



Weatherford

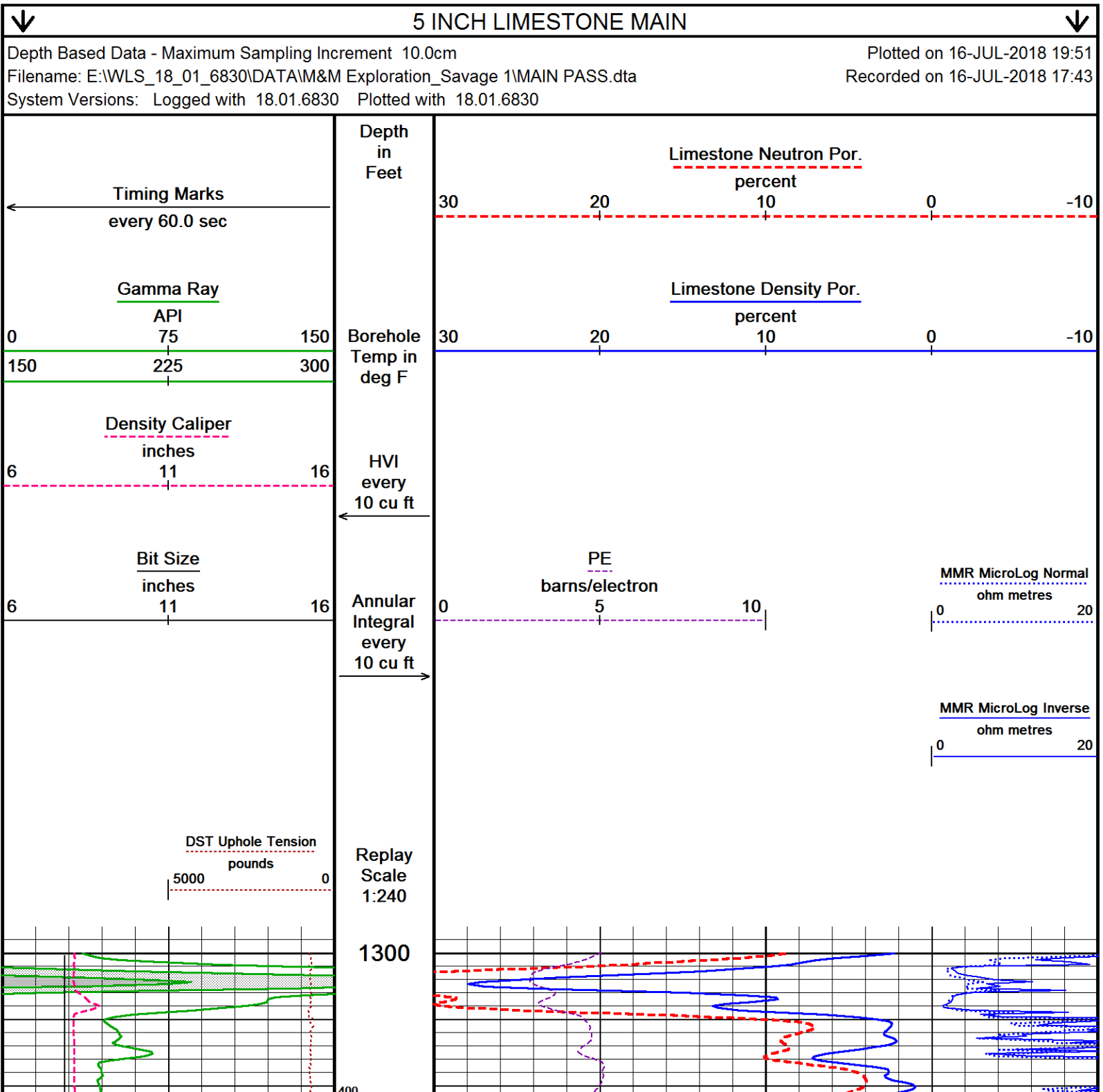
**COMPACT PHOTO DENSITY
DUAL SPACED NEUTRON
MICRO RESISTIVITY LOG**

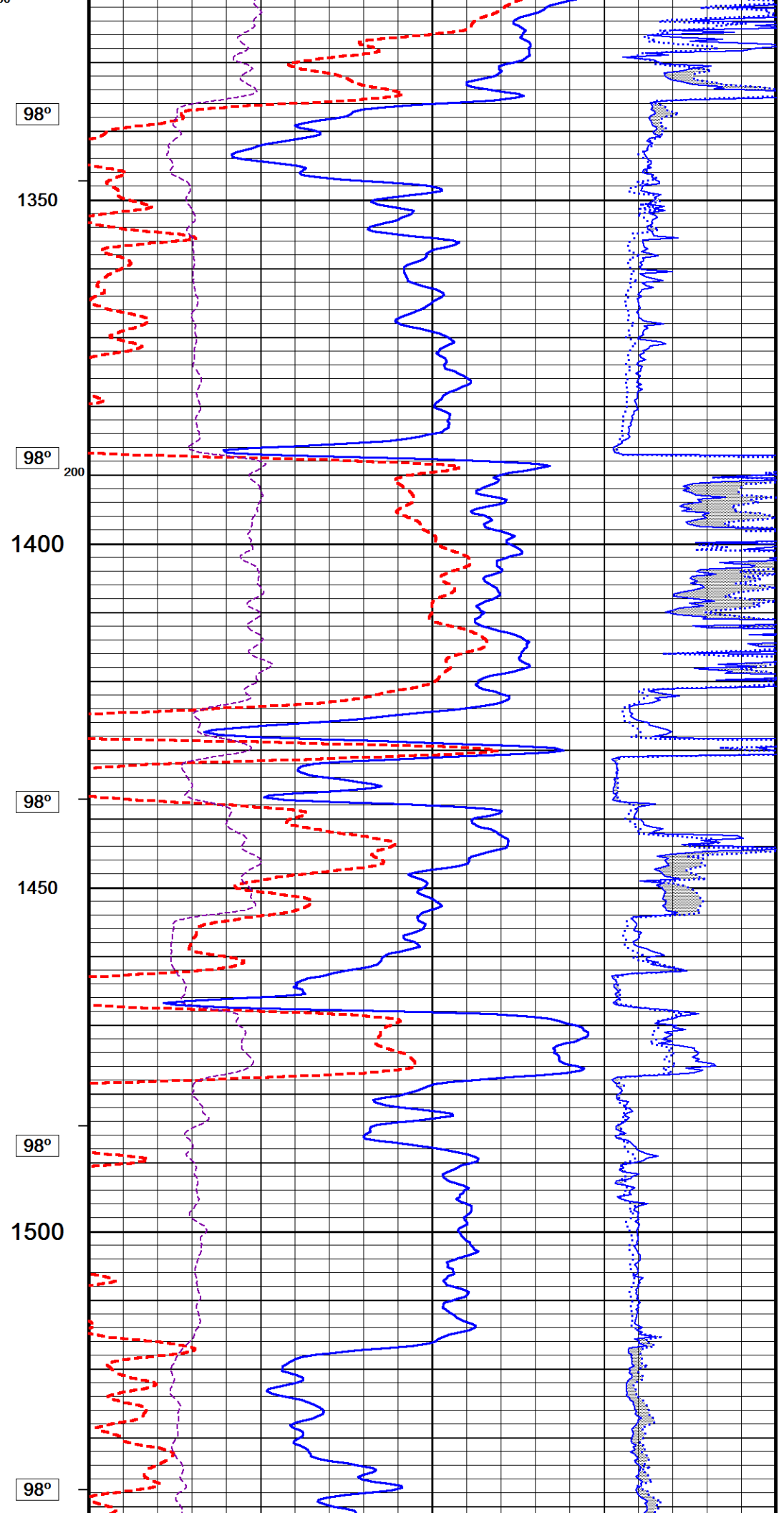
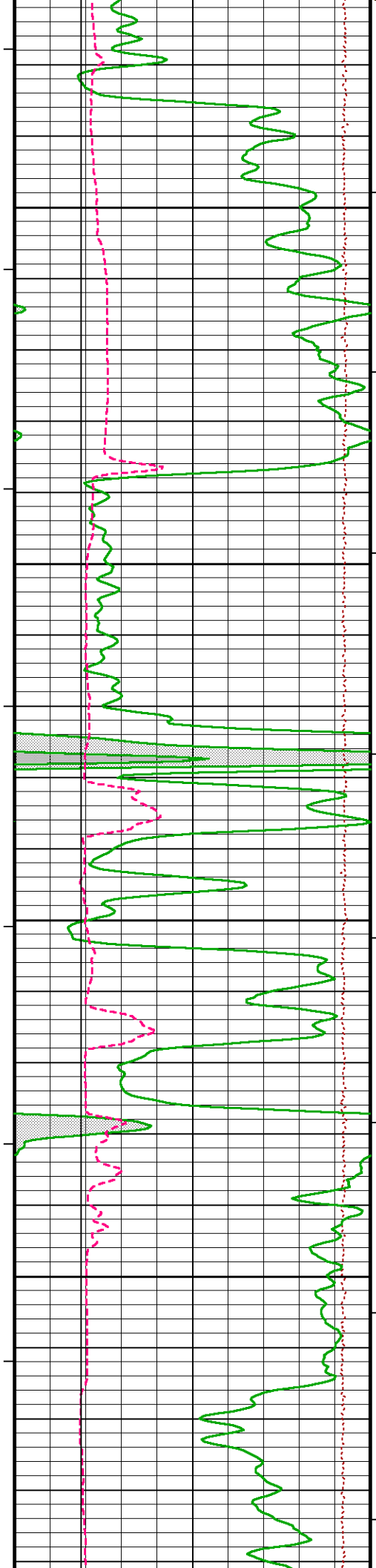
COMPANY		M & M EXPLORATION, INC			
WELL		SAVAGE #1			
FIELD		SAVAGE			
PROVINCE/COUNTY		MARION			
COUNTRY/STATE		KANSAS			
LOCATION		SW SE SW 330' FSL & 1650' FWL			
SEC 15	TWP 21S	RGE 4E	Other Services		
Latitude	38.2174338		ARRAY INDUCTION		
Longitude	-96.9814468		FOCUSED ELECTRIC		
API Number	15-115-21504				
Permanent Datum Ground Level, Elevation 1292 feet					
Log Measured From KB, 6.00 feet above Permanent Datum					
Drilling Measured From KB					
Date	16-JUL-2018				
Run Number	ONE				
Service Order	18148-218943986				
Depth Driller	2460.00				feet
Depth Logger	2455.00				feet
First Reading	3433.60				feet
Last Reading	259.00				feet
Casing Driller	252.00				feet
Casing Logger	259.00				feet
Bit Size	9.875				inches
Hole Fluid Type	WATER BASED				
Density / Viscosity	9.20	g/cc	47.00	sec/qt	
PH / Fluid Loss	10.00		8.80	ml/30Min	
Sample Source	FLOW LINE				
Rm @ Measured Temp	1.30	@ 96.0	ohm-m		
Rmf @ Measured Temp	1.20	@ 96.0	ohm-m		
Rmc @ Measured Temp	1.50	@ 96.0	ohm-m		
Source Rmf / Rmc	CALC		CALC		
Rm @ BHT	1.20	@104.0	ohm-m		
Time Since Circulation	3.0 HRS				
Max Recorded Temp	104.00		deg F		
Equipment / Base	13379		ELRENO		
Recorded By	S. WIGHT				
Witnessed By	JUSTIN CARTER				MIKE AUSTIN

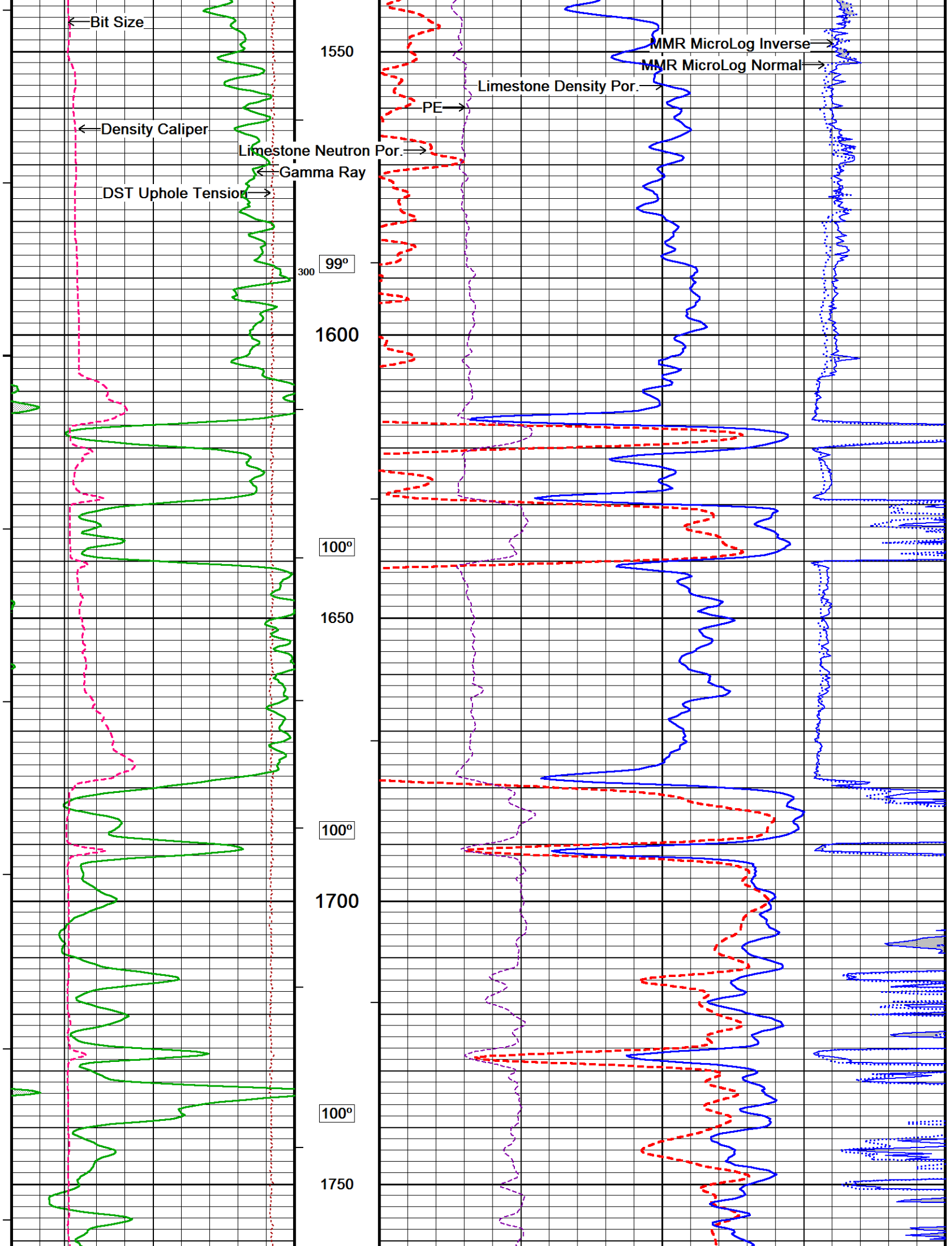
BOREHOLE RECORD					Last Edited: 16-JUL-2018 16:00
Bit Size inches		Depth From feet		Depth To feet	
12.250		0.00		252.00	
7.875		252.00		2460.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	252.00	24.00	

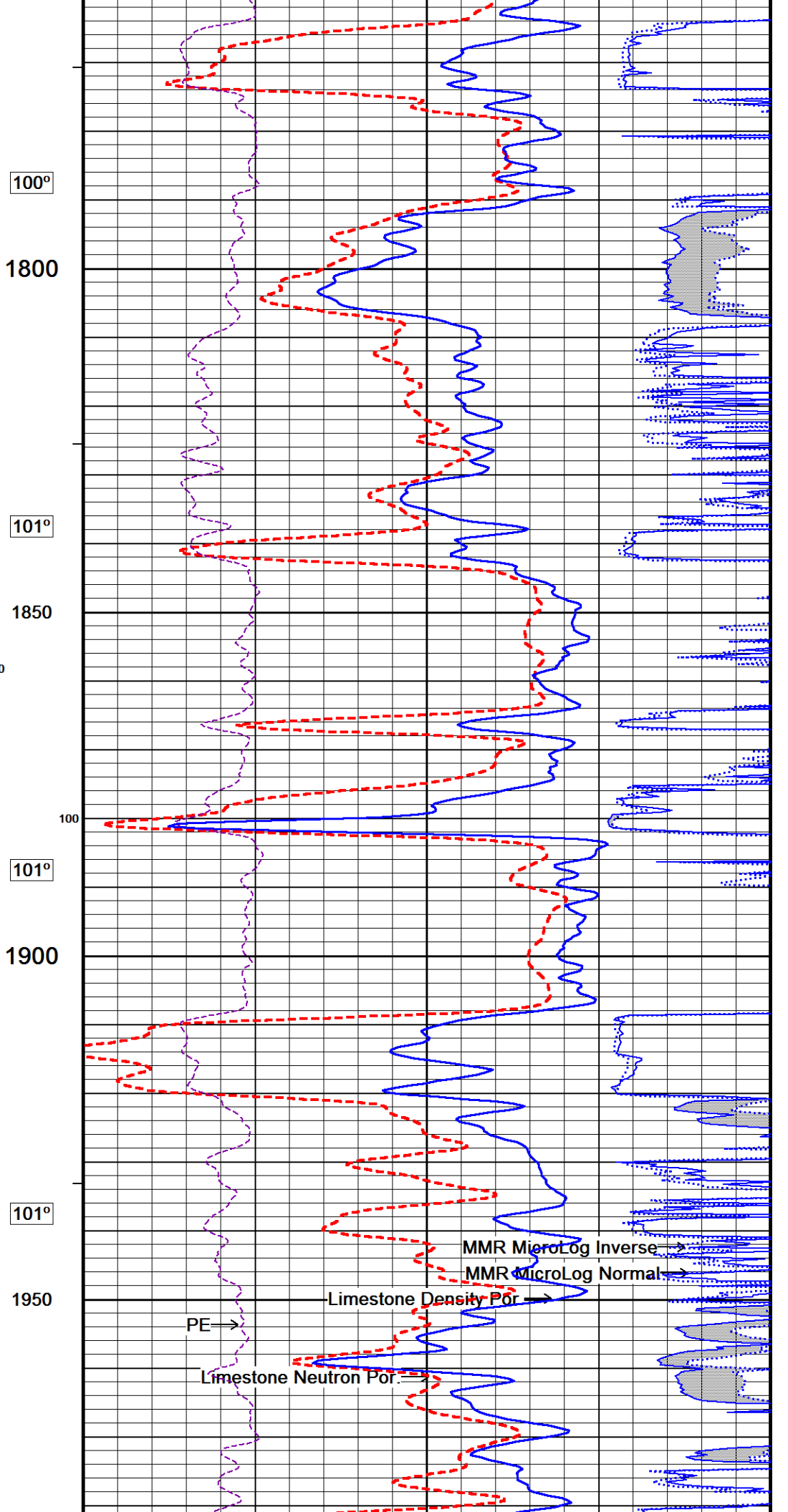
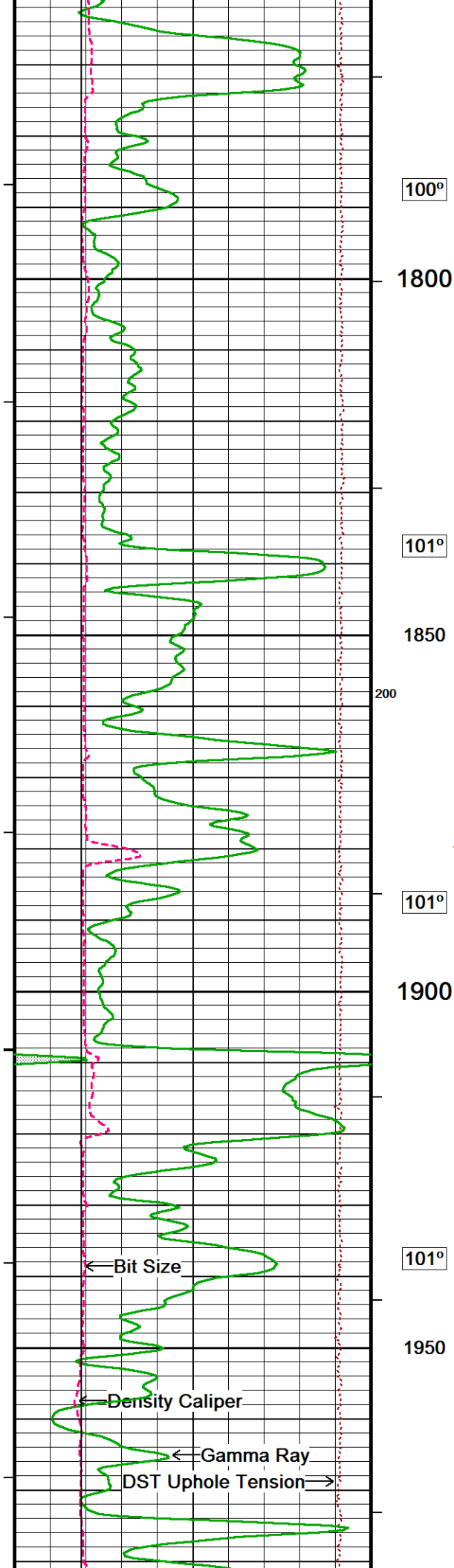
REMARKS
WLS 18.01.6830
TOOLSTRING: SHA, MCG, MDN (DUAL BOWSPRINGS), MPD (8" PROFILE PLATE), SKJ, MFE (ONE 0.5" STANDOFF), MAI (TWO 0.5" STANDOFFS).
INTERVAL REQUESTED: DENSITY / NEUTRON / MICROLOG: TD - 1300 FT INDUCTION / GAMMA RAY / CALIPER: TD - CASING
LIMESTONE MATRIX USED FOR POROSITY CALCULATION, 2.71 G/CC.
TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 830 CU FT. ANNULAR HOLE VOLUME FROM TD TO SURFACE CASING WITH 5.5" FUTURE CASING: 470 CU FT.
CREW: J. VOEGELI, D. PRICHARD
RIG: C I #1

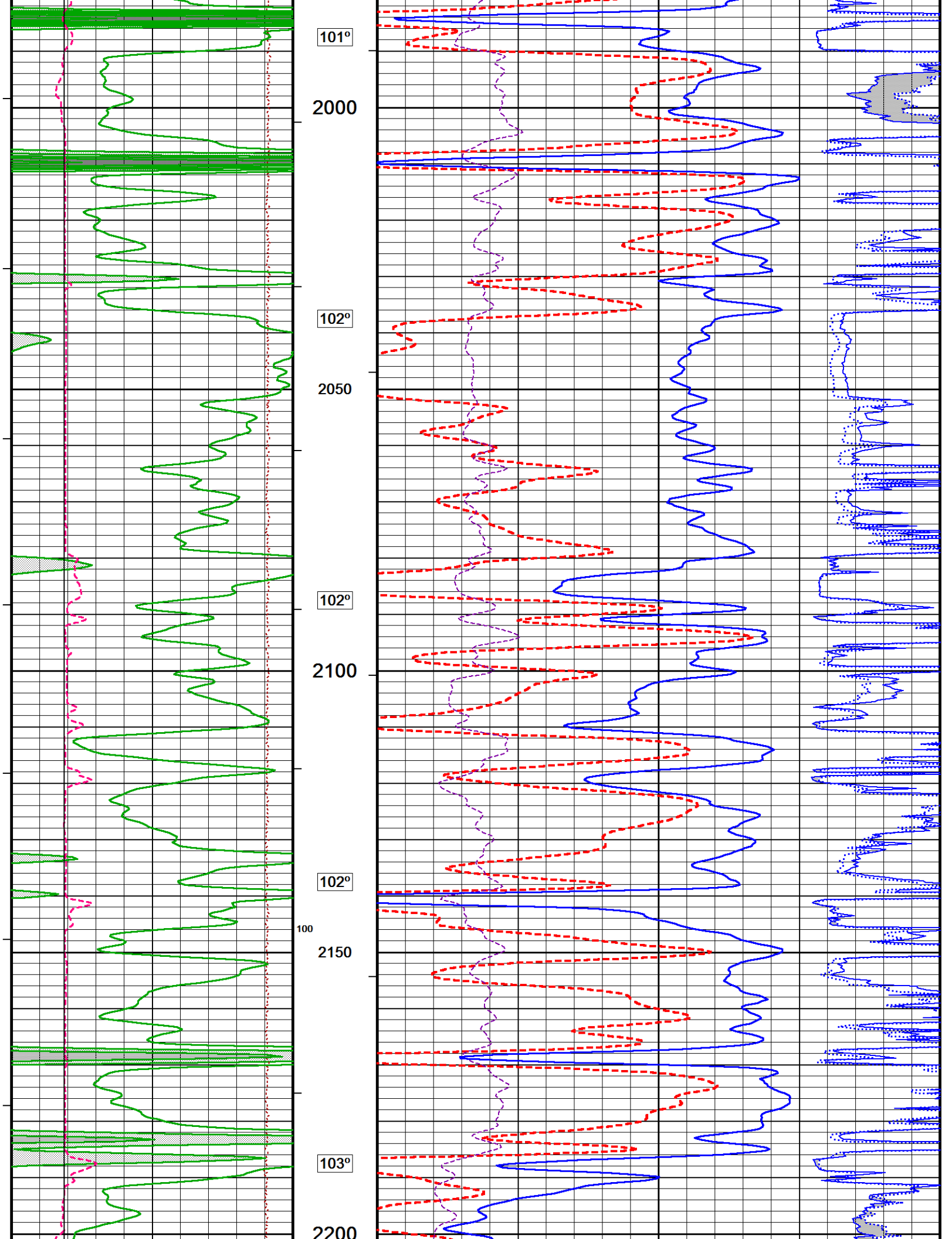
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will 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.

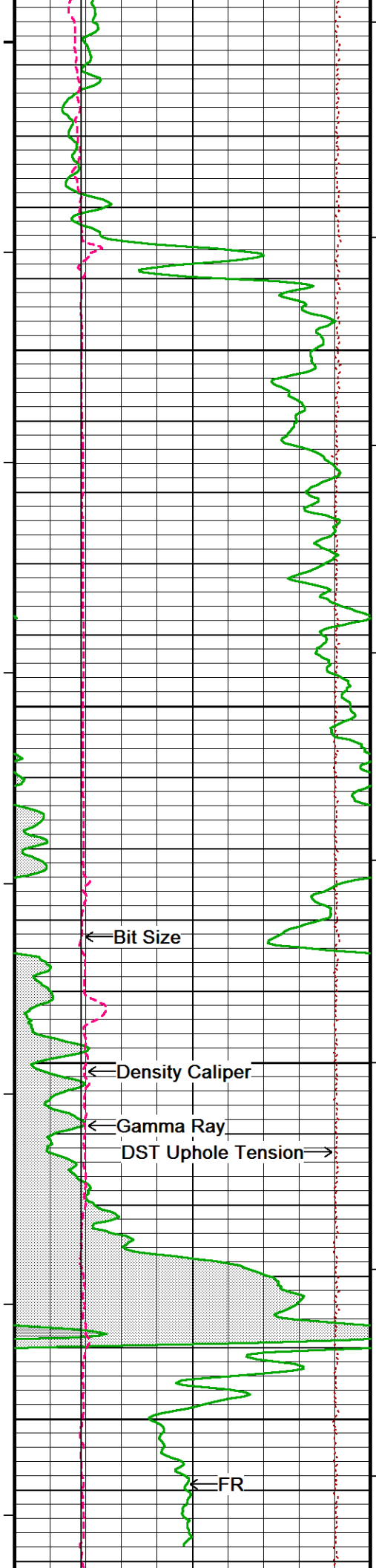




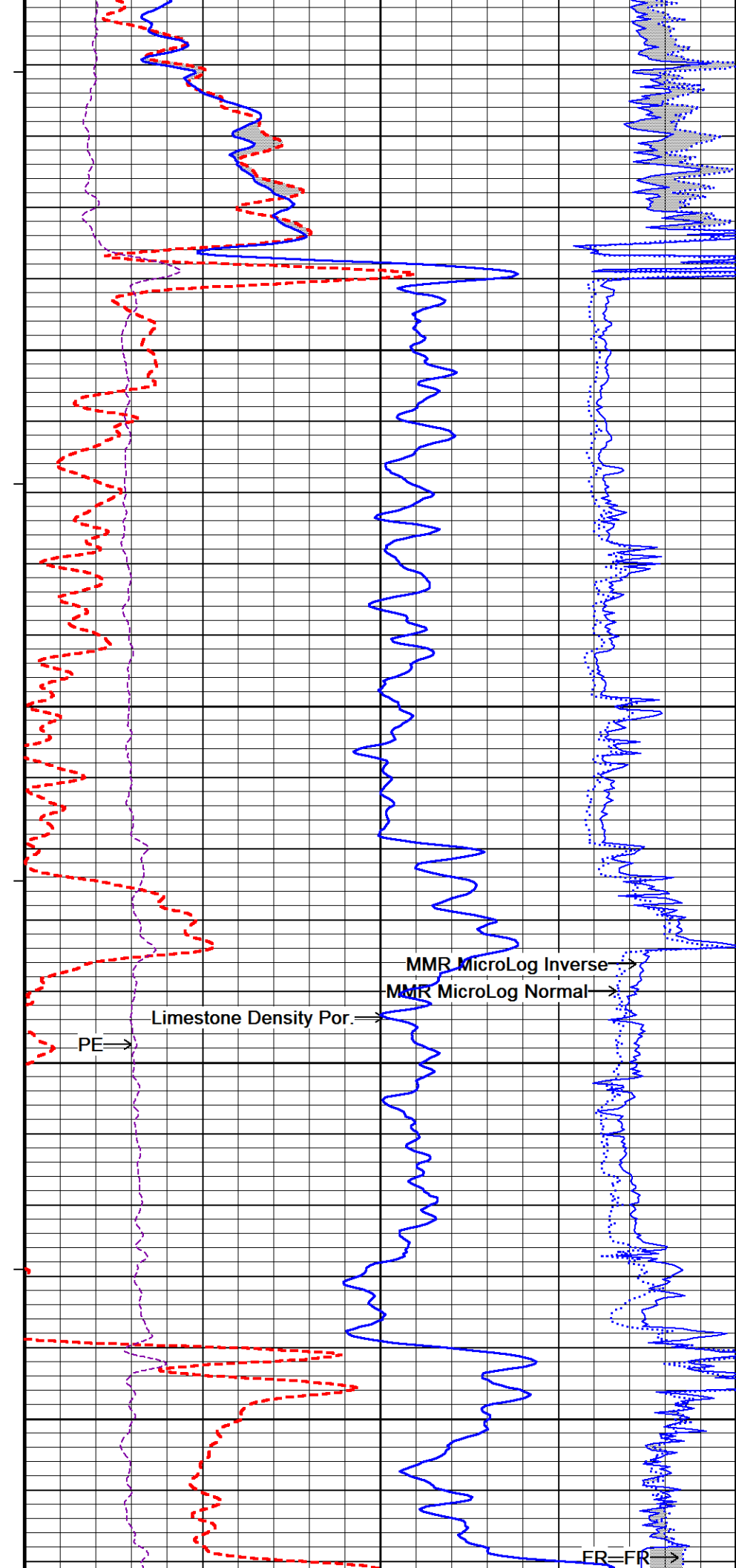








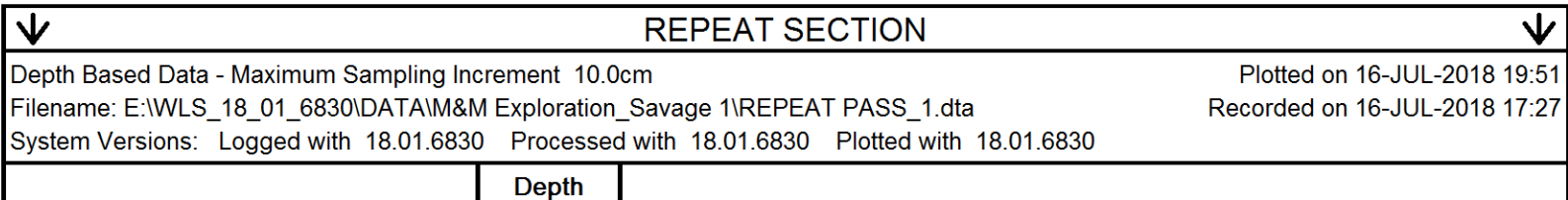
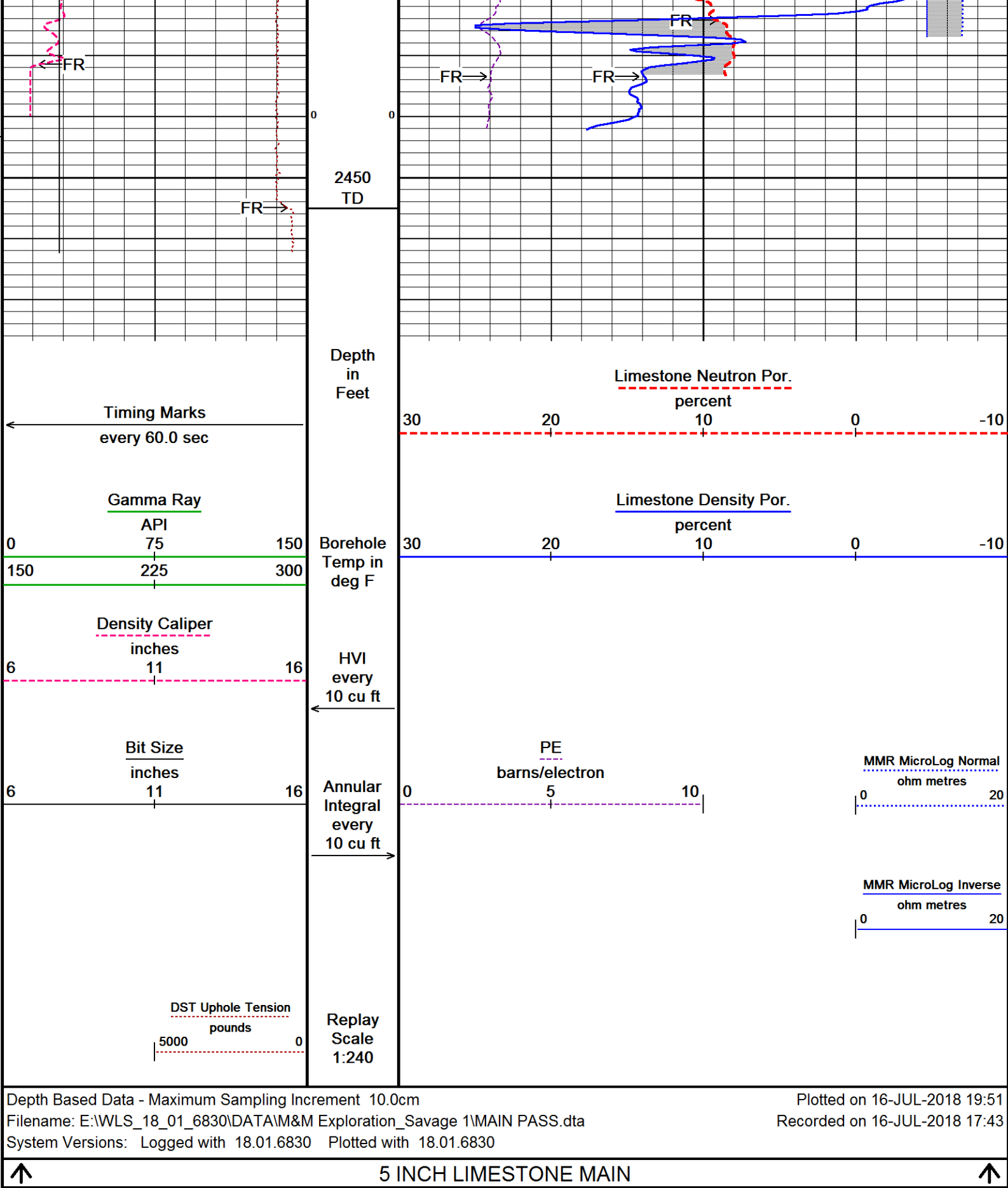
103°
2250
104°
2300
104°
2350
103°
2400

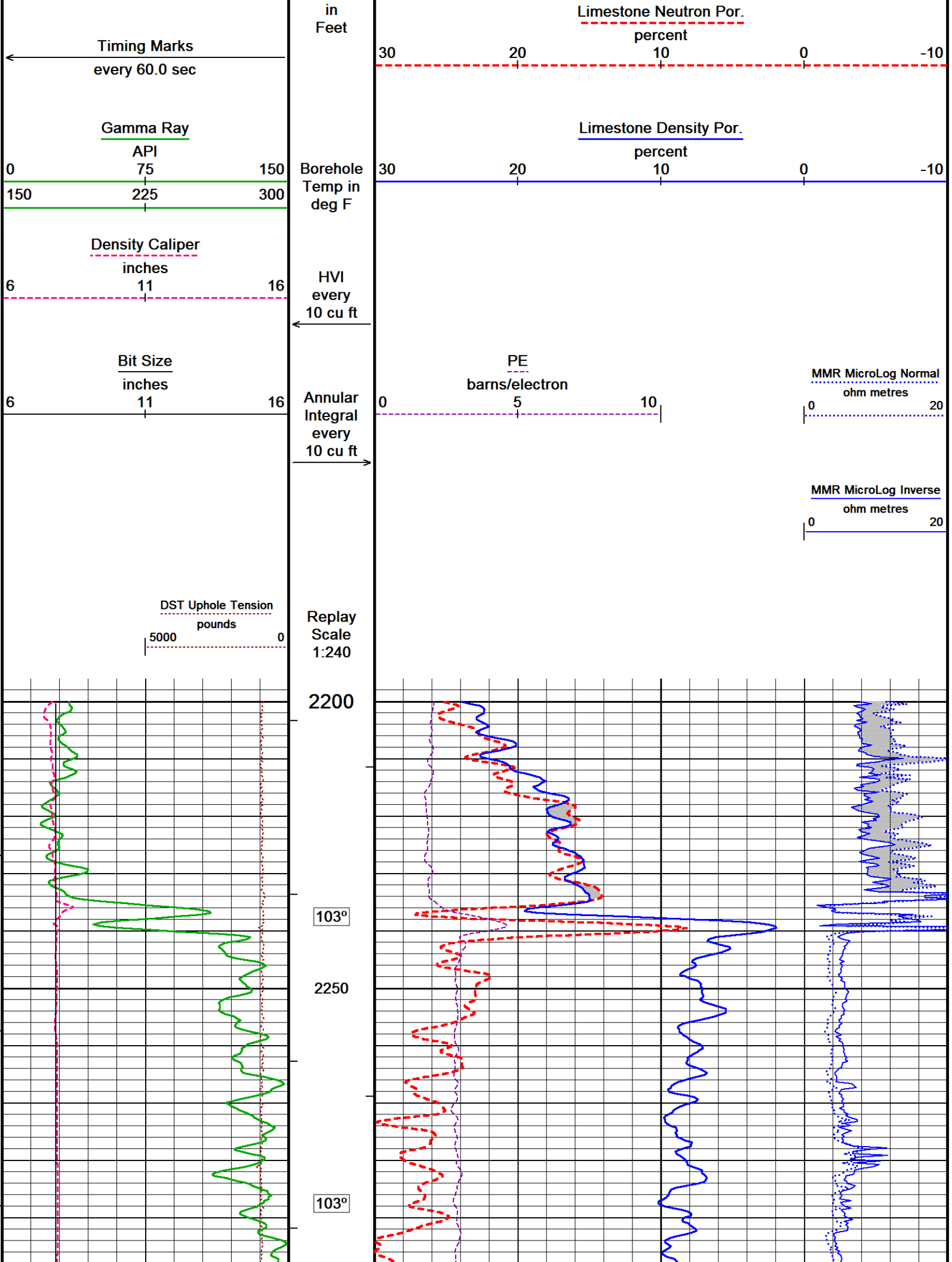


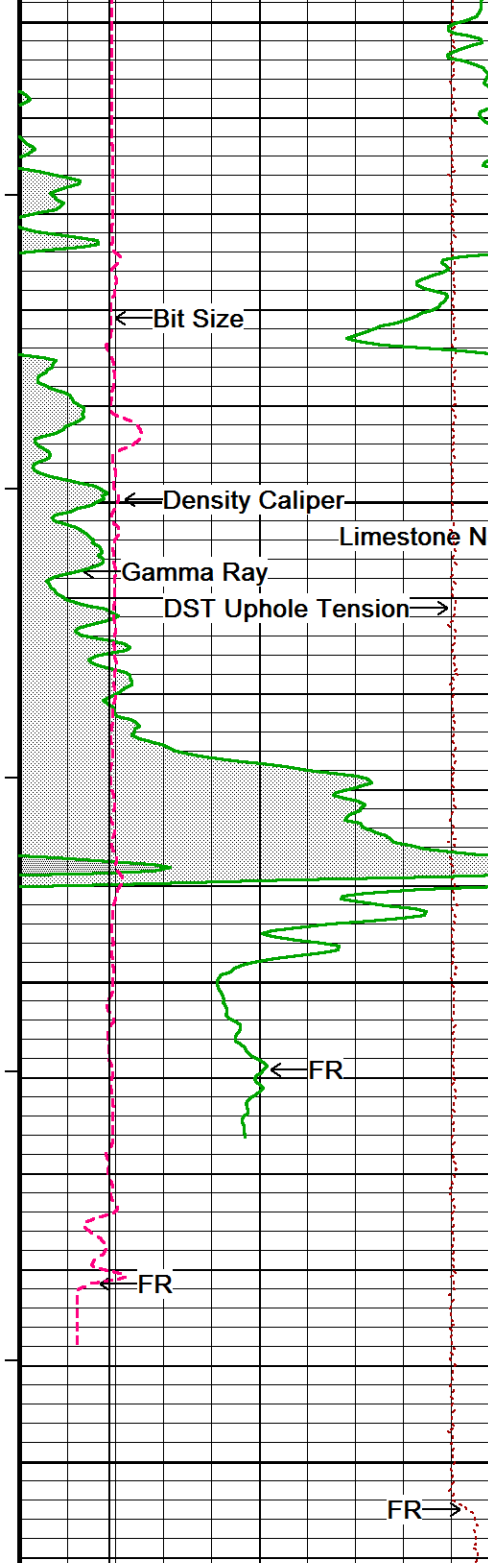
MMR MicroLog Inverse
MMR MicroLog Normal
Limestone Density Por.

PE

FR=FR







2300

104°

2350

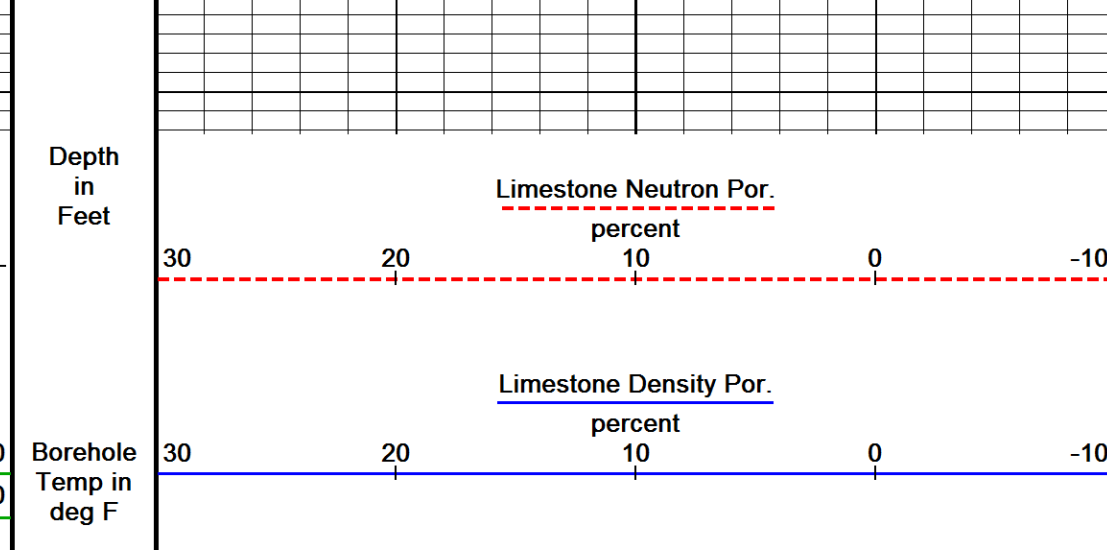
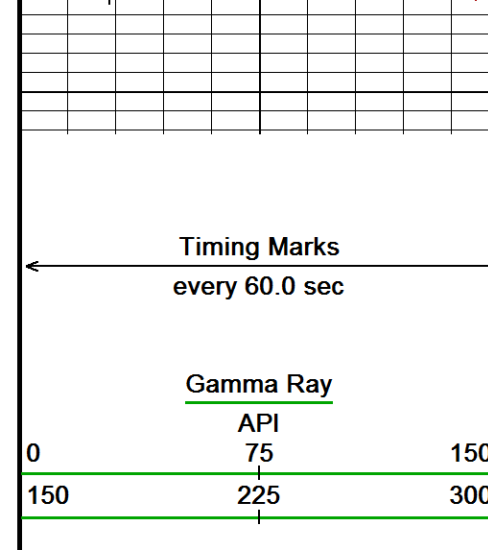
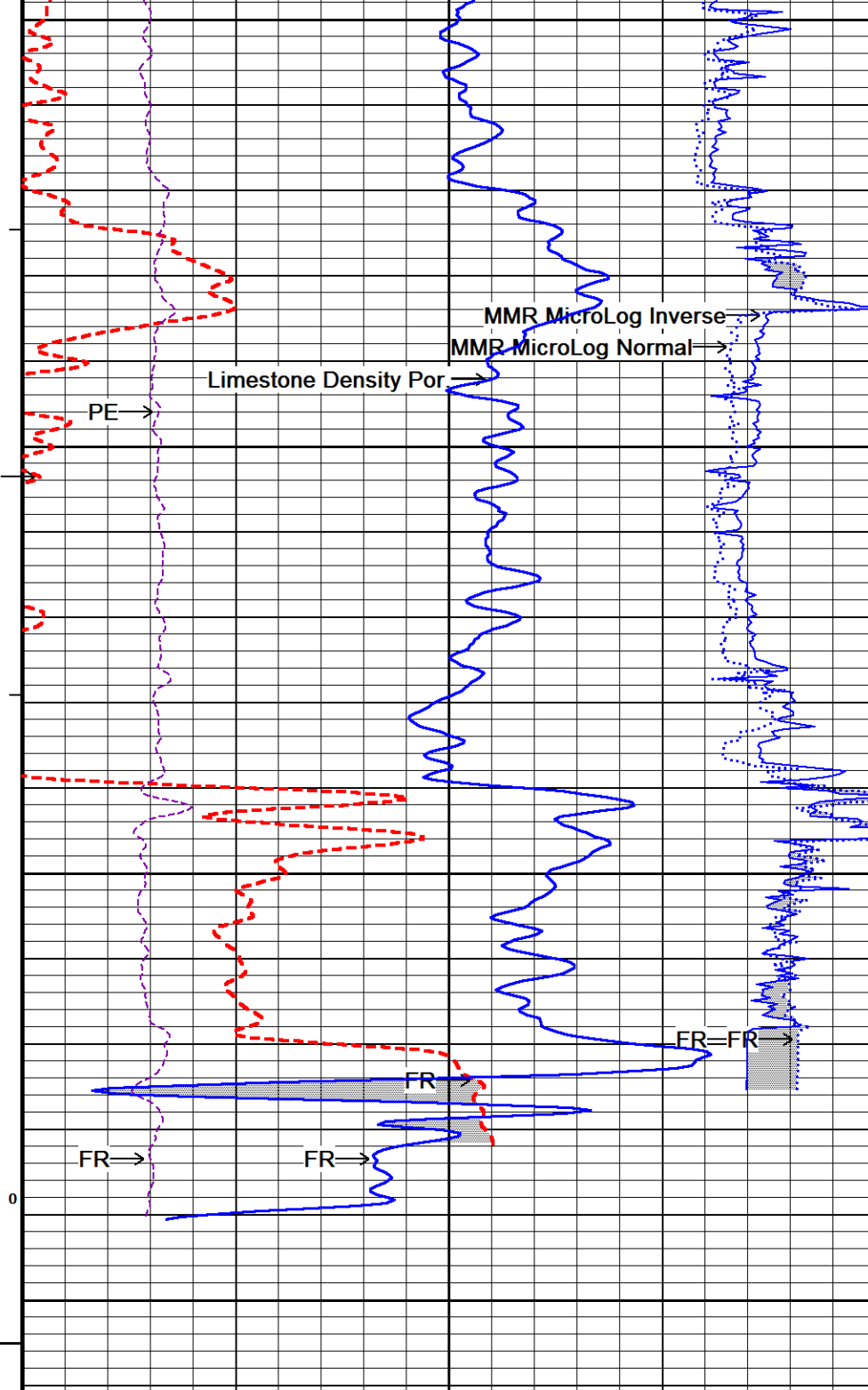
104°

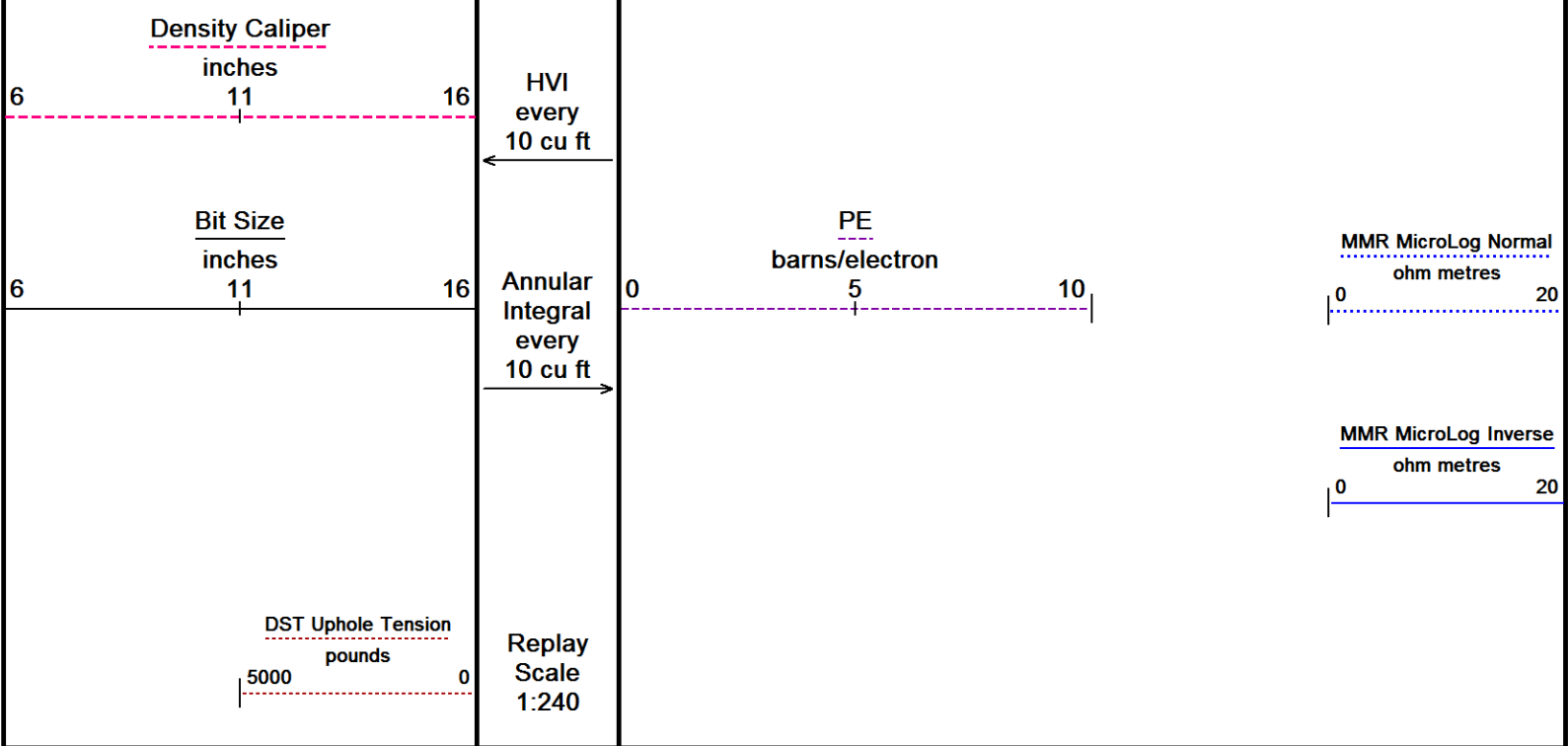
2400

0

2450 TD

Depth in Feet

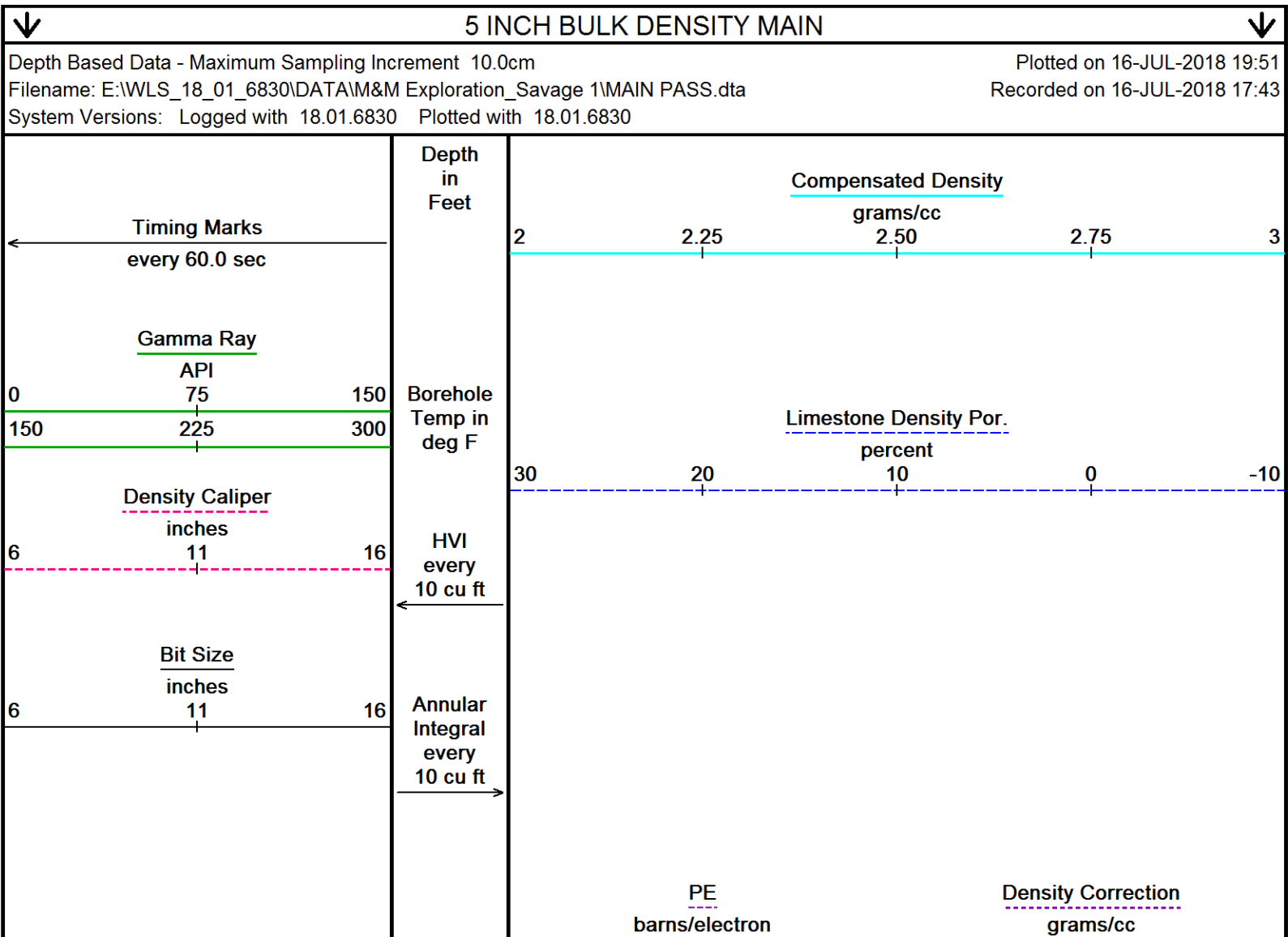




Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: E:\WLS_18_01_6830\DATA\M&M Exploration_Savage 1\REPEAT PASS_1.dta
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

Plotted on 16-JUL-2018 19:51
Recorded on 16-JUL-2018 17:27

↑ REPEAT SECTION ↑



DST Uphole Tension
pounds
5000 0

Replay
Scale
1:240

1300

400

98°

1350

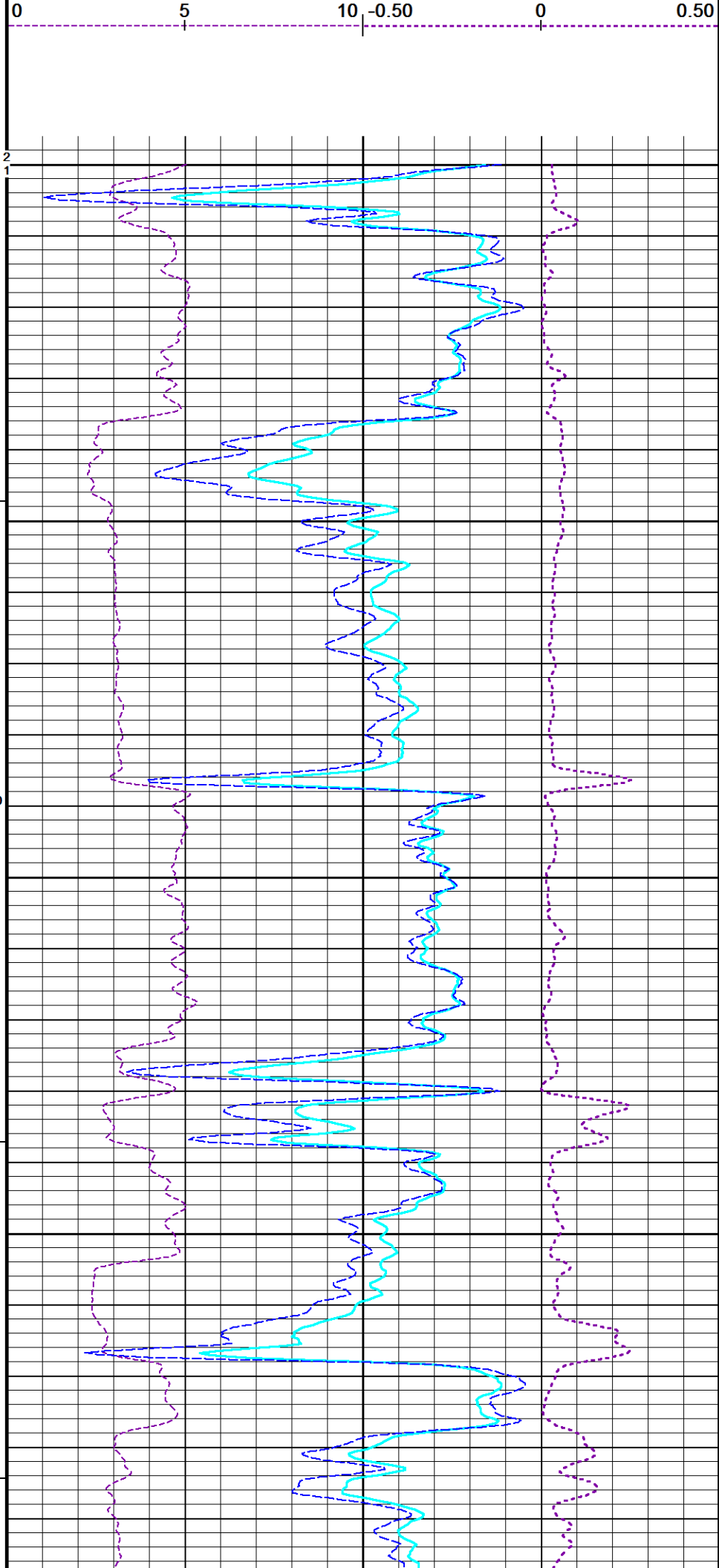
98°

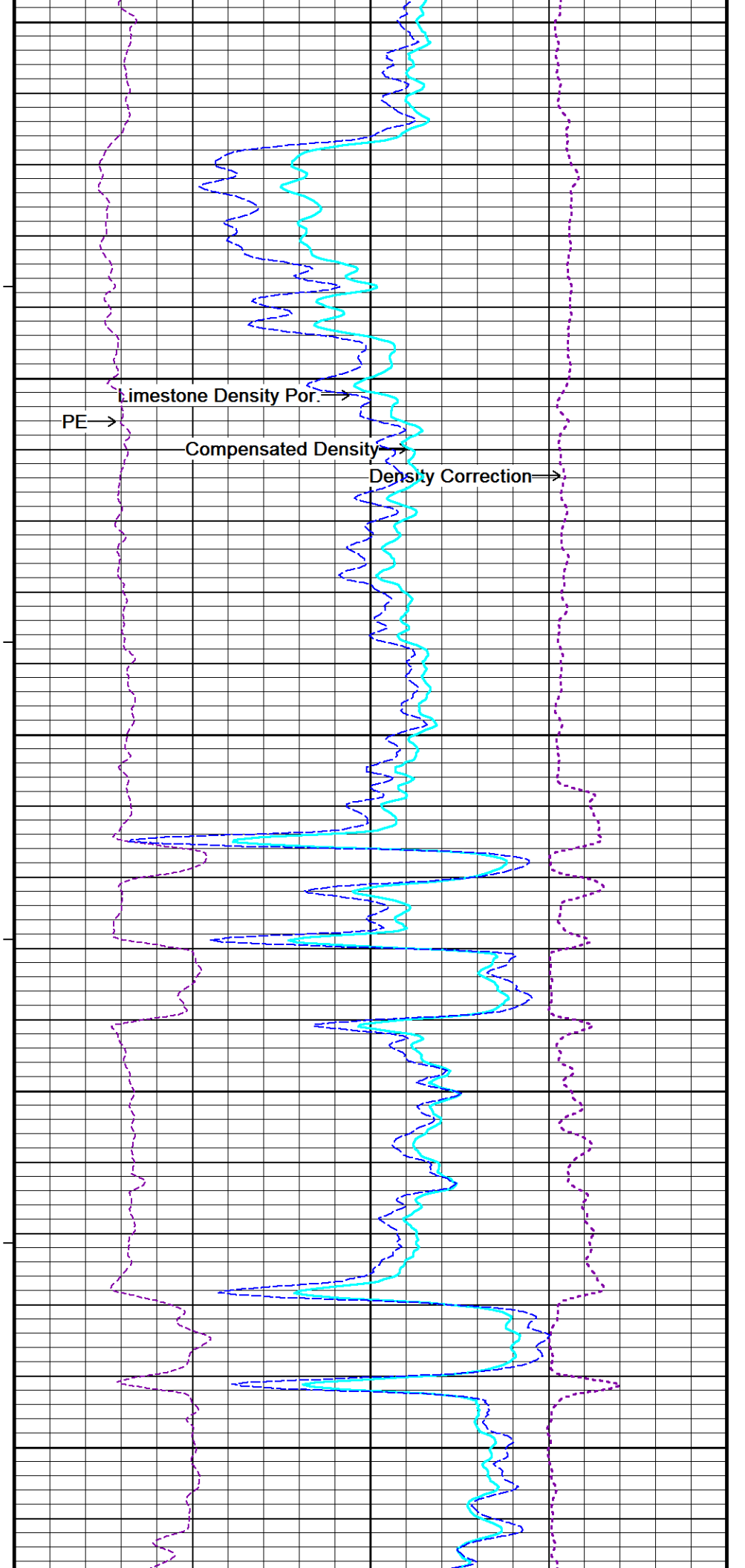
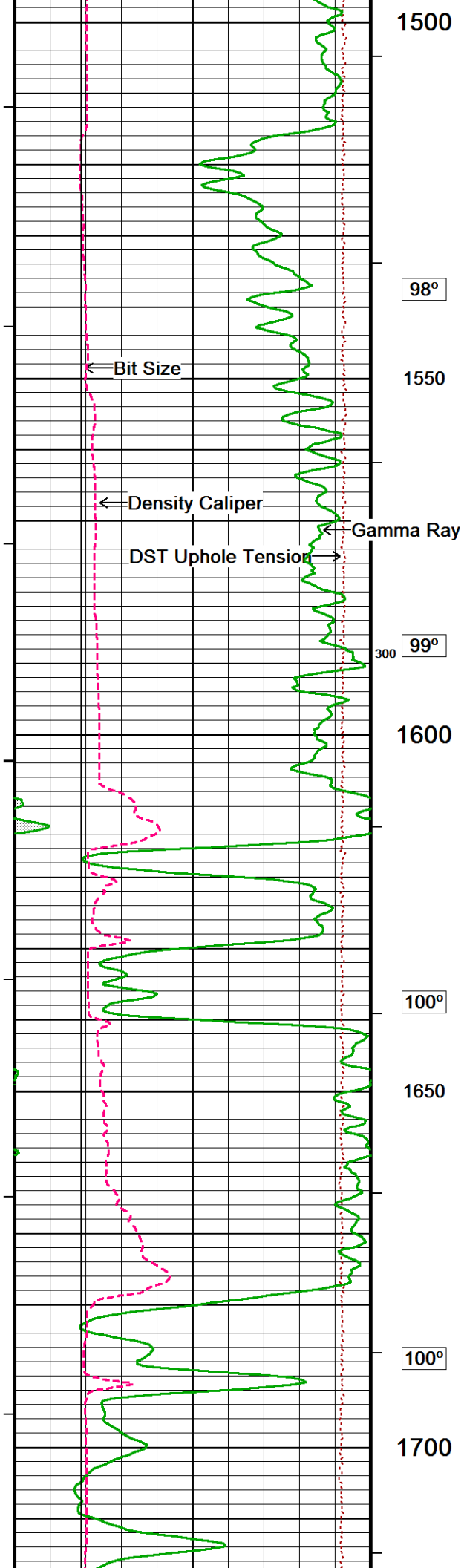
1400

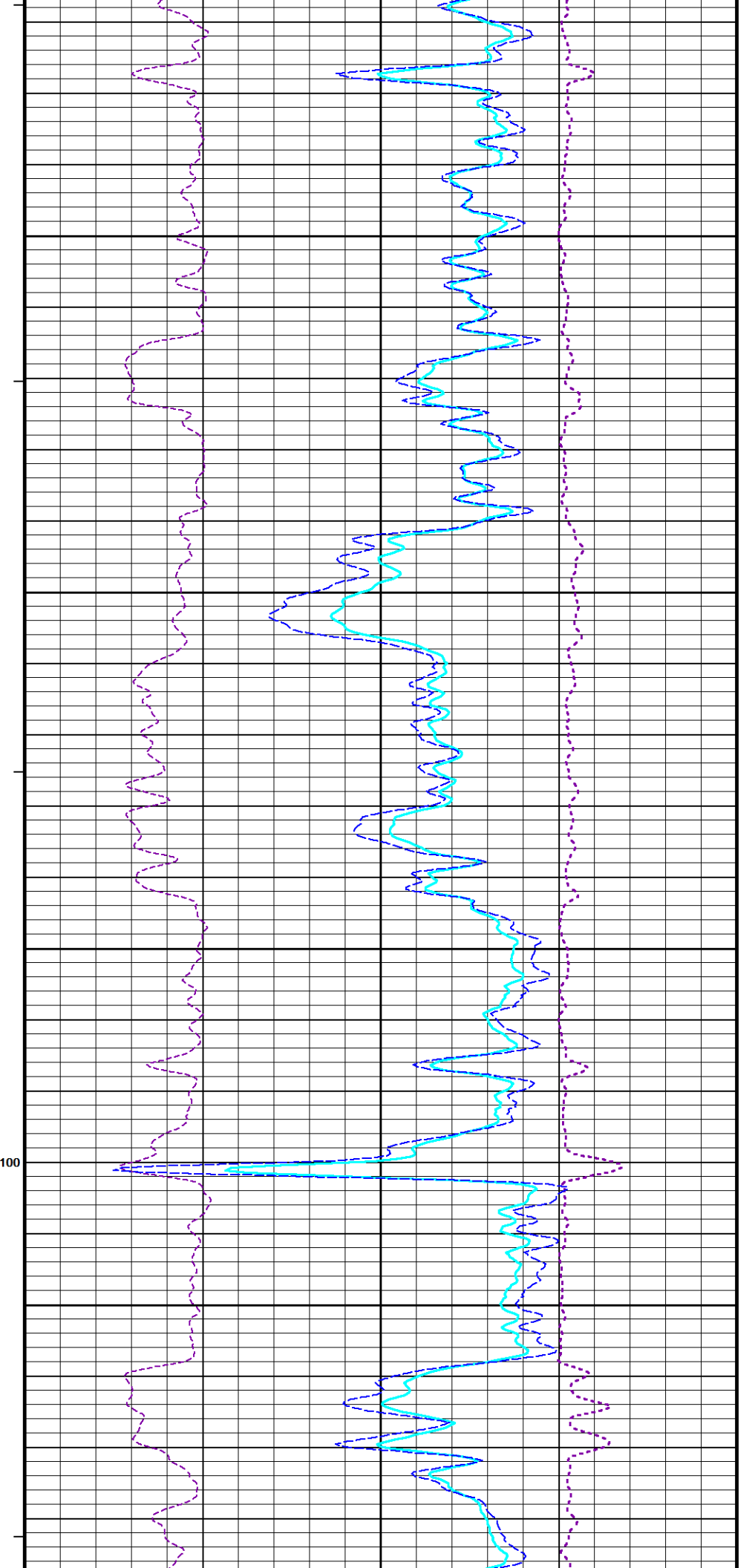
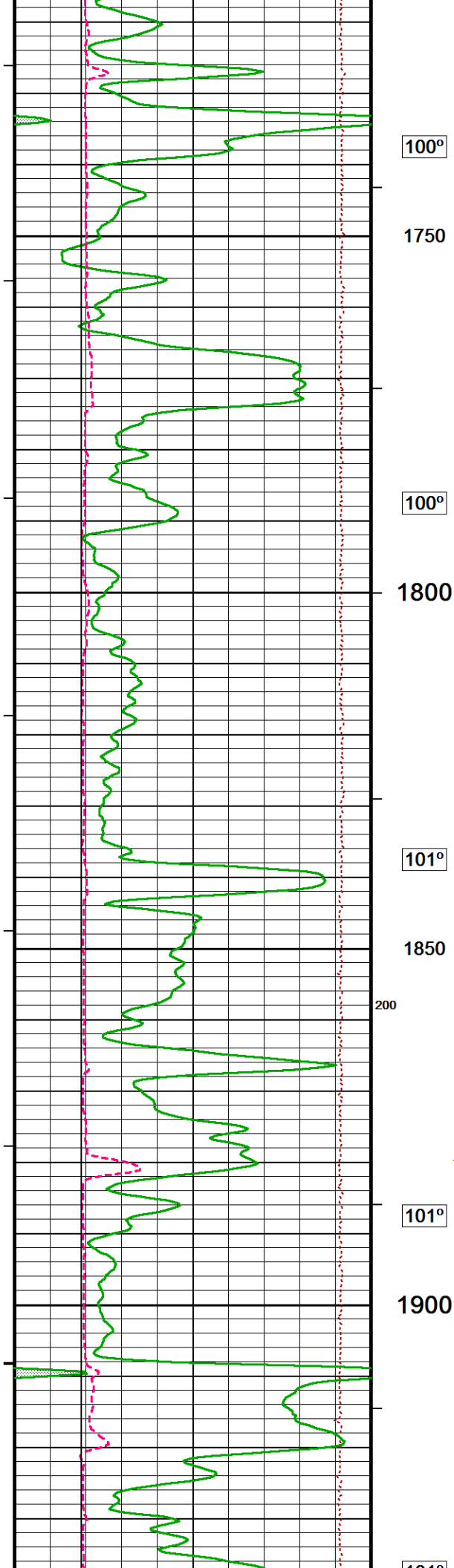
98°

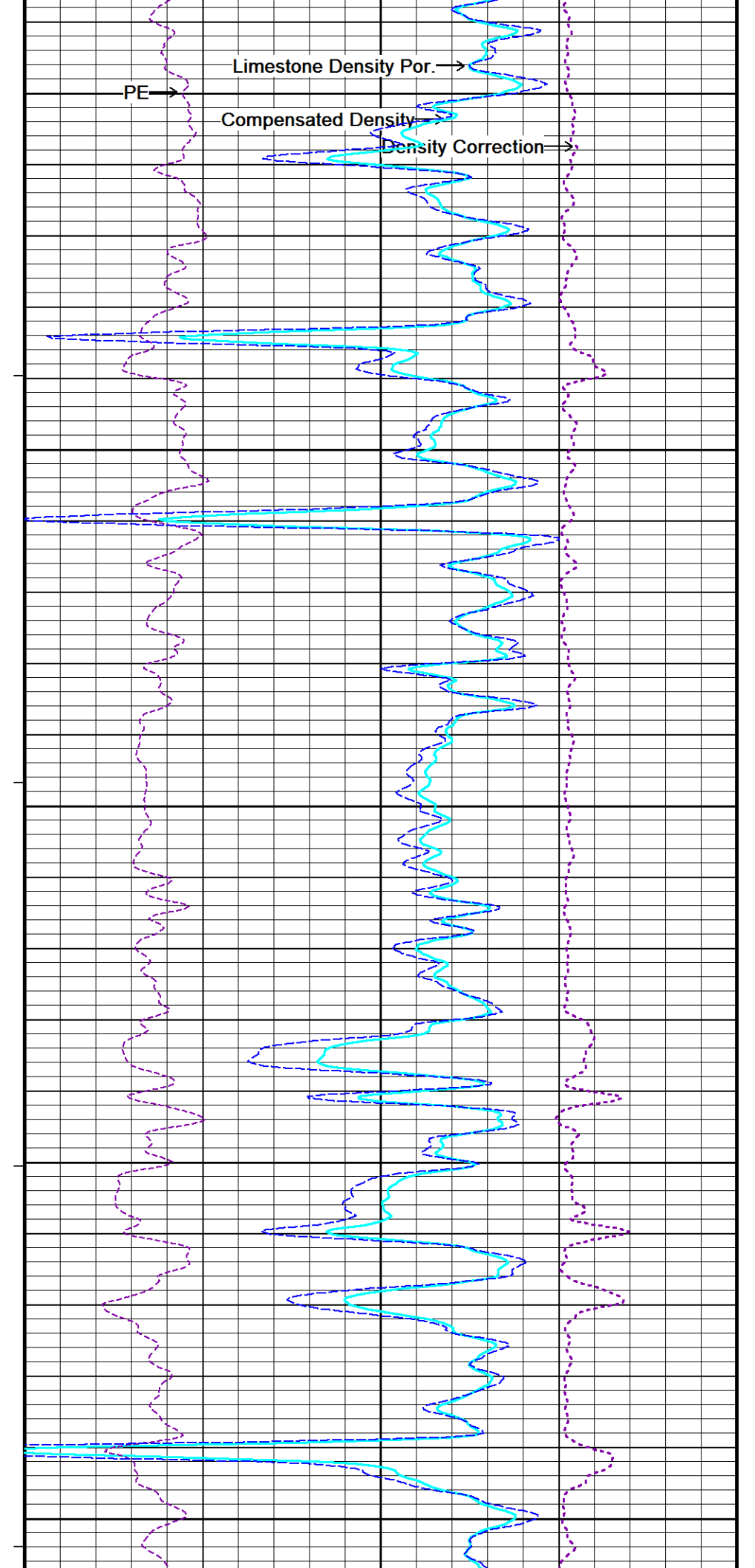
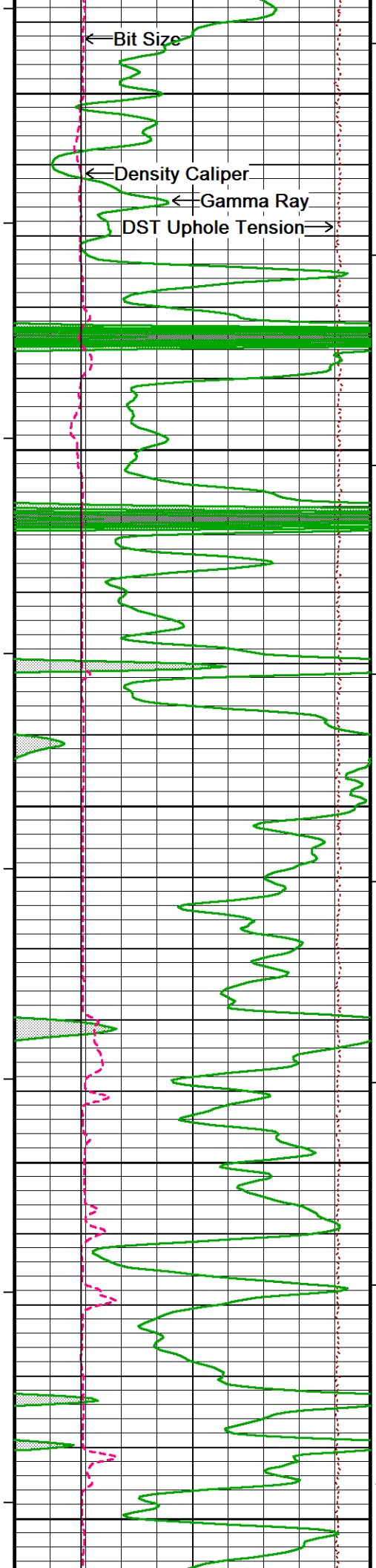
1450

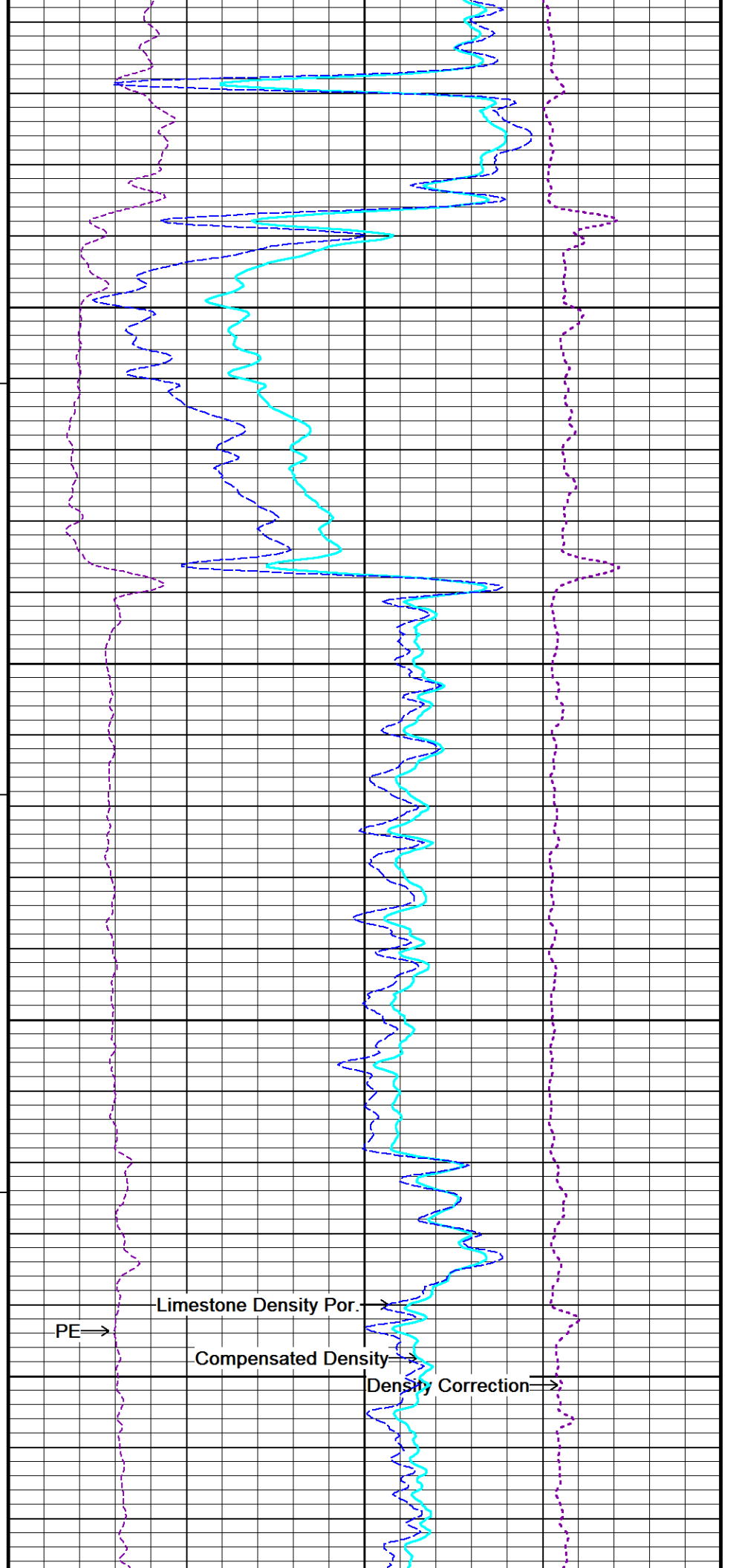
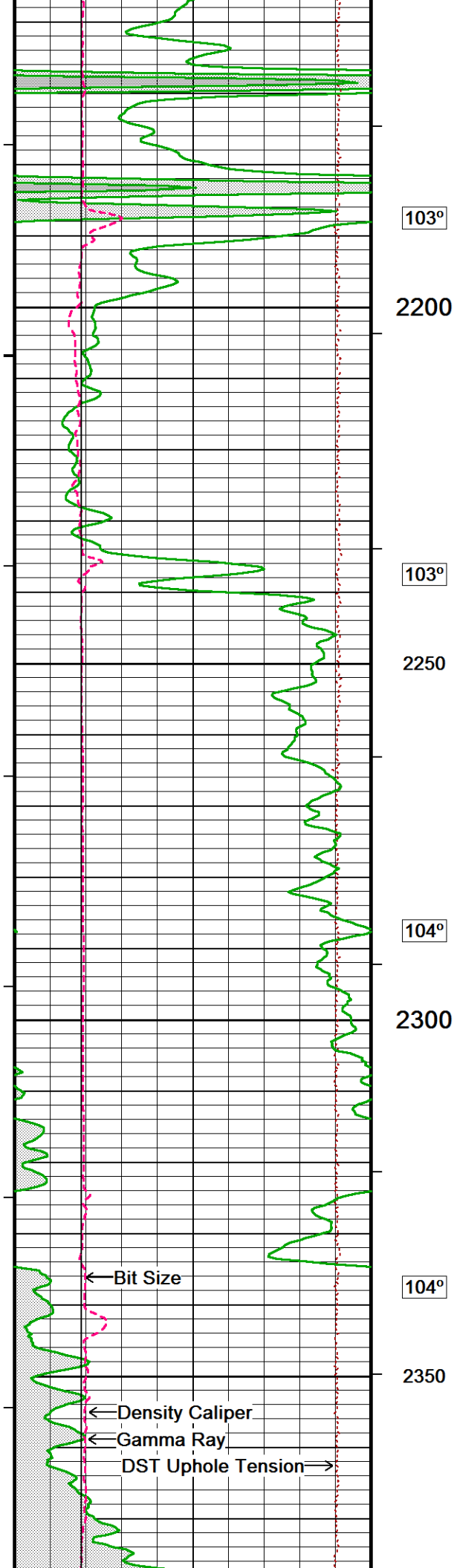
98°

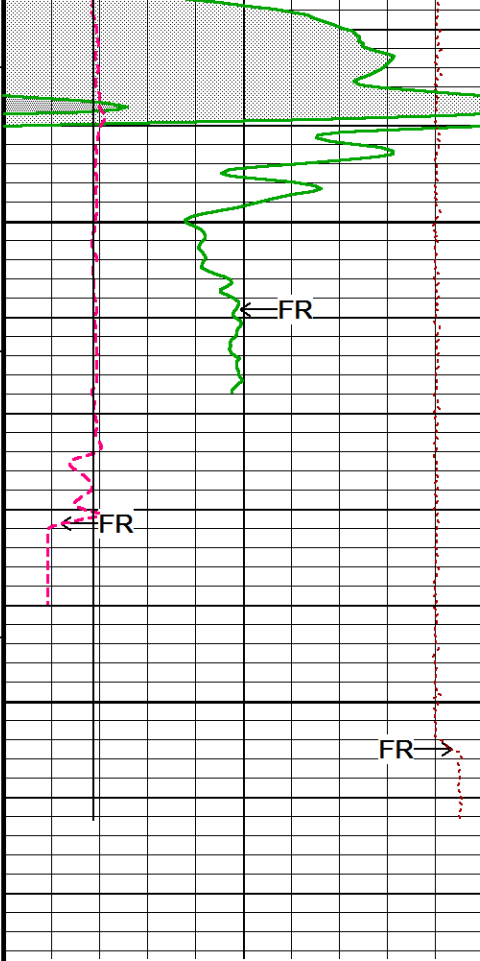












103°
2400

2450
TD

Depth
in
Feet

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

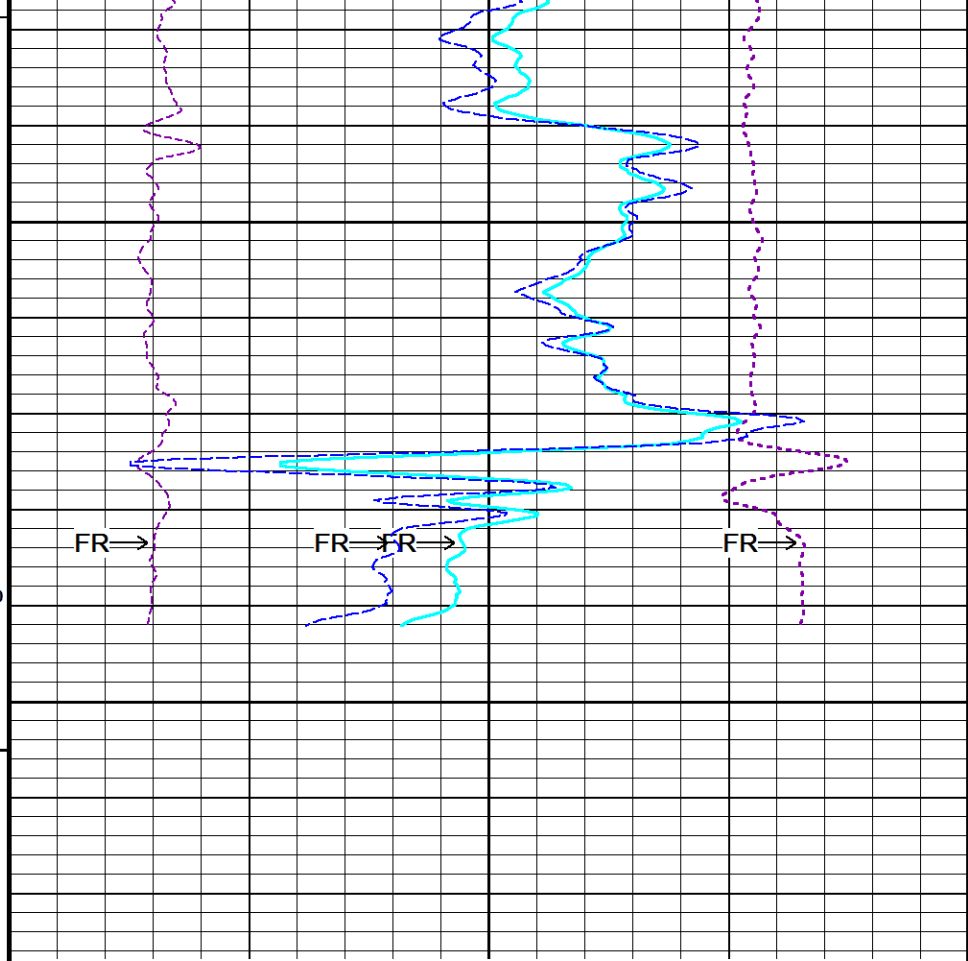
DST Uphole Tension
pounds
5000 0

Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay
Scale
1:240



Compensated Density
grams/cc

Limestone Density Por.
percent

PE
barns/electron

Density Correction
grams/cc

2 2.25 2.50 2.75 3

30 20 10 0 -10

0 5 10 -0.50 0 0.50

↑

5 INCH BULK DENSITY MAIN

↑

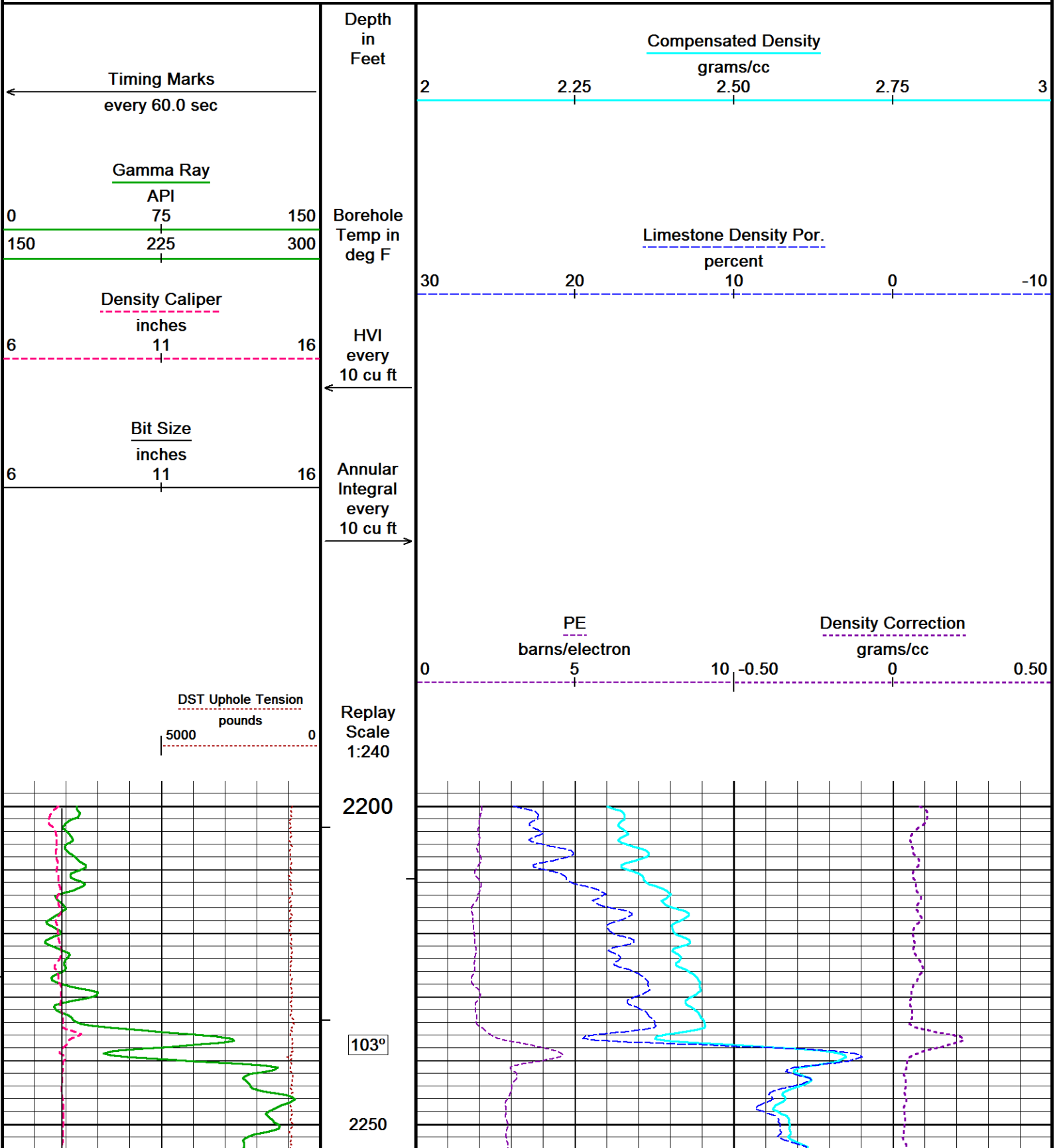
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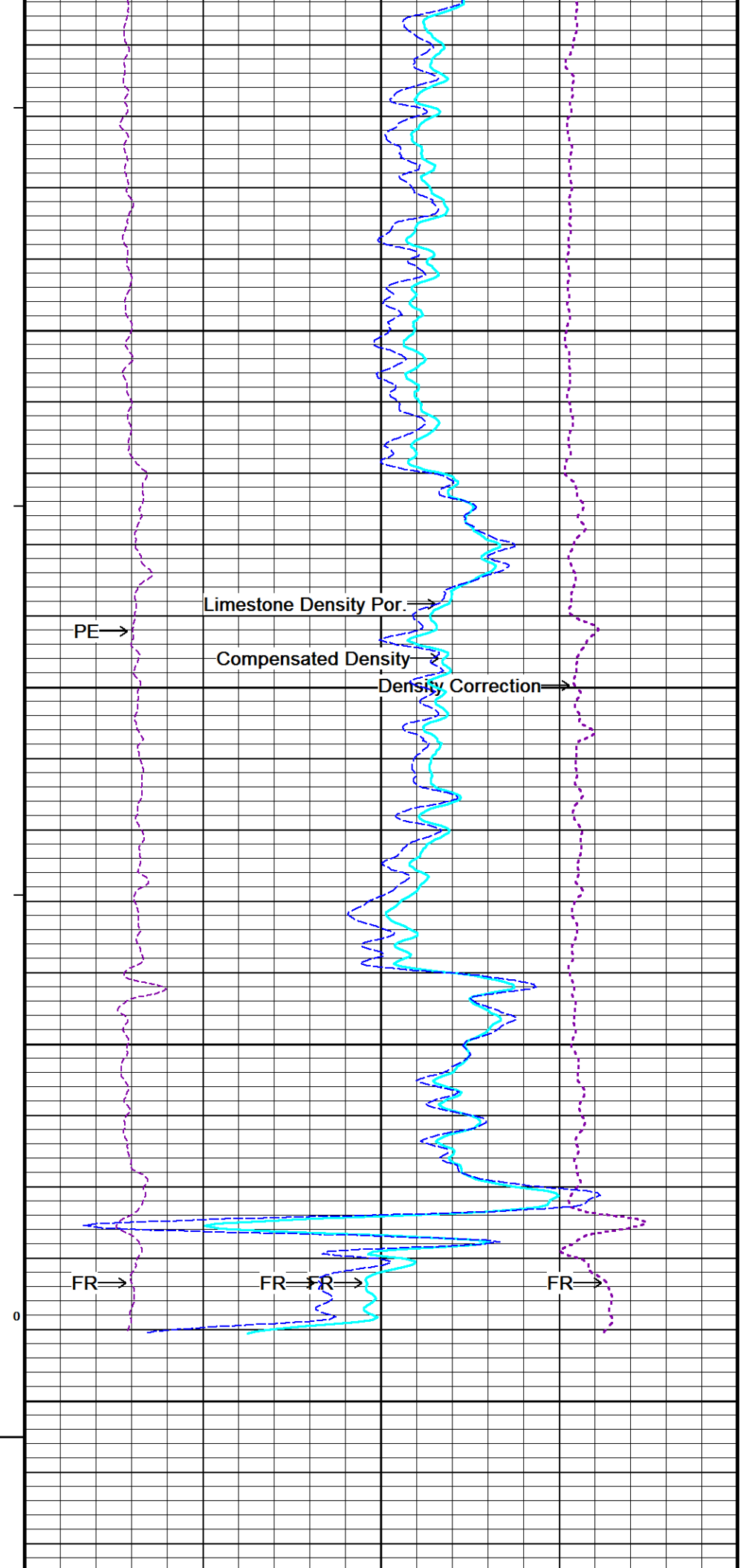
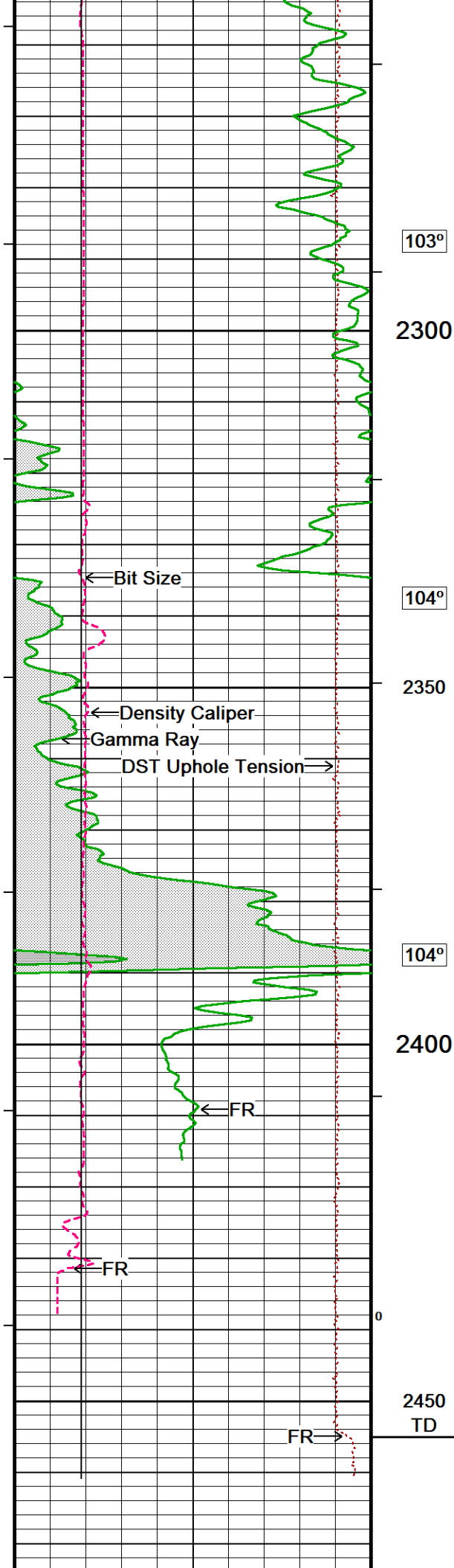
REPEAT SECTION

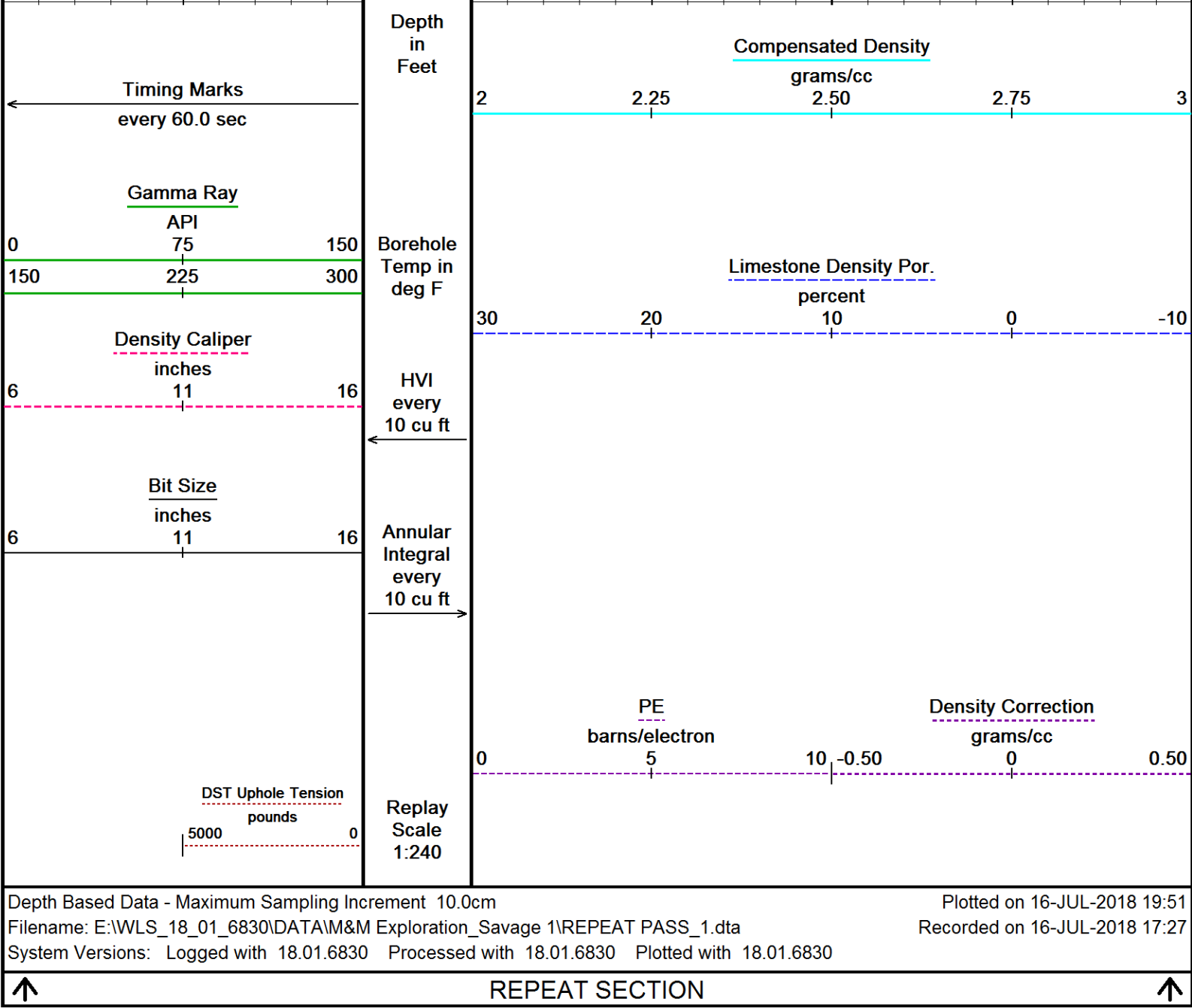
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Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: E:\WLS_18_01_6830\DATA\M&M Exploration_Savage 1\REPEAT PASS_1.dta
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

Plotted on 16-JUL-2018 19:51
Recorded on 16-JUL-2018 17:27







BEFORE SURVEY CALIBRATION		
E:\WLS_18_01_6830\DATA\M&M Exploration_Savage 1\MAIN PASS.dta		
General Constants All 000		Last Edited on 16-JUL-2018,17:08
General Parameters		
Mud Resistivity	1.300	ohm-metres
Mud Resistivity Temperature	96.000	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	Density Caliper	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. Two 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 05-JUL-2018 19:41

Reading No	Measured	Calibrated (lbs)
1	14963.50	0.00
2	16733.41	470.00

Gamma Calibration MCG-E.A 571

Field Calibration on 16-JUL-2018 09:54

	Measured	Calibrated (API)
Background	55	39
Calibrator (Gross)	1840	1300
Calibrator (Net)	1785	1261

Gamma Calibration Tolerances MCG-E.A 571

Ratio

1.40

1.475

1.55

1.416

Counts/API

Gamma Constants MCG-E.A 571

Last Edited on 16-JUL-2018,17:09

Gamma Calibrator Number	46	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.10	gm/cc
Caliper Source for Processing	Bit Size	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

SP Calibration MCG-E.A 571

Field Calibration on 05-JUL-2018,13:12

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

High Resolution Temperature Calibration MCG-E.A 571

Field Calibration on 05-JUL-2018,13:12

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	212.00	212.00

High Resolution Temperature Constants MCG-E.A 571

Last Edited on 28-MAR-2018,05:08

Pre-filter Length11

Micro Normal and Micro Inverse Calibration MMR-A 11

Base Calibration on 21-JUN-2018 17:28

Field Check on 16-JUL-2018 10:04

	Resistor 1 (ohm)	Resistor 2 (ohm)
	10.0	50.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Micro Normal	9.9 49.4	5.1 25.6
Micro Inverse	9.9 49.3	3.4 16.9
Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	94.3	94.3
Micro Inverse	62.5	62.5

Micro Normal & Micro Inverse Calibration Tolerance MMR-A 11

Micro Normal Res. 1

9.9

-5%

10.0

+5%

ohm

Micro Normal Res. 2

49.4

-5%

50.0

+5%

ohm

Micro Inverse Res. 1

9.9

-5%

10.0

+5%

ohm

Micro Inverse Res. 2

49.3

-5%

50.0

+5%

ohm

Micro Normal Base Check

94.3

-2%

94.22

+2%

ohm-m

Micro Inverse Base Check

62.5

-2%

62.45

+2%

ohm-m

Micro Normal Field Check

94.3

-2%

94.3

+2%

ohm-m

Micro Inverse Field Check

62.5

-2%

62.5

+2%

ohm-m

Micro Normal and Micro Inverse Constants MMR-A 11

Last Edited on 21-JUN-2018,17:25

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-A 11			Base Calibration on 21-JUN-2018 17:35
			Field Calibration on 16-JUL-2018 10:16
Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	15100	5.96	
2	18463	7.98	
3	21695	9.86	
4	25806	11.93	
5	0	0.00	
6	N/A	N/A	
Field Calibration			
	Measured Caliper (in)	Actual Caliper (in)	
	7.88	7.96	

Caliper Calibration Tolerances MMR-A 11			
Short Arm Field Cal.	7.88	7.76 7.96 8.16	in

Micro-Resistivity Caliper Constants MMR-A 11					
Sonde Configuration		Resistivity Mode			
Neutron Calibration MDN-B.J 391				Base Calibration on 21-JUN-2018 15:11	
				Field Check on 16-JUL-2018 10:10	
Base Calibration					
		Measured		Calibrated (cps)	
	Near		Far	Near	Far
	3312		98	3714	110
Ratio		33.845		33.764	
Field Calibrator at Base				Calibrated (cps)	
				1129	1703
Ratio				0.663	
Field Check				Calibrated (cps)	
				1139	1745
Ratio				0.652	

Neutron Calibration Tolerances MDN-B.J 391			
Ratio	33.845	-5% 33 +5%	
Base Check	0.663	0.65 0.7 0.75	
Field Check	0.652	0.643 0.663 0.683	

Neutron Constants MDN-B.J 391			Last Edited on 16-JUL-2018,17:09
Neutron Source Id	N1054		
Neutron Jig Number	BLUE		
Air Hole Processing	Modified Ratio		
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	Constant Value		
Formation Pressure	0.00	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	

FE Calibration MFE-B.J 359

Base Calibration on 21-JUN-2018 13:59

Field Check on 16-JUL-2018 09:55

	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	1000.0
Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	958.2	126.8
Base Check		281.1
Field Check		281.1

FE Calibration Tolerances MFE-B.J 359

Reference 2	958.2	-3% 980.0 +3%	ohm
Base Check	281.1	-2% 277.0 +2%	ohm-m
Field Check	281.1	-2% 281.1 +2%	ohm-m

FE Constants MFE-B.J 359

Last Edited on 16-JUL-2018,10:17

Running Mode	No Sleeve
MFE K Factor	0.1268
Borehole Correction Constants	
Sonde Position	0.5 inches
Hole Size Source	Density Caliper
Hole Size Constant Value	N/A inches
Rm Source	Global Value: Temperature Corrected
Temp. for Rm Corr.	MCG External Temperature

Induction Calibration MAI-B.J 375

Factory Loop Calibration 25-JUN-2018 18:06

Field Check on 16-JUL-2018 09:59

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)	17.2	476.6	9.3	966.2	2.083	-26.5
2	5.9	379.2	7.6	821.4	2.180	-5.4
3	3.1	258.6	5.2	566.0	2.195	-1.5
4 (far)	1.4	132.0	2.6	279.2	2.119	-0.4
Array Temperature	73.2		Deg F			

Tool Checks

Array	Factory Reference (mmho/m)		Before Survey (mmho/m)		
	Low	High	Low	High	
1 (near)	12.1	3803.1	12.3	3804.0	
2	30.4	3547.7	30.5	3547.6	
3	29.3	3051.9	29.3	3052.0	
4 (far)	20.6	2084.9	20.6	2084.9	
Array Temperature	88.8		86.0		Deg F

Induction Check Tolerances MAI-B.J 375

Low Array 1	12.3	10.6 12.1 13.6	mmho/m	High Array 1	3804.0	-0.5% 3803.1 +0.5%	mmho/m
Low Array 2	30.5	28.9 30.4 31.9	mmho/m	High Array 2	3547.6	-0.5% 3547.7 +0.5%	mmho/m
Low Array 3	29.3	27.8 29.3 30.8	mmho/m	High Array 3	3052.0	-0.5% 3051.9 +0.5%	mmho/m
Low Array 4	20.6	19.1 20.6 22.1	mmho/m	High Array 4	2084.9	-0.5% 2084.9 +0.5%	mmho/m

Induction Constants MAI-B.J 375

Last Edited on 16-JUL-2018,10:17

Induction Model	RtAP-WBM
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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		6.0000	
Stand-off Fin Angle		60.00	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 375

Field Calibration on 05-JUL-2018,13:02

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	212.00	212.00

High Resolution Temperature Constants MAI-B.J 375

Last Edited on 25-JUN-2018,18:09

Pre-filter Length	11
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Photo Density Calibration MPD-C.A 271

Base Calibration on 08-JUL-2018 19:16
Field Check on 16-JUL-2018 10:03

Density Calibration		Measured		Calibrated (sdu)	
Base Calibration		Near	Far	Near	Far
Background		1062	1229		
Reference 1		47579	23546	59494	26390
Reference 2		19446	2301	24557	2552
Field Check at Base					
		1062.0	1229.4		
Field Check					
		1061.4	1222.7		

PE Calibration				
Base Calibration		Measured	Calibrated	
	WS	WH	Ratio	Ratio
Background	195	955		
Reference 1	17862	47426	0.380	0.367
Reference 2	5263	19336	0.276	0.271
Field Check at Base				
	194.7	955.0		
Field Check				
	192.0	955.1		

Photo Density Calibration Tolerances MPD-C.A 271

Near Density Ratio	2.53		Far Density Ratio	20.83	
PE Calibration	0.099				
Near Den. Field Check	1061.4		Far Den. Field Check	1222.7	
PE WS Field Check	192.0		PE WH Field Check	955.1	

Density Constants MPD-C.A 271

Last Edited on 08-JUL-2018,19:17

Density Source Id	P56135B	
Nylon Calibrator Number	766	
Aluminium Calibrator Number	633	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.00	gm/cc
Mud Density Type		
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	
Precision Enhanced Density Processing	Not Applied	
Matrixdensity(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	

Caliper Calibration MPD-C.A 271

Base Calibration on 08-JUL-2018 19:39
Field Calibration on 16-JUL-2018 10:13

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14240	4.01
2	24080	5.96
3	34144	7.96
4	43826	9.86
5	54976	11.93
6	N/A	N/A
Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	7.93	7.96

Caliper Calibration Tolerances MPD-C.A 271

Short Arm Field Cal.	7.93		in
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11B Tension Cablehead
MCB-A.A 2 LG: 2.40 ft WT: 19.8 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 721 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-E.A 571 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-B.J 391 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

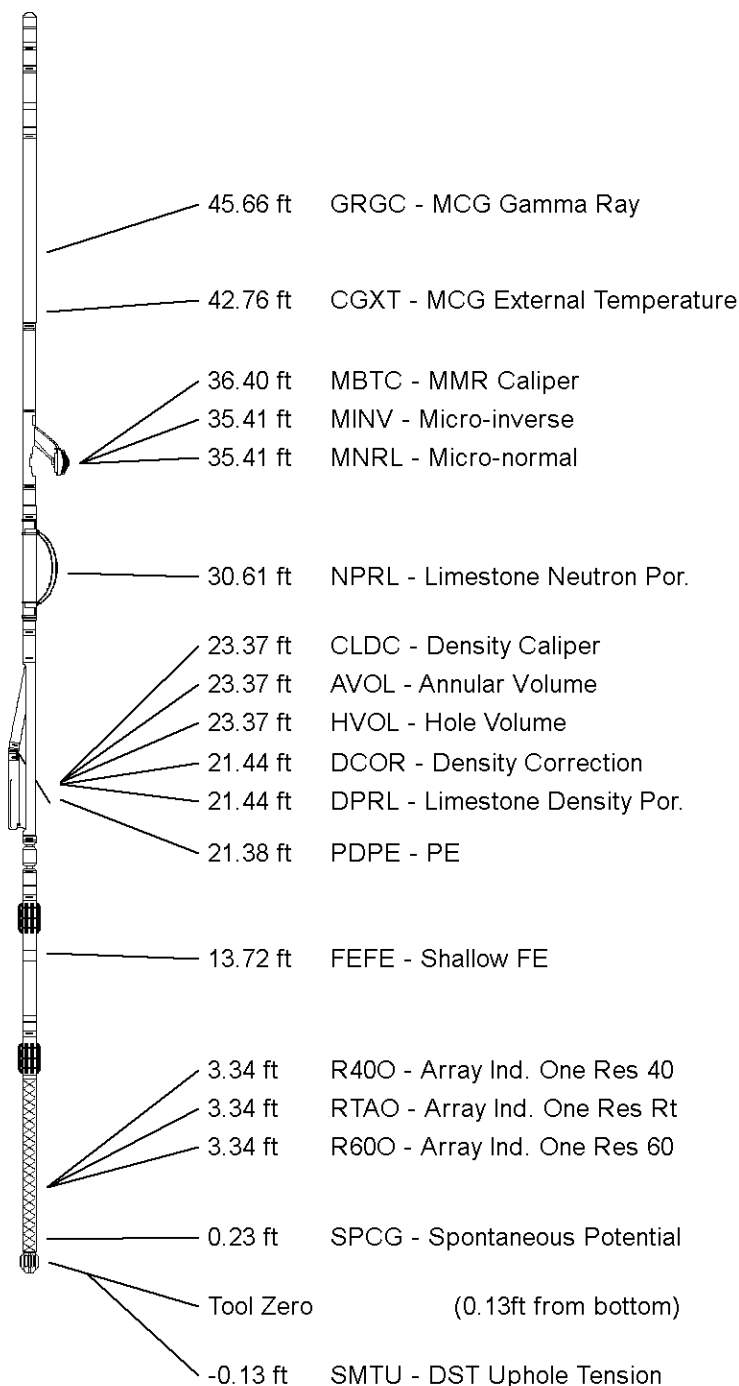
Compact Density/Caliper
MPD-C.A 271 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint
SKJ-E.A 166 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-B.J 359 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 375 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 55.64 ft Weight: 449.7 lb



All measurements relative to tool zero.

COMPANY	M & M EXPLORATION, INC
WELL	SAVAGE #1
FIELD	SAVAGE
PROVINCE/COUNTY	MARION
COUNTRY/STATE	KANSAS

Elevation Kelly Bushing	1298	feet	First Reading	3433.60	feet
Elevation Drill Floor		feet	Depth Driller	2460.00	feet
Elevation Ground Level	1292	feet	Depth Logger	2455.00	feet



COMPACT PHOTO DENSITY
DUAL SPACED NEUTRON

Weatherford®

