



**Weatherford**<sup>®</sup>

**COMPACT PHOTO DENSITY  
COMPENSATED NEUTRON  
MICRORESISTIVITY LOG**

**COMPANY** GRAND MESA OPERATING COMPANY  
**WELL** BREIT-HOSS #1-22  
**FIELD** WILDCAT  
**PROVINCE/COUNTY** NESS  
**COUNTRY/STATE** U.S.A. / KANSAS  
**LOCATION** 118' FSL & 1952' FEL  
SW SE SW SE

SEC	TWP	RGE	Other Services
22	19S	23W	MA/MI/FE
API Number	15-135-25530		
Permit Number			
Permanent Datum G.L., Elevation 2234 feet			
Log Measured From KB			
Drilling Measured From K.B.			
Date	14-FEB-2013		
Run Number	ONE		
Service Order	3538970		
Depth Driller	4470.00	feet	
Depth Logger	4470.00	feet	
First Reading	4450.00	feet	
Last Reading	3450.00	feet	
Casing Driller	220.00	feet	
Casing Logger	221.00	inches	
Bit Size	7.875		
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.30 lb/USg	48.00	
PH / Fluid Loss	10.50	10.50	
Sample Source	FLOWLINE		
Rm @ Measured Temp	0.85 @ 87.0	ohm-m	
Rmf @ Measured Temp	0.68 @ 87.0	ohm-m	
Rmc @ Measured Temp	1.02 @ 87.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.68 @109.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	109.00	deg F	
Equipment / Base	13096	LIB	
Recorded By	LYNN SCOTT		
Witnessed By	JOHN GOLDSMITH		
JOBS#	LB13-045		

Elevations:	feet
KB	2239.00
DF	2238.00
GL	2234.00

**BOREHOLE RECORD**

Last Edited: 13-FEB-2013 23:17

Bit Size inches	Depth From feet	Depth To feet
7.875	220.00	4470.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	220.00	24.00

**REMARKS**

Tools Used: MCG, MML, MDN, MPD, MFE, MAI ran in combination.  
 Hardware: MPD: 8 inch profile plate used.  
 MAI and MFE: 0.5 Inch standoffs used.  
 MDN: Dual Bowspring used.  
 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 volume with 5.5 inch production casing from TD to 3450 feet = 240 cubic feet  
 Total hole volume from TD to Surface casing= 2437 cubic feet  
 Service order #3538970  
 Rig: Murfin #24  
 Engineer: L. Scott  
 Operator(s): M. Stegman

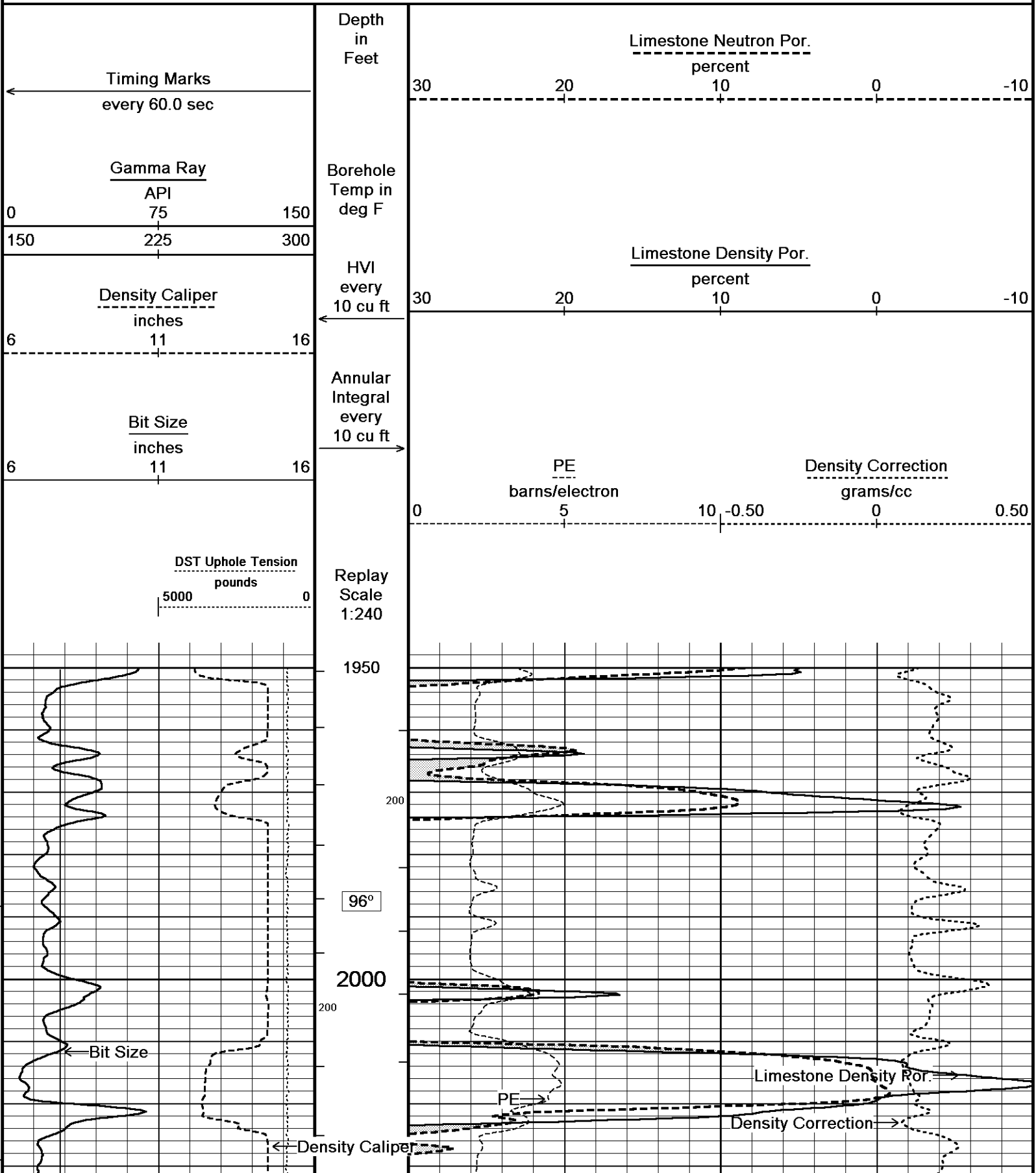
The software duplicates the pH value onto the fluid loss value. The fluid loss is 6.8.

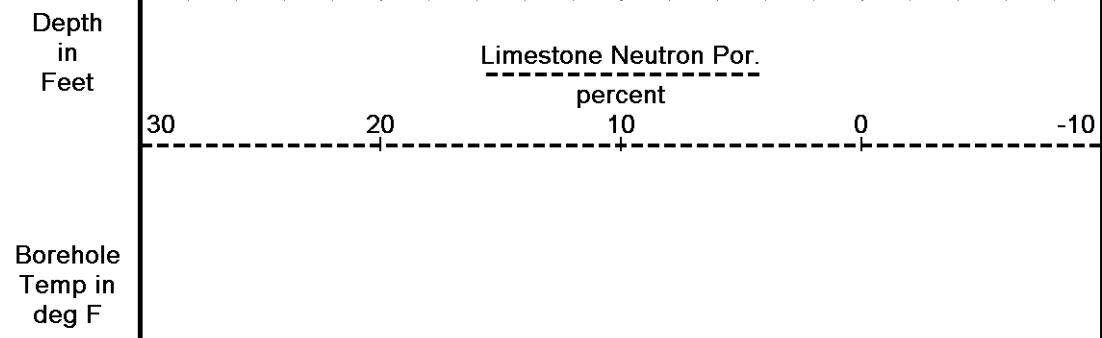
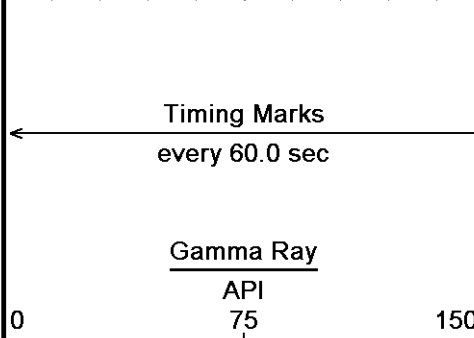
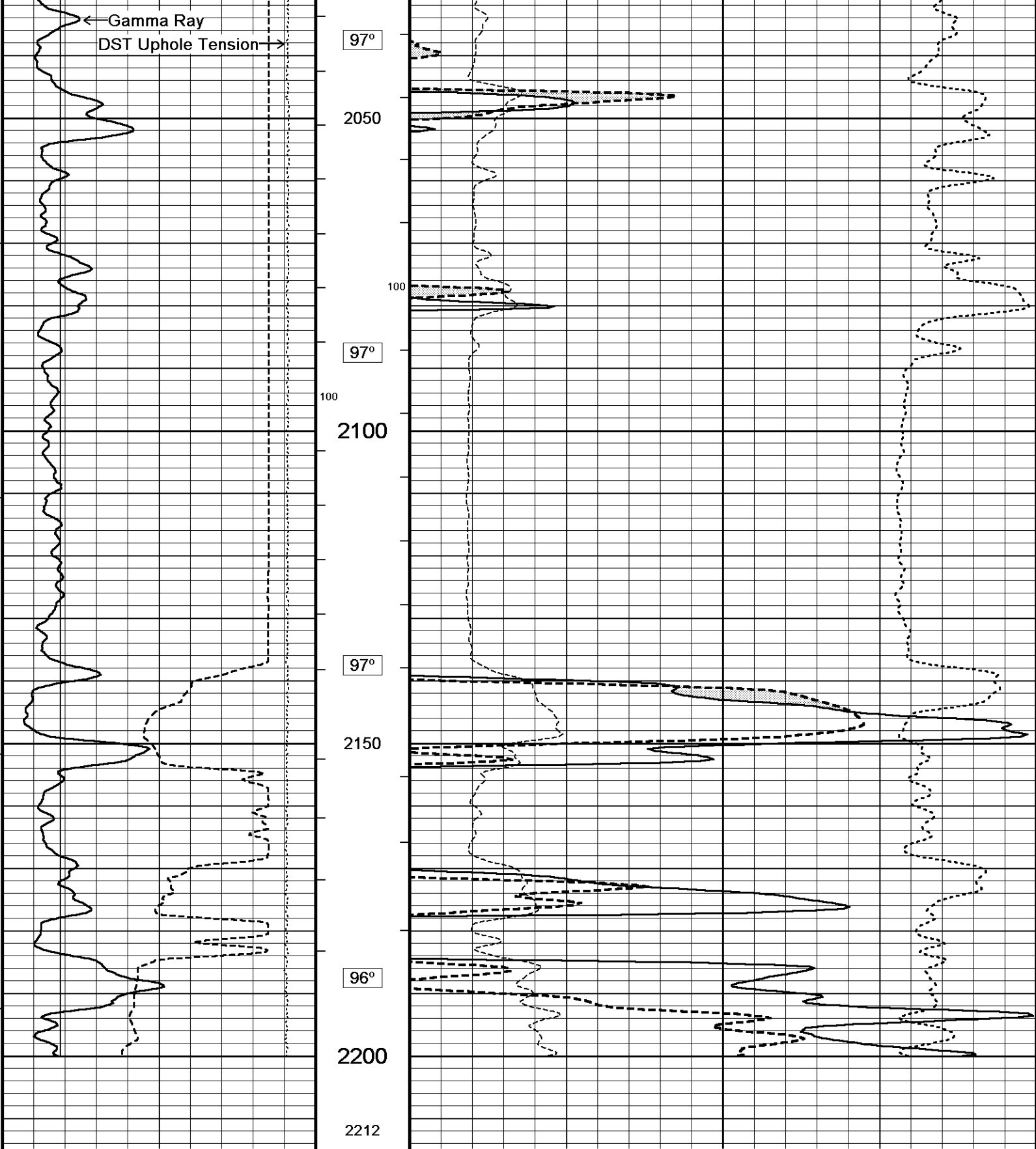
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy

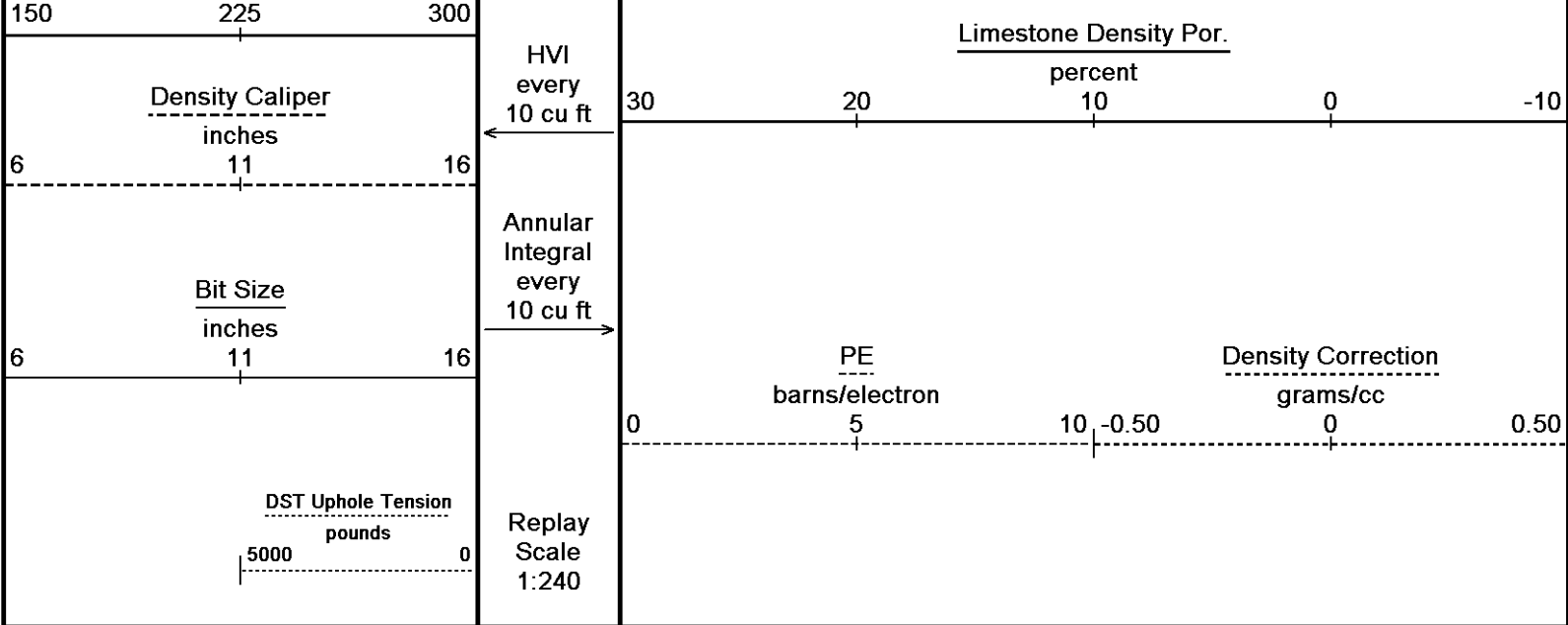
or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. 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 14-FEB-2013 01:14  
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Breit-Hoss ...\Grand Mesa Breit-Hoss 1-22\_002.dta Recorded on 13-FEB-2013 23:15  
 System Versions: Logged with 13.04.8492 Processed with 13.04.8492 Plotted with 13.04.8492



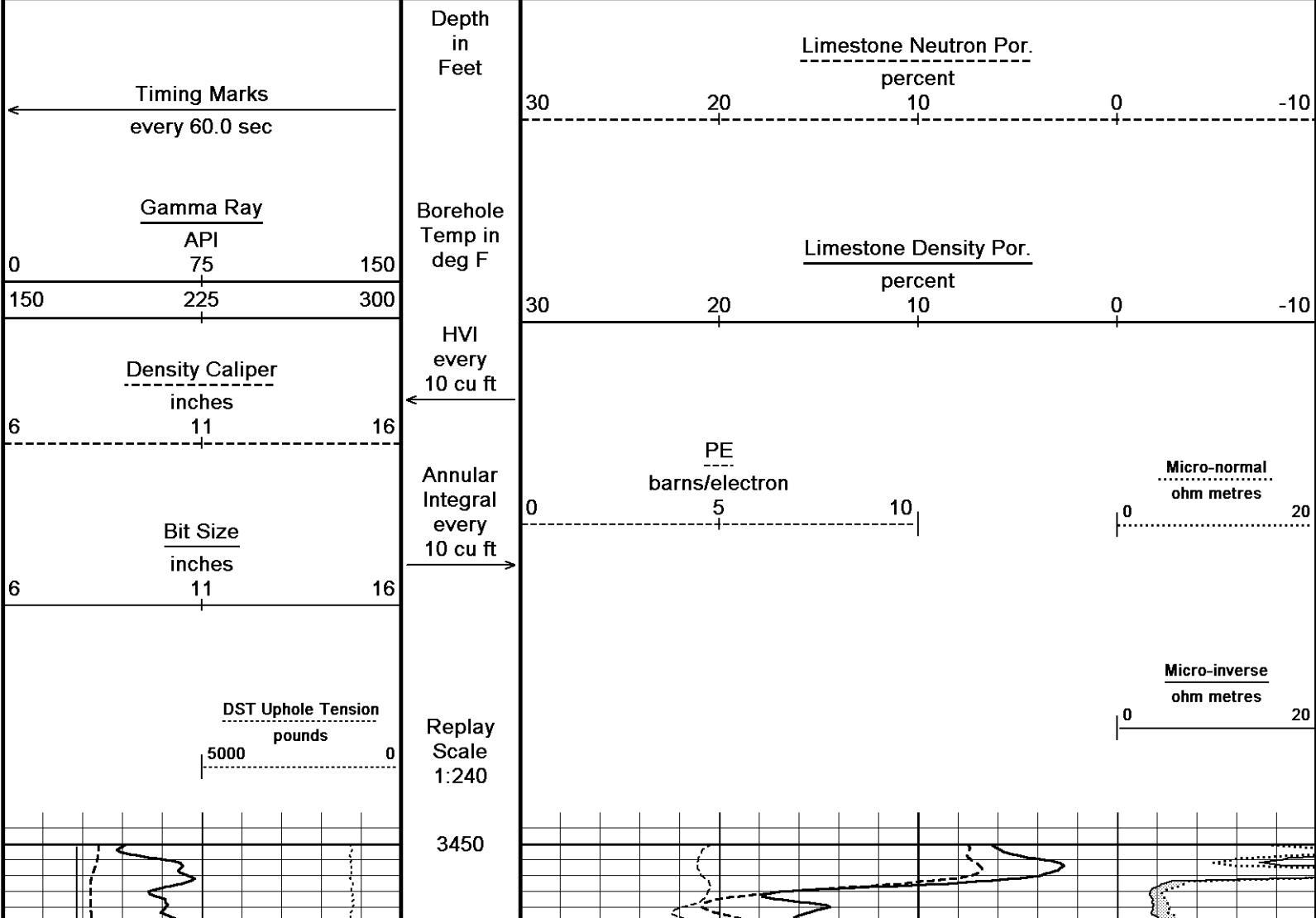


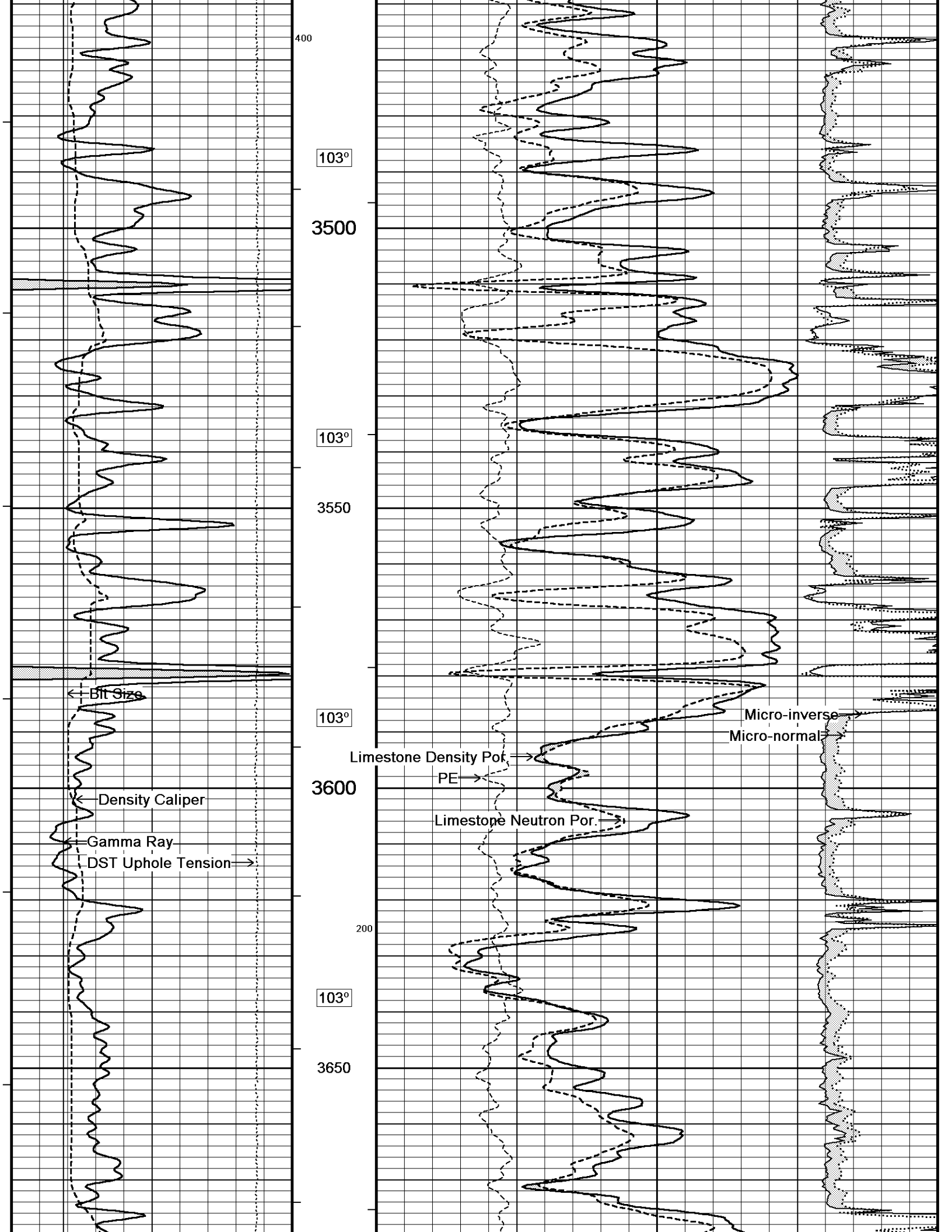


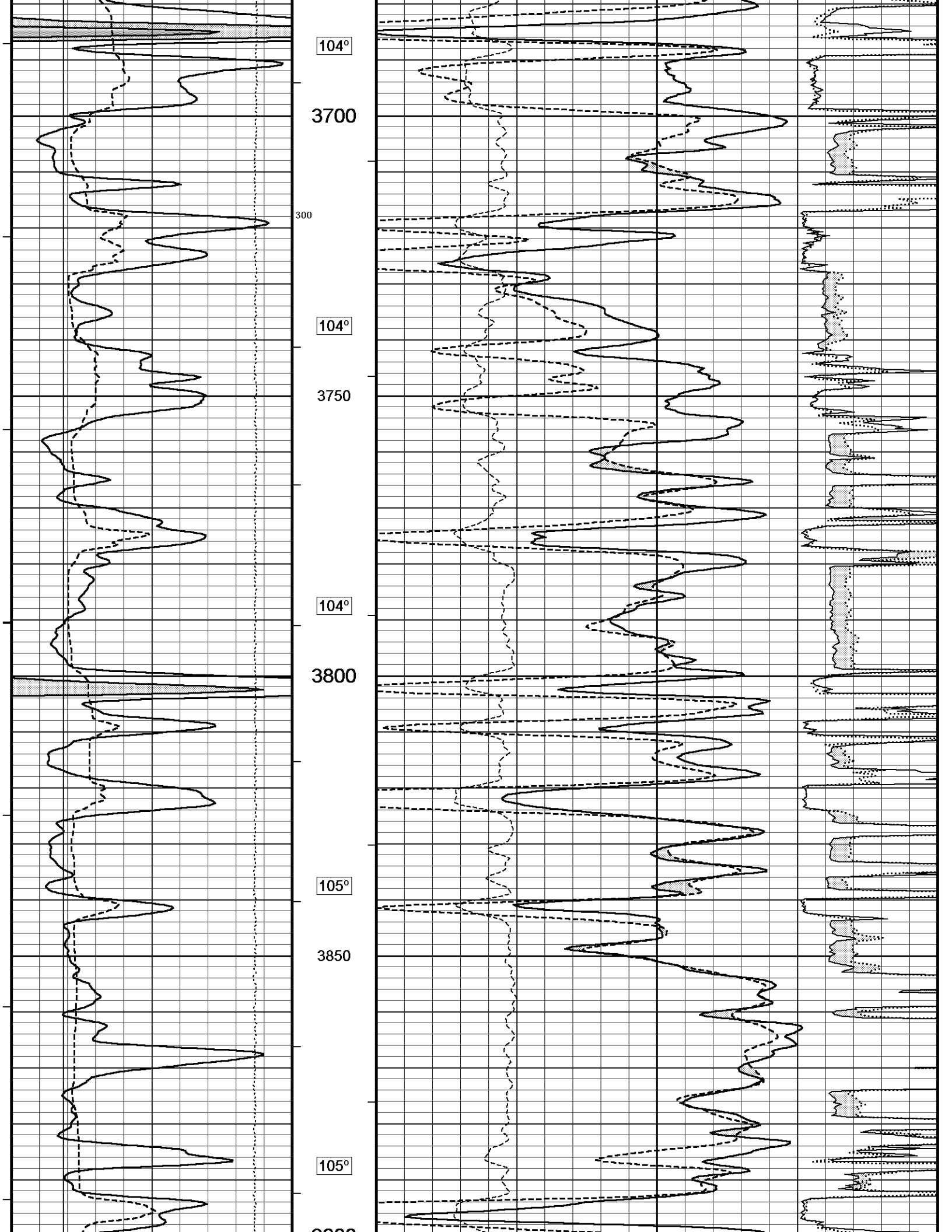
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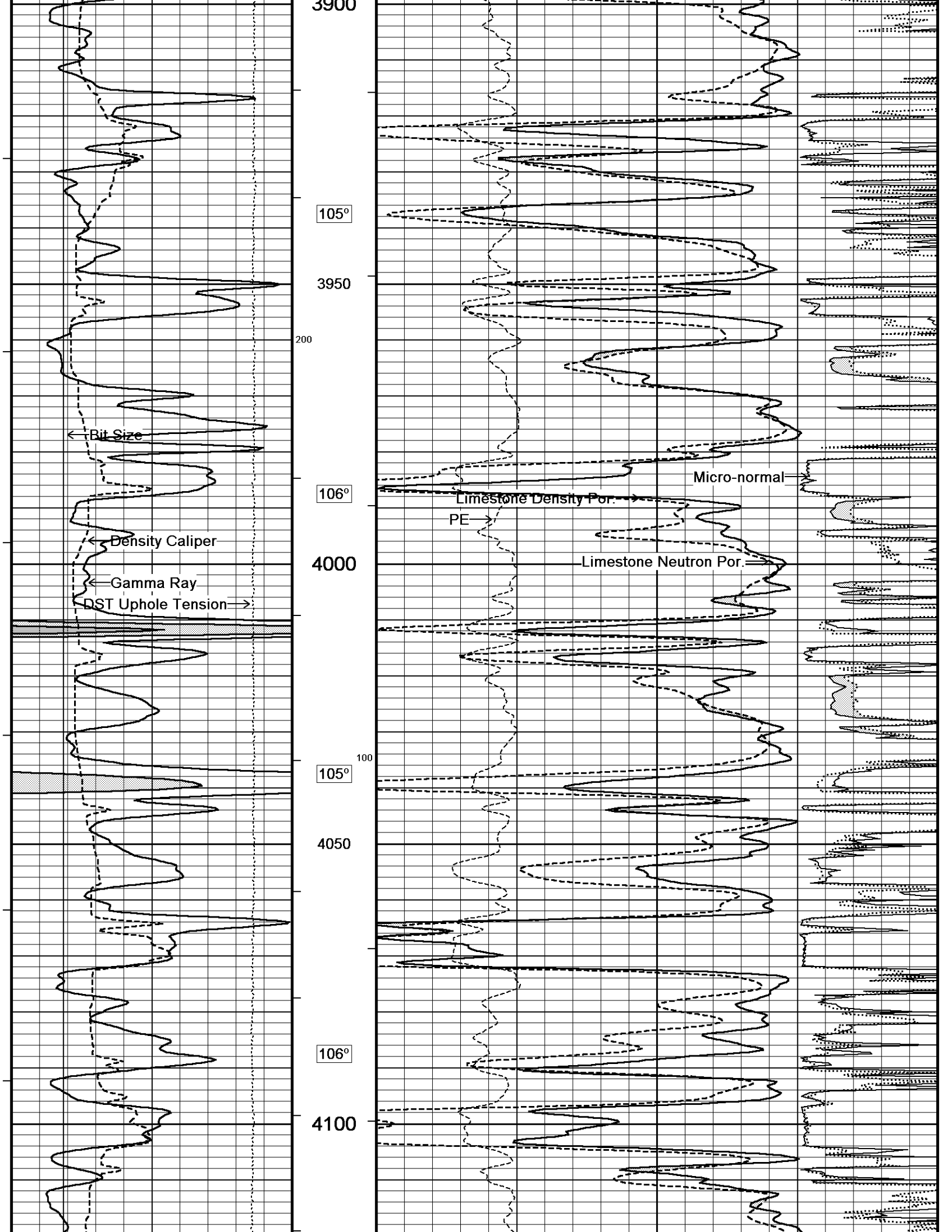
5 INCH MAIN

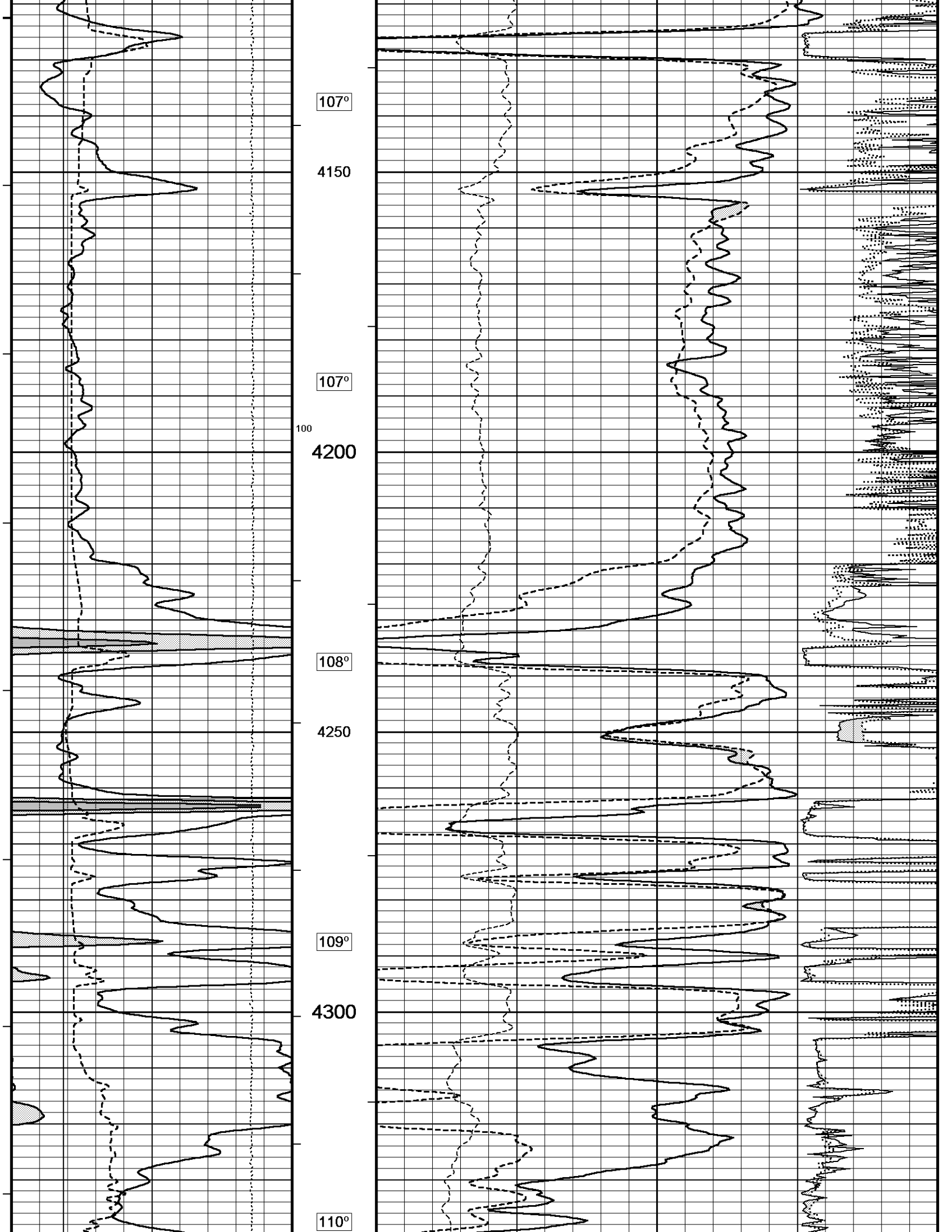
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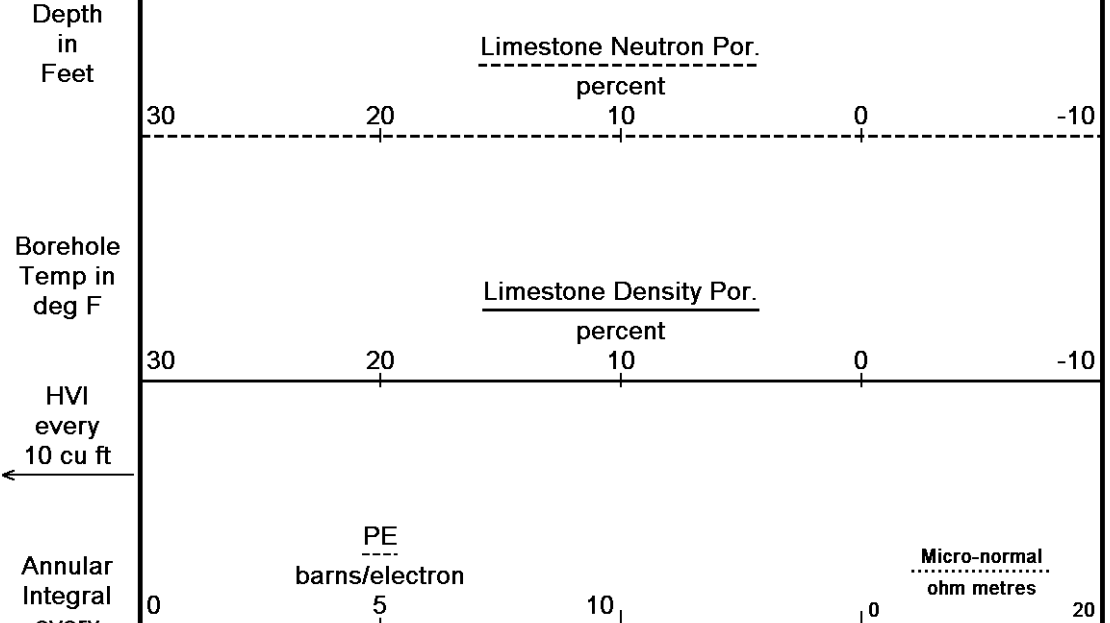
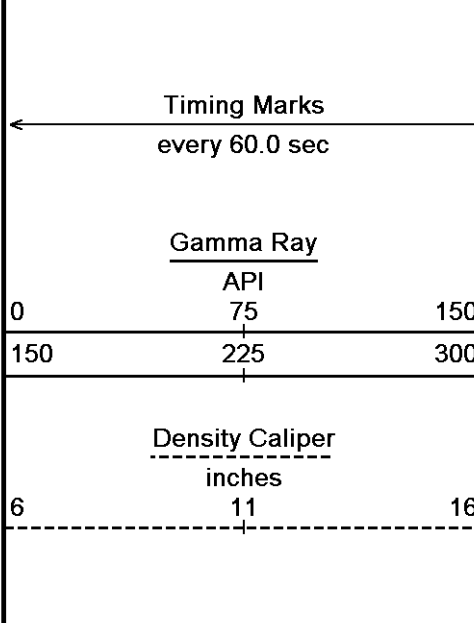
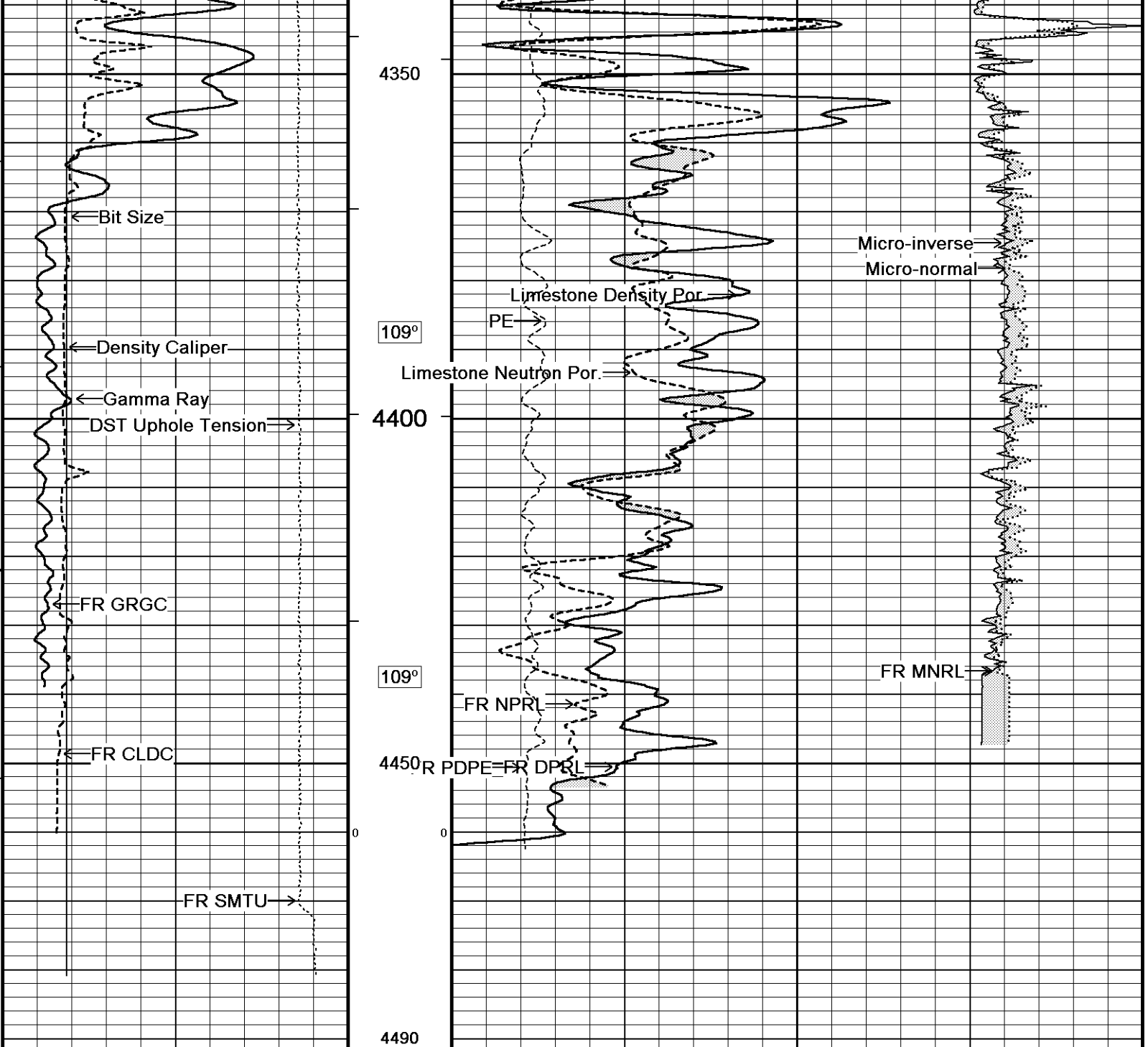


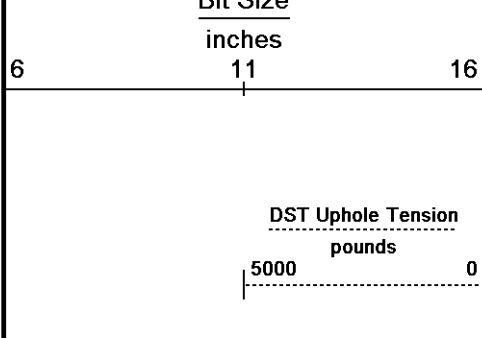






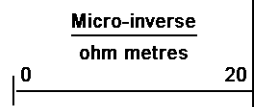






10 cu ft →

Replay  
Scale  
1:240

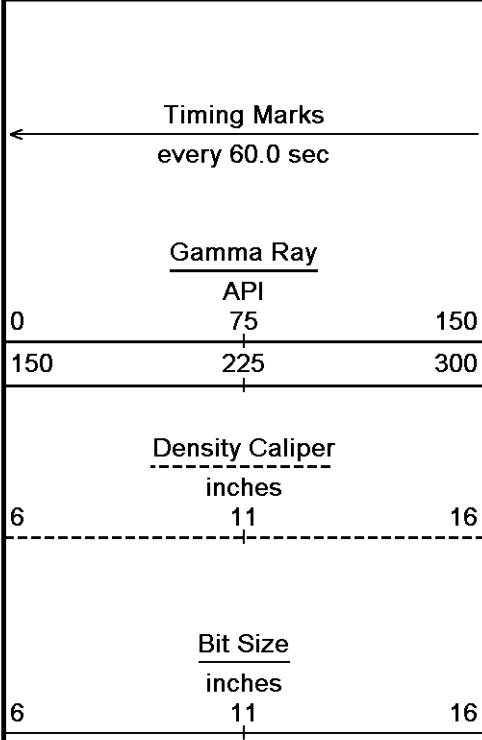


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↑ 5 INCH MAIN ↑

↓ REPEAT SECTION ↓

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 Plotted on 14-FEB-2013 01:14  
 Filename: C:\Minimus 13.04.8492\Data\Grand Mesa Breit-Hoss ...\Grand Mesa Breit-Hoss 1-22\_001.dta  
 Recorded on 13-FEB-2013 22:57  
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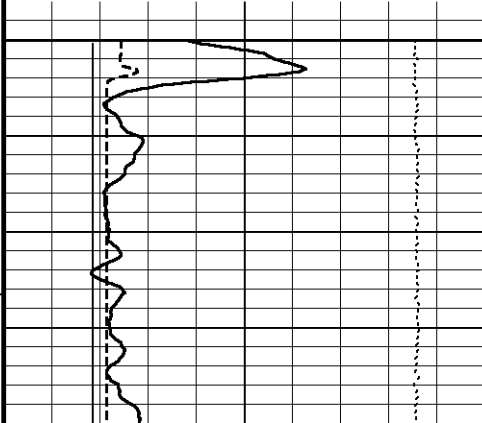
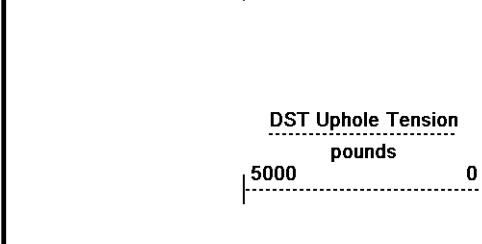
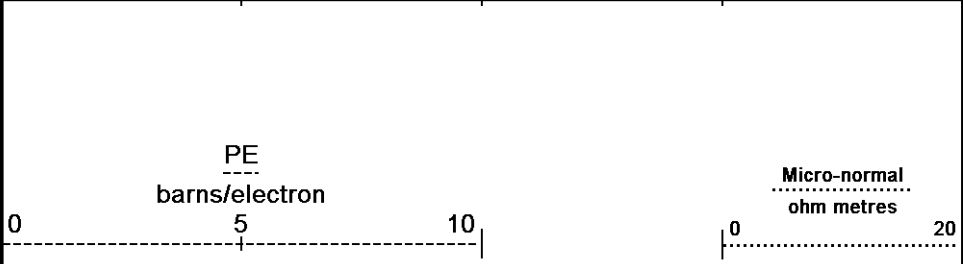
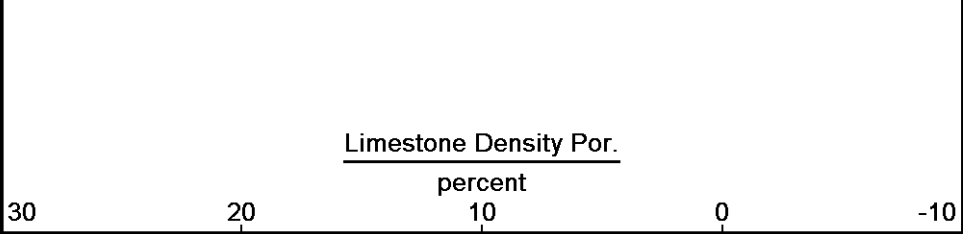
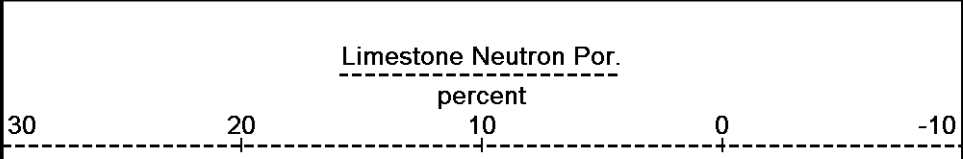
Depth  
in  
Feet

Borehole  
Temp in  
deg F

HVI  
every  
10 cu ft

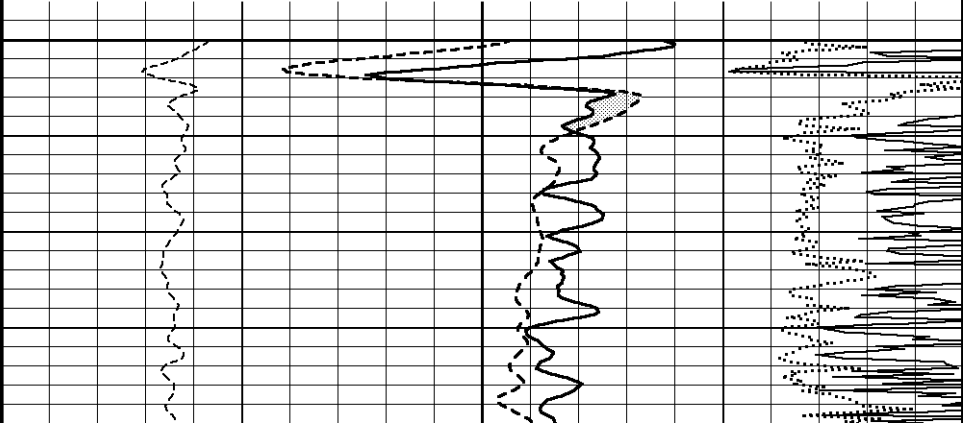
Annular  
Integral  
every  
10 cu ft

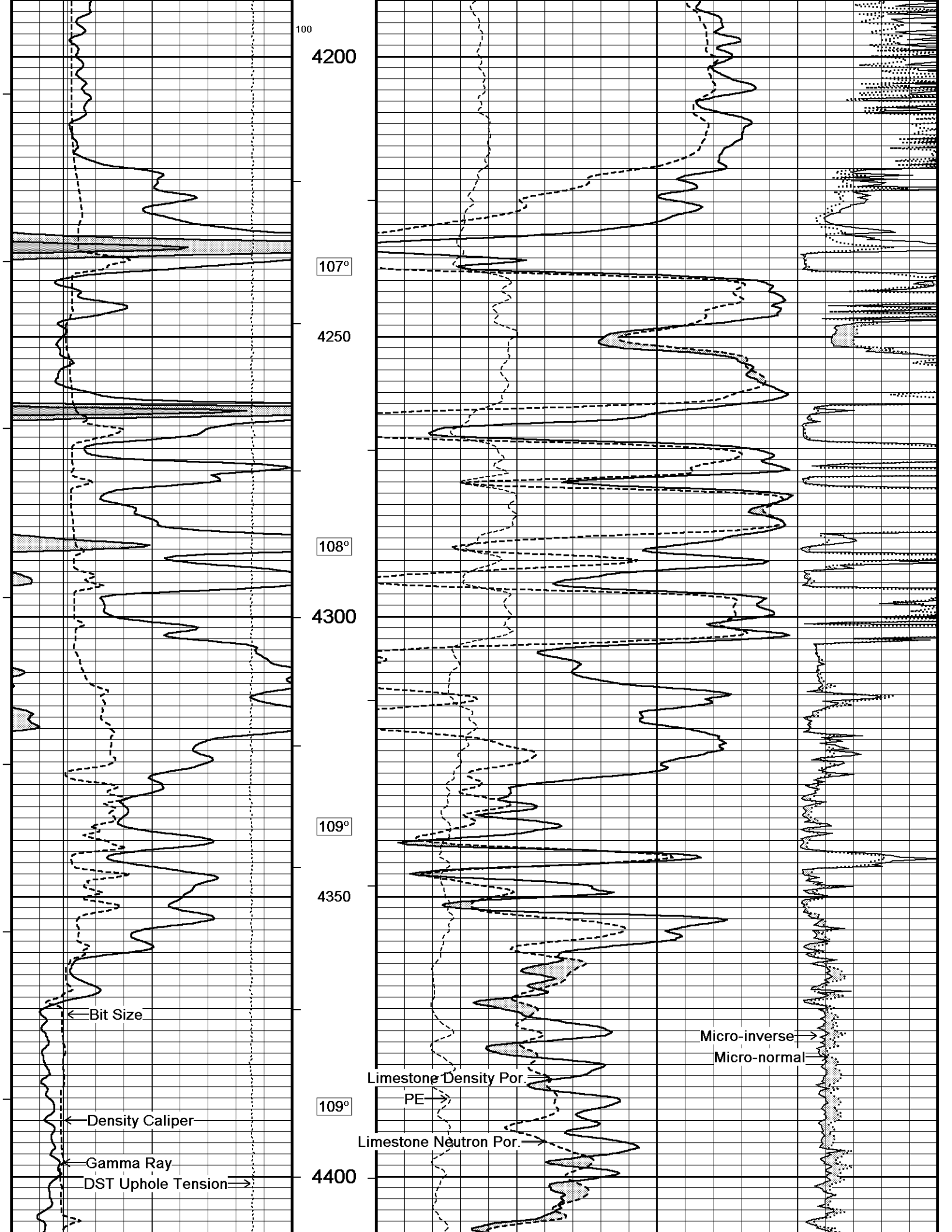
Replay  
Scale  
1:240

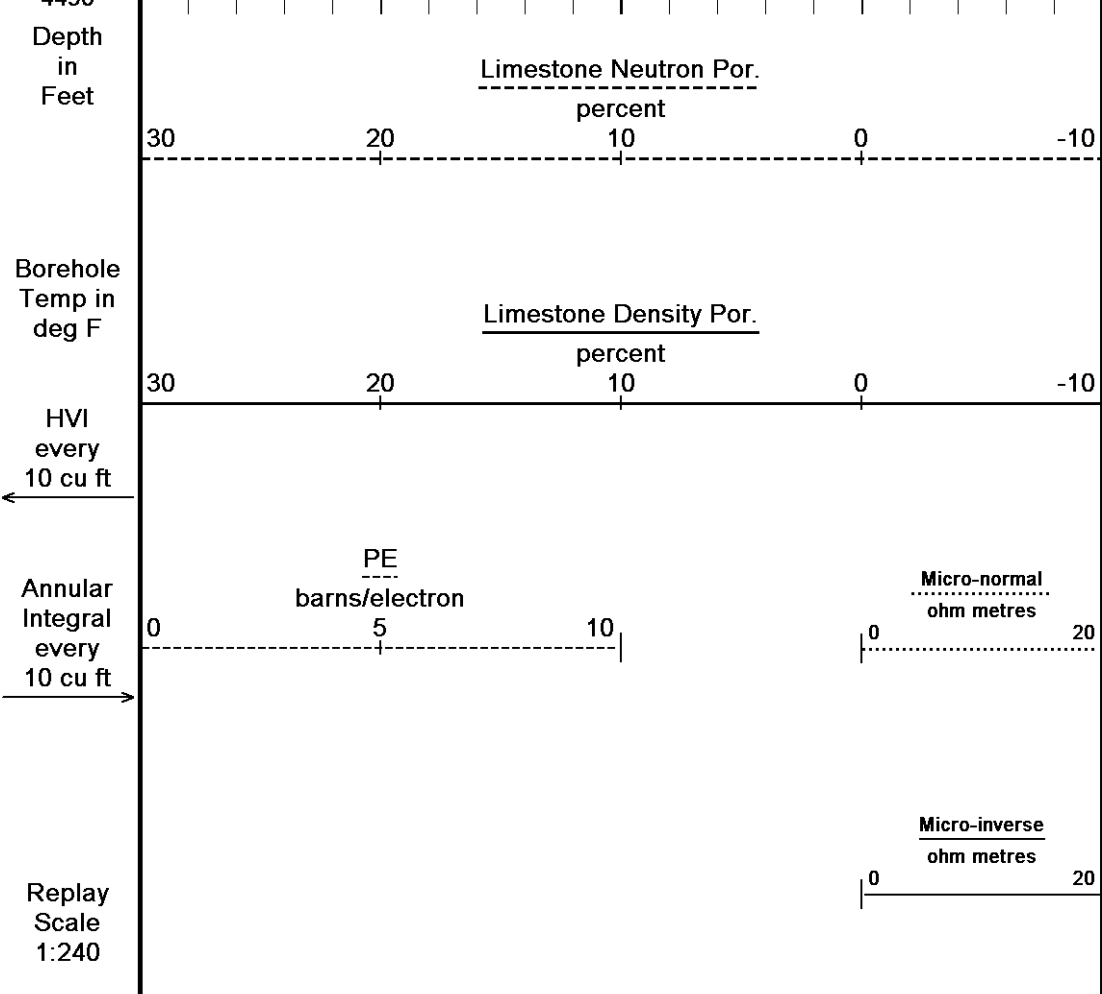
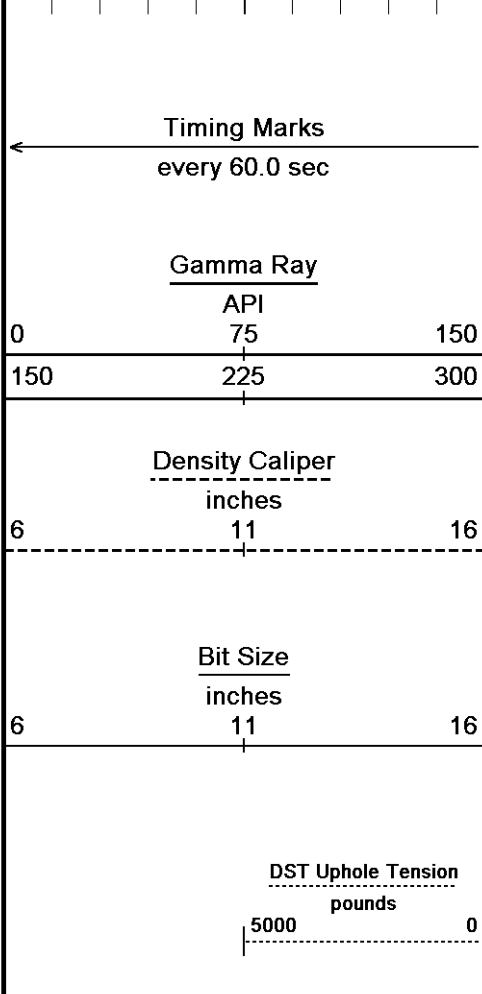
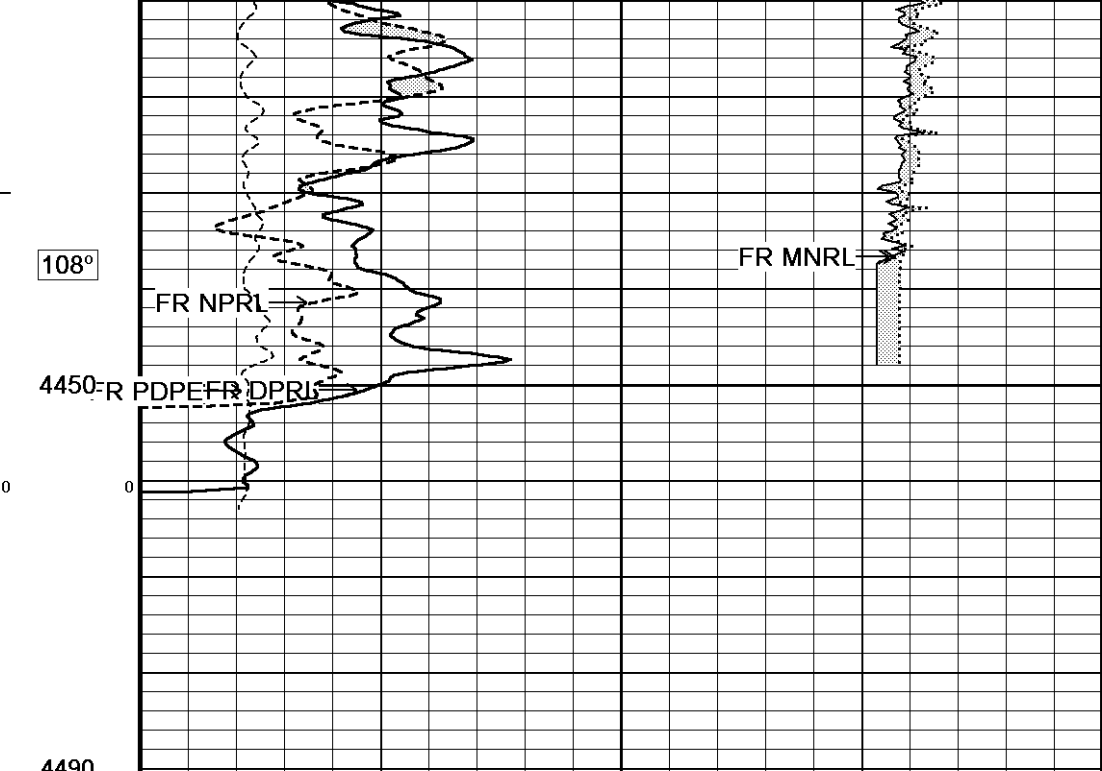
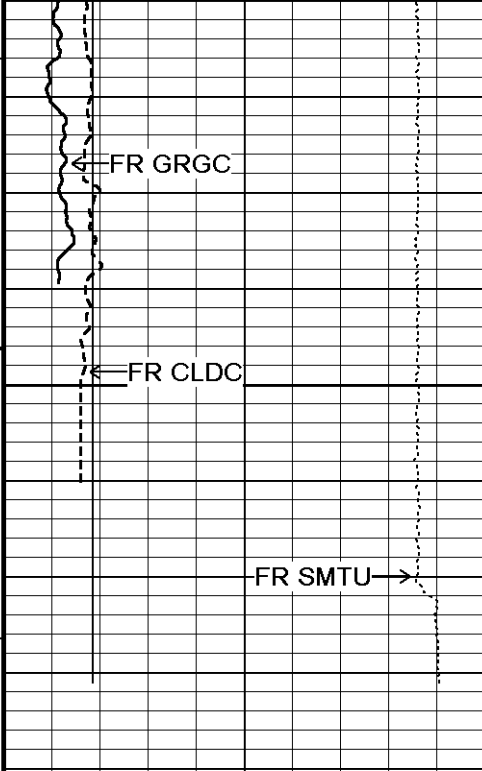


4150

107°





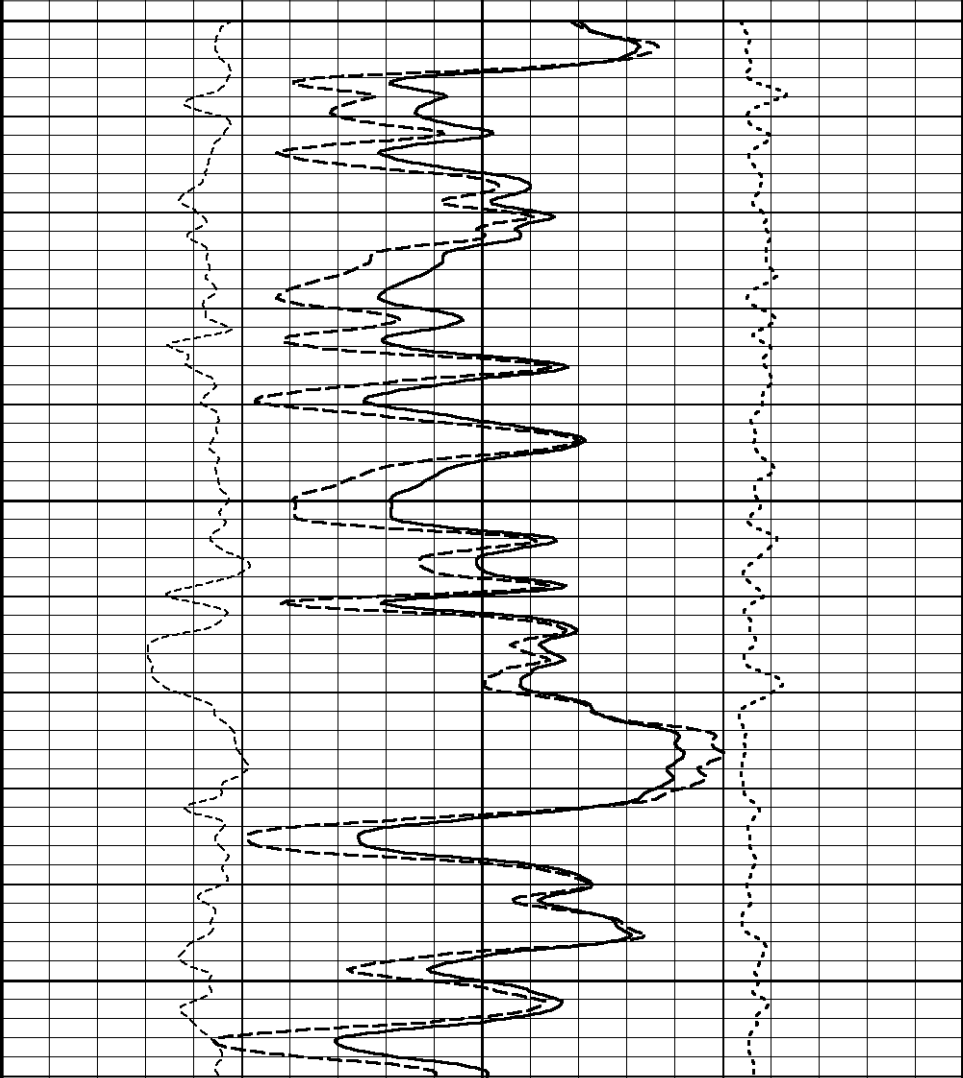
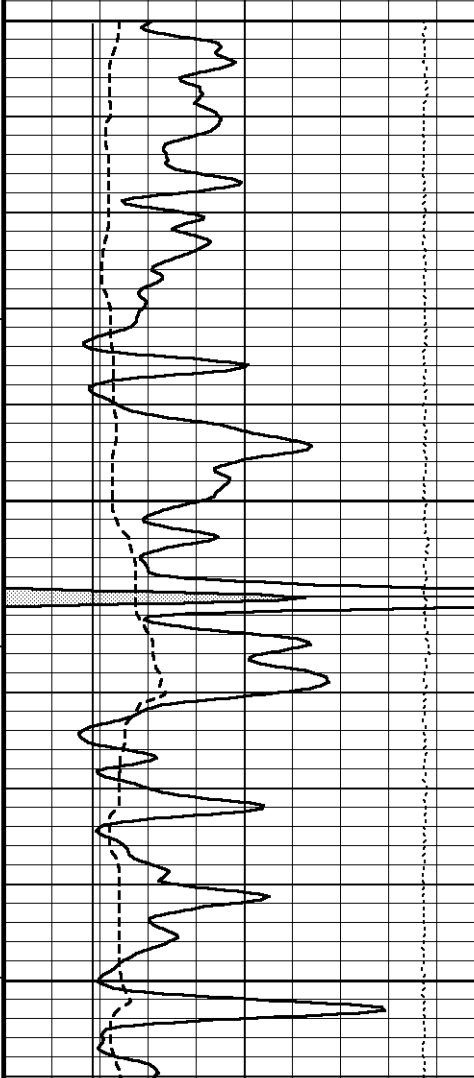
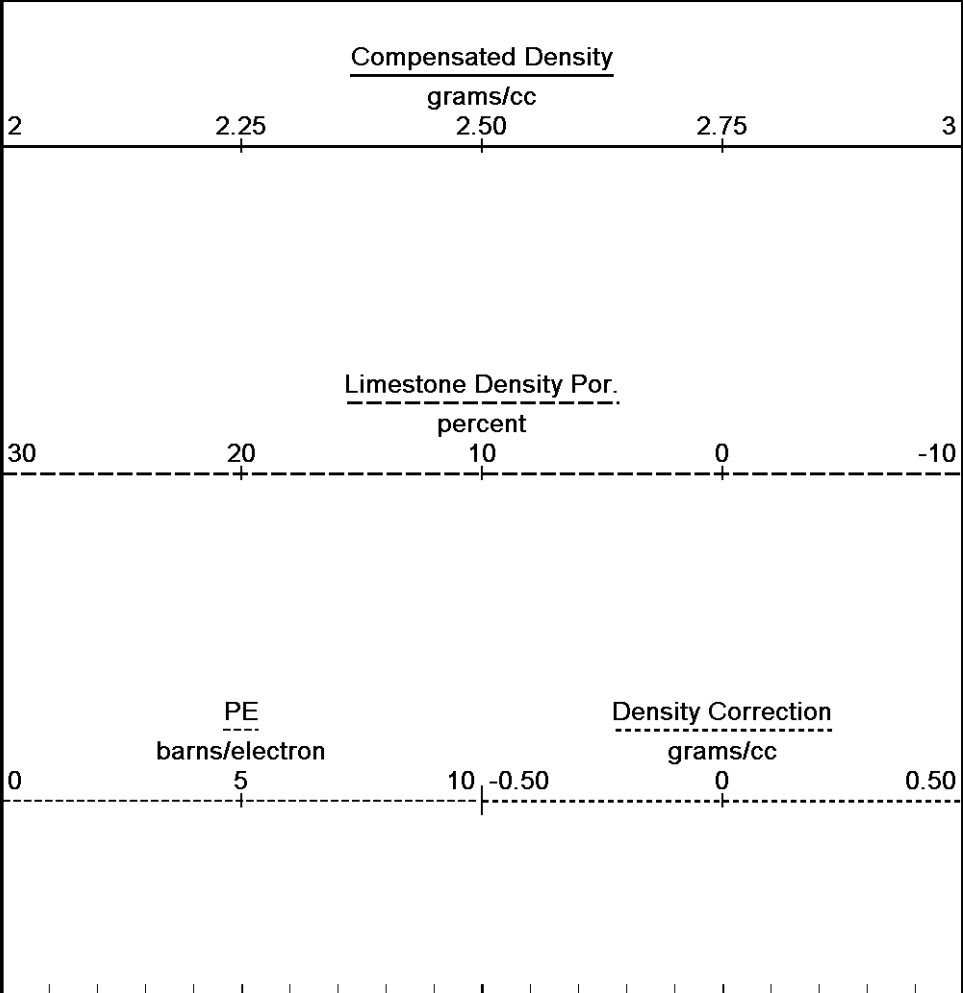
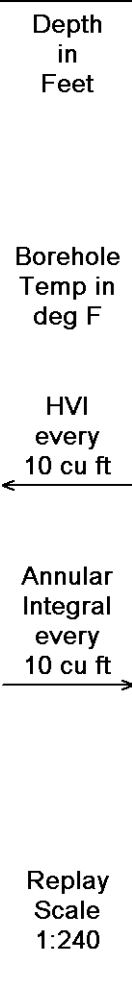
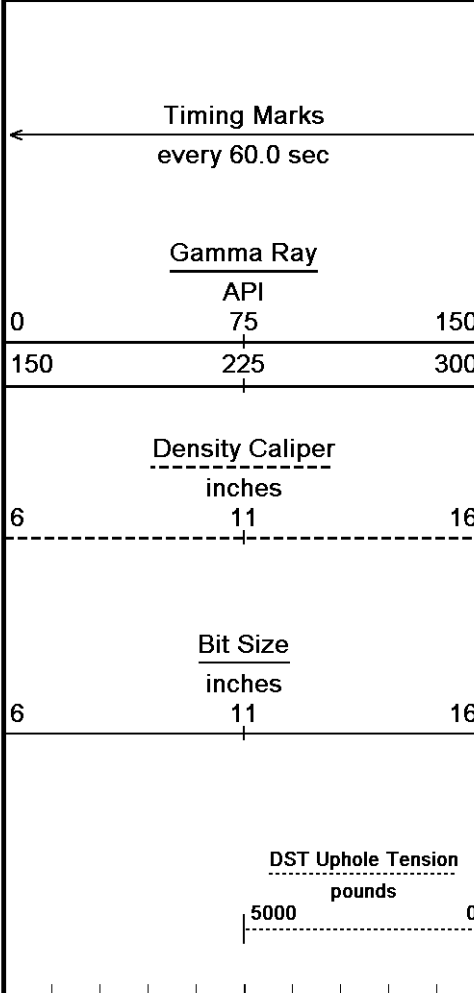


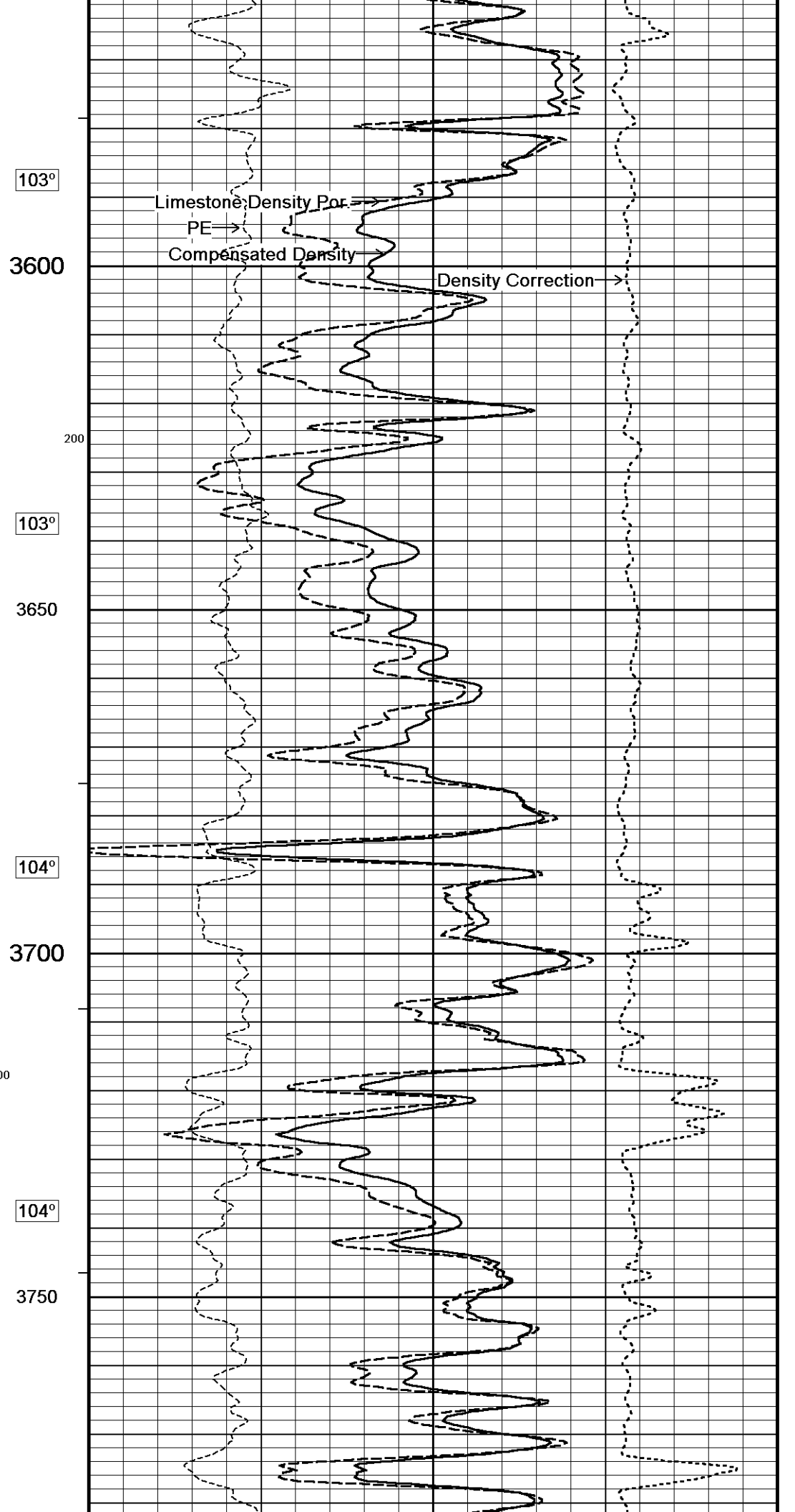
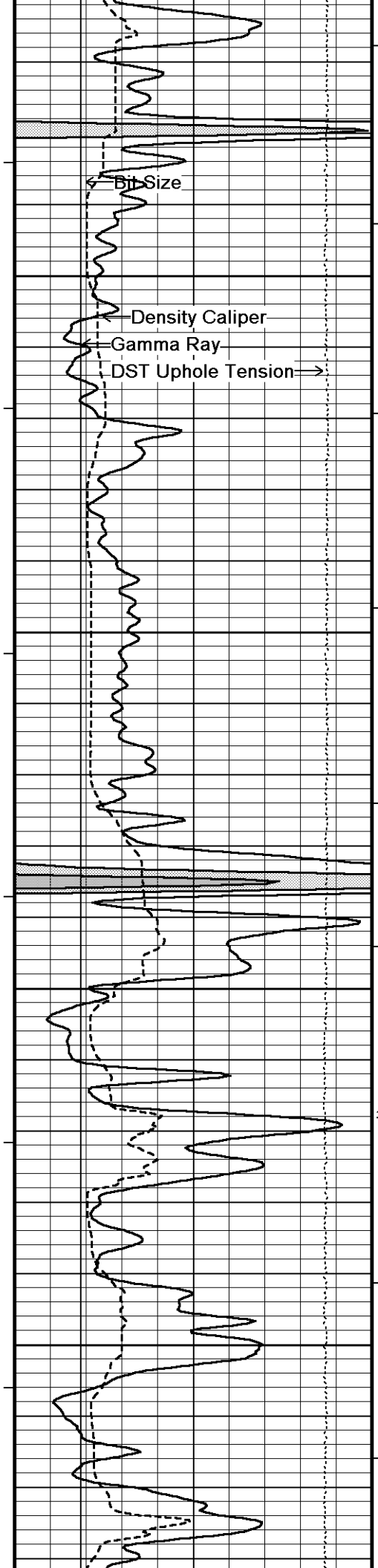
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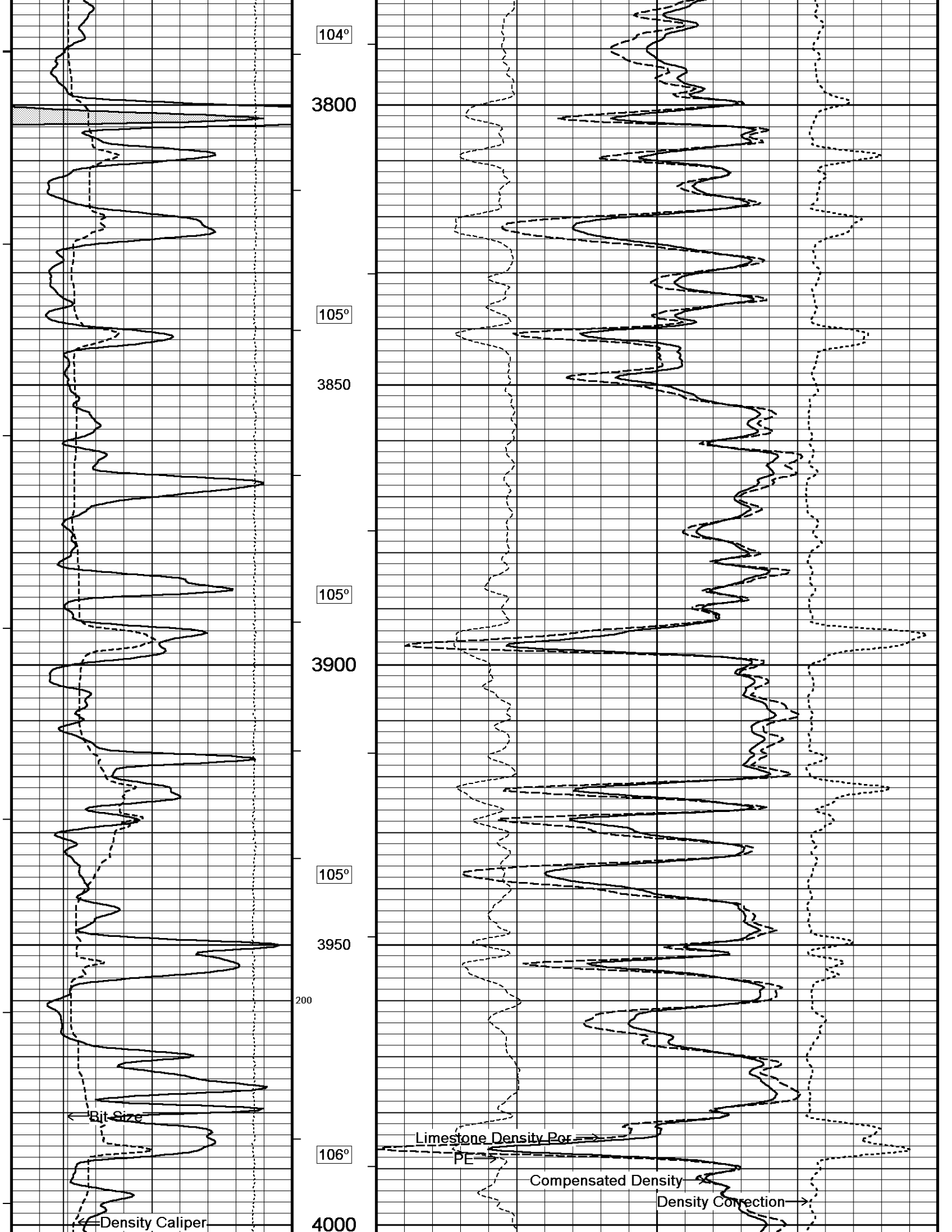
↑ REPEAT SECTION ↑

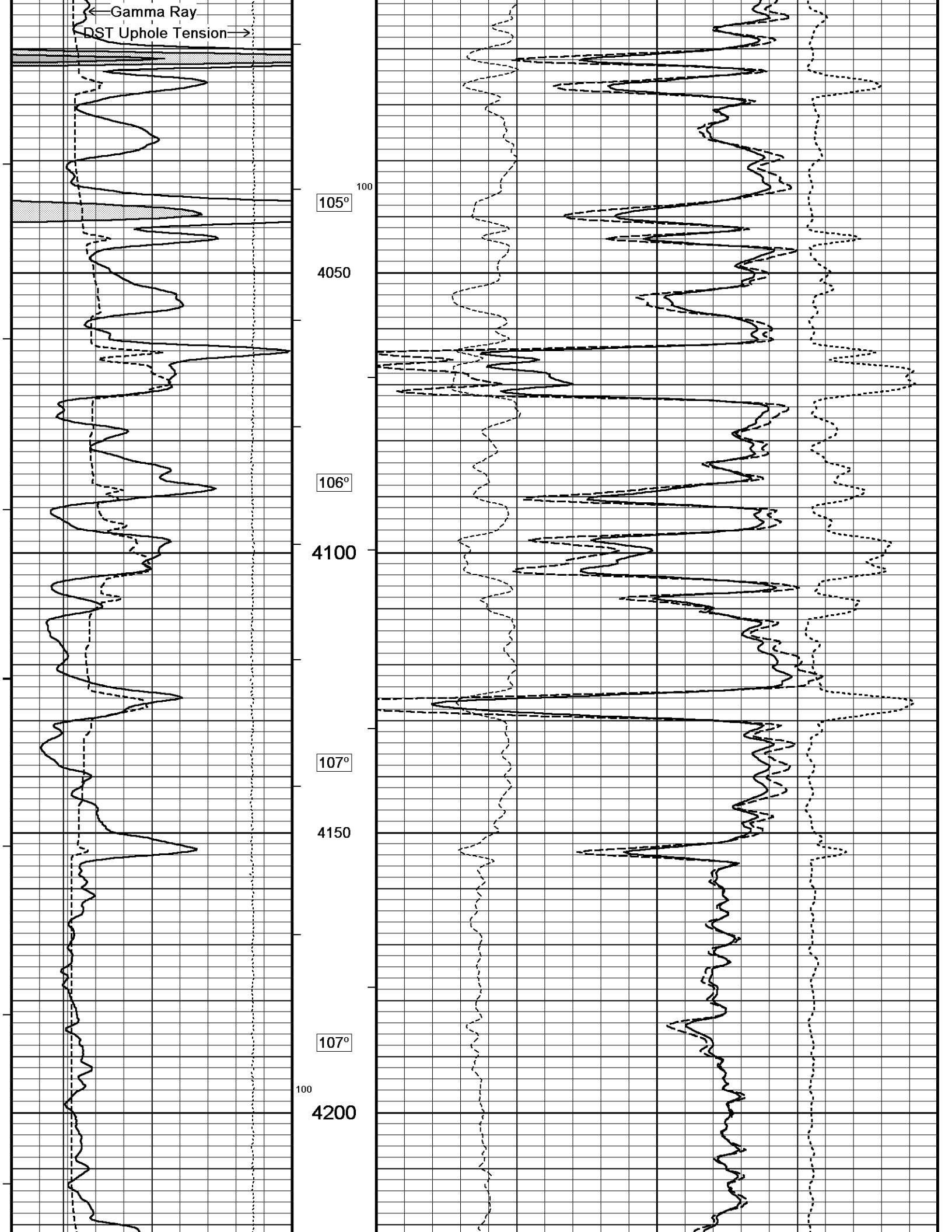
↓ 5 INCH BULK DENSITY ↓

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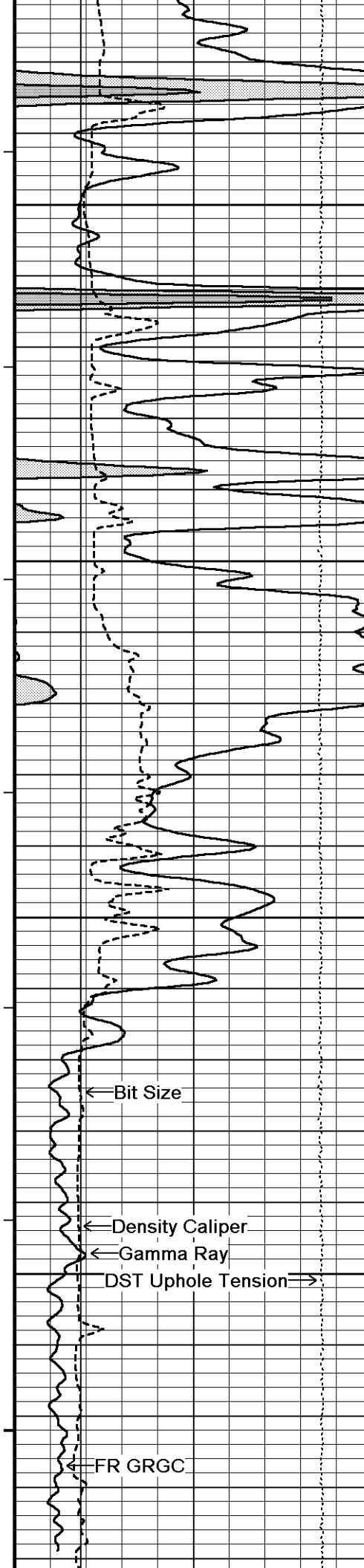




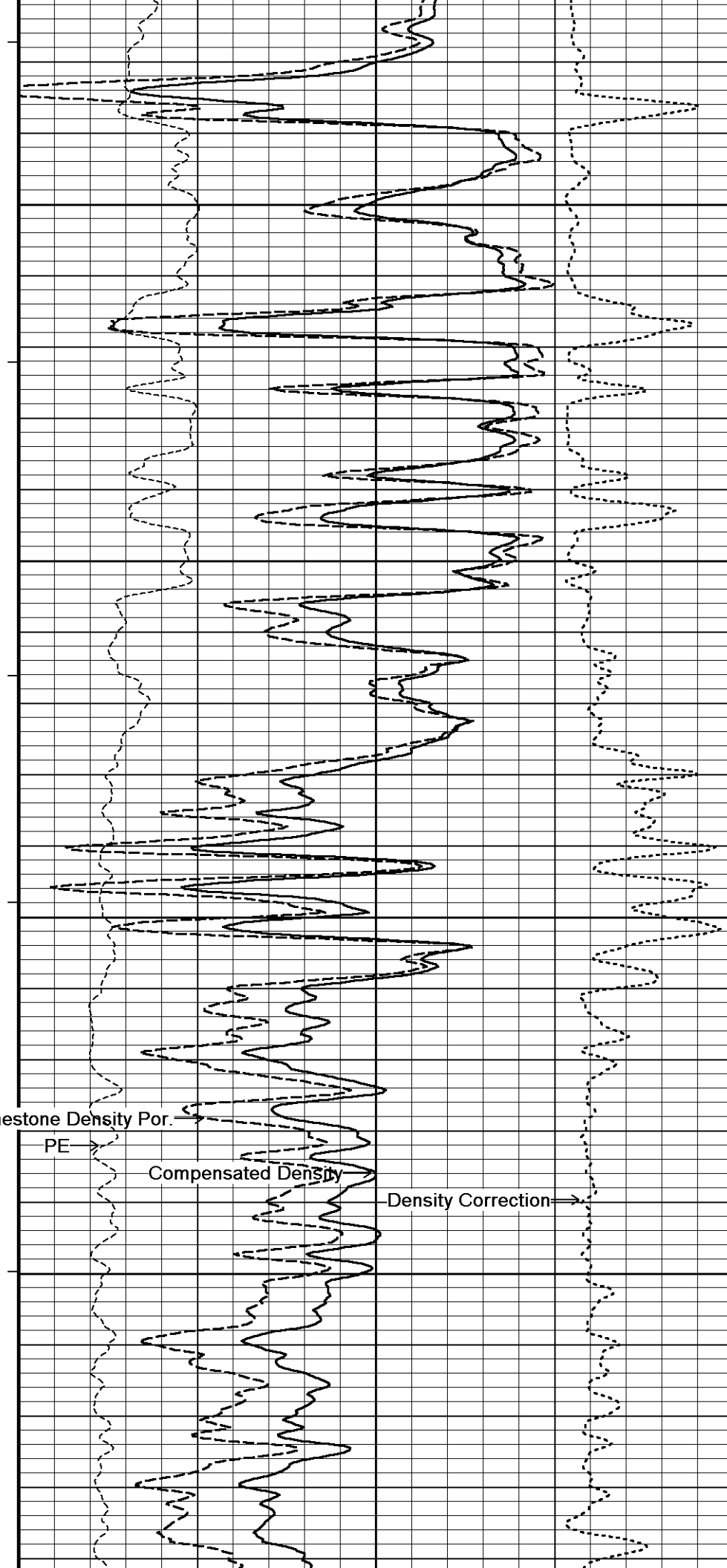


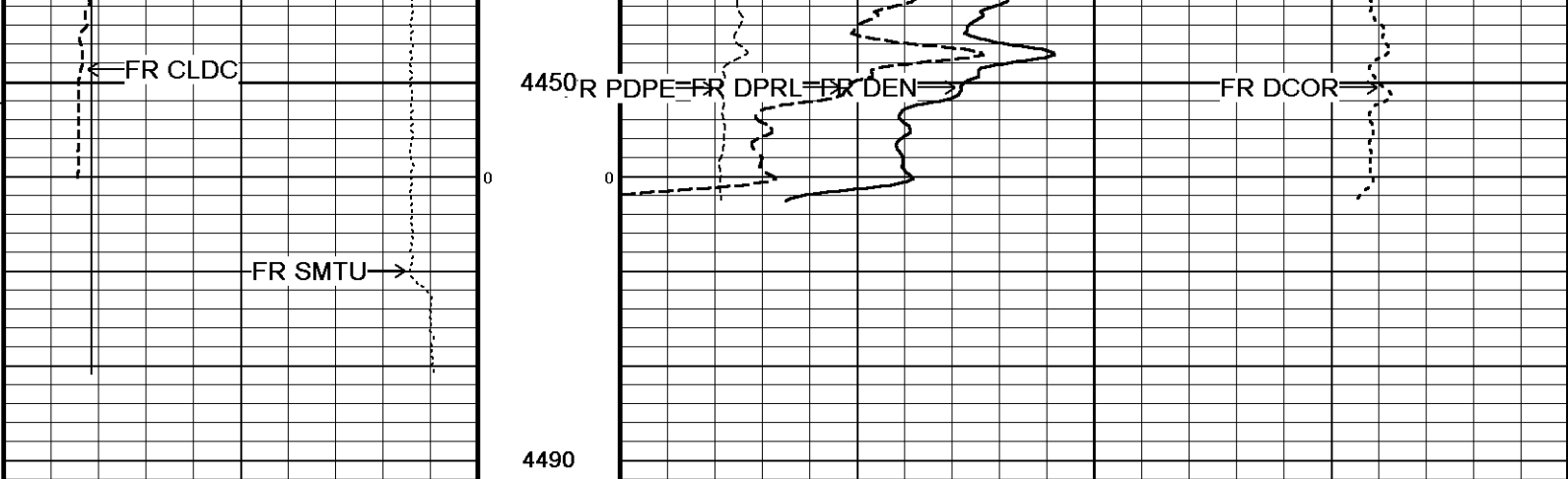






108°  
4250  
109°  
4300  
110°  
4350  
109°  
4400  
109°





Timing Marks every 60.0 sec

<u>Gamma Ray</u>		
API		
0	75	150
150	225	300

<u>Density Caliper</u>		
inches		
6	11	16

<u>Bit Size</u>		
inches		
6	11	16

<u>DST Uphole Tension</u>		
pounds		
5000		0

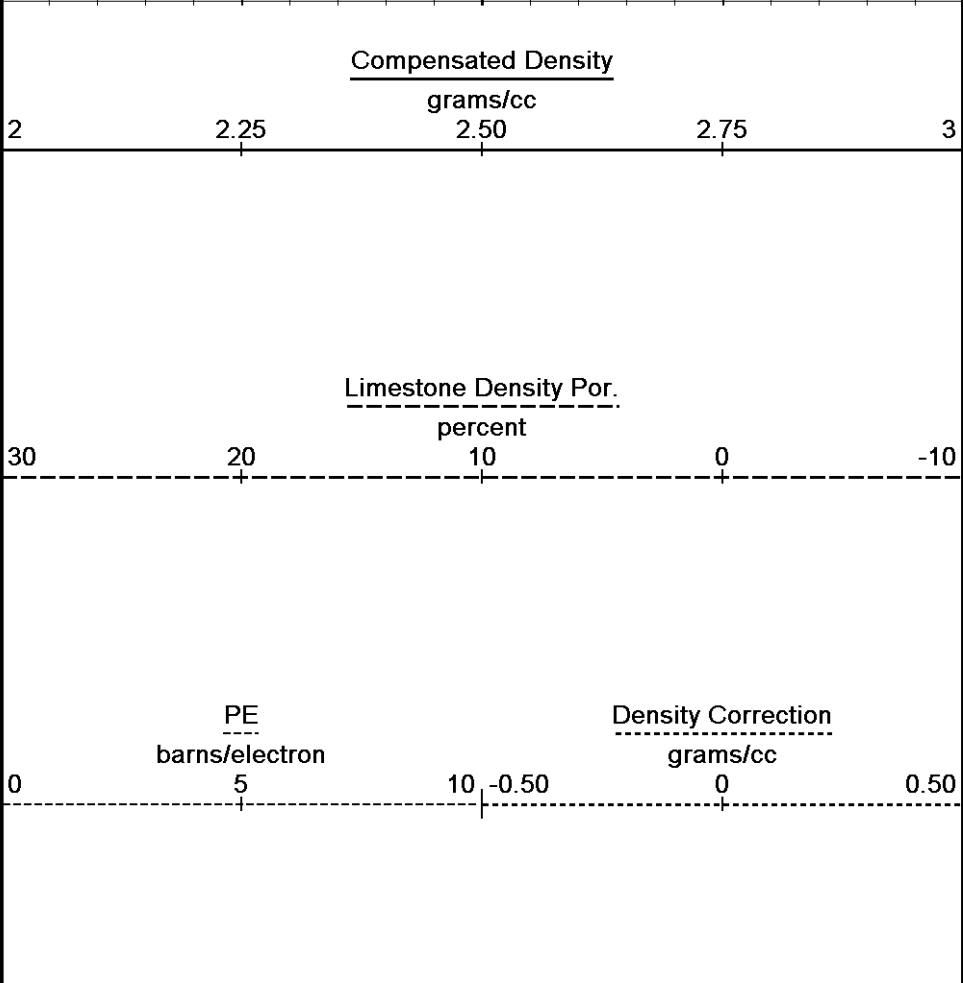
4490  
Depth in Feet

Borehole Temp in deg F

HVI every 10 cu ft

Annular Integral every 10 cu ft

Replay Scale 1:240

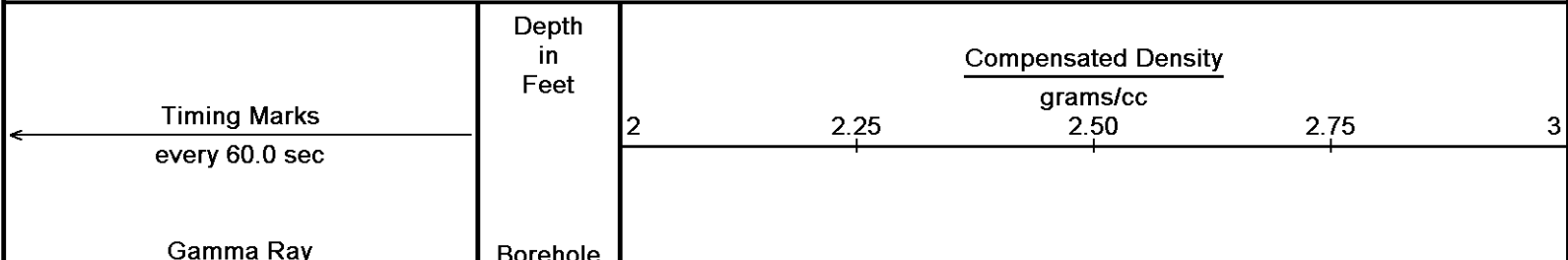


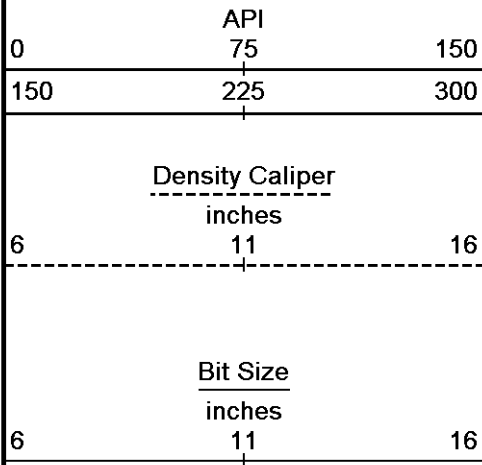
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5 INCH BULK DENSITY

REPEAT SECTION

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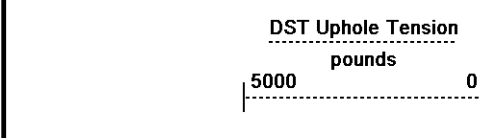
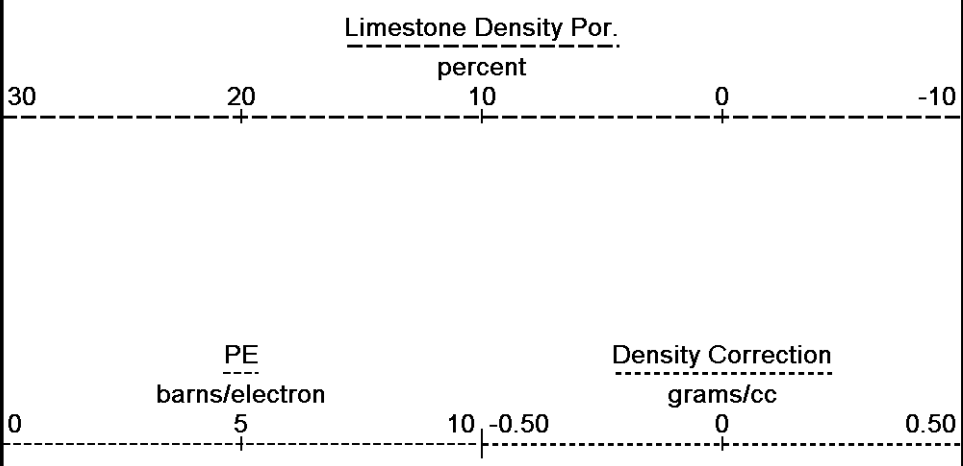




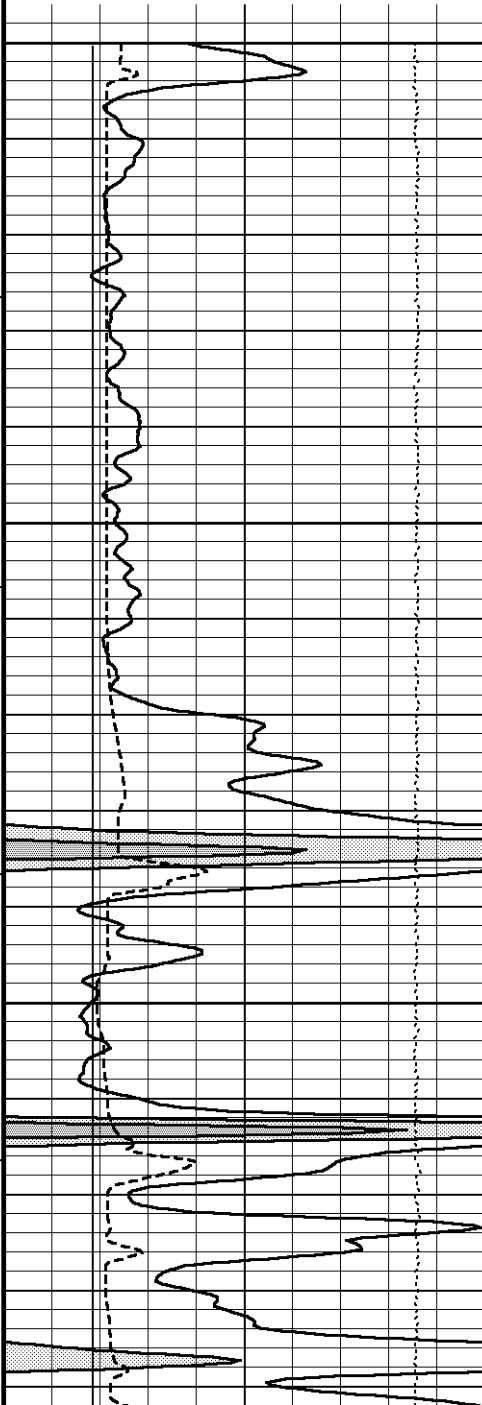
Temp in  
deg F

HVI  
every  
10 cu ft

Annular  
Integral  
every  
10 cu ft



Replay  
Scale  
1:240



4150

107°

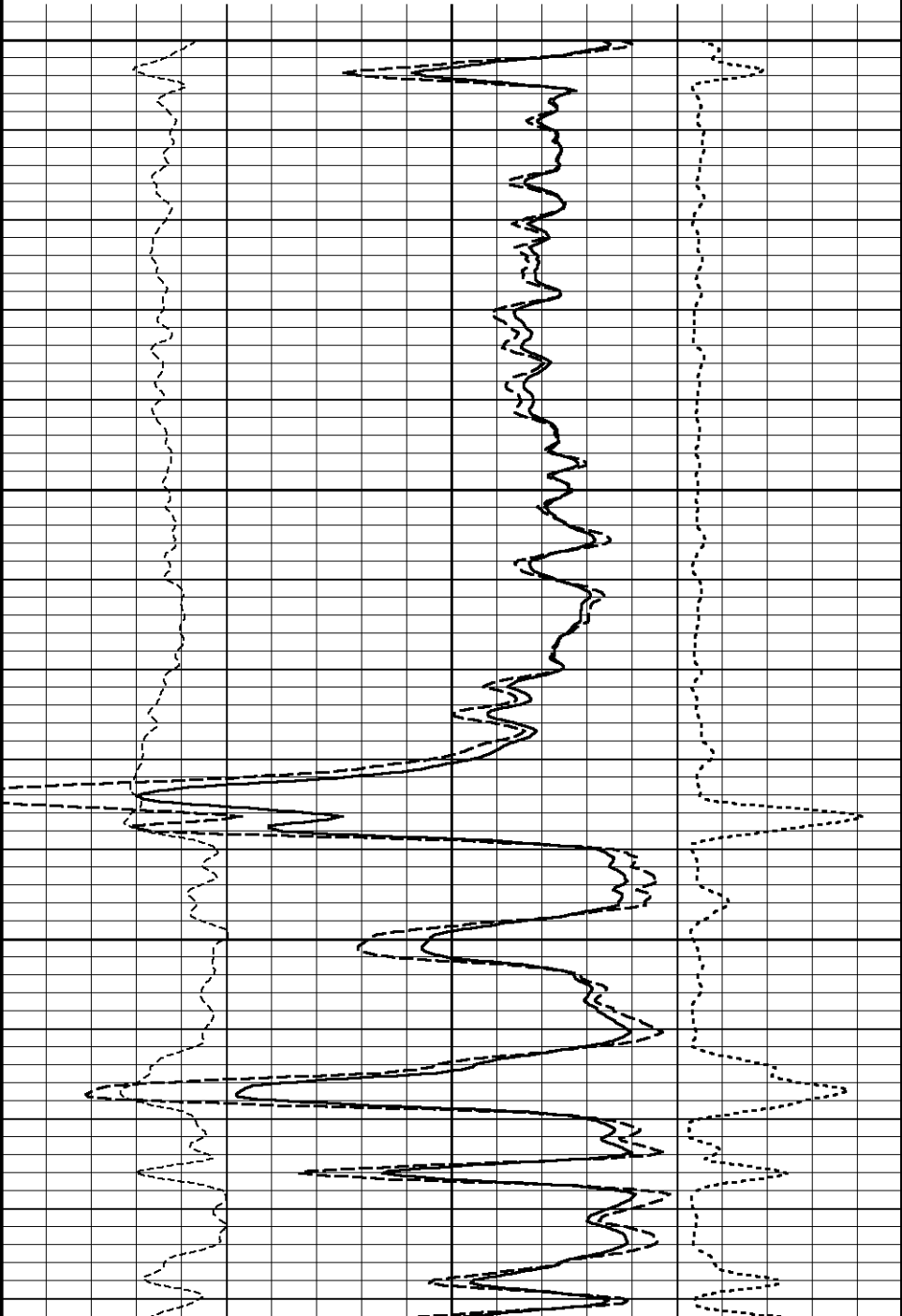
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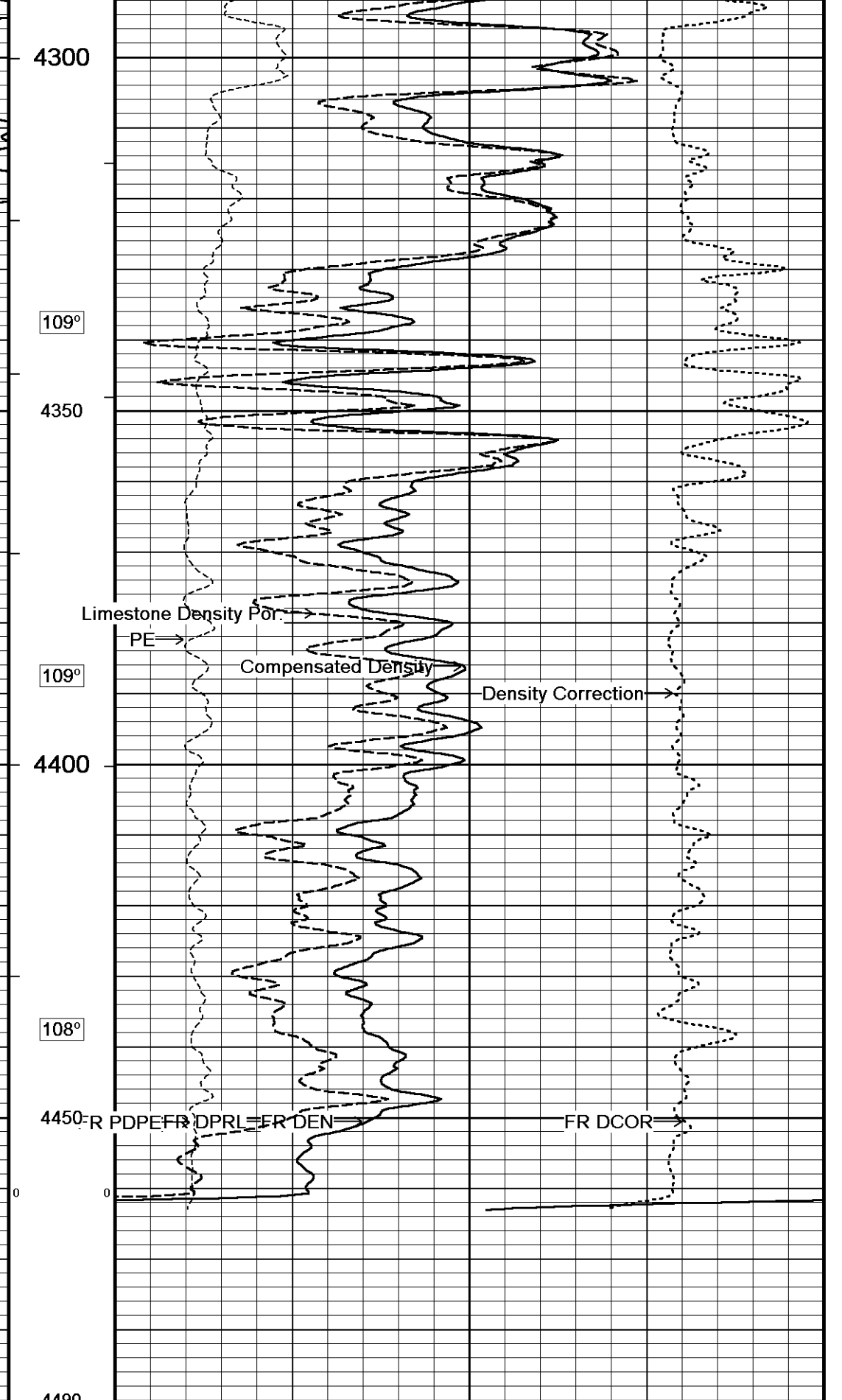
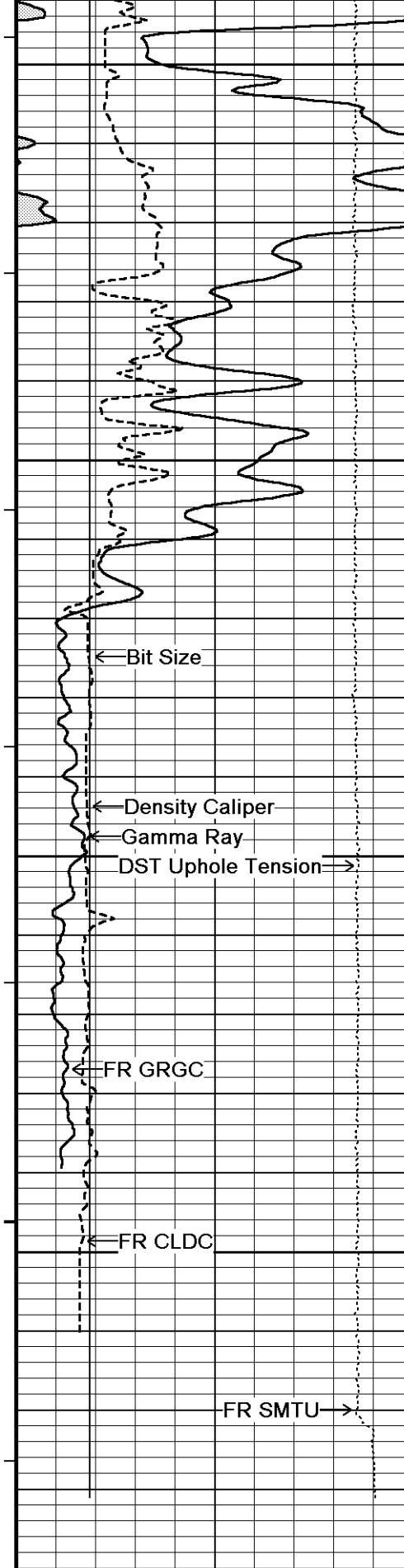
4200

107°

4250

108°



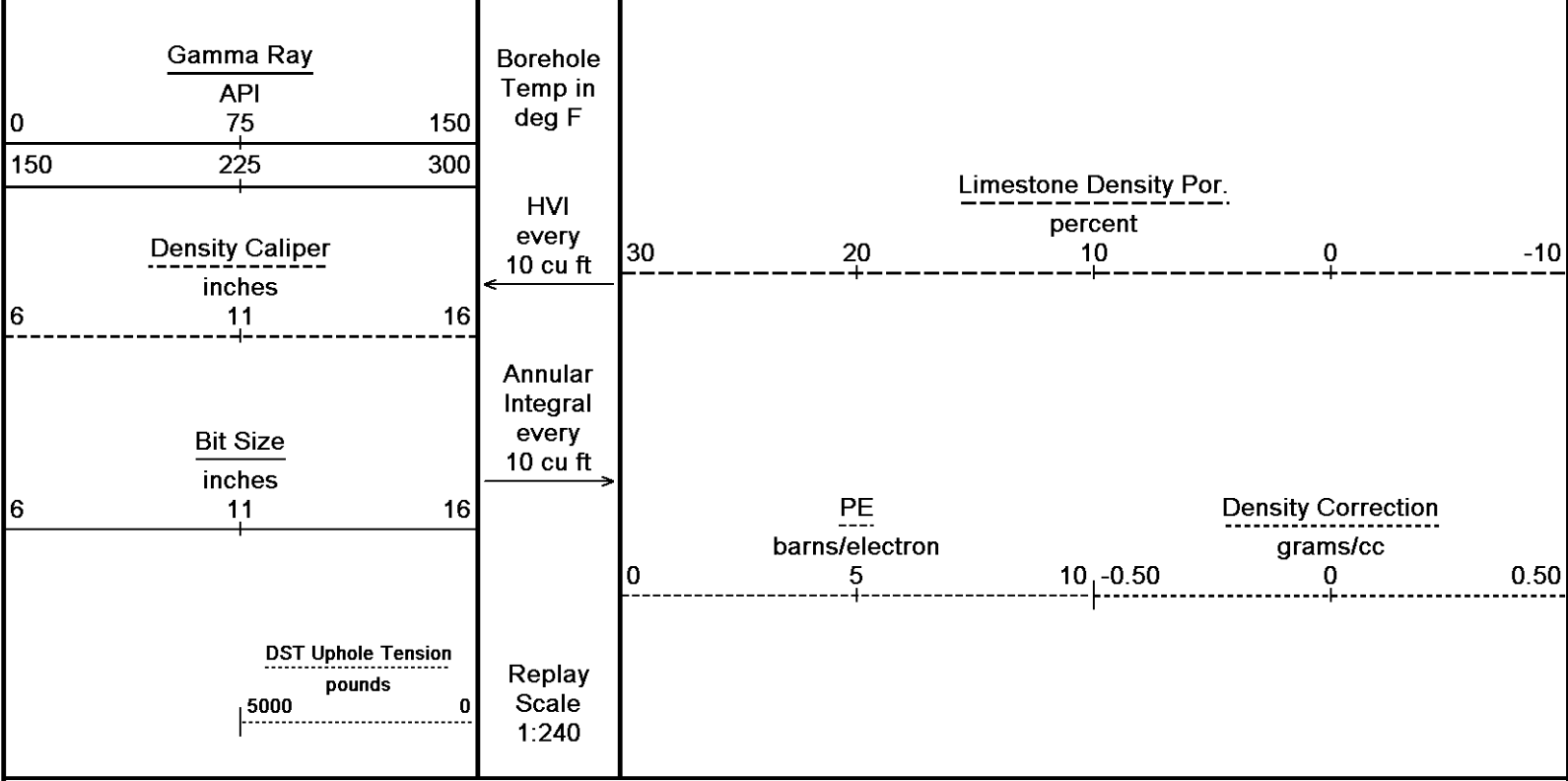


Timing Marks  
every 60.0 sec

Depth  
in  
Feet

Compensated Density  
grams/cc

2                      2.25                      2.50                      2.75                      3



Depth Based Data - Maximum Sampling Increment 10.0cm  
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↑ REPEAT SECTION ↑

### BEFORE SURVEY CALIBRATION

C:\Minimus 13.04.8492\Data\Grand Mesa Breit-Hoss 1-22\Grand Mesa Breit-Hoss 1-22\_001.dta

General Constants All 000		Last Edited on 13-FEB-2013,19:59
<b>General Parameters</b>		
Mud Resistivity	0.850	ohm-metres
Mud Resistivity Temperature	87.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
<b>Hole/Annular Volume and Differential Caliper Parameters</b>		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
<b>Rwa Parameters</b>		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Six Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	

Down-hole Tension Calibration SMS 0			Field Calibration on 09-FEB-2013 07:52
Reading No	Measured	Calibrated (lbs)	
1	15612.38	0.00	
2	16153.00	384.00	

High Resolution Temperature Calibration MCG-B 34			Field Calibration on 08-NOV-2012,10:05
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MCG-B 34 Last Edited on 08-NOV-2012,10:04

## SP Calibration MCG-B 34

Field Calibration on 08-NOV-2012 10:10

	Measured	Calibrated (mV)
Reference 1	107.1	100.0
Reference 2	-93.0	-100.0

## Gamma Calibration MCG-B 34

Field Calibration on 11-FEB-2013 15:40

	Measured	Calibrated (API)
Background	67	46
Calibrator (Gross)	1123	771
Calibrator (Net)	1055	725

## Gamma Constants MCG-B 34

Last Edited on 12-FEB-2013,03:33

Gamma Calibrator Number	GRC38	
Mud Density	1.12	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl	0.00	kppm

## Caliper Calibration MML-A 3

Base Calibration on 23-JAN-2013 09:15

Field Calibration on 11-FEB-2013 15:28

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14702	5.98
2	17956	7.97
3	21222	9.86
4	24713	11.92
5	0	0.00
6	N/A	N/A

## Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.04	5.98

## Micro Normal and Micro Inverse Calibration MML-A 3

Base Calibration on 23-JAN-2013 09:37

Field Check on 11-FEB-2013 15:30

Base Calibration				
Channel	Measured		Calibrated (ohm-m)	
	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.2	60.2	5.0	25.0
Micro Inverse	15.7	78.4	5.0	25.0
Channel	Base Check (ohm-m)		Field Check (ohm-m)	
Micro Normal	62.9		62.9	
Micro Inverse	48.2		48.2	

## Micro Normal and Micro Inverse Constants MML-A 3

Last Edited on 12-FEB-2013,03:33

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

## Neutron Calibration MDN-A.B 66

Base Calibration on 24-JAN-2013 15:42

Field Check on 11-FEB-2013 15:47

Base Calibration				
	Measured		Calibrated (cps)	
	Near	Far	Near	Far
Ratio	2998	94	3714	110
	31.811		33.764	
Field Calibrator at Base			Calibrated (cps)	
Ratio			1692	2389
			0.708	
Field Check			Calibrated (cps)	
Ratio			1682	2389
			0.695	

Neutron Source Id	P0204NN		
Neutron Jig Number	5824NE		
Epithermal Neutron	No		
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	None		
Temperature	N/A	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-B.J 353

Base Calibration on 23-JAN-2013 09:00  
Field Check on 11-FEB-2013 15:16

Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.3	126.8
Base Check		281.1
Field Check		281.1

FE Constants MFE-B.J 353

Last Edited on 13-FEB-2013, 19:59

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.	MCG External Temperature		
Stand-off	0.5	inches	

High Resolution Temperature Calibration MAI-A.A 167

Field Calibration on 14-NOV-2012,09:17

	Measured	Calibrated(Deg F)
Lower	1.00	33.80
Upper	11.00	51.80

High Resolution Temperature Constants MAI-A.A 167

Last Edited on 16-DEC-2012, 13:35

Pre-filter Length	11
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Induction Calibration MAI-A.A 167

Base Calibration on 14-NOV-2012,09:21  
Field Check on 11-FEB-2013 15:14

Base Calibration					
Test Loop Calibration		Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High	
1	17.3	474.2	9.3	966.2	
2	6.3	388.4	7.6	821.4	
3	3.3	259.4	5.2	566.0	
4	1.9	133.0	2.6	279.2	
Array Temperature	76.8		Deg F		
Channel	Base Check (mmho/m)		Field Check (mmho/m)		
	Low	High	Low	High	
1			12.0	3841.9	
2			29.3	3480.1	
3			28.9	3056.0	
4			19.7	2083.8	
Deep			18.5	2051.0	
Medium			42.1	3995.1	
Shallow			42.5	5058.6	

## Induction Constants MAI-A.A 167

Last Edited on 13-FEB-2013,19:59

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	

## Caliper Calibration MPD-B 64

Base Calibration on 11-FEB-2013 15:56

Field Calibration on 11-FEB-2013 15:58

## Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13724	3.99
2	22114	5.98
3	30659	7.97
4	39003	9.86
5	48418	11.92
6	N/A	N/A

## Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.97	5.98

## Photo Density Calibration MPD-B 64

Base Calibration on 24-JAN-2013 11:06

Field Check on 11-FEB-2013 15:27

## Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	59480	32613	59556	30836
Reference 2	24916	2887	24941	2541

## Field Check at Base

1175.4 1365.7

## Field Check

1173.0 1354.8



PE Calibration

Base Calibration	WS	Measured WH	Ratio	Calibrated Ratio
Background	213	1048		
Reference 1	22414	59275	0.381	0.371
Reference 2	6747	24782	0.275	0.272
Field Check at Base	212.8	1048.1		
Field Check	213.5	1044.8		

Density Constants MPD-B 64

Last Edited on 14-FEB-2013,01:07

Density Source Id	18235B	
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 (ft)	
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 13.04.8492\Data\Grand Mesa Breit-Hoss 1-22\Grand Mesa Breit-Hoss 1-22\_001.dta

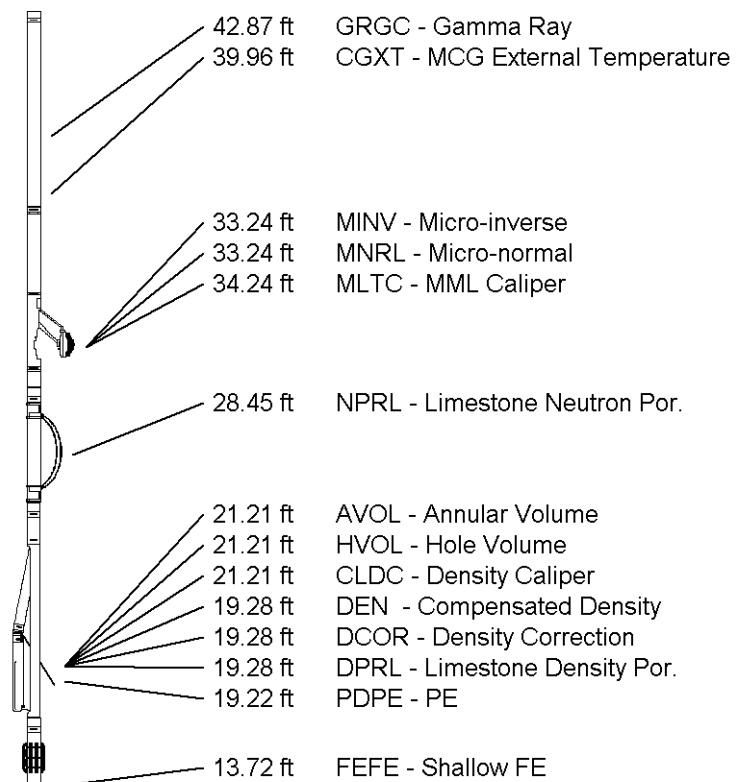
Compact Comms Gamma  
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

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-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric  
MFE-B.I 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: 48.16 ft Weight: 383.6 lb



3.34 ft R400 - Array Ind. One Res 40  
 3.34 ft RTAO - Array Ind. One Res Rt  
 3.34 ft R600 - 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	GRAND MESA OPERATING COMPANY
WELL	BREIT-HOSS #1-22
FIELD	WILDCAT
PROVINCE/COUNTY	NESS
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2239.00	feet	First Reading	4450.00	feet
Elevation Drill Floor	2238.00	feet	Depth Driller	4470.00	feet
Elevation Ground Level	2234.00	feet	Depth Logger	4470.00	feet



**Weatherford**<sup>®</sup>

COMPACT PHOTO DENSITY  
 COMPENSATED NEUTRON  
 MICRORESISTIVITY LOG