



Weatherford[®]

**ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG**

COMPANY	M&M EXPLORATION, INC.		
WELL	Z-BAR 35-6		
FIELD	AETNA GAS AREA		
PROVINCE/COUNTY	BARBER		
COUNTRY/STATE	U.S.A. / KANSAS		
LOCATION	1740' FNL & 2090' FWL NW/4		
SEC	TWP	RGE	Other Services
35	33S	15W	MPD/MDN
API Number	15-007-24034		MML
Permit Number			
Permanent Datum G.L., Elevation	1771 feet		
Log Measured From	KB		
Drilling Measured From	K.B. @ 10 FEET		
Date	28-JUN-2013		Elevations: KB 1781.00 DF 1779.00 GL 1771.00
Run Number	ONE		
Service Order	3537769		
Depth Driller	5150.00	feet	
Depth Logger	5154.00	feet	
First Reading	5151.00	feet	
Last Reading	896.00	feet	
Casing Driller	896.00	feet	
Casing Logger	896.00	feet	
Bit Size	7.880	inches	
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.00 lb/USg	54.00 CP	
PH / Fluid Loss	10.20	8.10 ml/30Min	
Sample Source	MUDDPIT		
Rm @ Measured Temp	0.87 @ 99.0	ohm-m	
Rmf @ Measured Temp	0.70 @ 99.0	ohm-m	
Rmc @ Measured Temp	1.04 @ 99.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.70 @ 123.0	ohm-m	
Time Since Circulation	5 HOURS		
Max Recorded Temp	123.00	deg F	
Equipment / Base	13096	LIB	
Recorded By	ROB HOFFMAN		
Witnessed By	BILL BUSCH		
JOB#	LB13-187		

BOREHOLE RECORD			Last Edited: 29-JUN-2013 01:14
Bit Size inches	Depth From feet	Depth To feet	
7.875	896.00	5150.00	

CASING RECORD				
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	896.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.05.9583.

- MCG, MML, MDN, MPD, MFE, MAI RUN IN COMBINATION.
 - HARDWARE: DUAL BOWSPRING USED ON MDN.
 0.5 INCH STANDOFF USED ON MFE.
 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: 1680 CU. FT.

- ANNULAR HOLE VOLUME WITH 4.5 INCH CASING FROM TD TO 3880: 298 CU. FT.

- SERVICE ORDER # 3537769

- RIG: HARDT RIG #1

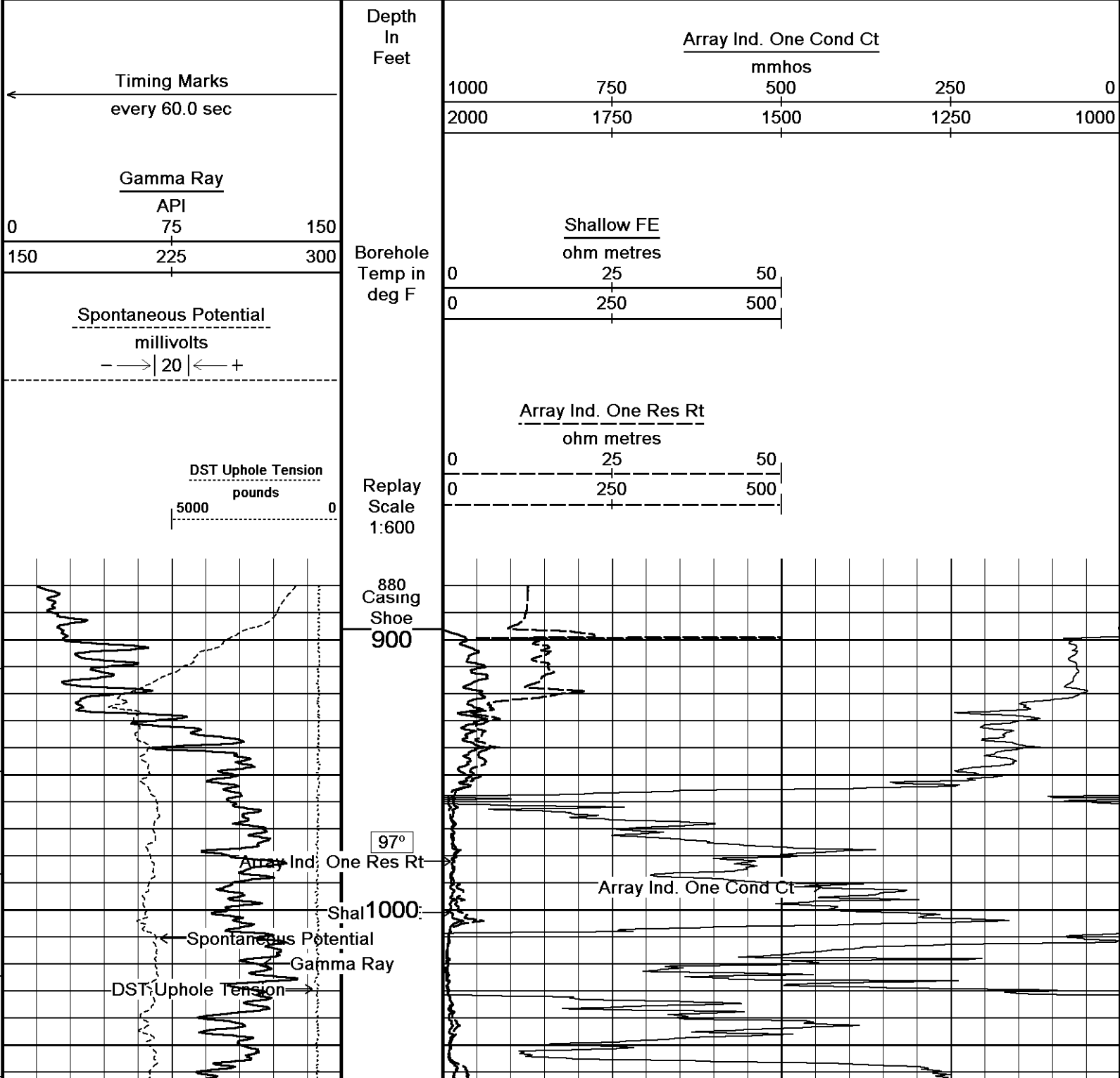
- ENGINEER: ROB HOFFMAN

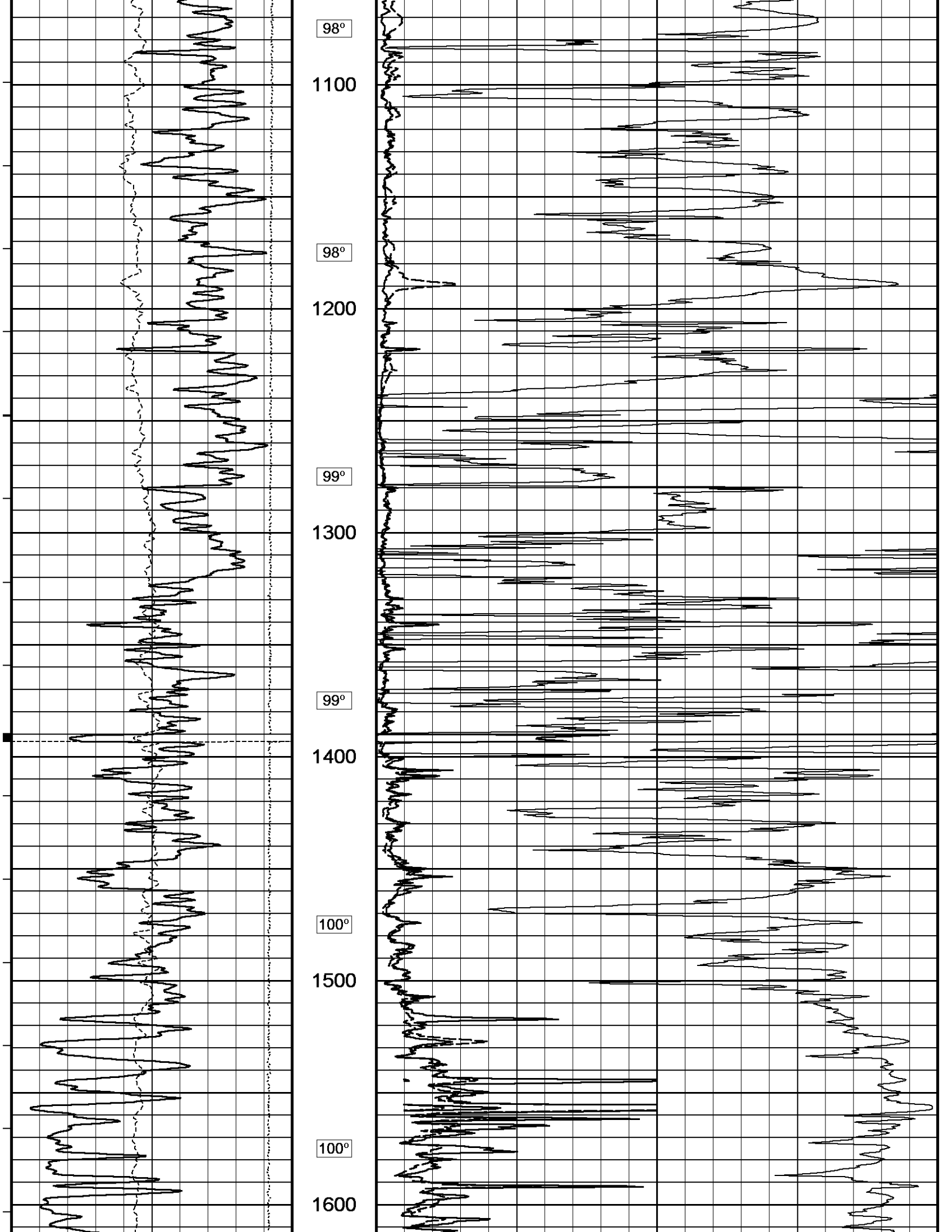
- OPERATOR(S): K. RINEHART, D. CANADAY

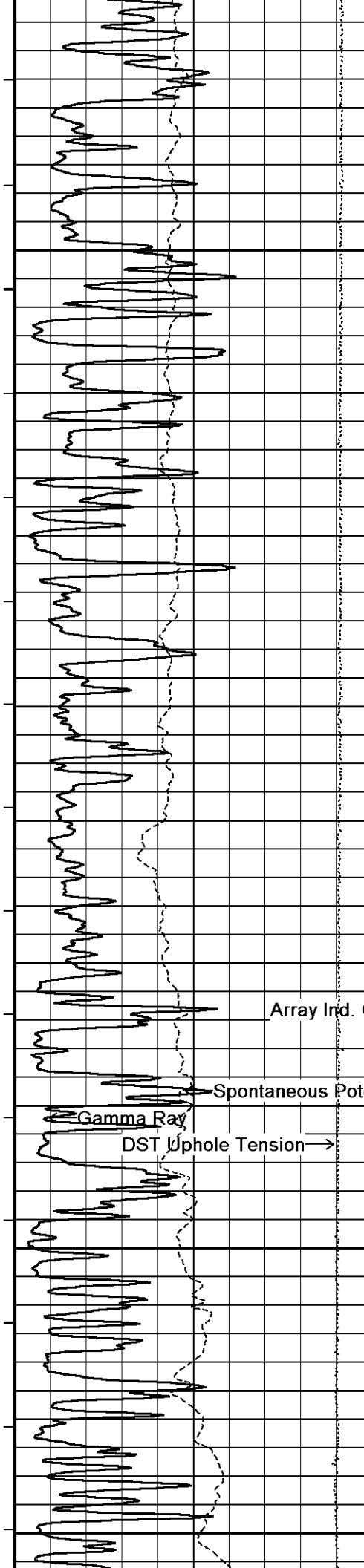
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs, 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.

2 INCH MAIN

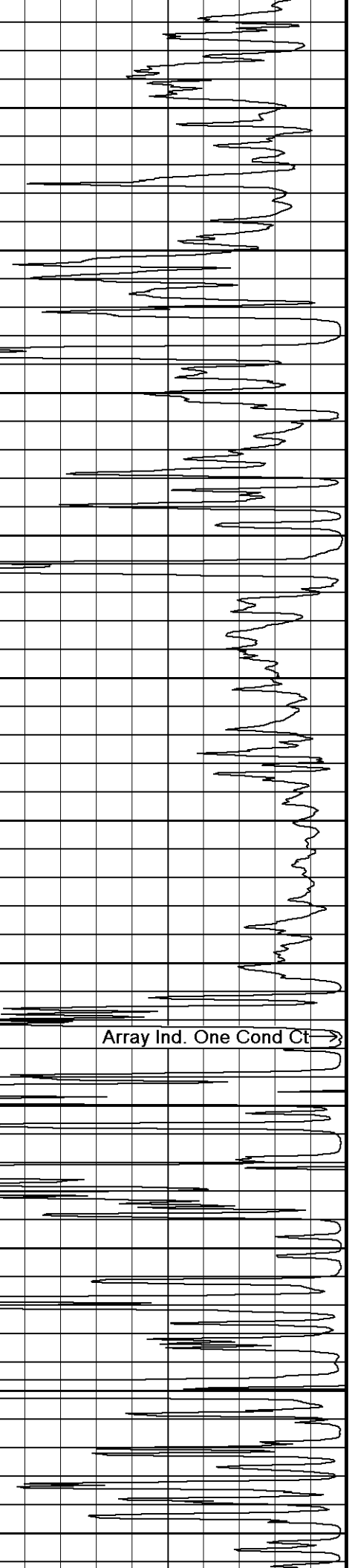
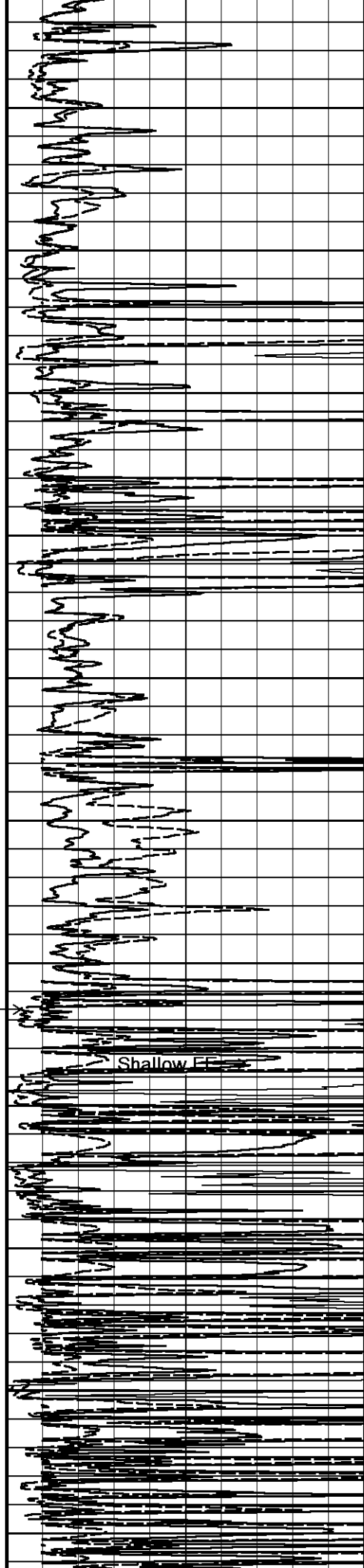
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 29-JUN-2013 06:08
 Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta Recorded on 29-JUN-2013 03:50
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583







100°
1700
100°
1800
100°
1900
100°
2000
100°
2100



Array Ind. One Res Rt

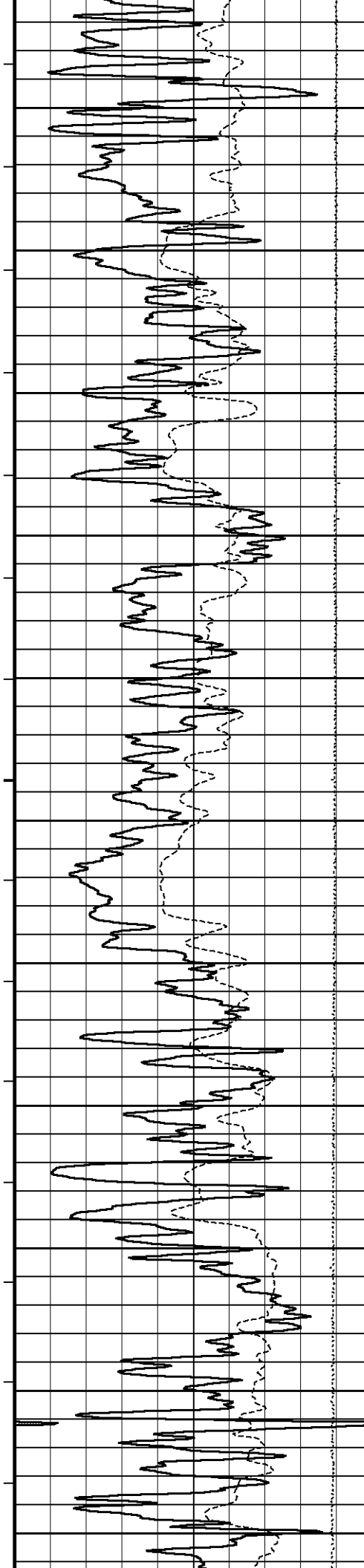
Spontaneous Potential

Gamma Ray

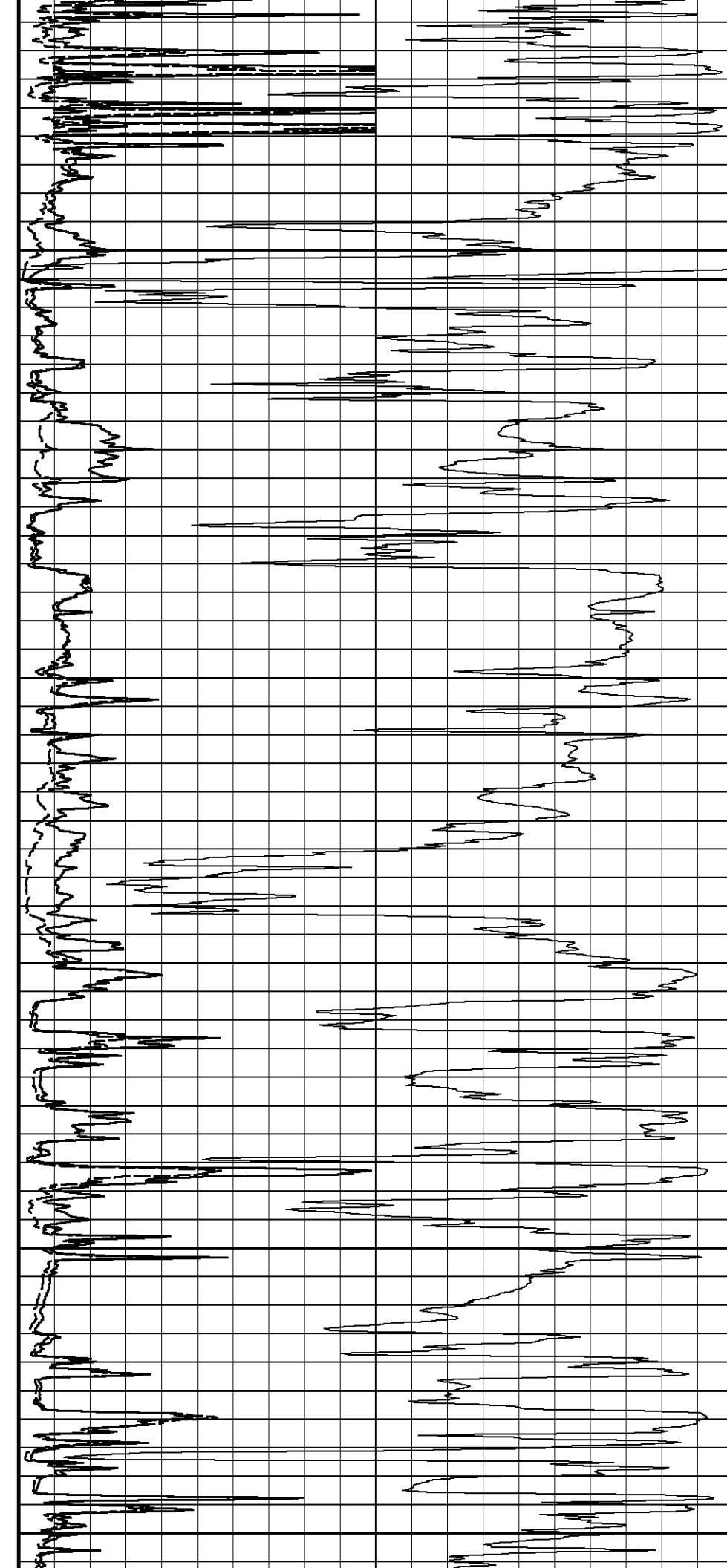
DST Up-hole Tension

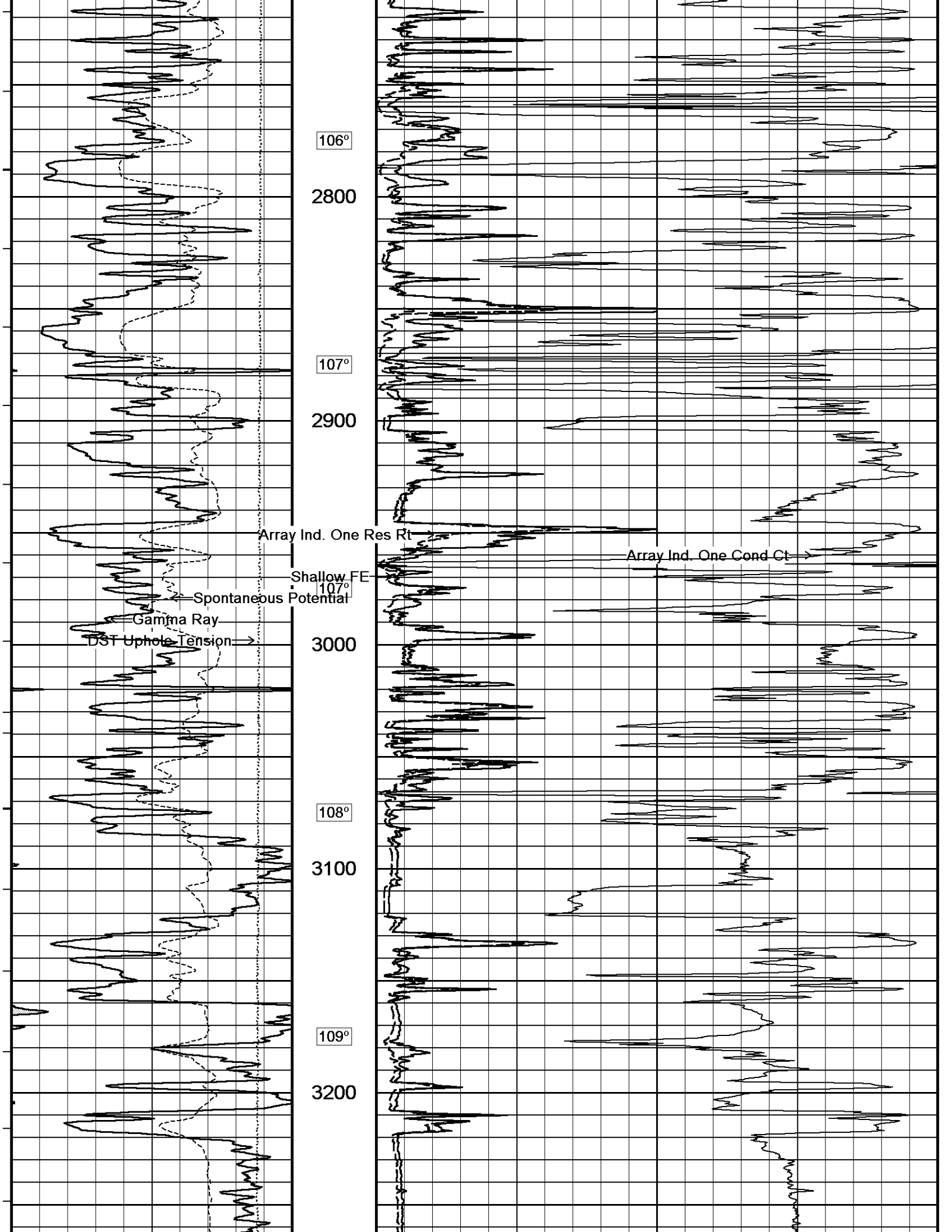
Shallow Et

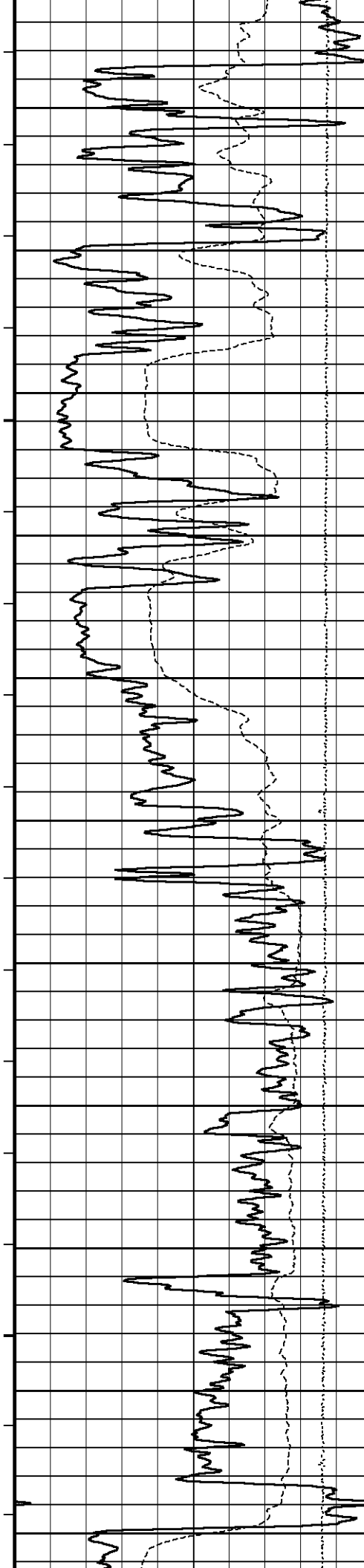
Array Ind. One Cond Ct



102°
2200
103°
2300
104°
2400
104°
2500
105°
2600
106°
2700







109°

3300

110°

3400

111°

3500

112°

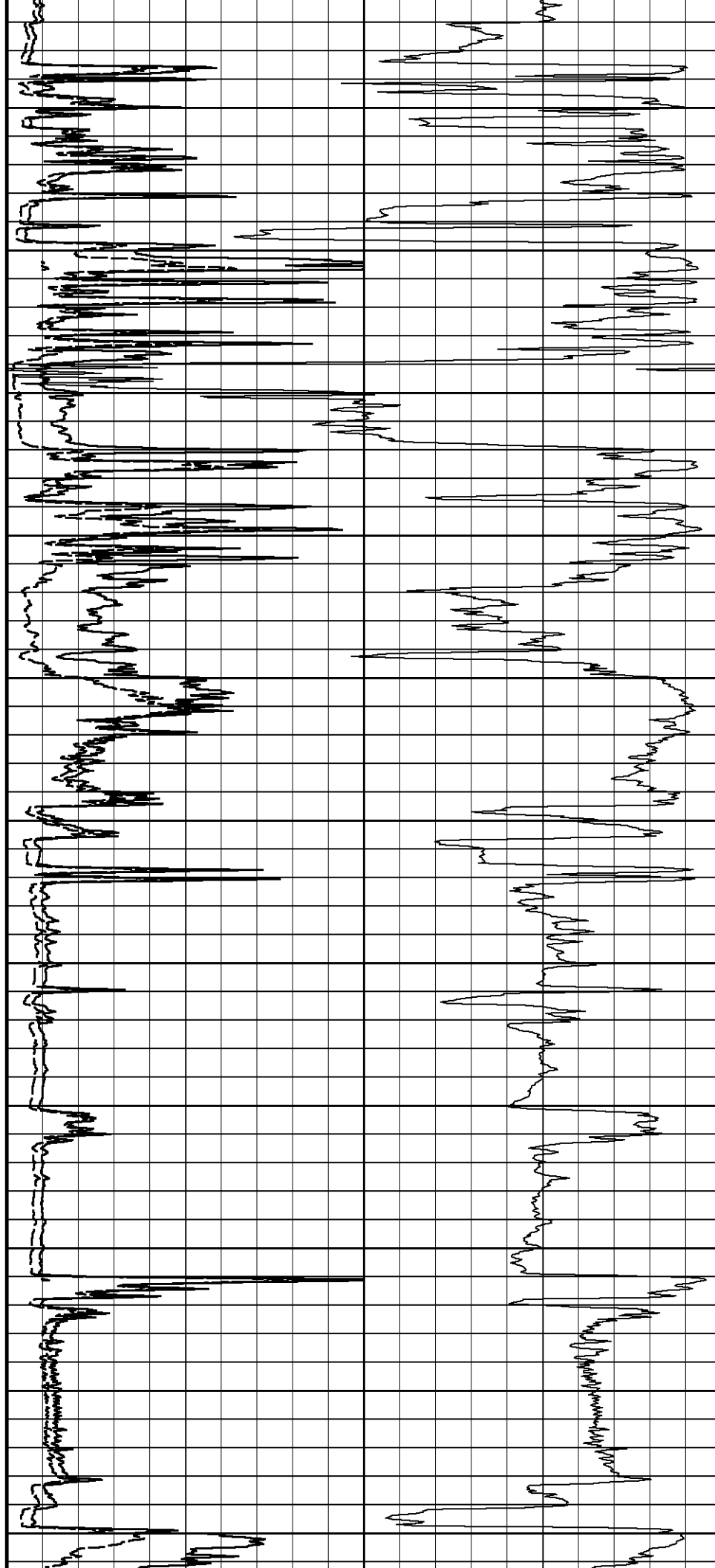
3600

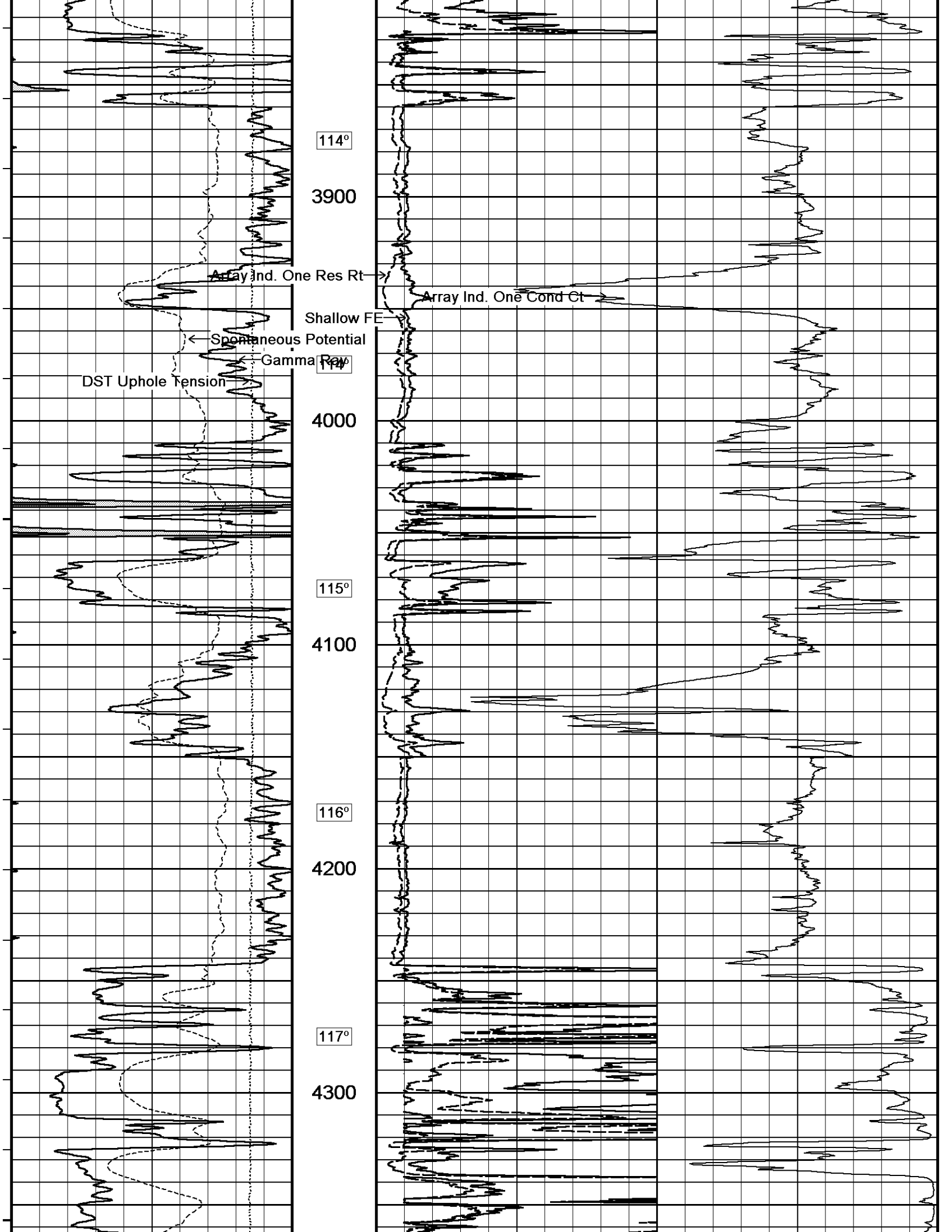
112°

3700

113°

3800





114°

3900

Array Ind. One Res Rt

Array Ind. One Cond Ct

Shallow FE

Spontaneous Potential

Gamma Ray

DST Uphole Tension

4000

115°

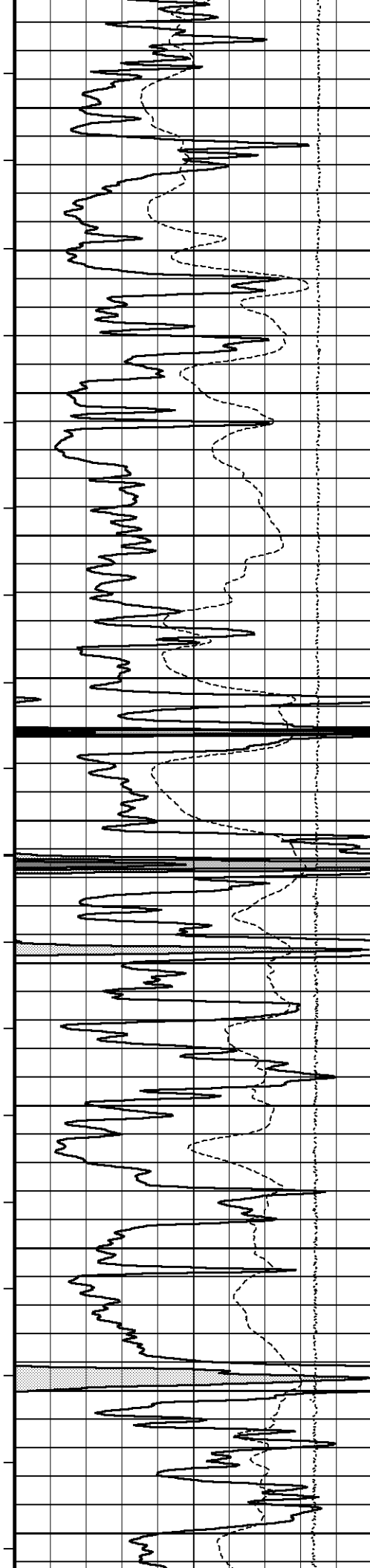
4100

116°

4200

117°

4300



117°

4400

118°

4500

118°

4600

119°

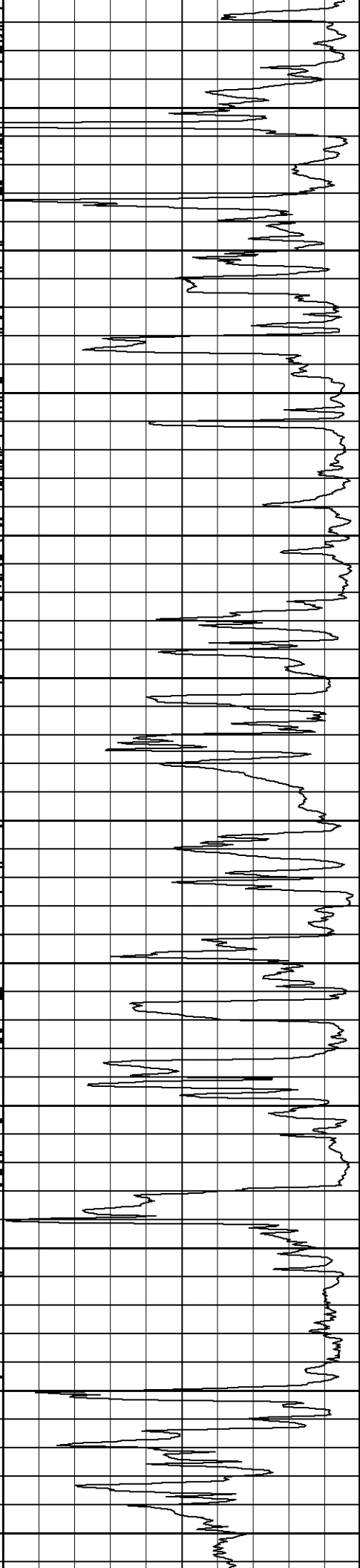
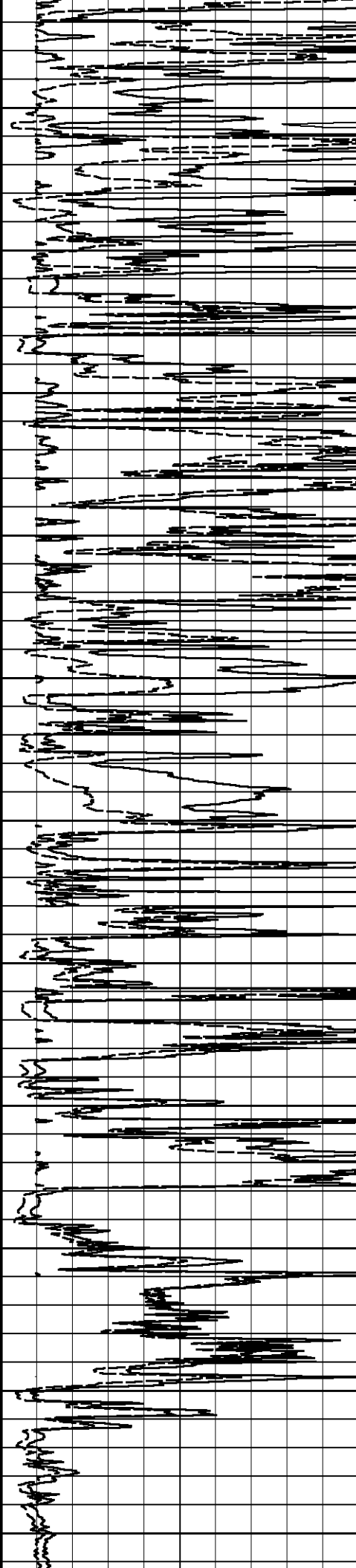
4700

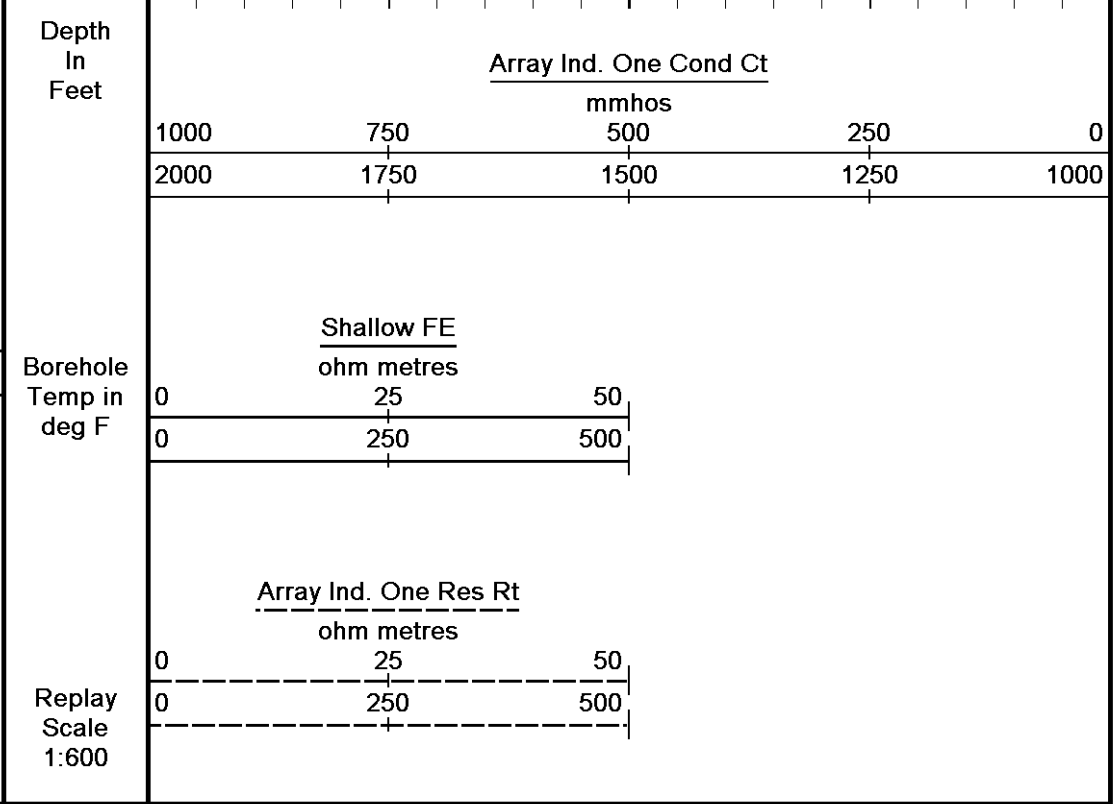
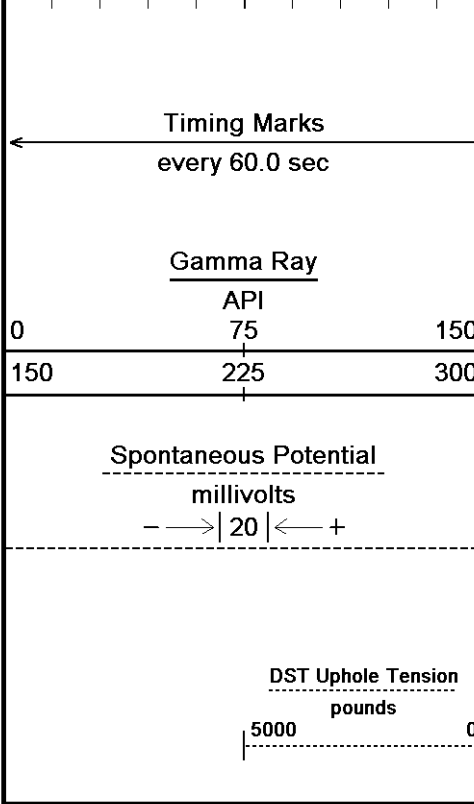
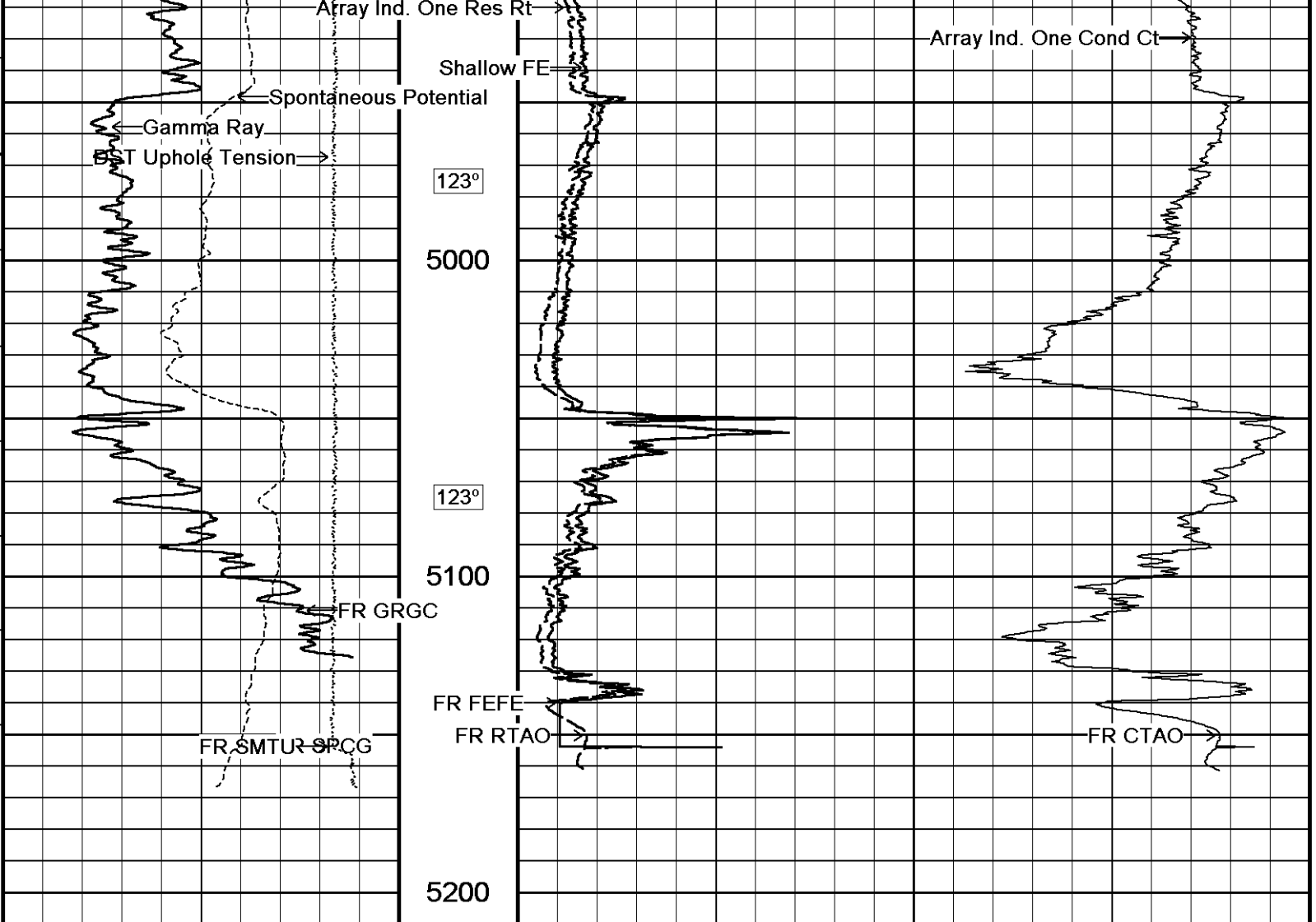
121°

4800

122°

4900





5 INCH MAIN

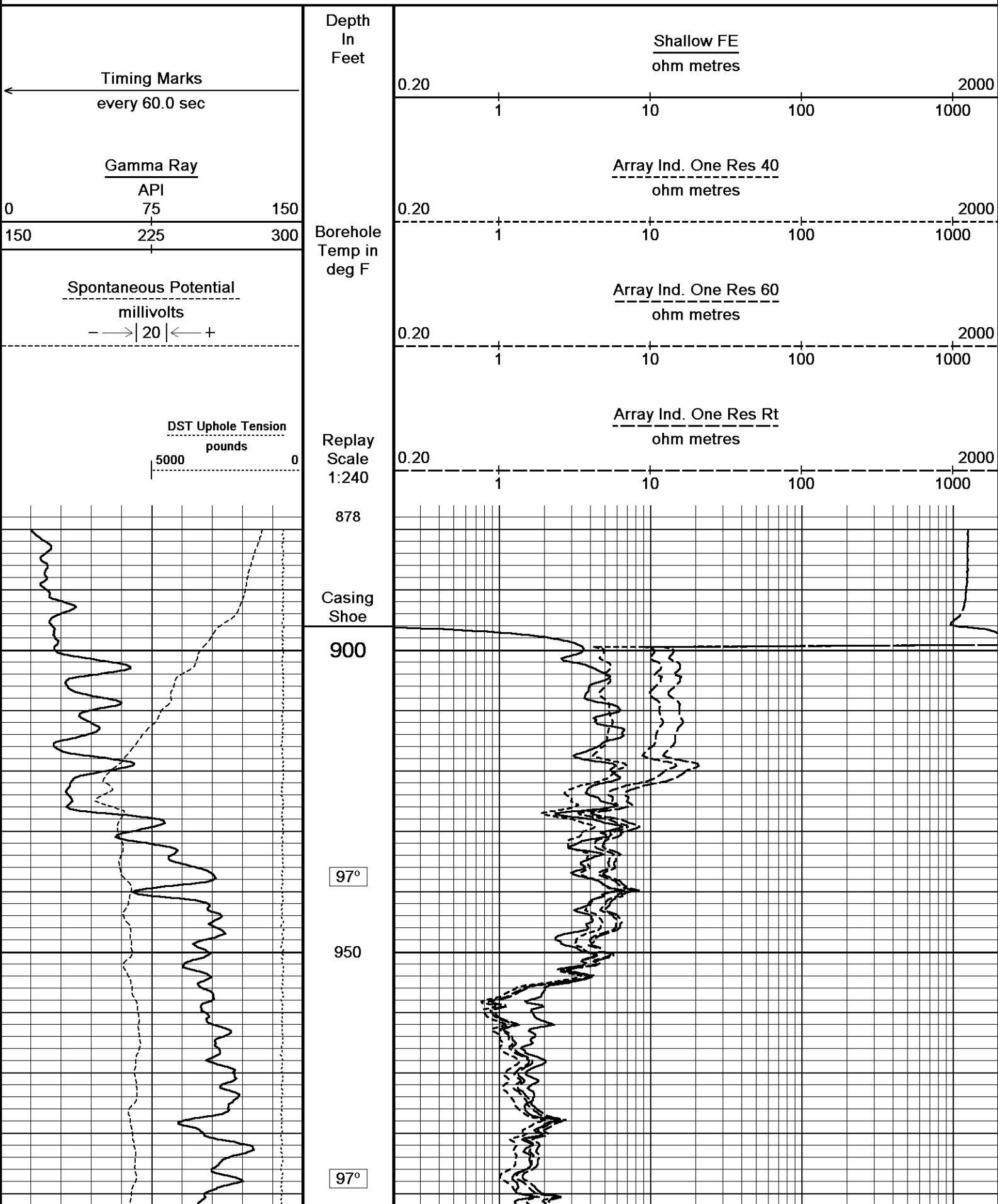
Depth Based Data - Maximum Sampling Increment 10.0cm

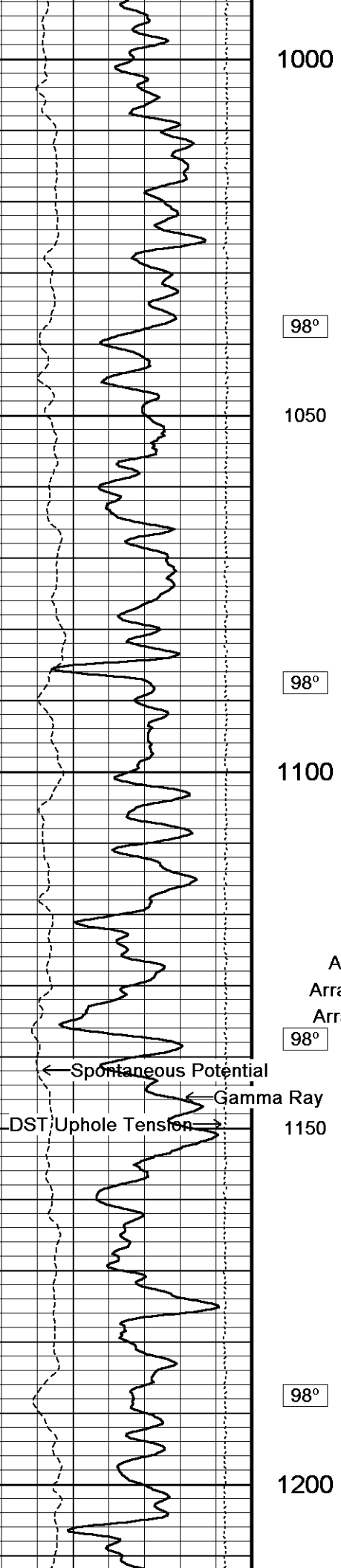
Plotted on 29-JUN-2013 06:08

Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta

Recorded on 29-JUN-2013 03:50

System Versions: Logged with 13.05.9583 Plotted with 13.05.9583





1000

98°

1050

98°

1100

98°

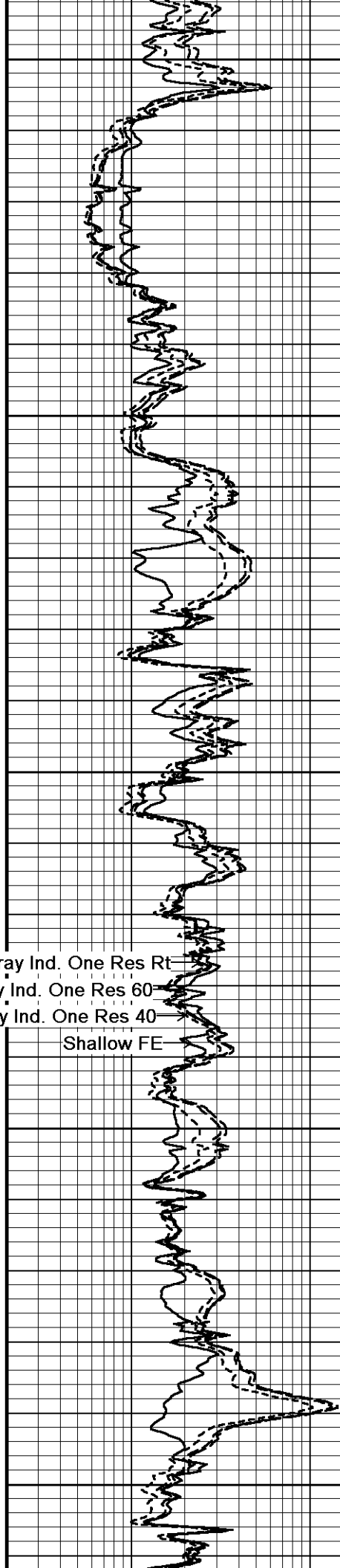
1150

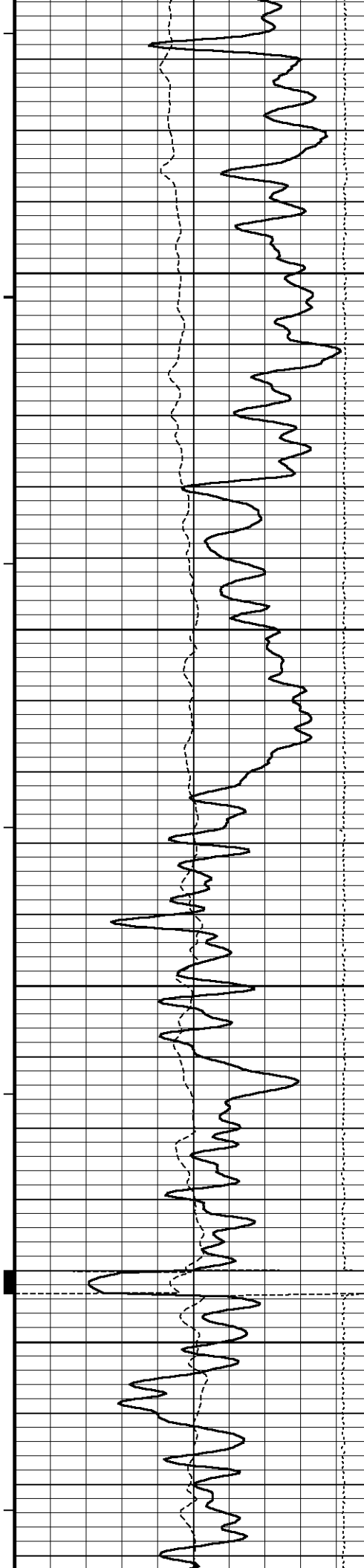
98°

1200

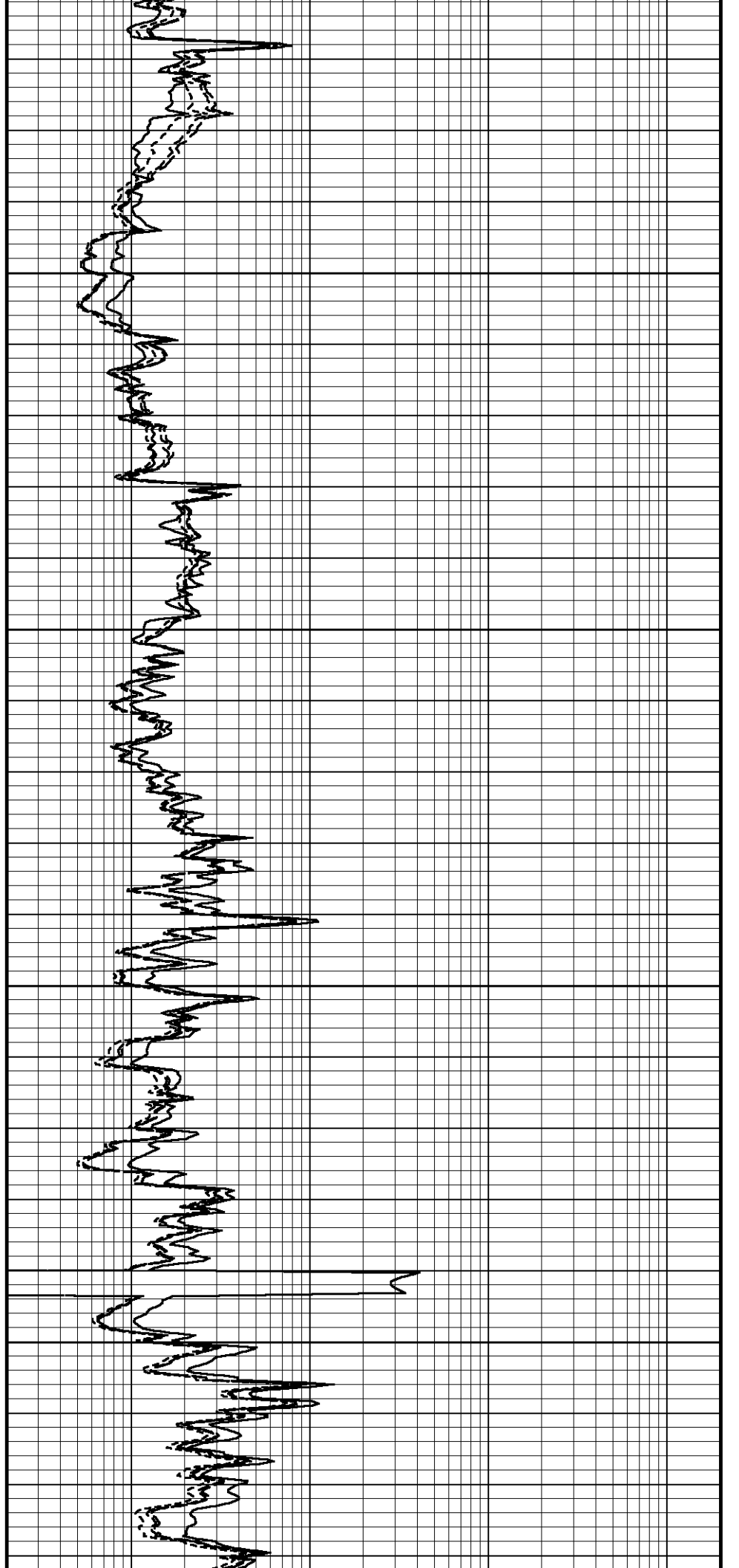
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE

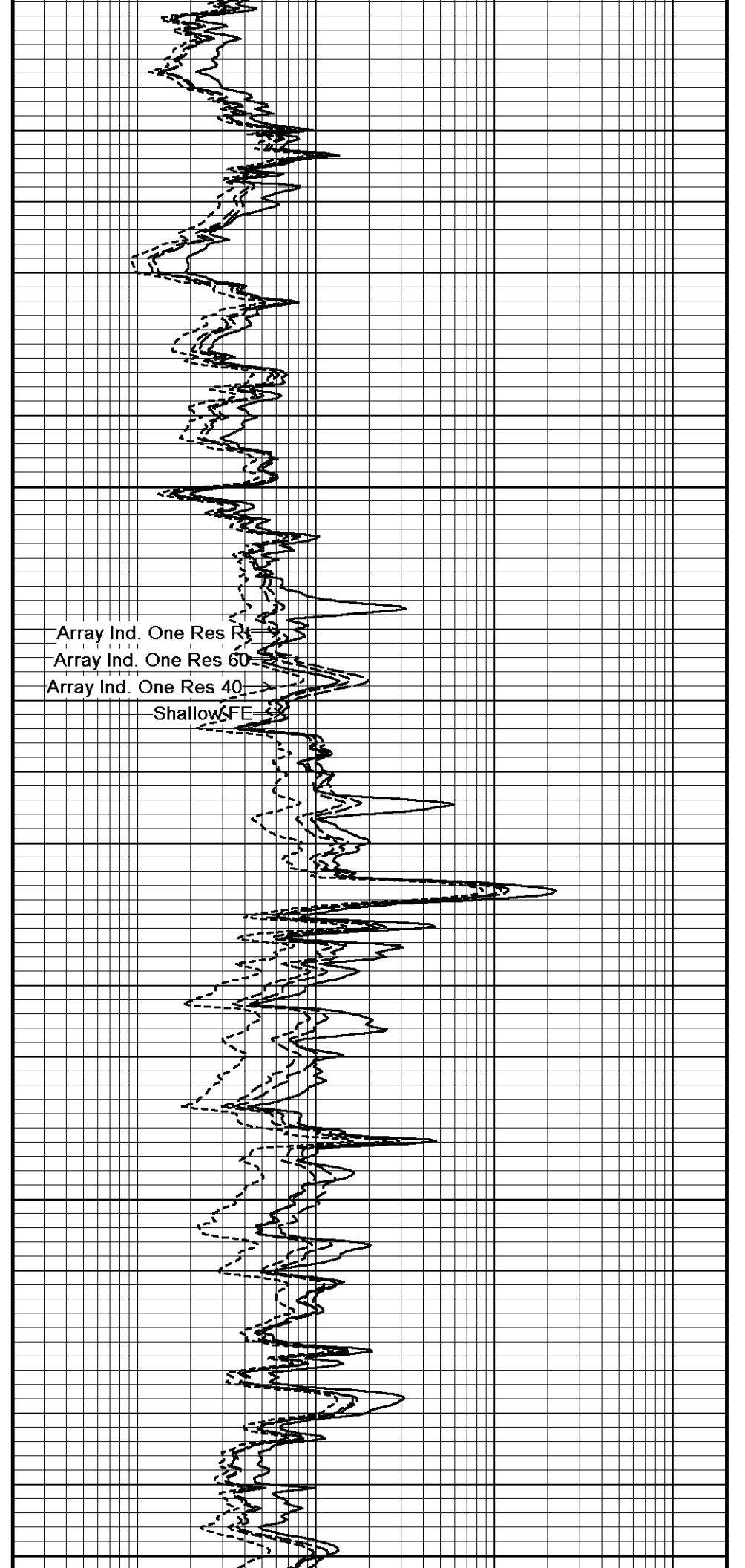
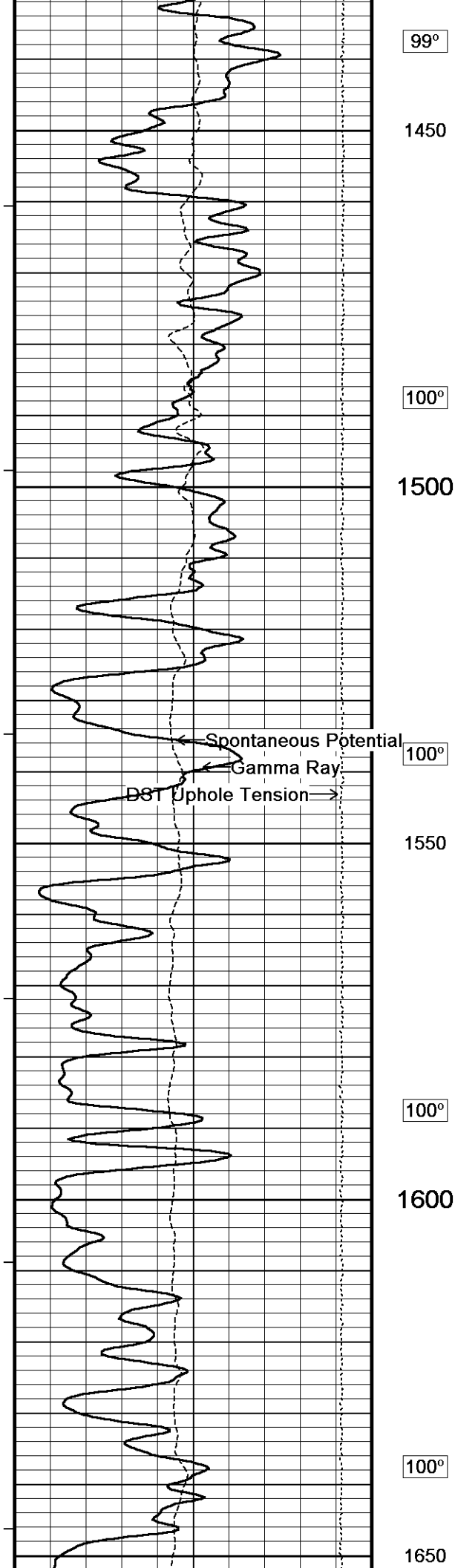
← Spontaneous Potential
DST/Uphole Tension →
Gamma Ray

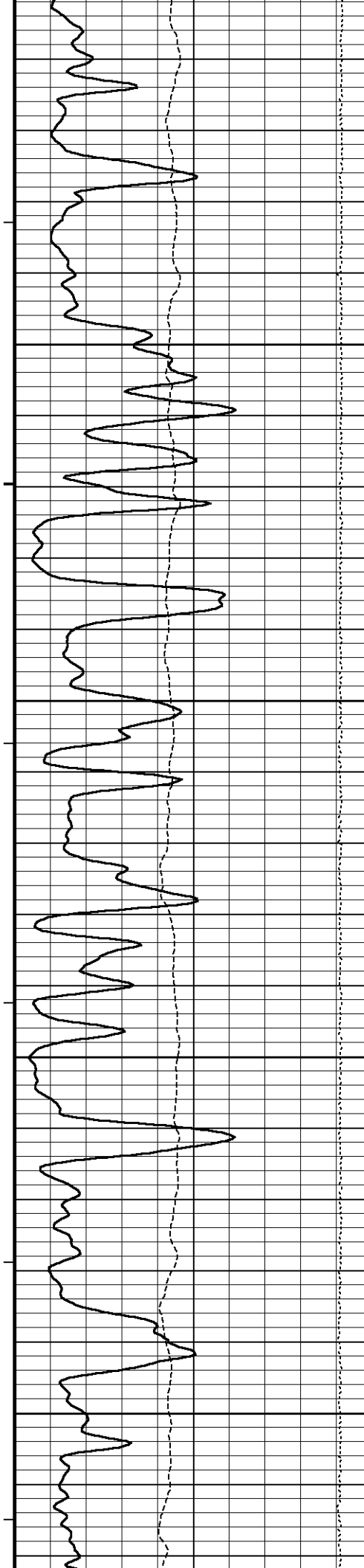




99°
1250
99°
1300
99°
1350
99°
1400







100°

1700

100°

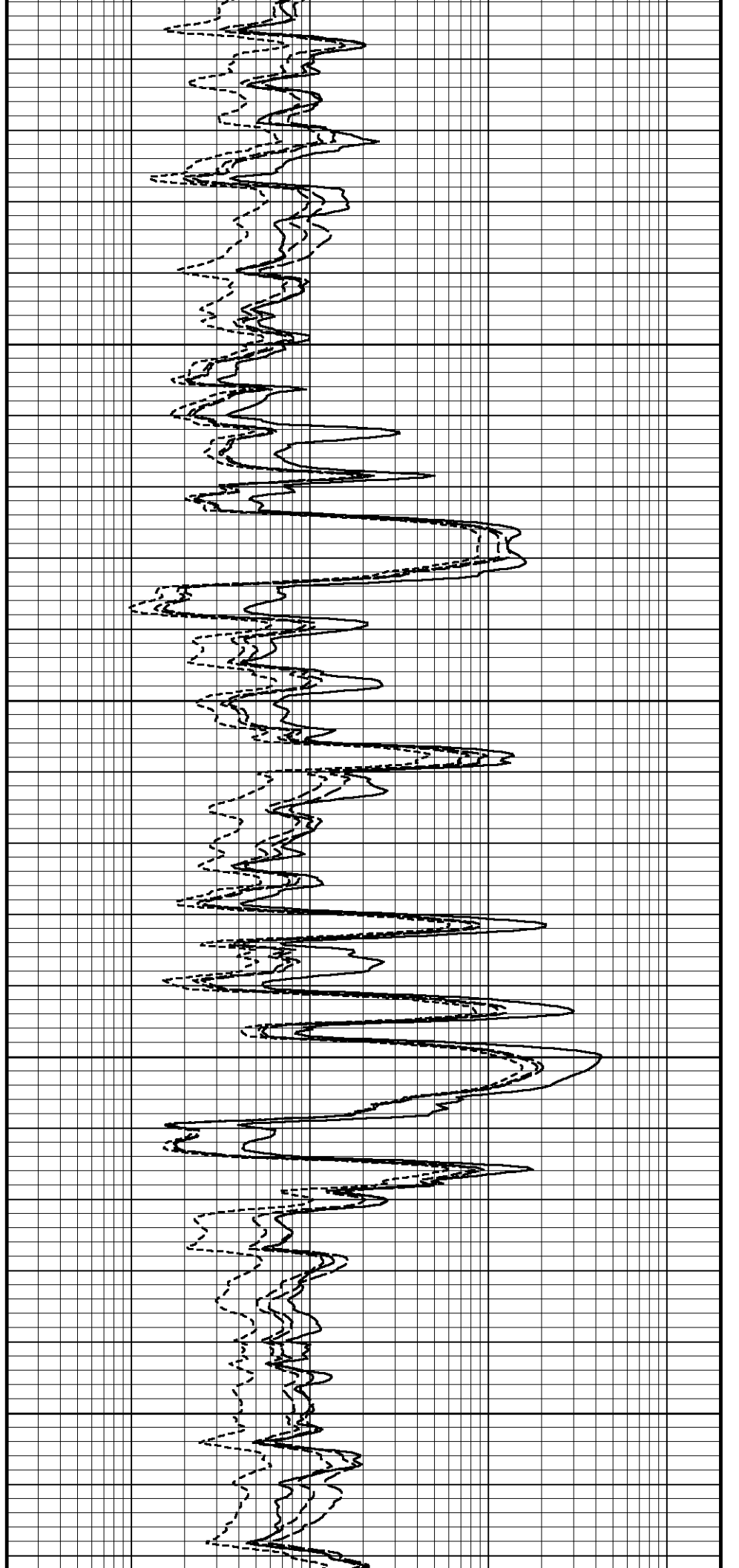
1750

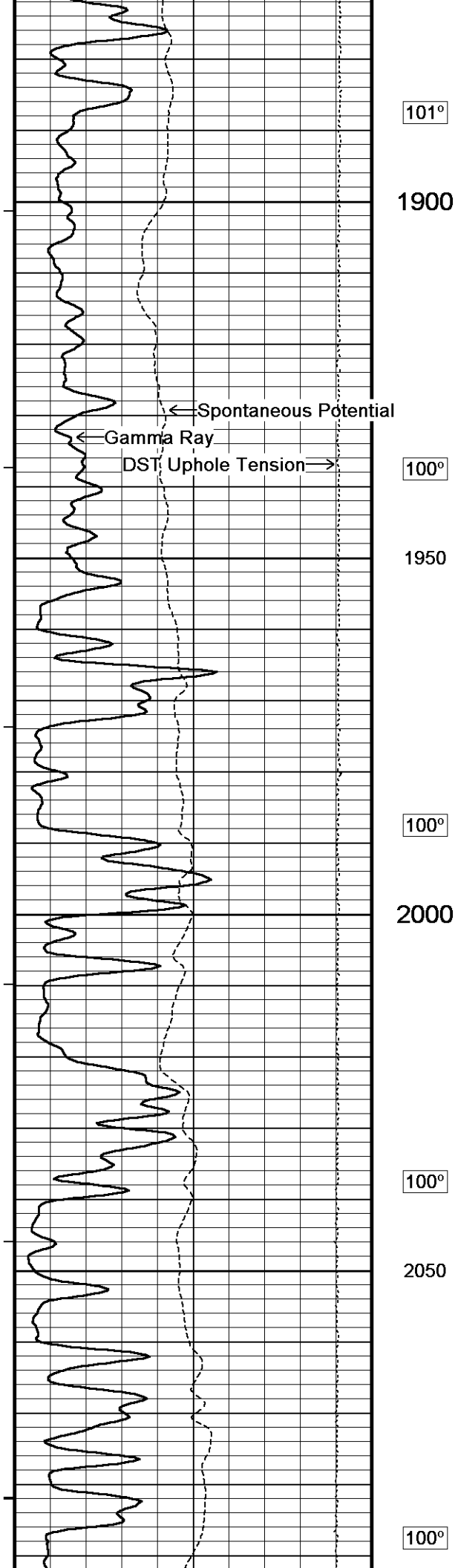
100°

1800

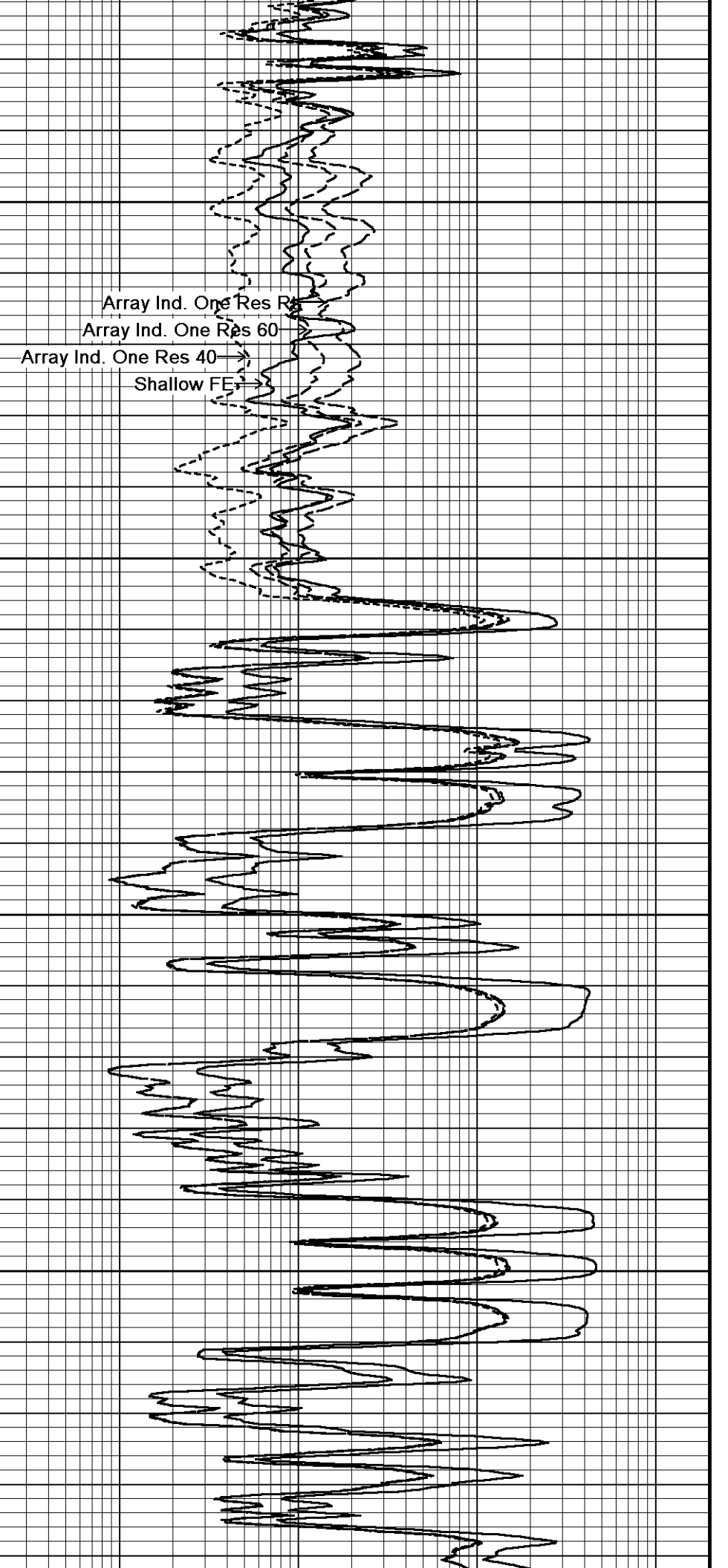
101°

1850

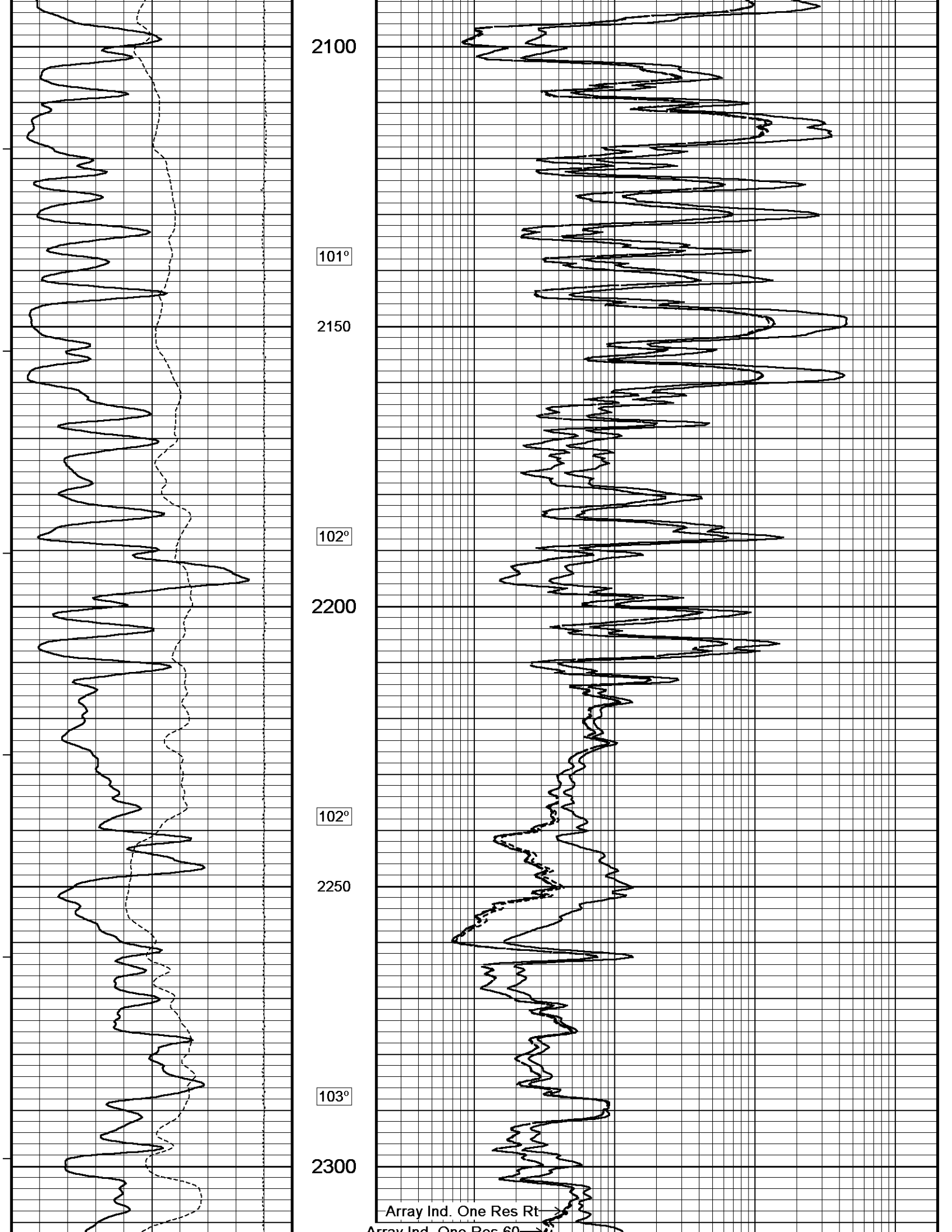




101°
1900
100°
1950
100°
2000
100°
2050
100°



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



Array Ind. One Res 60
Array Ind. One Res 40

Shallow FE

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →

104°

2350

104°

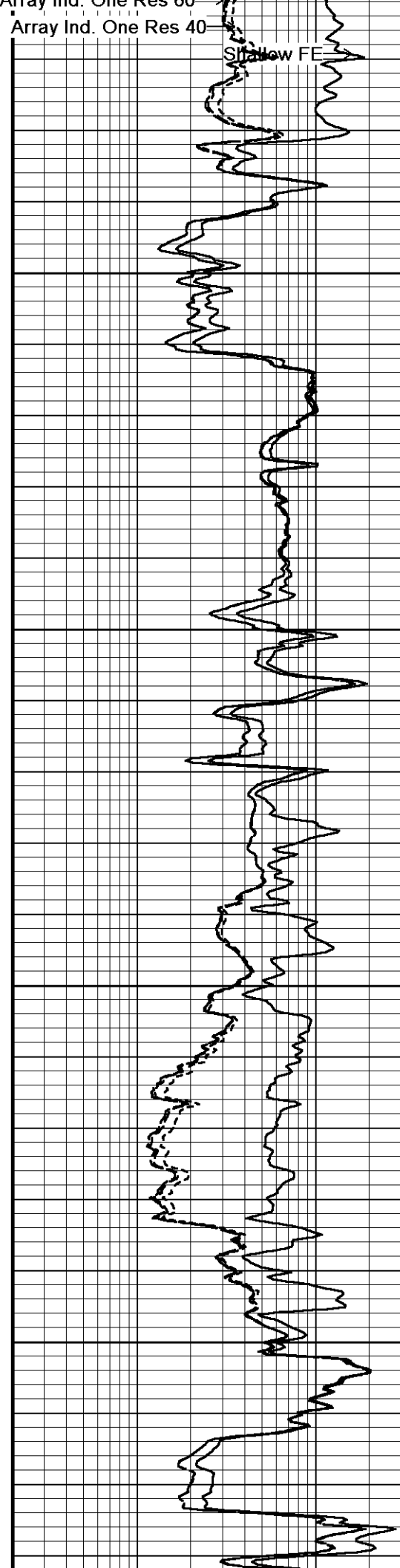
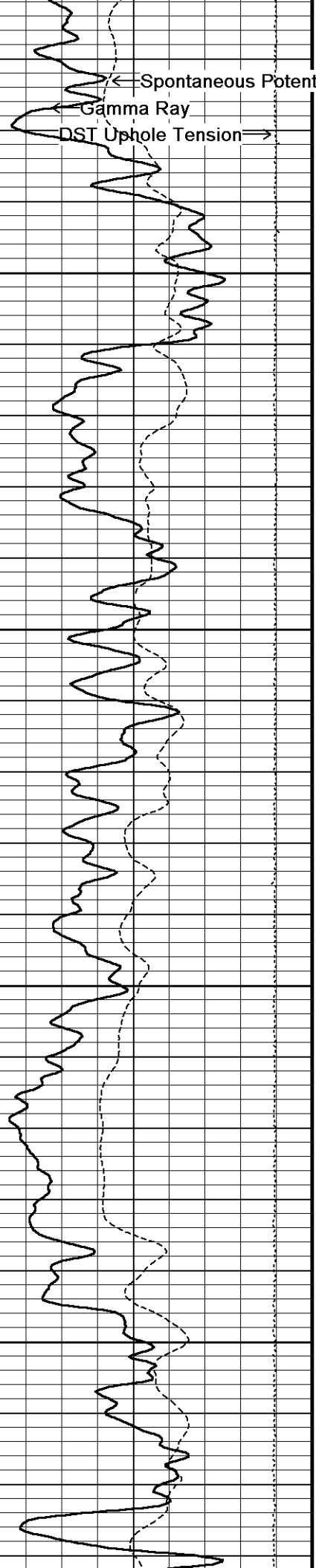
2400

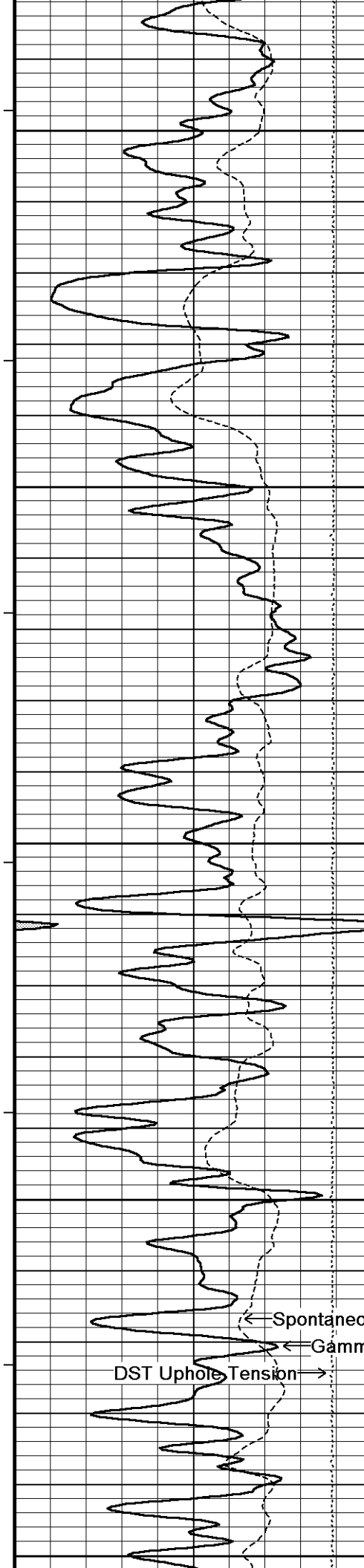
104°

2450

104°

2500





105°

2550

105°

2600

105°

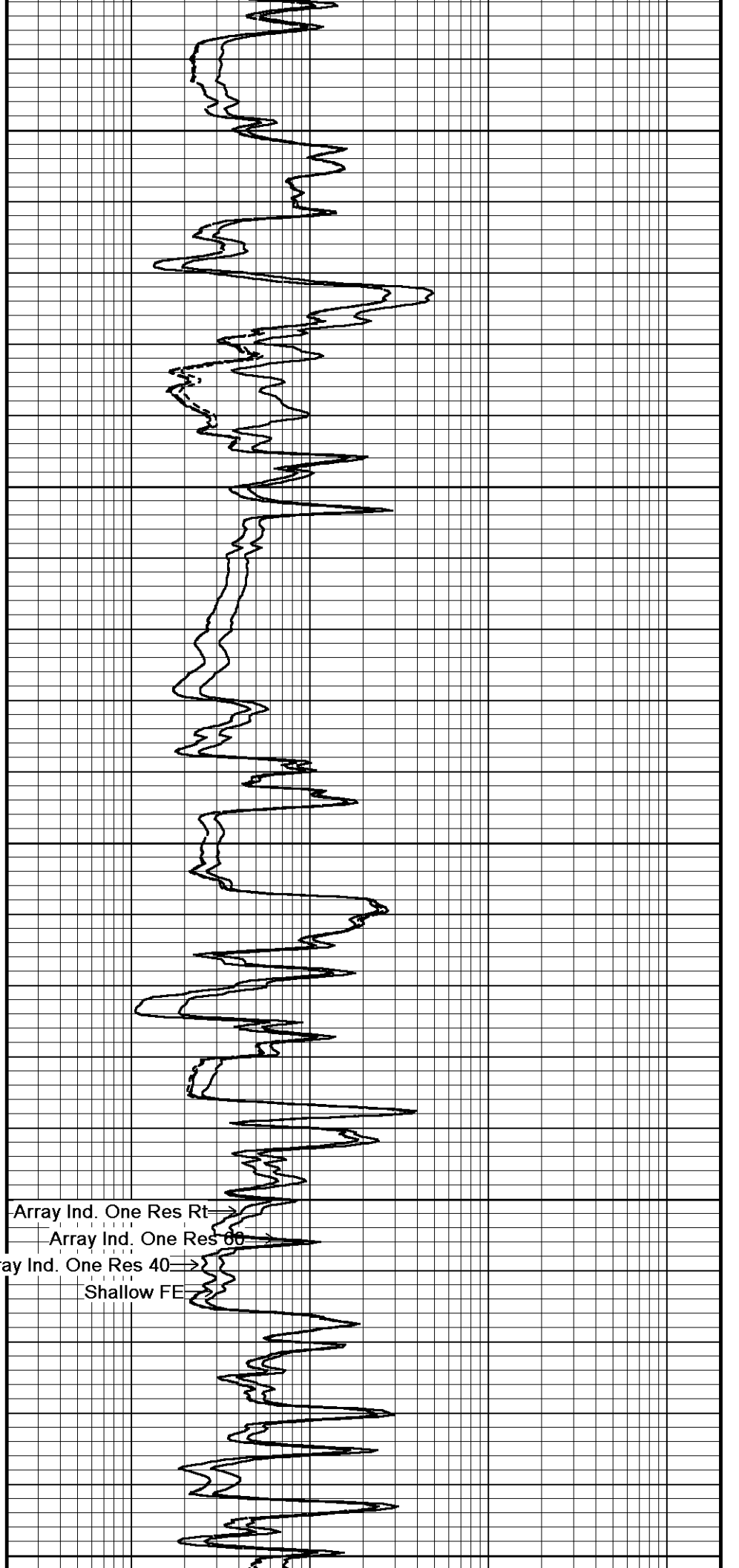
2650

106°

2700

106°

2750



Array Ind. One Res Rt →

Array Ind. One Res 60 →

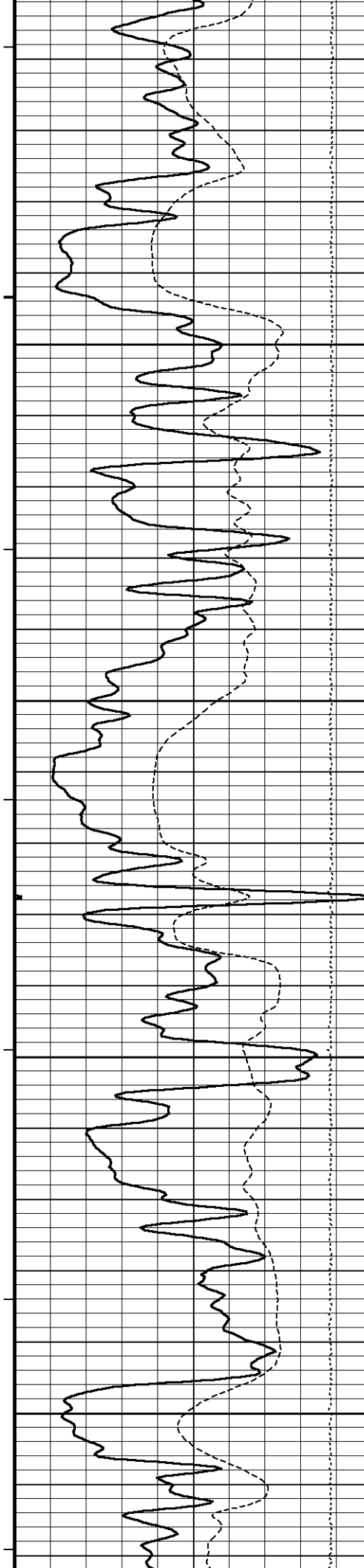
Array Ind. One Res 40 →

Shallow FE →

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →



106°

2800

106°

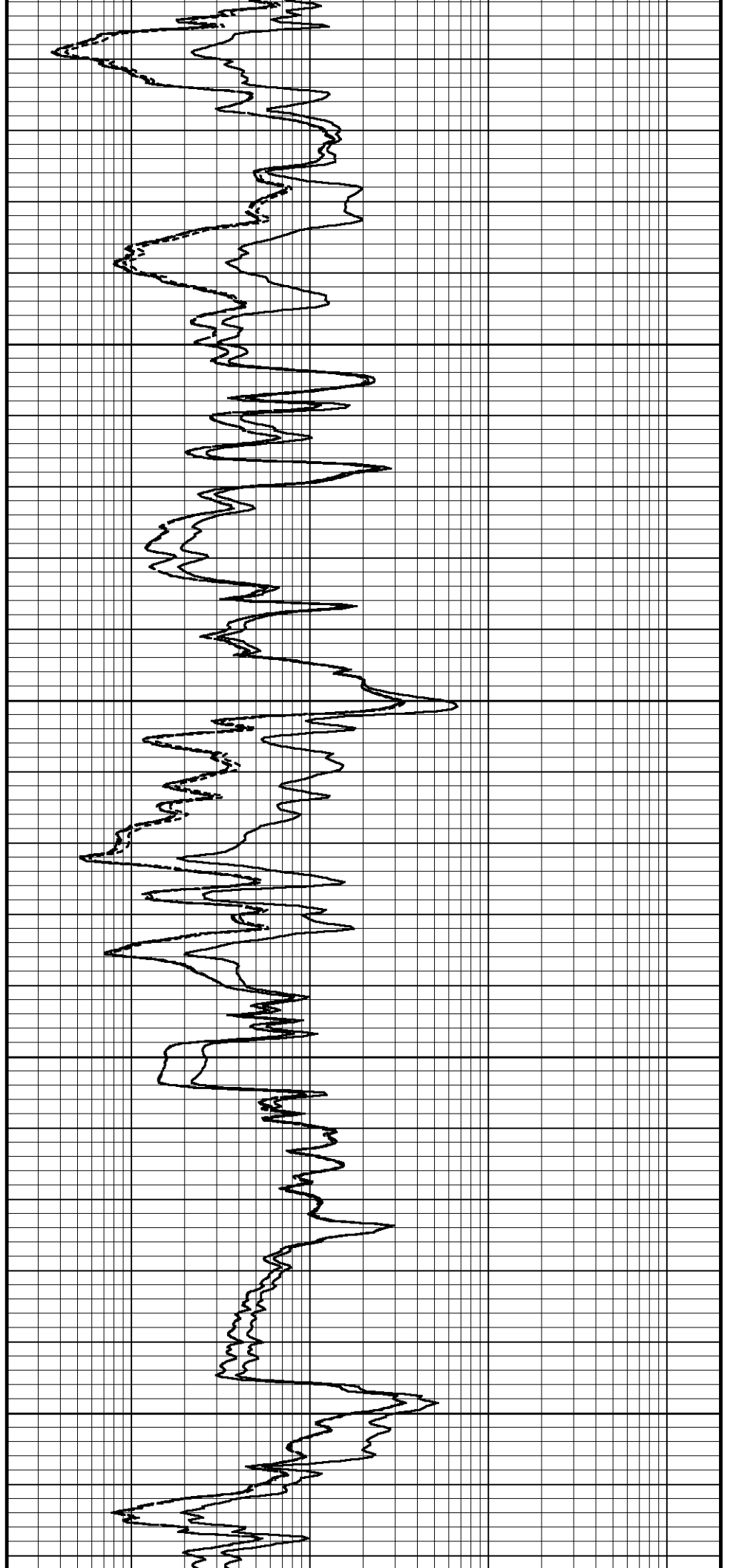
2850

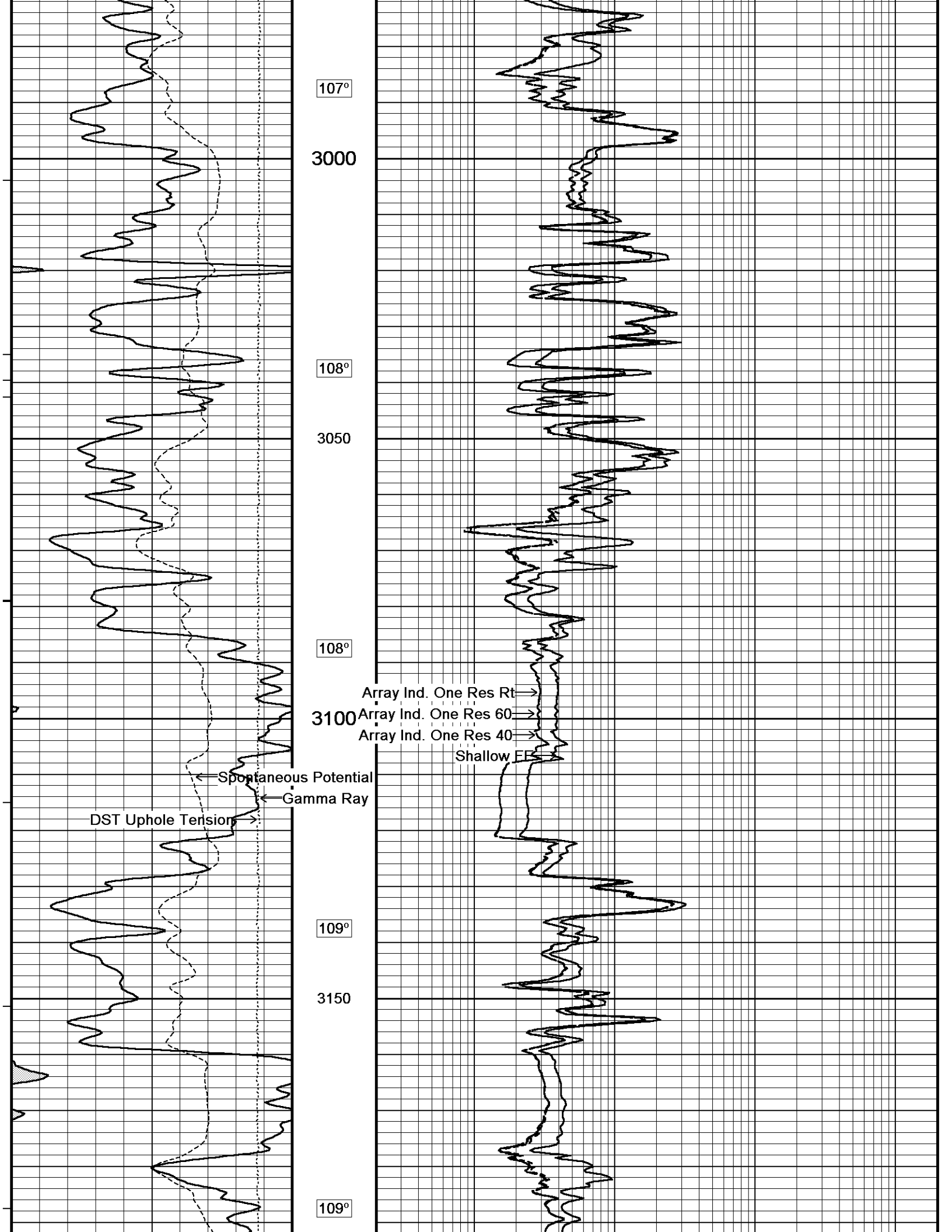
107°

2900

107°

2950





3200

109°

3250

110°

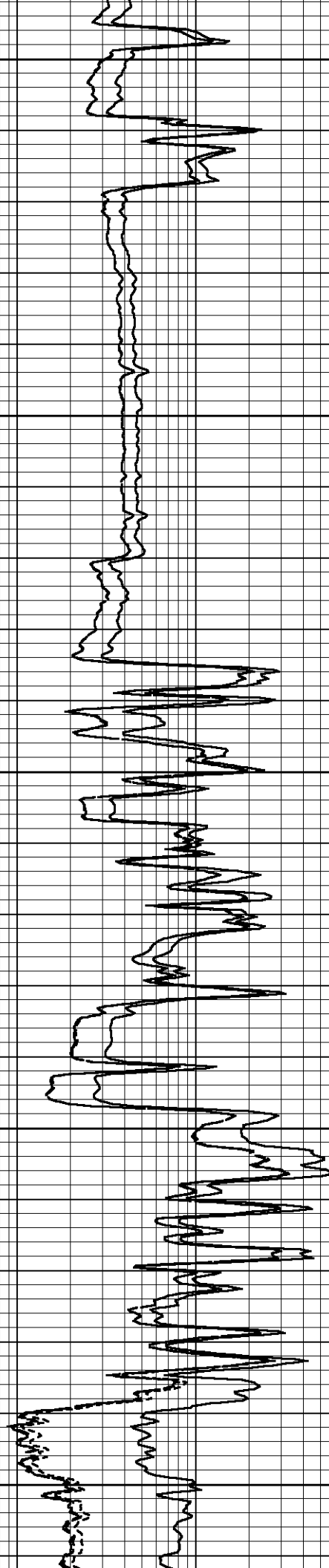
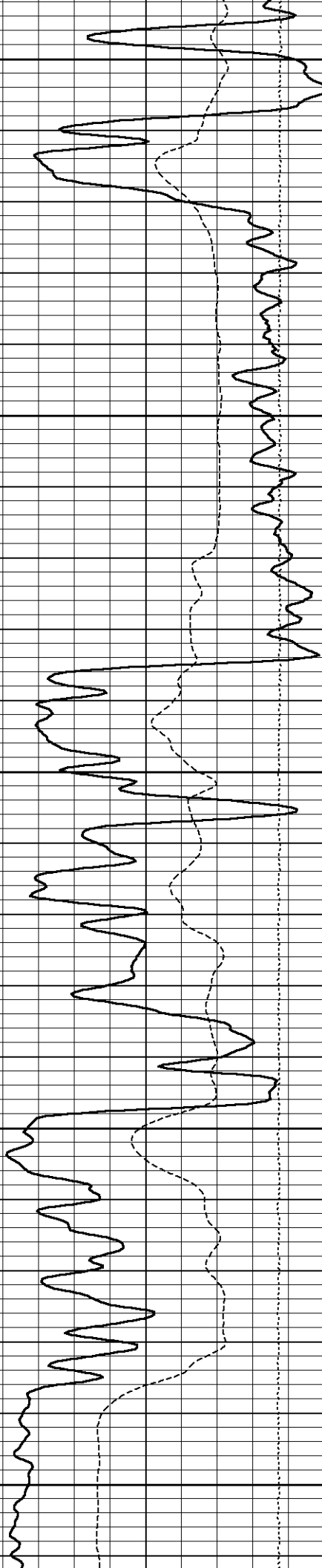
3300

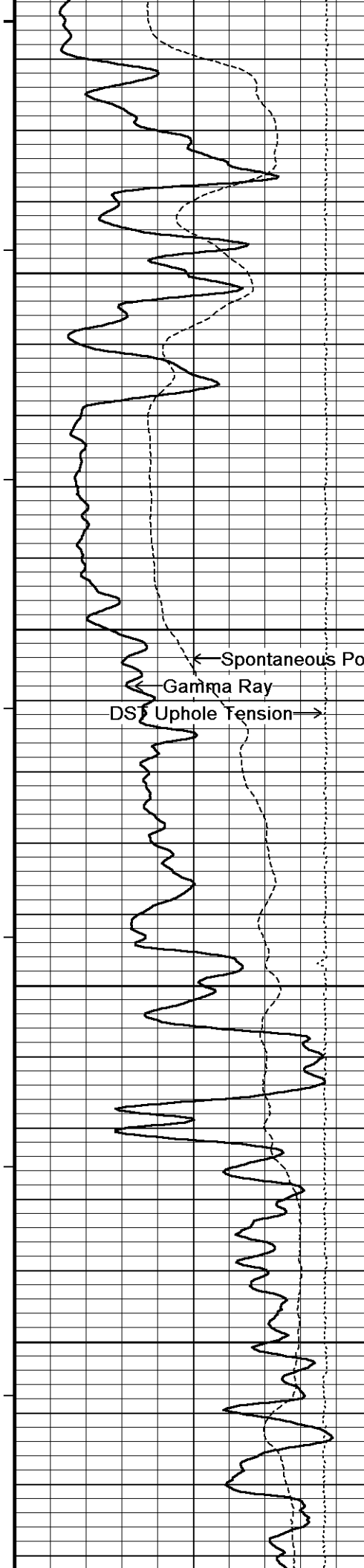
110°

3350

110°

3400





111°

3450

111°

3500

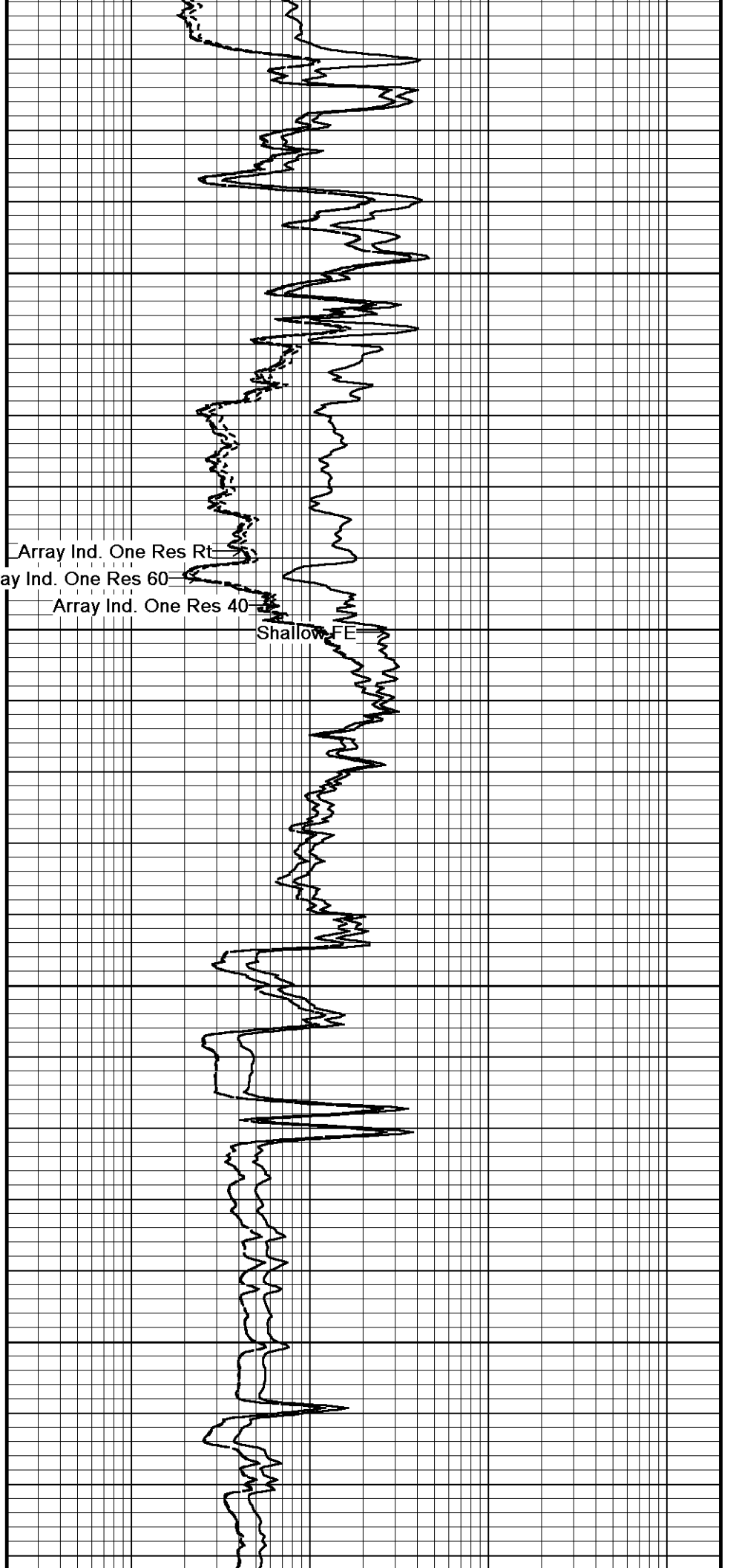
111°

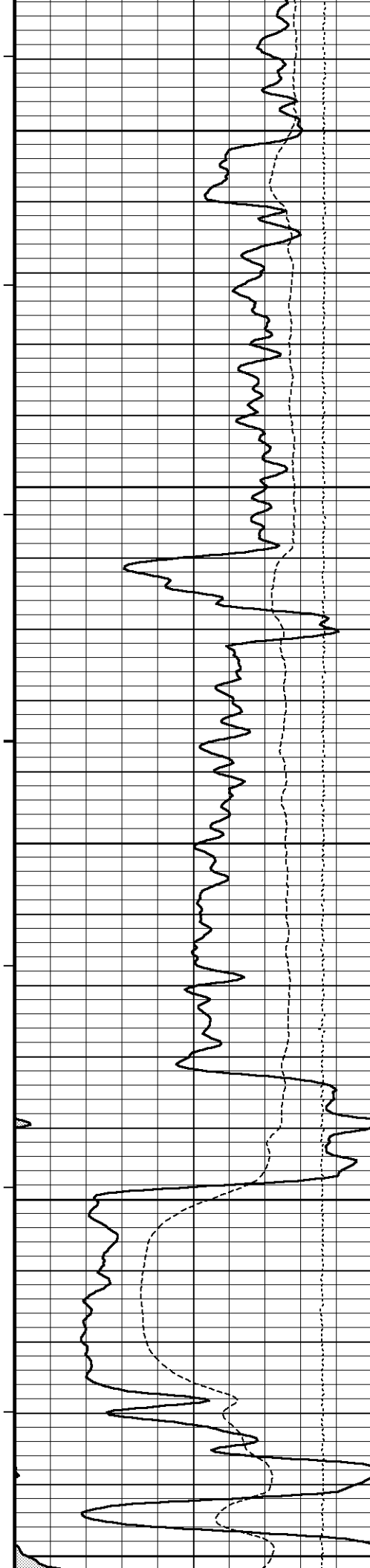
3550

112°

3600

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





112°

3650

112°

3700

113°

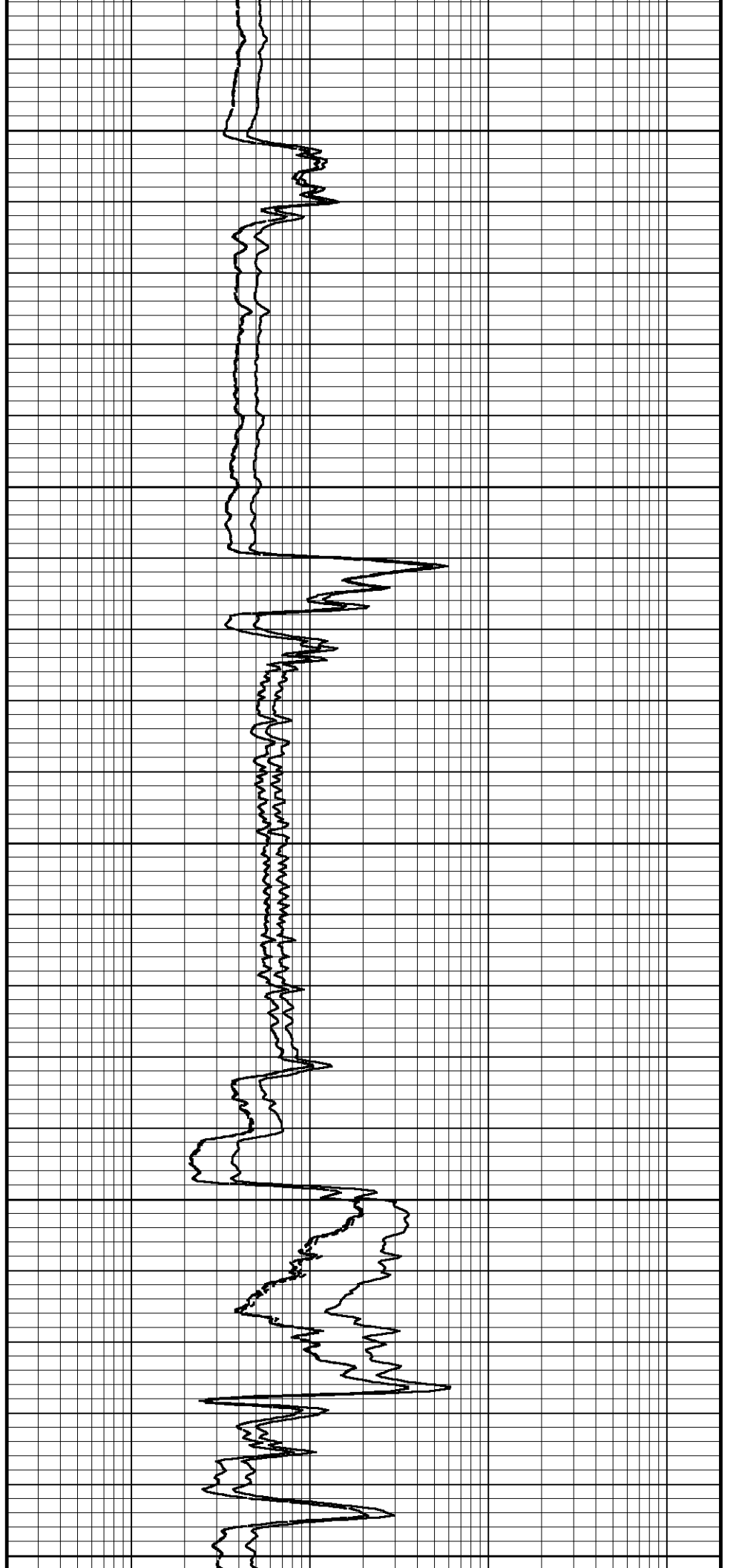
3750

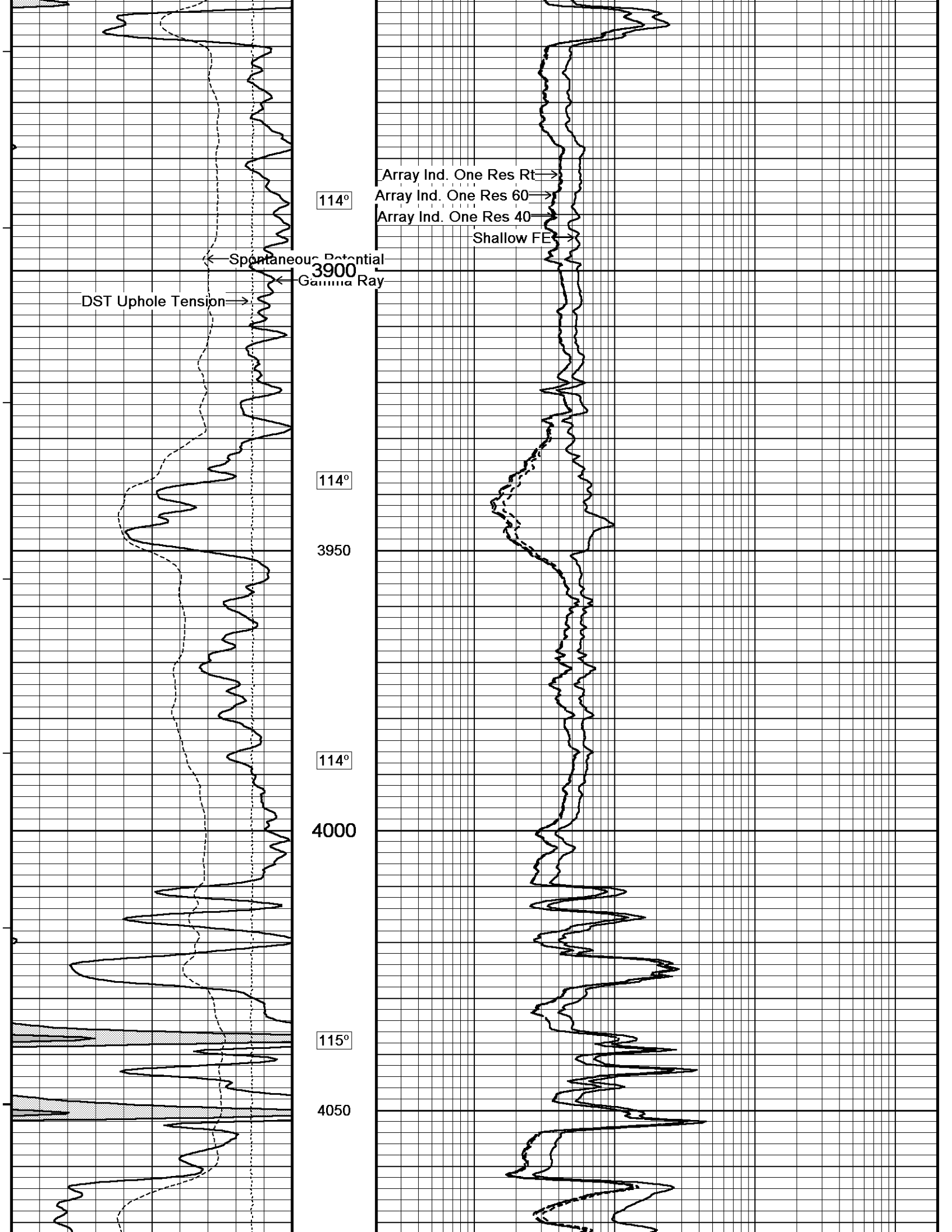
113°

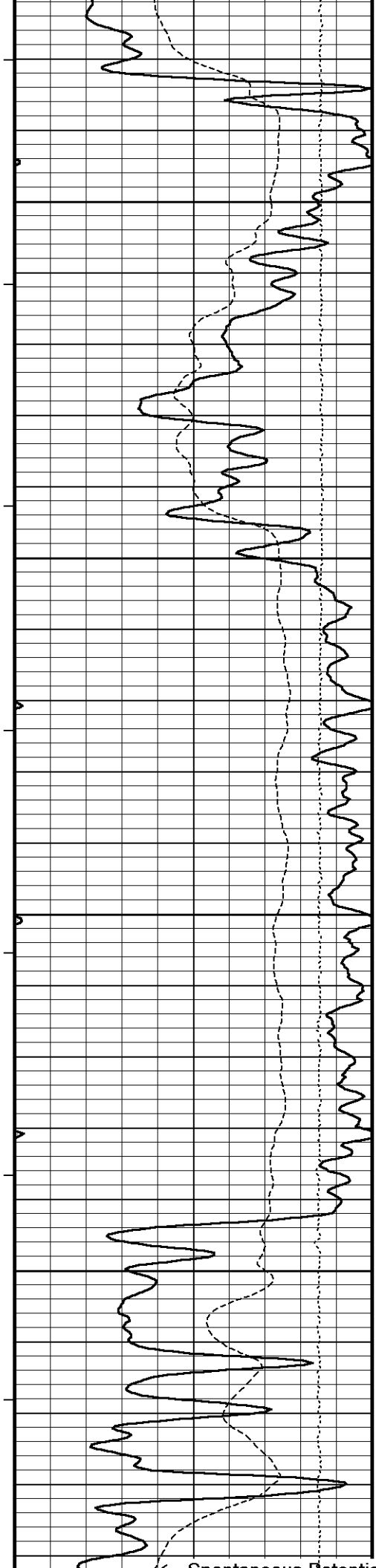
3800

114°

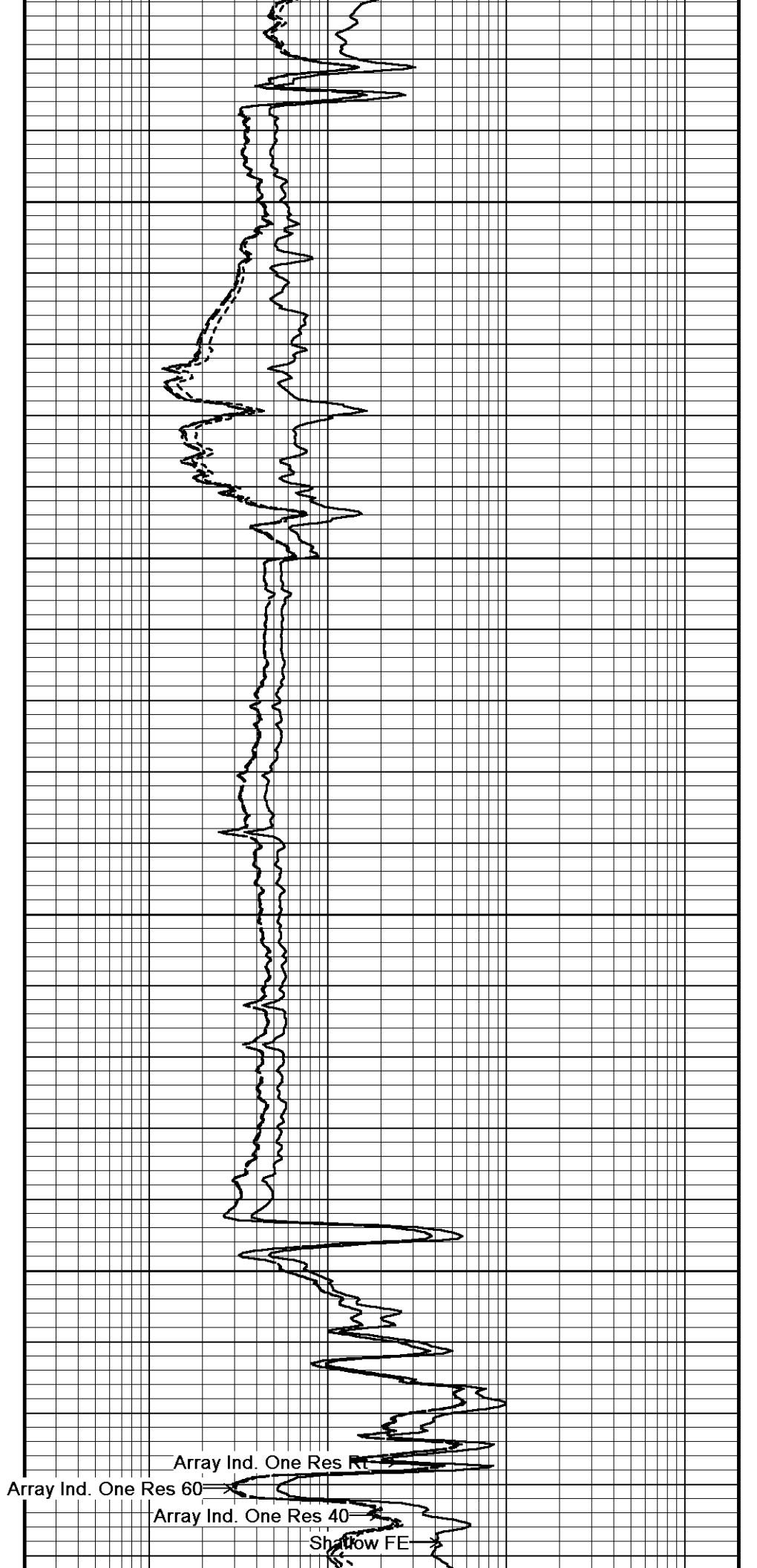
3850



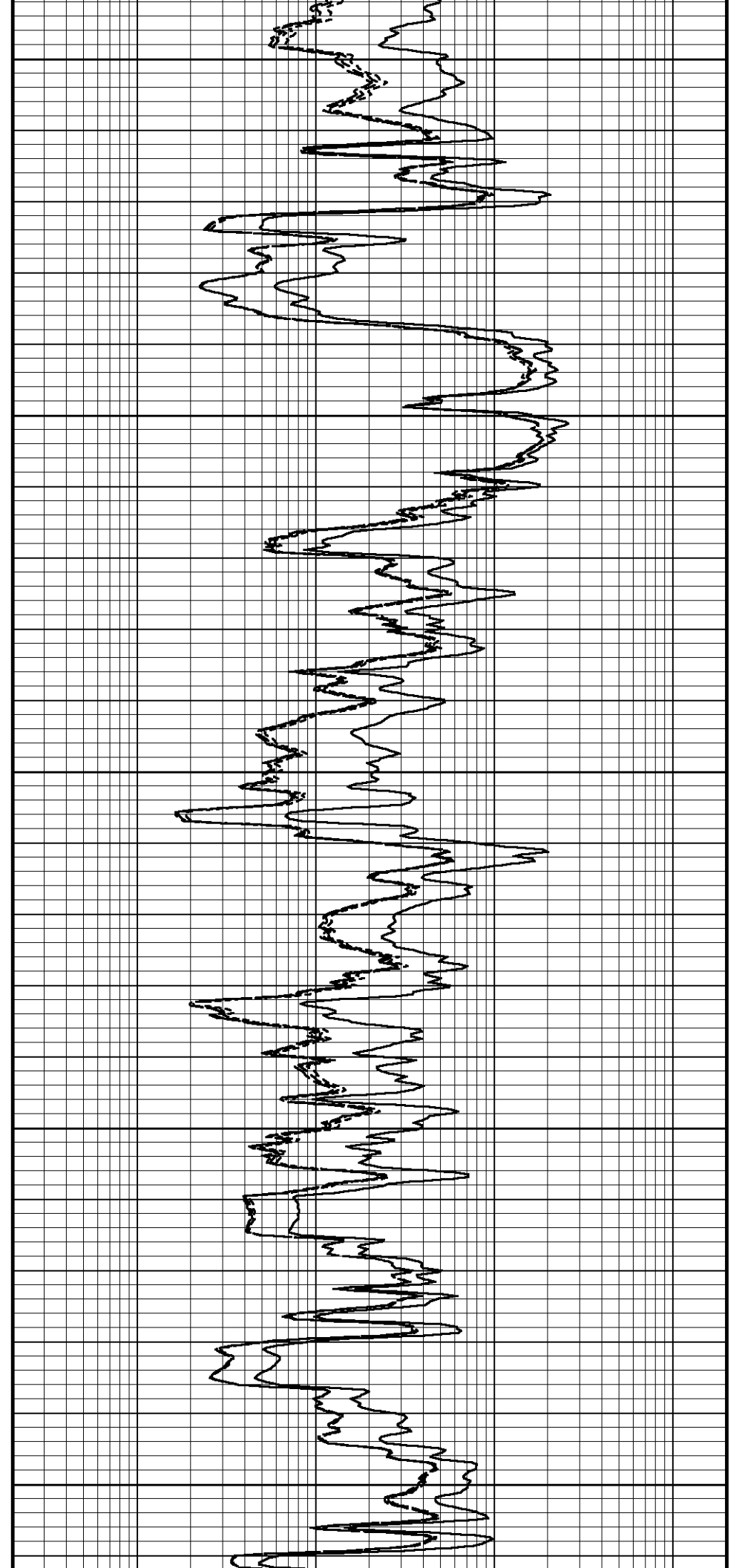
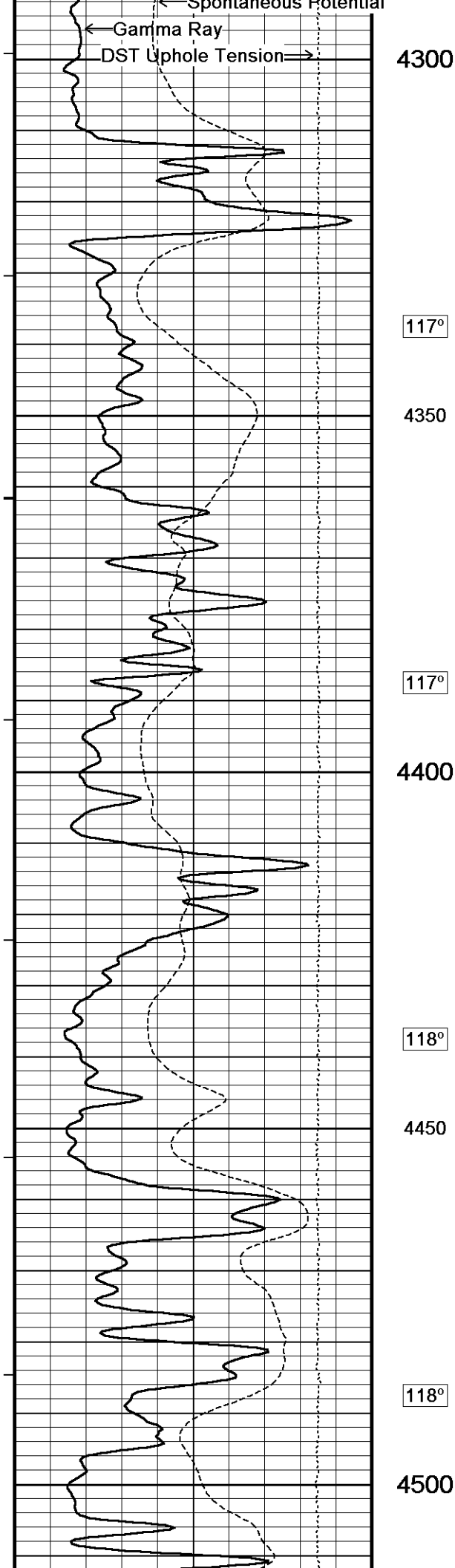


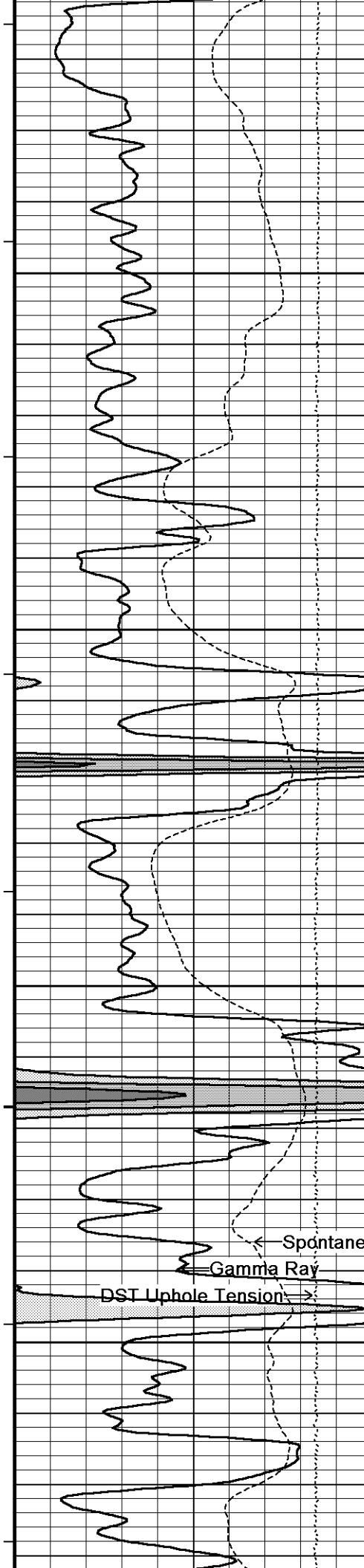


115°
4100
116°
4150
116°
4200
116°
4250
117°



Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 20
Shallow FE





118°

4550

119°

4600

119°

4650

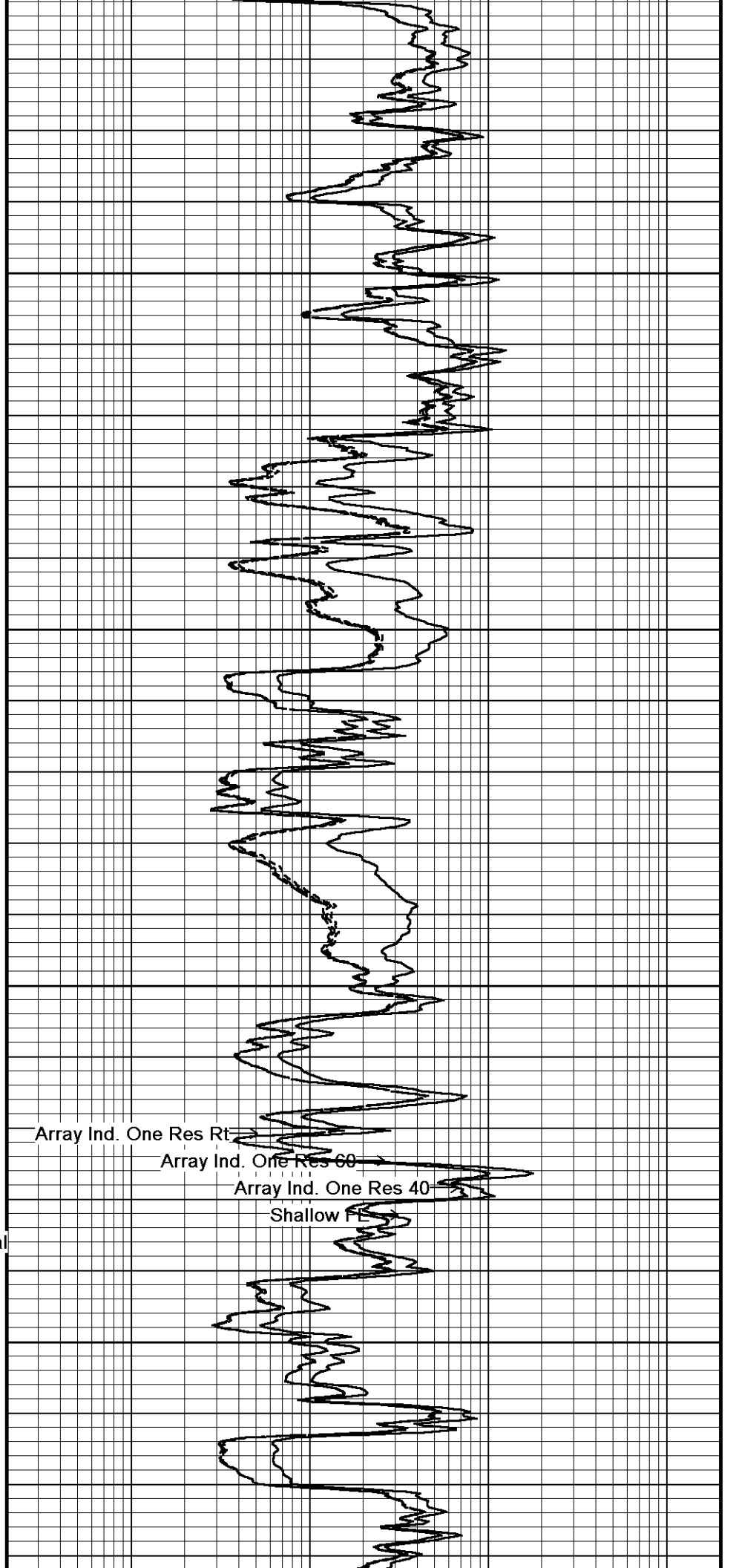
119°

4700

← Spontaneous Potential

← Gamma Ray

DST Uphole Tension →

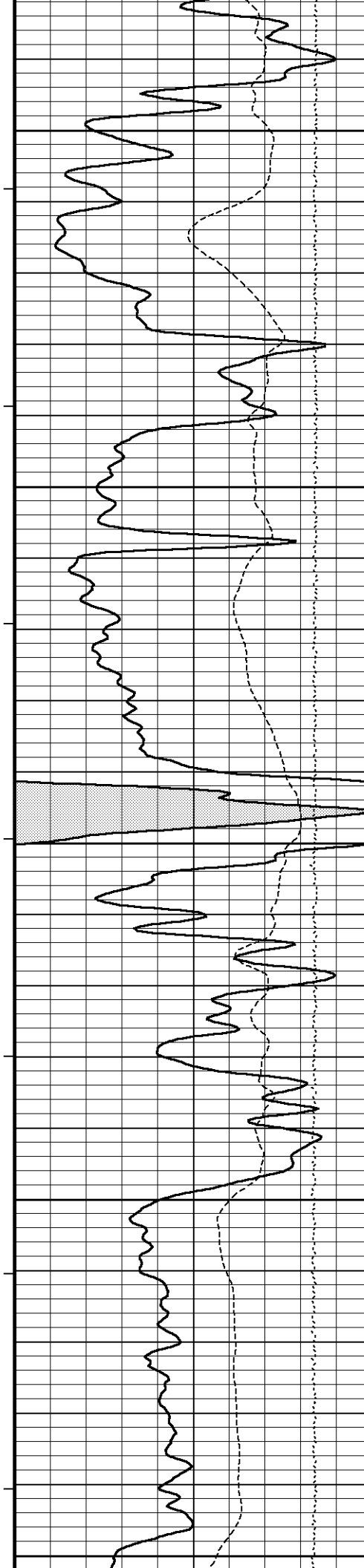


Array Ind. One Res Rt

Array Ind. One Res 60

Array Ind. One Res 40

Shallow FE



120°

4750

121°

4800

121°

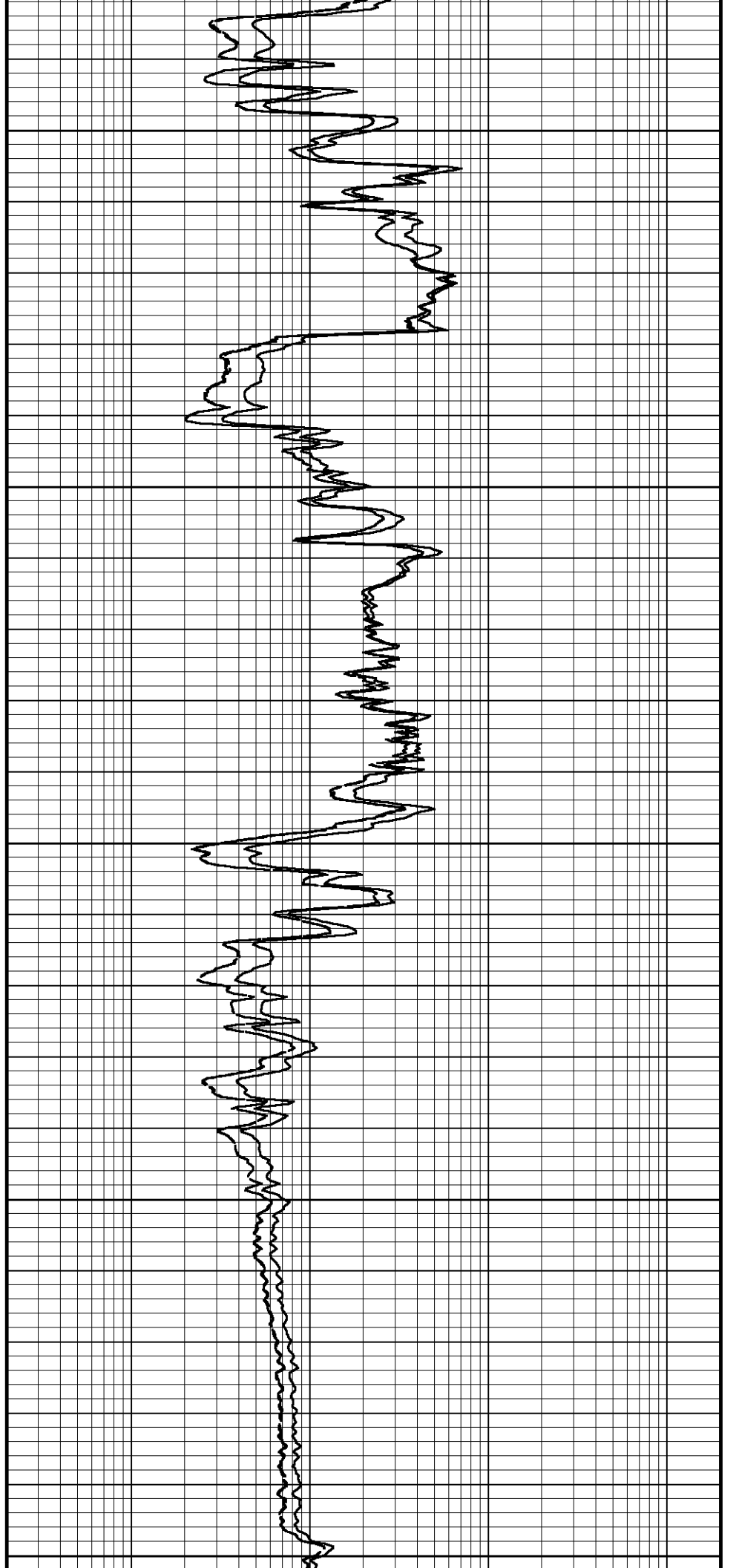
4850

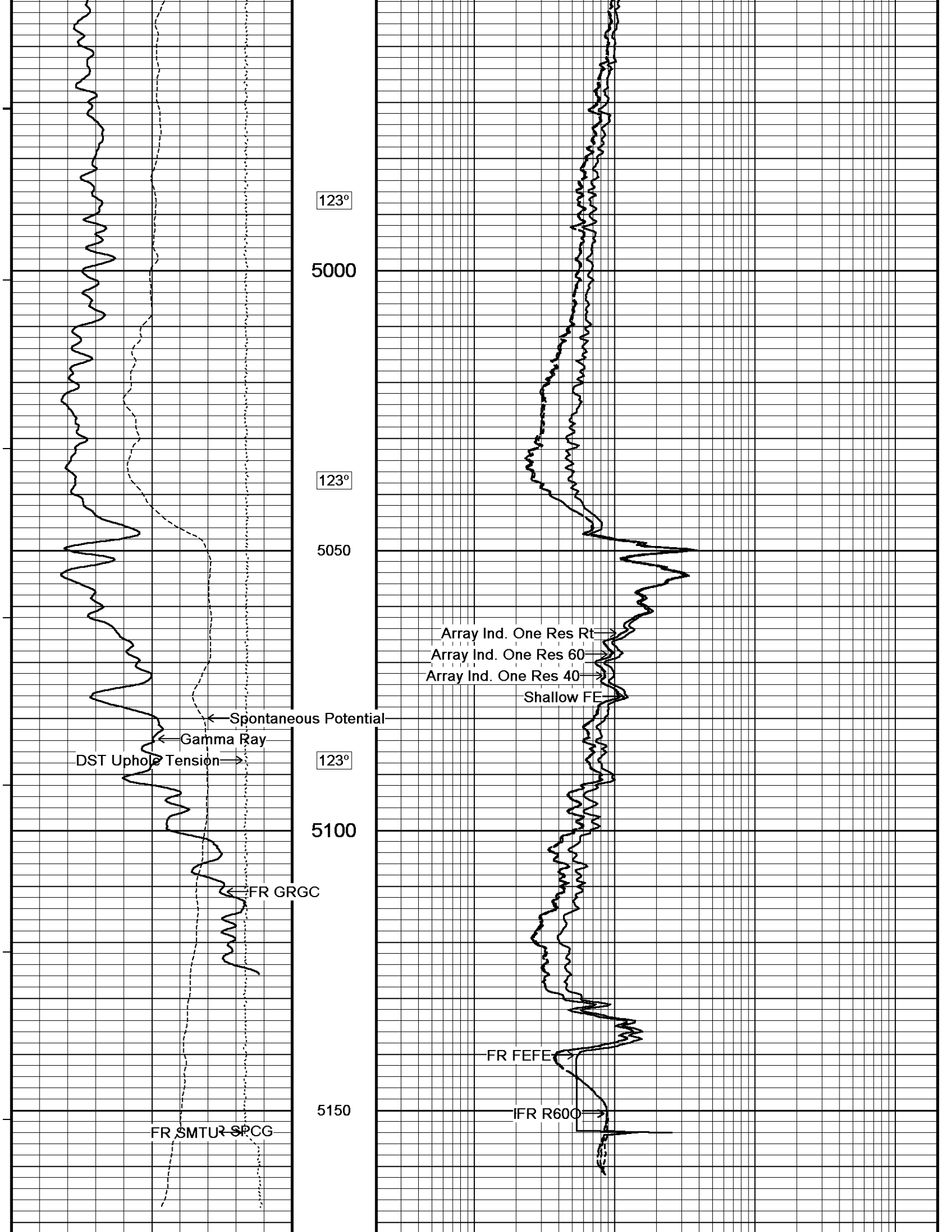
122°

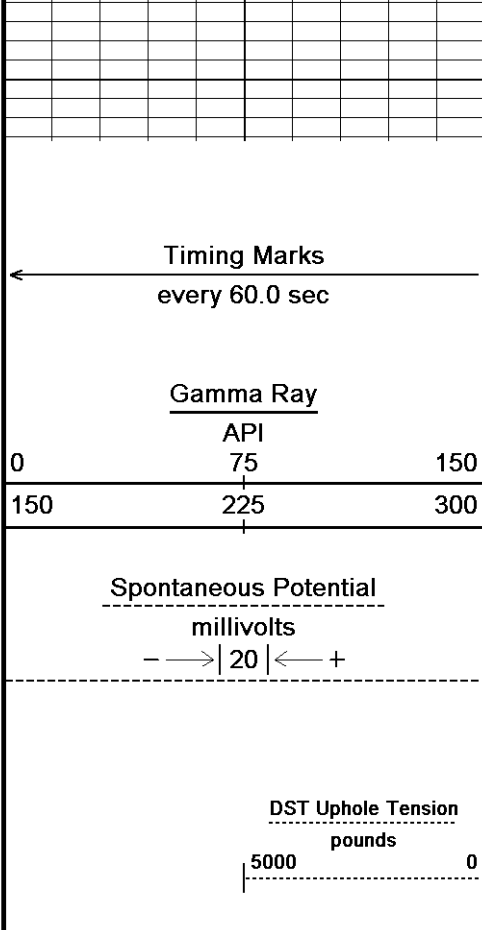
4900

123°

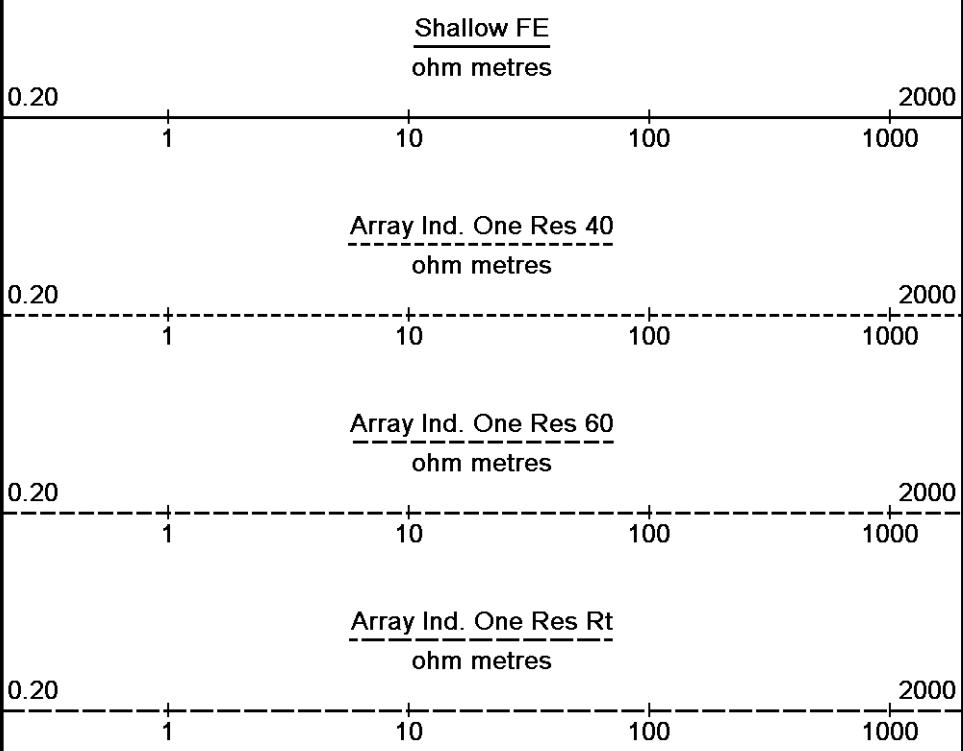
4950







5184
Depth In Feet
Borehole Temp in deg F
Replay Scale 1:240

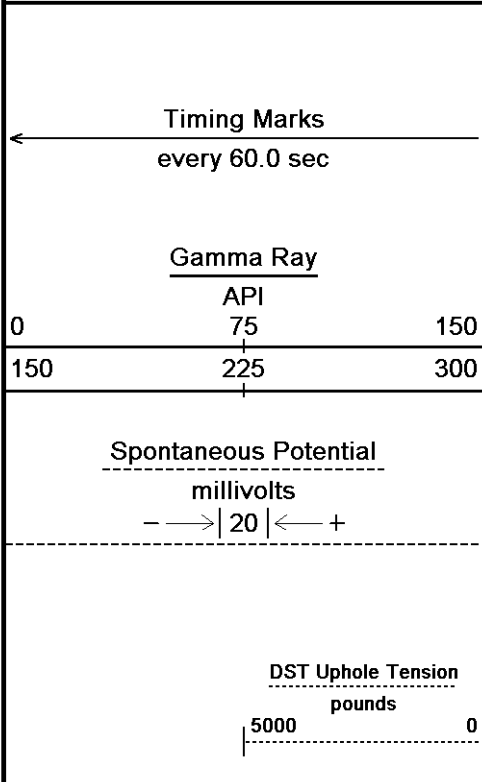


Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 29-JUN-2013 06:08
 Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta
 Recorded on 29-JUN-2013 03:50
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

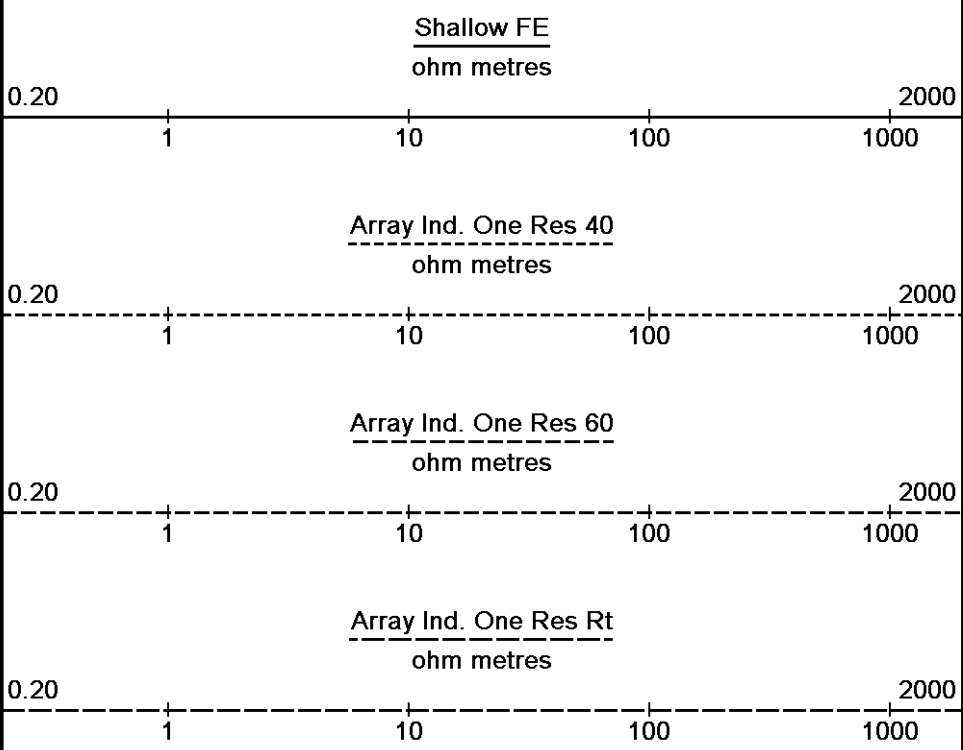
↑ 5 INCH MAIN ↑

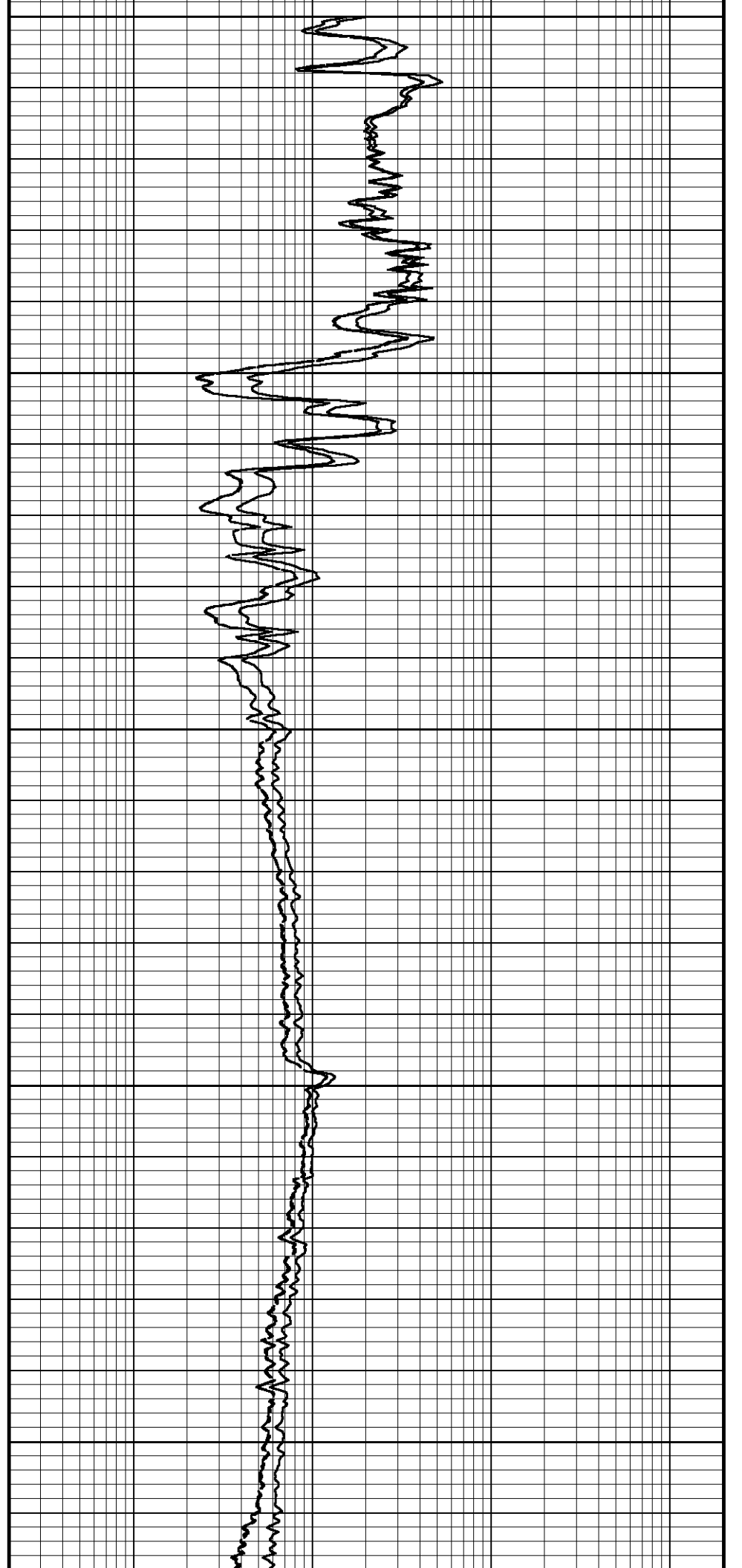
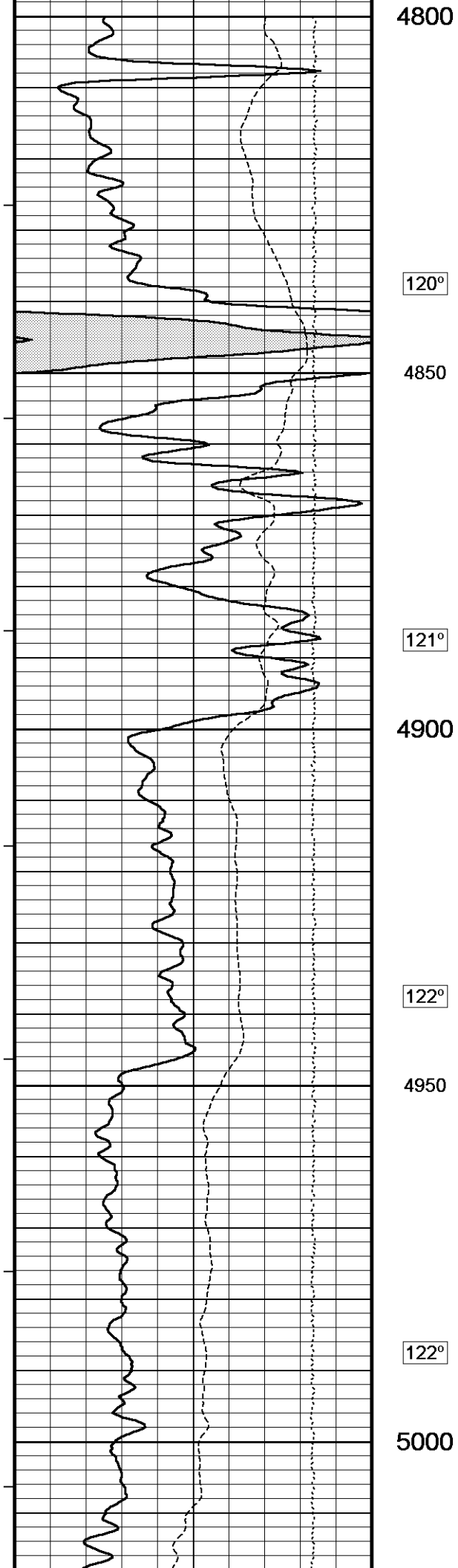
↓ REPEAT SECTION ↓

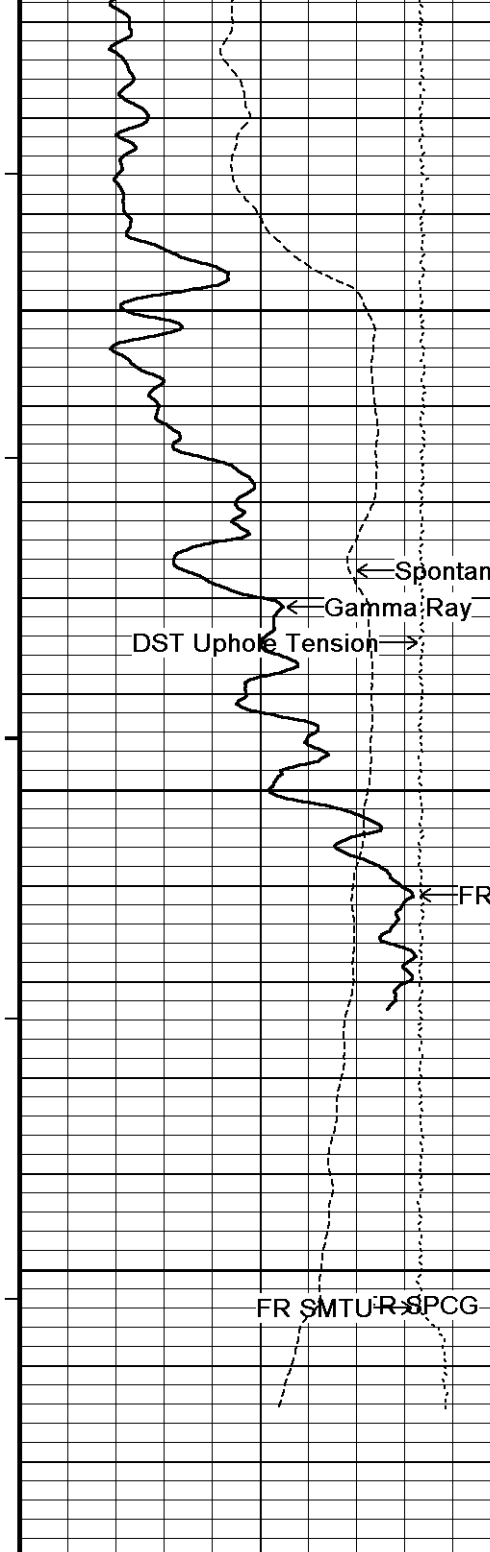
Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 29-JUN-2013 06:08
 Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_001.dta
 Recorded on 29-JUN-2013 03:11
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583



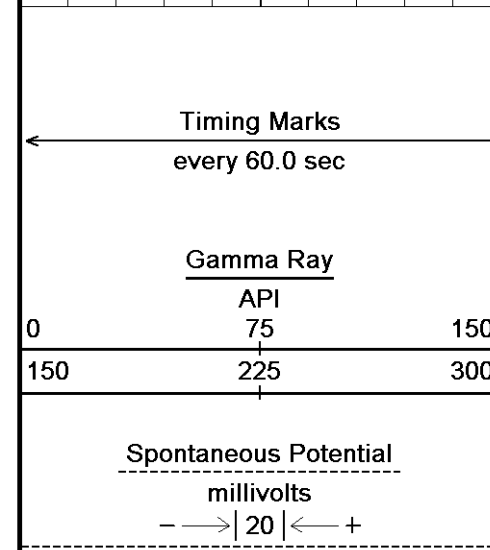
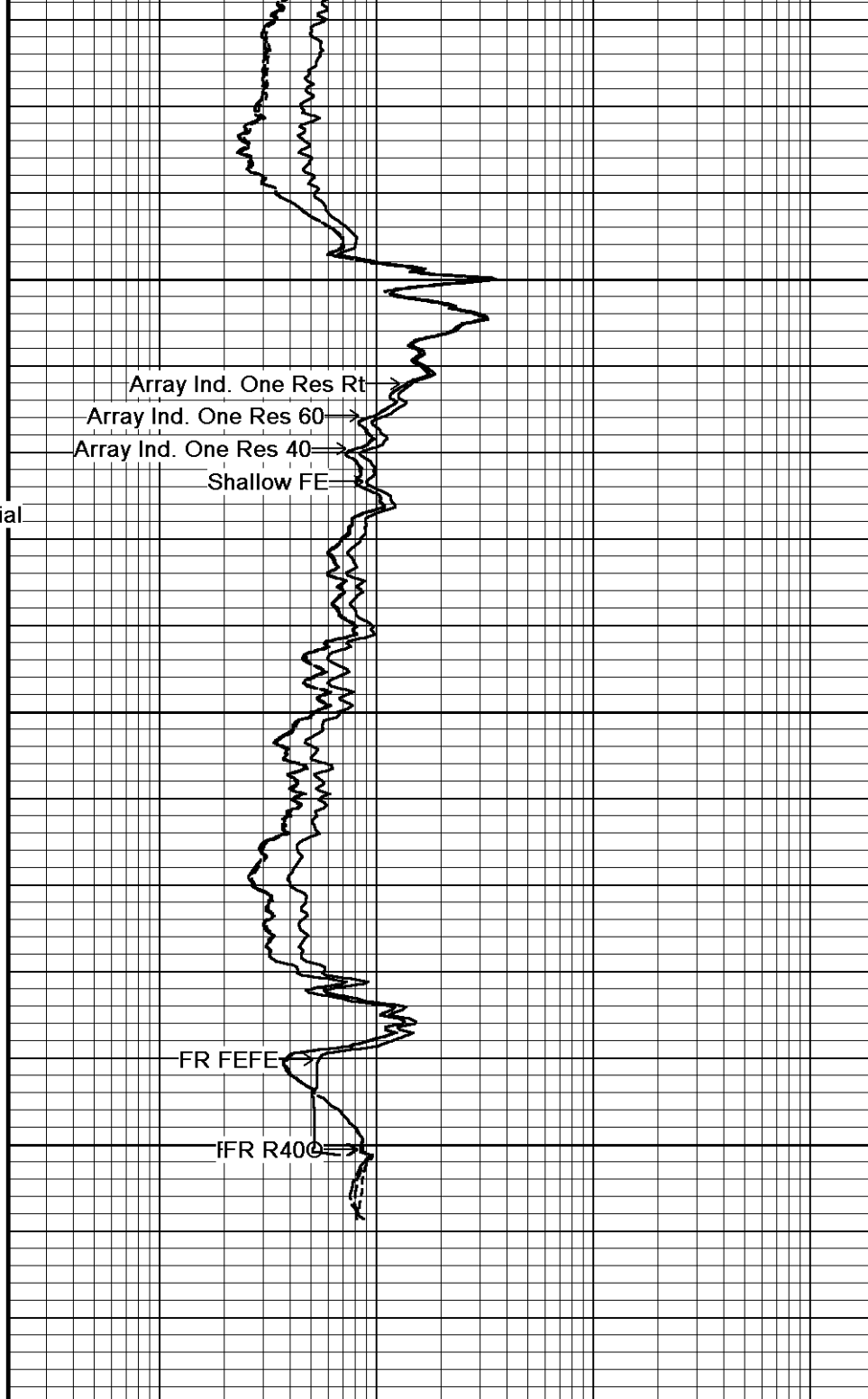
Depth in Feet
Borehole Temp in deg F
Replay Scale 1:240



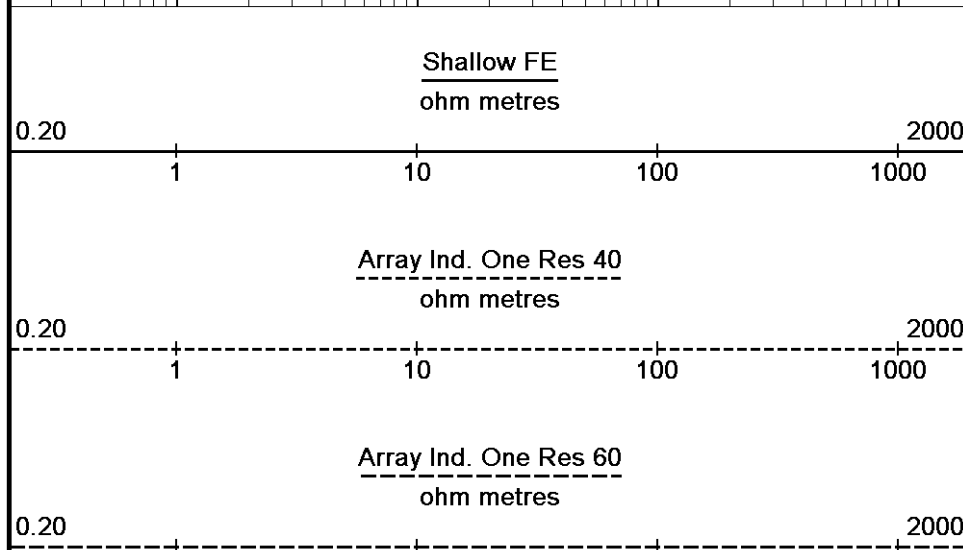


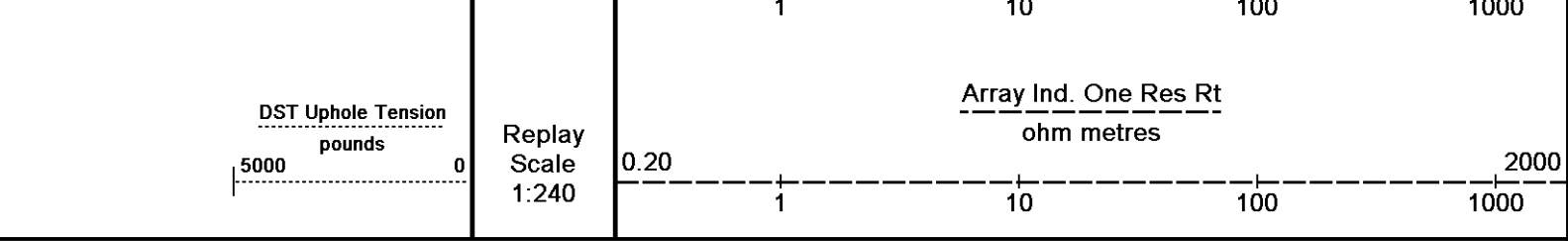


122°
 5050
 122°
 5100
 FR GRGC
 5150
 5178
 Depth
 in
 Feet



Borehole
 Temp in
 deg F





Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 29-JUN-2013 06:08
 Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_001.dta
 Recorded on 29-JUN-2013 03:11
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

↑ REPEAT SECTION ↑

BEFORE SURVEY CALIBRATION
 C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta

General Constants All 000 Last Edited on 29-JUN-2013,01:19

General Parameters		
Mud Resistivity	0.870	ohm-metres
Mud Resistivity Temperature	99.000	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	Crossplot Porosity	
Resistivity used	Array Ind. Six Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0 Field Calibration on 29-JUN-2013 02:28

Reading No	Measured	Calibrated (lbs)
1	14017.35	0.00
2	15249.80	399.00

Gamma Calibration MCG-D.K 469 Field Calibration on 28-JUN-2013 10:15

	Measured	Calibrated (API)
Background	78	54
Calibrator (Gross)	1127	779
Calibrator (Net)	1049	725

Gamma Constants MCG-D.K 469 Last Edited on 29-JUN-2013,01:11

Gamma Calibrator Number	GRC38	
Mud Density	1.08	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.K 469 Field Calibration on 28-JUN-2013,10:23

	Measured	Calibrated(Deg F)
Lower	50.00	50.00
Upper	100.00	100.00

High Resolution Temperature Constants MCG-D.K 469 Last Edited on 28-JUN-2013,10:23

Pre-filter Length	11
-------------------	----

SP Calibration MCG-D.K 469

Field Calibration on 28-JUN-2013,10:23

	Measured	Calibrated (mV)
Reference 1	105.8	100.0
Reference 2	-94.3	-100.0

Caliper Calibration MML-A 3

Base Calibration on 05-JUN-2013 15:43

Field Calibration on 28-JUN-2013 10:06

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14624	5.98
2	17958	7.97
3	21263	9.86
4	25213	11.92
5	0	0.00
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	6.06	5.98

Micro Normal and Micro Inverse Calibration MML-A 3

Base Calibration on 05-JUN-2013 15:36

Field Check on 28-JUN-2013 10:04

Base Calibration					
Channel	Resistor 1	Measured		Calibrated (ohm-m)	
		Resistor 2	Resistor 1	Resistor 2	
Micro Normal	12.2	60.2	5.0	25.0	
Micro Inverse	15.7	78.3	5.0	25.0	

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	63.0	63.0
Micro Inverse	48.2	48.2

Micro Normal and Micro Inverse Constants MML-A 3

Last Edited on 28-JUN-2013,10:03

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			N/A	inches

Neutron Calibration MDN-A.B 66

Base Calibration on 22-MAY-2013 15:00

Field Check on 28-JUN-2013 10:19

Base Calibration					
Ratio	Near	Measured		Calibrated (cps)	
		Far	Near	Far	
	3145	98	3714	110	
	32.215		33.764		

Field Calibrator at Base		
Ratio	Calibrated (cps)	
	1654	2365
	0.699	

Field Check		
Ratio	Calibrated (cps)	
	1643	2364
	0.698	

Neutron Constants MDN-A.B 66

Last Edited on 28-JUN-2013,10:15

Neutron Source Id	P0204NN	
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	Constant Value	
Temperature	68.00	degrees F
Mud Salinity	0.00	kppm

Salinity Correction	Not Applied	
Formation Fluid Salinity Source	None	
Formation Fluid Salinity	N/A	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-B.J 353		Base Calibration on 22-MAY-2013 08:22 Field Check on 28-JUN-2013 09:55	
Base Calibration			
	Measured	Calibrated (ohm-m)	
Reference 1	0.0	0.0	
Reference 2	964.9	126.8	
Base Check		280.9	
Field Check		280.7	

FE Constants MFE-B.J 353		Last Edited on 29-JUN-2013,01:11	
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 167		Base Calibration on 19-APR-2013,13:41 Field Check on 28-JUN-2013 10:23			
Base Calibration					
Test Loop Calibration		Measured		Calibrated (mmho/m)	
Channel	Low	High	Low	High	
1	17.3	474.2	9.3	966.2	
2	6.3	388.4	7.6	821.4	
3	3.3	259.4	5.2	566.0	
4	1.9	133.0	2.6	279.2	
Array Temperature	76.8		Deg F		
Channel	Base Check (mmho/m)		Field Check (mmho/m)		
	Low	High	Low	High	
1			13.6	3838.5	
2			29.7	3475.0	
3			29.2	3051.2	
4			19.8	2080.6	
Deep			18.7	2048.0	
Medium			42.2	3988.4	
Shallow			43.1	5051.1	
Array Temperature			83.0		Deg F

Induction Constants MAI-A.A 167		Last Edited on 29-JUN-2013,01:10			
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	60.00	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		

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	

High Resolution Temperature Calibration MAI-A.A 167

Field Calibration on 28-JUN-2013,10:23

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

High Resolution Temperature Constants MAI-A.A 167

Last Edited on 28-JUN-2013,10:23

Pre-filter Length	11
-------------------	----

Caliper Calibration MPD-B 64

Base Calibration on 21-MAY-2013 17:34

Field Calibration on 28-JUN-2013 10:03

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14464	3.99
2	23406	5.98
3	32206	7.97
4	40368	9.86
5	50018	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.02	5.98

Photo Density Calibration MPD-B 64

Base Calibration on 21-MAY-2013 17:55

Field Check on 28-JUN-2013 10:00

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	60105	33685	59556	30836
Reference 2	25286	2917	24941	2541

Field Check at Base

1165.8	1353.6
--------	--------

Field Check

1166.1	1349.7
--------	--------

PE Calibration

Base Calibration	WS	Measured		Calibrated
		WH	Ratio	Ratio
Background	210	1037		
Reference 1	22619	59903	0.381	0.371
Reference 2	6846	25146	0.275	0.272

Field Check at Base

210.2	1037.2
-------	--------

Field Check

209.6	1037.1
-------	--------

Density Constants MPD-B 64

Last Edited on 29-JUN-2013,01:11

Density Source Id	18235B	
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	1.08	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 (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	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta

3/8" Triple Cone Cable Head (MCB C A)
MCB-C.A 5 LG: 1.58 ft WT: 15.4 lb OD: 2.24 in

Compact Comms Gamma
MCG-D.K 469 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 3 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

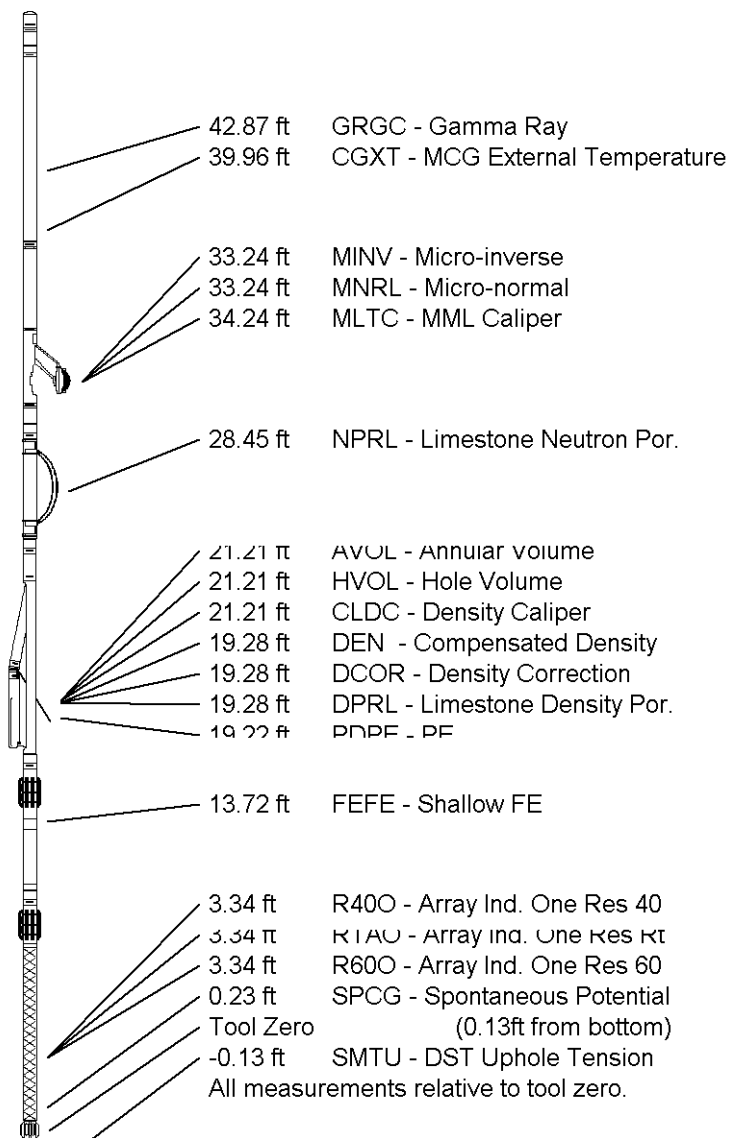
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

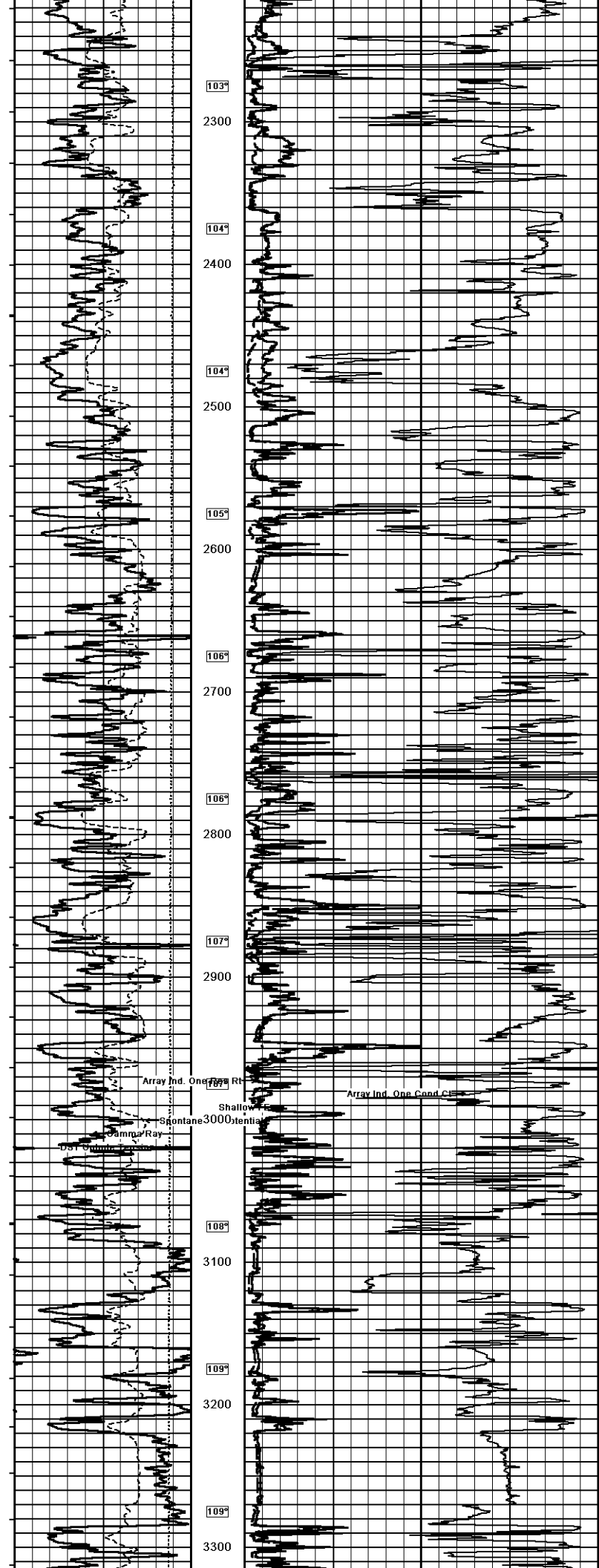
Compact Density/Caliper
MPD-B 64 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric
MFE-B.J 353 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 167 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 49.73 ft Weight: 399.0 lb





103°

2300

104°

2400

104°

2500

105°

2600

106°

2700

106°

2800

107°

2900

Array Ind. One Rt

Shallow

Spontaneous Potential

Gamma Ray

0.51 Gamma Ray

Array Ind. One Cond CE

108°

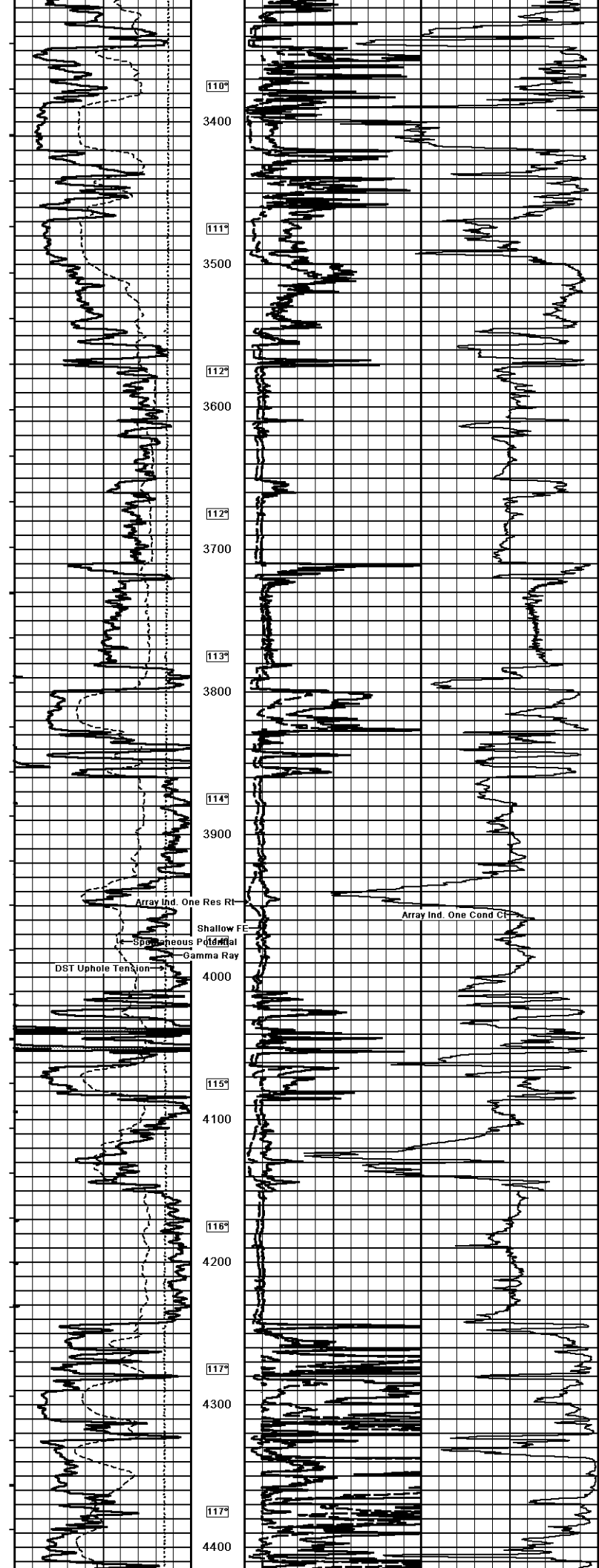
3100

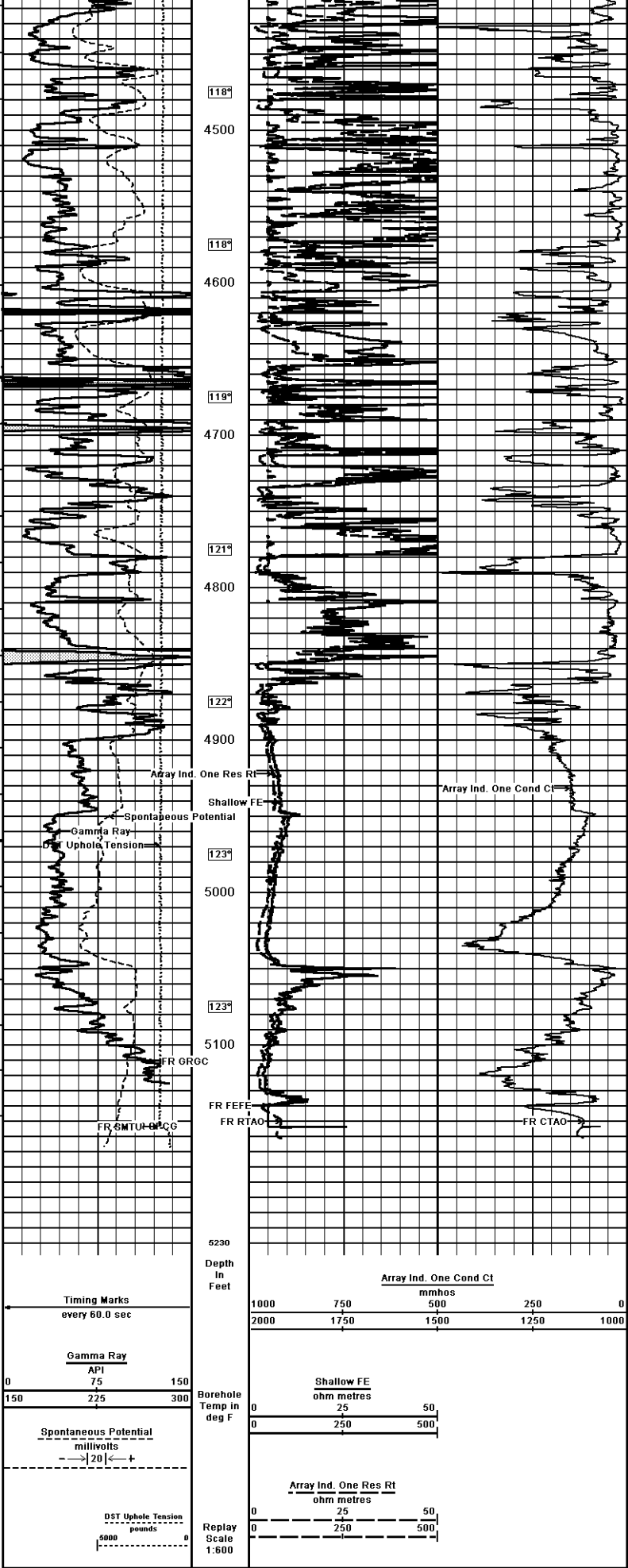
109°

3200

109°

3300





Depth Based Data - Maximum Sampling Increment 10.0cm
 Plotted on 29-JUN-2013 06:08
 Filename: C:\Minimus 13.05.9583\Log\M&M Exploration Z-Bar 35-6\M&M Z-Bar #35-6_002.dta
 Recorded on 29-JUN-2013 03:50
 System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

↑ 1 INCH MAIN ↑

COMPANY M&M EXPLORATION, INC.
 WELL Z-BAR 35-6

WELL
FIELD
PROVINCE/COUNTY
COUNTRY/STATE

Z BAR 00
AETNA GAS AREA
BARBER
U.S.A. / KANSAS

Elevation Kelly Bushing	1781.00	feet	First Reading	5151.00	feet
Elevation Drill Floor	1779.00	feet	Depth Driller	5150.00	feet
Elevation Ground Level	1771.00	feet	Depth Logger	5154.00	feet



ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG