ARRAY INDUCTION SHALLOW FOCUSED ELECTRIC LOG

Weatherford®

COMPANY	GRAND MESA OPERATING COMPANY
WELL	E & E #2-34
FIELD	WILDCAT
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	2078' FSL & 1667' FWL

SEC	TWP	RGE	Other Services
34	13S	32W	MPD/MDN MML

API Number 15-109-21177
Permit Number

Permanent Datum GL, Elevation 2906 feet
Log Measured From KB
Drilling Measured From KB

Elevations:	feet
KB	2917.00
DF	2916.00
GL	2906.00

Date	25-MAY-2013			
Run Number	ONE			
Service Order	3537751			
Depth Driller	4640.00	feet		
Depth Logger	4640.00	feet		
First Reading	4637.00	feet		
Last Reading	225.00	feet		
Casing Driller	230.00	feet		
Casing Logger	225.00	feet		
Bit Size	7.875	inches		
Hole Fluid Type	CHEMICAL			
Density / Viscosity	9.50 lb/USg		57.00 CP	
PH / Fluid Loss	9.00		9.60 ml/30Min	
Sample Source	FLOWLINE			
Rm @ Measured Temp	0.58 @ 99.0	ohm-m		
Rmf @ Measured Temp	0.46 @ 99.0	ohm-m		
Rmc @ Measured Temp	0.70 @ 99.0	ohm-m		
Source Rmf / Rmc	CALC		CALC	
Rm @ BHT	0.49 @117.0	ohm-m		
Time Since Circulation	4 HOURS			
Max Recorded Temp	117.00	deg F		
Equipment / Base	13096		LIB	
Recorded By	ADAM SILL			
Witnessed By	STEVE CARL			
JOB #	LB13-148			

BOREHOLE RECORD

Last Edited: 25-MAY-2013 03:56

Bit Size inches	Depth From feet	Depth To feet
7.875	230.00	4640.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	230.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.05.9583.
- MCG, MML, MDN, MPD, MFE, MAI RUN IN COMBINATION.
  - HARDWARE: DUAL BOWSPRING USED ON MDN.
  0.5 INCH STANDOFF USED ON MFE.
  0.5 INCH STANDOFF USED ON MAI.
- 2.71 G/CC LIMESTONE DENSITY MATRIX USED TO CALCULATE POROSITY.
- BOREHOLE RUGOSITY, TIGHT PULLS, AND WASHOUTS WILL AFFECT DATA QUALITY.
- ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
- TOTAL HOLE VOLUME FROM TD TO SURFACE CASING: 1902 CU. FT.
- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO 3600 FEET: 195 CU. FT.
- RIG: H-2 DRILLING #2

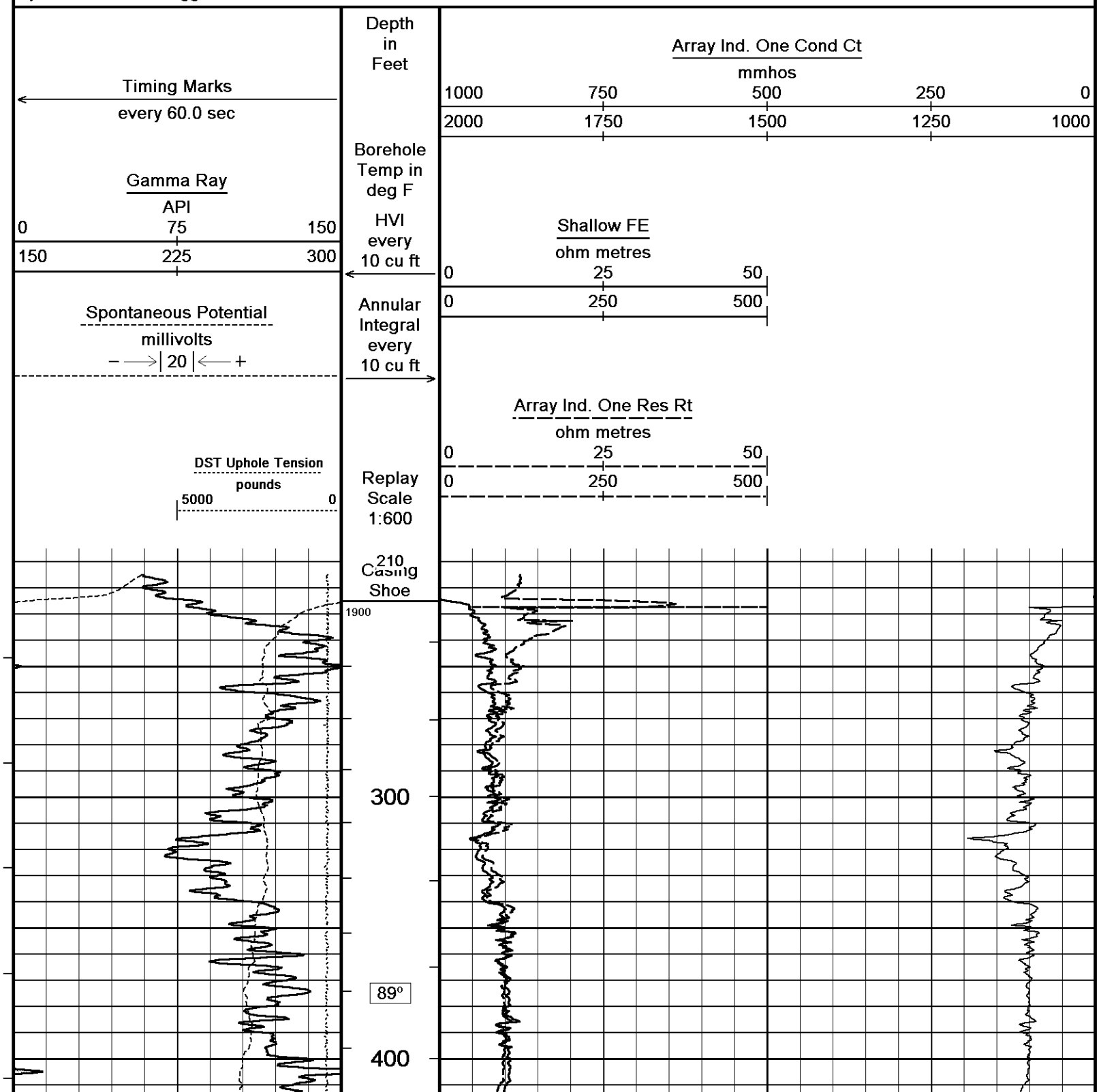
- RIG: H-2 DRILLING #2.

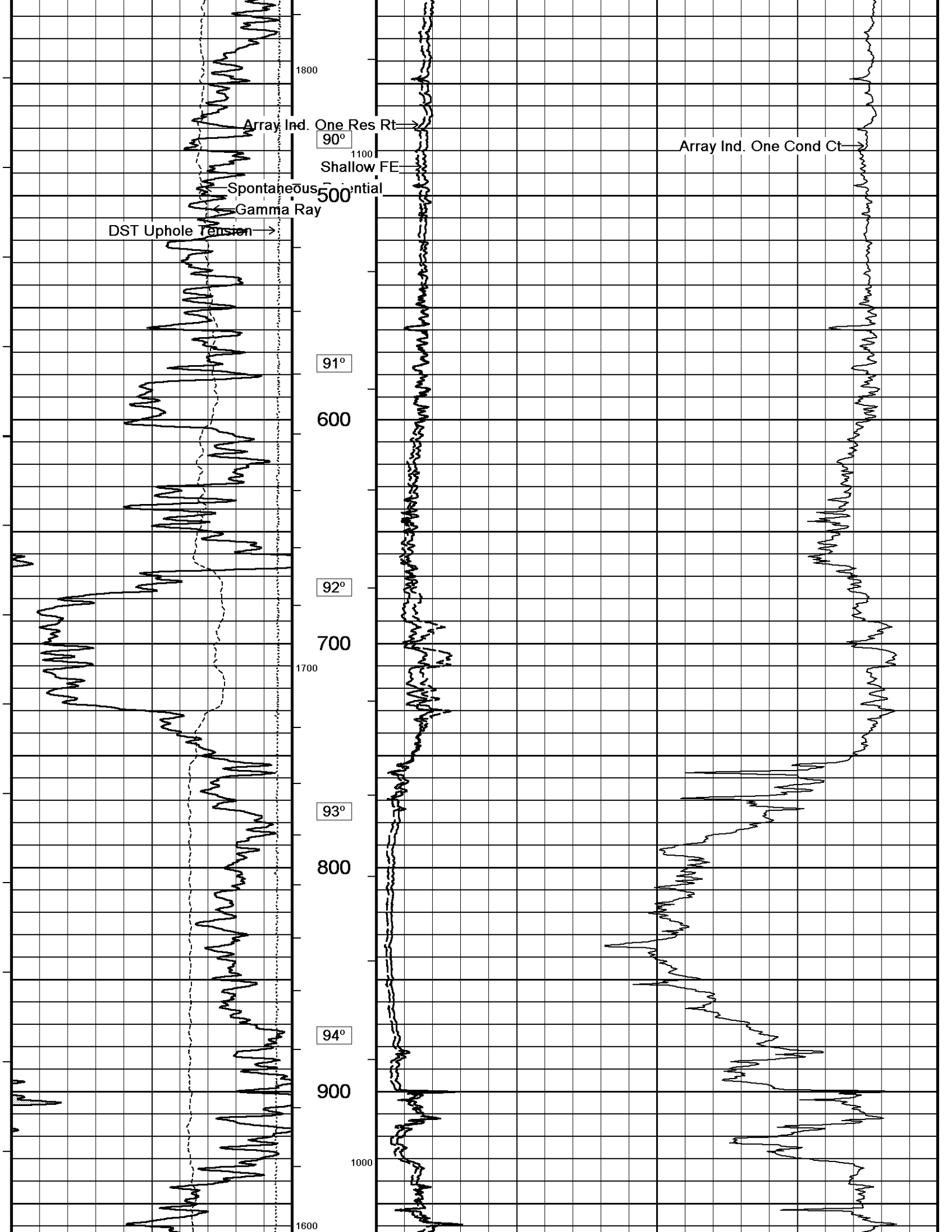
- ENGINEER: A. SILL.

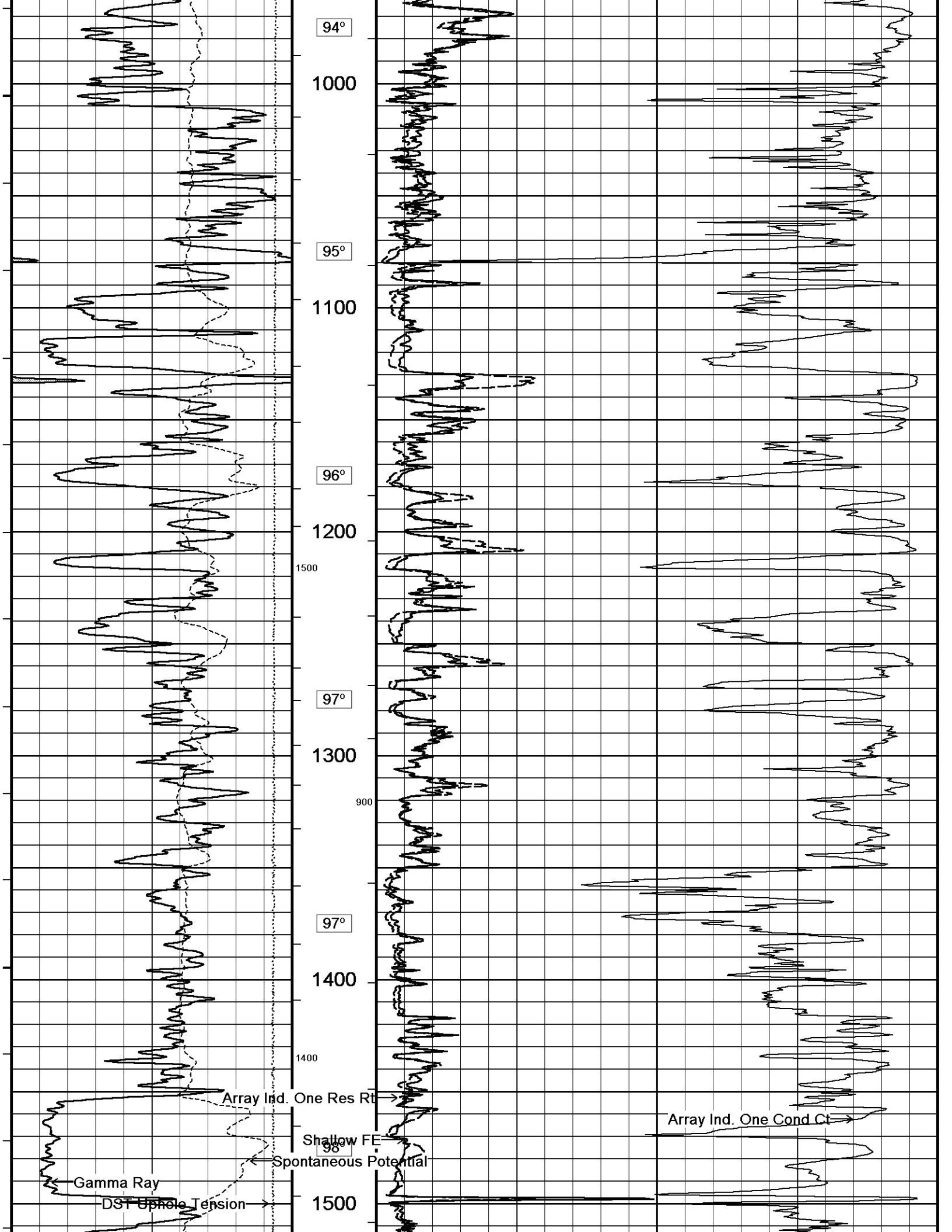
- OPERATOR(S): N. ADAME.

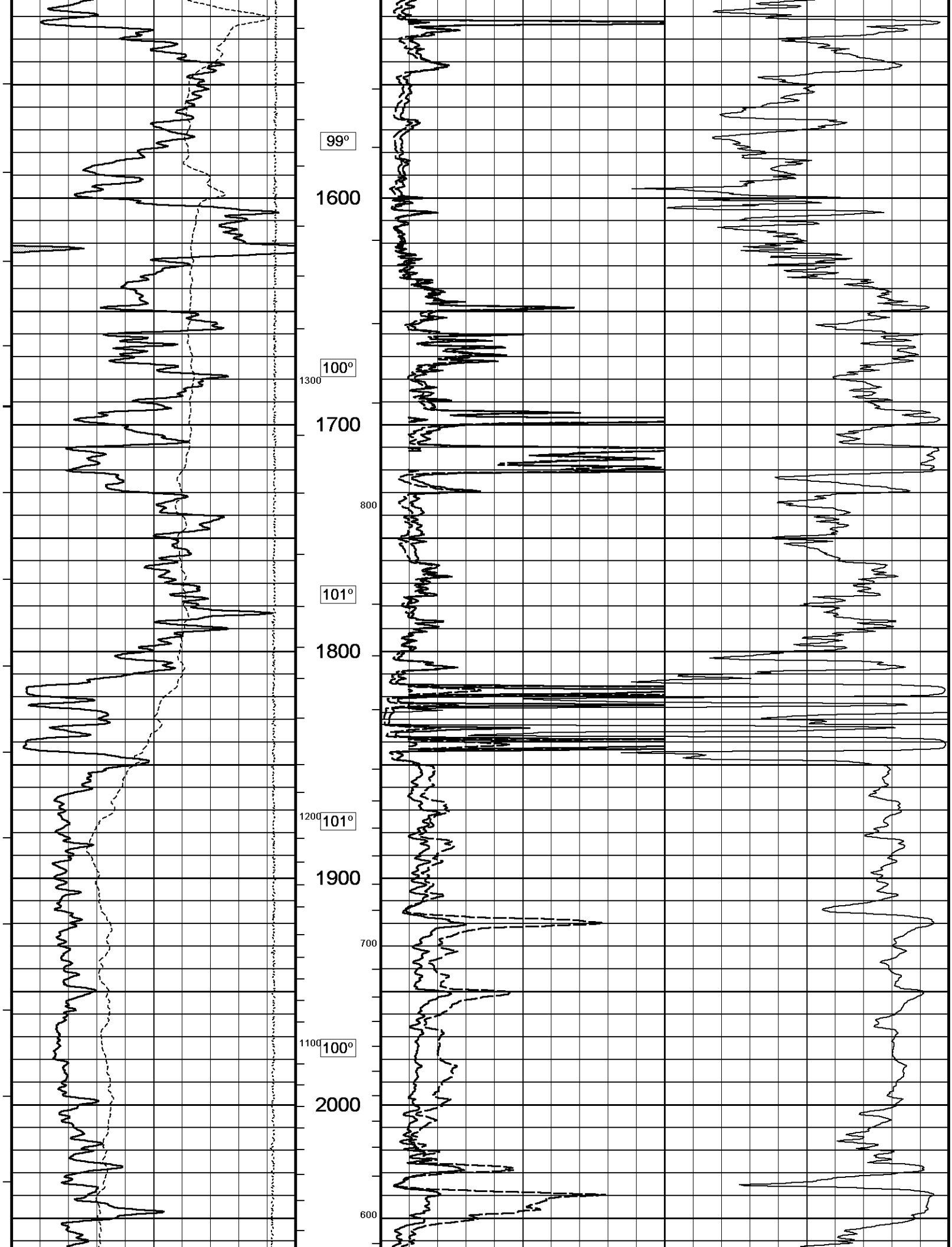
2 INCH MAIN

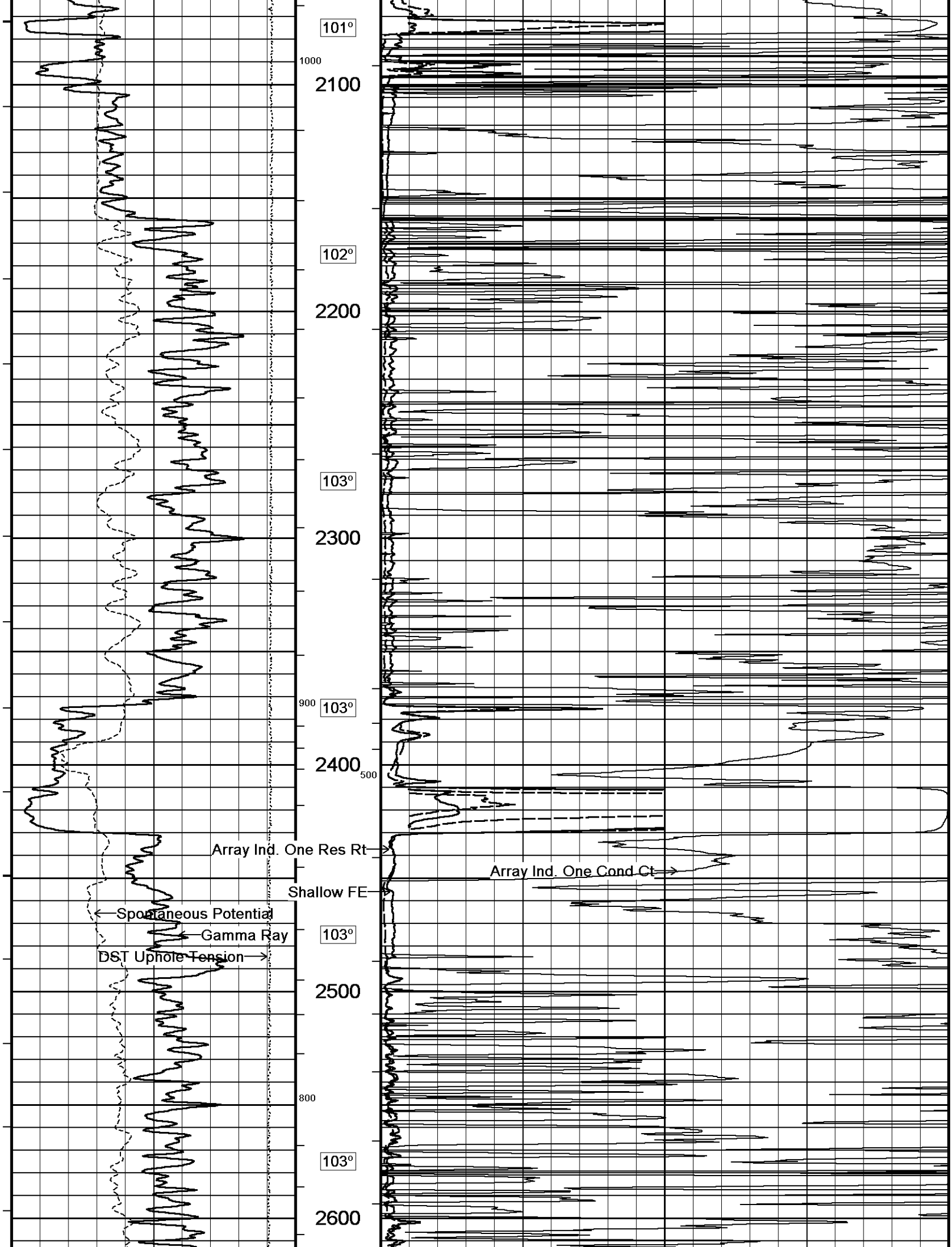
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34 Main.dta
Recorded on 25-MAY-2013 08:51
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

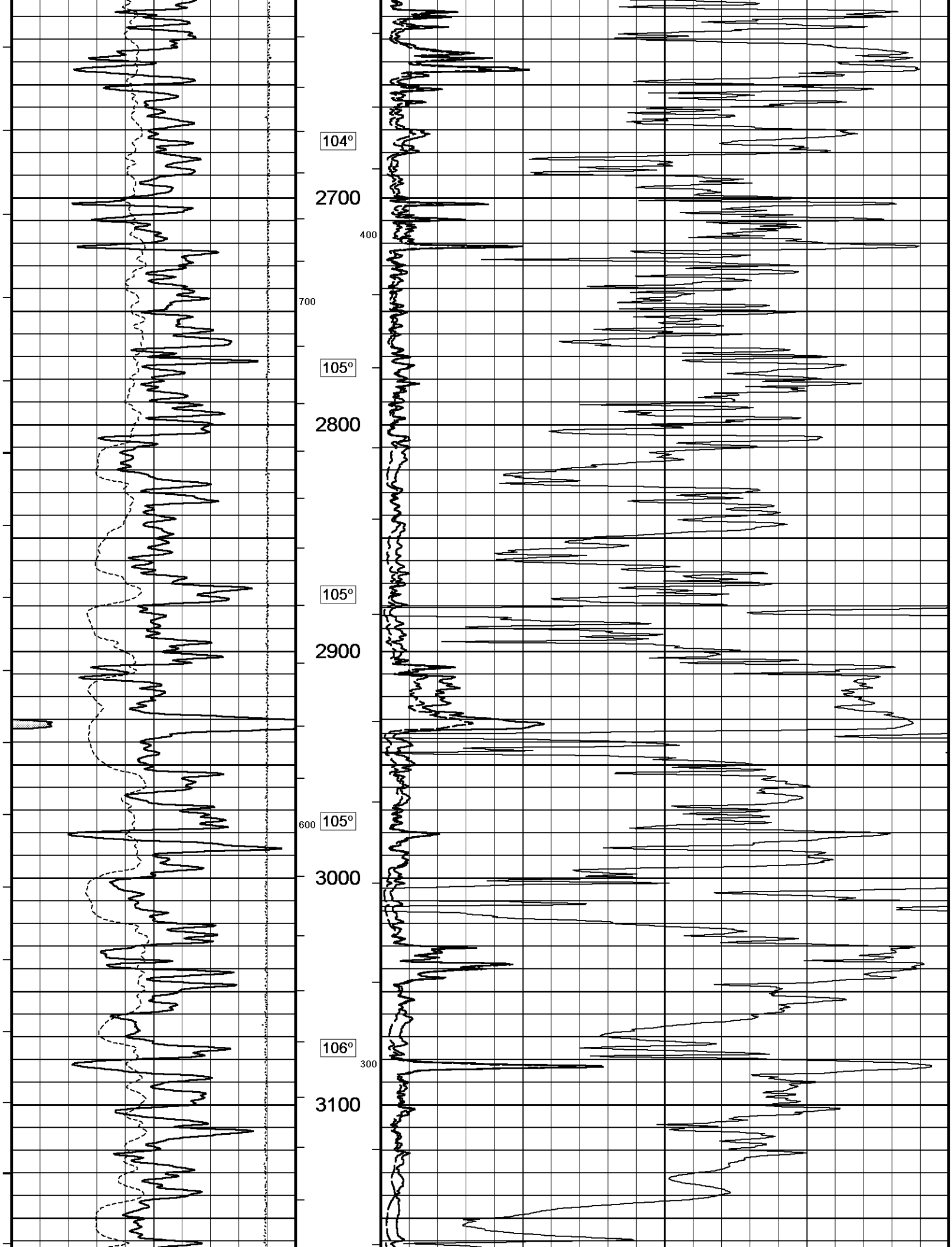


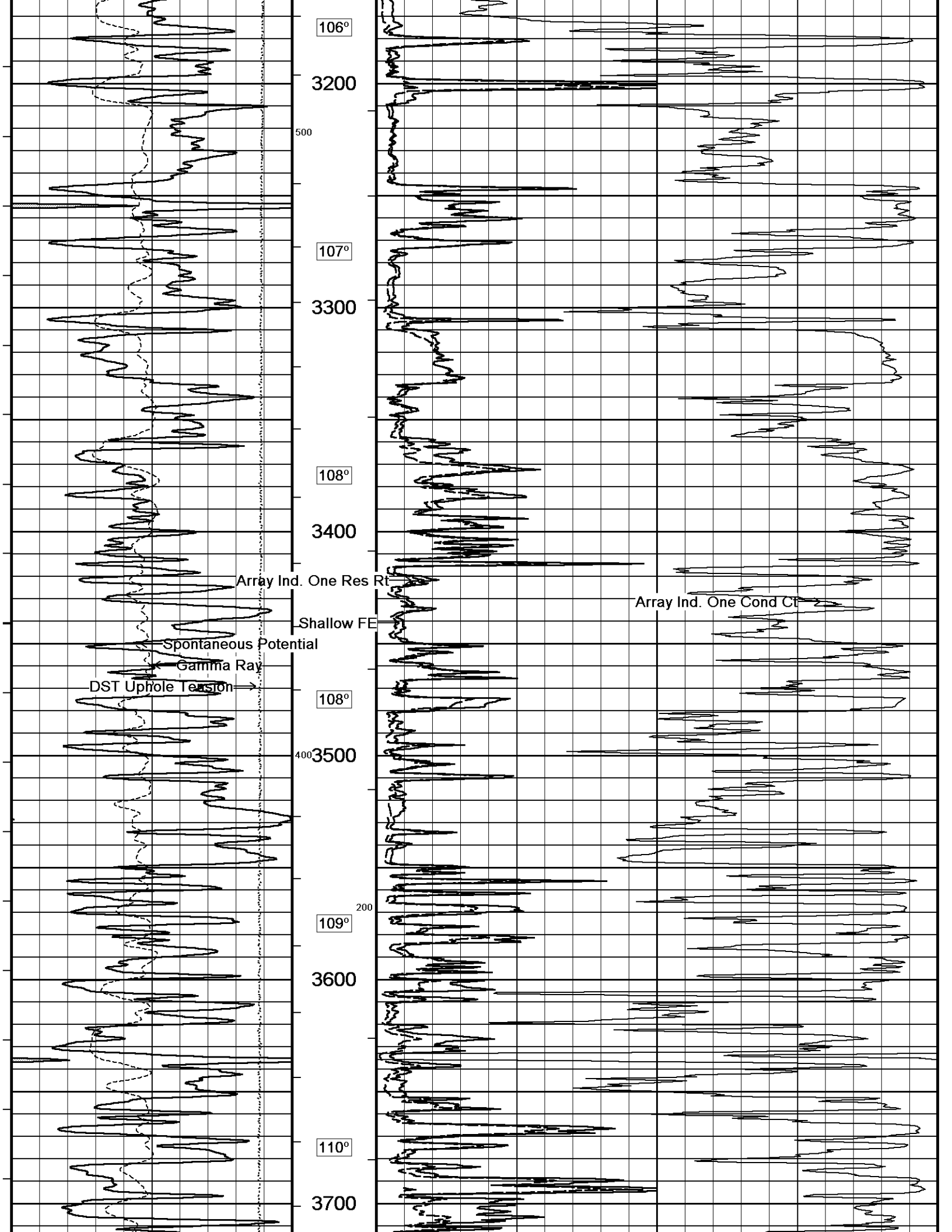

Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Ct
90°
91°
92°
93°
94°
1800
1100
500
600
700
1700
800
900
1000
1600

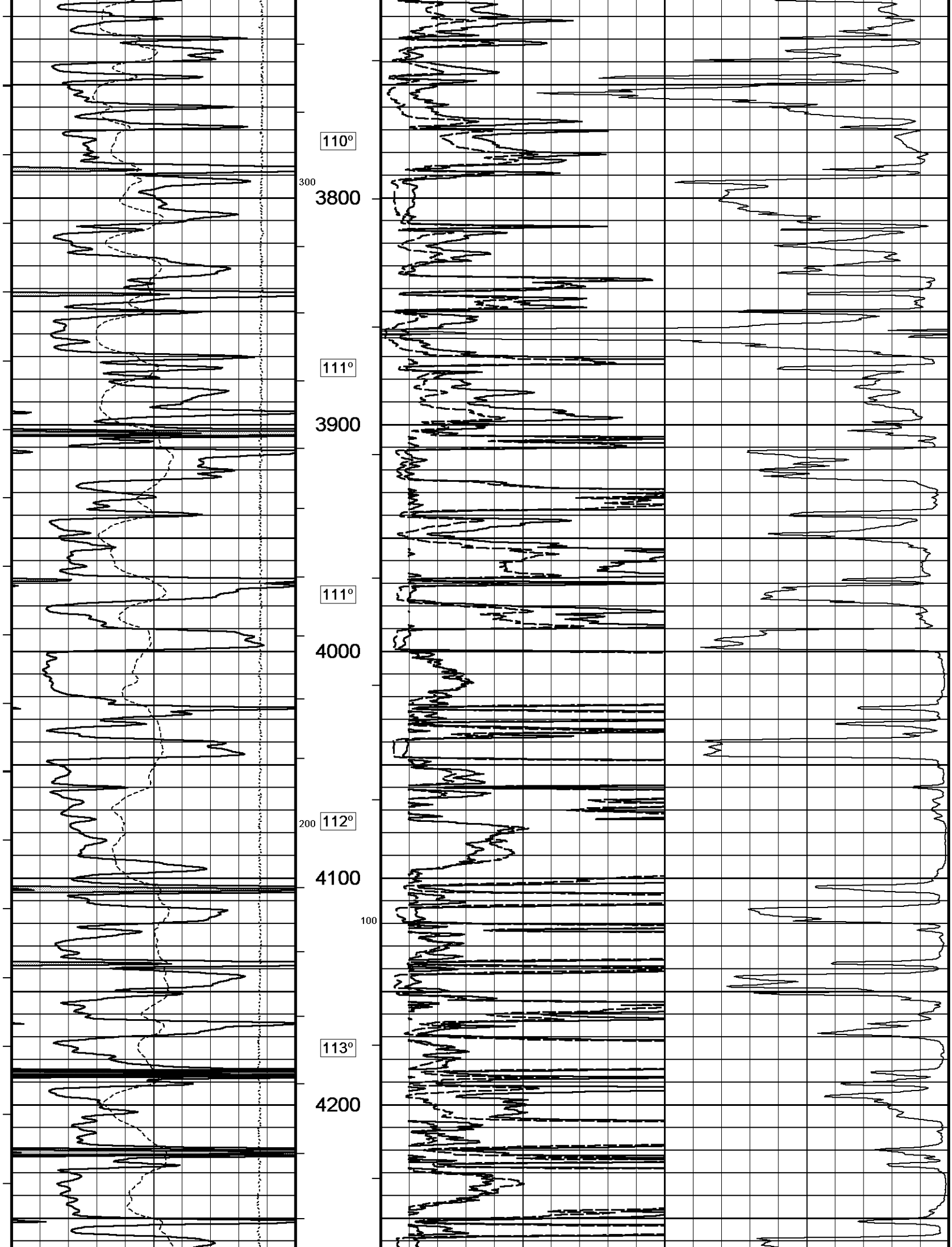

94°
1000
95°
1100
96°
1200
1500
97°
1300
900
97°
1400
1400
Array Ind. One Res Rt
Shallow FE
98°
Spontaneous Potential
Gamma Ray
DST Uphole Tension
1500
Array Ind. One Cond Ct

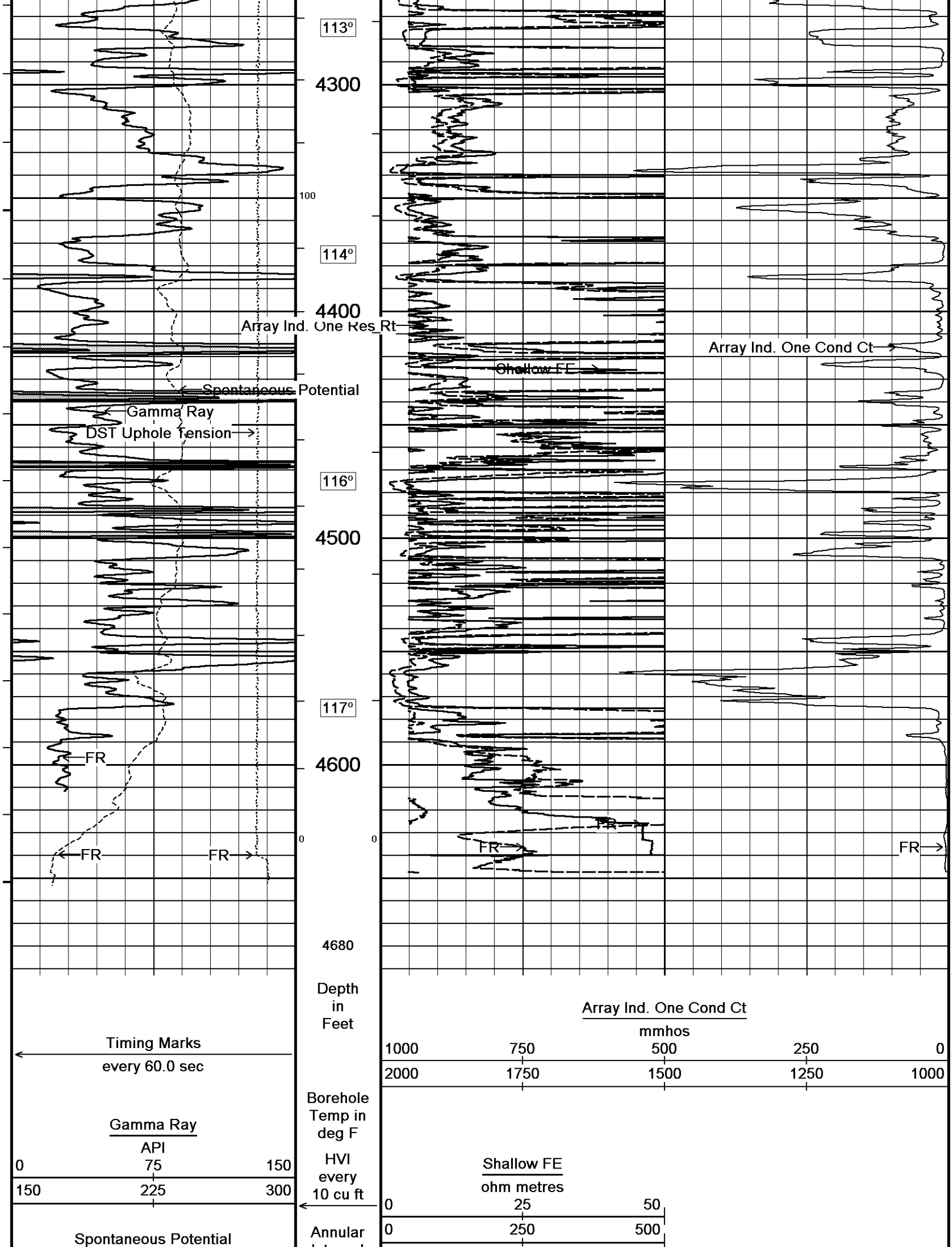

99°
1600
100°
1300
1700
800
101°
1800
1200
101°
1900
700
1100
100°
2000
600


101°
1000
2100
102°
2200
103°
2300
900
103°
2400
500
Array Ind. One Res Rt
Array Ind. One Cond Ct
Shallow FE
Spontaneous Potential
Gamma Ray
103°
DST Uphole Tension
2500
800
103°
2600


104°
2700
400
700
105°
2800
105°
2900
600
105°
3000
106°
300
3100


106°
3200
500
107°
3300
108°
3400
Array Ind. One Res Rt
Shallow FE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
108°
400
3500
200
109°
3600
110°
3700
Array Ind. One Cond Ct


110°
300
3800
111°
3900
111°
4000
200
112°
4100
100
113°
4200


113°
4300
100
114°
4400
Array Ind. One Res Rt
Spontaneous Potential
Gamma Ray
DST Uphole Tension
116°
4500
117°
4600
FR
FR
FR
0
0
Shallow FE
FR
FR
Array Ind. One Cond Ct
FR
4680
Depth in Feet
Timing Marks
every 60.0 sec
Gamma Ray
API
0
75
150
150
225
300
Spontaneous Potential
Borehole Temp in deg F
HVI every 10 cu ft
Annular
Array Ind. One Cond Ct
mmhos
1000
750
500
250
0
2000
1750
1500
1250
1000
Shallow FE
ohm metres
0
25
50
0
250
500

millivolts
− → | 20 | ← +

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

Depth Based Data - Maximum Sampling Increment 10.0cm
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2 INCH MAIN

5 INCH MAIN

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34 Main.dta
Recorded on 25-MAY-2013 08:51
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

Spontaneous Potential
millivolts
− → | 20 | ← +

DST Uphole Tension
pounds
5000 0

Depth
in
Feet

Borehole
Temp in
deg F

HVI
every
10 cu ft

Annular
Integral
every
10 cu ft

Replay
Scale
1:240

Shallow FE
ohm metres
0.20 2000
1 10 100 1000

Array Ind. One Res 40
ohm metres
0.20 2000
1 10 100 1000

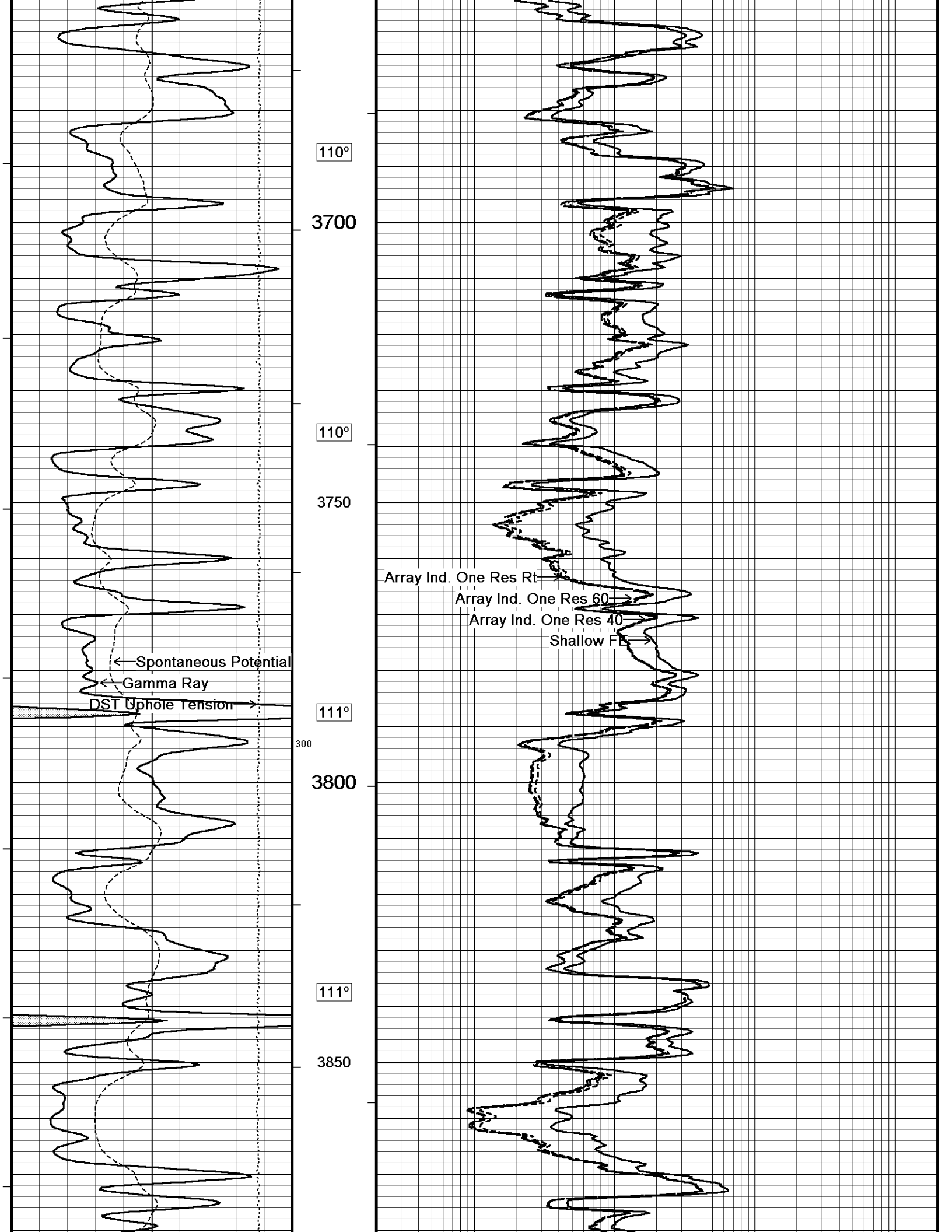
Array Ind. One Res 60
ohm metres
0.20 2000
1 10 100 1000

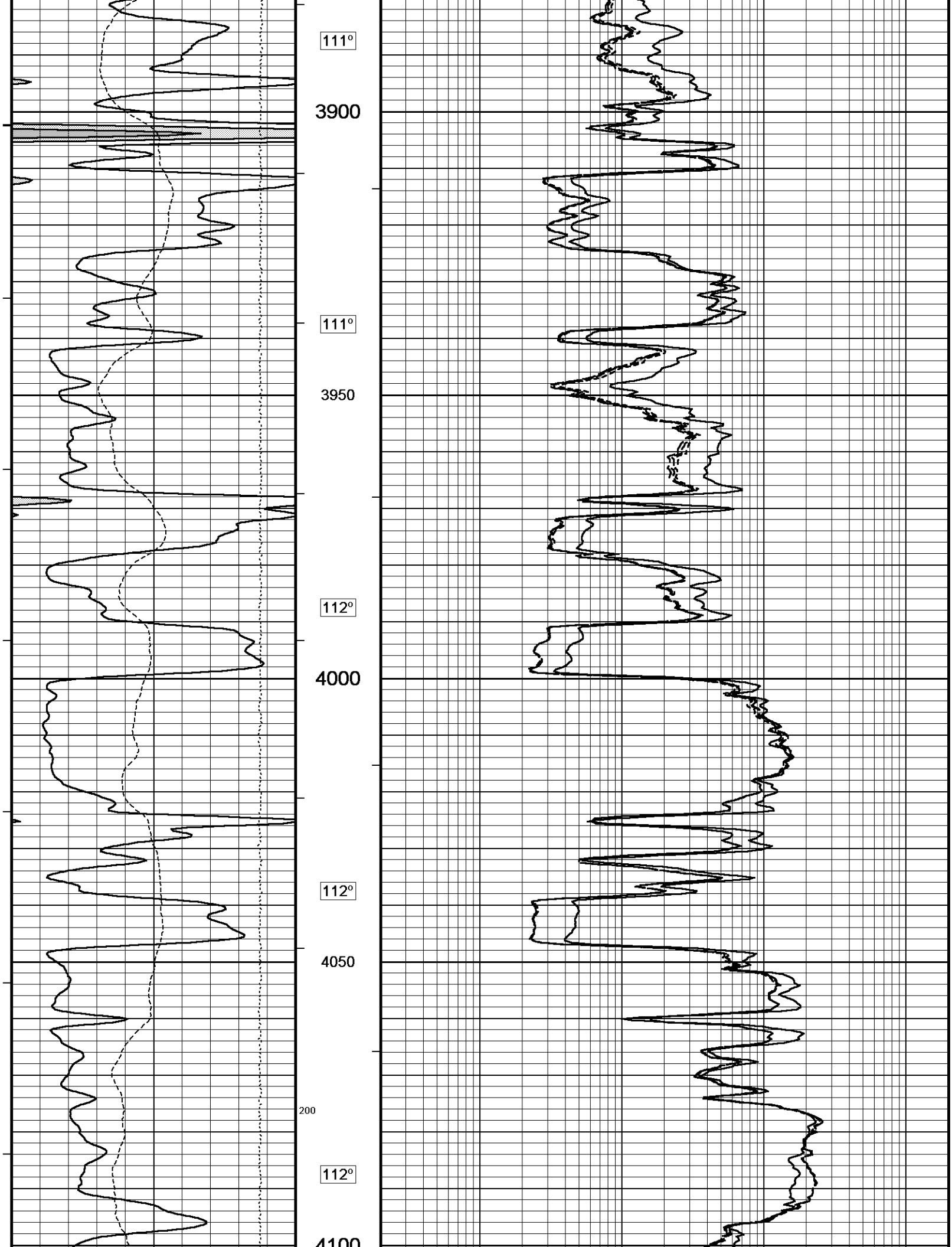
Array Ind. One Res Rt
ohm metres
0.20 2000
1 10 100 1000

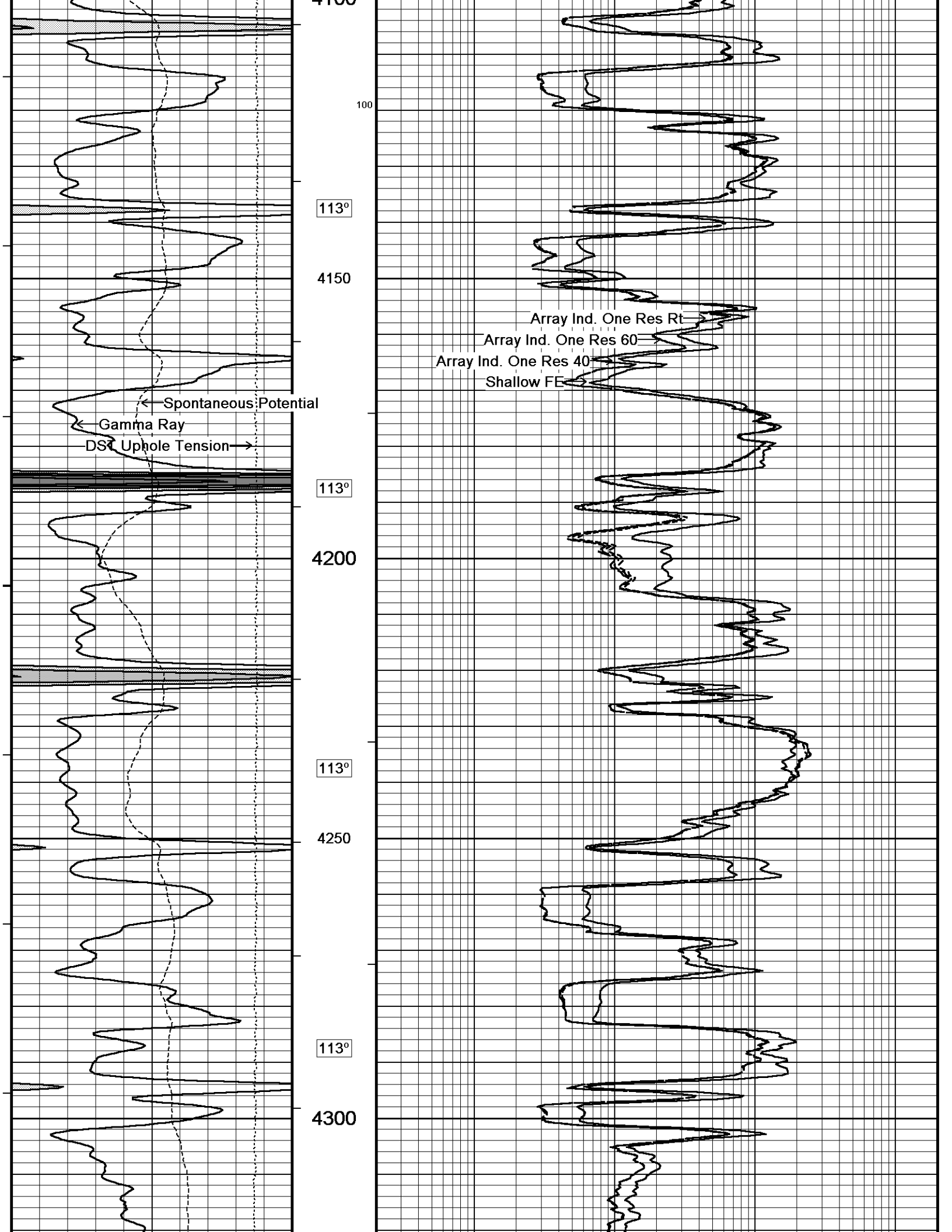
3600

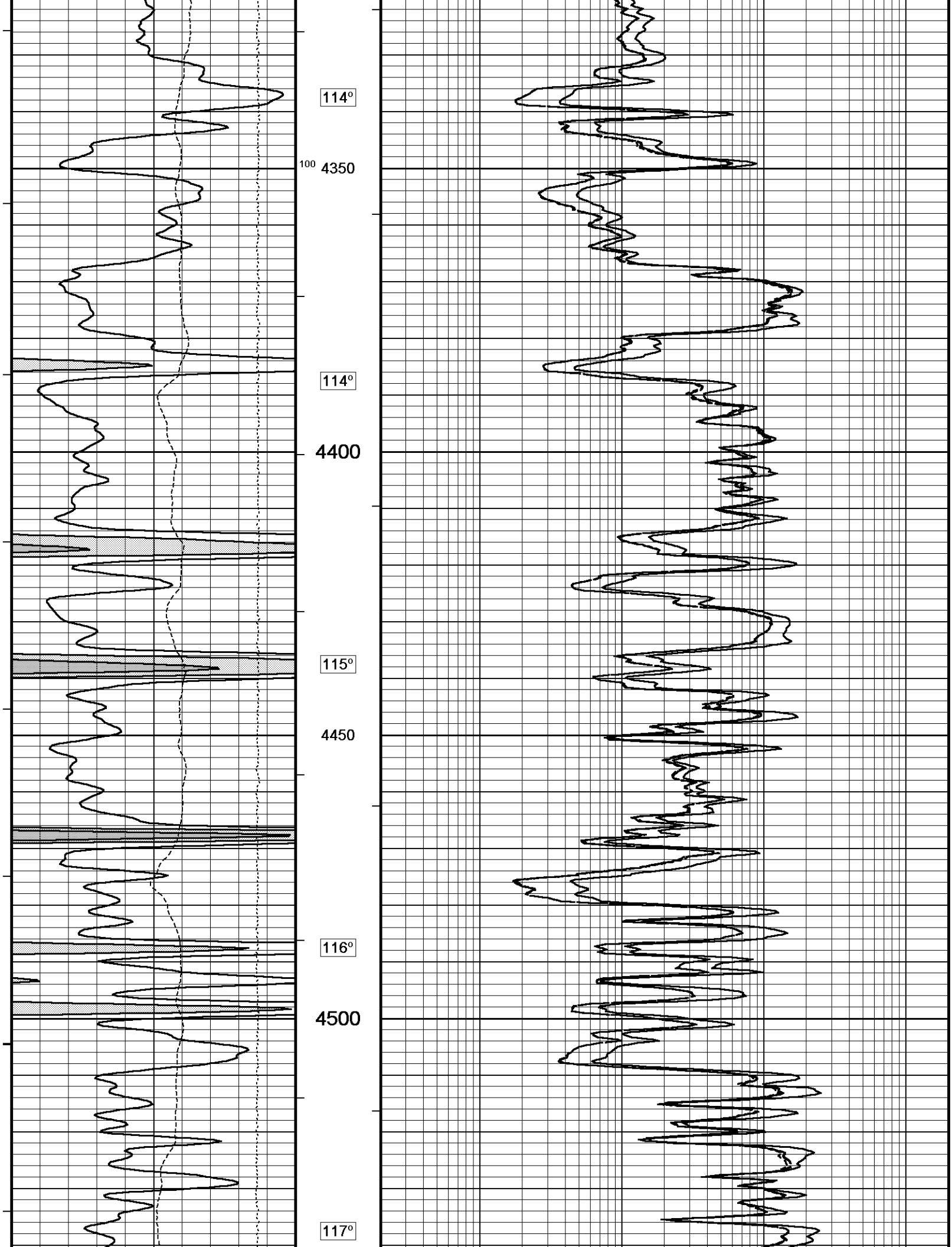
109°

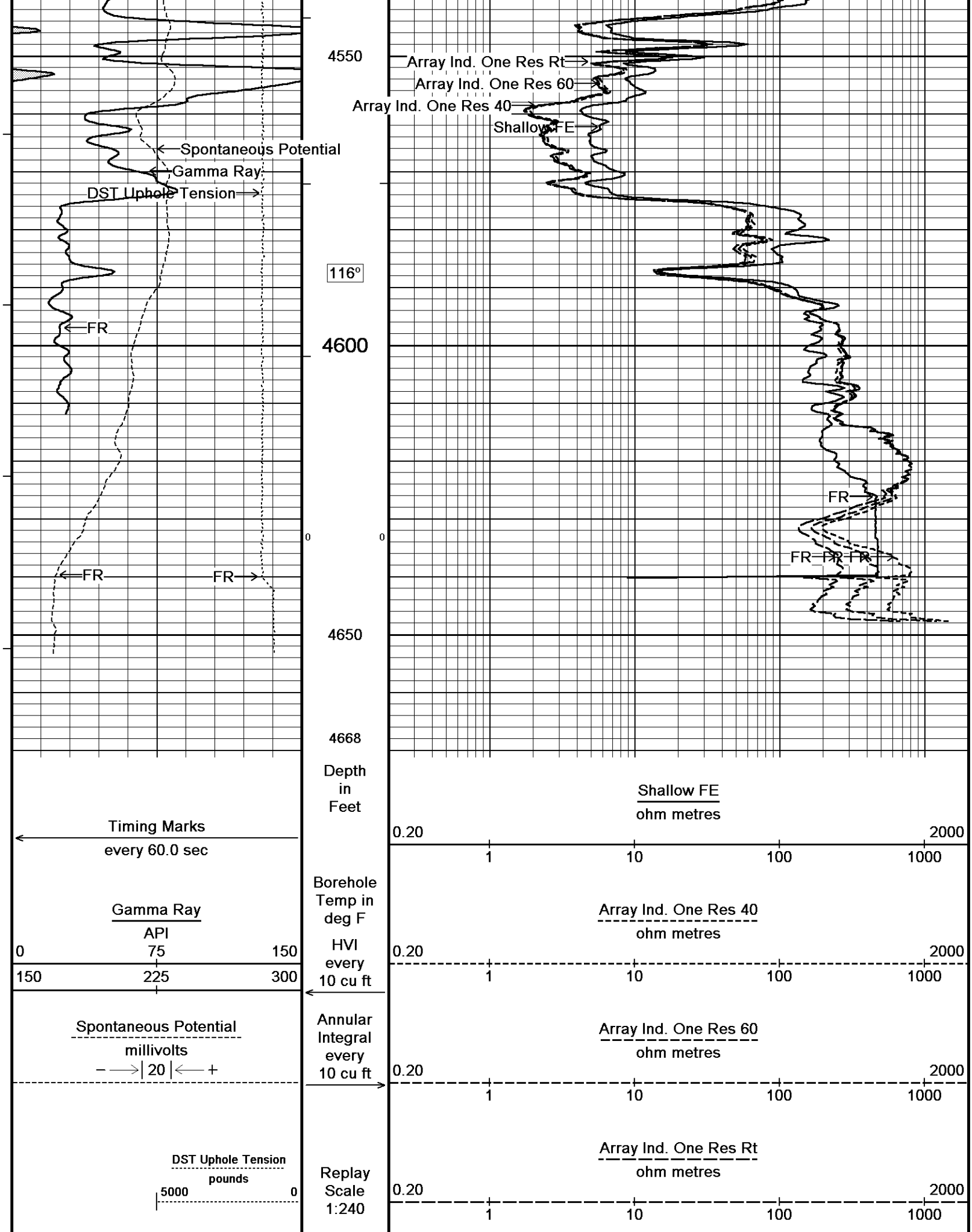
3650


110°
3700
110°
3750
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow Fl
Spontaneous Potential
Gamma Ray
DST Uphole Tension
111°
300
3800
111°
3850


111°
3900
111°
3950
112°
4000
112°
4050
200
112°
4100


100
113°
4150
Array Ind. One Res Rt
Array Ind. One Res 60
Array Ind. One Res 40
Shallow FE
Spontaneous Potential
Gamma Ray
DSI Uphole Tension
113°
4200
113°
4250
113°
4300


114°
100
4350
114°
4400
115°
4450
116°
4500
117°



Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 25-MAY-2013 11:51

Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34 Main.dta

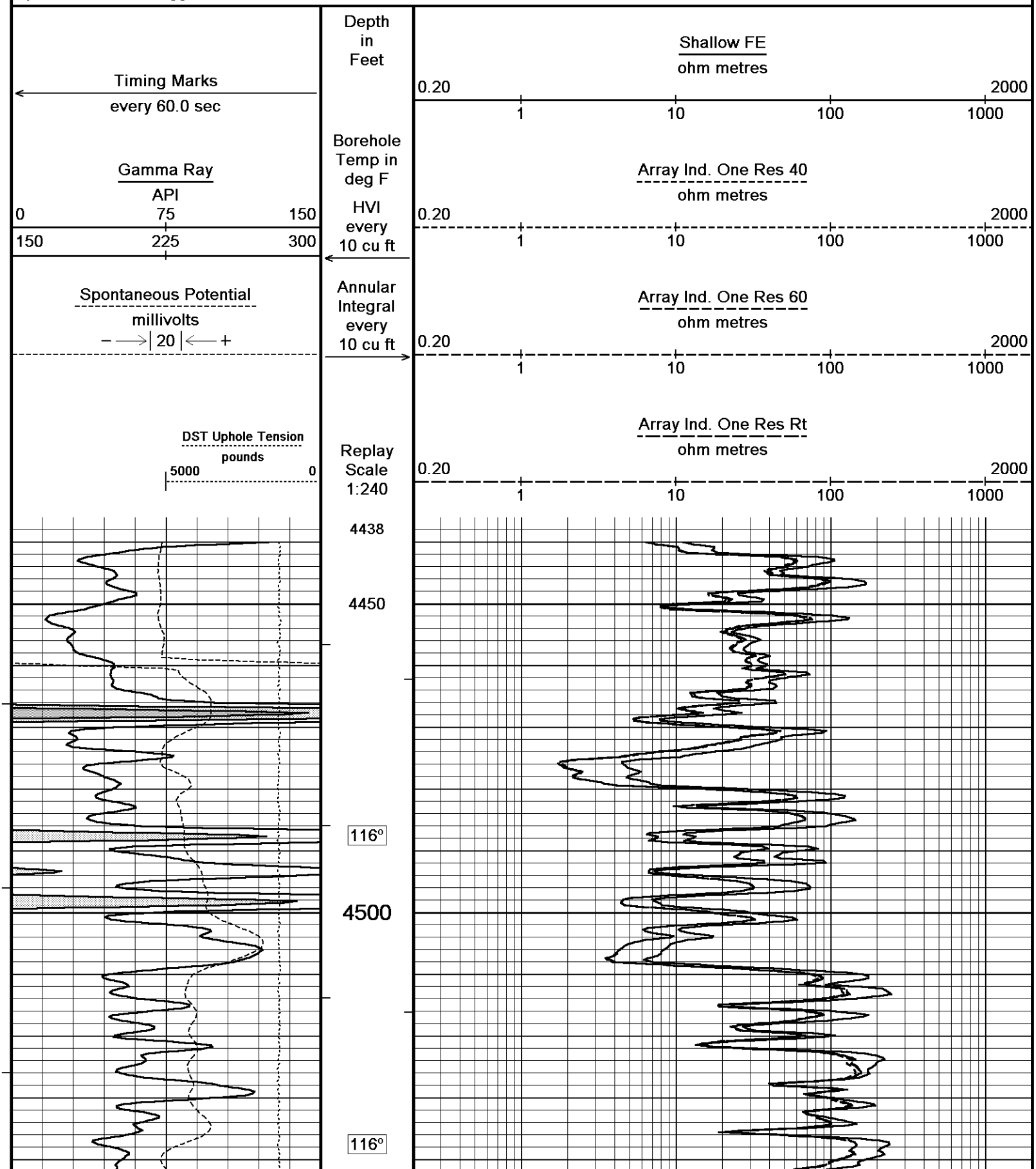
Recorded on 25-MAY-2013 08:51

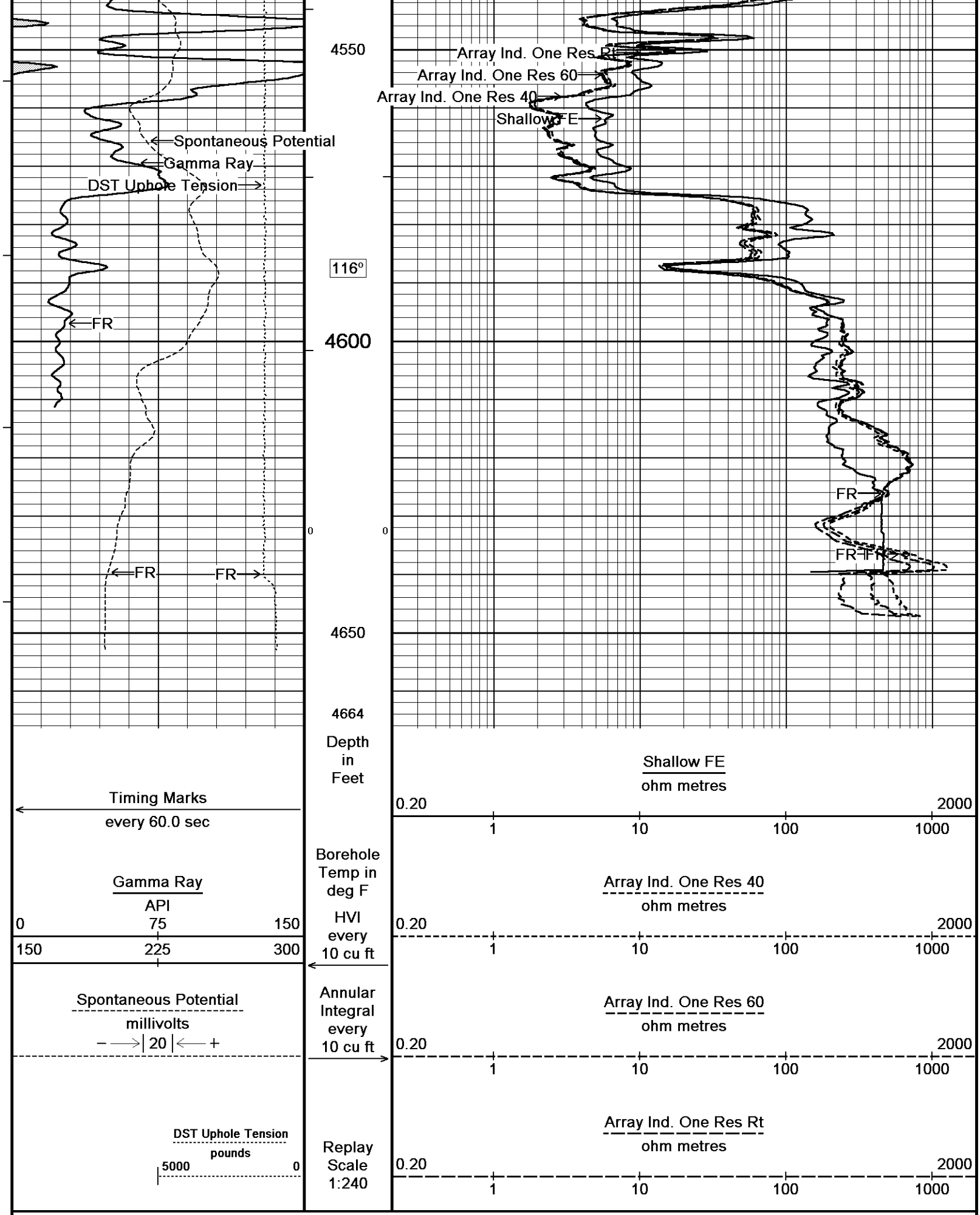
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

5 INCH MAIN

REPEAT SECTION

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34_001.dta
Recorded on 25-MAY-2013 08:31
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583





Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34_001.dta
Recorded on 25-MAY-2013 08:31
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

REPEAT SECTION

BEFORE SURVEY CALIBRATION

C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34_001.dta

General Constants All 000

Last Edited on 25-MAY-2013,04:12

General Parameters		
Mud Resistivity	0.580	ohm-metres
Mud Resistivity Temperature	99.000	degrees F
Water Level	0.000	feet
Borehole Fluid Processing	Wet Hole	
Hole/Annular Volume and Differential Caliper Parameters		
HVOL Method	Single Caliper	
HVOL Caliper 1	Density Caliper	
HVOL Caliper 2	N/A	
Annular Volume Diameter	5.500	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. Four Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

Gamma Calibration MCG-D.K 469

Field Calibration on 22-MAY-2013 08:38

	Measured	Calibrated (API)
Background	68	45
Calibrator (Gross)	1154	770
Calibrator (Net)	1086	725

Gamma Constants MCG-D.K 469

Last Edited on 25-MAY-2013,04:06

Gamma Calibrator Number	GRC38	
Mud Density	1.14	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

High Resolution Temperature Calibration MCG-D.K 469

Field Calibration on 22-MAY-2013,08:31

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

High Resolution Temperature Constants MCG-D.K 469

Last Edited on 22-MAY-2013,08:31

Pre-filter Length	11

FE Calibration MFE-B.J 353

Base Calibration on 22-MAY-2013 08:22
Field Check on 22-MAY-2013 08:29

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	964.9	126.8
Base Check		280.9
Field Check		281.0

FE Constants MFE-B.J 353

Last Edited on 25-MAY-2013,04:03

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	

Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

Induction Calibration MAI-A.A 167

Base Calibration on 19-APR-2013,13:41
Field Check on 21-MAY-2013 11:30

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) High
1	17.3	474.2	9.3	966.2
2	6.3	388.4	7.6	821.4
3	3.3	259.4	5.2	566.0
4	1.9	133.0	2.6	279.2

Array Temperature 76.8 Deg F

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1	13.1	3838.8	13.1	3838.5
2	29.5	3476.4	29.5	3476.3
3	29.1	3052.3	29.1	3052.2
4	19.8	2081.1	19.8	2080.9
Deep	18.6	2048.3	18.6	2048.1
Medium	42.1	3990.3	42.1	3990.4
Shallow	42.9	5053.6	42.9	5053.6
Array Temperature	77.1		77.5	Deg F

Induction Constants MAI-A.A 167

Last Edited on 25-MAY-2013,04:02

Induction Model	RtAP-WBM	
Caliper for Borehole Corr.	Density Caliper	
Hole Size for Borehole Correction	N/A	inches
Tool Centred	No	
Stand-off Type	Fins	
Stand-off	0.50	inches
Number of Fins on Stand-off	8.0000	
Stand-off Fin Angle	60.00	degrees
Stand-off Fin Width	0.5000	inches
Borehole Corr. Rm Source	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Squasher Start	0.0020	mhos/metre
Squasher Offset	N/A	mhos/metre

Borehole Normalisation

DRM1	0.0000	DRC1	0.0000
DRM2	0.0000	DRC2	0.0000
MRM1	0.0000	MRC1	0.0000
MRM2	0.0000	MRC2	0.0000
SRM1	0.0000	SRC1	0.0000
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-B 64

Base Calibration on 21-MAY-2013 17:34
Field Calibration on 21-MAY-2013 17:35

Base Calibration

Reading No	Measured	Calibrator Size (in)

1	14464	3.99
2	23406	5.98
3	32206	7.97
4	40368	9.86
5	50018	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.96	5.98

DOWNHOLE EQUIPMENT

C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34_001.dta

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

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

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

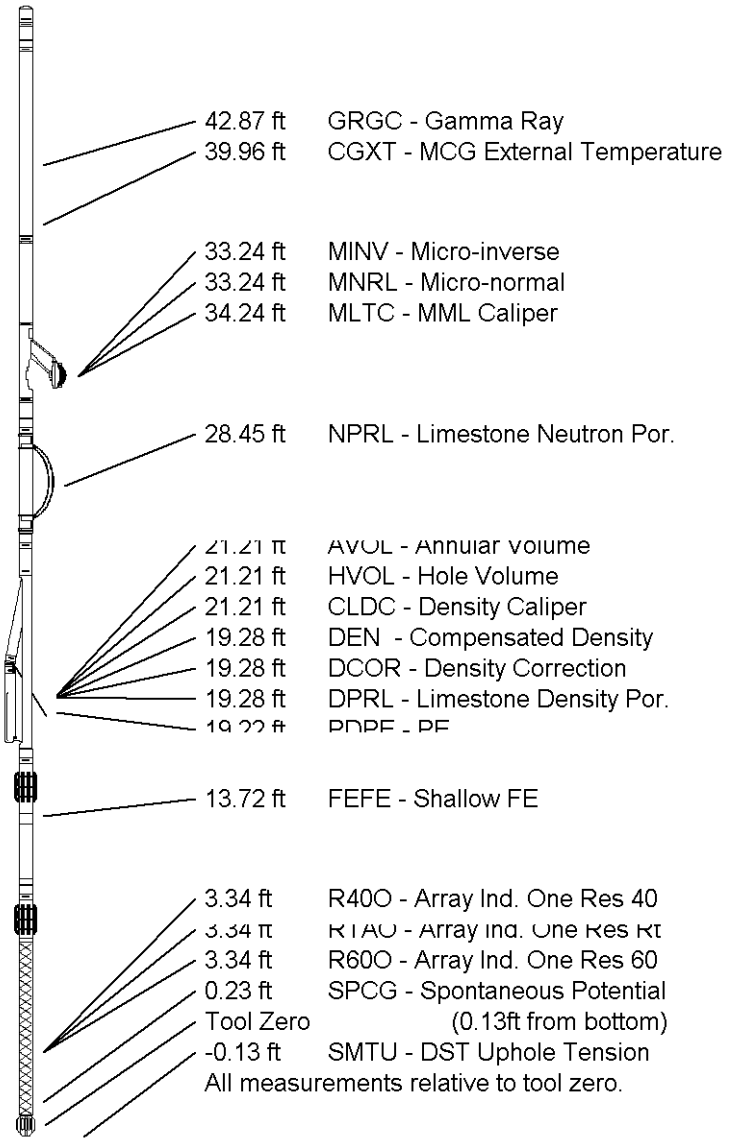
Compact Neutron
MDN-A.B 66 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

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

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

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

Total Length: 49.73 ft Weight: 399.0 lb



COMPANY	GRAND MESA OPERATING COMPANY
WELL	E & E #2-34
FIELD	WILDCAT
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2917.00	feet	First Reading	4637.00	feet
Elevation Drill Floor	2916.00	feet	Depth Driller	4640.00	feet
Elevation Ground Level	2906.00	feet	Depth Logger	4640.00	feet

ARRAY INDUCTION

Weatherford®

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

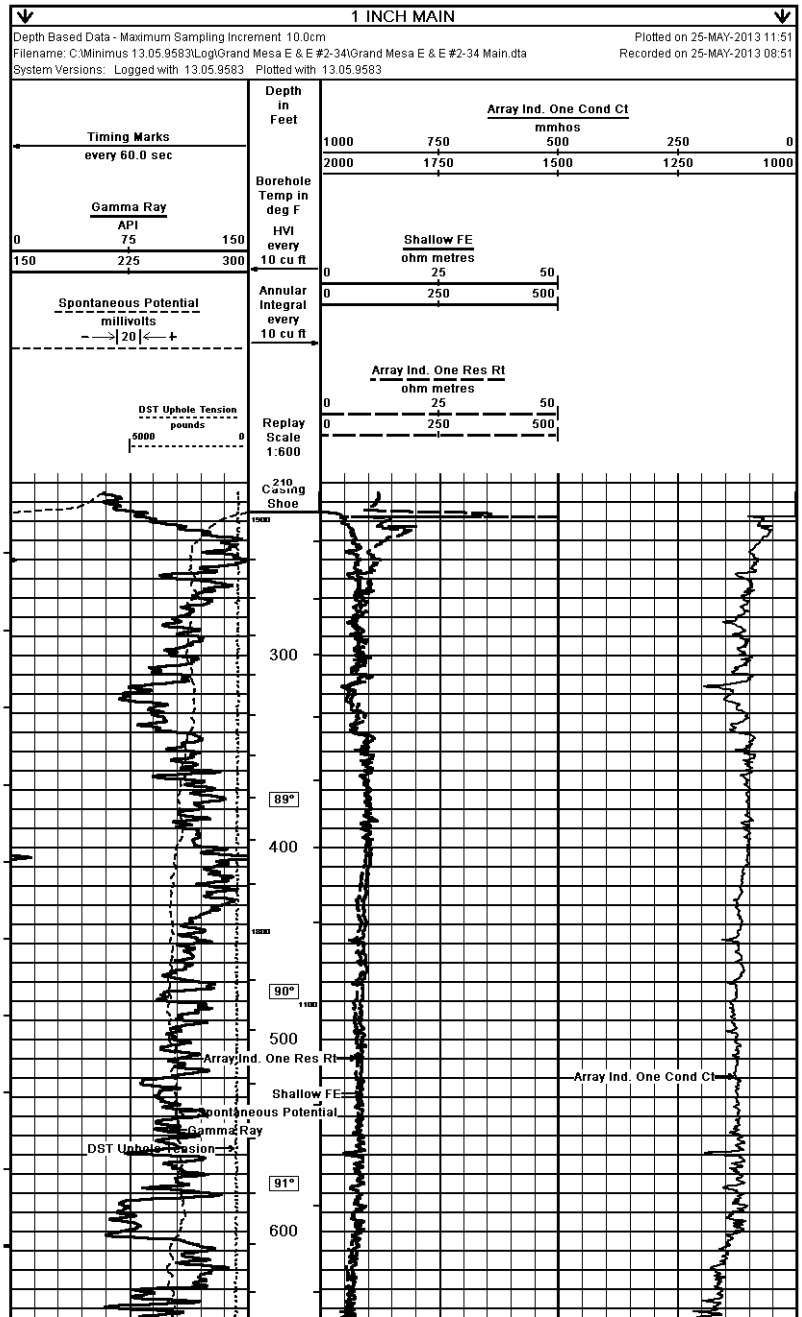
COMPANY	GRAND MESA OPERATING COMPANY
WELL	E & E #2-34
FIELD	WILDCAT
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	2078' FSL & 1667' FWL
SEC / TWP / RGE	34 / 13S / 32W
API Number	15-109-21177
Permit Number	
Other Services	MPD/MDN
Permanent Datum GL Elevation 2906 feet	
Log Measured From KB	11 feet above Permanent Datum
Drilling Measured From KB	
Elevations: KB	2917.00
Elevations: DF	2916.00
Elevations: GL	2906.00
Date	25-MAY-2013
Run Number	ONE
Service Order	3537751
Depth Driller	4640.00 feet
Depth Logger	4640.00 feet
First Reading	4637.00 feet
Last Reading	225.00 feet
Casing Driller	230.00 feet
Casing Logger	225.00 feet
Bit Size	7.875 inches
Hole Fluid Type	CHEMICAL
Density/Viscosity	9.50 lbt/USg 57.00 CP
PH / Fluid Loss	9.00 9.60 ml/30Min
Sample Source	FLOWLINE
Rm @ Measured Temp	0.58 @ 99.0 ohm-m
Rmf @ Measured Temp	0.46 @ 99.0 ohm-m
Rmc @ Measured Temp	0.70 @ 99.0 ohm-m
Source Rmf / Rmc	CALC CALC
Rm @ BHT	0.49 @ 117.0 ohm-m
Time Since Circulation	4 HOURS
Max Recorded Temp	117.00 deg F
Equipment / Base	LIB
Recorded By	13096
Witnessed By	ADAM SILL
JOB #	STEVE CARL
	LB13-148

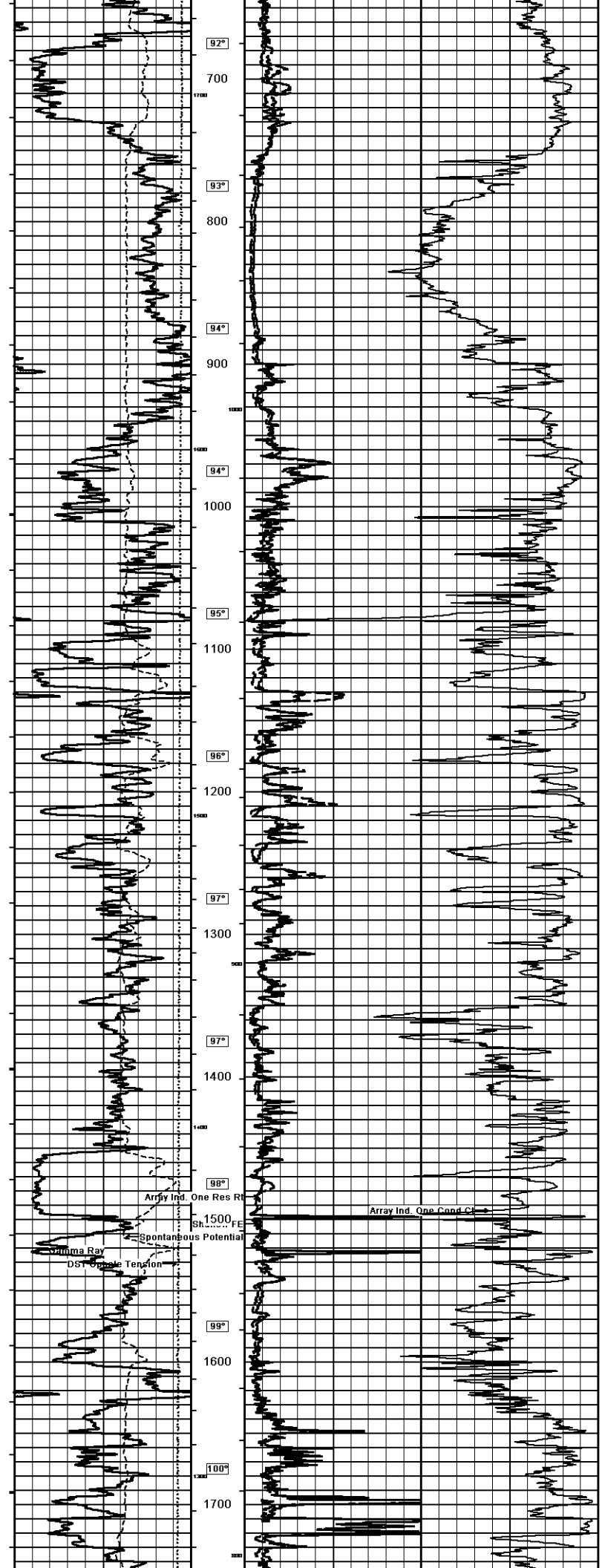
MML

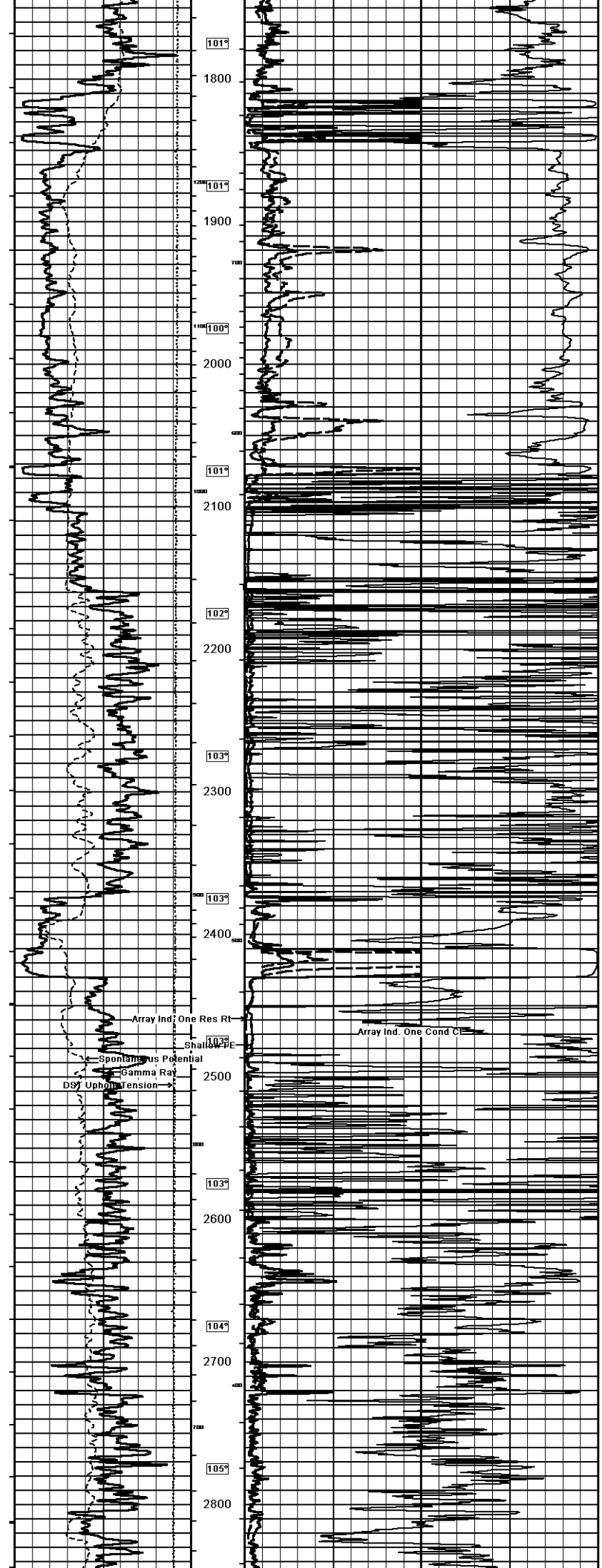
ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG

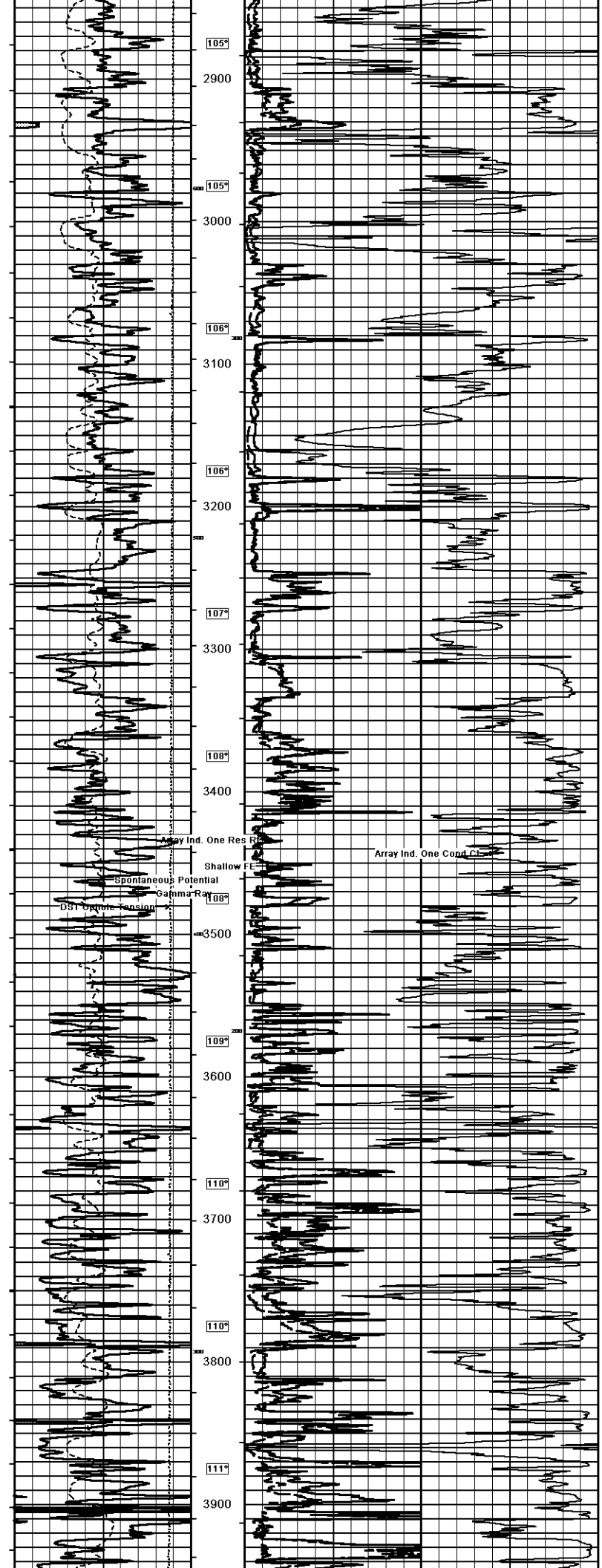
1 INCH MAIN

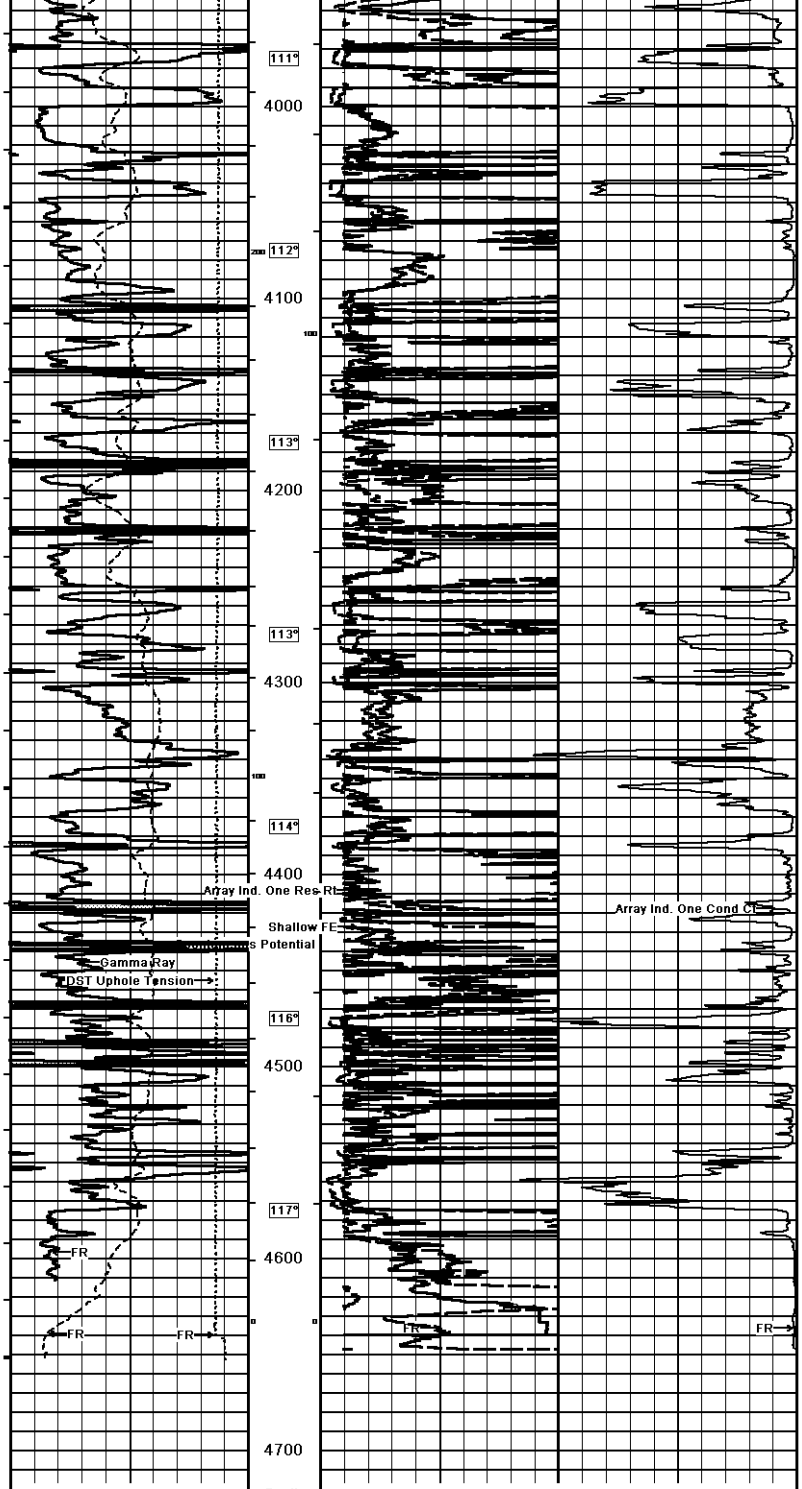
Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34 Main.dta — Recorded on 25-MAY-2013 08:51
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583




92°
700
93°
800
94°
900
94°
1000
95°
1100
96°
1200
97°
1300
97°
1400
98°
Array Ind. One Res Rt
1500
Array Ind. One Cond Ct
Spontaneous Potential
Gamma Ray
DST - Cable Tension
99°
1600
100°
1700


1800
1900
2000
2100
2200
2300
2400
2500
2600
2700
2800
Array Ind. One Res Rt
Shallow PE
Spontaneous Potential
Gamma Ray
DST Uphole Tension
Array Ind. One Cond Cl


105°
2900
105°
3000
106°
3100
106°
3200
107°
3300
108°
3400
Array Ind. One Res RT
Shallow FE
Spontaneous Potential
Gamma Ray
DST Cable Tension
108°
3500
Array Ind. One Cond CT
109°
3600
110°
3700
110°
3800
111°
3900



Depth in Feet

Timing Marks
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 1:600

Array Ind. One Cond Ct
mmhos
1000 750 500 250 0
2000 1750 1500 1250 1000

Shallow FE
ohm metres
0 25 50
0 250 500

Array Ind. One Res Rt
ohm metres
0 25 50
0 250 500

Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 25-MAY-2013 11:51
Filename: C:\Minimus 13.05.9583\Log\Grand Mesa E & E #2-34\Grand Mesa E & E #2-34 Main.dta
Recorded on 25-MAY-2013 08:51
System Versions: Logged with 13.05.9583 Plotted with 13.05.9583

1 INCH MAIN

COMPANY	GRAND MESA OPERATING COMPANY
WELL	E & E #2-34
FIELD	WILDCAT
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2917.00 feet	First Reading	4637.00 feet

Elevation Drill Floor	2916.00	feet	Depth Driller	4640.00	feet
Elevation Ground Level	2906.00	feet	Depth Logger	4640.00	feet

Weatherford

ARRAY INDUCTION
SHALLOW FOCUSED
ELECTRIC LOG