MICRORESISTIVITY LOG

Weatherford

COMPANY	GRAND MESA OPERATING COMPANY
WELL	CRATER LAKE #1-8
FIELD	WILDCAT
PROVINCE/COUNTY	LINCOLN
COUNTRY/STATE	U.S.A. / COLORADO
LOCATION	1145' FNL & 1934' FEL

SEC 8	TWP 8S	RGE 54W	Other Services
Latitude			MAI/MFE MPD/MDN
Longitude			MSS
API Number	05-073-06738		

Permanent Datum GL, Elevation 5404 feet
Log Measured From KB, 19.00 feet above Permanent Datum
Drilling Measured From KB

Elevations:	feet
KB	5423.00
DF	5421.00
GL	5404.00

Date	29-APR-2018			
Run Number	ONE			
Service Order	4558-212189226			
Depth Driller	8495.00	feet		
Depth Logger	8496.00	feet		
First Reading	8448.00	feet		
Last Reading	441.00	feet		
Casing Driller	441.00	feet		
Casing Logger	441.00	feet		
Bit Size	7.875	inches		
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.40 lb/USg	91.00 CP		
PH / Fluid Loss	11.00	7.20 ml/30Min		
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.94 @ 75.0	ohm-m		
Rmf @ Measured Temp	0.75 @ 75.0	ohm-m		
Rmc @ Measured Temp	1.13 @ 75.0	ohm-m		
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.37 @189.0	ohm-m		
Time Since Circulation	6 HOURS			
Max Recorded Temp	189.00	deg F		
Equipment / Base	13096	LIB		
Recorded By	ADAM SILL			
Witnessed By	KENT MATSON			

Last Edited: 29-APR-2018 12:41

BOREHOLE RECORD

Bit Size inches	Depth From feet	Depth To feet
7.875	441.00	8495.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	441.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 18.01.5248.
- 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: 3470 CU.FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 2142 CU.FT.

- RIG: WW DRILLING #20.

- ENGINEER: A. SILL.

- OPERATOR: B. TOVAR, J. FOWLER.

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 29-APR-2018 20:59

Filename: C:\Minimus 18.01.5248\Data\Grand Mesa Crater La...\Grand Mesa Crater Lake #1-8_002.dta — Recorded on 29-APR-2018 15:30

System Versions: Logged with 18.01.5248 Plotted with 18.01.5248

Depth In Feet

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− ⟶| 20 |⟵ +

MMR Caliper
inches
6 11 16

Bit Size
inches
6 11 16

DST Uphole Tension
pounds
5000 0

Borehole Temp in deg F

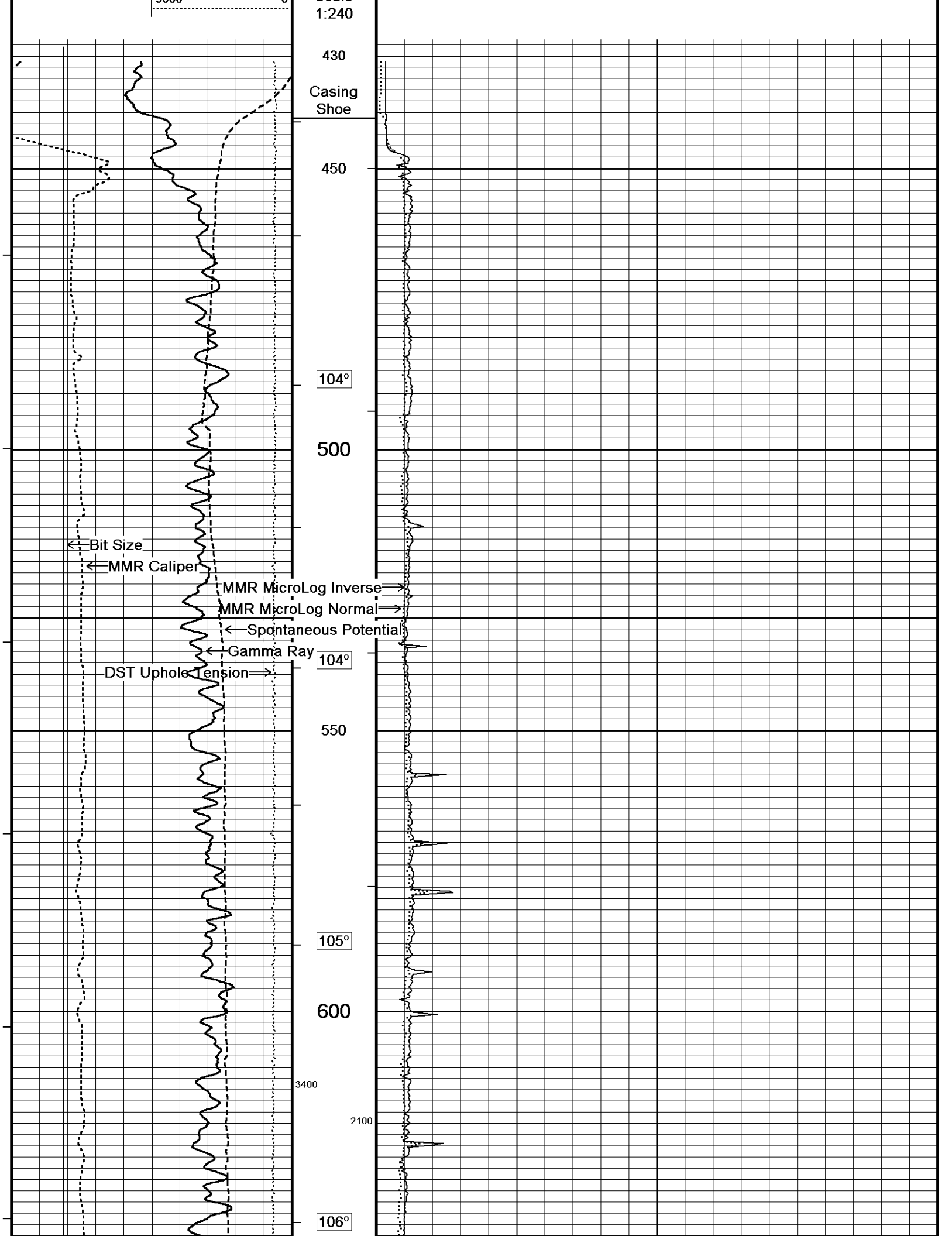
HVI every 10 cu ft

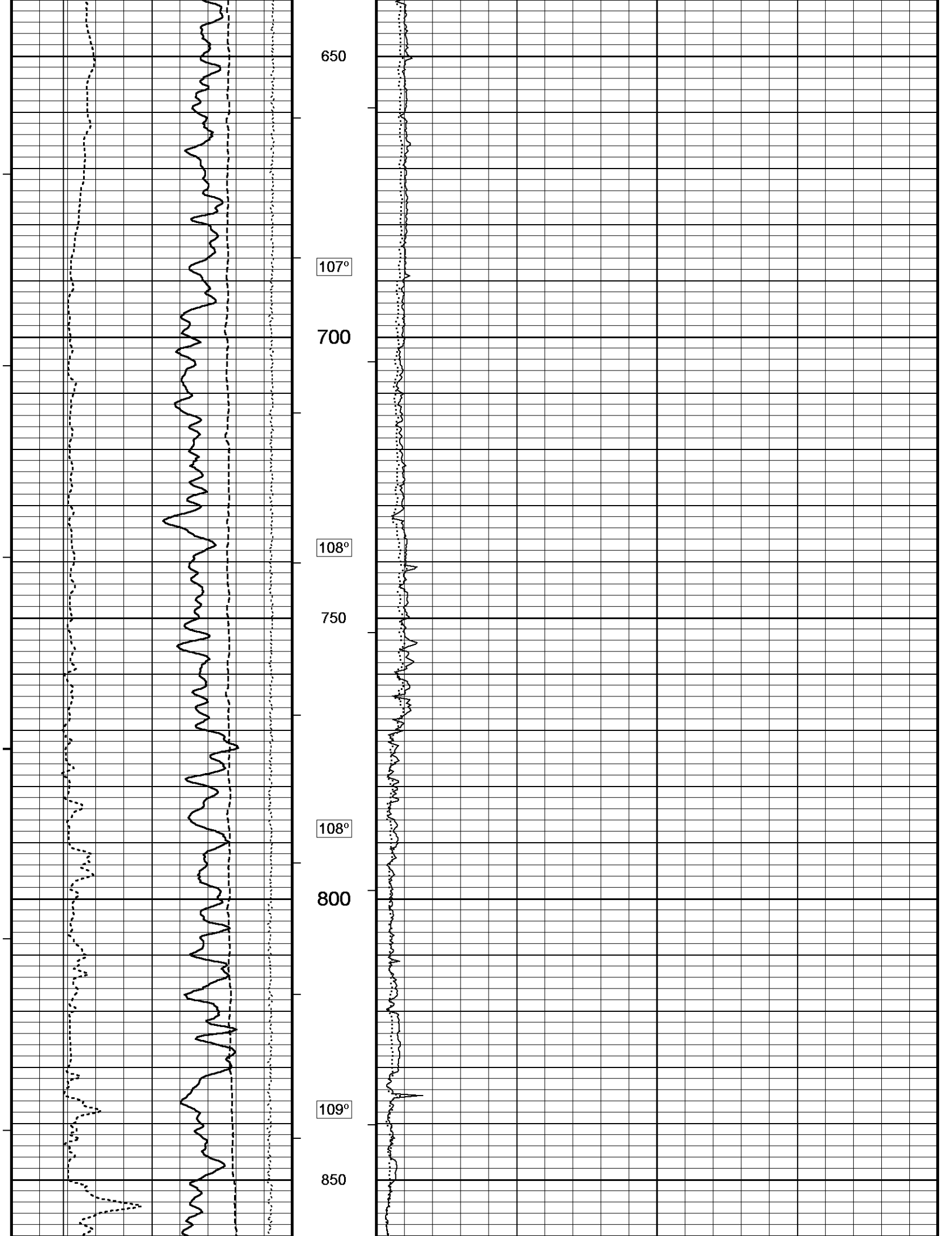
Annular Integral every 10 cu ft

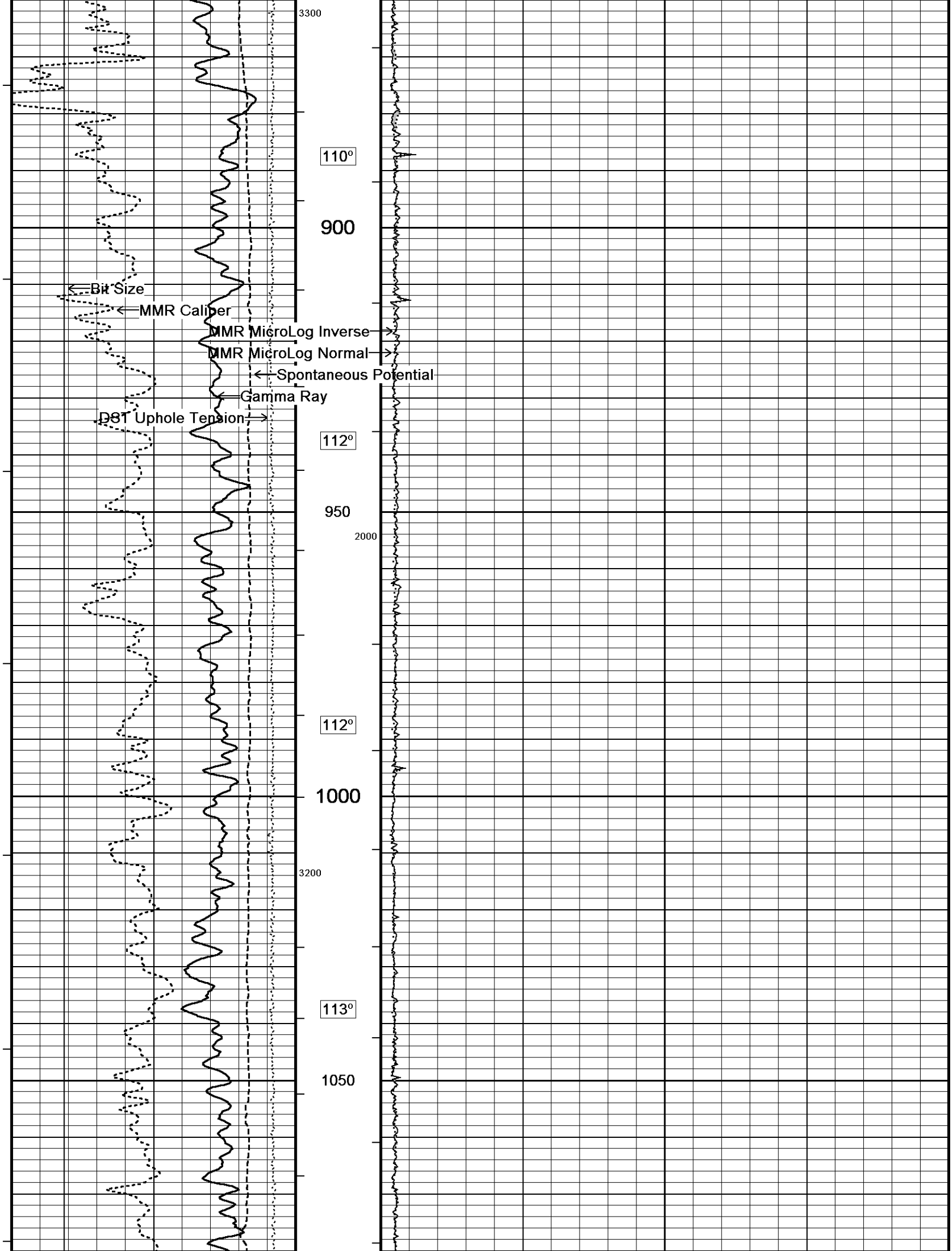
Replay Scale

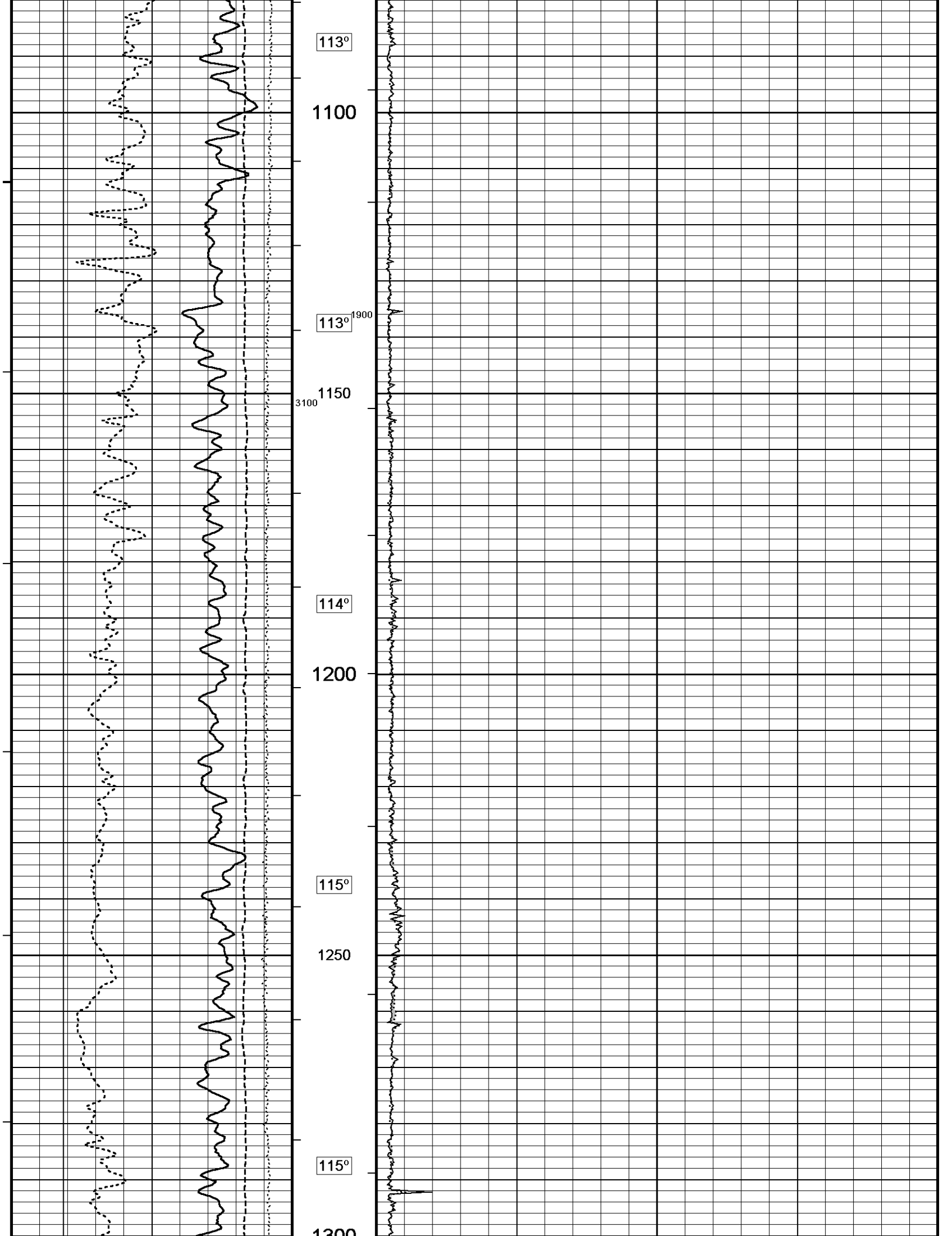
MMR MicroLog Normal
ohm metres
0 10 20 30 40

MMR MicroLog Inverse
ohm metres
0 10 20 30 40


1:240
430
Casing
Shoe
450
104°
500
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
104°
DST Uphole Tension
550
105°
600
3400
2100
106°


650
107°
700
108°
750
108°
800
109°
850


3300
110°
900
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
112°
950
2000
112°
1000
3200
113°
1050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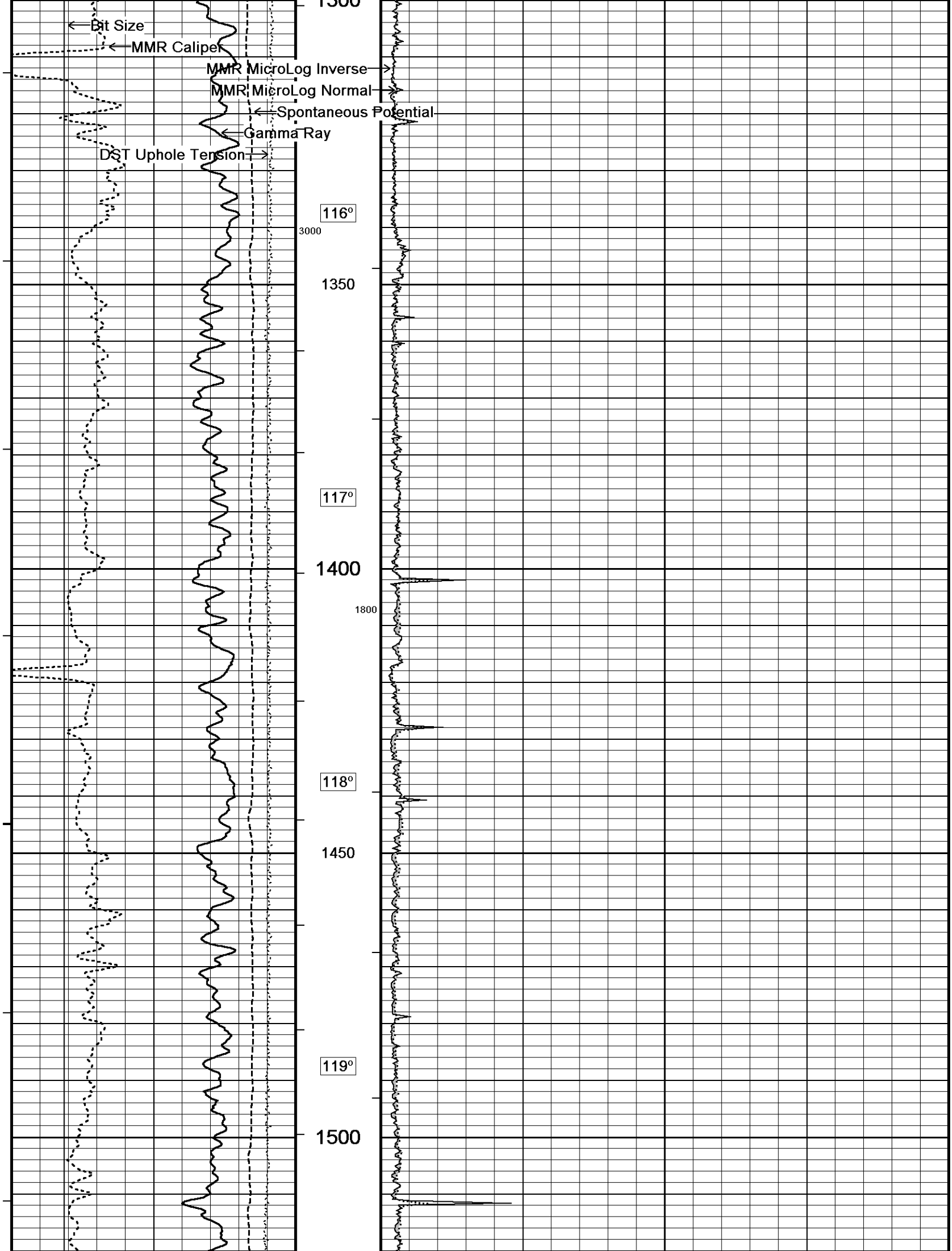
1100
113°
1900
1150
3100
114°
1200
115°
1250
115°
1300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MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
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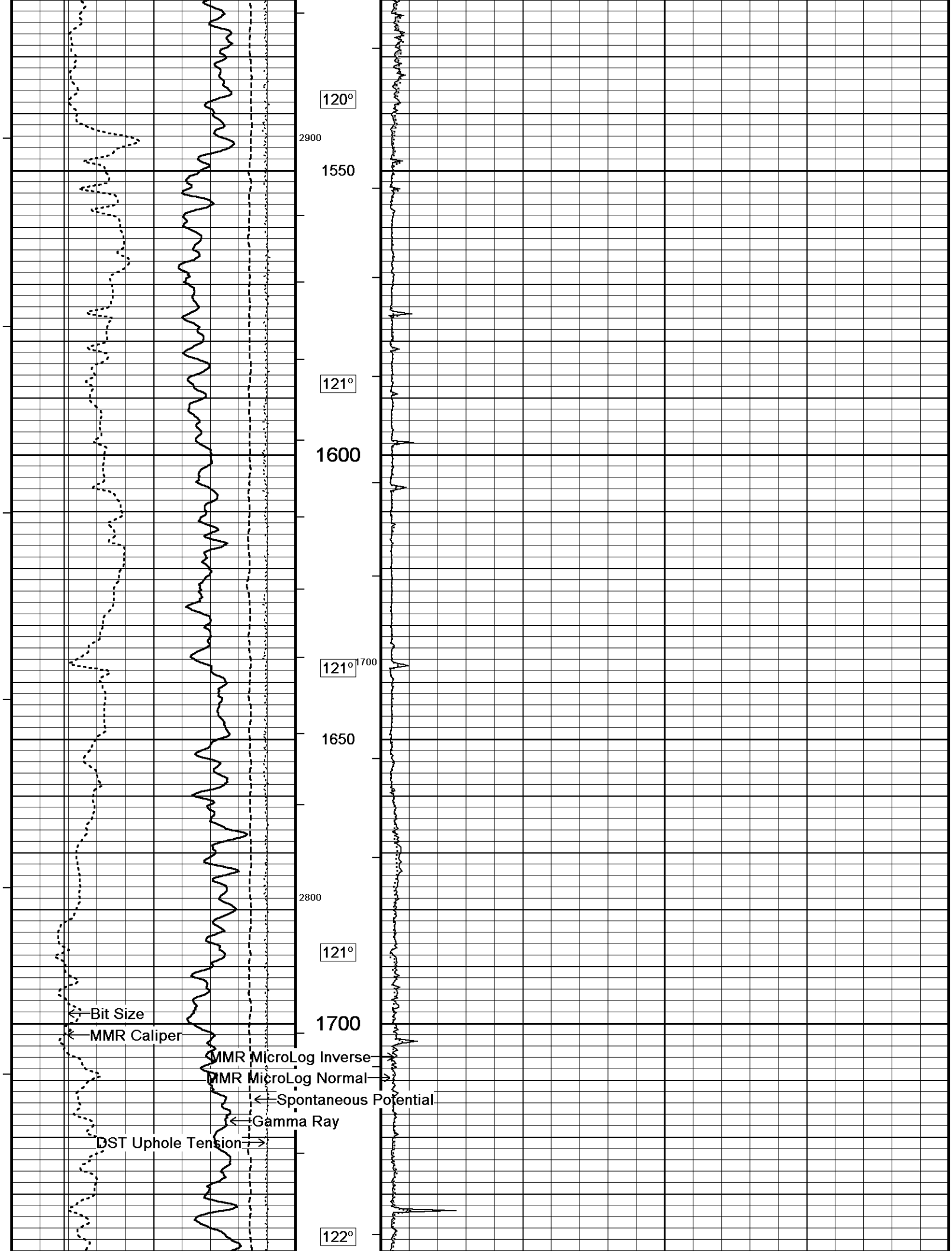
116°
3000
1350
117°
1400
1800
118°
1450
119°
1500


120°
2900
1550
121°
1600
121°
1700
1650
2800
121°
1700
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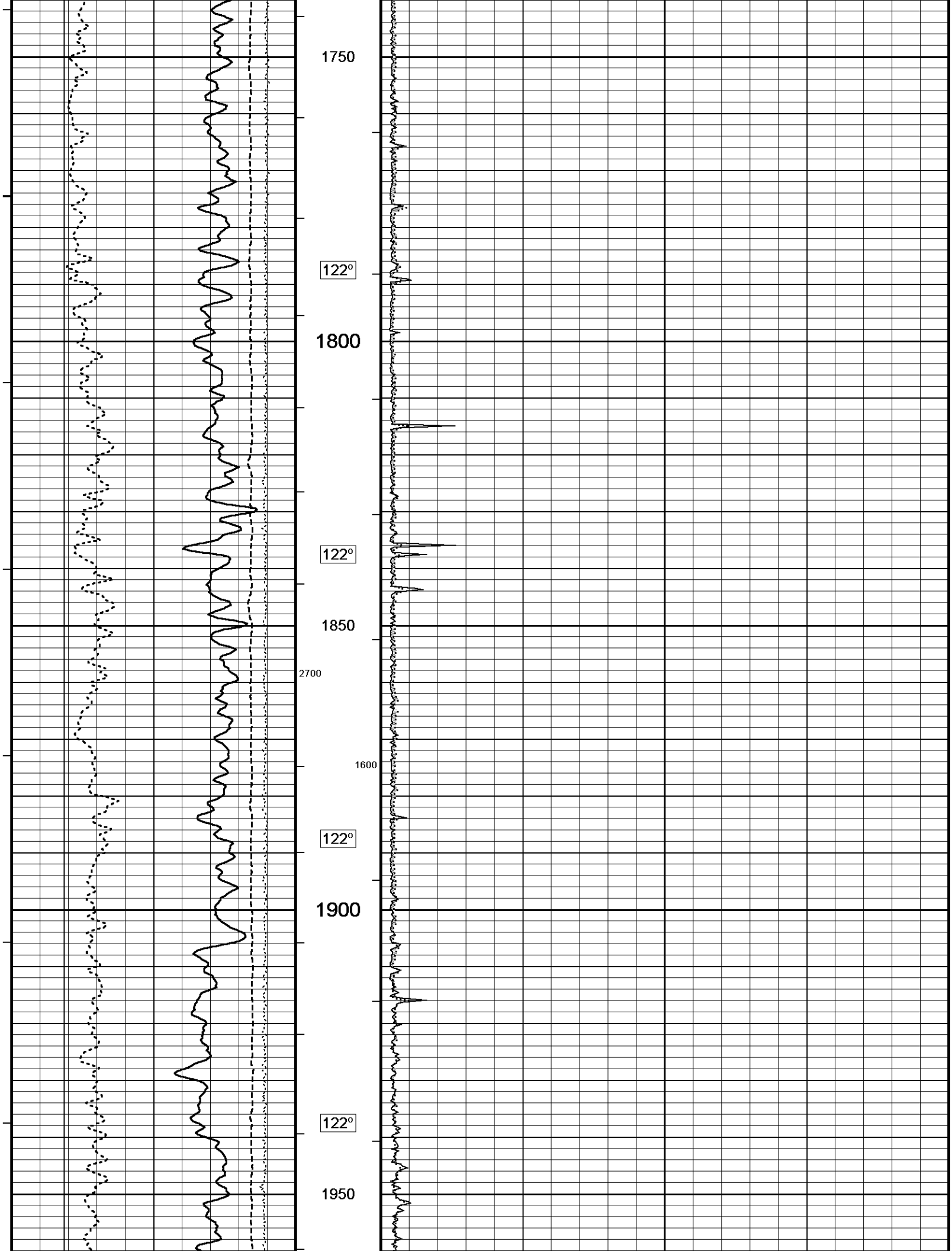
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
122°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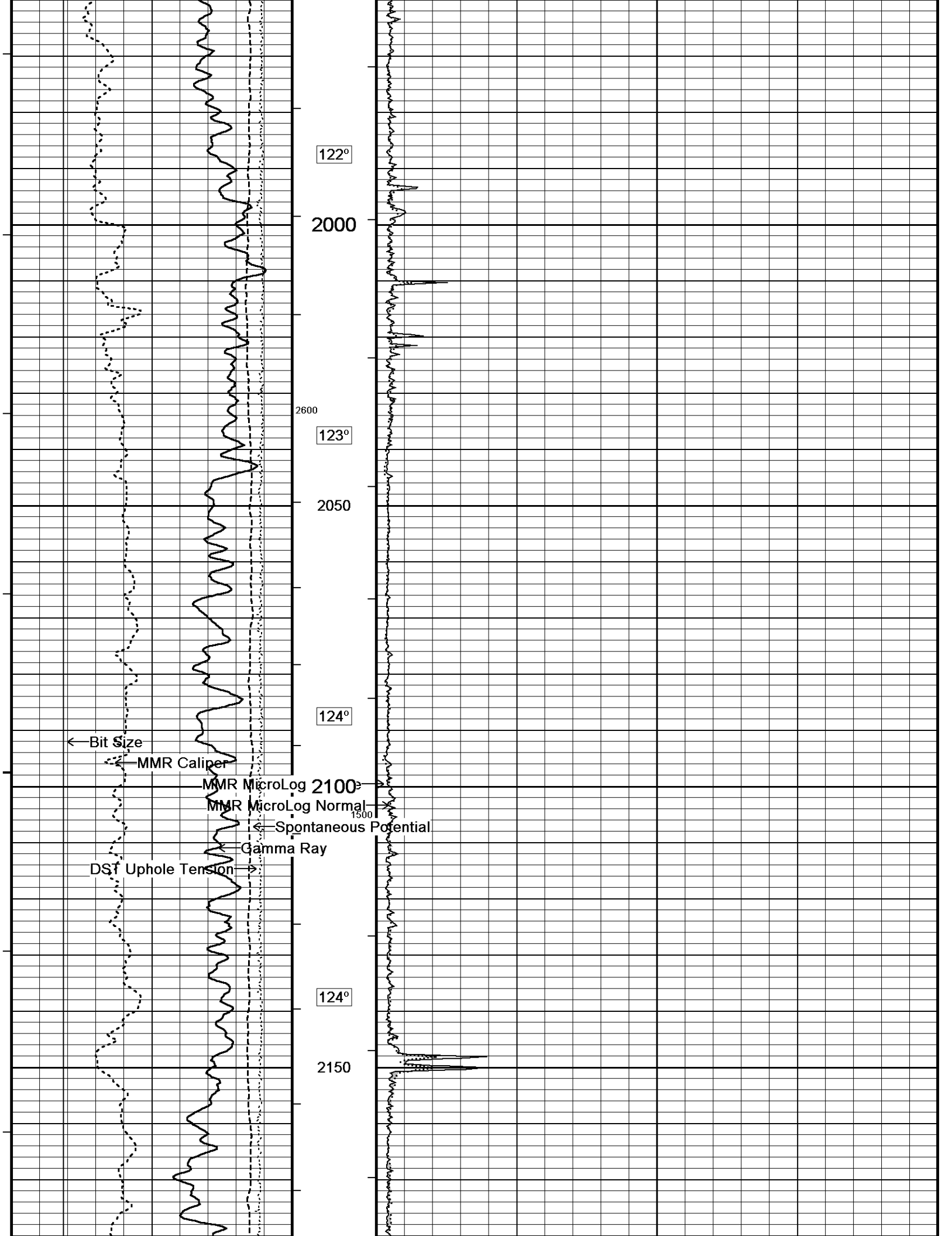
122°
1800
122°
1850
2700
1600
122°
1900
122°
1950


122°
2000
2600
123°
2050
124°
Bit Size
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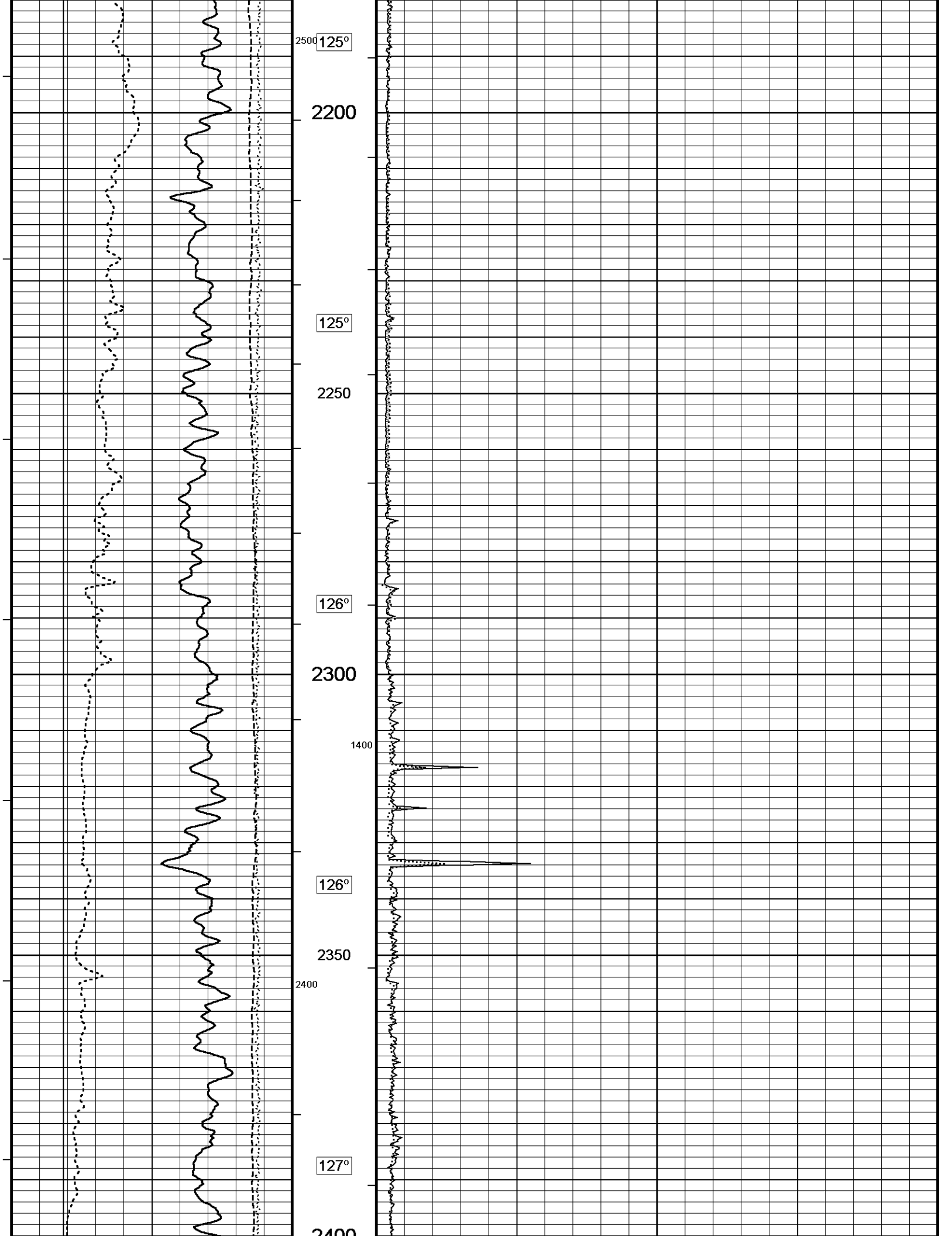
MMR MicroLog
2100
MMR MicroLog Normal
1500
Spontaneous Potential
Gamma Ray
DST Uphole Tension
124°
2150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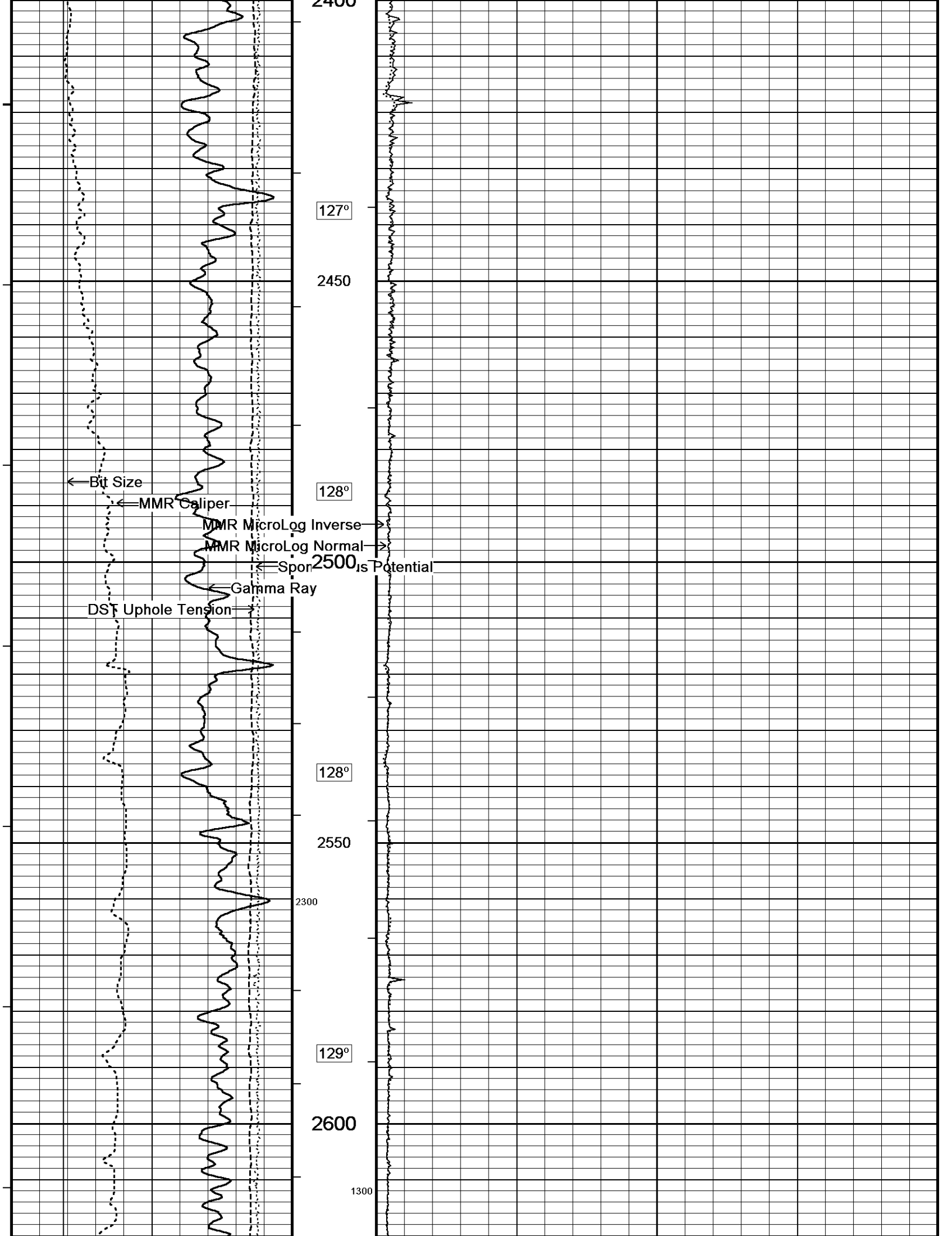
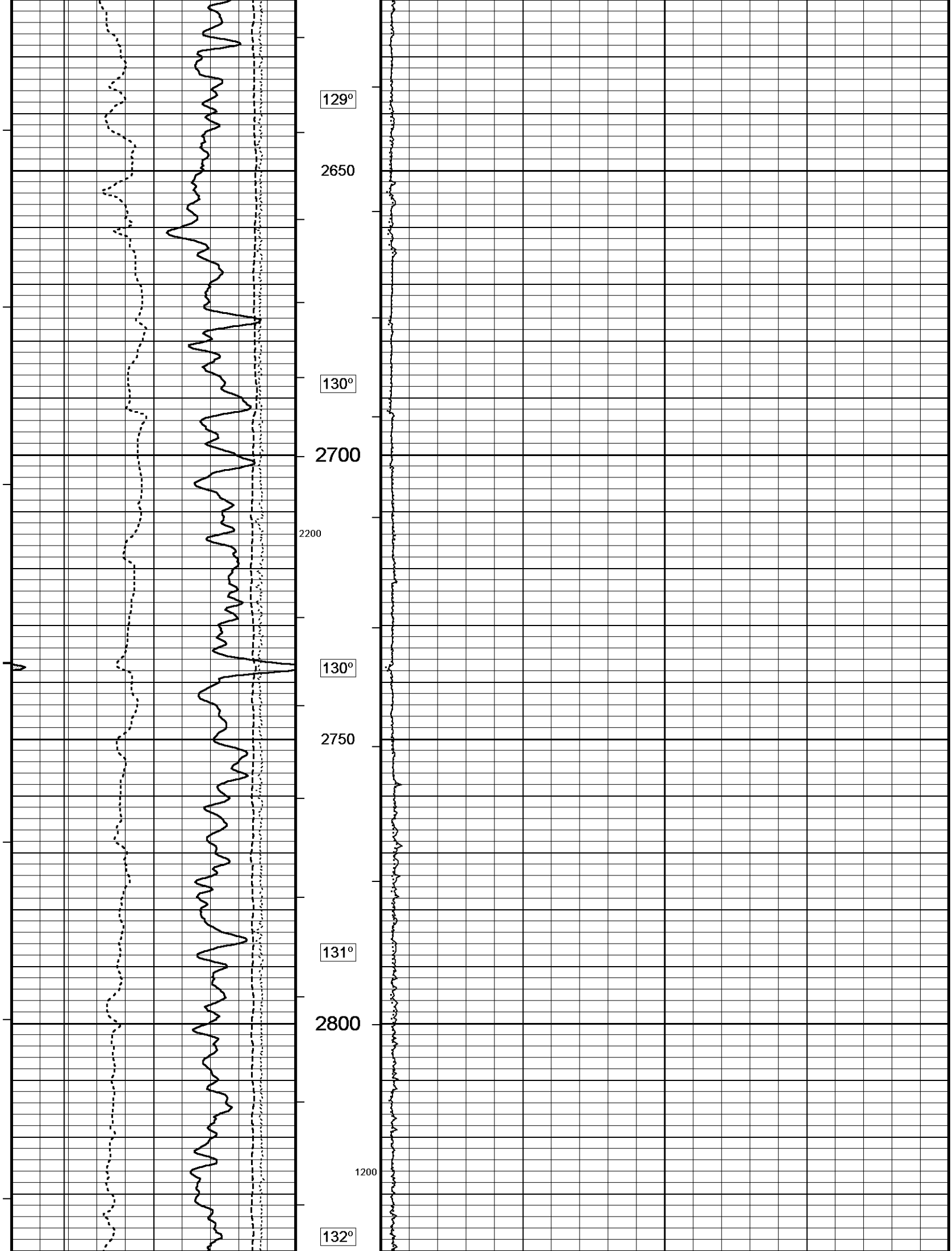
125°
2200
125°
2250
126°
2300
1400
126°
2350
2400
127°
2400


2400
127°
2450
128°
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spon
2500
is Potential
Gamma Ray
DST Uphole Tension
128°
2550
2300
129°
2600
1300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130°
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2200
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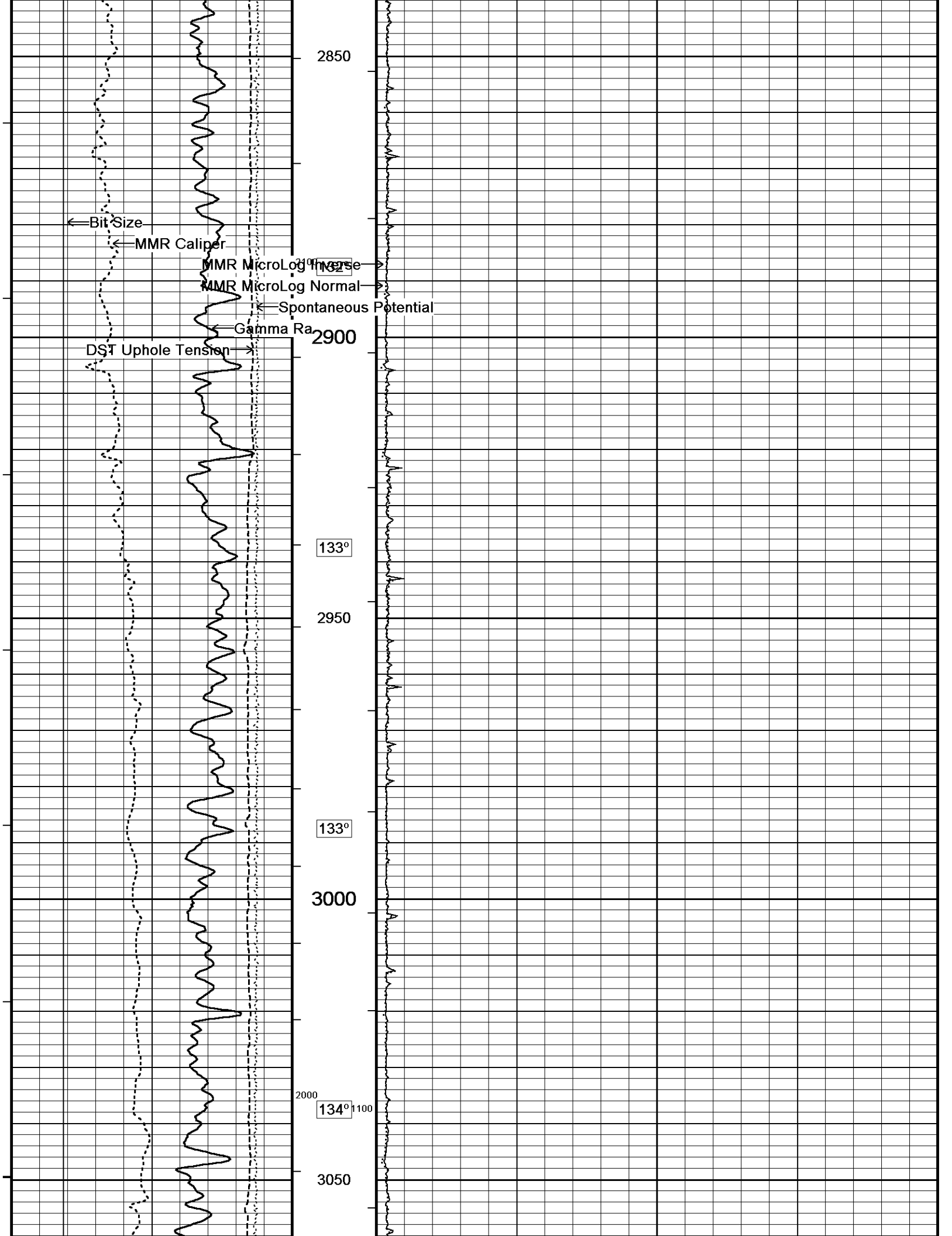
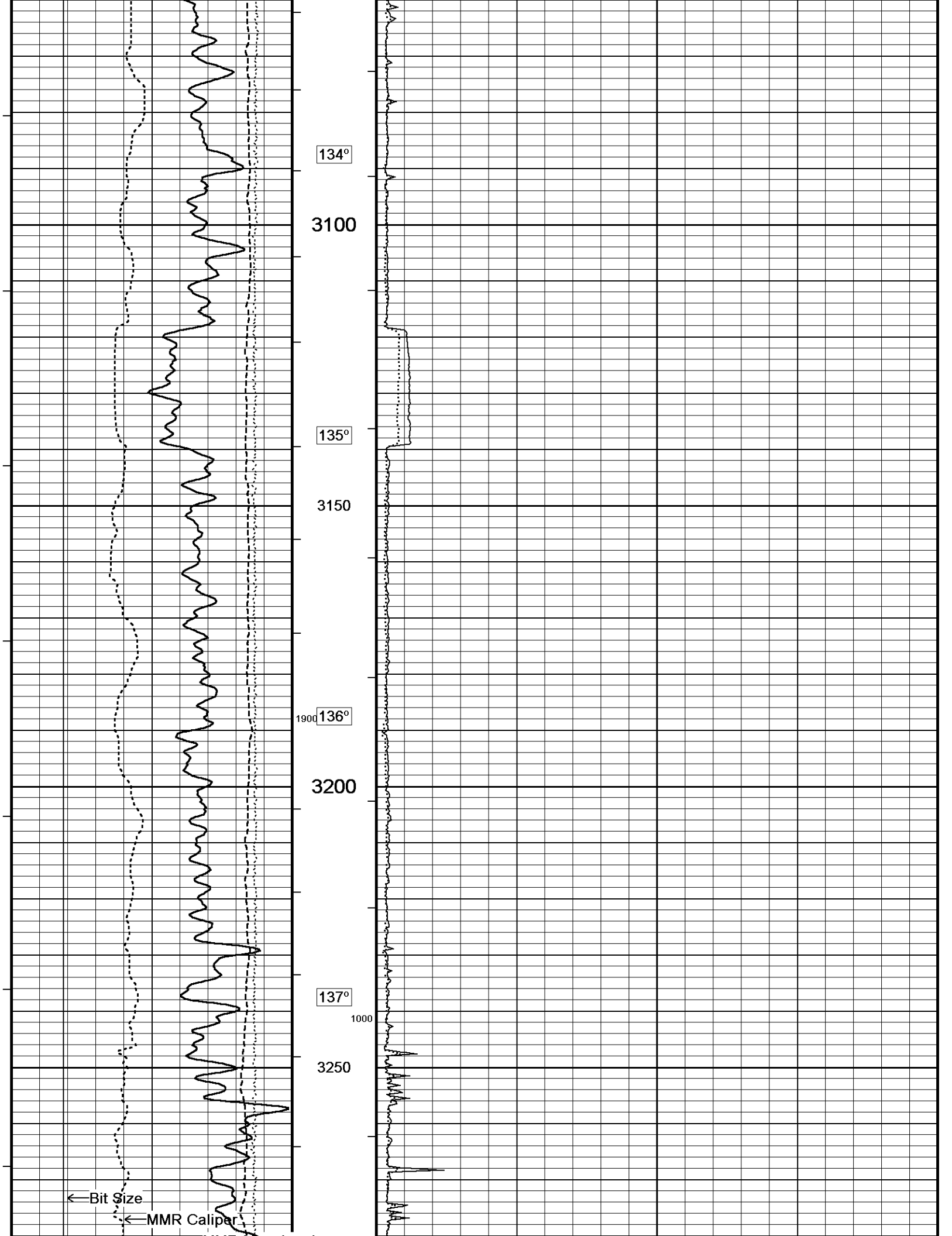
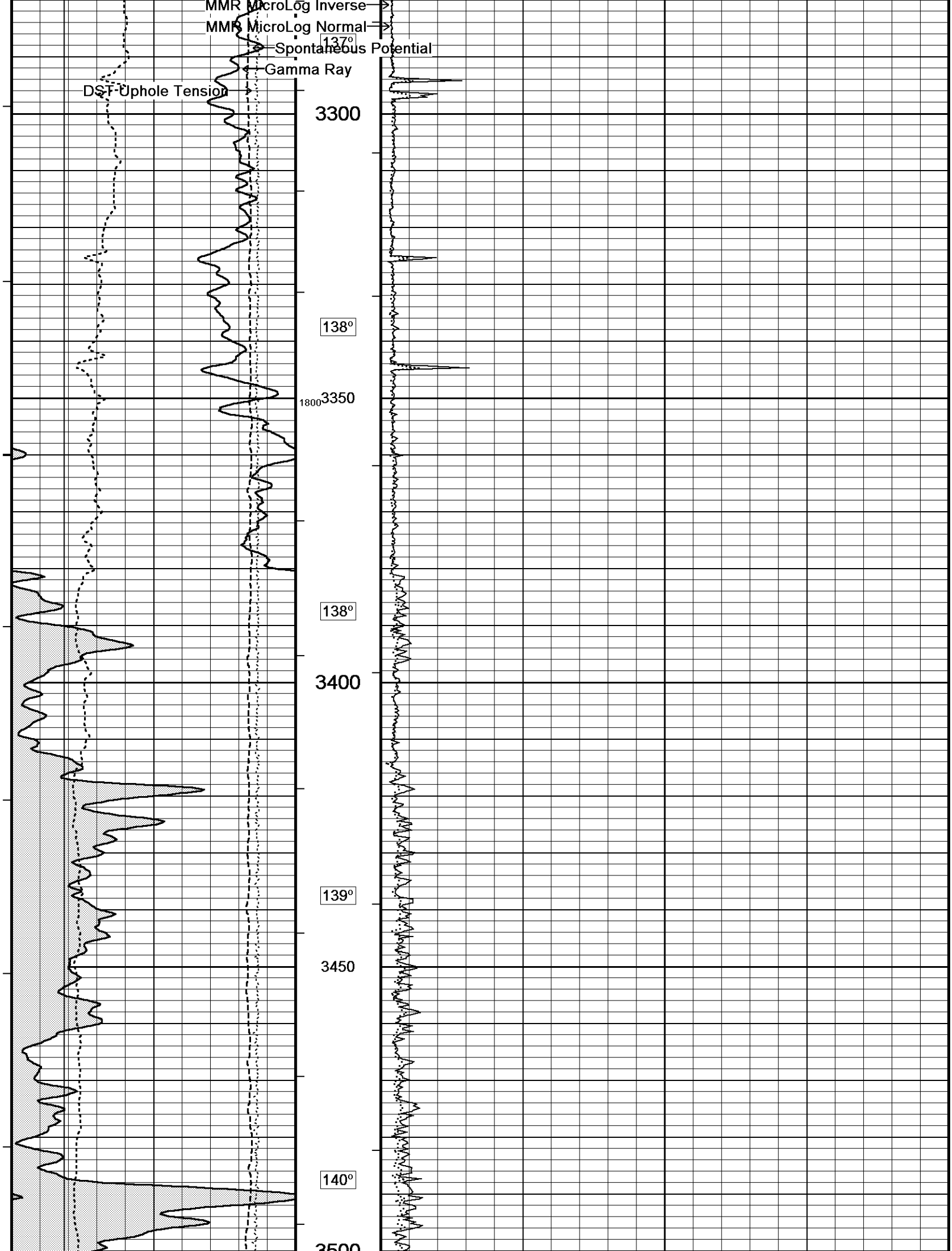
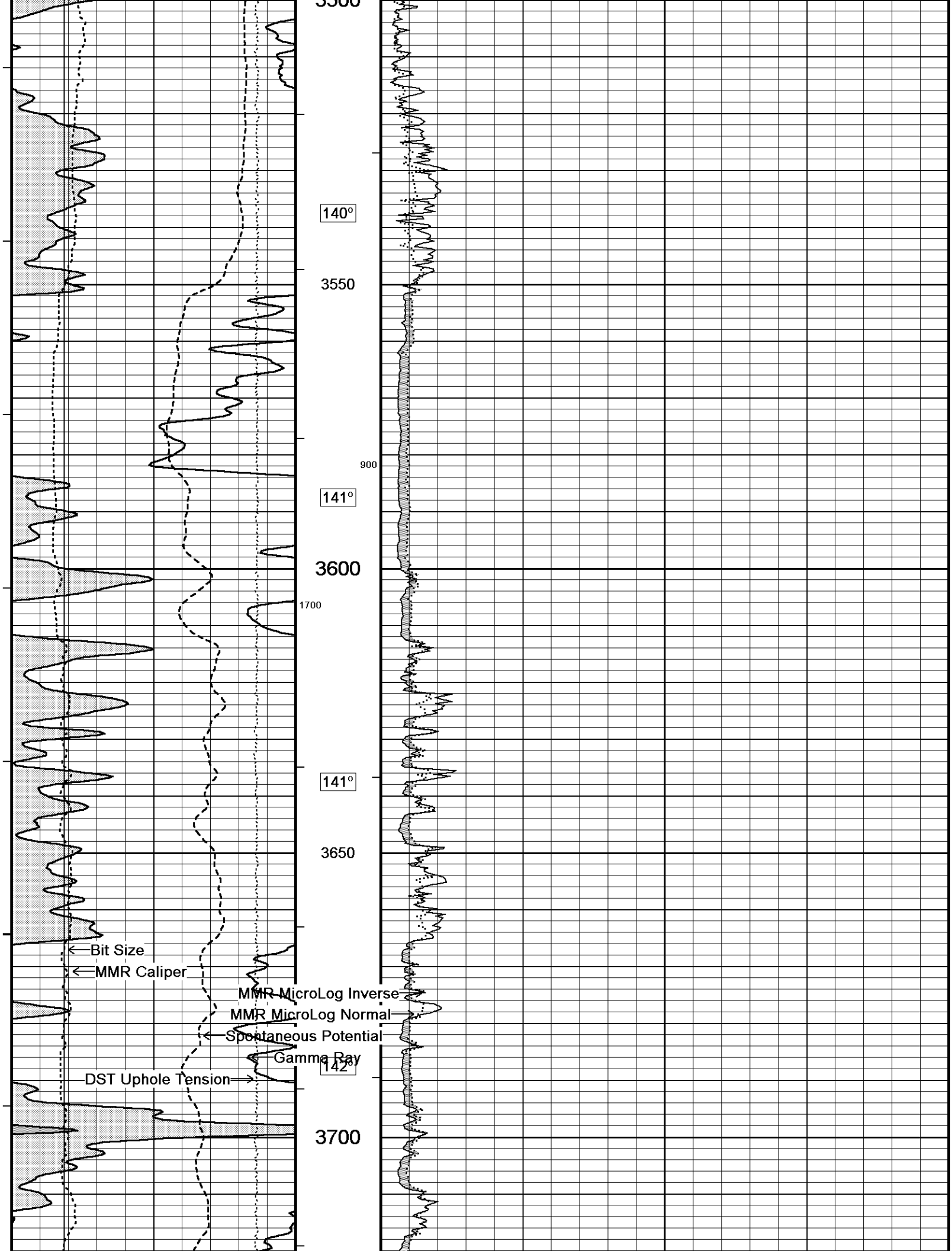
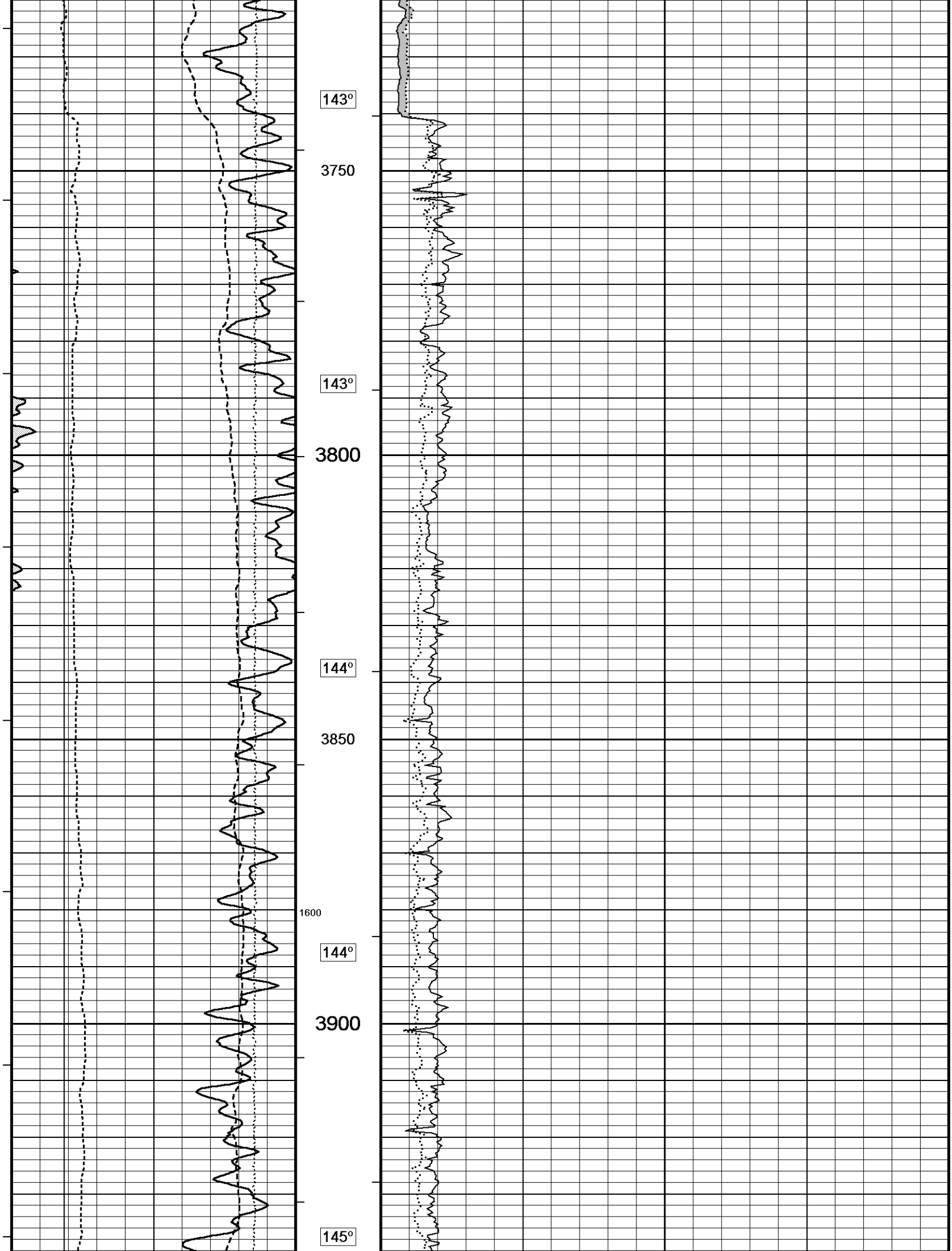
2750
131°
2800
1200
132°


2850
Bit Size
MMR Caliper
MMR MicroLog Inverse
2100
132
MMR MicroLog Normal
Spontaneous Potential
Gamma Ra
2900
DST Uphole Tension
133°
2950
133°
3000
2000
134°
1100
3050


134°
3100
135°
3150
1900
136°
3200
137°
1000
3250
⟵Bit Size
⟵MMR Caliper


MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST-Uphole Tension
137°
3300
138°
1800
3350
138°
3400
139°
3450
140°
3500


3500
140°
3550
900
141°
3600
1700
141°
3650
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
142°
DST Uphole Tension
3700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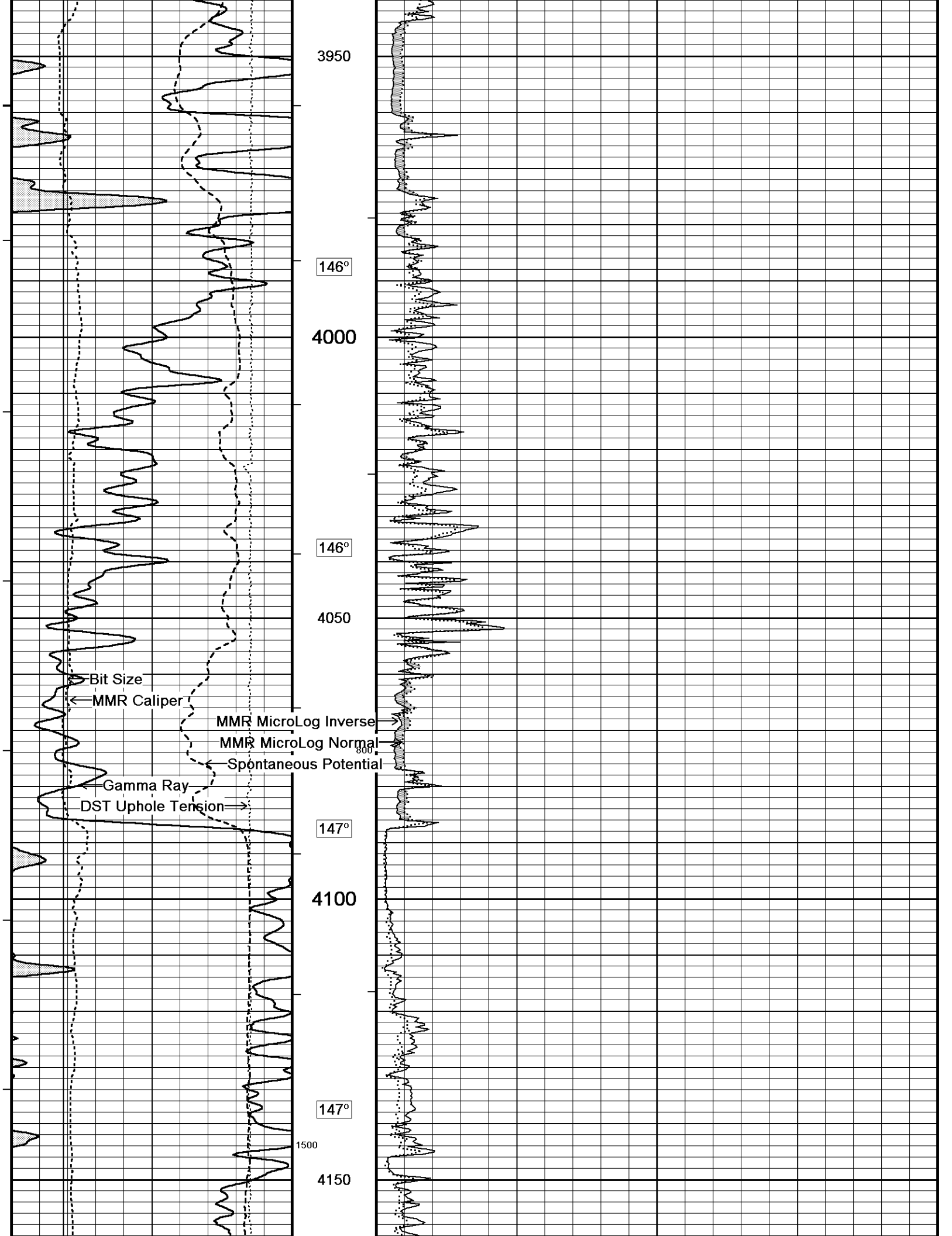
3750
143°
3800
144°
3850
1600
144°
3900
145°


3950
146°
4000
146°
4050
Bit Size
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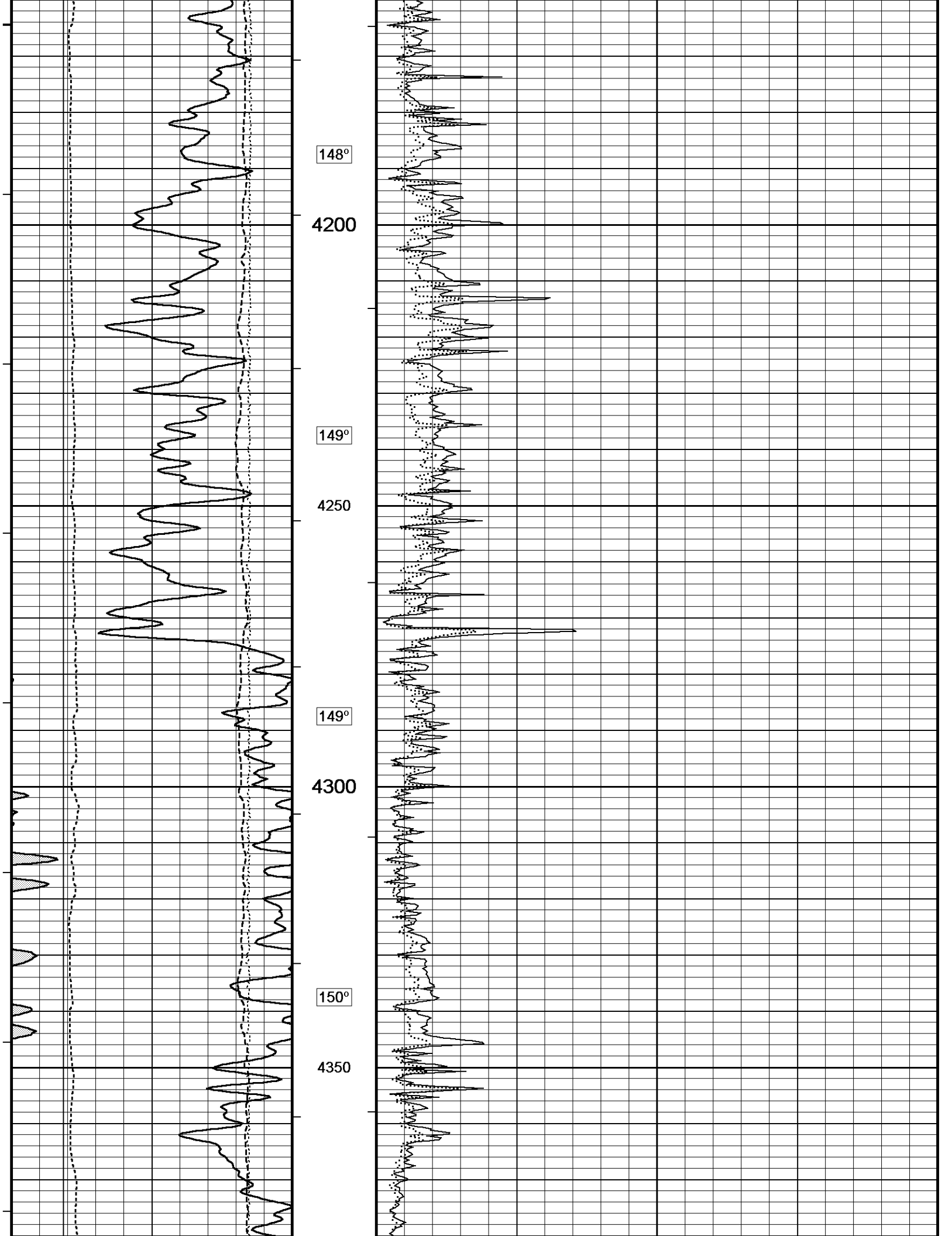
MMR MicroLog Normal
800
Spontaneous Potential
Gamma Ray
DST Uphole Tension
147°
4100
147°
1500
4150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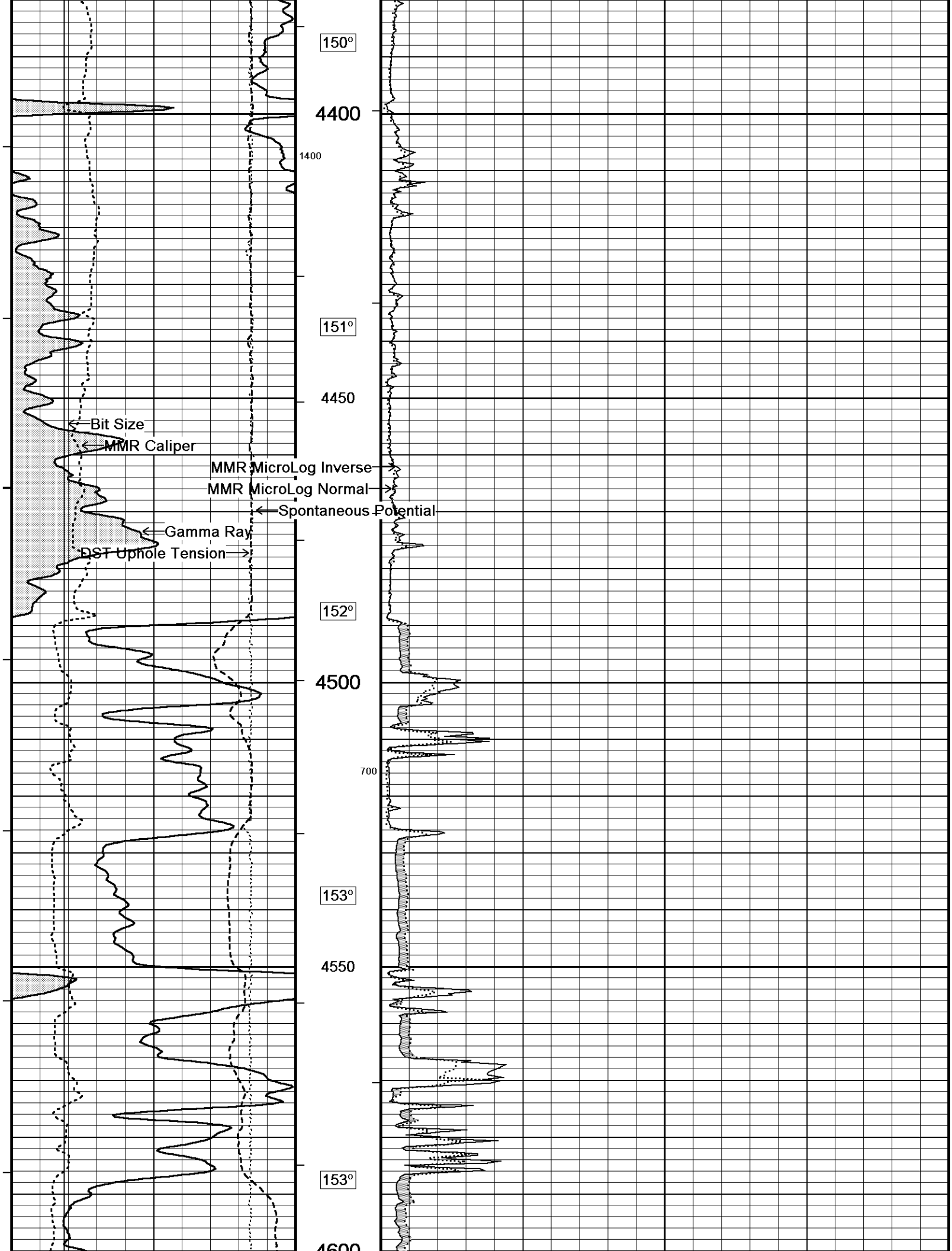
150°
4400
1400
151°
4450
Bit Size
MMR Caliper
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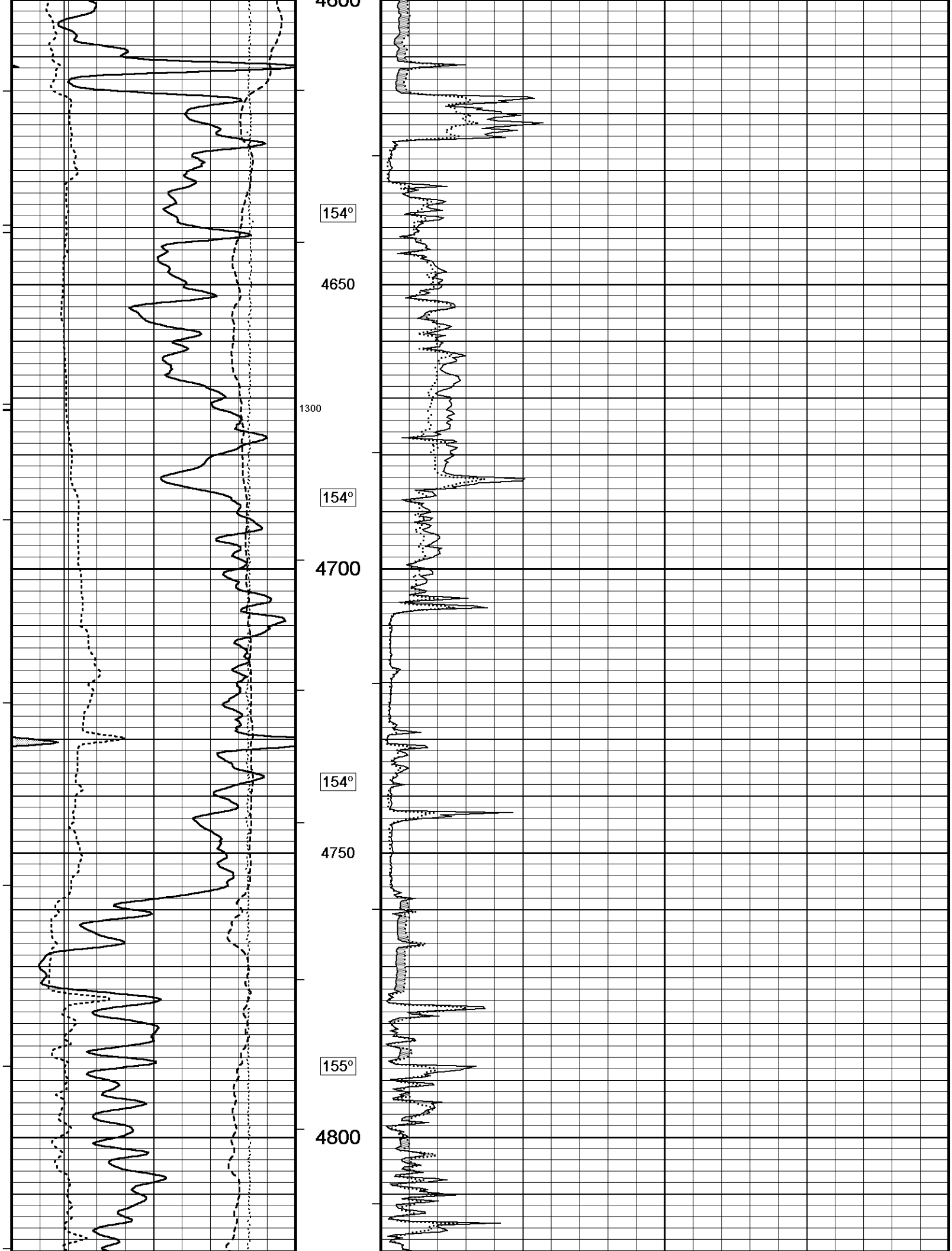
Spontaneous Potential
Gamma Ray
DST Uphole Tension
152°
4500
700
153°
4550
153°
4600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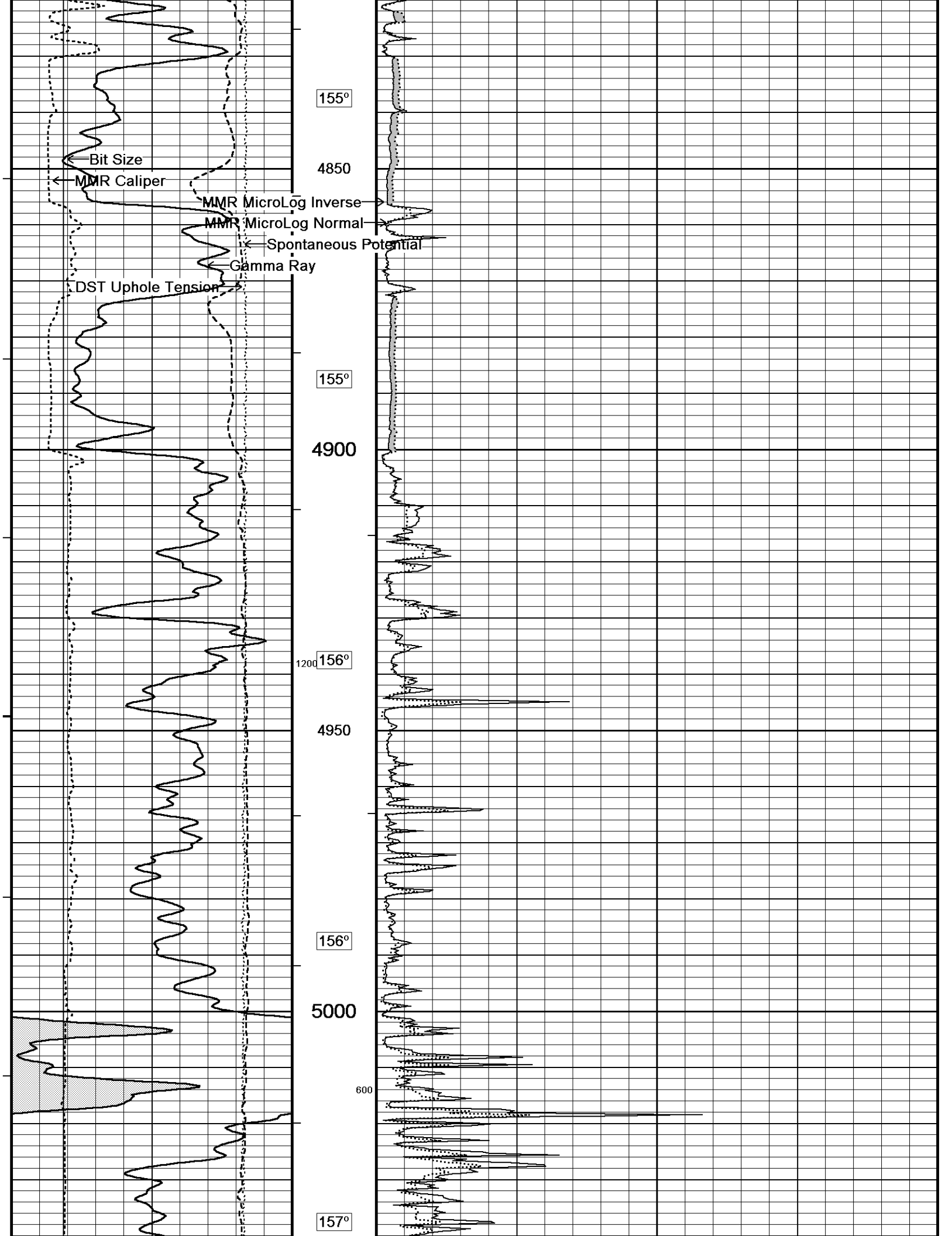
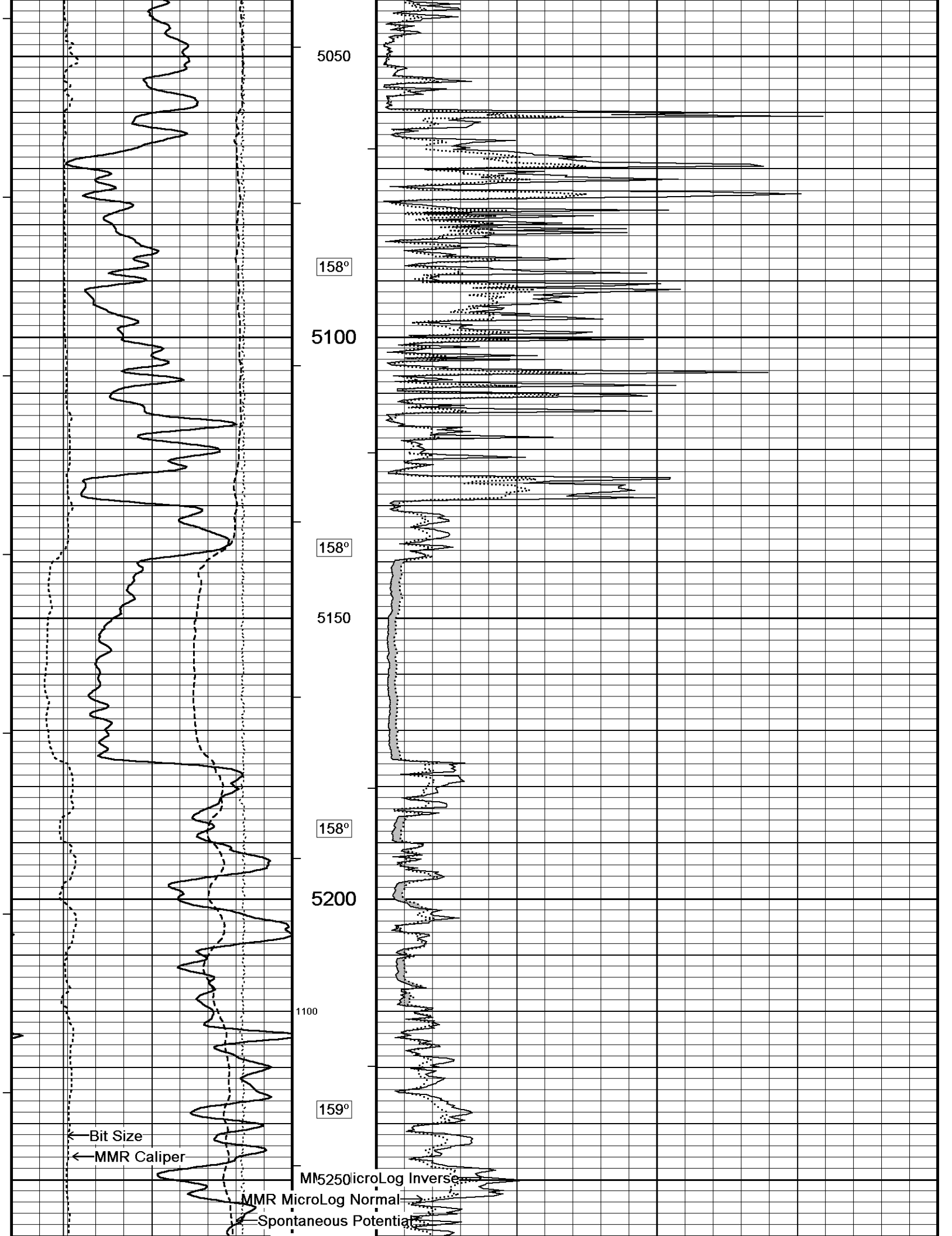
155°
4800


155°
Bit Size
4850
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
155°
4900
1200
156°
4950
156°
5000
600
157°


5050
158°
5100
158°
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5200
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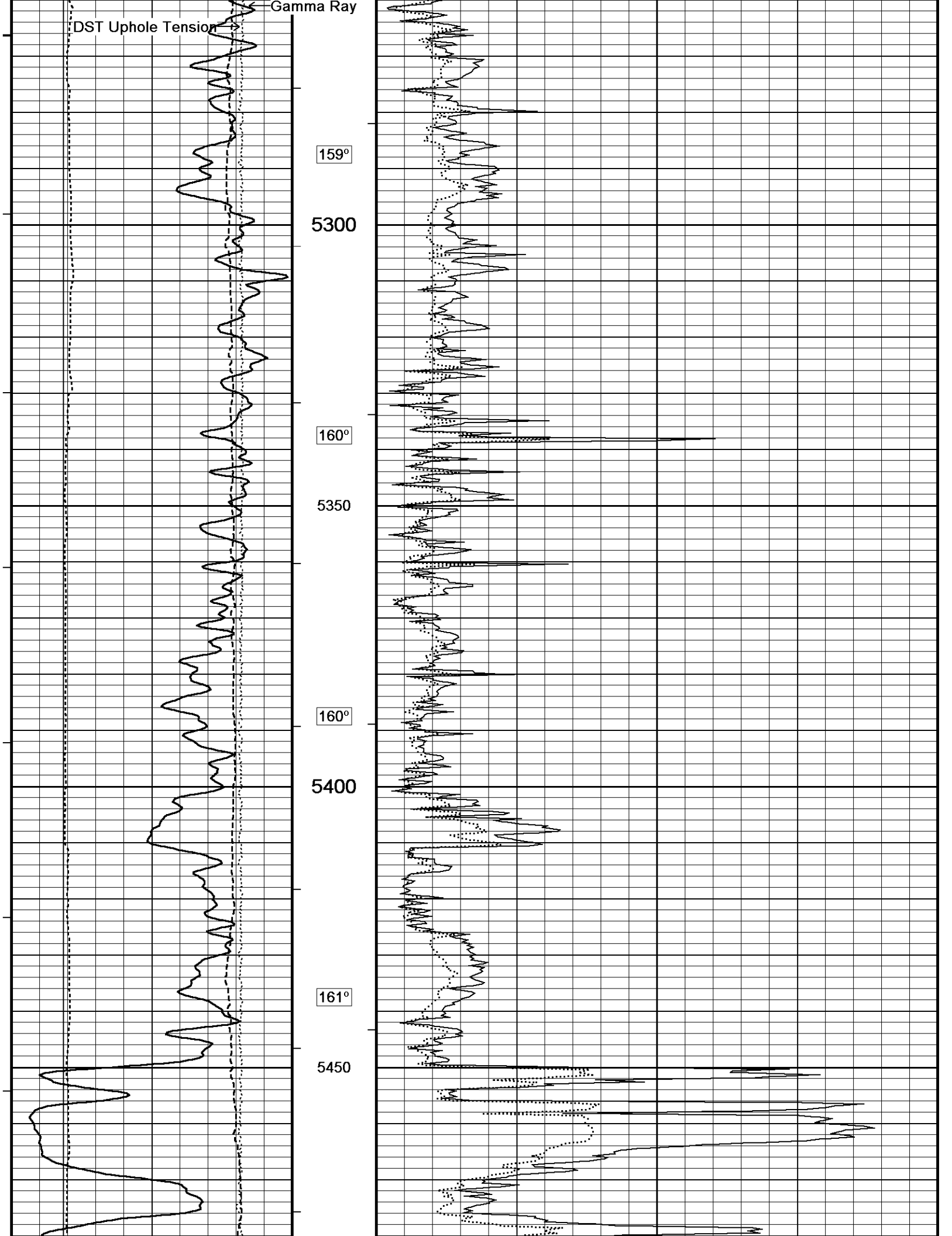
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential


Gamma Ray
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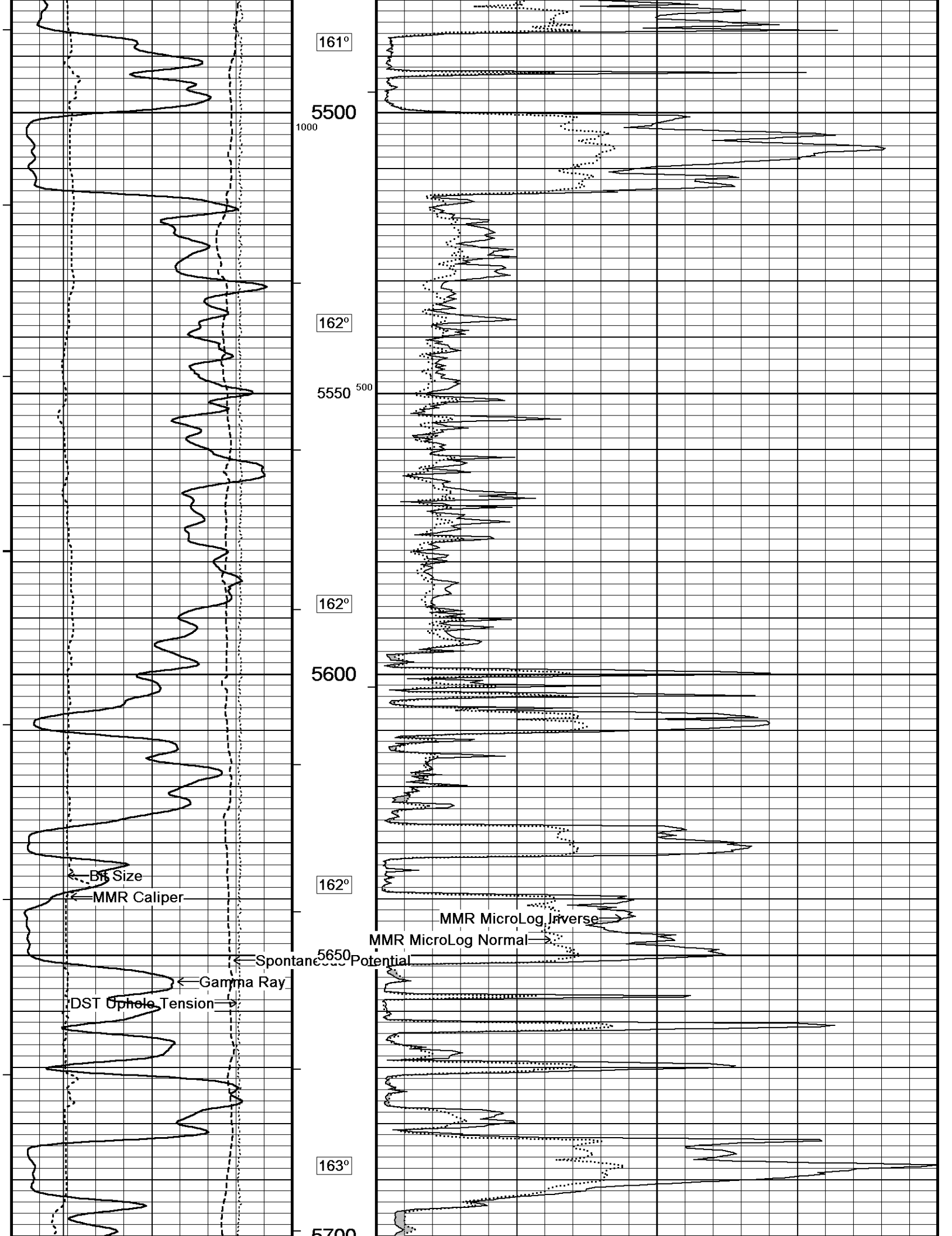
160°
5350
160°
5400
161°
5450


161°
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1000
162°
5550
500
162°
5600
162°
Bit Size
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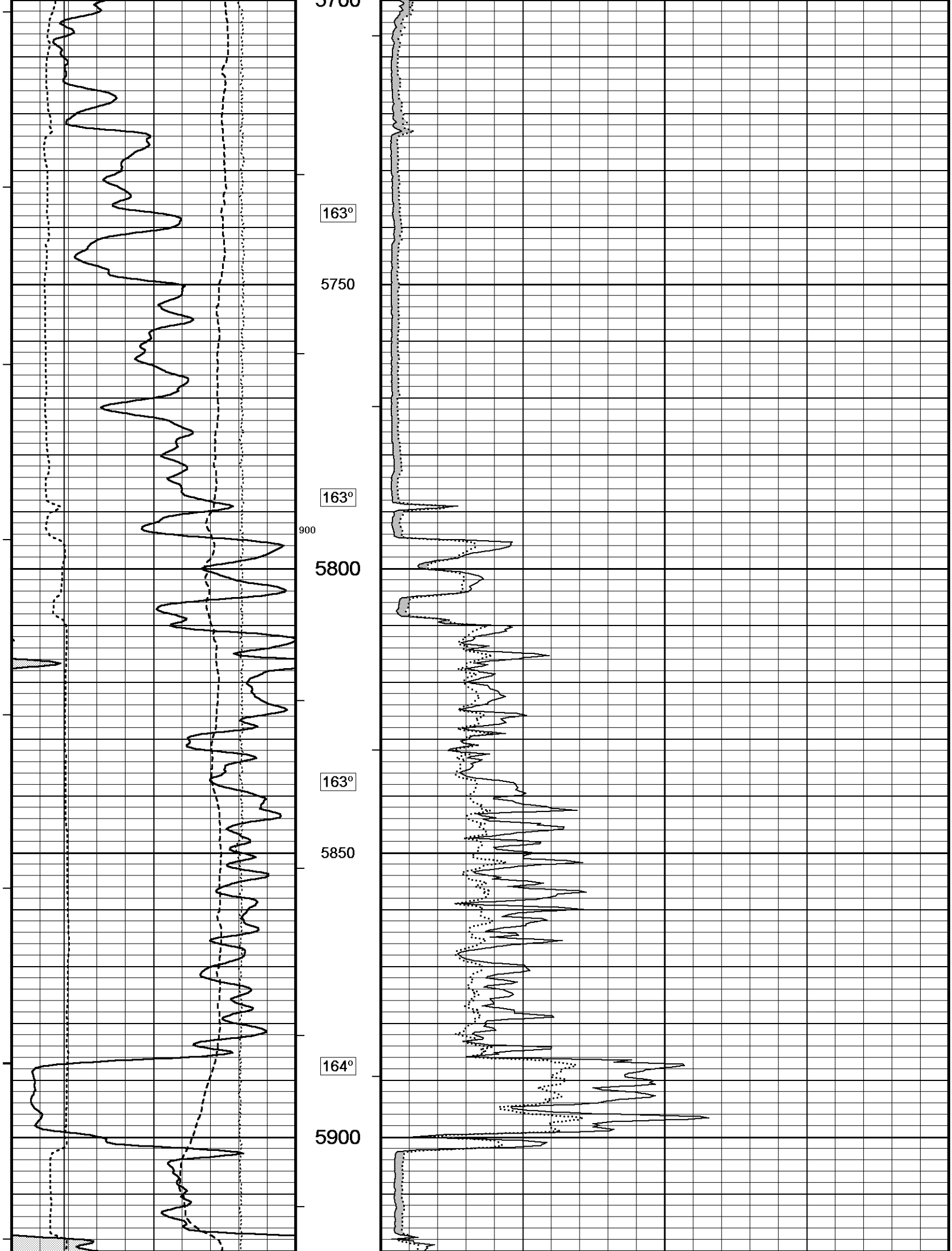
5650
Spontaneous Potential
Gamma Ray
DST Uphole Tension
163°
5700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164°
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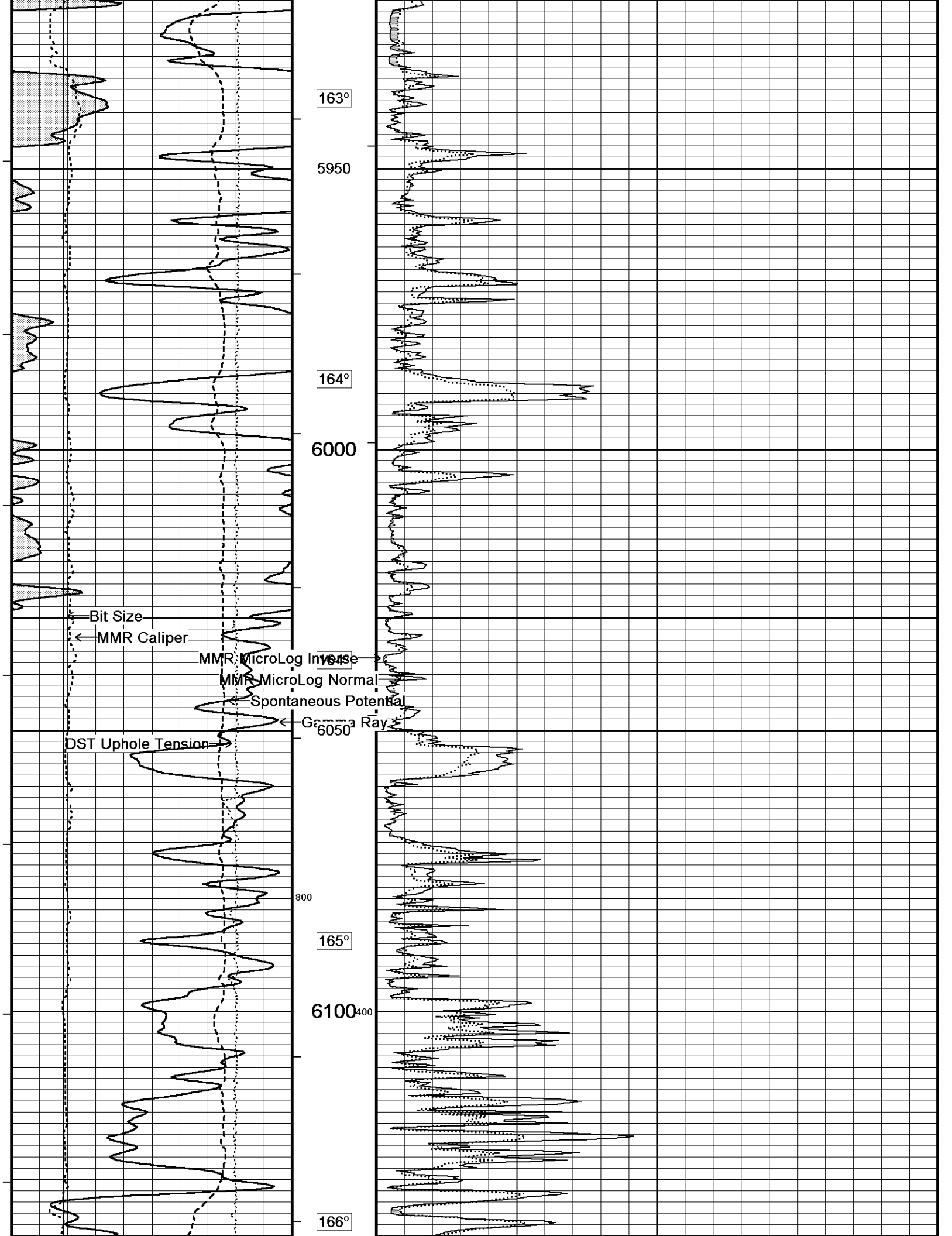
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164°
6000
Bit Size
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Spontaneous Potential
Gamma Ray
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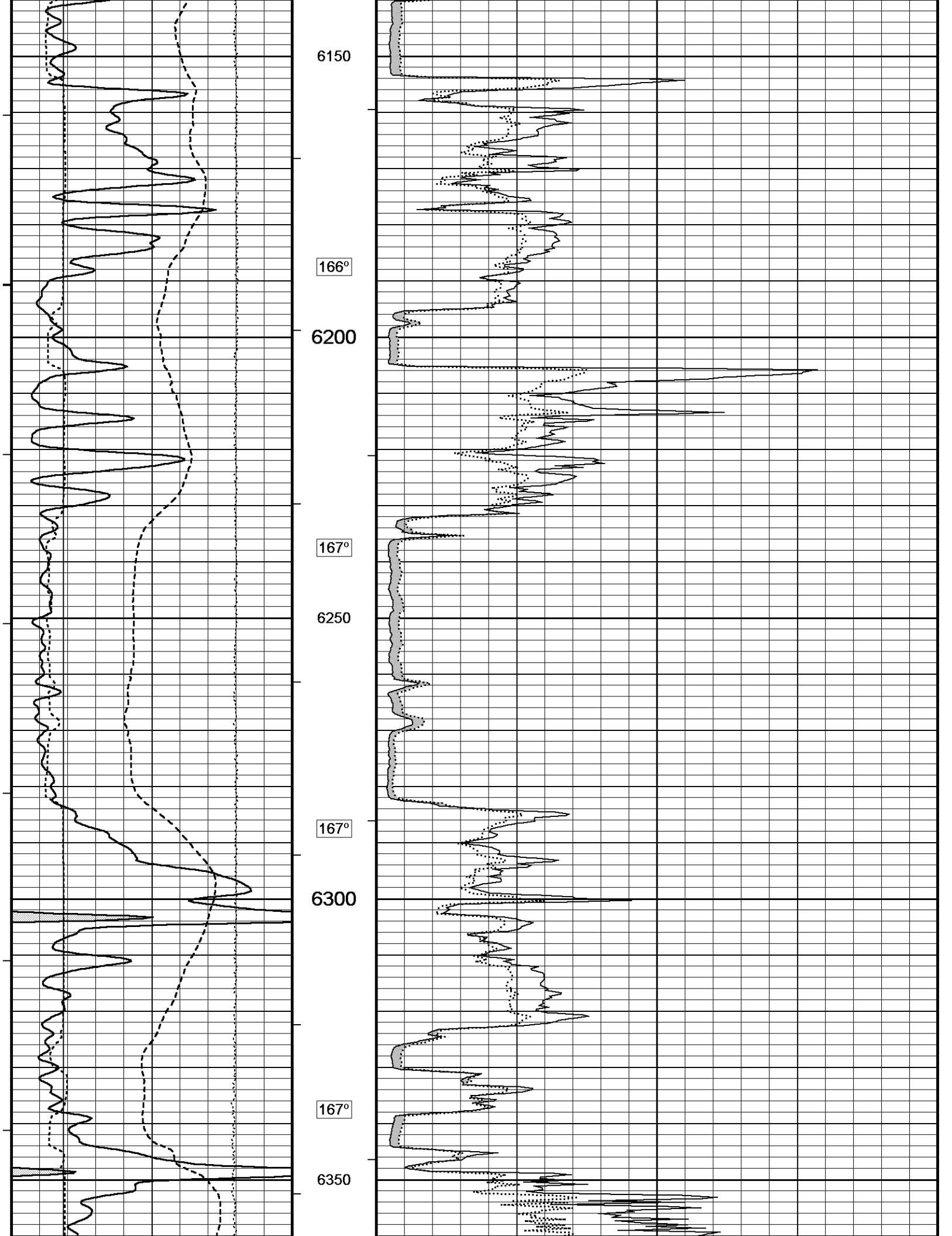
DST Uphole Tension
800
165°
6100
400
166°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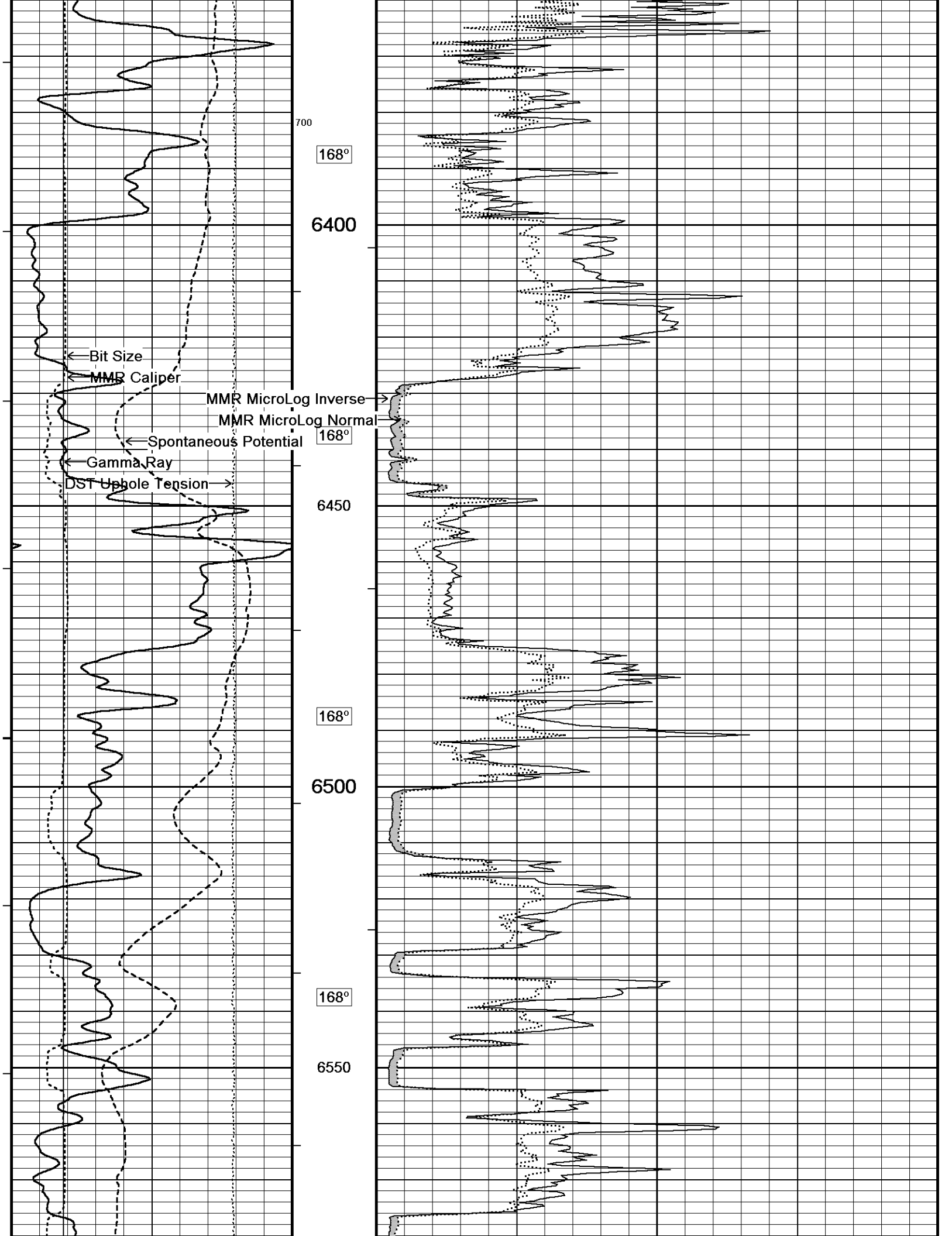
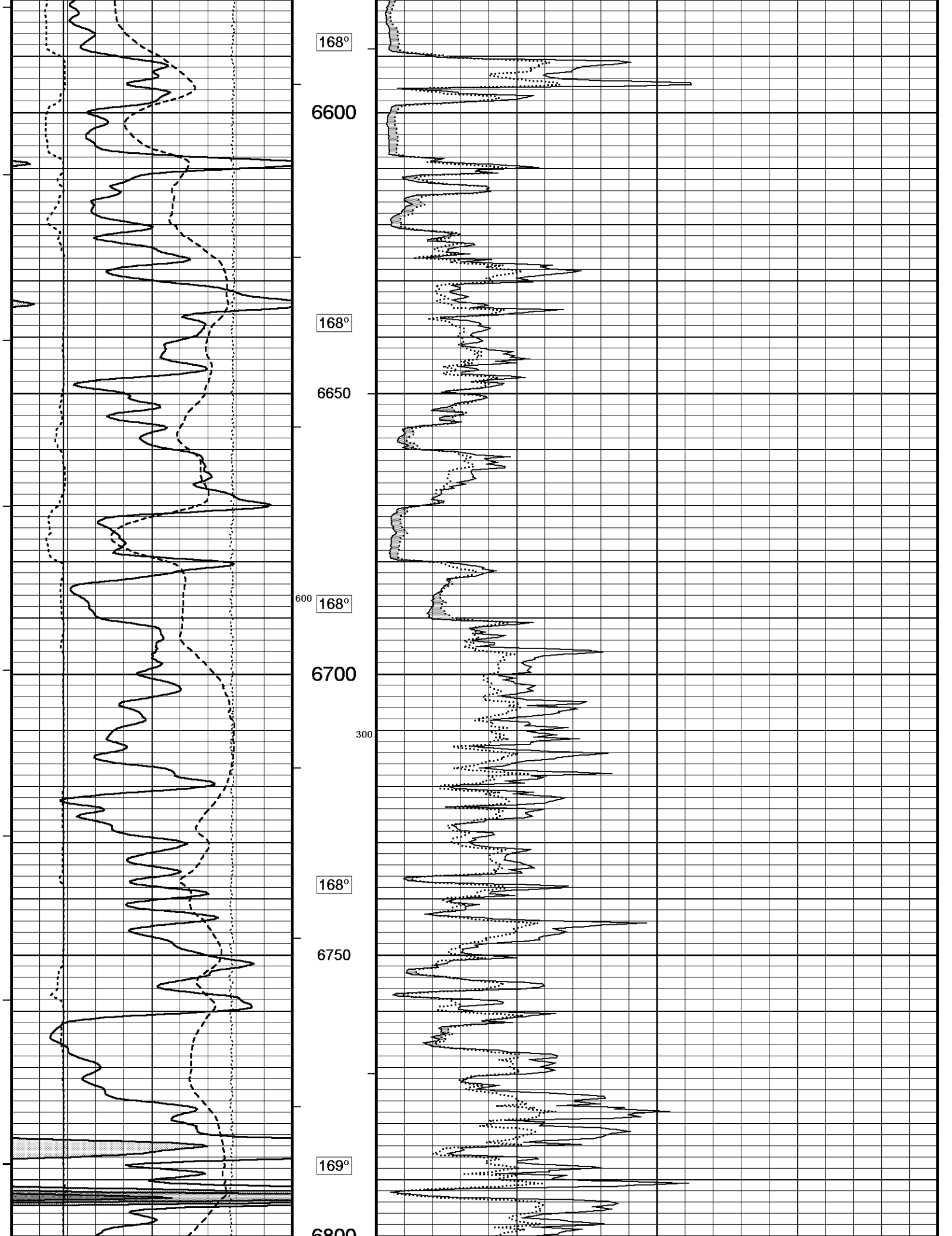

700
168°
6400
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
168°
Spontaneous Potential
Gamma Ray
DST Uphole Tension
6450
168°
6500
168°
6550


168°
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168°
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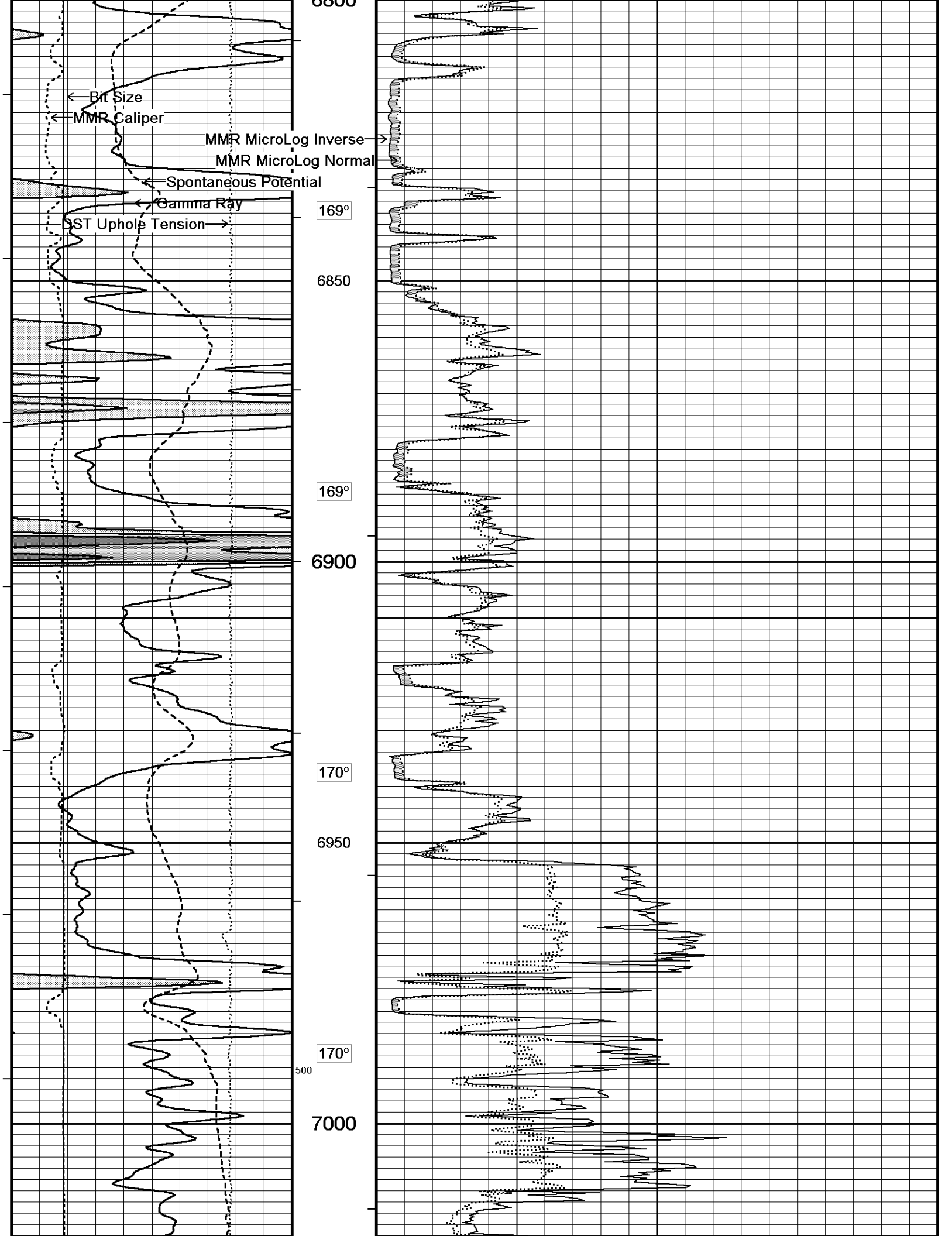
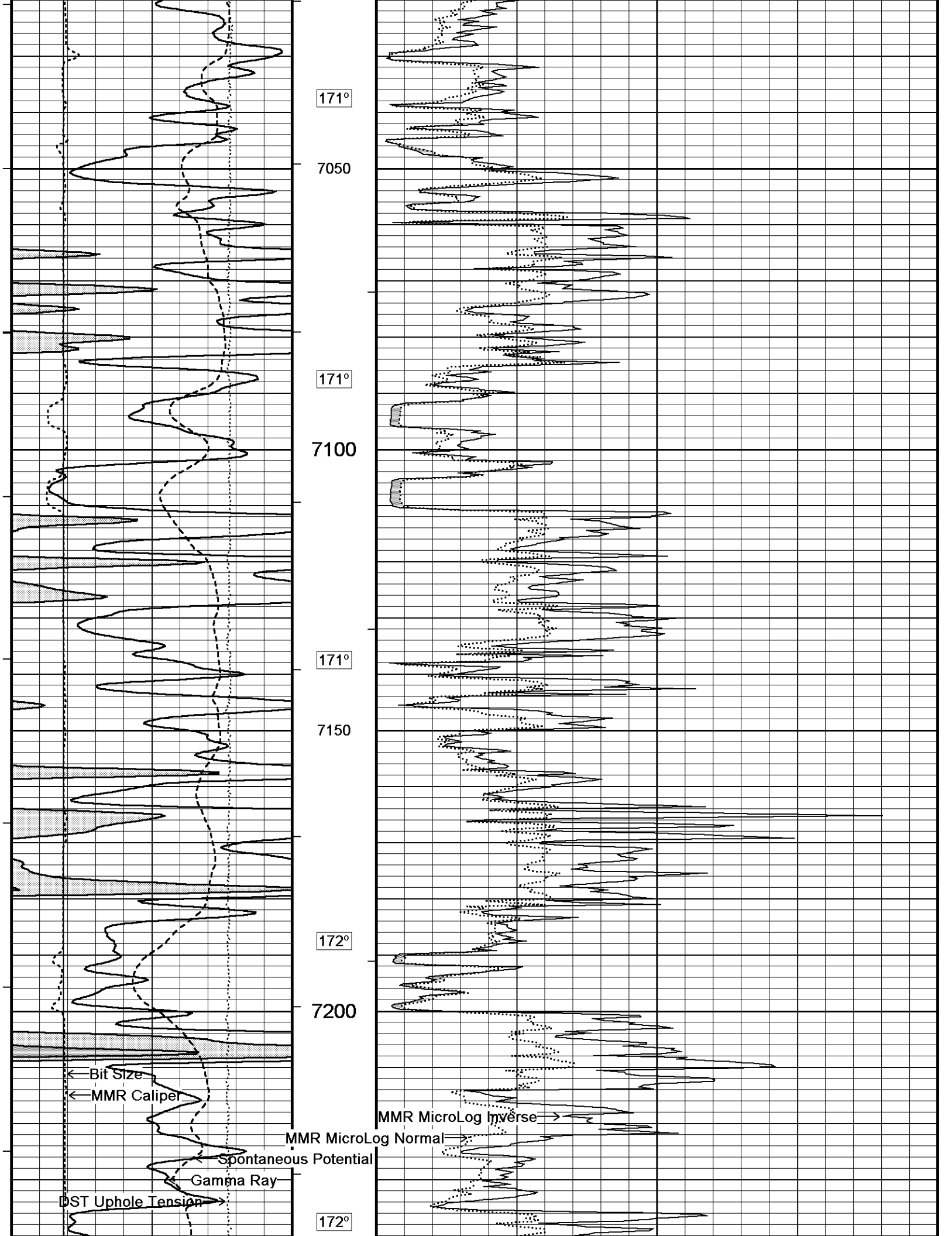
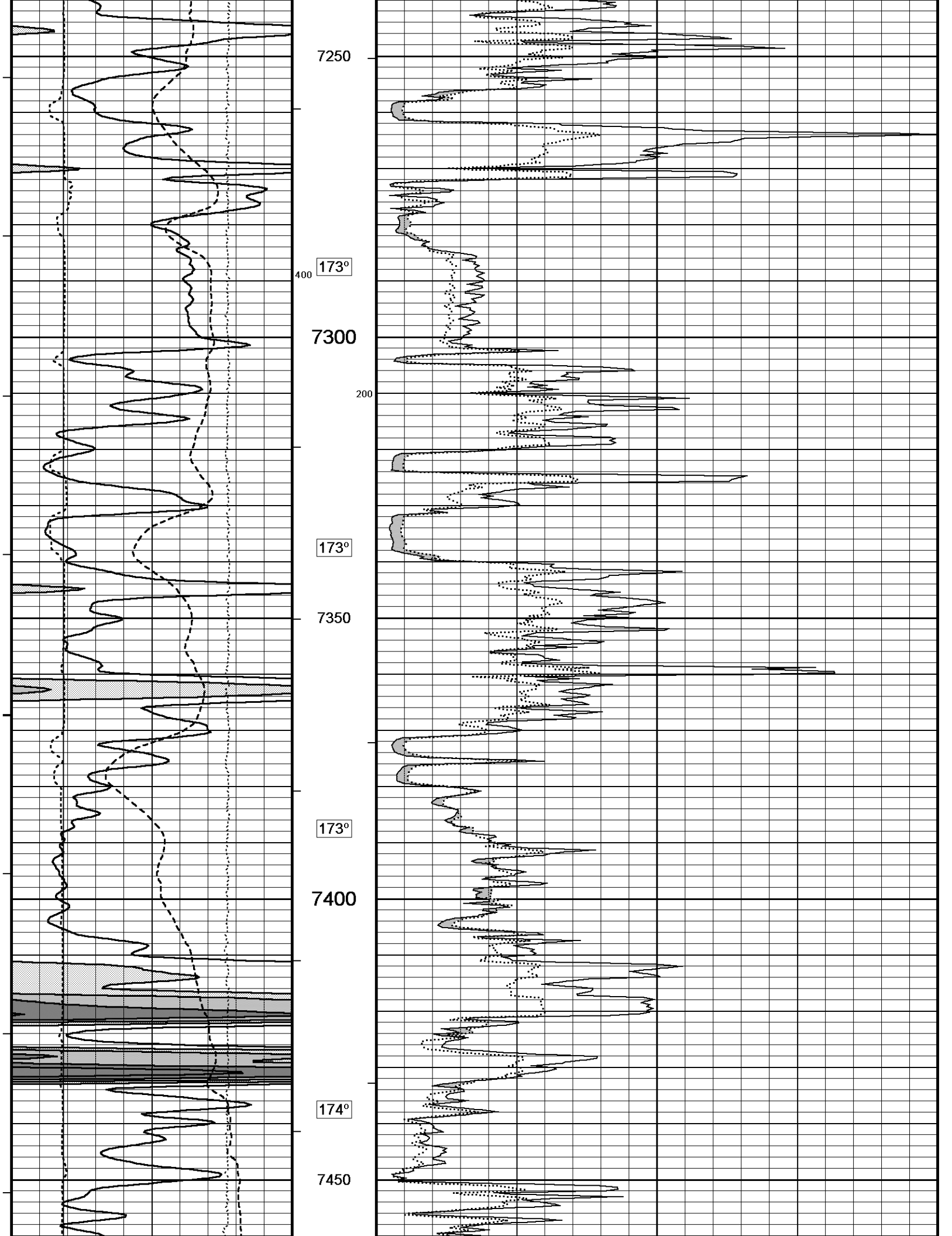
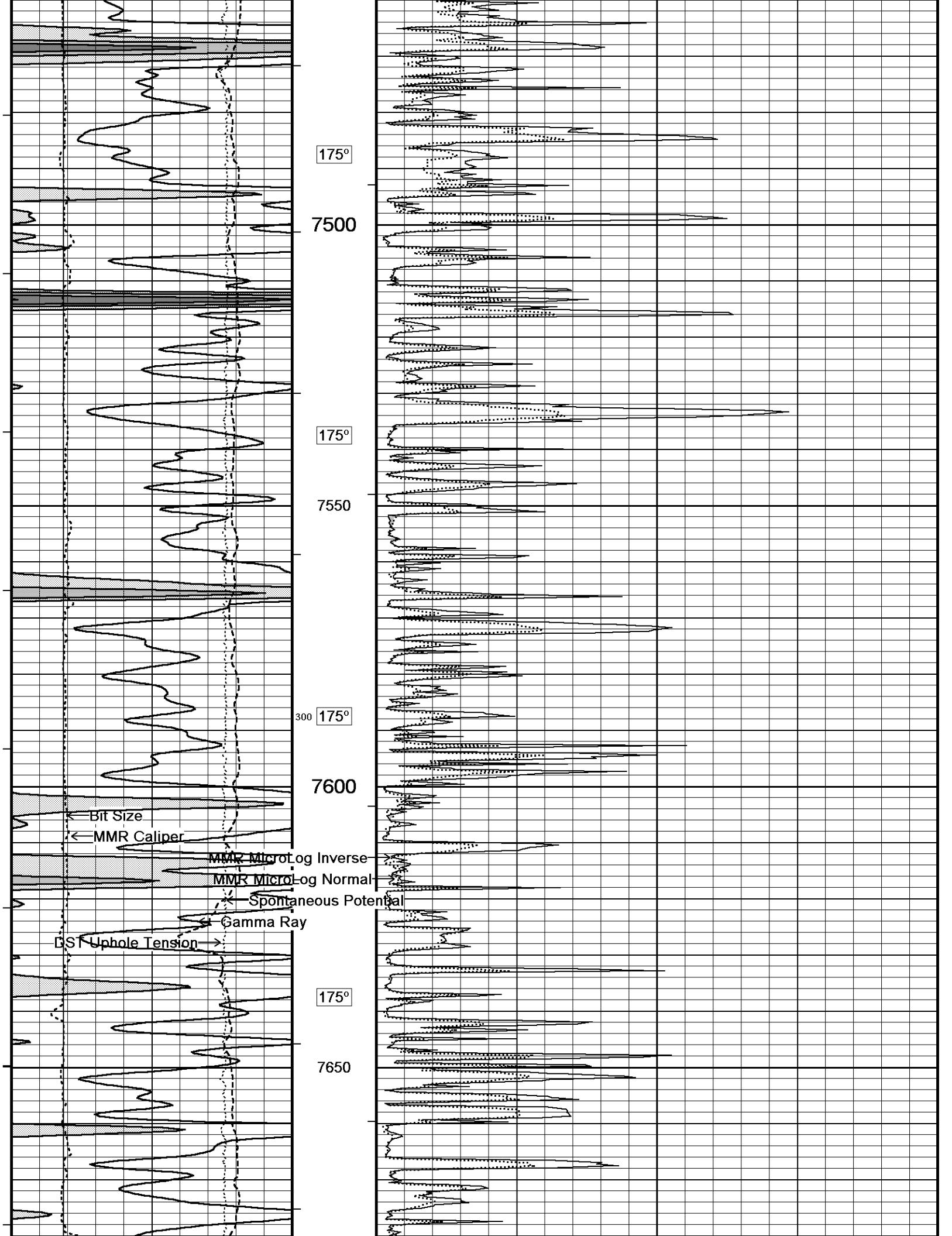
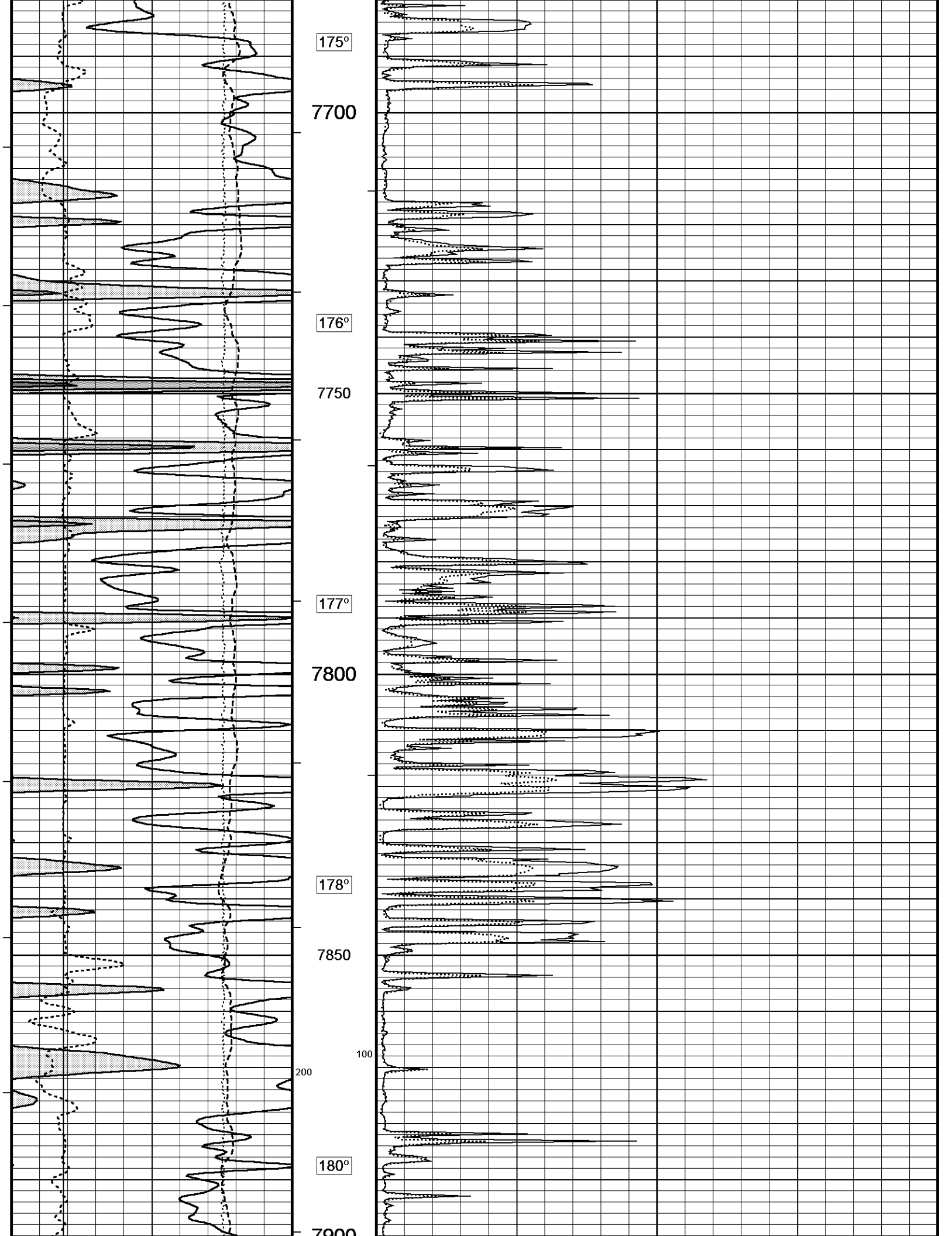
600
168°
6700
300
168°
6750
169°
6800

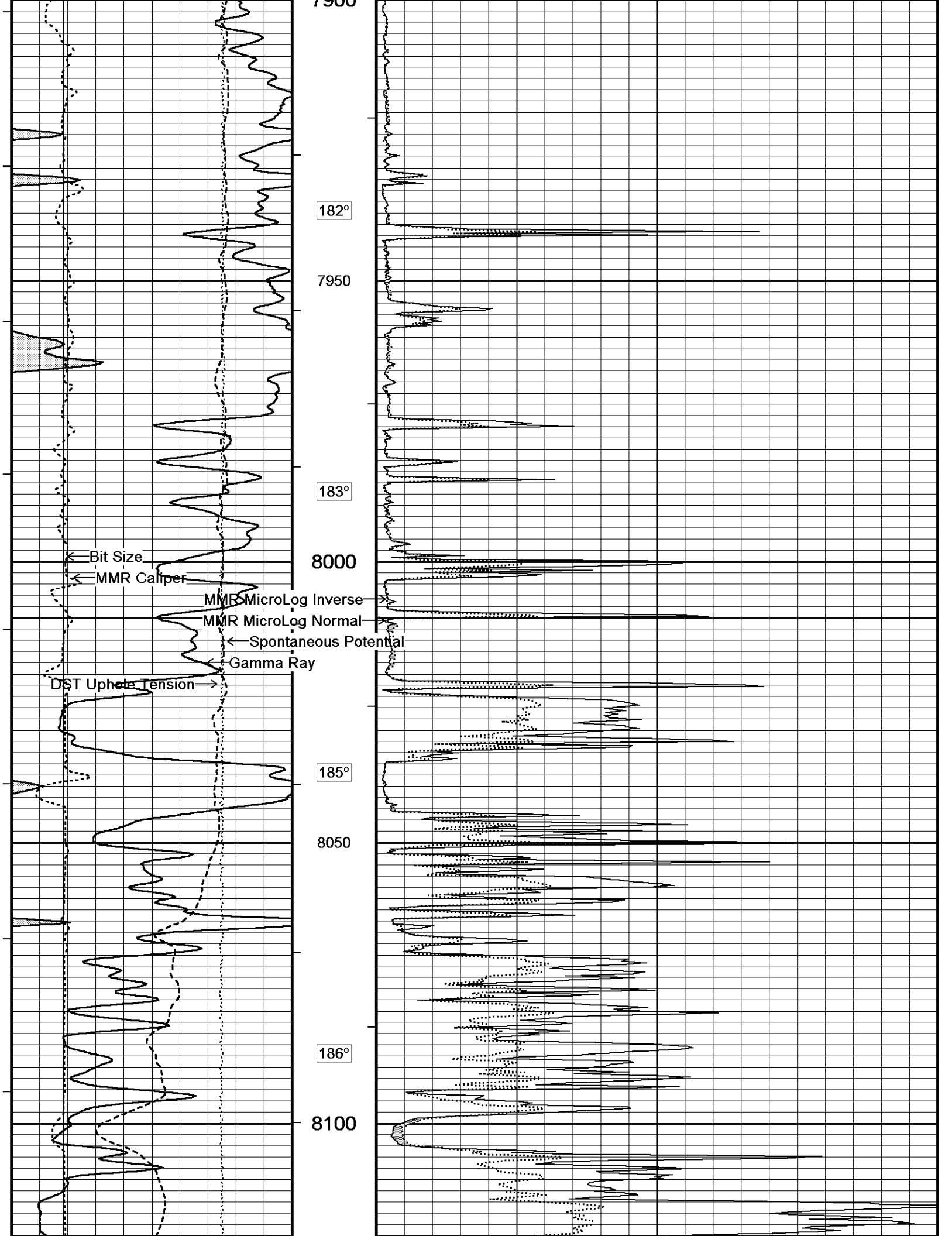

6800
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
SST Uphole Tension
169°
6850
169°
6900
170°
6950
170°
500
7000

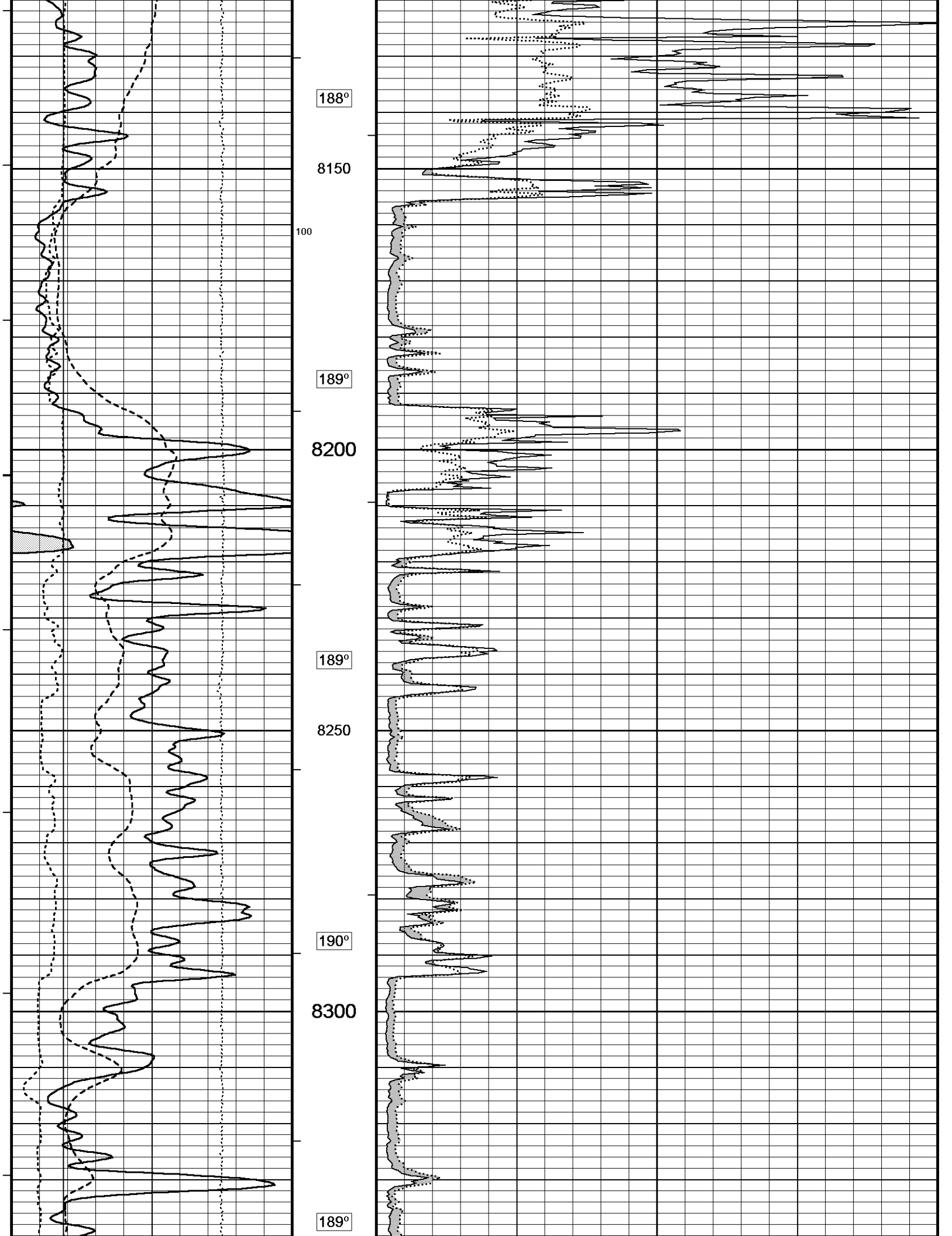

171°
7050
171°
7100
171°
7150
172°
7200
172°
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension

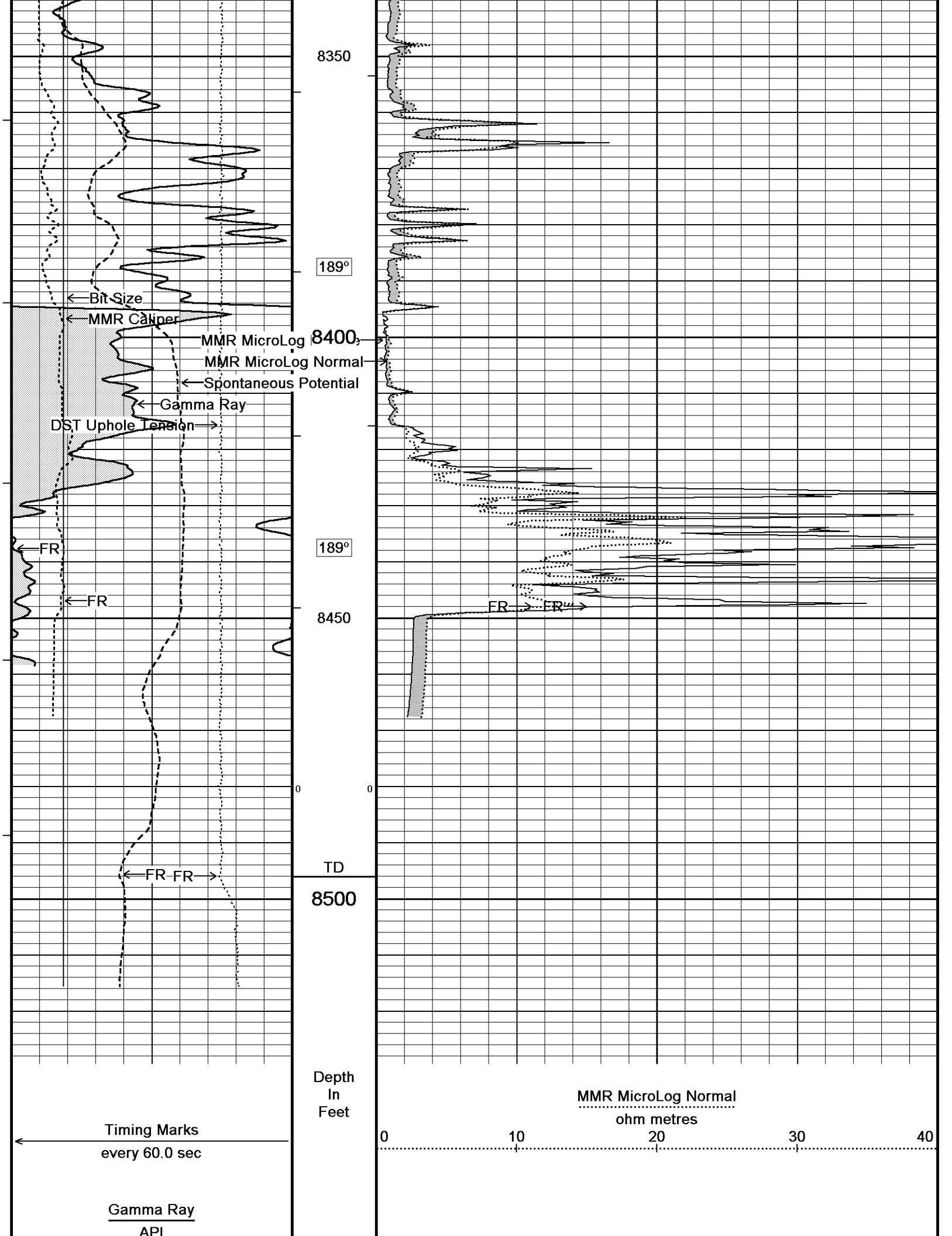

7250
400
173°
7300
200
173°
7350
173°
7400
174°
7450

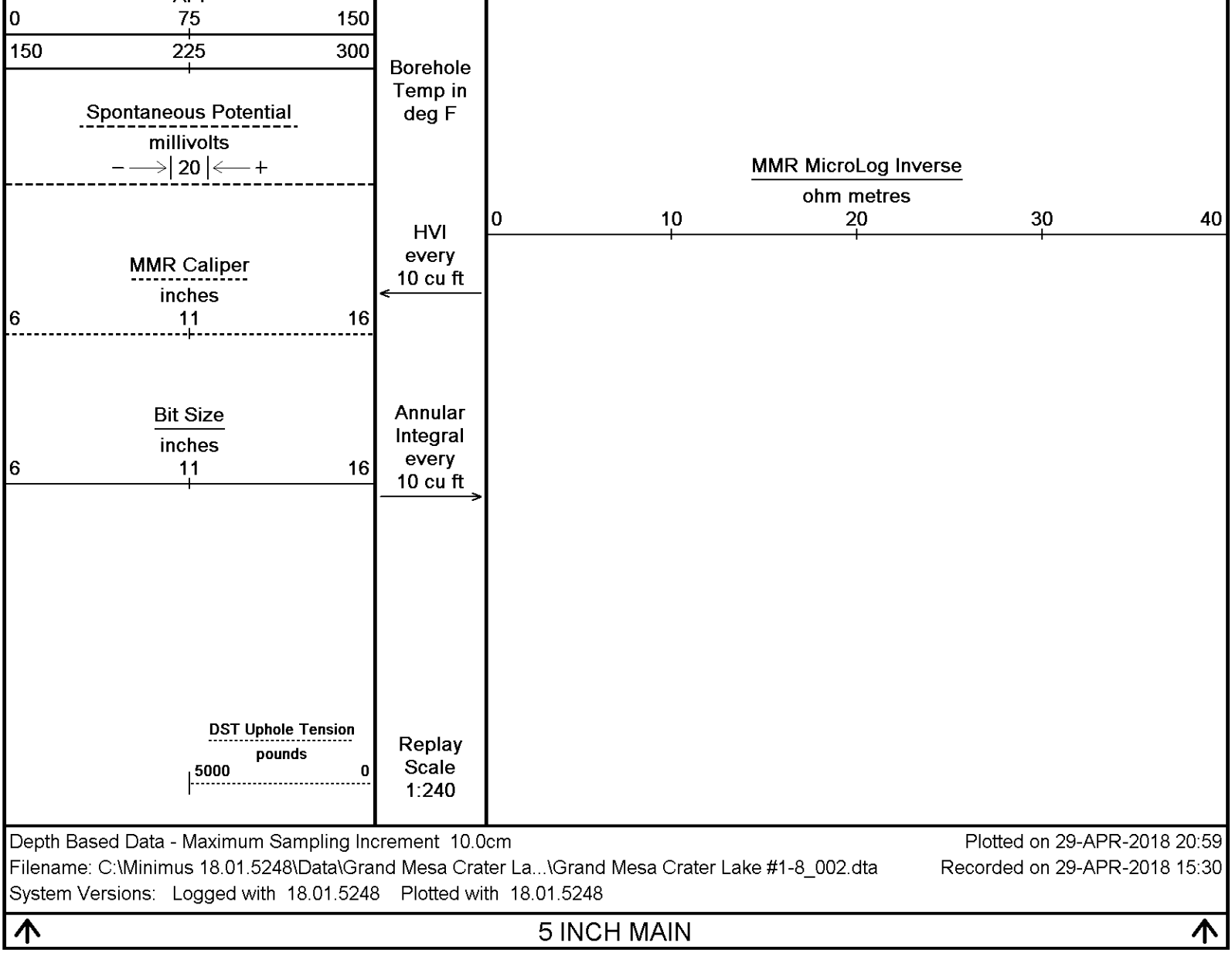

175°
7500
175°
7550
300
175°
7600
Bit Size
MMR Caliper
MMR Microlog Inverse
MMR Microlog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
175°
7650


175°
7700
176°
7750
177°
7800
178°
7850
100
200
180°
7900


7900
182°
7950
183°
8000
185°
8050
186°
8100
Bit Size
MMR Caliper
MMR MicroLog Inverse
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension


188°
8150
100
189°
8200
189°
8250
190°
8300
189°


8350
189°
Bit Size
MMR Caliper
MMR MicroLog
8400
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
FR
189°
FR
8450
FR
FR
0
0
TD
FR
FR
8500
Depth
In
Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
MMR MicroLog Normal
ohm metres
0
10
20
30
40

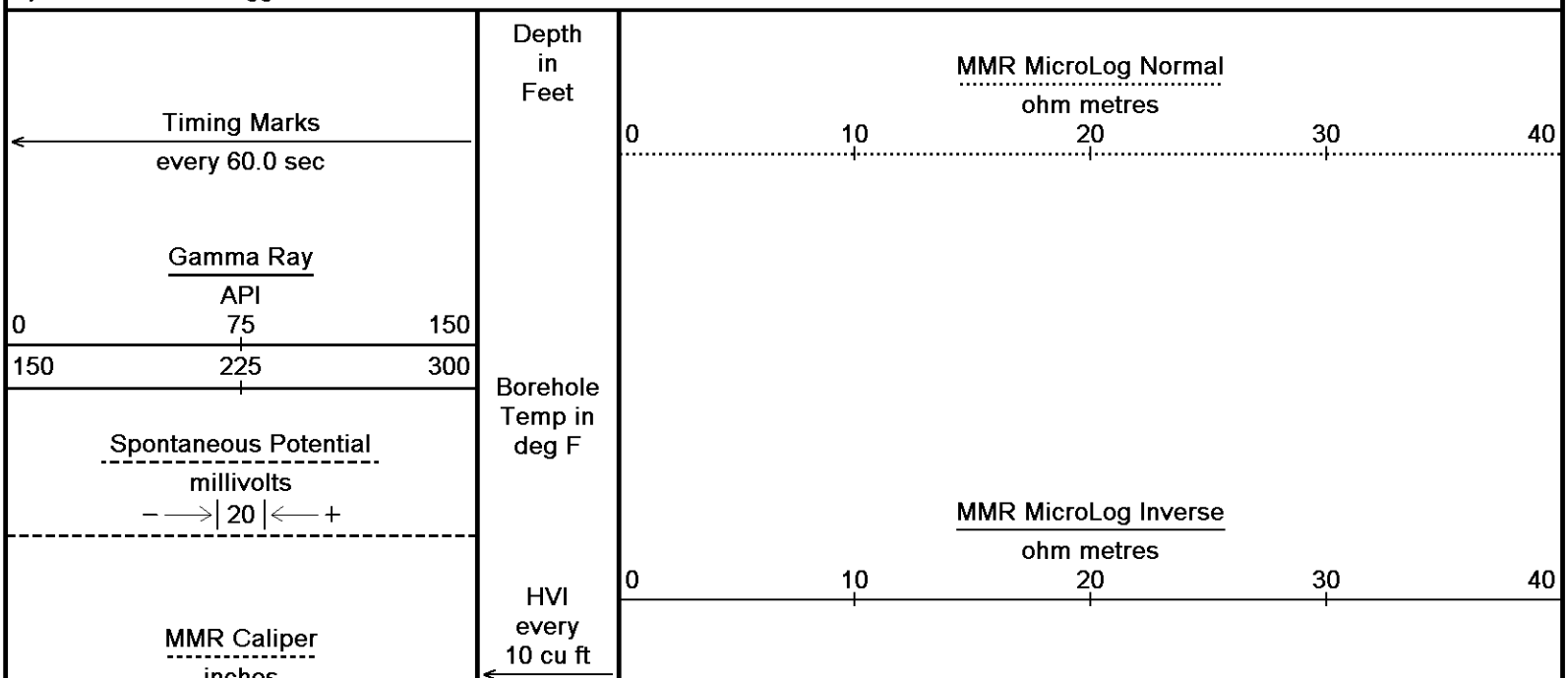


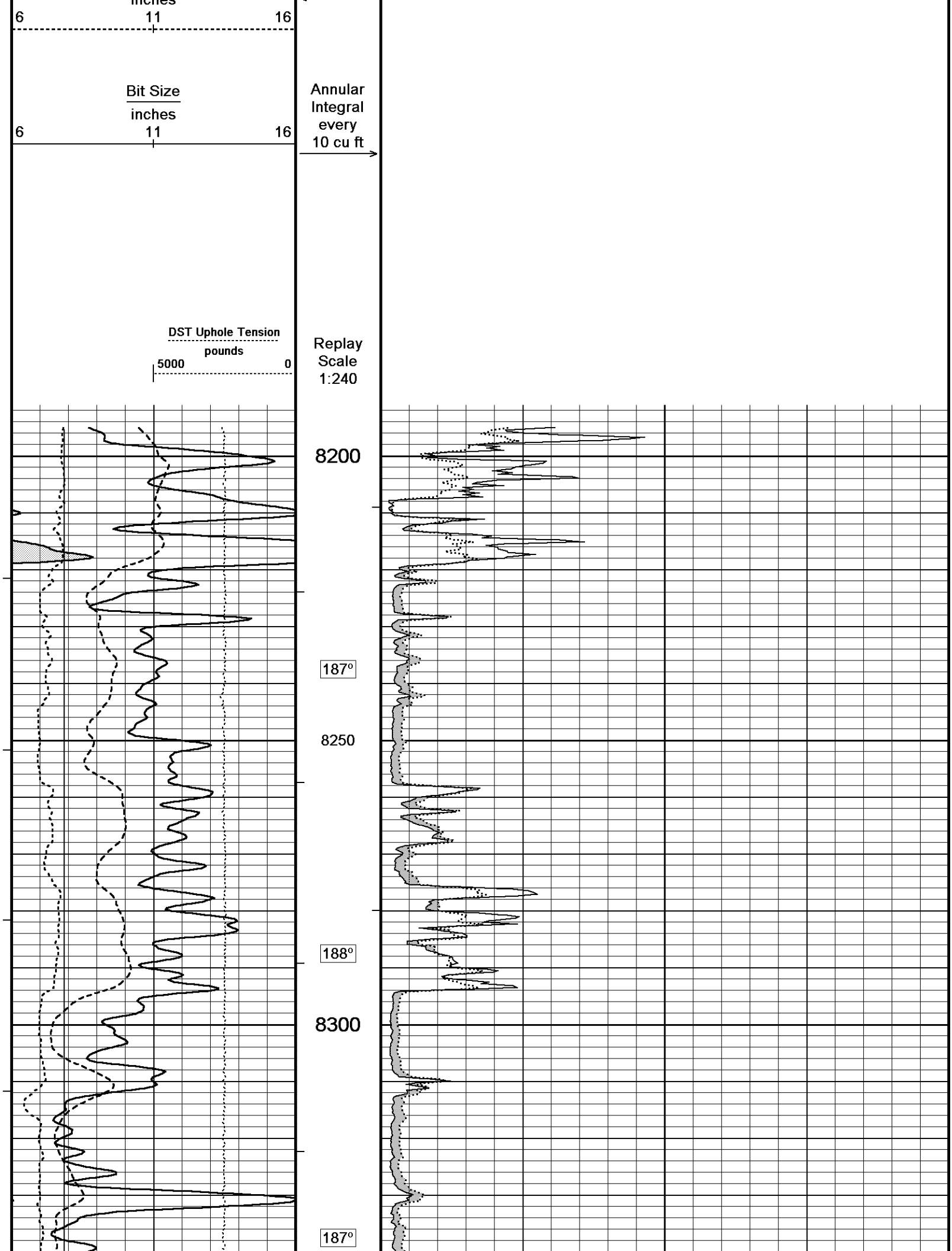
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-APR-2018 20:59
Filename: C:\Minimus 18.01.5248\Data\Grand Mesa Crater La...\Grand Mesa Crater Lake #1-8_002.dta — Recorded on 29-APR-2018 15:30
System Versions: Logged with 18.01.5248 Plotted with 18.01.5248

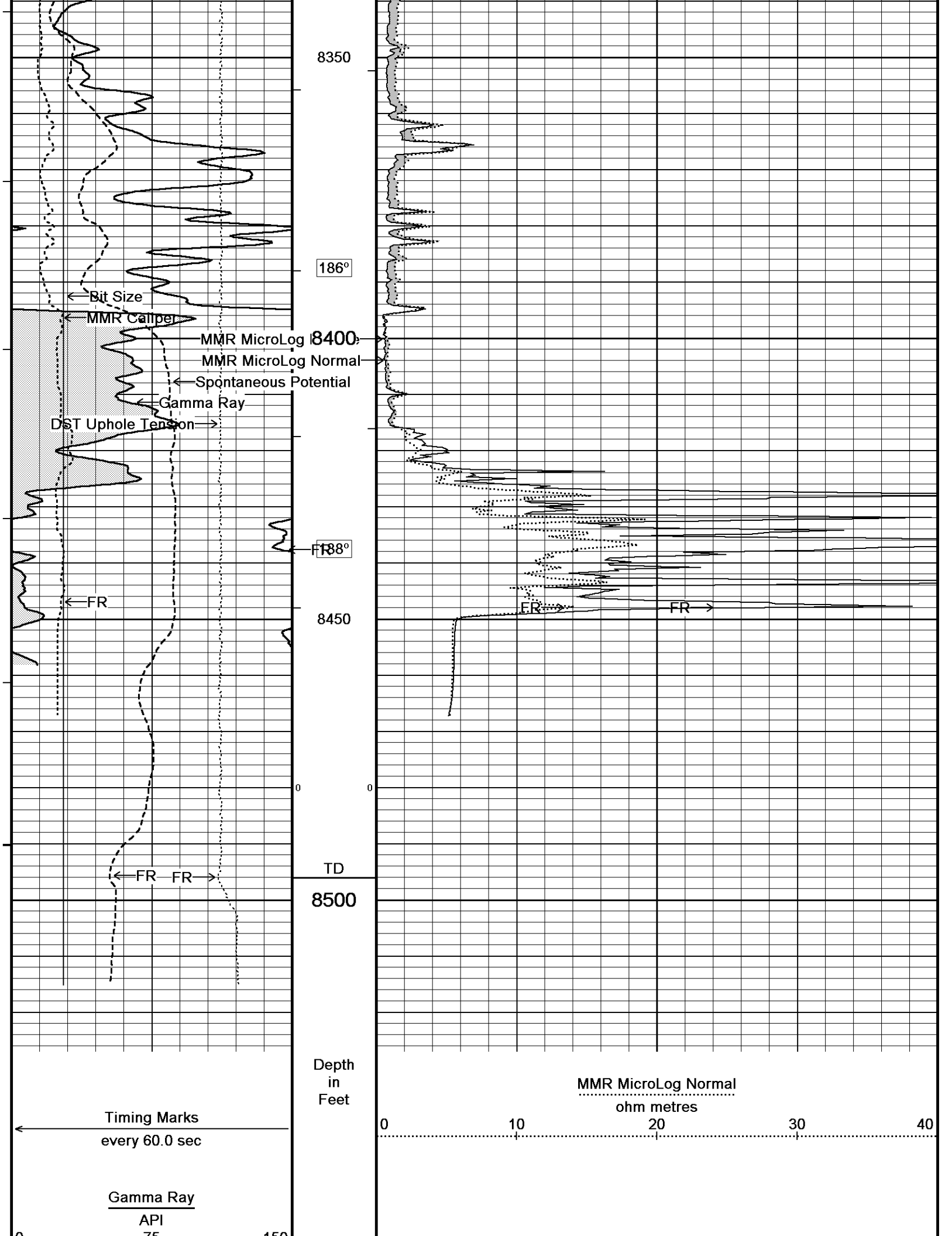
5 INCH MAIN

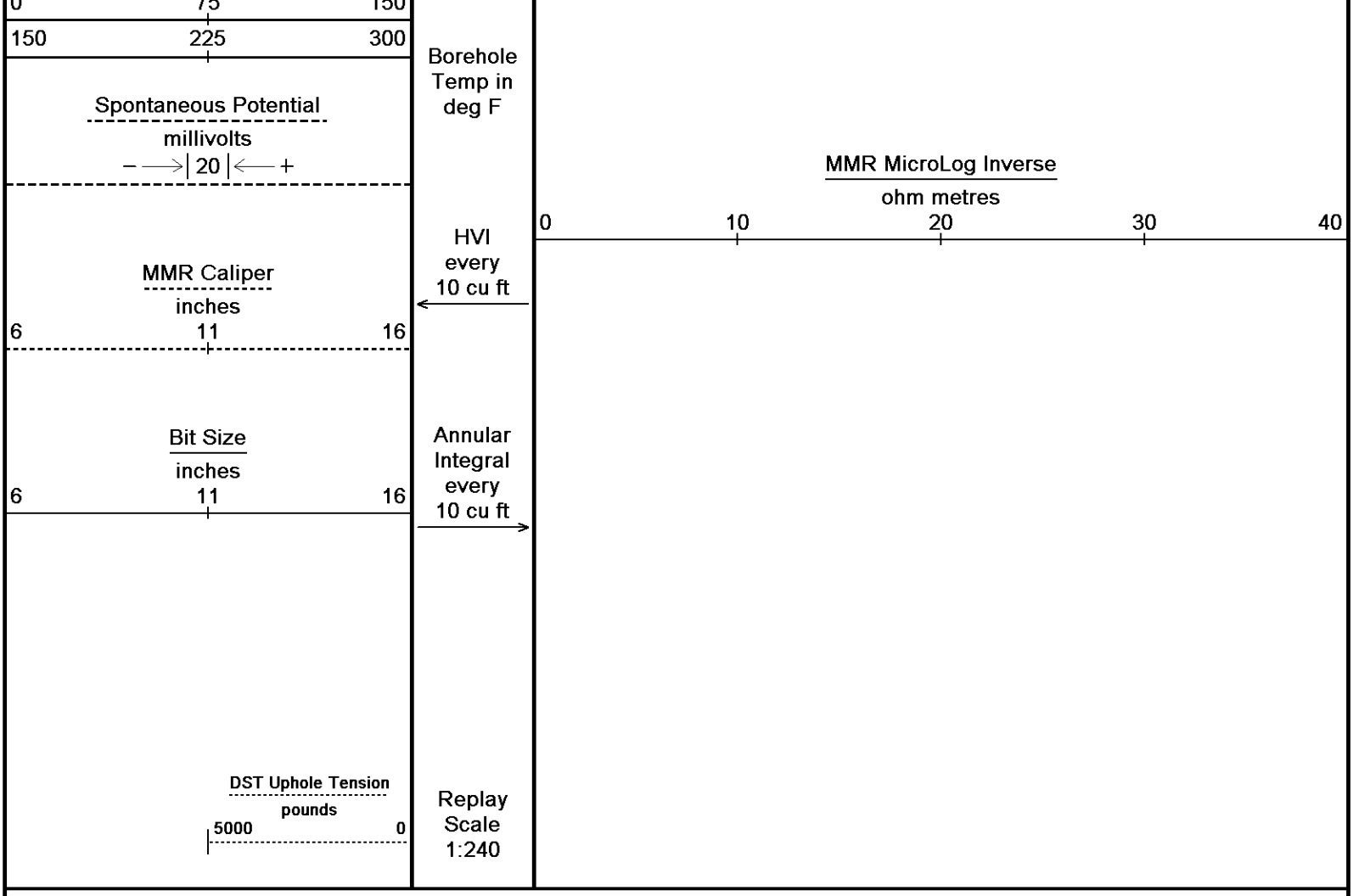
REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-APR-2018 20:59
Filename: C:\Minimus 18.01.5248\Data\Grand Mesa Crater La...\Grand Mesa Crater Lake #1-8_001.dta — Recorded on 29-APR-2018 15:05
System Versions: Logged with 18.01.5248 Plotted with 18.01.5248




inches
6
11
16
Bit Size
inches
6
11
16
Annular
Integral
every
10 cu ft
DST Uphole Tension
pounds
5000
0
Replay
Scale
1:240
8200
187°
8250
188°
8300
187°


8350
186°
Bit Size
MMR Caliper
MMR MicroLog
8400
MMR MicroLog Normal
Spontaneous Potential
Gamma Ray
DST Uphole Tension
FR
188°
FR
8450
0
0
TD
FR
FR
8500
Depth
in
Feet
MMR MicroLog Normal
ohm metres
0
10
20
30
40
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 29-APR-2018 20:59

Filename: C:\Minimus 18.01.5248\Data\Grand Mesa Crater La...\Grand Mesa Crater Lake #1-8_001.dta — Recorded on 29-APR-2018 15:05

System Versions: Logged with 18.01.5248 Plotted with 18.01.5248

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION

C:\Minimus 18.01.5248\Data\Grand Mesa Crater Lake #1-8\Grand Mesa Crater Lake #1-8_001.dta

General Constants All 000

Last Edited on 29-APR-2018,14:19

General Parameters		
Mud Resistivity	0.940	ohm-metres
Mud Resistivity Temperature	75.000	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	None	
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	

Gamma Calibration MCG-D.J 422

Field Calibration on 29-APR-2018 05:25

	Measured	Calibrated (API)
Background	90	63

Background	90	63
Calibrator (Gross)	742	519
Calibrator (Net)	653	456

Gamma Calibration Tolerances MCG-D.J 422

Ratio	1.431	1.40 / 1.475 / 1.55	Counts/API

Gamma Constants MCG-D.J 422

Last Edited on 29-APR-2018,12:43

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	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.J 422

Field Calibration on 13-APR-2018,06:34

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

High Resolution Temperature Constants MCG-D.J 422

Last Edited on 07-DEC-2017,17:17

Pre-filter Length	11

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

Base Calibration on 13-APR-2018 05:15
Field Check on 29-APR-2018 05:47

	Resistor 1 (ohm)	Resistor 2 (ohm)
	10.0	50.0

Base Calibration

		Measured		Calibrated (ohm-m)
Micro Normal	10.3	49.8	5.1	25.6
Micro Inverse	10.0	49.4	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.9	93.9
Micro Inverse	62.4	62.4

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91

Micro Normal Res. 1	10.3	-5% / 10.0 / +5%	ohm	Micro Normal Res. 2	49.8	-5% / 50.0 / +5%	ohm
Micro Inverse Res. 1	10.0	-5% / 10.0 / +5%	ohm	Micro Inverse Res. 2	49.4	-5% / 50.0 / +5%	ohm

Micro Normal Base Check	93.9	-2% / 93.30 / +2%	ohm-m
Micro Inverse Base Check	62.4	-2% / 62.24 / +2%	ohm-m
Micro Normal Field Check	93.9	-2% / 93.9 / +2%	ohm-m
Micro Inverse Field Check	62.4	-2% / 62.4 / +2%	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 13-APR-2018 05:09
Field Calibration on 29-APR-2018 05:46

Base Calibration

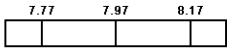
Reading No	Measured	Calibrator Size (in)
1	13869	5.98
2	17211	7.97
3	20545	9.86
4	24538	11.92
5	0	0.00
6	N/A	N/A

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



Caliper Calibration MPD-C.A 216

Base Calibration on 06-APR-2018 10:55
Field Calibration on 29-APR-2018 05:40

Base Calibration

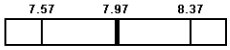
Reading No	Measured	Calibrator Size (in)
1	13889	3.99
2	22592	5.98
3	31350	7.97
4	39584	9.86
5	48879	11.92
6	N/A	N/A

Field Calibration

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

Caliper Calibration Tolerances MPD-C.A 216

Long Arm Field Cal. 7.99 in



DOWNHOLE EQUIPMENT

C:\Minimus 18.01.5248\Data\Grand Mesa Crater Lake #1-8\Grand Mesa Crater Lake #1-8_001.dta

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

Compact Swivel Head Adaptor
SHA-J.B 724 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.J 422 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: 2.913 in

Compact Knuckle Joint
SKJ-D.A 167 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

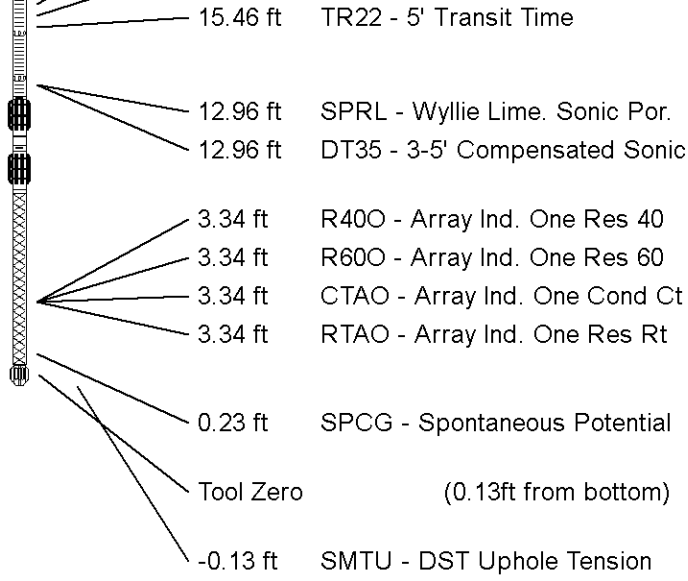
Compact Focussed Electric
MFE-A.A 135 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic
MSS-C.K 319 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in

58.18 ft GRGC - MCG Gamma Ray
55.28 ft CGXT - MCG External Temperature
48.92 ft MBTC - MMR Caliper
47.93 ft MINV - Micro-inverse
47.93 ft MNRL - Micro-normal
43.13 ft NPRL - Limestone Neutron Por.
35.89 ft AVOL - Annular Volume
35.89 ft HVOL - Hole Volume
35.89 ft CLDC - Density Caliper
33.96 ft DPRL - Limestone Density Por.
33.96 ft DEN - Compensated Density
33.96 ft DCOR - Density Correction
33.90 ft PDPE - PE
26.24 ft FEFE - Shallow FE
16.96 ft TR11 - 4' Transit Time
16.46 ft TR21 - 3' Transit Time
15.95 ft TR12 - 6' Transit Time

Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 68.16 ft Weight: 526.9 lb



All measurements relative to tool zero.

COMPANY	GRAND MESA OPERATING COMPANY
WELL	CRATER LAKE #1-8
FIELD	WILDCAT
PROVINCE/COUNTY	LINCOLN
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	5423	feet	First Reading	8448.00	feet
Elevation Drill Floor	5421	feet	Depth Driller	8495.00	feet
Elevation Ground Level	5404	feet	Depth Logger	8496.00	feet

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