: 17

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 88 5-90



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 88 5-90
DESCR: HAMMER #3 B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 88 5-90
6/24/2008 4:15:44 PM
Blow Number 4/1

Pile Properties

LE	92.00	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	10.90	ms
JC	0.50	[]

Quantity Results

CSXN	20.4	ksi
CSI	20.4	ksi
EFV	0.279	k-ft
ETR	79.9	(%)
BPM	0.0	bpm
VMX	14.0	f/s
FMX	24	kips
DFN	1.38	in
FVP	0.82	[]

Sensors

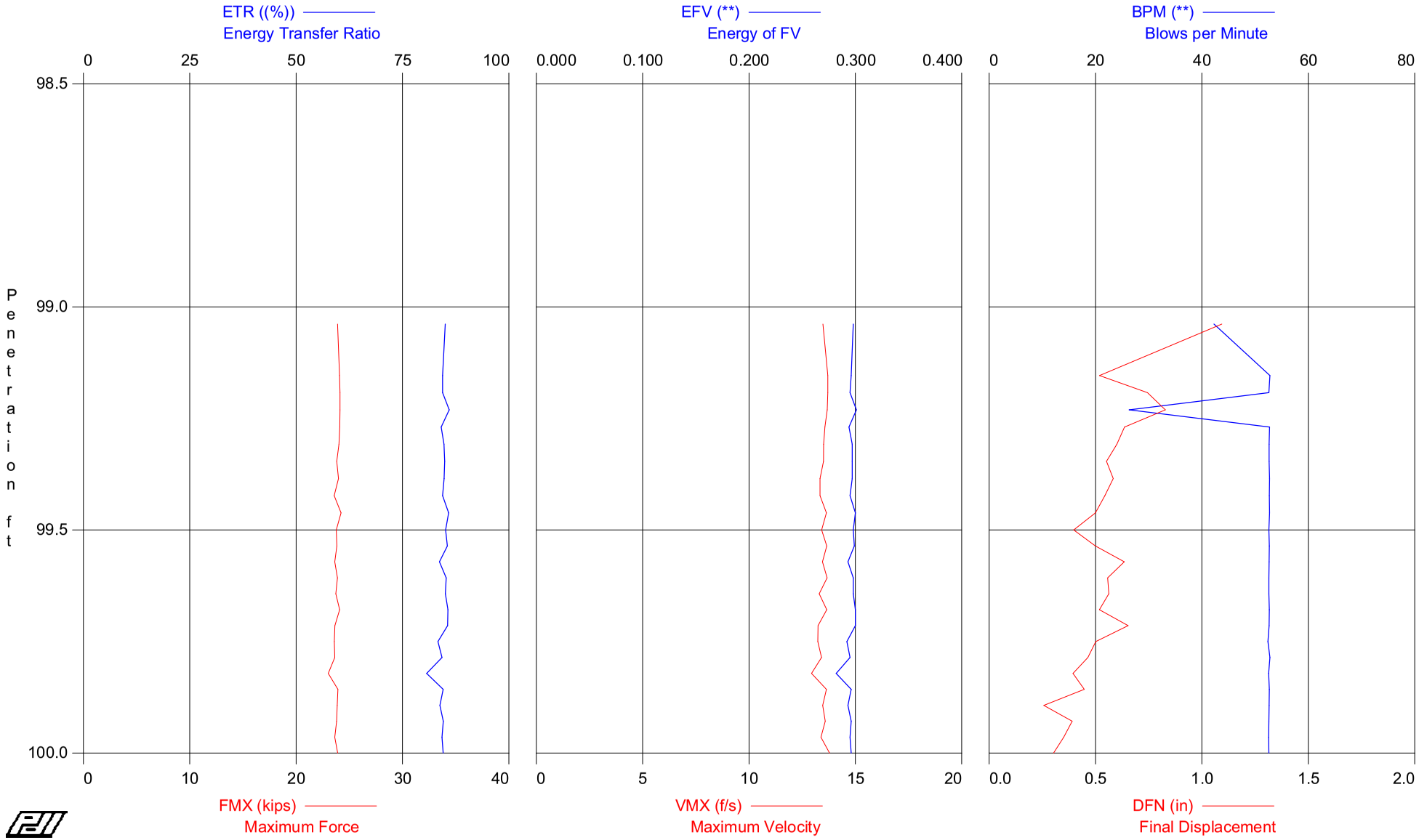
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 1.10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 98.5-100
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 98.5-100
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 101.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
13	99.50	26	AV11	20.1	20.2	0.297	85	49	13.5	24.0	0.6
			STD	0.2	0.2	0.002	1	8	0.1	0.2	0.2
			MAX	20.4	20.4	0.301	86	53	13.7	24.2	1.1
27	100.00	28	AV14	19.9	20.0	0.295	84	53	13.5	23.7	0.5
			STD	0.2	0.2	0.004	1	0	0.2	0.2	0.1
			MAX	20.2	20.3	0.300	86	53	13.8	24.1	0.7
			Average	20.0	20.1	0.296	85	51	13.5	23.8	0.5
			Std. Dev.	0.2	0.2	0.004	1	5	0.2	0.3	0.2
			Maximum	20.4	20.4	0.301	86	53	13.8	24.2	1.1

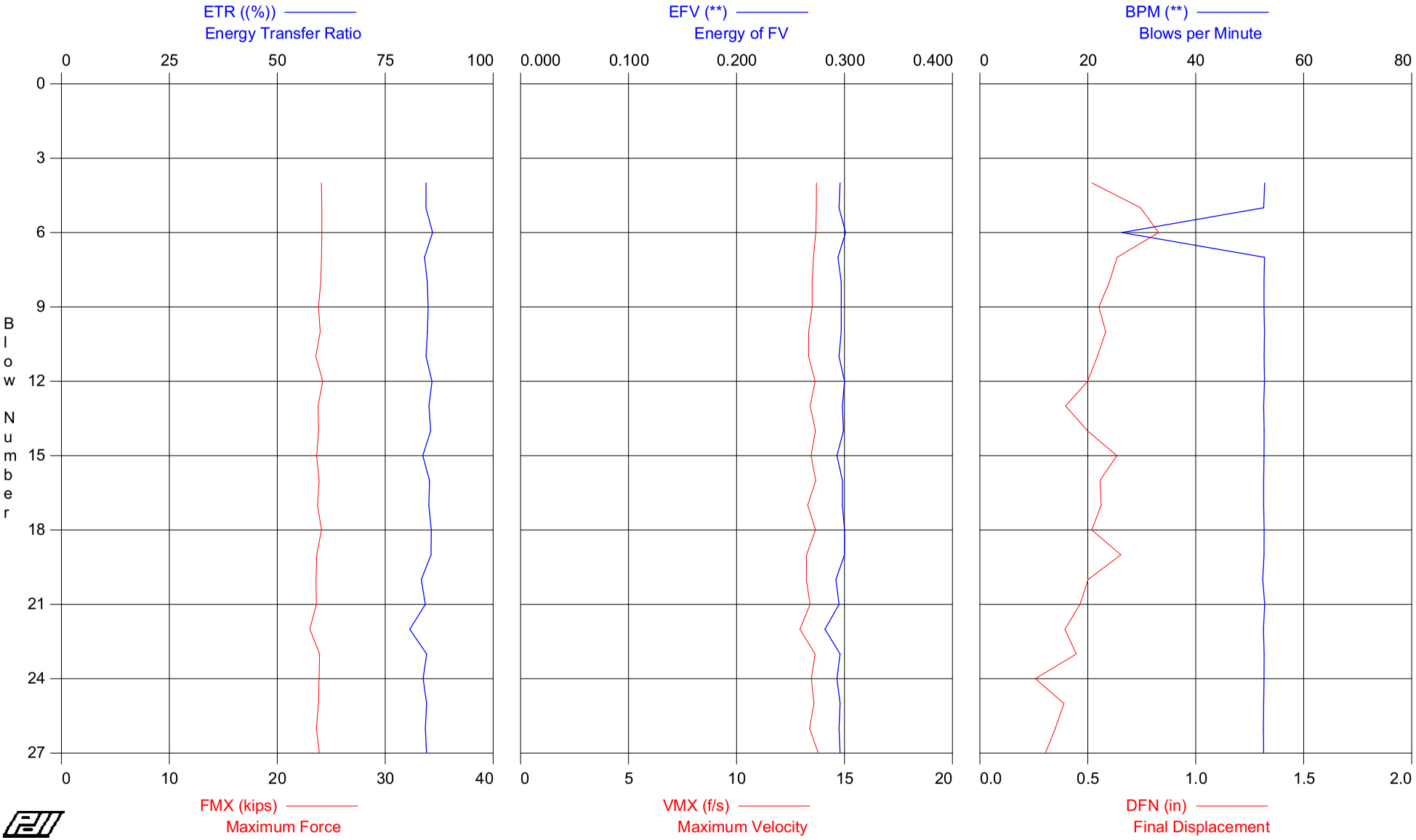
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 24-Jun-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 98.5-100
HAMMER #3 B-791



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG D-50 DEPTH 98.5-100
OP: DJF

HAMMER #3 B-791
Test date: 24-Jun-2008

AR: 1.19 in^2
LE: 101.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

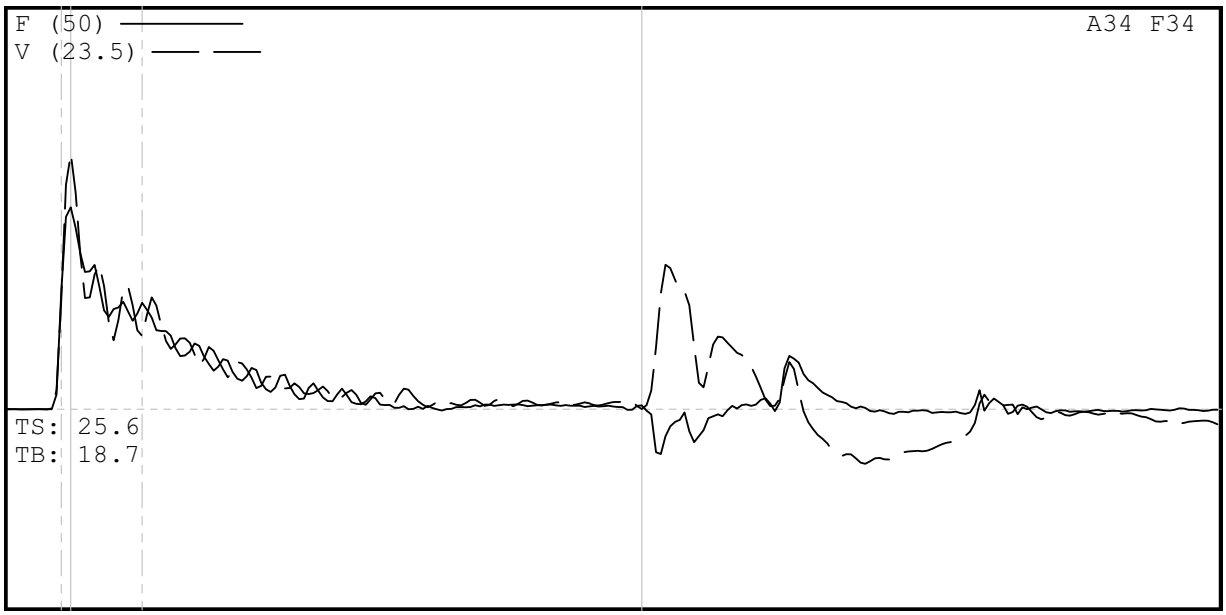
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
4	26	20.2	20.3	0.296	84	53	13.7	24.1	0.5
5	26	20.3	20.3	0.295	84	53	13.7	24.1	0.7
6	26	20.3	20.3	0.301	86	26	13.7	24.1	0.8
7	26	20.3	20.3	0.294	84	53	13.6	24.1	0.6
8	26	20.2	20.3	0.297	85	53	13.5	24.0	0.6
9	26	20.0	20.1	0.297	85	53	13.5	23.8	0.6
10	26	20.2	20.2	0.297	85	53	13.3	24.0	0.6
11	26	19.8	19.8	0.295	84	53	13.3	23.6	0.5
12	26	20.4	20.4	0.300	86	53	13.6	24.2	0.5
13	26	20.0	20.0	0.298	85	53	13.4	23.8	0.4
14	28	20.0	20.0	0.299	86	53	13.7	23.8	0.5
15	28	19.9	19.9	0.293	84	53	13.5	23.6	0.6
16	28	20.1	20.1	0.298	85	53	13.7	23.9	0.6
17	28	19.9	19.9	0.298	85	53	13.3	23.7	0.6
18	28	20.2	20.3	0.300	86	53	13.7	24.1	0.5
19	28	19.9	19.9	0.300	86	53	13.2	23.6	0.7
20	28	19.8	19.8	0.292	83	52	13.2	23.6	0.5
21	28	19.9	19.9	0.295	84	53	13.4	23.6	0.5
22	28	19.3	19.4	0.282	81	53	12.9	23.0	0.4
23	28	20.1	20.2	0.296	85	53	13.6	23.9	0.4
24	28	20.1	20.2	0.293	84	53	13.5	23.9	0.3
25	28	20.0	20.0	0.296	85	53	13.6	23.8	0.4
26	28	19.9	20.0	0.295	84	53	13.4	23.6	0.4
27	28	20.1	20.2	0.296	85	53	13.8	23.9	0.3
Average		20.0	20.1	0.296	85	52	13.5	23.8	0.5
Std. Dev.		0.2	0.2	0.004	1	5	0.2	0.3	0.1
Maximum		20.4	20.4	0.301	86	53	13.8	24.2	0.8

Total number of blows analyzed: 24

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG D-50 DEPTH 98 5-100



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG D-50 DEPTH 98 5-100
DESCR: HAMMER #3 B-791
OPERATOR: DJF
FILE: DRILL RIG D-50 DEPTH 98 5-100
6/24/2008 5:28:56 PM
Blow Number 41/25

Pile Properties

LE	101.20	ft
AR	1.19	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	12.04	ms
JC	0.50	[]

Quantity Results

CSXN	21.1	ksi
CSI	21.1	ksi
EFV	0.305	k-ft
ETR	87.2	(%)
BPM	52.6	bpm
VMX	14.9	f/s
FMX	25	kips
DFN	0.39	in
FVP	0.79	[]

Sensors

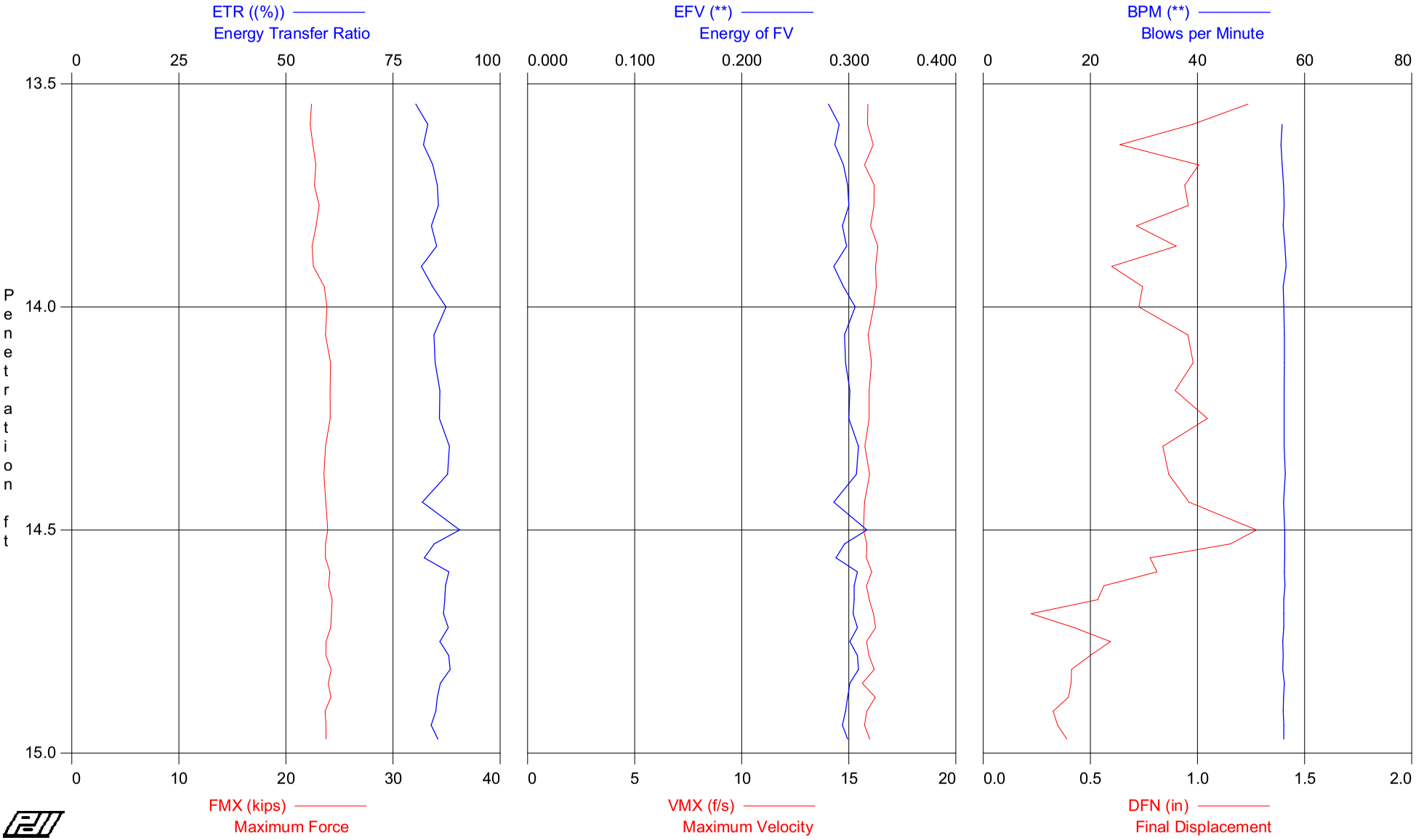
F3: [171-AWJ-1] 212.1 (1)
F4: [171-AWJ-2] 212.23 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0286] 350 mv/5000g's (1)
CLIP: OK
F3/F4: OK 0.99
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 13.5 - 15
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 13.5 - 15
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
11	14.00	22	AV11	19.7	19.7	0.294	84	56	16.1	22.8	0.9
			STD	0.4	0.4	0.007	2	0	0.2	0.5	0.2
			MAX	20.5	20.6	0.306	87	57	16.4	23.8	1.2
19	14.50	16	AV8	20.6	20.6	0.302	86	56	15.9	23.9	1.0
			STD	0.2	0.2	0.009	2	0	0.1	0.2	0.1
			MAX	20.8	20.9	0.317	91	56	16.1	24.2	1.3
34	14.97	32	AV15	20.6	20.7	0.301	86	56	16.0	23.9	0.5
			STD	0.2	0.2	0.006	2	0	0.2	0.2	0.2
			MAX	21.0	21.0	0.309	88	56	16.3	24.3	1.2
			Average	20.3	20.4	0.299	85	56	16.0	23.6	0.7
			Std. Dev.	0.5	0.5	0.008	2	0	0.2	0.6	0.3
			Maximum	21.0	21.0	0.317	91	57	16.4	24.3	1.3

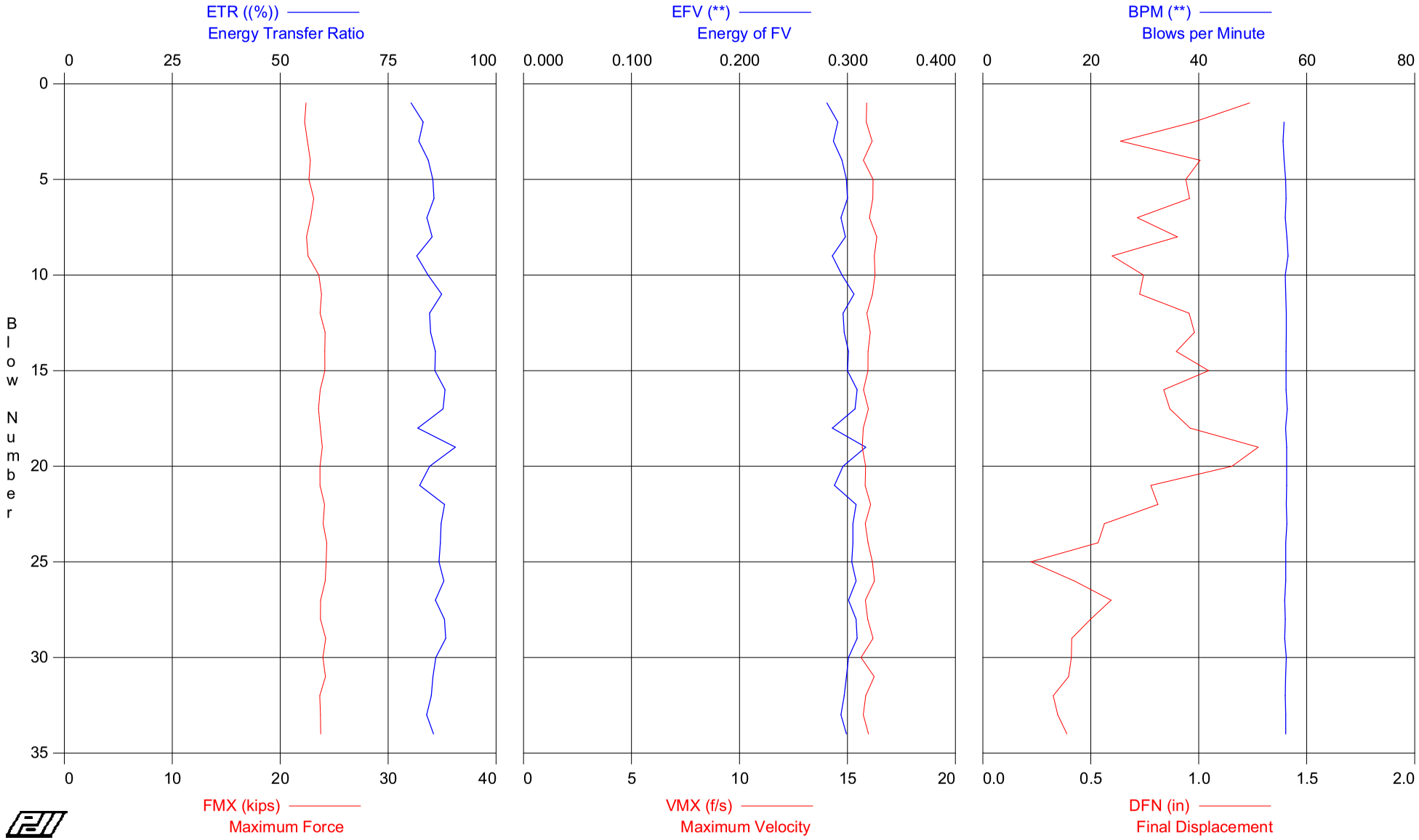
Total number of blows analyzed: 34

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 13.5 - 15
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 13.5 - 15
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

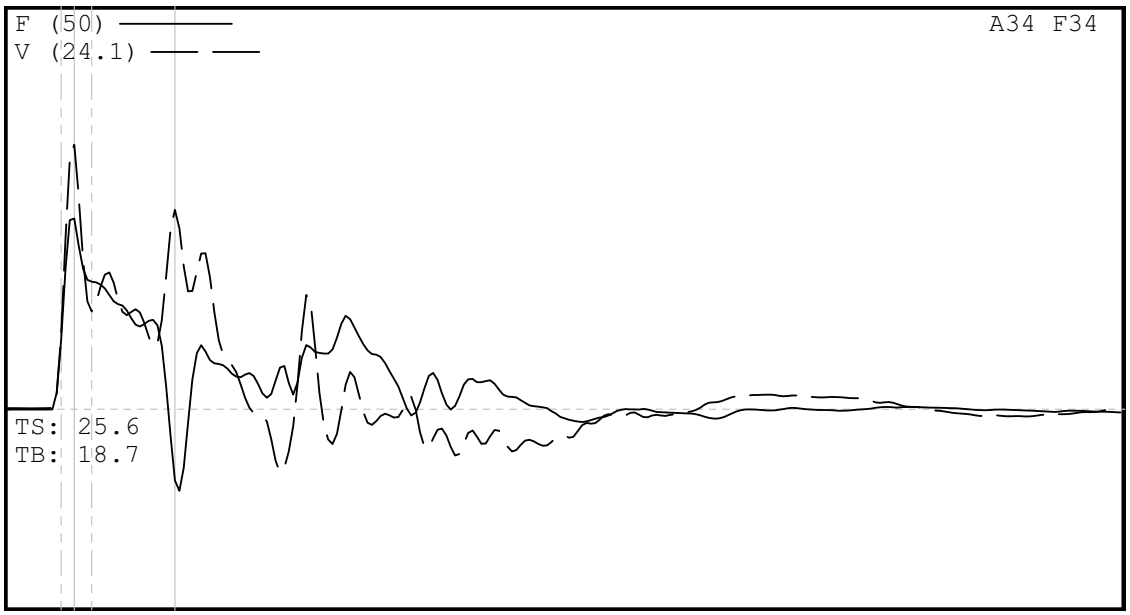
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	22	19.3	19.3	0.281	80	0	15.9	22.4	1.2
2	22	19.2	19.2	0.291	83	56	15.9	22.3	1.0
3	22	19.4	19.5	0.287	82	56	16.1	22.5	0.6
4	22	19.7	19.7	0.295	84	56	15.7	22.8	1.0
5	22	19.5	19.6	0.299	85	56	16.2	22.7	0.9
6	22	19.9	20.0	0.300	86	56	16.2	23.1	1.0
7	22	19.7	19.7	0.294	84	56	16.0	22.8	0.7
8	22	19.3	19.4	0.298	85	56	16.4	22.4	0.9
9	22	19.5	19.5	0.286	82	57	16.2	22.6	0.6
10	22	20.3	20.4	0.295	84	56	16.3	23.6	0.7
11	22	20.5	20.6	0.306	87	56	16.2	23.8	0.7
12	16	20.4	20.5	0.296	85	56	15.9	23.7	1.0
13	16	20.8	20.9	0.297	85	56	16.1	24.2	1.0
14	16	20.8	20.9	0.301	86	56	16.0	24.1	0.9
15	16	20.8	20.9	0.300	86	56	15.9	24.1	1.0
16	16	20.4	20.5	0.309	88	56	15.7	23.7	0.8
17	16	20.3	20.4	0.307	88	56	16.0	23.6	0.9
18	16	20.5	20.5	0.286	82	56	15.7	23.7	1.0
19	16	20.6	20.6	0.317	91	56	15.7	23.9	1.3
20	32	20.4	20.5	0.296	85	56	15.8	23.7	1.2
21	32	20.4	20.5	0.288	82	56	15.8	23.7	0.8
22	32	20.8	20.9	0.308	88	56	16.1	24.1	0.8
23	32	20.7	20.8	0.305	87	56	15.8	24.0	0.6
24	32	21.0	21.0	0.305	87	56	16.0	24.3	0.5
25	32	20.9	20.9	0.304	87	56	16.2	24.3	0.2
26	32	20.8	20.9	0.308	88	56	16.3	24.2	0.4
27	32	20.5	20.5	0.301	86	56	15.8	23.7	0.6
28	32	20.5	20.5	0.308	88	56	15.9	23.7	0.5
29	32	20.9	20.9	0.309	88	56	16.2	24.2	0.4
30	32	20.7	20.7	0.301	86	56	15.6	24.0	0.4
31	32	20.9	20.9	0.299	85	56	16.2	24.2	0.4
32	32	20.4	20.4	0.297	85	56	15.8	23.7	0.3
33	32	20.5	20.5	0.294	84	56	15.7	23.7	0.3
34	32	20.5	20.5	0.299	85	56	16.0	23.7	0.4
Average		20.3	20.4	0.299	85	56	16.0	23.6	0.7
Std. Dev.		0.5	0.5	0.008	2	0	0.2	0.6	0.3
Maximum		21.0	21.0	0.317	91	57	16.4	24.3	1.3

Total number of blows analyzed: 34

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 13 5 - 15



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 13 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 13 5 - 15
7/8/2008 12:31:11 PM
Blow Number 35/32

Pile Properties

LE	19.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	2.26	ms
JC	0.50	[]

Quantity Results

CSXN	20.4	ksi
CSI	20.4	ksi
EFV	0.297	k-ft
ETR	85.0	(%)
BPM	56.0	bpm
VMX	15.8	f/s
FMX	24	kips
DFN	0.33	in
FVP	0.72	[]

Sensors

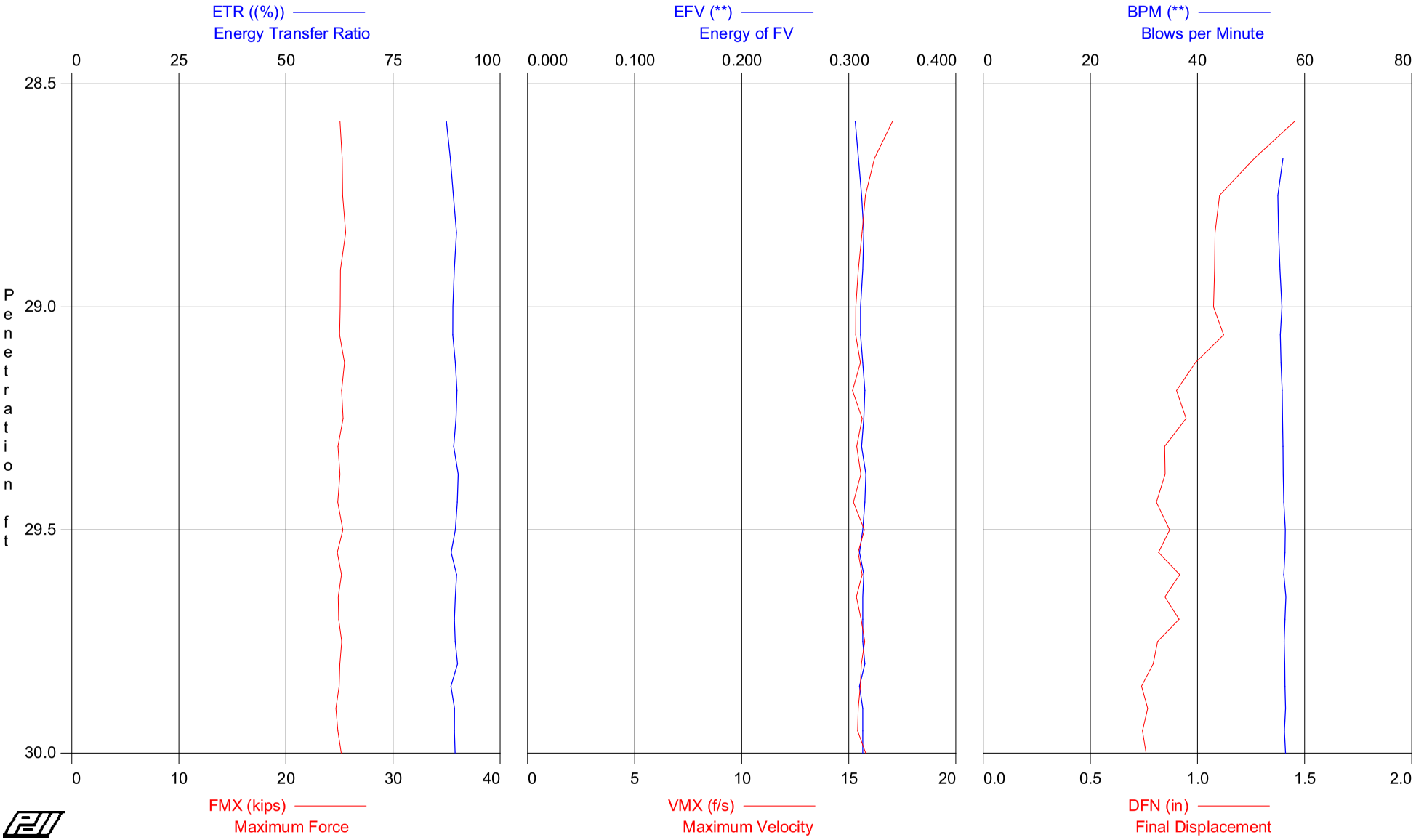
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 28.5 - 30
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 28.5 - 30
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	29.00	12	AV6	21.7	21.8	0.311	89	55	15.9	25.2	1.2
			STD	0.2	0.2	0.003	1	0	0.6	0.2	0.1
			MAX	22.0	22.1	0.314	90	56	17.0	25.6	1.5
14	29.50	16	AV8	21.7	21.7	0.314	90	56	15.4	25.1	0.9
			STD	0.2	0.2	0.002	0	0	0.2	0.2	0.1
			MAX	22.0	22.0	0.316	90	56	15.7	25.5	1.1
24	30.00	20	AV10	21.5	21.6	0.313	89	56	15.5	25.0	0.8
			STD	0.1	0.1	0.001	0	0	0.1	0.2	0.1
			MAX	21.7	21.8	0.315	90	56	15.8	25.2	0.9
			Average	21.6	21.7	0.313	89	56	15.6	25.1	0.9
			Std. Dev.	0.2	0.2	0.002	1	0	0.4	0.2	0.2
			Maximum	22.0	22.1	0.316	90	56	17.0	25.6	1.5

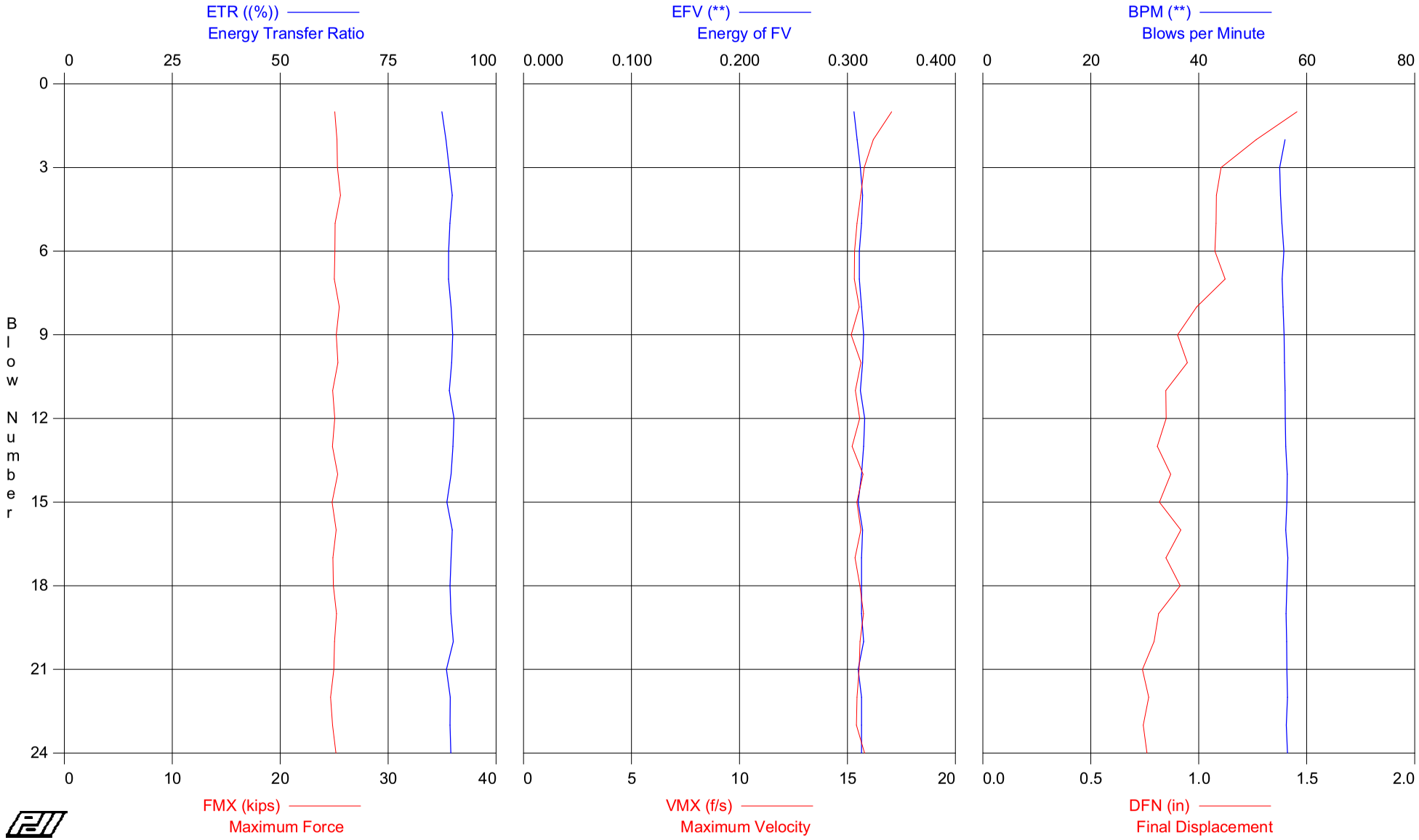
Total number of blows analyzed: 24

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 28.5 - 30
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 28.5 - 30
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 34.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

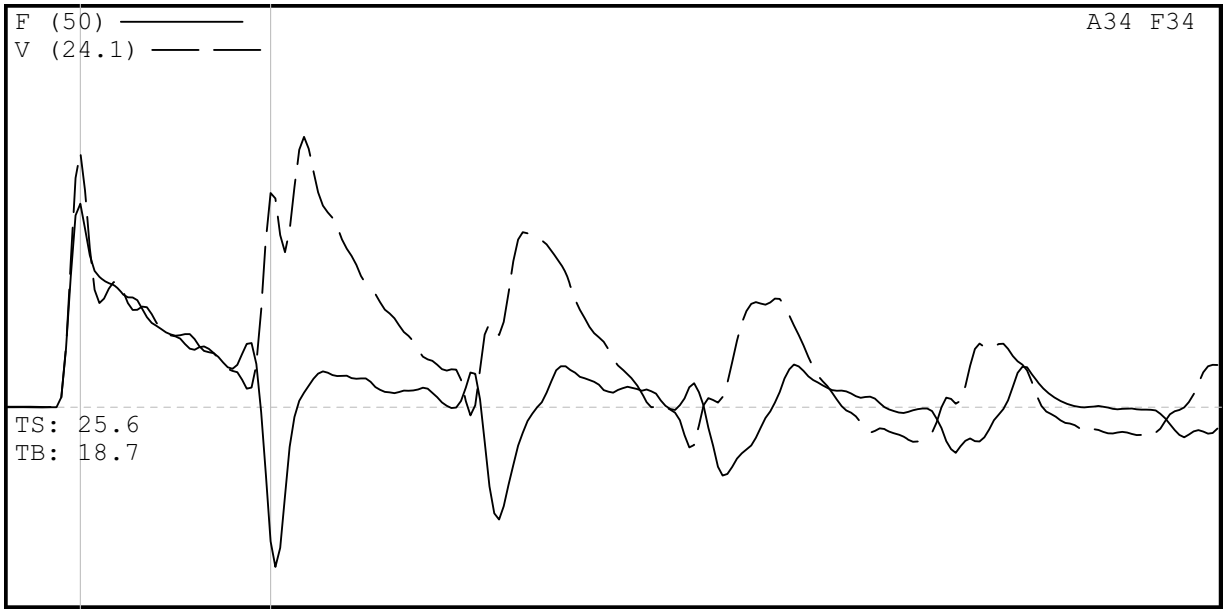
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	21.6	21.6	0.306	87	0	17.0	25.0	1.5
2	12	21.8	21.8	0.309	88	56	16.2	25.3	1.3
3	12	21.8	21.8	0.312	89	55	15.8	25.3	1.1
4	12	22.0	22.1	0.314	90	55	15.6	25.6	1.1
5	12	21.6	21.7	0.313	89	55	15.4	25.1	1.1
6	12	21.6	21.6	0.311	89	56	15.3	25.1	1.1
7	16	21.6	21.6	0.311	89	55	15.3	25.0	1.1
8	16	22.0	22.0	0.313	90	56	15.5	25.5	1.0
9	16	21.7	21.9	0.315	90	56	15.2	25.2	0.9
10	16	21.9	21.9	0.314	90	56	15.6	25.3	0.9
11	16	21.4	21.5	0.312	89	56	15.4	24.9	0.8
12	16	21.6	21.6	0.316	90	56	15.6	25.1	0.8
13	16	21.4	21.6	0.315	90	56	15.2	24.8	0.8
14	16	21.8	21.9	0.313	90	56	15.7	25.3	0.9
15	20	21.4	21.4	0.310	89	56	15.4	24.8	0.8
16	20	21.7	21.7	0.314	90	56	15.6	25.2	0.9
17	20	21.4	21.7	0.313	90	56	15.4	24.9	0.8
18	20	21.5	21.5	0.313	89	56	15.6	24.9	0.9
19	20	21.7	21.8	0.313	90	56	15.7	25.2	0.8
20	20	21.6	21.6	0.315	90	56	15.6	25.0	0.8
21	20	21.5	21.6	0.310	89	56	15.5	25.0	0.7
22	20	21.3	21.4	0.313	89	56	15.4	24.7	0.8
23	20	21.4	21.7	0.313	89	56	15.4	24.9	0.7
24	20	21.7	21.8	0.313	90	56	15.8	25.2	0.8
Average		21.6	21.7	0.313	89	56	15.6	25.1	0.9
Std. Dev.		0.2	0.2	0.002	1	0	0.4	0.2	0.2
Maximum		22.0	22.1	0.316	90	56	17.0	25.6	1.5

Total number of blows analyzed: 24

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 28 5 - 30



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 28 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 28 5 - 30
7/8/2008 2:18:08 PM
Blow Number 3/2

Pile Properties

LE	34.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	4.05	ms
JC	0.50	[]

Quantity Results

CSXN	21.8	ksi
CSI	21.8	ksi
EFV	0.309	k-ft
ETR	88.4	(%)
BPM	56.0	bpm
VMX	16.2	f/s
FMX	25	kips
DFN	1.27	in
FVP	0.80	[]

Sensors

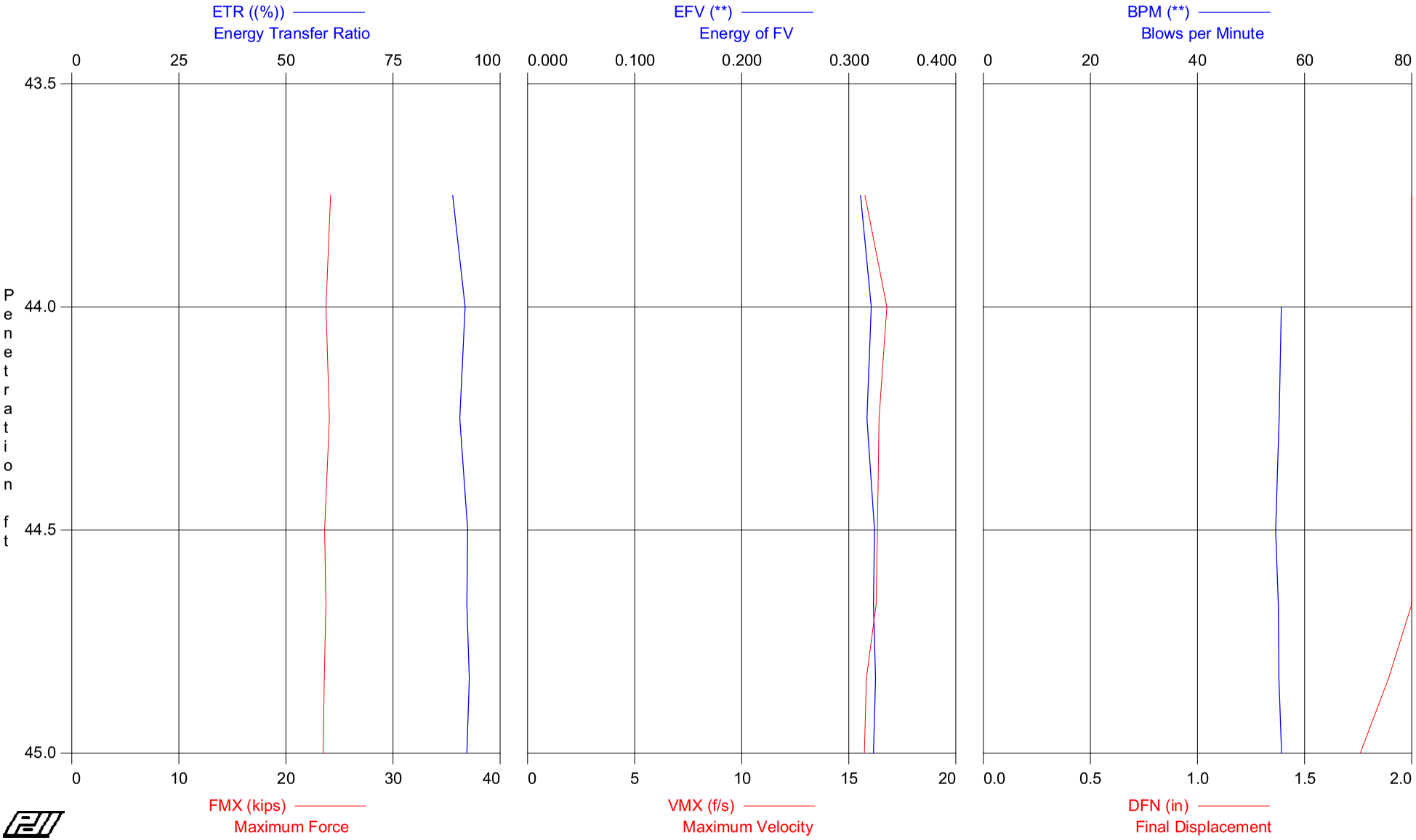
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 43.5 - 45
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 43.5 - 45
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 49.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
2	44.00	4	AV2	20.6	20.8	0.316	90	56	16.3	24.0	3.3
			STD	0.2	0.1	0.005	1	0	0.5	0.2	0.6
			MAX	20.8	20.9	0.321	92	56	16.8	24.2	3.9
4	44.50	4	AV2	20.5	20.7	0.321	92	55	16.4	23.8	3.8
			STD	0.2	0.1	0.003	1	0	0.0	0.2	0.1
			MAX	20.7	20.8	0.324	92	55	16.4	24.1	4.0
7	45.00	6	AV3	20.3	20.5	0.324	92	55	15.9	23.6	2.1
			STD	0.1	0.2	0.001	0	0	0.2	0.1	0.4
			MAX	20.5	20.7	0.325	93	56	16.3	23.7	2.6
			Average	20.5	20.6	0.321	92	55	16.2	23.8	2.9
			Std. Dev.	0.2	0.2	0.005	1	0	0.4	0.2	0.9
			Maximum	20.8	20.9	0.325	93	56	16.8	24.2	4.0

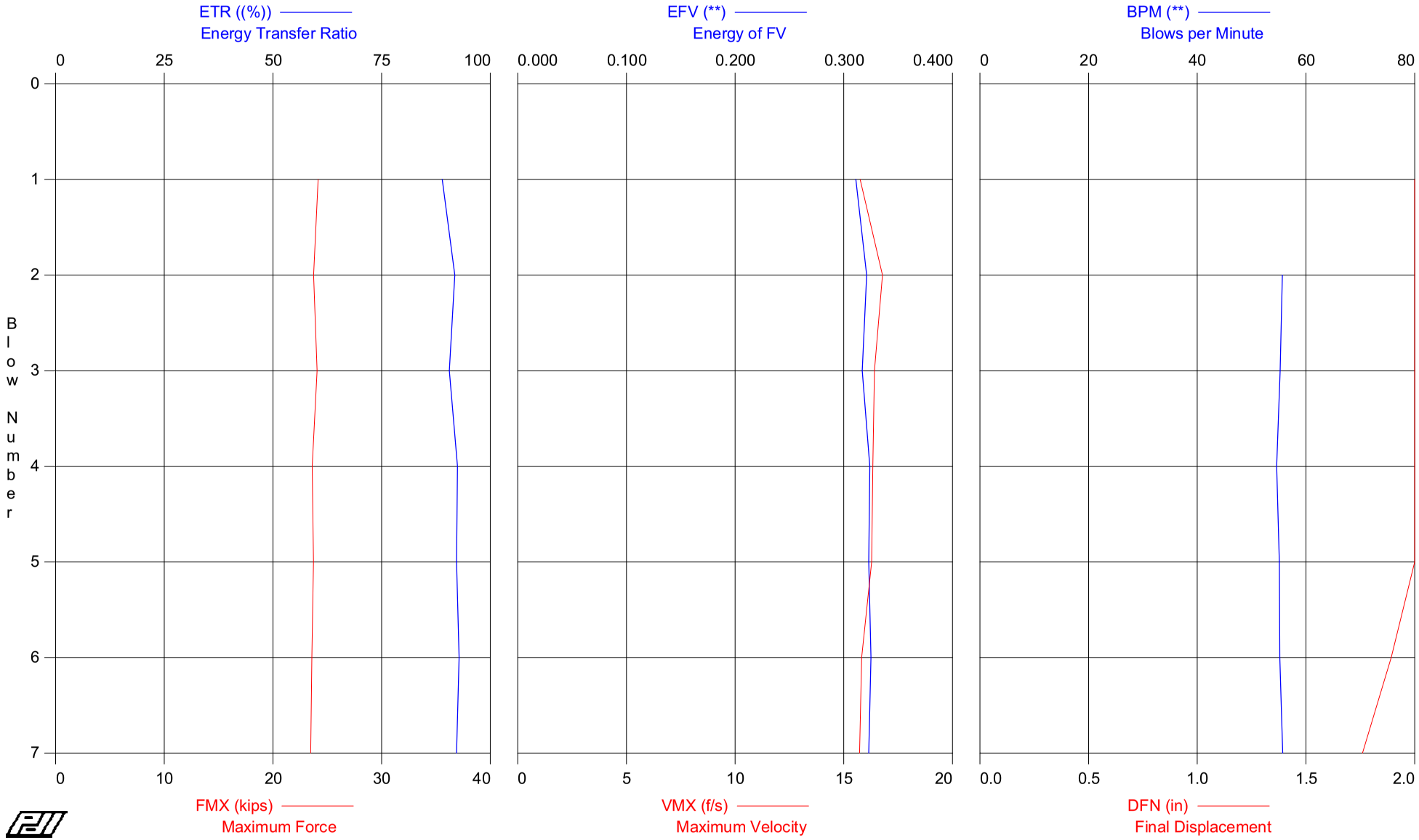
Total number of blows analyzed: 7

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 43.5 - 45
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 43.5 - 45
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 49.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

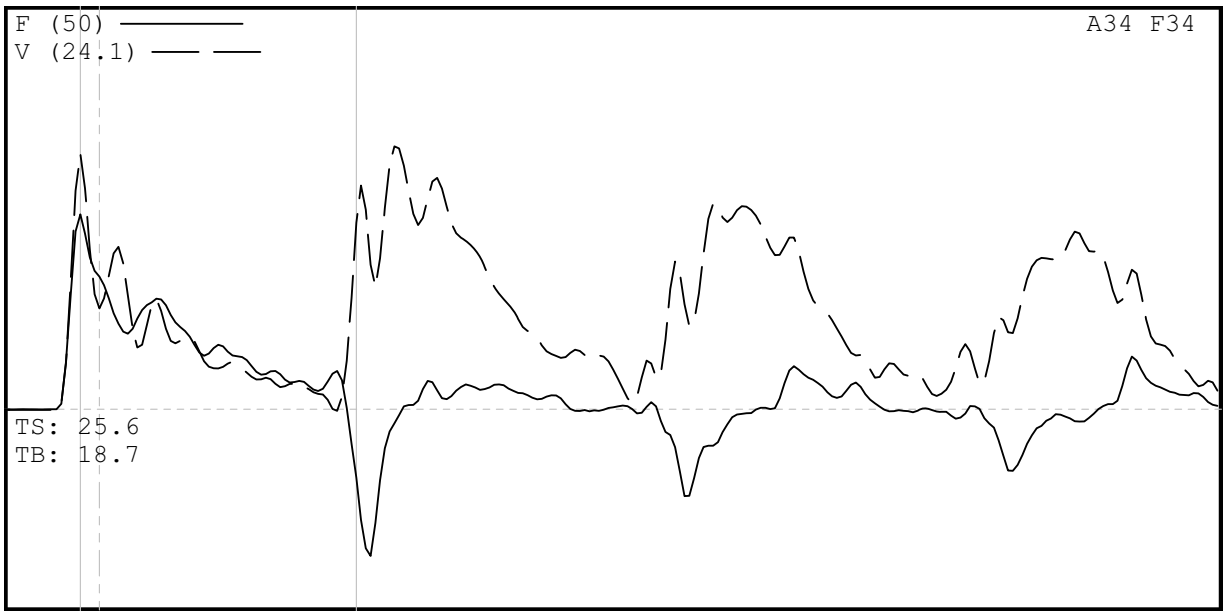
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	4	20.8	20.9	0.311	89	0	15.8	24.2	2.8
2	4	20.5	20.7	0.321	92	56	16.8	23.7	3.9
3	4	20.7	20.8	0.317	91	55	16.4	24.1	4.0
4	4	20.4	20.6	0.324	92	55	16.3	23.6	3.7
5	6	20.5	20.7	0.323	92	55	16.3	23.7	2.6
6	6	20.3	20.4	0.325	93	55	15.8	23.6	1.9
7	6	20.2	20.3	0.323	92	56	15.7	23.5	1.8
Average		20.5	20.6	0.321	92	55	16.2	23.8	2.9
Std. Dev.		0.2	0.2	0.005	1	0	0.4	0.2	0.9
Maximum		20.8	20.9	0.325	93	56	16.8	24.2	4.0

Total number of blows analyzed: 7

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 43 5 - 45



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 43 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 43 5 - 45
7/8/2008 3:11:10 PM
Blow Number 2/1

Pile Properties

LE	49.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	5.83	ms
JC	0.50	[]

Quantity Results

CSXN	20.8	ksi
CSI	20.9	ksi
EFV	0.311	k-ft
ETR	88.9	(%)
BPM	0.0	bpm
VMX	15.8	f/s
FMX	24	kips
DFN	2.78	in
FVP	0.76	[]

Sensors

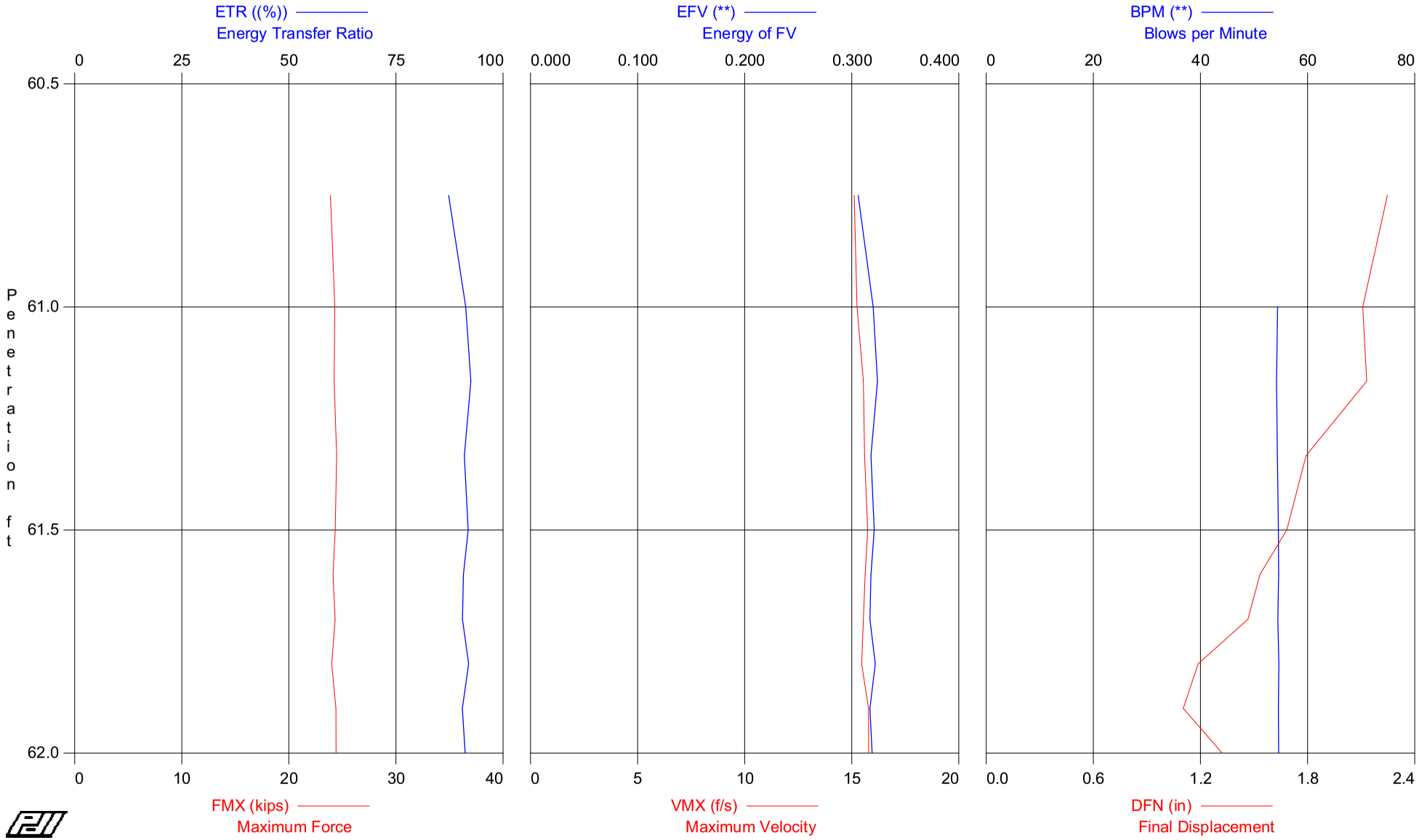
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 60.5 - 62
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 60.5 - 62
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 66.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
2	61.00	4	AV2	20.8	20.8	0.313	89	54	15.2	24.1	2.2
			STD	0.2	0.1	0.007	2	0	0.1	0.2	0.1
			MAX	20.9	21.0	0.320	91	54	15.2	24.3	2.2
5	61.50	6	AV3	21.0	21.1	0.321	92	54	15.6	24.3	1.9
			STD	0.1	0.1	0.002	1	0	0.1	0.1	0.2
			MAX	21.1	21.2	0.324	92	55	15.7	24.5	2.1
10	62.00	10	AV5	20.9	21.1	0.319	91	55	15.6	24.2	1.3
			STD	0.1	0.1	0.002	1	0	0.1	0.2	0.2
			MAX	21.0	21.2	0.322	92	55	15.8	24.4	1.5
			Average	20.9	21.0	0.318	91	54	15.5	24.2	1.7
			Std. Dev.	0.2	0.2	0.005	1	0	0.2	0.2	0.4
			Maximum	21.1	21.2	0.324	92	55	15.8	24.5	2.2

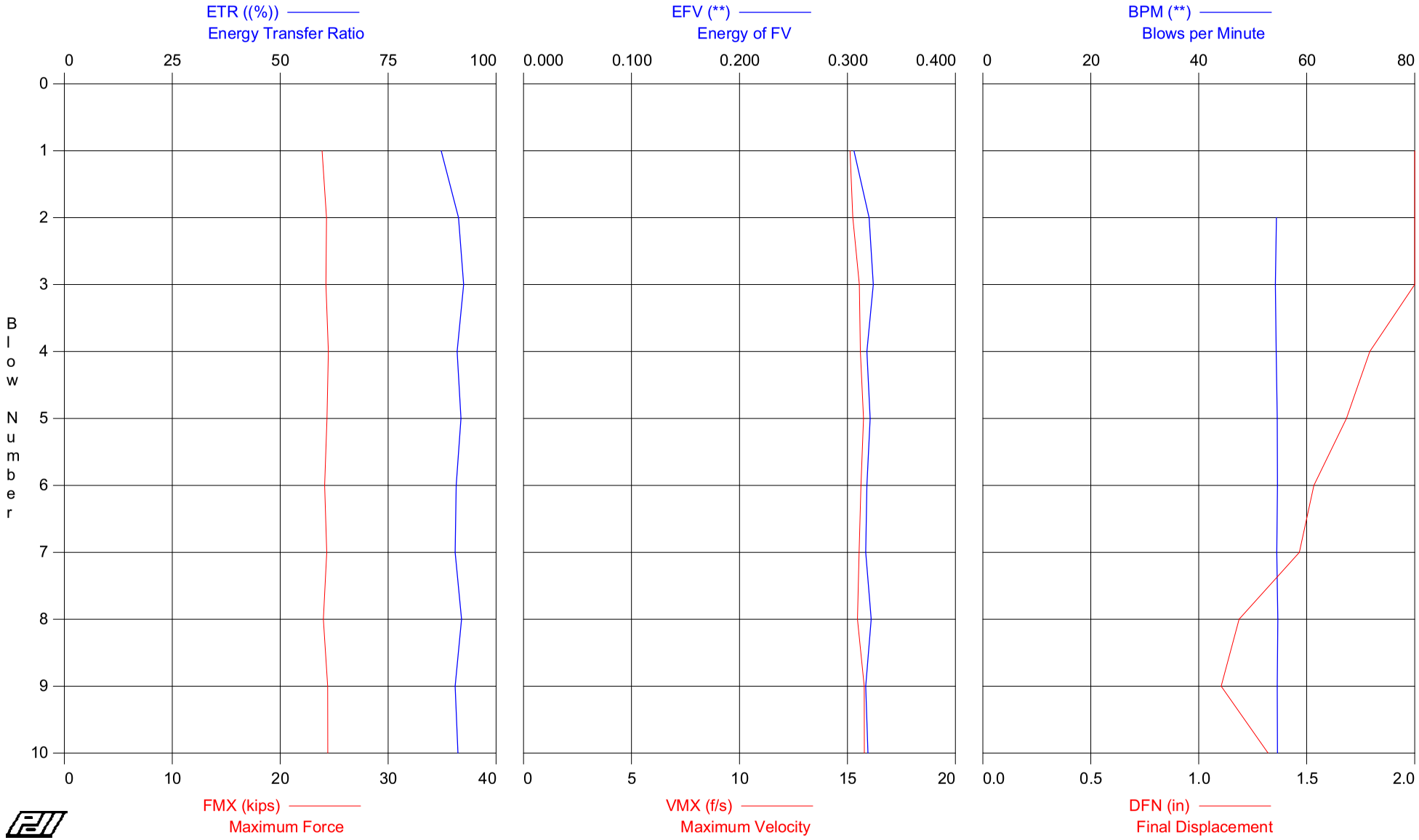
Total number of blows analyzed: 10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 60.5 - 62
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 60.5 - 62
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 66.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

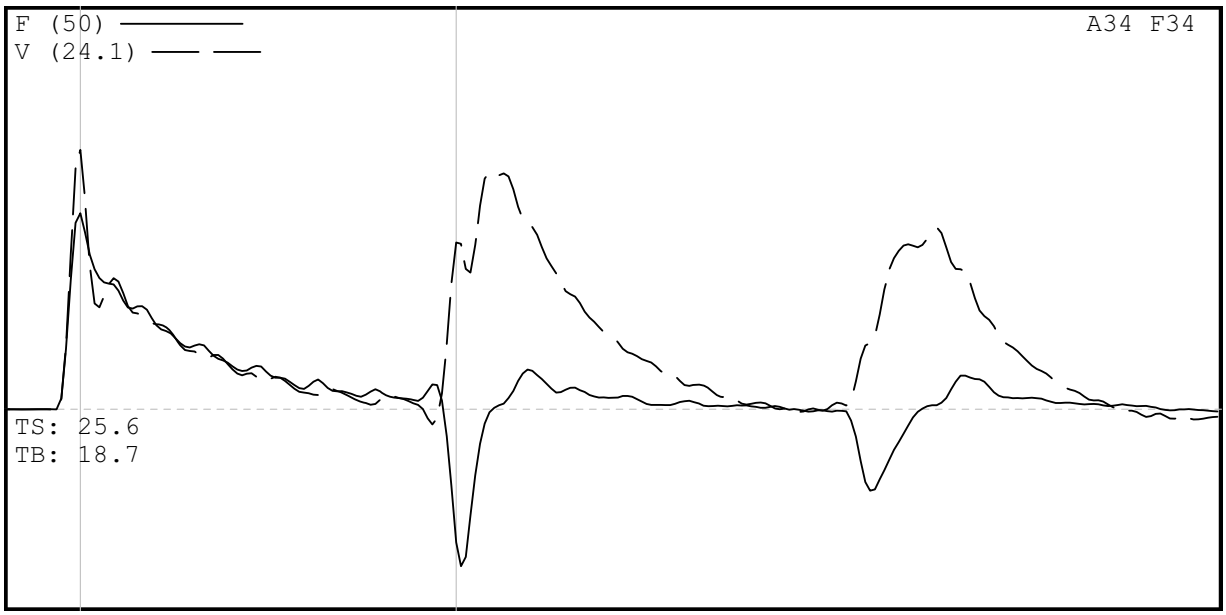
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	4	20.6	20.7	0.306	87	0	15.1	23.9	2.2
2	4	20.9	21.0	0.320	91	54	15.2	24.3	2.1
3	6	20.9	21.0	0.324	92	54	15.5	24.2	2.1
4	6	21.1	21.2	0.318	91	54	15.6	24.5	1.8
5	6	21.0	21.1	0.321	92	55	15.7	24.3	1.7
6	10	20.8	21.0	0.318	91	55	15.6	24.1	1.5
7	10	21.0	21.1	0.317	91	54	15.5	24.3	1.5
8	10	20.7	20.8	0.322	92	55	15.5	24.0	1.2
9	10	21.0	21.2	0.317	91	55	15.8	24.4	1.1
10	10	21.0	21.2	0.319	91	55	15.8	24.4	1.3
Average		20.9	21.0	0.318	91	54	15.5	24.2	1.7
Std. Dev.		0.2	0.2	0.005	1	0	0.2	0.2	0.4
Maximum		21.1	21.2	0.324	92	55	15.8	24.5	2.2

Total number of blows analyzed: 10

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 60 5 - 62



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 60 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 60 5 - 62
7/8/2008 5:07:06 PM
Blow Number 8/7

Pile Properties

LE	66.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	7.85	ms
JC	0.50	[]

Quantity Results

CSXN	21.0	ksi
CSI	21.1	ksi
EFV	0.317	k-ft
ETR	90.5	(%)
BPM	54.4	bpm
VMX	15.5	f/s
FMX	24	kips
DFN	1.47	in
FVP	0.76	[]

Sensors

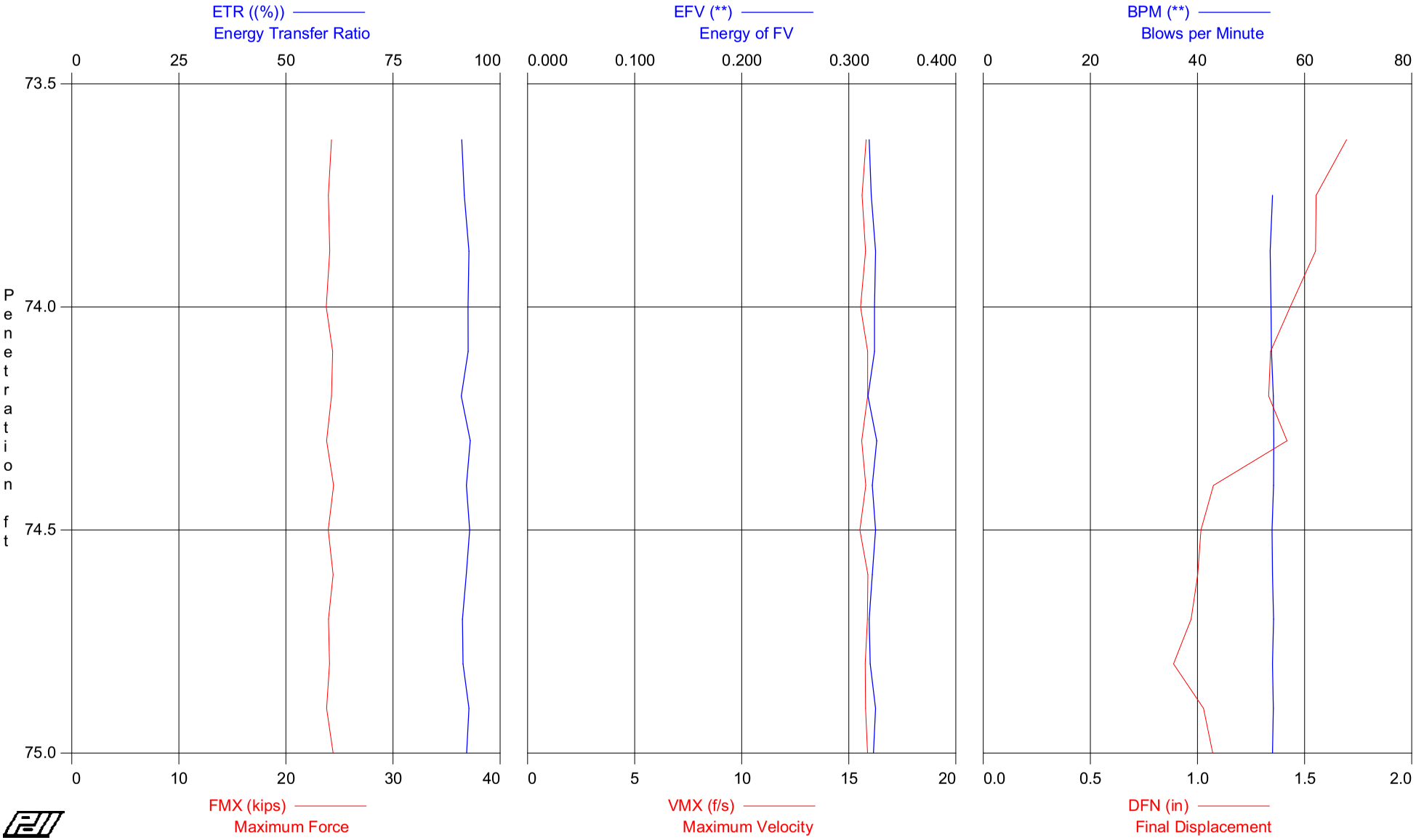
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 73.5 - 75
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 73.5 - 75
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	74.00	8	AV4	20.7	20.8	0.322	92	54	15.7	24.0	1.6
			STD	0.2	0.2	0.002	1	0	0.1	0.2	0.1
			MAX	20.9	21.0	0.325	93	54	15.8	24.3	1.7
9	74.50	10	AV5	20.8	21.0	0.323	92	54	15.7	24.2	1.2
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.2
			MAX	21.1	21.2	0.326	93	54	15.9	24.4	1.4
14	75.00	10	AV5	20.8	20.9	0.322	92	54	15.8	24.1	1.0
			STD	0.2	0.2	0.002	1	0	0.1	0.2	0.1
			MAX	21.0	21.2	0.325	93	54	15.9	24.4	1.1
			Average	20.8	20.9	0.322	92	54	15.8	24.1	1.2
			Std. Dev.	0.2	0.2	0.003	1	0	0.1	0.2	0.3
			Maximum	21.1	21.2	0.326	93	54	15.9	24.4	1.7

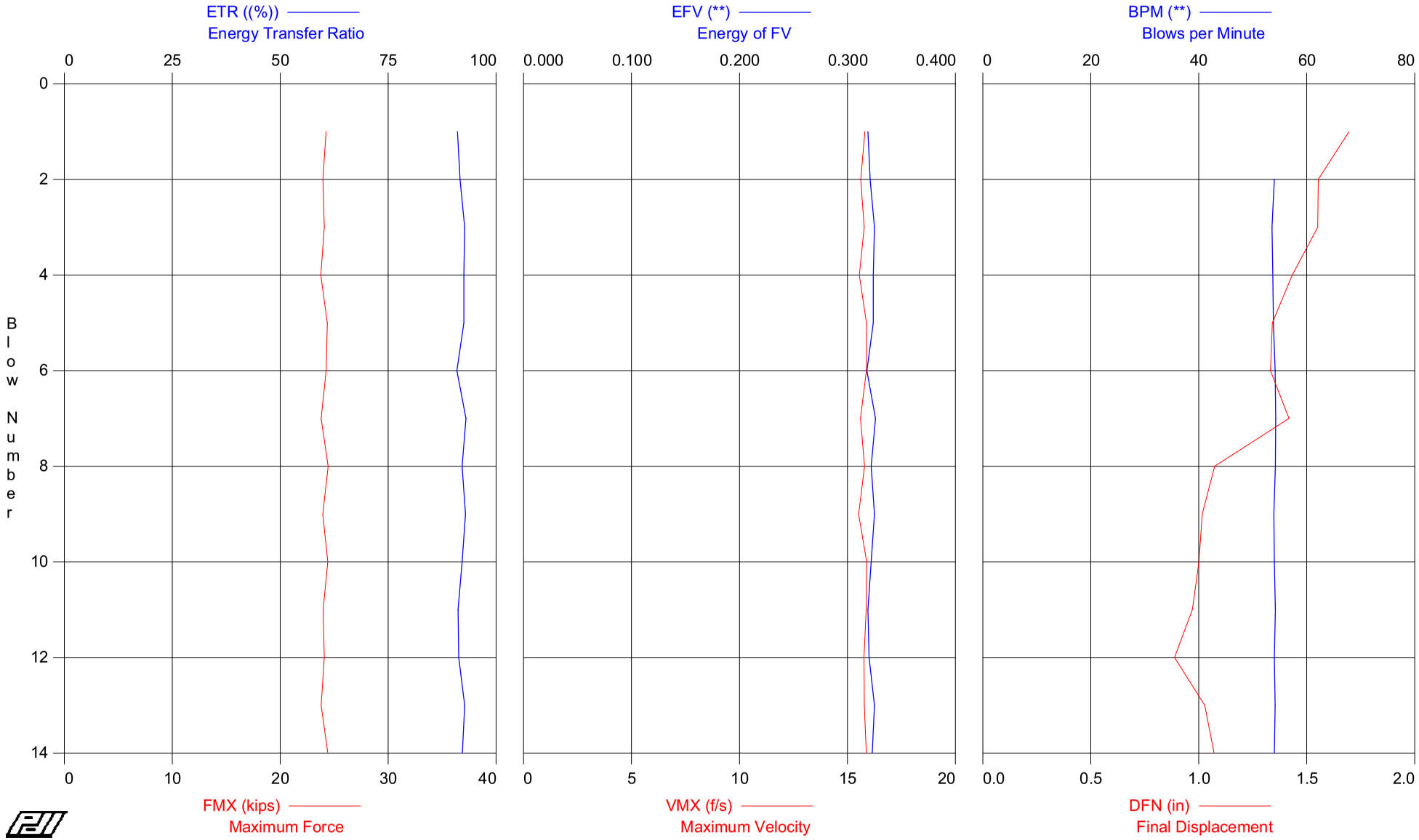
Total number of blows analyzed: 14

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 8-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 73.5 - 75
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 73.5 - 75
OP: SDW

HAMMER #4 AWJ B-356
Test date: 8-Jul-2008

AR: 1.16 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

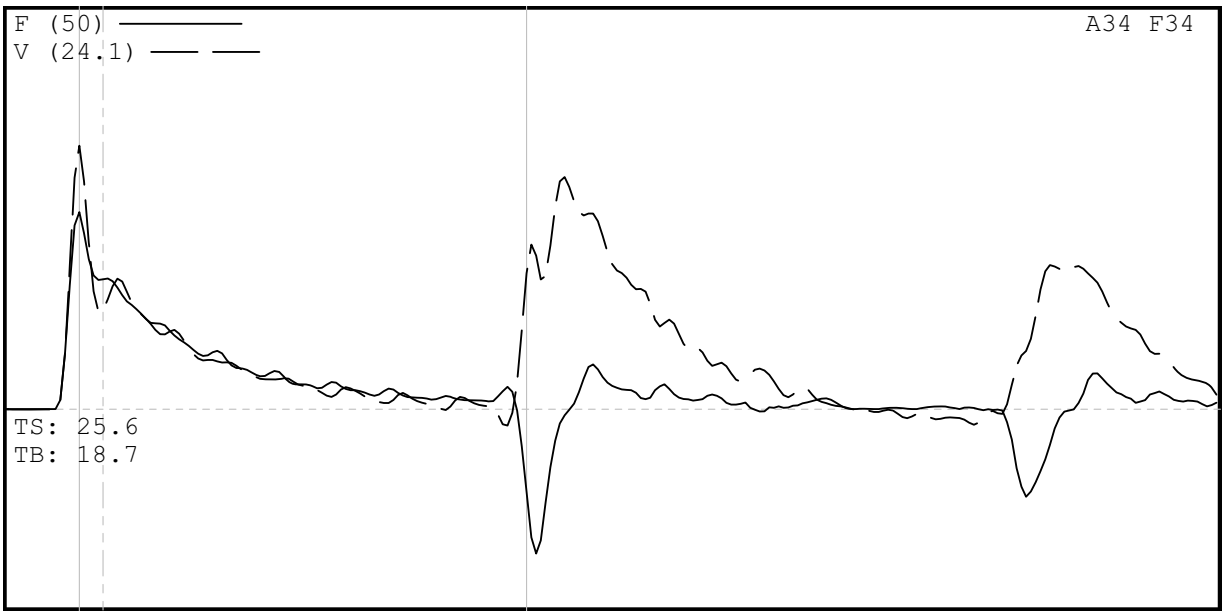
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.9	21.0	0.319	91	0	15.8	24.3	1.7
2	8	20.7	20.7	0.321	92	54	15.6	24.0	1.6
3	8	20.8	20.8	0.325	93	54	15.8	24.1	1.6
4	8	20.5	20.6	0.324	93	54	15.6	23.8	1.4
5	10	21.0	21.1	0.324	93	54	15.9	24.4	1.3
6	10	20.9	21.0	0.318	91	54	15.9	24.3	1.3
7	10	20.5	20.6	0.326	93	54	15.6	23.8	1.4
8	10	21.1	21.2	0.322	92	54	15.8	24.4	1.1
9	10	20.6	20.9	0.325	93	54	15.5	23.9	1.0
10	10	21.0	21.2	0.322	92	54	15.9	24.4	1.0
11	10	20.7	20.8	0.319	91	54	15.9	24.0	1.0
12	10	20.8	20.9	0.320	91	54	15.8	24.1	0.9
13	10	20.5	20.6	0.325	93	54	15.8	23.8	1.0
14	10	21.0	21.2	0.323	92	54	15.9	24.4	1.1
Average		20.8	20.9	0.322	92	54	15.8	24.1	1.2
Std. Dev.		0.2	0.2	0.003	1	0	0.1	0.2	0.3
Maximum		21.1	21.2	0.326	93	54	15.9	24.4	1.7

Total number of blows analyzed: 14

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 73 5 - 75



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 73 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 73 5 - 75
7/8/2008 6:40:04 PM
Blow Number 11/8

Pile Properties

LE	79.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	9.40	ms
JC	0.50	[]

Quantity Results

CSXN	21.1	ksi
CSI	21.2	ksi
EFV	0.322	k-ft
ETR	92.1	(%)
BPM	54.2	bpm
VMX	15.8	f/s
FMX	24	kips
DFN	1.07	in
FVP	0.75	[]

Sensors

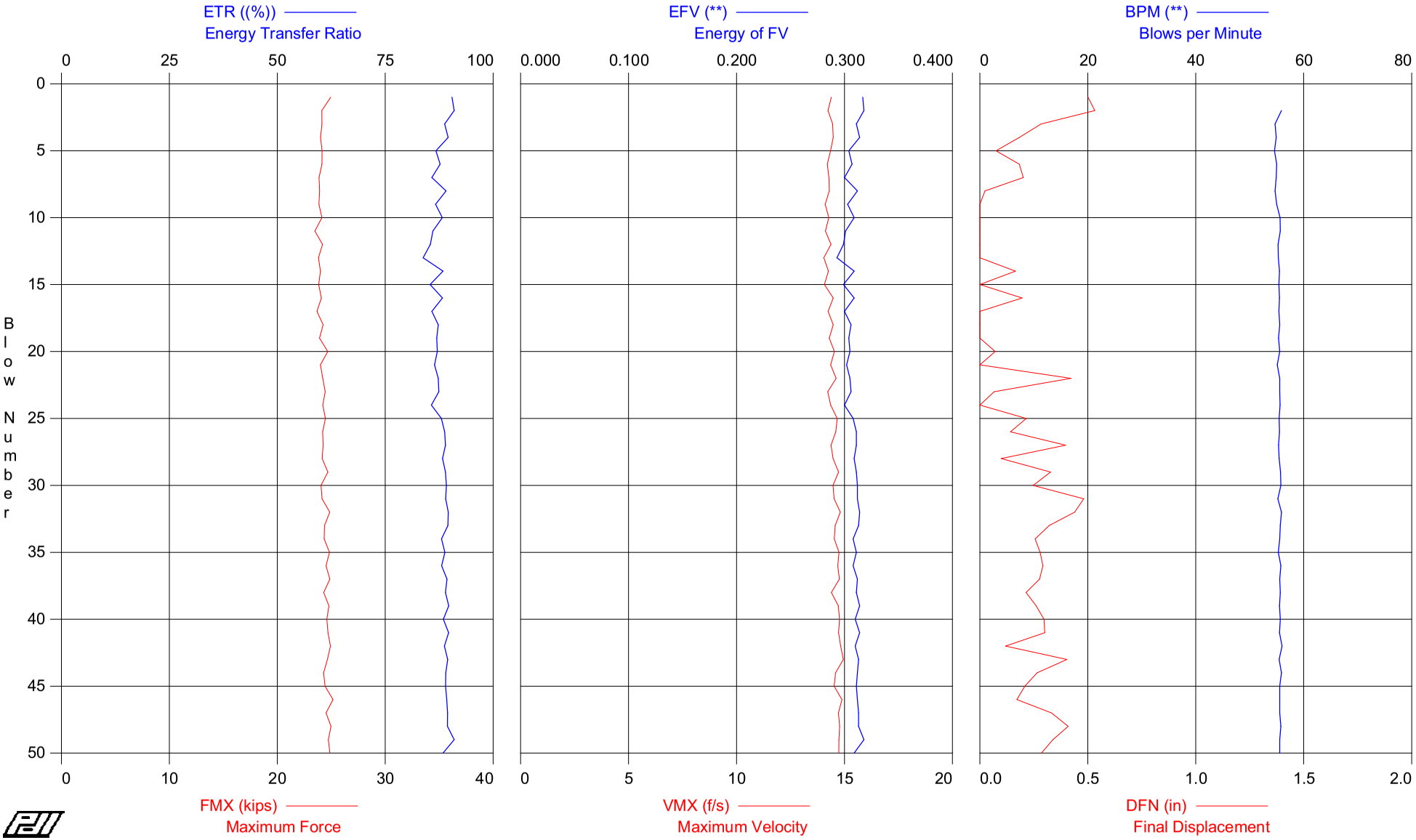
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.00

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 88 5 - 90
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 88 5 - 90
OP: SDW

HAMMER #4 AWJ B-356
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 94.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

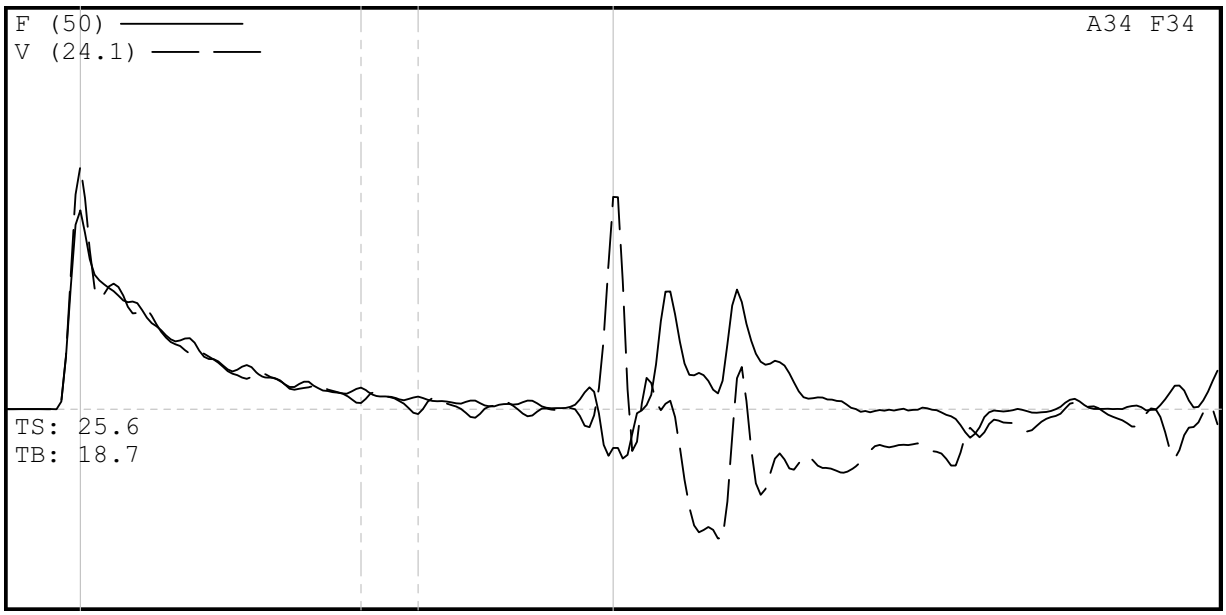
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	102	21.5	21.7	0.317	90	0	14.4	24.9	0.5
2	102	20.8	21.0	0.318	91	56	14.2	24.1	0.5
3	102	20.8	20.9	0.311	89	55	14.5	24.1	0.3
4	102	20.7	20.8	0.314	90	55	14.5	24.0	0.2
5	102	20.8	21.0	0.304	87	55	14.4	24.1	0.1
6	102	20.8	20.9	0.307	88	55	14.2	24.1	0.2
7	102	20.6	20.7	0.300	86	55	14.3	23.9	0.2
8	102	20.6	20.7	0.312	89	55	14.3	23.9	0.0
9	102	20.6	20.7	0.303	87	55	14.1	23.9	-0.1
10	102	20.8	21.1	0.309	88	56	14.3	24.1	0.0
11	102	20.2	20.6	0.301	86	56	14.1	23.5	-0.1
12	102	20.9	21.0	0.299	85	55	14.4	24.2	-0.3
13	102	20.5	20.8	0.293	84	55	14.0	23.8	-0.5
14	102	20.7	21.0	0.309	88	56	14.3	24.0	0.2
15	102	20.6	20.8	0.299	85	55	14.1	23.8	-0.1
16	102	20.8	20.9	0.309	88	56	14.5	24.1	0.2
17	102	20.4	20.7	0.300	86	55	14.2	23.7	-0.1
18	102	20.9	21.0	0.306	87	56	14.5	24.2	-0.2
19	102	20.6	20.9	0.304	87	55	14.3	23.9	-0.1
20	102	21.3	21.4	0.305	87	56	14.5	24.7	0.1
21	102	20.7	20.7	0.302	86	55	14.4	24.0	-0.1
22	102	20.9	21.0	0.305	87	56	14.6	24.2	0.4
23	102	21.1	21.3	0.306	87	56	14.2	24.4	0.1
24	102	20.9	21.0	0.300	86	56	14.4	24.2	0.0
25	102	21.1	21.2	0.308	88	55	14.7	24.5	0.2
26	102	20.9	21.0	0.311	89	56	14.6	24.2	0.1
27	102	20.9	21.2	0.311	89	55	14.4	24.3	0.4
28	102	20.8	21.1	0.309	88	55	14.5	24.2	0.1
29	102	21.3	21.4	0.311	89	56	14.7	24.7	0.3
30	102	20.7	21.0	0.312	89	56	14.5	24.1	0.2
31	102	20.8	21.0	0.312	89	55	14.5	24.2	0.5
32	102	21.4	21.6	0.314	90	56	14.8	24.9	0.4
33	102	21.0	21.2	0.313	90	56	14.6	24.4	0.3
34	102	21.0	21.1	0.308	88	56	14.5	24.3	0.3
35	102	21.4	21.6	0.311	89	55	14.8	24.8	0.3
36	102	21.1	21.2	0.308	88	56	14.7	24.5	0.3
37	102	21.4	21.6	0.312	89	56	14.8	24.9	0.3
38	102	20.9	21.2	0.311	89	56	14.4	24.3	0.2
39	102	21.4	21.5	0.314	90	56	14.7	24.8	0.3
40	102	21.2	21.4	0.310	88	56	14.8	24.6	0.3
41	102	21.3	21.4	0.314	90	56	14.7	24.7	0.3
42	102	21.5	21.6	0.310	89	56	14.8	24.9	0.1
43	102	21.2	21.4	0.313	89	55	14.9	24.6	0.4
44	102	20.9	21.2	0.312	89	56	14.6	24.3	0.3
45	102	21.1	21.3	0.311	89	56	14.5	24.4	0.2
46	102	21.7	21.8	0.312	89	56	14.9	25.2	0.2
47	102	21.1	21.3	0.313	89	56	14.7	24.5	0.3
48	102	21.5	21.7	0.313	89	56	14.8	25.0	0.4
49	102	21.3	21.6	0.318	91	56	14.7	24.7	0.3
50	102	21.4	21.6	0.309	88	56	14.7	24.9	0.3
Average		21.0	21.2	0.309	88	55	14.5	24.3	0.2
Std. Dev.		0.3	0.3	0.005	2	0	0.2	0.4	0.2
Maximum		21.7	21.8	0.318	91	56	14.9	25.2	0.5

Total number of blows analyzed: 50

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 88 5 - 90



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 88 5 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 88 5 - 90
7/9/2008 10:40:41 AM
Blow Number 21/20

Pile Properties

LE	94.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	11.19	ms
JC	0.50	[]

Quantity Results

CSXN	21.3	ksi
CSI	21.4	ksi
EFV	0.305	k-ft
ETR	87.1	(%)
BPM	55.6	bpm
VMX	14.5	f/s
FMX	25	kips
DFN	0.07	in
FVP	0.82	[]

Sensors

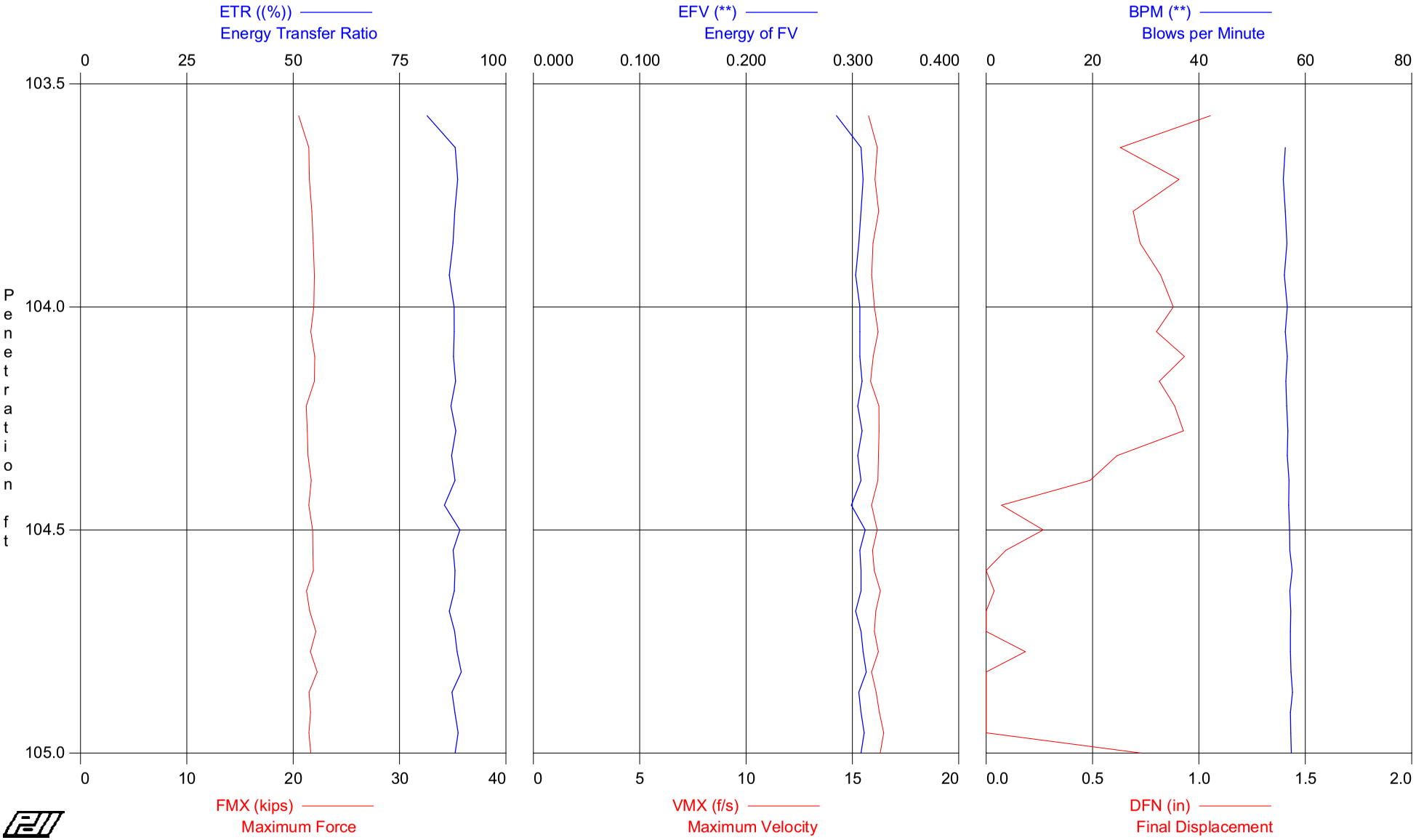
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 0.98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 103.5 - 105
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 103.5 - 105
OP: SDW

HAMMER #4 AWJ B-356
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 109.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
7	104.00	14	AV7	18.6	19.0	0.304	87	56	16.0	21.6	0.8
			STD	0.4	0.4	0.008	2	0	0.1	0.5	0.1
			MAX	19.0	19.3	0.310	89	57	16.2	22.0	1.1
16	104.50	18	AV9	18.6	19.1	0.307	88	57	16.1	21.6	0.6
			STD	0.2	0.2	0.003	1	0	0.1	0.3	0.3
			MAX	19.0	19.4	0.312	89	57	16.2	22.0	0.9
27	105.00	22	AV11	18.7	19.2	0.308	88	57	16.2	21.7	0.0
			STD	0.2	0.2	0.002	1	0	0.2	0.3	0.3
			MAX	19.2	19.5	0.313	89	58	16.5	22.3	0.7
			Average	18.7	19.1	0.307	88	57	16.1	21.6	0.4
			Std. Dev.	0.3	0.3	0.005	1	0	0.2	0.3	0.5
			Maximum	19.2	19.5	0.313	89	58	16.5	22.3	1.1

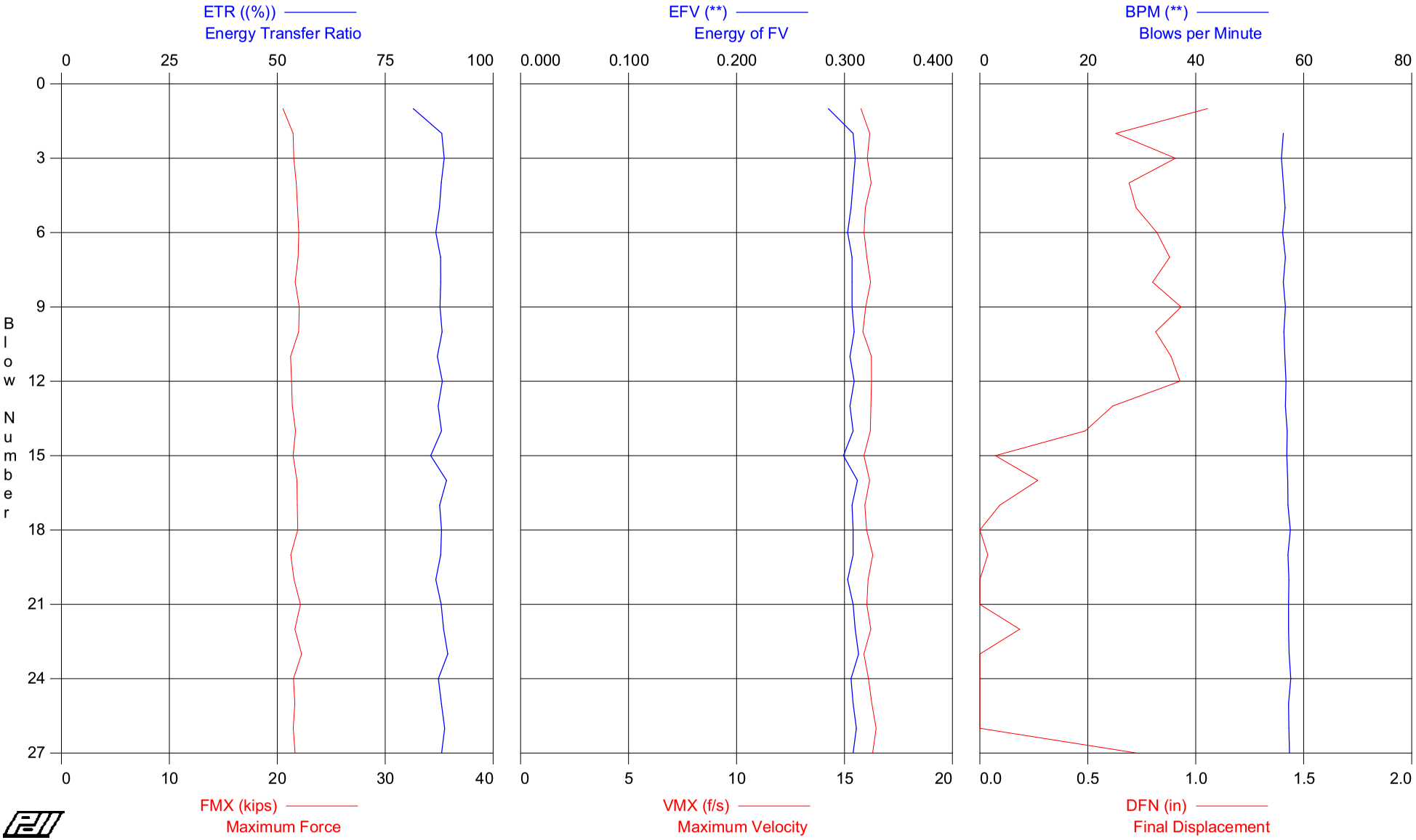
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 103.5 - 105
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 103.5 - 105
OP: SDW

HAMMER #4 AWJ B-356
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 109.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

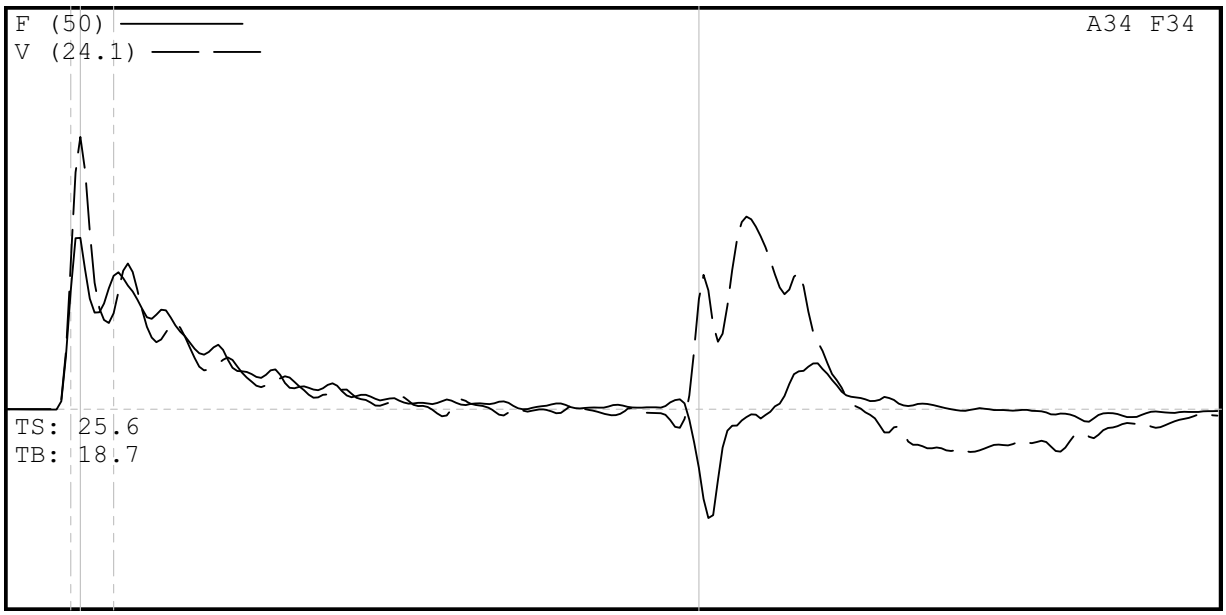
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	14	17.7	18.1	0.285	81	0	15.8	20.5	1.1
2	14	18.5	18.9	0.308	88	56	16.2	21.5	0.6
3	14	18.6	18.9	0.310	89	56	16.1	21.5	0.9
4	14	18.8	19.2	0.308	88	56	16.2	21.8	0.7
5	14	18.9	19.2	0.306	88	57	16.0	21.9	0.7
6	14	19.0	19.3	0.303	87	56	15.9	22.0	0.8
7	14	18.9	19.3	0.307	88	57	16.0	21.9	0.9
8	18	18.7	19.1	0.307	88	56	16.2	21.7	0.8
9	18	19.0	19.4	0.307	88	57	16.0	22.0	0.9
10	18	19.0	19.3	0.309	88	56	15.9	22.0	0.8
11	18	18.3	18.8	0.305	87	56	16.2	21.2	0.9
12	18	18.4	18.8	0.309	88	57	16.2	21.3	0.9
13	18	18.4	18.9	0.305	87	57	16.2	21.4	0.6
14	18	18.7	19.2	0.308	88	57	16.2	21.7	0.5
15	18	18.5	18.9	0.299	86	57	15.9	21.5	0.1
16	18	18.8	19.3	0.312	89	57	16.2	21.8	0.3
17	22	18.8	19.3	0.307	88	57	15.9	21.8	0.1
18	22	18.9	19.3	0.308	88	58	16.0	21.9	-0.5
19	22	18.3	18.8	0.308	88	57	16.3	21.3	0.0
20	22	18.6	19.0	0.303	87	57	16.1	21.6	0.0
21	22	19.1	19.5	0.308	88	57	16.0	22.1	0.0
22	22	18.6	19.1	0.310	89	57	16.2	21.6	0.2
23	22	19.2	19.5	0.313	89	57	15.9	22.3	-0.1
24	22	18.5	19.0	0.306	87	58	16.1	21.5	-0.4
25	22	18.6	19.1	0.308	88	57	16.3	21.6	-0.1
26	22	18.5	19.1	0.311	89	57	16.5	21.5	-0.2
27	22	18.7	19.2	0.308	88	57	16.3	21.7	0.7
Average		18.7	19.1	0.307	88	57	16.1	21.6	0.4
Std. Dev.		0.3	0.3	0.005	1	0	0.2	0.3	0.5
Maximum		19.2	19.5	0.313	89	58	16.5	22.3	1.1

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 103 5 - 105



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 103 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 103 5 - 105
7/9/2008 3:06:47 PM
Blow Number 21/19

Pile Properties

LE	109.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	12.97	ms
JC	0.50	[]

Quantity Results

CSXN	18.3	ksi
CSI05	18.8	ksi
EFV	0.308	k-ft
ETR	87.9	(%)
BPM	57.1	bpm
VMX	16.3	f/s
FMX	21	kips
DFN	0.04	in
FVP	0.63	[]

Sensors

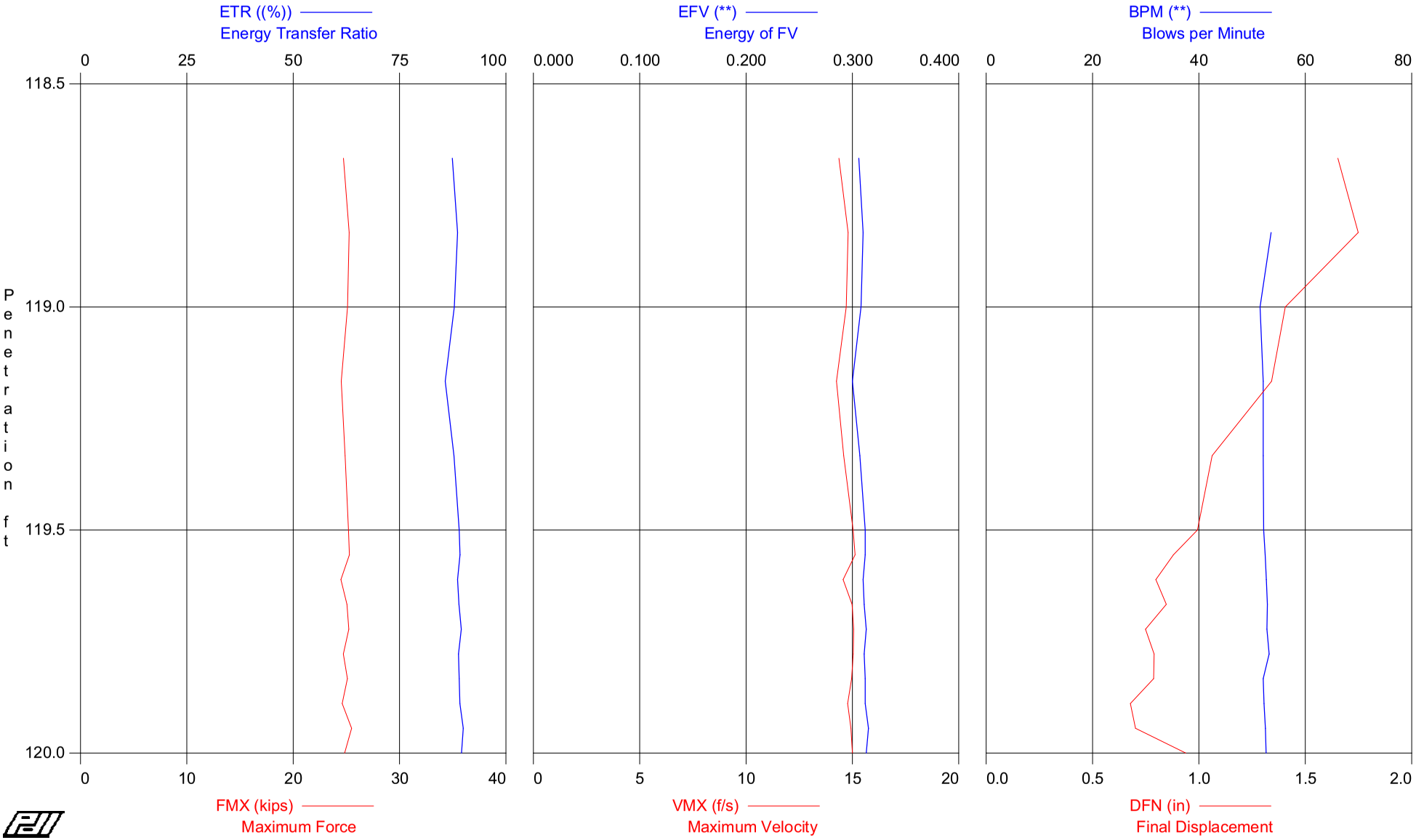
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 118.5 - 120
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 118.5 - 120
OP: SDW

HAMMER #4 AWJ B-356
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 124.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
3	119.00	6	AV3	21.6	21.6	0.308	88	53	14.6	25.0	1.6
			STD	0.2	0.2	0.002	1	1	0.2	0.2	0.1
			MAX	21.8	21.8	0.310	89	54	14.8	25.3	1.7
15	120.00	18	AV12	21.5	21.7	0.311	89	52	14.9	25.0	0.9
			STD	0.3	0.3	0.004	1	0	0.3	0.3	0.2
			MAX	22.0	22.2	0.315	90	53	15.1	25.5	1.3
			Average	21.5	21.7	0.310	89	52	14.8	25.0	1.0
			Std. Dev.	0.3	0.3	0.004	1	1	0.3	0.3	0.3
			Maximum	22.0	22.2	0.315	90	54	15.1	25.5	1.7

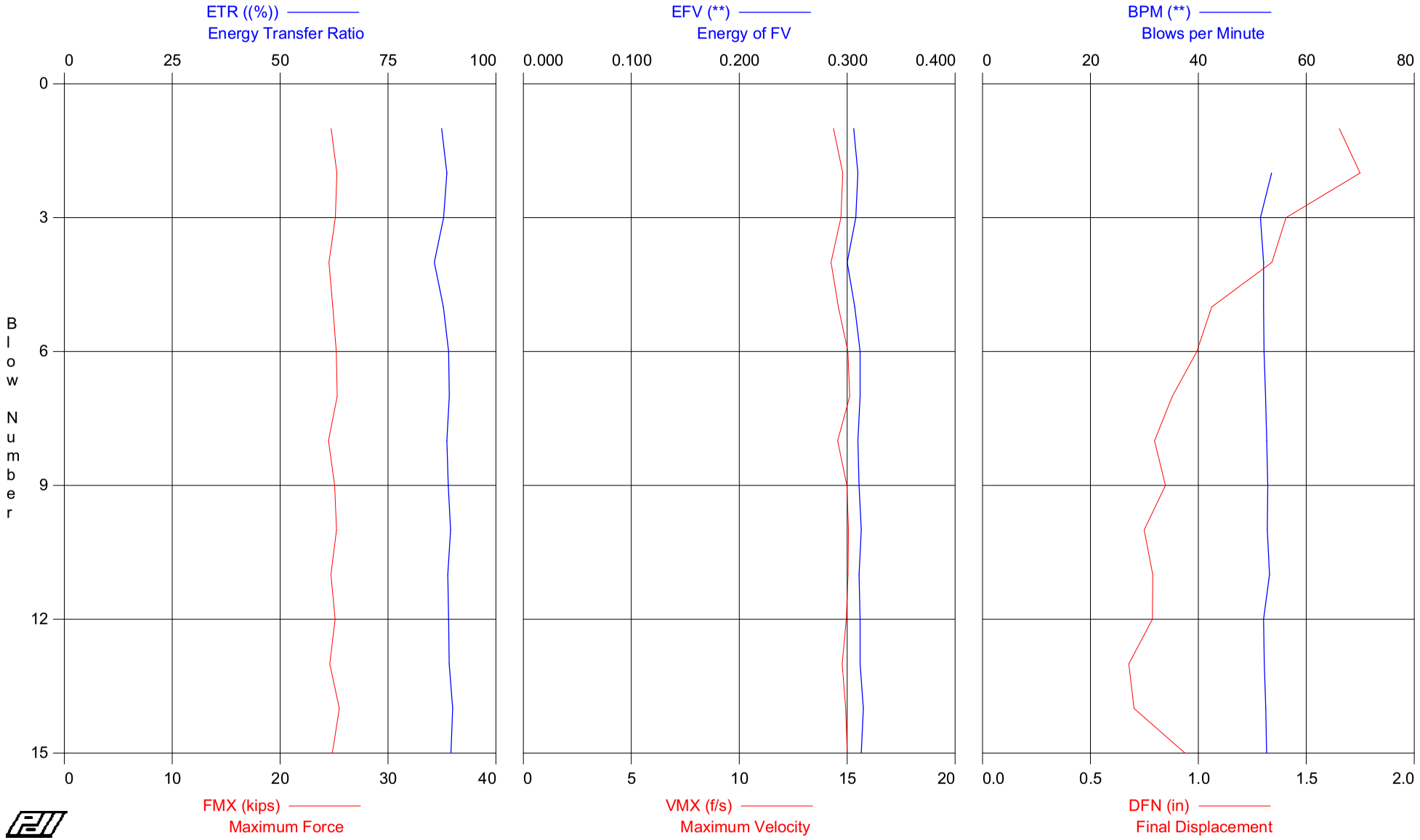
Total number of blows analyzed: 15

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 9-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 118.5 - 120
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 118.5 - 120
OP: SDW

HAMMER #4 AWJ B-356
Test date: 9-Jul-2008

AR: 1.16 in^2
LE: 124.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

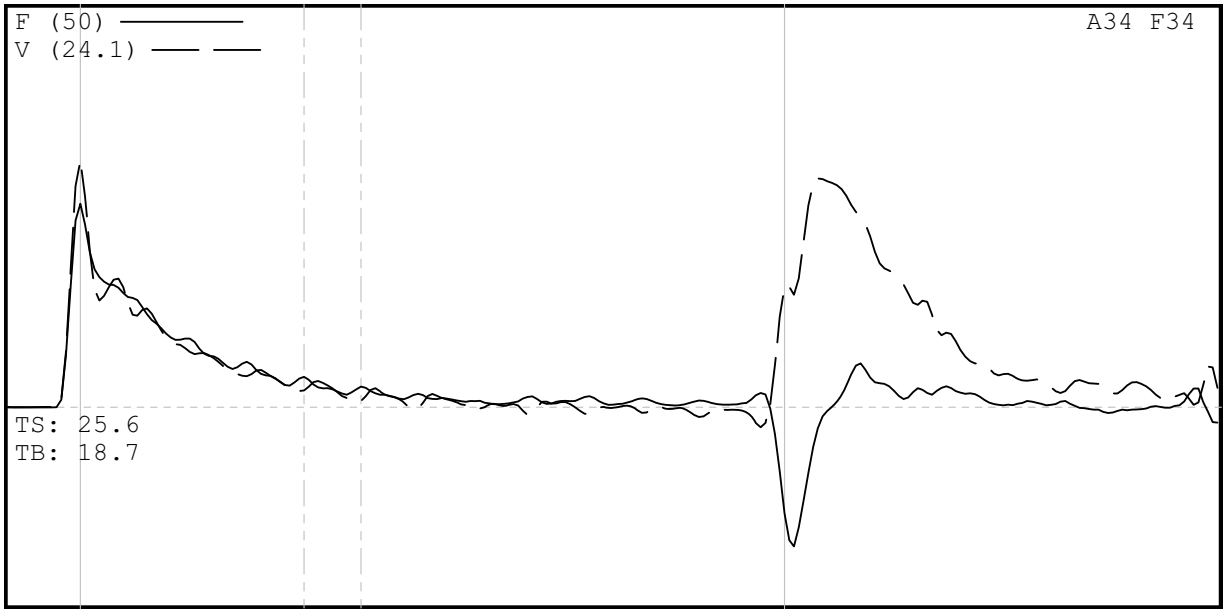
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	6	21.3	21.3	0.306	87	0	14.4	24.7	1.7
2	6	21.8	21.8	0.310	89	54	14.8	25.3	1.7
3	6	21.7	21.7	0.308	88	52	14.7	25.1	1.4
4	6	21.1	21.3	0.300	86	52	14.2	24.5	1.3
5	6	21.4	21.5	0.307	88	52	14.6	24.9	1.1
6	6	21.7	21.8	0.312	89	52	15.0	25.2	1.0
7	18	21.8	22.0	0.312	89	52	15.1	25.3	0.9
8	18	21.1	21.5	0.310	89	53	14.6	24.5	0.8
9	18	21.6	21.8	0.311	89	53	15.0	25.1	0.8
10	18	21.8	22.0	0.313	89	53	15.1	25.2	0.7
11	18	21.3	21.5	0.311	89	53	15.0	24.7	0.8
12	18	21.6	21.8	0.312	89	52	15.0	25.1	0.8
13	18	21.2	21.3	0.312	89	52	14.8	24.6	0.7
14	18	22.0	22.2	0.315	90	52	14.9	25.5	0.7
15	18	21.4	21.7	0.313	90	53	15.0	24.8	0.9
Average		21.5	21.7	0.310	89	52	14.8	25.0	1.0
Std. Dev.		0.3	0.3	0.004	1	1	0.3	0.3	0.3
Maximum		22.0	22.2	0.315	90	54	15.1	25.5	1.7

Total number of blows analyzed: 15

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 118 5 - 120



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 118 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 118 5 - 120
7/9/2008 5:47:52 PM
Blow Number 3/2

Pile Properties

LE	124.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	14.76	ms
JC	0.50	[]

Quantity Results

CSXN	21.8	ksi
CSI20	21.8	ksi
EFV	0.310	k-ft
ETR	88.6	(%)
BPM	53.6	bpm
VMX	14.8	f/s
FMX	25	kips
DFN	1.75	in
FVP	0.83	[]

Sensors

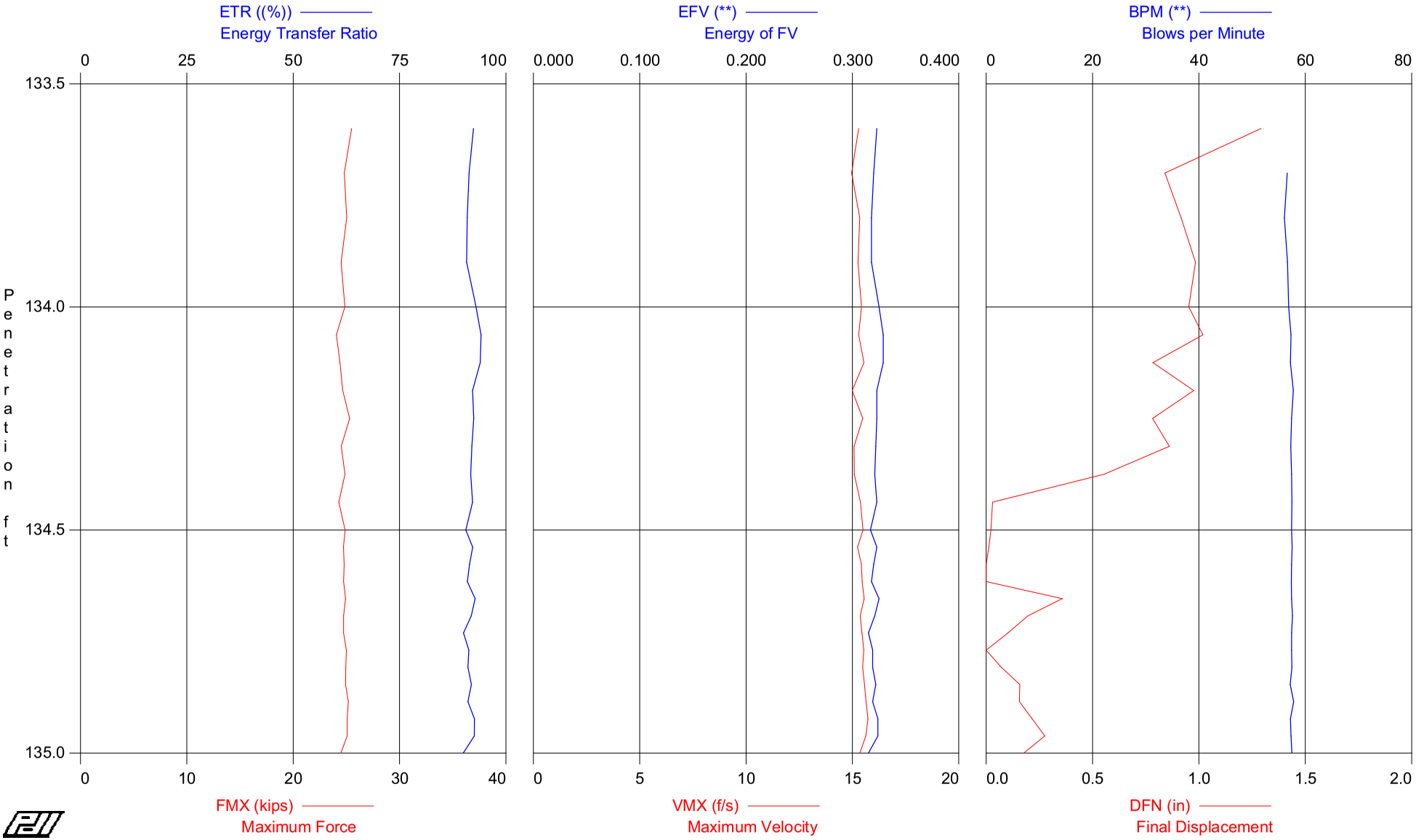
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.03

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 133.5 - 135
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 133.5 - 135
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 139.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	134.00	10	AV5	21.5	21.7	0.321	92	57	15.3	24.9	1.0
			STD	0.3	0.3	0.003	1	0	0.2	0.3	0.2
			MAX	22.0	22.1	0.325	93	57	15.4	25.5	1.3
13	134.50	16	AV8	21.2	21.5	0.323	92	57	15.3	24.6	0.6
			STD	0.3	0.3	0.004	1	0	0.2	0.4	0.4
			MAX	21.8	22.1	0.329	94	58	15.5	25.3	1.0
26	135.00	26	AV13	21.4	21.6	0.320	92	57	15.5	24.9	0.1
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	21.7	21.9	0.325	93	58	15.7	25.2	0.4
			Average	21.4	21.6	0.321	92	57	15.4	24.8	0.4
			Std. Dev.	0.3	0.2	0.004	1	0	0.2	0.3	0.4
			Maximum	22.0	22.1	0.329	94	58	15.7	25.5	1.3

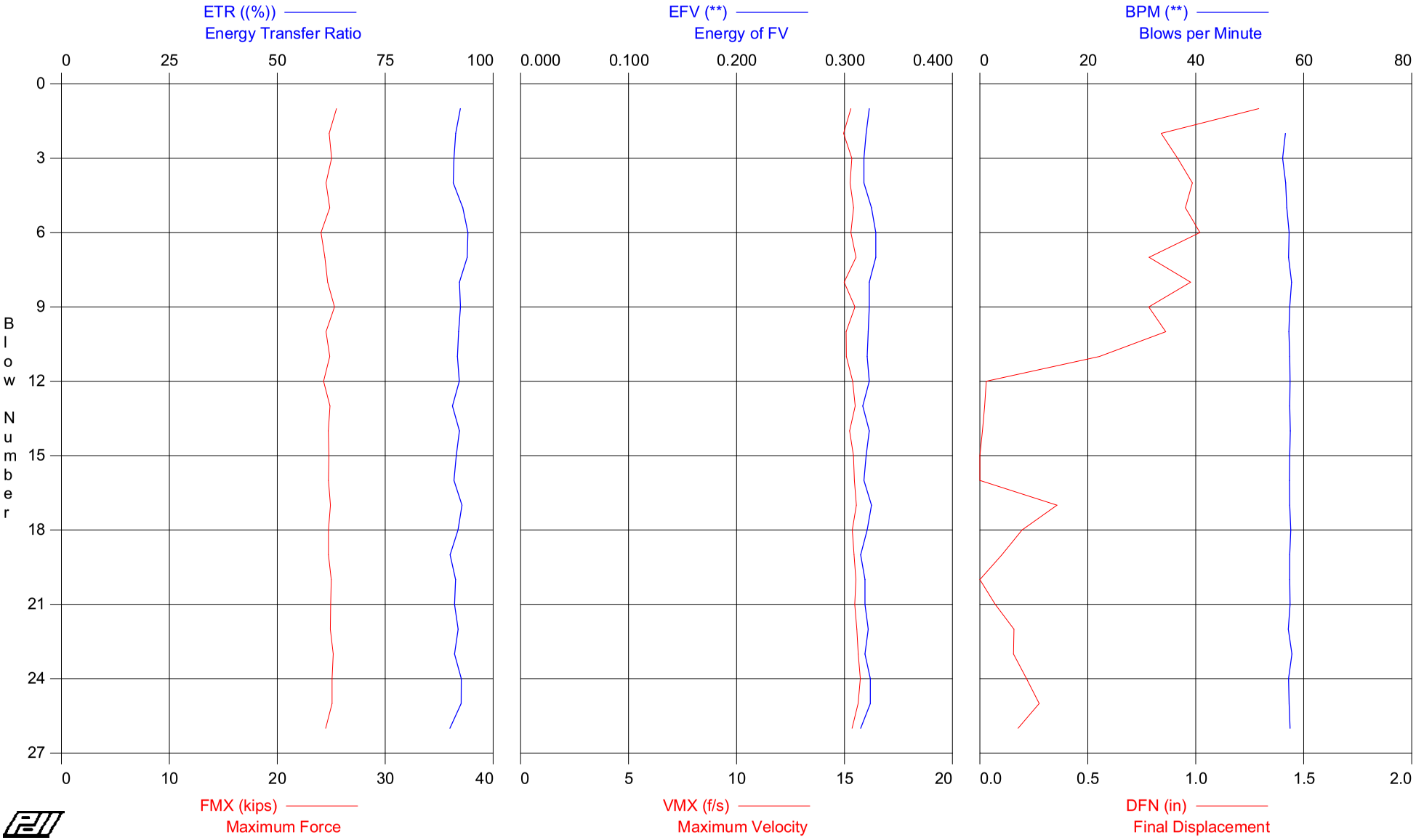
Total number of blows analyzed: 26

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 133.5 - 135
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 133.5 - 135
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 139.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

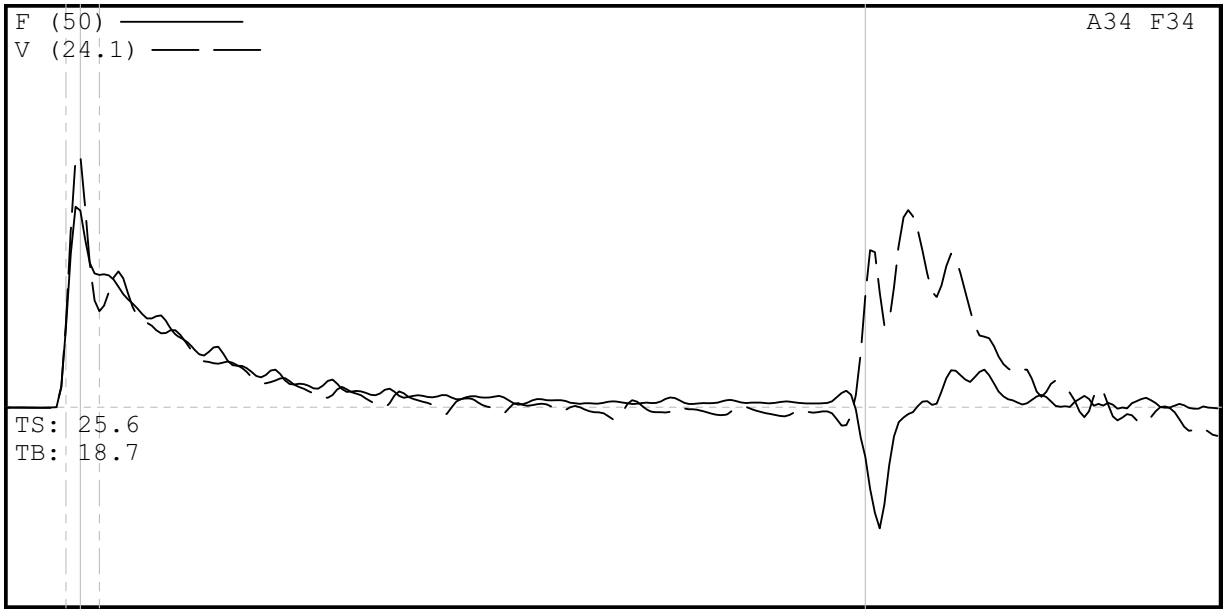
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	22.0	22.1	0.323	92	0	15.3	25.5	1.3
2	10	21.4	21.6	0.320	91	57	15.0	24.8	0.8
3	10	21.6	21.7	0.318	91	56	15.3	25.0	0.9
4	10	21.1	21.3	0.318	91	57	15.3	24.5	1.0
5	10	21.4	21.6	0.325	93	57	15.4	24.9	1.0
6	16	20.7	21.0	0.329	94	57	15.3	24.1	1.0
7	16	21.0	21.2	0.329	94	57	15.5	24.4	0.8
8	16	21.3	21.5	0.323	92	58	15.0	24.7	1.0
9	16	21.8	22.1	0.323	92	57	15.5	25.3	0.8
10	16	21.1	21.5	0.322	92	57	15.1	24.5	0.9
11	16	21.4	21.8	0.321	92	57	15.1	24.9	0.6
12	16	20.9	21.2	0.323	92	57	15.4	24.3	0.0
13	16	21.4	21.6	0.317	91	57	15.5	24.9	0.0
14	26	21.3	21.7	0.323	92	58	15.2	24.7	0.0
15	26	21.4	21.6	0.320	91	57	15.4	24.8	0.0
16	26	21.3	21.5	0.318	91	57	15.5	24.7	-0.1
17	26	21.5	21.7	0.325	93	57	15.6	24.9	0.4
18	26	21.3	21.6	0.321	92	58	15.4	24.7	0.2
19	26	21.3	21.5	0.315	90	57	15.4	24.7	0.1
20	26	21.5	21.7	0.319	91	57	15.5	25.0	-0.1
21	26	21.5	21.7	0.319	91	57	15.5	24.9	0.1
22	26	21.5	21.6	0.322	92	57	15.6	24.9	0.2
23	26	21.7	21.9	0.319	91	58	15.6	25.2	0.2
24	26	21.6	21.8	0.324	93	57	15.7	25.1	0.2
25	26	21.6	21.8	0.324	93	57	15.6	25.1	0.3
26	26	21.1	21.3	0.315	90	57	15.4	24.5	0.2
Average		21.4	21.6	0.321	92	57	15.4	24.8	0.4
Std. Dev.		0.3	0.2	0.004	1	0	0.2	0.3	0.4
Maximum		22.0	22.1	0.329	94	58	15.7	25.5	1.3

Total number of blows analyzed: 26

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 133 5 - 135



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 133 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 133 5 - 135
7/10/2008 11:09:22 AM
Blow Number 13/11

Pile Properties

LE	139.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	16.54	ms
JC	0.50	[]

Quantity Results

CSXN	21.4	ksi
CSI35	21.8	ksi
EFV	0.321	k-ft
ETR	91.7	(%)
BPM	57.4	bpm
VMX	15.1	f/s
FMX	25	kips
DFN	0.55	in
FVP	0.78	[]

Sensors

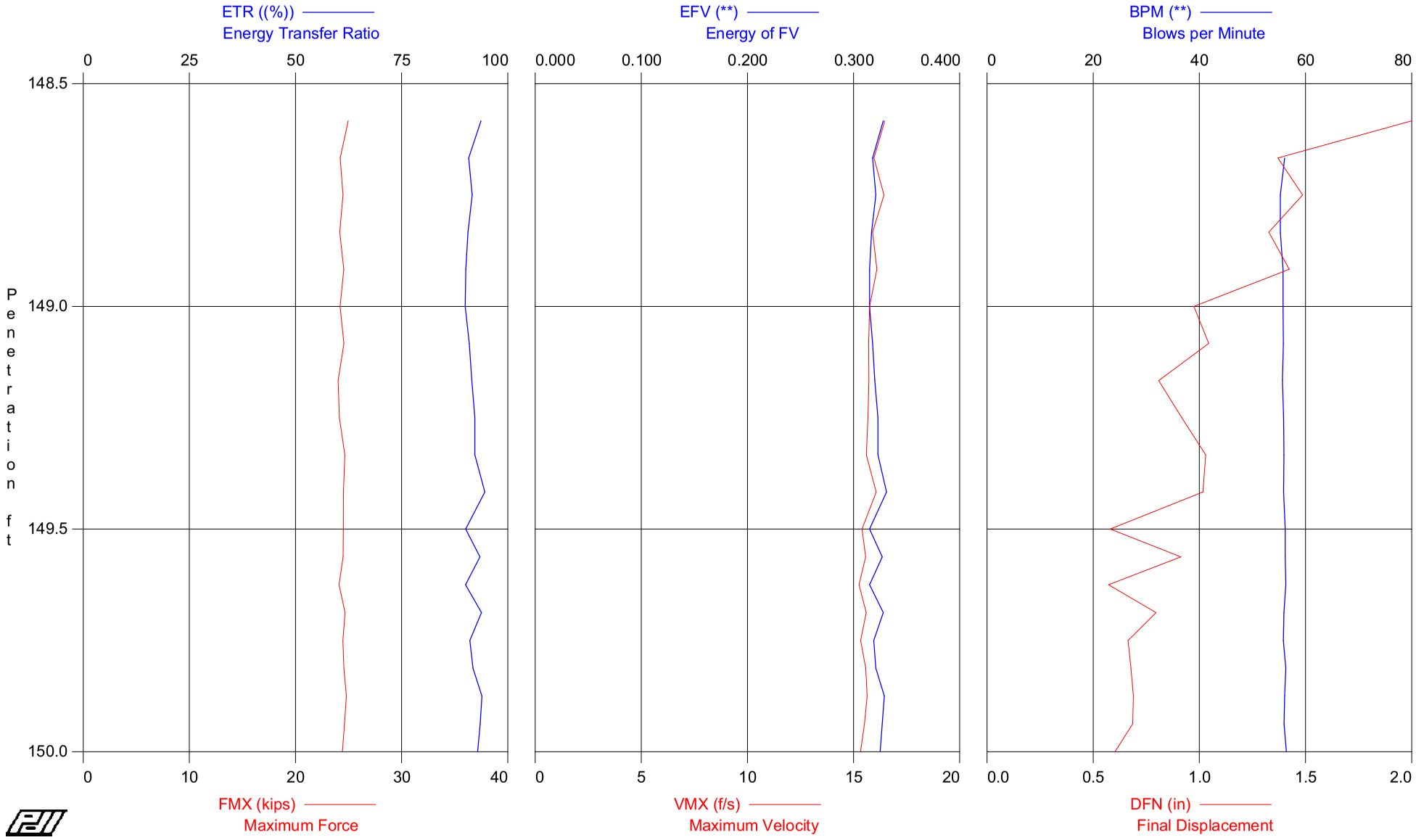
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 148.5 - 150
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 148.5 - 150
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 154.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	149.00	12	AV6	21.1	21.2	0.319	91	56	16.1	24.4	1.4
			STD	0.2	0.2	0.005	1	0	0.3	0.3	0.3
			MAX	21.5	21.6	0.328	94	56	16.5	25.0	2.0
12	149.50	12	AV6	21.0	21.1	0.322	92	56	15.7	24.4	0.9
			STD	0.2	0.2	0.005	1	0	0.2	0.2	0.2
			MAX	21.2	21.3	0.331	95	56	16.1	24.6	1.0
20	150.00	16	AV8	21.1	21.2	0.324	93	56	15.5	24.5	0.7
			STD	0.2	0.1	0.005	1	0	0.1	0.2	0.1
			MAX	21.4	21.4	0.329	94	56	15.6	24.8	0.9
			Average	21.1	21.2	0.322	92	56	15.7	24.5	1.0
			Std. Dev.	0.2	0.2	0.005	1	0	0.3	0.2	0.4
			Maximum	21.5	21.6	0.331	95	56	16.5	25.0	2.0

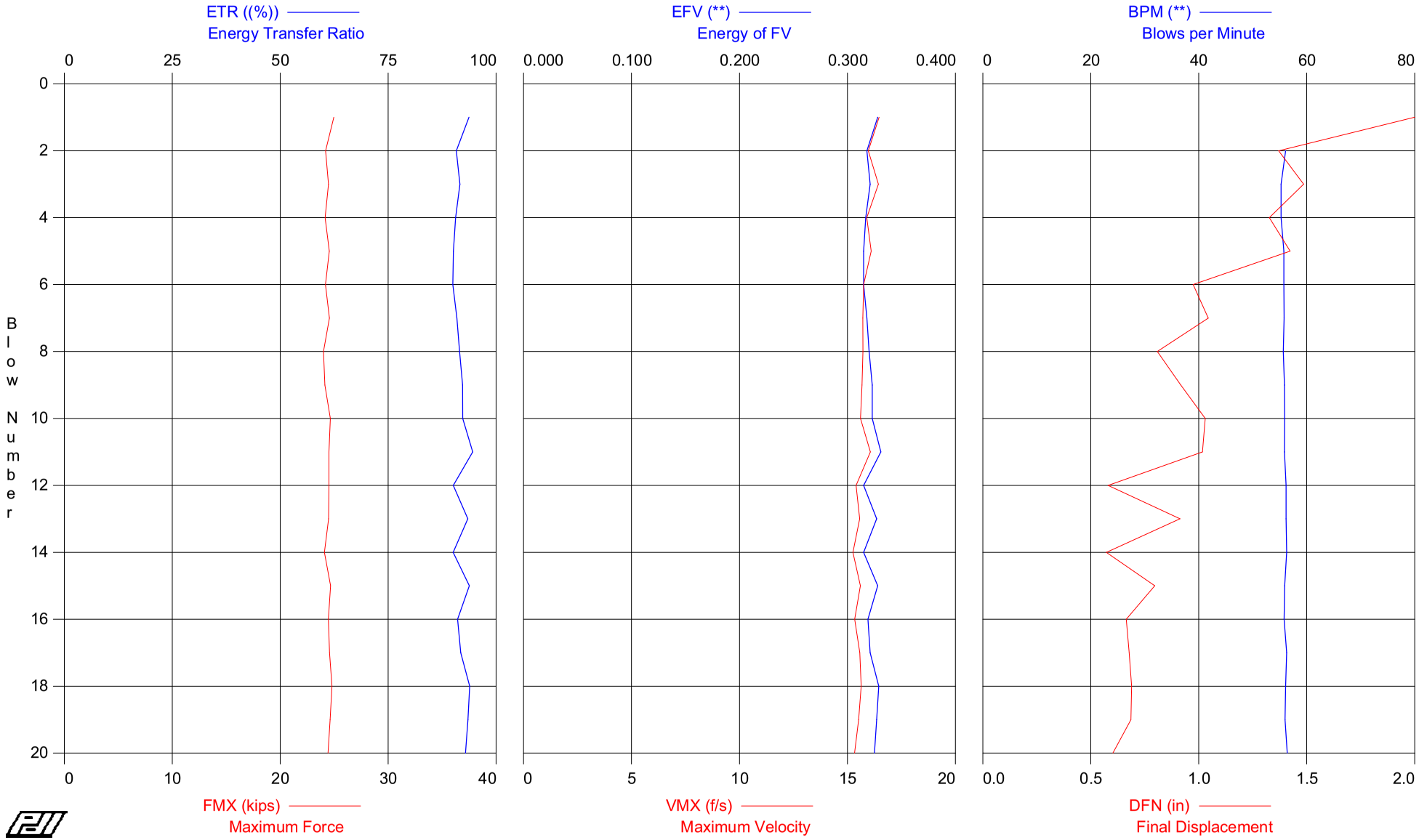
Total number of blows analyzed: 20

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 148.5 - 150
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 148.5 - 150
HAMMER #4 AWJ B-356
OP: SDW
Test date: 10-Jul-2008

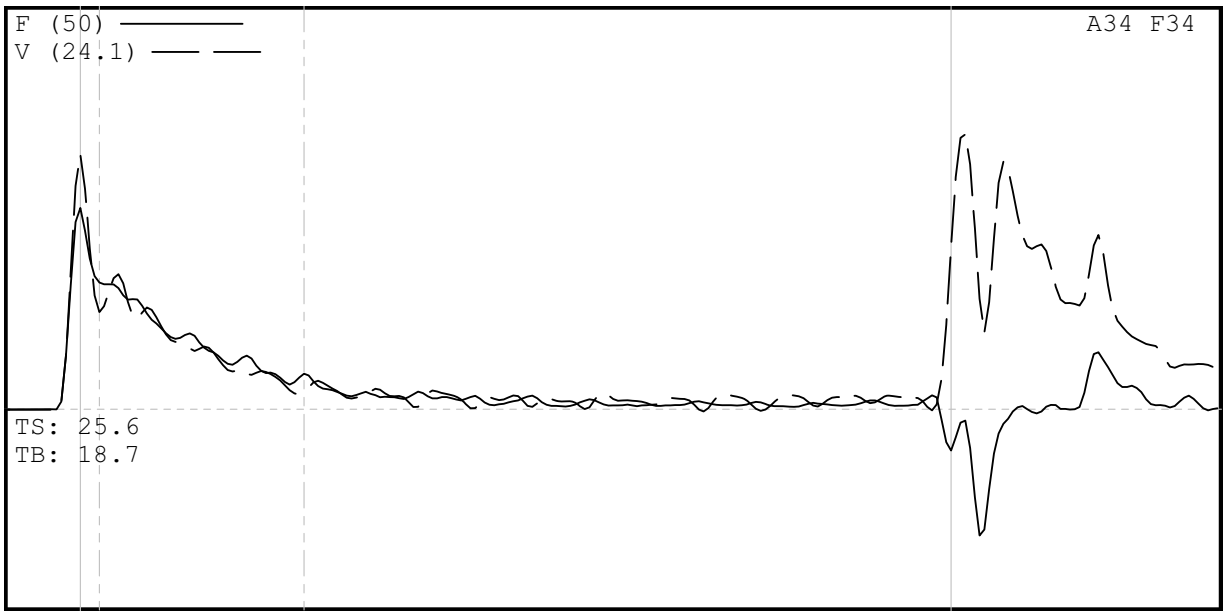
AR: 1.16 in^2
LE: 154.00 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	21.5	21.6	0.328	94	0	16.5	25.0	2.0
2	12	20.9	21.1	0.318	91	56	16.0	24.2	1.4
3	12	21.1	21.3	0.321	92	55	16.4	24.5	1.5
4	12	20.8	21.0	0.317	91	55	15.9	24.2	1.3
5	12	21.2	21.2	0.315	90	56	16.1	24.6	1.4
6	12	20.9	21.0	0.315	90	56	15.8	24.2	1.0
7	12	21.2	21.2	0.318	91	56	15.7	24.6	1.0
8	12	20.7	20.9	0.320	92	56	15.7	24.0	0.8
9	12	20.8	20.9	0.323	92	56	15.7	24.1	0.9
10	12	21.2	21.3	0.323	92	56	15.6	24.6	1.0
11	12	21.1	21.2	0.331	95	56	16.1	24.5	1.0
12	12	21.1	21.1	0.315	90	56	15.4	24.5	0.6
13	16	21.1	21.2	0.327	93	56	15.6	24.5	0.9
14	16	20.8	20.9	0.315	90	56	15.3	24.1	0.6
15	16	21.3	21.3	0.328	94	56	15.6	24.7	0.8
16	16	21.1	21.1	0.319	91	56	15.3	24.5	0.7
17	16	21.2	21.2	0.321	92	56	15.6	24.6	0.7
18	16	21.4	21.4	0.329	94	56	15.6	24.8	0.7
19	16	21.2	21.3	0.327	93	56	15.5	24.6	0.7
20	16	21.1	21.2	0.325	93	56	15.3	24.4	0.6
Average		21.1	21.2	0.322	92	56	15.7	24.5	1.0
Std. Dev.		0.2	0.2	0.005	1	0	0.3	0.2	0.4
Maximum		21.5	21.6	0.331	95	56	16.5	25.0	2.0

Total number of blows analyzed: 20

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 148 5 - 150



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 148 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 148 5 - 150
7/10/2008 1:08:21 PM
Blow Number 2/1

Pile Properties

LE	154.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	18.32	ms
JC	0.50	[]

Quantity Results

CSXN	21.5	ksi
CSI50	21.6	ksi
EFV	0.328	k-ft
ETR	93.7	(%)
BPM	0.0	bpm
VMX	16.5	f/s
FMX	25	kips
DFN	2.03	in
FVP	0.79	[]

Sensors

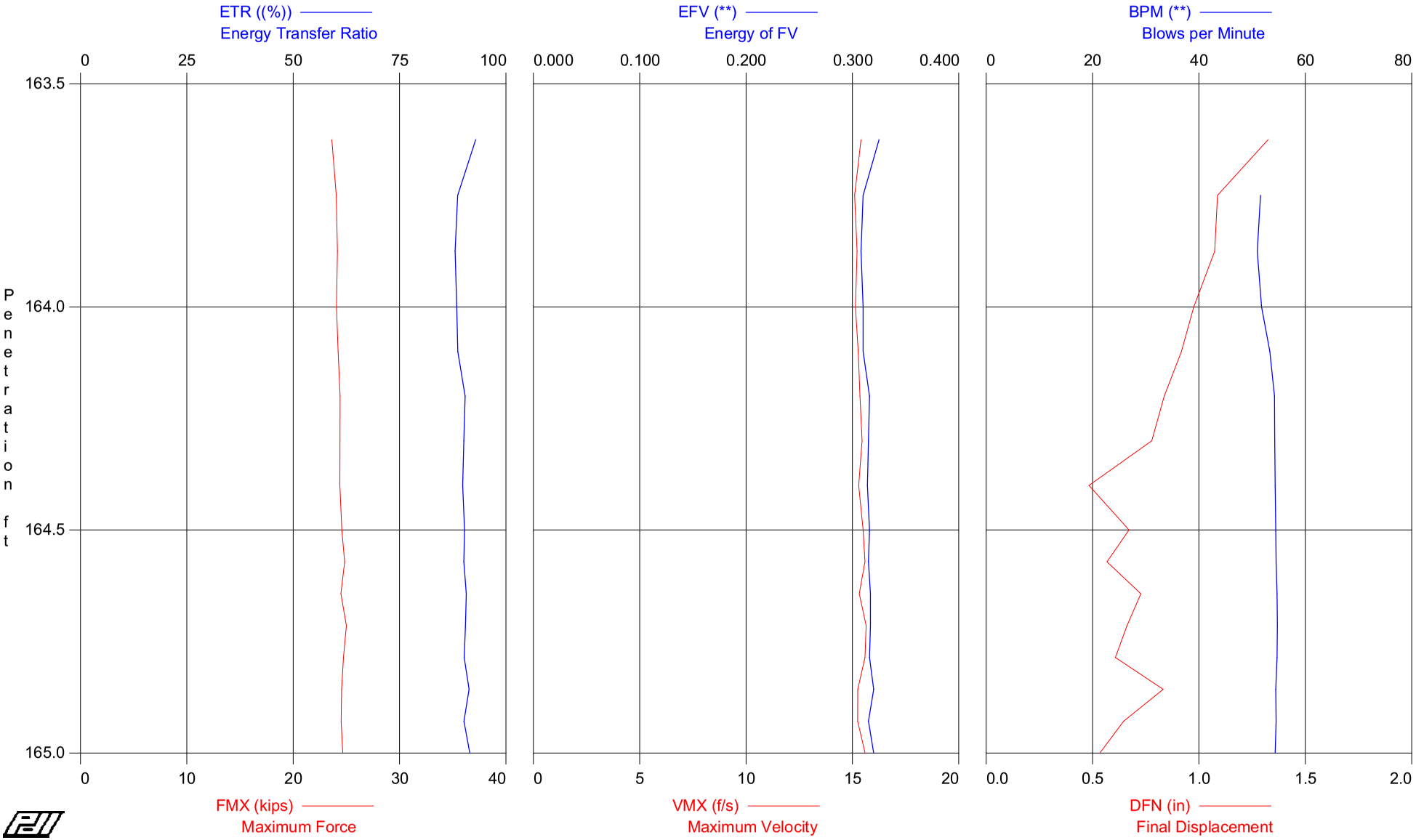
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 163.5 - 165
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 163.5 - 165
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 169.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	164.00	8	AV4	20.7	20.8	0.313	90	51	15.2	24.0	1.1
			STD	0.2	0.2	0.007	2	0	0.1	0.2	0.1
			MAX	20.8	21.0	0.325	93	52	15.4	24.2	1.3
9	164.50	10	AV5	21.0	21.2	0.314	90	54	15.4	24.4	0.7
			STD	0.1	0.1	0.002	1	0	0.1	0.1	0.2
			MAX	21.2	21.4	0.316	90	54	15.5	24.6	0.9
16	165.00	14	AV7	21.3	21.5	0.317	91	55	15.5	24.7	0.7
			STD	0.2	0.1	0.002	1	0	0.2	0.2	0.1
			MAX	21.5	21.7	0.320	92	55	15.6	25.0	0.8
			Average	21.0	21.2	0.315	90	54	15.4	24.4	0.8
			Std. Dev.	0.3	0.3	0.004	1	1	0.2	0.3	0.2
			Maximum	21.5	21.7	0.325	93	55	15.6	25.0	1.3

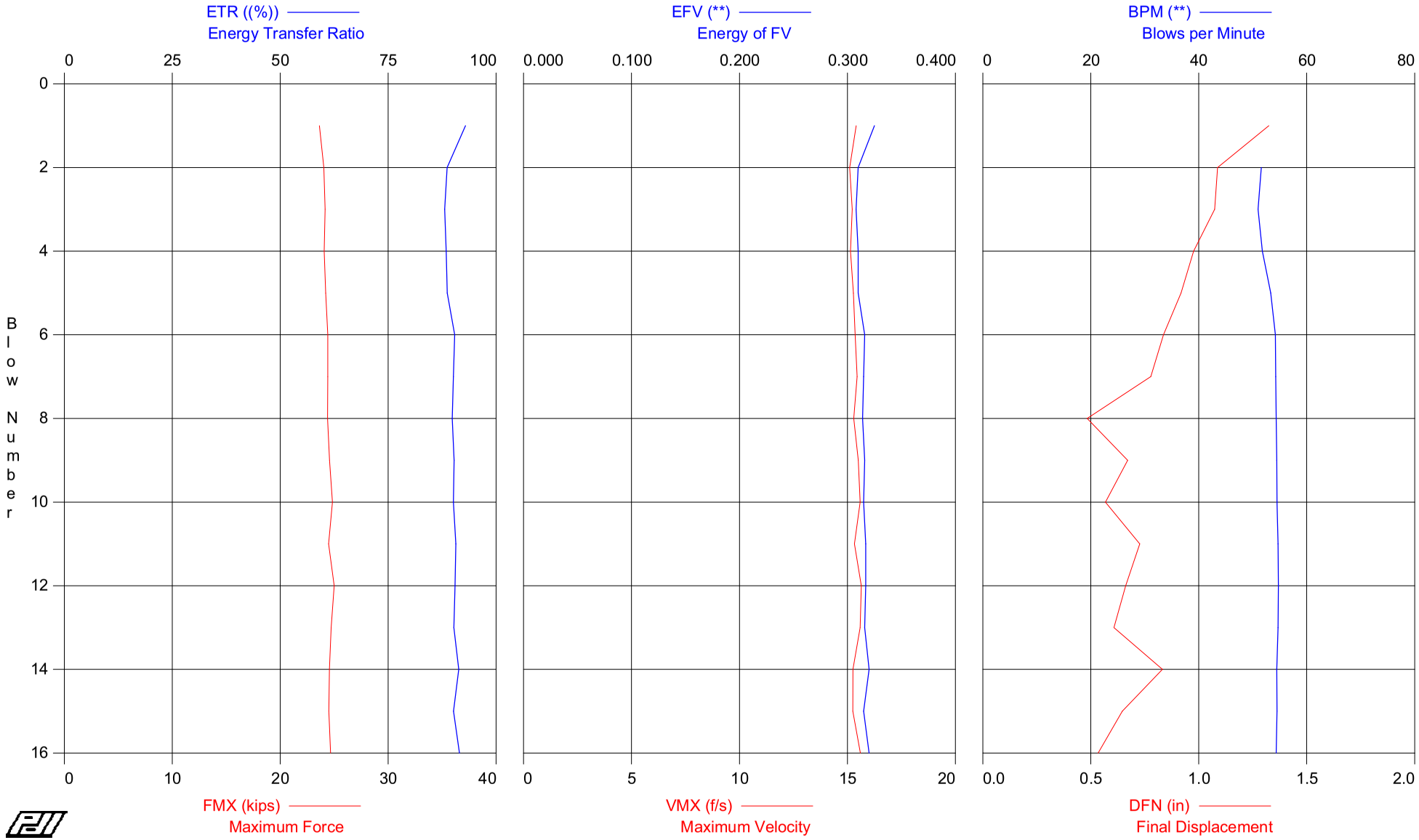
Total number of blows analyzed: 16

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 163.5 - 165
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 163.5 - 165
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 169.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

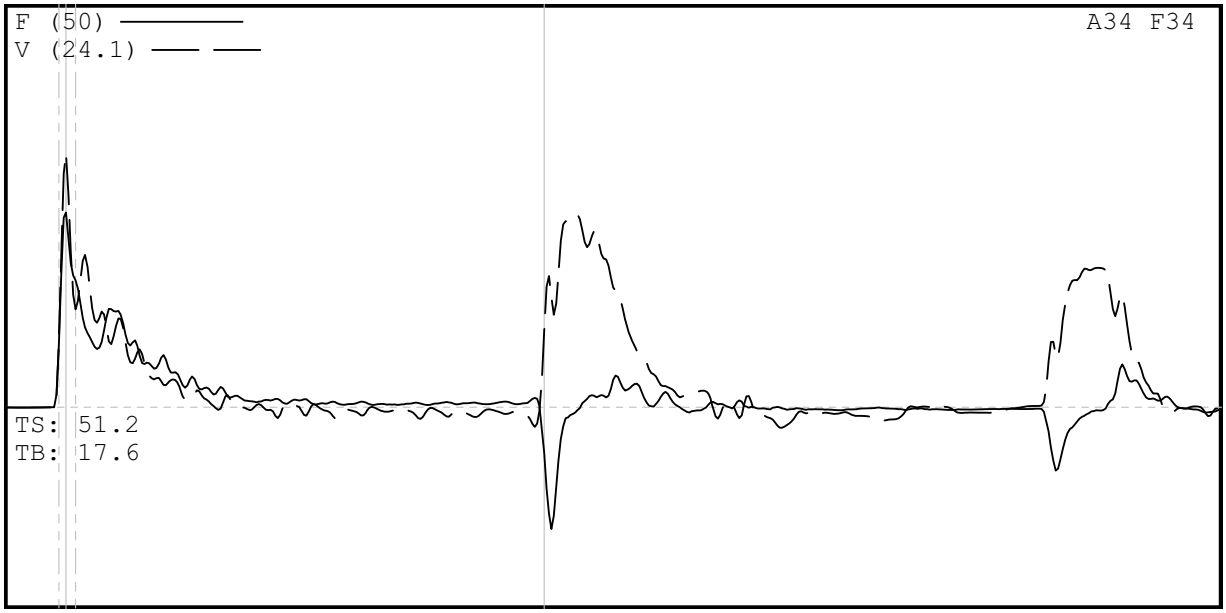
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.4	20.4	0.325	93	0	15.4	23.6	1.3
2	8	20.7	21.0	0.310	89	52	15.1	24.0	1.1
3	8	20.8	20.9	0.308	88	51	15.2	24.2	1.1
4	8	20.8	21.0	0.310	88	52	15.1	24.1	1.0
5	10	20.9	21.0	0.310	89	53	15.3	24.2	0.9
6	10	21.0	21.2	0.316	90	54	15.4	24.4	0.8
7	10	21.0	21.1	0.315	90	54	15.5	24.4	0.8
8	10	21.0	21.4	0.314	90	54	15.3	24.4	0.5
9	10	21.2	21.3	0.316	90	54	15.5	24.6	0.7
10	14	21.4	21.6	0.315	90	54	15.6	24.8	0.6
11	14	21.1	21.5	0.317	91	55	15.3	24.5	0.7
12	14	21.5	21.7	0.317	90	55	15.6	25.0	0.7
13	14	21.3	21.4	0.316	90	55	15.6	24.7	0.6
14	14	21.2	21.5	0.320	91	54	15.3	24.6	0.8
15	14	21.1	21.5	0.315	90	54	15.2	24.5	0.6
16	14	21.3	21.4	0.320	92	54	15.6	24.7	0.5
Average		21.0	21.2	0.315	90	54	15.4	24.4	0.8
Std. Dev.		0.3	0.3	0.004	1	1	0.2	0.3	0.2
Maximum		21.5	21.7	0.325	93	55	15.6	25.0	1.3

Total number of blows analyzed: 16

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 163 5 - 165



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 163 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 163 5 - 165
7/10/2008 3:23:31 PM
Blow Number 5/3

Pile Properties

LE	169.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	20.11	ms
JC	0.50	[]

Quantity Results

CSXN	20.8	ksi
CSI65	20.9	ksi
EFV	0.308	k-ft
ETR	88.1	(%)
BPM	51.0	bpm
VMX	15.2	f/s
FMX	24	kips
DFN	1.07	in
FVP	0.77	[]

Sensors

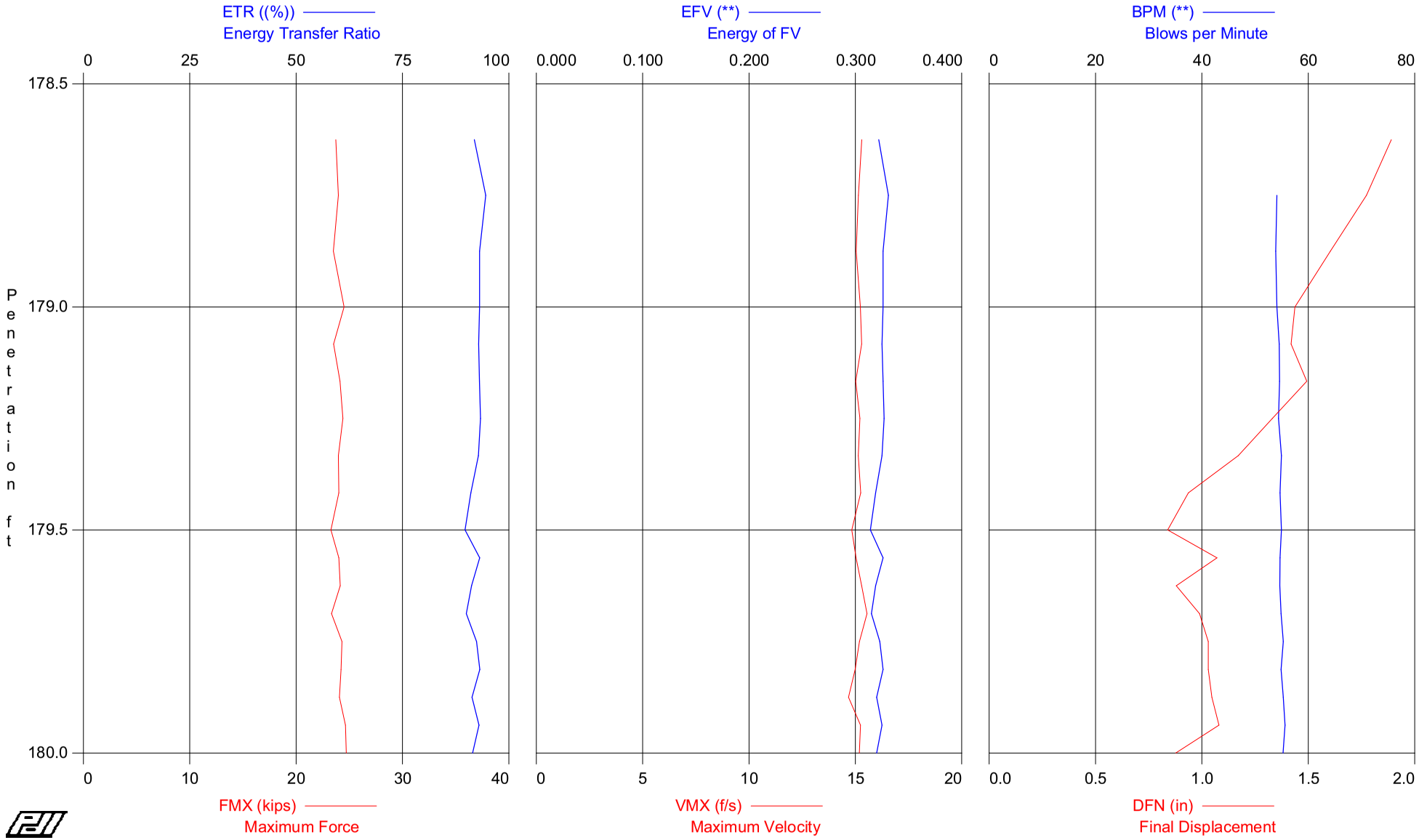
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.04

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCKDEPTH 178.5 - 180
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCKDEPTH 178.5 - 180
OP: SDW

HAMMER #4 AWJ B-356
Test date: 10-Jul-2008

AR: 1.16 in^2
LE: 184.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	179.00	8	AV4	20.6	20.8	0.326	93	54	15.2	23.9	1.7
			STD	0.3	0.2	0.003	1	0	0.1	0.4	0.2
			MAX	21.1	21.2	0.331	95	54	15.3	24.5	1.9
10	179.50	12	AV6	20.6	20.7	0.323	92	55	15.1	23.9	1.2
			STD	0.3	0.3	0.005	1	0	0.2	0.4	0.2
			MAX	21.0	21.2	0.327	93	55	15.3	24.4	1.5
18	180.00	16	AV8	20.8	21.1	0.322	92	55	15.1	24.2	1.0
			STD	0.3	0.3	0.004	1	0	0.2	0.4	0.1
			MAX	21.3	21.6	0.326	93	56	15.5	24.7	1.1
			Average	20.7	20.9	0.323	92	55	15.1	24.0	1.2
			Std. Dev.	0.4	0.4	0.004	1	0	0.2	0.4	0.3
			Maximum	21.3	21.6	0.331	95	56	15.5	24.7	1.9

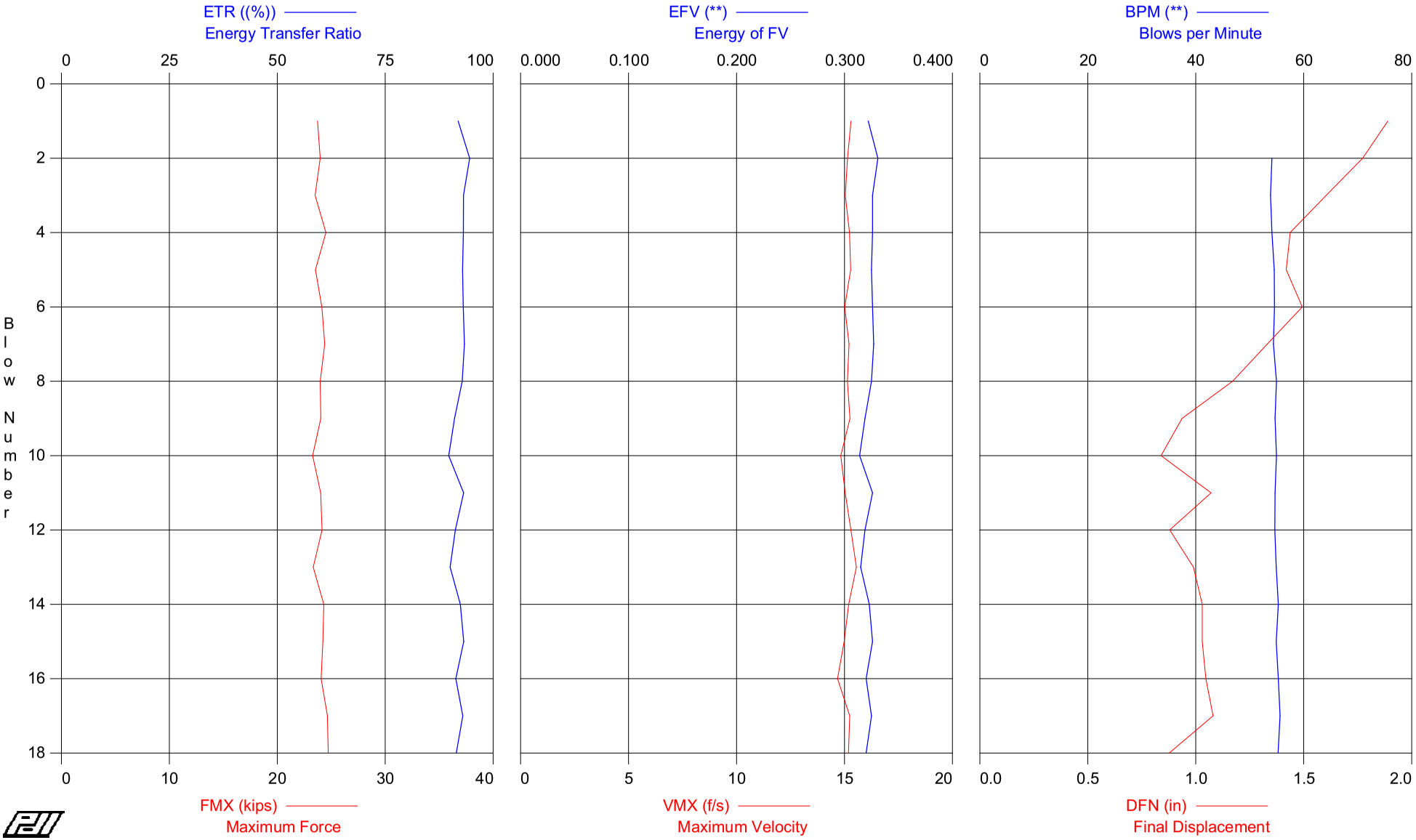
Total number of blows analyzed: 18

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 10-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCKDEPTH 178.5 - 180
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCKDEPTH 178.5 - 180
HAMMER #4 AWJ B-356
OP: SDW
Test date: 10-Jul-2008

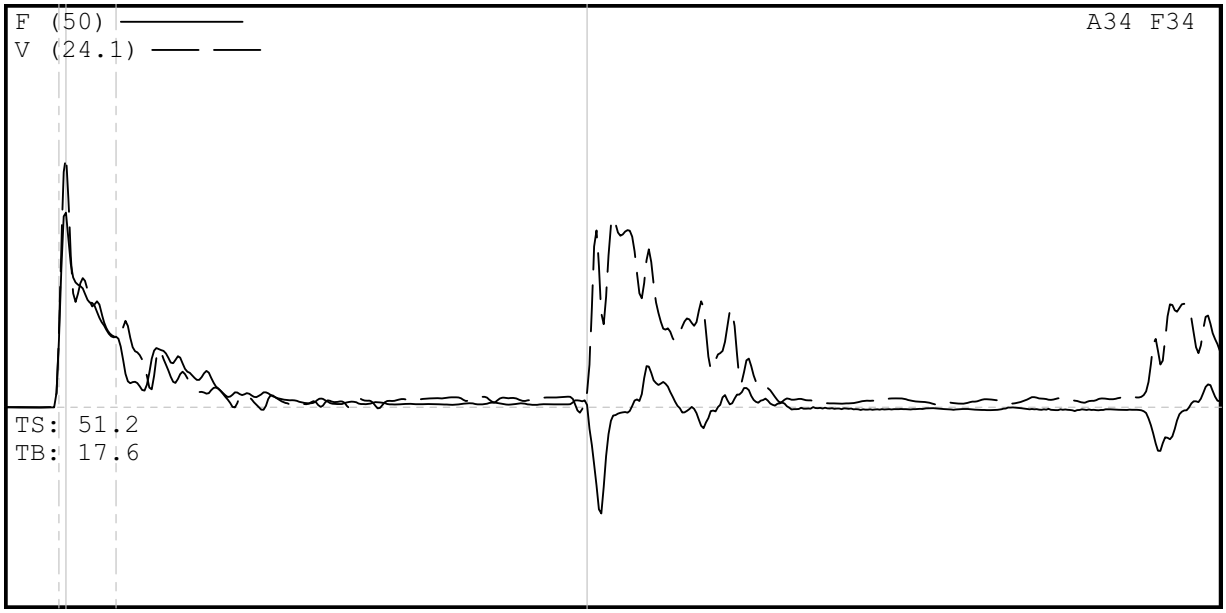
AR: 1.16 in^2
LE: 184.00 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.5	20.6	0.322	92	0	15.3	23.7	1.9
2	8	20.7	20.8	0.331	95	54	15.1	24.0	1.8
3	8	20.3	20.6	0.326	93	54	15.0	23.5	1.6
4	8	21.1	21.2	0.326	93	54	15.2	24.5	1.4
5	12	20.3	20.4	0.325	93	55	15.3	23.5	1.4
6	12	20.8	20.9	0.326	93	55	15.0	24.1	1.5
7	12	21.0	21.2	0.327	93	54	15.2	24.4	1.3
8	12	20.7	20.8	0.325	93	55	15.1	24.0	1.2
9	12	20.7	20.9	0.319	91	55	15.3	24.0	0.9
10	12	20.1	20.4	0.314	90	55	14.8	23.3	0.8
11	16	20.7	20.9	0.326	93	55	15.0	24.0	1.1
12	16	20.8	21.0	0.319	91	55	15.3	24.1	0.9
13	16	20.1	20.4	0.315	90	55	15.5	23.3	1.0
14	16	21.0	21.2	0.323	92	55	15.2	24.3	1.0
15	16	20.9	21.2	0.326	93	55	15.0	24.2	1.0
16	16	20.7	21.1	0.320	91	55	14.7	24.1	1.0
17	16	21.2	21.4	0.325	93	56	15.2	24.6	1.1
18	16	21.3	21.6	0.320	91	55	15.2	24.7	0.9
Average		20.7	20.9	0.323	92	55	15.1	24.0	1.2
Std. Dev.		0.4	0.4	0.004	1	0	0.2	0.4	0.3
Maximum		21.3	21.6	0.331	95	56	15.5	24.7	1.9

Total number of blows analyzed: 18

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCKDEPTH 178 5 - 180



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCKDEPTH 178 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 178 5 - 180
7/10/2008 5:53:03 PM
Blow Number 7/6

Pile Properties

LE	184.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	21.89	ms
JC	0.50	[]

Quantity Results

CSXN	20.8	ksi
CSIB0	20.9	ksi
EFV	0.326	k-ft
ETR	93.1	(%)
BPM	54.6	bpm
VMX	15.0	f/s
FMX	24	kips
DFN	1.49	in
FVP	0.78	[]

Sensors

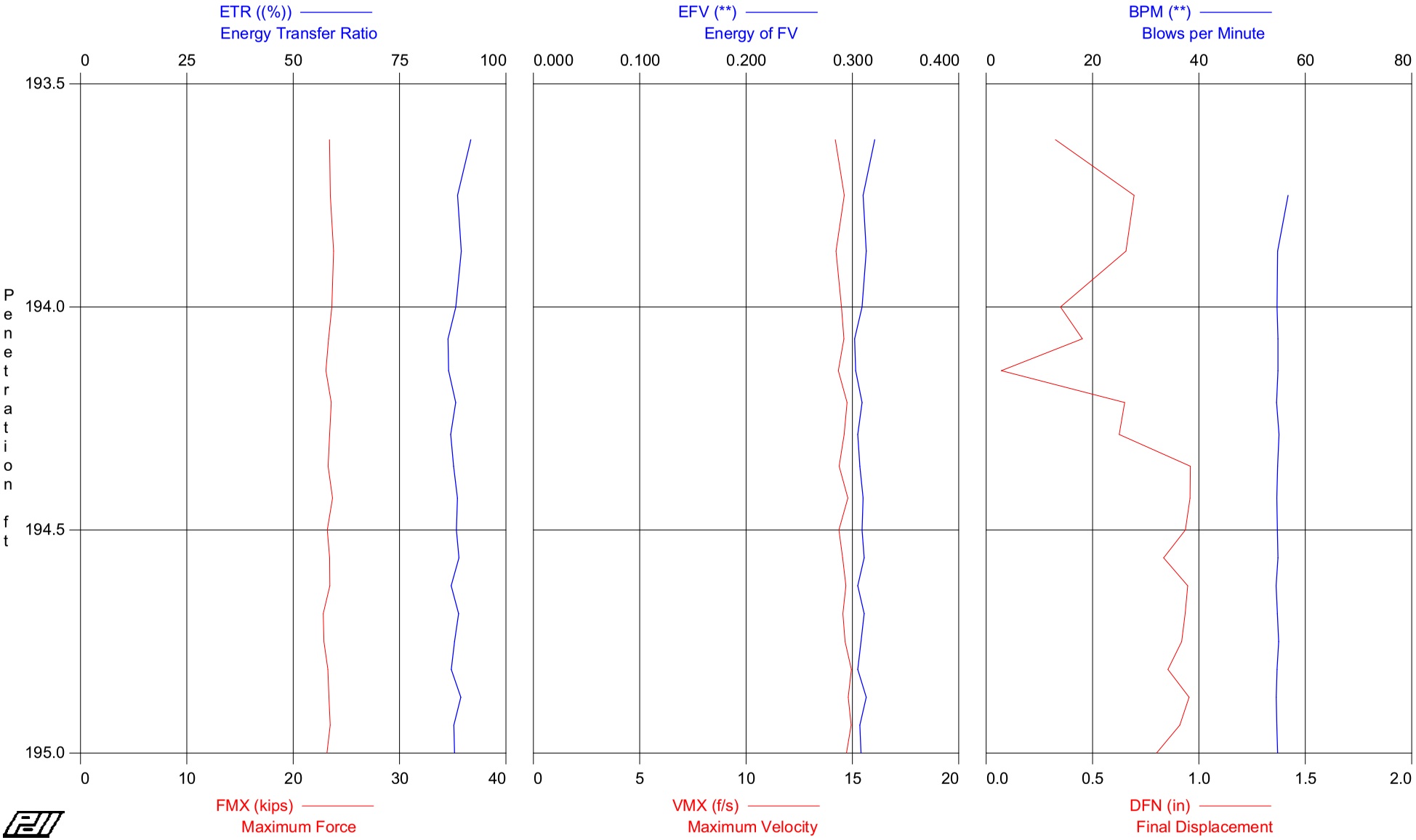
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.00

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 193.5 - 195
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 193.5 - 195
OP: SDW

HAMMER #4 AWJ B-356
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 199.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	194.00	8	AV4	20.3	20.5	0.313	90	55	14.4	23.6	0.5
			STD	0.1	0.2	0.005	1	1	0.2	0.1	0.2
			MAX	20.5	20.8	0.321	92	57	14.6	23.8	0.7
11	194.50	14	AV7	20.1	20.3	0.306	88	55	14.5	23.4	0.7
			STD	0.2	0.1	0.003	1	0	0.2	0.2	0.3
			MAX	20.4	20.6	0.310	89	55	14.8	23.7	1.0
19	195.00	16	AV8	20.0	20.2	0.308	88	55	14.7	23.2	0.9
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	20.2	20.4	0.313	89	55	14.9	23.5	1.0
			Average	20.1	20.3	0.309	88	55	14.6	23.4	0.7
			Std. Dev.	0.2	0.2	0.004	1	0	0.2	0.2	0.3
			Maximum	20.5	20.8	0.321	92	57	14.9	23.8	1.0

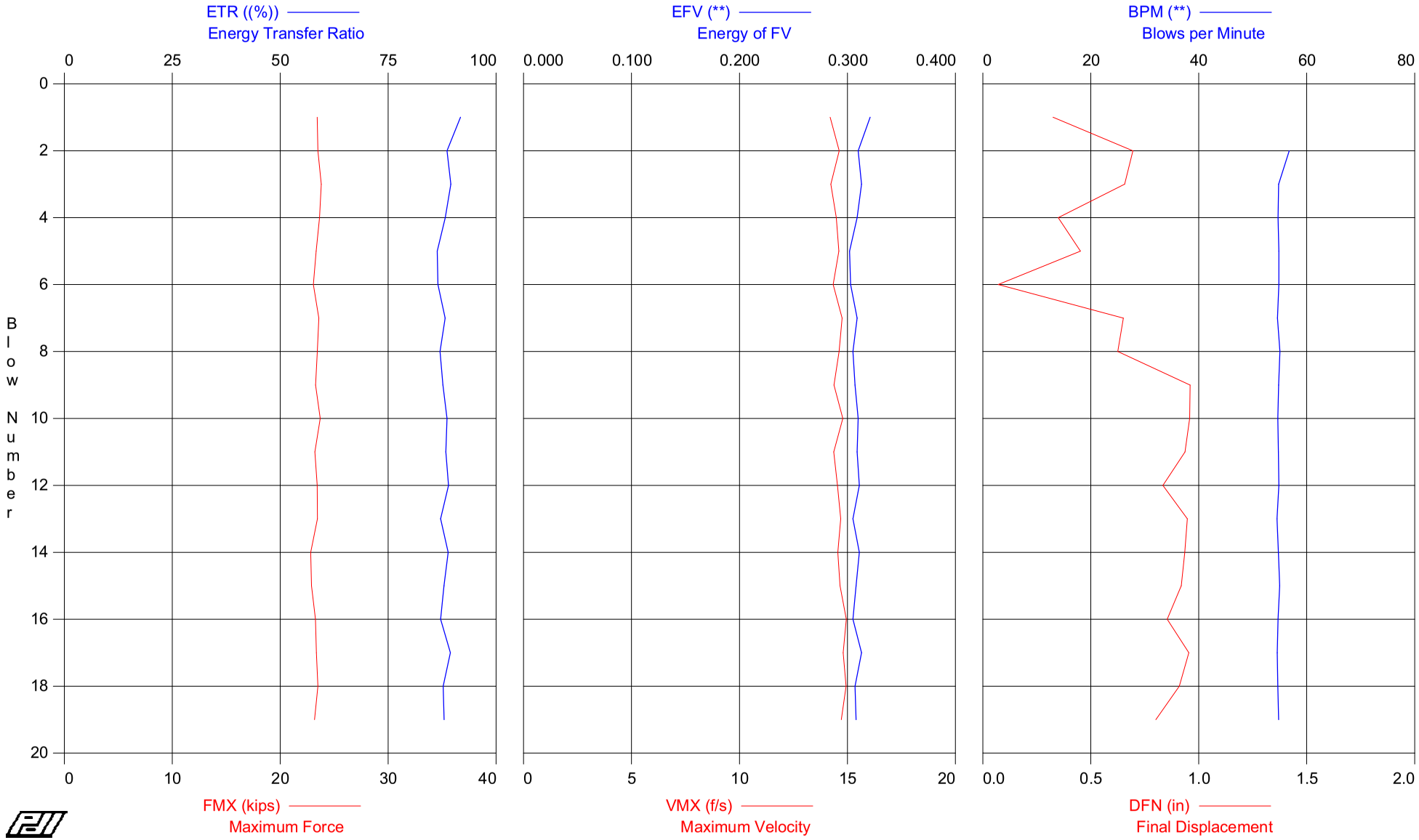
Total number of blows analyzed: 19

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 193.5 - 195
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 193.5 - 195
HAMMER #4 AWJ B-356
OP: SDW
Test date: 11-Jul-2008

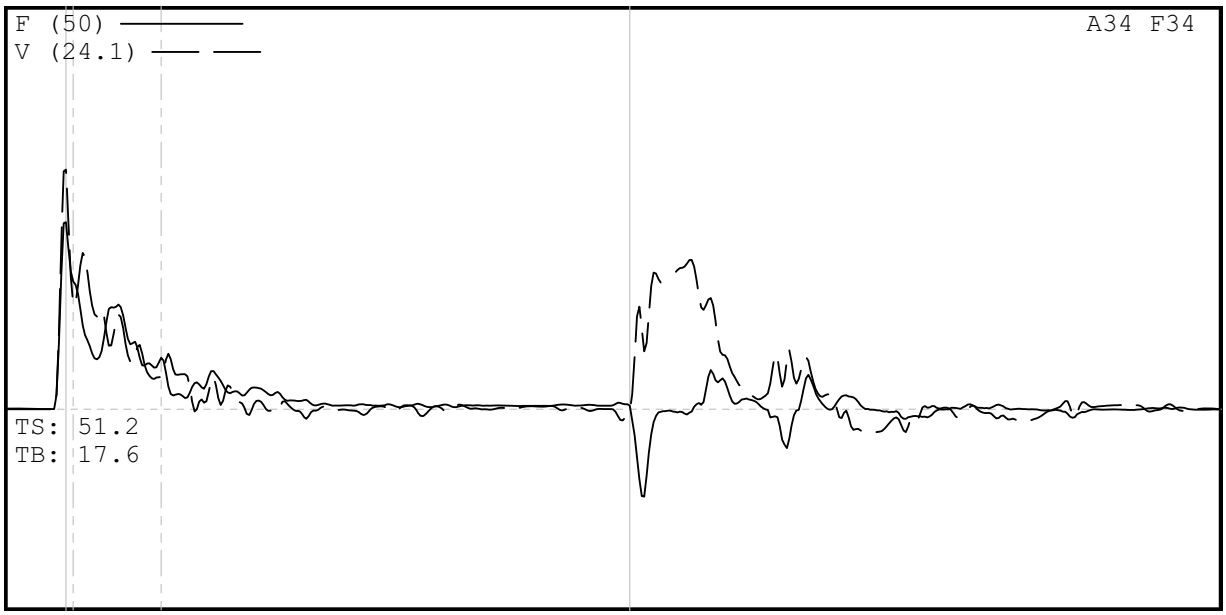
AR: 1.16 in^2
LE: 199.00 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	20.2	20.2	0.321	92	0	14.2	23.4	0.3
2	8	20.3	20.3	0.310	89	57	14.6	23.5	0.7
3	8	20.5	20.8	0.313	90	55	14.2	23.8	0.7
4	8	20.4	20.5	0.309	88	55	14.5	23.6	0.3
5	14	20.1	20.2	0.302	86	55	14.6	23.3	0.5
6	14	19.9	20.2	0.303	87	55	14.3	23.1	0.1
7	14	20.3	20.4	0.309	88	55	14.8	23.6	0.7
8	14	20.2	20.3	0.305	87	55	14.6	23.4	0.6
9	14	20.1	20.4	0.307	88	55	14.4	23.3	1.0
10	14	20.4	20.6	0.310	89	55	14.8	23.7	1.0
11	14	20.0	20.2	0.309	88	55	14.4	23.2	0.9
12	16	20.2	20.3	0.311	89	55	14.5	23.4	0.8
13	16	20.2	20.3	0.305	87	54	14.7	23.5	0.9
14	16	19.7	19.9	0.311	89	55	14.6	22.8	0.9
15	16	19.7	19.8	0.308	88	55	14.7	22.9	0.9
16	16	20.1	20.2	0.305	87	55	14.9	23.3	0.9
17	16	20.1	20.2	0.313	89	55	14.8	23.4	1.0
18	16	20.2	20.4	0.307	88	55	14.9	23.5	0.9
19	16	20.0	20.1	0.308	88	55	14.7	23.2	0.8
Average		20.1	20.3	0.309	88	55	14.6	23.4	0.7
Std. Dev.		0.2	0.2	0.004	1	0	0.2	0.2	0.3
Maximum		20.5	20.8	0.321	92	57	14.9	23.8	1.0

Total number of blows analyzed: 19

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 193 5 - 195



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 193 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 193 5 - 195
7/11/2008 8:54:37 AM
Blow Number 13/11

Pile Properties

LE	199.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	23.68	ms
JC	0.50	[]

Quantity Results

CSXN	20.0	ksi
CSI95	20.2	ksi
EFV	0.309	k-ft
ETR	88.4	(%)
BPM	54.7	bpm
VMX	14.4	f/s
FMX	23	kips
DFN	0.94	in
FVP	0.78	[]

Sensors

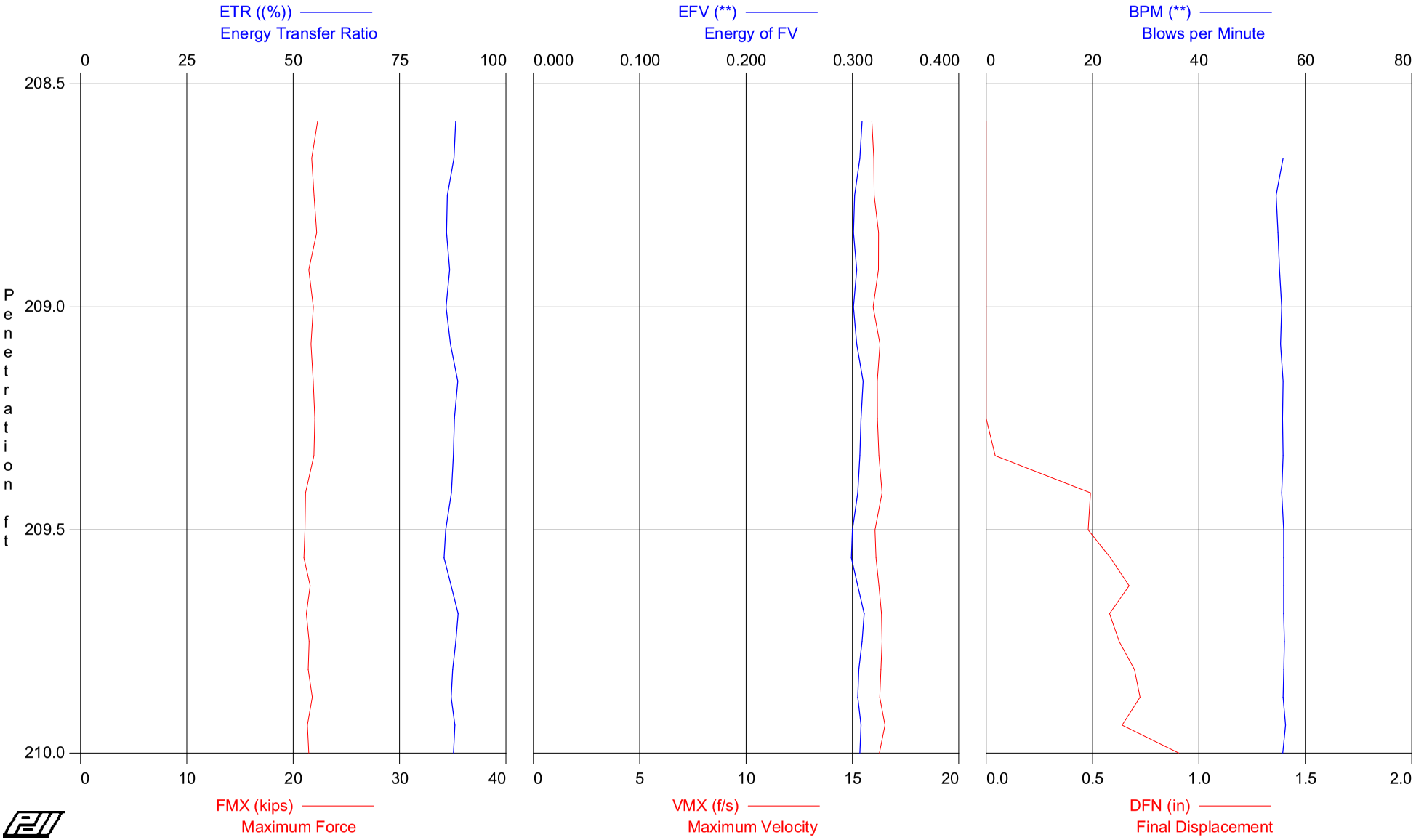
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 208.5 - 210
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 208.5 - 210
OP: SDW

HAMMER #4 AWJ B-356
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 214.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
6	209.00	12	AV6	18.9	19.2	0.304	87	55	16.1	21.9	-0.8
			STD	0.2	0.2	0.003	1	0	0.1	0.3	0.1
			MAX	19.2	19.5	0.309	88	56	16.2	22.3	-0.6
12	209.50	12	AV6	18.6	19.0	0.306	87	56	16.2	21.6	0.0
			STD	0.3	0.4	0.003	1	0	0.1	0.4	0.4
			MAX	19.0	19.4	0.310	89	56	16.4	22.0	0.5
20	210.00	16	AV8	18.5	18.9	0.306	87	56	16.3	21.4	0.7
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	18.8	19.2	0.311	89	56	16.5	21.8	0.9
			Average	18.7	19.0	0.305	87	56	16.2	21.6	0.1
			Std. Dev.	0.3	0.3	0.003	1	0	0.2	0.4	0.6
			Maximum	19.2	19.5	0.311	89	56	16.5	22.3	0.9

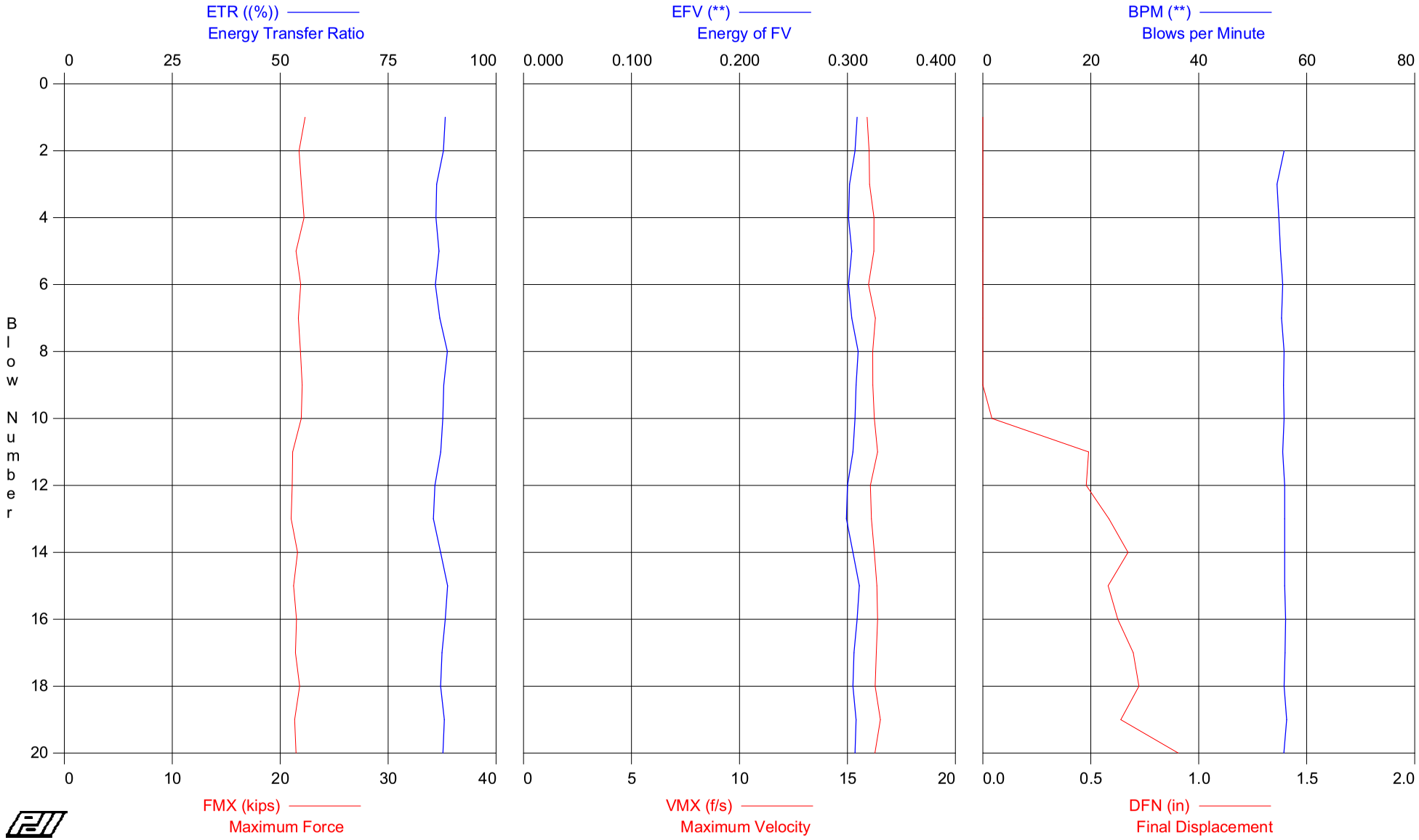
Total number of blows analyzed: 20

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 11-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 208. 5 - 210
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 208. 5 - 210
OP: SDW

HAMMER #4 AWJ B-356
Test date: 11-Jul-2008

AR: 1.16 in^2
LE: 214.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

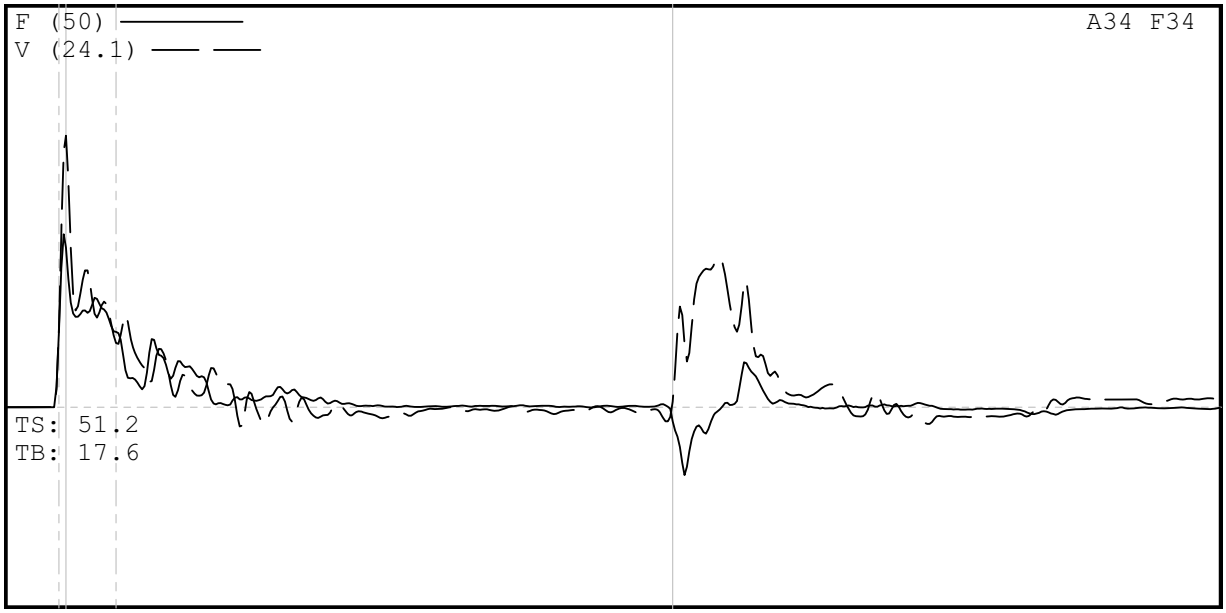
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	12	19.2	19.4	0.309	88	0	15.9	22.3	-0.9
2	12	18.7	18.9	0.307	88	56	16.0	21.7	-0.9
3	12	18.9	19.3	0.302	86	54	16.0	22.0	-0.7
4	12	19.2	19.5	0.301	86	55	16.2	22.2	-0.9
5	12	18.5	19.0	0.304	87	55	16.2	21.5	-0.6
6	12	18.9	19.1	0.301	86	56	16.0	21.9	-0.7
7	12	18.7	19.0	0.304	87	55	16.3	21.7	-0.5
8	12	18.9	19.1	0.310	89	56	16.2	21.9	-0.3
9	12	19.0	19.4	0.308	88	56	16.2	22.0	-0.1
10	12	18.9	19.3	0.307	88	56	16.2	21.9	0.0
11	12	18.2	18.6	0.305	87	56	16.4	21.2	0.5
12	12	18.2	18.4	0.300	86	56	16.1	21.1	0.5
13	16	18.1	18.6	0.299	85	56	16.1	21.0	0.6
14	16	18.6	19.1	0.305	87	56	16.2	21.6	0.7
15	16	18.3	18.7	0.311	89	56	16.4	21.2	0.6
16	16	18.5	18.9	0.309	88	56	16.4	21.5	0.6
17	16	18.5	18.9	0.306	87	56	16.3	21.4	0.7
18	16	18.8	19.2	0.305	87	56	16.3	21.8	0.7
19	16	18.4	18.9	0.308	88	56	16.5	21.3	0.6
20	16	18.5	18.9	0.307	88	56	16.3	21.5	0.9
Average		18.7	19.0	0.305	87	56	16.2	21.6	0.1
Std. Dev.		0.3	0.3	0.003	1	0	0.2	0.4	0.6
Maximum		19.2	19.5	0.311	89	56	16.5	22.3	0.9

Total number of blows analyzed: 20

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 208 5 - 210



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 208 5
DESCR: HAMMER #4 AWJ B-356
OPERATOR: SDW
FILE: DRILL RIG 75 TRUCK DEPTH 208 5 - 210
7/11/2008 12:12:39 PM
Blow Number 21/20

Pile Properties

LE	214.00	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	25.46	ms
JC	0.50	[]

Quantity Results

CSXN	18.5	ksi
CSI10	18.9	ksi
EFV	0.307	k-ft
ETR	87.7	(%)
BPM	55.8	bpm
VMX	16.3	f/s
FMX	21	kips
DFN	0.91	in
FVP	0.59	[]

Sensors

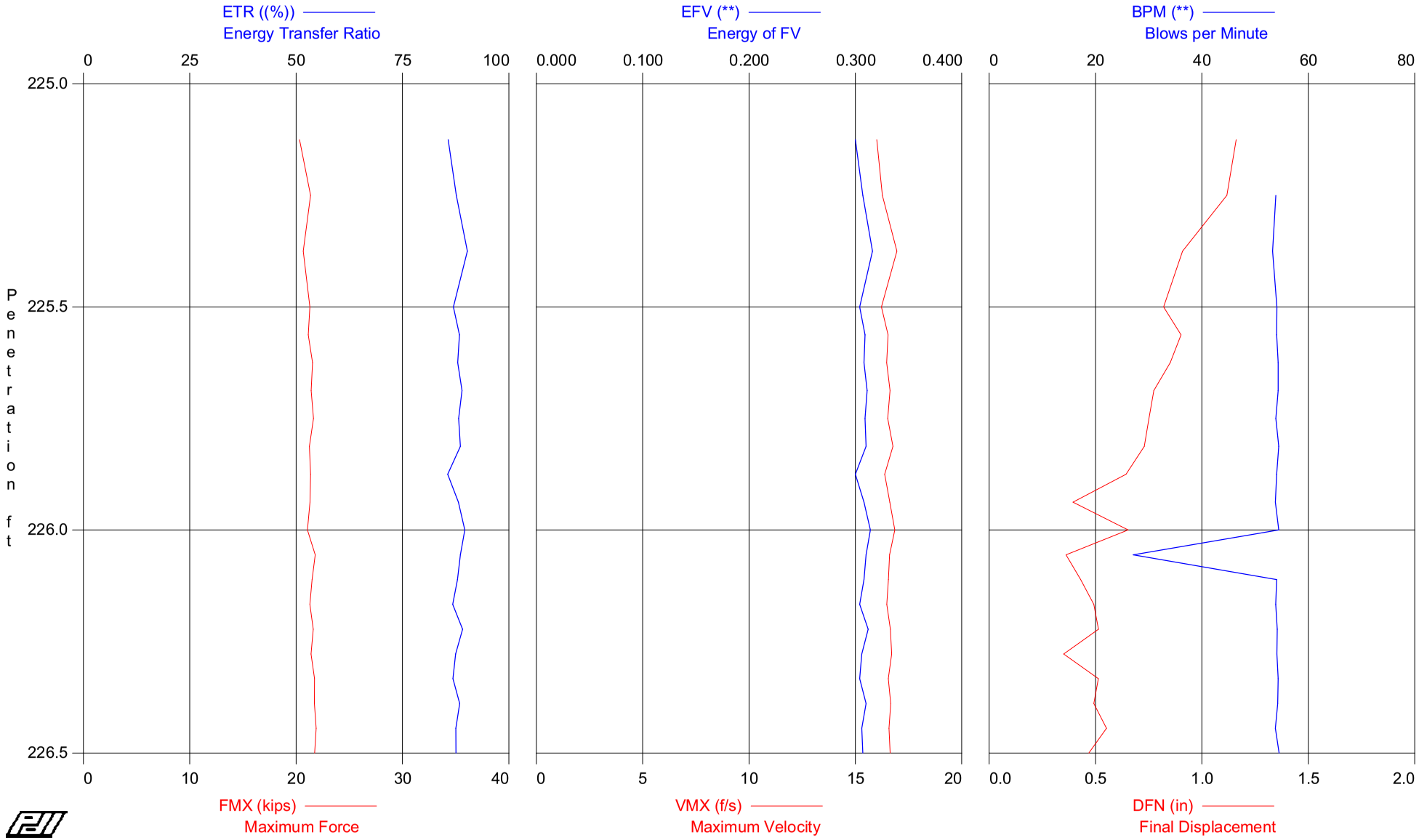
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.01

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 225 - 226.5
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 225 - 226.5
OP: DJF

HAMMER #4 AWJ B-356
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 228.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
4	225.50	8	AV4	18.0	18.3	0.307	88	54	16.4	20.9	1.0
			STD	0.4	0.3	0.006	2	0	0.4	0.4	0.1
			MAX	18.4	18.7	0.316	90	54	17.0	21.4	1.2
12	226.00	16	AV8	18.4	18.6	0.309	88	54	16.6	21.3	0.7
			STD	0.2	0.2	0.004	1	0	0.1	0.2	0.1
			MAX	18.6	18.9	0.314	90	54	16.9	21.6	0.9
21	226.50	18	AV9	18.6	18.8	0.307	88	51	16.6	21.6	0.5
			STD	0.2	0.2	0.003	1	8	0.1	0.2	0.1
			MAX	18.9	19.1	0.312	89	54	16.7	21.9	0.6
			Average	18.4	18.6	0.308	88	53	16.6	21.4	0.7
			Std. Dev.	0.3	0.3	0.004	1	6	0.2	0.4	0.2
			Maximum	18.9	19.1	0.316	90	54	17.0	21.9	1.2

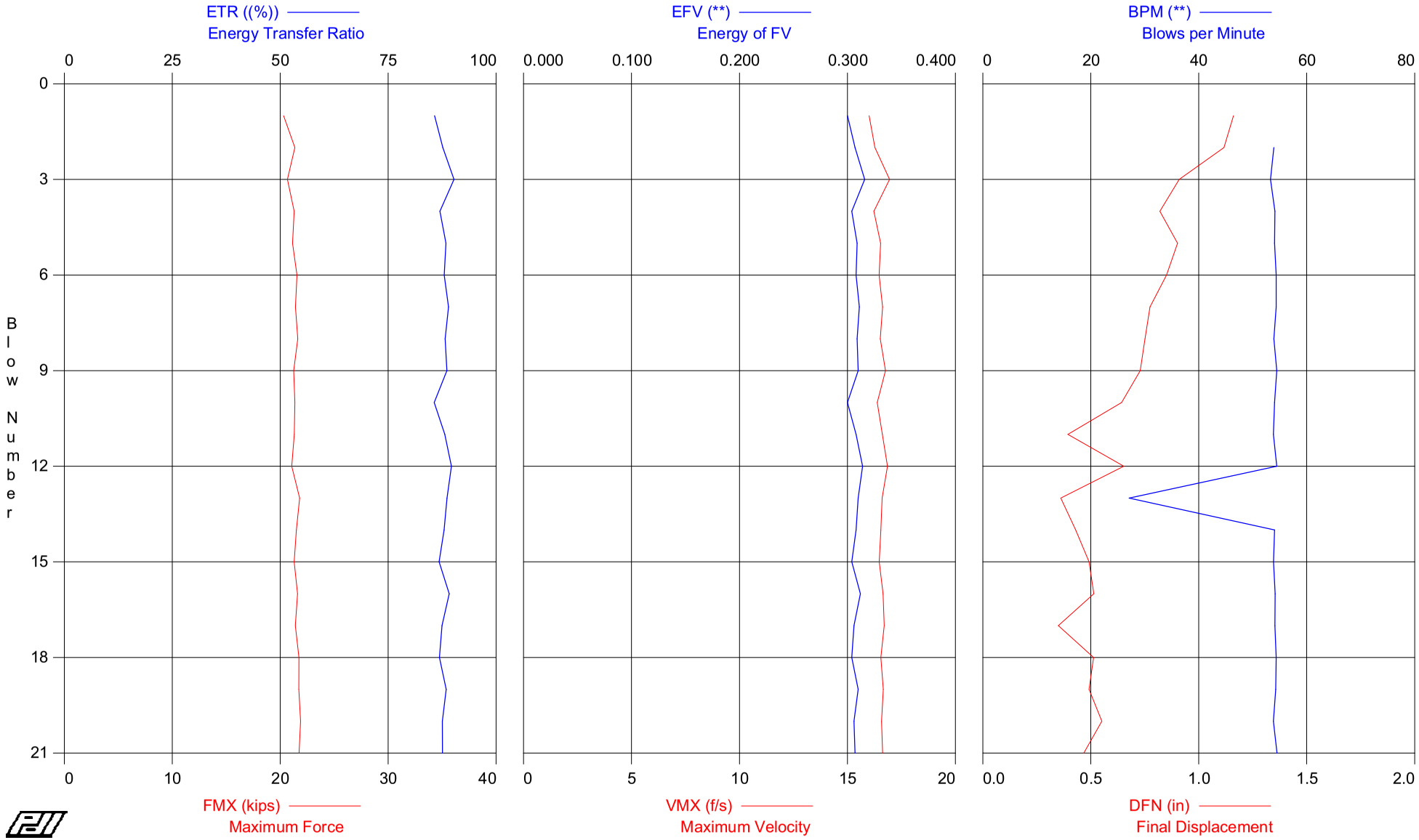
Total number of blows analyzed: 21

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 225 - 226.5
HAMMER #4 AWJ B-356



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 225 - 226.5
HAMMER #4 AWJ B-356
OP: DJF
Test date: 15-Jul-2008

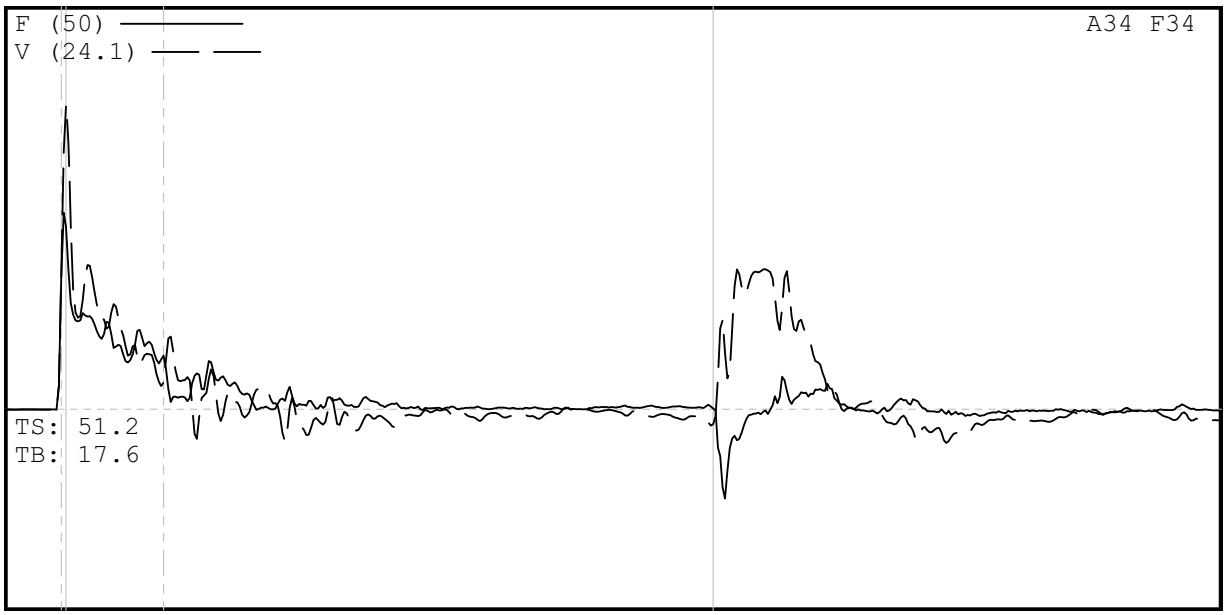
AR: 1.16 in^2
LE: 228.20 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	8	17.5	17.8	0.300	86	0	16.0	20.3	1.2
2	8	18.4	18.7	0.307	88	54	16.3	21.4	1.1
3	8	17.8	18.0	0.316	90	53	17.0	20.7	0.9
4	8	18.4	18.6	0.304	87	54	16.2	21.3	0.8
5	16	18.2	18.5	0.309	88	54	16.5	21.1	0.9
6	16	18.6	18.8	0.308	88	54	16.5	21.5	0.9
7	16	18.5	18.7	0.311	89	54	16.6	21.4	0.8
8	16	18.6	18.9	0.309	88	54	16.5	21.6	0.8
9	16	18.3	18.5	0.310	89	54	16.8	21.3	0.7
10	16	18.4	18.6	0.300	86	54	16.4	21.4	0.6
11	16	18.4	18.4	0.308	88	54	16.6	21.3	0.4
12	16	18.2	18.4	0.314	90	54	16.9	21.1	0.7
13	18	18.8	18.8	0.310	89	27	16.6	21.8	0.4
14	18	18.5	18.6	0.308	88	54	16.6	21.5	0.4
15	18	18.4	18.4	0.304	87	54	16.5	21.3	0.5
16	18	18.6	18.8	0.312	89	54	16.6	21.6	0.5
17	18	18.4	18.7	0.306	87	54	16.7	21.4	0.4
18	18	18.7	19.0	0.304	87	54	16.5	21.7	0.5
19	18	18.7	18.9	0.310	88	54	16.7	21.7	0.5
20	18	18.9	19.1	0.306	88	54	16.6	21.9	0.6
21	18	18.7	19.0	0.307	88	54	16.6	21.7	0.5
Average		18.4	18.6	0.308	88	53	16.6	21.4	0.7
Std. Dev.		0.3	0.3	0.004	1	6	0.2	0.4	0.2
Maximum		18.9	19.1	0.316	90	54	17.0	21.9	1.2

Total number of blows analyzed: 21

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 225 - 226 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 225 -
DESCR: HAMMER #4 AWJ B-356
OPERATOR: DJF
FILE: DRILL RIG 75 TRUCK DEPTH 225 - 226 5
7/15/2008 10:55:36 AM
Blow Number 15/14

Pile Properties

LE	228.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	27.15	ms
JC	0.50	[]

Quantity Results

CSXN	21.0	ksi
CSIN 5	21.1	ksi
EFV	0.318	k-ft
ETR	91.0	(%)
BPM	54.1	bpm
VMX	18.2	f/s
FMX	24	kips
DFN	0.44	in
FVP	0.60	[]

Sensors

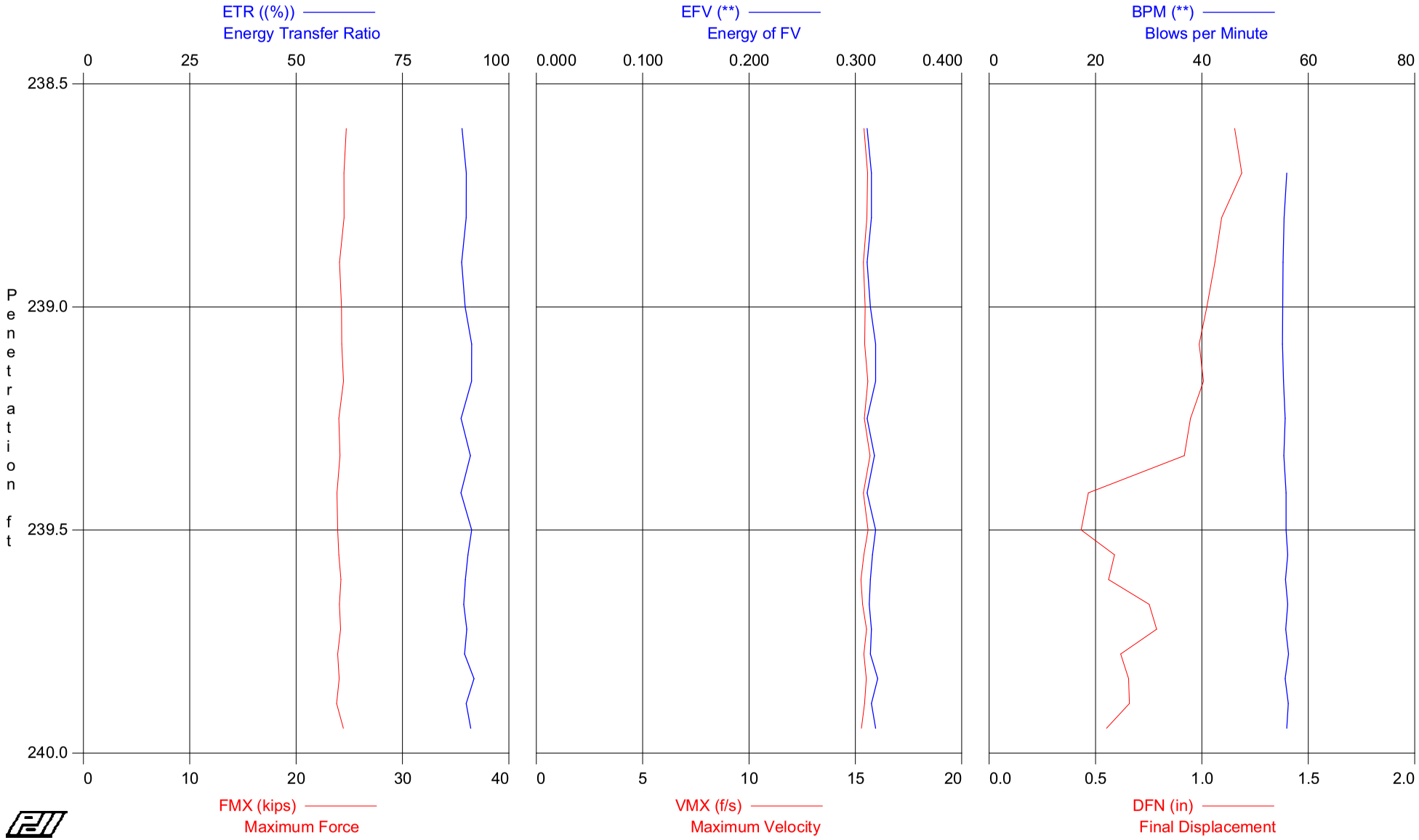
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.00
V3/V4: OK 0.98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 238.5 - 240
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 238.5 - 240
OP: DJF

HAMMER #1 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 243.50 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	239.00	10	AV5	21.0	21.2	0.313	90	55	15.5	24.4	1.1
			STD	0.2	0.2	0.002	0	0	0.1	0.2	0.1
			MAX	21.3	21.5	0.315	90	56	15.6	24.7	1.2
11	239.50	12	AV6	20.8	20.9	0.316	90	56	15.5	24.1	0.8
			STD	0.2	0.2	0.004	1	0	0.1	0.2	0.2
			MAX	21.1	21.2	0.319	91	56	15.7	24.5	1.0
19	239.94	18	AV8	20.8	20.9	0.316	90	56	15.4	24.1	0.6
			STD	0.2	0.2	0.003	1	0	0.1	0.2	0.1
			MAX	21.1	21.3	0.321	92	56	15.5	24.4	0.8
			Average	20.8	21.0	0.315	90	56	15.5	24.2	0.8
			Std. Dev.	0.2	0.2	0.003	1	0	0.1	0.2	0.2
			Maximum	21.3	21.5	0.321	92	56	15.7	24.7	1.2

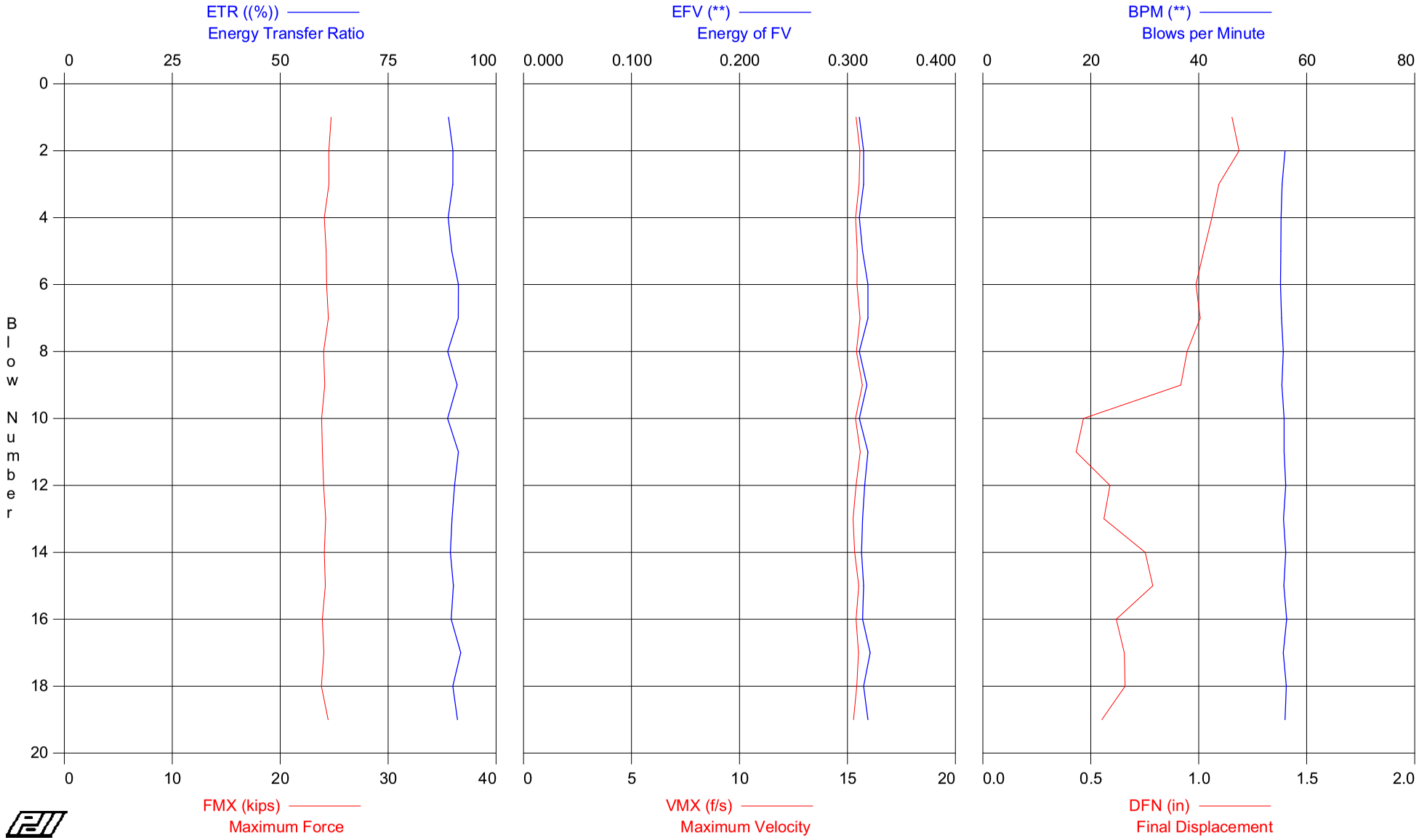
Total number of blows analyzed: 19

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 238.5 - 240
HAMMER #1 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 238.5 - 240
HAMMER #1 AWJ B-348
OP: DJF
Test date: 15-Jul-2008

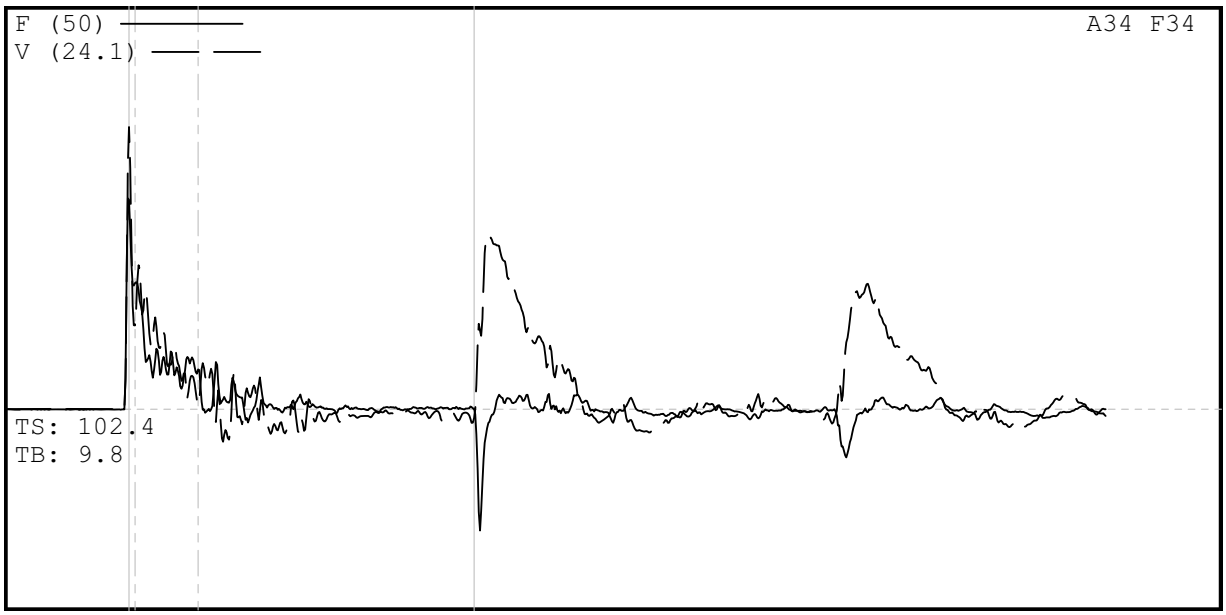
AR: 1.16 in^2
LE: 243.50 ft
WS: 16,807.9 f/s
SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio
BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	21.3	21.5	0.311	89	0	15.4	24.7	1.2
2	10	21.1	21.3	0.315	90	56	15.6	24.5	1.2
3	10	21.1	21.2	0.315	90	55	15.5	24.5	1.1
4	10	20.8	21.1	0.311	89	55	15.4	24.1	1.1
5	10	20.9	21.0	0.314	90	55	15.5	24.3	1.0
6	12	20.9	21.2	0.319	91	55	15.4	24.3	1.0
7	12	21.1	21.2	0.319	91	55	15.6	24.5	1.0
8	12	20.7	20.8	0.311	89	56	15.4	24.0	0.9
9	12	20.8	20.9	0.318	91	55	15.7	24.1	0.9
10	12	20.6	20.6	0.311	89	56	15.4	23.8	0.5
11	12	20.6	20.9	0.319	91	56	15.6	23.9	0.4
12	18	20.7	21.0	0.316	90	56	15.4	24.0	0.6
13	18	20.9	21.2	0.314	90	56	15.3	24.2	0.6
14	18	20.8	20.9	0.313	89	56	15.3	24.1	0.8
15	18	20.8	20.9	0.315	90	56	15.5	24.2	0.8
16	18	20.6	20.9	0.314	90	56	15.4	23.9	0.6
17	18	20.7	20.7	0.321	92	56	15.5	24.0	0.7
18	18	20.5	20.6	0.315	90	56	15.4	23.8	0.7
19	18	21.1	21.3	0.319	91	56	15.3	24.4	0.6
Average		20.8	21.0	0.315	90	56	15.5	24.2	0.8
Std. Dev.		0.2	0.2	0.003	1	0	0.1	0.2	0.2
Maximum		21.3	21.5	0.321	92	56	15.7	24.7	1.2

Total number of blows analyzed: 19

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 238 5 - 240



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 238 5
DESCR: HAMMER #1 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 TRUCK DEPTH 238 5 - 240
7/15/2008 3:50:19 PM
Blow Number 2/1

Pile Properties

LE	243.50	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	28.97	ms
JC	0.50	[]

Quantity Results

CSXN	22.6	ksi
CSI40	23.2	ksi
EFV	0.323	k-ft
ETR	92.2	(%)
BPM	0.0	bpm
VMX	16.9	f/s
FMX	26	kips
DFN	1.16	in
FVP	0.74	[]

Sensors

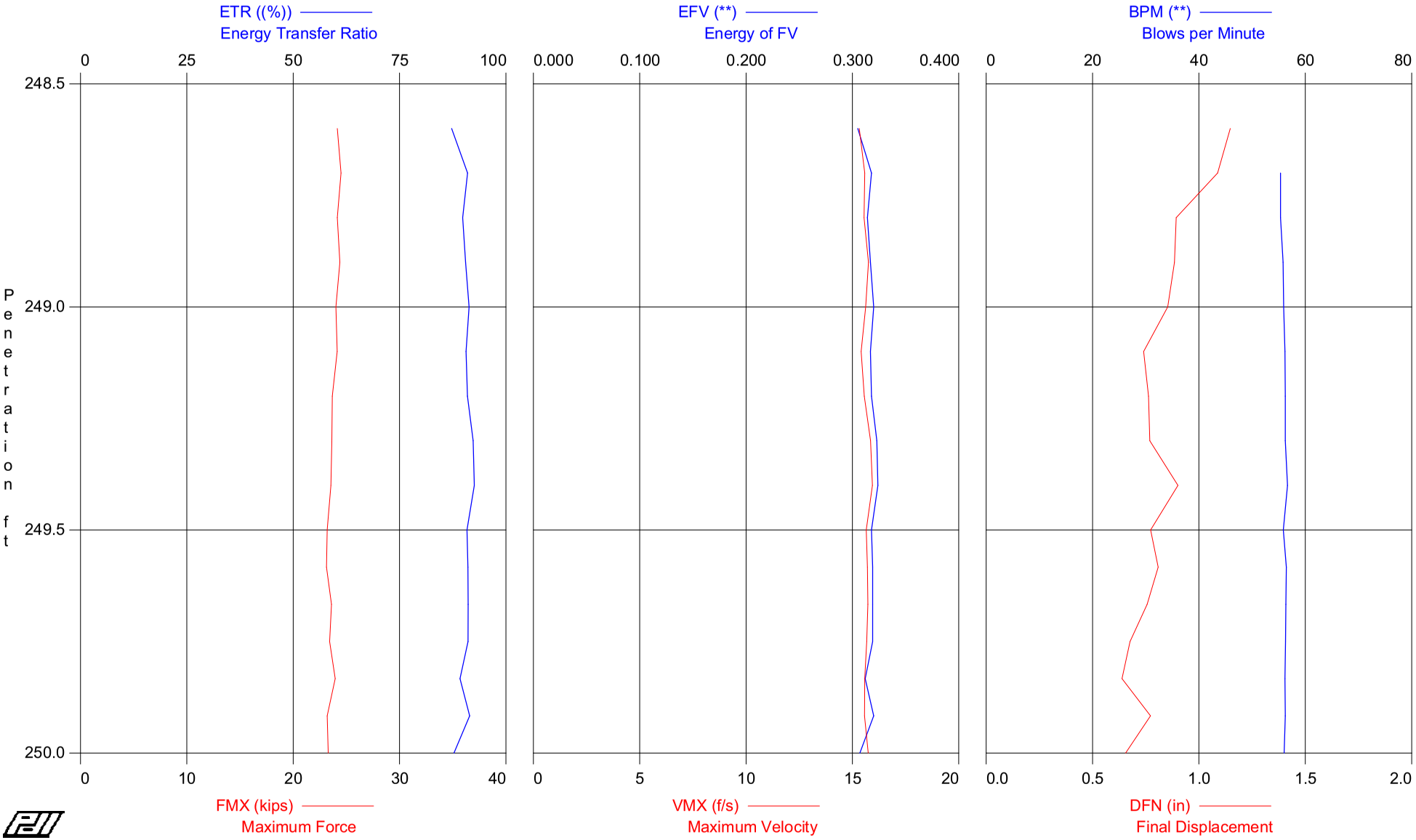
F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 0.98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 21-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 248.5 - 250
HAMMER #4 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 248.5 - 250
OP: DJF

HAMMER #4 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 253.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	VMX f/s	FMX kips	DFN in
5	249.00	10	AV5	20.9	21.0	0.315	90	56	15.6	24.2	1.0
			STD	0.2	0.2	0.005	1	0	0.1	0.2	0.1
			MAX	21.1	21.2	0.320	91	56	15.8	24.5	1.1
10	249.50	10	AV5	20.4	20.6	0.320	91	56	15.7	23.6	0.8
			STD	0.3	0.2	0.003	1	0	0.2	0.3	0.1
			MAX	20.8	21.0	0.324	93	57	15.9	24.1	0.9
16	250.00	12	AV6	20.2	20.4	0.316	90	56	15.7	23.4	0.7
			STD	0.2	0.2	0.005	1	0	0.1	0.3	0.1
			MAX	20.6	20.8	0.320	91	56	15.7	23.9	0.8
			Average	20.5	20.6	0.317	91	56	15.6	23.7	0.8
			Std. Dev.	0.4	0.3	0.005	1	0	0.1	0.4	0.1
			Maximum	21.1	21.2	0.324	93	57	15.9	24.5	1.1

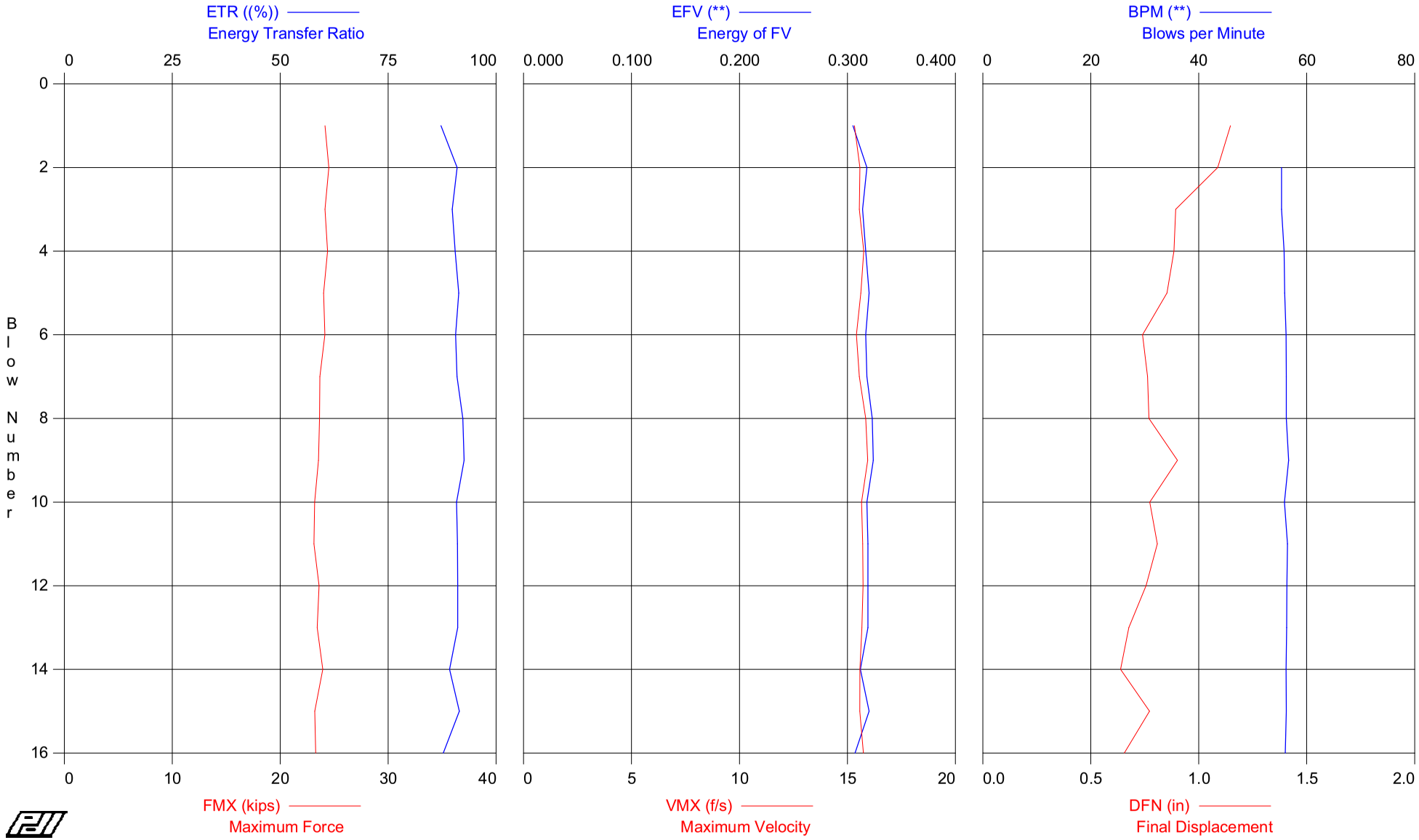
Total number of blows analyzed: 16

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 22-Jul-2008

Test date: 15-Jul-2008

CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 248.5 - 250
HAMMER #4 AWJ B-348



CCNP 2008 SUBSURFACE INVESTIGATION - DRILL RIG 75 TRUCK DEPTH 248.5 - 250
OP: DJF

HAMMER #4 AWJ B-348
Test date: 15-Jul-2008

AR: 1.16 in^2
LE: 253.20 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 0.50

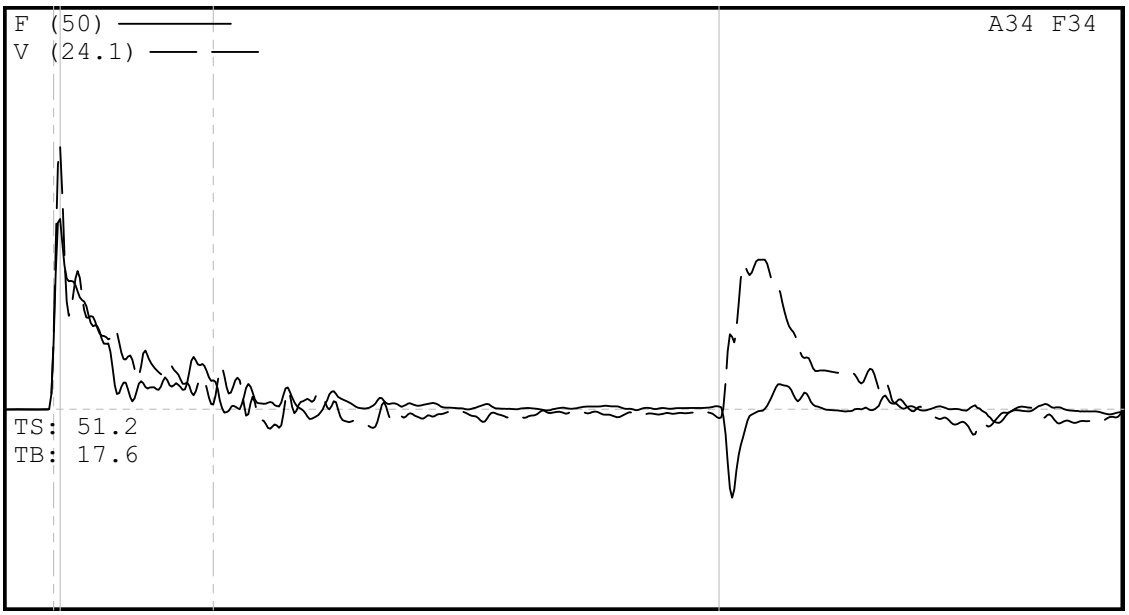
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
VMX: Maximum Velocity
FMX: Maximum Force
DFN: Final Displacement

BL#	BLC	CSX	CSI	EFV	ETR	BPM	VMX	FMX	DFN
	bl/ft	ksi	ksi	**	(%)	**	f/s	kips	in
1	10	20.8	21.0	0.305	87	0	15.3	24.1	1.1
2	10	21.1	21.2	0.318	91	55	15.6	24.5	1.1
3	10	20.8	20.9	0.314	90	55	15.5	24.1	0.9
4	10	21.0	21.1	0.317	91	56	15.8	24.4	0.9
5	10	20.7	20.7	0.320	91	56	15.6	24.0	0.9
6	10	20.8	21.0	0.317	91	56	15.4	24.1	0.7
7	10	20.4	20.7	0.318	91	56	15.6	23.7	0.8
8	10	20.4	20.5	0.323	92	56	15.9	23.6	0.8
9	10	20.3	20.4	0.324	93	57	15.9	23.5	0.9
10	10	20.0	20.3	0.318	91	56	15.7	23.2	0.8
11	12	19.9	20.2	0.319	91	56	15.7	23.1	0.8
12	12	20.3	20.5	0.319	91	56	15.7	23.6	0.8
13	12	20.2	20.4	0.319	91	56	15.7	23.4	0.7
14	12	20.6	20.8	0.312	89	56	15.6	23.9	0.6
15	12	20.0	20.3	0.320	91	56	15.6	23.2	0.8
16	12	20.1	20.2	0.307	88	56	15.7	23.3	0.7
Average		20.5	20.6	0.317	91	56	15.6	23.7	0.8
Std. Dev.		0.4	0.3	0.005	1	0	0.1	0.4	0.1
Maximum		21.1	21.2	0.324	93	57	15.9	24.5	1.1

Total number of blows analyzed: 16

CCNP 2008 SUBSURFACE INVESTIGATION DRILL RIG 75 TRUCK DEPTH 248 5 - 250



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: DRILL RIG 75 TRUCK DEPTH 248 5
DESCR: HAMMER #4 AWJ B-348
OPERATOR: DJF
FILE: DRILL RIG 75 TRUCK DEPTH 248 5 - 250
7/15/2008 7:03:01 PM
Blow Number 16/12

Pile Properties

LE	253.20	ft
AR	1.16	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	2.1	ksec/ft
2L/C	30.13	ms
JC	0.50	[]

Quantity Results

CSXN	20.3	ksi
CSI50	20.5	ksi
EFV	0.319	k-ft
ETR	91.1	(%)
BPM	56.3	bpm
VMX	15.7	f/s
FMX	24	kips
DFN	0.76	in
FVP	0.72	[]

Sensors

F3: [100-AWJ-1] 214.92 (1)
F4: [100-AWJ-2] 216.42 (1)
A3: [k0288] 355 mv/5000g's (1)
A4: [K0281] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 1.01

Appendix C

SPT Energy Measurement Checklists, SPT Hammer Energy Measurement Log, and Gauge Calibrations.

SPT HAMMER ENERGY MEASUREMENT CHECKLIST

Schnabel Engineering, Inc

Project: CCNPP 2008 Sub. Invest. **Project No:** 061 30048

Drill Rig ID: 75 **Hammer ID:** # 1 **Boring No:** B-357 & B-348

Size of Rods: AWJ **OD of Rods:** _____ **ID of Rods:** _____
Length of Rod Segments: 1, 2, 5, 10

Instrumented Subassembly ID: 100 AWJ, 171 AWJ
Accelerometer ID: K0288 K0281 K0286 K0297 K611 K0410

Pre-drill Check

Calibration of instruments verified? Yes ✓ No ___
Instrumented Subassembly Geometry:

Rod size matches drill string?	Yes ✓	No ___
Instruments > 12 inches from top?	Yes ✓	No ___
Instruments > 4 inches cross section change?	Yes ✓	No ___
Accelerometers < 4 inches from strain gages?	Yes ✓	No ___

Field Inspector: [signature]
Signature

Measurement Summary

Total Depth of Hole: [B-348] [B-357] 200', 105'
Number of Measurements: 14, 8
Measurements with poor data quality: B-357 Depth 88.5-90

Deviations and Unusual Conditions

Prepared by: [signature] GRL Engineers 7/21/08
Signature Company Date

Approved by: _____ _____ _____
Signature Company Date

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID 75 **SPT Hammer ID** 1 **Boring** B-357

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
6-24-08	13.5-15	18	3-6-9	15	59	285	81
6-24-08	28.5-30	33	3-1-2	3	49	287	82
6-24-08	43.5-45	48	3-6-6	12	52	296	85
6-25-08	58.5-60	61	6-13-22	35	58	313	90
6-25-08	73.5-75	79	2-4-8	12	54	312	89
6-30-08	88.5-90	92	7-11-22	33	58	Bad Data	
6-30-08	91.5-92	94	8-6-7	13	58	334	95
7-1-08	103.5-105	107	3-3-3	6	58	324	93

(1) Measured from instruments to tip of SPT sampler.

Prepared by: Darrell Fortson Company: GRL Engineers Date: 7/21/08
Approved by: _____ Company: _____ Date: _____

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID 75 SPT Hammer ID 1 Boring B-348

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
7-9-08	14.5-16	19	2-3-5	8	48	271	72
7-9-08	30-31.5	35	10-19-43	62	58	310	89
7-10-08	45-46.5	50	13-5-6	11	58	316	90
7-10-08	60-61.5	65	4-5-9	14	58	323	92
7-10-08	75-76.5	80	3-2-6	8	57	318	91
7-10-08	90-91.5	95	6-10-13	23	58	314	90
7-11-08	105-106.5	110	5-4-8	12	59	325	93
7-11-08	120-121.5	126	4-7-9	16	59	323	92
7-14-08	135-136.5	140	8-10-15	25	57	322	96
7-14-08	150-151.5	155	5-6-10	16	59	321	93
7-14-08	165-166.5	170	4-7-8	15	57	320	92
7-15-08	180-181.5	184	7-10-14	24	57	321	90
7-15-08	195-196.5	199	4-6-14	20	58	300	93
7-15-08	198.5-200	204	4-5-8	13	59	302	89

(1) Measured from instruments to tip of SPT sampler.

Prepared by: [signature] Company: GRL Engineers Date: 7/21/08
Approved by: Company: Date:

SPT HAMMER ENERGY MEASUREMENT CHECKLIST

Schnabel Engineering, Inc

Project: CCNPP 2008 Subsurf. Invest. **Project No:** 06120048

Drill Rig ID: SSO-X **Hammer ID:** 2 **Boring No:** B-354

Size of Rods: AWJ **OD of Rods:** _____ **ID of Rods:** _____
Length of Rod Segments: 1, 2, 5, 10

Instrumented Subassembly ID: 100AWJ, 101AWJ
Accelerometer ID: K0288 K0281 K0286 K0410 K0397 K611

Pre-drill Check

Calibration of instruments verified? Yes ✓ No ___

Instrumented Subassembly Geometry:

Rod size matches drill string?	Yes ✓	No ___
Instruments > 12 inches from top?	Yes ✓	No ___
Instruments > 4 inches cross section change?	Yes ✓	No ___
Accelerometers < 4 inches from strain gages?	Yes ✓	No ___

Field Inspector: [signature]
Signature

Measurement Summary

Total Depth of Hole: 250'
Number of Measurements: 21
Measurements with poor data quality: 285-30 1325-175 1385-190 2085-210

Deviations and Unusual Conditions

Prepared by: [signature] GRL Engineers 7/21/08
Signature Company Date

Approved by: _____ _____ _____
Signature Company Date

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID 550-X SPT Hammer ID 2 Boring B-354

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
6-23-08	15-16.5	18	4-9-11	20	52	288	82
6-24-08	28.5-30	33	3-3-5	8		Poor Data	
6-24-08	33.5-35	38	3-5-5	10	53	307	88
6-24-08	45-46.5	48	6-7-8	15	53	307	88
6-24-08	60-61.5	63	50/5"	50/5"	53	305	88
6-24-08	75-76.5	78	50/5"	50/5"	52	290	83
6-24-08	90-91.5	93	6-4-6	10	53	304	90
6-25-08	105-106.5	108	12-23-22	45	53	314	93
6-25-08	118.5-120	123	5-6-11	17	52	327	92
6-25-08	123.5-125	128	13-10-10	20		Poor Data	
6-25-08	128.5-140	143	8-9-12	21		Poor Data	
6-25-08	143.5-145	148	8-7-12	19	53	271	78
6-26-08	148.5-150	153	7-8-11	19	52	295	84
6-25-08	163.5-165	168	5-7-9	18	53	266	76
6-25-08	178.5-180	183	8-9-12	21	52	264	76
6-26-08	193.5-195	198	6-7-10	17	53	294	84
6-30-08	208.5-210	213	7-12-24	36		Poor Data	
6-30-08	213.5-215	218	5-8-13	21	53	315	90

(1) Measured from instruments to tip of SPT sampler.

Prepared by: Darell Jackson Company: GRL Engineers Date: 7/21/08
Approved by: Company: Date:

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID 550-X SPT Hammer ID 2 Boring B-354

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
7-1-08	223.5-225	228	5-6-10	16	53	321	92
7-2-08	238.5-240	243	6-9-15	24	54	316	90
7-2-08	250-251.5	255	6-11-15	26	53	313	89

(1) Measured from instruments to tip of SPT sampler.

Prepared by: [signature] Company: GRL Engineers Date: 7/21/08
Approved by: Company: Date:

SPT HAMMER ENERGY MEASUREMENT CHECKLIST

Schnabel Engineering, Inc

Project: CCNP 2008 Subsurface Investigation **Project No:** 06120048

Drill Rig ID: D-50 **Hammer ID:** #3 **Boring No:** 791

Size of Rods: AWJ **OD of Rods:** _____ **ID of Rods:** _____
Length of Rod Segments: 5, 10, and 2 ft

Instrumented Subassembly ID: 171-AWJ
Accelerometer ID: K0281 K0288

Pre-drill Check

Calibration of instruments verified? Yes ✓ No ___
Instrumented Subassembly Geometry:

Rod size matches drill string?	Yes ✓	No ___
Instruments > 12 inches from top?	Yes ✓	No ___
Instruments > 4 inches cross section change?	Yes ✓	No ___
Accelerometers < 4 inches from strain gages?	Yes ✓	No ___

Field Inspector: [signature]
Signature

Measurement Summary

Total Depth of Hole: 100'
Number of Measurements: 7
Measurements with poor data quality: 0

Deviations and Unusual Conditions

None noted

Prepared by: [signature] GRL Engineers 6-24-08
Signature Company Date

Approved by: [signature] Schnabel 6/25/08
Signature Company Date

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID D-50 SPT Hammer ID #3 Boring B-791

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
6-23-08	15-16.5	18	3-5-4	9	52	271	78
6-24-08	28.5-30	32	3-4-5	9	53	277	79
6-24-08	43.5-45	47	5-7-8	15	53	298	85
6-24-08	58.5-60	59	50/5"	50/5"	53	300	86
6-24-08	73.5-75	77	7-5-8	13	52	301	86
6-24-08	88.5-90	92	5-5-6	11	52	287	82
6-24-08	98.5-100	104	9-13-14	27	51	305	87

(1) Measured from instruments to tip of SPT sampler.

Prepared by: [signature] Company: GRL Engineers Date: 7/21/08
Approved by: _____ Company: _____ Date: _____

SPT HAMMER ENERGY MEASUREMENT CHECKLIST

Schnabel Engineering, Inc

Project: CCNP 2006 Subsurface Invest. **Project No:** 06120645

Drill Rig ID: CME 75 (Truck) **Hammer ID:** #4 **Boring No:** B-352 (250')

Size of Rods: AWT **OD of Rods:** _____ **ID of Rods:** _____
Length of Rod Segments: 5 to 10 ft

Instrumented Subassembly ID: 206-AWT
Accelerometer ID: K281 K288

Pre-drill Check

Calibration of instruments verified? Yes ✓ No ___
Instrumented Subassembly Geometry:

Rod size matches drill string?	Yes ✓ No ___
Instruments > 12 inches from top?	Yes ✓ No ___
Instruments > 4 inches cross section change?	Yes ✓ No ___
Accelerometers < 4 inches from strain gages?	Yes ✓ No ___

Field Inspector: Scott Wright
Signature

Measurement Summary

Total Depth of Hole: 250
Number of Measurements: 17
Measurements with poor data quality: _____ _____ _____ _____

Deviations and Unusual Conditions

Prepared by: [signature] GRL Engineers 7/2/08
Signature Company Date

Approved by: _____ _____ _____
Signature Company Date

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID CME 75 (Truck) **SPT Hammer ID** #4 **Boring** B-356

	Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
1	7/8/08	13.5-15	19	11-8-16	24	52	302	86
2	7/8/08	28.5-30	34	7-8-10	18	56	313	89
3	7/8/08	43.5-45	39	2-2-3	5	55	322	92
	7/8/08	63.5-65	66	3-3-5	8	54	319	91
	7/8/08	73.5-75	79	4-5-5	10	54	322	92
	7/9/08	88.5-90	94	50/4"	50/4"	55	309	88
	7/9/08	103.5-105	109	6-9-11	20	57	308	88
	7/9/08	118.5-120	124	3-3-9	12	52	311	89
	7/10/08	133.5-135	139	5-8-13	21	57	321	92
	7/10/08	148.5-150	154	6-6-8	14	56	323	92
	7/10/08	163.5-165	169	4-5-7	12	54	316	90
	7/10/08	178.5-180	184	3-6-8	14	55	322	92
	7/11/08	193.5-195	199	4-7-8	15	55	308	88
	7/11/08	208.5-210	214	5-6-8	14	56	307	88
	7/11/08	225-226.5	225	5-8-9	17	55	305	85
	7/15/08	238.5-240	240	4-6-9	15	52	310	87
	7/15/08	248.5-250	250	7-5-6	11	56	300	82

(1) Measured from instruments to tip of SPT sampler.

Prepared by: [signature] Company: GRL Engineers Date: 7/21/08
Approved by: _____ Company: _____ Date: _____

Calibration Data Sheet for SPT rod #:100AWJ
Calibrated: 11-12-07

Cycle No. 1

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-1.45	.00	.00	.00
2	1246.54	33.56	.17	.17
3	2016.34	55.52	.27	.27
4	3108.80	86.90	.41	.41
5	4088.10	114.29	.54	.54
6	5250.20	147.18	.70	.70
7	6052.50	169.68	.81	.81
8	7154.53	201.55	.95	.95
9	8052.00	227.61	1.08	1.07
10	9022.89	254.95	1.21	1.20
11	10071.82	283.05	1.35	1.34

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7472.80 lbs/V	211.40 ME/V		7492.38 lbs/V	211.96 ME/V
Offset	5.71	-.90		14.58	-.65
Corr Coe	.999992	.999964		.999997	.999972

Force Strain Calibration
EA Factor 35346.89 Kips
Offset 37.82
Corr Coe .999975

Cycle No. 2

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-2.90	.03	.00	.00
2	1005.76	29.17	.13	.13
3	2051.24	59.53	.27	.27
4	3007.73	86.97	.40	.40
5	4090.30	118.57	.54	.54
6	5189.97	149.96	.69	.69
7	6283.56	181.62	.83	.83
8	7031.65	203.12	.93	.93
9	8070.45	233.23	1.07	1.07
10	9177.08	265.32	1.22	1.22
11	10093.29	291.61	1.33	1.34

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7559.75 lbs/V	218.32 ME/V		7557.82 lbs/V	218.26 ME/V
Offset	-5.40	.02		2.56	.25
Corr Coe	.999998	.999999		.999998	.999999

Force Strain Calibration
EA Factor 34627.54 Kips
Offset -6.18
Corr Coe .999999

Calibration Data Sheet for SPT rod #:100AWJ
Calibrated: 11-12-07

Cycle No. 3

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-5.22	.00	.00	.00
2	1062.53	30.93	.14	.14
3	2024.06	58.61	.27	.27
4	3057.27	88.56	.40	.40
5	4061.75	117.71	.54	.54
6	5031.12	145.47	.66	.66
7	6093.35	176.47	.81	.80
8	7132.95	206.46	.94	.94
9	8071.55	233.45	1.07	1.07
10	9175.87	265.25	1.21	1.21
11	10002.74	288.99	1.32	1.32

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7547.45 lbs/V	218.03 ME/V		7582.64 lbs/V	219.04 ME/V
Offset	12.48	.60		-1.75	.19
Corr Coe	.999998	.999997		.999999	.999997

Force Strain Calibration
EA Factor 34616.74 Kips
Offset -8.28
Corr Coe .999999

Bridge Excitation: 6.4 Volts
A 60.4K Ohm shunt resistor produces 5.0 Volts output.

	Bridge 1	Bridge 2
Calibration Factor:	215.92 ME/V	216.42 ME/V
EA Factor	: 34863.73 Kips	

Calibrated by: James Deutsch

Pile Dynamics, Inc.
Calibrated on: 11-12-07
Traceable to N.I.S.T.

Calibration Data Sheet for SPT rod #:171AWJ
Calibrated: 26-Jul-07

Cycle No. 1

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-1.45	.05	.00	.00
2	1132.06	31.34	.15	.15
3	2008.16	56.24	.27	.27
4	3098.14	86.73	.41	.41
5	4053.46	113.63	.54	.54
6	5012.27	140.85	.67	.66
7	6153.91	172.66	.82	.81
8	7108.94	199.75	.94	.94
9	8143.49	228.61	1.08	1.07
10	9000.44	252.87	1.19	1.19
11	10008.29	281.74	1.33	1.32

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7566.94 lbs/V	212.38 ME/V		7576.20 lbs/V	212.64 ME/V
Offset	-23.65	-.98		-9.81	-.59
Corr Coe	.999996	.999992		.999997	.999994

Force Strain Calibration
EA Factor 35628.33 Kips
Offset 11.21
Corr Coe .999997

Cycle No. 2

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-3.19	-.13	.00	.00
2	1007.43	27.36	.14	.13
3	2043.59	56.71	.27	.27
4	3057.12	84.99	.41	.40
5	4043.36	113.10	.54	.53
6	5005.22	140.42	.67	.66
7	6049.80	170.35	.80	.80
8	7207.87	202.68	.95	.95
9	8156.38	229.61	1.08	1.08
10	9044.81	254.66	1.20	1.19
11	10032.21	282.64	1.33	1.32

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7575.51 lbs/V	213.34 ME/V		7580.05 lbs/V	213.47 ME/V
Offset	-29.95	-1.69		-6.72	-1.03
Corr Coe	.999995	.999982		1.000000	.999993

Force Strain Calibration
EA Factor 35508.62 Kips
Offset 30.10
Corr Coe .999993

Calibration Data Sheet for SPT rod #:171AWJ
Calibrated: 26-Jul-07

Cycle No. 3

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	3.19	.01	.00	.00
2	1004.33	26.49	.13	.13
3	2026.93	54.52	.27	.27
4	3100.03	84.48	.41	.41
5	4123.80	112.54	.54	.54
6	5179.49	142.48	.68	.69
7	6064.55	167.21	.80	.80
8	7009.39	194.04	.92	.93
9	8099.90	224.32	1.07	1.07
10	9040.38	250.87	1.19	1.19
11	10105.64	281.38	1.34	1.34

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	7567.11 lbs/V	210.59 ME/V		7567.02 lbs/V	210.59 ME/V
Offset	12.11	-1.25		.31	-1.58
Corr Coe	.999996	.999972		.999999	.999964

Force Strain Calibration
EA Factor 35930.63 Kips
Offset 57.36
Corr Coe .999972

Bridge Excitation: 6.4 Volts
A 60.4K Ohm shunt resistor produces 5.0 Volts output.

	Bridge 1	Bridge 2
Calibration Factor:	212.10 ME/V	212.23 ME/V
EA Factor	: 35689.19 Kips	

Calibrated by: _____

Pile Dynamics, Inc.
Calibrated on: 26-Jul-07
Traceable to N.I.S.T.

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:57

FS — 10 | BN 49 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

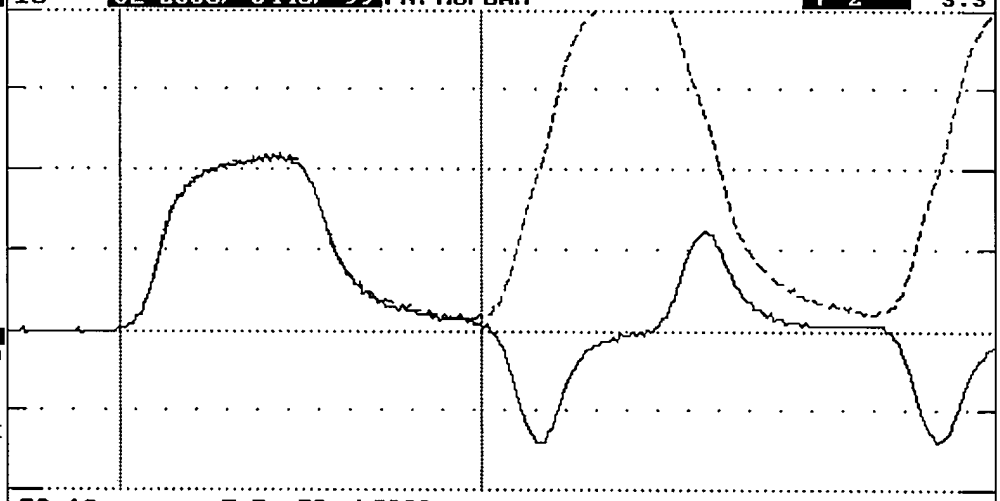
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -39
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 355



TS 12 E B PD: k0288 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.5 FMX= 54 AMX= 120
EMX= 0.2 MEX= 105 FVP= 0.98

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0288

CALIBRATION FACTOR: .071 mv/G

PAK (*5000): 355 DATE: 11-JUN-07

PDA OPERATOR: Alex

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
08-Feb-08 13:16

FS — 10 | BN 59 SL 2742/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

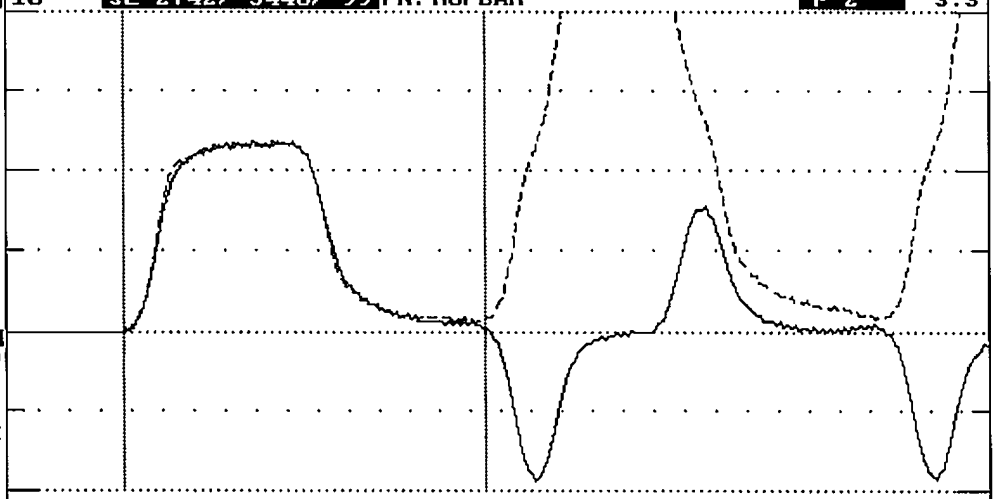
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -29
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 315



TS 12 E B PD: k611 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.8 FMX= 59 AMX= 169
EMX= 0.2 MEX= 115 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K611

CALIBRATION FACTOR: .063 mv/G

PAK (*5000): 315 DATE: 08-FEB-08

PDA OPERATOR:

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
08-Feb-08 13:08

FS — 10 | BN 42 SL 2742/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

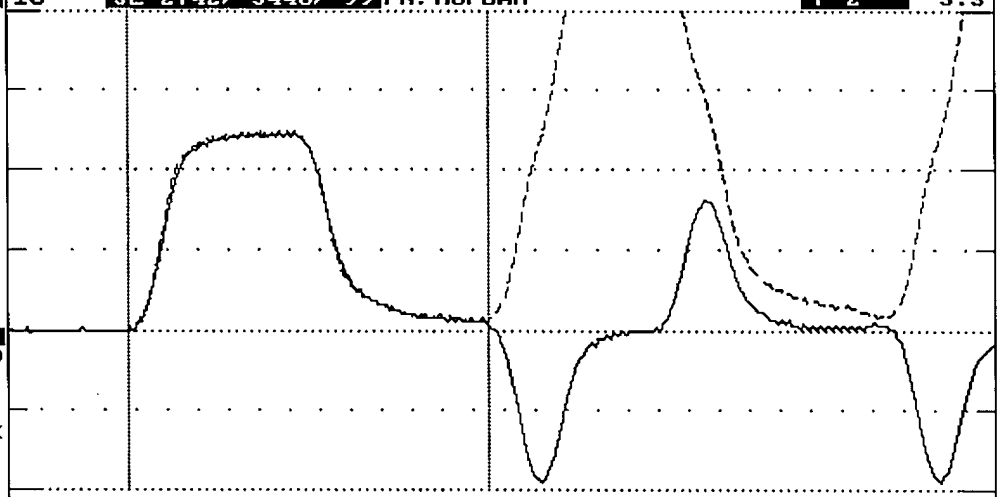
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -30
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 380



TS 12 E B PD: k0410 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 4.0 FMX= 62 AMX= 149
EMX= 0.2 MEX= 121 FVP= 0.98

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0410

CALIBRATION FACTOR: .076 mv/G

PAK (*5000): 380 DATE: 08-FEB-08

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:46

FS — 10 | BN 25 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

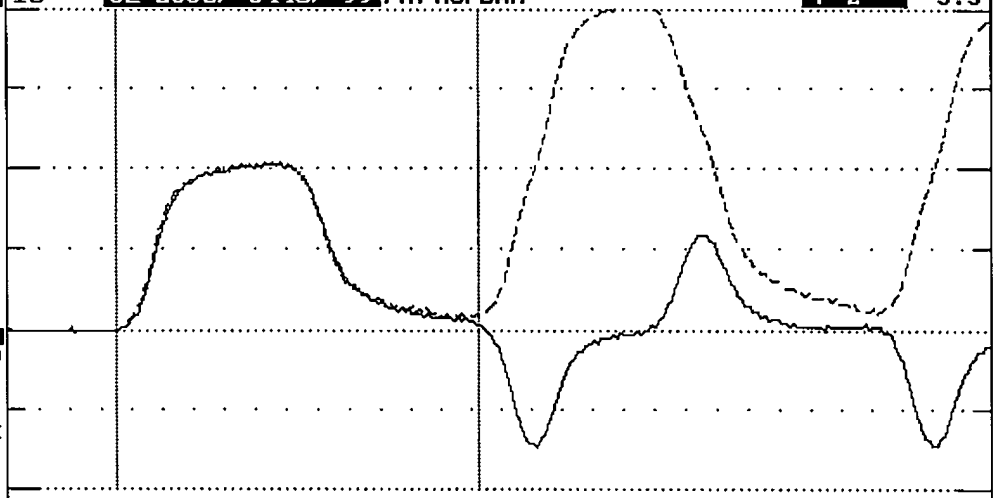
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -31
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 370



TS 12 E B PD: k0397 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.4 FMX= 52 AMX= 120
EMX= 0.2 MEX= 101 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0397

CALIBRATION FACTOR: .074 mv/G

PAK (*5000): 370 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:49

FS — 10 | BN 32 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- US 3.3

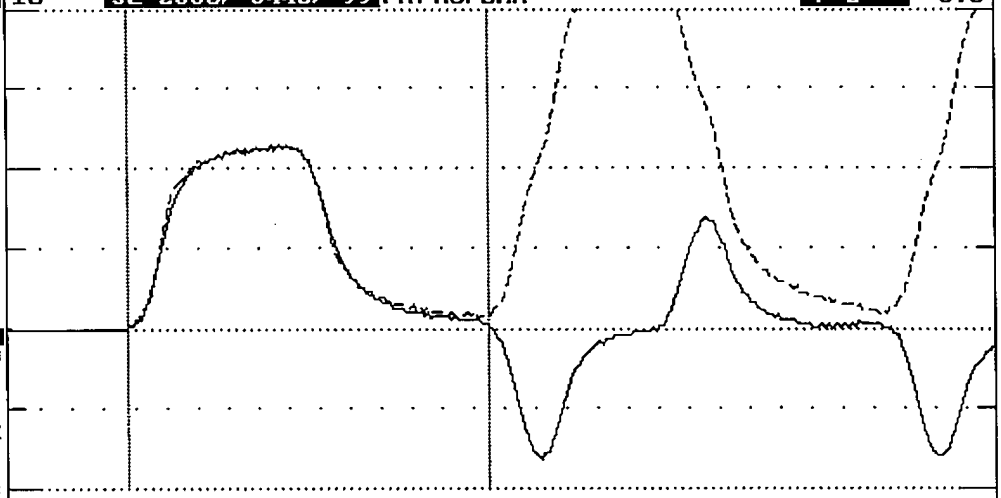
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -39
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 350



TS 12 E B PD: k0286 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

VMX= 3.7 FMX= 57 AMX= 139
EMX= 0.2 MEX= 111 FVP= 1.01

ACCEPT SQ-OFF FL-OFF PR-OFF

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0286

CALIBRATION FACTOR: .07 mv/G

PAK (*5000): 350 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:55

FS — 10 | BN 47 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- US 3.3

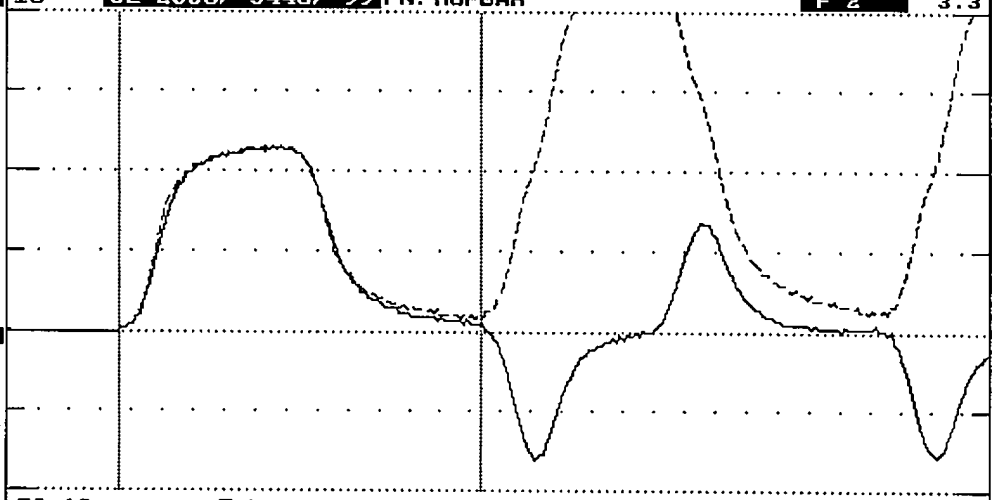
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -34
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 355



TS 12 E B PD: k0281 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.8 FMX= 58 AMX= 129
EMX= 0.2 MEX= 113 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0281

CALIBRATION FACTOR: .071 mv/G

PAK (*5000): 355 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model PAK

Serial Number: 1703K

was calibrated on 3 January 2008
using a PDA Calibration Box whose output was calibrated with test equipment traceable to NIST.

Tested by: Albert Sprunger

Pile Dynamics, Inc.
4535 Renaissance Parkway
Cleveland, Ohio 44128 USA

SPT HAMMER ENERGY STUDY REPORT

GRL Engineers, Inc.
Standard Penetration Test Energy Measurement Report #2
September 25, 2008

September 25, 2008

Mr. Brian Banks
Schnabel Engineering, Inc.
656 Quince Orchard Road, Suite 700
Gaithersburg, MD 20879 USA

Re: Standard Penetration Test Energy Measurements Report # 2
Calvert Cliffs Nuclear Power Plant 2008 Subsurface Investigation
Schnabel Project Number: 06120048
GRL Job No. 089053-1

Dear Mr. Banks,

This report presents results of energy measurements obtained from August 27 to September 12, 2008 during Standard Penetration Tests (SPT) sampling for the above referenced project. A Failing 1500 drill rig and automatic hammer were tested. All dynamic tests were performed on N3 drill rods. GRL Engineers, Inc. obtained the dynamic measurements with an instrumented N3 subsection and a Model PAK Pile Driving Analyzer®. This report describes the testing procedures and summarizes the test results. Appendix A describes our measurement and analysis methods, Appendix B is a summary of the field data and Appendix C contains the calibration certificates of the Model PAK and the sensors employed in this test series, SPT Hammer Energy Measurement Checklists, and SPT Hammer Energy Measurement Logs.

PURPOSE AND SCOPE OF WORK

At the request of Schnabel Engineering, Inc., GRL has carried out SPT energy measurements at the Calvert Cliffs site. GRL performed SPT energy measurements according to ASTM D4633-05 and the project specific procedures. Specifically, we provided SPT energy measurements at intervals of 15 feet to a depth of 300 feet, then every 20 feet until the boring termination depth of 400 feet including the last SPT sample. If necessary due to indications of poor quality dynamic test data or changes in the drilling procedure, additional energy measurements were obtained at the next available sample depth. In all, a total of 25 dynamic monitoring events were collected.

4535 Renaissance Parkway • Cleveland, OH 44128 USA • 216.831.6131 • fax 216.831.0916 • www.pile.com

California 661.259.2977 | Colorado 303.666.6127 | Florida 407.826.9539 | Illinois 847.670.7720 | North Carolina 704.593.0992 | Pennsylvania 610.459.0278

EQUIPMENT

Drilling and SPT Hammer Equipment
Failing 1500 (Hammer # 5)

SPT energy measurements were made on an automatic hammer used in connection with a Failing 1500 drill rig. The drilling method used to advance the boring was the rotary mud method. Energy measurements were collected at borehole location B-800, a 400 foot borehole. In total, 25 energy measurement events were monitored.

Instrumentation

A Model PAK Pile Driving Analyzer (PDA) data acquisition system was used to collect and process the dynamic measurements of force and velocity. A two-foot long section of N3 rod subsection was instrumented with two full bridge foil resistance strain gages and two piezoresistive accelerometers mounted in the midpoint location of the instrumented rod. Calibration certificates are included in Appendix C.

Analog signals from the strain gages and accelerometers were conditioned, digitized, stored and processed with the PDA. The sampling frequency used during the SPT testing was 10 kHz. Selected output from the PDA for each recorded impact included the maximum calculated rod top force (FMX), maximum rod top velocity (VMX), maximum energy transfer (EFV), and the hammer operating rate (BPM).

MEASUREMENTS AND CALCULATIONS

FV Method (EFV)

Energy transfer to the PDA gage location, EFV, was computed by the PDA using force, F(t), and velocity, v(t), records as follows:

$$EFV = \int_a^b F(t) \cdot v(t) dt$$

The time "a" corresponds to the start of the record when the energy transfer begins, and "b" is the time at which energy transferred to the rod reaches a maximum value. The FV Method is currently recognized in ASTM D4633-05, and is the theoretically correct result; therefore, no other energy calculation methods are reported.

Corrected SPT number (N_{60})

While the primary purpose of SPT energy testing is to calculate the maximum transfer energy (ETR) of each hammer blow, the overall average EMX value can be used to calculate the corrected SPT number (N_{60}). To adjust the SPT N-values for hammer performance, the following correction as suggested by Seed for N-value adjustment to 60% transfer efficiency (e.g. 210 ft-pounds) was used:

$$N_{60} = \left(\frac{E_m}{210}\right) N_m$$

Where:

N_{60} = Corrected N-value
E_m = overall average measured energy transfer (EMX)
N_m =number of blows for last 12 inches of sampler penetration

A general introduction to dynamic SPT testing methods is included in this report as Appendix A. References for more detailed descriptions of our testing and analysis methods are available upon request.

Any cross-sectional area difference between the GRL rod subsection and the drill rods, any loose connections or changes in area at section joints, or any cross-sectional area differences between the individual drill rod sections will result in stress wave reflections that can influence the energy transfer. The EFV transferred energy calculation method, utilizing both force and velocity records, is theoretically correct and gives energy transfer results that are not adversely affected by cross-sectional area changes or loose connectors. The EFV results are included in Appendix B for all records collected and accepted after checking them for consistency.

RESULTS

Subsequent to data collection, the records collected by the PDA were checked for consistency and accuracy. For example, records from very weak startup or final impacts were not included in average results. Appendix B contains a representative plot of force and normalized velocity versus time, as well as plots and tables of PDA results for all hammer blows at each dynamically monitored sampling depth. The PDA results include the EFV (transferred energy by the FV method, as recommended by ASTM D4633-05), ETR (energy transfer efficiency for the EFV method), BPM (hammer operating rate), FMX (maximum rod top force), and VMX (maximum rod top velocity). The plots show each calculated PDA result versus split-spoon penetration and blow number, while the tables show statistical summaries for each 6 inch increment and full printouts of every blow. At the end of each table is a statistical evaluation of the results which include the average and standard deviation of the entire measurement sample.

Table 1 summarizes the average transferred energy values calculated by the EFV method. The records consist of averaged hammer blows from the last 12 inches (i.e. N value) at each dynamically monitored sampling depth. The “energy transfer ratio” (ETR) is defined as the ratio of maximum transferred energy (EFV) divided by the theoretical hammer potential energy of 350 ft-lbs (i.e., computed per the 140 lb SPT hammer and the standard 30 inch drop as specified by ASTM D1586-99). The average hammer operating rate is reported in blows per minute (BPM). A summary of the dynamic measurements of the energy transfer to the drill rods using the EFV equation for the Failing 1500 drill rig is provided in the table below.

CONCLUSIONS

Based upon the dynamic test data obtained, the following conclusions are presented:

1. Loose connections in the drill string were sometimes observed in the force and velocity records. However, energy transfer values calculated using the EFV equation are not adversely affected by the connectors and therefore are considered a better indication of transferred energy.

2. Dynamic measurements of the transferred energy to the drill rods using the EFV equation ranged from 264 to 329 ft-lbs during testing. This corresponds to a transfer efficiency ranging from 75 to 94% of the SPT hammer energy of 350 ft-lbs.

3. The overall average transferred energy (EFV) for the Failing 1500 drill rig tested was 302 ft-lbs which corresponds to an energy transfer ratio (ETR) of 86%.

Please review both ASTM D4633-05 and ASTM D1586-99 prior to applying these test results. The energy calibrations reported herein are valid for the same hammer/drill rig, with the same drill operator, same anvil dimensions, and same drilling methods.

We appreciate the opportunity to be of assistance to you on this project. Please contact our office should you have any questions regarding this submittal, require additional information, or if we may be of further service.

Sincerely,

GRL Engineers, Inc.

Darrell Fortune, E.I.

Scott Webster, P.E.

DE:SW:dms

TABLE 1: Summary of SPT Energy Measurements
CCNP 2008 SUBSURFACE INVESTIGATION
FAILING 1500, HAMMER #5, BORING 800

Test Date	Reported Sample Depth (feet)	Reported Rod Length (feet)	Reported Blow Count (blows/6")	SPT Field N Value	Avg. Energy Transferred FV Method (ft-lbs)	Energy Transfer Efficiency1 (%)	Blow per Minute (bpm)	N_{60}
8/27/2008	13.5 - 15.0	19	3-2-4	6	264	75	43	8
8/27/2008	31.0 - 32.5	35	8-9-13	22	285	81	44	30
8/27/2008	43.5 - 45.0	45	12-20-27	47	294	84	44	66
8/28/2008	58.5 - 60.0	60	7-6-8	14	286	82	43	19
8/28/2008	73.5 - 75.0	75	4-4-7	11	284	81	44	15
8/28/2008	88.5 - 90.0	90	12-12-12	24	283	81	43	32
8/29/2008	103.5 - 105.0	105	5-10-11	21	287	82	43	29
8/29/2008	118.5 - 120.0	120	6-7-13	20	284	81	44	27
9/2/2008	133.5 - 135.0	139	4-8-12	20	299	85	43	28
9/2/2008	148.5 - 150.0	154	6-10-11	21	292	83	43	29
9/2/2008	163.5 - 165.0	169	6-9-12	21	293	84	43	29
9/2/2008	178.5 - 180.0	184	8-9-15	24	294	84	43	34
9/3/2008	200.0 - 201.5	206	6-7-14	21	317	90	55	32
9/3/2008	208.5 - 210.0	214	6-6-12	18	319	91	54	27
9/4/2008	223.5 - 225.0	229	6-6-12	18	329	94	58	28
9/4/2008	243.5 - 245.0	249	4-6-20	26	315	90	57	39
9/4/2008	253.5 - 255.0	259	4-8-12	20	327	93	56	31
9/5/2008	268.5 - 270.0	274	9-9-17	26	321	92	57	40
9/8/2008	283.5 - 285.0	289	24-41-50/2	50/2	315	90	53	
9/8/2008	300.0 - 301.5	304	8-9-19	28	295	84	60	39
9/9/2008	320.0 - 321.5	326	12-13-23	36	316	90	55	54
9/10/2008	342.0 - 343.5	344	14-20-28	48	298	85	52	68
9/10/2008	360.0 - 361.5	366	10-16-25	41	324	93	56	63
9/11/2008	380.0 - 381.5	386	9-23-32	55	294	84	49	77
9/12/2008	398.5 - 400.0	404	11-17-25	42	295	84	52	59
Average(2)					**302**	**86**	**50**	
Standard Dev.(2)					**15**	**4**	**6**	

Notes: 1 - Energy transfer efficiency is the energy calculated by the FV method divided by the SPT hammer potential energy of 140 lbs times 2.5 foot drop height or 350 ft-lbs.
2 - Average and standard deviation are calculated using averaged data from SPT hammer blows from the last two six inch increments (i.e. N value) from all sampling depths tested.

Appendix A

An Introduction into SPT Dynamic Pile Testing

APPENDIX A
AN INTRODUCTION INTO SPT DYNAMIC PILE TESTING

The following has been written by GRL Engineers, Inc. and may only be copied with its written permission.

1. BACKGROUND

The Standard Penetration Test is frequently conducted as an in-situ assessment of soil strength. This test requires that a 140 lb weight is dropped 30 inches onto a drive rod at whose bottom a sampler is usually installed. The sampler is driven for 18 inches; the number of blows required for the last 12 inches of driving is the so-called N-value. The N-value may be used as a strength indicator for foundation design or as a means of assessing the liquefaction potential of soils.

Obviously, the SPT hammer efficiency is an important consideration when using the N-values for design purposes. Measurements have indicated that the energy in the drive rod is sometimes only 30% and and may reach 90% of the potential or rated energy of the SPT hammer (E-rated = 0.35 kip-ft or 0.475 kJ). The type of hammer used to drive the rod is the main reason for these variations. On the average, the energy in the drive rod is 60% of the standard rated energy.

Because of the variability of energy, methods based on N-values are considered unreliable. However, measurements during SPT testing using the Case Method can be done on a routine basis and these measurements yield the transferred energy values. With measured energy, EMX, known, an adjustment of the measured N-value, N_m, can be made as follows.

$$N_{60} = N_m [E_m / (0.6E_r)] \quad (1)$$

Thus, if the measured energy value is equal to the normally expected transferred energy of 60% of E-rated then the adjusted and measured N-values are identical. On the other hand, if the measured energy is only 30% then the adjusted blow count will be reduced by 50%.

2. DYNAMIC TESTING AND ANALYSIS METHODS APPLIED TO SPT

The Case Method of dynamic pile testing, named after the Case Institute of Technology where it was developed between 1964 and 1975, requires that a substantial ram mass (e.g. a pile driving hammer) impacts the pile top such that the pile undergoes at least a small permanent set. Thus, the method is also referred to as a “High Strain Method”. The Case Method requires dynamic measurements on the pile or shaft under the ram impact and then a calculation of various quantities. Conveniently, for SPT applications, the measurements and analyses are done by a single piece of equipment: the SPT Analyzer. The Pile Driving Analyzer® (PDA) is also suitable to perform these measurements and data processing.

A related analysis method is the “Wave Equation Analysis” which calculates a relationship between bearing capacity, pile stresses, transferred energy and field blow count. The GRLWEAP™ program performs this analysis and provides a complete set of helpful information and input data. This program can be used very effectively to simulate the SPT driving process.

3. MEASUREMENTS

GRL uses equipment manufactured by Pile Dynamics, Inc. The system includes either an SPT-Analyzer™ (SPTA) or a Pile Driving Analyzer® (PDA), an instrumented rod section and two accelerometers. SPT energy testing is very closely related to and borrows procedures from dynamic pile testing. Those interested in the basis of the SPT energy testing method may obtain extensive literature on dynamic pile testing from GRL Engineers, Inc.

3.1 SPT Analyzer or Pile Driving Analyzer

The basis for the results calculated by the SPTA or PDA are strain and acceleration measured in an instrumented rod section. These signals are converted to rod top force, F(t), and rod top velocity, v(t). The SPTA or PDA conditions, calibrates and displays these signals and immediately computes average pile force and velocity thereby eliminating bending effects. The product of these two

measurements is then integrated over time which yields the energy transferred to the instrumented section as a function of time (see Section 4.1).

For convenience and accuracy, strain measurements are usually taken on an instrumented section of SPT drive rod. Ideally, the section properties of the instrumented rod and those of the drive rod are the same, however, using subs, other sections can also be utilized.

For the instrumented section, PDI provides a force calibration in such a way that the output of the instrumented rod is directly calculated without the need for an accurate elastic modulus or cross sectional area of the rod section.

The acceleration measurements are often demanding in the SPT environment, because of high frequency and high acceleration motion components. An experienced measurement engineer, therefore, has to evaluate the quality of this data before final conclusions are drawn from the numerical results calculated by SPTA or PDA.

SPTA or PDA records are taken while the standard N-value is acquired in the conventional manner. This then allows a direct correlation between N-value and average transferred energy.

3.2 HPA

The SPT hammer's ram velocity may be directly obtained using radar technology in the Hammer Performance Analyzer™. The impact velocity results can be automatically processed with a PC or recorded on a strip chart. HPA measurements yield a hammer kinetic energy, but not the energy transferred to the drive rod.

4 RECORD EVALUATION BY SPTA OR PDA

4.1 HAMMER PERFORMANCE

The PDA calculates the energy transferred to the pile top from:

$$E(t) = \int_0^t F(\tau)v(\tau)\, d\tau \qquad (2)$$

The maximum of the E(t) curve is often called **ENTHRU or EMX;** it is the most important quantity for an overall evaluation of the performance of a hammer and driving system. **EMX** allows for a classification of the hammer's performance when presented as, e_T, the rated transfer efficiency, also called energy transfer ratio (**ETR**) or global efficiency.

$$e_T = EMX/E_R \qquad (3)$$

where E_R is the hammer manufacturer's rated energy value or 0.35 kip-ft (0.475 kJ) in the case of the SPT hammer.

Often in the SPT literature one finds also reference to the EF2 energy. This evaluation is based on assumed proportionality between force and velocity (see also Section 5):

$$v(t) = F(t) / Z \qquad (4)$$

where Z = EA/c is the pile impedance, E is the elastic modulus, A is the cross sectional area and c is the speed of the stress wave in the pile material..

Combining equations 2 and 4 leads to

$$EF(t) = \int_0^t F(\tau)^2 / Z\, d\tau \qquad (5)$$

The EF2 transferred energy value is the EF-value at the time t = 2L/c, where L is the drive rod length and c is the stress wave speed in steel (16,800 ft/s or 5,124 m/s). Since the force is easier to measure than both force and velocity, Equation 5 is preferred by some test engineers. However, the EF method is fraught with errors and certain correction factors have to be applied to make it approximately correct. Among the error sources are the following:

- Proportionality is often violated prior to time 2L/c. The proportionality between force and velocity in a downward traveling wave only holds if the wave does not encounter a disturbance prior to reflecting off the pile toe. Such disturbances include a change in cross sectional area, an open or loose splice or joint, or resistance along the shaft.

- Using only one force measurement precludes a data quality check based on the proportionality between force and velocity. Thus, a force measurement that is for some reason in error may not be detectable, which will lead to errors in the EF2 value. Data quality checks will be discussed further in Section 5.

The use if EF2 is therefore not recommended but it is often included in result presentations for the sake of completeness.

4.2 STRESSES

During SPT monitoring, it is also of interest to monitor compressive stresses at both the top of the drive rod and at its bottom.

At the pile top (location of sensors) the maximum compression stress averaged over the rod's cross section, **CSX**, is directly obtained from the measurements. Note that this stress value refers to the instrumented section. If the rod has a different cross sectional area then the stress in the rod will be different from CSX.

The SPTA or PDA can also calculate, in an approximate manner, the force at the rod bottom, **CFB**. To obtain the corresponding stress, this force value should be divided by the appropriate cross sectional area, e.g. by the rod area just above the sampler or by the sampler area itself. Of course, non-uniform stress components as they might occur at the sampler tip due to a sloping rock are not considered in this calculation.

5. DATA QUALITY CHECKS

Quality data is the first and foremost requirement for accurate dynamic testing results. It is therefore important that the measurement engineer performing SPTA or PDA tests has the experience necessary to recognize measurement problems and take appropriate corrective action should problems develop. Fortunately, dynamic pile testing allows for certain data quality checks because two independent measurements are taken that have to conform to the so-called proportionality relationship.

As long as there is only a wave traveling in one direction, as is the case during impact when only a downward traveling wave exists in the rod, force and velocity measured at its top are proportional

$$F = v\,Z \qquad (5)$$

where Z is again the pile impedance, Z = EA/c. This relationship can also be expressed in terms of stress

$$\sigma = F/A = v\,(E/c) \qquad (6)$$

or strain

$$\epsilon = \sigma/E = v / c \qquad (7)$$

This means that the early portion of strain times wave speed must be equal to the velocity unless the proportionality is affected by high friction near the pile top or by a pile cross sectional change not far below the sensors. Checking the proportionality is an excellent means of assuring meaningful measurements but is only truly meaningful for perfectly uniform rods. Open or loose splices, for example, will lead to a non-proportionality. For SPT rods it is fortunate that usually no soil resistance acts along the shaft and for that reason, proportionality can exist until the stress wave returns from sampler top or rod bottom unless connectors are not sufficiently tightened or have a significant mass.

Velocity data quality can also be checked by looking at the final displacement, DFN, which is calculated from the acceleration by double integration. If the calculated final displacement is much higher or lower than indicated by the N-value, the accelerometer attachment may be loose or the sensor may be faulty. If major drift in the velocity is observed, the EMX value may be in error, even though proportionality from impact to time 2L/c exists. In this case, it may be useful to evaluate the energy transferred to the drill rod at time 2L/c, which is calculated by the PDA or SPTA as the E2E quantity.

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Appendix B

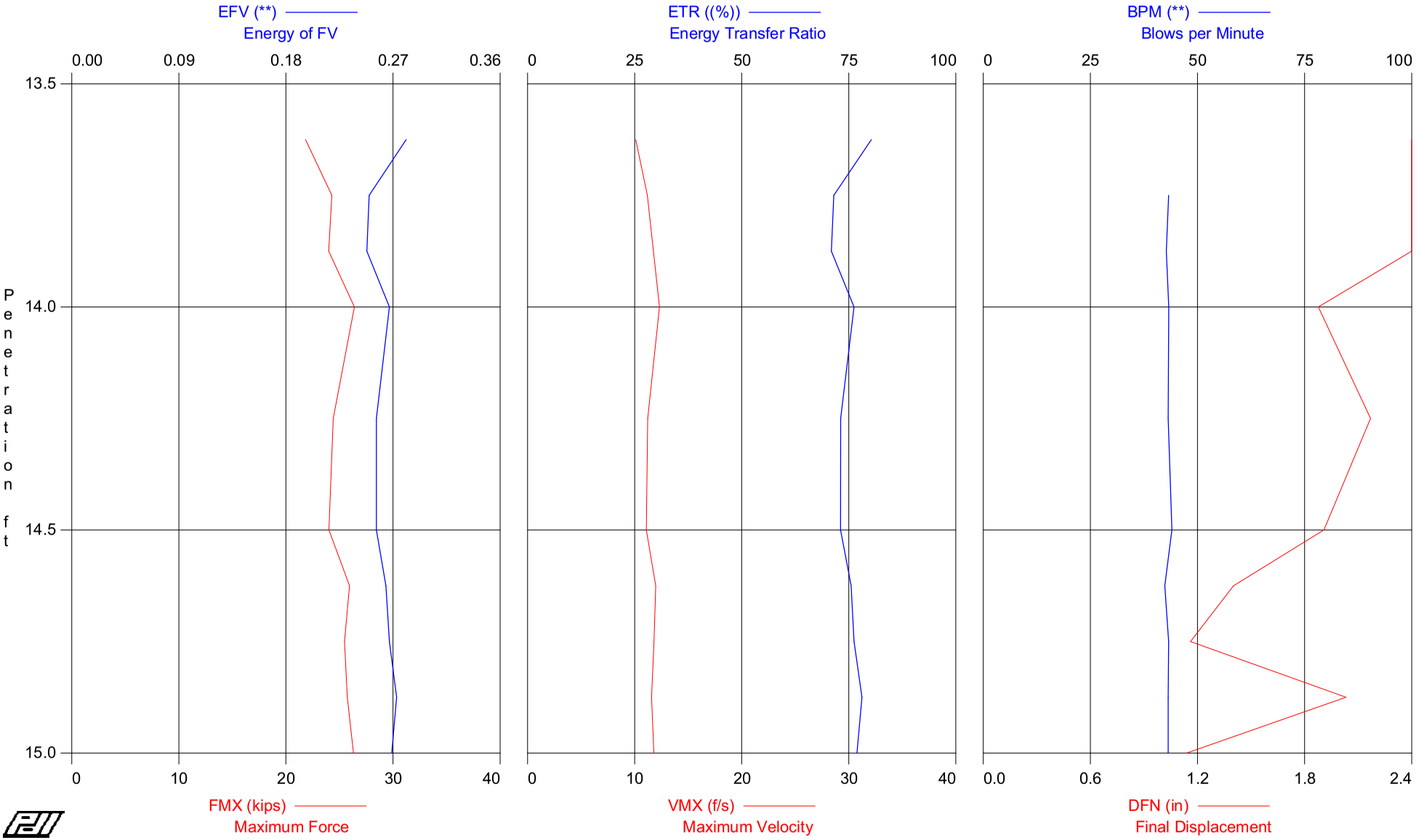
SPT Energy Measurement Results.

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 13.5 - 15
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 13.5 - 15
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
4	14.00	8	AV4	10.3	10.3	0.262	75	43	24.1	11.3	2.6
			STD	0.7	0.7	0.013	4	0	1.6	0.8	0.5
			MAX	11.2	11.3	0.281	80	43	26.4	12.3	3.3
6	14.50	4	AV2	10.3	10.4	0.256	73	44	24.2	11.2	2.0
			STD	0.1	0.1	0.000	0	0	0.2	0.1	0.1
			MAX	10.4	10.4	0.256	73	44	24.4	11.2	2.2
10	15.00	8	AV4	11.0	11.1	0.268	77	43	25.9	11.8	1.4
			STD	0.1	0.2	0.003	1	0	0.3	0.1	0.4
			MAX	11.2	11.3	0.273	78	43	26.3	12.0	2.0
			Average	10.6	10.6	0.263	75	43	24.8	11.5	2.0
			Std. Dev.	0.6	0.6	0.010	3	0	1.3	0.6	0.6
			Maximum	11.2	11.3	0.281	80	44	26.4	12.3	3.3

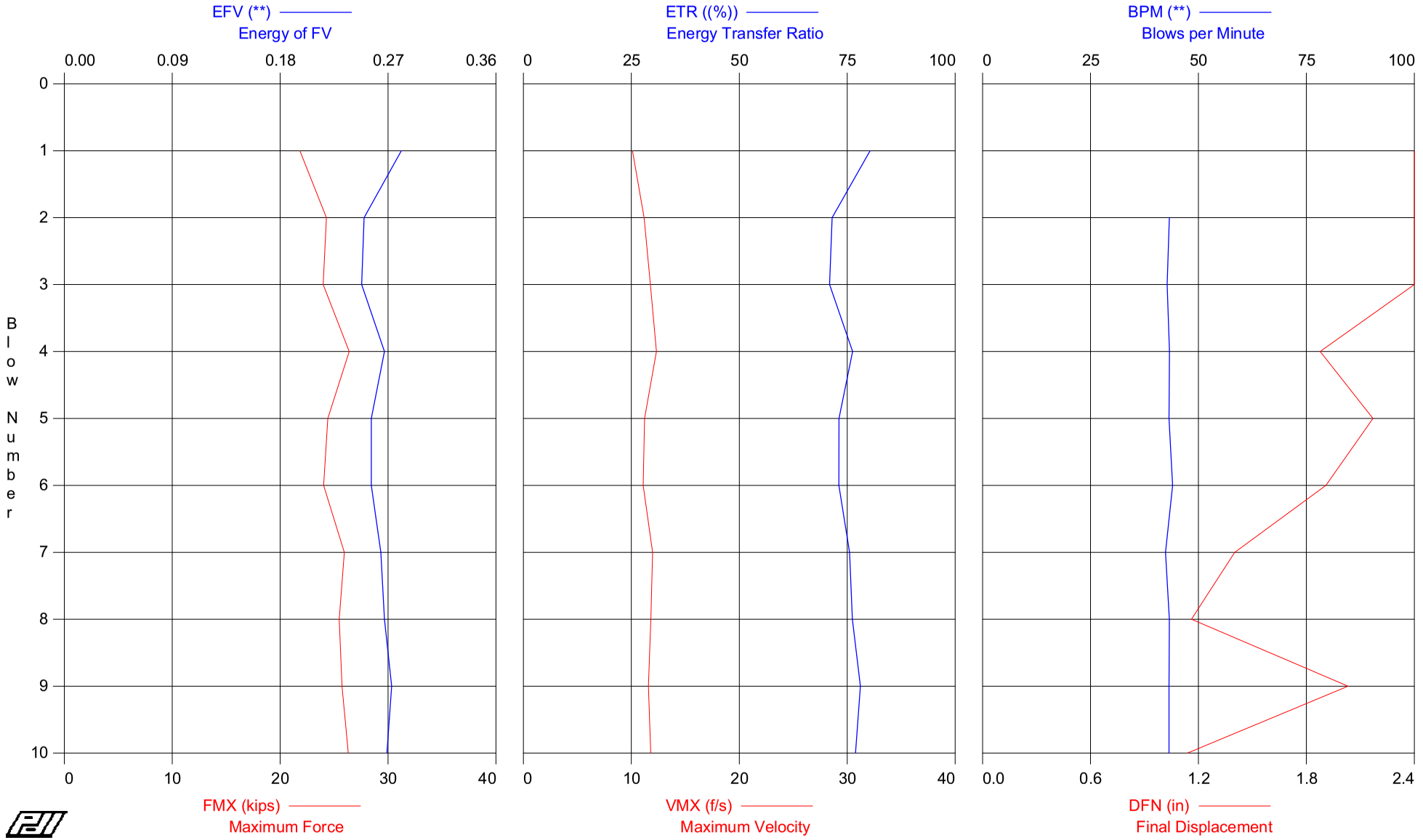
Total number of blows analyzed: 10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 13.5 - 15
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 13.5 - 15
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 19.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

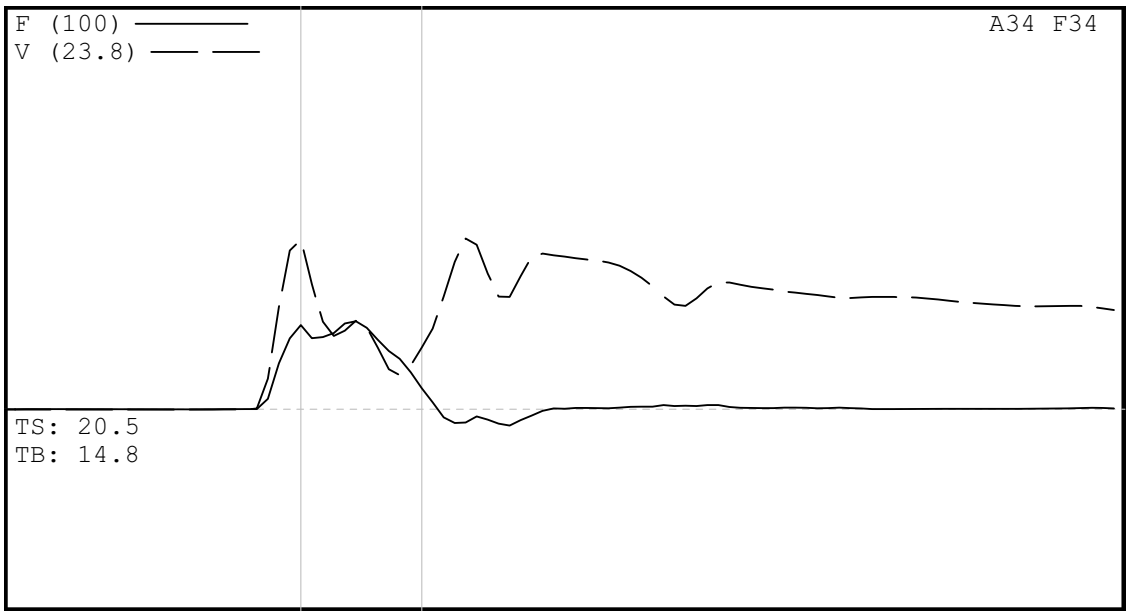
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	13.63	8	9.3	9.4	0.281	80	0	21.8	10.1	3.3
2	13.75	8	10.3	10.4	0.250	72	43	24.3	11.2	2.7
3	13.88	8	10.2	10.3	0.248	71	43	24.0	11.8	2.5
4	14.00	8	11.2	11.3	0.267	76	43	26.4	12.3	1.9
5	14.25	4	10.4	10.4	0.256	73	43	24.4	11.2	2.2
6	14.50	4	10.2	10.3	0.256	73	44	24.0	11.1	1.9
7	14.63	8	11.0	11.1	0.264	76	42	25.9	12.0	1.4
8	14.75	8	10.8	10.9	0.267	76	43	25.5	11.8	1.2
9	14.88	8	10.9	11.0	0.273	78	43	25.7	11.6	2.0
10	15.00	8	11.2	11.3	0.269	77	43	26.3	11.8	1.1
		Average	10.6	10.6	0.263	75	43	24.8	11.5	2.0
		Std. Dev.	0.6	0.6	0.010	3	0	1.3	0.6	0.6
		Maximum	11.2	11.3	0.281	80	44	26.4	12.3	3.3

Total number of blows analyzed: 10

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 13 5 - 15



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 13 5 - 15
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 13 5 - 15
8/27/2008 1:45:09 PM
Blow Number 3/1

Pile Properties

LE	19.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	2.26	ms
JC	1.20	[]
LP	13.63	ft

Quantity Results

CSXN	9.3	ksi
CSI	9.4	ksi
CSB	9.9	ksi
EFV	0.281	k-ft
ETR	80.3	(%)
BPM	0.0	bpm
FMX	22	kips
VMX	10.1	f/s
DFN	3.27	in

Sensors

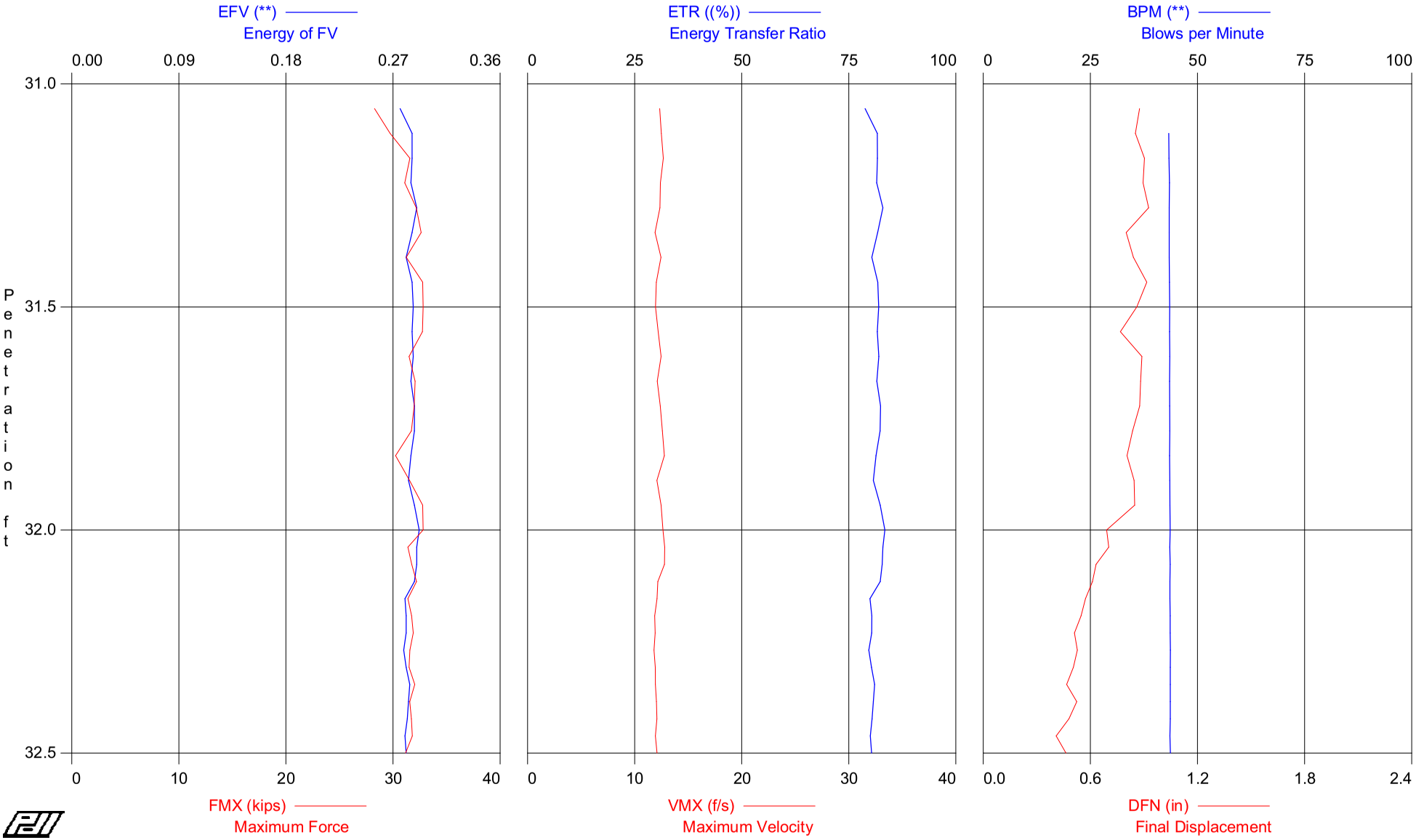
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 0.94

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 31 - 32.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 31 - 32.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 35.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
9	31.50	18	AV9	13.3	13.5	0.285	81	43	31.4	12.3	0.9
			STD	0.6	0.6	0.004	1	0	1.4	0.3	0.0
			MAX	14.0	14.0	0.290	83	44	32.8	12.7	0.9
18	32.00	18	AV9	13.6	13.8	0.287	82	44	31.9	12.4	0.8
			STD	0.3	0.2	0.002	1	0	0.8	0.2	0.1
			MAX	14.0	14.1	0.292	83	44	32.8	12.8	0.9
31	32.50	26	AV13	13.5	13.8	0.283	81	44	31.7	12.1	0.5
			STD	0.1	0.1	0.004	1	0	0.3	0.3	0.1
			MAX	13.7	14.0	0.290	83	44	32.2	12.8	0.7
			Average	13.5	13.7	0.285	81	44	31.7	12.3	0.7
			Std. Dev.	0.4	0.4	0.004	1	0	0.9	0.3	0.2
			Maximum	14.0	14.1	0.292	83	44	32.8	12.8	0.9

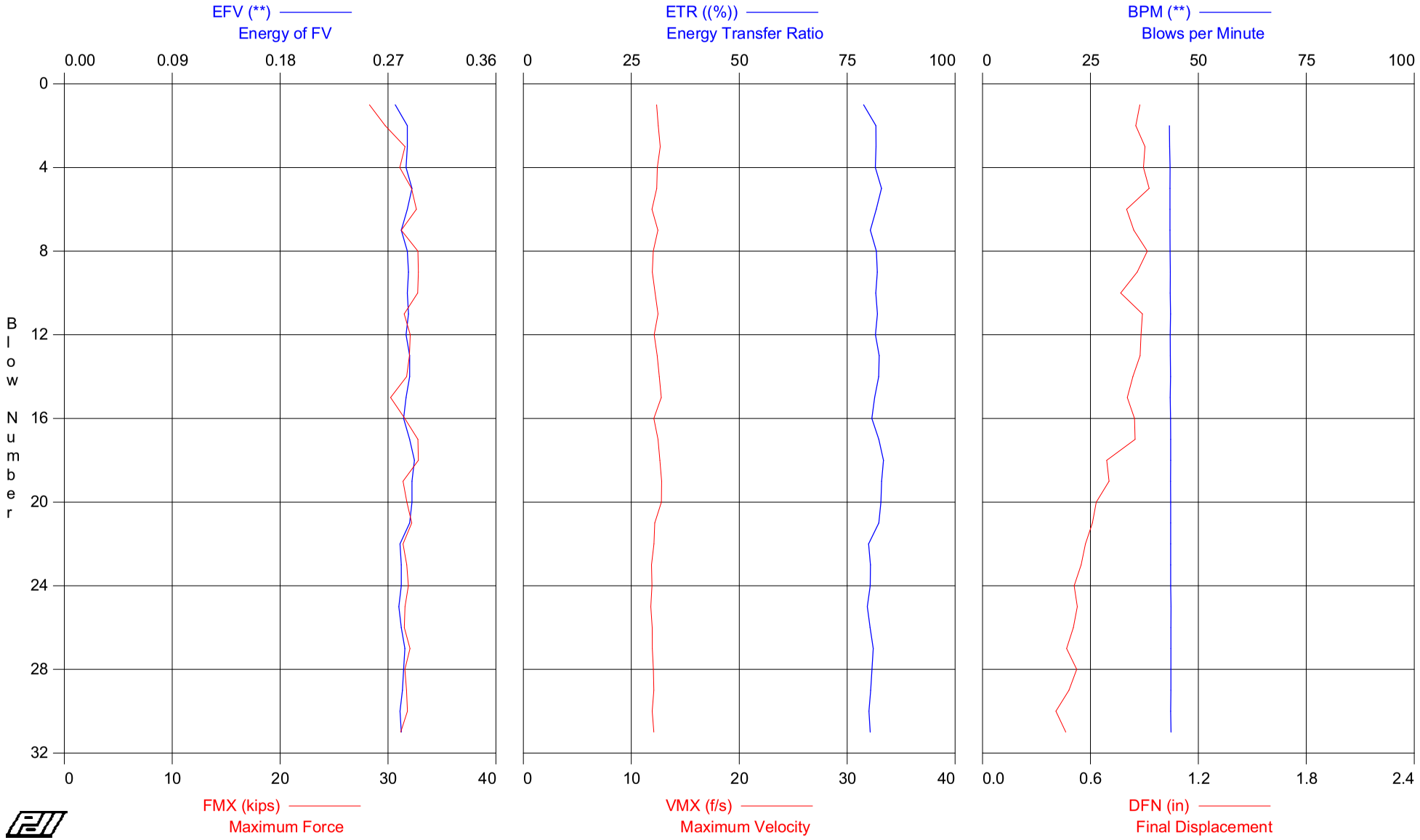
Total number of blows analyzed: 31

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 31 - 32.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 31 - 32.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 35.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

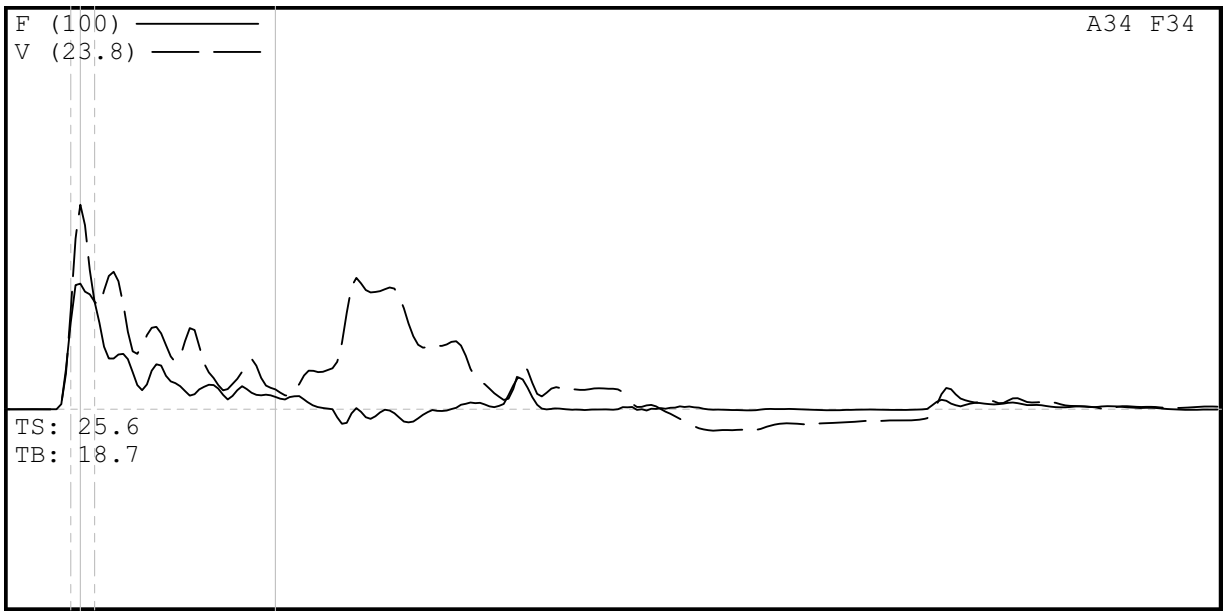
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	31.06	18	12.0	12.1	0.276	79	0	28.3	12.3	0.9
2	31.11	18	12.7	13.2	0.286	82	43	29.7	12.5	0.9
3	31.17	18	13.4	13.7	0.286	82	43	31.6	12.7	0.9
4	31.22	18	13.2	13.6	0.285	82	43	31.1	12.4	0.9
5	31.28	18	13.7	13.7	0.290	83	43	32.2	12.4	0.9
6	31.33	18	13.9	14.0	0.286	82	43	32.6	11.9	0.8
7	31.39	18	13.3	13.7	0.281	80	43	31.2	12.5	0.8
8	31.44	18	13.9	14.0	0.286	82	43	32.8	12.0	0.9
9	31.50	18	14.0	14.0	0.287	82	44	32.8	12.0	0.9
10	31.56	18	13.9	14.1	0.286	82	43	32.7	12.2	0.8
11	31.61	18	13.4	13.6	0.287	82	44	31.5	12.5	0.9
12	31.67	18	13.6	13.7	0.285	82	43	32.1	12.1	0.9
13	31.72	18	13.6	13.8	0.288	82	44	32.0	12.4	0.9
14	31.78	18	13.5	13.8	0.288	82	44	31.7	12.6	0.8
15	31.83	18	12.9	13.4	0.285	81	43	30.2	12.8	0.8
16	31.89	18	13.4	13.5	0.283	81	44	31.5	12.1	0.8
17	31.94	18	13.9	14.0	0.288	82	44	32.8	12.5	0.8
18	32.00	18	14.0	14.0	0.292	83	44	32.8	12.6	0.7
19	32.04	26	13.4	13.6	0.290	83	44	31.4	12.8	0.7
20	32.08	26	13.5	13.8	0.290	83	44	31.7	12.8	0.6
21	32.12	26	13.7	14.0	0.288	82	44	32.2	12.2	0.6
22	32.15	26	13.4	13.6	0.280	80	44	31.4	12.1	0.6
23	32.19	26	13.5	13.8	0.281	80	44	31.7	11.9	0.5
24	32.23	26	13.6	13.9	0.281	80	44	31.9	11.9	0.5
25	32.27	26	13.4	13.7	0.279	80	44	31.6	11.8	0.5
26	32.31	26	13.4	13.6	0.281	80	44	31.5	11.9	0.5
27	32.35	26	13.6	14.0	0.284	81	44	32.0	11.9	0.5
28	32.38	26	13.4	13.8	0.283	81	44	31.6	12.0	0.5
29	32.42	26	13.5	13.7	0.282	80	44	31.7	12.1	0.5
30	32.46	26	13.5	13.9	0.280	80	44	31.8	11.9	0.4
31	32.50	26	13.3	13.6	0.281	80	44	31.2	12.1	0.5
		Average	13.5	13.7	0.285	81	44	31.7	12.3	0.7
		Std. Dev.	0.4	0.4	0.004	1	0	0.9	0.3	0.2
		Maximum	14.0	14.1	0.292	83	44	32.8	12.8	0.9

Total number of blows analyzed: 31

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 31 - 32 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 31 - 32 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 31 - 32 5
8/27/2008 2:50:01 PM
Blow Number 43/31

Pile Properties

LE	35.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	4.10	ms
JC	1.20	[]
LP	32.50	ft

Quantity Results

CSXN	13.3	ksi
CSI	13.6	ksi
CSB	17.0	ksi
EFV	0.281	k-ft
ETR	80.3	(%)
BPM	43.7	bpm
FMX	31	kips
VMX	12.1	f/s
DFN	0.46	in

Sensors

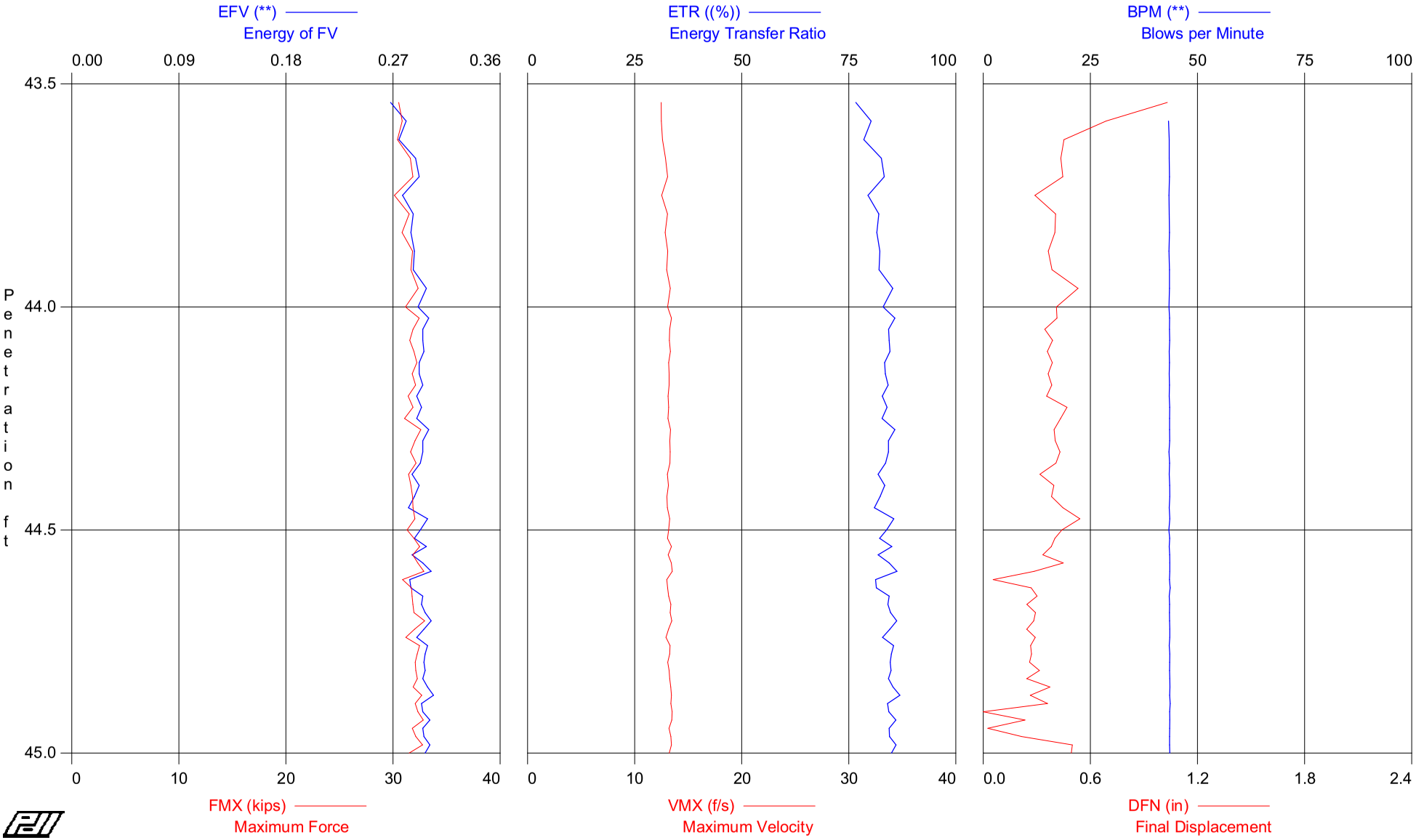
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 43.5 - 45
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 43.5 - 45
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 49.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
12	44.00	24	AV12	13.3	13.9	0.285	81	43	31.2	12.9	0.5
			STD	0.3	0.3	0.008	2	0	0.7	0.3	0.2
			MAX	13.8	14.4	0.298	85	43	32.3	13.3	1.0
32	44.50	40	AV20	13.6	14.2	0.293	84	43	31.8	13.2	0.4
			STD	0.2	0.1	0.004	1	0	0.4	0.1	0.0
			MAX	13.9	14.5	0.300	86	44	32.6	13.4	0.5
59	45.00	54	AV27	13.7	14.3	0.295	84	44	32.1	13.3	0.3
			STD	0.2	0.2	0.005	1	0	0.5	0.2	0.1
			MAX	14.0	14.6	0.304	87	44	33.0	13.5	0.5
			Average	13.6	14.2	0.293	84	43	31.8	13.2	0.4
			Std. Dev.	0.3	0.2	0.007	2	0	0.6	0.2	0.2
			Maximum	14.0	14.6	0.304	87	44	33.0	13.5	1.0

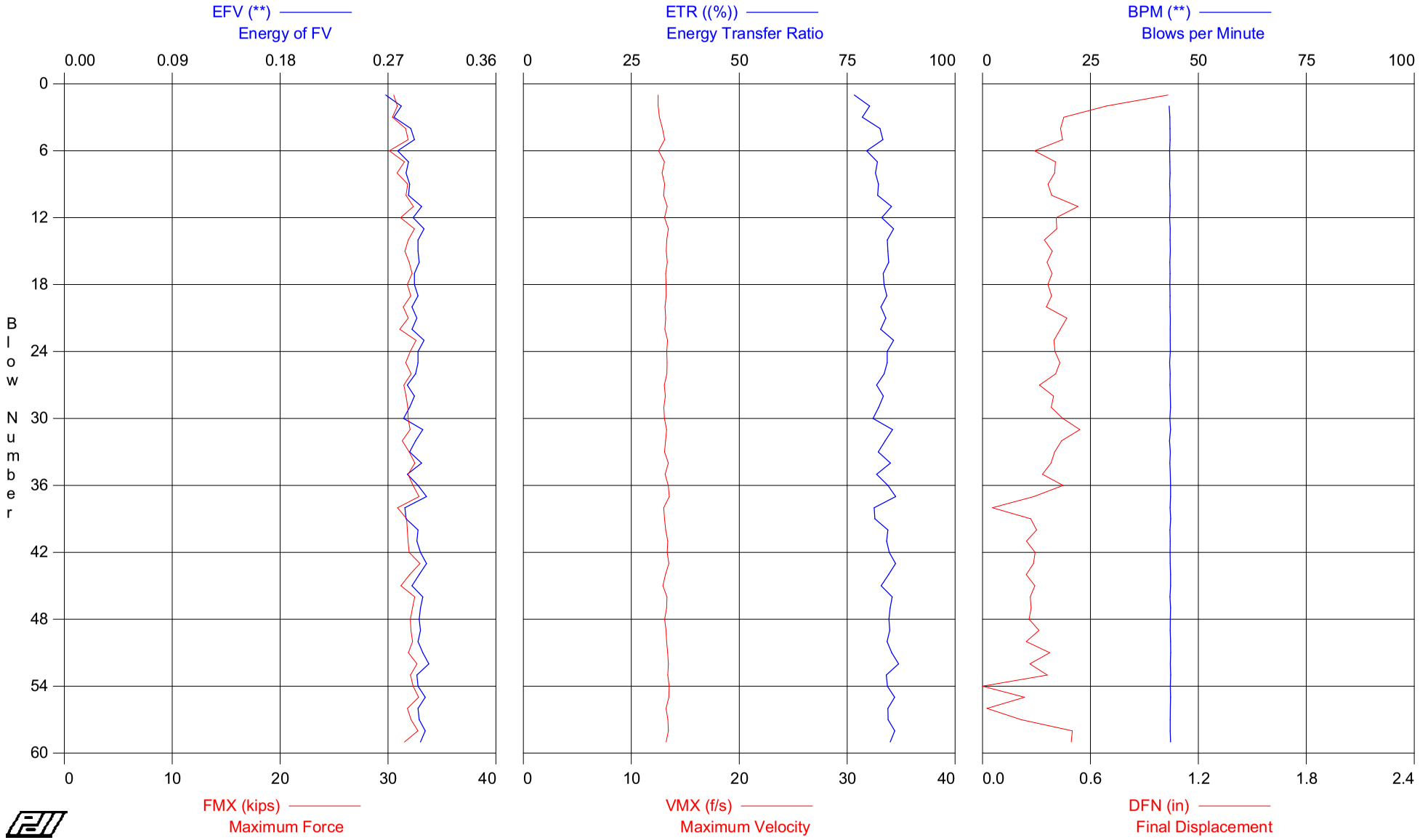
Total number of blows analyzed: 59

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 27-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 43.5 - 45
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 43.5 - 45
OP: SDW

HAMMER #5 N3 B-800
Test date: 27-Aug-2008

AR: 2.35 in^2
LE: 49.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

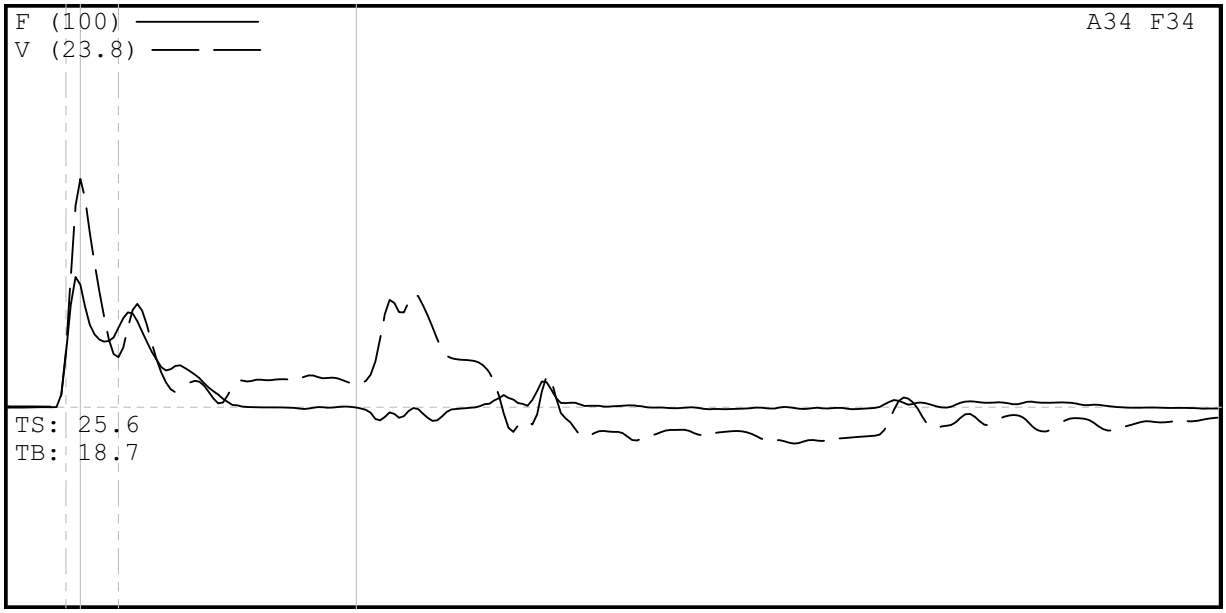
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	43.54	24	13.0	13.6	0.268	77	0	30.5	12.5	1.0
2	43.58	24	13.1	13.5	0.281	80	43	30.9	12.5	0.7
3	43.63	24	12.9	13.4	0.275	79	43	30.4	12.6	0.5
4	43.67	24	13.5	14.0	0.289	83	43	31.6	12.9	0.4
5	43.71	24	13.6	14.1	0.292	83	43	31.9	13.1	0.4
6	43.75	24	12.8	13.6	0.278	80	43	30.1	12.5	0.3
7	43.79	24	13.4	14.0	0.287	82	43	31.5	13.1	0.4
8	43.83	24	13.1	13.7	0.285	82	43	30.8	12.9	0.4
9	43.88	24	13.5	14.1	0.288	82	43	31.8	13.1	0.4
10	43.92	24	13.5	14.1	0.287	82	43	31.7	13.0	0.4
11	43.96	24	13.8	14.4	0.298	85	43	32.3	13.3	0.5
12	44.00	24	13.3	14.0	0.291	83	43	31.2	13.1	0.4
13	44.03	40	13.8	14.4	0.300	86	43	32.4	13.4	0.4
14	44.05	40	13.6	14.2	0.295	84	43	31.9	13.3	0.3
15	44.08	40	13.4	14.1	0.295	84	44	31.6	13.2	0.4
16	44.10	40	13.6	14.2	0.296	85	43	32.0	13.3	0.4
17	44.13	40	13.7	14.2	0.292	83	43	32.2	13.2	0.4
18	44.15	40	13.5	14.2	0.292	84	43	31.8	13.2	0.4
19	44.18	40	13.7	14.2	0.295	84	43	32.1	13.2	0.4
20	44.20	40	13.4	14.0	0.290	83	43	31.4	13.1	0.4
21	44.23	40	13.6	14.2	0.294	84	44	31.9	13.2	0.5
22	44.25	40	13.2	13.9	0.290	83	43	31.1	13.1	0.4
23	44.28	40	13.9	14.5	0.300	86	43	32.6	13.4	0.4
24	44.30	40	13.6	14.2	0.295	84	44	32.1	13.3	0.4
25	44.33	40	13.5	14.1	0.295	84	43	31.6	13.3	0.4
26	44.35	40	13.7	14.3	0.293	84	43	32.1	13.3	0.4
27	44.38	40	13.4	14.2	0.286	82	43	31.5	13.1	0.3
28	44.40	40	13.5	14.2	0.292	83	44	31.7	13.2	0.4
29	44.43	40	13.5	14.3	0.288	82	44	31.8	13.0	0.4
30	44.45	40	13.6	14.2	0.283	81	43	31.9	13.1	0.4
31	44.48	40	13.6	14.3	0.299	86	44	32.0	13.3	0.5
32	44.50	40	13.3	14.0	0.293	84	43	31.3	13.2	0.4
33	44.52	54	13.6	14.2	0.288	82	44	32.0	13.1	0.4
34	44.54	54	13.8	14.4	0.298	85	43	32.5	13.4	0.4
35	44.56	54	13.6	14.3	0.286	82	44	31.9	13.1	0.3
36	44.57	54	13.8	14.3	0.295	84	44	32.3	13.4	0.4
37	44.59	54	14.0	14.6	0.302	86	44	32.9	13.5	0.3
38	44.61	54	13.1	14.0	0.284	81	43	30.9	13.0	0.1
39	44.63	54	13.5	14.2	0.285	81	44	31.7	13.1	0.3
40	44.65	54	13.5	14.3	0.295	84	43	31.8	13.2	0.3
41	44.67	54	13.6	14.2	0.294	84	43	31.9	13.4	0.2
42	44.69	54	13.6	14.2	0.297	85	43	32.0	13.3	0.3
43	44.70	54	14.0	14.6	0.302	86	43	33.0	13.5	0.3
44	44.72	54	13.6	14.2	0.296	85	44	32.0	13.2	0.2
45	44.74	54	13.3	14.0	0.290	83	44	31.2	12.9	0.3
46	44.76	54	13.8	14.4	0.299	85	43	32.5	13.3	0.3
47	44.78	54	13.7	14.4	0.297	85	44	32.3	13.3	0.3
48	44.80	54	13.6	14.2	0.296	85	44	32.1	13.1	0.3
49	44.81	54	13.7	14.3	0.297	85	43	32.1	13.2	0.3
50	44.83	54	13.7	14.3	0.295	84	44	32.3	13.3	0.2
51	44.85	54	13.6	14.2	0.299	85	44	31.9	13.4	0.4
52	44.87	54	13.9	14.5	0.304	87	44	32.7	13.4	0.3
53	44.89	54	13.7	14.2	0.294	84	44	32.1	13.4	0.4
54	44.91	54	13.8	14.3	0.295	84	44	32.3	13.5	-0.1
55	44.93	54	14.0	14.5	0.301	86	44	32.8	13.5	0.2
56	44.94	54	13.5	13.9	0.295	84	44	31.8	13.2	0.0
57	44.96	54	13.7	14.2	0.296	84	43	32.1	13.4	0.2
58	44.98	54	13.9	14.5	0.301	86	43	32.8	13.4	0.5
59	45.00	54	13.4	14.0	0.297	85	44	31.5	13.2	0.5
		Average	13.6	14.2	0.293	84	43	31.8	13.2	0.4
		Std. Dev.	0.3	0.2	0.007	2	0	0.6	0.2	0.2
		Maximum	14.0	14.6	0.304	87	44	33.0	13.5	1.0

Total number of blows analyzed: 59

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 43 5 - 45



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 43 5 - 45
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 43 5 - 45
8/27/2008 5:08:19 PM
Blow Number 55/54

Pile Properties

LE	49.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	5.83	ms
JC	1.20	[]
LP	44.91	ft

Quantity Results

CSXN	13.8	ksi
CSI	14.3	ksi
CSB	14.2	ksi
EFV	0.295	k-ft
ETR	84.3	(%)
BPM	43.5	bpm
FMX	32	kips
VMX	13.5	f/s
DFN	-0.14	in

Sensors

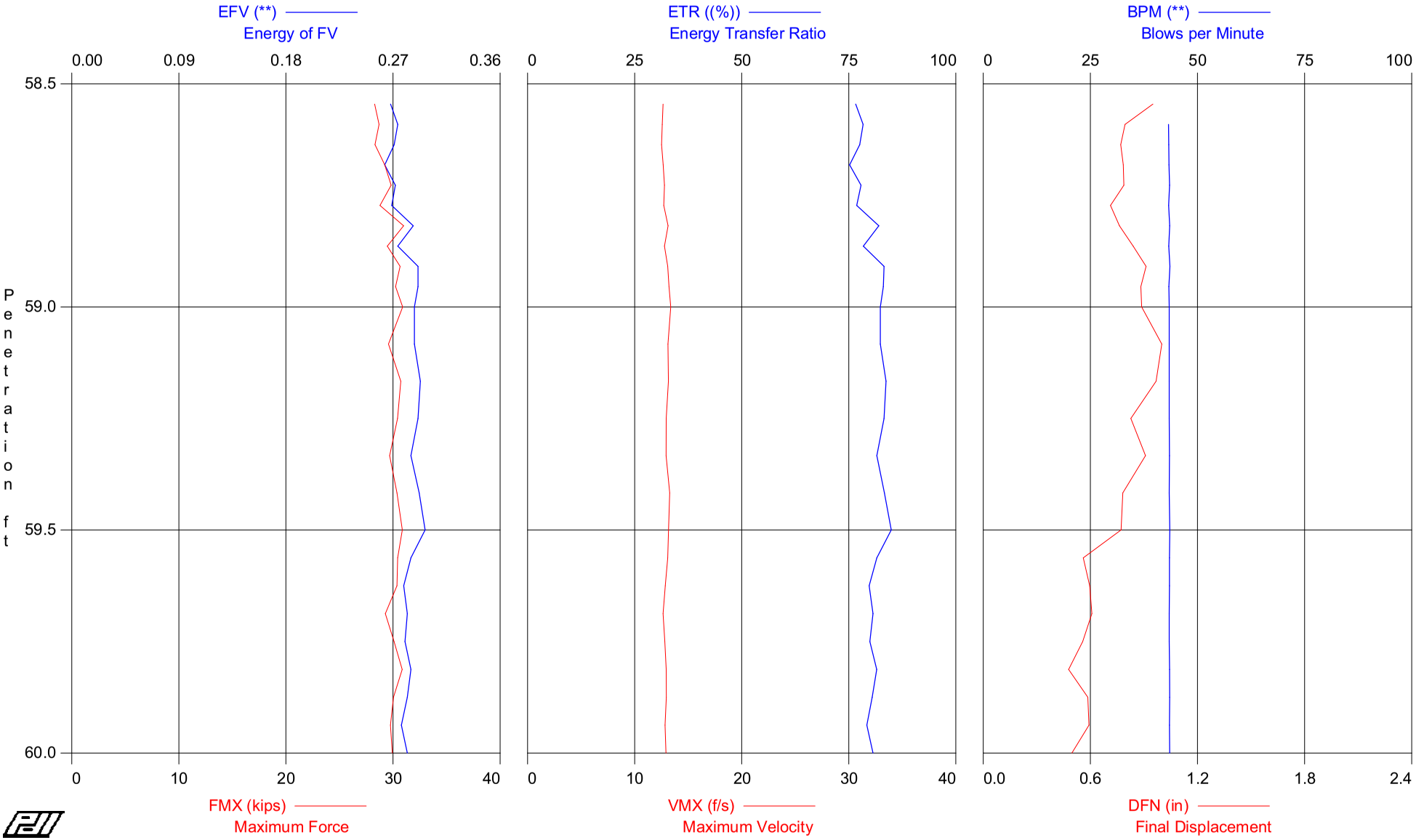
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.03
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 58.5 - 60
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 58.5 - 60
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 64.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
11	59.00	22	AV11	12.6	13.4	0.277	79	43	29.6	12.9	0.8
			STD	0.4	0.4	0.010	3	0	1.0	0.3	0.1
			MAX	13.2	13.8	0.291	83	44	31.0	13.4	1.0
17	59.50	12	AV6	12.9	13.6	0.291	83	43	30.3	13.1	0.9
			STD	0.2	0.2	0.004	1	0	0.5	0.1	0.1
			MAX	13.1	13.9	0.297	85	44	30.9	13.3	1.0
25	60.00	16	AV8	12.8	13.8	0.282	80	43	30.1	12.9	0.6
			STD	0.2	0.2	0.003	1	0	0.4	0.1	0.0
			MAX	13.1	14.1	0.285	82	44	30.9	13.1	0.6
			Average	12.7	13.6	0.282	81	43	29.9	12.9	0.8
			Std. Dev.	0.3	0.3	0.009	2	0	0.8	0.2	0.2
			Maximum	13.2	14.1	0.297	85	44	31.0	13.4	1.0

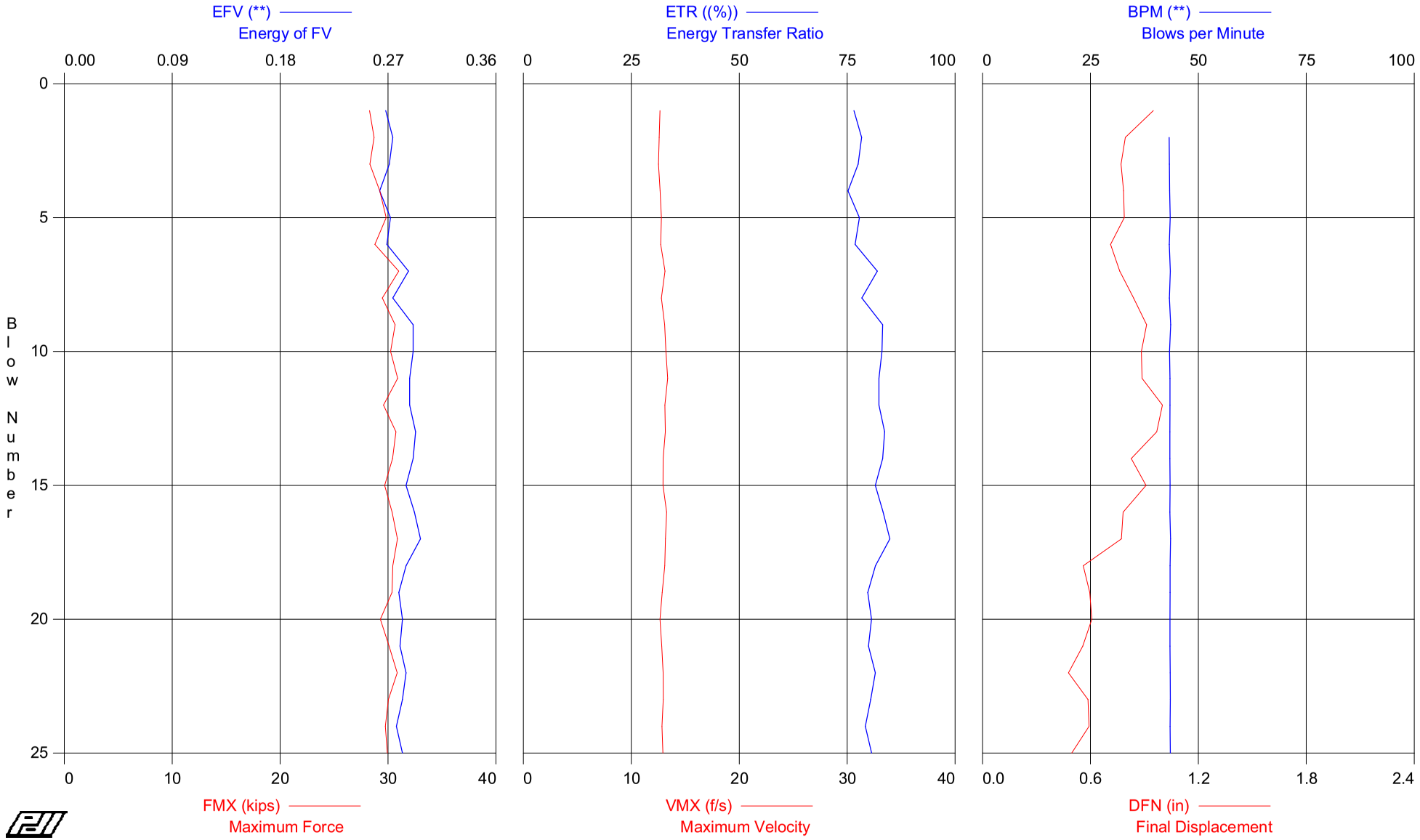
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 58.5 - 60
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 58.5 - 60
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 64.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

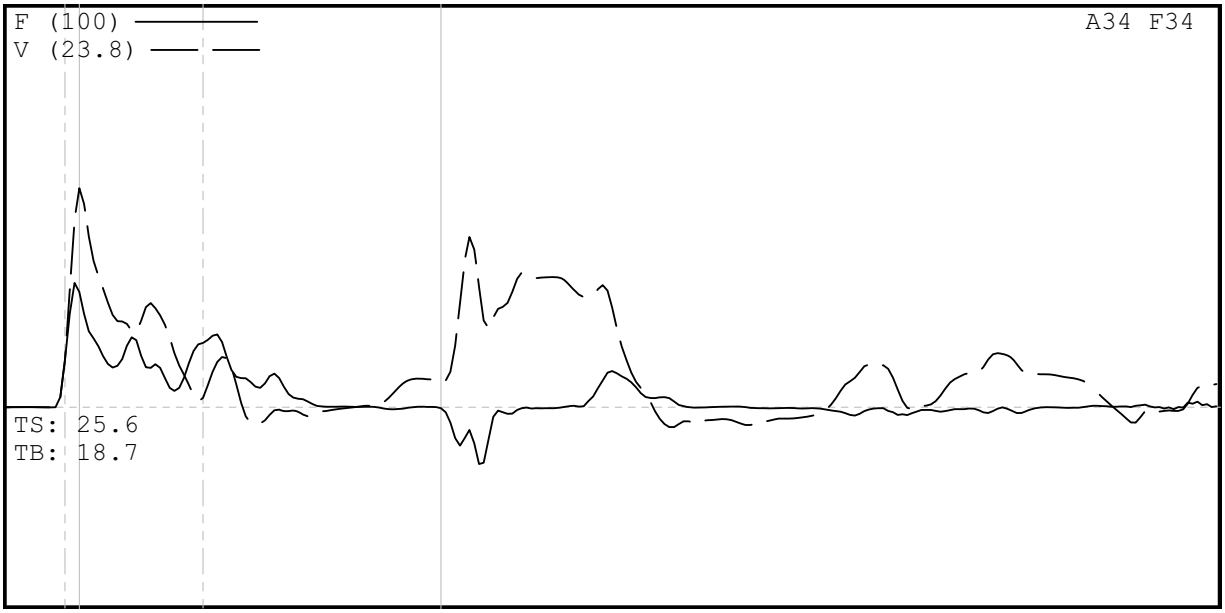
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	58.55	22	12.0	12.9	0.268	77	0	28.3	12.7	1.0
2	58.59	22	12.2	13.0	0.274	78	43	28.7	12.6	0.8
3	58.64	22	12.1	12.8	0.271	78	43	28.3	12.5	0.8
4	58.68	22	12.4	13.2	0.263	75	43	29.2	12.7	0.8
5	58.73	22	12.7	13.5	0.272	78	43	29.8	12.8	0.8
6	58.77	22	12.2	13.2	0.269	77	43	28.8	12.7	0.7
7	58.82	22	13.2	13.8	0.287	82	44	31.0	13.1	0.8
8	58.86	22	12.5	13.5	0.274	78	43	29.5	12.8	0.8
9	58.91	22	13.0	13.8	0.291	83	44	30.7	13.1	0.9
10	58.95	22	12.9	13.7	0.291	83	43	30.2	13.2	0.9
11	59.00	22	13.1	13.8	0.288	82	43	30.9	13.4	0.9
12	59.08	12	12.6	13.4	0.288	82	43	29.6	13.1	1.0
13	59.17	12	13.1	13.8	0.293	84	43	30.7	13.2	1.0
14	59.25	12	12.9	13.7	0.291	83	43	30.4	13.0	0.8
15	59.33	12	12.6	13.4	0.285	82	43	29.7	12.9	0.9
16	59.42	12	12.9	13.7	0.292	83	43	30.4	13.3	0.8
17	59.50	12	13.1	13.9	0.297	85	44	30.9	13.2	0.8
18	59.56	16	13.0	13.7	0.285	82	43	30.4	13.1	0.6
19	59.63	16	12.9	13.8	0.279	80	43	30.4	12.9	0.6
20	59.69	16	12.5	13.4	0.282	81	43	29.3	12.7	0.6
21	59.75	16	12.8	13.8	0.280	80	43	30.1	12.8	0.6
22	59.81	16	13.1	14.1	0.285	82	43	30.9	13.0	0.5
23	59.88	16	12.8	13.8	0.282	80	44	30.0	13.0	0.6
24	59.94	16	12.7	13.7	0.277	79	43	29.8	12.8	0.6
25	60.00	16	12.7	13.7	0.282	81	44	29.9	12.9	0.5
		Average	12.7	13.6	0.282	81	43	29.9	12.9	0.8
		Std. Dev.	0.3	0.3	0.009	2	0	0.8	0.2	0.2
		Maximum	13.2	14.1	0.297	85	44	31.0	13.4	1.0

Total number of blows analyzed: 25

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 58 5 - 60



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 58 5 - 60
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 58 5 - 60
8/28/2008 12:10:17 PM
Blow Number 23/22

Pile Properties

LE	64.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	7.62	ms
JC	1.20	[]
LP	59.81	ft

Quantity Results

CSXN	13.1	ksi
CSI	14.1	ksi
CSB	10.1	ksi
EFV	0.285	k-ft
ETR	81.5	(%)
BPM	43.5	bpm
FMX	31	kips
VMX	13.0	f/s
DFN	0.48	in

Sensors

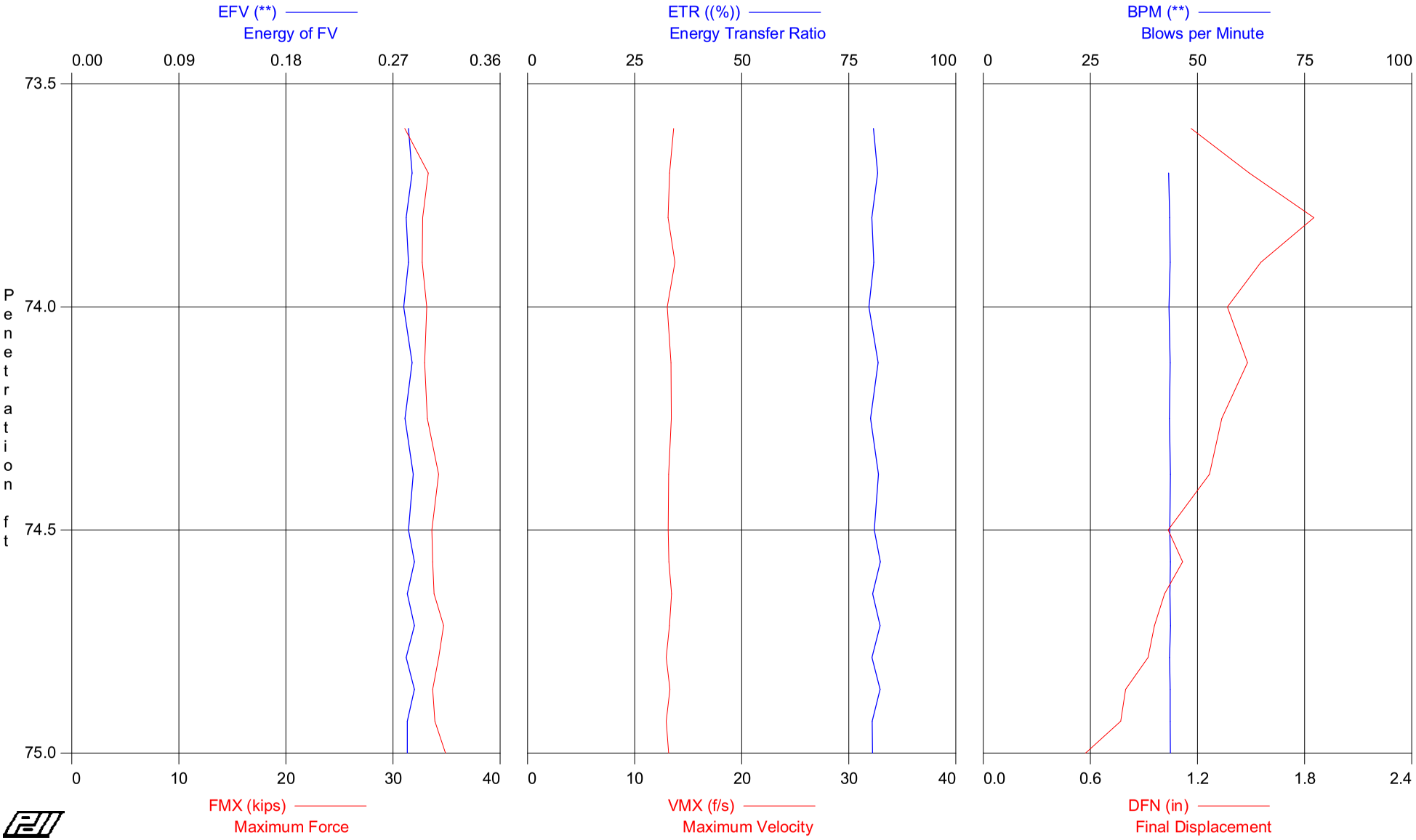
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.10
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 73.5 - 75
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 73.5 - 75
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
5	74.00	10	AV5	13.9	14.7	0.282	81	43	32.6	13.4	1.5
			STD	0.3	0.3	0.002	1	0	0.8	0.3	0.2
			MAX	14.2	15.2	0.286	82	44	33.3	13.8	1.9
9	74.50	8	AV4	14.3	15.0	0.284	81	44	33.5	13.3	1.3
			STD	0.2	0.2	0.003	1	0	0.5	0.1	0.2
			MAX	14.6	15.3	0.287	82	44	34.3	13.4	1.5
16	75.00	14	AV7	14.5	15.3	0.284	81	44	34.1	13.2	0.9
			STD	0.2	0.3	0.003	1	0	0.5	0.2	0.2
			MAX	14.9	15.8	0.288	82	44	34.9	13.5	1.1
			Average	14.3	15.1	0.284	81	44	33.5	13.3	1.2
			Std. Dev.	0.4	0.4	0.003	1	0	0.9	0.2	0.3
			Maximum	14.9	15.8	0.288	82	44	34.9	13.8	1.9

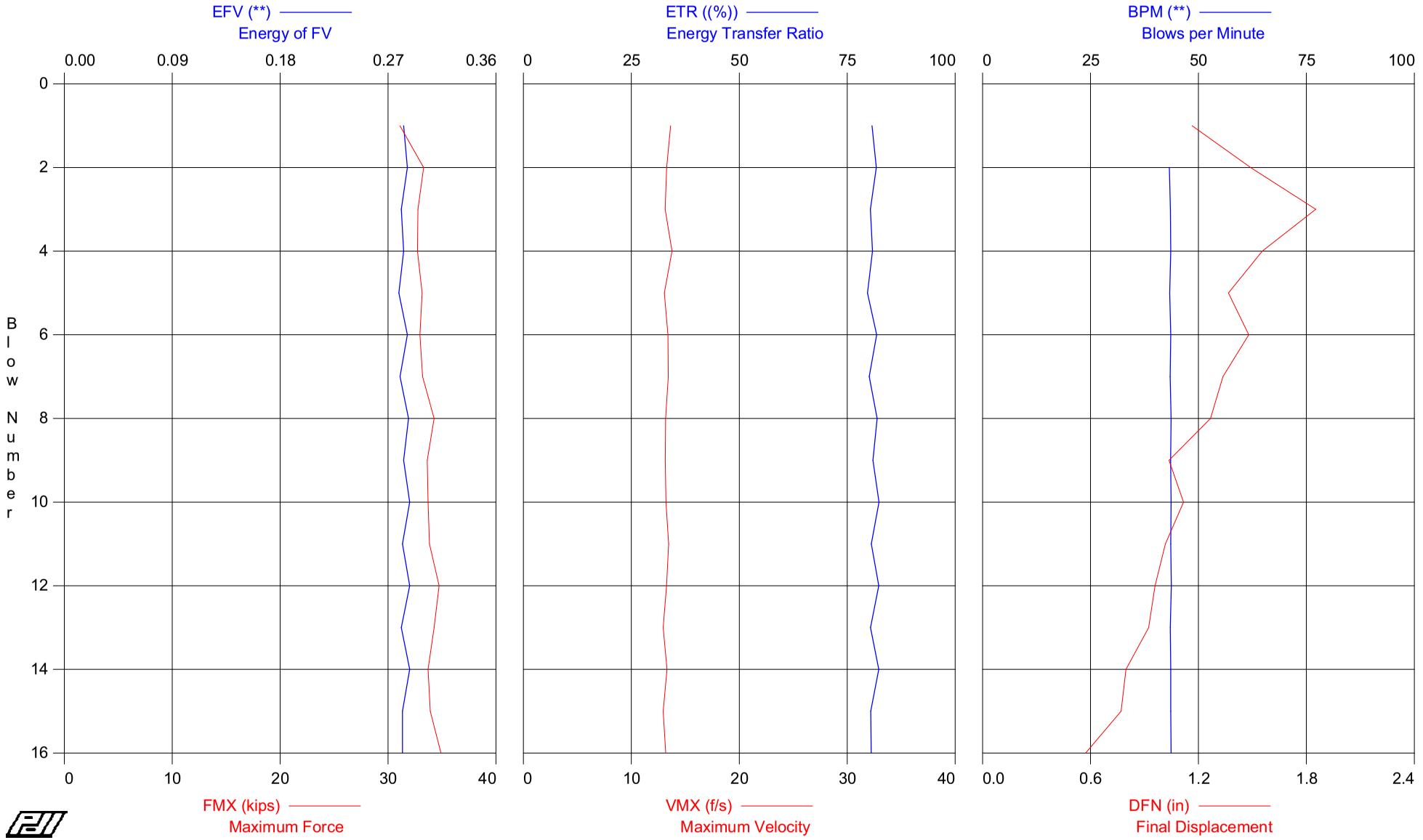
Total number of blows analyzed: 16

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 73.5 - 75
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 73.5 - 75
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 79.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

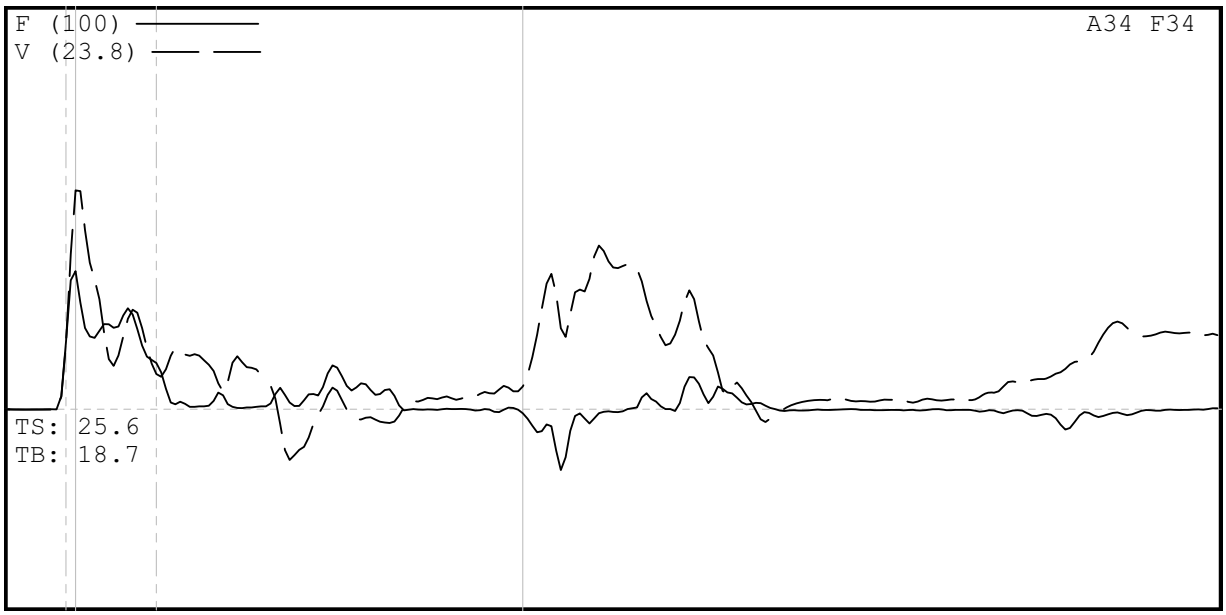
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	73.60	10	13.2	14.3	0.283	81	0	31.1	13.6	1.2
2	73.70	10	14.2	15.2	0.286	82	43	33.3	13.3	1.5
3	73.80	10	13.9	14.6	0.281	80	44	32.8	13.1	1.9
4	73.90	10	13.9	14.9	0.283	81	44	32.7	13.8	1.6
5	74.00	10	14.1	14.8	0.279	80	43	33.2	13.0	1.4
6	74.13	8	14.0	14.6	0.286	82	44	33.0	13.4	1.5
7	74.25	8	14.1	15.2	0.280	80	43	33.2	13.4	1.3
8	74.38	8	14.6	15.3	0.287	82	44	34.3	13.2	1.3
9	74.50	8	14.3	15.1	0.283	81	44	33.6	13.1	1.0
10	74.57	14	14.3	15.0	0.288	82	44	33.7	13.2	1.1
11	74.64	14	14.4	15.4	0.282	81	44	33.8	13.5	1.0
12	74.71	14	14.8	15.5	0.288	82	44	34.7	13.3	1.0
13	74.79	14	14.6	15.3	0.281	80	43	34.3	12.9	0.9
14	74.86	14	14.3	15.0	0.288	82	44	33.7	13.3	0.8
15	74.93	14	14.4	15.2	0.282	80	44	33.9	13.0	0.8
16	75.00	14	14.9	15.8	0.282	81	44	34.9	13.2	0.6
		Average	14.3	15.1	0.284	81	44	33.5	13.3	1.2
		Std. Dev.	0.4	0.4	0.003	1	0	0.9	0.2	0.3
		Maximum	14.9	15.8	0.288	82	44	34.9	13.8	1.9

Total number of blows analyzed: 16

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 73 5 - 75



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 73 5 - 75
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 73 5 - 75
8/28/2008 1:22:26 PM
Blow Number 14/13

Pile Properties

LE	79.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	9.40	ms
JC	1.20	[]
LP	74.79	ft

Quantity Results

CSXN	14.6	ksi
CSI	15.3	ksi
CSB	11.4	ksi
EFV	0.281	k-ft
ETR	80.4	(%)
BPM	43.5	bpm
FMX	34	kips
VMX	12.9	f/s
DFN	0.92	in

Sensors

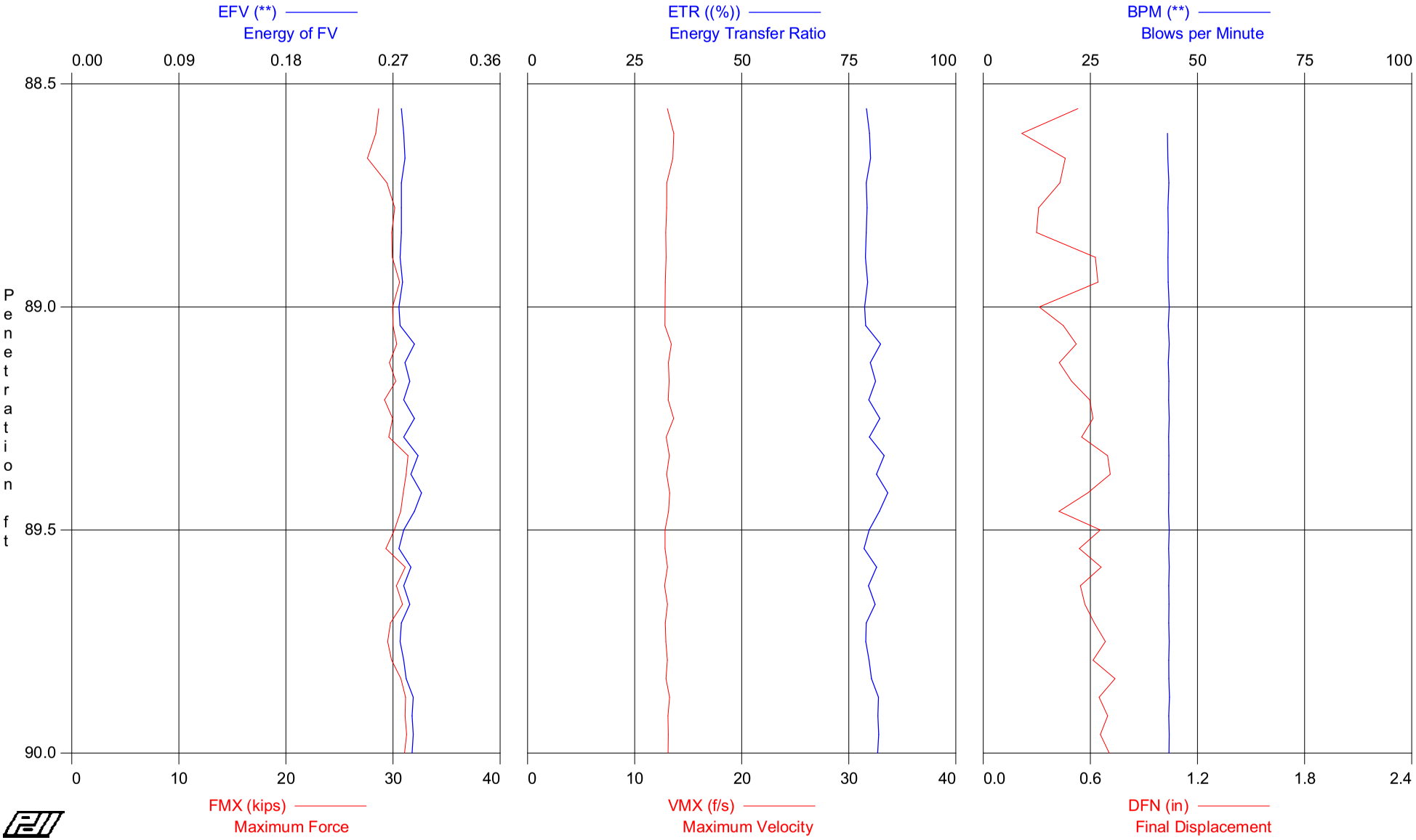
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.10
V3/V4: OK 1.11

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 88.5 - 90
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 88.5 - 90
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 94.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
9	89.00	18	AV9	12.5	13.2	0.277	79	43	29.4	13.1	0.4
			STD	0.4	0.4	0.001	0	0	0.9	0.3	0.1
			MAX	13.0	13.7	0.280	80	43	30.6	13.7	0.6
21	89.50	24	AV12	12.9	13.7	0.284	81	43	30.3	13.2	0.6
			STD	0.3	0.2	0.005	2	0	0.6	0.2	0.1
			MAX	13.4	14.0	0.294	84	43	31.4	13.6	0.7
33	90.00	24	AV12	13.0	13.8	0.282	81	43	30.5	13.0	0.6
			STD	0.3	0.2	0.004	1	0	0.7	0.1	0.1
			MAX	13.3	14.0	0.287	82	43	31.3	13.3	0.7
			Average	12.8	13.6	0.281	80	43	30.1	13.1	0.6
			Std. Dev.	0.4	0.4	0.005	1	0	0.9	0.2	0.1
			Maximum	13.4	14.0	0.294	84	43	31.4	13.7	0.7

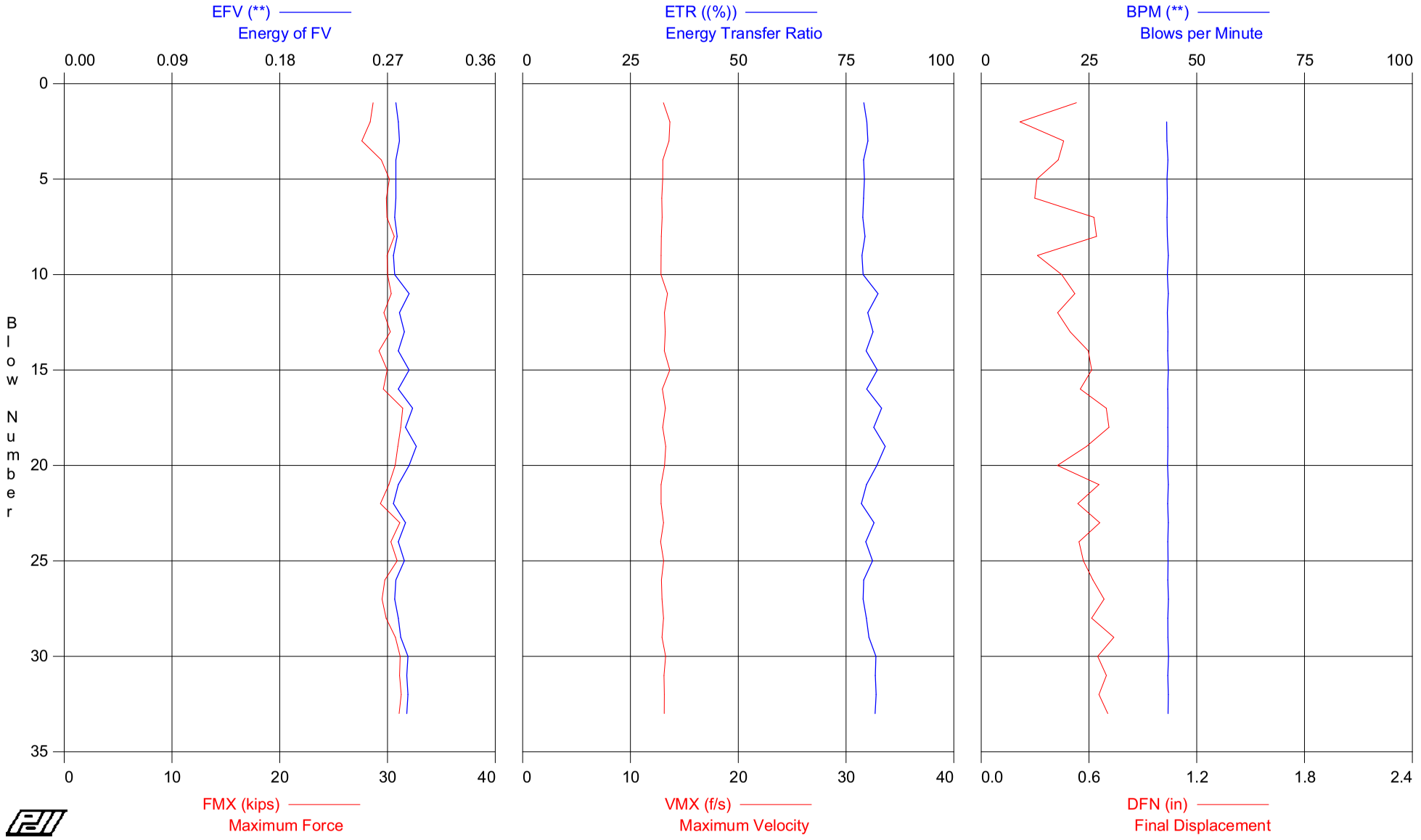
Total number of blows analyzed: 33

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 28-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 88.5 - 90
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 88.5 - 90
OP: SDW

HAMMER #5 N3 B-800
Test date: 28-Aug-2008

AR: 2.35 in^2
LE: 94.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

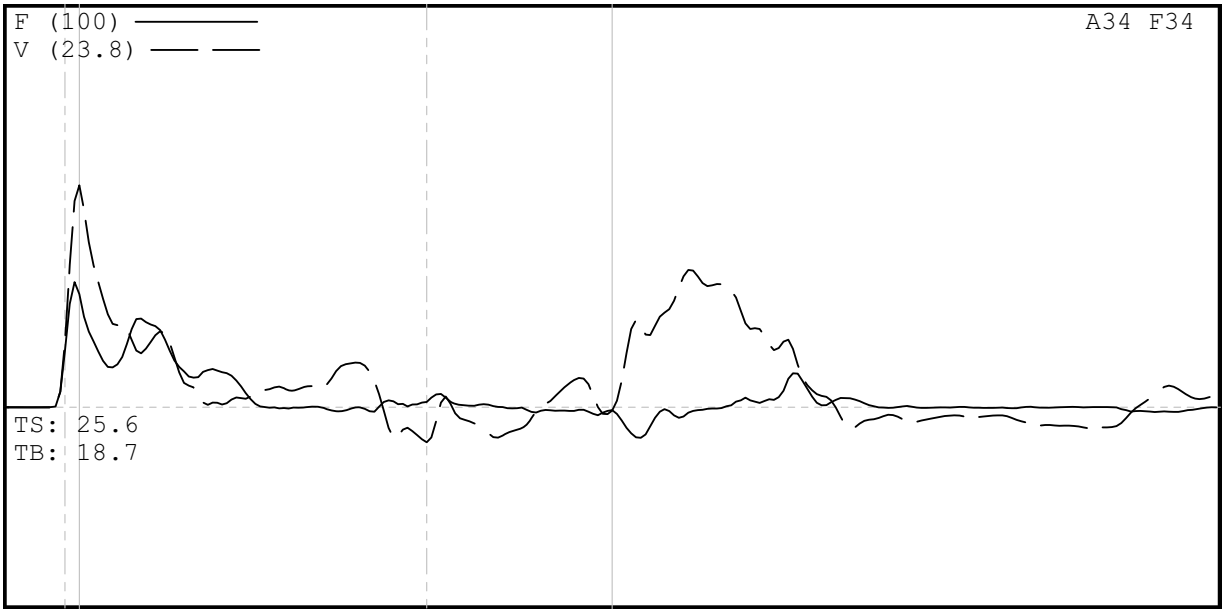
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	88.56	18	12.2	13.0	0.277	79	0	28.7	13.1	0.5
2	88.61	18	12.1	12.8	0.279	80	43	28.4	13.7	0.2
3	88.67	18	11.8	12.4	0.280	80	43	27.6	13.6	0.5
4	88.72	18	12.5	13.3	0.277	79	43	29.4	13.0	0.4
5	88.78	18	12.8	13.6	0.277	79	43	30.2	13.0	0.3
6	88.83	18	12.7	13.4	0.277	79	43	29.9	12.9	0.3
7	88.89	18	12.7	13.5	0.276	79	43	29.9	12.9	0.6
8	88.94	18	13.0	13.7	0.278	79	43	30.6	12.9	0.6
9	89.00	18	12.7	13.5	0.275	79	43	30.0	12.8	0.3
10	89.04	24	12.8	13.5	0.276	79	43	30.0	12.8	0.4
11	89.08	24	12.9	13.7	0.288	82	43	30.3	13.4	0.5
12	89.13	24	12.6	13.4	0.280	80	43	29.7	13.2	0.4
13	89.17	24	12.9	13.6	0.284	81	43	30.3	13.2	0.5
14	89.21	24	12.4	13.3	0.279	80	43	29.2	13.1	0.6
15	89.25	24	12.8	13.5	0.288	82	43	30.0	13.6	0.6
16	89.29	24	12.6	13.4	0.279	80	43	29.6	13.0	0.6
17	89.33	24	13.4	14.0	0.291	83	43	31.4	13.2	0.7
18	89.38	24	13.3	14.0	0.285	81	43	31.2	13.0	0.7
19	89.42	24	13.2	13.9	0.294	84	43	31.0	13.3	0.6
20	89.46	24	13.1	13.9	0.288	82	43	30.7	13.2	0.4
21	89.50	24	12.8	13.7	0.279	80	43	30.1	12.8	0.7
22	89.54	24	12.5	13.4	0.275	79	43	29.3	12.8	0.5
23	89.58	24	13.3	13.9	0.285	81	43	31.1	13.1	0.7
24	89.63	24	12.9	13.7	0.279	80	43	30.3	12.8	0.5
25	89.67	24	13.1	14.0	0.284	81	43	30.9	13.1	0.6
26	89.71	24	12.7	13.6	0.277	79	43	29.8	12.9	0.6
27	89.75	24	12.6	13.4	0.276	79	43	29.5	12.9	0.7
28	89.79	24	12.7	13.5	0.279	80	43	29.9	13.1	0.6
29	89.83	24	13.1	13.9	0.281	80	43	30.7	12.9	0.7
30	89.88	24	13.3	14.0	0.287	82	43	31.2	13.3	0.6
31	89.92	24	13.2	14.0	0.286	82	43	31.1	13.1	0.7
32	89.96	24	13.3	14.0	0.287	82	43	31.3	13.1	0.7
33	90.00	24	13.2	13.9	0.286	82	43	31.1	13.1	0.7
		Average	12.8	13.6	0.281	80	43	30.1	13.1	0.6
		Std. Dev.	0.4	0.4	0.005	1	0	0.9	0.2	0.1
		Maximum	13.4	14.0	0.294	84	43	31.4	13.7	0.7

Total number of blows analyzed: 33

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 88 5 - 90



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 88 5 - 90
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 88 5 - 90
8/28/2008 3:44:47 PM
Blow Number 35/33

Pile Properties

LE	94.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	11.19	ms
JC	1.20	[]
LP	90.00	ft

Quantity Results

CSXN	13.2	ksi
CSI	13.9	ksi
CSB	13.5	ksi
EFV	0.286	k-ft
ETR	81.7	(%)
BPM	43.4	bpm
FMX	31	kips
VMX	13.1	f/s
DFN	0.70	in

Sensors

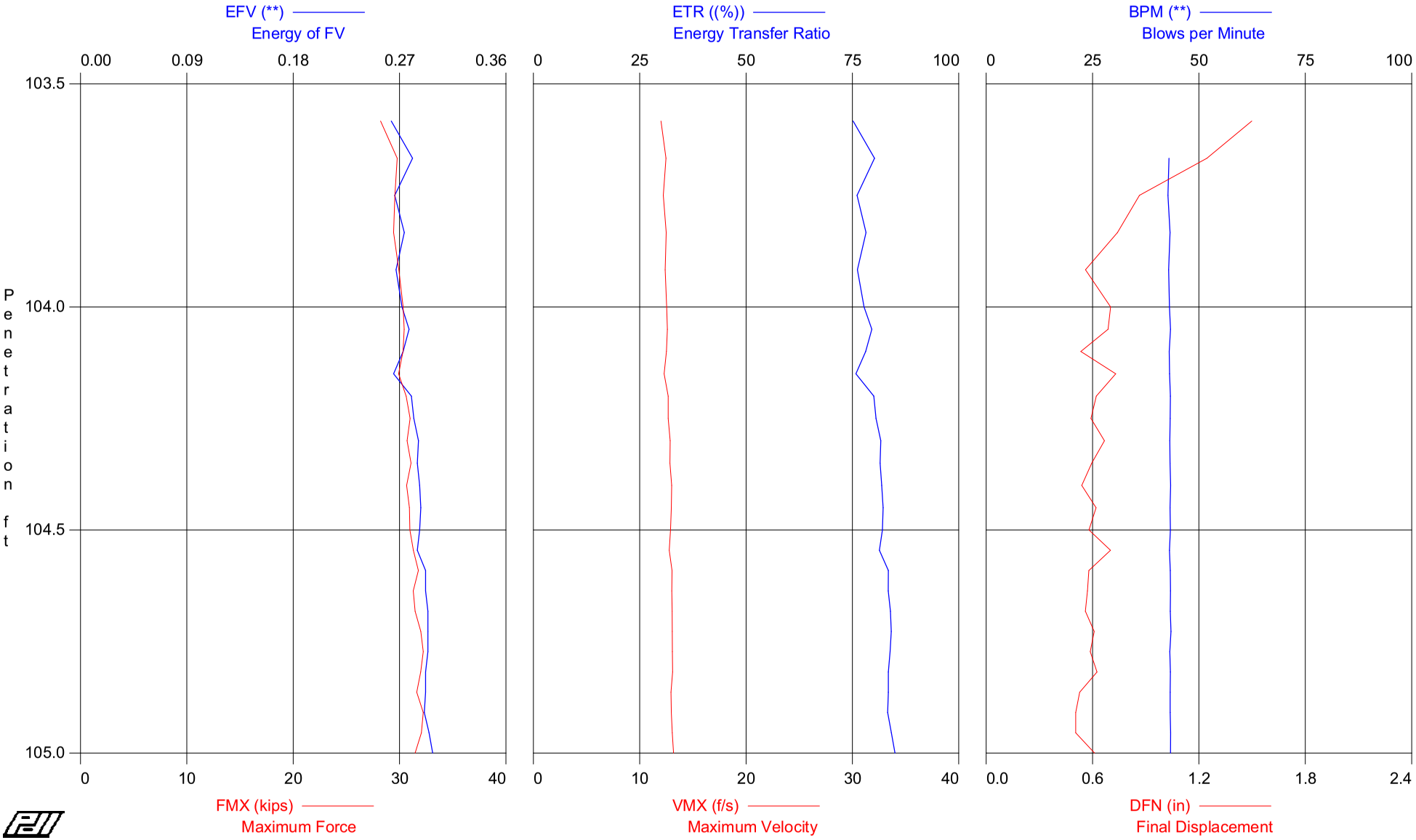
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 29-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 103.5 - 105
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 103.5 - 105
OP: SDW

HAMMER #5 N3 B-800
Test date: 29-Aug-2008

AR: 2.35 in^2
LE: 109.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	104.00	12	AV6	12.6	13.3	0.271	77	43	29.5	12.3	0.9
			STD	0.3	0.2	0.006	2	0	0.7	0.2	0.3
			MAX	12.9	13.5	0.281	80	43	30.3	12.5	1.5
16	104.50	20	AV10	13.0	13.7	0.281	80	43	30.7	12.7	0.6
			STD	0.1	0.1	0.007	2	0	0.3	0.2	0.1
			MAX	13.2	13.9	0.288	82	43	31.1	13.0	0.7
27	105.00	22	AV11	13.5	14.1	0.293	84	43	31.8	13.0	0.6
			STD	0.1	0.1	0.003	1	0	0.3	0.1	0.1
			MAX	13.7	14.3	0.298	85	43	32.2	13.2	0.7
			Average	13.1	13.8	0.283	81	43	30.9	12.8	0.7
			Std. Dev.	0.4	0.4	0.010	3	0	1.0	0.3	0.2
			Maximum	13.7	14.3	0.298	85	43	32.2	13.2	1.5

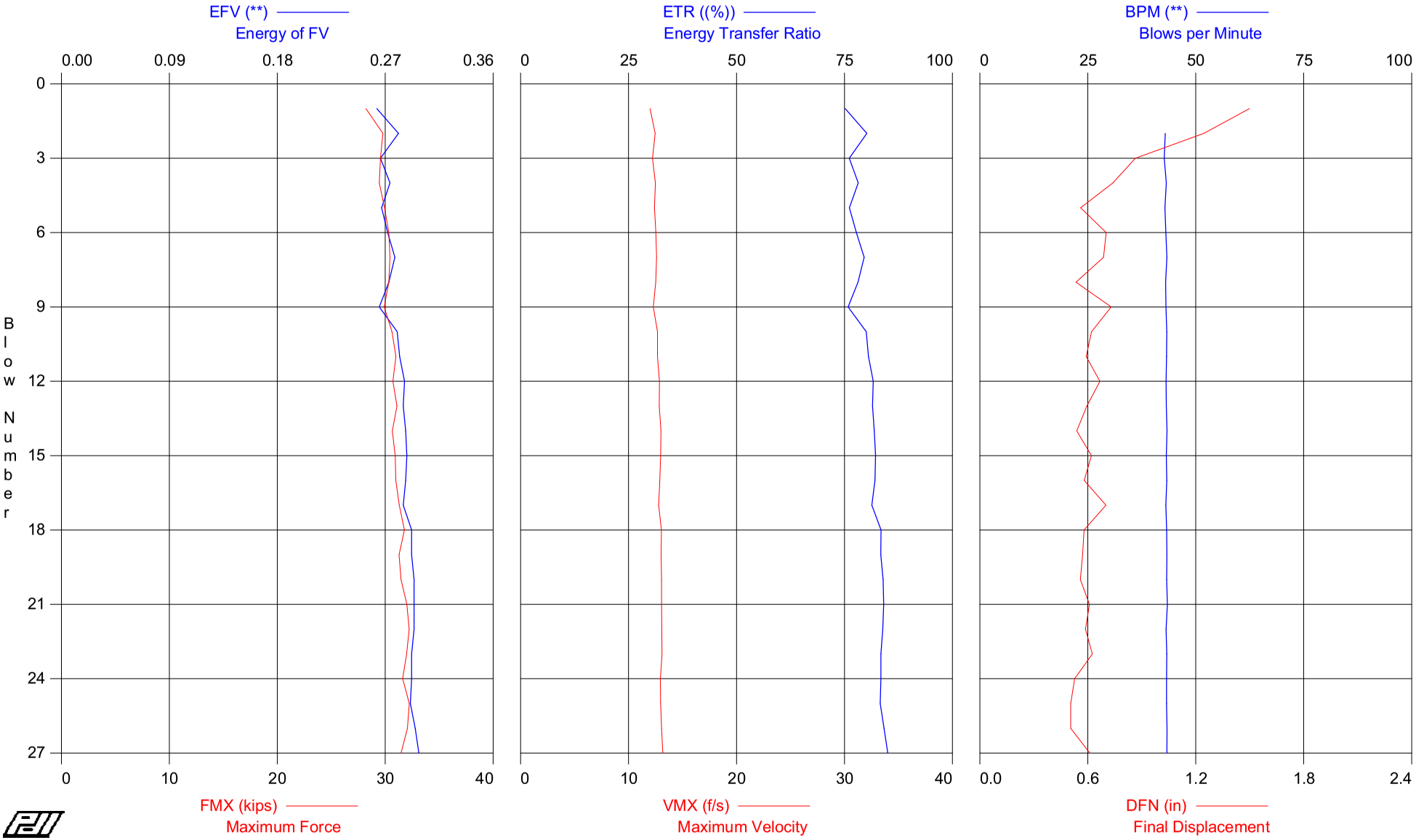
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 29-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 103.5 - 105
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 103.5 - 105
OP: SDW

HAMMER #5 N3 B-800
Test date: 29-Aug-2008

AR: 2.35 in^2
LE: 109.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

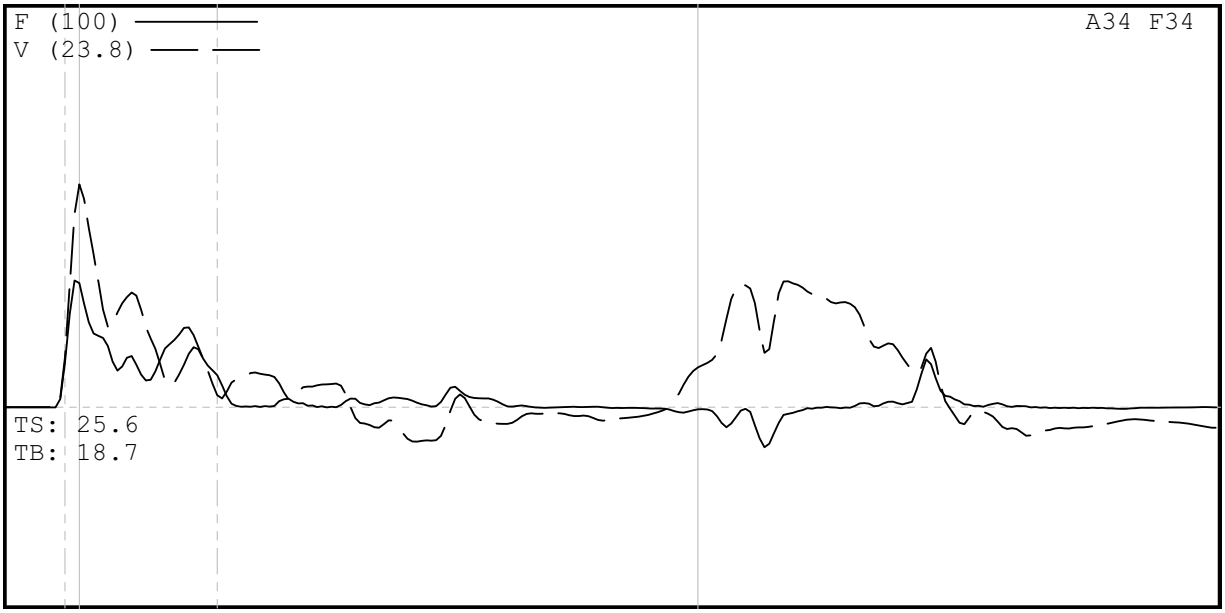
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	103.58	12	12.0	12.7	0.263	75	0	28.2	12.0	1.5
2	103.67	12	12.7	13.4	0.281	80	43	29.8	12.5	1.2
3	103.75	12	12.6	13.2	0.266	76	43	29.6	12.2	0.9
4	103.83	12	12.5	13.3	0.274	78	43	29.4	12.5	0.7
5	103.92	12	12.7	13.4	0.267	76	43	29.9	12.4	0.6
6	104.00	12	12.9	13.5	0.272	78	43	30.3	12.5	0.7
7	104.05	20	13.0	13.6	0.278	80	43	30.4	12.6	0.7
8	104.10	20	12.9	13.6	0.273	78	43	30.3	12.5	0.5
9	104.15	20	12.7	13.4	0.265	76	43	29.9	12.3	0.7
10	104.20	20	13.0	13.8	0.280	80	43	30.6	12.7	0.6
11	104.25	20	13.2	13.9	0.282	81	43	31.0	12.7	0.6
12	104.30	20	13.1	13.8	0.286	82	43	30.7	12.9	0.7
13	104.35	20	13.2	13.8	0.285	81	43	31.1	12.8	0.6
14	104.40	20	13.0	13.7	0.287	82	43	30.7	13.0	0.5
15	104.45	20	13.2	13.8	0.288	82	43	30.9	13.0	0.6
16	104.50	20	13.2	13.9	0.287	82	43	31.0	12.9	0.6
17	104.55	22	13.3	14.0	0.285	81	43	31.3	12.8	0.7
18	104.59	22	13.5	14.1	0.292	83	43	31.8	13.0	0.6
19	104.64	22	13.3	13.9	0.292	83	43	31.3	13.0	0.6
20	104.68	22	13.4	13.9	0.294	84	43	31.5	13.1	0.6
21	104.73	22	13.6	14.3	0.294	84	43	32.0	13.1	0.6
22	104.77	22	13.7	14.2	0.294	84	43	32.2	13.1	0.6
23	104.82	22	13.6	14.2	0.292	83	43	32.0	13.1	0.6
24	104.86	22	13.5	13.9	0.292	83	43	31.6	12.9	0.5
25	104.91	22	13.7	14.2	0.291	83	43	32.2	13.0	0.5
26	104.95	22	13.6	14.2	0.295	84	43	32.0	13.1	0.5
27	105.00	22	13.4	14.0	0.298	85	43	31.5	13.2	0.6
		Average	13.1	13.8	0.283	81	43	30.9	12.8	0.7
		Std. Dev.	0.4	0.4	0.010	3	0	1.0	0.3	0.2
		Maximum	13.7	14.3	0.298	85	43	32.2	13.2	1.5

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 103 5 - 105



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 103 5 - 105
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 103 5 - 105
8/29/2008 9:16:30 AM
Blow Number 28/27

Pile Properties

LE	109.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	12.97	ms
JC	1.20	[]
LP	105.00	ft

Quantity Results

CSXN	13.4	ksi
CSI	14.0	ksi
CSB	11.6	ksi
EFV	0.298	k-ft
ETR	85.0	(%)
BPM	43.3	bpm
FMX	31	kips
VMX	13.2	f/s
DFN	0.61	in

Sensors

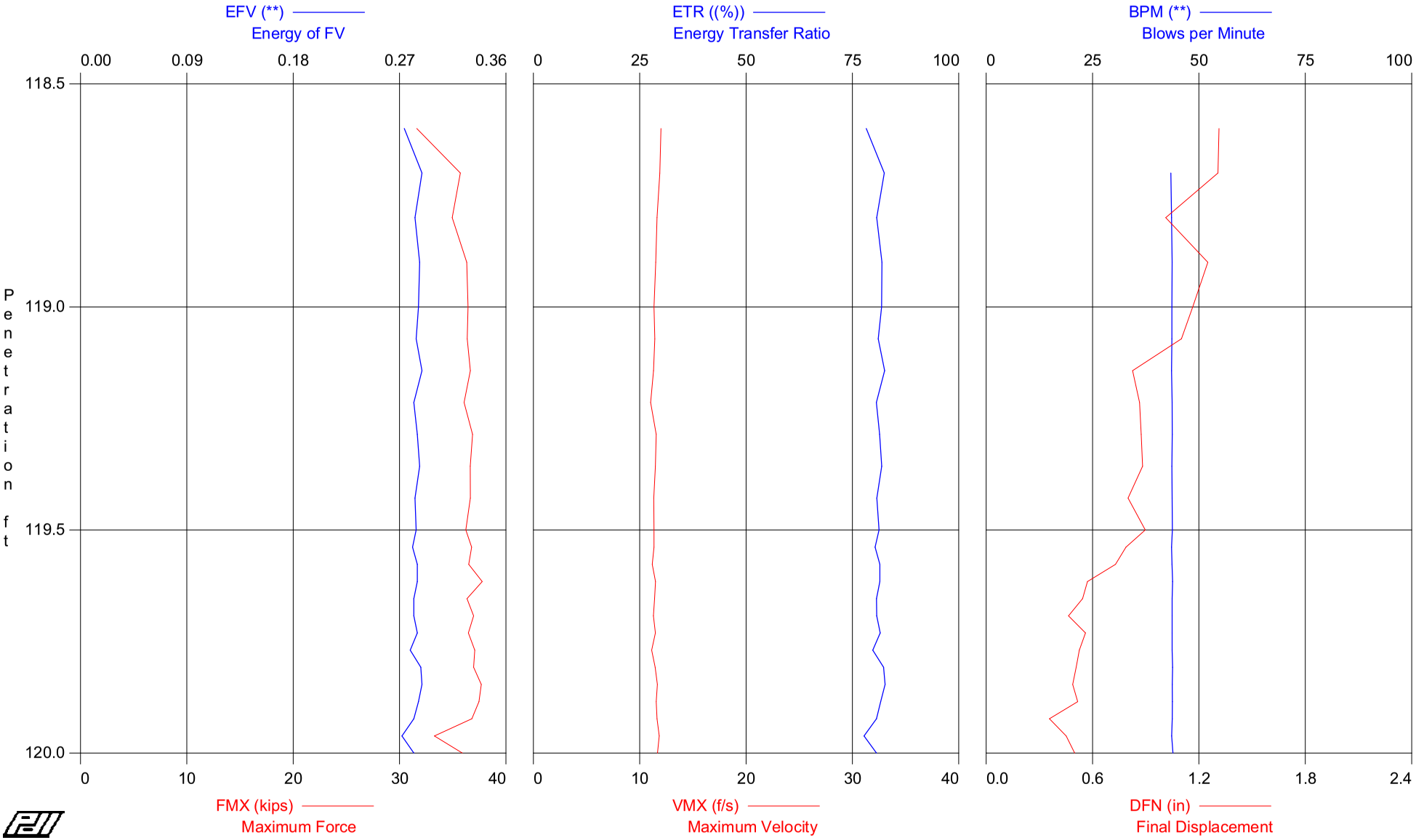
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.06
V3/V4: OK 0.96

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 29-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 118.5 - 120
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 118.5 - 120
OP: SDW

HAMMER #5 N3 B-800
Test date: 29-Aug-2008

AR: 2.35 in^2
LE: 124.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
5	119.00	10	AV5	14.9	15.3	0.284	81	44	35.0	11.7	1.2
			STD	0.8	0.7	0.005	2	0	1.8	0.2	0.1
			MAX	15.5	15.8	0.289	82	44	36.4	12.0	1.3
12	119.50	14	AV7	15.5	15.8	0.285	81	44	36.5	11.3	0.9
			STD	0.1	0.2	0.002	1	0	0.3	0.2	0.1
			MAX	15.7	16.1	0.289	83	44	36.9	11.5	1.1
25	120.00	26	AV13	15.6	15.9	0.283	81	44	36.6	11.5	0.5
			STD	0.5	0.5	0.004	1	0	1.1	0.2	0.1
			MAX	16.1	16.4	0.289	83	44	37.8	11.8	0.8
			Average	15.4	15.8	0.284	81	44	36.3	11.5	0.8
			Std. Dev.	0.5	0.5	0.004	1	0	1.3	0.2	0.3
			Maximum	16.1	16.4	0.289	83	44	37.8	12.0	1.3

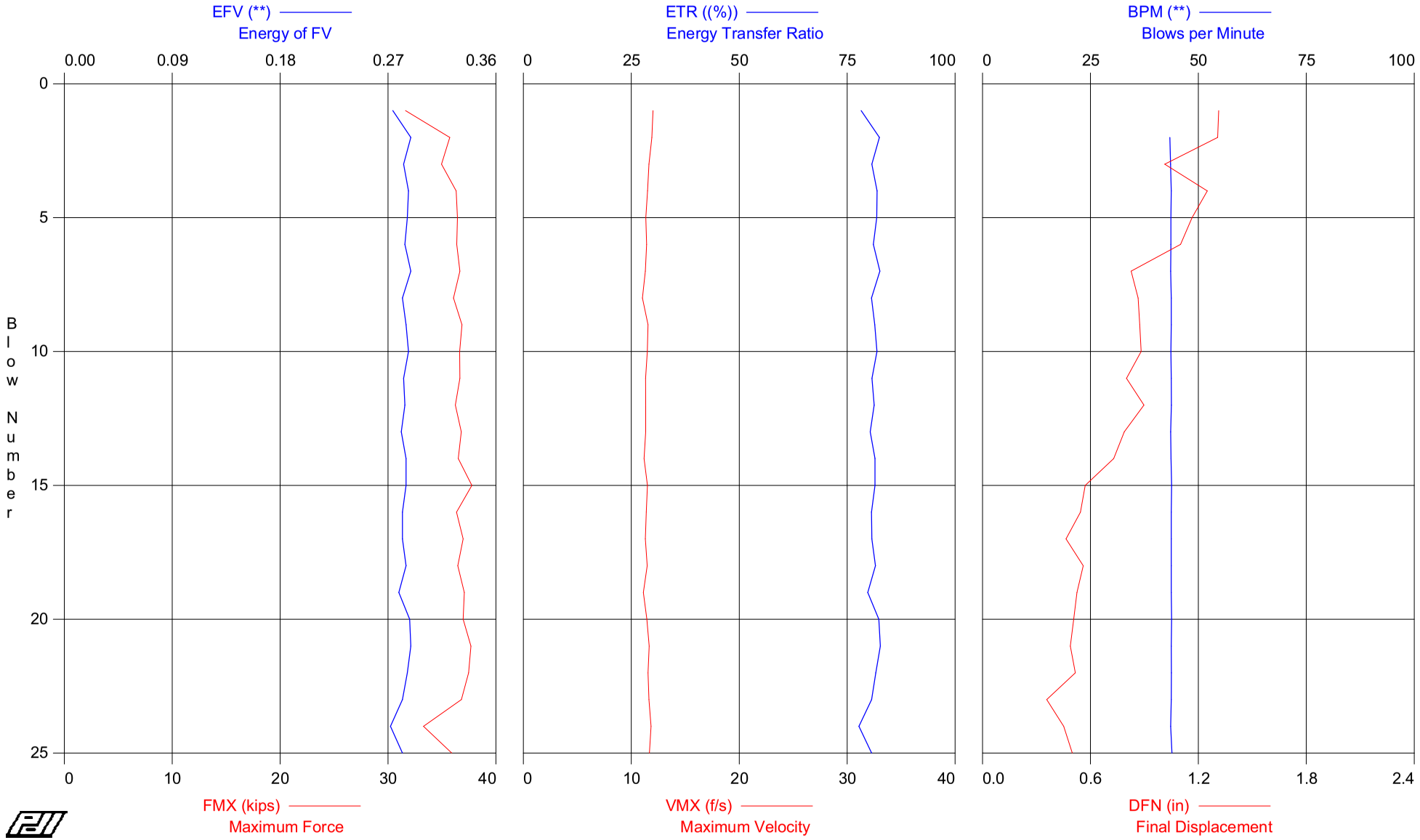
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 29-Aug-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 118.5 - 120
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 118.5 - 120
OP: SDW

HAMMER #5 N3 B-800
Test date: 29-Aug-2008

AR: 2.35 in^2
LE: 124.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

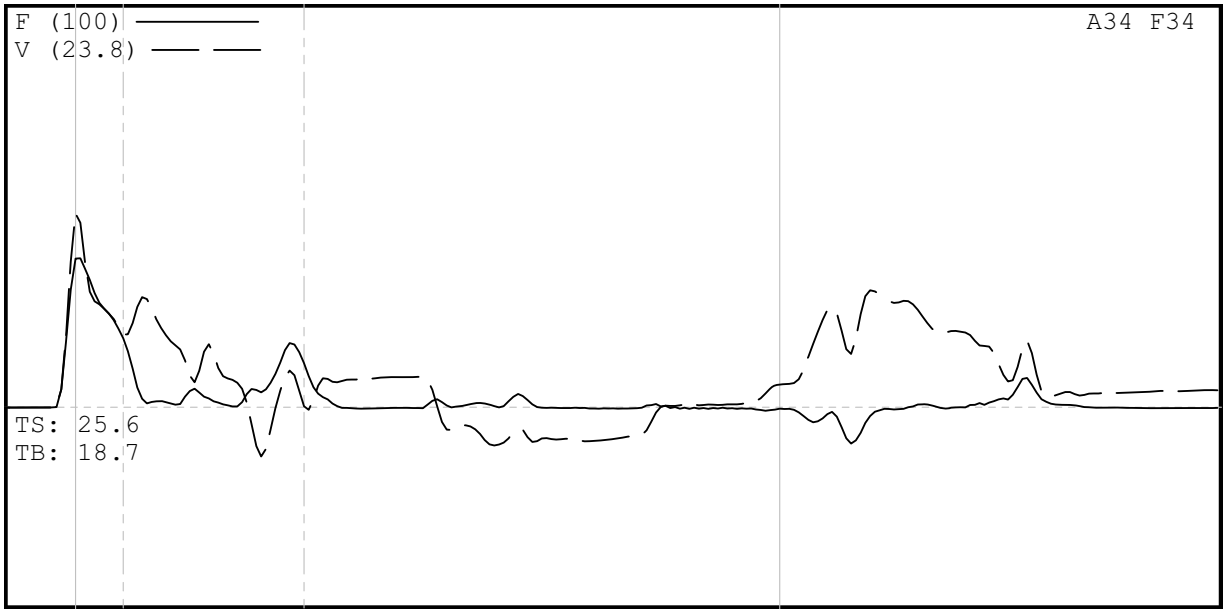
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	118.60	10	13.5	14.0	0.274	78	0	31.6	12.0	1.3
2	118.70	10	15.2	15.5	0.289	82	43	35.7	11.9	1.3
3	118.80	10	14.9	15.2	0.283	81	44	34.9	11.6	1.0
4	118.90	10	15.5	15.8	0.287	82	44	36.3	11.5	1.3
5	119.00	10	15.5	15.8	0.286	82	44	36.4	11.3	1.2
6	119.07	14	15.5	15.8	0.284	81	44	36.4	11.4	1.1
7	119.14	14	15.6	15.8	0.289	83	44	36.7	11.3	0.8
8	119.21	14	15.3	15.5	0.282	81	44	36.1	11.0	0.9
9	119.29	14	15.7	16.1	0.285	81	44	36.9	11.5	0.9
10	119.36	14	15.6	15.9	0.287	82	44	36.6	11.5	0.9
11	119.43	14	15.6	15.9	0.283	81	44	36.7	11.3	0.8
12	119.50	14	15.4	15.7	0.284	81	44	36.2	11.3	0.9
13	119.54	26	15.7	16.0	0.281	80	44	36.8	11.3	0.8
14	119.58	26	15.5	15.8	0.285	81	44	36.5	11.2	0.7
15	119.62	26	16.1	16.4	0.285	81	44	37.8	11.5	0.6
16	119.65	26	15.5	15.9	0.282	81	44	36.3	11.4	0.5
17	119.69	26	15.7	16.1	0.282	81	44	37.0	11.3	0.5
18	119.73	26	15.5	15.8	0.285	82	44	36.5	11.5	0.6
19	119.77	26	15.8	16.1	0.279	80	44	37.1	11.1	0.5
20	119.81	26	15.7	16.1	0.288	82	44	37.0	11.4	0.5
21	119.85	26	16.0	16.4	0.289	83	44	37.7	11.7	0.5
22	119.88	26	15.9	16.3	0.286	82	44	37.5	11.5	0.5
23	119.92	26	15.7	16.1	0.282	81	44	36.8	11.6	0.4
24	119.96	26	14.2	14.5	0.272	78	44	33.3	11.8	0.5
25	120.00	26	15.3	15.6	0.282	81	44	35.9	11.7	0.5
		Average	15.4	15.8	0.284	81	44	36.3	11.5	0.8
		Std. Dev.	0.5	0.5	0.004	1	0	1.3	0.2	0.3
		Maximum	16.1	16.4	0.289	83	44	37.8	12.0	1.3

Total number of blows analyzed: 25

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 118 5 - 120



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 118 5 - 120
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 118 5 - 120
8/29/2008 10:33:59 AM
Blow Number 21/20

Pile Properties

LE	124.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	14.76	ms
JC	1.20	[]
LP	119.81	ft

Quantity Results

CSXN	15.7	ksi
CSI	16.1	ksi
CSB	10.0	ksi
EFV	0.288	k-ft
ETR	82.3	(%)
BPM	43.8	bpm
FMX	37	kips
VMX	11.4	f/s
DFN	0.51	in

Sensors

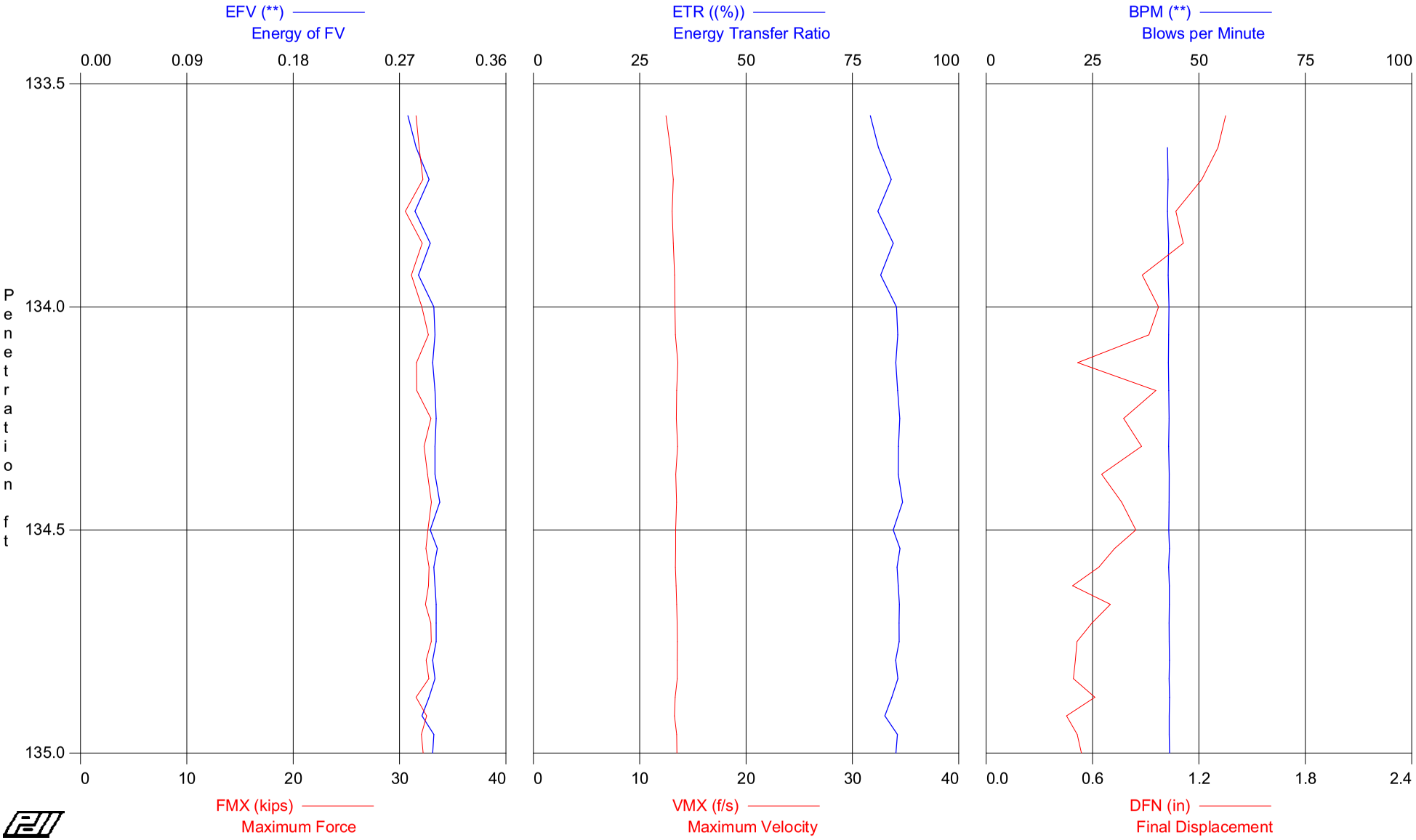
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.05
V3/V4: OK 1.02

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 133.5 - 135
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 133.5 - 135
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 139.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
7	134.00	14	AV7	13.5	13.5	0.289	82	43	31.6	13.0	1.1
			STD	0.2	0.2	0.008	2	0	0.6	0.3	0.2
			MAX	13.7	13.7	0.299	85	43	32.2	13.3	1.4
15	134.50	16	AV8	13.8	13.8	0.300	86	43	32.4	13.5	0.8
			STD	0.2	0.2	0.002	1	0	0.5	0.1	0.1
			MAX	14.0	14.0	0.304	87	43	33.0	13.6	1.0
27	135.00	24	AV12	13.8	13.8	0.299	85	43	32.5	13.4	0.6
			STD	0.2	0.2	0.003	1	0	0.4	0.1	0.1
			MAX	14.0	14.0	0.302	86	43	33.0	13.5	0.7
			Average	13.7	13.7	0.296	85	43	32.3	13.3	0.8
			Std. Dev.	0.3	0.3	0.007	2	0	0.6	0.2	0.3
			Maximum	14.0	14.0	0.304	87	43	33.0	13.6	1.4

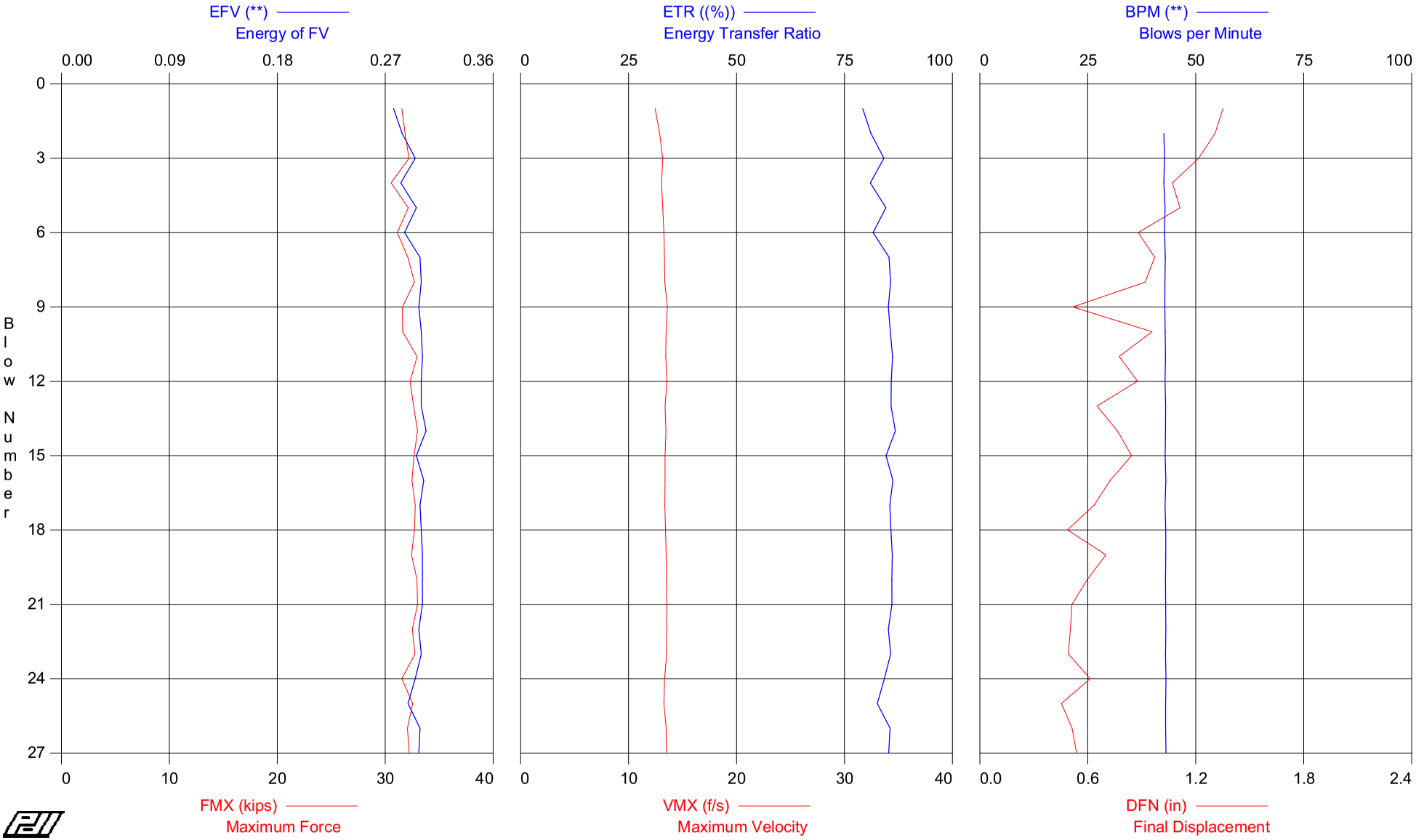
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 133.5 - 135
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 133.5 - 135
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 139.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

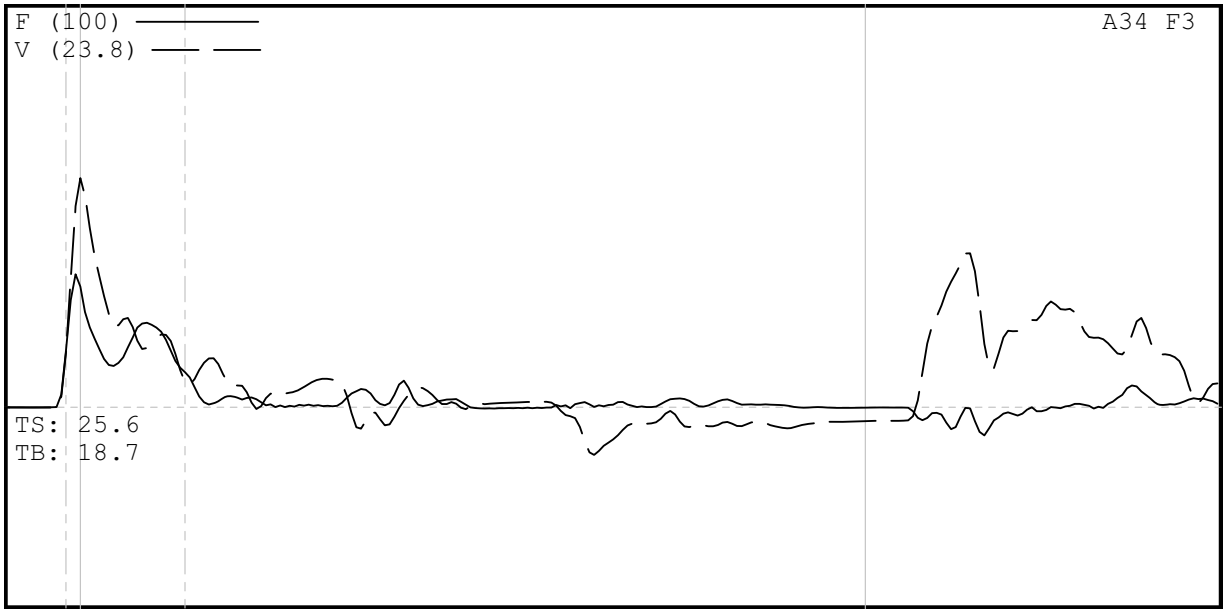
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	133.57	14	13.4	13.4	0.277	79	0	31.5	12.5	1.4
2	133.64	14	13.6	13.6	0.284	81	43	31.8	12.9	1.3
3	133.71	14	13.7	13.7	0.295	84	43	32.2	13.2	1.2
4	133.79	14	13.0	13.0	0.283	81	43	30.5	13.1	1.1
5	133.86	14	13.7	13.7	0.296	85	43	32.1	13.2	1.1
6	133.93	14	13.2	13.2	0.286	82	43	31.1	13.3	0.9
7	134.00	14	13.7	13.7	0.299	85	43	32.1	13.3	1.0
8	134.06	16	13.9	13.9	0.300	86	43	32.7	13.4	0.9
9	134.13	16	13.4	13.4	0.298	85	43	31.6	13.6	0.5
10	134.19	16	13.5	13.5	0.300	86	43	31.6	13.5	1.0
11	134.25	16	14.0	14.0	0.301	86	43	32.9	13.4	0.8
12	134.31	16	13.7	13.7	0.300	86	43	32.3	13.6	0.9
13	134.38	16	13.9	13.9	0.300	86	43	32.6	13.4	0.7
14	134.44	16	14.0	14.0	0.304	87	43	33.0	13.5	0.8
15	134.50	16	13.9	13.9	0.296	85	43	32.7	13.4	0.8
16	134.54	24	13.8	13.8	0.302	86	43	32.5	13.4	0.7
17	134.58	24	13.9	13.9	0.299	86	43	32.8	13.4	0.6
18	134.63	24	13.9	13.9	0.300	86	43	32.7	13.4	0.5
19	134.67	24	13.8	13.8	0.301	86	43	32.4	13.5	0.7
20	134.71	24	14.0	14.0	0.301	86	43	32.9	13.5	0.6
21	134.75	24	14.0	14.0	0.301	86	43	33.0	13.5	0.5
22	134.79	24	13.8	13.8	0.298	85	43	32.5	13.5	0.5
23	134.83	24	13.9	13.9	0.300	86	43	32.7	13.5	0.5
24	134.88	24	13.4	13.4	0.295	84	43	31.5	13.3	0.6
25	134.92	24	13.8	13.8	0.289	83	43	32.5	13.3	0.5
26	134.96	24	13.6	13.6	0.299	86	43	32.1	13.5	0.5
27	135.00	24	13.7	13.7	0.298	85	43	32.2	13.5	0.5
		Average	13.7	13.7	0.296	85	43	32.3	13.3	0.8
		Std. Dev.	0.3	0.3	0.007	2	0	0.6	0.2	0.3
		Maximum	14.0	14.0	0.304	87	43	33.0	13.6	1.4

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 133 5 - 135



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 133 5 - 135
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 133 5 - 135
9/2/2008 12:17:49 PM
Blow Number 22/21

Pile Properties

LE	139.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	16.54	ms
JC	1.20	[]
LP	134.75	ft

Quantity Results

CSXN	14.0	ksi
CSI	14.0	ksi
CSB	14.1	ksi
EFV	0.301	k-ft
ETR	86.0	(%)
BPM	43.0	bpm
FMX	33	kips
VMX	13.5	f/s
DFN	0.51	in

Sensors

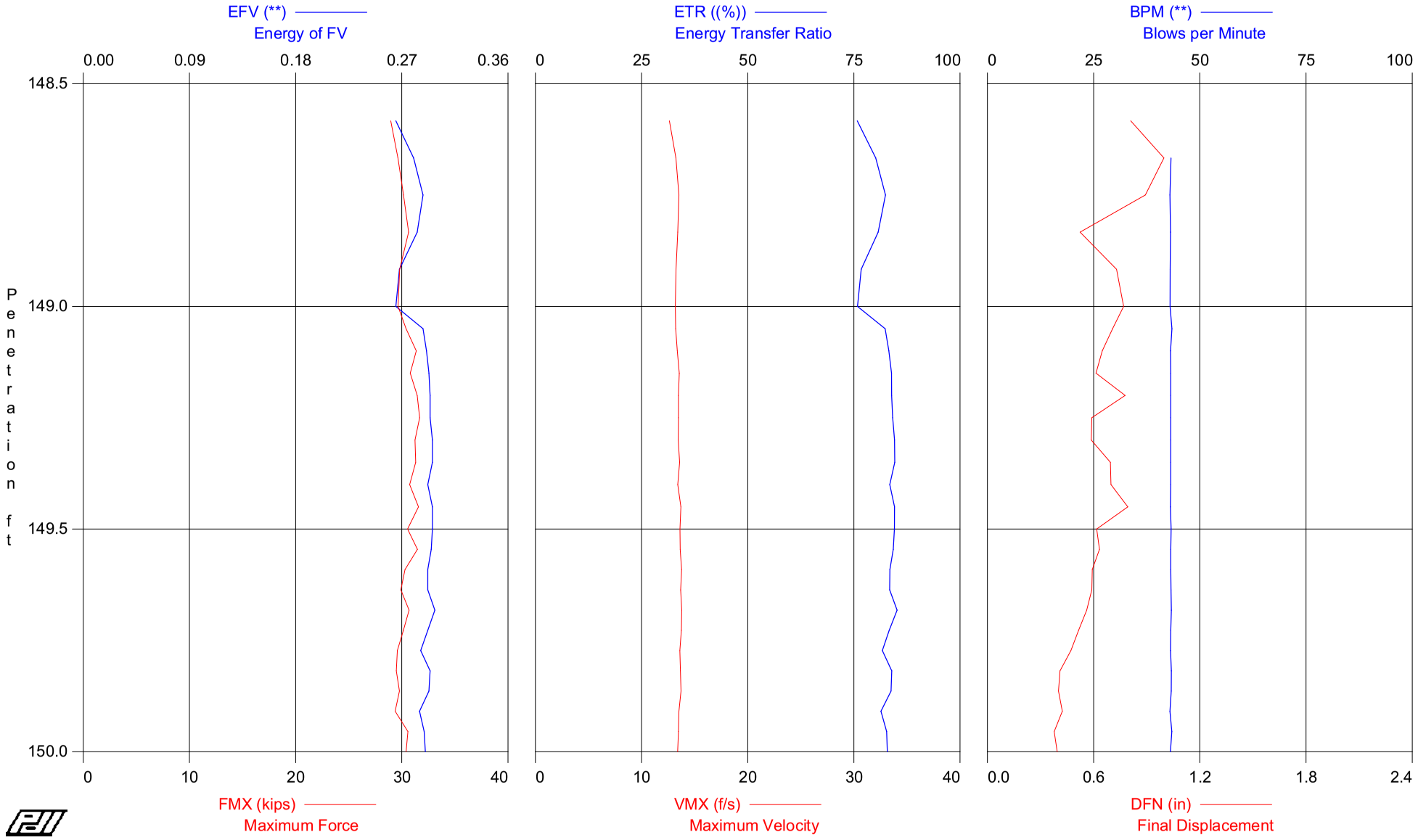
F3: [40-N3-1] 215.99 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F1/F2: USE 2 STRAIN
V3/V4: OK 0.98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 148.5 - 150
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 148.5 - 150
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 154.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	149.00	12	AV6	12.7	13.3	0.275	79	43	29.8	13.2	0.8
			STD	0.2	0.2	0.009	3	0	0.5	0.3	0.1
			MAX	13.0	13.6	0.288	82	43	30.6	13.5	1.0
16	149.50	20	AV10	13.2	13.9	0.294	84	43	31.1	13.5	0.7
			STD	0.2	0.2	0.003	1	0	0.4	0.1	0.1
			MAX	13.5	14.1	0.296	85	43	31.7	13.7	0.8
27	150.00	22	AV11	12.8	13.4	0.291	83	43	30.2	13.6	0.5
			STD	0.3	0.3	0.004	1	0	0.6	0.1	0.1
			MAX	13.4	14.0	0.298	85	43	31.5	13.8	0.6
			Average	12.9	13.6	0.289	82	43	30.4	13.5	0.6
			Std. Dev.	0.3	0.3	0.009	3	0	0.7	0.2	0.2
			Maximum	13.5	14.1	0.298	85	43	31.7	13.8	1.0

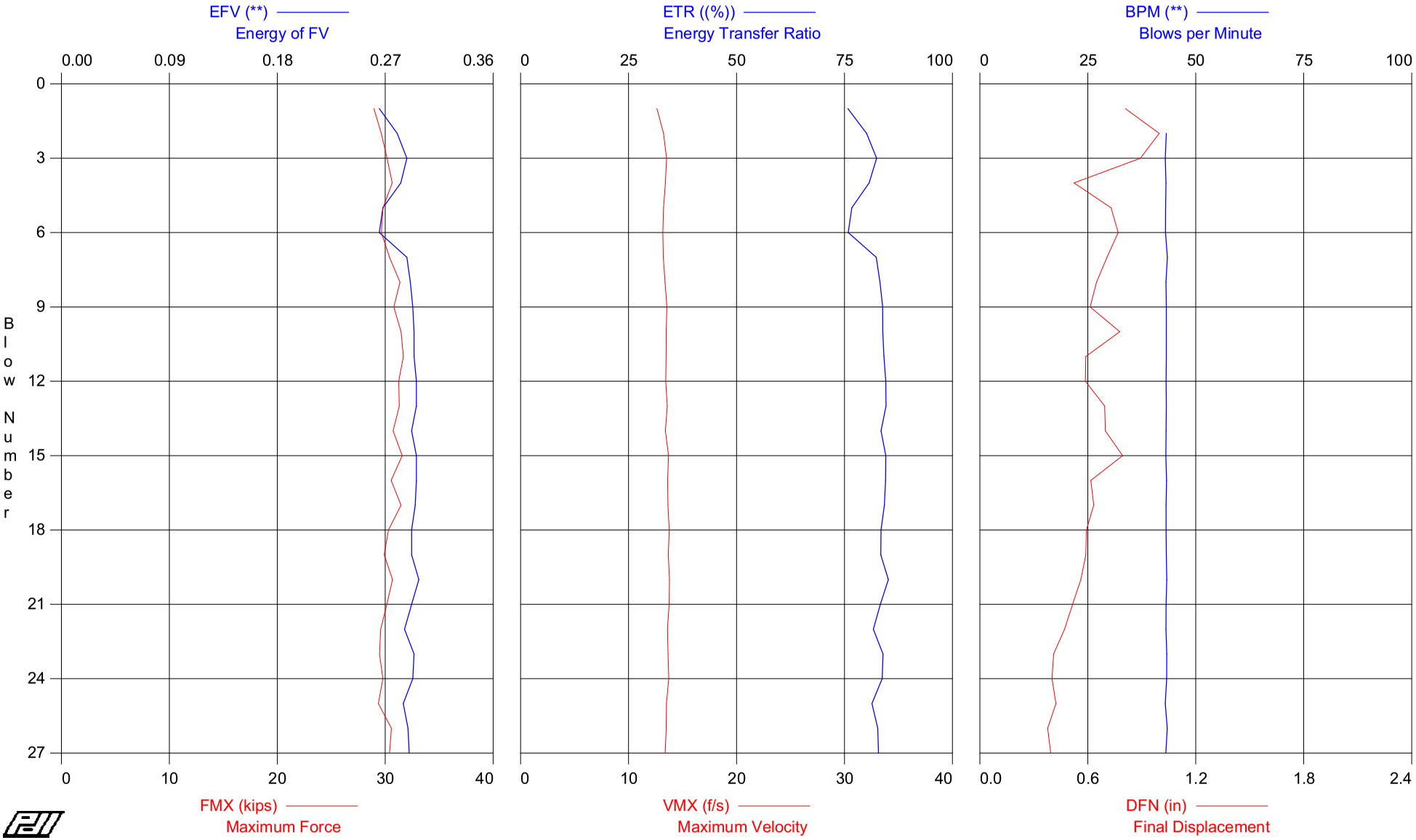
Total number of blows analyzed: 27

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 148.5 - 150
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 148.5 - 150
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 154.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

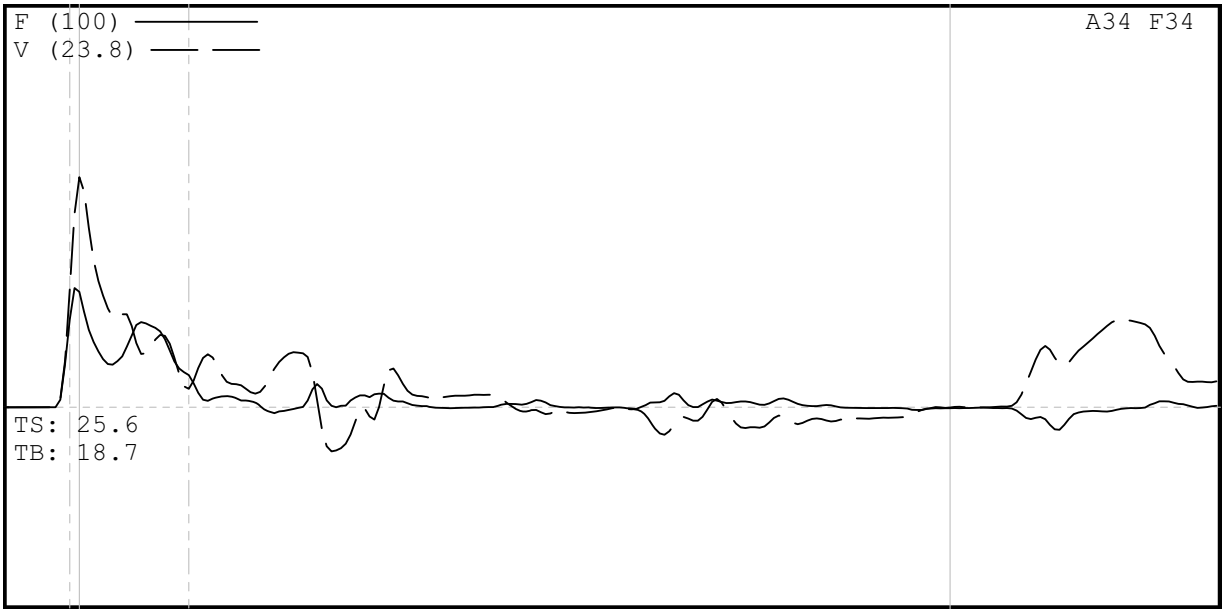
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	148.58	12	12.3	13.1	0.265	76	0	29.0	12.6	0.8
2	148.67	12	12.6	13.2	0.280	80	43	29.6	13.2	1.0
3	148.75	12	12.8	13.5	0.288	82	43	30.2	13.5	0.9
4	148.83	12	13.0	13.6	0.283	81	43	30.6	13.4	0.5
5	148.92	12	12.7	13.3	0.268	77	43	29.8	13.2	0.7
6	149.00	12	12.6	13.2	0.265	76	43	29.6	13.2	0.8
7	149.05	20	12.9	13.6	0.288	82	43	30.4	13.2	0.7
8	149.10	20	13.3	14.0	0.291	83	43	31.4	13.4	0.6
9	149.15	20	13.1	13.7	0.293	84	43	30.8	13.6	0.6
10	149.20	20	13.4	14.0	0.294	84	43	31.5	13.5	0.8
11	149.25	20	13.5	14.1	0.294	84	43	31.7	13.5	0.6
12	149.30	20	13.3	14.0	0.296	85	43	31.2	13.5	0.6
13	149.35	20	13.3	14.0	0.296	85	43	31.3	13.6	0.7
14	149.40	20	13.1	13.7	0.292	83	43	30.7	13.4	0.7
15	149.45	20	13.4	14.0	0.296	85	43	31.6	13.7	0.8
16	149.50	20	13.0	13.6	0.296	85	43	30.5	13.6	0.6
17	149.55	22	13.4	14.0	0.295	84	43	31.5	13.6	0.6
18	149.59	22	12.9	13.5	0.292	83	43	30.3	13.8	0.6
19	149.64	22	12.7	13.4	0.292	83	43	29.9	13.7	0.6
20	149.68	22	13.1	13.6	0.298	85	43	30.7	13.8	0.6
21	149.73	22	12.8	13.4	0.292	83	43	30.1	13.8	0.5
22	149.77	22	12.6	13.1	0.286	82	43	29.6	13.6	0.5
23	149.82	22	12.5	13.1	0.294	84	43	29.5	13.7	0.4
24	149.86	22	12.7	13.3	0.293	84	43	29.8	13.7	0.4
25	149.91	22	12.5	13.0	0.285	81	43	29.4	13.5	0.4
26	149.95	22	13.0	13.6	0.289	83	43	30.6	13.5	0.4
27	150.00	22	12.9	13.6	0.290	83	43	30.4	13.4	0.4
		Average	12.9	13.6	0.289	82	43	30.4	13.5	0.6
		Std. Dev.	0.3	0.3	0.009	3	0	0.7	0.2	0.2
		Maximum	13.5	14.1	0.298	85	43	31.7	13.8	1.0

Total number of blows analyzed: 27

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 148 5 - 150



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 148 5 - 150
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 148 5 - 150
9/2/2008 1:49:07 PM
Blow Number 24/22

Pile Properties

LE	154.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	18.32	ms
JC	1.20	[]
LP	149.77	ft

Quantity Results

CSXN	12.6	ksi
CSI	13.1	ksi
CSB	13.3	ksi
EFV	0.286	k-ft
ETR	81.7	(%)
BPM	43.1	bpm
FMX	30	kips
VMX	13.6	f/s
DFN	0.47	in

Sensors

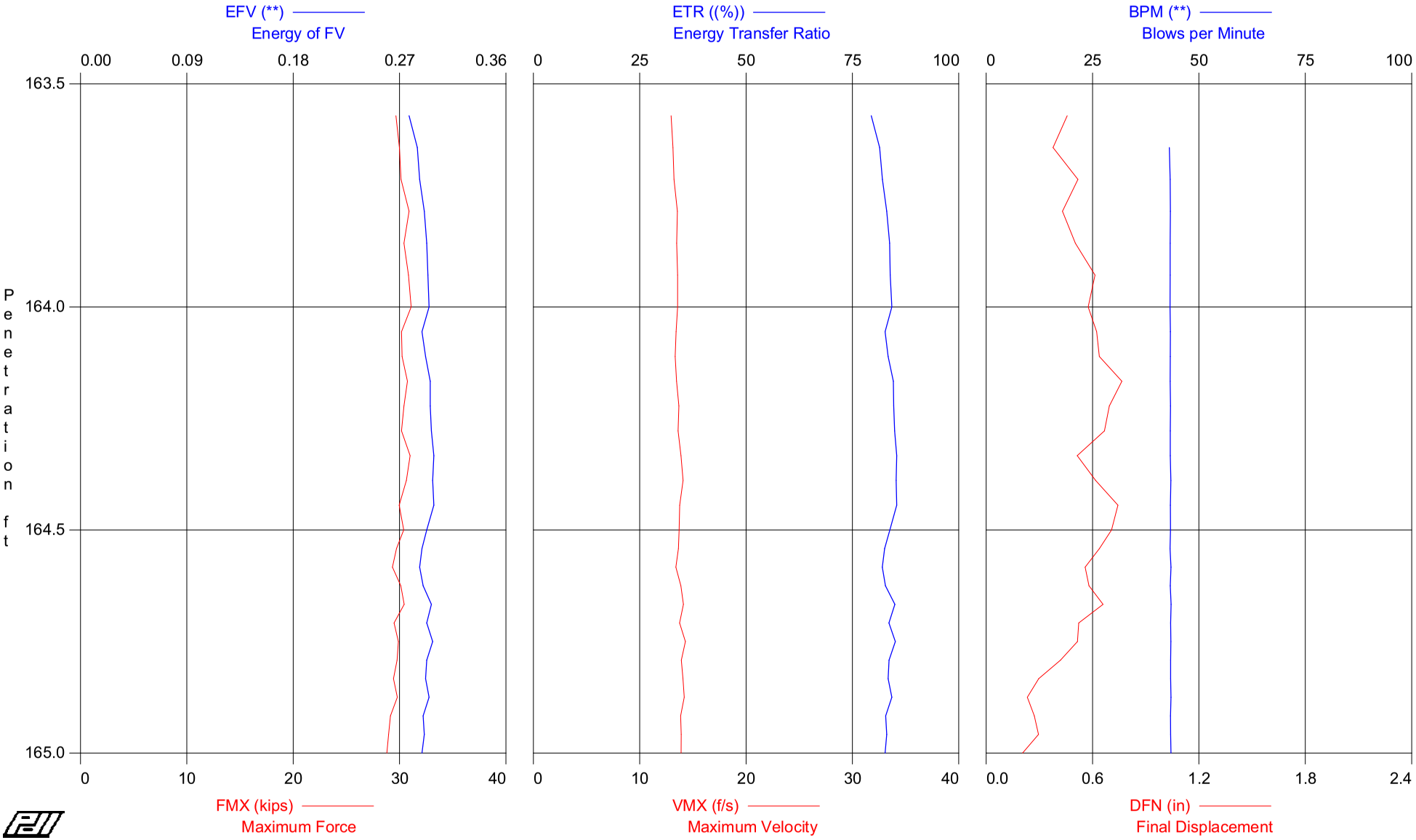
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 1.00

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 163.5 - 165
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 163.5 - 165
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 169.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
7	164.00	14	AV7	12.9	13.5	0.289	83	43	30.4	13.3	0.5
			STD	0.2	0.2	0.006	2	0	0.5	0.2	0.1
			MAX	13.2	13.8	0.295	84	43	31.1	13.6	0.6
16	164.50	18	AV9	12.9	13.5	0.295	84	43	30.4	13.7	0.7
			STD	0.1	0.1	0.003	1	0	0.3	0.2	0.1
			MAX	13.2	13.8	0.299	85	43	31.0	14.1	0.8
28	165.00	24	AV12	12.6	13.3	0.292	83	43	29.6	13.9	0.4
			STD	0.2	0.2	0.003	1	0	0.5	0.2	0.2
			MAX	13.0	13.6	0.298	85	43	30.4	14.3	0.7
			Average	12.8	13.4	0.292	84	43	30.1	13.7	0.5
			Std. Dev.	0.3	0.2	0.005	1	0	0.6	0.3	0.2
			Maximum	13.2	13.8	0.299	85	43	31.1	14.3	0.8

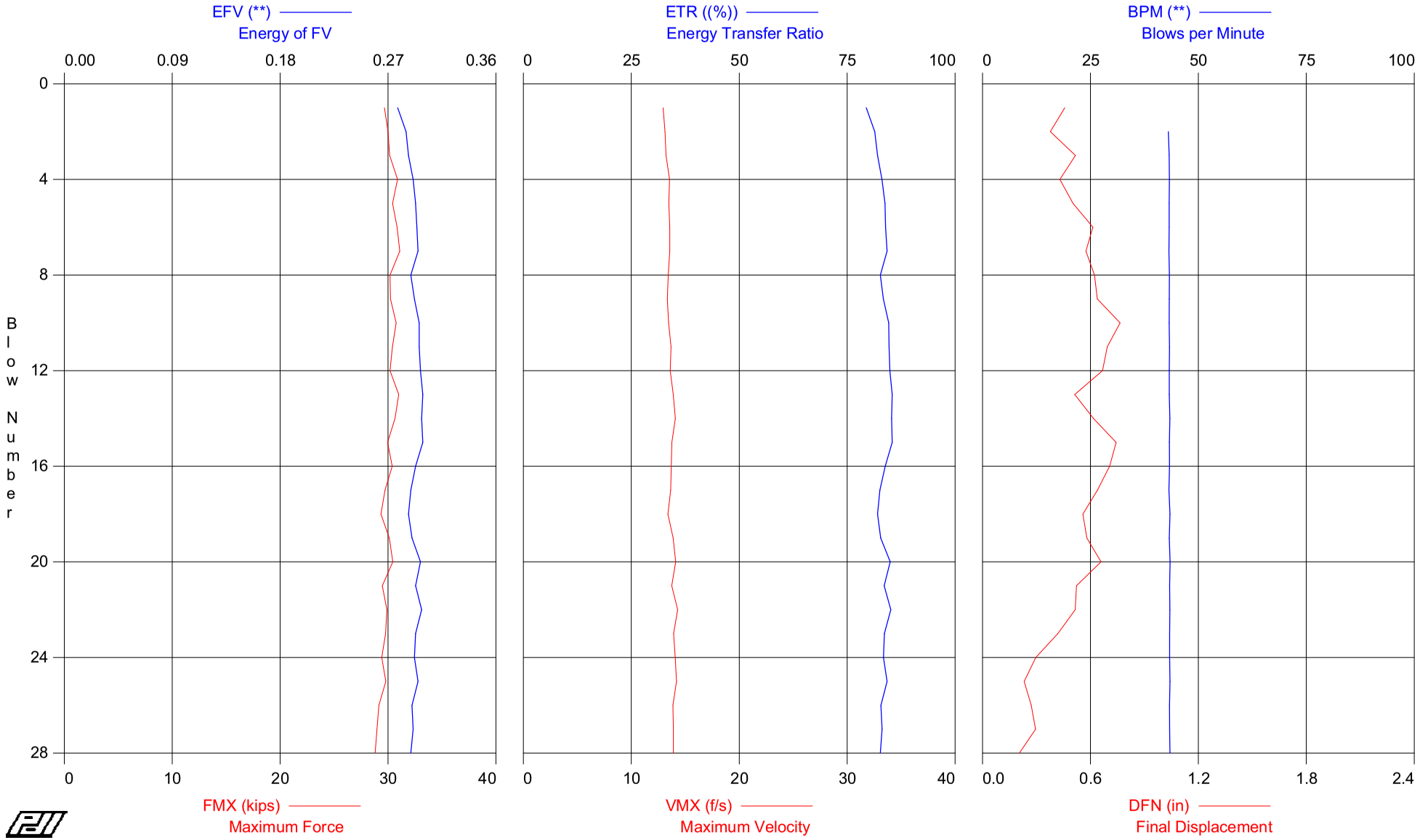
Total number of blows analyzed: 28

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 163.5 - 165
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 163.5 - 165
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 169.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

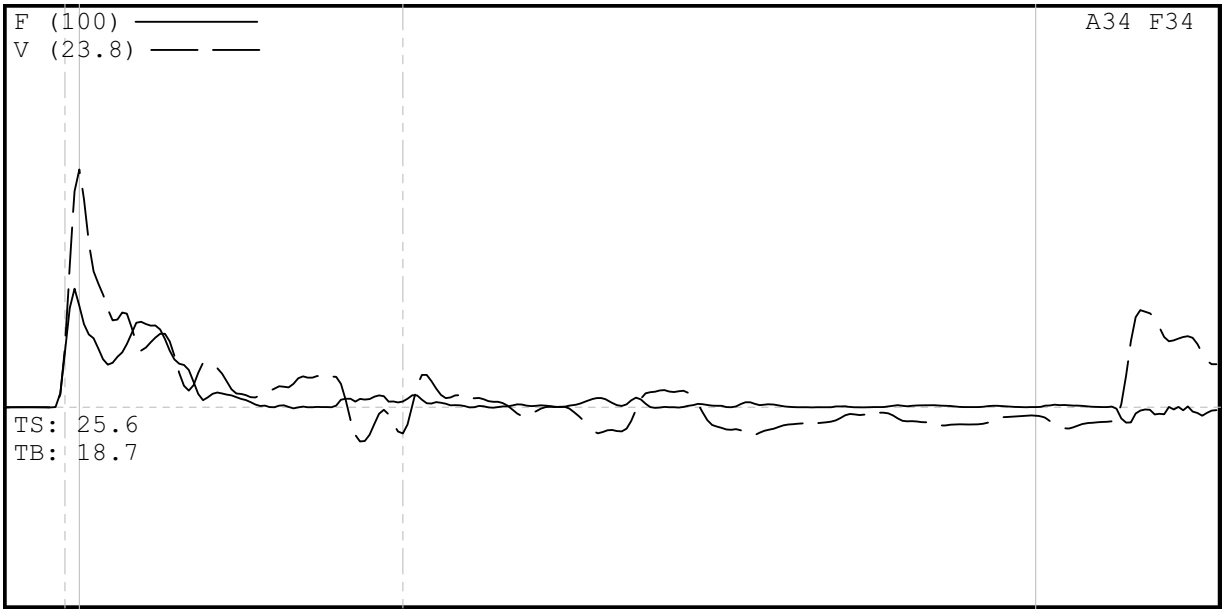
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	163.57	14	12.6	13.2	0.278	79	0	29.7	13.0	0.5
2	163.64	14	12.8	13.3	0.285	81	43	30.0	13.1	0.4
3	163.71	14	12.8	13.4	0.287	82	43	30.1	13.2	0.5
4	163.79	14	13.1	13.7	0.291	83	43	30.9	13.5	0.4
5	163.86	14	12.9	13.5	0.293	84	43	30.4	13.5	0.5
6	163.93	14	13.1	13.7	0.294	84	43	30.8	13.6	0.6
7	164.00	14	13.2	13.8	0.295	84	43	31.1	13.6	0.6
8	164.06	18	12.8	13.3	0.289	83	43	30.2	13.4	0.6
9	164.11	18	12.9	13.4	0.292	83	43	30.2	13.3	0.6
10	164.17	18	13.1	13.7	0.296	85	43	30.7	13.5	0.8
11	164.22	18	12.9	13.5	0.296	85	43	30.4	13.7	0.7
12	164.28	18	12.8	13.5	0.297	85	43	30.2	13.6	0.7
13	164.33	18	13.2	13.8	0.299	85	43	31.0	13.9	0.5
14	164.39	18	13.0	13.6	0.298	85	43	30.6	14.1	0.6
15	164.44	18	12.8	13.4	0.299	85	43	30.0	13.8	0.7
16	164.50	18	12.9	13.6	0.293	84	43	30.4	13.7	0.7
17	164.54	24	12.6	13.4	0.289	83	43	29.7	13.6	0.6
18	164.58	24	12.5	13.2	0.287	82	43	29.3	13.4	0.6
19	164.63	24	12.8	13.3	0.290	83	43	30.1	13.9	0.6
20	164.67	24	13.0	13.6	0.297	85	43	30.4	14.1	0.7
21	164.71	24	12.5	13.3	0.293	84	43	29.5	13.7	0.5
22	164.75	24	12.7	13.3	0.298	85	43	29.9	14.3	0.5
23	164.79	24	12.7	13.4	0.293	84	43	29.8	13.9	0.4
24	164.83	24	12.5	13.2	0.292	83	43	29.4	14.1	0.3
25	164.88	24	12.7	13.4	0.295	84	43	29.8	14.2	0.2
26	164.92	24	12.4	13.2	0.290	83	43	29.1	13.8	0.3
27	164.96	24	12.3	13.0	0.291	83	43	29.0	13.9	0.3
28	165.00	24	12.3	12.9	0.289	83	43	28.8	13.9	0.2
		Average	12.8	13.4	0.292	84	43	30.1	13.7	0.5
		Std. Dev.	0.3	0.2	0.005	1	0	0.6	0.3	0.2
		Maximum	13.2	13.8	0.299	85	43	31.1	14.3	0.8

Total number of blows analyzed: 28

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 163 5 - 165



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 163 5 - 165
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 163 5 - 165
9/2/2008 3:35:10 PM
Blow Number 28/24

Pile Properties

LE	169.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	20.10	ms
JC	1.20	[]
LP	164.83	ft

Quantity Results

CSXN	12.5	ksi
CSI	13.2	ksi
CSB	13.9	ksi
EFV	0.292	k-ft
ETR	83.4	(%)
BPM	43.4	bpm
FMX	29	kips
VMX	14.1	f/s
DFN	0.30	in

Sensors

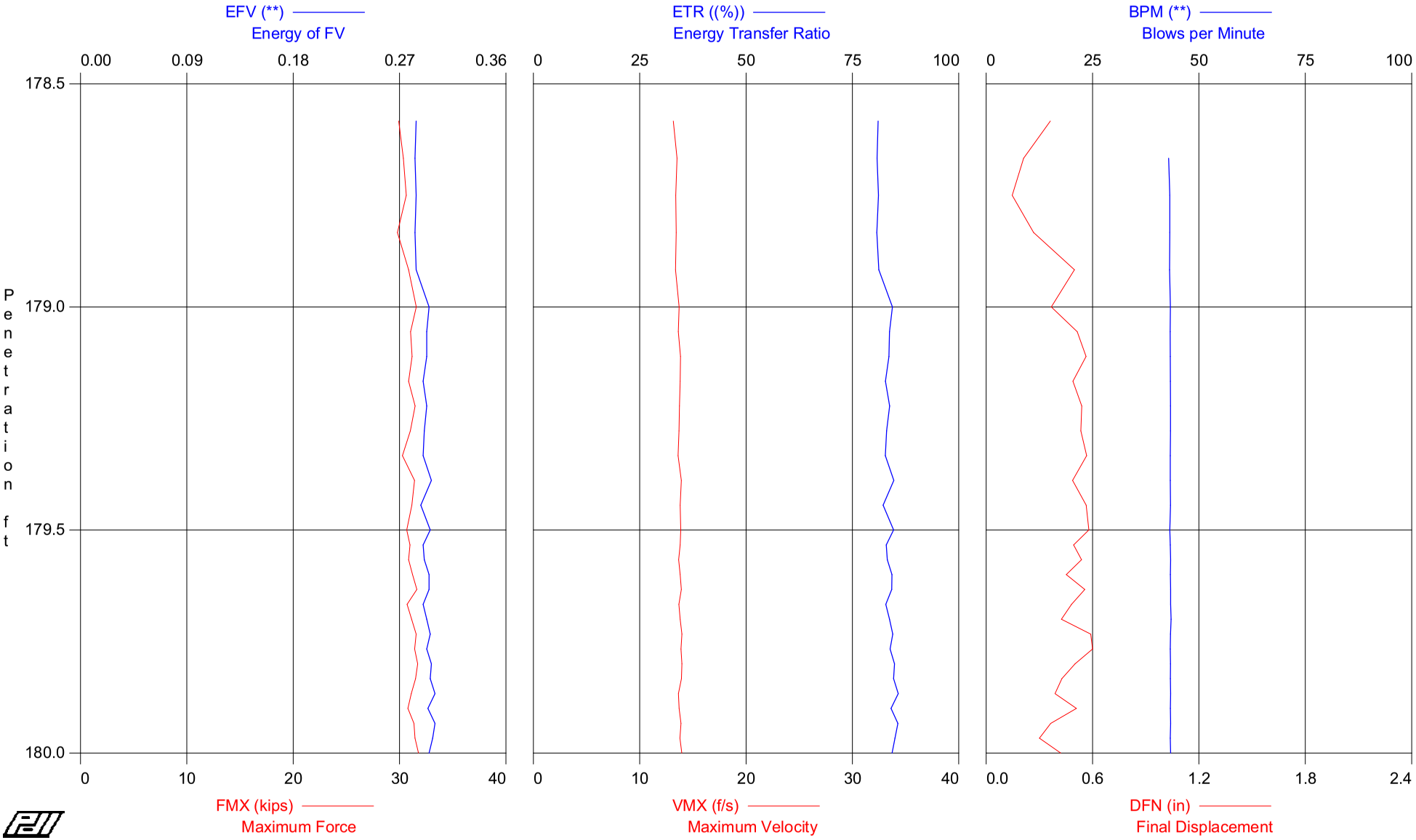
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.08
V3/V4: OK 1.09

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 178.5 - 180
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 178.5 - 180
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 184.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	179.00	12	AV6	13.0	13.5	0.286	82	43	30.5	13.4	0.3
			STD	0.3	0.3	0.004	1	0	0.6	0.2	0.1
			MAX	13.4	14.0	0.295	84	43	31.6	13.7	0.5
15	179.50	18	AV9	13.2	13.7	0.292	83	43	31.0	13.8	0.5
			STD	0.1	0.1	0.003	1	0	0.3	0.1	0.0
			MAX	13.4	13.9	0.297	85	43	31.5	13.9	0.6
30	180.00	30	AV15	13.3	13.8	0.295	84	43	31.3	13.8	0.5
			STD	0.1	0.1	0.003	1	0	0.3	0.1	0.1
			MAX	13.5	14.0	0.300	86	43	31.8	14.0	0.6
			Average	13.2	13.7	0.292	83	43	31.0	13.7	0.5
			Std. Dev.	0.2	0.2	0.005	1	0	0.5	0.2	0.1
			Maximum	13.5	14.0	0.300	86	43	31.8	14.0	0.6

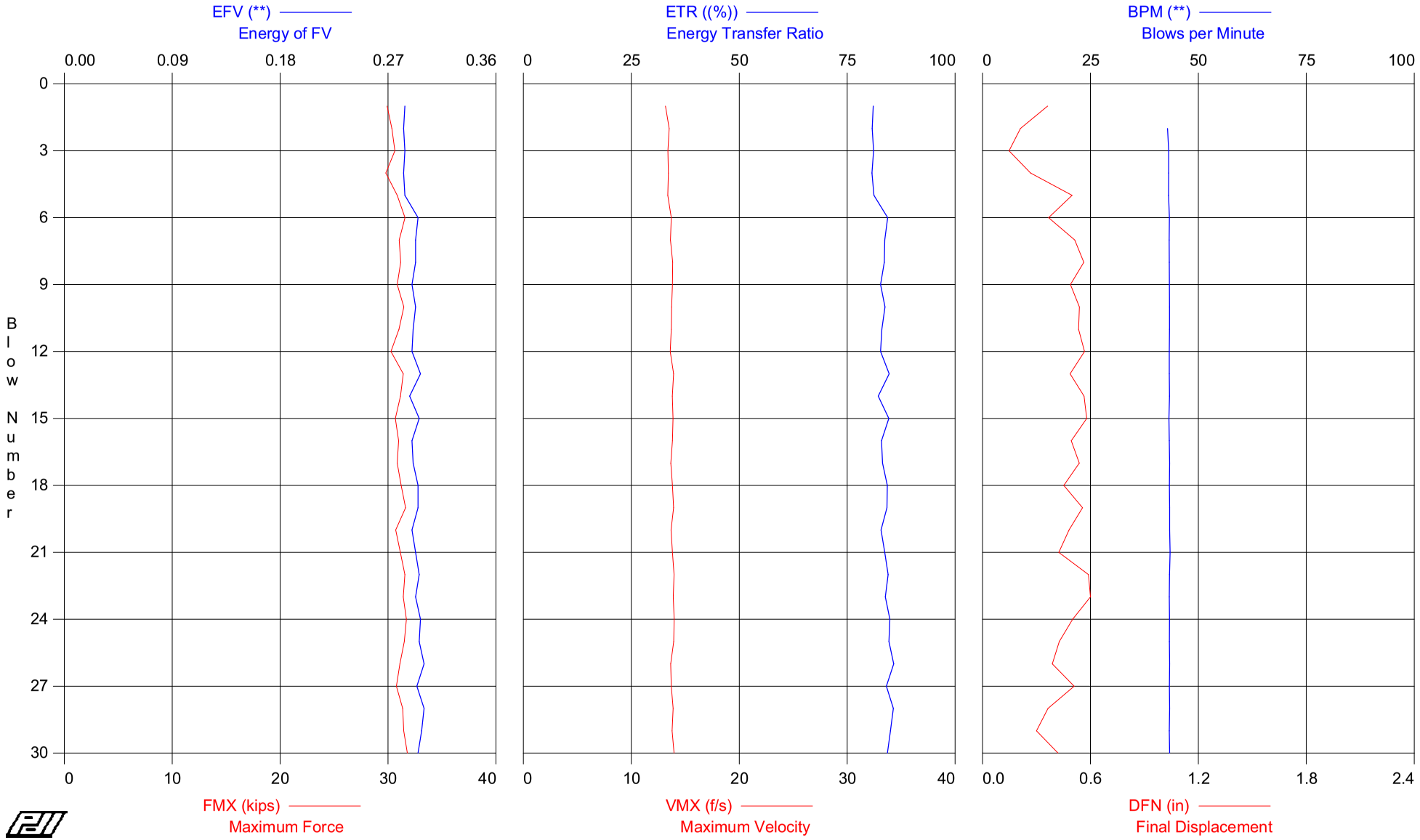
Total number of blows analyzed: 30

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 24-Sep-2008

Test date: 2-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 178.5 - 180
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 178.5 - 180
OP: SDW

HAMMER #5 N3 B-800
Test date: 2-Sep-2008

AR: 2.35 in^2
LE: 184.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

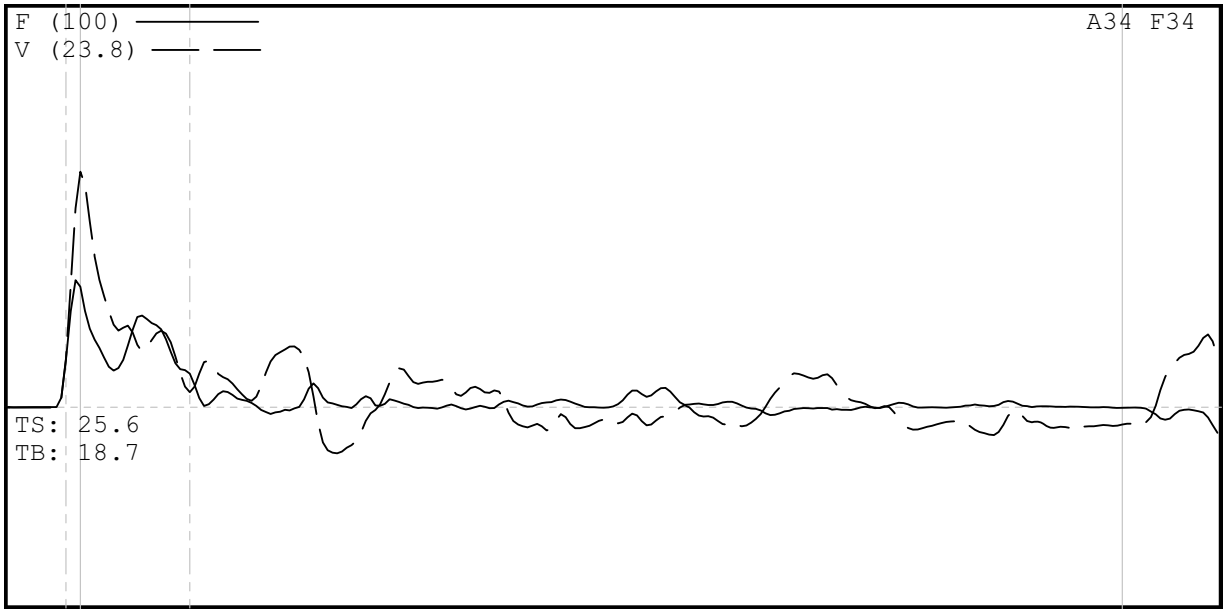
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	178.58	12	12.7	13.3	0.284	81	0	29.9	13.2	0.4
2	178.67	12	12.9	13.4	0.283	81	43	30.4	13.5	0.2
3	178.75	12	13.0	13.6	0.284	81	43	30.6	13.4	0.1
4	178.83	12	12.7	13.2	0.283	81	43	29.8	13.4	0.3
5	178.92	12	13.1	13.7	0.284	81	43	30.9	13.4	0.5
6	179.00	12	13.4	14.0	0.295	84	43	31.6	13.7	0.4
7	179.06	18	13.2	13.8	0.293	84	43	31.0	13.6	0.5
8	179.11	18	13.3	13.7	0.293	84	43	31.2	13.8	0.6
9	179.17	18	13.1	13.6	0.290	83	43	30.9	13.8	0.5
10	179.22	18	13.4	13.9	0.293	84	43	31.5	13.7	0.5
11	179.28	18	13.2	13.7	0.291	83	43	31.0	13.7	0.5
12	179.33	18	12.9	13.5	0.290	83	43	30.3	13.6	0.6
13	179.39	18	13.4	13.8	0.297	85	43	31.4	13.9	0.5
14	179.44	18	13.3	13.7	0.288	82	43	31.2	13.8	0.6
15	179.50	18	13.1	13.6	0.296	85	43	30.7	13.9	0.6
16	179.53	30	13.2	13.6	0.290	83	43	31.0	13.8	0.5
17	179.57	30	13.1	13.7	0.291	83	43	30.9	13.7	0.5
18	179.60	30	13.3	13.8	0.295	84	43	31.2	13.8	0.5
19	179.63	30	13.5	13.9	0.295	84	43	31.6	13.9	0.6
20	179.67	30	13.1	13.6	0.290	83	43	30.7	13.7	0.5
21	179.70	30	13.2	13.8	0.293	84	43	31.1	13.8	0.4
22	179.73	30	13.4	13.9	0.296	84	43	31.6	14.0	0.6
23	179.77	30	13.4	13.9	0.293	84	43	31.4	13.9	0.6
24	179.80	30	13.5	13.9	0.297	85	43	31.7	14.0	0.5
25	179.83	30	13.4	13.9	0.296	85	43	31.5	13.9	0.4
26	179.87	30	13.2	13.7	0.300	86	43	31.1	13.6	0.4
27	179.90	30	13.1	13.7	0.294	84	43	30.8	13.7	0.5
28	179.93	30	13.3	13.9	0.300	86	43	31.4	13.9	0.4
29	179.97	30	13.4	13.9	0.298	85	43	31.4	13.8	0.3
30	180.00	30	13.5	14.0	0.295	84	43	31.8	14.0	0.4
		Average	13.2	13.7	0.292	83	43	31.0	13.7	0.5
		Std. Dev.	0.2	0.2	0.005	1	0	0.5	0.2	0.1
		Maximum	13.5	14.0	0.300	86	43	31.8	14.0	0.6

Total number of blows analyzed: 30

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 178 5 - 180



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 178 5 - 180
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 178 5 - 180
9/2/2008 5:34:05 PM
Blow Number 30/25

Pile Properties

LE	184.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	21.89	ms
JC	1.20	[]
LP	179.83	ft

Quantity Results

CSXN	13.4	ksi
CSI	13.9	ksi
CSB	14.5	ksi
EFV	0.296	k-ft
ETR	84.7	(%)
BPM	43.3	bpm
FMX	32	kips
VMX	13.9	f/s
DFN	0.43	in

Sensors

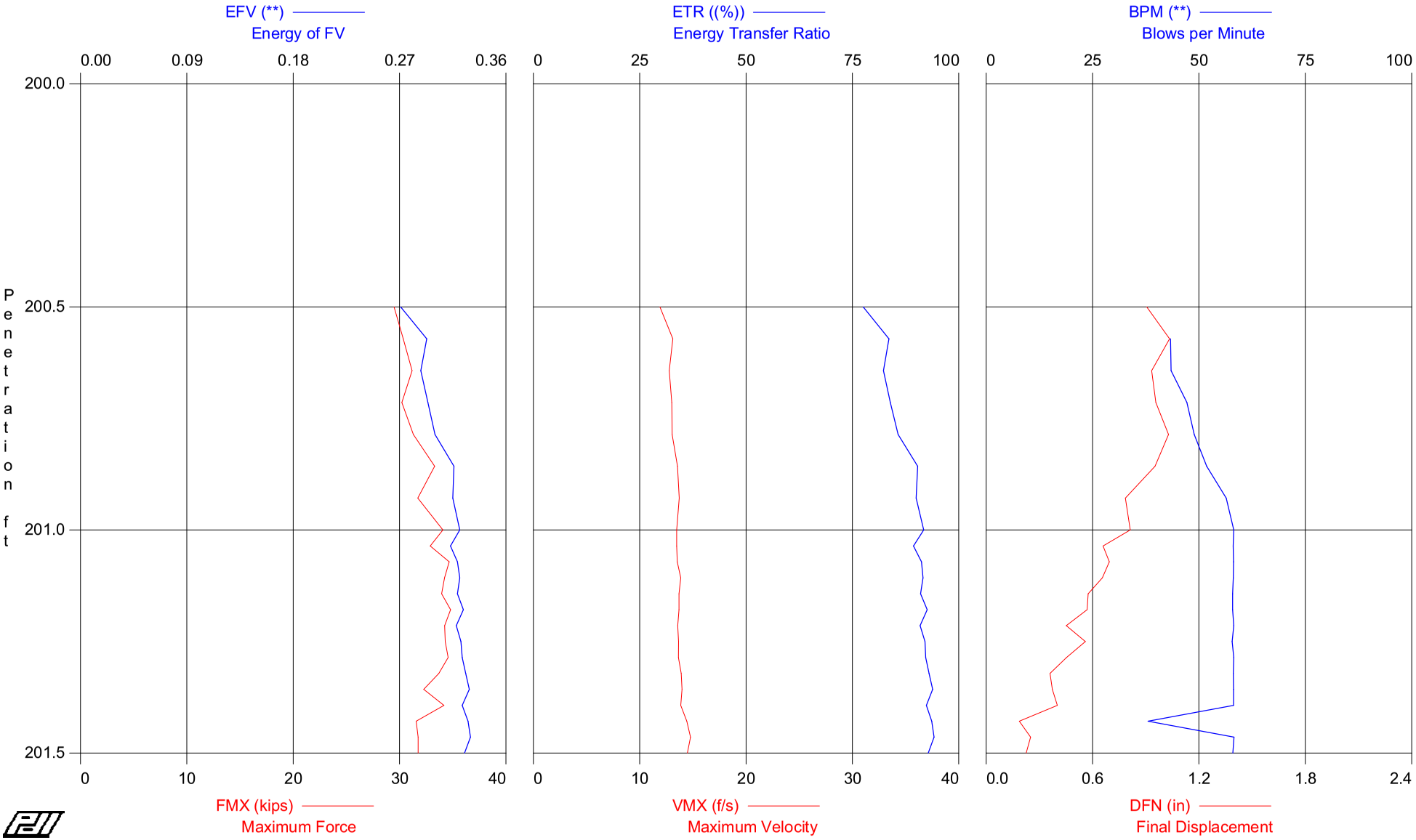
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 3-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 200 - 201.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 200 - 201.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 3-Sep-2008

AR: 2.35 in^2
LE: 206.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
1	200.50	2	AV1	12.5	12.5	0.271	78	**	29.5	11.9	0.9
			MAX	12.5	12.5	0.271	78	**	29.5	11.9	0.9
8	201.00	14	AV7	13.5	13.5	0.304	87	50	31.7	13.2	0.9
			STD	0.6	0.6	0.012	4	5	1.3	0.3	0.1
			MAX	14.5	14.5	0.321	92	58	34.1	13.7	1.0
22	201.50	28	AV14	14.2	14.2	0.323	92	57	33.5	13.9	0.5
			STD	0.5	0.5	0.005	1	5	1.1	0.4	0.2
			MAX	14.8	14.8	0.330	94	58	34.8	14.8	0.7
			Average	13.9	13.9	0.314	90	54	32.7	13.6	0.6
			Std. Dev.	0.7	0.7	0.015	4	6	1.6	0.6	0.3
			Maximum	14.8	14.8	0.330	94	58	34.8	14.8	1.0

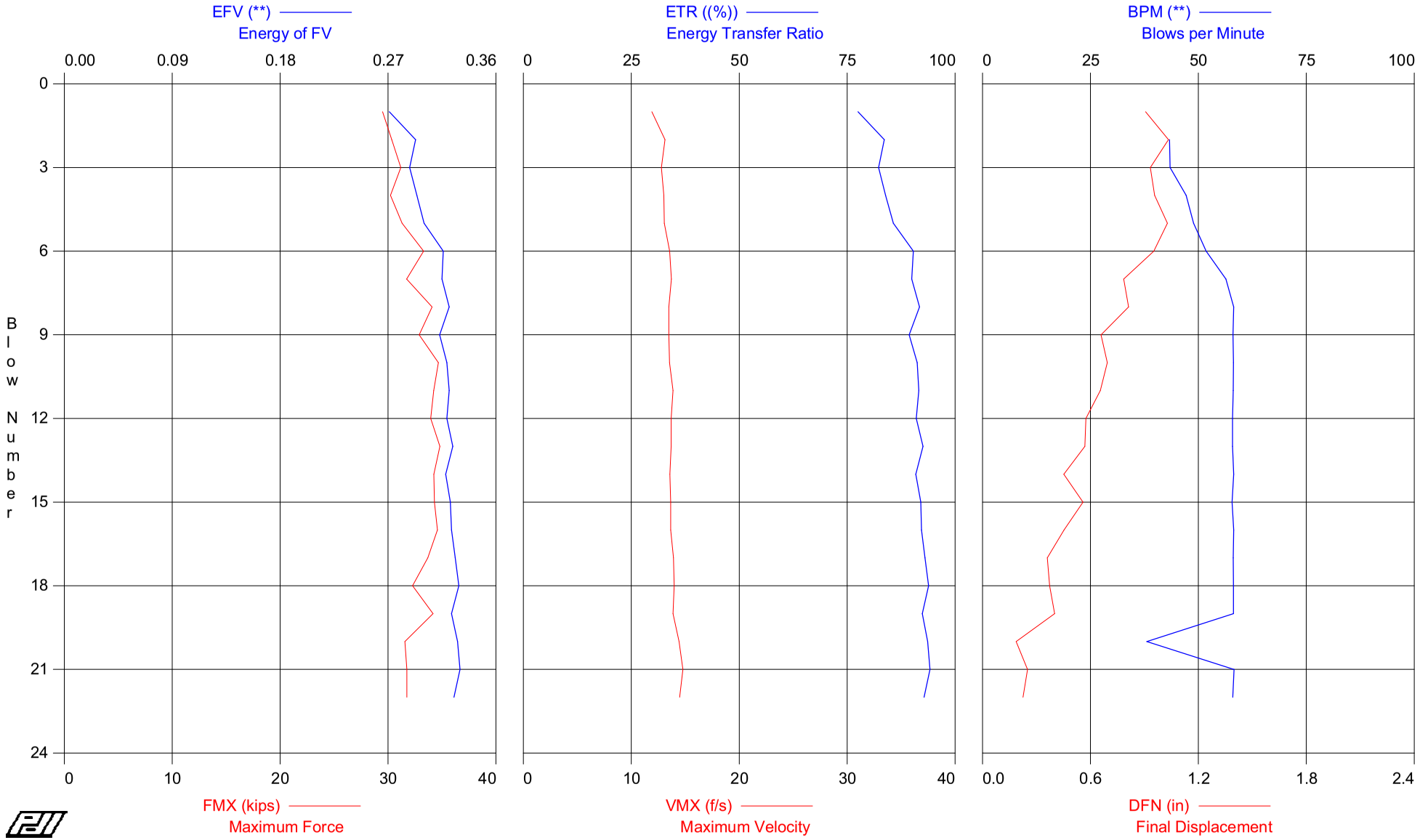
Total number of blows analyzed: 22

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 3-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 200 - 201.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 200 - 201.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 3-Sep-2008

AR: 2.35 in^2
LE: 206.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

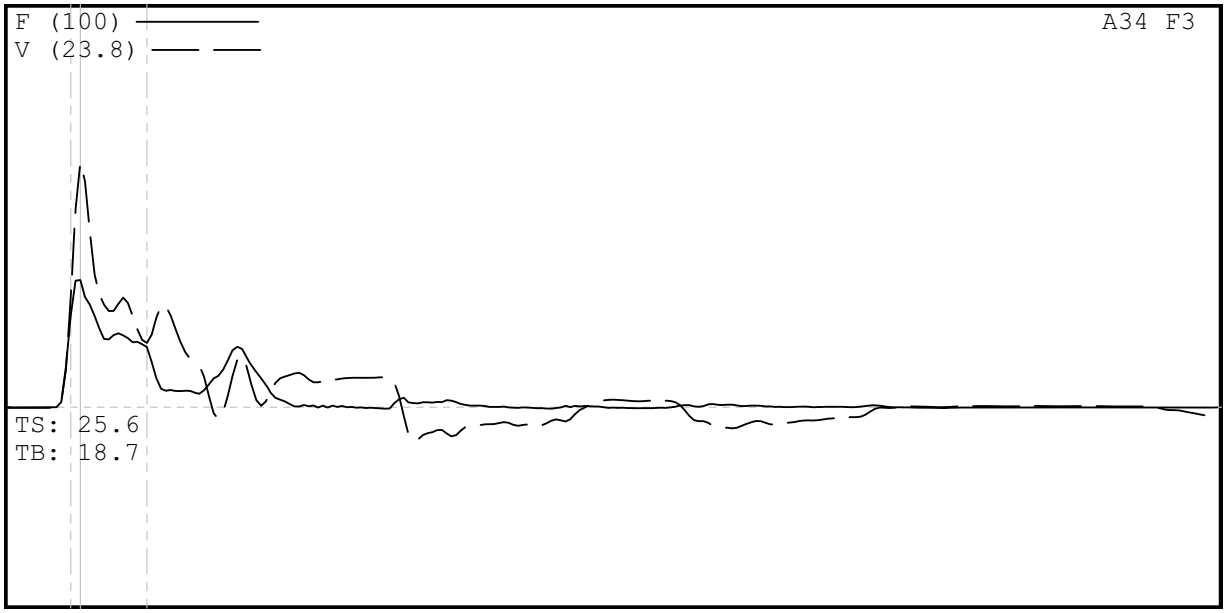
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	200.50	2	12.5	12.5	0.271	78	0	29.5	11.9	0.9
2	200.57	14	12.9	12.9	0.293	84	43	30.3	13.1	1.0
3	200.64	14	13.3	13.3	0.288	82	43	31.2	12.8	0.9
4	200.71	14	12.9	12.9	0.294	84	47	30.2	13.0	1.0
5	200.79	14	13.3	13.3	0.300	86	49	31.3	13.1	1.0
6	200.86	14	14.2	14.2	0.316	90	52	33.3	13.6	1.0
7	200.93	14	13.5	13.5	0.315	90	56	31.7	13.7	0.8
8	201.00	14	14.5	14.5	0.321	92	58	34.1	13.5	0.8
9	201.04	28	14.0	14.0	0.313	89	58	32.9	13.5	0.7
10	201.07	28	14.7	14.7	0.319	91	58	34.7	13.5	0.7
11	201.11	28	14.6	14.6	0.321	92	58	34.2	13.9	0.7
12	201.14	28	14.4	14.4	0.319	91	58	34.0	13.7	0.6
13	201.18	28	14.8	14.8	0.324	93	58	34.8	13.7	0.6
14	201.21	28	14.6	14.6	0.318	91	58	34.2	13.6	0.5
15	201.25	28	14.6	14.6	0.322	92	58	34.3	13.7	0.6
16	201.29	28	14.7	14.7	0.323	92	58	34.6	13.6	0.5
17	201.32	28	14.3	14.3	0.326	93	58	33.7	13.9	0.4
18	201.36	28	13.7	13.7	0.329	94	58	32.3	14.0	0.4
19	201.39	28	14.5	14.5	0.323	92	58	34.2	13.9	0.4
20	201.43	28	13.4	13.4	0.328	94	38	31.6	14.4	0.2
21	201.46	28	13.5	13.5	0.330	94	58	31.8	14.8	0.3
22	201.50	28	13.5	13.5	0.325	93	58	31.8	14.5	0.2
		Average	13.9	13.9	0.314	90	54	32.7	13.6	0.6
		Std. Dev.	0.7	0.7	0.015	4	6	1.6	0.6	0.3
		Maximum	14.8	14.8	0.330	94	58	34.8	14.8	1.0

Total number of blows analyzed: 22

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 200 - 201 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 200 - 201 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 200 - 201 5
9/3/2008 12:58:31 PM
Blow Number 28/20

Pile Properties

LE	206.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	24.50	ms
JC	1.20	[]

Quantity Results

CSXN	13.4	ksi
CSI	13.4	ksi
CSB	15.5	ksi
EFV	0.328	k-ft
ETR	93.6	(%)
BPM	38.0	bpm
FMX	32	kips
VMX	14.4	f/s
DFN	0.19	in

Sensors

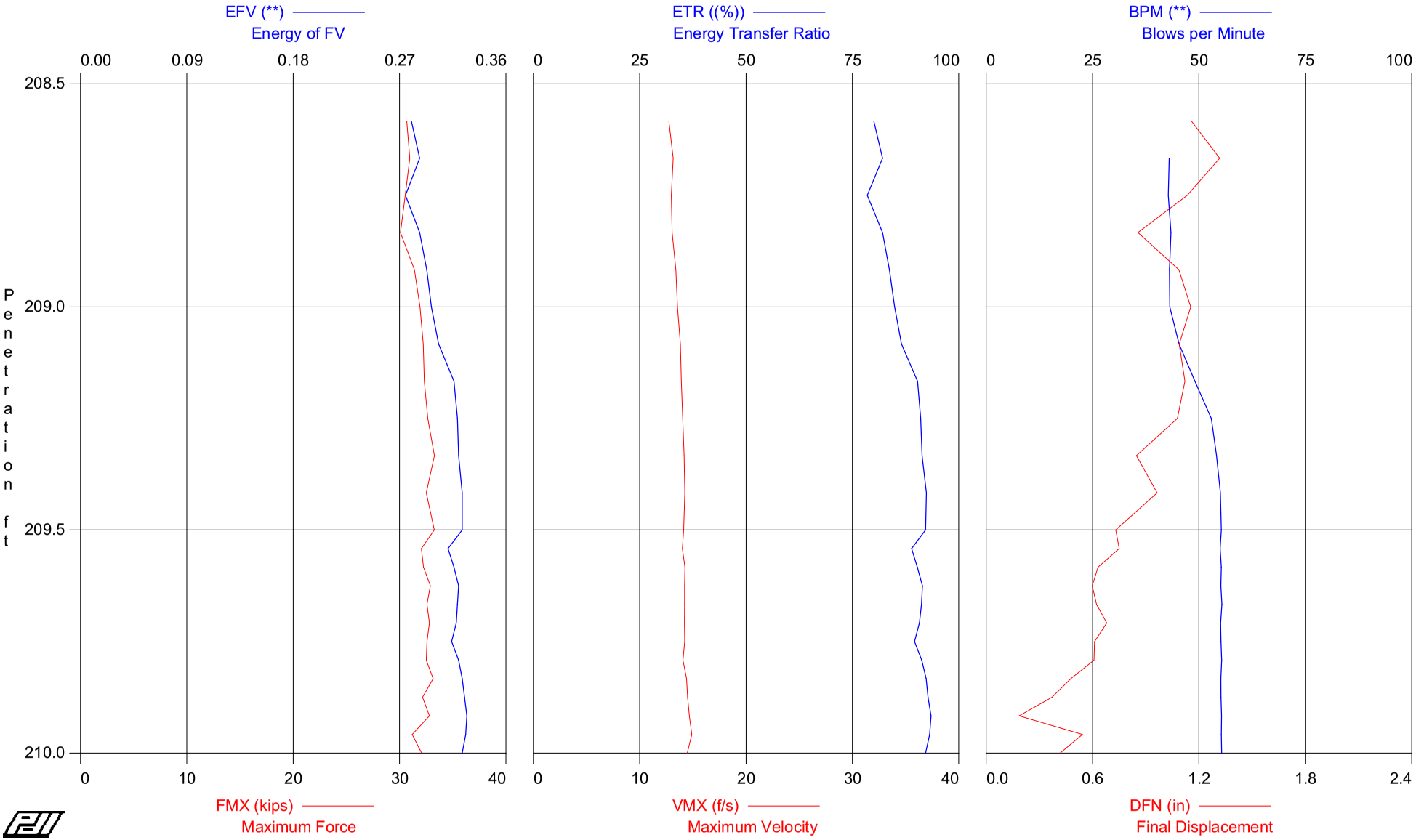
F3: [40-N3-1] 215.99 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F1/F2: USE 2 STRAIN
V3/V4: OK 1.08

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 3-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 208.5 - 210
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 208.5 - 210
OP: SDW

HAMMER #5 N3 B-800
Test date: 3-Sep-2008

AR: 2.35 in^2
LE: 214.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	209.00	12	AV6	13.2	13.8	0.286	82	43	30.9	13.1	1.1
			STD	0.3	0.3	0.007	2	0	0.6	0.3	0.1
			MAX	13.6	14.1	0.297	85	43	31.9	13.6	1.3
12	209.50	12	AV6	13.9	14.5	0.317	91	52	32.7	14.1	1.0
			STD	0.2	0.2	0.007	2	4	0.4	0.1	0.1
			MAX	14.2	14.8	0.323	92	55	33.3	14.2	1.1
24	210.00	24	AV12	13.8	14.4	0.320	91	55	32.4	14.3	0.5
			STD	0.2	0.2	0.005	1	0	0.5	0.2	0.1
			MAX	14.1	14.7	0.327	93	55	33.2	14.9	0.8
			Average	13.7	14.3	0.311	89	52	32.1	14.0	0.8
			Std. Dev.	0.4	0.4	0.015	4	5	0.9	0.5	0.3
			Maximum	14.2	14.8	0.327	93	55	33.3	14.9	1.3

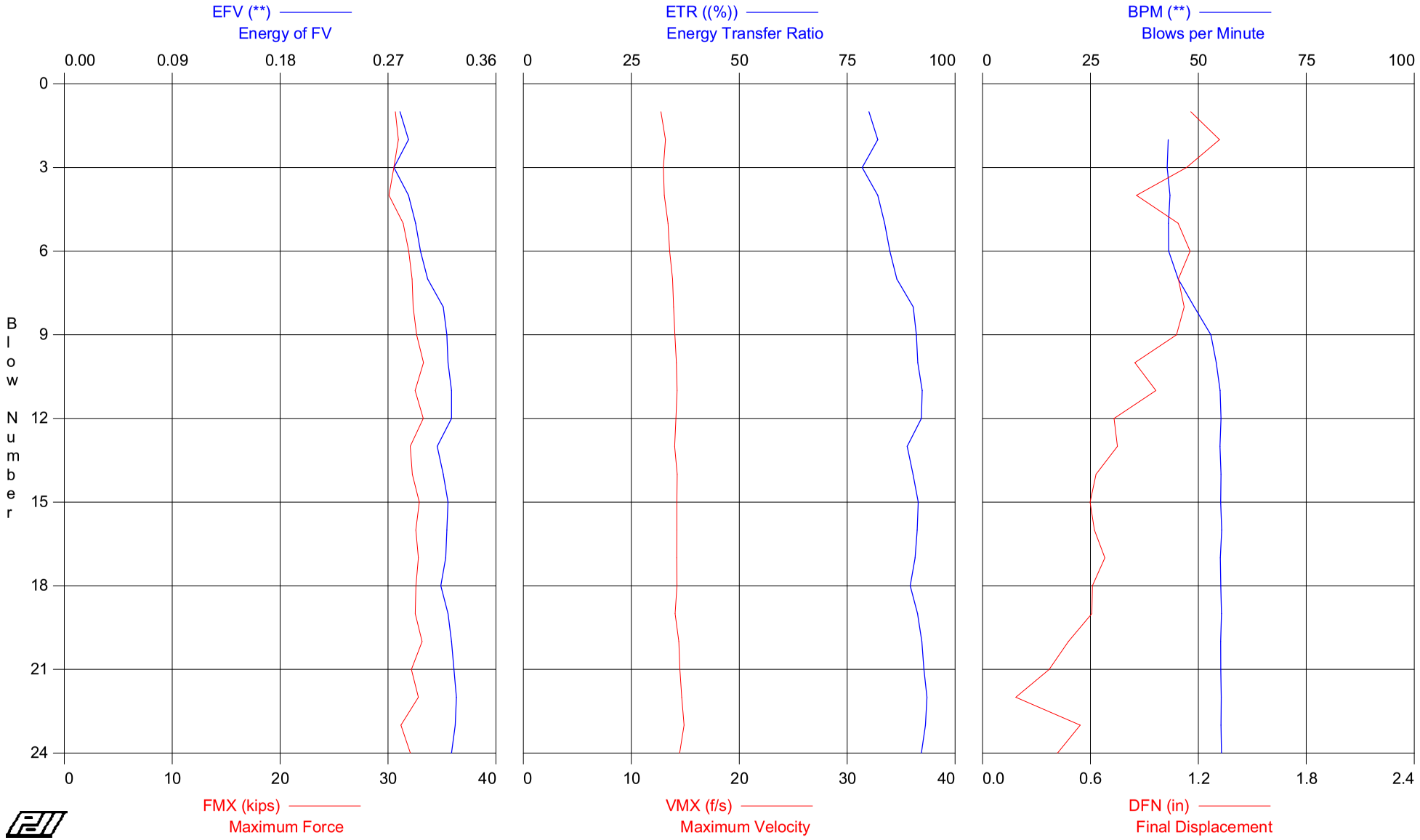
Total number of blows analyzed: 24

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 3-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 208.5 - 210
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 208.5 - 210
OP: SDW

HAMMER #5 N3 B-800
Test date: 3-Sep-2008

AR: 2.35 in^2
LE: 214.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

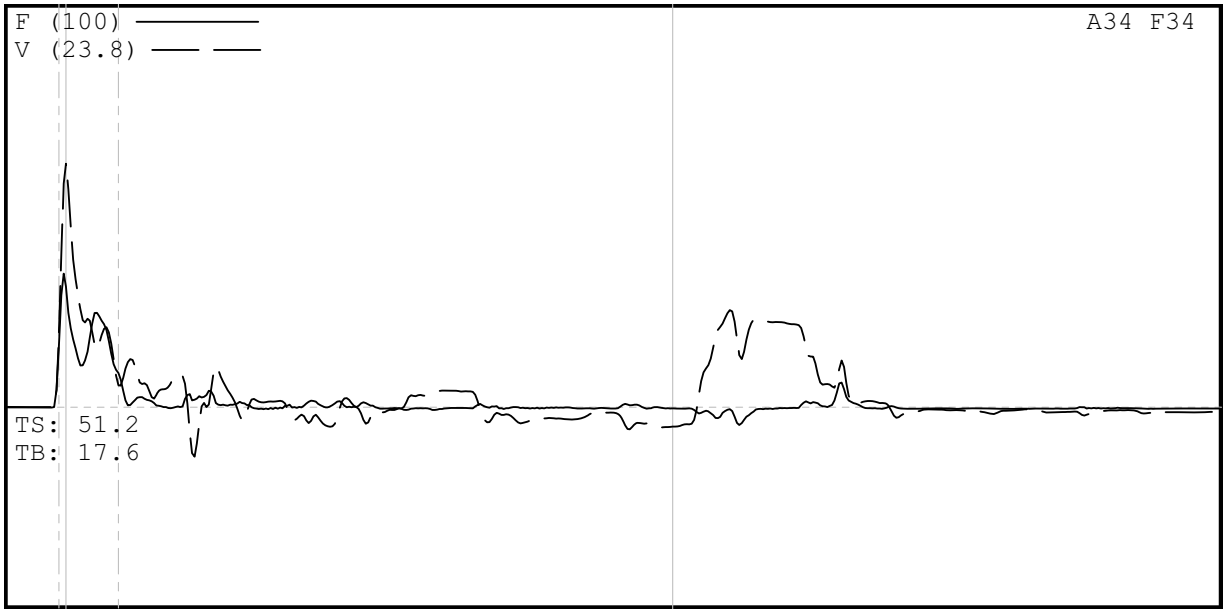
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	208.58	12	13.1	13.7	0.280	80	0	30.7	12.7	1.2
2	208.67	12	13.2	13.8	0.287	82	43	31.0	13.2	1.3
3	208.75	12	13.0	13.7	0.275	78	43	30.5	13.0	1.1
4	208.83	12	12.8	13.3	0.287	82	43	30.1	13.1	0.9
5	208.92	12	13.4	14.0	0.293	84	43	31.4	13.4	1.1
6	209.00	12	13.6	14.1	0.297	85	43	31.9	13.6	1.2
7	209.08	12	13.7	14.2	0.303	87	45	32.2	13.8	1.1
8	209.17	12	13.8	14.4	0.316	90	49	32.3	13.9	1.1
9	209.25	12	13.9	14.5	0.319	91	53	32.7	14.0	1.1
10	209.33	12	14.2	14.8	0.320	91	54	33.3	14.2	0.8
11	209.42	12	13.8	14.5	0.323	92	55	32.5	14.2	1.0
12	209.50	12	14.2	14.7	0.323	92	55	33.3	14.1	0.7
13	209.54	24	13.6	14.3	0.311	89	55	32.0	14.0	0.8
14	209.58	24	13.7	14.4	0.316	90	55	32.2	14.3	0.6
15	209.63	24	14.0	14.7	0.320	91	55	32.9	14.2	0.6
16	209.67	24	13.9	14.5	0.319	91	55	32.6	14.2	0.6
17	209.71	24	14.0	14.6	0.318	91	55	32.8	14.2	0.7
18	209.75	24	13.9	14.5	0.314	90	55	32.6	14.2	0.6
19	209.79	24	13.8	14.5	0.320	91	55	32.5	14.1	0.6
20	209.83	24	14.1	14.6	0.323	92	55	33.2	14.4	0.5
21	209.88	24	13.7	14.3	0.325	93	55	32.2	14.5	0.4
22	209.92	24	14.0	14.5	0.327	93	55	32.8	14.7	0.2
23	209.96	24	13.3	13.9	0.326	93	55	31.2	14.9	0.5
24	210.00	24	13.6	14.2	0.323	92	55	32.1	14.5	0.4
		Average	13.7	14.3	0.311	89	52	32.1	14.0	0.8
		Std. Dev.	0.4	0.4	0.015	4	5	0.9	0.5	0.3
		Maximum	14.2	14.8	0.327	93	55	33.3	14.9	1.3

Total number of blows analyzed: 24

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 208 5 - 210



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 208 5 - 210
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 208 5 - 210
9/3/2008 2:21:01 PM
Blow Number 21/20

Pile Properties

LE	214.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	25.46	ms
JC	1.20	[]
LP	209.83	ft

Quantity Results

CSXN	14.1	ksi
CSI	14.6	ksi
CSB	14.2	ksi
EFV	0.323	k-ft
ETR	92.3	(%)
BPM	55.1	bpm
FMX	33	kips
VMX	14.4	f/s
DFN	0.48	in

Sensors

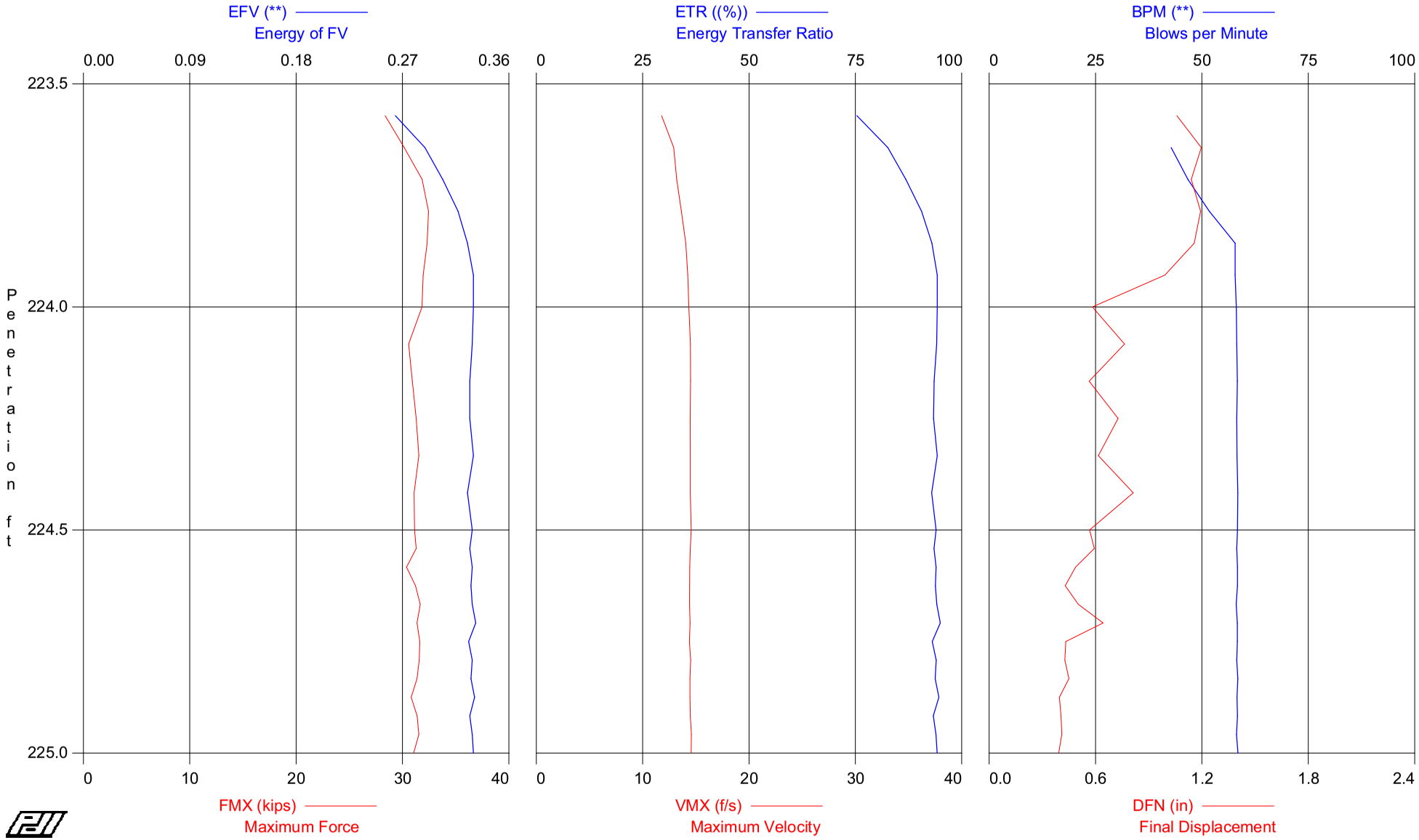
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 0.97

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 223.5 - 225
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 223.5 - 225
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 229.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
7	224.00	14	AV7	13.3	13.9	0.308	88	52	31.3	13.5	1.0
			STD	0.6	0.6	0.023	7	6	1.4	0.8	0.2
			MAX	13.8	14.4	0.330	94	58	32.4	14.3	1.2
13	224.50	12	AV6	13.2	13.8	0.328	94	58	31.1	14.5	0.7
			STD	0.1	0.1	0.002	0	0	0.3	0.0	0.1
			MAX	13.4	14.0	0.330	94	58	31.5	14.6	0.8
25	225.00	24	AV12	13.3	13.9	0.329	94	58	31.3	14.5	0.5
			STD	0.2	0.1	0.002	0	0	0.4	0.1	0.1
			MAX	13.5	14.0	0.332	95	58	31.7	14.6	0.6
			Average	13.3	13.9	0.323	92	57	31.2	14.2	0.7
			Std. Dev.	0.3	0.3	0.015	4	4	0.8	0.6	0.3
			Maximum	13.8	14.4	0.332	95	58	32.4	14.6	1.2

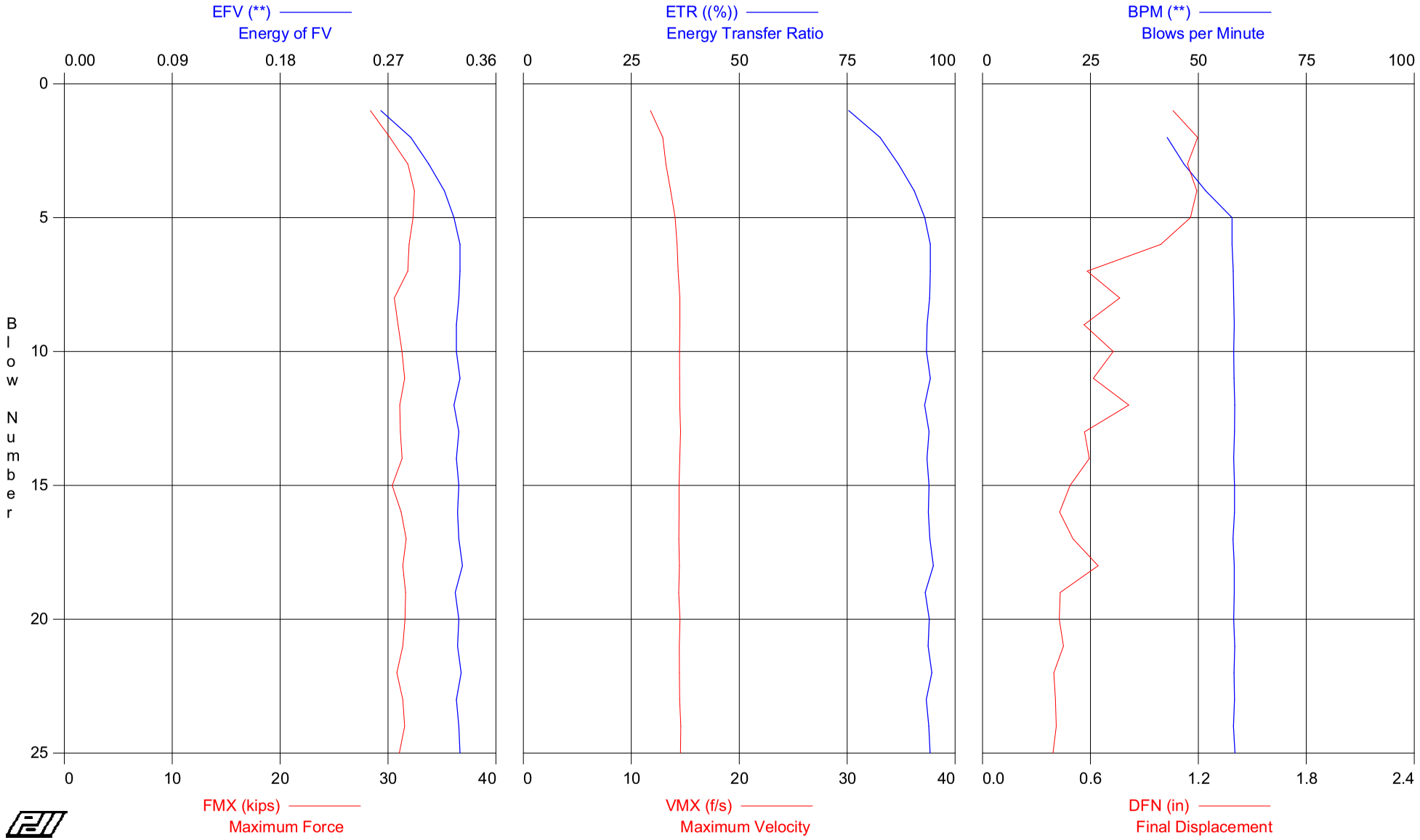
Total number of blows analyzed: 25

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 223.5 - 225
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 223.5 - 225
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 229.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

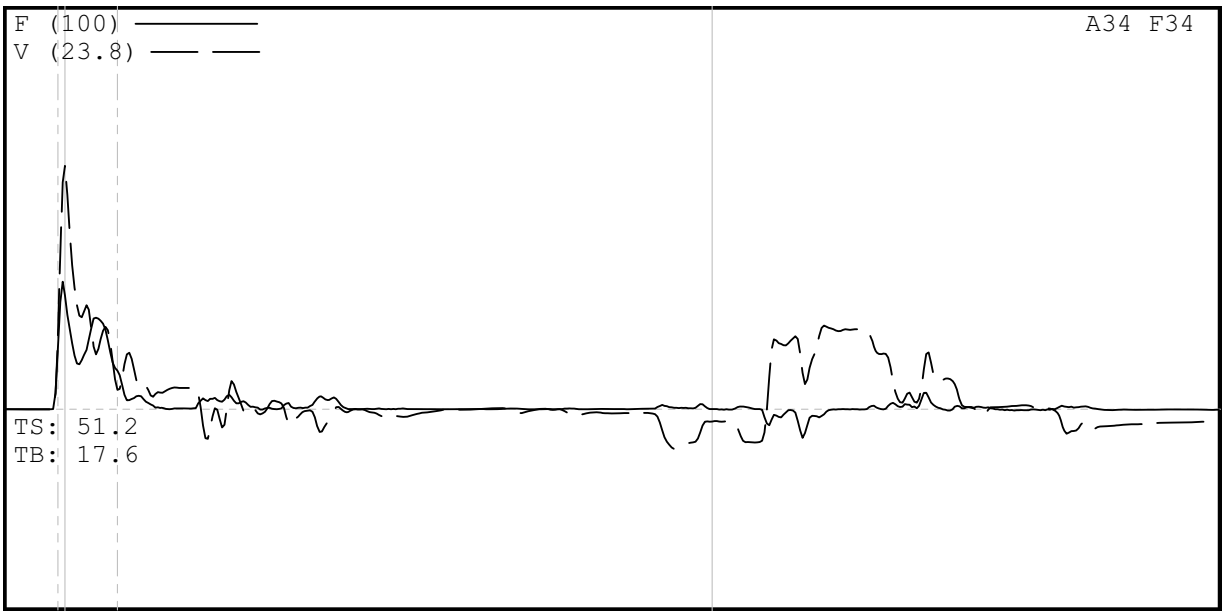
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	223.57	14	12.1	12.7	0.264	75	0	28.4	11.8	1.1
2	223.64	14	12.8	13.5	0.289	83	43	30.2	12.9	1.2
3	223.71	14	13.6	14.1	0.304	87	47	31.8	13.2	1.1
4	223.79	14	13.8	14.4	0.317	91	52	32.4	13.6	1.2
5	223.86	14	13.8	14.4	0.325	93	58	32.3	14.1	1.2
6	223.93	14	13.6	14.1	0.330	94	58	31.9	14.2	1.0
7	224.00	14	13.5	14.2	0.330	94	58	31.8	14.3	0.6
8	224.08	12	13.0	13.6	0.329	94	58	30.6	14.5	0.8
9	224.17	12	13.2	13.8	0.327	94	58	30.9	14.5	0.6
10	224.25	12	13.3	13.9	0.327	93	58	31.3	14.5	0.7
11	224.33	12	13.4	14.0	0.330	94	58	31.5	14.5	0.6
12	224.42	12	13.2	13.8	0.325	93	58	31.1	14.5	0.8
13	224.50	12	13.3	13.9	0.329	94	58	31.1	14.6	0.6
14	224.54	24	13.3	13.9	0.327	93	58	31.3	14.5	0.6
15	224.58	24	12.9	13.6	0.329	94	58	30.4	14.4	0.5
16	224.63	24	13.3	13.9	0.328	94	58	31.2	14.4	0.4
17	224.67	24	13.5	14.0	0.329	94	58	31.7	14.4	0.5
18	224.71	24	13.3	14.0	0.332	95	58	31.4	14.5	0.6
19	224.75	24	13.5	14.0	0.326	93	58	31.6	14.4	0.4
20	224.79	24	13.4	14.0	0.329	94	58	31.6	14.5	0.4
21	224.83	24	13.3	13.9	0.328	94	58	31.4	14.4	0.5
22	224.88	24	13.1	13.8	0.331	95	58	30.8	14.5	0.4
23	224.92	24	13.4	13.9	0.327	93	58	31.4	14.5	0.4
24	224.96	24	13.4	14.0	0.329	94	58	31.5	14.6	0.4
25	225.00	24	13.2	13.8	0.330	94	58	31.0	14.6	0.4
		Average	13.3	13.9	0.323	92	57	31.2	14.2	0.7
		Std. Dev.	0.3	0.3	0.015	4	4	0.8	0.6	0.3
		Maximum	13.8	14.4	0.332	95	58	32.4	14.6	1.2

Total number of blows analyzed: 25

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 223 5 - 225



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 223 5 - 225
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 223 5 - 225
9/4/2008 9:03:34 AM
Blow Number 20/19

Pile Properties

LE	229.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	27.25	ms
JC	1.20	[]
LP	224.75	ft

Quantity Results

CSXN	13.5	ksi
CSI	14.0	ksi
CSB	15.1	ksi
EFV	0.326	k-ft
ETR	93.1	(%)
BPM	58.3	bpm
FMX	32	kips
VMX	14.4	f/s
DFN	0.43	in

Sensors

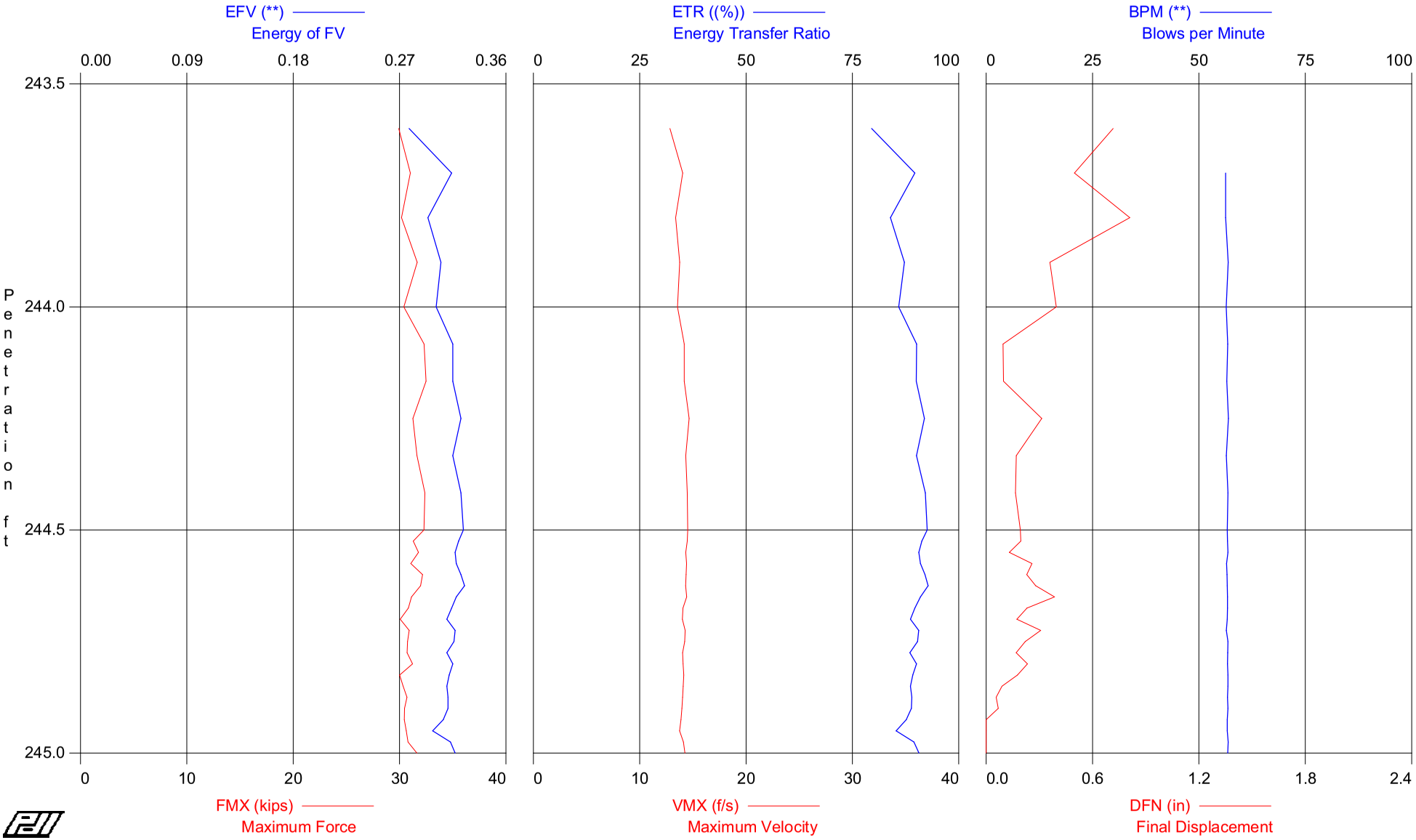
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.04
V3/V4: OK 0.93

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 243.5 - 245
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 243.5 - 245
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 249.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
5	244.00	10	AV5	13.0	13.6	0.298	85	56	30.6	13.5	0.6
			STD	0.3	0.3	0.012	3	0	0.6	0.4	0.2
			MAX	13.5	14.0	0.314	90	57	31.7	14.0	0.8
11	244.50	12	AV6	13.6	14.3	0.319	91	57	32.1	14.4	0.2
			STD	0.2	0.2	0.004	1	0	0.5	0.2	0.1
			MAX	13.8	14.4	0.324	93	57	32.5	14.6	0.3
31	245.00	40	AV20	13.2	13.8	0.314	90	57	30.9	14.2	0.1
			STD	0.2	0.2	0.006	2	0	0.6	0.2	0.1
			MAX	13.7	14.3	0.325	93	57	32.2	14.5	0.4
			Average	13.2	13.9	0.312	89	57	31.1	14.1	0.2
			Std. Dev.	0.3	0.3	0.009	3	0	0.7	0.4	0.2
			Maximum	13.8	14.4	0.325	93	57	32.5	14.6	0.8

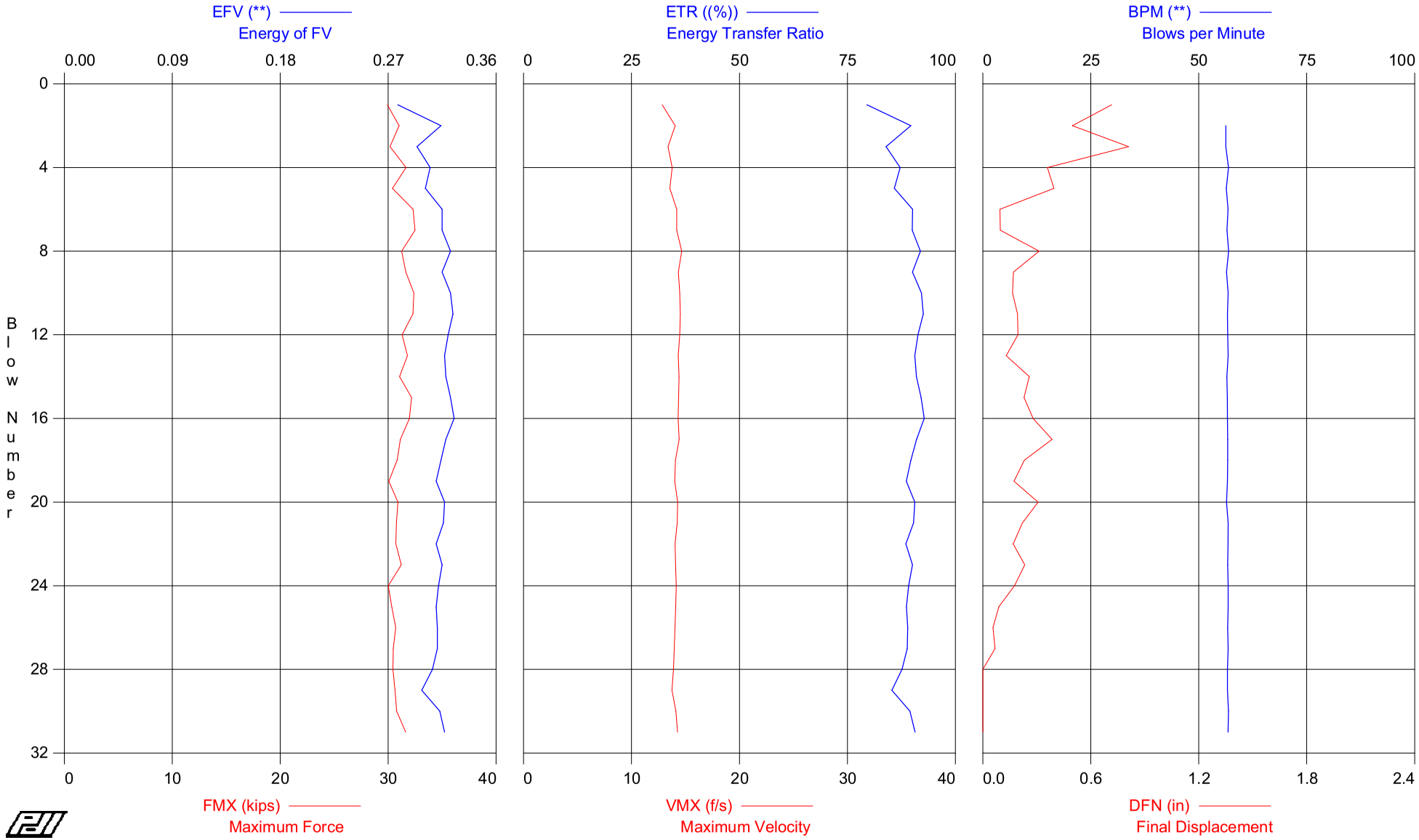
Total number of blows analyzed: 31

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 243.5 - 245
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 243.5 - 245
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 249.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

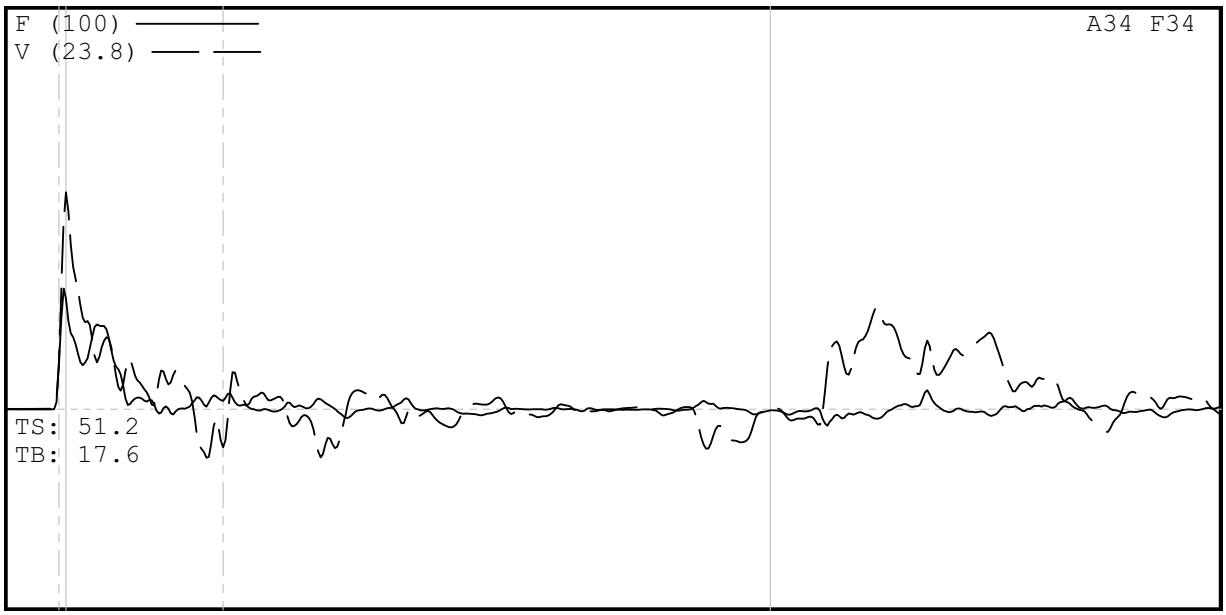
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	243.60	10	12.7	13.4	0.278	80	0	29.9	12.8	0.7
2	243.70	10	13.2	13.9	0.314	90	56	31.0	14.0	0.5
3	243.80	10	12.8	13.5	0.294	84	56	30.2	13.4	0.8
4	243.90	10	13.5	14.0	0.305	87	57	31.7	13.8	0.4
5	244.00	10	12.9	13.5	0.301	86	56	30.4	13.6	0.4
6	244.08	12	13.7	14.4	0.315	90	57	32.3	14.2	0.1
7	244.17	12	13.8	14.4	0.315	90	57	32.5	14.2	0.1
8	244.25	12	13.3	13.9	0.322	92	57	31.3	14.6	0.3
9	244.33	12	13.5	14.1	0.315	90	56	31.6	14.3	0.2
10	244.42	12	13.8	14.4	0.322	92	57	32.4	14.5	0.2
11	244.50	12	13.7	14.4	0.324	93	57	32.3	14.5	0.2
12	244.53	40	13.3	13.8	0.320	91	57	31.3	14.5	0.2
13	244.55	40	13.5	14.1	0.317	91	57	31.8	14.3	0.1
14	244.58	40	13.2	13.7	0.318	91	56	31.1	14.4	0.3
15	244.60	40	13.7	14.3	0.322	92	57	32.2	14.4	0.2
16	244.63	40	13.6	14.2	0.325	93	57	32.0	14.3	0.3
17	244.65	40	13.2	13.8	0.318	91	57	31.1	14.4	0.4
18	244.68	40	13.1	13.7	0.314	90	57	30.8	14.1	0.2
19	244.70	40	12.8	13.4	0.310	89	57	30.1	14.0	0.2
20	244.73	40	13.2	13.8	0.317	91	56	30.9	14.3	0.3
21	244.75	40	13.1	13.7	0.316	90	57	30.8	14.2	0.2
22	244.78	40	13.1	13.7	0.310	89	57	30.7	14.0	0.2
23	244.80	40	13.3	13.9	0.315	90	57	31.2	14.1	0.2
24	244.83	40	12.8	13.4	0.312	89	57	30.0	14.1	0.2
25	244.85	40	12.9	13.5	0.310	89	57	30.3	14.1	0.1
26	244.88	40	13.1	13.7	0.311	89	57	30.7	14.0	0.1
27	244.90	40	13.0	13.6	0.311	89	57	30.5	14.0	0.1
28	244.93	40	13.0	13.6	0.307	88	57	30.4	13.9	-0.2
29	244.95	40	13.0	13.7	0.298	85	57	30.6	13.7	-0.1
30	244.98	40	13.1	13.8	0.313	89	57	30.8	14.1	-0.1
31	245.00	40	13.5	14.1	0.317	91	57	31.6	14.3	-0.1
		Average	13.2	13.9	0.312	89	57	31.1	14.1	0.2
		Std. Dev.	0.3	0.3	0.009	3	0	0.7	0.4	0.2
		Maximum	13.8	14.4	0.325	93	57	32.5	14.6	0.8

Total number of blows analyzed: 31

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 243 5 - 245



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 243 5 - 245
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 243 5 - 245
9/4/2008 12:34:31 PM
Blow Number 3/1

Pile Properties

LE	249.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	29.63	ms
JC	1.20	[]
LP	243.60	ft

Quantity Results

CSXN	12.7	ksi
CSI	13.4	ksi
CSB	11.2	ksi
EFV	0.278	k-ft
ETR	79.5	(%)
BPM	0.0	bpm
FMX	30	kips
VMX	12.8	f/s
DFN	0.72	in

Sensors

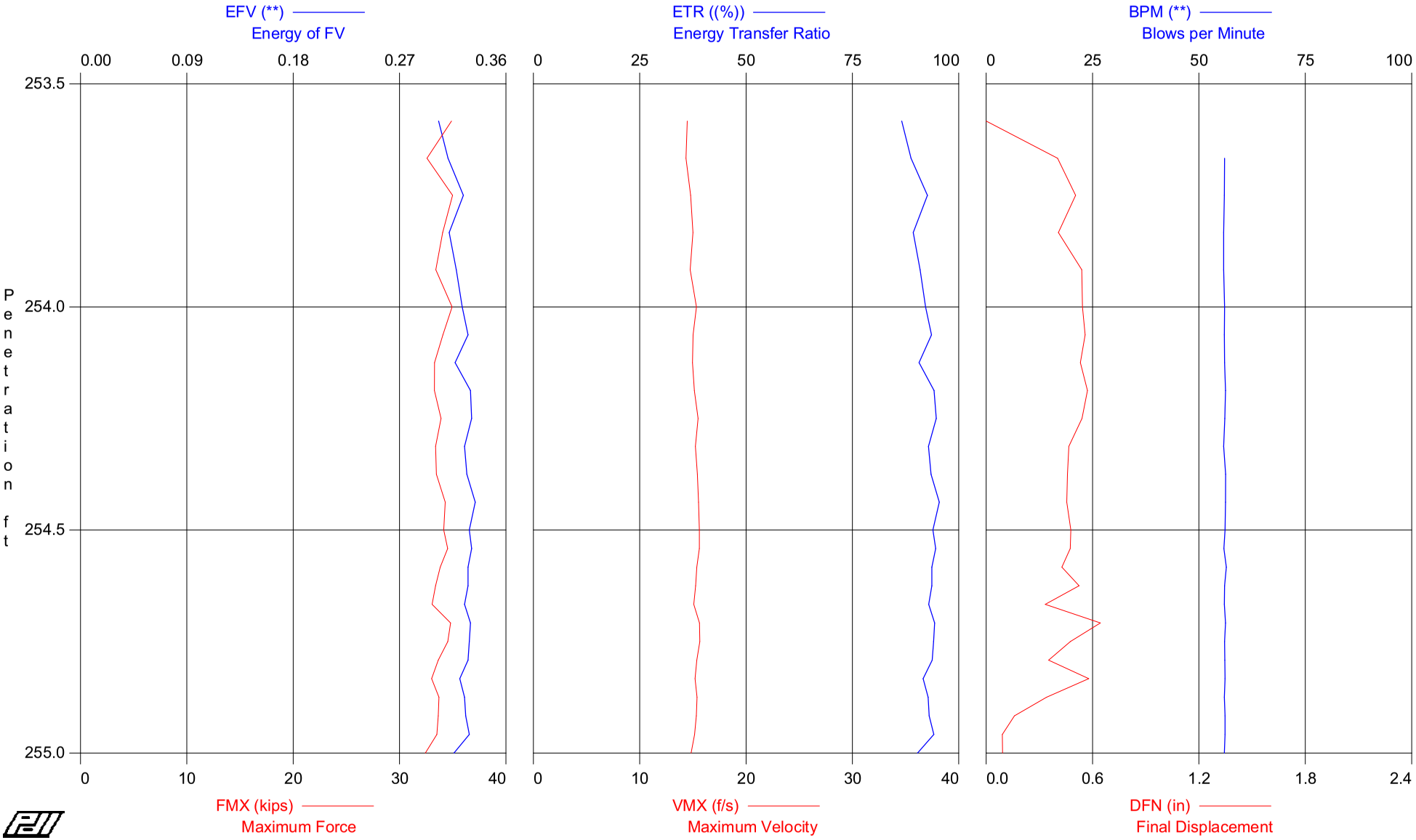
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.07
V3/V4: OK 1.06

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 253.5 - 255
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 253.5 - 255
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 259.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	254.00	12	AV6	14.5	15.3	0.315	90	56	34.1	14.8	0.4
			STD	0.4	0.4	0.007	2	0	0.9	0.3	0.3
			MAX	14.9	15.7	0.324	93	56	35.0	15.3	0.5
14	254.50	16	AV8	14.4	15.1	0.328	94	56	33.7	15.3	0.5
			STD	0.2	0.2	0.005	1	0	0.4	0.2	0.0
			MAX	14.6	15.4	0.334	95	56	34.3	15.6	0.6
26	255.00	24	AV12	14.3	15.1	0.326	93	56	33.7	15.3	0.4
			STD	0.3	0.3	0.004	1	0	0.7	0.2	0.2
			MAX	14.8	15.6	0.331	95	56	34.8	15.6	0.6
			Average	14.4	15.1	0.324	93	56	33.8	15.2	0.4
			Std. Dev.	0.3	0.3	0.007	2	0	0.7	0.3	0.2
			Maximum	14.9	15.7	0.334	95	56	35.0	15.6	0.6

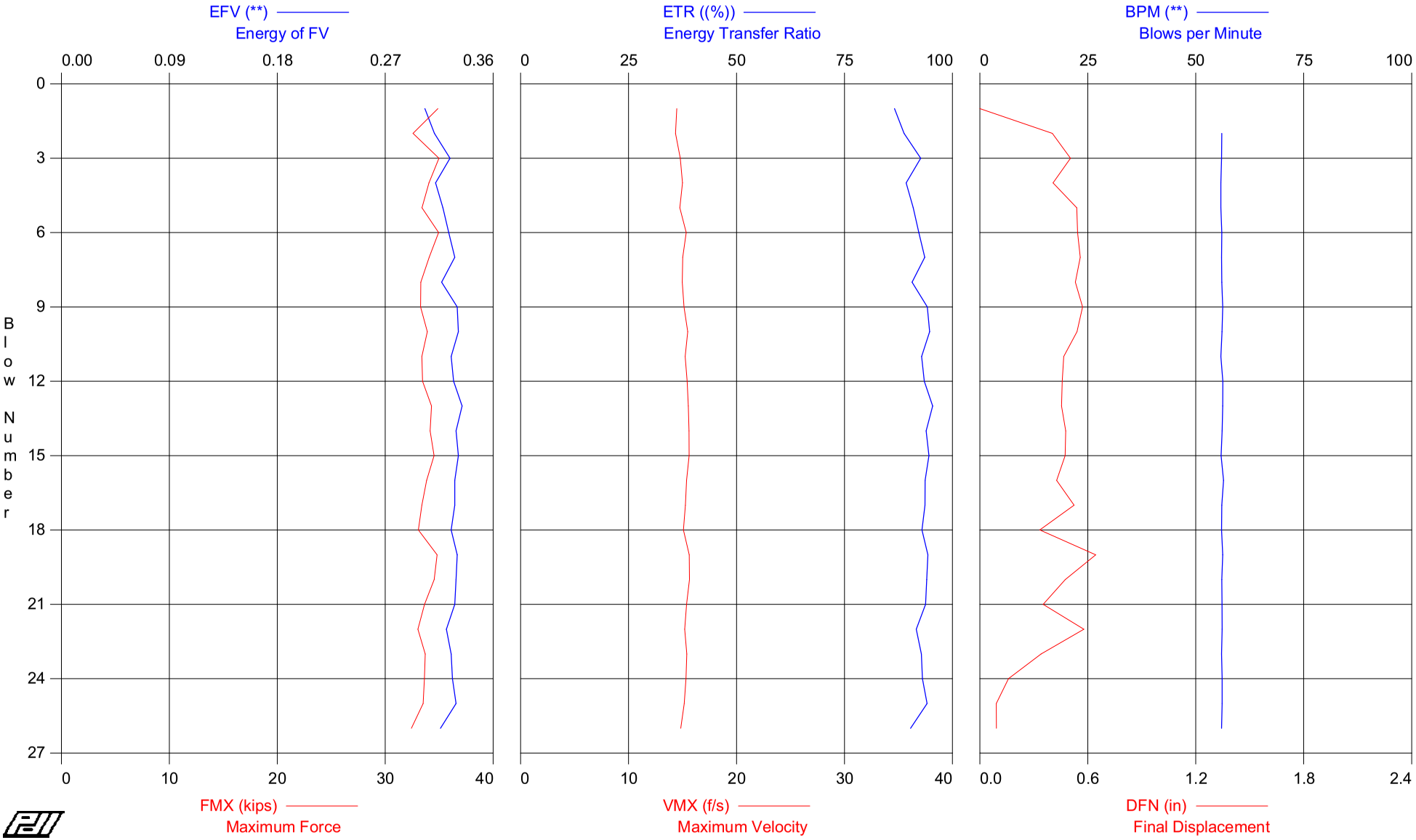
Total number of blows analyzed: 26

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 4-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 253.5 - 255
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 253.5 - 255
OP: SDW

HAMMER #5 N3 B-800
Test date: 4-Sep-2008

AR: 2.35 in^2
LE: 259.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

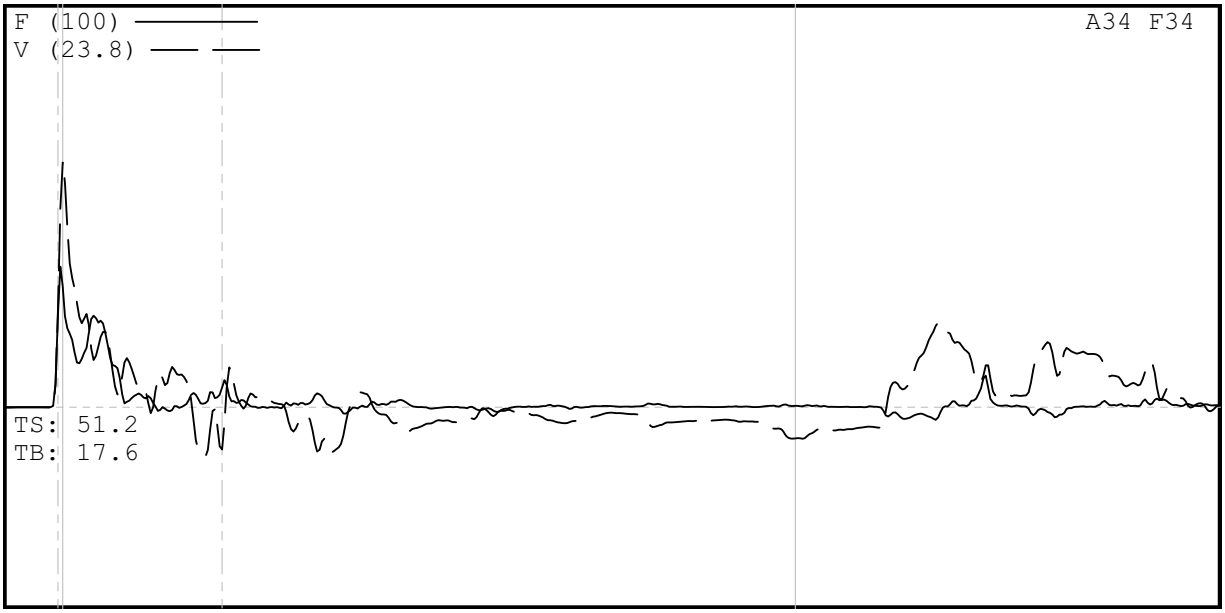
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	253.58	12	14.8	15.7	0.303	87	0	34.9	14.5	-0.2
2	253.67	12	13.9	14.6	0.311	89	56	32.6	14.4	0.4
3	253.75	12	14.9	15.6	0.324	93	56	35.0	14.8	0.5
4	253.83	12	14.5	15.2	0.312	89	56	34.1	15.0	0.4
5	253.92	12	14.2	14.8	0.318	91	56	33.4	14.7	0.5
6	254.00	12	14.9	15.5	0.323	92	56	34.9	15.3	0.5
7	254.06	16	14.5	15.3	0.328	94	56	34.1	15.0	0.6
8	254.13	16	14.2	14.7	0.317	91	56	33.3	15.0	0.5
9	254.19	16	14.2	14.9	0.330	94	56	33.3	15.1	0.6
10	254.25	16	14.4	15.1	0.331	95	56	33.9	15.5	0.5
11	254.31	16	14.2	15.0	0.325	93	56	33.4	15.2	0.5
12	254.38	16	14.2	14.8	0.327	93	56	33.5	15.4	0.5
13	254.44	16	14.6	15.4	0.334	95	56	34.3	15.5	0.5
14	254.50	16	14.5	15.3	0.329	94	56	34.2	15.6	0.5
15	254.54	24	14.7	15.5	0.331	95	56	34.5	15.6	0.5
16	254.58	24	14.4	15.1	0.328	94	56	33.8	15.4	0.4
17	254.63	24	14.2	15.1	0.328	94	56	33.4	15.3	0.5
18	254.67	24	14.1	14.7	0.325	93	56	33.1	15.1	0.3
19	254.71	24	14.8	15.6	0.330	94	56	34.8	15.6	0.6
20	254.75	24	14.7	15.5	0.329	94	56	34.5	15.6	0.5
21	254.79	24	14.3	14.9	0.328	94	56	33.6	15.4	0.4
22	254.83	24	14.1	14.8	0.321	92	56	33.0	15.2	0.6
23	254.88	24	14.3	15.2	0.325	93	56	33.7	15.4	0.3
24	254.92	24	14.3	15.1	0.326	93	56	33.6	15.3	0.2
25	254.96	24	14.3	15.1	0.329	94	56	33.5	15.2	0.1
26	255.00	24	13.8	14.4	0.316	90	56	32.4	14.8	0.1
		Average	14.4	15.1	0.324	93	56	33.8	15.2	0.4
		Std. Dev.	0.3	0.3	0.007	2	0	0.7	0.3	0.2
		Maximum	14.9	15.7	0.334	95	56	35.0	15.6	0.6

Total number of blows analyzed: 26

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 253 5 - 255



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 253 5 - 255
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 253 5 - 255
9/4/2008 2:07:40 PM
Blow Number 4/1

Pile Properties

LE	259.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	30.82	ms
JC	1.20	[]
LP	253.58	ft

Quantity Results

CSXN	14.8	ksi
CSI	15.7	ksi
CSB	14.5	ksi
EFV	0.303	k-ft
ETR	86.6	(%)
BPM	0.0	bpm
FMX	35	kips
VMX	14.5	f/s
DFN	-0.19	in

Sensors

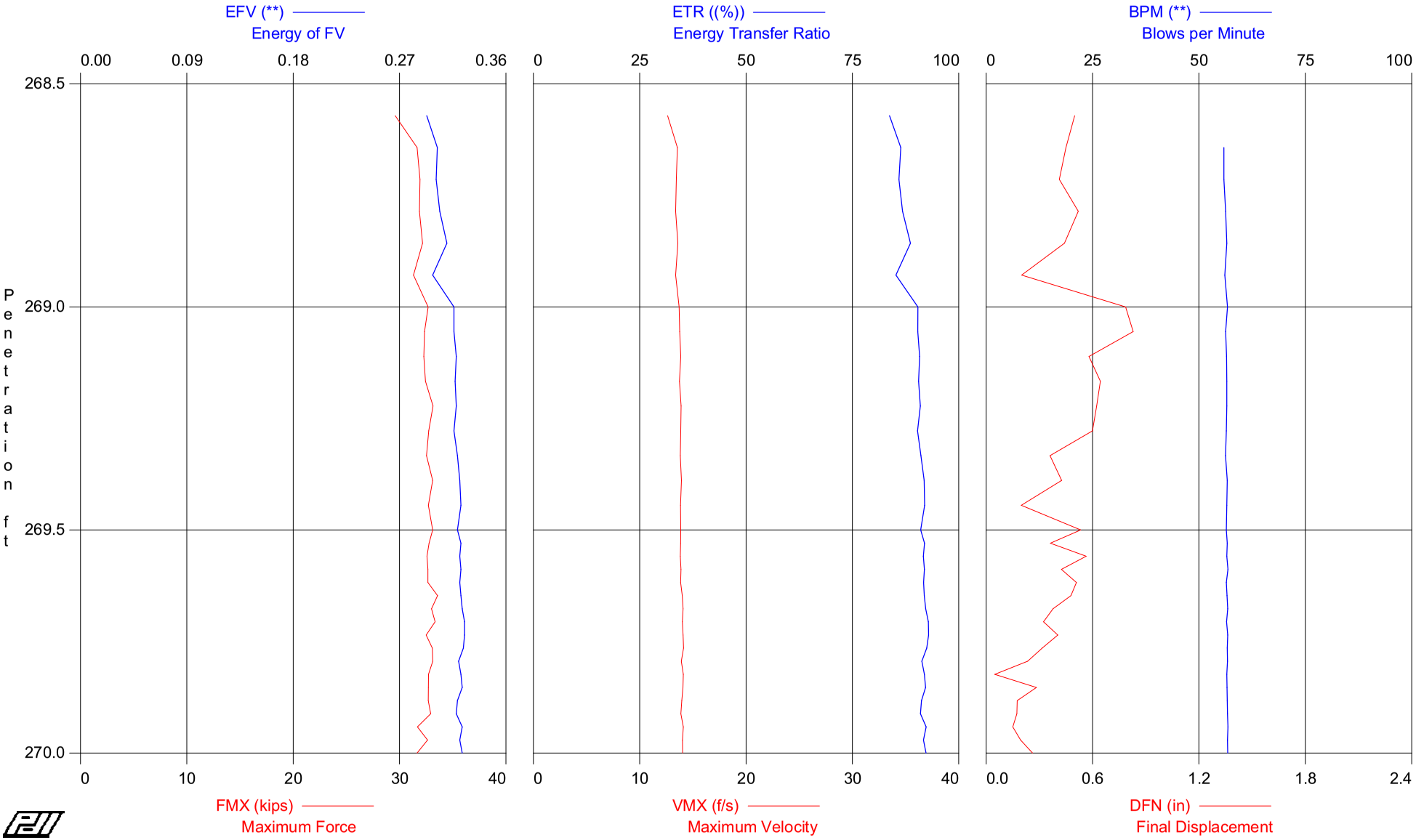
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.08
V3/V4: OK 1.11

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 5-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 268.5 - 270
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 268.5 - 270
OP: SDW

HAMMER #5 N3 B-800
Test date: 5-Sep-2008

AR: 2.35 in^2
LE: 274.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
7	269.00	14	AV7	13.4	14.0	0.303	87	56	31.6	13.4	0.5
			STD	0.4	0.3	0.007	2	0	0.9	0.3	0.2
			MAX	13.9	14.4	0.316	90	57	32.7	13.7	0.8
16	269.50	18	AV9	13.9	14.5	0.318	91	56	32.7	13.8	0.5
			STD	0.1	0.1	0.002	1	0	0.3	0.1	0.2
			MAX	14.1	14.7	0.322	92	57	33.1	13.9	0.8
33	270.00	34	AV17	13.9	14.5	0.322	92	57	32.7	14.0	0.3
			STD	0.2	0.2	0.002	1	0	0.5	0.1	0.1
			MAX	14.3	14.8	0.325	93	57	33.6	14.1	0.6
			Average	13.8	14.4	0.317	91	57	32.5	13.8	0.4
			Std. Dev.	0.3	0.3	0.008	2	0	0.7	0.3	0.2
			Maximum	14.3	14.8	0.325	93	57	33.6	14.1	0.8

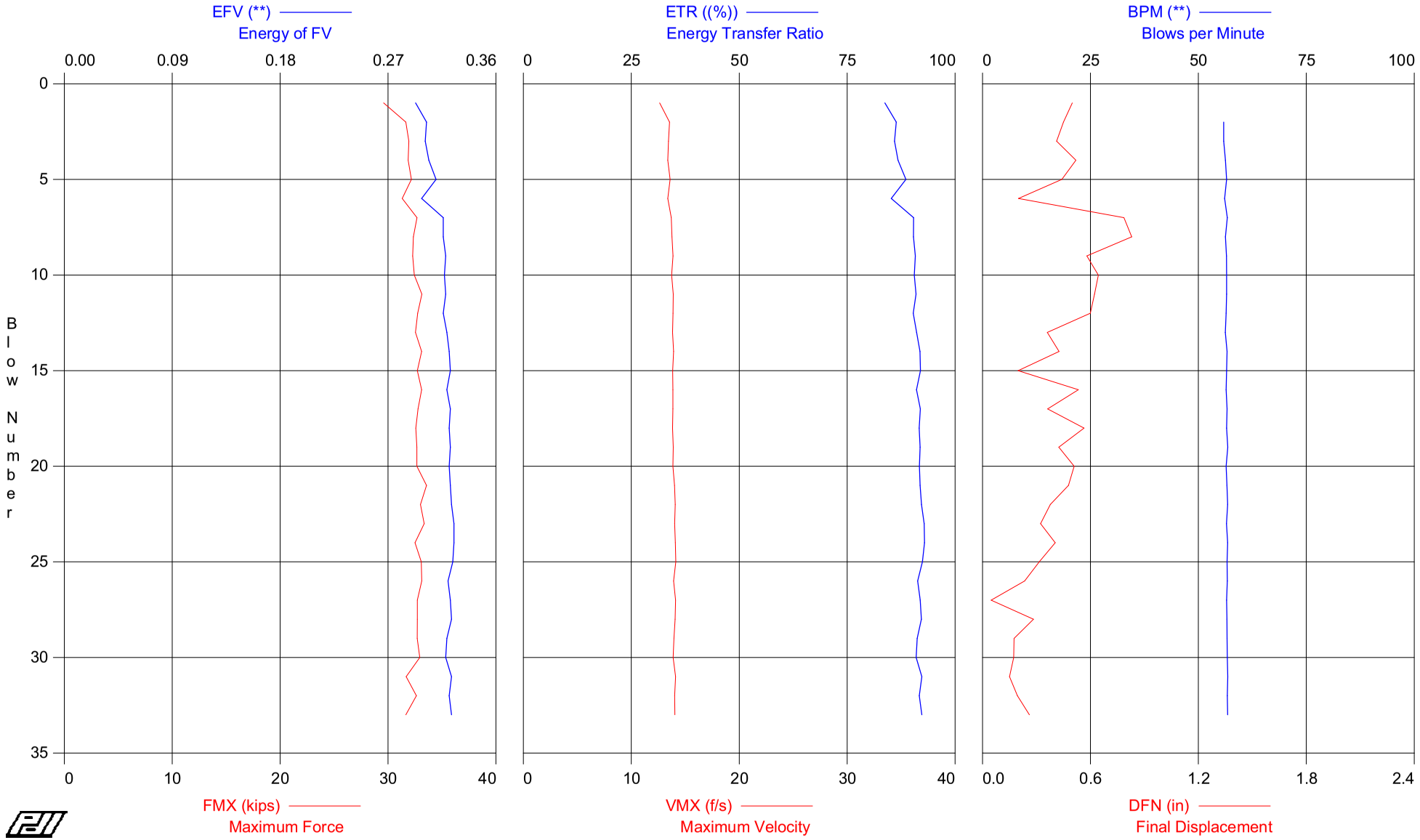
Total number of blows analyzed: 33

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 5-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 268.5 - 270
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 268.5 - 270
OP: SDW

HAMMER #5 N3 B-800
Test date: 5-Sep-2008

AR: 2.35 in^2
LE: 274.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

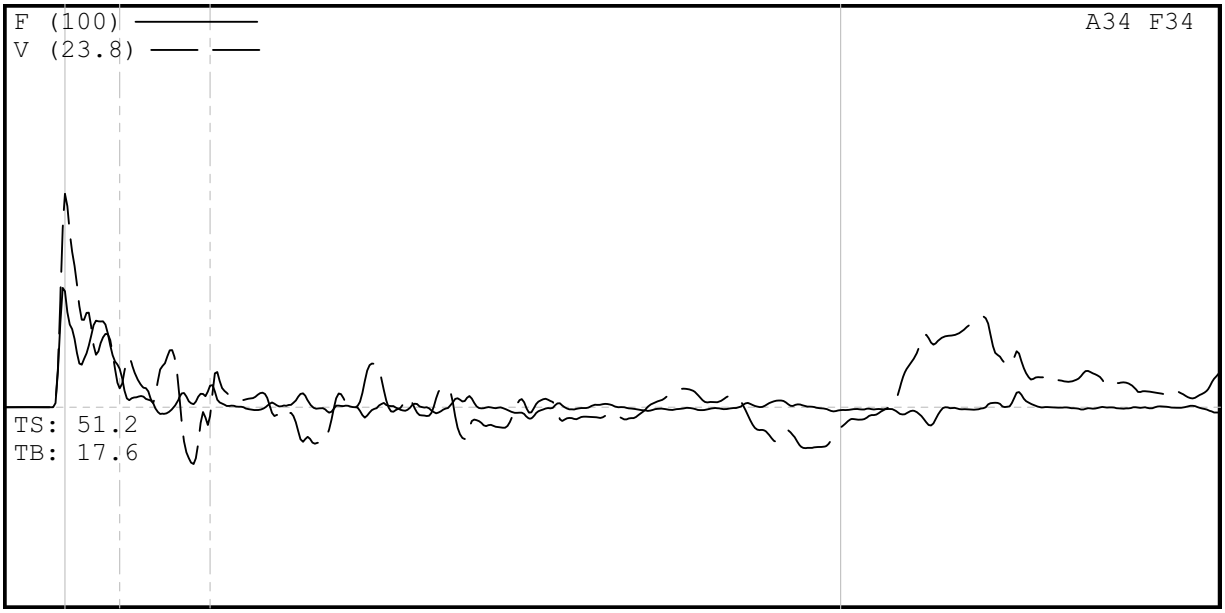
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	268.57	14	12.6	13.3	0.293	84	0	29.6	12.6	0.5
2	268.64	14	13.5	14.0	0.302	86	56	31.6	13.5	0.5
3	268.71	14	13.6	14.2	0.301	86	56	31.9	13.4	0.4
4	268.79	14	13.6	14.2	0.304	87	56	31.9	13.4	0.5
5	268.86	14	13.7	14.3	0.310	89	57	32.2	13.6	0.4
6	268.93	14	13.3	13.9	0.298	85	56	31.3	13.4	0.2
7	269.00	14	13.9	14.4	0.316	90	57	32.7	13.7	0.8
8	269.06	18	13.8	14.4	0.316	90	56	32.4	13.8	0.8
9	269.11	18	13.7	14.4	0.318	91	56	32.3	13.9	0.6
10	269.17	18	13.8	14.4	0.317	91	57	32.4	13.7	0.6
11	269.22	18	14.1	14.7	0.318	91	57	33.1	13.9	0.6
12	269.28	18	13.9	14.5	0.316	90	56	32.7	13.9	0.6
13	269.33	18	13.8	14.5	0.319	91	56	32.5	13.8	0.4
14	269.39	18	14.1	14.7	0.321	92	57	33.1	13.9	0.4
15	269.44	18	13.9	14.5	0.322	92	57	32.7	13.8	0.2
16	269.50	18	14.1	14.7	0.319	91	56	33.1	13.9	0.5
17	269.53	34	13.9	14.6	0.322	92	57	32.8	13.8	0.4
18	269.56	34	13.9	14.4	0.321	92	57	32.6	13.8	0.6
19	269.59	34	13.9	14.4	0.322	92	57	32.7	13.9	0.4
20	269.62	34	13.9	14.5	0.321	92	56	32.7	13.8	0.5
21	269.65	34	14.3	14.8	0.322	92	57	33.6	14.0	0.5
22	269.68	34	14.0	14.5	0.323	92	57	33.0	14.1	0.4
23	269.71	34	14.2	14.6	0.325	93	56	33.3	14.0	0.3
24	269.74	34	13.8	14.4	0.325	93	57	32.5	14.1	0.4
25	269.76	34	14.1	14.6	0.324	92	57	33.1	14.1	0.3
26	269.79	34	14.1	14.5	0.320	91	57	33.1	13.9	0.2
27	269.82	34	13.9	14.3	0.322	92	57	32.7	14.1	0.0
28	269.85	34	13.9	14.4	0.323	92	57	32.7	14.1	0.3
29	269.88	34	13.9	14.4	0.319	91	57	32.7	14.0	0.2
30	269.91	34	14.0	14.5	0.318	91	57	32.9	13.9	0.2
31	269.94	34	13.5	14.1	0.323	92	57	31.7	14.1	0.2
32	269.97	34	13.9	14.4	0.321	92	57	32.6	14.0	0.2
33	270.00	34	13.5	14.1	0.323	92	57	31.6	14.0	0.3
		Average	13.8	14.4	0.317	91	57	32.5	13.8	0.4
		Std. Dev.	0.3	0.3	0.008	2	0	0.7	0.3	0.2
		Maximum	14.3	14.8	0.325	93	57	33.6	14.1	0.8

Total number of blows analyzed: 33

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 268 5 - 270



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 268 5 - 270
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 268 5 - 270
9/5/2008 9:24:37 AM
Blow Number 3/1

Pile Properties

LE	274.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	32.60	ms
JC	1.20	[]
LP	268.57	ft

Quantity Results

CSXN	12.6	ksi
CSI	13.3	ksi
CSB	12.0	ksi
EFV	0.293	k-ft
ETR	83.7	(%)
BPM	0.0	bpm
FMX	30	kips
VMX	12.6	f/s
DFN	0.50	in

Sensors

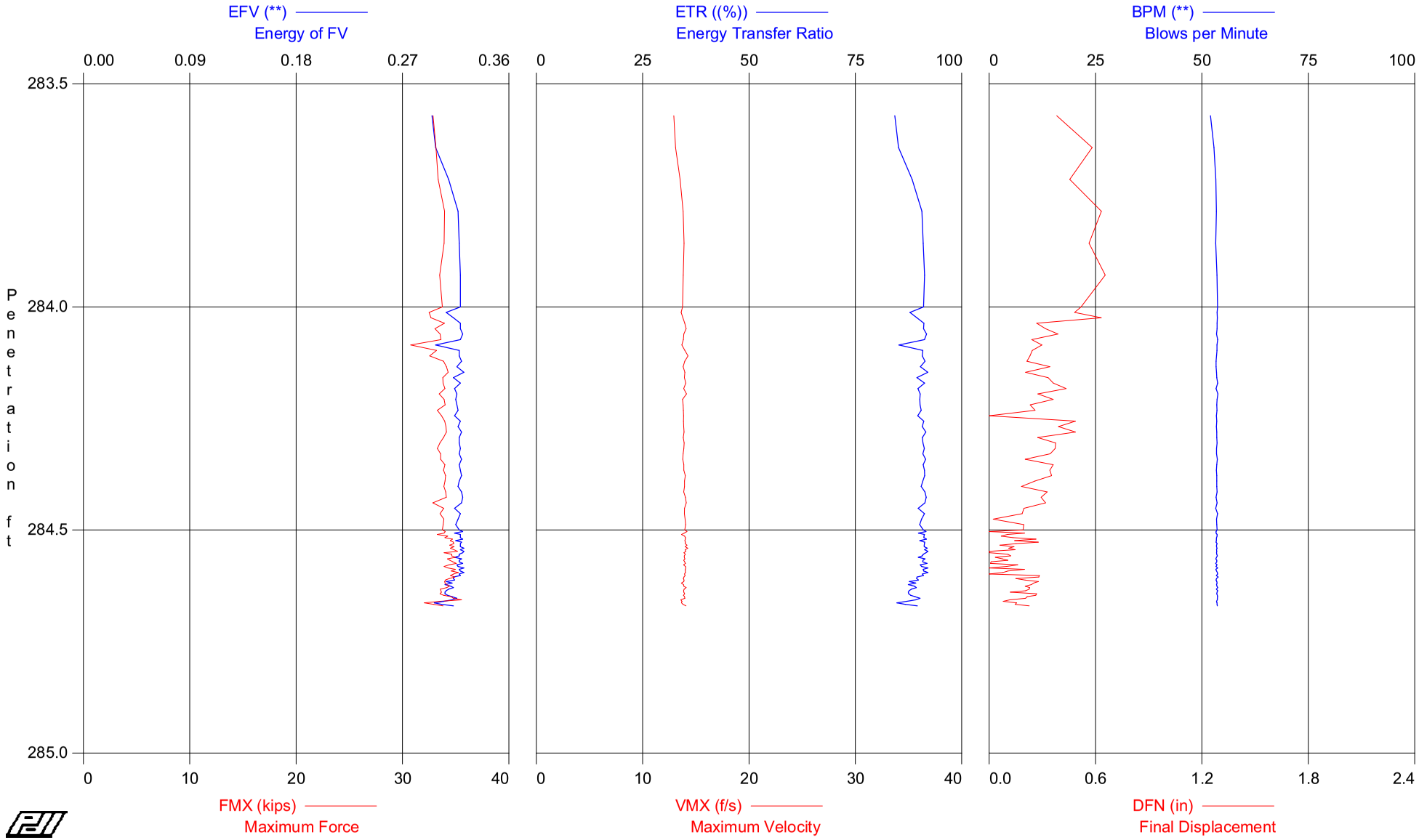
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.05
V3/V4: OK 0.99

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 8-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 283.5 285
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 283.5 285
OP: SDW

HAMMER #5 N3 B-800
Test date: 8-Sep-2008

AR: 2.35 in^2
LE: 285.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
7	284.00	14	AV7	14.3	14.3	0.311	89	53	33.5	13.5	0.5
			STD	0.2	0.2	0.010	3	1	0.4	0.4	0.1
			MAX	14.4	14.4	0.319	91	54	34.0	13.9	0.7
48	284.50	82	AV41	14.3	14.3	0.317	91	53	33.6	13.9	0.3
			STD	0.3	0.3	0.004	1	0	0.6	0.1	0.1
			MAX	14.6	14.6	0.322	92	54	34.3	14.3	0.6
98	284.67	294	AV50	14.6	14.6	0.315	90	53	34.3	13.9	0.1
			STD	0.3	0.3	0.006	2	0	0.6	0.1	0.1
			MAX	15.1	15.1	0.322	92	54	35.6	14.2	0.3
			Average	14.4	14.4	0.316	90	53	33.9	13.9	0.2
			Std. Dev.	0.3	0.3	0.006	2	0	0.7	0.2	0.2
			Maximum	15.1	15.1	0.322	92	54	35.6	14.3	0.7

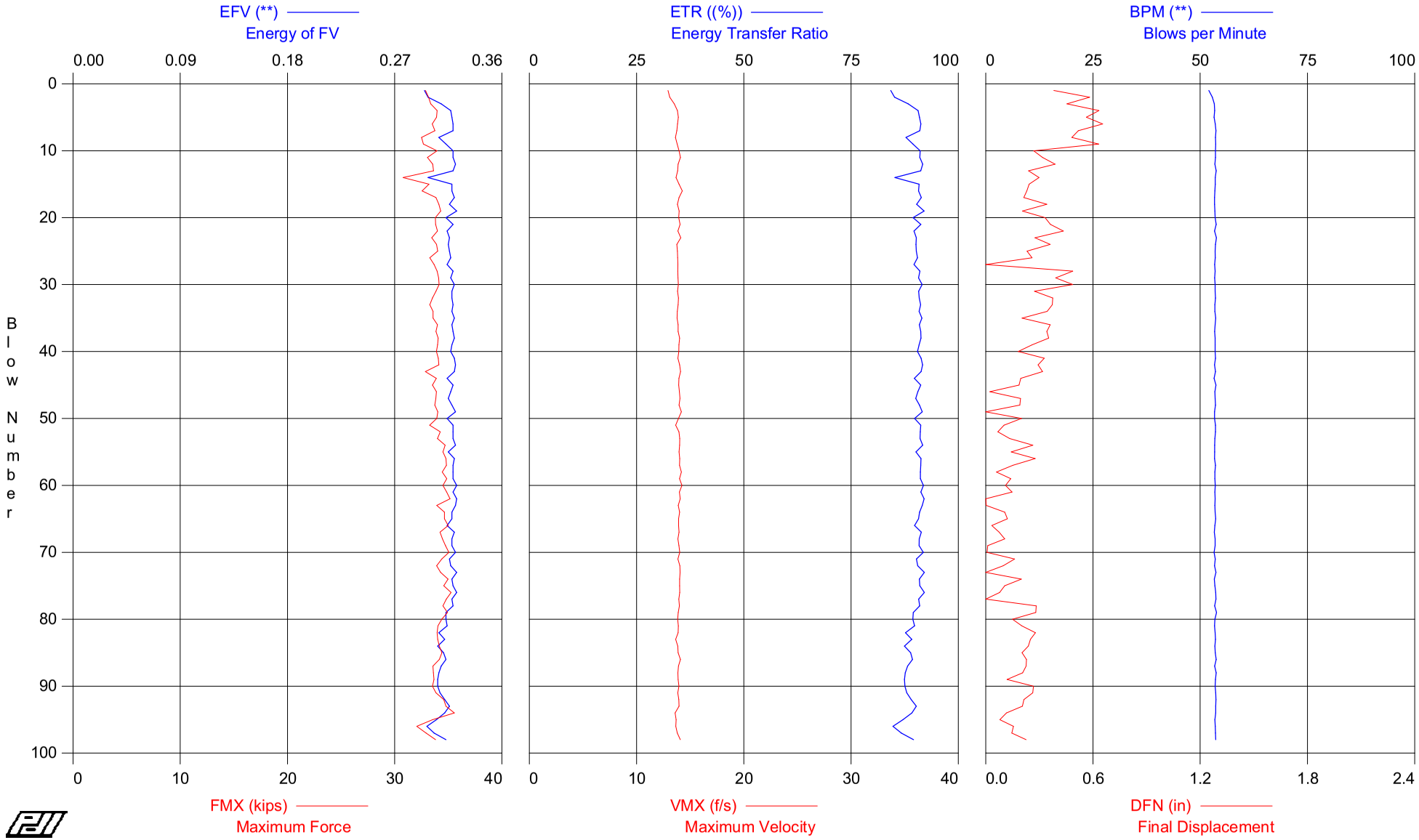
Total number of blows analyzed: 98

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 8-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 283.5 285
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 283.5 285
OP: SDW

HAMMER #5 N3 B-800
Test date: 8-Sep-2008

AR: 2.35 in^2
LE: 285.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	283.57	14	14.0	14.0	0.295	84	52	32.9	12.9	0.4
2	283.64	14	14.1	14.1	0.298	85	53	33.2	13.1	0.6
3	283.71	14	14.2	14.2	0.309	88	53	33.4	13.5	0.5
4	283.79	14	14.4	14.4	0.317	91	53	34.0	13.8	0.6
5	283.86	14	14.4	14.4	0.318	91	53	33.9	13.9	0.6
6	283.93	14	14.3	14.3	0.319	91	54	33.5	13.8	0.7
7	284.00	14	14.4	14.4	0.319	91	54	33.8	13.8	0.5
8	284.01	82	13.8	13.8	0.307	88	54	32.5	13.6	0.5
9	284.02	82	13.9	13.9	0.313	89	54	32.7	13.8	0.6
10	284.04	82	14.4	14.4	0.319	91	54	33.9	14.0	0.3
11	284.05	82	14.1	14.1	0.319	91	54	33.1	14.1	0.3
12	284.06	82	14.3	14.3	0.321	92	53	33.5	13.9	0.4
13	284.07	82	14.3	14.3	0.319	91	54	33.6	13.8	0.2
14	284.09	82	13.1	13.1	0.298	85	54	30.8	13.7	0.3
15	284.10	82	14.1	14.1	0.318	91	54	33.2	14.0	0.2
16	284.11	82	13.9	13.9	0.318	91	53	32.6	14.3	0.2
17	284.12	82	14.4	14.4	0.320	91	53	33.9	14.0	0.2
18	284.13	82	14.5	14.5	0.316	90	53	34.1	13.8	0.3
19	284.15	82	14.6	14.6	0.322	92	53	34.3	14.0	0.2
20	284.16	82	14.4	14.4	0.313	89	53	33.8	13.9	0.3
21	284.17	82	14.4	14.4	0.319	91	54	33.8	14.1	0.4
22	284.18	82	14.5	14.5	0.314	90	53	34.0	13.9	0.4
23	284.20	82	14.2	14.2	0.316	90	54	33.5	14.1	0.3
24	284.21	82	14.4	14.4	0.315	90	54	33.9	13.8	0.4
25	284.22	82	14.5	14.5	0.316	90	53	34.0	13.8	0.2
26	284.23	82	14.2	14.2	0.317	90	54	33.3	13.8	0.3
27	284.24	82	14.3	14.3	0.314	90	53	33.7	13.8	-0.1
28	284.26	82	14.5	14.5	0.319	91	53	34.0	13.8	0.5
29	284.27	82	14.5	14.5	0.317	91	53	34.1	13.9	0.4
30	284.28	82	14.5	14.5	0.320	92	53	34.1	13.9	0.5
31	284.29	82	14.4	14.4	0.318	91	53	33.9	13.8	0.3
32	284.30	82	14.3	14.3	0.318	91	54	33.5	13.9	0.4
33	284.32	82	14.2	14.2	0.319	91	53	33.3	13.9	0.4
34	284.33	82	14.3	14.3	0.318	91	53	33.6	13.8	0.3
35	284.34	82	14.3	14.3	0.320	92	54	33.6	13.8	0.2
36	284.35	82	14.5	14.5	0.318	91	53	34.0	13.9	0.4
37	284.37	82	14.4	14.4	0.319	91	53	33.9	13.9	0.3
38	284.38	82	14.5	14.5	0.320	91	53	34.0	14.0	0.4
39	284.39	82	14.5	14.5	0.318	91	53	34.0	13.9	0.3
40	284.40	82	14.4	14.4	0.317	90	53	33.9	13.9	0.2
41	284.41	82	14.5	14.5	0.320	91	54	34.1	13.9	0.3
42	284.43	82	14.5	14.5	0.321	92	53	34.1	14.0	0.3
43	284.44	82	14.0	14.0	0.320	91	54	32.9	14.1	0.3
44	284.45	82	14.4	14.4	0.314	90	53	33.9	13.9	0.2
45	284.46	82	14.3	14.3	0.319	91	54	33.5	13.9	0.2
46	284.48	82	14.4	14.4	0.317	91	53	33.9	14.0	0.0
47	284.49	82	14.4	14.4	0.315	90	53	33.8	14.0	0.2
48	284.50	82	14.4	14.4	0.318	91	54	33.7	14.0	0.2
49	284.50	294	14.5	14.5	0.321	92	53	34.0	14.2	0.0
50	284.51	294	14.4	14.4	0.314	90	53	33.9	13.9	0.2
51	284.51	294	14.2	14.2	0.319	91	54	33.3	13.7	0.1
52	284.51	294	14.6	14.6	0.319	91	54	34.3	13.9	0.1
53	284.52	294	14.5	14.5	0.319	91	53	34.0	14.0	0.1
54	284.52	294	14.8	14.8	0.321	92	53	34.7	14.0	0.3
55	284.52	294	14.7	14.7	0.315	90	53	34.5	14.0	0.1
56	284.53	294	14.8	14.8	0.320	91	53	34.8	14.0	0.3
57	284.53	294	14.8	14.8	0.319	91	54	34.8	14.0	0.2
58	284.53	294	14.7	14.7	0.319	91	53	34.4	14.2	0.1
59	284.54	294	14.8	14.8	0.319	91	53	34.9	14.0	0.1
60	284.54	294	14.7	14.7	0.322	92	54	34.5	14.2	0.1
61	284.54	294	14.8	14.8	0.319	91	53	34.8	14.0	0.1
62	284.55	294	15.0	15.0	0.322	92	53	35.2	14.1	-0.1
63	284.55	294	14.4	14.4	0.321	92	53	33.9	13.9	0.0
64	284.55	294	14.7	14.7	0.318	91	53	34.6	14.0	0.1
65	284.56	294	14.7	14.7	0.318	91	54	34.6	13.9	0.1
66	284.56	294	14.9	14.9	0.314	90	53	35.0	13.9	0.0

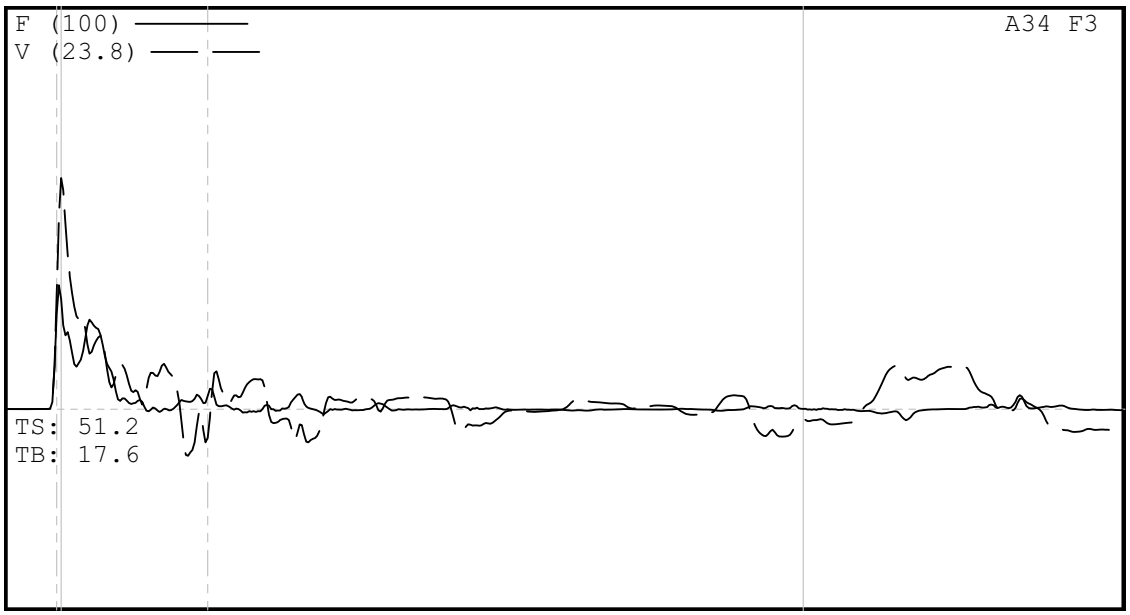
CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 283.5 285
OP: SDW

HAMMER #5 N3 B-800
Test date: 8-Sep-2008

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
67	284.56	294	14.6	14.6	0.320	91	53	34.2	14.0	0.1
68	284.57	294	14.7	14.7	0.318	91	53	34.5	13.9	0.1
69	284.57	294	14.8	14.8	0.318	91	53	34.7	13.9	0.0
70	284.57	294	14.9	14.9	0.321	92	53	35.1	14.0	0.0
71	284.58	294	14.6	14.6	0.316	90	54	34.4	13.8	0.2
72	284.58	294	14.4	14.4	0.317	91	53	33.9	14.0	0.1
73	284.59	294	14.6	14.6	0.322	92	54	34.3	14.1	0.0
74	284.59	294	14.9	14.9	0.318	91	53	35.0	14.0	0.2
75	284.59	294	14.7	14.7	0.319	91	53	34.6	14.0	0.1
76	284.60	294	15.0	15.0	0.322	92	54	35.2	14.0	0.1
77	284.60	294	14.8	14.8	0.318	91	54	34.8	13.9	0.0
78	284.60	294	14.7	14.7	0.319	91	53	34.5	14.0	0.3
79	284.61	294	14.9	14.9	0.313	89	54	34.9	13.9	0.3
80	284.61	294	14.6	14.6	0.313	89	53	34.4	13.8	0.2
81	284.61	294	14.5	14.5	0.314	90	53	34.0	13.9	0.2
82	284.62	294	14.5	14.5	0.307	88	53	34.0	13.9	0.3
83	284.62	294	14.5	14.5	0.312	89	54	34.0	13.6	0.3
84	284.62	294	14.5	14.5	0.306	87	53	34.2	13.8	0.2
85	284.63	294	14.6	14.6	0.311	89	54	34.4	13.9	0.2
86	284.63	294	14.5	14.5	0.313	89	54	34.2	14.1	0.2
87	284.63	294	14.3	14.3	0.309	88	53	33.6	13.9	0.2
88	284.64	294	14.3	14.3	0.307	88	54	33.6	13.8	0.2
89	284.64	294	14.3	14.3	0.306	87	54	33.7	13.9	0.1
90	284.64	294	14.3	14.3	0.306	88	53	33.5	13.9	0.3
91	284.65	294	14.4	14.4	0.308	88	54	33.9	13.8	0.3
92	284.65	294	14.7	14.7	0.312	89	54	34.6	13.9	0.2
93	284.65	294	14.8	14.8	0.316	90	54	34.8	14.0	0.2
94	284.66	294	15.1	15.1	0.312	89	54	35.6	13.6	0.1
95	284.66	294	14.3	14.3	0.305	87	53	33.5	13.7	0.1
96	284.66	294	13.6	13.6	0.297	85	54	32.1	13.7	0.2
97	284.67	294	14.0	14.0	0.303	87	54	32.9	13.8	0.1
98	284.67	294	14.4	14.4	0.313	90	54	33.8	14.1	0.2
		Average	14.4	14.4	0.316	90	53	33.9	13.9	0.2
		Std. Dev.	0.3	0.3	0.006	2	0	0.7	0.2	0.2
		Maximum	15.1	15.1	0.322	92	54	35.6	14.3	0.7

Total number of blows analyzed: 98

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 283 5 285



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 283 5 285
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 283 5 285
9/8/2008 12:05:38 PM
Blow Number 17/14

Pile Properties

LE	285.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	33.91	ms
JC	1.20	[]
LP	284.09	ft

Quantity Results

CSXN	13.1	ksi
CSI	13.1	ksi
CSB	12.8	ksi
EFV	0.298	k-ft
ETR	85.2	(%)
BPM	53.5	bpm
FMX	31	kips
VMX	13.7	f/s
DFN	0.30	in

Sensors

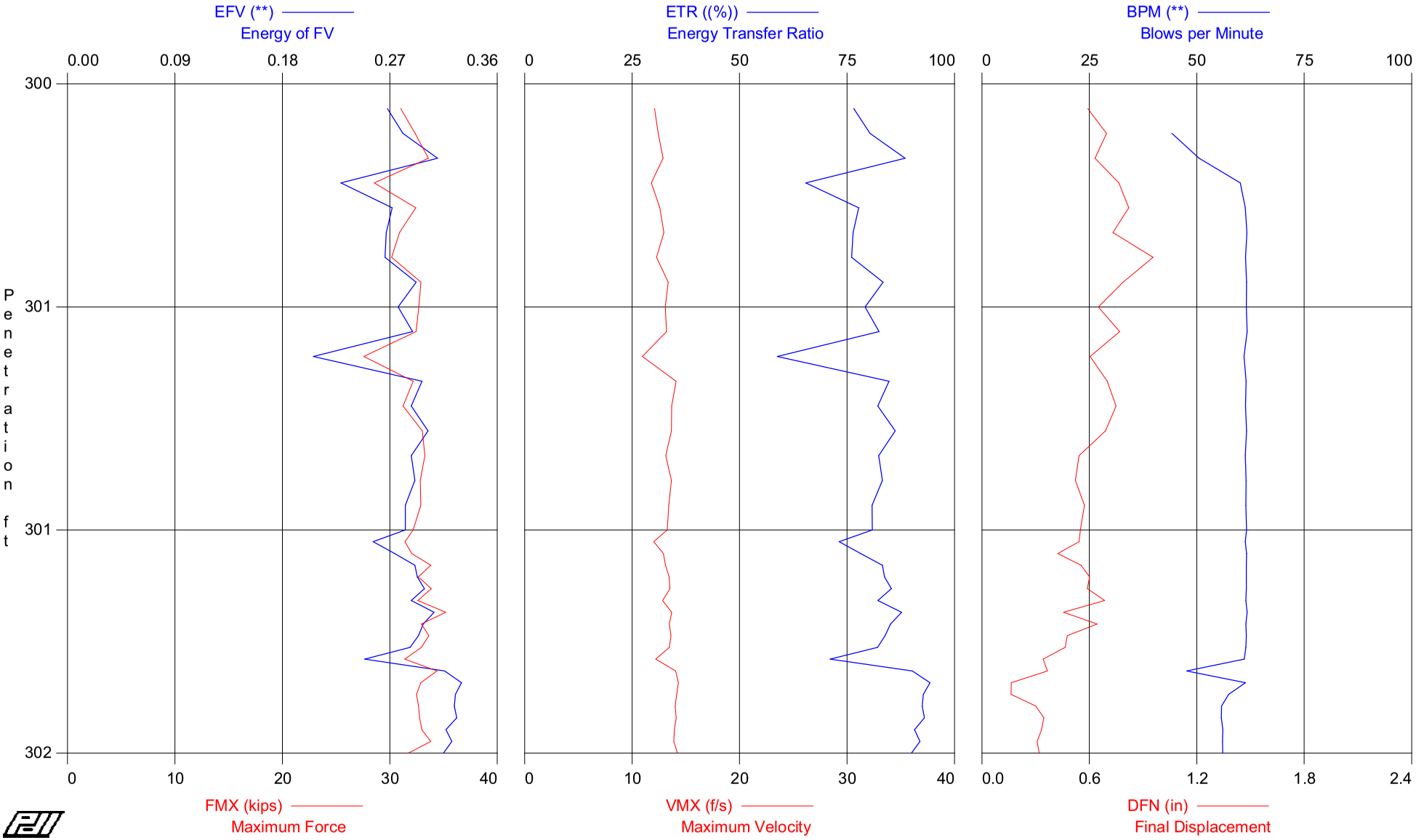
F3: [40-N3-1] 215.99 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F1/F2: USE 2 STRAIN
V3/V4: OK 0.91

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 8-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 300-301.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 300-301.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 8-Sep-2008

AR: 2.35 in^2
LE: 304.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
9	300.50	18	AV9	13.5	13.9	0.274	78	58	31.6	12.6	0.7
			STD	0.6	0.6	0.021	6	6	1.5	0.5	0.1
			MAX	14.3	14.9	0.310	89	62	33.6	13.4	1.0
18	301.00	18	AV9	13.6	14.0	0.281	80	61	32.0	13.2	0.6
			STD	0.7	0.7	0.027	8	0	1.6	0.9	0.1
			MAX	14.2	14.6	0.302	86	62	33.3	14.1	0.8
37	301.50	38	AV19	14.0	14.3	0.301	86	59	33.0	13.5	0.4
			STD	0.4	0.4	0.023	6	4	1.0	0.6	0.1
			MAX	15.0	15.1	0.330	94	62	35.2	14.3	0.7
			Average	13.8	14.1	0.289	83	59	32.4	13.2	0.6
			Std. Dev.	0.6	0.6	0.026	7	4	1.4	0.8	0.2
			Maximum	15.0	15.1	0.330	94	62	35.2	14.3	1.0

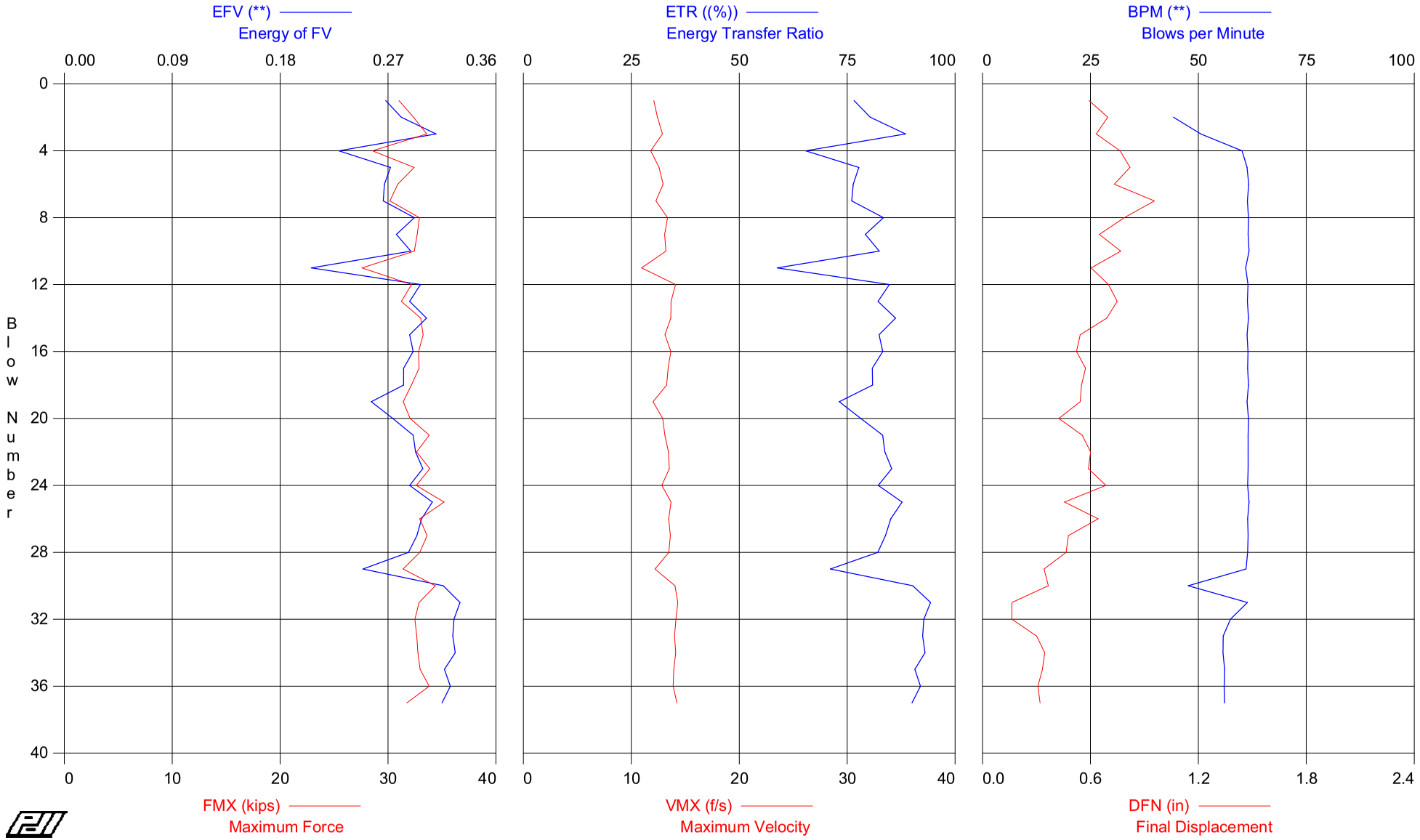
Total number of blows analyzed: 37

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 8-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 300-301.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 300-301.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 8-Sep-2008

AR: 2.35 in^2
LE: 304.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

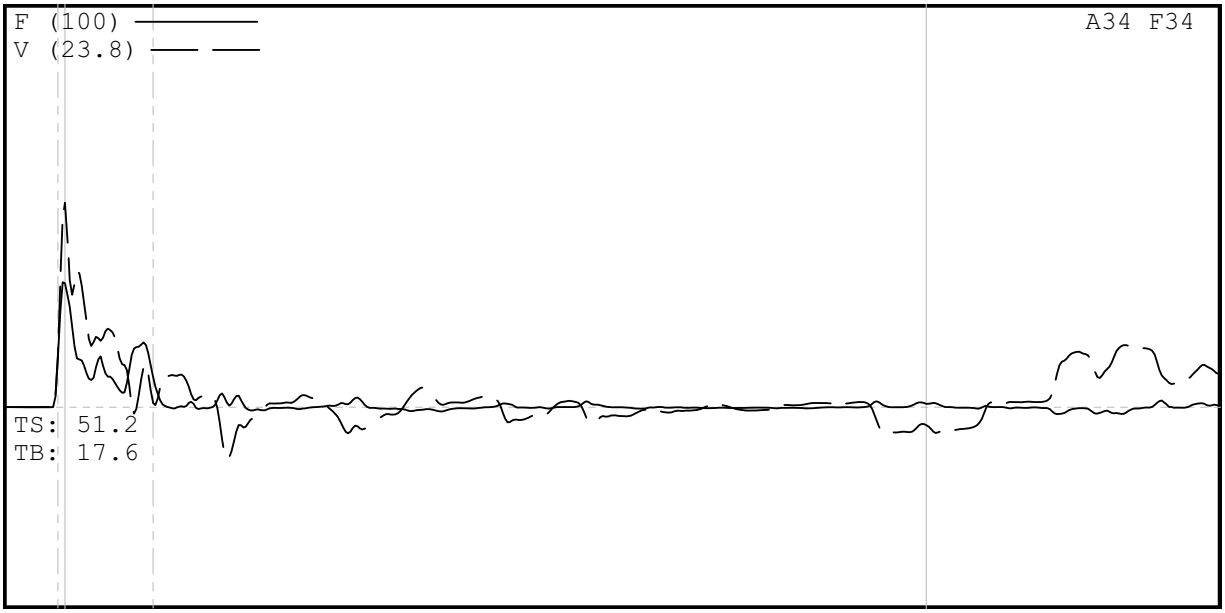
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	300.06	18	13.2	13.6	0.268	77	0	31.0	12.1	0.6
2	300.11	18	13.8	14.3	0.281	80	44	32.4	12.4	0.7
3	300.17	18	14.3	14.9	0.310	89	51	33.6	12.9	0.6
4	300.22	18	12.2	12.7	0.229	65	60	28.6	11.8	0.8
5	300.28	18	13.8	14.0	0.272	78	61	32.4	12.6	0.8
6	300.33	18	13.1	13.7	0.267	76	62	30.9	12.9	0.7
7	300.39	18	12.8	13.2	0.266	76	61	30.2	12.3	1.0
8	300.44	18	14.0	14.2	0.292	83	62	32.9	13.4	0.8
9	300.50	18	13.9	14.4	0.277	79	62	32.7	13.1	0.7
10	300.56	18	13.8	14.4	0.289	82	62	32.4	13.2	0.8
11	300.61	18	11.7	12.2	0.206	59	61	27.6	11.0	0.6
12	300.67	18	13.7	14.1	0.297	85	61	32.2	14.1	0.7
13	300.72	18	13.3	13.5	0.288	82	61	31.2	13.7	0.7
14	300.78	18	14.1	14.6	0.302	86	62	33.0	13.7	0.7
15	300.83	18	14.2	14.6	0.288	82	61	33.3	13.1	0.5
16	300.89	18	14.0	14.4	0.291	83	61	32.8	13.7	0.5
17	300.94	18	14.0	14.1	0.283	81	61	32.9	13.4	0.6
18	301.00	18	13.7	14.1	0.283	81	62	32.2	13.3	0.6
19	301.03	38	13.4	13.8	0.256	73	61	31.4	12.0	0.5
20	301.05	38	13.6	14.2	0.274	78	62	32.0	12.9	0.4
21	301.08	38	14.4	14.7	0.291	83	62	33.8	13.1	0.6
22	301.11	38	13.9	14.2	0.293	84	62	32.6	13.4	0.6
23	301.13	38	14.4	14.5	0.299	85	62	33.9	13.5	0.6
24	301.16	38	13.9	14.2	0.288	82	61	32.6	12.8	0.7
25	301.18	38	15.0	15.1	0.307	88	62	35.2	13.7	0.5
26	301.21	38	14.0	14.3	0.298	85	61	32.9	13.5	0.6
27	301.24	38	14.3	14.6	0.294	84	62	33.6	13.6	0.5
28	301.26	38	14.0	14.3	0.287	82	61	32.9	13.5	0.5
29	301.29	38	13.4	13.4	0.249	71	61	31.4	12.2	0.3
30	301.32	38	14.6	14.8	0.316	90	48	34.4	14.0	0.4
31	301.34	38	14.0	14.4	0.330	94	61	32.9	14.3	0.2
32	301.37	38	13.8	14.0	0.325	93	57	32.5	14.1	0.2
33	301.39	38	13.9	14.0	0.324	92	56	32.7	14.0	0.3
34	301.42	38	13.9	14.1	0.326	93	56	32.8	14.1	0.3
35	301.45	38	14.0	14.4	0.317	91	56	33.0	13.9	0.3
36	301.47	38	14.4	14.7	0.322	92	56	33.8	13.9	0.3
37	301.50	38	13.5	14.0	0.315	90	56	31.7	14.2	0.3
		Average	13.8	14.1	0.289	83	59	32.4	13.2	0.6
		Std. Dev.	0.6	0.6	0.026	7	4	1.4	0.8	0.2
		Maximum	15.0	15.1	0.330	94	62	35.2	14.3	1.0

Total number of blows analyzed: 37

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 300-301 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 300-301 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 300-301 5
9/8/2008 3:31:55 PM
Blow Number 2/1

Pile Properties

LE	304.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	36.17	ms
JC	1.20	[]
LP	300.06	ft

Quantity Results

CSXN	13.2	ksi
CSI	13.6	ksi
CSB	11.6	ksi
EFV	0.268	k-ft
ETR	76.6	(%)
BPM	0.0	bpm
FMX	31	kips
VMX	12.1	f/s
DFN	0.59	in

Sensors

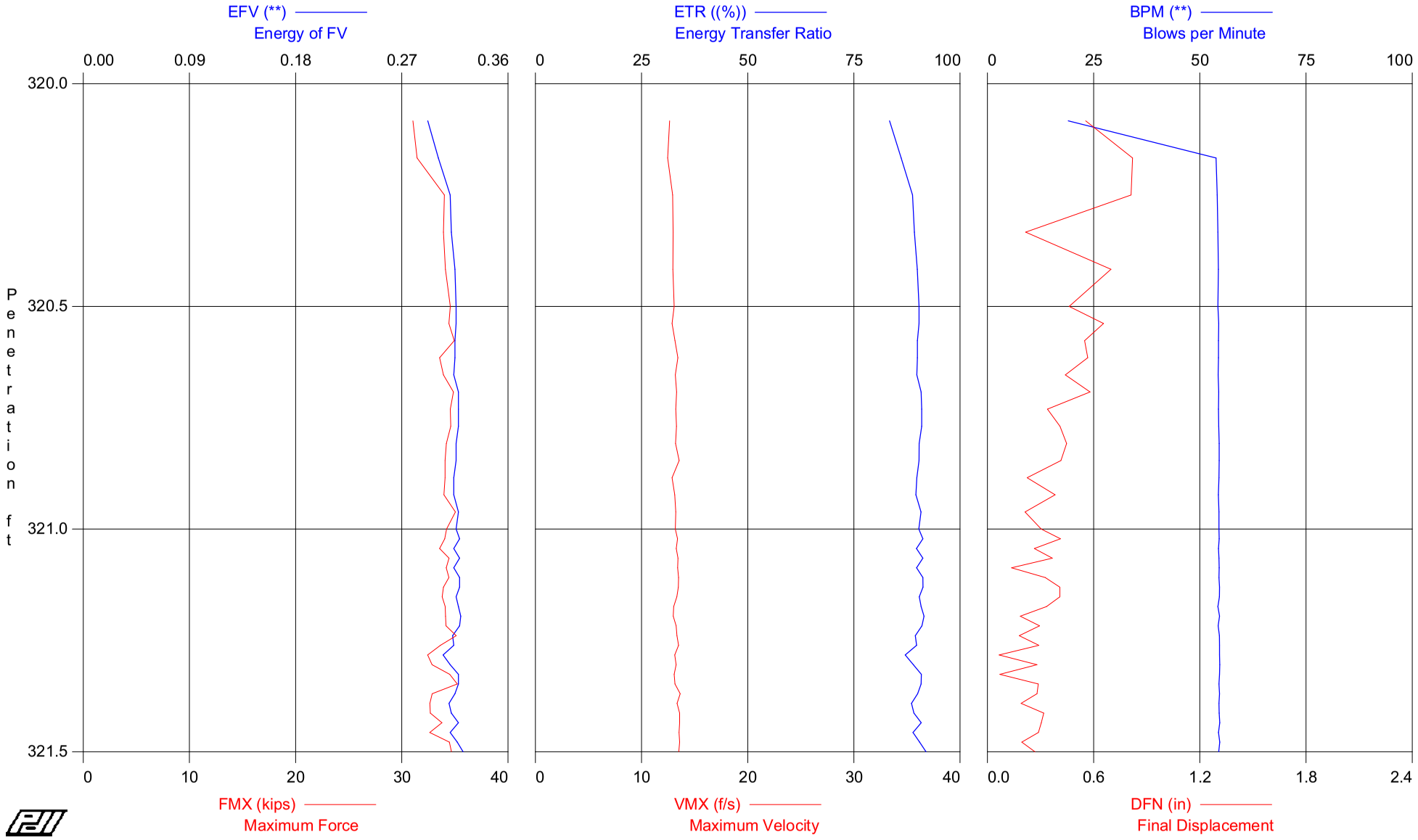
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.01
V3/V4: OK 1.05

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 9-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 320-321.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 320-321.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 9-Sep-2008

AR: 2.35 in^2
LE: 326.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
6	320.50	12	AV6	14.1	14.6	0.308	88	48	33.2	12.8	0.6
			STD	0.6	0.5	0.009	2	13	1.4	0.2	0.2
			MAX	14.7	15.3	0.316	90	54	34.6	13.1	0.8
19	321.00	26	AV13	14.6	15.1	0.316	90	54	34.3	13.2	0.4
			STD	0.2	0.2	0.002	0	0	0.4	0.2	0.1
			MAX	14.9	15.3	0.318	91	55	35.0	13.5	0.7
42	321.50	46	AV23	14.4	14.9	0.316	90	55	33.8	13.4	0.3
			STD	0.3	0.3	0.004	1	0	0.8	0.2	0.1
			MAX	15.0	15.4	0.322	92	55	35.2	13.6	0.4
			Average	14.4	14.9	0.315	90	54	33.9	13.2	0.4
			Std. Dev.	0.4	0.4	0.005	2	5	0.9	0.3	0.2
			Maximum	15.0	15.4	0.322	92	55	35.2	13.6	0.8

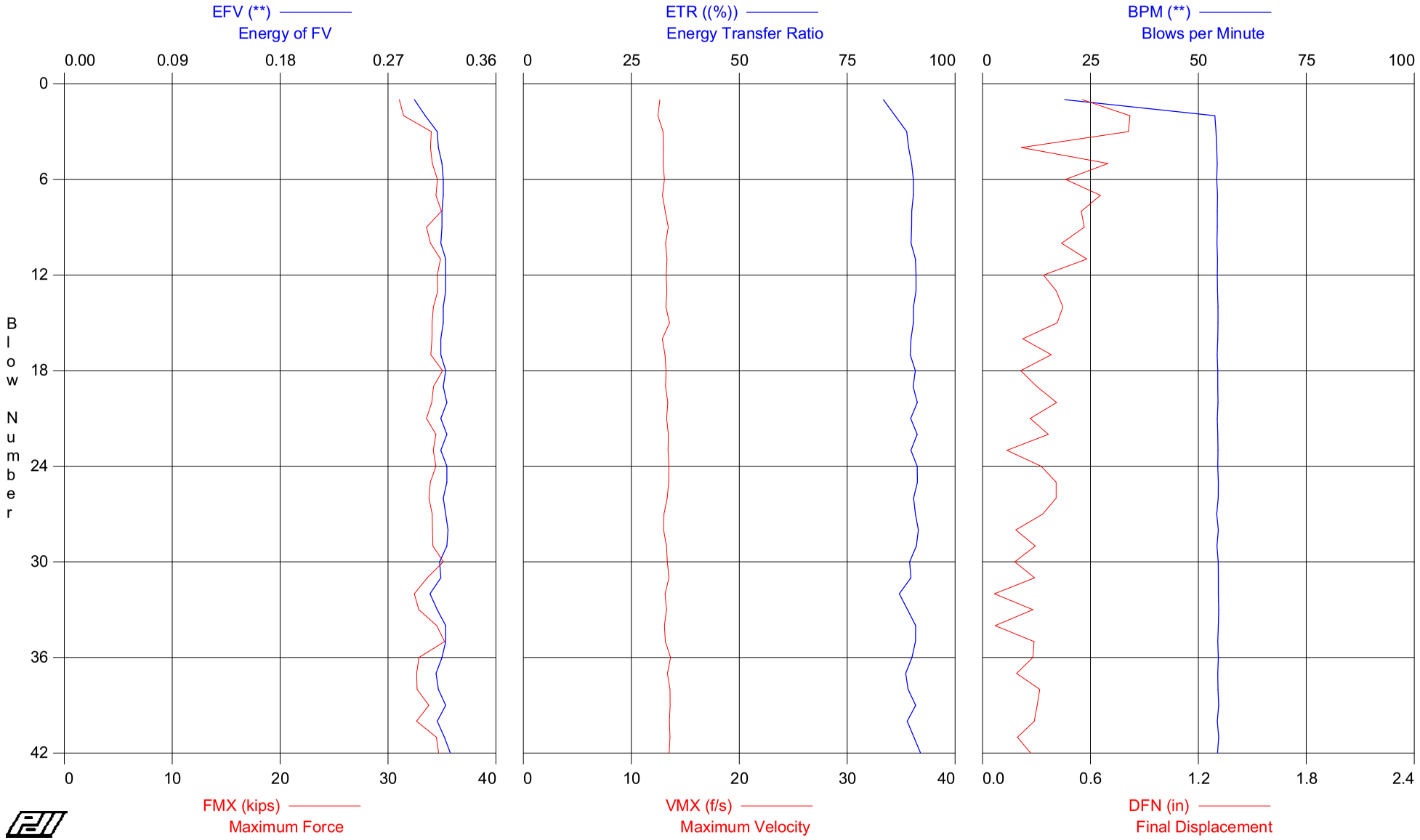
Total number of blows analyzed: 42

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 9-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 320-321.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 320-321.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 9-Sep-2008

AR: 2.35 in^2
LE: 326.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

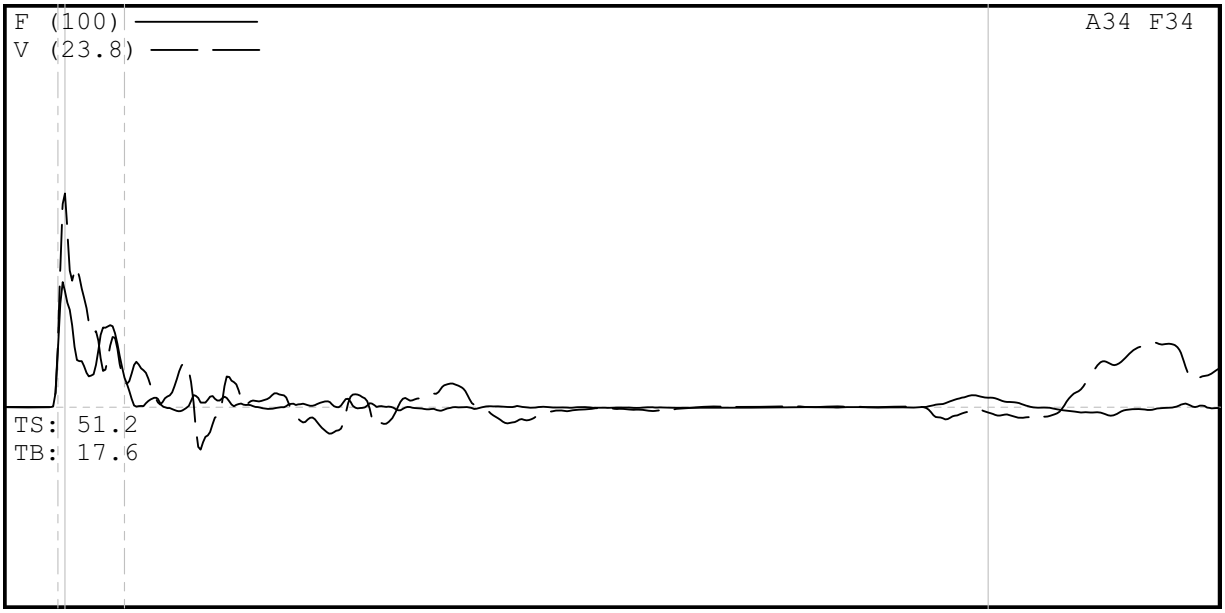
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	320.08	12	13.2	13.8	0.292	83	19	31.1	12.6	0.6
2	320.17	12	13.4	14.0	0.301	86	54	31.4	12.5	0.8
3	320.25	12	14.5	14.8	0.311	89	54	34.0	12.9	0.8
4	320.33	12	14.4	14.9	0.312	89	54	33.9	13.0	0.2
5	320.42	12	14.5	14.9	0.315	90	54	34.1	13.0	0.7
6	320.50	12	14.7	15.3	0.316	90	54	34.6	13.1	0.5
7	320.54	26	14.7	15.2	0.316	90	54	34.4	12.9	0.7
8	320.58	26	14.9	15.3	0.315	90	54	34.9	13.1	0.5
9	320.62	26	14.3	14.8	0.315	90	54	33.6	13.4	0.6
10	320.65	26	14.4	14.9	0.314	90	54	33.9	13.2	0.4
11	320.69	26	14.8	15.2	0.318	91	54	34.9	13.3	0.6
12	320.73	26	14.7	15.1	0.318	91	54	34.6	13.2	0.3
13	320.77	26	14.7	15.1	0.318	91	54	34.6	13.3	0.4
14	320.81	26	14.6	15.0	0.316	90	55	34.2	13.2	0.4
15	320.85	26	14.5	15.0	0.316	90	55	34.1	13.5	0.4
16	320.88	26	14.5	15.1	0.314	90	54	34.1	12.9	0.2
17	320.92	26	14.5	15.1	0.314	90	54	34.0	13.1	0.4
18	320.96	26	14.9	15.3	0.318	91	54	35.0	13.2	0.2
19	321.00	26	14.6	15.2	0.316	90	54	34.2	13.2	0.3
20	321.02	46	14.5	14.9	0.319	91	55	34.0	13.4	0.4
21	321.04	46	14.3	14.9	0.314	90	54	33.6	13.3	0.3
22	321.07	46	14.7	15.1	0.319	91	54	34.4	13.4	0.4
23	321.09	46	14.5	14.9	0.314	90	55	34.2	13.4	0.1
24	321.11	46	14.7	15.0	0.319	91	54	34.4	13.5	0.3
25	321.13	46	14.4	14.8	0.319	91	55	33.9	13.5	0.4
26	321.15	46	14.4	15.0	0.316	90	55	33.8	13.3	0.4
27	321.17	46	14.5	15.1	0.318	91	54	34.1	13.0	0.3
28	321.20	46	14.5	15.1	0.320	91	55	34.1	13.0	0.2
29	321.22	46	14.5	15.1	0.319	91	54	34.2	13.3	0.3
30	321.24	46	14.9	15.3	0.313	89	55	35.1	13.3	0.2
31	321.26	46	14.3	14.8	0.314	90	55	33.6	13.5	0.3
32	321.28	46	13.8	14.2	0.305	87	55	32.4	13.1	0.1
33	321.30	46	14.0	14.5	0.311	89	55	32.9	13.3	0.3
34	321.33	46	14.7	15.2	0.318	91	55	34.5	13.1	0.1
35	321.35	46	15.0	15.4	0.318	91	54	35.2	13.1	0.3
36	321.37	46	14.0	14.5	0.315	90	55	32.9	13.6	0.3
37	321.39	46	13.9	14.4	0.310	89	54	32.6	13.3	0.2
38	321.41	46	13.9	14.4	0.312	89	55	32.7	13.6	0.3
39	321.43	46	14.4	14.8	0.318	91	55	33.8	13.6	0.3
40	321.46	46	13.9	14.5	0.311	89	54	32.6	13.5	0.3
41	321.48	46	14.7	15.1	0.317	90	55	34.5	13.6	0.2
42	321.50	46	14.8	15.2	0.322	92	54	34.7	13.5	0.3
		Average	14.4	14.9	0.315	90	54	33.9	13.2	0.4
		Std. Dev.	0.4	0.4	0.005	2	5	0.9	0.3	0.2
		Maximum	15.0	15.4	0.322	92	55	35.2	13.6	0.8

Total number of blows analyzed: 42

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 320-321 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 320-321 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 320-321 5
9/9/2008 11:24:45 AM
Blow Number 2/1

Pile Properties

LE	326.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	38.79	ms
JC	1.20	[]
LP	320.08	ft

Quantity Results

CSXN	13.2	ksi
CSI	13.8	ksi
CSB	13.0	ksi
EFV	0.292	k-ft
ETR	83.4	(%)
BPM	19.0	bpm
FMX	31	kips
VMX	12.6	f/s
DFN	0.55	in

Sensors

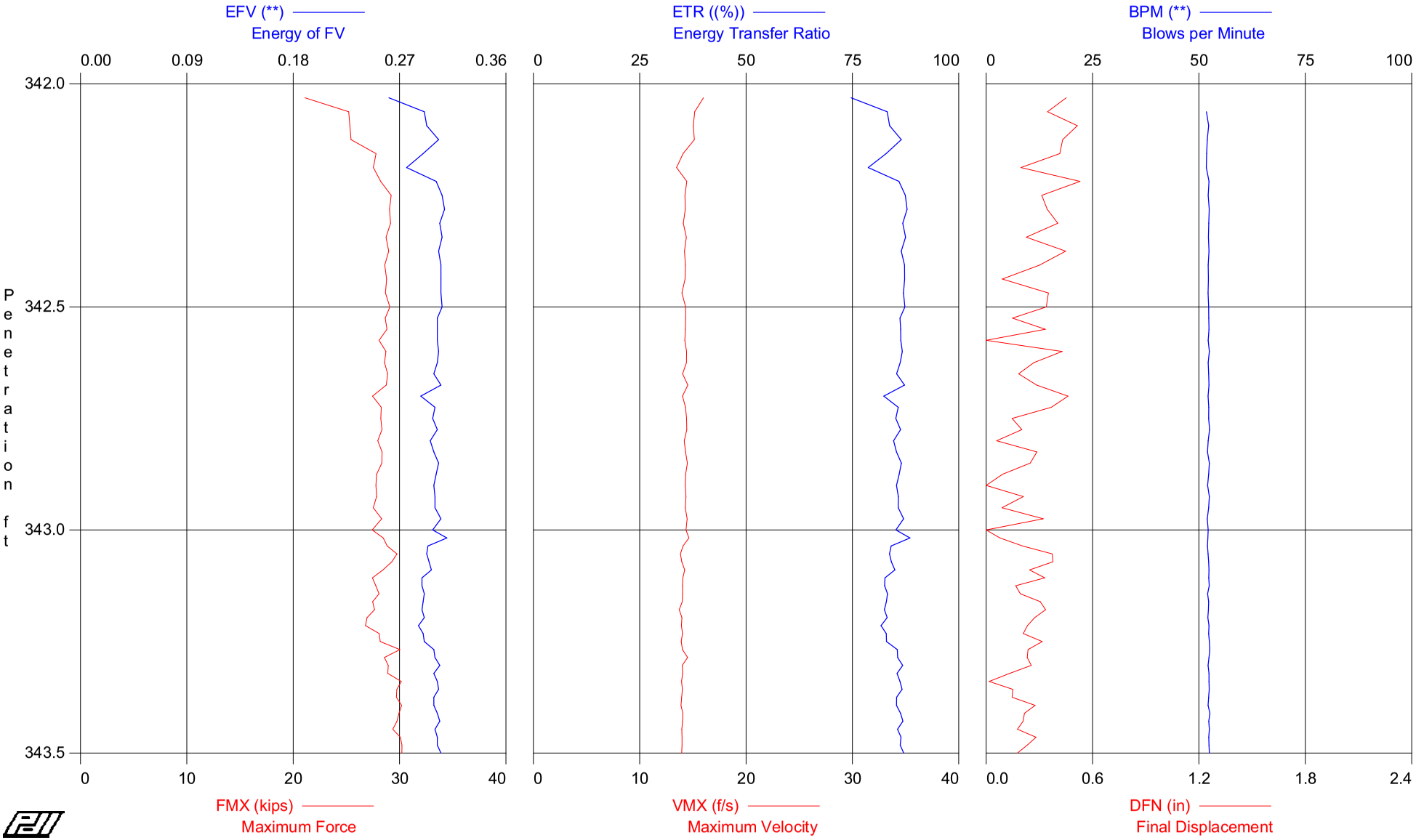
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.05
V3/V4: OK 1.11

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 10-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 342- 343.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 342- 343.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 10-Sep-2008

AR: 2.35 in^2
LE: 344.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
16	342.50	32	AV16	11.7	12.4	0.298	85	52	27.6	14.5	0.4
			STD	0.9	0.8	0.013	4	0	2.2	0.6	0.1
			MAX	12.4	13.2	0.308	88	52	29.2	16.0	0.5
36	343.00	40	AV20	12.0	12.6	0.300	86	52	28.2	14.3	0.2
			STD	0.2	0.2	0.004	1	0	0.4	0.1	0.1
			MAX	12.3	13.0	0.305	87	52	28.9	14.5	0.5
64	343.50	56	AV28	12.3	13.0	0.297	85	52	28.9	14.0	0.2
			STD	0.5	0.4	0.006	2	0	1.1	0.2	0.1
			MAX	12.9	13.6	0.310	89	53	30.2	14.6	0.4
			Average	12.1	12.7	0.298	85	52	28.3	14.2	0.3
			Std. Dev.	0.6	0.6	0.008	2	0	1.4	0.4	0.1
			Maximum	12.9	13.6	0.310	89	53	30.2	16.0	0.5

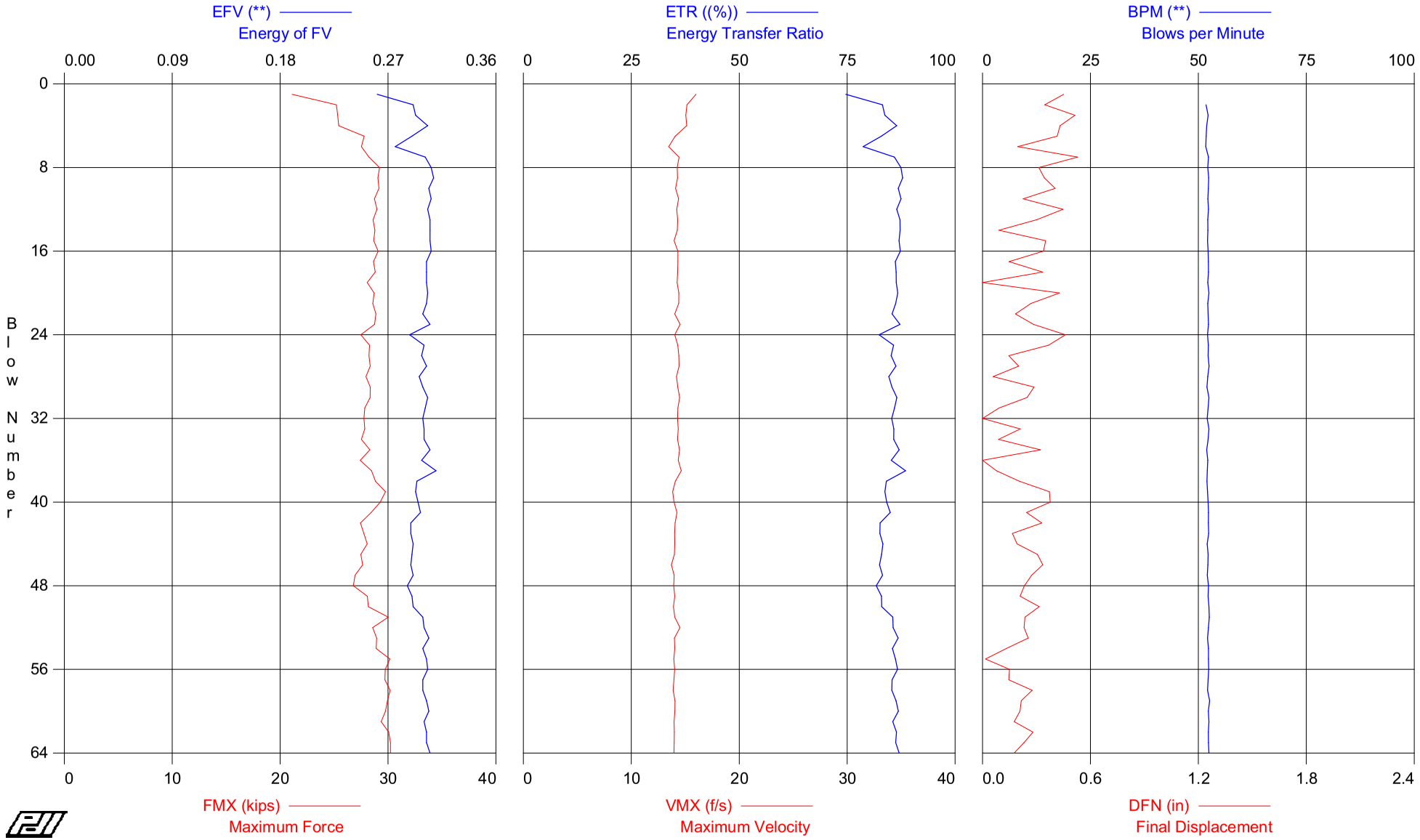
Total number of blows analyzed: 64

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 10-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 342- 343.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 342- 343.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 10-Sep-2008

AR: 2.35 in^2
LE: 344.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	342.03	32	9.0	10.1	0.261	75	0	21.1	16.0	0.5
2	342.06	32	10.7	11.5	0.291	83	52	25.2	15.2	0.3
3	342.09	32	10.8	11.5	0.293	84	52	25.3	15.0	0.5
4	342.13	32	10.8	11.5	0.303	86	52	25.4	15.1	0.4
5	342.16	32	11.8	12.7	0.290	83	52	27.8	14.1	0.4
6	342.19	32	11.7	12.6	0.276	79	52	27.5	13.5	0.2
7	342.22	32	12.0	12.8	0.301	86	52	28.2	14.4	0.5
8	342.25	32	12.4	13.2	0.306	87	52	29.2	14.3	0.3
9	342.28	32	12.4	13.1	0.308	88	52	29.1	14.3	0.3
10	342.31	32	12.4	13.0	0.304	87	52	29.2	14.1	0.4
11	342.34	32	12.2	12.8	0.306	87	52	28.7	14.4	0.2
12	342.38	32	12.3	13.0	0.303	86	52	29.0	14.2	0.4
13	342.41	32	12.2	12.6	0.305	87	52	28.6	14.3	0.3
14	342.44	32	12.3	12.8	0.305	87	52	28.8	14.3	0.1
15	342.47	32	12.2	12.8	0.305	87	52	28.7	14.0	0.4
16	342.50	32	12.4	13.1	0.306	87	52	29.1	14.3	0.3
17	342.53	40	12.2	12.8	0.302	86	52	28.7	14.3	0.1
18	342.55	40	12.3	12.9	0.302	86	52	28.8	14.3	0.3
19	342.58	40	11.9	12.6	0.302	86	52	28.1	14.2	-0.1
20	342.60	40	12.2	12.9	0.303	87	52	28.7	14.4	0.4
21	342.63	40	12.2	12.9	0.302	86	52	28.6	14.4	0.3
22	342.65	40	12.3	13.0	0.299	85	52	28.9	14.0	0.2
23	342.68	40	12.2	12.8	0.305	87	52	28.8	14.5	0.3
24	342.70	40	11.7	12.2	0.288	82	52	27.5	14.0	0.5
25	342.73	40	12.0	12.8	0.300	86	52	28.3	14.3	0.4
26	342.75	40	12.0	12.7	0.298	85	52	28.2	14.4	0.1
27	342.78	40	12.1	12.8	0.302	86	52	28.4	14.4	0.2
28	342.80	40	11.9	12.5	0.296	85	52	28.0	14.2	0.1
29	342.83	40	12.1	12.7	0.299	85	52	28.4	14.3	0.3
30	342.85	40	12.1	12.7	0.303	87	52	28.3	14.5	0.2
31	342.88	40	11.8	12.4	0.301	86	52	27.8	14.3	0.1
32	342.90	40	11.8	12.5	0.299	85	52	27.8	14.3	0.0
33	342.93	40	11.8	12.4	0.300	86	52	27.8	14.4	0.2
34	342.95	40	11.7	12.4	0.300	86	52	27.5	14.3	0.1
35	342.98	40	12.1	12.7	0.305	87	52	28.3	14.5	0.3
36	343.00	40	11.7	12.3	0.298	85	52	27.4	14.3	0.0
37	343.02	56	12.1	12.8	0.310	89	52	28.5	14.6	0.1
38	343.04	56	12.3	12.9	0.294	84	52	28.8	14.1	0.2
39	343.05	56	12.7	13.3	0.293	84	52	29.8	13.8	0.4
40	343.07	56	12.5	13.0	0.295	84	52	29.3	14.0	0.4
41	343.09	56	12.1	12.7	0.297	85	52	28.4	14.2	0.2
42	343.11	56	11.7	12.4	0.289	83	52	27.4	14.1	0.3
43	343.13	56	11.8	12.6	0.289	83	52	27.8	14.0	0.2
44	343.14	56	11.9	12.6	0.291	83	52	28.1	14.0	0.2
45	343.16	56	11.7	12.5	0.290	83	52	27.5	14.0	0.3
46	343.18	56	11.8	12.5	0.289	83	52	27.7	13.7	0.3
47	343.20	56	11.5	12.2	0.291	83	52	26.9	14.0	0.3
48	343.21	56	11.4	12.3	0.286	82	52	26.8	13.9	0.2
49	343.23	56	12.0	12.7	0.290	83	52	28.1	14.0	0.2
50	343.25	56	12.0	12.7	0.291	83	52	28.2	13.9	0.3
51	343.27	56	12.8	13.5	0.299	86	53	30.0	14.0	0.2
52	343.29	56	12.2	12.9	0.300	86	52	28.6	14.5	0.2
53	343.30	56	12.3	13.0	0.304	87	52	28.9	14.0	0.3
54	343.32	56	12.3	12.9	0.299	85	52	28.9	14.0	0.1
55	343.34	56	12.8	13.4	0.302	86	52	30.2	13.9	0.0
56	343.36	56	12.7	13.4	0.303	87	52	29.7	14.0	0.2
57	343.38	56	12.6	13.3	0.299	85	52	29.7	13.9	0.1
58	343.39	56	12.8	13.5	0.299	85	52	30.2	13.9	0.3
59	343.41	56	12.7	13.4	0.302	86	53	29.9	14.1	0.2
60	343.43	56	12.7	13.4	0.304	87	52	29.8	14.0	0.2
61	343.45	56	12.5	13.2	0.300	86	52	29.4	14.0	0.2
62	343.46	56	12.8	13.4	0.302	86	52	30.1	14.0	0.3
63	343.48	56	12.9	13.6	0.302	86	52	30.2	14.0	0.2
64	343.50	56	12.9	13.6	0.305	87	52	30.2	13.9	0.2

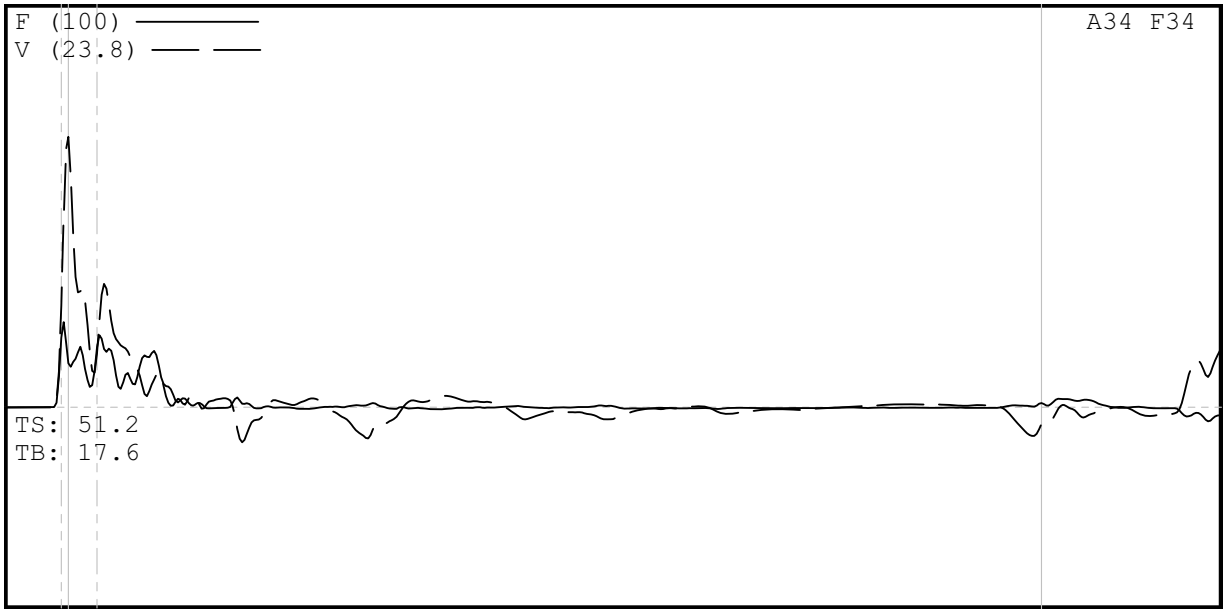
CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 342- 343.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 10-Sep-2008

	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ksi	ksi	**	(%)	**	kips	f/s	in
Average	12.1	12.7	0.298	85	52	28.3	14.2	0.3
Std. Dev.	0.6	0.6	0.008	2	0	1.4	0.4	0.1
Maximum	12.9	13.6	0.310	89	53	30.2	16.0	0.5

Total number of blows analyzed: 64

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 342- 343 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 342- 343 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 342- 343 5
9/10/2008 10:28:32 AM
Blow Number 3/1

Pile Properties

LE	344.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	40.93	ms
JC	1.20	[]
LP	342.03	ft

Quantity Results

CSXN	9.0	ksi
CSI	10.1	ksi
CSB	13.5	ksi
EFV	0.261	k-ft
ETR	74.7	(%)
BPM	0.0	bpm
FMX	21	kips
VMX	16.0	f/s
DFN	0.45	in

Sensors

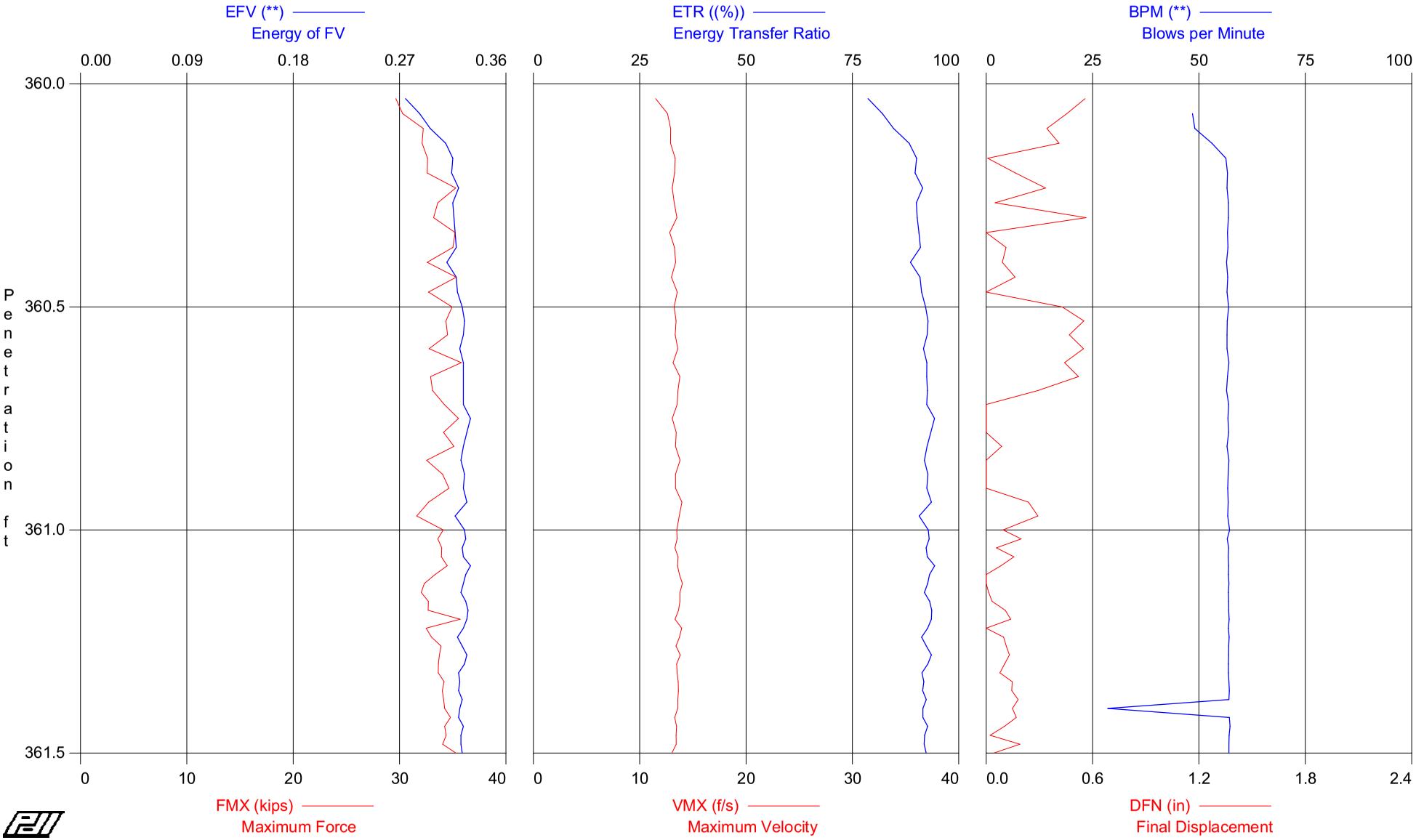
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.10
V3/V4: OK 0.96

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 10-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 360- 361.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 360- 361.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 10-Sep-2008

AR: 2.35 in^2
LE: 366.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
15	360.50	30	AV15	14.1	14.6	0.310	89	55	33.2	13.0	0.2
			STD	0.7	0.7	0.013	4	3	1.7	0.5	0.2
			MAX	15.0	15.5	0.323	92	57	35.3	13.5	0.6
31	361.00	32	AV16	14.4	14.8	0.324	93	57	33.9	13.5	0.2
			STD	0.5	0.4	0.003	1	0	1.1	0.2	0.3
			MAX	15.2	15.6	0.330	94	57	35.8	14.0	0.6
56	361.50	50	AV25	14.4	14.8	0.324	92	56	33.8	13.6	0.1
			STD	0.4	0.4	0.003	1	6	0.9	0.2	0.1
			MAX	15.2	15.6	0.330	94	57	35.7	14.0	0.2
			Average	14.3	14.7	0.320	91	56	33.6	13.4	0.2
			Std. Dev.	0.5	0.5	0.009	3	4	1.3	0.4	0.2
			Maximum	15.2	15.6	0.330	94	57	35.8	14.0	0.6

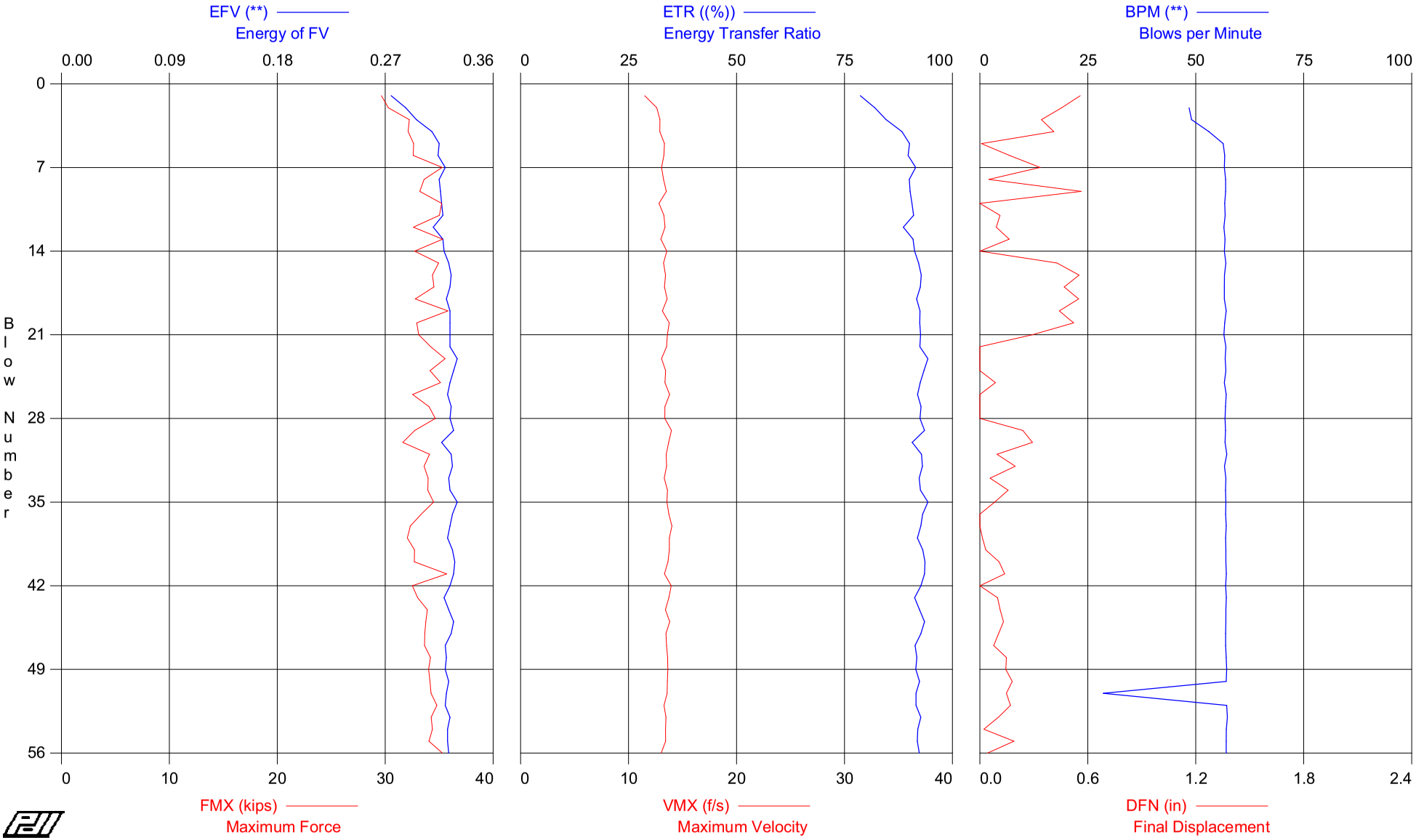
Total number of blows analyzed: 56

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 10-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 360- 361.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 360- 361.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 10-Sep-2008

AR: 2.35 in^2
LE: 366.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

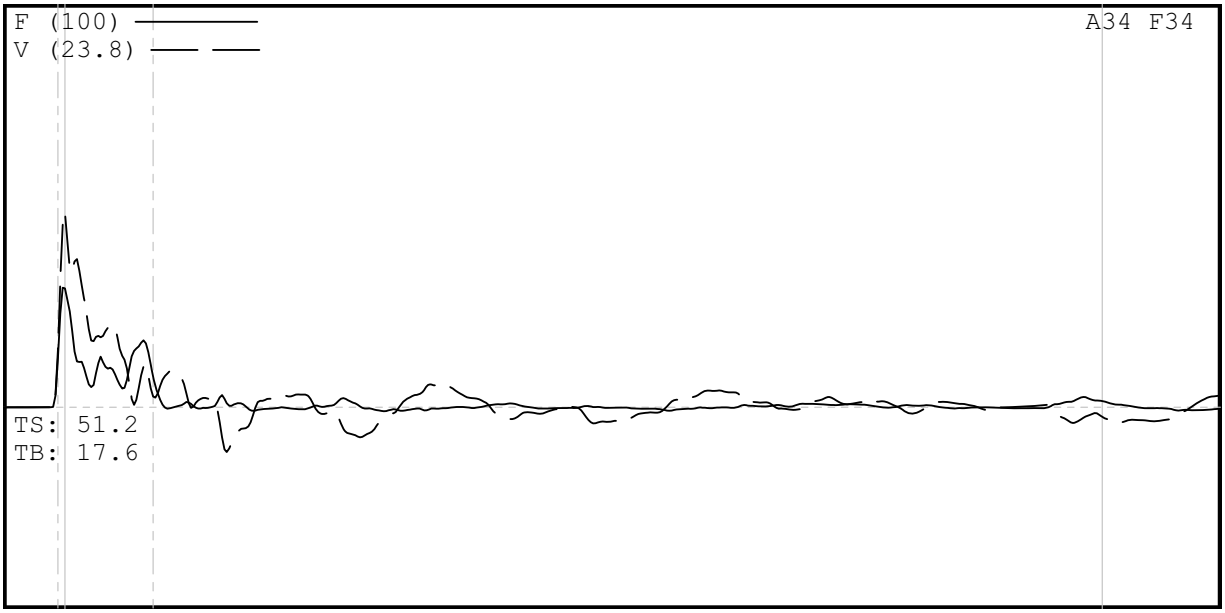
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	360.03	30	12.6	13.1	0.275	79	0	29.6	11.5	0.6
2	360.07	30	12.9	13.4	0.287	82	48	30.3	12.6	0.5
3	360.10	30	13.7	14.0	0.296	85	49	32.2	12.9	0.3
4	360.13	30	13.7	14.3	0.309	88	53	32.1	12.9	0.4
5	360.17	30	13.9	14.4	0.315	90	56	32.6	13.3	0.0
6	360.20	30	13.9	14.4	0.314	90	57	32.6	13.3	0.2
7	360.23	30	15.0	15.4	0.320	92	57	35.3	13.1	0.3
8	360.27	30	14.3	14.8	0.315	90	57	33.6	13.2	0.1
9	360.30	30	14.1	14.6	0.316	90	57	33.2	13.5	0.6
10	360.33	30	15.0	15.5	0.317	91	57	35.2	12.8	0.0
11	360.37	30	14.9	15.3	0.318	91	57	35.0	13.3	0.1
12	360.40	30	13.9	14.4	0.310	89	56	32.6	13.4	0.1
13	360.43	30	15.0	15.3	0.318	91	57	35.3	13.0	0.2
14	360.47	30	13.9	14.5	0.319	91	57	32.7	13.5	0.0
15	360.50	30	14.9	15.1	0.323	92	57	34.9	13.2	0.4
16	360.53	32	14.6	14.9	0.325	93	57	34.4	13.4	0.6
17	360.56	32	14.7	15.0	0.324	93	57	34.5	13.3	0.5
18	360.59	32	13.9	14.3	0.321	92	57	32.8	13.6	0.5
19	360.63	32	15.2	15.5	0.324	92	57	35.8	13.1	0.4
20	360.66	32	14.0	14.4	0.324	92	57	32.9	13.8	0.5
21	360.69	32	14.1	14.7	0.324	93	56	33.1	13.6	0.3
22	360.72	32	14.6	14.9	0.324	92	57	34.2	13.5	-0.1
23	360.75	32	15.1	15.6	0.330	94	57	35.5	13.1	-0.1
24	360.78	32	14.5	15.0	0.327	93	57	34.1	13.4	0.0
25	360.81	32	14.9	15.2	0.324	93	57	35.1	13.4	0.1
26	360.84	32	13.8	14.5	0.322	92	57	32.5	13.8	-0.2
27	360.88	32	14.5	15.0	0.325	93	57	34.0	13.4	-0.1
28	360.91	32	14.7	15.0	0.324	92	57	34.6	13.4	-0.1
29	360.94	32	13.9	14.4	0.327	94	57	32.7	14.0	0.2
30	360.97	32	13.5	14.1	0.317	91	57	31.6	13.7	0.3
31	361.00	32	14.5	14.8	0.325	93	57	34.1	13.5	0.1
32	361.02	50	14.3	14.8	0.326	93	57	33.6	13.5	0.2
33	361.04	50	14.5	15.0	0.323	92	57	34.0	13.3	0.1
34	361.06	50	14.4	14.7	0.324	93	57	33.9	13.6	0.2
35	361.08	50	14.7	14.9	0.330	94	57	34.5	13.6	0.1
36	361.10	50	14.2	14.5	0.326	93	57	33.3	13.7	-0.1
37	361.12	50	13.8	14.1	0.324	93	57	32.3	14.0	0.0
38	361.14	50	13.6	14.2	0.322	92	57	32.0	13.8	0.0
39	361.16	50	13.9	14.3	0.326	93	57	32.7	13.8	0.0
40	361.18	50	13.9	14.4	0.328	94	57	32.7	13.7	0.1
41	361.20	50	15.2	15.6	0.327	94	57	35.7	13.3	0.1
42	361.22	50	13.8	14.2	0.324	93	57	32.5	13.9	-0.1
43	361.24	50	14.0	14.4	0.319	91	57	33.0	13.7	0.1
44	361.26	50	14.4	14.9	0.323	92	57	33.9	13.4	0.1
45	361.28	50	14.4	14.6	0.327	94	57	33.8	13.8	0.1
46	361.30	50	14.3	14.9	0.325	93	57	33.7	13.5	0.1
47	361.32	50	14.3	14.7	0.320	91	57	33.6	13.5	0.1
48	361.34	50	14.5	14.9	0.321	92	57	34.2	13.6	0.1
49	361.36	50	14.5	14.8	0.320	92	57	34.0	13.6	0.1
50	361.38	50	14.5	14.9	0.323	92	57	34.1	13.6	0.2
51	361.40	50	14.6	14.8	0.321	92	29	34.2	13.6	0.1
52	361.42	50	14.8	15.2	0.320	92	57	34.8	13.3	0.2
53	361.44	50	14.6	14.9	0.324	93	57	34.2	13.5	0.1
54	361.46	50	14.6	14.9	0.322	92	57	34.4	13.4	0.0
55	361.48	50	14.5	14.8	0.322	92	57	34.1	13.4	0.2
56	361.50	50	15.0	15.5	0.323	92	57	35.3	13.0	0.0
		Average	14.3	14.7	0.320	91	56	33.6	13.4	0.2
		Std. Dev.	0.5	0.5	0.009	3	4	1.3	0.4	0.2
		Maximum	15.2	15.6	0.330	94	57	35.8	14.0	0.6

Total number of blows analyzed: 56

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 360- 361 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 360- 361 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 360- 361 5
9/10/2008 3:12:43 PM
Blow Number 7/1

Pile Properties

LE	366.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	43.55	ms
JC	1.20	[]
LP	360.03	ft

Quantity Results

CSXN	12.6	ksi
CSI	13.1	ksi
CSB	11.7	ksi
EFV	0.275	k-ft
ETR	78.7	(%)
BPM	0.0	bpm
FMX	30	kips
VMX	11.5	f/s
DFN	0.56	in

Sensors

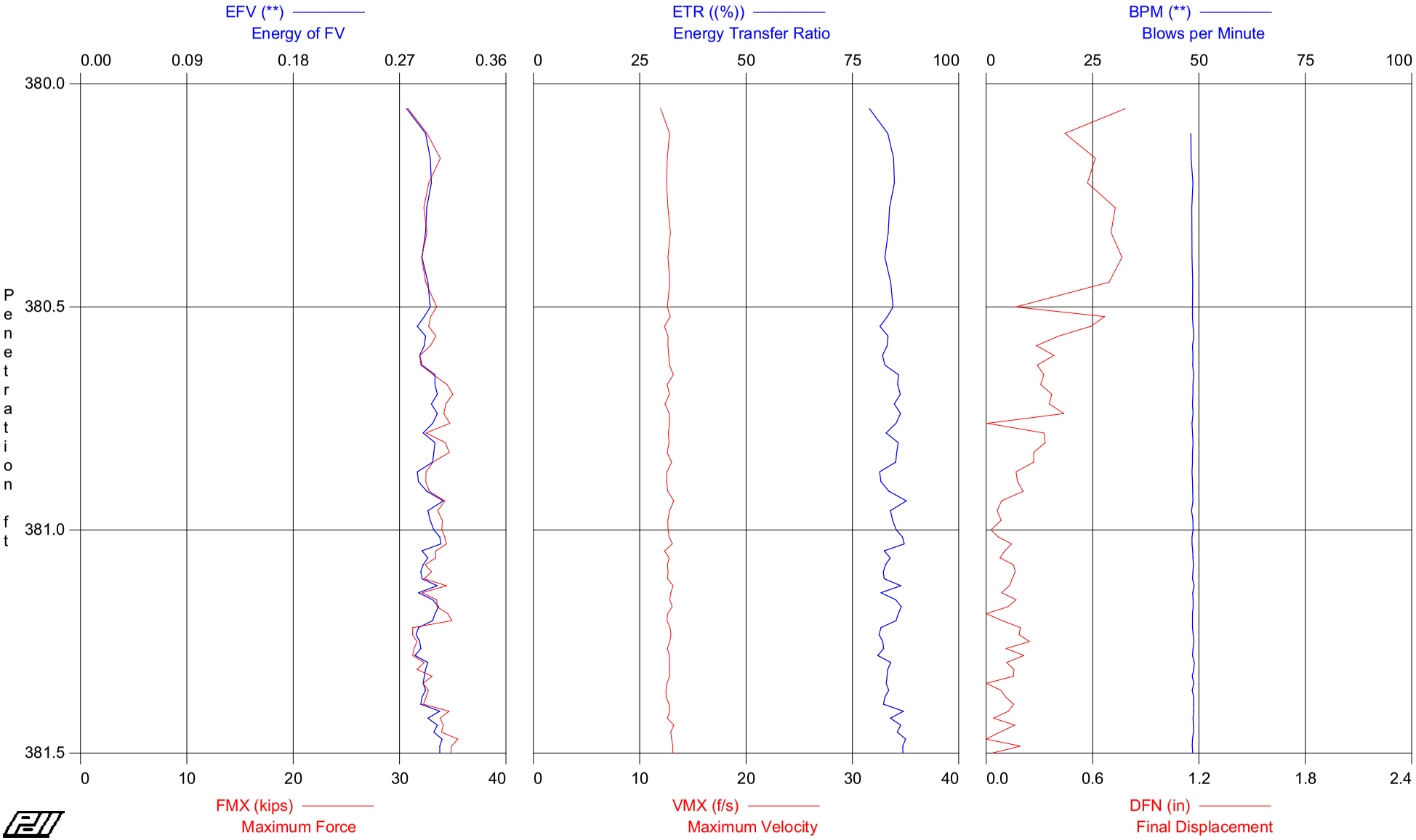
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.02
V3/V4: OK 0.87

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 11-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 380- 381.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 380- 381.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 11-Sep-2008

AR: 2.35 in^2
LE: 386.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
9	380.50	18	AV9	13.8	14.4	0.292	83	48	32.5	12.6	0.6
			STD	0.3	0.4	0.006	2	0	0.8	0.3	0.2
			MAX	14.4	15.0	0.297	85	49	33.8	12.9	0.8
32	381.00	46	AV23	14.2	14.8	0.295	84	49	33.5	12.7	0.3
			STD	0.4	0.3	0.006	2	0	0.9	0.2	0.2
			MAX	14.9	15.3	0.307	88	49	35.0	13.2	0.7
64	381.50	64	AV32	14.1	14.7	0.294	84	49	33.2	12.8	0.1
			STD	0.5	0.5	0.007	2	0	1.2	0.2	0.1
			MAX	15.1	15.5	0.306	87	49	35.5	13.2	0.2
			Average	14.1	14.7	0.294	84	49	33.2	12.7	0.2
			Std. Dev.	0.5	0.4	0.007	2	0	1.1	0.2	0.2
			Maximum	15.1	15.5	0.307	88	49	35.5	13.2	0.8

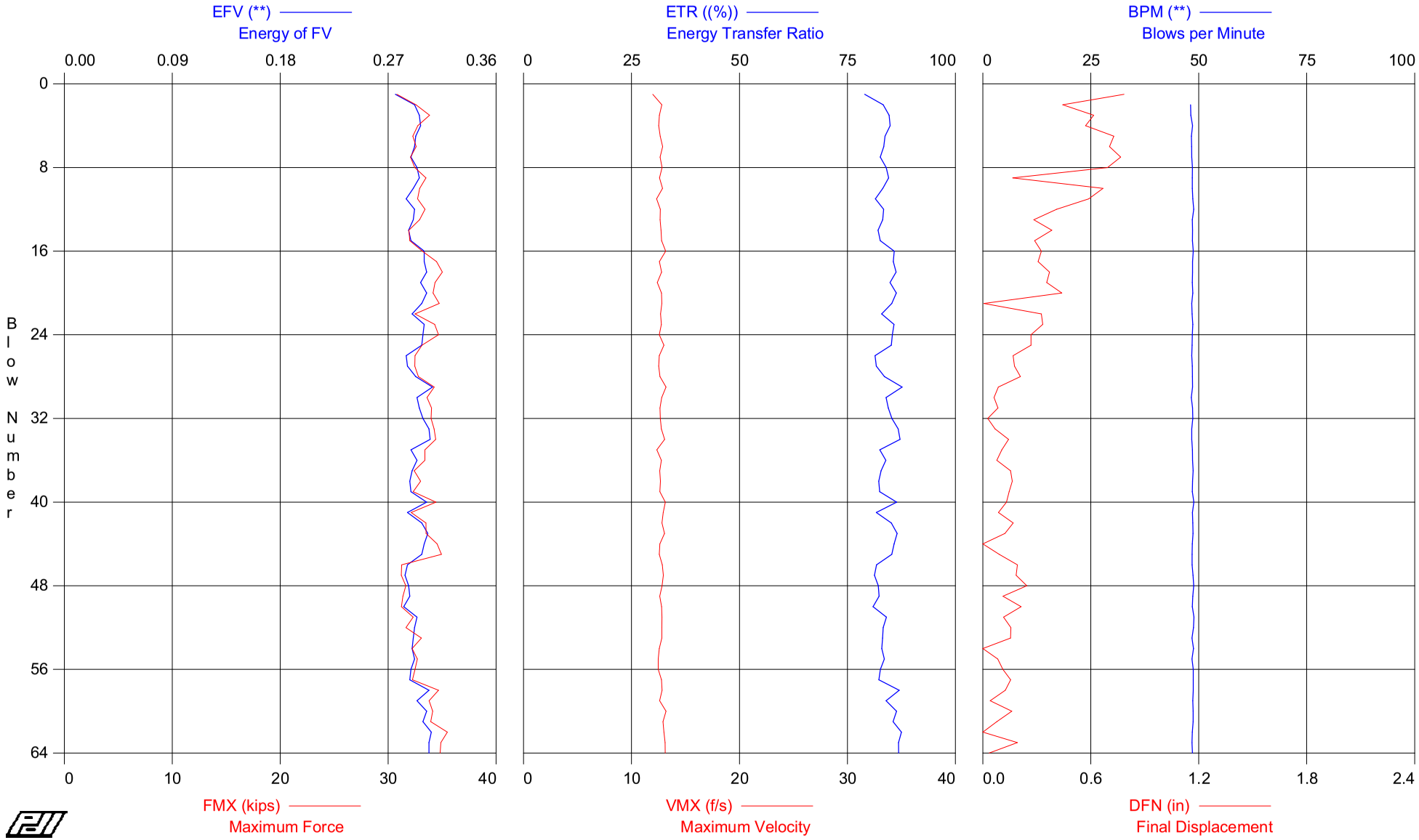
Total number of blows analyzed: 64

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 11-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 380- 381.5
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 380- 381.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 11-Sep-2008

AR: 2.35 in^2
LE: 386.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	380.06	18	13.1	13.6	0.276	79	0	30.8	12.0	0.8
2	380.11	18	13.9	14.1	0.292	83	48	32.6	12.8	0.4
3	380.17	18	14.4	15.0	0.296	85	48	33.8	12.6	0.6
4	380.22	18	13.9	14.6	0.297	85	49	32.7	12.5	0.6
5	380.28	18	13.7	14.4	0.293	84	48	32.3	12.7	0.7
6	380.33	18	13.9	14.4	0.292	83	48	32.6	12.9	0.7
7	380.39	18	13.6	14.2	0.289	83	48	32.1	12.7	0.8
8	380.44	18	13.8	14.3	0.294	84	49	32.5	12.8	0.7
9	380.50	18	14.3	14.9	0.296	85	49	33.5	12.6	0.2
10	380.52	46	14.0	14.5	0.291	83	49	32.9	12.9	0.7
11	380.54	46	13.9	14.6	0.285	81	49	32.7	12.3	0.6
12	380.57	46	14.2	14.9	0.292	83	49	33.4	12.7	0.4
13	380.59	46	14.0	14.7	0.291	83	49	32.9	12.6	0.3
14	380.61	46	13.6	14.3	0.287	82	49	31.9	12.7	0.4
15	380.63	46	13.6	14.3	0.289	83	49	32.0	12.8	0.3
16	380.65	46	14.1	14.5	0.300	86	49	33.2	13.2	0.3
17	380.67	46	14.7	15.2	0.300	86	49	34.5	12.6	0.3
18	380.70	46	14.9	15.2	0.302	86	49	35.0	12.8	0.4
19	380.72	46	14.6	15.2	0.297	85	49	34.3	12.4	0.4
20	380.74	46	14.5	15.0	0.302	86	49	34.2	12.8	0.4
21	380.76	46	14.8	15.1	0.298	85	48	34.7	12.8	0.0
22	380.78	46	13.8	14.5	0.290	83	48	32.5	12.7	0.3
23	380.80	46	14.6	15.2	0.300	86	49	34.3	12.8	0.3
24	380.83	46	14.8	15.3	0.299	85	49	34.7	12.6	0.3
25	380.85	46	14.1	14.4	0.298	85	48	33.1	13.0	0.3
26	380.87	46	13.8	14.3	0.285	81	48	32.5	12.6	0.2
27	380.89	46	13.8	14.4	0.286	82	49	32.5	12.5	0.2
28	380.91	46	14.0	14.7	0.293	84	49	32.8	12.6	0.2
29	380.93	46	14.6	14.9	0.307	88	49	34.3	13.2	0.1
30	380.96	46	14.3	14.8	0.294	84	48	33.6	12.8	0.1
31	380.98	46	14.5	15.1	0.296	84	49	34.0	12.6	0.1
32	381.00	46	14.5	15.1	0.299	85	49	34.0	12.7	0.0
33	381.02	64	14.6	15.1	0.304	87	48	34.3	12.8	0.1
34	381.03	64	14.6	14.9	0.305	87	48	34.4	13.1	0.1
35	381.05	64	14.2	14.9	0.289	82	49	33.4	12.3	0.1
36	381.06	64	14.2	14.9	0.294	84	49	33.4	12.8	0.1
37	381.08	64	13.8	14.5	0.290	83	49	32.4	12.6	0.2
38	381.09	64	14.0	14.6	0.288	82	49	33.0	12.7	0.2
39	381.11	64	13.8	14.5	0.289	82	49	32.3	12.6	0.1
40	381.13	64	14.7	15.0	0.302	86	49	34.4	13.1	0.1
41	381.14	64	13.7	14.3	0.286	82	49	32.1	12.9	0.1
42	381.16	64	14.3	14.9	0.298	85	49	33.5	12.8	0.2
43	381.17	64	14.3	14.9	0.303	86	49	33.5	13.1	0.1
44	381.19	64	14.7	15.3	0.300	86	49	34.5	12.6	0.0
45	381.20	64	14.9	15.5	0.298	85	48	34.9	12.6	0.1
46	381.22	64	13.3	14.0	0.286	82	48	31.2	12.9	0.2
47	381.23	64	13.3	13.8	0.284	81	49	31.2	12.9	0.2
48	381.25	64	13.5	14.1	0.287	82	49	31.6	12.8	0.2
49	381.27	64	13.3	14.0	0.288	82	49	31.4	12.6	0.1
50	381.28	64	13.3	13.9	0.283	81	49	31.2	12.8	0.2
51	381.30	64	13.8	14.3	0.294	84	49	32.3	12.8	0.1
52	381.31	64	13.5	14.2	0.292	83	49	31.6	12.8	0.2
53	381.33	64	14.1	14.5	0.291	83	48	33.1	12.8	0.2
54	381.34	64	13.7	14.4	0.290	83	49	32.2	12.6	0.0
55	381.36	64	13.9	14.6	0.292	84	48	32.7	12.5	0.1
56	381.38	64	13.8	14.5	0.289	83	49	32.5	12.5	0.1
57	381.39	64	13.7	14.1	0.288	82	49	32.2	12.8	0.2
58	381.41	64	14.8	15.3	0.304	87	49	34.7	12.8	0.1
59	381.42	64	14.4	15.0	0.294	84	49	33.8	12.6	0.0
60	381.44	64	14.5	14.9	0.302	86	49	34.1	13.2	0.2
61	381.45	64	14.4	15.0	0.299	86	49	33.9	12.9	0.1
62	381.47	64	15.1	15.4	0.306	87	49	35.5	13.0	0.0
63	381.48	64	14.8	15.2	0.304	87	48	34.9	13.1	0.2
64	381.50	64	14.8	15.2	0.304	87	49	34.8	13.1	0.0

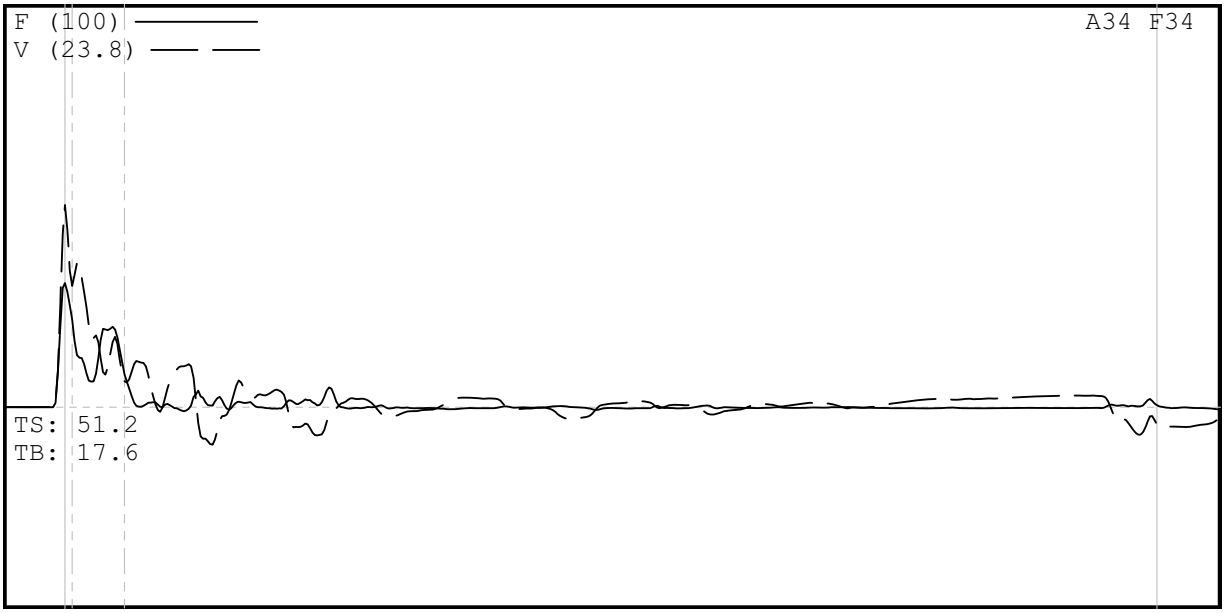
CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 380- 381.5
OP: SDW

HAMMER #5 N3 B-800
Test date: 11-Sep-2008

	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ksi	ksi	**	(%)	**	kips	f/s	in
Average	14.1	14.7	0.294	84	49	33.2	12.7	0.2
Std. Dev.	0.5	0.4	0.007	2	0	1.1	0.2	0.2
Maximum	15.1	15.5	0.307	88	49	35.5	13.2	0.8

Total number of blows analyzed: 64

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 380- 381 5



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 380- 381 5
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 380- 381 5
9/11/2008 1:20:34 PM
Blow Number 11/1

Pile Properties

LE	386.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	45.93	ms
JC	1.20	[]
LP	380.06	ft

Quantity Results

CSXN	13.1	ksi
CSI	13.6	ksi
CSB	13.5	ksi
EFV	0.276	k-ft
ETR	79.0	(%)
BPM	0.0	bpm
FMX	31	kips
VMX	12.0	f/s
DFN	0.79	in

Sensors

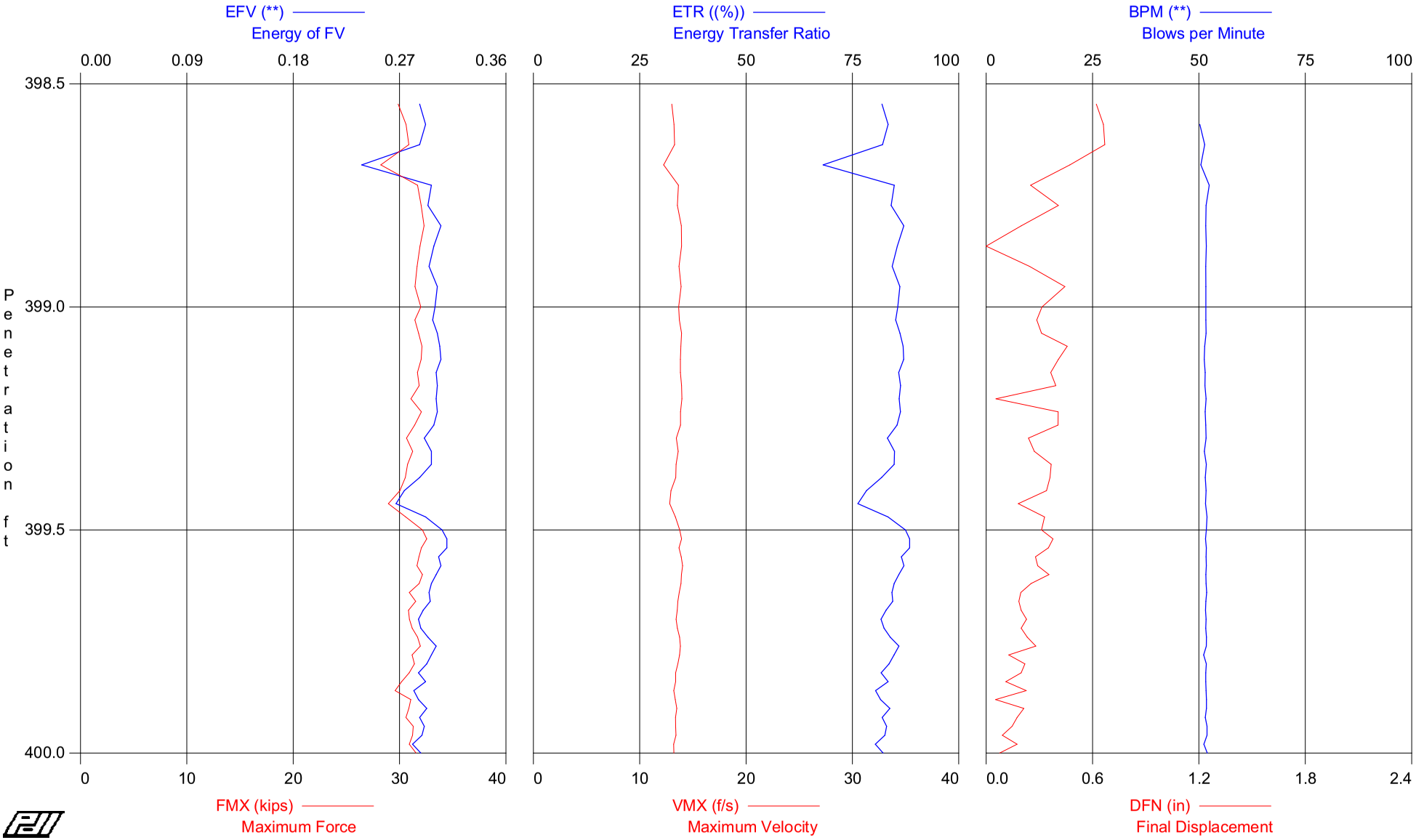
F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.08
V3/V4: OK 1.10

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 12-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 398.5- 400
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 398.5- 400
OP: SDW

HAMMER #5 N3 B-800
Test date: 12-Sep-2008

AR: 2.35 in^2
LE: 404.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL# end	depth ft	BLC bl/ft	TYPE	CSX ksi	CSI ksi	EFV **	ETR (%)	BPM **	FMX kips	VMX f/s	DFN in
11	399.00	22	AV11	13.3	13.9	0.291	83	51	31.1	13.5	0.4
			STD	0.5	0.5	0.017	5	1	1.2	0.5	0.2
			MAX	13.7	14.4	0.305	87	52	32.3	13.9	0.7
28	399.50	34	AV17	13.3	13.9	0.296	84	52	31.2	13.6	0.3
			STD	0.4	0.4	0.010	3	0	0.8	0.3	0.1
			MAX	13.7	14.4	0.306	87	52	32.1	14.0	0.5
53	400.00	50	AV25	13.3	13.9	0.294	84	52	31.3	13.6	0.2
			STD	0.3	0.3	0.008	2	0	0.6	0.2	0.1
			MAX	13.9	14.5	0.310	88	52	32.6	14.0	0.4
			Average	13.3	13.9	0.294	84	52	31.2	13.6	0.3
			Std. Dev.	0.4	0.4	0.011	3	0	0.8	0.3	0.1
			Maximum	13.9	14.5	0.310	88	52	32.6	14.0	0.7

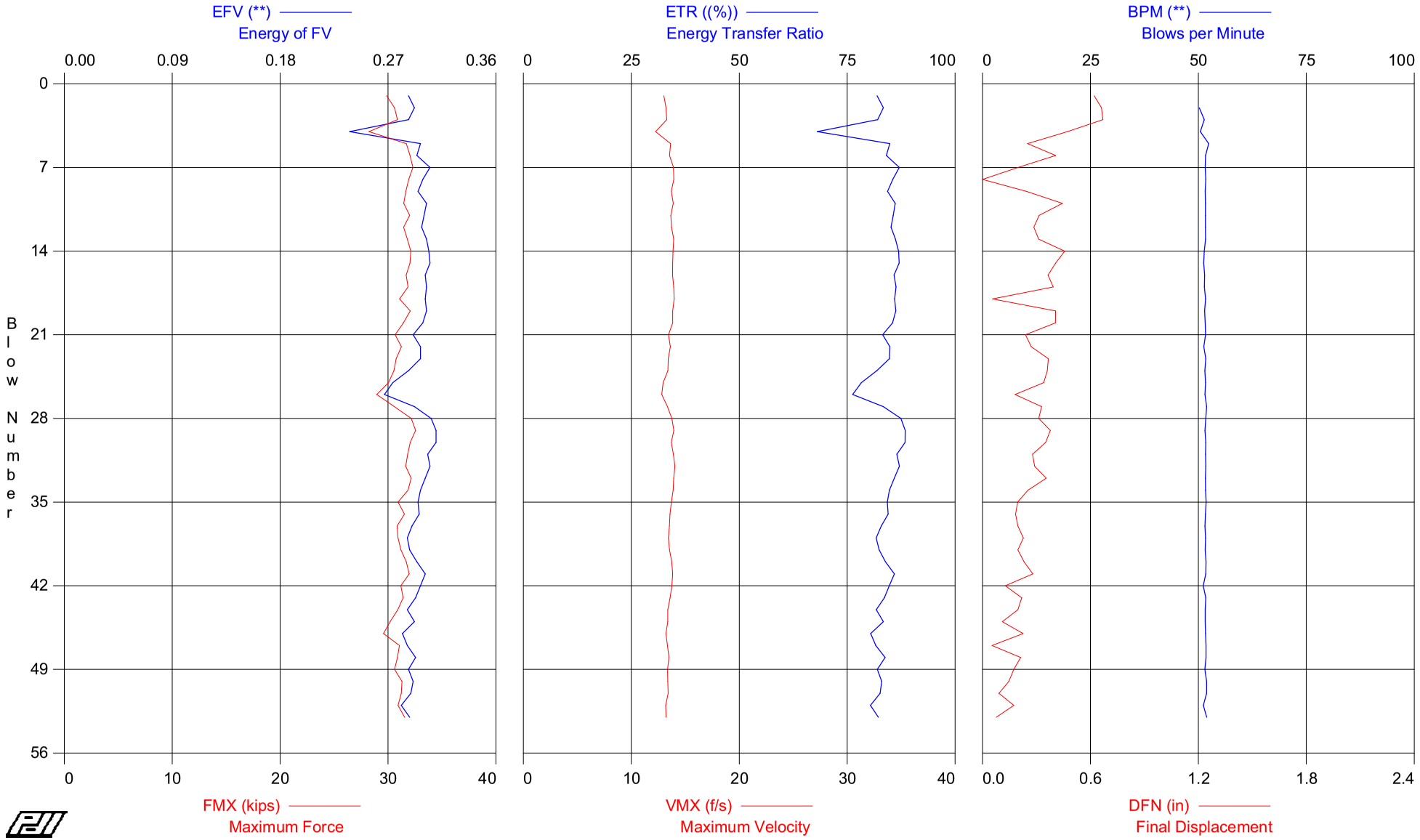
Total number of blows analyzed: 53

GRL Engineers, Inc. - Case Method Results

PDIPLOT Ver. 2008.1 - Printed: 25-Sep-2008

Test date: 12-Sep-2008

CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 398.5- 400
HAMMER #5 N3 B-800



CCNP 2008 SUBSURFACE INVESTIGATION - FAILING 1500 DEPTH 398.5- 400
OP: SDW

HAMMER #5 N3 B-800
Test date: 12-Sep-2008

AR: 2.35 in^2
LE: 404.00 ft
WS: 16,807.9 f/s

SP: 0.492 k/ft3
EM: 30,000 ksi
JC: 1.20

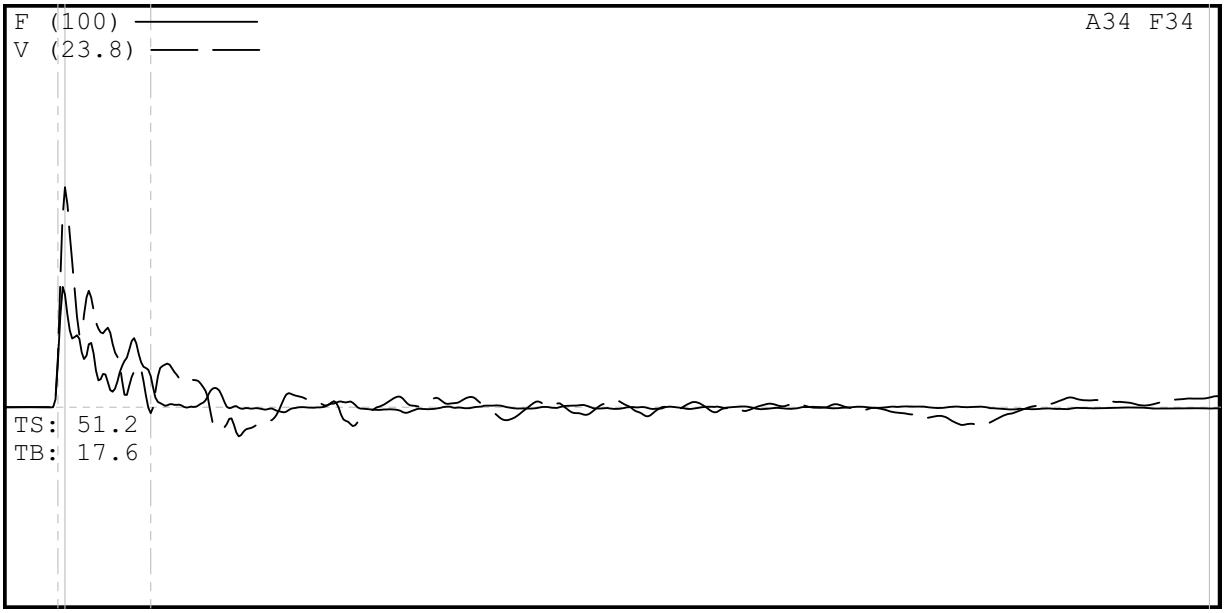
CSX: Max Measured Compr. Stress
CSI: Max F1 or F2 Compr. Stress
EFV: Energy of FV
ETR: Energy Transfer Ratio

BPM: Blows per Minute
FMX: Maximum Force
VMX: Maximum Velocity
DFN: Final Displacement

BL#	depth	BLC	CSX	CSI	EFV	ETR	BPM	FMX	VMX	DFN
	ft	bl/ft	ksi	ksi	**	(%)	**	kips	f/s	in
1	398.55	22	12.7	13.3	0.287	82	0	29.9	13.0	0.6
2	398.59	22	13.0	13.6	0.292	83	50	30.6	13.2	0.7
3	398.64	22	13.1	13.7	0.287	82	51	30.9	13.3	0.7
4	398.68	22	12.0	12.6	0.238	68	50	28.2	12.2	0.5
5	398.73	22	13.5	14.1	0.297	85	52	31.7	13.6	0.3
6	398.77	22	13.6	14.3	0.294	84	52	32.0	13.5	0.4
7	398.82	22	13.7	14.4	0.305	87	52	32.3	13.9	0.2
8	398.86	22	13.6	14.3	0.299	86	52	31.9	13.9	0.0
9	398.91	22	13.5	14.1	0.295	84	52	31.6	13.7	0.2
10	398.95	22	13.4	14.1	0.302	86	52	31.4	13.9	0.4
11	399.00	22	13.6	14.2	0.300	86	52	32.0	13.7	0.3
12	399.03	34	13.4	14.0	0.298	85	52	31.4	13.7	0.3
13	399.06	34	13.5	14.2	0.302	86	52	31.8	13.9	0.3
14	399.09	34	13.7	14.3	0.304	87	51	32.1	13.9	0.5
15	399.12	34	13.6	14.3	0.305	87	51	32.0	13.8	0.4
16	399.15	34	13.5	14.1	0.301	86	51	31.7	13.8	0.4
17	399.18	34	13.6	14.1	0.302	86	51	31.9	13.9	0.4
18	399.21	34	13.2	13.8	0.301	86	52	31.1	14.0	0.1
19	399.24	34	13.6	14.3	0.302	86	51	32.1	13.8	0.4
20	399.26	34	13.4	14.1	0.299	86	52	31.4	13.8	0.4
21	399.29	34	13.0	13.8	0.291	83	52	30.7	13.4	0.2
22	399.32	34	13.3	14.0	0.297	85	51	31.2	13.6	0.3
23	399.35	34	13.1	13.8	0.297	85	52	30.8	13.4	0.4
24	399.38	34	13.0	13.7	0.287	82	52	30.5	13.4	0.4
25	399.41	34	12.8	13.4	0.274	78	52	30.0	12.9	0.3
26	399.44	34	12.3	13.0	0.267	76	52	29.0	12.8	0.2
27	399.47	34	13.0	13.6	0.292	83	52	30.6	13.4	0.3
28	399.50	34	13.7	14.4	0.306	87	52	32.1	13.8	0.3
29	399.52	50	13.9	14.5	0.310	88	52	32.6	13.9	0.4
30	399.54	50	13.6	14.2	0.310	88	52	32.1	13.7	0.4
31	399.56	50	13.5	14.1	0.303	87	52	31.8	13.9	0.3
32	399.58	50	13.5	14.2	0.305	87	52	31.6	14.0	0.3
33	399.60	50	13.7	14.3	0.301	86	52	32.1	13.9	0.4
34	399.62	50	13.6	14.2	0.297	85	52	31.9	13.9	0.3
35	399.64	50	13.2	13.8	0.295	84	52	30.9	13.7	0.2
36	399.66	50	13.4	14.0	0.296	84	52	31.5	13.6	0.2
37	399.68	50	13.1	13.7	0.290	83	52	30.8	13.5	0.2
38	399.70	50	13.2	13.8	0.286	82	52	30.9	13.4	0.2
39	399.72	50	13.3	13.9	0.288	82	52	31.2	13.5	0.2
40	399.74	50	13.5	14.1	0.294	84	52	31.7	13.7	0.2
41	399.76	50	13.6	14.2	0.301	86	52	32.0	13.8	0.3
42	399.78	50	13.3	13.9	0.297	85	51	31.2	13.8	0.1
43	399.80	50	13.4	14.0	0.293	84	52	31.4	13.6	0.2
44	399.82	50	13.2	13.7	0.286	82	52	30.9	13.4	0.2
45	399.84	50	12.8	13.5	0.292	83	52	30.2	13.4	0.1
46	399.86	50	12.6	13.2	0.282	80	52	29.6	13.2	0.2
47	399.88	50	13.2	13.8	0.286	82	52	31.1	13.3	0.1
48	399.90	50	13.1	13.8	0.293	84	52	30.9	13.5	0.2
49	399.92	50	13.0	13.6	0.287	82	52	30.6	13.4	0.2
50	399.94	50	13.3	13.9	0.291	83	52	31.3	13.4	0.1
51	399.96	50	13.3	13.8	0.289	83	52	31.2	13.4	0.1
52	399.98	50	13.2	13.7	0.281	80	51	30.9	13.2	0.2
53	400.00	50	13.4	13.9	0.288	82	52	31.5	13.2	0.1
		Average	13.3	13.9	0.294	84	52	31.2	13.6	0.3
		Std. Dev.	0.4	0.4	0.011	3	0	0.8	0.3	0.1
		Maximum	13.9	14.5	0.310	88	52	32.6	14.0	0.7

Total number of blows analyzed: 53

CCNP 2008 SUBSURFACE INVESTIGATION FAILING 1500 DEPTH 398 5- 400



Project Information

PROJECT: CCNP 2008 SUBSURFACE INVESTIGA
PILE NAME: FAILING 1500 DEPTH 398 5- 400
DESCR: HAMMER #5 N3 B-800
OPERATOR: SDW
FILE: FAILING 1500 DEPTH 398 5- 400
9/12/2008 4:27:05 PM
Blow Number 5/1

Pile Properties

LE	404.00	ft
AR	2.35	in^2
EM	30000	ksi
SP	0.492	k/ft3
WS	16807.9	f/s
EA/C	4.2	ksec/ft
2L/C	48.07	ms
JC	1.20	[]
LP	398.55	ft

Quantity Results

CSXN	12.7	ksi
CSI	13.3	ksi
CSB	12.9	ksi
EFV	0.287	k-ft
ETR	81.9	(%)
BPM	0.0	bpm
FMX	30	kips
VMX	13.0	f/s
DFN	0.62	in

Sensors

F3: [40-N3-1] 215.99 (1)
F4: [40-N3-2] 217.39 (1)
A3: [K0281] 355 mv/5000g's (1)
A4: [k0288] 355 mv/5000g's (1)
CLIP: OK
F3/F4: OK 1.07
V3/V4: OK 0.93

Appendix C

SPT Energy Measurement Checklists, SPT Hammer Energy Measurement Log, and Gauge Calibrations.

SPT HAMMER ENERGY MEASUREMENT CHECKLIST

Schnabel Engineering, Inc

Project: Calvert Cliff **Project No:** _____

Drill Rig ID: Failing 1500 **Hammer ID:** 5 **Boring No:** B-806

Size of Rods: N3 **OD of Rods:** _____ **ID of Rods:** _____
Length of Rod Segments: _____

Instrumented Subassembly ID: 40N3
Accelerometer ID: K281 K288

Pre-drill Check

Calibration of instruments verified? Yes ✓ No____
Instrumented Subassembly Geometry:

Rod size matches drill string?	Yes ✓	No____
Instruments > 12 inches from top?	Yes ✓	No____
Instruments > 4 inches cross section change?	Yes ✓	No____
Accelerometers < 4 inches from strain gages?	Yes ✓	No____

Field Inspector: _____
Signature

Measurement Summary

Total Depth of Hole: 40a
Number of Measurements: _____
Measurements with poor data quality: _____

Deviations and Unusual Conditions

_____
_____
_____
_____
_____
_____

Prepared by: _____ _____ _____
Signature Company Date

Approved by: _____ _____ _____
Signature Company Date

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID Failing 1506 **SPT Hammer ID** #5 **Boring** B-800

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)	
8/27/08	13.5-15	19	3-2-4	6	43	287	82	
8/27/08	23.5-25	29	4-5-6	11	43	285	81	– Poor Data
8/27/08	31-32.5	31	8-9-13	21	44	292	83	
8/27/08	43.5-45	45	12-20-27	47	44	308	88	
8/28/08	58.5-60	64	7-6-8	14	43	301	86	
8/28/08	73.5-75	79	4-4-7	11	44	293	84	
8/28/08	88.5-90	94	12-12-12	24	43	296	85	
8/29/08	103.5-105	109	5-10-11	21	43	299	85	
8/29/08	118.5-120	124	6-7-13	20	44	296	85	
9/2/08	133.5-135	139	4-8-12	20	43	309	88	
9/2/08	148.5-150	154	6-10-11	21	43	307	88	
9/2/08	163.5-165	169	6-9-12	21	43	307	88	
9/2/08	178.5-180	184	8-9-15	24	43	308	88	
9/3/08	193.5-195	199	6-12-28	40	61	256	73	– Poor Data
9/3/08	200-201.5	206	6-7-14	21	58	327	93	
9/3/08	208.5-210	214	6-6-12	18	55	334	95	
9/4/08	223.5-225	229	6-6-12	18	58	334	95	
9/4/08	240-241.5	246	50/4"	50/4"	N/A	N/A	N/A	– No Data
9/4/08	243.5-245	249	4-6-20	26	57	325	93	

(1) Measured from instruments to tip of SPT sampler.

Prepared by: _____ Company: _____ Date: _____
Approved by: _____ Company: _____ Date: _____

SPT Hammer Energy Measurement Log
Cola Project
Calvert Cliffs Nuclear Power Station

Drill Rig ID Failing 1500 **SPT Hammer ID** #5 **Boring** B-800

Date	Sample Depth (ft)	Length of Rods (ft)(1)	SPT Blows (blows/6")	SPT N Value	Hammer Speed (bpm)	Preliminary Average Energy Transferred FV Method (ft-lbs)	Preliminary Energy Transfer Efficiency (%)
9/4/08	253.5-255	259	4-8-12	20	56	330	94
9/5/08	268.5-270	274	9-9-17	26	57	331	95
9/8	283.5-285	289	24-41-50/2	50/2	56	308	88
9/8	300-301.5	304	8-8-19	28	[illegible]	320	93
9/9	320-321.5	326	12-13-23	36	54	319	92
	~~340-341.5~~	~~346~~					
9/10	342-343.5	344	14-20-28	48	52	290	83
9/10	360-361.5	366	10-16-25	41	57	325	93
9/11	380-381.5	386	9-23-32	55	49	305	87
9/12	398.5-400	404	11-17-25	42	52	305	87

(1) Measured from instruments to tip of SPT sampler.

Prepared by: _____ Company: _____ Date: _____
Approved by: _____ Company: _____ Date: _____

Calibration Data Sheet for SPT rod #:40N3
Calibrated: 15-Aug-07

Cycle No. 1

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-.87	-.01	.00	.00
2	1024.70	14.35	.07	.07
3	2132.69	30.24	.14	.14
4	3253.45	46.57	.22	.21
5	4126.96	58.85	.27	.27
6	5118.29	72.97	.34	.34
7	6113.10	87.11	.40	.40
8	7038.55	100.38	.46	.46
9	8041.20	114.89	.53	.53
10	9205.49	131.83	.61	.60
11	10119.04	145.25	.67	.66

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	15178.40 lbs/V	217.44 ME/V		15275.94 lbs/V	218.84 ME/V
Offset	-7.97	-.41		-5.96	-.38
Corr Coe	.999993	.999987		.999997	.999991

Force Strain Calibration
EA Factor 69804.24 Kips
Offset 20.85
Corr Coe .999988

Cycle No. 2

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	-2.03	-.06	.00	.00
2	1137.92	16.14	.07	.08
3	2050.35	28.98	.14	.14
4	3029.23	42.77	.20	.20
5	4182.82	59.36	.28	.28
6	5170.12	73.52	.34	.34
7	6030.89	85.73	.40	.40
8	7041.70	100.05	.47	.46
9	8269.00	117.29	.55	.54
10	9037.48	128.32	.60	.59
11	10084.28	143.14	.66	.66

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	15187.67 lbs/V	215.24 ME/V		15263.83 lbs/V	216.32 ME/V
Offset	-26.68	-.43		-20.83	-.34
Corr Coe	.999987	.999987		.999996	.999996

Force Strain Calibration
EA Factor 70559.85 Kips
Offset 3.33
Corr Coe .999998

Calibration Data Sheet for SPT rod #:40N3
Calibrated: 15-Aug-07

Cycle No. 3

Sample No.	lbs	ME	Bridge 1 Volts	Bridge 2 Volts
1	4.93	.00	.00	.00
2	1058.28	14.92	.07	.07
3	2045.45	29.09	.13	.13
4	3016.07	42.59	.20	.20
5	4194.52	59.65	.28	.27
6	5091.71	72.14	.33	.33
7	6176.40	87.29	.40	.40
8	7064.01	99.91	.46	.46
9	8089.49	114.32	.53	.53
10	9355.02	132.28	.61	.61
11	10016.80	141.53	.65	.65

Bridge 1	Force Cal	Strain Cal	Bridge 2	Force Cal	Strain Cal
Cal Factor	15260.85 lbs/V	215.28 ME/V		15383.07 lbs/V	217.01 ME/V
Offset	-.70	.05		-7.92	-.06
Corr Coe	.999994	.999991		.999996	.999995

Force Strain Calibration
EA Factor 70887.25 Kips
Offset -3.90
Corr Coe .999996

Bridge Excitation: 6.4 Volts
A 60.4K Ohm shunt resistor produces 5.0 Volts output.

	Bridge 1	Bridge 2
Calibration Factor:	215.99 ME/V	217.39 ME/V
EA Factor	: 70417.12 Kips	

Calibrated by: _____

Pile Dynamics, Inc.
Calibrated on: 15-Aug-07
Traceable to N.I.S.T.

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:57

FS — 10 | BN 49 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

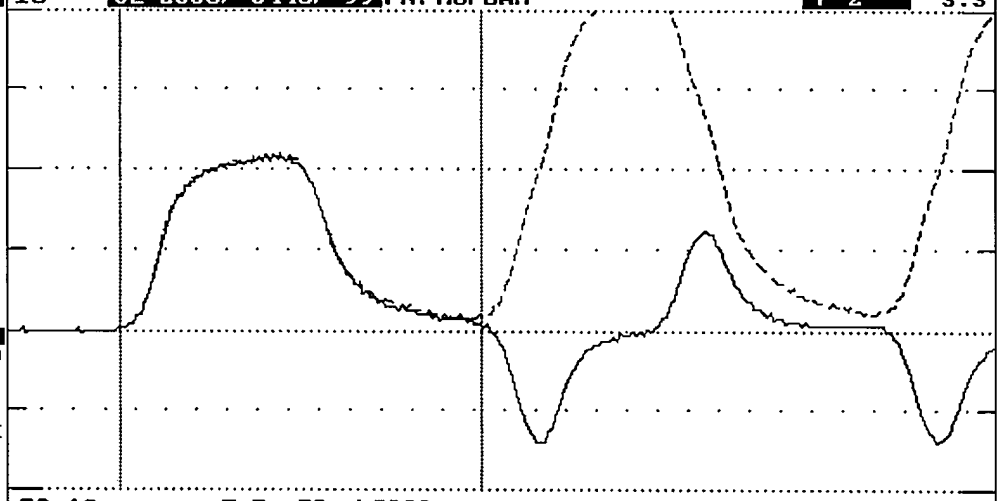
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -39
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 355



TS 12 E B PD: k0288 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.5 FMX= 54 AMX= 120
EMX= 0.2 MEX= 105 FVP= 0.98

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0288

CALIBRATION FACTOR: .071 mv/G

PAK (*5000): 355 DATE: 11-JUN-07

PDA OPERATOR: Alex

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
08-Feb-08 13:16

FS — 10 | BN 59 SL 2742/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

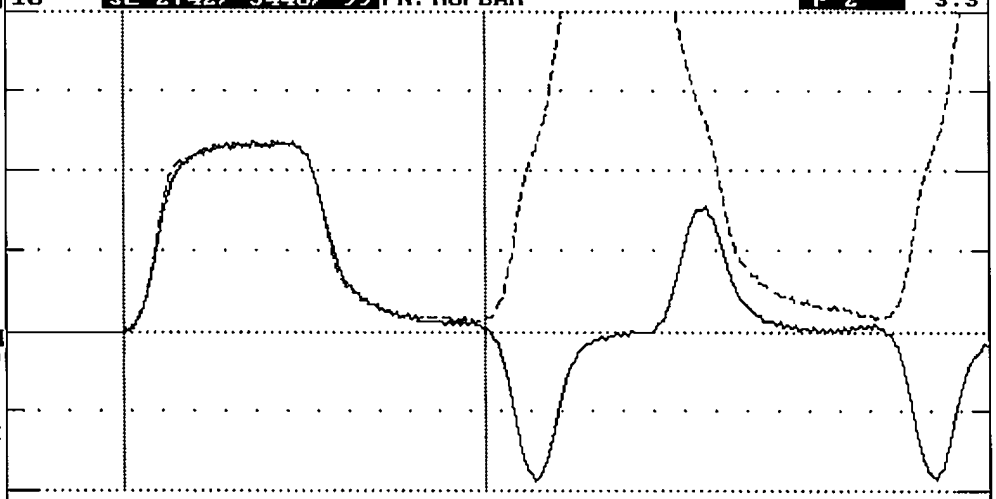
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -29
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 315



TS 12 E B PD: k611 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.8 FMX= 59 AMX= 169
EMX= 0.2 MEX= 115 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K611

CALIBRATION FACTOR: .063 mv/G

PAK (*5000): 315 DATE: 08-FEB-08

PDA OPERATOR:

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
08-Feb-08 13:08

FS — 10 | BN 42 SL 2742/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

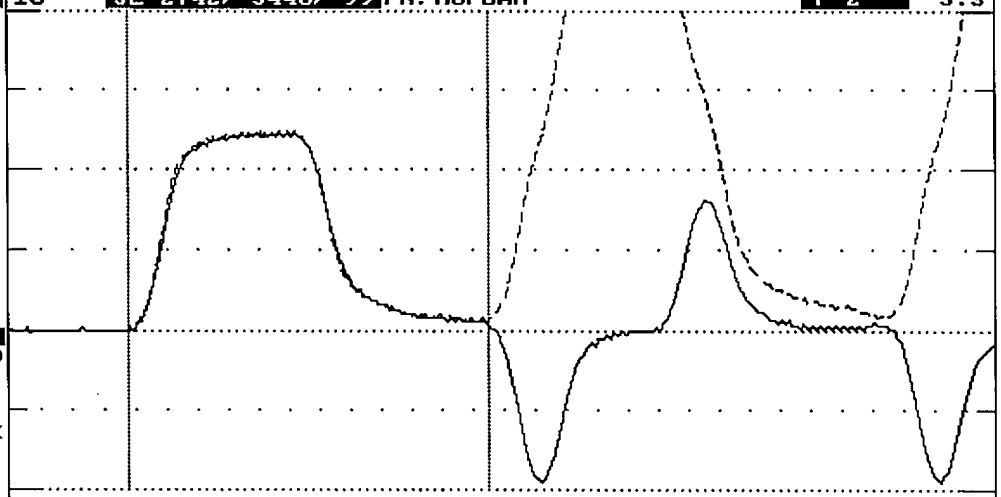
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -30
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 380



TS 12 E B PD: k0410 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 4.0 FMX= 62 AMX= 149
EMX= 0.2 MEX= 121 FVP= 0.98

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0410

CALIBRATION FACTOR: .076 mv/G

PAK (*5000): 380 DATE: 08-FEB-08

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:46

FS — 10 | BN 25 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- VS 3.3

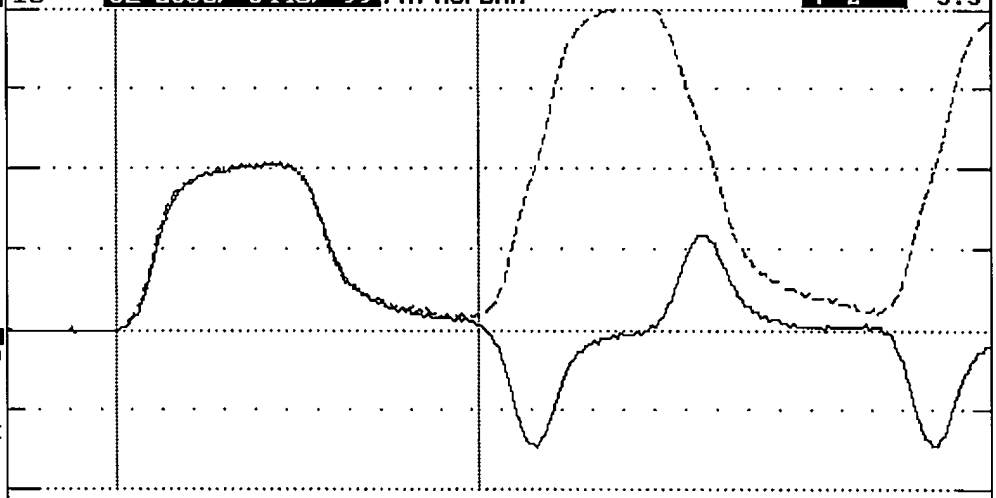
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -31
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 370



TS 12 E B PD: k0397 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.4 FMX= 52 AMX= 120
EMX= 0.2 MEX= 101 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0397

CALIBRATION FACTOR: .074 mv/G

PAK (*5000): 370 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:49

FS — 10 | BN 32 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- US 3.3

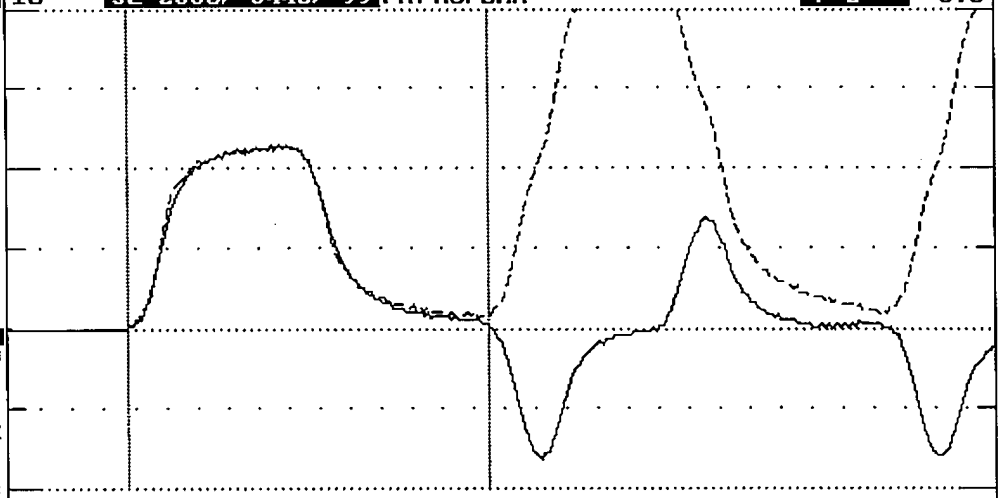
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -39
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 350



TS 12 E B PD: k0286 LP 0.00 ft
TB 8.0 T1 9.5 2L/C 4.7 VA 1000 VE 1022 LI 1.0

VMX= 3.7 FMX= 57 AMX= 139
EMX= 0.2 MEX= 111 FVP= 1.01

ACCEPT SQ-OFF FL-OFF PR-OFF

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0286

CALIBRATION FACTOR: .07 mv/G

PAK (*5000): 350 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

QBTA: ON [ALT-F1/BB=60] Pile Dynamics, Inc. TG F2 DPF

Pile Dynamics
11-Jun-07 11:55

FS — 10 | BN 47 SL 2680/ 3440/ 99 | PJ: sn PN: HOPBAR | A 4 F 2 | -- US 3.3

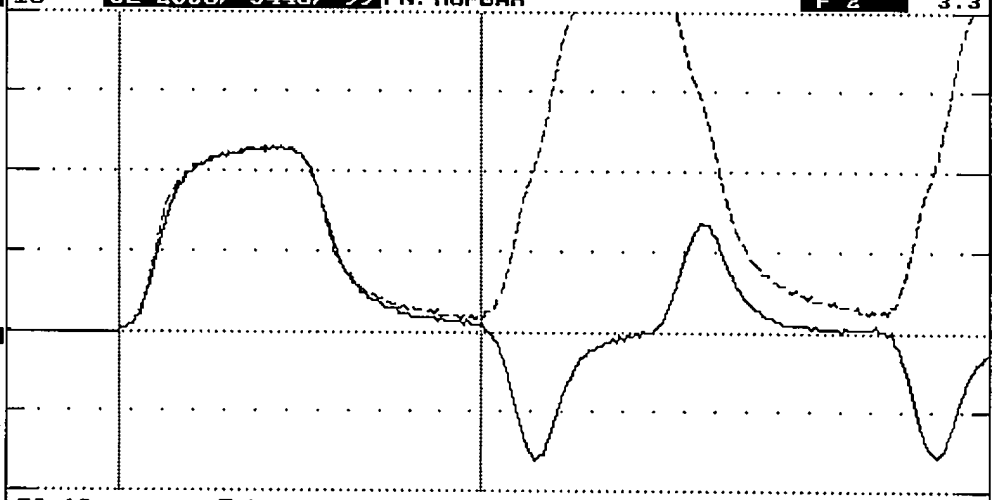
LE 39.6 ft
AR 1.7 in2
EM 30000 Ksi
SP 0.492 K/ft3
WS 16810 ft/s
WC 16862 ft/s

JC 0.40
FM 1.00
VM 1.00

EA/C 30.3 Ks/ft
UN KIPS*0.1
FR 20000 MB 30

DL -34
VT -1
PK 1 TM-PEAK

F1/2 500/ 213
F3/4 213/ 213
A1/2 999/ 999
A3/4 999/ 355



TS 12 E B PD: k0281 LP 0.00 ft
TB 8.0 T1 9.4 2L/C 4.7 VA 1000 VE 1022 LI 1.0

ACCEPT SQ-OFF FL-OFF PR-OFF

VMX= 3.8 FMX= 58 AMX= 129
EMX= 0.2 MEX= 113 FVP= 1.00

contact Pile Dynamics USA
with your questions
tel USA - 216 - 831- 6131
fax USA - 216 - 831- 0916

ACCELEROMETER CALIBRATION N.I.S.T. Traceable

SERIAL NUMBER: K0281

CALIBRATION FACTOR: .071 mv/G

PAK (*5000): 355 DATE: 11-JUN-07

PDA OPERATOR: [signature]

<-AT:PIEZORESISTIVE OP: alex [ver:4.05] AT:PIEZOELECTRIC->

Certificate of Calibration

Pile Dynamics, Inc. certifies that the

Pile Driving Analyzer®, Model PAK

Serial Number: 1703K

was calibrated on 3 January 2008
using a PDA Calibration Box whose output was calibrated with test equipment traceable to NIST.

Tested by: Albert Sprunger

Pile Dynamics, Inc.
4535 Renaissance Parkway
Cleveland, Ohio 44128 USA