



Weatherford

**DUAL LATEROLOG
MICRO RESISTIVITY
LOG**

COMPANY	KINDER MORGAN C02 Co. L.P			
WELL	DOE CANYON #15			
FIELD	DOE CANYON			
PROVINCE/COUNTY	DOLORES			
COUNTRY/STATE	U.S.A. / COLORADO			
LOCATION	1069' FSL & 1610' FWL			
SEC 11	TWP 40N	RGE 18W	Other Services MPD/MDN MIE	CXD
API Number	05-033-06176 MSG			
Permanent Datum GL, Elevation	7227 feet			Elevations: KB 7250.00 DF 7250.00 GL 7227.00
Log Measured From	KB			
Drilling Measured From	KB @ 23 FEET			
Date	24-AUG-2013			
Run Number	ONE			
Service Order	3529587			
Depth Driller	8710.00			feet
Depth Logger	8705.00			feet
First Reading	8705.00			feet
Last Reading	8335.00			feet
Casing Driller	8534.00			feet
Casing Logger	8525.00			feet
Bit Size	6.000			inches
Hole Fluid Type	H2O			
Density / Viscosity	8.40 lb/USg			29.00 CP
PH / Fluid Loss	7.00			
Sample Source	PIT			
Rm @ Measured Temp	0.95 @ 86.0			ohm-m
Rmf @ Measured Temp	0.76 @ 86.0			ohm-m
Rmc @ Measured Temp	1.14 @ 86.0			ohm-m
Source Rmf / Rmc	CALC	CALC		
Rm @ BHT	0.49 @172.0			ohm-m
Time Since Circulation	8 HOURS			
Max Recorded Temp	172.00			deg F
Equipment / Base	13045			GJ/CO
Recorded By	S.LACKEY			
Witnessed By	D.MOORE			

BOREHOLE RECORD					Last Edited: 24-AUG-2013 21:07
Bit Size inches		Depth From feet		Depth To feet	
6.000		8534.00		8710.00	
CASING RECORD					
Type	Size inches	Depth From feet	Shoe Depth feet	Weight pounds/ft	
INTERMED	7.000	0.00	8534.00	29.00	

REMARKS
WLS VERSION 13.06.9804
TOOLS IN THREE SEPERATE RUNS: 1ST RUN: SHA, MBE, MBE, MCG, MUG, MLE AND MMR 2ND RUN: SHA, MCG, MSG, MISD, MDN AND MPD 3RD RUN: SHA, MCG, MIM AND MIE 4TH RUN: SHA, MCG, MDM, MRD AND MTD 5TH RUN: SHA, MCG AND SGS
HARDWARE: MUG: 0.5" STANDOFF MMR: 0.5" STANDOFF MDN: DUAL BOWSPRINGS MPD: 8" PROFILE PLATE MIM: NONMAGNETIC BASKET MIE: NONMAGNETIC BASKET, 1.0" STANDOFF
2 71 GM/CC DENSITY MATRIX USED TO CALCULATE POROSITY

DEPTH/LOG/SS DENSITY MATRIX USED TO CALCULATE RESISTIVITY.

ALL INTERVALS LOGGED AND SCALED PER CUSTOMER'S REQUEST.

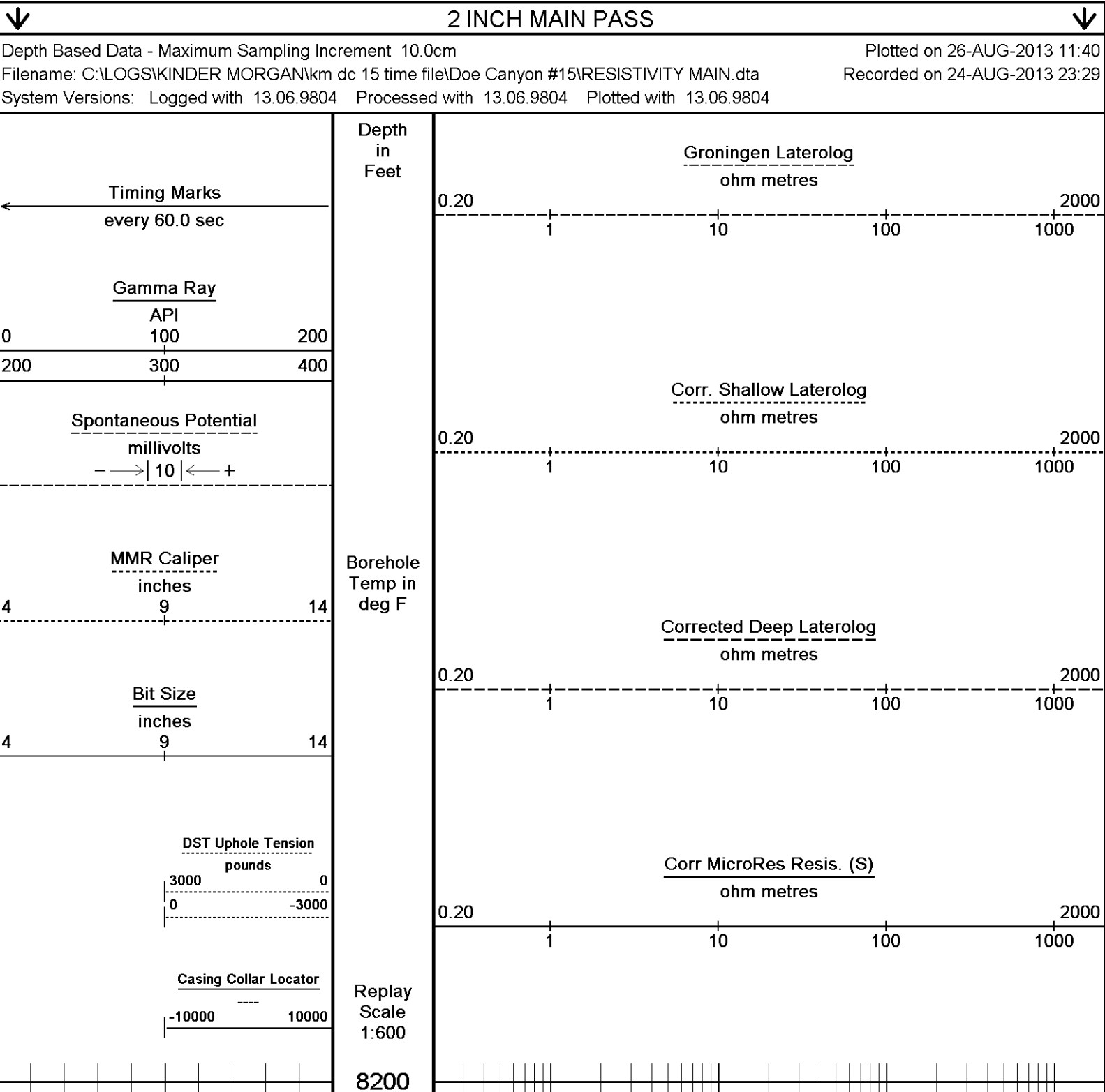
TIGHT PULLS, BOREHOLE SIZE AND RUGOSITY WILL AFFECT DATA QUALITY.

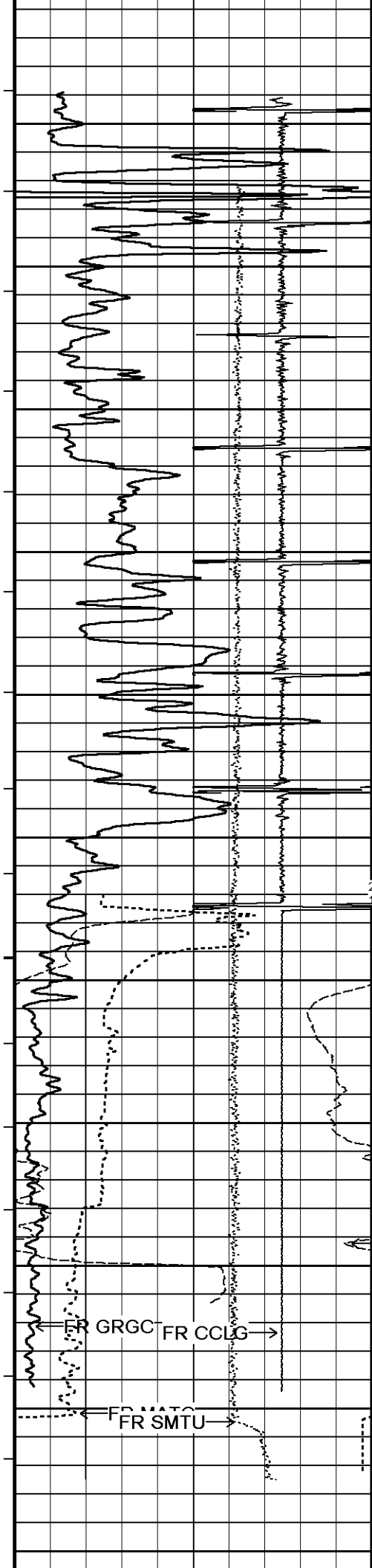
TOTAL HOLE VOLUME = 40 CUBIC FEET.

SERVICE ORDER: 3529587

RIG: NABORS M13

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.





171°

8300

172°

8400

172°

8500

Casing
Shoe

172°

8600

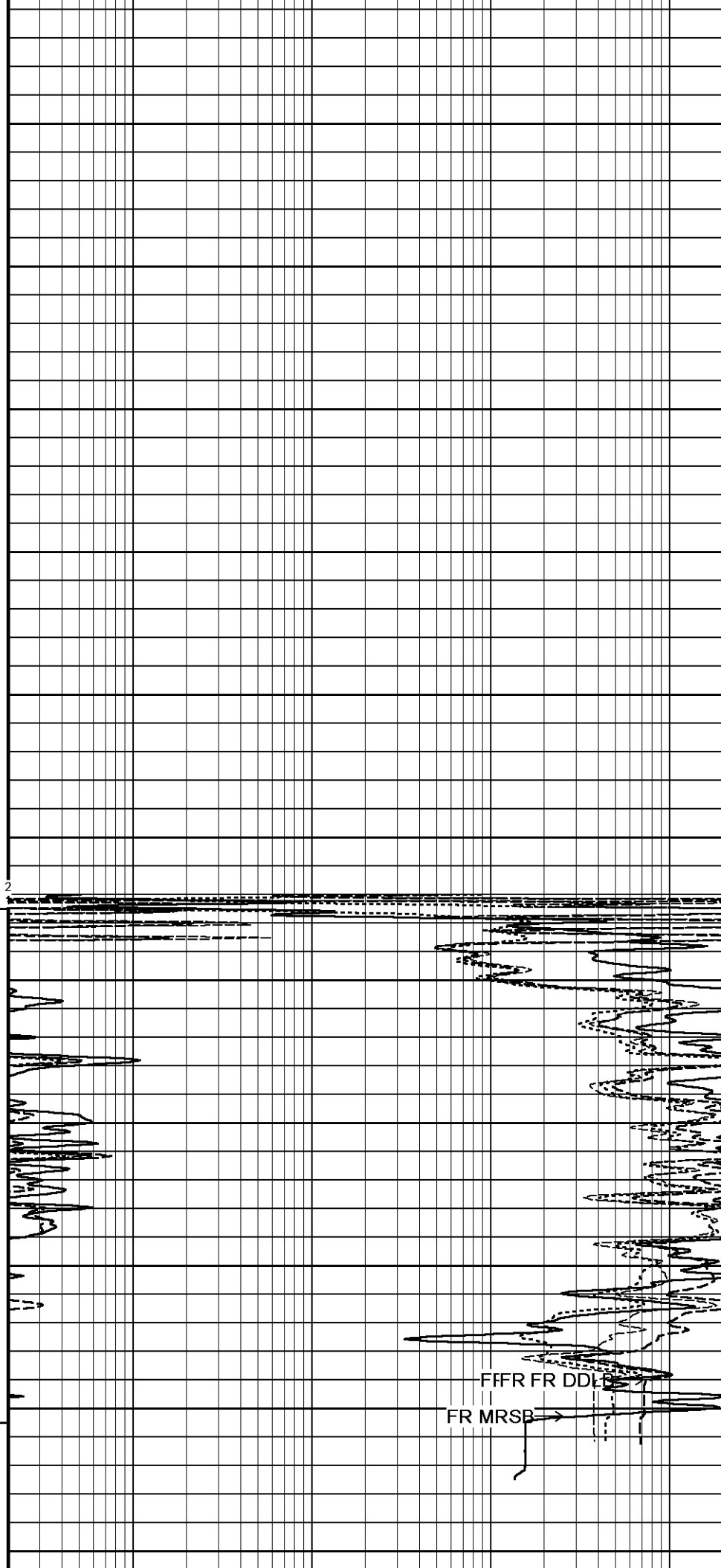
FR SPDL

172°

8700

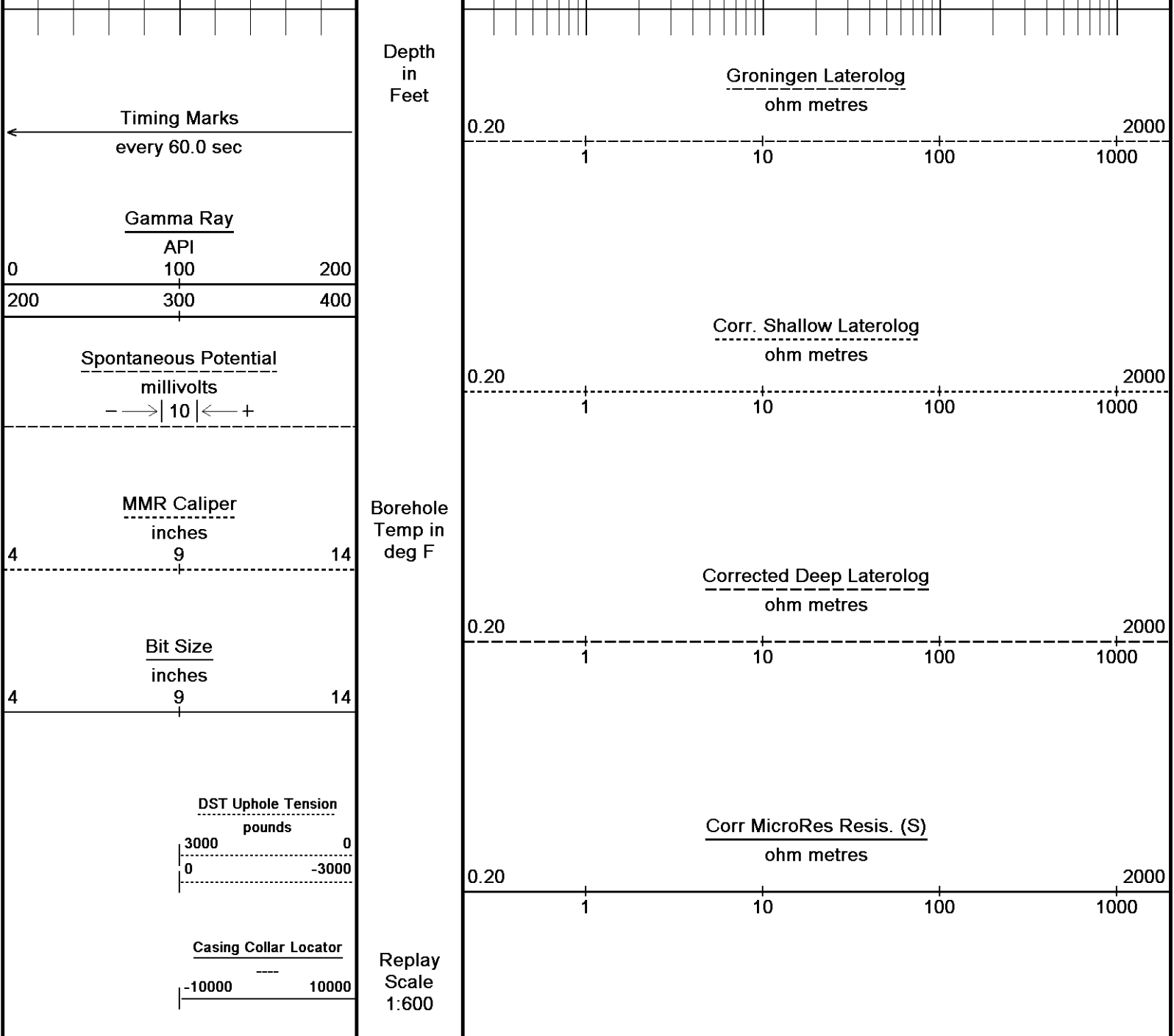
FR GRGC FR CCLG

FR MATC FR SMTU



FFR FR DDL

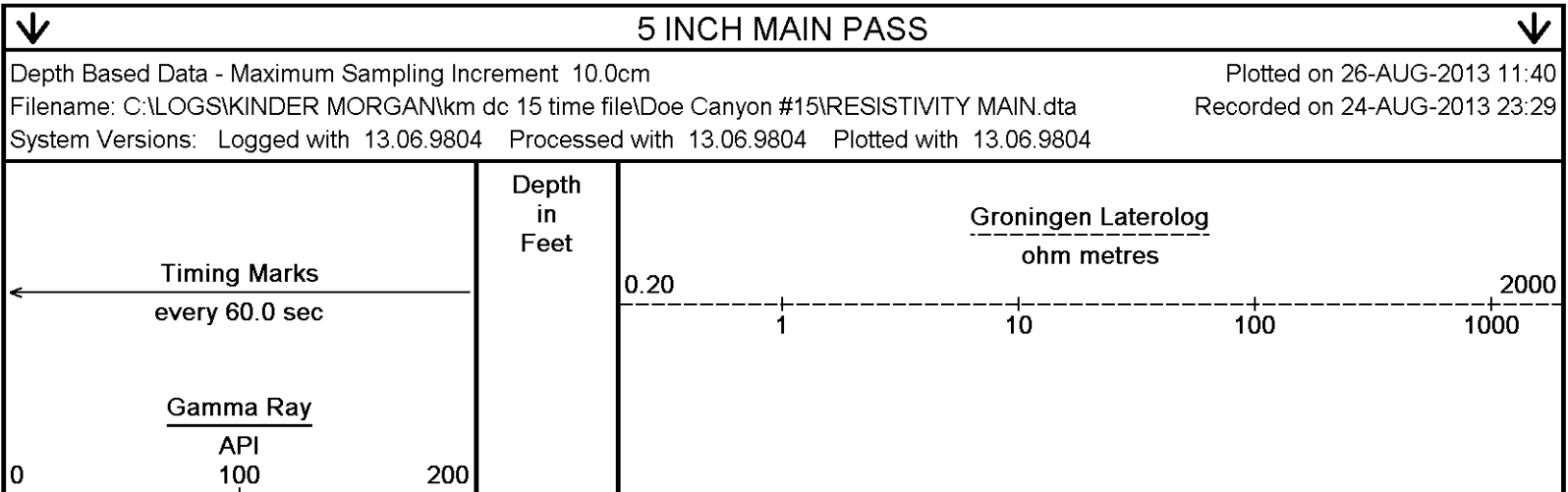
FR MRSB

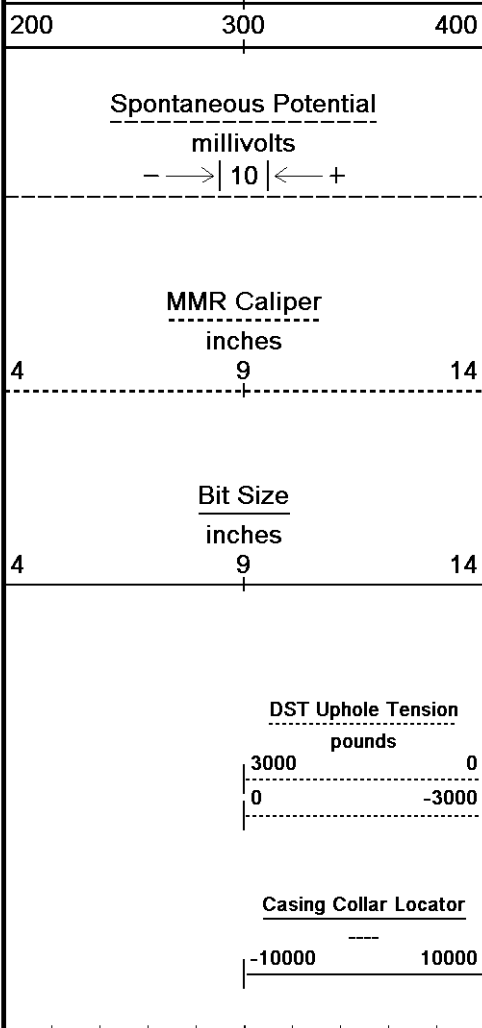


Depth Based Data - Maximum Sampling Increment 10.0cm
Filename: C:\LOGS\KINDER MORGAN\km dc 15 time file\Doe Canyon #15\RESISTIVITY MAIN.dta
System Versions: Logged with 13.06.9804 Processed with 13.06.9804 Plotted with 13.06.9804

Plotted on 26-AUG-2013 11:40
Recorded on 24-AUG-2013 23:29

2 INCH MAIN PASS





Borehole
Temp in
deg F

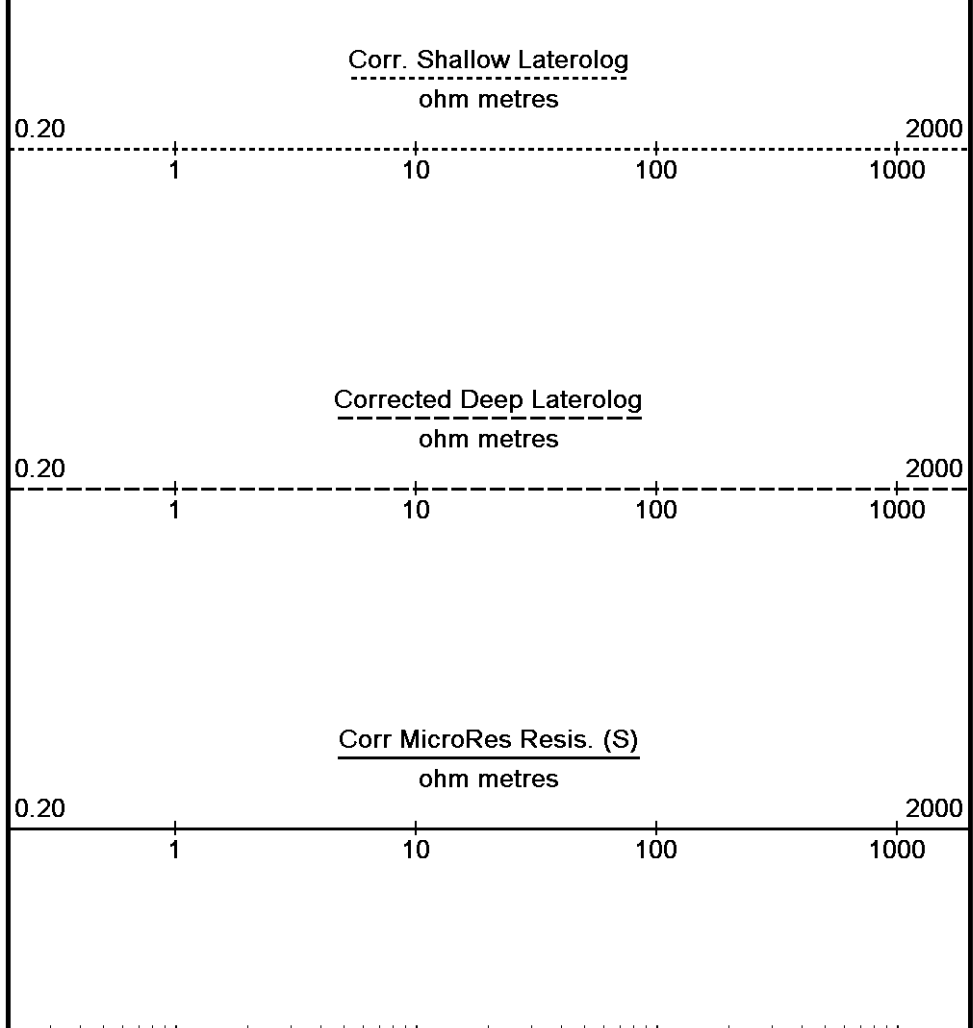
Replay
Scale
1:240

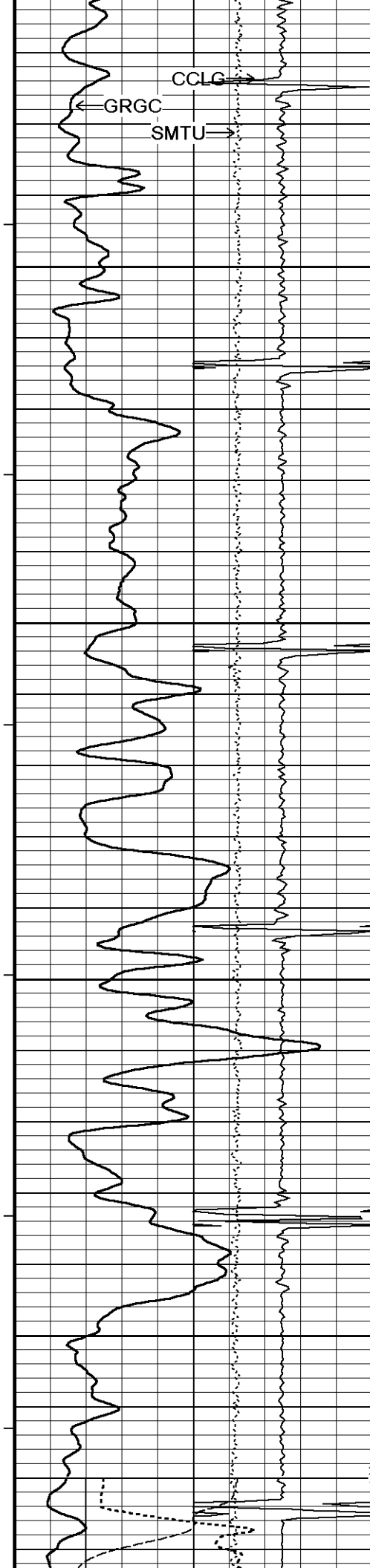
8200

8250

171°

8300





172°

8350

172°

8400

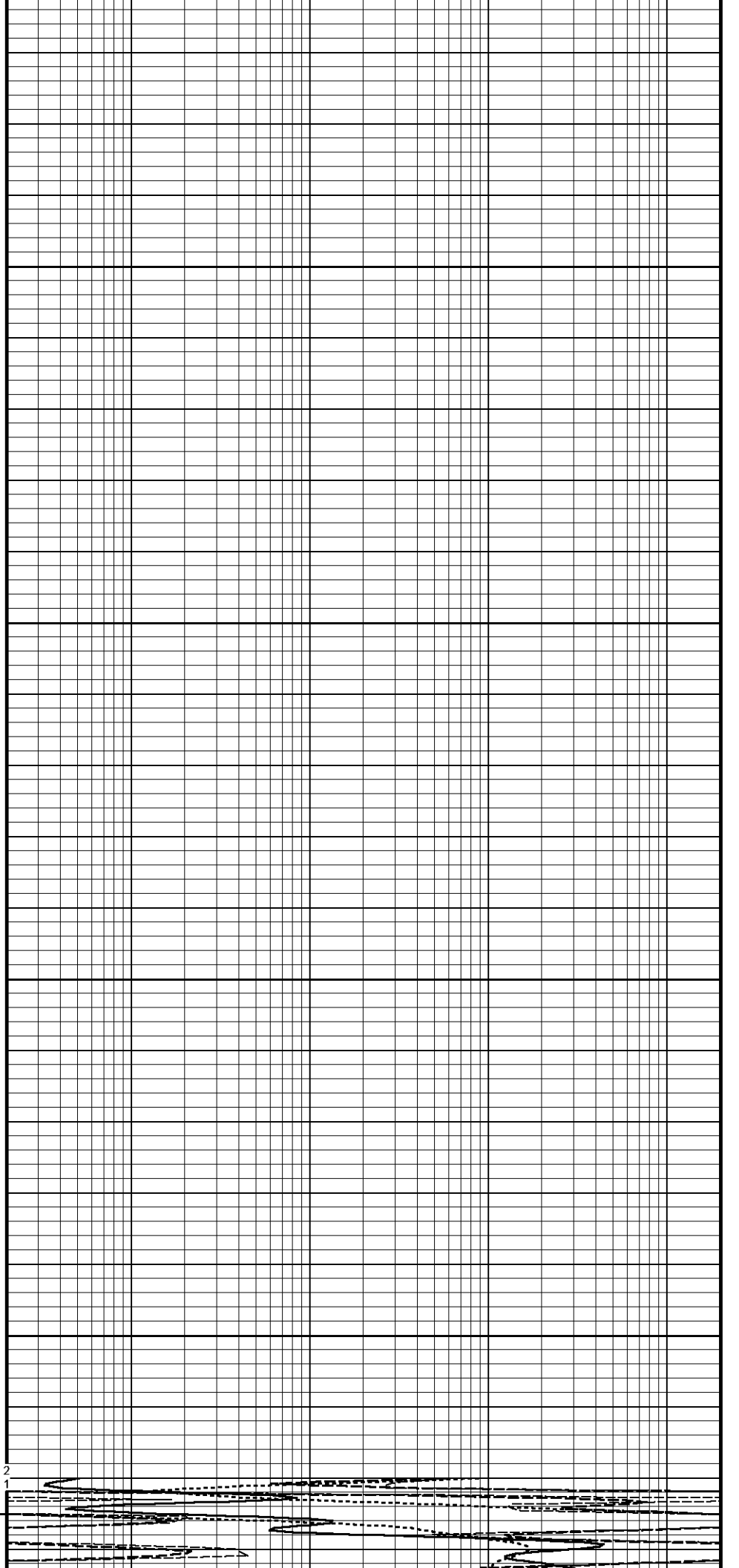
172°

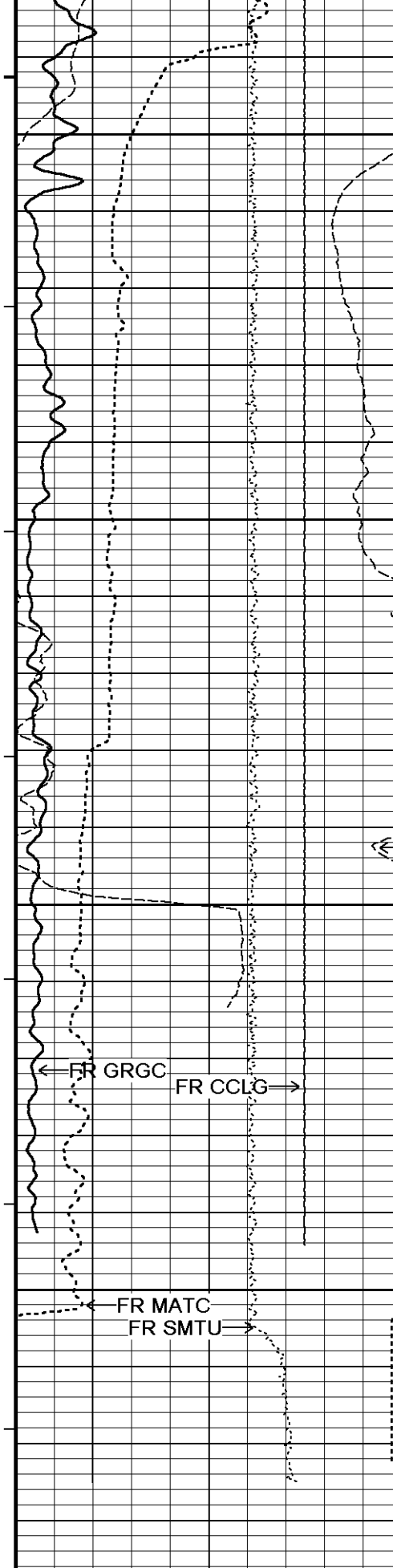
8450

172°

8500

Casing
Shoe





172°

8550

172°

8600

172°

8650

172°

8700

TD

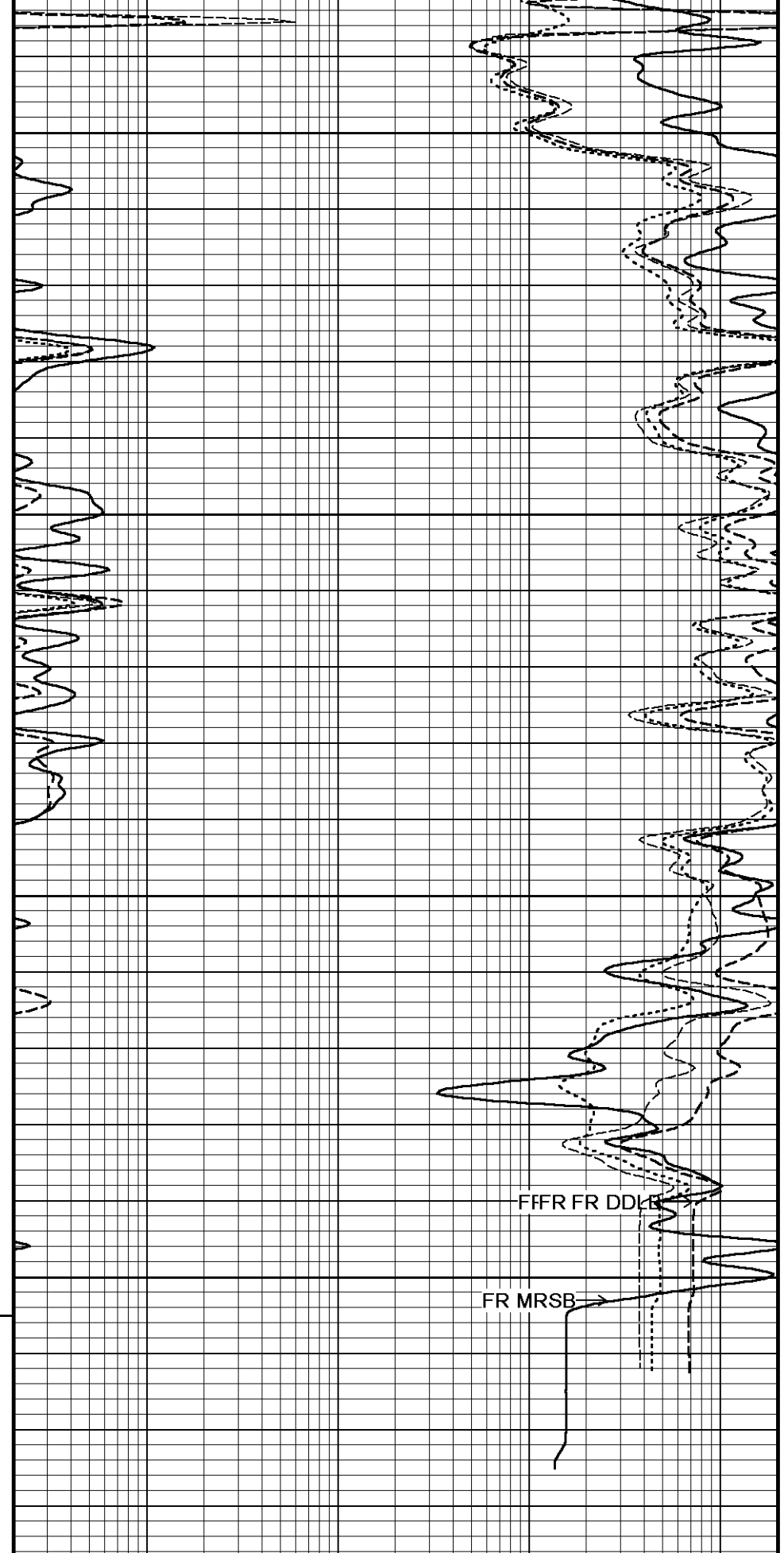
Depth
in
Feet

FR SPDL

FR GRGC FR CCLG

FR MATC
FR SMTU

Timing Marks
every 60.0 sec



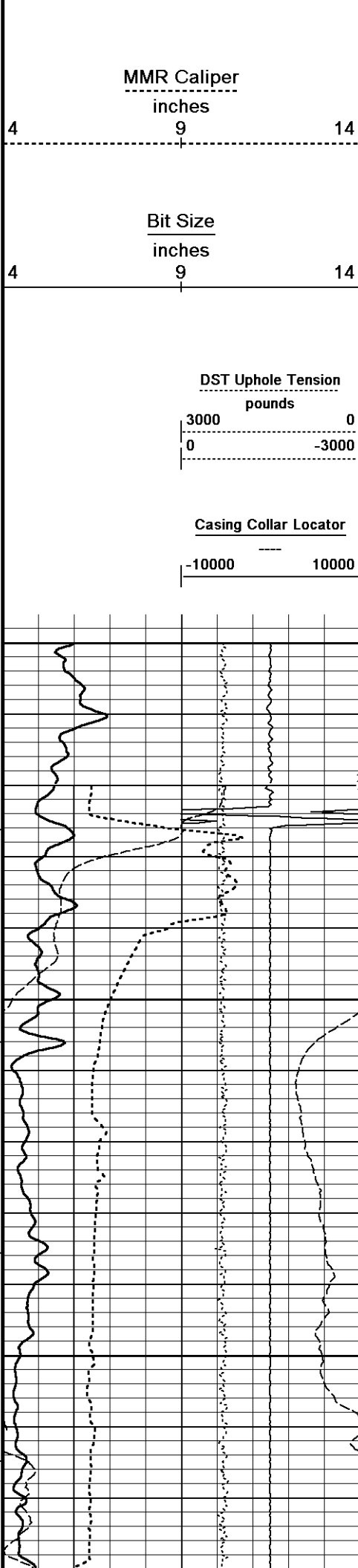
FFR FR DDL

FR MRSB

Groningen Laterolog
ohm metres

0.20

2000



Borehole
Temp in
deg F

Replay
Scale
1:240

8500

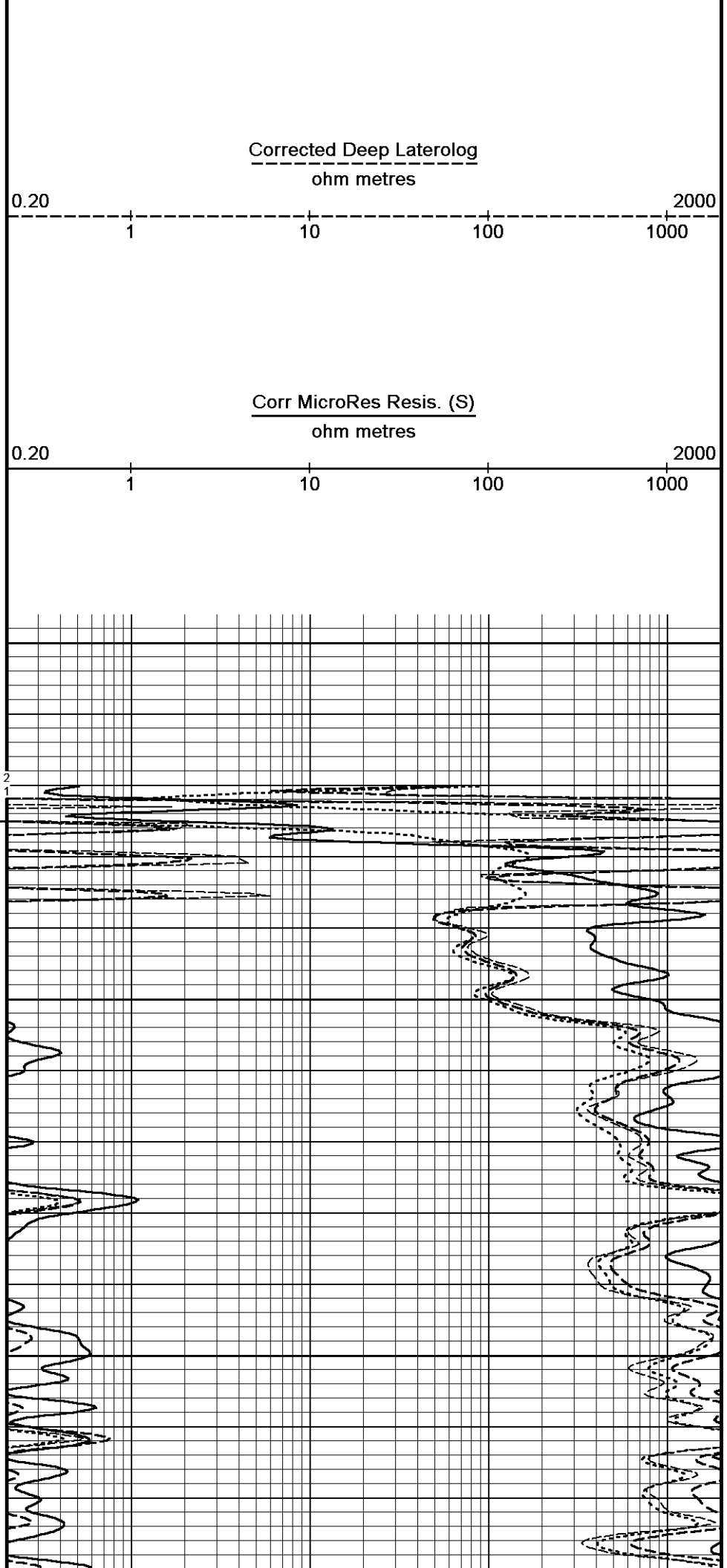
Casing
Shoe

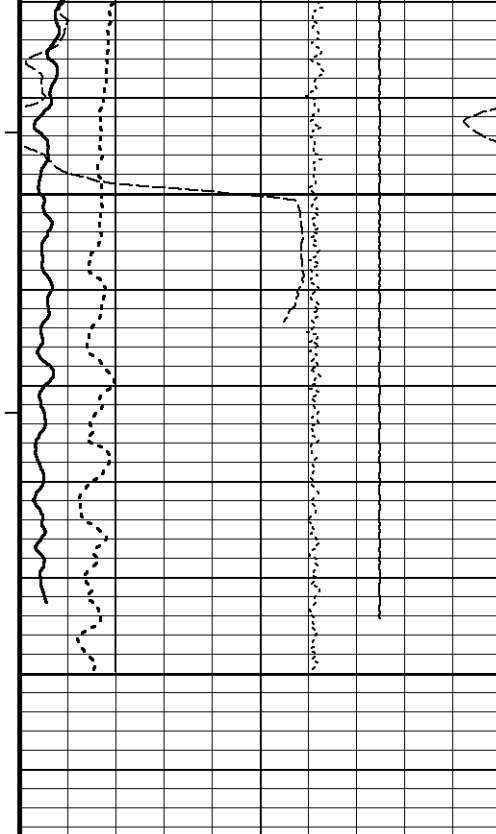
172°

8550

172°

8600





Depth
in
Feet

Timing Marks
every 60.0 sec

Gamma Ray

API

0 100 200

A horizontal number line with tick marks at 200, 300, and 400.

Spontaneous Potential

millivolts

$- \longrightarrow | 10 | \longleftarrow +$

MMR Caliper

inches

4 **9** **14**

Bit Size

inches

4 9 14

DST Uphole Tension

pounds

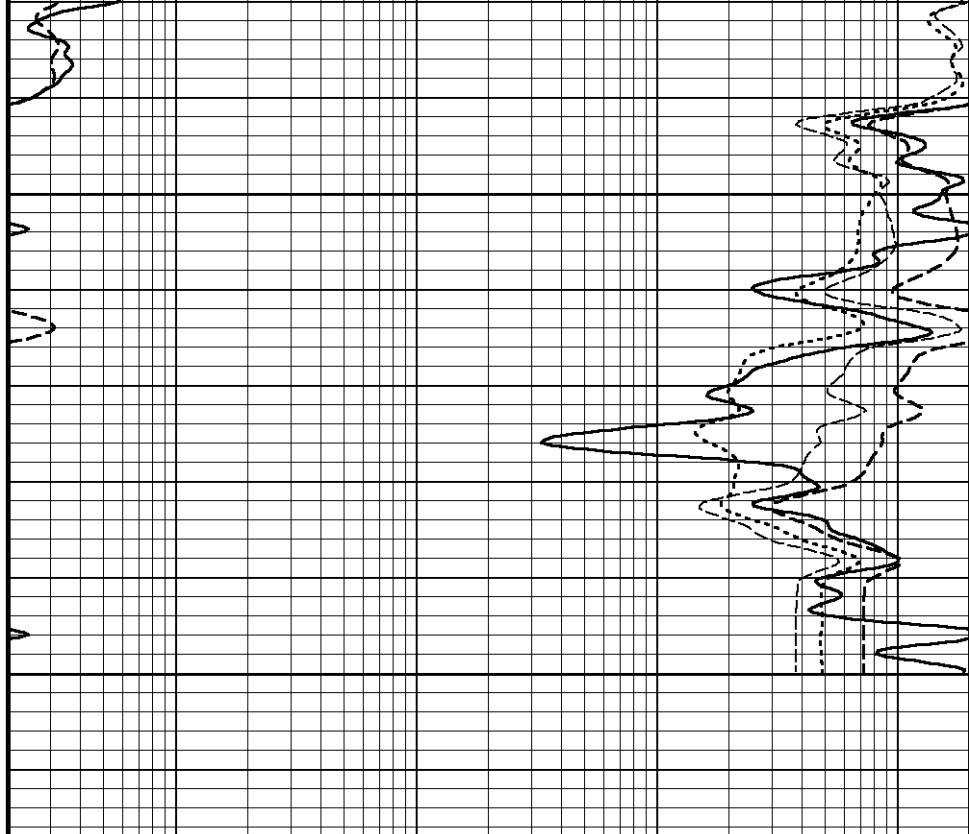
3000 0

0	-3000
---	-------

Casing Collar Locator

Borehole
Temp in
deg F

Replay



Groningen Laterolog

ohm metres

0.20 2000

A horizontal logarithmic scale with major ticks labeled 1, 10, 100, and 1000. The scale is represented by a line with a dashed horizontal line above it and a solid horizontal line below it.

Corr. Shallow Laterolog

ohm metres

0.20	2000
------	------

Corrected Deep Laterolog

ohm metres

0.20	2000
------	------

A horizontal logarithmic scale with major tick marks labeled 1, 10, 100, and 1000. The scale is represented by a dashed line.

Corr MicroRes Resis. (S)

ohm metres

0.20	2000
------	------

Depth Based Data - Maximum Sampling Increment 10.0cm Plotted on 26-AUG-2013 11:40
 Filename: C:\LOGS\KINDER MORGAN\km dc 15 time file\Doe Canyon #15\RESISTIVITY MAIN.dta Recorded on 24-AUG-2013 23:29
 System Versions: Logged with 13.06.9804 Processed with 13.06.9804 Plotted with 13.06.9804

↑ REPEAT OVERLAY ↑

BEFORE SURVEY CALIBRATION

C:\LOGS\KINDER MORGAN\km dc 15 time file\Doe Canyon #15\RESISTIVITY MAIN.dta

General Constants All 000

Last Edited on 24-AUG-2013,20:22

General Parameters

Mud Resistivity	0.950	ohm-metres
Mud Resistivity Temperature	86.000	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	None	
HVOL Caliper 2	N/A	
Annular Volume Diameter	0.000	inches
Caliper for Differential Caliper	None	

Rwa Parameters

Porosity used	N/A
Resistivity used	N/A
RWA Constant A	N/A
RWA Constant M	N/A
SW/APOR Tool Source	0.000

High Resolution Temperature Calibration MCG-D.A 287

Field Calibration on 12-JUL-2012 04:06

	Measured	Calibrated(Deg F)
Lower	10.00	10.00
Upper	200.00	200.00

High Resolution Temperature Constants MCG-D.A 287

Last Edited on 27-FEB-2012 21:44

Pre-filter Length 11

Gamma Calibration MCG-D.A 287

Field Calibration on 24-AUG-2013,20:27

	Measured	Calibrated (API)
Background	130	91
Calibrator (Gross)	1028	717
Calibrator (Net)	898	626

Gamma Constants MCG-D.A 287

Last Edited on 19-AUG-2013,13:39

Gamma Calibrator Number	GRC005	
Mud Density	1.22	gm/cc
Caliper Source for Processing	Bit Size	
Tool Position	Centred	
Concentration of KCl		kppm
K Mud Type	Chloride	
K Mud Concentration	0.00	%

SP Calibration MLE-D.A 258

Field Calibration on 24-AUG-2013,20:52

	Measured	Calibrated (mV)
Reference 1	99.5	88.7
Reference 2	-100.8	-75.2

Laterolog Calibration MLE-D.A 258

Base Calibration on 24-AUG-2013,20:52

Field Check on 24-AUG-2013 21:32

Base Calibration

	Measured	Calibrated (ohm-m)
Channel	Resistor 1 Resistor 2	Resistor 1 Resistor 2

Channel	Resistor 1	Resistor 2	Resistor 1	Resistor 2
Shallow	0.0	1008.0	0.0	1289.5
Deep	0.0	1007.8	0.0	809.8
Groningen	0.0	1007.7	0.0	838.7
Channel	Base Check (ohm-m)		Field Check (ohm-m)	
Shallow	0.0		46.0	
Deep	0.0		28.9	
Groningen	0.0		239.5	

Laterolog Constants MLE-D.A 258

Last Edited on 24-AUG-2013,21:33

Squasher Start	40000	ohm-m
Shallow Laterolog K Factor	1.2895	
Deep Laterolog K Factor	0.8098	
Groningen Laterolog K Factor	0.8387	
Interference Rejection	50 Hz	
SP Connection	Groningen Electrode (Upper)	
Groningen Connection	SP Bridle Electrode (Lower)	

Borehole Correction Constants

Bridle Type	Short	
Stand-off	0.50	inches
Caliper Source	MMR Caliper	
Hole Size	N/A	inches
Mud Resistivity Source	Temperature Corrected	
Temp. for Rm Corr.	MCG External Temperature	

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 MMR-C.A 242

Base Calibration on 24-AUG-2013,20:27

Field Calibration on 24-AUG-2013 23:22

Base Calibration

Reading No	Measured	Calibrator Size (in)
1	12878	4.00
2	14636	5.96
3	16704	7.98
4	18744	9.86
5	21106	11.88
6	N/A	N/A

Field Calibration

Measured Caliper (in)	Actual Caliper (in)
6.43	6.28

Micro Laterolog Calibration MMR-C.A 242

Base Calibration on 24-AUG-2013,20:28

Field Check on 31-DEC-1999 00:00

Base Calibration

Measured		Calibrated (ohm-m)	
Ref 1	Ref 2	Ref 1	Ref 2
10.0	9933.2	0.1	128.0
Base Check (ohm-m)		Field Check (ohm-m)	
5.2		0.0	

Micro Laterolog Constants MMR-C.A 242

Last Edited on 24-AUG-2013,20:21

Pad Type	6 in Solid Nylon B23059		
Micro Laterolog K Factor	0.0128		
Standoff Offset	0.0000	inches	

Mudcake Thickness Correction Constants

Mud Cake Source	Constant Value		
Mud Cake Thickness	0.4000	inches	
Mud Cake Thickness Caliper	N/A		

Mud Cake Thickness Caliper	N/A	
Mud Cake Resistivity	0.1500	ohm-m
Mud Cake Resistivity Temp.	68.00	Deg F
Mud Cake Resistivity Source	Constant Value	
Temp. Source Rmc Correc.	N/A	

DOWNHOLE EQUIPMENT

C:\LOGS\KINDER MORGAN\km dc 15 time file\Doe Canyon #15\RESISTIVITY MAIN.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

Compact Stiff Bridle Electrode Sub.

MBE-C.B 331 LG: 12.33 ft WT: 77.2 lb OD: 2.28 in

Compact Stiff Bridle Electrode Sub.

MBE-C.B 335 LG: 12.33 ft WT: 77.2 lb OD: 2.28 in

SHA-J.A Compact Swivel Head Adaptor

SHA-J.A 313 LG: 2.30 ft WT: 22.0 lb OD: 2.24 in

Compact Comms Gamma

MCG-D.A 287 LG: 8.70 ft WT: 63.9 lb OD: 2.24 in

Compact Upper Guard sub

MUG-B.B 284 LG: 8.98 ft WT: 68.3 lb OD: 2.24 in

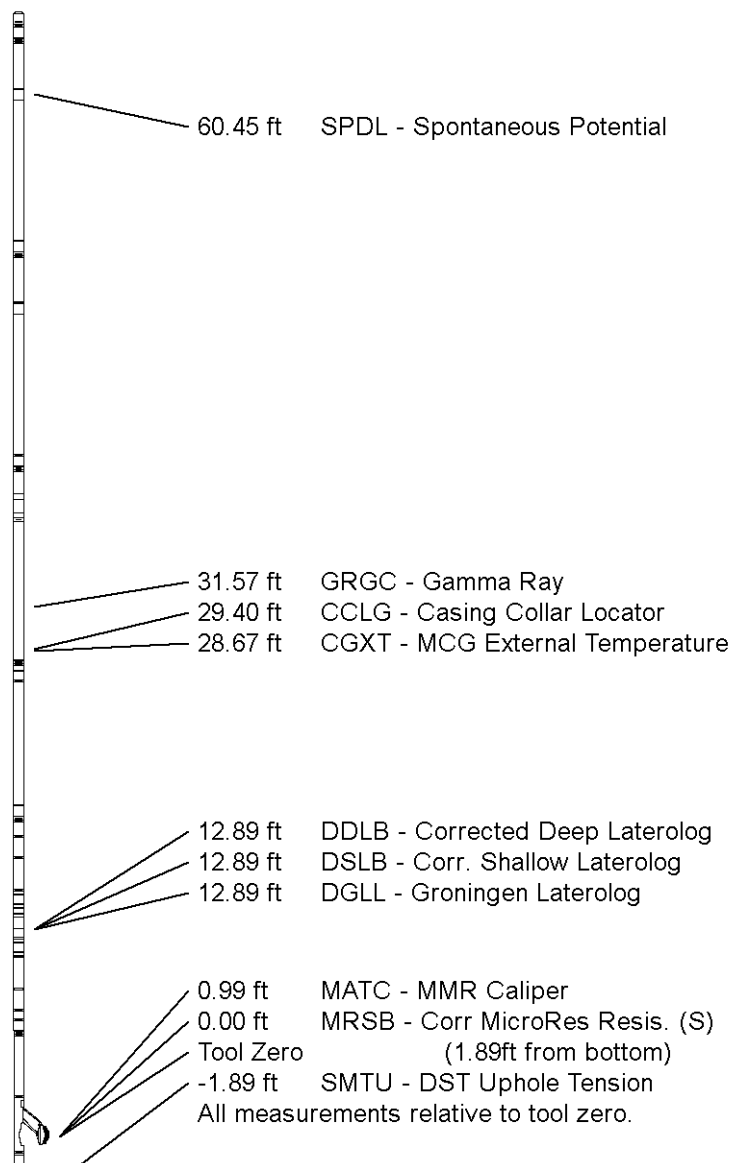
Compact Laterolog Electrode Sub.

MLE-D.A 258 LG: 12.34 ft WT: 92.6 lb OD: 2.24 in

Compact Micro-Resistivity

MMR-C.A 242 LG: 8.59 ft WT: 81.6 lb OD: 3.82 in

Total Length: 67.16 ft Weight: 498.2 lb



COMPANY	KINDER MORGAN C02 Co. L.P
WELL	DOE CANYON #15
FIELD	DOE CANYON
PROVINCE/COUNTY	DOLORES
COUNTRY/STATE	U.S.A. / COLORADO

Elevation Kelly Bushing	7250.00	feet	First Reading	8705.00	feet
Elevation Drill Floor	7250.00	feet	Depth Driller	8710.00	feet
Elevation Ground Level	7227.00	feet	Depth Logger	8705.00	feet



DUAL LATEROLOG
MICRO RESISTIVITY

Weatherford®

