



**Weatherford**<sup>®</sup>

**MICRO-RESISTIVITY LOG**

COMPANY **UNIT PETROLEUM COMPANY**  
 WELL **LOUDENBACK 7 #1**  
 FIELD **WILDCAT**  
 PROVINCE/COUNTY **RENO**  
 COUNTRY/STATE **U.S.A. / KANSAS**  
 LOCATION **150' FNL & 850' FEL**  
**NE-NW-NE-NW**

SEC **18** TWP **25S** RGE **10W** Other Services  
 MA/MFE  
 MDN/MPD  
 API Number **15-155-21662**  
 Permit Number  
 Permanent Datum GL, Elevation 1770 feet  
 Log Measured From **KB**  
 Drilling Measured From **KB**

Elevations:  
 KB **1784.00**  
 DF **1785.00**  
 GL **1770.00**

Date	22-JUL-2013	
Run Number	ONE	
Service Order	3542196	
Depth Driller	4158.00	feet
Depth Logger	4156.00	feet
First Reading	4122.00	feet
Last Reading	1514.00	feet
Casing Driller	1515.00	feet
Casing Logger	1514.00	feet
Bit Size	8.750	inches
Hole Fluid Type	WBM	
Density / Viscosity	9.40 lb/USg	40.00 CP
PH / Fluid Loss	10.60	6.80 ml/30Min
Sample Source	MUD PIT	
Rm @ Measured Temp	0.90 @109.0	ohm-m
Rmf @ Measured Temp	0.72 @109.0	ohm-m
Rmc @ Measured Temp	1.08 @109.0	ohm-m
Source Rmf / Rmc	CALC	CALC
Rm @ BHT	0.77 @127.0	ohm-m
Time Since Circulation	4 HOURS	
Max Recorded Temp	128.00	deg F
Equipment / Base	13145	OKC
Recorded By	JIM SCHULER	J. HICKS
Witnessed By	ROB WILSON	LARRY MILLER

**BOREHOLE RECORD**

Last Edited: 22-JUL-2013 15:33

Bit Size inches	Depth From feet	Depth To feet
12.250	0.00	1515.00
8.750	1515.00	4158.00

**CASING RECORD**

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	9.650	0.00	1515.00	36.00

**REMARKS**

WLS 13.04.8723

MAGNETIC DECLINATION = 4.2

DEPTH CONTROL: CALIBRATED MEASURING WHEEL

TOOLS RAN: SHA, MCG, MMR, MDN, MPD, MFE, MAI RAN IN COMBINATION

HARDWARE:  
 MAI: TWO 0.5 INCH STANDOFFS USED.  
 MFE: ONE 0.5 INCH STANDOFF USED  
 MDN: DUAL NEUTRON BOW SPRINGS USED.  
 MPD: 8 INCH PROFILE PLATE USED.

2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY  
 ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

TOTAL HOLE VOLUME FROM TD TO 1514' = 1551 CU.FT.  
 ANNULAR HOLE VOLUME WITH 7.0 INCH PRODUCTION CASING FROM TD TO 1514' = 855 CU.FT.

SERVICE ORDER # 3542196

RIG: UNIT TEXAS RIG 331

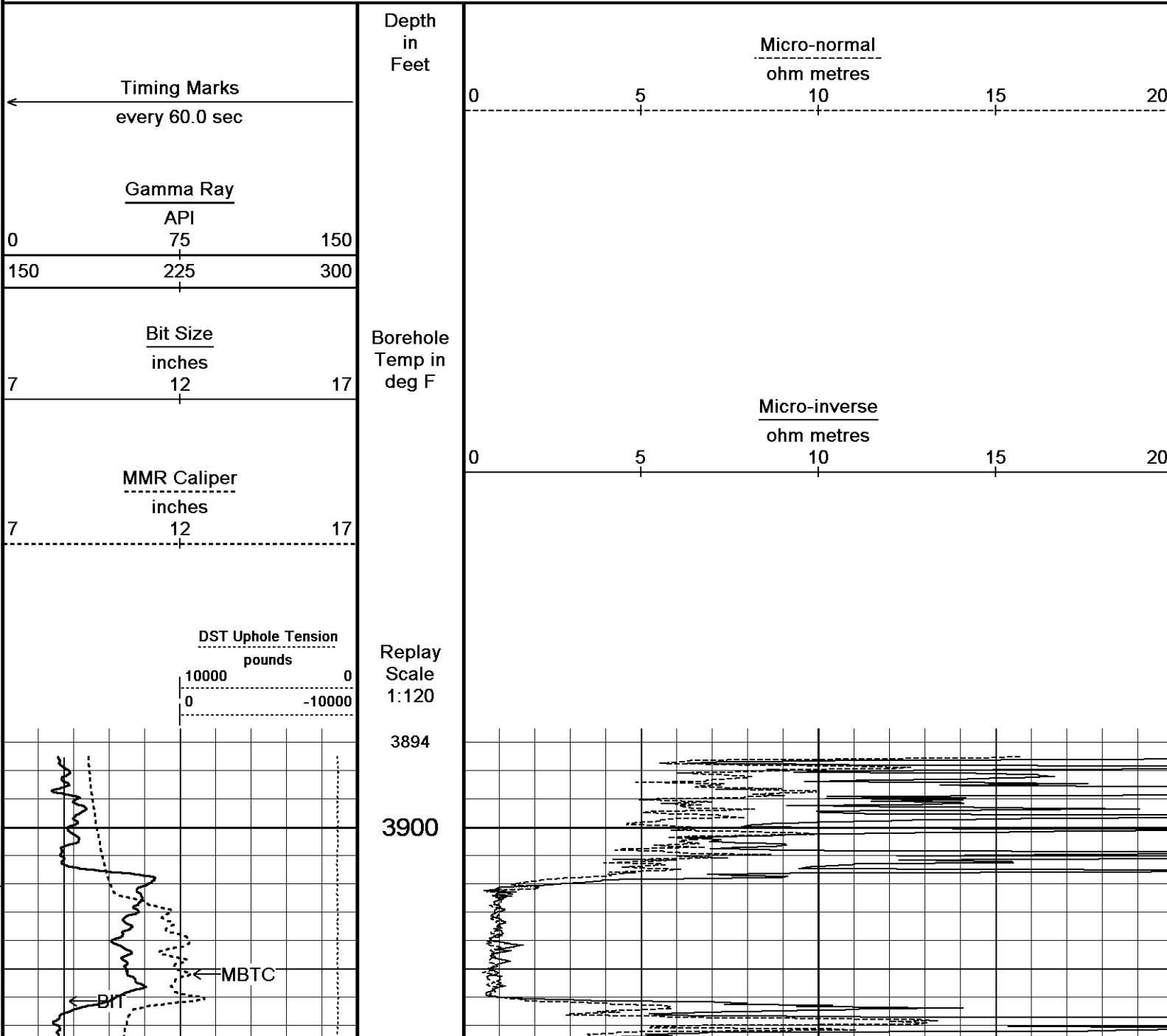
OPERATOR(S): JASON TURNER

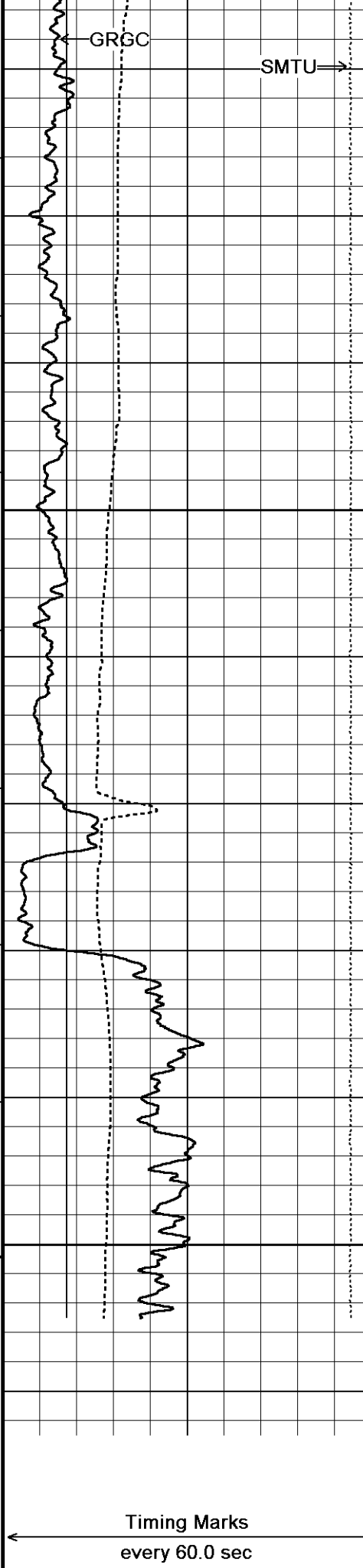
\*HOLE WASHOUTS AND RUGOSITY WILL AFFECT LOG QUALITY AND REPEATABILITY\*

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.

**10 INCH HI RESOLUTION SECTION**

Depth Based Data - Maximum Sampling Increment 2.5cm Plotted on 22-JUL-2013 22:13  
 Filename: C:\Program Files\Weatherford\WLS 13.04\DATA\UNIT PETROLEUM (LOU...MAIN\_001.dta Recorded on 22-JUL-2013 19:21  
 System Versions: Logged with 13.04.8723 Plotted with 13.04.8723





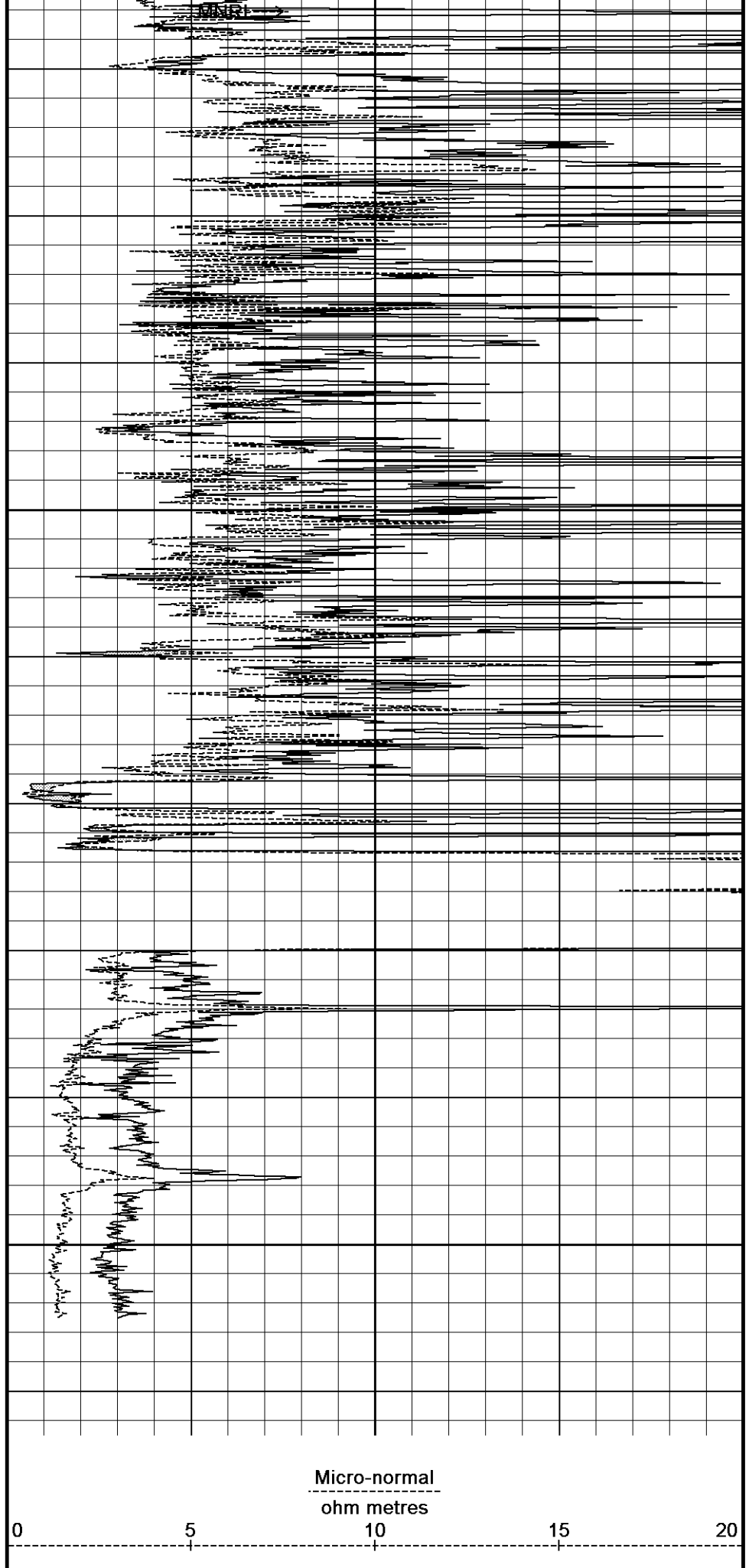
128°

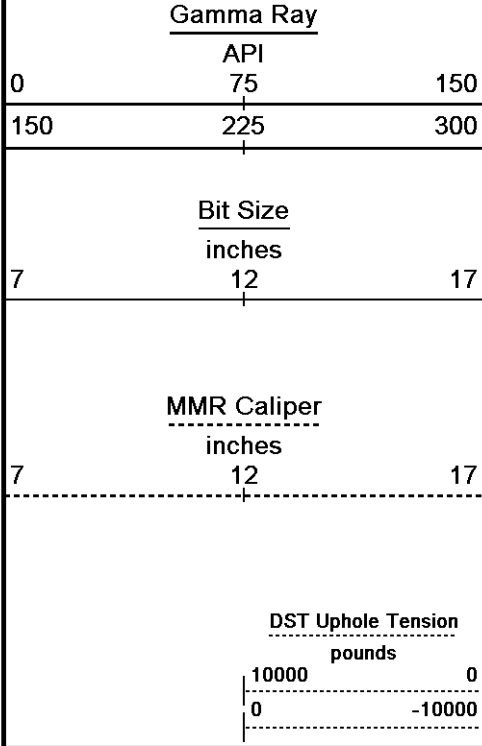
3950

128°

4000

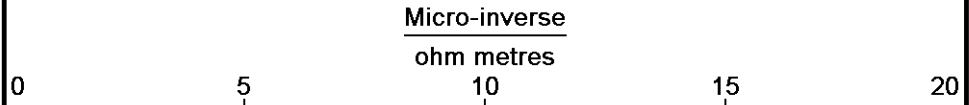
4012  
Depth  
in  
Feet





Borehole  
Temp in  
deg F

Replay  
Scale  
1:120

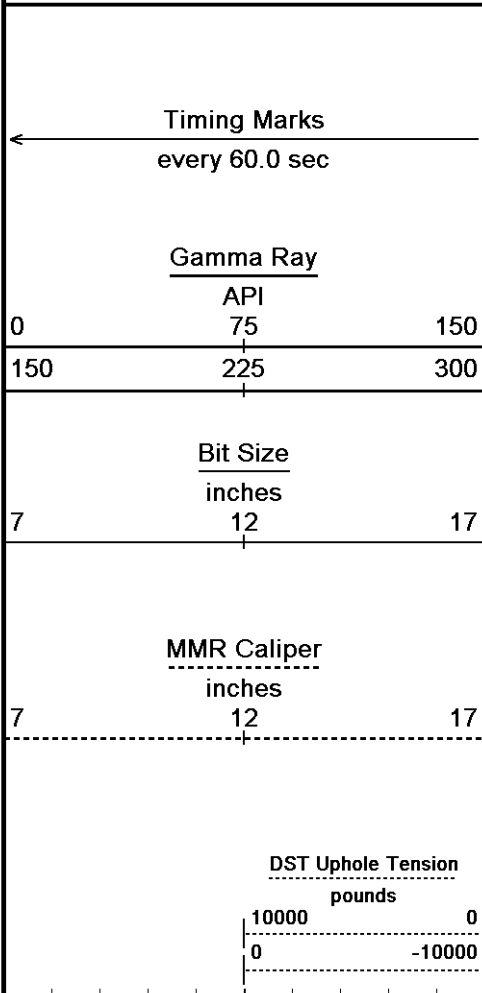


Depth Based Data - Maximum Sampling Increment 2.5cm Plotted on 22-JUL-2013 22:13  
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 System Versions: Logged with 13.04.8723 Plotted with 13.04.8723

↑ 10 INCH HI RESOLUTION SECTION ↑

↓ 5 INCH MAIN LOG ↓

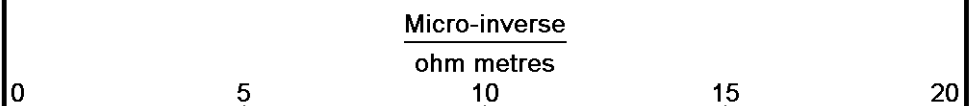
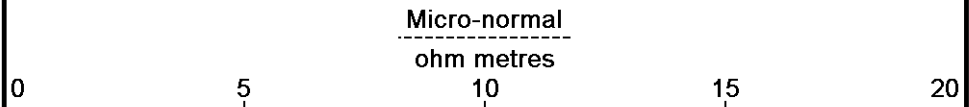
Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 22-JUL-2013 22:13  
 Filename: C:\Program Files\Weatherford\WLS 13.04\DATA\UNIT PETRLOEUM (LOU...MAIN\_003.dta Recorded on 22-JUL-2013 19:56  
 System Versions: Logged with 13.04.8723 Processed with 13.04.8723 Plotted with 13.04.8723



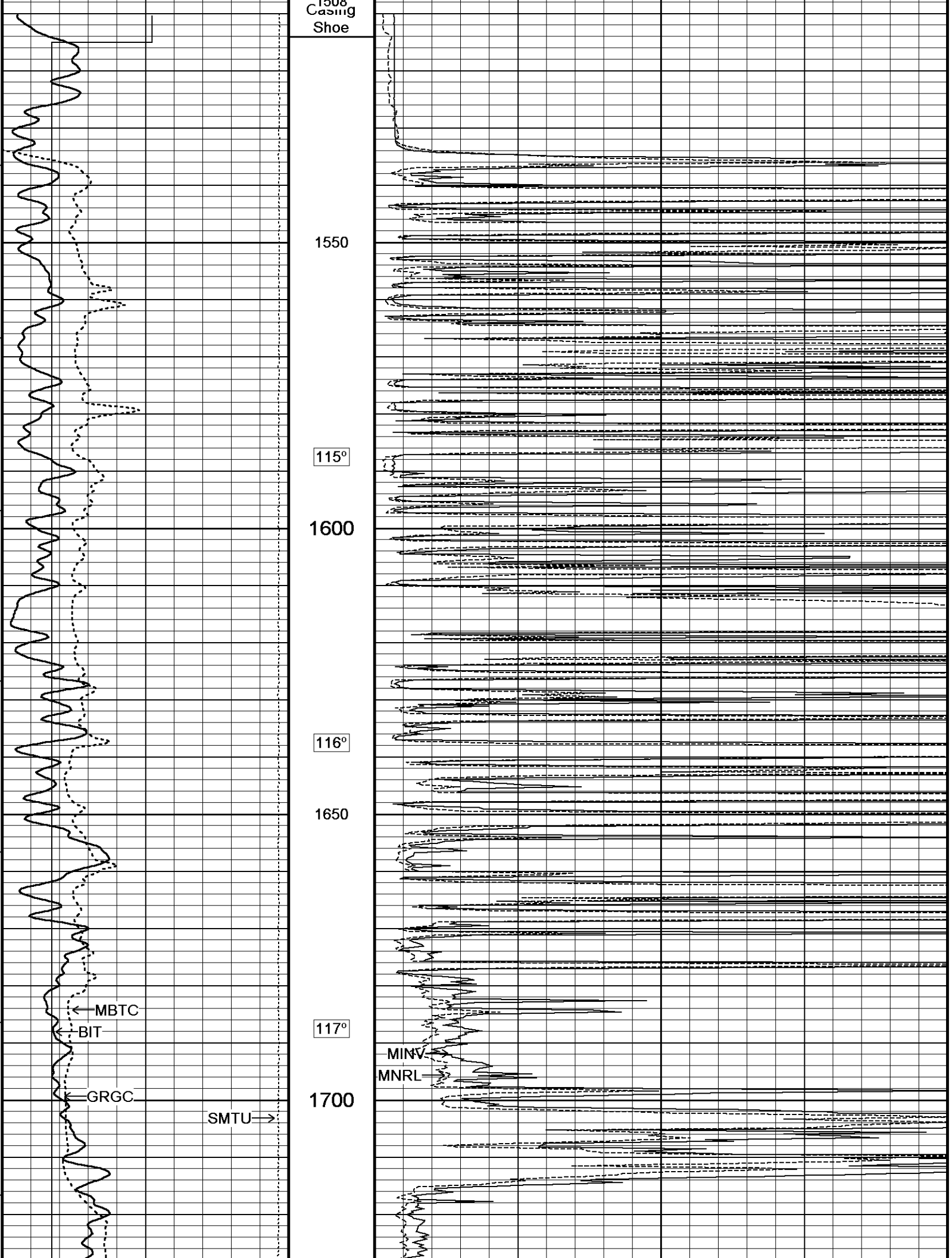
Depth  
in  
Feet

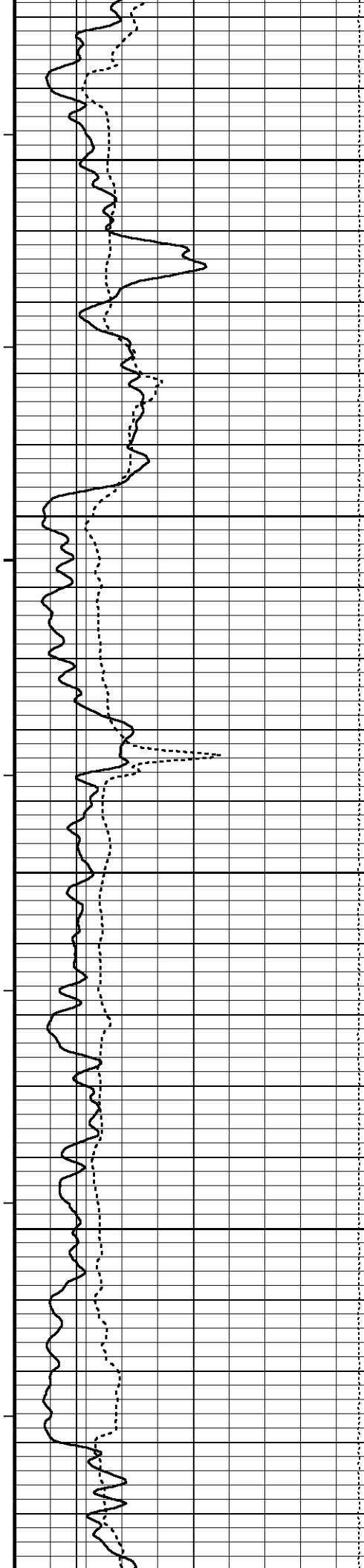
Borehole  
Temp in  
deg F

Replay  
Scale  
1:240



1500





117°

1750

118°

1800

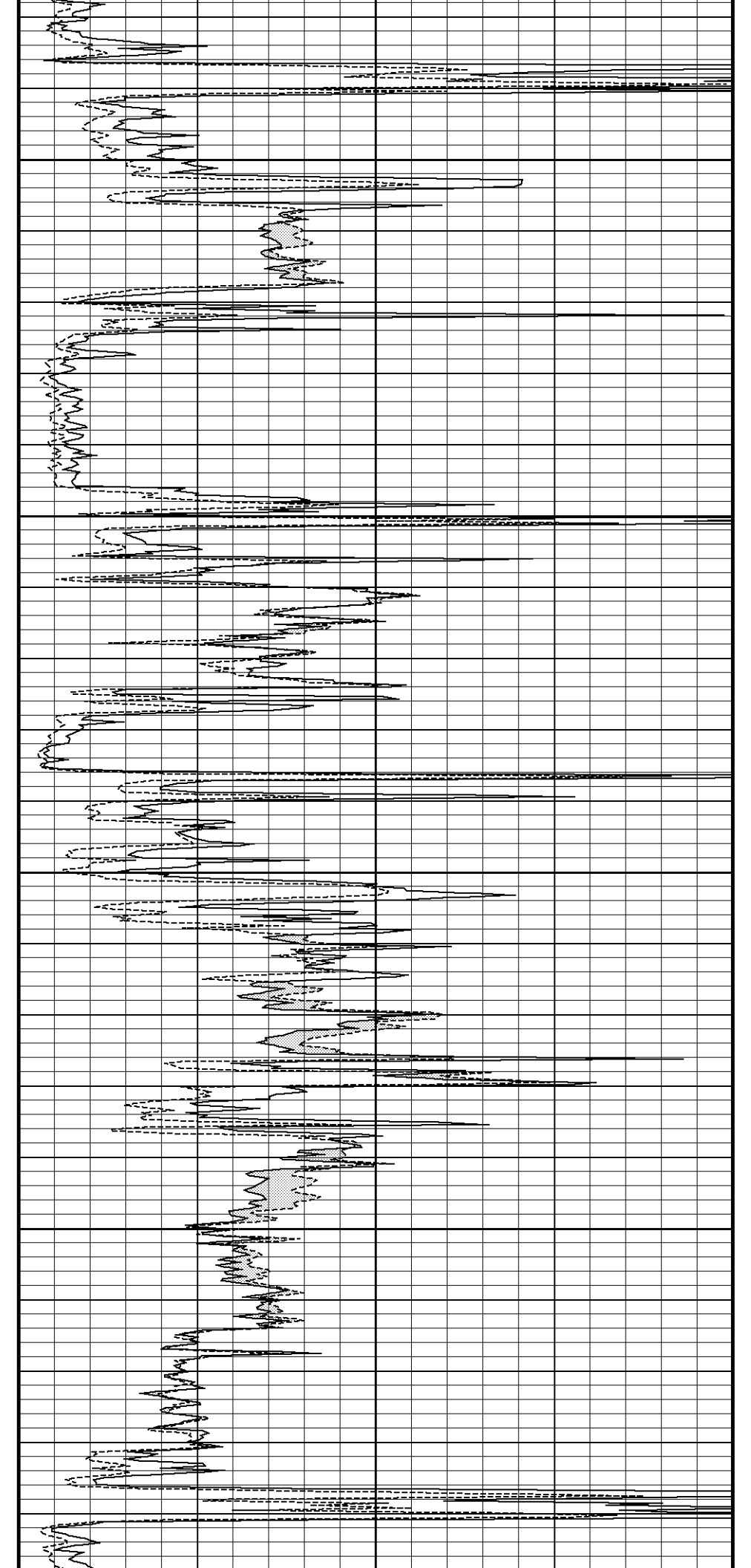
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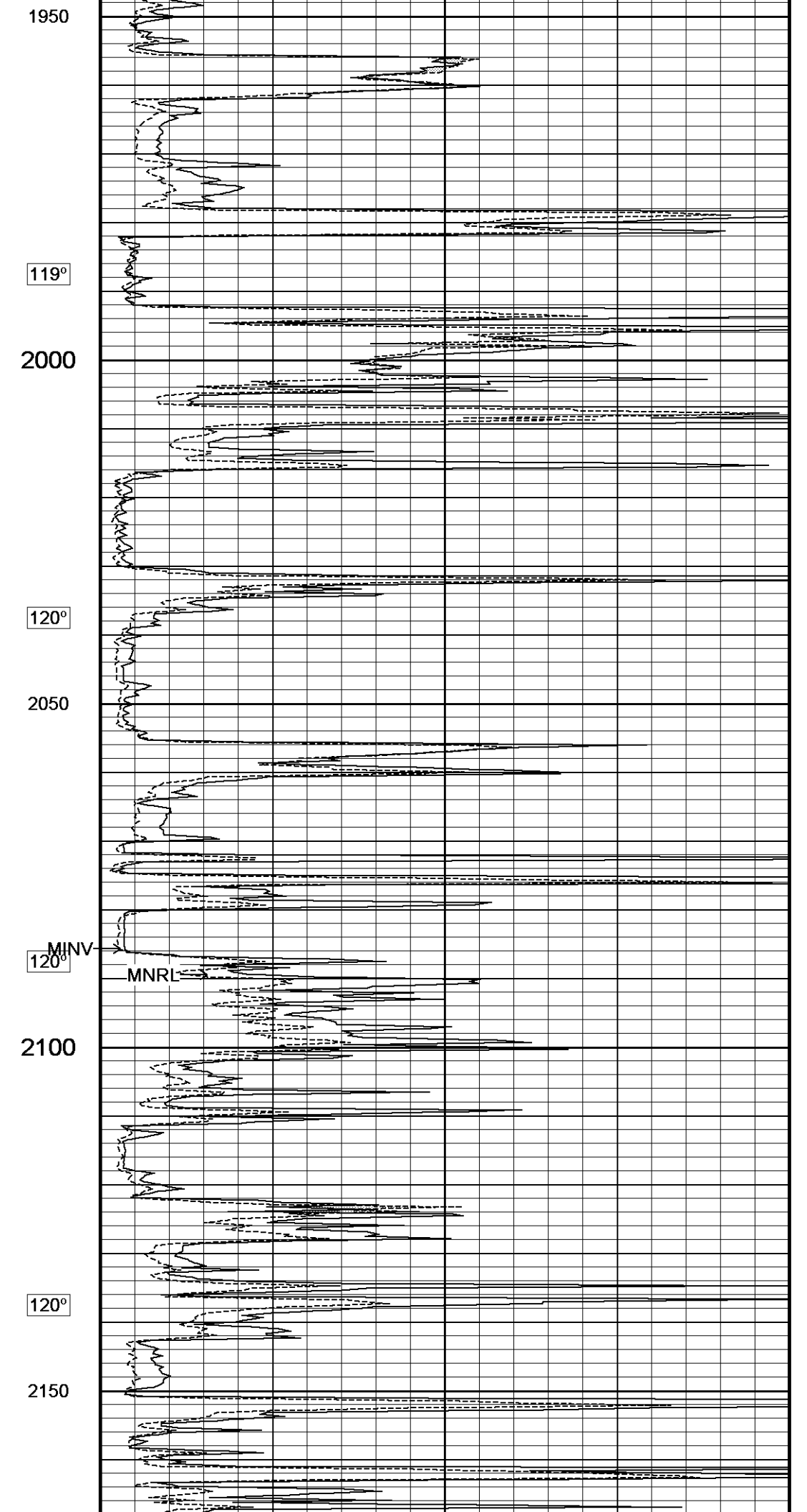
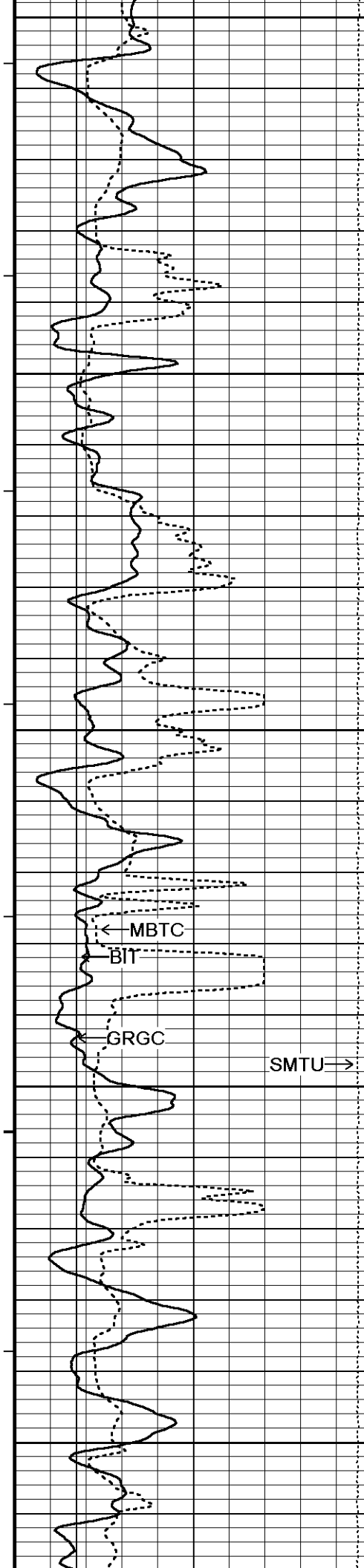
1850

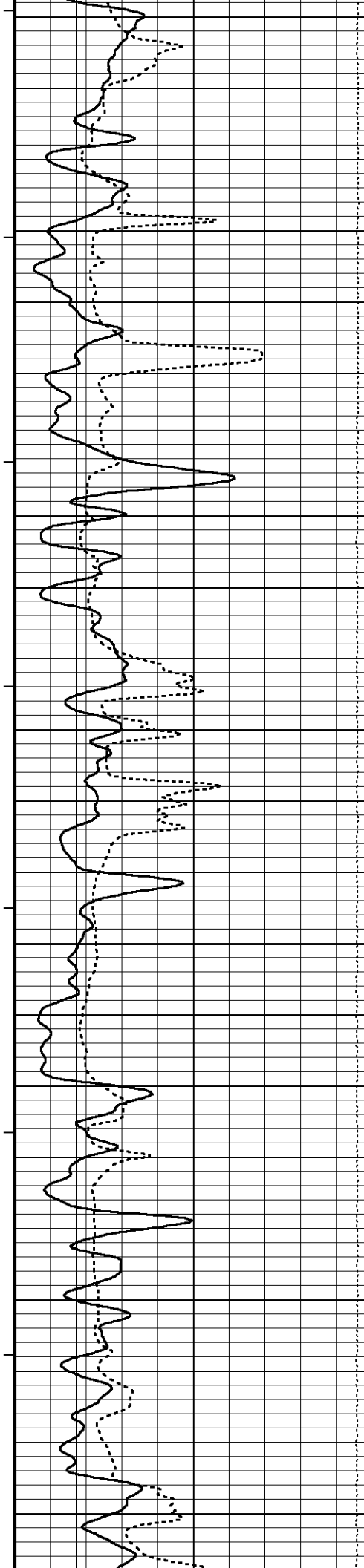
118°

1900

119°







121°

2200

121°

2250

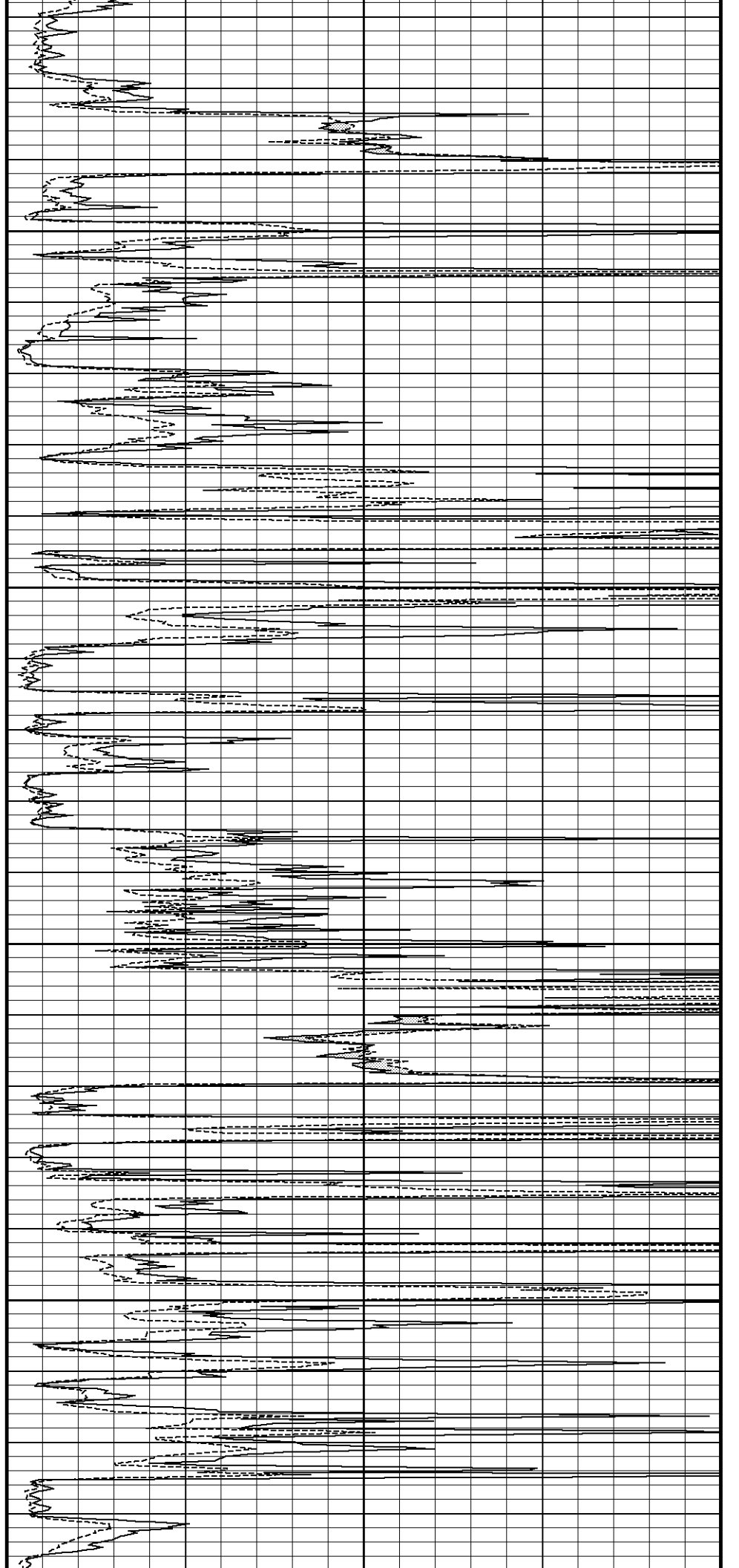
121°

2300

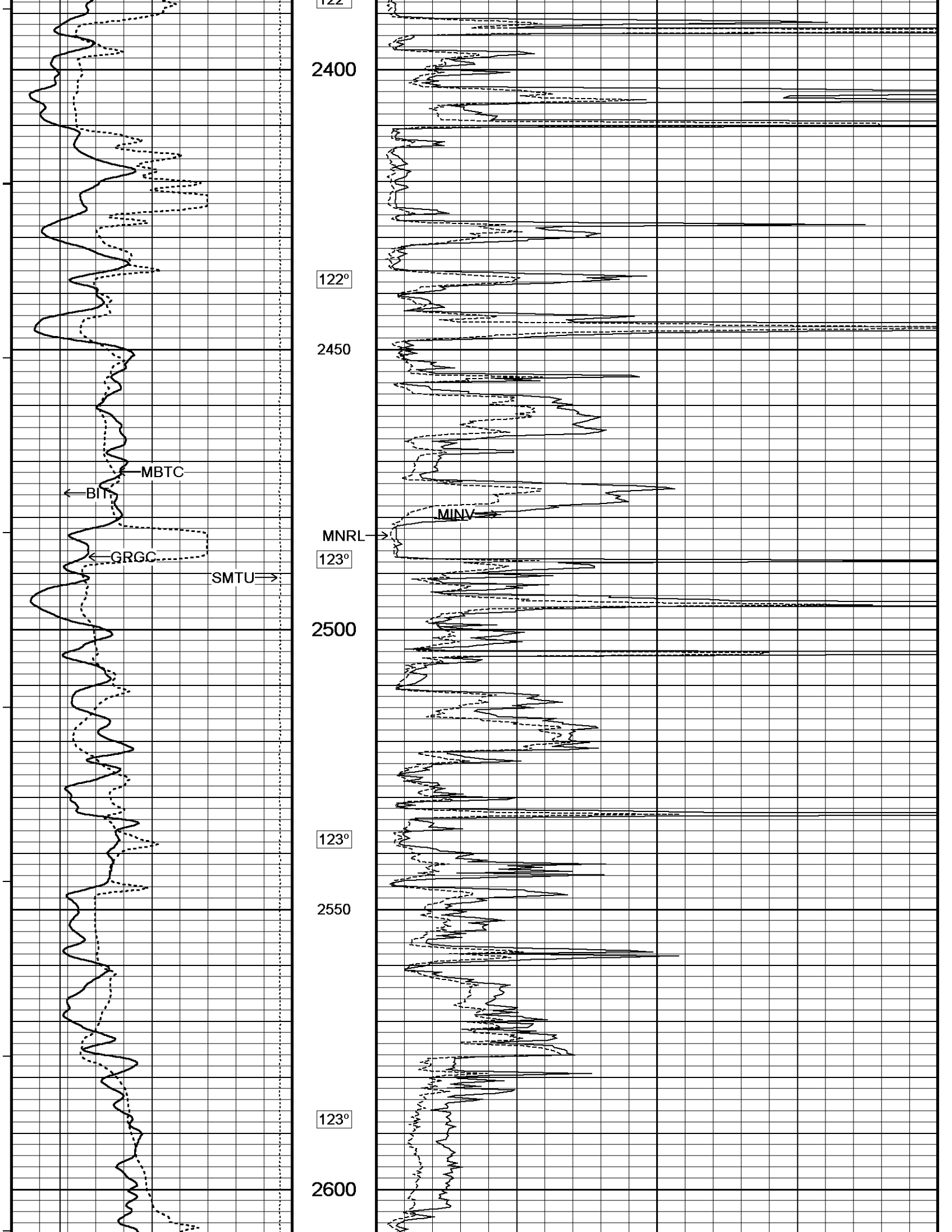
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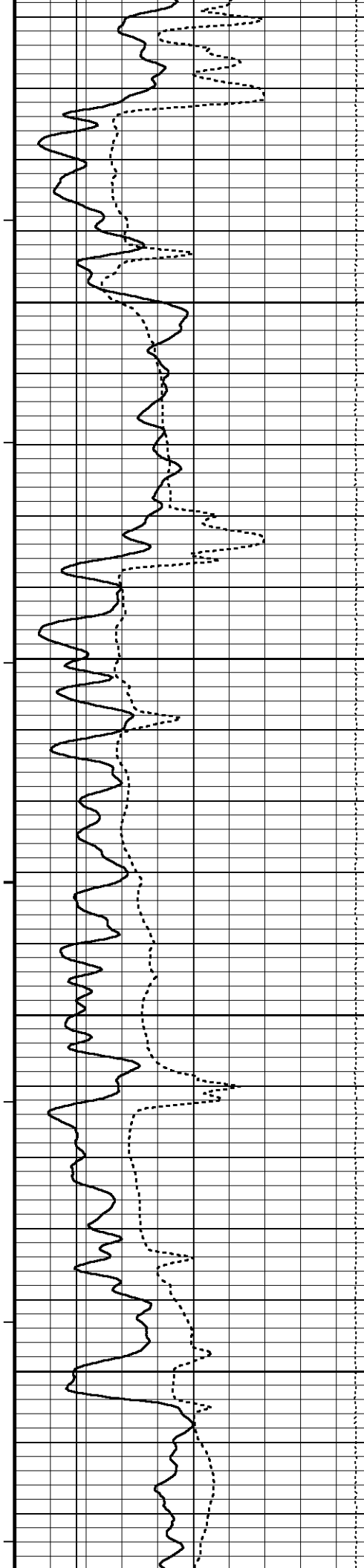
2350

122°









123°

2650

124°

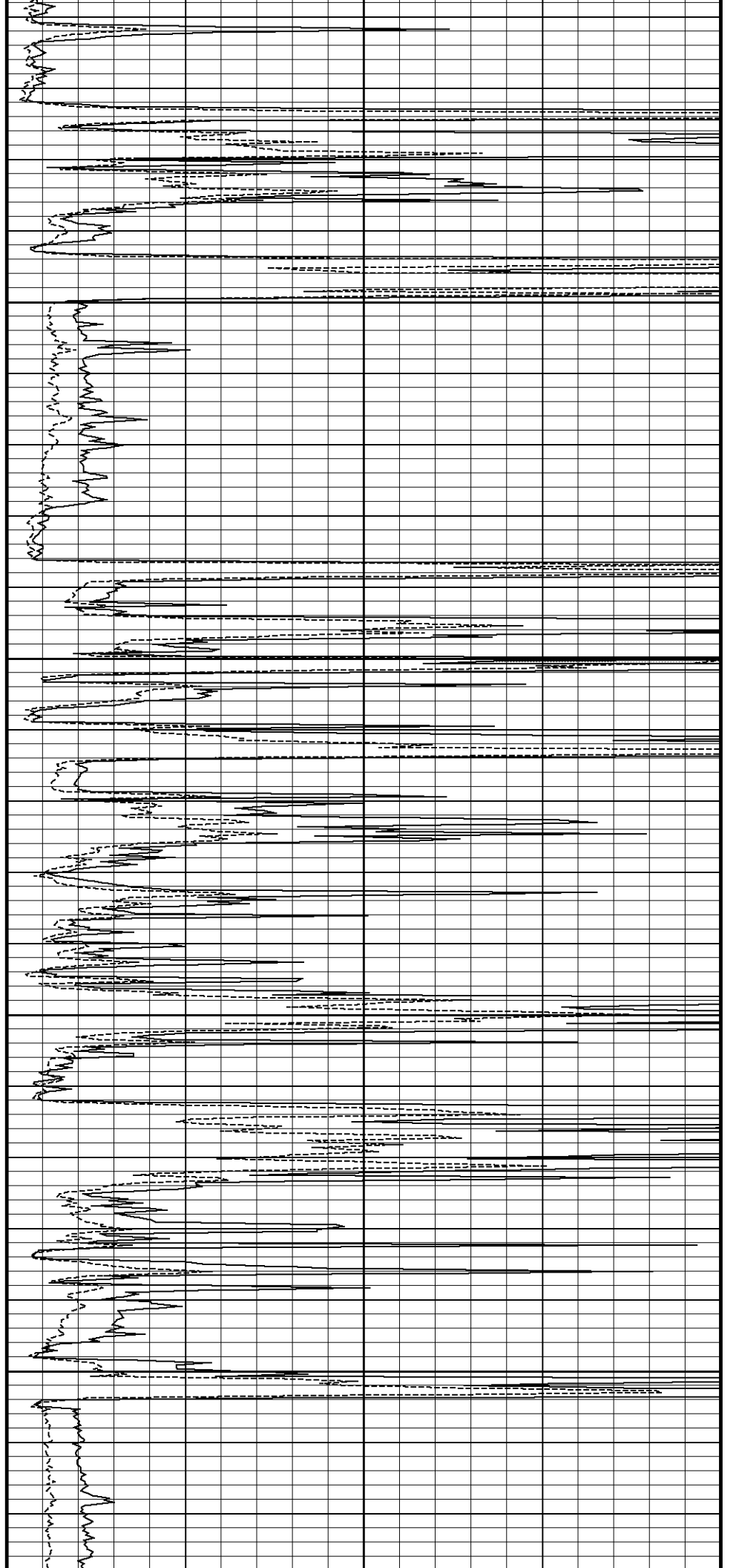
2700

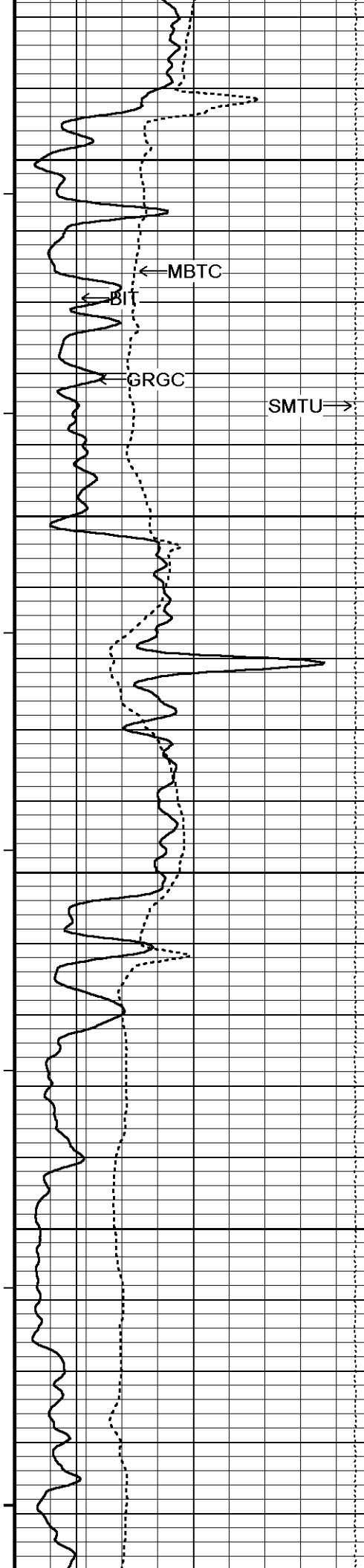
124°

2750

124°

2800





124°

2850

125°

2900

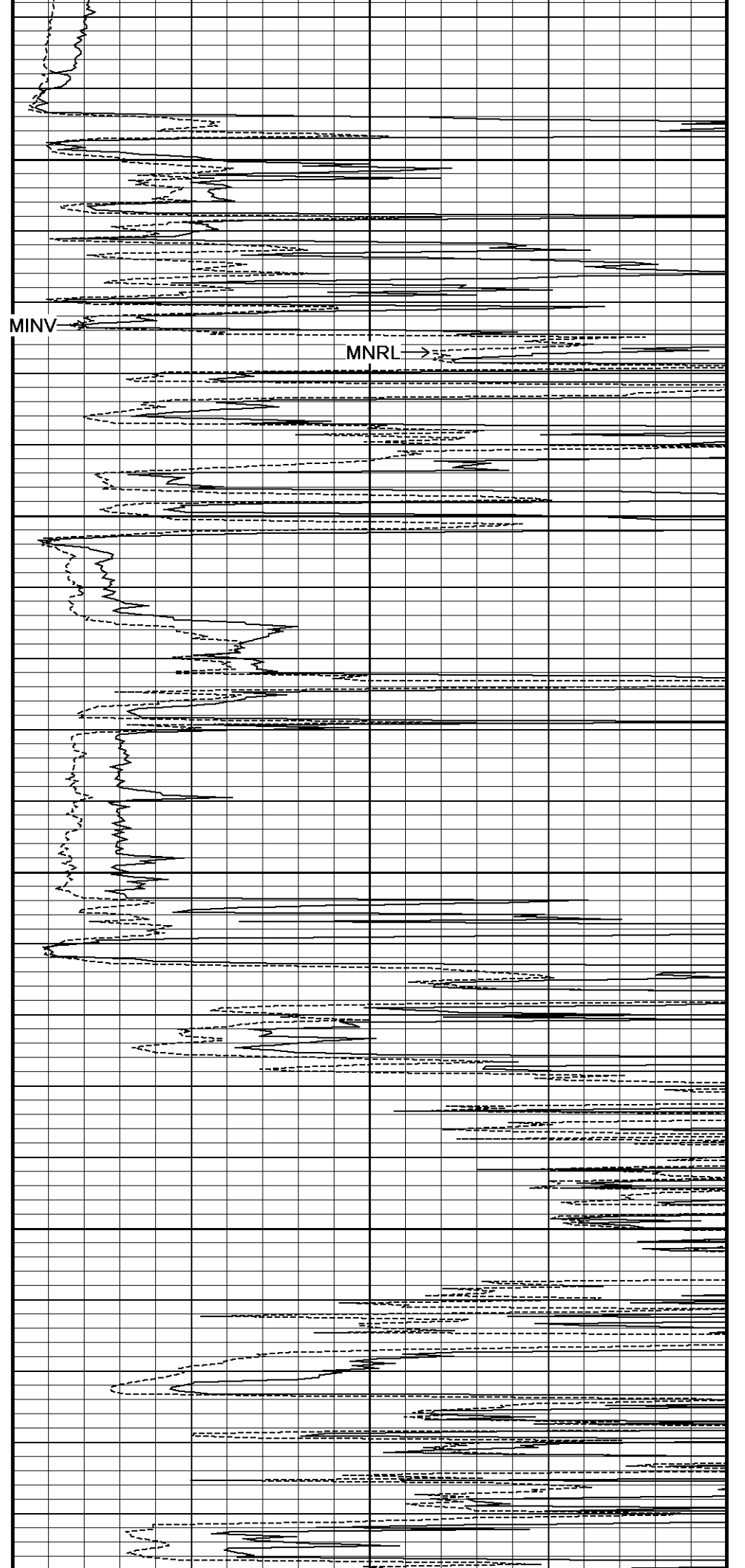
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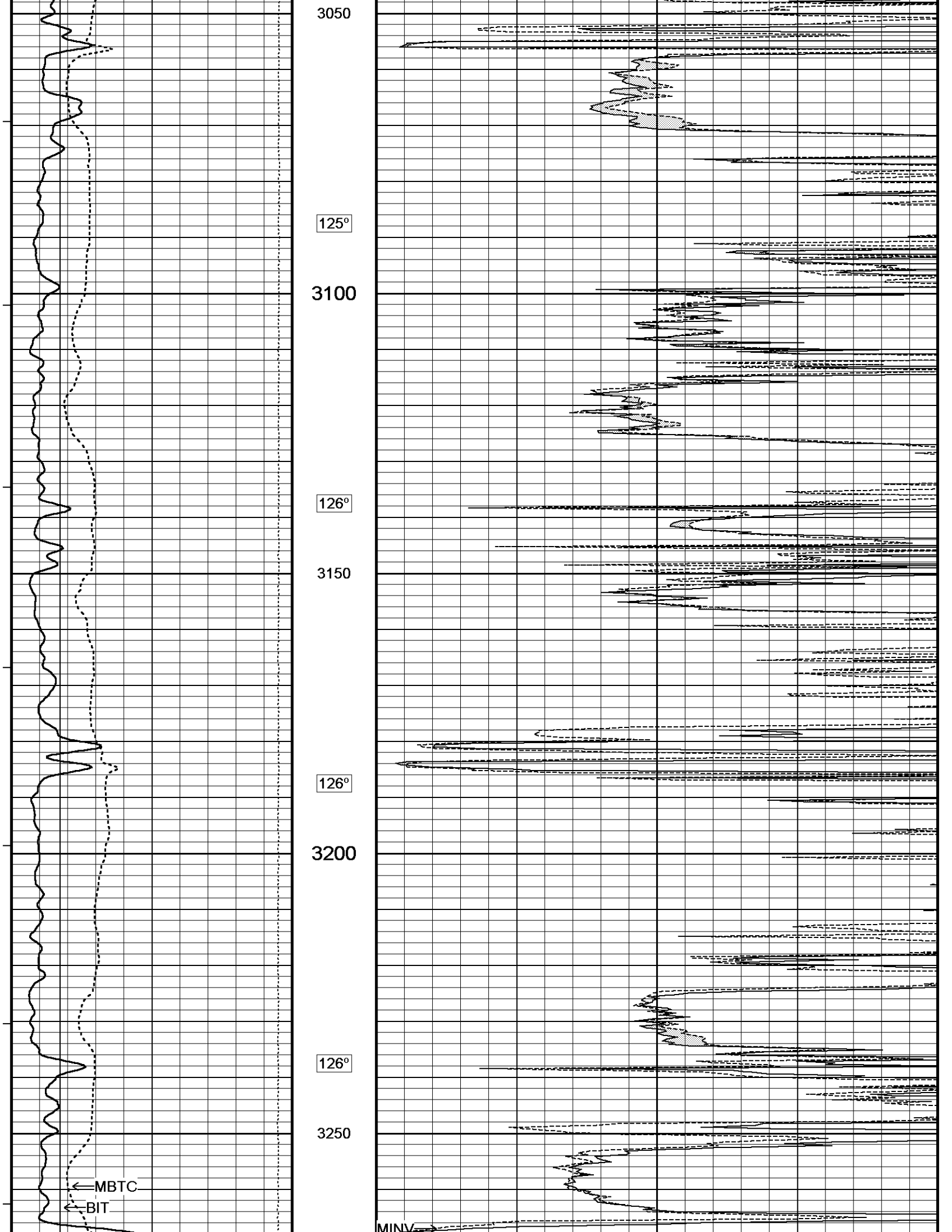
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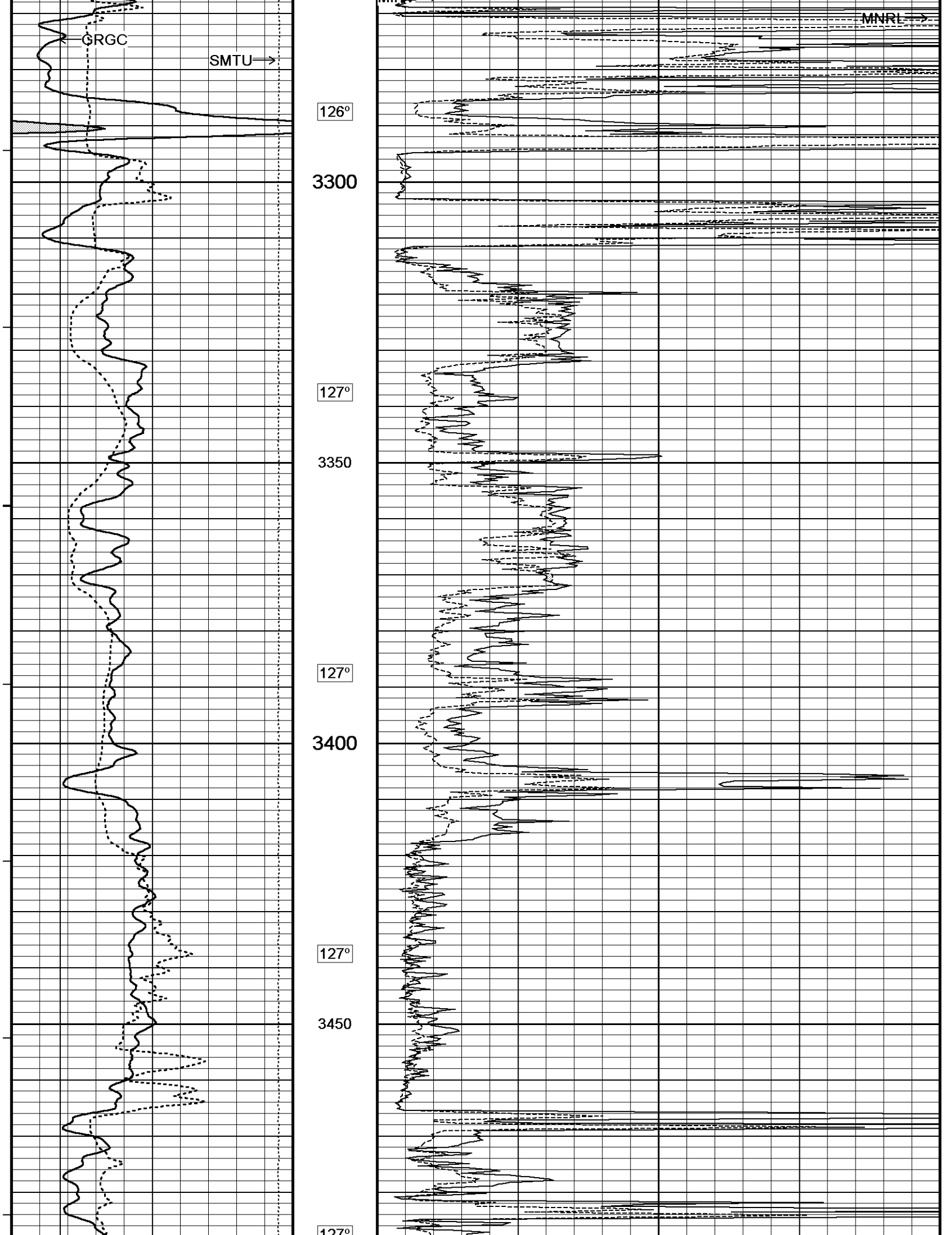
125°

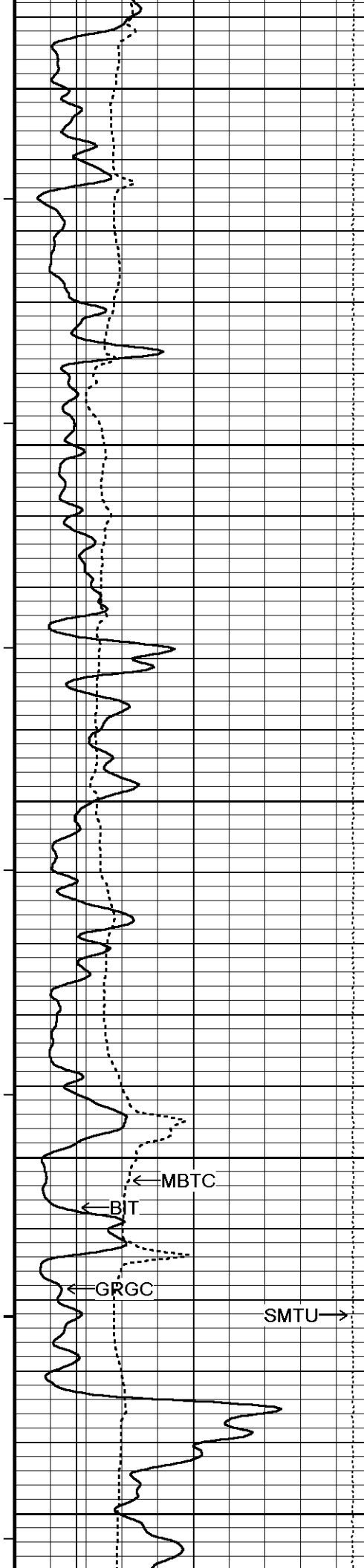
3000

125°

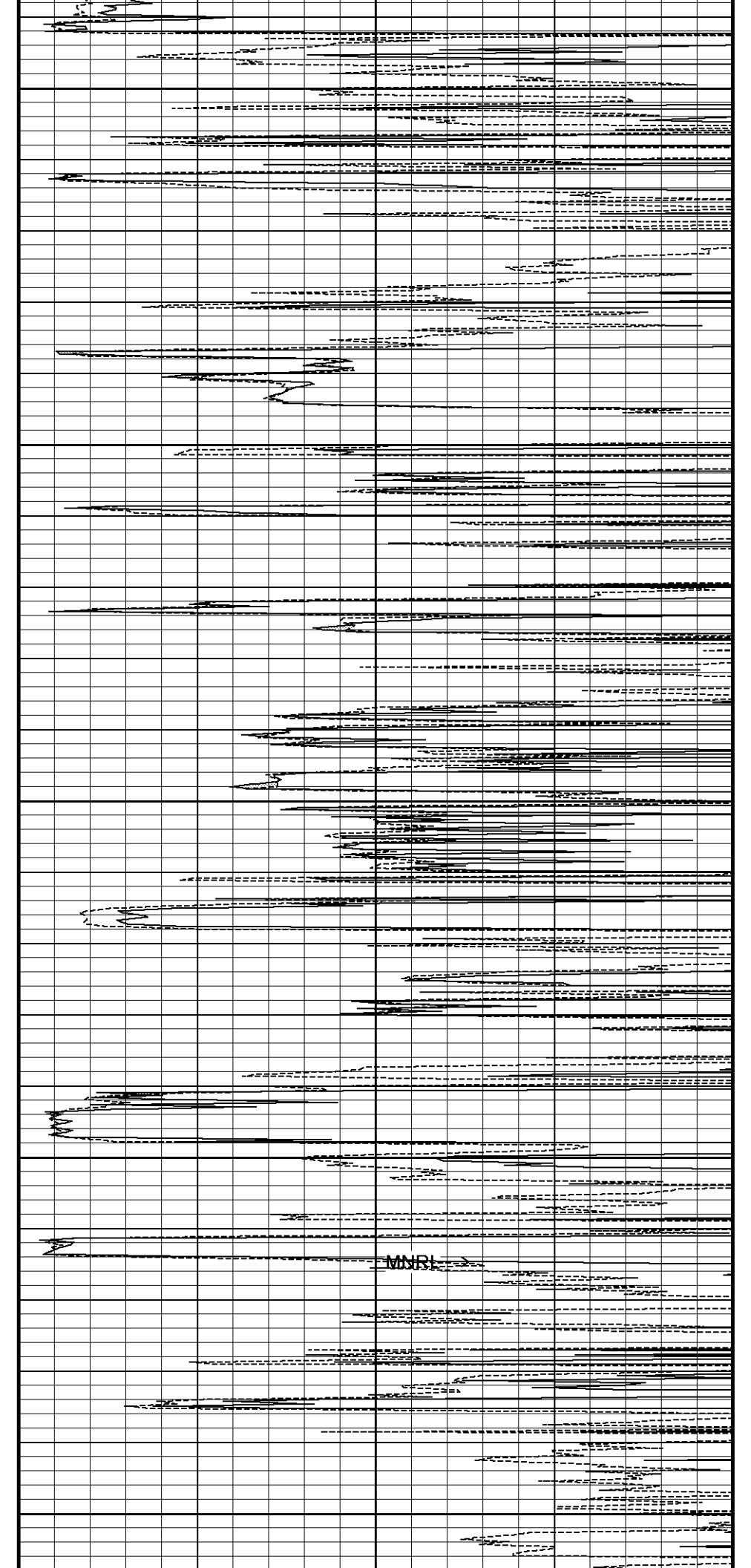


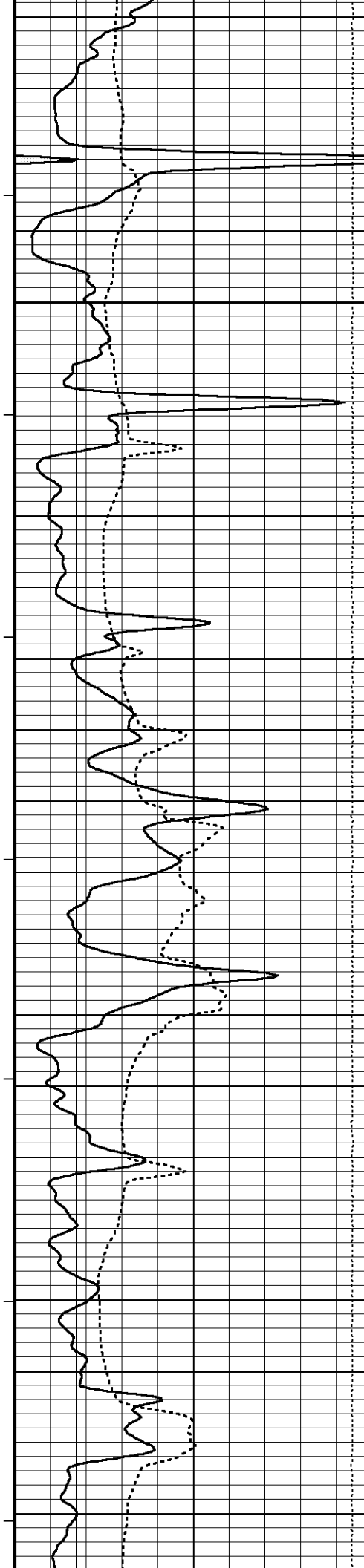






127  
3500  
127°  
3550  
128°  
3600  
128°  
3650  
128°  
3700





128°

3750

128°

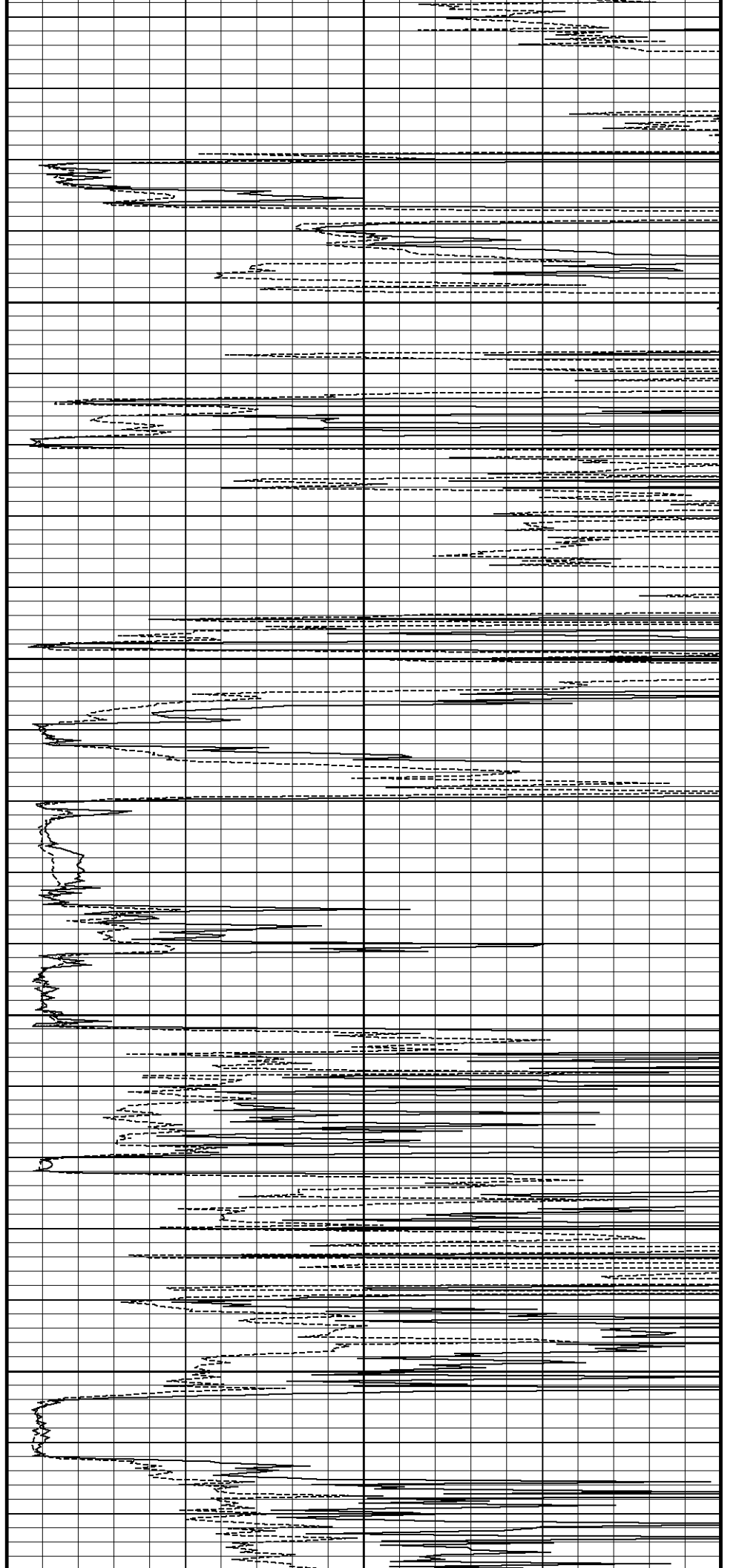
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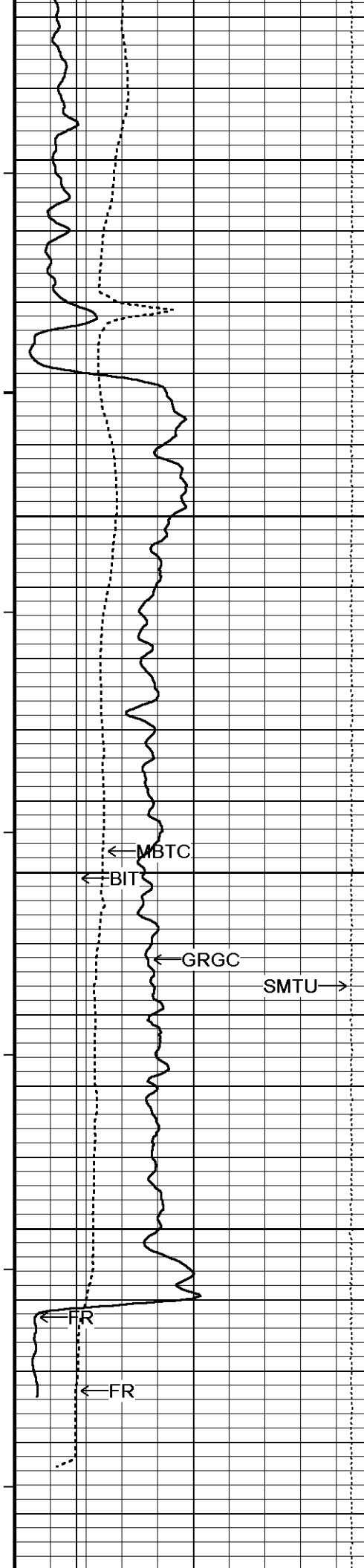
128°

3850

128°

3900





128°

3950

128°

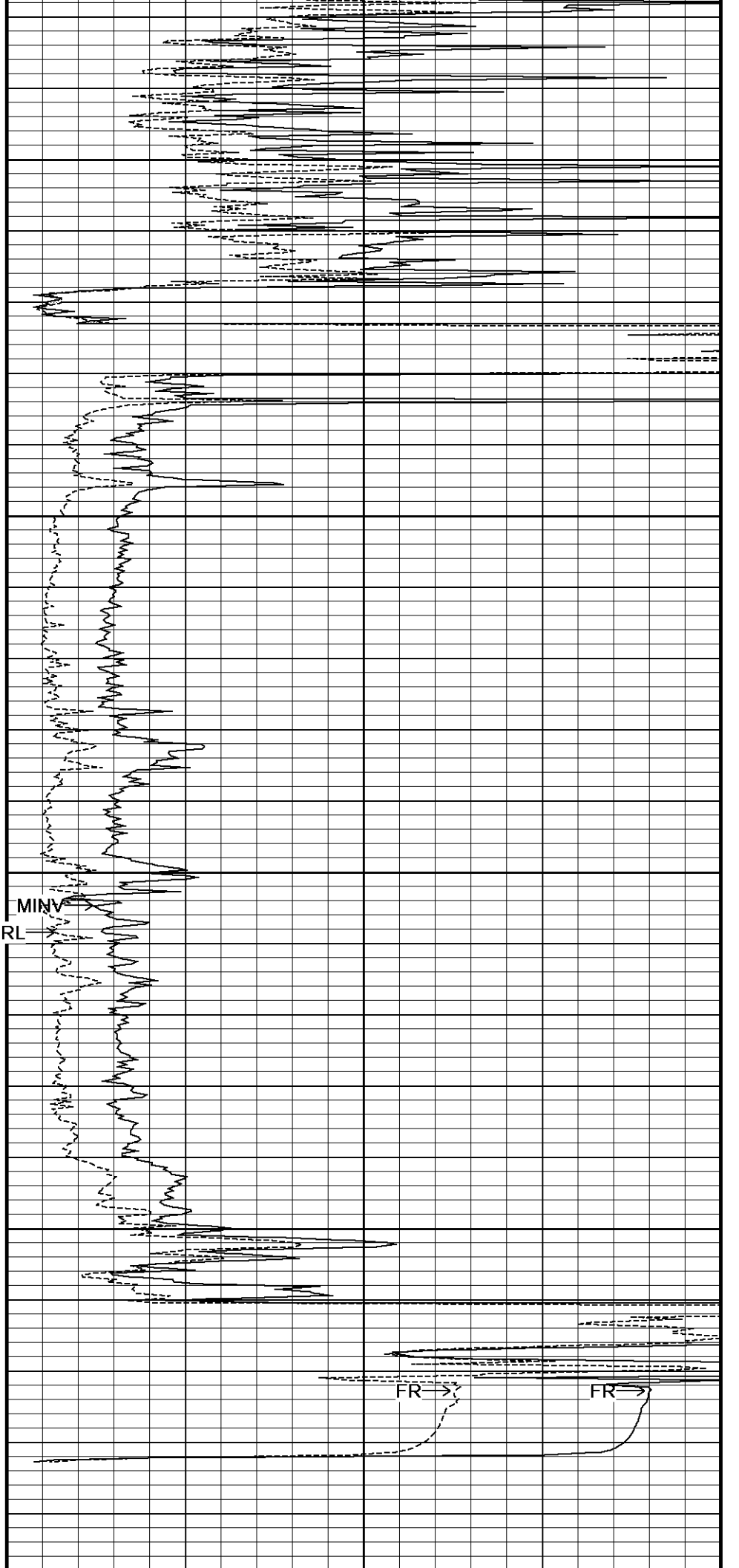
4000

128°

4050

128°

4100



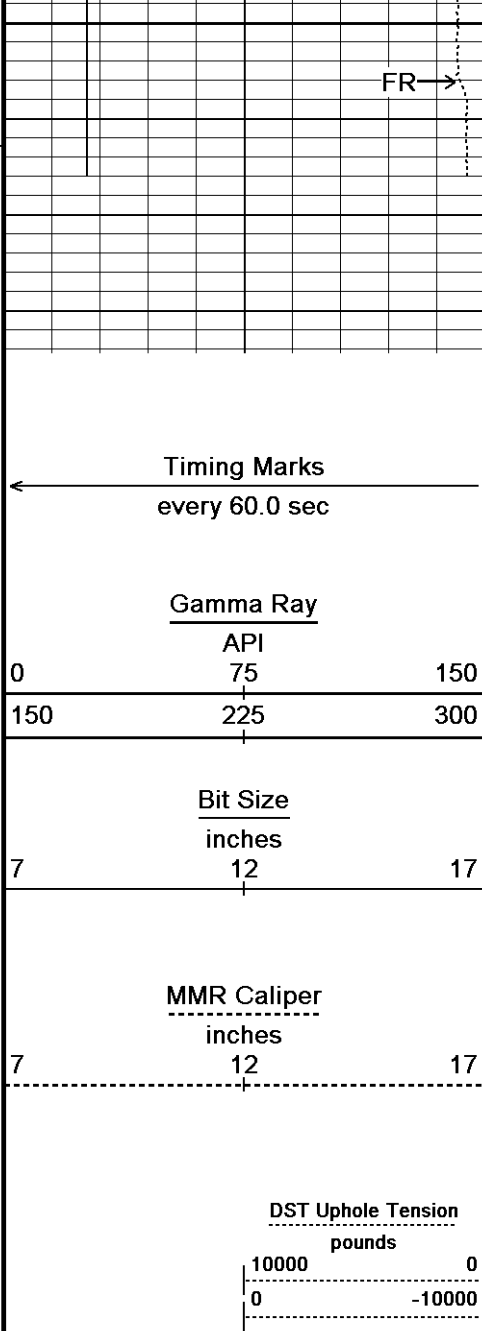
MINV

MNRL

FR

FR





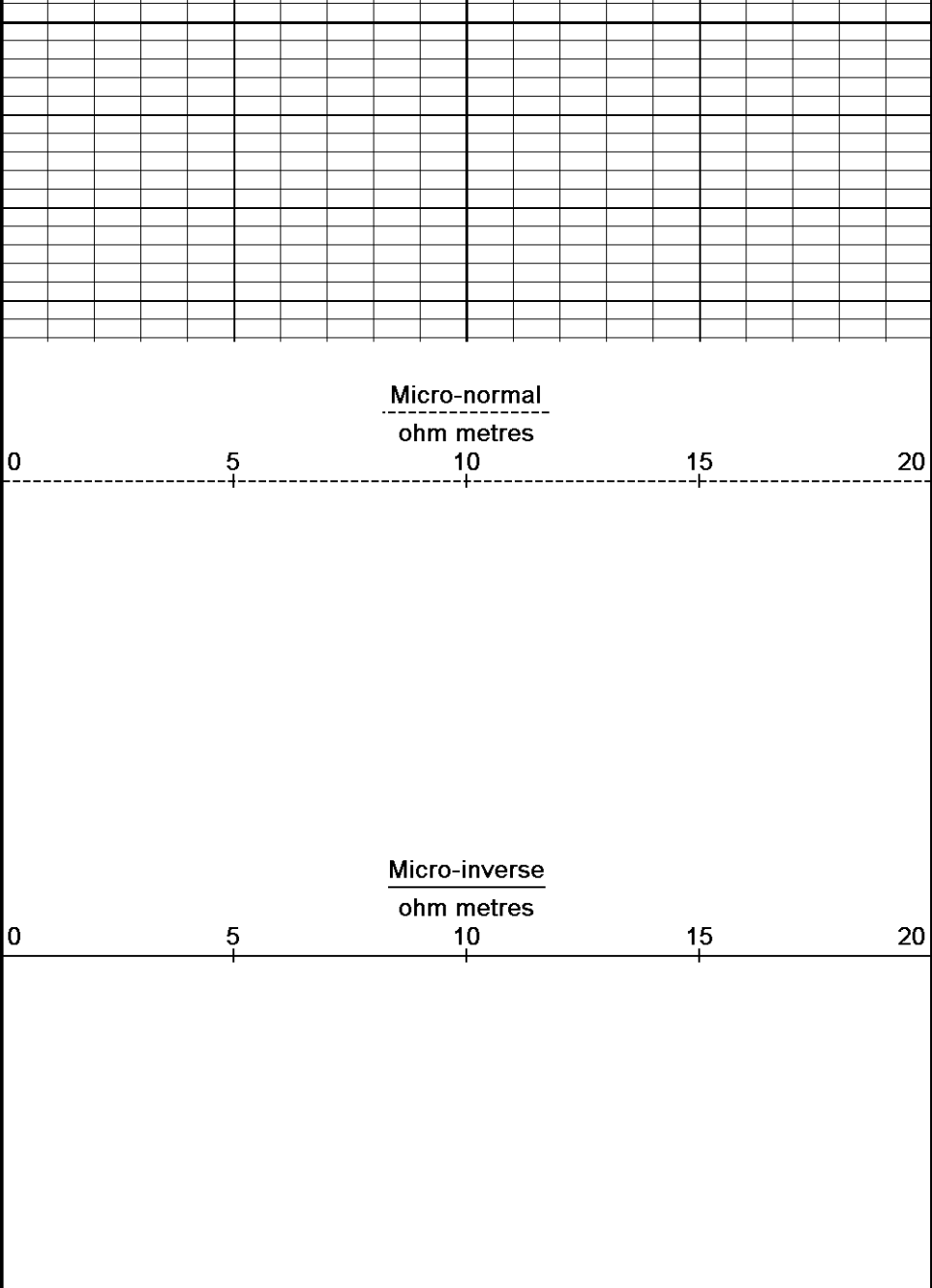
4150

4182

Depth in Feet

Borehole Temp in deg F

Replay Scale 1:240

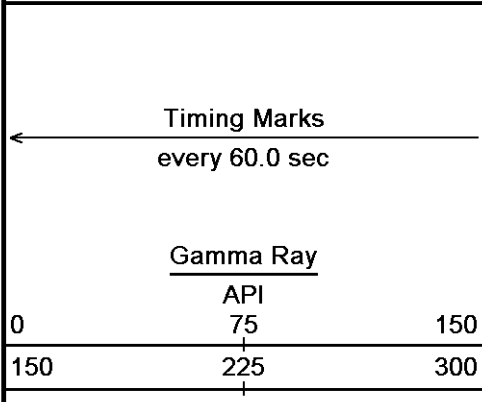


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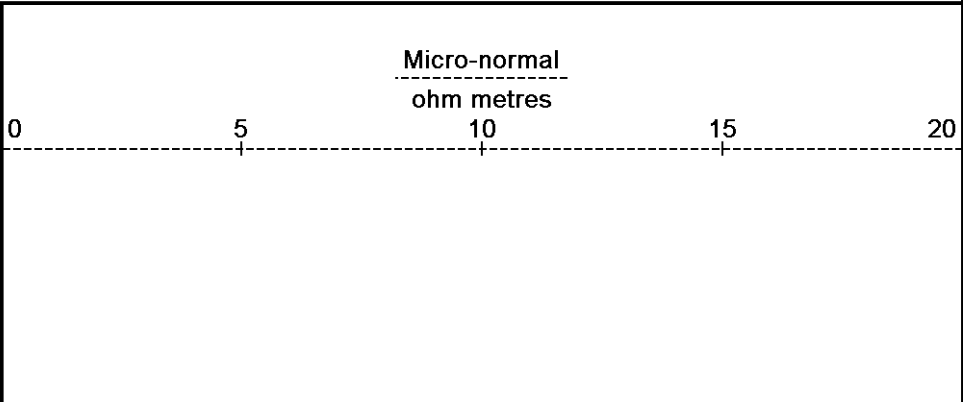
↑ 5 INCH MAIN LOG ↑

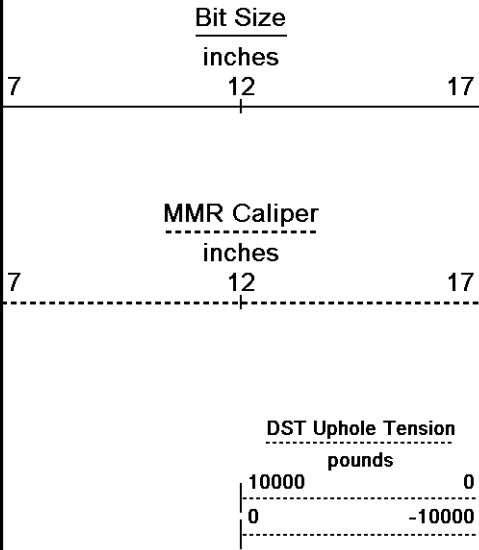
↓ 5 INCH REPEAT ↓

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 22-JUL-2013 22:13  
 Filename: C:\Program Files\Weatherford\WLS 13.04\DATA\UNIT PETRLOEUM (LOU...MAIN\_002.dta Recorded on 22-JUL-2013 19:21  
 System Versions: Logged with 13.04.8723 Processed with 13.04.8723 Plotted with 13.04.8723

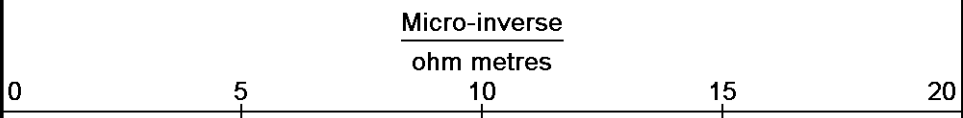


Depth in Feet

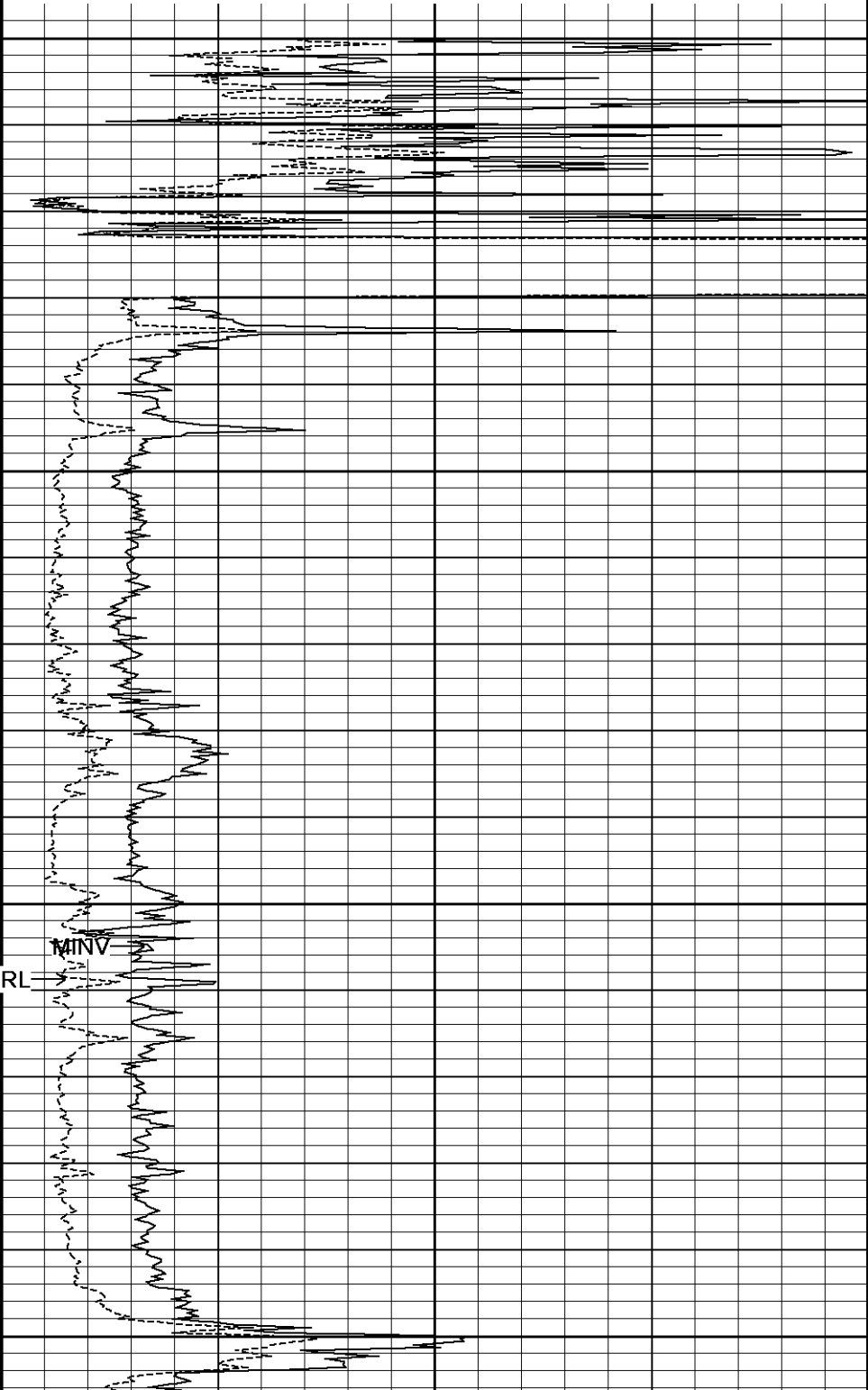
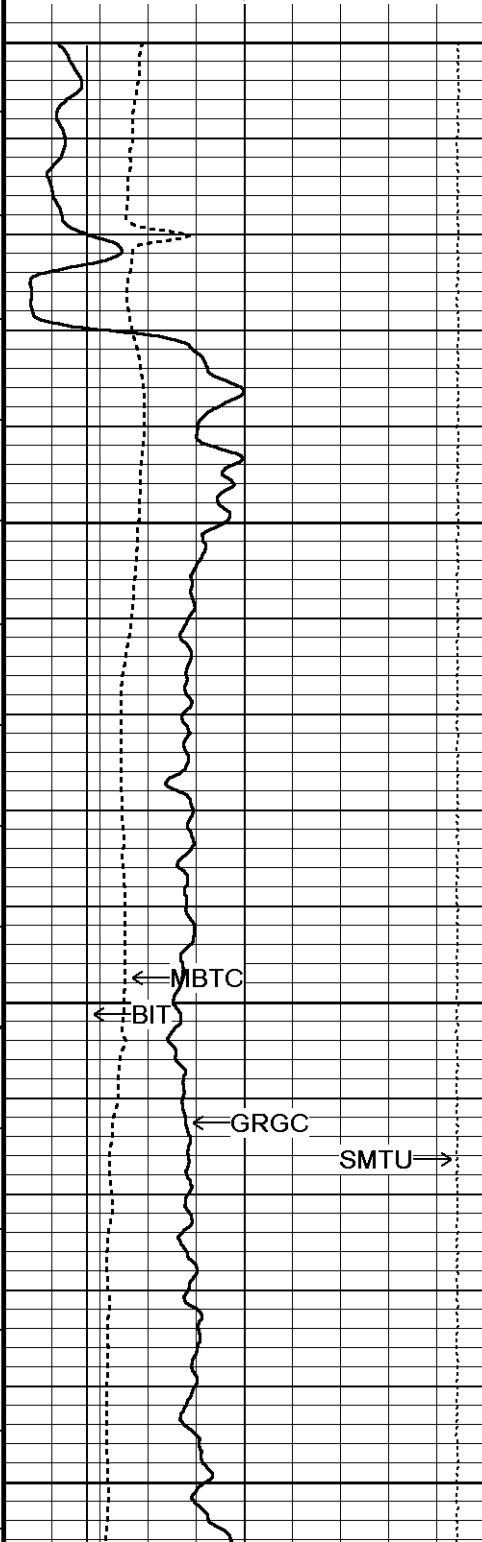


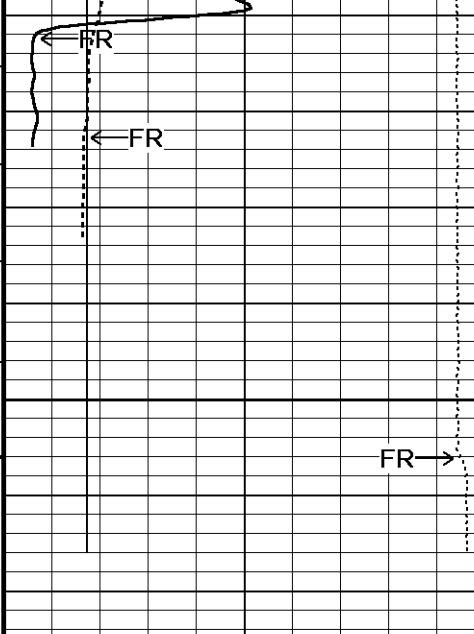


Borehole  
Temp in  
deg F



Replay  
Scale  
1:240



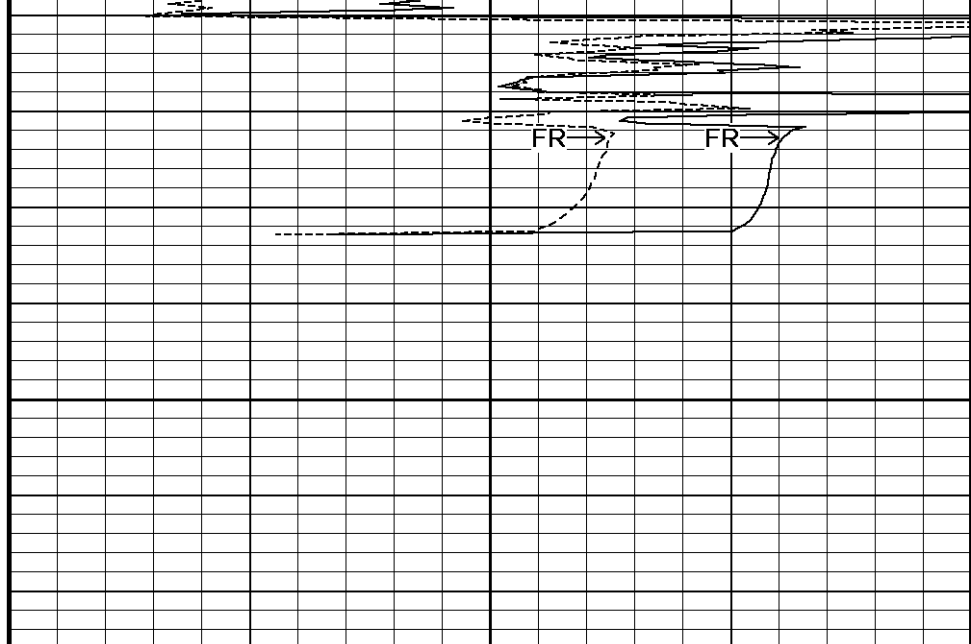


4150

FR →

4174

Depth  
in  
Feet



Timing Marks  
every 60.0 sec

Gamma Ray

API

75

0

150

225

150

300

Bit Size

inches

12

7

17

MMR Caliper

inches

12

7

17

DST Uphole Tension

pounds

10000

0

0

-10000

Borehole  
Temp in  
deg F

Replay  
Scale  
1:240

Depth Based Data - Maximum Sampling Increment 10.0cm

Plotted on 22-JUL-2013 22:13

Filename: C:\Program Files\Weatherford\WLS 13.04\DATA\UNIT PETRLOEUM (LOU...MAIN\_002.dta

Recorded on 22-JUL-2013 19:21

System Versions: Logged with 13.04.8723 Processed with 13.04.8723 Plotted with 13.04.8723



5 INCH REPEAT



**BEFORE SURVEY CALIBRATION**

C:\Program Files\Weatherford\WLS 13.04\DATA\UNIT PETRLOEUM (LOUDENBACK 7 #1)\MAIN.dta

General Constants All 000

Last Edited on 22-JUL-2013,17:46

**General Parameters**

Mud Resistivity 0.900 ohm-metres

Mud Resistivity Temperature 109.000 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	7.000	inches
Caliper for Differential Caliper	None	
Rwa Parameters		
Porosity used	Limestone Density Por.	
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 22-JUL-2013 18:50
Reading No	Measured	Calibrated (lbs)	
1	13022.91	0.00	
2	13023.63	375.00	

Gamma Calibration MCG-D.K 475			Field Calibration on 21-JUL-2013 22:42
	Measured	Calibrated (API)	
Background	38	14	
Calibrator (Gross)	1863	710	
Calibrator (Net)	1826	696	

Gamma Constants MCG-D.K 475			Last Edited on 22-JUL-2013,15:44
Gamma Calibrator Number	46		
Mud Density	1.13	gm/cc	
Caliper Source for Processing	Density Caliper		
Tool Position	Eccentred		
Concentration of KCl	0.00	kppm	

SP Calibration MCG-D.K 475			Field Calibration on 21-JUL-2013,22:50
	Measured	Calibrated (mV)	
Reference 1	100.0	100.0	
Reference 2	-100.0	-100.0	

High Resolution Temperature Calibration MCG-D.K 475			Field Calibration on 21-JUL-2013,22:50
	Measured	Calibrated(Deg F)	
Lower	50.00	50.00	
Upper	100.00	100.00	

High Resolution Temperature Constants MCG-D.K 475			Last Edited on 21-JUL-2013,23:00
Pre-filter Length	11		

Micro Normal and Micro Inverse Calibration MMR-B.A 68			Base Calibration on 28-JUN-2013,03:34	Field Check on 21-JUL-2013 22:05
Base Calibration				
		Measured	Calibrated (ohm-m)	
Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	11.9	58.8	5.0	25.0
Micro Inverse	15.5	77.0	5.0	25.0
Channel	Base Check (ohm-m)		Field Check (ohm-m)	
Micro Normal	77.5		77.5	
Micro Inverse	59.2		59.2	

Micro Normal and Micro Inverse Constants MMR-B.A 68			Last Edited on 04-JUN-2013,09:48
Pad Type	8-12 in Soft Rubber Inflatable 006-9011-159		
Micro Normal K Factor	1.0000		
Micro Inverse K Factor	1.0000		
Standoff Offset	0.0000		inches

Caliper Calibration MMR-B.A 68			Base Calibration on 28-JUN-2013,03:33	Field Calibration on 21-JUL-2013 22:18
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Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14007	5.96
2	17124	7.98
3	20434	9.94
4	24160	11.91
5	0	0.00
6	N/A	N/A

Field Calibration		
	Measured Caliper (in)	Actual Caliper (in)
	10.02	9.94

Neutron Calibration MDN-A.B 55 Base Calibration on 28-JUN-2013,03:34  
Field Check on 21-JUL-2013 22:50

Base Calibration					
	Measured		Calibrated (cps)		Ratio
	Near	Far	Near	Far	
	3091	97	3714	110	
	31.818		33.764		
Field Calibrator at Base					
			Calibrated (cps)		
			2024	3009	
			0.673		
Field Check					
			Calibrated (cps)		
			1226	1798	
			0.691		

Neutron Constants MDN-A.B 55 Last Edited on 21-JUL-2013,23:02

Neutron Source Id	P14033B	
Neutron Jig Number	NEC056	
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	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
Salinity Correction	Not Applied	
Formation Fluid Salinity Source	Constant Value	
Formation Fluid Salinity	0.00	kppm
Barite Mud Correction	Not Applied	

FE Calibration MFE-A.A 65 Base Calibration on 28-JUN-2013,03:35  
Field Check on 21-JUL-2013 22:03

Base Calibration		
	Measured	Calibrated (ohm-m)
Reference 1	9.7	1.3
Reference 2	956.6	126.8
Base Check		282.0
Field Check		281.9

FE Constants MFE-A.A 65 Last Edited on 21-JUL-2013,23:02

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 102

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

## High Resolution Temperature Constants MAI-A.A 102

Last Edited on 21-JUL-2013,23:03

Pre-filter Length 11

## Induction Calibration MAI-A.A 102

Base Calibration on 28-JUN-2013,03:36

Field Check on 21-JUL-2013 22:02

## Base Calibration

## Test Loop Calibration

Channel	Measured		Calibrated (mmho/m)	
	Low	High	Low	High
1	18.0	481.9	9.3	966.2
2	6.6	378.8	7.6	821.4
3	4.0	256.0	5.2	566.0
4	3.8	134.5	2.6	279.2

Array Temperature 86.5 Deg F

Channel	Base Check (mmho/m)		Field Check (mmho/m)	
	Low	High	Low	High
1			10.3	3806.1
2			27.8	3600.5
3			26.4	3128.4
4			14.7	2098.3
Deep			13.2	2016.9
Medium			42.2	4173.6
Shallow			45.3	5344.9

Array Temperature 90.8 Deg F

## Induction Constants MAI-A.A 102

Last Edited on 21-JUL-2013,23:03

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	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-B 165

Base Calibration on 19-JUL-2013 12:51  
Field Calibration on 21-JUL-2013,23:02

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	14317	4.01
2	22698	5.96
3	31426	7.98
4	39984	9.94
5	48822	11.91
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.99	7.98

Photo Density Calibration MPD-B 165

Base Calibration on 19-JUL-2013 13:22  
Field Check on 21-JUL-2013,23:02

Density Calibration

Base Calibration	Measured		Calibrated (sdu)	
	Near	Far	Near	Far
Reference 1	44710	22034	59869	31110
Reference 2	18707	2248	24557	2522

Field Check at Base

1138.1	1219.2
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Field Check

1138.1	1222.3
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PE Calibration

Base Calibration	WS	Measured		Calibrated Ratio
		WH	Ratio	
Background	206	1018		
Reference 1	18814	44541	0.428	0.369
Reference 2	5343	18579	0.293	0.271

Field Check at Base

206.3	1018.4
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Field Check

207.2	1015.6
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Density Constants MPD-B 165

Last Edited on 22-JUL-2013,15:44

Density Source Id	260
Nylon Calibrator Number	633
Aluminium Calibrator Number	633
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 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	0.00

SHA-J.B Compact Swivel Head Adaptor  
 SHA-J.B 592 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact Comms Gamma  
 MCG-D.K 475 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Micro-Resistivity  
 MMR-B.A 68 LG: 8.59 ft WT: 81.6 lb OD: 4.88 in

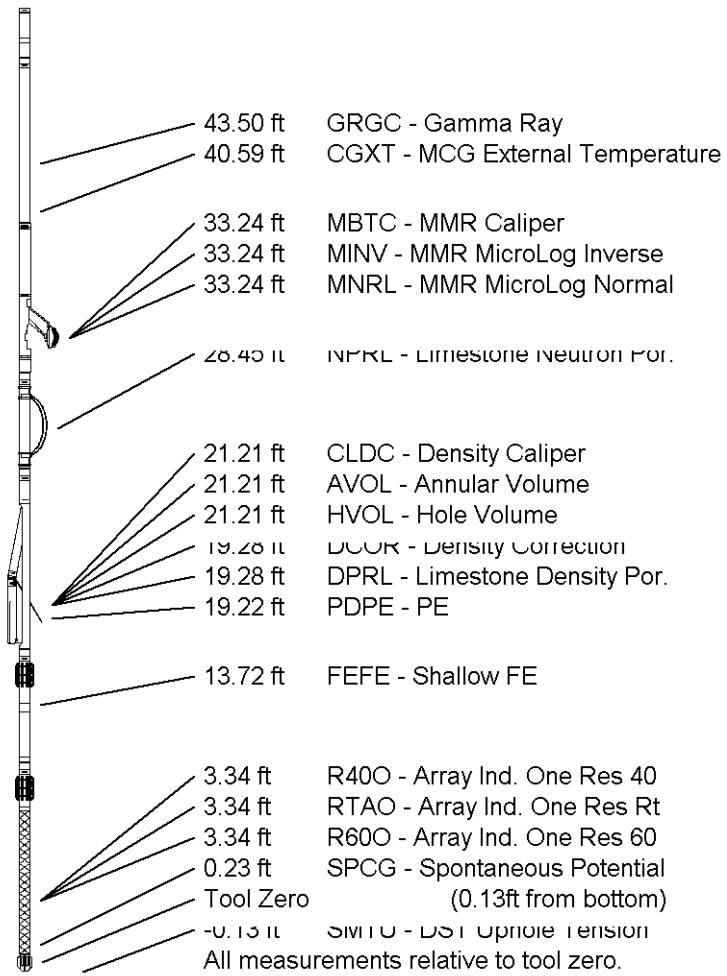
Compact Neutron  
 MDN-A.B 55 LG: 5.04 ft WT: 50.7 lb OD: 2.24 in

Compact Density/Caliper  
 MPD-B 165 LG: 9.59 ft WT: 90.4 lb OD: 2.45 in

Compact Focussed Electric  
 MFE-A.A 65 LG: 6.05 ft WT: 48.5 lb OD: 2.24 in

Compact Induction  
 MAI-A.A 102 LG: 10.81 ft WT: 48.5 lb OD: 2.24 in

Total Length: 51.08 ft Weight: 405.7 lb



COMPANY	UNIT PETROLEUM COMPANY
WELL	LOUDENBACK 7 #1
FIELD	WILDCAT
PROVINCE/COUNTY	RENO
COUNTRY/STATE	U.S.A. / KANSAS

Elevation Kelly Bushing	1784.00	feet	First Reading	4122.00	feet
Elevation Drill Floor	1785.00	feet	Depth Driller	4158.00	feet
Elevation Ground Level	1770.00	feet	Depth Logger	4156.00	feet



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MICRO-RESISTIVITY LOG