MICRORESISTIVITY LOG

COMPANY	SHAKESPEARE OIL CO., INC
WELL	TEETER #2-11
FIELD	STRATFORD
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	514' FSL & 1494' FEL

SEC	TWP	RGE	Other Services
11	13S	32W	MPD/MDN
			MAI/MFE

API Number 15-109-21219
Permit Number

Permanent Datum GL, Elevation 2983 feet
Log Measured From KB
Drilling Measured From KB

Elevations:	feet
KB	2995.00
DF	2993.00
GL	2983.00

Date	08-DEC-2013			
Run Number	ONE			
Service Order	3547626			
Depth Driller	4700.00	feet		
Depth Logger	4698.00	feet		
First Reading	4664.76	feet		
Last Reading	3698.00	feet		
Casing Driller	227.00	feet		
Casing Logger	222.00	feet		
Bit Size	7.875	inches		
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.40 lb/USg	55.00 CP		
PH / Fluid Loss	10.00	7.20 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	1.73 @ 89.3	ohm-m		
Rmf @ Measured Temp	1.38 @ 89.3	ohm-m		
Rmc @ Measured Temp	2.08 @ 89.3	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	1.34 @116.0	ohm-m		
Time Since Circulation	3 HOURS			
Max Recorded Temp	116.00	deg F		
Equipment / Base	13096	LIB		
Recorded By	DEREK CARTER		ROB HOFFMAN	
Witnessed By	TIM PRIEST			
JOB#	LB13-346			

BOREHOLE RECORD

Last Edited: 08-DEC-2013 15:52

Bit Size inches	Depth From feet	Depth To feet
7.875	227.00	4700.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	227.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.05.9583
- TOOL STRING: MCG, MML, MDN, MPD, MFE, MSS, MAI RUN IN COMBINATION
- HARDWARE:
  MDN: DUAL BOWSPRING ECCENTRALIZER
  MFE: 1 X 0.5 INCH STANDOFF
  MAI: 2 X 0.5 INCH STANDOFF
- 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
- SERVICE ORDER # 3547626
- RIG: H D DRILLING #2

- ENGINEER: DEREK CARTER

- OPERATORS: KEN RINEHART, DAVID CANADAY

- WHILE LOGGING THE REPEAT SECTION HIT TIGHT SPOT AT 4432'-4436'; INITIAL PULL TO 2850 POUNDS; PULLED TO 3200 POUNDS AND TOOLS CAME FREE

- WHILE LOGGING THE MAIN SECTION HIT TIGHT SPOT AT 4432'-4436'; INITIAL PULL TO 2700 POUNDS; PULLED TO 3000 POUNDS AND TOOLS CAME FREE

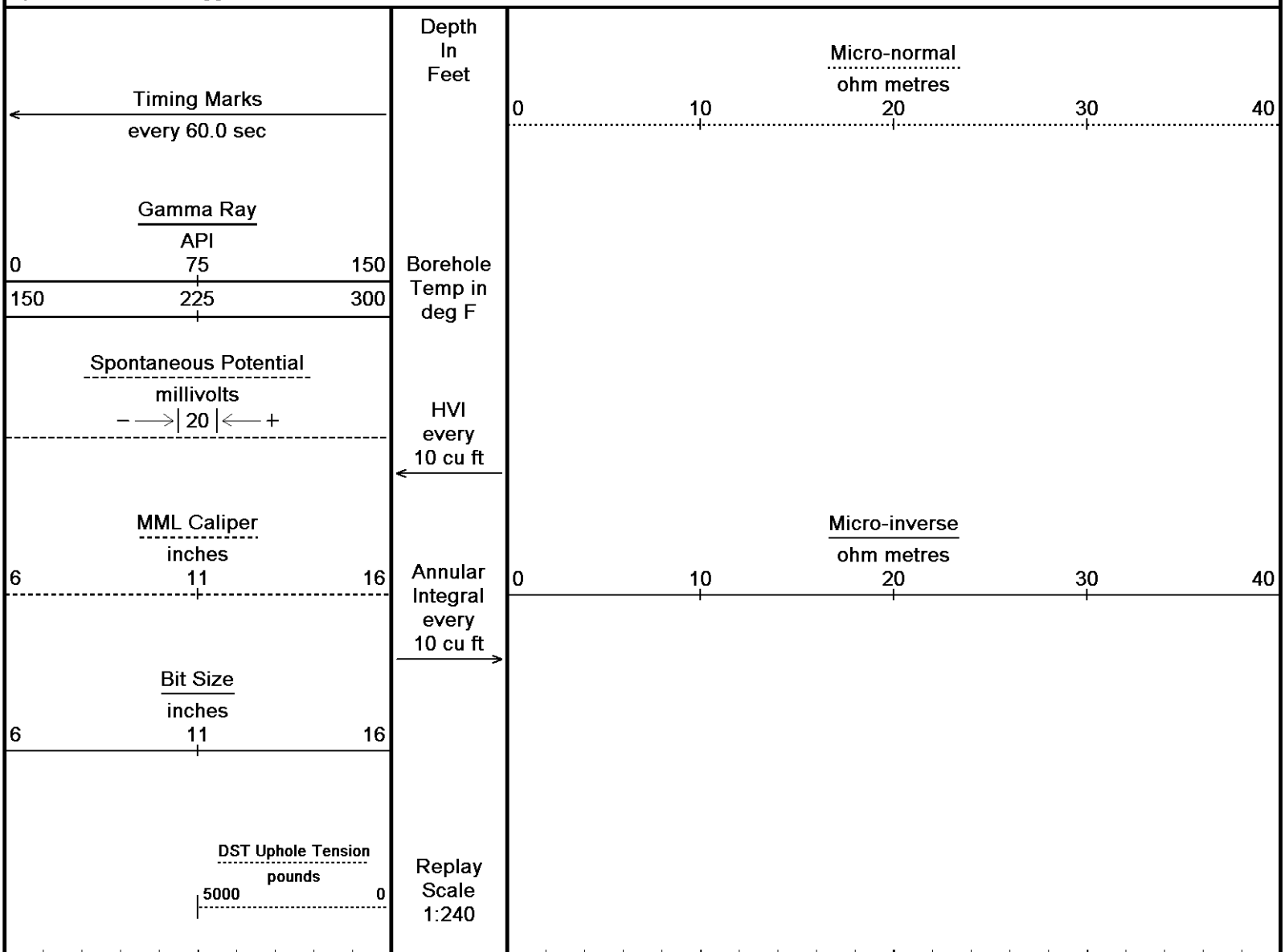
- AFTER TOOLS CAME FREE ON MAIN PASS THE DENSITY CALIPER BECAME NOTICEABLY UNDERGAUGED; UPON PULLING THE TOOLS OUT OF THE HOLE IT WAS DISCOVERED THAT THE DENSITY CALIPER ARM HAD BEEN BENT, POSSIBLY DUE TO A 'YO-YO' EFFECT WHEN THE TOOLS CAME FREE; ADDITIONALLY, IT WAS DISCOVERED THAT THE MICROLOG PAD HAD APPROXIMATELY A 0.5 INCH INCISION AND HAD LEAKED A LARGE AMOUNT OF OIL; AS A RESULT THE DENSITY CALIPER MEASUREMENT (INCLUDING HOLE VOLUME AND ANNULAR VOLUME) IS INVALID AND THE MICROLOG MEASUREMENTS ARE QUESTIONABLE; DON WILLIAMS OF SHAKESPEARE WAS CONTACTED AND IT WAS DETERMINED THAT THE DATA WAS ADEQUATE FOR THE ZONES OF INTEREST AND NO FURTHER RUNS WOULD BE MADE

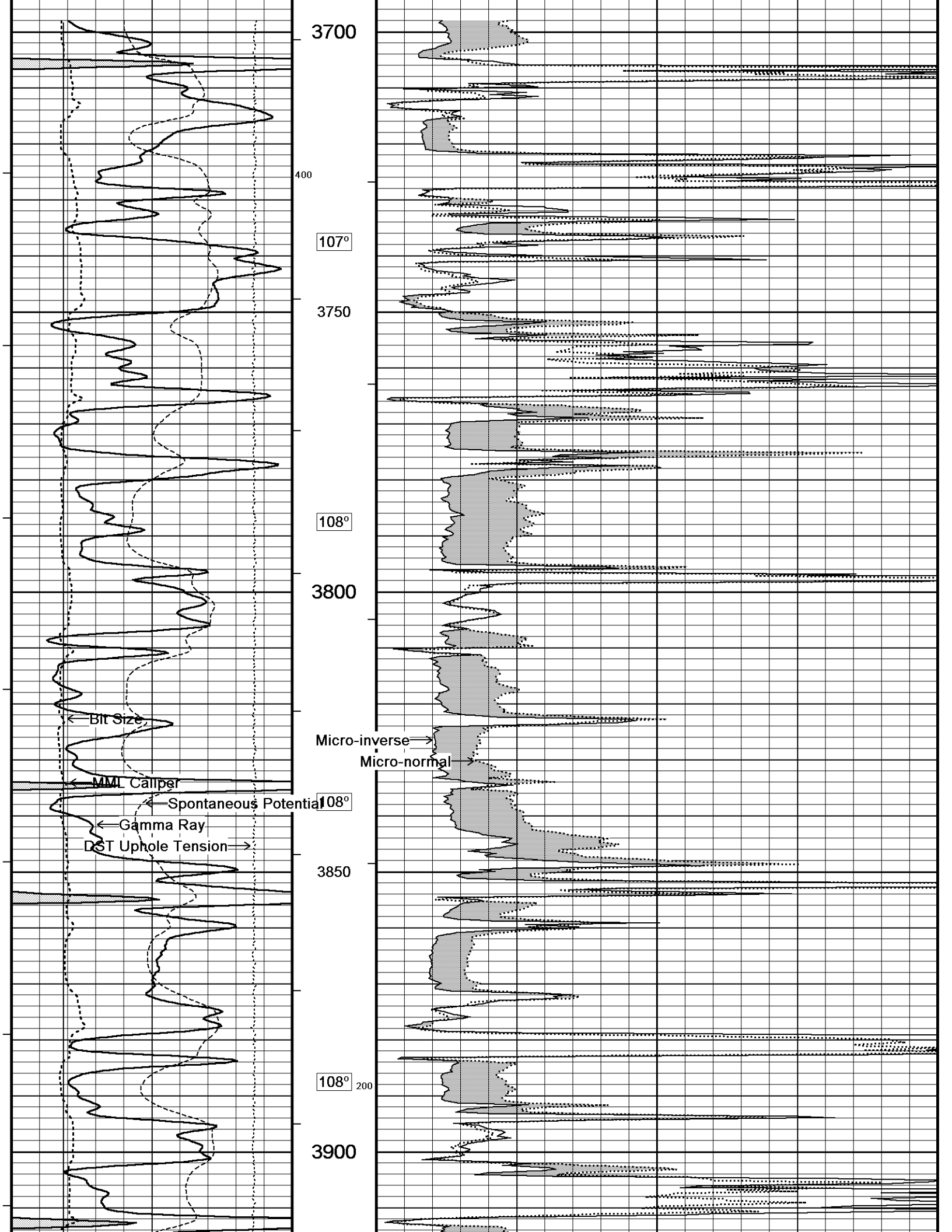
5 INCH MAIN

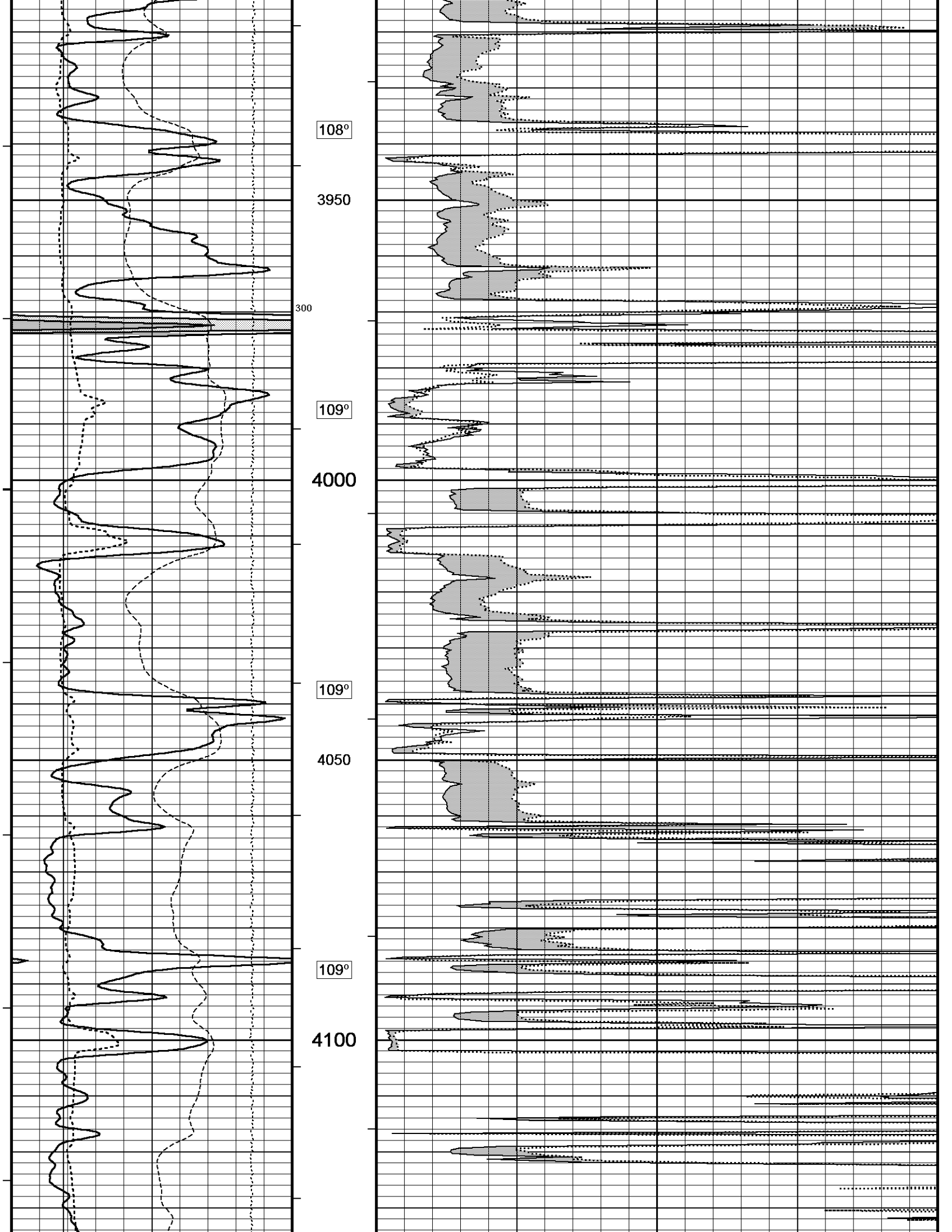
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 09-DEC-2013 00:32

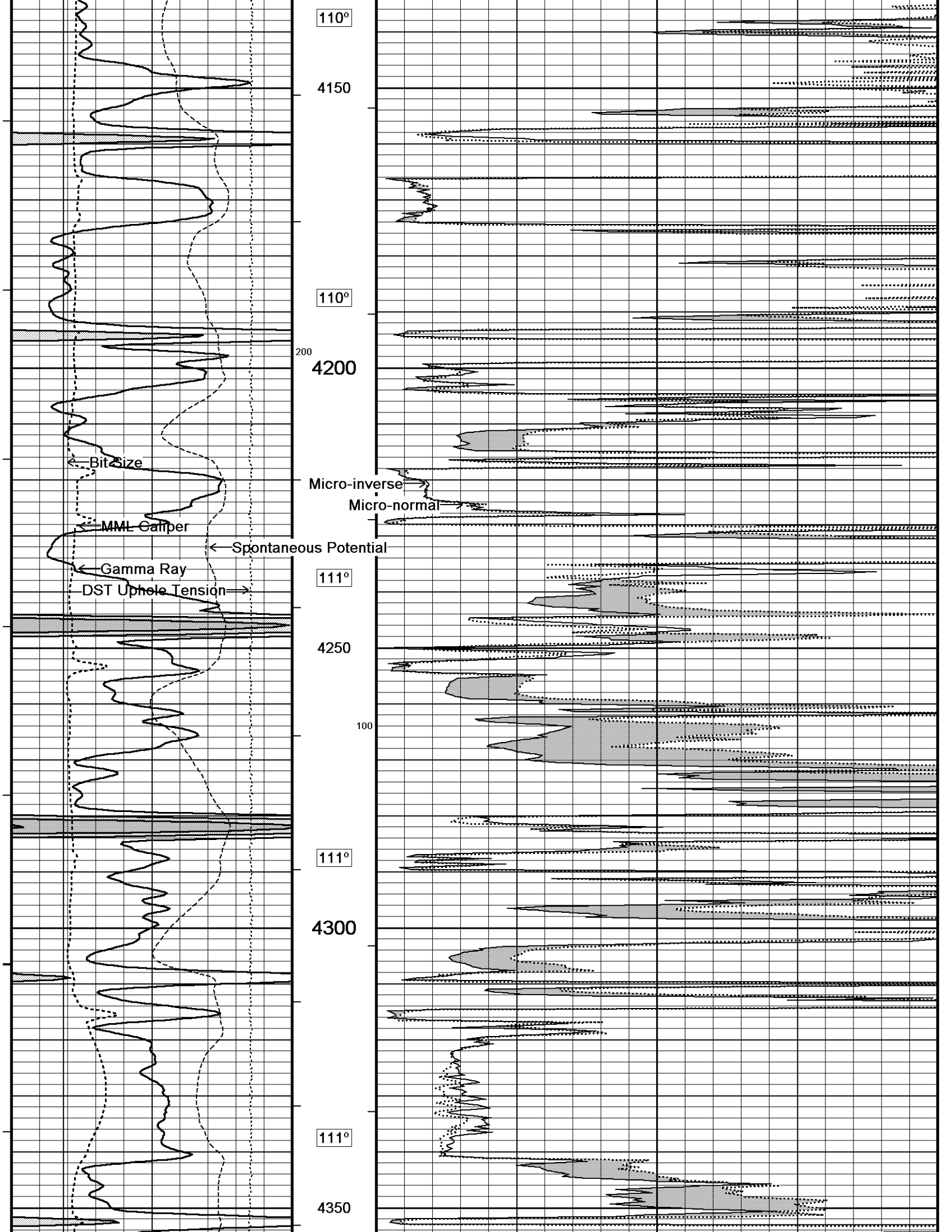
Filename: E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Main.dta — Recorded on 08-DEC-2013 19:59

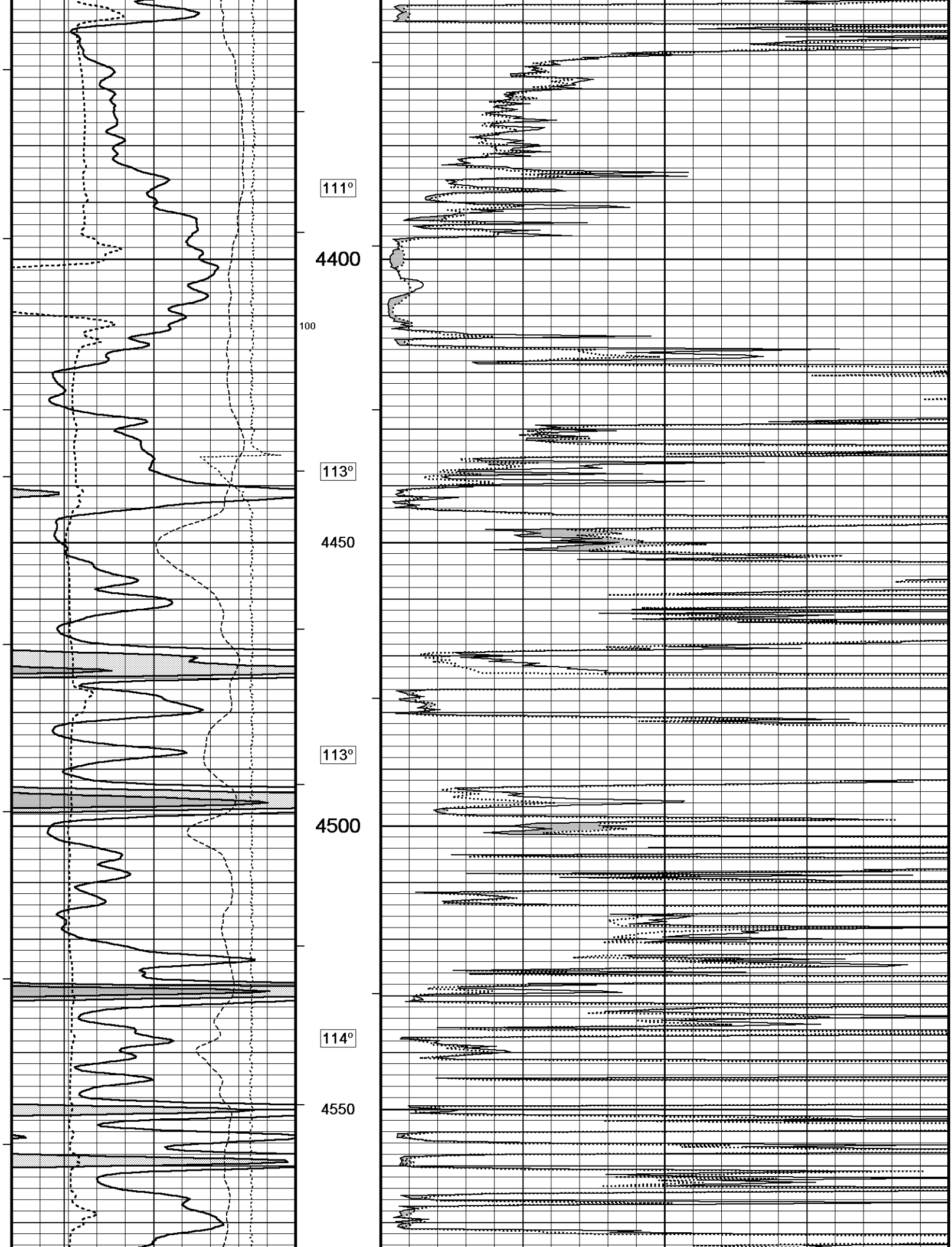
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

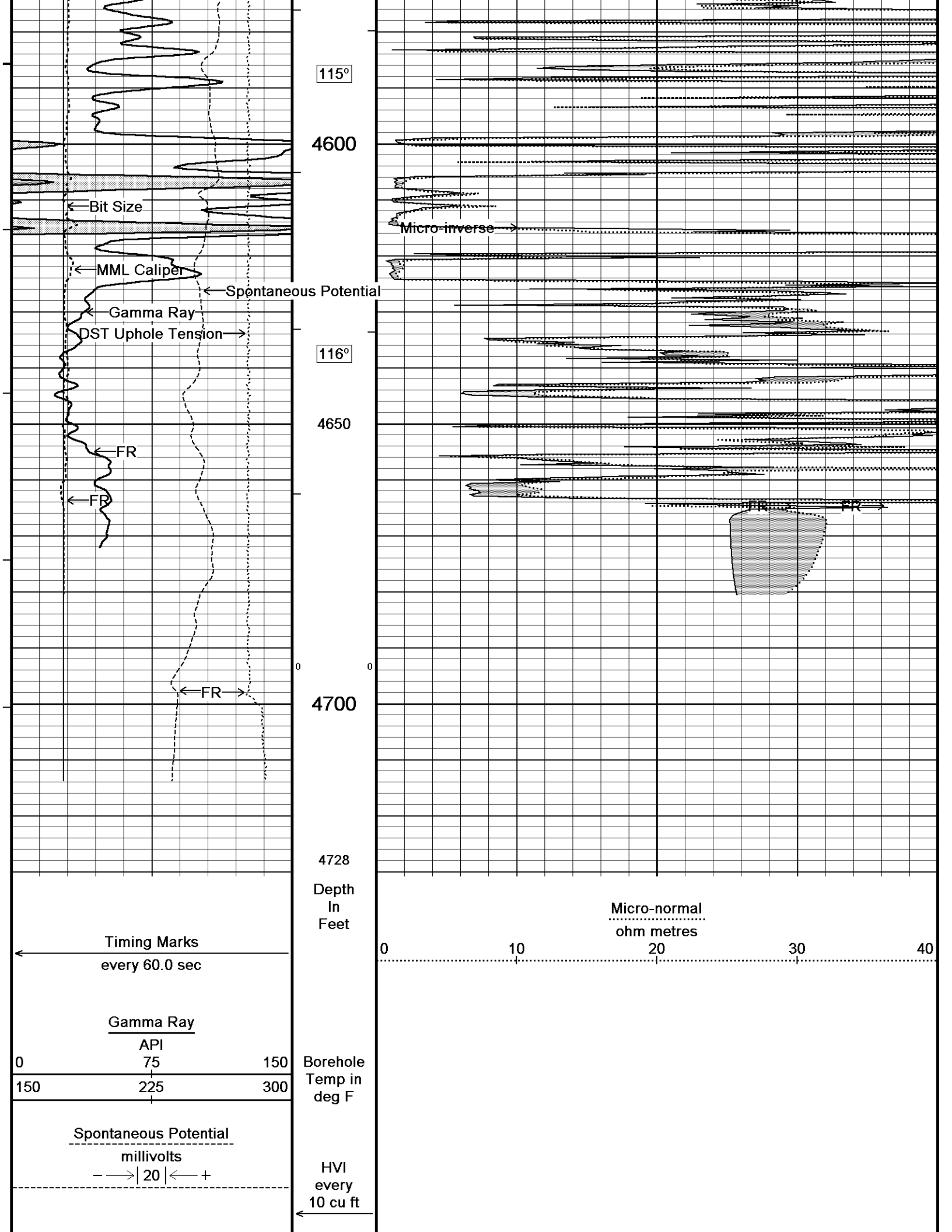



3700
400
107°
3750
108°
3800
Bit Size
Micro-inverse
Micro-normal
MML Caliper
Spontaneous Potential
108°
Gamma Ray
DST Uphole Tension
3850
108°
200
3900


108°
3950
300
109°
4000
109°
4050
109°
4100


110°
4150
110°
200
4200
Bit Size
Micro-inverse
Micro-normal
MML Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
111°
4250
100
111°
4300
111°
4350


111°
4400
100
113°
4450
113°
4500
114°
4550


115°
4600
Bit Size
Micro-inverse
MML Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
116°
4650
FR
FR
FR
FR
FR
0
0
4700
4728
Depth
In
Feet
Micro-normal
ohm metres
0
10
20
30
40
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Borehole
Temp in
deg F
Spontaneous Potential
millivolts
– 20 +
HVI
every
10 cu ft

MML Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Annular Integral every 10 cu ft

Replay Scale 1:240

Micro-inverse
ohm metres
0 10 20 30 40

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 09-DEC-2013 00:32
Filename: E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Main.dta
Recorded on 08-DEC-2013 19:59
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 09-DEC-2013 00:32
Filename: E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Repeat.dta
Recorded on 08-DEC-2013 19:18
System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

Depth in Feet

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Borehole Temp in deg F

Spontaneous Potential
millivolts
− 20 +

HVI every 10 cu ft

Micro-normal
ohm metres
0 10 20 30 40

MML Caliper
inches
6 11 16

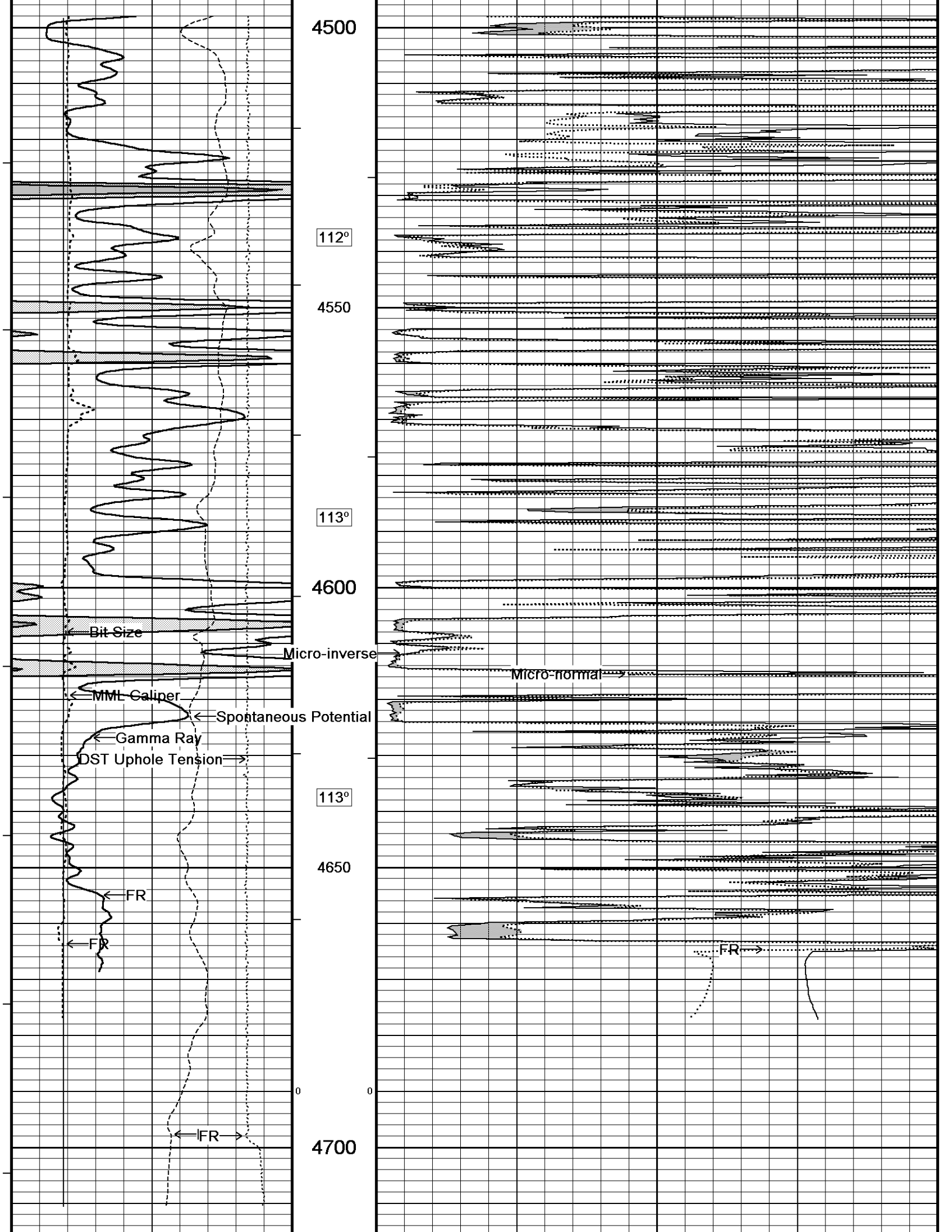
Bit Size
inches
6 11 16

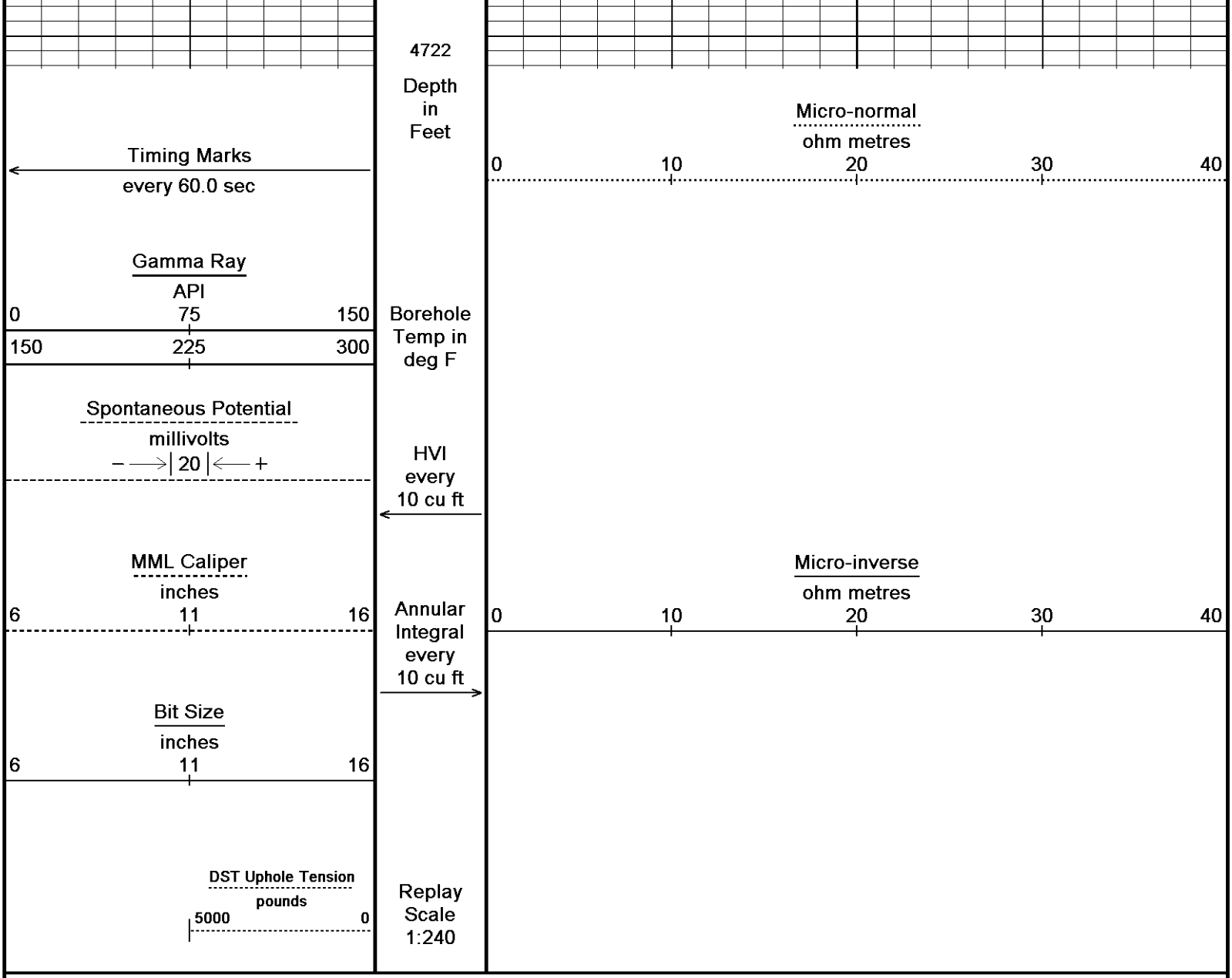
DST Uphole Tension
pounds
5000 0

Annular Integral every 10 cu ft

Replay Scale 1:240

Micro-inverse
ohm metres
0 10 20 30 40


4500
112°
4550
113°
4600
Bit Size
Micro-inverse
Micro-normal
MML Caliper
Spontaneous Potential
Gamma Ray
DST Uphole Tension
113°
4650
FR
FR
FR
FR
0
0
4700



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 09-DEC-2013 00:32

Filename: E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Repeat.dta — Recorded on 08-DEC-2013 19:18

System Versions: Logged with 13.05.9583 Processed with 13.05.9583 Plotted with 13.05.9583

REPEAT SECTION

BEFORE SURVEY CALIBRATION

E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Main Detail.dta

General Constants All 000 — Last Edited on 08-DEC-2013,15:56

General Parameters		
Mud Resistivity	1.730	ohm-metres
Mud Resistivity Temperature	89.300	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	None	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. One Res Rt	

RWA Constant A	1.000
RWA Constant M	2.000
SW/APOR Tool Source	0.000

Gamma Calibration MCG-B 39

Field Calibration on 08-DEC-2013 11:44

	Measured	Calibrated (API)
Background	60	40
Calibrator (Gross)	1135	765
Calibrator (Net)	1075	725

Gamma Constants MCG-B 39

Last Edited on 08-DEC-2013,15:55

Gamma Calibrator Number	GRC38	
Mud Density	1.13	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-B 39

Field Calibration on 08-DEC-2013,11:39

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	75.00	75.00

High Resolution Temperature Constants MCG-B 39

Last Edited on 08-DEC-2013,11:39

Pre-filter Length	11

Caliper Calibration MML-A 3

Base Calibration on 23-NOV-2013 19:41
Field Calibration on 08-DEC-2013 11:21

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	15082	5.98
2	18325	7.97
3	21622	9.86
4	25597	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.97	7.97

Micro Normal and Micro Inverse Calibration MML-A 3

Base Calibration on 23-NOV-2013 17:02
Field Check on 08-DEC-2013 11:19

Base Calibration

	Measured		Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.2	60.2	5.0	25.0
Micro Inverse	15.7	78.3	5.0	25.0

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	63.0	63.0
Micro Inverse	48.3	48.3

Micro Normal and Micro Inverse Constants MML-A 3

Last Edited on 08-DEC-2013,15:54

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 MPD-C.A 216

Base Calibration on 03-NOV-2013 23:03
Field Calibration on 08-DEC-2013 11:18

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	16494	4.01
2	26560	5.96
3	36690	7.98
4	46752	9.95
5	57360	11.91

6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
8.00	7.97

DOWNHOLE EQUIPMENT

E:\Shakespeare Teeter #2-11\Shakespeare Teeter #2-11 Main Detail.dta

3/8" Triple Cone Cable Head (MCB C A)
MCB-C.A 5 LG: 1.58 ft WT: 15.4 lb OD: 2.24 in

Compact Comms Gamma
MCG-B 39 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 3 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

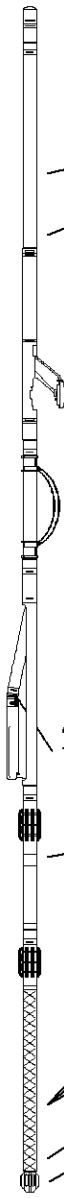
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-C.A 216 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 Induction
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 49.73 ft Weight: 399.0 lb



42.87 ft	GRGC - Gamma Ray
39.96 ft	CGXT - MCG External Temperature
33.24 ft	MINV - Micro-inverse
33.24 ft	MNRL - Micro-normal
34.24 ft	MLTC - MML Caliper
28.45 ft	NPRL - Limestone Neutron Por.
21.21 ft	AVOL - Annular Volume
21.21 ft	HVOL - Hole Volume
21.21 ft	CLDC - Density Caliper
19.28 ft	DEN - Compensated Density
19.28 ft	DCOR - Density Correction
19.28 ft	DPRL - Limestone Density Por.
19.22 ft	PDPE - PE
13.72 ft	FEFE - Shallow FE
3.34 ft	R40O - Array Ind. One Res 40
3.34 ft	RTAO - Array Ind. One Res Rt
3.34 ft	R60O - Array Ind. One Res 60
0.23 ft	SPCG - Spontaneous Potential
Tool Zero	(0.13ft from bottom)
-0.13 ft	SMTU - DST Uphole Tension

All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL CO., INC
WELL	TEETER #2-11
FIELD	STRATFORD
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2995.00	feet	First Reading	4664.76	feet
Elevation Drill Floor	2993.00	feet	Depth Driller	4700.00	feet
Elevation Ground Level	2983.00	feet	Depth Logger	4698.00	feet

MICRORESISTIVITY LOG

Weatherford®

MICRORESISTIVITY LOG