

**Weatherford****ARRAY INDUCTION
LOGS**

COMPANY

EAST CHEYENNE GAS STORAGE LLC

WELL

ECGS NO 6-14 WPD008-1

FIELD

PEETZ WEST

PROVINCE/COUNTY

LOGAN

COUNTRY/STATE

USA/COLORADO

LOCATION

NWNE 257' FNL & 1642' FEL

SEC

TWP
6 11NRGE
52WOther Services
MPD/MDN
CMI

API Number WPD008-1

Permit Number 05-075-09403

Permanent Datum GL, Elevation 4544 feet

Log Measured From KB

Drilling Measured From KB

Date 30-SEP-2012

ONE

ALL INTERVALS LOGGED AND CORRECTED PER CUSTOMER REQUEST.

LAT, LONG: 40.96288 N, 103.21683 W

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING =1770 CUBIC FEET

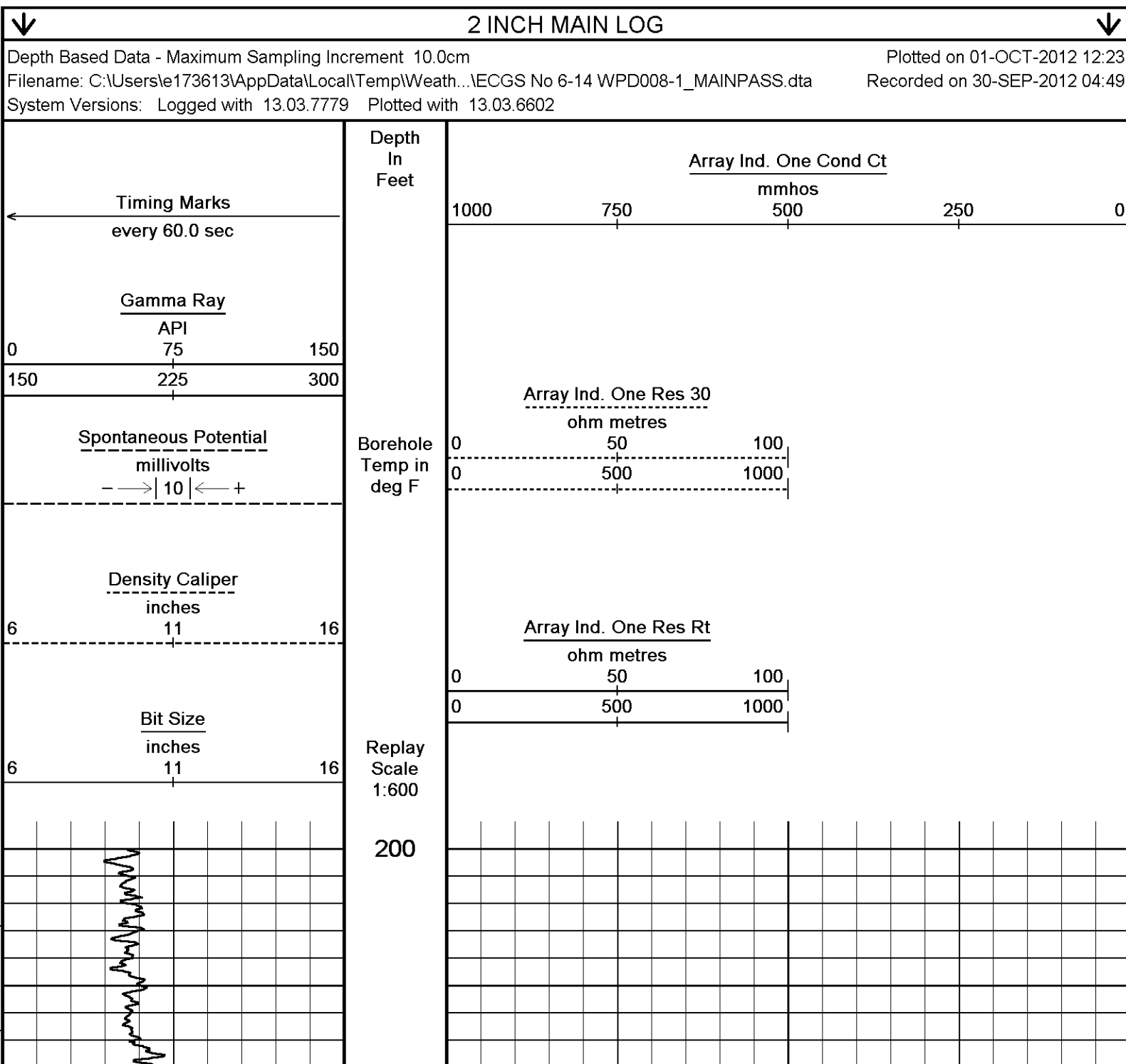
ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 700 CUBIC FEET

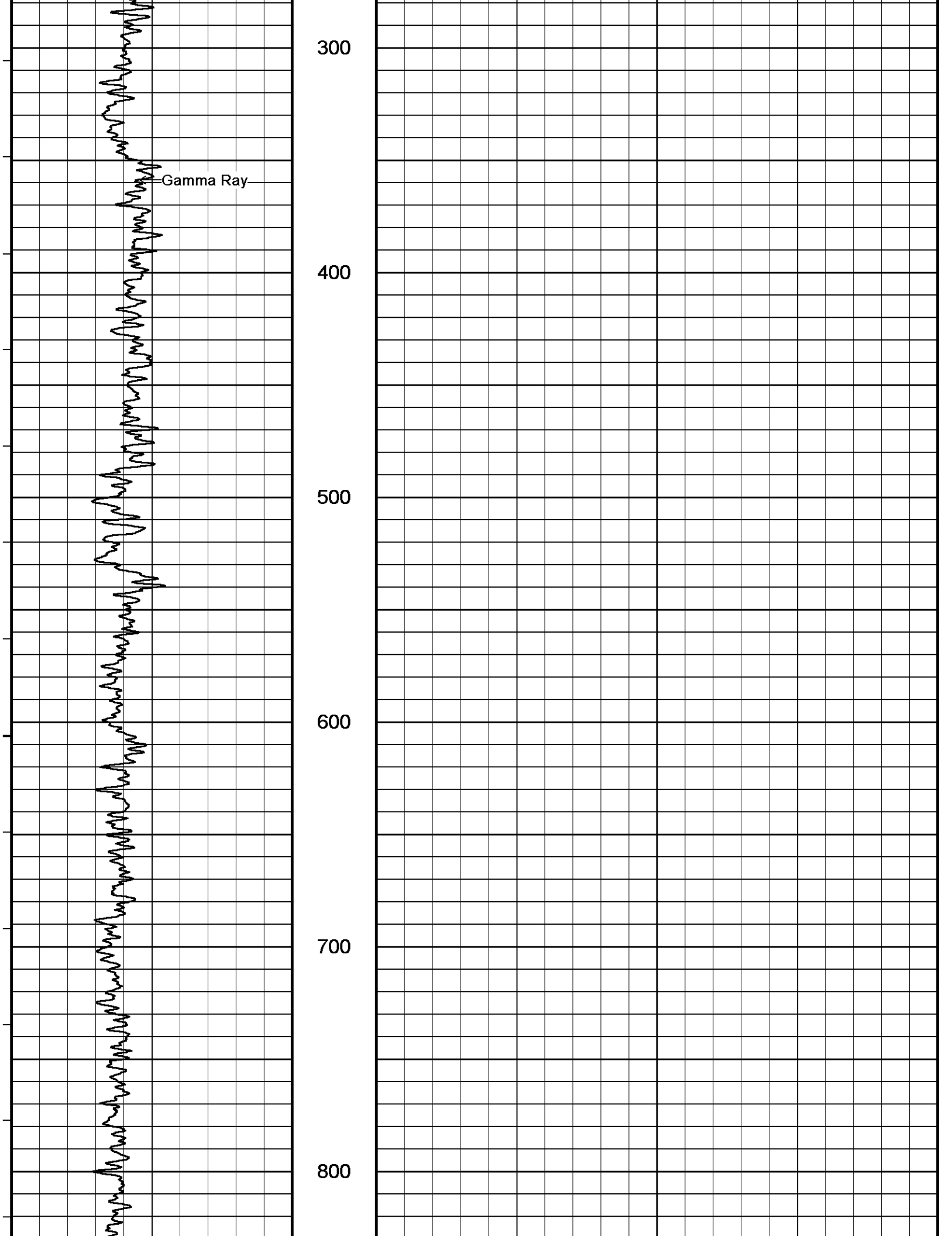
SERVICE ORDER: #3531928

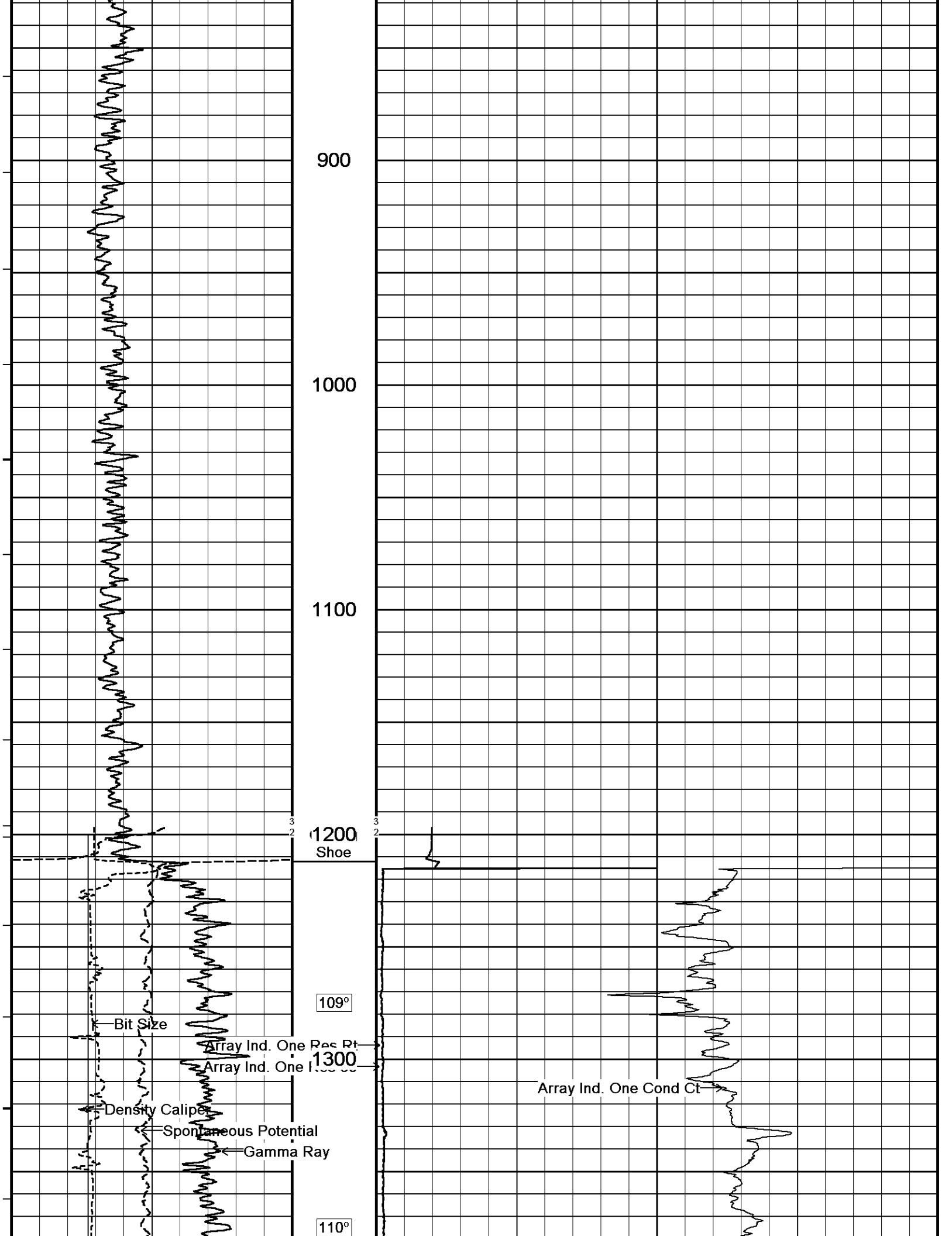
OPERATOR: D. SMITH
S.ELMORE

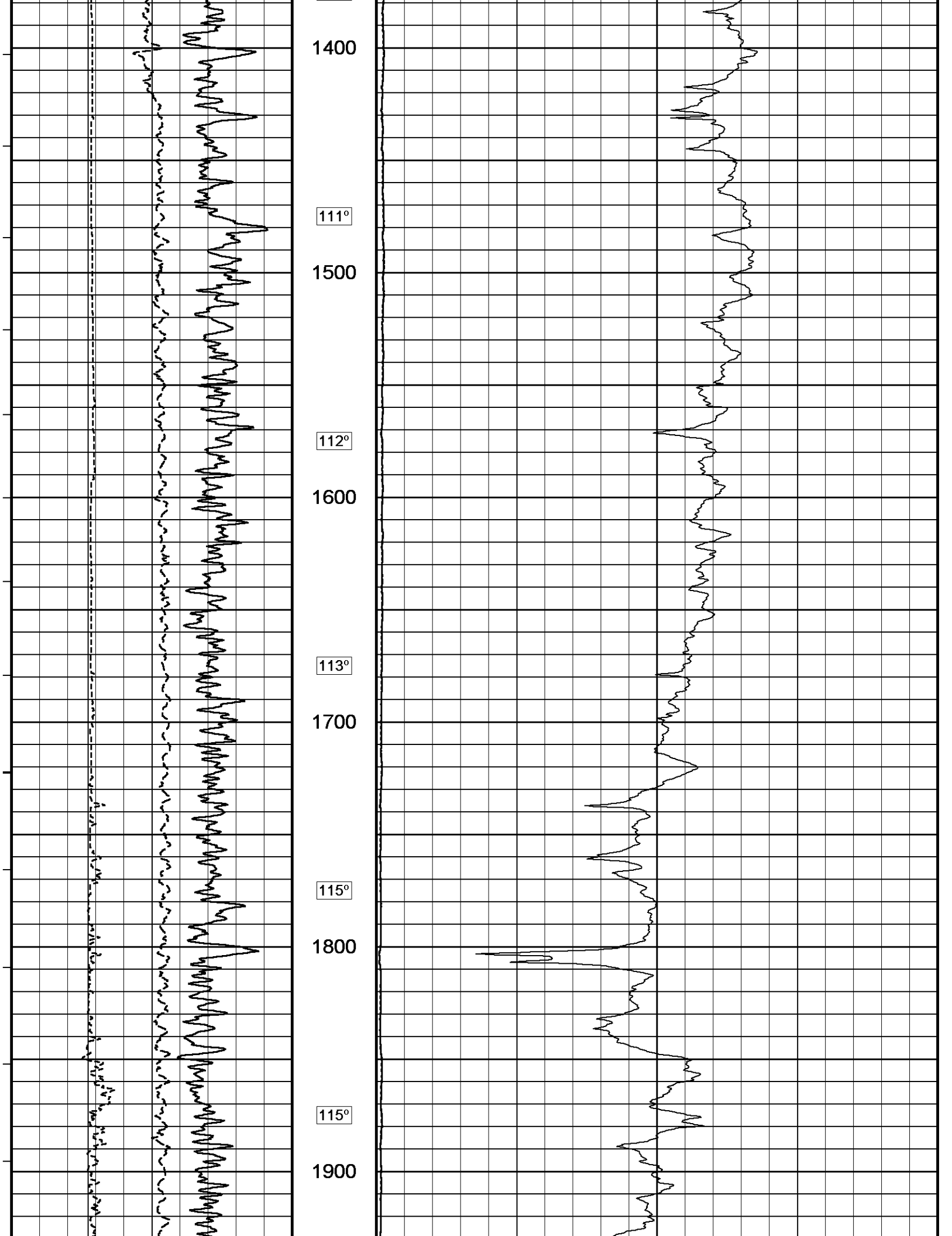
RIG: CADE 22

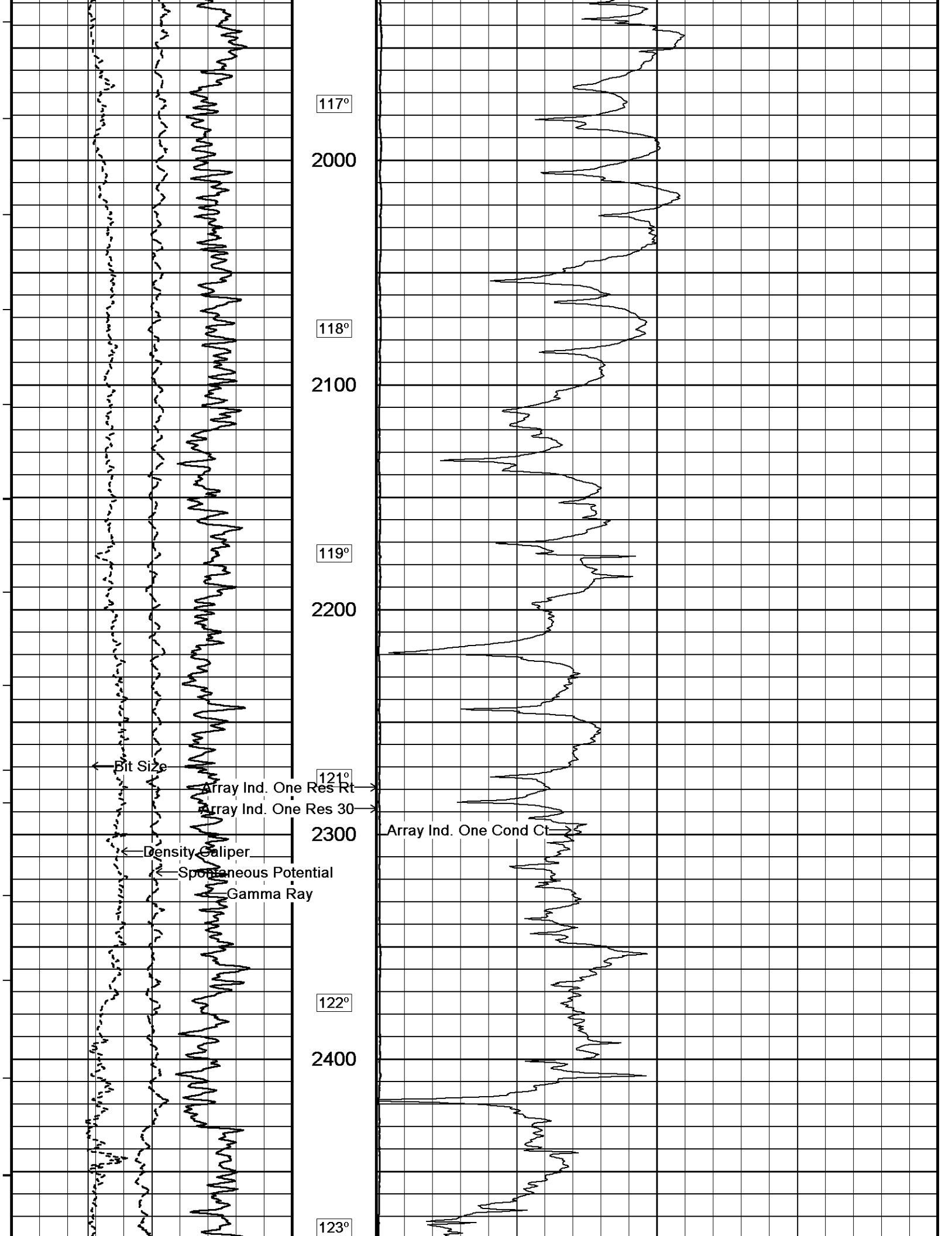
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs,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

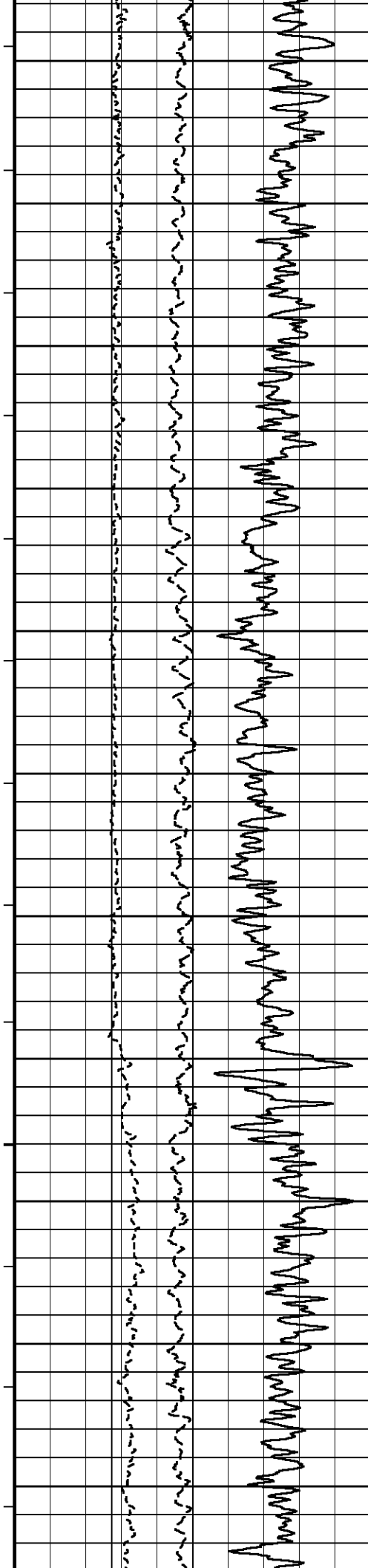




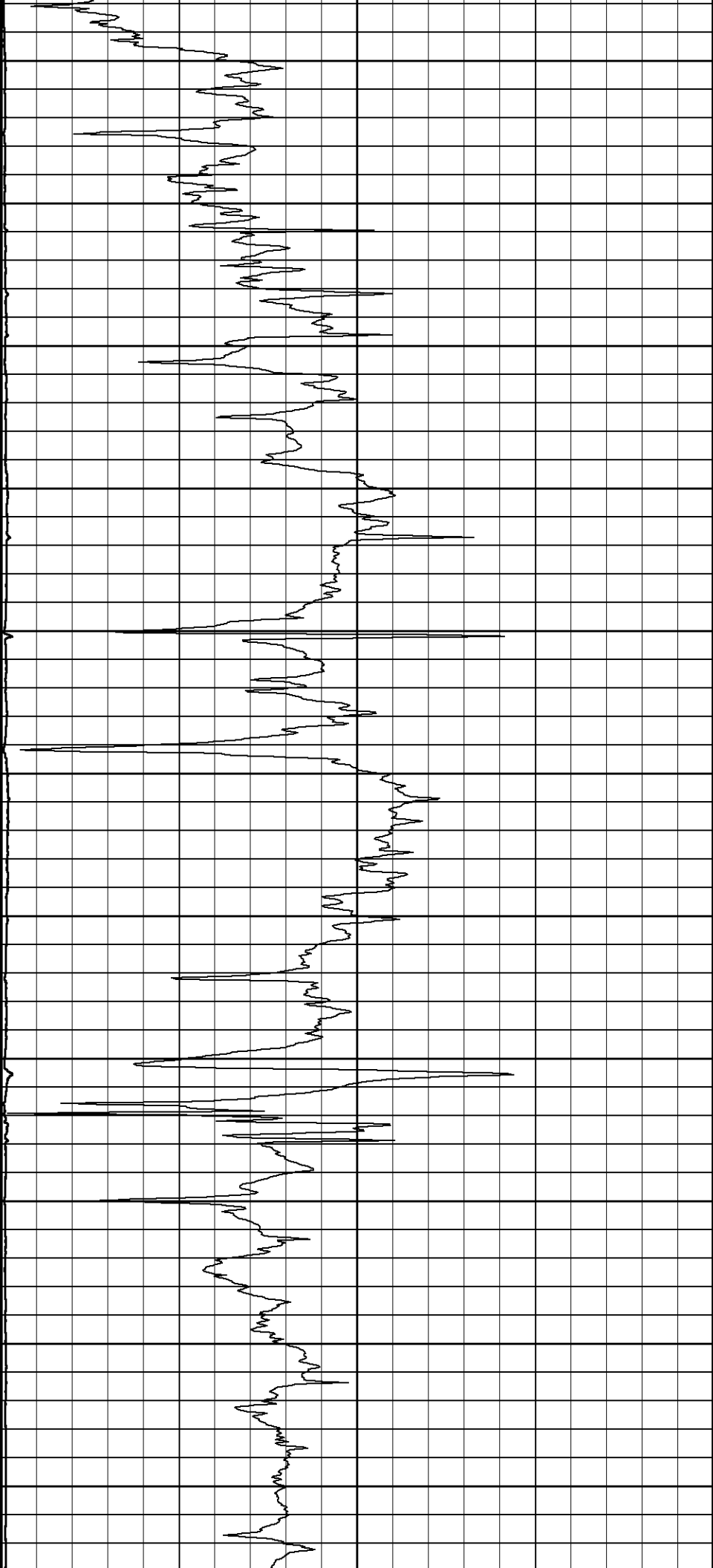


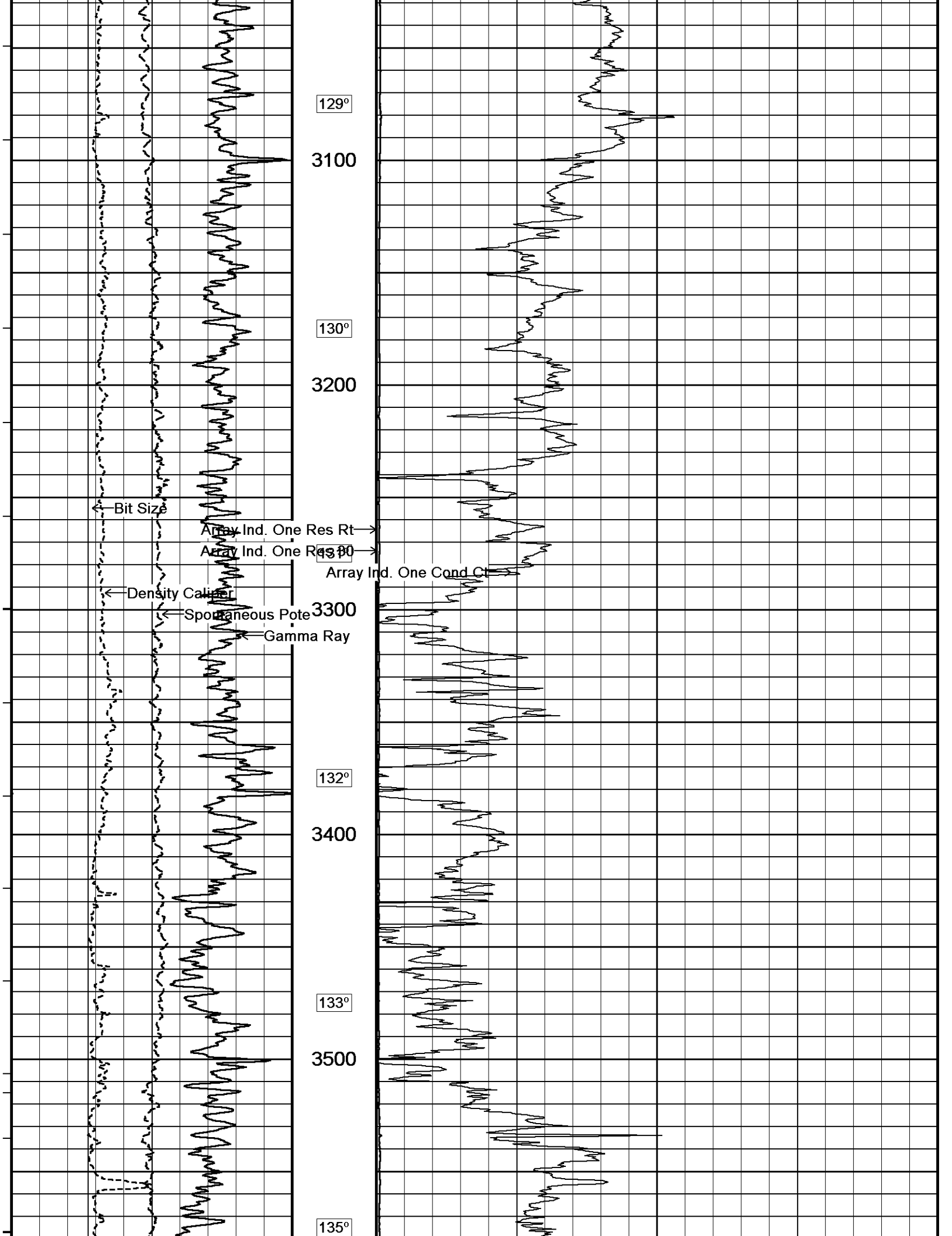


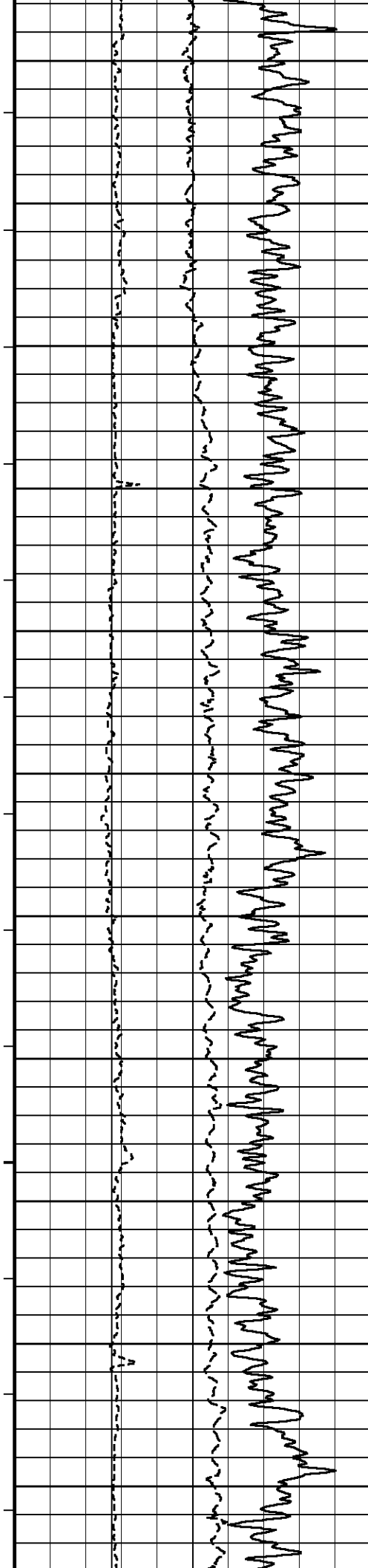




2500
124°
2600
125°
2700
125°
2800
127°
2900
128°
3000







3600

136°

3700

138°

3800

139°

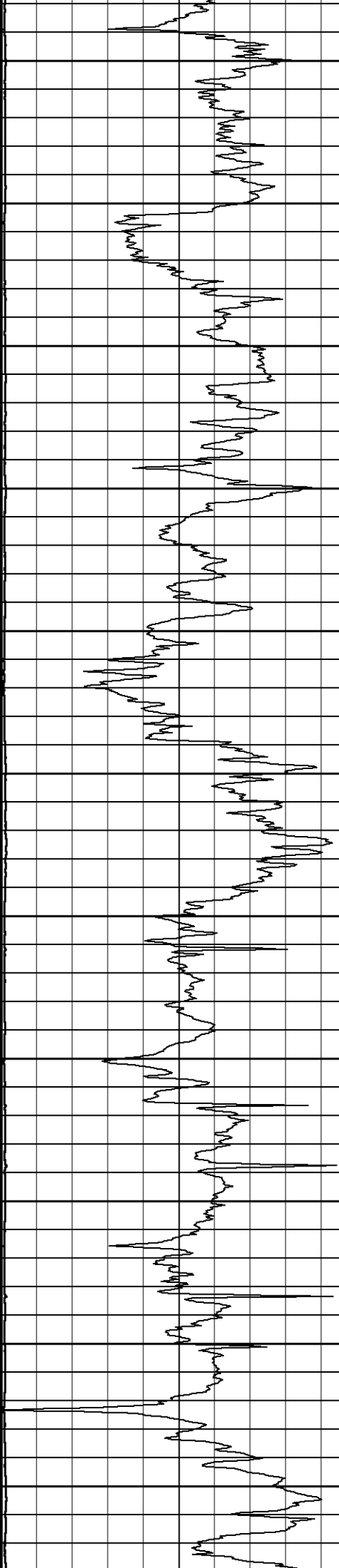
3900

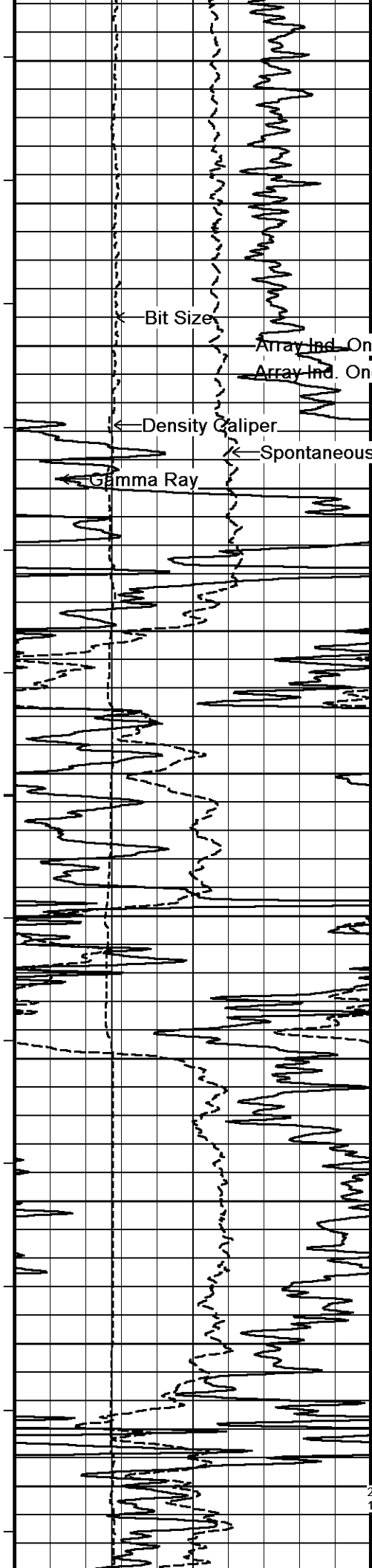
140°

4000

141°

4100





143°

4200

Bit Size

Array Ind. One Res Rt

Array Ind. One Res 30

Density Caliper

Spontaneous Potential

Gamma Ray

144°

4300

145°

4400

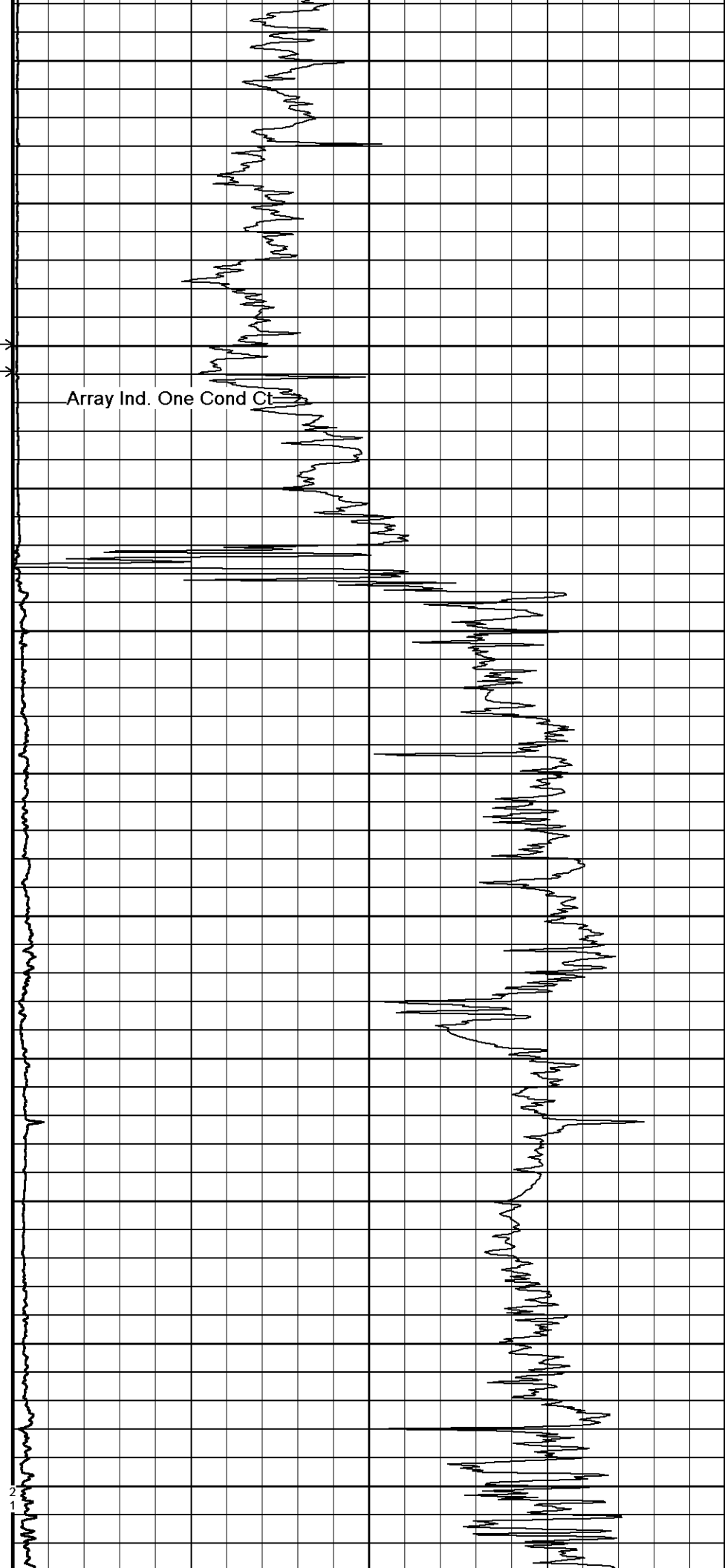
146°

4500

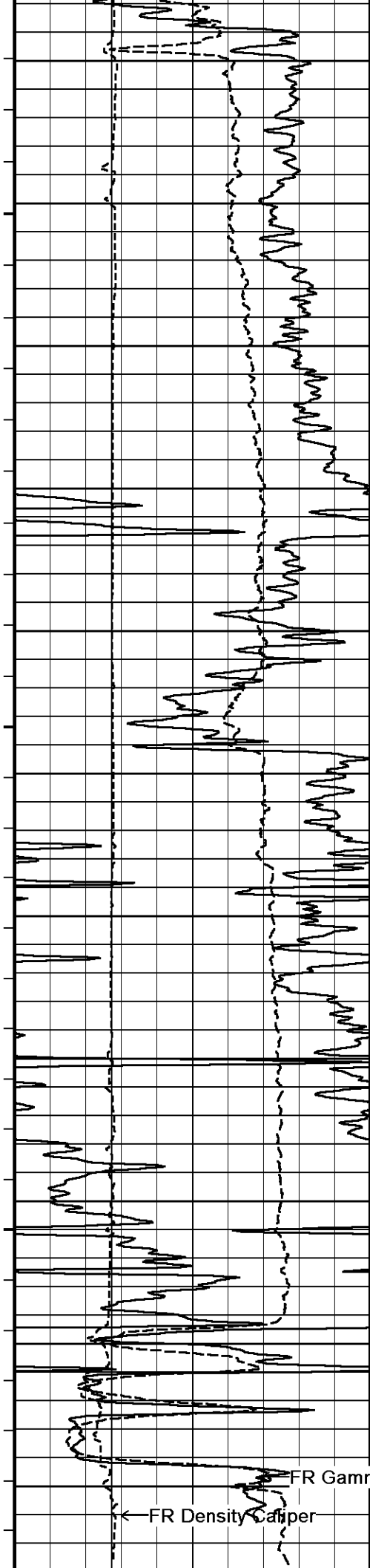
148°

4600

149°



Array Ind. One Cond Ct



4700

149°

4800

151°

4900

152°

5000

154°

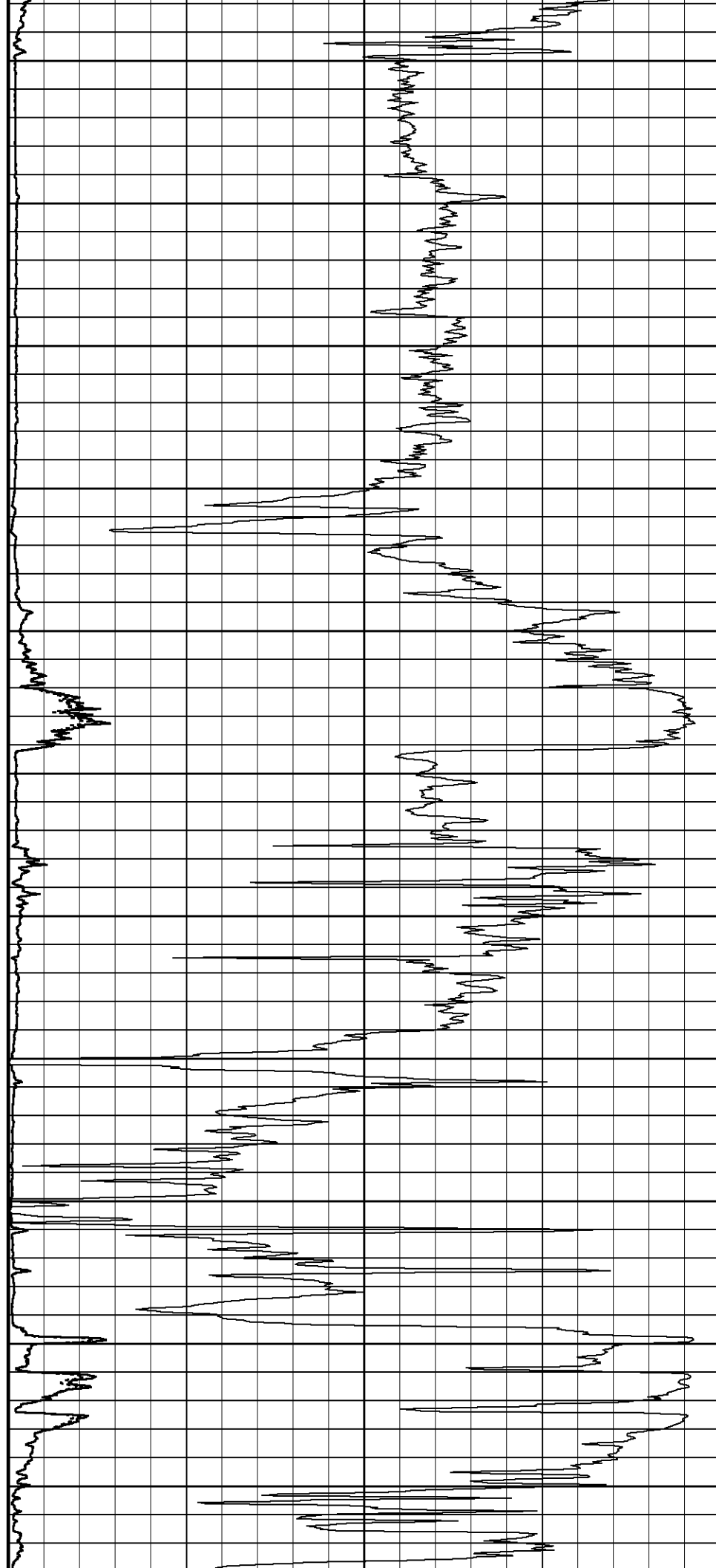
5100

154°

5200

FR Gamma

FR Density Caliper



FR Array Ind. Or FR Spontaneous Potential Cond Ct

5300

Depth
In
Feet

Timing Marks
every 60.0 sec

Gamma Ray

API

0 75 150
150 225 300

Spontaneous Potential

millivolts

- -> | 10 | <- +

Density Caliper

inches

6 11 16

Bit Size

inches

6 11 16

Borehole
Temp in
deg F

Array Ind. One Cond Ct
mmhos
1000 750 500 250 0

Array Ind. One Res 30

ohm metres

0 50 100
0 500 1000

Array Ind. One Res Rt

ohm metres

0 50 100
0 500 1000

Replay
Scale
1:600

Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: C:\Users\le173613\AppData\Local\Temp\Weath...\IECGS No 6-14 WPD008-1_MAINPASS.dta

System Versions: Logged with 13.03.7779 Plotted with 13.03.6602

Plotted on 01-OCT-2012 12:23

Recorded on 30-SEP-2012 04:49



2 INCH MAIN LOG



MAINPASS



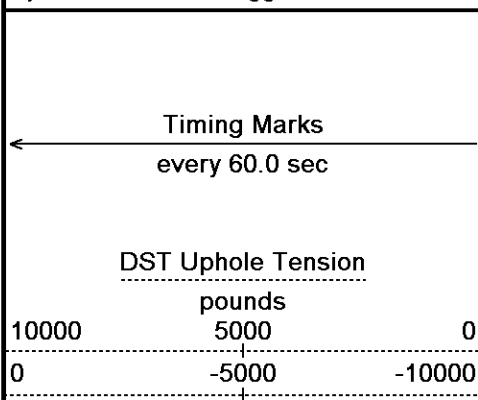
Depth Based Data - Maximum Sampling Increment 10.0cm

Filename: C:\Users\le173613\AppData\Local\Temp\Weath...\IECGS No 6-14 WPD008-1_MAINPASS.dta

System Versions: Logged with 13.03.7779 Plotted with 13.03.6602

Plotted on 01-OCT-2012 12:23

Recorded on 30-SEP-2012 04:49



Depth
In
Feet

Array Ind. One Res 20

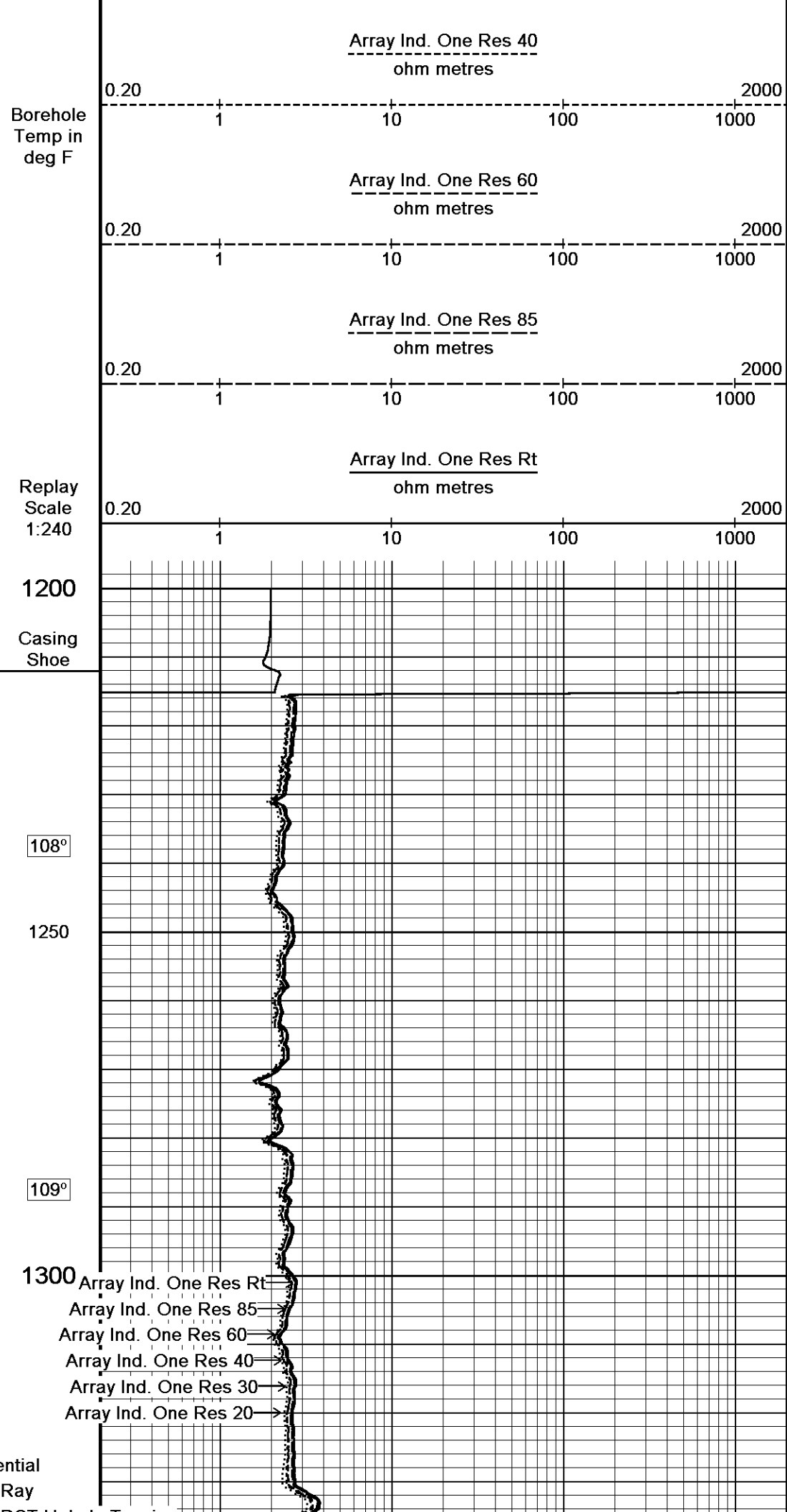
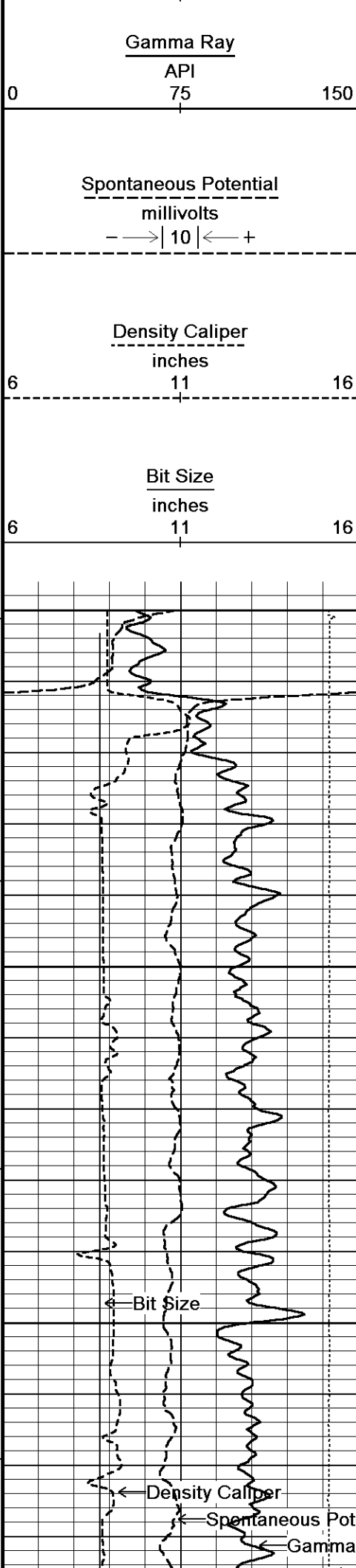
ohm metres

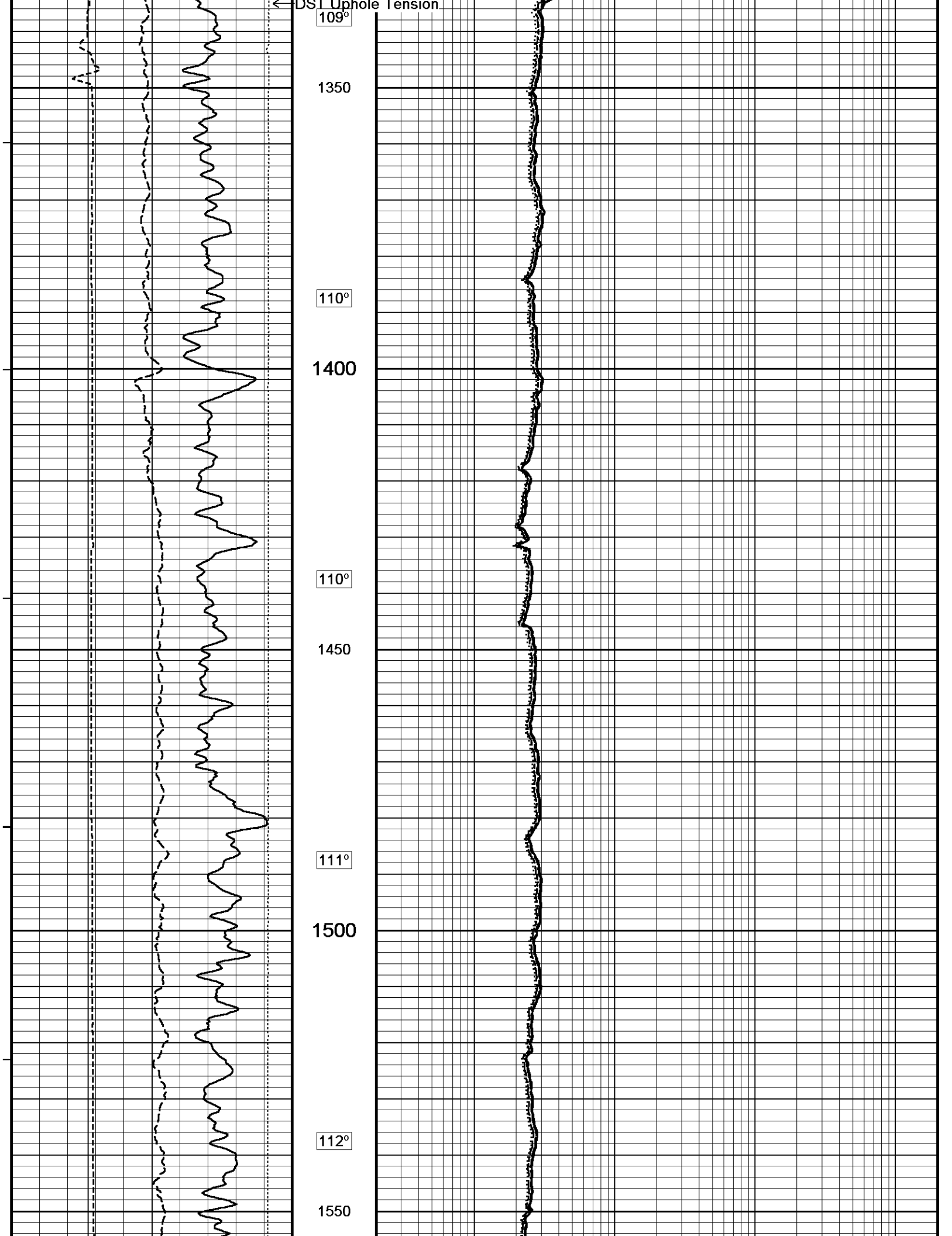
0.20 1 10 100 1000 2000

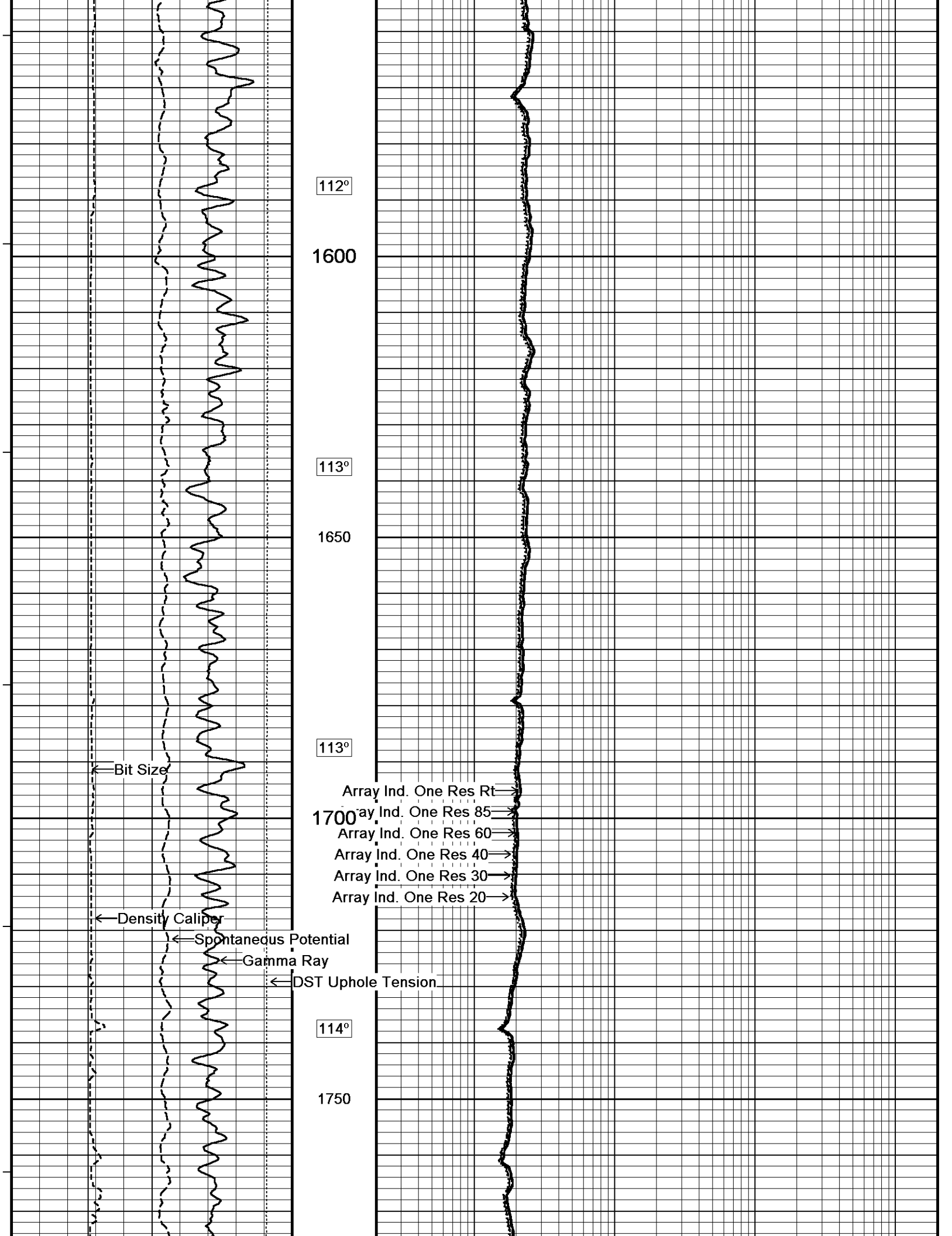
Array Ind. One Res 30

ohm metres

0.20 1 10 100 1000 2000









115°

1800

115°

1850

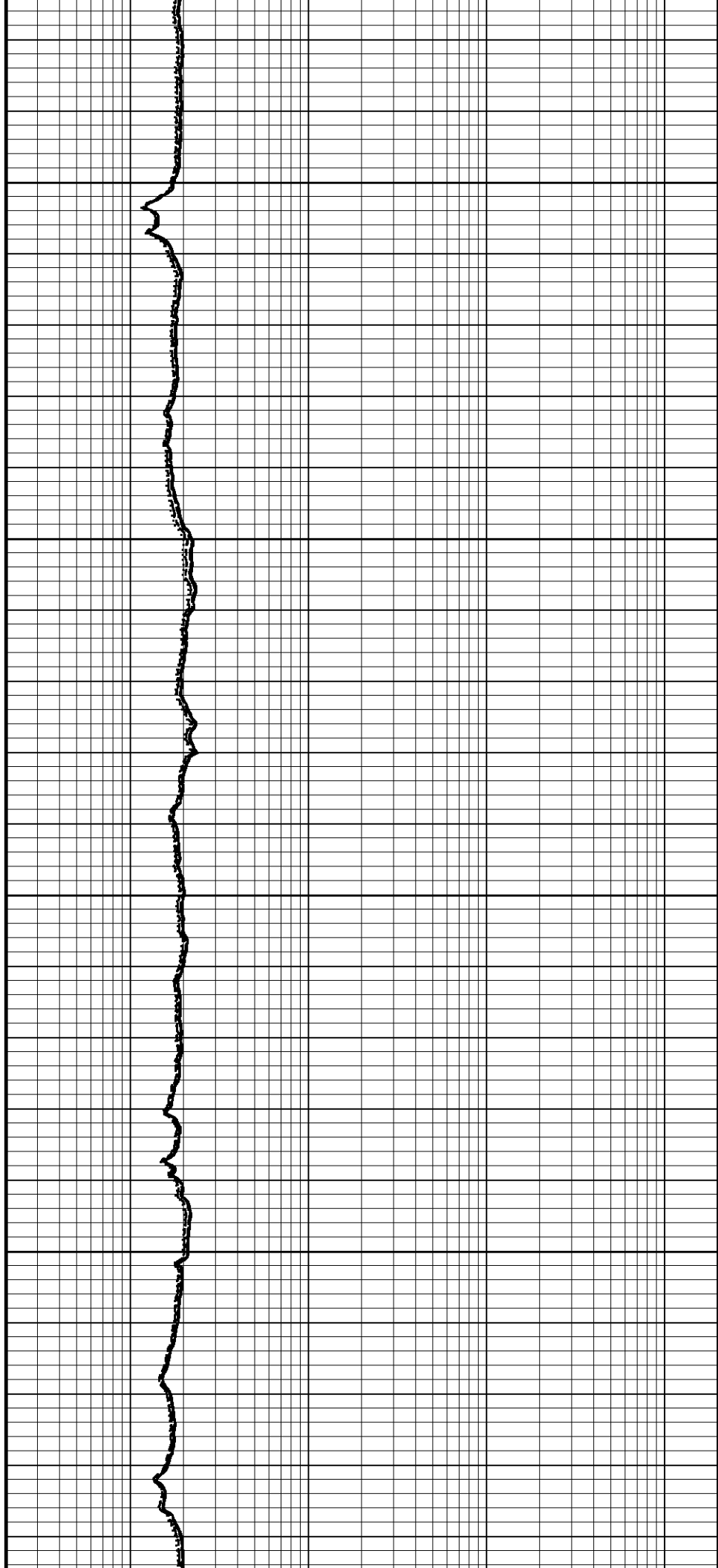
116°

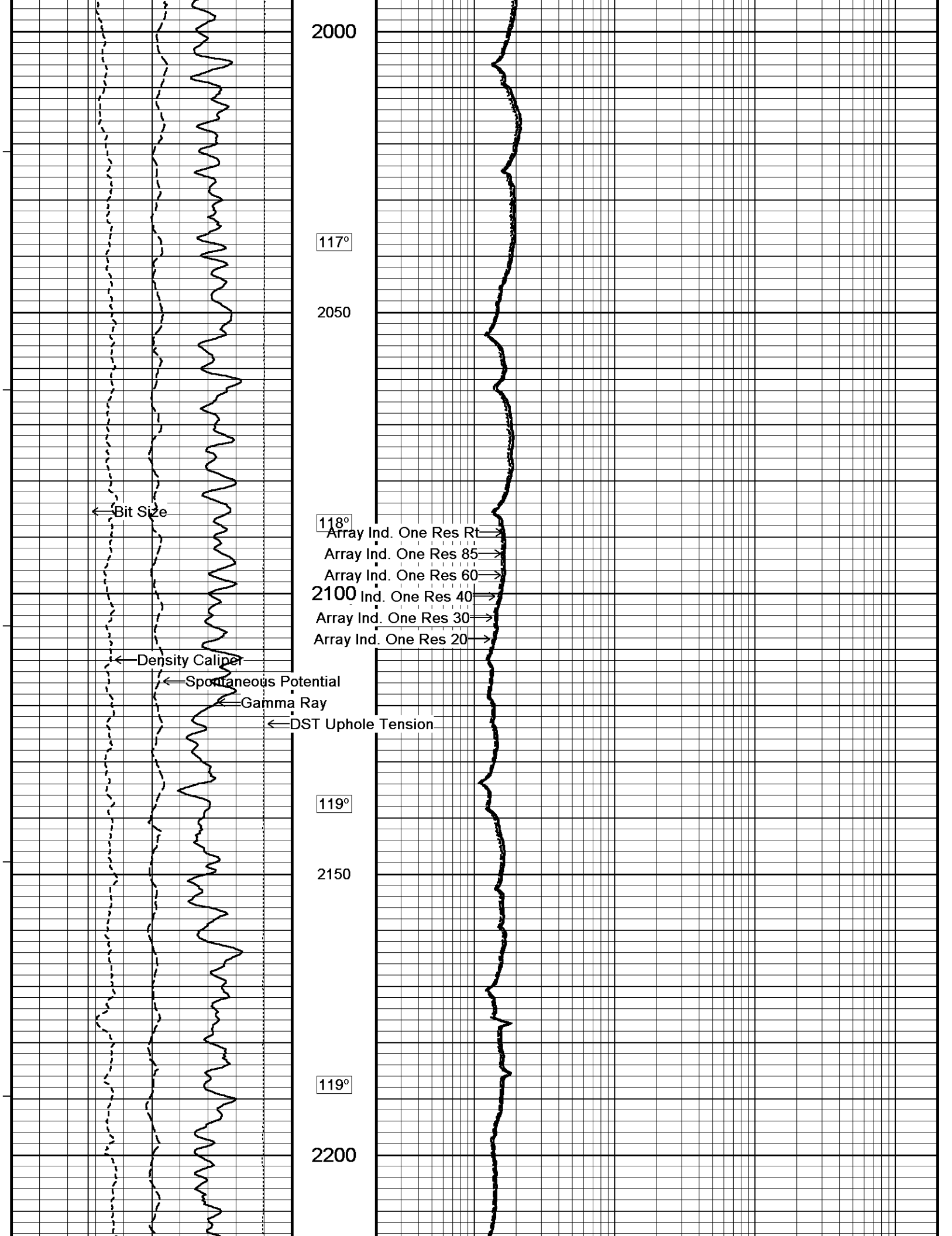
1900

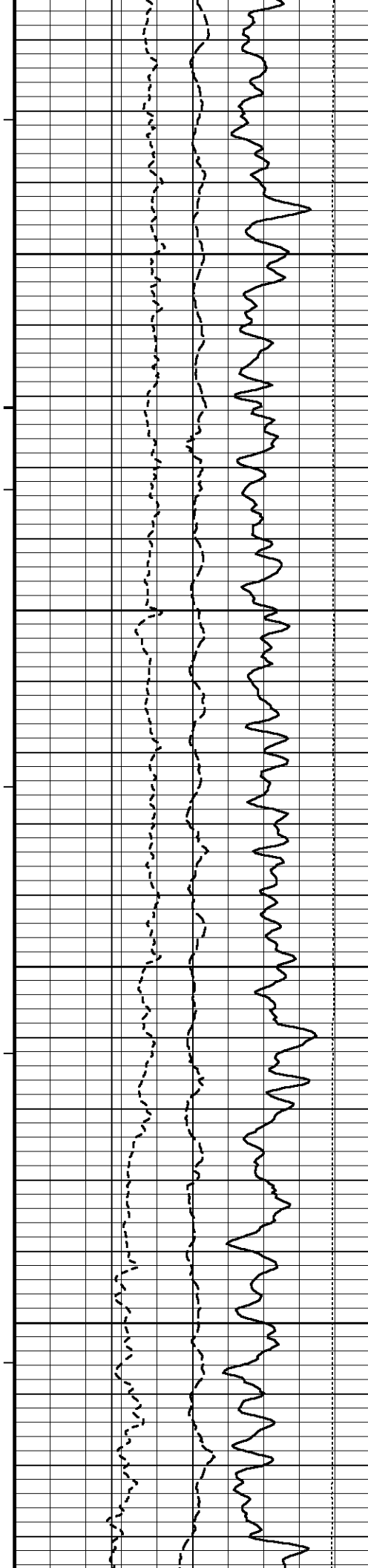
116°

1950

117°







119°

2250

121°

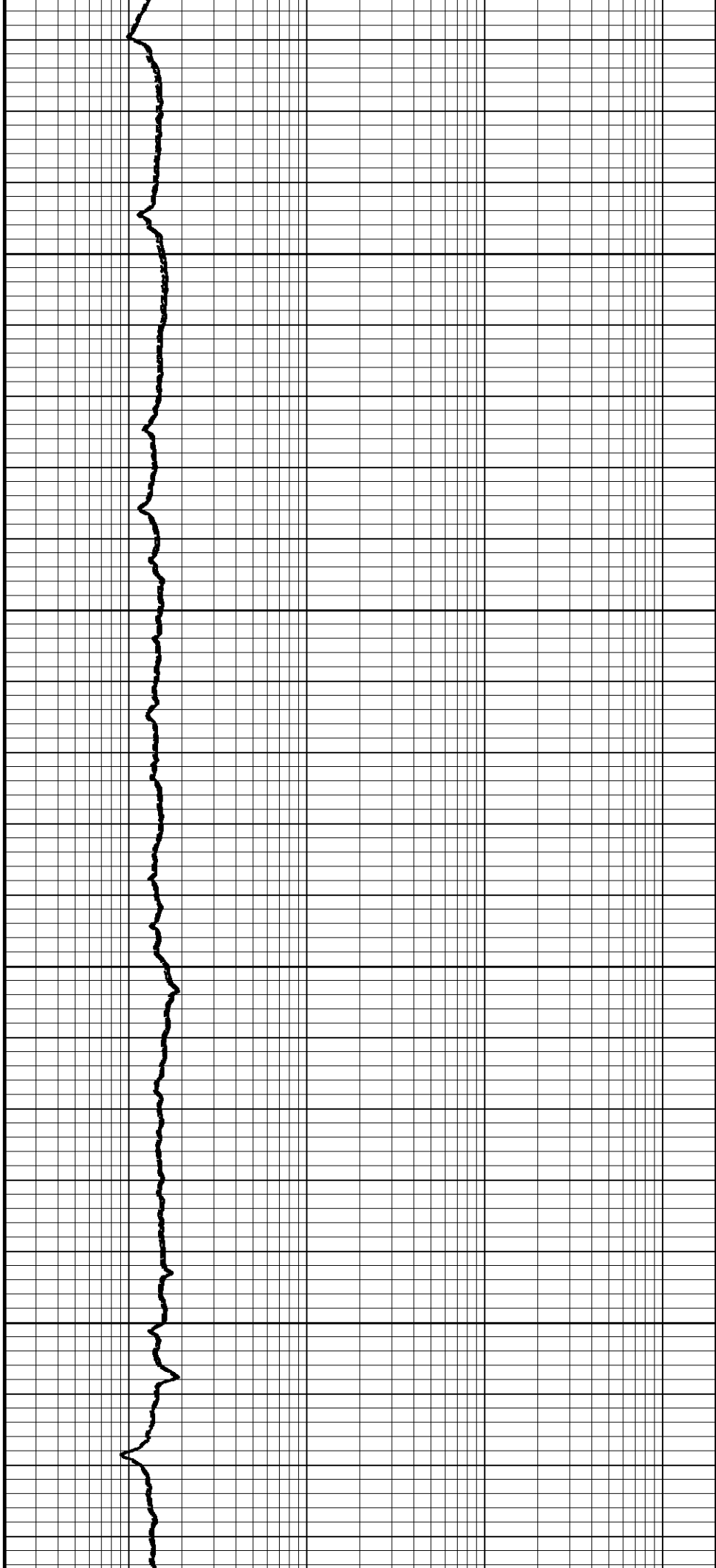
2300

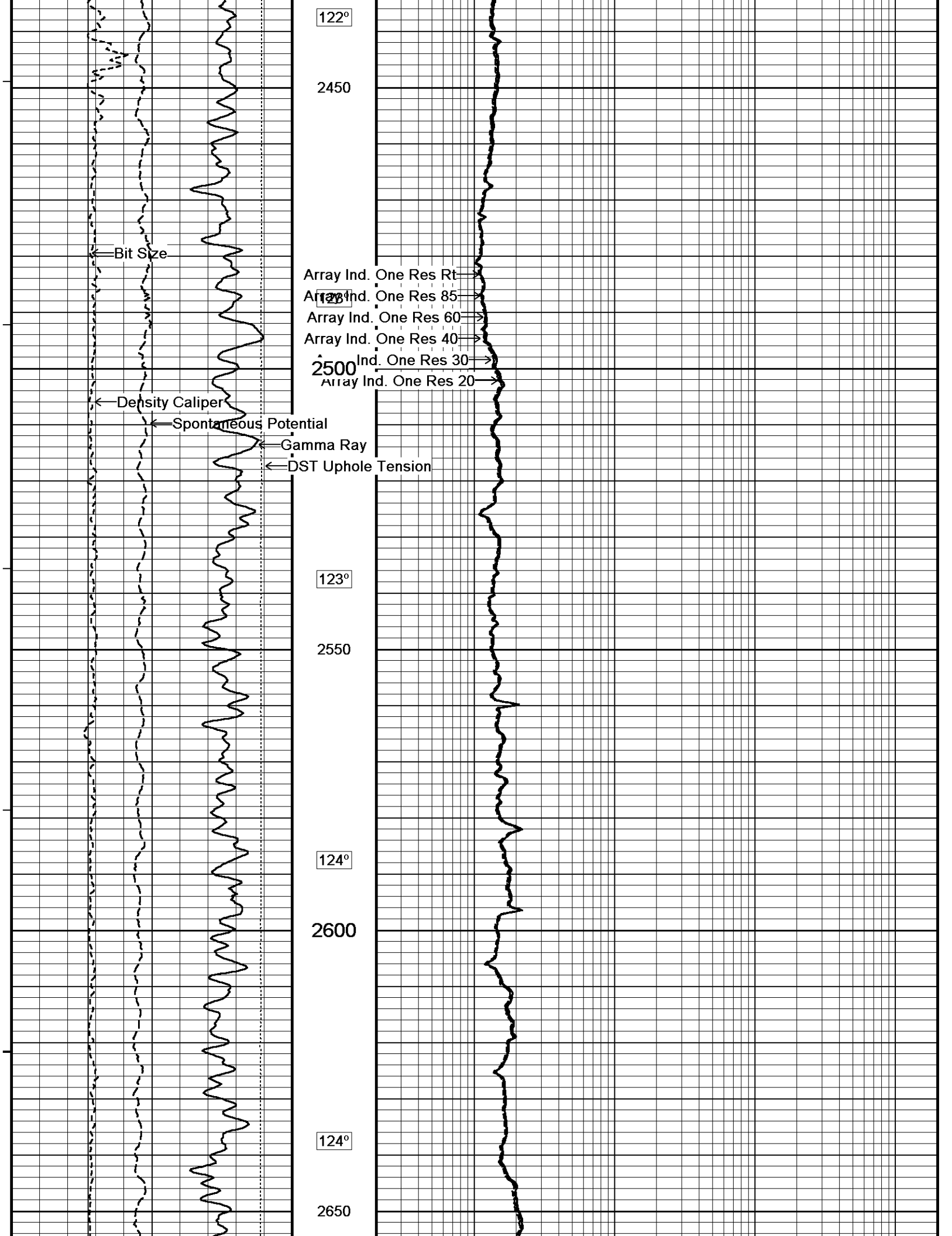
121°

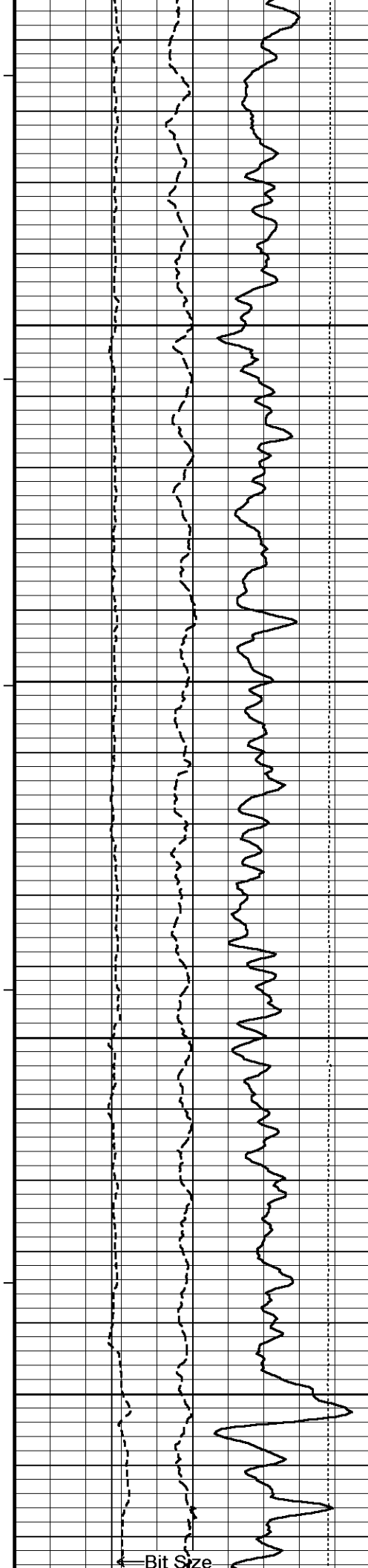
2350

122°

2400







125°

2700

125°

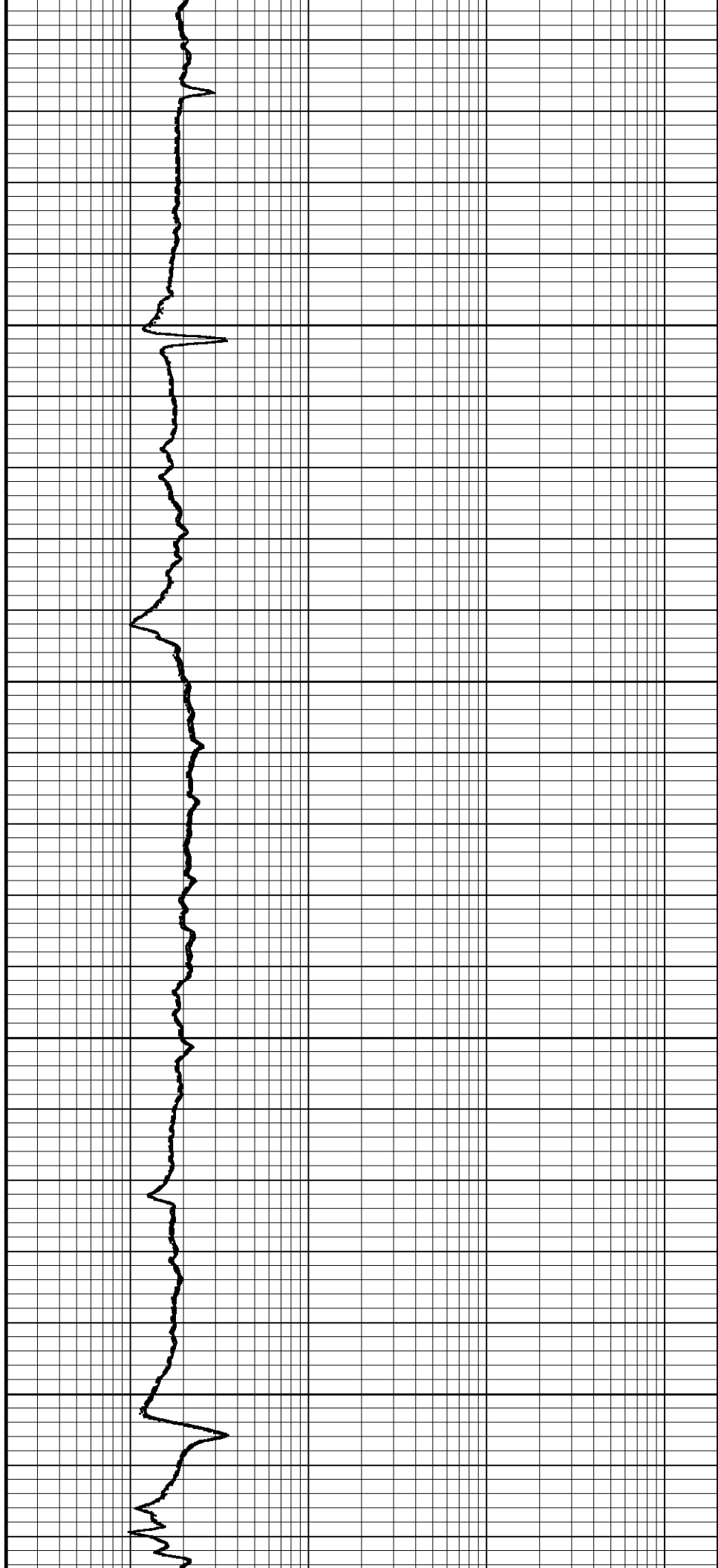
2750

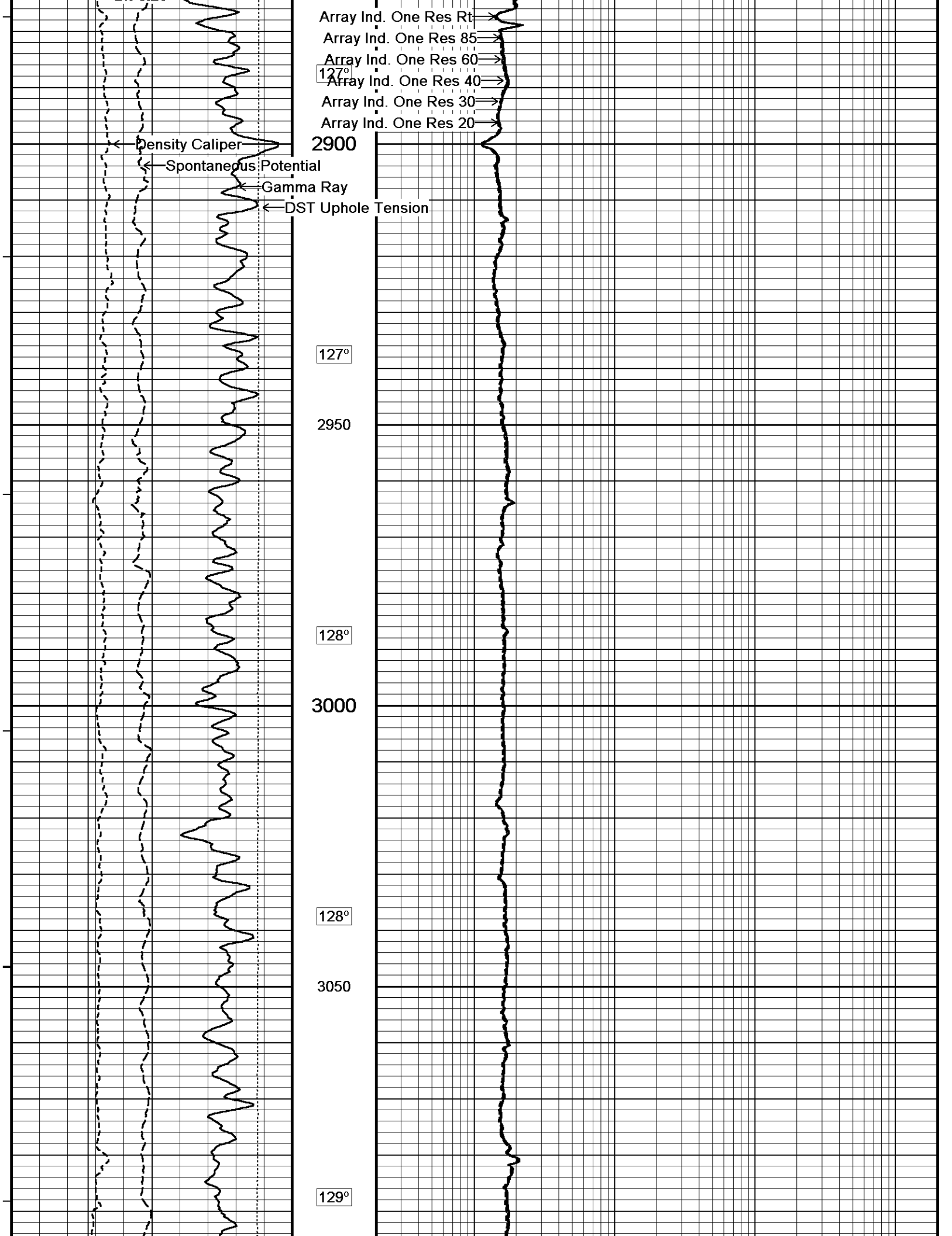
126°

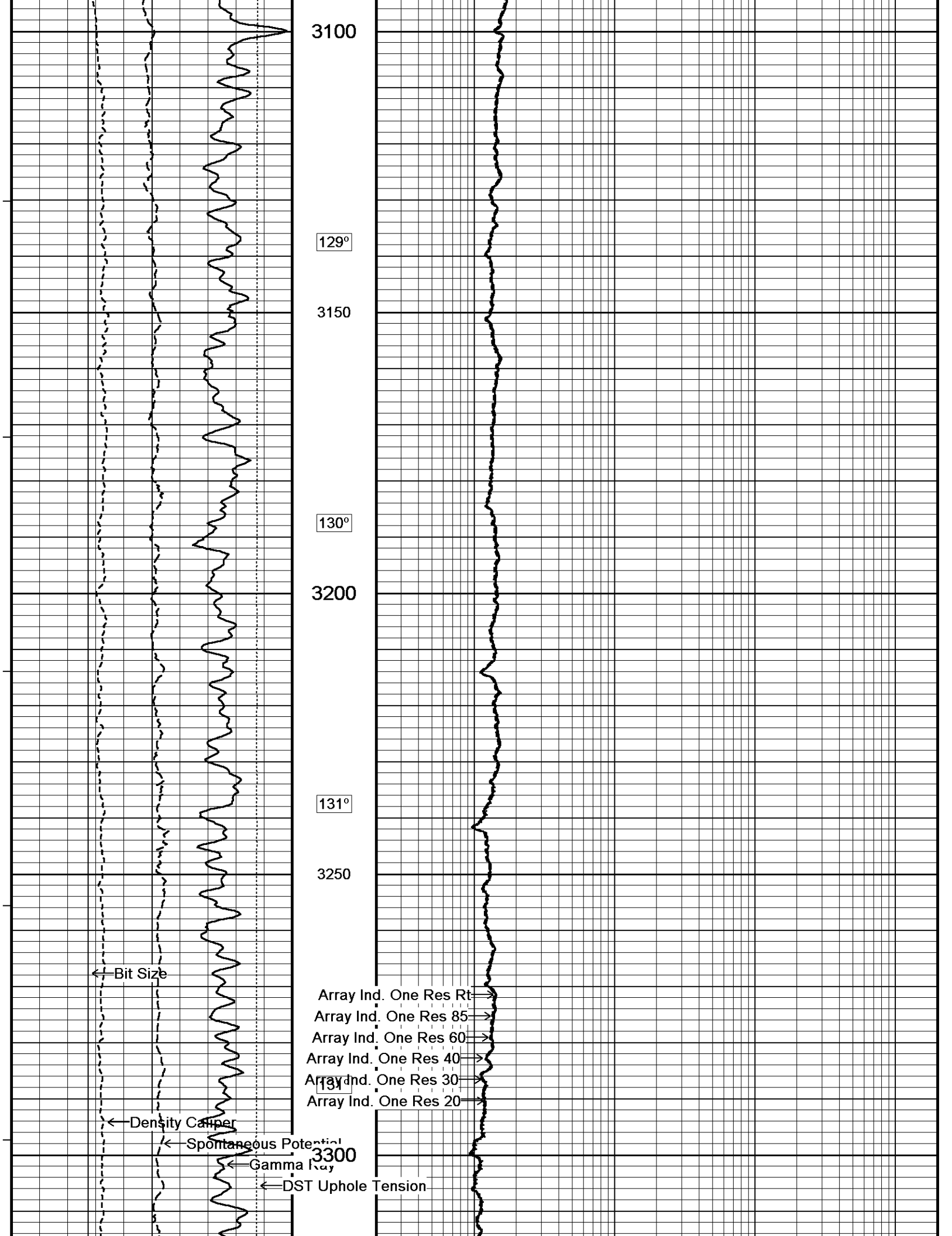
2800

126°

2850









132°

3350

132°

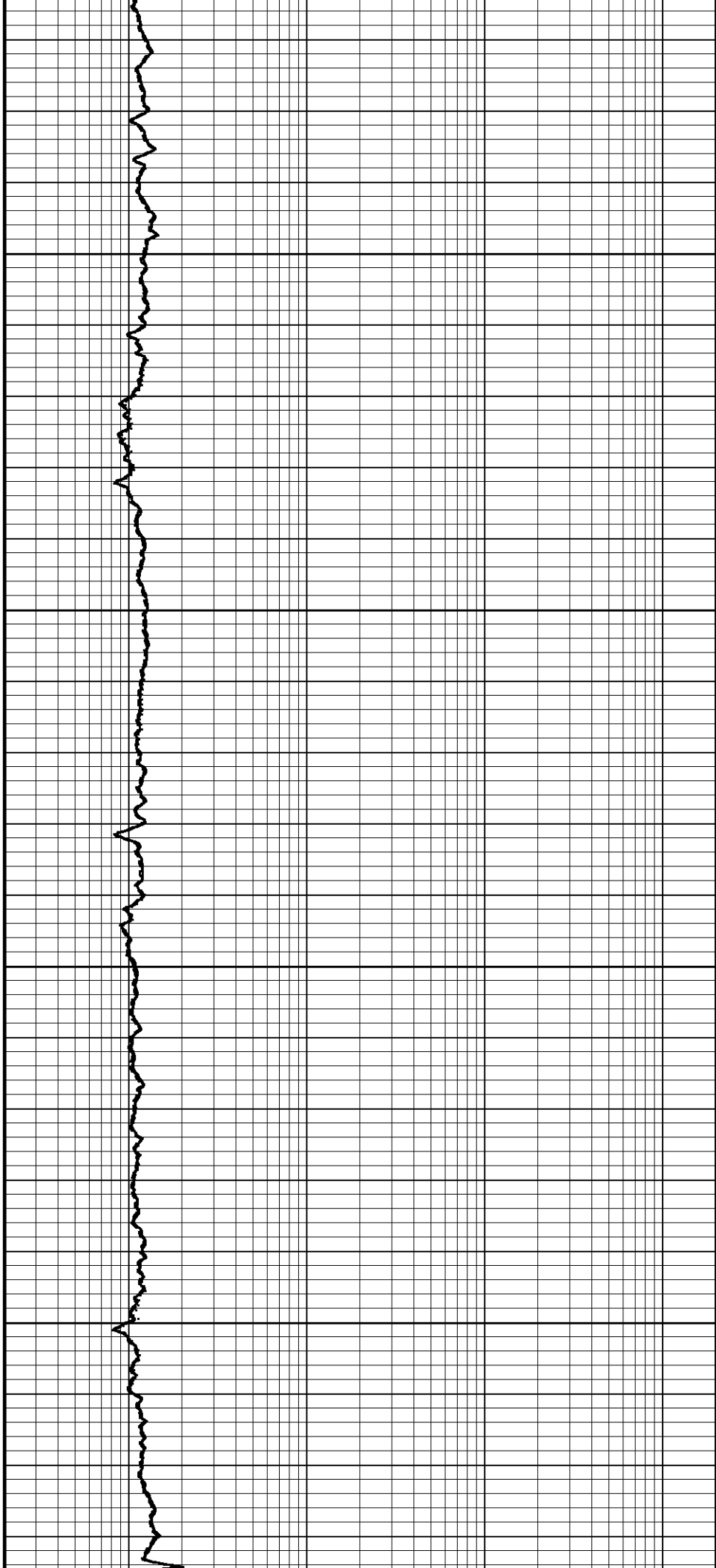
3400

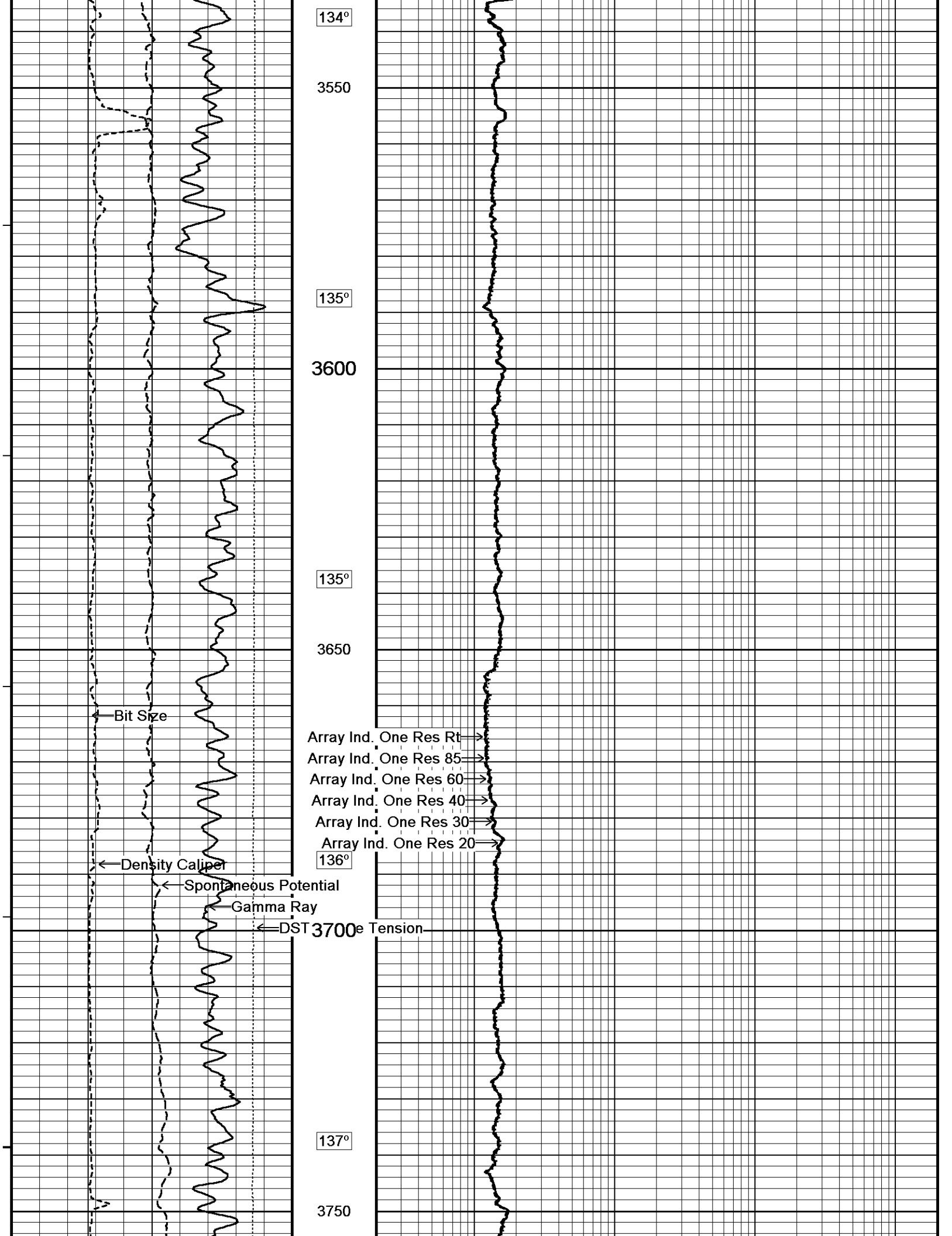
132°

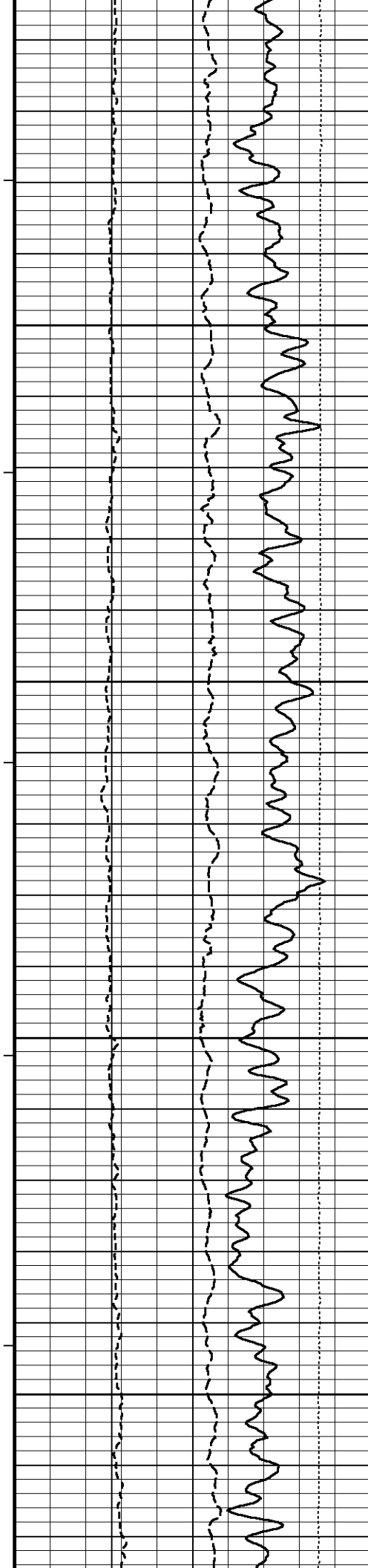
3450

133°

3500







138°

3800

139°

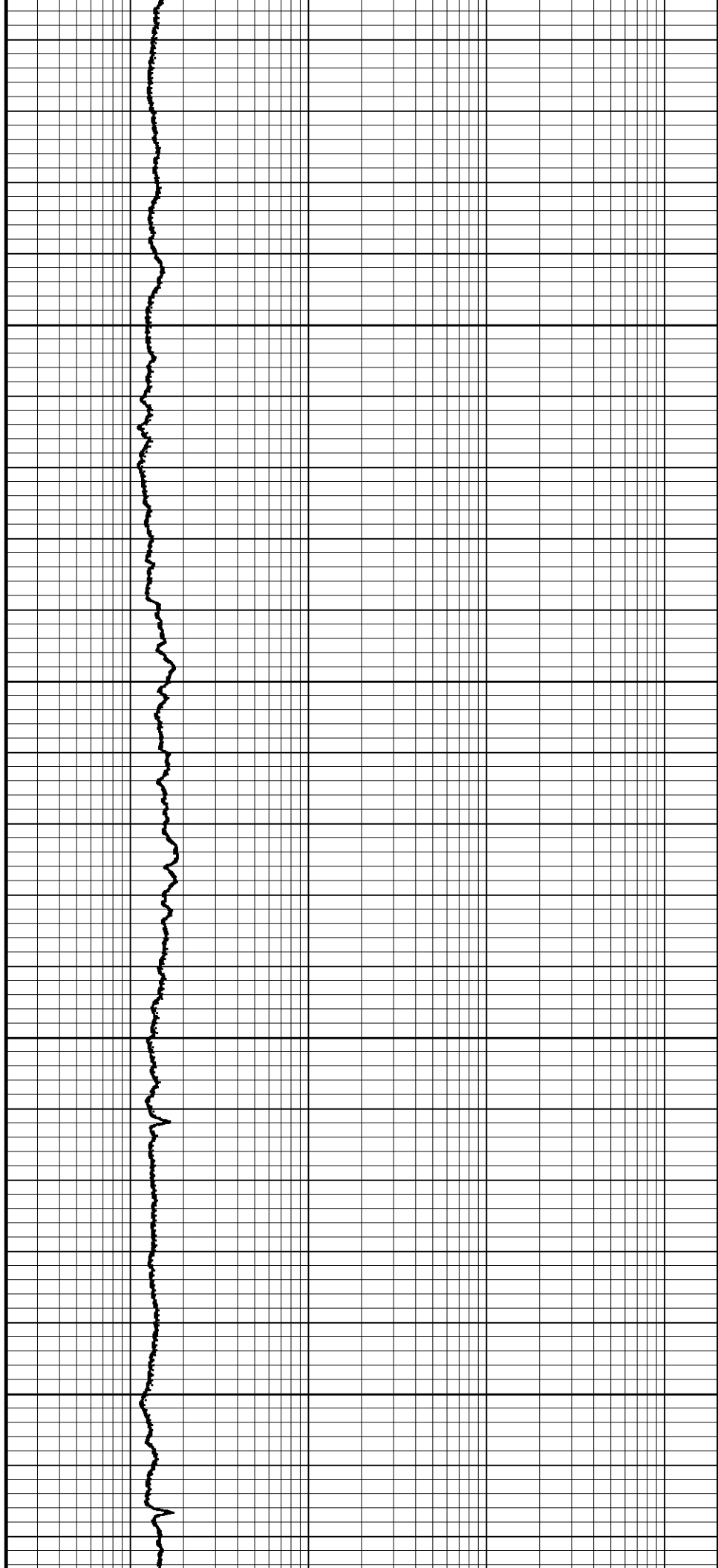
3850

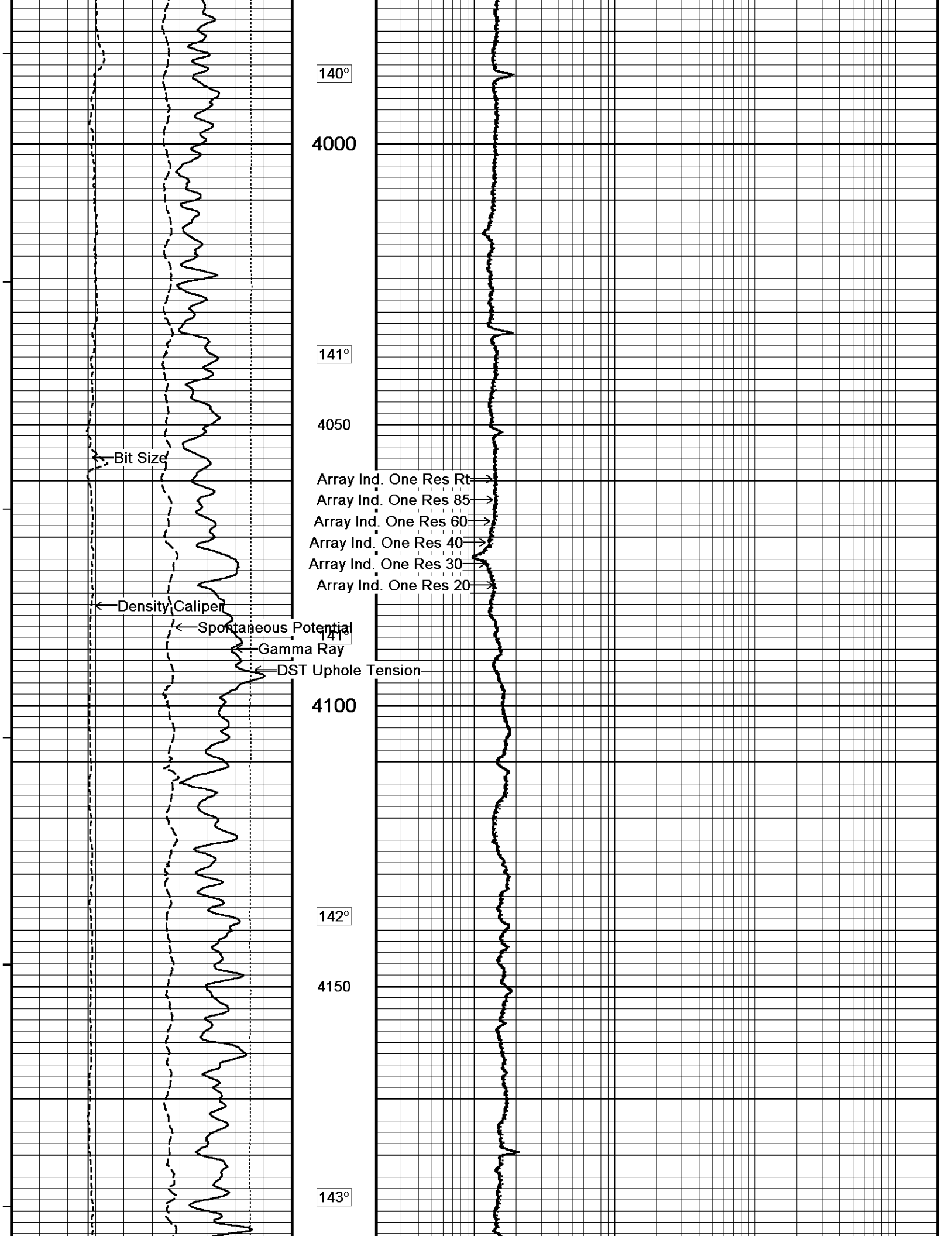
139°

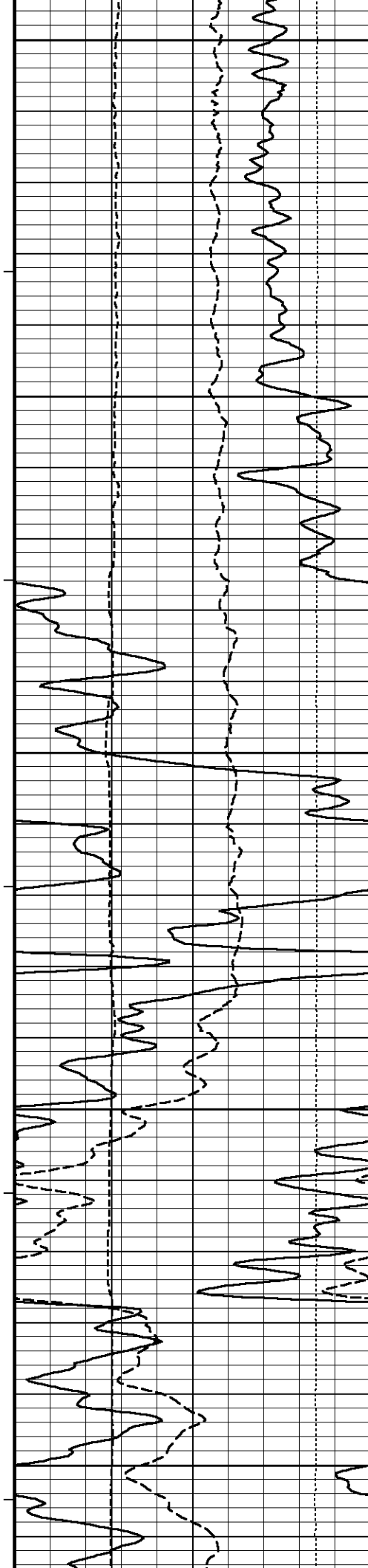
3900

140°

3950







4200

143°

4250

144°

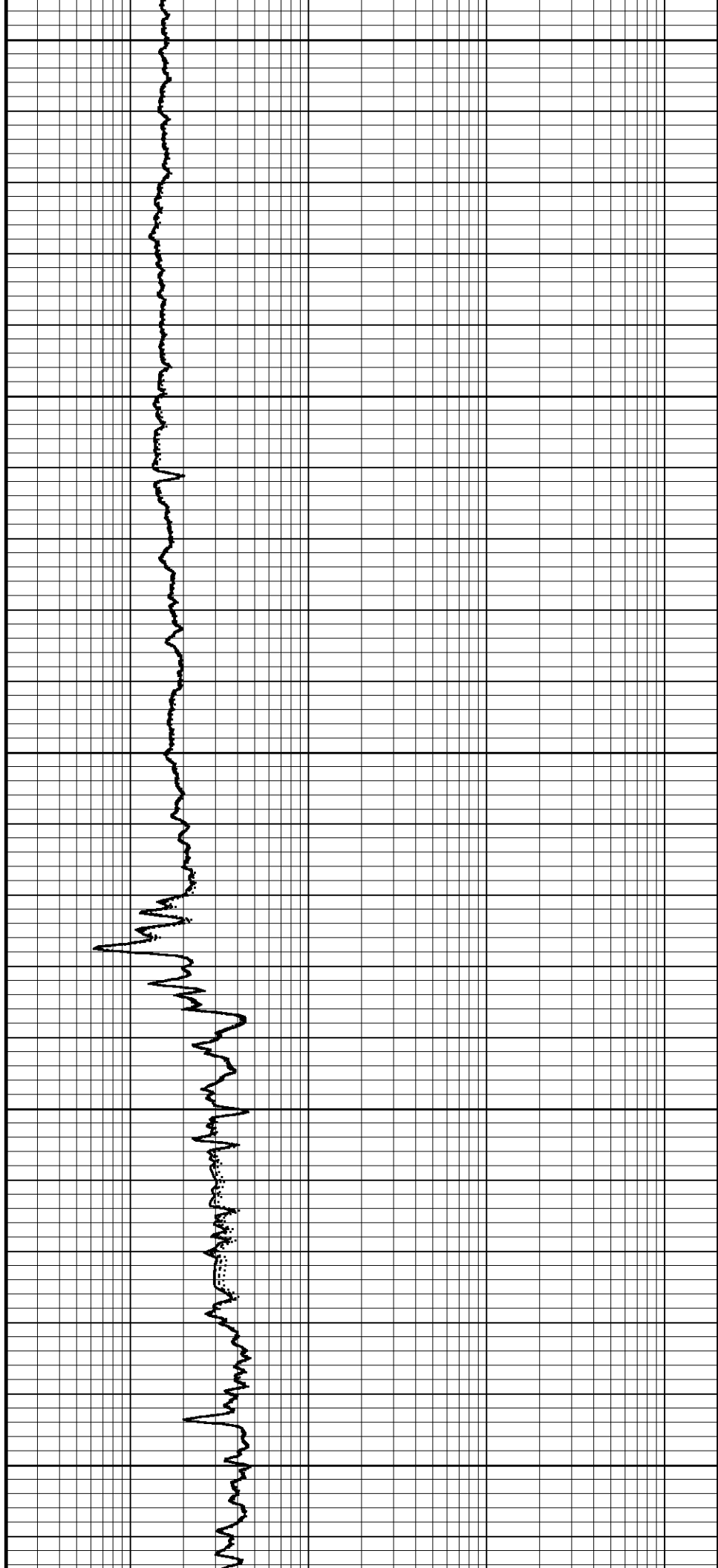
4300

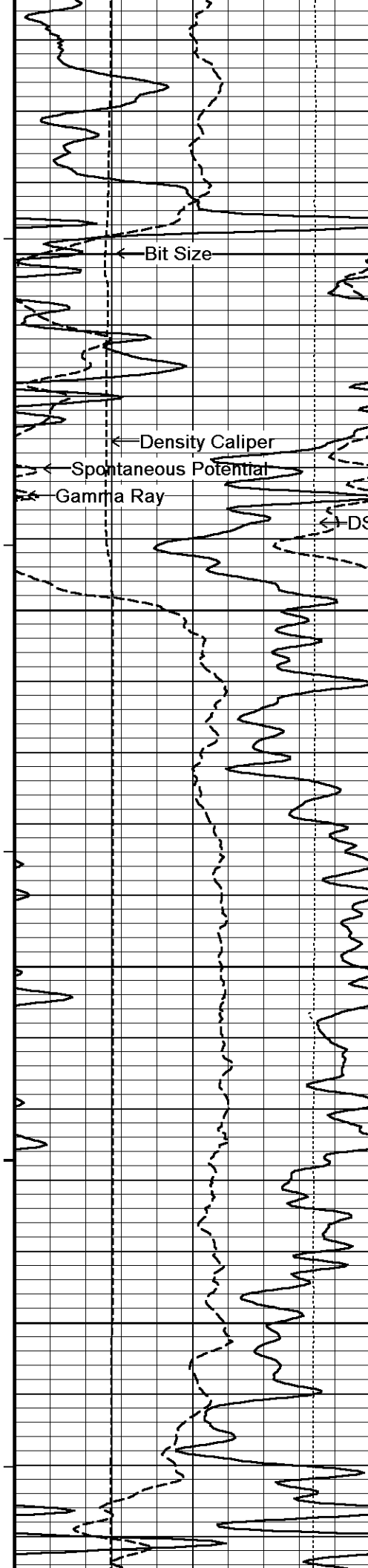
144°

4350

145°

4400





146°

4450

- Array Ind. One Res Rt
- Array Ind. One Res 85
- Array Ind. One Res 60
- Array Ind. One Res 40
- Array Ind. One Res 30
- Array Ind. One Res 20

146°

4500

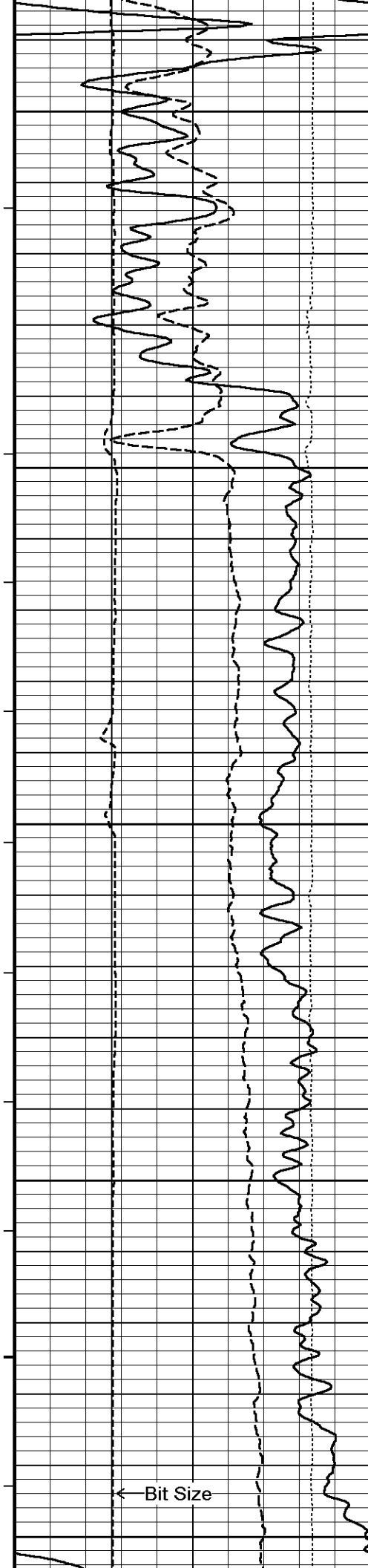
147°

4550

148°

4600

DST Up Hole Tension



149°

4650

149°

4700

149°

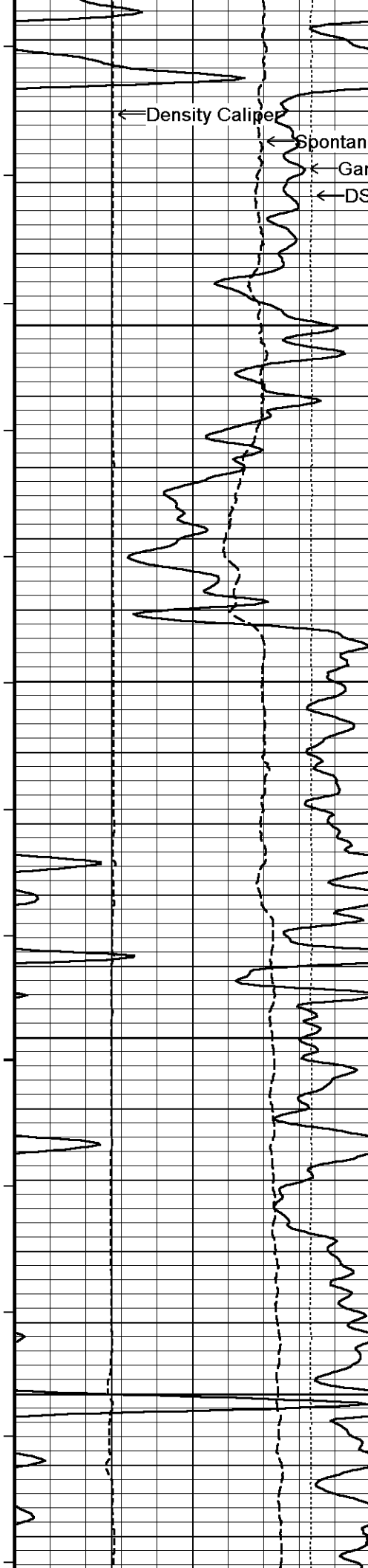
4750

149°

4800

150°

Array Ind. One Res Rt →
4850
Array Ind. One Res 85 →



Array Ind. One Res 60
Array Ind. One Res 40
Array Ind. One Res 30
Array Ind. One Res 20

151°

4900

151°

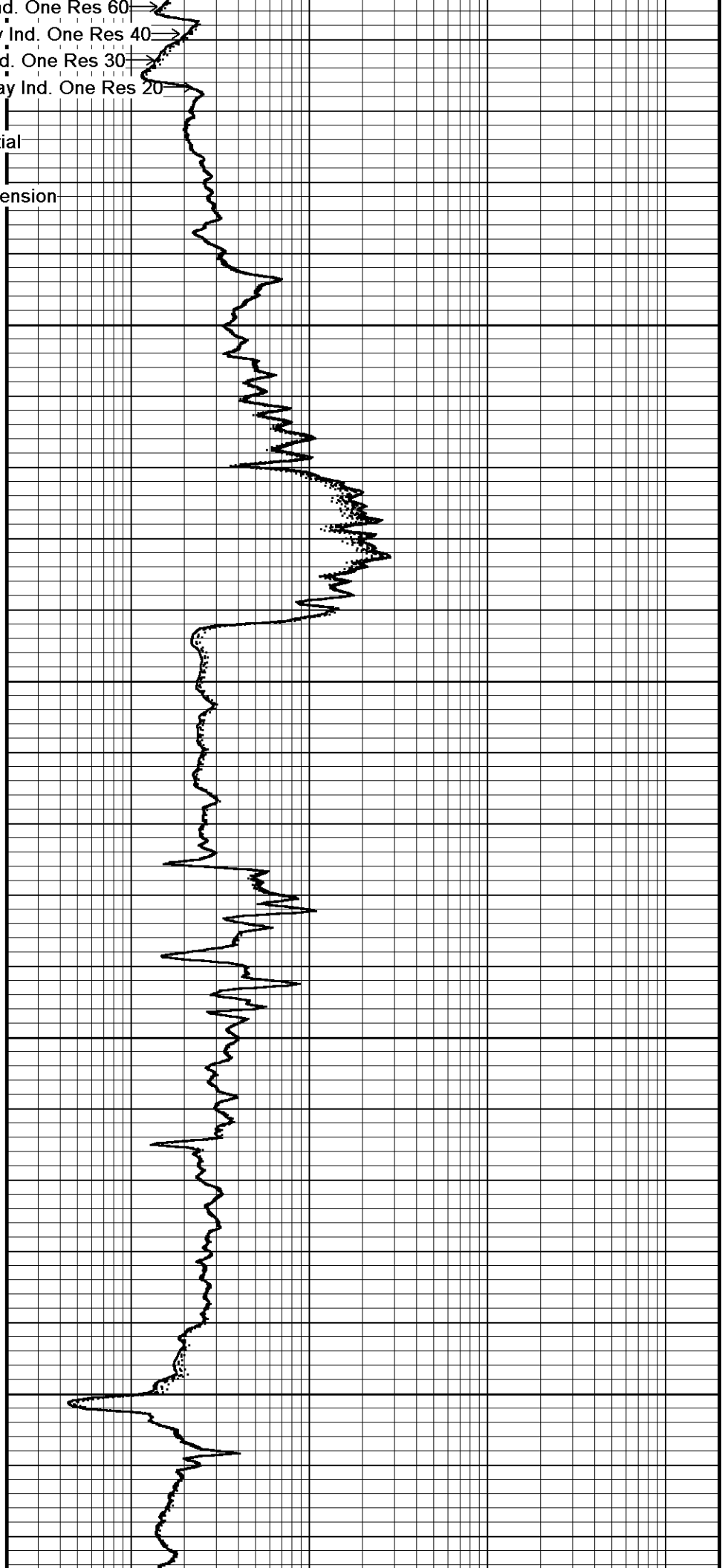
4950

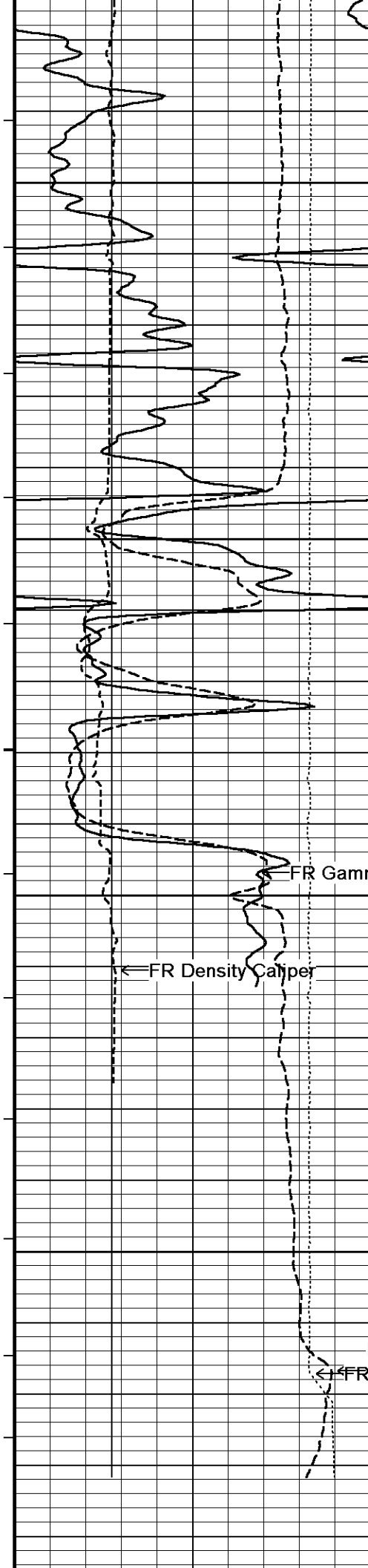
152°

5000

153°

5050





154°

5100

155°

5150

154°

FR Gamma Ray
5200

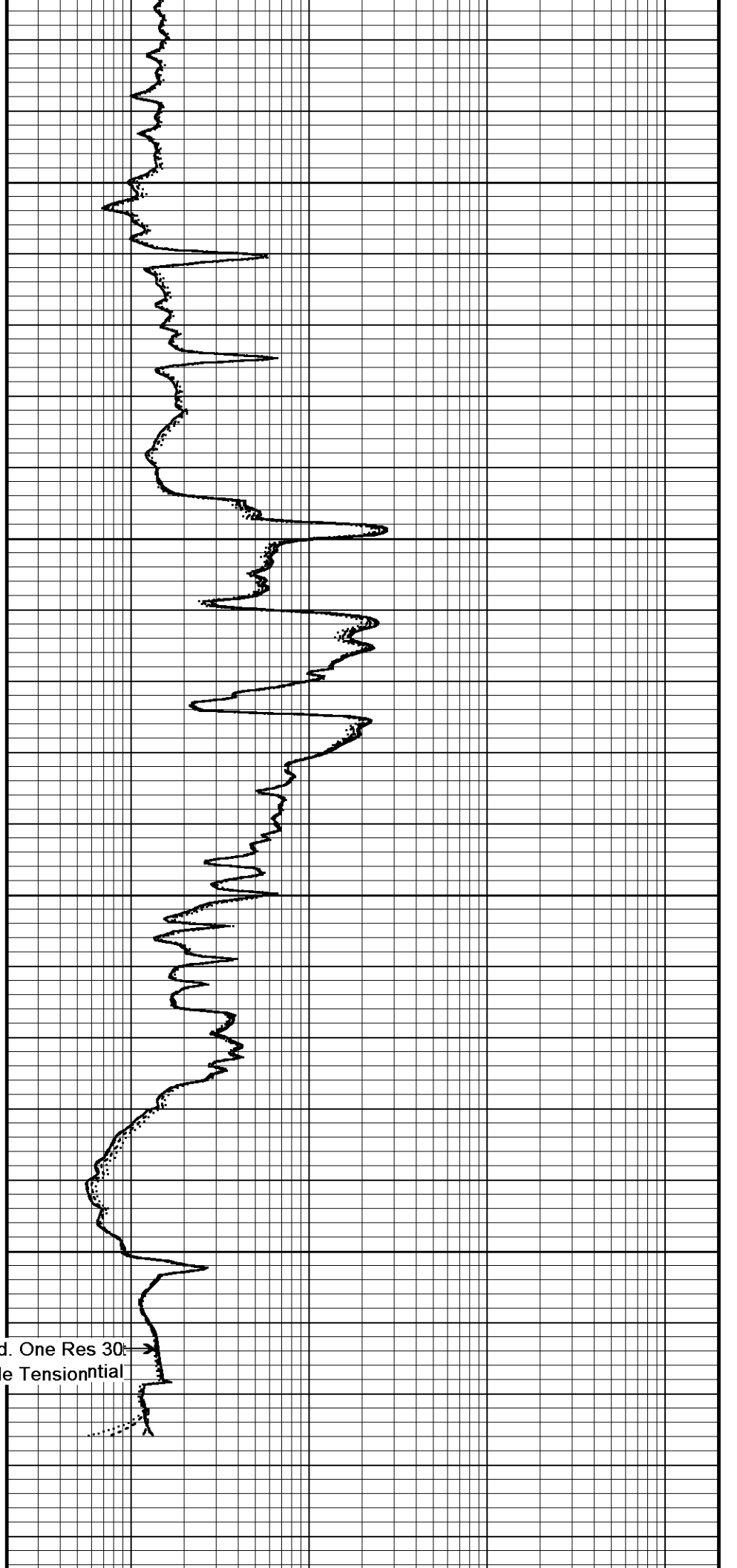
← FR Density Caliper

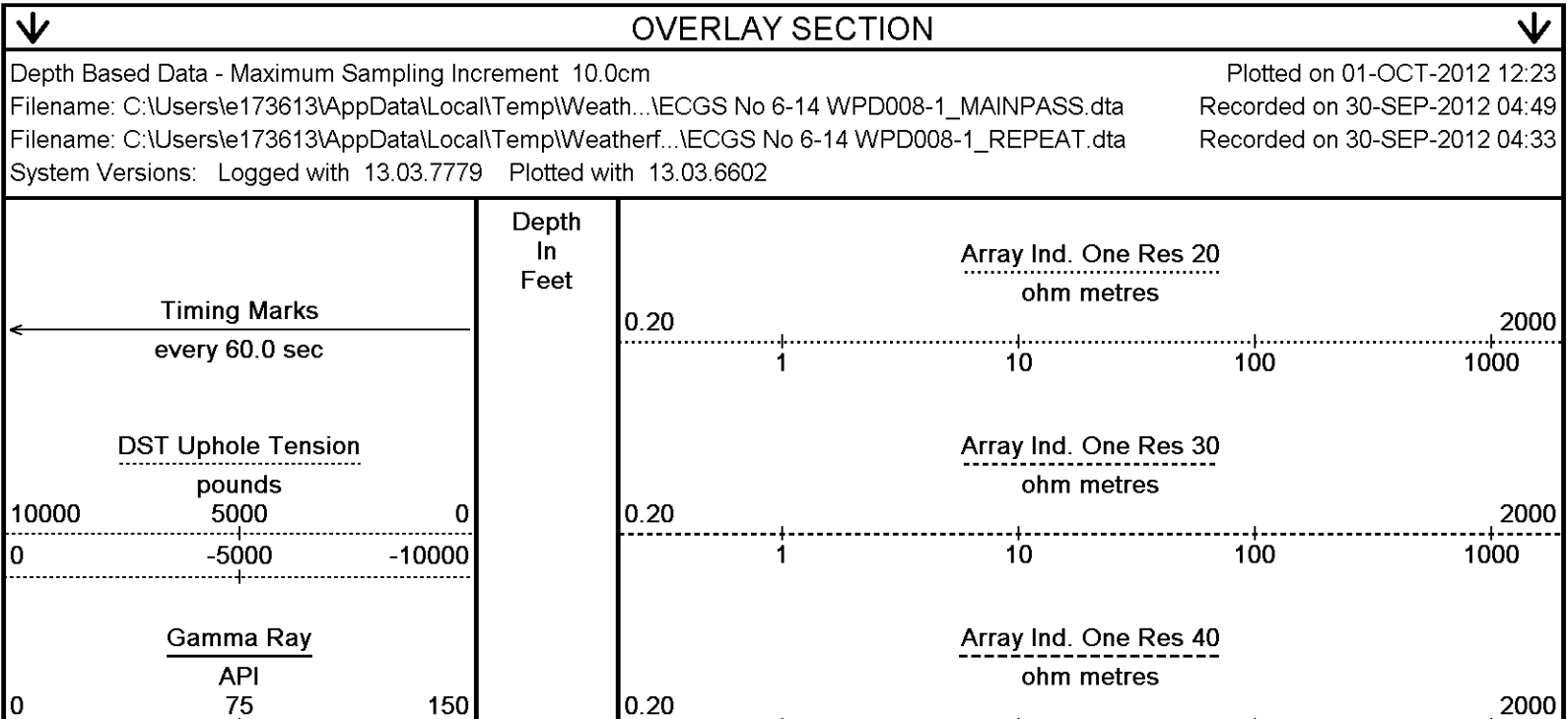
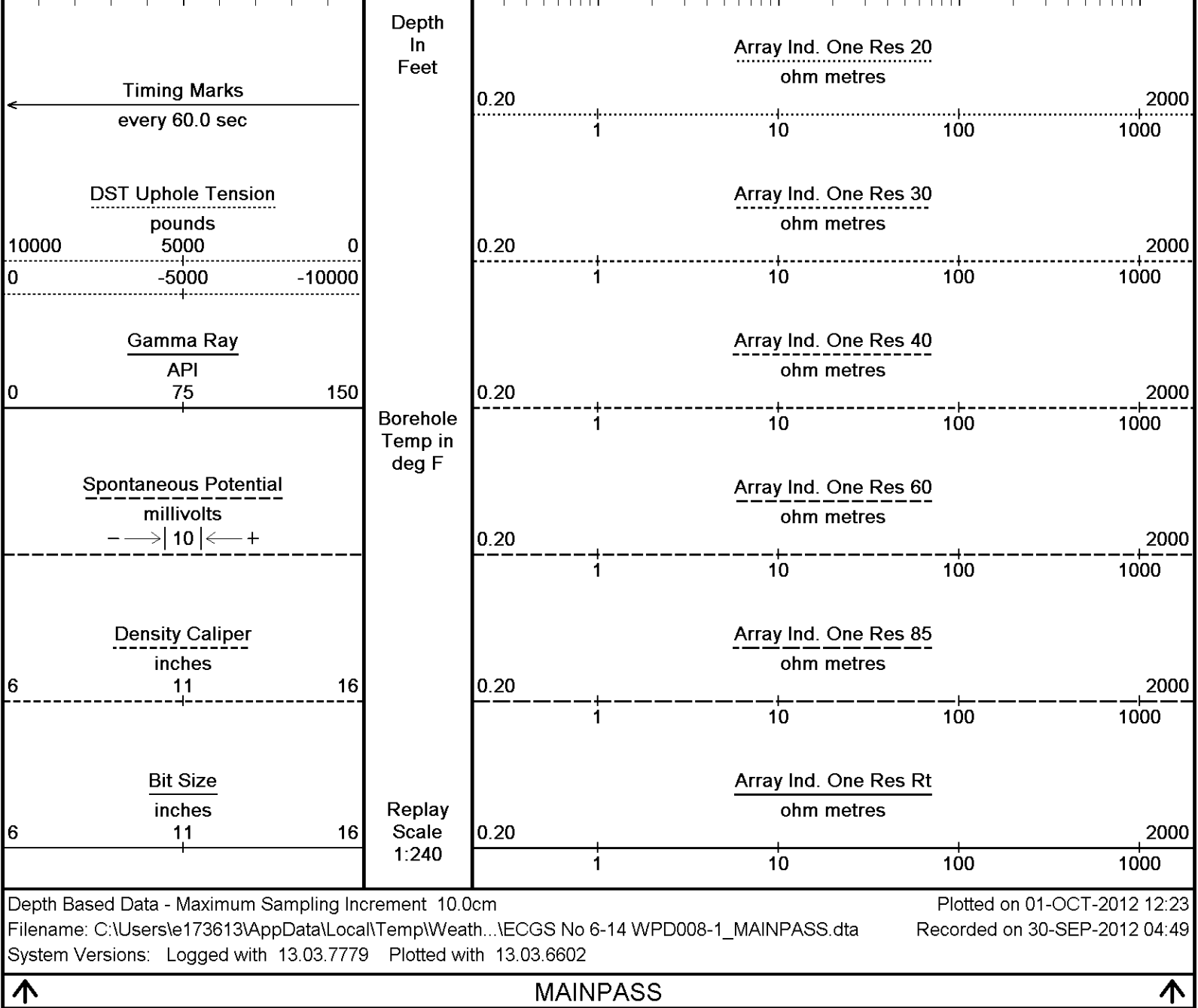
154°

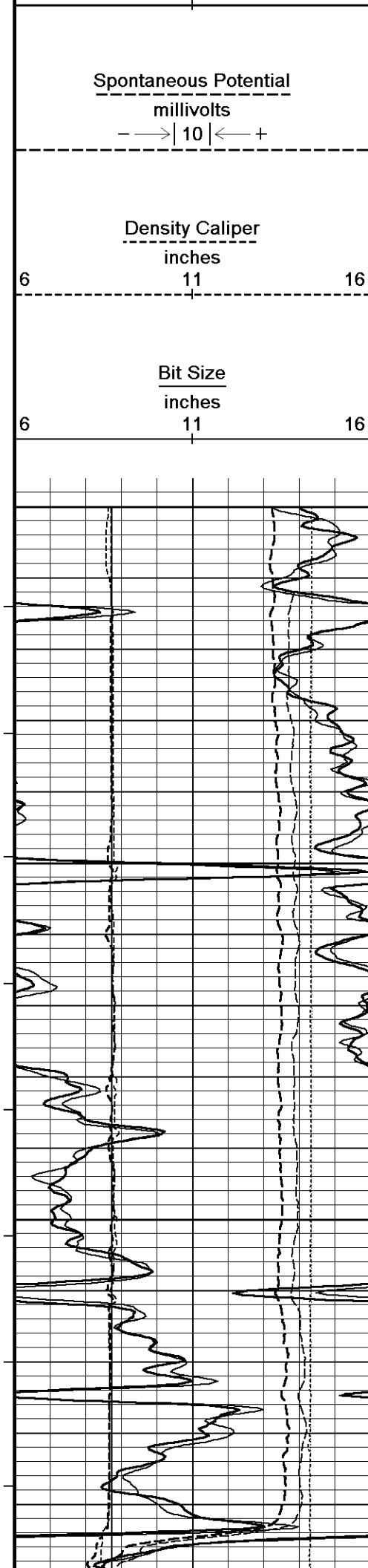
5250

FR Array Ind. One Res 30

← FR DST Uphole Tensiontial







Borehole
Temp in
deg F

Replay
Scale
1:240

5000

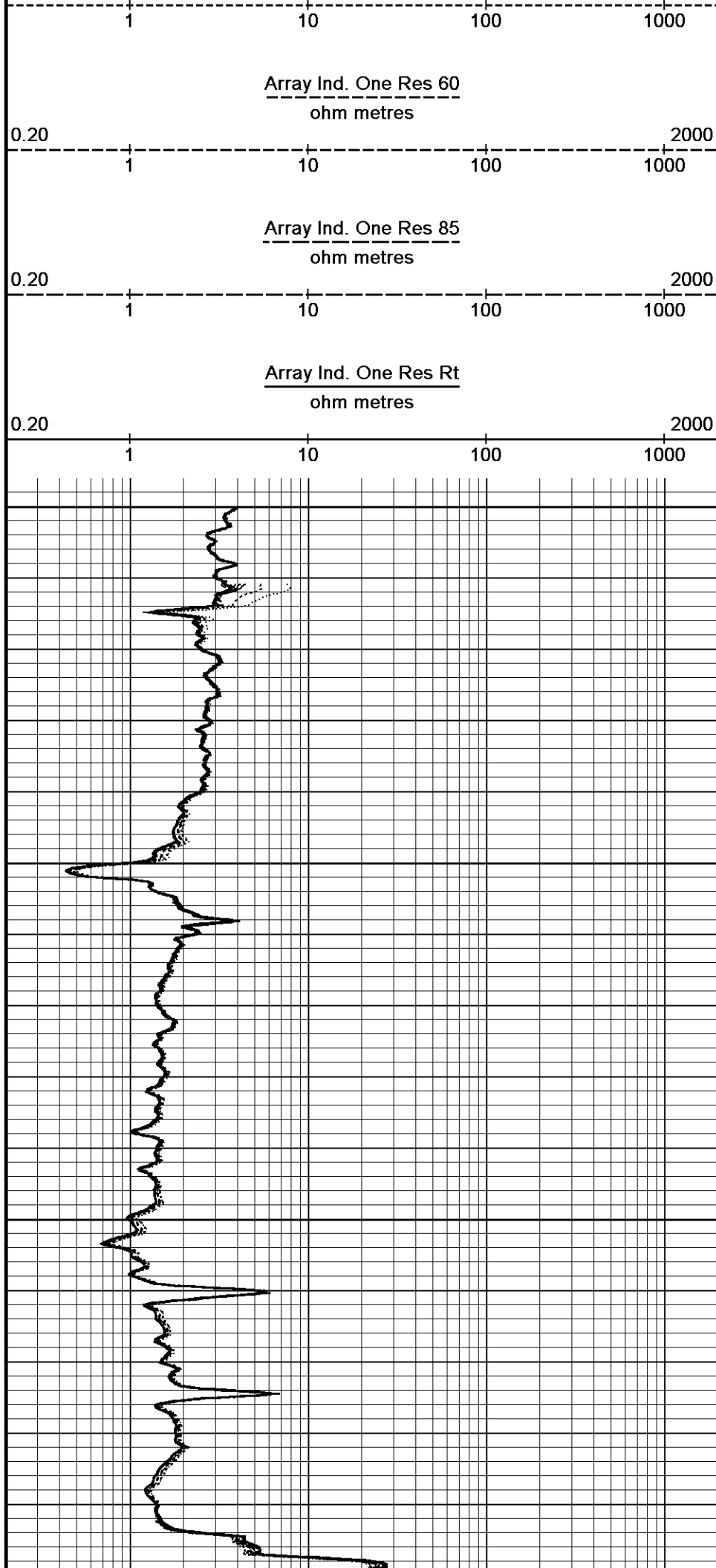
153°

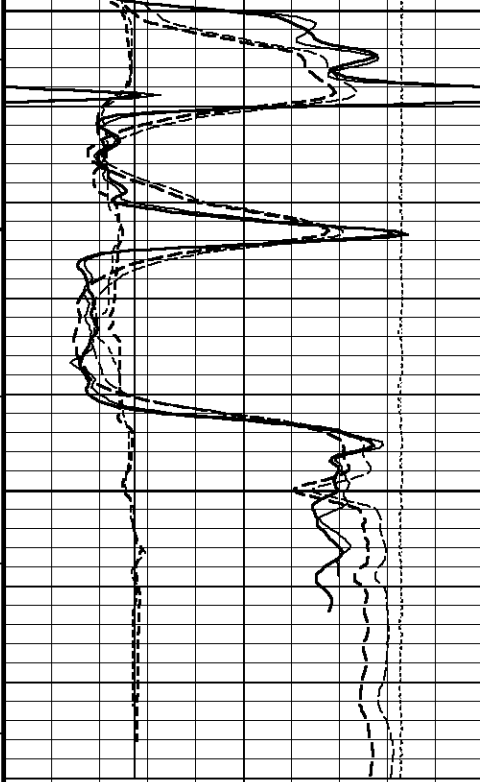
5050

154°

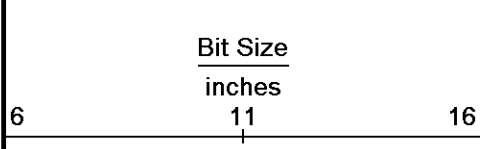
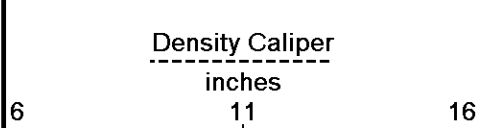
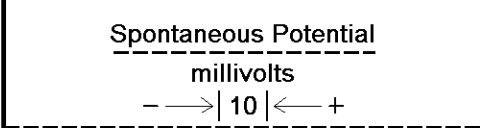
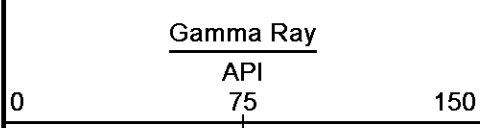
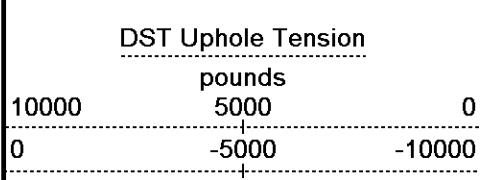
5100

155°





Timing Marks
every 60.0 sec

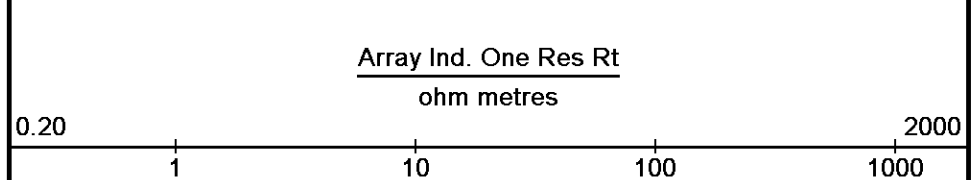
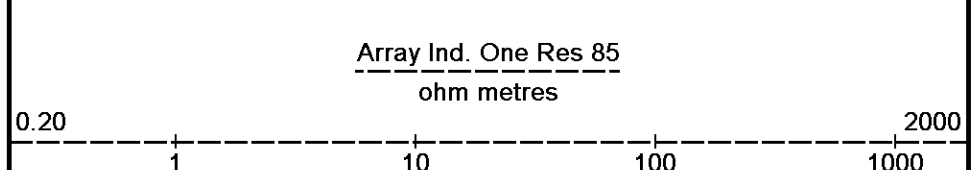
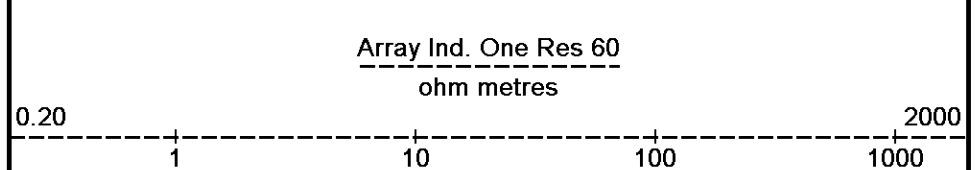
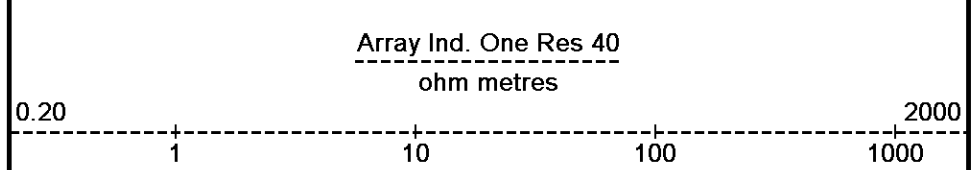
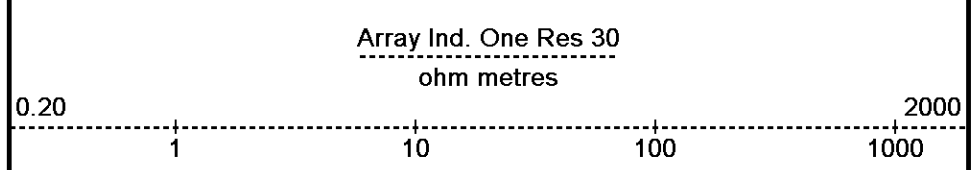
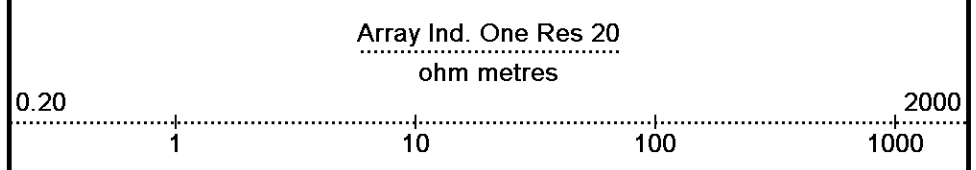
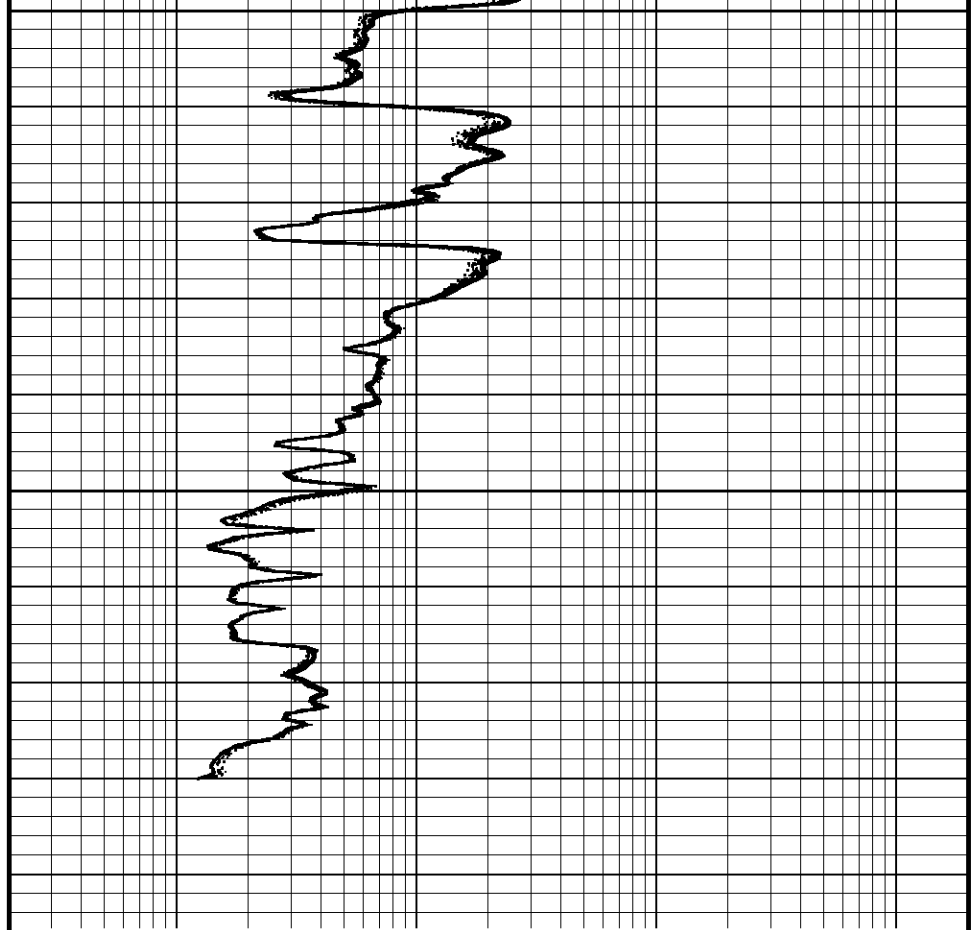


5150
154°
5200
154°

Depth
In
Feet

Borehole
Temp in
deg F

Replay
Scale
1:240



↑

OVERLAY SECTION

↑

BEFORE SURVEY CALIBRATION			
C:\Users\le173613\AppData\Local\Temp\Weatherford PreView\0\IECGS No 6-14 WPD008-1_MAINPASS.dta			
Down-hole Tension Calibration All 000			Field Calibration on 24-OCT-2010 03:34
Reading No	Measured	0	
1	15659.85	0.00	
2	15734.68	370.00	
General Constants All 000			Last Edited on 30-SEP-2012,04:08
General Parameters			
Mud Resistivity	2.370	ohm-metres	
Mud Resistivity Temperature	93.500	degrees F	
Water Level	0.000	feet	
Density/Neutron 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	7.000	inches	
Caliper for Differential Caliper	Density Caliper		
Rwa Parameters			
Porosity used	Base Density Porosity		
Resistivity used	Array Ind. One Res Rt		
RWA Constant A	0.610		
RWA Constant M	2.150		
Down-hole Tension Calibration SMS 0			Field Calibration on 30-SEP-2012 03:26
Reading No	Measured	Calibrated (lbs)	
1	15589.90	0.00	
2	16735.70	480.00	
Gamma Calibration MCG-D.K 483			Field Calibration on 29-SEP-2012 18:20
	Measured	Calibrated (API)	
Background	74	50	
Calibrator (Gross)	842	569	
Calibrator (Net)	768	519	
Gamma Constants MCG-D.K 483			Last Edited on 30-SEP-2012,01:50
Gamma Calibrator Number	GRCC119		
Mud Density	1.00	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	
SP Calibration MCG-D.K 483			Field Calibration on 23-SEP-2012,10:15
	Measured	Calibrated (mV)	
Reference 1	100.0	100.0	
Reference 2	-100.0	-100.0	
High Resolution Temperature Calibration MCG-D.K 483			Field Calibration on 30-SEP-2012,04:09
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	75.00	75.00	
High Resolution Temperature Constants MCG-D.K 483			Last Edited on 30-SEP-2012,04:08

Neutron Calibration MDN-B.J 372

Base Calibration on 11-SEP-2012 10:37
Field Check on 29-SEP-2012 18:42

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	2935	90	3714	110
Ratio	32.738		33.764	

Field Calibrator at Base

		Calibrated (cps)	
		2265	3365
Ratio		0.673	

Field Check

		Calibrated (cps)	
		2313	3388
Ratio		0.683	

Neutron Constants MDN-B.J 372

Last Edited on 30-SEP-2012,01:50

Neutron Source Id	P31115B		
Neutron Jig Number	NJ5299		
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	7.00	cu	
Dolomite Sigma	4.70	cu	
Formation Pressure Source	None		
Formation Pressure	N/A	kpsi	
Temperature Source	MCG External Temperature		
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		

Navigation Constants MIE-A.J 241

Last Edited on 30-SEP-2012,01:56

Magnetic Declination	0.00	degrees	East
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Magnetometer Parameters MIE-A.J 241

Date Of Last Magnetometer Calibration	14-FEB-2012,20:54		
	X Magnetometer	Y Magnetometer	Z Magnetometer
Slope	-1.000000	-1.011676	-0.999264
Offset	0.001649	-0.018156	0.001398

Magnetometer Constants MIE-A.J 241

Last Edited on 30-SEP-2012,01:55

Magnetometer Calibrator Number	0
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Accelerometer Parameters MIE-A.J 241

Date Of Last Accelerometer Calibration	14-FEB-2012,19:26		
	X Accelerometer	Y Accelerometer	Z Accelerometer
Slope	-1.107927	-1.107152	-1.089726
Offset	-0.004165	0.008747	-0.006277

Accelerometer Constants MIE-A.J 241

Last Edited on 30-SEP-2012,01:54

Accelerometer Calibrator Number	000
---------------------------------	-----

Accelerometer Temperature Characterisation

X Accelerometer				
Serial Number	922			
Calibration Date	14-Nov-2010			
	B0	B1	B2	B3
Bias(g)	0.00000e+000	1.98626e-005	-2.34772e-009	1.61466e-010
	SF0	SF1	SF2	SF3
	0.00000	0.00000	0.00000	0.00000

Scale Factor(mA/g)	3.00000e+000	2.59314e-004	4.64734e-007	5.67183e-010
Y Accelerometer				
Serial Number	970			
Calibration Date	19-Jan-2011			
	B0	B1	B2	B3
Bias(g)	0.00000e+000	-4.23329e-006	-2.08894e-008	1.84400e-010
	SF0	SF1	SF2	SF3
Scale Factor(mA/g)	3.00000e+000	2.61643e-004	3.45088e-007	8.15526e-010
Z Accelerometer				
Serial Number	1076			
Calibration Date	05-May-2011			
	B0	B1	B2	B3
Bias(g)	0.00000e+000	-5.18602e-006	1.72429e-008	7.30746e-011
	SF0	SF1	SF2	SF3
Scale Factor(mA/g)	3.00000e+000	2.93462e-004	2.41183e-007	1.26400e-009

Caliper Calibration MIE-A.J 241					Base Calibration on 28-SEP-2012 11:04
					Field Calibration on 28-SEP-2012 11:06
Base Calibration					
Reading No	Pads 1-5 Meas.	Pads 3-7 Meas.	Calibrator Size (in)		
1	25529	28507	5.97		
2	35884	38819	7.96		
3	45829	48887	9.87		
4	57640	60711	11.92		
5	0	0	0.00		
Reading No	Pad 2 Meas.	Pad 4 Meas.	Pad 6 Meas.	Pad 8 Meas.	Calibrator Size (in)
1	24865	25887	25754	25884	5.97
2	34293	34905	33925	34009	7.96
3	42506	43163	42193	42341	9.87
4	52787	53107	51835	52240	11.92
5	0	0	0	0	0.00
Field Calibration					
	Measured	Measured	Actual		
	Pads 1-5 Caliper(in)	Pads 3-7 Caliper(in)	Caliper(in)		
	7.94	7.72	7.96		
	Measured	Measured	Measured	Measured	Actual
	Pad 2 Caliper(in)	Pad 4 Caliper(in)	Pad 6 Caliper(in)	Pad 8 Caliper(in)	Caliper(in)
	3.89	3.89	4.06	4.06	7.96

Caliper Constants MIE-A.J 241					Last Edited on 09-JUN-2012,12:33
Caliper Difference for BRKT	0.120	inches			

Imager Pad Check MIE-A.J 241					Field Check on
Pad 1	Pad Not Tested	Pad 5	Pad Not Tested		
Pad 2	Pad Not Tested	Pad 6	Pad Not Tested		
Pad 3	Pad Not Tested	Pad 7	Pad Not Tested		
Pad 4	Pad Not Tested	Pad 8	Pad Not Tested		

Compact Micro Imager Constants MIE-A.J 241			Last Edited on 30-SEP-2012,01:56
Sonde Configuration	Imager Mode	degrees	
Arm-Pad Kit	Normal Pads (12.25 in)		
Centre Pad 1 Rotational Offset	0.00		
Image/Borehole Ovality Reference	Azimuth of Pad 1	degrees	
Non Active Buttons	Omit	feet	
Search Angle	0.00	feet	
Correlation Interval	3.28	mAmp	
Correlation Step	1.64	mAmp	
Current Offset	0.0000		
Squasher Start	0.0500		
Image Processing	Enabled		

FE Calibration MFE-A.A 76					Base Calibration on 10-SEP-2012 11:36
					Field Check on 29-SEP-2012 18:21
Base Calibration					
	Measured	Calibrated (ohm-m)			
Reference 1	0.0	0.0			

Reference 2	964.4	126.8		
Base Check		279.9		
Field Check		280.1		
FE Constants MFE-A.A 76		Last Edited on 30-SEP-2012,01:57		
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	1.0	inches		
High Resolution Temperature Calibration MAI-B.A 219		Field Calibration on 10-AUG-2011,00:10		
	Measured	Calibrated(Deg F)		
Lower	50.00	50.00		
Upper	75.00	75.00		
High Resolution Temperature Constants MAI-B.A 219		Last Edited on 30-SEP-2012,04:08		
Pre-filter Length	11			
Induction Calibration MAI-B.A 219		Base Calibration on 08-MAY-2012,15:56 Field Check on 29-SEP-2012 18:14		
Base Calibration				
Test Loop Calibration		Measured	Calibrated (mmho/m)	
Channel	Low	High	Low	High
1	17.4	478.1	9.3	966.2
2	5.8	380.3	7.6	821.4
3	3.5	258.5	5.2	566.0
4	1.9	136.0	2.6	279.2
Array Temperature	77.2	Deg F		
Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1	0.0	0.0	12.4	3792.3
2	0.0	0.0	31.0	3535.9
3	0.0	0.0	28.7	3054.7
4	0.0	0.0	19.3	2027.5
Deep	0.0	0.0	16.5	1947.7
Medium	0.0	0.0	42.8	4086.8
Shallow	0.0	0.0	47.7	5281.8
Array Temperature	0.0		67.3	Deg F
Induction Constants MAI-B.A 219		Last Edited on 30-SEP-2012,02:04		
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	1.00 inches			
Number of Fins on Stand-off	6.0000			
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	
SRM2	0.0000	SRC2	0.0000	

Calibration Site Corrections		
Channel 1	0.00	mmhos/metre
Channel 2	0.00	mmhos/metre
Channel 3	0.00	mmhos/metre
Channel 4	0.00	mmhos/metre

Apparent Porosity and Water Saturation Constants

Archie Constant (A)	1.00	
Cementation Exponent (M)	2.00	
Saturation Exponent (N)	2.00	
Saturation of Water for Apor	100.00	percent
Resistivity of Water for Apor and Sw	0.05	ohm-m
Resistivity of Mud Filtrate for Sw	0.00	ohm-m
Source for Rt	0.00	
Source for Rxo	0.00	

Caliper Calibration MPD-C.J 378

Base Calibration on 29-SEP-2012 18:35

Field Calibration on 29-SEP-2012 18:36

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14193	3.99
2	22768	5.97
3	31248	7.96
4	39297	9.87
5	48452	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.91	7.96

Photo Density Calibration MPD-C.J 378

Base Calibration on 27-SEP-2012 12:49

Field Check on 29-SEP-2012 18:28

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	39385	12332	52994	19128
Reference 2	18690	2207	25185	2558

Field Check at Base

1201.6	1277.5
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Field Check

1202.3	1288.1
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PE Calibration

Base Calibration	WS	Measured		Calibrated	
		WH	Ratio	Ratio	
Background	219	1074			
Reference 1	13507	39225	0.348	0.309	
Reference 2	5341	18558	0.293	0.274	

Field Check at Base

219.0	1074.2
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Field Check

219.4	1076.2
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Density Constants MPD-C.J 378

Last Edited on 30-SEP-2012,01:52

Density Source Id	P15771B	
Nylon Calibrator Number	DNC-D-527	
Aluminium Calibrator Number	DAC-D-527	
Density Shoe Profile	8 inch	
Caliper Source for Processing	Density Caliper	
PE Correction to Density	Not Applied	
Mud Density	1.20	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)	
2.68	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:\Users\le173613\AppData\Local\Temp\Weatherford PreView\0\IECGS No 6-14 WPD008-1_MAINPASS.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

SHA-H Compact Swivel Head Adaptor
SHA-H 142 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact Comms Gamma
MCG-D.K 483 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Neutron
MDN-B.J 372 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-C.J 378 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

MIS-A.A Compact Inline Bowspring sub
MIS-A.A 70 LG: 5.70 ft WT: 33.1 lb OD: 2.24 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 112 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

MIS-E.A Compact Inline Standoff sub
MIS-E.A 334 LG: 2.14 ft WT: 15.4 lb OD: 2.24 in

SKJ-E.A Compact Knuckle Joint
SKJ-E.A 143 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

SHA-J.B Compact Swivel Head Adaptor
SHA-J.B 574 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact MMI Memory Section
MIM-A.J 241 LG: 4.65 ft WT: 26.5 lb OD: 2.24 in

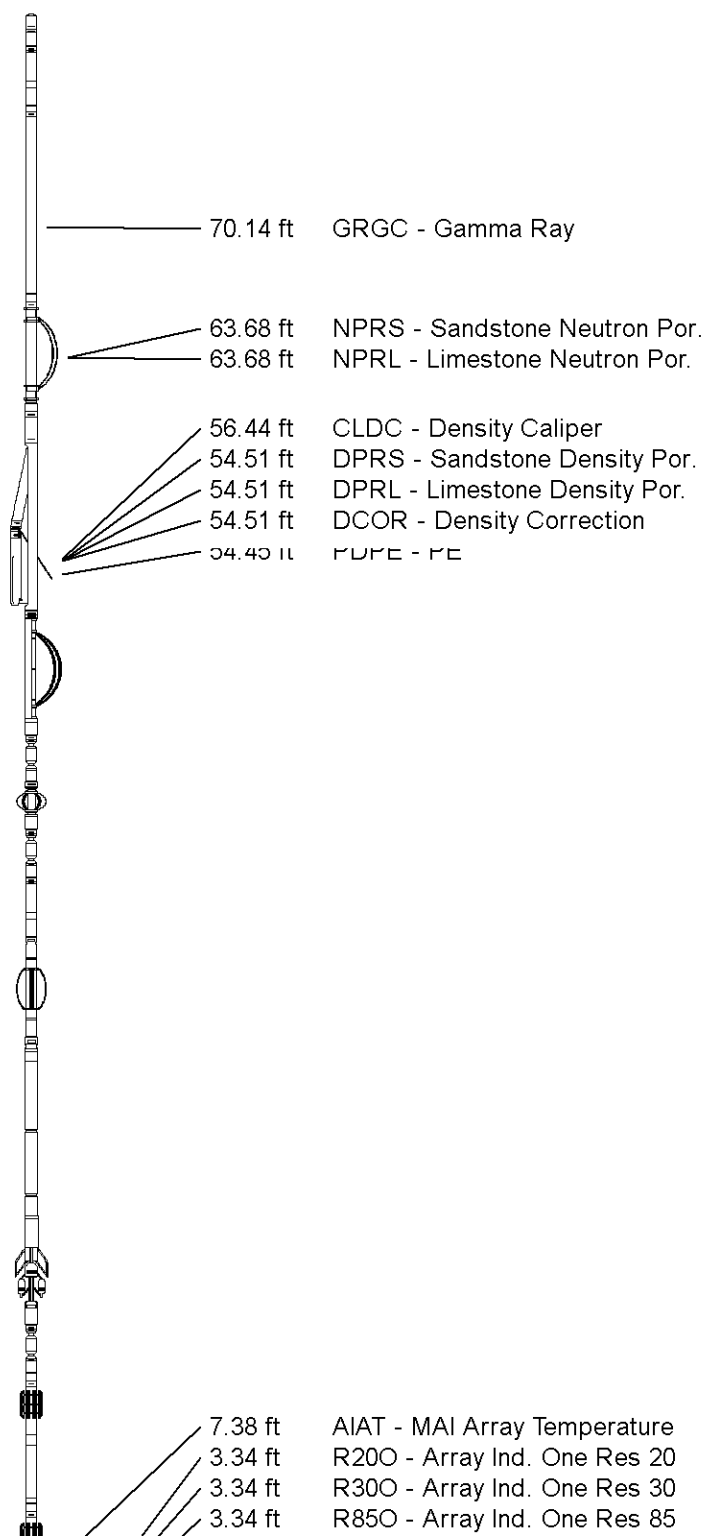
Compact MMI Electrode Section
MIE-A.J 241 LG: 13.96 ft WT: 99.2 lb OD: 4.09 in

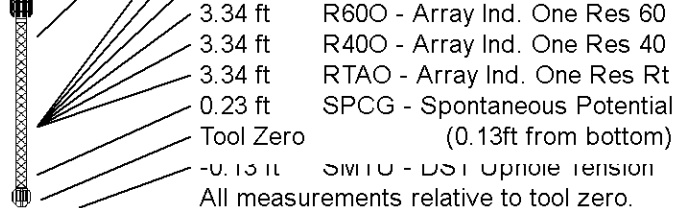
SKJ-E.B Compact Knuckle Joint
SKJ-E.B 583 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact Focussed Electric
MFE-A.A 76 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-B.A 219 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 79.30 ft Weight: 608.5 lb





COMPANY	EAST CHEYENNE GAS STORAGE LLC
WELL	ECGS NO 6-14 WPD008-1
FIELD	PEETZ WEST
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA/COLORADO

Elevation Kelly Bushing	4558.00	feet	First Reading	5264.00	feet
Elevation Drill Floor	4557.00	feet	Depth Driller	5265.00	feet
Elevation Ground Level	4544.00	feet	Depth Logger	5267.00	feet



ARRAY INDUCTION
 LOGS

Weatherford®