



**Weatherford**<sup>®</sup>

**MICRORESISTIVITY LOG**

COMPANY	SHAKESPEARE OIL CO., INC.		
WELL	ZANOBIJA #1-21		
FIELD	WILDCAT		
PROVINCE/COUNTY	LOGAN		
COUNTRY/STATE	U.S.A. / KANSAS		
LOCATION	2285' FSL & 1420' FWL		
SEC	TWP	RGE	Other Services
21	15S	33W	MAI/MFE
API Number	15-109-21141		MSS
Permit Number	MPPDMDN		
Permanent Datum GL, Elevation	2855 feet		
Log Measured From	KB		
Drilling Measured From	KB		
Date	27-NOV-2012		
Run Number	ONE		
Service Order	3537784		
Depth Driller	4600.00 feet		
Depth Logger	4601.00 feet		
First Reading	4555.00 feet		
Last Reading	3600.00 feet		
Casing Driller	225.00 feet		
Casing Logger	222.00 inches		
Bit Size	7.875		
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.10 lb/USg	52.00 CP	
PH / Fluid Loss	10.50	10.50	
Sample Source	MUDDPIT		
Rm @ Measured Temp	0.72 @ 78.0	ohm-m	
Rmf @ Measured Temp	0.58 @ 78.0	ohm-m	
Rmc @ Measured Temp	0.86 @ 78.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.52 @ 110.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	110.00	deg F	
Equipment / Base	13096	LIB	
Recorded By	ADAM SILL		
Witnessed By	TIM PRIEST		
JOB #	LB12-311		

Elevations:	feet
KB	2867.00
DF	2865.00
GL	2855.00

**BOREHOLE RECORD** Last Edited: 27-NOV-2012 22:17

Bit Size inches	Depth From feet	Depth To feet
7.875	225.00	4600.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	225.00	24.00

**REMARKS**

- SOFTWARE ISSUE: WLS 13.04.8492.
- MCG, MML, MDN, MPD, MFE, MSS, MAI RAN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  - 0.5 INCH STANDOFF USED ON MFE.
  - TWO 0.5 INCH STANDOFFS USED ON MSS.
  - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- ANNULAR HOLE VOLUME WITH 4.5 INCH CASING FROM TD TO 3600 FT: 280 CU. FT.
- SERVICE ORDER # 3537784.

- RIG: H-D DRILLING #2.

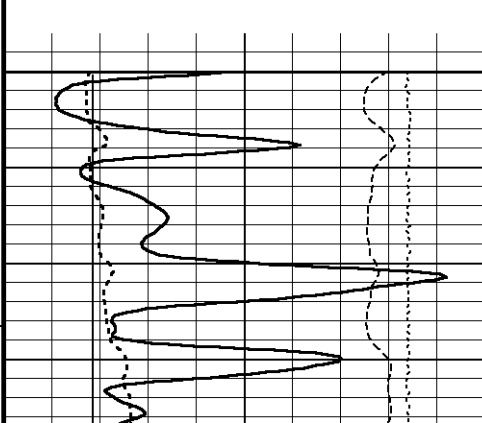
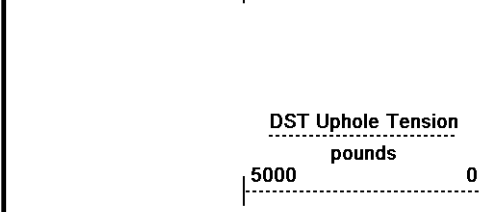
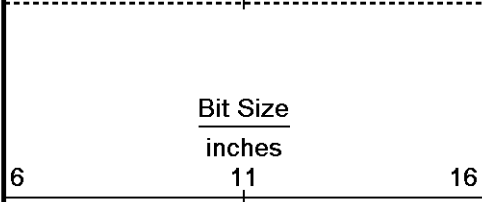
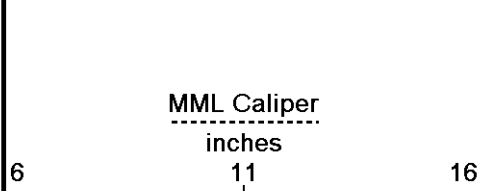
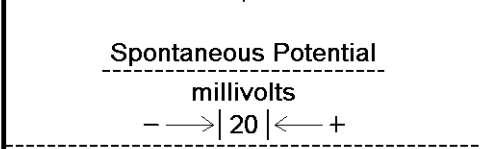
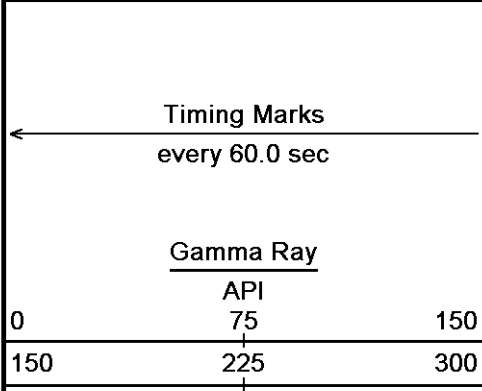
- ENGINEER: A. SILL.

- OPERATOR(S): N. ADAME, R. VENEGAS.

All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions in our price schedule.

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm  
Plotted on 28-NOV-2012 04:17  
Filename: C:\Minimus 13.04.8492\Data\...Shakespeare Oil Co. Zanobia #1-21\_003 spooled section.dta  
Recorded on 28-NOV-2012 03:46  
System Versions: Logged with 13.04.8492 Processed with 13.04.8492 Plotted with 13.04.8492

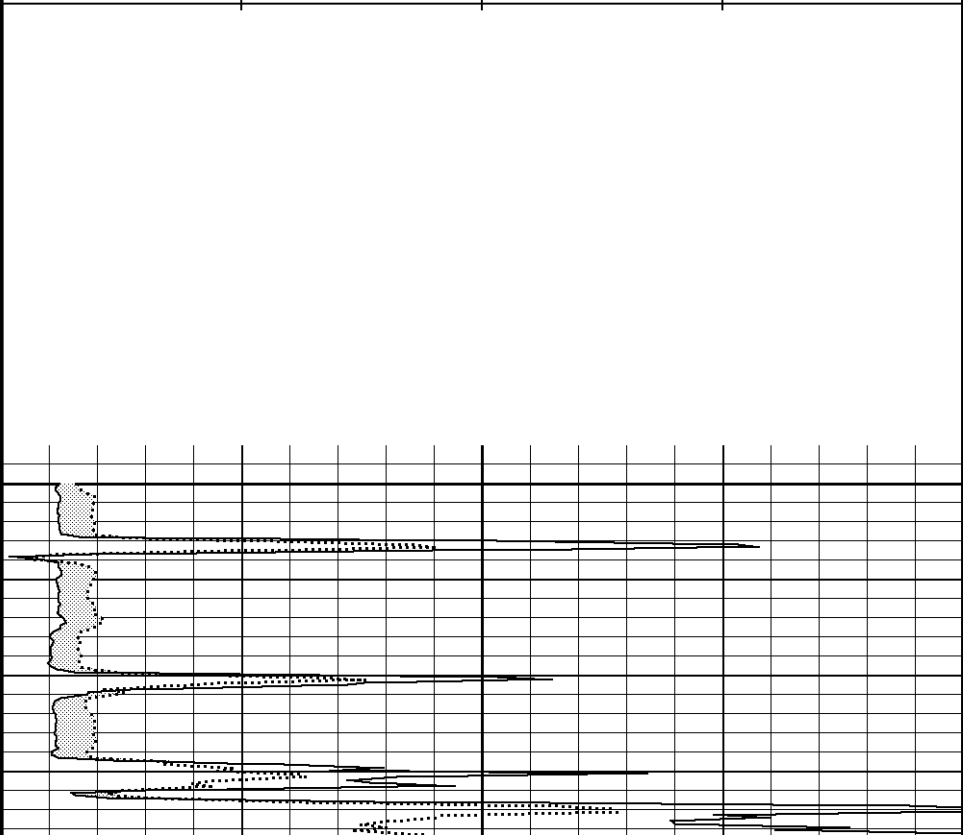
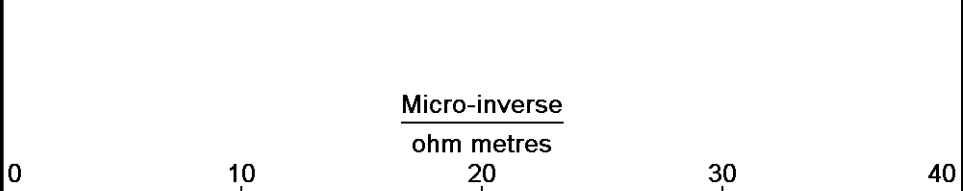
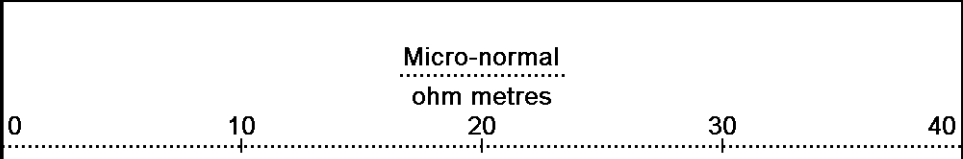


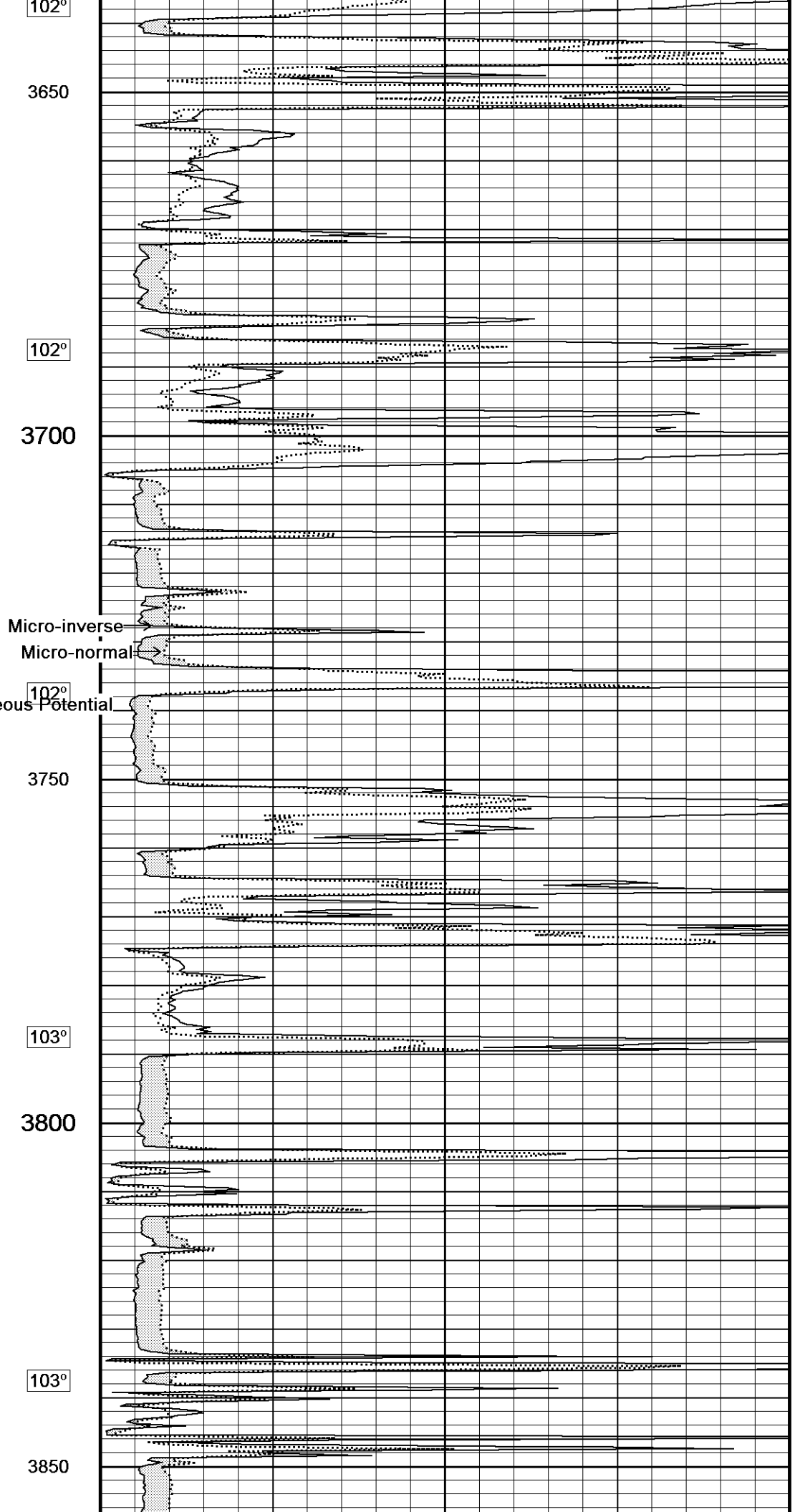
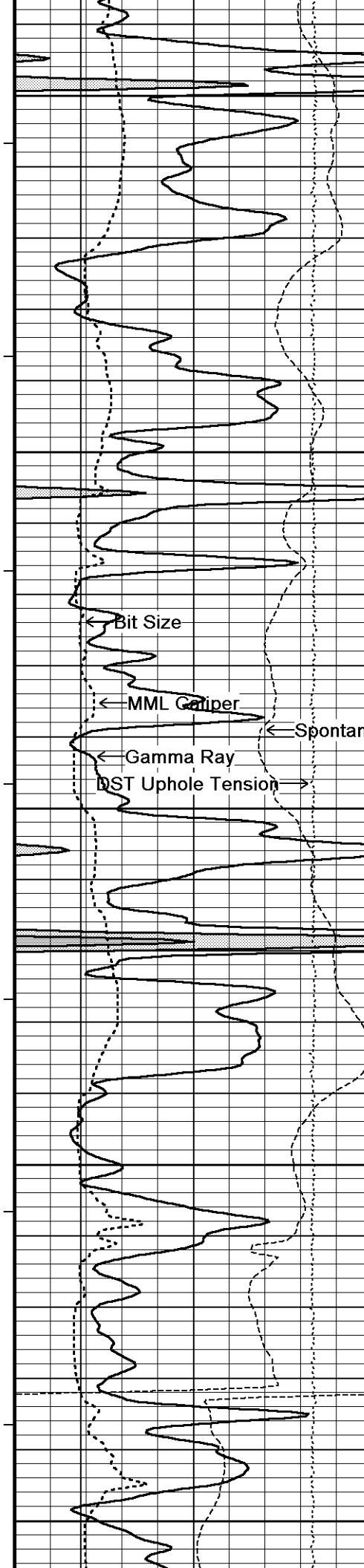
Depth in Feet

Borehole Temp in deg F

Replay Scale 1:240

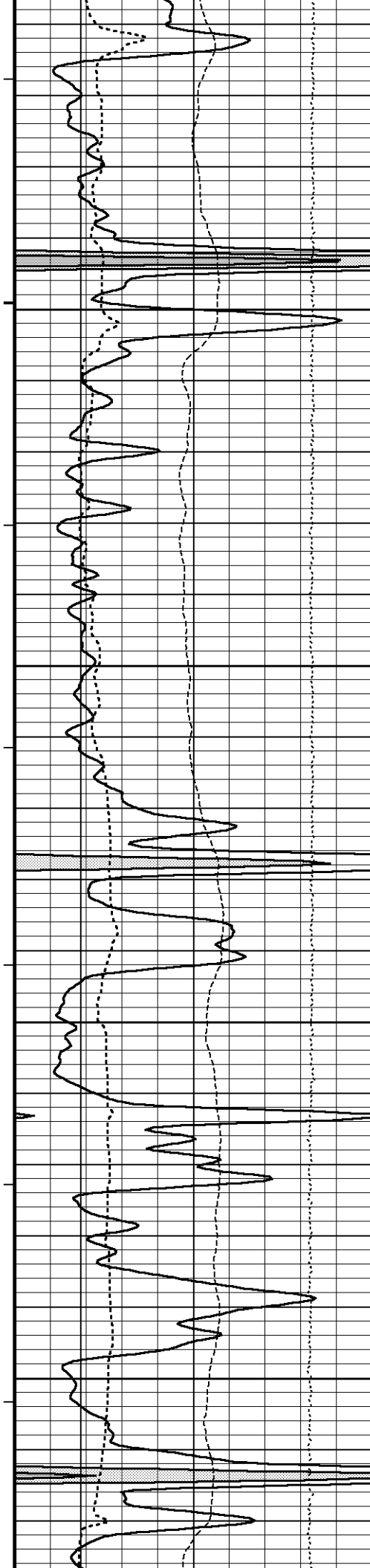
3600





102°  
3650  
102°  
3700  
102°  
3750  
103°  
3800  
103°  
3850

Spontaneous Potential



104°

3900

104°

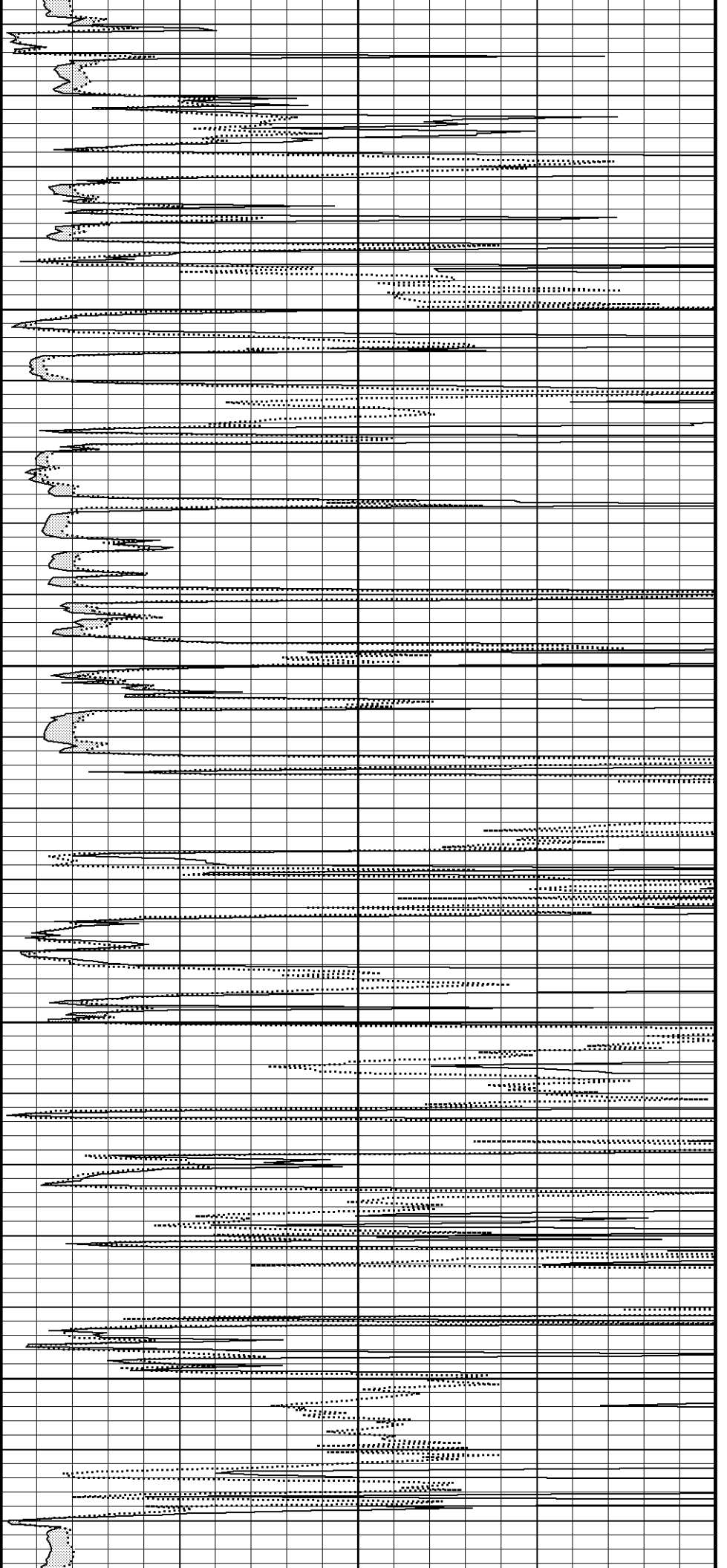
3950

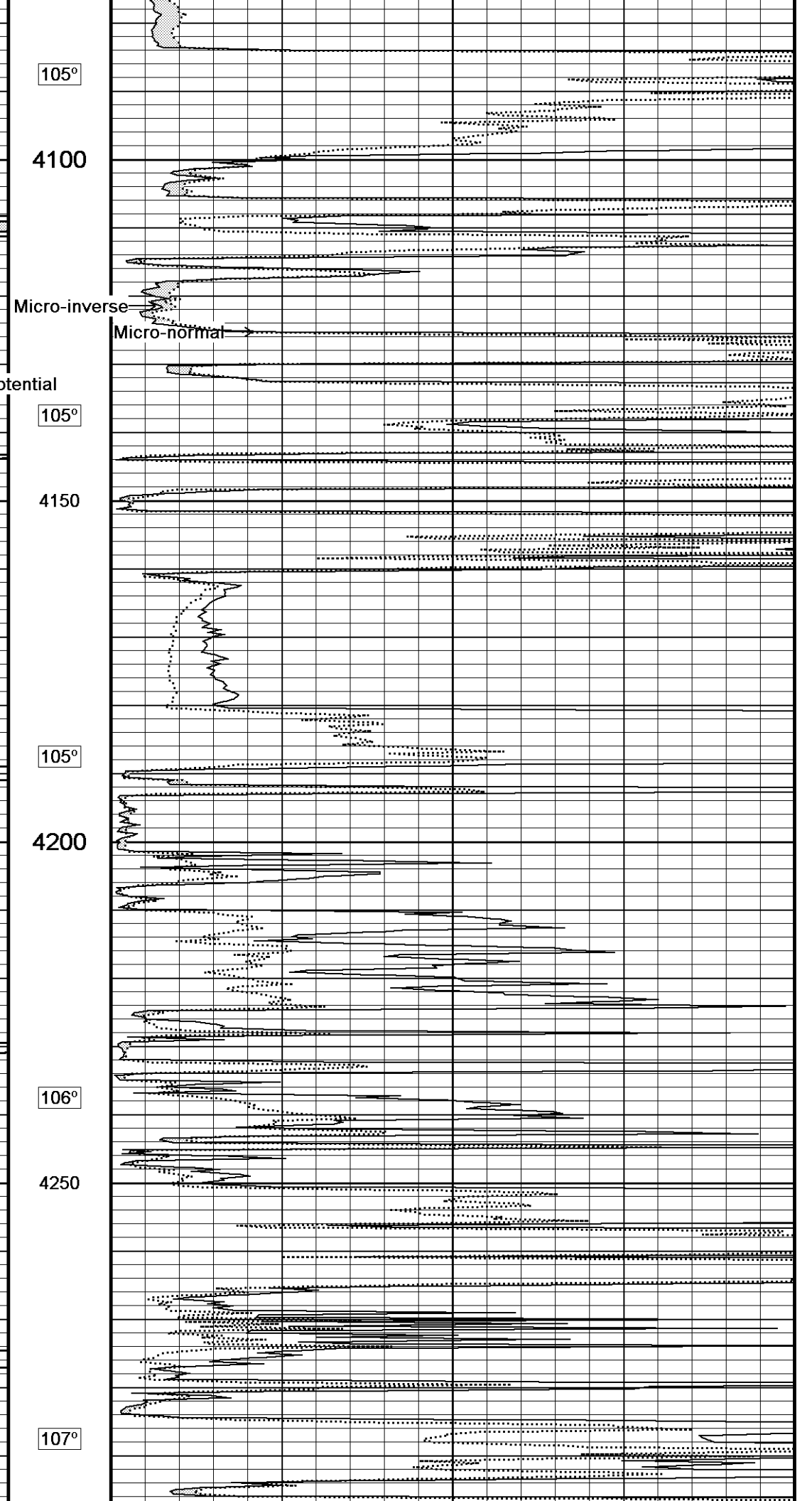
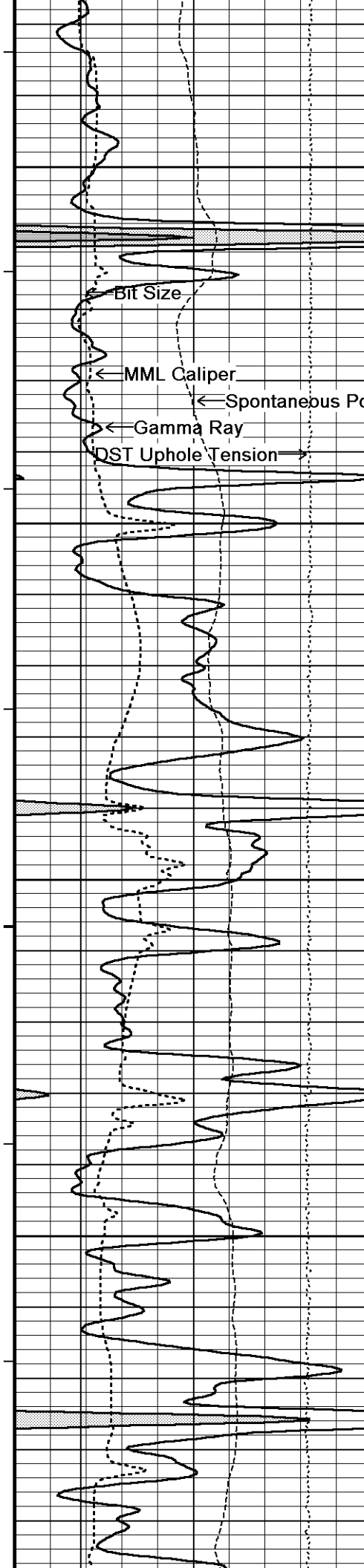
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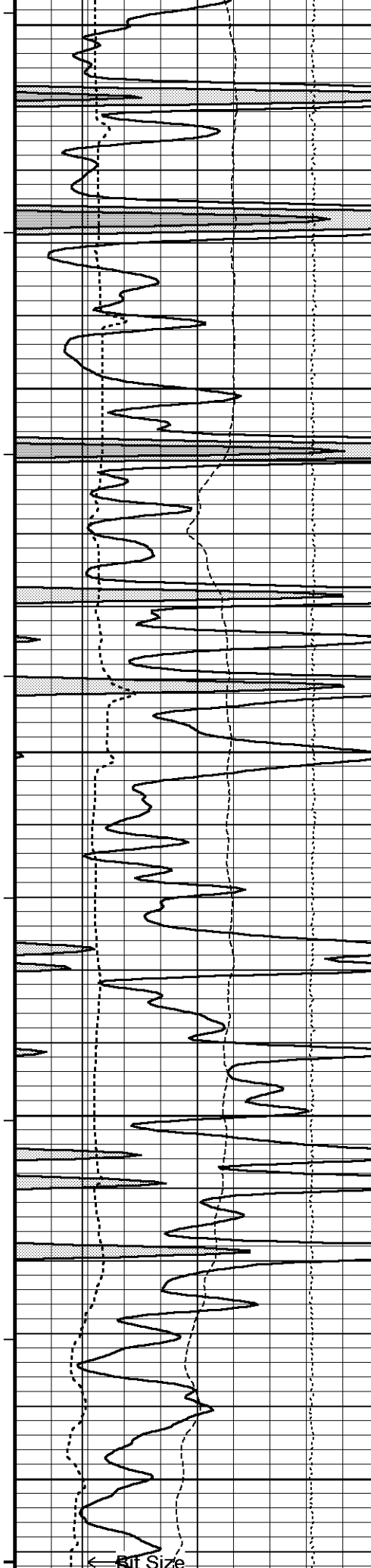
4000

104°

4050







4300

107°

4350

108°

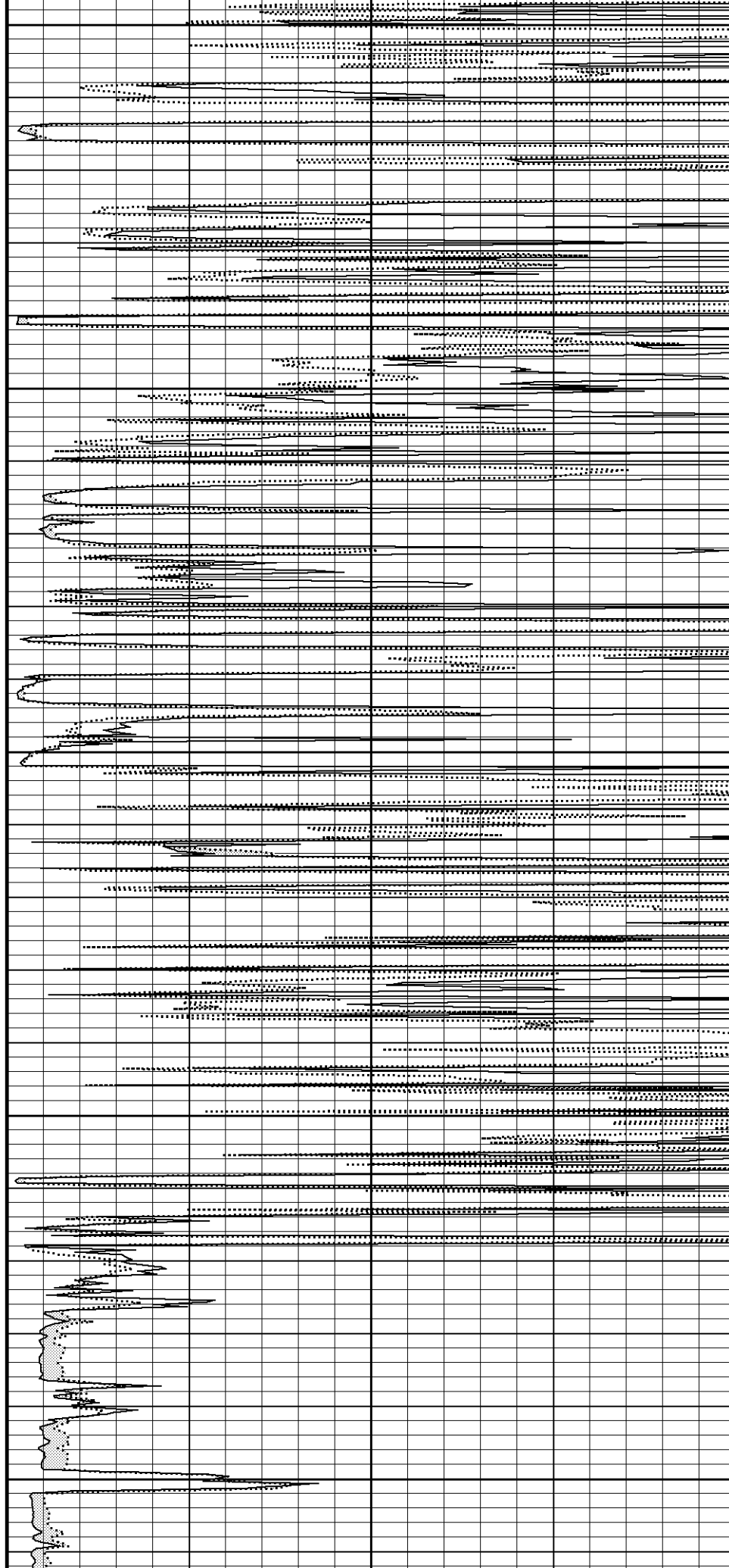
4400

109°

4450

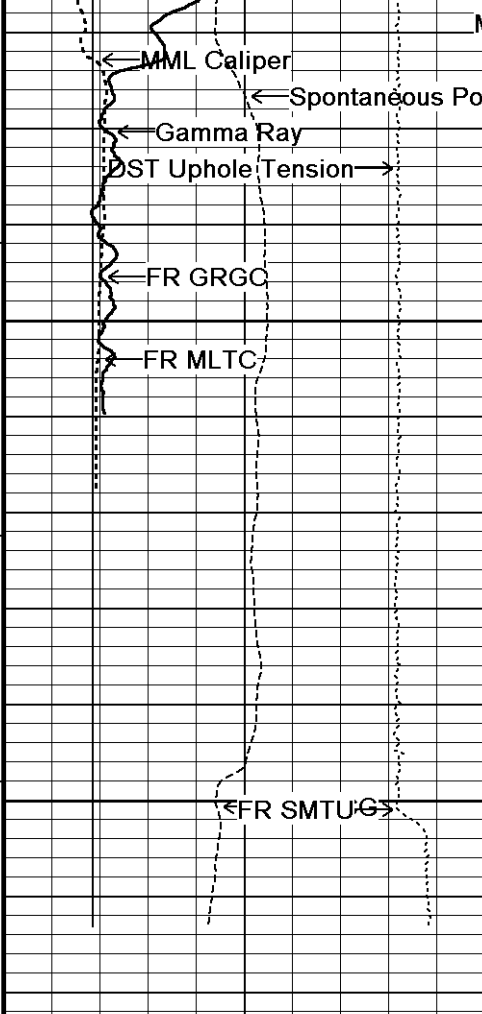
110°

4500

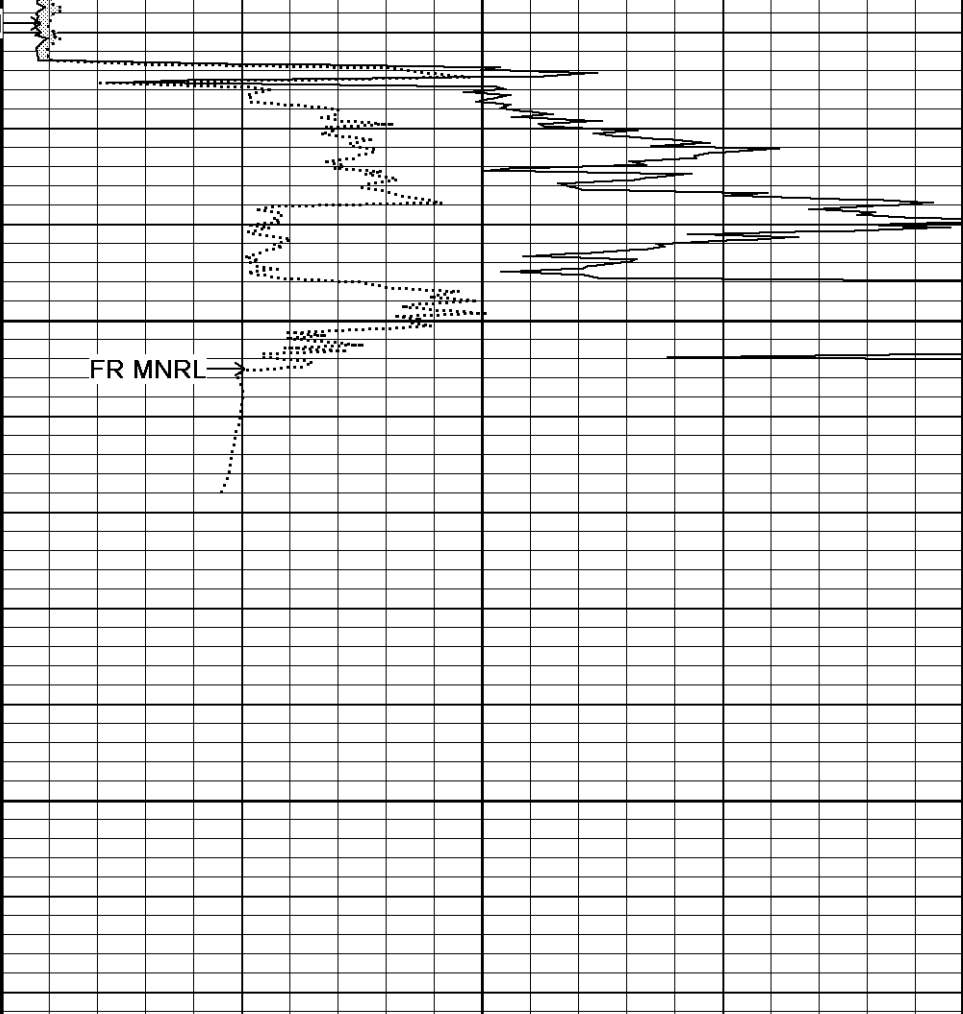


← Bit Size

Micro-inverse →



109°  
 4550  
 4600  
 4620  
 Depth in Feet



Timing Marks  
 every 60.0 sec

Gamma Ray  
 API  
 0 75 150  
 150 225 300

Spontaneous Potential  
 millivolts  
 - -> | 20 | <- +

MML Caliper  
 inches  
 6 11 16

Bit Size  
 inches  
 6 11 16

DST Uphole Tension  
 pounds

Micro-normal  
 ohm metres  
 0 10 20 30 40  
 Borehole Temp in deg F  
 Micro-inverse  
 ohm metres  
 0 10 20 30 40  
 Replay

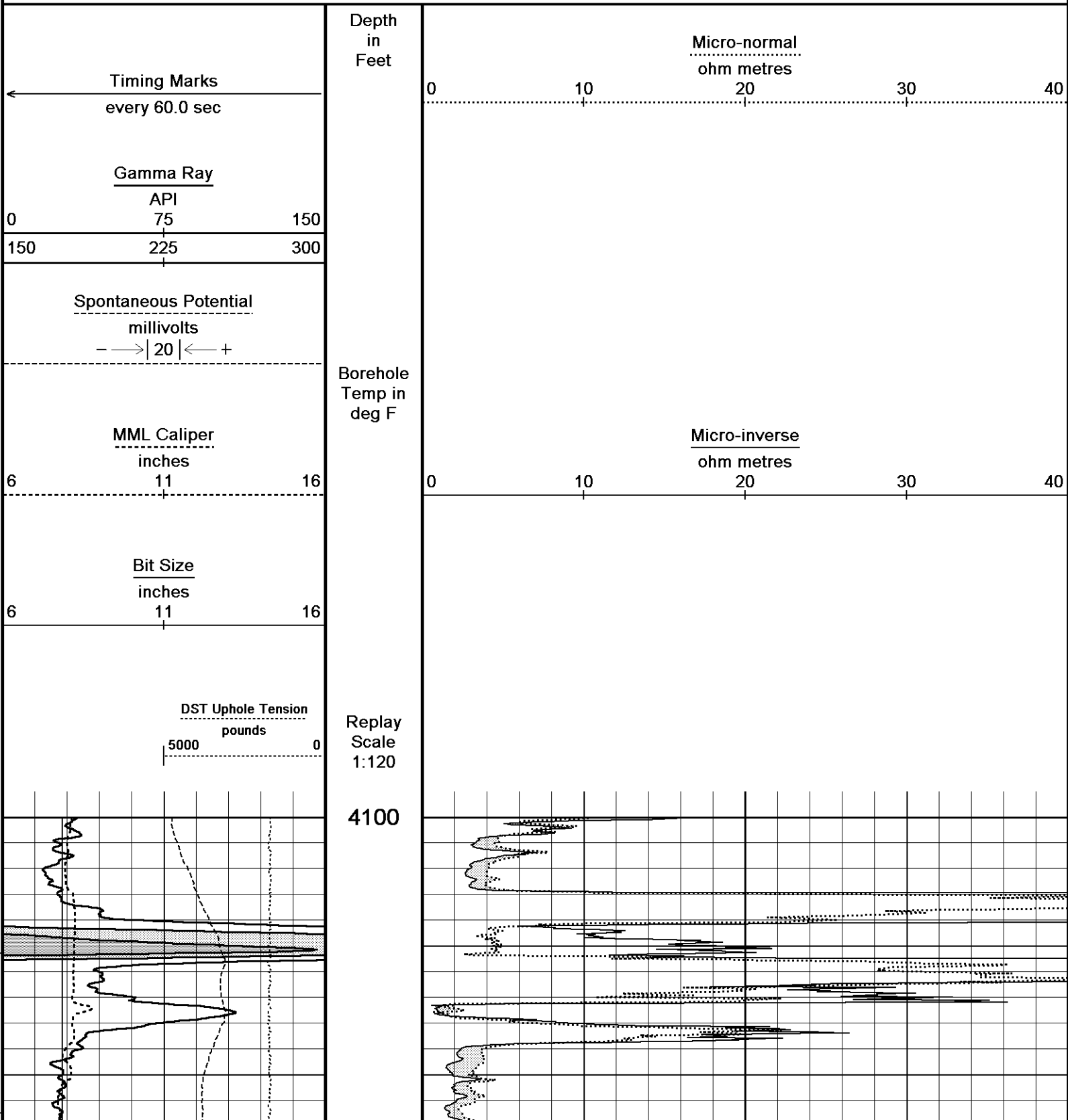
5000 0  
Scale  
1:240

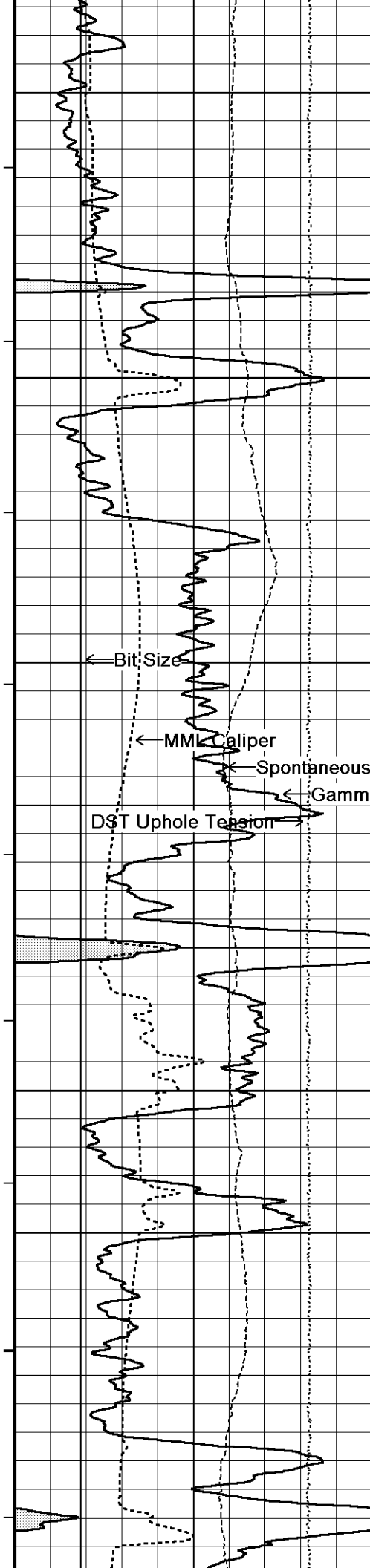
Depth Based Data - Maximum Sampling Increment 10.0cm  
Plotted on 28-NOV-2012 04:17  
Filename: C:\Minimus 13.04.8492\Data\...\Shakespeare Oil Co. Zanobia #1-21\_003 spooled section.dta  
Recorded on 28-NOV-2012 03:46  
System Versions: Logged with 13.04.8492 Processed with 13.04.8492 Plotted with 13.04.8492

↑ 5 INCH MAIN ↑

↓ 10 INCH HI RES ↓

Depth Based Data - Maximum Sampling Increment 2.5cm  
Plotted on 28-NOV-2012 04:17  
Filename: C:\Minimus 13.04.8492\Data\Shakespeare Oil Co.\Shakespeare Oil Co. Zanobia #1-21\_001.dta  
Recorded on 28-NOV-2012 01:41  
System Versions: Logged with 13.04.8492 Plotted with 13.04.8492





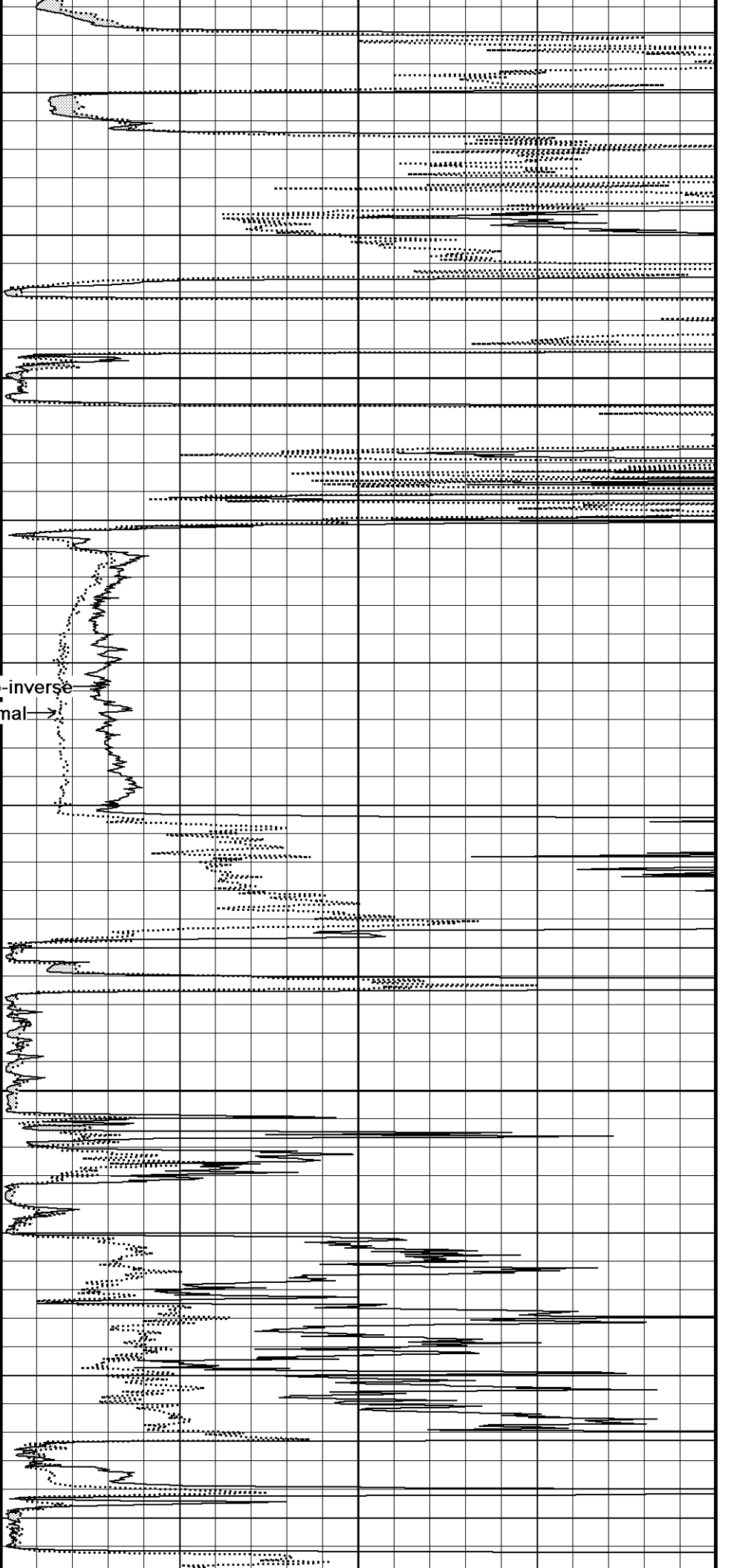
104°

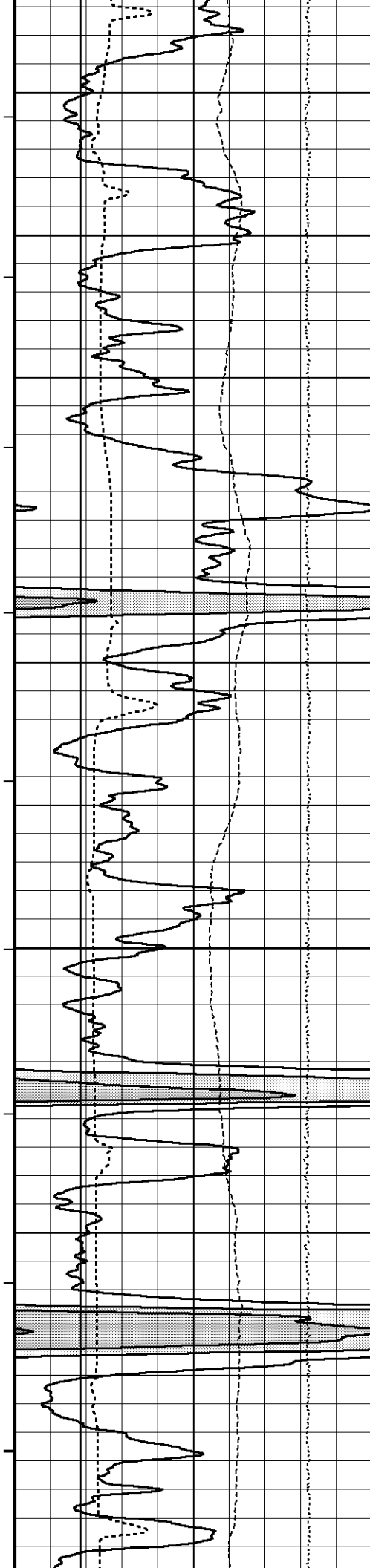
4150

Micro-inverse  
Micro-normal

105°

4200





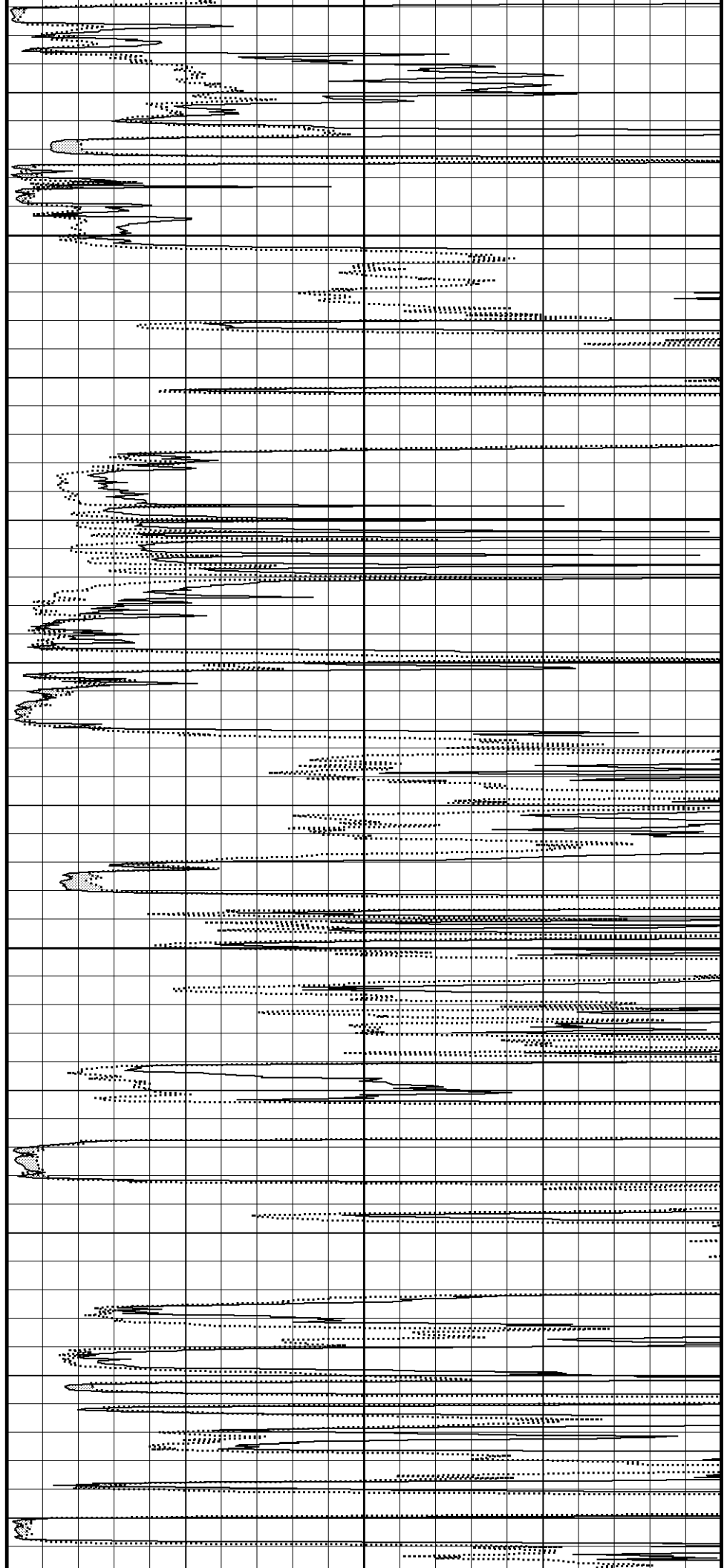
105°

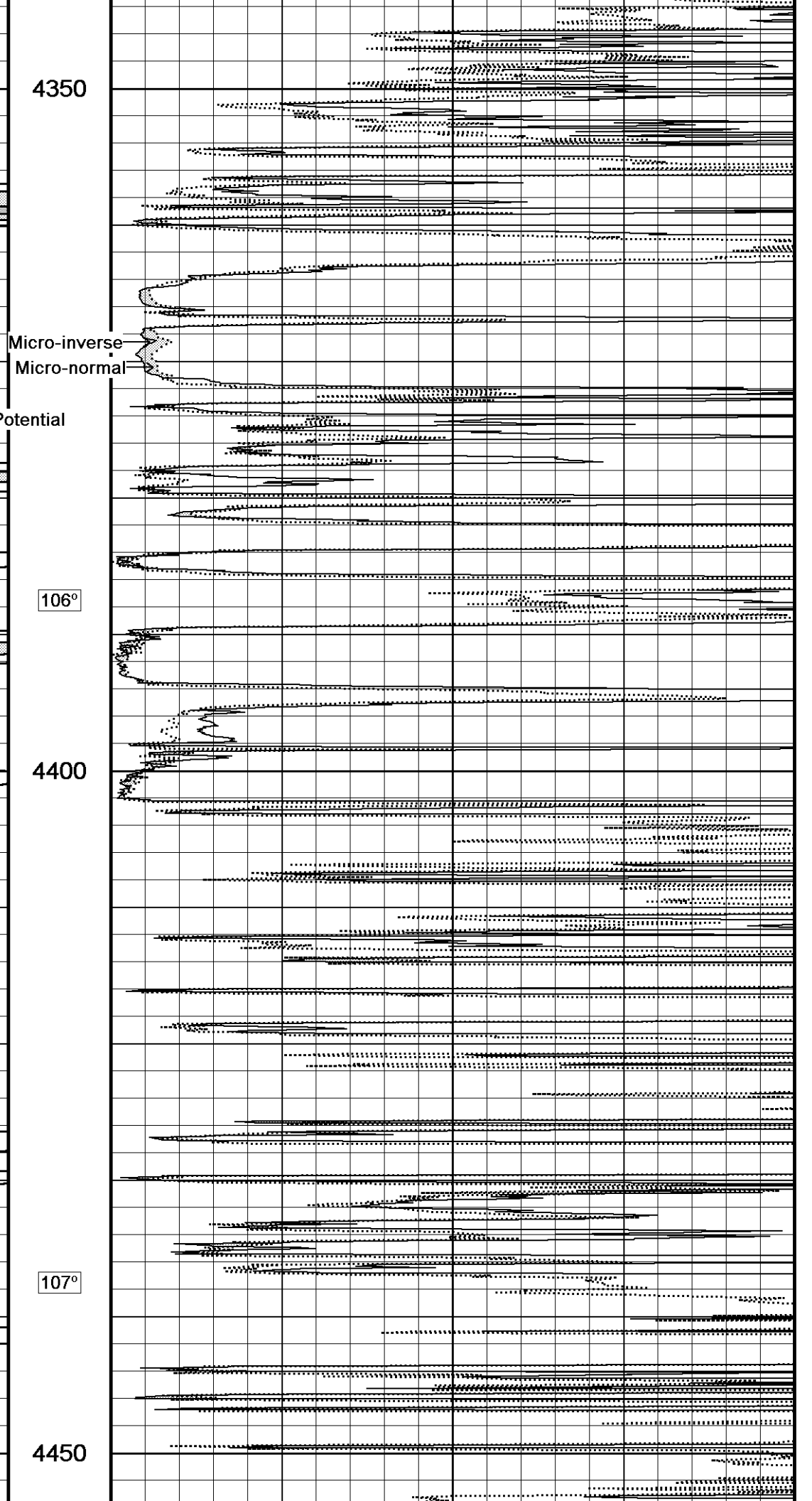
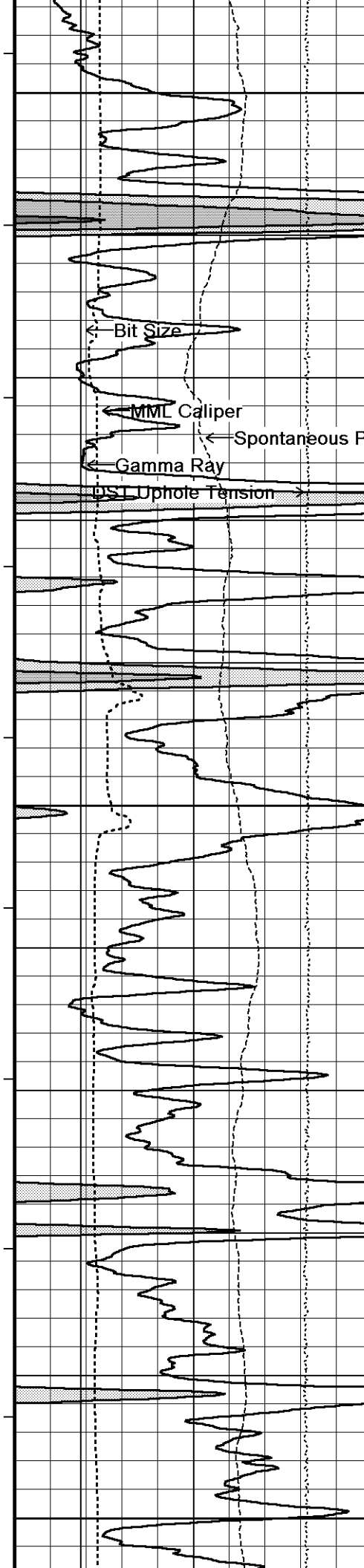
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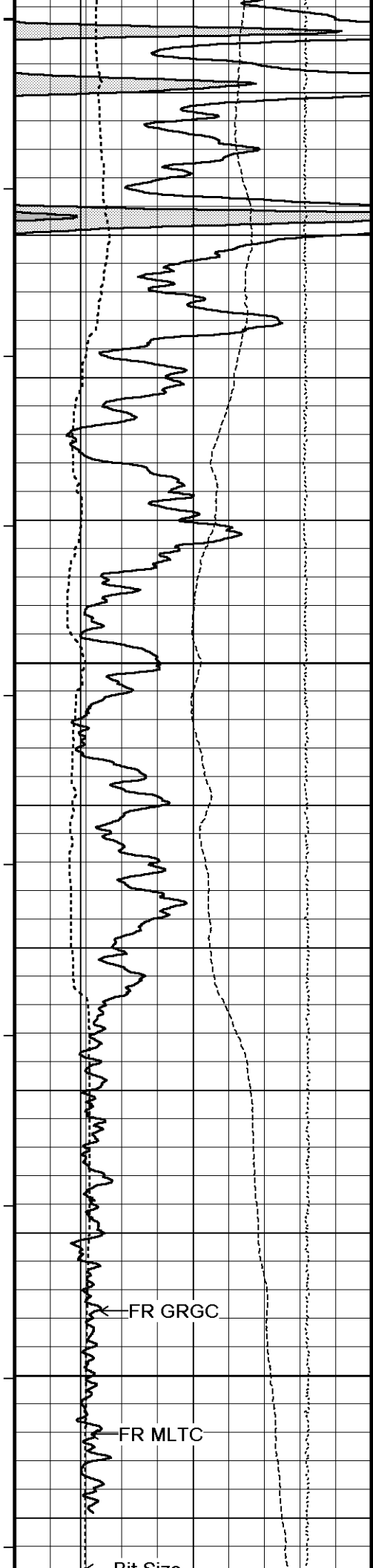
106°

4300

106°





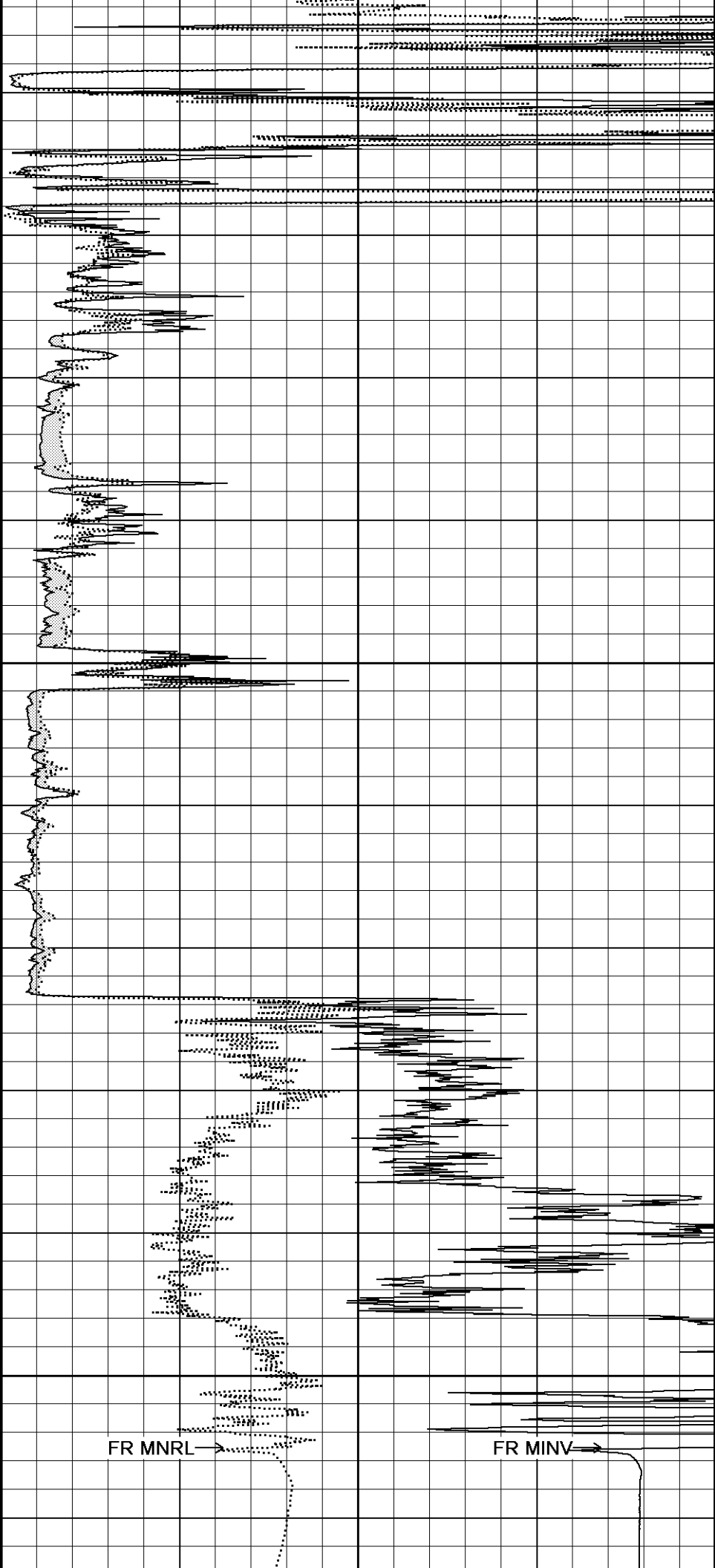


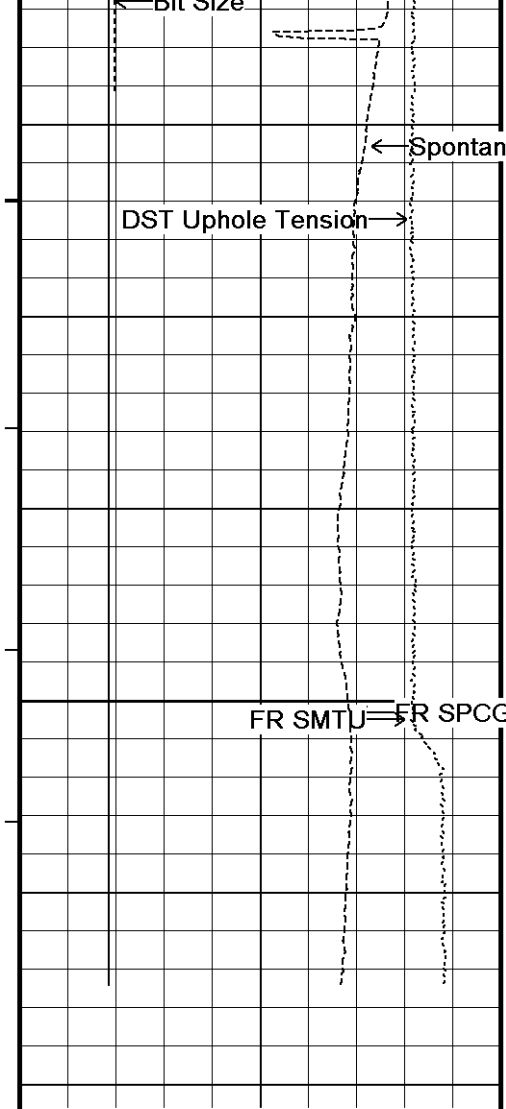
107°

4500

106°

4550





4600

4620  
Depth  
in  
Feet

Timing Marks  
every 60.0 sec

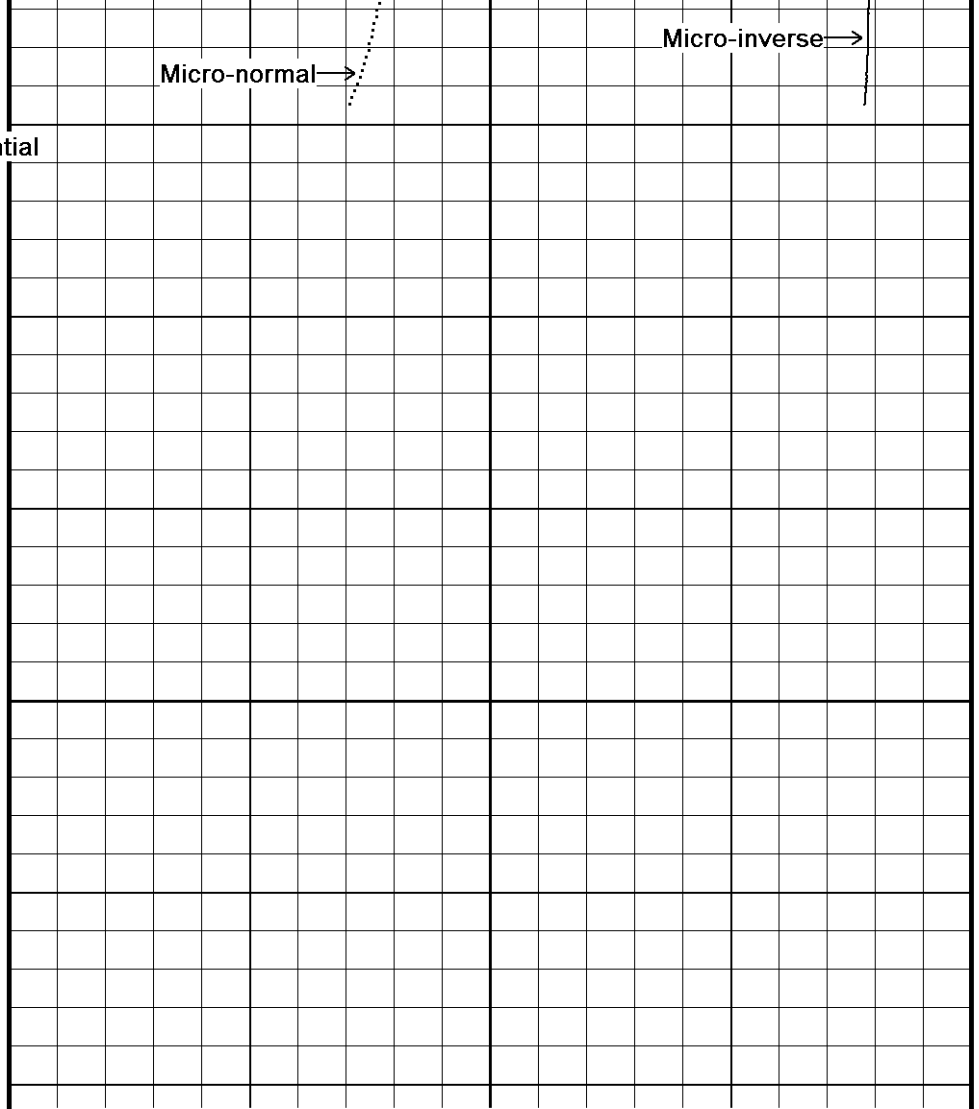
Gamma Ray  
API  
0 75 150  
150 225 300

Spontaneous Potential  
millivolts  
- -> | 20 | <- +

MML Caliper  
inches  
6 11 16

Bit Size  
inches  
6 11 16

Borehole  
Temp in  
deg F



Micro-normal  
ohm metres  
0 10 20 30 40

Micro-inverse  
ohm metres  
0 10 20 30 40

DST Uphole Tension  
pounds  
5000 0

Replay  
Scale  
1:120

Depth Based Data - Maximum Sampling Increment 2.5cm  
 Plotted on 28-NOV-2012 04:17  
 Filename: C:\Minimus 13.04.8492\Data\Shakespeare Oil...\Shakespeare Oil Co. Zanobia #1-21\_001.dta  
 Recorded on 28-NOV-2012 01:41  
 System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

↑ 10 INCH HI RES ↑

↓ REPEAT SECTION ↓

Depth Based Data - Maximum Sampling Increment 10.0cm  
 Plotted on 28-NOV-2012 04:17  
 Filename: C:\Minimus 13.04.8492\Data\Shakespeare Oil...\Shakespeare Oil Co. Zanobia #1-21\_002.dta  
 Recorded on 28-NOV-2012 01:41  
 System Versions: Logged with 13.04.8492 Processed with 13.04.8492 Plotted with 13.04.8492

Timing Marks  
every 60.0 sec

Gamma Ray  
API  
0 75 150  
150 225 300

Spontaneous Potential  
millivolts  
- -> | 20 | <- +

MML Caliper  
inches  
6 11 16

Bit Size  
inches  
6 11 16

DST Uphole Tension  
pounds  
5000 0

Depth  
in  
Feet

Borehole  
Temp in  
deg F

Replay  
Scale  
1:240

4100

Micro-inverse

Spontaneous Potential

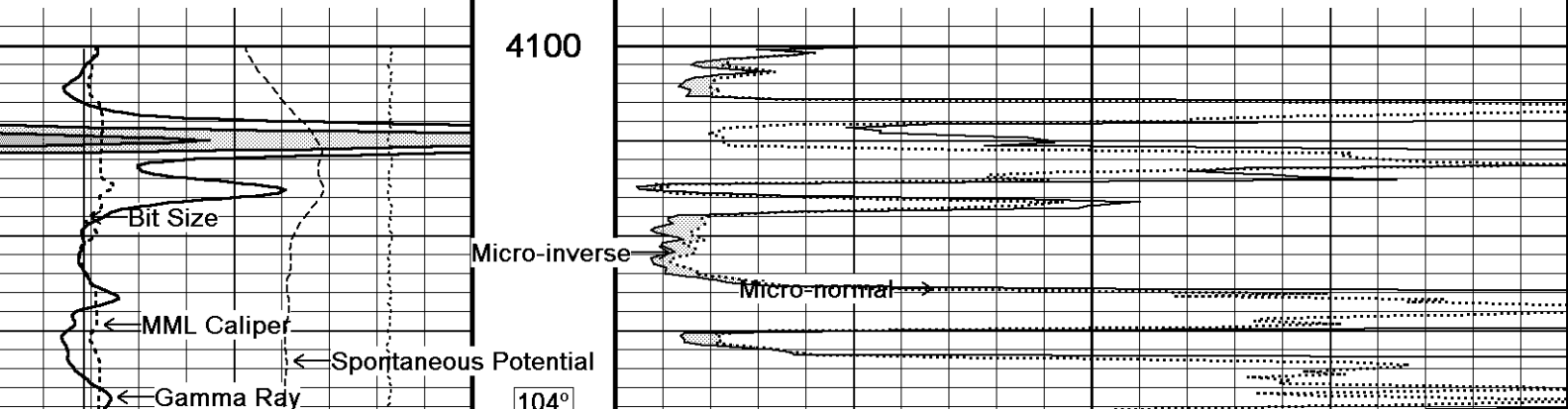
104°

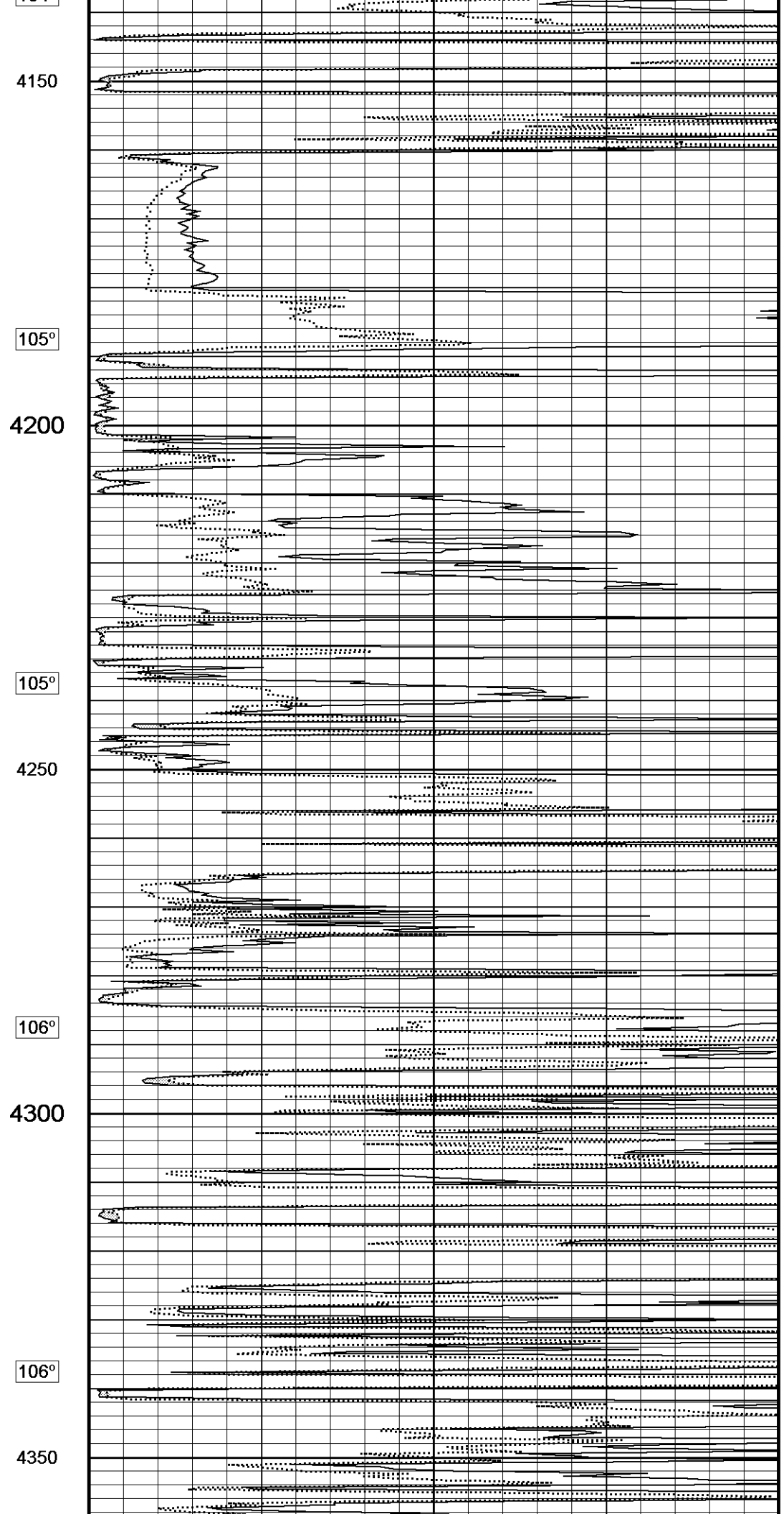
Micro-normal  
ohm metres

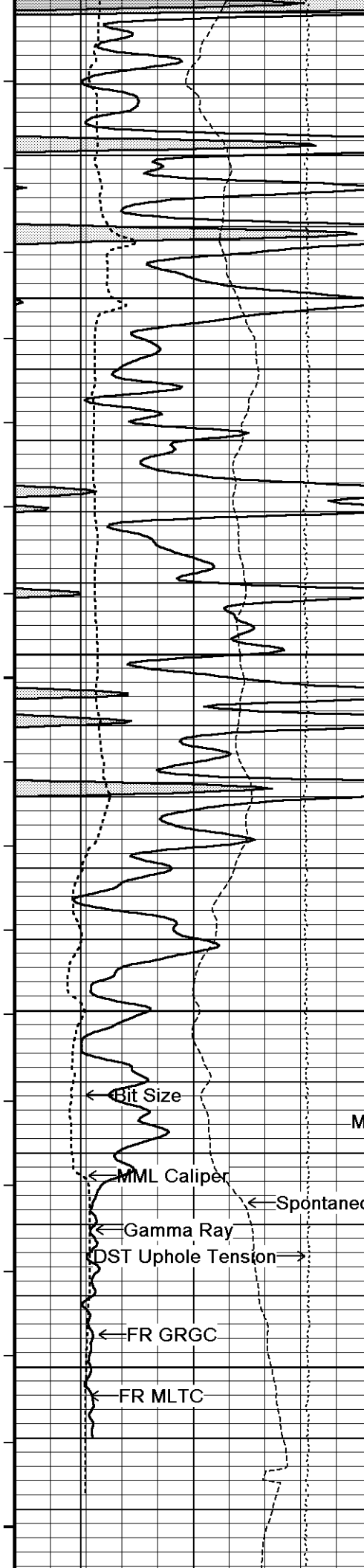
0 10 20 30 40

Micro-inverse  
ohm metres

0 10 20 30 40







106°

4400

107°

4450

107°

4500

Micro-inverse

Micro-normal

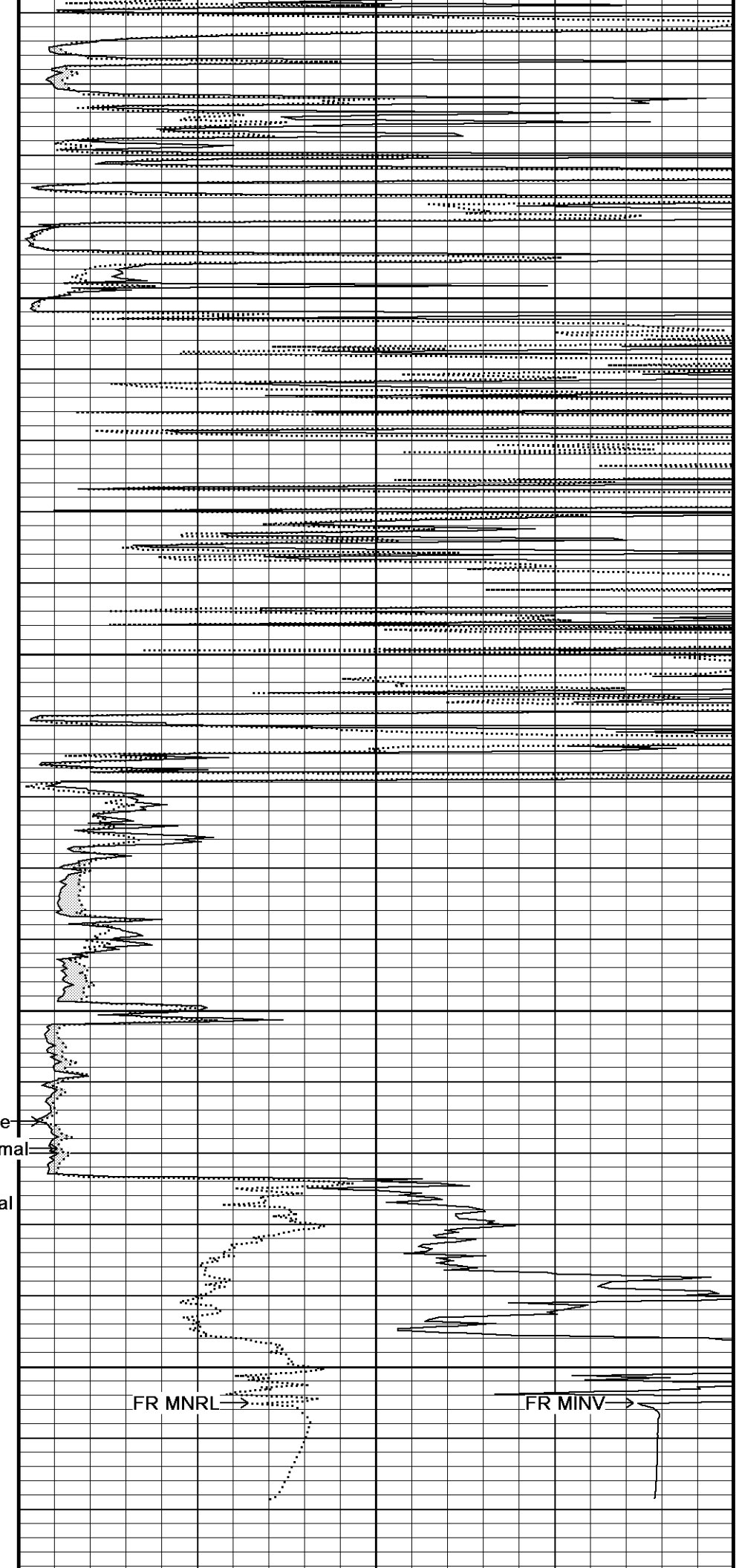
Spontaneous Potential

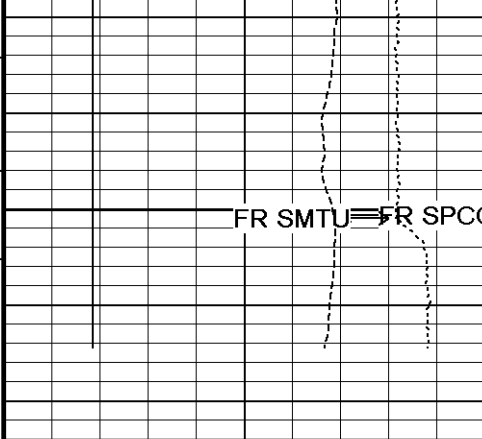
106°

4550

FR MNRL

FR MINV

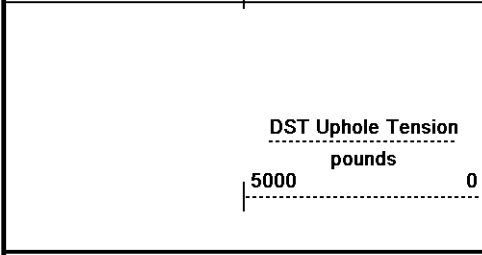
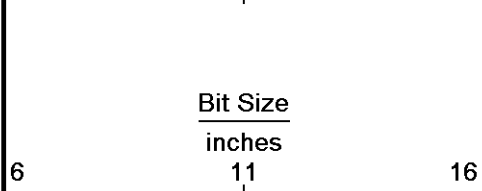
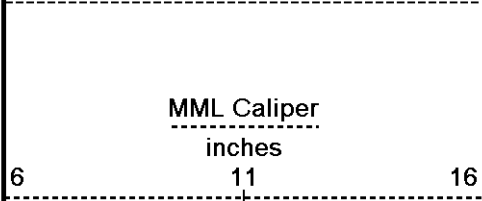
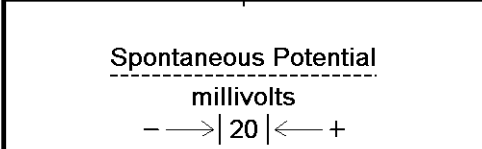
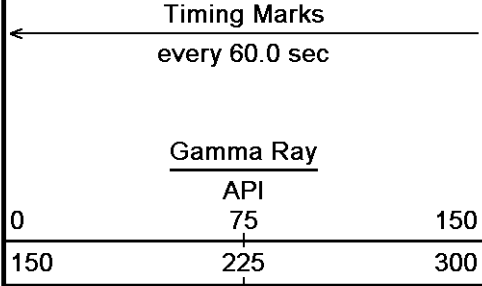




FR SMTU FR SPCG

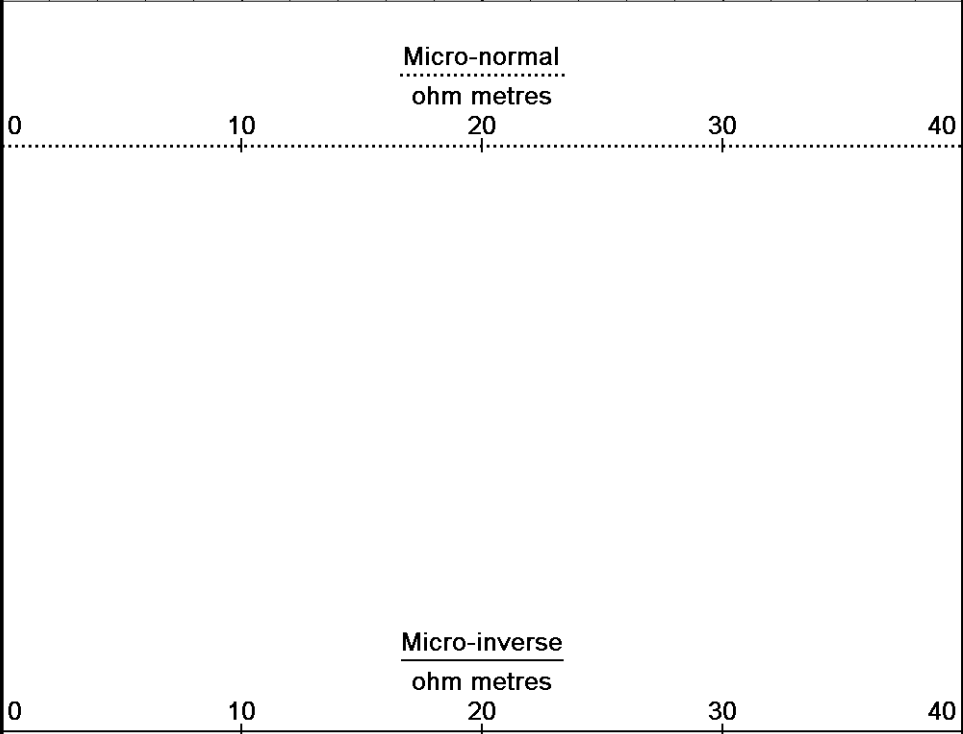
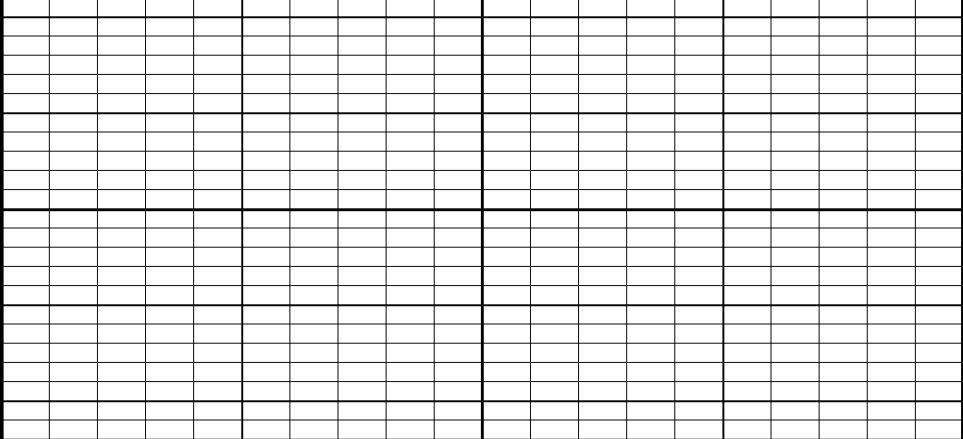
4600

4622  
Depth  
in  
Feet



Borehole  
Temp in  
deg F

Replay  
Scale  
1:240



Depth Based Data - Maximum Sampling Increment 10.0cm  
 Filename: C:\Minimus 13.04.8492\Data\Shakespeare Oil Co. Zanobia #1-21\_002.dta  
 System Versions: Logged with 13.04.8492 Processed with 13.04.8492 Plotted with 13.04.8492  
 Plotted on 28-NOV-2012 04:17  
 Recorded on 28-NOV-2012 01:41

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION  
 C:\Minimus 13.04.8492\Data\Shakespeare Oil Co. Zanobia #1-21\Shakespeare Oil Co. Zanobia #1-21\_002.dta

General Constants All 000 Last Edited on 27-NOV-2012,22:25

General Parameters		
Mud Resistivity	0.720	ohm-metres
Mud Resistivity Temperature	78.000	degrees F
Water Level	0.000	feet

## Hole/Annular Volume and Differential Caliper Parameters

HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	4.500	inches
Caliper for Differential Caliper	Density Caliper	

## Rwa Parameters

Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	

## High Resolution Temperature Calibration MCG-D.K 442

Field Calibration on 08-NOV-2012,09:48

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

## High Resolution Temperature Constants MCG-D.K 442

Last Edited on 08-NOV-2012,09:48

Pre-filter Length	11
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## Gamma Calibration MCG-D.K 442

Field Calibration on 27-NOV-2012 16:06

	Measured	Calibrated (API)
Background	70	47
Calibrator (Gross)	1147	772
Calibrator (Net)	1077	725

## Gamma Constants MCG-D.K 442

Last Edited on 27-NOV-2012,22:19

Gamma Calibrator Number	GRC38	
Mud Density	1.09	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

## Micro Normal and Micro Inverse Calibration MML-A 16

Base Calibration on 08-NOV-2012 09:16

Field Check on 27-NOV-2012 15:48

## Base Calibration

Channel	Resistor 1	Resistor 2	Measured		Calibrated (ohm-m)	
			Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.2	59.9	5.0	25.0	5.0	25.0
Micro Inverse	15.6	78.0	5.0	25.0	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	63.3	63.3
Micro Inverse	48.5	48.5

## Micro Normal and Micro Inverse Constants MML-A 16

Last Edited on 27-NOV-2012,22:19

Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159
Micro Normal K Factor	1.0000
Micro Inverse K Factor	1.0000
Standoff Offset	N/A inches

## Caliper Calibration MML-A 16

Base Calibration on 08-NOV-2012 09:06

Field Calibration on 27-NOV-2012 15:46

## Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13968	5.98
2	17082	7.97
3	20284	9.86
4	24165	11.92
5	0	0.00
6	N/A	N/A

## Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.07	5.98

# DOWNHOLE EQUIPMENT

C:\Minimus 13.04.8492\Data\Shakespeare Oil Co. Zanolbia #1-21\Shakespeare Oil Co. Zanolbia #1-21\_002.dta

Compact Comms Gamma  
MCG-D.K 442 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log  
MML-A 16 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

Compact Neutron  
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

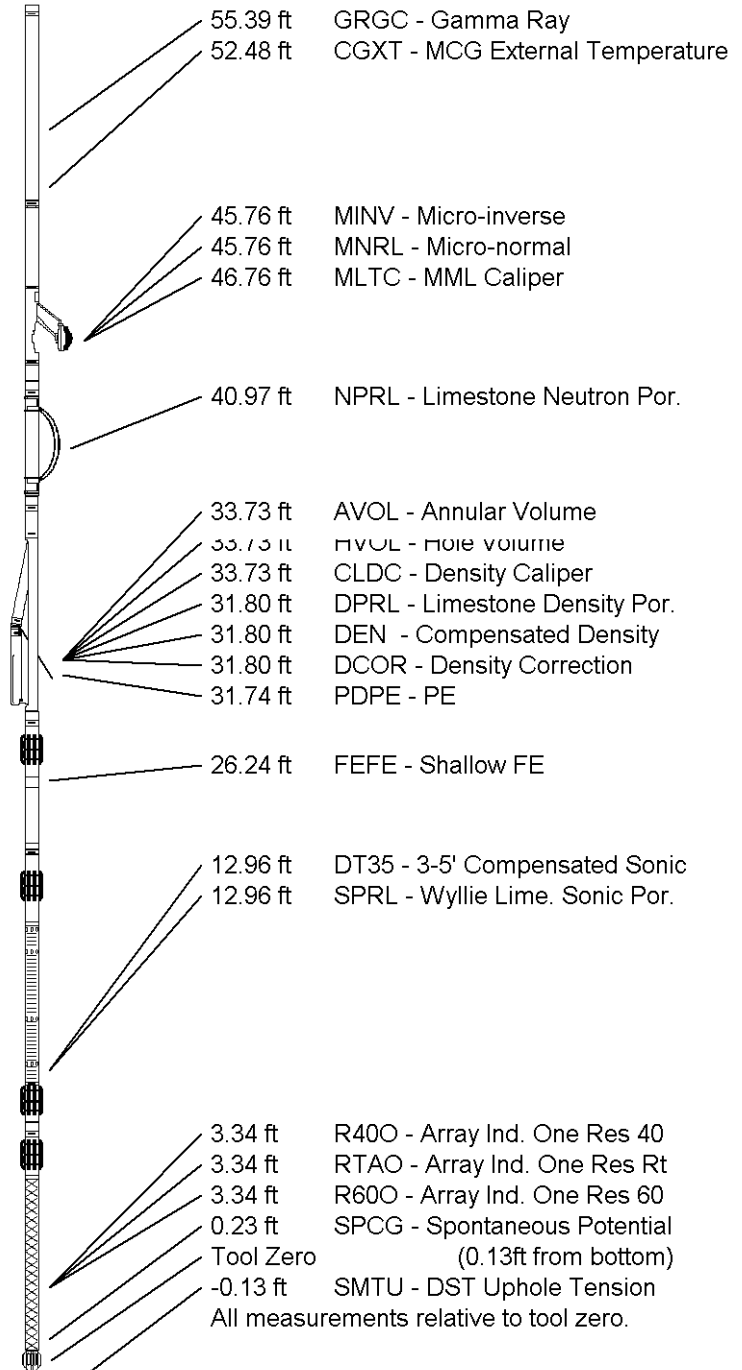
Compact Density/Caliper  
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric  
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Sonic  
MSS-A.A 126 LG: 12.52 ft WT: 72.8 lb OD: 2.24 in

Compact Induction  
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 60.68 ft Weight: 456.4 lb



<b>COMPANY</b>	<b>SHAKESPEARE OIL CO., INC.</b>
<b>WELL</b>	<b>ZANOBIA #1-21</b>
<b>FIELD</b>	<b>WILDCAT</b>
<b>PROVINCE/COUNTY</b>	<b>LOGAN</b>
<b>COUNTRY/STATE</b>	<b>U.S.A. / KANSAS</b>

Elevation Kelly Bushing	2867.00	feet	First Reading	4555.00	feet
Elevation Drill Floor	2865.00	feet	Depth Driller	4600.00	feet
Elevation Ground Level	2855.00	feet	Depth Logger	4601.00	feet



