



Weatherford

MICRORESISTIVITY LOG

COMPANY			MID-CON ENERGY OPERATING		
WELL			HRMU 11-13		
FIELD			HARKER RANCH MORROW UNIT		
PROVINCE/COUNTY			CHEYENNE		
COUNTRY/STATE			U.S.A. / COLORADO		
LOCATION			600' FNL & 760' FWL		
SEC 13	TWP 13S	RGE 43W	Other Services		MPD/MDN
Latitude		MAI/MFE			
Longitude					
API Number		05-017-07793			
Permanent Datum GL, Elevation 4091 feet					
Log Measured From KB					
Drilling Measured From KB @ 16.6					
Date	19-AUG-2014				Elevations: KB 4107.60 DF 4105.60 GL 4091.00
Run Number	ONE				
Service Order	7606-95666857				
Depth Driller	5450.00				feet
Depth Logger	5451.00				feet
First Reading	5417.76				feet
Last Reading	4450.00				feet
Casing Driller	442.00				feet
Casing Logger	442.00				feet
Bit Size	7.875				inches
Hole Fluid Type	CHEMICAL				
Density / Viscosity	9.40 lb/USg		60.00 CP		
PH / Fluid Loss	8.00		10.40 ml/30Min		
Sample Source	MUDPIT				
Rm @ Measured Temp	1.12 @ 75.0		ohm-m		
Rmf @ Measured Temp	0.89 @ 75.0		ohm-m		
Rmc @ Measured Temp	1.34 @ 75.0		ohm-m		
Source Rmf / Rmc	CALC	CALC			
Rm @ BHT	0.58 @148.0		ohm-m		
Time Since Circulation	4 HOURS				
Max Recorded Temp	148.00		deg F		
Equipment / Base	13057	LIB			
Recorded By	BEN WELDIN				
Witnessed By	CHRIS BEAN				
JOB#	LB14-243				

BOREHOLE RECORD

Last Edited: 19-AUG-2014 20:56

Bit Size inches	Depth From feet	Depth To feet
12.250	0.00	425.00
7.875	425.00	5450.00

CASING RECORD

Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft
SURFACE	8.625	0.00	425.00	24.00

REMARKS

- SOFTWARE ISSUE: WLS 13.08.2113
- TOOL STRING: MCG, MML, MDN, MPD, MFE, MAI RUN IN COMBINATION
- HARDWARE:
 - MDN: DUAL BOWSPRING ECCENTRALIZER
 - MFE: 1 X 0.5 INCH STANDOFF
 - MAI: 2 X 0.5 INCH STANDOFF
- 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: 1830 CU. FT.

- ANNULAR HOLE VOLUME WITH 5.5 INCH CASING FROM TD TO SURFACE CASING FT.: 1000 CU. FT.

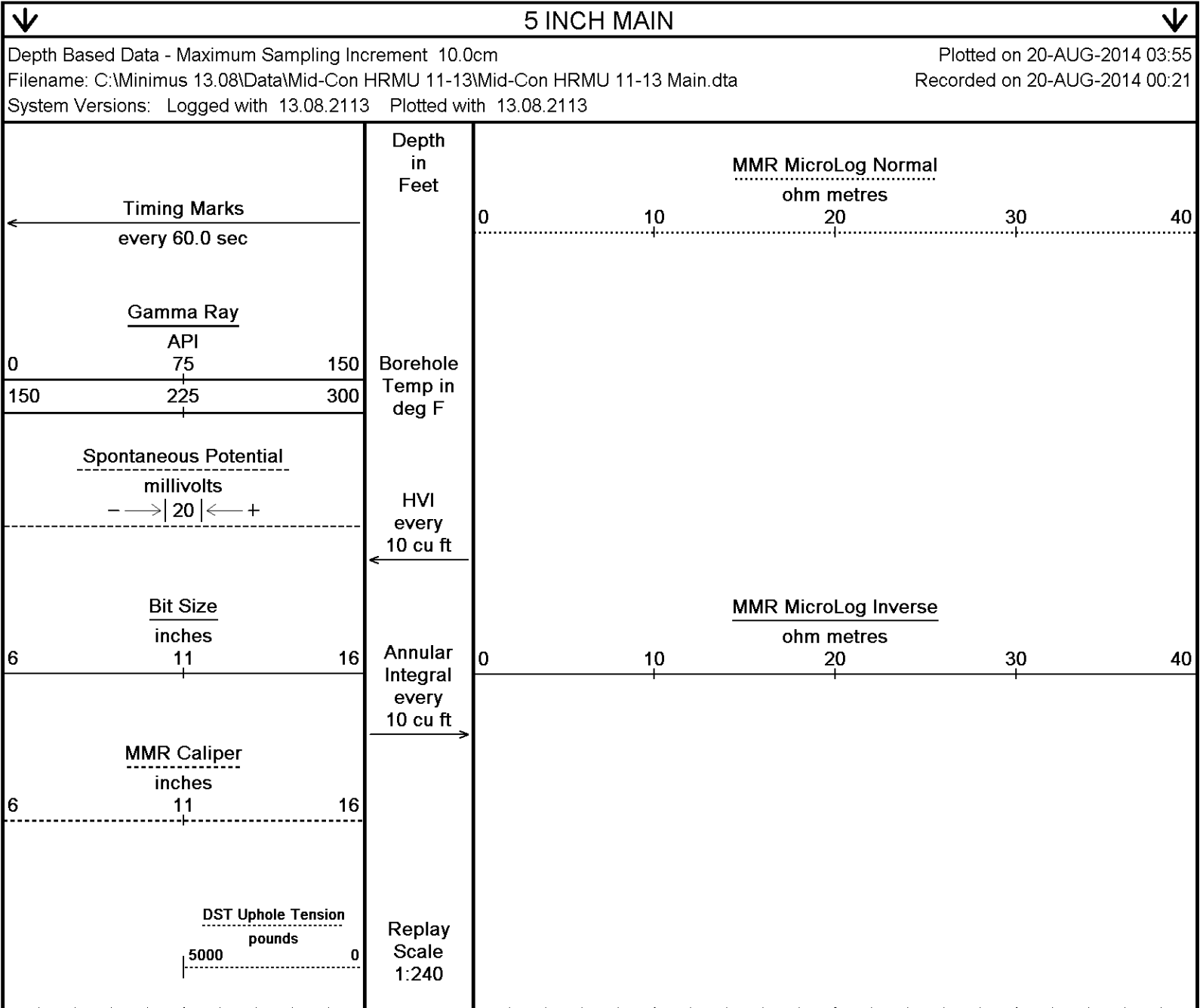
- RIG: WILDCAT DRILLING RIG #1

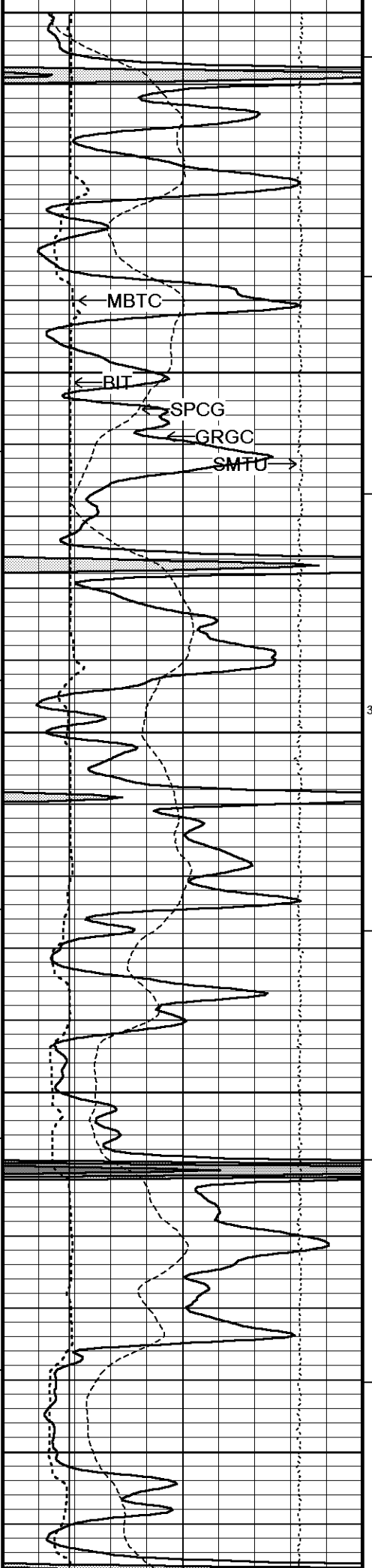
- SERVICE ORDER #: 7606-95666847

- ENGINEER: BEN WELDIN

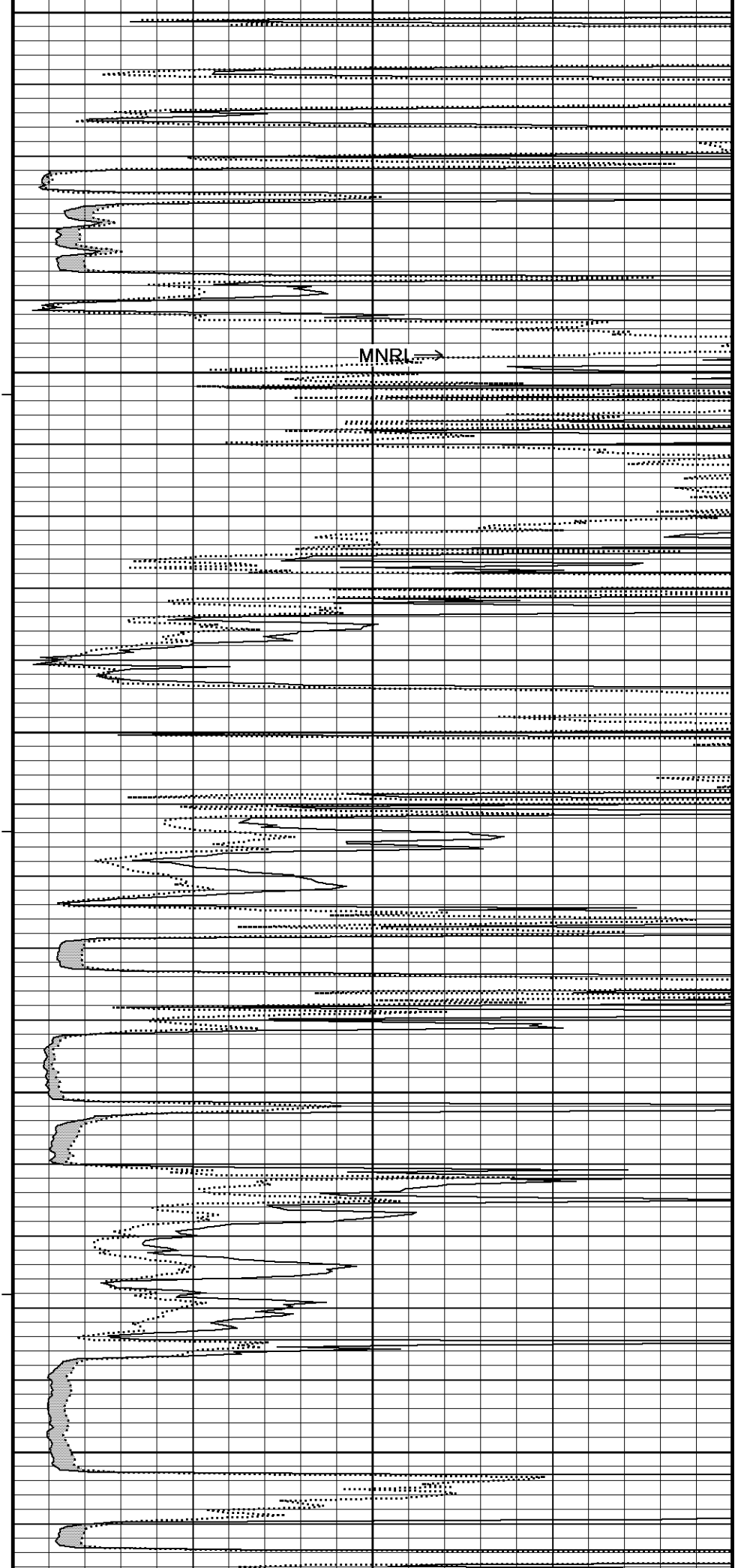
- OPERATOR: KEN RINEHART

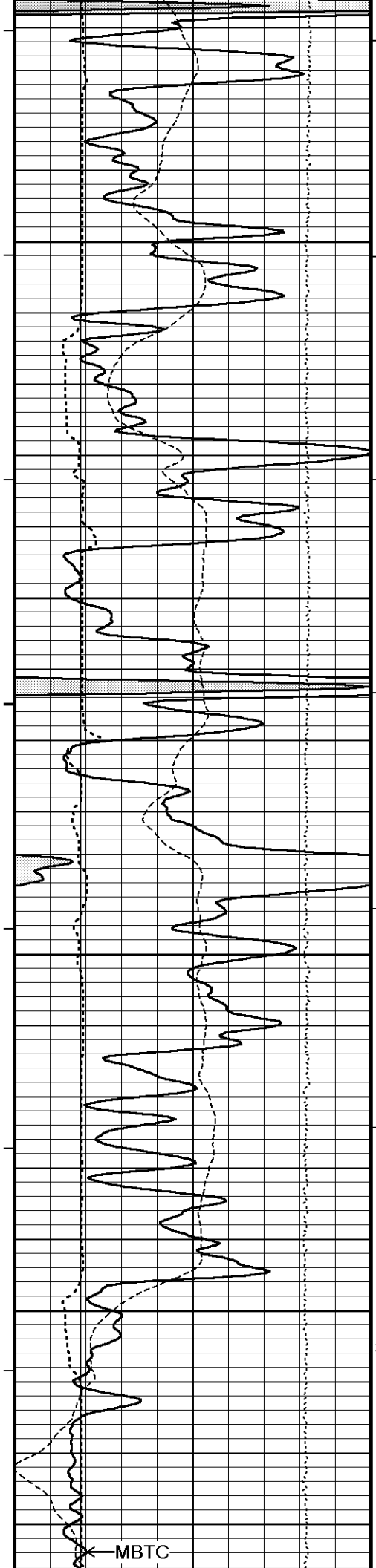
In interpreting, communicating or providing information and/or making recommendations, either written or oral, as to logs or test or other data, type or amount of material, or Work or other service to be furnished, or manner of performance, or in predicting results to be obtained, the Contractor will give the Company the benefit of the Contractor's best judgment based on its experience and will perform all such Work in a good and workmanlike manner. Any interpretation of test or other data, and any recommendation or reservoir description based upon such interpretations, are opinions based upon inferences from measurements and empirical relationships and assumptions, which inferences and assumptions are not infallible, and with respect to which professional engineers and analysts may differ. ACCORDINGLY ANY INTERPRETATION OR RECOMMENDATION RESULTING FROM THE SERVICES WILL BE AT THE SOLE RISK OF THE COMPANY, AND THE CONTRACTOR CANNOT AND DOES NOT WARRANT THE ACCURACY, CORRECTNESS OR COMPLETENESS OF ANY SUCH INTERPRETATION OR RECOMMENDATION, WHICH INTERPRETATIONS AND RECOMMENDATIONS SHOULD NOT, THEREFORE, UNDER ANY CIRCUMSTANCES BE RELIED UPON AS THE SOLE OR MAIN BASIS FOR ANY DRILLING, COMPLETION, WELL TREATMENT, PRODUCTION OR FINANCIAL DECISION, OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING ACTIVITY, DRILLING RIG OR ITS CREW OR ANY OTHER INDIVIDUAL. THE COMPANY HAS FULL RESPONSIBILITY FOR ALL DECISIONS CONCERNING THE SERVICES.





4450
138°
4500
139°
300
4550
139°
4600
140°
4650





140°

4700

140°

4750

141°

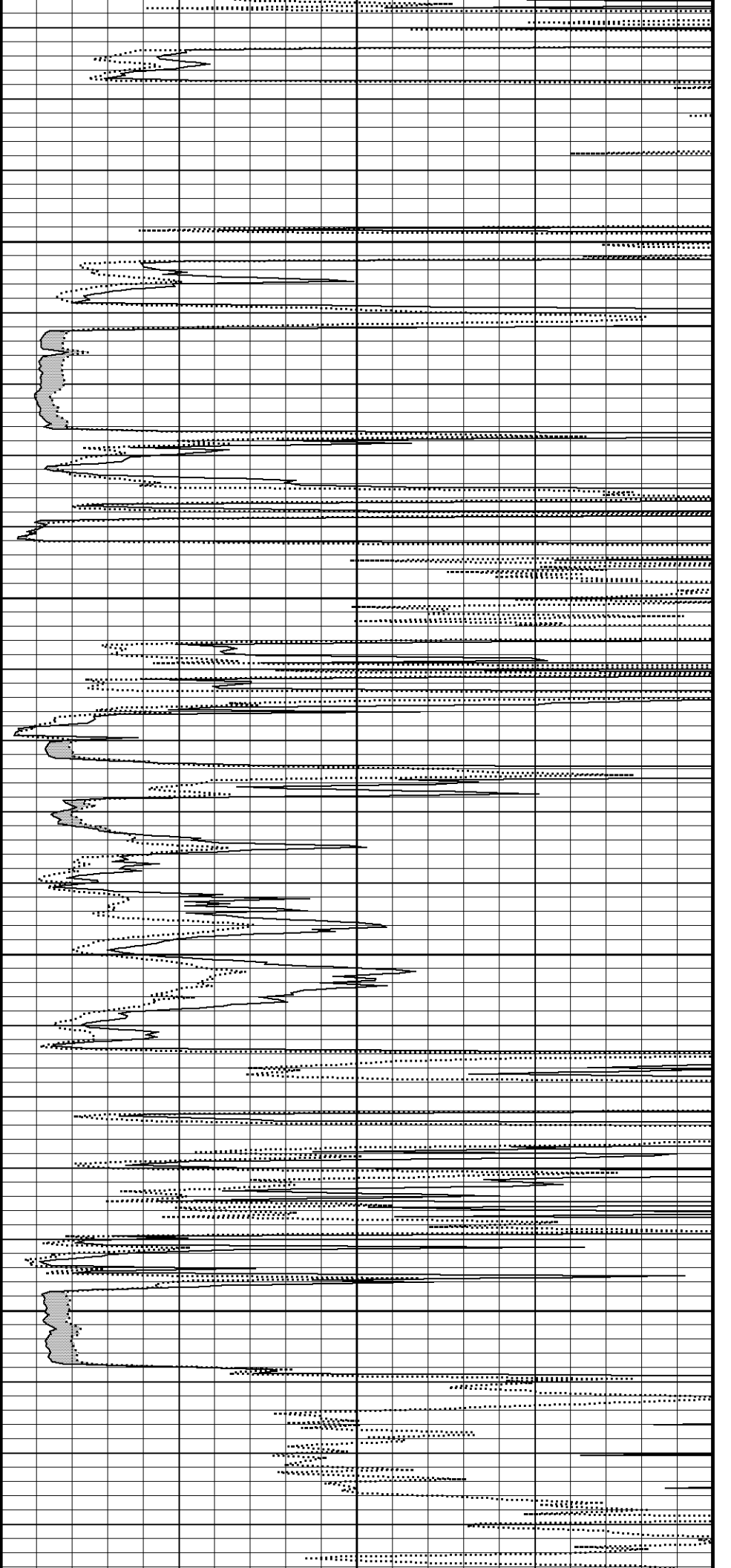
4800

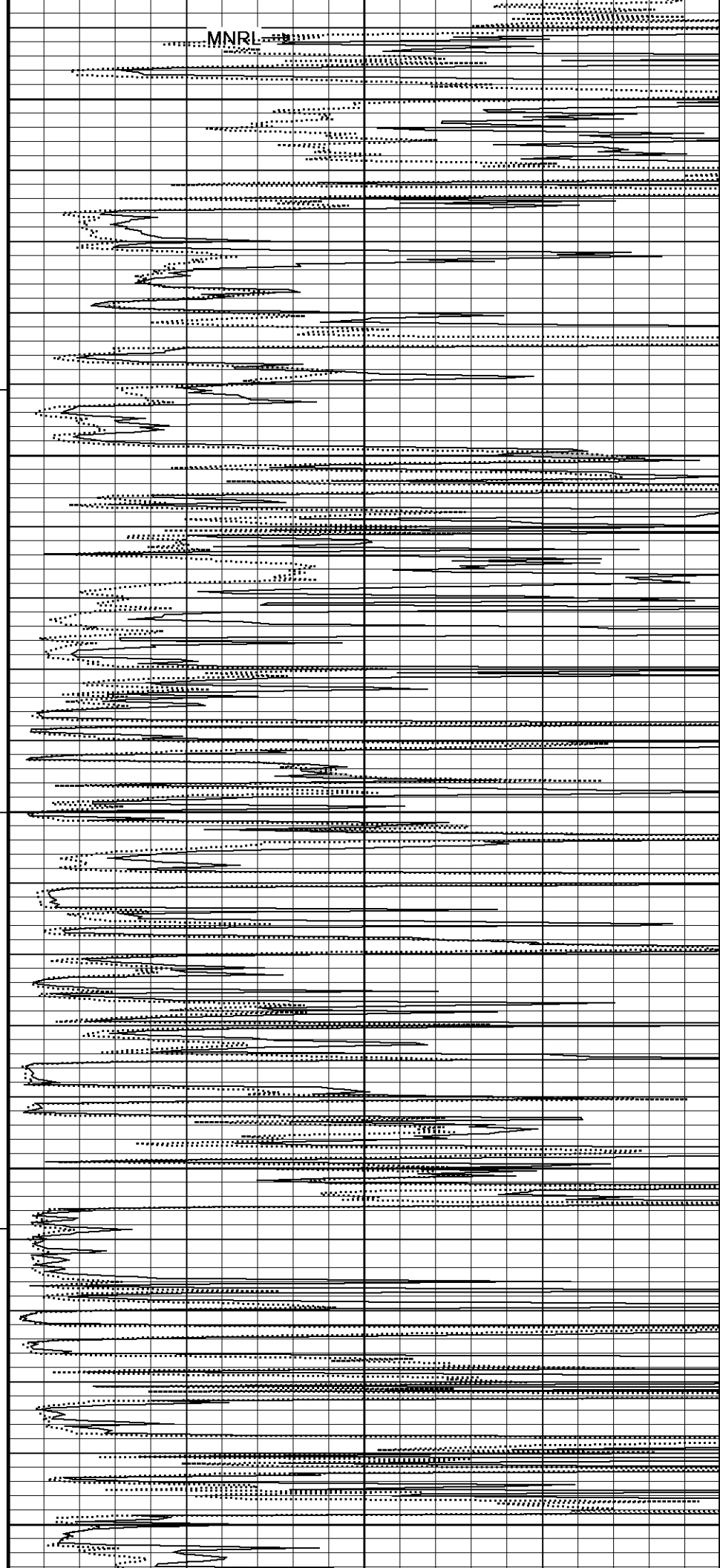
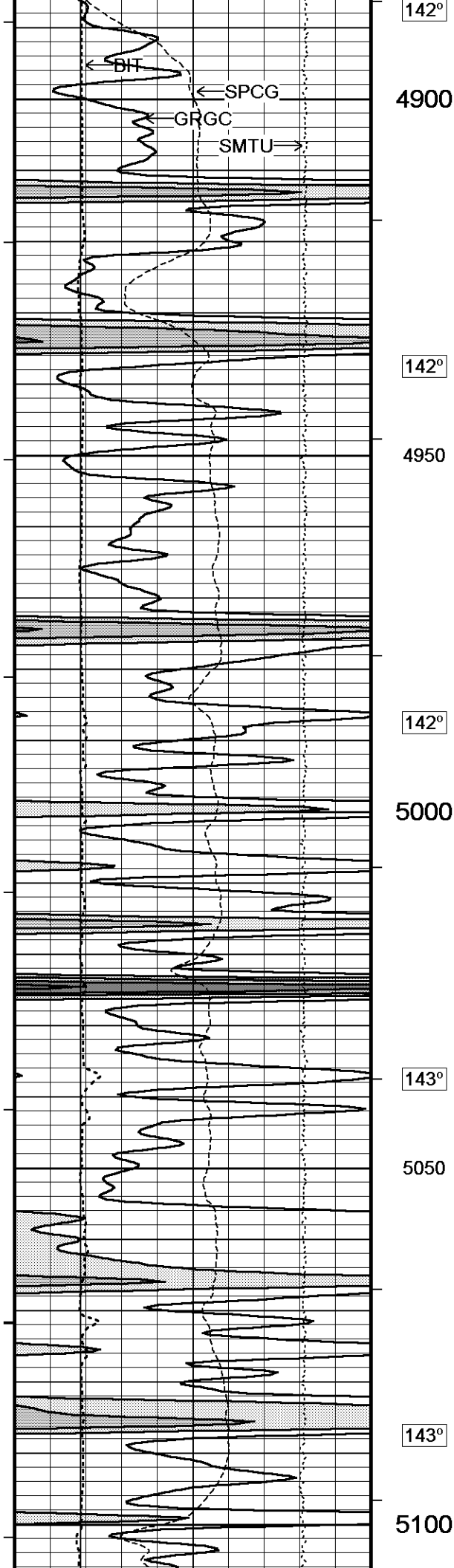
141°

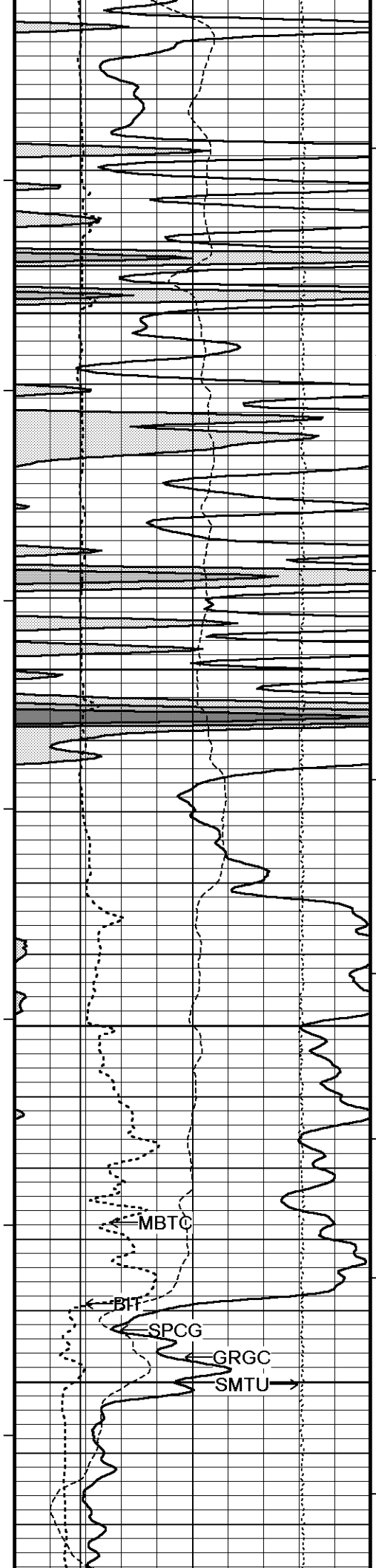
4850

200

100







144°

5150

100

144°

5200

144°

5250

MBTC

BIT

SPCG

GRGC

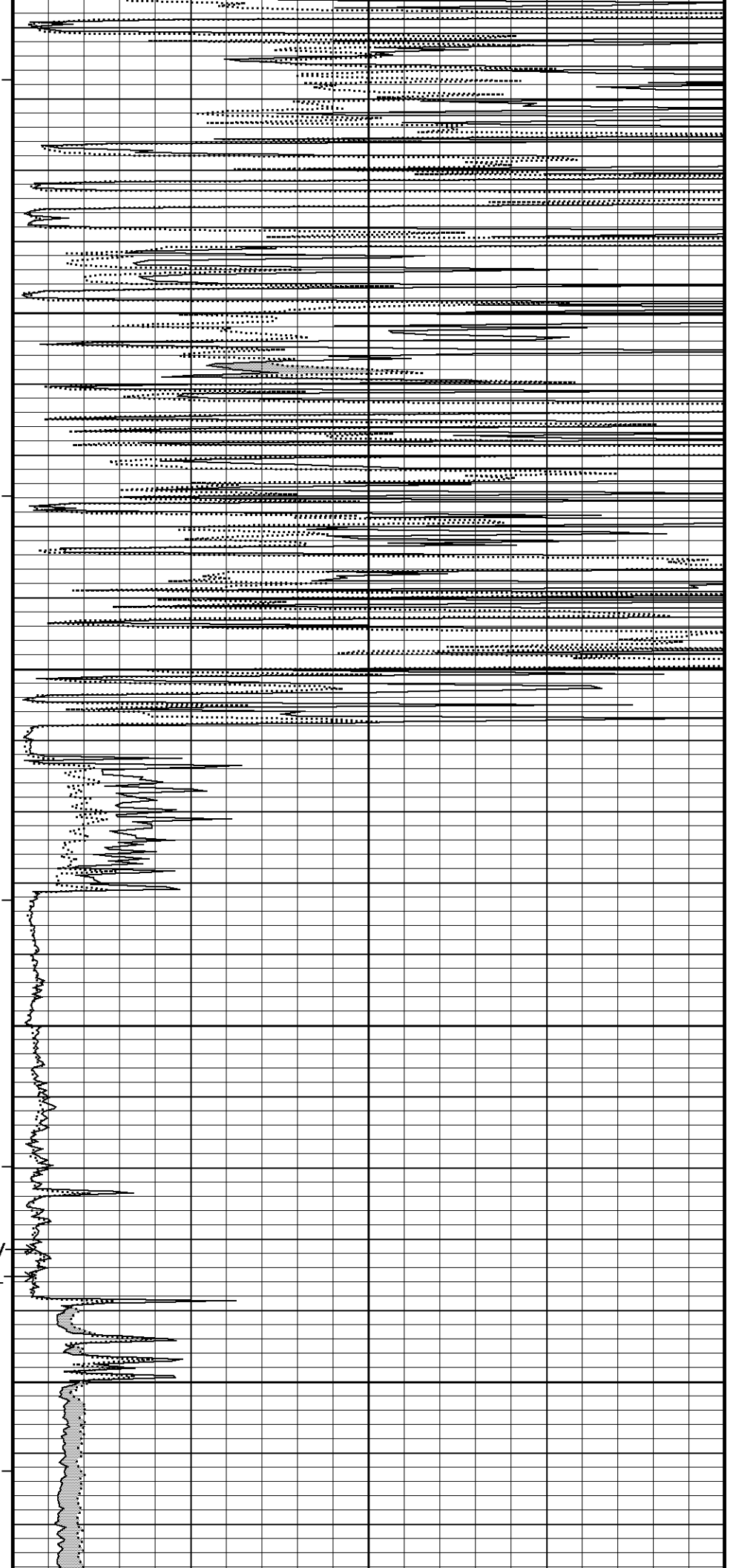
SMTU

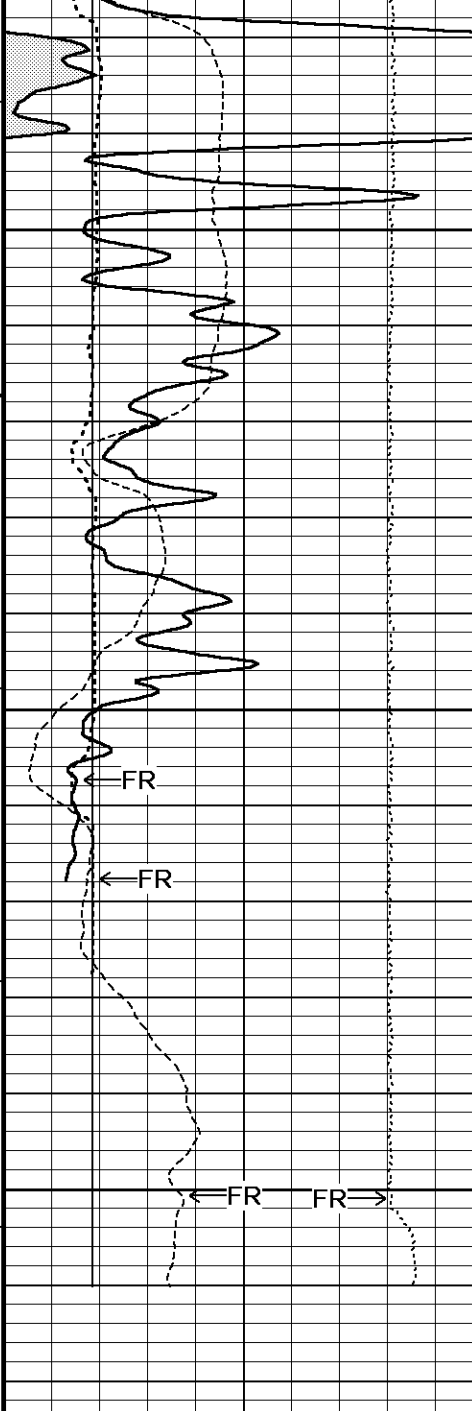
5300

MINV

MNRL

147°





148°

5350

148°

5400

5450

Depth
in
Feet

Timing Marks
every 60.0 sec

Gamma Ray
API
0 75 150
150 225 300

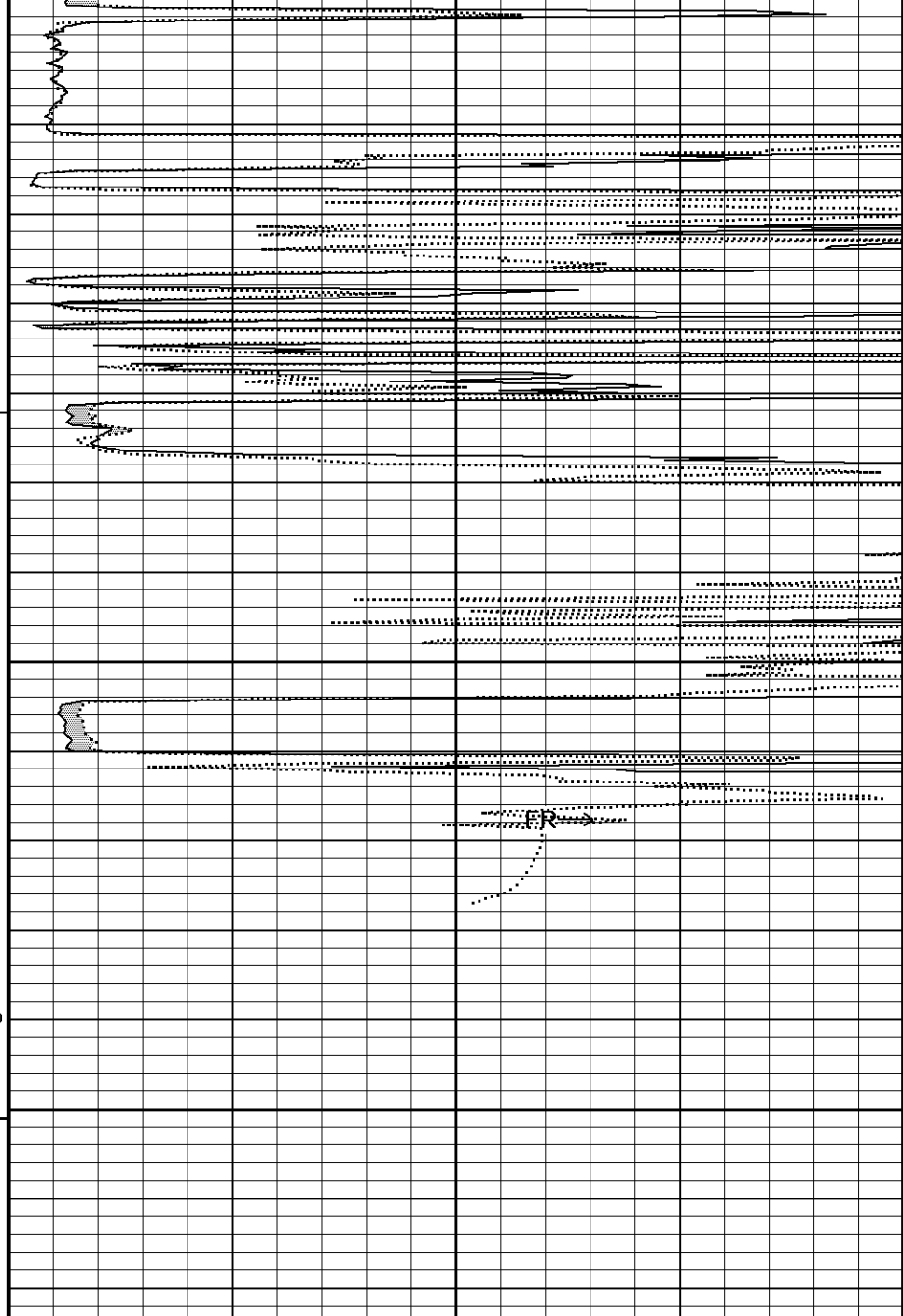
Borehole
Temp in
deg F

Spontaneous Potential
millivolts
—→ | 20 | ← +

HVI
every
10 cu ft

Bit Size
inches

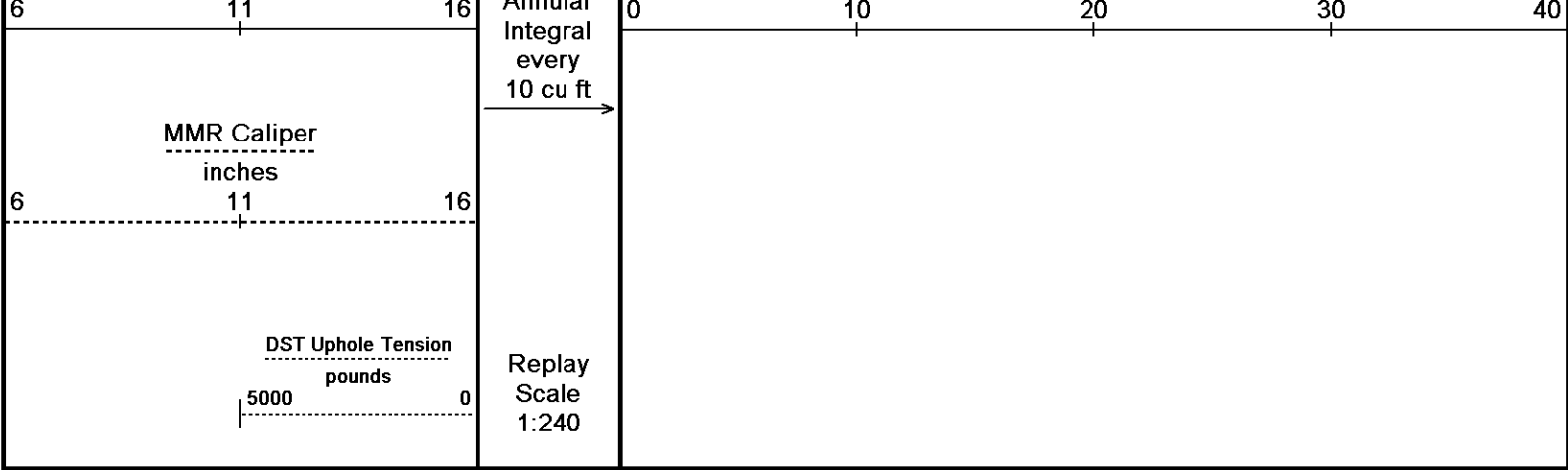
Annular



MMR MicroLog Normal
ohm metres

0 10 20 30 40

MMR MicroLog Inverse
ohm metres



Depth Based Data - Maximum Sampling Increment 10.0cmPlotted on 20-AUG-2014 03:55

Filename: C:\Minimus 13.08\Data\Mid-Con HRMU 11-13\Mid-Con HRMU 11-13 Main.dtaRecorded on 20-AUG-2014 00:21

System Versions: Logged with 13.08.2113 Plotted with 13.08.2113

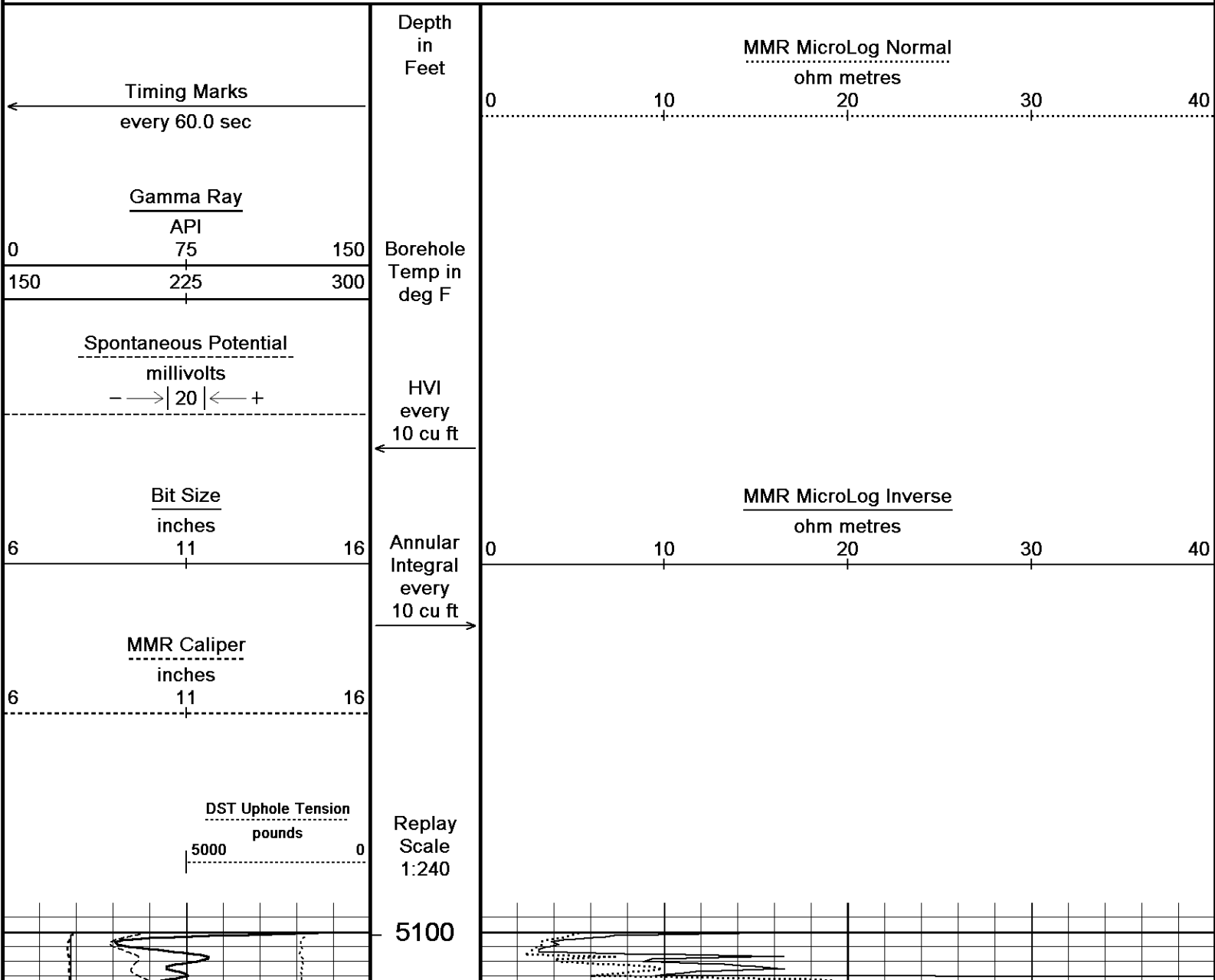
↑5 INCH MAIN↑

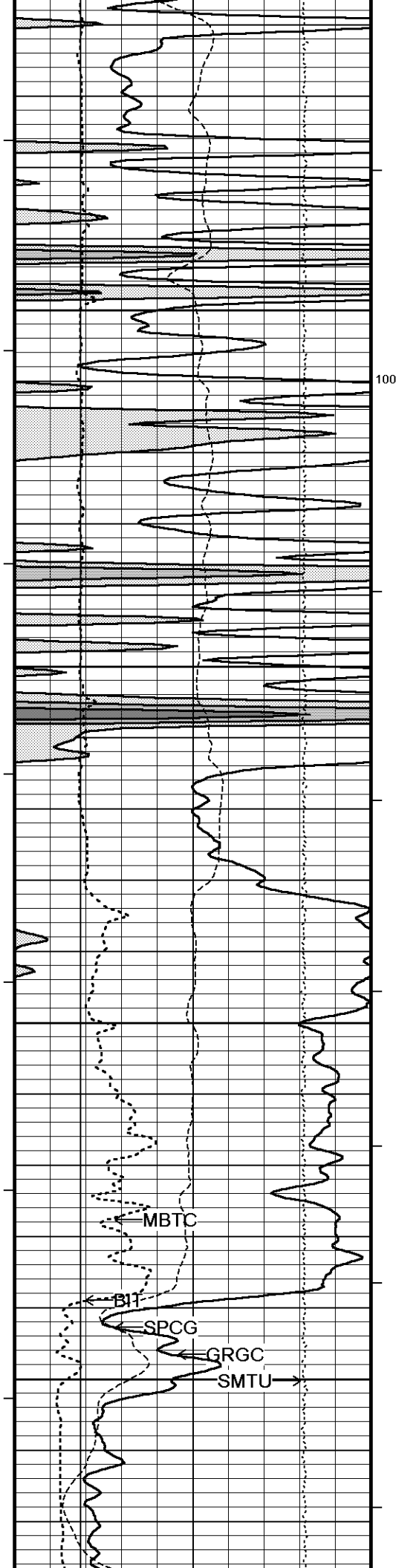
↓REPEAT SECTION↓

Depth Based Data - Maximum Sampling Increment 10.0cmPlotted on 20-AUG-2014 03:55

Filename: C:\Minimus 13.08\Data\Mid-Con HRMU 11-13\Mid-Con HRMU 11-13 Repeat.dtaRecorded on 19-AUG-2014 23:43

System Versions: Logged with 13.08.2113 Plotted with 13.08.2113





142°

5150

100

142°

5200

142°

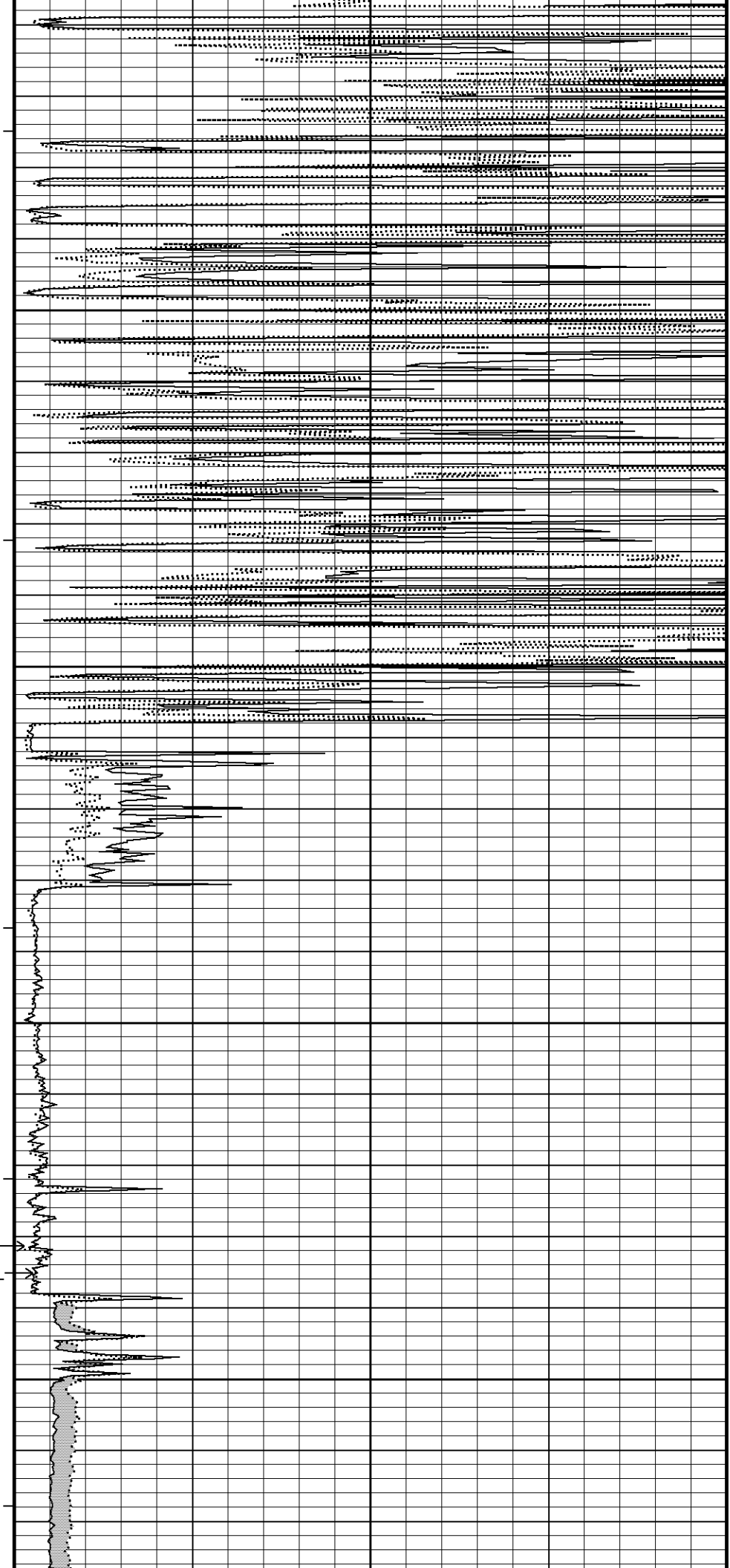
5250

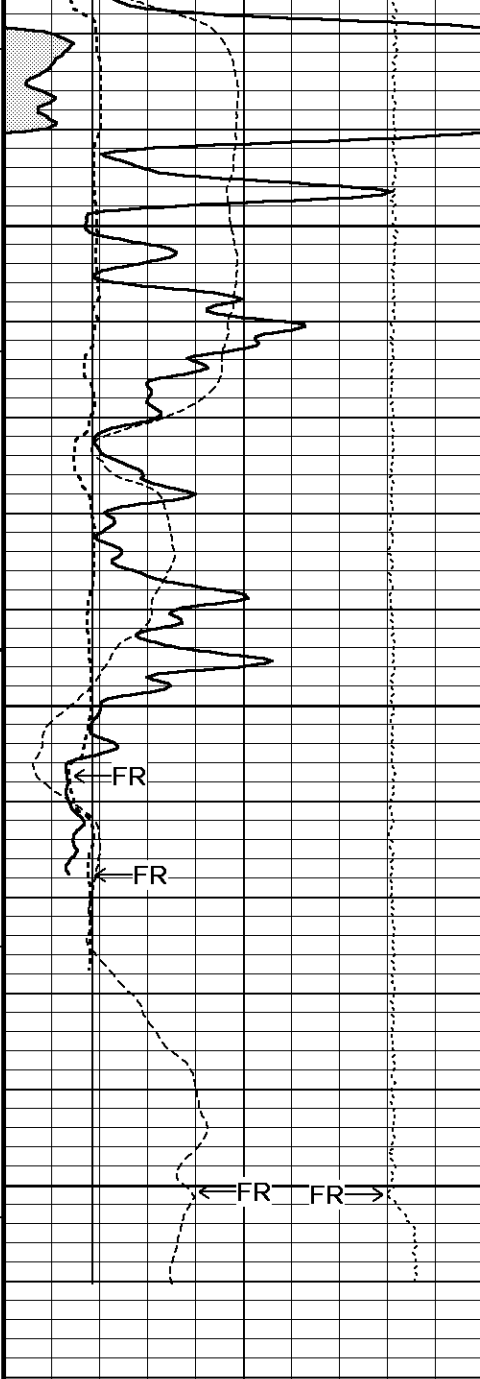
MINV

MNRL

146°

5300





146°

5350

146°

5400

5450

Depth
in
Feet

← Timing Marks
every 60.0 sec →

Gamma Ray
API
0 75 150
150 225 300

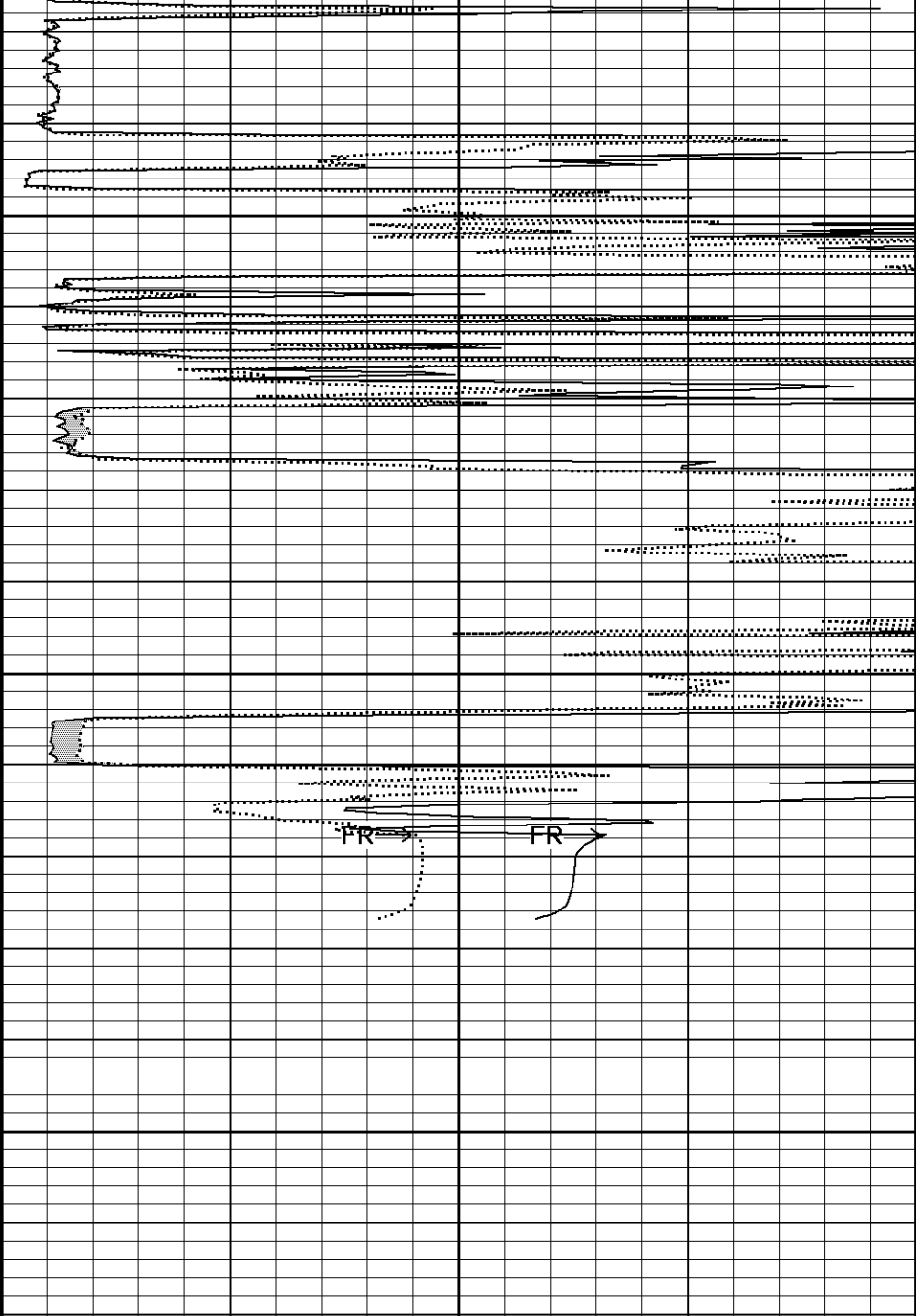
Borehole
Temp in
deg F

Spontaneous Potential
millivolts
— → | 20 | ← +

HVI
every
10 cu ft

Bit Size
inches
6 11 16

Annular
Integral

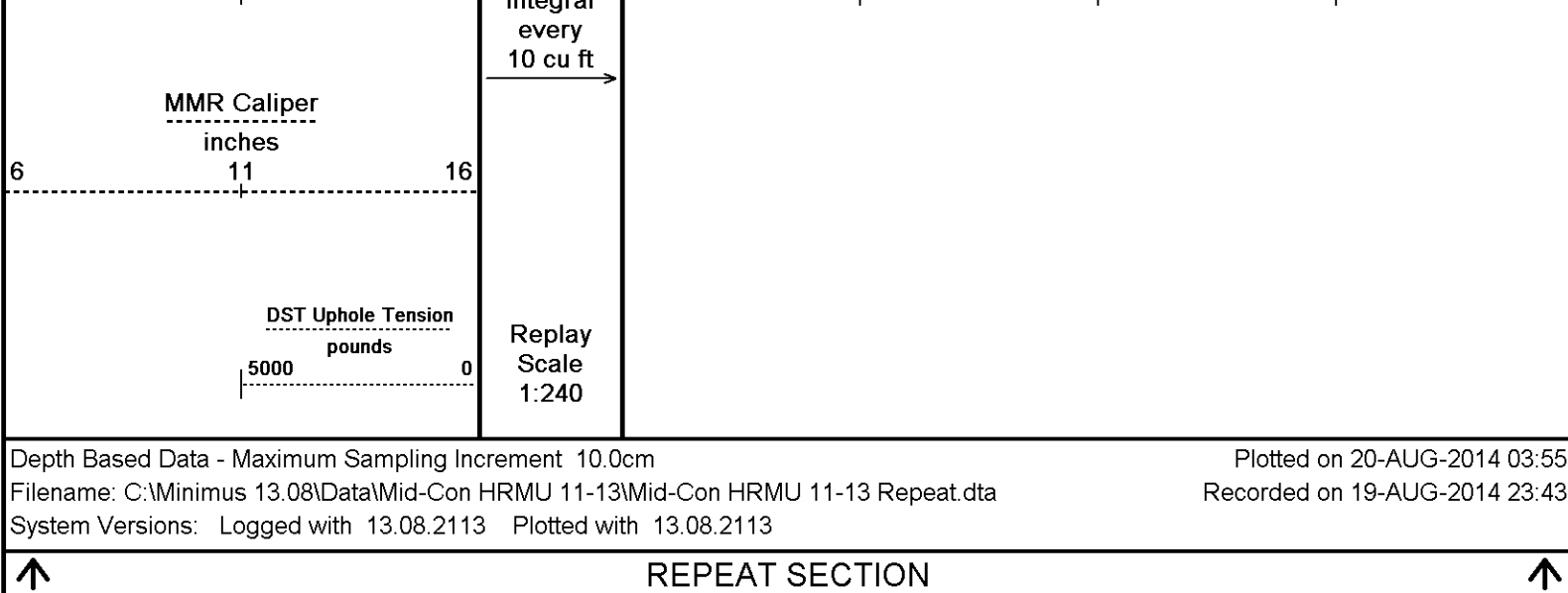


MMR MicroLog Normal
ohm metres

0 10 20 30 40

MMR MicroLog Inverse
ohm metres

0 10 20 30 40



BEFORE SURVEY CALIBRATION

C:\Minimus 13.08\Data\Mid-Con HRMU 11-13\Mid-Con HRMU 11-13 Main.dta

General Constants All 000

Last Edited on 19-AUG-2014,23:19

General Parameters

Mud Resistivity	1.120	ohm-metres
Mud Resistivity Temperature	75.000	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	Crossplot Porosity	
Resistivity used	Array Ind. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

High Resolution Temperature Calibration MCG-D.K 443

Field Calibration on 05-MAR-2014,20:50

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

High Resolution Temperature Constants MCG-D.K 443

Last Edited on 22-JUL-2014,11:40

Pre-filter Length	11
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Gamma Calibration MCG-D.K 443

Field Calibration on 19-AUG-2014 11:53

	Measured	Calibrated (API)
Background	70	46
Calibrator (Gross)	1164	771
Calibrator (Net)	1094	725

Gamma Constants MCG-D.K 443

Last Edited on 19-AUG-2014,20:55

Gamma Calibrator Number	GRC38	
Mud Density	1.13	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Concentration of KCl		kppm
K Mud Type	Chloride	

K Mud Concentration 0.00 %

Caliper Calibration MMR-A 11

Base Calibration on 07-AUG-2014 16:28
Field Calibration on 19-AUG-2014 11:35

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	13912	5.98
2	17046	7.97
3	20284	9.86
4	24184	11.92
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
8.03	7.97

Micro Normal and Micro Inverse Calibration MMR-A 11

Base Calibration on 07-AUG-2014 16:39
Field Check on 19-AUG-2014 11:33

Base Calibration

Channel	Measured		Calibrated (ohm-m)	
	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Micro Normal	10.2	49.9	5.1	25.6
Micro Inverse	10.0	49.4	3.4	16.9

Channel	Base Check (ohm-m)	Field Check (ohm-m)
Micro Normal	93.7	93.7
Micro Inverse	62.3	62.3

Micro Normal and Micro Inverse Constants MMR-A 11

Last Edited on 10-JUL-2014,16:35

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 MPD-B 104

Base Calibration on 12-AUG-2014 21:09
Field Calibration on 19-AUG-2014 11:36

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	12248	3.99
2	21021	5.98
3	29619	7.97
4	37847	9.86
5	46921	11.92
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
7.96	7.97

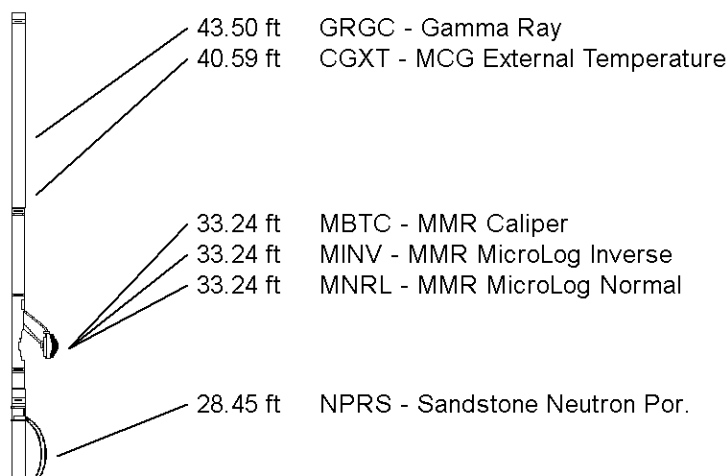
DOWNHOLE EQUIPMENT

C:\Minimus 13.08\Data\Mid-Con HRMU 11-13\Mid-Con HRMU 11-13 Main.dta

Compact Comms Gamma
MCG-D.K 443 LG: 8.70 ft WT: 63.9 lb OD: 2.240 in

Compact Micro-Resistivity
MMR-A 11 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

Compact Neutron
MDN-A.B 65 LG: 5.04 ft WT: 50.7 lb OD: 2.240 in

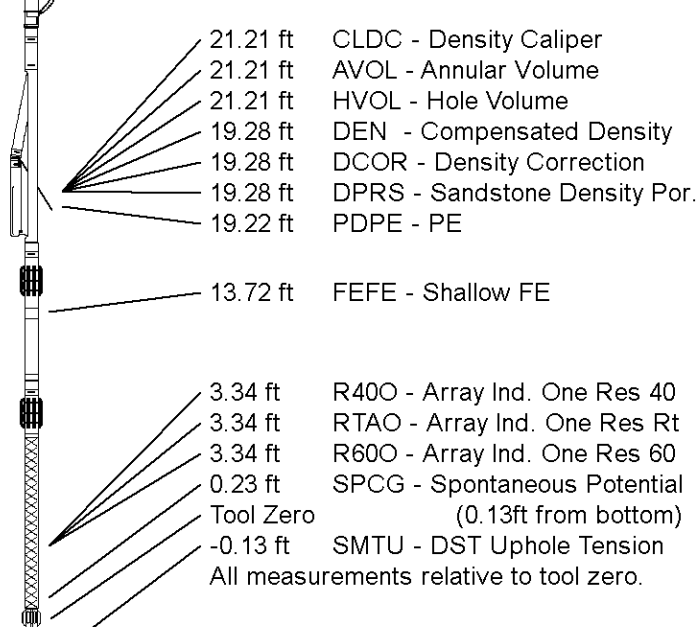


Compact Density/Caliper
MPD-B 104 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-B.J 352 LG: 6.05 ft WT: 48.5 lb OD: 2.240 in

Compact Induction
MAI-A.A 158 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 48.78 ft Weight: 383.6 lb



COMPANY	MID-CON ENERGY OPERATING
WELL	HRMU 11-13
FIELD	HARKER RANCH MORROW UNIT
PROVINCE/COUNTY	CHEYENNE
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	4107.60	feet	First Reading	5417.76	feet
Elevation Drill Floor	4105.60	feet	Depth Driller	5450.00	feet
Elevation Ground Level	4091.00	feet	Depth Logger	5451.00	feet



Weatherford®

MICRORESISTIVITY LOG