



Weatherford®

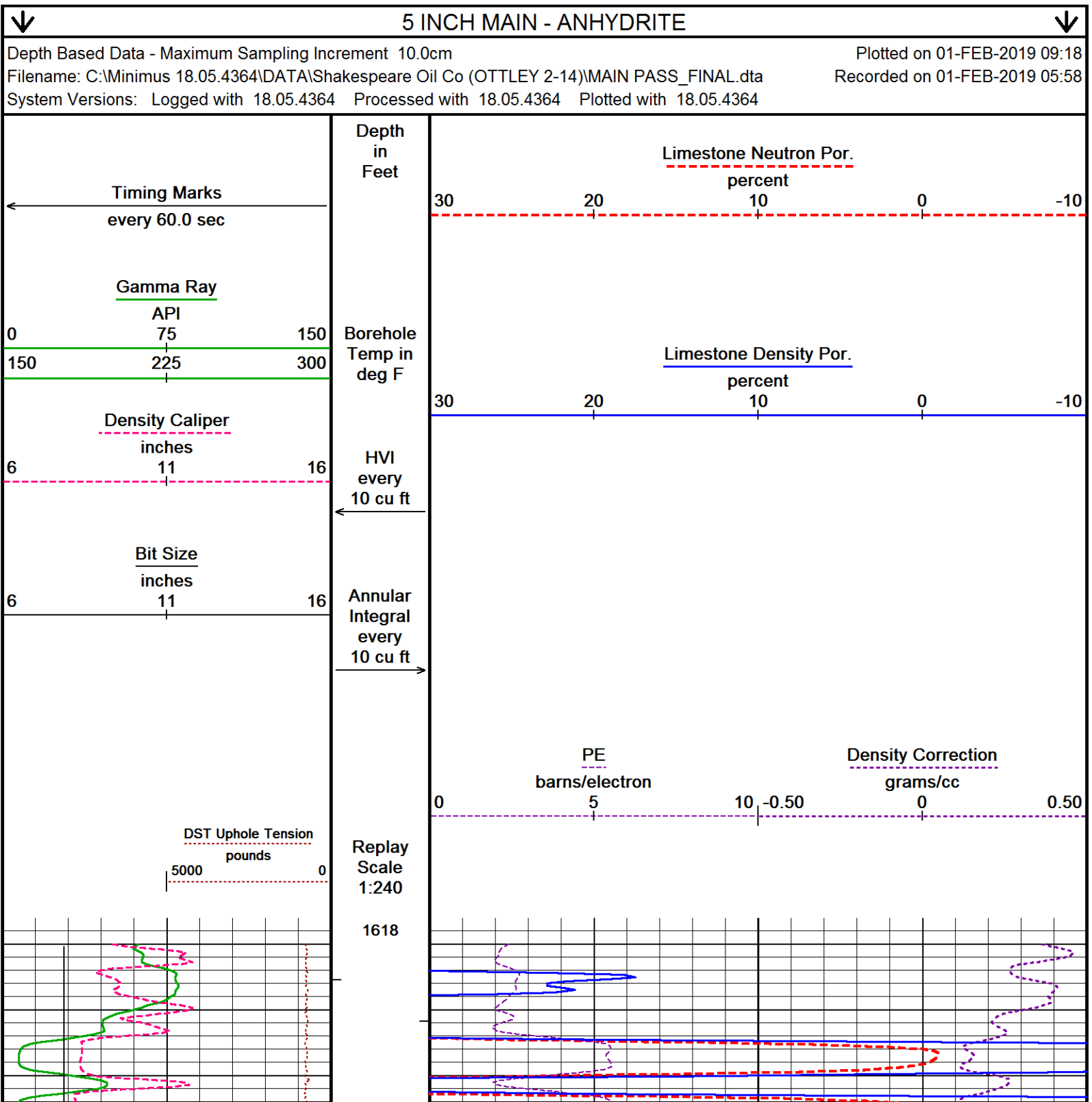
**PHOTO DENSITY
DUAL SPACED NEUTRON
MICRO RESISTIVITY**

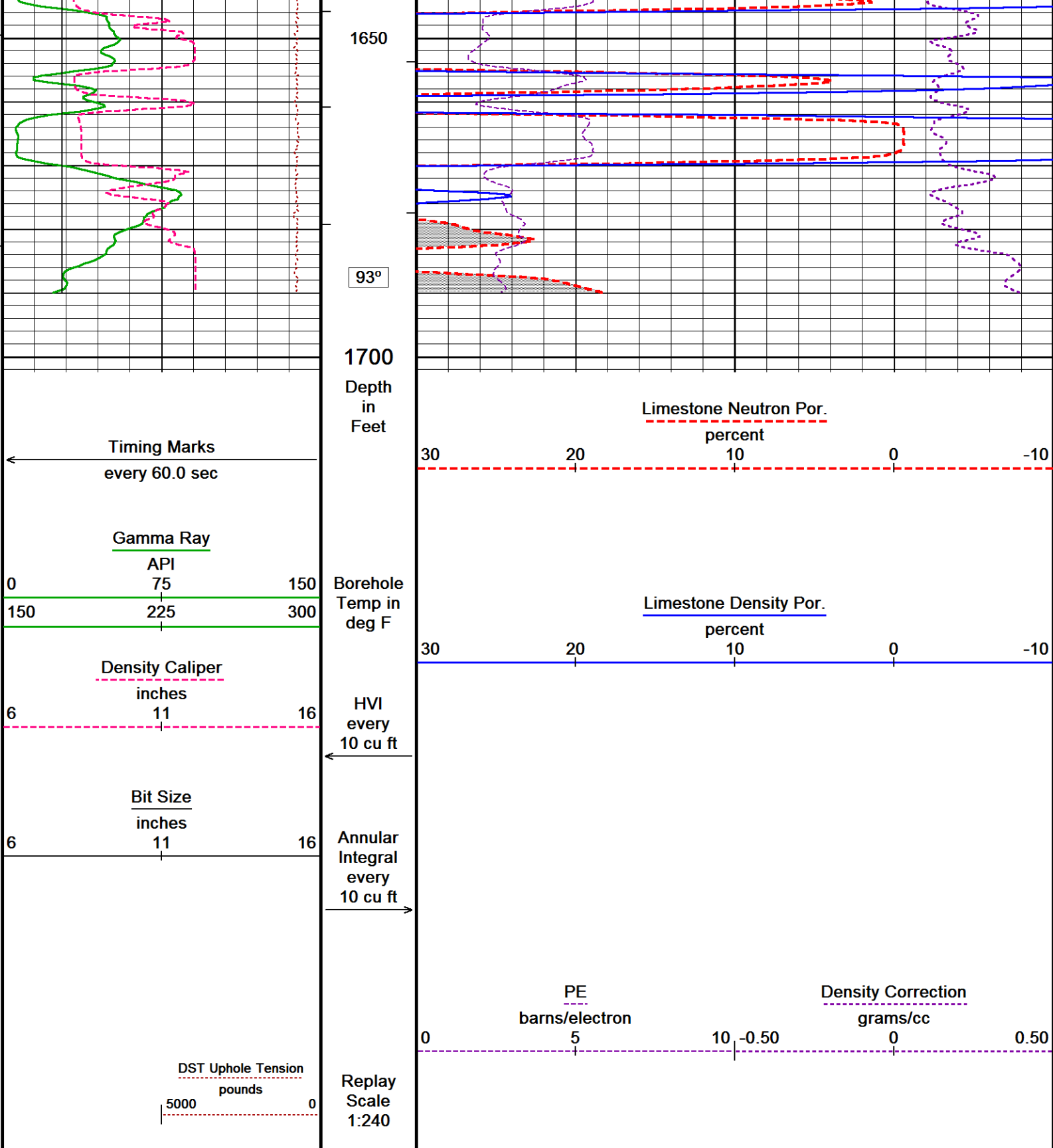
COMPANY				SHAKESPEARE OIL CO., INC.			
WELL				K OTTLEY 2-14			
FIELD				WILDCAT			
PROVINCE/COUNTY				LOGAN			
COUNTRY/STATE				USA / KANSAS			
LOCATION				NW-SW-SE-SE 500' FSL & 1150' FEL			
SEC 14	TWP 14S	RGE 32W	Other Services				
Latitude	38.831151		ARRAY INDUCTION				
Longitude	-100.8393015						
API Number	15-109-21579						
Permanent Datum Ground Level, Elevation 2791 feet							Elevations:
Log Measured From KB, 9.00 feet above Permanent Datum							KB 2800.00
Drilling Measured From KB							DF 2791.00
							GL
Date	01-FEB-2019						
Run Number	ONE						
Service Order	18148-236170428						
Depth Driller	4550.00						feet
Depth Logger	4548.00						feet
First Reading	4530.00						feet
Last Reading	3500.00						feet
Casing Driller	264.00						feet
Casing Logger	262.00						feet
Bit Size	7.875						inches
Hole Fluid Type	WATER BASED						
Density / Viscosity	9.40 lb/USg		57.00 sec/qt				
PH / Fluid Loss	10.00		9.60 ml/30Min				
Sample Source	FLOW LINE						
Rm @ Measured Temp	0.45 @ 83.0		ohm-m				
Rmf @ Measured Temp	0.40 @ 83.0		ohm-m				
Rmc @ Measured Temp	0.54 @ 83.0		ohm-m				
Source Rmf / Rmc	CALC		CALC				
Rm @ BHT	0.34 @111.0		ohm-m				
Time Since Circulation	3.0 HOURS						
Max Recorded Temp	111.00		deg F				
Equipment / Base	13244		LIB				
Recorded By	S. WIGHT						
Witnessed By	TIM LAUER						

BOREHOLE RECORD					Last Edited: 01-FEB-2019 07:24
Bit Size inches		Depth From feet		Depth To feet	
12.250		0.00		264.00	
7.875		264.00		4550.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	264.00	24.00	

REMARKS
- RUN ONE: MCG, MML, MDN, MPD, MAI RUN IN COMBINATION. - HARDWARE: DUAL BOWSPRING USED ON MDN. 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: 1835 CU.FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1360 CU.FT.
- RIG: DUKE #4.
- OPERATOR: B TOVAR, B COPELAND, D STEELE

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.





Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.05.4364

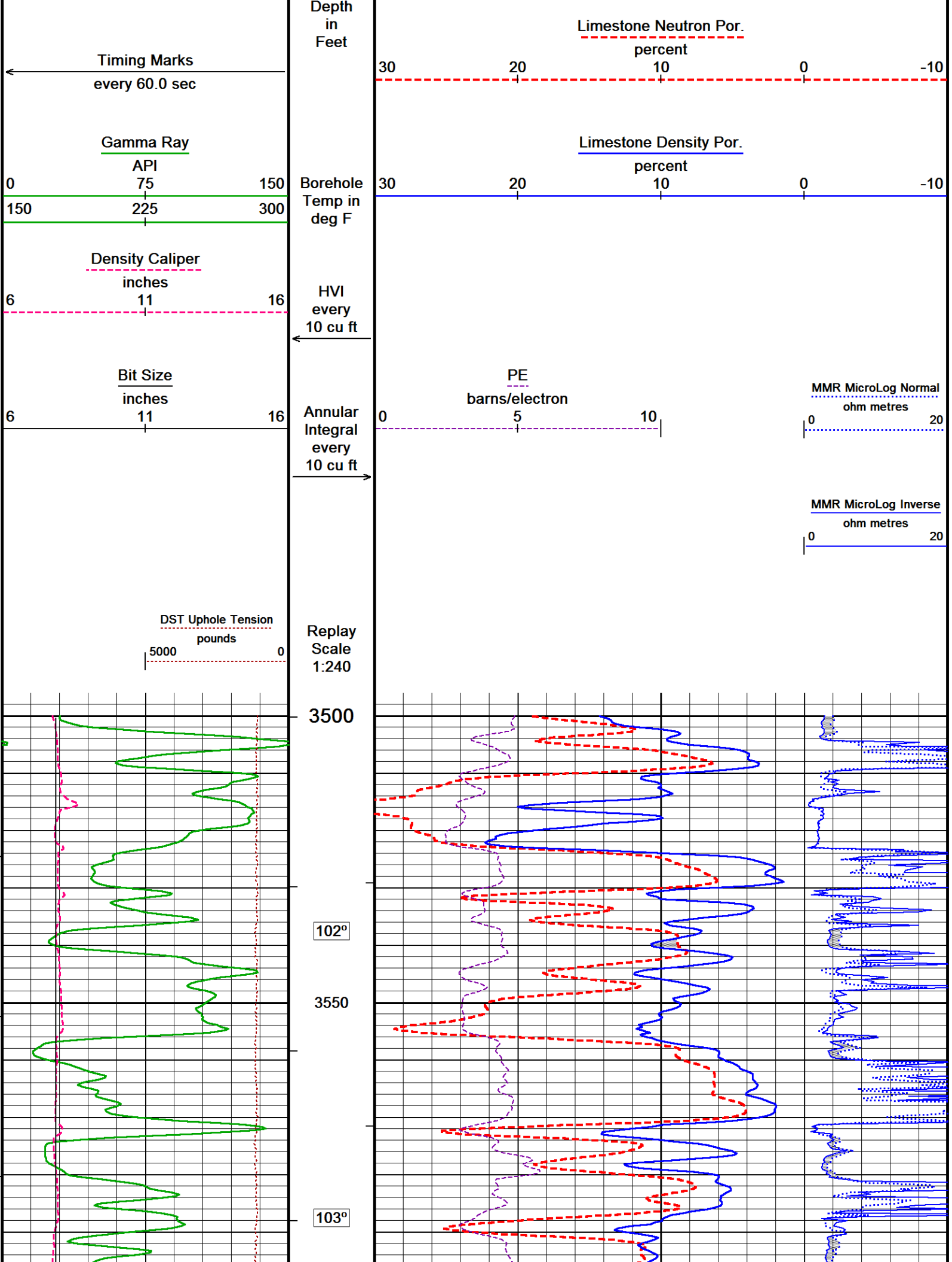
Plotted on 01-FEB-2019 09:18
Recorded on 01-FEB-2019 05:58

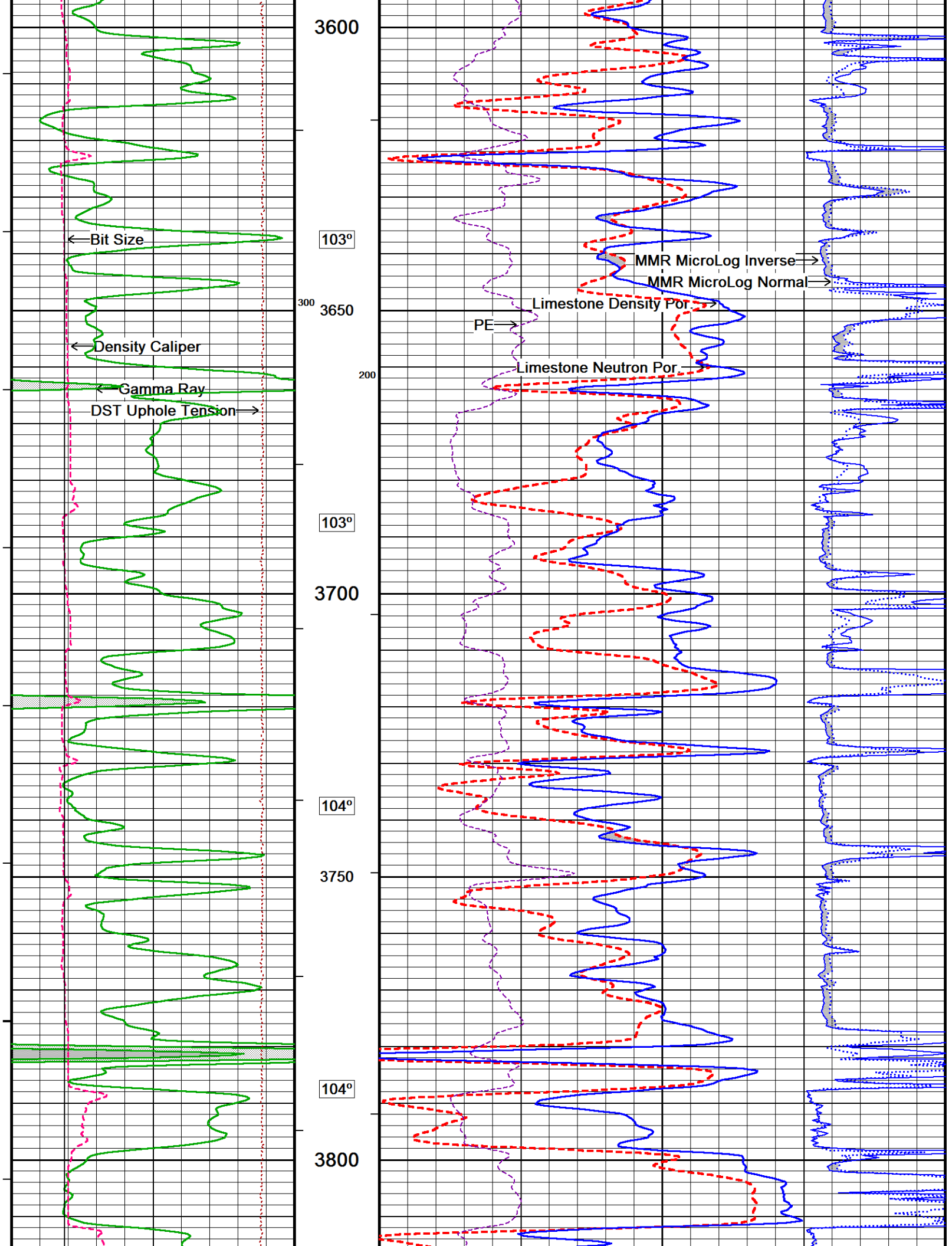
5 INCH MAIN - ANHYDRITE

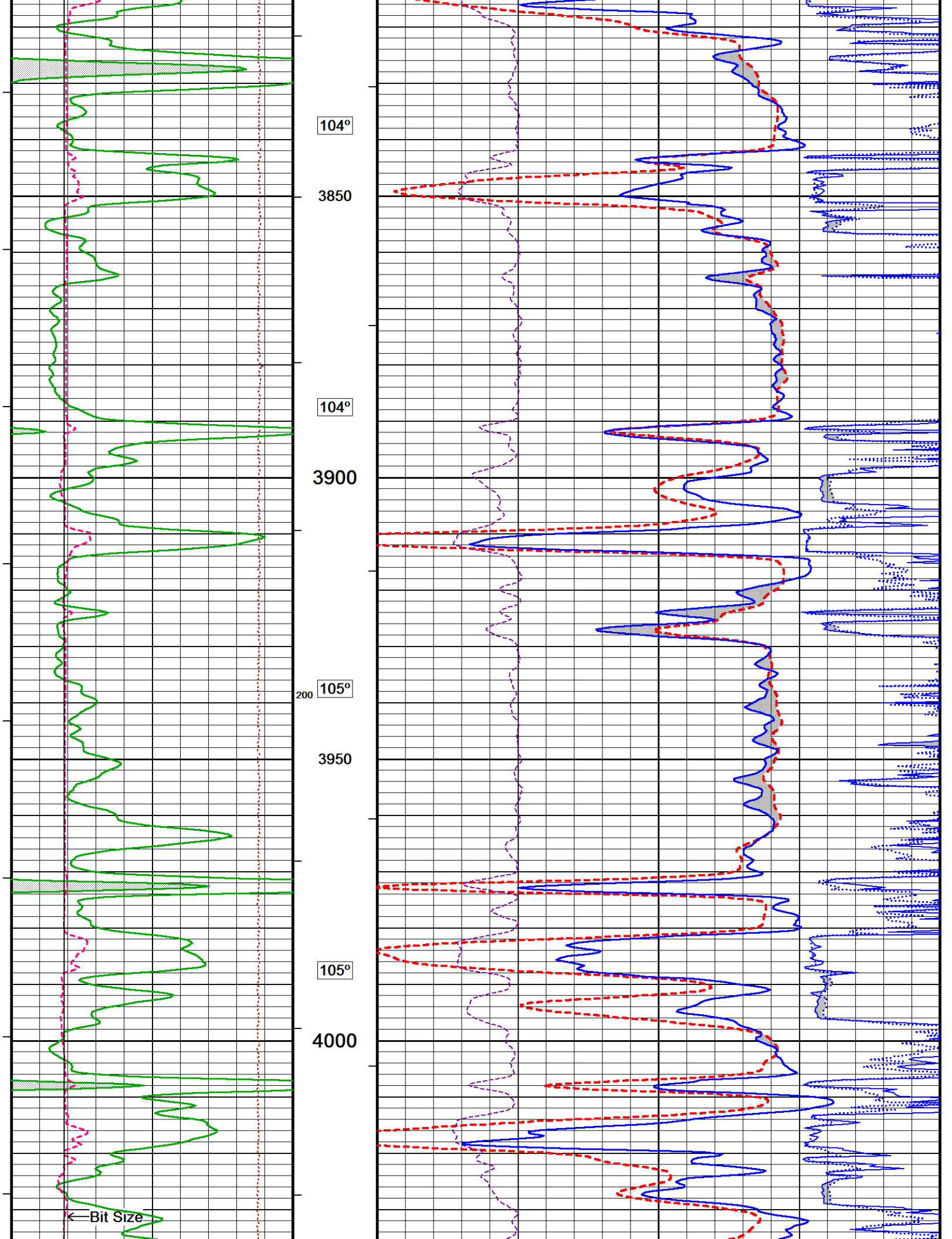
5 INCH LIMESTONE MAIN

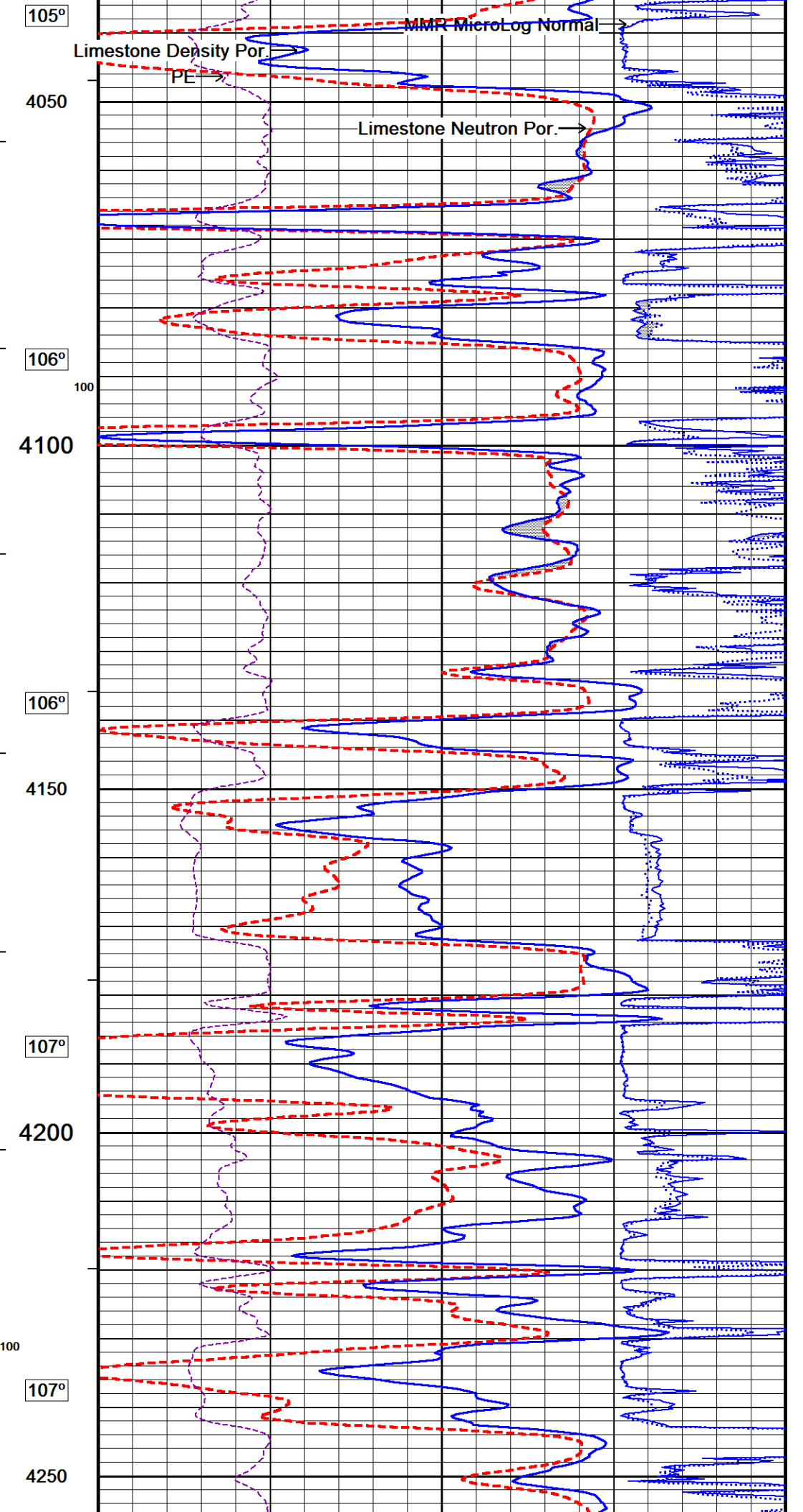
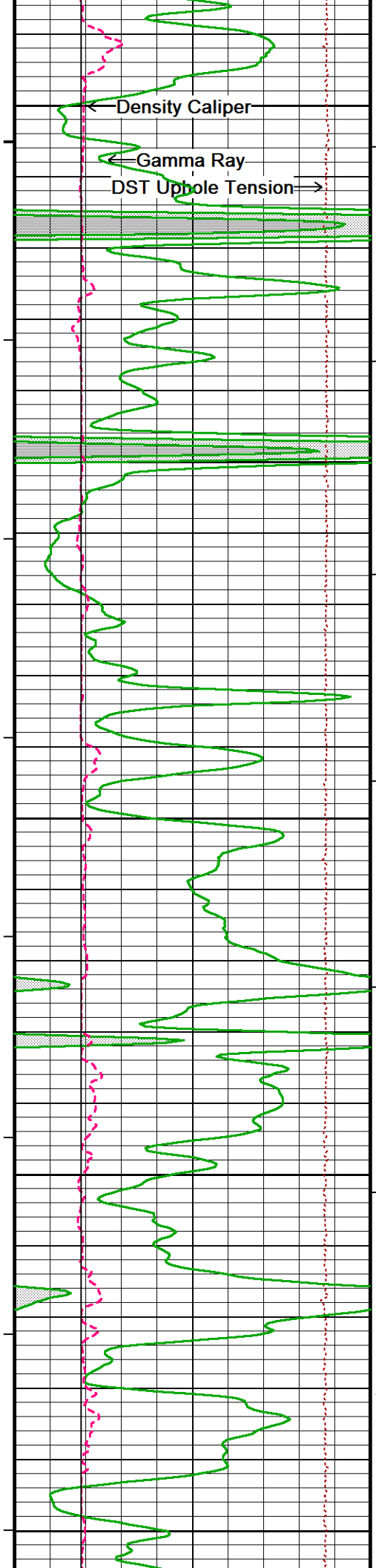
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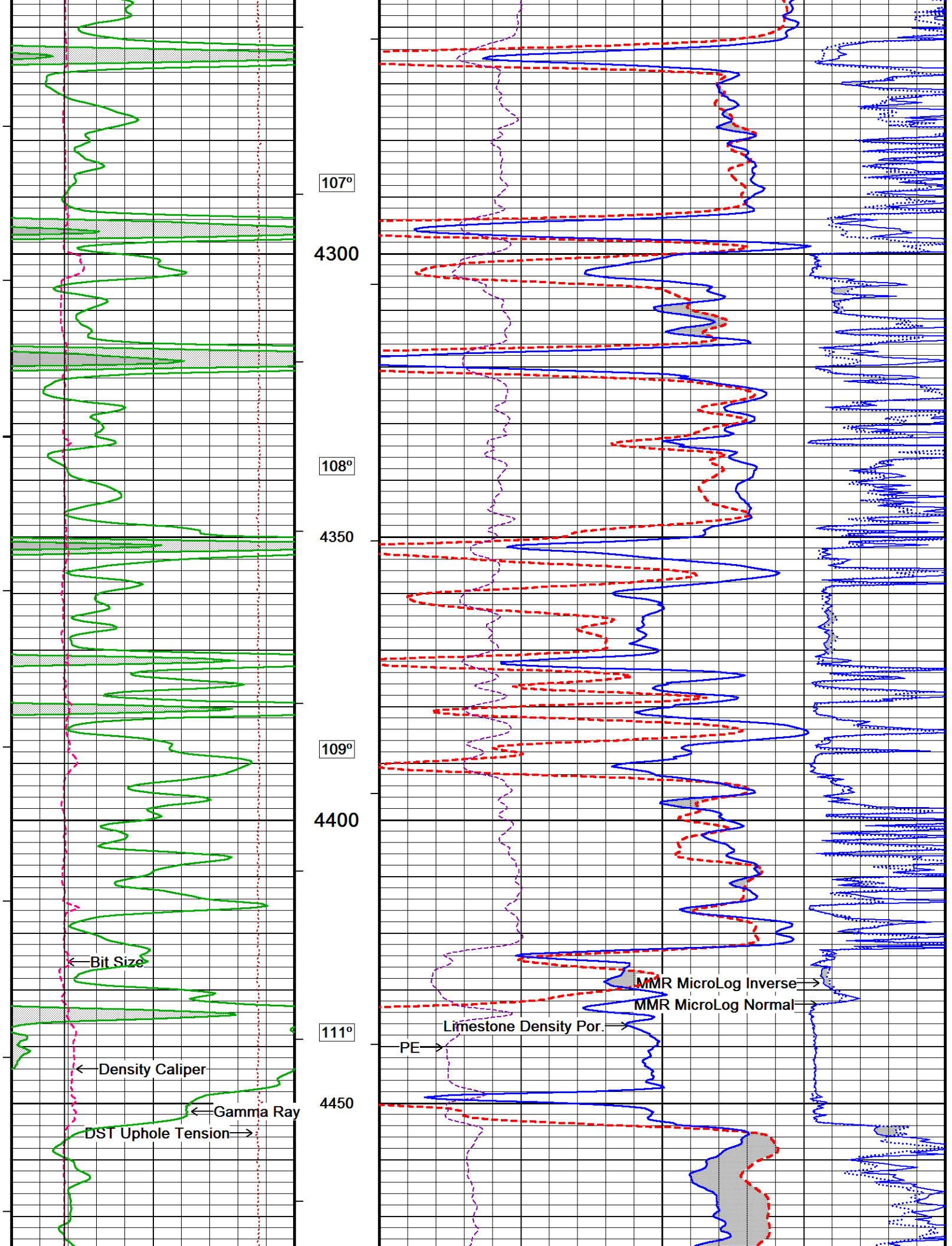
Plotted on 01-FEB-2019 09:18
Recorded on 01-FEB-2019 05:58











↑

5 INCH LIMESTONE MAIN

↑

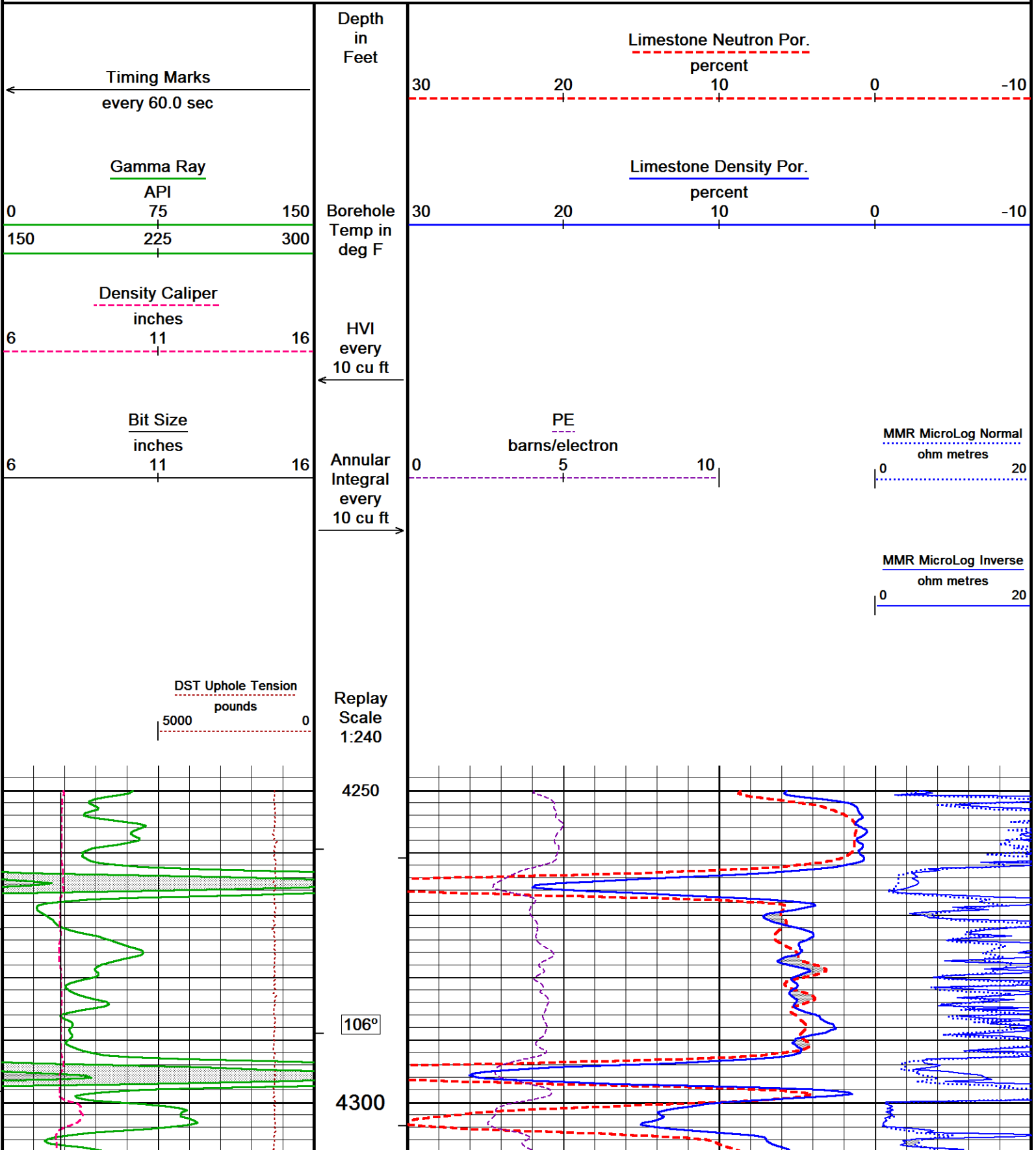
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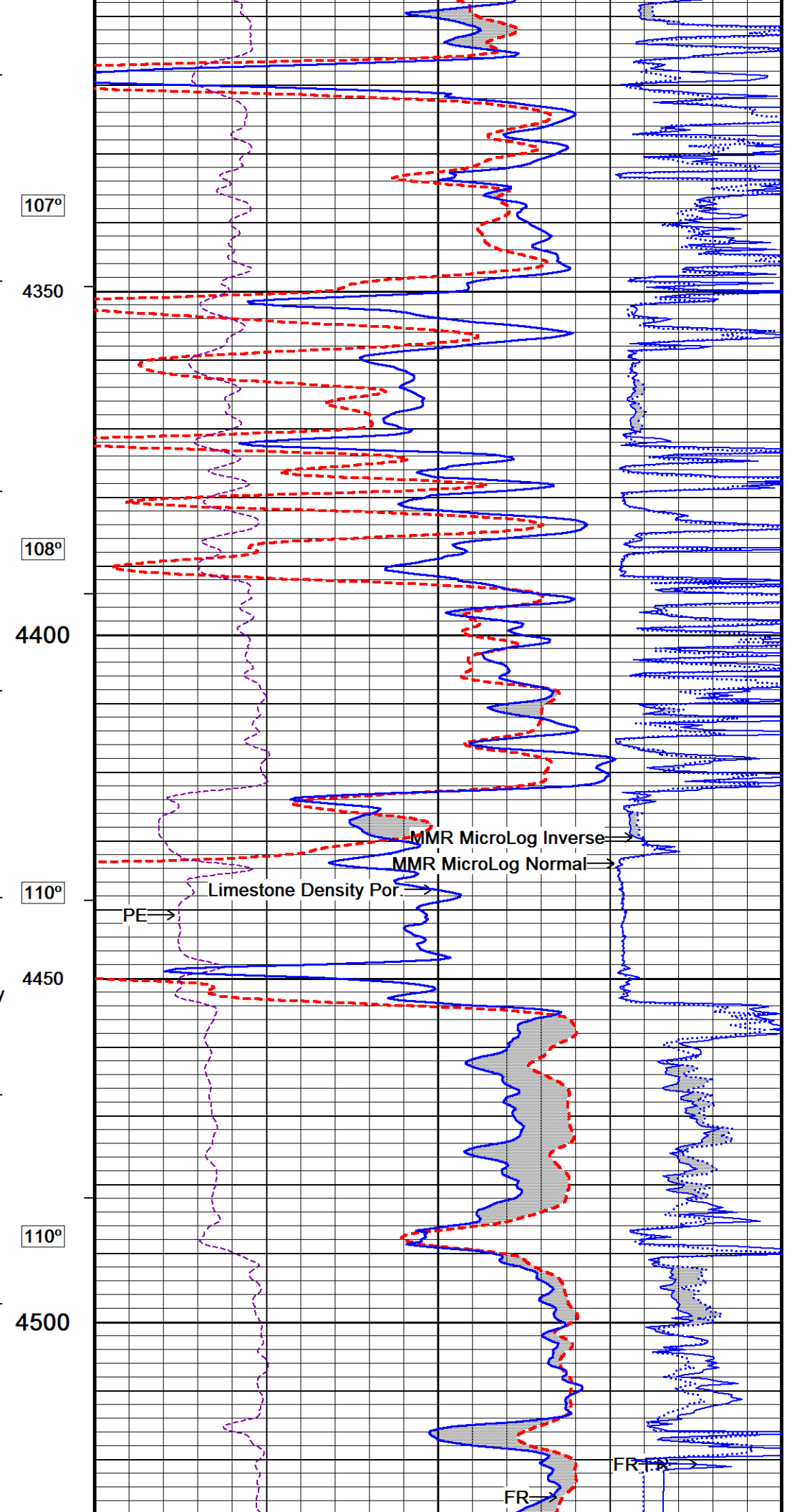
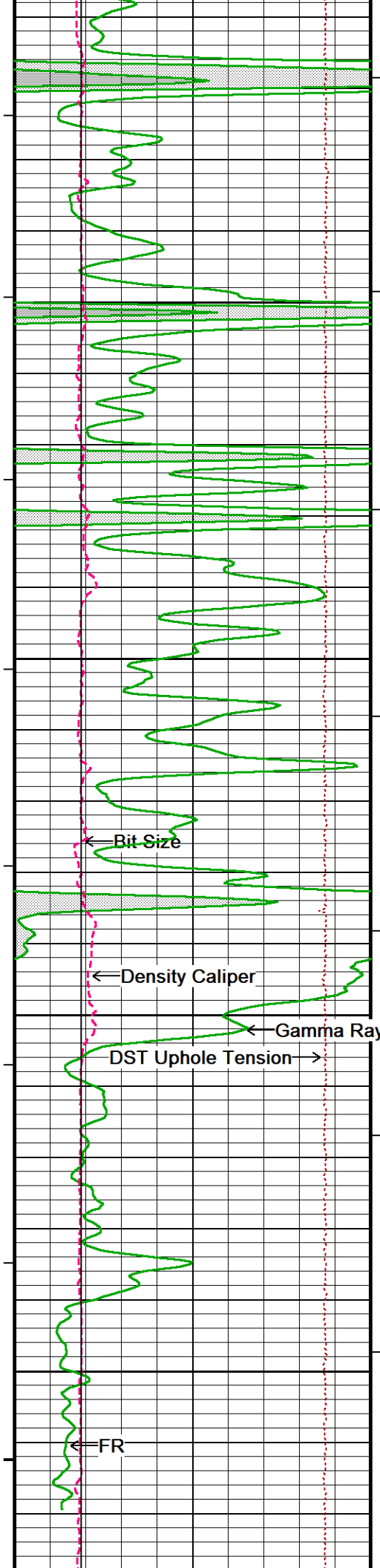
REPEAT SECTION

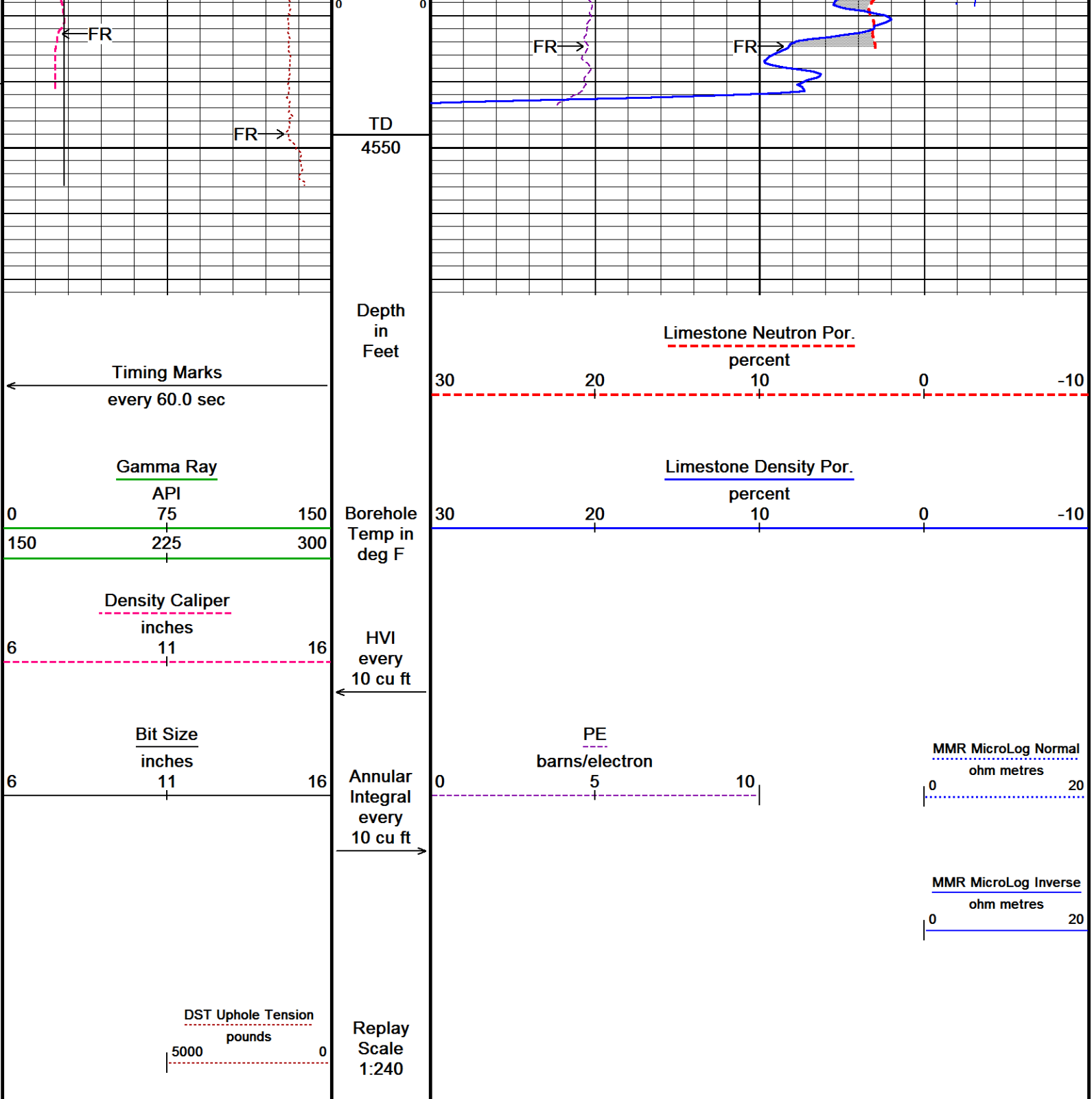
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Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\REPEAT PASS_FINAL.dta
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.05.4364

Plotted on 01-FEB-2019 09:18
Recorded on 01-FEB-2019 05:35





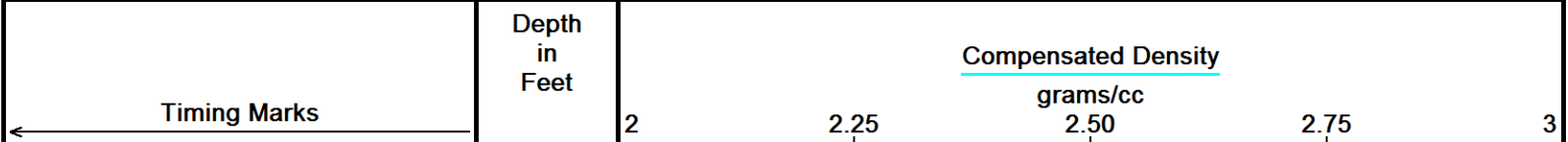


Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 01-FEB-2019 09:18
Filename: C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-...\REPEAT PASS_FINAL.dta Recorded on 01-FEB-2019 05:35
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.05.4364

↑ REPEAT SECTION ↑

↓ 5 INCH BULK DENSITY MAIN ↓

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 01-FEB-2019 09:18
Filename: C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta Recorded on 01-FEB-2019 05:58
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.05.4364



every 60.0 sec

Gamma Ray

API

75

225

300

0 150 150 300

Borehole
Temp in
deg F

Density Caliper

inches

11

6 16

HVI
every
10 cu ft

Bit Size

inches

11

6 16

Annular
Integral
every
10 cu ft

DST Uphole Tension

pounds

5000

0

Replay
Scale
1:240

Limestone Density Por.

percent

30

20

10

0

-10

PE

barns/electron

0

5

10 -0.50

Density Correction

grams/cc

0

0.50

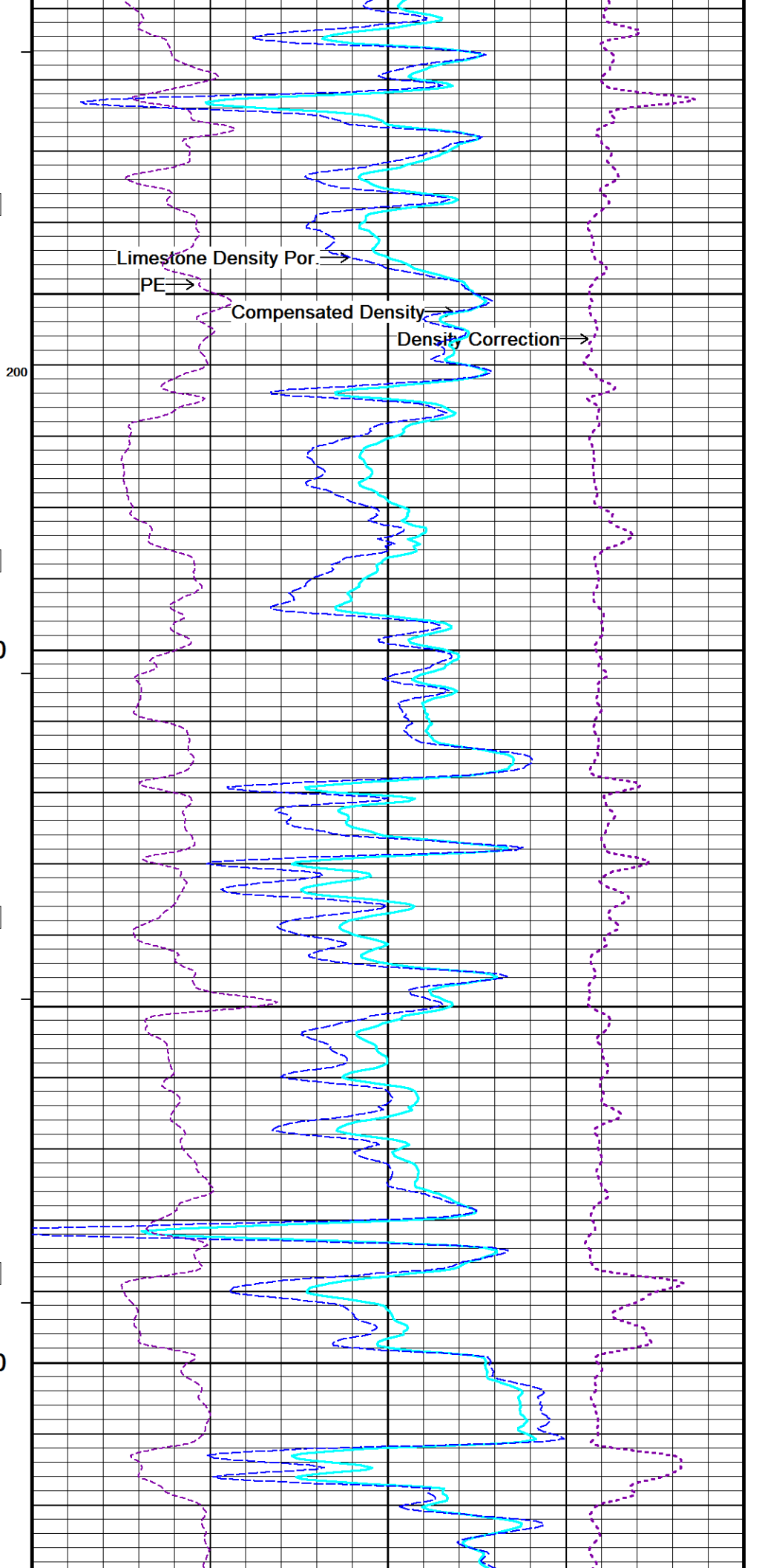
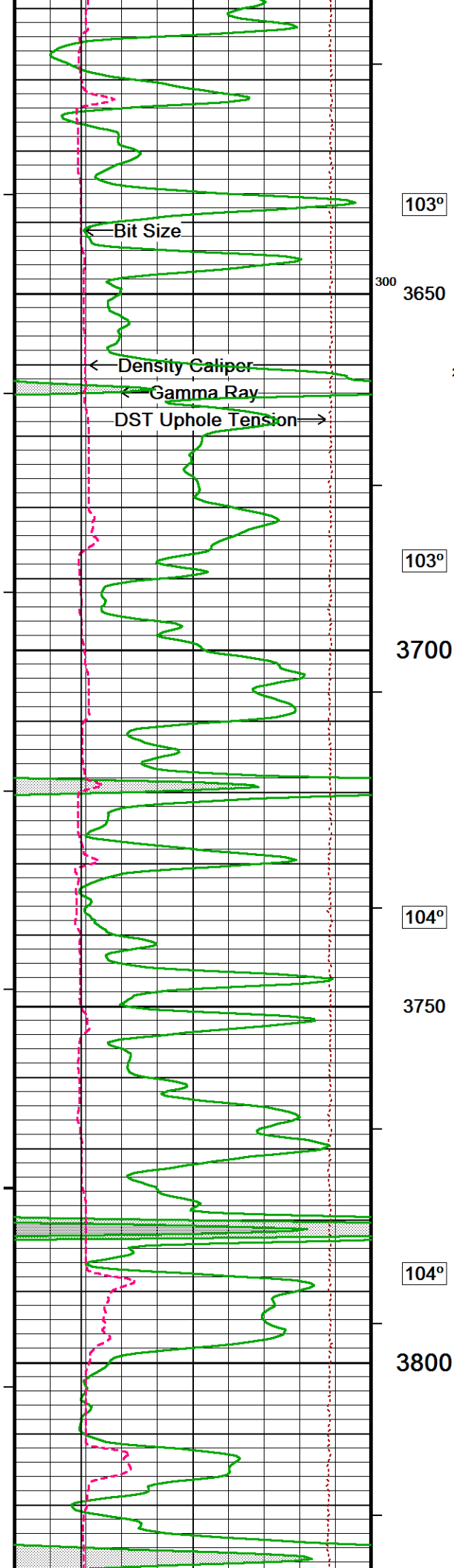
3500

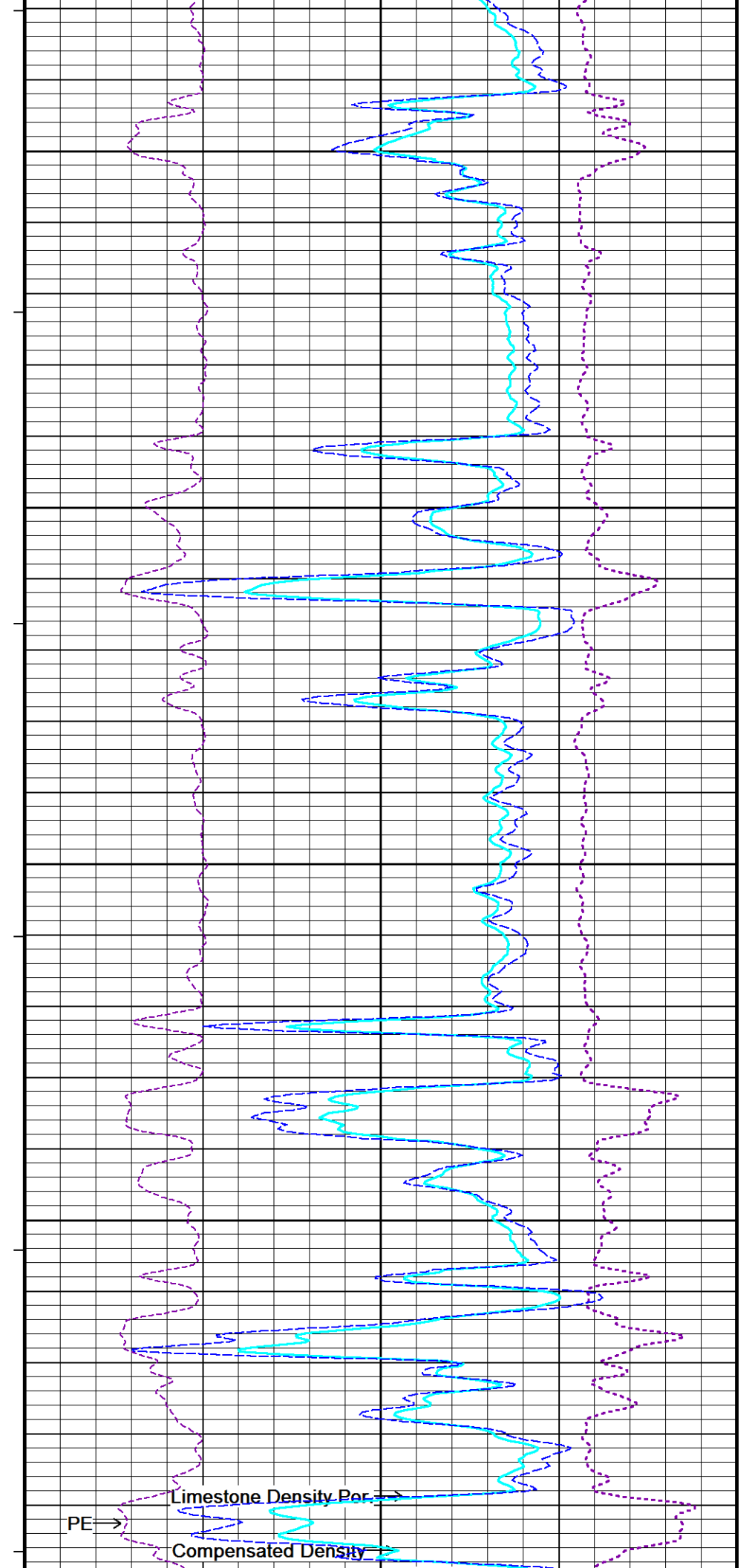
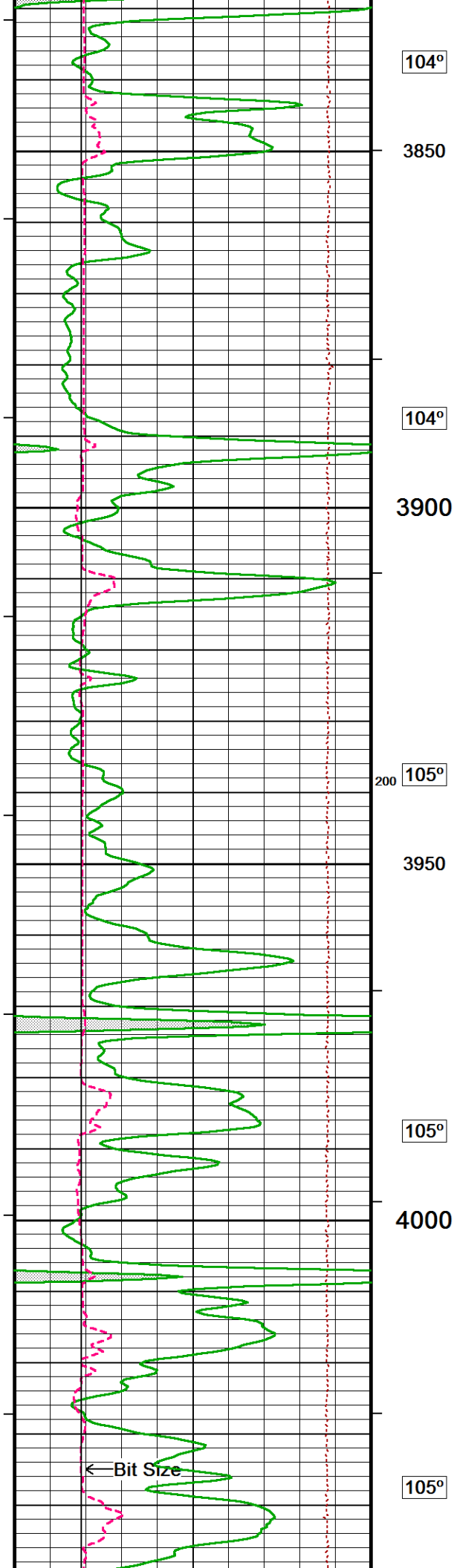
102°

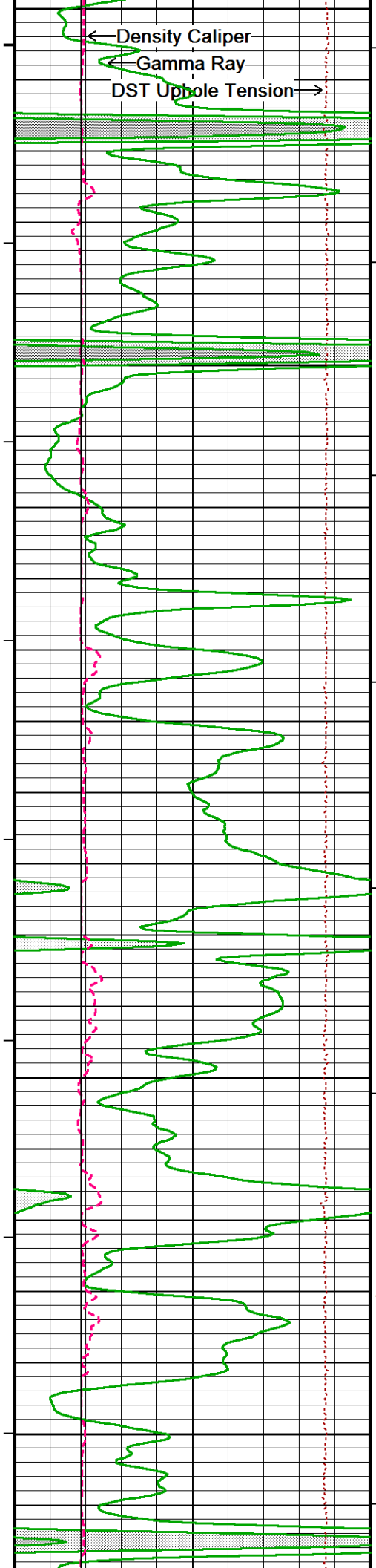
3550

103°

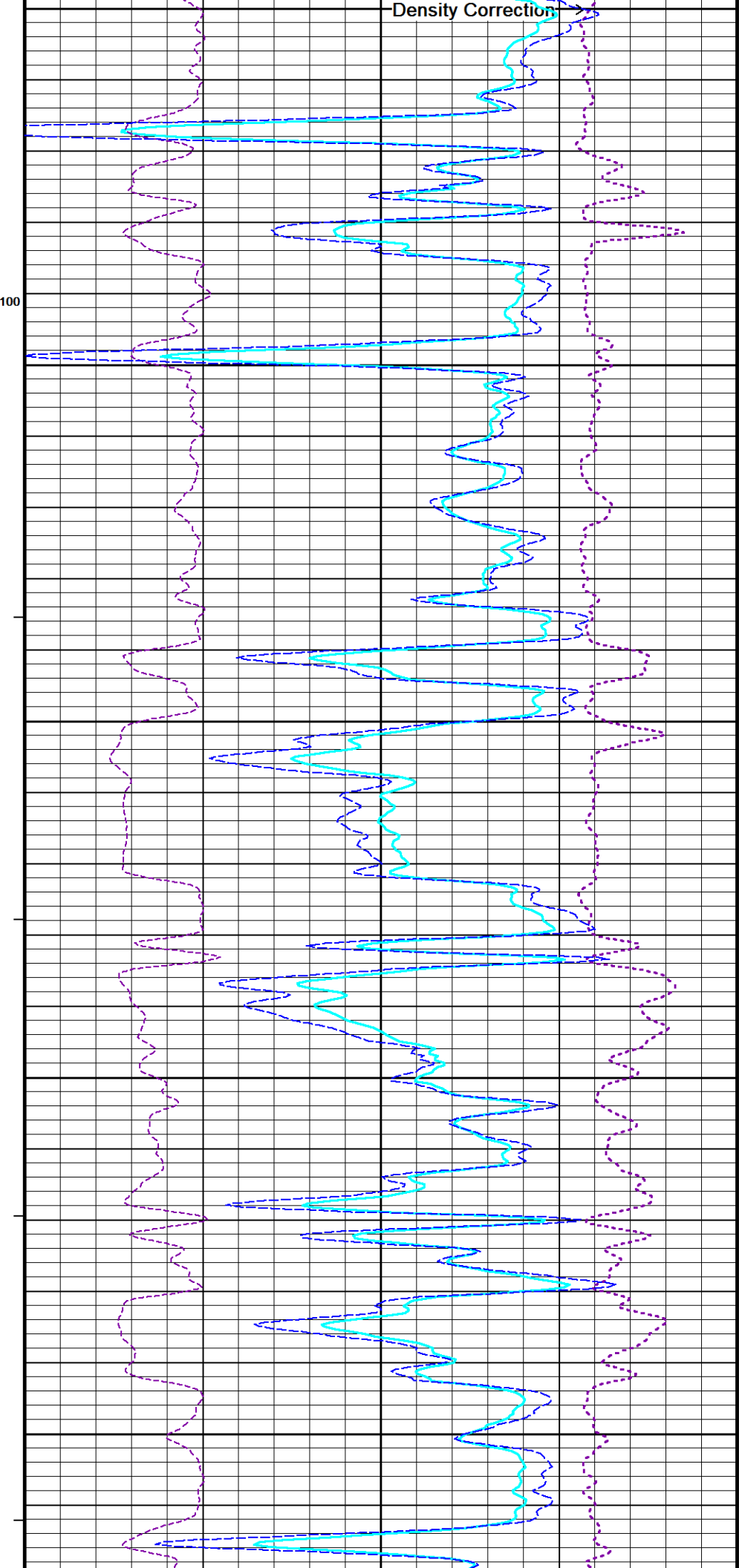
3600

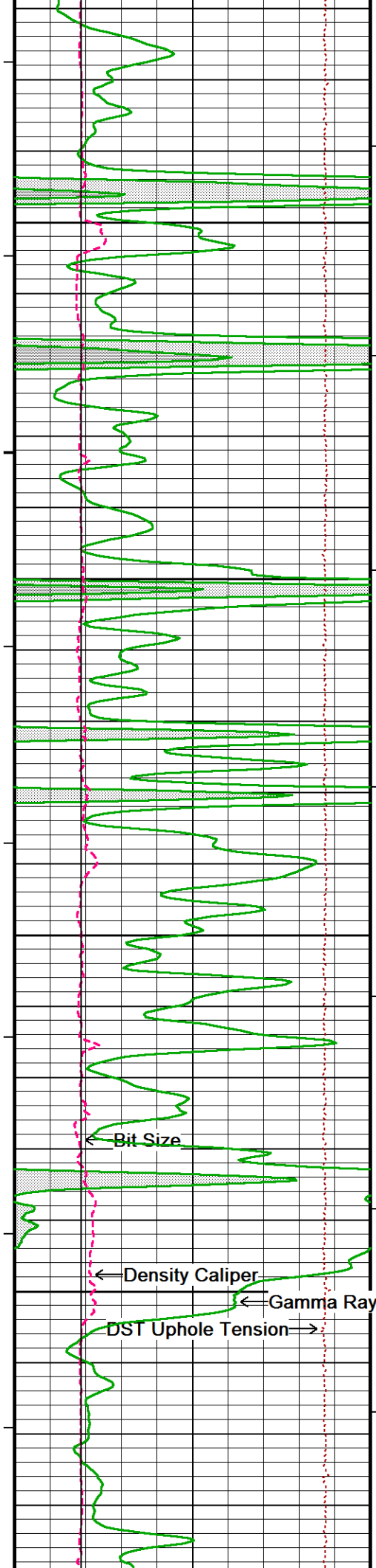






4050
106°
100
4100
106°
4150
107°
4200
100
107°
4250





107°

4300

108°

4350

109°

4400

111°

4450

111°

← Bit Size

← Density Caliper

← Gamma Ray

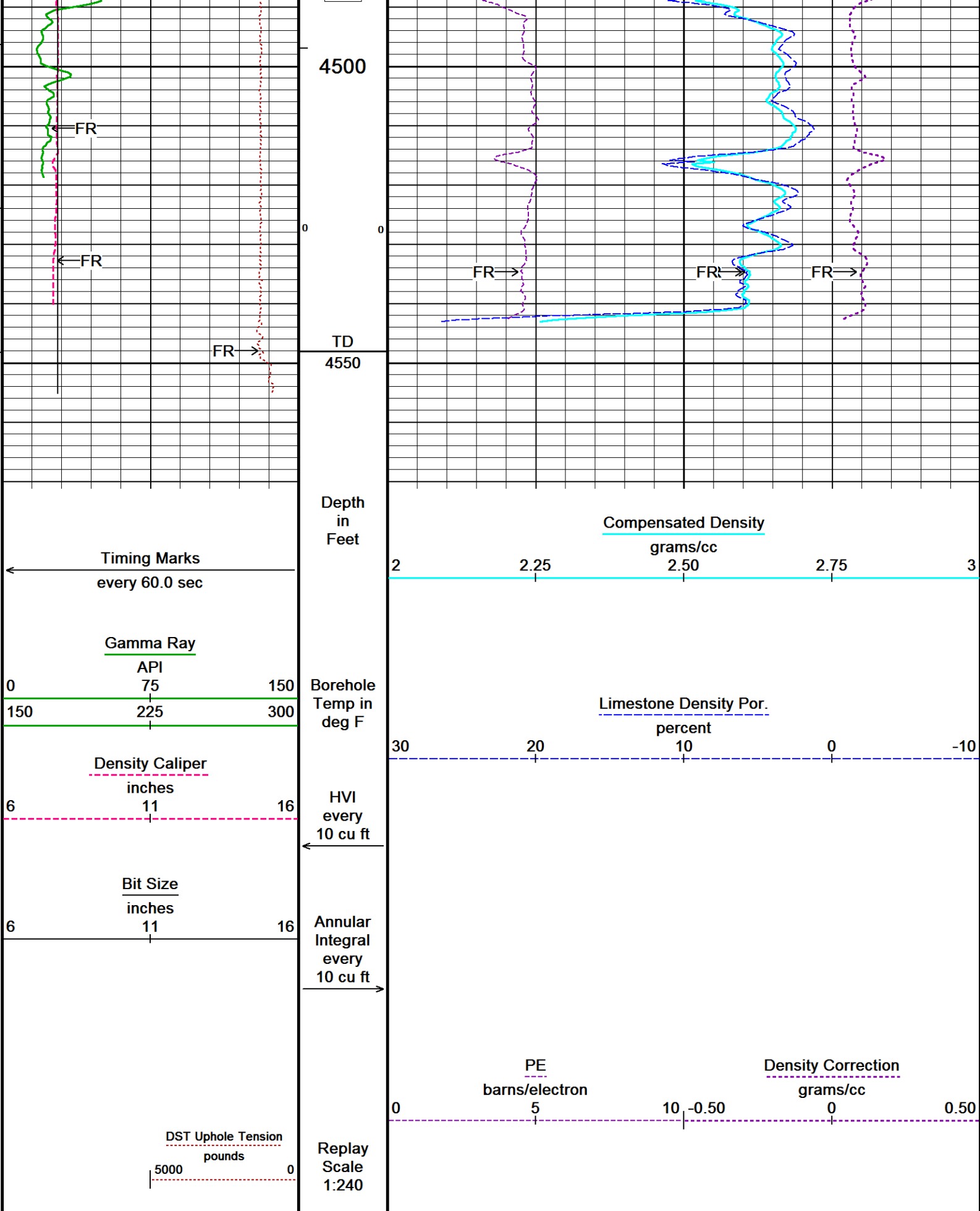
DST Uphole Tension →

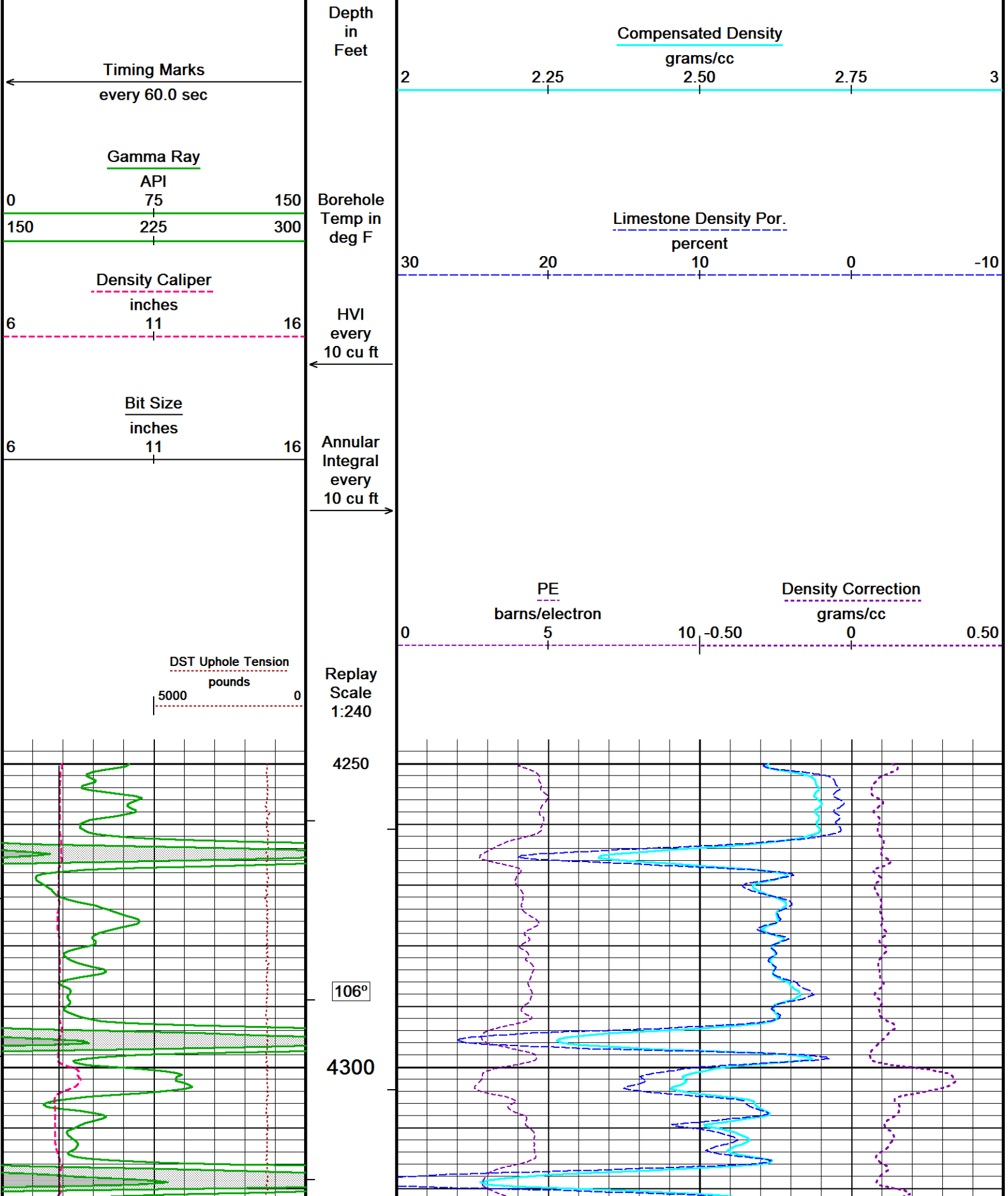
Limestone Density Por. →

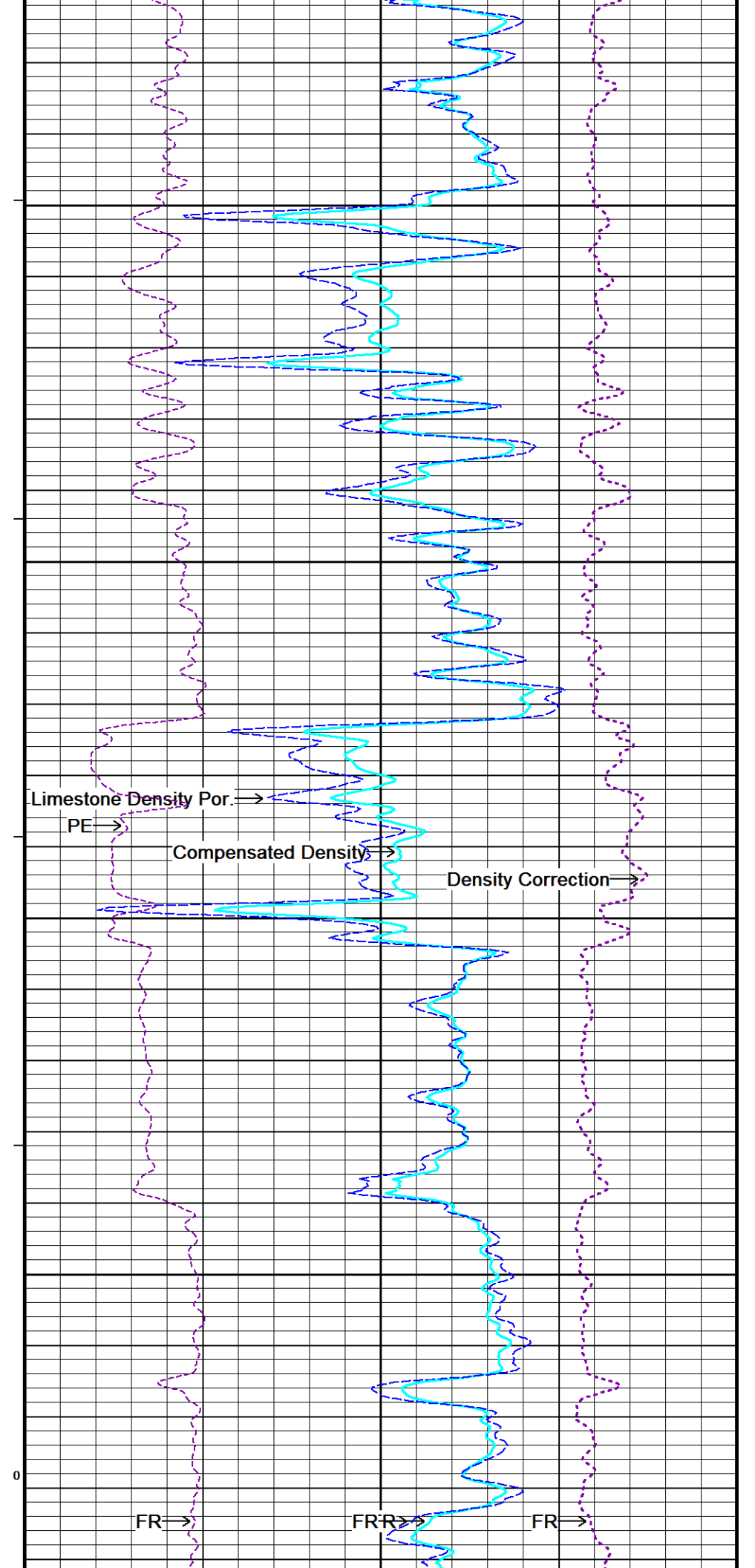
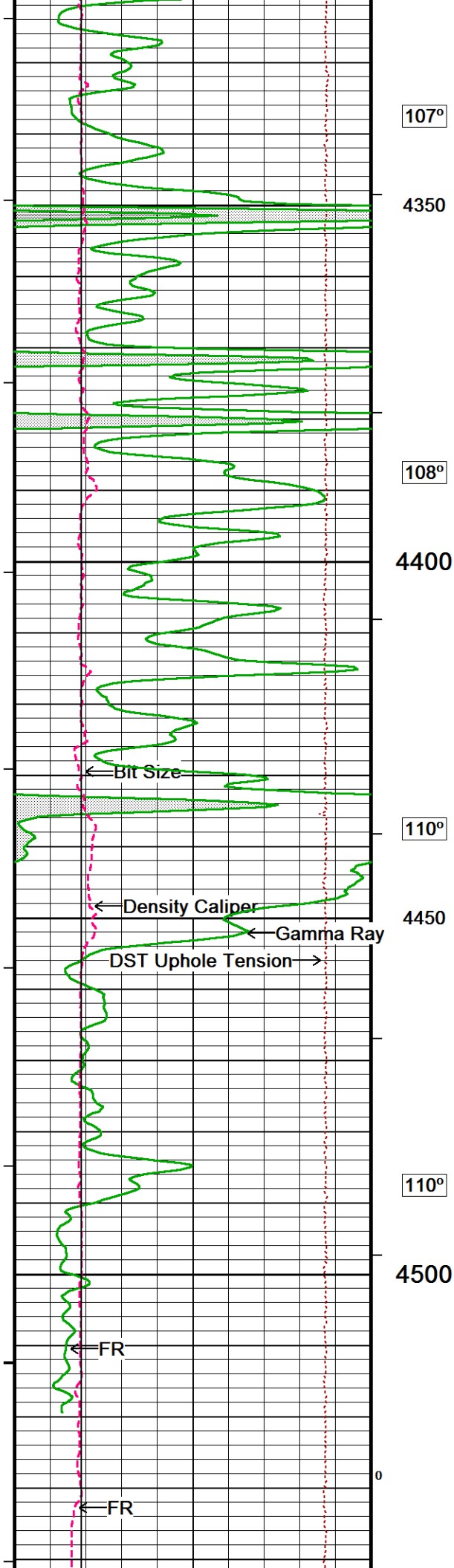
PE →

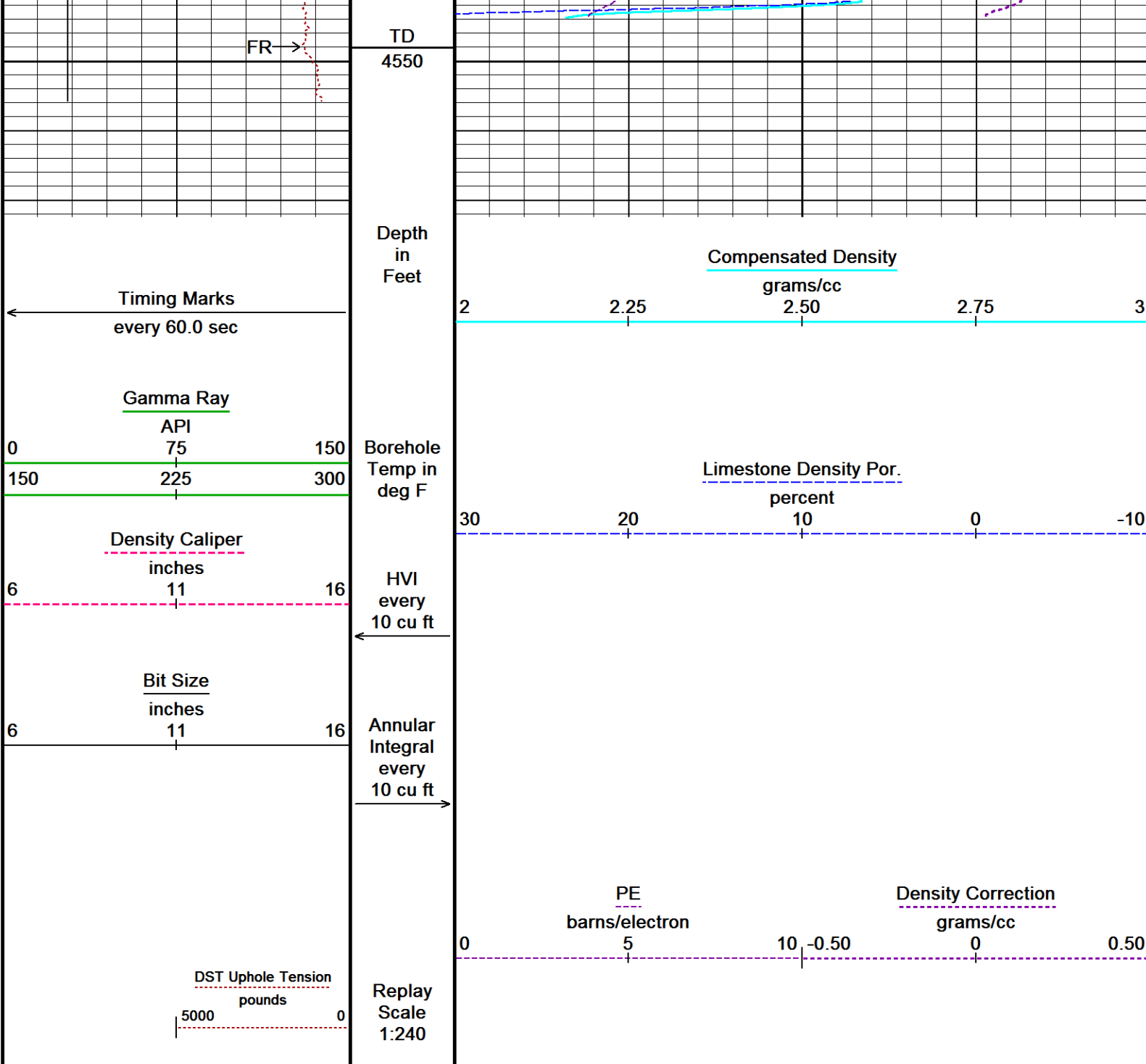
Compensated Density →

Density Correction →









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↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION

C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta

General Constants All 000 Last Edited on 01-FEB-2019,08:32

General Parameters

Mud Resistivity	0.450	ohm-metres
Mud Resistivity Temperature	83.000	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	MMR Caliper

HVOL Caliper 2	N/A	
Annular Volume Diameter	4.500	inches
Caliper for Differential Caliper	MMR Caliper	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	0.620	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0			Field Calibration on 01-FEB-2019 04:18
Reading No	Measured	Calibrated (lbs)	
1	14340.40	0.00	
2	14867.91	377.00	

SP Calibration MCG-D.K 443			Field Calibration on 10-DEC-2018 15:37
	Measured	Calibrated (mV)	
Reference 1	100.8	99.9	
Reference 2	-98.4	-99.9	

High Resolution Temperature Calibration MCG-D.K 443			Field Calibration on 12-OCT-2018,05:20
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	212.00	212.00	

High Resolution Temperature Constants MCG-D.K 443			Last Edited on 12-OCT-2018,05:20
Pre-filter Length	11		

Gamma Calibration MCG-D.K 443			Field Calibration on 31-JAN-2019 17:18
	Measured	Calibrated (API)	
Background	79	54	
Calibrator (Gross)	744	510	
Calibrator (Net)	665	456	

Gamma Calibration Tolerances MCG-D.K 443			
Ratio	1.458	1.40 1.475 1.55	Counts/API

Gamma Constants MCG-D.K 443			Last Edited on 01-FEB-2019,04:57
Gamma Calibrator Number	MCGGRCC141		
GRC-M Calibrator Jig in Use?	NO		
Inactive Background Jig in Use?	NO		
Mud Density	1.13	gm/cc	
Caliper Source for Processing	MMR Caliper		
Tool Position	Eccentred		
Potassium Equivalence	Chloride		
K Mud Concentration	0.00	%	

Micro Normal and Micro Inverse Calibration MMR-B.A 91			Base Calibration on 18-JAN-2019 12:24	Field Check on 31-JAN-2019 16:51
	Resistor 1 (ohm)	Resistor 2 (ohm)		
	10.0	50.0		
Base Calibration				
	Measured	Calibrated (ohm-m)		
Micro Normal	10.2	49.8	5.1	25.6
Micro Inverse	9.9	49.4	3.4	16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)		
Micro Normal	93.8	93.8		
Micro Inverse	62.3	62.3		

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91							
Micro Normal Res. 1	10.2	-5% 10.0 +5%	ohm	Micro Normal Res. 2	49.8	-5% 50.0 +5%	ohm
Micro Inverse Res. 1	9.9	-5% 10.0 +5%	ohm	Micro Inverse Res. 2	49.4	-5% 50.0 +5%	ohm

Micro Normal Base Check	93.8		ohm-m
Micro Inverse Base Check	62.3		ohm-m
Micro Normal Field Check	93.8		ohm-m
Micro Inverse Field Check	62.3		ohm-m

Micro Normal and Micro Inverse Constants MMR-B.A 91

Last Edited on 13-APR-2018,05:04

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	

Caliper Calibration MMR-B.A 91

Base Calibration on 18-JAN-2019 14:14

Field Calibration on 31-JAN-2019 16:54

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14078	5.98
2	17477	7.97
3	20615	9.86
4	24868	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

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

Caliper Calibration Tolerances MMR-B.A 91

Short Arm Field Cal.	7.97		in
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Micro-Resistivity Caliper Constants MMR-B.A 91

Sonde Configuration	Resistivity Mode
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Micro Laterolog Calibration MMR-B.A 91

Base Calibration on 31-DEC-1999 00:00

Field Check on 31-DEC-1999 00:00

Base Calibration	Resistor 1 (ohm)		Resistor 2 (ohm)	
	0.0		0.0	
	Measured		Calibrated (ohm-m)	
	Ref 1	Ref 2	Ref 1	Ref 2
	0.0	0.0	0.0	0.0
	Base Check (ohm-m)		Field Check (ohm-m)	
	0.0		0.0	

Micro Laterolog Constants MMR-B.A 91

Pad Type	6 in Solid Nylon B23059		
Standoff Offset	0.0000	inches	
Micro Laterolog K Factor	0.0128		
Micro Laterolog Rm K Factor	N/A		
Mudcake Thickness Correction Constants			
Mud Cake Source	Constant Value		
Mud Cake Thickness	0.4000	inches	
Mud Cake Thickness Caliper			
Mud Cake Resistivity	0.1500	ohm-m	
Mud Cake Resistivity Temp.	20.00	Degrees C	
Mud Cake Resistivity Source	Constant Value		
Temp. for Rmc Corr.	MCG External Temperature		

Neutron Calibration MDN-B.A 292

Base Calibration on 07-JAN-2019,13:23

Field Check on 31-JAN-2019 17:01

Base Calibration			
Ratio	Measured		Calibrated (cps)
	Near	Far	Near Far
	2910	91	3714 110
	31.871		33.764

Field Calibrator at Base	Calibrated (cps)
	2207 3209
Ratio	0.688
Field Check	Calibrated (cps)
	2227 3174
Ratio	0.702

Neutron Calibration Tolerances MDN-B.A 292

Ratio	31.871	
		-5% 33 +5%
Base Check	0.688	
		0.65 0.7 0.75
Field Check	0.702	
		0.668 0.688 0.708

Neutron Constants MDN-B.A 292

Last Edited on 31-JAN-2019,16:57

Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Legacy	
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	

Induction Calibration MAI-B.J 390

Factory Loop Calibration 07-JAN-2019 10:28

Field Check on 31-JAN-2019 16:41

Factory Loop Calibration

High Conductivity Reference Resistor	3.3	ohm
Low Conductivity Reference Resistor	333.3	ohm

Array	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
	Low	High	Low	High	Gain	Offset
1 (near)	16.8	458.6	9.3	966.2	2.166	-27.2
2	6.3	377.7	7.6	821.4	2.191	-6.2
3	3.8	258.6	5.2	566.0	2.200	-3.0
4 (far)	1.9	132.3	2.6	279.2	2.121	-1.4
Array Temperature	77.9		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		
	Low	High	Low	High	
1 (near)	13.2	3960.1	13.2	3959.7	
2	29.9	3563.5	30.0	3563.4	
3	27.9	3061.4	28.0	3061.6	
4 (far)	19.7	2087.8	19.7	2087.8	
Array Temperature	64.9		65.0		Deg F

Induction Check Tolerances MAI-B.J 390

Low Array 1	13.2		mmho/m	High Array 1	3959.7		mmho/m
		11.7 13.2 14.7				-0.5% 3960.1 +0.5%	
Low Array 2	30.0		mmho/m	High Array 2	3563.4		mmho/m
		28.4 29.9 31.4				-0.5% 3563.5 +0.5%	
Low Array 3	28.0		mmho/m	High Array 3	3061.6		mmho/m
		26.4 27.9 29.4				-0.5% 3061.4 +0.5%	
Low Array 4	19.7		mmho/m	High Array 4	2087.8		mmho/m
		18.2 19.7 21.2				-0.5% 2087.8 +0.5%	

Induction Model		RtAP-NC	
Borehole Correction Constants			
Tool Centred		No	
Hole Size Source		Density Caliper	
Hole Size Constant Value		N/A inches	
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	
Rm Source	Global Value: Temperature Corrected		
Temp. for Rm Corr.	MCG External Temperature		
Borehole Correction Method		Default	
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	
Symmetrised Receiver Gains			
Receiver 1		1.00	
Receiver 2		1.00	
Receiver 3		1.00	
Receiver 4		1.00	
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-B.J 390			Field Calibration on 15-MAY-2018,12:48
	Measured	Calibrated(Deg F)	
Lower	10.00	10.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MAI-B.J 390		Last Edited on 06-MAR-2018,13:01
Pre-filter Length	11	

Caliper Calibration MPD-C.A 216		Base Calibration on 18-JAN-2019 17:06
		Field Calibration on 31-JAN-2019,17:29
Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	16199	3.99
2	24624	5.98
3	33344	7.97
4	41632	9.86
5	50912	11.92
6	N/A	N/A

Actual Caliper (in)
7.97

Long Arm Field Cal. 7.93 in

Field Check	183.0	894.1
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[illegible]

DOWNHOLE EQUIPMENT

C:\Minimus 18.05.4364\DATA\Shakespeare Oil Co (OTTLEY 2-14)\MAIN PASS_FINAL.dta

11B Tension Cablehead

MCB-A 1 LG: 2.18 ft WT: 19.8 lb OD: 2.244 in

Compact Swivel Head Adaptor

SHA-J.B 717 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma

MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity

MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron

MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

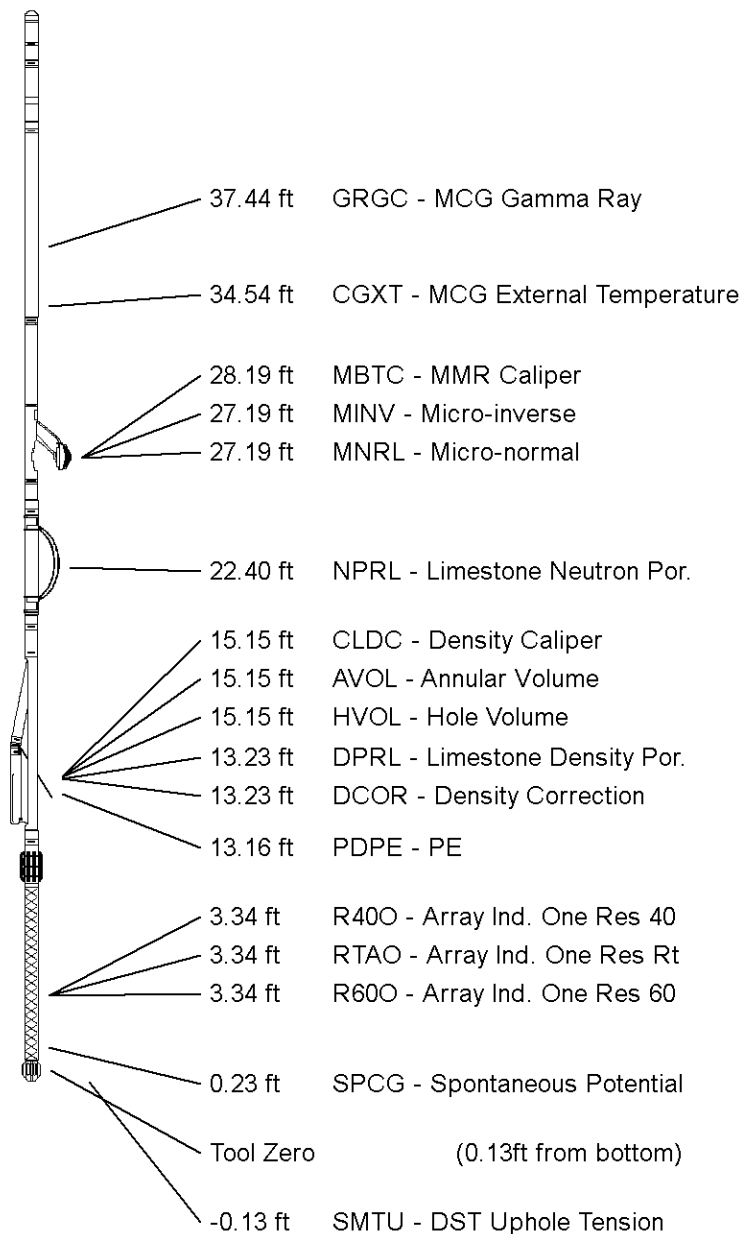
Compact Density/Caliper

MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Induction

MAI-B.J 390 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 47.21 ft Weight: 377.0 lb



All measurements relative to tool zero.

COMPANY

SHAKESPEARE OIL CO., INC.

WELL

K OTTLEY 2-14

FIELD

WILDCAT

PROVINCE/COUNTY

LOGAN

COUNTRY/STATE

USA / KANSAS

Elevation Kelly Bushing	2800	feet
Elevation Drill Floor		feet
Elevation Ground Level	2791	feet

First Reading	4530.00	feet
Depth Driller	4550.00	feet
Depth Logger	4548.00	feet



Weatherford®

PHOTO DENSITY

DUAL SPACED NEUTRON

MICRO RESISTIVITY

