ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG

Weatherford®

COMPANY	SHAKESPEARE OIL CO., INC
WELL	OTTLEY 2-21
FIELD	CHALK BUTTES
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS
LOCATION	2050' FNL & 2490' FEL NW-SW-SW-NE

SEC	TWP	RGE
21	14S	32W

Latitude	38.8249133
Longitude	-100.8817901
API Number	15-109-21551

Other Services
MPD/MDN MML

Permanent Datum GL, Elevation 2771 feet
Log Measured From KB, 12.00 feet above Permanent Datum
Drilling Measured From KB

Elevations:	feet
KB	2783.00
DF	2781.00
GL	2771.00

Date	14-JUN-2018		
Run Number	ONE		
Service Order	7055-216229097		
Depth Driller	4511.00 feet		
Depth Logger	4511.00 feet		
First Reading	4508.00 feet		
Last Reading	266.00 feet		
Casing Driller	267.00 feet		
Casing Logger	266.00 feet		
Bit Size	7.875 inches		
Hole Fluid Type	WBM		
Density / Viscosity	9.40 lb/USg	59.00 sec/qt	
PH / Fluid Loss	9.50	10.00 ml/30Min	
Sample Source	MUD TANK		
Rm @ Measured Temp	0.60 @ 96.0 ohm-m		
Rmf @ Measured Temp	0.48 @ 96.0 ohm-m		
Rmc @ Measured Temp	0.72 @ 96.0 ohm-m		
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.50 @116.0 ohm-m		
Time Since Circulation	5 HOURS		
Max Recorded Temp	116.00 deg F		
Equipment / Base	13096	LIB	
Recorded By	JUSTIN HICKS		
Witnessed By	WES HANSON		

BOREHOLE RECORD

Last Edited: 14-JUN-2018 22:07

Bit Size inches	Depth From feet	Depth To feet
7.875	267.00	4511.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	267.00	24.00

REMARKS

- RUN ONE: MCB, SHA, MCG, MML, MDN, MPD, SKJ, MFE, MSS, 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: 1730 CU.FT.
- ANNULAR HOLE VOLUME WITH 4.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING: 1262 CU.FT.
- RIG: DUKE #1.

- ENGINEER: J. HICKS.

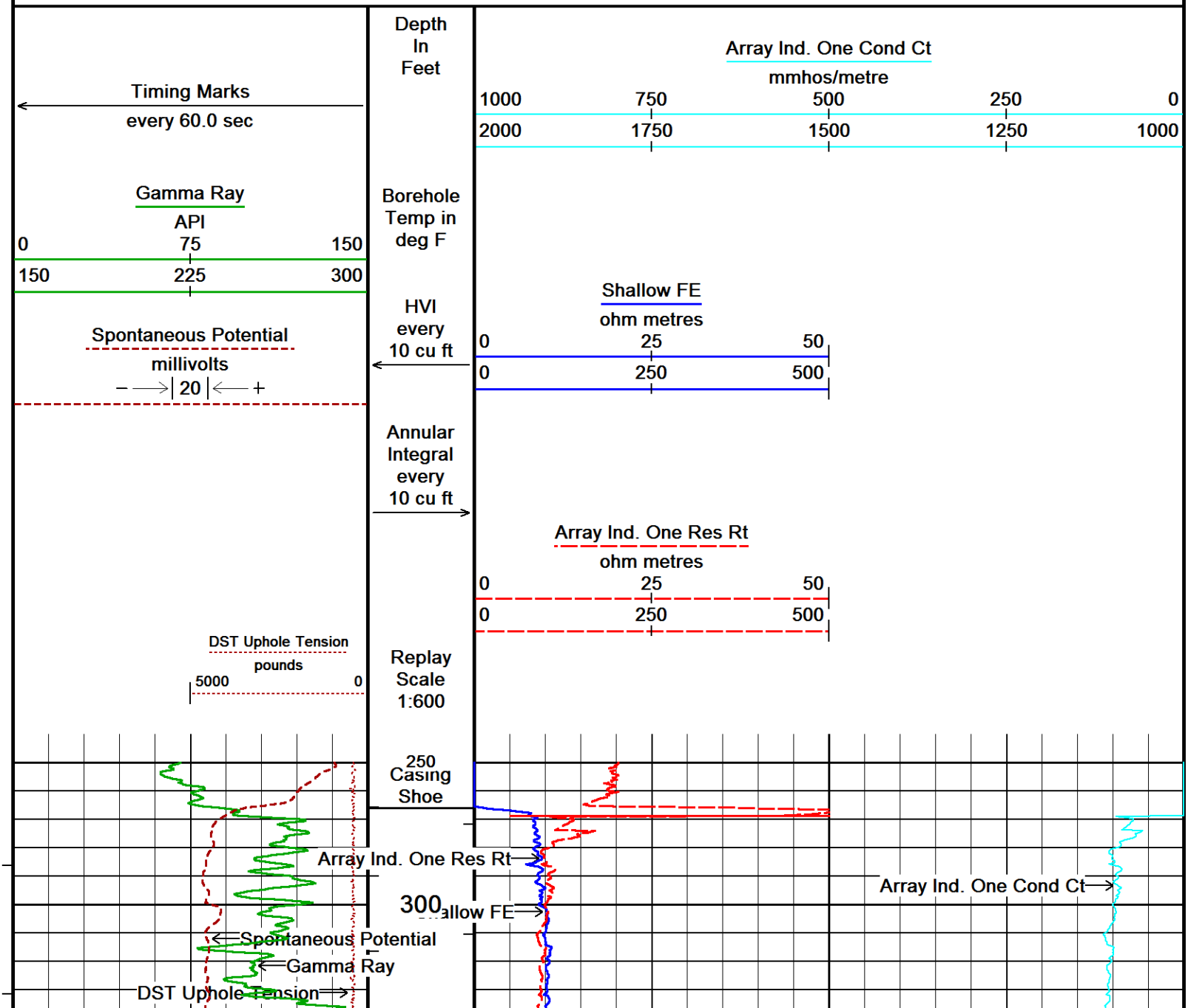
- OPERATOR: B. TOVAR, B. COPELAND.

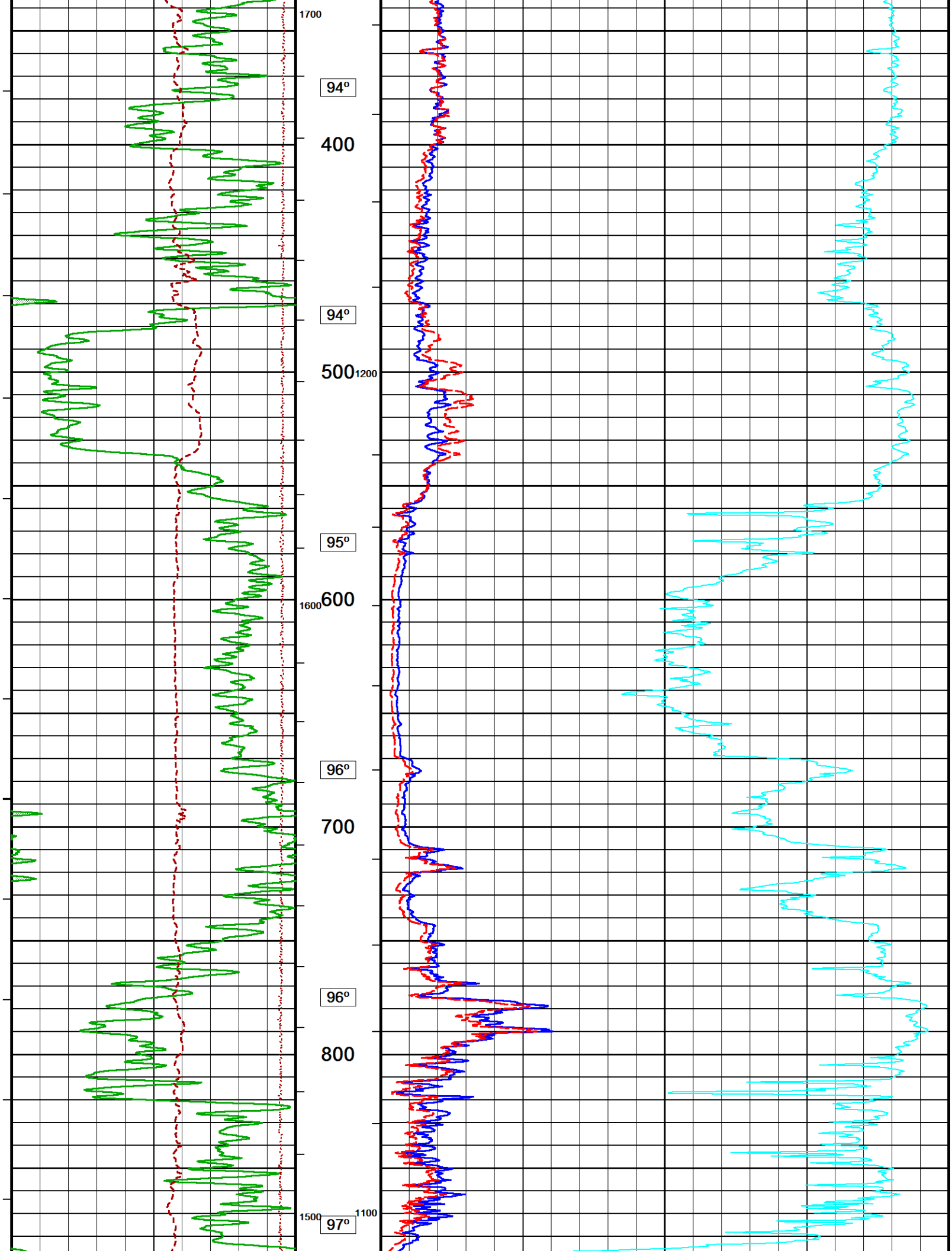
2 INCH MAIN

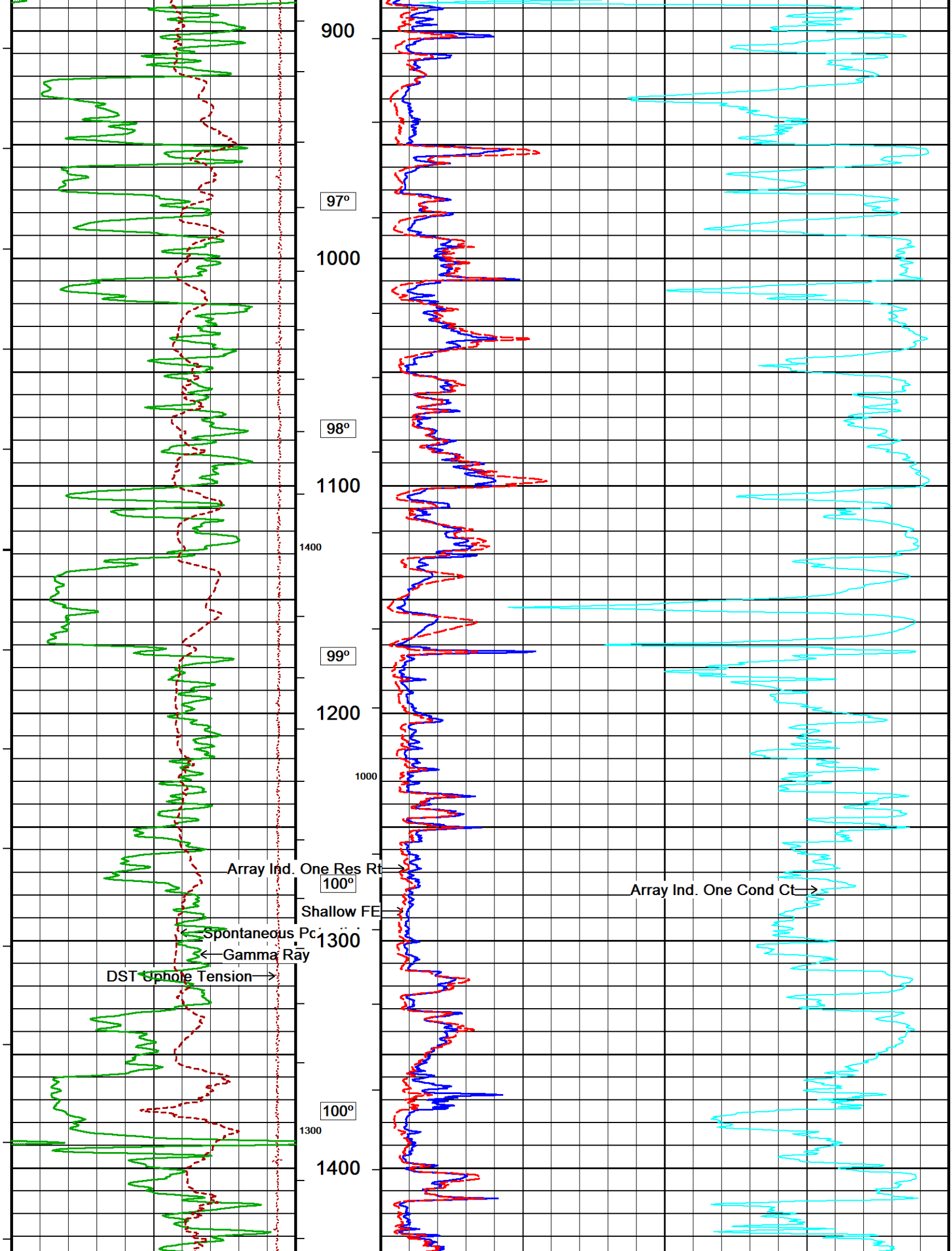
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2018 02:31

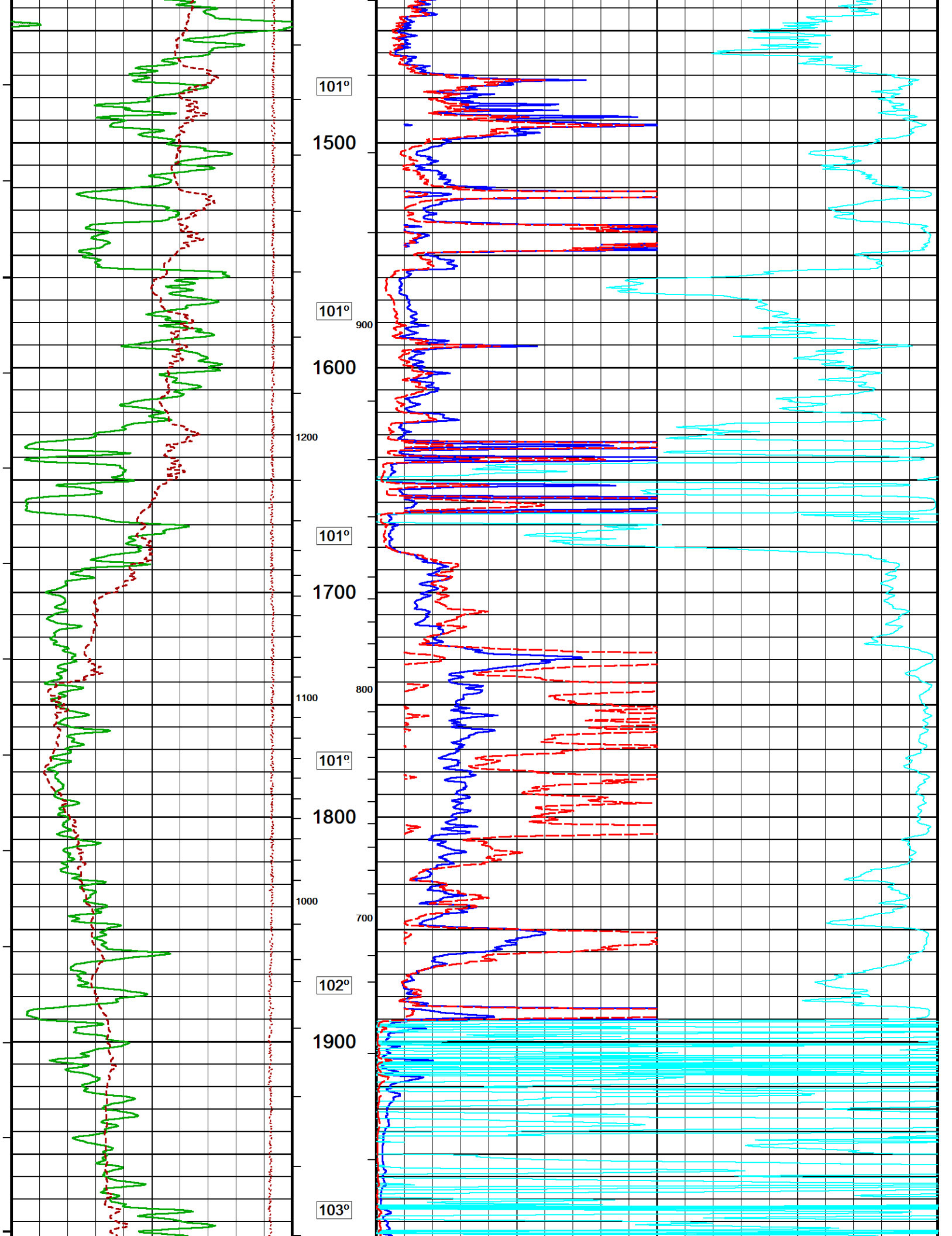
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta — Recorded on 14-JUN-2018 23:45

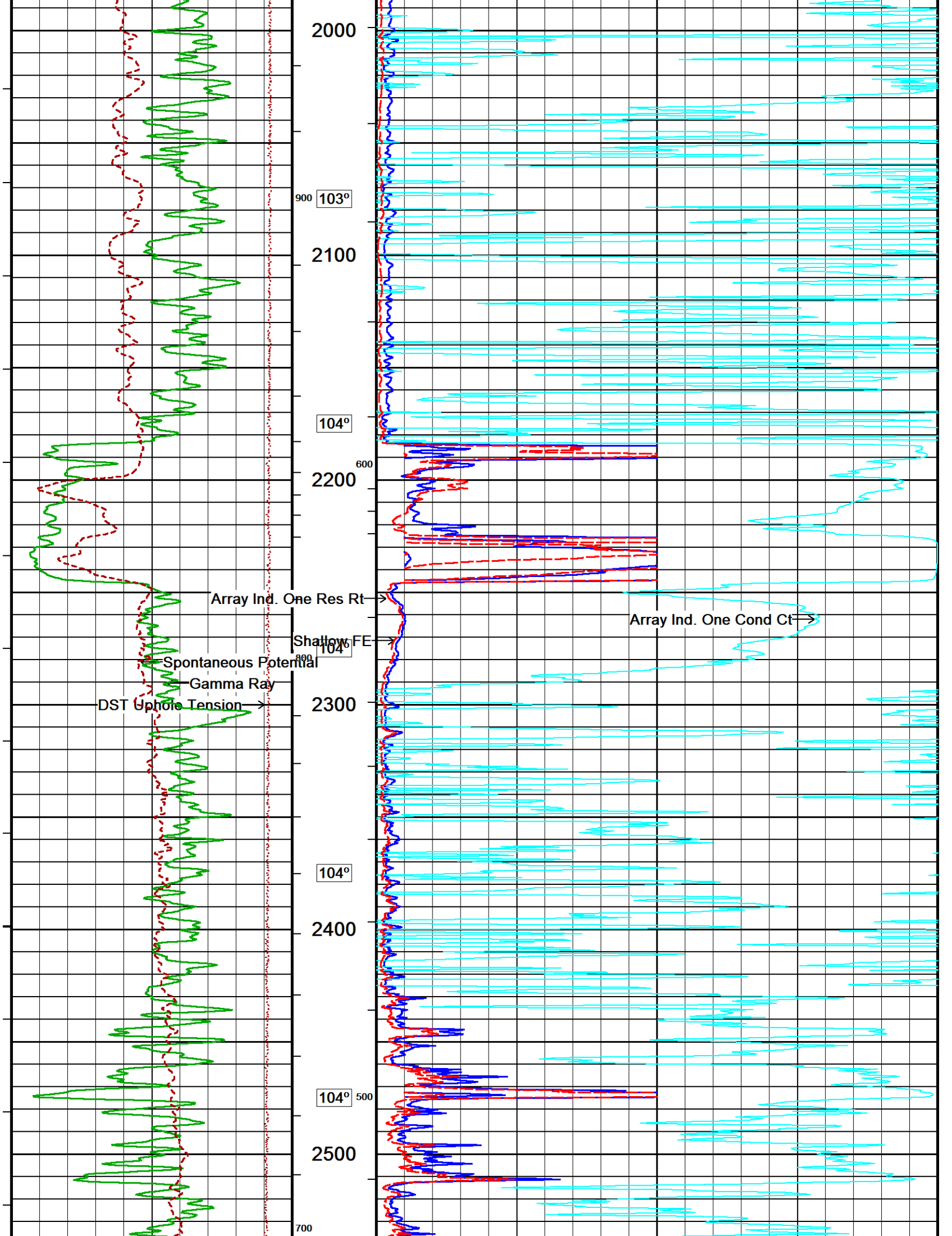
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

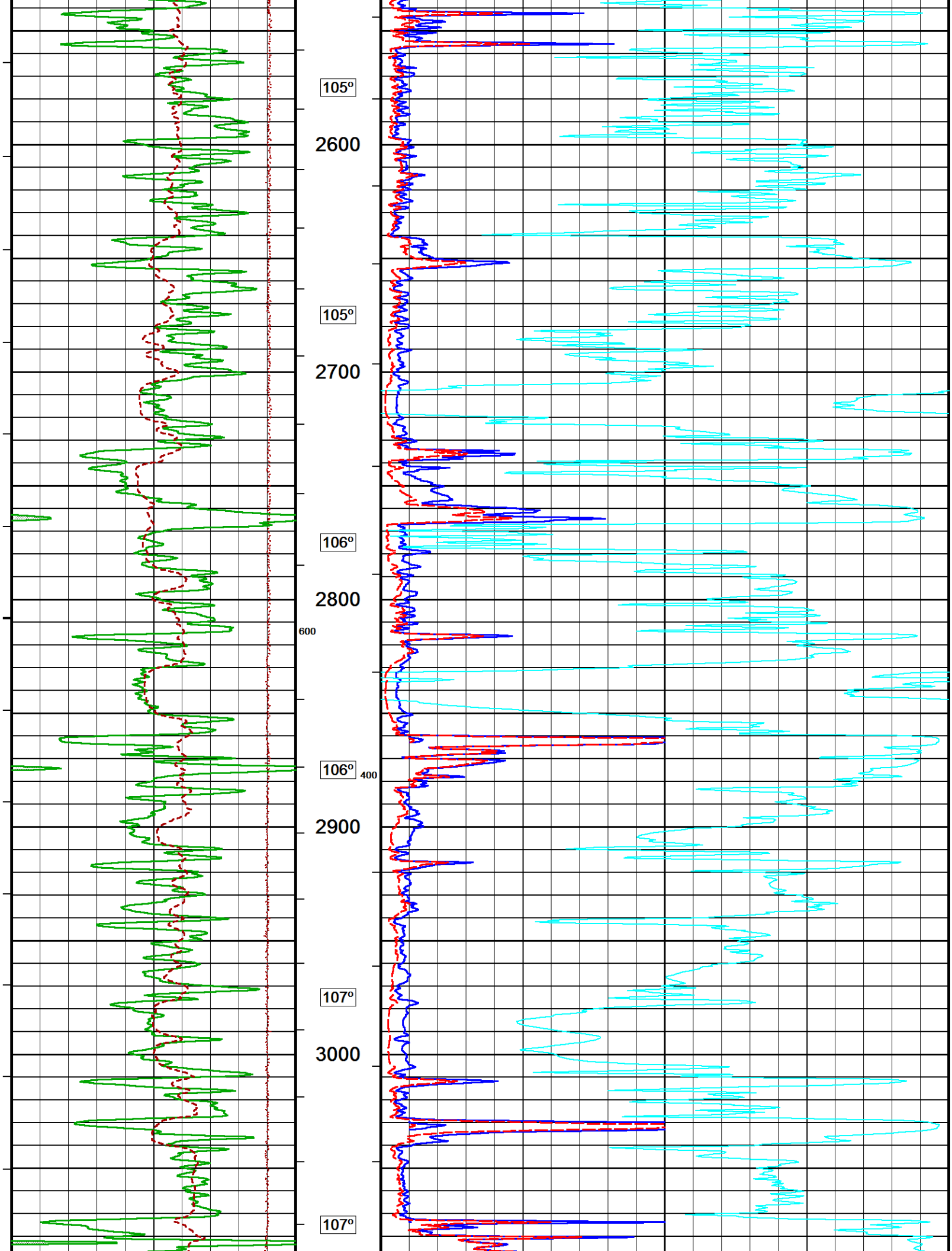


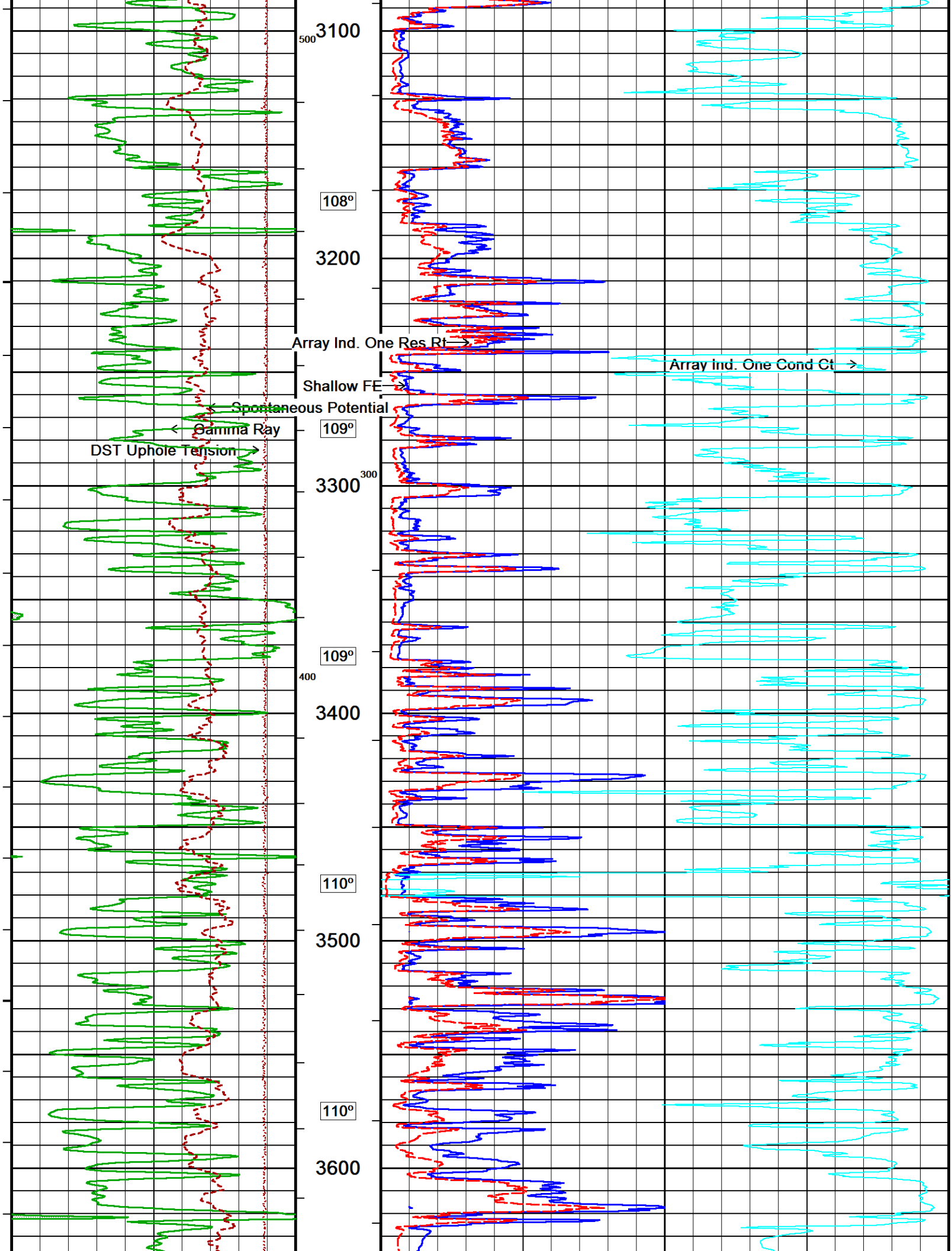

1700
94°
400
94°
500
1200
95°
1600
600
96°
700
96°
800
1500
97°
1100

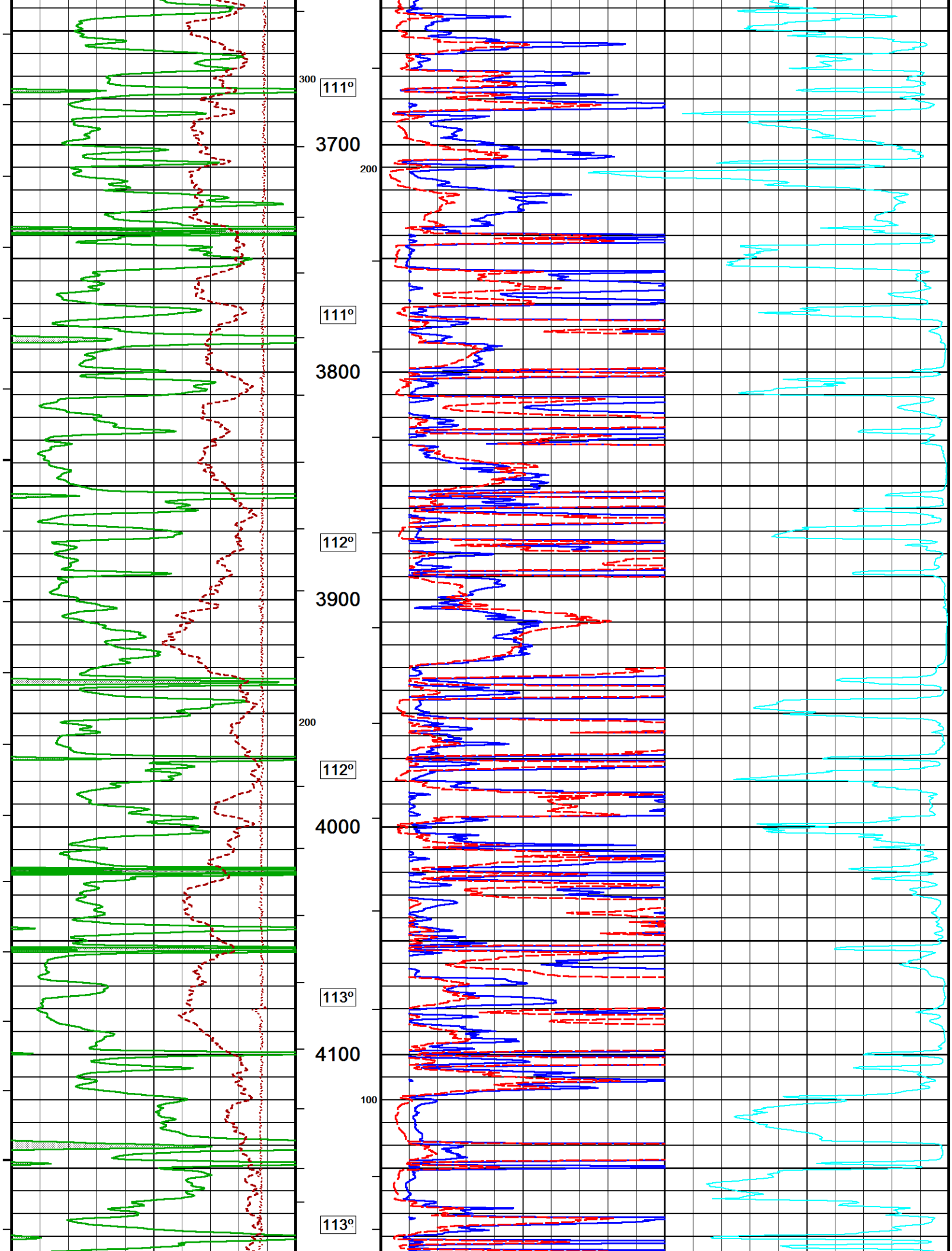

900
97°
1000
98°
1100
1400
99°
1200
1000
Array Ind. One Res Rt
100°
Shallow FE
Spontaneous Pc
1300
Gamma Ray
DST Uphole Tension
100°
1300
1400
Array Ind. One Cond Ct

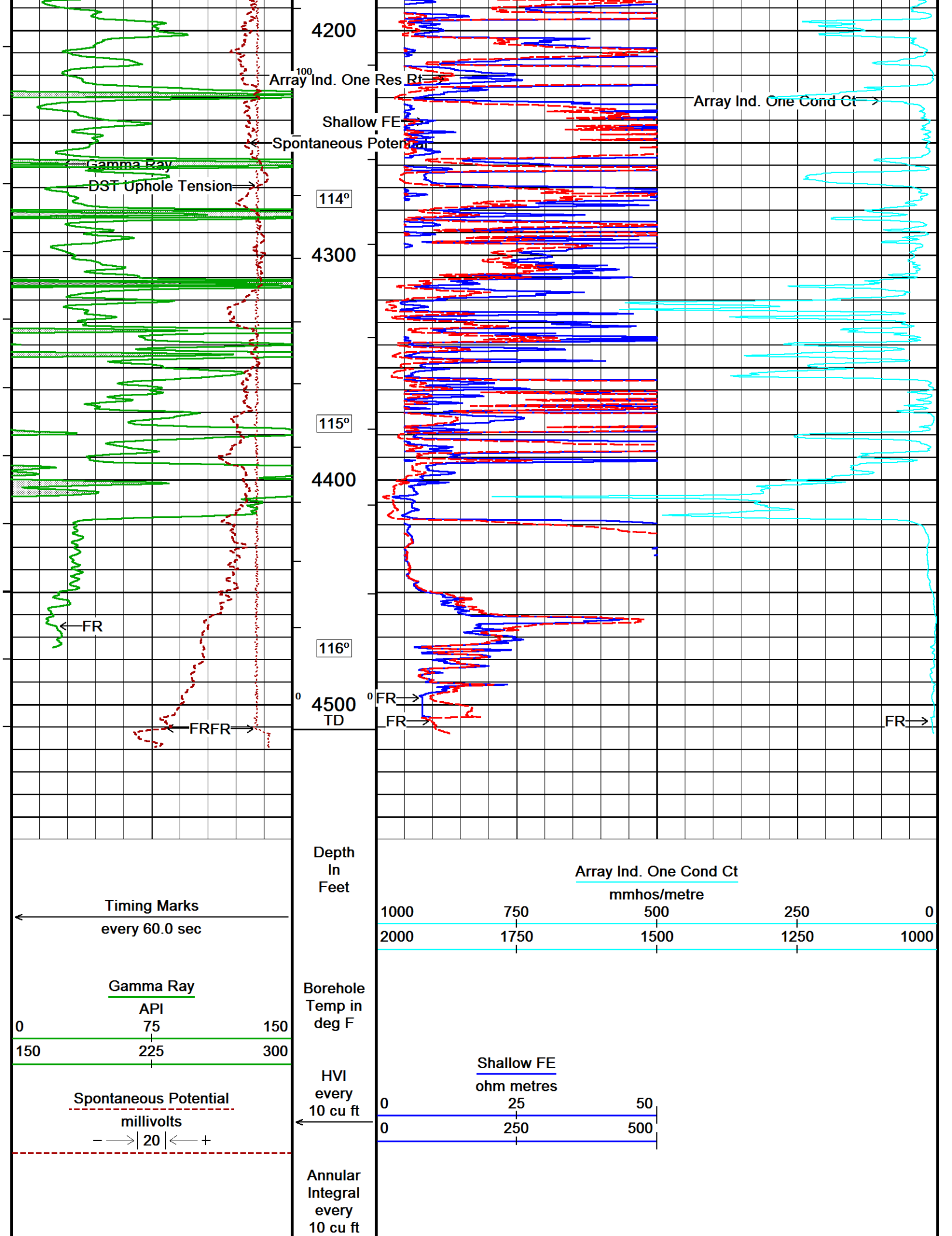

101º
1500
101º
900
1600
1200
101º
1700
800
1100
101º
1800
700
1000
102º
1900
103º

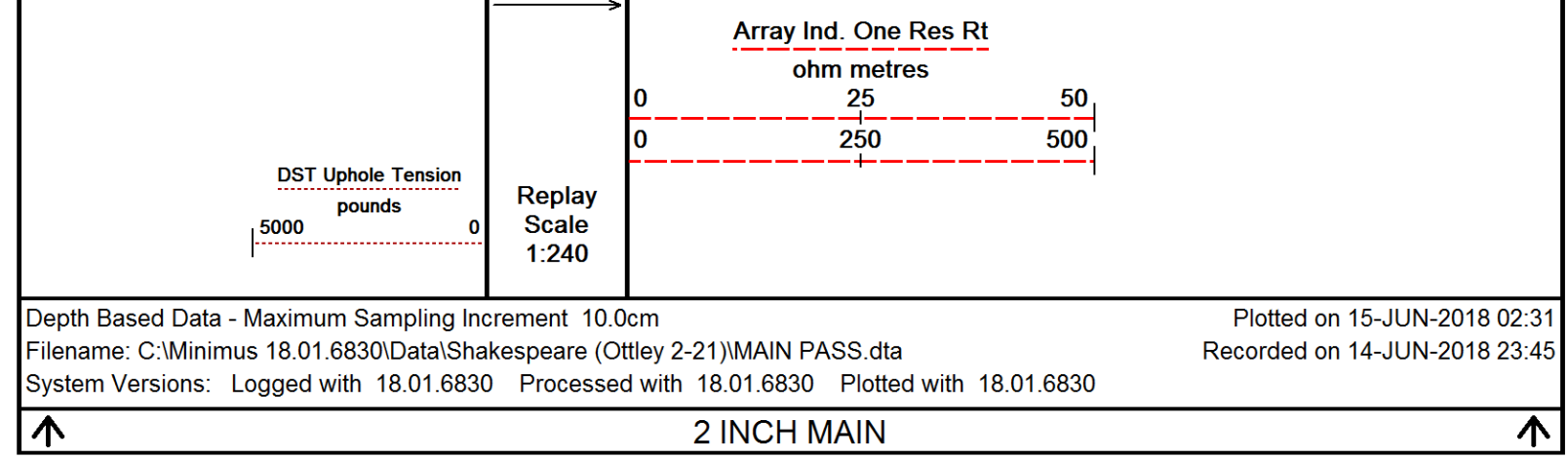

2000
900
103°
2100
104°
600
2200
Array Ind. One Res Rt
Array Ind. One Cond Ct
Shallow FE
104°
800
Spontaneous Potential
Gamma Ray
DST Uphole Tension
2300
104°
2400
104°
500
2500
700


105°
2600
105°
2700
106°
2800
600
106°
400
2900
107°
3000
107°


500
3100
108°
3200
Array Ind. One Res Rt
Array Ind. One Cond Ct
Shallow FE
Spontaneous Potential
109°
Gamma Ray
DST Uphole Tension
300
3300
109°
400
3400
110°
3500
110°
3600


300
111°
3700
200
111°
3800
112°
3900
200
112°
4000
113°
4100
100
113°


4200
100
Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Ct
114°
4300
115°
4400
116°
0
4500
TD
FR
FRFR
0
FR
FR
FR
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
Gamma Ray
API
0
75
150
150
225
300
Borehole
Temp in
deg F
Shallow FE
ohm metres
0
25
50
0
250
500
HVI
every
10 cu ft
Spontaneous Potential
millivolts
– 20 +
Annular
Integral
every
10 cu ft

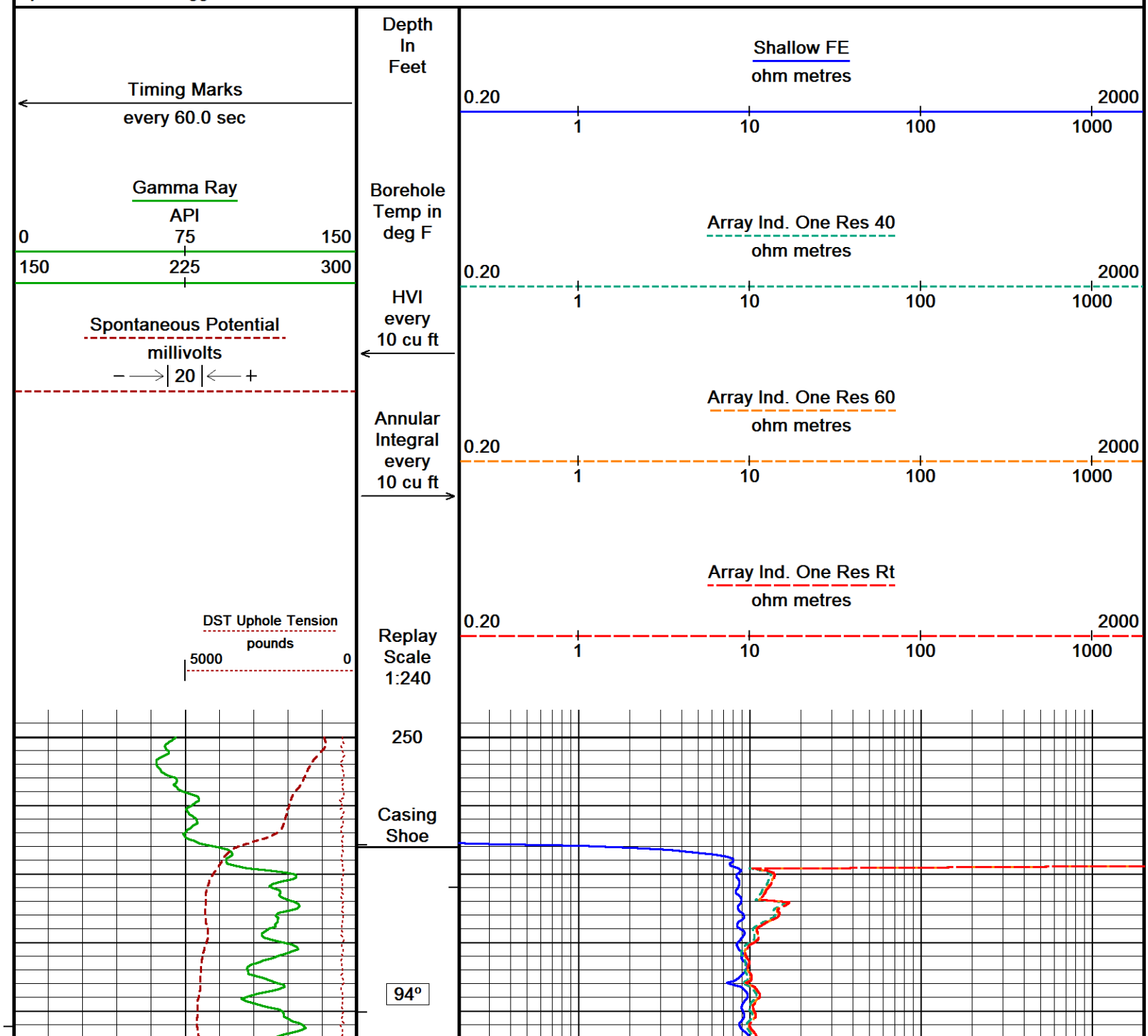


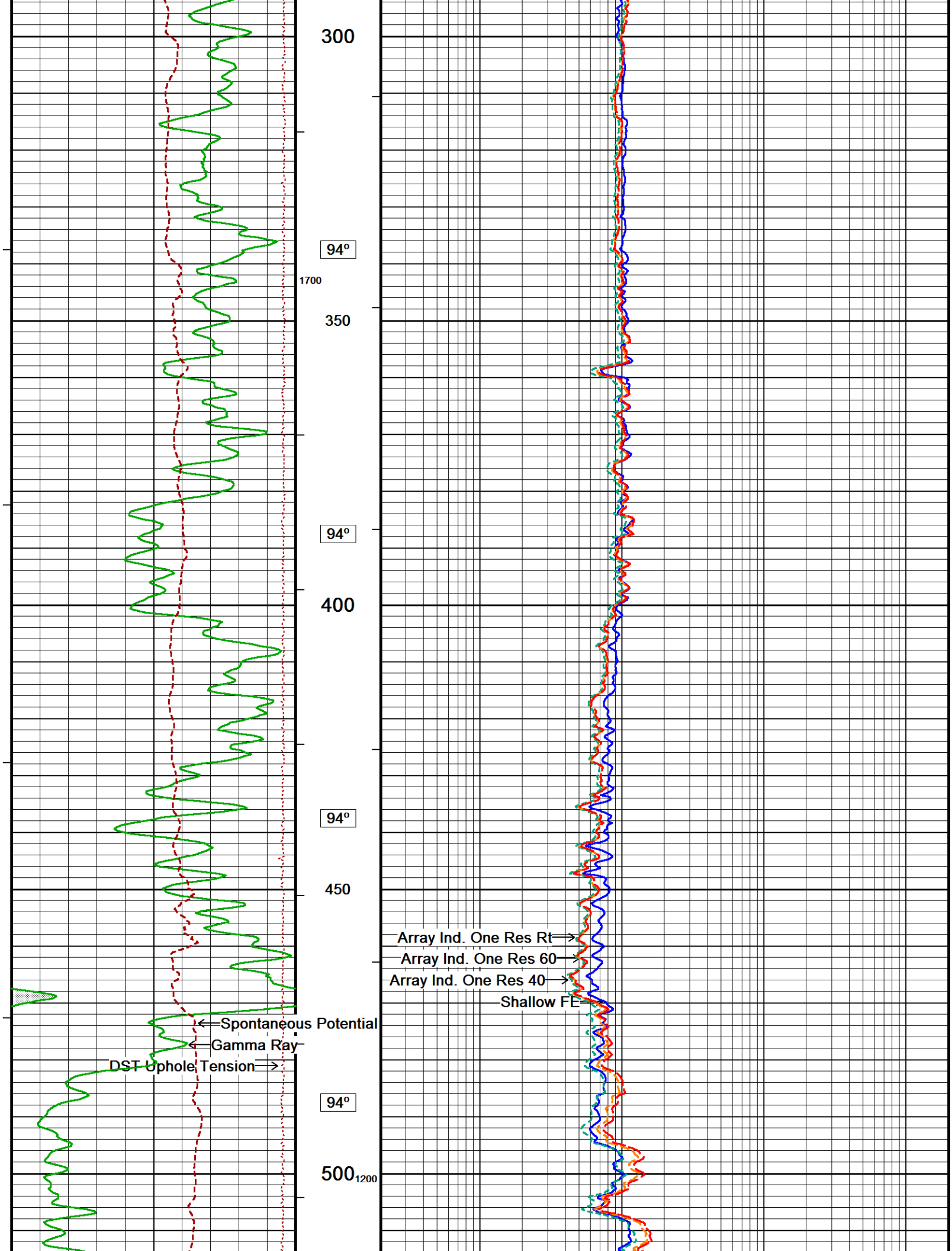
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2018 02:31
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta — Recorded on 14-JUN-2018 23:45
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

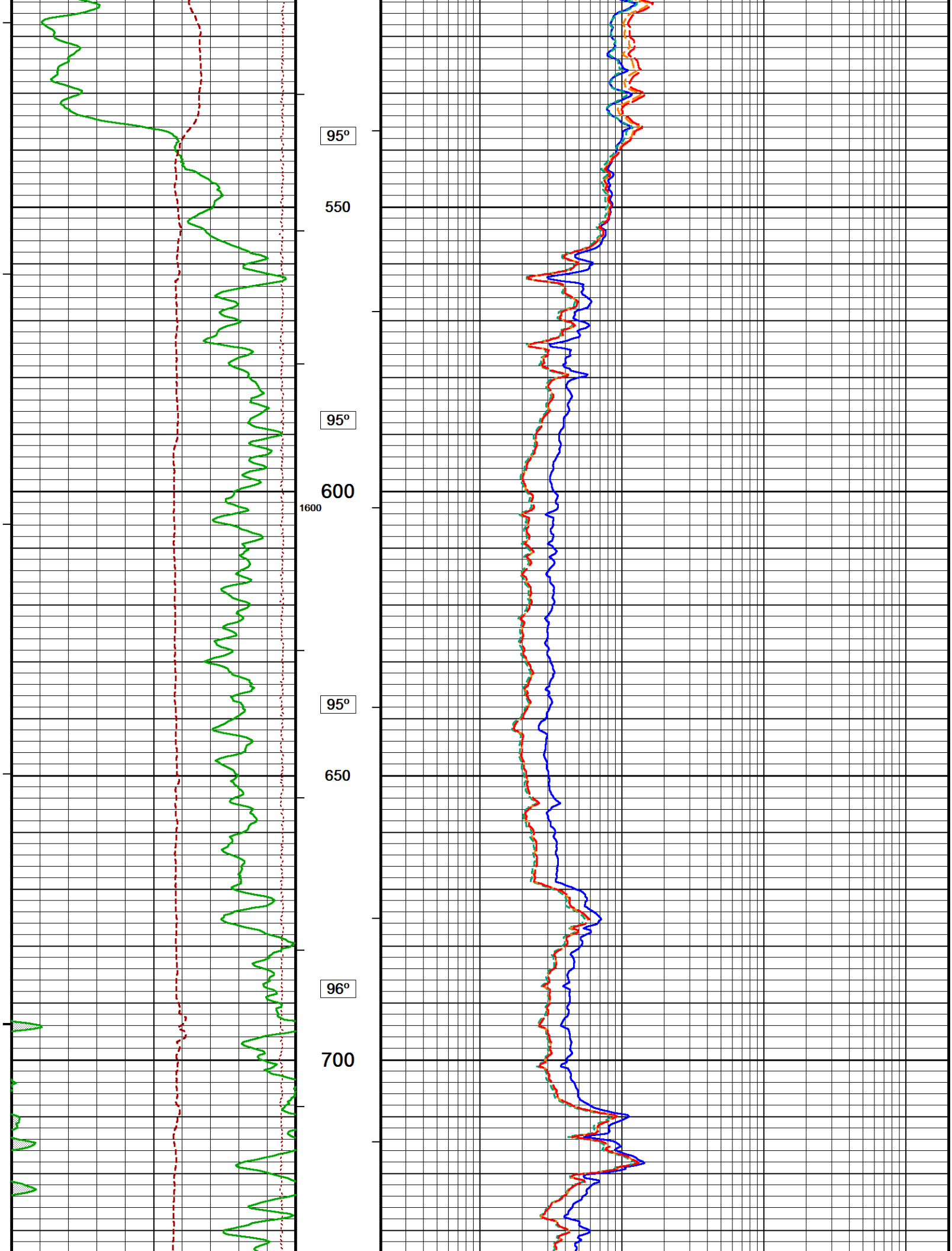
2 INCH MAIN

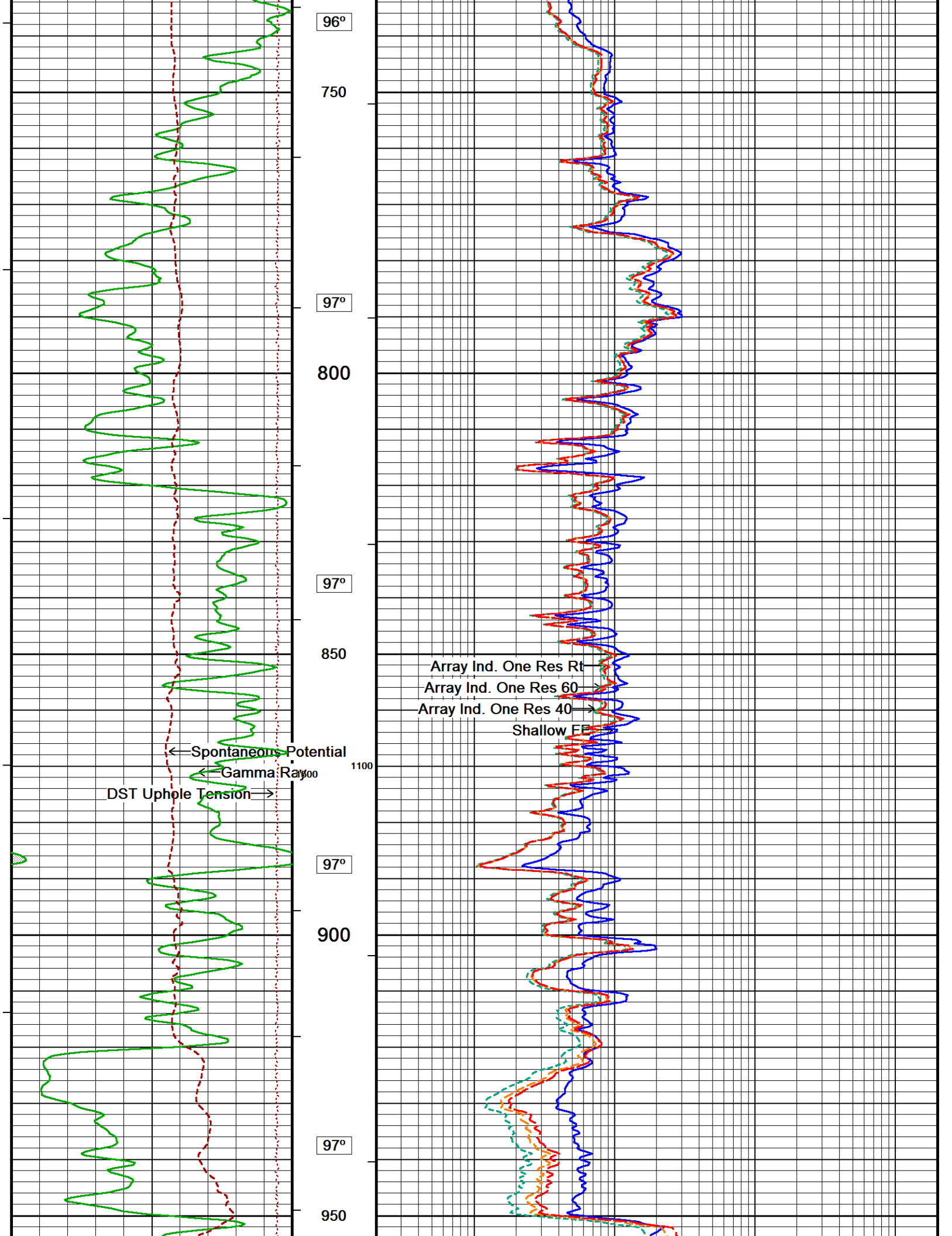
5 INCH MAIN

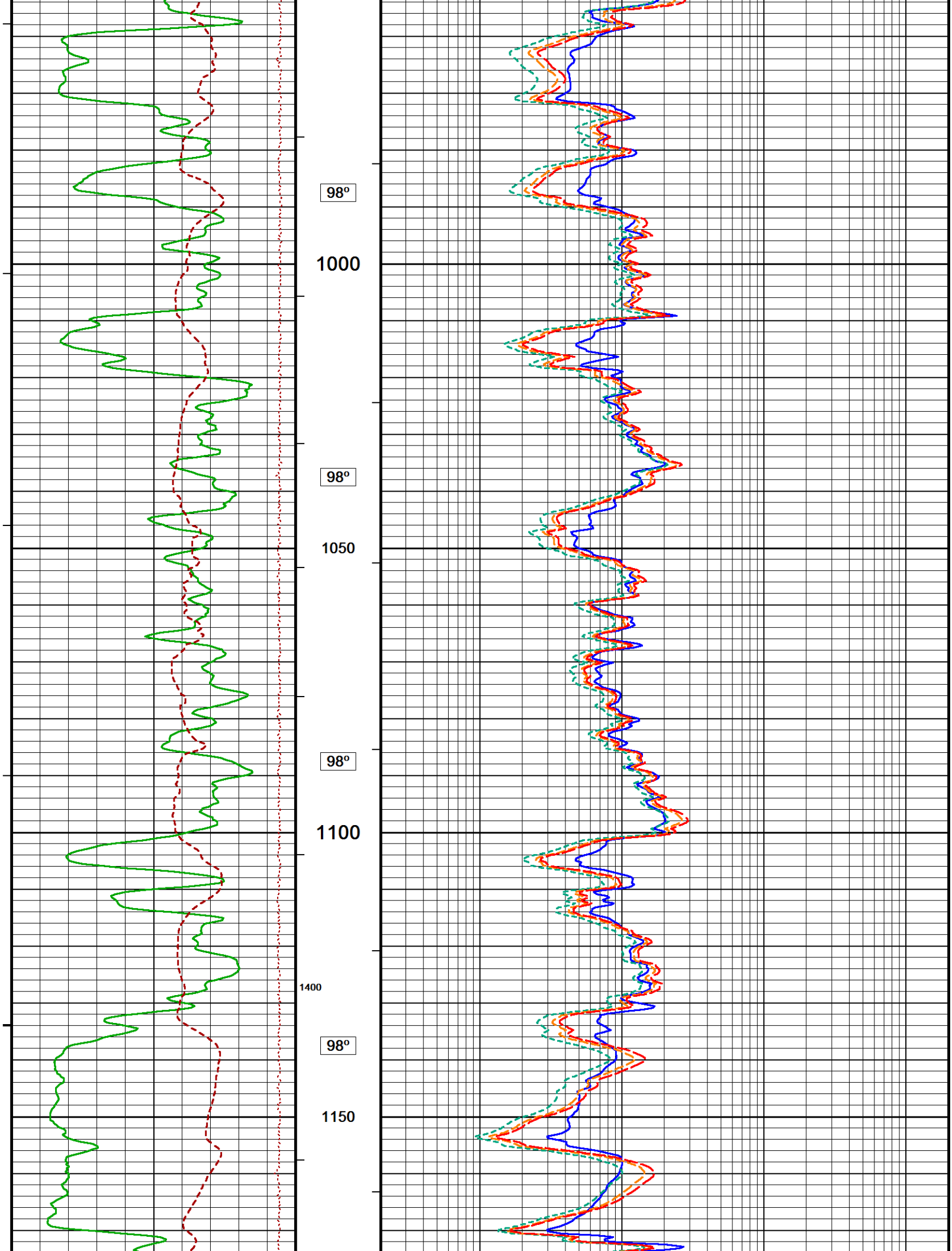
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 15-JUN-2018 02:31
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta — Recorded on 14-JUN-2018 23:45
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

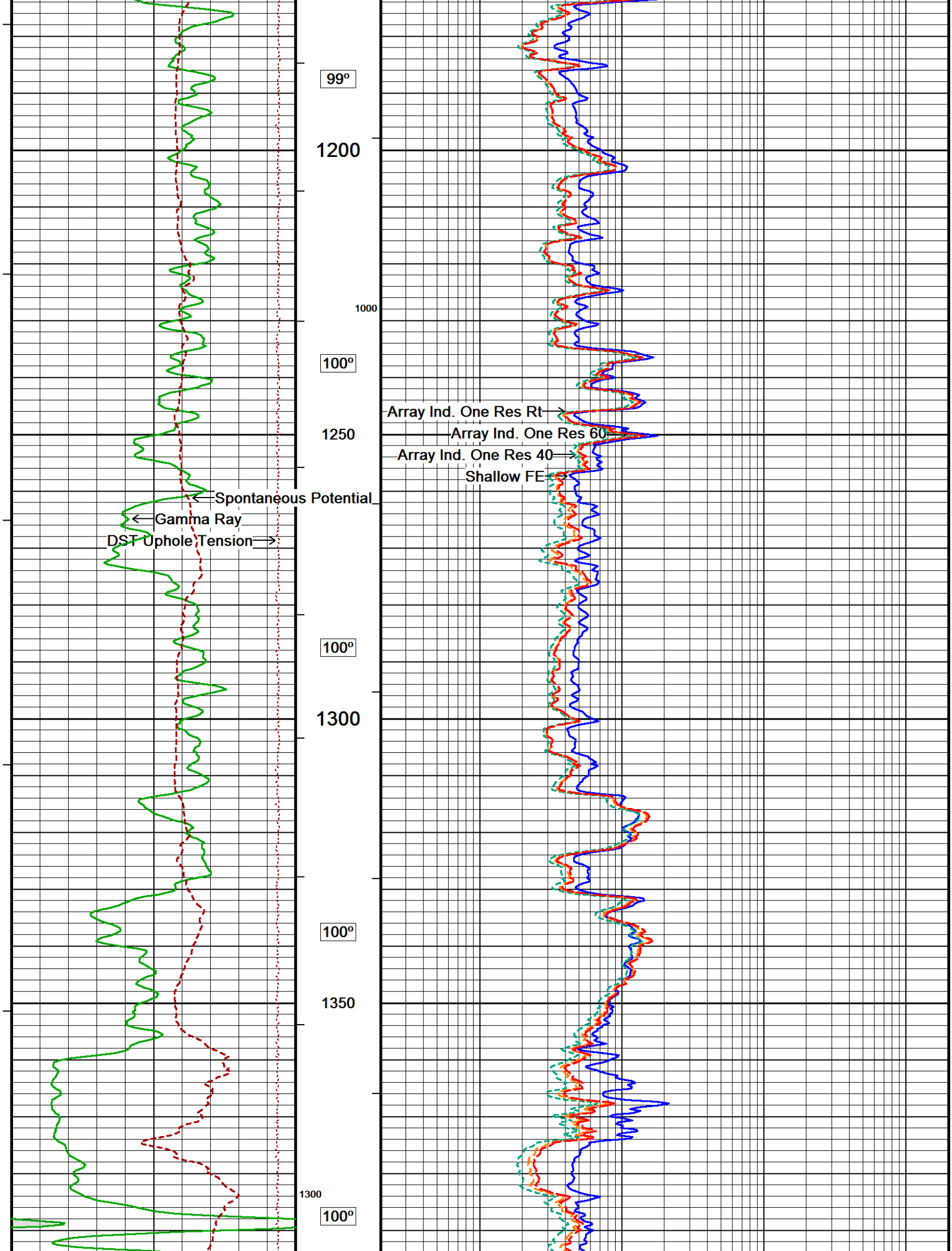


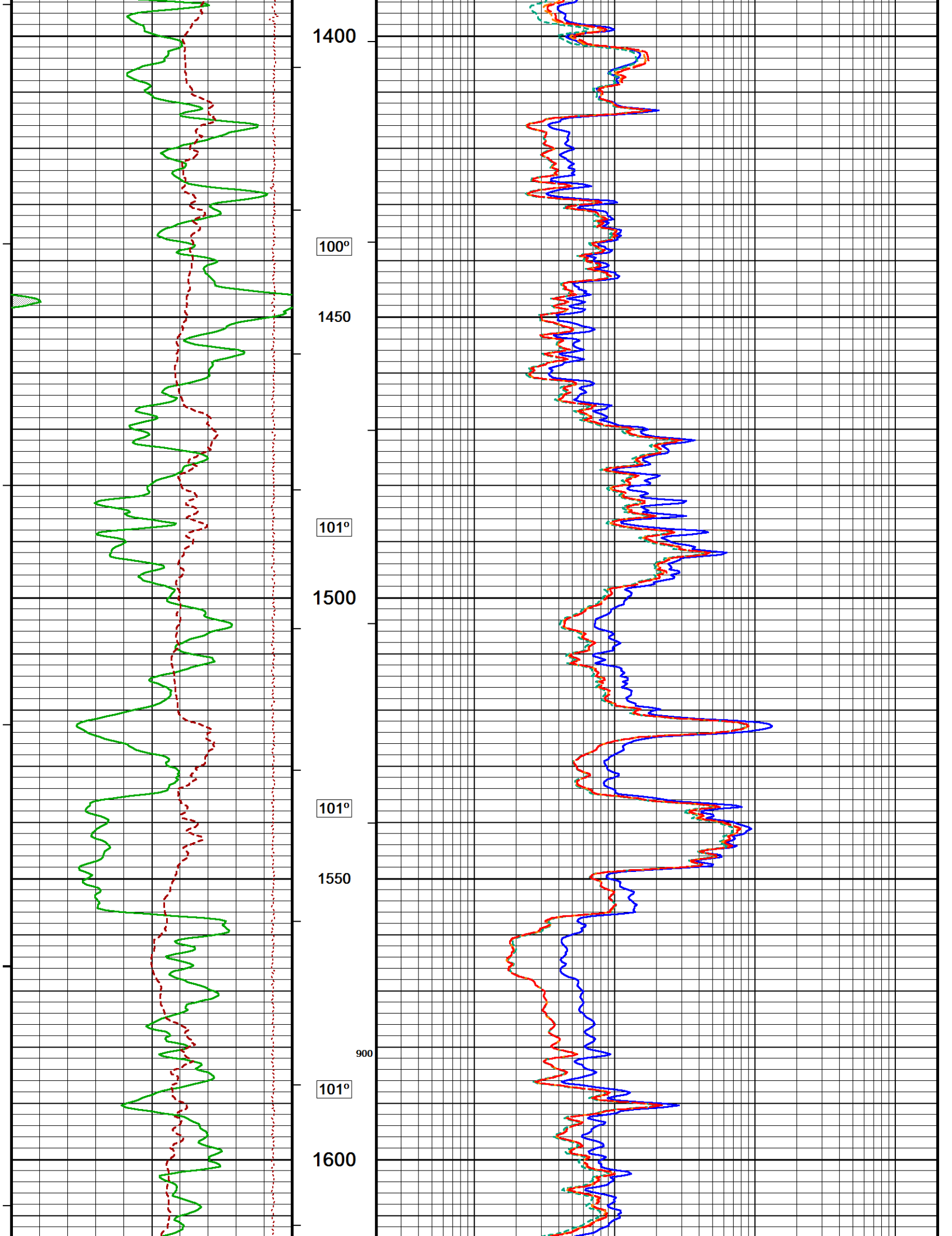

300
94°
1700
350
94°
400
94°
450
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
94°
500
1200

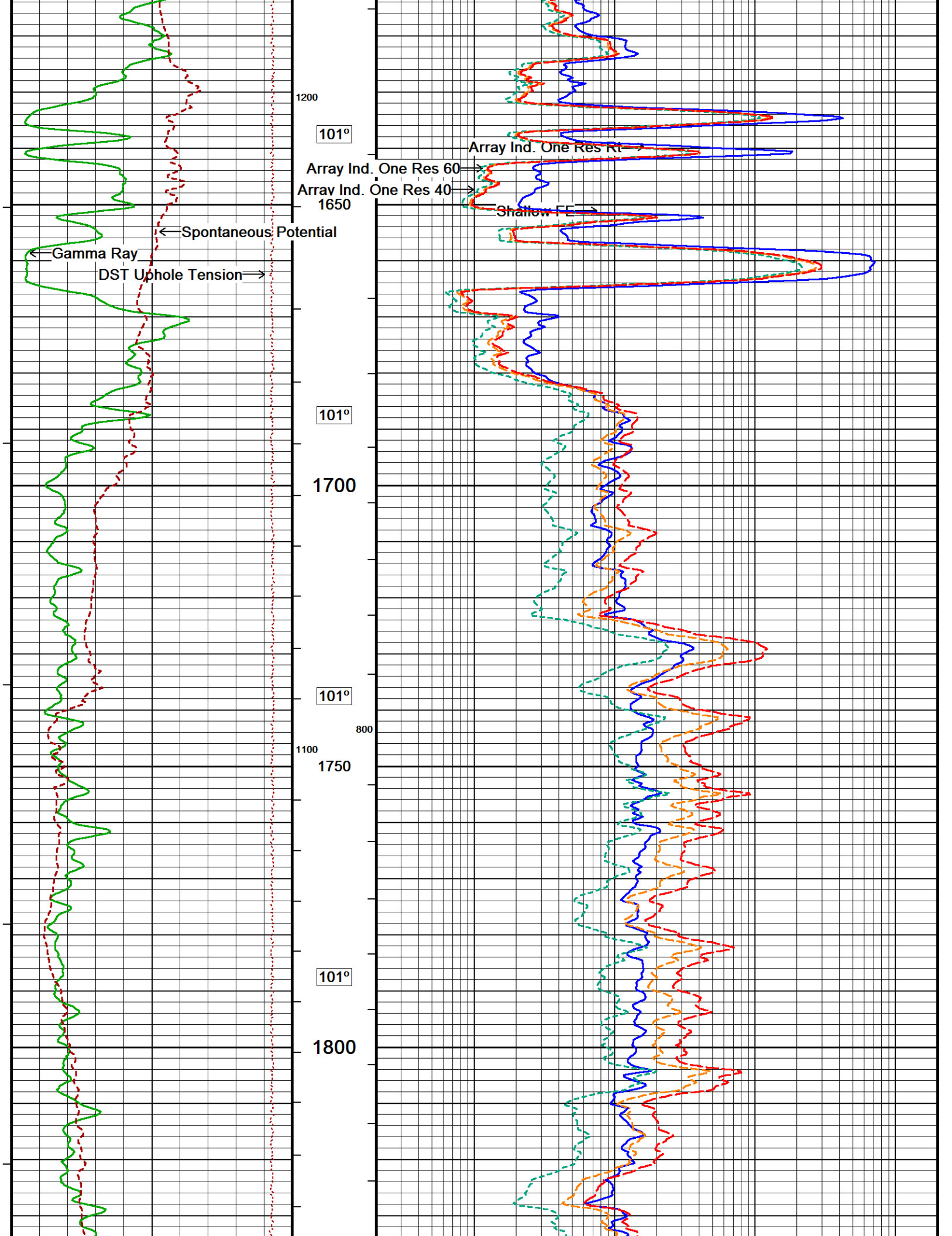

95°
550
95°
600
1600
95°
650
96°
700

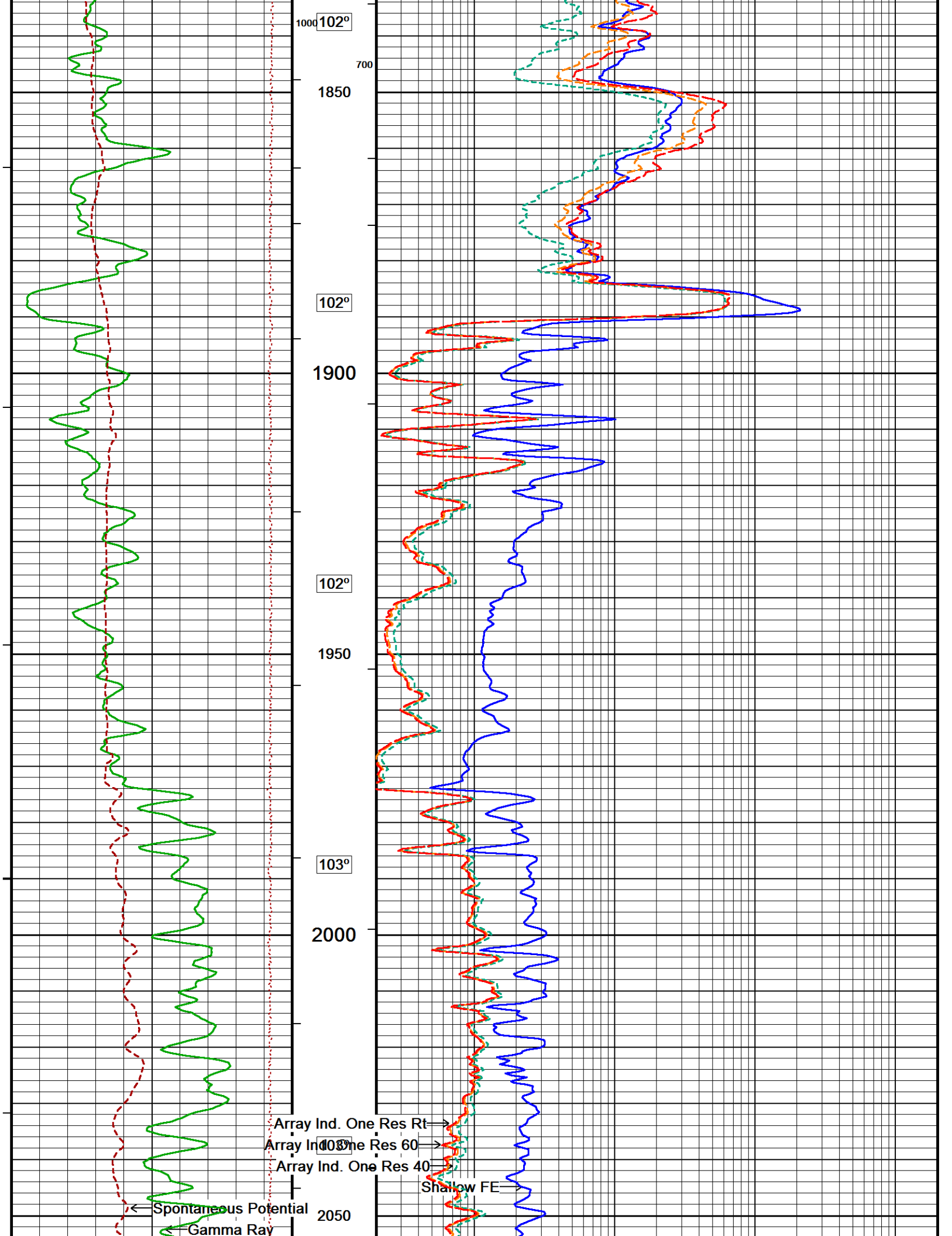

96°
750
97°
800
97°
850
1100
97°
900
97°
950
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension

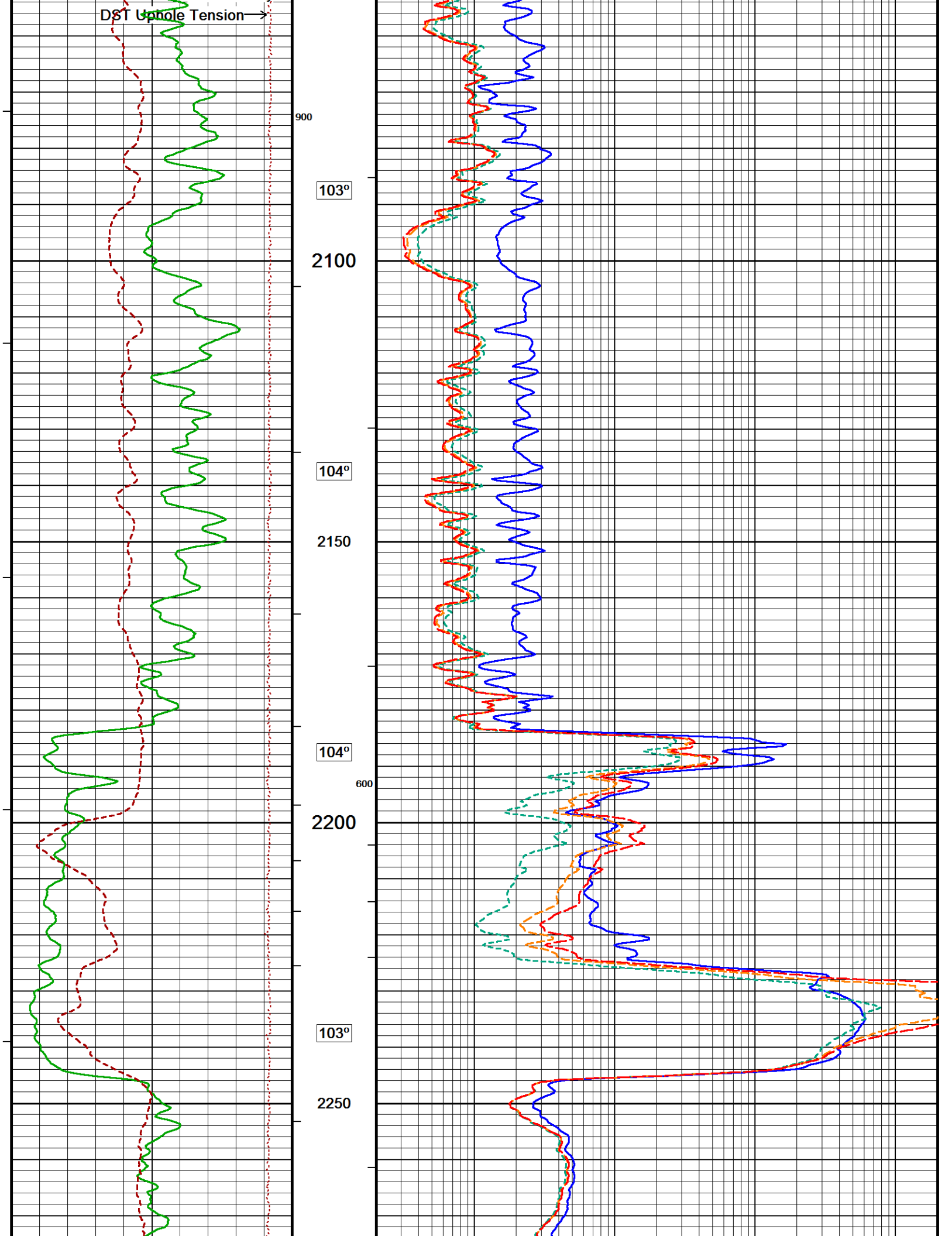

98°
1000
98°
1050
98°
1100
1400
98°
1150

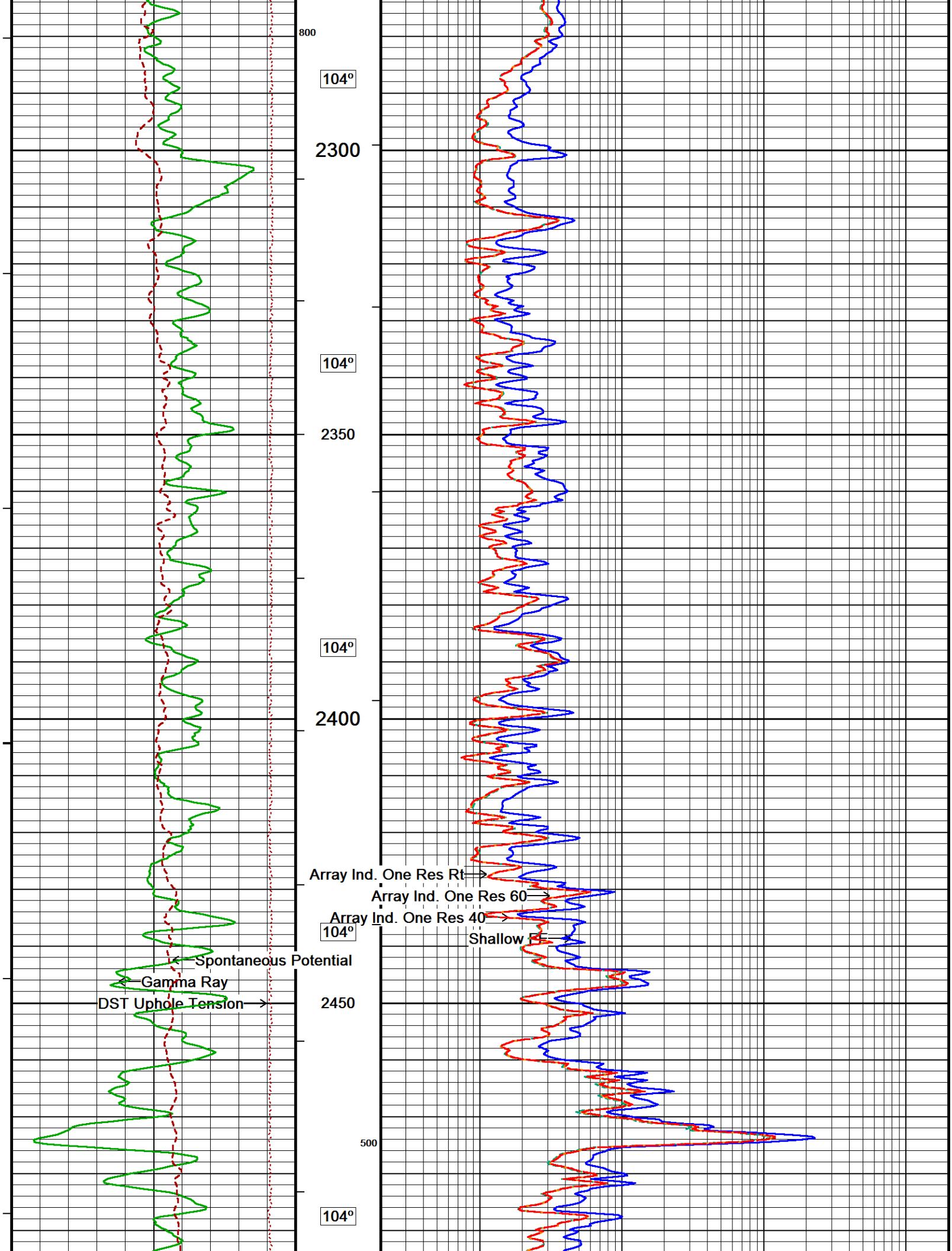

99°
1200
1000
100°
Array Ind. One Res Rt
1250
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
100°
1300
100°
1350
1300
100°

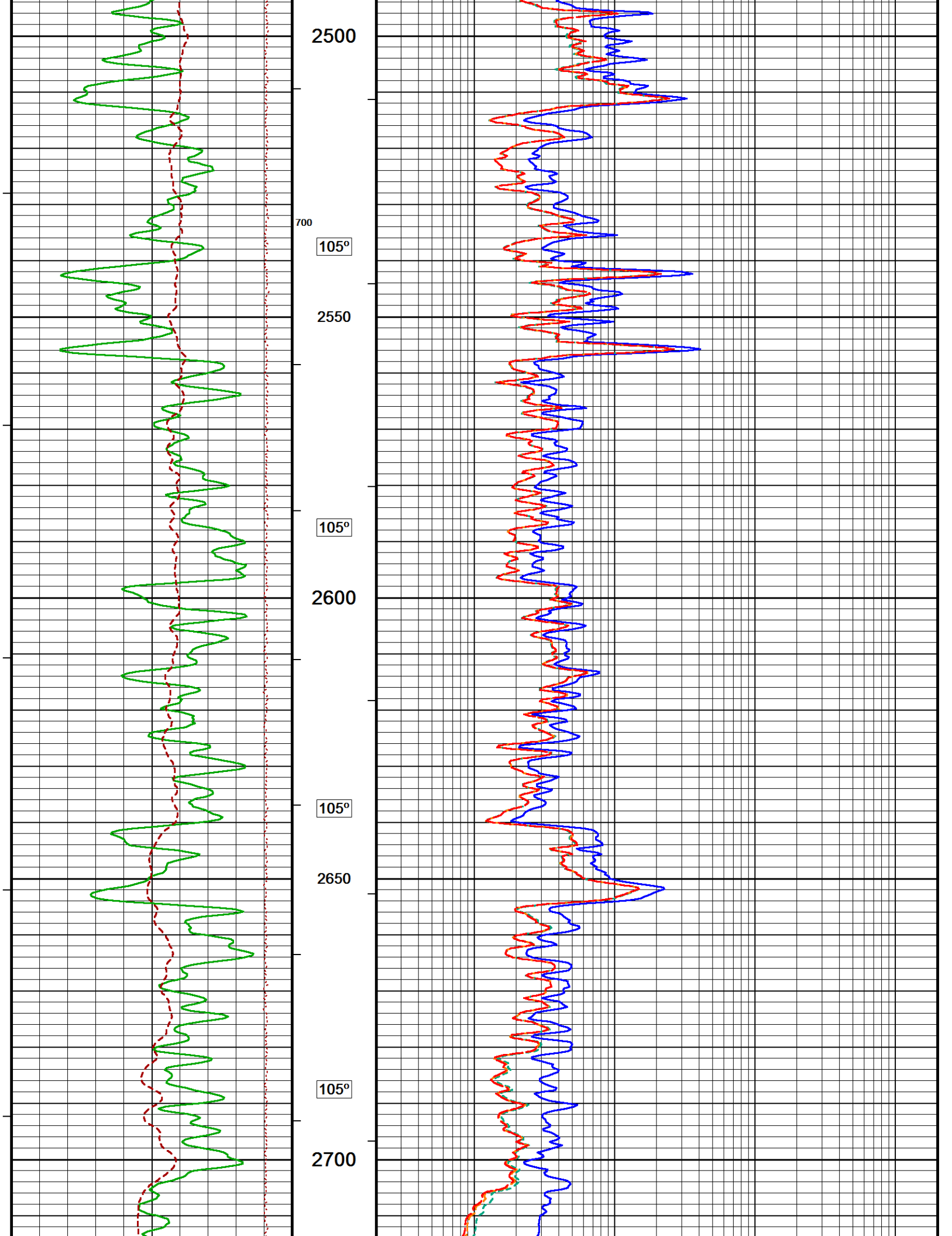

1400
100°
1450
101°
1500
101°
1550
900
101°
1600

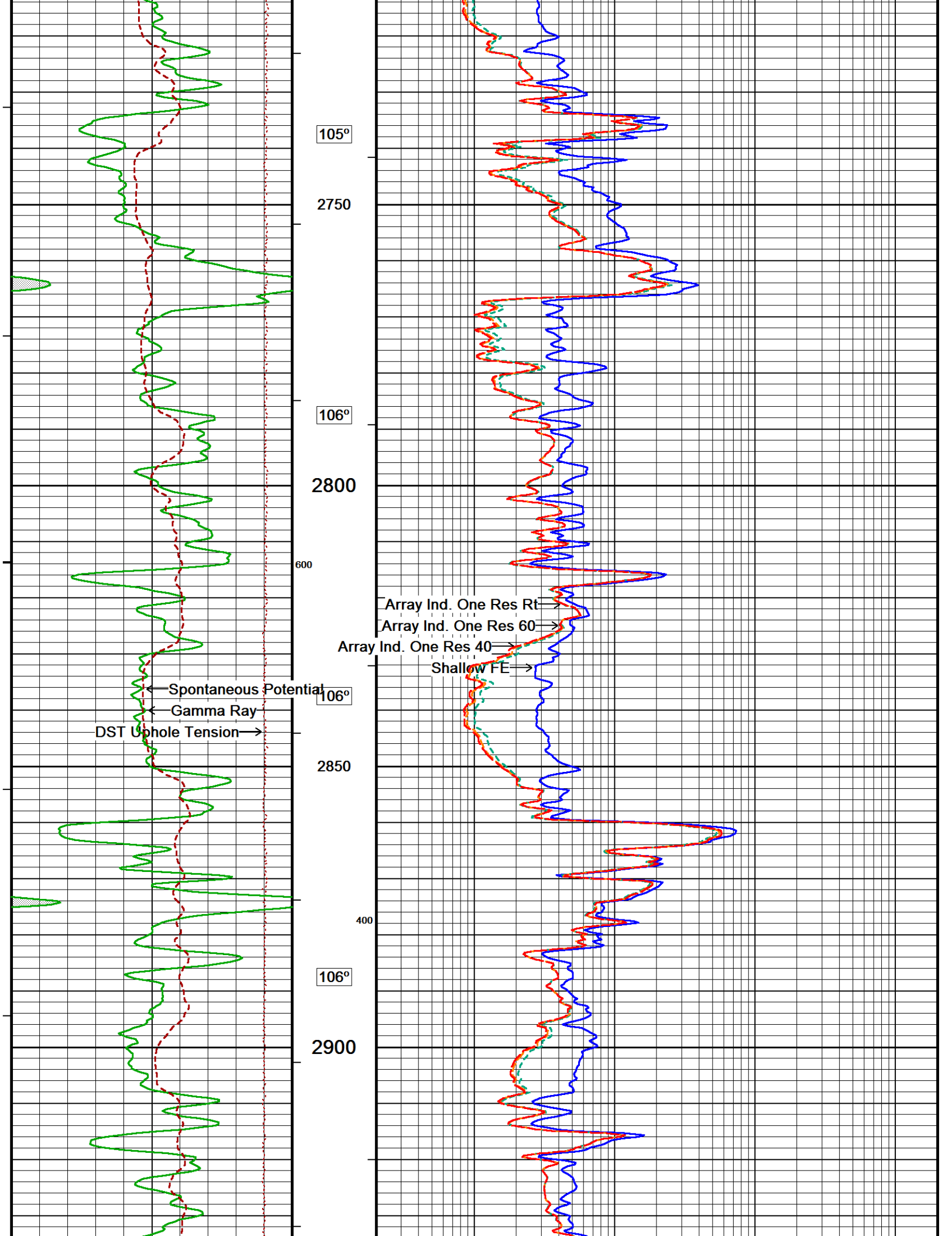

Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
1200
101°
1650
101°
1700
101°
800
1100
1750
101°
1800

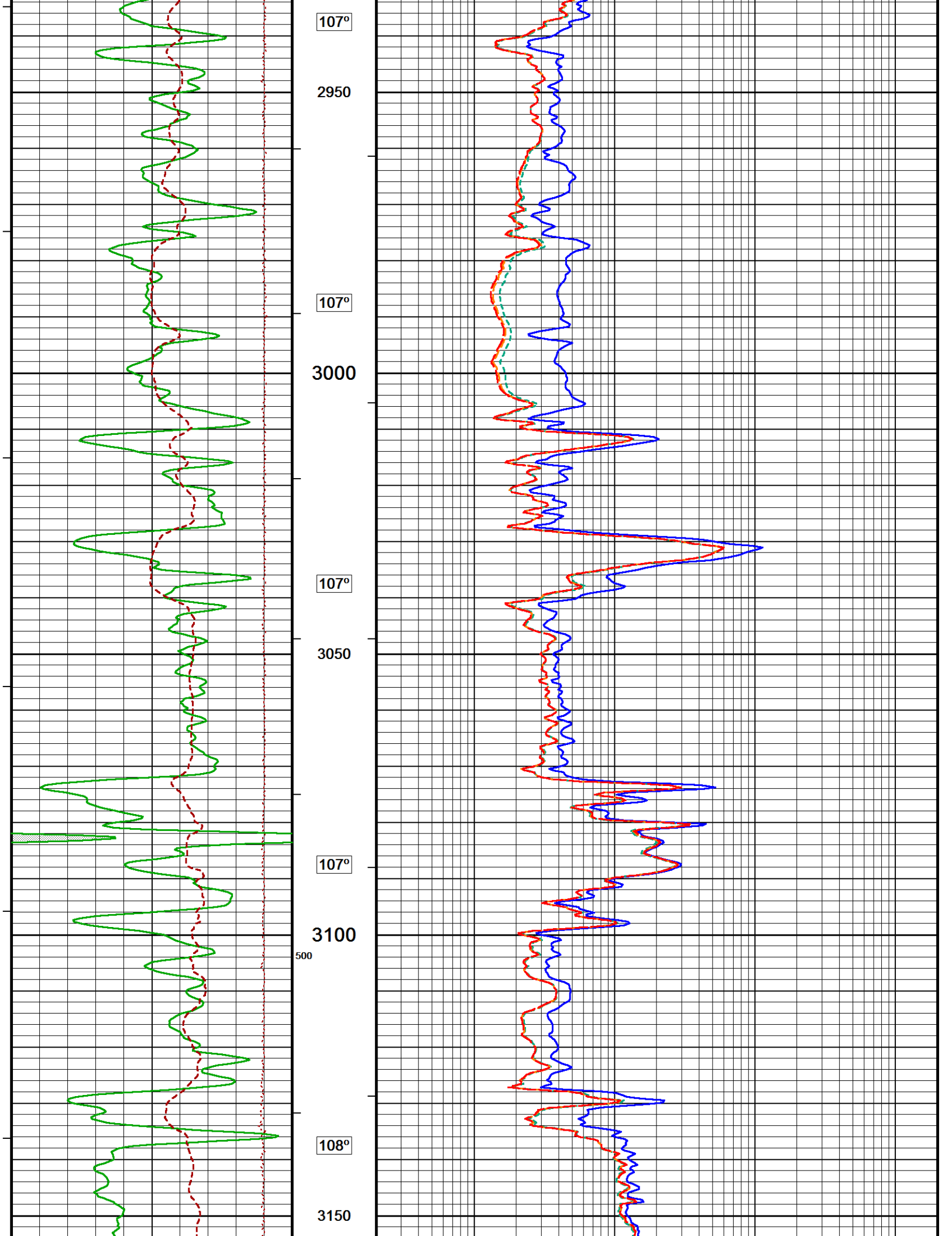

1000
102°
700
1850
102°
1900
102°
1950
103°
2000
103°
2050
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray

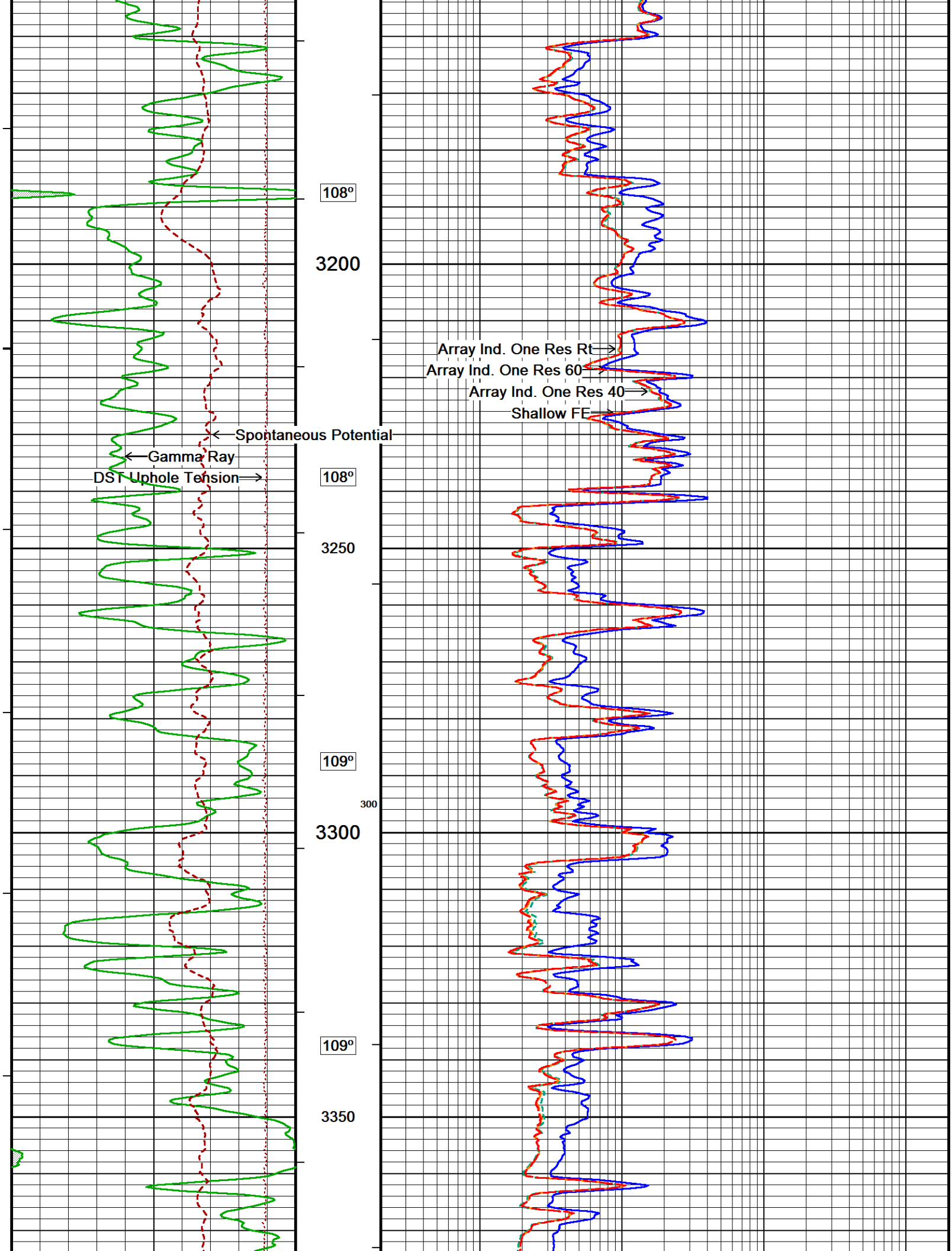

DST Uphole Tension
900
103°
2100
104°
2150
104°
600
2200
103°
2250

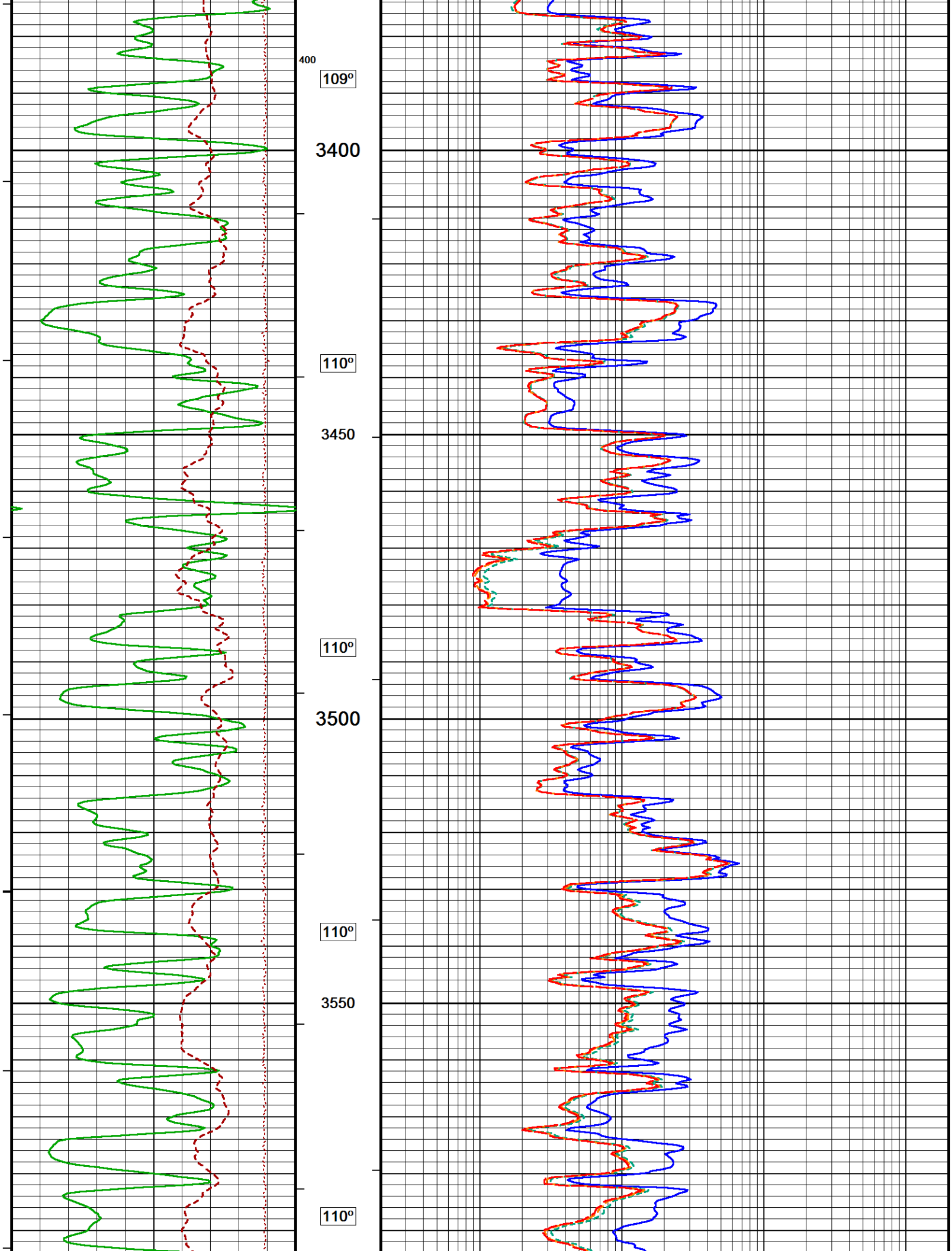

800
104°
2300
104°
2350
104°
2400
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow R
104°
Spontaneous Potential
Gamma Ray
DST Uphole Tension
2450
500
104°

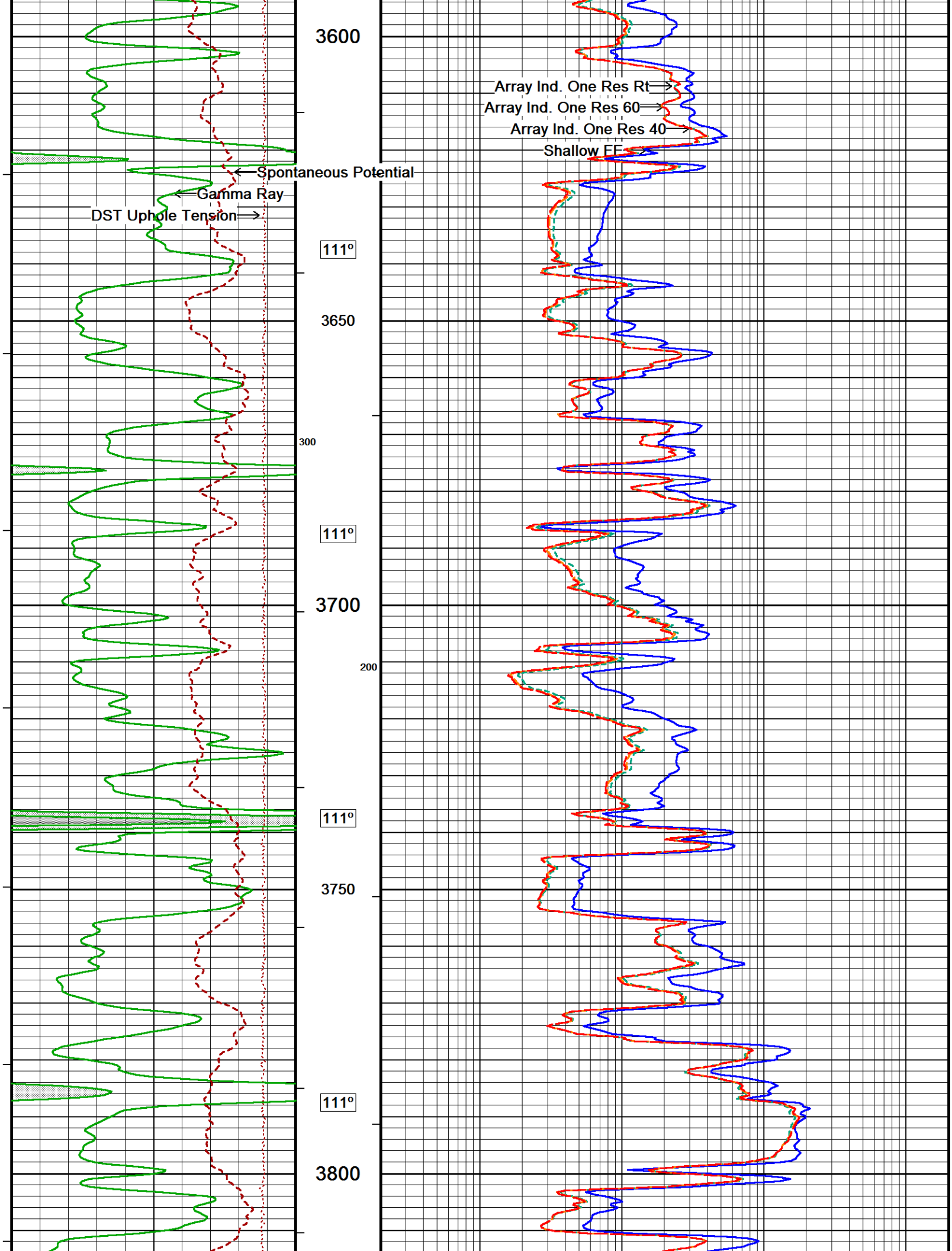

2500
700
105°
2550
105°
2600
105°
2650
105°
2700

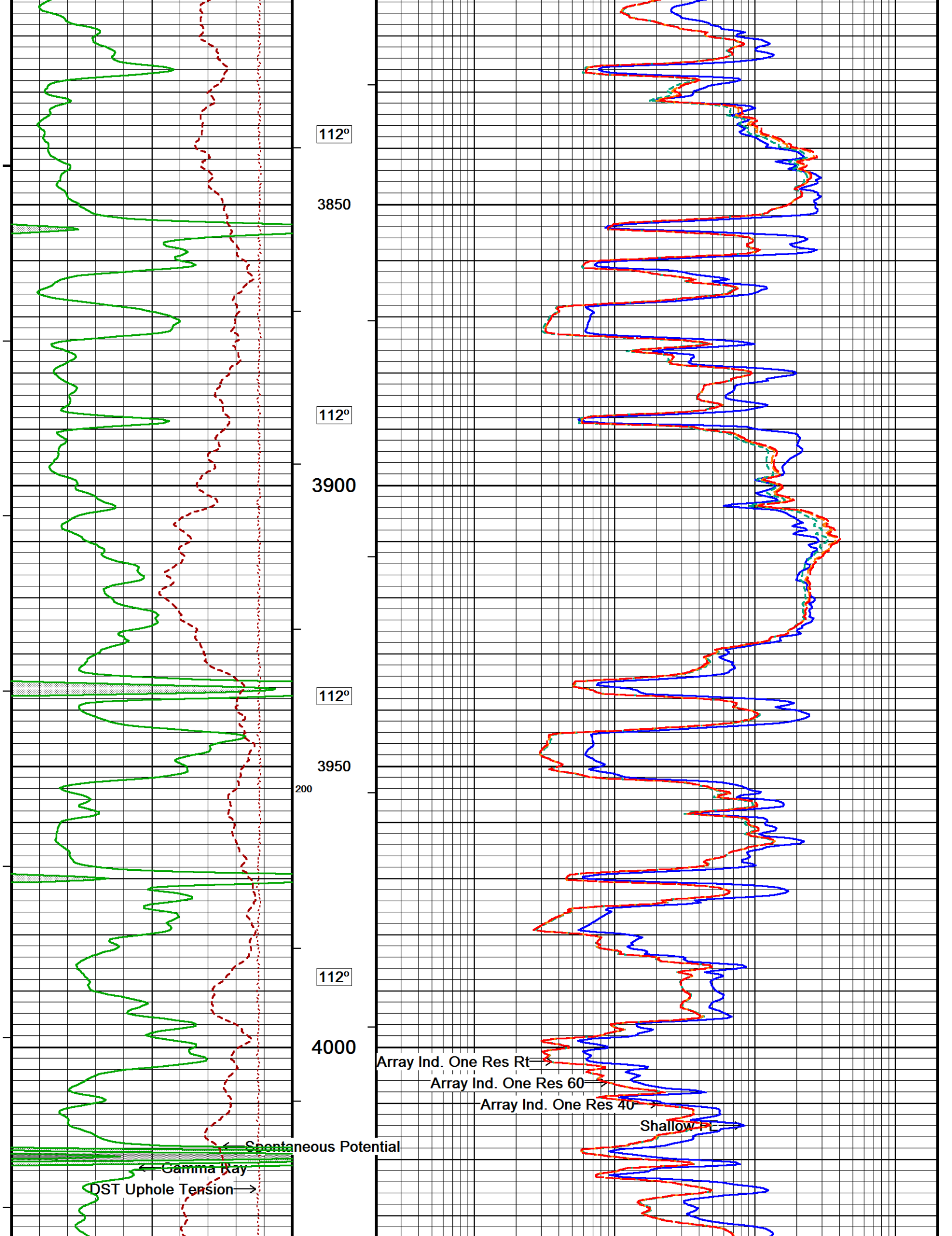

105°
2750
106°
2800
600
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
106°
2850
400
106°
2900

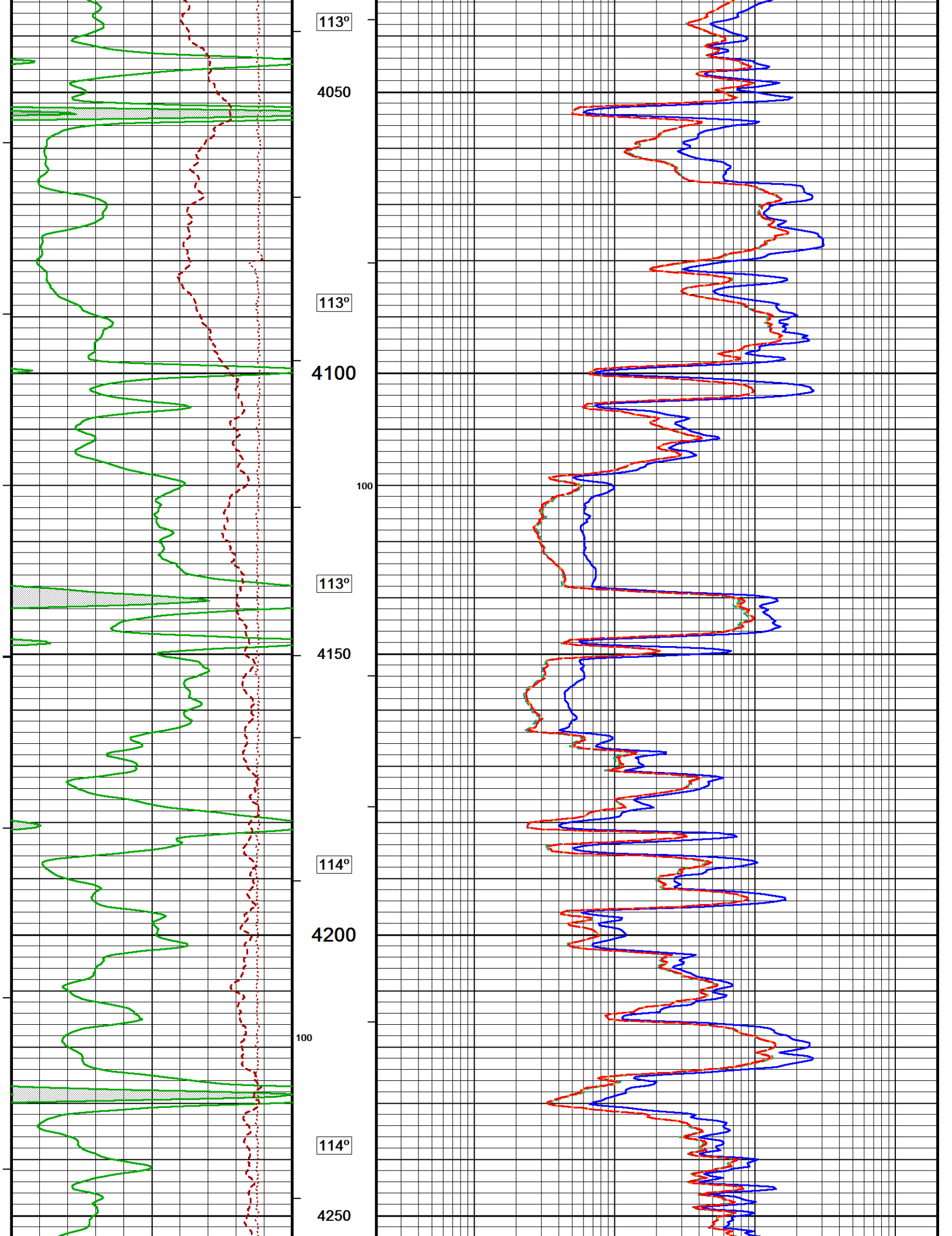

107°
2950
107°
3000
107°
3050
107°
3100
500
108°
3150

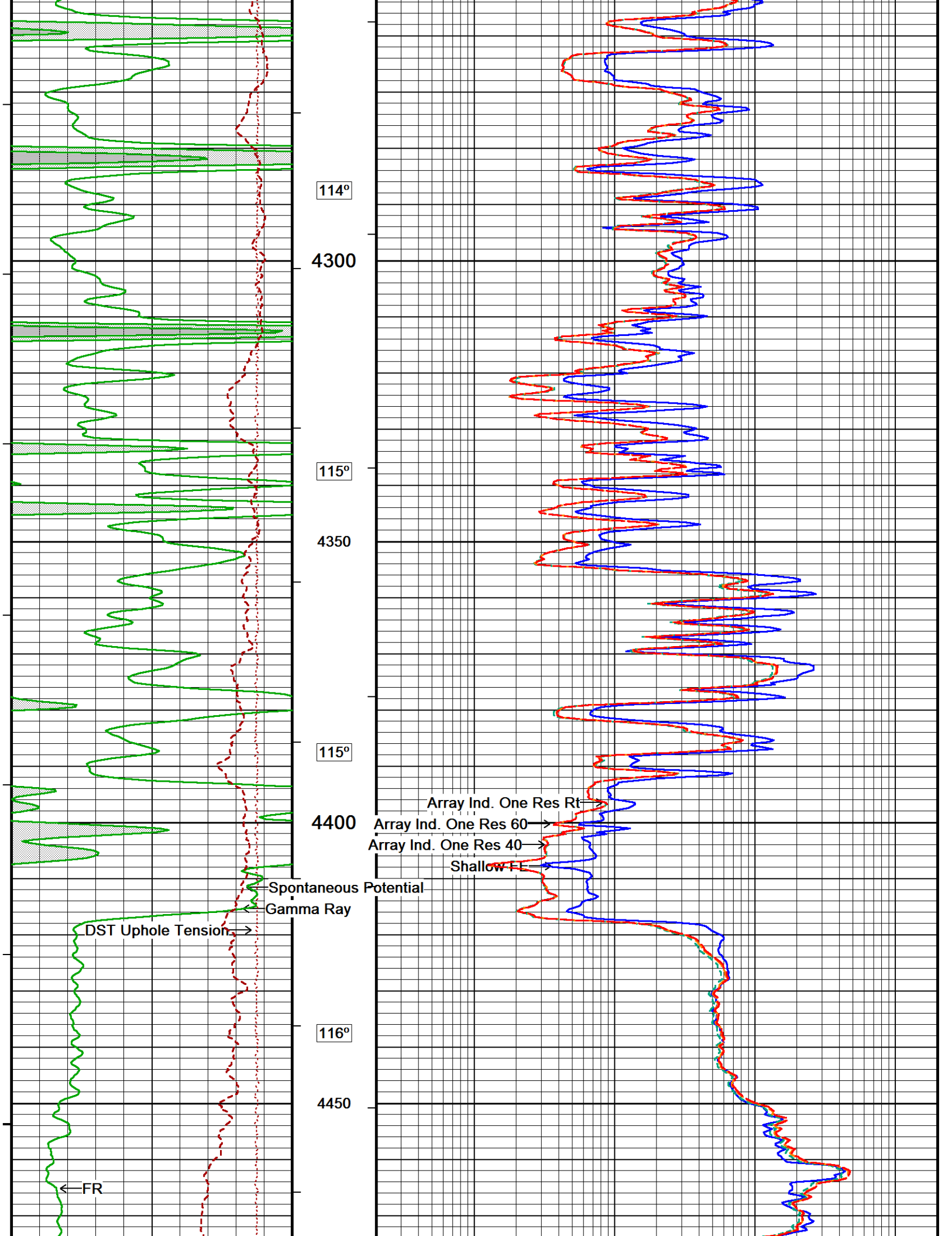

108°
3200
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
108°
3250
109°
300
3300
109°
3350

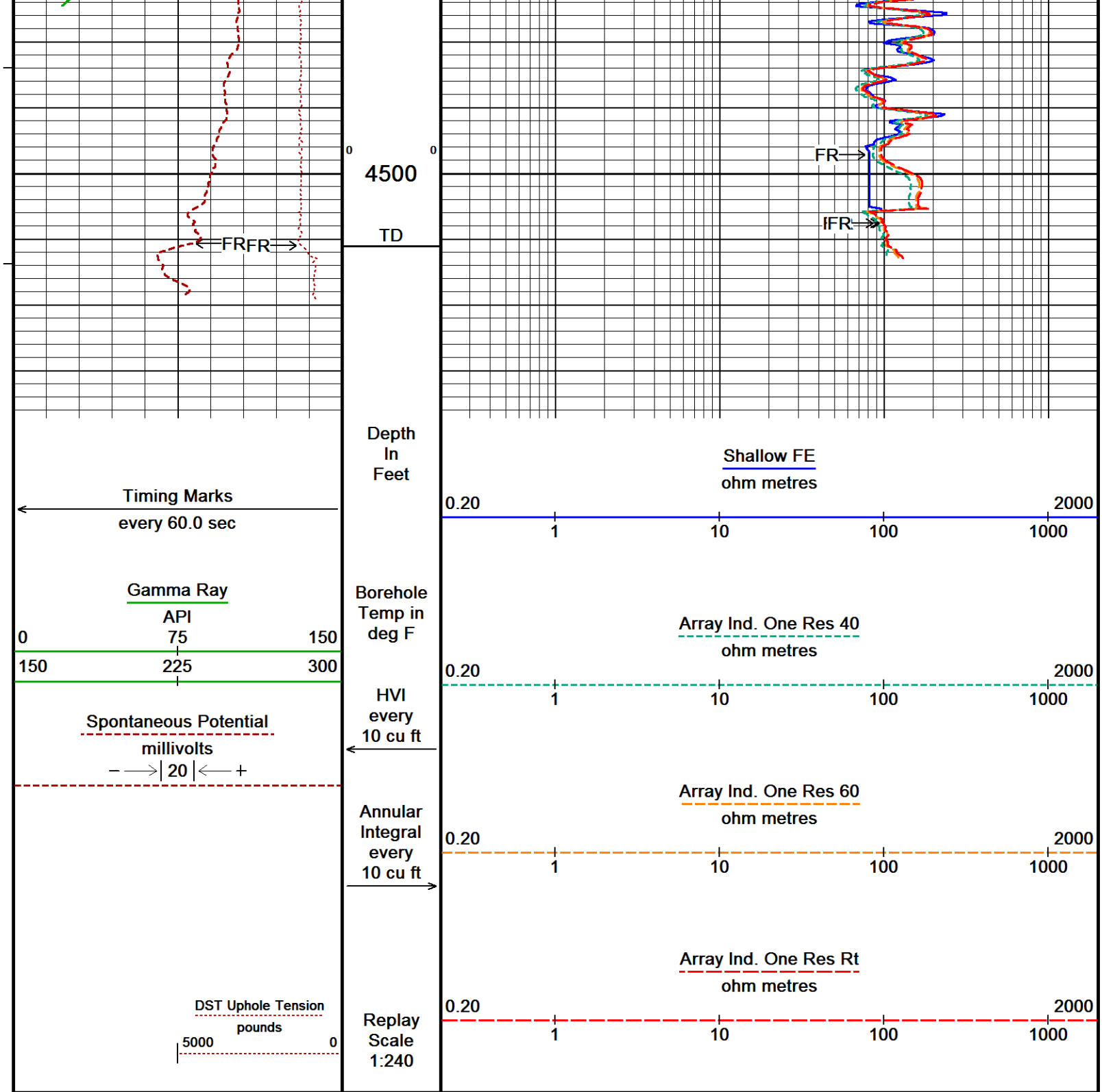

400
109°
3400
110°
3450
110°
3500
110°
3550
110°


3600
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FF
Spontaneous Potential
Gamma Ray
DST Uphole Tension
111°
3650
300
111°
3700
200
111°
3750
111°
3800


112°
3850
112°
3900
112°
3950
200
112°
4000
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow Rt
Spontaneous Potential
Gamma Ray
DST Uphole Tension


113°
4050
113°
4100
100
113°
4150
114°
4200
100
114°
4250


114°
4300
115°
4350
115°
4400
116°
4450
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
FR

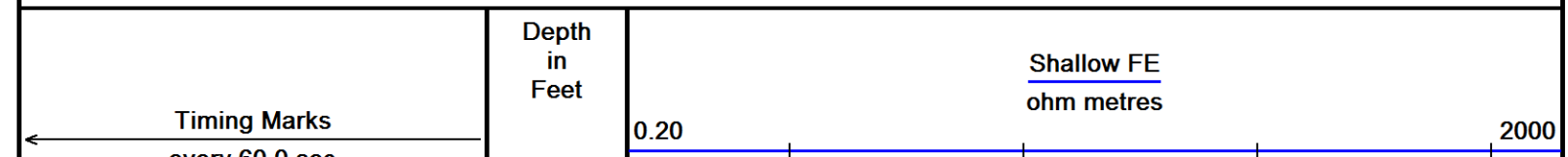


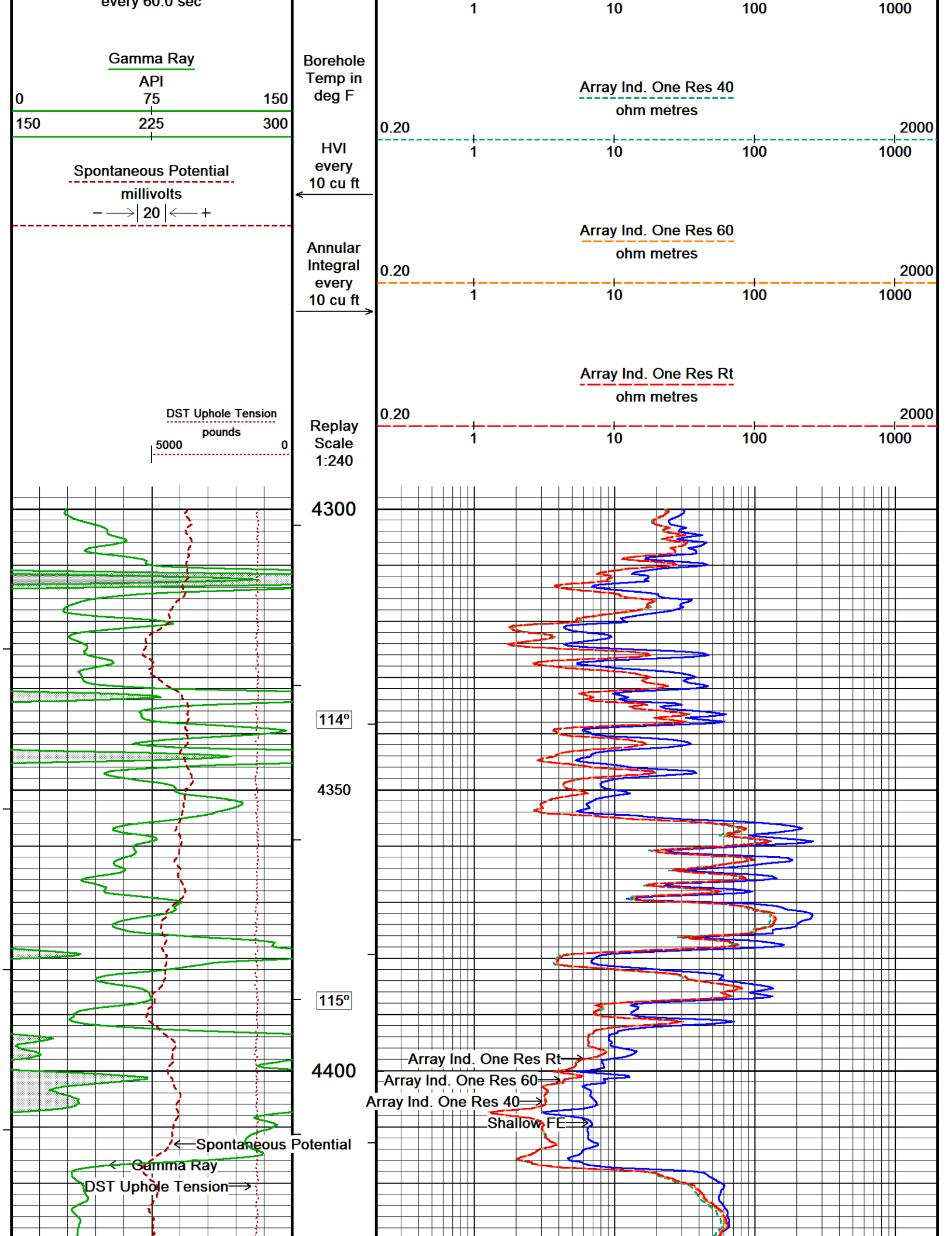
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2018 02:31
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta
Recorded on 14-JUN-2018 23:45
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

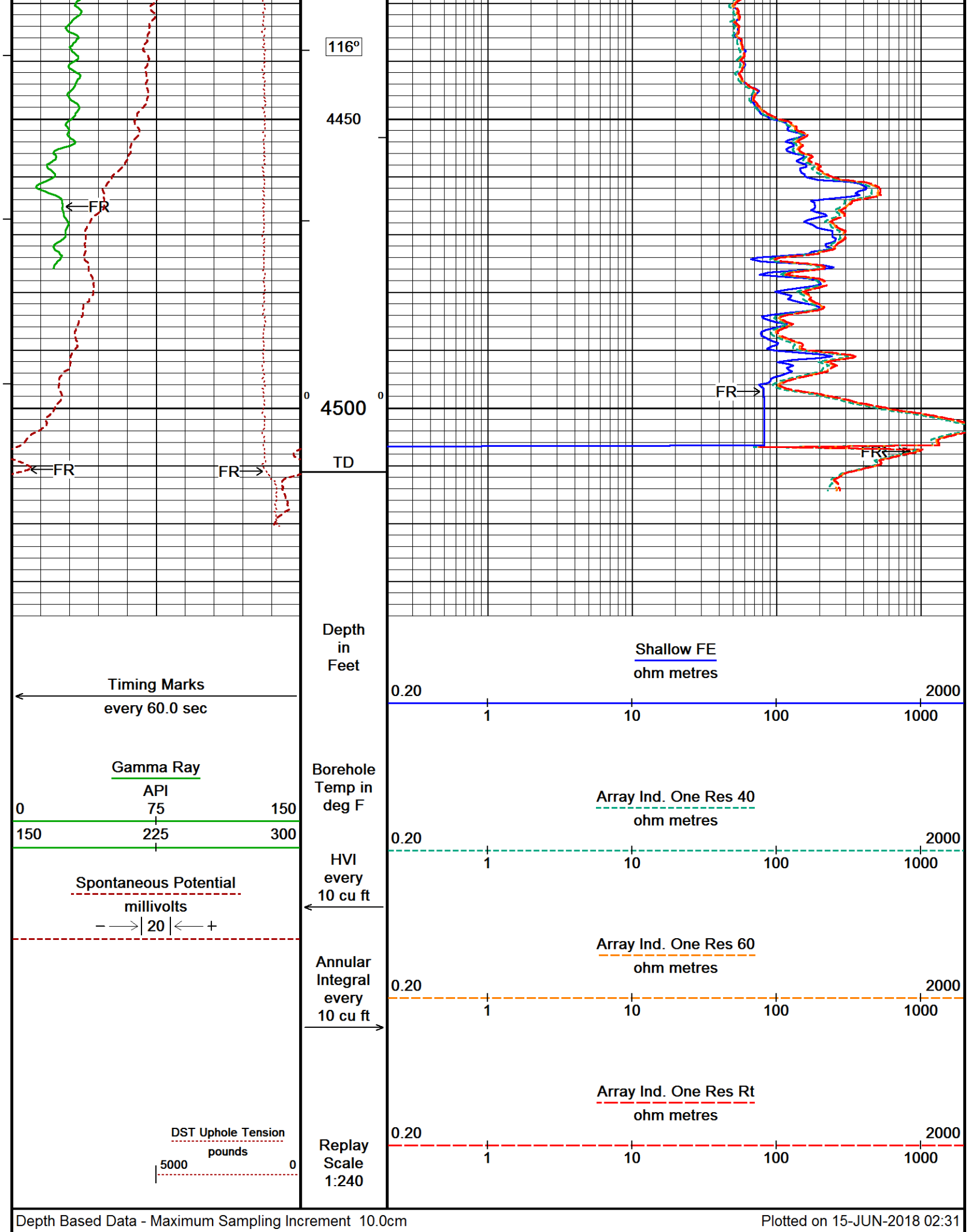
5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2018 02:31
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\REPEAT PASS.dta
Recorded on 14-JUN-2018 23:30
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830




every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Spontaneous Potential
millivolts
– 20 +
DST Uphole Tension
pounds
5000
0
Borehole Temp in deg F
HVI every 10 cu ft
Annular Integral every 10 cu ft
Replay Scale 1:240
1
10
100
1000
Array Ind. One Res 40
ohm metres
0.20
2000
Array Ind. One Res 60
Array Ind. One Res Rt
4300
114°
4350
115°
4400
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension



Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2018 02:31
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\REPEAT PASS.dta
Recorded on 14-JUN-2018 23:30
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta

General Constants All 000

Last Edited on 15-JUN-2018,01:35

General Parameters		
Mud Resistivity	0.600	ohm-metres
Mud Resistivity Temperature	96.000	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. Two 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 14-JUN-2018 22:36

Reading No	Measured	Calibrated (lbs)
1	15468.14	0.00
2	16556.59	454.20

Gamma Calibration MCG-D.A 246

Field Calibration on 11-JUN-2018 15:07

	Measured	Calibrated (API)
Background	75	51
Calibrator (Gross)	743	507
Calibrator (Net)	668	456

Gamma Calibration Tolerances MCG-D.A 246

Ratio 1.465 (1.40 – 1.475 – 1.55) Counts/API

Gamma Constants MCG-D.A 246

Last Edited on 14-JUN-2018,22:06

Gamma Calibrator Number	MCGGRCC141	
GRC-M Calibrator Jig in Use?	NO	
Inactive Background Jig in Use?	NO	
Mud Density	1.13	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.A 246

Field Calibration on 07-JUN-2018,10:42

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

High Resolution Temperature Constants MCG-D.A 246

Last Edited on 07-JUN-2018,10:42

Pre-filter Length	11

SP Calibration MCG-D.A 246

Field Calibration on 07-JUN-2018 11:07

	Measured	Calibrated (mV)
Reference 1	103.5	100.0
Reference 2	-96.9	-100.1

Micro Normal and Micro Inverse Calibration MMR-B.A 91

Base Calibration on 07-JUN-2018 13:43

Micro Normal and Micro Inverse Calibration MMR-B.A 91

Base Calibration on 07-JUN-2018 13:45
Field Check on 11-JUN-2018 15:37

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

Base Calibration

	Measured		Calibrated (ohm-m)	
Micro Normal	10.2	49.8	5.1	25.6
Micro Inverse	9.9	49.4	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.9	93.9
Micro Inverse	62.3	62.3

Micro Normal & Micro Inverse Calibration Tolerance MMR-B.A 91

Micro Normal Res. 1	10.2	-5% 10.0 +5%	ohm	Micro Normal Res. 2	49.8	-5% 50.0 +5% ohm
Micro Inverse Res. 1	9.9	-5% 10.0 +5%	ohm	Micro Inverse Res. 2	49.4	-5% 50.0 +5% ohm
Micro Normal Base Check	93.9	-2% 93.39 +2%	ohm-m			
Micro Inverse Base Check	62.3	-2% 62.26 +2%	ohm-m			
Micro Normal Field Check	93.9	-2% 93.9 +2%	ohm-m			
Micro Inverse Field Check	62.3	-2% 62.3 +2%	ohm-m			

Micro Normal and Micro Inverse Constants MMR-B.A 91

Last Edited on 13-APR-2018,05:04

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	0.0000	inches

Caliper Calibration MMR-B.A 91

Base Calibration on 07-JUN-2018 13:30
Field Calibration on 11-JUN-2018 15:36

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13946	5.98
2	17303	7.97
3	20607	9.86
4	24616	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 MMR-B.A 91

Short Arm Field Cal.	8.00	7.77 7.97 8.17	in

Micro-Resistivity Caliper Constants MMR-B.A 91

Sonde Configuration	Resistivity Mode

Micro Laterolog Calibration MMR-B.A 91

Base Calibration on 31-DEC-1999 00:00
Field Check on 31-DEC-1999 00:00

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

Base Calibration

	Measured		Calibrated (ohm-m)	
	Ref 1	Ref 2	Ref 1	Ref 2
	0.0	0.0	0.0	0.0

Base Check (ohm-m)	Field Check (ohm-m)
0.0	0.0

Micro Laterolog Constants MMR-B.A 91

Pad Type	6 in Solid Nylon B23059	
Standoff Offset	0.0000	inches
Micro Laterolog K Factor	0.0128	

Micro Laterolog Rm K Factor	N/A

Mudcake Thickness Correction Constants

Mud Cake Source	Constant Value	
Mud Cake Thickness	0.4000	inches
Mud Cake Thickness Caliper		
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	20.00	Degrees C
Mud Cake Resistivity Source	Constant Value	
Temp. for Rmc Corr.	MCG External Temperature	

Neutron Calibration MDN-B.A 292

Base Calibration on 15-MAY-2018 10:16
Field Check on 11-JUN-2018 15:13

Base Calibration

	Measured Near	Measured Far	Calibrated (cps) Near	Calibrated (cps) Far
	2945	91	3714	110
Ratio	32.304		33.764	

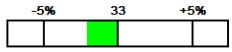
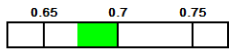
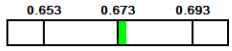
Field Calibrator at Base

	Calibrated (cps)	
	2179	3239
Ratio	0.673	

Field Check

	Calibrated (cps)	
	2170	3215
Ratio	0.675	

Neutron Calibration Tolerances MDN-B.A 292

Ratio	32.304	
Base Check	0.673	
Field Check	0.675	

Neutron Constants MDN-B.A 292

Last Edited on 14-JUN-2018,22:08

Neutron Source Id	P0204NN	
Neutron Jig Number	NJ5736	
Air Hole Processing	Modified Ratio	
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-A.A 135

Base Calibration on 07-JUN-2018 13:53
Field Check on 11-JUN-2018 15:20

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

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	962.0	126.8
Base Check		281.3
Field Check		281.2

FE Calibration Tolerances MFE-A.A 135

Reference 2	962.0	-3% 980.0 +3%	ohm
Base Check	281.3	-2% 277.0 +2%	ohm-m
Field Check	281.2	-2% 281.3 +2%	ohm-m

FE Constants MFE-A.A 135

Last Edited on 11-JUN-2018,15:18

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	

High Resolution Temperature Calibration MAI-A.A 111

Field Calibration on 23-FEB-2018,11:15

	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

Induction Calibration MAI-A.A 111

Factory Loop Calibration 07-JUN-2018 14:52
Field Check on 11-JUN-2018 16:21

Factory Loop Calibration

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

	Measured Signal (unitless)		Reference Conductivity (mmho/m)		Calibration	
Array	Low	High	Low	High	Gain	Offset
1 (near)	17.6	473.6	9.3	966.2	0.000	0.0
2	6.4	385.9	7.6	821.4	0.000	0.0
3	3.2	264.0	5.2	566.0	0.000	0.0
4 (far)	2.1	135.5	2.6	279.2	0.000	0.0

Array Temperature	23.0	Deg F

Tool Checks

	Factory Reference (mmho/m)		Before Survey (mmho/m)		
Array	Low	High	Low	High	
1 (near)	11.4	3841.4	11.4	3842.9	
2	29.4	3499.6	29.4	3500.4	
3	28.8	2996.9	28.7	2997.4	
4 (far)	18.9	2041.5	18.9	2041.9	
Array Temperature	83.6		99.3		Deg F

Induction Check Tolerances MAI-A.A 111

Low Array 1	11.4	9.9 11.4 12.9	mmho/m	High Array 1	3842.9	-0.5% 3841.4 +0.5% mmho/m
Low Array 2	29.4	27.9 29.4 30.9	mmho/m	High Array 2	3500.4	-0.5% 3499.6 +0.5% mmho/m
Low Array 3	28.7	27.3 28.8 30.3	mmho/m	High Array 3	2997.4	-0.5% 2996.9 +0.5% mmho/m
Low Array 4	18.9	17.4 18.9 20.4	mmho/m	High Array 4	2041.9	-0.5% 2041.5 +0.5% mmho/m

Induction Constants MAI-A.A 111

Last Edited on 14-JUN-2018,22:05

Induction Model	RtAP-WBM	
Borehole Correction Constants		
Tool Centred	No	
Hole Size Source	Density Caliper	
Hole Size Constant Value	2.500	inches
Stand-off Type	Fins	
Stand-off	0.50	inches

Stand-off	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	45.00	degrees
Stand-off Fin Width	0.5000	inches
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	

Caliper Calibration MPD-C.A 216

Base Calibration on 07-JUN-2018 14:09
Field Calibration on 11-JUN-2018 15:33

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14245	3.99
2	22960	5.98
3	31650	7.97
4	39952	9.86
5	49231	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.93	7.97

Caliper Calibration Tolerances MPD-C.A 216

Long Arm Field Cal. 7.93 in

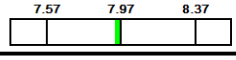


Photo Density Calibration MPD-C.A 216

Base Calibration on 07-JUN-2018 14:35
Field Check on 11-JUN-2018 15:18

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Background	1007	1198		
Reference 1	50088	24364	59556	30836
Reference 2	19851	2273	24941	2541

Field Check at Base

1006.9	1197.8

Field Check

1004.3 1191.6

PE Calibration

Base Calibration	WS	Measured WH	Ratio	Calibrated Ratio
Background	184	903		
Reference 1	21030	49928	0.425	0.371
Reference 2	5765	19740	0.296	0.272

Field Check at Base

184.4 903.5

Field Check

182.8 903.0

Photo Density Calibration Tolerances MPD-C.A 216

Near Density Ratio	2.60	-5% 2.52 +5%	Far Density Ratio	21.54	-5% 21.00 +5%
PE Calibration	0.120	0.089 0.110 0.131			
Near Den. Field Check	1004.3	-3% 1006.9 +3%	Far Den. Field Check	1191.6	-3% 1197.8 +3%
PE WS Field Check	182.8	-6% 184.4 +6%	PE WH Field Check	903.0	-6% 903.5 +6%

Density Constants MPD-C.A 216

Last Edited on 14-JUN-2018,22:06

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	1.13	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	Not 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	0.00

DOWNHOLE EQUIPMENT

C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta

Cablehead, 11 pin
CBH-C 0 LG: 2.40 ft WT: 24.3 lb OD: 2.244 in

Compact Swivel Head Adaptor
SHA-J.B 724 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-D.A 246 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-B.A 91 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

45.66 ft GRGC - MCG Gamma Ray

42.76 ft CGXT - MCG External Temperature

36.40 ft MRTC - MMR Caliper

Compact Neutron
MDN-B.A 292 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

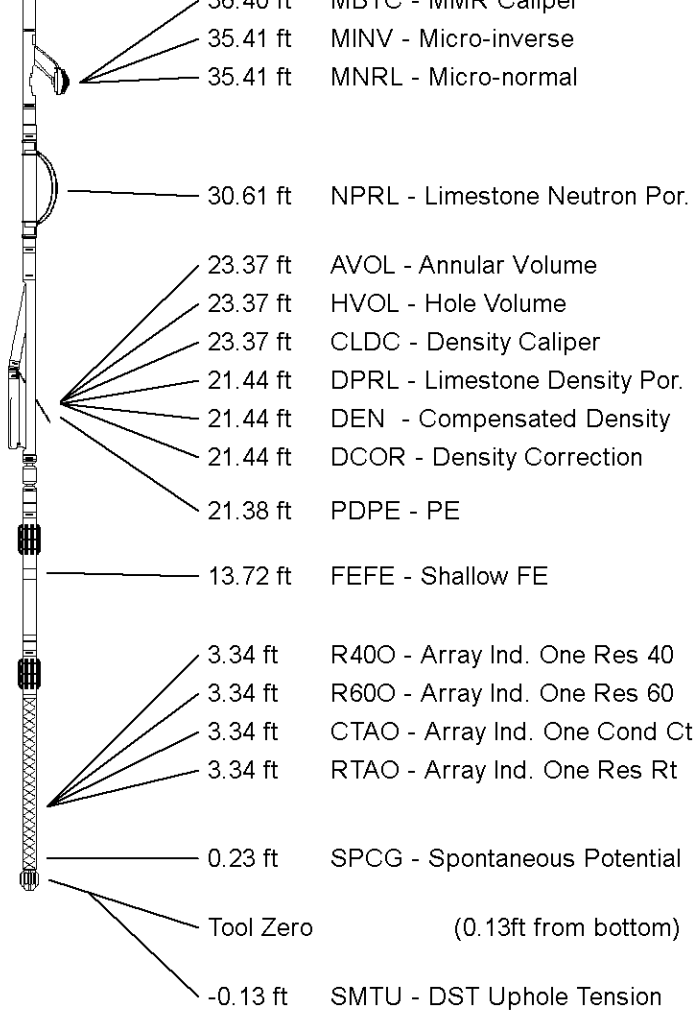
Compact Density/Caliper
MPD-C.A 216 LG: 9.59 ft WT: 90.4 lb OD: 2.913 in

Compact Knuckle Joint
SKJ-D.A 167 LG: 2.17 ft WT: 24.3 lb OD: 2.244 in

Compact Focussed Electric
MFE-A.A 135 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-A.A 111 LG: 10.81 ft WT: 48.5 lb OD: 2.244 in

Total Length: 55.64 ft Weight: 454.2 lb



All measurements relative to tool zero.

COMPANY	SHAKESPEARE OIL CO., INC
WELL	OTTLEY 2-21
FIELD	CHALK BUTTES
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2783	feet	First Reading	4508.00	feet
Elevation Drill Floor	2781	feet	Depth Driller	4511.00	feet
Elevation Ground Level	2771	feet	Depth Logger	4511.00	feet

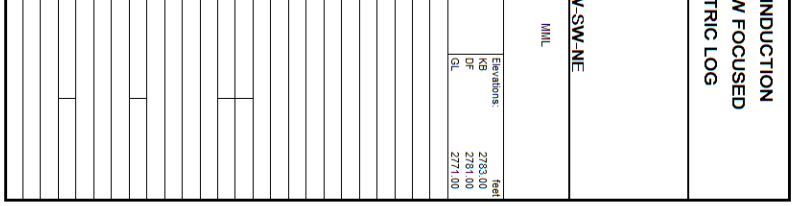
Weatherford®

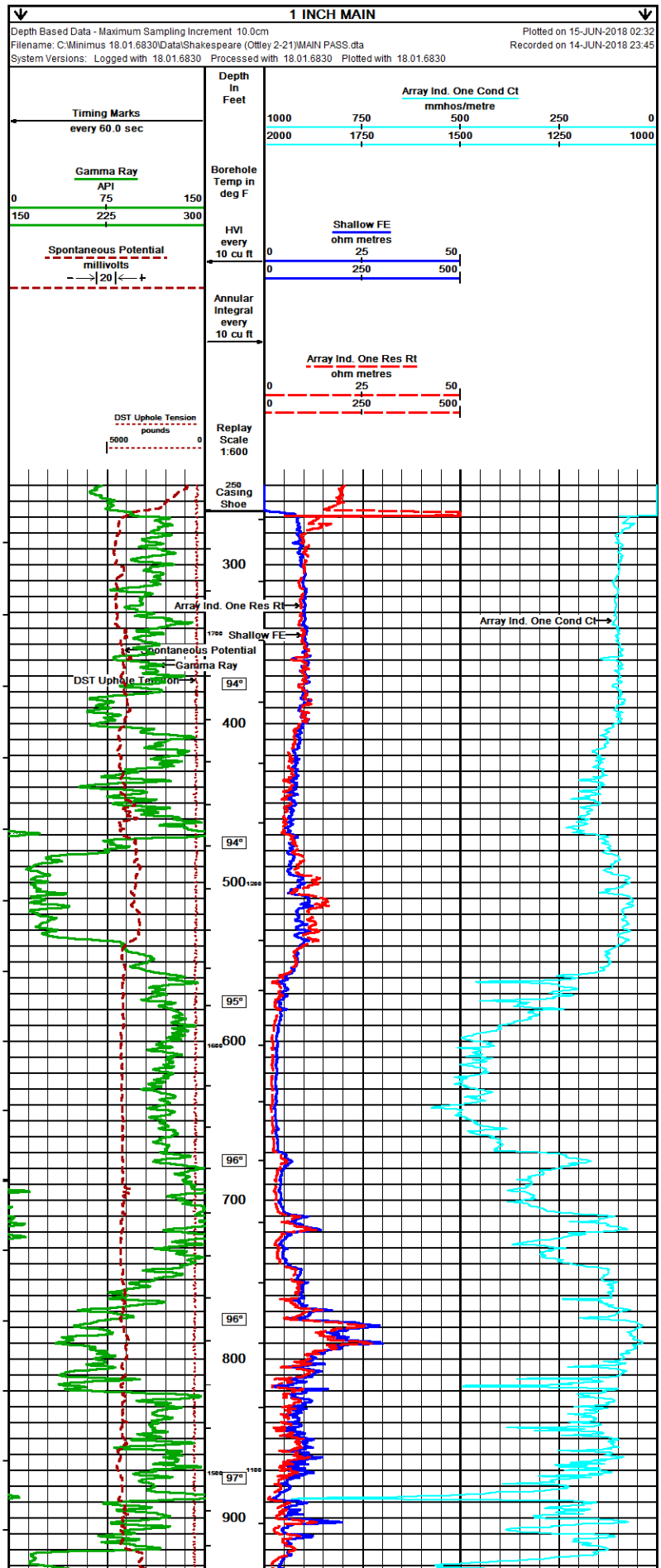
ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

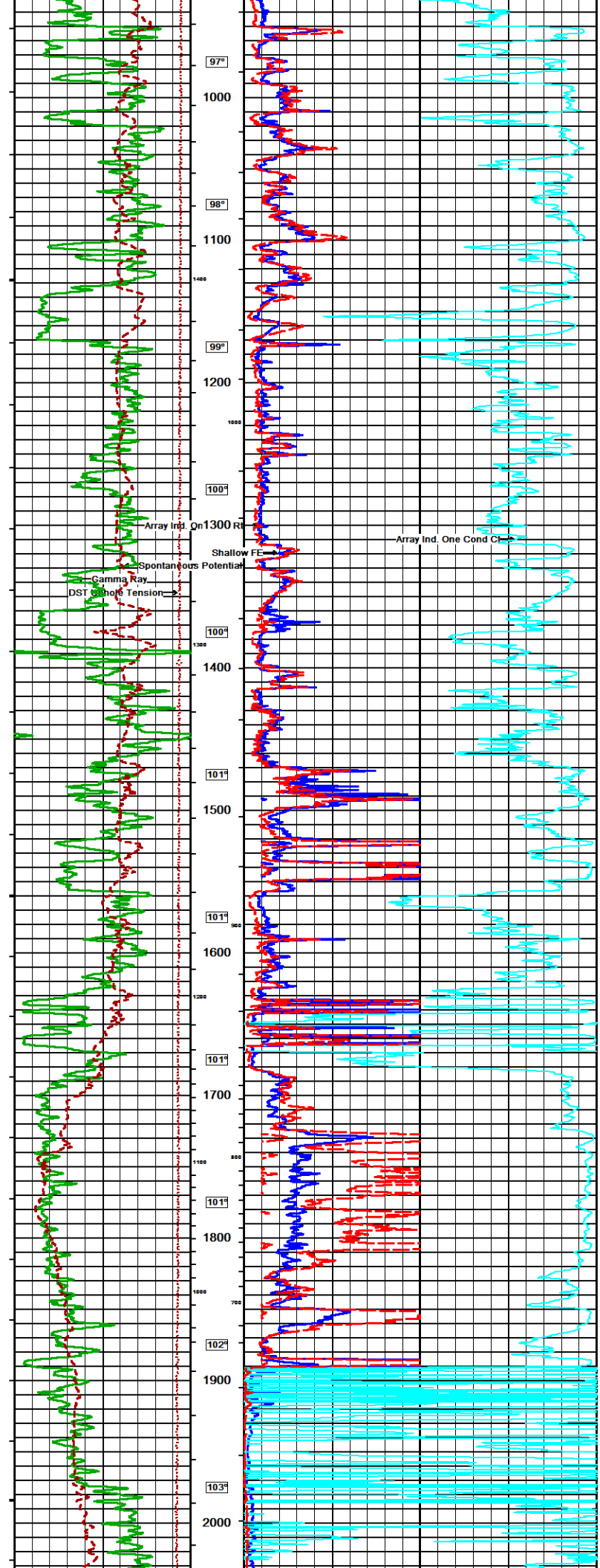
Weatherford®

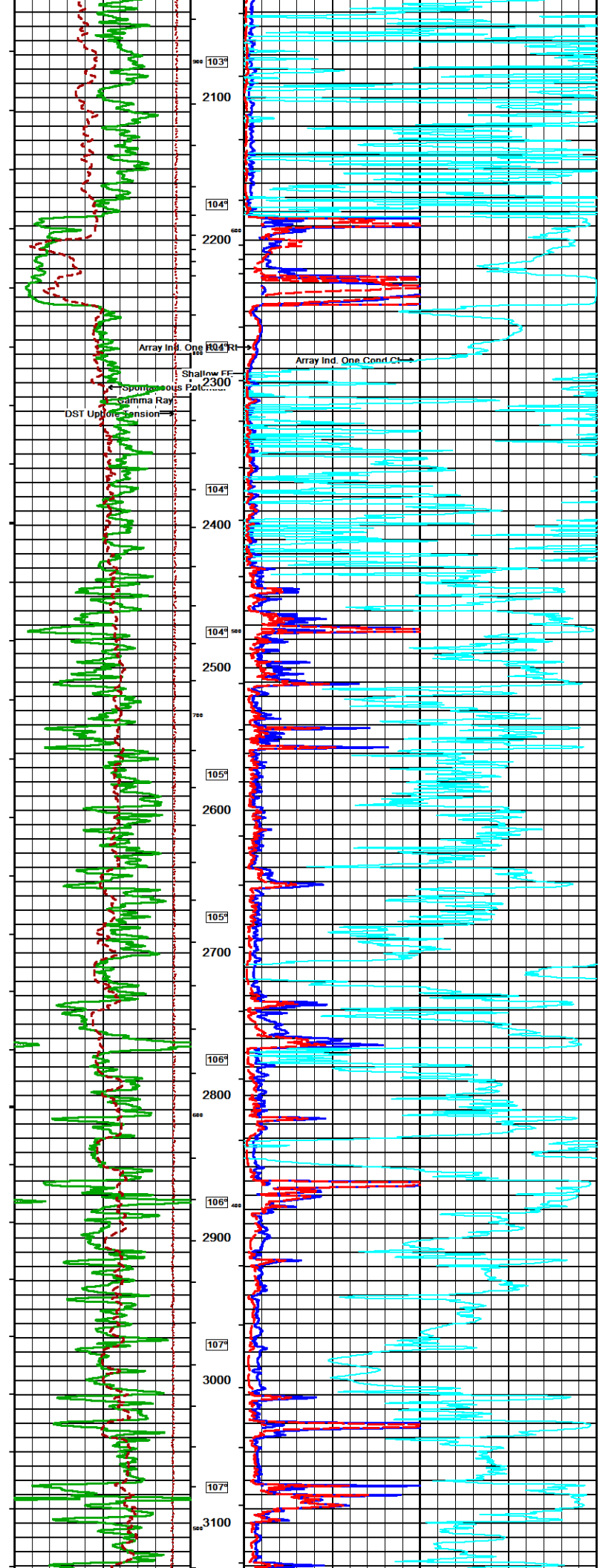
COMPANY	SHAKESPEARE OIL CO., INC
WELL	OTTLEY 2-21
FIELD	CHALK BUTTES
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS
LOCATION	2050' FNL & 2490' FEL NW-SW
SEC 21 TWP 14S RGE 32W	Other Services
Latitude 38.8249133	MPD/MDN
Longitude -100.8817901	
API Number 15-109-21551	
Permanent Datum GL Elevation 2771 feet	
Log Measured From KB 12.00 feet above Permanent Datum	
Drilling Measured From KB	

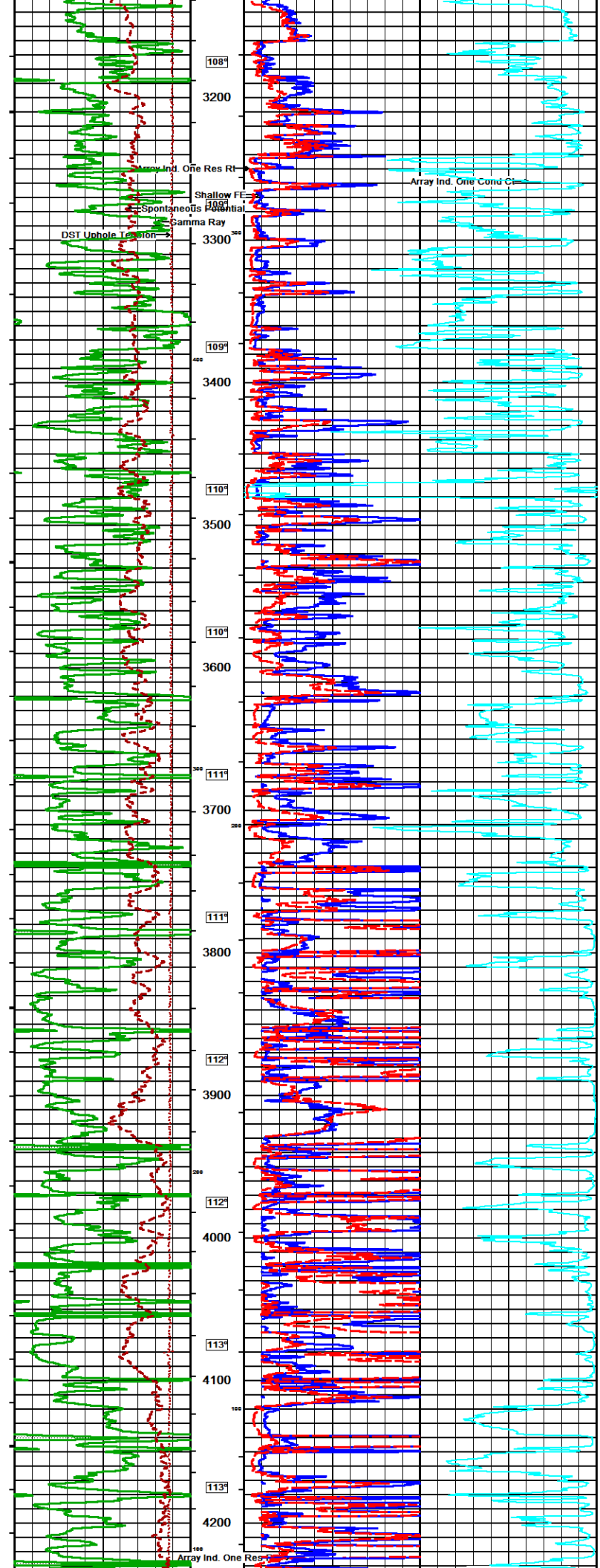
Date		14-JUN-2018	
Run Number		ONE	
Service Order		7055-216229097	
Depth Driller		4511.00	feet
Depth Logger		4511.00	feet
First Reading		4508.00	feet
Last Reading		266.00	feet
Casing Driller		267.00	feet
Casing Logger		266.00	feet
Bit Size		7 7/8	inches
Hole Fluid Type		WBM	
Density / Viscosity		9.40	lb/USg 59.00 sec/qt
PH / Fluid Loss		9.50	10.00 ml/30Min
Sample Source		MUD TANK	
Rm @ Measured Temp		0.60 @ 96.0	ohm-m
Rmf @ Measured Temp		0.48 @ 96.0	ohm-m
Rmc @ Measured Temp		0.72 @ 96.0	ohm-m
Source Rmf / Rmc		CALC	CALC
Rm @ BHT		0.50 @ 116.0	ohm-m
Time Since Circulation		5 HOURS	
Max Recorded Temp		116.00	deg F
Equipment / Base		13096	LB
Recorded By		JUSTIN HICKS	
Witnessed By		WES HANSON	

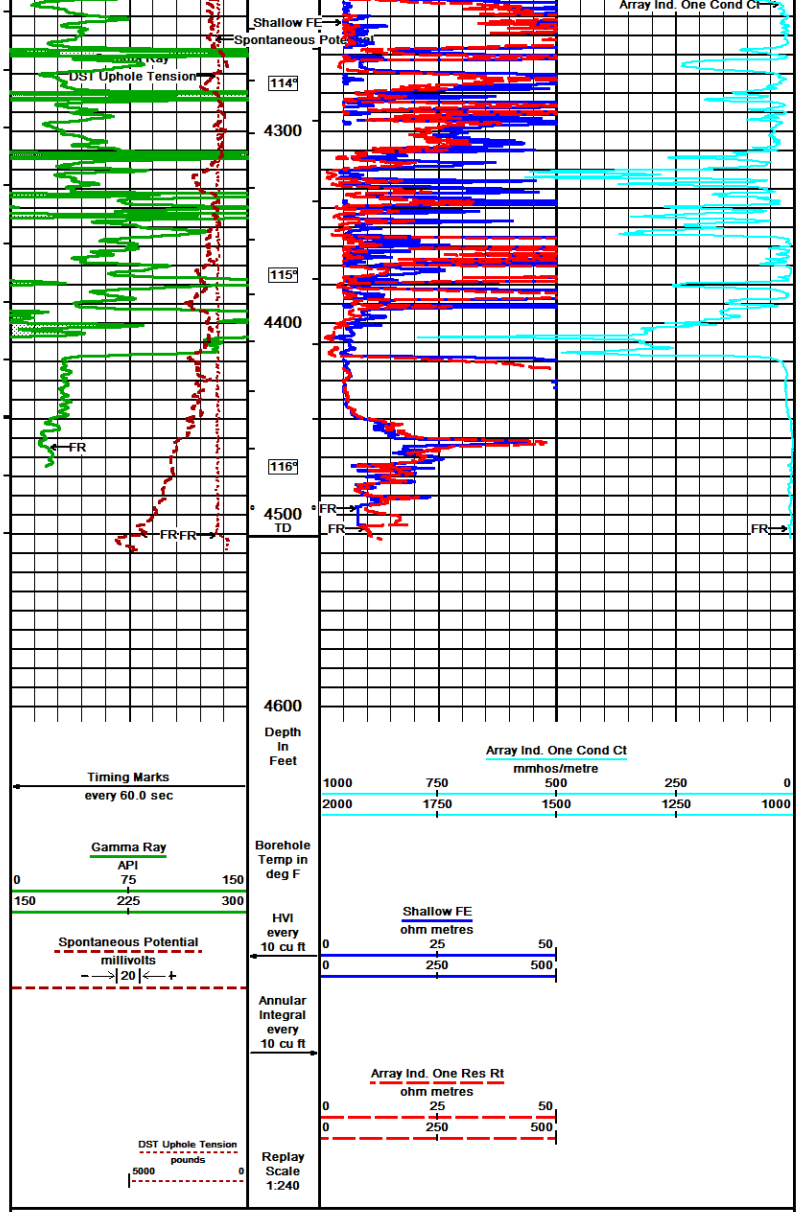

Elevations:
KB
DF
GL
2783.00
2781.00
2771.00
feet
NMIL
V-SW-NE
NDUCTION
W FOCUSED
TRIC LOG


1 INCH MAIN
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2018 02:32
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta
Recorded on 14-JUN-2018 23:45
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830
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
Gamma Ray
API
0 75 150
150 225 300
Borehole Temp in deg F
HVI every 10 cu ft
Shallow FE
ohm metres
0 25 50
0 250 500
Spontaneous Potential
millivolts
20
Annular Integral every 10 cu ft
Array Ind. One Res Rt
ohm metres
0 25 50
0 250 500
DST Uphole Tension
pounds
5000 0
Replay Scale 1:600
250
Casing Shoe
300
Array Ind. One Res Rt
Shallow FE
Array Ind. One Cond Ct
Spontaneous Potential
Gamma Ray
DST Uphole Tension
94°
400
94°
500
95°
600
96°
700
96°
800
97°
900


97°
1000
98°
1100
99°
1200
100°
Array Ind. On
1300 Rt
Array Ind. One Cond Cl
Shallow FE
Spontaneous Potential
Gamma Ray
DST Borehole Tension
100°
1400
101°
1500
101°
1600
101°
1700
101°
1800
102°
1900
103°
2000


2100
2200
2300
2400
2500
2600
2700
2800
2900
3000
3100
Array Ind. One Cond Ch
Shallow FE
Gamma Ray
DST Upper Tension


Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Ct
Array Ind. One Res
108°
109°
110°
111°
112°
113°
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200



Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 15-JUN-2018 02:32
Filename: C:\Minimus 18.01.6830\Data\Shakespeare (Ottley 2-21)\MAIN PASS.dta
Recorded on 14-JUN-2018 23:45
System Versions: Logged with 18.01.6830 Processed with 18.01.6830 Plotted with 18.01.6830

1 INCH MAIN

COMPANY	SHAKESPEARE OIL CO., INC
WELL	OTTLEY 2-21
FIELD	CHALK BUTTES
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2783	feet	First Reading	4508.00	feet
Elevation Drill Floor	2781	feet	Depth Driller	4511.00	feet
Elevation Ground Level	2771	feet	Depth Logger	4511.00	feet

Weatherford®

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG