

**Weatherford**[®]**CALIPER
LOG**

COMPANY **EAST CHEYENNE GAS STORAGE LLC**
WELL **ECGS NO 6-13 WPD007-2**
FIELD **PEETZ WEST**
PROVINCE/COUNTY **LOGAN**
COUNTRY/STATE **US/COLORADO**
LOCATION **NENW 283' FNL & 2275' FEL**

SEC **6** TWP **11N** RGE **52W** Other Services
API Number **05-075-09411** MAI
Permit Number **MPD/MDN** CMI

Permanent Datum GL, Elevation 4550 feet
Log Measured From KB
Drilling Measured From KB

Elevations:
KB 4564.00
DF 4563.00
GL 4550.00

Date **06-OCT-2012**Run Number **ONE**Depth Driller **5265.00** feetDepth Logger **5265.00** feetFirst Reading **5246.00** feetLast Reading **1222.00** feetCasing Driller **1208.00** feetCasing Logger **1222.00** feetBit Size **8.750** inchesHole Fluid Type **WBM**Density / Viscosity **9.80** lb/USg **49.00** CPPH / Fluid Loss **9.00** **6.40** ml/10minSample Source **FLOWLINE**Rm @ Measured Temp **4.23 @ 84.7** ohm-mRmf @ Measured Temp **3.384 @ 84.7** ohm-mRmc @ Measured Temp **5.076 @ 84.7** ohm-mSource Rmf / Rmc **CALC** **CALC**Rm @ BHT **1.08 @166.0** ohm-mTime Since Circulation **4 HOURS**Max Recorded Temp **166.00** deg FEquipment Name **COMPACT**Equipment / Base **13144** **RK SPR**Recorded By **J. PAULSON**Witnessed By **J. ASHBY****T. BENICH****L. CARRASCO****BOREHOLE RECORD**

Last Edited: 06-OCT-2012 05:05

Bit Size inches	Depth From feet	Depth To feet
8.750	1222.00	5265.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.625	0.00	1222.00	36.00

REMARKS

SOFTWARE VERSION 13.03.7779

TOOLS RUN: SHA, MCG, MDN, MPD, MIS-A, SKJ, MIS-E, SKJ, SHA, MIM, MIE, MFE, MAI RUN IN COMBINATION.

HARDWARE: MPD: 8" PROFILE PLATE USED.
MAI: TWO 1 INCH STANDOFFS USED.
MDN: DUAL BOWSPRING USED.
MIM: ONE NONMETALIC CENTRALIZING BASKET USED.
MIE: ONE 1 INCH STANDOFF USED

2.65 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY FROM TD TO BOTTOM OF NIOBRARA FORMATION (5265 FT TO 4700 FT)

2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY IN NIOBRARA FORMATION (4700 FT TO 4200 FT).

TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT REPEATABILITY AND DATA QUALITY.

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

LAT/ LONG: 40.96296 N/103.22070 W

TOTAL HOLE VOLUME FROM TD TO SURFACE CASING =1780 CUBIC FEET

ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 720 CUBIC FEET

TOTAL VOLUME FROM TD TO 4200 FT = 410 CUBIC FEET

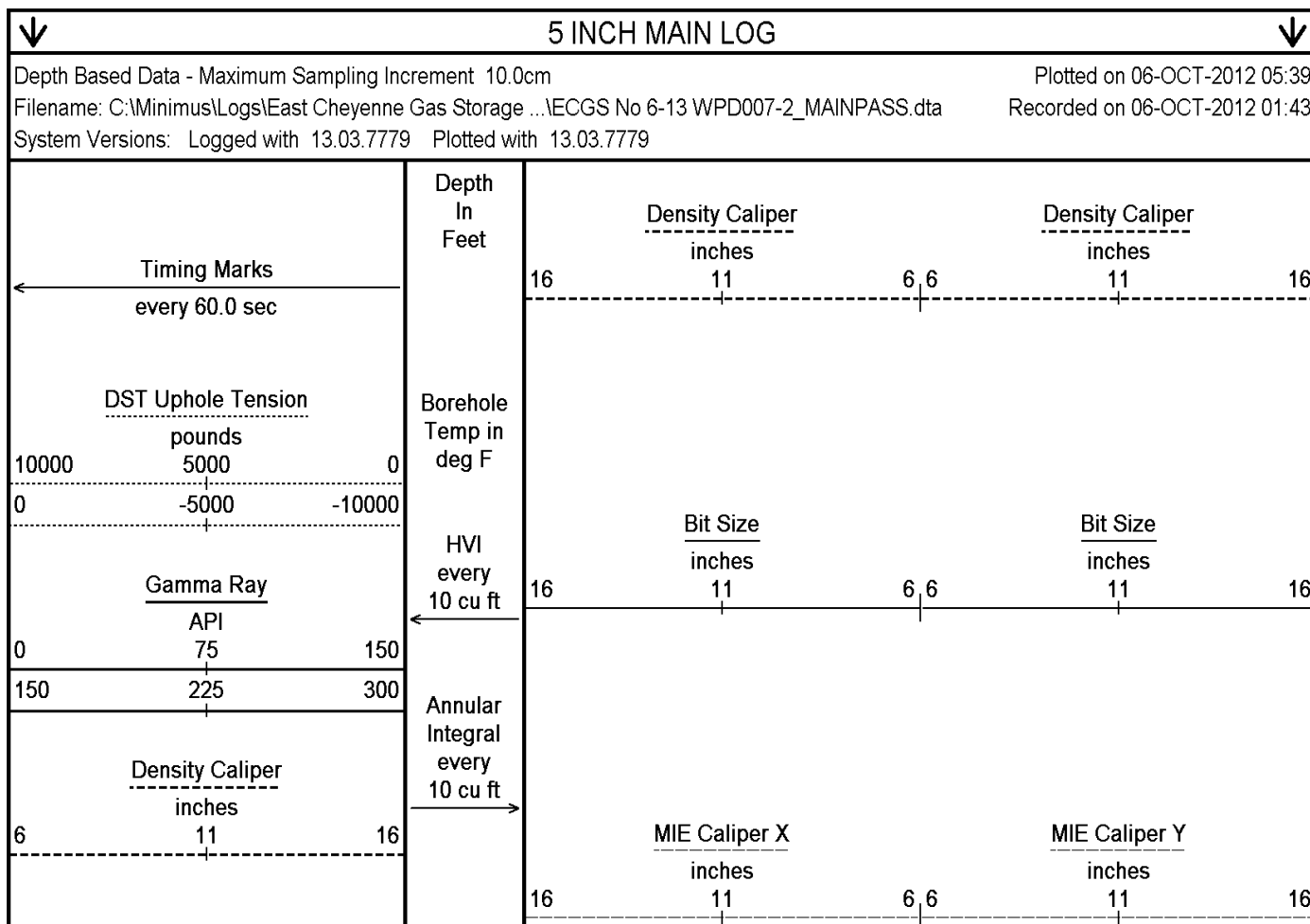
ANNULAR VOLUME WITH 7 INCH PRODUCTION CASING FROM TD TO 4200 FT = 140 CUBIC FEET

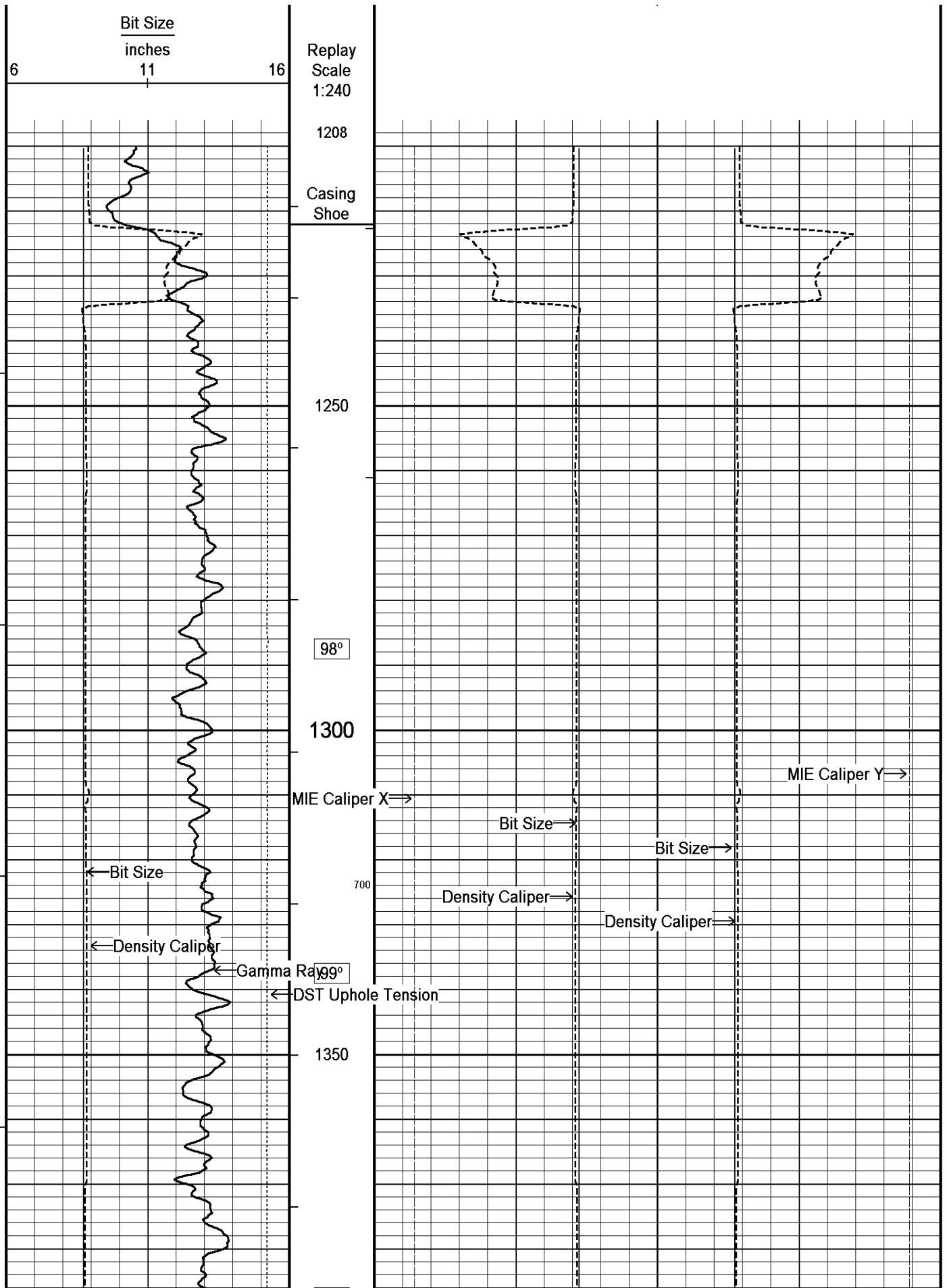
SERVICE ORDER: #3531930

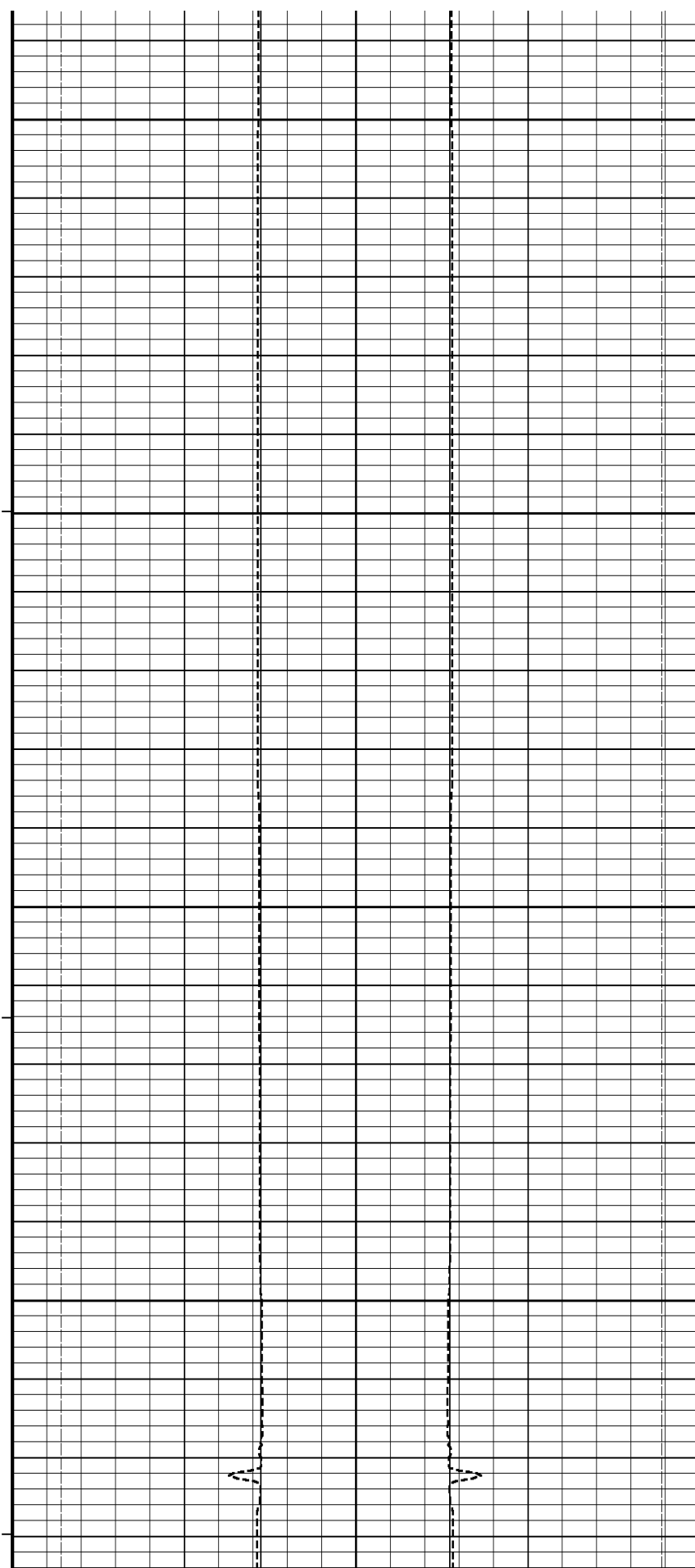
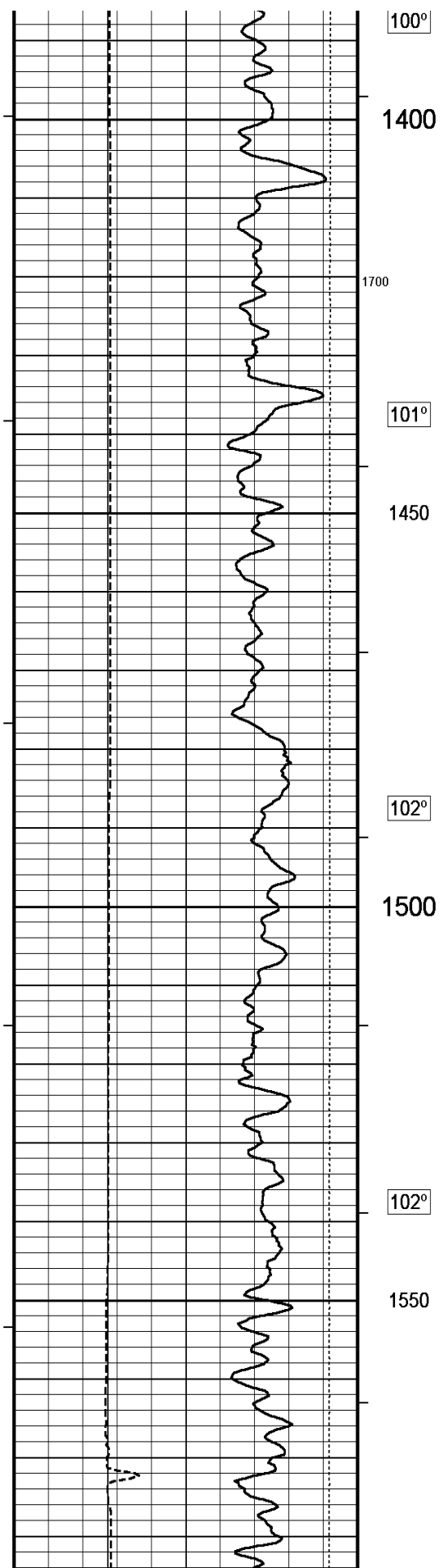
OPERATOR: M. LAMOREAUX
J. BAASSIRI

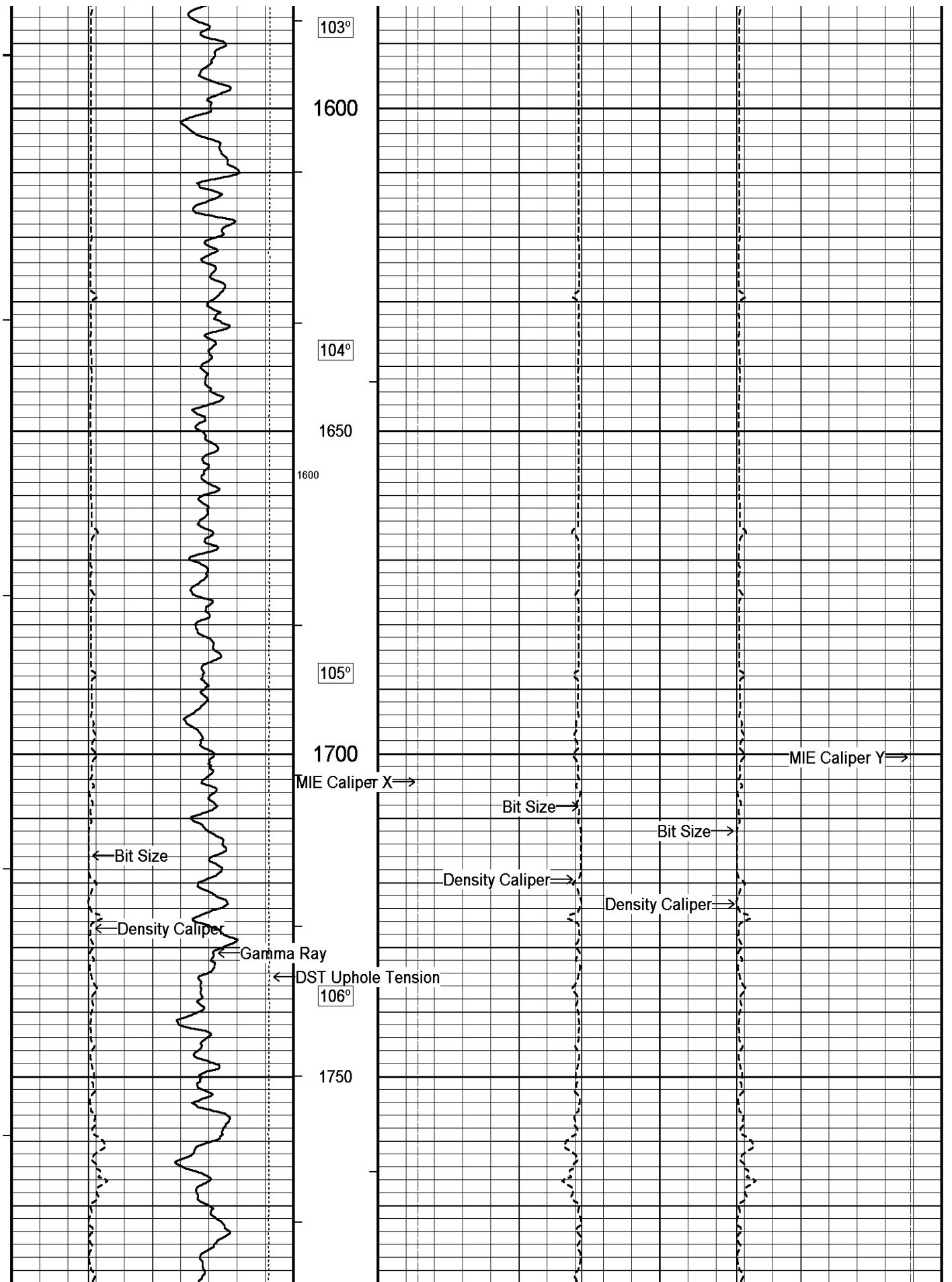
RIG: CADE 22

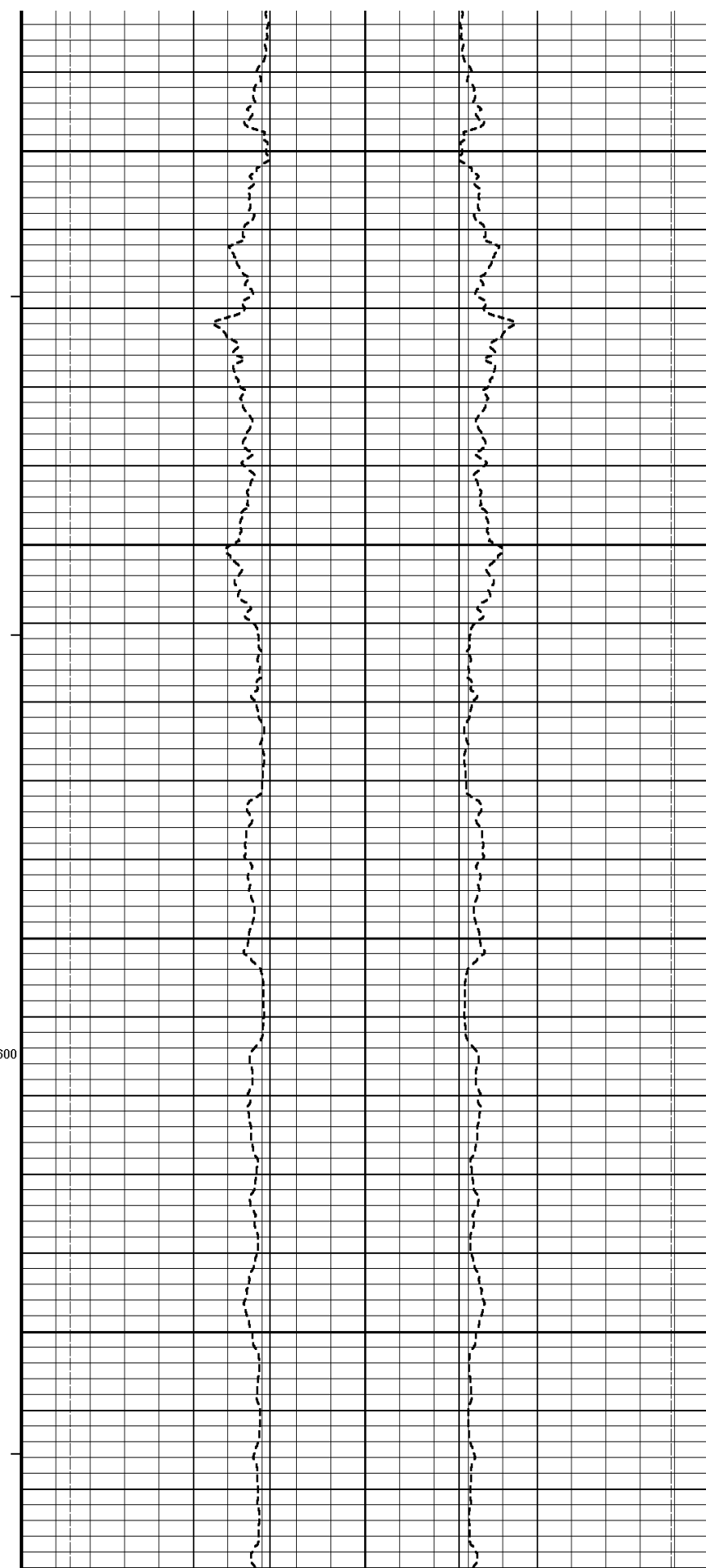
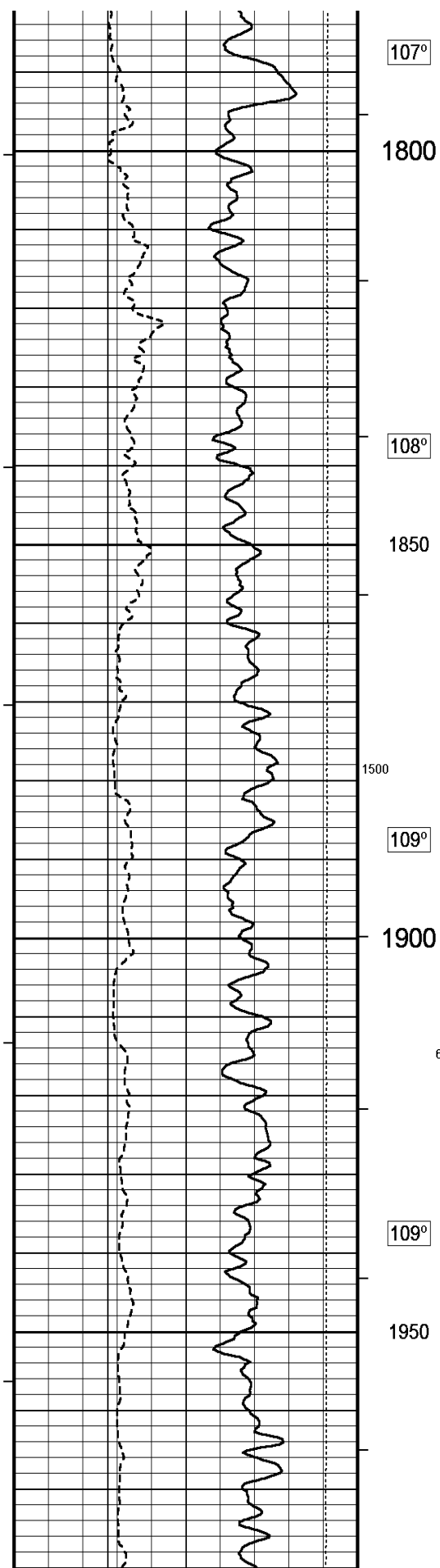
All interpretations are opinions based on inferences from electrical or other measurements and we cannot, and do not, guarantee the accuracy or correctness of any interpretations, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss, costs,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

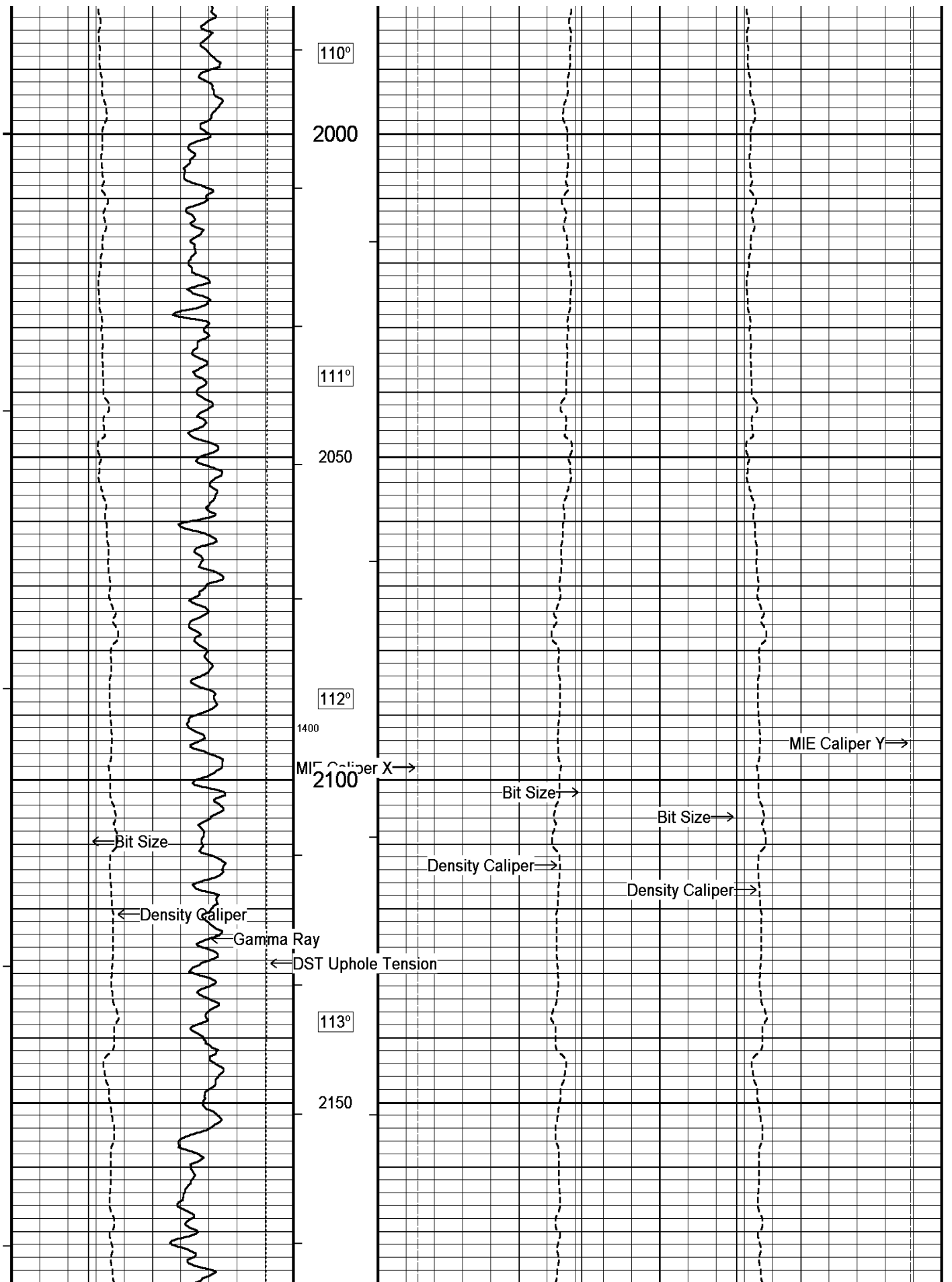


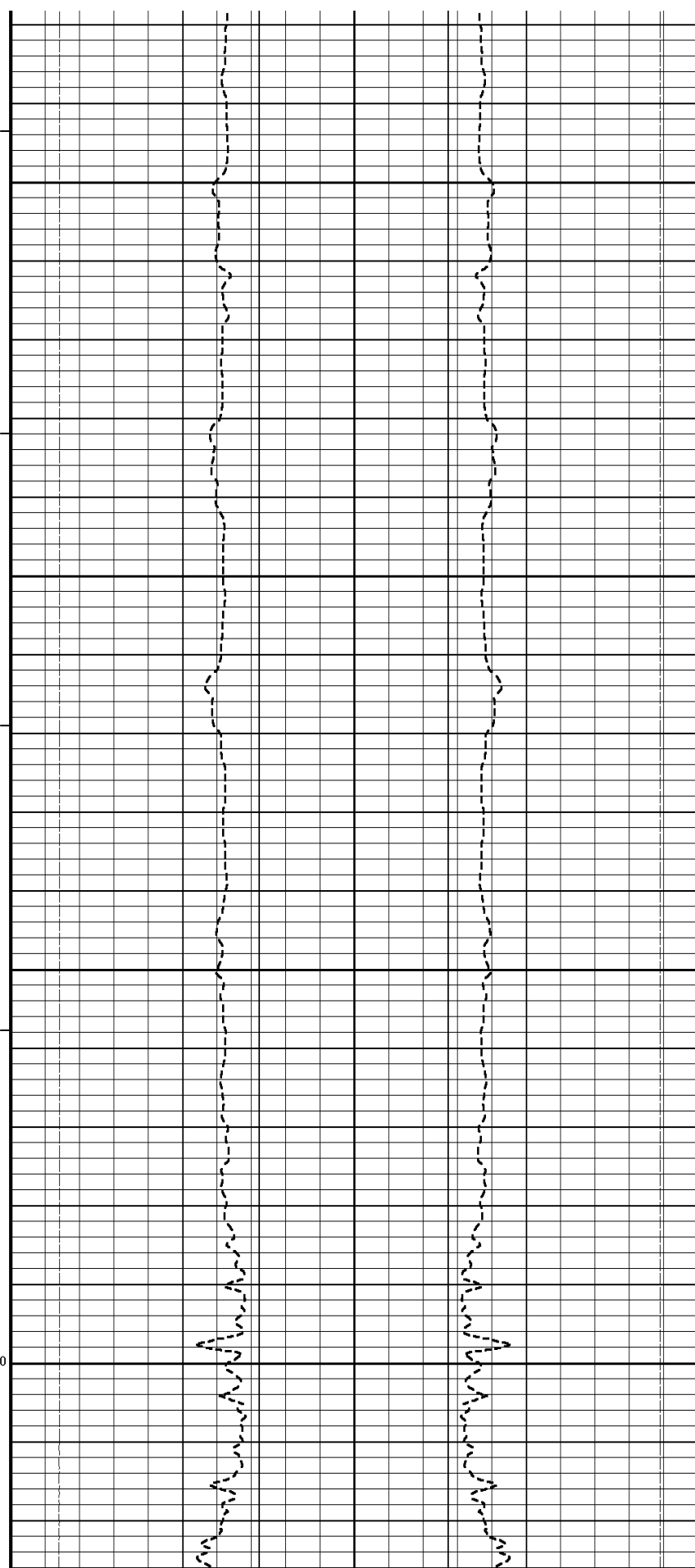
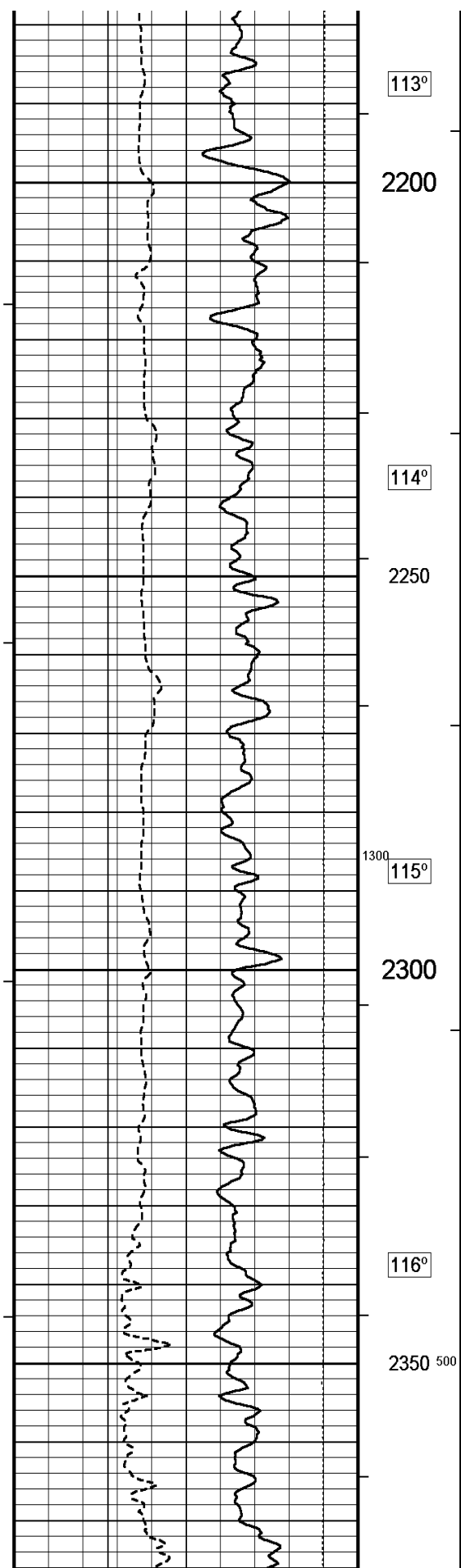


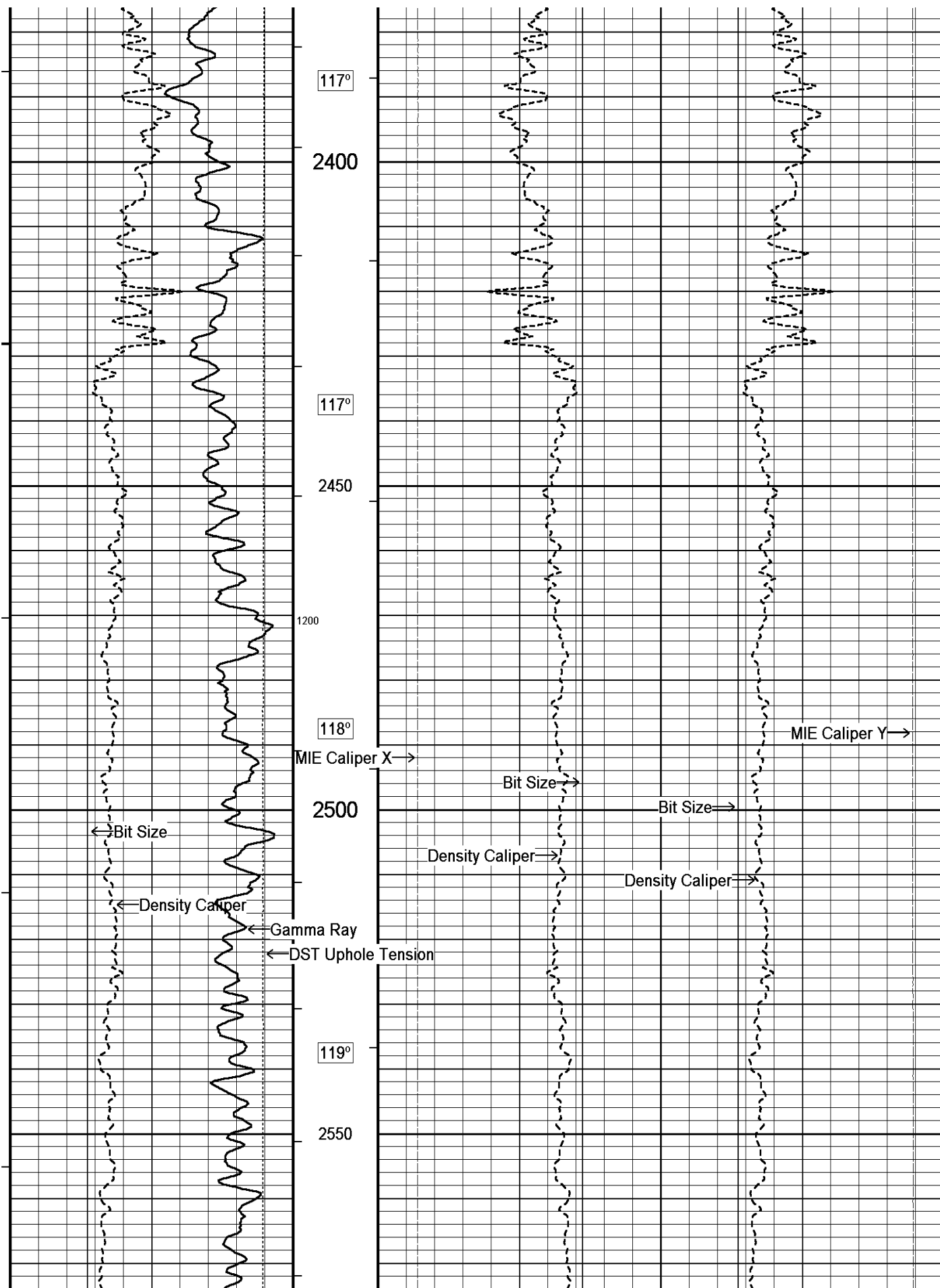


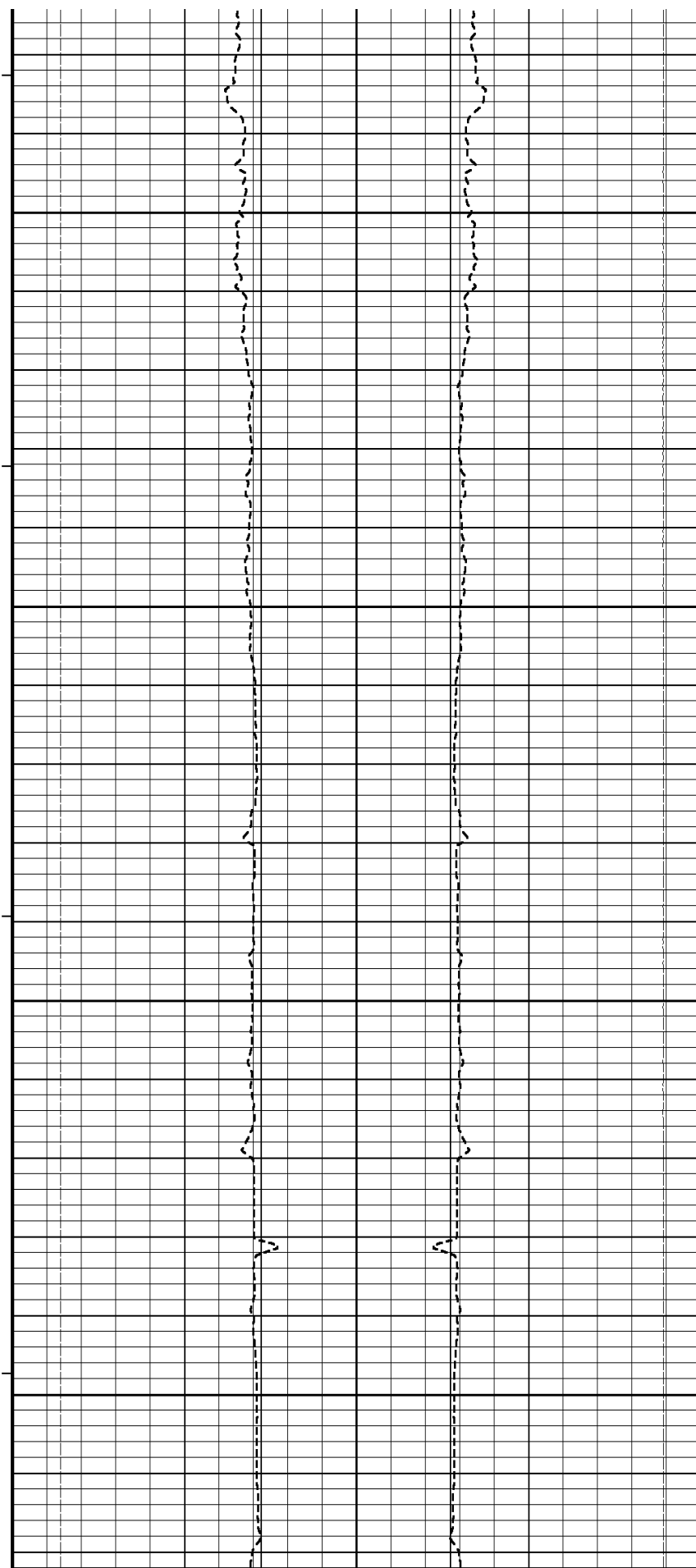
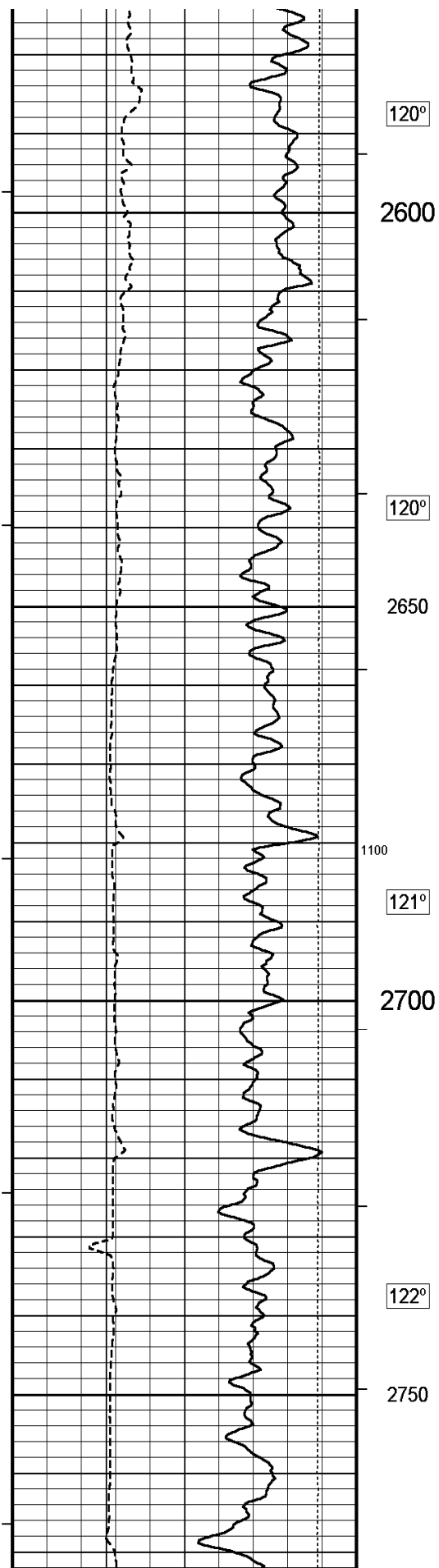


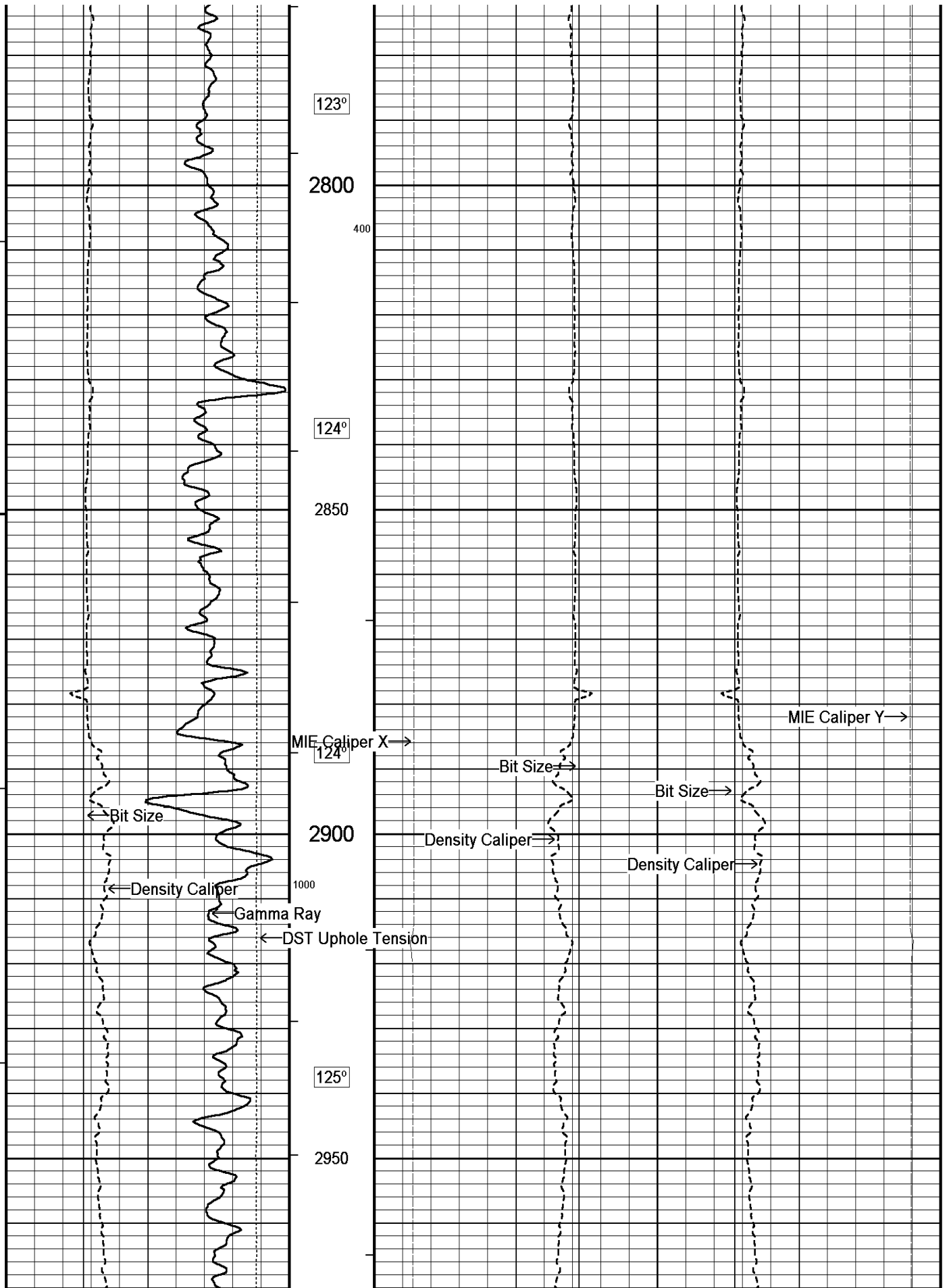


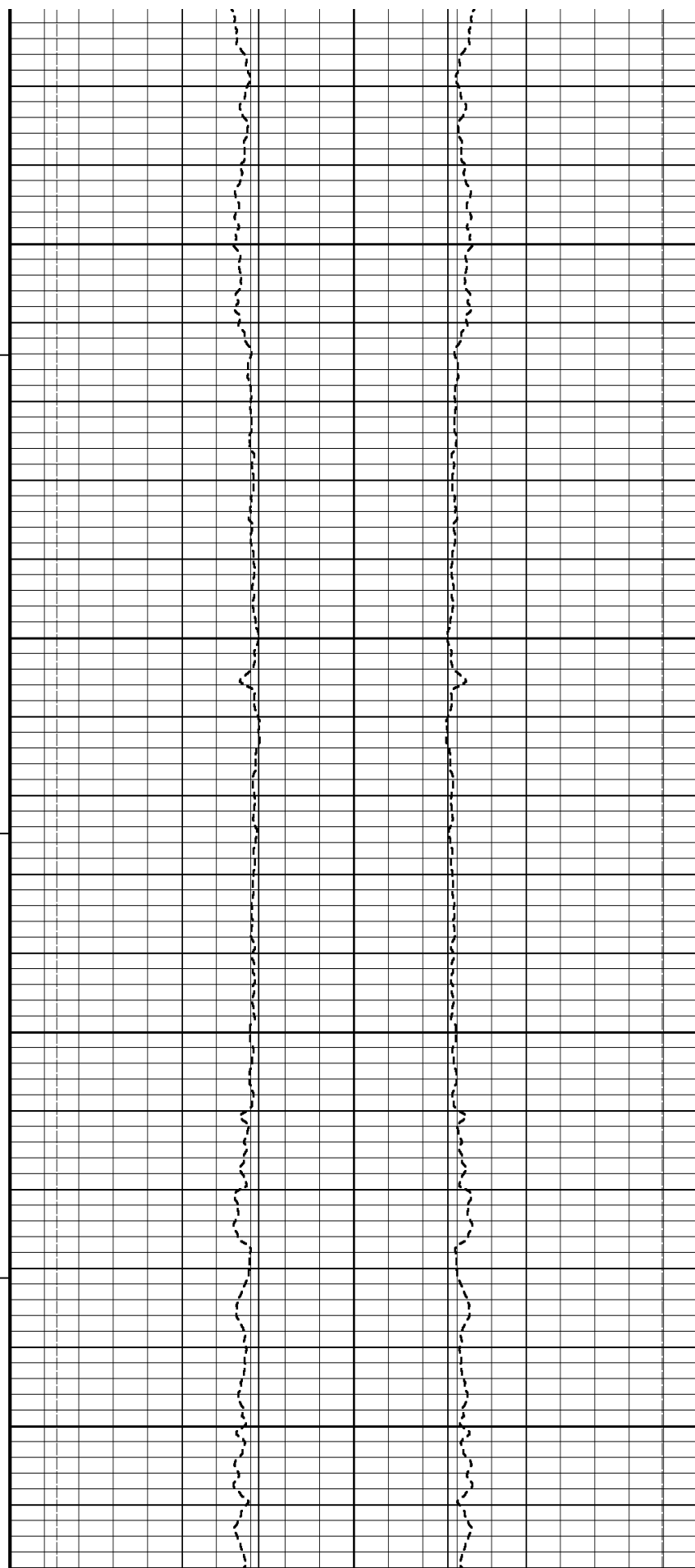
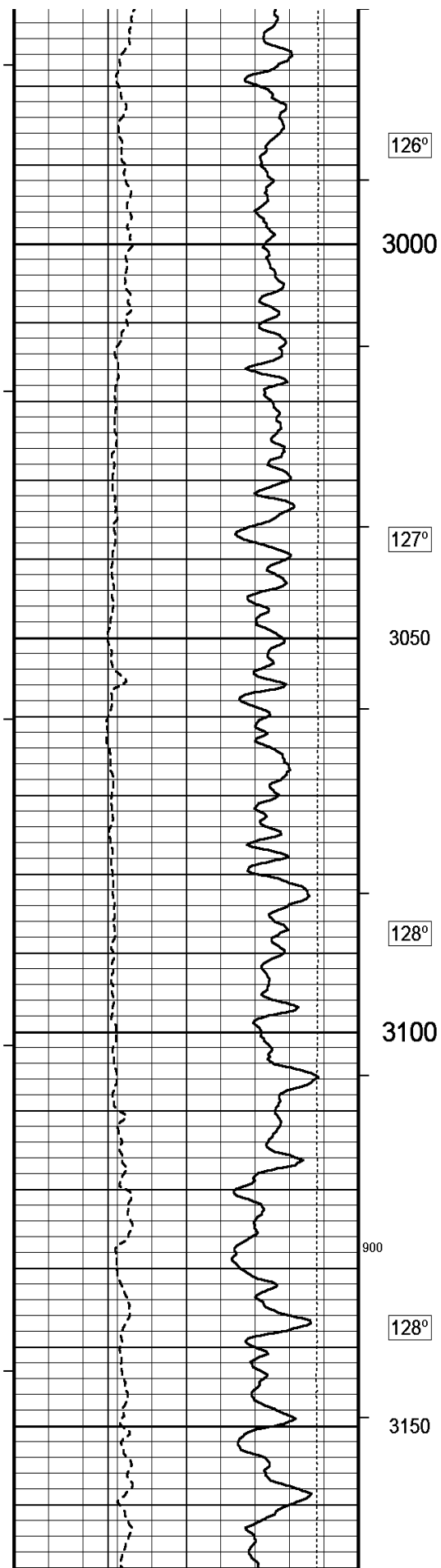


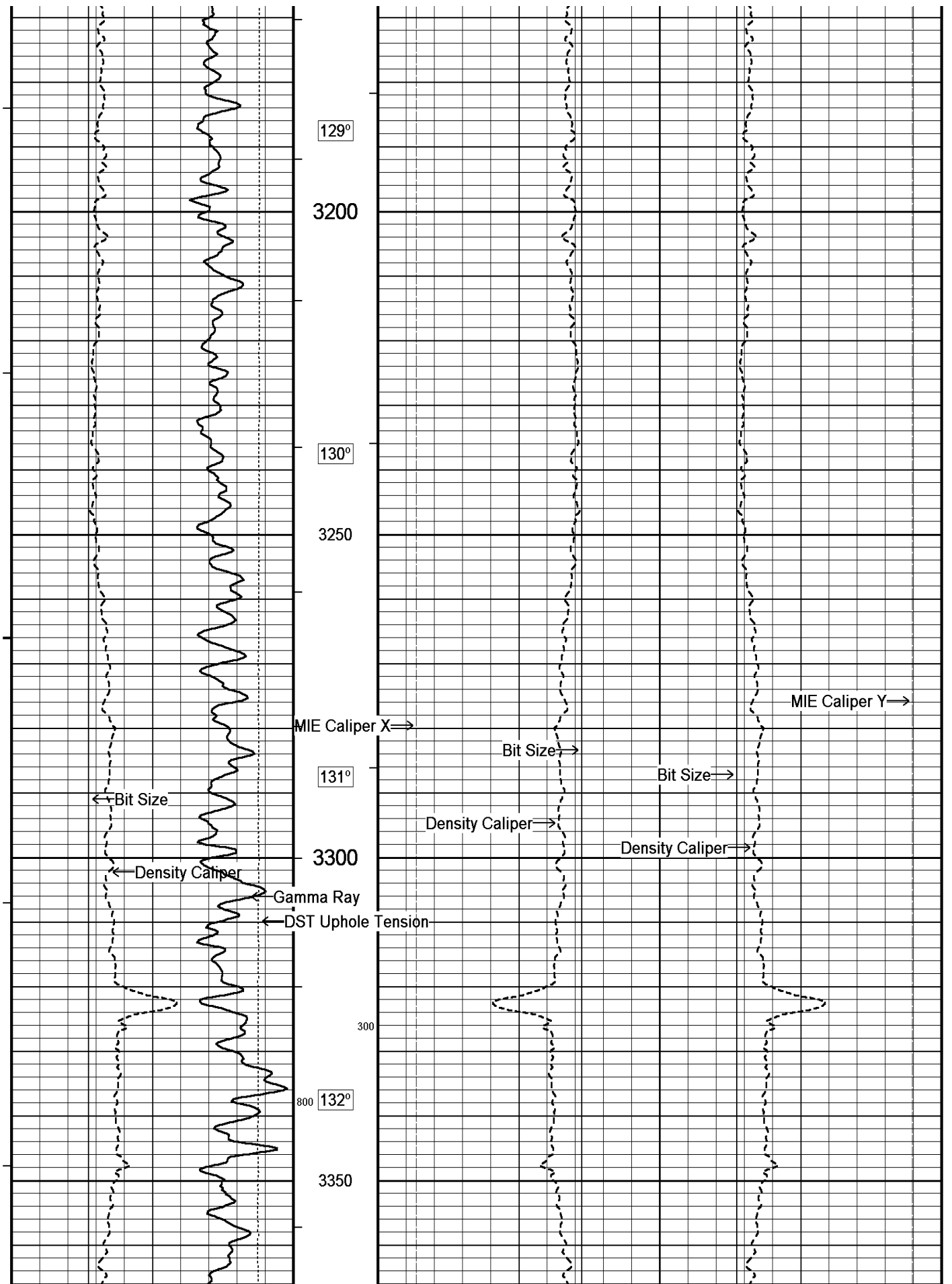


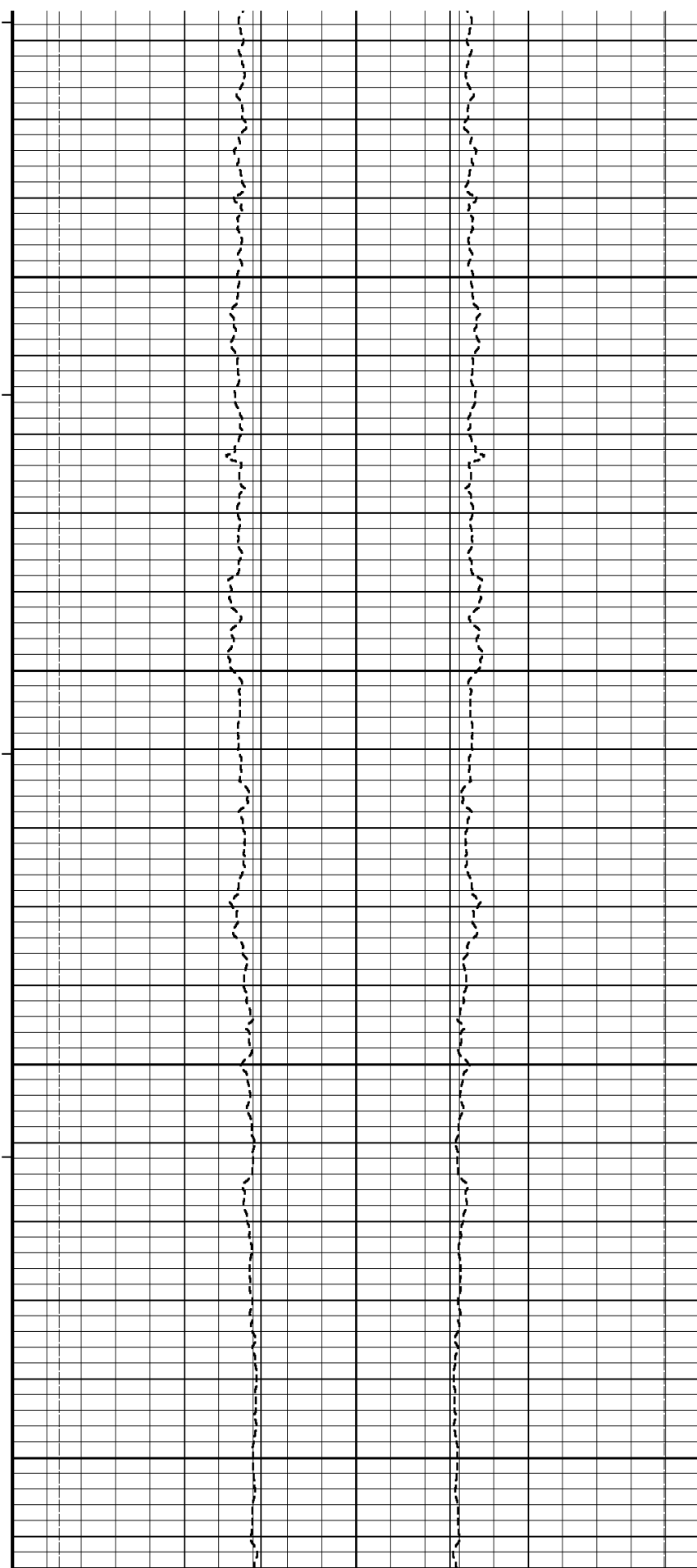
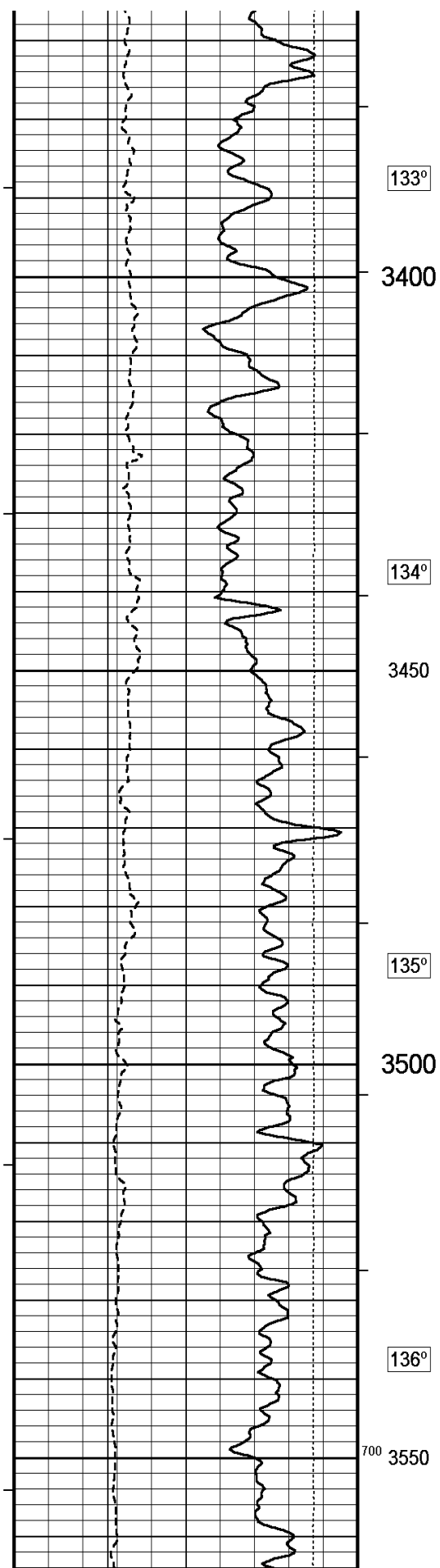


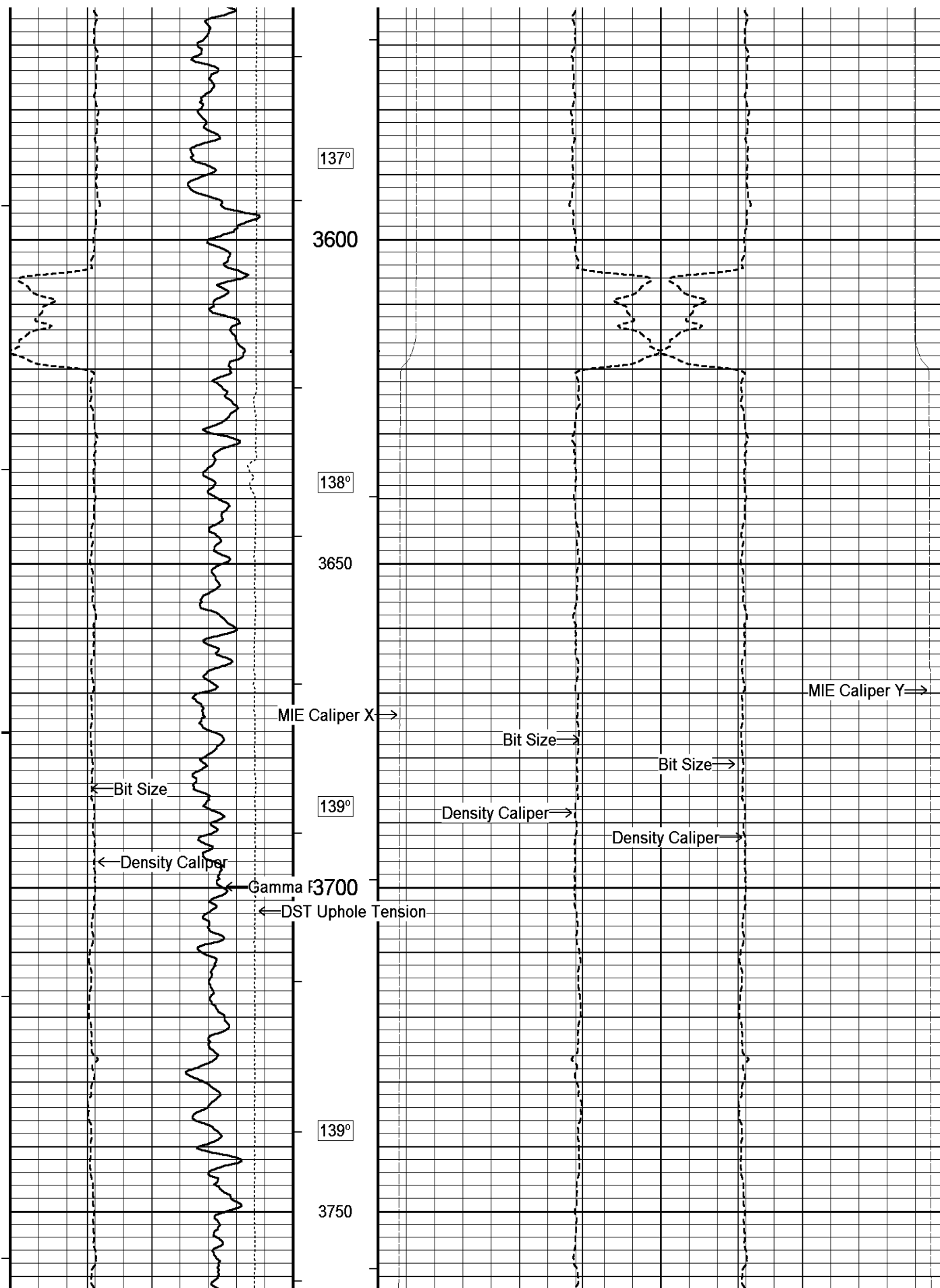


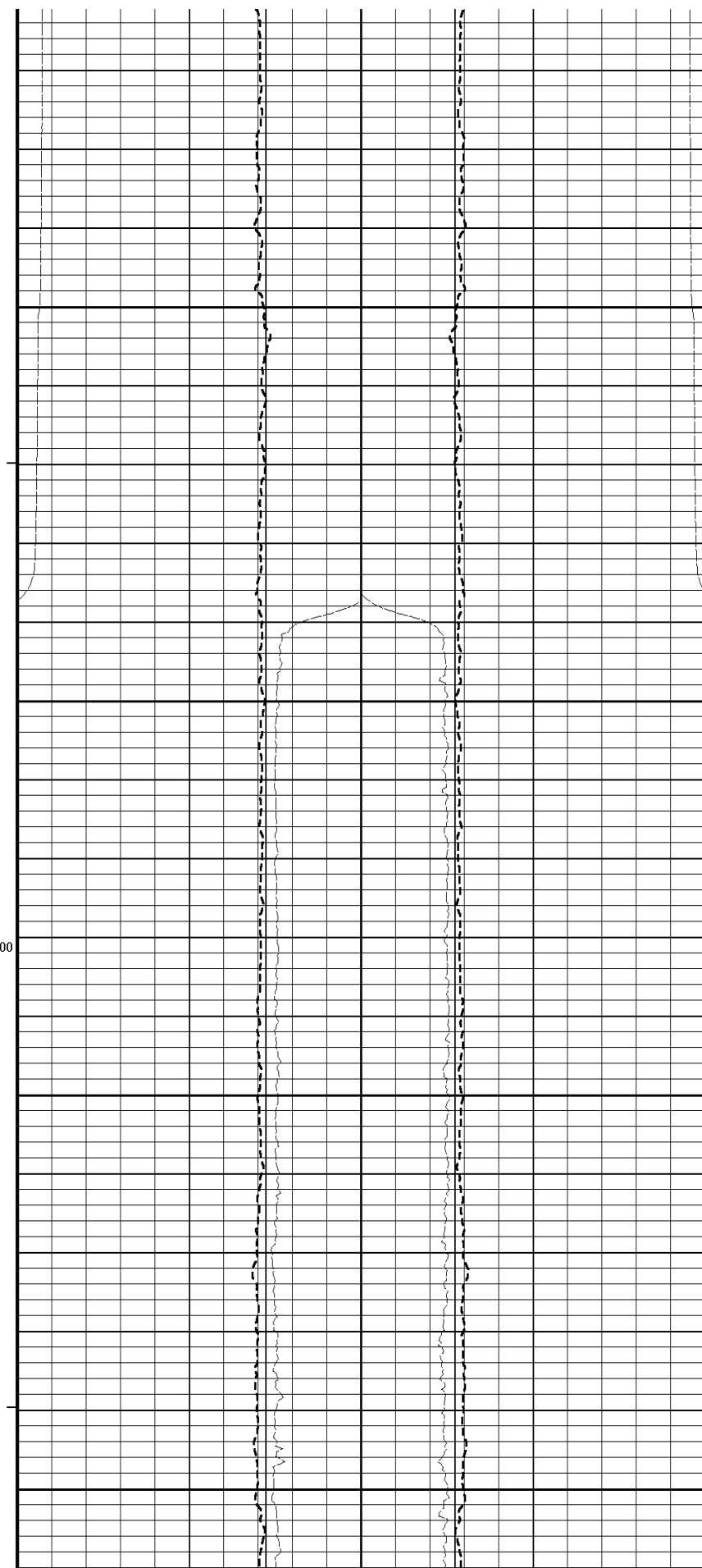
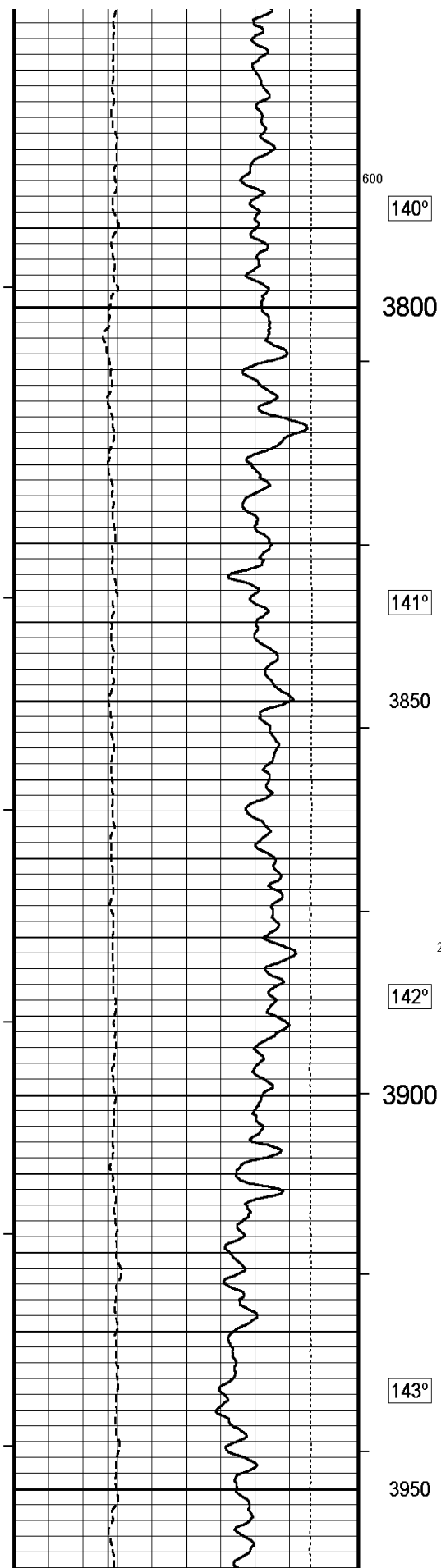


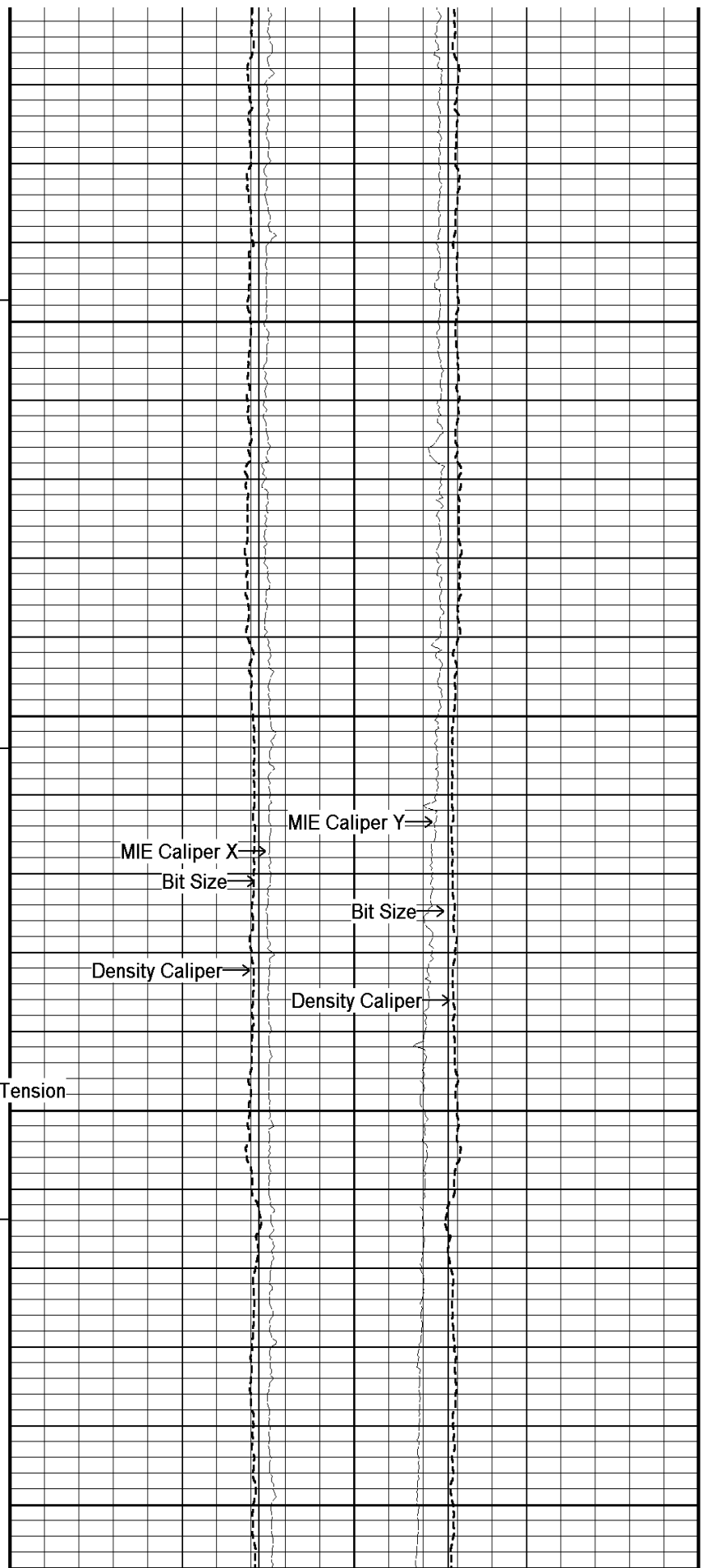
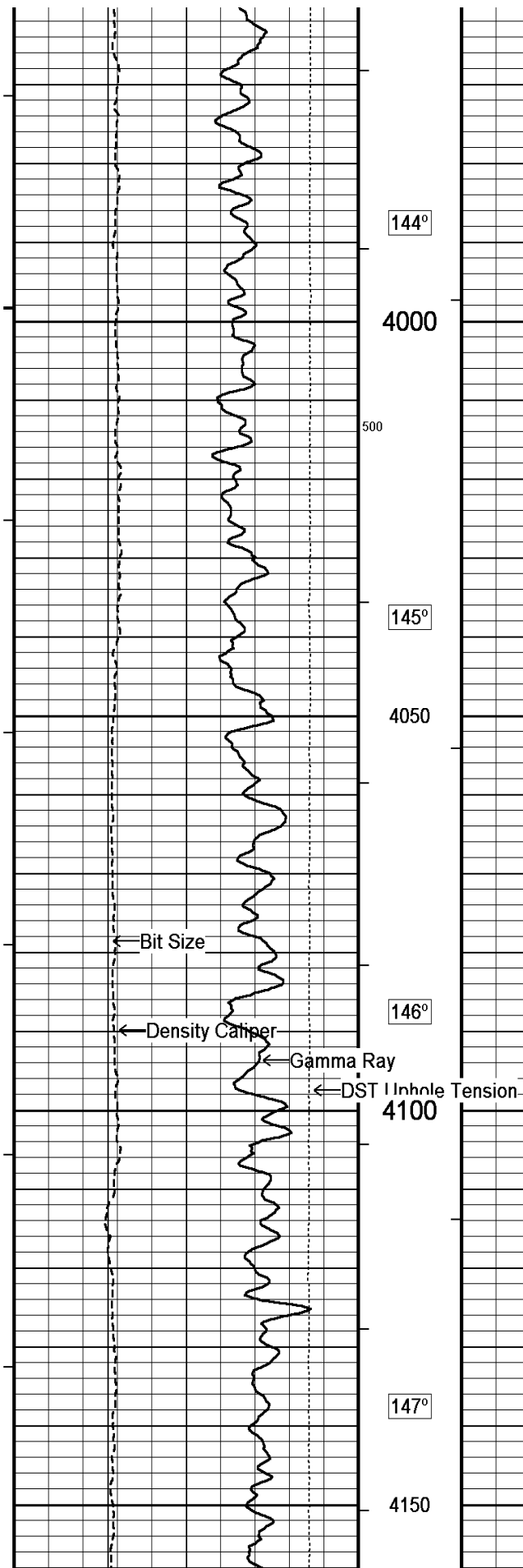


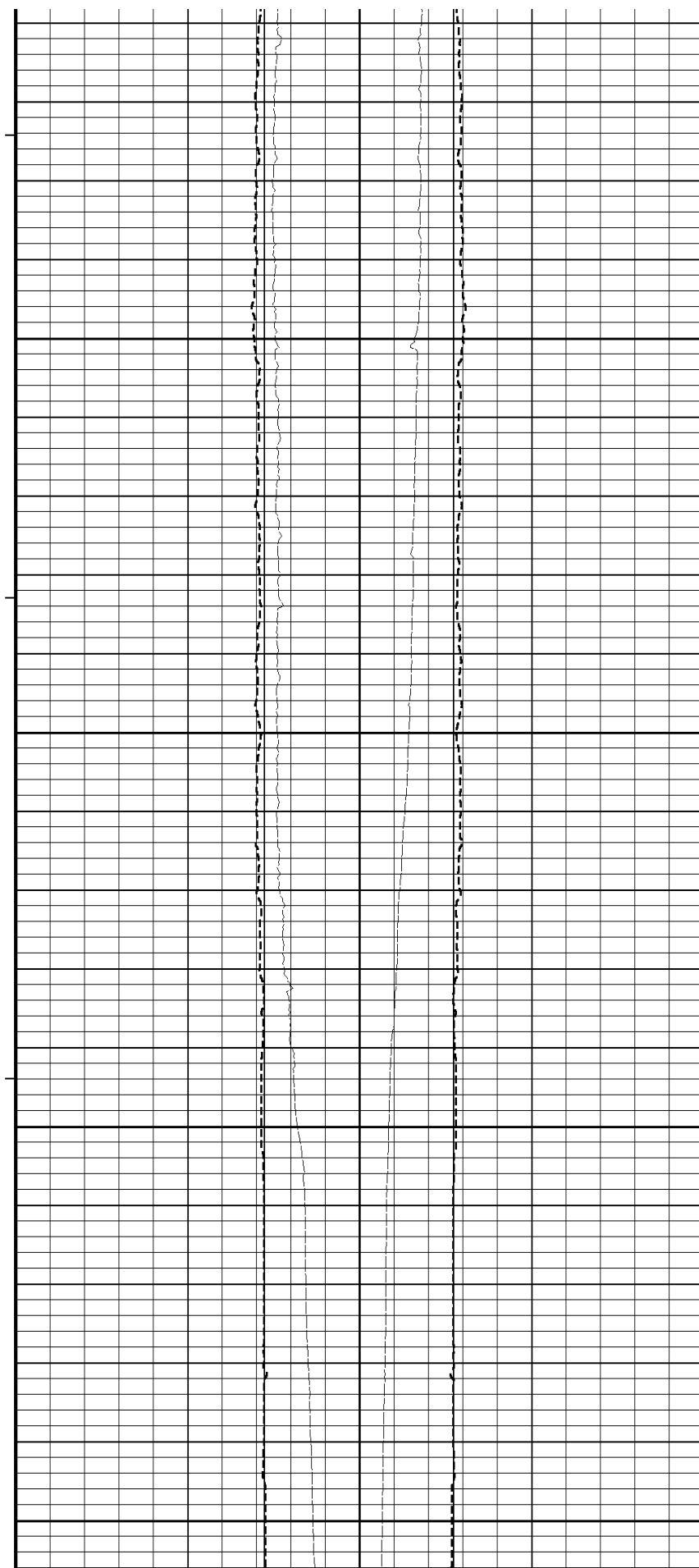
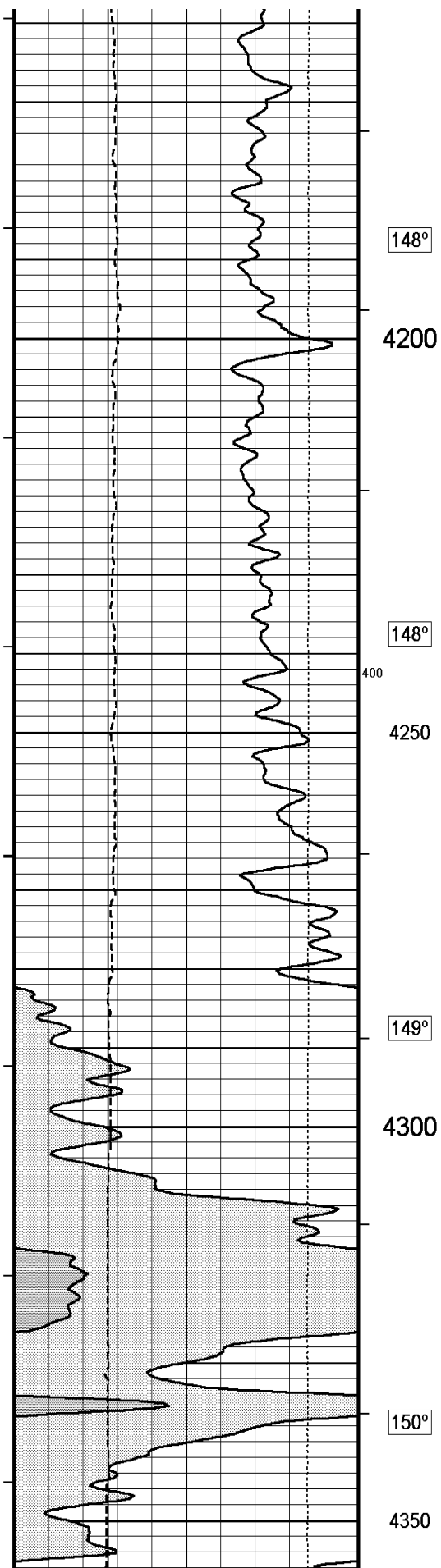


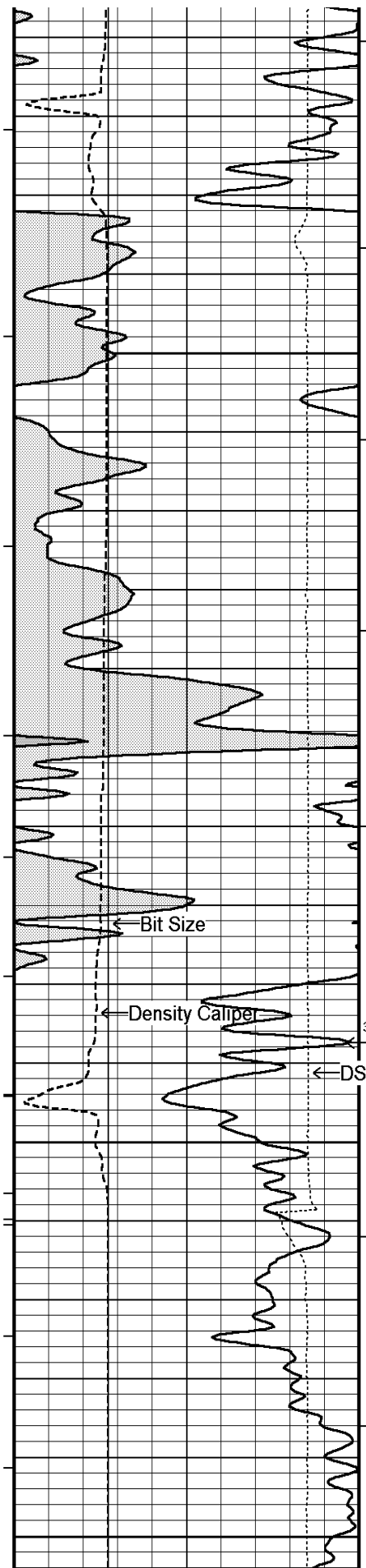












150°

4400

151°

4450

← Bit Size

← Density Caliper

300

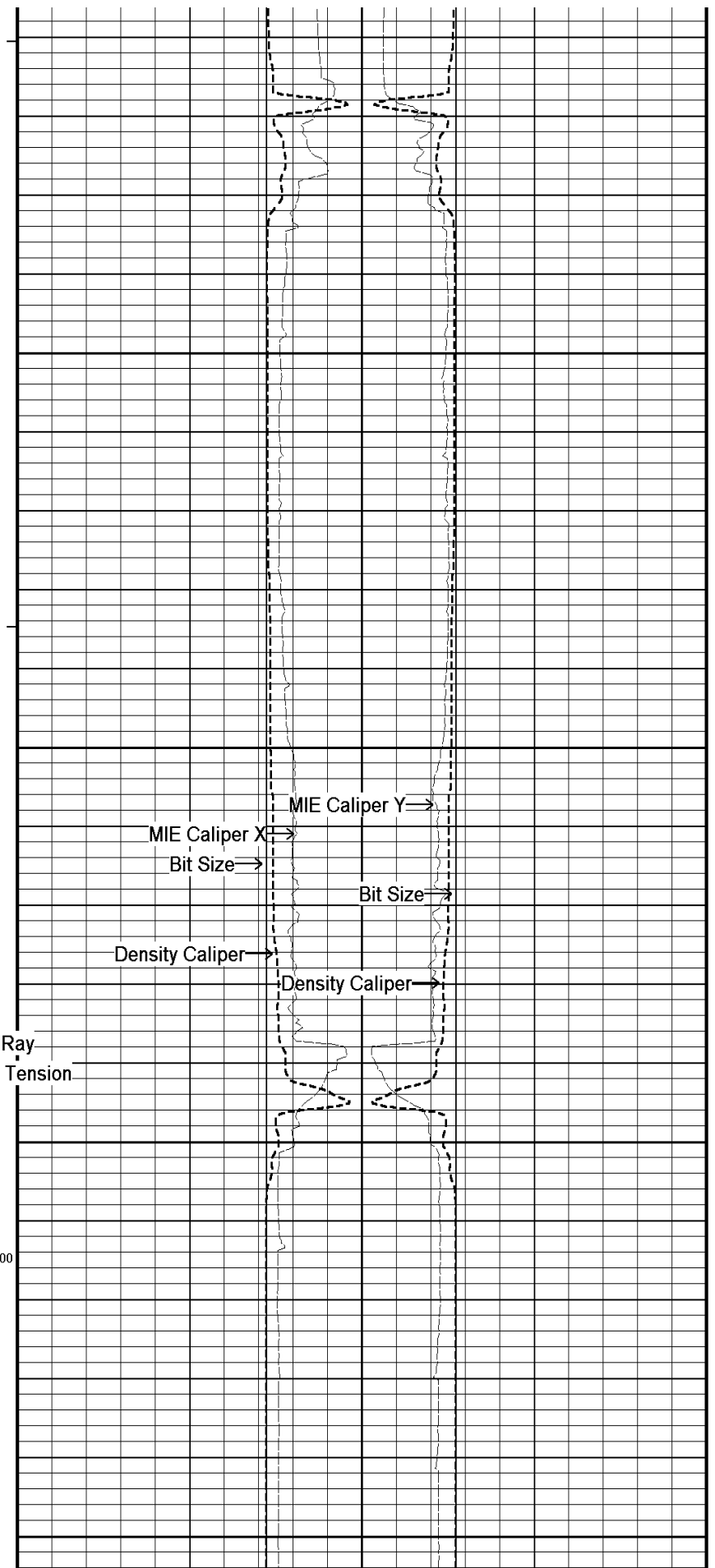
Gamma Ray

← DST Uphole Tension

4500

153°

4550



MIE Caliper Y →

MIE Caliper X →

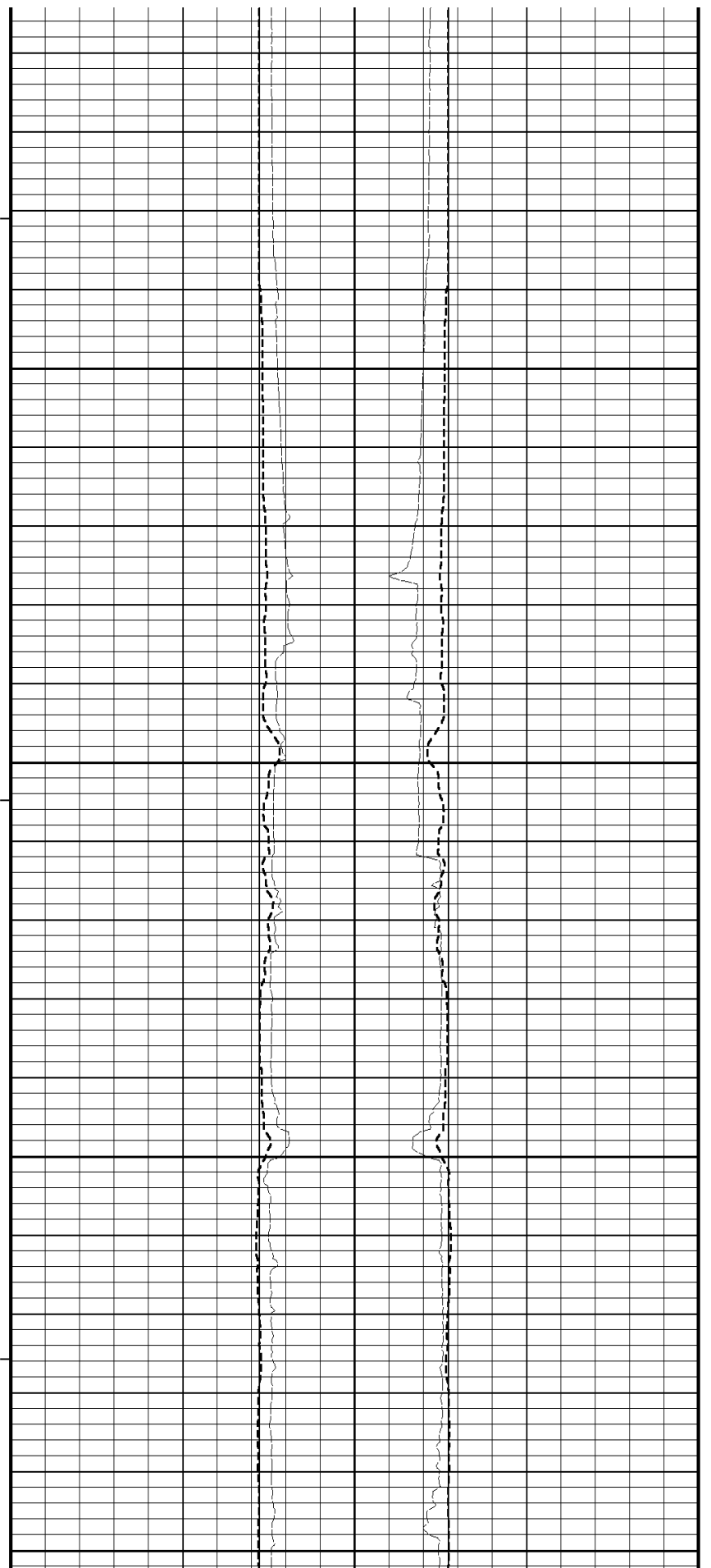
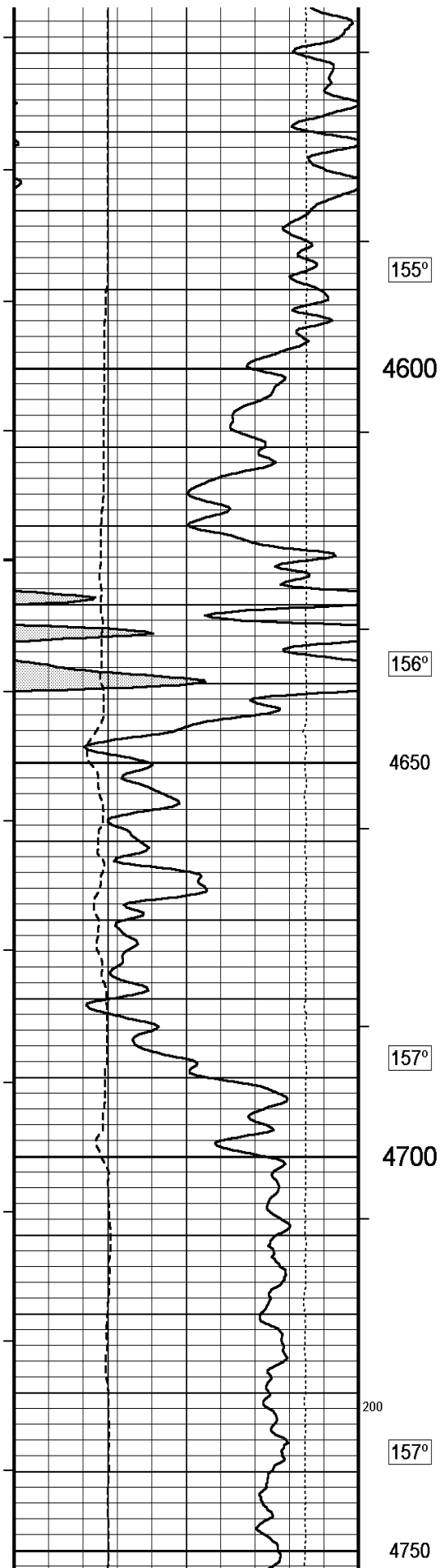
Bit Size →

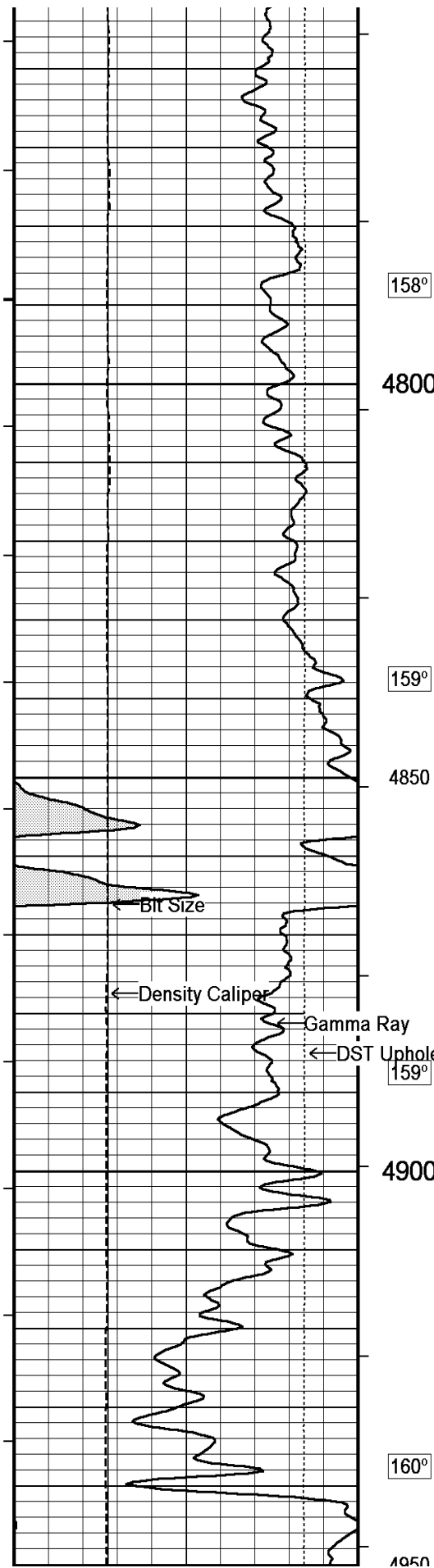
Bit Size →

Density Caliper →

Density Caliper →

100





158°

4800

159°

4850

Bit Size

Density Caliper

Gamma Ray

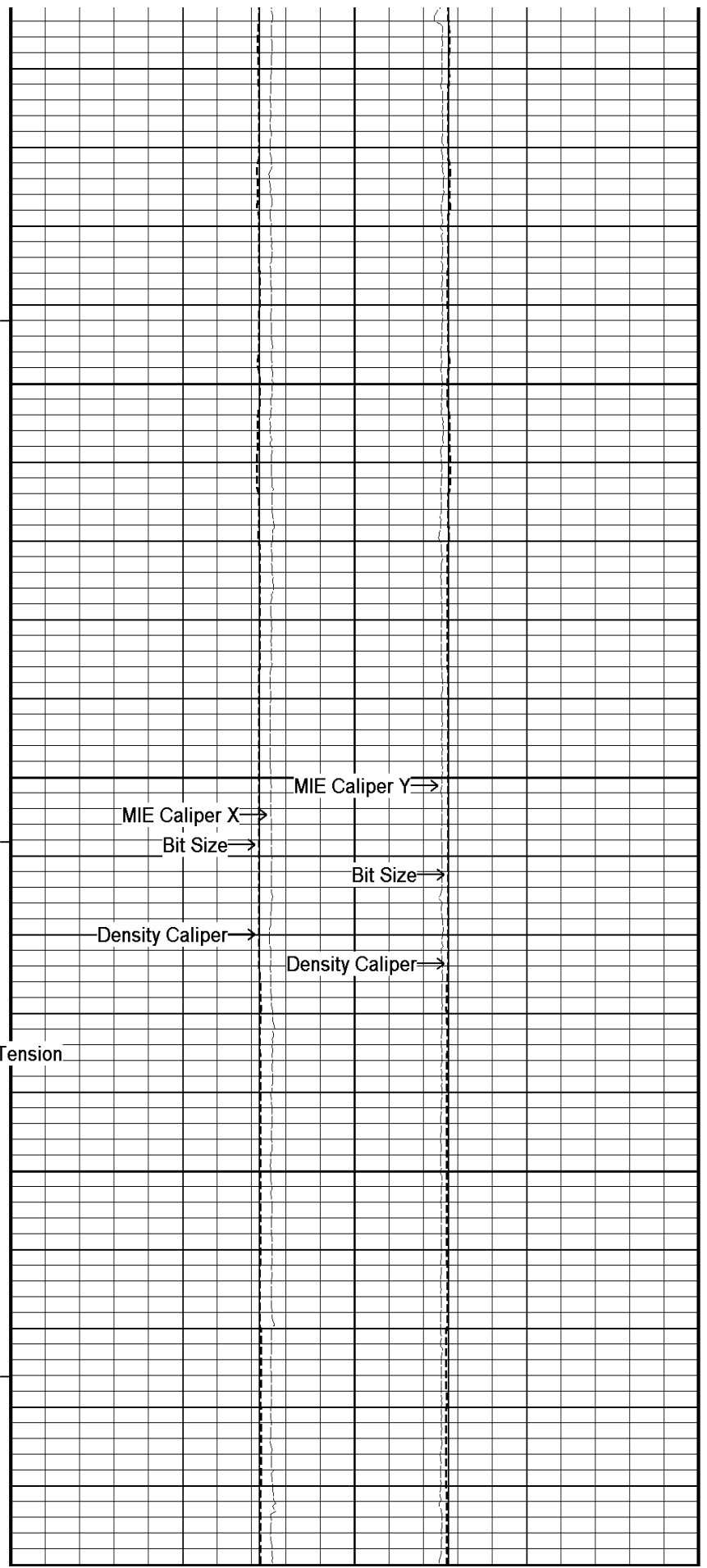
DST Uphole Tension

159°

4900

160°

4950



MIE Caliper X

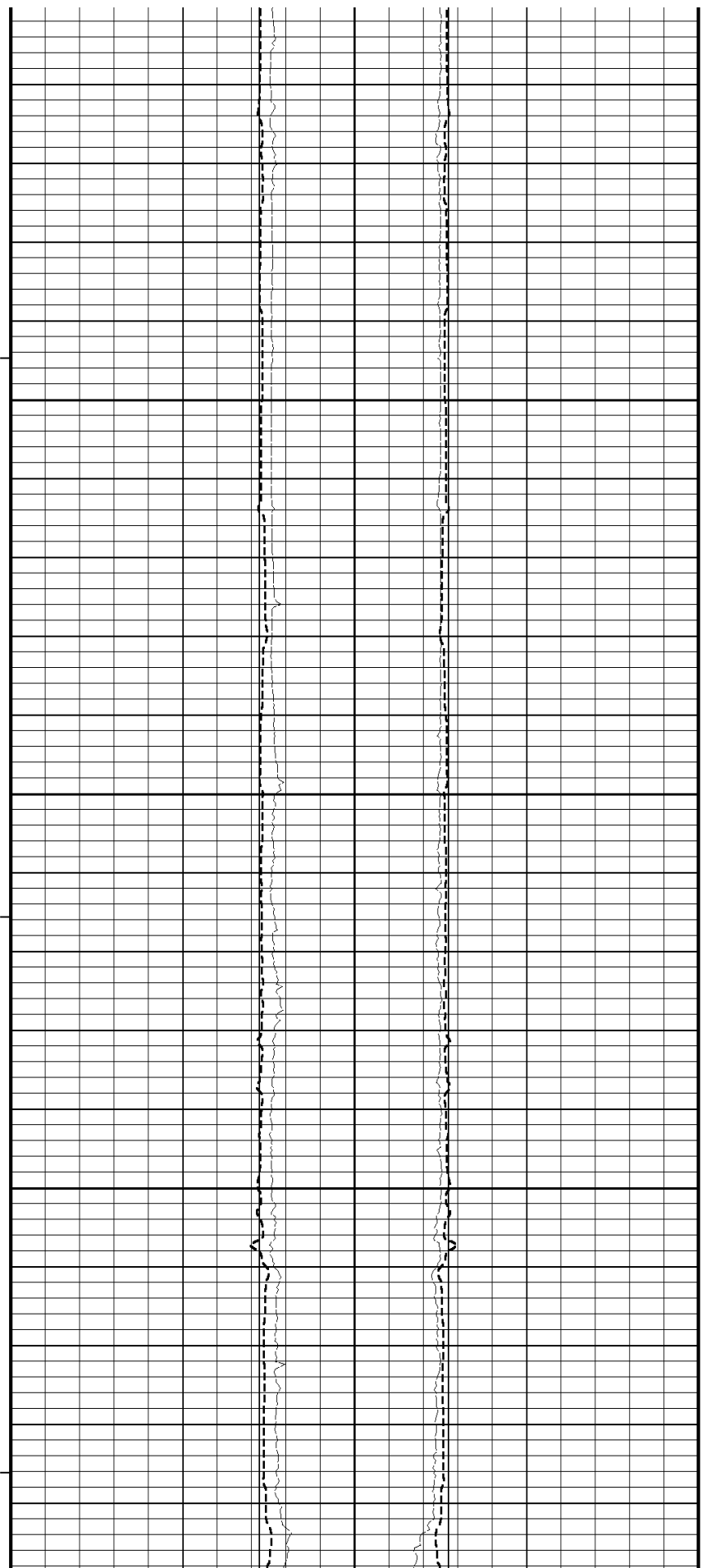
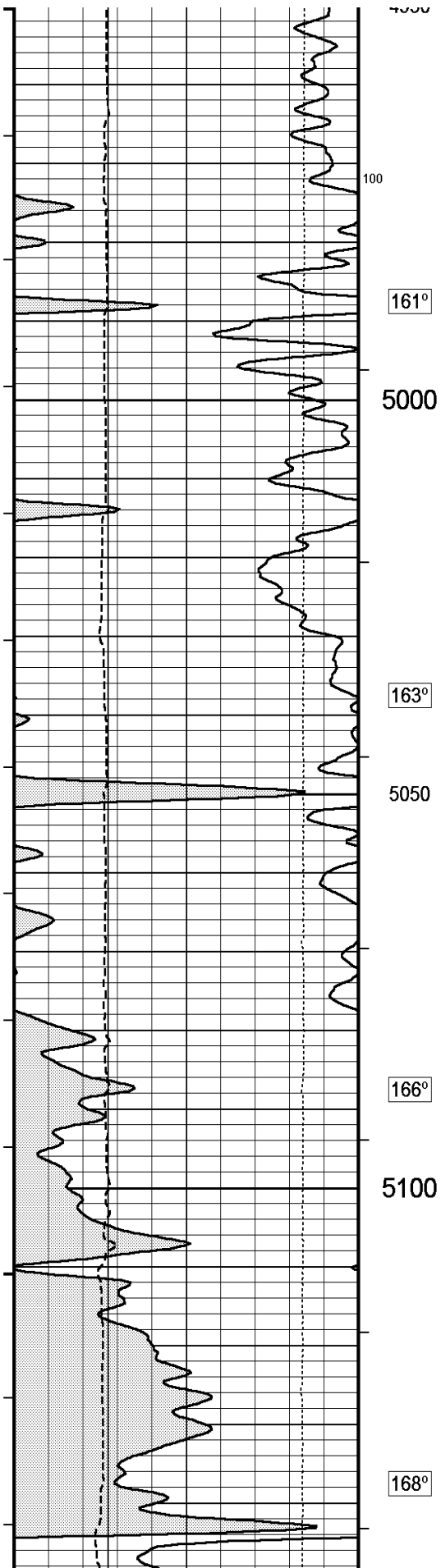
Bit Size

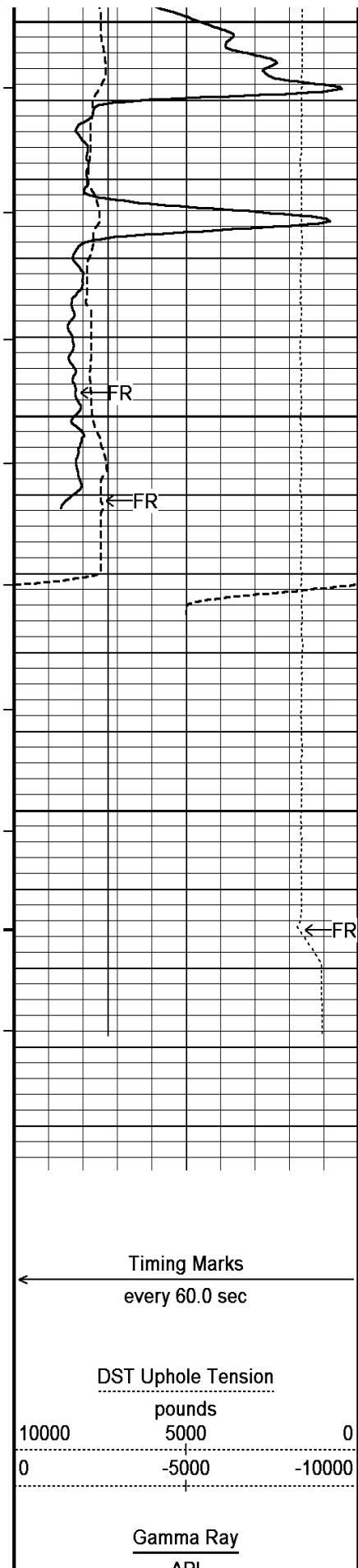
Density Caliper

MIE Caliper Y

Bit Size

Density Caliper





5150

166°

5200

166°

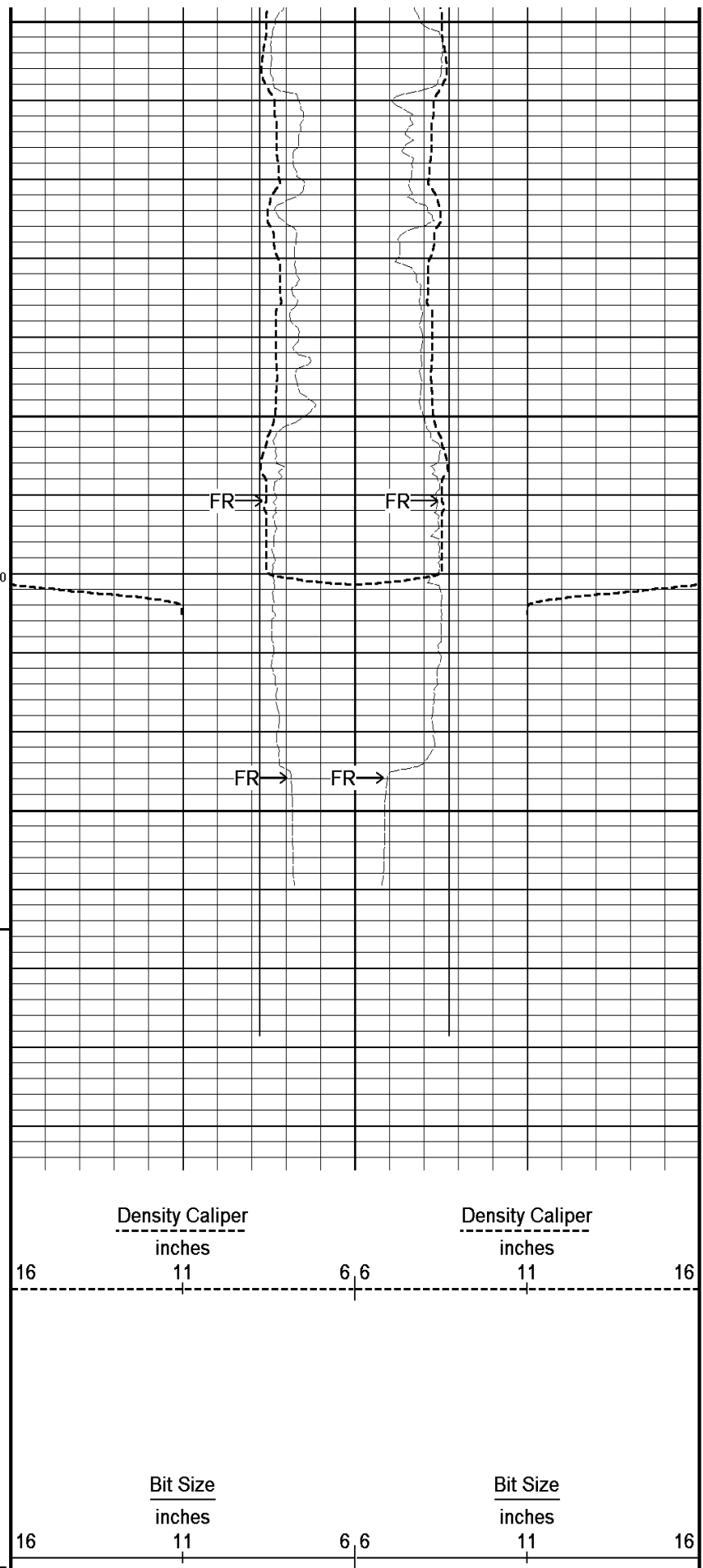
5250

TD

Depth
In
Feet

Borehole
Temp in
deg F

HVI
every
10 cu ft

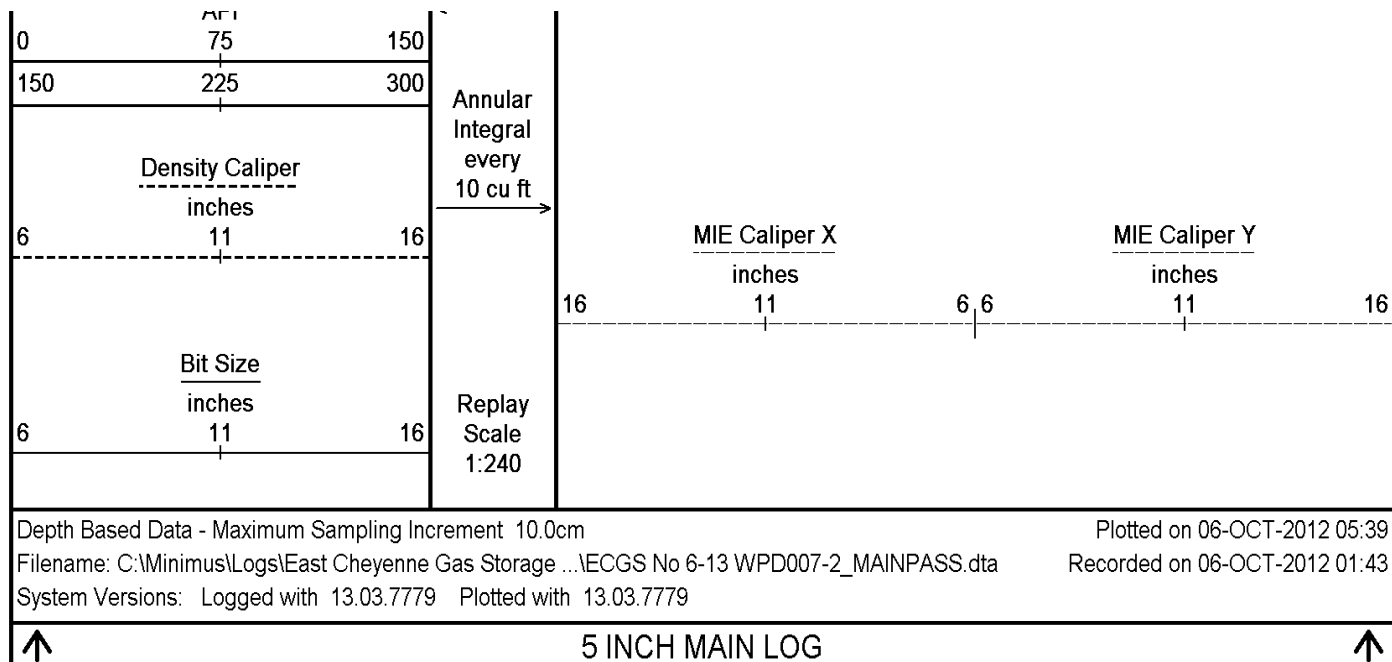


Density Caliper
inches

Density Caliper
inches

Bit Size
inches

Bit Size
inches



BEFORE SURVEY CALIBRATION			
C:\Minimus\Logs\East Cheyenne Gas Storage LLC\IECGS No 6-13 WPD007-2\IECGS No 6-13 WPD007-2_MAINPASS.dta			
Down-hole Tension Calibration All 000			Field Calibration on 24-OCT-2010 03:34
Reading No	Measured		
1	15659.85	0.00	
2	15734.68	370.00	
General Constants All 000			Last Edited on 05-OCT-2012,17:12
General Parameters			
Mud Resistivity	4.230	ohm-metres	
Mud Resistivity Temperature	84.700	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 05-OCT-2012 16:38
Reading No	Measured	Calibrated (lbs)	
1	15464.68	0.00	
2	16668.93	515.00	
Gamma Calibration MCG-D.K 483			Field Calibration on 05-OCT-2012 04:32
	Measured	Calibrated (API)	
Background	76	51	
Calibrator (Gross)	851	570	

Calibrator (Gross)	551	570
Calibrator (Net)	776	519
Gamma Constants MCG-D.K 483		Last Edited on 05-OCT-2012,14:10
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 02-OCT-2012,09:19
Pre-filter Length	11	
Neutron Calibration MDN-B.J 372		Base Calibration on 11-SEP-2012 10:37 Field Check on 05-OCT-2012 04:43
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		
Neutron Constants MDN-B.J 372		Last Edited on 05-OCT-2012,14:11
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	
Accelerometer Parameters MIE-A.J 244		
Date Of Last Accelerometer Calibration	05-OCT-2012 13:09	

Slope	X Accelerometer -1.102009	Y Accelerometer -1.108690	Z Accelerometer -1.102611
Offset	-0.007164	0.008495	-0.004580
Accelerometer Constants MIE-A.J 244			Last Edited on 05-OCT-2012,13:10
Accelerometer Calibrator Number		000	
Accelerometer Temperature Characterisation			
X Accelerometer			
Serial Number	1016		
Calibration Date	12-Apr-2011		
	B0	B1	B2
Bias(g)	0.00000e+000	1.93698e-005	-7.60293e-010
	SF0	SF1	SF2
Scale Factor(mA/g)	3.00000e+000	2.59257e-004	6.13375e-007
			-3.90888e-010
Y Accelerometer			
Serial Number	973		
Calibration Date	19-Jan-2011		
	B0	B1	B2
Bias(g)	0.00000e+000	1.95276e-005	-1.88058e-008
	SF0	SF1	SF2
Scale Factor(mA/g)	3.00000e+000	2.75268e-004	3.53140e-007
			7.52116e-010
Z Accelerometer			
Serial Number	1032		
Calibration Date	18-Apr-2011		
	B0	B1	B2
Bias(g)	0.00000e+000	-1.14960e-005	3.94288e-009
	SF0	SF1	SF2
Scale Factor(mA/g)	3.00000e+000	2.88058e-004	2.44833e-007
			8.38007e-010
Magnetometer Parameters MIE-A.J 244			
Date Of Last Magnetometer Calibration		05-OCT-2012,13:13	
	X Magnetometer	Y Magnetometer	Z Magnetometer
Slope	-1.000000	-1.000925	-0.993497
Offset	0.008903	-0.008749	0.009457
Magnetometer Constants MIE-A.J 244			Last Edited on
Magnetometer Calibrator Number		000	
Compact Micro Imager Constants MIE-A.J 244			Last Edited on
Sonde Configuration		Imager Mode	
Arm-Pad Kit	Normal Pads (12.25 in)		
Arm-Pad Kit Serial Number			
Centre Pad 1 Rotational Offset	0.00	degrees	
Image/Borehole Ovality Reference	Azimuth of Pad 1		
Non Active Buttons	Omit		
Search Angle	0.00	degrees	
Correlation Interval	3.28	feet	
Correlation Step	1.64	feet	
Current Offset	0.0000	mAmp	
Squasher Start	0.0500	mAmp	
Image Processing	Enabled		
Caliper Calibration MIE-A.J 244			Base Calibration on 05-OCT-2012 13:33 Field Calibration on 05-OCT-2012 13:37
Base Calibration			
Reading No	Pads 1-5 Meas.	Pads 3-7 Meas.	Calibrator Size (in)
1	25476	26124	5.97
2	35871	36979	7.96

3	44943	46748	9.87		
4	59347	57917	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	22282	27314	24804	22108	5.97
2	33535	36001	32513	31768	7.96
3	41769	44988	41324	39908	9.87
4	54189	52954	48629	51823	11.92
5	0	0	0	0	0.00
Field Calibration					
	Measured Pads 1-5 Caliper(in)	Measured Pads 3-7 Caliper(in)		Actual Caliper(in)	
	8.47	7.99		7.96	
	Measured Pad 2 Caliper(in)	Measured Pad 4 Caliper(in)	Measured Pad 6 Caliper(in)	Measured Pad 8 Caliper(in)	Actual Caliper(in)
	4.26	3.72	3.77	4.34	7.96
Caliper Constants MIE-A.J 244				Last Edited on 05-OCT-2012,13:26	
Caliper Difference for BRKT		0.120	inches		
Navigation Constants MIE-A.J 244				Last Edited on 05-OCT-2012,14:15	
Magnetic Declination		7.85	degrees	East	
FE Calibration MFE-A.A 76				Base Calibration on 10-SEP-2012 11:36 Field Check on 05-OCT-2012 04:36	
Base Calibration					
		Measured	Calibrated (ohm-m)		
Reference 1		0.0	0.0		
Reference 2		964.4	126.8		
Base Check			279.9		
Field Check			280.3		
FE Constants MFE-A.A 76				Last Edited on 05-OCT-2012,14:15	
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 05-OCT-2012 04:26	
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	11.5	3793.9
2	0.0	0.0	30.8	3537.8
3	0.0	0.0	28.6	3056.6
4	0.0	0.0	19.3	2028.9
Deep			16.5	1949.2
Medium			42.7	4089.1
Shallow			47.4	5284.2
Array Temperature	0.0		52.9	Deg F

Induction Constants MAI-B.A 219

Last Edited on 05-OCT-2012,14:16

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 05-OCT-2012 04:53

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) 7.86	Actual Caliper (in) 7.96
Photo Density Calibration MPD-C.J 378		Base Calibration on 27-SEP-2012 12:49 Field Check on 05-OCT-2012 04:51
Density Calibration	Measured	Calibrated (sdu)
Base Calibration	Near Far	Near Far
Reference 1	39385 12332	52994 19128
Reference 2	18690 2207	25185 2558
Field Check at Base	1201.6 1277.5	
Field Check	1197.1 1283.9	
PE Calibration	Measured	Calibrated
Base Calibration	WS 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	
Field Check	220.3 1075.4	
Density Constants MPD-C.J 378		Last Edited on 05-OCT-2012,14:12
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	1.17	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:\Minimus\Logs\East Cheyenne Gas Storage LLC\ECGS No 6-13 WPD007-2\ECGS No 6-13 WPD007-2_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-D.A Compact Knuckle Joint

SKJ-D.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.A 125 LG: 4.65 ft WT: 26.5 lb OD: 2.24 in

Compact MMI Electrode Section

MIE-A.J 244 LG: 13.96 ft WT: 99.2 lb OD: 4.09 in

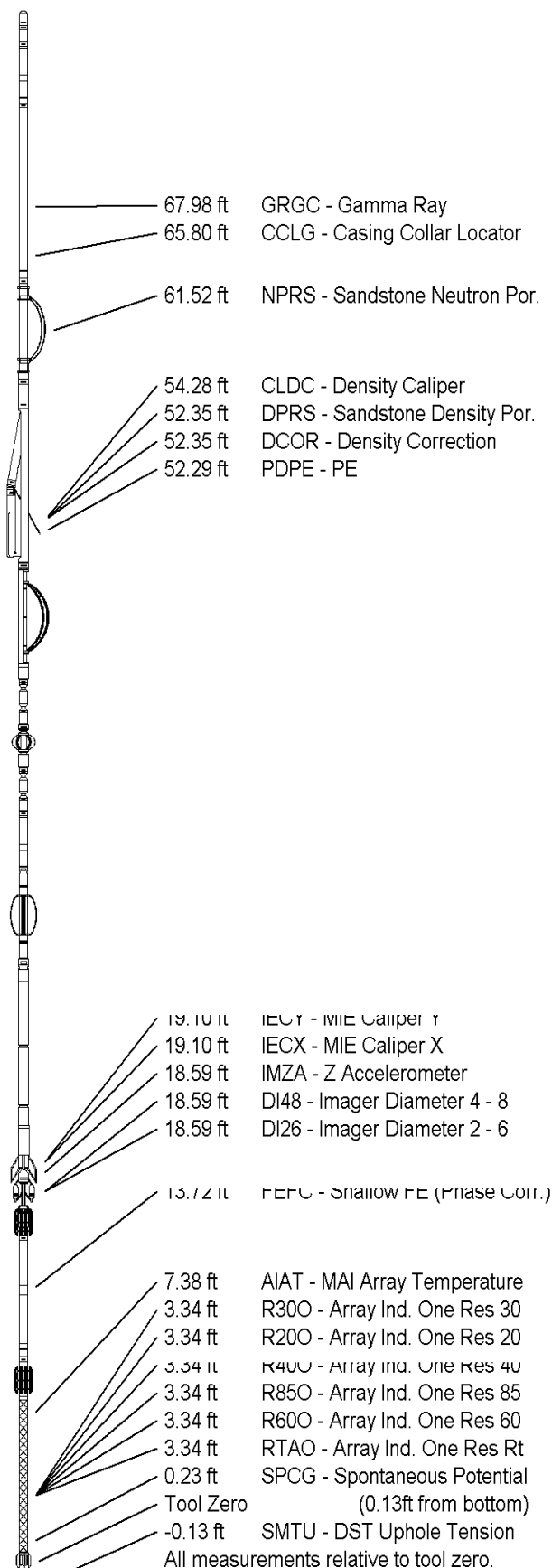
Compact Focussed Electric

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: 77.14 ft Weight: 584.2 lb



WELL	ECGS NO 6-13 WPD007-2
FIELD	PEETZ WEST
PROVINCE/COUNTY	LOGAN
COUNTRY/STATE	USA/COLORADO

Elevation Kelly Bushing	4564.00	feet	First Reading	5246.00	feet
Elevation Drill Floor	4563.00	feet	Depth Driller	5265.00	feet
Elevation Ground Level	4550.00	feet	Depth Logger	5265.00	feet



Weatherford®

CALIPER

LOG