FINAL DATA REPORT Rev 0
GEOTECHNICAL EXPLORATION AND TESTING

EXELON TEXAS COL PROJECT
VICTORIA COUNTY, TEXAS
COOLING BASIN

July 18, 2008

VOLUME 2

Prepared By:

MACTEC Engineering and Consulting, Inc.
Raleigh, North Carolina

MACTEC Project No. 6468-07-1777

Prepared For:

Bechtel Power Corporation
Subcontract No. 25352-102-HC4-CY00-00001

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FUGRO CONSULTANTS, INC.

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March 14, 2008
Report Number 1907-0075

Mr. Scott Auger, P.E., PMP
Mactec Engineering and Consulting, Inc.
3301 Atlantic Avenue
Raleigh, North Carolina 27604

REPORT FOR
SEISMIC PIEZOCONE PENETRATION TESTING
AND RELATED SERVICES
EXELON TEXAS PROJECT UNIT 3
VICTORIA, TEXAS
MACTEC PROJECT # 6468071777

Dear Mr. Auger:

Fugro is pleased to enclose the data report for Cone Penetration Testing (CPT) at the Exelon Texas Col Unit 3 site at Victoria, Texas. Cone Penetration Tests were carried out according to ASTM 5778-2000, "Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils" standard test method.

For your information, the soil stratigraphy was identified using Campanella and Robertson's Simplified Soil Behavior Chart. Please note that because of the empirical nature of the soil behavior chart, the soil identification should be verified locally. Some soils, such as glacial till, cemented soils and calcareous soils are outside the scope of these soil behavior charts."

Cone Penetration Test data was collected utilizing Fugro's digital cone penetrometer systems that were mounted on a purpose-built 25-ton capacity truck-mounted unit and a 15-ton capacity ATV track-mounted unit.

The Fugro Organization has been developing and deploying Cone Penetration Testing (CPT) systems since the early 1940's. We currently own and operate over 600 onshore and offshore cone deployment systems worldwide. Fugro developed the first commercial cone penetrometer in the 1960's and has manufactured and utilized the industry standard in electronic cone penetrometers since that time.

The following sections summarize the CPT test method and our site investigation activities:

1.0 Summary of CPT Test Method

A penetrometer assembly with a conical point having a 60° apex angle and a cone base area of 15 cm^2 is advanced through the soil at a constant rate of 2 centimeters per second. The force on the conical point (cone) required to penetrate the soil is measured by strain gages at a minimum of every 2 centimeters of penetration. Stress is calculated by dividing the measured force (total cone force) by the cone base area to obtain cone resistance, q_c.

KAW 7/16/08

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A friction sleeve is present on the penetrometer immediately behind the cone tip, and the force exerted on the friction sleeve is measured by strain gages attached to load cells at the top and bottom of the sleeve assembly, at a minimum of every 2 cm of penetration. Stress is calculated by dividing the measured force by the surface area (200 cm^2) of the friction sleeve to determine friction sleeve resistance, f_s.

Many penetrometers are capable of measuring dynamic pore pressure induced during advancement of the penetrometer tip using an internal pressure transducer. These penetrometers are called "piezocones." The piezocone is advanced at a rate of 2 centimeters per second, and readings are taken at a minimum of every 2 centimeters of penetration. The dissipation of excess pore pressure can be monitored by stopping penetration, unloading the push rod, and recording pore pressure as a function of time. When pore pressure becomes constant, it is measuring the equilibrium value or piezometric head at that depth.

Penetrometers are also available with geophones mounted above the friction sleeve for measuring shear wave velocity. These penetrometers are called "seismic cones." The seismic cone is advanced at a rate of 2 centimeters per second, and readings taken at a minimum of every 2 centimeters of penetration. Advancement of the seismic cone is stopped at predetermined intervals (usually 5 or 10 feet). At these intervals shear wave velocity measurements are recorded using a seismograph. Placing a metal beam on the ground and striking the ends of the beam with a hammer generate the shear waves.

2.0 Significance and Use

Tests performed using CPT methods provide a detailed record of penetrometer results, which are used for the evaluation of site stratigraphy, homogeneity and depth to firm layers, voids or cavities, other discontinuities, and correlations with geotechnical and hydrogeological properties of soils. When properly performed at suitable sites, the test provides a rapid means for determining subsurface conditions.

CPT methods provide data used for estimating engineering properties of soil intended to help with the design and construction of earthworks, foundations for structures, and the behavior of soils under static and dynamic loads.

CPT methods test the soil in situ and soil samples are not obtained. The interpretation of the results from the test methods provides estimates of the types of soil penetrated. Engineers may obtain soil samples from parallel borings for correlation purposes since the results of these tests are empirical in nature and yield results regarded as behavior type, but not actual grain size.

3.0 Limitations of Use

Refusal, deflection, or damage to the penetrometer assembly may occur in coarse-grained soil deposits with maximum particle sizes that approach or exceed the diameter of the cone. Partially lithified and/or cemented deposits may cause refusal, deflection, or damage to the penetrometer assembly.

Standard push rods can be damaged or broken under extreme load conditions. The amount of force that push rods are able to sustain is a function of the unrestrained length of the push rods and the weak links in the push rod-penetrometer tip string, such as push rod joints and push rod-penetrometer assembly connections. The force at which rods may break is a function of the equipment configuration and ground conditions during penetration. Excessive rod deflection is the most common cause for rod breakage during deep pushes in dense material with soft overlying soil.

4.0 Equipment

Equipment utilized in conducting Cone Penetrometer Testing include:

1. Digital Standard Cone (CPT) to measure tip and sleeve resistances and probe inclination.
2. Digital Piezocone (CPTu) to measure tip and sleeve resistances, probe inclination and dynamic pore pressure.
3. Digital Seismic Cone (SCPTu) to measure tip and sleeve resistances, probe inclination, dynamic pore pressure, and shear wave velocity.
4. Cone rods with pre strung electrical cone cable.
5. Digital Data Acquisition System including the Digital Connection Box (PCUM), a data logging laptop computer and laser printer.
6. A self-contained CPT rig that contains the hydraulic pushing system, a power supply unit and other tools, equipment and materials necessary.

Digital Piezocone (CPTu) and Digital Seismic Cone (SCPTu) testing was done during this investigation.

4.1 Electric Cone Penetrometers

Fugro utilizes electric cone penetrometers, available in either a $10cm^2$ or $15cm^2$ cone base area that exceed the standards set forth by ASTM-D5778-2000, ISO 9001 and ISSMGE Technical Committee 16. Technical details and specifications of Fugro's Cone Penetrometers are given in Appendix A.

4.2 Cone Rods

Fugro's CPT cone rods are manufactured from high tensile strength steel and have a cross sectional area adequate to sustain, without buckling, the thrust required to advance the penetrometer tip. Prior to testing, an electrical cone cable is prestrung through the cone rods and is connected by a crossover cable to the Data Acquisition System.

Push rods are supplied in 1 meter lengths and must be secured together to bear against each other at the joints to form a rigid-jointed string. The deviation of push rod alignment from a straight axis should be held to a minimum, especially in the push rods near the penetrometer tip, to avoid excessive directional penetrometer drift.

Generally, when a 1-m long push rod is subjected to a permanent circular bending resulting in 1 to 2 millimeter (mm) of center axis rod shortening, the push rod should be discarded. This corresponds to a horizontal deflection of 2 to 3 mm at the center of bending. The locations of push rods in the string should be varied periodically to avoid permanent curvature.

Standard 20-metric ton high tensile strength steel push rods with 36-mm OD, 16-mm ID, and a mass per unit length of 6.65 kg/m are used.

4.3 Data Acquisition System

The. digital data acquisition system utilized by Fugro in conducting CPT Testing consists of a PCUM, a portable laptop computer, and a printer.

The digital data acquisition system collects the cone penetrometer's digital signal, which is monitored, recorded and presented in near-real time on the laptop computer.

Information collected during a push is stored digitally as binary data on computer's hard disk and transferred to compact disks. Windows-based programs read the data and convert it to text files. The data files include project description and location, operator, data format information and other pertinent information about the sounding.

Following each push, data collected with a standard CPT cone are presented in a graphical format. The log includes:

1. Cone resistance plot in tons/ft^2 (TSF)
2. Friction sleeve resistance plot in tons/ft.^{2} (TSF)
3. Friction ratio plot in %

Versus depth below ground surface in feet.

For data collected with a piezocone, the log includes, in addition to the above, an additional plot of pore pressure in tons/ft^2 (TSF), versus depth in feet.

A variety of plotting parameters are available for uniform presentation of data. As stipulated in the ASTM standard, the vertical axis is designated for the depth while the horizontal axis displays the magnitude of the test values recorded. Final plotting scales are determined after all the tests are completed, and takes into consideration test values and depths recorded for the project.

4.4 CPT Rig

A primary component of any CPT system is the CPT rig. Fugro Consultants, Inc. currently owns and operates ten (10) truck-mounted CPT units, four (4) ATV-mounted units, and two (2) skid-mounted units in the United States. The CPT rigs have self contained electrical, hydraulic, and climate control systems and range in weight from 15 to 30 tons. Except for the skid-mounted units, the rigs have hydraulic jacking systems to lift and level the pushing platform. The "dead weight" of the rigs provides the reaction weight necessary for advancing the CPT tools, eliminating the need for time-consuming earth anchoring. Fugro's typical purpose build CPT rigs are shown in Appendix B.

5.0 Calibration

Fugro's cone penetrometer manufacturing and calibration procedures include ISO 9001, ASTM D-5778-2000, and European cone penetration standards. The calibration tests include load testing over the full range of output for each cone. Cones are tested and calibrated for the following:

- Mechanical Calibration
- Cross-talk Check
- Dimension Check
- Seal / O-Ring Check
- Electronic Calibration

- Temperature Effect
- Pre and Post Test Voltage Readings (zeros)
- Full Scale Output Load Reading
- Pore Pressure effect on tip and friction readings
- Pore Pressure Transducer calibration

Fugro's cone penetrometer calibration zeros are checked and verified before and after each sounding. Periodic full-scale calibration is likewise conducted according to the Quality Assurance and Quality Control procedures as specified in ASTM D-5778-2000.

During this investigation, utilized cone penetrometers, were load range checked and calibration verified before and after the project. Calibration Verification is documented in our report dated January 24, 2008.

6.0 Test Procedure

Prior to beginning a sounding, a site survey is performed to ensure hazards such as underground utilities will not be encountered. The rig is positioned over the location of the sounding and the leveling jacks are lowered to raise the machine mass off the rig's suspension system. The hydraulic rams of the penetrometer thrust system are set to as near vertical as possible by adjusting the leveling jacks. Once the rig is set level, the data acquisition system is power up, and standard Fugro CPT checklist procedures are followed.

During this investigation, for each CPT test initial and final zero readings were recorded and included in Appendix C. In addition to standard cone penetrometer checklist during piezocone penetration testing the following procedures were followed:

1. Assemble the piezo elements with all fluid chambers submerged in the de-aired medium (silicon oil) used to prepare the elements. Flush all confined areas with fluid to remove air bubbles, tighten the cone tip to effectively seal the flat surfaces and apply vacuum pressure to piezo tip section.

2. If unsaturated soil is first penetrated and it is desired to obtain accurate dynamic pore pressure response once below the groundwater, it may be necessary to prebore or sound a pilot hole to the water table. In many cases the piezocone fluid system may be cavitated during penetration through unsaturated soil or in dilating sand layers below the water table, which can adversely affect dynamic response. The prebore technique was not used on this project.

The CPT rig was placed over the location and leveled with leveling jacks. After insuring the cone was cleaned and the seals were in place, the cone was prepared as in step 1 above. The cone was then suspended over the location and lowered until the tip was above the ground surface, but not in contact with it.

Labels were entered into the computer to identify the CPT sounding and location. The test was then started on the computer. After starting the test software the operator waits for 30 seconds to allow the system to collect zero readings before lowering the cone to the ground surface and advancing the penetrometer into the soil.

The penetrometer is pushed into the soil at a rate of 2 cm per second. A shaft encoder that is connected to the cone rod using a slip ring plate measures depth. A steel cable is attached to slip ring plate. The cable is then routed over a pulley then attached to a spring-loaded wheel on the shaft encoder. As the cone rod penetrates the soil the cable turns the wheel on the encoder and counts the depth.

The readings from the penetrometer and encoder are sent to the computer, which displays the data graphically and numerically on screen in real time. The raw data is also stored on the computer hard drive. After the desired depth or refusal is reached, the penetrometer and cone rod are pulled from the ground. When the penetrometer is hanging free above the ground, post test zero readings are recorded and the data stored.

CPT soundings may encounter refusal prior to reaching the desired depth for several reasons. These reasons include:

- The CPT rig cannot generate enough downward force to continue penetration.
- The CPT rig is lifting off the ground while pushing.
- The slope of the penetrometer exceeds angle limits.
- There is not enough lateral support from the soil to prevent the cone rod from bowing and breaking as it is advanced. Casing can help in this situation, however it is not always possible to advance casing to the depth required.

If refusal is due to slope the operator will terminate the sounding and determine the cause. The test will also be terminated if there is a problem with the data observed during the test. After correcting the problem, the operator will move over and re-push the test.

Pore Pressure Dissipation Testing was performed during some CPT soundings. Penetration is temporarily stopped at the location of interest, and the force is released from the cone rods. Pore pressure versus time is recorded during the dissipation test. Pressures are monitored until equilibrium pore pressure is reached or 50% of the initial pore pressure is dissipated. In fine grained soils of very low hydraulic conductivity, very long times may be required to reach the 50% dissipation. Some dissipation tests were terminated prior to reaching 50% pressure at the direction of the client.

7.0 Quality Assurance and Quality Control

As part of Fugro's QA procedures, when a digital data acquisition system is activated, the serial number, calibration values for each channel, calibration date and calibration due dates will automatically be recorded in each CPT test file along with the initial and final zero readings of the cone penetrometer.

Upon completion of a project, the field data is transmitted electronically or by overnight mail to the main office in Houston, Texas, where it is processed, reviewed and finalized. The original, unprocessed data is stored in a large capacity, limited access storage medium where it is kept indefinitely for future reference as a confidential records.

The integrity of the measurements are checked and verified to ensure that the logs generated are as accurate as possible. Rod spikes, which are generated naturally when the pushing is stopped to add rods while advancing the sounding, are identified and edited out.

Prior to the release of the Final Report, the entire set of data is reviewed by a Senior Staff member. In this process, the reviewer conducts a thorough assessment of the data set checking its consistency and accuracy. Should any deviation beyond Fugro's accepted standards occur, the data is rejected and test is redone at Fugro's expense.

8.0 Summary of Testing performed on this project

The table below is a summary of testing done for this project. All CPT testing was done using Fugro's Digital Cone Penetrometer system. All cones used were 15 cm^2 cones piezocones or seismic cones with the piezo transducer mounted in the U2 position (between the tip and sleeve).

CPT	Date	Depth (feet)	Dissipations [1] (feet)		Comments
C-2301S	1/2/2008	34.5			Refusal [2] [5]
C-2301SA	1/2/2008	30			Refusal [2] [5] Bad seismic data ZHU 5-29-08
C-2302	1/5/2008	94.7			[5]
C-2303S	2/18/2007	97.2	80.1	82.3 , 95.6	[6]
C-2304	12/17/2007	60			[6]
C-2305	12/19/2007	60			[6]
C-2306	12/19/2007	60			[6]
C-2307	12/17/2007	60			[6]
C-2308	1/6/2008	86.4			[5]
C-2309	12/19/2007	54.2			[6]
C-2310	12/19/2007	60			[6]
C-2311	1/6/2008	78	58		Refusal [5]
C-2311A	1/7/2008	100	91.5		[5]
C-2312	1/3/2008	90.2	51.9	70.6	[5]
C-2313	12/20/2007	60			[6]
C-2314	12/19/2007	60			[6]
C-2315	1/7/2008	60			[5]
C-2316	1/8/2008	60			[5]
C-2317	1/7/2008	83.8			[5]
C-2318	12/20/2007	60			[6]
C-2319	12/20/2007	60			[6]
C-2321S	1/4/2008	49.9			Refusal [3] [5] Bad siesmic data ZHU 5-29-08
C-2321SA	1/4/2008	51			Refusal [3] [5]
C-2322	1/10/2008	83.9			[4]
C-2323S	1/8/2008	35			Bad seismic data [4] [5]
C-2323SA	1/9/2008	100	100.1		[5]
C-2324	12/20/2007	60			[6]
C-2328	1/4/2008	60			[5]

Notes:

1. Initially dissipation test were planned to be conducted at predetermined depths. Following a review with the client, this procedure was changed to the selection of dissipation test depths by the client's engineer, with the client's engineer observing the test data as the test progressed.
2. CPT C-2301S was attempted twice and refused due to soil conditions. No further attempts were made per instructions of MACTEC field engineer.
3. CPT C-2321S was attempted twice and refused due to dense/hard soil conditions. No further attempts were made per instructions of Bechtel field engineer.
4. CPT C-2323S. There were problems with the seismograph during the first attempt and CPT was terminated. After repairing the seismograph the CPT pushed to the planned depth.
5. Track Rig 5000
6. Truck Rig 5040

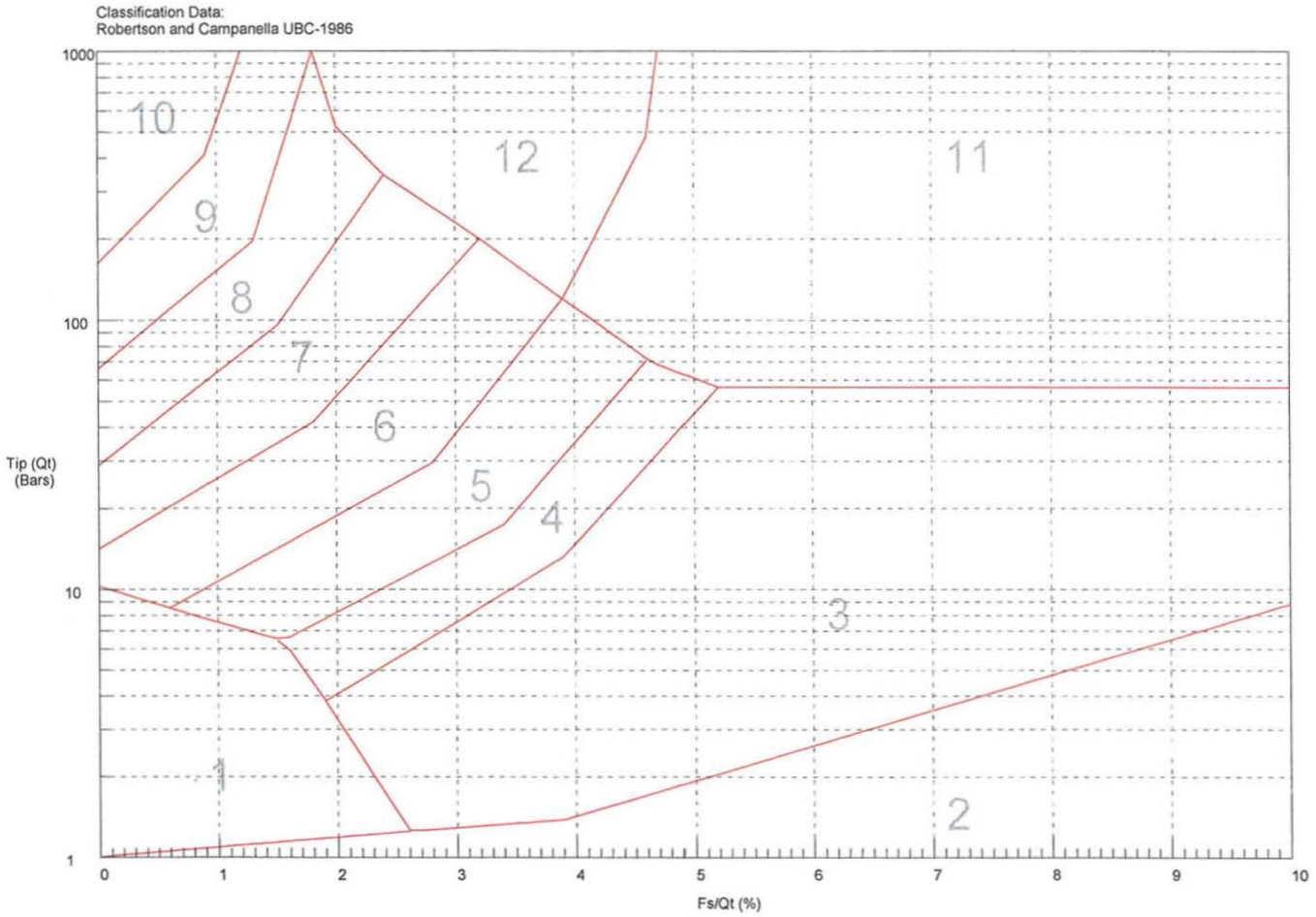
Fugro appreciates the opportunity to be of service to Mactec Engineering and Consulting, Inc. If you have any questions, please feel free to contact me at 713-346-4000.

Very truly yours,
FUGRO CONSULTANTS, INC.

Recep Yilmaz
Senior Vice President

CPT LOGS

12 Zone Soil Behavior Chart

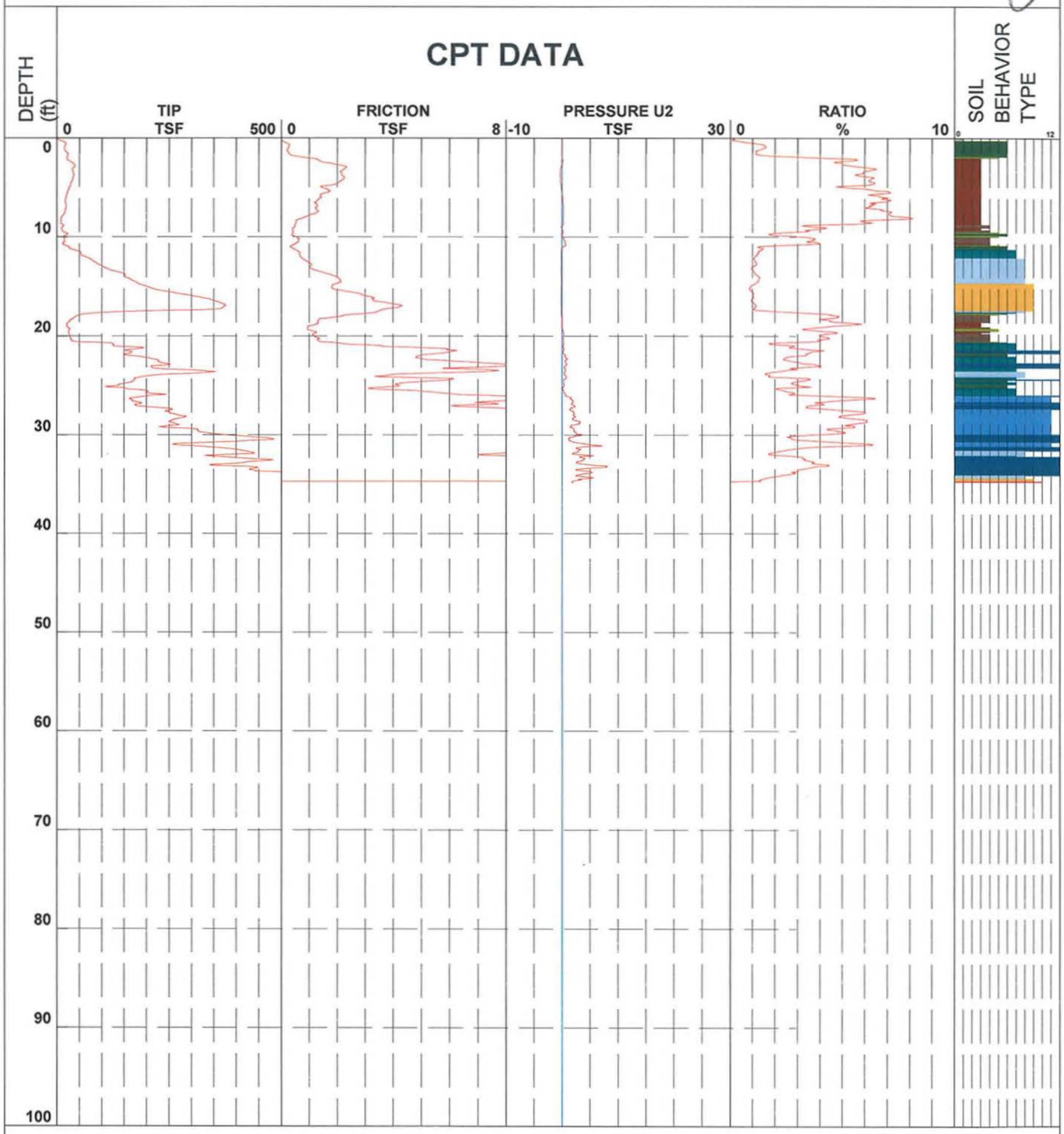


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

* Overconsolidated or cemented

CPT Data

Job Number	1907-0075	CPT Number	C-2301s	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	02-Jan-2008 11:48:04	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	79.08	Water Table	ND
Coord. North	13408989.39	Coord. East	2599158.23	Check:	Verify:



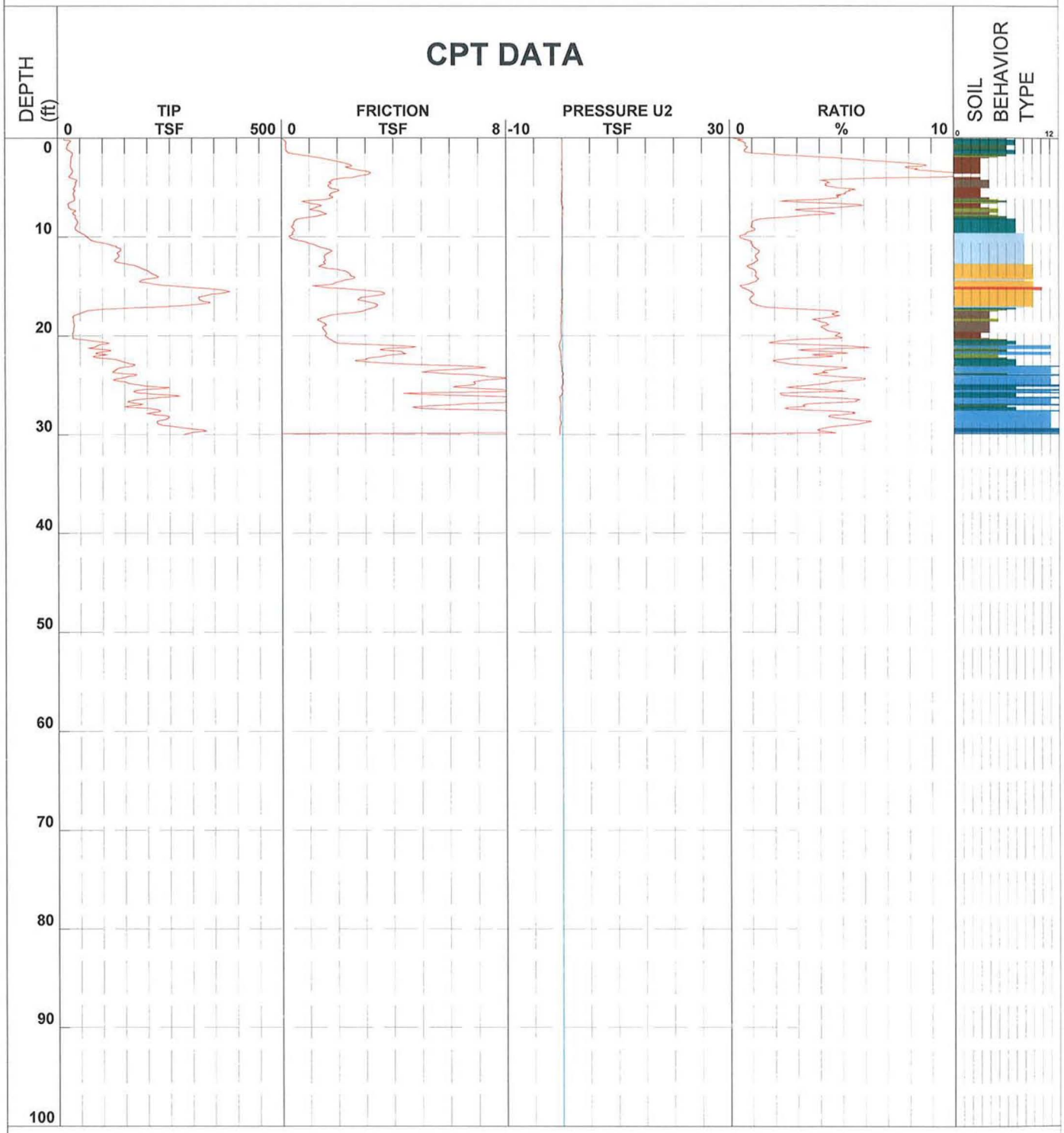
1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Robertson et al. 1986 * Overconsolidated or Cemented

Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2301SA	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	02-Jan-2008 15:03:44	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	78.70	Water Table	ND
Coord. North	13408982.41	Coord. East	2599162.20	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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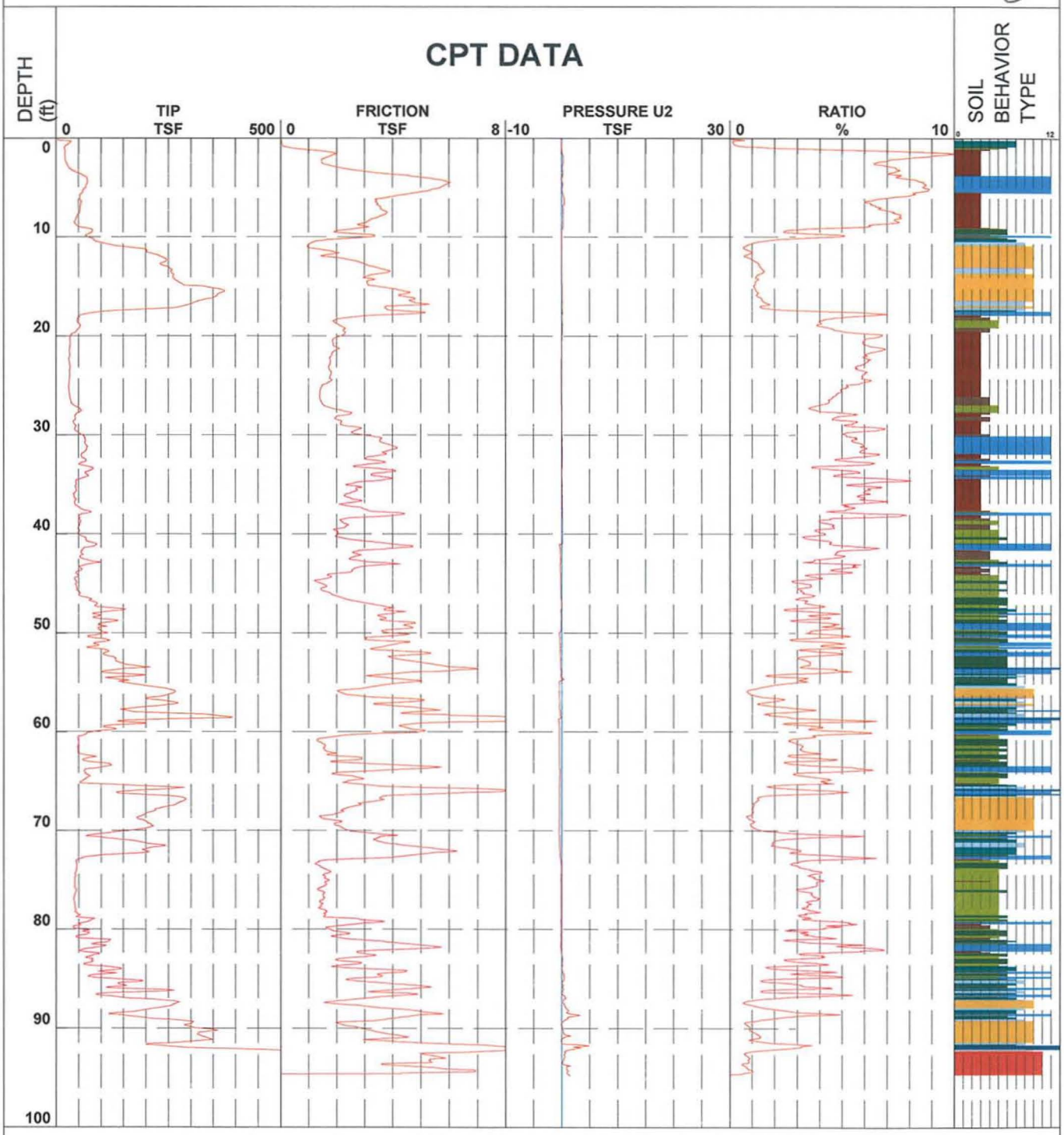
Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2302	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	05-Jan-2008 14:03:12	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	77.79	Water Table	ND
Coord. North	13412519.49	Coord. East	2602124.85	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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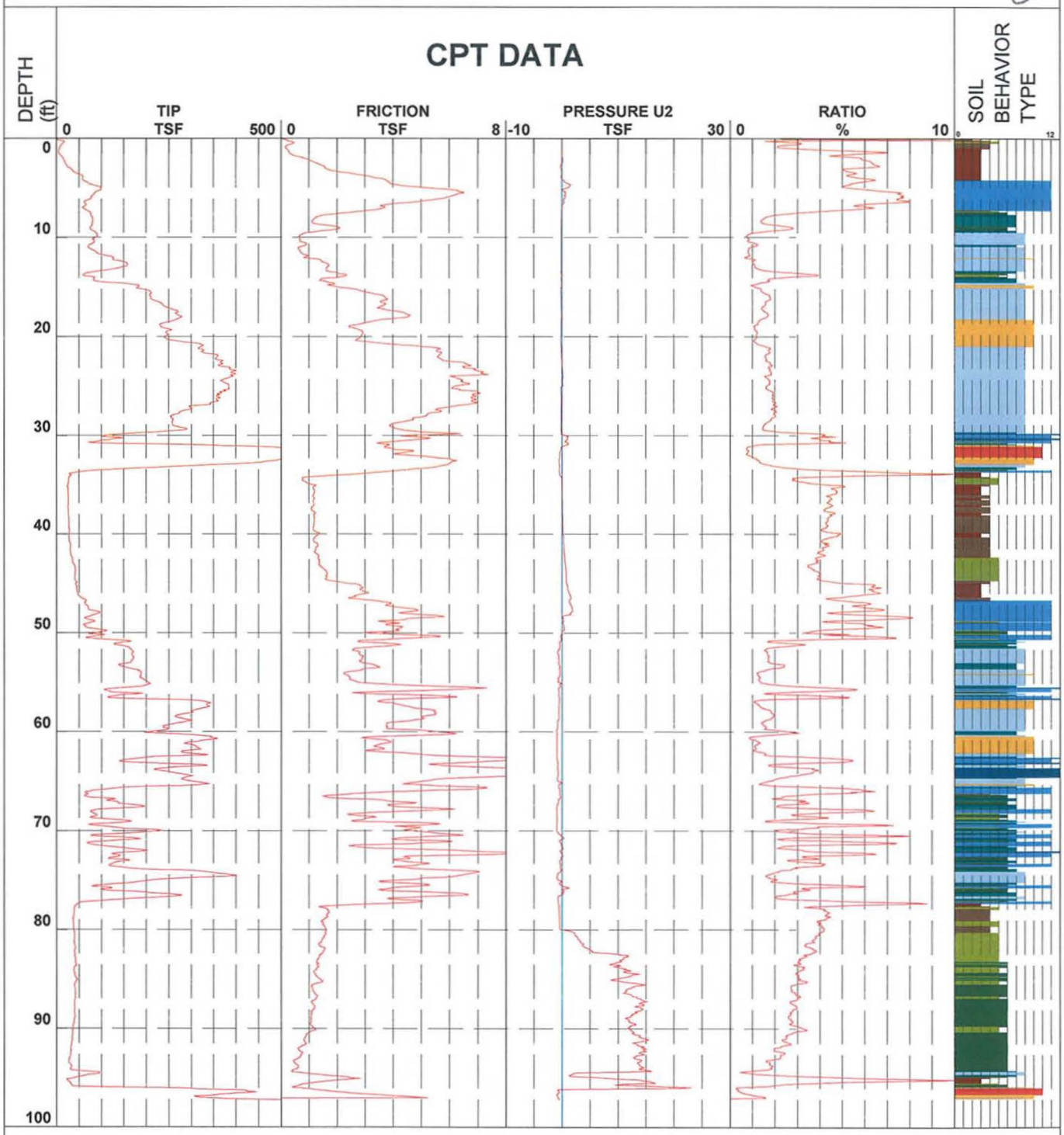
Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2303s	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	18-Dec-2007 08:10:39	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	76.79	Water Table	ND
Coord. North	13416428.66	Coord. East	2605405.65	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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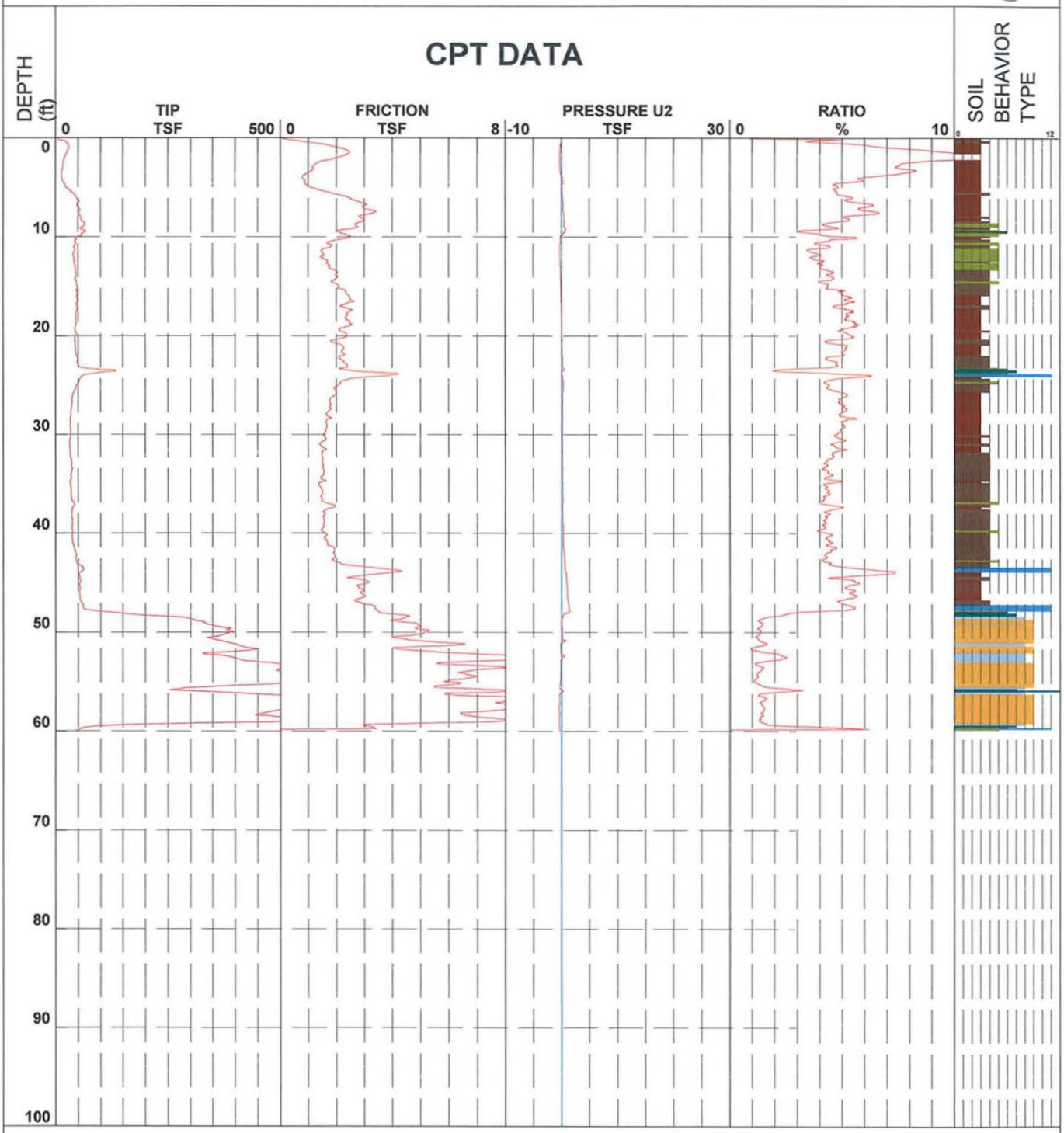
Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2304	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	17-Dec-2007 14:05:39	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	74.85	Water Table	ND
Coord. North	13418878.70	Coord. East	2607463.62	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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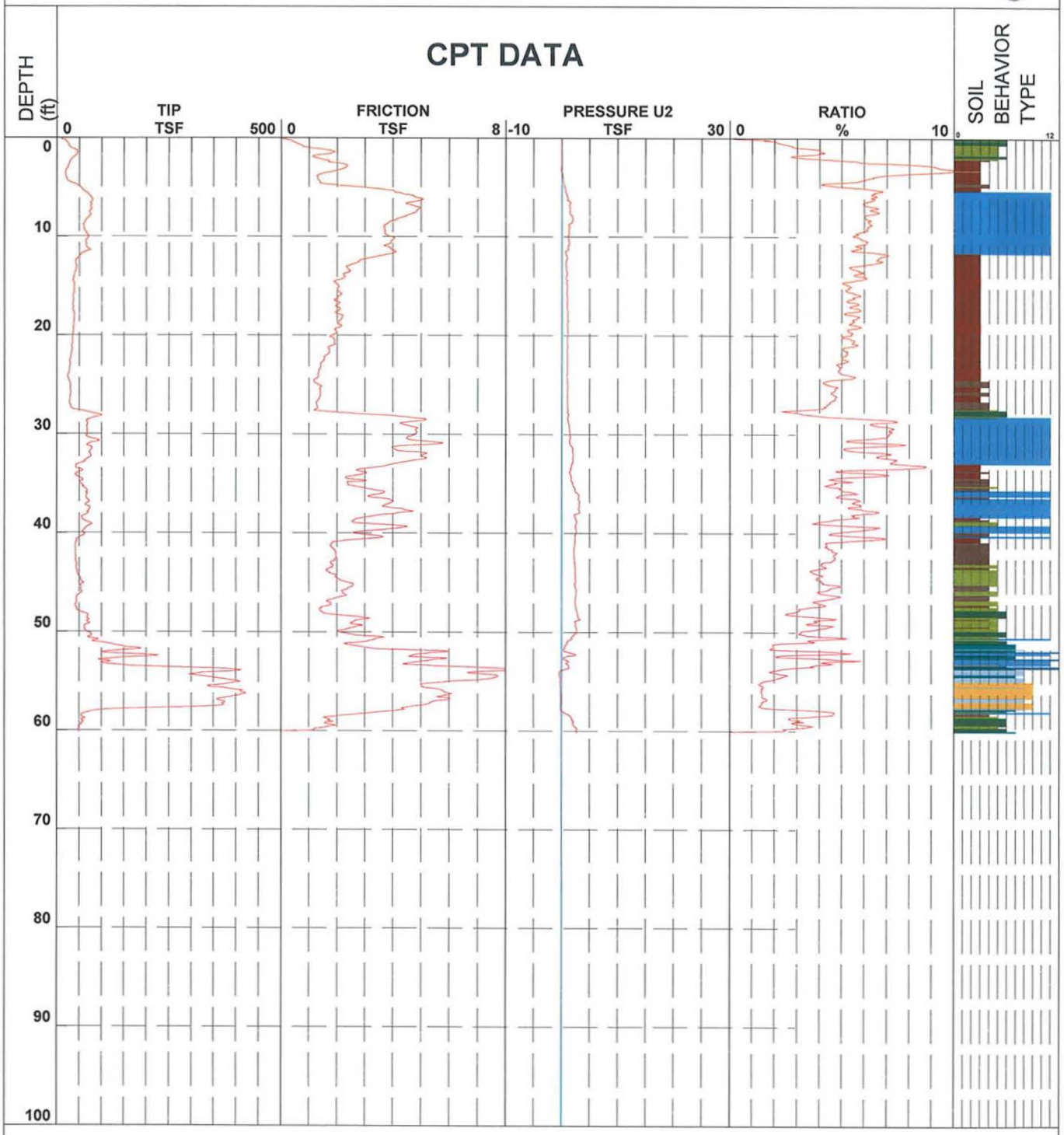
Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2305	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	19-Dec-2007 14:48:21	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	75.47	Water Table	ND
Coord. North	13408849.43	Coord. East	2603251.14	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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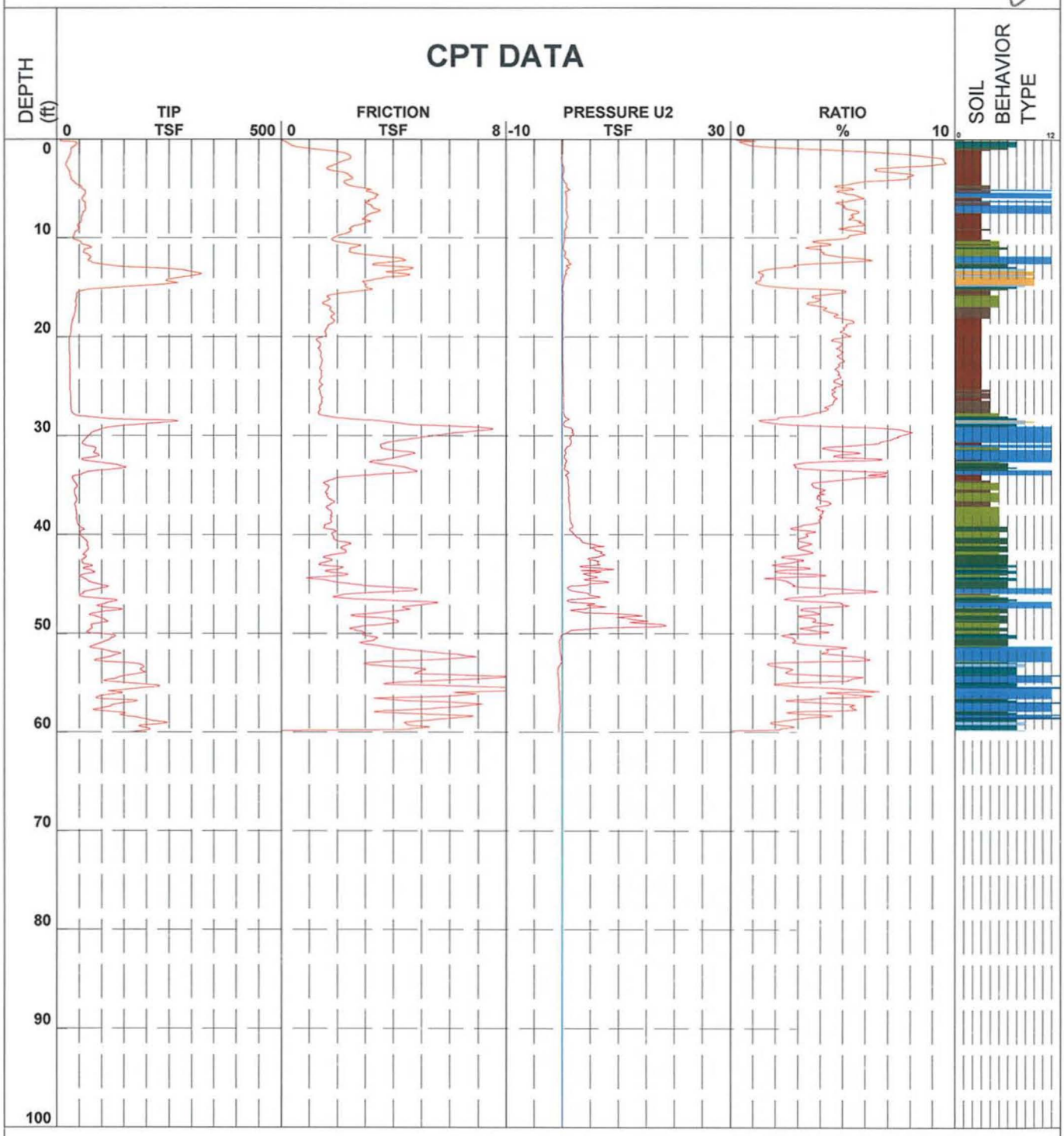
Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2306	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	19-Dec-2007 08:40:36	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	77.54	Water Table	ND
Coord. North	13411148.27	Coord. East	2605179.25	Check: SG	Verify: RY



1 - sensitive fine grained
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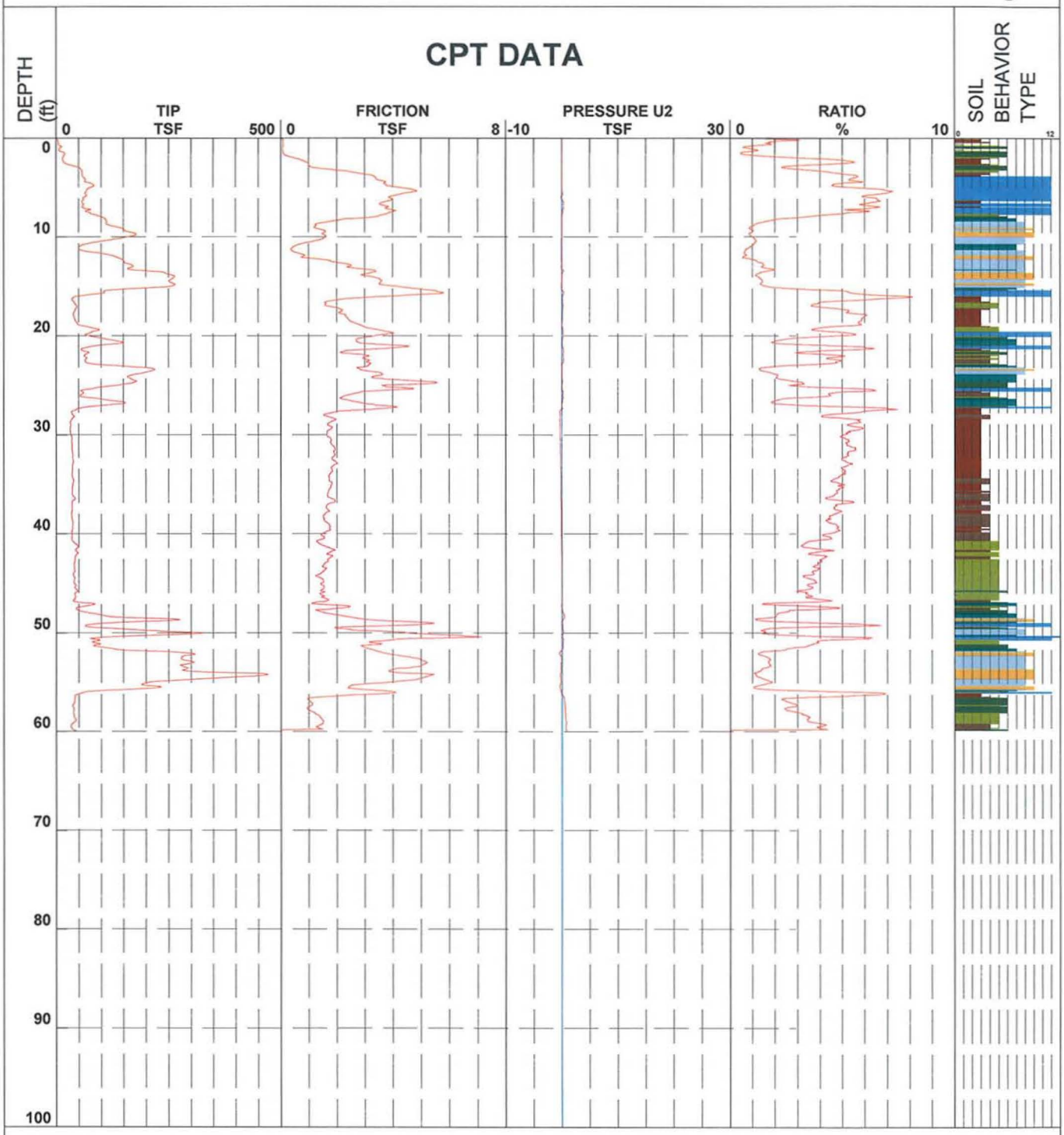
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Robertson et al. 1986 * Overconsolidated or Cemented

Plate 1 of 1

CPT Data

Job Number	1907-0075	CPT Number	C-2307	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	17-Dec-2007 15:47:19	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	74.88	Water Table	ND
Coord. North	13414685.38	Coord. East	2608147.28	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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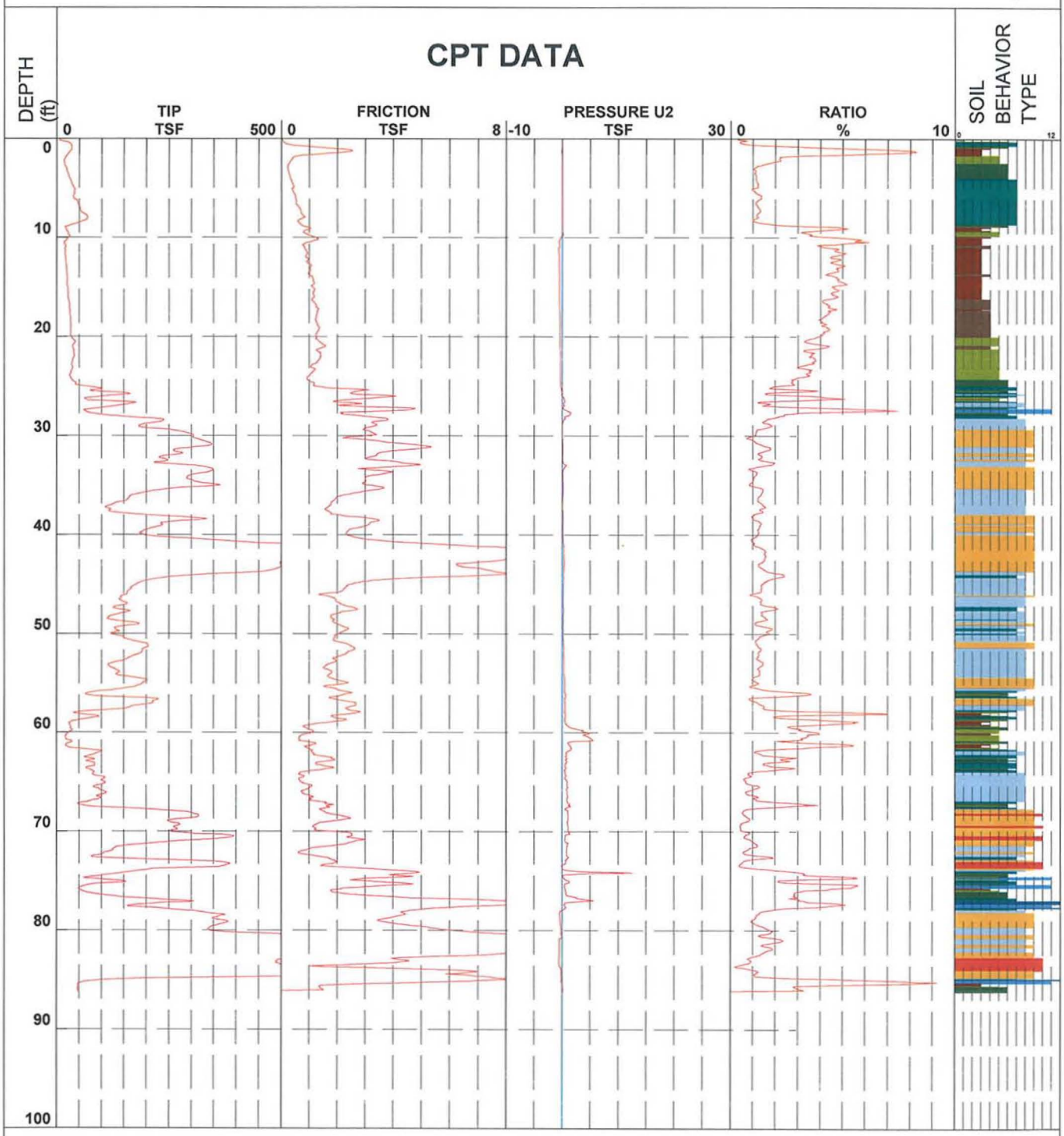
CPT Data

Job Number	1907-0075	CPT Number	C-2308	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	06-Jan-2008 11:07:55	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	58.02	Water Table	ND
Coord. North	13415348.90	Coord. East	2610567.73	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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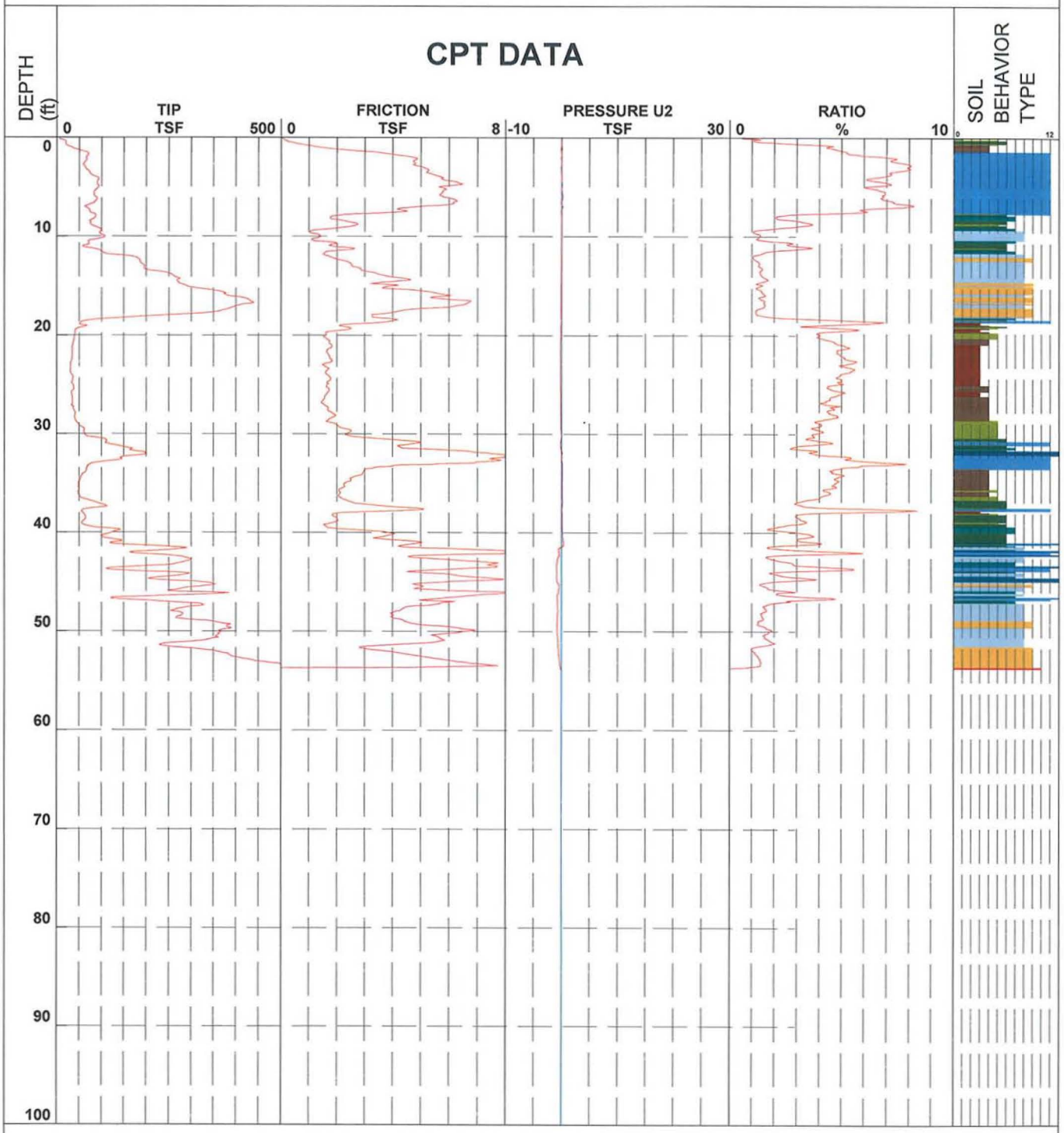
CPT Data

Job Number	1907-0075	CPT Number	C-2309	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	19-Dec-2007 11:43:37	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	72.92	Water Table	ND
Coord. North	13405587.95	Coord. East	2604945.49	Check: CG	Verify: fy



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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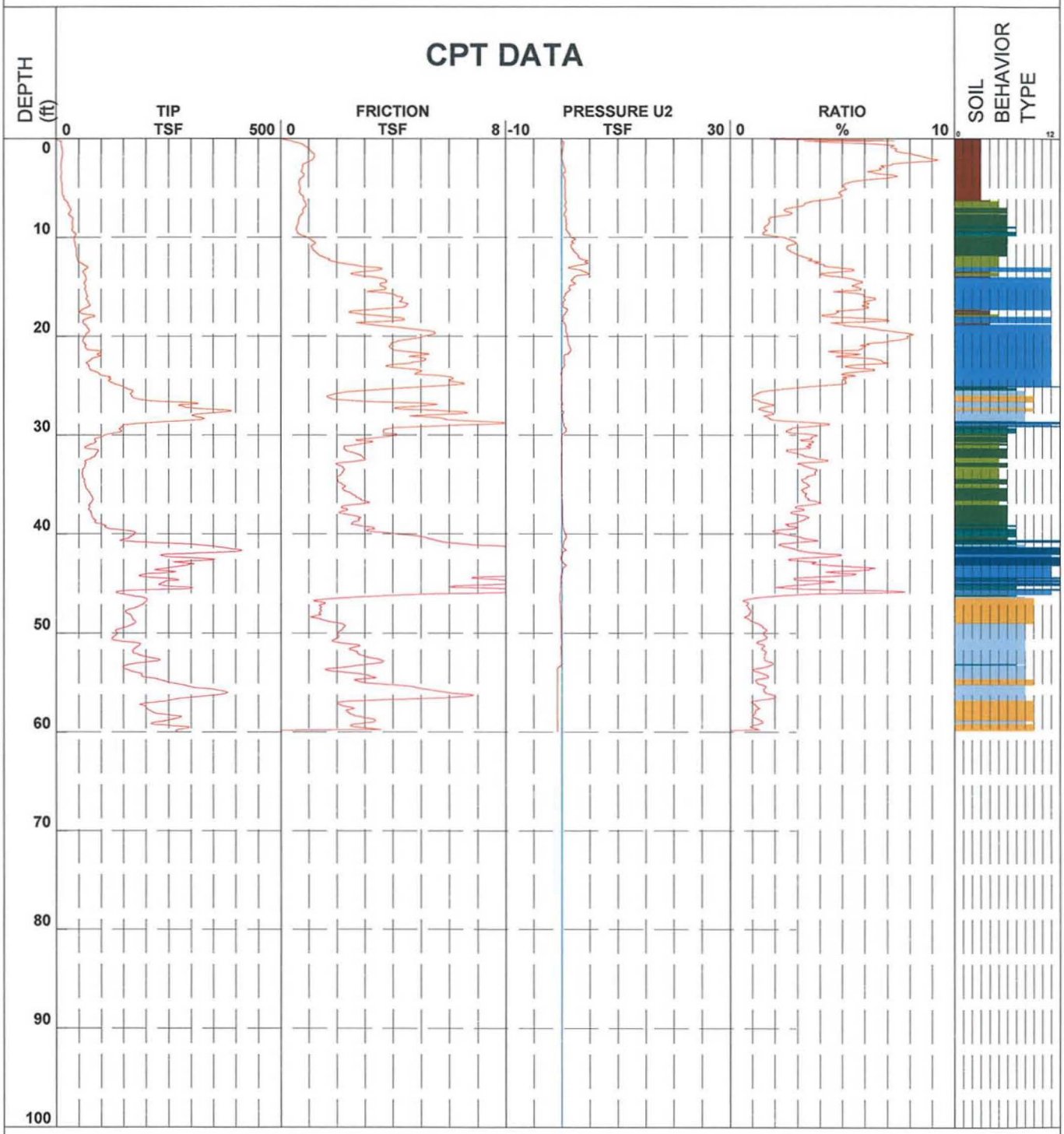
CPT Data

Job Number	1907-0075	CPT Number	C-2310	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	19-Dec-2007 10:05:33	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	70.88	Water Table	ND
Coord. North	13409556.77	Coord. East	2608738.56	Check: SG	Verify: RY



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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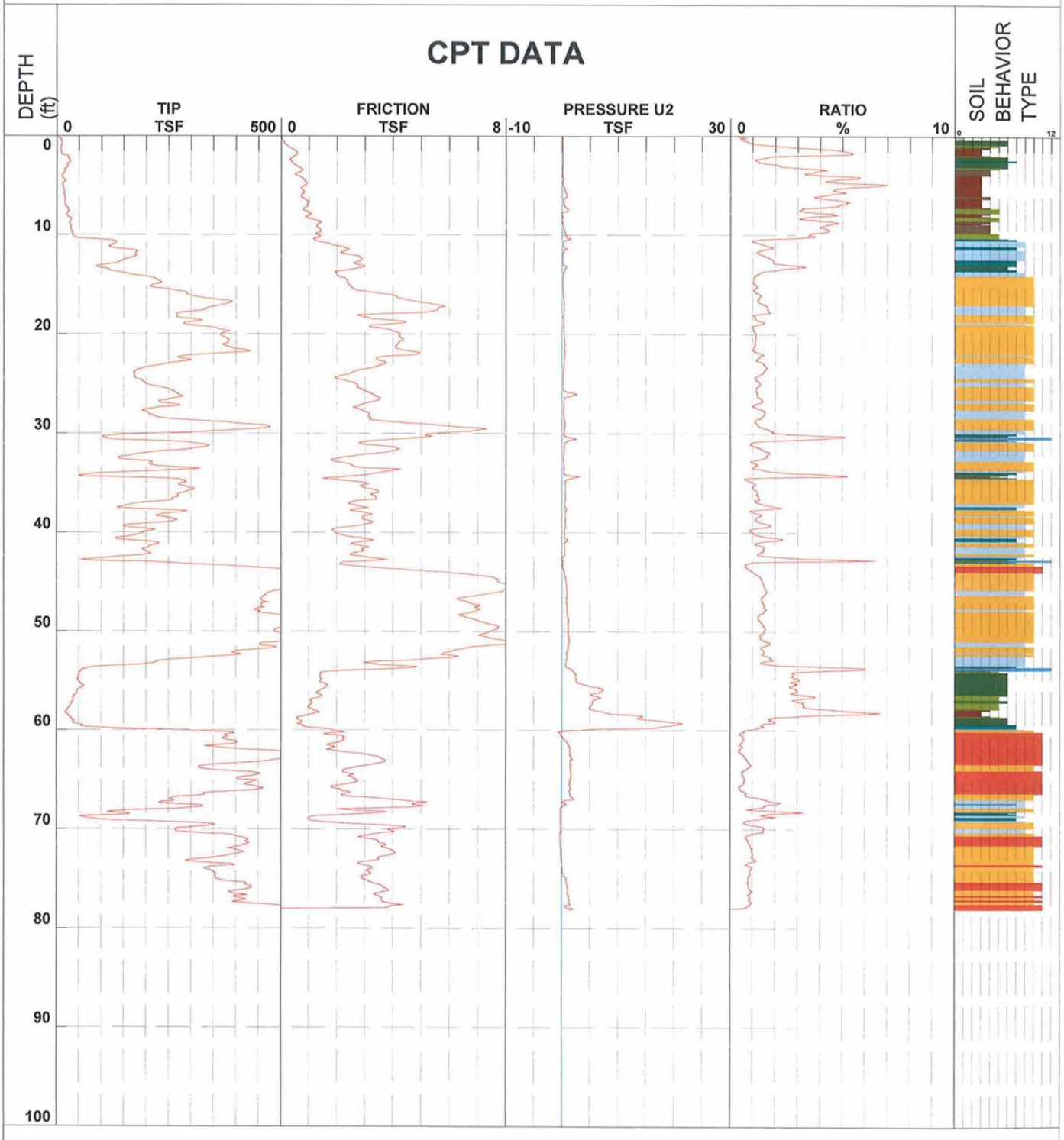
CPT Data

Job Number	1907-0075	CPT Number	C-2311	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	06-Jan-2008 13:48:05	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	41.70	Water Table	ND
Coord. North	13413231.26	Coord. East	2613049.76	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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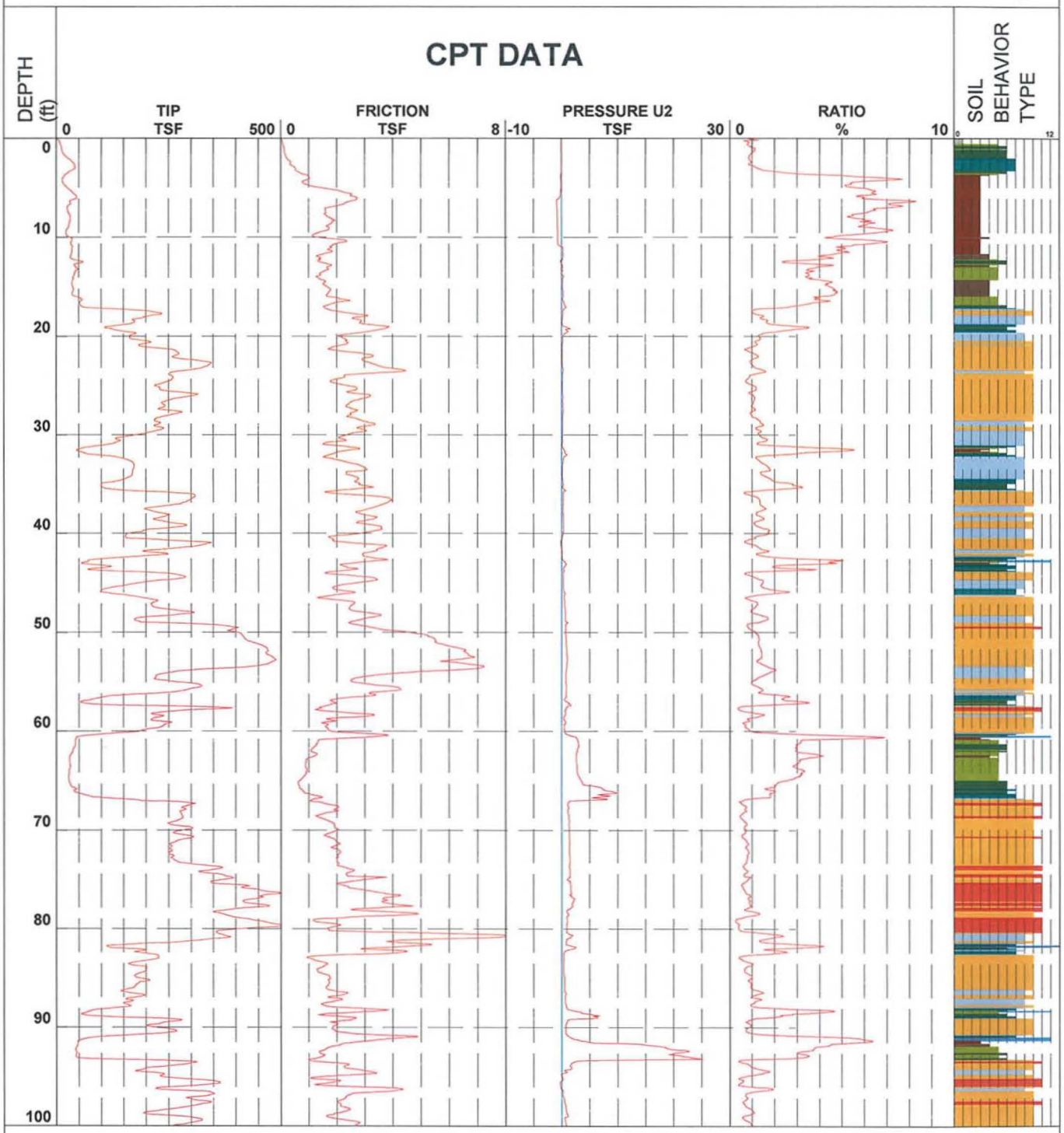
CPT Data

Job Number	1907-0075	CPT Number	C-2311A	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	07-Jan-2008 08:07:13	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	50.49	Water Table	ND
Coord. North	13413277.55	Coord. East	2612969.43	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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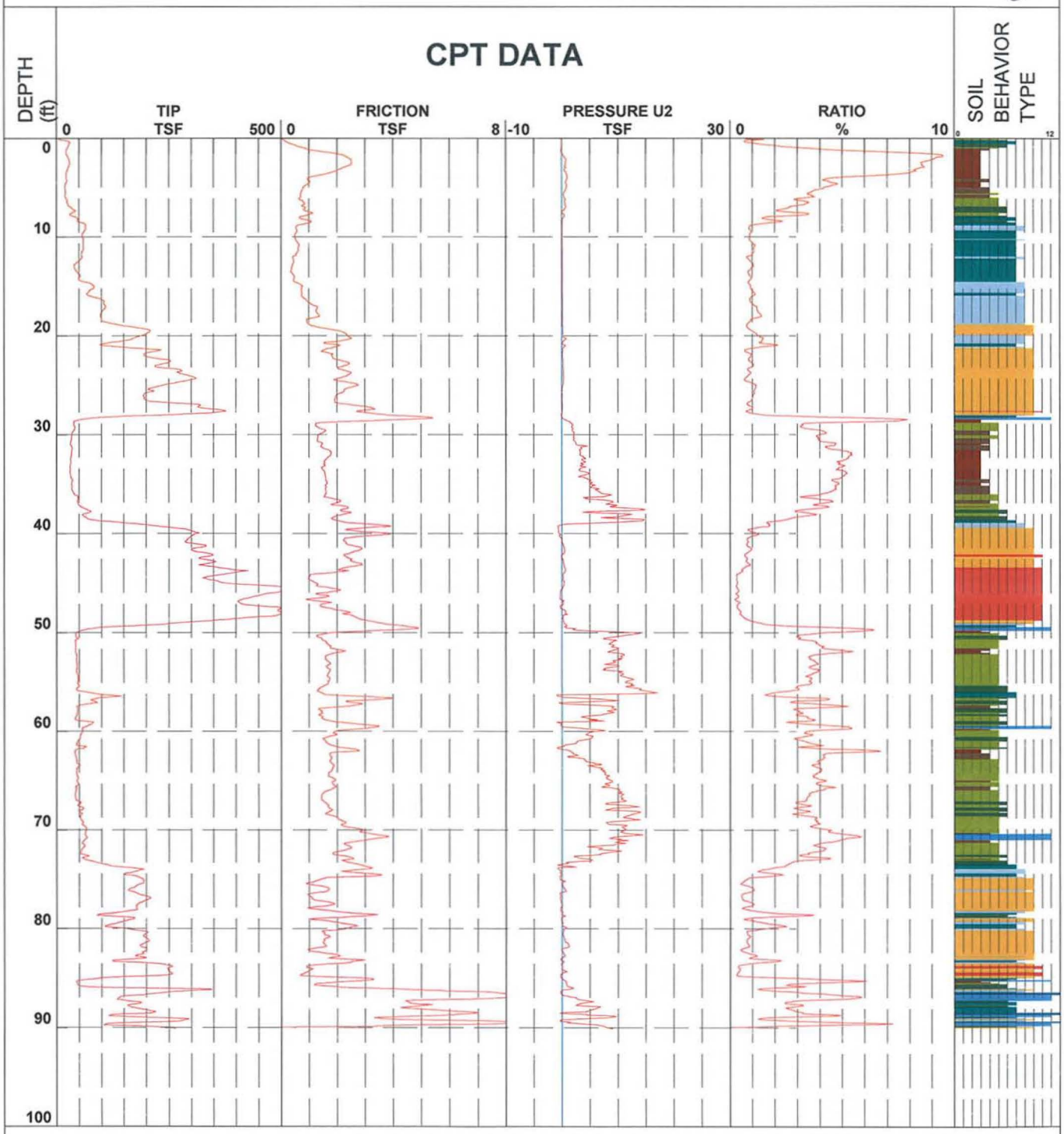
CPT Data

Job Number	1907-0075	CPT Number	C-2312	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	03-Jan-2008 10:23:56	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	64.99	Water Table	ND
Coord. North	13397971.98	Coord. East	2606226.92	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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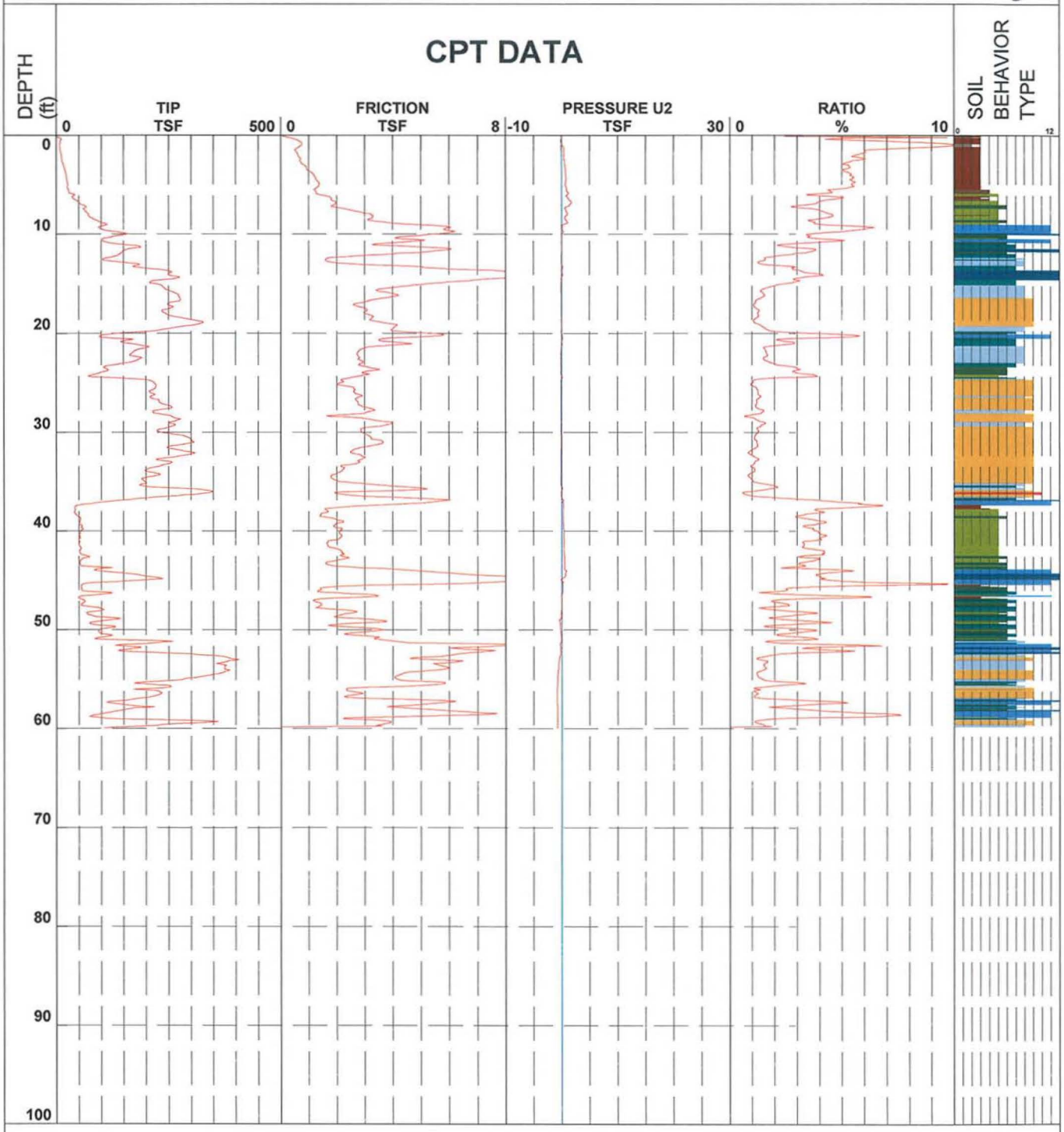
CPT Data

Job Number	1907-0075	CPT Number	C-2313	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	20-Dec-2007 08:30:59	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	71.17	Water Table	ND
Coord. North	13399066.96	Coord. East	2607529.09	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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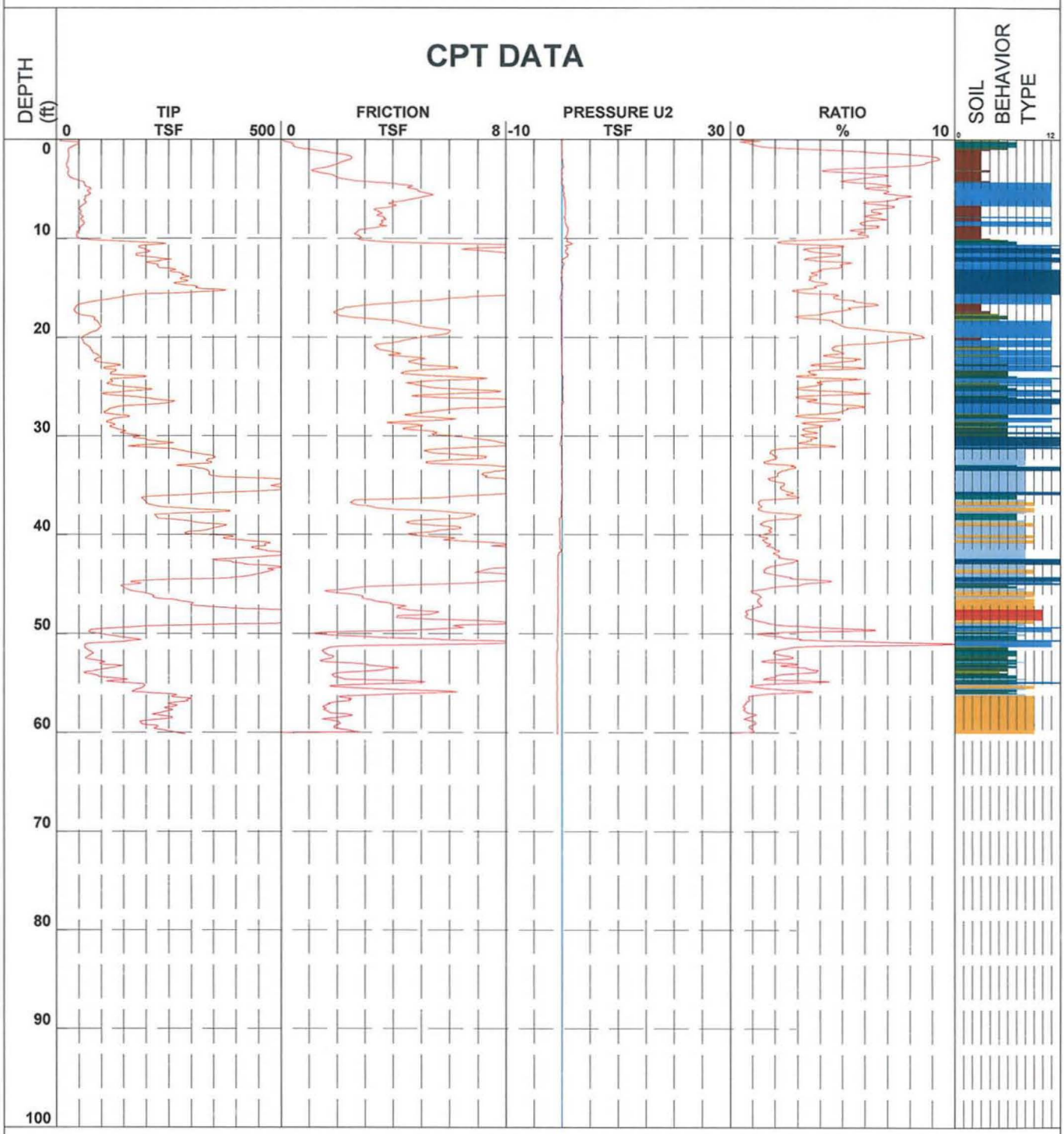
CPT Data

Job Number	1907-0075	CPT Number	C-2314	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	19-Dec-2007 16:38:08	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	69.45	Water Table	ND
Coord. North	13402413.42	Coord. East	2608270.67	Check: SG	Verify: RY



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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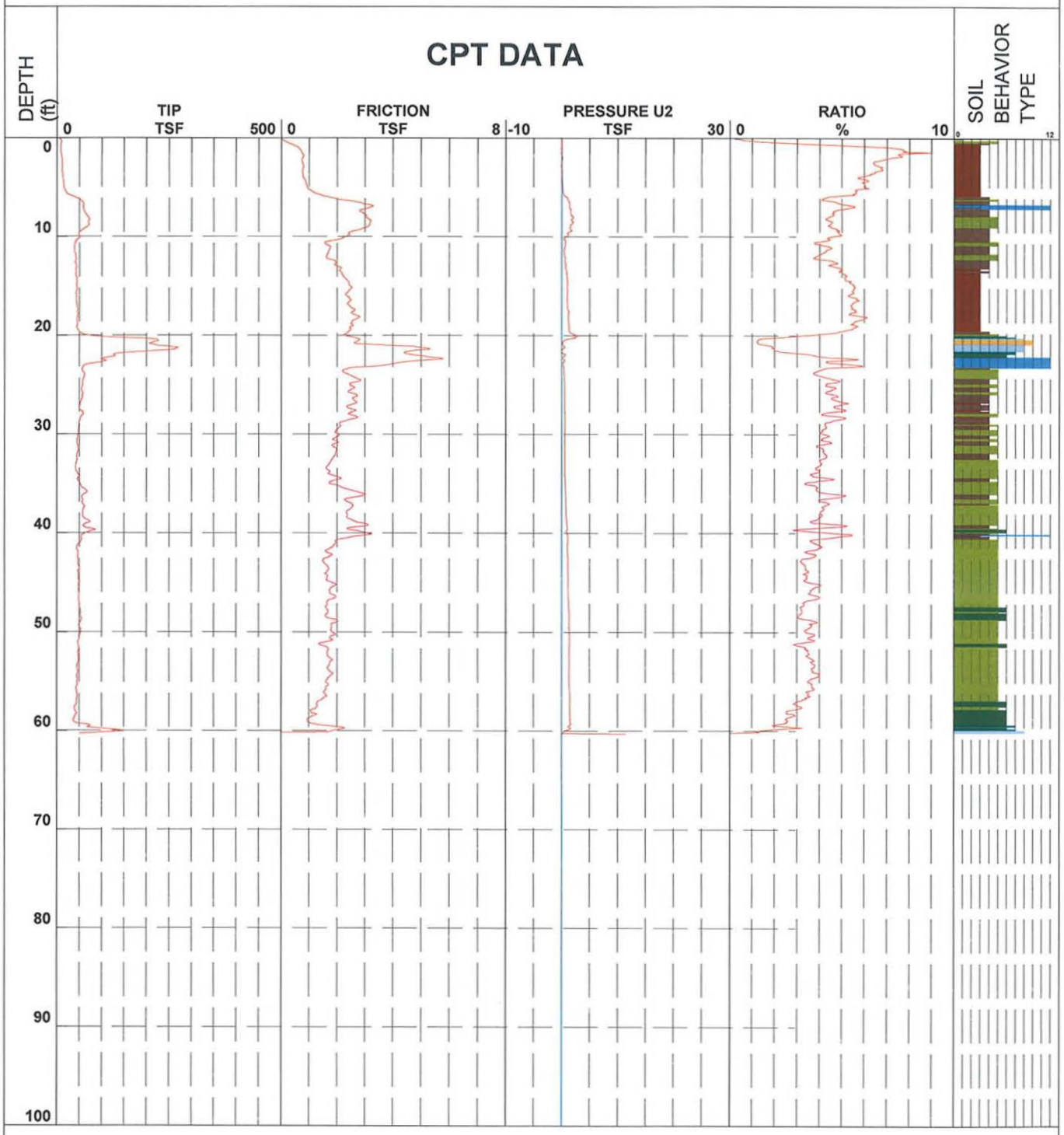
CPT Data

Job Number	1907-0075	CPT Number	C-2315	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	07-Jan-2008 16:31:53	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	66.35	Water Table	ND
Coord. North	13405943.12	Coord. East	2612535.56	Check: SG	Verify: RY



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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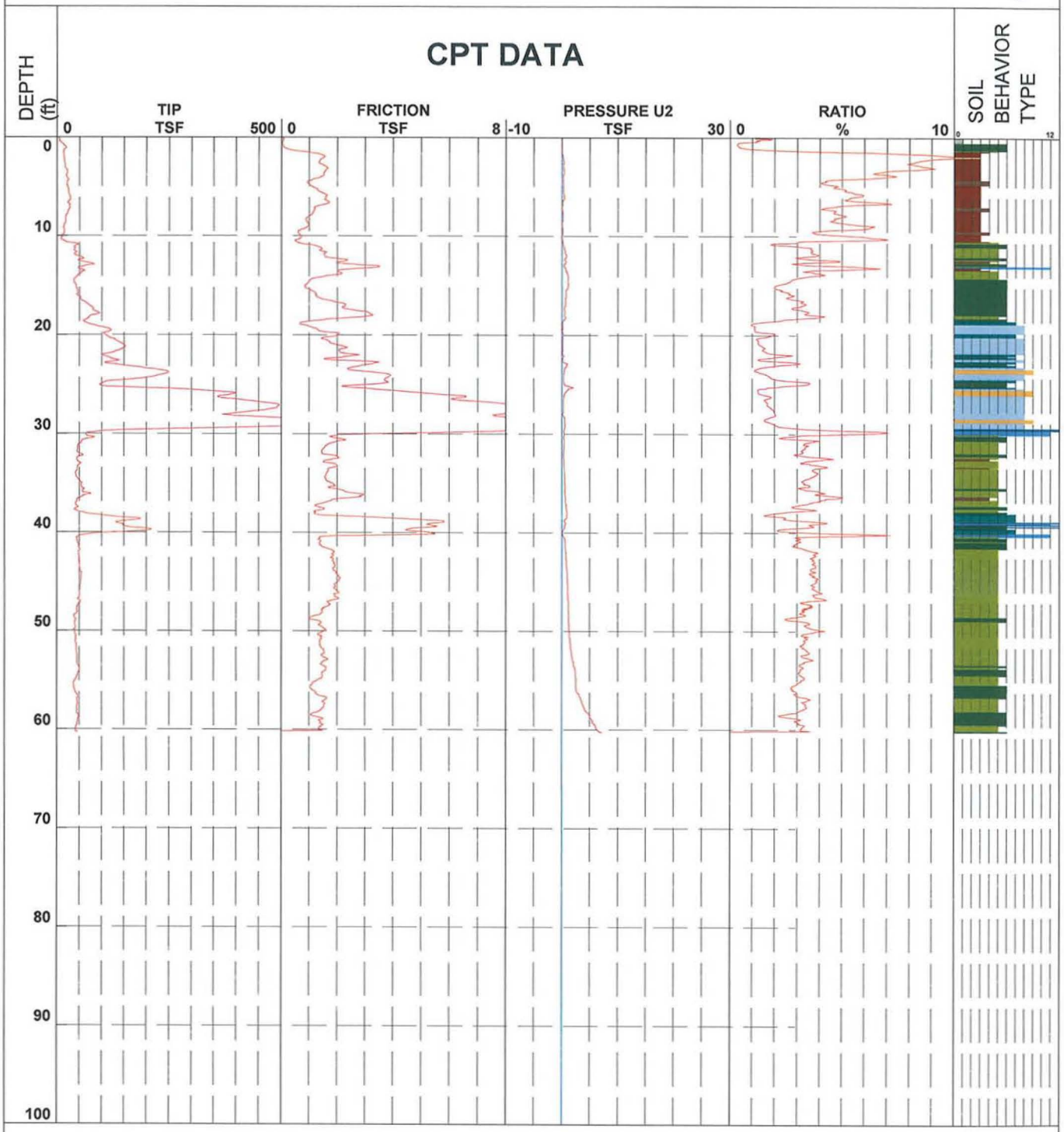
CPT Data

Job Number	1907-0075	CPT Number	C-2316	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	08-Jan-2008 09:07:50	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	68.23	Water Table	ND
Coord. North	13407731.74	Coord. East	2614700.43	Check: SG	Verify: RY



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

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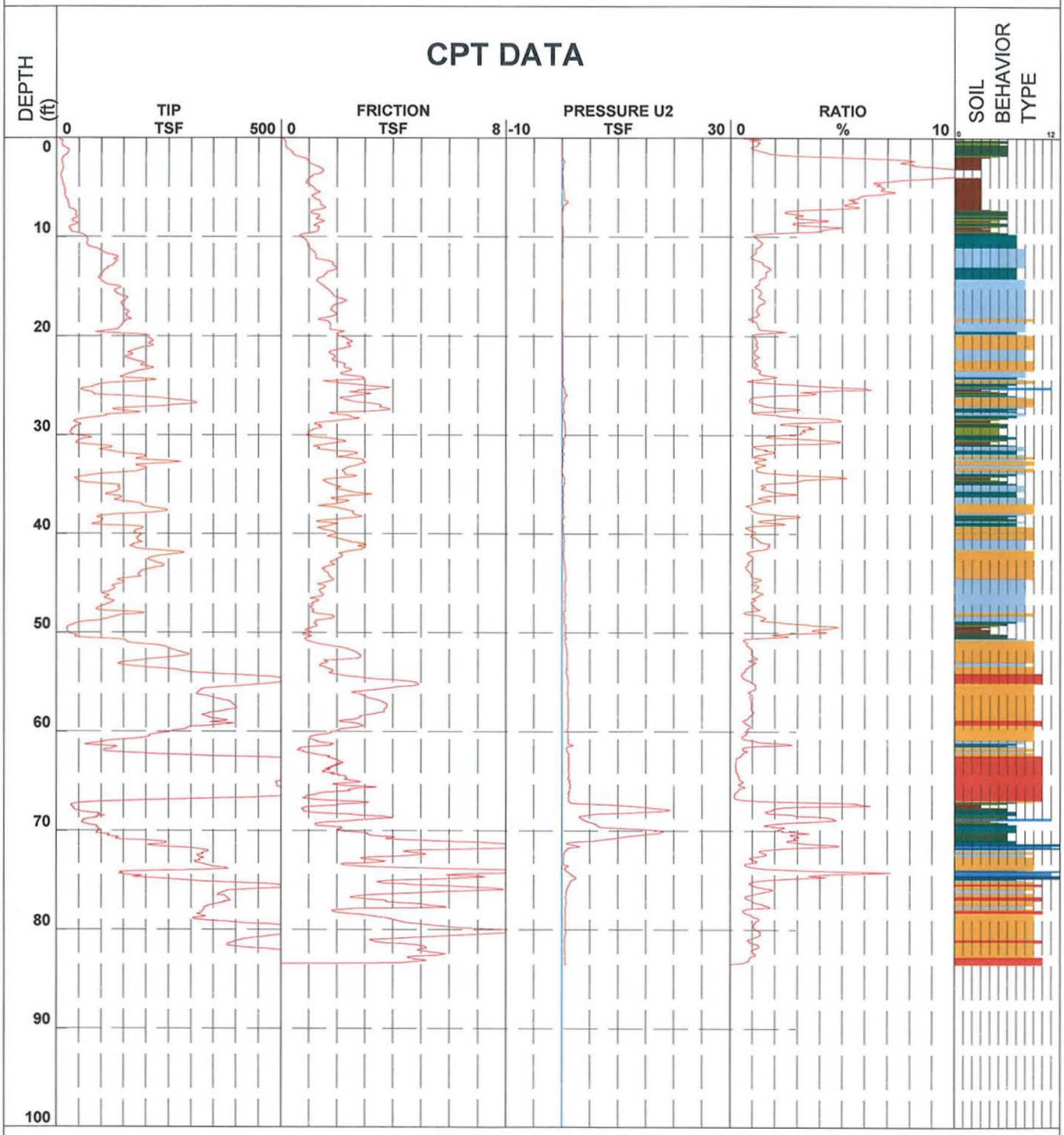
CPT Data

Job Number	1907-0075	CPT Number	C-2317	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	07-Jan-2008 13:41:53	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	45.17	Water Table	ND
Coord. North	13408493.37	Coord. East	2617901.20	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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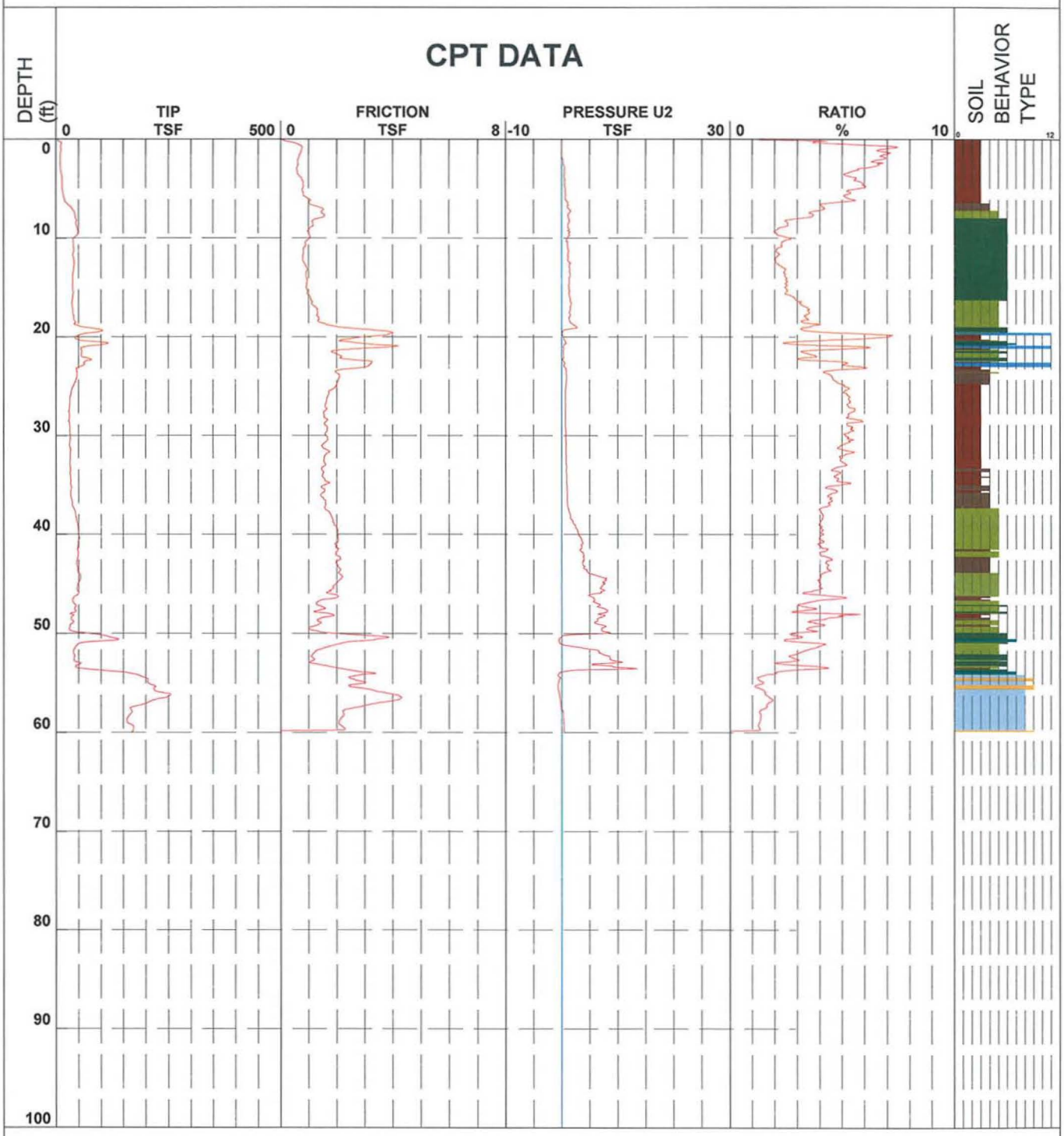
CPT Data

Job Number	1907-0075	CPT Number	C-2318	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	20-Dec-2007 09:48:50	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	66.39	Water Table	ND
Coord. North	13403305.07	Coord. East	2613240.79	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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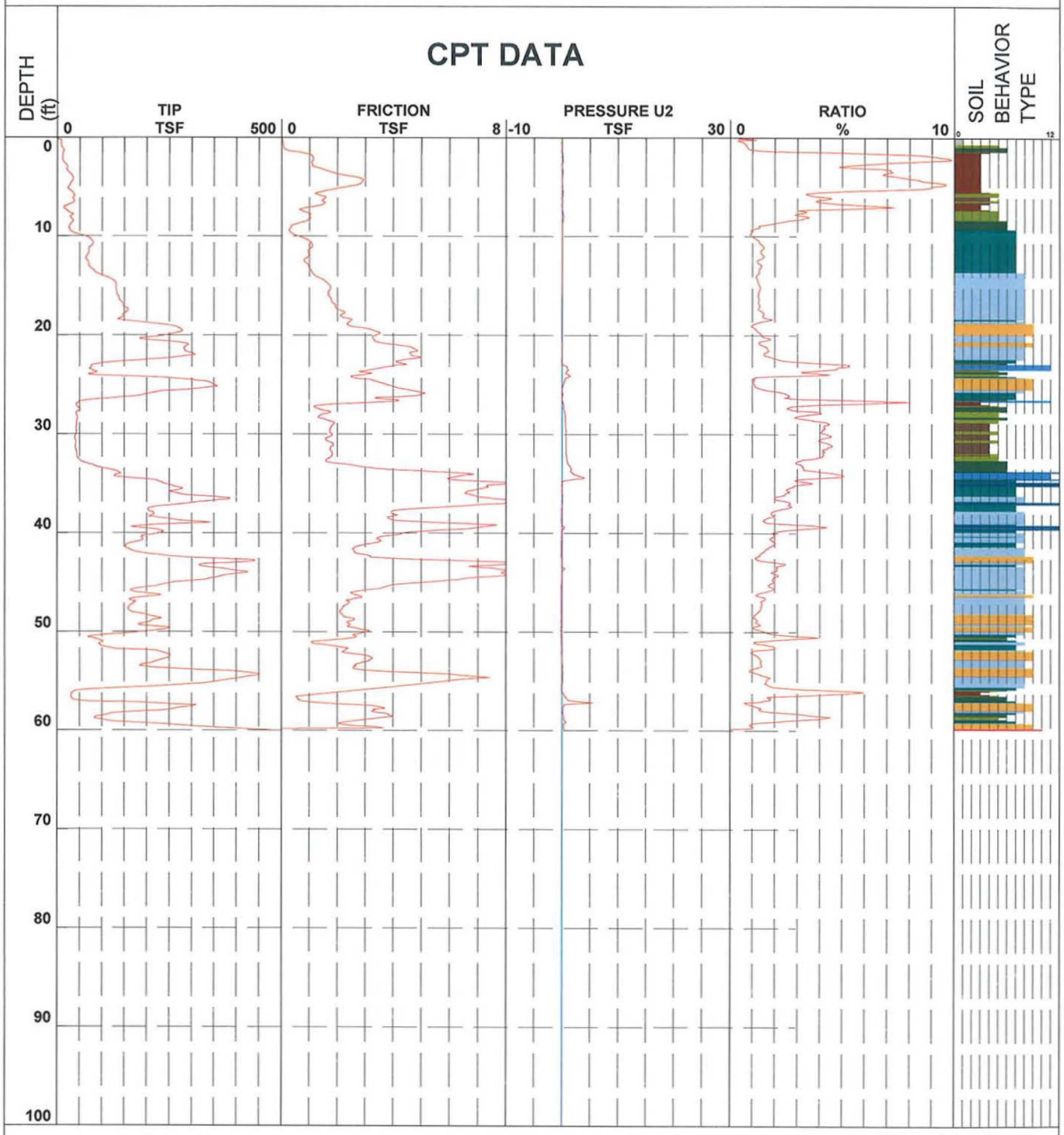
CPT Data

Job Number	1907-0075	CPT Number	C-2319	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	20-Dec-2007 10:54:28	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	65.56	Water Table	ND
Coord. North	13406689.77	Coord. East	2617807.82	Check: SG	Verify: RY



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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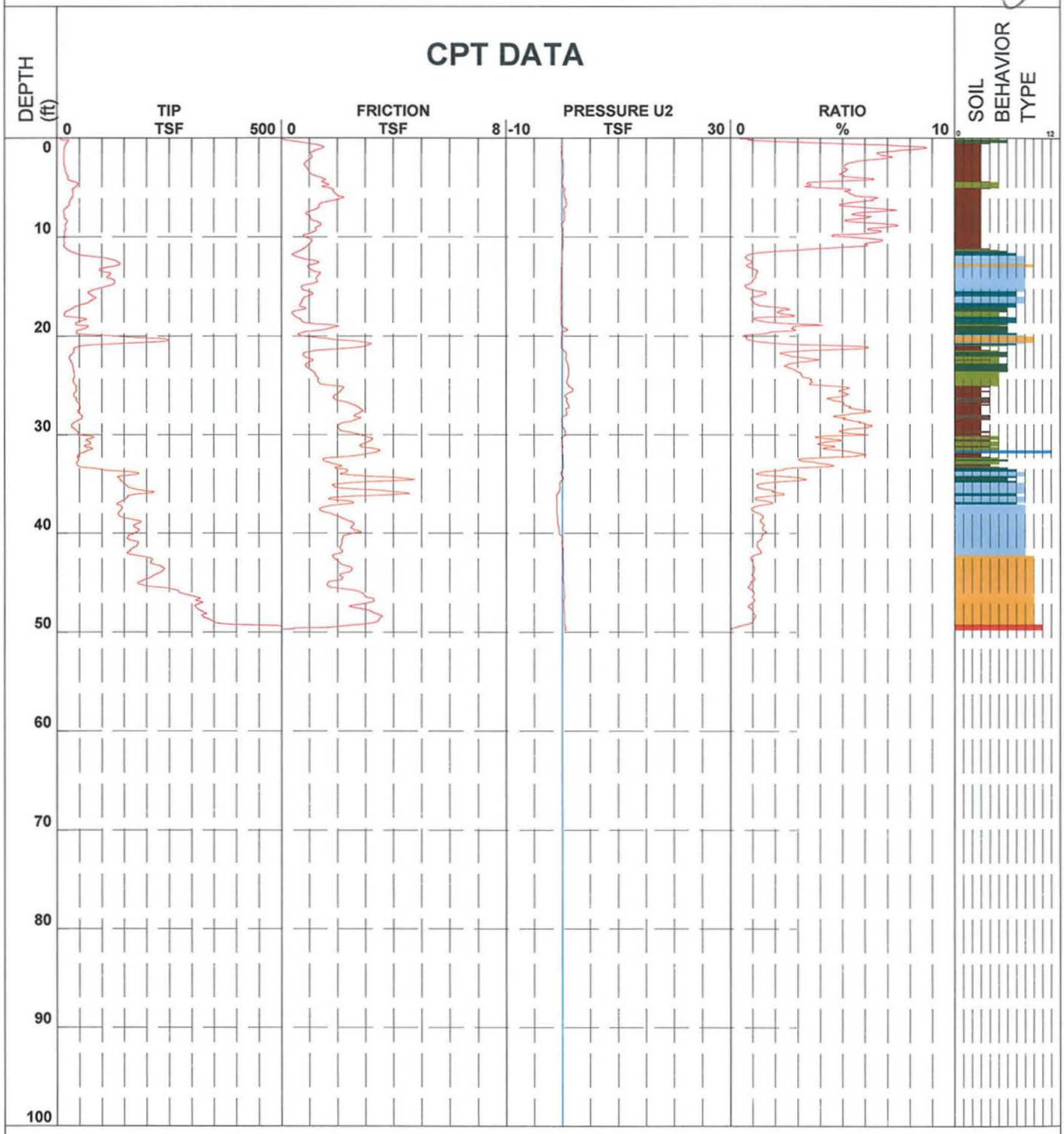
CPT Data

Job Number	1907-0075	CPT Number	C-2321s	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	04-Jan-2008 09:55:04	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	65.80	Water Table	ND
Coord. North	13397141.61	Coord. East	2611187.71	Check:	Verify:



1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

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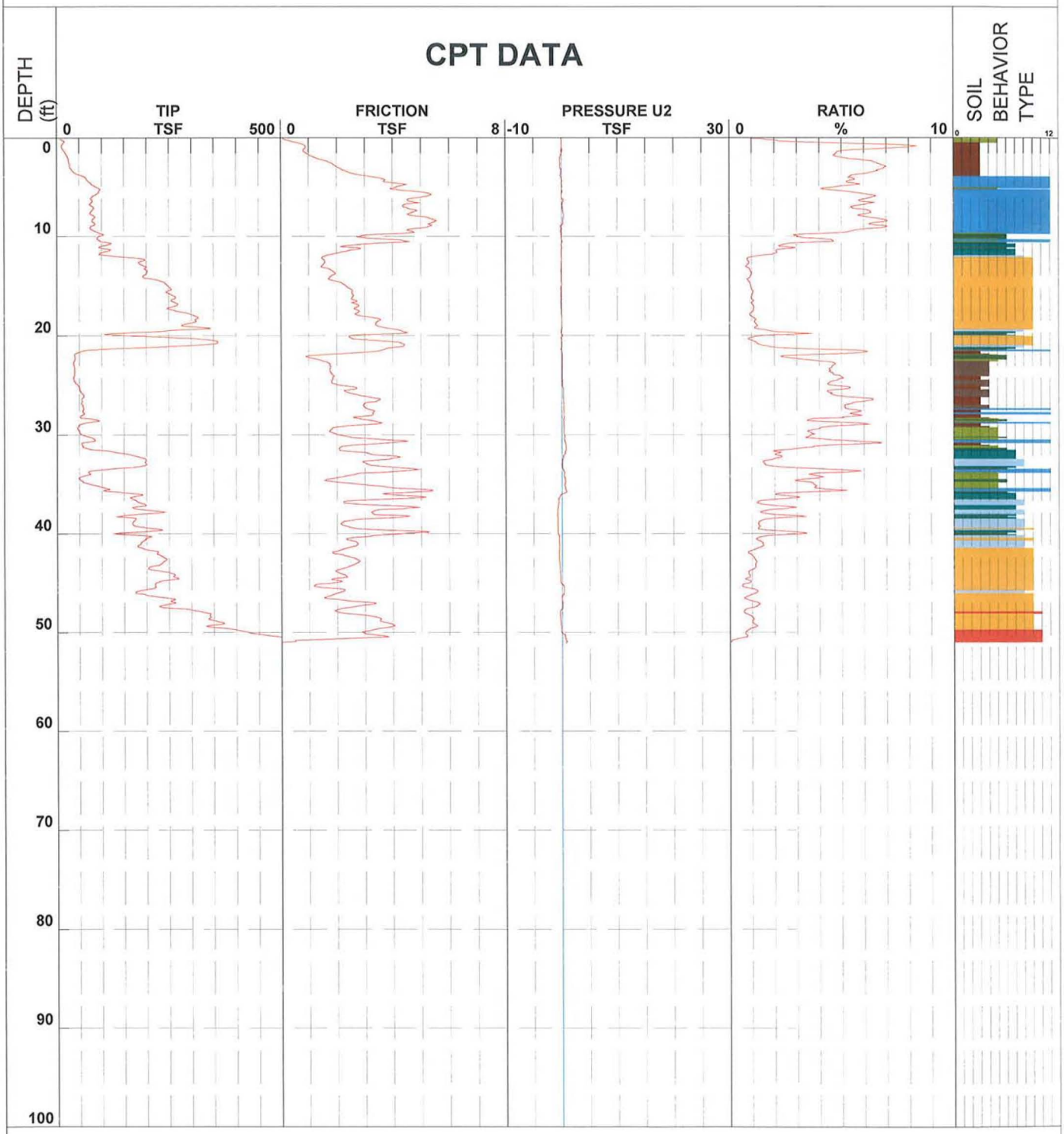
CPT Data

Job Number	1907-0075	CPT Number	C-2321SA	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	04-Jan-2008 12:50:51	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	65.90	Water Table	ND
Coord. North	13397149.37	Coord. East	2611182.17	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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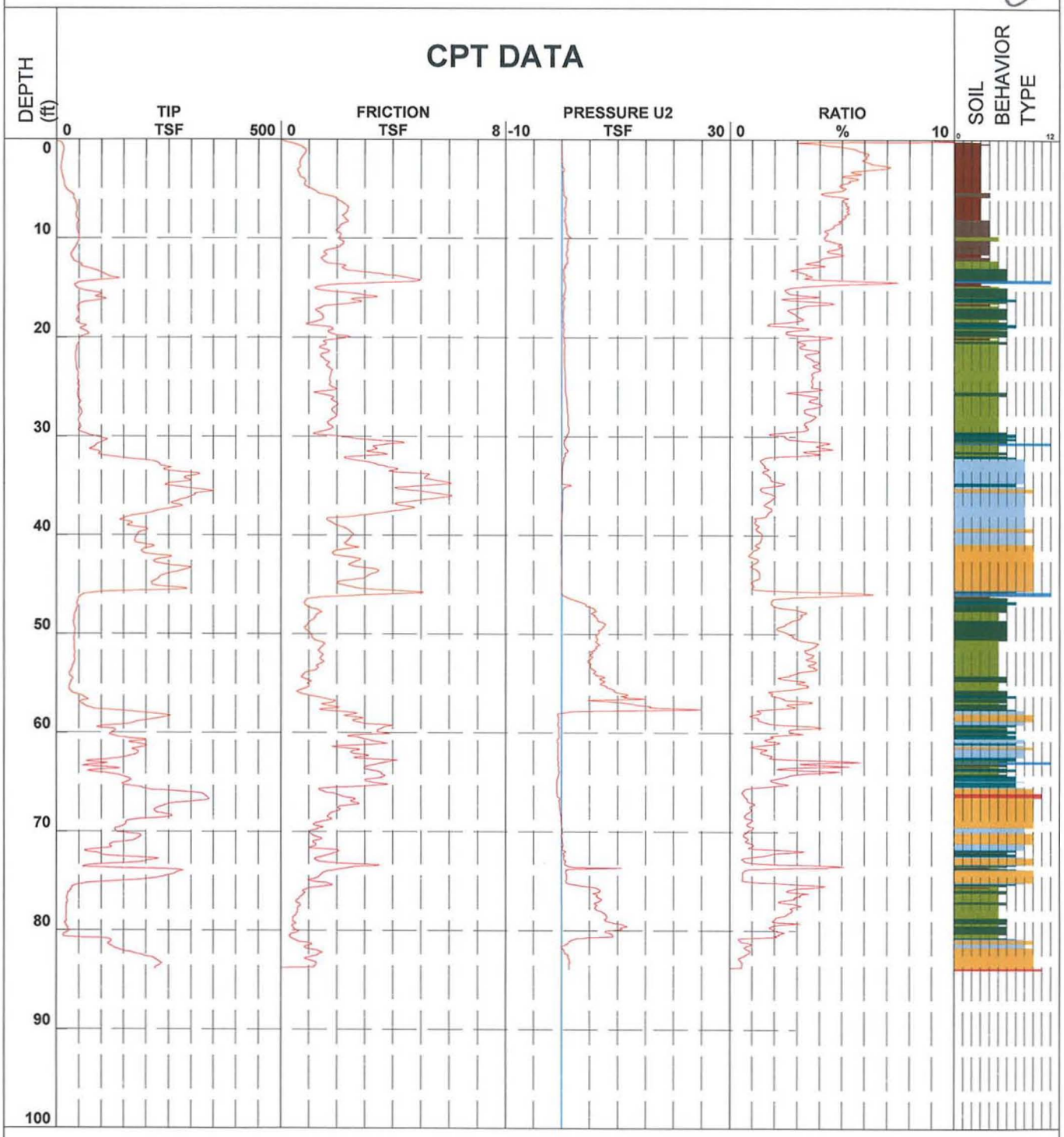
CPT Data

Job Number	1907-0075	CPT Number	C-2322	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	10-Jan-2008 08:17:04	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	62.19	Water Table	ND
Coord. North	13400701.15	Coord. East	2615409.91	Check: SG	Verify: ly



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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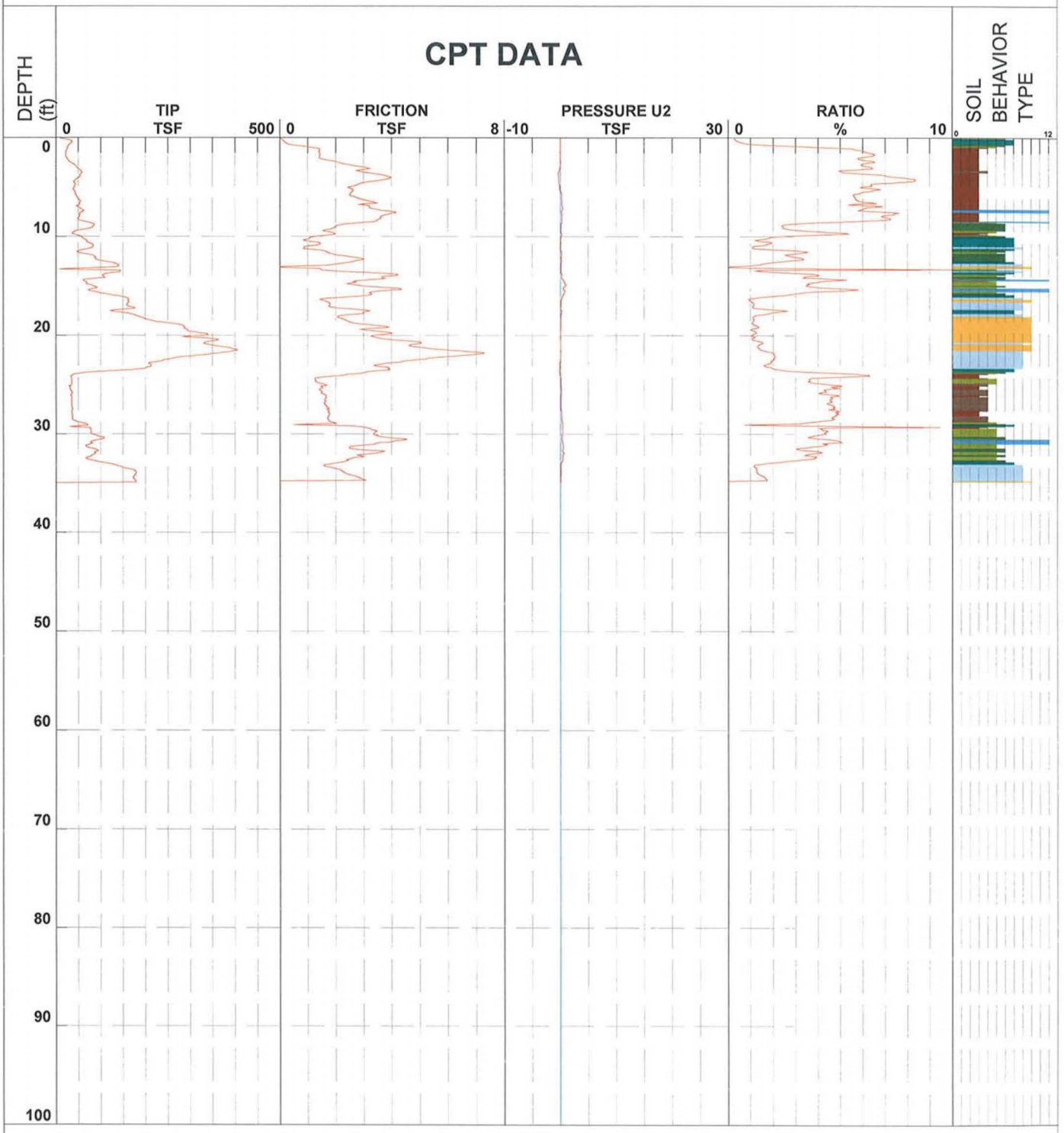
CPT Data - DISREGARD

Job Number	1907-0075	CPT Number	C-2323s	Location	Exelon Victoria-TX
Operator	Albert Fonseca	Date and T	08-Jan-2008 12:39:36	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	ND	Water Table	ND
Coord. North	ND	Coord. East	ND	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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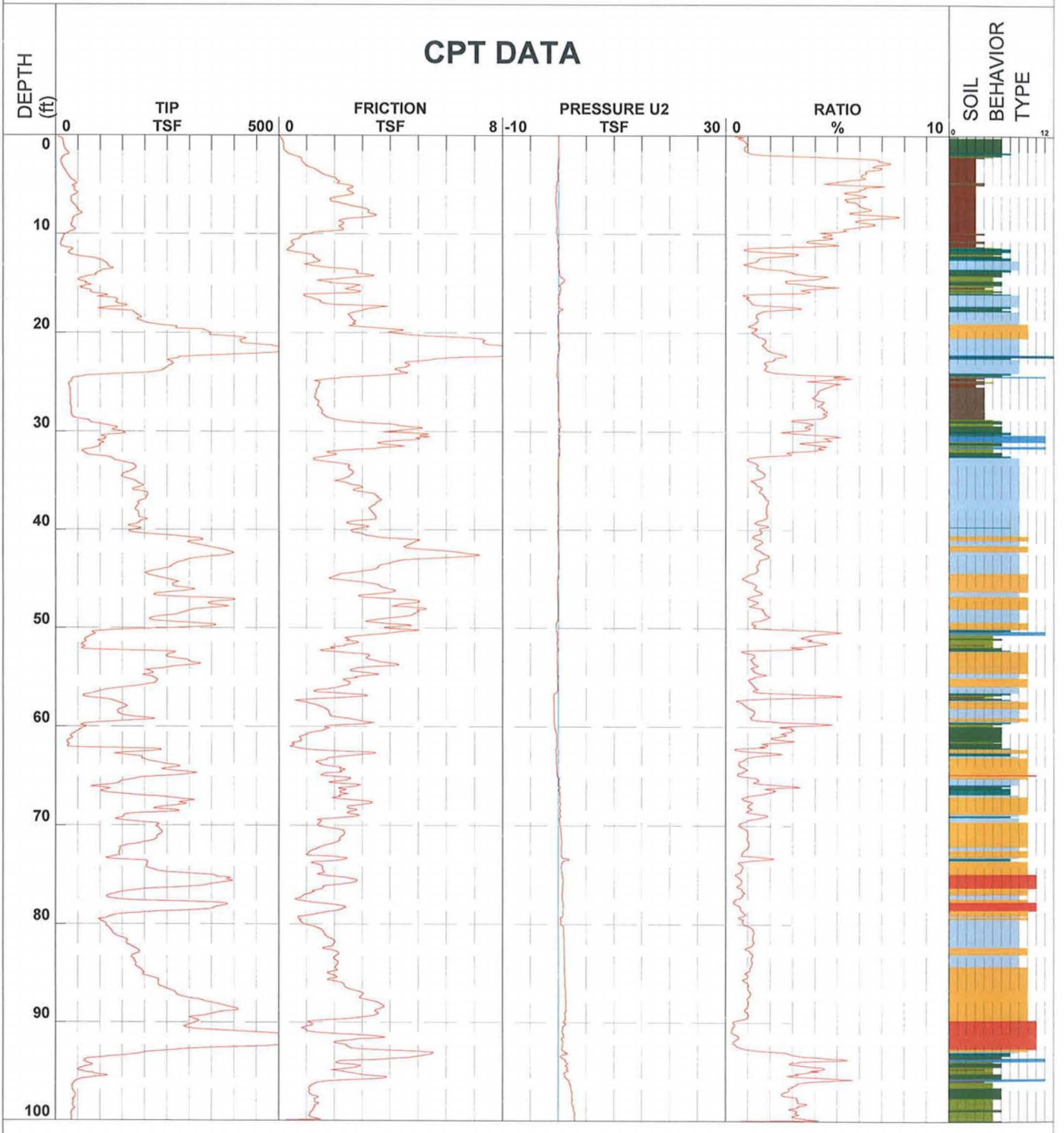
CPT Data

Job Number	1907-0075	CPT Number	C-2323SA	Location	Exelon Victoria-TX
Operator	Albert Fonseca	Date and T	09-Jan-2008 08:23:49	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	65.67	Water Table	ND
Coord. North	13404257.20	Coord. East	2619650.56	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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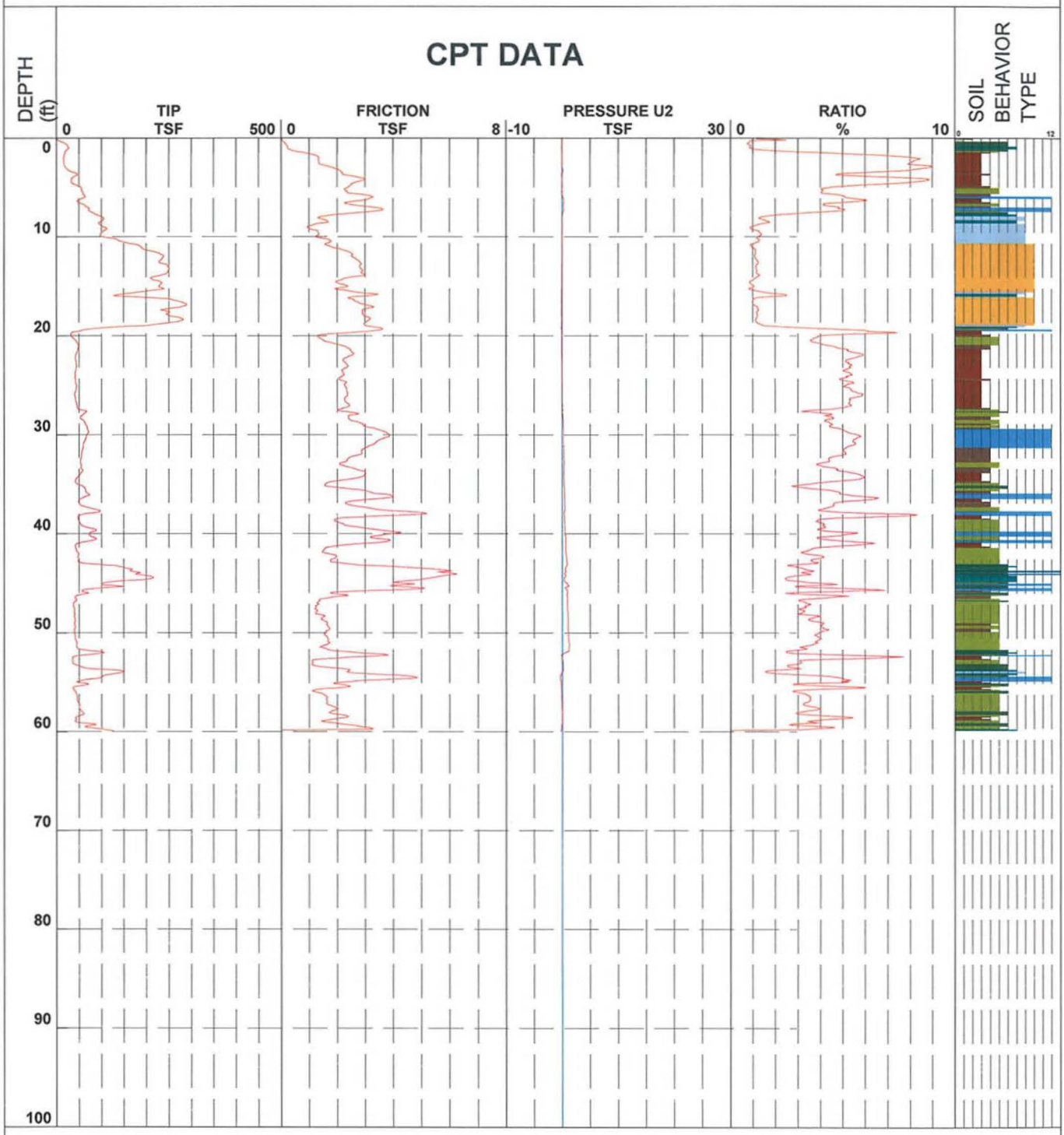
CPT Data

Job Number	1907-0075	CPT Number	C-2324	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	20-Dec-2007 13:58:43	Cone Number	A15F2.5CKE3S1788
Client	MACTEC	Elevation	63.58	Water Table	ND
Coord. North	13406320.31	Coord. East	2622094.07	Check: SG	Verify: Ry



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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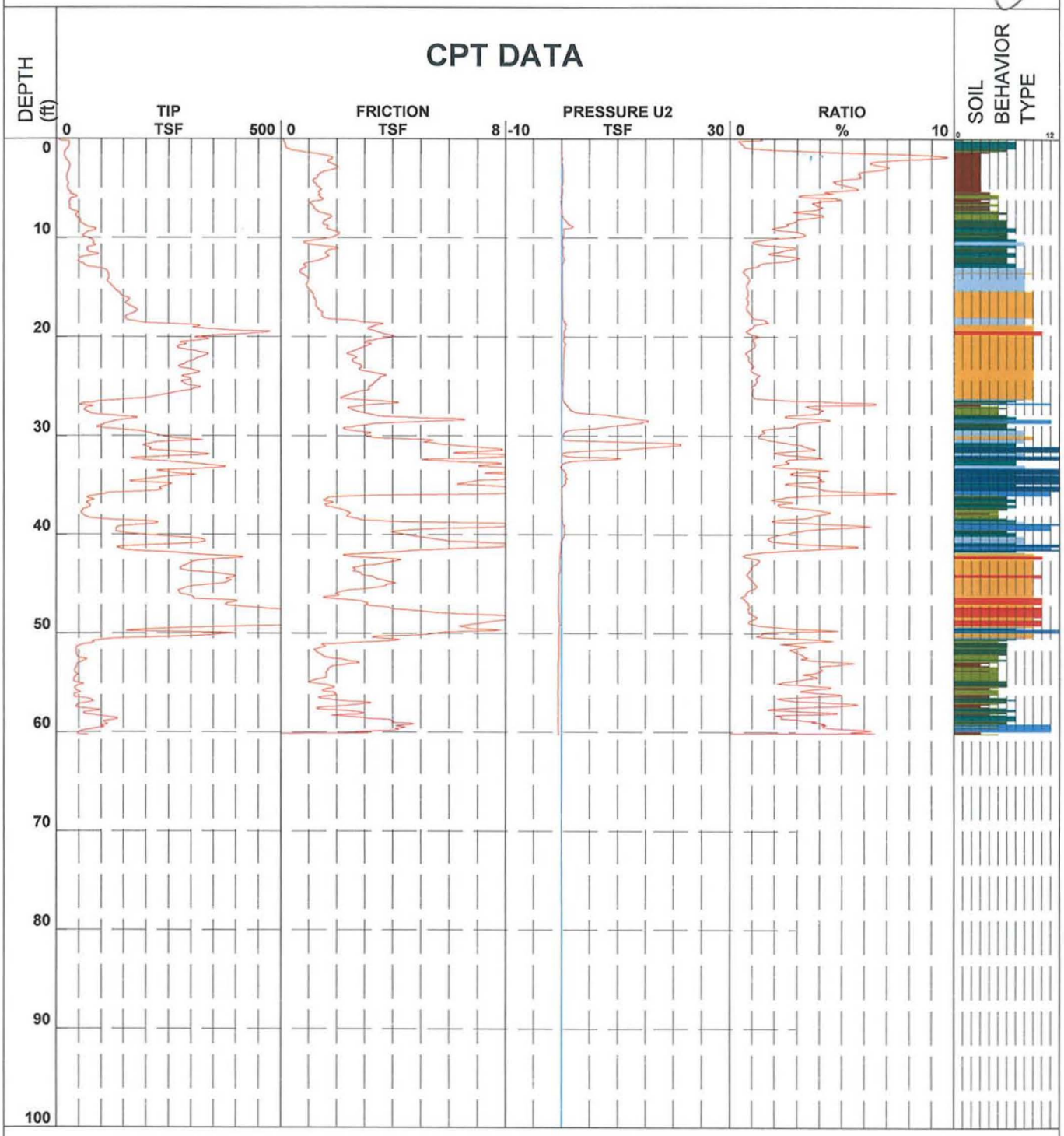
CPT Data

Job Number	1907-0075	CPT Number	C-2328	Location	Exelon Victoria, TX
Operator	Albert Fonseca	Date and Tin	04-Jan-2008 08:20:00	Cone Number	F7.5CKEW2/B 1498
Client	MACTEC	Elevation	65.62	Water Table	ND
Coord. North	13395274.28	Coord. East	2609720.08	Check:	Verify:



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

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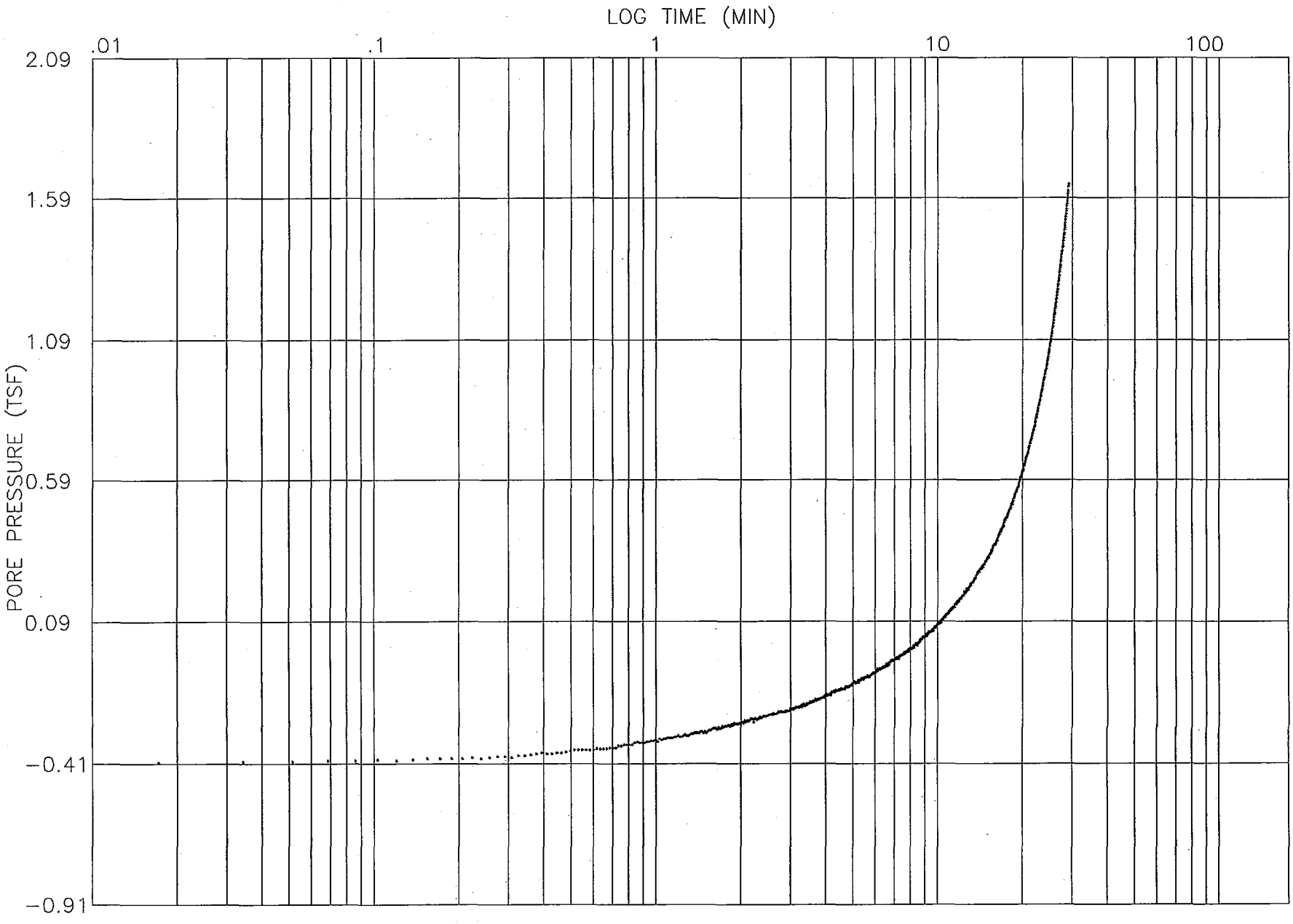
DISSIPATIONS

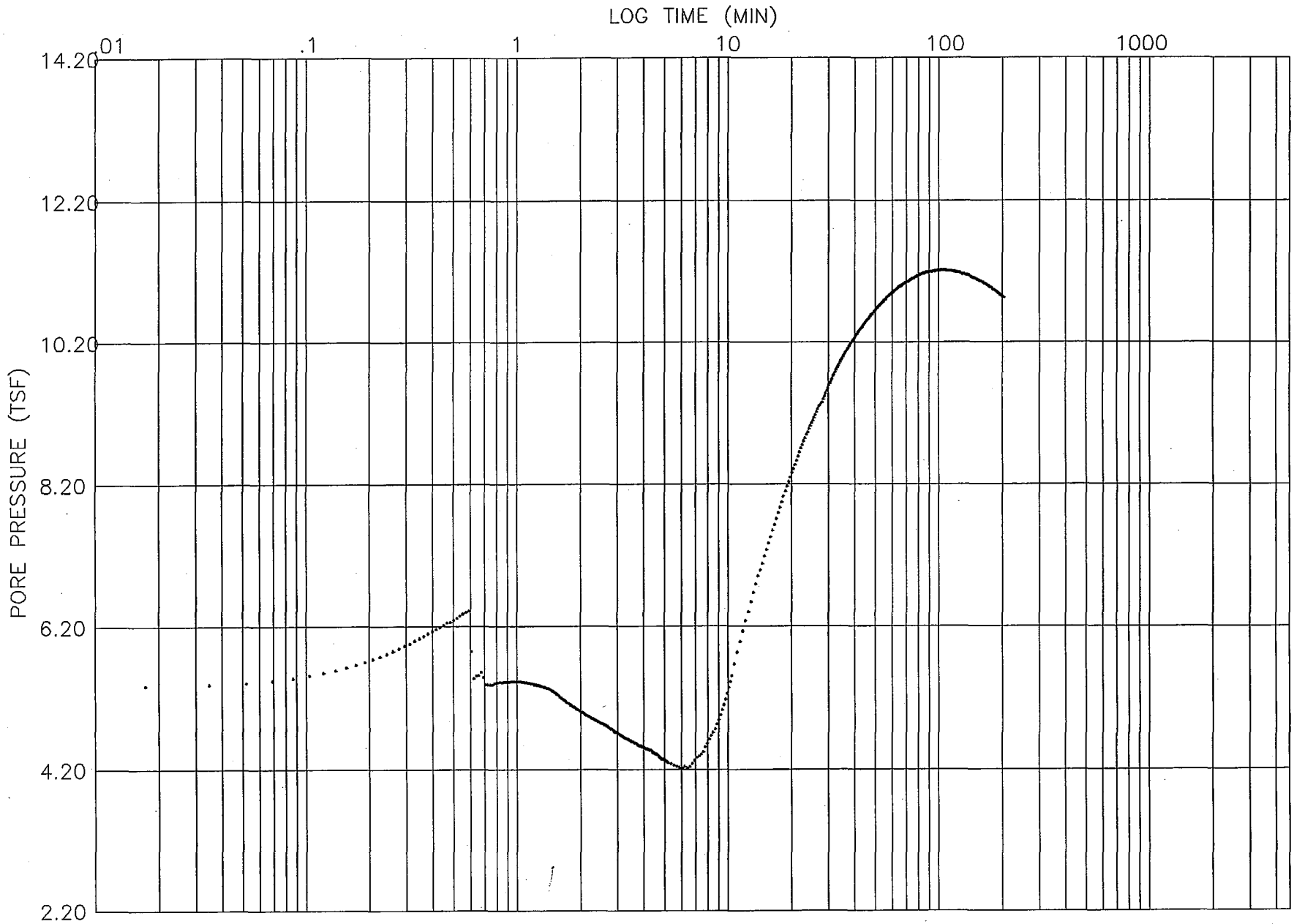


CPT NUMBER: C−2303s
JOB NUMBER: 1907−0075

DISSIPATION TEST

DEPTH: 80.1 FEET
DATE: 18−Dec−2007

FUGRO GEOSCIENCES, INC.

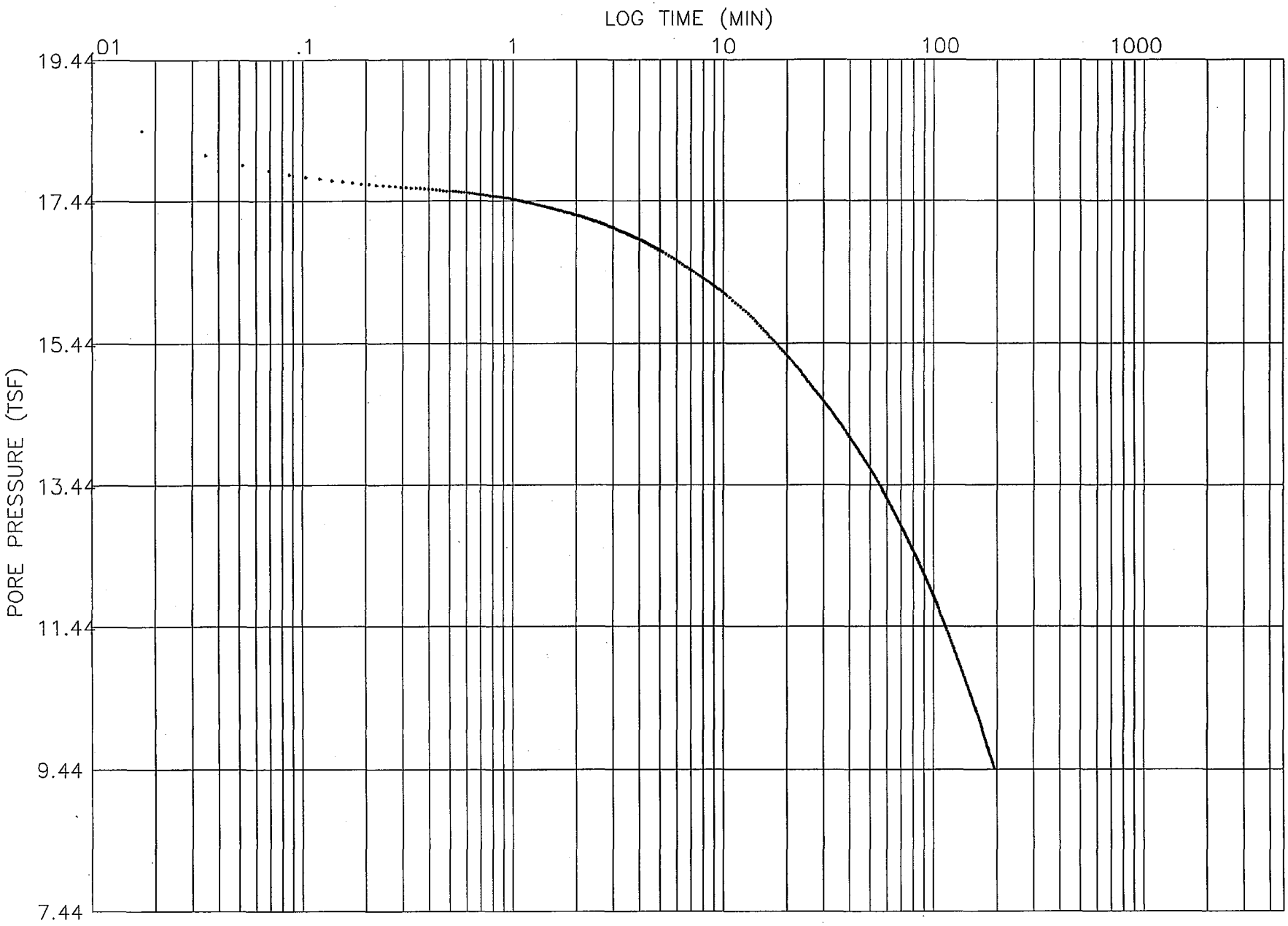


CPT NUMBER: C-2303s
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 82.3 FEET
DATE: 18-Dec-2007

FUGRO GEOSCIENCES, INC.

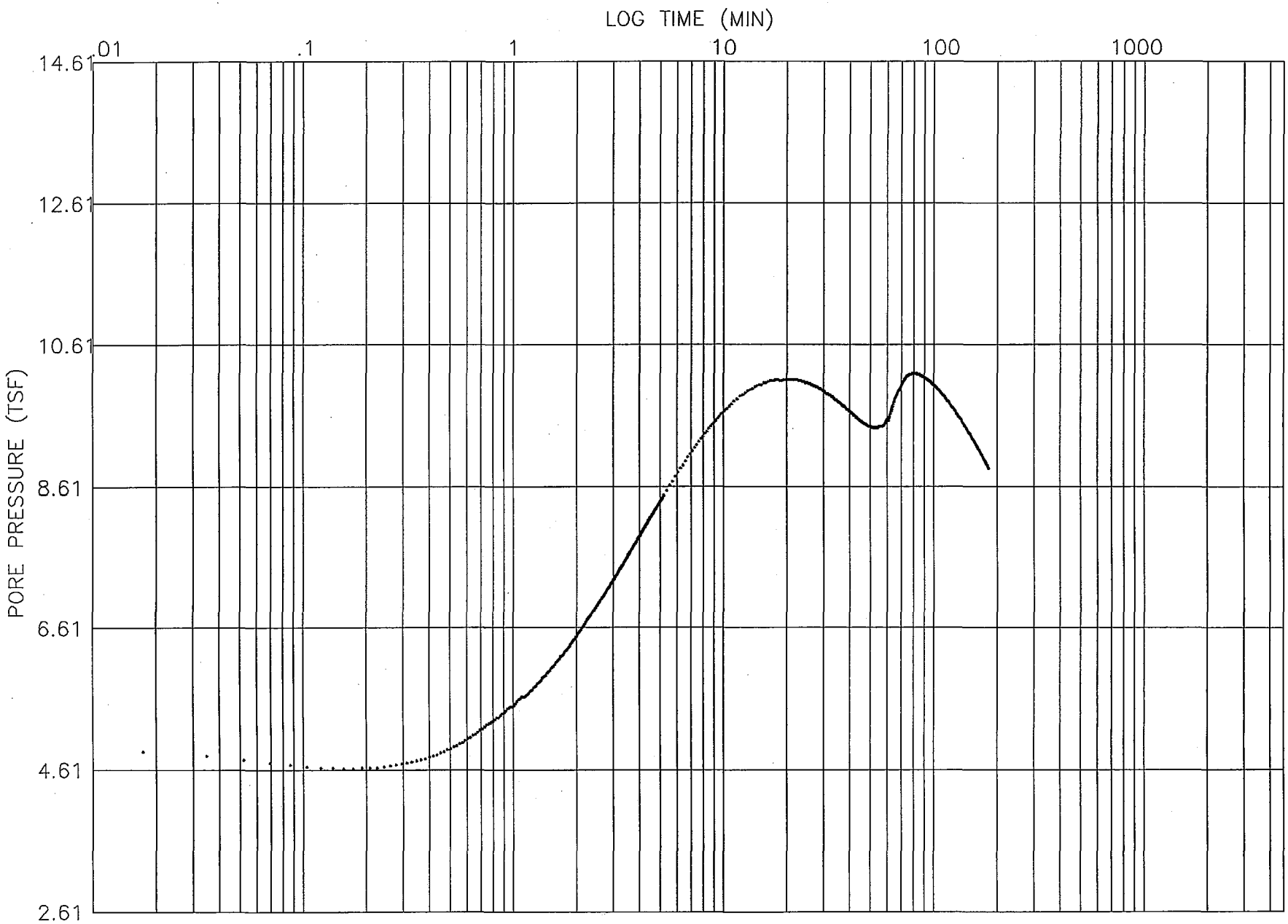


CPT NUMBER: C-2303s
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 95.6 FEET
DATE: 18-Dec-2007

FUGRO GEOSCIENCES, INC.

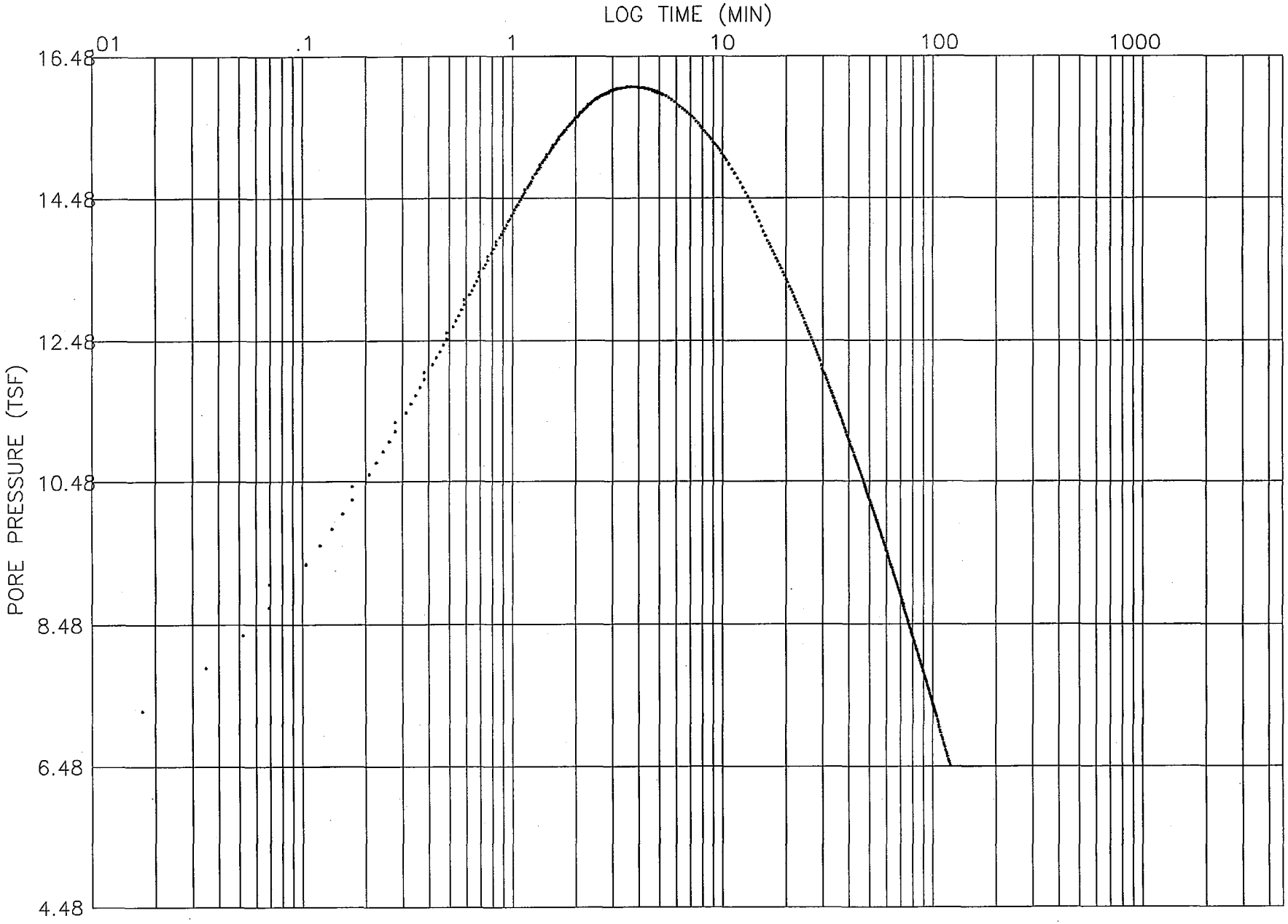


CPT NUMBER: C-2311
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 58.0 FEET
DATE: 06-Jan-2008

FUGRO GEOSCIENCES, INC.

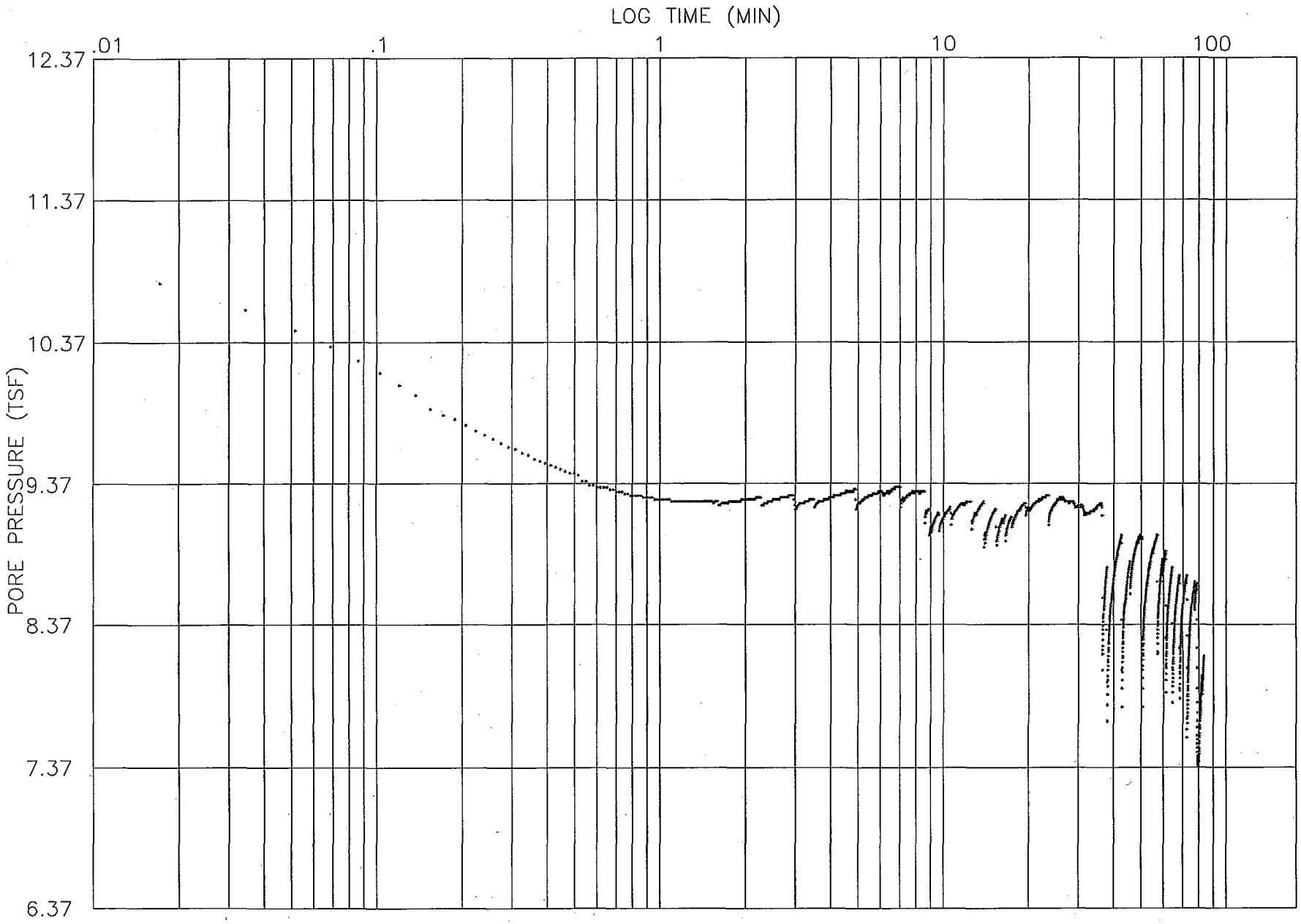


CPT NUMBER: C-2311A
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 91.5 FEET
DATE: 07-Jan-2008

FUGRO GEOSCIENCES, INC.

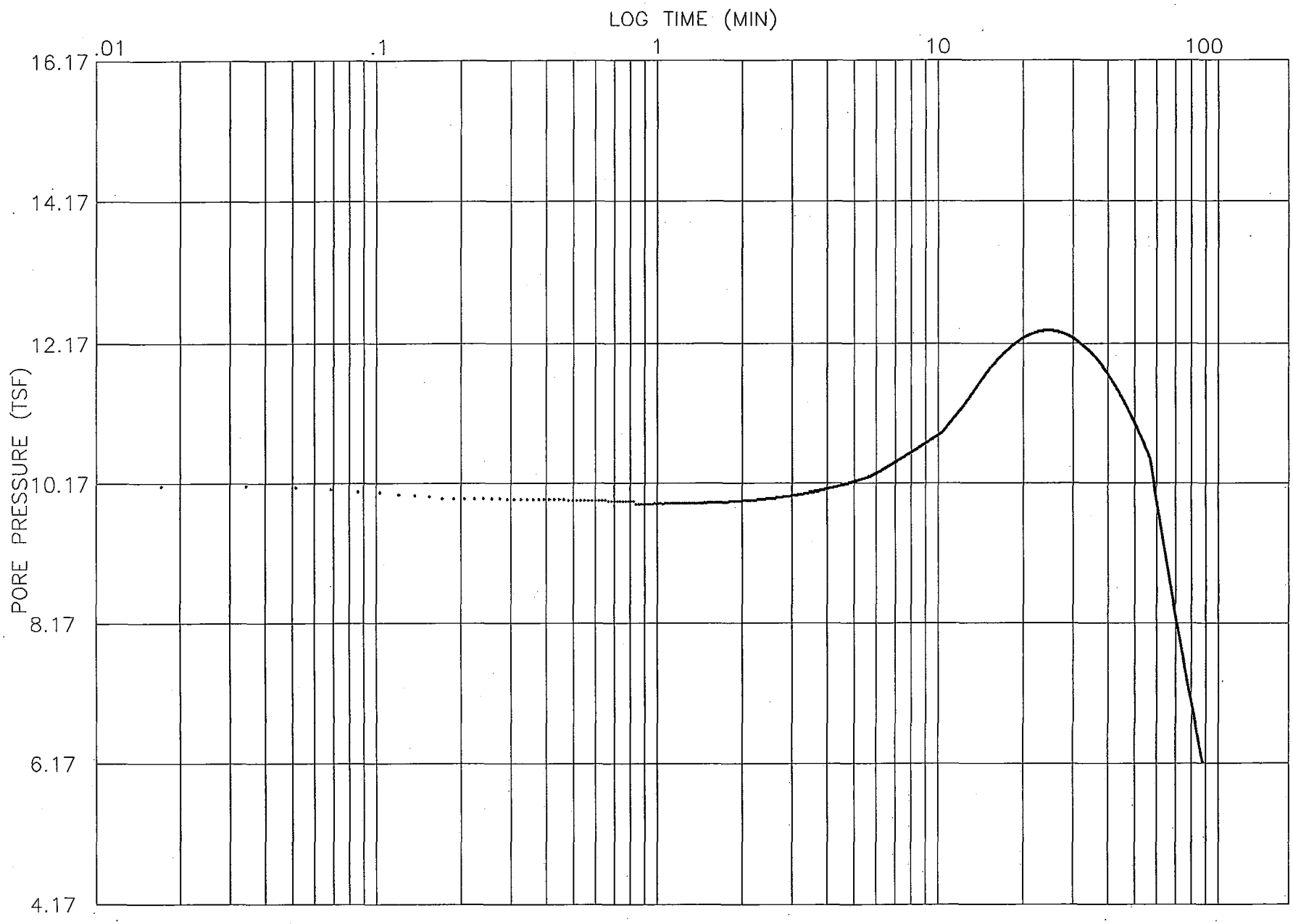


CPT NUMBER: C-2312
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 51.9 FEET
DATE: 03-Jan-2008

FUGRO GEOSCIENCES, INC.

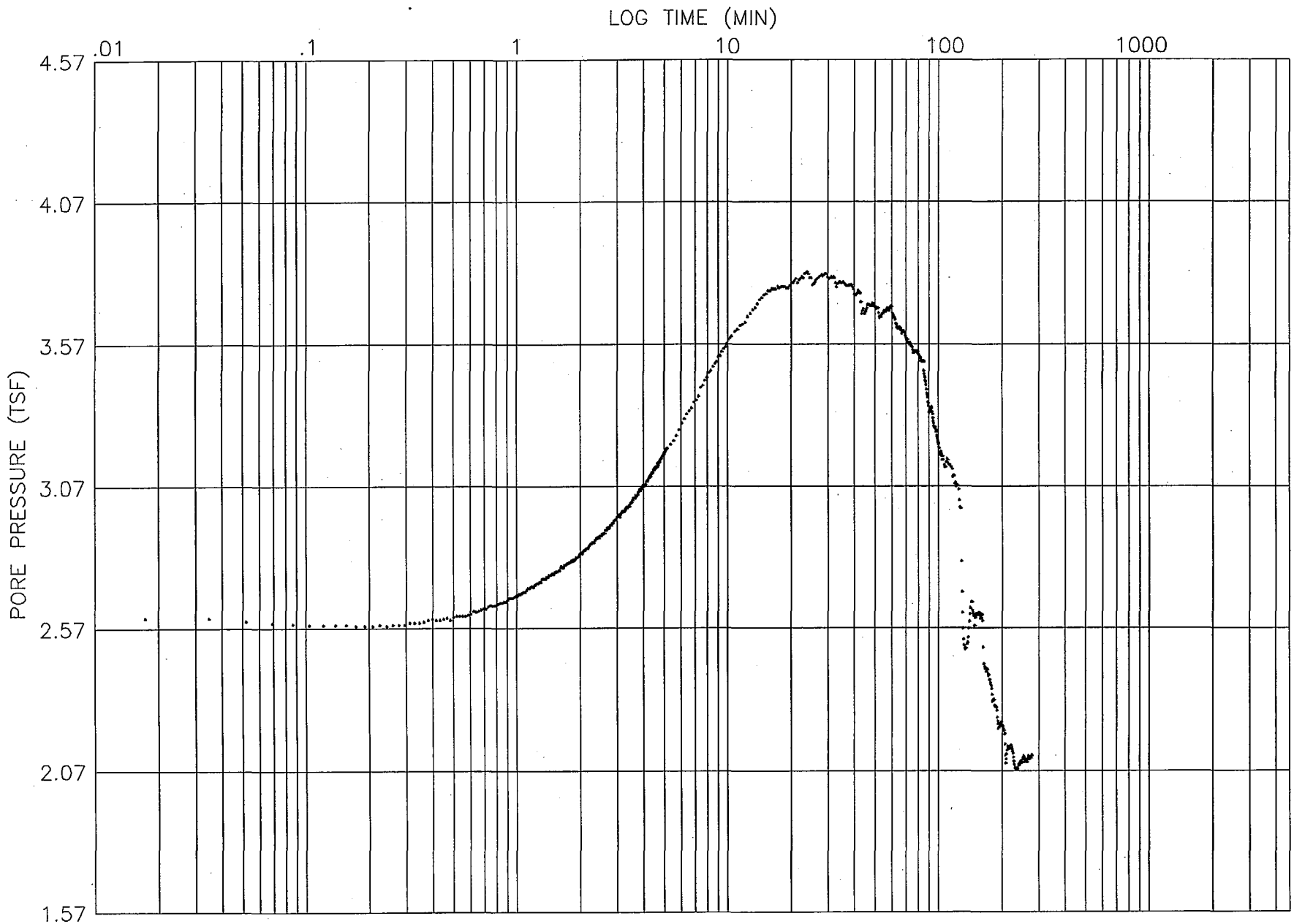


CPT NUMBER: C-2312
JOB NUMBER: 1907-0075

DISSIPATION TEST

DEPTH: 70.6 FEET
DATE: 03-Jan-2008

FUGRO GEOSCIENCES, INC.



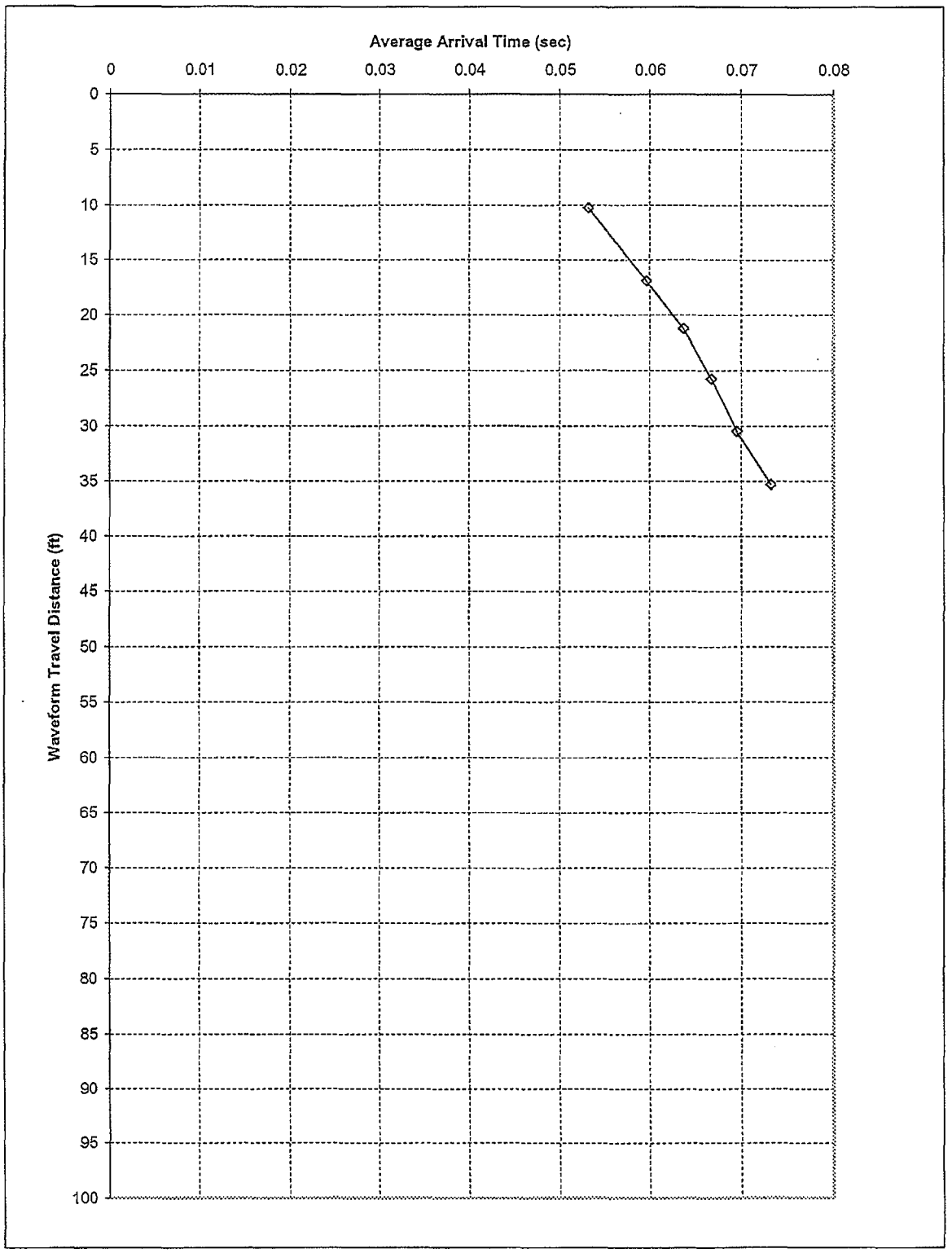
CPT NUMBER: C-2323sA
JOB NUMBER: 1907-0075

DISSIPATION TEST

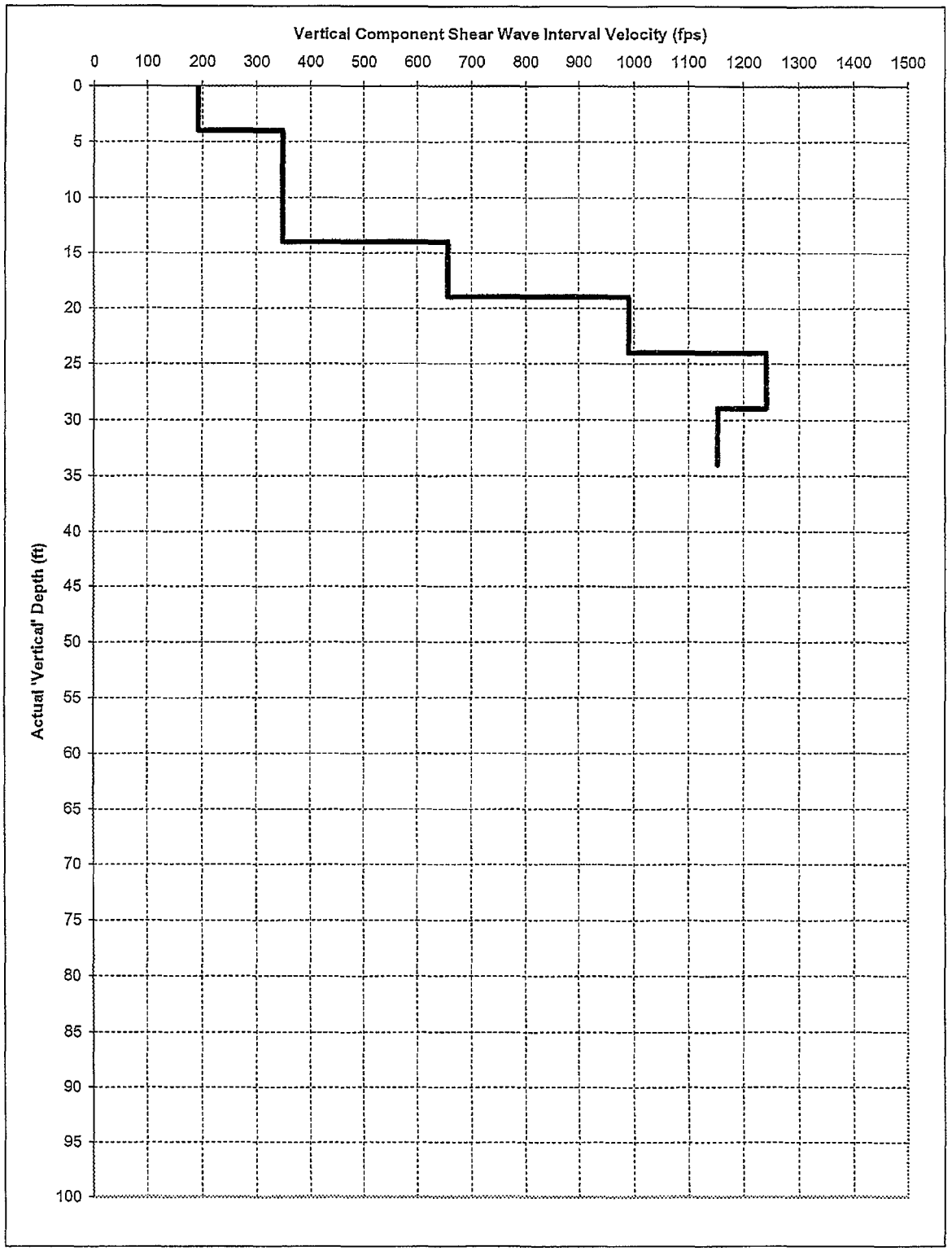
DEPTH: 100.1 FEET
DATE: 08-Jan-2008

FUGRO GEOSCIENCES, INC.

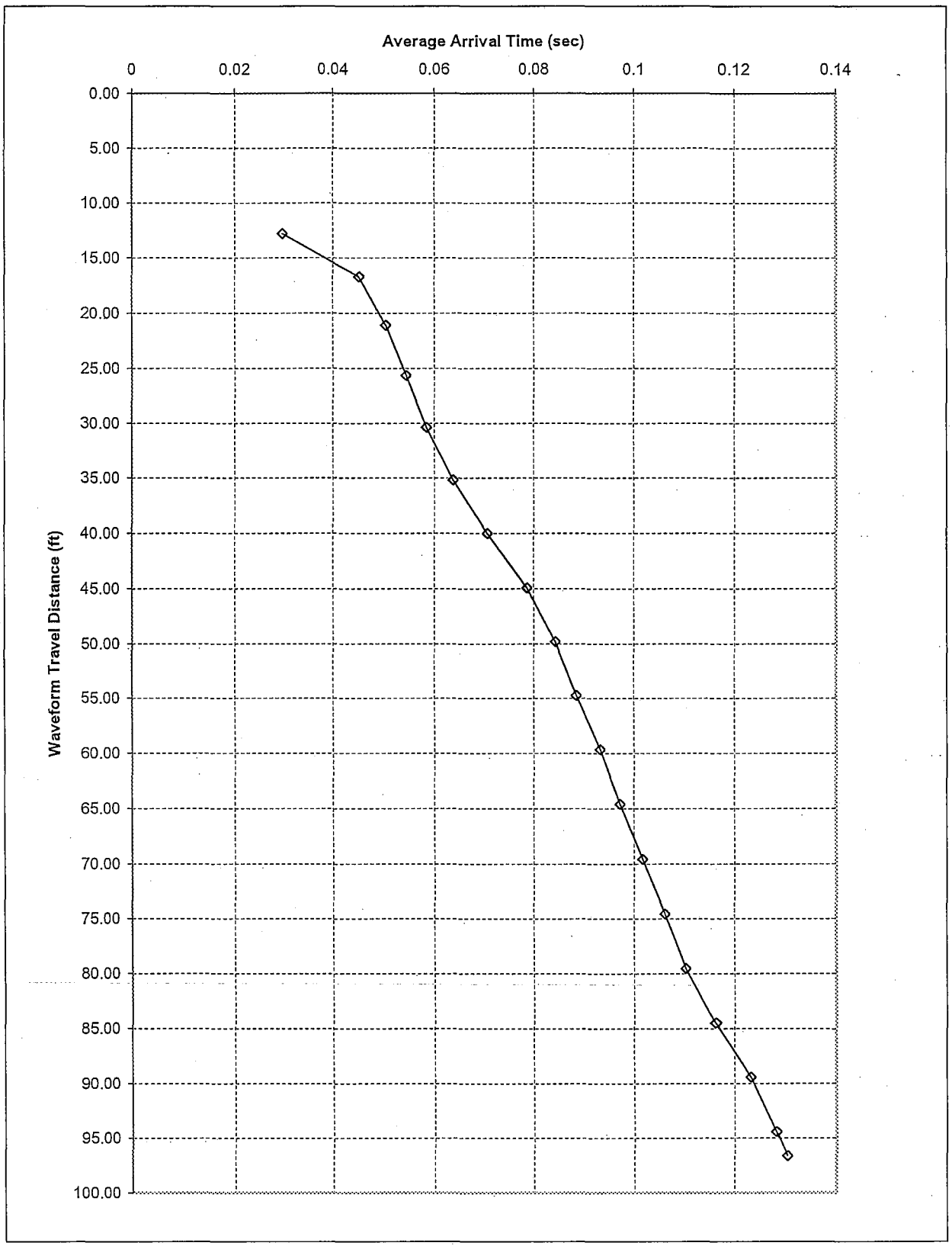
SEISMIC DATA



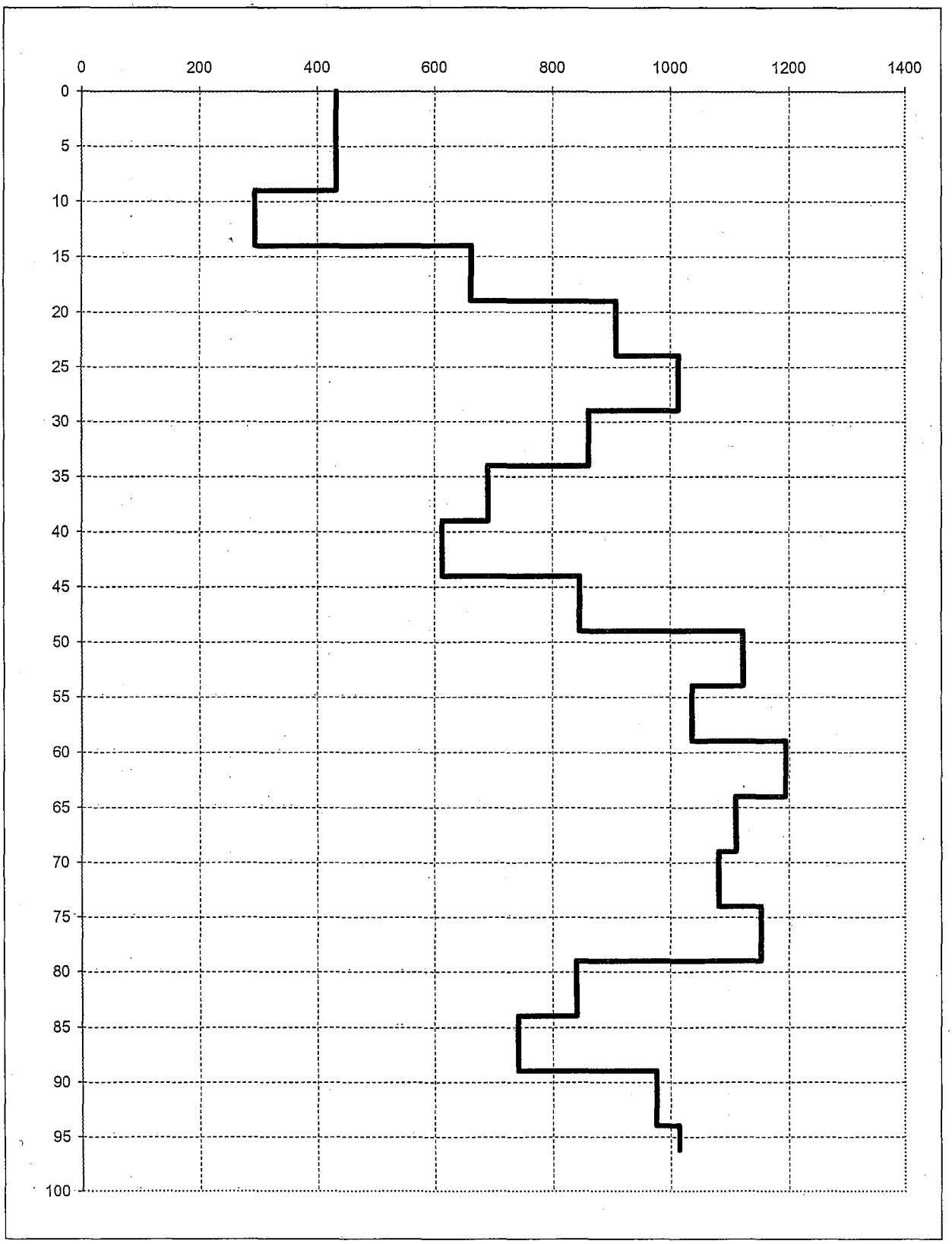
AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE
2301s



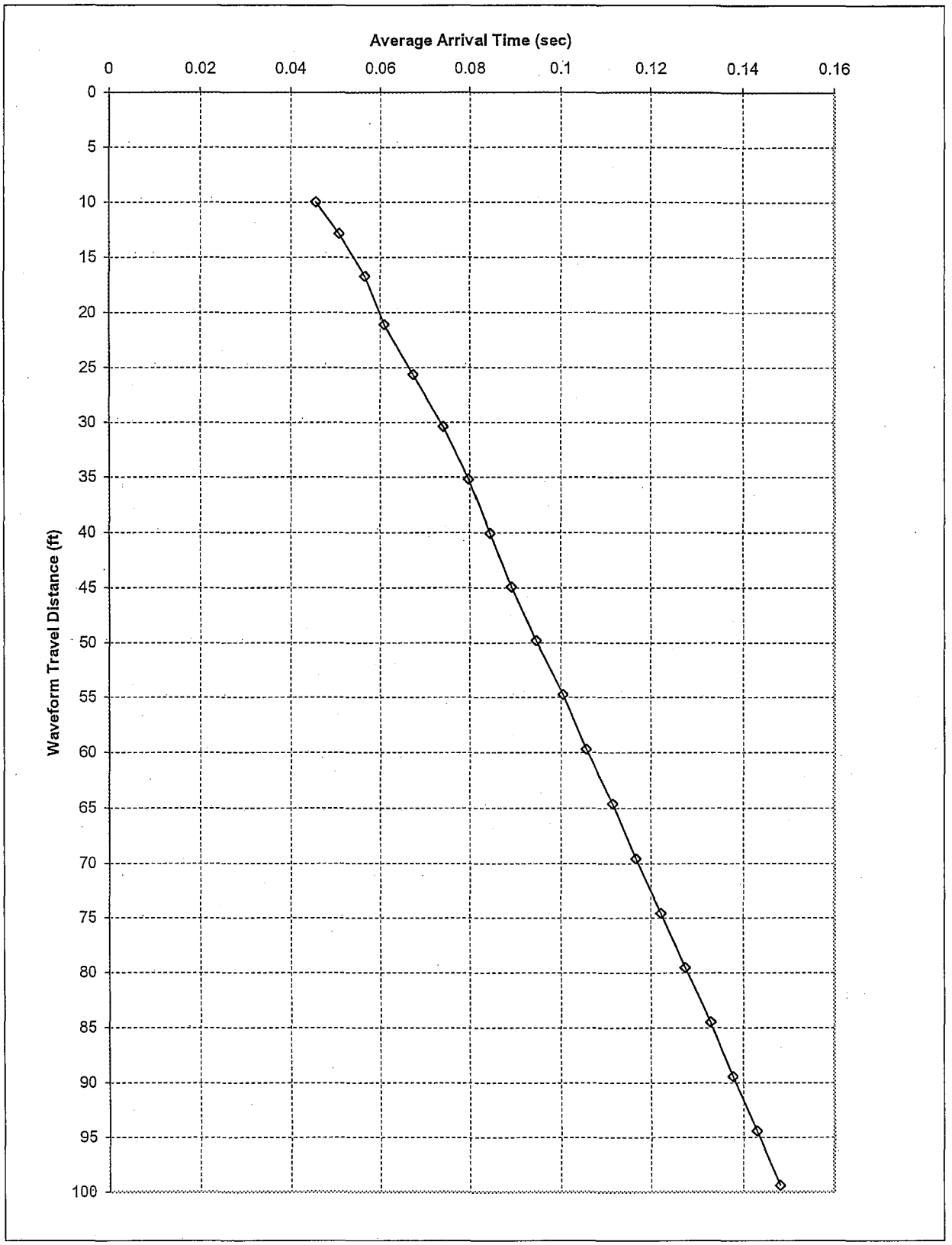
SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
2301s



AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE
(SCPT C-2303s)

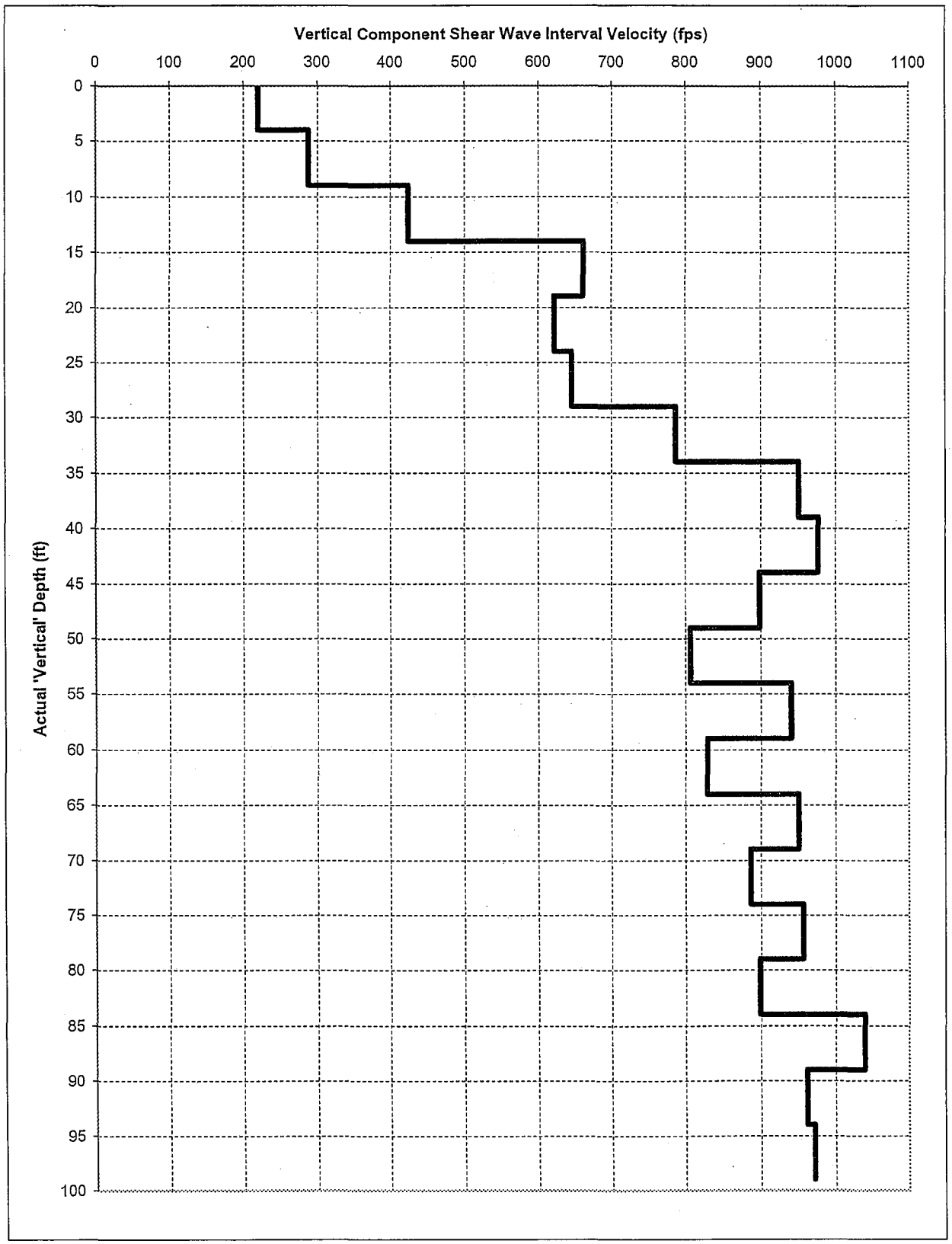


SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
(SCPT-C-2303s)



AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE

C-2323sA



SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH

C-2323-A

APPENDIX A

FUGRO'S CONE PENETROMETERS

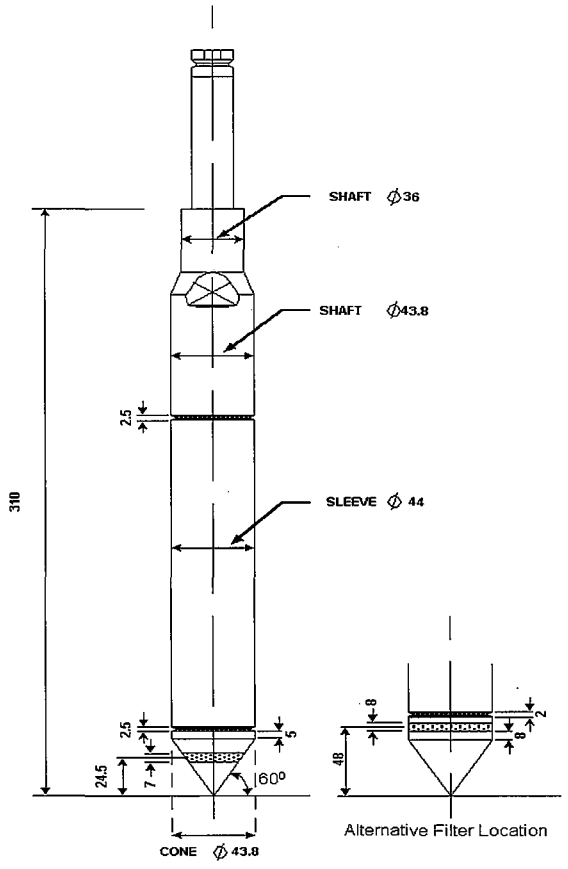
APPENDIX A

FUGRO PENETROMETER TIPS DATA - TYPES FCKE

SPECIFICATIONS LOADCELLS		F5CKE	F10CKE	F7.5CKE F15CKE A15F7.5CKE
CONE LOADCELL				
Base Area	cm^2	10	10	15
Apex Angle	DEG	60	60	60
Full Range	kN	50	100	150
Load Limit	kN	100	100	200
Effect of 10 bar water pressure	N	450	450	880
Output at zero load	mV	< ± 0.5	< ± 0.5	< ± 0.5
Full range output (FRO)	mV	10	10	10
Input resistance	ohm ca.	270	270	270
Output resistance	ohm ca.	240	240	240
Non linearity and hysteresis	%FRO	< 0.1	< 0.1	< 0.1
Calibration accuracy	%FRO	< 0.5	< 0.5	< 0.5
Rated bridge supply voltage	Volt	10	10	10
Maximum bridge supply voltage	Volt	15	15	15
Thermal zero shift	%FRO/10^{0}C	< 0.2	< 0.2	< 0.2
Thermal Sensitivity shift	%FRO/10^{0}C	< 0.1	< 0.1	< 0.1
Repeatability	%FRO	< 0.1	< 0.1	< 0.1
SLEEVE + CONE LOADCELL				
Sleeve Area	cm^2	150	150	200
Full Range	kN	50	100	150
Load Limit	kN	100	100	200
Effect of 10 bar water pressure	N	300	300	280
Output at zero load	mV	< ± 0.5	< ± 0.5	< ± 0.5
Full range output	mV	10	10	10
Input resistance	ohm ca.	270	270	270
Output resistance	ohm ca.	240	240	240
Non linearity and hysteresis	%FRO	< 0.1	< 0.1	< 0.1
Calibration accuracy	%FRO	< 0.5	< 0.5	< 0.5
Rated bridge supply voltage	Volt	10	10	10
Maximum bridge supply voltage	Volt	15	15	15
Thermal zero shift	%FRO/10^{0}C	< 0.2	< 0.2	< 0.2
Thermal Sensitivity shift	%FRO/10^{0}C	< 0.1	< 0.1	< 0.1
Repeatability	%FRO	< 0.1	< 0.1	< 0.1
GENERAL				
Friction output at full range load of cone	%FRO	< 2		
Compensated temperature range	^{0}C	- 10 to + 40		
Maximum temperature	^{0}C	80		
Insulation resistance	10^8 ohm	> 5		
Slope sensor built-in		on request		

NOTES: The friction sleeve is located immediately above the cone.
Standard delivery includes: cone, calibration sheet, and connector tube.
The accuracy during field use will depend on: field calibrations, treatment during testing, readout equipment, abrasion and maintenance.

TYPE F7.5CKEW/V



DIMENSIONS

CONE BASE AREA	(mm^2)	:	1,500
SLEEVE AREA	(mm^2)	:	20,000
á FACTOR		:	0.59

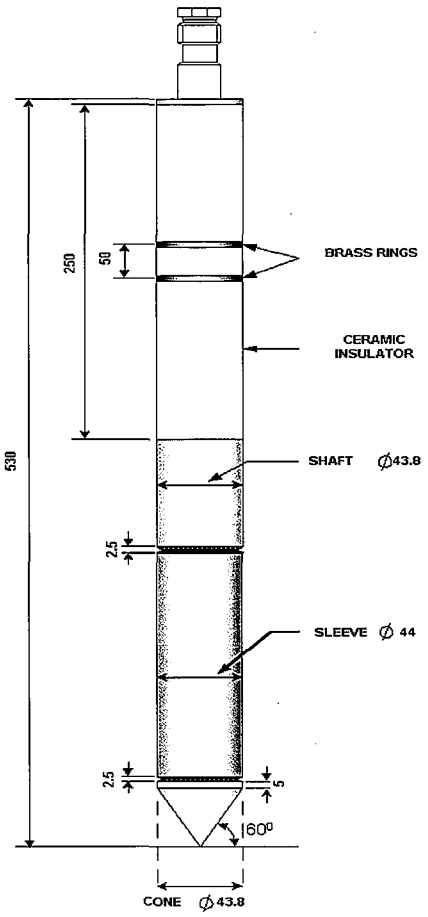
SPECIFICATIONS

CONE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
CONE PLUS SLEEVE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
PORE PRESSURE TRANSDUCER			
- FULL SCALE RANGE	(Mpa)	:	5.0
- BURST PRESSURE	(Mpa)	:	12.5

NOTES:

1. LOAD CELLS/TRANSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : INTERNAL, CONICAL

TYPE F7.5CKEG/V



DIMENSIONS

CONE BASE AREA	(mm^2)	:	1,500
SLEEVE AREA	(mm^2)	:	20,000
ά FACTOR		:	0.59

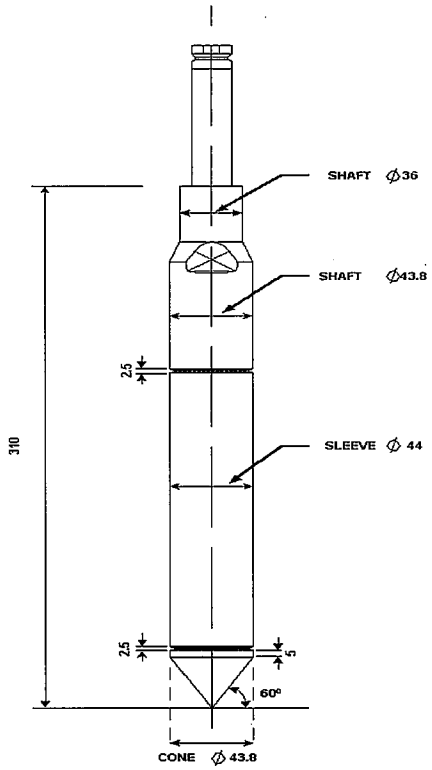
SPECIFICATIONS

CONE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
CONE PLUS SLEEVE LOAD CELL			
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200
PORE PRESSURE TRANSDUCER			
- FULL SCALE RANGE	(Mpa)	:	5.0
- BURST PRESSURE	(Mpa)	:	12.5
ELECTRICAL CONDUCTIVITY			
- FULL SCALE RANGE	(S/m)	:	1.0
- MAXIMUM RANGE	(S/m)	:	5.0

NOTES:

1. LOAD CELLS/TRNSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : EXTERNAL. M28 x 2

TYPE F7.5CKE/V



DIMENSIONS

CONE BASE AREA	(mm^2)	:	1,500
SLEEVE AREA	(mm^2)	:	20,000
ά FACTOR		:	0.59

SPECIFICATIONS

CONE LOAD CELL

- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200

CONE PLUS SLEEVE LOAD CELL

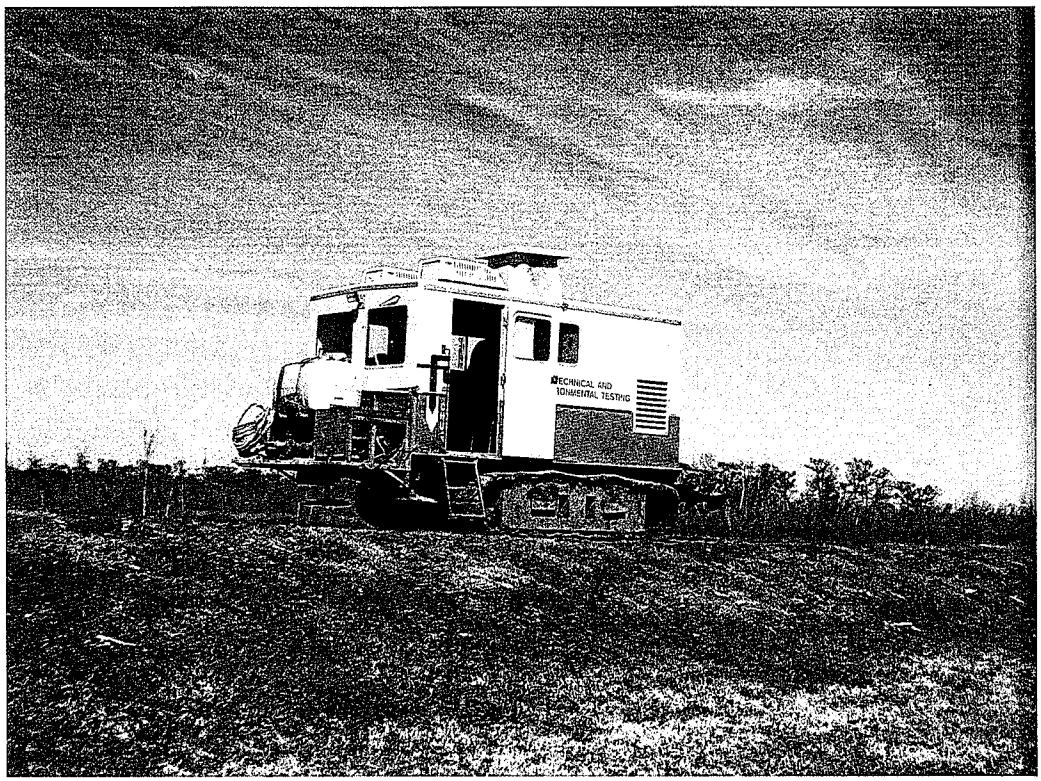
- FULL SCALE RANGE	(kN)	:	75
- OVERLOAD CAPACITY	(kN)	:	200

NOTES:

1. LOAD CELLS/TRANSDUCERS MAY BE CALIBRATED FOR LOWER RANGES
2. UNEQUAL SLEEVE END AREAS
3. SUBTRACTION TYPE
4. ALL DIMENSIONS IN mm
5. BUILT-IN AMPLIFIERS
6. SLOPE SENSOR INCORPORATED
7. THREADED END : INTERNAL, CONICAL

APPENDIX B

FUGRO'S DEPLOYMENT SYSTEMS


TECHNICAL AND
TONMENTAL TESTING

UGRO
GEOTECHNICAL
ENVIRONMENTAL
CONE PENETROMETER SYSTEM
HOUSTON, TEXAS
LOS ANGELES, CALIFORNIA
BATON ROUGE, LOUISIANA

APPENDIX C

ZERO READINGS

CPT	Date	Cone Type	Cone S/N	Tip Start	Tip Stop	Sleeve Sta	Sleeve Sto	Piezo Start	Piezo End	Slope Start	Slope End
C-2301S	02-Jan-2008	F2.5CKEW2/B	1701-1788	0.033911	0.025065	0.002551	-0.0059	-0.001484	-0.004622	0.01109	0.010677
C-2301SA	02-Jan-2008	F2.5CKEW2/B	1701-1788	0.029175	0.0271	-0.001294	-0.006144	-0.002617	-0.005762	0.011129	0.011003
C-2302	05-Jan-2008	F7.5CKEW2/B	1701-1498	0.005432	0.004801	0.002441	0.00175	-0.00166	-0.001563	0.045367	0.043424
C-2303s	18-Dec-2007	F2.5CKEW2/B	1701-1788	0.031543	0.029948	-0.001624	-0.007894	-0.001631	-0.005599	0.010938	0.010664
C-2304	17-Dec-2007	F2.5CKEW2/B	1701-1788	0.028674	0.026408	-0.004517	-0.010132	-0.003848	-0.006185	0.011074	0.010586
C-2305	19-Dec-2007	F2.5CKEW2/B	1701-1788	0.027563	0.028239	-0.006311	-0.007487	-0.004639	-0.004753	0.010703	0.010703
C-2306	19-Dec-2007	F2.5CKEW2/B	1701-1788	0.030945	0.029215	-0.002637	-0.007975	-0.007432	-0.00459	0.010602	0.010781
C-2307	17-Dec-2007	F2.5CKEW2/B	1701-1788	0.025464	0.025024	-0.008728	-0.010742	-0.003584	-0.006185	0.010781	0.010469
C-2308	06-Jan-2008	F7.5CKEW2/B	1701-1498	0.004871	0.003174	0.003052	0.001953	-0.00166	-0.001465	0.048582	0.065091
C-2309	19-Dec-2007	F2.5CKEW2/B	1701-1788	0.027112	0.024089	-0.006238	-0.012288	-0.004346	-0.006934	0.010906	0.010508
C-2310	19-Dec-2007	F2.5CKEW2/B	1701-1788	0.029773	0.027547	-0.004333	-0.008911	-0.003701	-0.005697	0.010848	0.010625
C-2311	06-Jan-2008	F7.5CKEW2/B	1701-1498	0.003564	0.00415	0.002441	0.002401	-0.002617	-0.001465	0.043184	0.045169
C-2311A	07-Jan-2008	F7.5CKEW2/B	1701-1498	0.007947	0.007853	0.006824	0.006592	-0.001758	-0.001563	0.044211	0.046367
C-2312	03-Jan-2008	F7.5CKEW2/B	1701-1498	0.007837	0.003825	0.005798	0.000936	-0.001953	-0.00166	0.043984	0.045234
C-2313	20-Dec-2007	F2.5CKEW2/B	1701-1788	0.030615	0.02596	-0.003552	-0.011393	-0.00377	-0.006966	0.010828	0.010469
C-2314	19-Dec-2007	F2.5CKEW2/B	1701-1788	0.029297	0.026611	-0.005054	-0.010213	-0.004443	-0.006152	0.010742	0.010508
C-2315	07-Jan-2008	F7.5CKEW2/B	1701-1498	0.010376	0.006999	0.007495	0.004801	-0.001563	-0.001432	0.045859	0.043021
C-2316	08-Jan-2008	F7.5CKEW2/B	1701-1498	0.011951	0.009521	0.009485	0.00647	-0.00166	-0.001465	0.045918	0.048789
C-2317	07-Jan-2008	F7.5CKEW2/B	1701-1498	0.009766	0.009155	0.007214	0.006429	-0.00166	-0.00166	0.043887	0.042852
C-2318	20-Dec-2007	F2.5CKEW2/B	1701-1788	0.025854	0.026978	-0.007495	-0.008545	-0.005332	-0.006217	0.010664	0.010586
C-2319	20-Dec-2007	F2.5CKEW2/B	1701-1788	0.026379	0.024658	-0.007227	-0.010742	-0.004648	-0.005371	0.010664	0.010599
C-2321S	04-Jan-2008	F2.5CKEW2/B	1701-1788	0.032861	0.030314	0.003174	-0.001953	-0.001924	-0.004753	0.011375	0.011081
C-2321SA	04-Jan-2008	F2.5CKEW2/B	1701-1788	0.030566	0.026978	-0.001099	-0.006429	-0.004189	-0.005273	0.011797	0.011497
C-2322	10-Jan-2008	F2.5CKEW2/B	1701-1788	0.031079	0.031657	0.001904	0.000854	-0.003438	-0.004948	0.01125	0.010703
C-2323S	08-Jan-2008	F2.5CKEW2/B	1701-1788	0.027893	0.02832	-0.002661	-0.003947	-0.006172	-0.007617	0.01082	0.010703
C-2323SA	09-Jan-2008	F2.5CKEW2/B	1701-1788	0.03269	0.029134	0.003967	-0.001465	-0.001924	-0.00485	0.011094	0.011133
C-2324	20-Dec-2007	F2.5CKEW2/B	1701-1788	0.028076	0.024414	-0.006372	-0.008179	-0.005234	-0.006445	0.010703	0.010625
C-2328	04-Jan-2008	F7.5CKEW2/B	1701-1498	0.007397	0.005046	0.006323	0.002523	-0.002148	-0.001563	0.042414	0.06849

FUGRO CONSULTANTS, INC.

6105 Rookin Road
Houston, Texas 77074
Tel: 713-346-4000
Fax: 713-346-4002

January 24, 2008
Report Number 1907-0075

Mactec Engineering and Consulting, Inc.
7041 Old Wake Forest Road
Suite 103
Raleigh, North Carolina 27616

Attention: Mr. Scot Auger, P.E., PMP

CALIBRATION VERIFICATION REPORT
FOR SEISMIC PIEZOCONE PENETRATION TESTING
EXELON TEXAS COL
VICTORIA, TEXAS
MACTEC PROJECT #6468071777

Dear Mr. Auger:

Please find enclosed herewith the calibration verification results for the instruments used in the above referenced project. The data has been reviewed and has undergone the appropriate QA/QC process. These post calibrations checks were performed on cones F7.5CKEW2/B 1701-1832, F7.5CKESW2/B 1701-1788, and F7.5CKEW2/B 1701-1498. Post calibration checks on cone F7.5CKEW2/B 1701-1831 which was damaged attempting to perform a CPT through drill pipe.

Fugro's cone penetrometer manufacturing and calibration procedures include ISO 9001, ASTM D5778-2000 and European cone penetrometer standards. Cone penetrometers are tested and calibrated for the following:

Mechanical Calibration
- Cross Talk Check
- Dimension Check
- Seal/O-Ring Check

Electronic Calibration
- Temperature effect
- Pre and Post test voltage readings (zeros)
- Full scale output load readings
- Pore Pressure transducer calibration
- Slope indicator calibration

Calibration Verification Methodology

Manufactured and calibrated according to ISO 9001, the calibration values of the electric cone penetrometers used for this project were verified before and after fieldwork utilizing the following A2LA and/or ANSI/NCSL approved verification systems.

Tip and Friction (Up To 10,000 lbs.)

Load cell:	Indicator system
Calibrated by:	Interface (A2LA approved)
Calibration date:	March 9, 2007
Load cell model:	1211EX-10KB, Serial No. 113655
Capacity:	10,000 lbs.
Indicator:	Interface 9820-000-1, Serial No. M2635

Tip (Up To 20,000 lbs.)

Load cell:	Geotac
Calibrated by:	Applied Technical Services (A2LA approved)
Calibration date:	November 28, 2006 and March 14, 2008 ZHU 4/29/08
Load cell model:	560K
Capacity:	50,000K

Pore Pressure Transducer

Digital Pressure Indicator

Calibrated by:	GD Sensing (ANSI/NCSL approved)
Manufactured by:	Eaton
Model number:	UPS 3000CC
Serial number:	A0813
Calibration date:	September 15, 2006

Cone Penetrometer Temperature

Digital Thermometer

Calibrated by:	Houston Precision (ANSI/NCSL approved)
Manufactured by:	Cole Parmer
Model Number:	Degi-sence Type K
Serial Number:	TD-001
Calibration date:	November 16, 2007

Utilizing the above systems each was load and pressure tested as follows:

Tip:	0-20,000 lb.
Friction:	0-7,500 lb.
Pore Pressure:	0:350 PSI
Temperature effect	30 Degrees Fahrenheit – 115 Degrees Fahrenheit

Under each load/pressure increment, the cone penetrometer readings are recorded in millivolts (mV). Load/pressure (pounds/psi) load increments and corresponding cone readings in mV are input into **HGL Instrument Verificaton** software to obtain linear regression and correlation coefficient (R^2) values (See attached **HGL Instrument Verification** Forms).

Additionally, load/pressure increments and cone readings were also input into a calibration **Verification Certificate Program** to calculate each cone penetrometer's calibration value in MPa units (See attached **Calibration Verification Certificates** for each cone penetrometer). The last column in these forms represents the calibration values of tip, friction and pore pressure.

Calculation Example

Load Increment, P1	= 590 lb.
	= 0.295 tons
Tip Reading	= 35.2 mV
Tip Area, A= 15cm^2	= 0.0161 sq. ft.
Tip Pressure	= P1/A = 0.295/0.0161
	= 18.32298 tsf
Tip Pressure Per mV	= 18.32298/35.2 mV
	= 0.520539 tsf/mv
Tip Pressure Per Volt	= 0.520539 x 1,000
	= 520.539 tsf/volt
	= 49.847 MPa/Volt
Tip Calibration Valve	~ 50 Mpa/Volt

Temperature Calibration:

Cone Penetrometers are placed in a temperature-controlled enclosure and zero readings recorded in mV at intervals between 30 degrees (F) and 115 degees (F). Temperatures and zero readings (mV) are entered into the **Calibration Verification Certificate** software which calculates the deviation between the maximum and minimum zero readings (mV) for the tip friction and pore pressure channels.

Data Recording

During the cone penetration test, the calibration numbers are automatically recorded in CPT test data files along with the following information (See attached CPT test data file, 6710.DEP):

- Date of CPT test
- Starting time of test
- Project Number
- CPT test number
- Operator name
- Elevation, starting depth, water depth
- Cone serial number
- Number of cone channels (3)
  - Tip calibration (50 MPa)
  - Friction calibration (0.5 MPa)
  - Pore Pressure Calibration (2.5 MPa)
  - Slope calibration (525)
- Initial baseline (zero) readings for depth, tip, friction, pore pressure and slope.

Seismograph

Seismic data was collected using an ES-300 seismograph manufactured by Geometrics, Inc. The accuracy of the time readings of this instrument was verified before and after field work utilizing following A2LA and/or ANSI/NCSL approved verification systems.

Function Generator:	Oscilliscope with built function generator.
Manufactured by:	EZ Digital, Inc.
Model number:	OS-5020G
Serial number:	3080209
Calibrated by:	Transcat Calibration Services (ANSI/NCSL approved)

Calibration date:	February 28, 2007

Frequency Counter, 120 MHz, 1 Channel

Manufactured by:	Insetek God Will Instruments
Model number:	GFC – 8010H
Serial number:	CF 871549

Calibrated by:	Transcat Calibration Services (A2LA/NCSL approved)
Calibration date:	February 28, 2007

Seismograph Verification Methodology

The function generator was connected to the input of the seismograph and frequency counter. Sine wave signals were generated at 10 Hz intervals from 10-100 Hz. The seismograph was manually triggered for each frequency and the data stored in standard seg2 seismic data format files, one frequency per file. Each file was opened with SeisImager software and converted to the frequency domain. The input and seismograph frequencies were entered into **Calibration Verification Certificate** software (See attached **Calibration Verification Certificate**).

Fugro appreciates the opportunity to submit our calibration verification report for your review. If you have any questions, or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,
FUGRO CONSULTANTS, INC.

Recep Yilmaz
Senior Vice President

RY/jm

1 CD Enclosed

CALIBRATION CERTIFICATES

TRANSCAT® CALIBRATION SERVICES

NVLAP®

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON, TX 77081

Customer Nbr: 1-525293-000

Cert/RA Nbr: 5-V2023-1-1
Manufacturer: EZ Digital, Inc
Description: OSCILLOSCOPE
Model Nbr: OS-5020G
Serial Nbr: 3080209
ID Nbr:
PO Nbr: D111

Date Received: Feb 28, 2007
Date Calibrated: Feb 28, 2007
Next Calibration: Feb 28, 2008
Calibration Proc: 1-AC10468-0
Item Received: Out Of Tolerance
Item Returned: Limited Calibration

For calibration data, see Supplemental Report for RA Nbr 5-V2023-1-1

Temperature: 72°F / 22.2°C **Relative Humidity: 47%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope are noted below.

Transcat calibrations, as applicable, are performed in compliance with the requirements of ISO 9001:2000, ISO TS16949, ANSI/NCSL Z540-1994, QS-9000 and ISO 10012-1992. When specified contractually, the requirements of 10CFR21, 10CFR50 App. B and NQA-1 are also covered.

Transcat will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standard bodies (NMIs), or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available there for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the manufacturer's published specifications.

All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibrated, unless otherwise noted. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the uses of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration.

Notes: Limited Calibration: "Limitations on this calibration are: Sweep time is +/- 6%, and Frequency is +/- 10%, approved by (Brent Lawrence, 02/28/2007)." Risetime measurements are calibrated traceable, not accredited.

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5346	Fluke Corporation	5520A-SC1100	Multifunction Cal. w/ Scope Op	03/13/2006	03/31/2007	F3094007
TEMP02	Oakton Instruments	35710-10	RH/Temperature Datalogger	01/25/2007	01/31/2008	6-V10A4-1-1

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Jimmy Shipley

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

Michael Sublett 2/28/07
Michael A. Sublett — Date
Lab Manager

F0013R19 1/30/2006

This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

To access your calibration records, log on to www.caltrakonline.com
For all of your product, repair, and calibration needs, call Transcat at 1.800.828.1470.

TRANSCAT® CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 5-V2024-2-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

RA Nbr:	5-V2024-2-1	Mfg:	Instek Good Will Instruments
Description:	Frequency Counter, 120 MHz, 1 Channel	Model:	GFC-8010H
Customer:	FUGRO CONSULTANTS LP	Serial:	CF871549
Calibrated:	Feb 28, 2007	PO Nbr:	D111
Date Due:	Feb 28, 2008	ID Nbr:	NONE
Service Type:	S6	Calibration Proc:	1-AC17352-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Uncertainty (k=2; ±)	TUR
Frequency Accuracy								
Frequency Accuracy	10.000000 MHz	±(12 PPM Rdg)	9.999880	10.000120	10.000007 MHz			
Input Sensitivity								
10 Hz to 10 MHz < (15 mVrms)			P	P	P			
10 MHz to 40 MHz < (20 mVrms)			P	P	P			
40 MHz to 80 MHz < (35 mVrms)			P	P	P			
80 MHz to 120 MHz < (50 mVrms)			P	P	P			

When uncertainties are provided, the uncertainty only includes the measurement process and does not include uncertainty contributions of the instrument under test.

Field not applicable.

TRANSCAT®
CALIBRATION SERVICES • TEST & MEASUREMENT INSTRUMENTS

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PAGE 1
16:05:11 02/28/07
PL Run 852503

01V202300

1181 BRITTMOORE
SUITE 600
HOUSTON TX 77043

Ship To: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON TX 77081

Order 02/27/07
3/09/07
DSNYDER MSUBLETT

Co/Cust	P.O. No	Order No	Ship Via	WH
01/0000525293	D111	V2023/00	UPS GROUND	05

Item Number/Description	Ordered	Shipped	B/O	U/M	Loc Seq
Contact BRENT LAWRENCE			7133695400		
Carrier: UPS GROUND					
001. ED1801-6	1.000	1.000	.000	EA	BELOW
Cal&Data-EZ Digital, Inc Mdl:OS -5020G,OSCILLOSCOPE					
LOC: ZZ.99.99					
S/N:3080209 UNIT ID:					
1 YEAR CALIBRATION INTERVAL					
TURNAROUND TIME - 7 BUSINESS DAYS AFTER RECEIPT OF ORDER					
Thank you!! Denise Snyder 800-828-1470 x 9505					
Fax: 800-395-0543 E-Mail: dsnyder@transcat.com					

* COMPLETE *

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TRANSCAT® CALIBRATION SERVICES

NVLAP®

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON, TX 77081

Customer Nbr: 1-525293-000

Cert/RA Nbr: 5-V2024-2-1
Manufacturer: Instek Good Will Instruments
Description: Frequency Counter, 120 MHz, 1 Channel
Model Nbr: GFC-8010H
Serial Nbr: CF871549
ID Nbr: NONE
PO Nbr: D111

Date Received: Feb 27, 2007
Date Calibrated: Feb 28, 2007
Next Calibration: Feb 28, 2008
Calibration Proc: 1-AC17352-0
Item Received: In Tolerance
Item Returned: In Tolerance

For calibration data, see Supplemental Report for RA Nbr 5-V2024-2-1

Temperature: 72°F / 22.2°C **Relative Humidity: 47%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by this Lab's Scope are noted below.

Transcat calibrations, as applicable, are performed in compliance with the requirements of ISO 9001:2000, ISO TS16949, ANSI/NCSL Z540-1994, QS-9000 and ISO 10012-1992. When specified contractually, the requirements of 10CFR21, 10CFR50 App. B and NQA-1 are also covered.

Transcat will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standard bodies (NMIs), or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available there for review

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the manufacturer's published specifications.

All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibrated, unless otherwise noted. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the user of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration.

Notes:

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5219	Agilent/HP/Agilent Tech	8902A	Measuring Receiver	11/20/2006	11/30/2007	1-496265449-1
5346	Fluke Corporation	5520A-SC1100	Multifunction Cal. w/ Scope Op	03/13/2006	03/31/2007	F3094007
J568	Agilent/HP/Agilent Tech	11722A	Sensor Module, 100k-2.6GHz	03/30/2006	03/31/2007	1-270725701-1
TEMP02	Oakton Instruments	35710-10	RH/Temperature Datalogger	01/25/2007	01/31/2008	6-V10A4-1-1

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Jimmy Shipley

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

Michael A. Sublett 2/28/08
Michael A. Sublett — Date
Lab Manager

F0013R19 1/30/2006

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PAGE 1
16:05:03 02/28/07
PL Run 852502

01V202400

35 VANTAGE POINT DR
ROCHESTER NY 14624

Ship To: FUGRO CONSULTANTS LP
6100 HILLCROFT
HOUSTON TX 77081

Order 02/27/07
3/02/07
DSNYDER MSUBLETT

Co/Cust	P.O. No	Order No	Ship Via	WH
01/0000525293	D111	V2024/00	DO NOT SHIP	01

Item Number/Description	Ordered	Shipped	B/O	U/M	Loc Seq
Contact BRENT LAWRENCE			7133695400		
Carrier: DO NOT SHIP					
001. GFC8010H	1.000	1.000	.000	EA	BELOW
FREQUENCY COUNTER 120MHZ					
LOC: I .14.05					
002. EHP016	1.000	1.000	.000	EA	BELOW
Cal&Data-Instek Good Will Instr					
uments Mdl:GFC-8010H,FREQUENCY					
LOC: OS.01.01					
********* PLEASE SHIP TO HOUSTON LAB UPS RED EARLY AM					
MIKE SUBLETT WILL CALIBRATE TOMORROW 2/28/07					
1 YEAR CALIBRATION INTERVAL					

* COMPLETE *

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PICK

ilac-MRA

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

INTERFACE, INC.
Scottsdale, AZ

for technical competence in the field of **Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 18th day of October 2006.

President
For the Accreditation Council
Certificate Number 1991.01
Valid to November 30, 2008

For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO 17025:2005
& ANSI/NCSL Z540-1-1994

INTERFACE, INC.
7401 E. Butherus Drive
Scottsdale, AZ 85260
LaVar Clegg Phone: 480 948 5555 ext 106

CALIBRATION

Valid To: November 30, 2008 Certificate Number: 1991.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

I. Mechanical

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
Force – Load Cells, Force Transducers	(200 to 240 000) lbf (100 to 1100) lbf (240 000 to 1 000 000) lbf	0.035 % reading 0.050 % reading 0.041 % reading	Load cells
	(1 to 500) lbf	0.040 % reading	Free weights
	(25 to 1100) lbf	0.030 % reading	Actuated weights
	(10 to 550) lbf	0.021 % reading	Actuated weights (stainless steel)
	(25 to 2000) gf	0.030 % reading	Free weights
Mass – Measure Dead Weight	(1 to 25) lb (25 to 100) lb	0.0032 % 0.0085 %	Transfer method using load cells

Roxanne M. Robinson

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

II. Electrical – DC & Low Frequency

Parameter/Equipment	Range	Best Uncertainty[2] (±)	Comments
DC Voltage – Measure	(0 to 0.14) V (0.14 to 1.4) V (1.4 to 14) V (14 to 140) V	0.0026 % + 0.2 μV 0.0024 % + 2 μV 0.0022 % + 20 μV 0.0022 % + 200 μV	Solartron 7071
DC Voltage Ratio	(0 to 0.1) V	0.0007 % rdg + 0.1 μV/V_{ref}	Kelvin-Varley divider
Resistance – Measure	(0 to 1.4) kΩ (0.14 to 1.4) kΩ (1.4 to 14) kΩ (14 to 140) kΩ (140 to 1400) kΩ	0.0026 % + 0.2 mΩ 0.0026 % + 2 mΩ 0.0026 % + 20 mΩ 0.0028 % + 0.2 Ω 0.0036 % + 2 Ω	Solartron 7071

[1] This laboratory offers commercial calibration service.

[2] "Best Uncertainty" is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

Roxanne M. Robinson

ACCREDITED
CALIBRATION CERTIFICATE
1991.01

interface
ADVANCED FORCE MEASUREMENT

LOAD CELL-INDICATOR SYSTEM CALIBRATION CERTIFICATE

Customer : FUGRO GEOSCIENCES,INC.
Address : Houston, TX 77074
Condition : AS FOUND & FINAL
Load Cell Model: 1211EX-10K-B
Capacity : 10000 lbf
Indicator Model: INTERFACE 9820-000-1
Excitation : 10 VDC

S.O. # : 71644

Procedure: C-1761
P.O. # : CREDIT CARD
Serial : 113655

Serial : M2635
Count-By : 1

TEST CONDITIONS

TEMPERATURE: 75 °F HUMIDITY: 30 %

TRACEABILITY

FORCE STANDARD : STD-18 NIST #: 822/273975-06 DUE: 15-SEP-09
STANDARD INDICATOR: BRD106 NIST #: 496182

SHUNT CALIBRATION

	Shunt KOhm	Reading		Connections
Tension		N/A	lbf	
Compression	30.1	6779	lbf	Internal

PERFORMANCE

TEST LOAD (lbf)	RECORDED READINGS lbf Tension	Compression
0		0
2000		1998
4000		3997
6000		5997
8000		7999
10000		10000
4000		4001
0		0

Interface, Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC 17025, MIL STD-45662A & ANSI/NCSL Z540-1-1994. Estimated measurement uncertainty is 0.049% RDG, expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to above serial numbers only.
DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval

TECHNICIAN : Josh Smith DATE :09-MAR-07

INTERFACE INC.
7401 EAST BUTHERUS DRIVE · SCOTTSDALE, ARIZONA 85260, U.S.A.
TELEPHONE (480)948-5555 · FAX (480)948-1924

F16-107D-1206

PAGE 1 OF 1

CERTIFICATE OF CALIBRATION

Certificate Number M503691-1

Manufacturer: **Geotac**
Model No: **560K**
Customer PO No.: **L-2416**

Description: **Load Cell**
Serial No: **129739**
Customer Asset No.: **129739**

Customer:
Fugro Consultants LP
6100 Hillcroft
Houston, TX 77081

Location of Calibration:
Applied Technical Services, Inc.
1049 Triad Court
Marietta, GA 30062

Calibration Procedure: **ATS-521 Rev. 5: Calibration of Force Gages**

Date of Calibration: **November 28, 2006**
Temperature: **70° F**
Condition Received: **As Found Data Only**

*Next Calibration Due: **November 28, 2007**
Humidity: **29 %**
Condition Returned: **As Found Data Only**

This instrument has been calibrated using primary or secondary standards whose calibration is traceable to the International System of Units (SI) through the National Institute of Standards and Technology (NIST). Some measurements are traceable to natural physical constants, consensus standards or ratio type measurements.

The reported expanded measurement uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a confidence level of approximately 95%. ATS maintains, wherever possible, at least a 4:1 Test Uncertainty Ratio. Statements of compliance, where applicable, are based on test results falling within specified limits with no reduction by the uncertainty of the measurement, unless otherwise allowed by procedure.

All calibrations are performed in accordance with the ATS Quality Manual QM1, Rev. 7 dated July 7, 2006. Applied Technical Services, Inc.'s Quality System complies with the applicable requirements of ANSI/NCSL Z540-1, ISO 9001-2000, 10CFR 50 Appendix B, 10CFR Part 21 and ISO/IEC 17025. ATS is an ISO/IEC 17025 Accredited Calibration Laboratory through A2LA.

The reported data is valid only at the time of the test and related only to the item calibrated. *Calibration due dates appearing on this Certificate of Calibration and calibration label are determined by the client and do not imply continued conformance to specifications.

This certificate shall not be reproduced except in full, without the permission of Applied Technical Services, Inc.

Notes: *Gage Factor = -2.1826mV/V*

Calibration Equipment Used::

Model: **Tinius Olsen Super L** Desc.: **Universal Testing Machine** ID No.: **ATS-01226** Cal Due Date: **2/11/2007**

Calibrated by: Christopher A. Gerlach
Senior Calibration Technician

APPLIED TECHNICAL SERVICES, INCORPORATED

CALIBRATION DATA SHEET

Customer: Fugro Consultants Purchase Order No.: L-2416

Item Name: Load Cell w/o Display Asset No.: 129739 ATS Reference No.: M503691-1

Manufacturer: GeoTac Model No.: 50Klbs Proc. No.: 521 Rev.: 5

Serial No.: 129739 Calibration Date: 11/28/06 Calibration Due Date: 11/28/07

Reason For Service: ☒ Initial Calibration ☐ Due For Calibration ☐ Repair and Calibration

Equipment Used: ATS-01226 Due: 02/11/07 Universal Testing Machine

Due:

Due:

Due:

Due:

Due:

Calibrated By: [signature]

Customer Instrument Under Test

UNCERTAINTY (SEE NOTE) g	RANGE Lbs	ATS STANDARD Lbs	TOLERANCE Lbs	AS FOUND READING mV	AS CALIBRATED READING Lbs
0.03%	50000	(Comp.) 5000.000	As Found Data Only	-2.176	Same as - As Found
0.03%		10000.000	As Found Data Only	-4.358	Same as - As Found
0.03%		20000.000	As Found Data Only	-8.722	Same as - As Found
0.03%		30000.000	As Found Data Only	-13.092	Same as - As Found
0.03%		40000.000	As Found Data Only	-17.479	Same as - As Found
0.03%		50000.000	As Found Data Only	-21.826	Same as - As Found
Excitation (Before)	10.0000VDC				
Excitation (After)	10.0000VDC				
Zero (Before)	0.000				
Zero (After)	0.000				
Gage Factor	-2.1826mV/V				

* Indicates out of tolerance readings.

Remarks: Measurement Uncertainty reported at coverage factor K = 2 or 95% confidence level.

A= + Excitation B= -Excitation C= + Output D= -Output

ATS 538, 05/03

ACCREDITED CALIBRATION CERTIFICATE 1991.01

interface
ADVANCED FORCE MEASUREMENT

LOAD CELL CALIBRATION CERTIFICATION

CUSTOMER : FUGRO CONSULTANTS INC.
ADDRESS : Houston,TX 77081
CONDITION: AS FOUND & FINAL S.O. #: 78664 P.O. #: L-2563
MODEL: FT451-50K SERIAL: 129739 BRIDGE: A CAPACITY: 50 Klbf
PROCEDURE: C-1257

INPUT RESISTANCE: 376.3 OHM OUTPUT RESISTANCE: 354.7 OHM
ZERO BALANCE : 0.166 %RO

TEST CONDITIONS

TEMPERATURE: 74 °F HUMIDITY: 30 % EXCITATION: 10 VDC

TRACEABILITY

FORCE STANDARD : STD-14 NIST #: 822/273338-06 DUE: 15-MAR-10
STANDARD INDICATOR: BRD295 NIST #: 512727
TEST INDICATOR : BRD297 NIST #: 512727

SHUNT CALIBRATION

	Shunt (± 0.01%)	Output	Straight Line Conversion	Connections*
Tension	Kohm	.00000 mV/V	.0000 Klbf	
Compression	60 Kohm	-1.46285 mV/V	33.650 Klbf	-Out to +Exc

*For models wired with +Sense, -Sense, or -SCal leads, resistor connections are actually to these leads in place of +Exc, -Exc, or -Out respectively.

PERFORMANCE

	RATED OUTPUT	SEB OUTPUT	NONLINEARITY	HYSTERESIS	SEB
TENSION	.00000 mV/V	.00000 mV/V	.000 %FS	.000 %FS	± .000 %FS
COMPRESSION	-2.17387 mV/V	-2.17364 mV/V	-.027 %FS	.045 %FS	± .022 %FS

STATIC ERROR BAND (SEB) - The band of maximum deviations of the ascending and descending calibration points from a best fit straight line through zero OUTPUT. It includes the effects of NONLINEARITY, HYSTERESIS, and nonreturn to MINIMUM LOAD.

TEST LOAD APPLIED (Klbf)	RECORDED READINGS (mV/V) Tension	Compression
0		.00000
10		-.43434
20		-.86897
30		-1.30378
40		-1.73876
50		-2.17387
20		-.86994
0		-.00018

Interface, Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC 17025, MIL-STD-45662A & ANSI/NCSL Z540-1-1994. Estimated measurement uncertainty is 0.040% expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to load cell serial 129739 only.
DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval.

TECHNICIAN : Josh Smith DATE :14-MAR-08

INTERFACE INC.
7401 EAST BUTHERUS DRIVE · SCOTTSDALE, ARIZONA 85260, U.S.A.
TELEPHONE (480)948-5555 · FAX (480)948-1924

F16-40-1206

PAGE 1 OF 1

ACCREDITED CALIBRATION CERTIFICATE 1991.01

interface
ADVANCED FORCE MEASUREMENT

LOAD CELL CALIBRATION CERTIFICATION

CUSTOMER : FUGRO CONSULTANTS INC.
ADDRESS : Houston,TX 77081
CONDITION: FINAL S.O. #: 78664 P.O. #: L-2563
MODEL: FT451-50K SERIAL: 129739 BRIDGE: A CAPACITY: 12.5 Klbf
PROCEDURE: C-1257

INPUT RESISTANCE: 374.7 OHM OUTPUT RESISTANCE: 353.0 OHM
ZERO BALANCE : -0.386 %RO

TEST CONDITIONS

TEMPERATURE: 75 °F HUMIDITY: 30 % EXCITATION: 10 VDC

TRACEABILITY

FORCE STANDARD : STD-22 NIST #: 822/275431-07 DUE: 15-SEP-11
STANDARD INDICATOR: BRD106 NIST #: 512727
TEST INDICATOR : BRD300 NIST #: 512727

SHUNT CALIBRATION

	Shunt (± 0.01%)	Output	Straight Line Conversion	Connections*
Tension	60 Kohm	1.46154 mV/V	33.590 Klbf	-Out to -Exc
Compression	Kohm	.00000 mV/V	.0000 Klbf	

*For models wired with +Sense, -Sense, or -SCal leads, resistor connections are actually to these leads in place of +Exc, -Exc, or -Out respectively.

PERFORMANCE

	RATED OUTPUT	SEB OUTPUT	NONLINEARITY	HYSTERESIS	SEB
TENSION	.54411 mV/V	.54388 mV/V	-.073 %FS	.066 %FS	± .044 %FS
COMPRESSION	.00000 mV/V	.00000 mV/V	.000 %FS	.000 %FS	± .000 %FS

STATIC ERROR BAND (SEB) - The band of maximum deviations of the ascending and descending calibration points from a best fit straight line through zero OUTPUT. It includes the effects of NONLINEARITY, HYSTERESIS, and nonreturn to MINIMUM LOAD.

TEST LOAD APPLIED (Klbf)	RECORDED READINGS (mV/V) Tension	Compression
0.0	.00000	
2.5	.10868	
5.0	.21743	
7.5	.32609	
10.0	.43489	
12.5	.54411	
5.0	.21779	
0.0	.00026	

Interface, Inc. certifies that force measurements are traceable to primary standards at NIST. Calibration performed per Interface QA program and the requirements of ISO/IEC-17025, MIL-STD-45662A & ANSI/NCSL Z540-1-1994. Estimated measurement uncertainty is 0.040%, expressed as the expanded uncertainty at 95% confidence level using a coverage factor of k=2. Results relate to load cell serial 129739 only.
DO NOT REPRODUCE THIS REPORT except in full or with Interface Inc. written approval.

TECHNICIAN : Josh Smith DATE :14-MAR-08

INTERFACE INC.
7401 EAST BUTHERUS DRIVE · SCOTTSDALE, ARIZONA 85260, U.S.A.
TELEPHONE (480)948-5555 · FAX (480)948-1924

F16-40-1206

PAGE 1 OF 1

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Manufacturer: Eaton
Sales Order: 216724

Model Number: UPS3000CC
Serial Number: A0813
ID Number: XPE-001

Preceding the calibration, the elastic element of this gauge was exercised and zero was adjusted. The horizontal plane of reference for pressure measurement is at the centerline of the test port.

The calibration and traceability of the transfer standards used in this calibration are maintained according to Quality Manual (QMS-001) Revision R (12/14/2005). The measurement results are traceable through an unbroken chain of comparisons to reference standards developed and maintained by the National Institute of Standards and Technology. The uncertainty reported with the data is the expanded uncertainty, and is based on the standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

This calibration was performed at the GE Infrastructure Sensing Houston facility. At the time of the calibration, the environmental conditions were 21 °C, 60%RH, and 101 kPa. The best estimate of gravitational acceleration at the site of calibration was 9.792778 m/s².

The calibration procedure CS-125 Revision D satisfies the requirements of ANSI/NCSL Z540-1-1994, ISO 9001, ISO/IEC 17025:1999 (E), NIST Handbook 150, and MIL-STD-45662A.

This report shall not be reproduced, except in full, without the written permission of the issuing laboratory.

Approved by: Sharon R. Ellis
Calibration Technician

Calibrated by: Joseph P. Balliew
Calibration Technician

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 250 psi gauge

As Found Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
124.6680	1.4E-03	124.70
249.579	2.7E-03	249.65
124.6680	1.4E-03	124.65
0.00	0.0E+00	0.05

Note: The instrument was not adjusted prior to the above data being recorded. An asterisk denotes a point that is out of tolerance.

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
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GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 100 psi gauge

As Found Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-67, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
49.8390	5.0E-04	49.80
99.9320	1.0E-03	99.88
49.8400	5.0E-04	49.76
0.00	0.0E+00	0.00

Note: The instrument was not adjusted prior to the above data being recorded. An asterisk denotes a point that is out of tolerance.

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 500 psi gauge

As Found / As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, and ,WS-12

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.0	0.0E+00	0.0
124.6700	1.4E-03	124.7
249.580	2.7E-03	249.6
374.330	4.1E-03	374.4
499.070	5.5E-03	499.2
249.580	2.7E-03	249.6
0.0	0.0E+00	0.1

Notes: The instrument was not adjusted.

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 250 psi gauge

As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-89, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
61.7960	6.8E-04	61.80
124.6680	1.4E-03	124.65
186.5430	2.1E-03	186.55
249.579	2.7E-03	249.60
124.6680	1.4E-03	124.65
0.00	0.0E+00	0.00

Notes: The instrument was adjusted prior to recording the above data.

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

GE Infrastructure
Sensing

Calibration Report 060915A0813

Digital Pressure Indicator

for

Fugro Consultants LP

6100 Hillcroft
Houston, TX 77081

Date of Issue: September 15, 2006

Full Scale: 100 psi gauge

As Left Calibration Data

Calibration Date: September 15, 2006

Calibration Standard: PC-67, WS-12, and WS-27

Medium: nitrogen

Applied psi	Uncertainty psi	Displayed psi
0.00	0.0E+00	0.00
24.86100	2.5E-04	24.84
49.8390	5.0E-04	49.84
74.9860	7.5E-04	74.98
99.9310	1.0E-03	99.96
49.8390	5.0E-04	49.82
0.00	0.0E+00	0.00

Notes: The instrument was adjusted prior to recording the above data.

General Electric Company
10311 Westpark Drive
Houston, TX 77042
USA

T 713 975 0547
F 713 975 6338

National Voluntary Laboratory Accreditation Program

SCOPE OF ACCREDITATION TO ISO/IEC 17025:1999

GE Infrastructure Sensing
10311 Westpark Drive
Houston, TX 77042-5312
Mr. Kenneth A. Kolb
Phone: 713-975-0547 Fax: 713-975-6338
E-mail: kenneth.kolb@ge.com
URL: http://www.gesening.com

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

NVLAP Code: 20/A01 ANSI/NCSL Z540-1-1994; Part 1 Compliant

MECHANICAL

NVLAP Code: 20/M08
Mass

Calibration of Primary Piston Gauge Masses

Range	*Best Uncertainty (±) Relative to Indicated Value* [note 1]	*Remarks*
1 mg to 17 kg	5.0×10^{-6} but not less than 0.5 mg	Substitution – Mechanical
1 mg to 1.2 kg	5.0×10^{-6} but not less than 0.5 mg	Substitution – Electronic

Calibration of Secondary Piston Gauge Masses

1 mg to 8.0 kg	2.0×10^{-5} but not less than 0.5 mg	Substitution – Electronic
1 mg to 1.2 kg	2.0×10^{-5} but not less than 0.5 mg	Direct Reading - Electronic
1.2 kg to 8 kg	2.0×10^{-5} but not less than 43 mg	Direct Reading – Electronic

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

THERMODYNAMICS

NVLAP Code: 20/T05
Pressure

Pneumatic Pressure using Primary Piston Gauge [note 2]

Range	*Best Uncertainty (±) of Reading* [note 1]	*Remarks*
-100 kPa to -1.38 kPa	1.0×10^{-5} but not less than 0.07 Pa	Negative Gauge Mode
-16 kPa to 16 kPa	1.1×10^{-5} but not less than 0.034 Pa	Differential Mode
1.38 kPa to 1.4 MPa	1.0×10^{-5} but not less than 0.07 Pa	Gauge Mode [note 4]
1.4 MPa to 7 MPa	1.1×10^{-5} but not less than 2.8 Pa	Gauge Mode [note 4]
7 MPa to 21 MPa	$1.1 \times 10^{-5} + 1.9 \times 10^{-7}$ per MPa	Gauge Mode
21 MPa to 104 MPa	3.5×10^{-5}	Gauge Mode

Pneumatic Effective Area Determination using Primary Piston Gauge [note 2]

Range	*Best Uncertainty (±) of Reading* [notes 1, 7]	*Remarks*
1.38 kPa to 345 kPa	8.8×10^{-6}	
11.72 kPa to 1.4 MPa	8.3×10^{-6}	
14 kPa to 7 MPa	$1.0 \times 10^{-5} + 2.4 \times 10^{-7}$ per MPa [note 3]	
700 kPa to 21 MPa	$1.0 \times 10^{-5} + 4.8 \times 10^{-7}$ per MPa [note 3]	
1.17 MPa to 104 MPa	3.37×10^{-5}	

Pneumatic Pressure using Precision Transducer [note 2]

Range	*Best Uncertainty (±) of Reading* [note 1]	*Remarks*
0 Pa to 133 Pa	0.133 Pa	Absolute Mode
-16 kPa to 16 kPa	5.0×10^{-5} but not less than 0.035 Pa	Differential Mode
-100 kPa to 17 MPa	6.5×10^{-5} but not less than 0.22 Pa	Gauge Mode [note 5]

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

Pneumatic Effective Area Determination using Precision Transducer [note 2]

20 Pa to 17 MPa	7.2×10^{-5} but not less than 0.05 Pa

Pneumatic Deadweight Tester Output Pressure Conformance using Precision Transducer [note 2]

Range	*Best Uncertainty (±) of Reading* [notes 1, 8]	*Remarks*
20 Pa to 17 MPa	7.5×10^{-5} but not less than 0.053 Pa	

Hydraulic Pressure using Primary Piston Gauge [note 2]

Range	*Best Uncertainty (±) of Reading* [notes 1, 6]	*Remarks*
50 kPa to 7 MPa	2.5×10^{-5} but not less than 10 Pa	Gauge Mode
7 MPa to 140 MPa	3.5×10^{-5}	Gauge Mode
14 MPa to 280 MPa	7.5×10^{-5}	Gauge Mode
280 MPa to 500 MPa	1.0×10^{-4}	Gauge Mode

Hydraulic Effective Area Determination using Primary Piston Gauge [note 2]

Range	*Best Uncertainty (±) of Reading* [note 1]	*Remarks*
50 kPa to 7 MPa	2.31×10^{-5}	
7 MPa to 140 MPa	3.34×10^{-5}	
140 MPa to 280 MPa	7.29×10^{-5}	
280 MPa to 500 MPa	9.80×10^{-5}	

Hydraulic Effective Area Determination using Secondary Piston Gauge [note 2]

70 kPa to 140 MPa	7.2×10^{-5}

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

CALIBRATION LABORATORIES **NVLAP LAB CODE 200491-0**

Hydraulic Deadweight Tester Output Pressure Conformance using Secondary Piston Gauge *note 2*

70 kPa to 140 MPa	7.5×10^{-5} but not less than 50 Pa

1. Represents an expanded uncertainty using a coverage factor, k = 2, at an approximate level of confidence of 95 %.
2. This capability includes on-site calibration service, as limited by influences of operating environment.
3. Component uncertainties are combined in quadrature.
4. For absolute mode, uncertainties increase by 1.33E + 00 Pa, combined in quadrature with stated level.
5. For absolute mode, uncertainties increase by 1.88E + 00 Pa, combined in quadrature with stated level.
6. For absolute mode, uncertainties increase by 1.31E + 01 Pa, combined in quadrature with stated level.
7. Calibration process may include the use of transducers to measure small differential pressures.
8. Conformance evaluation of Deadweight Tester output pressure compared to indicated pressure.

2006-01-01 through 2006-12-31

Effective dates

For the National Institute of Standards and Technology

TRANSCAT® CALIBRATION SERVICES

NVLAP®

NVLAP LAB CODE
200730-0

CERTIFICATE OF CALIBRATION

Customer: FUGRO CONSULTANTS INC
6100 HILLCROFT
HOUSTON, TX 77081

Customer Nbr: 1-525293-000
PO Nbr: FO200708

Cert/RA Nbr: 5-V8842-1-1
Manufacturer: Cole-Parmer
Model Nbr: 8528-40
Description: Thermometer, Type K

Serial Nbr: C95005824
ID Nbr: TD 001

Date Received: Nov 16, 2007
Date Calibrated: Nov 16, 2007
Next Calibration: Nov 16, 2008
Calibration Proc: 1-AC22434-0
Item Received: In Tolerance
Item Returned: In Tolerance

For calibration data, see Supplemental Report for RA Nbr 5-V8842-1-1

Temperature: 70°F / 21.1°C **Temp/RH Asset: temp02** **Relative Humidity: 33%**

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number on this Certificate of Calibration. Any measurements on an accredited calibration not covered by that Lab's Scope are noted below.

Transcat calibrations, as applicable, are performed in compliance with the requirements of ISO 9001:2000, ISO TS16949, ANSI/NCSL Z540-1994, QS-9000 and ISO 10012-1992. When specified contractually, the requirements of 10CFR21, 10CFR50 App. B and NQA-1 are also covered.

Transcat will maintain and document the traceability of all its standards to the National Institute of Standards and Technology (NIST) or the National Research Council of Canada (NRC), or to other recognized national or international standard bodies (NMIs), or to measurable conditions created in our laboratory, or accepted fundamental and/or natural physical constants, ratio type of calibration, or by comparison to consensus standards. The specific path of traceability for the reported measurement results is maintained at the Transcat facility and is available there for review.

Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are shown below.

The results in this report relate only to the item calibrated or tested, and the determination of in or out of tolerance is specific to the model/serial no. referenced above based on the manufacturer's published specifications.

All calibrations have been performed using processes having a test uncertainty ratio of four or more times greater than the unit calibrated, unless otherwise noted. Uncertainties have been estimated at a 95 percent confidence level (k=2). Calibration at a 4:1 TUR provides reasonable confidence that the instrument is within the manufacturer's published specifications. Limitations on the uses of this instrument are detailed in the manufacturer's operating instructions. Any number of factors can cause a unit to drift out of tolerance at any time following its calibration.

Notes: Unit meets all manufacturers specifications. When using the K type probe with the unit, the readings were: @0.0°C/ 0.1°C @50.0°C/49.8°C @100.0°C/100.2°C

Assets	Manufacturer	Model	Description	Cal Date	Due Date	Traceability Numbers
5072	Fluke Corporation	5500A	Multi-Product Calibrator	5/7/2007	5/31/2008	5-&5072-3-8
5342	Hart Scientific	1502A	Thermometer, SPRT, -200° to 96	8/21/2007	8/31/2008	15-V54VR-1-1
5343	Hart Scientific	5626	Probe, Secondary Reference, PR	8/21/2007	8/31/2008	15-V54VR-1-1
K1TCW-11	Omega Engineering, Inc.	Type-K	Thermocouple Probe, Type-K	6/11/2007	12/31/2099	6-&K1TCW-507-11

Calibrated at:
1181 Brittmore
Houston, TX 77043
By: Thomas M. Laguna

Facility Responsible:
1181 Brittmore
Houston, TX 77043
713-465-4399

Michael A. Sublett
Lab Manager
Date 11/18/07

This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).

F0013R20 5/02/2007

To access your calibration records, log on to www.caltrakonline.com

TRANSCAT® CALIBRATION SERVICES

SUPPLEMENTAL REPORT FOR 5-V8842-1-1

CALIBRATION LAB DATA AS FOUND / AS LEFT

RA Nbr:	5-V8842-1-1	Mfg:	Cole-Parmer
Description:	Thermometer, Type K	Model:	8528-40
Customer:	FUGRO CONSULTANTS INC	Serial:	C95005824
Calibrated:	Nov 16, 2007	PO Nbr:	FO200708
Date Due:	Nov 16, 2008	ID Nbr:	TD 001
Service Type:	R6	Calibration Proc:	1-AC22434-0

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	OOT	Uncertainty (k=2; ±)	TUR
Temperature Measure								
Type K (ITS90)	-145.0 °C	±(0.25% Rdg + 2 °C)	-147.4	-142.6	-145.2 °C			
	0.0 °C	±(0.25% Rdg + 1 °C)	-1.0	1.0	-0.1 °C			
	450.0 °C	±(0.25% Rdg + 1 °C)	447.9	452.1	450.1 °C			
	900.0 °C	±(0.25% Rdg + 1 °C)	896.7	903.3	900.0 °C			
	1350 °C	±(0.25% Rdg + 1 °C)	1346	1354	1350 °C			
Units Conversion	2462 °F	±(0.25% Rdg + 1.8 °F)	2454	2470	2461 °F			

Remarks:

Unit meets all manufacturers specifications. When using the K type probe with the unit, the readings were: @0.0°C/ 0.1°C @50.0°C/49.8°C @100.0°C/100.2°C

When uncertainties are provided, the uncertainty only includes the measurement process and does not include uncertainty contributions of the instrument under test.

Field not applicable.

QUALITY SYSTEM MANUAL

FOR

HOUSTON GEOTECHNICAL LABORATORY

CONTROL #: GEO-1

Fugro Consultants, Inc.
6100 Hillcroft
Houston, Texas 77081
Phone: (713) 369-5400
Fax: (713) 369-5545

Document Revised: July 07, 2007

CALIBRATION EQUIPMENT OR REFERENCE STANDARDS			
Equipment Name	Calibration Interval	Check Interval	Procedure Used
Digital Micrometer & Mechanical Micrometers	2 years		Outside Source
Force Transducers	1 year		Outside Source
Metal Specimens	Verify Before Use or After Repair		HGL-2655
Pressure Gages	2 years		Outside Source
Set of Gage Blocks	5 years		Outside Source
Thermometers	1 year		Outside Source
Torque Transducers	2 years		Outside Source
Voltmeters/Multimeters (6.5 digit)	3 years		Outside Source

***The term "calibration" is used to maintain consistency with ASTM D 3740. It is taken to mean "verification."**

```
10-02-2007
11:21:31
1907-0067
10
AL
  0.00    0.00    0.00     1
F7.5CKESW1576
3  50.00 0.500    2.500   525.0
   0 -0.00013 -0.00119  0.00013  0.00400 -0.00006
   2 -0.00013 -0.00119  0.00013  0.00400
   4 -0.00013 -0.00119  0.00013  0.00400
   6 -0.00013 -0.00119  0.00013  0.00400
   8  0.01794  0.00013  0.00013  0.00262
  10  0.03737  0.00081  0.00013  0.00244
  12  0.06181  0.00031  0.00013  0.00213
  14  0.08025  0.00050  0.00013  0.00281
  16  0.08677  0.00456  0.00013  0.00269
  18  0.09328  0.01281  0.00019  0.00231
  20  0.09980  0.02656  0.00013  0.00212
  22  0.10631  0.09099  0.00019  0.00244
  24  0.29775  0.15541  0.00038  0.00225
  26  0.48094  0.21983  0.00038  0.00356
  28  0.49413  0.28426  0.00006  0.00400
  30  0.39231  0.34868  0.00019  0.00294
  32  0.37288  0.41310  0.00031  0.00525
  34  0.35475  0.47753  0.00000  0.00538
  36  0.32225  0.54195  0.00000  0.00556
  38  0.31706  0.60637  0.00006  0.00500
  40  0.26138  0.62738  0.00006  0.00594
  42  0.23619  0.62400  0.00013  0.00538
  44  0.21856  0.60164  0.00050  0.00544
  46  0.19506  0.57929  0.00050  0.00575
  48  0.17344  0.53070  0.00019  0.00581
  50  0.15519  0.48211  0.00075  0.00587
  52  0.14296  0.43353  0.00075  0.00500
  54  0.13073  0.38716  0.00013  0.00562
  56  0.11850  0.34079  0.00050  0.00581
  58  0.11916  0.29443  0.00062  0.00588
  60  0.11981  0.24806  0.00044  0.00500
  62  0.12047  0.22700  0.00019  0.00506
  64  0.12294  0.22131  0.00006  0.00519
  66  0.12406  0.20137  0.00006  0.00525
  68  0.12094  0.19737  0.00075  0.00538
  70  0.11187  0.19319  0.00156  0.00556
```

PRE JOB CALIBRATION VERIFICATION

CALIBRATION CERTIFICATE

APPLICANT	FCI Houston	Certificate number	FC071310	Page 1 of 1
SUBMITTED	**A Piezo Cone Penetrometer**	Manufacturer	Fugro Engineers B.V.	
Device type	CONE, A15F7.5CKEW2/B, 70 bar		Serial number	1701-1498

The device contains an electronic data sheet which contains, amongst others, the characteristics of all the sensors inside the device. The data acquisition system calculates the measured value from these known characteristics. All calibration results are conform the values specified below.

Force calibration

Calibration reference : 548 FRE.002
Procedure : FEBV.CAL.PRO.003 KALIBRATIE KRACHT
Title of channel(s) : Cone and Cone+Fric.
Max. load 150 kN

Range	Calibration range From	to	Sensitivity Deviation	Zero load output
1	0	75 kN	< 0.5 %	< 1.50 kN
Calibration uncertainty			0.3 %	0.008 kN

Pressure test :

Deviation from specified Alpha factor at 2.5 MPa	< 5 %

Cone quality control values :

Max. deviation from reference	< 1 %
Max. Tip to Sleeve friction Crosstalk	< 1 %

Pressure calibration

Calibration reference : 3257-0001
Procedure : FEBV.CAL.PRO.004 KALIBRATIE DRUK
Title of channel : Pore 2
Max. load 10.5 Mpa

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	2.5 MPa	< 1.0 %	< 0.28 MPa
Calibration uncertainty			0.6 %	0.003 MPa
Pore 2 transducer : Kulite HKM 150-70bar SN : 7056-1-133				

Calibration of the slope sensor

Calibration reference :
Procedure;FEBV.CAL.PRO.006 KALIBRATIE HELLING
Title of channel : Slope x

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	15 deg	< 10 %	< 1.5 deg
Calibration uncertainty			1 %	0.5 deg

Typical values for this type of device

Cone diameter (mm)	43.7	Pore 2 position	2	Alpha factor	0.58
Cone area (square cm)	15	Sleeve length (mm)	144.7	Cone - Sleeve distance (mm)	14.4
Sleeve diameter (mm)	43.9	Sleeve area (square cm)	200	Cone - Pore 2 distance (mm)	6.0

TRACEABILITY The measurements have been executed using standards for which the traceability to primary and/or (inter)national standards has been demonstrated .

Calibrated by: Boer de, Kimmo

Approved by : Sinjorgo, Gerry

Calibration date: 03/12/2007

Approval date: 03/12/2007

Calibrate before: 27/11/2008

FUGRO ENGINEERS B.V. Veurse Achterweg 10 2201 DA Leidschendam

Template : 75CKEW2 70bar002 Updated : 8/11/2007 11:26:00 AM

Calibration Verification Certificate

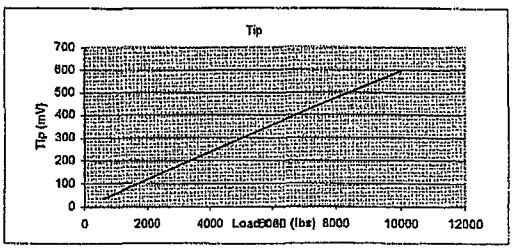
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKEW2/B 1701-1498**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

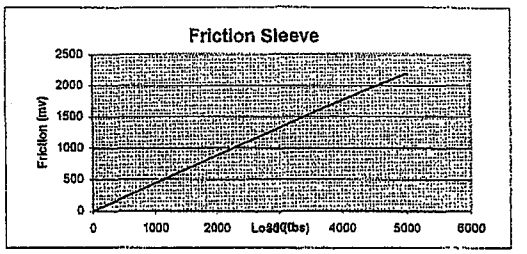
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
595	0.2975	18.47826	35.3	50.1272162
6120	3.06	190.0621	363.9	50.0150484
8510	4.255	264.2857	505.6	50.0557325
10010	5.005	310.8696	595.3	50.0068526
15005	7.5025	465.9938	892.3	50.0099515
19985	9.9925	620.6522	1184.3	50.1849794



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

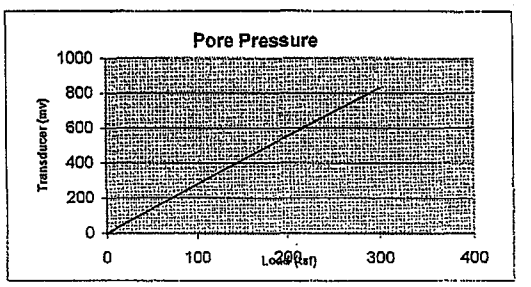
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
520	0.26	1.207617	230.6	0.50148415
2490	1.245	5.782629	1101.3	0.50281344
3510	1.755	8.151417	1548.2	0.50418884
4990	2.495	11.58848	2191.6	0.50635188
7520	3.76	17.464	3286.3	0.50888987



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 7056-1-133
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	207.8	2.48848722
150	10.8	414.3	2.49629565
300	21.6	827.8	2.49870812



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	1.578	0.973	-0.438
50	1.652	0.939	-0.984
75	1.681	0.981	-1.023
100	1.840	1.222	1.564
115	1.877	2.011	3.210

Deviation	mV	Mpa	% Full Scale
Tip	0.338	0.0169	0.0338
Friction	1.694	0.000847	0.1694
Piezo	5.714	0.014285	0.5714

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 12/16/2007

Checked By : Recep Yilmaz Date: 12/16/2007

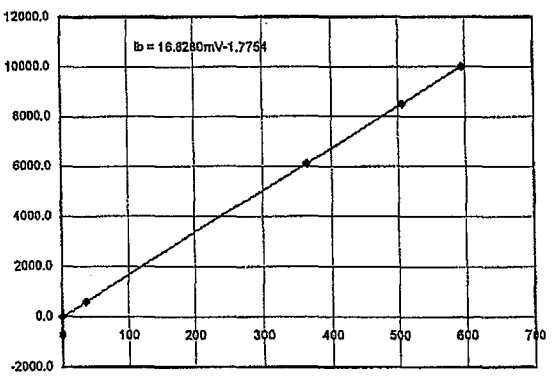
HGL Instrument Verification

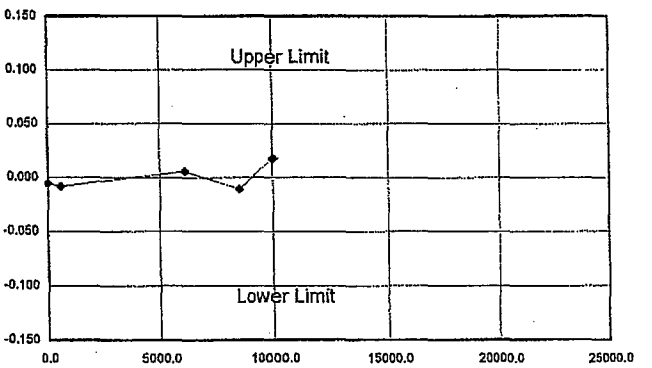
DATE: 12/16/2007 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer-TIP					
Manufacturer	Fugro	0.000000	0.0	-1.8	1.8	-0.01
Model Number	F7.5CKE3SW2/B	35.300000	595.0	592.3	2.7	-0.01
Serial Number	1701-1498(Tip)	363.900000	6120.0	6121.9	1.9	0.01
HGL Instrument Number	ft	505.600000	8510.0	8506.4	3.6	-0.01
Excitation (V)		595.300000	10010.0	10015.9	5.9	0.02
Gain/Span Setting	NA	892.300000	15005.0	15013.8	8.8	0.03
Full Range Output (V)		1187.200000	19985.0	19976.4	8.6	-0.03
Full Range/Capacity (lb)	33716					
Date Verified	12/16/2007					
Date Due	12/15/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotak					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999325					
Intercept (lb)	-1.775423408					
Slope (lb/mV)	16.82797742					
Verification (Calib.) Factor	16.82797742					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	1.145434402					
Coverage Factor	2					
Expanded Uncertainty (lb)	2.290868805					
Max. Abs. or FS Error (%)	0.03 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	1.1454	N	1.0000	A	1.1454	1.3120	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	1.1454	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		2.291		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File:

Remarks:

HGL Instrument Verification

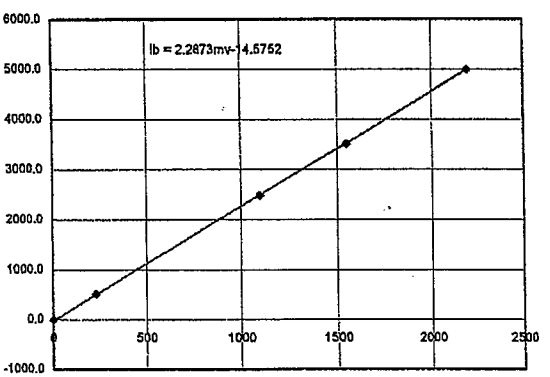
DATE: 12/16/2007 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

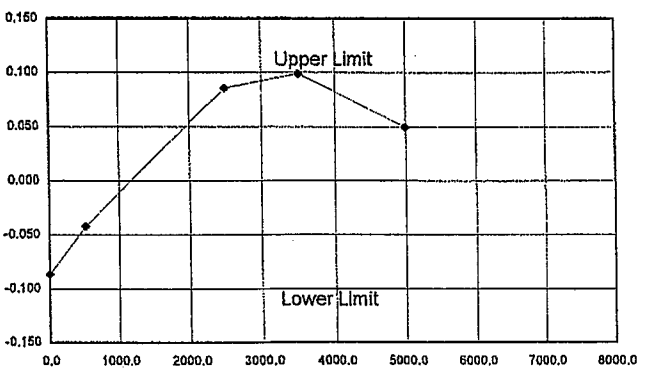
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer
Manufacturer	Fugro
Model Number	F7.5CKEW2/B
Serial Number	1701-1498 (Friction)
HGL Instrument Number	ft100
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	16858
Date Verified	12/16/2007
Date Due	12/15/2008
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.
Verification/Standard Equipment	
Type	Load Cell (A2AL APPROVED)
Manufacturer	INTERFACE
Model Number	1211EX-10K-B
Serial Number	113655
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.999971576
Intercept (lb)	-14.57516298
Slope (lb/mv)	2.287323639
Verification (Calib.) Factor	2.28732364
Verification Factor Units	lb/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	1.796528357
Coverage Factor	2
Expanded Uncertainty (lb)	3.593056715
Max. Abs. or FS Error (%)	-0.11 [X] FS; [ ] Abs.

Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	-14.6	14.6	-0.09
230.600000	520.0	512.9	7.1	-0.04
1101.300000	2490.0	2504.5	14.5	0.09
1548.200000	3510.0	3526.7	16.7	0.10
2191.600000	4990.0	4998.3	8.3	0.05
3286.300000	7520.0	7502.3	17.7	-0.11

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	1.7965	N	1.0000	A	1.7965	3.2275	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	1.7965	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		3.593		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

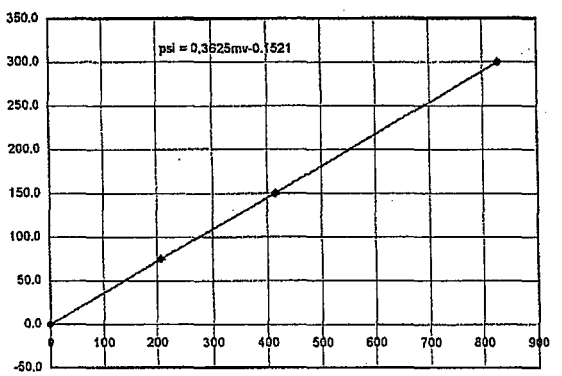
HGL Instrument Verification

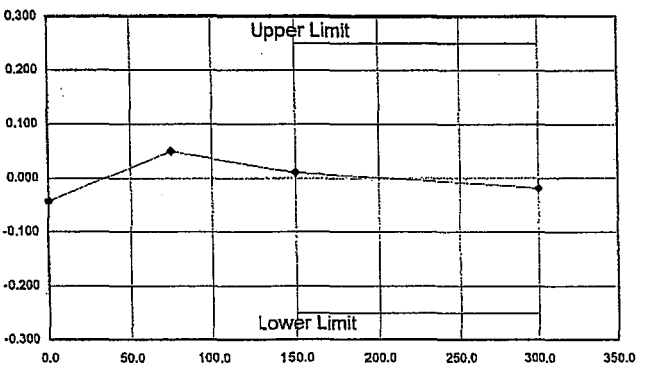
DATE: 12/16/2007 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-0.2	0.2	-0.04
Model Number	F7.5CKEW2/B	207.800000	75.0	75.2	0.2	0.05
Serial Number	1701-1576-7056-1-133 (Piezo)	414.300000	150.0	150.0	0.0	0.01
HGL Instrument Number	pt	827.800000	300.0	299.9	0.1	-0.02
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	12/16/2007					
Date Due	12/15/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999998775					
Intercept (psi)	-0.152094883					
Slope (psi/mv)	0.362513539					
Verification (Calib.) Factor	0.36251354					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.03399576					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.06799152					
Max. Abs. or FS Error (%)	0.05 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0340	N	1.0000	A	0.0340	0.0012	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0340	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.068		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: Input By: Reviewed By: Checked By:

File:

Remarks:

CALIBRATION CERTIFICATE

APPLICANT	FGI HOUSTON	Certificate number	FC070040	Page 1 of 1
SUBMITTED	**A Piezo Cone Penetrometer**	Manufacturer	Fugro Engineers B.V.	
Device type	CONE, A15F2.5CKE3SW2/ B, 50 bar	Serial number	1701-1788	

The device contains an electronic data sheet which contains, amongst others, the characteristics of all the sensors inside the device. The data acquisition system calculates the measured value from these known characteristics. All calibration results are conform the values specified below.

Force calibration

Calibration reference : 548 FRE.001
Procedure : FEBV.CAL.PRO.003 KALIBRATIE KRACHT
Title of channel(s) : Cone and Cone+Fric.
Max. load 150 kN

Range	Calibration range From	to	Sensitivity Deviation	Zero load output
1	0	25 kN	< 0.5 %	< 0.75 kN
Calibration uncertainty			0.3 %	0.008 kN

Pressure test :

Deviation from specified Alpha factor at 2.5 MPa	< 5 %

Cone quality control values :

Max. deviation from reference	< 1 %
Max. Tip to Sleeve friction Crosstalk	< 1 %

Pressure calibration

Calibration reference : 3257-0001
Procedure : FEBV.CAL.PRO.004 KALIBRATIE DRUK
Title of channel : Pore 2
Max. load 30 Mpa

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	2.5 MPa	< 1.0 %	< 0.002 MPa
Calibration uncertainty			0.6 %	0.003 MPa
Pore 2 transducer : Kistler 4043A50 SN : 1233109				

Calibration of the slope sensor

Calibration reference :
Procedure:FEBV.CAL.PRO.006 KALIBRATIE HELLING
Title of channel : Slope x

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	15 deg	< 10 %	< 1.5 deg
Calibration uncertainty			1 %	0.5 deg

Typical values for this type of device

Cone diameter (mm)	43.7	Pore 2 position	2	Alpha factor	0.58
Cone area (square cm)	15	Sleeve length (mm)	144.7	Cone - Sleeve distance (mm)	14.4
Sleeve diameter (mm)	43.9	Sleeve area (square cm)	200	Cone - Pore 2 distance (mm)	6.0

TRACEABILITY. The measurements have been executed using standards for which the traceability to primary and/or (inter)national standards has been demonstrated .

Calibrated by: Hoogendoorn, Raymond

Approved by : Sinjorgo, Gerry

Calibration date: 16-1-2007

Approval date: 16-1-2007

Calibrate before: 16-1-2008

FUGRO ENGINEERS B.V. Veurse

Calibration Verification Certificate

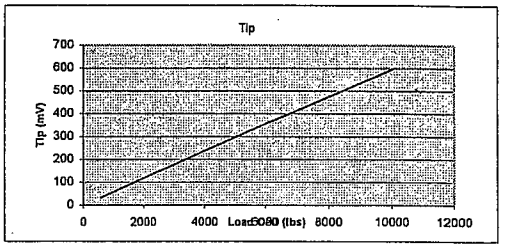
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKESW2/V 1701-1788**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

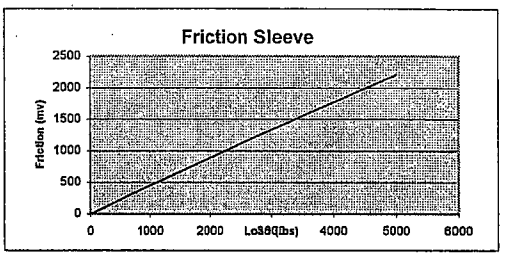
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
540	0.27	16.77019	32.1	50.0287963
5110	2.555	158.6957	303.4	50.0883413
7580	3.79	235.4037	449.8	50.1165401
10020	5.01	311.1801	596.3	49.9728639
15020	7.51	466.4596	892.5	50.0487269
20005	10.0025	621.2733	1183.2	50.2819048



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

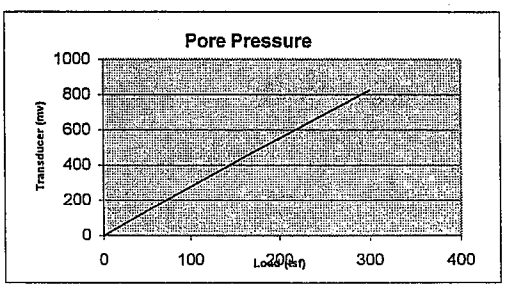
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
620	0.31	1.439851	279.8	0.49278463
1990	0.995	4.621458	884.6	0.50028711
3520	1.76	8.17464	1562.3	0.50106193
5010	2.505	11.63493	2212.2	0.5036473
7510	3.755	17.44078	3308.9	0.50474203



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 1233109
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	206.7	2.50173026
150	10.8	413.6	2.50052053
300	21.6	824.2	2.50962215



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	-0.017	-0.198	-0.109
50	-0.008	-0.336	-0.067
75	0.011	-0.456	-0.054
100	0.132	2.307	-2.192
115	0.257	2.987	-2.647

Deviation	mV	Mpa	% Full Scale
Tip	0.274	0.0137	0.0274
Friction	3.185	0.001593	0.3185
Piezo	2.593	0.006483	0.2593

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 11/5/2007

Checked By : Recep Yilmaz Date: 11/5/2007

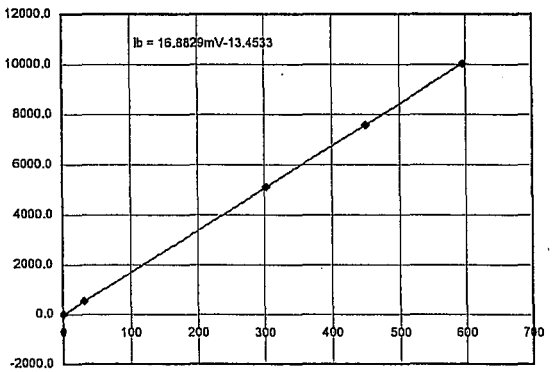
HGL Instrument Verification

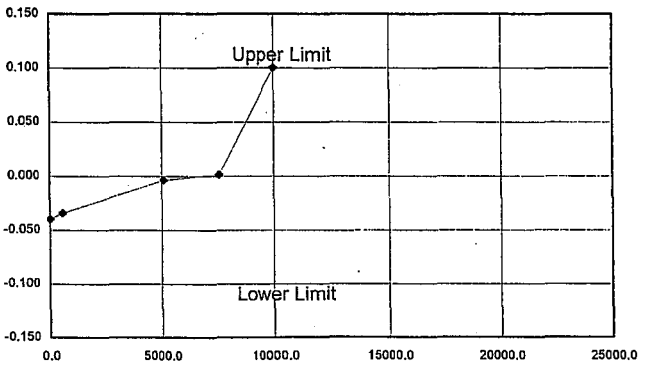
DATE: 11/5/2007 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer_TIP	0.000000	0.0	-13.5	13.5	-0.04
Manufacturer	Fugro	32.100000	540.0	528.5	11.5	-0.03
Model Number	F7.5CKESW2/B1	303.400000	5110.0	5108.8	1.2	0.00
Serial Number	1701-1788 (Tip)	449.800000	7580.0	7580.5	0.5	0.00
HGL Instrument Number	ft	596.300000	10020.0	10053.8	33.8	0.10
Excitation (V)		892.500000	15020.0	15054.5	34.5	0.10
Gain/Span Setting	NA	1183.200000	20005.0	19962.4	42.6	-0.13
Full Range Output (V)						
Full Range/Capacity (lb)	33716					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotac					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999986252					
Intercept (lb)	-13.45326099					
Slope (lb/mV)	16.88287763					
Verification (Calib.) Factor	16.88287763					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	6.479058372					
Coverage Factor	2					
Expanded Uncertainty (lb)	12.95811674					
Max. Abs. or FS Error (%)	-0.13 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	6.4791	N	1.0000	A	6.4791	41.9782	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	6.4791	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		12.958		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

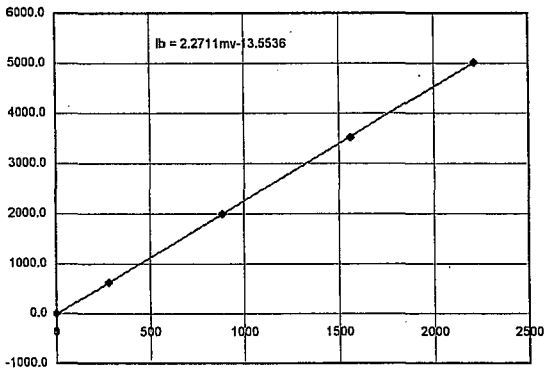
HGL Instrument Verification

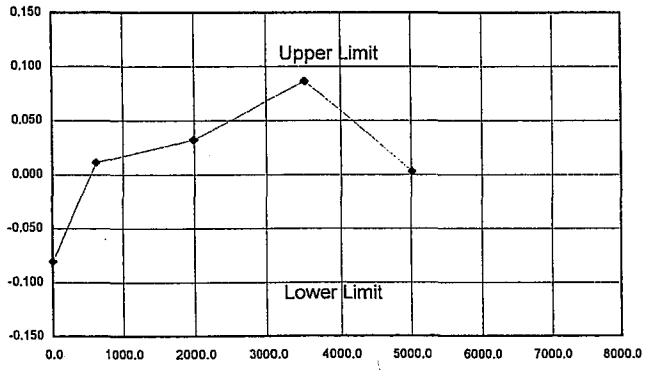
DATE: 11/5/2007 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-13.6	13.6	-0.08
Model Number	F7.5CKESW2/B1	279.800000	620.0	621.9	1.9	0.01
Serial Number	1701-1788 (Friction)	884.600000	1990.0	1995.4	5.4	0.03
HGL Instrument Number	ft100	1562.300000	3520.0	3534.5	14.5	0.09
Excitation (V)		2212.200000	5010.0	5010.5	0.5	0.00
Gain/Span Setting	NA	3308.900000	7510.0	7501.2	8.8	-0.05
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	INTERFACE					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999987431					
Intercept (lb)	-13.55356528					
Slope (lb/mv)	2.271068817					
Verification (Calib.) Factor	2.27106882					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	2.398188297					
Coverage Factor	2					
Expanded Uncertainty (lb)	4.796376595					
Max. Abs. or FS Error (%)	0.09 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	2.3982	N	1.0000	A	2.3982	5.7513	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	2.3982	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		4.796		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: _____ Input By: _____ Reviewed By: _____ Checked By: _____

File: _____

Remarks: _____

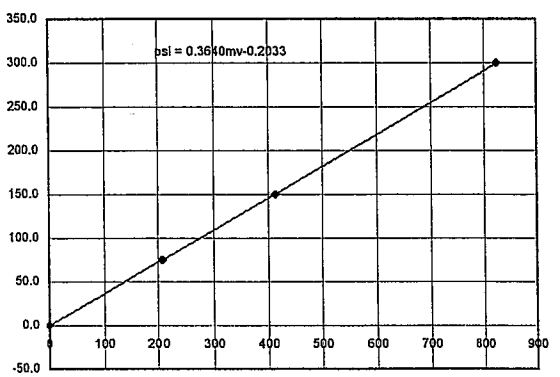
HGL Instrument Verification

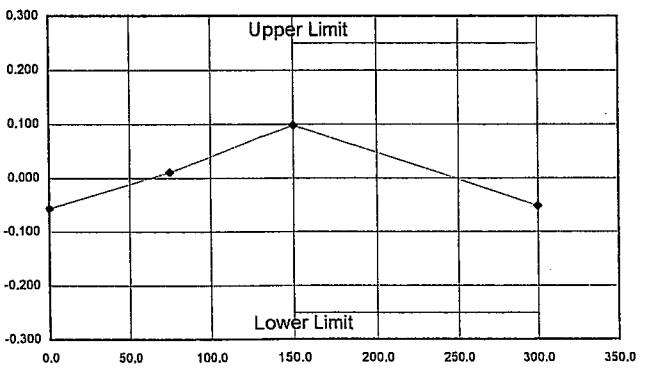
DATE: 11/5/2007 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-0.2	0.2	-0.06
Model Number	F7.5CKESW2/B1	206.700000	75.0	75.0	0.0	0.01
Serial Number	1701-1788-1233109 (Piezo)	413.600000	150.0	150.4	0.4	0.10
HGL Instrument Number	pt	824.200000	300.0	299.8	0.2	-0.05
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.99999592					
Intercept (psi)	-0.20331044					
Slope (psi/mv)	0.364010552					
Verification (Calib.) Factor	0.36401055					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.064150208					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.128300415					
Max. Abs. or FS Error (%)	0.10 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0642	N	1.0000	A	0.0642	0.0041	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0642	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.128		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

CALIBRATION CERTIFICATE

APPLICANT	FGI HOUSTON	Certificate number	FC070494	Page 1 of 1
SUBMITTED	**A Piezo Cone Penetrometer**	Manufacturer	Fugro Engineers B.V.	
Device type	CONE, A15F7.5CKEW2/B, 50 bar (2.5 ton)	Serial number	1701-1831	

The device contains an electronic data sheet which contains, amongst others, the characteristics of all the sensors inside the device. The data acquisition system calculates the measured value from these known characteristics. All calibration results are conform the values specified below.

Force calibration

Calibration reference : 548 FRE.001
Procedure : FEBV.CAL.PRO.003 KALIBRATIE KRACHT
Title of channel(s) : Cone and Cone+Fric.
Max. load 150 kN

Range	Calibration range From	to	Sensitivity Deviation	Zero load output
1	0	25 kN	< 0.5 %	< 0.75 kN
Calibration uncertainty			0.3 %	0.008 kN

Pressure test :

Deviation from specified Alpha factor at 2.5 MPa	< 5 %

Cone quality control values :

Max. deviation from reference	< 1 %
Max. Tip to Sleeve friction Crosstalk	< 1 %

Pressure calibration

Calibration reference : 3257-0001
Procedure : FEBV.CAL.PRO.004 KALIBRATIE DRUK
Title of channel : Pore 2
Max. load 12.5 Mpa

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	2.5 MPa	< 1.0 %	< 0.002 MPa
Calibration uncertainty			0.6 %	0.003 MPa
Pore 2 transducer : Kistler 4043A50 SN : 1233111				

Calibration of the slope sensor

Calibration reference :
Procedure:FEBV.CAL.PRO.006 KALIBRATIE HELLING
Title of channel : Slope x

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	15 deg	< 10 %	< 1.5 deg
Calibration uncertainty			1 %	0.5 deg

Typical values for this type of device

Cone diameter (mm)	43.7	Pore 2 position	2	Alpha factor	0.58
Cone area (square cm)	15	Sleeve length (mm)	144.7	Cone - Sleeve distance (mm)	14.4
Sleeve diameter (mm)	43.9	Sleeve area (square cm)	200	Cone - Pore 2 distance (mm)	6.0

TRACEABILITY The measurements have been executed using standards for which the traceability to primary and/or (inter)national standards has been demonstrated .

Calibrated by: Mouaouya, Mo

Calibration date: 15/05/2007

Calibrate before: 15/05/2008

Approved by : Siniorgo, Gerry

Approval date: 15/05/2007

FUGRO ENGINEERS B.V. * Veurse Achterweg 10 - 2264 SG Leidschendam *

Template : 75CKEW2 Updated : 29/09/2005 3:15:00 PM

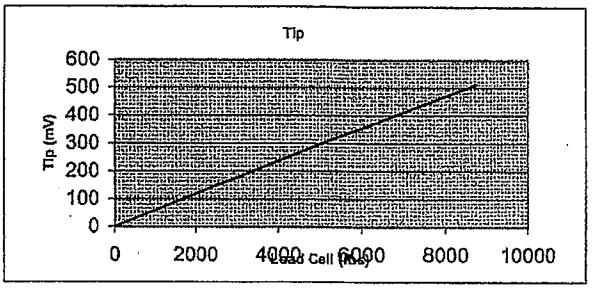
Calibration Verification Certificate

Device Type: Piezo Cone Penetrometer

Device Number: F7.5CKEW2/B1 1701-1831

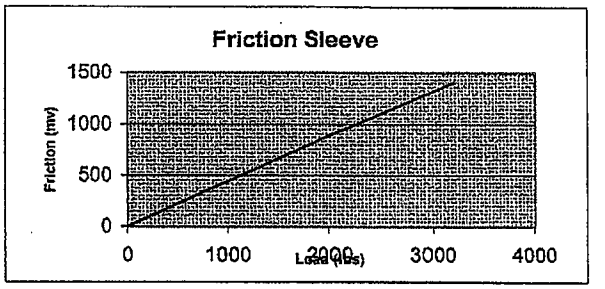
Tip = 15 cm2 = 0.0161 ft2
Tip + Friction (cone readings in mV)

Load lbs	load tons	load tsf	Tip mV	Cal Factor
0	0		0	
600	0.3	18.63354	35.4	52.63712
5000	2.5	155.2795	296.2	52.42387
8750	4.35	270.1863	512.3	52.73987



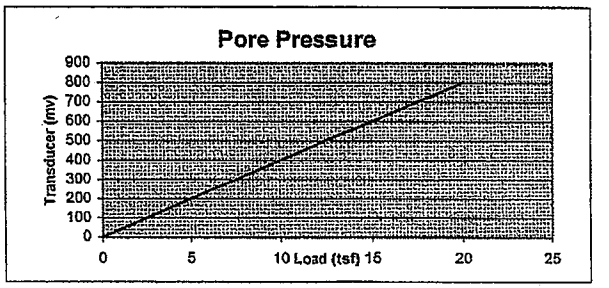
Sleeve = 200 cm2 = 0.2153 ft2
Friction Only (cone readings in mV)

Load lbs	load tons	load tsf	Friction	Cal Factor
0	0	0	0.2	
600	0.3	1.393405	265.4	0.5250
2100	1.05	4.876916	934.3	0.5220
3200	1.6	7.431491	1405.3	0.5288



Pore Pressure Transducer

Pressure (tsf)	Transducer Output (mV)		
0	0	0	
5	5	200.5	2.4938
10	10	401.2	2.4925
20	20	801.6	2.4950



Calibration verified Interface 9820-000-1 Loadcell #113655 For Tip and Friction Calibration
Model #UPS3000CC SERIAL # A0813 for Pore pressure calibration
Loadcell used for calibration verification is traceable to primary standards at NIST and was calibrated by an A2LA accredited Laboratory.

Calibration verified by Dennis Stauffer Date: 10/5/07

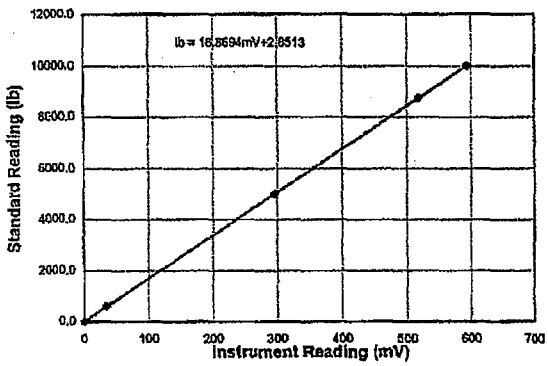
Checked by: Recep Yilmaz Date: 10/5/07

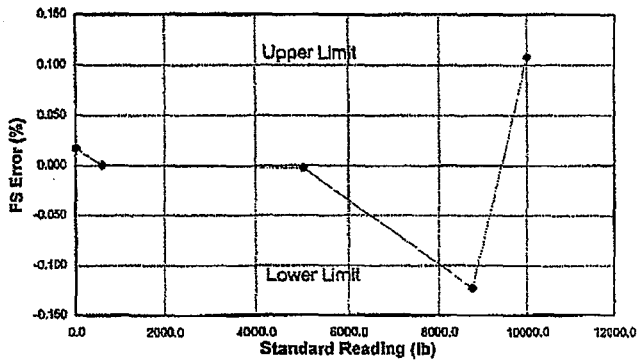
HGL Instrument Verification

DATE: _____ Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer_TIP					
Manufacturer	Fugro	0.000000	0.0	2.9	2.9	0.02
Model Number	F7.5CKEW2/B1	35.400000	600.0	600.0	0.0	0.00
Serial Number	1701-1831	296.200000	5000.0	4999.6	0.4	0.00
HGL Instrument Number	ft	517.300000	8750.0	8729.4	20.6	-0.12
Excitation (V)		593.700000	10000.0	10018.2	18.2	0.11
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified						
Date Due						
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Interface					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999990823					
Intercept (lb)	2.851328541					
Slope (lb/mV)	16.8693632					
Verification (Calib.) Factor	16.86936320					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	4.525449005					
Coverage Factor	2					
Expanded Uncertainty (lb)	9.050898011					
Max. Abs. or FS Error (%)	-0.12 [X] FS; [ ] Abs.			MTS [ ] Yes; [X] No		





Uncertainty Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	4.5254	N	1.0000	A	4.5254	20.4797	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	4.5254	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		9.051		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

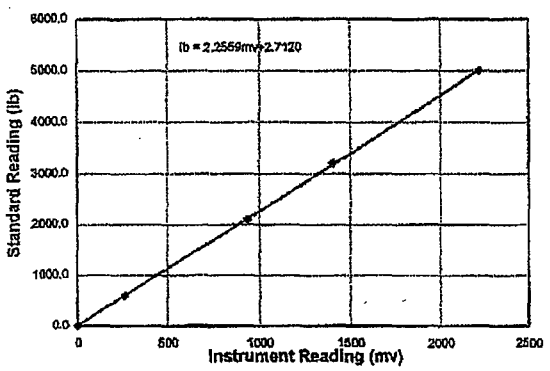
2000.2 (06/14/07) Tip1831.xls, CalData 10/15/2007 FUGRO CONSULTANTS INC

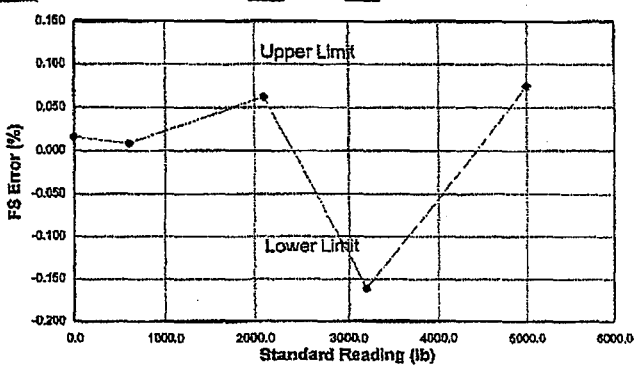
HGL Instrument Verification

DATE: _____ Instrument No.: ft Location: _____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	2.7	2.7	0.02
Model Number	F7.5CKEW2/B1	265.400000	600.0	601.4	1.4	0.01
Serial Number	1701-1831	934.300000	2100.0	2110.4	10.4	0.06
HGL Instrument Number	ft	1405.300000	3200.0	3172.9	27.1	-0.16
Excitation (V)		2220.850000	5000.0	5012.6	12.6	0.07
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified						
Date Due						
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	INTERFACE					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999937691					
Intercept (lb)	2.711953603					
Slope (lb/mv)	2.255859638					
Verification (Calib.) Factor	2.25585984					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	4.602345851					
Coverage Factor	2					
Expanded Uncertainty (lb)	9.204691303					
Max. Abs. or FS Error (%)	-0.16 [X] FS; [ ] Abs.			MTS [ ] Yes; [X] No		





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	4.6023	N	1.0000	A	4.6023	21.1816	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	4.6023	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		9.205		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: _____ Input By: _____ Reviewed By: _____ Checked By: _____

File:

Remarks:

2000.2 (06/14/07) Fric1831.xls, CalData 10/15/2007 FUGRO CONSULTANTS INC

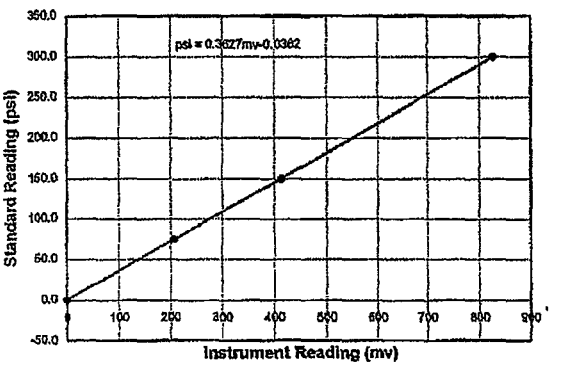
HGL Instrument Verification

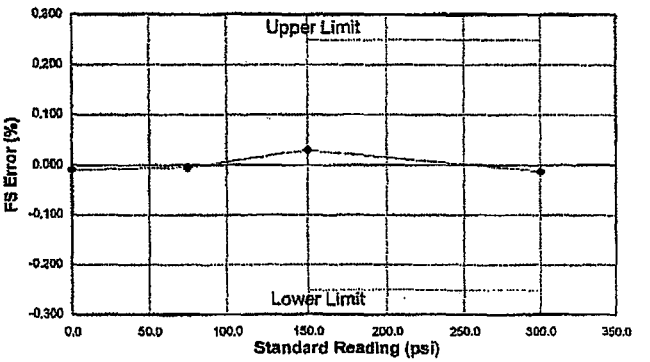
DATE: _____ Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	0.0	0.0	-0.01
Model Number	F7.5CKEW2/B1	206.800000	75.0	75.0	0.0	-0.01
Serial Number	1701-1831-1233111	413.900000	150.0	150.1	0.1	0.03
HGL Instrument Number	pt	827.000000	300.0	300.0	0.0	-0.01
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified						
Date Due						
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999702					
Intercept (psi)	-0.036235332					
Slope (psi/mv)	0.362744313					
Verification (Calib.) Factor	0.36274431					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.018078098					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.036156196					
Max. Abs. or FS Error (%)	0.03 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0181	N	1.0000	A	0.0181	0.0003	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0181	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		0.036		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: SG Input By: _____ Reviewed By: _____ Checked By: RY

File: _____

Remarks: _____

2000.2 (06/14/07) Pore1831.xls, CalData 10/15/2007 FUGRO CONSULTANTS INC

CALIBRATION CERTIFICATE

APPLICANT	FGI HOUSTON	Certificate number	FC070496	Page 1 of 1
SUBMITTED	**A Piezo Cone Penetrometer**	Manufacturer	Fugro Engineers B.V.	
Device type	CONE, A15F7.5CKEW2/B, 50 bar (2,5 ton)	Serial number	1701-1832	

The device contains an electronic data sheet which contains, amongst others, the characteristics of all the sensors inside the device. The data acquisition system calculates the measured value from these known characteristics. All calibration results are conform the values specified below.

Force calibration

Calibration reference : 548 FRE.001
Procedure : FEBV.CAL.PRO.003 KALIBRATIE KRACHT
Title of channel(s) : Cone and Cone+Fric.
Max. load 150 kN

Range	Calibration range From	to	Sensitivity Deviation	Zero load output
1	0	25 kN	< 0.5 %	< 0.75 kN
Calibration uncertainty			0.3 %	0.008 kN

Pressure test :

Deviation from specified Alpha factor at 2.5 MPa	< 5 %

Cone quality control values :

Max. deviation from reference	< 1 %
Max. Tip to Sleeve friction Crosstalk	< 1 %

Pressure calibration

Calibration reference : 3257-0001
Procedure : FEBV.CAL.PRO.004 KALIBRATIE DRUK
Title of channel : Pore 2
Max. load 12.5 Mpa

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	2.5 MPa	< 1.0 %	< 0.002 MPa
Calibration uncertainty			0.6 %	0.003 MPa
Pore 2 transducer : Kistler 4043A50 SN : 1233112				

Calibration of the slope sensor

Calibration reference :
Procedure:FEBV.CAL.PRO.006 KALIBRATIE HELLING
Title of channel : Slope x

Range	Calibration range From		Sensitivity Deviation	Zero load output
1	0	15 deg	< 10 %	< 1.5 deg
Calibration uncertainty			1 %	0.5 deg

Typical values for this type of device

Cone diameter (mm)	43.7	Pore 2 position	2	Alpha factor	0.58
Cone area (square cm)	15	Sleeve length (mm)	144.7	Cone - Sleeve distance (mm)	14.4
Sleeve diameter (mm)	43.9	Sleeve area (square cm)	200	Cone - Pore 2 distance (mm)	6.0

TRACEABILITY The measurements have been executed using standards for which the traceability to primary and/or (inter)national standards has been demonstrated .

Calibrated by: Mouaouya, Mo

Calibration date: 15/05/2007

Calibrate before: 15/05/2008

Approved by : Sinjorgo, Gerry

Approval date: 15/05/2007

FUGRO ENGINEERS B.V. * Veurse Achterweg 10 - 2264 SG Leidschendam *

Calibration Verification Certificate

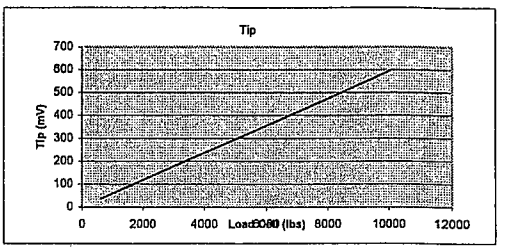
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKEW2/V 1701-1832**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

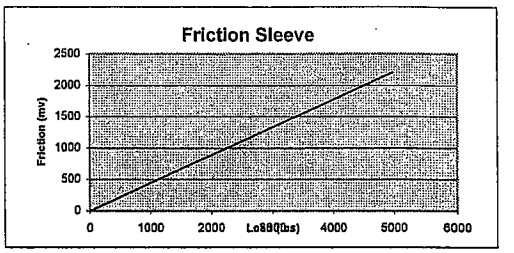
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
610	0.305	18.9441	36.3	49.9751995
5130	2.565	159.3168	304.1	50.1686335
8550	4.275	265.528	506.9	50.1620354
10030	5.015	311.4907	596.4	50.0143495
15040	7.52	467.0807	892.2	50.1322208
20010	10.005	621.4286	1184.4	50.2435152



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

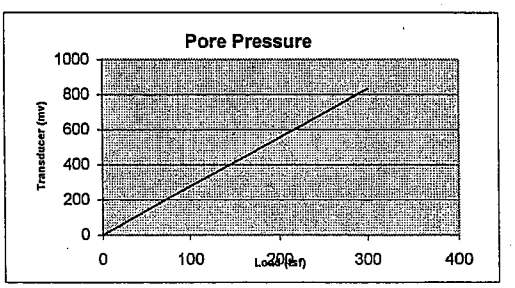
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
630	0.315	1.463075	279.8	0.50073277
1995	0.9975	4.63307	887.6	0.49984894
3350	1.675	7.779842	1488.4	0.50053946
4980	2.49	11.56526	2210	0.50112981
7520	3.76	17.464	3307.8	0.50558219



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 123312
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	209.1	2.473016
150	10.8	413.8	2.49931196
300	21.6	833.8	2.48072749



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	-0.007	0.189	-0.047
50	-0.035	0.203	0.126
75	-0.049	0.291	0.140
100	-0.129	2.804	-2.391
115	-0.249	3.363	-2.932

Deviation	mV	Mpa	% Full Scale
Tip	0.242	0.0121	0.0242
Friction	3.174	0.001587	0.31738
Piezo	3.058	0.007645	0.3058

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 11/5/2007

Checked By : Recep Yilmaz Date: 11/5/2007

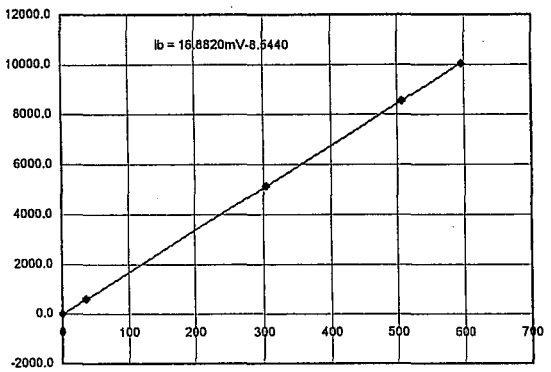
HGL Instrument Verification

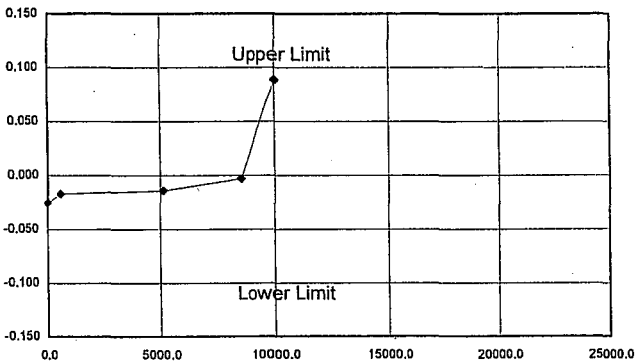
DATE: 11/5/2007 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer_TIP					
Manufacturer	Fugro	0.000000	0.0	-8.5	8.5	-0.03
Model Number	F7.5CKEW2/B1	36.300000	610.0	604.3	5.7	-0.02
Serial Number	1701-1832 (Tip)	304.100000	5130.0	5125.3	4.7	-0.01
HGL Instrument Number	ft	506.900000	8550.0	8549.0	1.0	0.00
Excitation (V)		596.400000	10030.0	10059.9	29.9	0.09
Gain/Span Setting	NA	892.200000	15040.0	15053.6	13.6	0.04
Full Range Output (V)		1184.400000	20010.0	19986.5	23.5	-0.07
Full Range/Capacity (lb)	33716					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotac					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999994562					
Intercept (lb)	-8.544049781					
Slope (lb/mV)	16.88202947					
Verification (Calib.) Factor	16.88202947					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	4.016393928					
Coverage Factor	2					
Expanded Uncertainty (lb)	8.032787857					
Max. Abs. or FS Error (%)	0.09 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	4.0164	N	1.0000	A	4.0164	16.1314	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	4.0164	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		8.033		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

HGL Instrument Verification

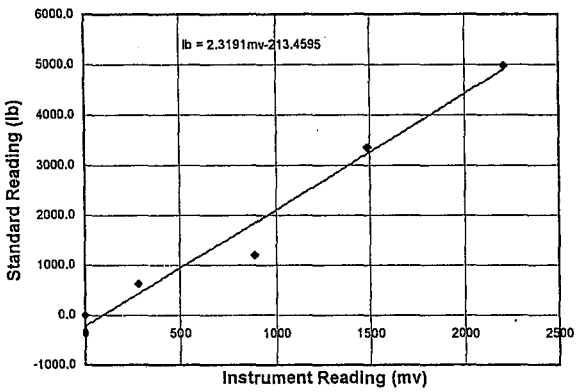
DATE: 11/5/2007 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

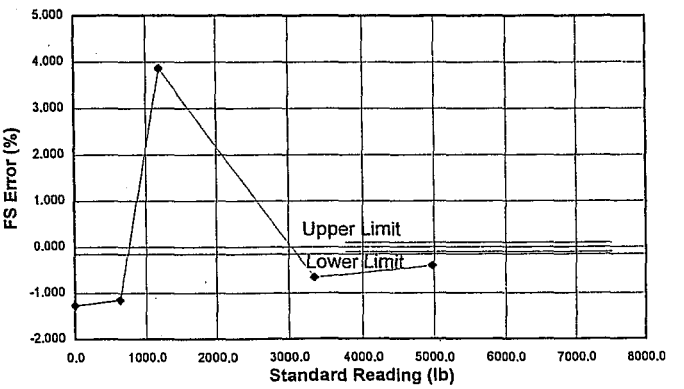
Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data	
Type	Cone Penetrometer
Manufacturer	Fugro
Model Number	F7.5CKEW2/B1
Serial Number	1701-1832 (Friction)
HGL Instrument Number	ft100
Excitation (V)	
Gain/Span Setting	NA
Full Range Output (V)	
Full Range/Capacity (lb)	16858
Date Verified	11/5/2007
Date Due	11/4/2008
Service Status	In Service
Accept. Abs. or FS Error (%)	0.1 X FS; Abs.
Verification/Standard Equipment	
Type	Load Cell (A2AL APPROVED)
Manufacturer	INTERFACE
Model Number	1211EX-10K-B
Serial Number	113655
HGL Instrument Number	
Date Verified	
Temperature	°C = °F
Linear Regression, Uncertainty, & Error Summary	
Correlation Coeff. (R^2)	0.98755242
Intercept (lb)	-213.4594712
Slope (lb/mv)	2.319144175
Verification (Calib.) Factor	2.31914417
Verification Factor Units	lb/mv
Absolute Zero (V)	
Floating Zero (V)	
Combined Uncertainty (lb)	90.41311646
Coverage Factor	2
Expanded Uncertainty (lb)	180.8262329
Max. Abs. or FS Error (%)	3.86 X FS; Abs.

Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
0.000000	0.0	-213.5	213.5	-1.27
279.800000	630.0	435.4	194.6	-1.15
887.600000	1195.0	1845.0	650.0	3.86
1488.400000	3350.0	3238.4	111.6	-0.66
2210.000000	4980.0	4911.8	68.2	-0.40
3307.800000	7520.0	7457.8	62.2	-0.37

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	90.4131	N	1.0000	A	90.4131	8,174.5316	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	90.4131	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		180.826		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: _____ Input By: _____ Reviewed By: _____ Checked By: _____

File: _____

Remarks: _____

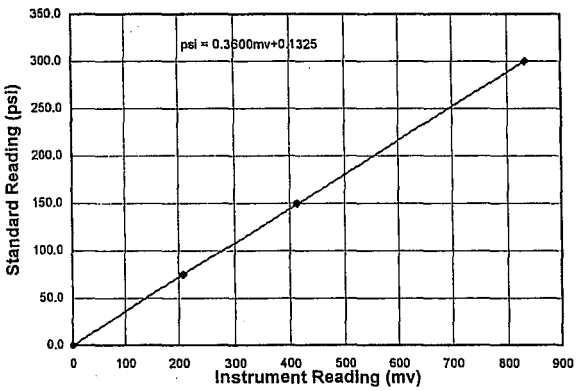
HGL Instrument Verification

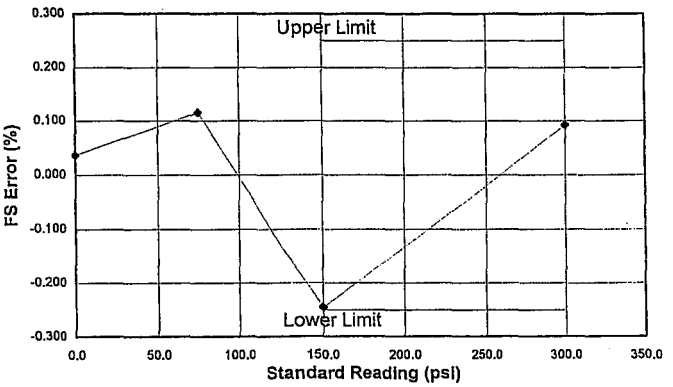
DATE: 11/5/2007 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	0.1	0.1	0.04
Model Number	F7.5CKEW2/B1	209.100000	75.0	75.4	0.4	0.12
Serial Number	1701-1832-123312 (Piezo)	413.800000	150.0	149.1	0.9	-0.25
HGL Instrument Number	pt	833.800000	300.0	300.3	0.3	0.09
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	11/5/2007					
Date Due	11/4/2008					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 X FS; Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999978009					
Intercept (psi)	0.132500696					
Slope (psi/mv)	0.360039814					
Verification (Calib.) Factor	0.36003981					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.158811828					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.317623656					
Max. Abs. or FS Error (%)	-0.25 X FS; Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.1588	N	1.0000	A	0.1588	0.0252	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.1588	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.318		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

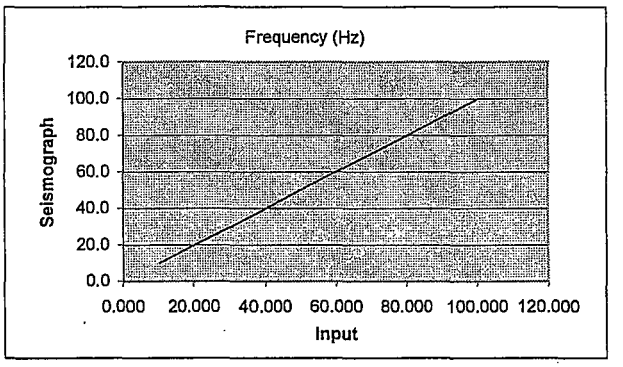
Calibration Verification Certificate

Device Type: **Seismograph**

Device Manufacturer **Geometrics, Inc.**
Model Number: **ES-3000**
Serial Number: **5138**

Frequency (Hz)

Input	Seismograph
10.059	10.0
20.042	19.8
30.061	29.5
40.042	40.1
50.056	50.3
60.050	60.3
70.050	70.2
80.002	80.0
90.080	90.0
100.002	99.7

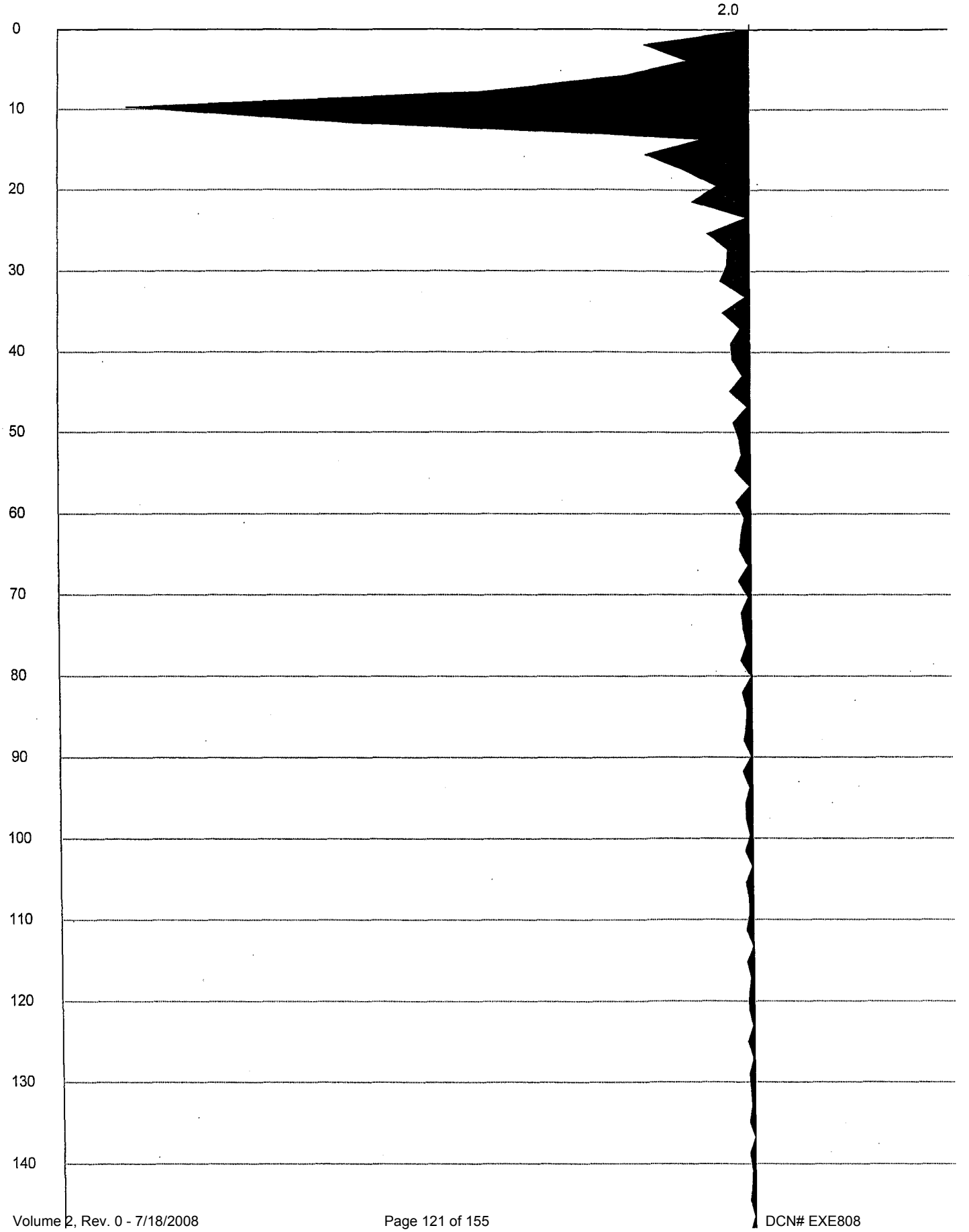


FREQUENCY CALIBRATED BY INSTEK GOOD WILL INSTRUMENTS (A2LA APPROVED) FREQUENCY COUNTER :
Model: GFC-80101H, Serial No. CF871549
FREQUENCY GENERATED BY EZ DIGITAL, INC (A2LA APPROVED) OSCILLISCOPE WITH BUILT IN FUNCTION GENERATOR
Model: OS-5020G, Serial No.: 3080209

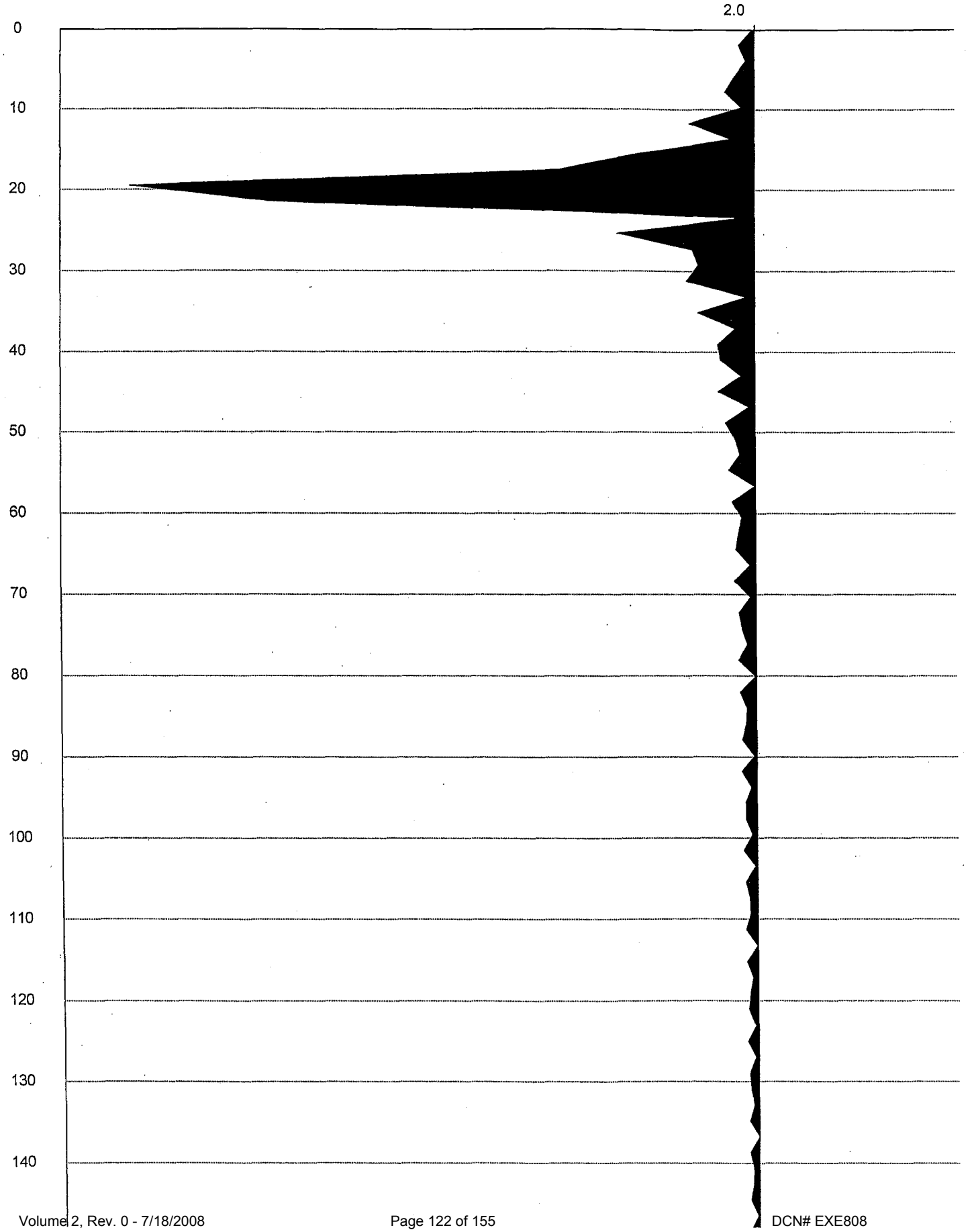
Calibration Verified by: Dennis Stauffer DS Date: 10/5/2007

Checked By : Recep Yilmaz RY Date: 10/5/2007

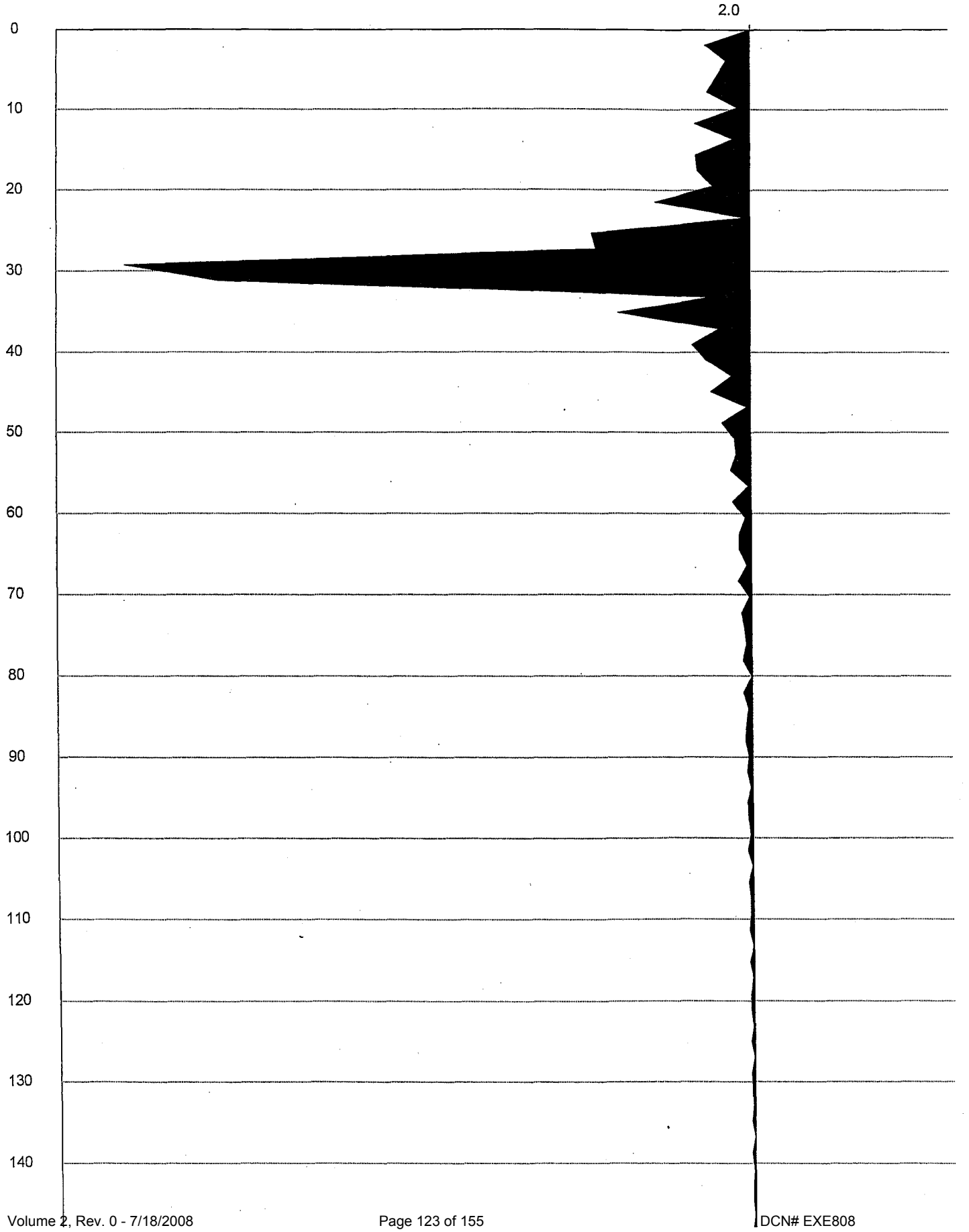
Geometrics ES-3000 S/N 5138
Frequency (Hz) In: 10.059 Seismograph: 10.0 11/02/2007



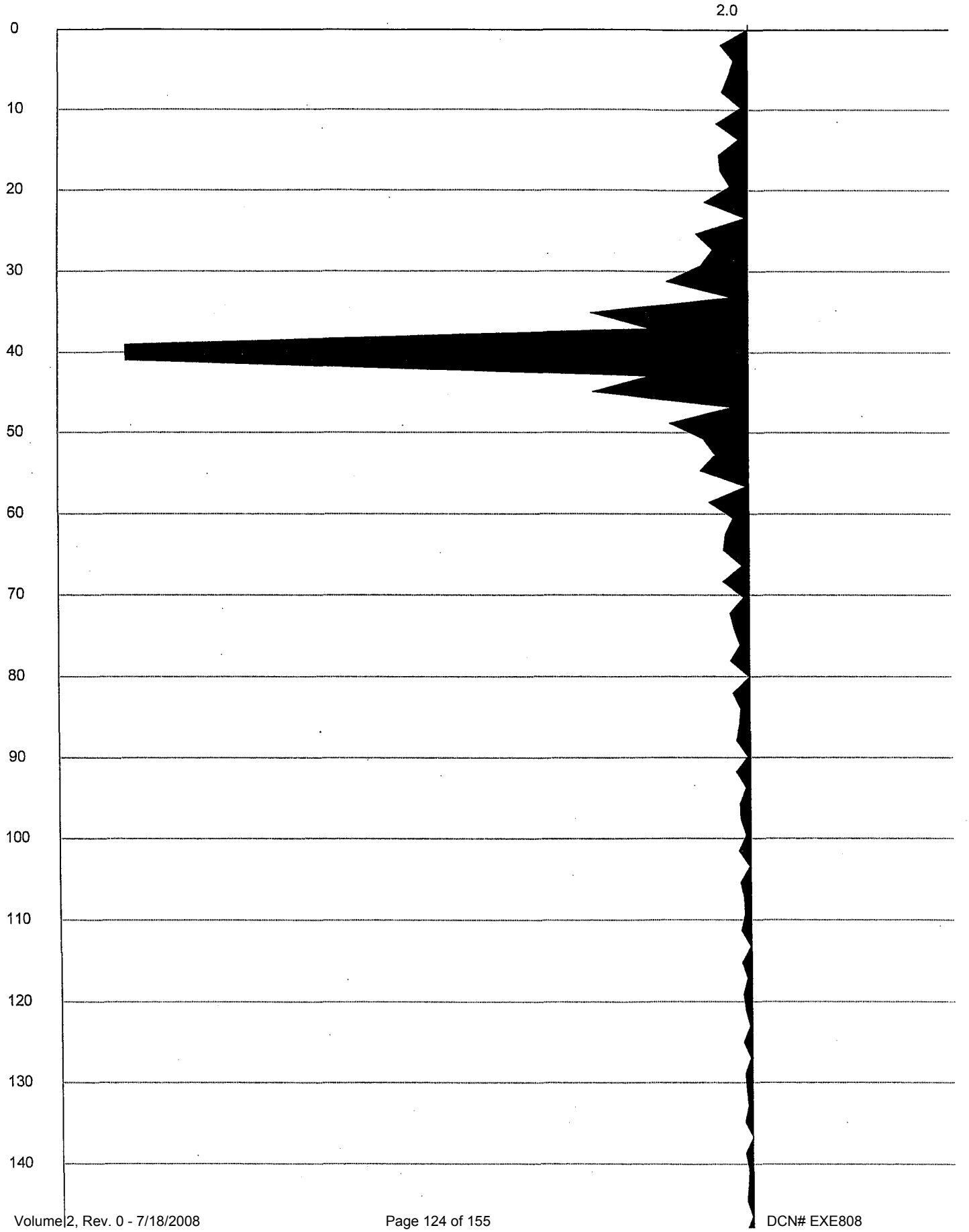
Geometrics ES-3000 S/N 5138
Frequency (hz) IN: 20.042 Seismograph: 19.8
11/02/2007



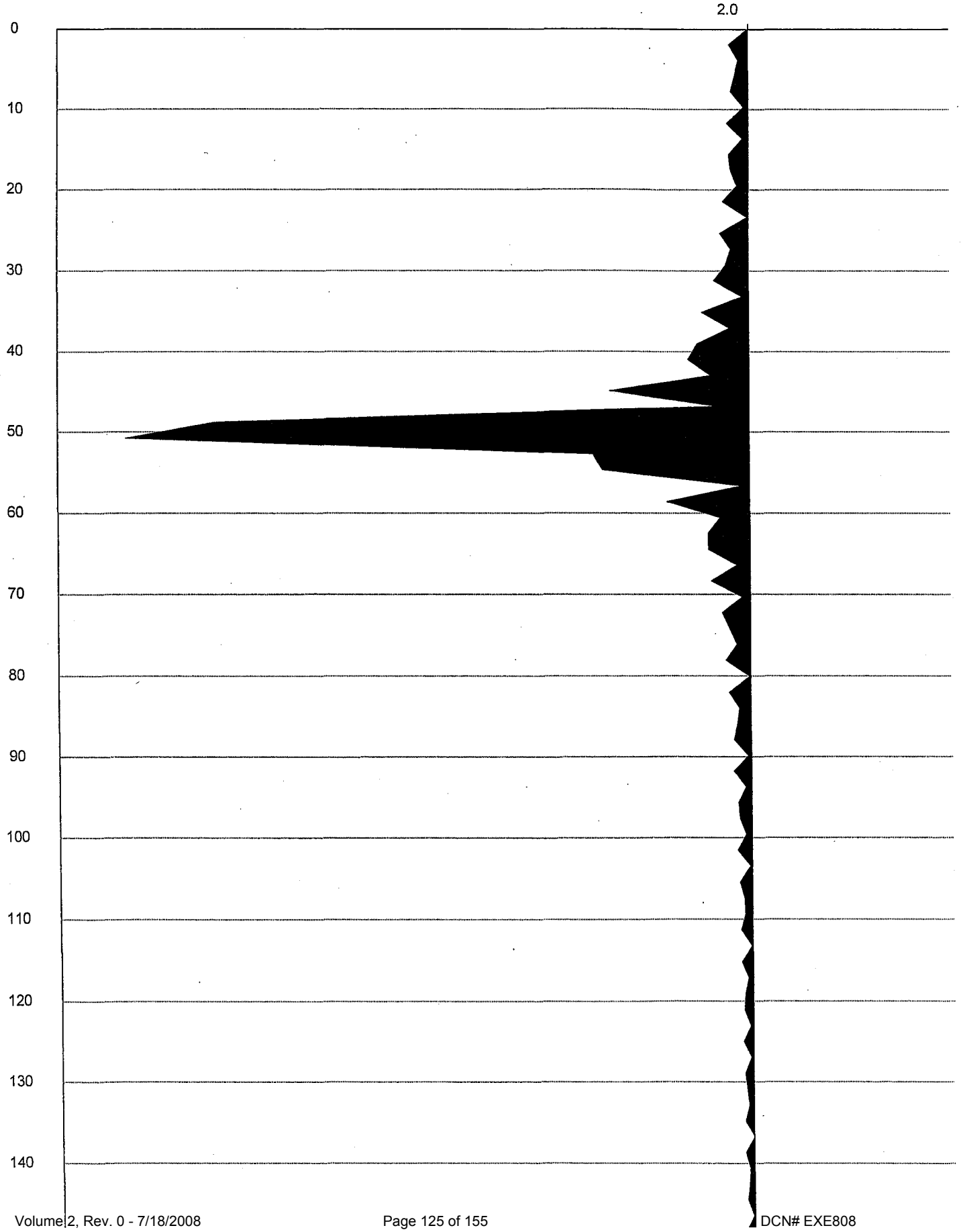
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 30.061 Seismograph: 29.5
11/02/2007



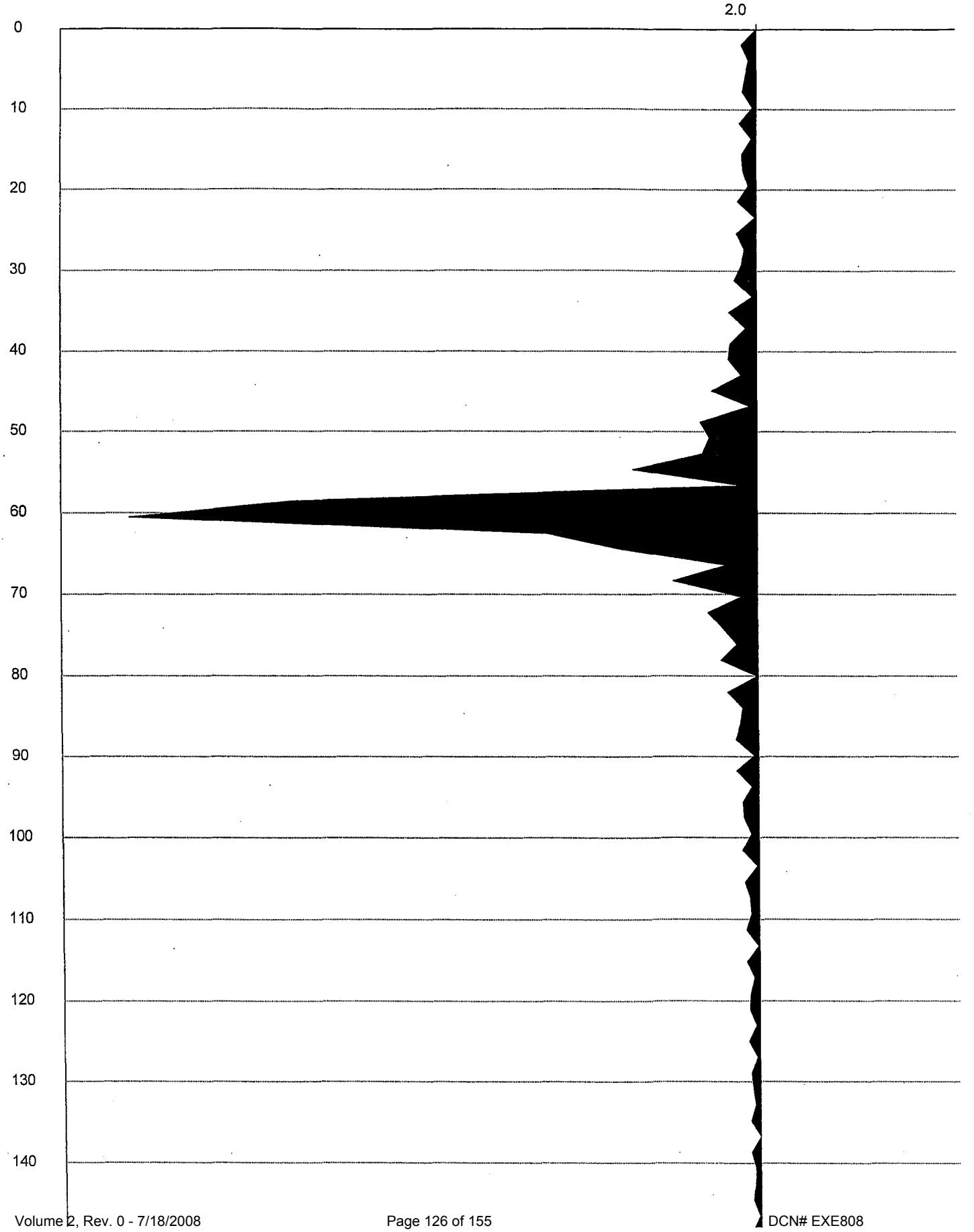
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 40.042 Seismograph: 40.1
11/02/2007



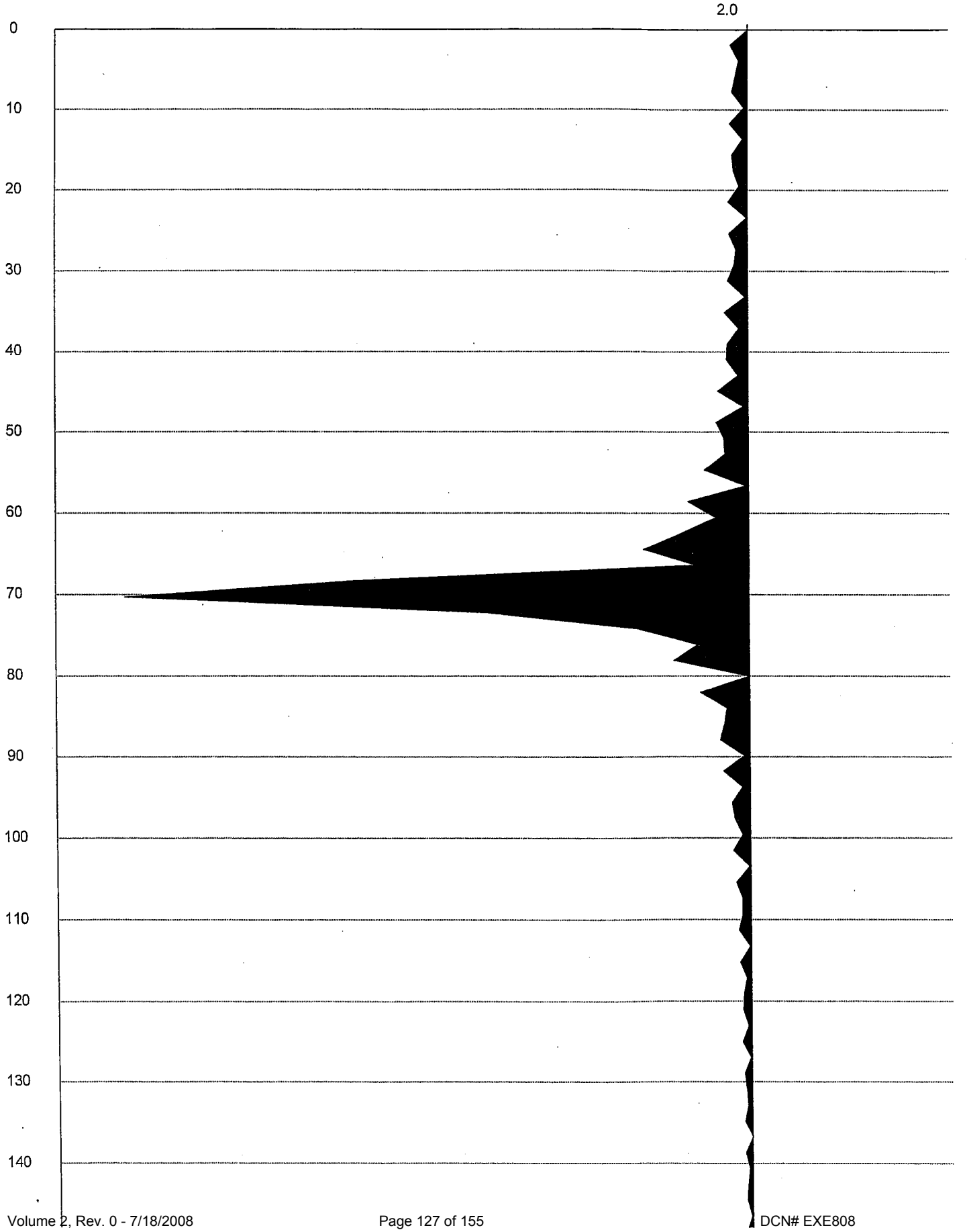
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 50.056 Seismograph: 50.3
11/02/2007



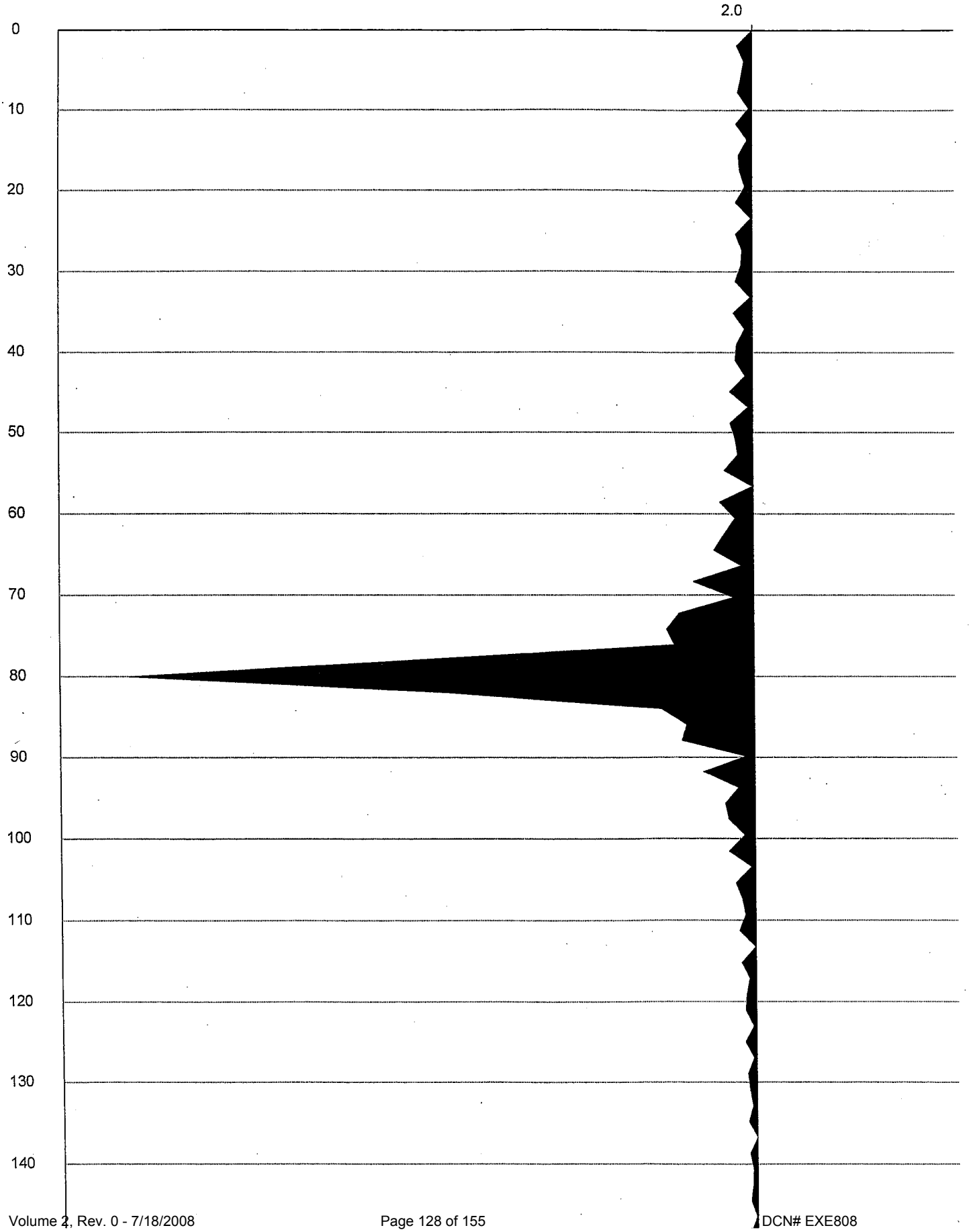
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 60.050 Seismograph: 60.3
11/02/2007



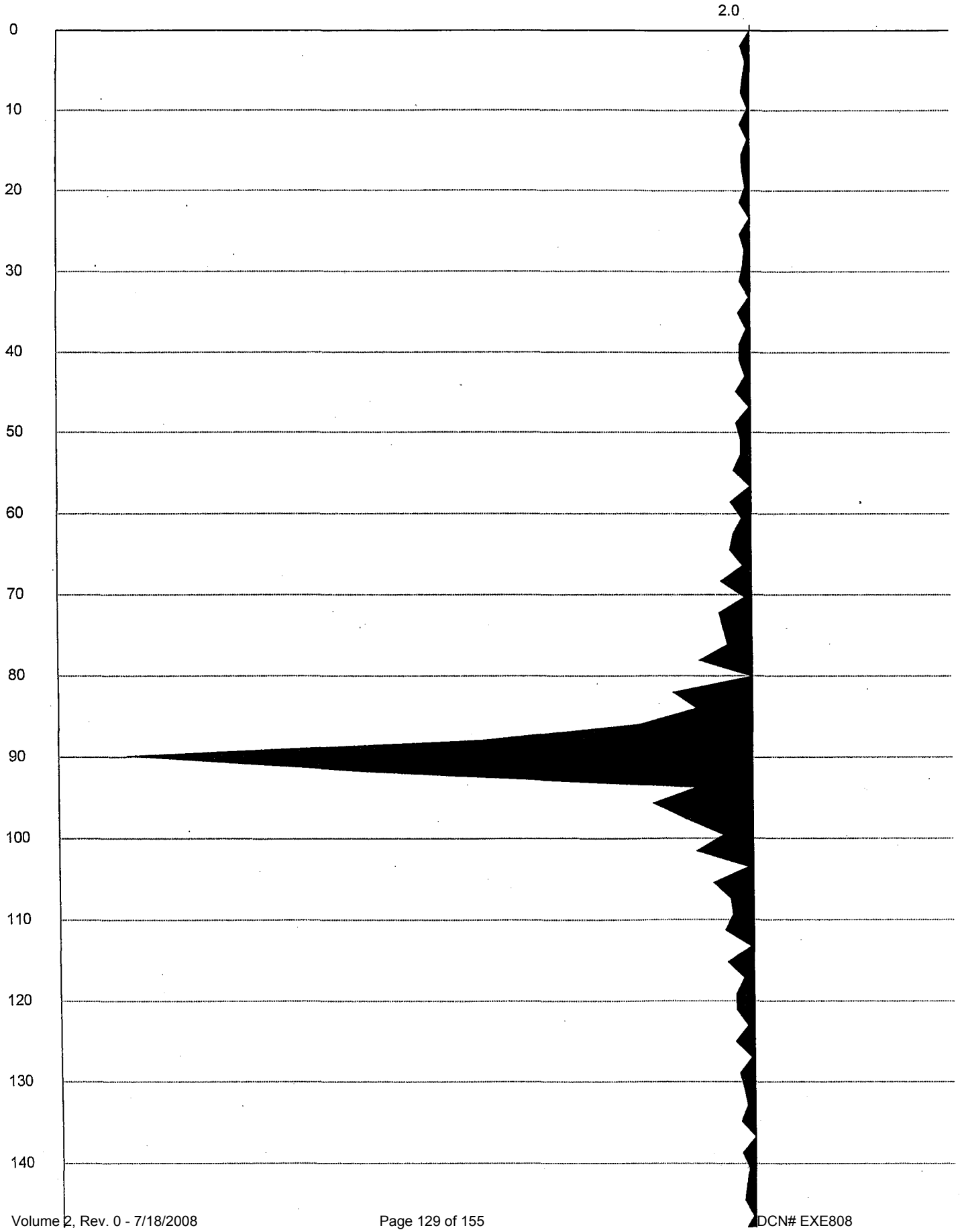
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 70.050 Seismograph: 70.2
11/02/2007



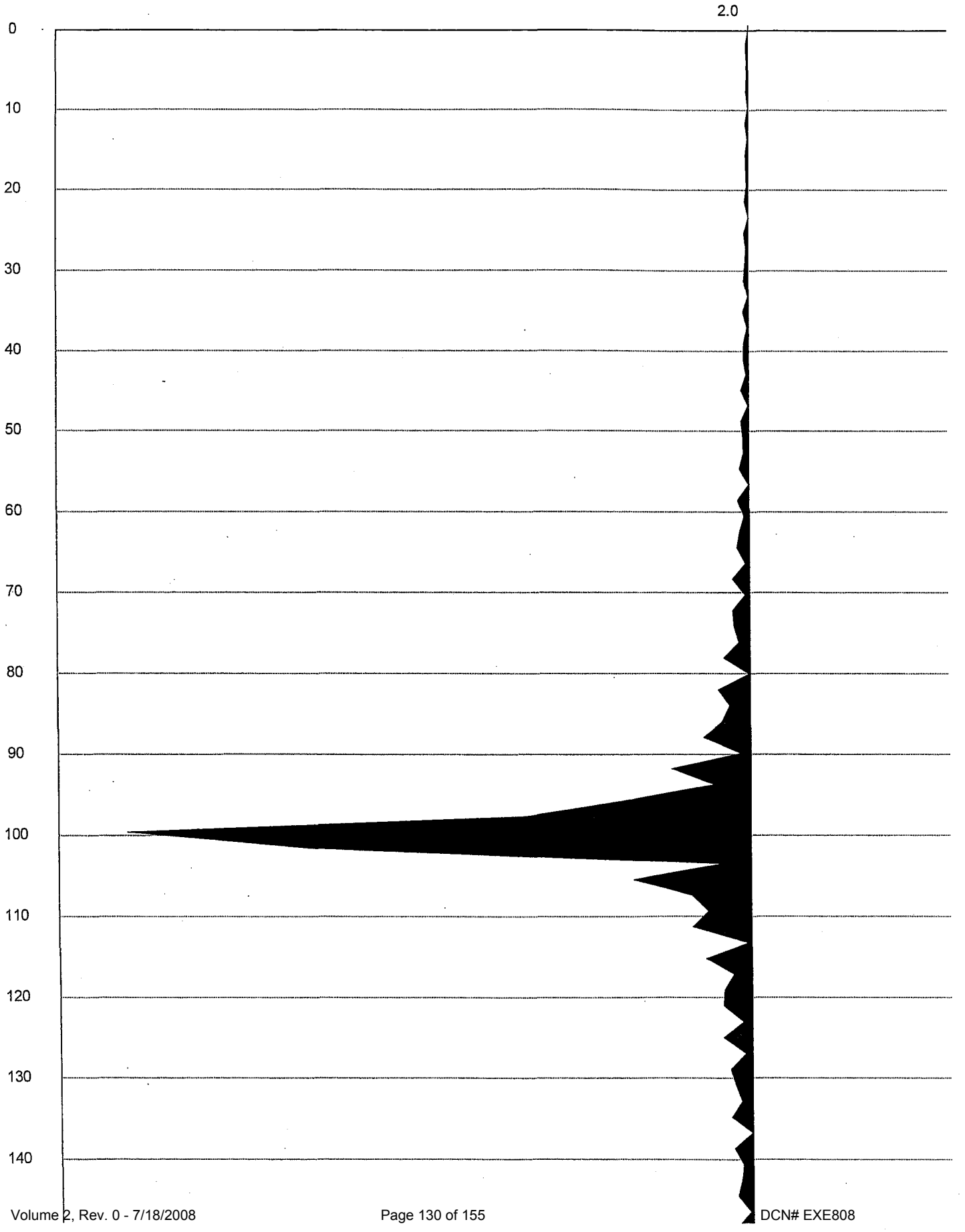
Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 80.002 Seismograph: 80.0
11/02/2007



Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 90.080 Seismograph: 90.0
11/02/2007



Geometrics ES-3000 S/N 5138
Frequency (Hz) IN: 100.002 Seismograph: 99.7
11/02/2007



POST JOB CALIBRATION VERIFICATION

Calibration Verification Certificate

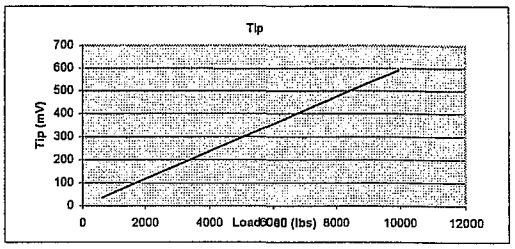
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKEW2/B 1701-1498**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

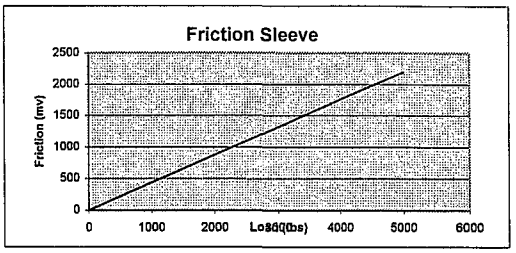
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
605	0.3025	18.78882	35.7	50.3986015
5080	2.54	157.764	301.2	50.1579839
7520	3.76	233.5404	446.7	50.0648841
9960	4.98	309.3168	591.2	50.1021358
15150	7.575	470.4969	899.3	50.1001892
20040	10.02	622.3602	1190.2	50.0736325



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

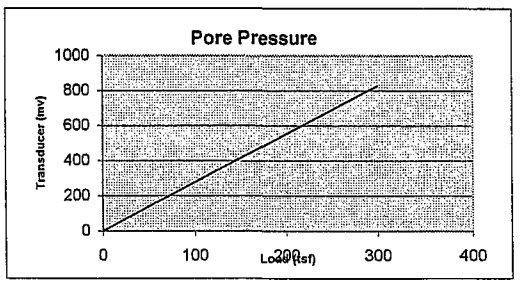
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
480	0.24	1.114724	211.7	0.50423566
2530	1.265	5.875523	1112.8	0.50561107
3610	1.805	8.383651	1586.7	0.50597092
5005	2.5025	11.62332	2197.3	0.50655651
7480	3.74	17.37111	3287.4	0.50601364



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 7056-1-133
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	206.9	2.49931196
150	10.8	415.2	2.49088461
300	21.6	827.5	2.49961399



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	1.623	1.032	-0.397
50	1.680	1.128	-0.946
75	1.728	1.331	-1.147
100	1.901	1.507	1.473
115	1.943	2.174	3.319

Deviation	mV	Mpa	% Full Scale
Tip	0.338	0.0169	0.0338
Friction	1.694	0.000847	0.1694
Piezo	5.714	0.014285	0.5714

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 1/22/2008

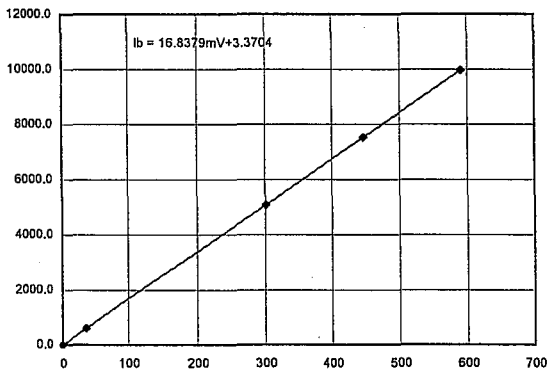
Checked By : Recep Yilmaz Date: 1/22/2008

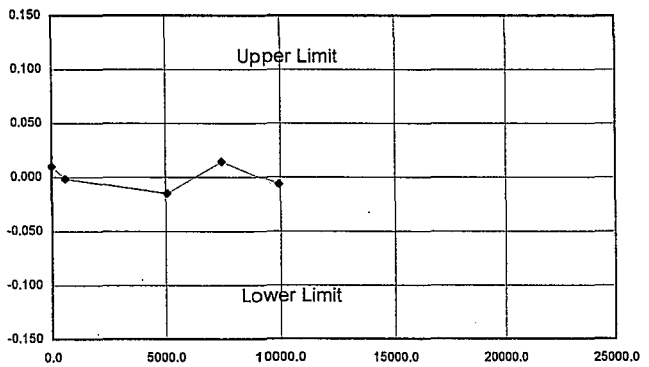
HGL Instrument Verification

DATE: 1/22/2008 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer-TIP					
Manufacturer	Fugro	0.000000	0.0	3.4	3.4	0.01
Model Number	F7.5CKE3SW2/B	35.700000	605.0	604.5	0.5	0.00
Serial Number	1701-1498(Tip)	301.200000	5080.0	5074.9	5.1	-0.02
HGL Instrument Number	ft	446.700000	7520.0	7524.8	4.8	0.01
Excitation (V)		591.200000	9960.0	9957.9	2.1	-0.01
Gain/Span Setting	NA	899.300000	15150.0	15145.7	4.3	-0.01
Full Range Output (V)		1190.200000	20040.0	20043.8	3.8	0.01
Full Range/Capacity (lb)	33716					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotak					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999699					
Intercept (lb)	3.370369765					
Slope (lb/mV)	16.8378626					
Verification (Calib.) Factor	16.83786260					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	0.6157721					
Coverage Factor	2					
Expanded Uncertainty (lb)	1.2315442					
Max. Abs. or FS Error (%)	-0.02 [X] FS; [ ] Abs.			MTS [ ] Yes; [X] No		





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.6158	N	1.0000	A	0.6158	0.3792	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.6158	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		1.232		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

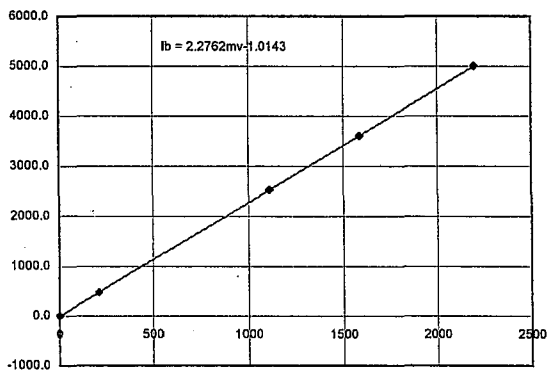
HGL Instrument Verification

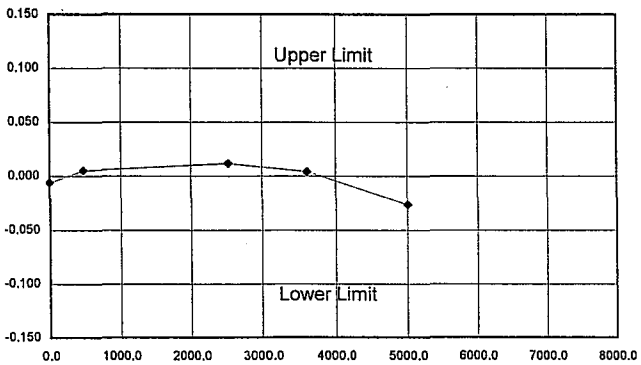
DATE: 1/22/2008 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-1.0	1.0	-0.01
Model Number	F7.5CKEW2/B	211.700000	480.0	480.9	0.9	0.01
Serial Number	1701-1498 (Friction)	1112.800000	2530.0	2532.0	2.0	0.01
HGL Instrument Number	ft100	1586.700000	3610.0	3610.7	0.7	0.00
Excitation (V)		2197.300000	5005.0	5000.6	4.4	-0.03
Gain/Span Setting	NA	3287.400000	7480.0	7481.9	1.9	0.01
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	INTERFACE					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999261					
Intercept (lb)	-1.014317764					
Slope (lb/mv)	2.276240297					
Verification (Calib.) Factor	2.27624030					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	0.567926155					
Coverage Factor	2					
Expanded Uncertainty (lb)	1.13585231					
Max. Abs. or FS Error (%)	-0.03 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.5679	N	1.0000	A	0.5679	0.3225	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.5679	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		1.136		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: _____ Input By: _____ Reviewed By: _____ Checked By: _____

File: _____

Remarks: _____

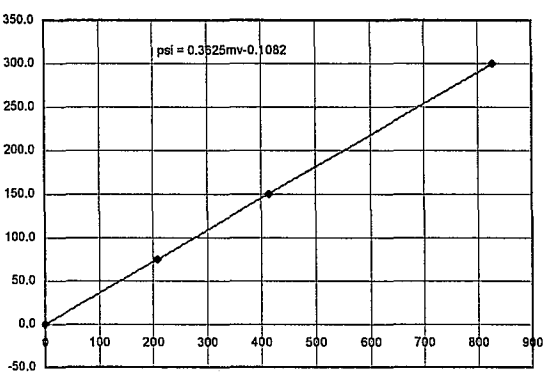
HGL Instrument Verification

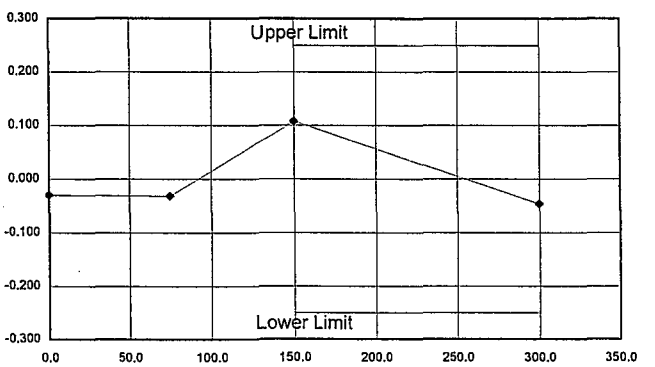
DATE: 1/22/2008 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-0.1	0.1	-0.03
Model Number	F7.5CKEW2/B	206.900000	75.0	74.9	0.1	-0.03
Serial Number	1701-1576-7056-1-133 (Piezo)	415.200000	150.0	150.4	0.4	0.11
HGL Instrument Number	pt	827.500000	300.0	299.8	0.2	-0.05
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999995874					
Intercept (psi)	-0.108198682					
Slope (psi/mv)	0.362467436					
Verification (Calib.) Factor	0.36246744					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.066029689					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.132059378					
Max. Abs. or FS Error (%)	0.11 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0660	N	1.0000	A	0.0660	0.0044	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0660	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		0.132		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: Input By: Reviewed By: Checked By: RY

File:

Remarks:

Calibration Verification Certificate

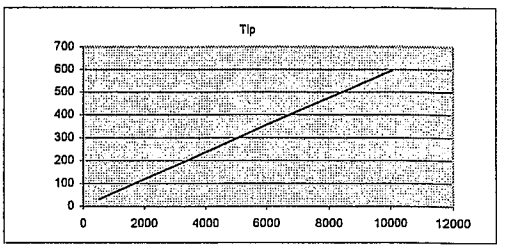
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKESW2/V 1701-1788**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

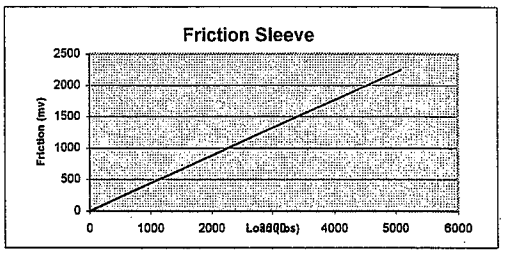
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
510	0.255	15.83851	30.3	50.0563149
4980	2.49	154.6584	295.3	50.1530353
7510	3.755	233.2298	446.3	50.0431198
10040	5.02	311.8012	595.4	50.1482993
14970	7.485	464.9068	889.4	50.0559839
19960	9.98	619.8758	1184.3	50.1222011



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

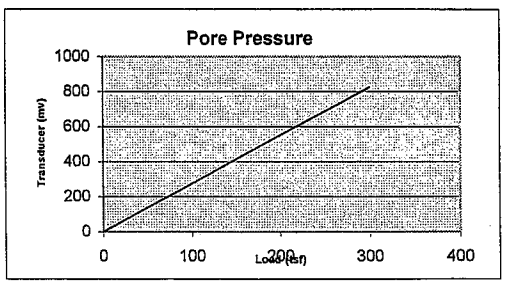
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
550	0.275	1.277288	243.8	0.50169776
2020	1.01	4.691129	890.4	0.50452117
3590	1.795	8.337204	1584.6	0.50383458
5100	2.55	11.84394	2250.7	0.50392481
7480	3.74	17.37111	3295.4	0.50478522



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 1233109
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	206.3	2.50658092
150	10.8	413.5	2.50112525
300	21.6	824.8	2.50779653



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	-0.010	-0.201	-0.098
50	0.002	-0.332	-0.073
75	0.015	-0.392	-0.049
100	0.143	1.978	-2.032
115	0.245	2.658	-2.539

Deviation	mV	Mpa	% Full Scale
Tip	0.255	0.01275	0.0255
Friction	2.859	0.00143	0.2859
Piezo	2.490	0.006225	0.249

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 1/22/2008

Checked By : Recep Yilmaz Date: 1/22/2008

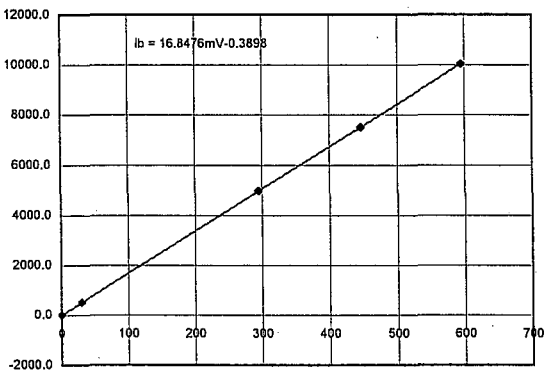
HGL Instrument Verification

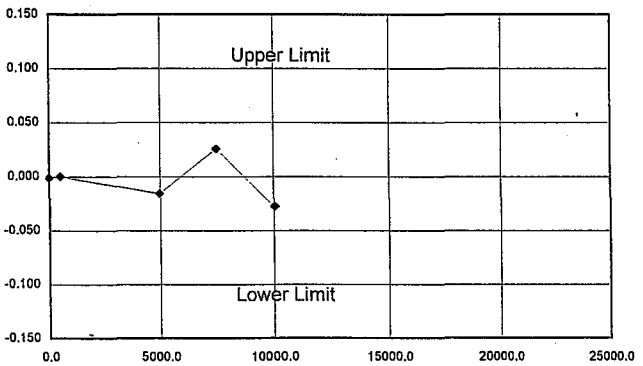
DATE: 1/22/2008 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer_TIP					
Manufacturer	Fugro	0.000000	0.0	-0.4	0.4	0.00
Model Number	F7.5CKESW2/B1	30.300000	510.0	510.1	0.1	0.00
Serial Number	1701-1788 (Tip)	295.300000	4980.0	4974.7	5.3	-0.02
HGL Instrument Number	ft	446.300000	7510.0	7518.7	8.7	0.03
Excitation (V)		595.400000	10040.0	10030.7	9.3	-0.03
Gain/Span Setting	NA	889.400000	14970.0	14983.9	13.9	0.04
Full Range Output (V)		1184.300000	19960.0	19952.3	7.7	-0.02
Full Range/Capacity (lb)	33716					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotac					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999998634					
Intercept (lb)	-0.389801857					
Slope (lb/mV)	16.84763982					
Verification (Calib.) Factor	16.84763982					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	1.882927137					
Coverage Factor	2					
Expanded Uncertainty (lb)	3.765854274					
Max. Abs. or FS Error (%)	0.04 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	1.8829	N	1.0000	A	1.8829	3.5454	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	1.8829	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		3.766		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

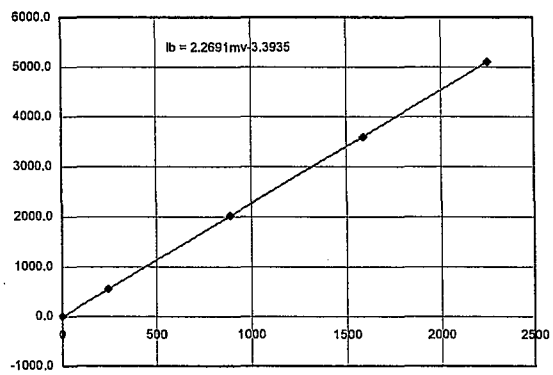
Remarks: _____

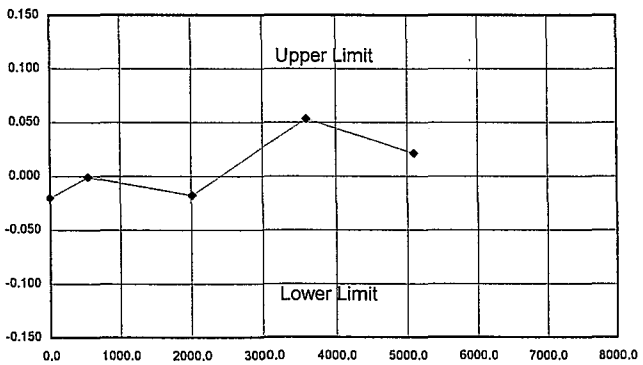
HGL Instrument Verification

DATE: 1/22/2008 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-3.4	3.4	-0.02
Model Number	F7.5CKESW2/B1	243.800000	550.0	549.8	0.2	0.00
Serial Number	1701-1788 (Friction)	890.400000	2020.0	2017.0	3.0	-0.02
HGL Instrument Number	ft100	1587.600000	3590.0	3599.0	9.0	0.05
Excitation (V)		2250.700000	5100.0	5103.6	3.6	0.02
Gain/Span Setting	NA	3295.400000	7480.0	7474.1	5.9	-0.04
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	INTERFACE					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999996337					
Intercept (lb)	-3.393488832					
Slope (lb/mv)	2.269059971					
Verification (Calib.) Factor	2.26905997					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	1.213348951					
Coverage Factor	2					
Expanded Uncertainty (lb)	2.426697903					
Max. Abs. or FS Error (%)	0.05 [X] FS; [ ] Abs.			MTS [ ] Yes; [X] No		





Uncertainity Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	1.2133	N	1.0000	A	1.2133	1.4722	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	1.2133	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		2.427		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: _____ Input By: _____ Reviewed By: _____ Checked By: _____

File: _____

Remarks: _____

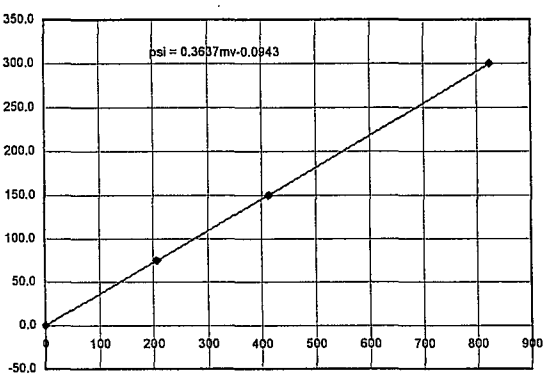
HGL Instrument Verification

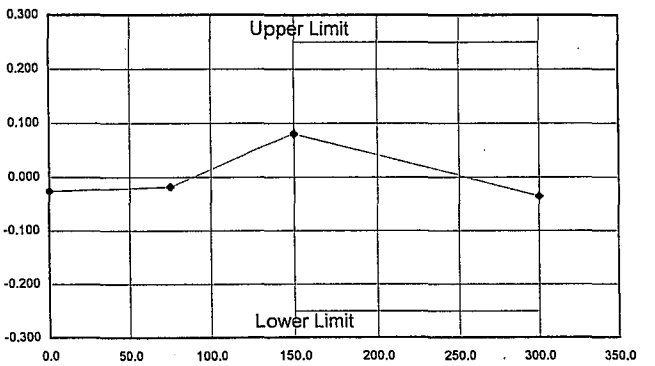
DATE: 1/22/2008 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	-0.1	0.1	-0.03
Model Number	F7.5CKESW2/B1	206.300000	75.0	74.9	0.1	-0.02
Serial Number	1701-1788-1233109 (Piezo)	413.500000	150.0	150.3	0.3	0.08
HGL Instrument Number	pt	824.800000	300.0	299.9	0.1	-0.04
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 X FS; Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999997701					
Intercept (psi)	-0.094255964					
Slope (psi/mv)	0.363683389					
Verification (Calib.) Factor	0.36368339					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.0497694					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.099538799					
Max. Abs. or FS Error (%)	0.08 X FS; Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.0498	N	1.0000	A	0.0498	0.0025	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.0498	Coverage Factor		2		for 95% confidence level.	
Expanded Uncertainty (Best Measurement Capability)[3]		0.100		psi			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

Calibration Verification Certificate

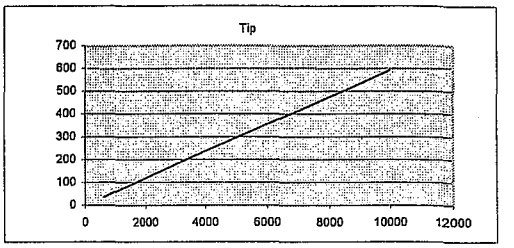
Device Type: Piezo Cone Penetrometer

Device Number: **F7.5CKEW2/V 1701-1832**

TIP CALIBRATION

Tip area = 15 cm2 = 0.0161 ft2
Tip readings in mV

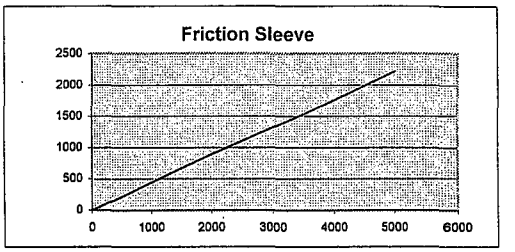
Load lb	Load Tons	load/area tsf	Tip mV	TIP Cal Factor Mpa
0	0	0	0	0
605	0.3025	18.78882	35.9	50.1178293
5200	2.6	161.4907	308.2	50.1766931
8120	4.06	252.1739	481.7	50.1315012
9990	4.995	310.2484	592.8	50.1174101
15100	7.55	468.9441	895.2	50.1635427
19990	9.995	620.8075	1184.6	50.1848225



FRICTION CALIBRATION

Sleeve area = 200 cm2 = 0.2153 ft2
Friction readings in mV

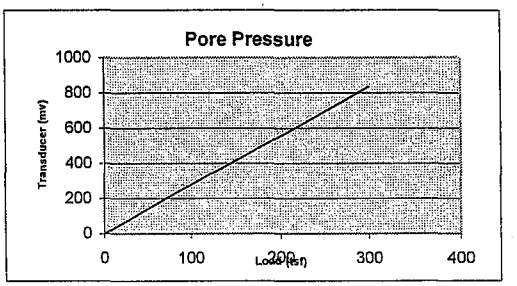
Load lb	Load Tons	load/area tsf	Friction mV	Friction Cal Factor Mpa
0	0	0	0	0
550	0.275	1.277288	243.1	0.50314238
2030	1.015	4.714352	899.6	0.50183363
3540	1.77	8.221087	1552.8	0.50699177
5010	2.505	11.63493	2218.3	0.50226234
7480	3.74	17.37111	3310.2	0.50252831



PORE PRESSURE TRANSDUCER CALIBRATION

Serial : 123312
Pore Pressure readings in mV

Pressure psi	Pressure tsf	Transducer readings mV	P.Pres. Cal Factor Mpa
0	0	0	0
75	5.4	208.9	2.47538365
150	10.8	414.1	2.4975013
300	21.6	834.2	2.47953797



Temperature Calibration (30 - 115 degrees F)

Temp (deg	TIP (mV)	FRIC (mV)	PIEZO (mV)
30	-0.009	0.195	-0.052
50	-0.041	0.207	0.135
75	-0.046	0.284	0.148
100	-0.133	2.812	-2.345
115	-0.247	3.375	-2.883

Deviation	mV	Mpa	% Full Scale
Tip	0.238	0.0119	0.0238
Friction	3.180	0.00159	0.318
Piezo	3.018	0.007545	0.3018

TIP CALIBRATED BY GEOTAC (A2LA APPROVED) LOAD CELL:
Model 560K, Serial No. 129739
FRICTION CALIBRATED BY INTERFACE (A2LA APPROVED) LOAD CELL :
Model: 1211EX-10K-B, Serial : 113655
PORE PRESSURE TRANSDUCER CALIBRATED BY GE SENSING (AANSI/NCSL APPROVED)
Pressure Indicator Model: UPS3000CC, Serial : A0813
TEMPERATURE CALIBRATED BY HOUSTON PRECISION TYPE K THERMOCOUPLE (A2LA APPROVED)
Model # 8528-40, Serial # C95005824, ID # TD-001

Calibration Verified by: Dennis Stauffer Date: 1/22/2008

Checked By : Recep Yilmaz Date: 1/22/2008

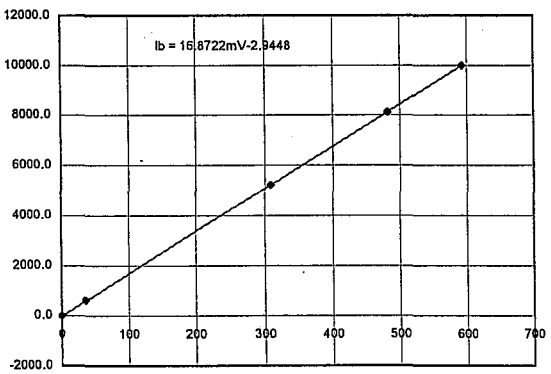
HGL Instrument Verification

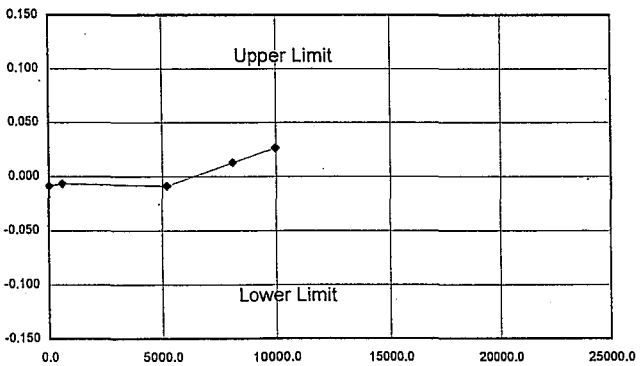
DATE: 1/22/2008 Instrument No.: ft Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mV	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer_TIP					
Manufacturer	Fugro	0.000000	0.0	-2.9	2.9	-0.01
Model Number	F7.5CKEW2/B1	35.900000	605.0	602.8	2.2	-0.01
Serial Number	1701-1832 (Tip)	308.200000	5200.0	5197.1	2.9	-0.01
HGL Instrument Number	ft	481.700000	8120.0	8124.4	4.4	0.01
Excitation (V)		592.800000	9990.0	9998.9	8.9	0.03
Gain/Span Setting	NA	895.200000	15100.0	15101.0	1.0	0.00
Full Range Output (V)		1184.600000	19990.0	19983.8	6.2	-0.02
Full Range/Capacity (lb)	33716					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	Geotac					
Model Number	560K					
Serial Number	129739					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999999507					
Intercept (lb)	-2.944801092					
Slope (lb/mV)	16.87217402					
Verification (Calib.) Factor	16.87217402					
Verification Factor Units	lb/mV					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	1.009640807					
Coverage Factor	2					
Expanded Uncertainty (lb)	2.019281615					
Max. Abs. or FS Error (%)	0.03 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For ft							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	1.0096	N	1.0000	A	1.0096	1.0194	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	1.0096	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		2.019		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

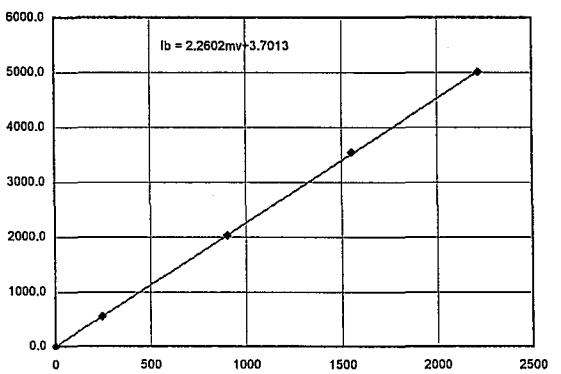
HGL Instrument Verification

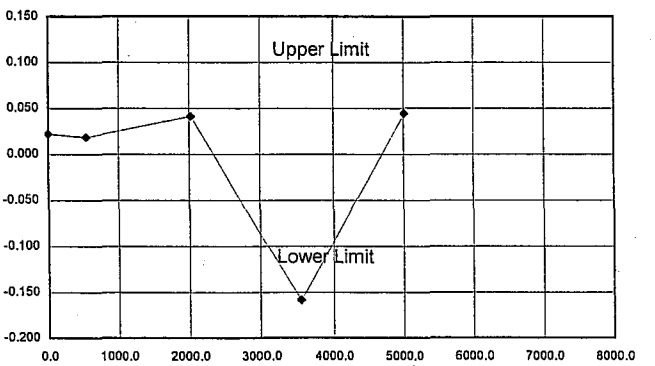
DATE: 1/22/2008 Instrument No.: ft100 Location: _____ LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard lb	Prediction lb	Abs. Error lb	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	3.7	3.7	0.02
Model Number	F7.5CKEW2/B1	243.100000	550.0	553.2	3.2	0.02
Serial Number	1701-1832 (Friction)	899.600000	2030.0	2037.0	7.0	0.04
HGL Instrument Number	ft100	1552.800000	3540.0	3513.3	26.7	-0.16
Excitation (V)		2218.300000	5010.0	5017.5	7.5	0.04
Gain/Span Setting	NA	3310.200000	7480.0	7485.4	5.4	0.03
Full Range Output (V)						
Full Range/Capacity (lb)	16858					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.1 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	Load Cell (A2AL APPROVED)					
Manufacturer	INTERFACE					
Model Number	1211EX-10K-B					
Serial Number	113655					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999978435					
Intercept (lb)	3.70130146					
Slope (lb/mv)	2.260188739					
Verification (Calib.) Factor	2.26018874					
Verification Factor Units	lb/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (lb)	3.62518158					
Coverage Factor	2					
Expanded Uncertainty (lb)	7.25036316					
Max. Abs. or FS Error (%)	-0.16 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainty Budget Analysis For ft100							
Source of Uncertainty	Value in lb	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	3.6252	N	1.0000	A	3.6252	13.1419	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	3.6252	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		7.250		lb			

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File: _____

Remarks: _____

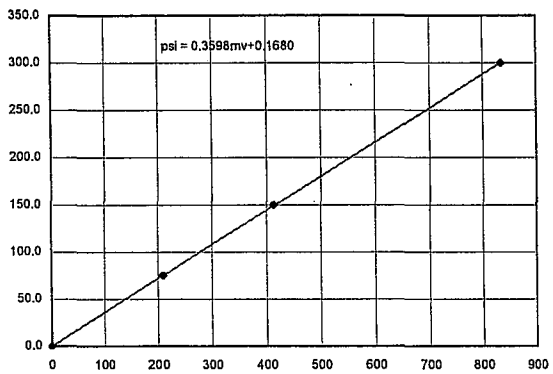
HGL Instrument Verification

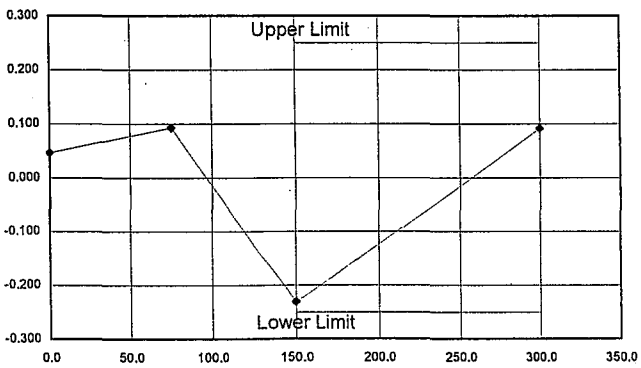
DATE: 1/22/2008 Instrument No.: pt Location: Houston LVDT?: [ ] Yes; [X] No

Type Analysis: [X] BF; [ ] NonBF; [X] FS; [ ] Abs. Reading Resolution of Instrument: 0.000001

Instrument Identification/Data		Instrument mv	Standard psi	Prediction psi	Abs. Error psi	Full Scale Error (%)
Type	Cone Penetrometer					
Manufacturer	Fugro	0.000000	0.0	0.2	0.2	0.05
Model Number	F7.5CKEW2/B1	208.900000	75.0	75.3	0.3	0.09
Serial Number	1701-1832-123312 (Piezo)	414.100000	150.0	149.2	0.8	-0.23
HGL Instrument Number	pt	834.200000	300.0	300.3	0.3	0.09
Excitation (V)						
Gain/Span Setting	NA					
Full Range Output (V)						
Full Range/Capacity (psi)	360					
Date Verified	1/22/2008					
Date Due	1/21/2009					
Service Status	In Service					
Accept. Abs. or FS Error (%)	0.25 [X] FS; [ ] Abs.					
Verification/Standard Equipment						
Type	PT(ANSI/NCSL APPROVED)					
Manufacturer	Eaton					
Model Number	UPS3000CC					
Serial Number	A0813					
HGL Instrument Number						
Date Verified						
Temperature	°C = °F					
Linear Regression, Uncertainty, & Error Summary						
Correlation Coeff. (R^2)	0.999980929					
Intercept (psi)	0.168019664					
Slope (psi/mv)	0.359818777					
Verification (Calib.) Factor	0.35981878					
Verification Factor Units	psi/mv					
Absolute Zero (V)						
Floating Zero (V)						
Combined Uncertainty (psi)	0.143768546					
Coverage Factor	2					
Expanded Uncertainty (psi)	0.287537093					
Max. Abs. or FS Error (%)	-0.23 [X] FS; [ ] Abs.					

MTS [ ] Yes; [X] No





Uncertainity Budget Analysis For pt							
Source of Uncertainty	Value in psi	Distribution	Divisor	Type	Uncertainty (u_i)	u_i^2	Comments
Standard's Uncertainty		N	2.0000	B			
Abs. Error-STDEV[1]	0.1438	N	1.0000	A	0.1438	0.0207	
Resolution of Instrument	0.0000	R	3.4641	B	0.0000	0.0000	
Repeatability[2]		N	1.0000	A			
Resolution of Standard	#N/A	R	3.4641	B			
Combined Uncertainty	0.1438	Coverage Factor		2	for 95% confidence level.		
Expanded Uncertainty (Best Measurement Capability)[3]		0.288	psi				

(1) This equation follows the approach presented by A2LA, not that typically used in uncertainty calculations; i.e., STDEV of the Mean. (2) This value is unique for type (model) of equipment.

(3) This uncertainty represents an expanded uncertainty expressed as approximately the 95% confidence level using a coverage factor of k=2.

Verified By: [signature] Input By: _____ Reviewed By: _____ Checked By: [signature]

File:

Remarks:

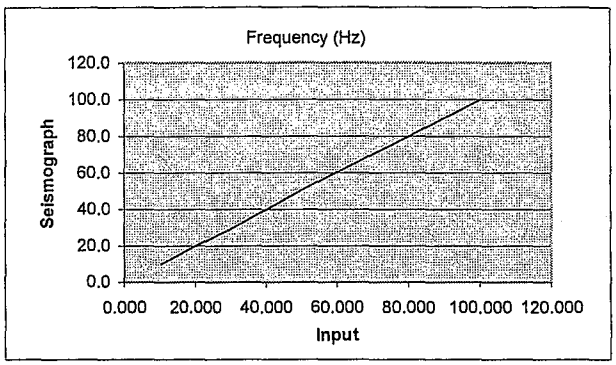
Calibration Verification Certificate

Device Type: **Seismograph**

Device Manufacturer **Geometrics, Inc.**
Model Number: **ES-3000**
Serial Number: **5138**

Frequency (Hz)

Input	Seismograph
10.055	9.9
20.037	19.9
30.071	29.3
40.040	40.1
50.061	50.6
60.048	60.3
70.005	70.2
80.011	79.9
90.090	90.1
100.014	99.8

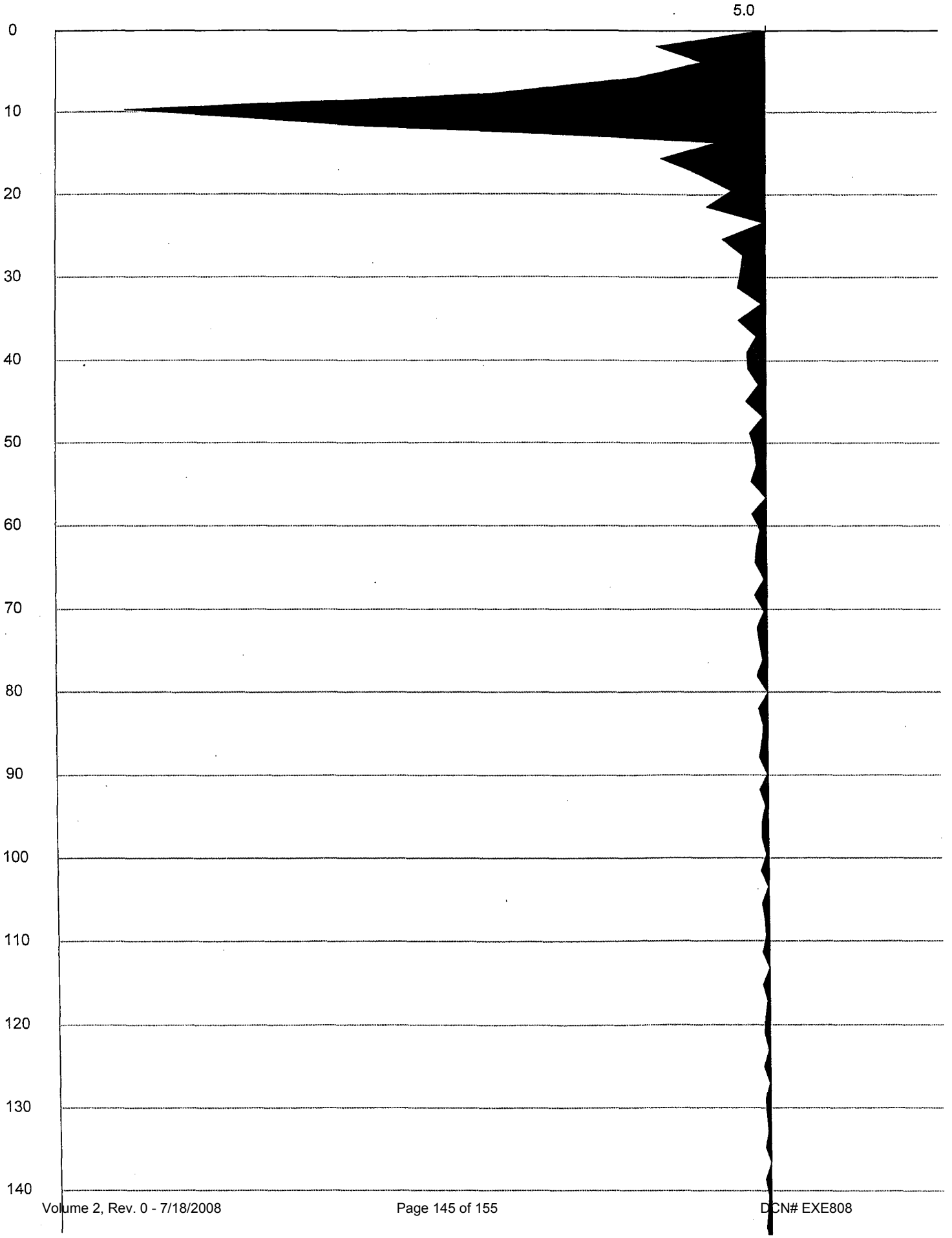


FREQUENCY CALIBRATED BY INSTEK GOOD WILL INSTRUMENTS (A2LA APPROVED) FREQUENCY COUNTER :
Model: GFC-80101H, Serial No. CF871549
FREQUENCY GENERATED BY EZ DIGITAL, INC (A2LA APPROVED) OSCILLISCOPE WITH BUILT IN FUNCTION GENERATOR
Model: OS-5020G, Serial No.: 3080209

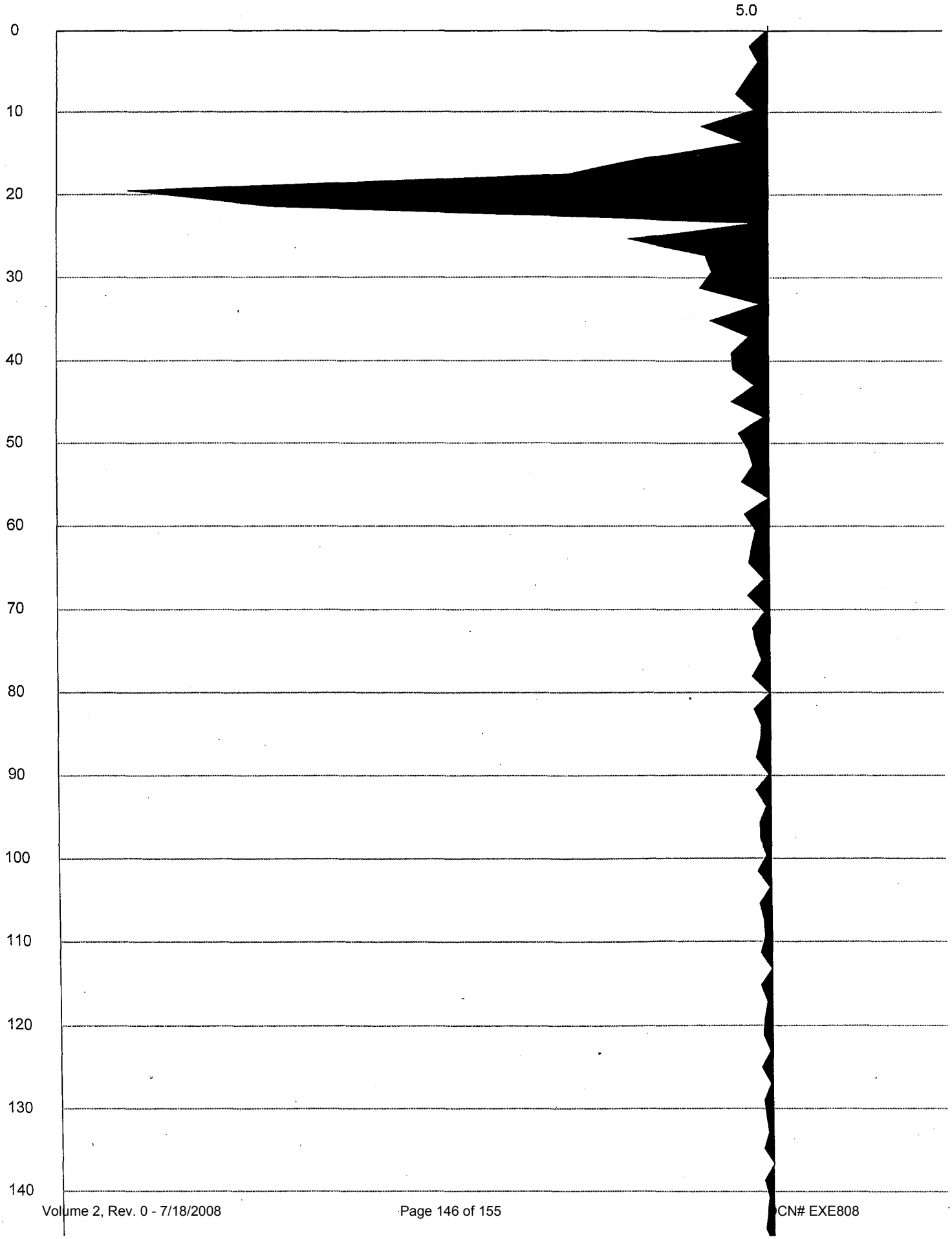
Calibration Verified by: Dennis Stauffer Date: 1/22/2008

Checked By : Recep Yilmaz Date: 1/22/2008

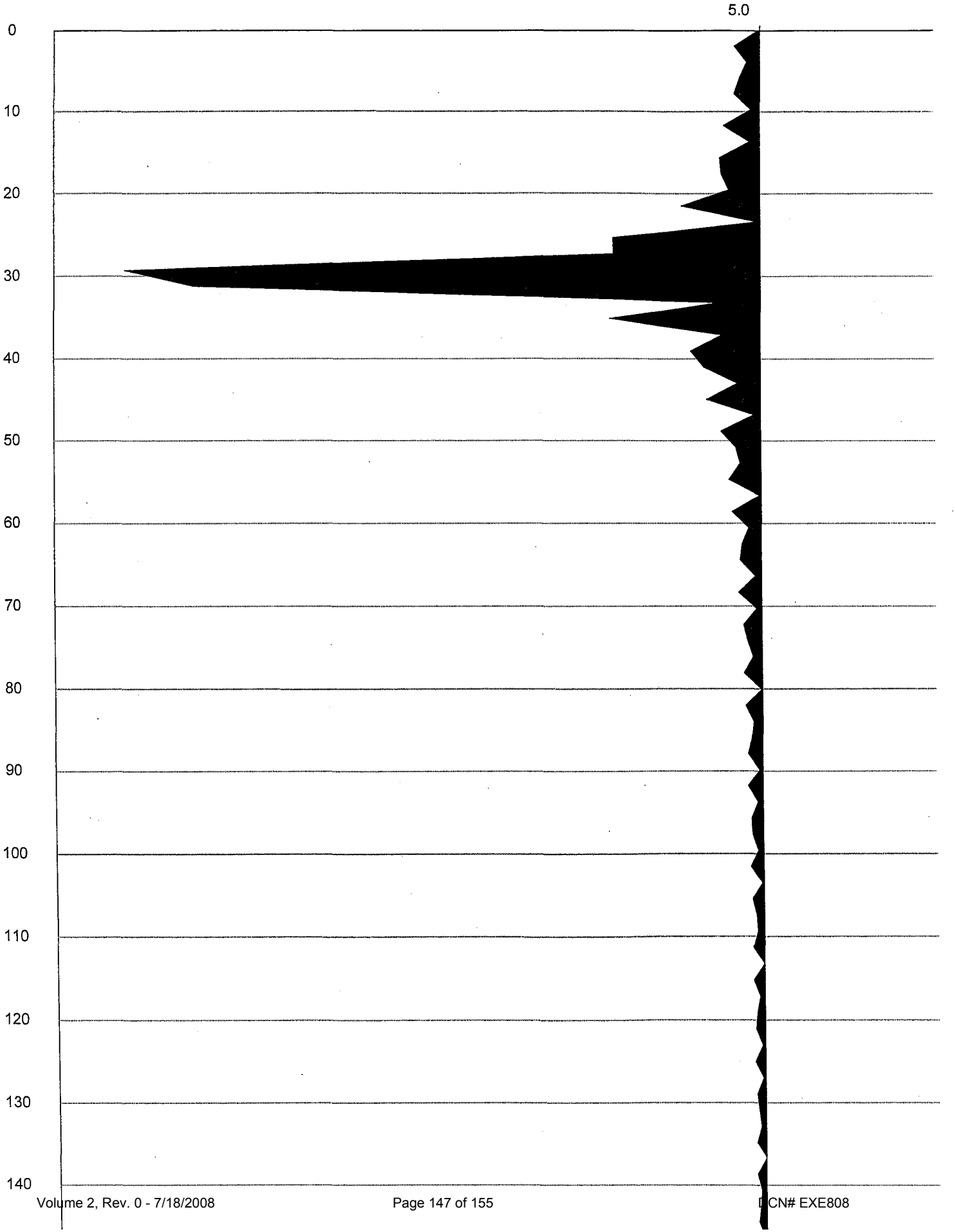
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 10.055 Seismograph: 9.9
Date: 1/22/2008



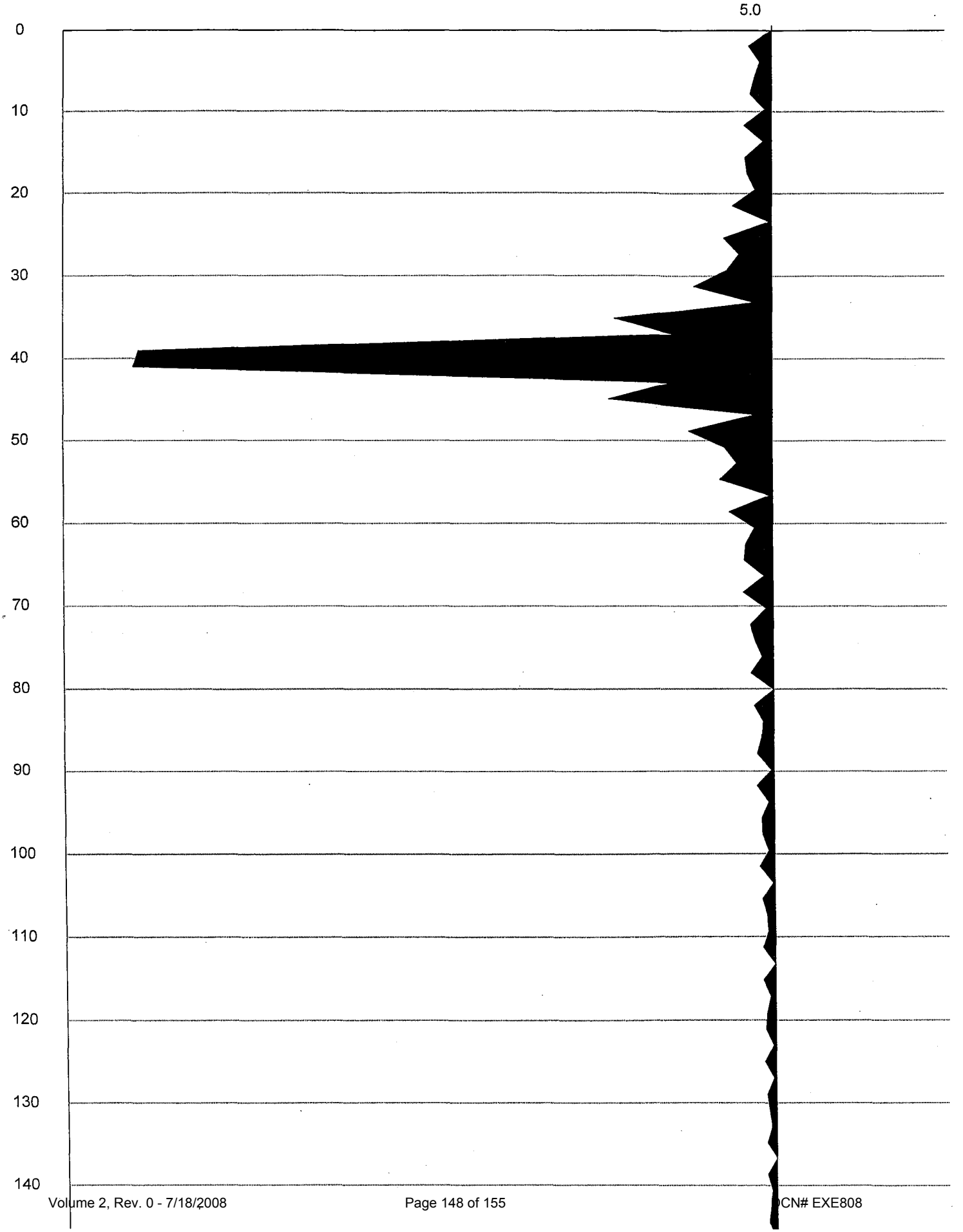
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 20.037 Seismograph: 19.9
Date: 1/22/2008



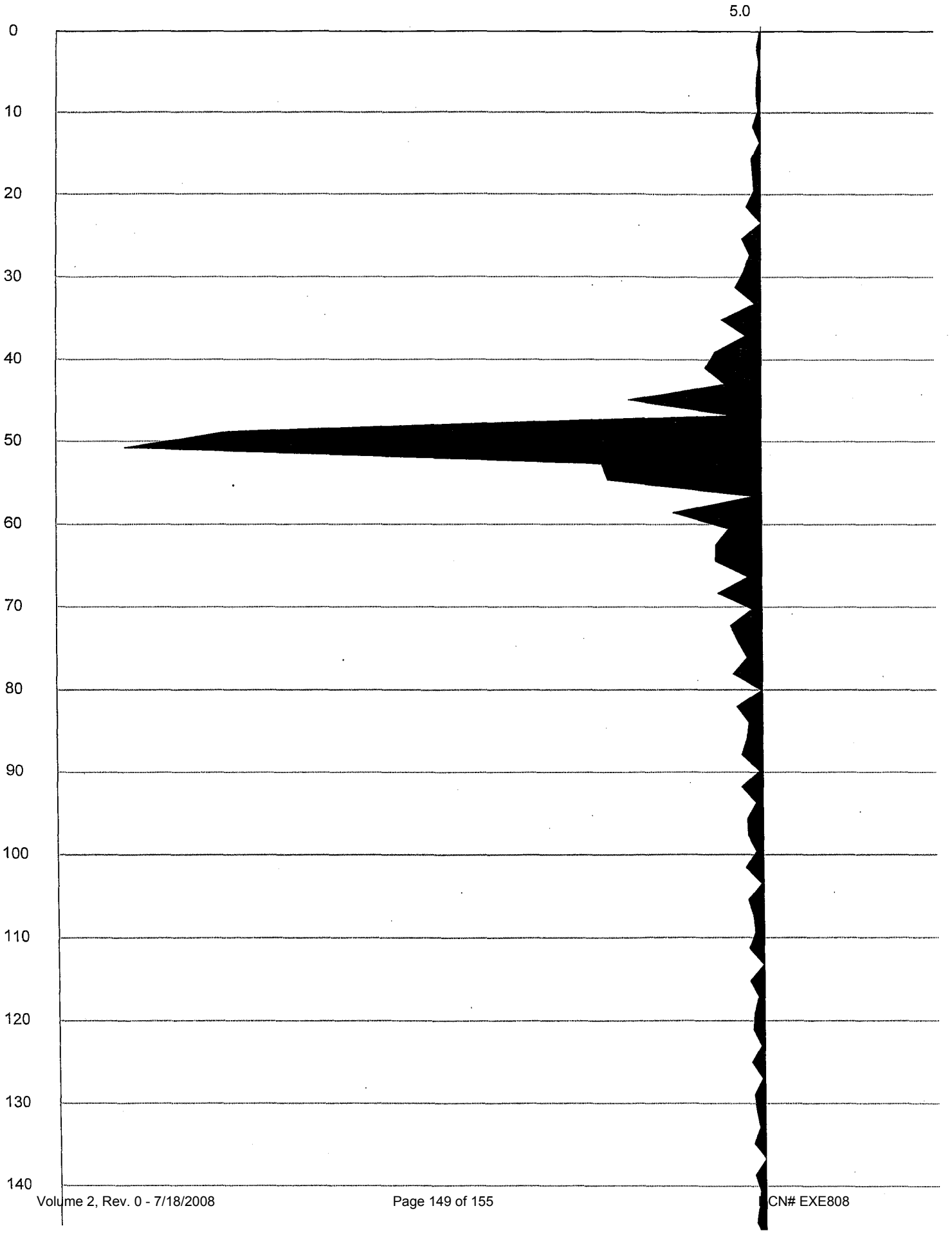
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 30.071 Seismograph: 29.3
Date: 1/22/2008



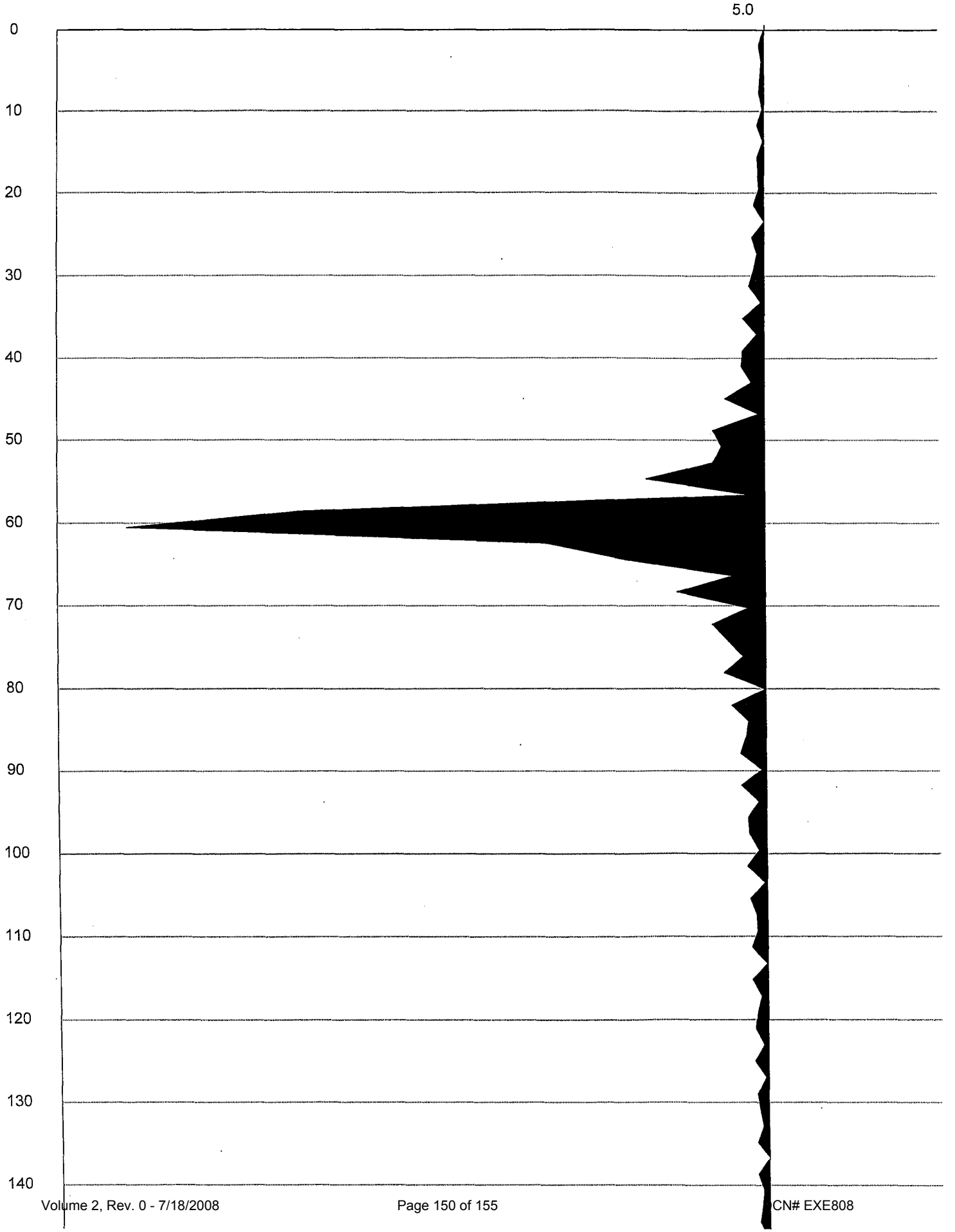
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 40.040 Seismograph: 40.1
Date: 1/22/2008



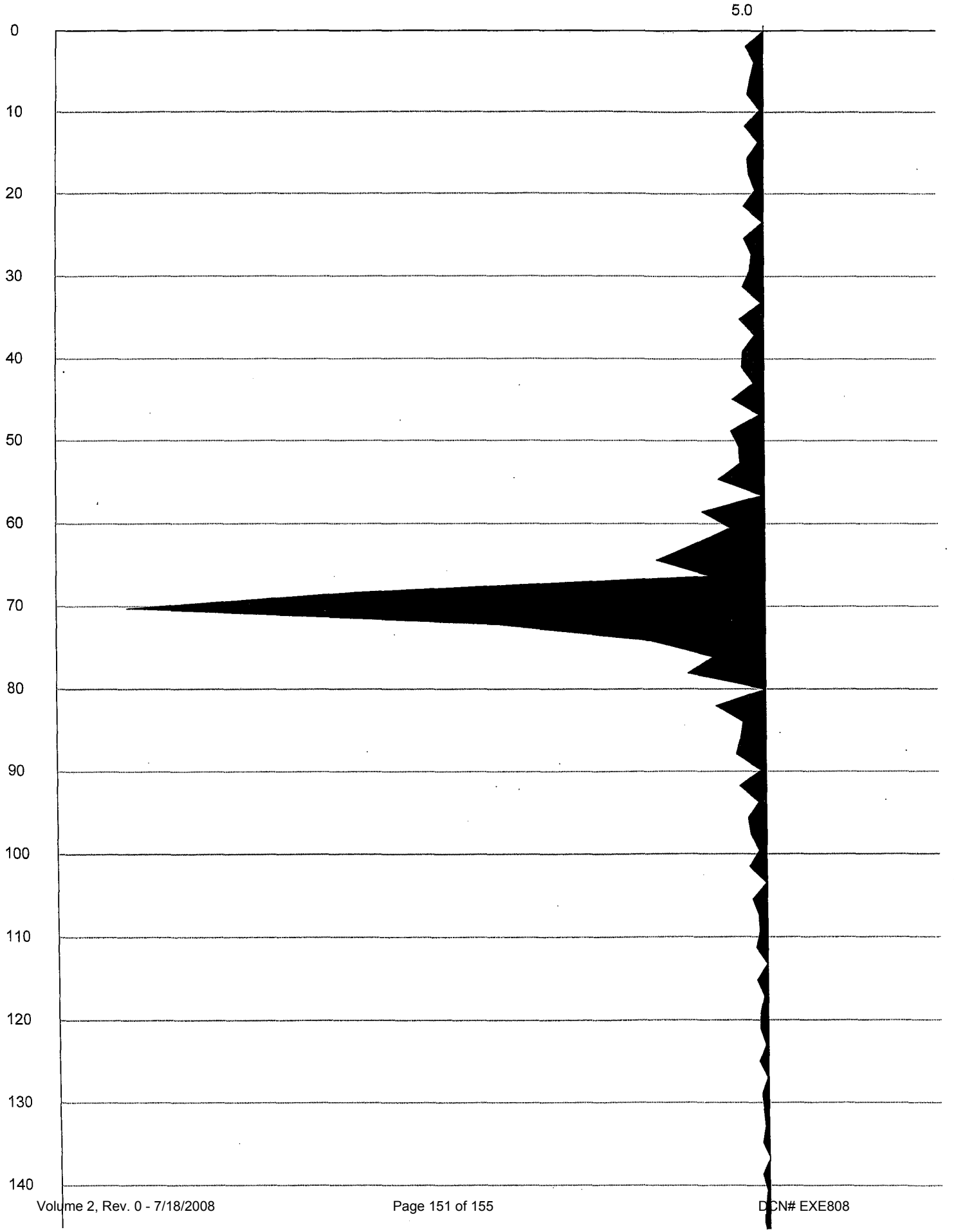
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 50.061 Seismograph: 50.6
Date: 1/22/2008



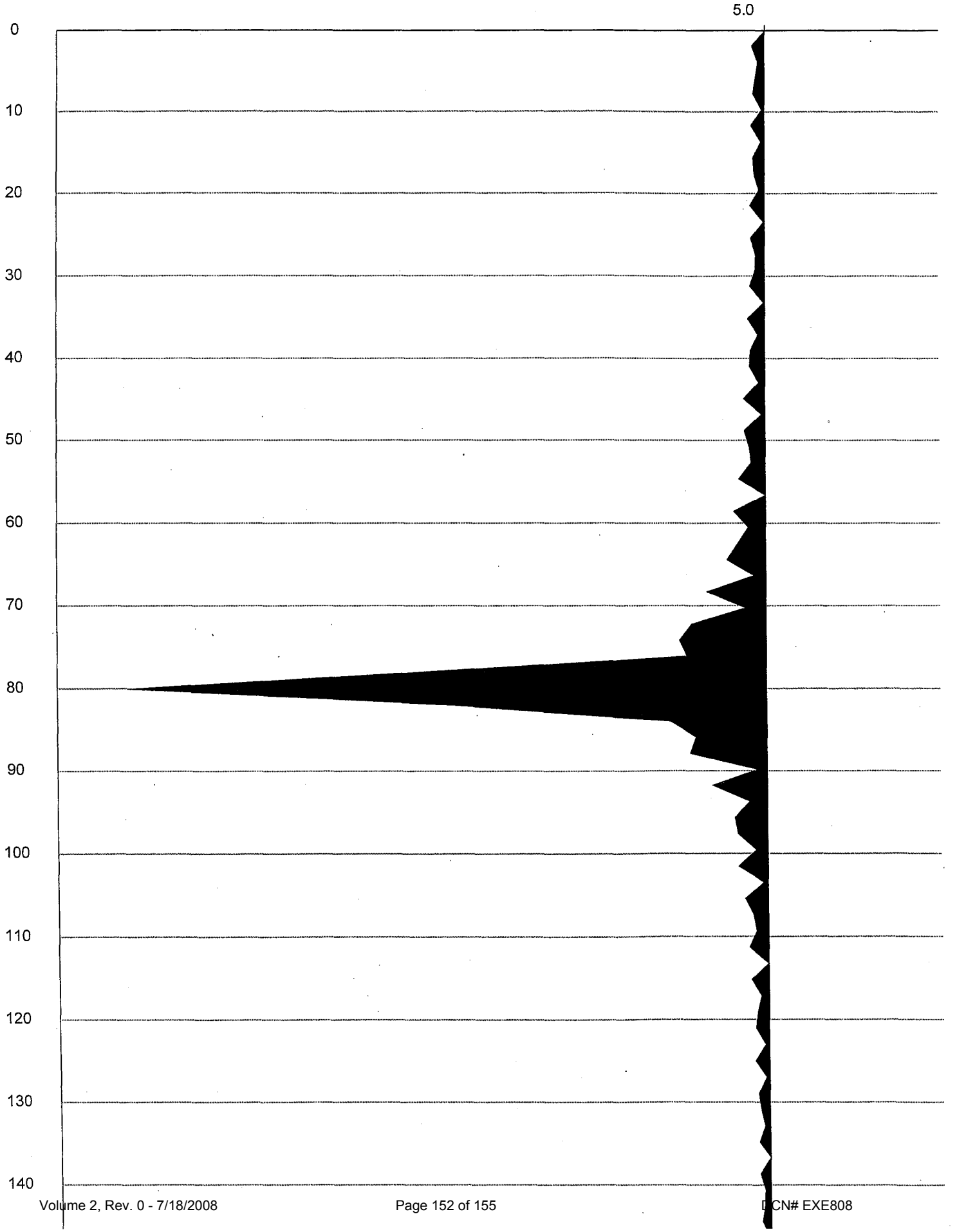
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 60.048 Seismograph: 60.3
Date: 1/22/2008



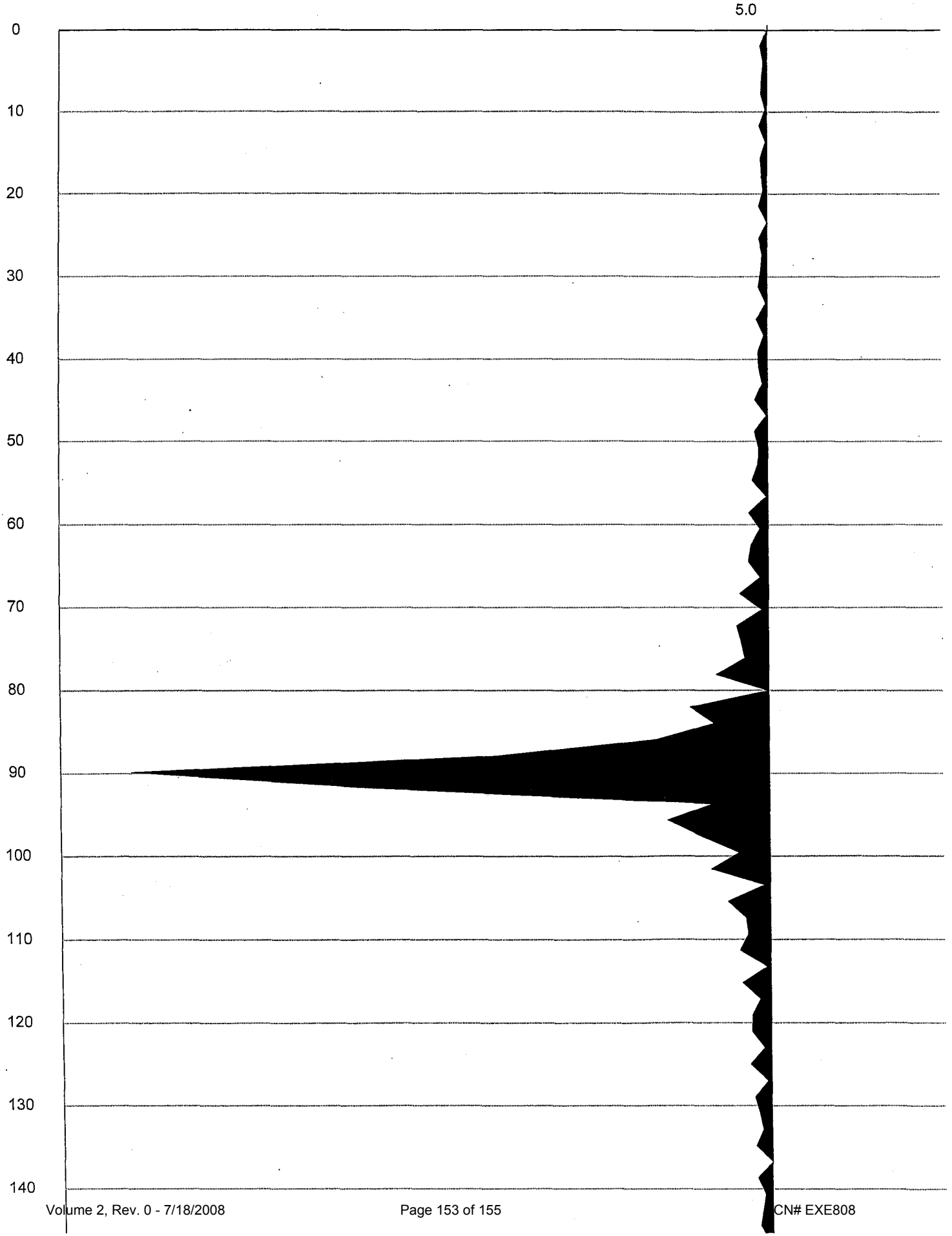
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 70.005 Seismograph: 70.2
Date: 1/22/2008



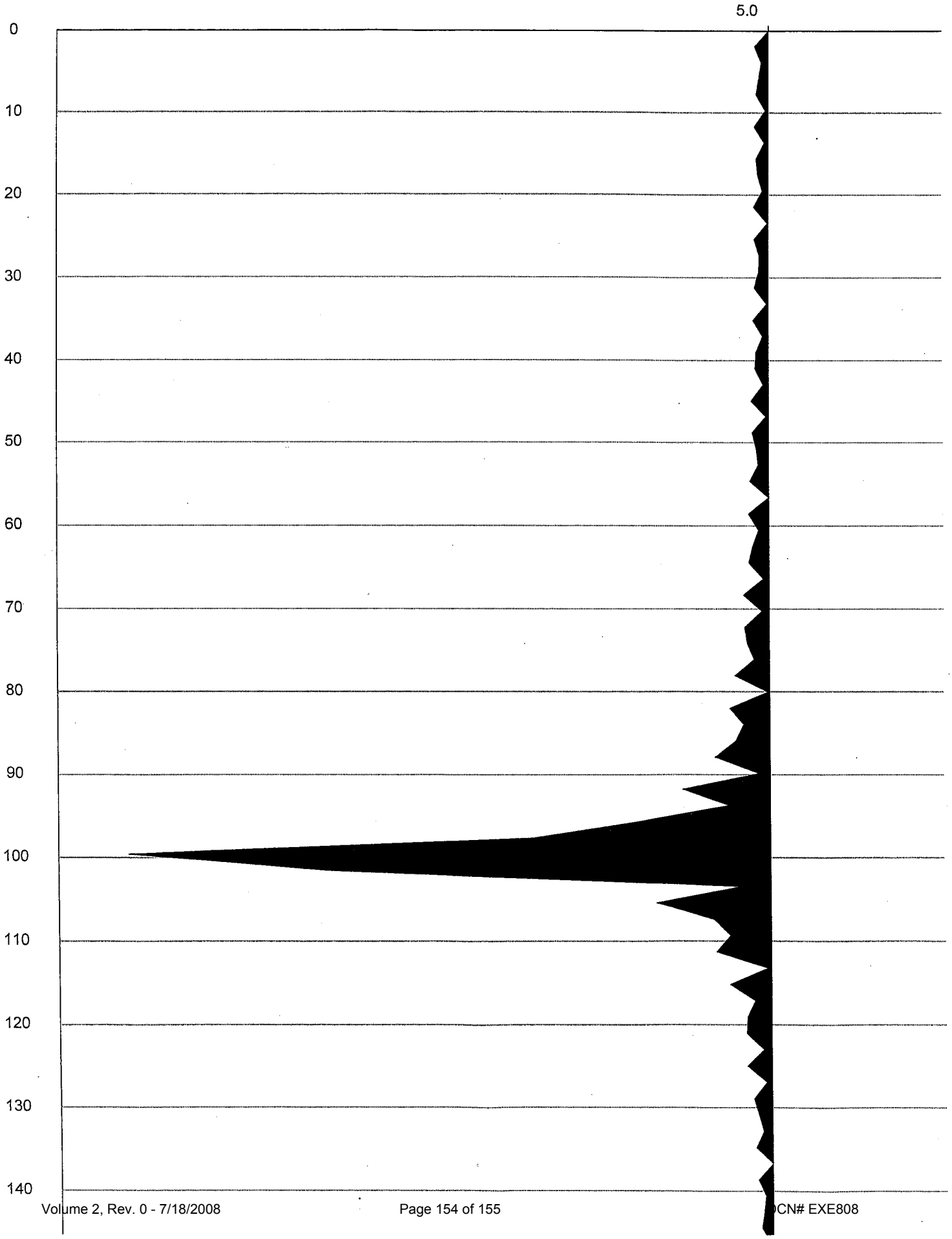
Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 80.011 Seismograph: 79.9
Date: 1/22/2008



Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 90.090 Seismograph: 90.1
Date: 1/22/2008



Geometrics ES-3000 S/N 5138
Frequency (HZ) In: 100.014 Seismograph: 99.8
Date: 1/22/2008



FINAL DATA REPORT Rev 0
GEOTECHNICAL EXPLORATION AND TESTING

EXELON TEXAS COL PROJECT
VICTORIA COUNTY, TEXAS
COOLING BASIN

July 18, 2008

VOLUME 2
Appendix D
(See Final Data Report Rev 0 of Geotechnical Exploration and Testing for Power Block, Appendix D, July 10, 2008)

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