Weatherford

COMPACT PHOTO DENSITY COMPENSATED NEUTRON MICRORESISTIVITY LOG

COMPANY	SHAKESPEARE OIL COMPANY
WELL	GLASSMAN #5-35
FIELD	UNNAMED
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS
LOCATION	335' FNL & 1990' FEL

40 Years of Wireline 1970 2010

SEC	TWP	RGE	Other Services
35	12S	32W	MAI/MFE

API Number 15-109-20992
Permit Number

Permanent Datum G.L., Elevation 2984 feet
Log Measured From KB
Drilling Measured From K.B.

Elevations:	feet
KB	2994.00
DF	2992.00
GL	2984.00

Date	04-APR-2011		
Run Number	ONE		
Depth Driller	4700.00 feet		
Depth Logger	4697.00 feet		
First Reading	4676.00 feet		
Last Reading	3500.00 feet		
Casing Driller	225.00 feet		
Casing Logger	225.00 feet		
Bit Size	7.875 inches		
Hole Fluid Type	CHEMICAL		
Density / Viscosity	9.40 lb/USg	54.00 CP	
PH / Fluid Loss	9.60	10.00 ml/30Min	
Sample Source	FLOWLINE		
Rm @ Measured Temp	1.83 @ 55.0 ohm-m		
Rmf @ Measured Temp	1.46 @ 55.0 ohm-m		
Rmc @ Measured Temp	2.20 @ 5.0 ohm-m		
Source Rmf / Rmc	CALC	CALC	
Rm @ BHT	0.89 @113.0 ohm-m		
Time Since Circulation	4 HOURS		
Max Recorded Temp	113.00 deg F		
Equipment Name	COMPACT		
Equipment / Base	13057	LIB	
Recorded By	R.HOFFMAN		
Witnessed By	DON WILLIAMS		
S.O. # / JOB #	3529128	LB11-067	

BOREHOLE RECORD

Last Edited: 04-APR-2011 05:41

Bit Size inches	Depth From feet	Depth To feet
7.875	225.00	4697.00

CASING RECORD

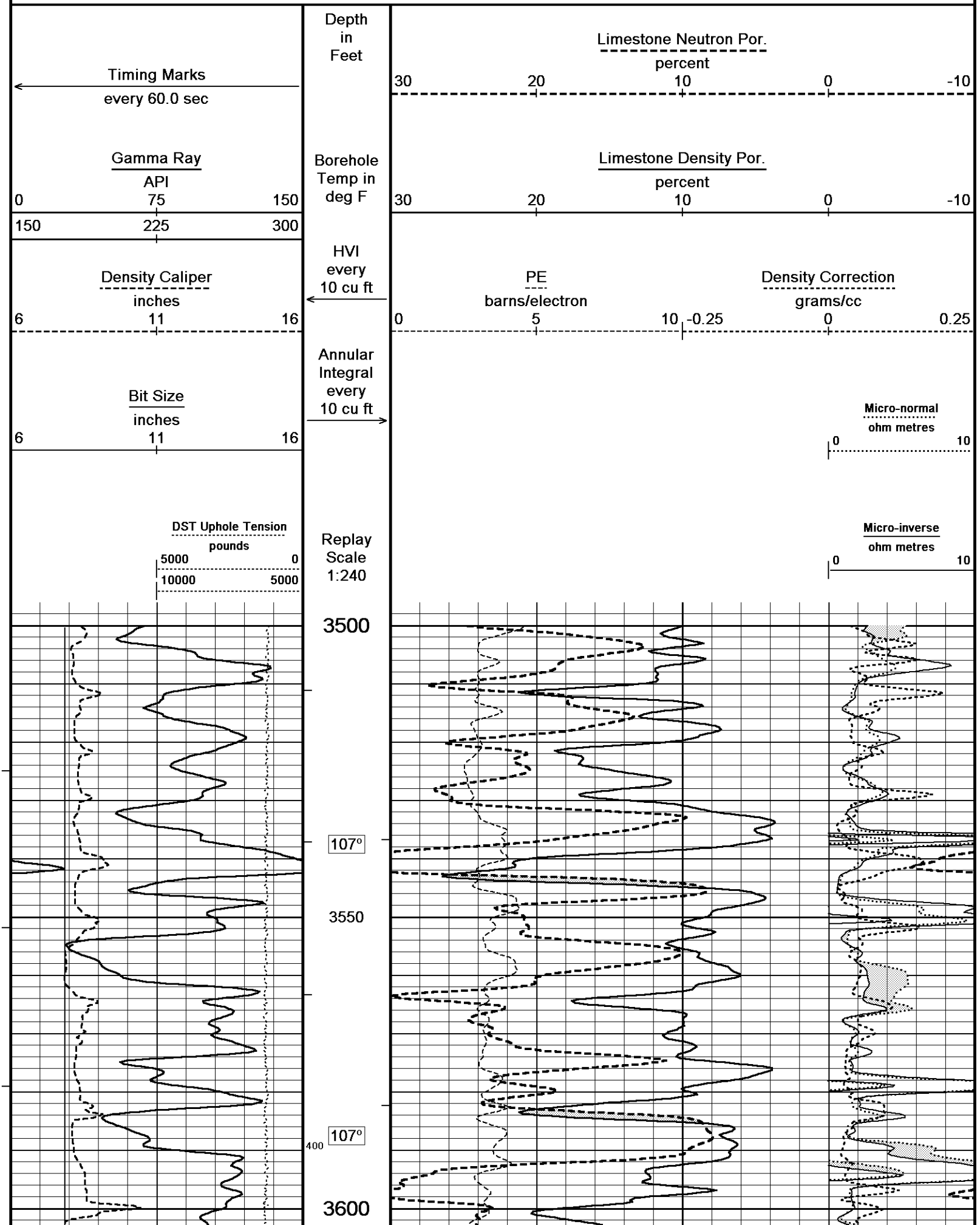
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	225.00	24.00

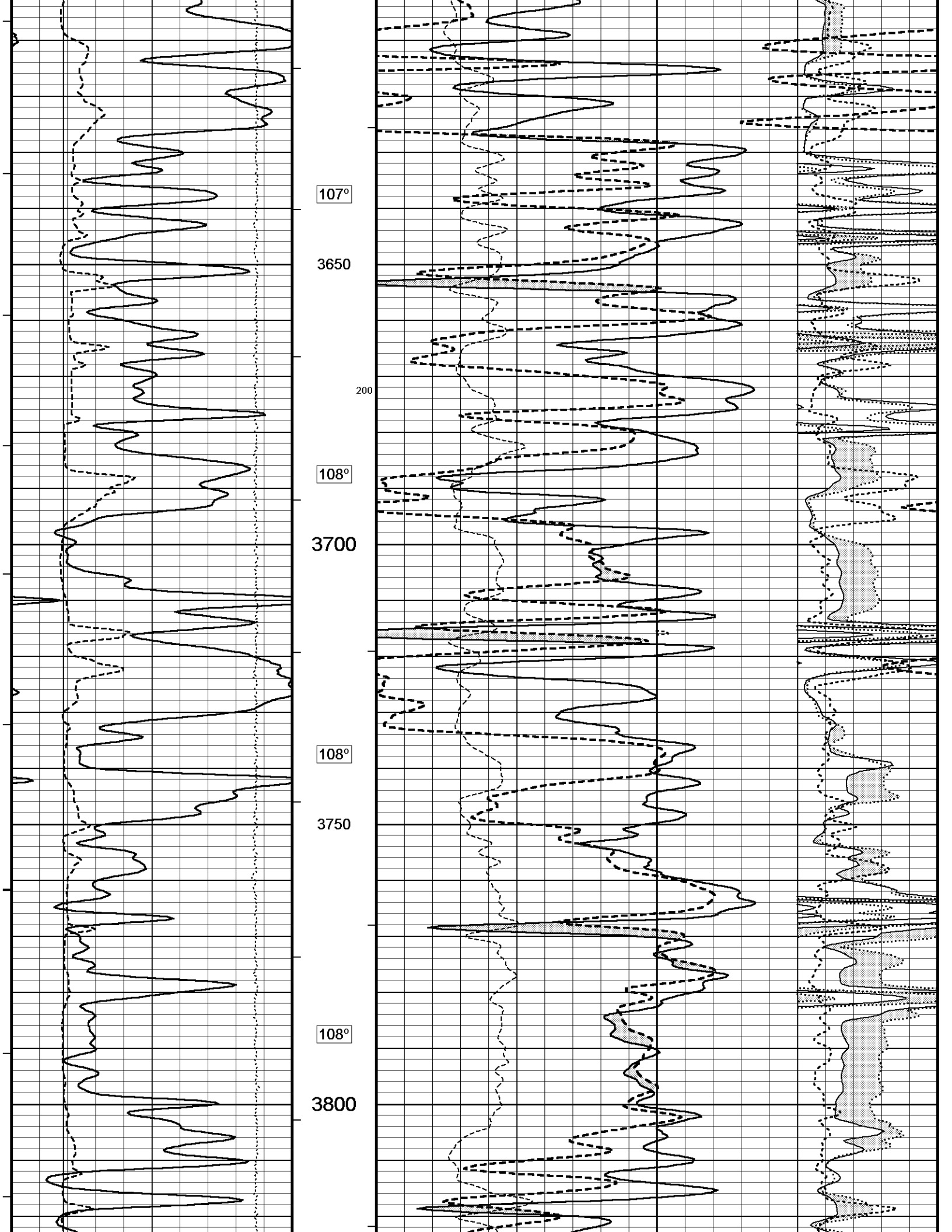
REMARKS

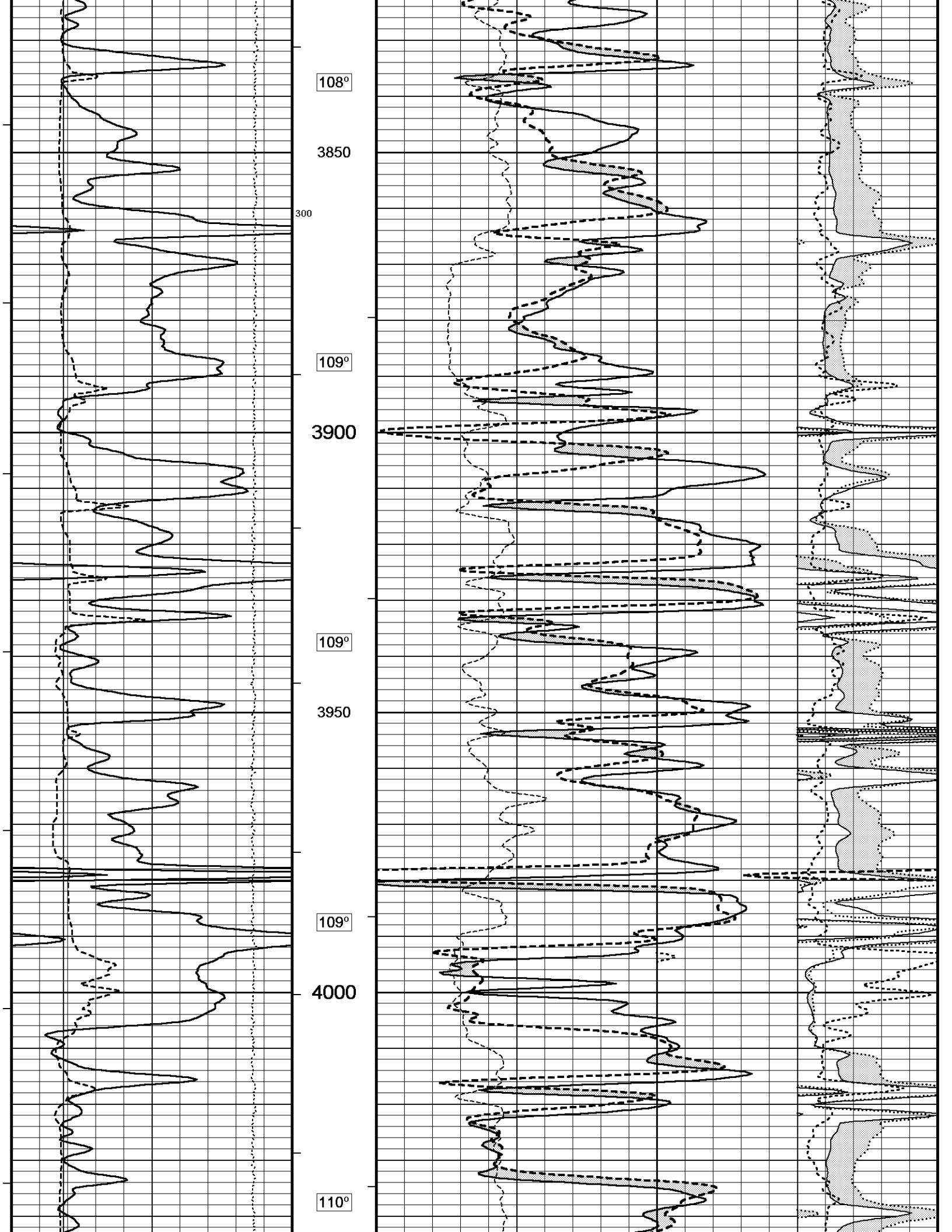
Tools Ran: MCG, MML, MDN, MPD, SKJ, MFE, MAI.
Hardware Used: MDN Dual Eccentralizer used. MPD 8 inch profile plate used. MFE and MAI 0.5 inch standoffs used.
2.71 g/cc Limestone Density Matrix used to calculate porosity.
All intervals logged and scaled per customer's request.
Annular volume with 5.5 inch production casing= 238 cu. ft.
Service order #3529128
Engineer: R. Hoffman
Operator(s): N. Adame, M. Stegman

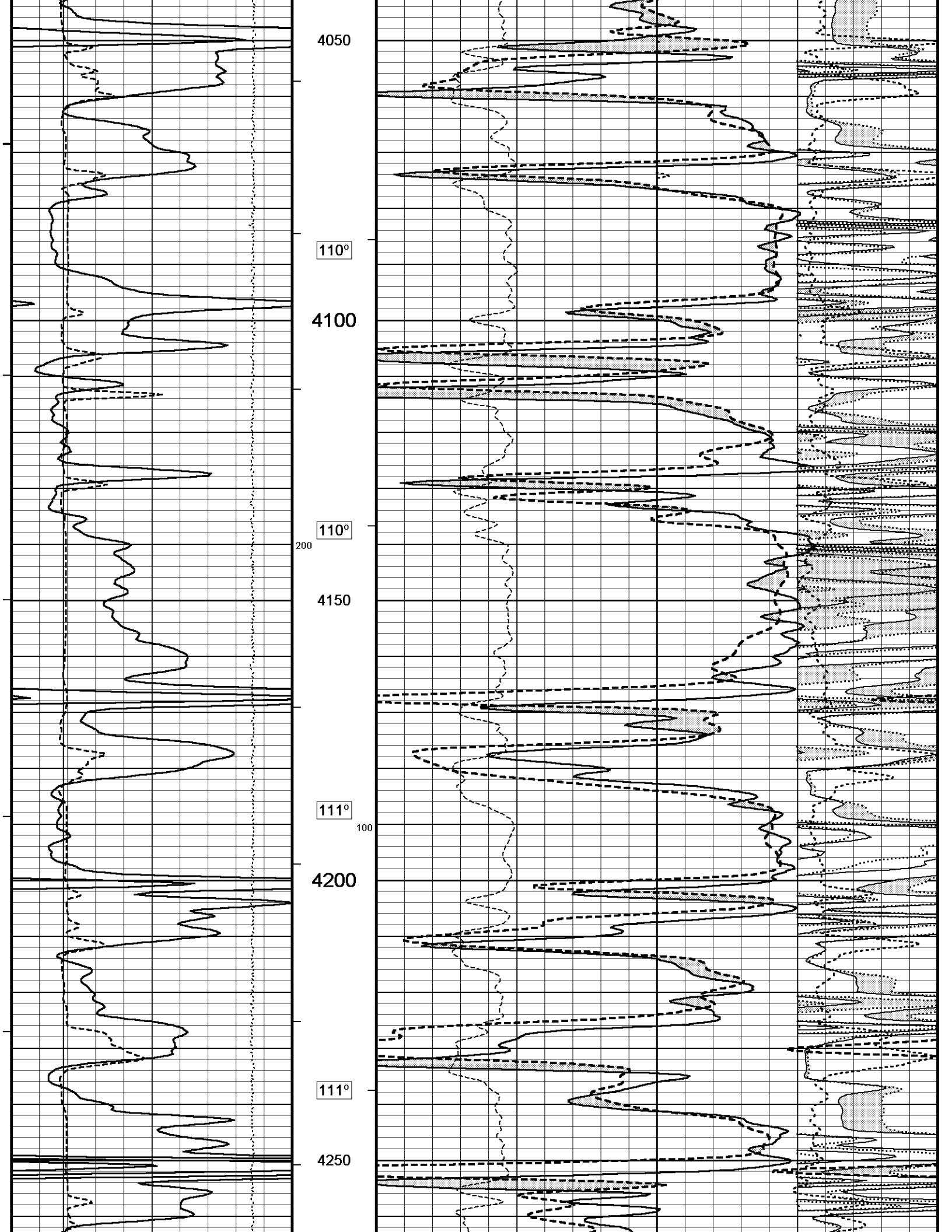
5 INCH MAIN PASS

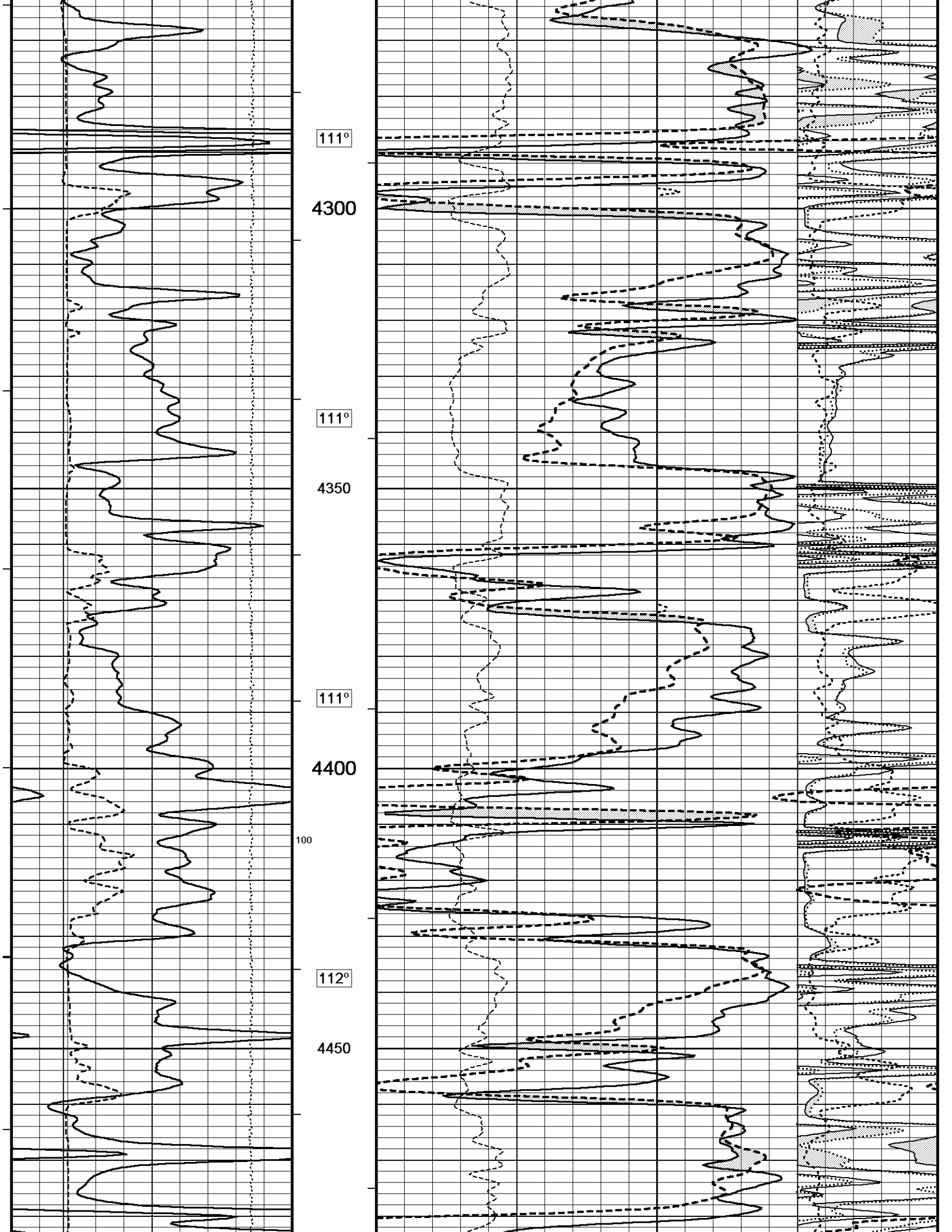
Depth Based Data - Maximum Sampling Increment 10.0cm
Plotted on 04-APR-2011 06:14
Filename: C:\Program Files\Weatherford\WLS 11.03\Dat...\Shakespeare Glassman 5-35 Reprocess.dta
Recorded on 04-APR-2011 02:32
System Versions: Processed with 11.03.3274 Plotted with 11.03.3274

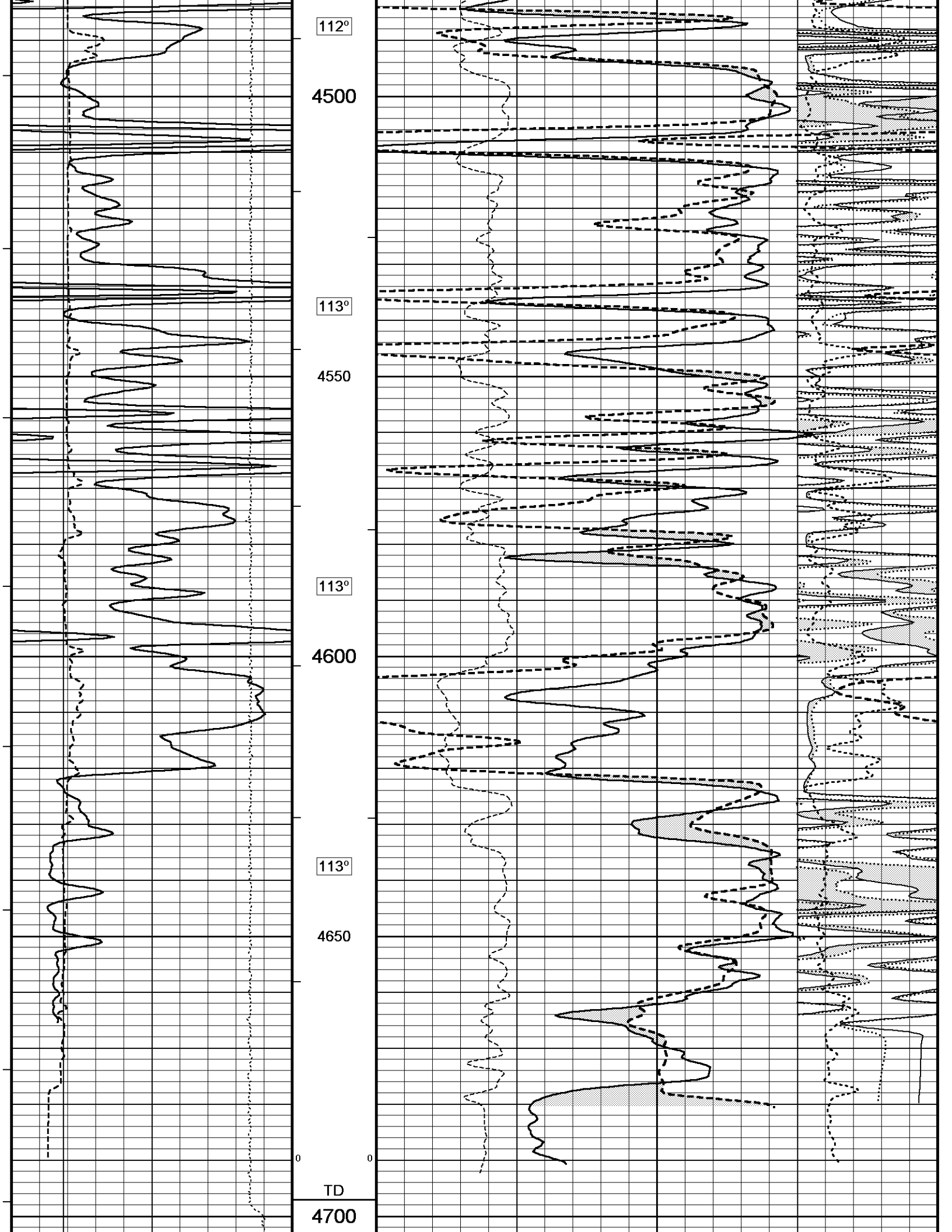


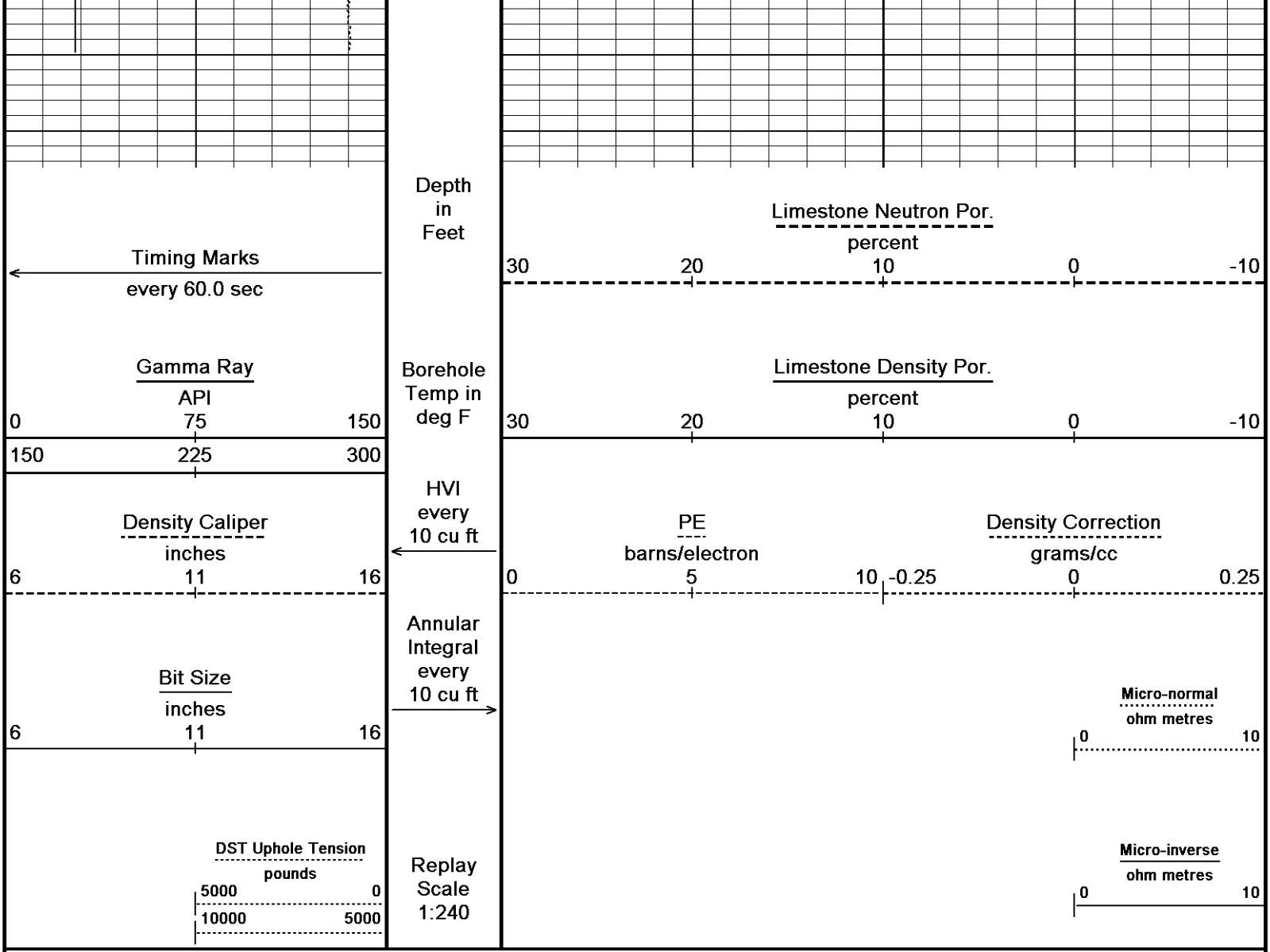

107°
3650
200
108°
3700
108°
3750
108°
3800


108°
3850
300
109°
3900
109°
3950
109°
4000
110°


4050
110°
4100
110°
200
4150
111°
100
4200
111°
4250


111°
4300
111°
4350
111°
4400
100
112°
4450


112°
4500
113°
4550
113°
4600
113°
4650
0
0
TD
4700



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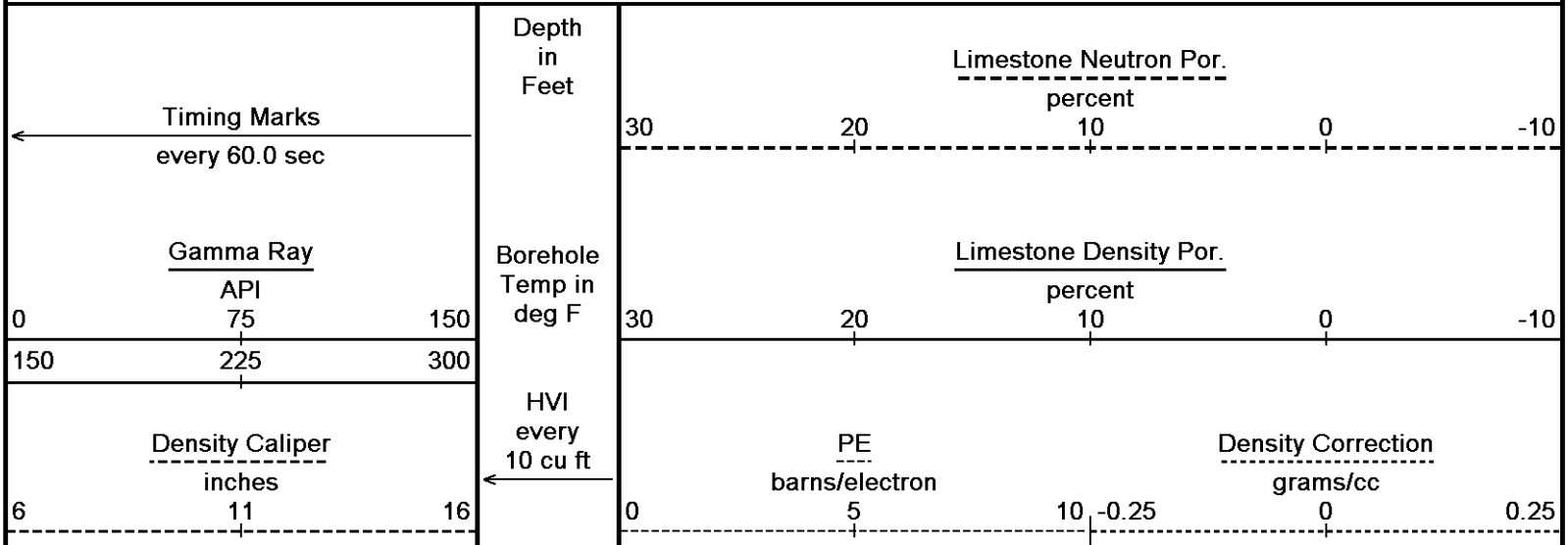
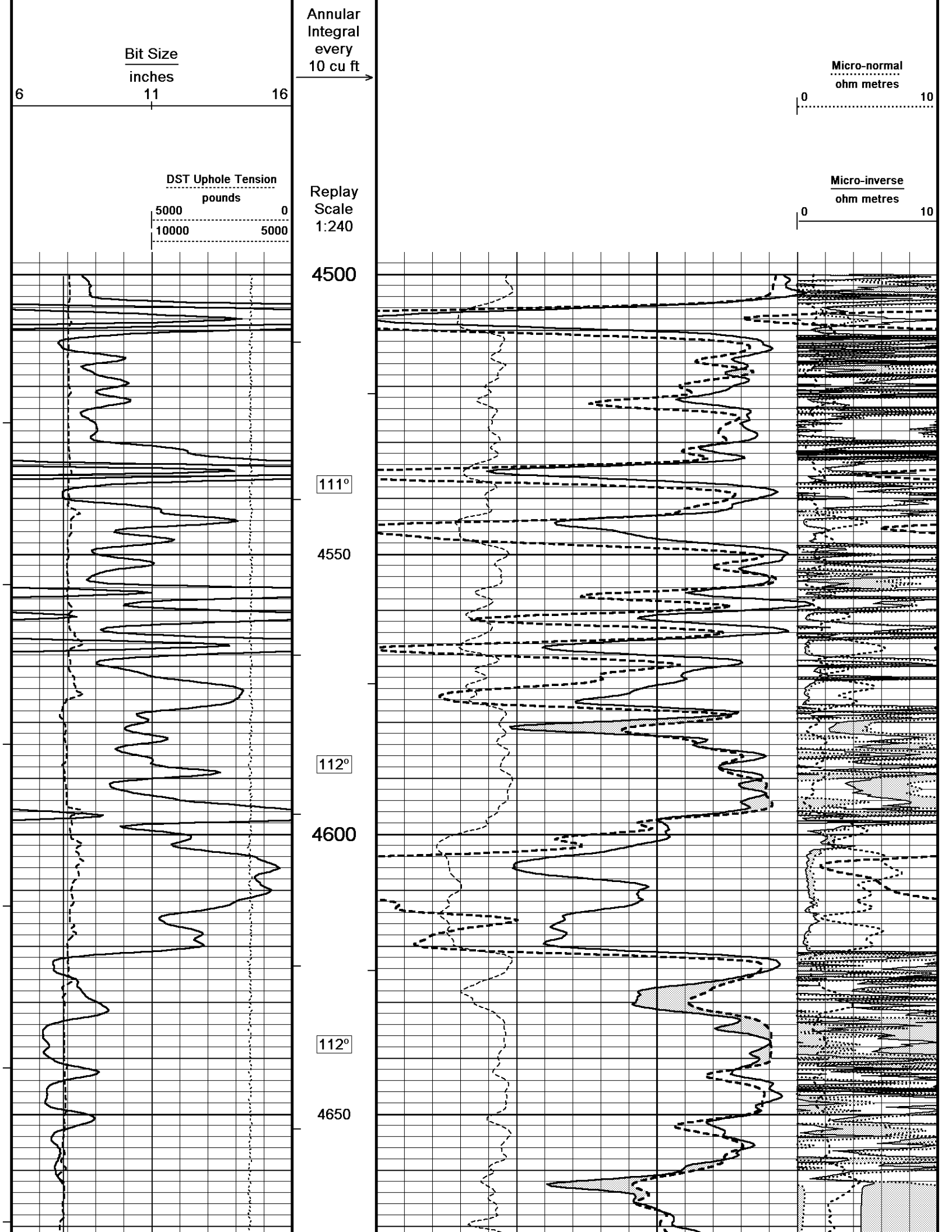
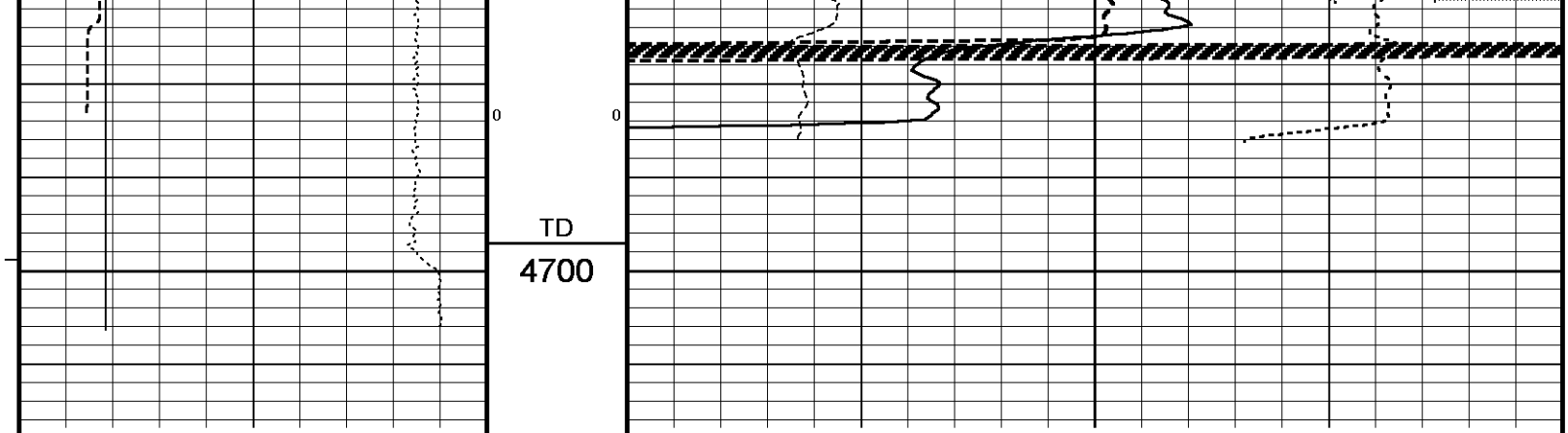
5 INCH MAIN PASS

5 INCH REPEAT PASS

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 04-APR-2011 06:14
Filename: C:\Program Files\Weatherford\WLS 11.03\Data\Sh...\Shakespeare Glassman #5-35_001.dta — Recorded on 04-APR-2011 02:12
System Versions: Logged with 11.03.3274 Plotted with 11.03.3274




Bit Size
inches
6
11
16
Annular Integral every 10 cu ft
Micro-normal
ohm metres
0
10
DST Uphole Tension
pounds
5000
0
10000
5000
Micro-inverse
ohm metres
0
10
Replay Scale 1:240
4500
111°
4550
112°
4600
112°
4650



Depth in Feet

Timing Marks
every 60.0 sec

Limestone Neutron Por.
percent
30 20 10 0 -10

Gamma Ray
API
0 75 150
150 225 300

Borehole Temp in deg F

Limestone Density Por.
percent
30 20 10 0 -10

HVI every 10 cu ft

Density Caliper
inches
6 11 16

PE
barns/electron
0 5 10

Density Correction
grams/cc
-0.25 0 0.25

Annular Integral every 10 cu ft

Bit Size
inches
6 11 16

Micro-normal
ohm metres
0 10

DST Uphole Tension
pounds
5000 0
10000 5000

Micro-inverse
ohm metres
0 10

Replay Scale 1:240

Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 04-APR-2011 06:14
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5 INCH REPEAT PASS

5 INCH MAIN PASS

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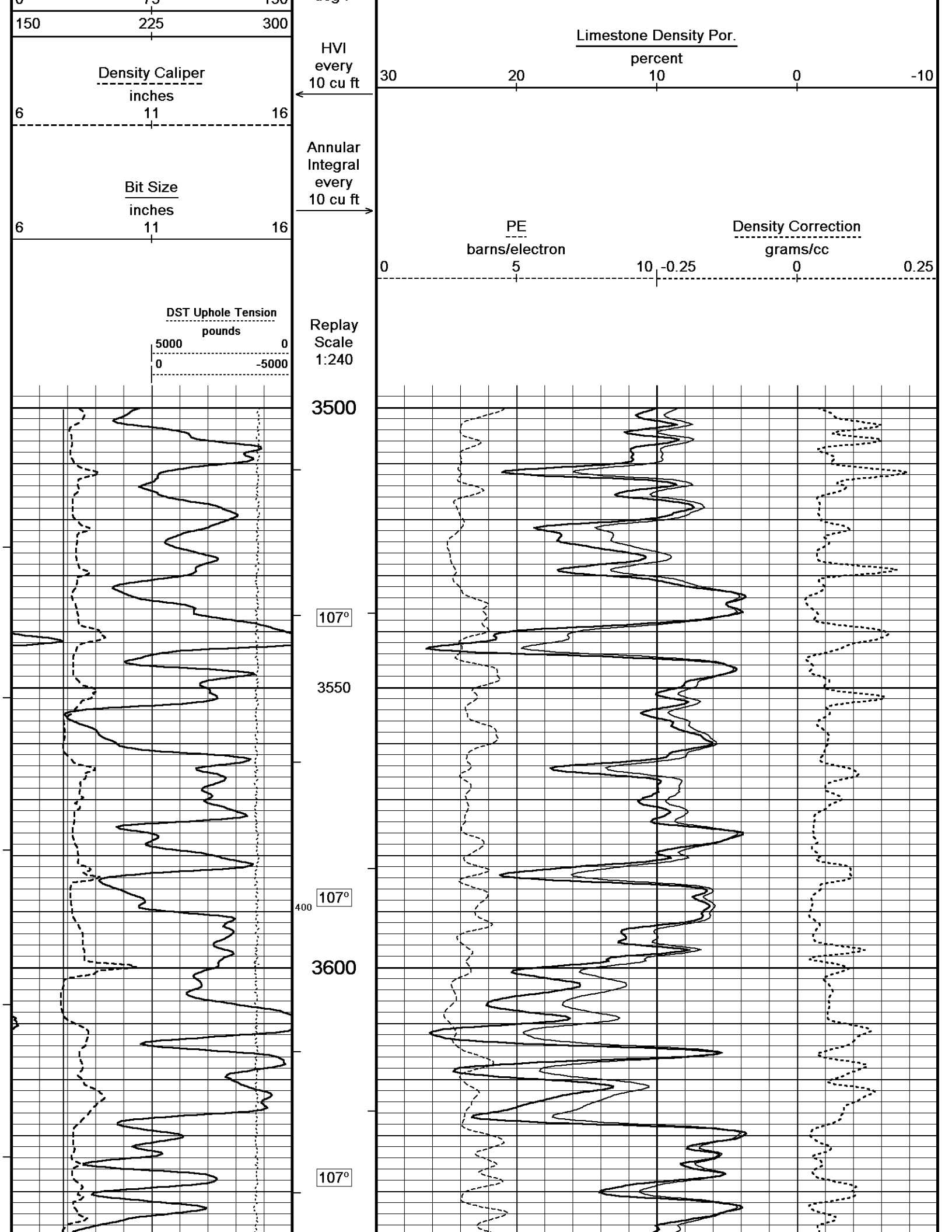
Depth in Feet

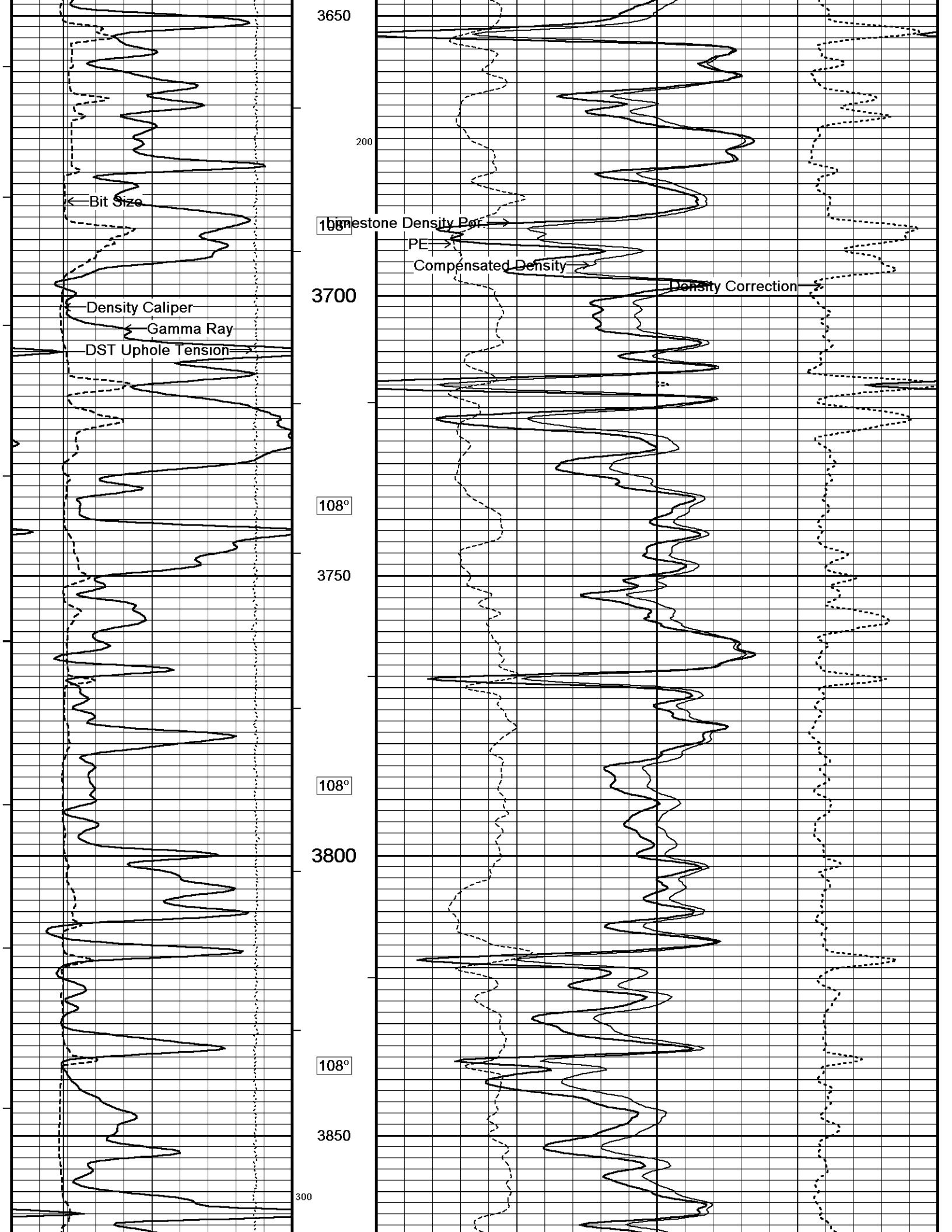
Timing Marks
every 60.0 sec

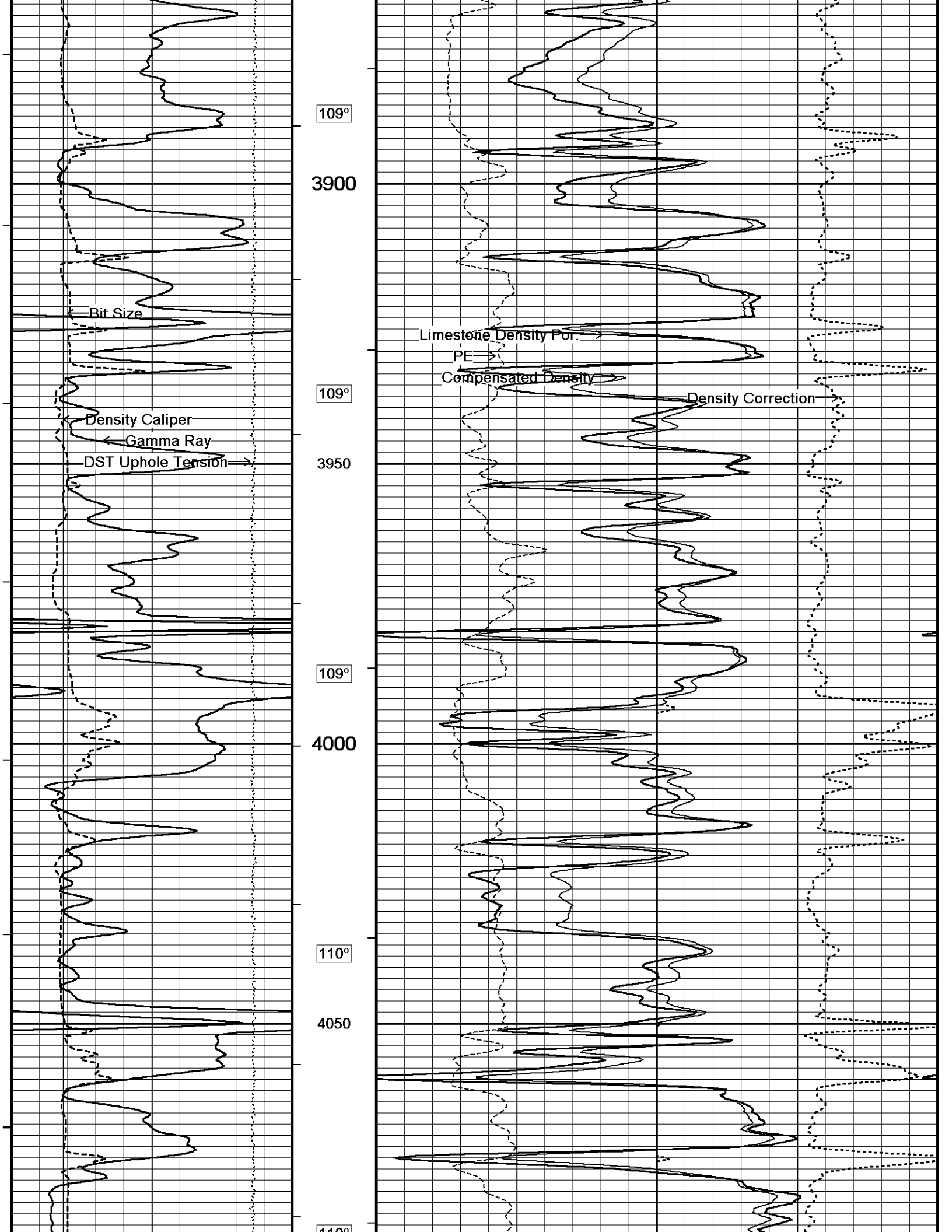
Compensated Density
grams/cc
2 2.25 2.50 2.75 3

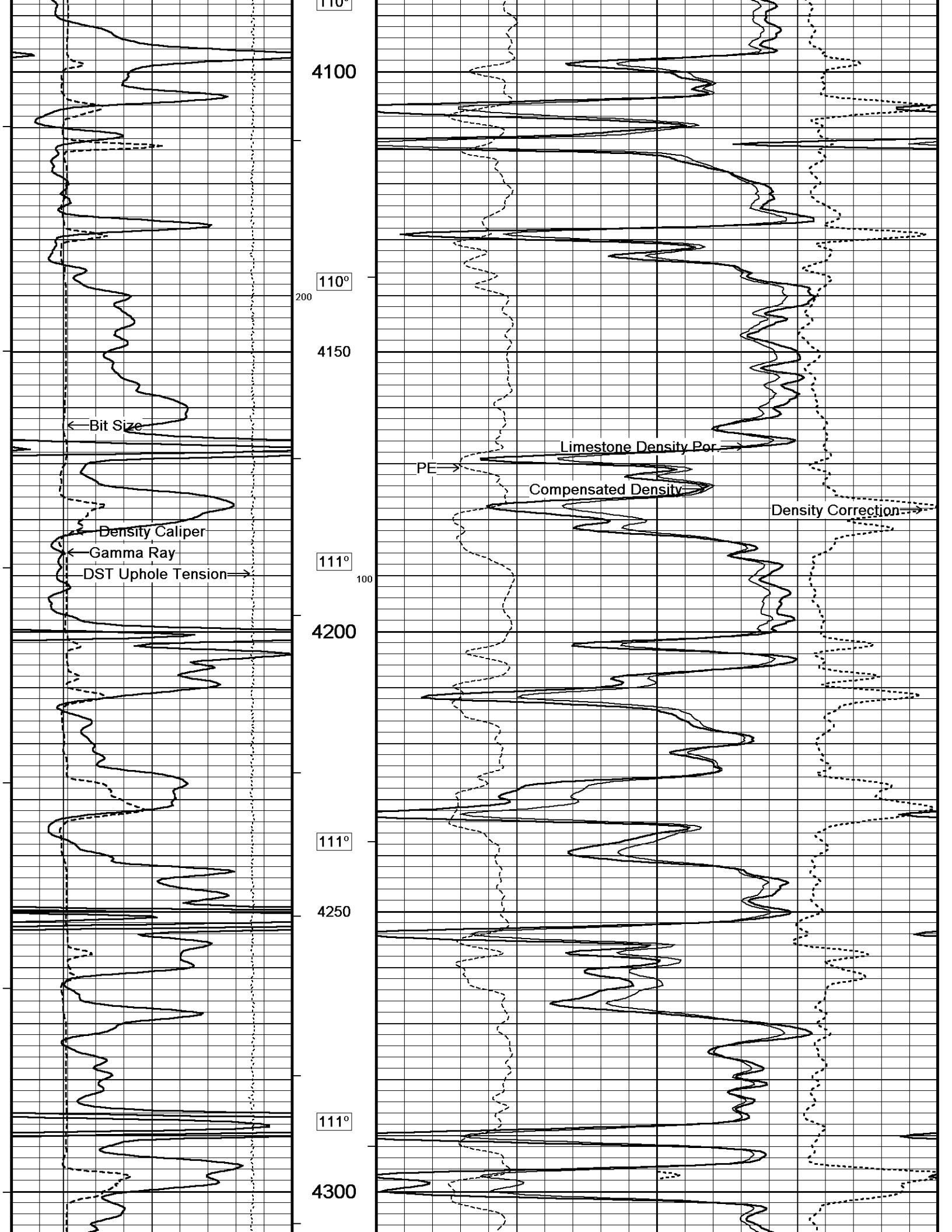
Gamma Ray
API
0 75 150

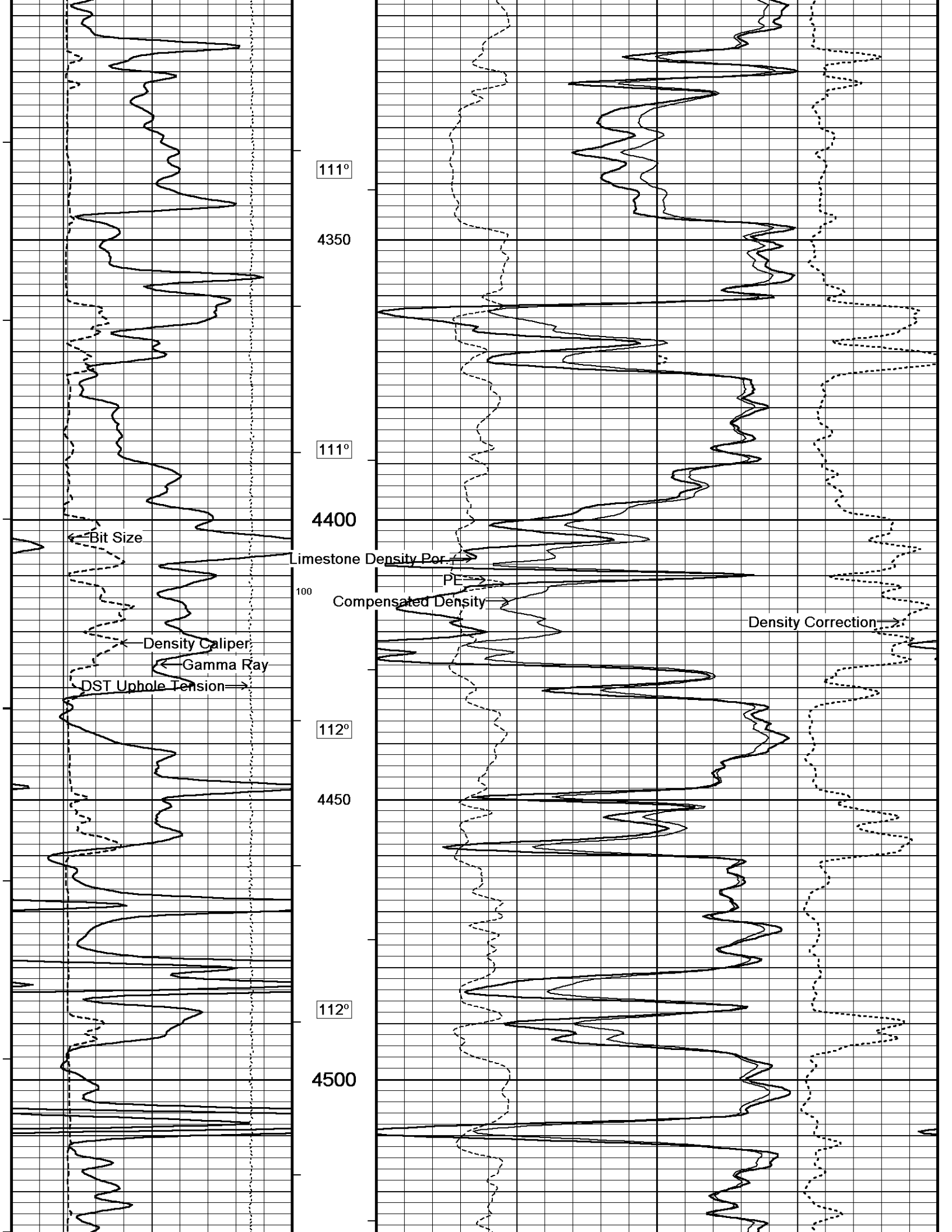
Borehole Temp in deg F

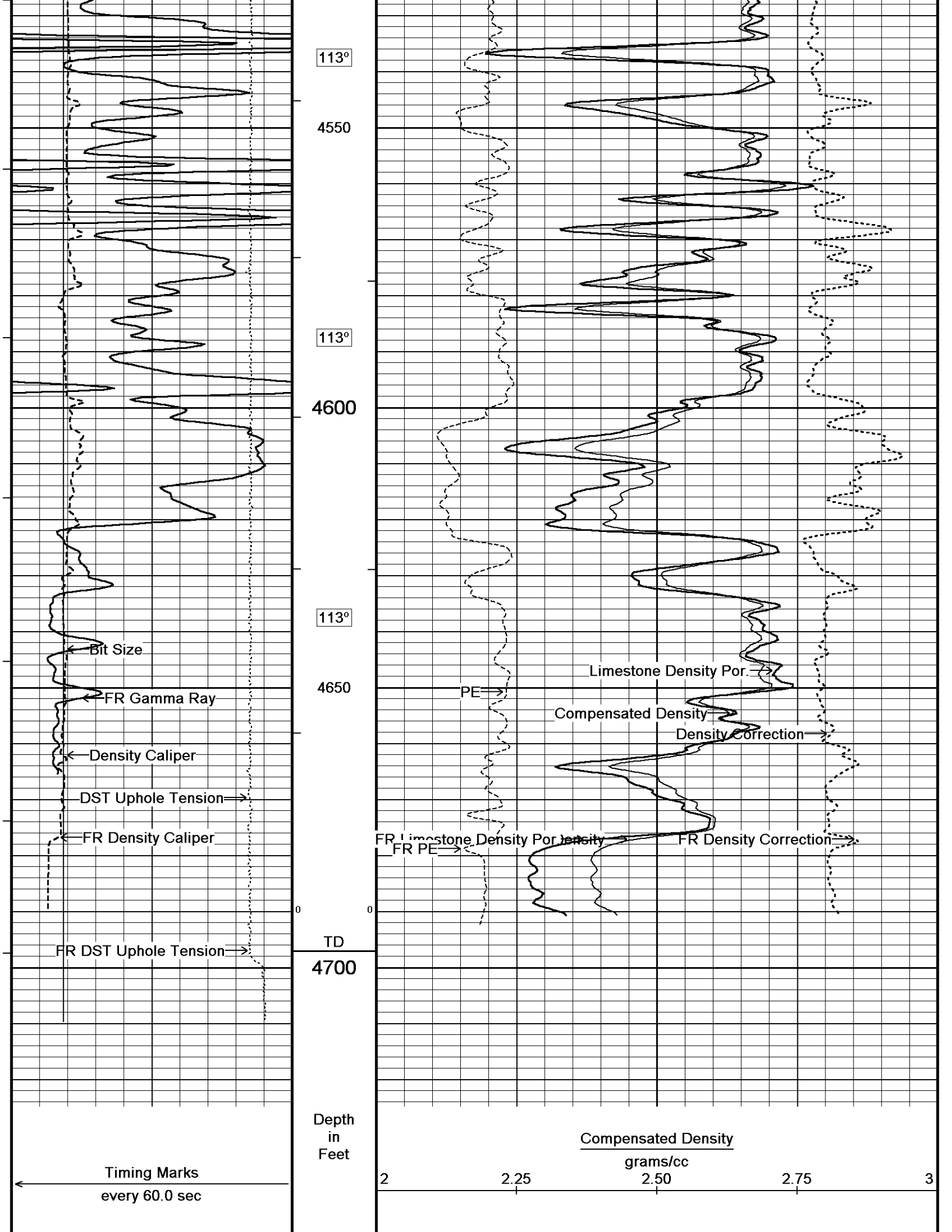

150
225
300
Density Caliper
inches
6
11
16
HVI
every
10 cu ft
Limestone Density Por.
percent
30
20
10
0
-10
Annular
Integral
every
10 cu ft
Bit Size
inches
6
11
16
PE
barns/electron
0
5
10
Density Correction
grams/cc
-0.25
0
0.25
DST Uphole Tension
pounds
5000
0
0
-5000
Replay
Scale
1:240
3500
107°
3550
400
107°
3600
107°

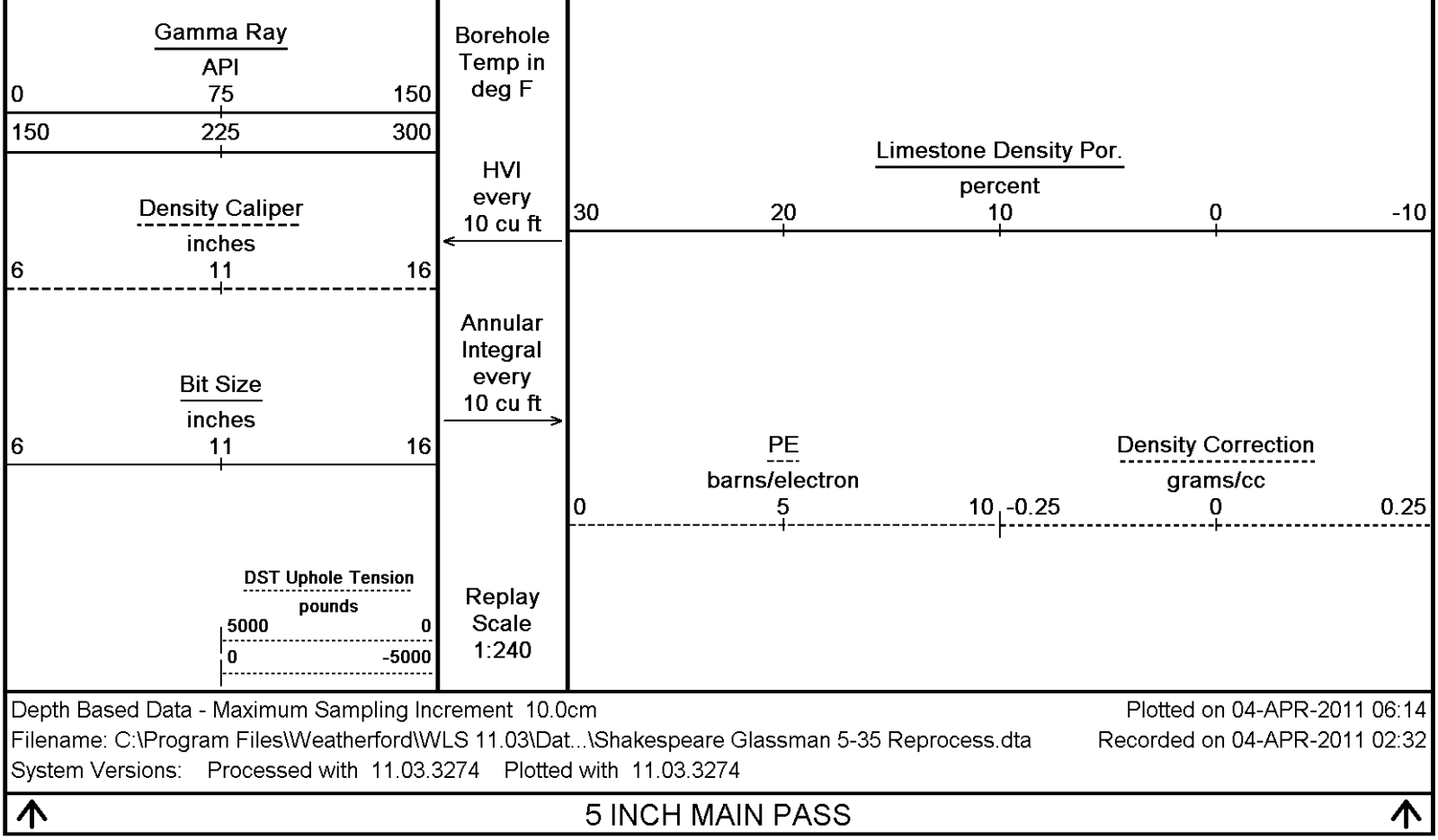

3650
200
Bit Size
Limestone Density Por
PE
Compensated Density
Density Correction
108°
3700
Density Caliper
Gamma Ray
DST Uphole Tension
108°
3750
108°
3800
108°
3850
300


109°
3900
Bit Size
Limestone Density Por.
PE
Compensated Density
109°
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
3950
109°
4000
110°
4050
110°


110°
4100
110°
200
4150
Bit Size
Limestone Density Por
PE
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
111°
100
4200
111°
4250
111°
4300


111°
4350
111°
4400
Bit Size
Limestone Density Por.
PE
100
Compensated Density
Density Correction
Density Caliper
Gamma Ray
DST Uphole Tension
112°
4450
112°
4500


113°
4550
113°
4600
113°
4650
TD
4700
Bit Size
FR Gamma Ray
Density Caliper
DST Uphole Tension
FR Density Caliper
FR DST Uphole Tension
PE
FR PE
Limestone Density Por.
Compensated Density
Density Correction
FR Limestone Density Por.
FR Density Correction
0
0
Depth
in
Feet
Timing Marks
every 60.0 sec
Compensated Density
grams/cc
2
2.25
2.50
2.75
3



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5 INCH MAIN PASS

5 INCH REPEAT

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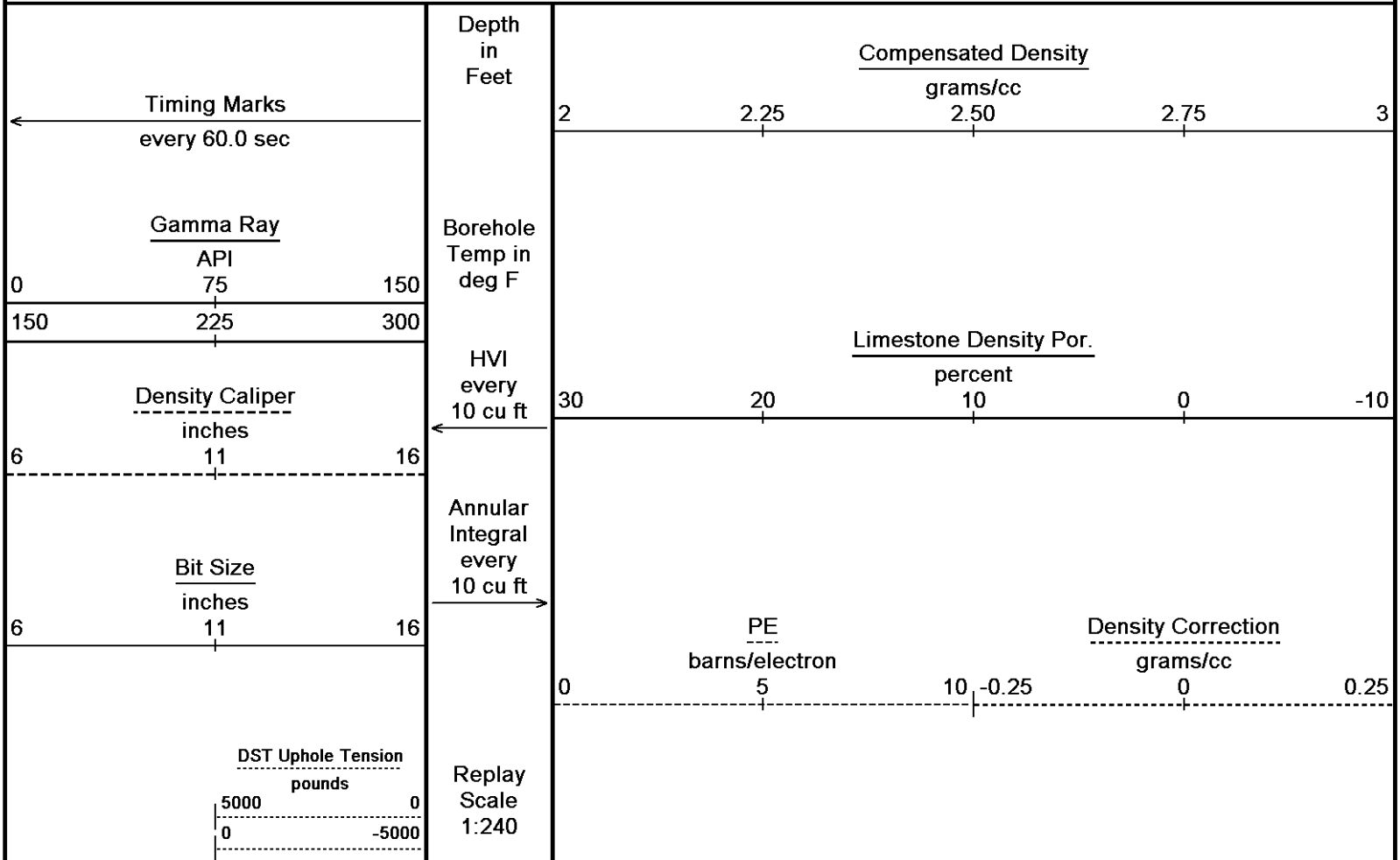
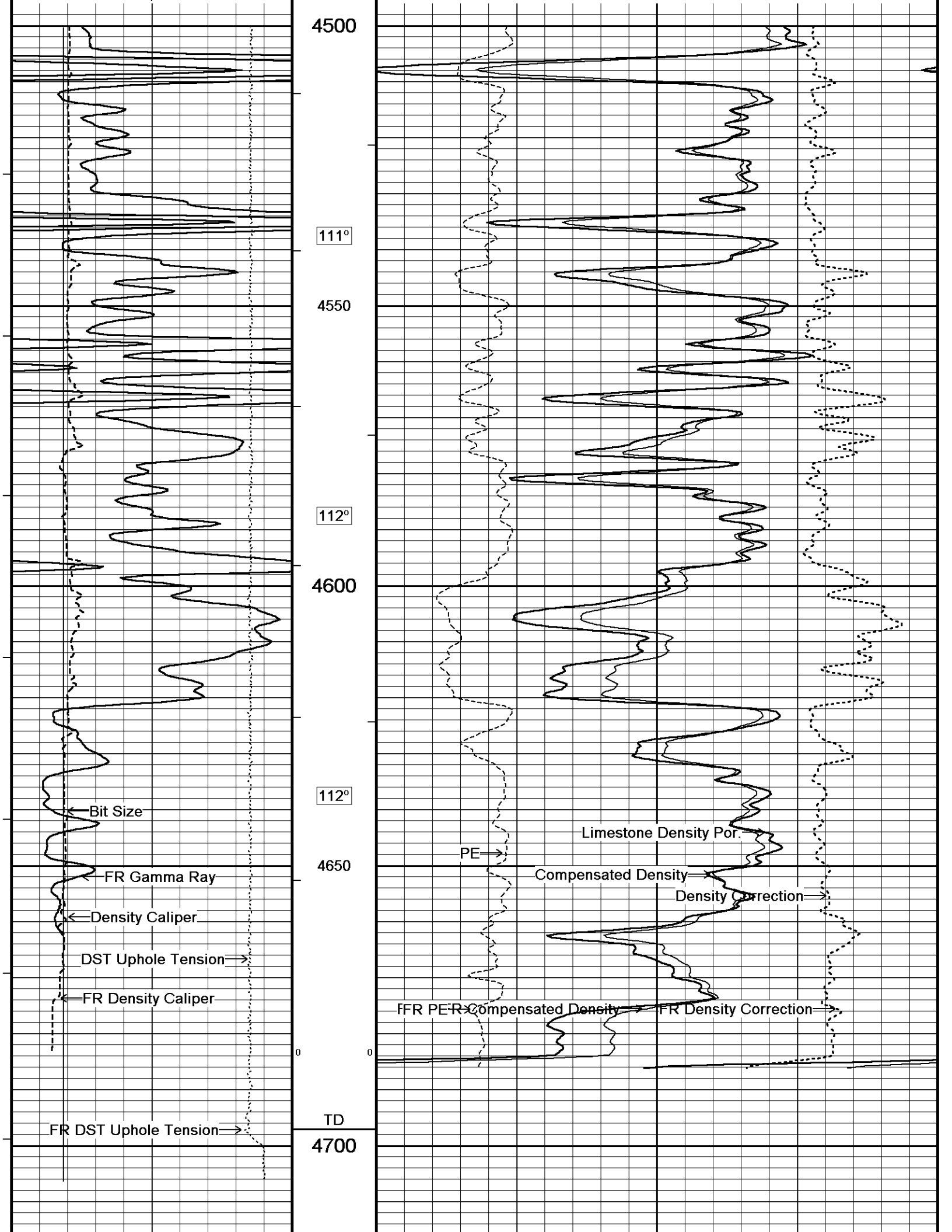
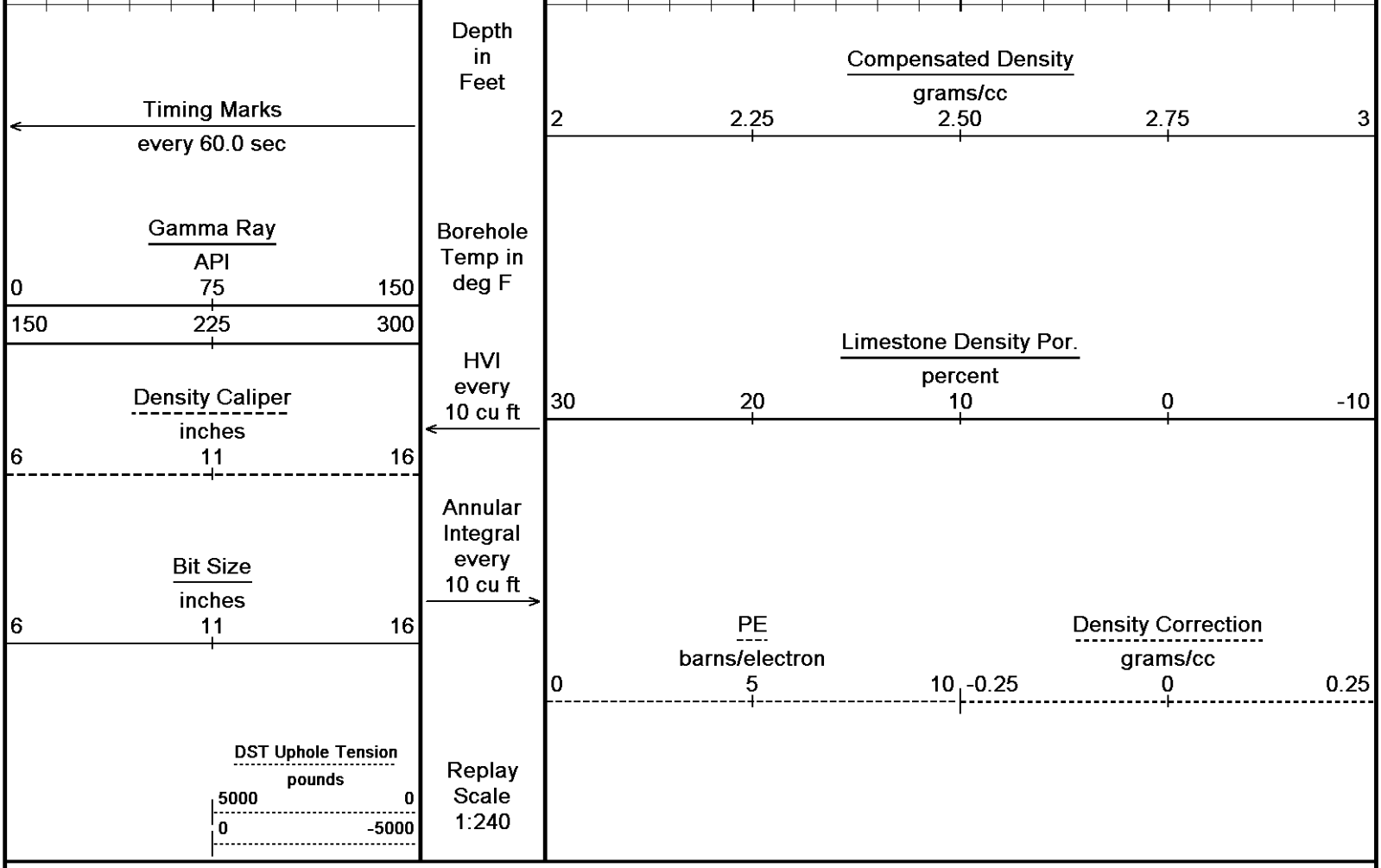



4500
111°
4550
112°
4600
112°
4650
TD
4700
Bit Size
FR Gamma Ray
Density Caliper
DST Uphole Tension
FR Density Caliper
FR DST Uphole Tension
0
0
PE
Limestone Density Por.
Compensated Density
Density Correction
FFR PE
FR Compensated Density
FR Density Correction



Depth Based Data - Maximum Sampling Increment 10.0cm — Plotted on 04-APR-2011 06:14

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5 INCH REPEAT

BEFORE SURVEY CALIBRATION

C:\Program Files\Weatherford\WLS 11.03\Data\Shakespeare Glassman #5-35\Shakespeare Glassman #5-35.dta

General Constants All 000

Last Edited on 04-APR-2011,00:33

General Parameters		
Mud Resistivity	1.830	ohm-metres
Mud Resistivity Temperature	55.000	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	5.500	inches
Caliper for Differential Caliper	Density Caliper	
Rwa Parameters		
Porosity used	Base Density Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	1.000	
RWA Constant M	2.000	

High Resolution Temperature Calibration MCG-B 34

Field Calibration on 19-OCT-2009,11:45

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

High Resolution Temperature Constants MCG-B 34

Last Edited on

High Resolution Temperature Constants MCG-B 34 — Last Edited on

Pre-filter Length	11

SP Calibration MCG-B 34

Field Calibration on 9-NOV-2009,18:07

	Measured	Calibrated (mV)
Reference 1	107.7	100.0
Reference 2	-93.8	-100.0

Gamma Calibration MCG-B 34

Field Calibration on 03-APR-2011 20:44

	Measured	Calibrated (API)
Background	65	46
Calibrator (Gross)	1098	771
Calibrator (Net)	1033	725

Gamma Constants MCG-B 34

Last Edited on 04-APR-2011,00:34

Gamma Calibrator Number	grc38	
Mud Density	1.14	gm/cc
Caliper Source for Processing	Bit Size	
Tool Position	Centred	
Concentration of KCl	0.00	kppm

Micro Normal and Micro Inverse Calibration MML-A 4

Base Calibration on 27-MAR-2011 22:52
Field Check on 03-APR-2011 20:31

Base Calibration

	Measured		Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	12.1	60.2	2.6	12.8
Micro Inverse	15.7	78.4	1.7	8.4

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	32.1	32.1
Micro Inverse	16.3	16.3

Micro Normal and Micro Inverse Constants MML-A 4

Last Edited on 30-MAR-2011,02:15

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

Caliper Calibration MML-A 4

Base Calibration on 27-MAR-2011 23:01
Field Calibration on 03-APR-2011 20:33

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14539	5.98
2	18210	7.97
3	21545	9.86
4	25509	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.12	5.98

Neutron Calibration MDN-A.B 65

Base Calibration on 31-MAR-2011 09:35
Field Check on 03-APR-2011 20:38

Base Calibration

	Measured		Calibrated (cps)	
	Near	Far	Near	Far
	3086	96	3714	110
Ratio	32.144		33.764	

Field Calibrator at Base	Calibrated (cps)	
	1663	2383
Ratio	0.698	

Field Check	Calibrated (cps)	
	1661	2386
Ratio	0.696	

Neutron Constants MDN-A.B 65

Last Edited on 04-APR-2011,00:34

Neutron Source Id	757	
Neutron Jig Number	5824NE	
Epithermal Neutron	No	
Caliper Source for Processing	Density Caliper	
Stand-off	0.00	inches
Mud Density	1.14	gm/cc
Limestone Sigma	7.10	cu
Sandstone Sigma	4.26	cu
Dolomite Sigma	4.70	cu
Formation Pressure Source	Constant Value	
Formation Pressure	0.00	kpsi
Temperature Source	MCG External Temperature	
Temperature	N/A	degrees F
Mud Salinity	0.00	kppm
Formation Fluid Salinity Source	Constant Value	
Formation Fluid Salinity	0.00	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-A.A 55

Base Calibration on 27-MAR-2011 23:08
Field Check on 03-APR-2011 20:24

Base Calibration

	Measured	Calibrated (ohm-m)
Reference 1	0.0	0.0
Reference 2	953.4	126.8
Base Check		281.6
Field Check		281.5

FE Constants MFE-A.A 55

Last Edited on 03-APR-2011,20:23

Running Mode	No Sleeve	
MFE K Factor	0.1268	
Caliper Source for FE correction	Density Caliper	
Caliper Value for FE correction	N/A	inches
Rm Source for FE correction	Temperature Corr	
Temp. for Rm Corr.	MCG External Temperature	
Stand-off	0.5	inches

High Resolution Temperature Calibration MAI-A.A 178

Field Calibration on 28-MAR-2010,00:50

	Measured	Calibrated(Deg F)
Lower	1.00	33.80
Upper	11.00	51.80

High Resolution Temperature Constants MAI-A.A 178

Last Edited on

Pre-filter Length	11

Induction Calibration MAI-A.A 178

Base Calibration on 31-MAR-2011,10:05
Field Check on 03-APR-2011 20:23

Base Calibration

Test Loop Calibration

Channel	Measured Low	Measured High	Calibrated (mmho/m) Low	Calibrated (mmho/m) High
1	17.6	484.7	9.3	966.2
2	6.2	391.4	7.6	821.4
3	4.0	264.5	5.2	566.0
4	2.3	135.1	2.6	279.2

Array Temperature 77.0 Deg F

Channel	Base Check (mmho/m) Low	Base Check (mmho/m) High	Field Check (mmho/m) Low	Field Check (mmho/m) High
1	0.0	0.0	12.5	3763.3
2	0.0	0.0	29.8	3466.6
3	0.0	0.0	27.2	3014.9
4	0.0	0.0	18.7	2063.8
Deep	0.0	0.0	15.8	1995.8
Medium	0.0	0.0	40.3	3957.3
Shallow	0.0	0.0	45.8	5081.2

Shallow	0.0	0.0	45.8	3081.2
Array Temperature		0.0	76.7	Deg F

Induction Constants MAI-A.A 178

Last Edited on 03-APR-2011,20:21

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	45.00	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 65

Base Calibration on 26-MAR-2011 21:35
Field Calibration on 03-APR-2011 20:30

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13025	3.99
2	21664	5.98
3	30144	7.97
4	38507	9.86
5	47728	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
5.92	5.98

Photo Density Calibration MPD-B 65

Base Calibration on 26-MAR-2011 21:55
Field Check on 03-APR-2011 20:29

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	50493	24334	59556	30836
Reference 2	20772	2298	24941	2541

Field Check at Base

1251.7	1197.0

Field Check

1252.6	1200.6

PE Calibration

Base Calibration	WS	Measured WH	Ratio	Calibrated Ratio
Background	228	1114		
Reference 1	19703	50302	0.396	0.371
Reference 2	5658	20626	0.278	0.272
Field Check at Base	227.6	1114.3		
Field Check	226.2	1117.6		

Density Constants MPD-B 65

Last Edited on 04-APR-2011,00:33

Density Source Id	254	
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	1.14	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)
2.71	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:\Program Files\Weatherford\WLS 11.03\Data\Shakespeare Glassman #5-35\Shakespeare Glassman #5-35.dta

Compact Comms Gamma
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Comms Gamma
MCG-B 34 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-log
MML-A 4 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

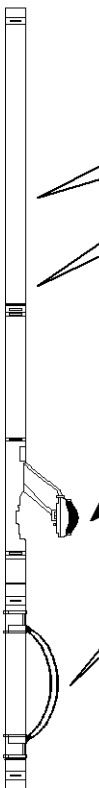
Compact Micro-log
MML-A 4 LG: 7.97 ft WT: 81.6 lb OD: 2.24 in

Compact Neutron
MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Neutron
MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper
MPD-B 65 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Density/Caliper
MPD-B 65 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in



45.04 ft	GRGC - Gamma Ray
45.04 ft	GRGC - Gamma Ray
42.13 ft	CGXT - MCG External Temperature
42.13 ft	CGXT - MCG External Temperature
35.41 ft	MINV - Micro-inverse
35.41 ft	MNRL - Micro-normal
36.40 ft	MLTC - MML Caliper
35.41 ft	MINV - Micro-inverse
35.41 ft	MNRL - Micro-normal
36.40 ft	MLTC - MML Caliper
30.61 ft	NPRL - Limestone Neutron Por.
30.61 ft	NPRL - Limestone Neutron Por.
23.37 ft	CLDC - Density Caliper
23.37 ft	CLDC - Density Caliper

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 37 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

SKJ-D.A Compact Knuckle Joint
SKJ-D.A 37 LG: 2.17 ft WT: 24.3 lb OD: 2.24 in

Compact Focussed Electric
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

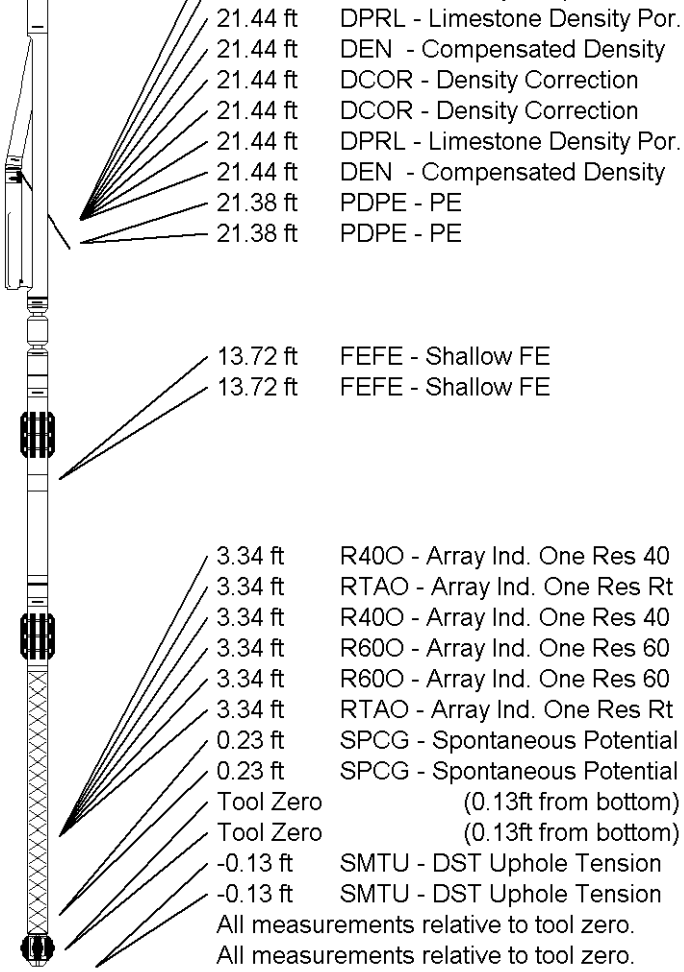
Compact Focussed Electric
MFE-A.A 55 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 178 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Compact Induction
MAI-A.A 178 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 50.32 ft Weight: 407.9 lb

Total Length: 50.32 ft Weight: 407.9 lb



COMPANY	SHAKESPEARE OIL COMPANY
WELL	GLASSMAN #5-35
FIELD	UNNAMED
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	2994.00	feet	First Reading	4676.00	feet
Elevation Drill Floor	2992.00	feet	Depth Driller	4700.00	feet
Elevation Ground Level	2984.00	feet	Depth Logger	4697.00	feet

Weatherford®

COMPACT PHOTO DENSITY
COMPENSATED NEUTRON
MICRORESISTIVITY LOG

40 Years of Wireline 1970 2010