



**Weatherford**

**COMPENSATED NEUTRON  
SONIC POROSITY  
OVERLAY**

COMPANY	SHAKESPEARE OIL CO., INC.		
WELL	B4US #1-32		
FIELD	WILDCAT		
PROVINCE/COUNTY	SCOTT		
COUNTRY/STATE	U.S.A. / KANSAS		
LOCATION	335' FNL & 1440' FWL		
SEC 32	TWP 17S	RGE 33W	Other Services
Latitude			
Longitude			
API Number	15-171-21051		
Permanent Datum GL, Elevation	3056 feet		
Log Measured From	KB		
Drilling Measured From	KB		
Date	10-MAY-2014		
Run Number	ONE		
Service Order	4558-86926003		
Depth Driller	4845.00	feet	Elevations: KB 3066.00
Depth Logger	4842.00	feet	DF 3064.00
First Reading	4829.00	feet	GL 3056.00
Last Reading	3800.00	feet	
Casing Driller	270.00	feet	
Casing Logger	266.00	feet	
Bit Size	7.875	inches	
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.30 lb/USg	54.00 CP	
PH / Fluid Loss	10.50	8.00 ml/30Min	
Sample Source	FLOWLINE		
Rm @ Measured Temp	0.37 @ 93.0	ohm-m	
Rmf @ Measured Temp	0.30 @ 93.0	ohm-m	
Rmc @ Measured Temp	0.44 @ 93.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.30 @ 115.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	115.00	deg F	
Equipment / Base	13244	LIB	
Recorded By	ADAM SILL		
Witnessed By	TIM PRIEST		
JOB #	LB14-140		

BOREHOLE RECORD			Last Edited: 10-MAY-2014 18:38
Bit Size inches	Depth From feet	Depth To feet	
7.875	270.00	4845.00	
CASING RECORD			
Type	Size inches	Depth From feet	Shoe Depth feet
SURFACE	8.625	0.00	270.00
			Weight pounds/ft
			24.00

**REMARKS**

- SOFTWARE ISSUE: WLS 13.08.2113.

- RUN ONE: MCG, MML, MDN, MPD, MFE, MSS, MAI RUN 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.

- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 2321 CU.FT.

- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 3800 FEET: 227 CU.FT.

- RIG: H-D DRILLING #2.

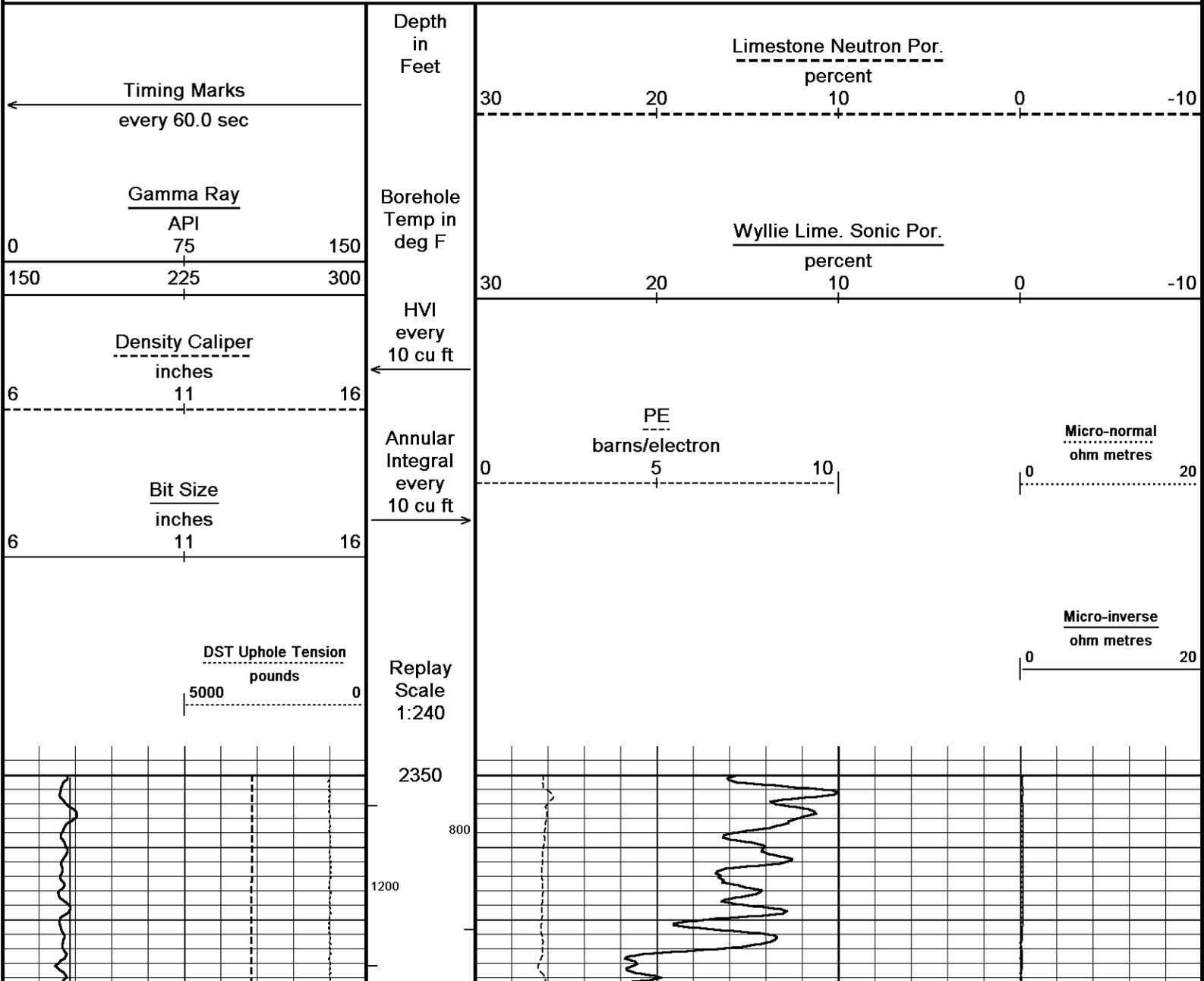
- ENGINEER: A. SILL.

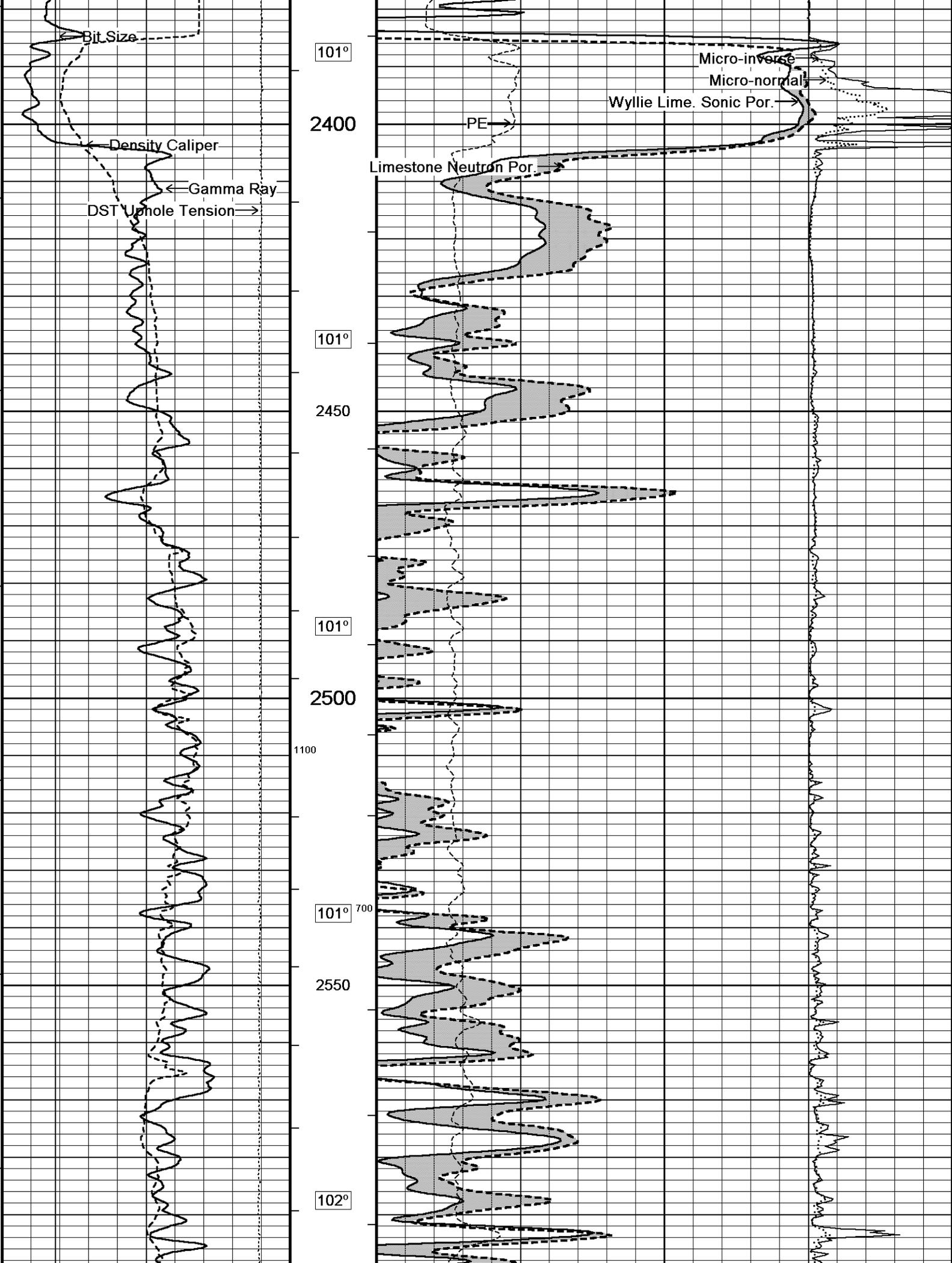
- OPERATOR: J. LaPOINT.

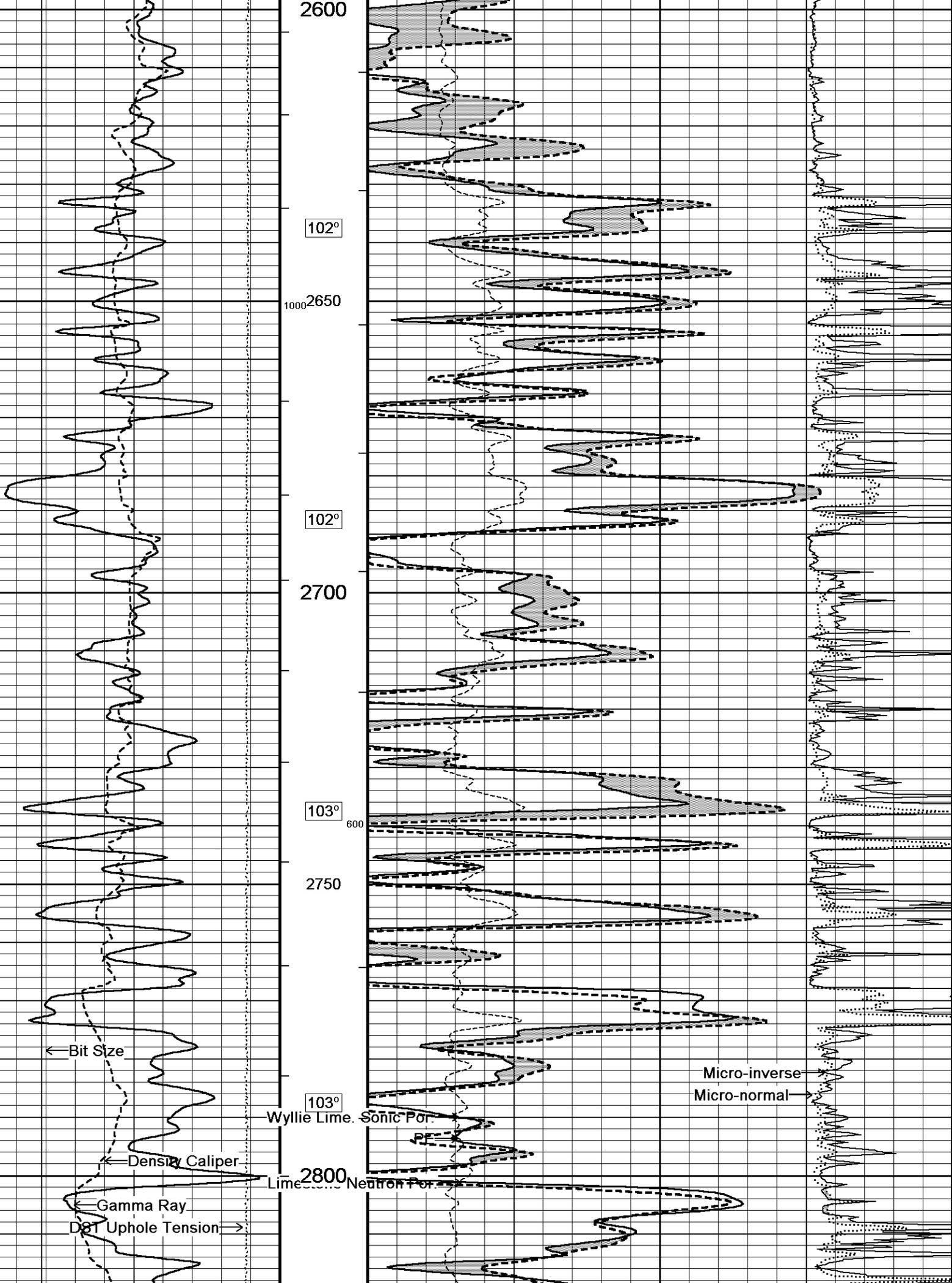
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.

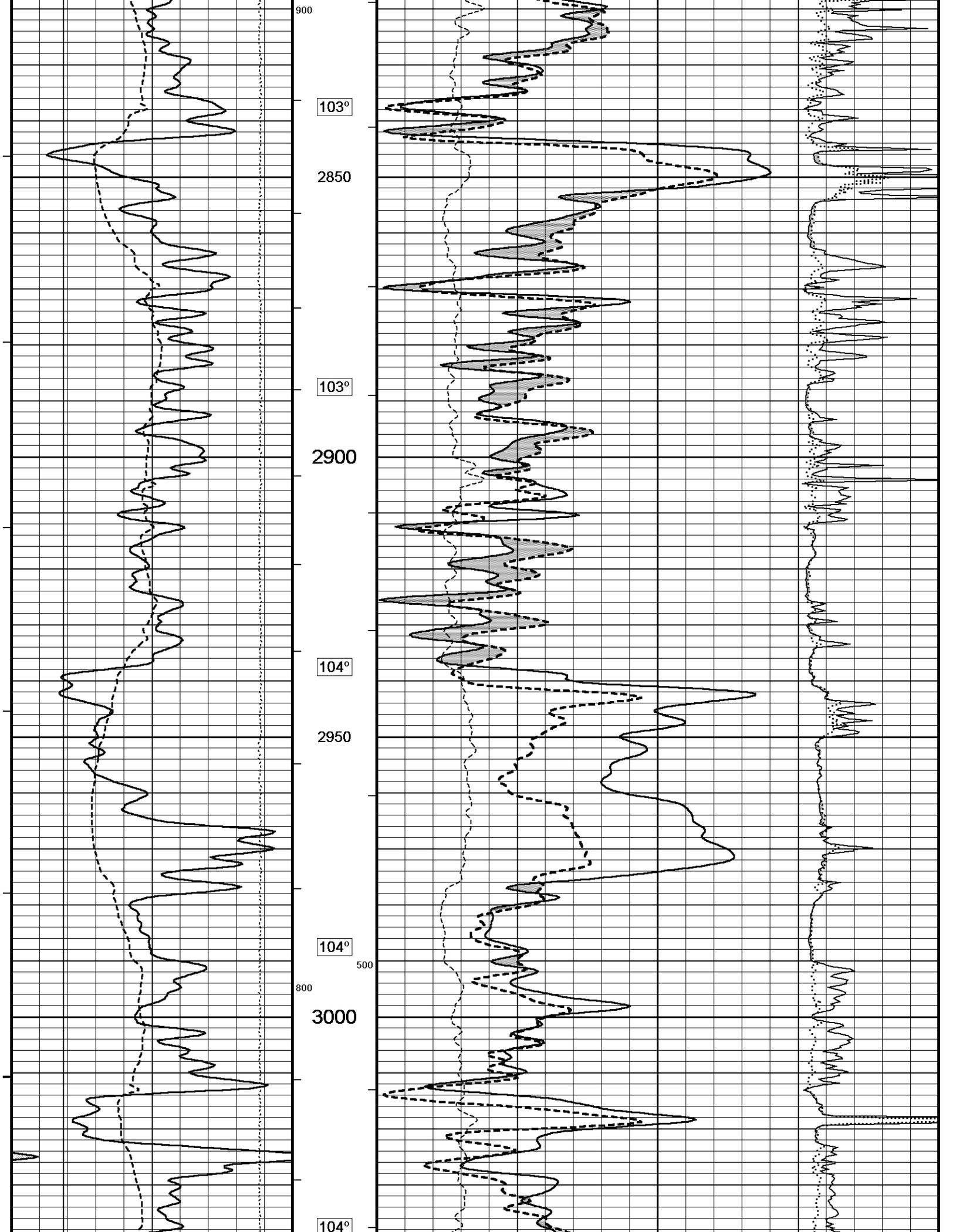
**5 INCH MAIN**

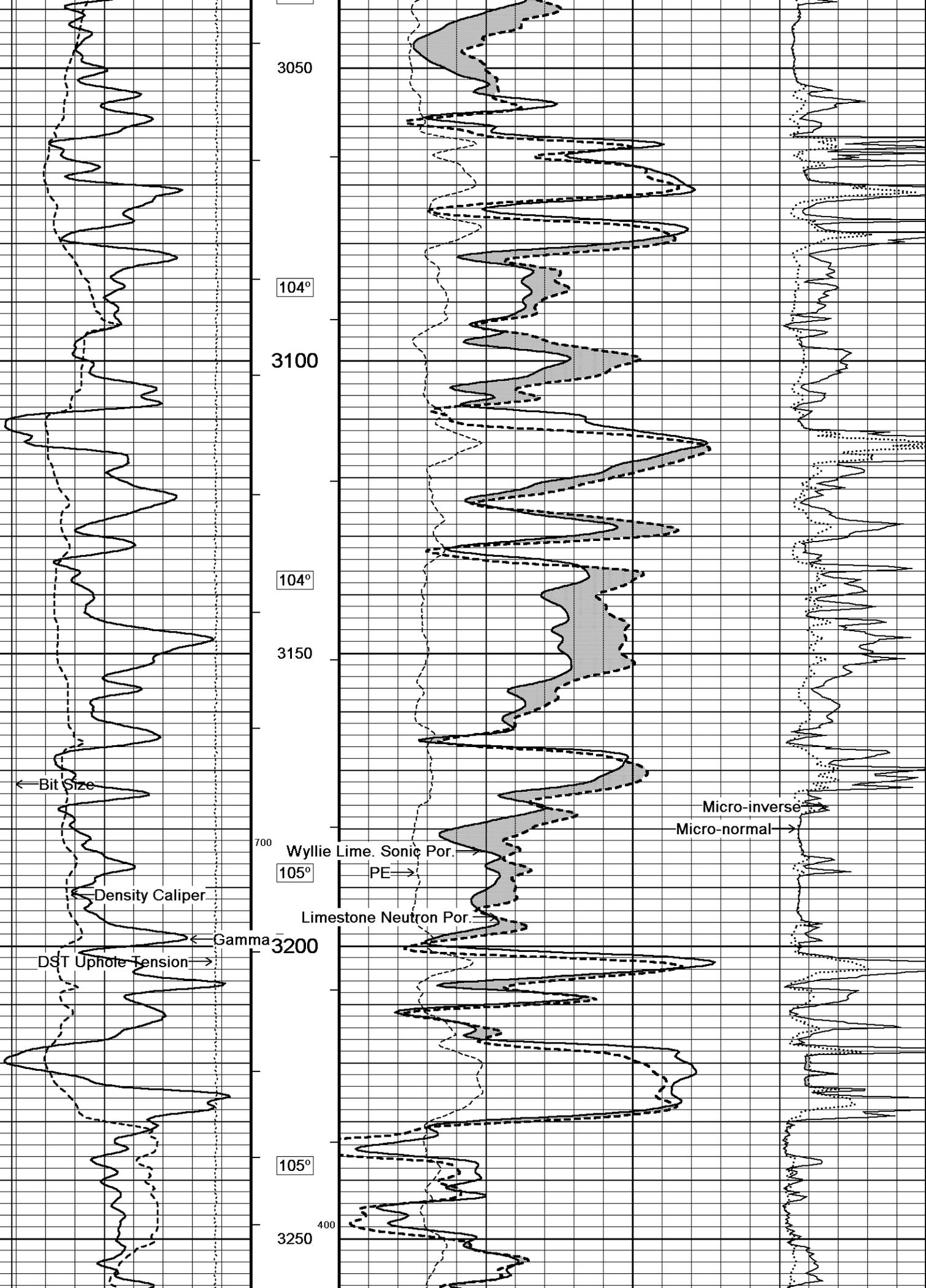
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 11-MAY-2014 00:14  
 Filename: C:\Minimus 13.08.2113\Logs\Shakespeare B4US #1-32\Shakespeare B4US #1-32\_002.dta Recorded on 10-MAY-2014 21:00  
 System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

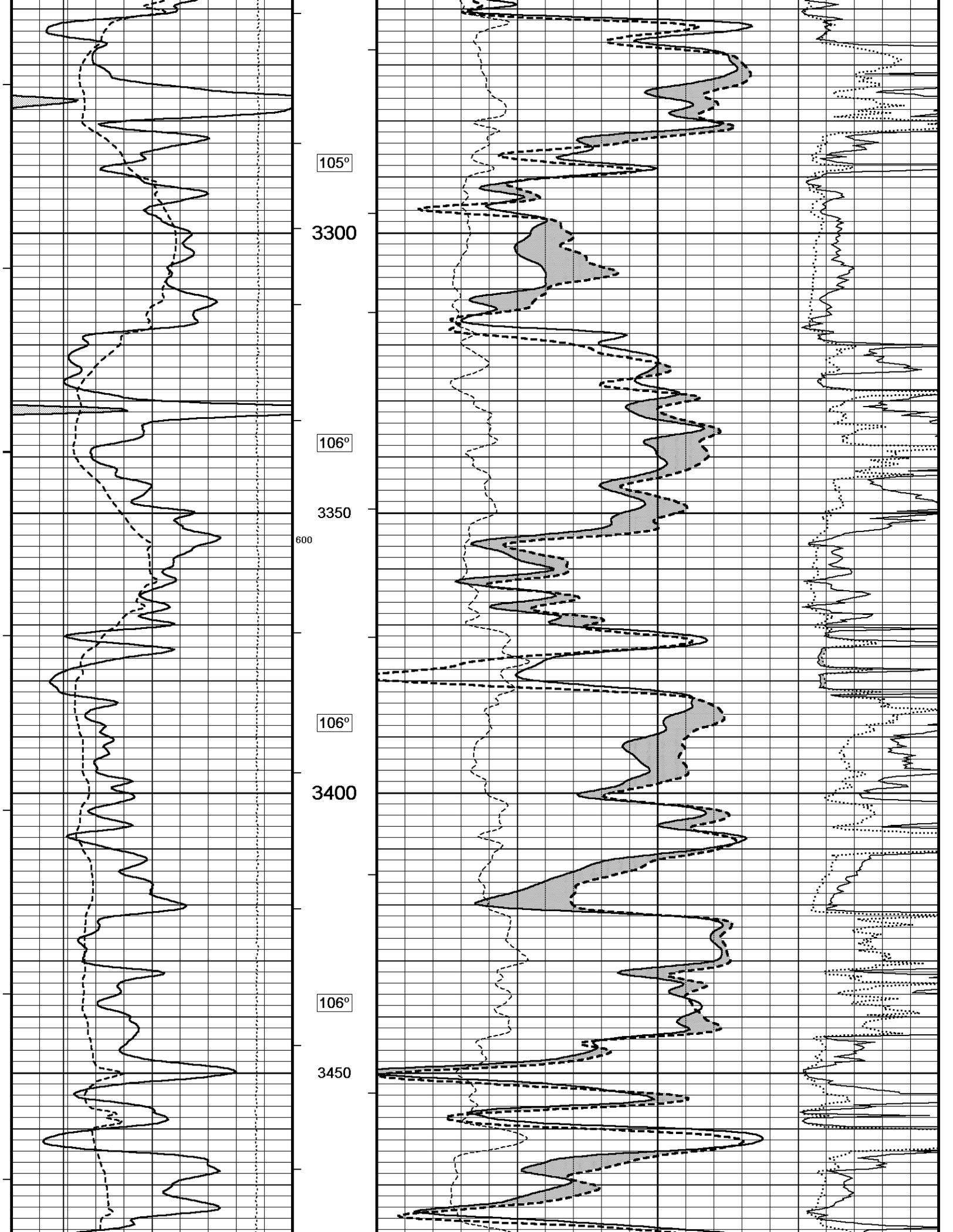


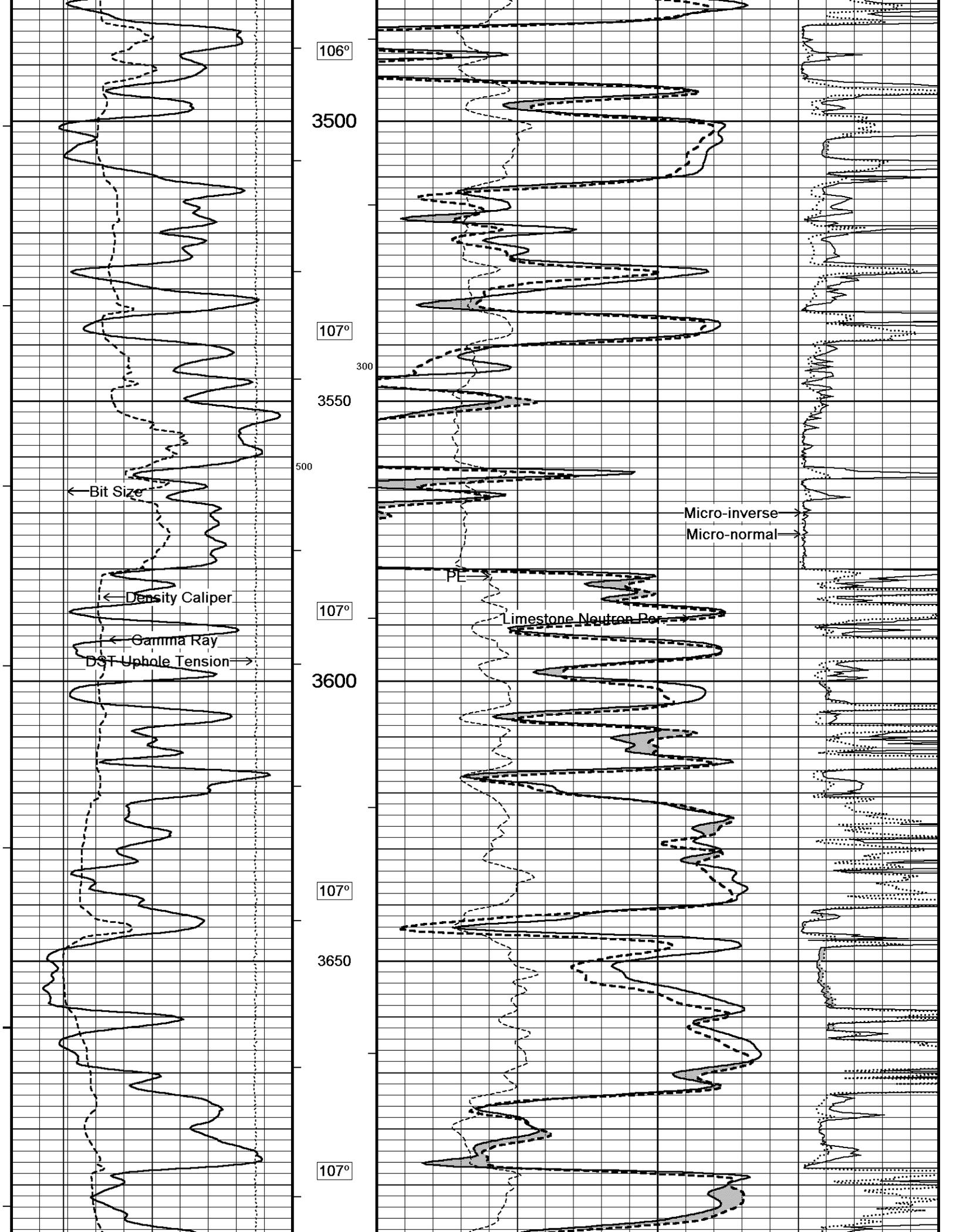


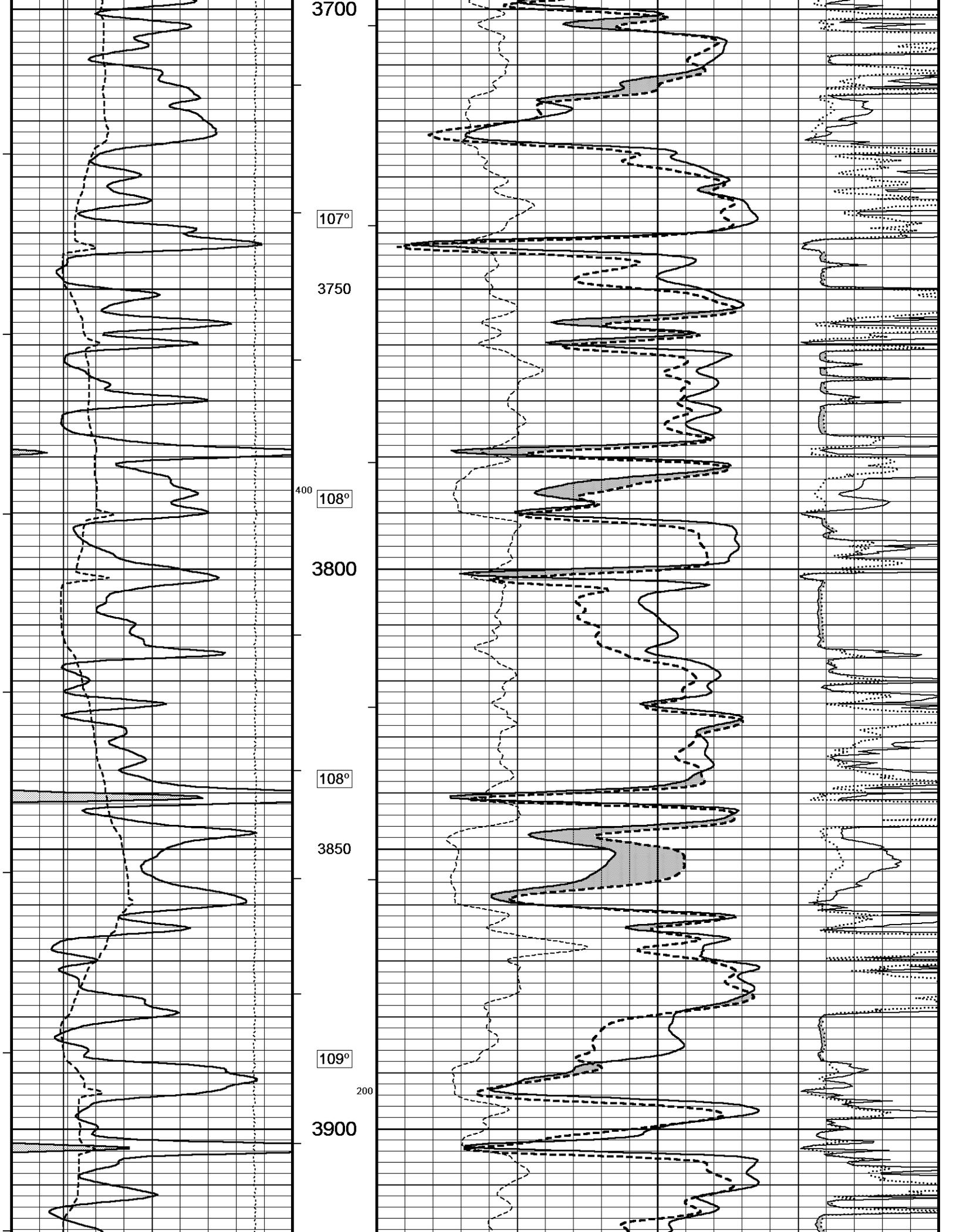


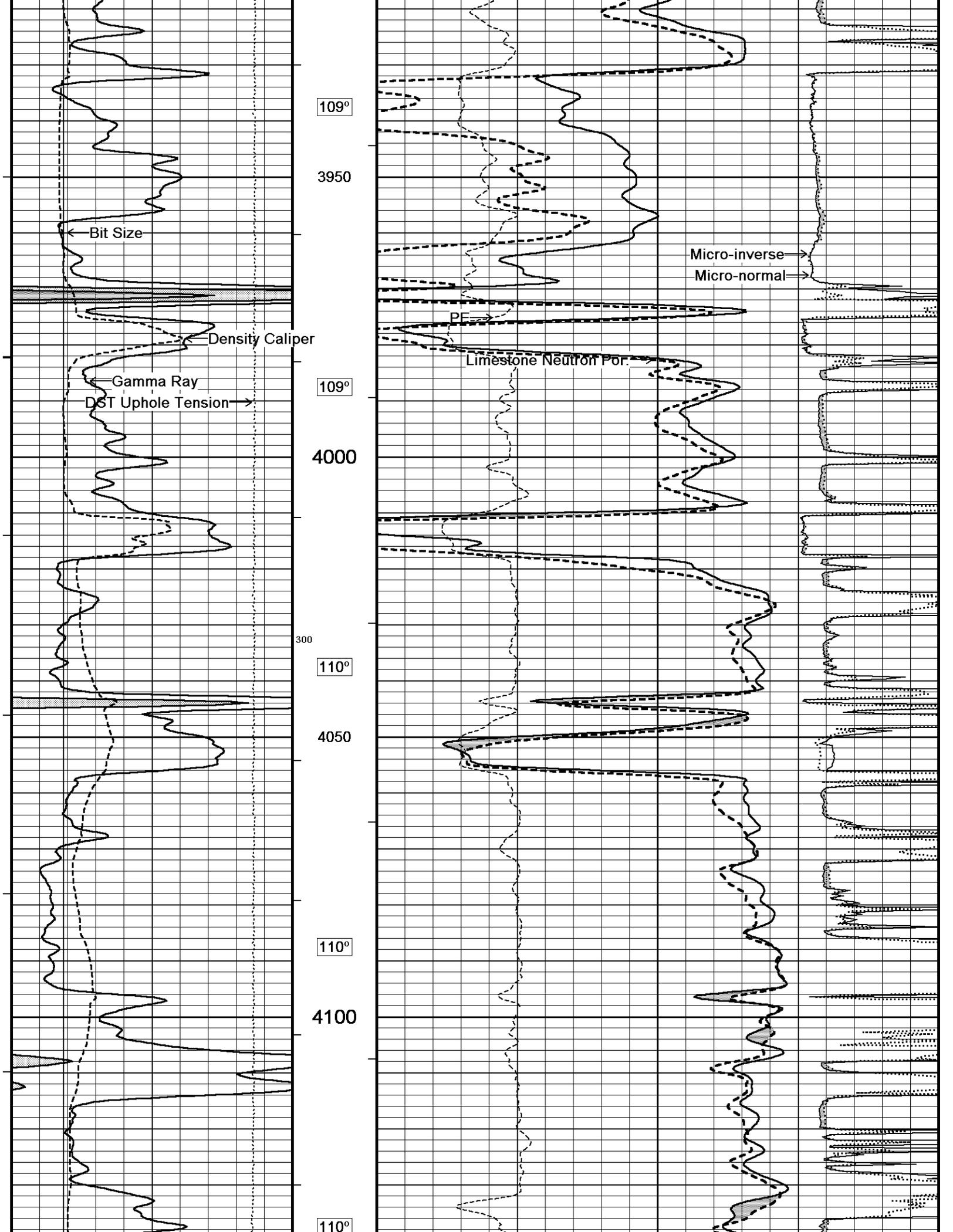


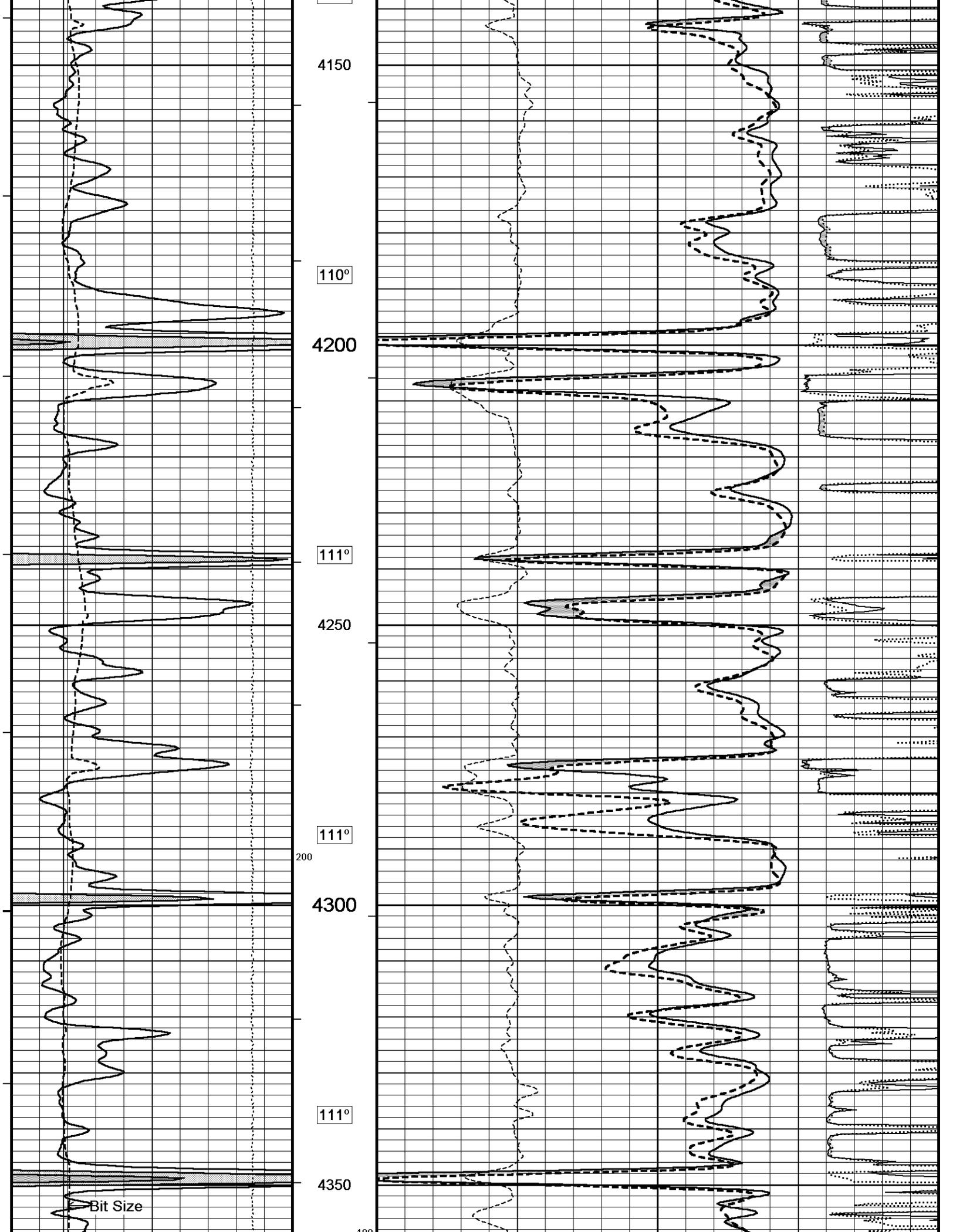


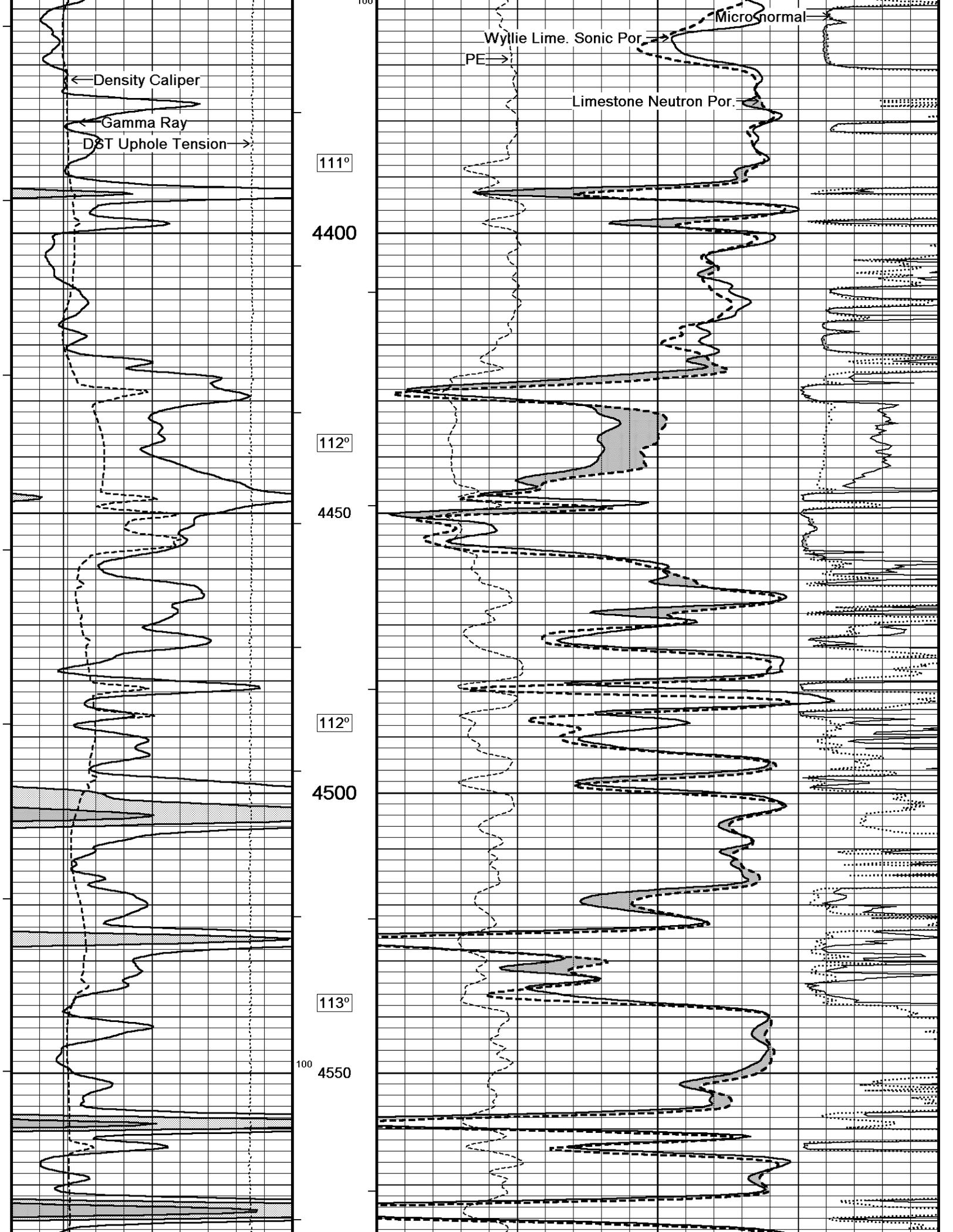


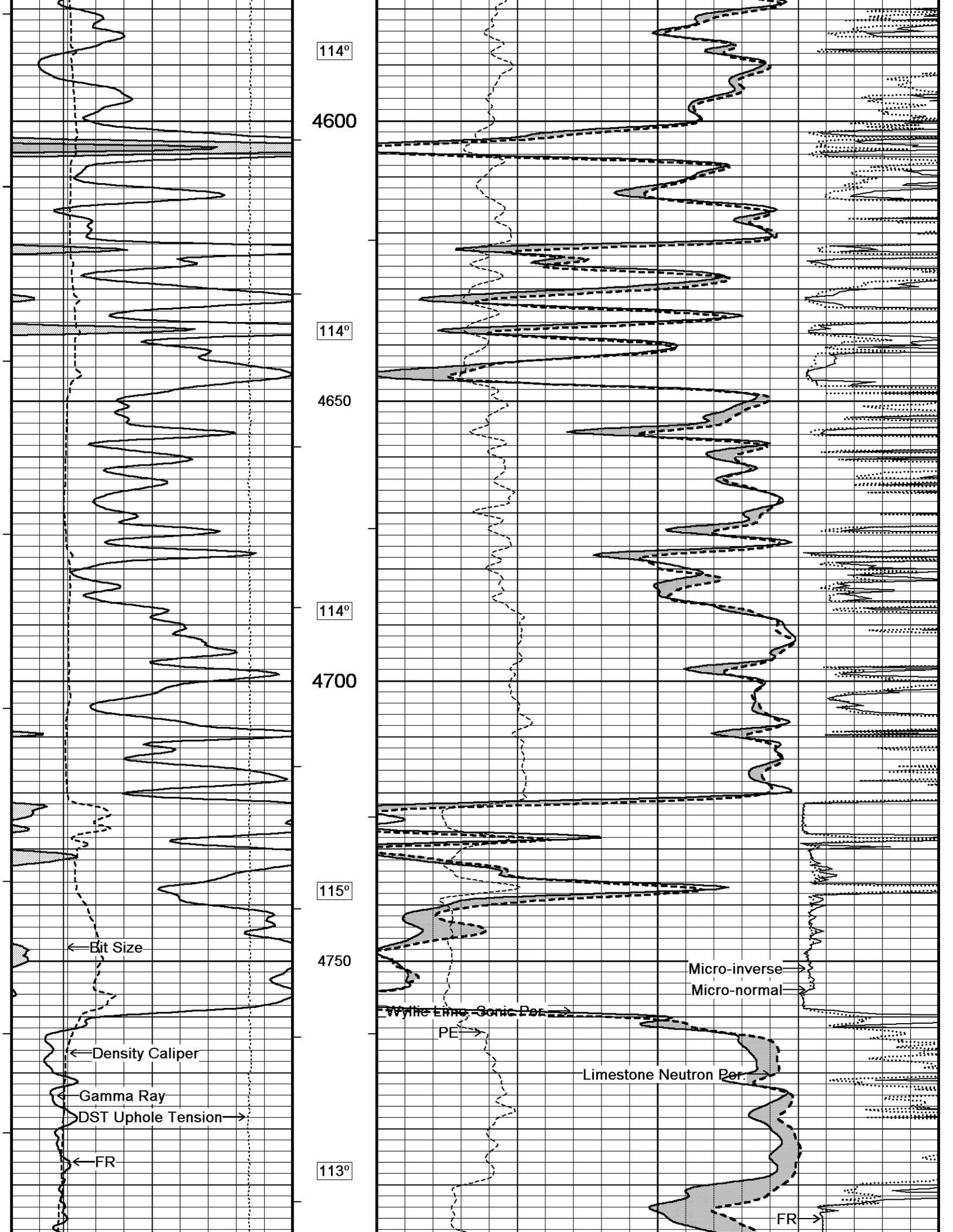


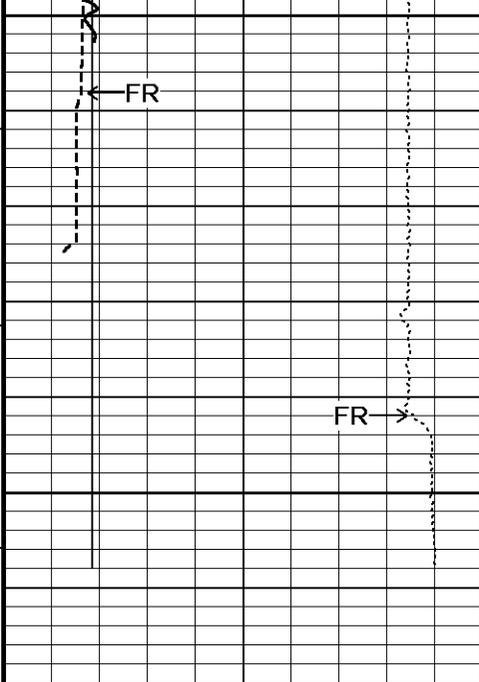




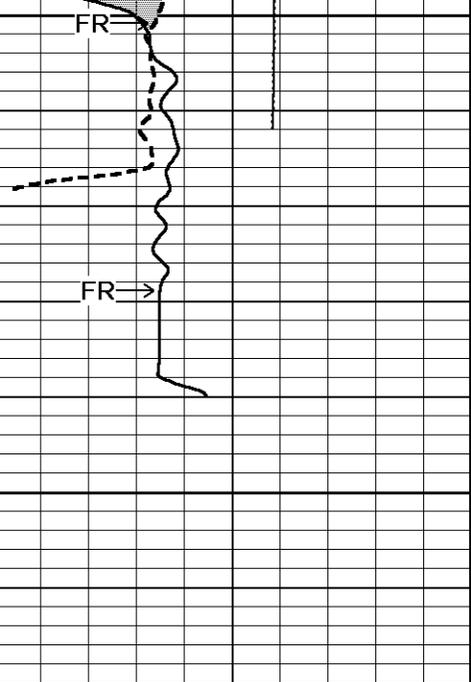
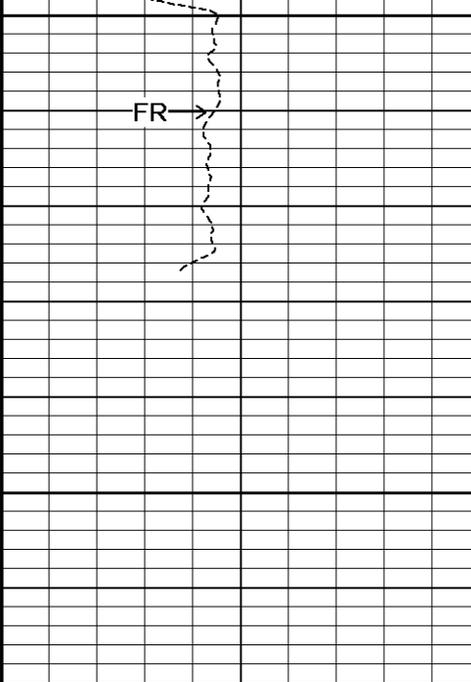








4800  
0  
4850



Timing Marks  
every 60.0 sec

Gamma Ray  
API  
0 75 150  
150 225 300

Density 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  
  
HVI  
every  
10 cu ft  
  
Annular  
Integral  
every  
10 cu ft  
  
Replay  
Scale  
1:240

Limestone Neutron Por.  
percent  
30 20 10 0 -10

Wyllie Lime. Sonic Por.  
percent  
30 20 10 0 -10

PE  
barns/electron  
0 5 10

Micro-normal  
ohm metres  
0 20  
  
Micro-inverse  
ohm metres  
0 20

Depth Based Data - Maximum Sampling Increment 10.0cm  
Plotted on 11-MAY-2014 00:14  
Filename: C:\Minimus 13.08.2113\Logs\Shakespeare B4US #1-32\Shakespeare B4US #1-32\_002.dta  
Recorded on 10-MAY-2014 21:00  
System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

↑ 5 INCH MAIN ↑

BEFORE SURVEY CALIBRATION  
C:\Minimus 13.08.2113\Logs\Shakespeare B4US #1-32\Shakespeare B4US #1-32\_001.dta

General Constants All 000 Last Edited on 10-MAY-2014,20:10

General Parameters  
Mud Resistivity 0.370 ohm-metres

Mud Resistivity Temperature	93.000	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	MMR Caliper	

Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

**Down-hole Tension Calibration SMS 0**

Field Calibration on 06-MAY-2014 23:40

Reading No	Measured	Calibrated (lbs)
1	15071.71	0.00
2	15879.48	481.00

**Gamma Calibration MCG-C 208**

Field Calibration on 10-MAY-2014 11:35

	Measured	Calibrated (API)
Background	69	48
Calibrator (Gross)	1124	773
Calibrator (Net)	1055	725

**Gamma Constants MCG-C 208**

Last Edited on 10-MAY-2014,18:40

Gamma Calibrator Number	GRC038	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

**SP Calibration MCG-C 208**

Field Calibration on 10-MAY-2014 11:38

	Measured	Calibrated (mV)
Reference 1	99.7	99.0
Reference 2	-97.7	-98.8

**High Resolution Temperature Calibration MCG-C 208**

Field Calibration on 23-JAN-2014,17:11

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

**High Resolution Temperature Constants MCG-C 208**

Last Edited on 23-JAN-2014,17:11

Pre-filter Length	11
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**Caliper Calibration MMR-C.A 248**

Base Calibration on 10-MAY-2014 09:28  
Field Calibration on 10-MAY-2014 09:30

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	13446	5.98
2	16585	7.97
3	19782	9.86
4	23693	11.92
5	0	0.00
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.99	7.97

**Micro Normal and Micro Inverse Calibration MMR-C.A 248**

Base Calibration on 10-MAY-2014 09:40  
Field Check on 10-MAY-2014 09:43

## Base Calibration

Channel	Resistor 1	Measured		Calibrated (ohm-m)	
		Resistor 2	Resistor 1	Resistor 2	Resistor 1
Micro Normal	10.1	49.8	5.1	25.6	
Micro Inverse	9.9	49.5	3.4	16.9	
Channel	Base Check (ohm-m)		Field Check (ohm-m)		
Micro Normal	93.6		93.6		
Micro Inverse	62.2		62.2		

## Micro Normal and Micro Inverse Constants MMR-C.A 248

Last Edited on 23-JAN-2014,17:04

Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159			
Micro Normal K Factor	0.5110			
Micro Inverse K Factor	0.3380			
Standoff Offset	0.0000	inches		

## Neutron Calibration MDN-B.J 387

Base Calibration on 08-MAY-2014 14:03

Field Check on 08-MAY-2014 14:19

Base Calibration	Near	Measured		Calibrated (cps)	
		Far	Near	Far	Ratio
	2970	91	3714	110	
Ratio	32.668		33.764		
Field Calibrator at Base			Calibrated (cps)		
			1688	2486	
Ratio	0.679				
Field Check			Calibrated (cps)		
			1694	2467	
Ratio	0.687				

## Neutron Constants MDN-B.J 387

Last Edited on 10-MAY-2014,18:40

Neutron Source Id	P58125B		
Neutron Jig Number	5824NE		
Epithermal Neutron			
Caliper Source for Processing	Density Caliper		
Stand-off	0.00	inches	
Mud Density	1.00	gm/cc	
Limestone Sigma	7.10	cu	
Sandstone Sigma	4.26	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	Constant Value		
Temperature	68.00	degrees F	
Mud Salinity	0.00	kppm	
Salinity Correction	Not Applied		
Formation Fluid Salinity Source	None		
Formation Fluid Salinity	N/A	kppm	
Barite Mud Correction	Not Applied		

## FE Calibration MFE-A.A 55

Base Calibration on 10-MAY-2014 09:55

Field Check on 10-MAY-2014 10:04

Base Calibration	Measured		Calibrated (ohm-m)	
	Reference 1	Reference 2	Reference 1	Reference 2
	0.0		0.0	
	952.2		126.8	
Base Check	281.3			
Field Check	281.3			

## FE Constants MFE-A.A 55

Last Edited on 10-MAY-2014,18:39

Running Mode	No Sleeve		
MFE K Factor	0.1268		
Caliper Source for FE correction	Density Caliper		
Caliper Value for FE correction	N/A	inches	
Rm Source for FE correction	Temperature Corr		

Temp. for Rm Corr.  
Stand-off

MCG External Temperature  
0.5

inches

Sonic Constants MSS-A.A 73

Last Edited on 10-MAY-2014,18:39

Maximum Boundary Contrast	100.00	micro-sec/ft
Fluid Transit Time	189.00	micro-sec/ft
Limestone Transit Time	47.50	micro-sec/ft
Sandstone Transit Time	55.50	micro-sec/ft
Dolomite Transit Time	43.50	micro-sec/ft
Sonic used for Porosities	3-5' Compensated Sonic	
Correction for Sonde Skew	Applied	
Cycle Stretch Algorithm	Applied	
MN3FT	N/A	micro-sec
MX3FT	N/A	micro-sec
Hunt-Raymer Constant	83.13	micro-sec/ft

Sonde Mode	Compensated
Hole Type	Open Hole

Sonde Parameters

	Measured	Calibrated
Offset	N/A	0.0000
Free Pipe	N/A	N/A
Peak Amplitude Source		N/A

Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'	N/A	N/A	N/A	N/A	N/A
4'	N/A	N/A	N/A	N/A	N/A
5'	N/A	N/A	N/A	N/A	N/A
6'	N/A	N/A	N/A	N/A	N/A

Processed Fixed Gate Parameters

Waveform Used For Processing	N/A			
Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	N/A	
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A

Full Waveform Parameters

Use 3' Waveform to derive TR	N/A	
Use 4' Waveform to derive TR	N/A	
Use 5' Waveform to derive TR	N/A	
Use 6' Waveform to derive TR	N/A	
3' Waveform Discriminator Level	N/A	mV
4' Waveform Discriminator Level	N/A	mV
5' Waveform Discriminator Level	N/A	mV
6' Waveform Discriminator Level	N/A	mV
3' Waveform Filter	N/A	
4' Waveform Filter	N/A	
5' Waveform Filter	N/A	
6' Waveform Filter	N/A	
Semblance Level	N/A	
Semblance Window Width	N/A	micro-sec
Sonic 1 Despiker	N/A	N/A
Sonic 2 Despiker	N/A	N/A

Induction Calibration MAI-A.A 5

Base Calibration on 21-JAN-2014,09:50  
Field Check on 09-MAY-2014 12:52

Base Calibration

Test Loop Calibration Channel	Measured		Calibrated (mmho/m)	
	Low	High	Low	High
1	16.3	470.8	9.3	966.2
2	5.6	376.1	7.6	821.4
3	2.6	266.1	5.2	566.0
4	1.6	130.0	2.6	279.2

Array Temperature		71.1		Deg F	
Channel	Base Check (mmho/m)		Field Check (mmho/m)		
	Low	High	Low	High	
1	15.5	3863.1	15.5	3862.9	
2	31.9	3590.9	31.9	3590.8	
3	29.9	2971.4	29.9	2971.4	
4	20.8	2126.1	20.8	2126.1	
Deep	18.5	1912.1	18.5	1912.2	
Medium	43.1	3861.3	43.1	3861.2	
Shallow	47.4	5372.9	47.5	5372.7	
Array Temperature		78.9		79.0	Deg F

Induction Constants MAI-A.A 5

Last Edited on 10-MAY-2014,18:39

Induction Model	RtAP-WBM		
Caliper for Borehole Corr.	Density Caliper		
Hole Size for Borehole Correction	N/A	inches	
Tool Centred	No		
Stand-off Type	Fins		
Stand-off	0.50	inches	
Number of Fins on Stand-off	8.0000		
Stand-off Fin Angle	45.00	degrees	
Stand-off Fin Width	0.5000	inches	
Borehole Corr. Rm Source	Temperature Corr		
Temp. for Rm Corr.	MCG External Temperature		
Squasher Start	0.0020	mhos/metre	
Squasher Offset	N/A	mhos/metre	

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

High Resolution Temperature Calibration MAI-A.A 5

Field Calibration on 21-JAN-2014,15:43

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

High Resolution Temperature Constants MAI-A.A 5

Last Edited on 09-MAY-2014,12:22

Pre-filter Length	11
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Caliper Calibration MPD-D.A 480

Base Calibration on 08-MAY-2014 14:36

Field Calibration on 08-MAY-2014 14:37

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	17491	3.99
2	27463	5.98
3	37484	7.97
4	47415	9.86

4	47413	58518	11.92
5		N/A	N/A
6			

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.96	7.97

Photo Density Calibration MPD-D.A 480

Base Calibration on 08-MAY-2014 14:53  
Field Check on 08-MAY-2014 15:00

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Background	1275	1464		
Reference 1	55908	26147	59556	30836
Reference 2	22982	2651	24941	2541

Field Check at Base  
1274.5      1464.0

Field Check  
1277.3      1470.9

PE Calibration

Base Calibration	Measured			Calibrated
	WS	WH	Ratio	Ratio
Background	241	1140		
Reference 1	23265	55701	0.422	0.371
Reference 2	6806	22836	0.303	0.272

Field Check at Base  
240.7      1139.6

Field Check  
239.8      1141.3

Density Constants MPD-D.A 480

Last Edited on 10-MAY-2014,18:39

Density Source Id                      P50557B  
Nylon Calibrator Number              DNCE695  
Aluminium Calibrator Number        DACD698  
Density Shoe Profile                    8 inch  
Caliper Source for Processing        Density Caliper  
PE Correction to Density              Not Applied  
Mud Density                              1.12      gm/cc  
Mud Density Z/A Multiplier            1.11  
Mud Filtrate Density                    1.00      gm/cc  
Dry Hole Mud Filtrate Density        1.00      gm/cc  
DNCT                                      0.00      gm/cc  
CRCT                                      0.00      gm/cc  
Density Z/A Correction                Hybrid

Matrix density (gm/cc)	Depth (m)
2.71	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 13.08.2113\Log\Shakespeare B4US #1-32\Shakespeare B4US #1-32\_001.dta

CBH-C, Cablehead, 11 pin  
CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Comms Gamma



56.02 ft GRGC - Gamma Ray

MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity  
MMR-C.A 248 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron  
MDN-B.J 387 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

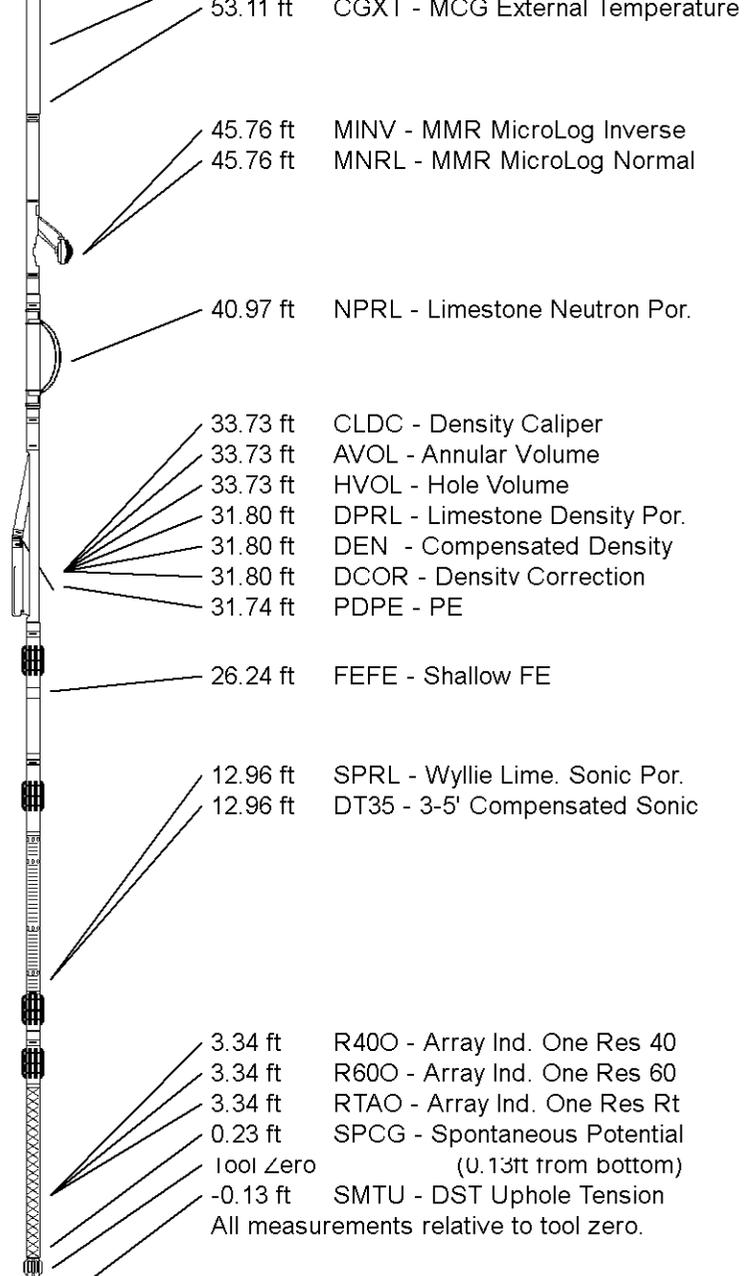
Compact Density/Caliper  
MPD-D.A 480 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric  
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic  
MSS-A.A 73 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

Compact Induction  
MAI-A.A 5 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 63.70 ft Weight: 480.6 lb



COMPANY SHAKESPEARE OIL CO., INC.  
WELL B4US #1-32  
FIELD WILDCAT  
PROVINCE/COUNTY SCOTT  
COUNTRY/STATE U.S.A. / KANSAS

Elevation Kelly Bushing	3066.00	feet	First Reading	4829.00	feet
Elevation Drill Floor	3064.00	feet	Depth Driller	4845.00	feet
Elevation Ground Level	3056.00	feet	Depth Logger	4842.00	feet



**Weatherford**<sup>®</sup>

COMPENSATED NEUTRON  
SONIC POROSITY  
OVERLAY

