

**Weatherford****ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG**

COMPANY				M & M EXPLORATION, INC.			
WELL				Z-BAR 21-8			
FIELD				AETNA GAS AREA			
PROVINCE/COUNTY				BARBER			
COUNTRY/STATE				U.S.A. / KANSAS			
LOCATION				1975' FNL & 380' FEL NE/4			
SEC	TWP	RGE	Other Services				
21	34S	15W	MPD/MDN				
API Number		15-007-24066		MML			
Permit Number				MSS			
Permanent Datum GL, Elevation 1557 feet							
Log Measured From KB							
Drilling Measured From KB @ 10 FEET							
Date	24-OCT-2013					Elevations:	feet
Run Number	ONE					KB	1567.00
Service Order	3541145					DF	1565.00
Depth Driller	5050.00					GL	1557.00
Depth Logger	5053.00						
First Reading	5050.00						
Last Reading	920.00						
Casing Driller	930.00						
Casing Logger	939.00						
Bit Size	7.875						
Hole Fluid Type	CHEMICAL						
Density / Viscosity	9.20 lb/USg		52.00 CP				
PH / Fluid Loss	10.30		8.00 ml/30Min				
Sample Source	FLOWLINE						
Rm @ Measured Temp	0.80 @ 72.0					ohm-m	
Rmf @ Measured Temp	0.64 @ 72.0					ohm-m	
Rmc @ Measured Temp	0.96 @ 72.0					ohm-m	
Source Rmf / Rmc	CALC		CALC				
Rm @ BHT	0.49 @ 117.0		ohm-m				
Time Since Circulation	4 HOURS						
Max Recorded Temp	117.00		deg F				
Equipment / Base	13057		KANSAS				
Recorded By	JIM SCHULER					JOHN LAPOINT	
Witnessed By	BILL BUSCH						
IOB #	LB13-301						

BOREHOLE RECORD

Last Edited: 24-OCT-2013 06:17

Bit Size inches	Depth From feet	Depth To feet
7.875	939.00	5053.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	939.00	24.00

REMARKS

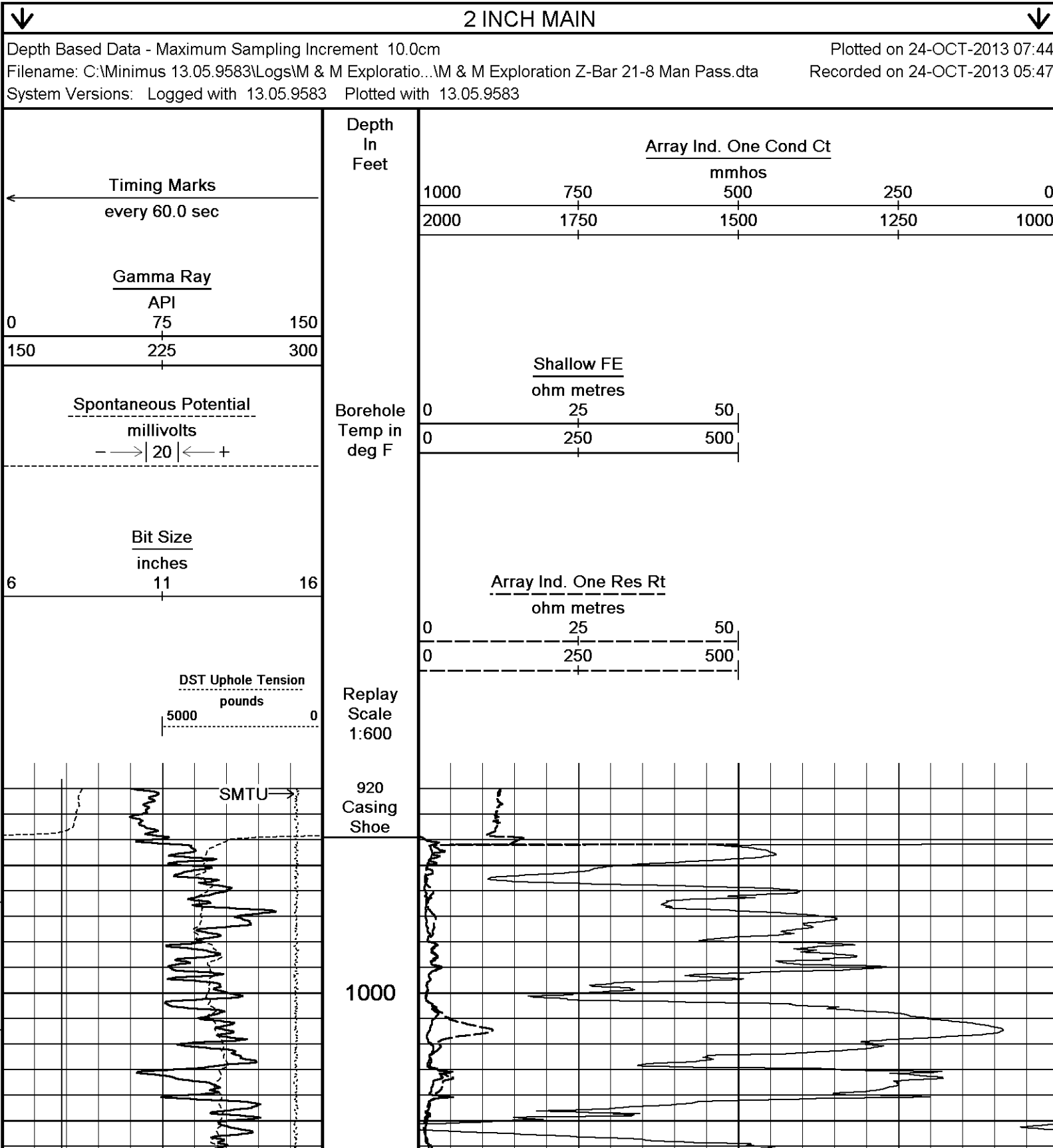
- SOFTWARE ISSUE: WLS 13.05.9583.
- MCG, MML, MDN, MPD, MFE, MSS, MAI RAN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 - 0.5 INCH STANDOFF USED ON MFE.
 - TWO 0.5 INCH STANDOFFS USED ON MSS.
 - 0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- 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 3900 FEET: 390 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO 3900 FEET: 205 CU. FT.

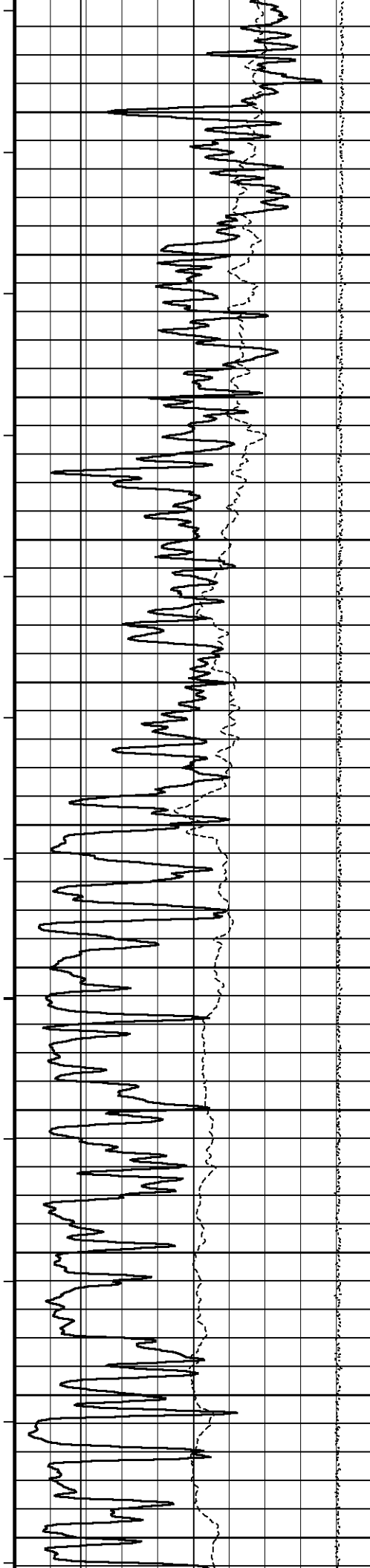
- RIG: HARDT DRILLING 1

- ENGINEER: J. SCHULER AND J. LAPOINT

- OPERATOR(S): C. RAMIREZ

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.





94°

1100

95°

1200

95°

1300

95°

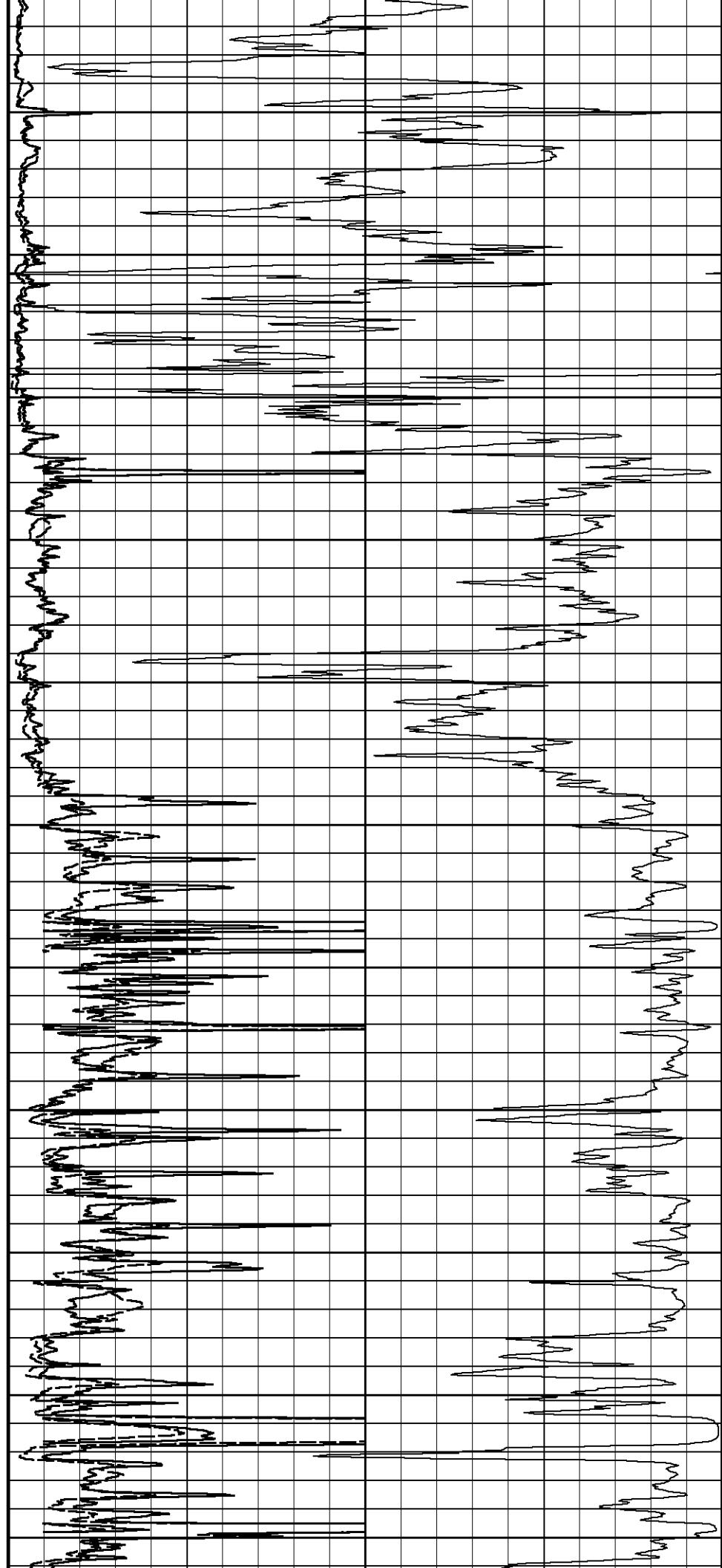
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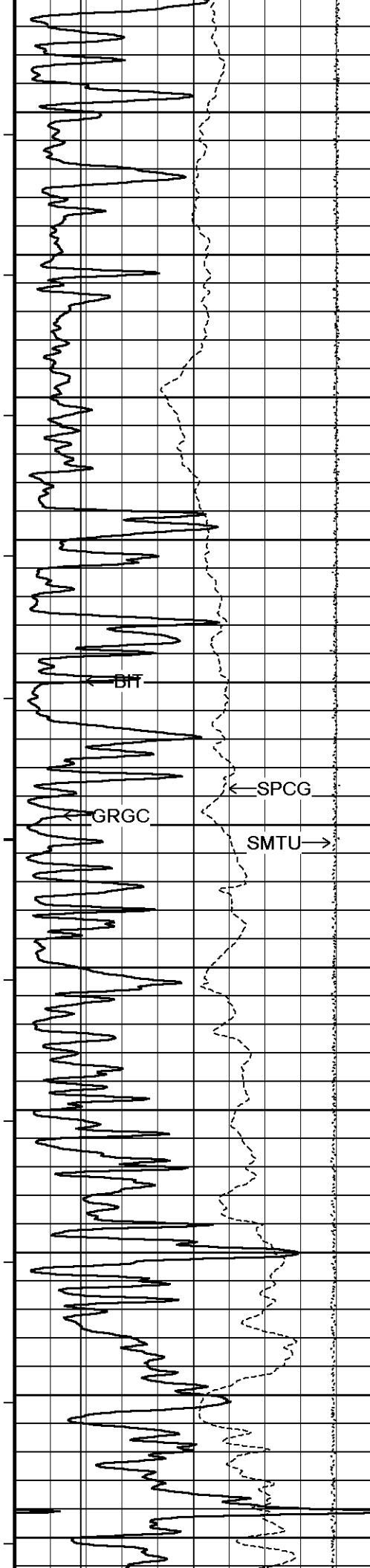
95°

1500

95°

1600





95°

1700

95°

1800

96°

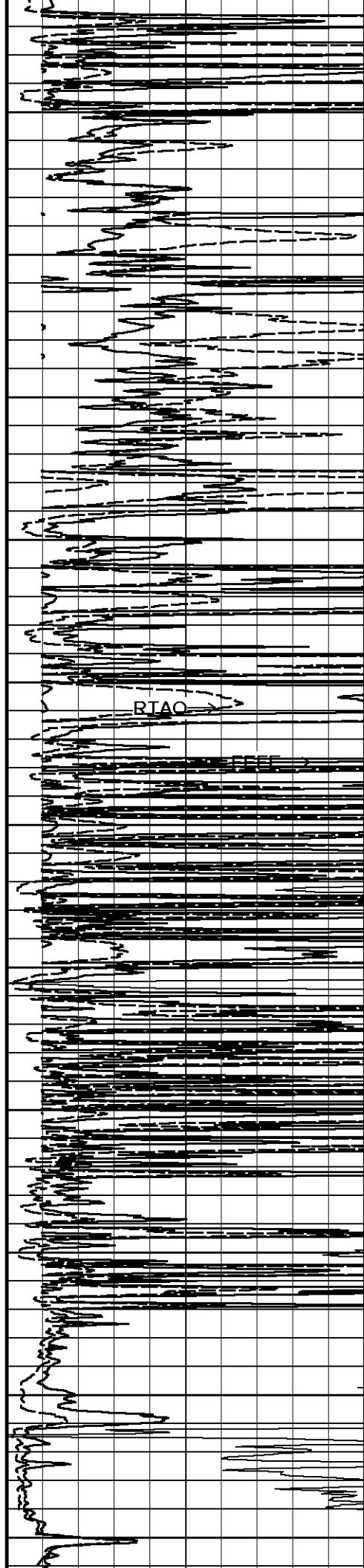
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97°

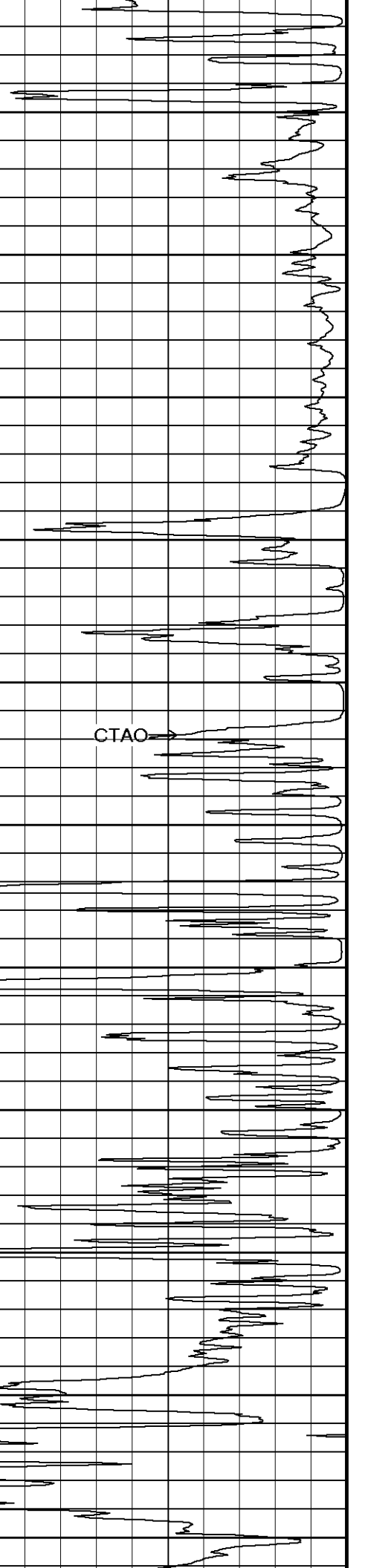
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98°

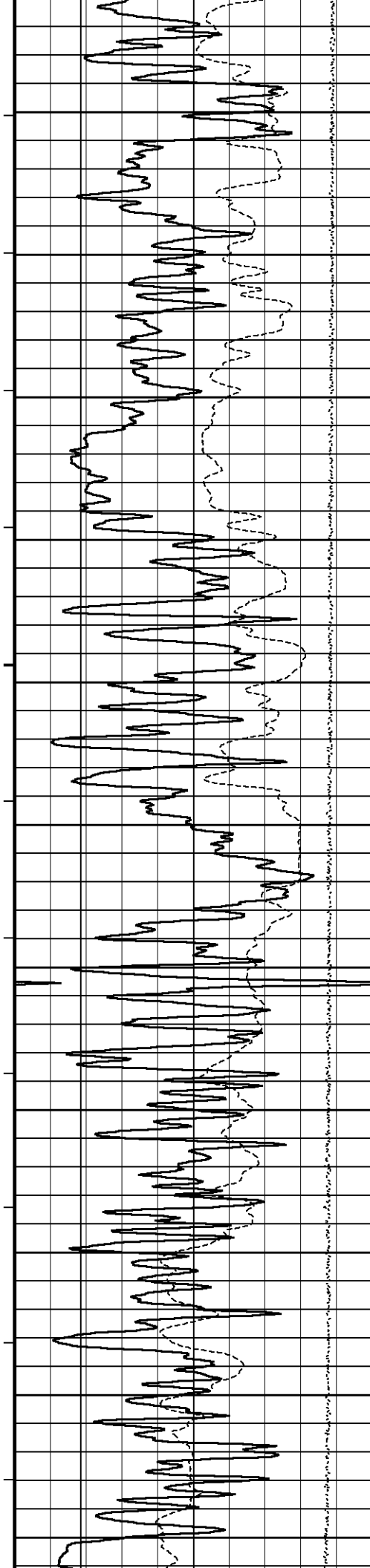
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RTAO



CTAO



98°

2200

99°

2300

99°

2400

100°

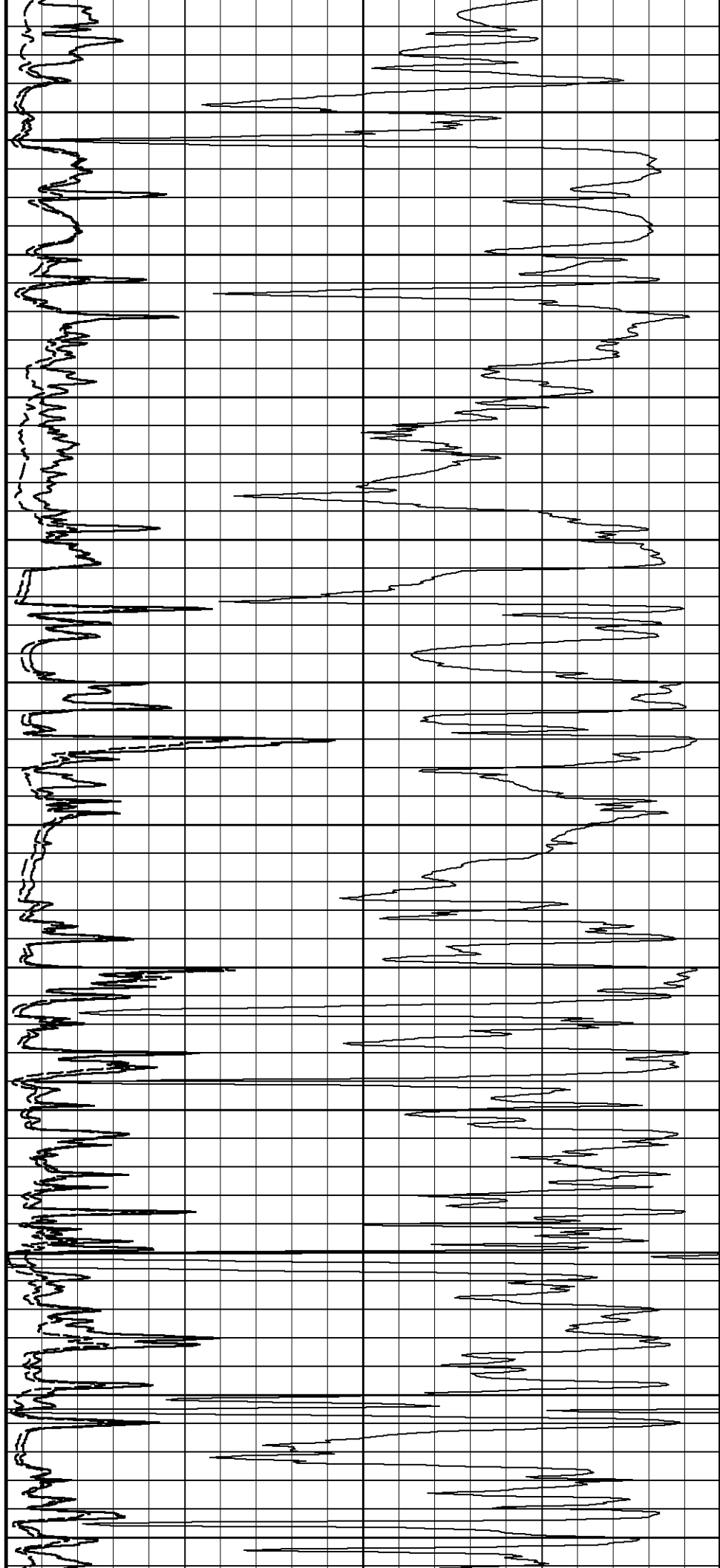
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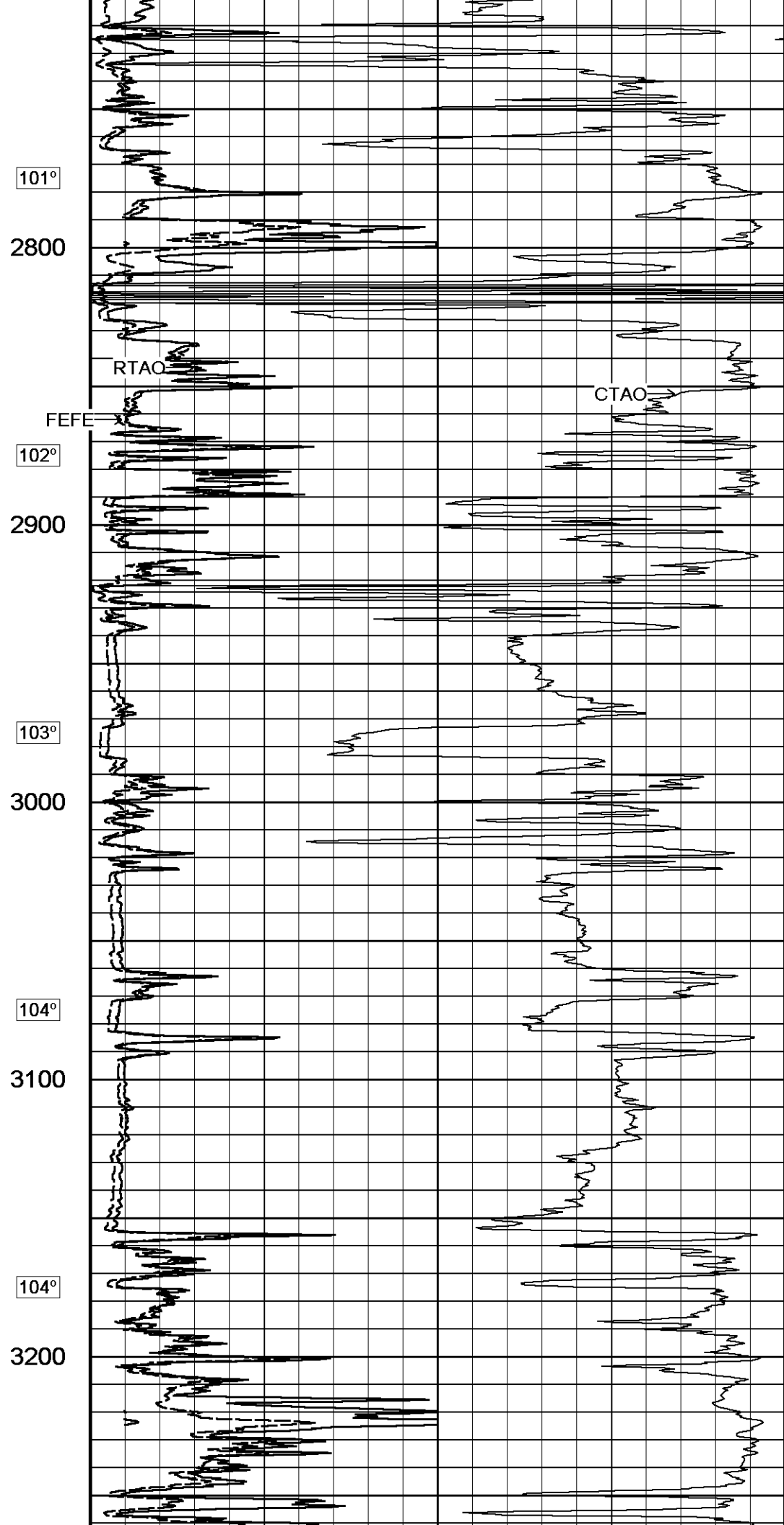
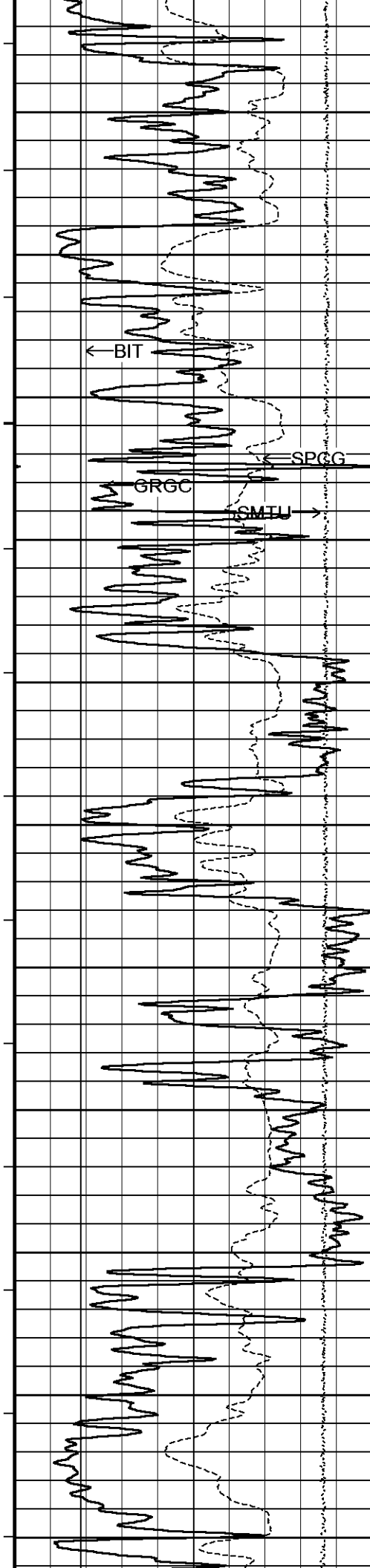
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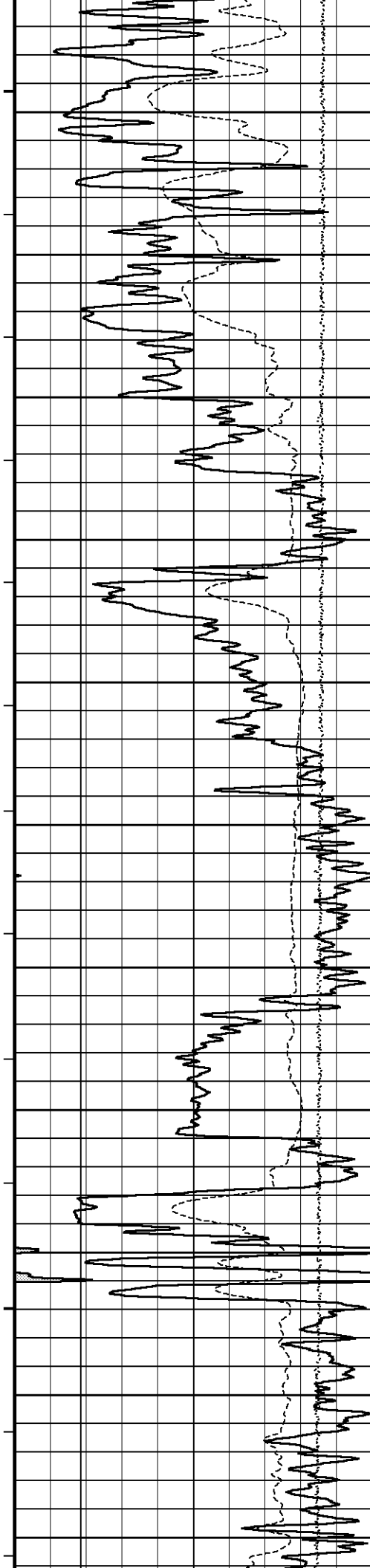
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100°

2700







105°

3300

106°

3400

107°

3500

108°

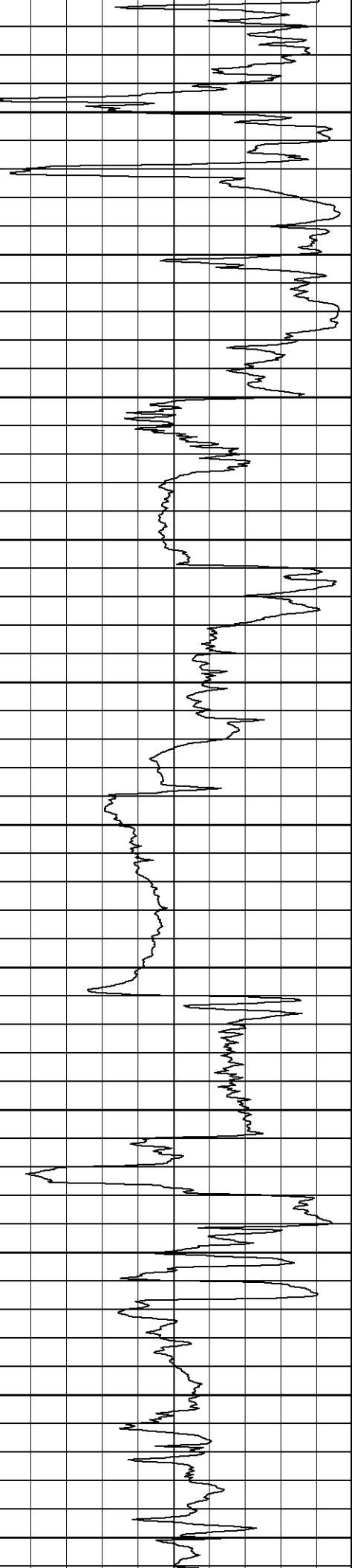
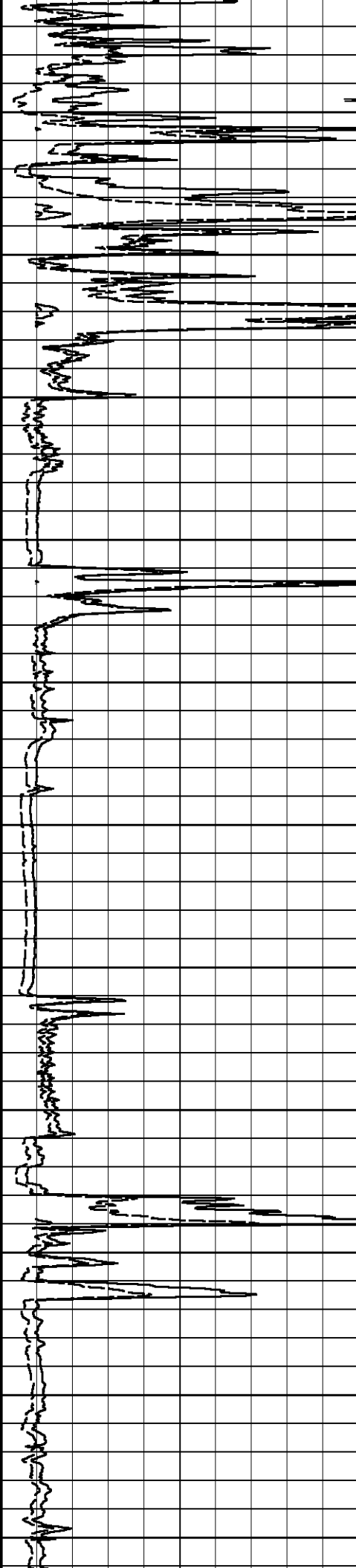
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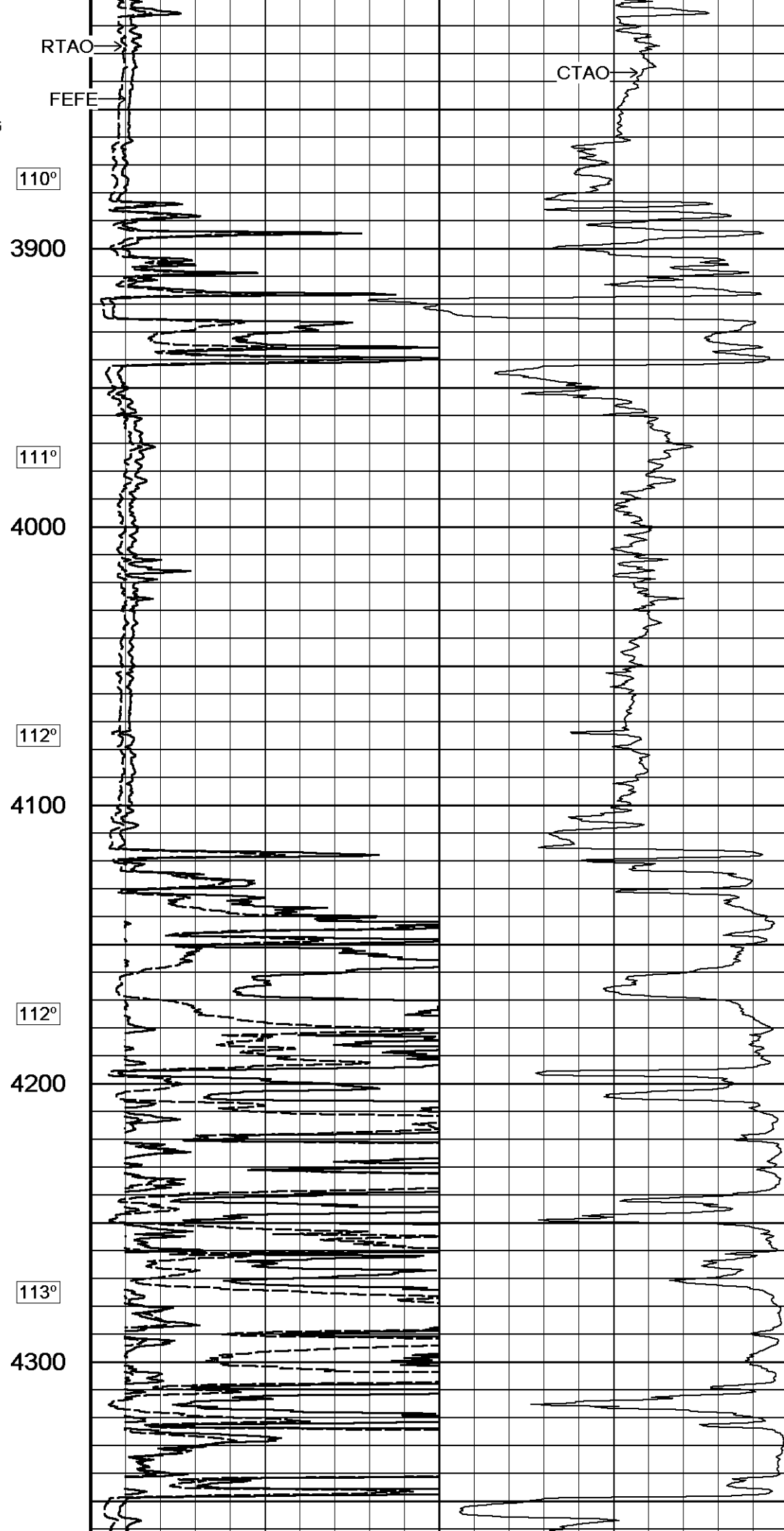
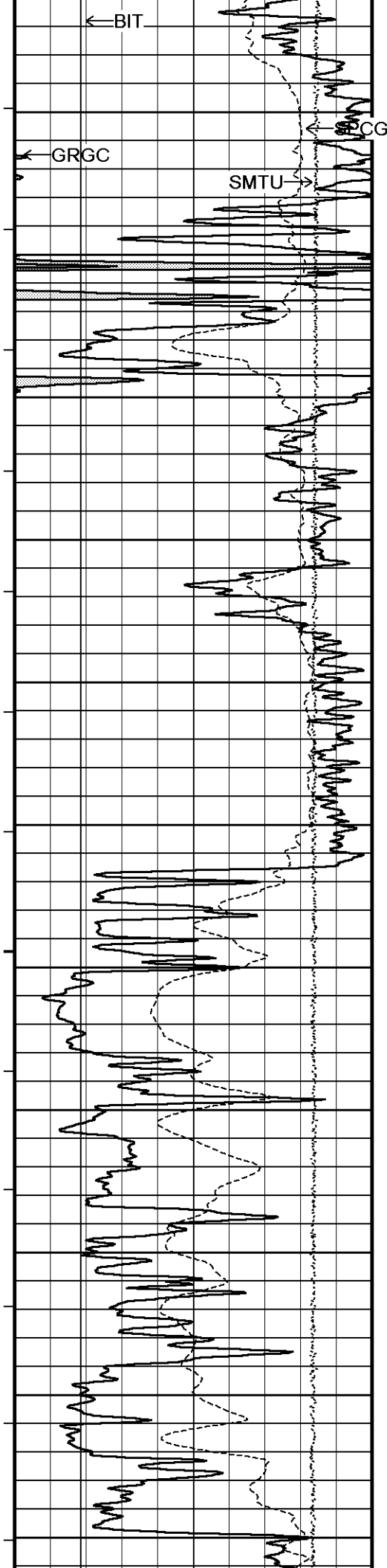
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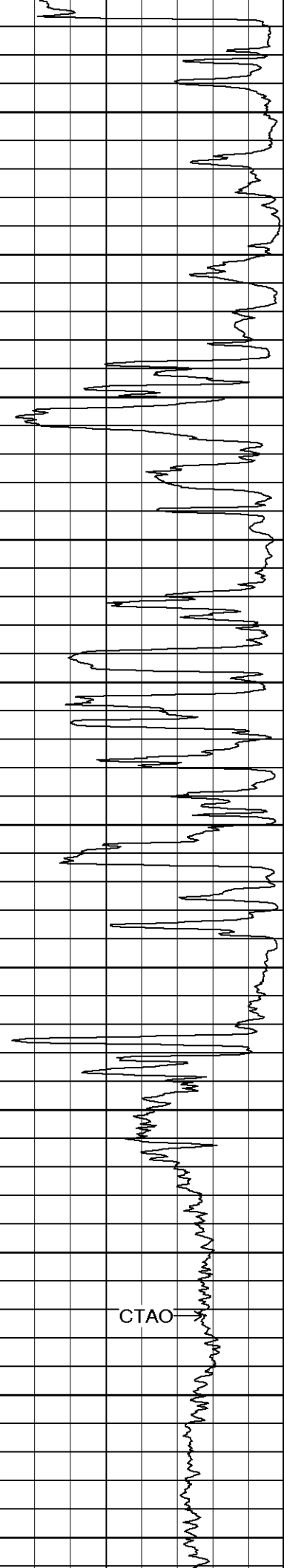
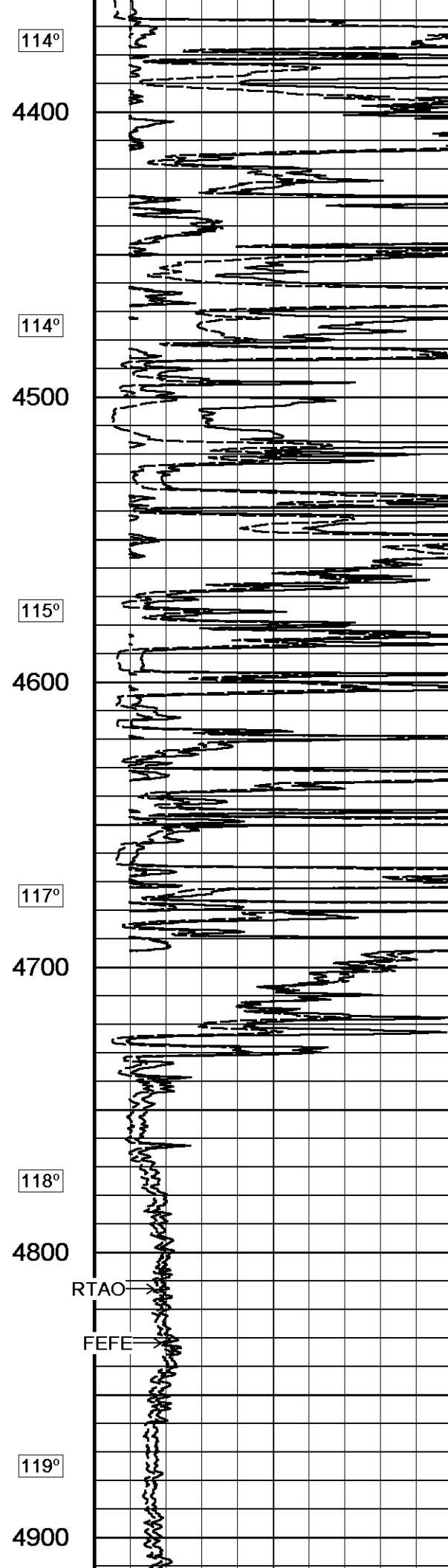
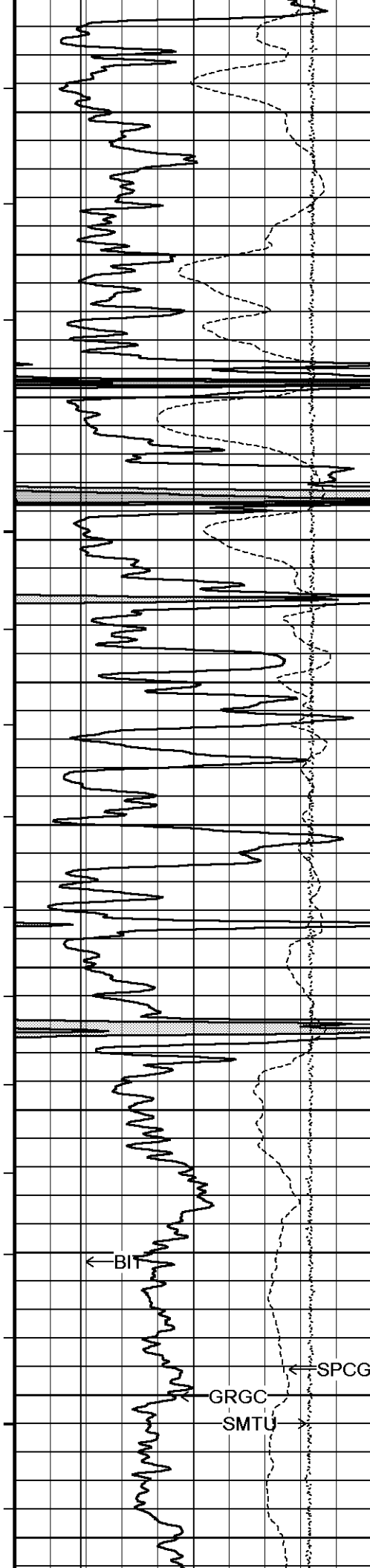
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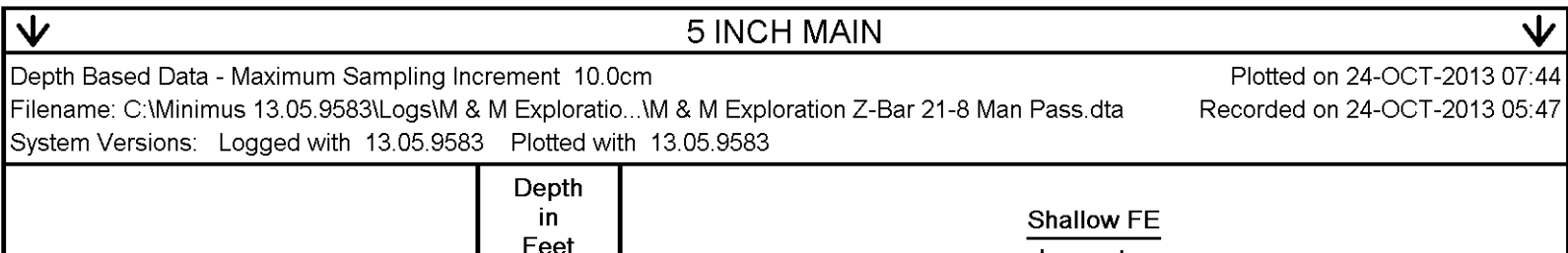
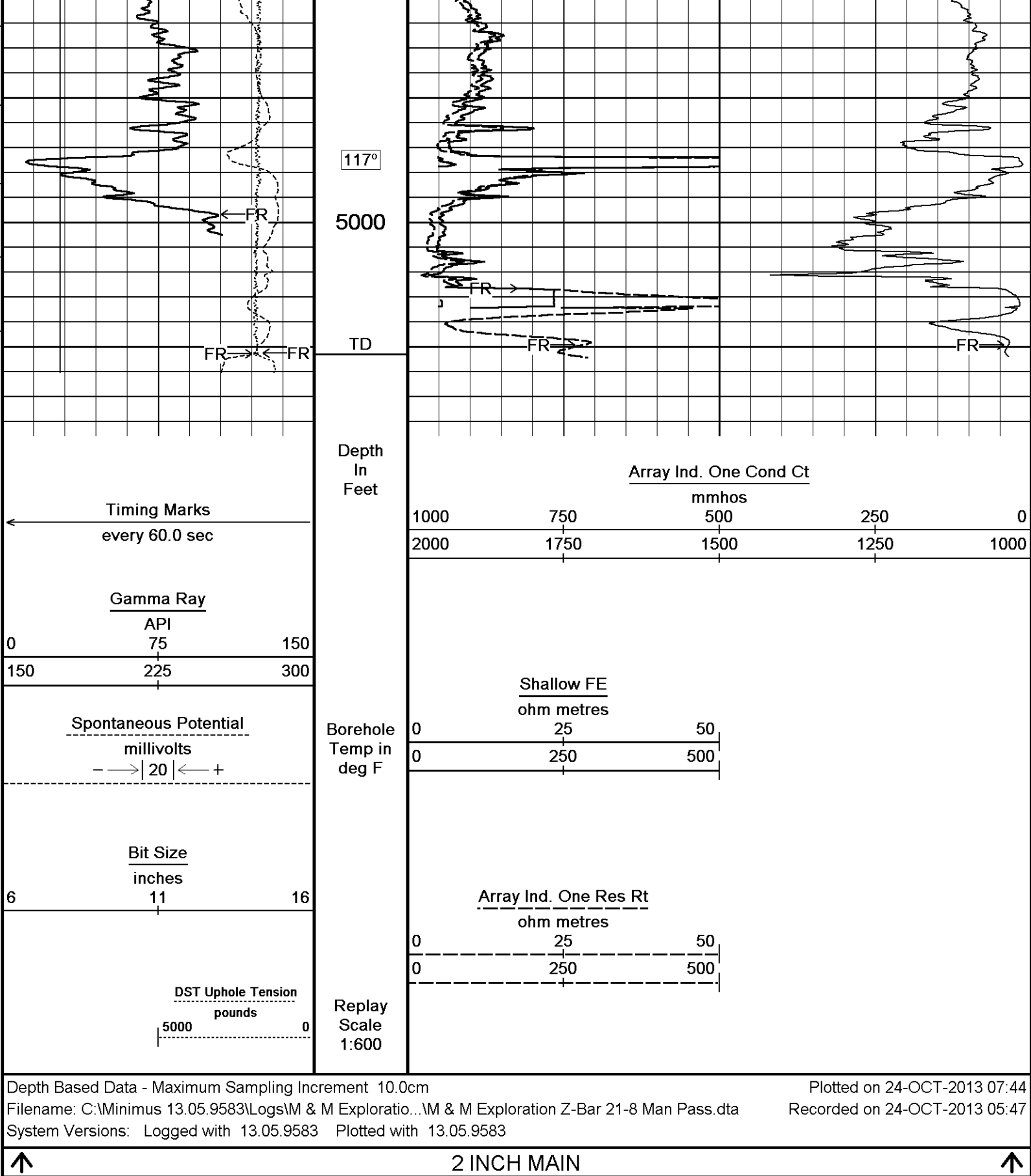
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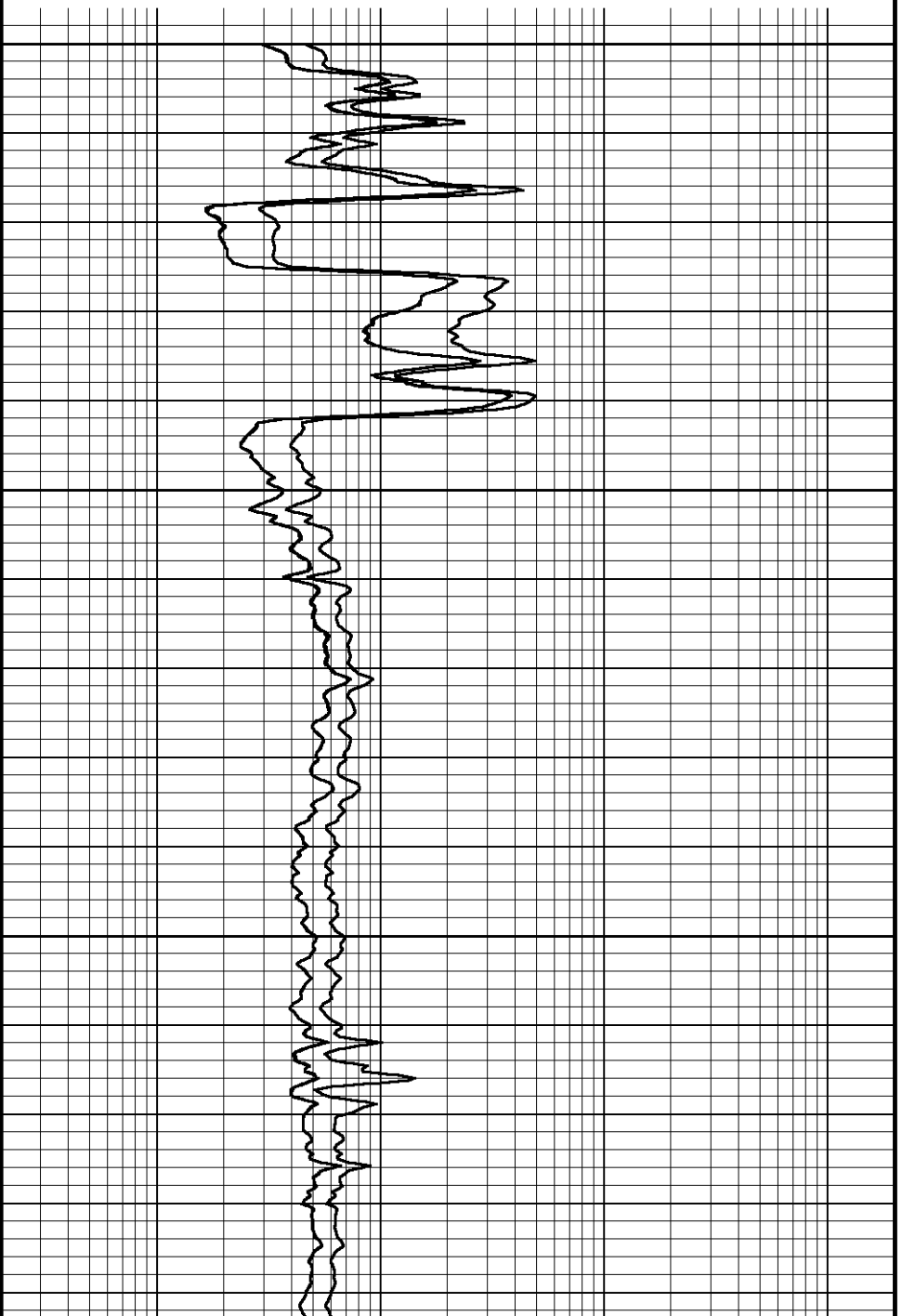
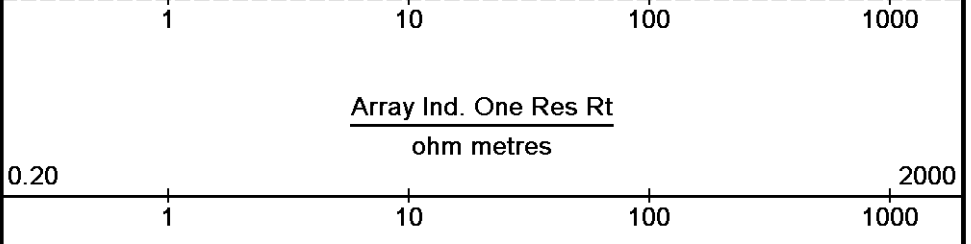
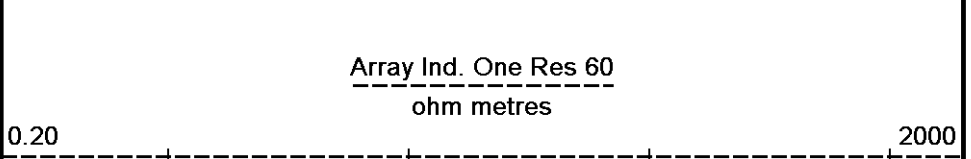
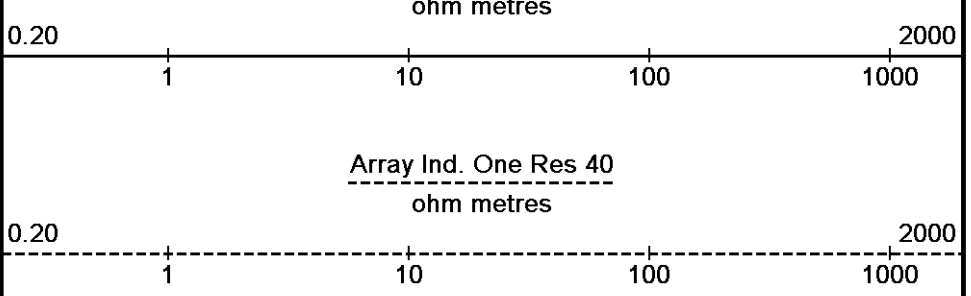
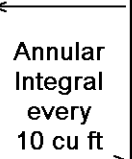
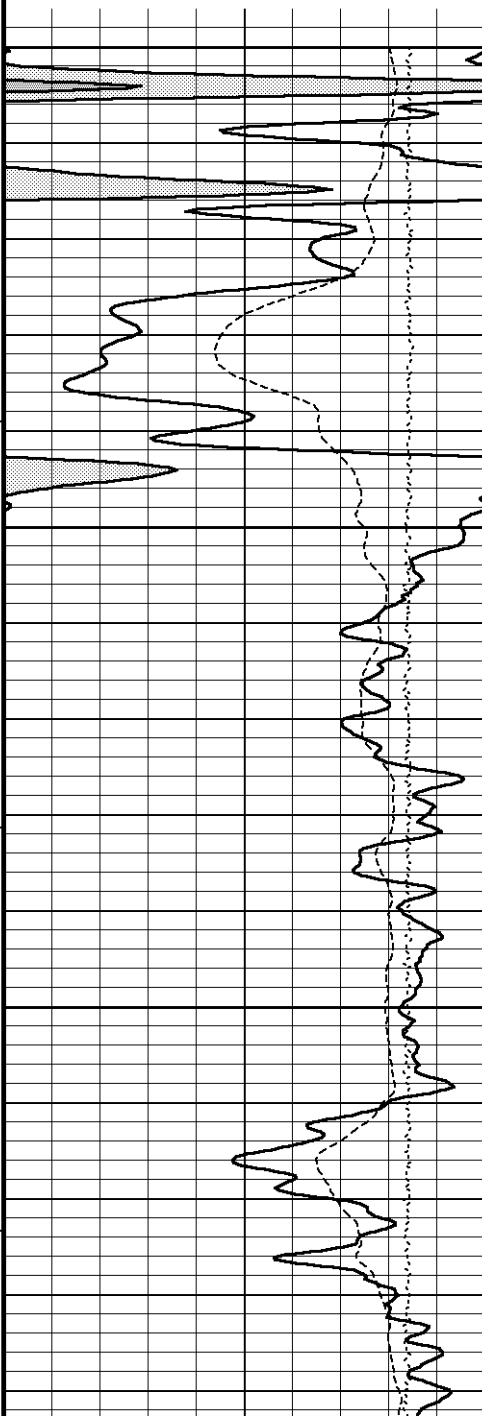
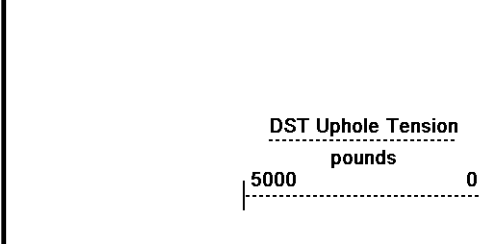
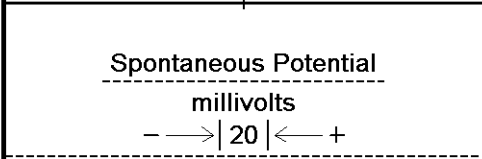
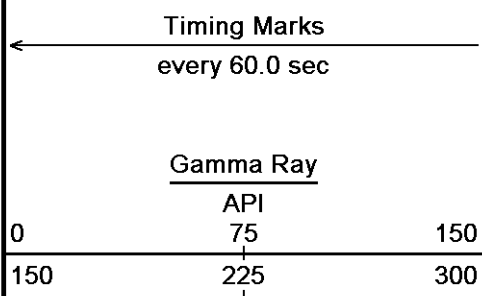
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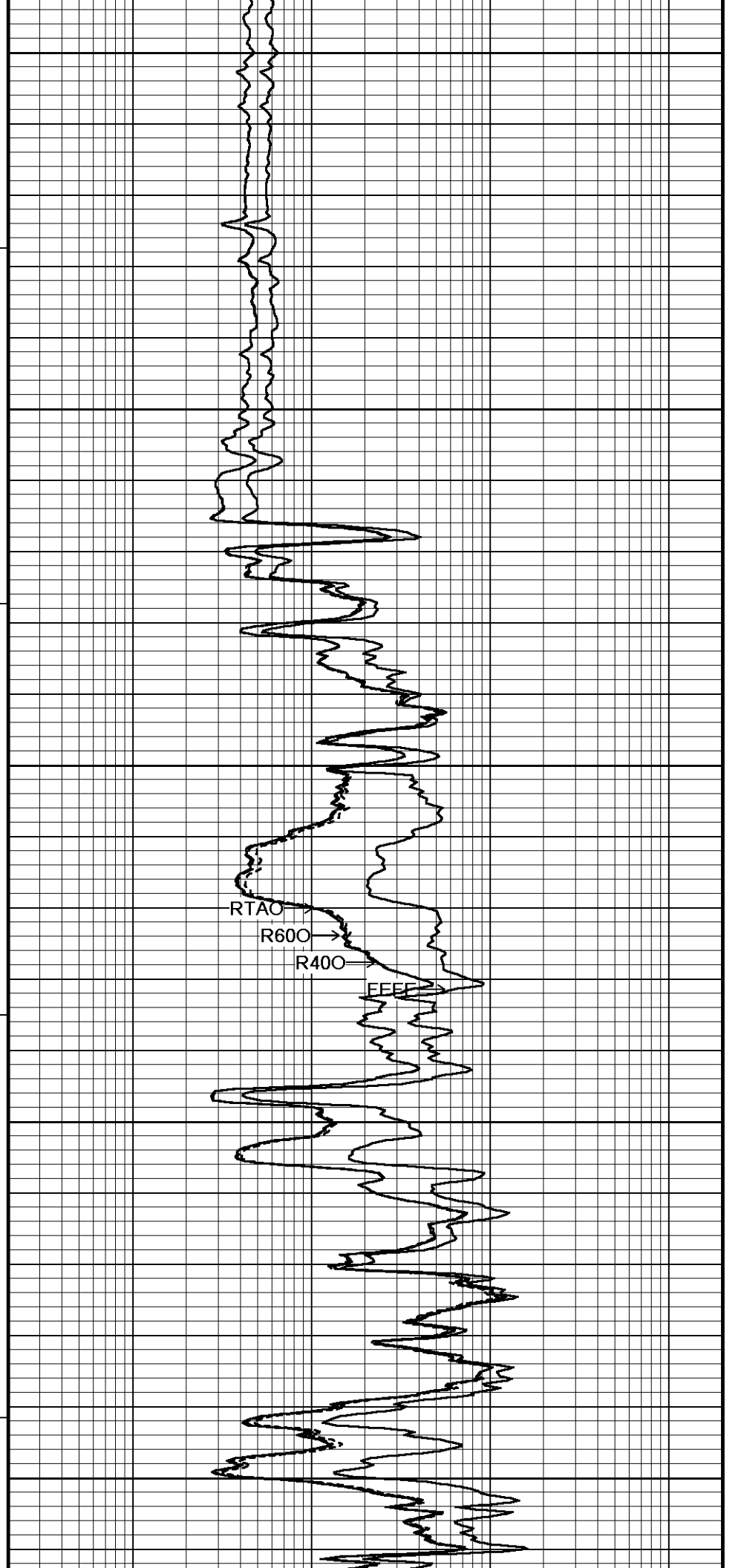
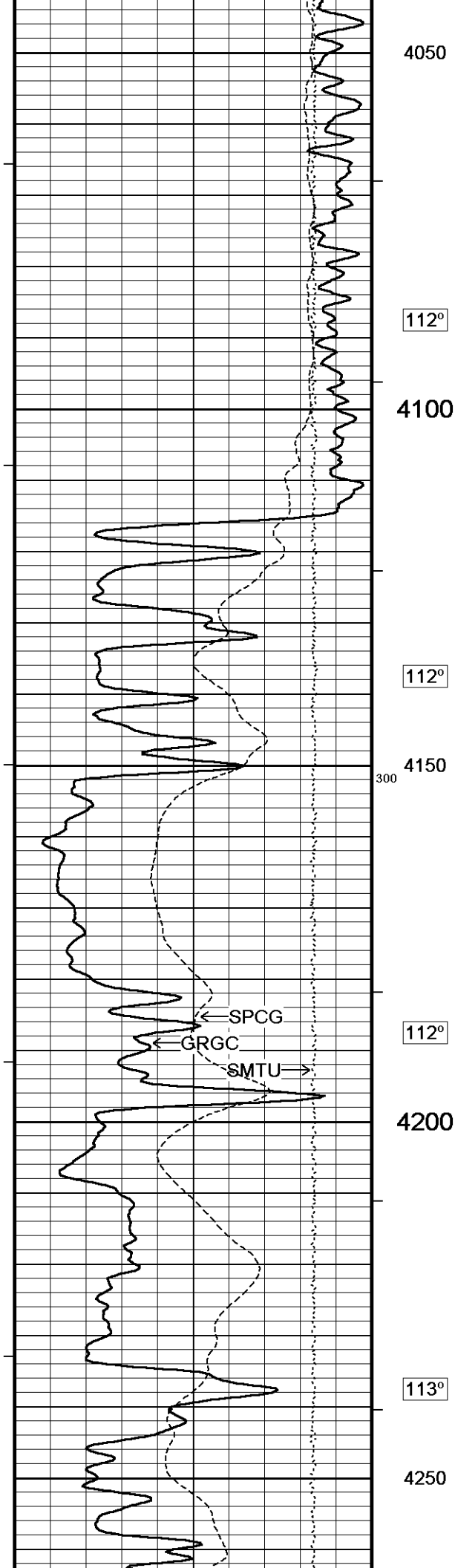


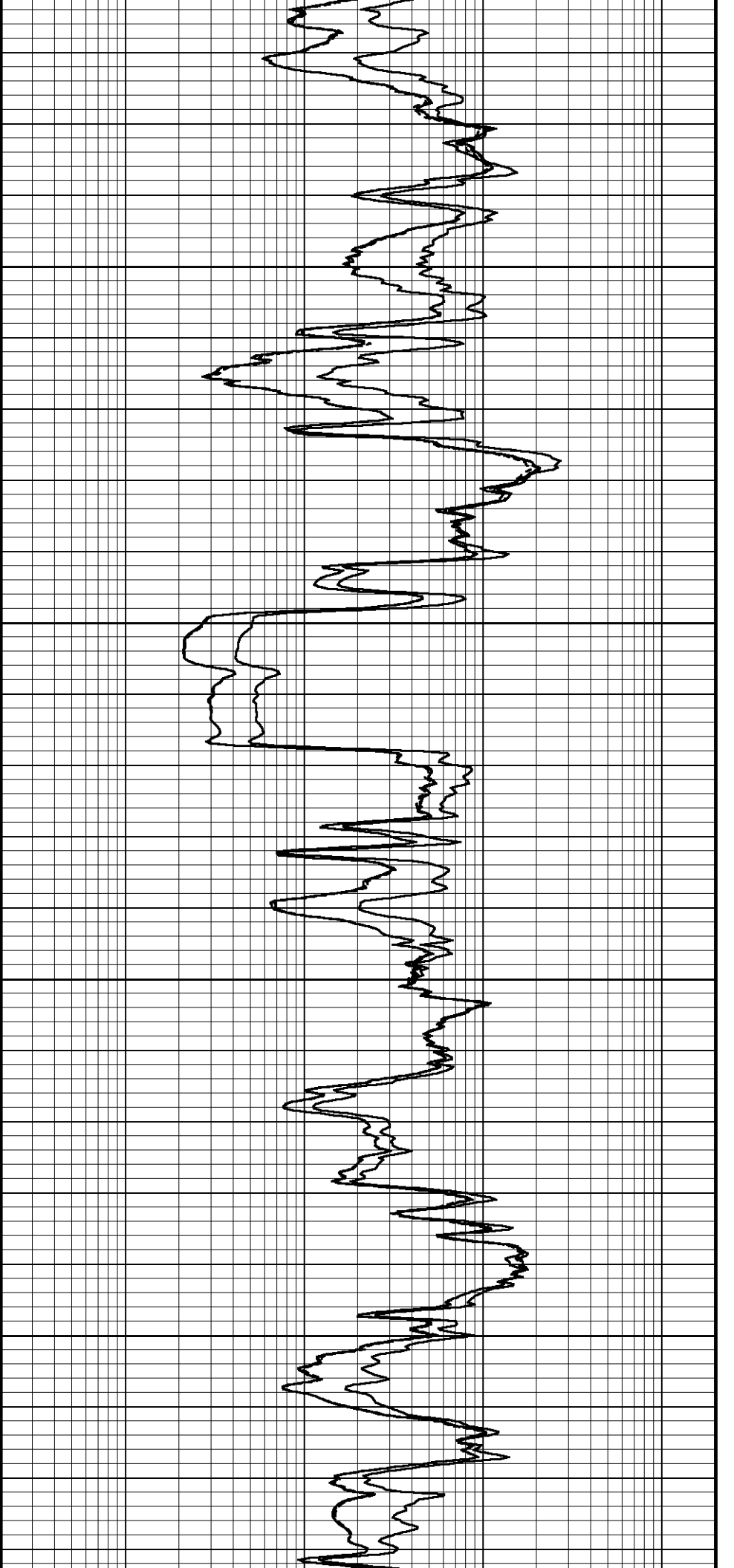
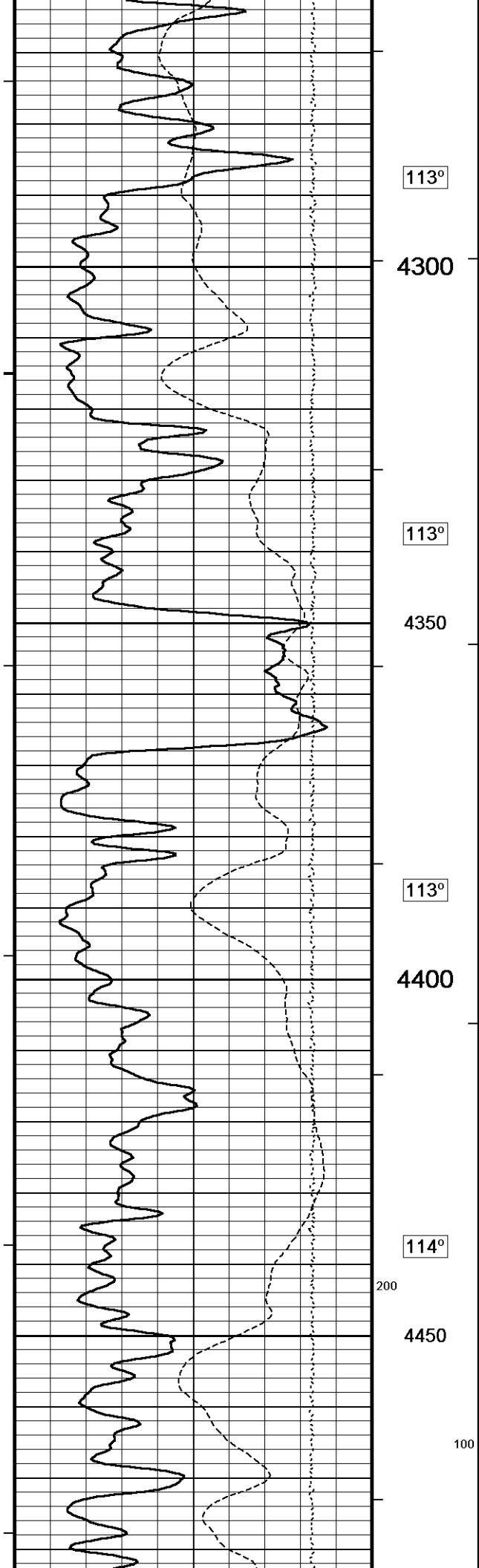


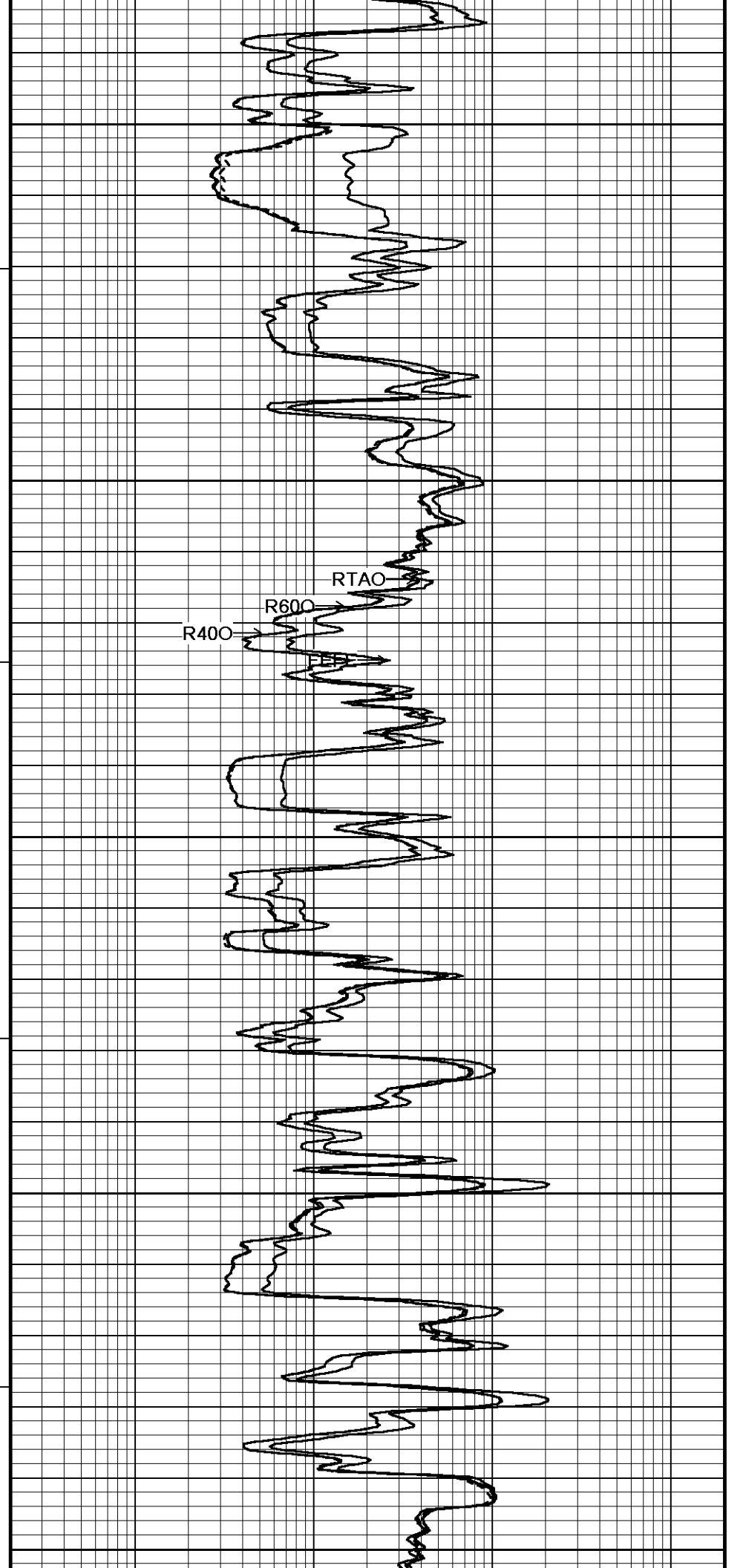
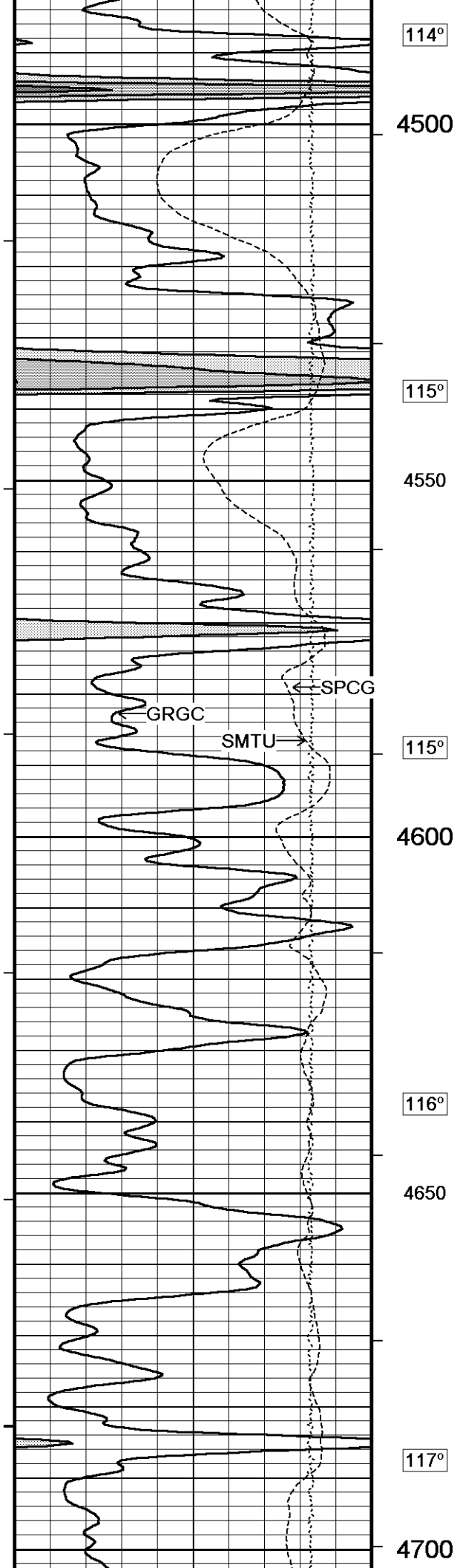


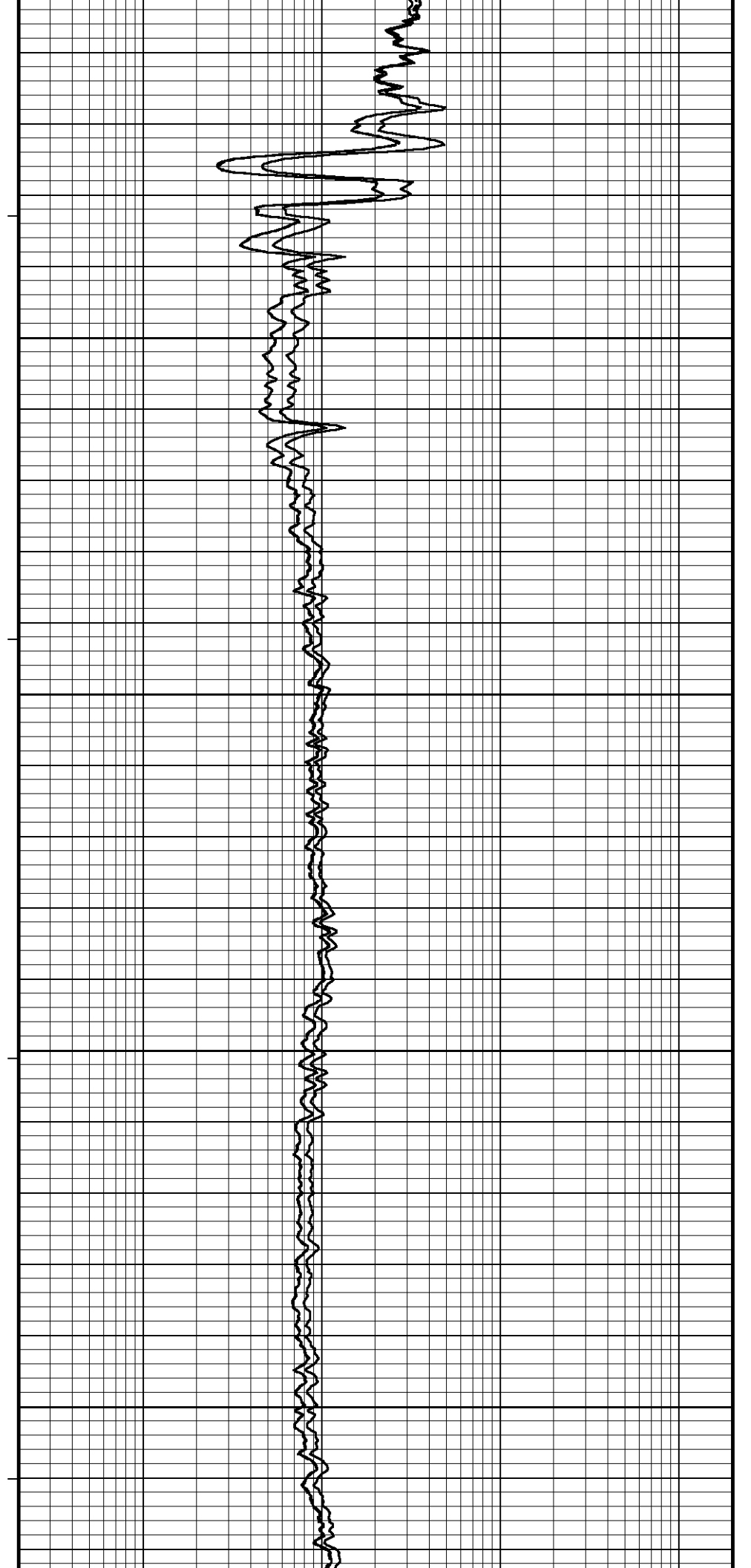
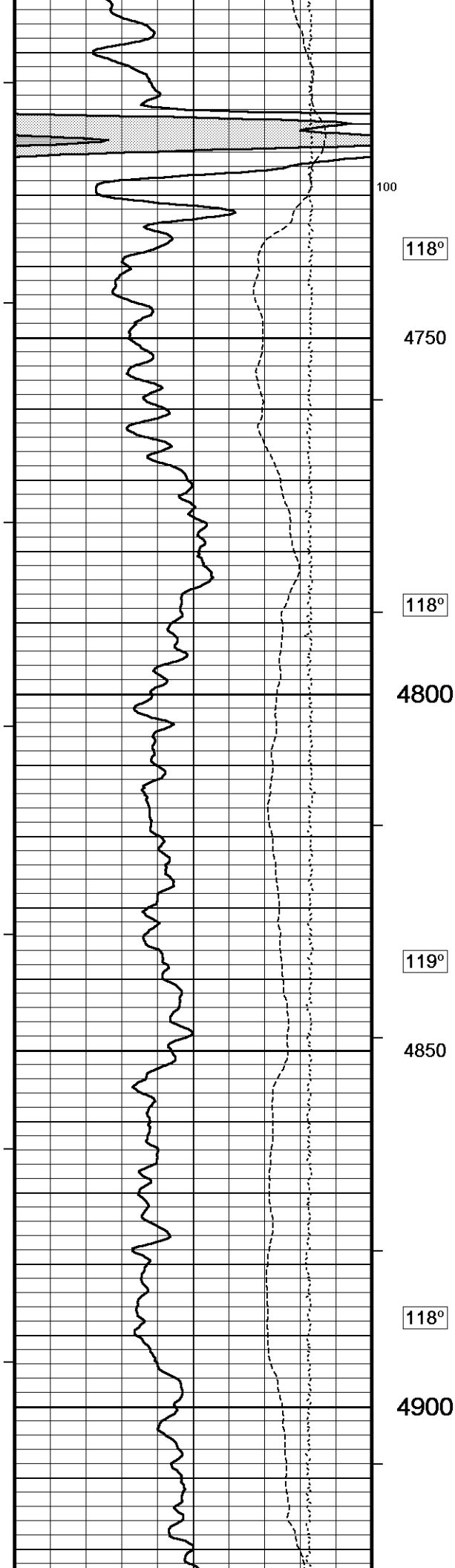


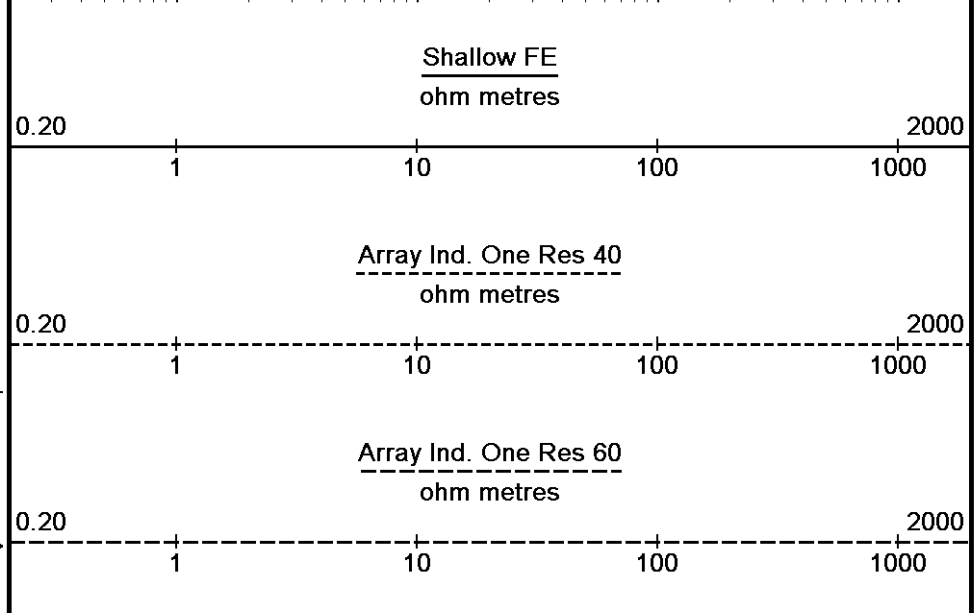
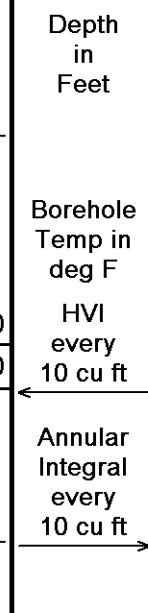
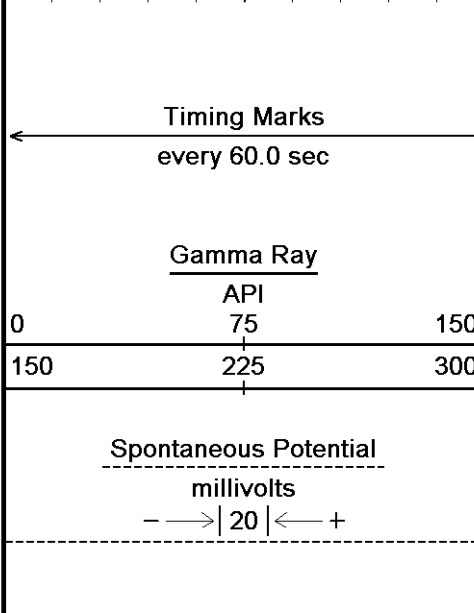
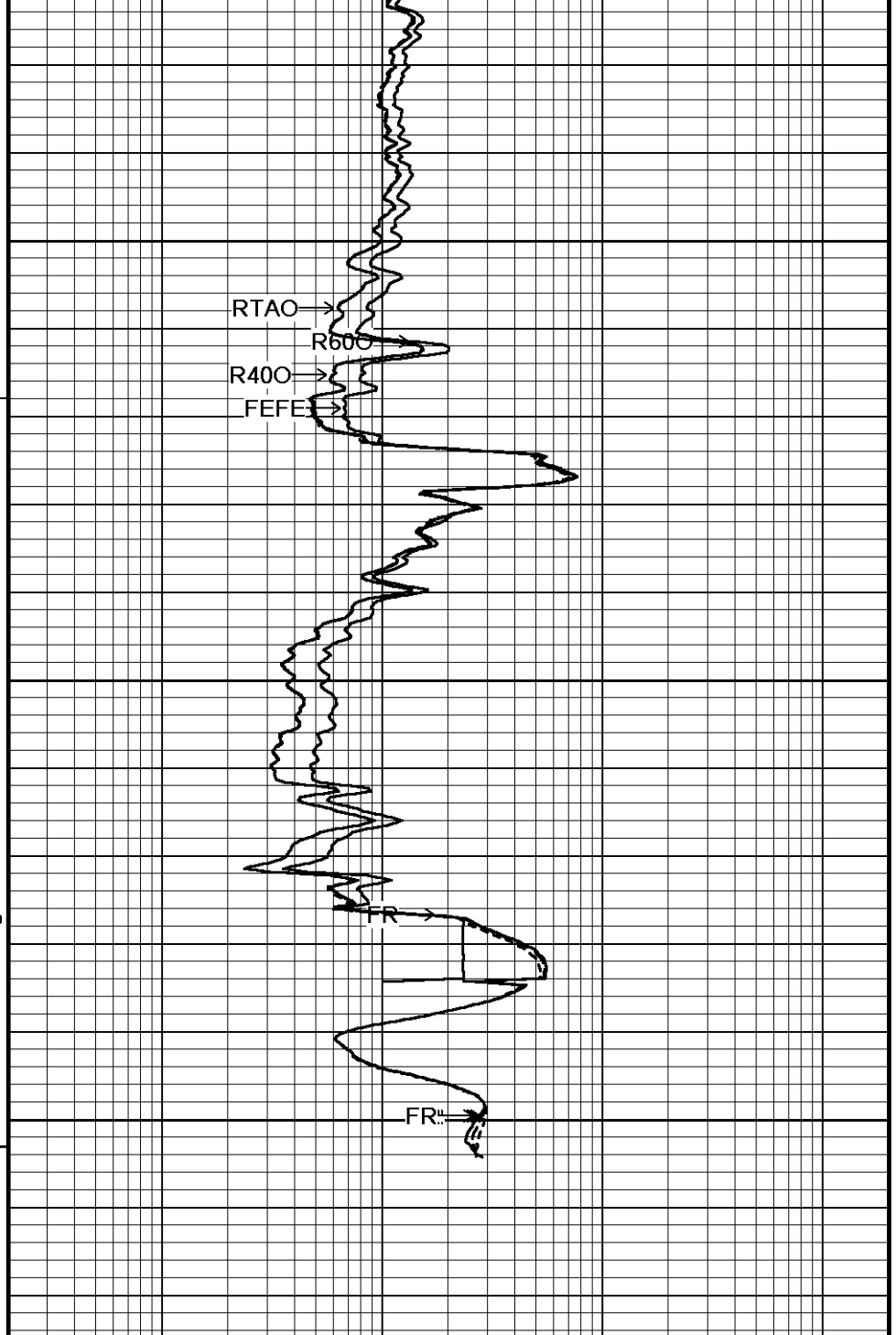
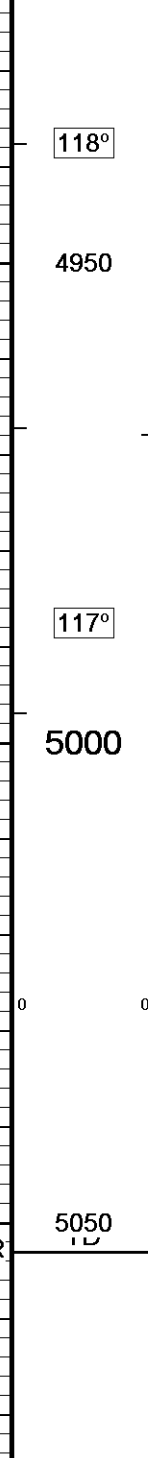
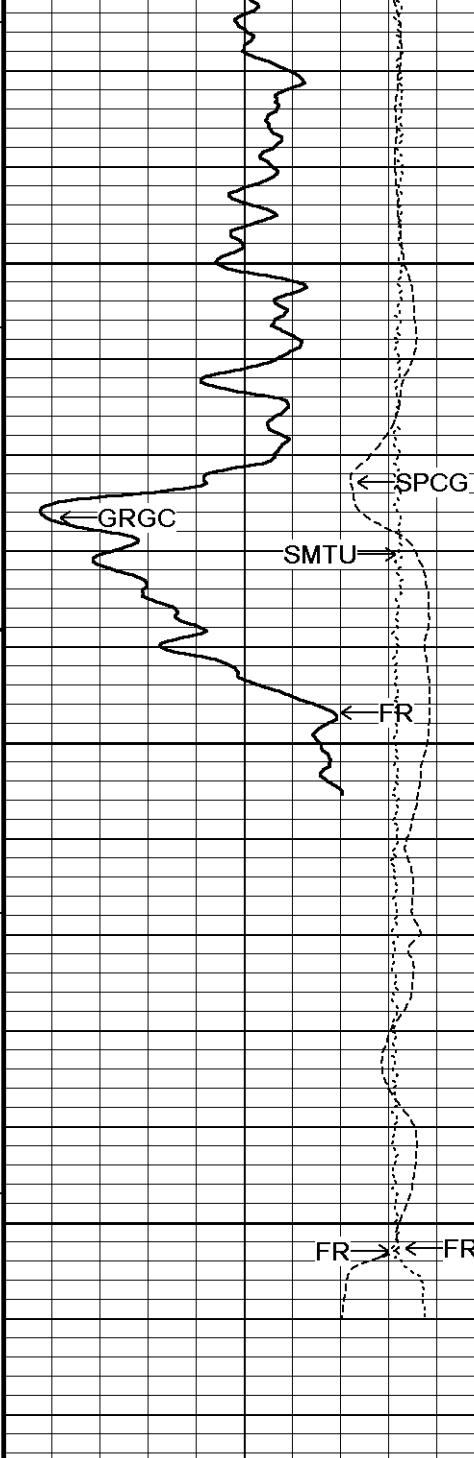


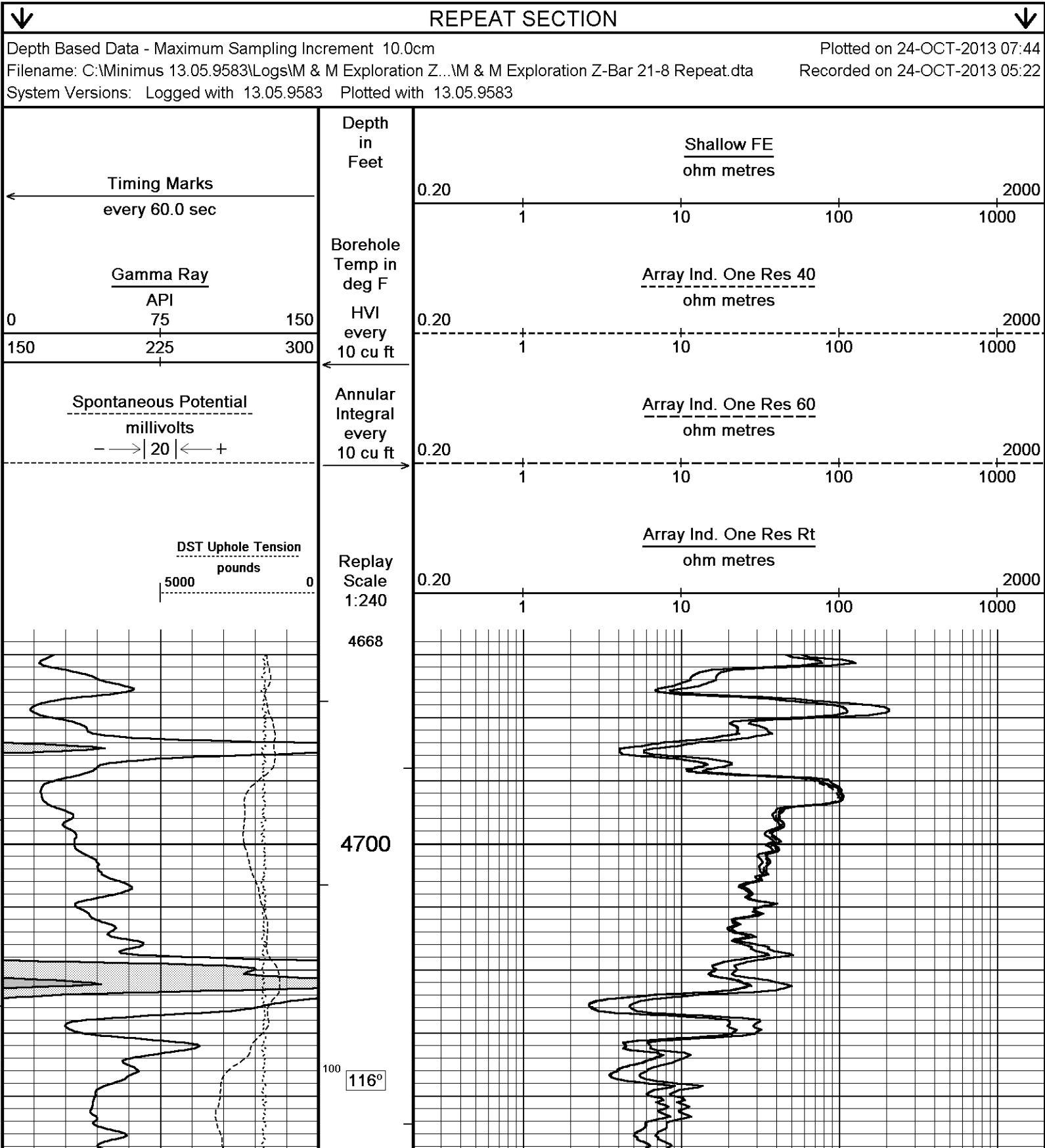
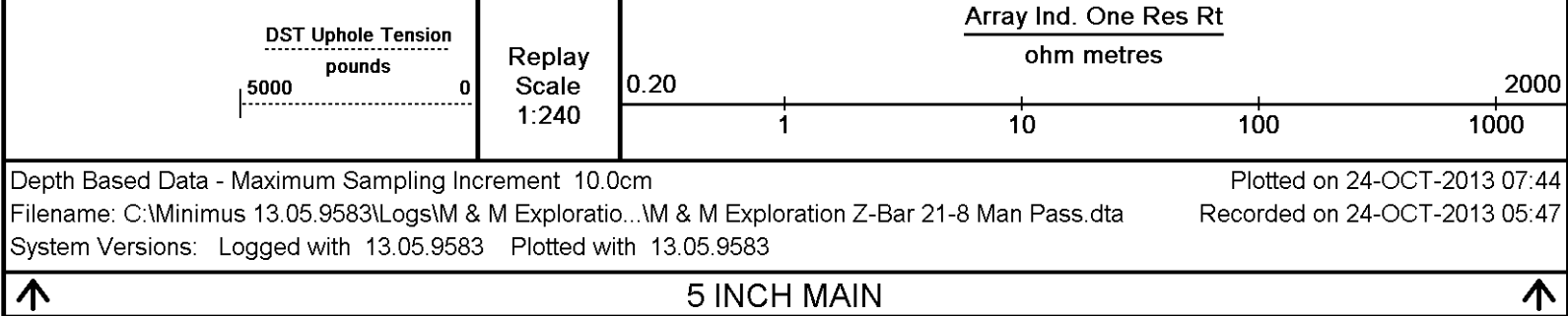


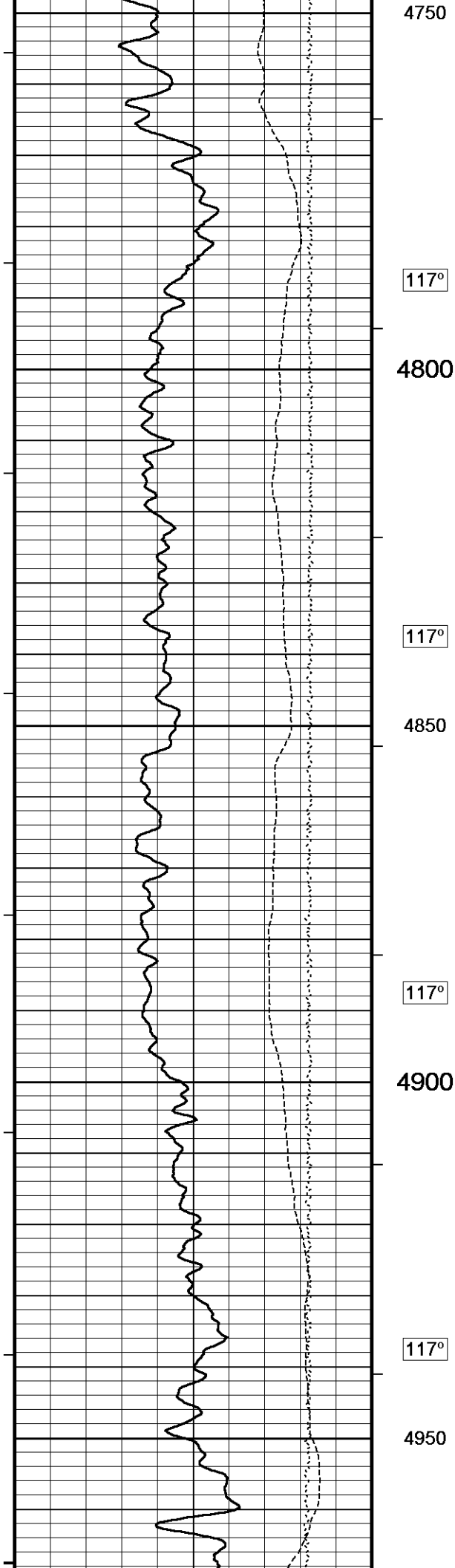












4750

117°

4800

117°

4850

117°

4900

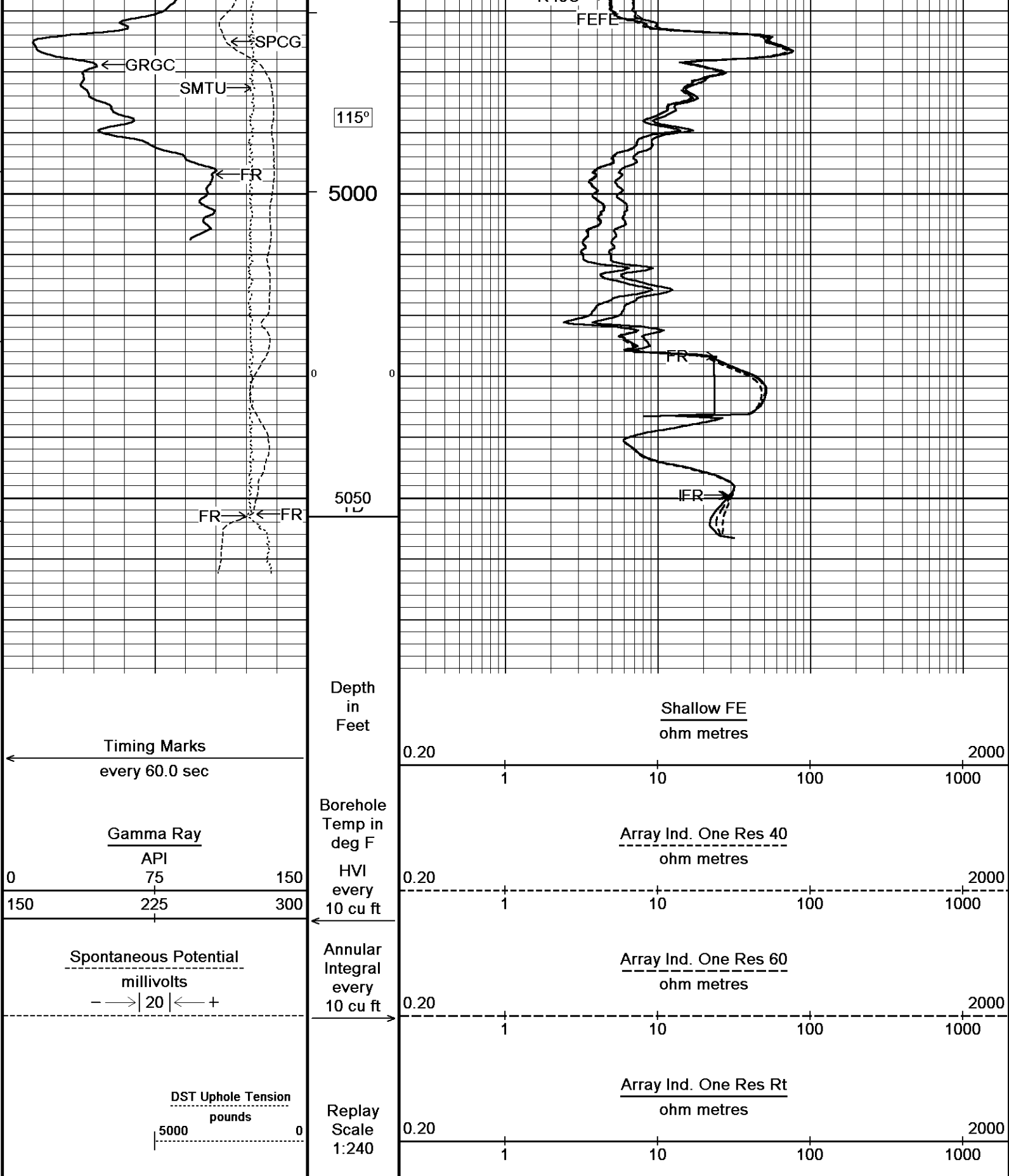
117°

4950

RTAO →

R600 →

R400 →



General Constants All 000

Last Edited on 24-OCT-2013,02:56

General Parameters

Mud Resistivity	0.900	ohm-metres
Mud Resistivity Temperature	72.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	

Hole/Annular Volume and Differential Caliper Parameters

HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	MMR Caliper	

Rwa Parameters

Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	
SW/APOR Tool Source	0.000	

High Resolution Temperature Calibration MCG-D.K 442

Field Calibration on 20-OCT-2013,18:27

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

High Resolution Temperature Constants MCG-D.K 442

Last Edited on 20-OCT-2013,18:27

Pre-filter Length	11
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Gamma Calibration MCG-D.K 442

Field Calibration on 23-OCT-2013 01:26

	Measured	Calibrated (API)
Background	74	50
Calibrator (Gross)	1157	775
Calibrator (Net)	1083	725

Gamma Constants MCG-D.K 442

Last Edited on 24-OCT-2013,02:55

Gamma Calibrator Number	GRC38	
Mud Density	1.10	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

FE Calibration MFE-B.J 352

Base Calibration on 11-OCT-2013 11:23

Field Check on 23-OCT-2013 14:29

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	965.0	126.8
Base Check		281.1
Field Check		281.1

FE Constants MFE-B.J 352

Last Edited on 24-OCT-2013,02:54

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

Induction Calibration MAI-A.A 45

Base Calibration on 21-MAY-2013,16:47

Field Check on 23-OCT-2013,14:25

Base Calibration

Test Loop Calibration

Channel	Measured		Calibrated (mmho/m)	
	Low	High	Low	High
1	14.4	472.6	9.3	966.2
2	5.7	374.0	7.6	821.4
3	3.4	261.2	5.2	566.0
4	2.5	133.9	2.6	279.2

Array Temperature 0.0 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			18.9	3851.4
2			31.8	3629.2
3			28.6	3049.3
4			18.3	2079.2
Deep			16.1	1911.2
Medium			42.5	4060.4
Shallow			49.7	5482.8

Array Temperature 69.9 Deg F

Induction Constants MAI-A.A 45

Last Edited on 24-OCT-2013,02:54

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 31

Base Calibration on 11-OCT-2013 13:50

Field Calibration on 23-OCT-2013 01:14

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	18160	3.99
2	27038	5.98
3	35584	7.97
4	43976	9.86
5	53328	11.92

Field Calibration

Measured Caliper (in)
7.94

Actual Caliper (in)
7.97

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Logs\M & M Exploration Z-Bar 21-8\M & M Exploration Z-Bar 21-8 Repeat.dta

CBH-C, Cablehead, 11 pin

CBH-CA 170 LG: 2.40 ft WT: 24.3 lb OD: 2.24 in

Compact Comms Gamma

MCG-D.K 442 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-Resistivity

MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.88 in

Compact Neutron

MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper

MPD-B 31 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric

MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

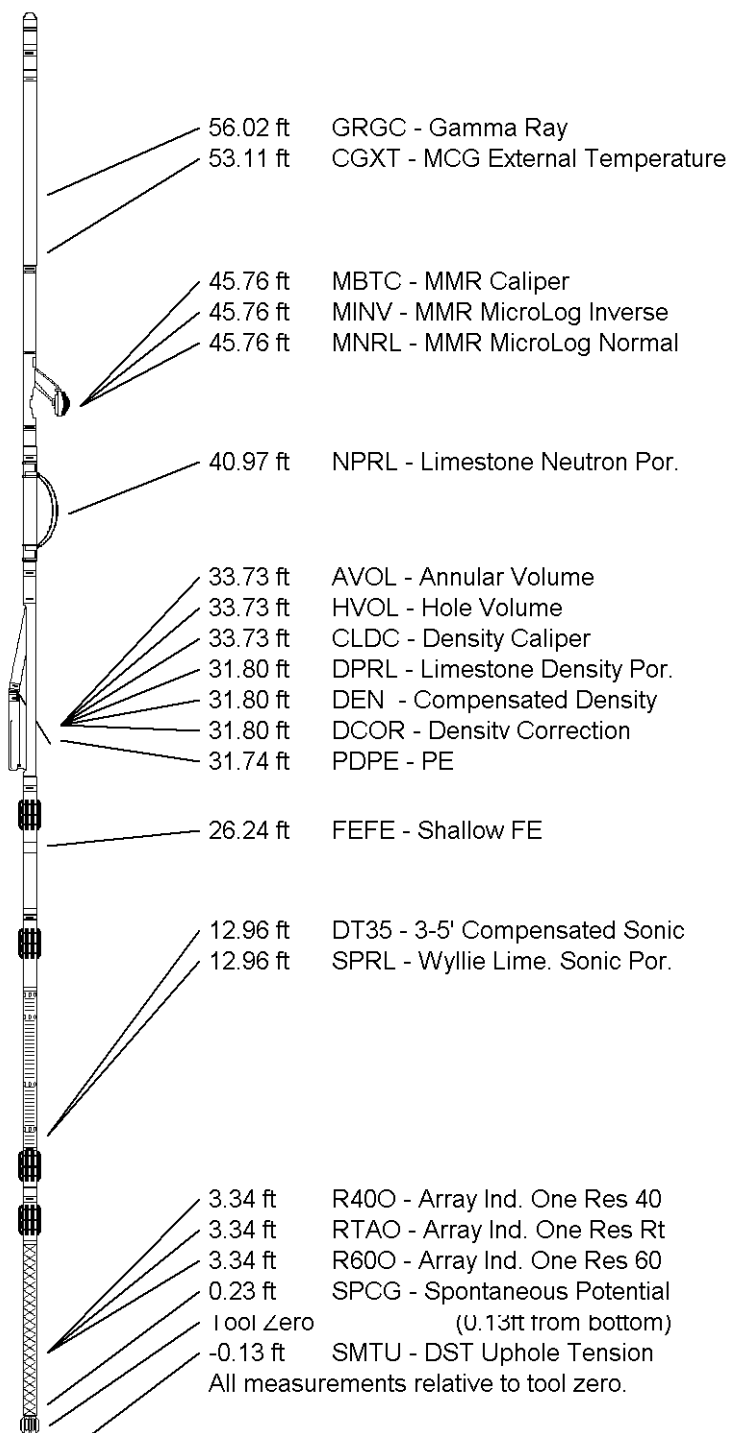
Compact Sonic

MSS-A.A 126 LG: 12.52 ft WT: 72.8 lb OD: 2.24 in

Compact Induction

MAI-A.A 45 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 63.70 ft Weight: 480.6 lb



COMPANY

M & M EXPLORATION, INC.

WELL

Z-BAR 21-8

FIELD

AETNA GAS AREA

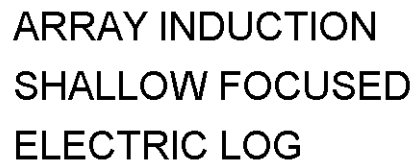
PROVINCE/COUNTY

BARBER

COUNTRY/STATE

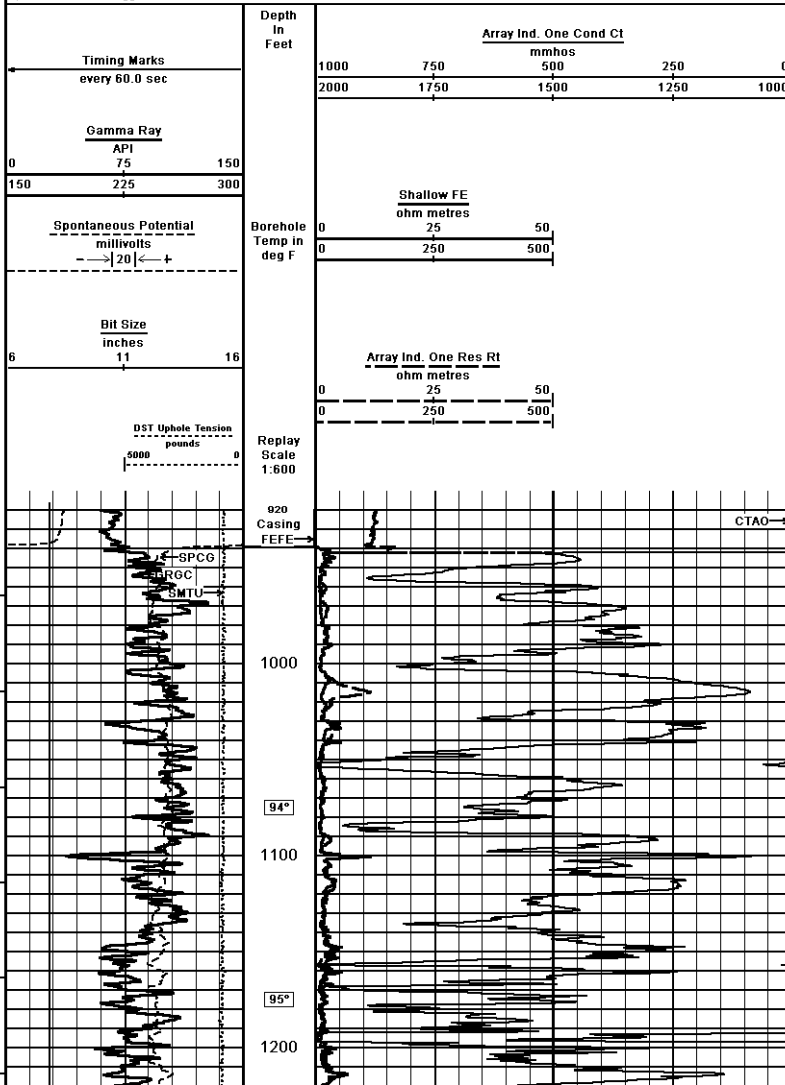
U.S.A. / KANSAS

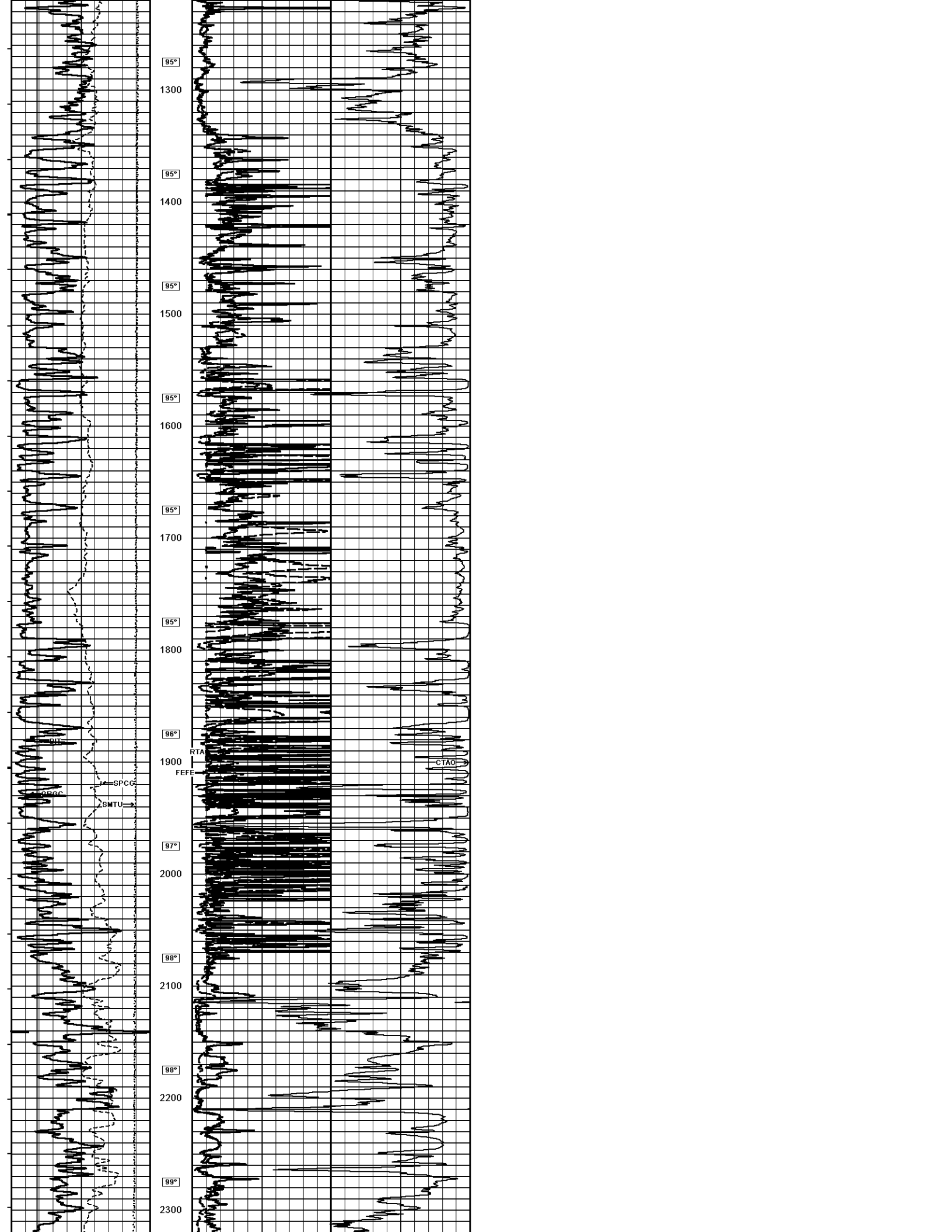
First Reading	5050.00	feet
Depth Driller	5050.00	feet
Depth Logger	5053.00	feet

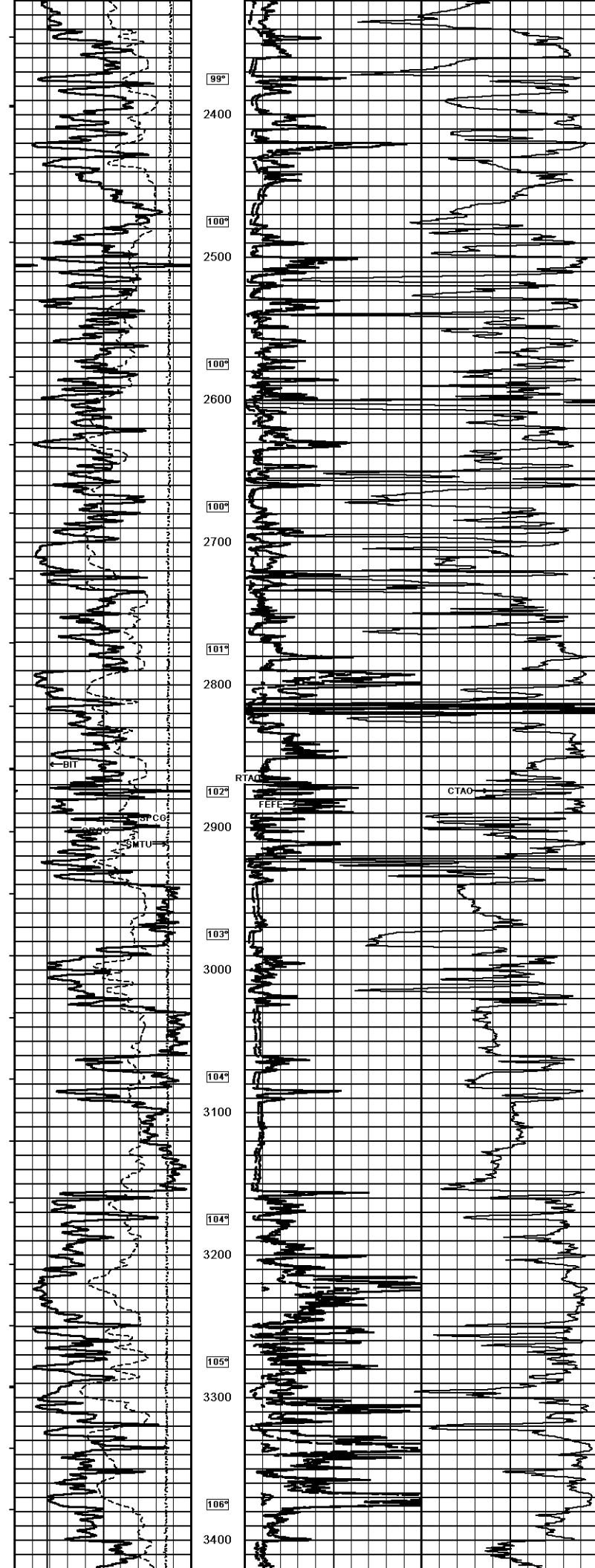


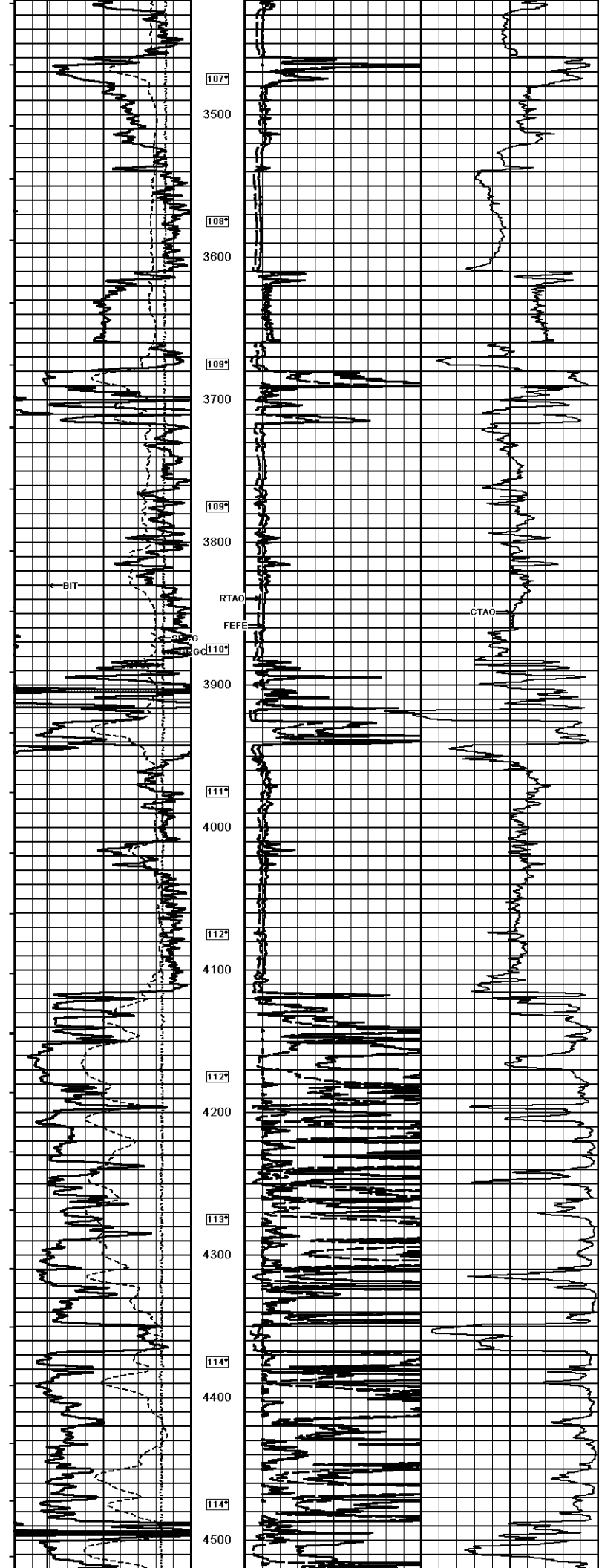
Weatherford®

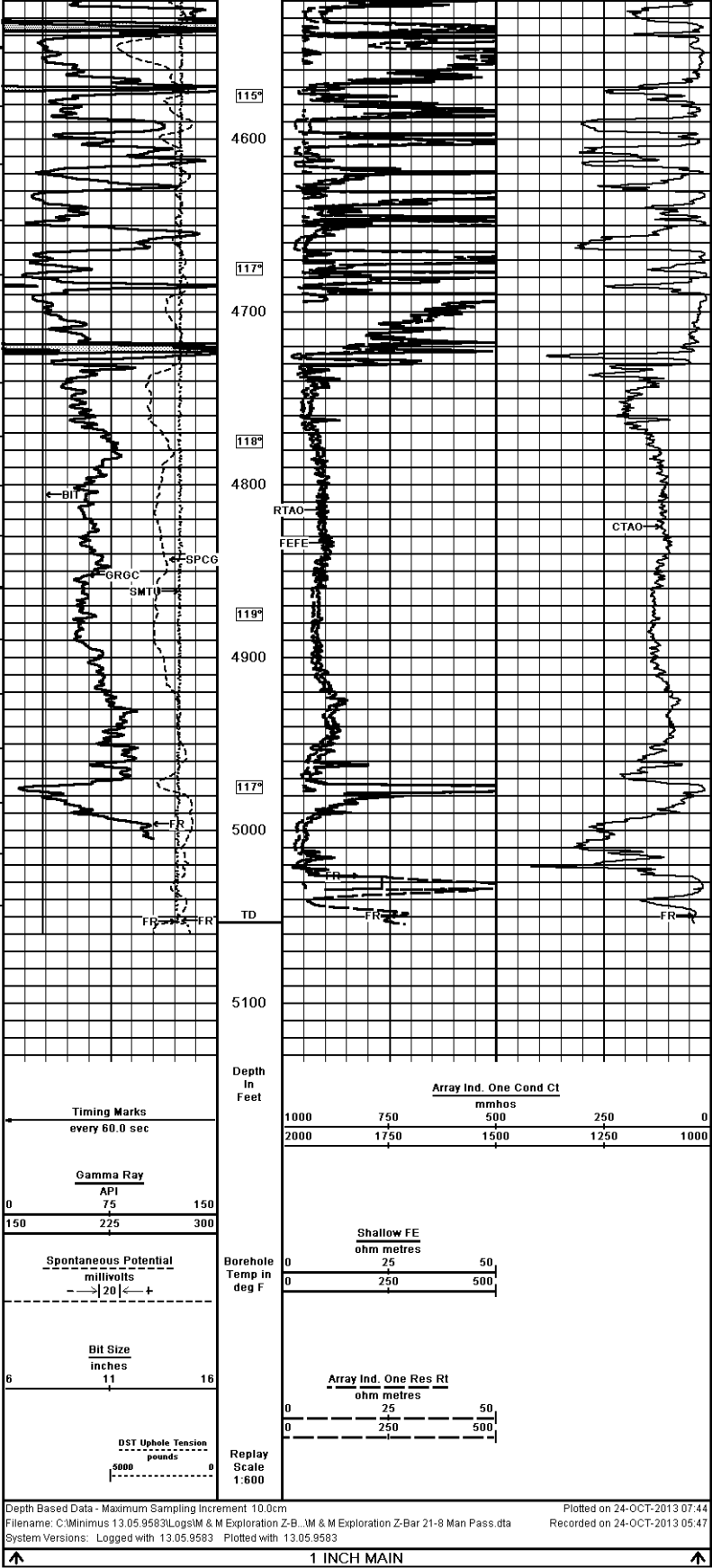
1 INCH MAIN	
Depth Based Data - Maximum Sampling Interval 10.0cm	Plotted on 24-OCT-2013 07:44
Filename: C:\Minimus 13.05.9583\LogSM & M Exploration Z-Bar 21-8 Man Pass.dta	Recorded on 24-OCT-2013 05:41
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583	











COMPANY

WELL

FIELD

PROVINCE/COUNTY

COUNTRY/STATE

M & M EXPLORATION, INC.

Z-BAR 21-8

AETNA GAS AREA

BARBER

U.S.A. / KANSAS

Elevation Kelly Bushing	1587.00	feet	First Reading	5050.00	feet
Elevation Drill Floor	1585.00	feet	Depth Driller	5050.00	feet
Elevation Ground Level	1557.00	feet	Depth Logger	5053.00	feet



ARRAY INDUCTION

SHALLOW FOCUSED

ELECTRIC LOG

