Weatherford®

SHALLOW FOCUSED ARRAY INDUCTION ELECTRIC LOG

COMPANY	BLACK OAK EXPLORATION
WELL	FRISIBIE FAMILY 1-15
FIELD	WILDCAT
PROVINCE/COUNTY	RAWLINS
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	SE NW NW SE 2180' FSL & 2300' FEL
PERMIT NUMBER	SE NE NW SE

SEC 15	TWP 2S	RGE 36W
Latitude		39.865833
Longitude		-101.360000
API Number		15-153-21221

Other Services
MPD/MDN MSS
MML

Permanent Datum GL, Elevation 3330 feet
Log Measured From KB, 5.00 feet above Permanent Datum
Drilling Measured From KB

Elevations:	feet
KB	3335.00
DF	3333.00
GL	3330.00

Date	21-MAR-2019		
Run Number	ONE		
Service Order	17937-240384345		
Depth Driller	4860.00	feet	
Depth Logger	4865.00	feet	
First Reading	4862.00	feet	
Last Reading	0.00	feet	
Casing Driller	420.00	feet	
Casing Logger	420.00	feet	
Bit Size	7.875	inches	
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.00 lb/USg	65.00 sec/qt	
PH / Fluid Loss	10.00	8.80 ml/30Min	
Sample Source	FLOWLINE		
Rm @ Measured Temp	1.04 @103.0	ohm-m	
Rmf @ Measured Temp	0.83 @103.0	ohm-m	
Rmc @ Measured Temp	1.25 @103.0	ohm-m	
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.80 @135.0	ohm-m	
Time Since Circulation	4 HOURS		
Max Recorded Temp	135.00	deg F	
Equipment / Base	13244	LIB	
Recorded By	MATT MCGLOTHLIN		
Witnessed By	CLAYTON CAMOZZI		

BOREHOLE RECORD

Last Edited: 22-MAR-2019 00:06

Bit Size inches	Depth From feet	Depth To feet
7.875	420.00	4860.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	420.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 18.05.4364
- TOOLSTRING: CBH, SHA, MCG, MML, MDN, MPD, SKJ, MFE, MSS, MAI LOGGED IN COMBINATION.
- HARDWARE:
  - MDN: DUAL BOWSPRING FOR DECENTRALIZATION
  - MFE: 1 X 0.5 INCH STANDOFF
  - MSS: 2 X 0.5 INCH STANDOFF
  - MAI: 2 X 0.5 INCH STANDOFF
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST:
  - NEUTRON / DENSITY / MICROLOG / SONIC / INDUCTION: TD - SURFACE CASING.
  - GAMMA RAY: TD - SURFACE.
- CREW: J. JOHNSON, B. COPELAND.

- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.

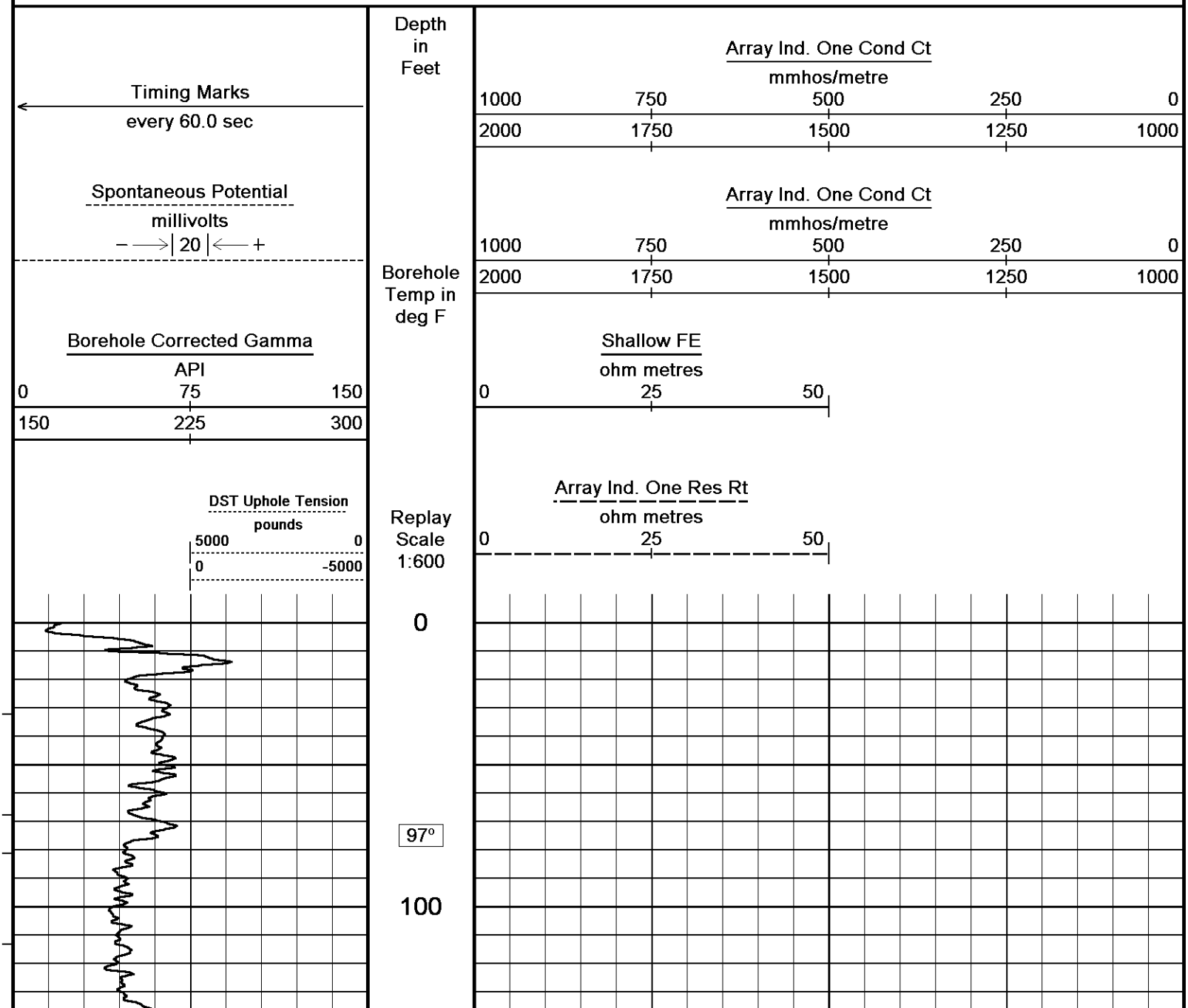
****CLIENT REQUESTE TO PULL REPEAT PASS UP TO 4000 FEET FROM TD.****

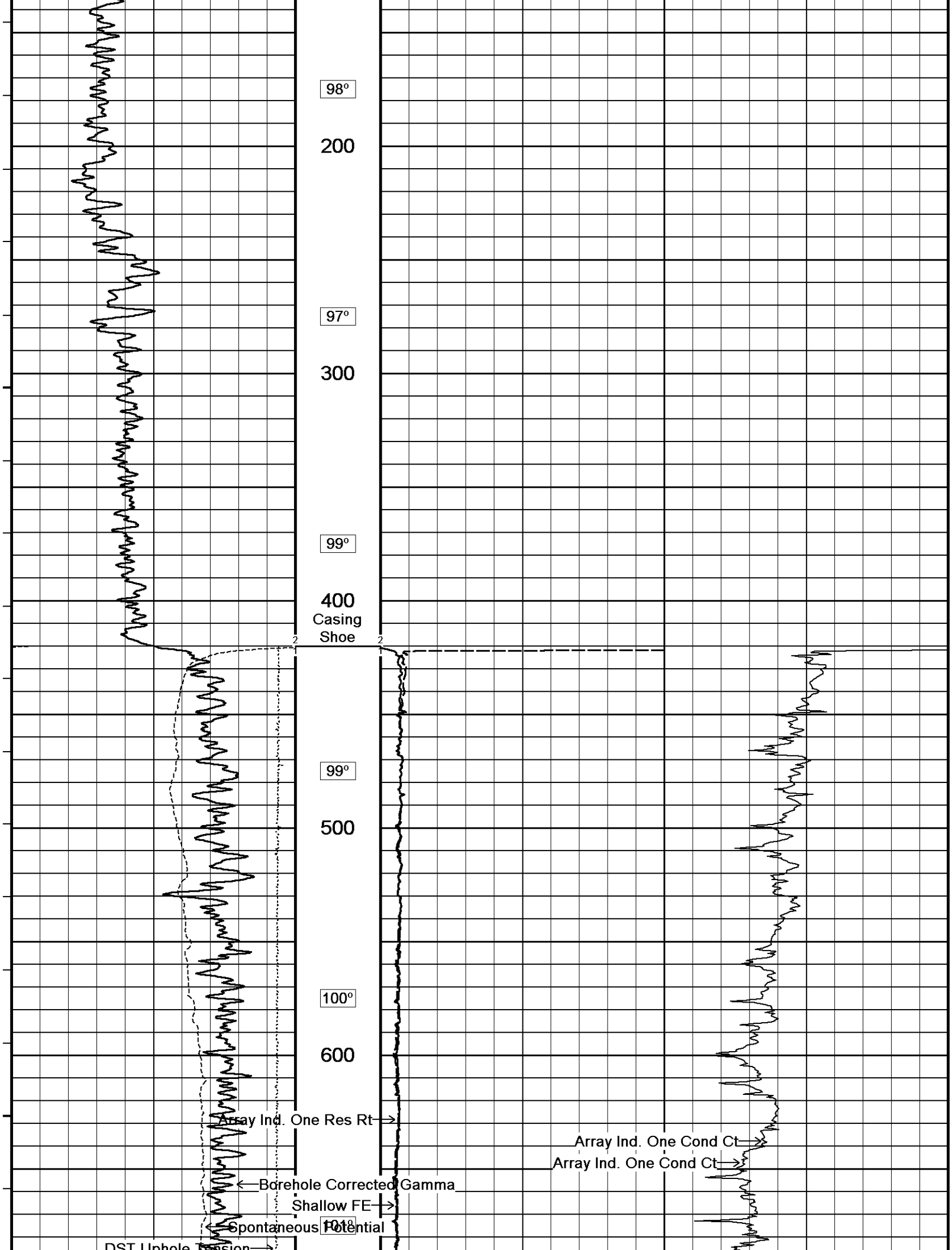
2 INCH MAIN PASS 1:600

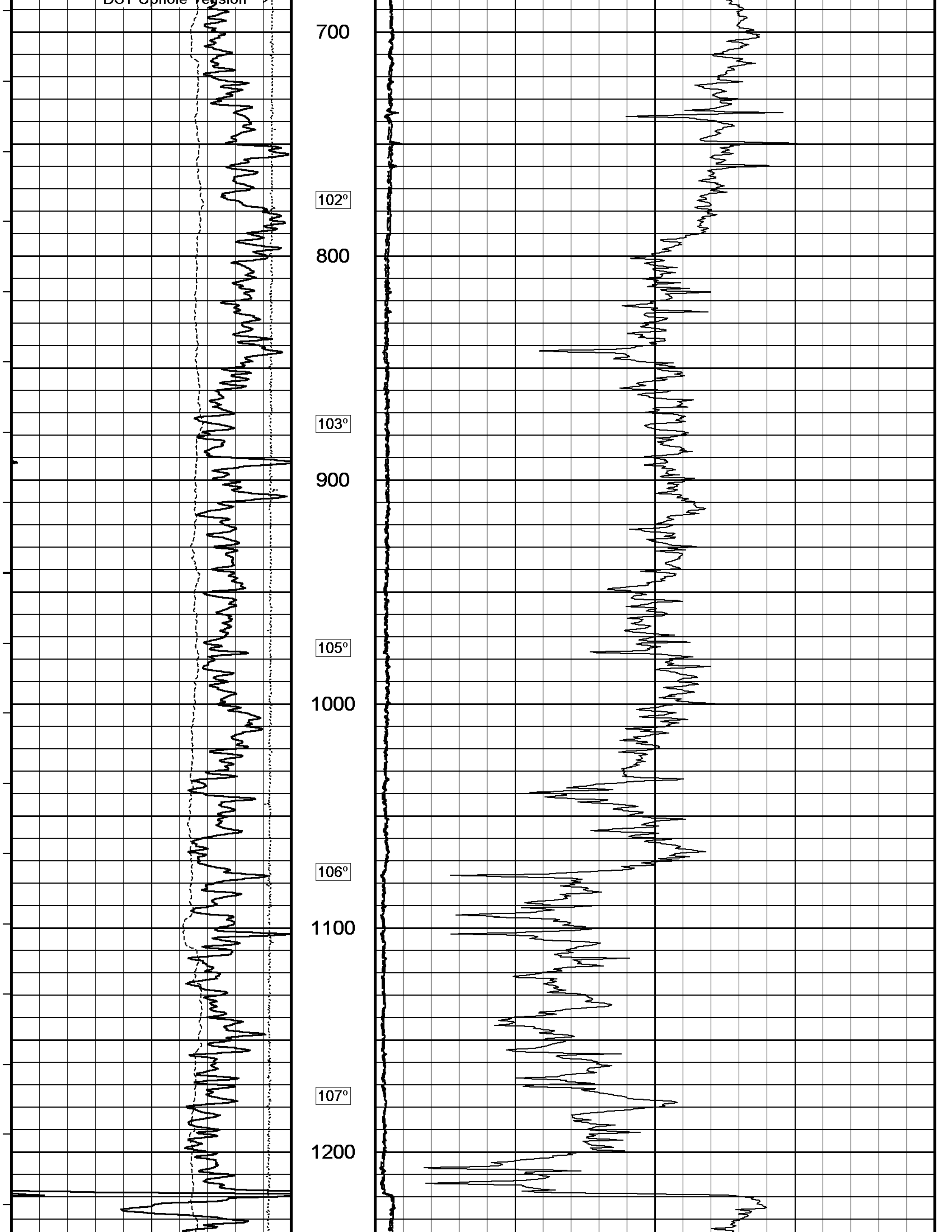
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 22-MAR-2019 08:17

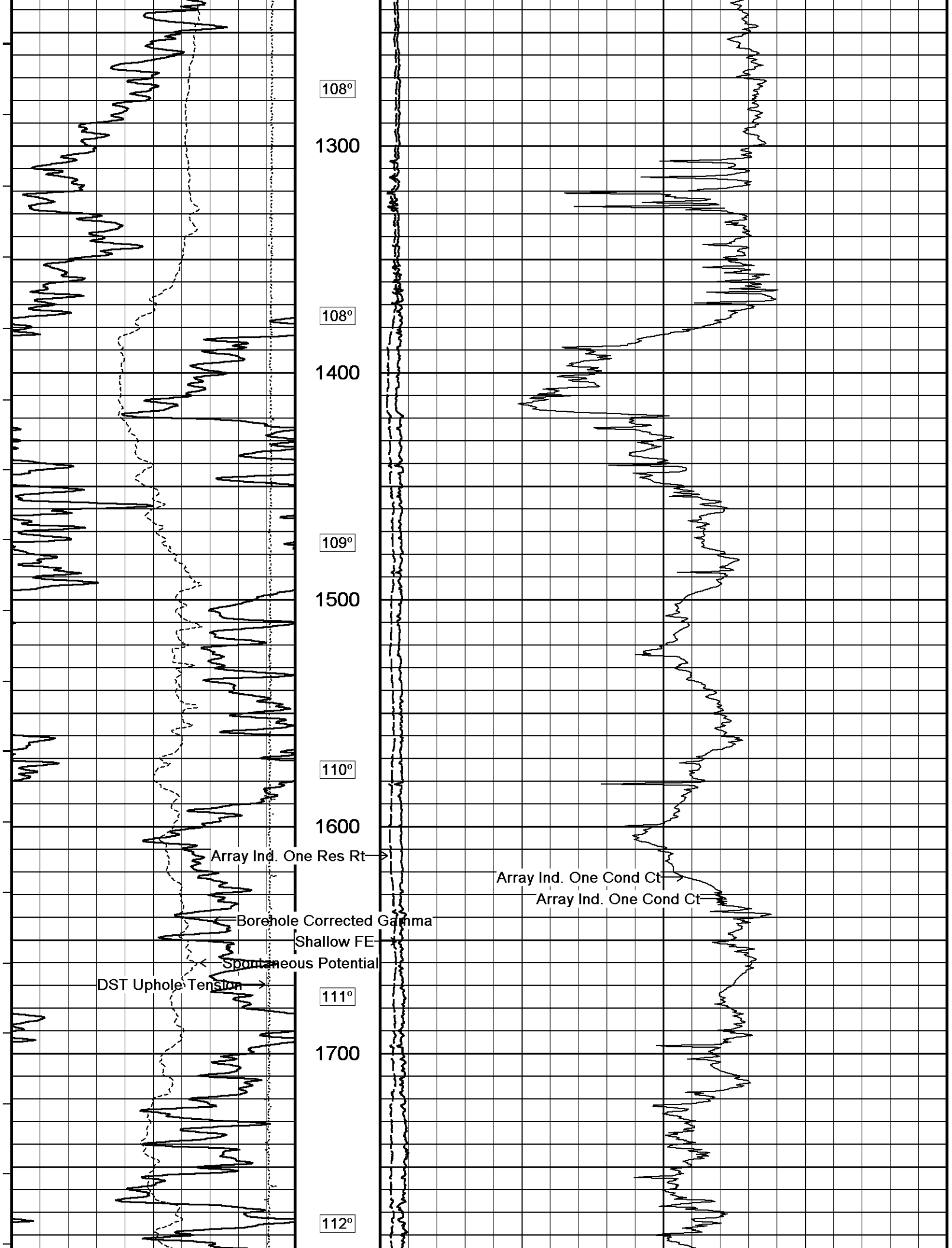
Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta — Recorded on 22-MAR-2019 00:23

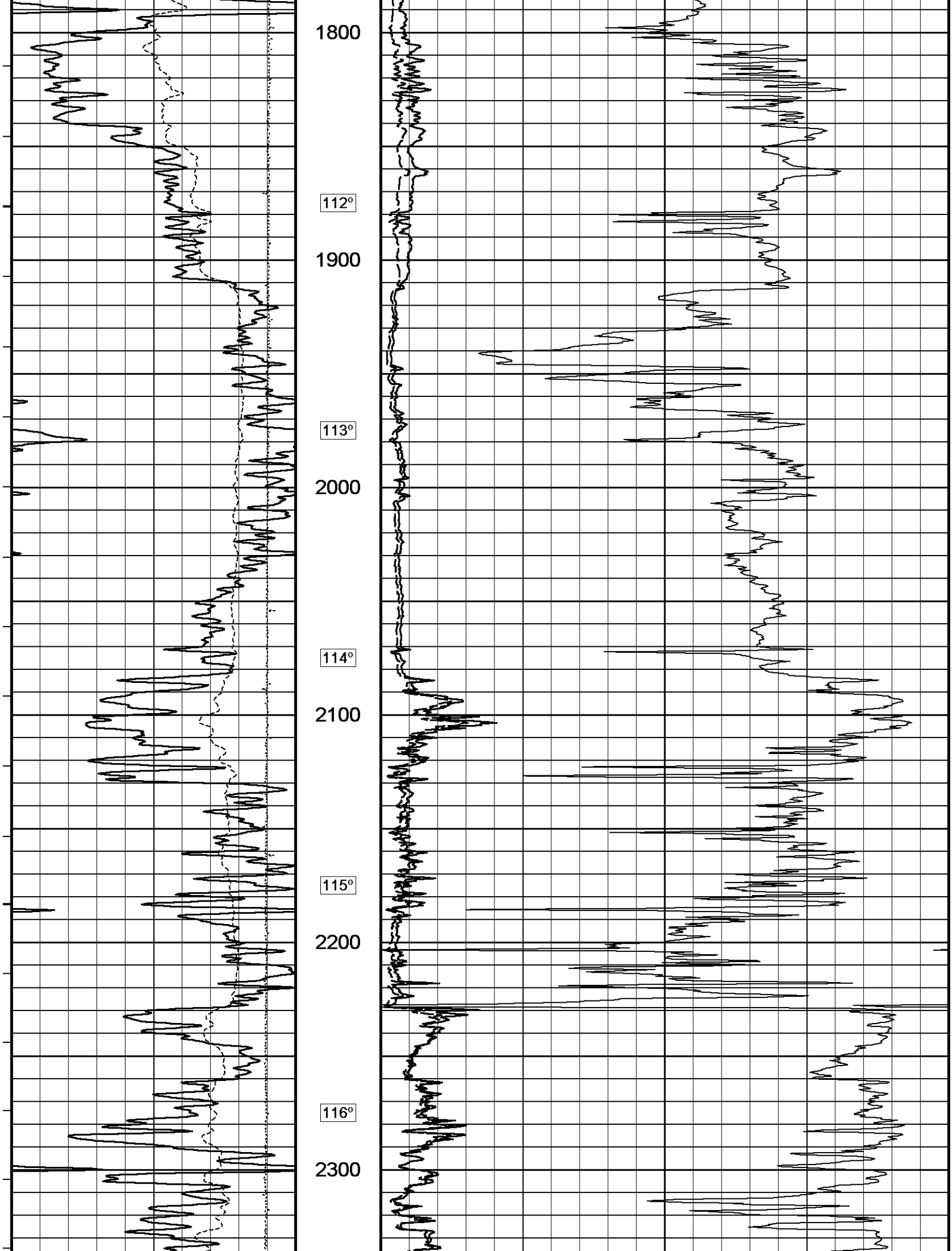
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

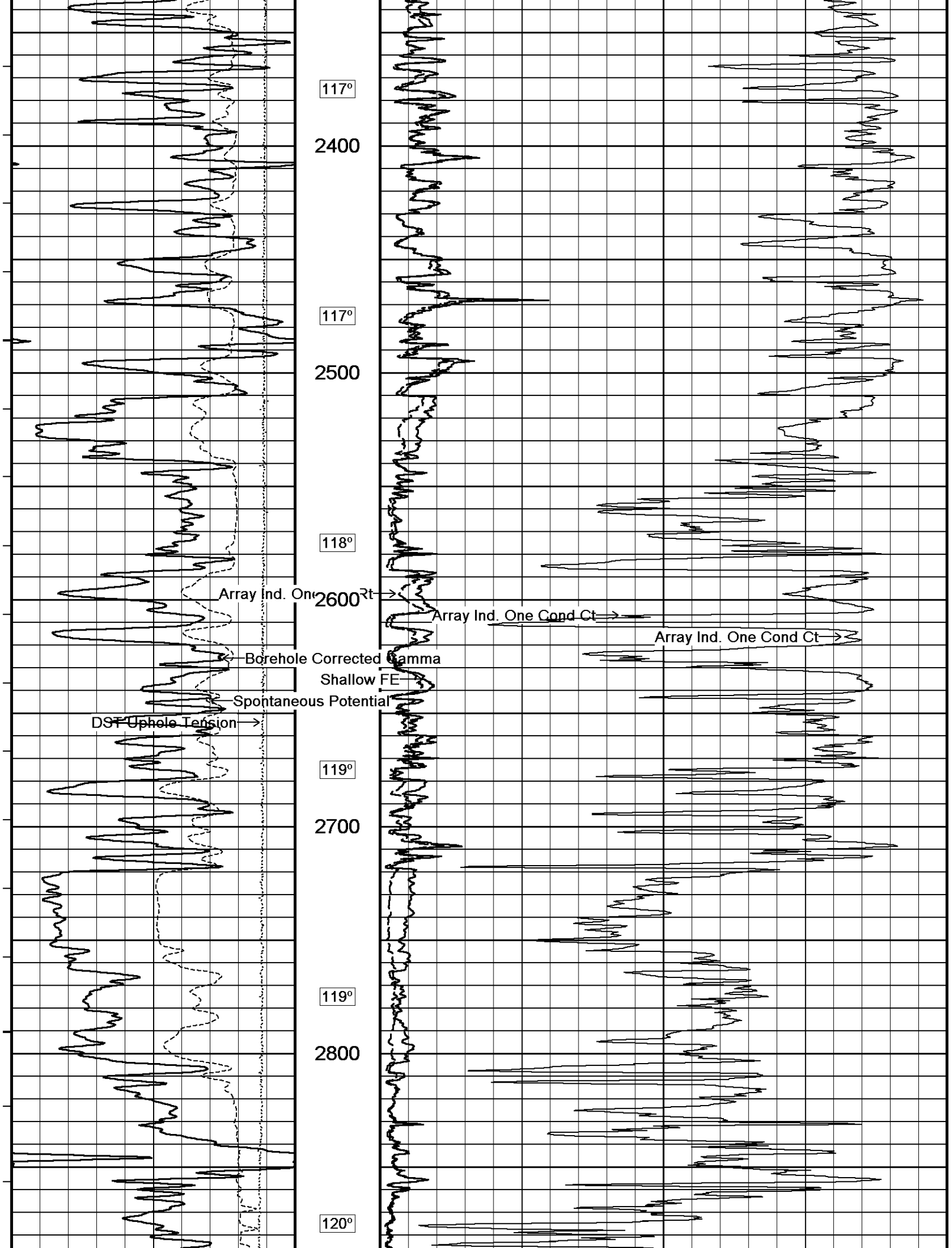


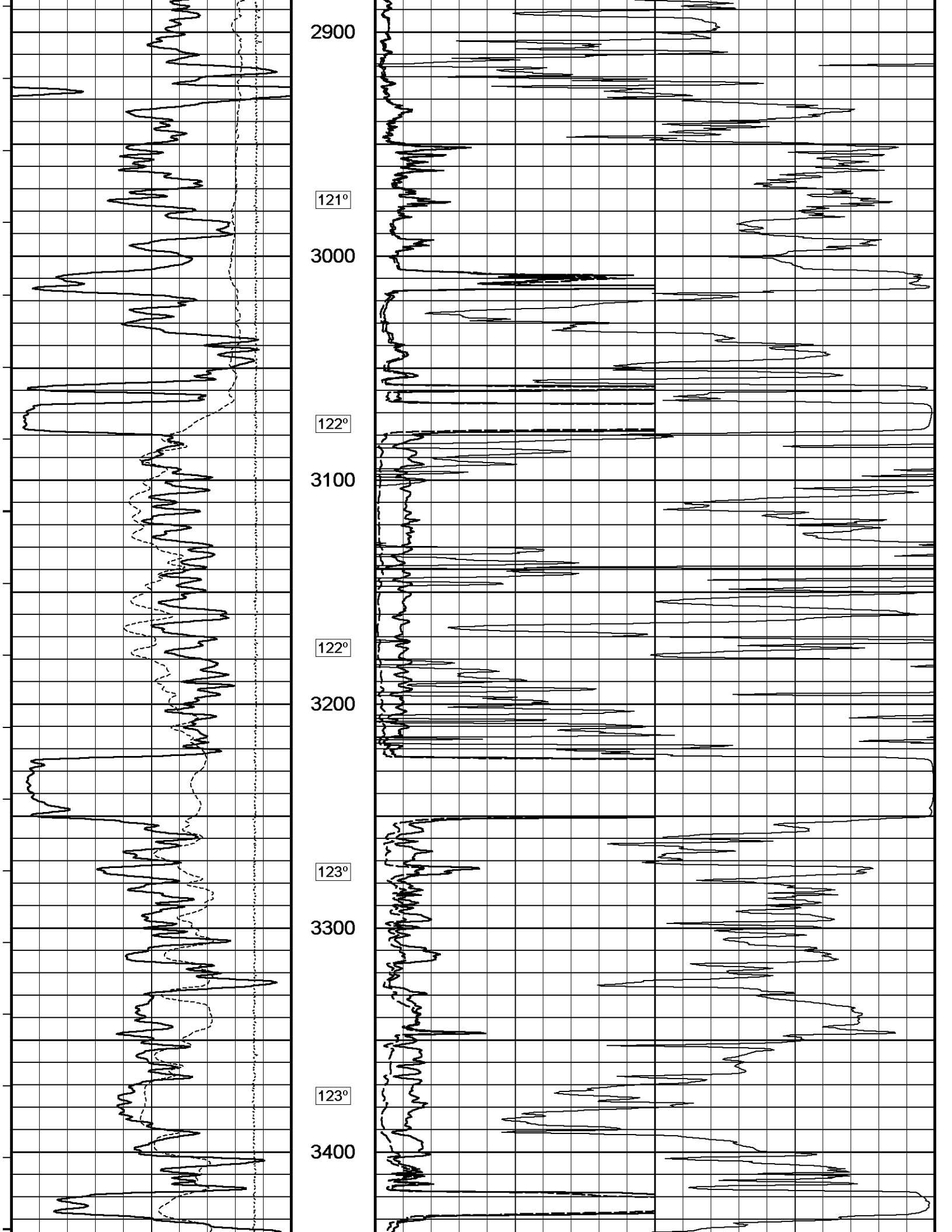

98°
200
97°
300
99°
400
Casing
Shoe
99°
500
100°
600
Array Ind. One Res Rt
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
101°
DST Uphole Tension
Array Ind. One Cond Ct
Array Ind. One Cond Ct

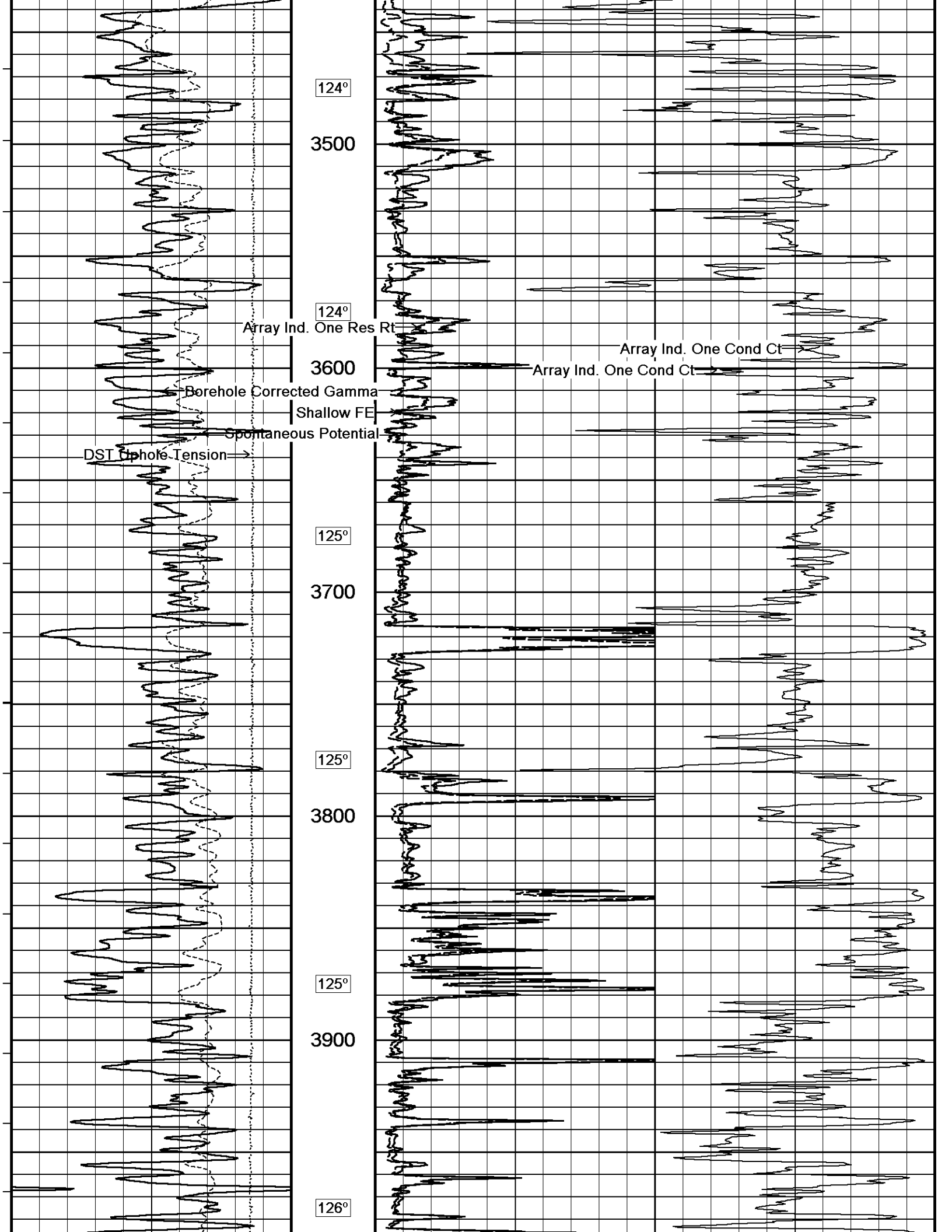

700
102°
800
103°
900
105°
1000
106°
1100
107°
1200

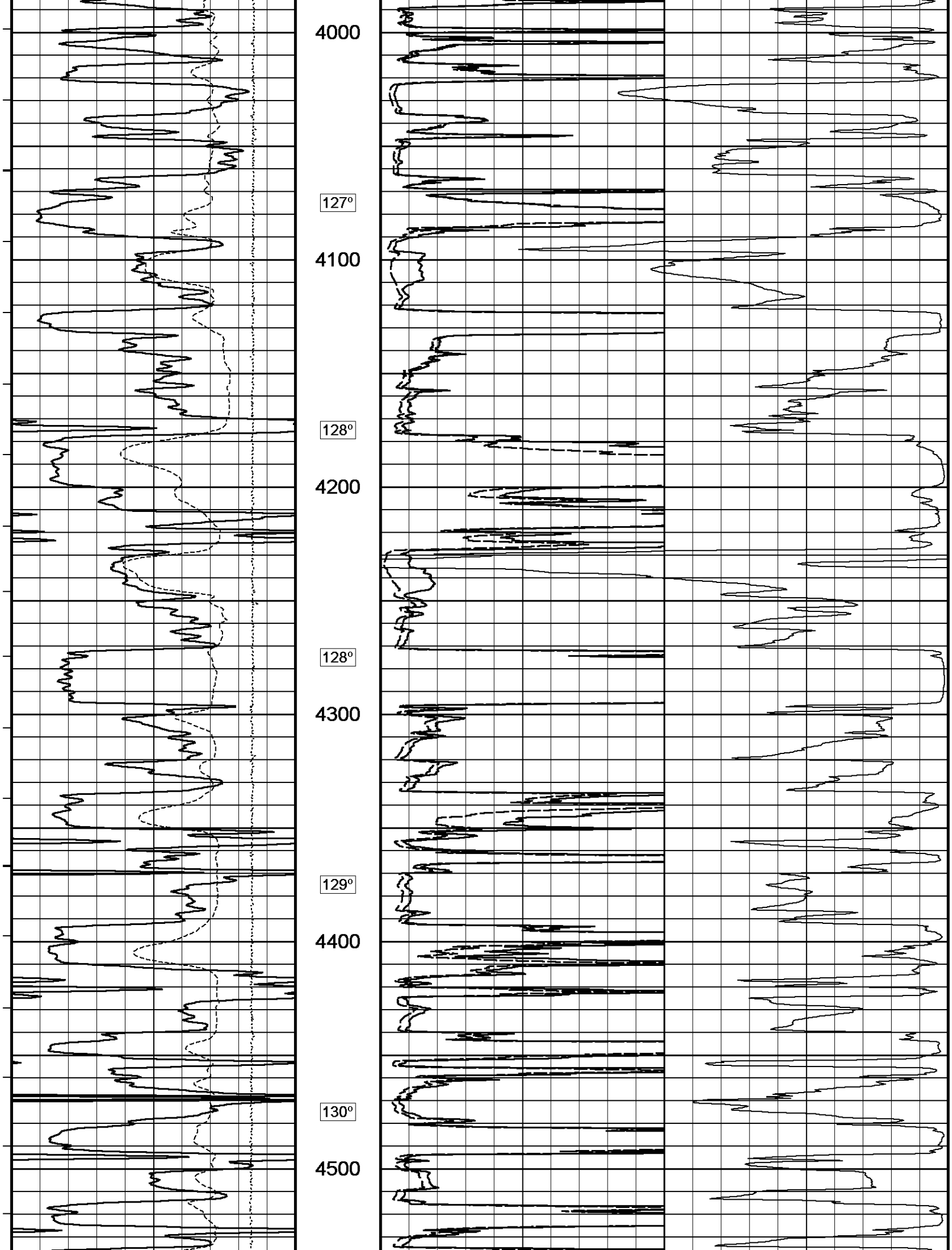

108°
1300
108°
1400
109°
1500
110°
1600
Array Ind. One Res Rt
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
111°
1700
112°

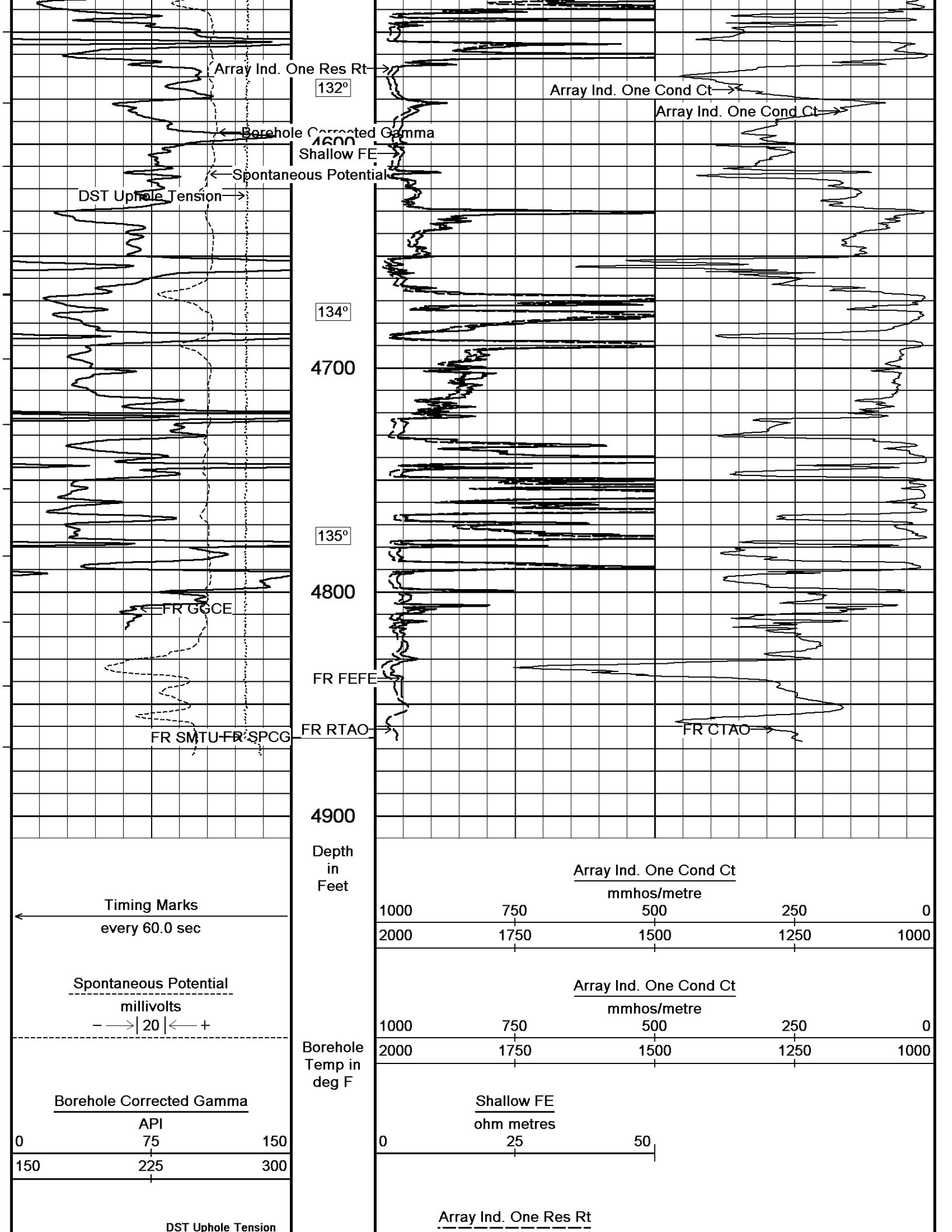

1800
112°
1900
113°
2000
114°
2100
115°
2200
116°
2300


117°
2400
117°
2500
118°
Array Ind. One
2600
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
119°
2700
119°
2800
120°


2900
121°
3000
122°
3100
122°
3200
123°
3300
123°
3400


124°
3500
124°
Array Ind. One Res Rt
3600
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Tiphole Tension
125°
3700
125°
3800
125°
3900
126°
Array Ind. One Cond Ct
Array Ind. One Cond Ct


4000
127°
4100
128°
4200
128°
4300
129°
4400
130°
4500


Array Ind. One Res Rt
132°
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
4600
Shallow FE
Spontaneous Potential
DST Uphole Tension
134°
4700
135°
4800
FR GGCE
FR FEFE
FR SMTU
FR SPCG
FR RTAO
FR CTAO
4900
Depth in Feet
Timing Marks
every 60.0 sec
Array Ind. One Cond Ct
mmhos/metre
1000 750 500 250 0
2000 1750 1500 1250 1000
Spontaneous Potential
millivolts
– 20 +
Array Ind. One Cond Ct
mmhos/metre
1000 750 500 250 0
2000 1750 1500 1250 1000
Borehole Temp in deg F
Borehole Corrected Gamma
API
0 75 150
150 225 300
Shallow FE
ohm metres
0 25 50
DST Uphole Tension
Array Ind. One Res Rt

pounds
5000 0
0 -5000

Replay Scale 1:600

ohm metres
0 25 50

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

Plotted on 22-MAR-2019 08:17
Recorded on 22-MAR-2019 00:23

2 INCH MAIN PASS 1:600

5 INCH MAIN 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

Plotted on 22-MAR-2019 08:17
Recorded on 22-MAR-2019 00:23

Timing Marks
every 60.0 sec

Spontaneous Potential
millivolts
– → | 20 | ← +

Borehole Corrected Gamma
API
0 75 150
150 225 300

DST Uphole Tension
pounds
5000 0

Depth in Feet

Borehole Temp in deg F

Replay Scale 1:240

0

97°

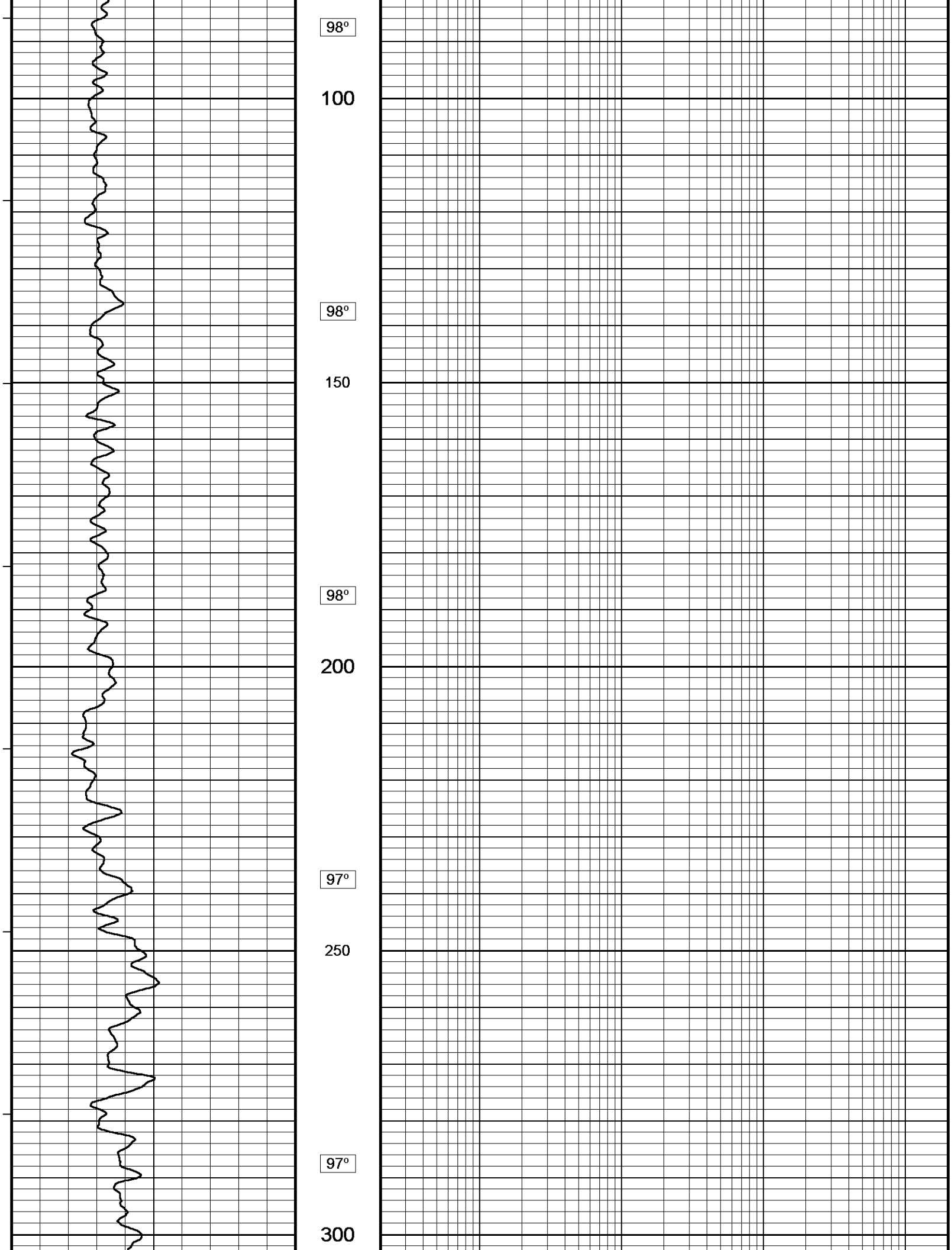
← Borehole Corrected Gamma
50

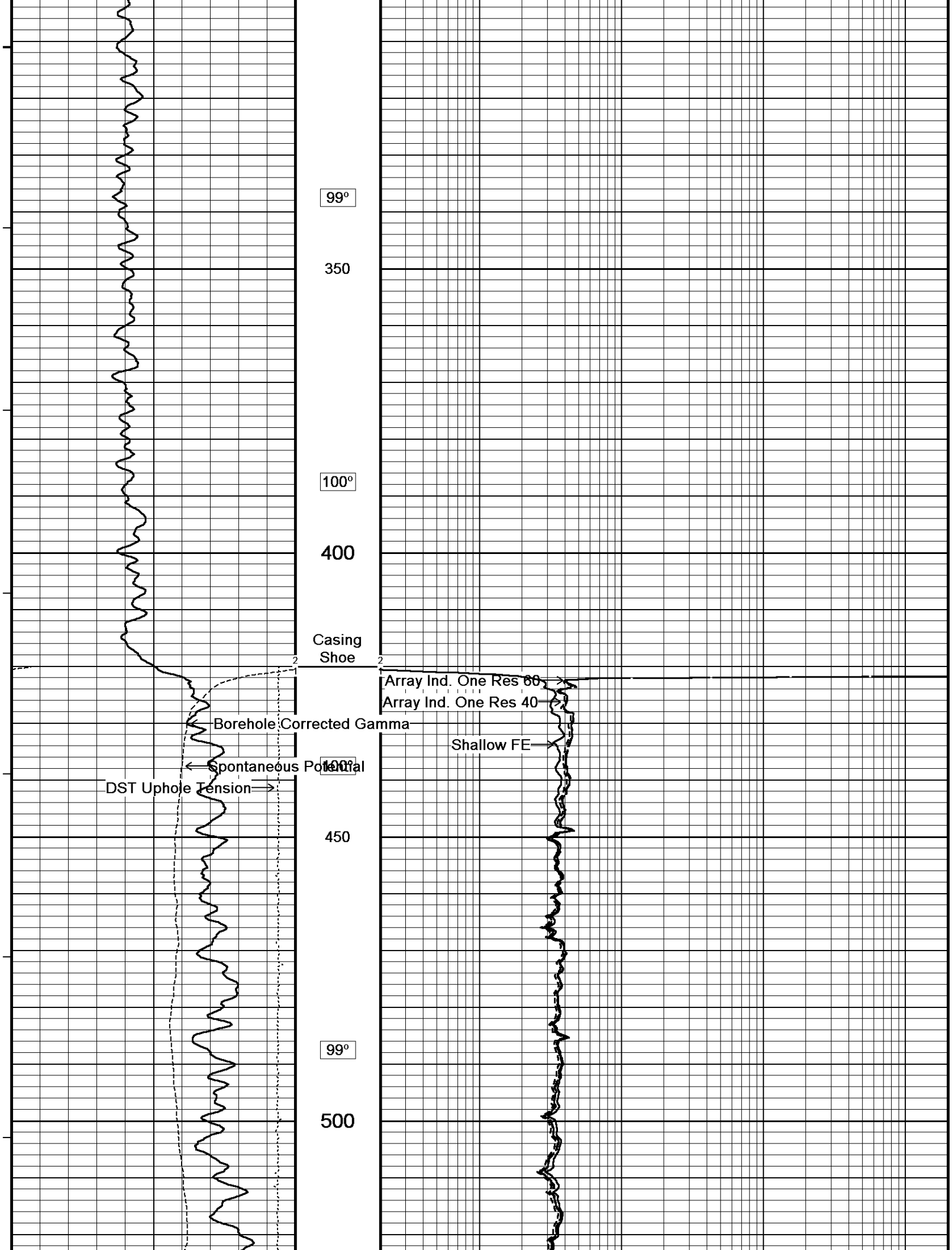
Shallow FE
ohm metres
0.20 1 10 100 2000

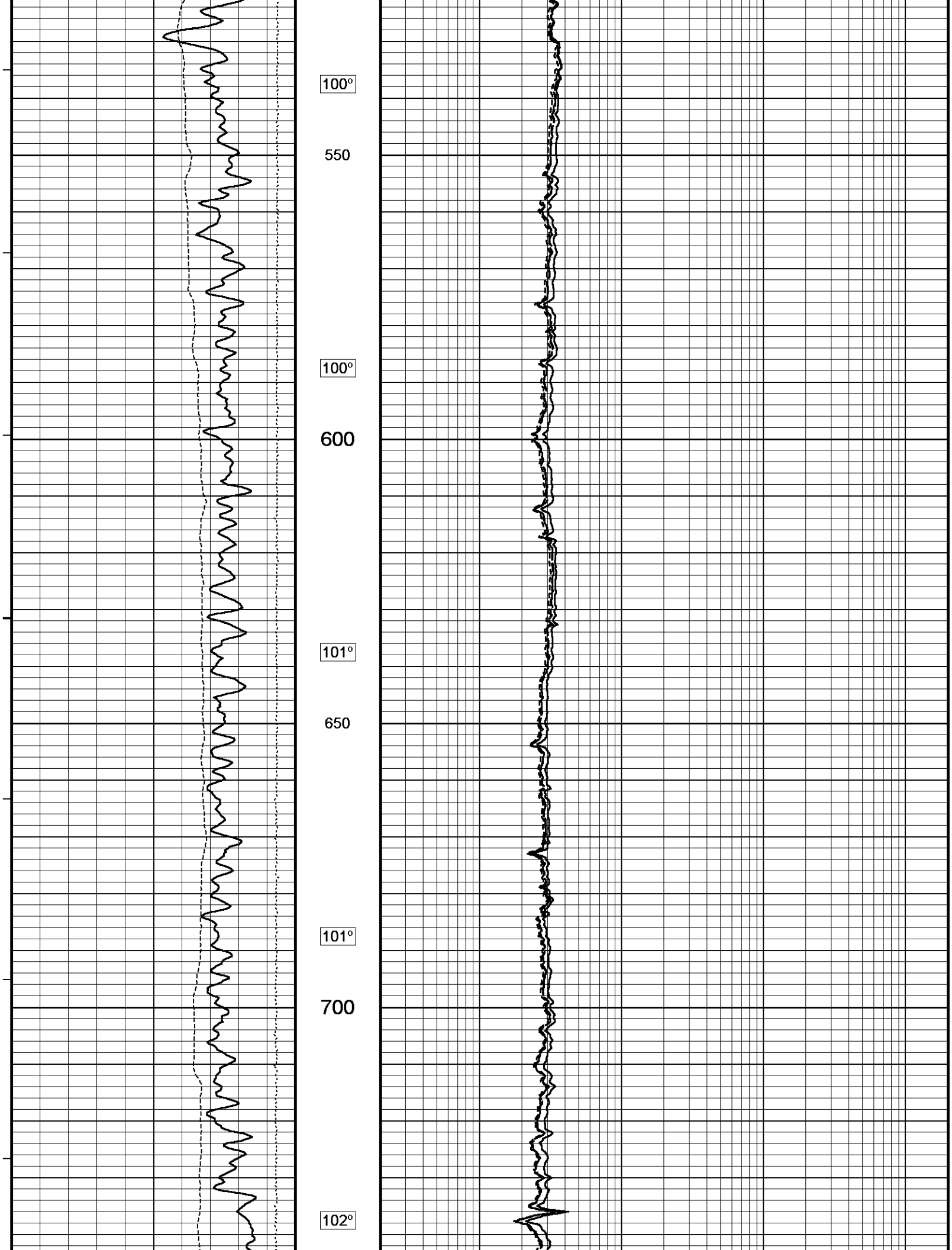
Array Ind. One Res 40
ohm metres
0.20 1 10 100 2000

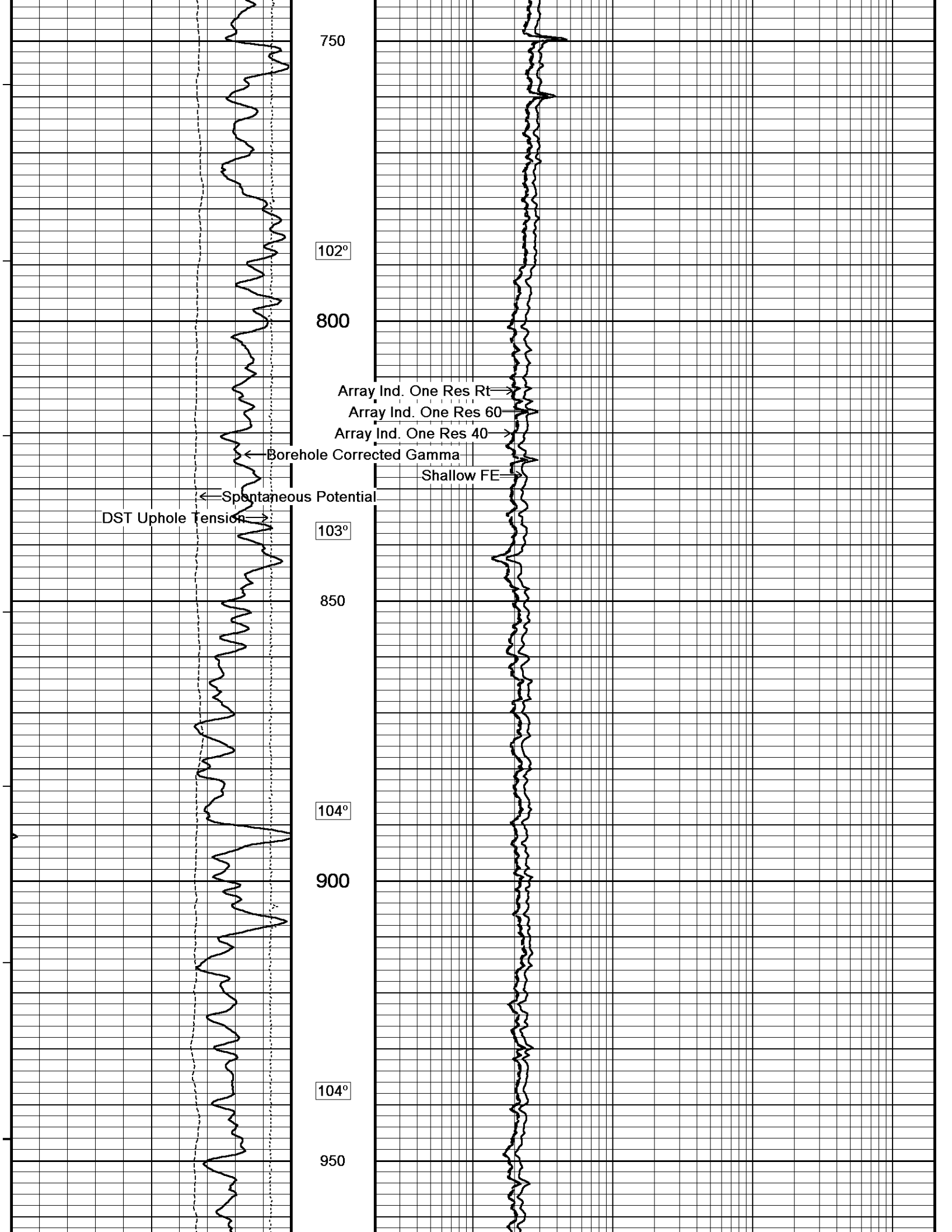
Array Ind. One Res 60
ohm metres
0.20 1 10 100 2000

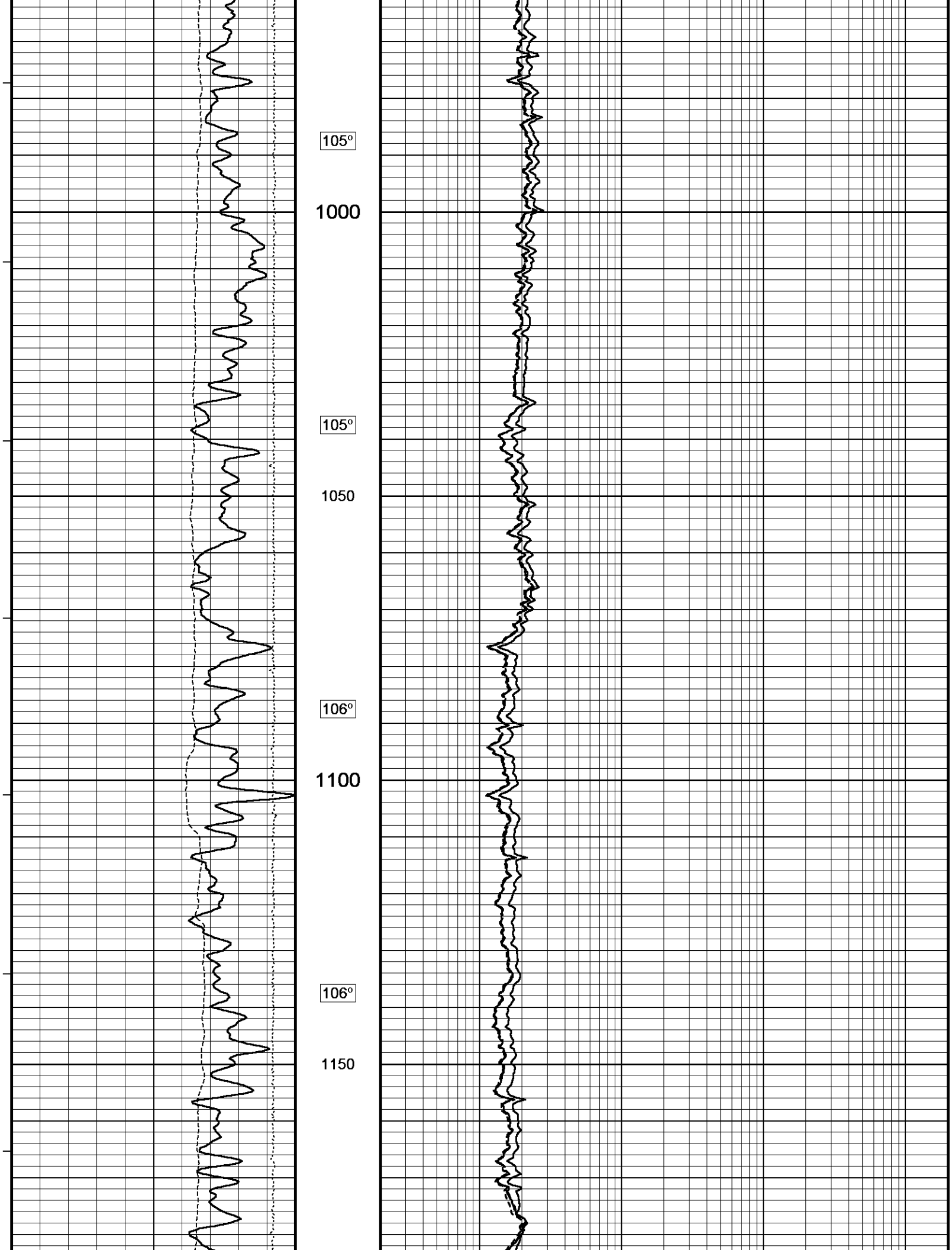
Array Ind. One Res Rt
ohm metres
0.20 1 10 100 2000

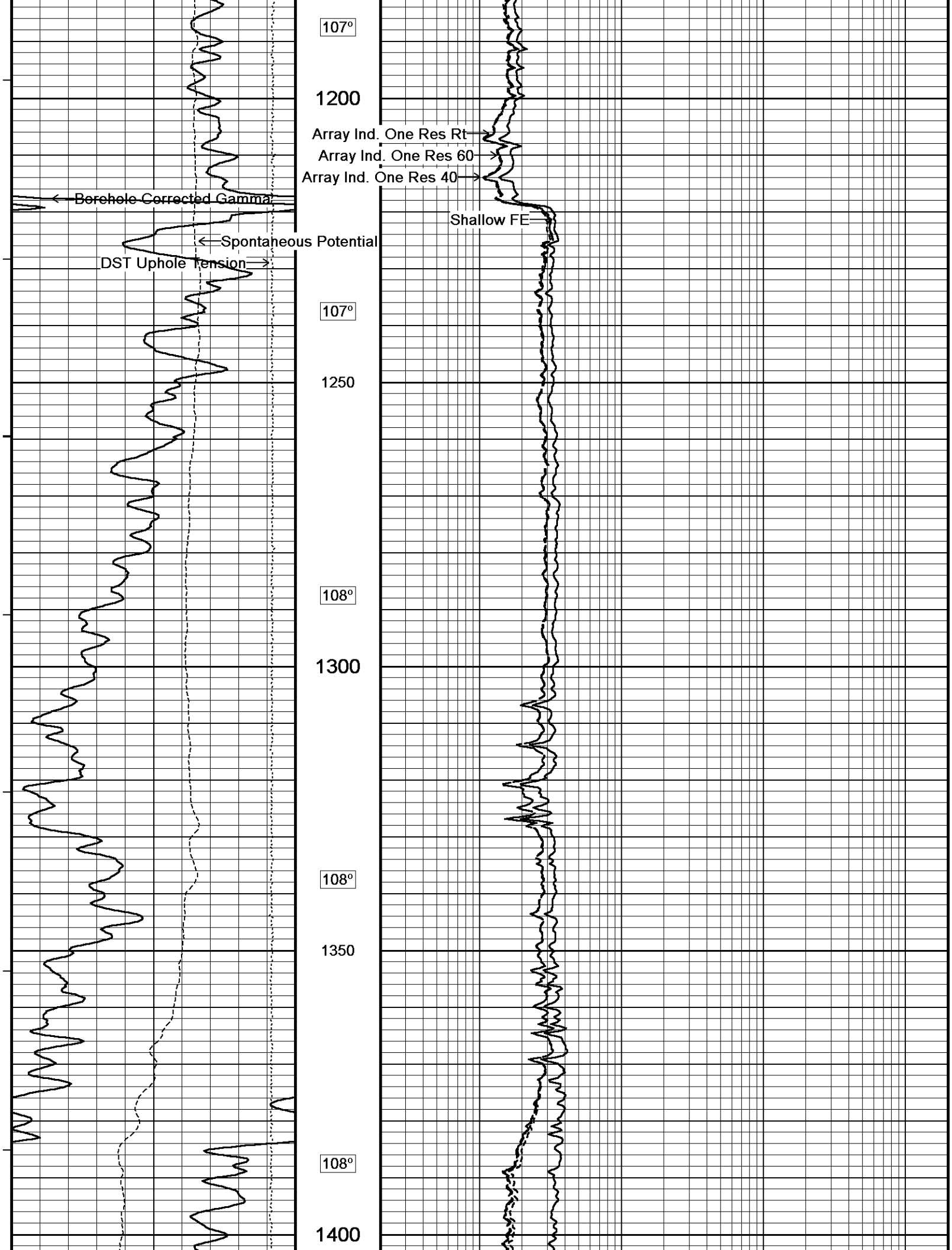

98°
100
98°
150
98°
200
97°
250
97°
300

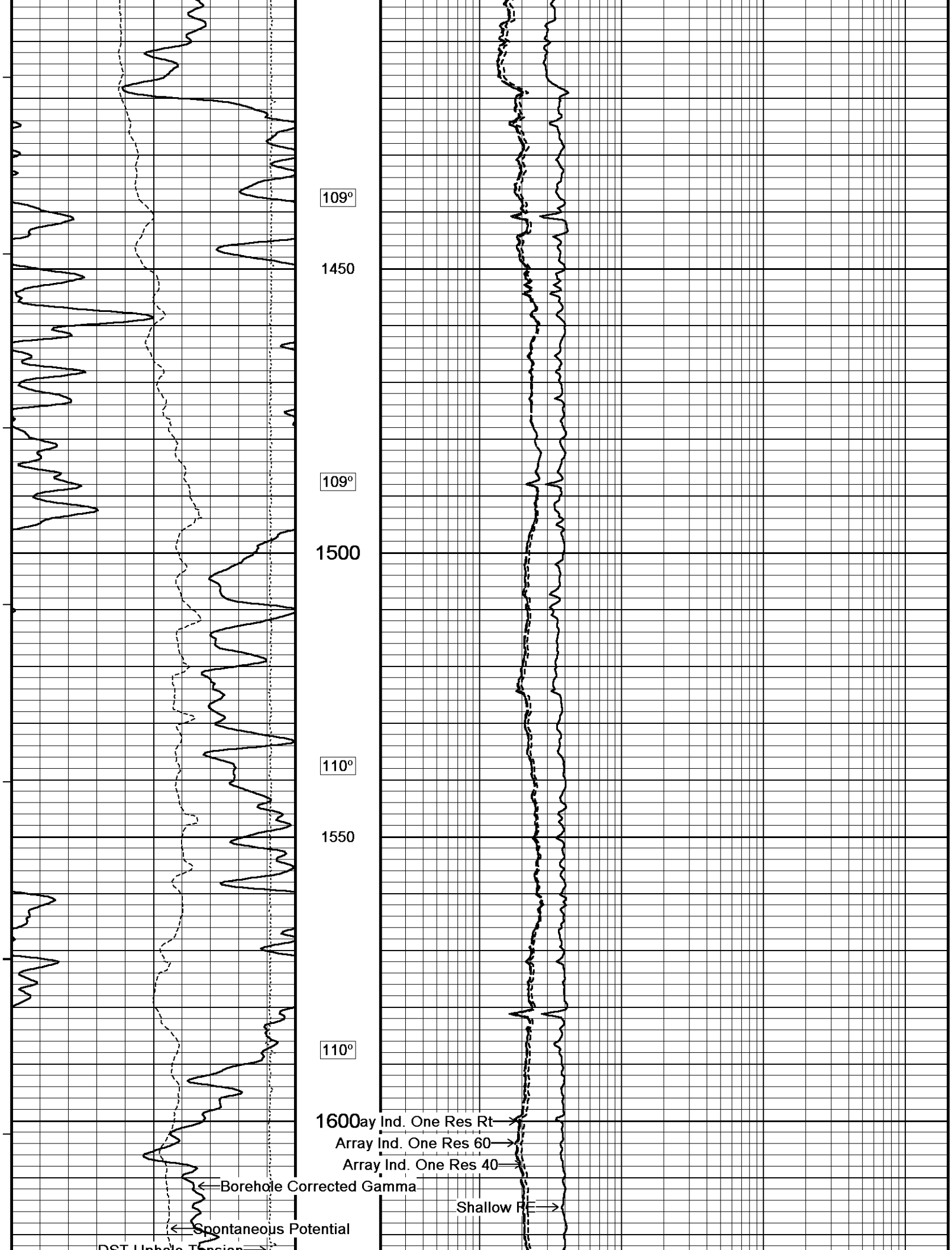

99°
350
100°
400
Casing
Shoe
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
100°
450
99°
500

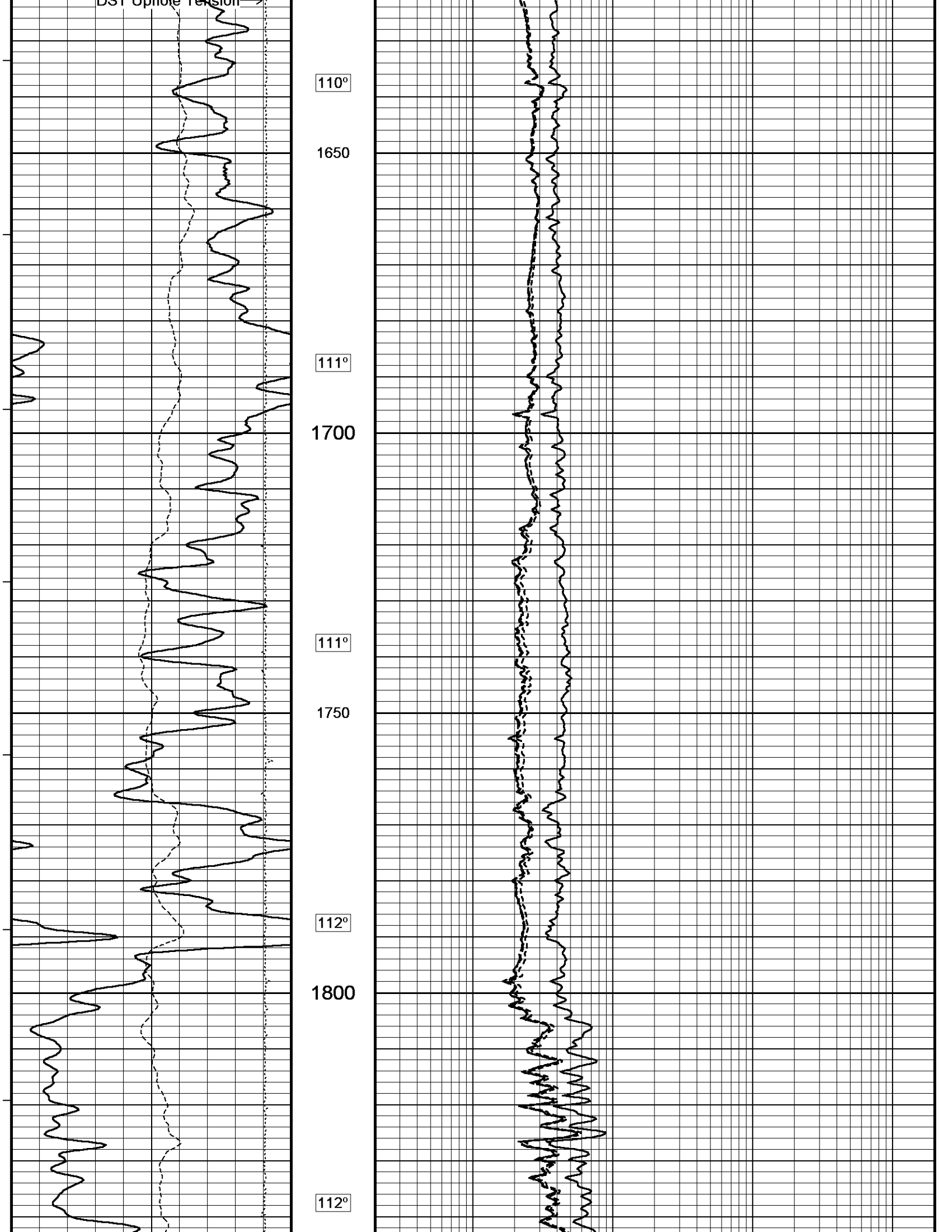

100°
550
100°
600
101°
650
101°
700
102°

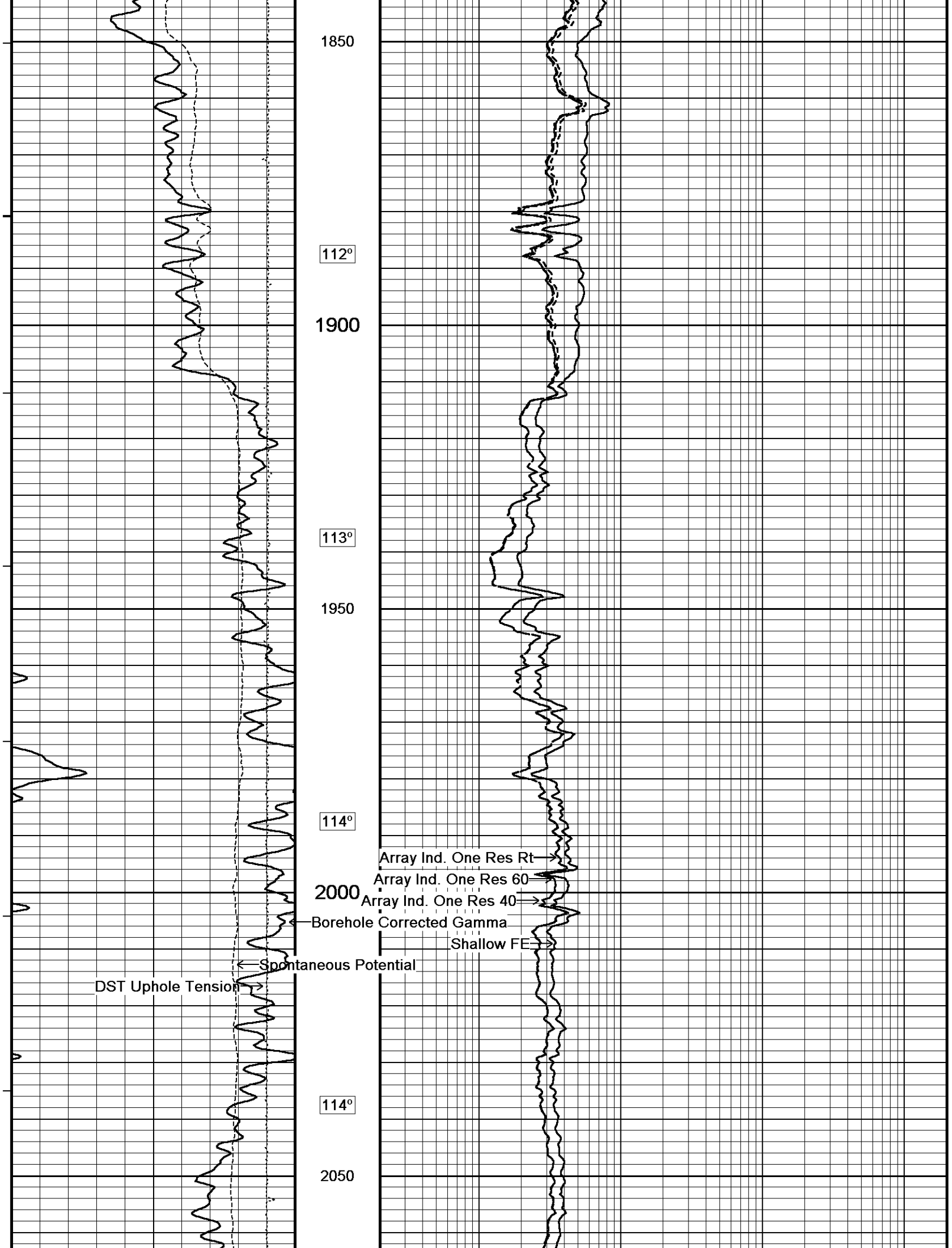

750
102°
800
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
103°
850
104°
900
104°
950

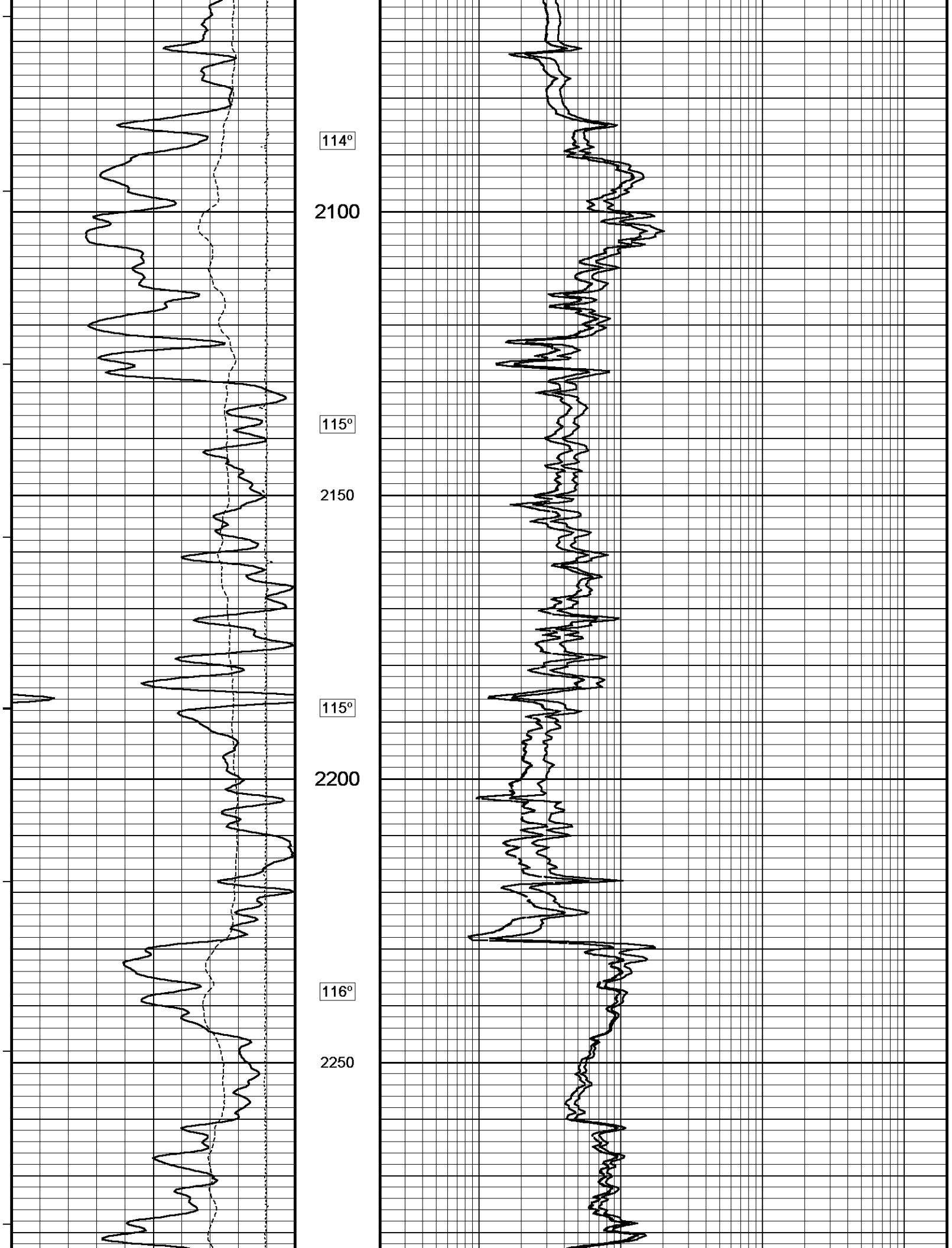

105°
1000
105°
1050
106°
1100
106°
1150

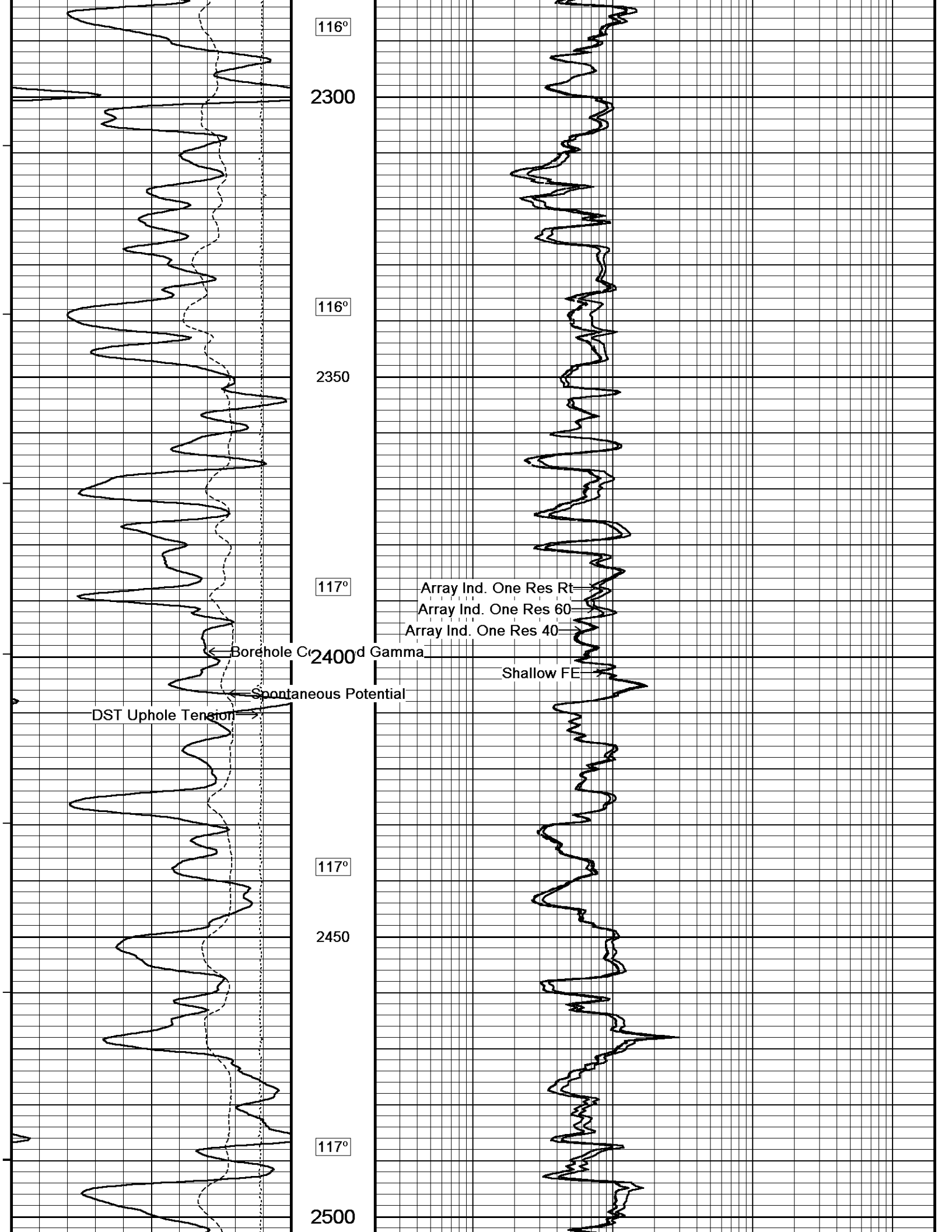

107°
1200
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
107°
1250
108°
1300
108°
1350
108°
1400

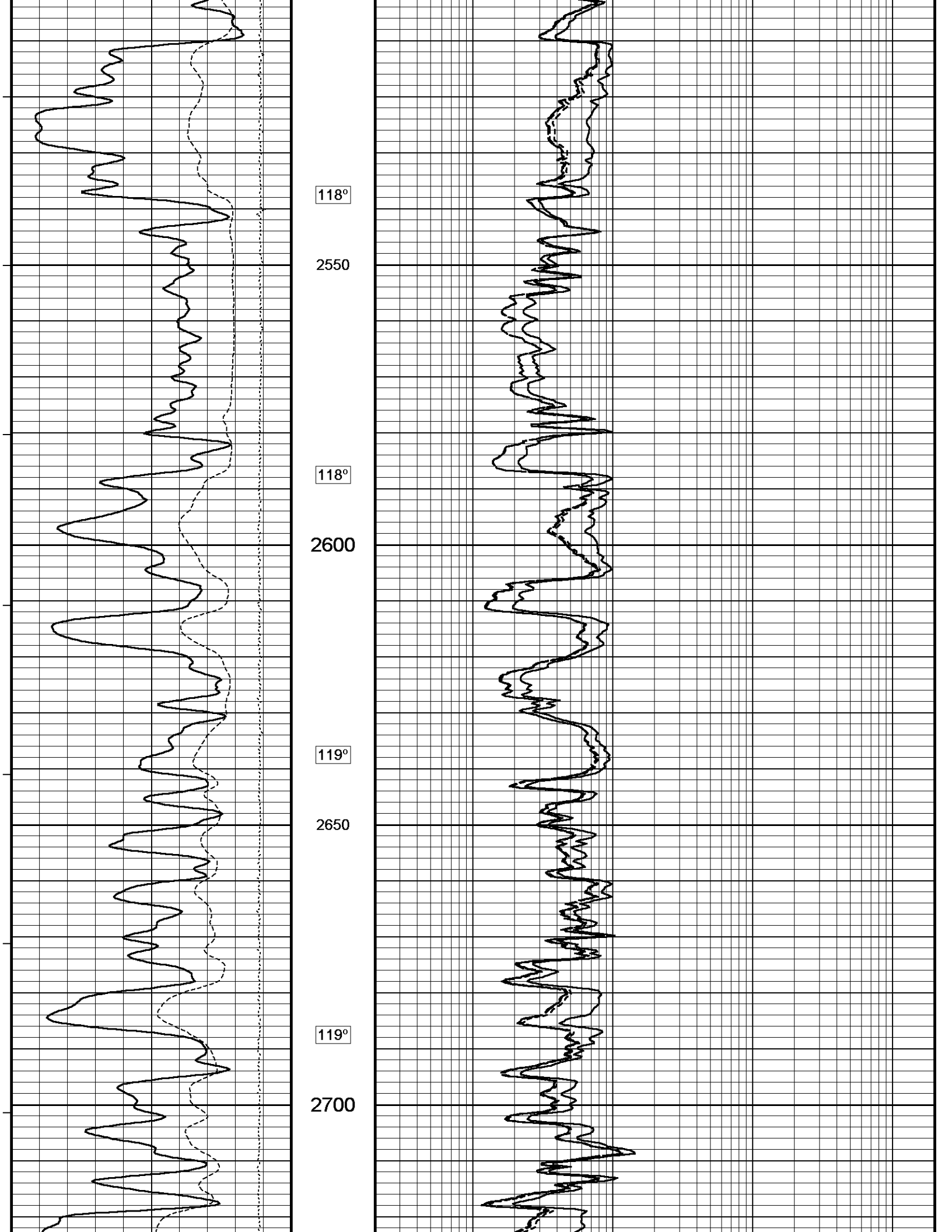

109°
1450
109°
1500
110°
1550
110°
1600
ay Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow RE
Spontaneous Potential

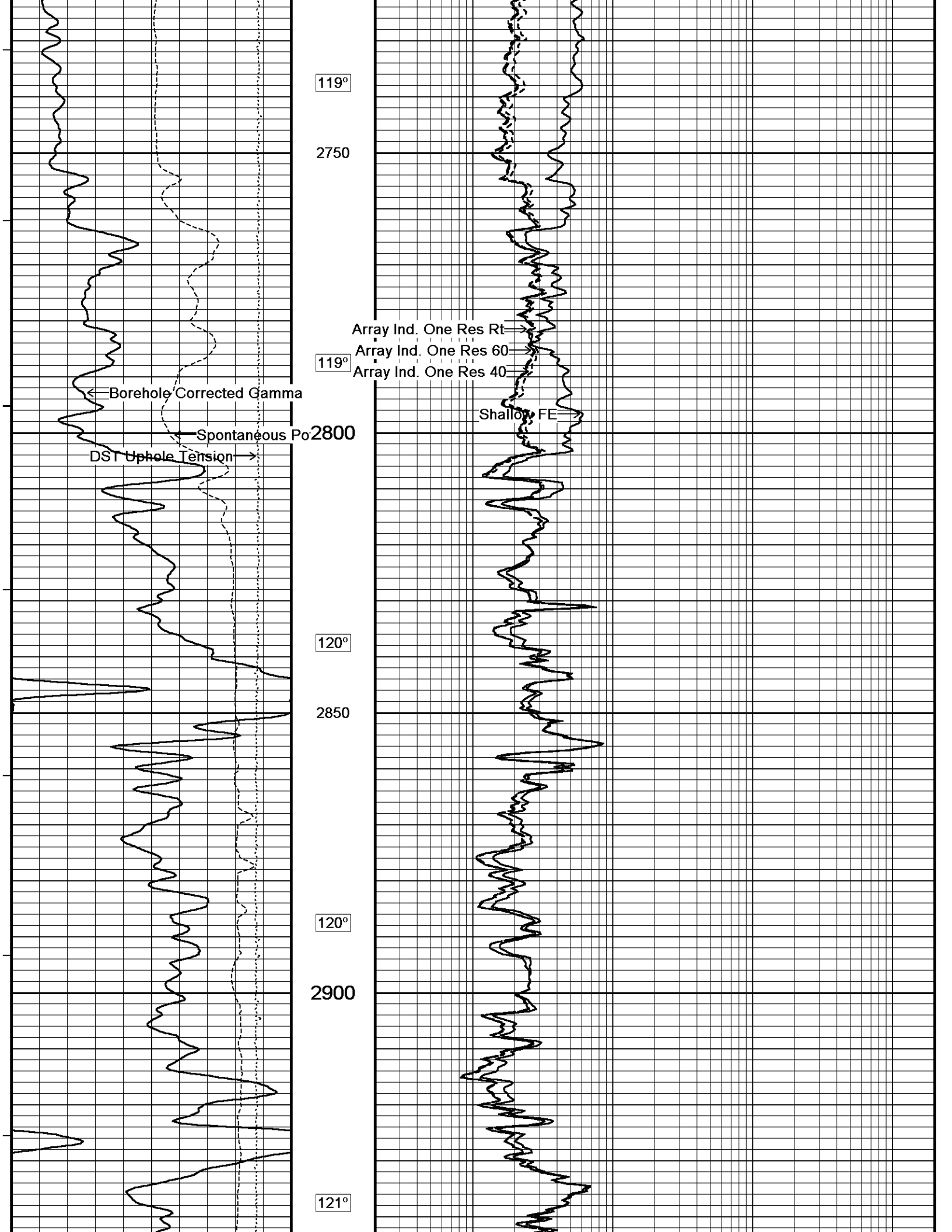

DST Upihole Tension
110°
1650
111°
1700
111°
1750
112°
1800
112°

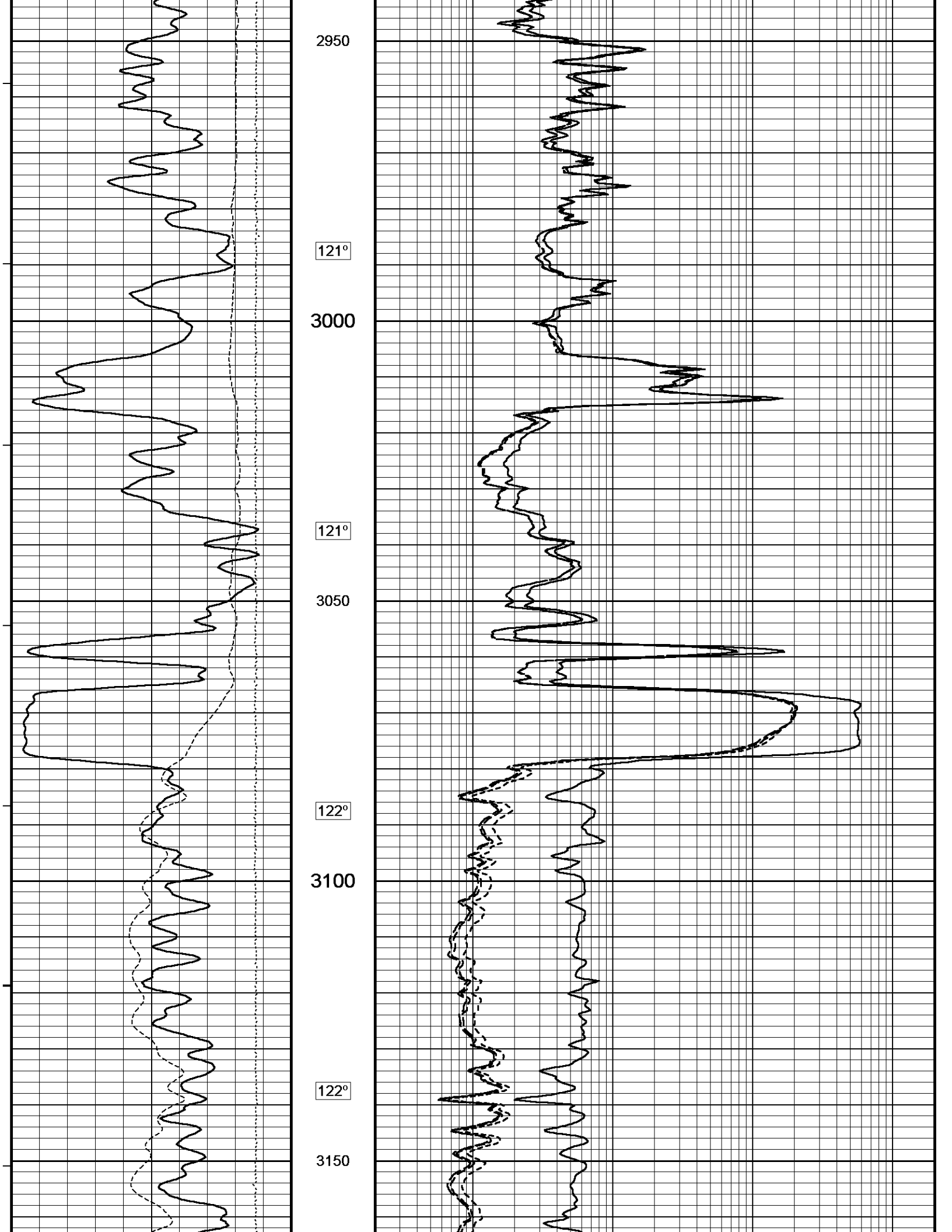

1850
112°
1900
113°
1950
114°
Array Ind. One Res Rt
Array Ind. One Res 60
2000
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
114°
2050

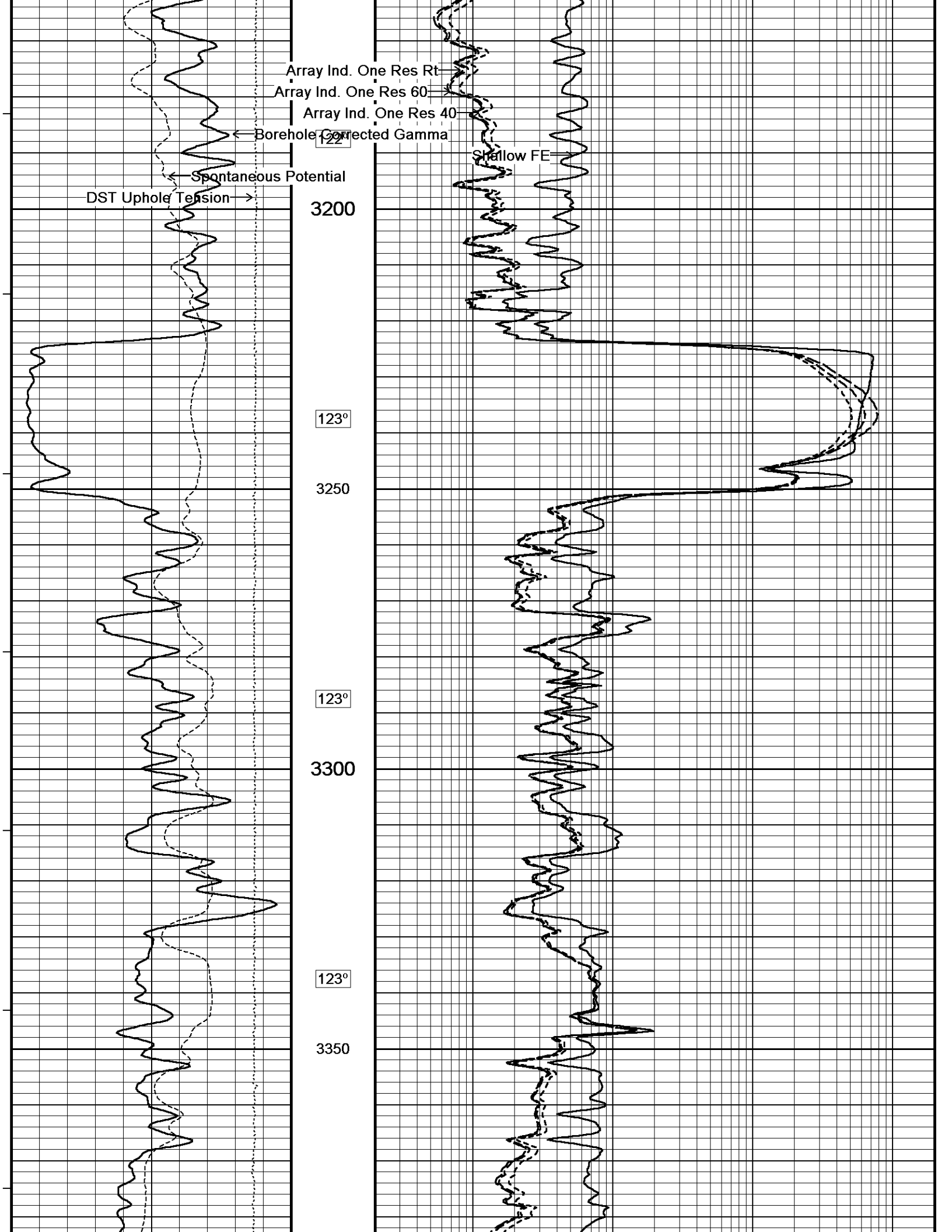

114°
2100
115°
2150
115°
2200
116°
2250

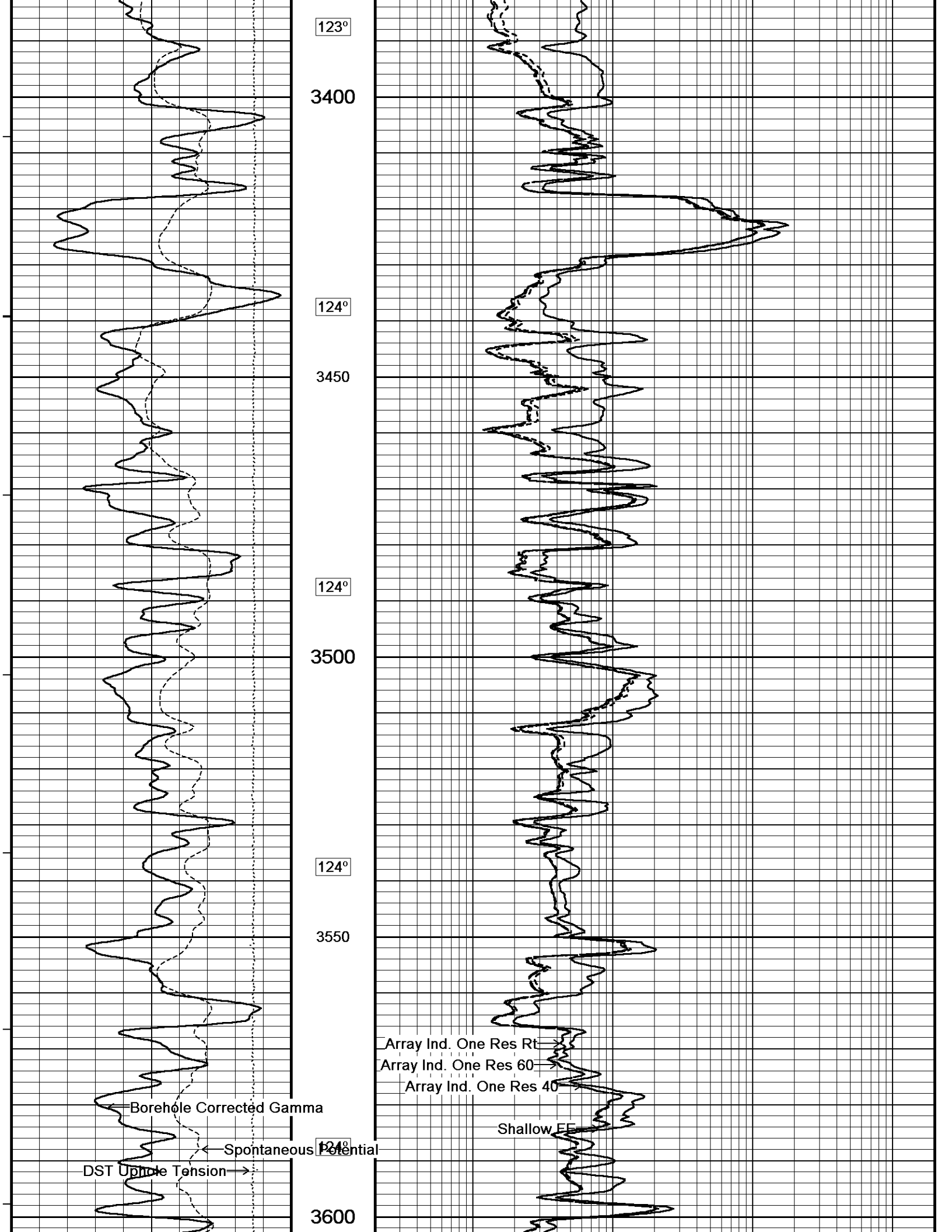

116°
2300
116°
2350
117°
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Co d Gamma
2400
Shallow FE
Spontaneous Potential
DST Uphole Tension
117°
2450
117°
2500

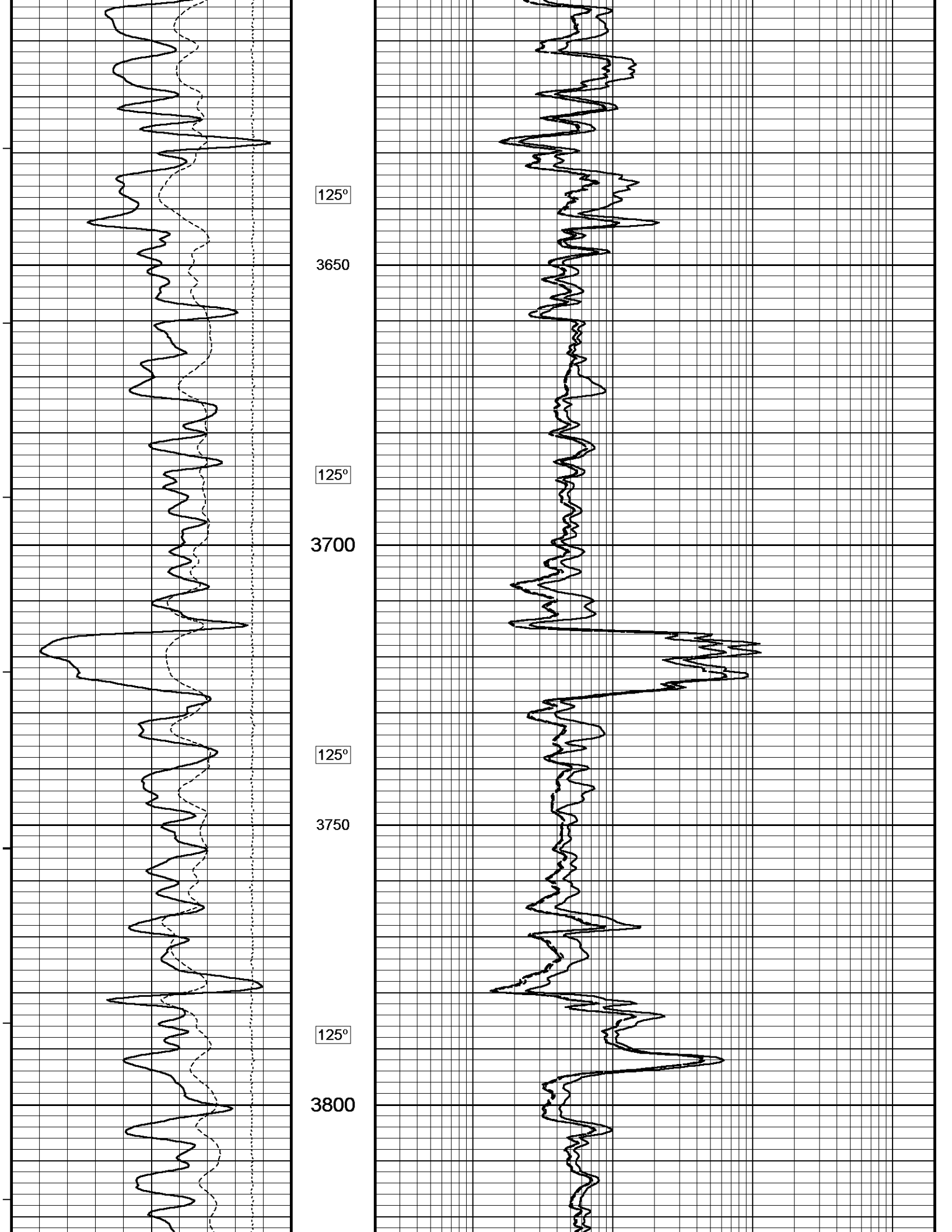

118°
2550
118°
2600
119°
2650
119°
2700

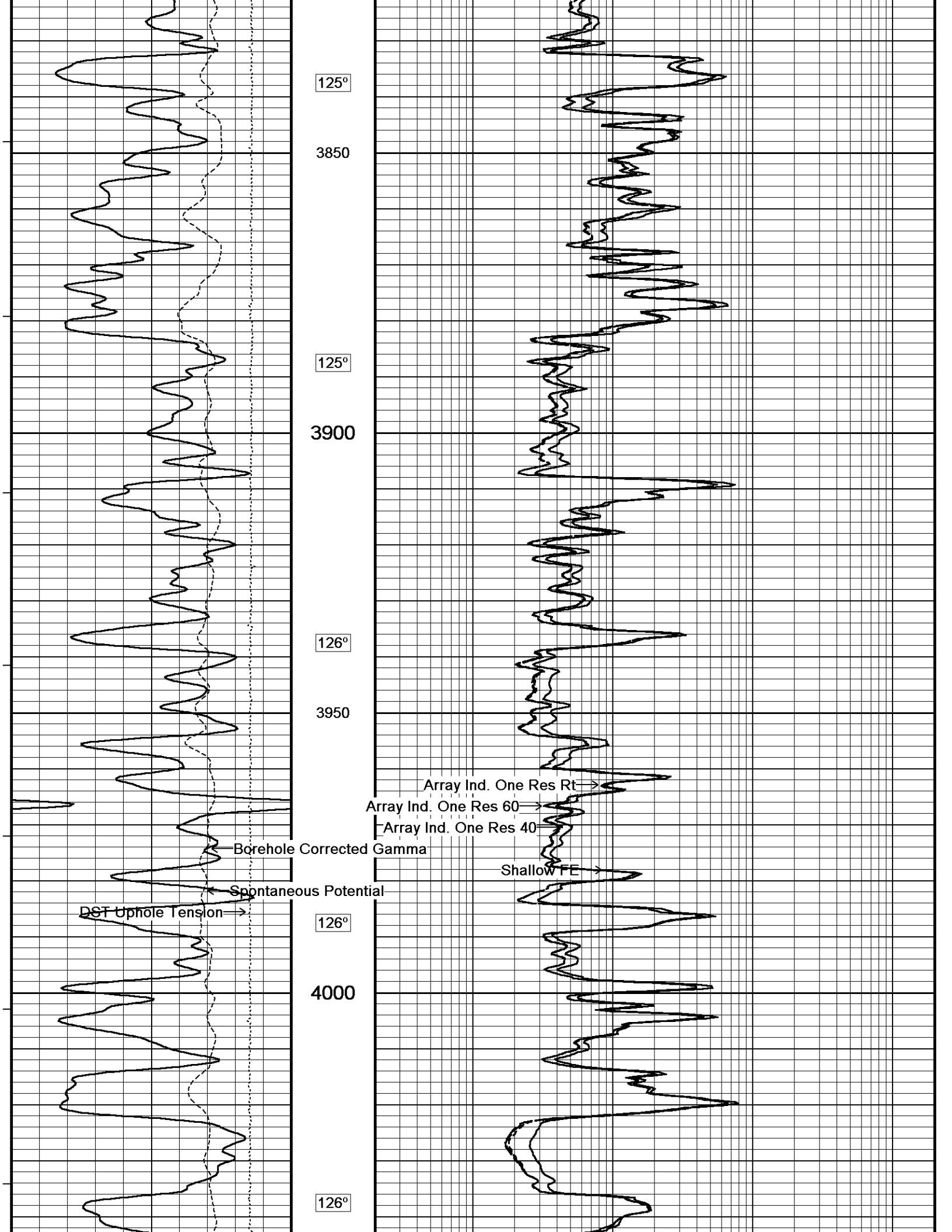

119°
2750
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
119°
Borehole Corrected Gamma
Shallow FE
Spontaneous Po
2800
DST Uphole Tension
120°
2850
120°
2900
121°

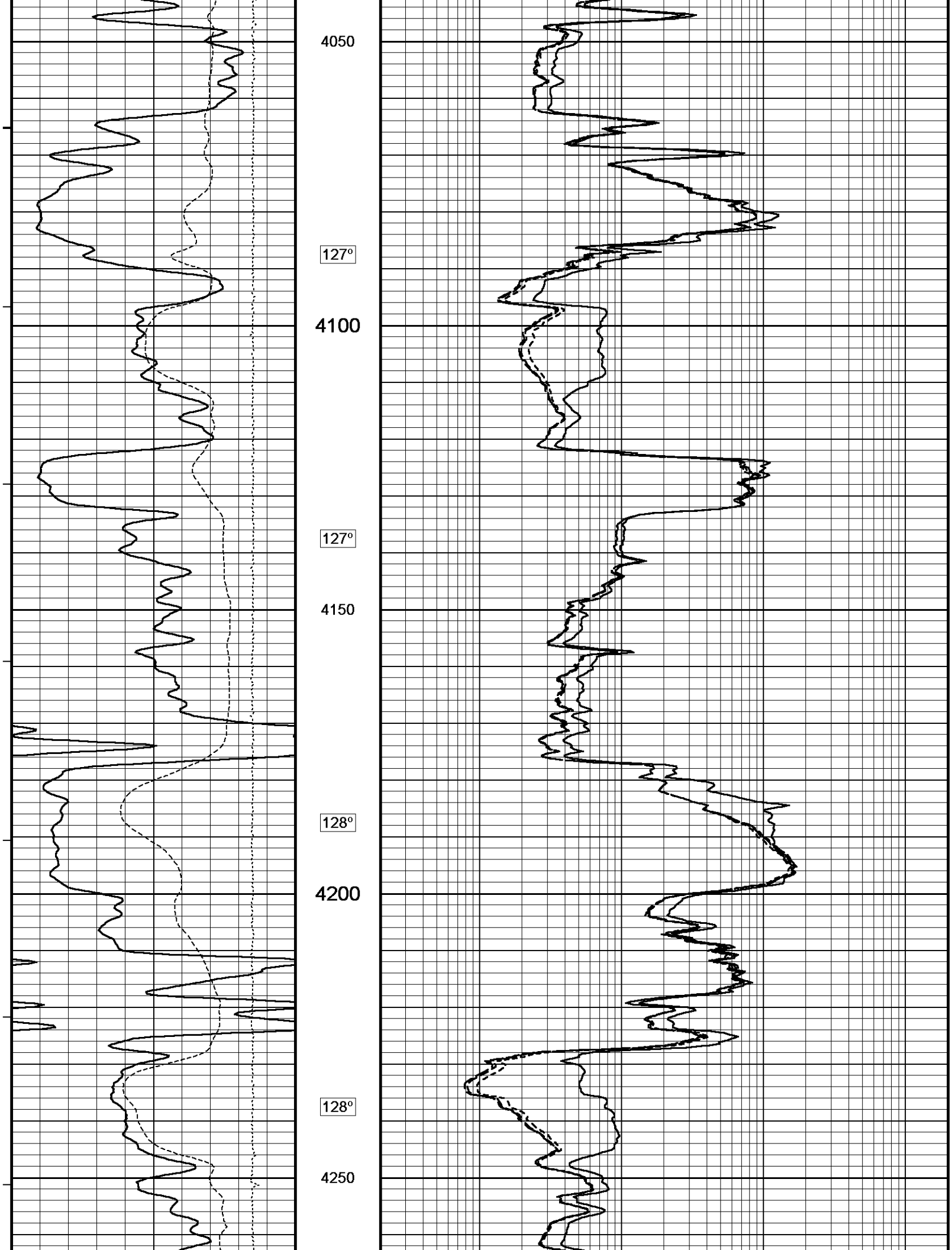

2950
121°
3000
121°
3050
122°
3100
122°
3150

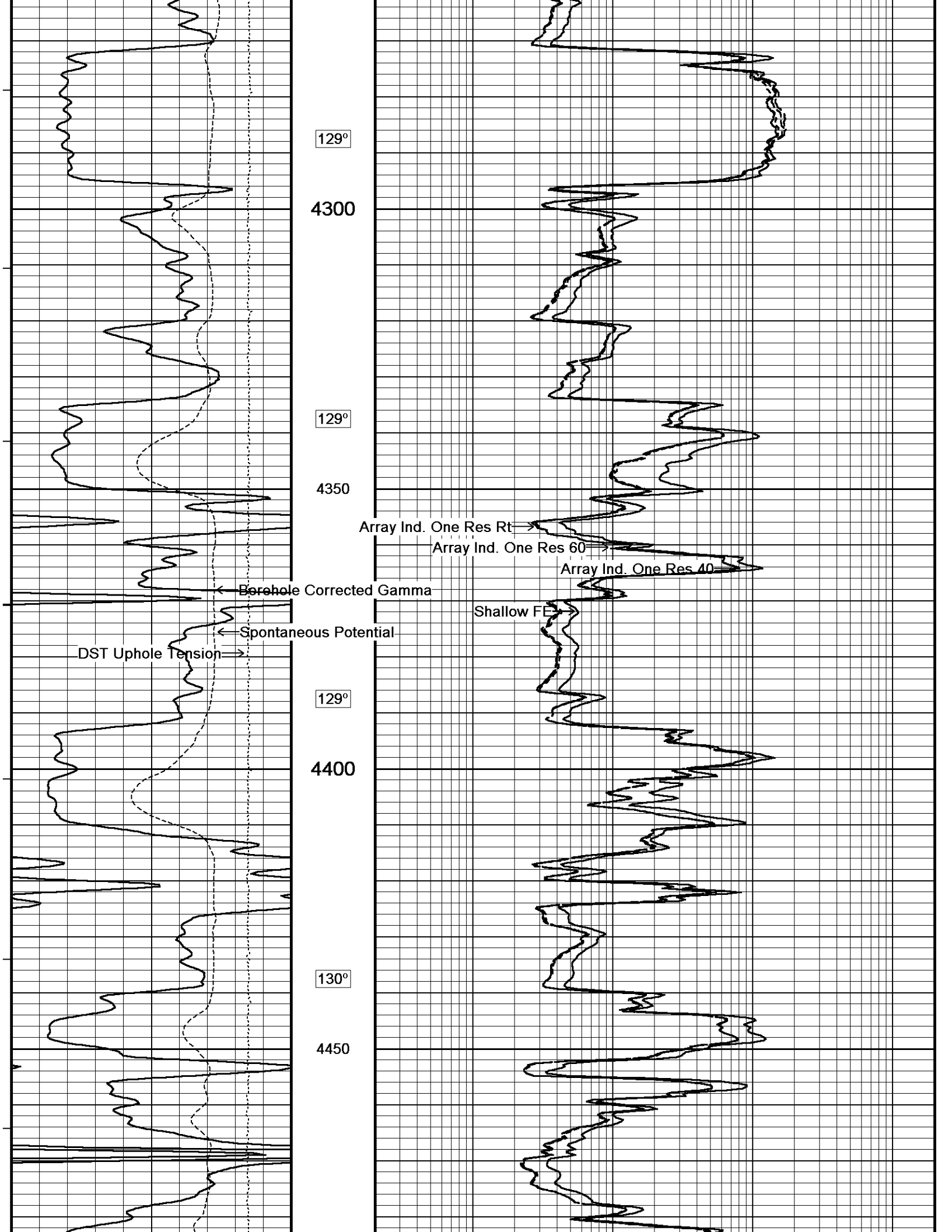

Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
122°
Shallow FE
Spontaneous Potential
DST Uphole Tension
3200
123°
3250
123°
3300
123°
3350

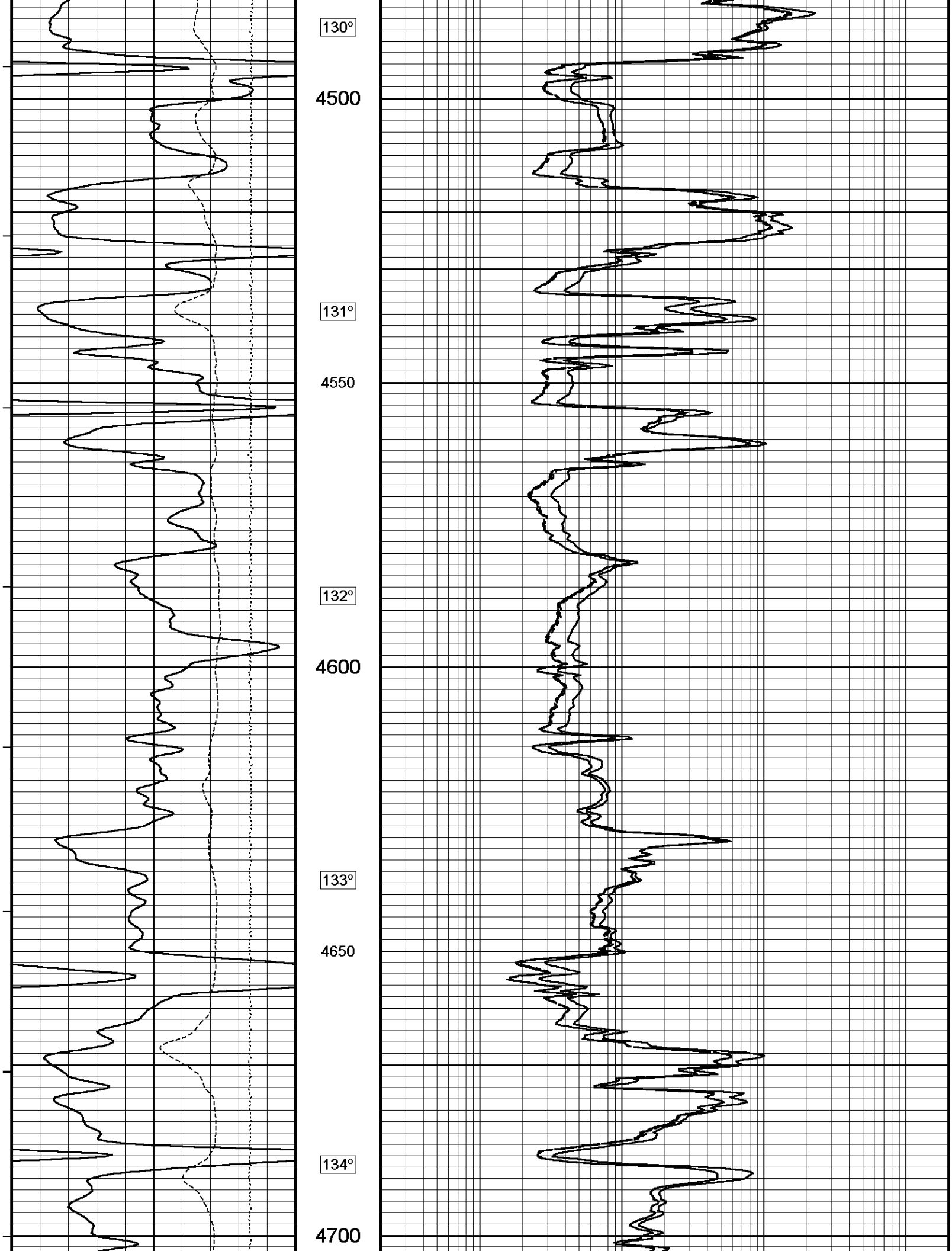

123°
3400
124°
3450
124°
3500
124°
3550
124°
3600
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Borehole Corrected Gamma
Spontaneous Potential
DST Uphole Tension

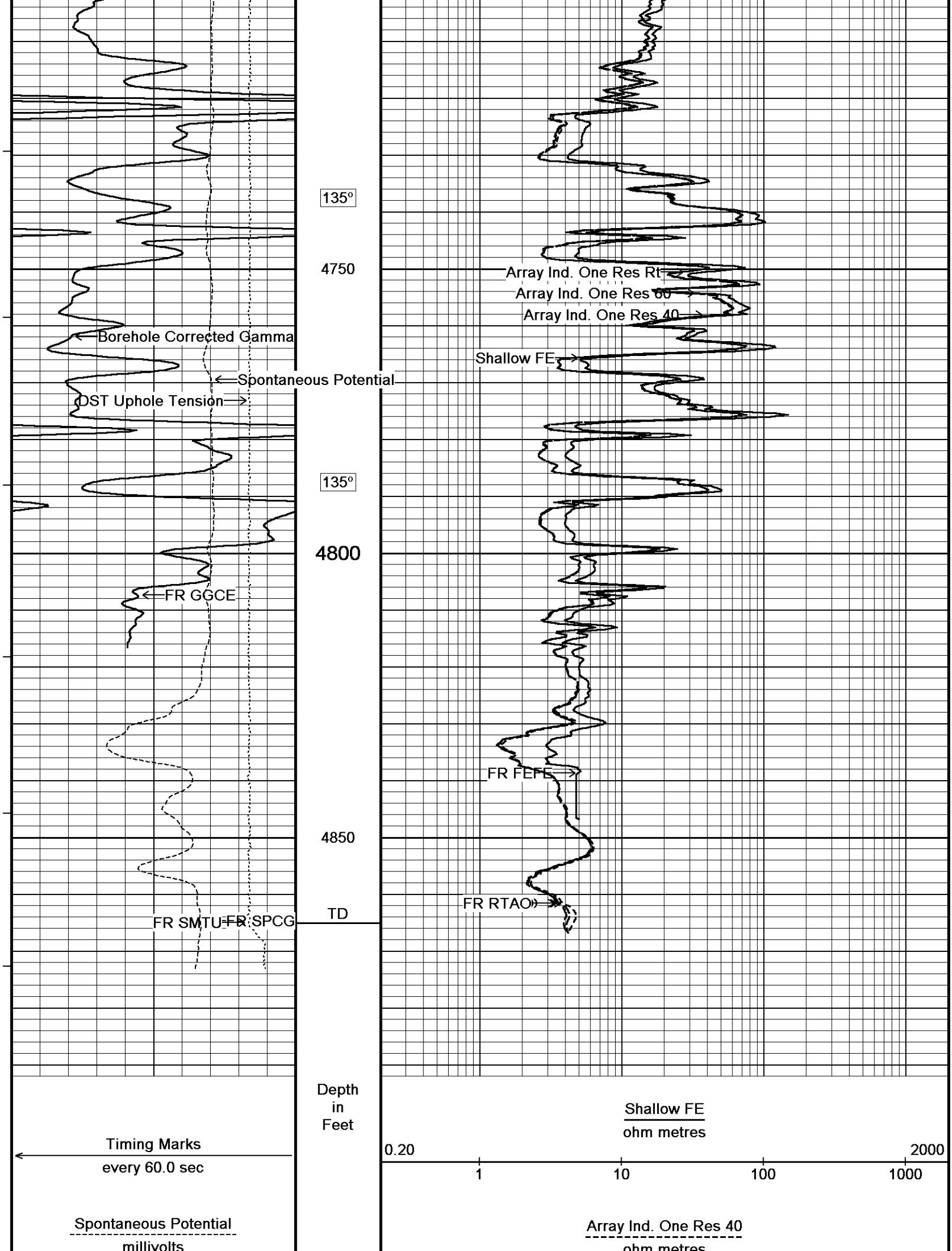

125°
3650
125°
3700
125°
3750
125°
3800


125°
3850
125°
3900
126°
3950
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
126°
4000
126°


4050
127°
4100
127°
4150
128°
4200
128°
4250


129°
4300
129°
4350
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
129°
4400
130°
4450


130°
4500
131°
4550
132°
4600
133°
4650
134°
4700


135°
4750
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
135°
4800
FR GGCE
FR FEFE
4850
FR RTAO
TD
FR SMTU
FR SPCG
Depth
in
Feet
Timing Marks
every 60.0 sec
Shallow FE
ohm metres
0.20
2000
1
10
100
1000
Spontaneous Potential
millivolts
Array Ind. One Res 40
ohm metres

− ⟶| 20 |⟵ +

0.20 — 2000

1 10 100 1000

Borehole Temp in deg F

Borehole Corrected Gamma

API

0 75 150

150 225 300

Array Ind. One Res 60

ohm metres

0.20 — 2000

1 10 100 1000

DST Uphole Tension

pounds

5000 0

Replay Scale 1:240

Array Ind. One Res Rt

ohm metres

0.20 — 2000

1 10 100 1000

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 22-MAR-2019 08:17

Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta — Recorded on 22-MAR-2019 00:23

System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

5 INCH MAIN 1:240

REPEAT SECTION 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 22-MAR-2019 08:17

Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\REPEAT PASS_ 001.dta — Recorded on 21-MAR-2019 23:34

System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

Depth in Feet

Timing Marks

every 60.0 sec

Shallow FE

ohm metres

0.20 — 2000

1 10 100 1000

Spontaneous Potential

millivolts

− ⟶| 20 |⟵ +

Array Ind. One Res 40

ohm metres

0.20 — 2000

1 10 100 1000

Borehole Temp in deg F

Borehole Corrected Gamma

API

0 75 150

150 225 300

Array Ind. One Res 60

ohm metres

0.20 — 2000

1 10 100 1000

DST Uphole Tension

pounds

5000 0

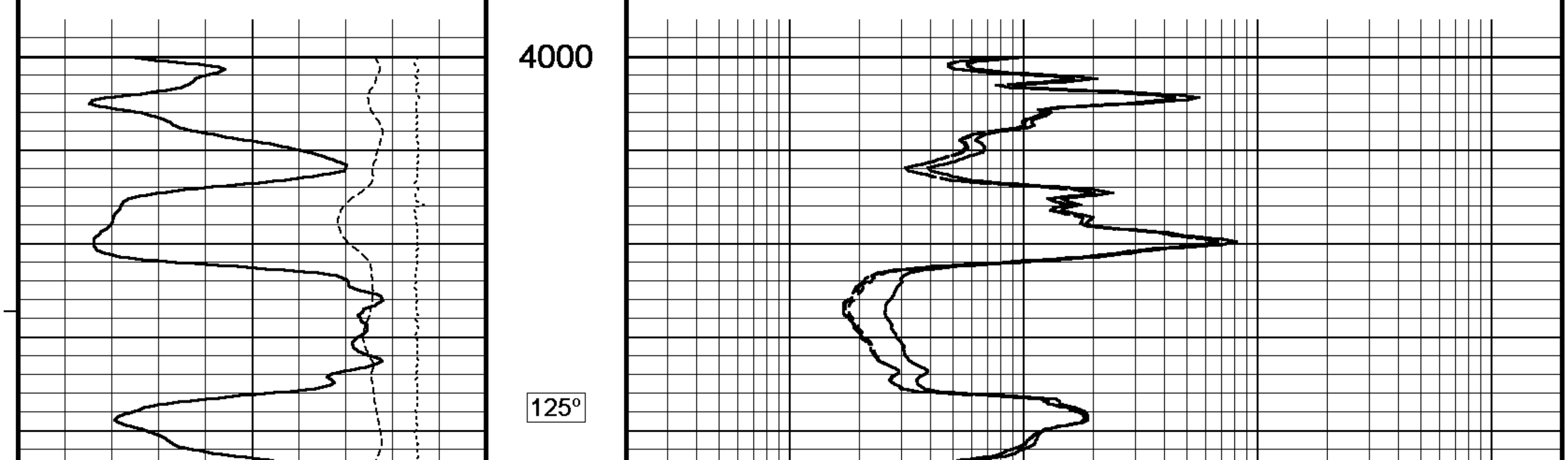
Replay Scale 1:240

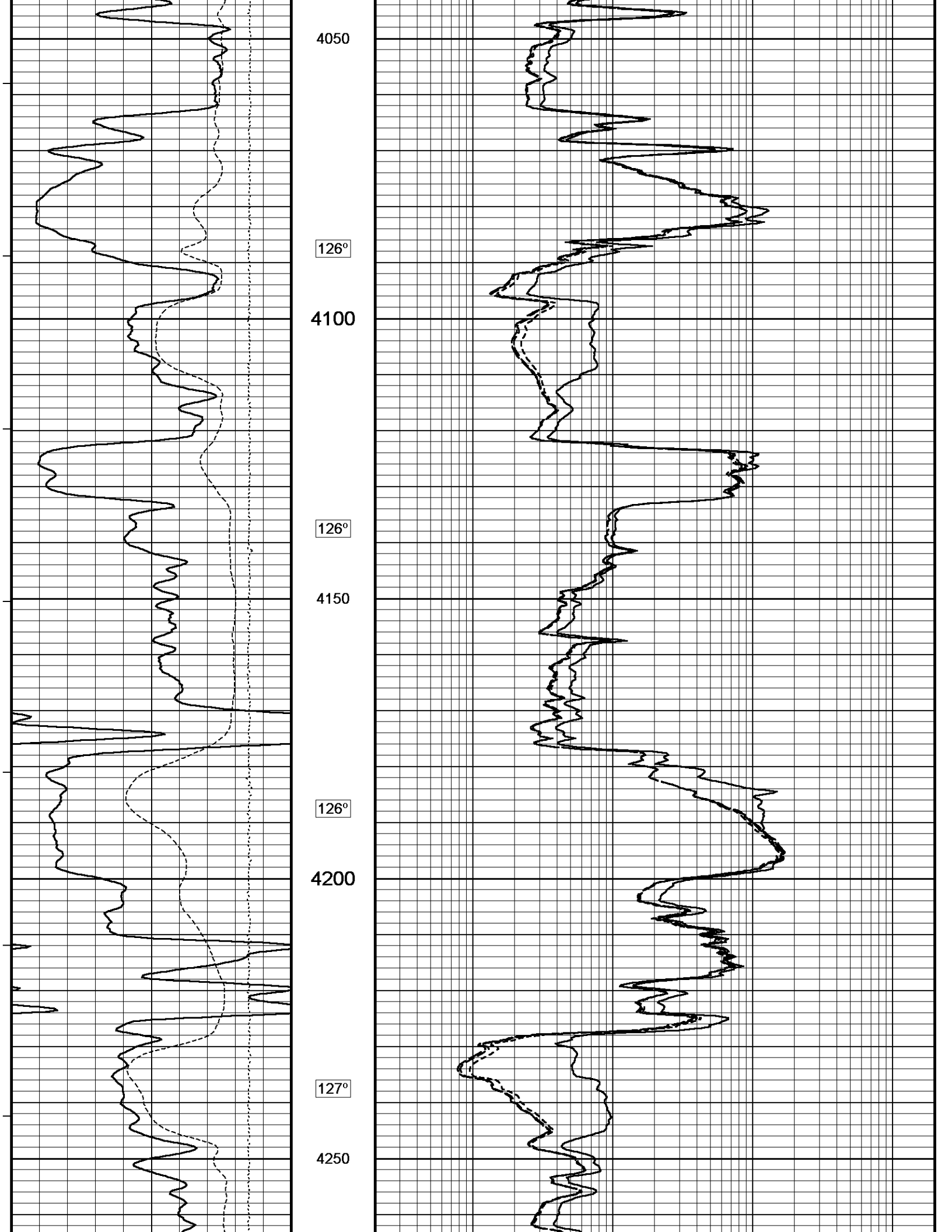
Array Ind. One Res Rt

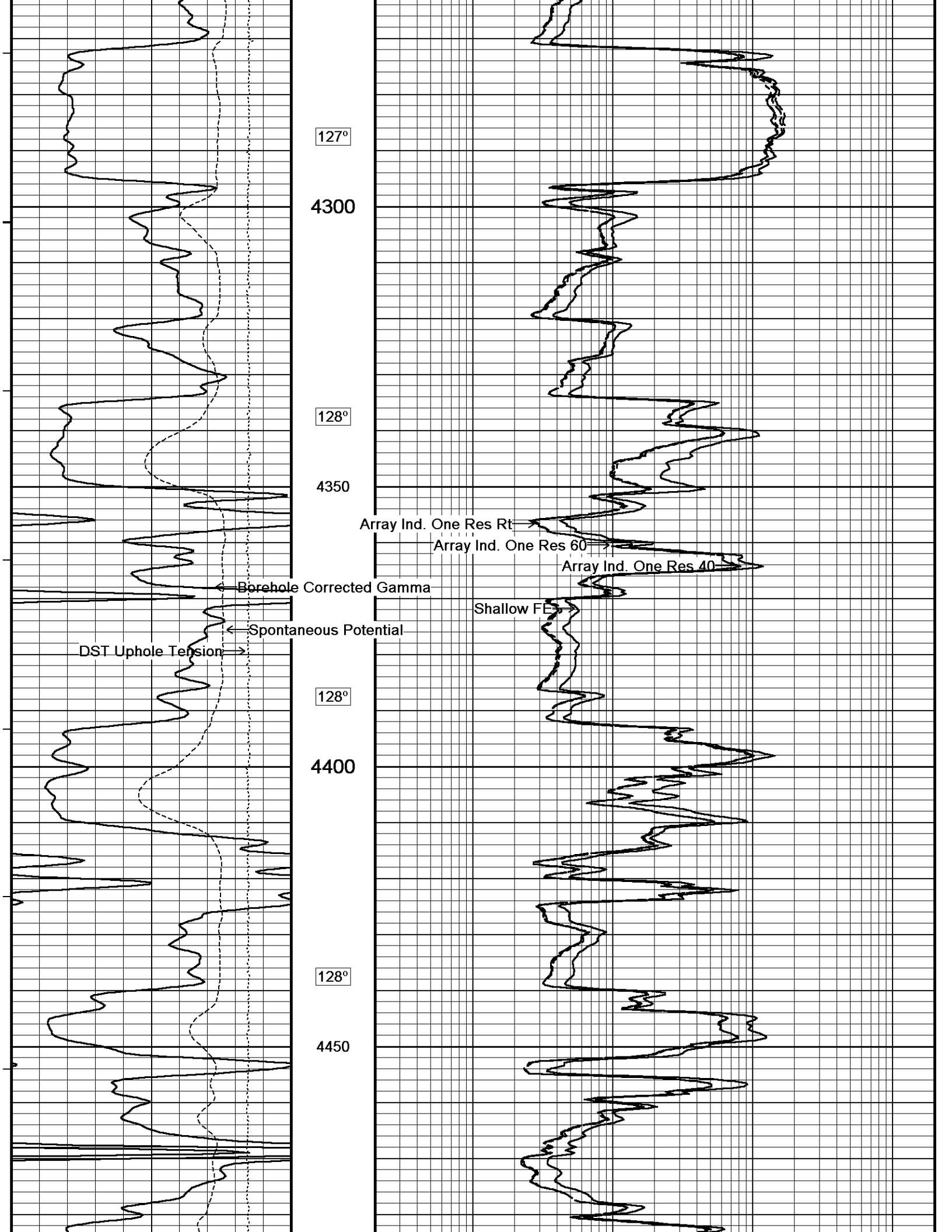
ohm metres

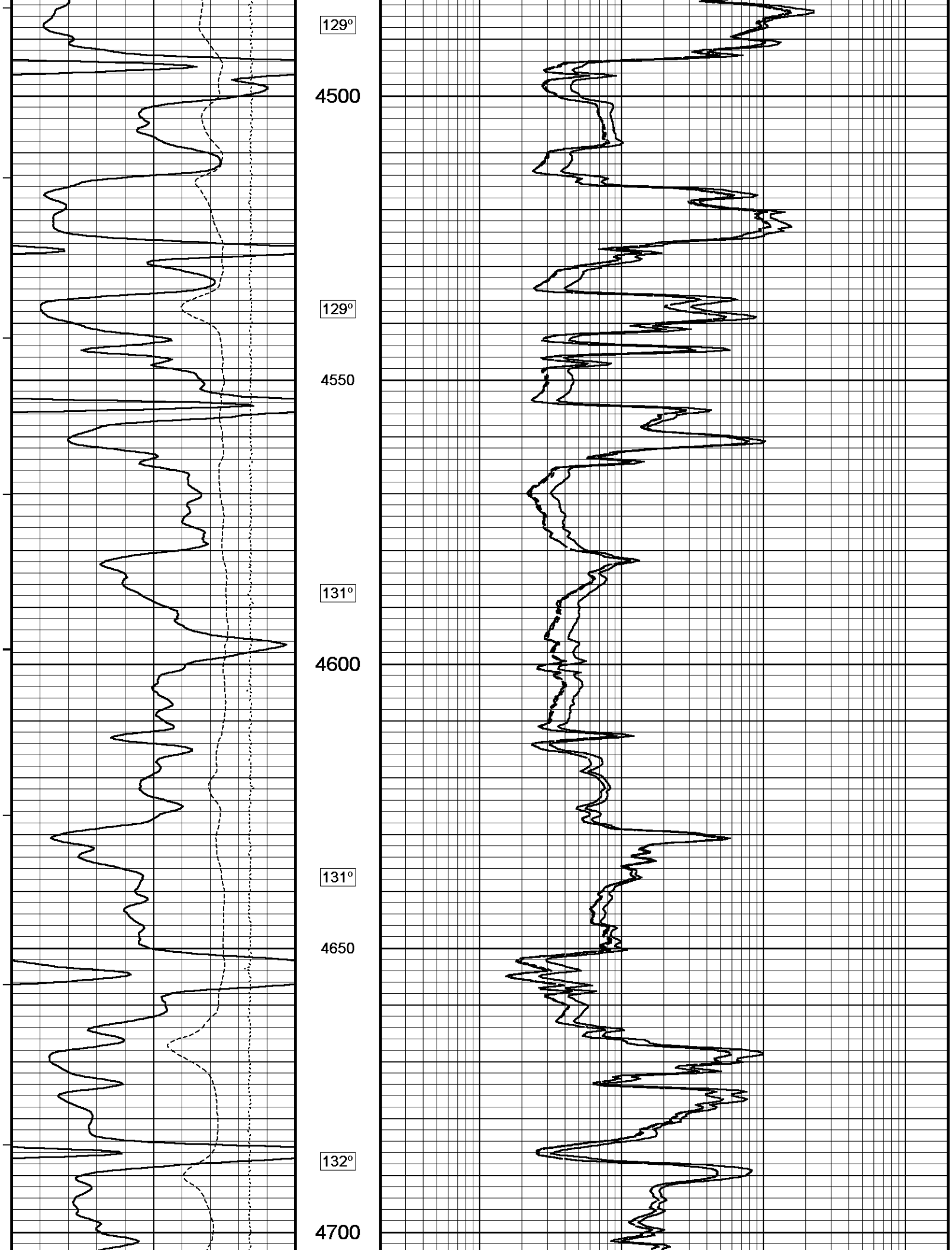
0.20 — 2000

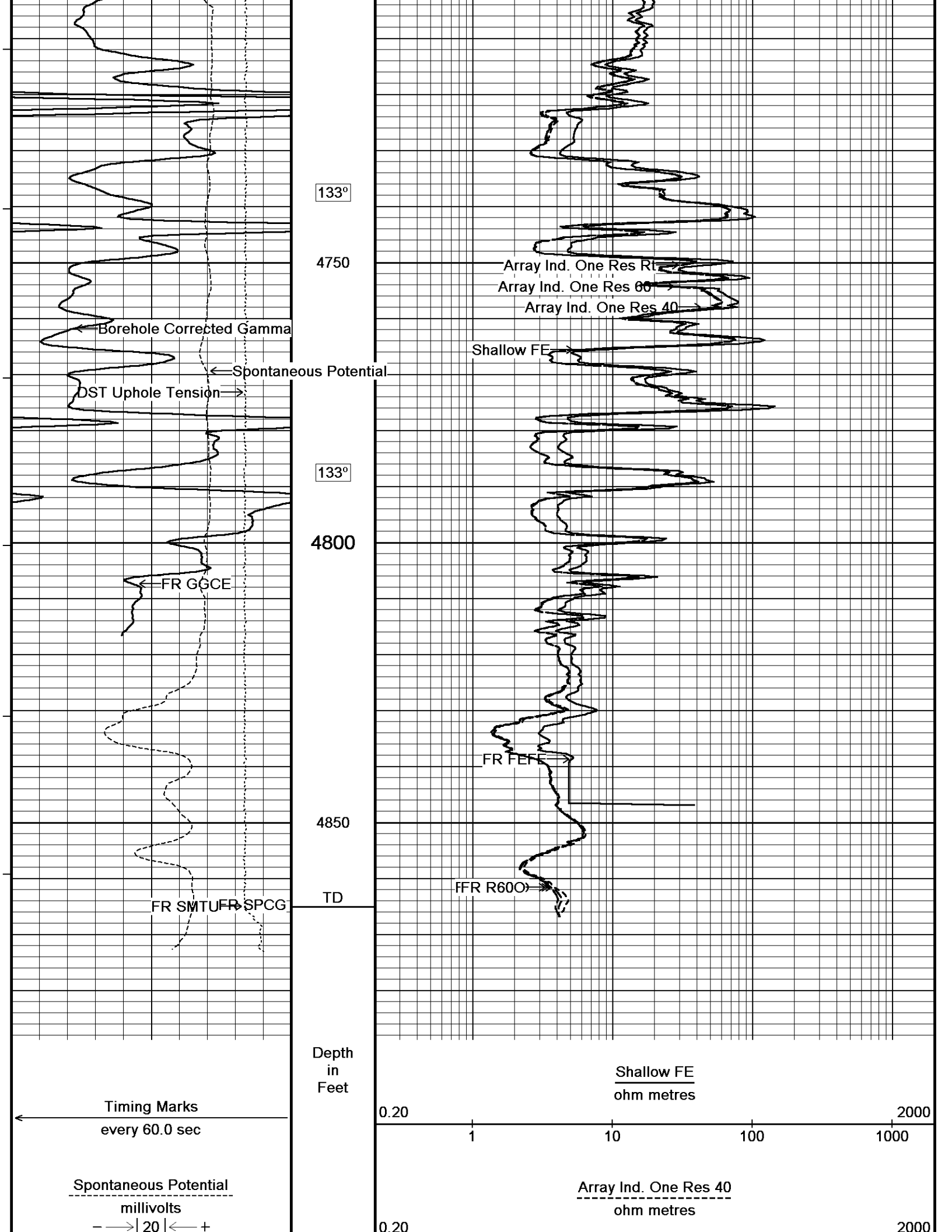
1 10 100 1000

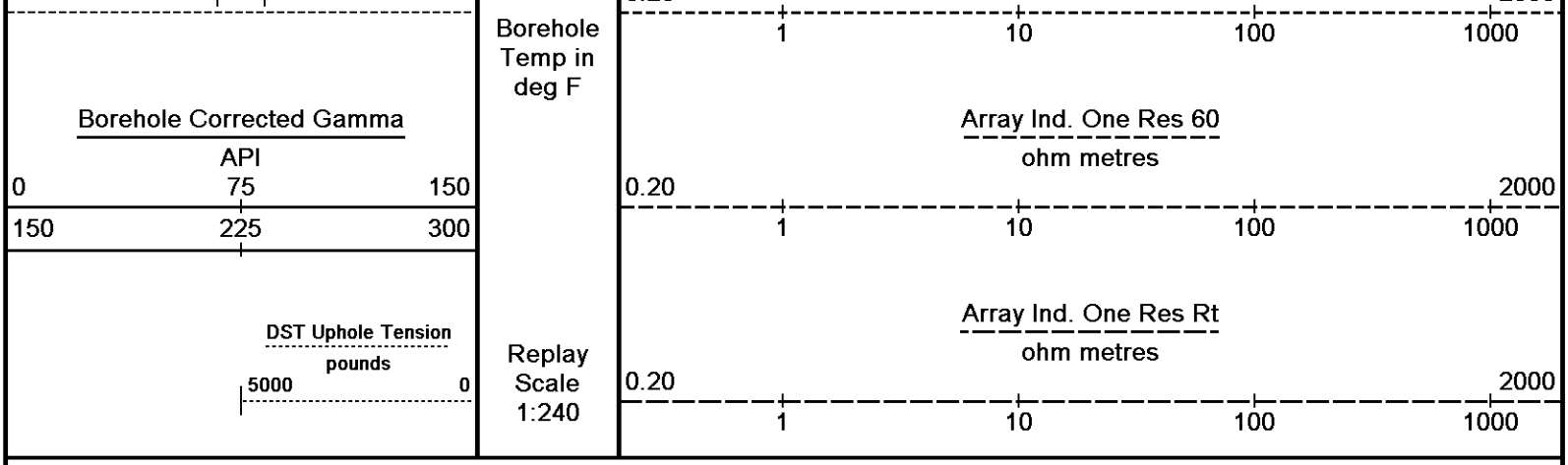



4050
126°
4100
126°
4150
126°
4200
127°
4250


127°
4300
128°
4350
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
128°
4400
128°
4450


129°
4500
129°
4550
131°
4600
131°
4650
132°
4700


133°
4750
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
133°
4800
FR GGCE
FR FEFE
4850
FFR R60O
TD
FR SMTU
FR SPCG
Depth
in
Feet
Timing Marks
every 60.0 sec
Shallow FE
ohm metres
0.20
2000
1
10
100
1000
Spontaneous Potential
millivolts
20
Array Ind. One Res 40
ohm metres
0.20
2000



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 22-MAR-2019 08:17

Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\REPEAT PASS_ 001.dta — Recorded on 21-MAR-2019 23:34

System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

REPEAT SECTION 1:240

BEFORE SURVEY CALIBRATION

C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta

General Constants All 000

Last Edited on 21-MAR-2019,23:06

General Parameters		
Mud Resistivity	1.040	ohm-metres
Mud Resistivity Temperature	103.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Crossplot Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.620	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Down-hole Tension Calibration SMS 0

Field Calibration on 21-MAR-2019 22:36

Reading No	Measured	Calibrated (lbs)
1	17760.84	0.00
2	19449.73	522.50

Gamma Calibration MCG-D.K 443

Field Calibration on 21-MAR-2019 09:55

	Measured	Calibrated (API)
Background	64	45
Calibrator (Gross)	707	501
Calibrator (Net)	644	456

Gamma Calibration Tolerances MCG-D.K 443

Ratio 1.412 (1.40 – 1.475 – 1.55) Counts/API

Gamma Constants MCG-D.K 443

Last Edited on 21-MAR-2019,22:14

Gamma Calibrator Number	MCGGRCC141	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.08	gm/cc
Caliper Source for Processing	Density Caliper	

Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

SP Calibration MCG-D.K 443

Field Calibration on 21-MAR-2019,09:55

	Measured	Calibrated (mV)
Reference 1	100.8	99.9
Reference 2	-98.4	-99.9

High Resolution Temperature Calibration MCG-D.K 443

Field Calibration on 21-MAR-2019,09:56

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

High Resolution Temperature Constants MCG-D.K 443

Last Edited on 12-OCT-2018,05:20

Pre-filter Length	11

Caliper Calibration MML-A 7

Base Calibration on 13-MAR-2019 13:20
Field Calibration on 21-MAR-2019 10:49

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14099	5.98
2	17497	7.97
3	20709	9.86
4	24720	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
8.00	7.97

Caliper Calibration Tolerances MML-A 7

Short Arm Field Cal.	8.00	7.77	7.97	8.17	in

Micro Normal and Micro Inverse Calibration MML-A 7

Base Calibration on 13-MAR-2019 13:20
Field Check on 21-MAR-2019 10:48

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

Base Calibration

	Measured		Calibrated (ohm-m)	
Micro Normal	10.2	50.4	5.1	25.6
Micro Inverse	10.0	50.1	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	76.8	76.8
Micro Inverse	51.0	51.0

Micro Normal & Micro Inverse Calibration Tolerance MML-A 7

Micro Normal Res. 1	10.2	-5%	10.0	+5%	ohm
Micro Inverse Res. 1	10.0	-5%	10.0	+5%	ohm
Micro Normal Res. 2	50.4	-5%	50.0	+5%	ohm
Micro Inverse Res. 2	50.1	-5%	50.0	+5%	ohm
Micro Normal Base Check	76.8	-2%	76.57	+2%	ohm-m
Micro Inverse Base Check	51.0	-2%	50.97	+2%	ohm-m
Micro Normal Field Check	76.8	-2%	76.8	+2%	ohm-m
Micro Inverse Field Check	51.0	-2%	51.0	+2%	ohm-m

Micro Normal and Micro Inverse Constants MML-A 7

Last Edited on 21-MAR-2019,13:44

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	N/A	inches

Neutron Calibration MDN-B-A 295

Base Calibration on 21-MAR-2019 10:09

Neutron Calibration MDN-B.A 295

Base Calibration on 13-MAR-2019 13:31
Field Check on 21-MAR-2019 10:17

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	2915	92	3714	110
Ratio	31.740		33.764	

Field Calibrator at Base

	Calibrated (cps)	
	2183	3130
Ratio	0.697	

Field Check

	Calibrated (cps)	
	2224	3184
Ratio	0.699	

Neutron Calibration Tolerances MDN-B.A 295

Ratio	31.740	-5% 33 +5%
Base Check	0.697	0.65 0.7 0.75
Field Check	0.699	0.677 0.697 0.717

Neutron Constants MDN-B.A 295

Last Edited on 21-MAR-2019,13:45

Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Legacy	
Caliper Source for Processing	Bit Size	
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 352

Base Calibration on 13-MAR-2019 13:31
Field Check on 21-MAR-2019 09:40

	Resistor 1 (ohm)	Resistor 2 (ohm)
	0.0	1000.0

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	960.2	126.8
Base Check		281.8
Field Check		282.3

FE Calibration Tolerances MFE-B.J 352

Reference 2	960.2	-3% 980.0 +3%	ohm
Base Check	281.8	-2% 277.0 +2%	ohm-m
Field Check	282.3	-2% 281.8 +2%	ohm-m

FE Constants MFE-B.J 352

Last Edited on 21-MAR-2019,13:45

Running Mode	No Sleeve
MFE K Factor	0.1268

Borehole Correction Constants

Sonde Position	0.5	inches
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	

Sonic Constants MSS-C.K 308

Maximum Boundary Contrast	70.00	micro-sec/ft
Fluid Transit Time	189.00	micro-sec/ft
Limestone Transit Time	47.50	micro-sec/ft
Sandstone Transit Time	55.50	micro-sec/ft
Dolomite Transit Time	43.50	micro-sec/ft
Sonic used for Porosities	3-5' Compensated	
Correction for Sonde Skew	Applied	
Cycle Stretch Algorithm	Applied	
MN3FT	0.00	micro-sec
MX3FT	1500.00	micro-sec
Hunt-Raymer Constant	83.13	micro-sec/ft
Sonde Mode	Compensated	
Hole Type	Open Hole	

Sonde Parameters

	Measured	Calibrated
Offset		0.0000
Free Pipe	0.0000	

Peak Amplitude Source

Waveform	Start Time (micro-sec)	Width (micro-sec)	Pre Gain	Start Gain	Discriminator (mV)
3'					
4'					
5'					
6'					

Processed Fixed Gate Parameters

Waveform Used For Processing N/A

Start Time (micro-sec)	End Time (micro-sec)	Discriminator (mV)	Depth (m)
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	0.00	0.00

Full Waveform Parameters

Use 3' Waveform to derive TR	No	
Use 4' Waveform to derive TR	No	
Use 5' Waveform to derive TR	No	
Use 6' Waveform to derive TR	No	
3' Waveform Discriminator Level	0.30	mV
4' Waveform Discriminator Level	0.30	mV
5' Waveform Discriminator Level	0.15	mV
6' Waveform Discriminator Level	0.15	mV
Waveform Discriminator Filter	Not Applied	
Semblance Window Width	150.00	micro-sec
Semblance Processing Enabled	Yes	
Tracking Boxes Enabled In Processing	Yes	

Induction Calibration MAI-A.A 111

Factory Loop Calibration 17-MAR-2019 17:11
Field Check on 21-MAR-2019 09:38

Factory Loop Calibration

High Conductivity Reference Resistor	3.3	ohm
Low Conductivity Reference Resistor	333.3	ohm

Array	Measured Signal (unitless) Low	High	Reference Conductivity (mmho/m) Low	High	Calibration Gain	Offset
1 (near)	17.6	473.6	9.3	966.2	2.099	-27.8

2	6.4	385.9	7.6	821.4	2.144	-6.1
3	3.2	264.0	5.2	566.0	2.150	-1.6
4 (far)	2.1	135.5	2.6	279.2	2.074	-1.8

Array Temperature 23.0 Deg F

Tool Checks

	Factory Reference (mmho/m)		Before Survey (mmho/m)		
Array	Low	High	Low	High	
1 (near)	8.9	3838.6	9.7	3837.6	
2	27.2	3497.1	27.8	3497.5	
3	26.8	2994.8	27.4	2995.9	
4 (far)	17.6	2040.6	18.0	2040.9	
Array Temperature		70.6		62.2	Deg F

Induction Check Tolerances MAI-A.A 111

Low Array 1	9.7	7.4 8.9 10.4	mmho/m	High Array 1	3837.6	-0.5% 3838.6 +0.5% mmho/m
Low Array 2	27.8	25.7 27.2 28.7	mmho/m	High Array 2	3497.5	-0.5% 3497.1 +0.5% mmho/m
Low Array 3	27.4	25.3 26.8 28.3	mmho/m	High Array 3	2995.9	-0.5% 2994.8 +0.5% mmho/m
Low Array 4	18.0	16.1 17.6 19.1	mmho/m	High Array 4	2040.9	-0.5% 2040.6 +0.5% mmho/m

Induction Constants MAI-A.A 111

Last Edited on 21-MAR-2019,22:56

Induction Model	RtAP-WBM	
Borehole Correction Constants		
Tool Centred	No	
Hole Size Source	Density Caliper	
Hole Size Constant Value	N/A	inches
Stand-off Type	Pineapple	
Stand-off	0.49	inches
Number of Fins on Stand-off	5.0000	
Stand-off Fin Angle	72.00	degrees
Stand-off Fin Width	1.3878	inches
Rm Source	Global Value: Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	
Borehole Correction Method	Default	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
SRM2	0.0000	SRC2	0.0000

Calibration Site Corrections

Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Symmetrised Receiver Gains

Receiver 1	1.00
Receiver 2	1.00
Receiver 3	1.00
Receiver 4	1.00

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m

Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

High Resolution Temperature Calibration MAI-A.A 111

Field Calibration on 21-MAR-2019,09:38

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	100.00	100.00

High Resolution Temperature Constants MAI-A.A 111

Last Edited on 26-JUN-2014,15:06

Pre-filter Length	11

Caliper Calibration MPD-C.A 216

Base Calibration on 21-MAR-2019 10:44
Field Calibration on 21-MAR-2019 10:45

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	16416	3.99
2	24992	5.98
3	33618	7.97
4	41920	9.86
5	51021	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.96	7.97

Caliper Calibration Tolerances MPD-C.A 216

		7.57	7.97	8.37	
Long Arm Field Cal.	7.96				in

Photo Density Calibration MPD-C.A 216

Base Calibration on 13-MAR-2019 13:15
Field Check on 21-MAR-2019 10:28

Density Calibration

Base Calibration	Measured Near	Measured Far	Calibrated (sdu) Near	Calibrated (sdu) Far
Background	993	1178		
Reference 1	49484	24265	59556	30836
Reference 2	19819	2323	24941	2541

Field Check at Base

Near	Far
992.5	1177.7

Field Check

Near	Far
988.7	1170.7

PE Calibration

Base Calibration	WS	Measured WH	Measured Ratio	Calibrated Ratio
Background	179	888		
Reference 1	20495	49325	0.419	0.371
Reference 2	5677	19711	0.292	0.272

Field Check at Base

WS	WH
179.0	888.4

Field Check

WS	WH
180.5	888.3

Photo Density Calibration Tolerances MPD-C.A 216

Near Density Ratio	2.58	-5%	2.52	+5%	Far Density Ratio	20.15	-5%	21.00	+5%
PE Calibration	0.119	0.089	0.110	0.131					
Near Den. Field Check	988.7	-3%	992.5	+3%	Far Den. Field Check	1170.7	-3%	1177.7	+3%
PE WS Field Check	180.5	-6%	179.0	+6%	PE WH Field Check	888.3	-6%	888.4	+6%

Density Constants MPD-C.A 216

Last Edited on 21-MAR-2019,22:15

Density Source Id	P50557B	
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 Type		
Mud Filtrate Density	1.00	gm/cc
Dry Hole Mud Filtrate Density	1.00	gm/cc
DNCT	0.00	gm/cc
CRCT	0.00	gm/cc
Density Z/A Correction	Hybrid	
Precision Enhanced Density Processing	Applied	

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	

DOWNHOLE EQUIPMENT

C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta

Cablehead, 11 pin
CBH-CB 267 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 722 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-log
MML-A 7 LG: 7.97 ft WT: 81.6 lb OD: 2.240 in

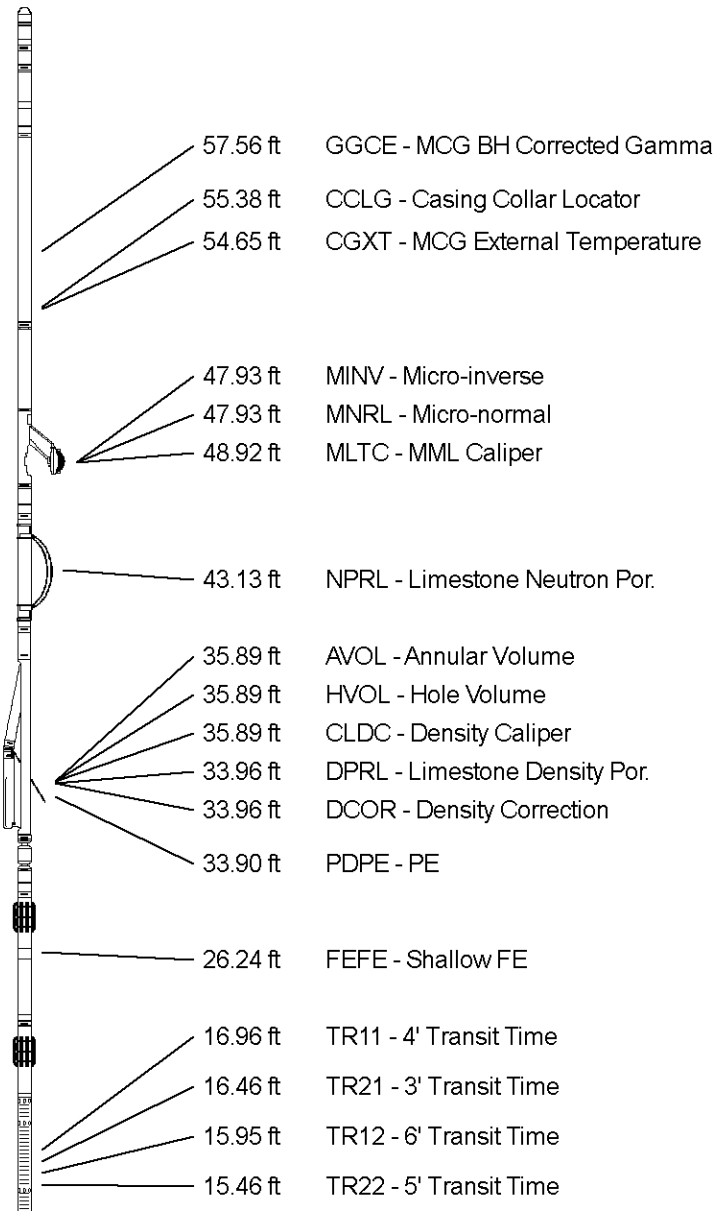
Compact Neutron
MDN-B.A 295 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Knuckle Joint
SKJ-E.B 733 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

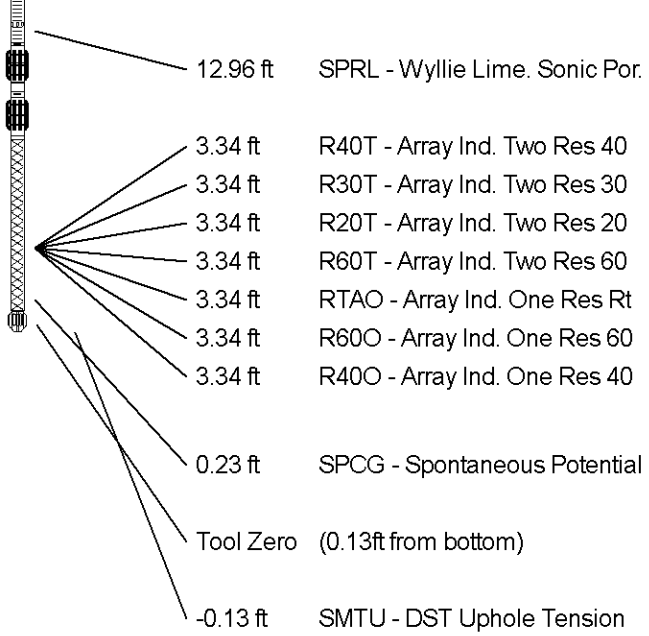
Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Sonic
MSS-C.K 308 LG: 12.52 ft WT: 72.8 lb OD: 2.244 in



Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 67.54 ft Weight: 526.9 lb



All measurements relative to tool zero.

COMPANY	BLACK OAK EXPLORATION
WELL	FRISIBIE FAMILY 1-15
FIELD	WILDCAT
PROVINCE/COUNTY	RAWLINS
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3335	feet	First Reading	4862.00	feet
Elevation Drill Floor	3333	feet	Depth Driller	4860.00	feet
Elevation Ground Level	3330	feet	Depth Logger	4865.00	feet

Weatherford®

SHALLOW FOCUSED
ARRAY INDUCTION
ELECTRIC LOG

COMPANY	BLACK OAK EXPLORATION
WELL	FRISIBIE FAMILY 1-15
FIELD	WILDCAT
PROVINCE/COUNTY	RAWLINS
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	SE NW NW SE 2180' FSL & 2300' FEL
	SE NE NW SE
PERMIT NUMBER	
SEC 15 TWP 28 RGE 36W Other Services	
Latitude	39.865833 MPD/MDN
Longitude	-101.360000 MML
API Number	15-153-21221
Permanent Datum GL Elevation 3330 feet	MSS
Log Measured From KB, 5.00 feet above Permanent Datum	
Drilling Measured From KB	

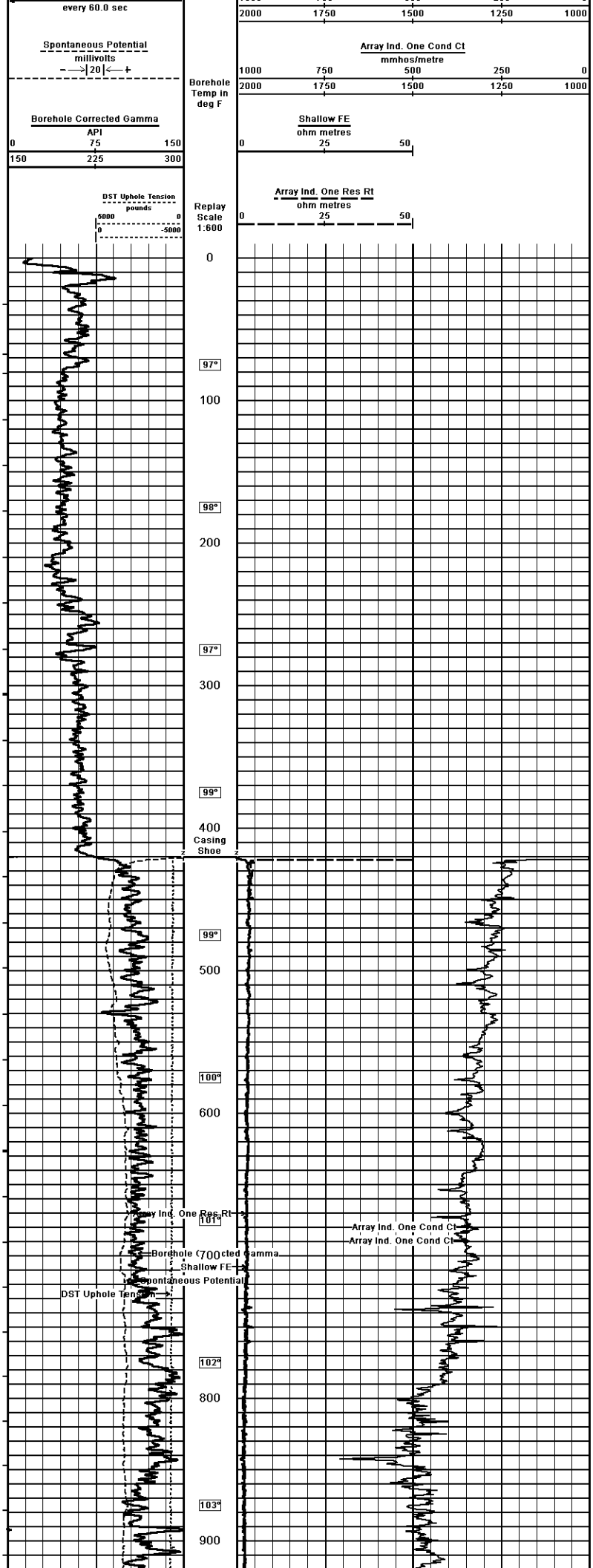
Elevations:	feet
KB	3335.00
DF	3333.00
GL	3330.00

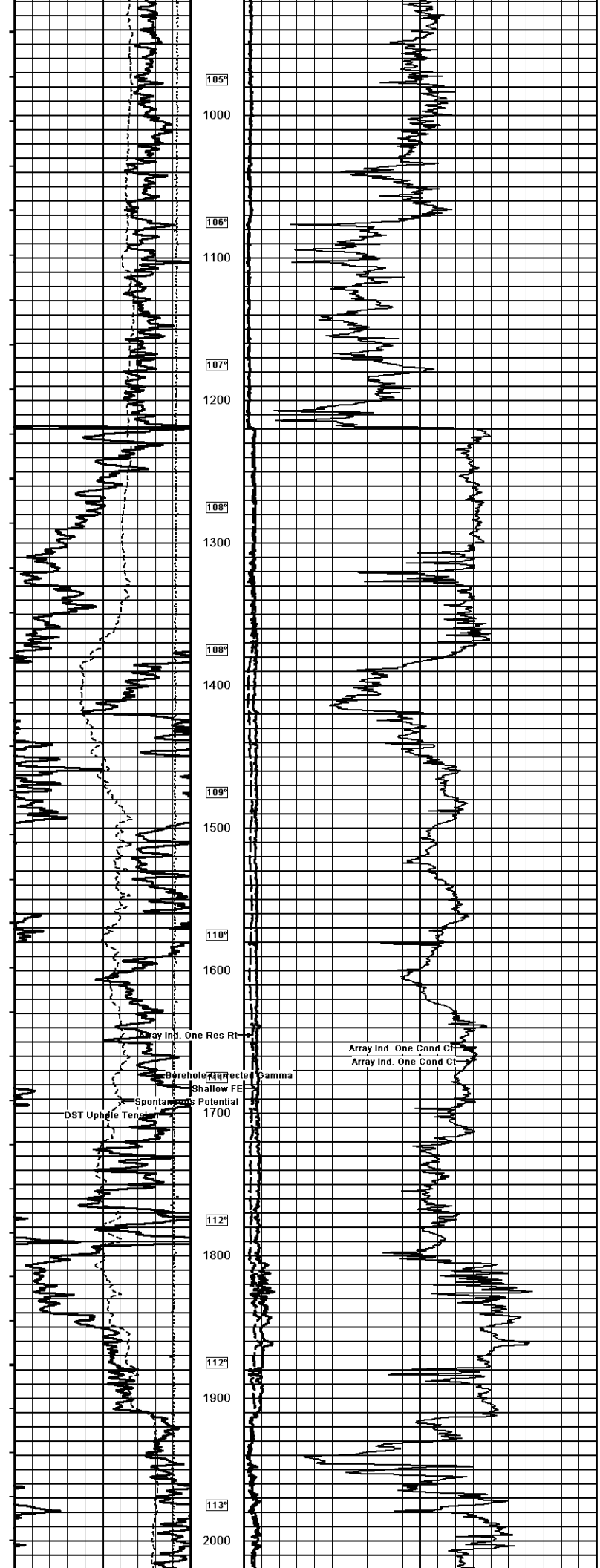
Date	21-MAR-2019	
Run Number	ONE	
Service Order	17937-24384345	
Depth Driller	4860.00	feet
Depth Logger	4865.00	feet
First Reading	4862.00	feet
Last Reading	0.00	feet
Casing Driller	420.00	feet
Casing Logger	420.00	feet
Bit Size	7.875	inches
Hole Fluid Type	CHEMICAL	
Density/ Viscosity	9.00 lbm/Usg	65.00 sec/qt
PH / Fluid Loss	10.00	8.80 ml/30Min
Sample Source	FLOWLINE	
Rm @ Measured Temp	1.04 @103.0	ohm-m
Rmf @ Measured Temp	0.83 @103.0	ohm-m
Rmc @ Measured Temp	1.25 @103.0	ohm-m
Source Rmf / Rmc	CALC	CALC
Rm @ BHT	0.80 @135.0	ohm-m
Time Since Circulation	4 HOURS	
Max Recorded Temp	135.00	deg F
Equipment / Base	LIB	LIB
Recorded By	MATT MCGLOTHLIN	
Witnessed By	CLAYTON CAMOZZI	

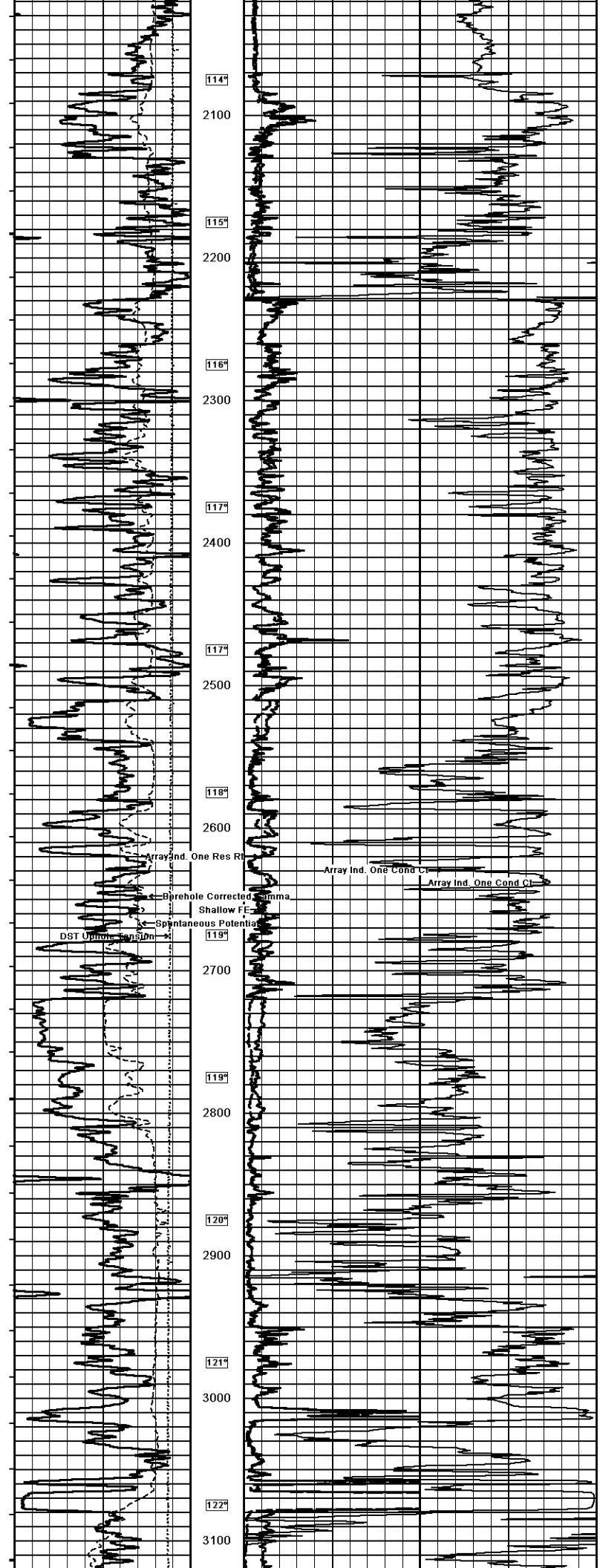
1 INCH MAIN 1:600

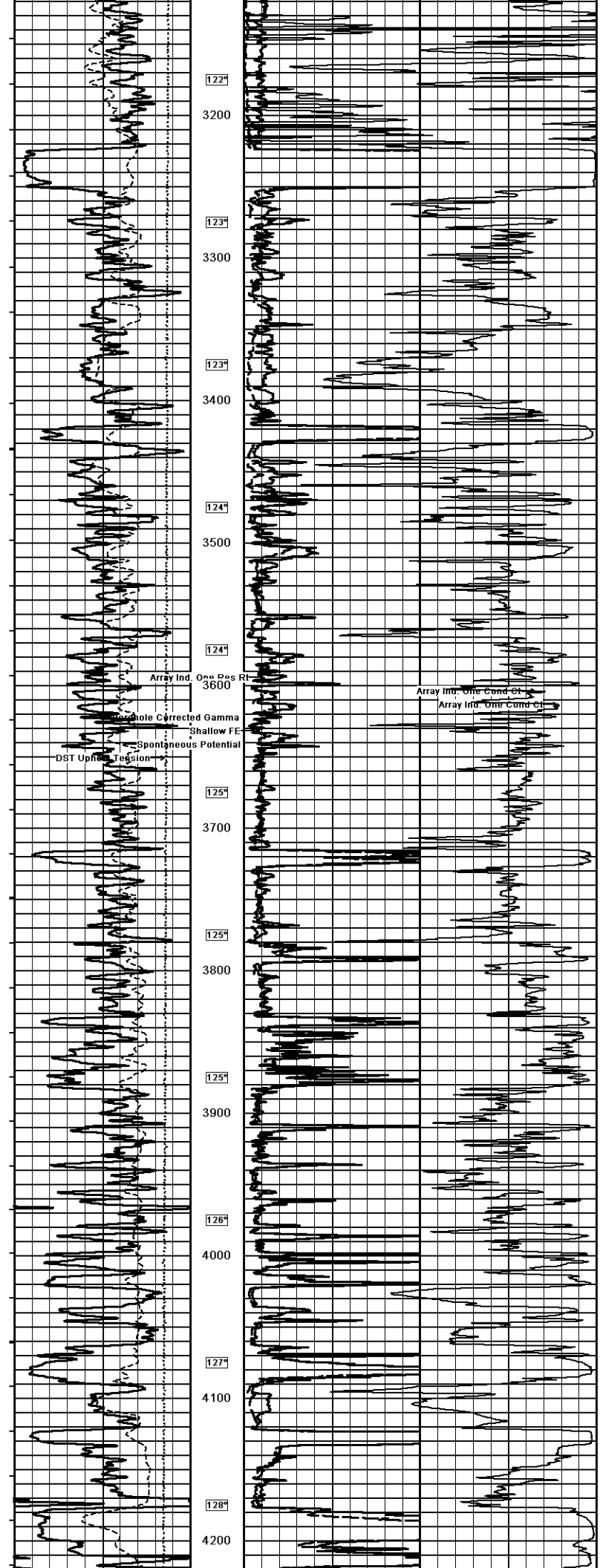
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 22-MAR-2019 08:17
Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta — Recorded on 22-MAR-2019 00:23
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

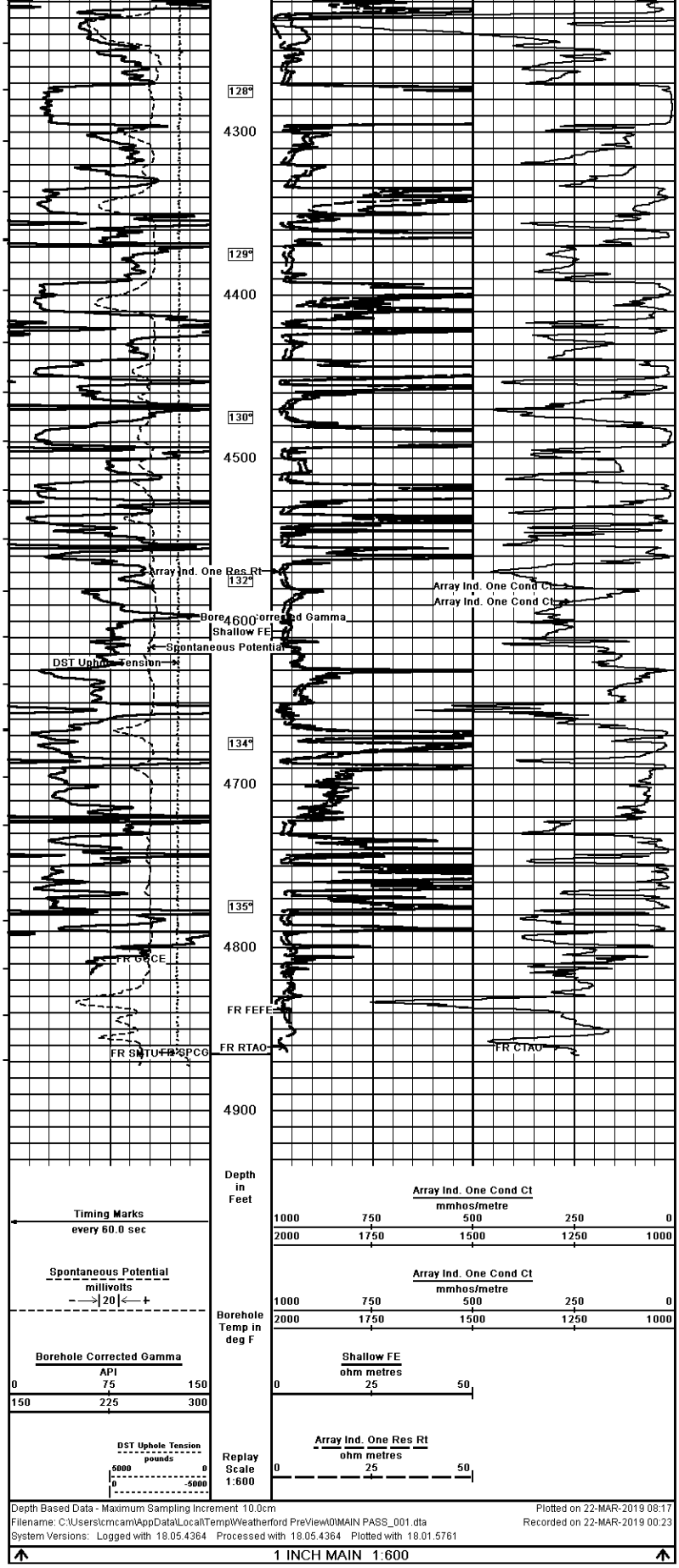
Timing Marks	Depth in Feet	Array Ind. One Cond Ct mmhos/metre 1000	750	500	250	0
	3300					
	3400					
	3500					
	3600					
	3700					
	3800					
	3900					
	4000					
	4100					
	4200					
	4300					
	4400					
	4500					
	4600					
	4700					
	4800					
	4900					
	5000					


every 60.0 sec
Spontaneous Potential
millivolts
20
Borehole Corrected Gamma
API
0
75
150
225
300
DST Uphole Tension
pounds
5000
0
-5000
Borehole Temp in deg F
Replay Scale 1:600
2000
1750
1500
1250
1000
Array Ind. One Cond Ct
mmhos/metre
1000
750
500
250
0
Shallow FE
ohm metres
0
25
50
Array Ind. One Res Rt
ohm metres
0
100
200
300
400
Casing Shoe
500
600
700
800
900
97°
98°
99°
100°
101°
102°
103°
Array Ind. One Res Rt
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension


105"
1000
106"
1100
107"
1200
108"
1300
108"
1400
109"
1500
110"
1600
Array Ind. One Res Rt
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
1700
112"
1800
112"
1900
113"
2000


114°
2100
115°
2200
116°
2300
117°
2400
117°
2500
118°
2600
Array Ind. One Res Rt
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Upper Tension
119°
2700
119°
2800
120°
2900
121°
3000
122°
3100


122°
3200
123°
3300
123°
3400
124°
3500
124°
3600
Array Ind. One Res Rt
Array Ind. One Cond Ct
Array Ind. One Cond Ct
Borehole Corrected Gamma
Shallow FE
Spontaneous Potential
DST Uphole Tension
125°
3700
125°
3800
125°
3900
126°
4000
127°
4100
128°
4200



Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 22-MAR-2019 08:17
Filename: C:\Users\cmcam\AppData\Local\Temp\Weatherford PreView\0\MAIN PASS_001.dta
Recorded on 22-MAR-2019 00:23
System Versions: Logged with 18.05.4364 Processed with 18.05.4364 Plotted with 18.01.5761

1 INCH MAIN 1:600

COMPANY	BLACK OAK EXPLORATION
WELL	FRISIBIE FAMILY 1-15
FIELD	WILDCAT
PROVINCE/COUNTY	RAWLINS
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	3335	feet	First Reading	4862.00	feet
Elevation Drill Floor	3333	feet	Depth Driller	4860.00	feet
Elevation Ground Level	3330	feet	Depth Logger	4865.00	feet

SHALLOW FOCUSED
ARRAY INDUCTION

Weatherford ELECTRIC LOG