



Weatherford

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

COMPANY

O'BRIEN ENERGY RESOURCES CORP.

WELL

VAIL #5-31

FIELD

NOVINGER EAST

PROVINCE/COUNTY

MEADE

COUNTRY/STATE

U.S.A. / KANSAS

LOCATION

1320' FNL & 1320' FWL
NW/4

SEC

TWP

RGE

Other Services
MPD/MDN

MML

31

33S

29W

API Number

15-119-21333

Permit Number

Permanent Datum G.L., Elevation 2671 feet

Log Measured From KB

Drilling Measured From K.B.

Elevations:
KB
DF
GL

feet
2683.00
2682.00
2671.00

Date

29-JAN-2013

Run Number

ONE

Service Order

3537854

Depth Driller

6400.00

feet

Depth Logger

6408.00

feet

First Reading

6405.00

feet

Last Reading

1490.00

feet

Casing Driller

1490.00

feet

Casing Logger

1490.00

inches

Bit Size

7.875

Hole Fluid Type

CHEMICAL

lb/USg

Density / Viscosity

9.35 lb/USg

52.00 type in

PH / Fluid Loss

9.00

9.00

Sample Source

FLOWLINE

Rm @ Measured Temp

1.05 @ 84.0

ohm-m

Rmf @ Measured Temp

0.84 @ 84.0

ohm-m

Rmc @ Measured Temp

1.26 @ 84.0

ohm-m

Source Rmf / Rmc

CALC

CALC

Rm @ BHT

0.69 @126.0

ohm-m

Time Since Circulation

5 HOURS

Max Recorded Temp

126.00

deg F

Equipment / Base

13057

LIB

LYNN SCOTT

ERIK PETERSEN

PETER DEBENHAM

ROGER PEARSON

LB13-027

BOREHOLE RECORD

Last Edited: 29-JAN-2013 12:18

Bit Size
inches

7.875

Depth From
feet

1490.00

Depth To
feet

6400.00

CASING RECORD

Type

Size
inches

8.625

Depth From
feet

0.00

Shoe Depth
feet

1490.00

Weight
pounds/ft

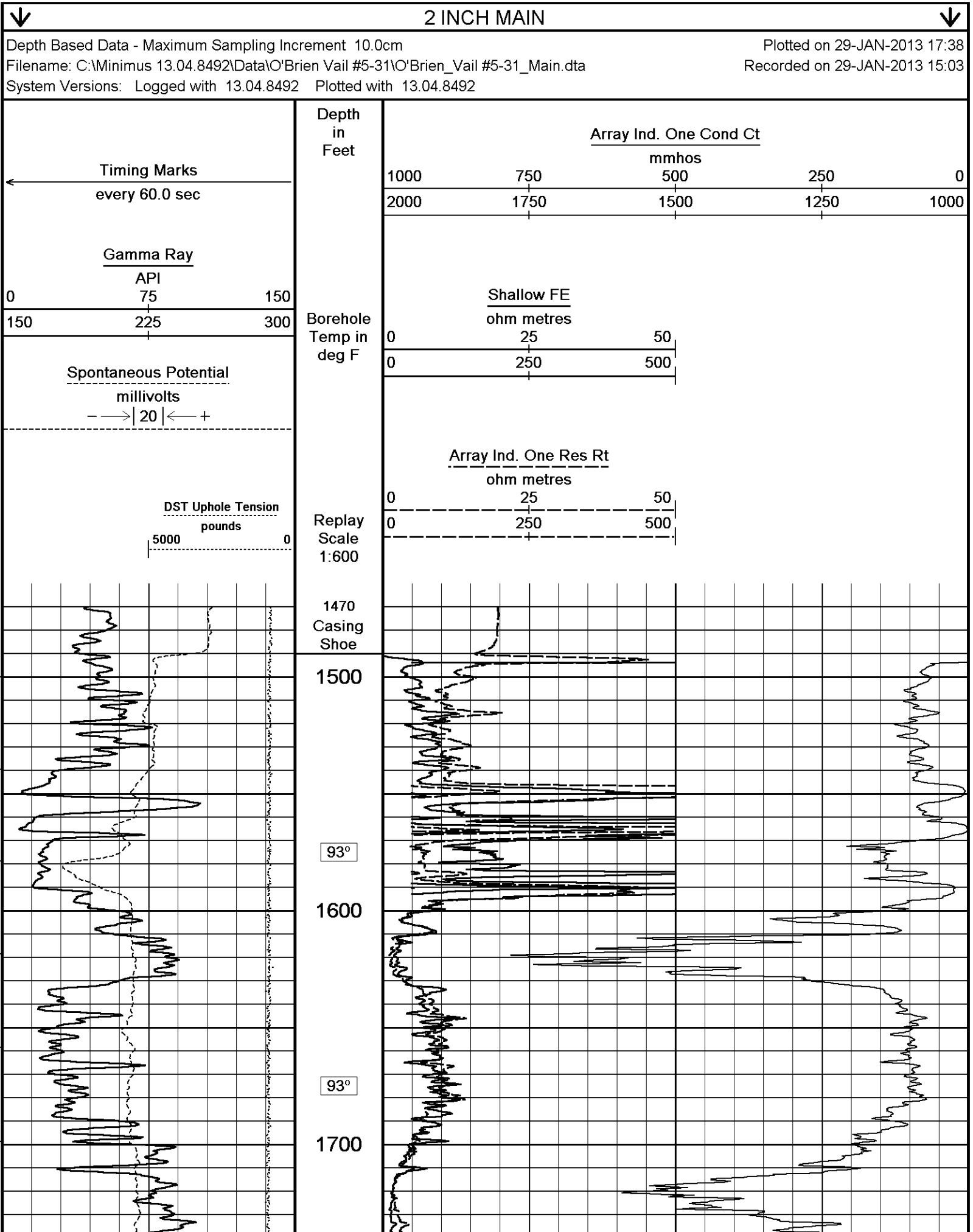
24.00

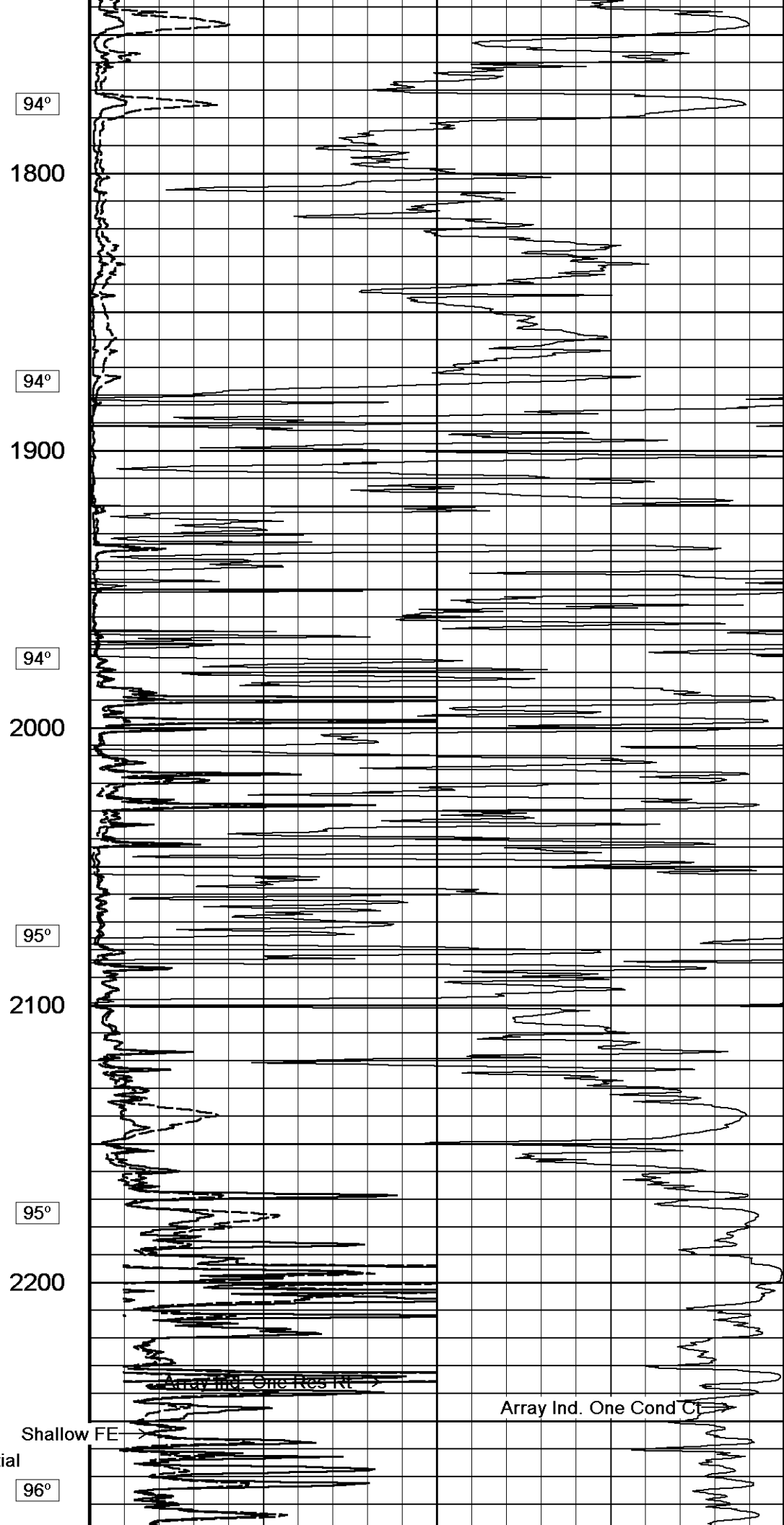
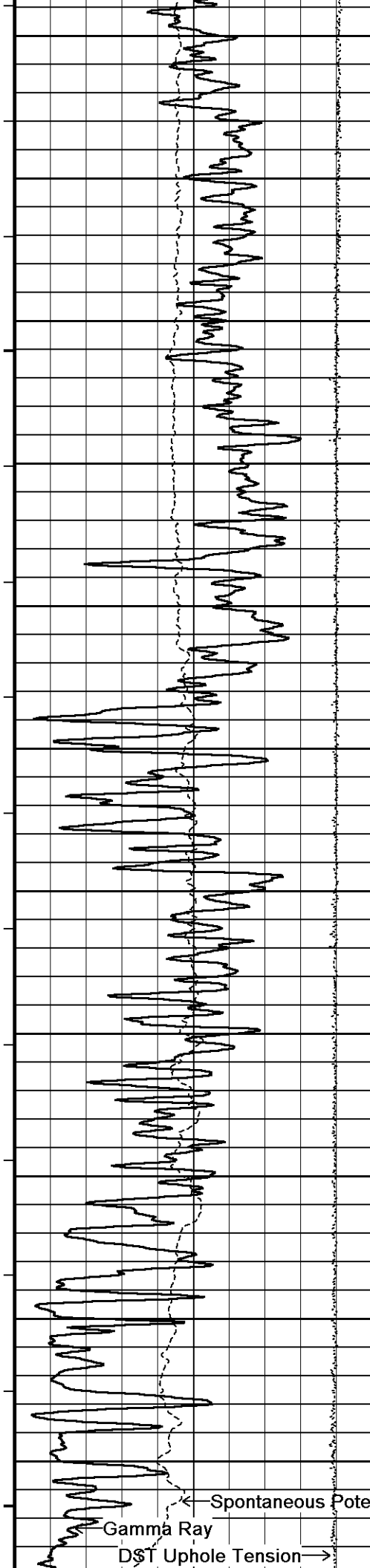
REMARKS

Tools Ran: MCG, MML, MDN, MPD, MFE, MAI ran in combination.
Hardware Used: MDN Dual bowspring used. MPD 8 inch profile plate used. MAI and MFE 0.5 Inch standoffs used.
2.71 g/cc Limestone Density Matrix used to calculate porosity.
All intervals logged and scaled per customer's request.
Tight pulls, washouts and borehole rugosity will affect data quality.
Total hole volume from TD to Surface Casing= 1960 cu. ft.
Annular volume with 4.5 inch production casing from TD to 4000 = 580 cu. ft.
Service order: #3537854
Rig: Duke #6
Engineer: L. Scott, E. Petersen
Operator(s): M. Stegman

Software duplicates the pH onto the fluid loss. The fluid loss is 8.0 ml/30min.

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





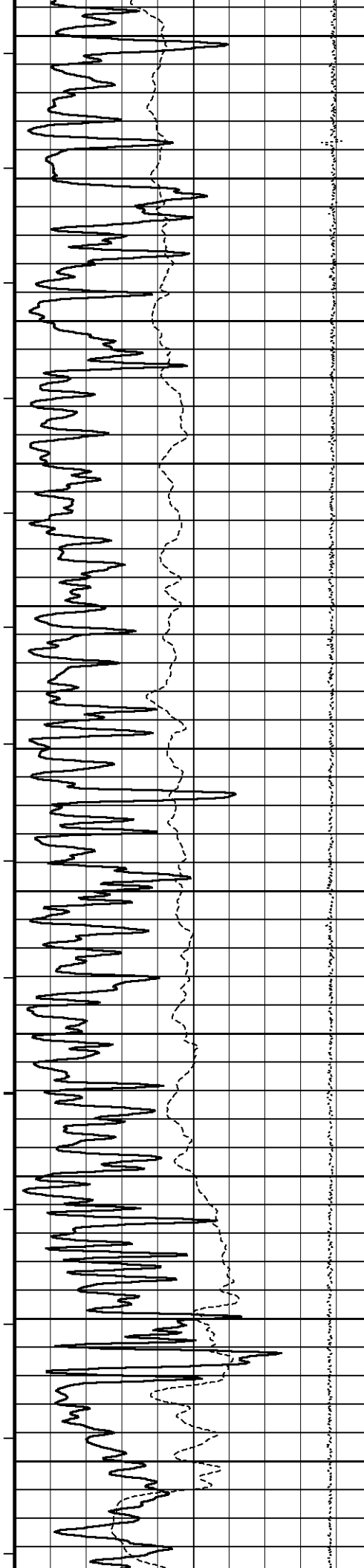
94°
1800
94°
1900
94°
2000
95°
2100
95°
2200
96°

← Spontaneous Potential
Gamma Ray
DST Uphole Tension →

Shallow FE →

Array Ind. One Res Rt →

Array Ind. One Cond Ct →



2300

96°

2400

96°

2500

96°

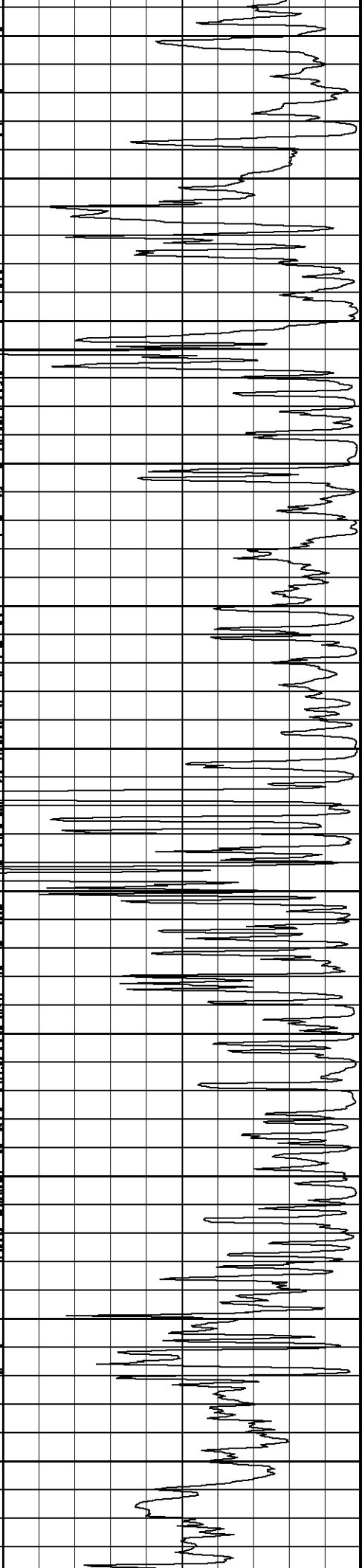
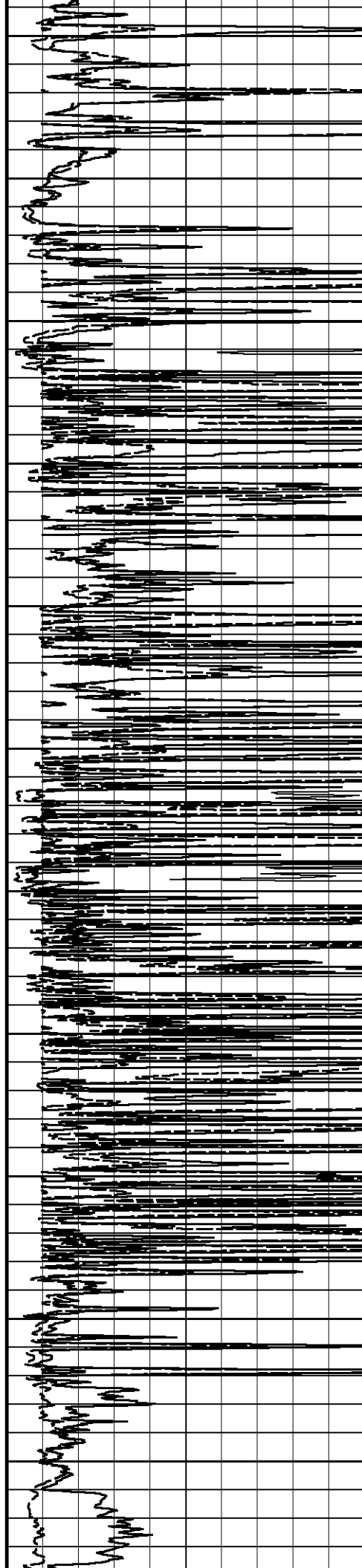
2600

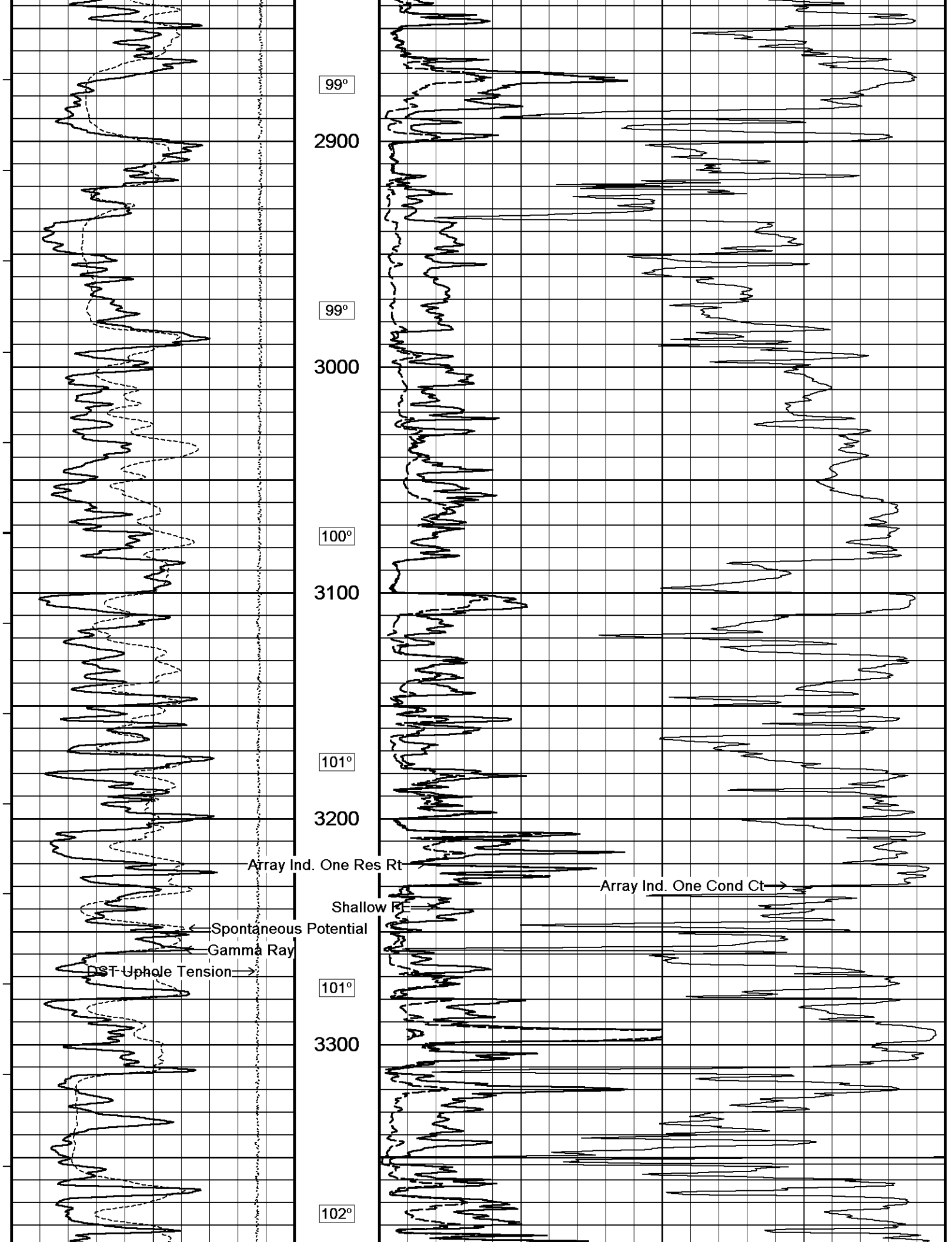
97°

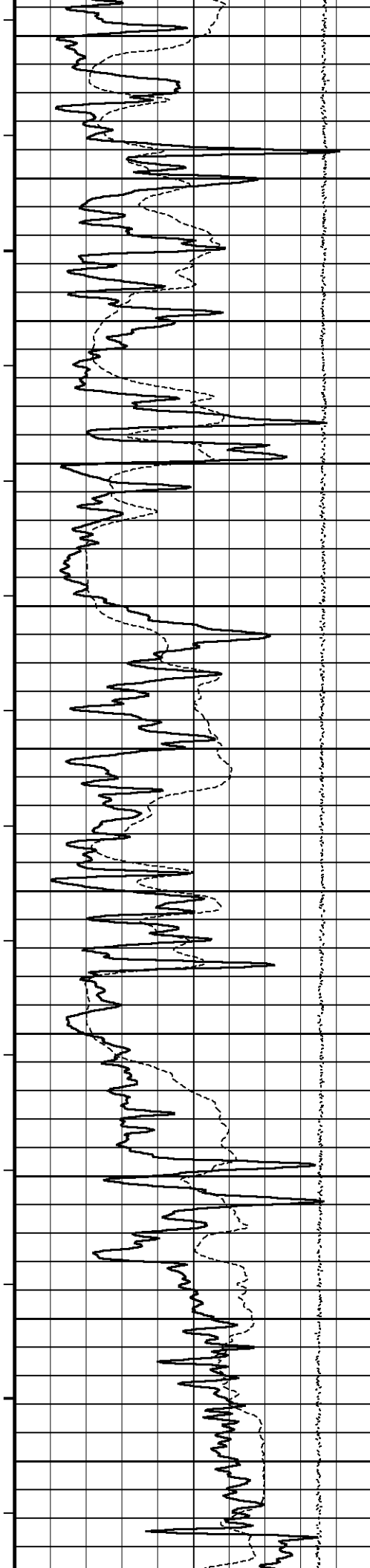
2700

98°

2800







3400

103°

3500

103°

3600

104°

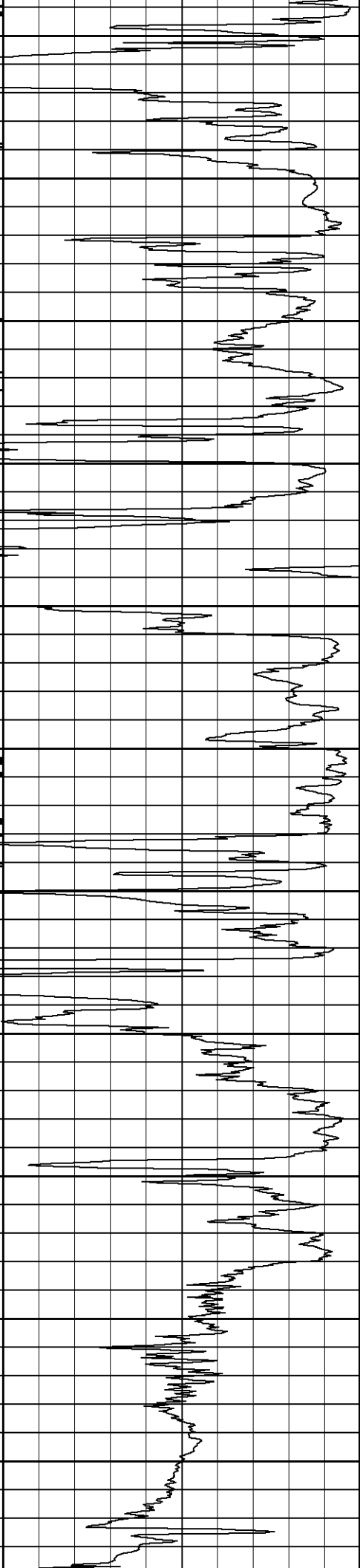
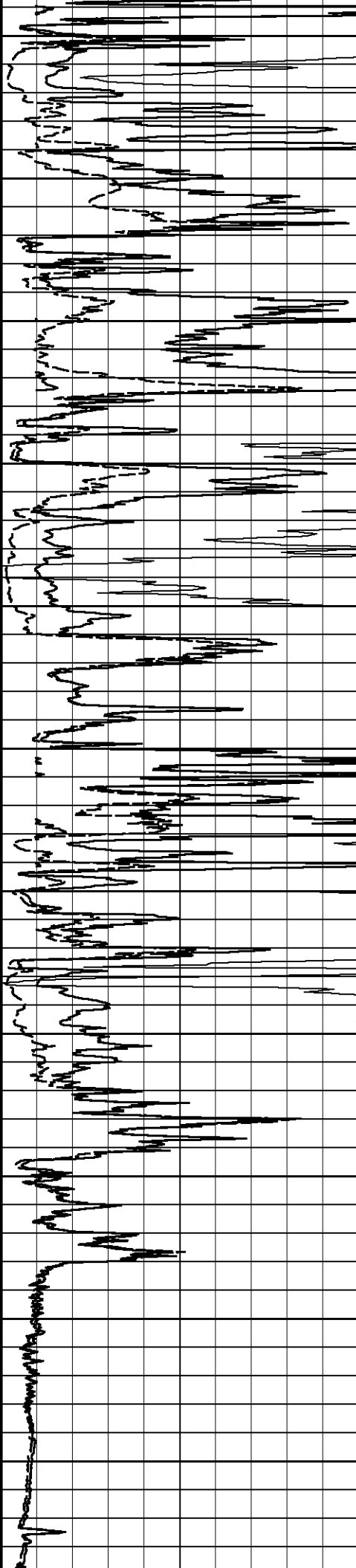
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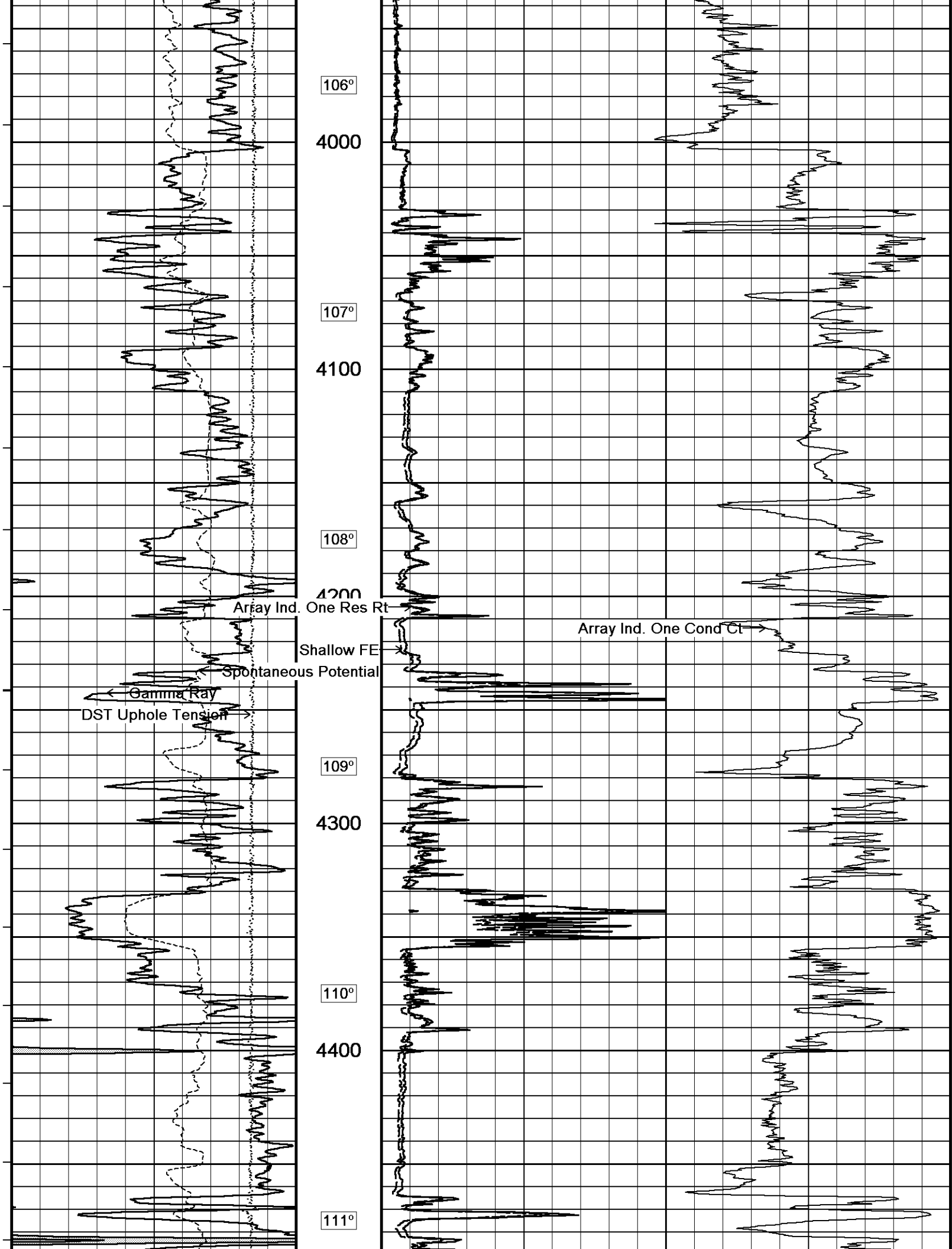
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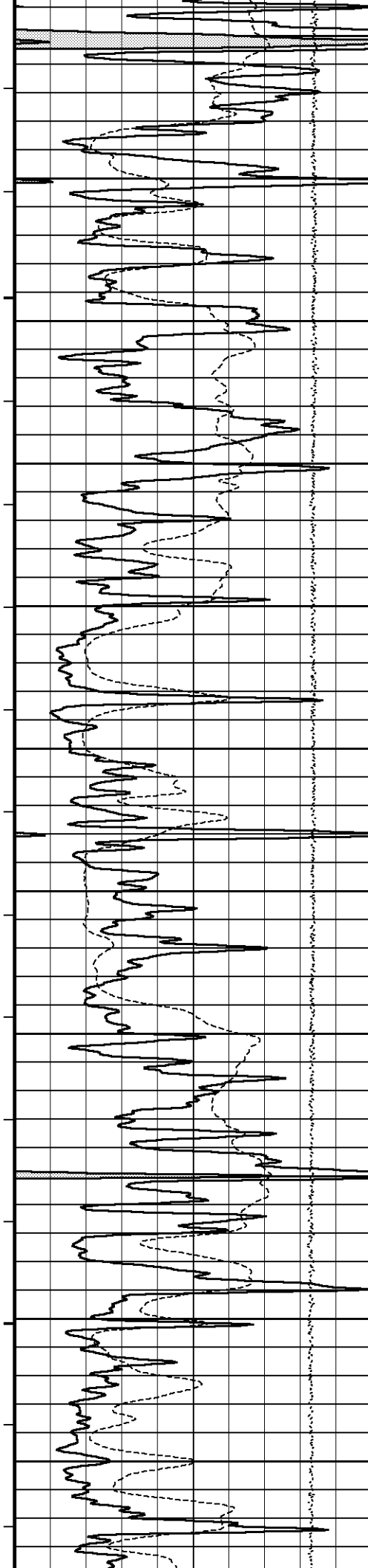
3800

105°

3900







4500

112°

4600

113°

4700

114°

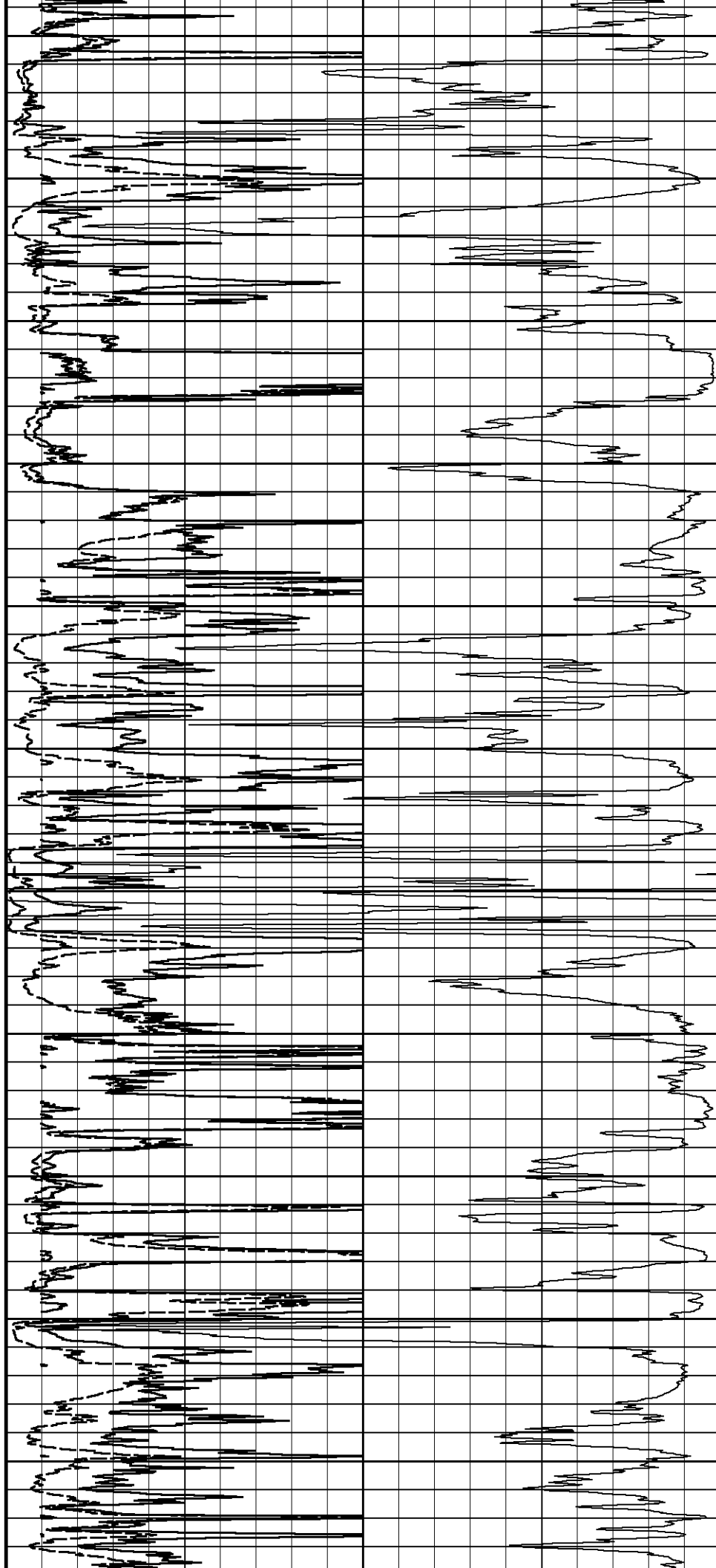
4800

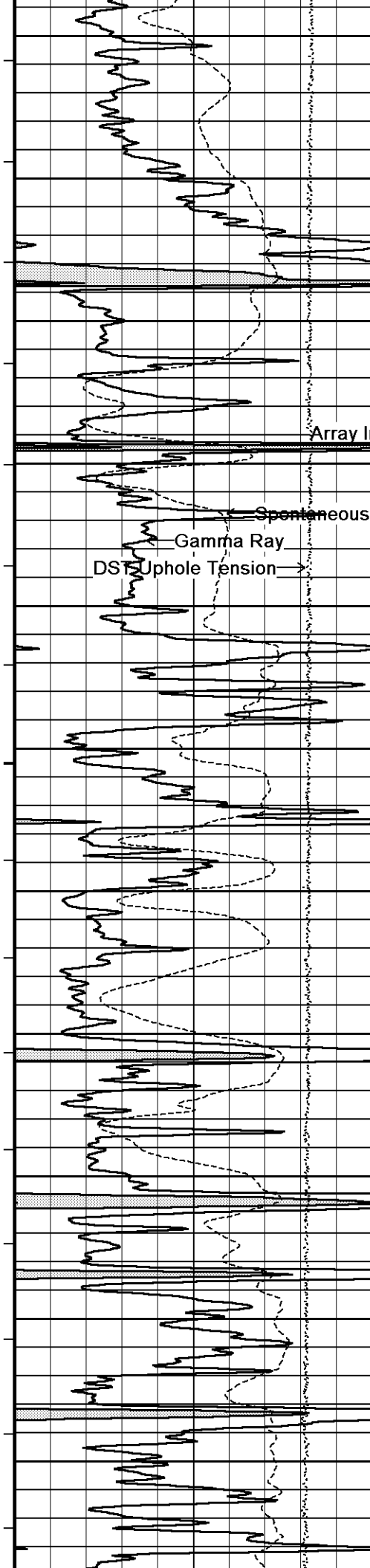
114°

4900

115°

5000





116°

5100

117°

5200

Array Ind. One Res Rt

Spontaneous Potential

Gamma Ray

DST/Uphole Tension

117°

5300

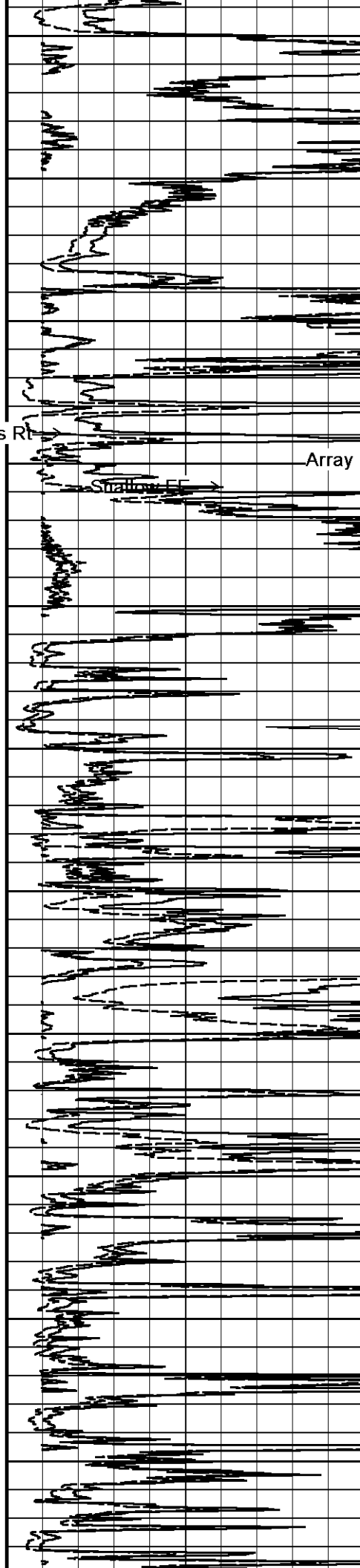
118°

5400

119°

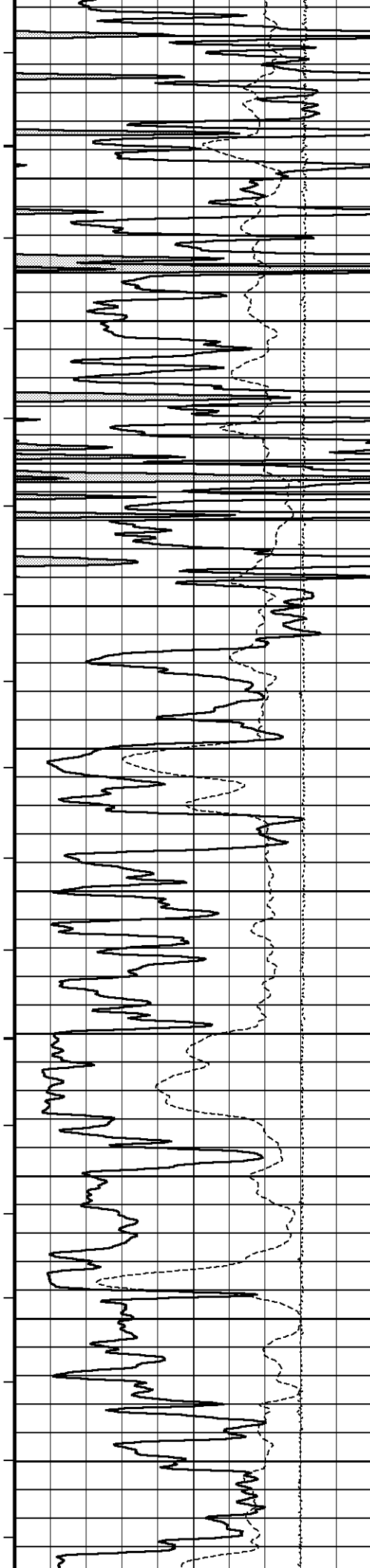
5500

120°



Array Ind. One Cond Ct

Shallow FF



5600

120°

5700

121°

5800

121°

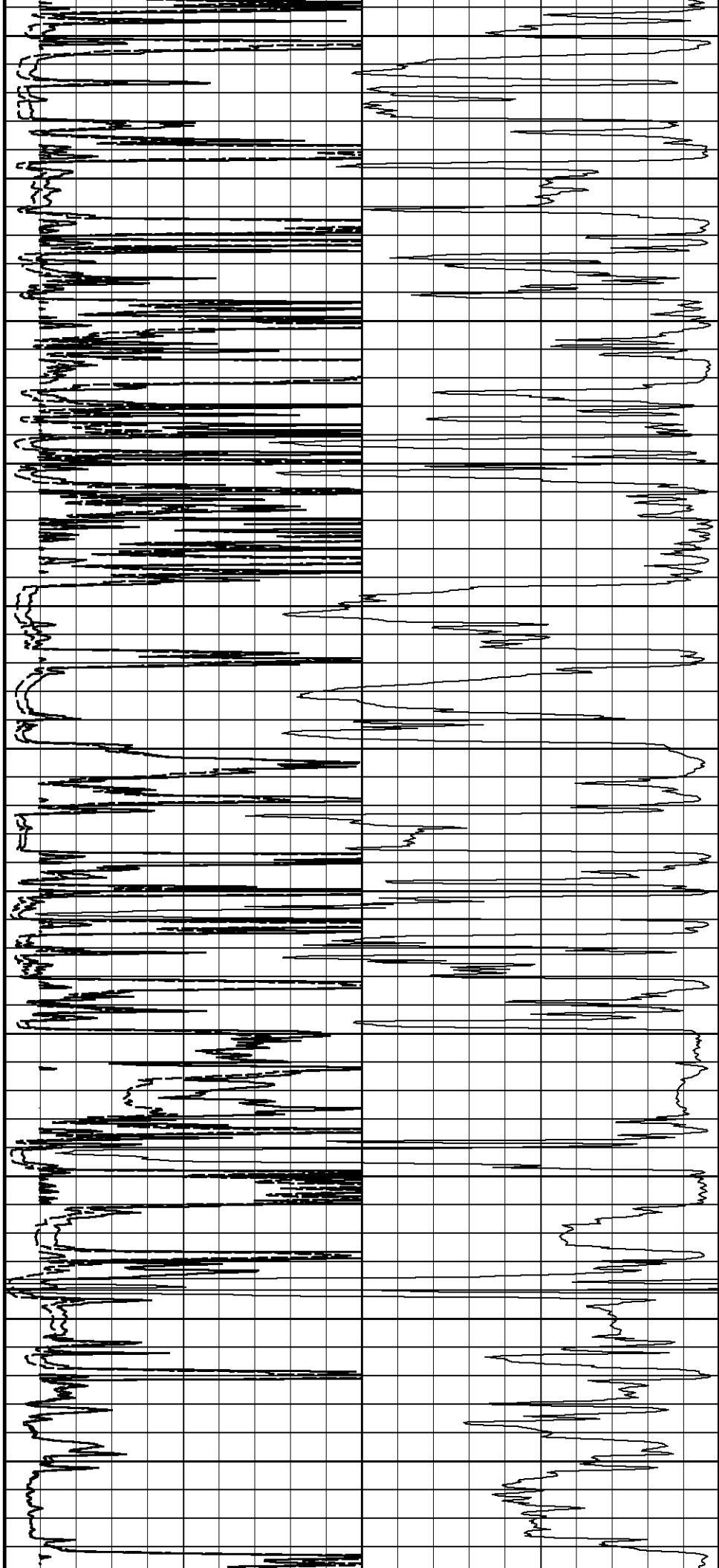
5900

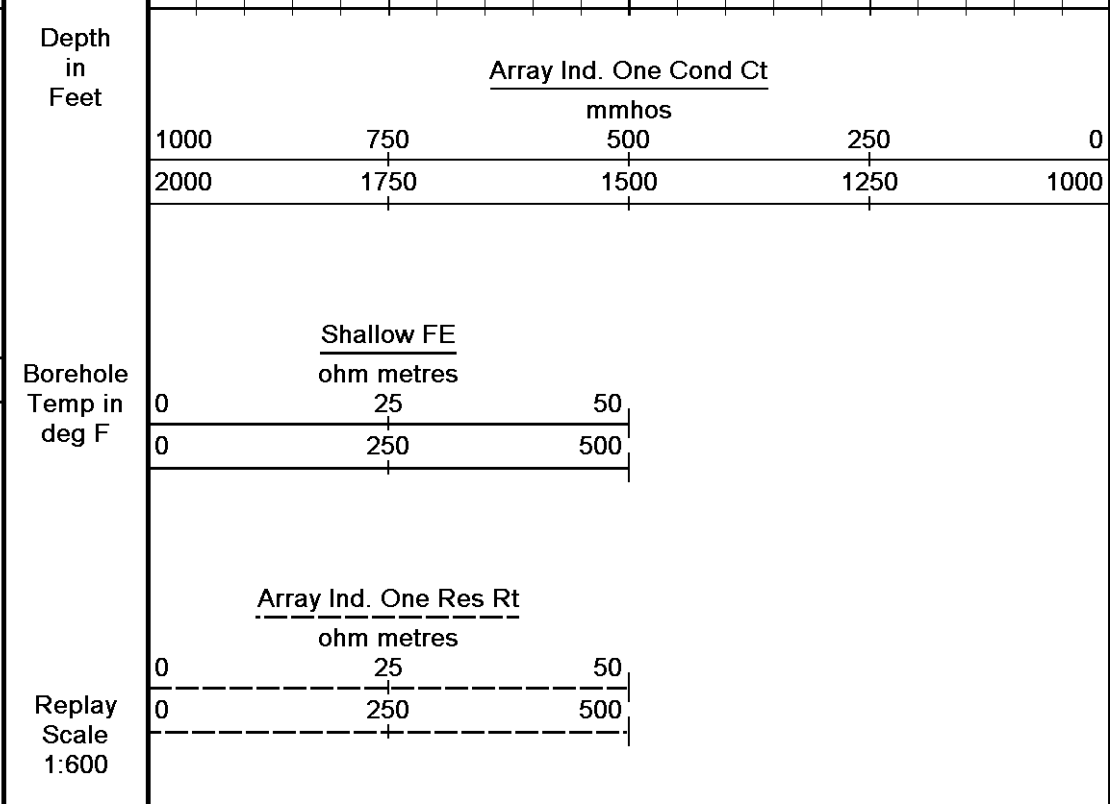
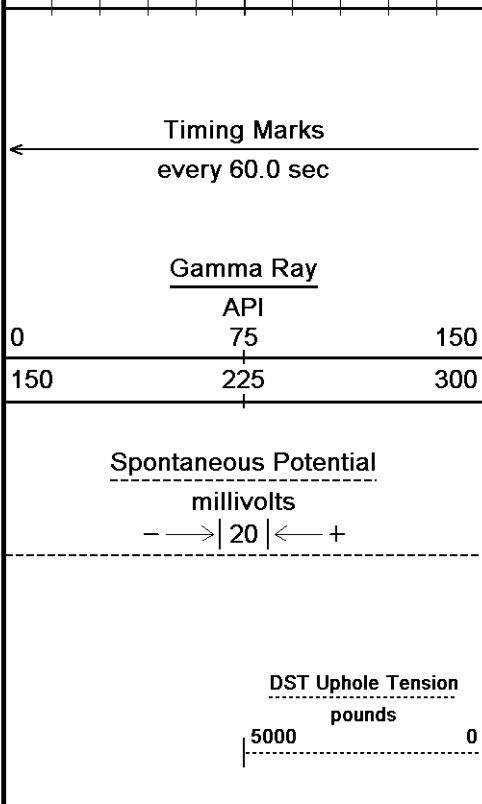
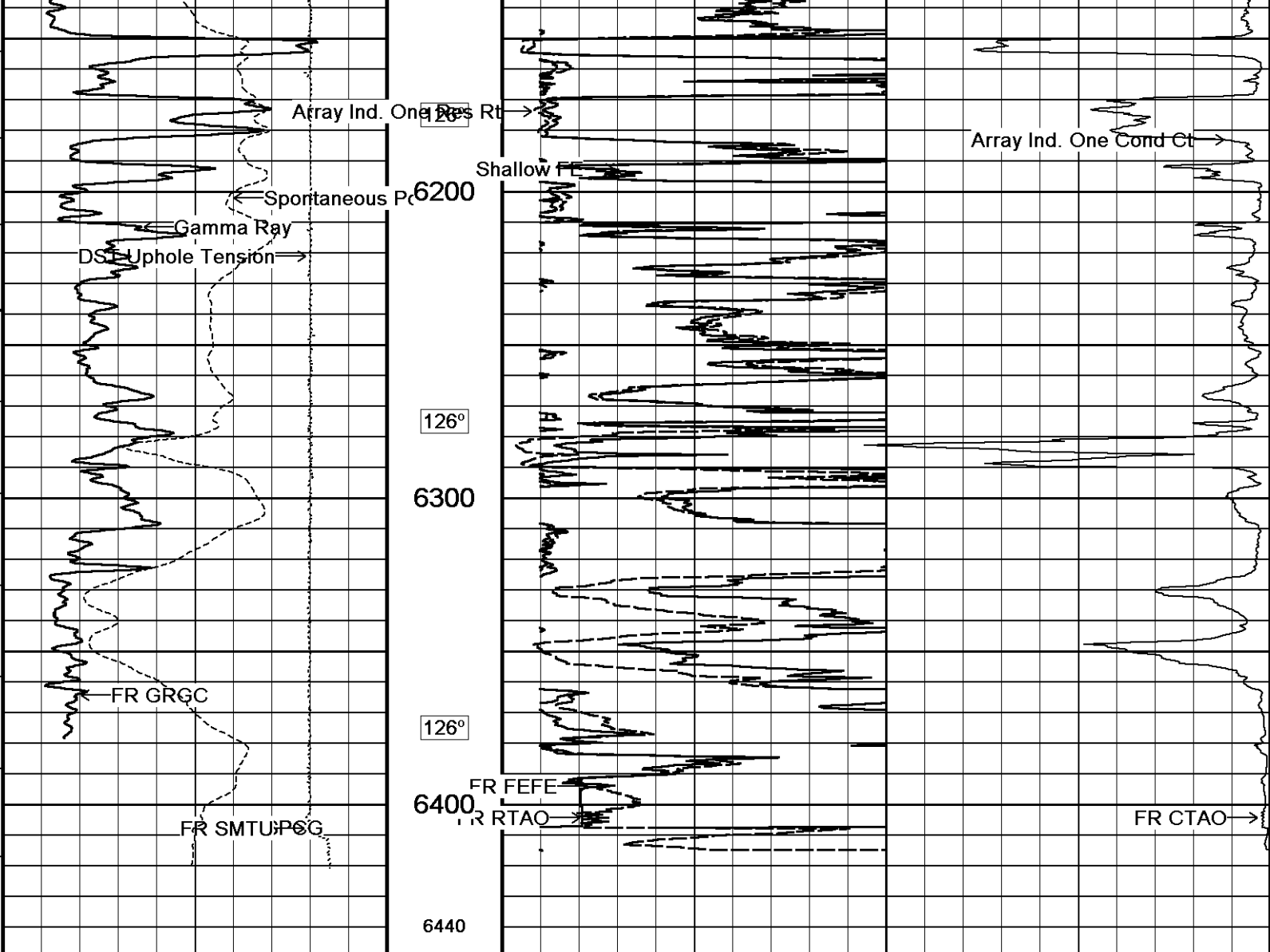
123°

6000

124°

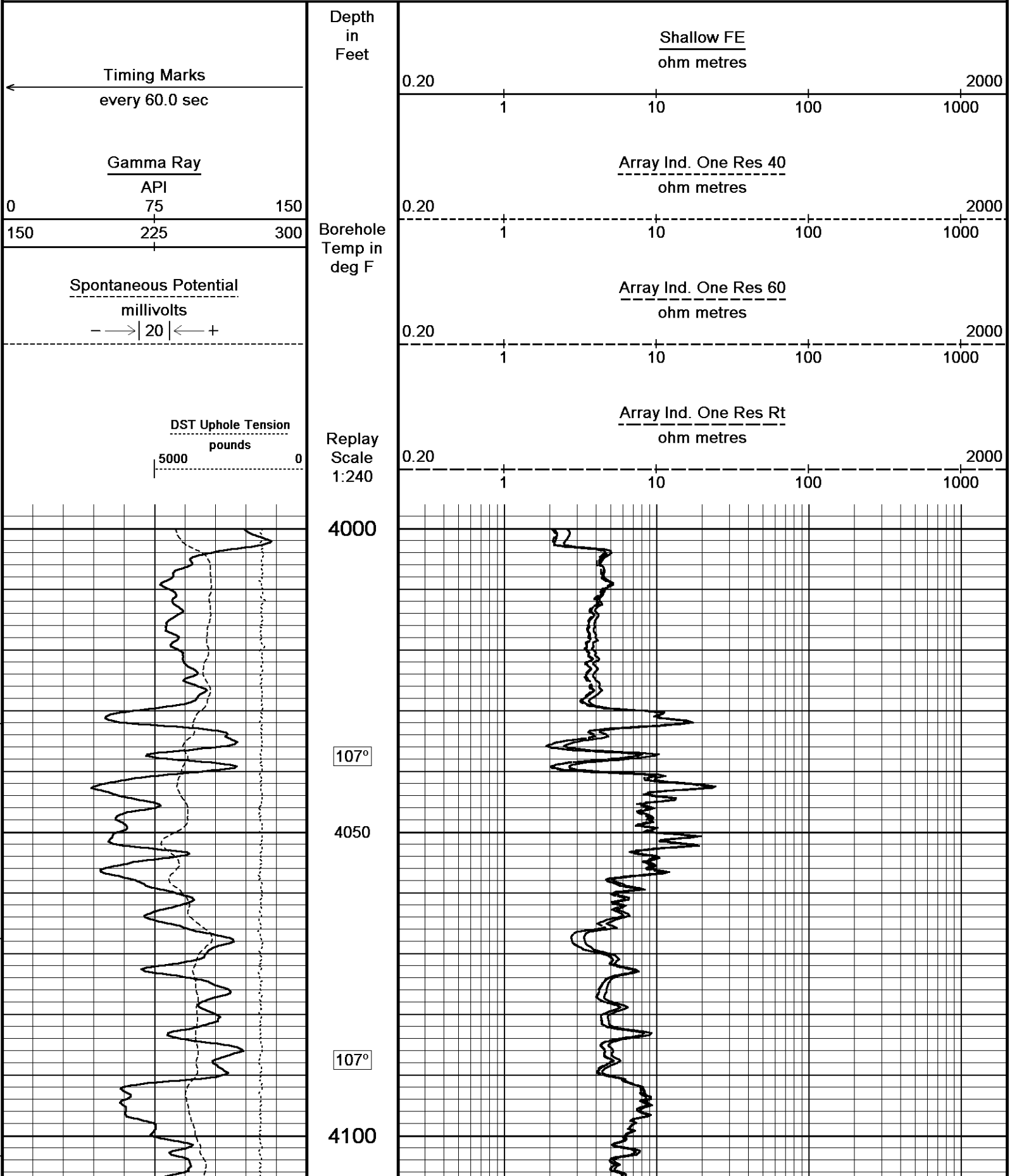
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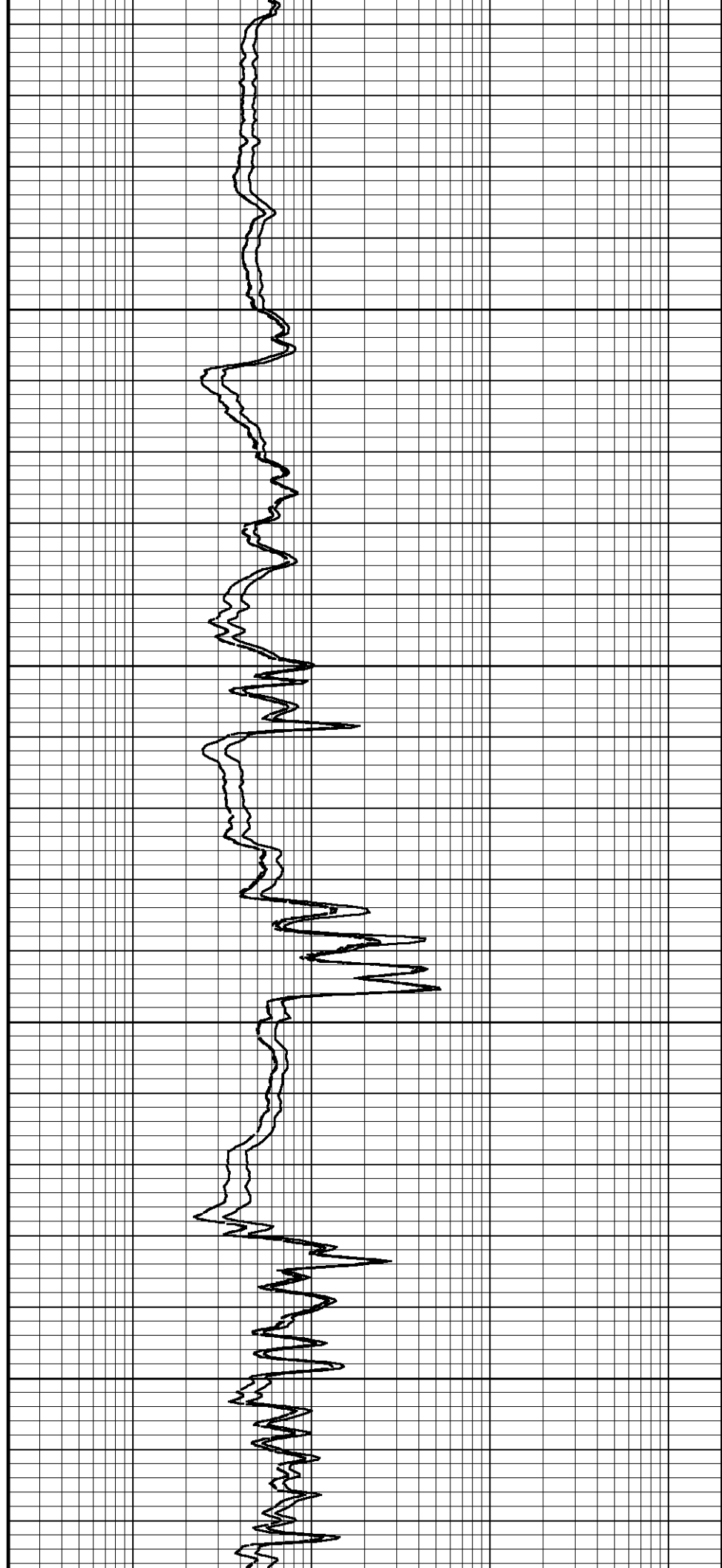
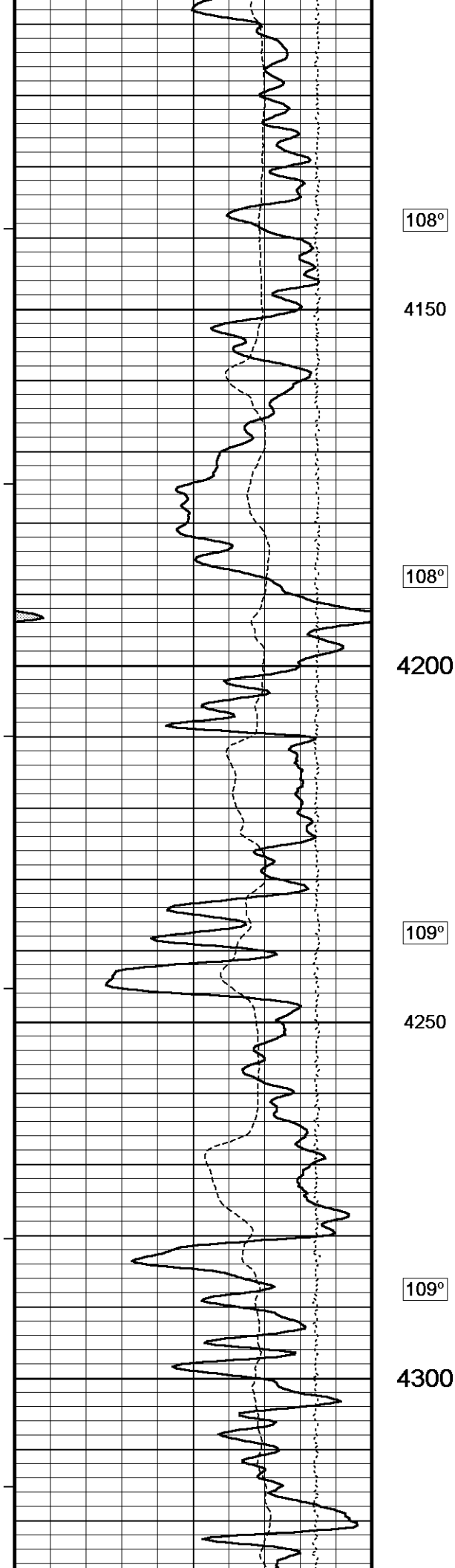


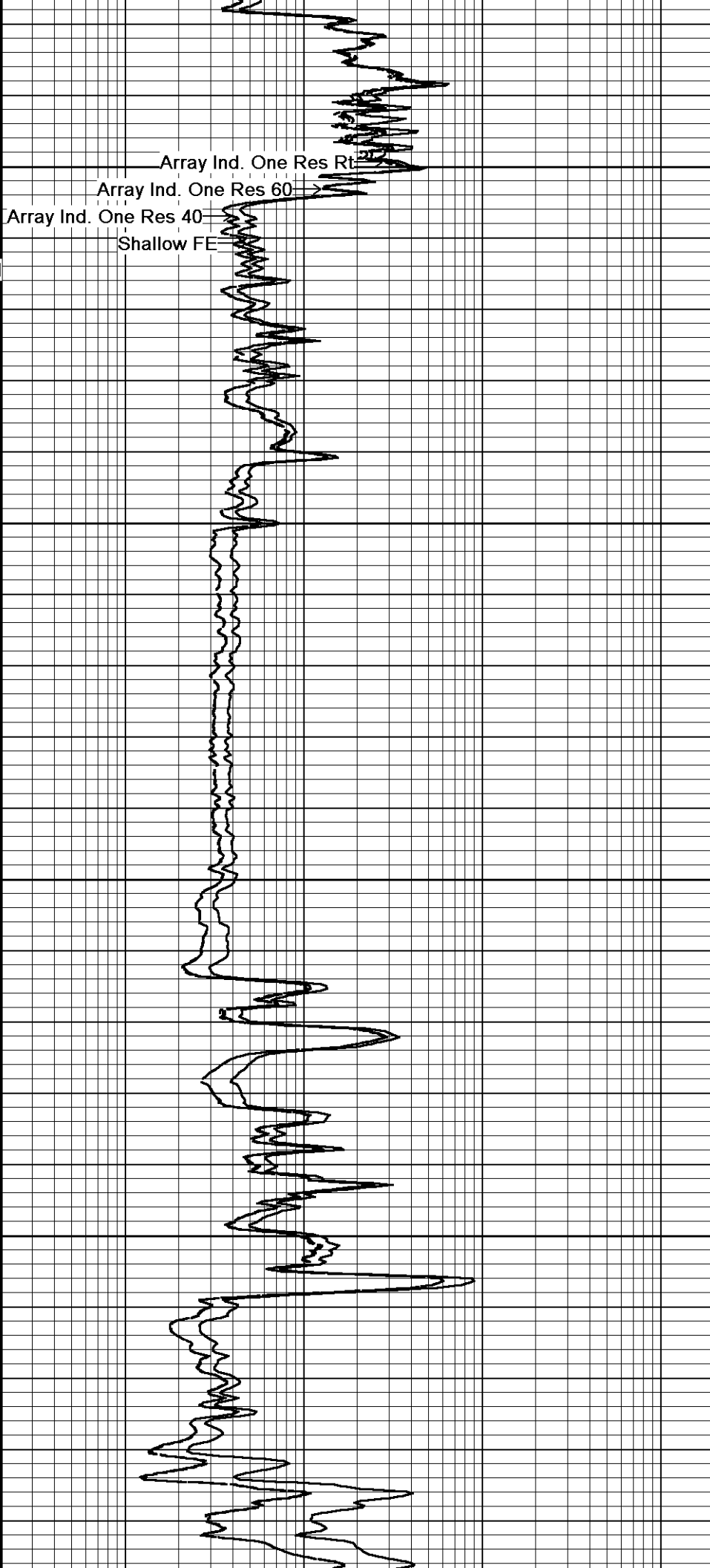
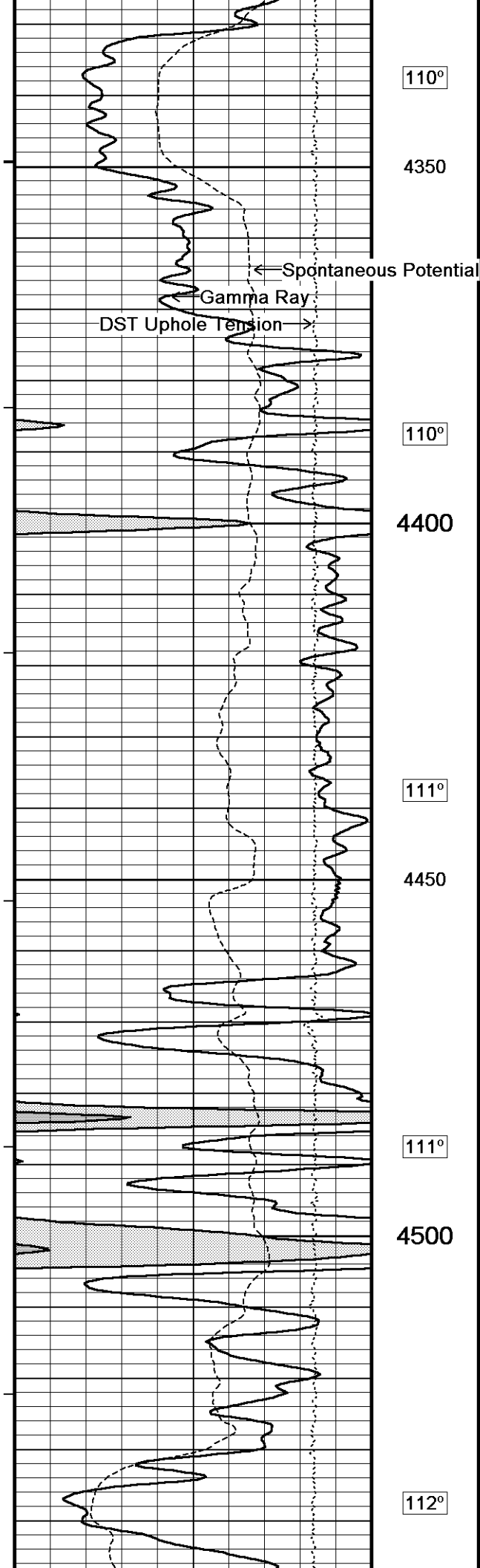


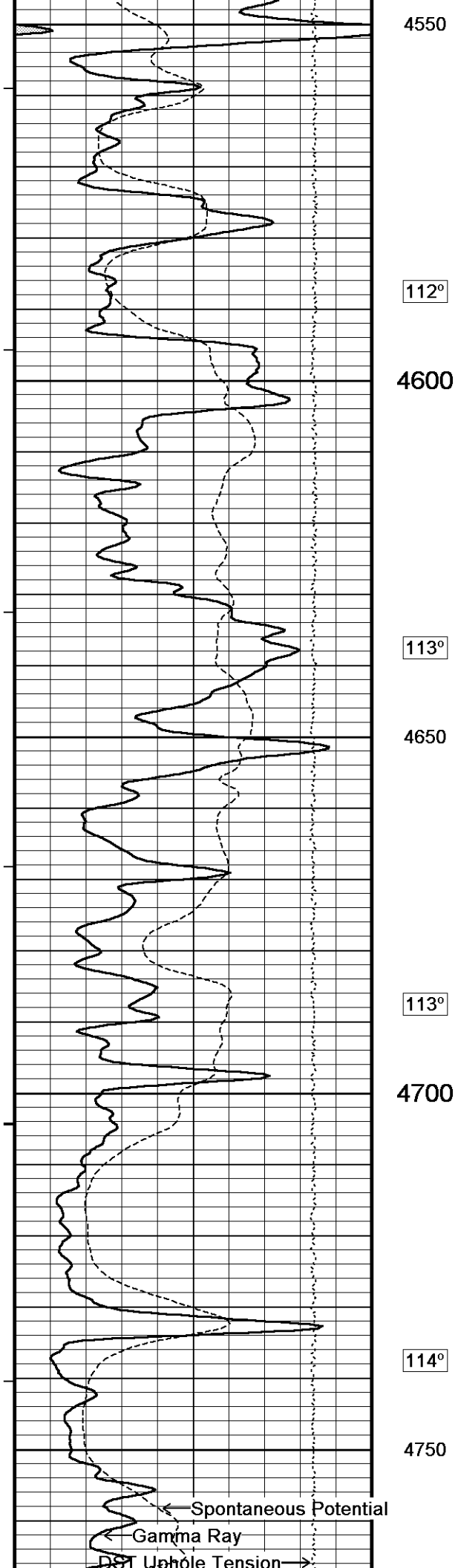
Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Minimus 13.04.8492\Data\O'Brien Vail #5-31\O'Brien_Vail #5-31_Main.dta
System Versions: Logged with 13.04.8492 Plotted with 13.04.8492

Plotted on 29-JAN-2013 17:38
Recorded on 29-JAN-2013 15:03









4550

112°

4600

113°

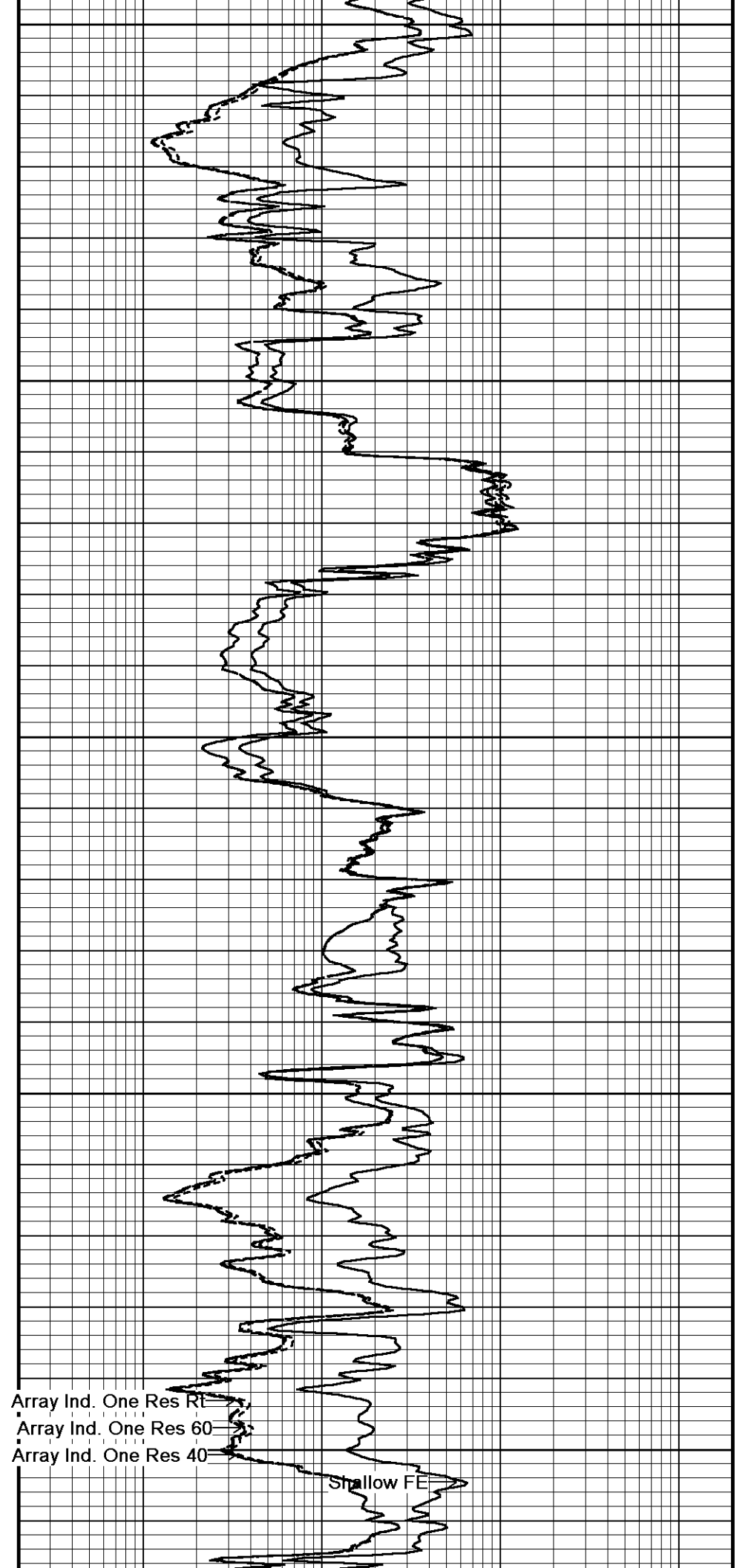
4650

113°

4700

114°

4750

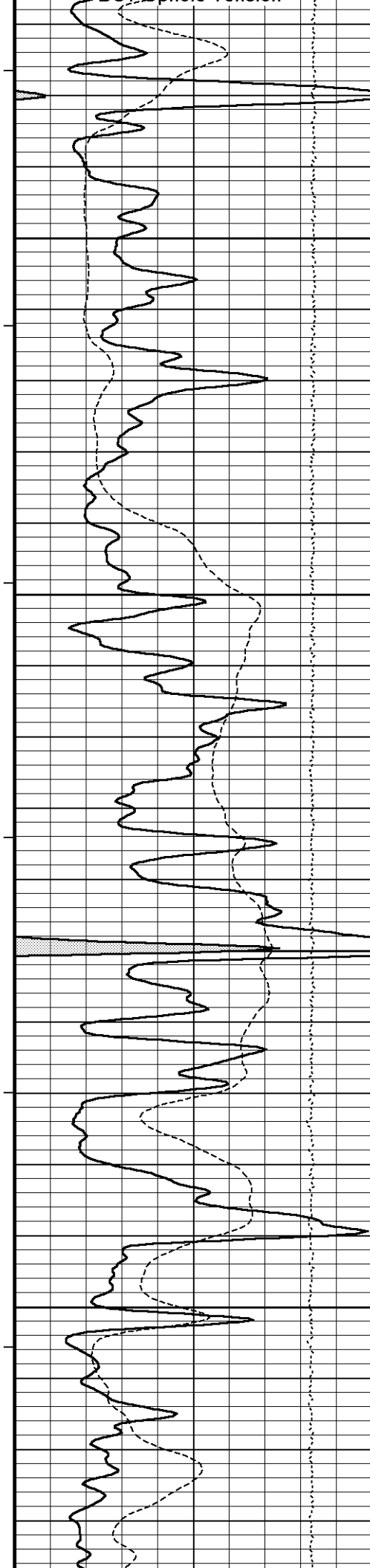


Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FE



114°

4800

114°

4850

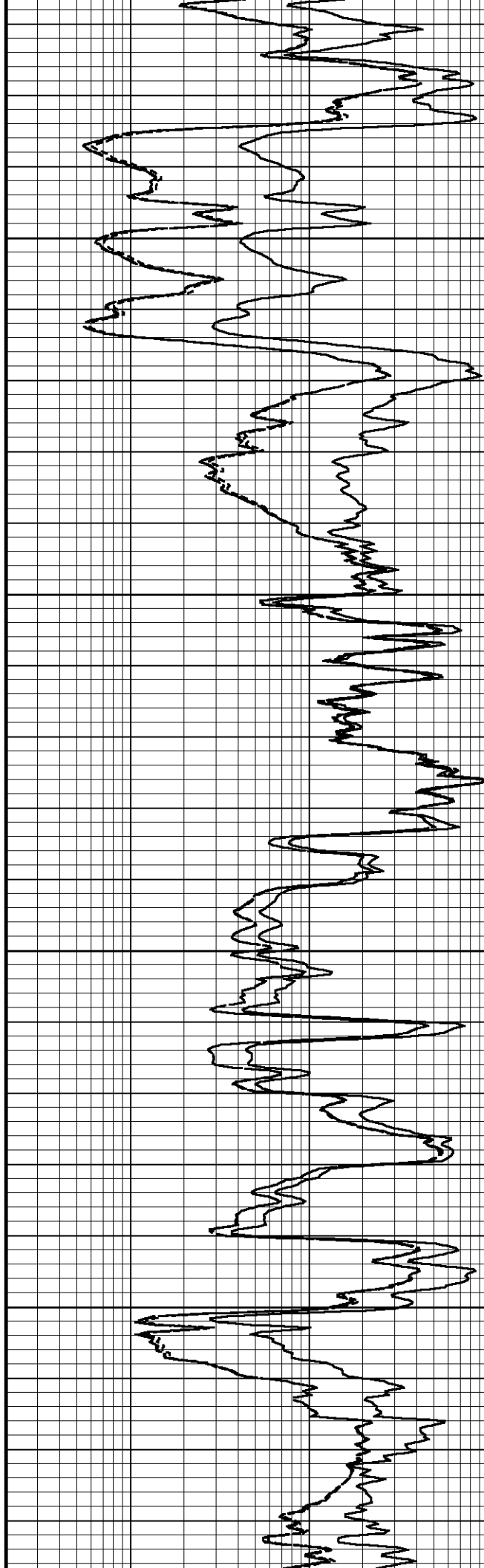
114°

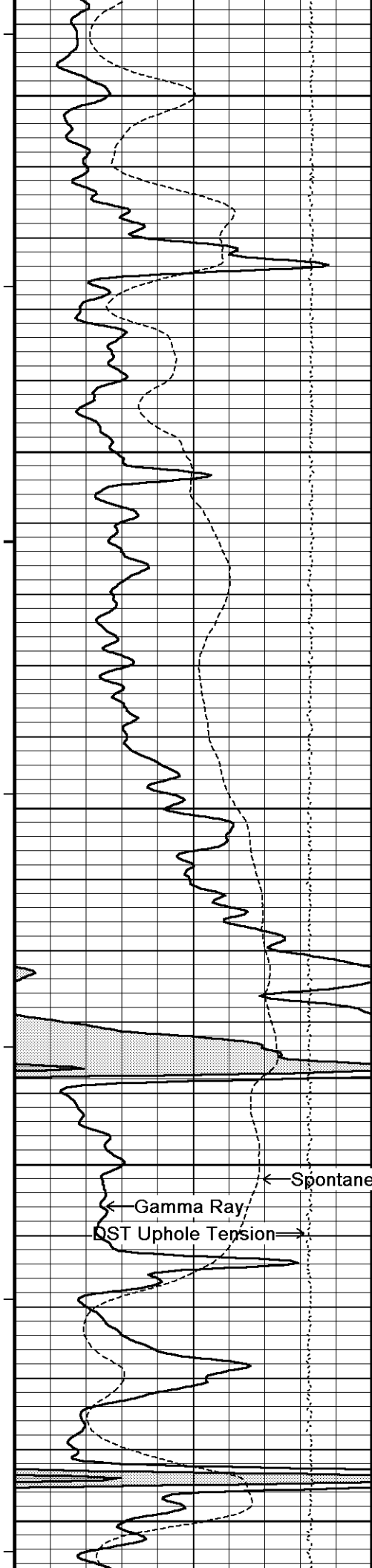
4900

115°

4950

115°





115°

5000

116°

5050

116°

5100

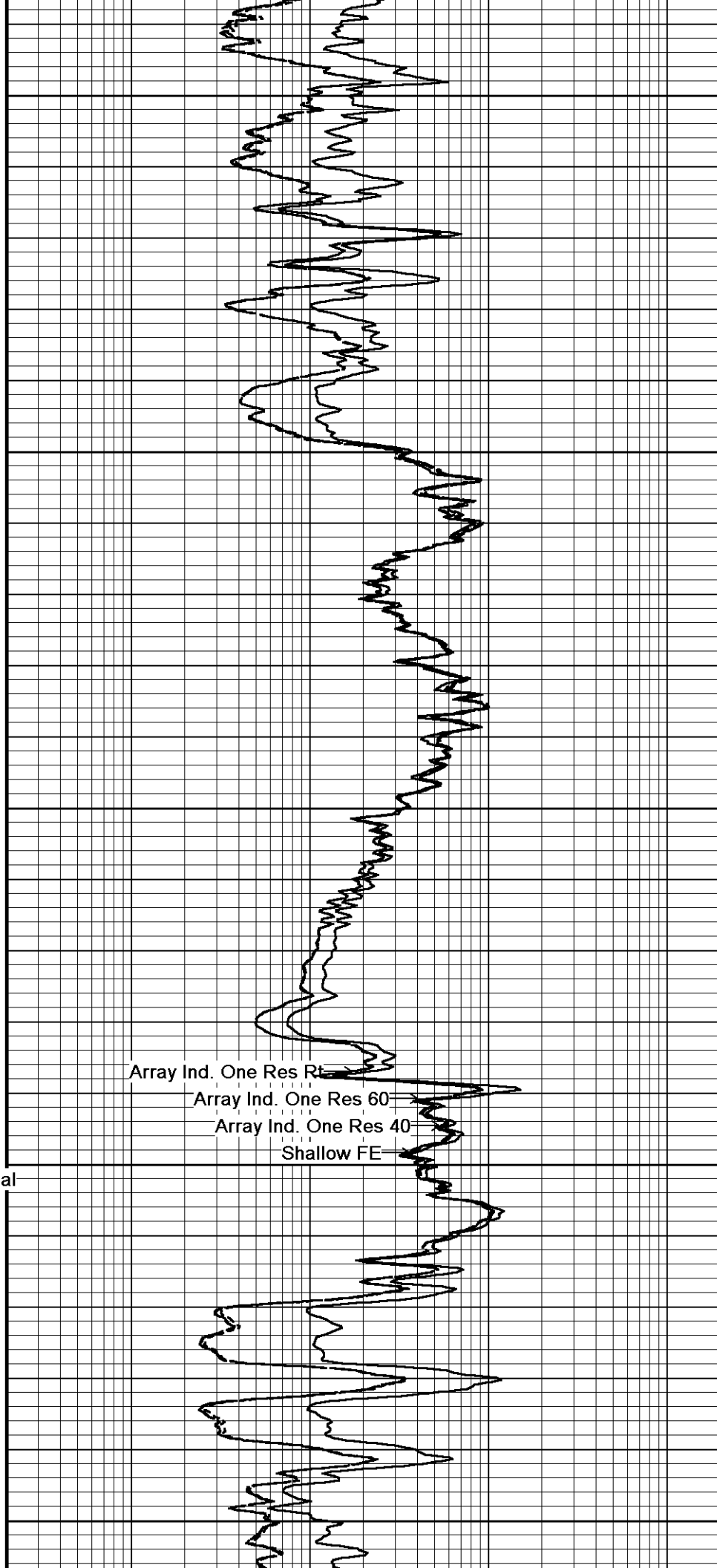
116°

5150
Spontaneous Potential

← Gamma Ray
DST Uphole Tension →

117°

5200

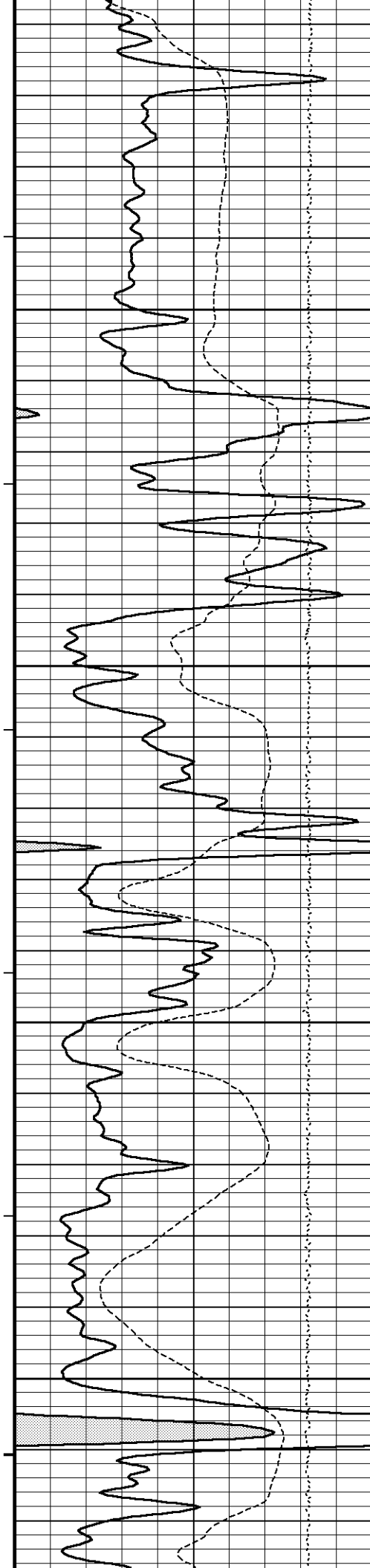


Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FE



117°

5250

117°

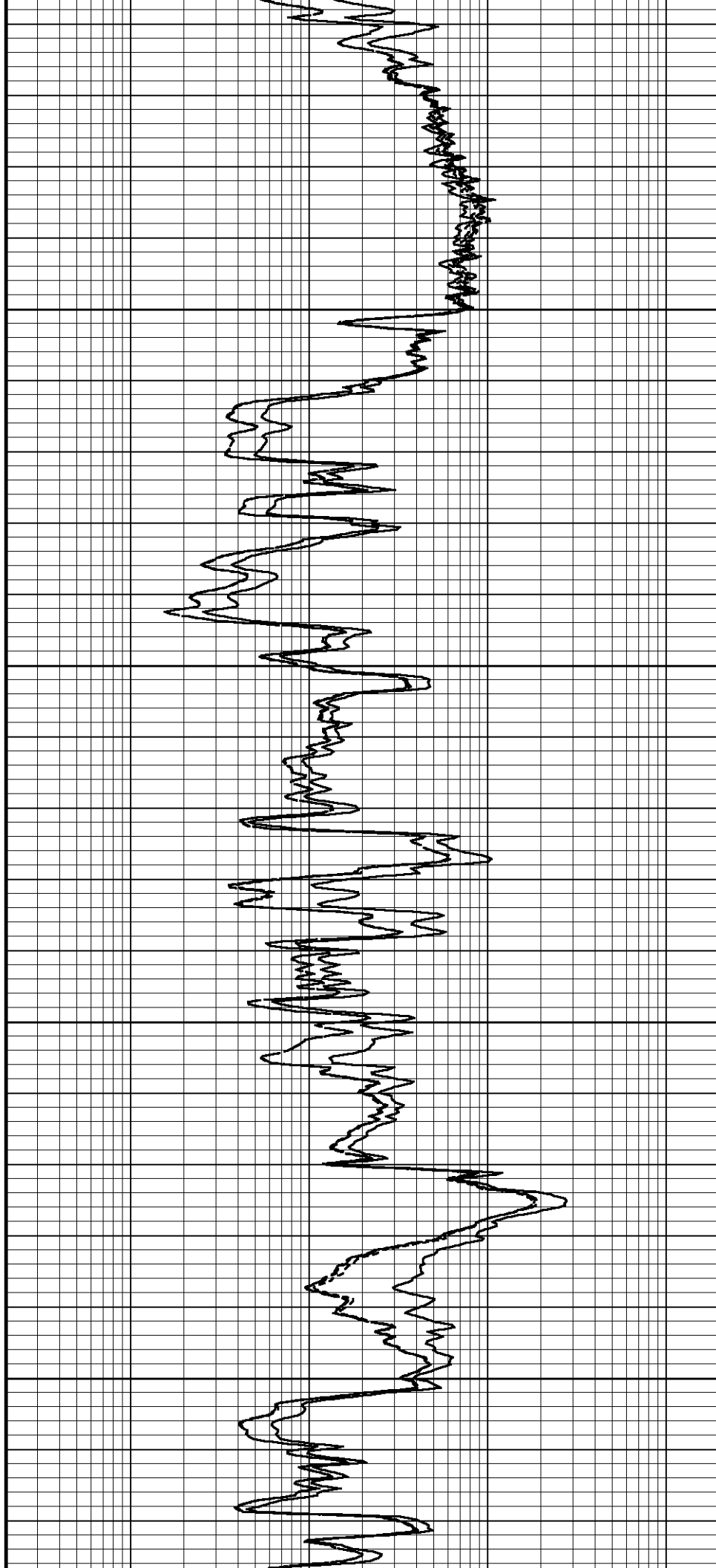
5300

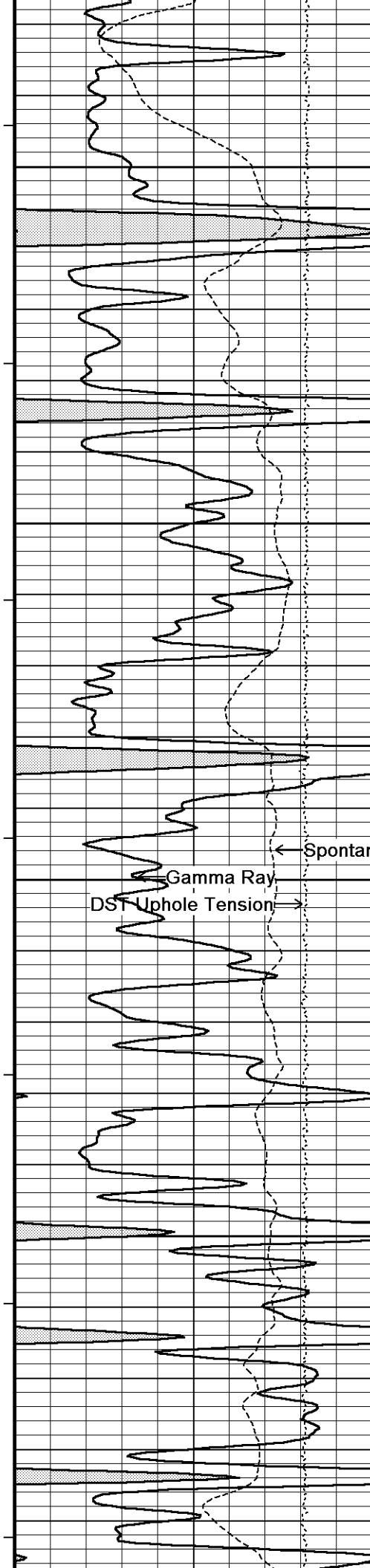
118°

5350

118°

5400





119°

5450

119°

5500

119°

← Spontaneous Potential

Gamma Ray

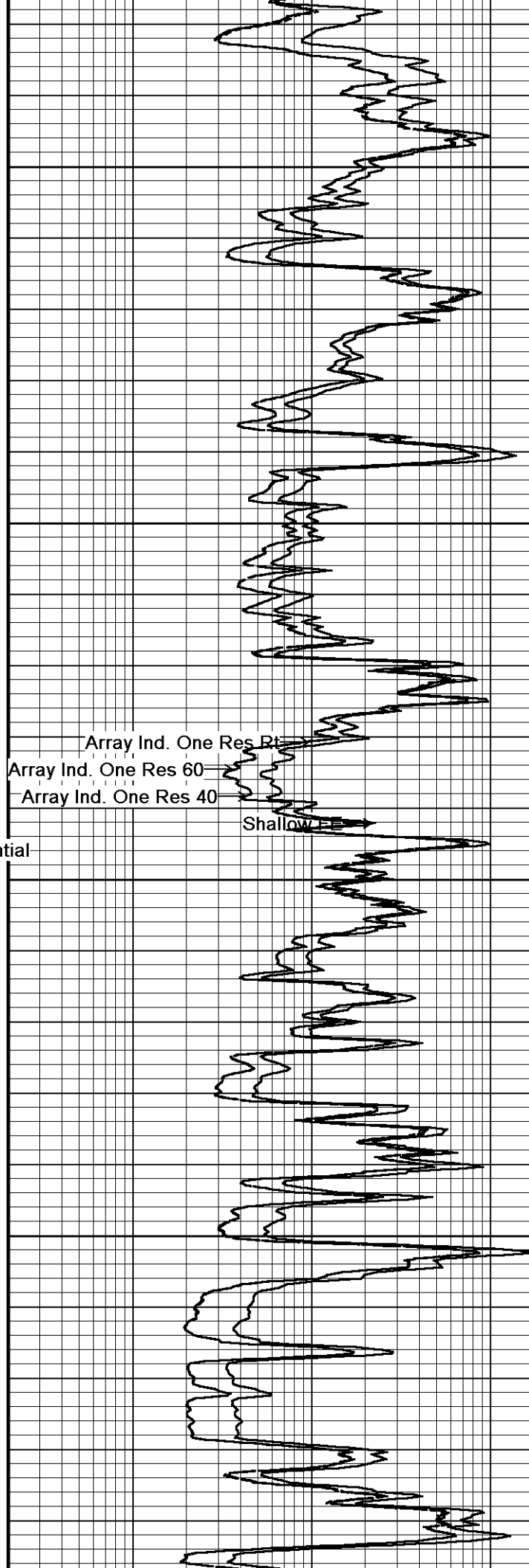
DST Uphole Tension →

5550

120°

5600

120°

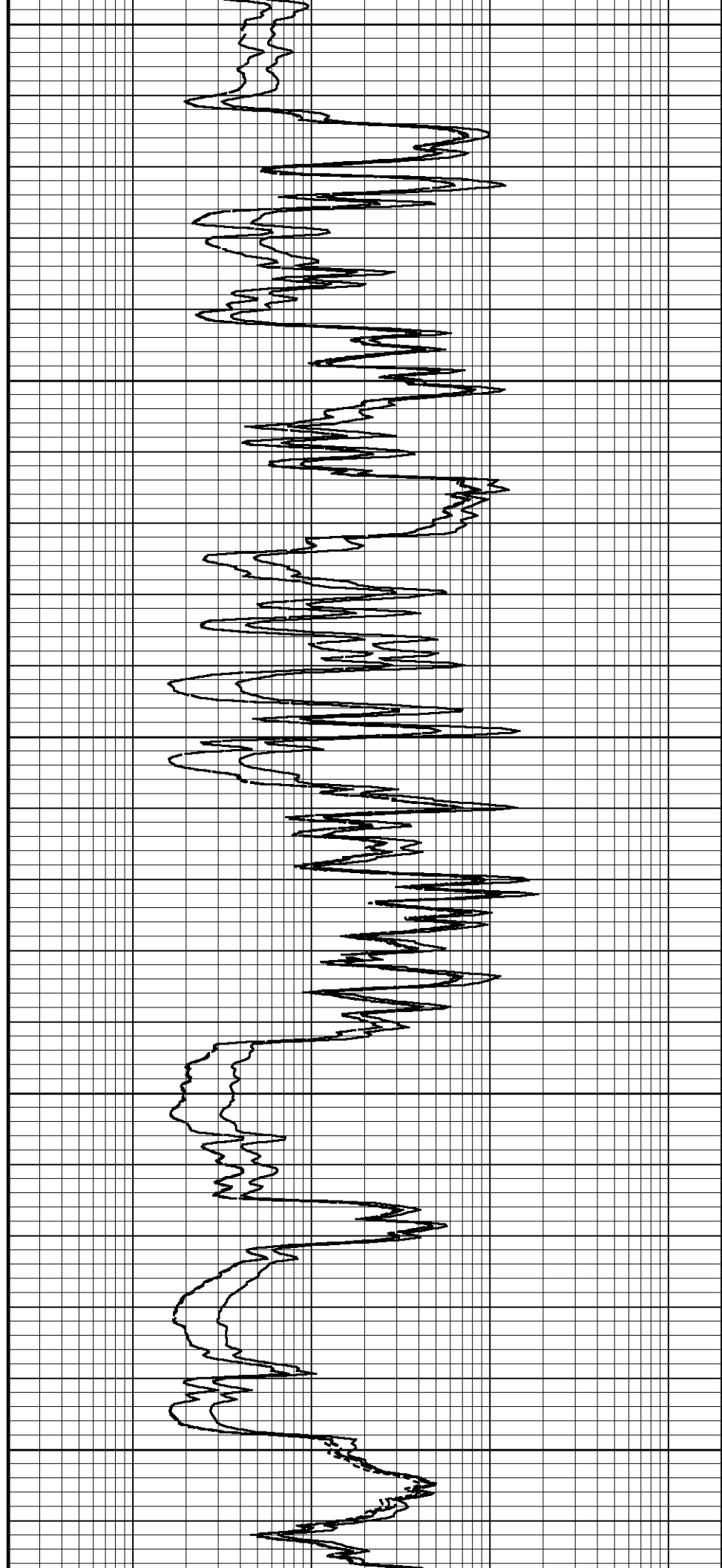
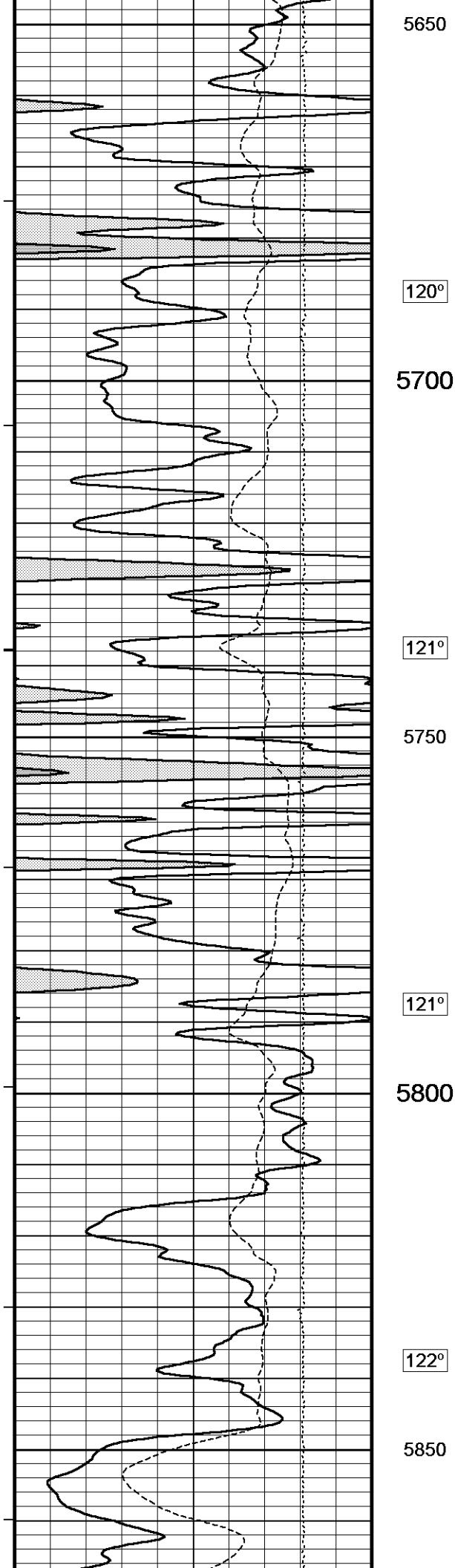


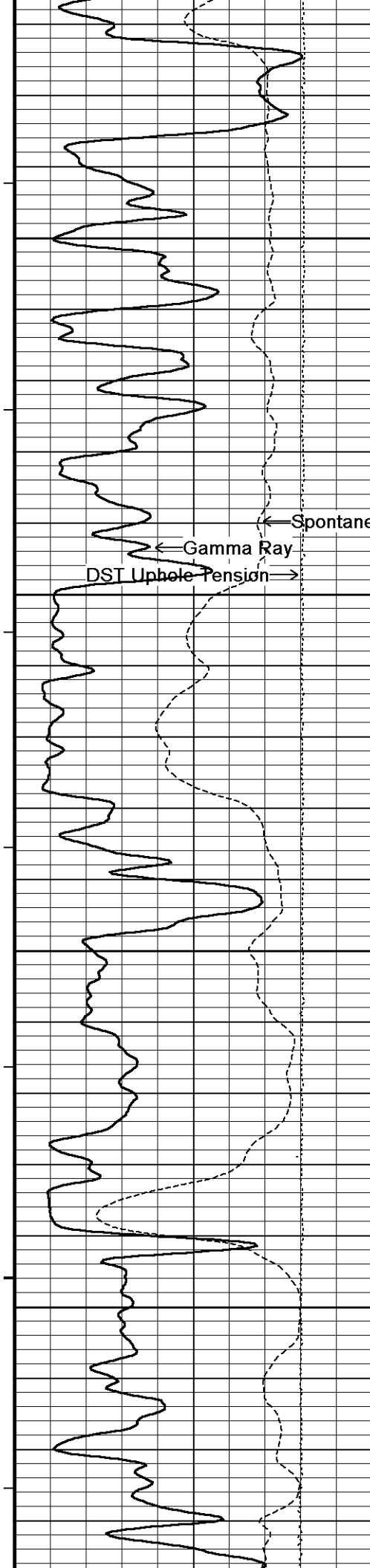
Array Ind. One Res 80

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FF





121°

5900

122°

5950

123°

6000

123°

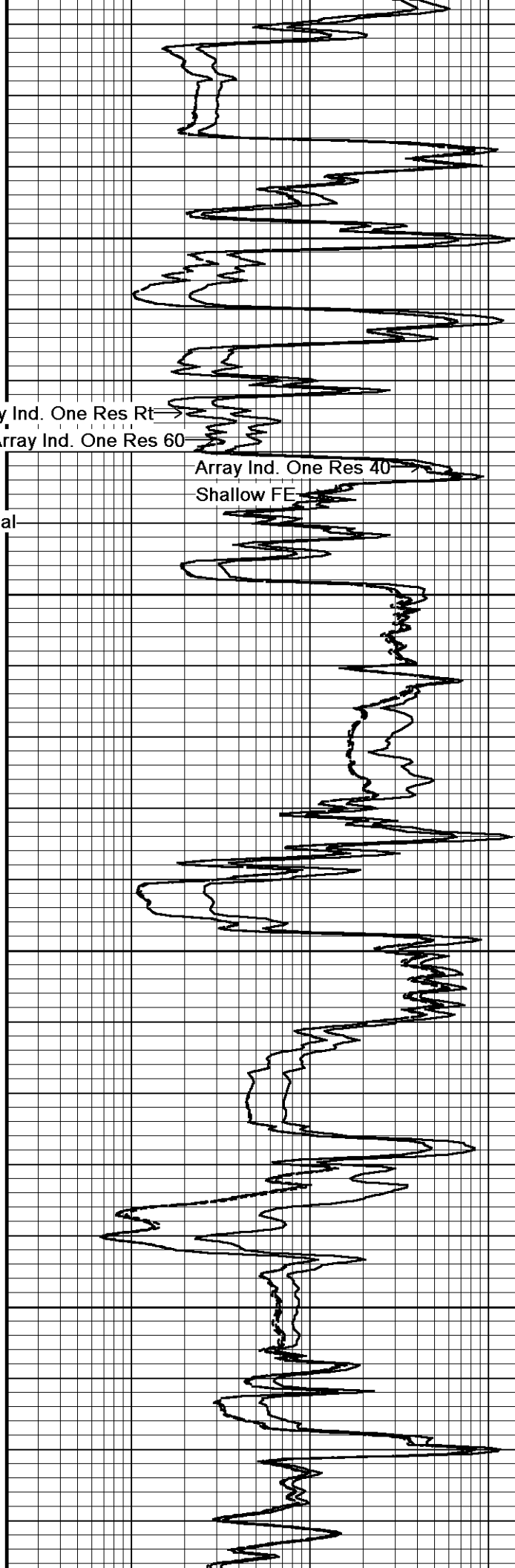
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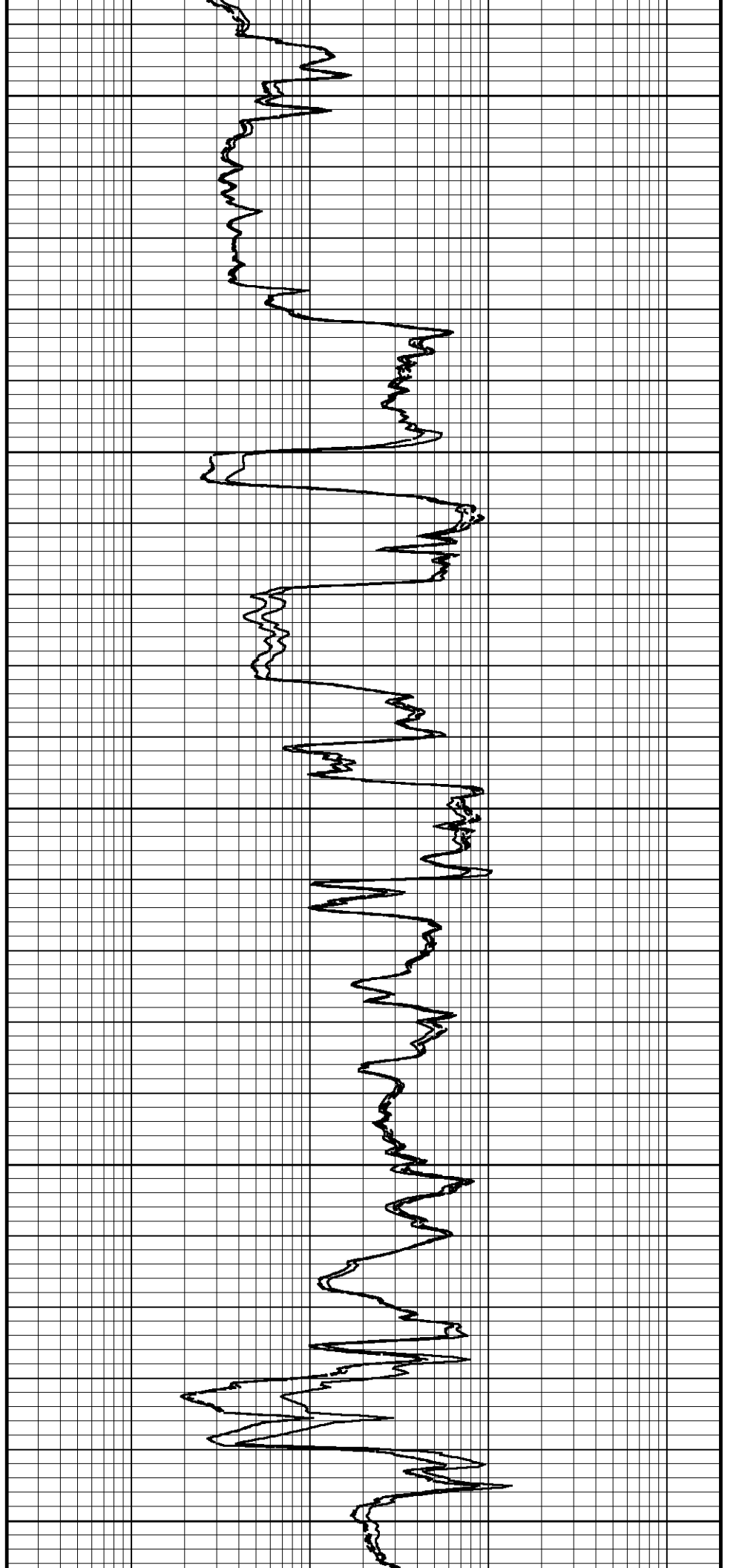
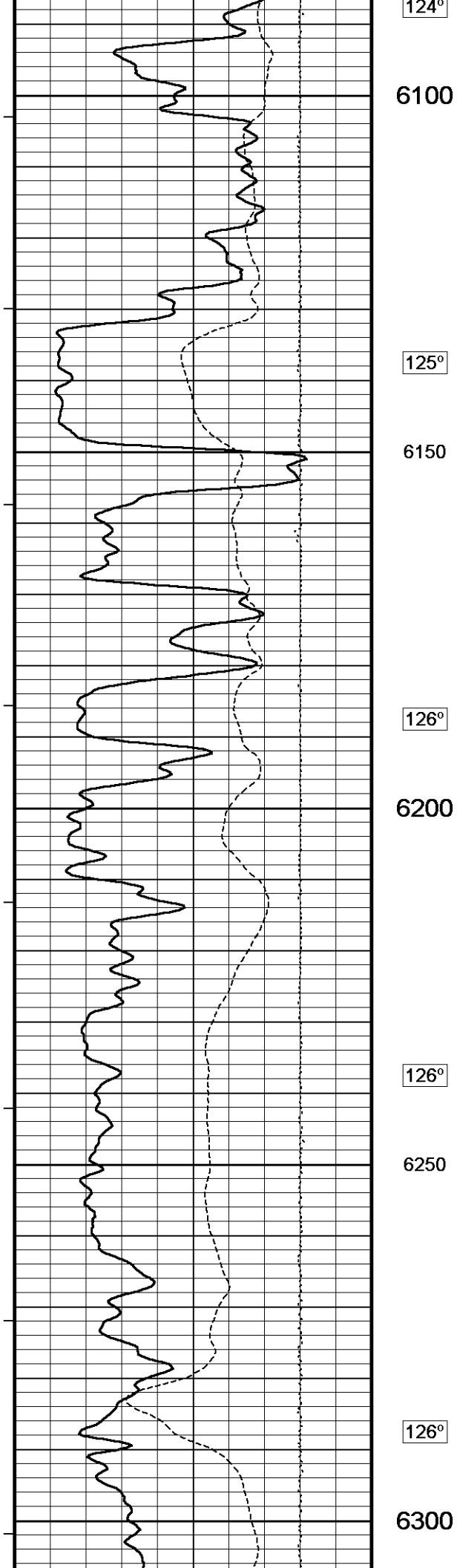
← Gamma Ray
DST Uphole Tension →

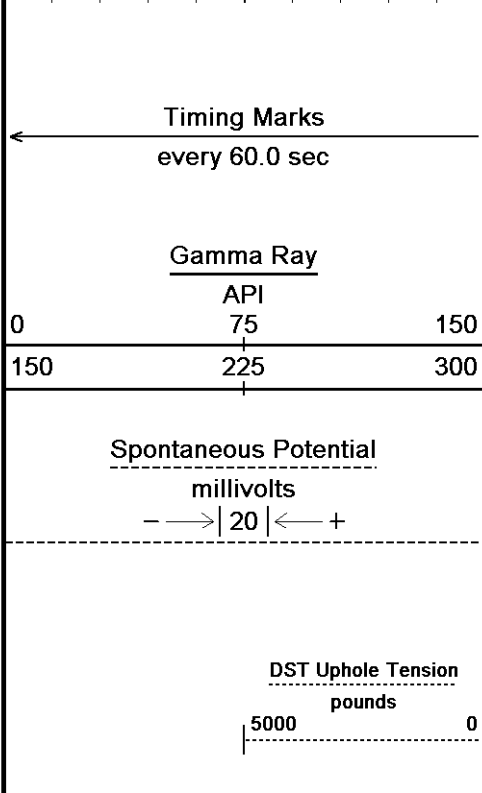
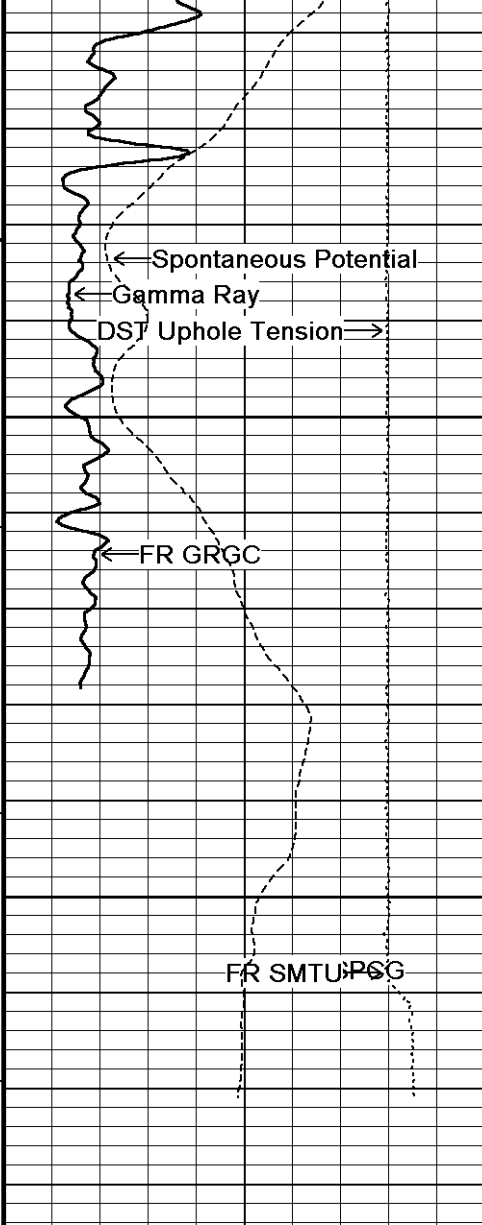
← Spontaneous Potential

Array Ind. One Res Rt
Array Ind. One Res 60

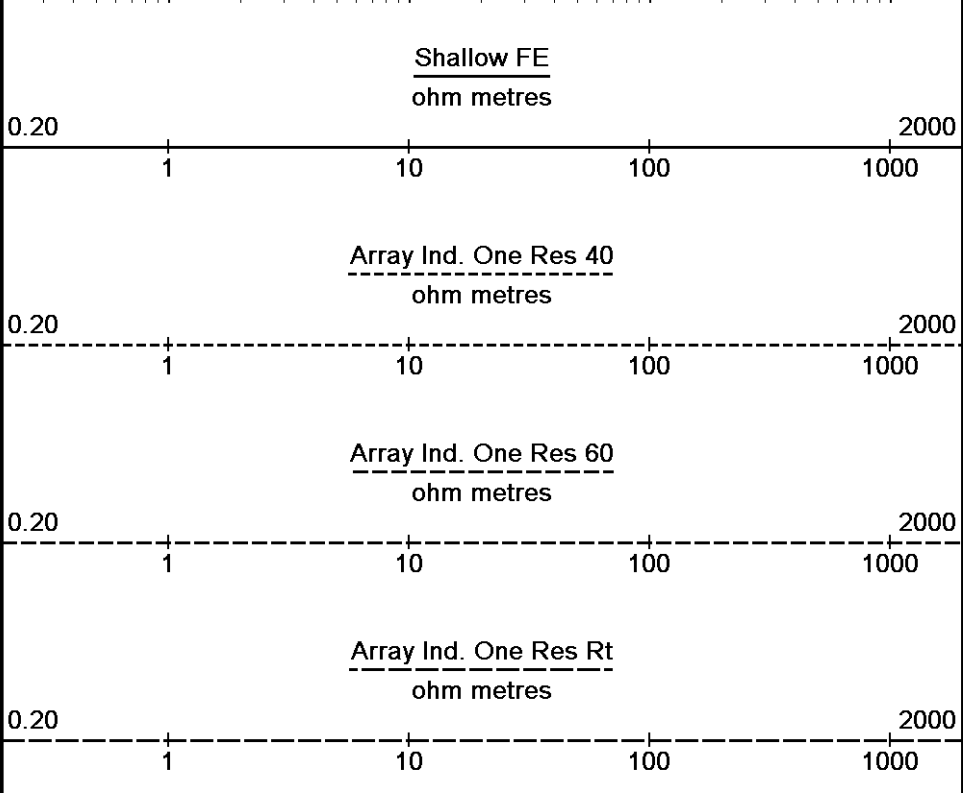
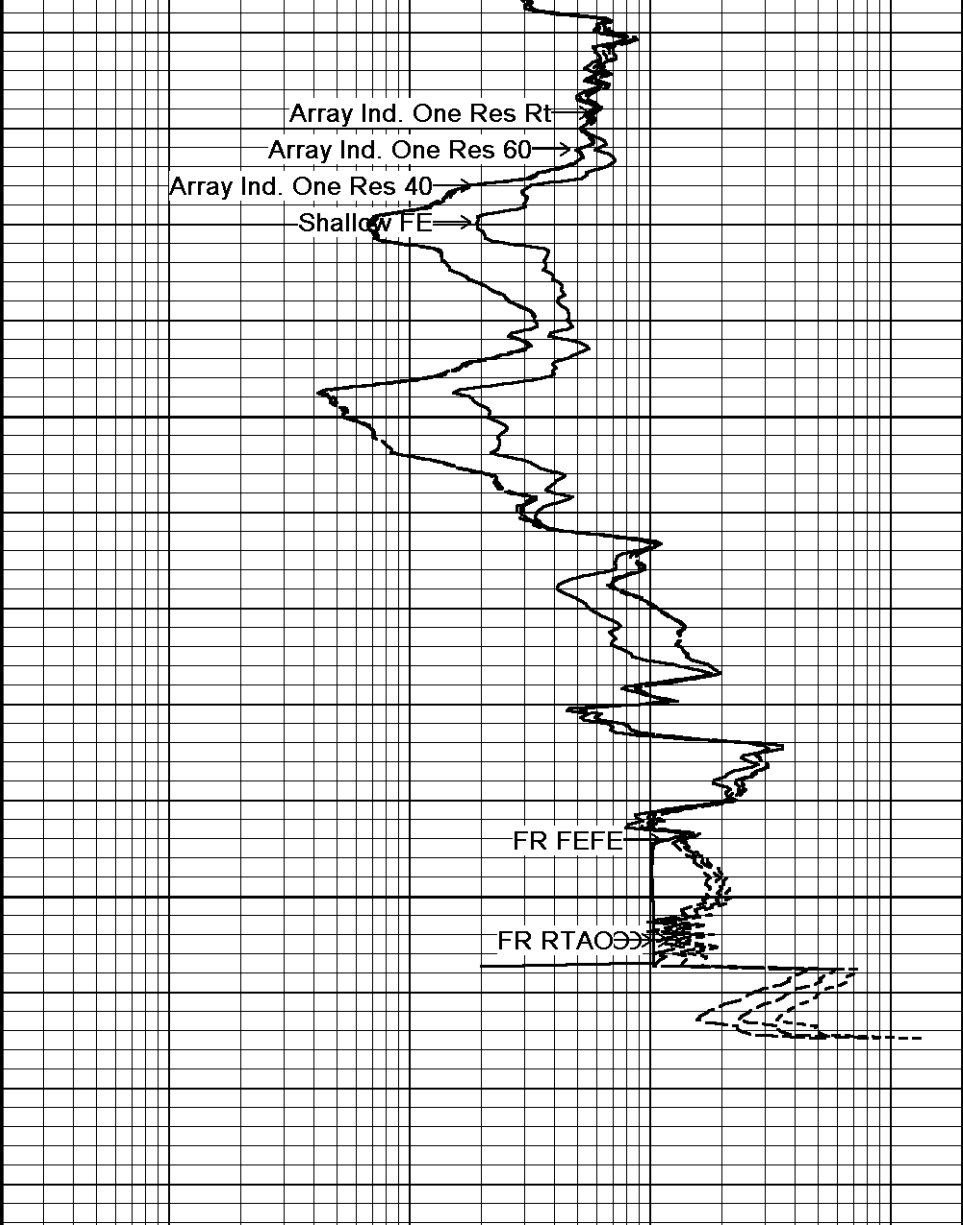
Array Ind. One Res 40
Shallow FE

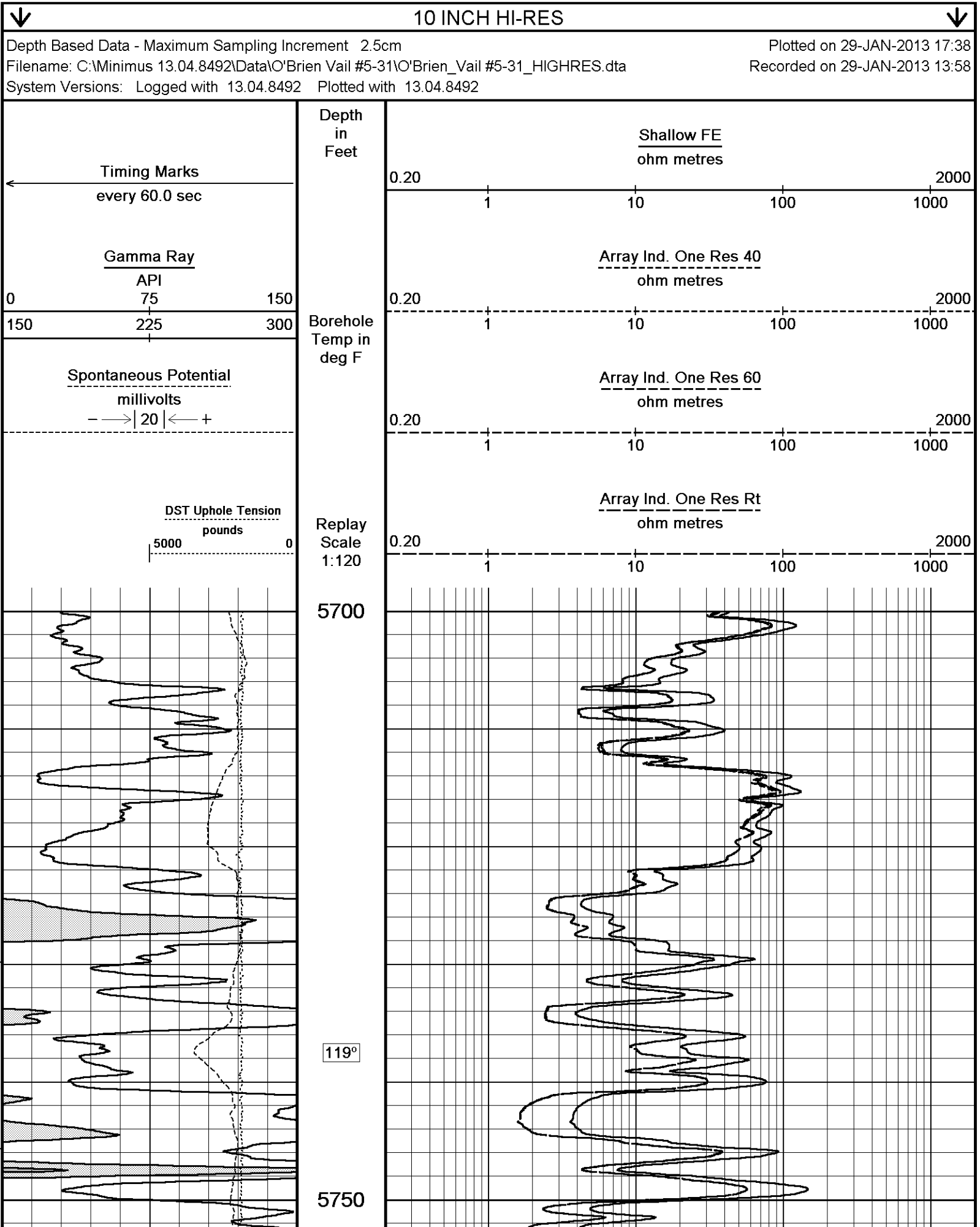


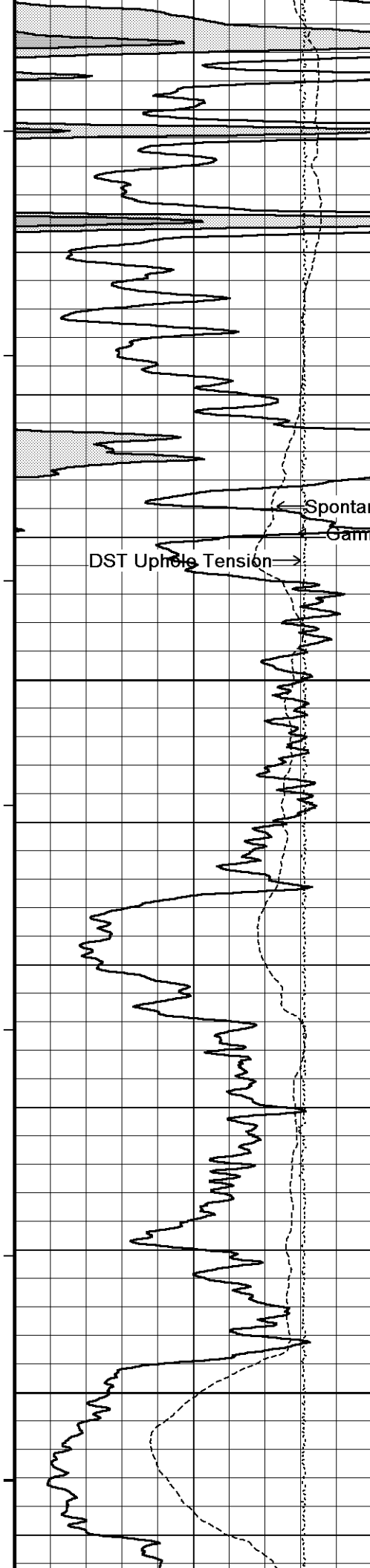




126°
 6350
 6400
 6432
 Depth
 in
 Feet
 Borehole
 Temp in
 deg F
 Replay
 Scale
 1:240







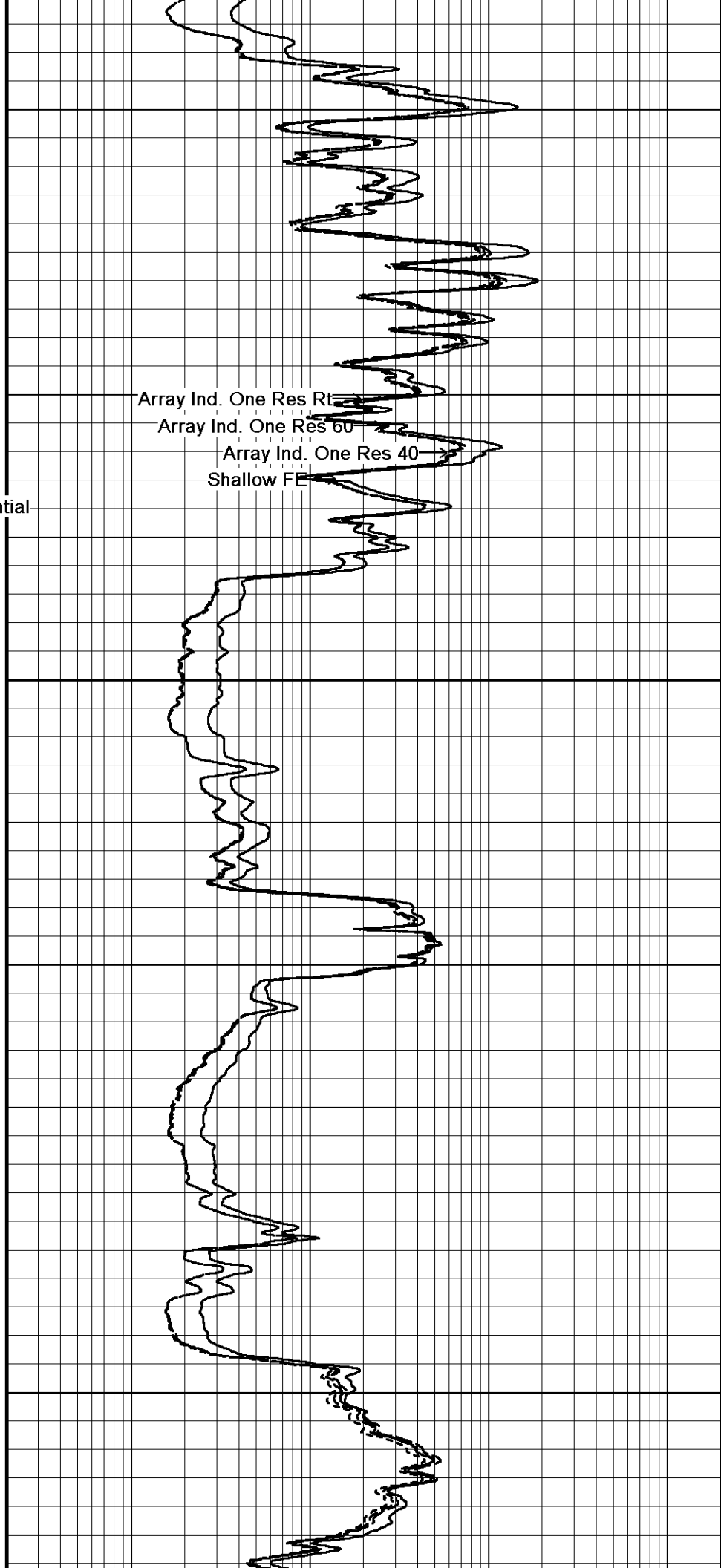
120°
Spontaneous Potential
Gamma Ray

DST Uphole Tension

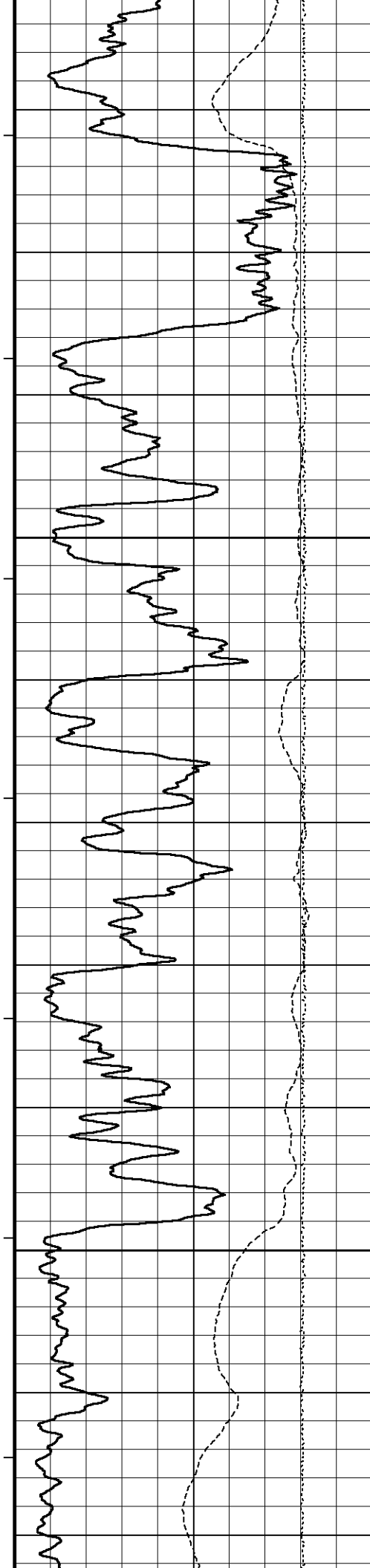
5800

120°

5850



Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

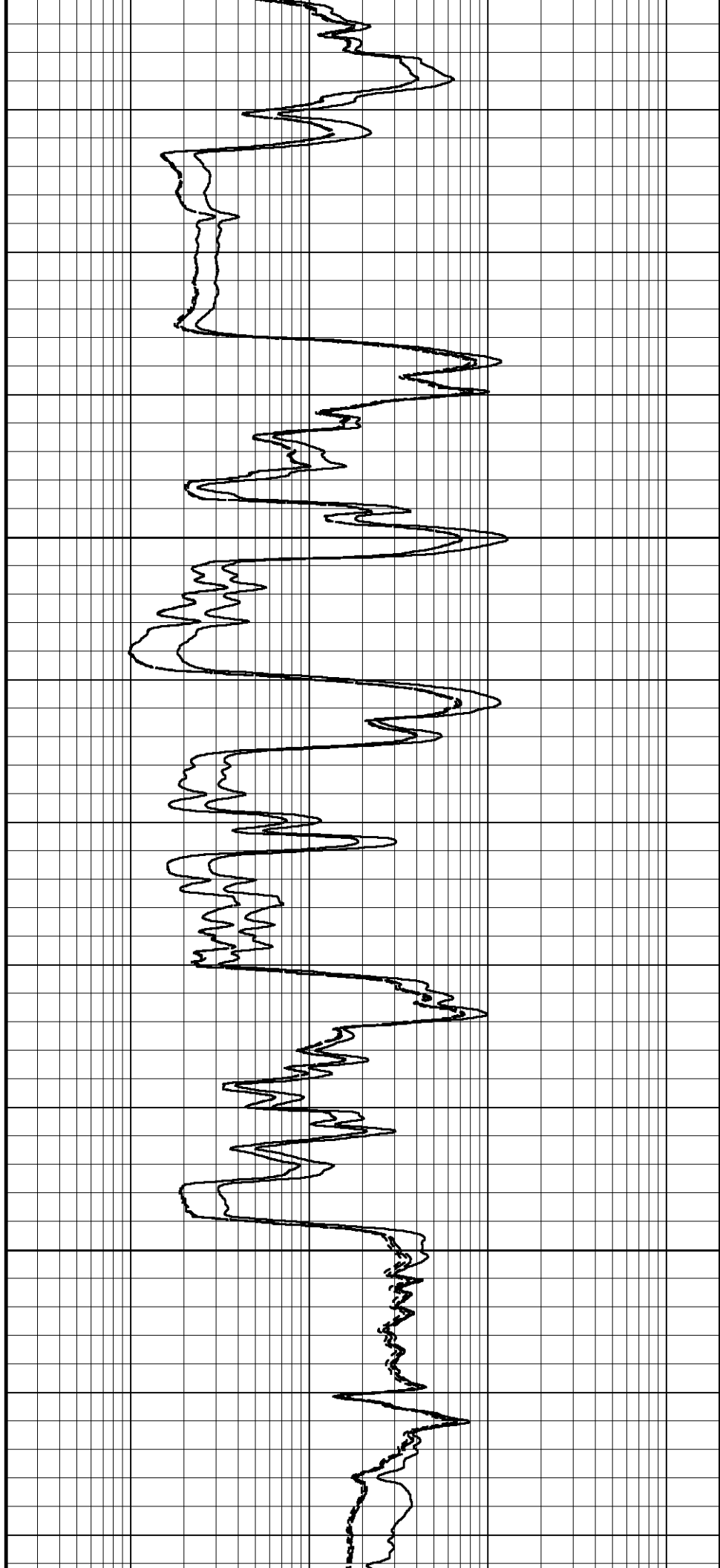


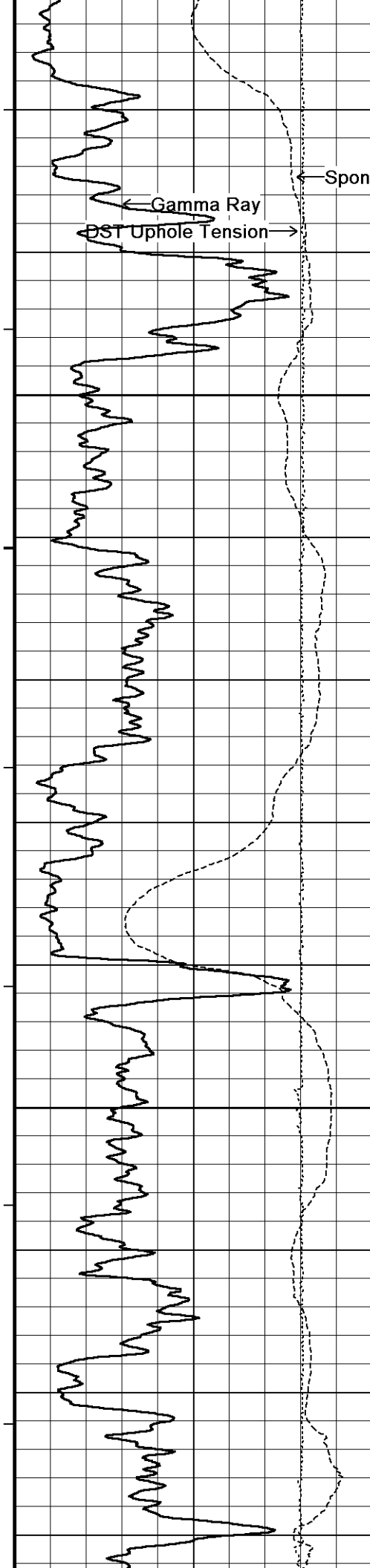
119°

5900

120°

5950



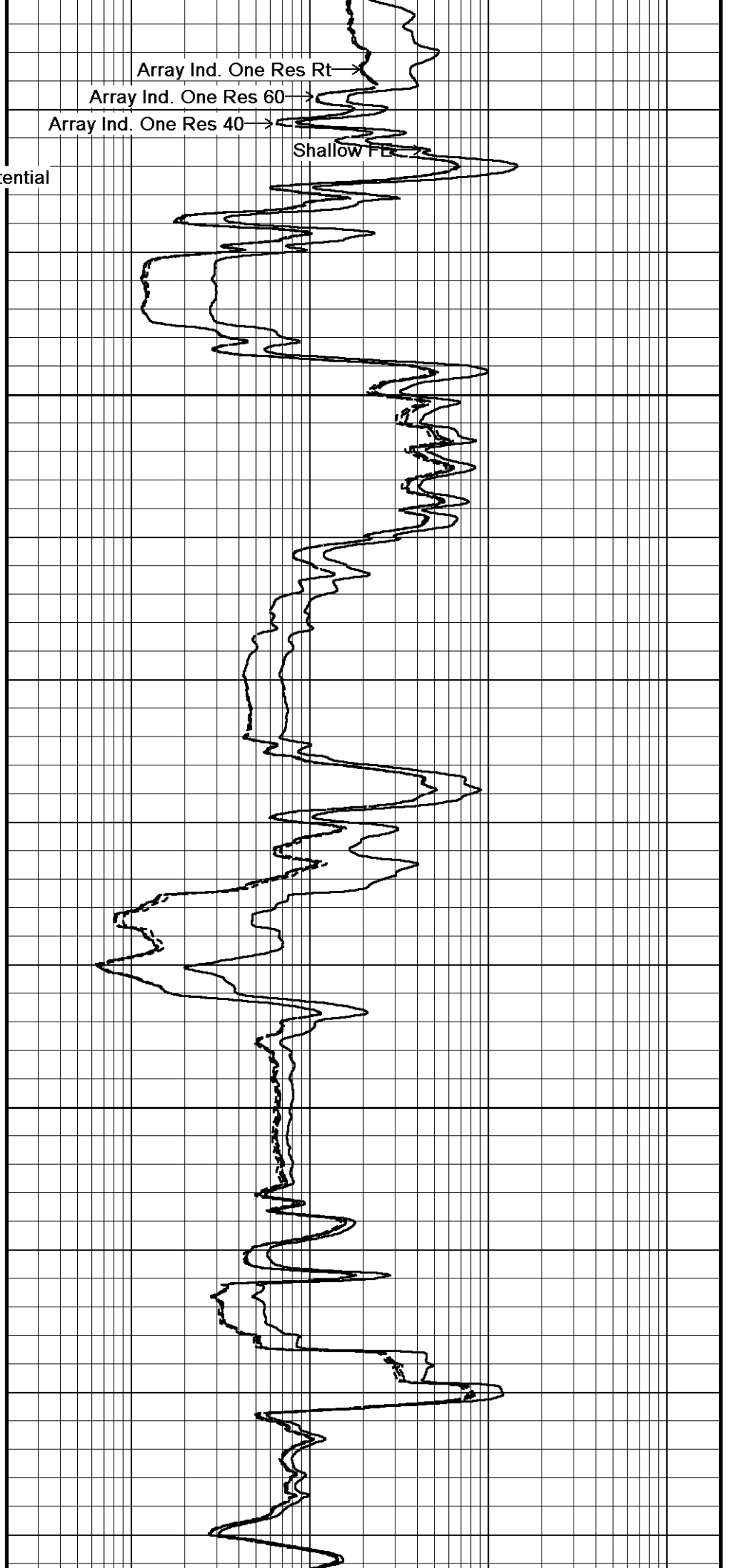


121°

6000

121°

6050

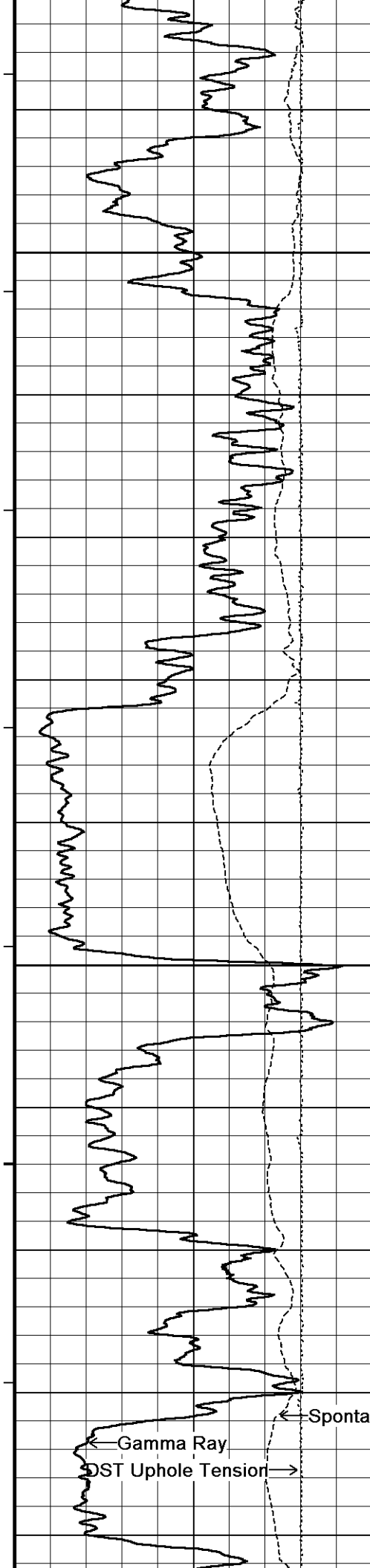


Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow Fm



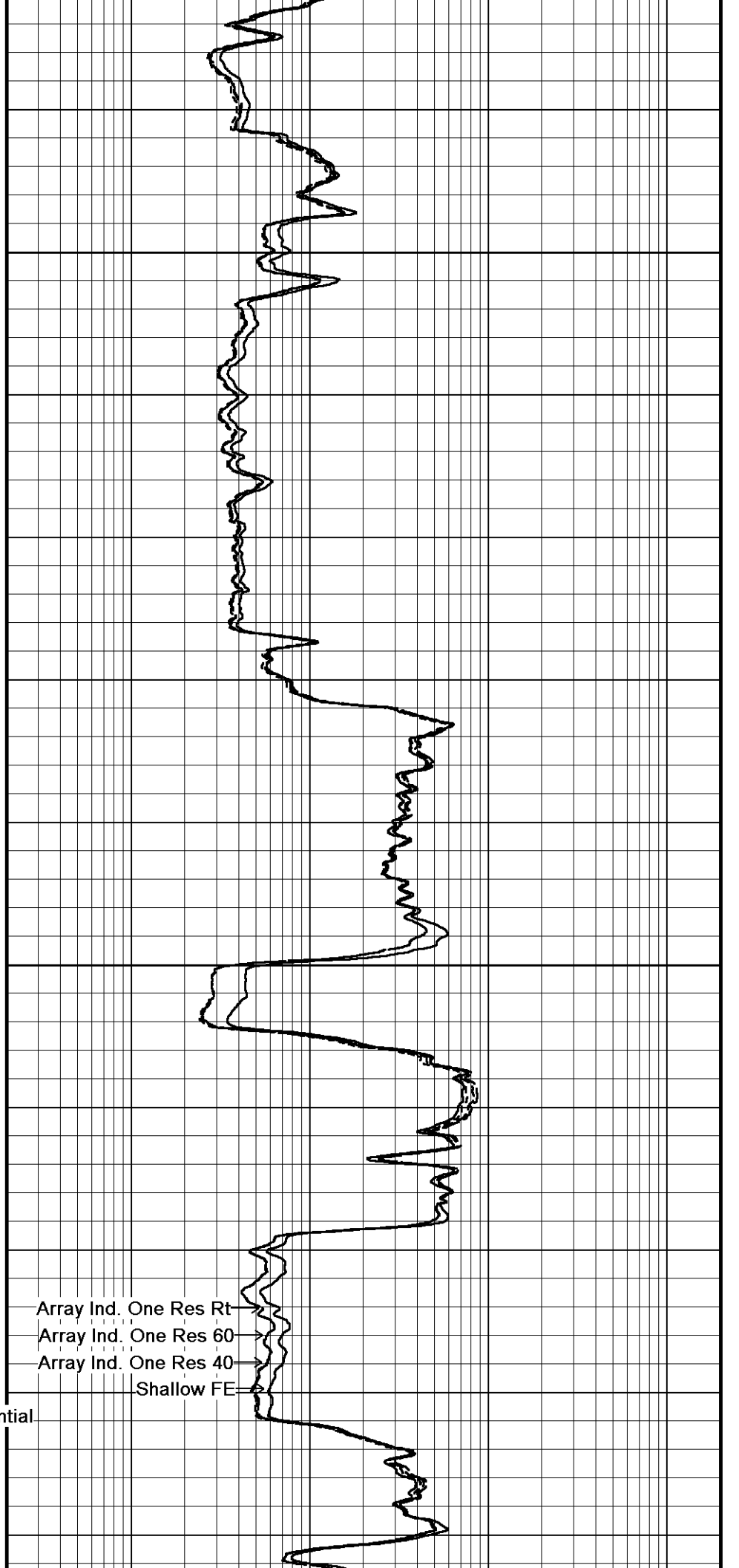
121°

6100

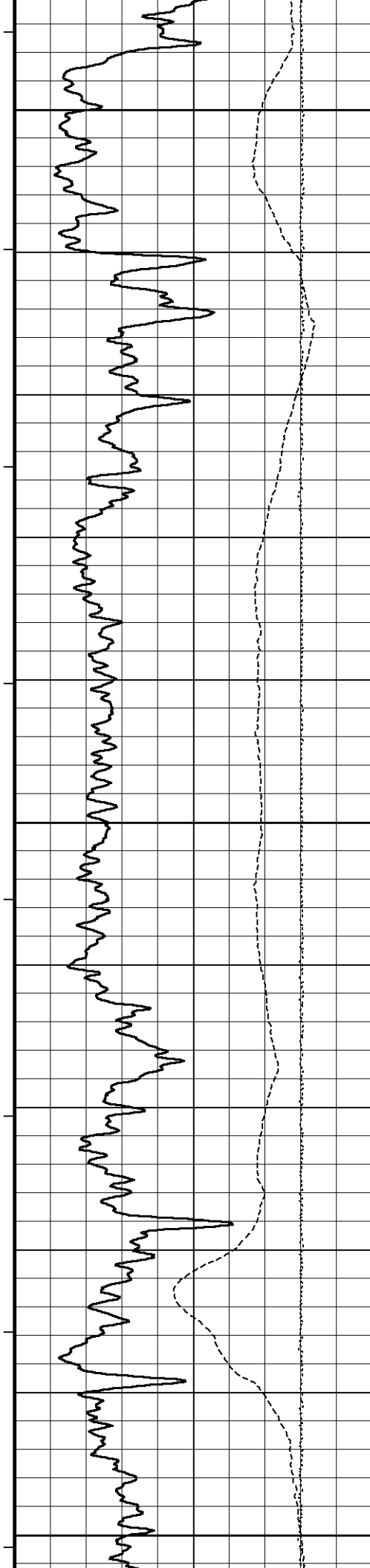
122°

6150

122°



Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE



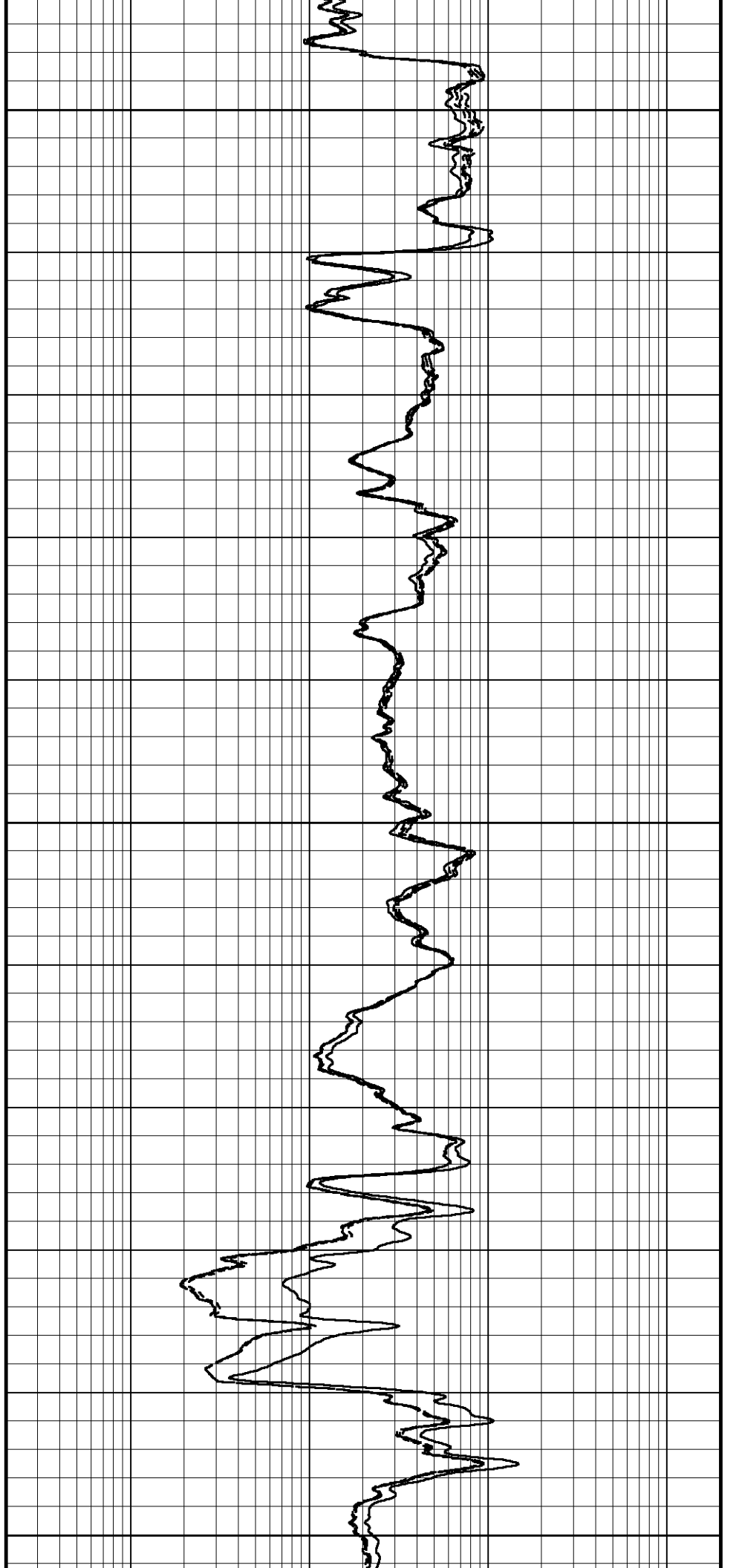
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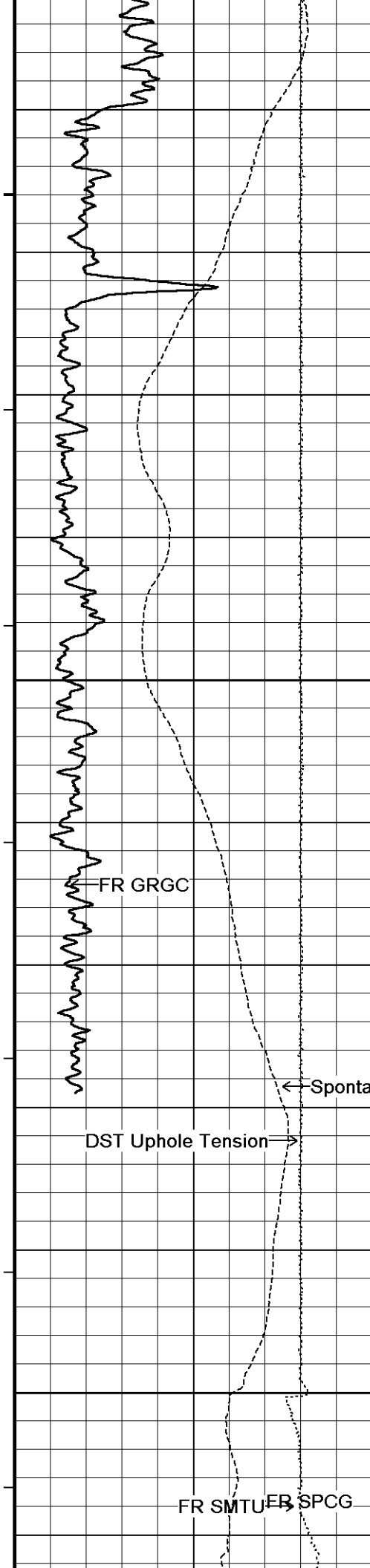
122°

6250

123°

6300

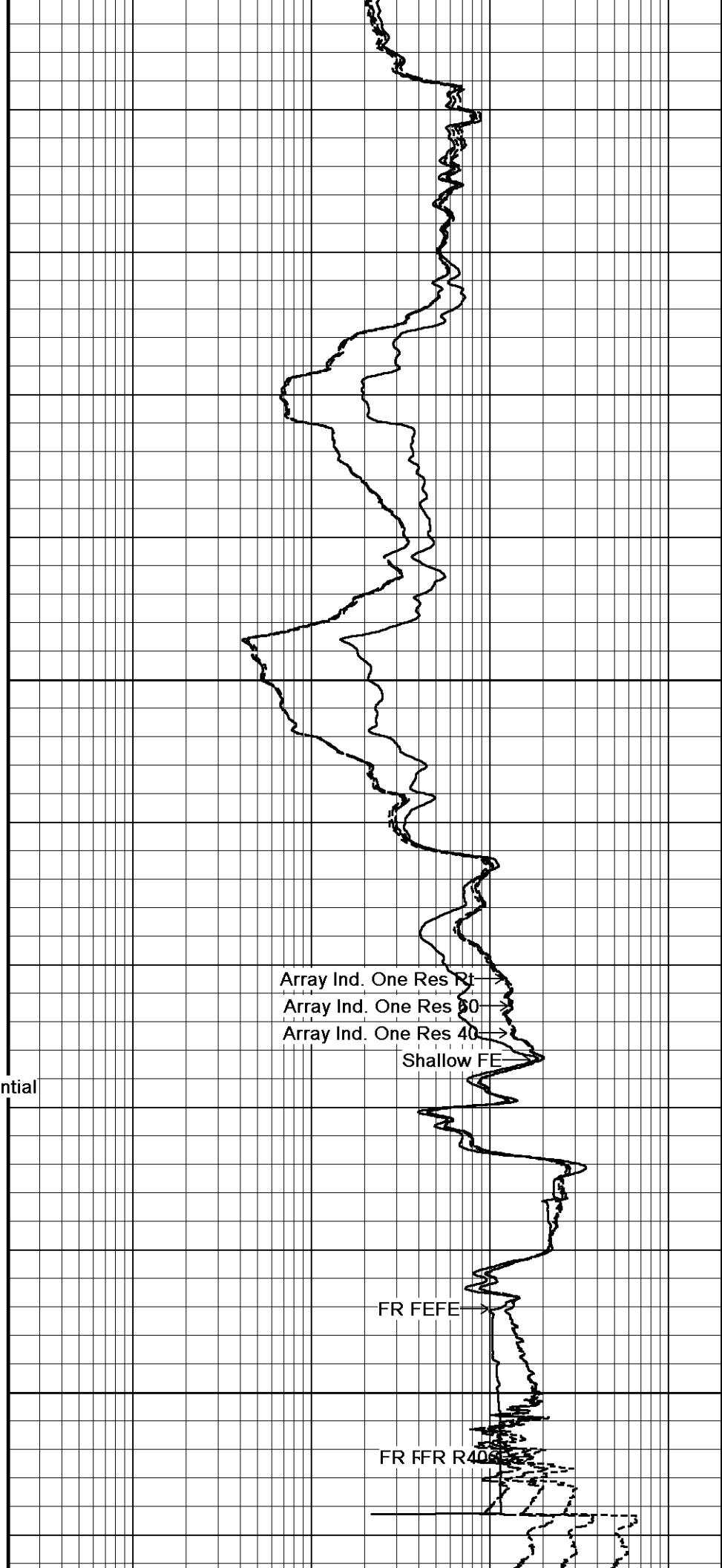


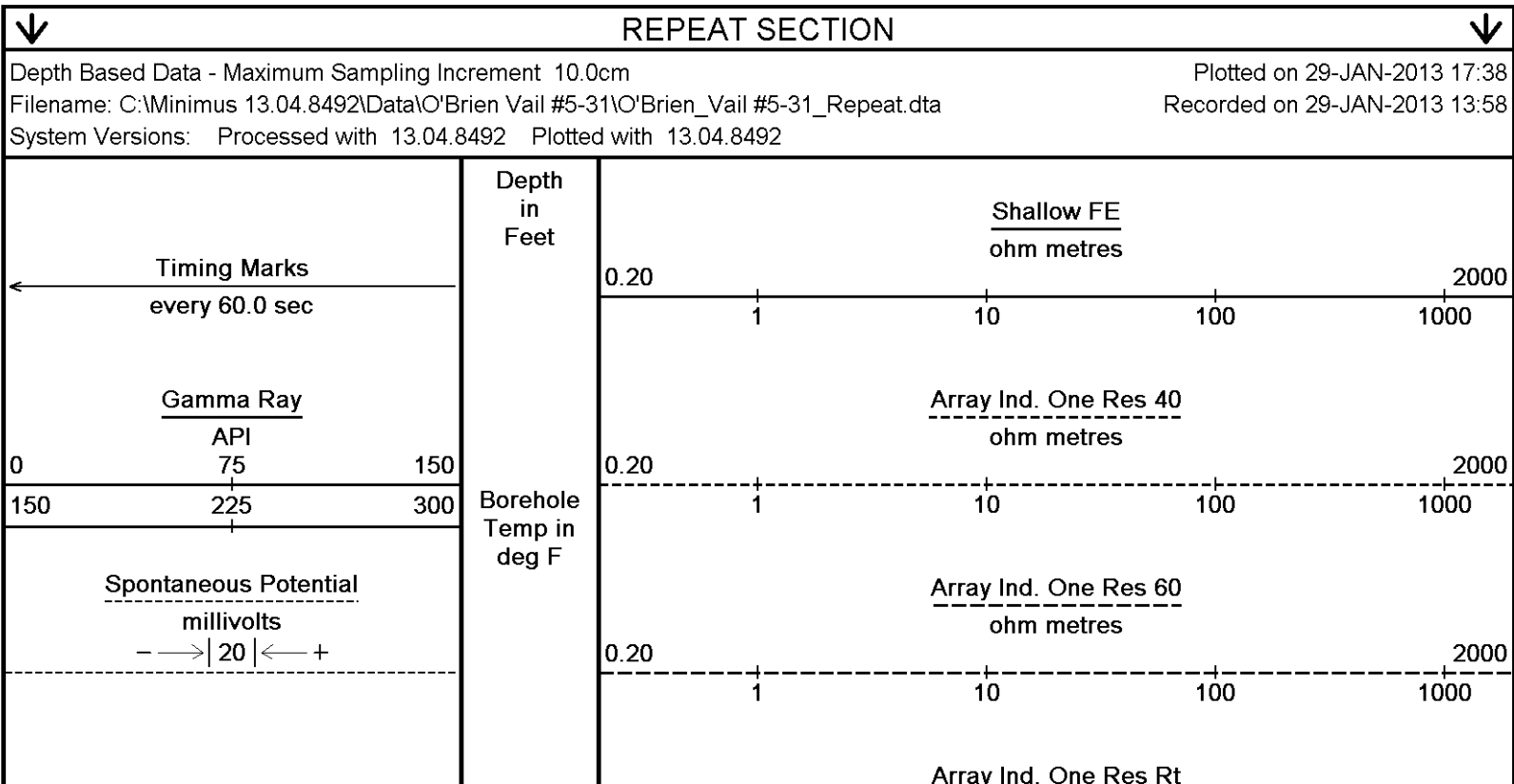
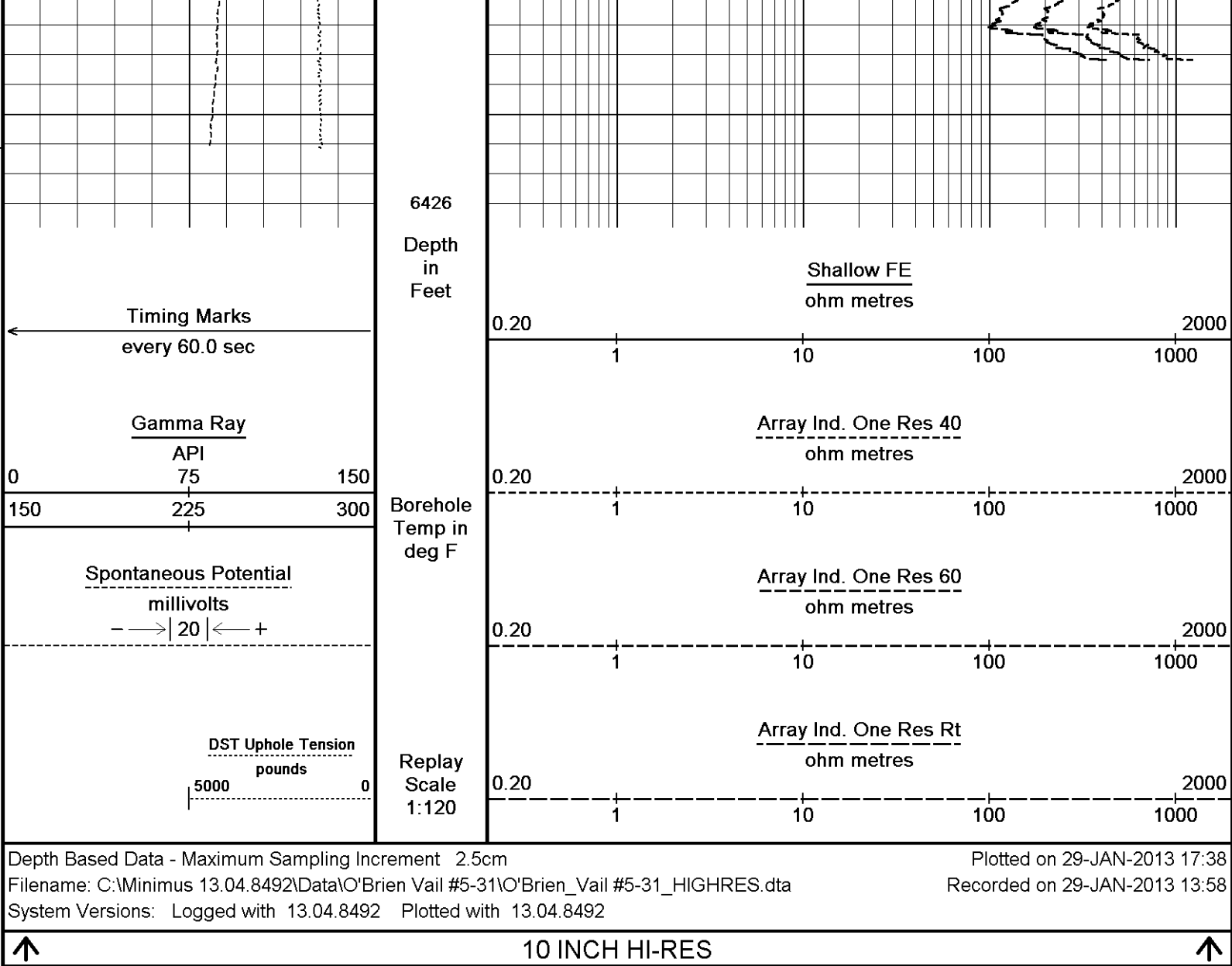


123°

6350

6400





DST Uphole Tension
pounds
5000 0

Replay
Scale
1:240

0.20

ohm metres

2000

1

10

100

1000

5616

5650

119°

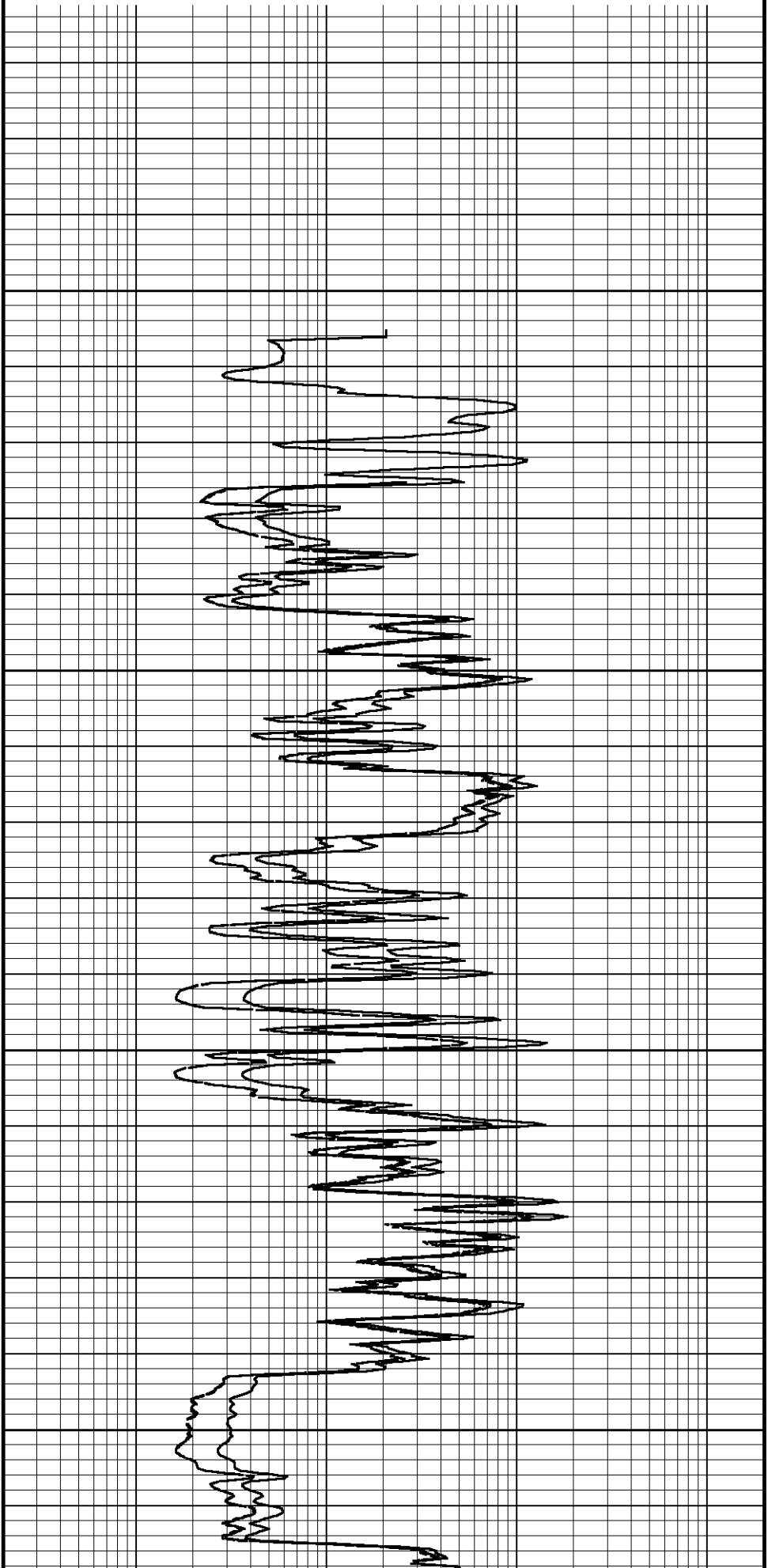
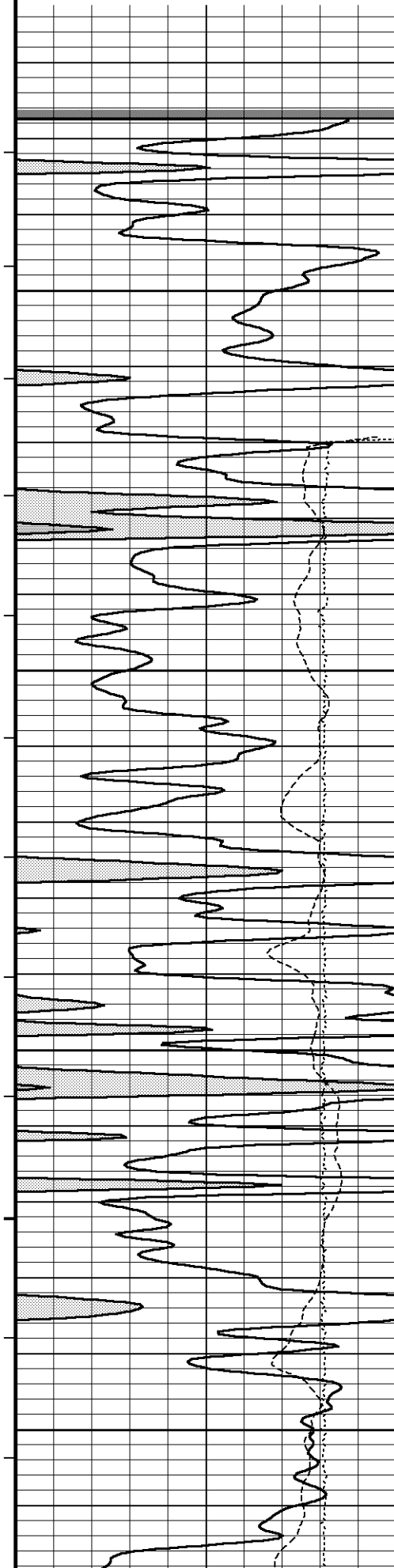
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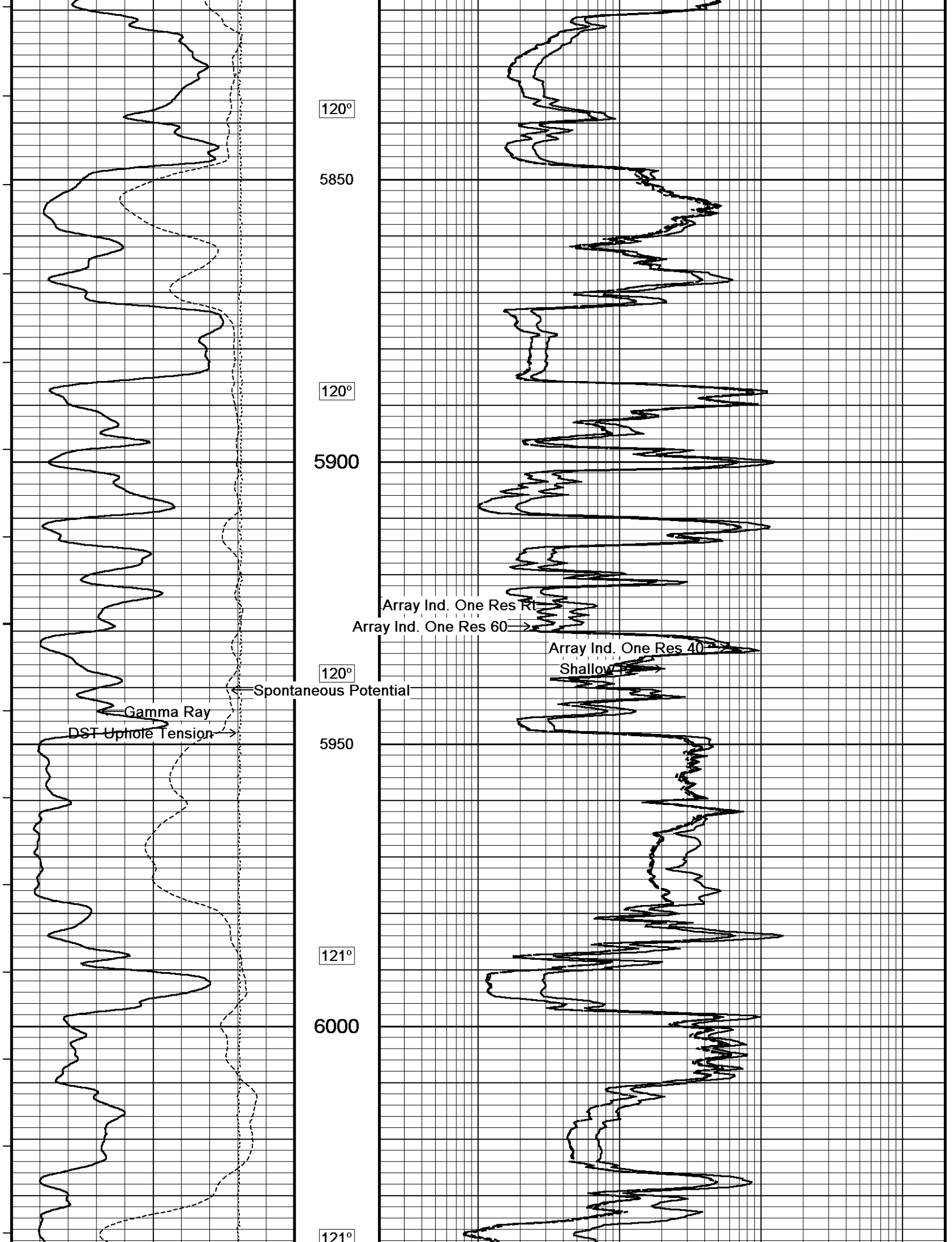
119°

5750

120°

5800





121°

6050

121°

6100

122°

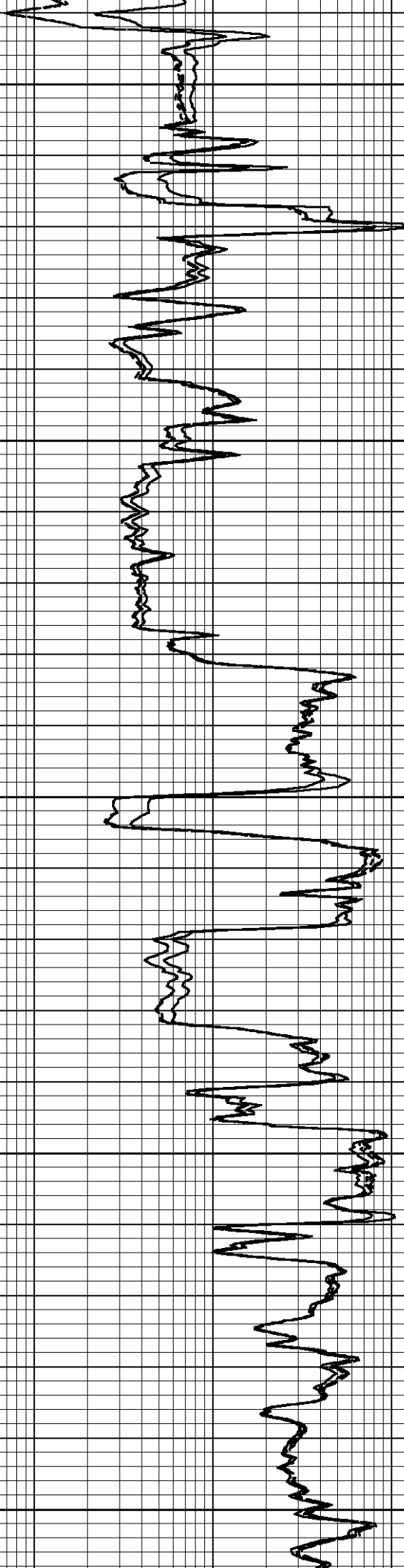
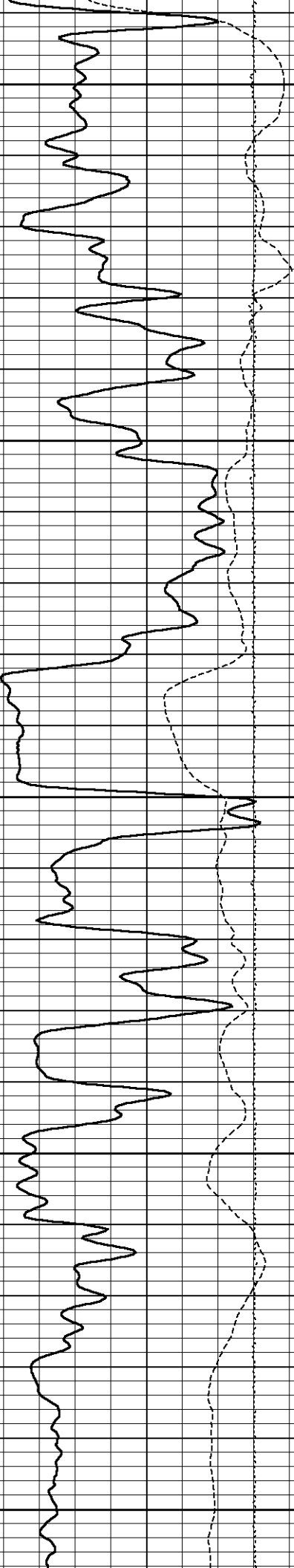
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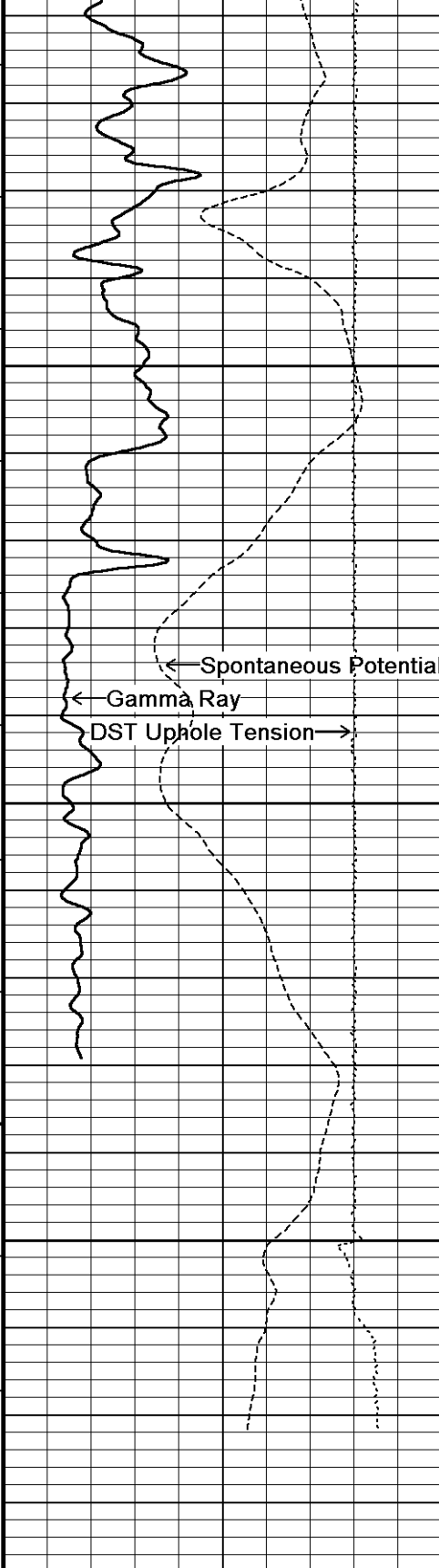
122°

6200

122°

6250





123°

6300

123°

6350

6400

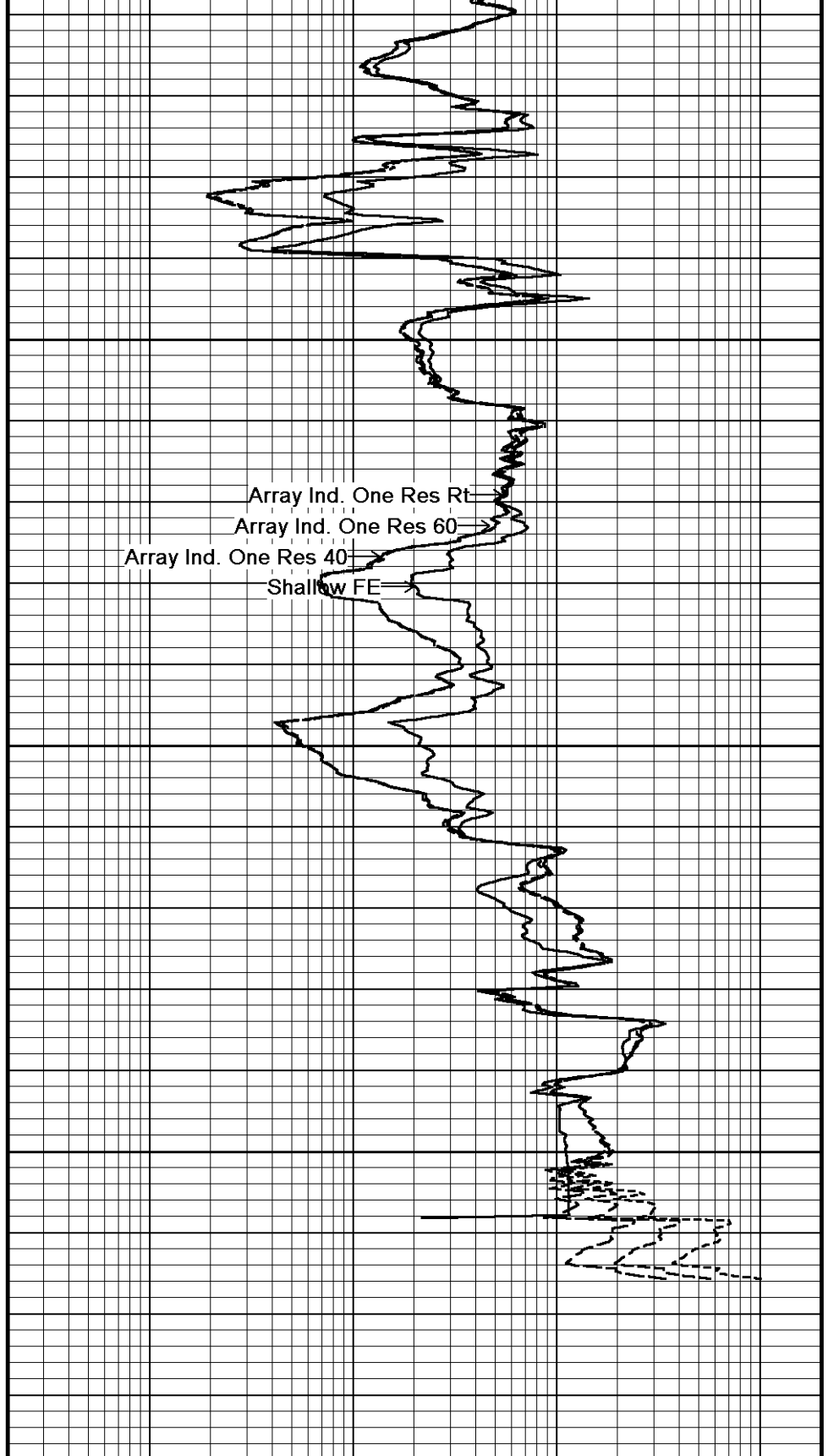
6436

Depth
in
Feet

← Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150

Borehole
Temp in
150 225 300



Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

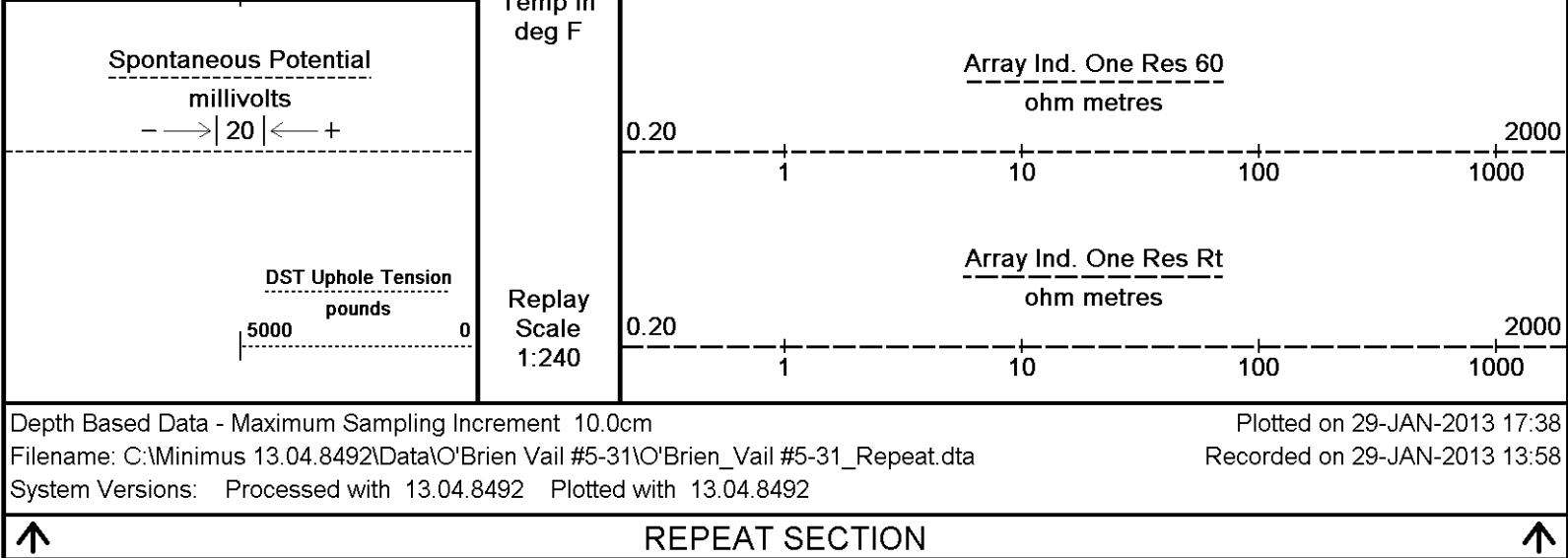
Shallow FE

Shallow FE
ohm metres

0.20 1 10 100 1000 2000

Array Ind. One Res 40
ohm metres

0.20 1 10 100 1000 2000



BEFORE SURVEY CALIBRATION			
C:\Minimus 13.04.8492\Data\O'Brien Vail #5-31\O'Brien_Vail #5-31_Main.dta			
General Constants All 000		Last Edited on 29-JAN-2013,12:10	
General Parameters			
Mud Resistivity	1.050	ohm-metres	
Mud Resistivity Temperature	81.000	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	4.500	inches	
Caliper for Differential Caliper	Density Caliper		
Rwa Parameters			
Porosity used	Base Density Porosity		
Resistivity used	Array Ind. Four Res Rt		
RWA Constant A	1.000		
RWA Constant M	2.000		
Down-hole Tension Calibration SMS 0		Field Calibration on 25-JAN-2013 17:27	
Reading No	Measured	Calibrated (lbs)	
1	15306.37	0.00	
2	15980.37	415.00	
SP Calibration MCG-C 208		Field Calibration on 27-DEC-2012 10:06	
	Measured	Calibrated (mV)	
Reference 1	100.9	100.0	
Reference 2	-100.6	-100.0	
High Resolution Temperature Calibration MCG-C 208		Field Calibration on 05-NOV-2012,14:26	
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	
High Resolution Temperature Constants MCG-C 208		Last Edited on 05-NOV-2012,14:25	
Pre-filter Length	11		
Gamma Calibration MCG-C 208		Field Calibration on 29-JAN-2013 09:50	
	Measured	Calibrated (API)	
Background	74	51	
Calibrator (Gross)	1129	776	
Calibrator (Net)	1055	725	

Gamma Constants MCG-C 208		Last Edited on 29-JAN-2013,09:44	
Gamma Calibrator Number	GR38		
Mud Density	1.00	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	

Micro Laterolog Calibration MMR-A 11				Base Calibration on 31-DEC-1999 00:00	
				Field Check on 31-DEC-1999 00:00	
Base Calibration					
	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-A 11		Last Edited on 12-NOV-2012,01:59	
Pad Type	6 in Solid Nylon B23059		
Micro Laterolog K Factor	0.0128		
Standoff Offset	0.0000	inches	
Mudcake Thickness Correction Constants			
Mud Cake Source	Constant Value		
Mud Cake Thickness	0.4000	inches	
Mud Cake Thickness Caliper	N/A		
Mud Cake Resistivity	0.1500	ohm-m	
Mud Cake Resistivity Temp.	68.00	Deg F	
Mud Cake Resistivity Source	Constant Value		
Temp. Source Rmc Correc.	N/A		

Caliper Calibration MMR-A 11			Base Calibration on 16-JAN-2013 10:32
			Field Calibration on 29-JAN-2013 09:44
Base Calibration			
Reading No	Measured	Calibrator Size (in)	
1	13881	5.98	
2	17138	7.97	
3	20398	9.86	
4	24351	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 MMR-A 11					Base Calibration on 16-JAN-2013 10:36	
					Field Check on 29-JAN-2013 09:42	
Base Calibration						
		Measured		Calibrated (ohm-m)		
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2		
Micro Normal	12.3	59.9	5.0	25.0		
Micro Inverse	15.5	77.5	5.0	25.0		
Channel	Base Check (ohm-m)		Field Check (ohm-m)			
Micro Normal	76.3		76.3			
Micro Inverse	58.7		58.7			

Micro Normal and Micro Inverse Constants MMR-A 11		Last Edited on 05-NOV-2012,13:54	
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	0.0000	inches	

Neutron Calibration MDN-A.B 65				Base Calibration on 24-JAN-2013 15:09			
				Field Check on 29-JAN-2013 09:54			
Base Calibration							
		Measured				Calibrated (cps)	
	Near		Far		Near		Far

Ratio	2952	92	3714	110
	32.138		33.764	
Field Calibrator at Base			Calibrated (cps)	
			1720	2499
Ratio			0.688	
Field Check			Calibrated (cps)	
			1721	2500
Ratio			0.696	

Neutron Constants MDN-A.B 65			Last Edited on 29-JAN-2013,12:10	
Neutron Source Id	PN-521			
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 352			Base Calibration on 16-JAN-2013 10:20 Field Check on 29-JAN-2013 09:36	
Base Calibration				
	Measured	Calibrated (ohm-m)		
Reference 1	0.0	0.0		
Reference 2	964.3	126.8		
Base Check		281.2		
Field Check		281.4		

FE Constants MFE-B.J 352			Last Edited on 29-JAN-2013,12:12	
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 45			Field Calibration on 13-DEC-2012,10:54	
	Measured	Calibrated(Deg F)		
Lower	50.00	50.00		
Upper	75.00	75.00		

High Resolution Temperature Constants MAI-A.A 45			Last Edited on 13-DEC-2012,10:53	
Pre-filter Length	11			

Induction Calibration MAI-A.A 45			Base Calibration on 26-JUL-2012,09:22 Field Check on 29-JAN-2013 09:34	
Base Calibration				
Test Loop Calibration		Measured	Calibrated (mmho/m)	
Channel	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	78.4		Deg F	
Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			18.6	3851.8
2			31.7	3629.2
3			28.6	3049.2
4			18.3	2079.1
Deep			16.1	1911.1
Medium			42.5	4060.2
Shallow			49.6	5482.8
Array Temperature			62.9	Deg F

Induction Constants MAI-A.A 45

Last Edited on 29-JAN-2013,12:12

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	

Photo Density Calibration MPD-B 31

Base Calibration on 24-JAN-2013 09:49

Field Check on 29-JAN-2013 09:40

Density Calibration					
Base Calibration		Measured		Calibrated (sdu)	
		Near	Far	Near	Far
	Reference 1	45759	23102	59556	30836
	Reference 2	18982	1934	24941	2541
Field Check at Base					
		680.7	842.1		
Field Check					
		685.5	845.6		
PE Calibration					
Base Calibration		Measured		Calibrated	
	WS	WH	Ratio	Ratio	

Background	127	606		
Reference 1	19469	45650	0.429	0.371
Reference 2	5712	18903	0.305	0.272

Field Check at Base	126.6	606.1
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Field Check	124.4	609.5
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Density Constants MPD-B 31

Last Edited on 29-JAN-2013,12:11

Density Source Id	254
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

Caliper Calibration MPD-B 31

Base Calibration on 28-JAN-2013 08:35

Field Calibration on 29-JAN-2013 09:41

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	15824	3.99
2	24384	5.98
3	33040	7.97
4	41376	9.86
5	50943	11.92
6	N/A	N/A

Field Calibration	Measured Caliper (in)	Actual Caliper (in)
	5.94	5.98

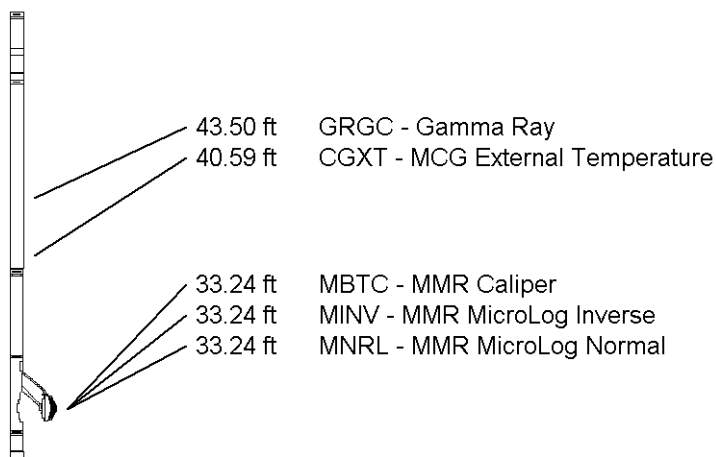
DOWNHOLE EQUIPMENT

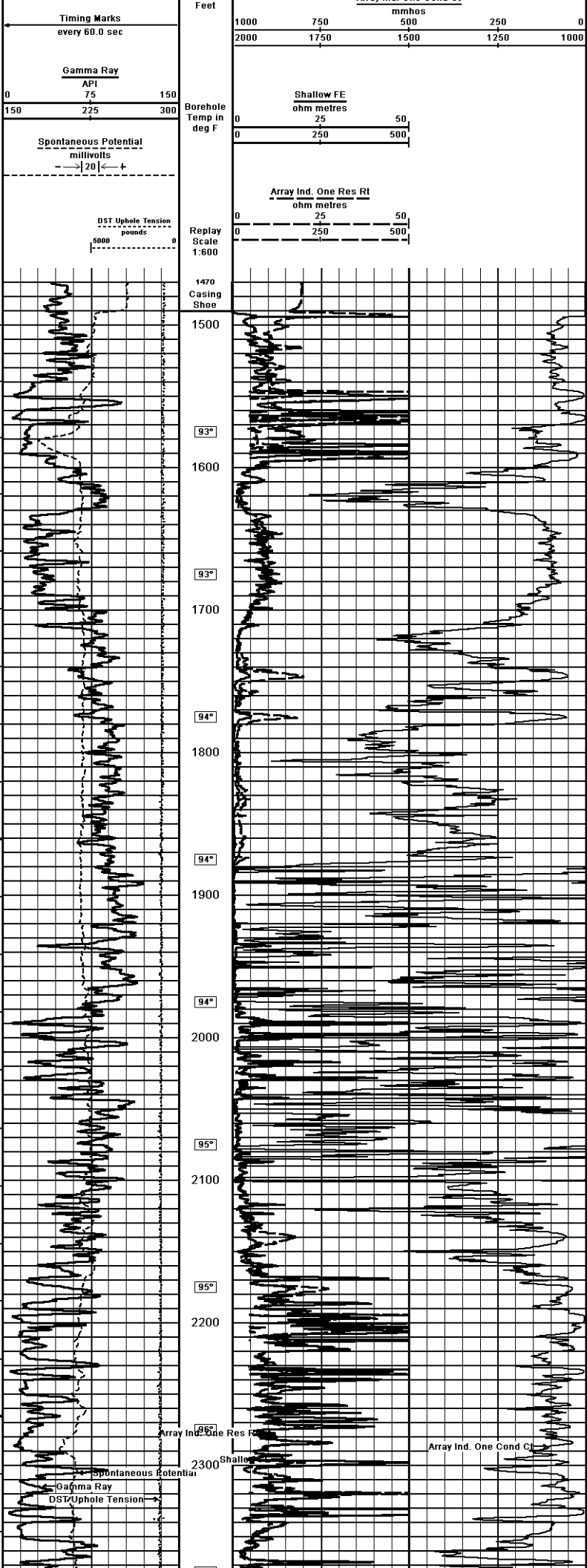
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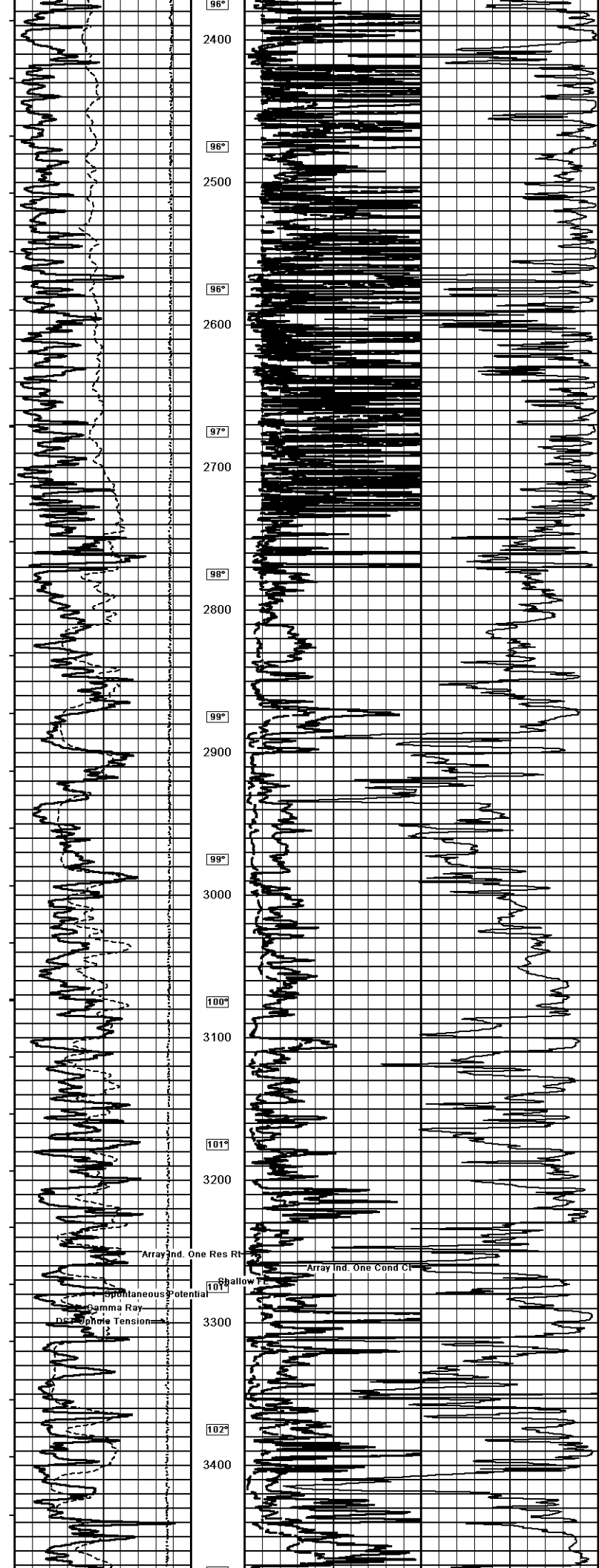
SHA-F Compact Swivel Head Adaptor
SHA-F 59 LG: 2.74 ft WT: 26.5 lb OD: 2.24 in

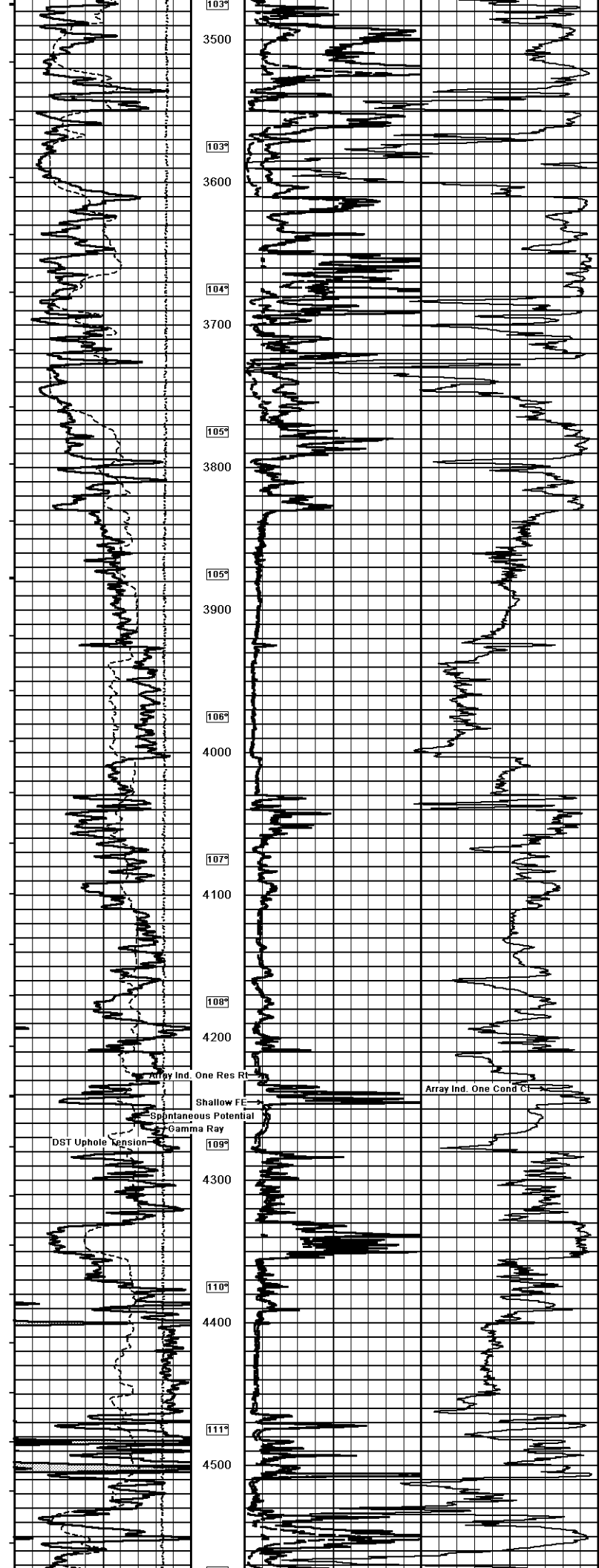
Compact Comms Gamma
MCG-C 208 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

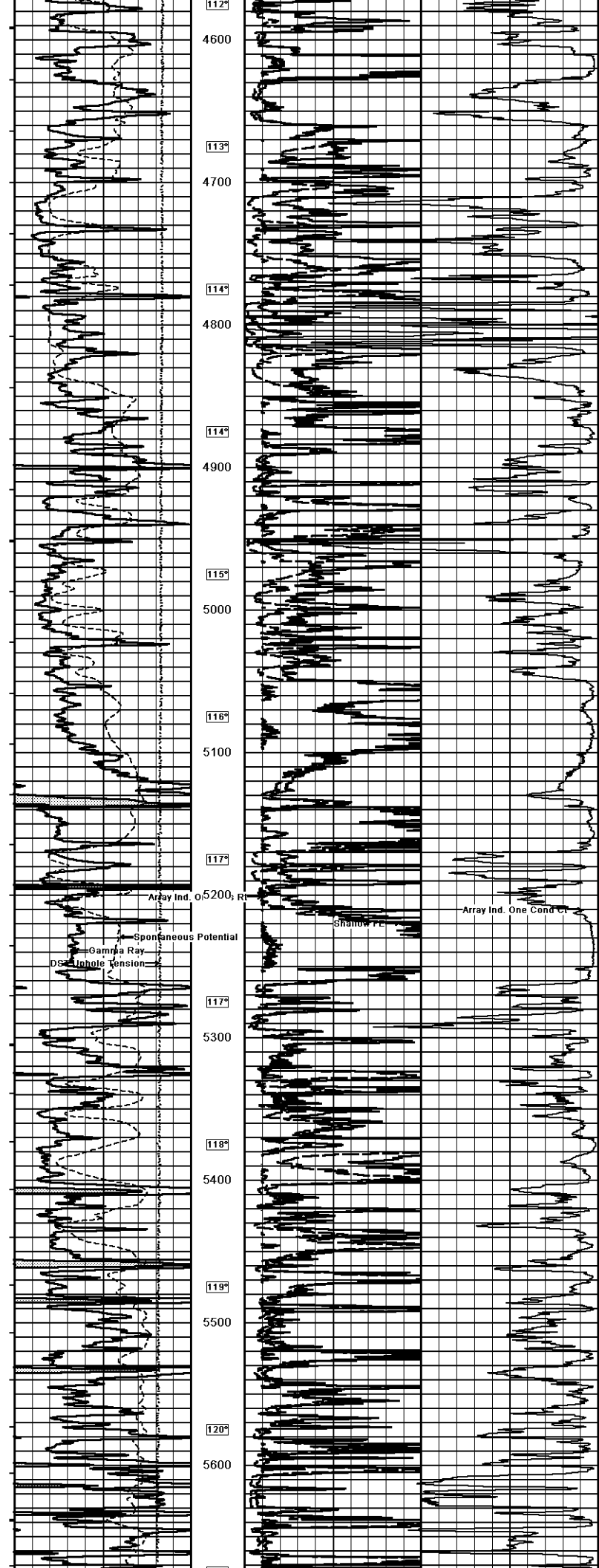
Compact Micro-Resistivity
MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.88 in

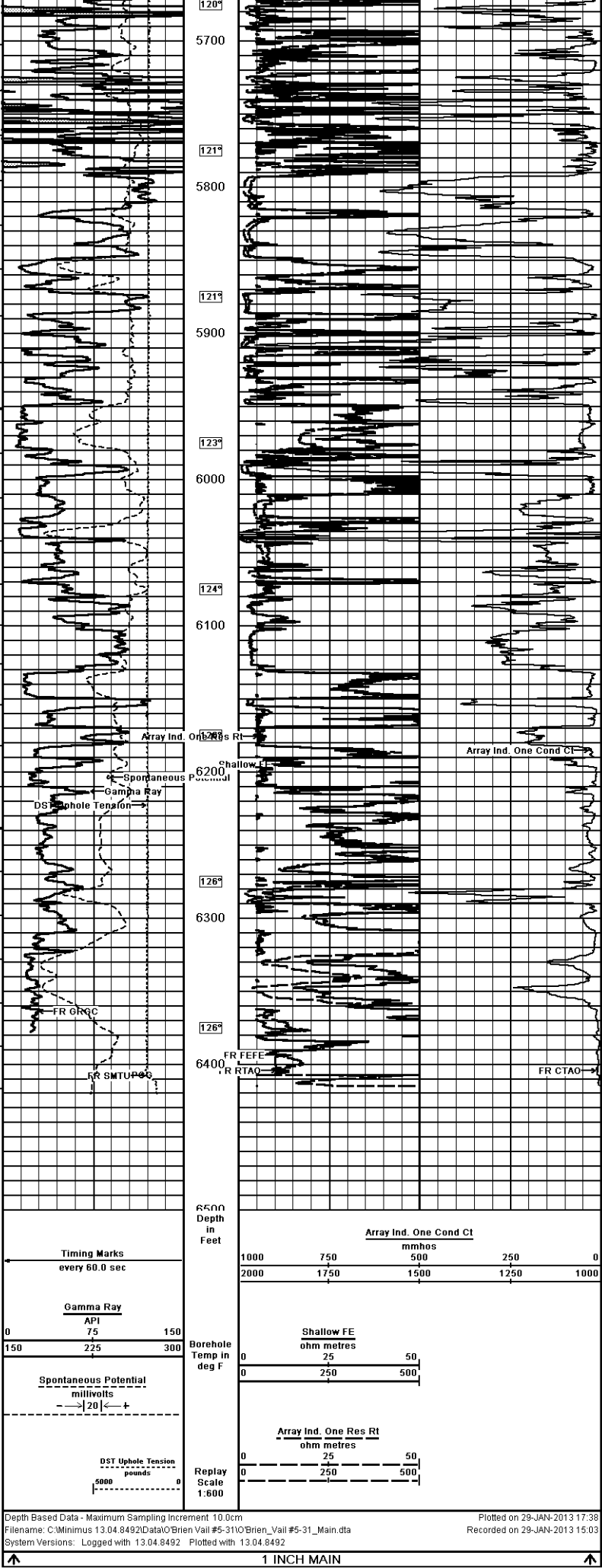












WELL		VAIL #5-31			
FIELD		NOVINGER EAST			
PROVINCE/COUNTY		MEADE			
COUNTRY/STATE		U.S.A. / KANSAS			
Elevation Kelly Bushing	2683.00	feet	First Reading	6405.00	feet
Elevation Drill Floor	2682.00	feet	Depth Driller	6400.00	feet
Elevation Ground Level	2671.00	feet	Depth Logger	6408.00	feet
		ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG			