



Weatherford

**MICRO-RESISTIVITY
LOG**

COMPANY	LARSON ENGINEERING, INC.			
WELL	INDUSTRIAL PARK #1-19			
FIELD	WIDLCAT			
PROVINCE/COUNTY LANE				
COUNTRY/STATE	USA / KANSAS			
LOCATION	936' FNL & 1163' FEL NW-SW-NE-NE			
SEC 19	TWP 18S	RGE 28W	Other Services	
			MAI/MFE	
			MDN/MPD	
API Number	15-101-22575		MSG	
Permanent Datum GL, Elevation	2761 feet			
Log Measured From	KB		Elevations:	feet
Drilling Measured From	KB		KB	2770.00
			DF	2768.00
			GL	2761.00
Date	06-DEC-2015			
Run Number	ONE			
Service Order	7055-136599778			
Depth Driller	4650.00		feet	
Depth Logger	4646.00		feet	
First Reading	3600.00		feet	
Last Reading	4613.00		feet	
Casing Driller	265.00		feet	
Casing Logger	264.00		feet	
Bit Size	7.875		inches	
Hole Fluid Type	WBM			
Density / Viscosity	9.25	lb/USg	56.00	sec/qt
PH / Fluid Loss	9.50		6.80	ml/30Min
Sample Source	MUD TANK			
Rm @ Measured Temp	2.50 @ 52.0		ohm-m	
Rmf @ Measured Temp	2.0 @ 52.0		ohm-m	
Rmc @ Measured Temp	3.0 @ 52.0		ohm-m	
Source Rmf / Rmc	CALC		CALC	
Rm @ BHT	1.20 @ 112.0		ohm-m	
Time Since Circulation	5 HOURS			
Max Recorded Temp	112.00		deg F	
Equipment / Base	13379		OKC	
Recorded By	JUSTIN HICKS			
Witnessed By	VERN SCHRAG			

BOREHOLE RECORD					Last Edited: 06-DEC-2015 12:19
Bit Size inches		Depth From feet		Depth To feet	
7.875		264.00		4650.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
SURFACE	8.625	0.00	264.00	24.00	

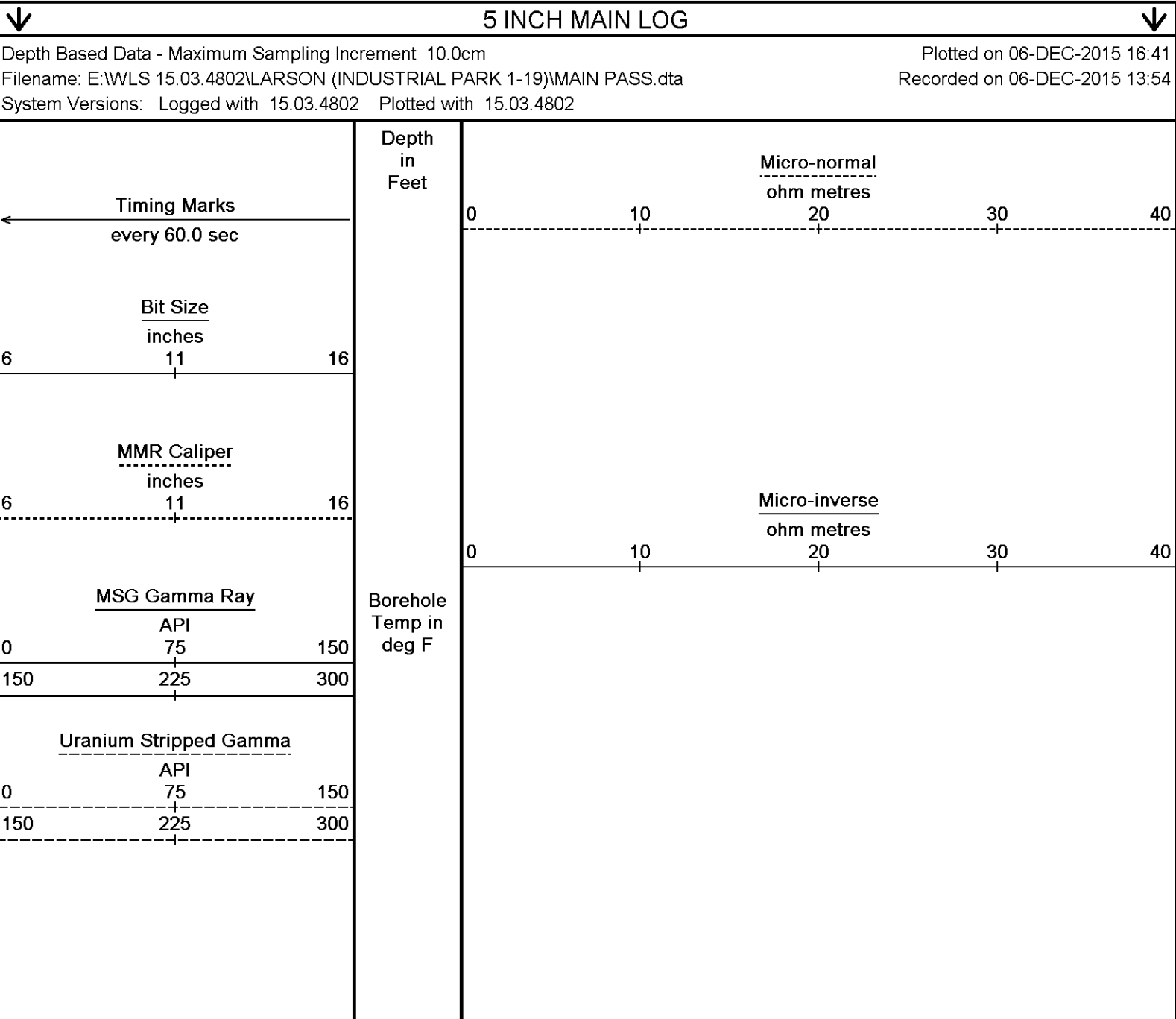
REMARKS
TOOLS RAN: CBH, SHA, MCG, MSG, MMR, MDN, MPD, MFE, MAI RAN IN COMBINATION.
HARDWARE USED: MAI: TWO 0.5 INCH STANDOFFS. MFE: ONE 0.5 INCH STANDOFF. MDN: DUAL NEUTRON BOWSPRING. MPD: 8 INCH PROFILE PLATE.
2.71 G/CC DENSITY MATRIX USED TO CALCULATE POROSITY. ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.
TOTAL HOLE VOLUME FROM TD TO SURFACE CASING = 1783 CU.FT. ANNULAR HOLE VOLUME WITH 5.5 INCH PRODUCTION CASING FROM TD TO SURFACE CASING = 1062 CU.FT.
FIELD TICKET NUMBER: 7055-136599778
RIG: H AND D DRILLING, RIG #3

OPERATOR(S): R. BRADSHAW

MUD PROPERTIES:
CHLORIDES: 2400 MG/L
LCM: 2 PPB

HOLE WASHOUTS AND RUGOSITY WILL AFFECT LOG QUALITY AND REPEATABILITY.

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.



DST Uphole Tension
pounds
10000 0
0 -10000

Replay
Scale
1:240

3600

106°

3650

106°

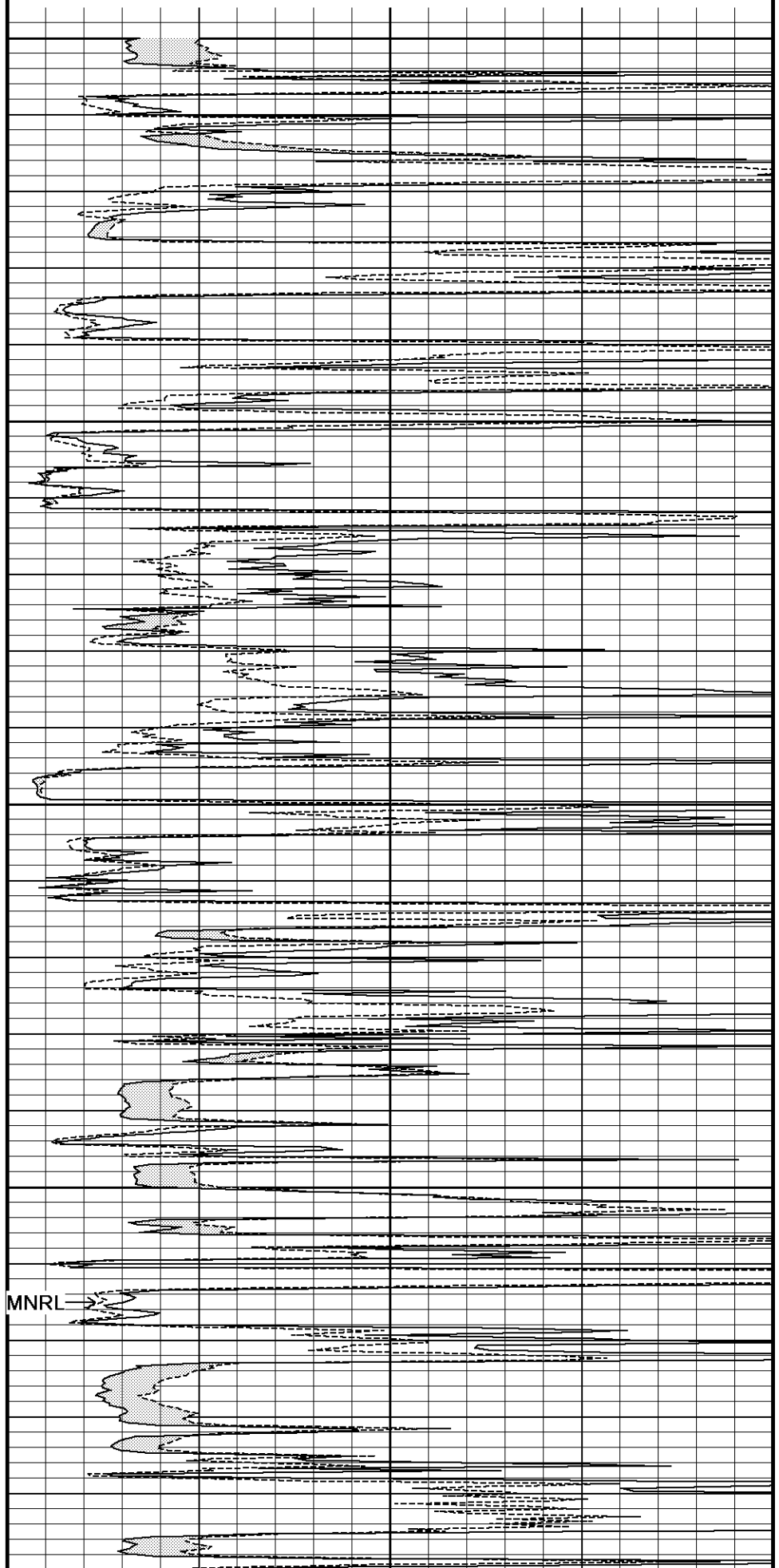
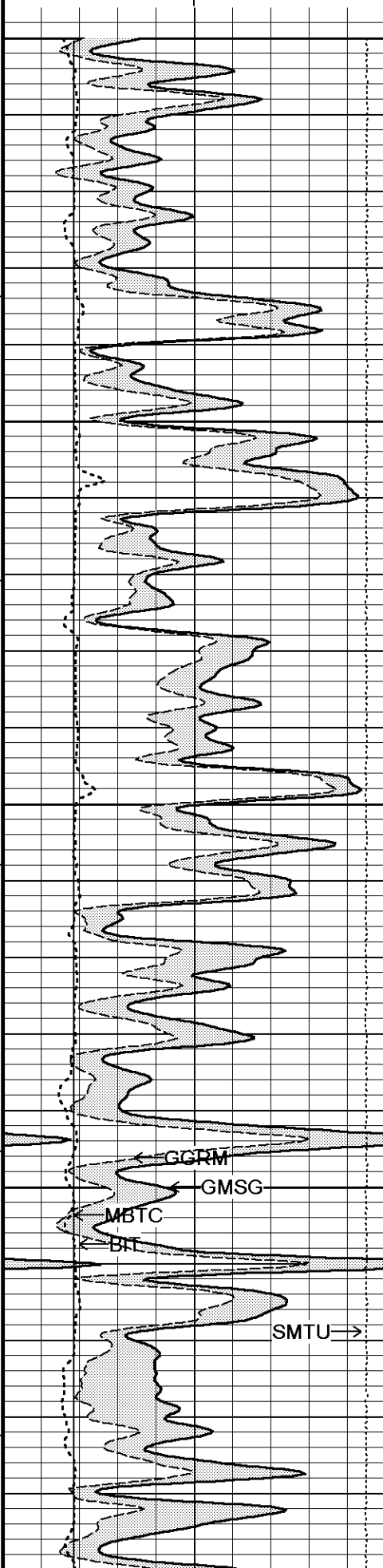
3700

107°

3750

107°

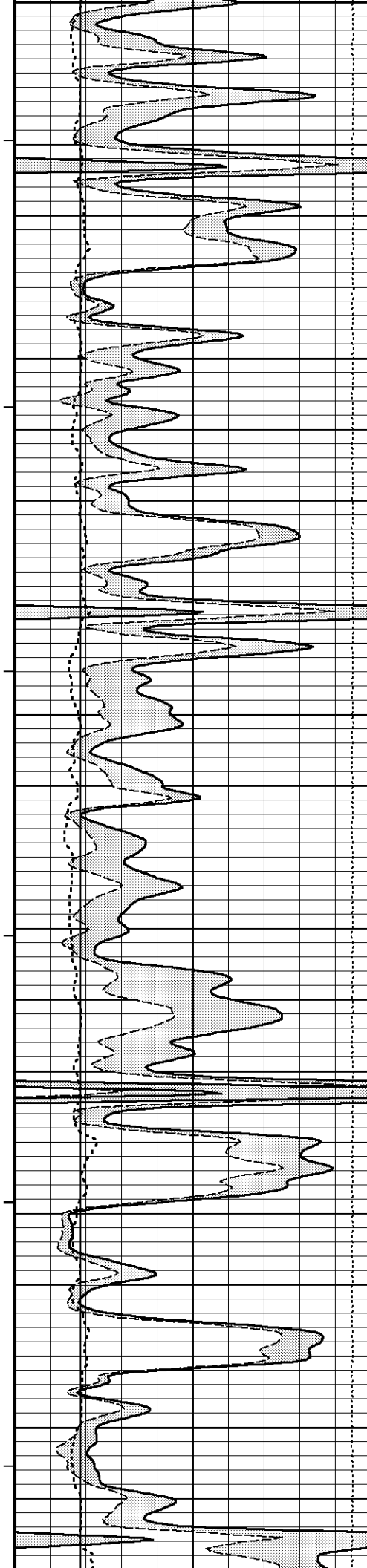
3800



GCRM
GMSG
MBTC
BIT

SMTU

MNRL



3800

107°

3850

107°

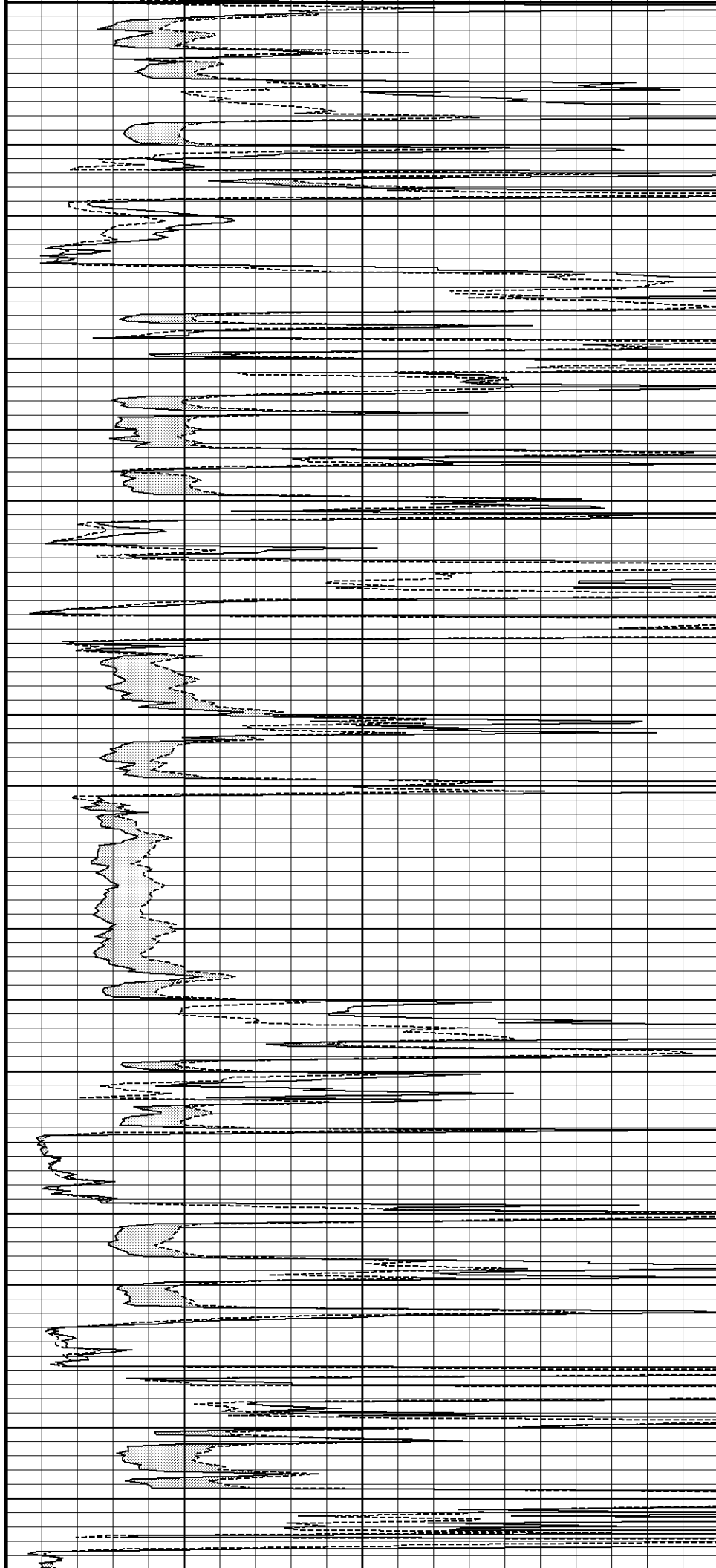
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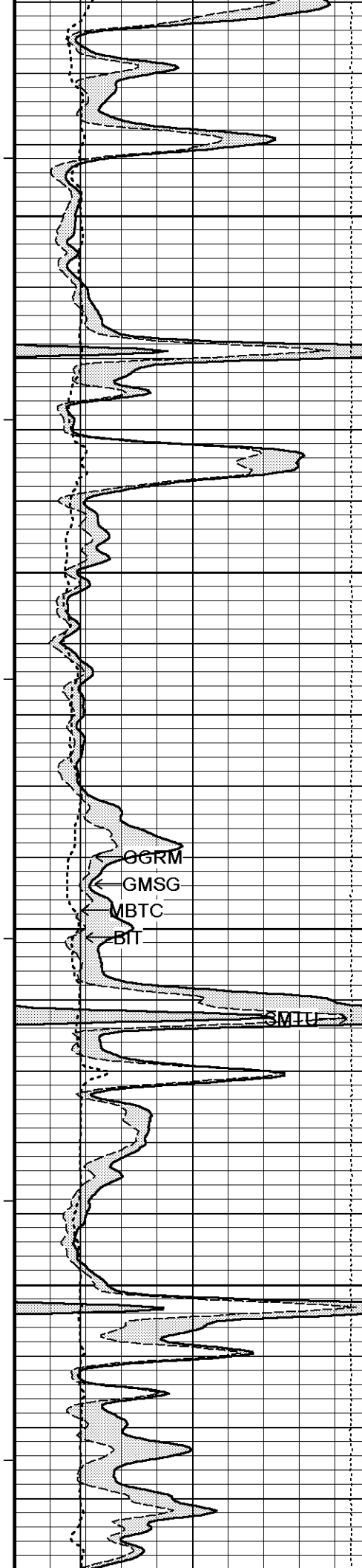
107°

3950

107°

4000





107°

4050

107°

4100

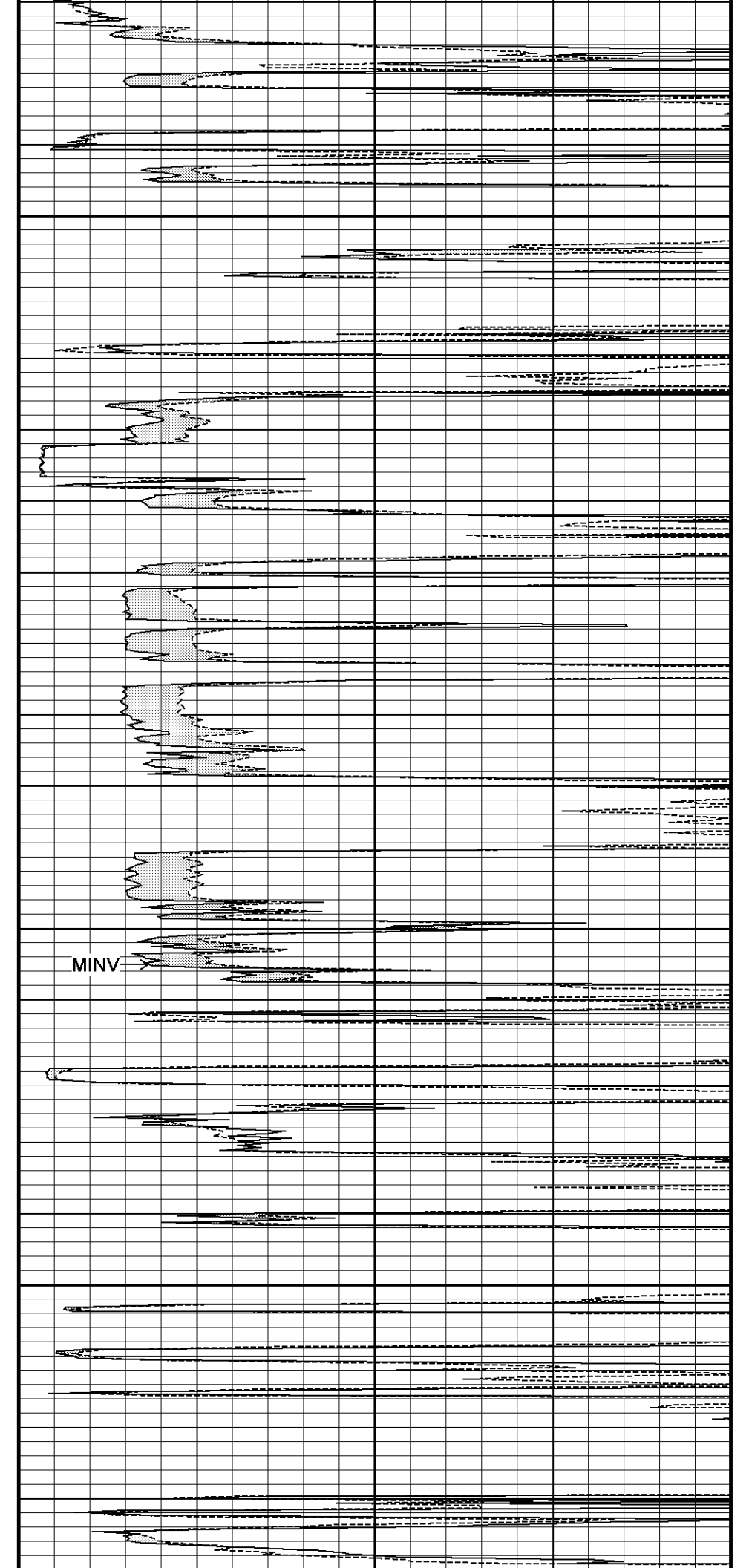
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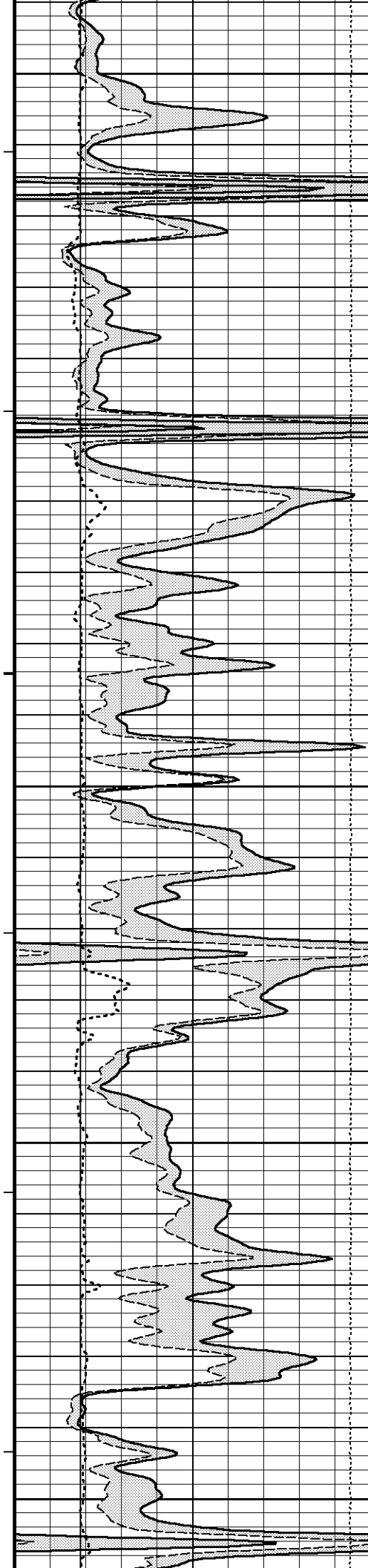
4150

108°

4200

109°





4250

109°

4300

109°

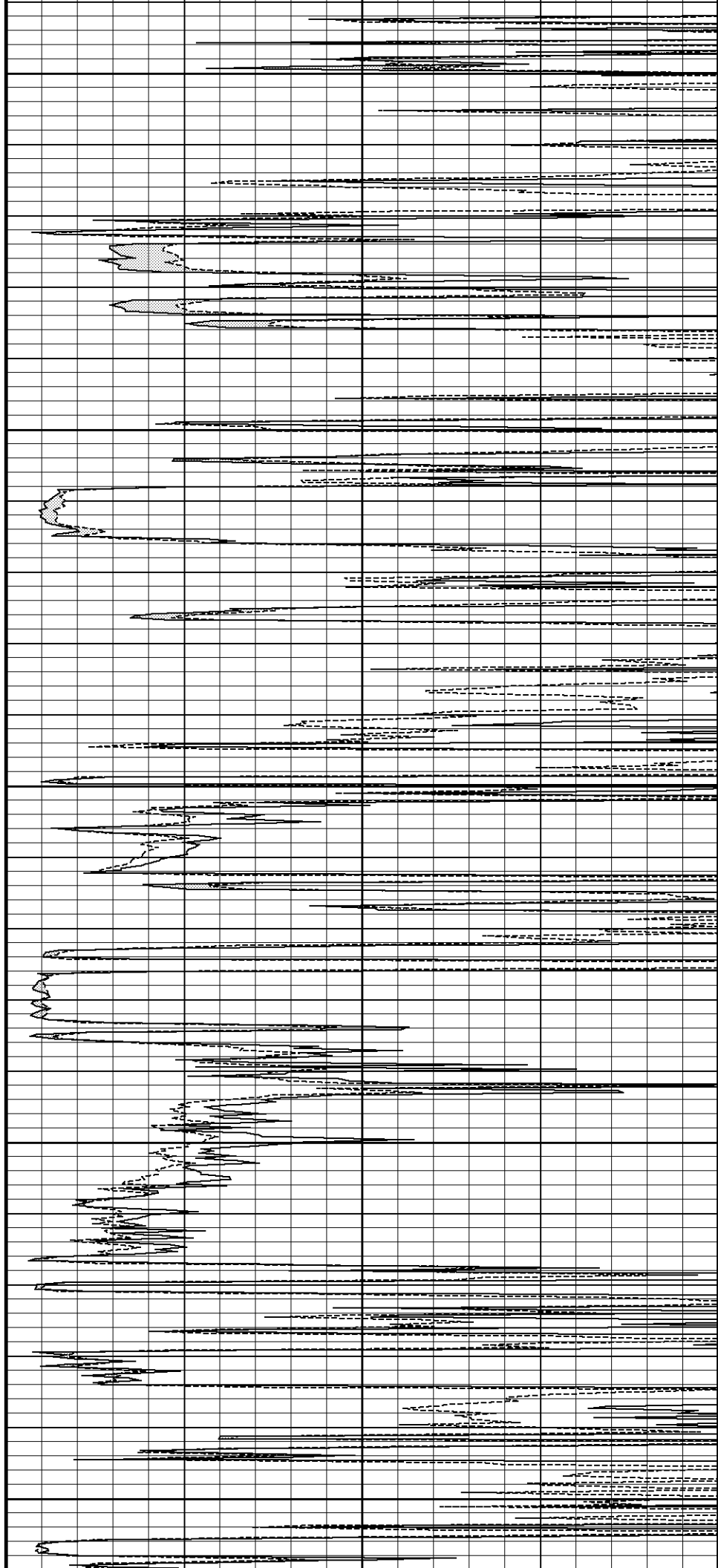
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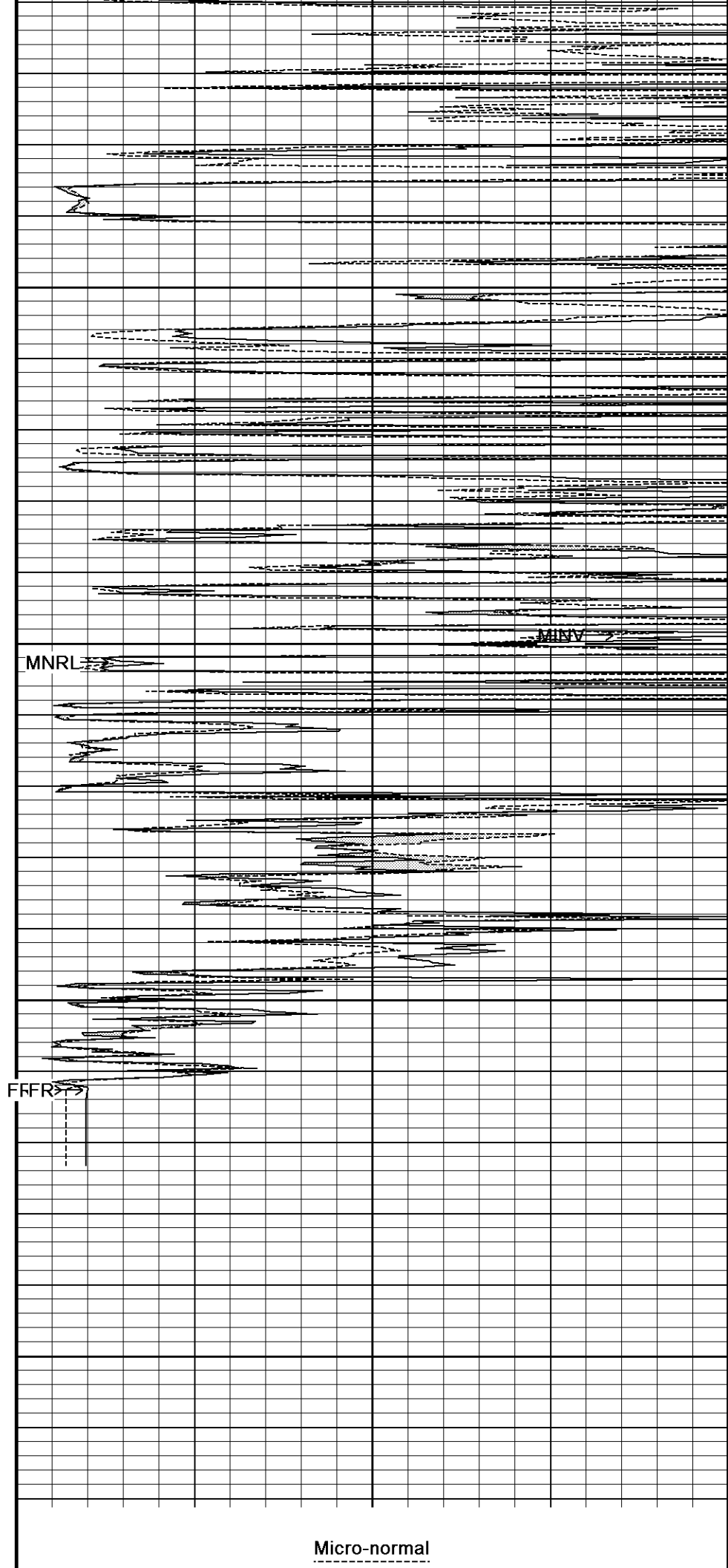
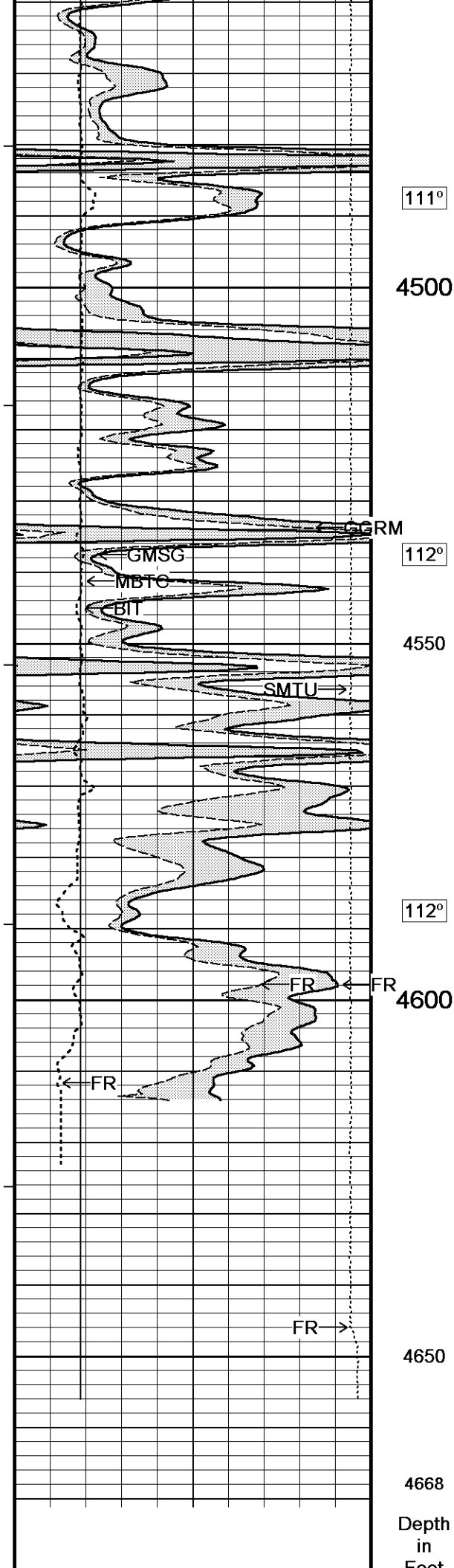
110°

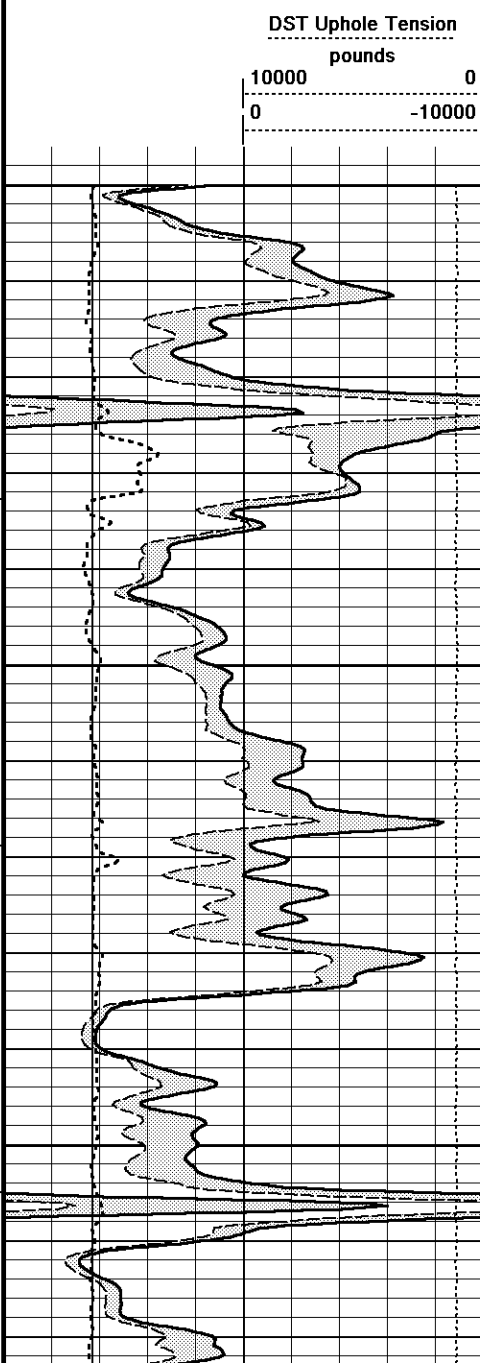
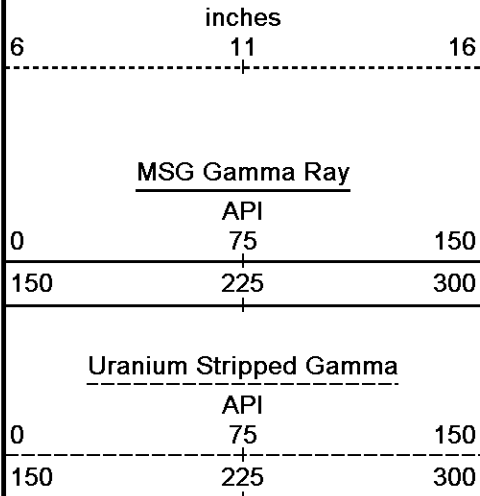
4400

111°

4450







Borehole
Temp in
deg F

Replay
Scale
1:240

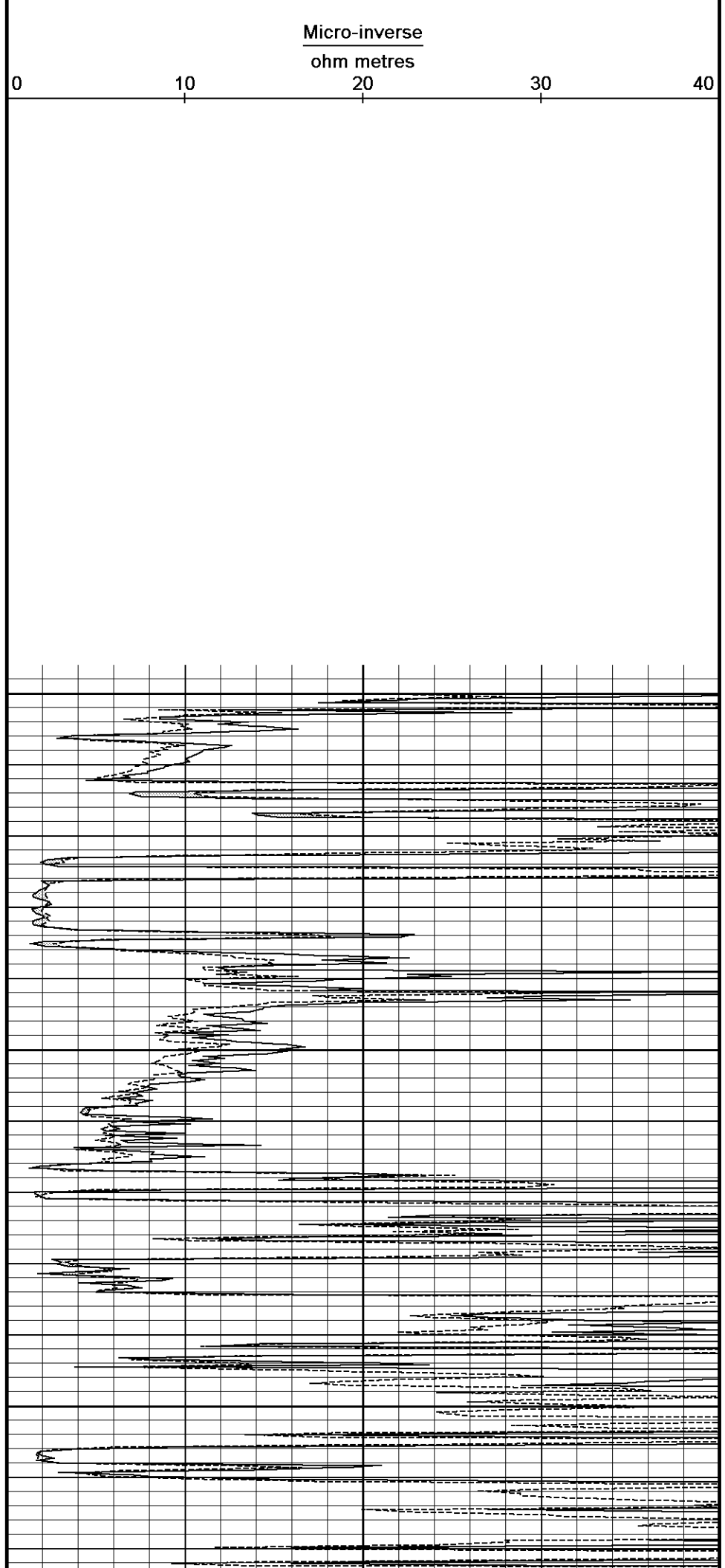
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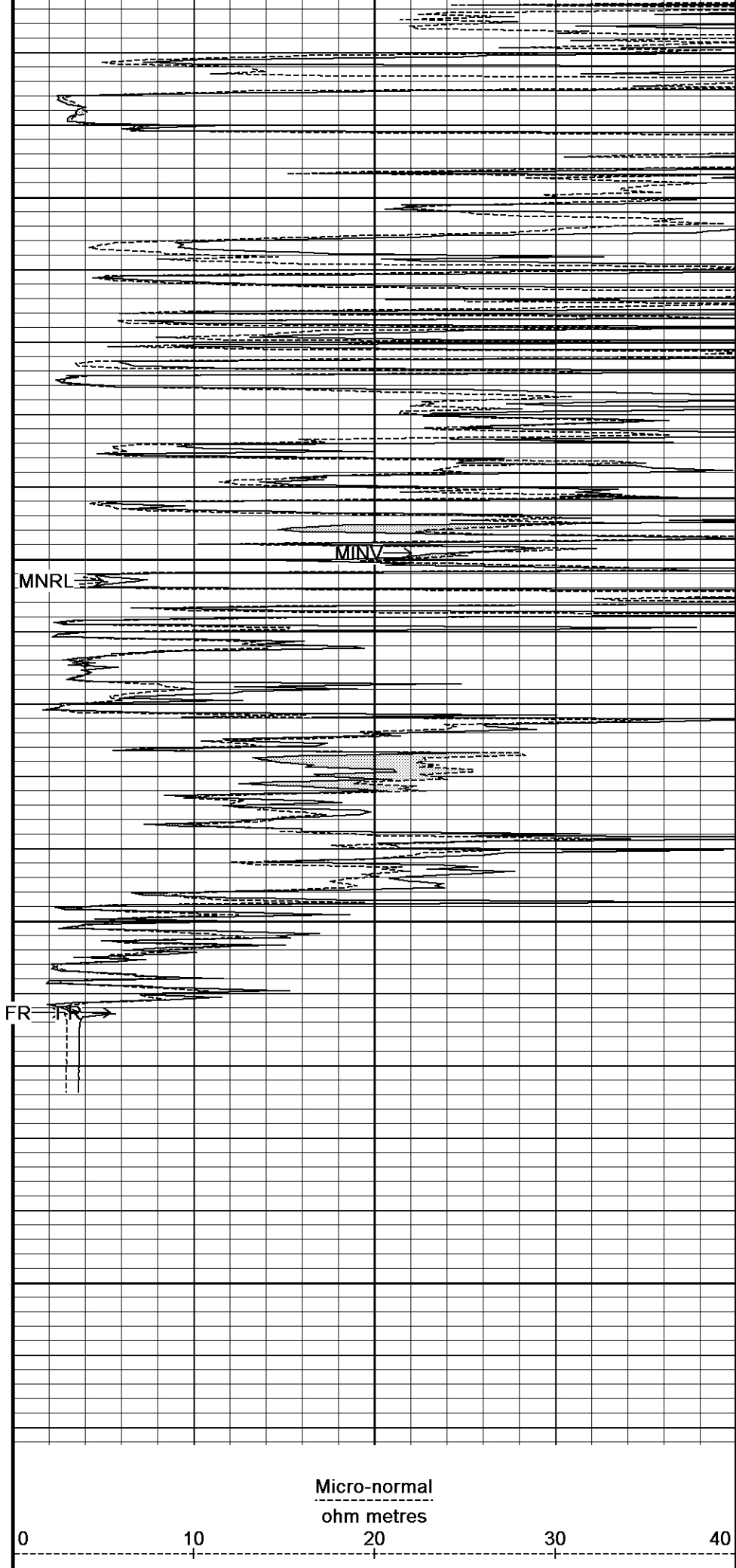
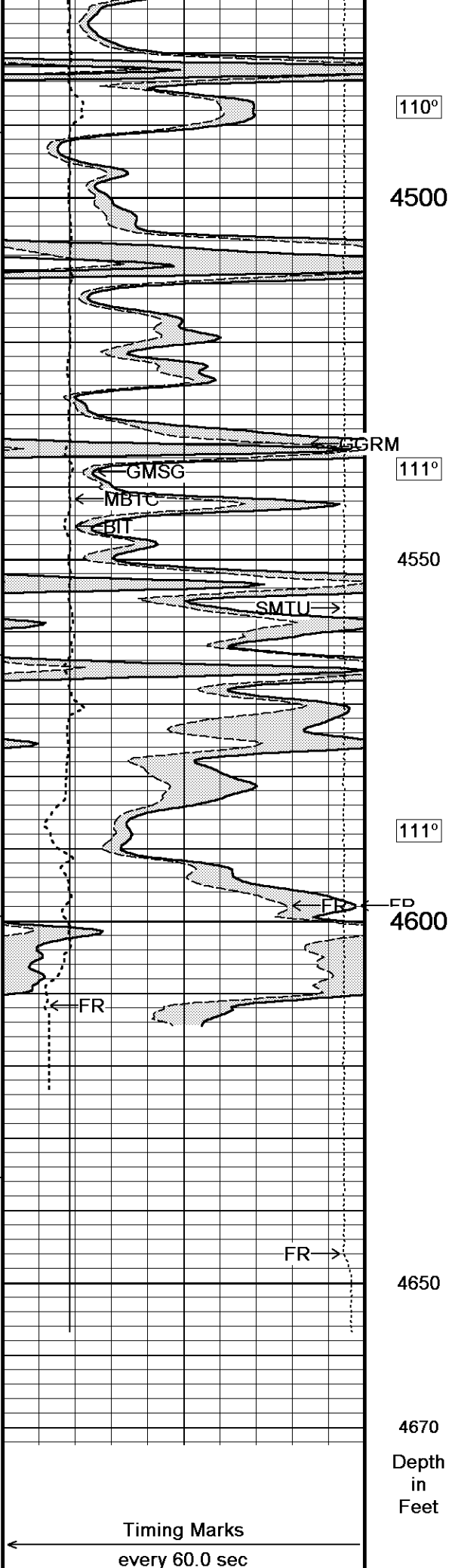
109°

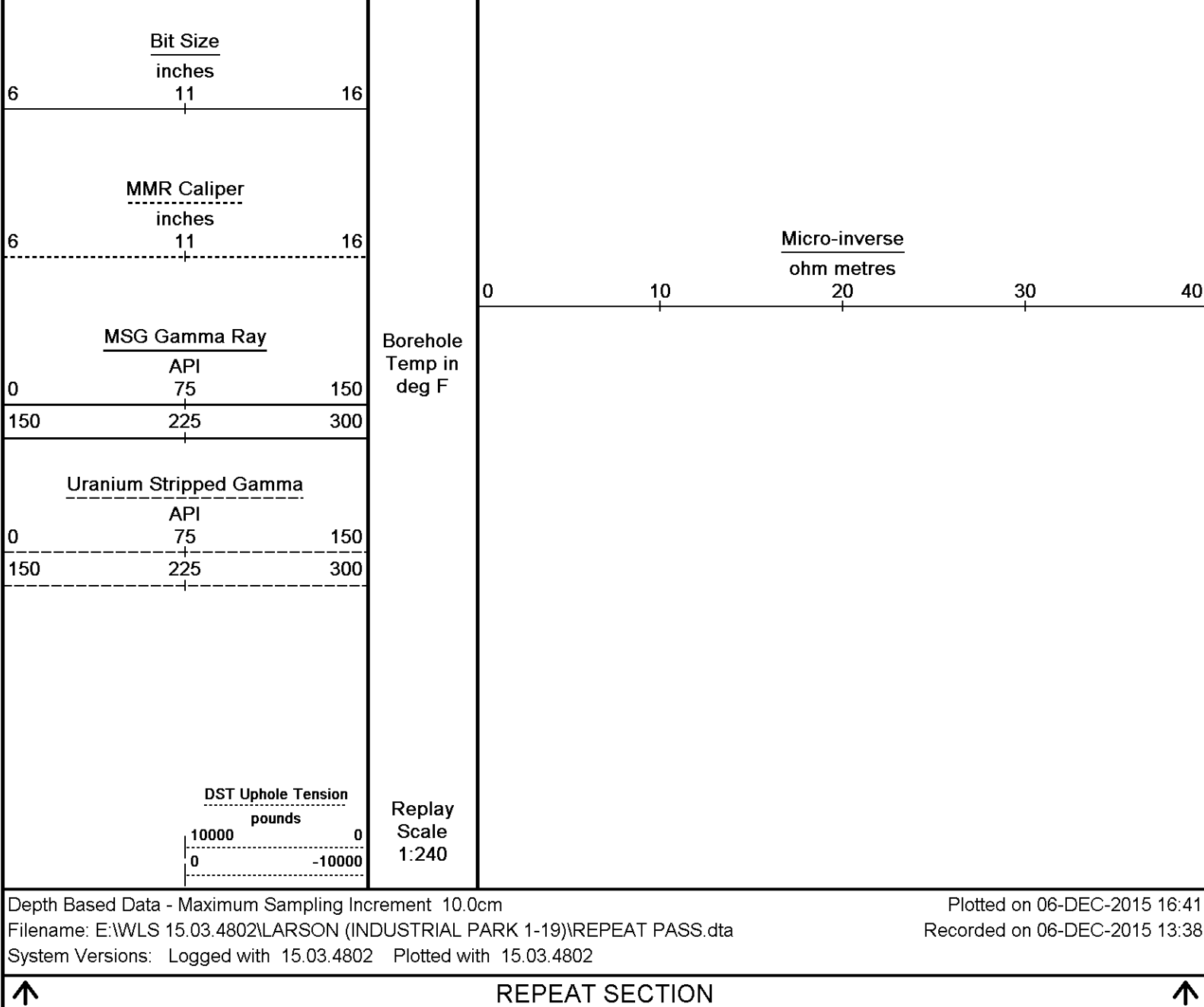
4400

109°

4450







BEFORE SURVEY CALIBRATION		
E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\DATA.dta		
General Constants All 000		Last Edited on 06-DEC-2015,12:25
General Parameters		
Mud Resistivity	2.500	ohm-metres
Mud Resistivity Temperature	52.000	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. One Res Rt	
RWA Constant A	0.610	
RWA Constant M	2.150	
SW/APOR Tool Source	0.000	

High Resolution Temperature Calibration MCG-E.A 571

Field Calibration on 26-NOV-2015,09:10

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

High Resolution Temperature Constants MCG-E.A 571

Last Edited on 22-JUL-2014,14:44

Pre-filter Length 11

Caliper Calibration MMR-A 33

Base Calibration on 05-NOV-2015 10:59

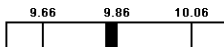
Field Calibration on 06-DEC-2015 06:04

Base Calibration		
Reading No	Measured	Calibrator Size (in)
1	14001	5.96
2	17371	8.03
3	20549	9.86
4	24526	11.93
5	0	0.00
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
9.82	9.86

Caliper Calibration Tolerances MMR-A 33

Short Arm Field Cal. 9.82  in

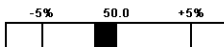
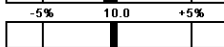
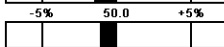
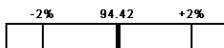
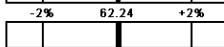
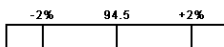
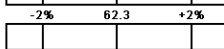
Micro Normal and Micro Inverse Calibration MMR-A 33

Base Calibration on 05-NOV-2015 10:22

Field Check on 06-DEC-2015 06:06

Base Calibration				
Channel	Resistor 1	Measured Resistor 2	Calibrated (ohm-m) Resistor 1	Resistor 2
Micro Normal	9.9	49.2	5.1	25.6
Micro Inverse	9.9	49.4	3.4	16.9
Channel	Base Check (ohm-m)		Field Check (ohm-m)	
Micro Normal	94.5		94.5	
Micro Inverse	62.3		62.3	

Micro Normal & Micro Inverse Calibration Tolerance MMR-A 33

Micro Normal Res. 1	9.9		ohm	Micro Normal Res. 2	49.2		ohm
Micro Inverse Res. 1	9.9		ohm	Micro Inverse Res. 2	49.4		ohm
Micro Normal Base Check	94.5		ohm-m				
Micro Inverse Base Check	62.3		ohm-m				
Micro Normal Field Check	94.5		ohm-m				
Micro Inverse Field Check	62.3		ohm-m				

Micro Normal and Micro Inverse Constants MMR-A 33

Last Edited on 05-NOV-2015,10:19

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

Compact Spectral Gamma Calibration MSG-A.A 119

Base Calibration on 25-AUG-2015 12:42

Field Calibration on

Base Calibration

Gamma Ray

	Measured	Calibrated (API)
Background	42	18
Calibrator (Gross)	730	314
Calibrator (Net)	688	296

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	580.8	100.0	29.9	9.0	10.0
Calibrator (Net)	546.5	94.8	28.5	8.6	9.5

	K %	U ppm	Th ppm
Concentrations	6.0	17.1	40.5

Potassium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	108.2	34.5	15.8	0.4	0.6
Calibrator (Net)	74.0	29.3	14.4	0.1	0.0

	K %	U ppm	Th ppm
Concentrations	5.8	0.0	0.0

Uranium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	322.2	44.6	10.7	6.0	2.4
Calibrator (Net)	288.0	39.4	9.3	5.6	1.9

	K %	U ppm	Th ppm
Concentrations	0.0	17.0	0.0

Thorium Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	240.0	34.7	6.6	3.7	9.0
Calibrator (Net)	205.8	29.4	5.2	3.3	8.5

	K %	U ppm	Th ppm
Concentrations	0.0	0.0	41.1

Field @ Base Calibration

Calibration Type

496
525

Gamma Ray

	Measured	Calibrated (API)
Background	41.8	18.0
Calibrator (Gross)	729.7	314.0
Calibrator (Net)	687.9	296.1

Mixture Calibrator

	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	34.2	5.2	1.4	0.4	0.5
Calibrator (Gross)	580.8	100.0	29.9	9.0	10.0
Calibrator (Net)	546.5	94.8	28.5	8.6	9.5

Field Calibration

Calibration Type

000

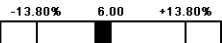
Gamma Ray

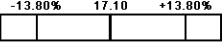
	Measured	Calibrated (API)
Background	0.0	0.0
Calibrator (Gross)	0.0	0.0
Calibrator (Net)	0.0	0.0

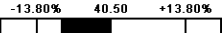
Mixture Calibrator

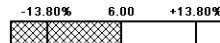
	Gate 1	Gate 2	Gate 3	Gate 4	Gate 5
Background	0.0	0.0	0.0	0.0	0.0
Calibrator (Gross)	0.0	0.0	0.0	0.0	0.0
Calibrator (Net)	0.0	0.0	0.0	0.0	0.0

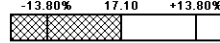
Compact Spectral Gamma Calibration Tolerances MSG-A.A 119

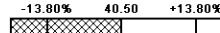
Base Check K 5.81  %

Base Check U 17.03  ppm

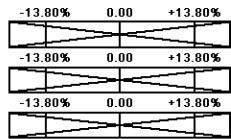
Base Check T 36.71  ppm

Field @ Base Check K 0.00  %

Field @ Base Check U 0.00  ppm

Field @ Base Check T 0.00  ppm

Base Check T	50.71	ppm
Field Check K	0.00	%
Field Check U	0.00	ppm
Field Check T	0.00	ppm



Compact Spectral Gamma Constants MSG-A.A 119

Last Edited on 06-DEC-2015,12:20

Background Calibrator Number	496	
Mixture Calibrator Number	525	
Potassium Calibrator Number	499	
Uranium Calibrator Number	505	
Thorium Calibrator Number	502	
Mud Density	1.11	gm/cc
Caliper Source for Processing	Density Caliper	
Tool Position	Eccentred	
Potassium Equivalence	Chloride	
K Mud Concentration	0.00	%

DOWNHOLE EQUIPMENT

E:\WLS 15.03.4802\LARSON (INDUSTRIAL PARK 1-19)\DATA.data

Cablehead, 11 pin
CBH-C 175 LG: 2.40 ft WT: 24.3 lb OD: 2.240 in

Compact Swivel Head Adaptor
SHA-J.B 719 LG: 2.30 ft WT: 22.0 lb OD: 2.244 in

Compact Comms Gamma
MCG-E.A 571 LG: 8.70 ft WT: 63.9 lb OD: 2.244 in

Compact Spectral Gamma
MSG-A.A 119 LG: 10.94 ft WT: 90.4 lb OD: 2.244 in

Compact Micro-Resistivity
MMR-A 33 LG: 8.59 ft WT: 81.6 lb OD: 4.882 in

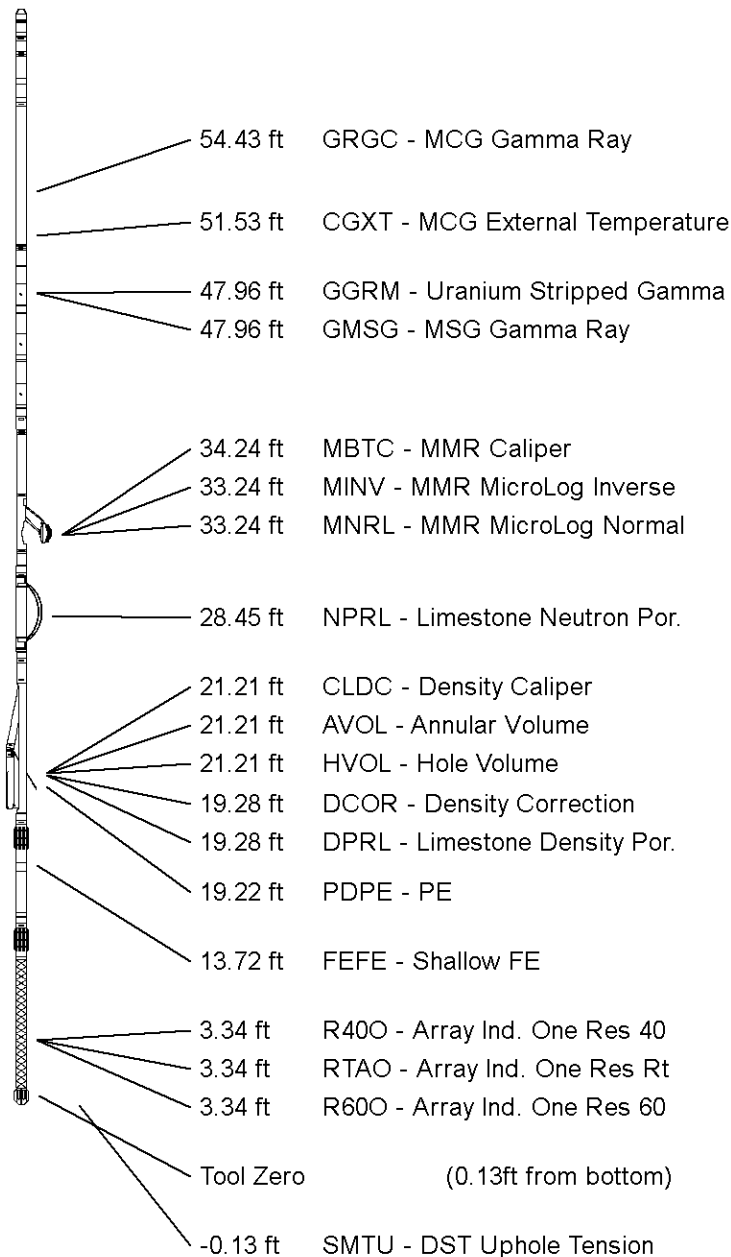
Compact Neutron
MDN-B.J 391 LG: 5.04 ft WT: 50.7 lb OD: 2.244 in

Compact Density/Caliper
MPD-B 120 LG: 9.59 ft WT: 90.4 lb OD: 2.449 in

Compact Focussed Electric
MFE-B.J 359 LG: 6.05 ft WT: 48.5 lb OD: 2.244 in

Compact Induction
MAI-B.J 392 LG: 10.81 ft WT: 48.5 lb OD: 2.240 in

Total Length: 64.41 ft Weight: 520.3 lb



All measurements relative to tool zero.

COMPANY	LARSON ENGINEERING, INC.
WELL	INDUSTRIAL PARK #1-19
FIELD	WIDLCAT
PROVINCE/COUNTY	LANE
COUNTRY/STATE	USA / KANSAS

Elevation Kelly Bushing	2770.00	feet	First Reading	3600.00	feet
Elevation Drill Floor	2768.00	feet	Depth Driller	4650.00	feet
Elevation Ground Level	2761.00	feet	Depth Logger	4646.00	feet



Weatherford[®]

MICRO-RESISTIVITY
LOG