



ThruBit
A Schlumberger Company

**ARRAY INDUCTION
GAMMA RAY
MEMORY LOG**

Company	SANDRIDGE ENERGY	Location:	API #: 15-077-21981-01-00	Other Services
Well	CATHER 3507 2-4H	SHL: 250' FSL & 2150' FEL		THRUBIT
Field	WALDRON	SEC 4 TWP 35S RGE 7W		PORTAL BIT
County	HARPER			Elevation
State	KANSAS			K.B. 1304'
				D.F. 1304'
				G.L. 1286'

Date	25 NOV 2013
Run Number	ONE
Depth Driller	8122'
Depth Logger	8095'
Bottom Logged Interval	8084'
Top Log Interval	3000'
Casing Driller	7" @ 5495'
Casing Logger	7" @ 5490'
Bit Size	6.125"
Type Fluid in Hole	WBM
Density / Viscosity	8.5 / 43
pH / Fluid Loss	10.5 / 6.0
Source of Sample	MUD SENSOR
Rm @ Meas. Temp	3.24 OHM @ 56 DEGF
Rmf @ Meas. Temp	2.43 OHM @ 56 DEGF
Rmc @ Meas. Temp	4.05 OHM @ 56 DEGF
Source of Rmf / Rmc	CALCULATED
Rm @ BHT	2.02 OHM @ 105 DEGF
Time Circulation Stopped	0115 25 NOV 2013
Time Logger on Bottom	0230 25 NOV 2013
Maximum Recorded Temperature	105 DEGF
Equipment Number	T011
Location	OKLAHOMA CITY, OK
Recorded By	RICK BROOMFIELD
Witnessed By	BILL TORBETT

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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 interpretation, and we shall not, except in the case of gross or willful 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 set out in our current Price Schedule.

Comments

**SERVICE: LEVEL 4- HORIZONTAL MEMORY PUMPDOWN - BIT DEPTH 8027' LOG TO 3000'
ALL SCALES AND PRESENTATION PER CLIENT REQUEST
LIMESTONE POROSITY , 2.71 G/CC, USED FOR POROSITY CALCULATIONS
LOG RAN WITH SWIVEL, SMALL DECENTRALIZER AND NO STANDOFFS
TBHV REPRESENTS TOTAL BOREHOLE VOLUME, FT3
ABHV REPRESENTS ANNULAR BOREHOLE VOLUME, FT3, CALCULATED FOR 4.50" CASING
RIGMINDER LITE AND RIGSENSE USED TO CREATE DEPTH LOG
LOG DEPTH CORRELATED TO MWD GR PROVIDED BY CUSTOMER
TOOL WAS ROLLING OVER DURING FIRST 200' OF LOG**

**RIG: LARIAT 45
CREW: R. BROOMFIELD, J. HIRSCHLER, E. PRICE**

Service Ticket No.	2344	API No.	15-077-21981-01-00	PGM Ver	WARRIOR 7.0
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The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

EQUIPMENT DATA

GAMMA RAY	NEUTRON	DENSITY	INDUCTION
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Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	PS24T	Serial No.	PS29N	Serial No.	PS43D	Serial No.	PS15R
Model No.	PS	Model No.	PS	Model No.	PS	Model No.	PS
Diameter	2.125"	Diameter	2.125"	Diameter	2.125"	Diameter	2.125"

LOGGING DATA

General Data

Pass	Depths		Well Head	Speed	Logging Run Comments
No.	From	To	Pressure	Ft/Min	
ONE	8095'	3000'	0	30 FPM	

	GAMMA RAY		NEUTRON		DENSITY		INDUCTION	
Pass	Scale		Scale		Scale		Scale	
No.	L	R	L	R	L	R	L	R
ONE	0 API	150 API	30 %	-10 %	30 %	-10 %	0.2 OHM-M	2000 OHM-M

DIRECTIONAL INFORMATION

Maximum Deviation	91.8	deg. @	7199'	KOP	4097'
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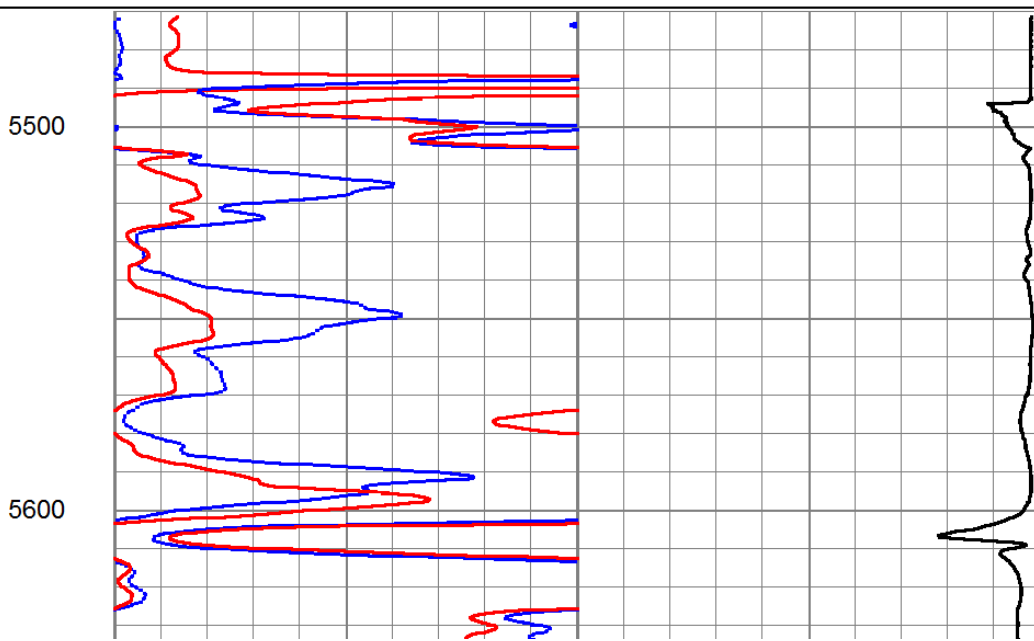
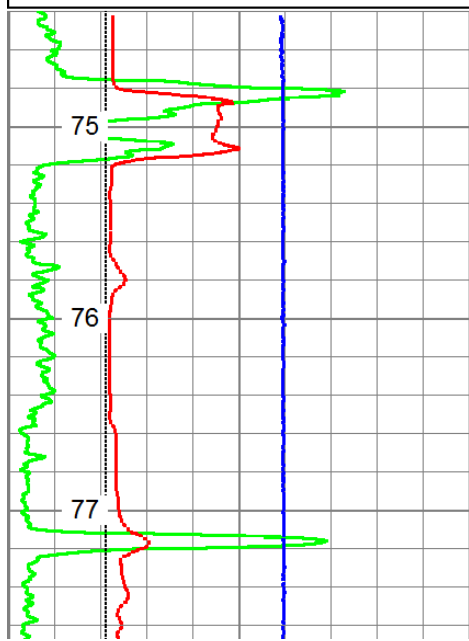


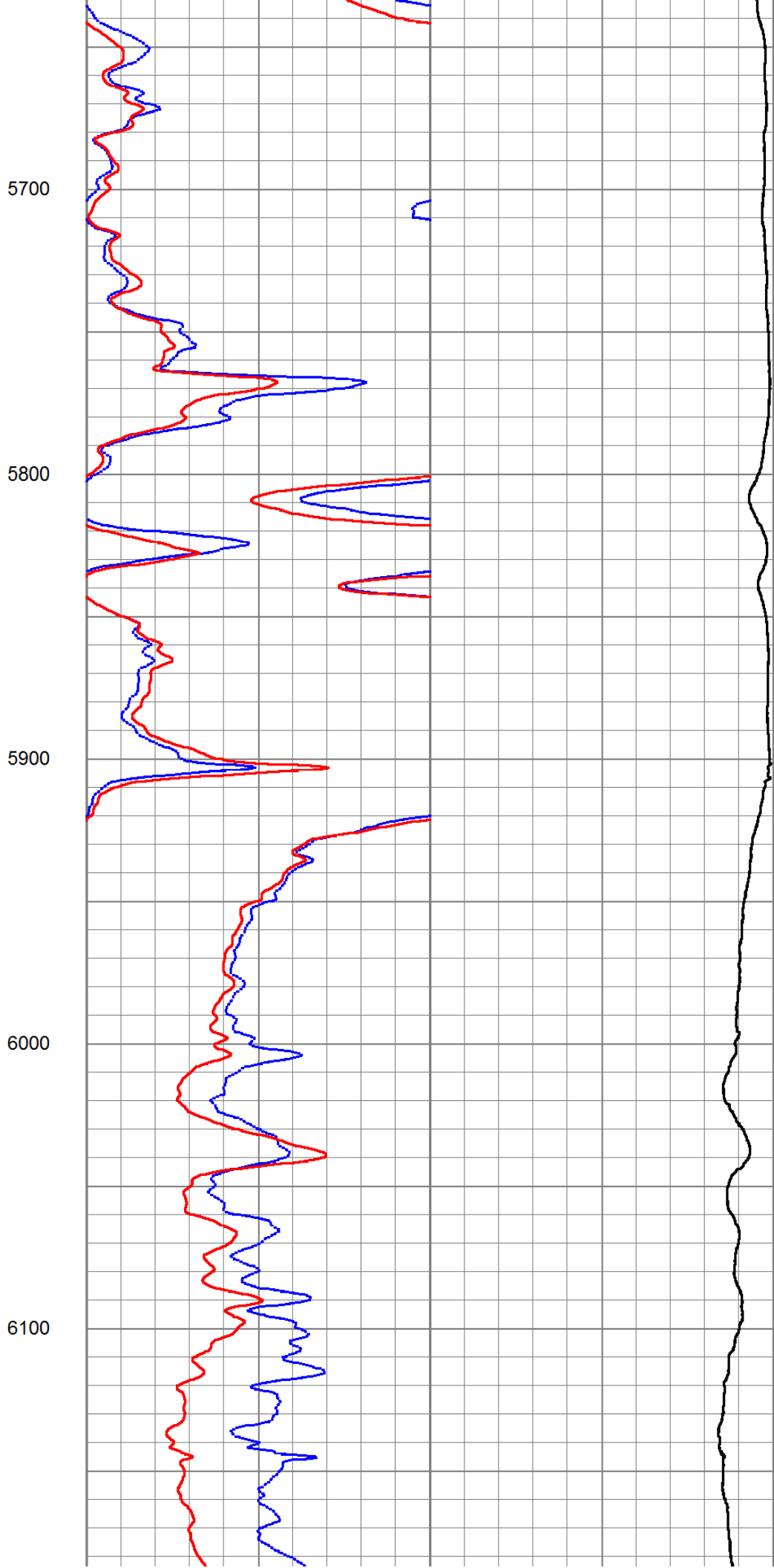
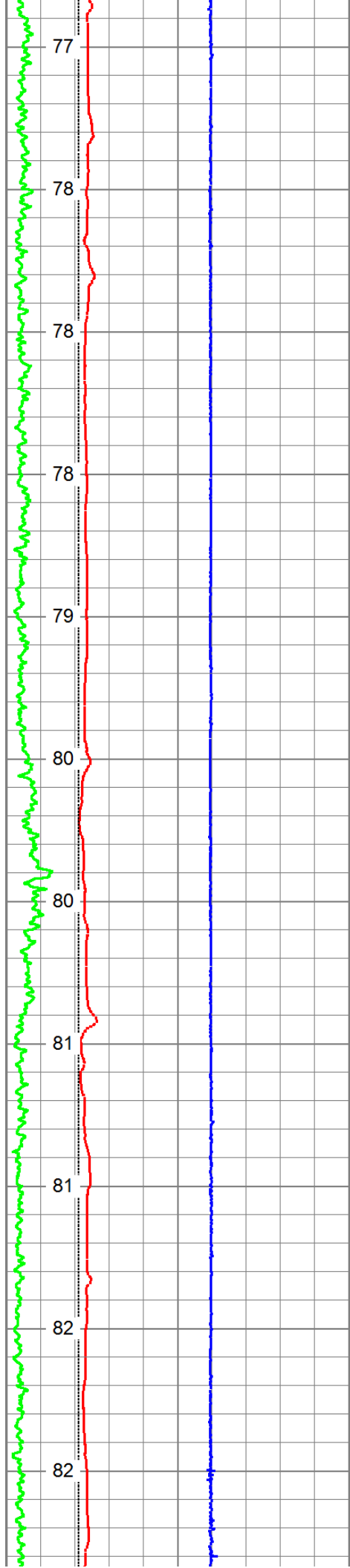
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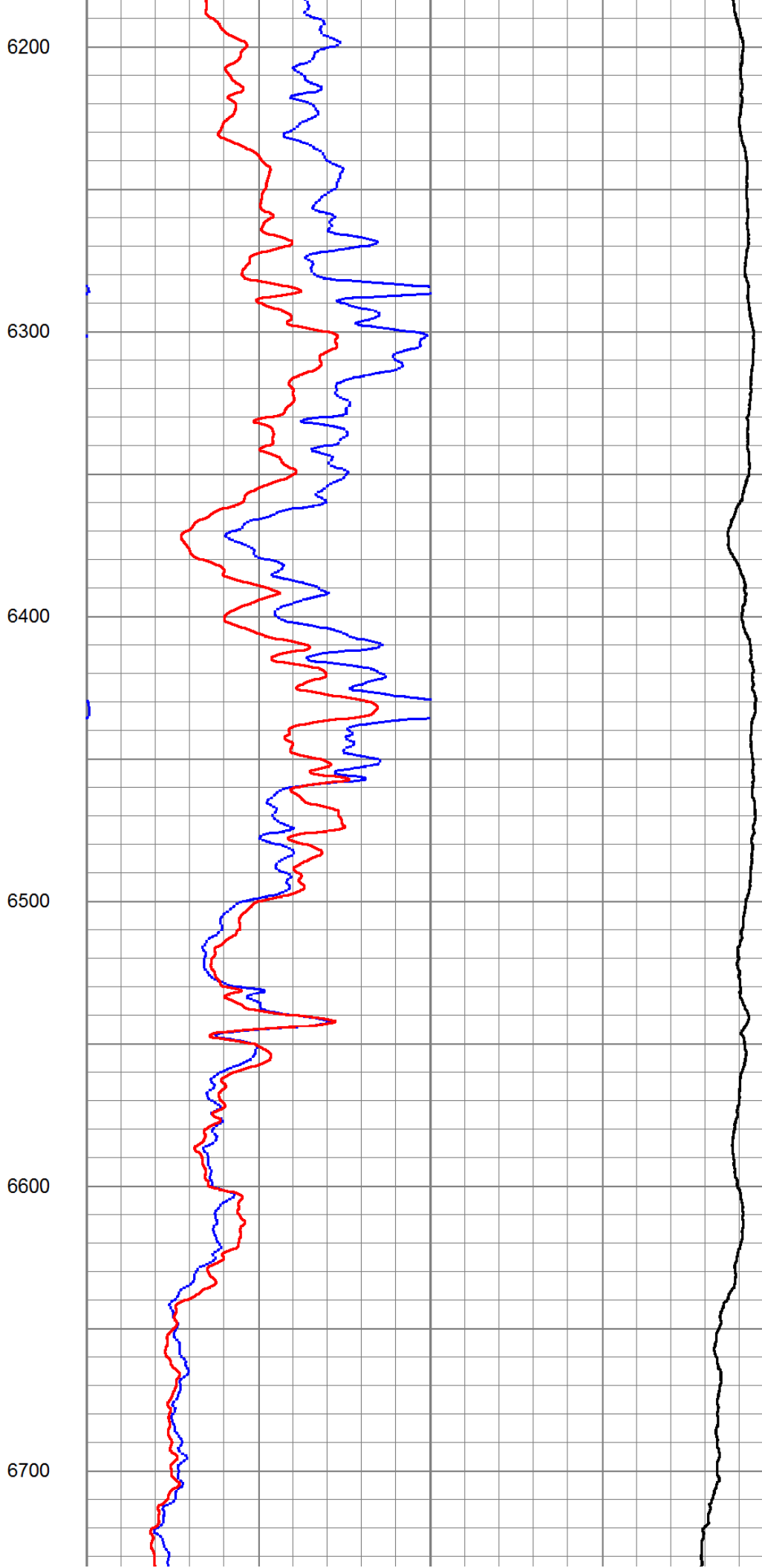
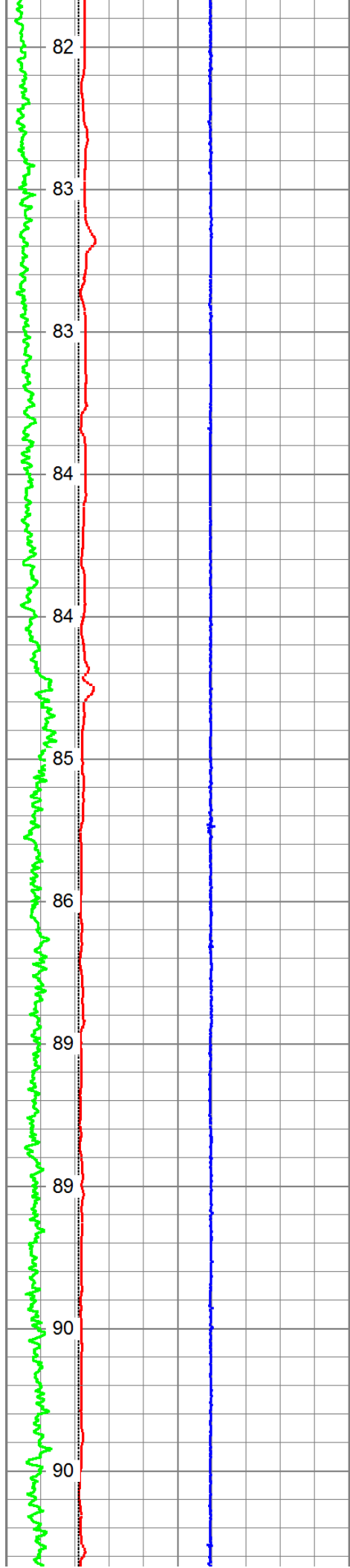
MAIN PASS

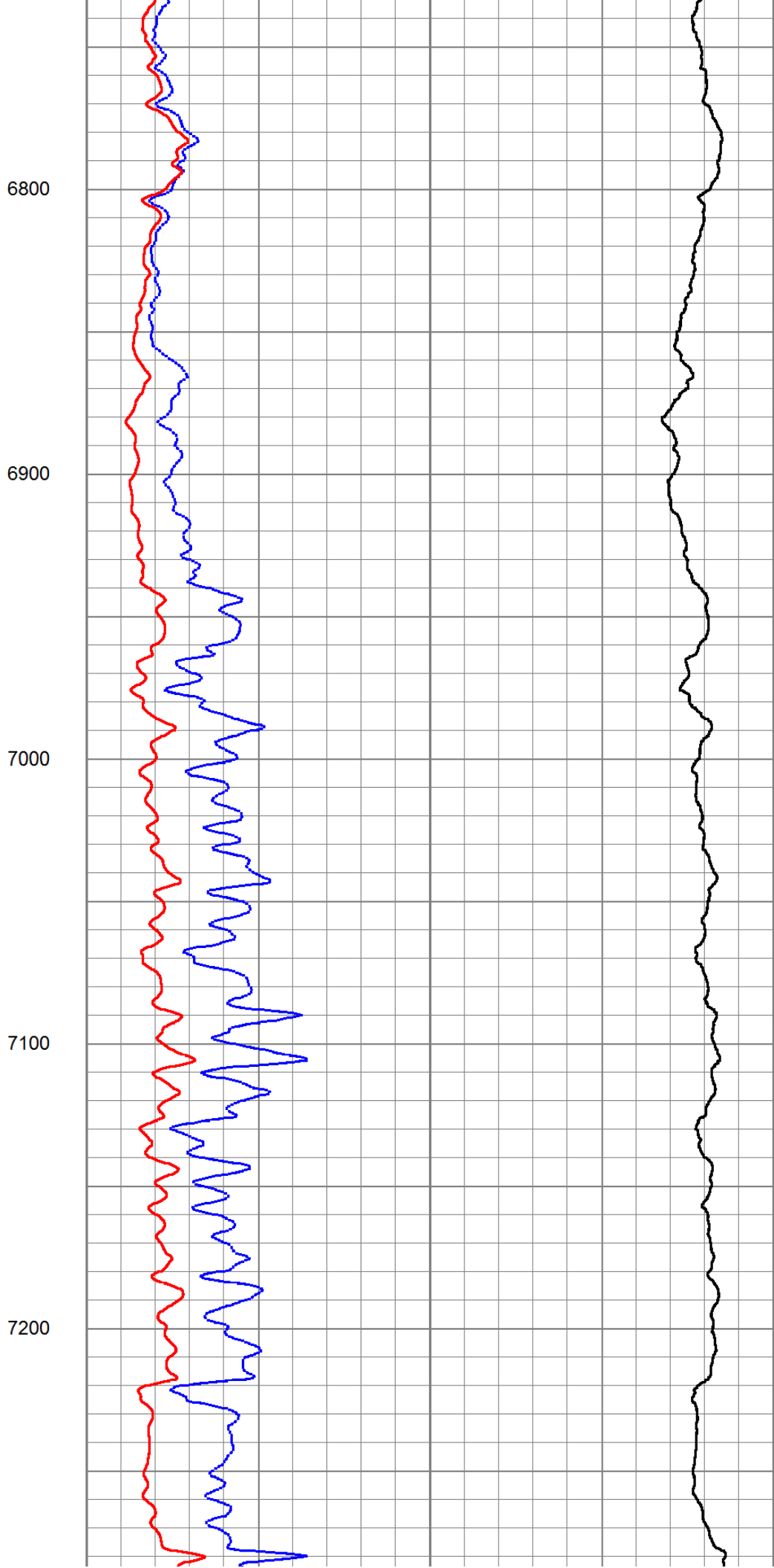
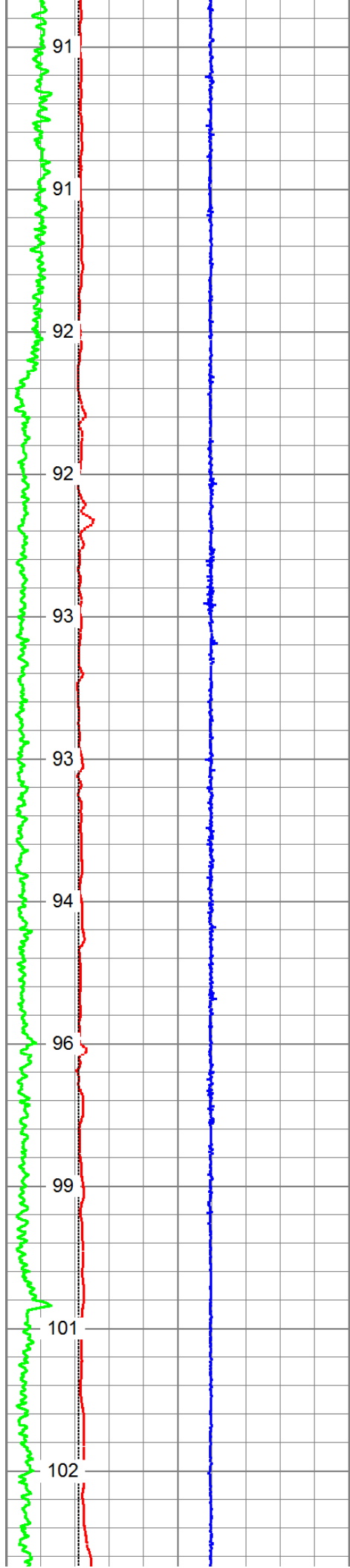
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 Presentation Format: 6_2r_chk
 Dataset Creation: Mon Nov 25 12:18:53 2013
 Charted by: Depth in Feet scaled 1:600

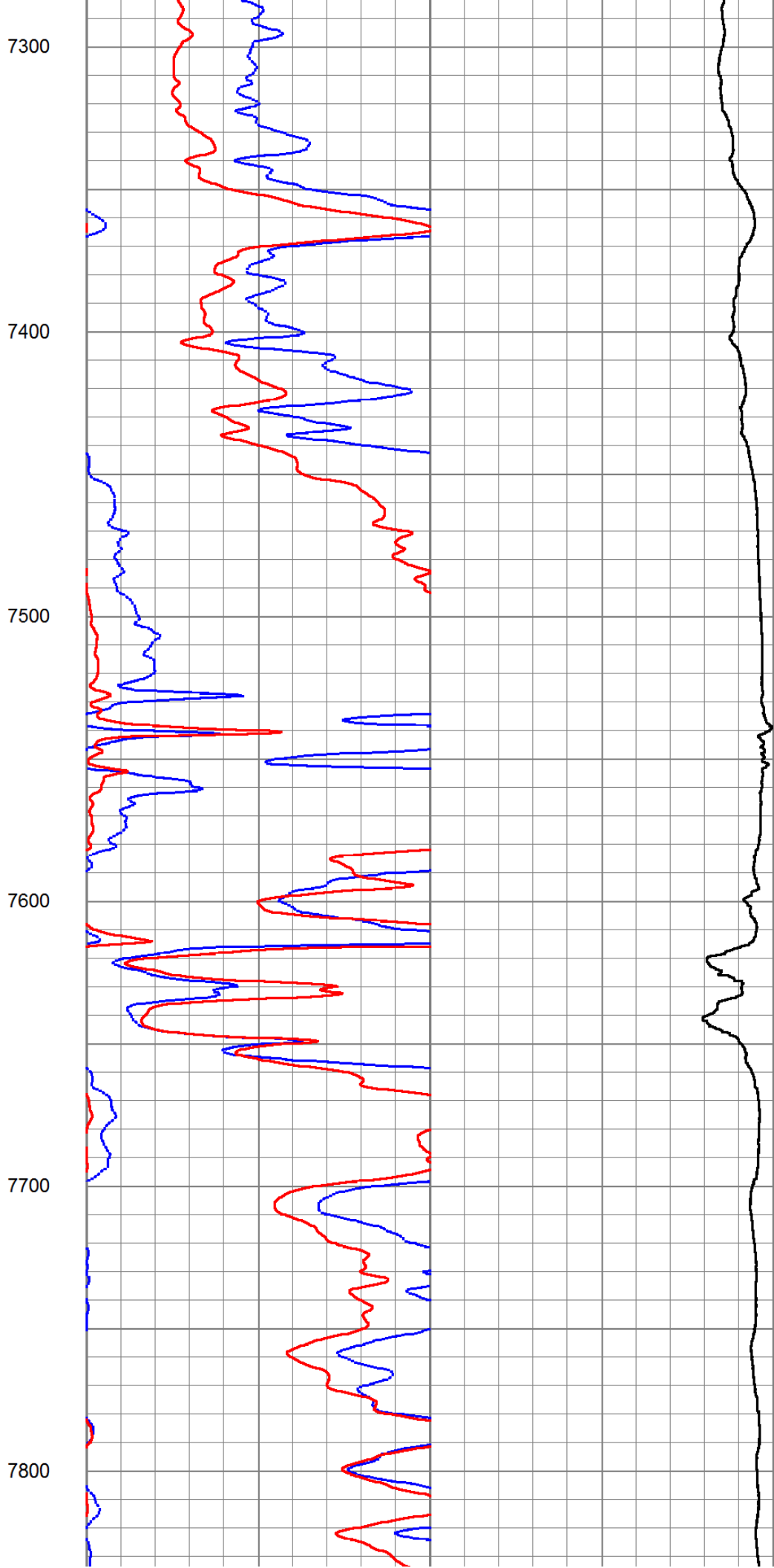
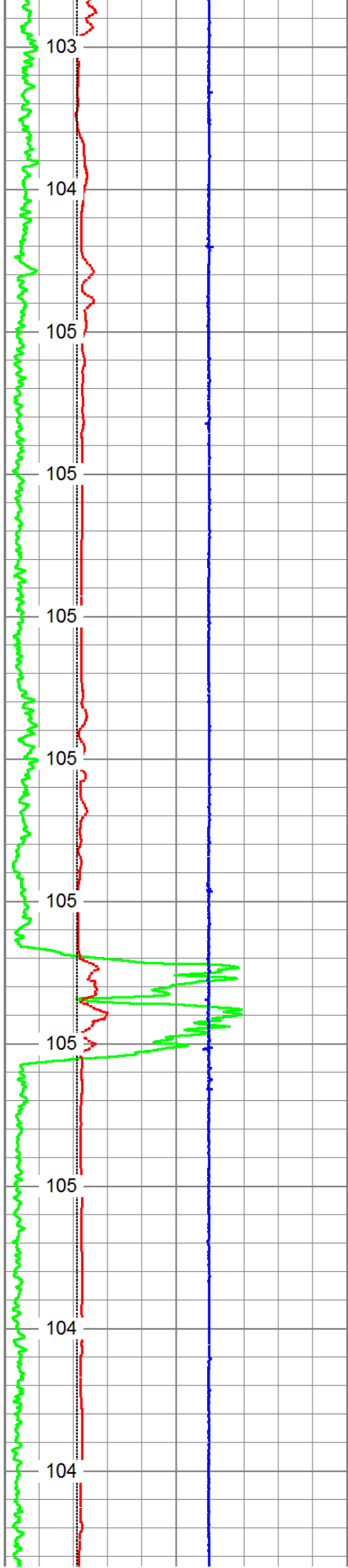
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4	DCAL (in)	14	50	90in 2ft Res (Ohm-m)	500
-5	ACCY	5	1000	DEEP COND (mmho/m) 0	
4	BOREID (in)	14	0	20in 2ft Res (Ohm-m)	50
	GRTEMP (degF)		0	90in 2ft Res (Ohm-m)	50

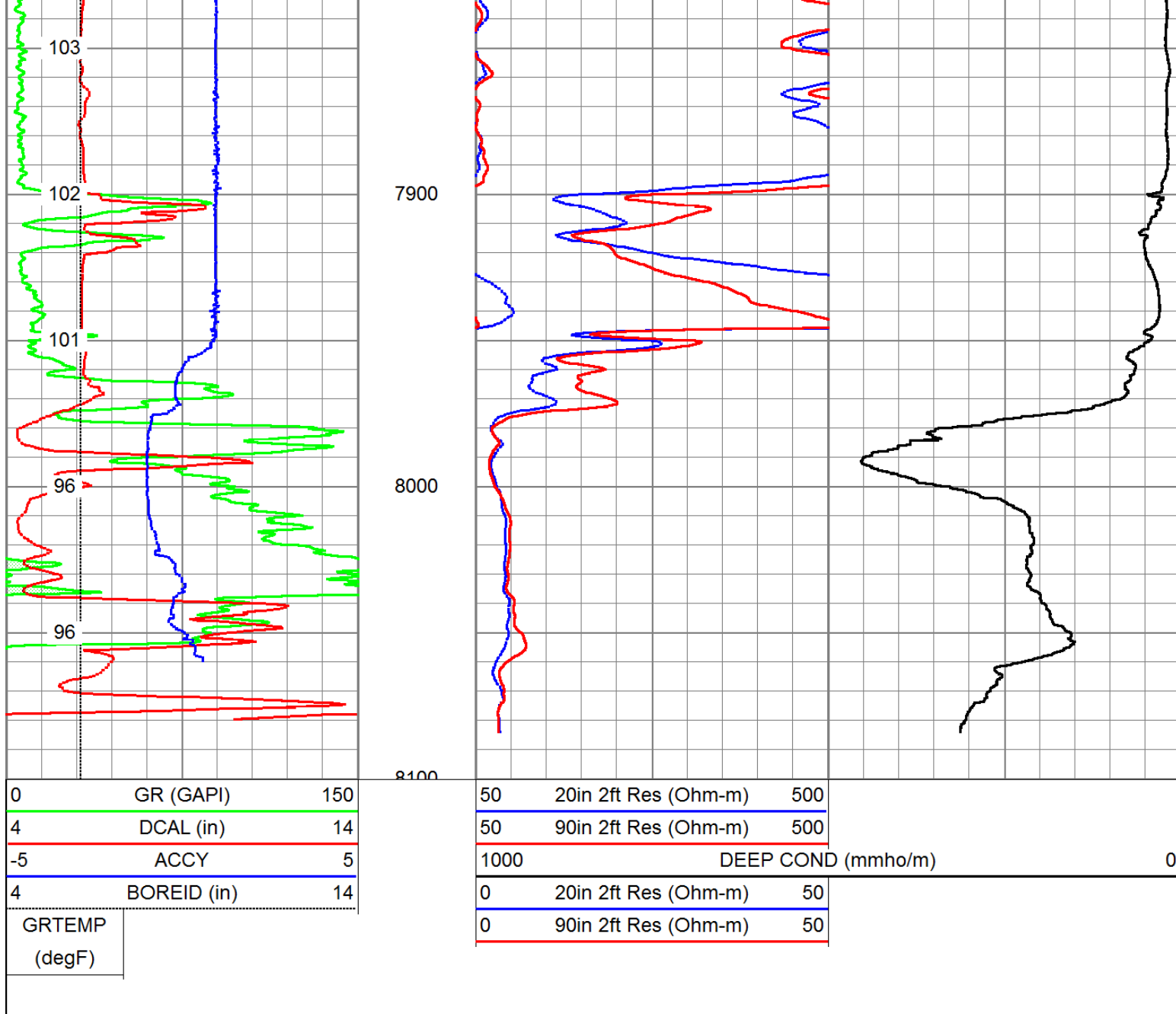








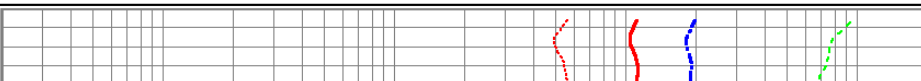
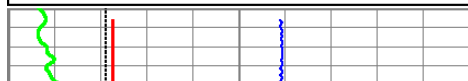


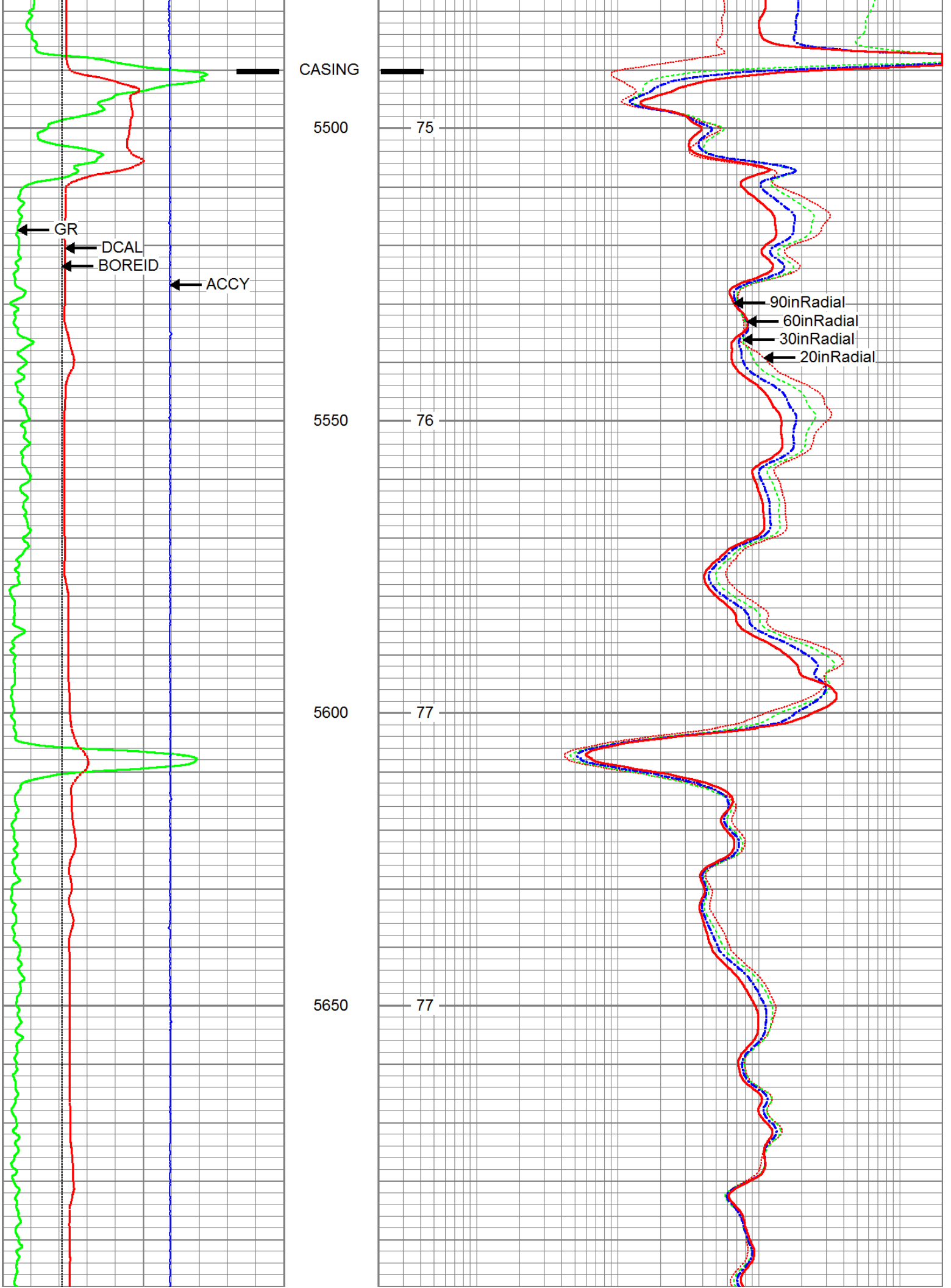


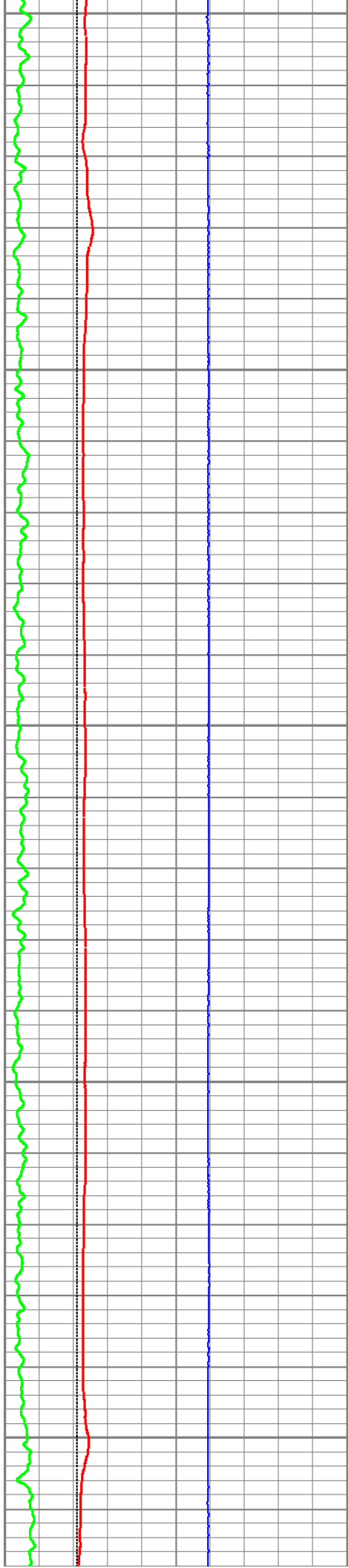
MAIN PASS

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 Presentation Format: 6_5r10_c
 Dataset Creation: Mon Nov 25 12:18:53 2013
 Charted by: Depth in Feet scaled 1:240

0	GR (GAPI)	150	0.2	20inRadial (Ohm-m)	2000
4	BOREID (in)	14	0.2	30inRadial (Ohm-m)	2000
4	DCAL (in)	14	0.2	60inRadial (Ohm-m)	2000
-5	ACCY	5	0.2	90inRadial (Ohm-m)	2000
GRTEMP (degF)					







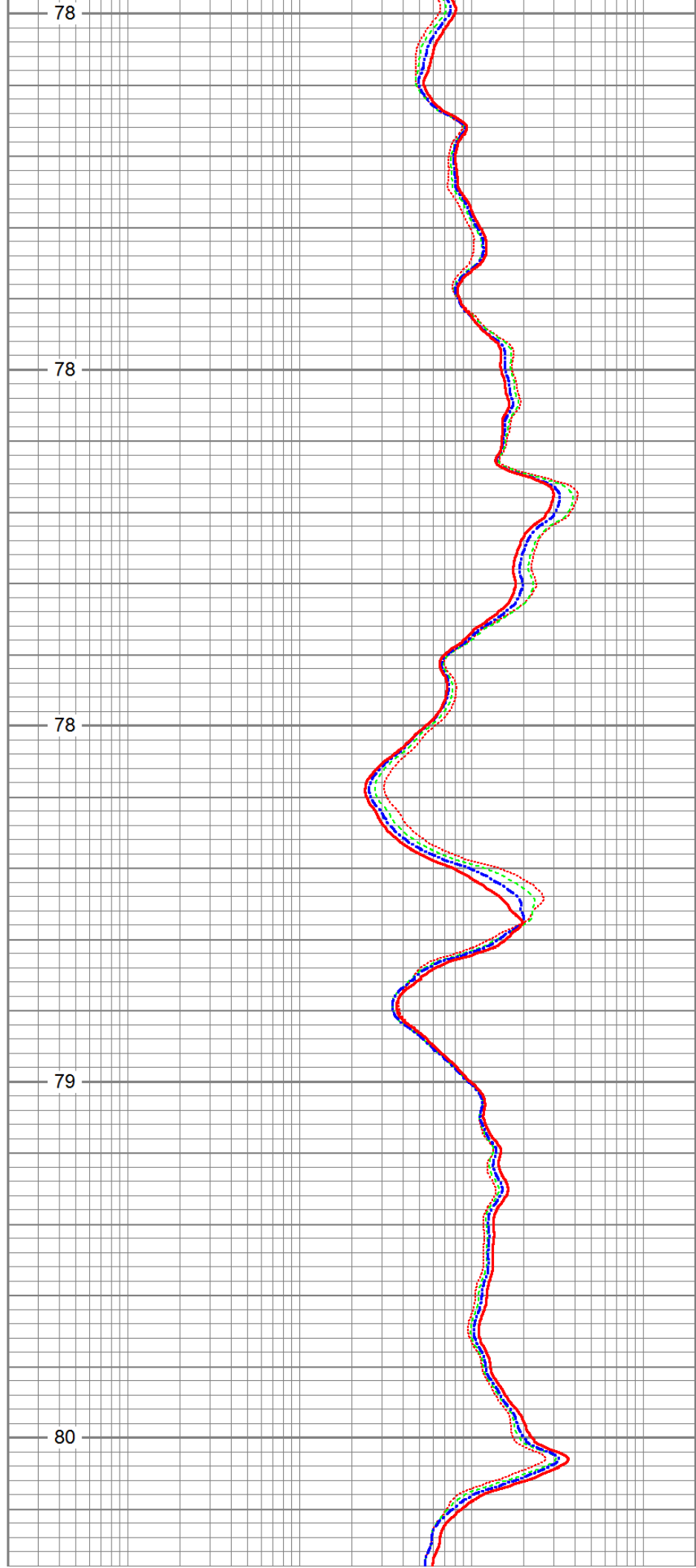
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5750

5800

5850

5900



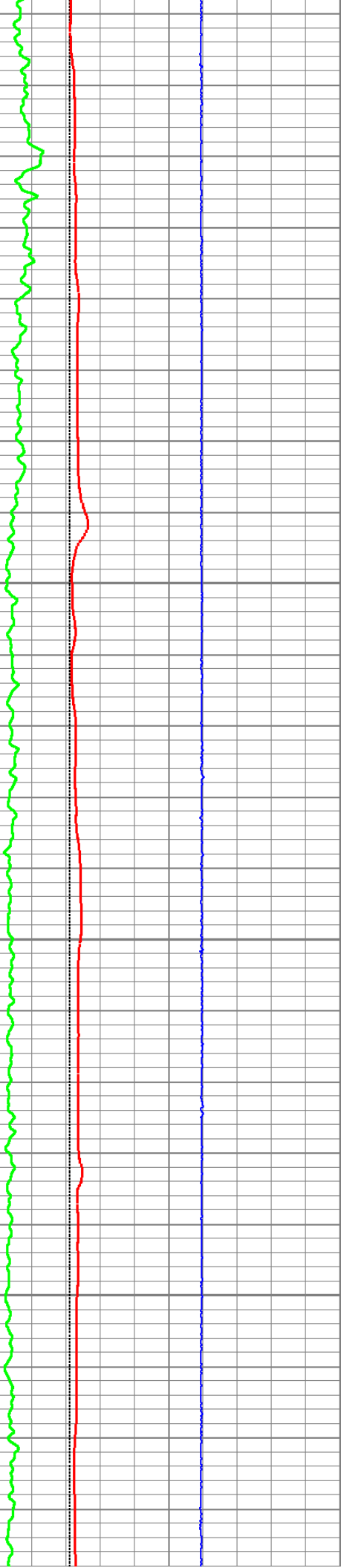
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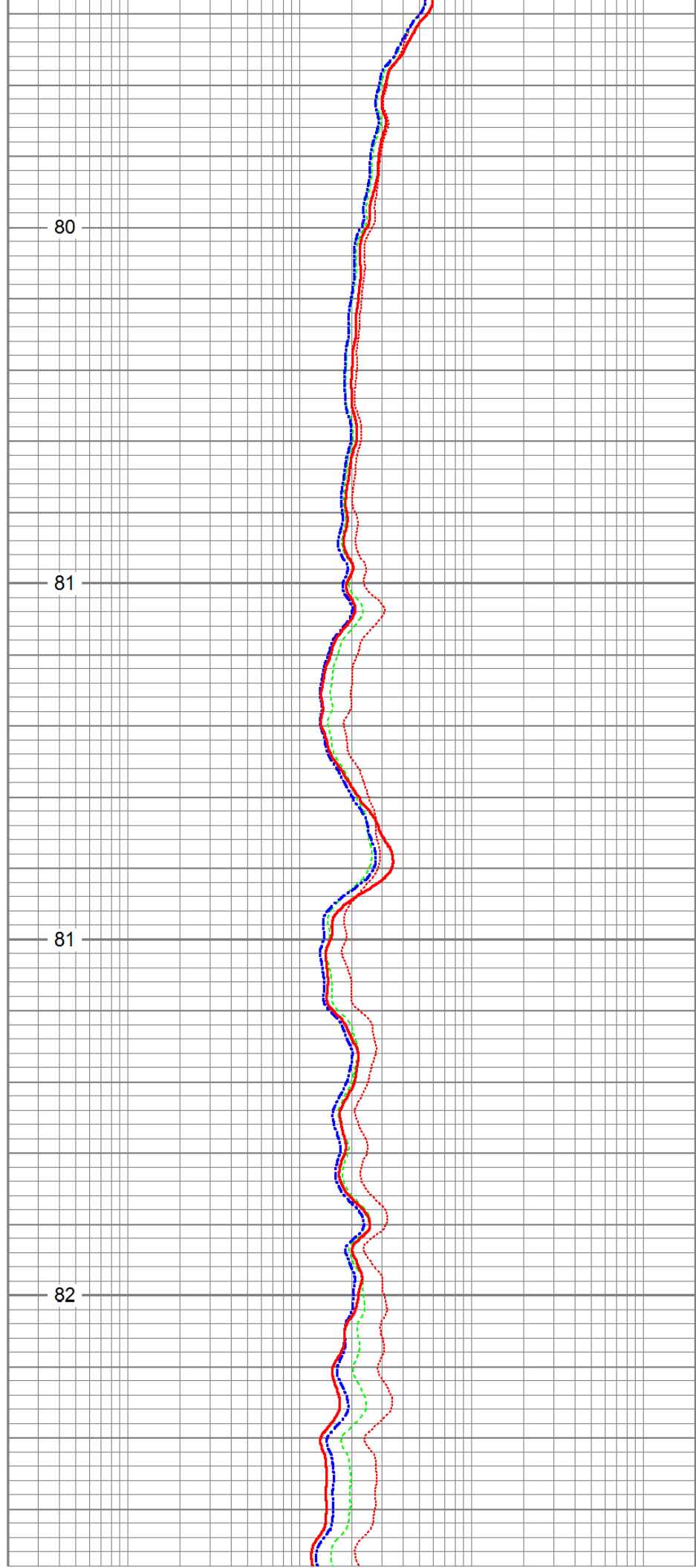


5950

6000

6050

6100

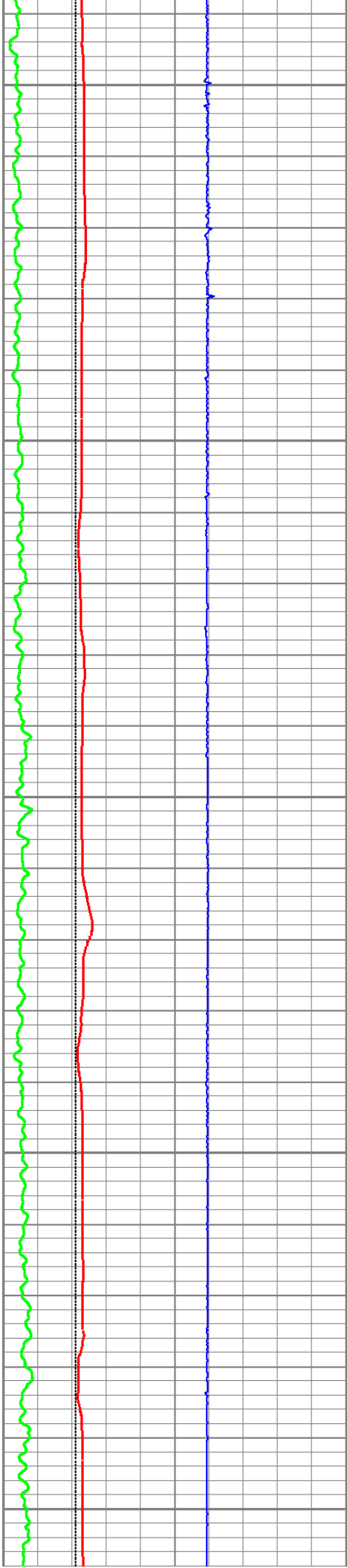


80

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82



6150

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6200

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6250

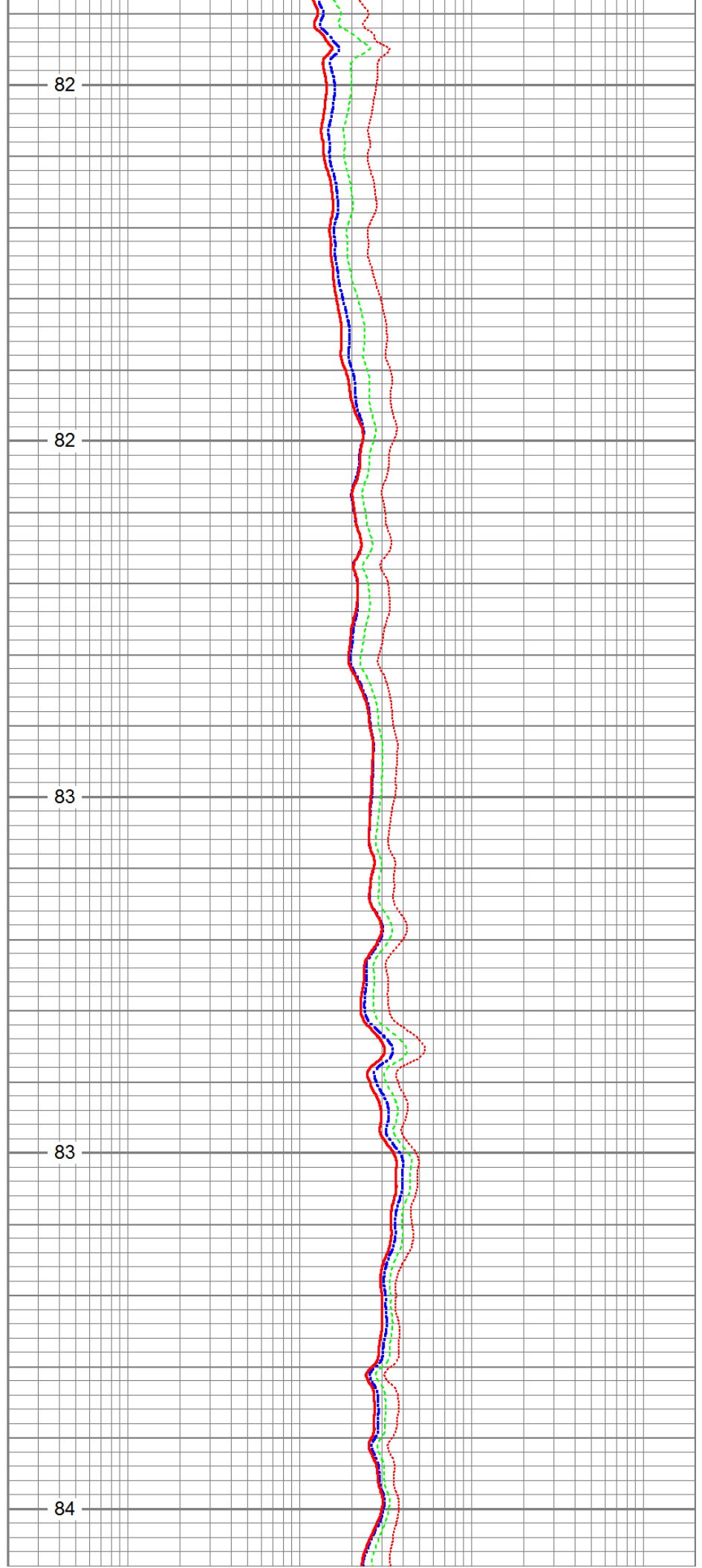
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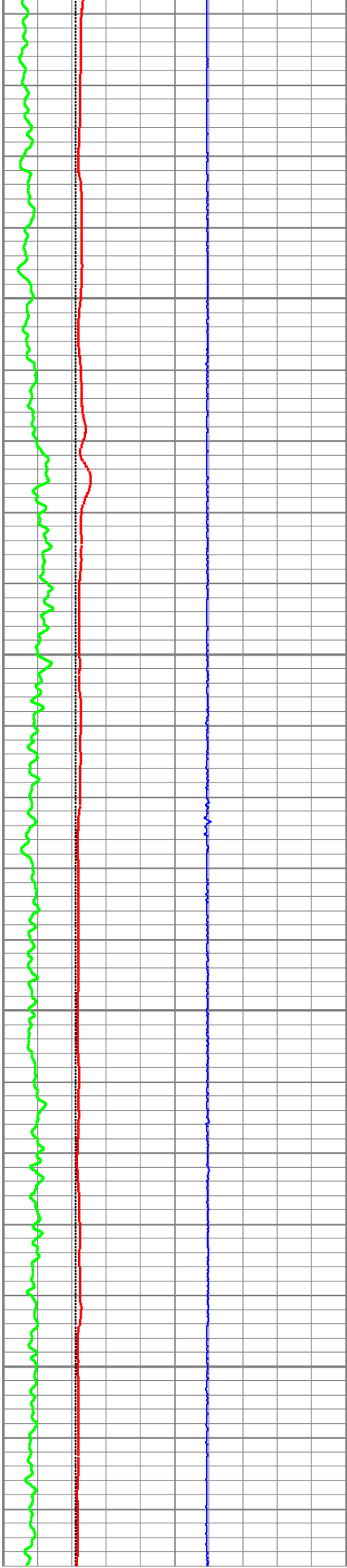
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6350

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6400

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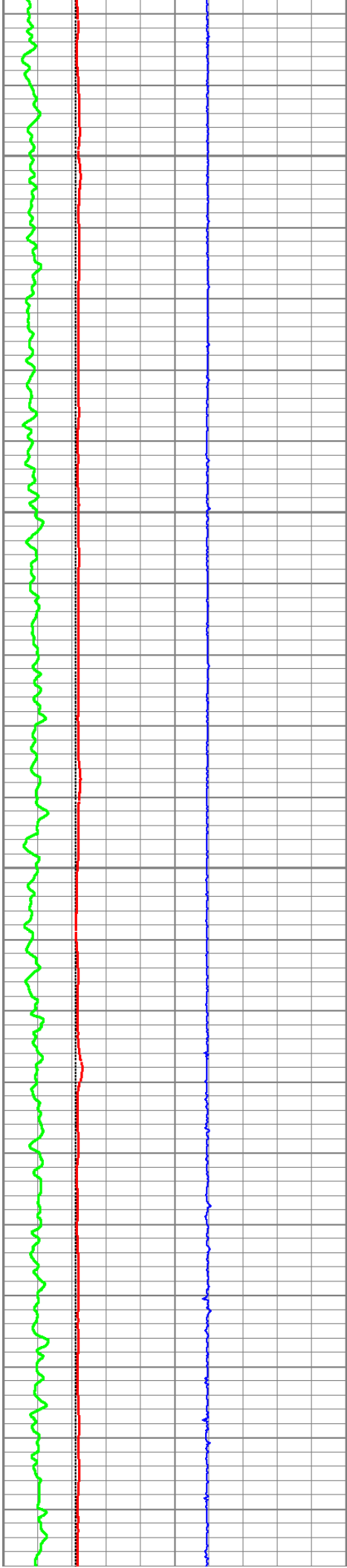
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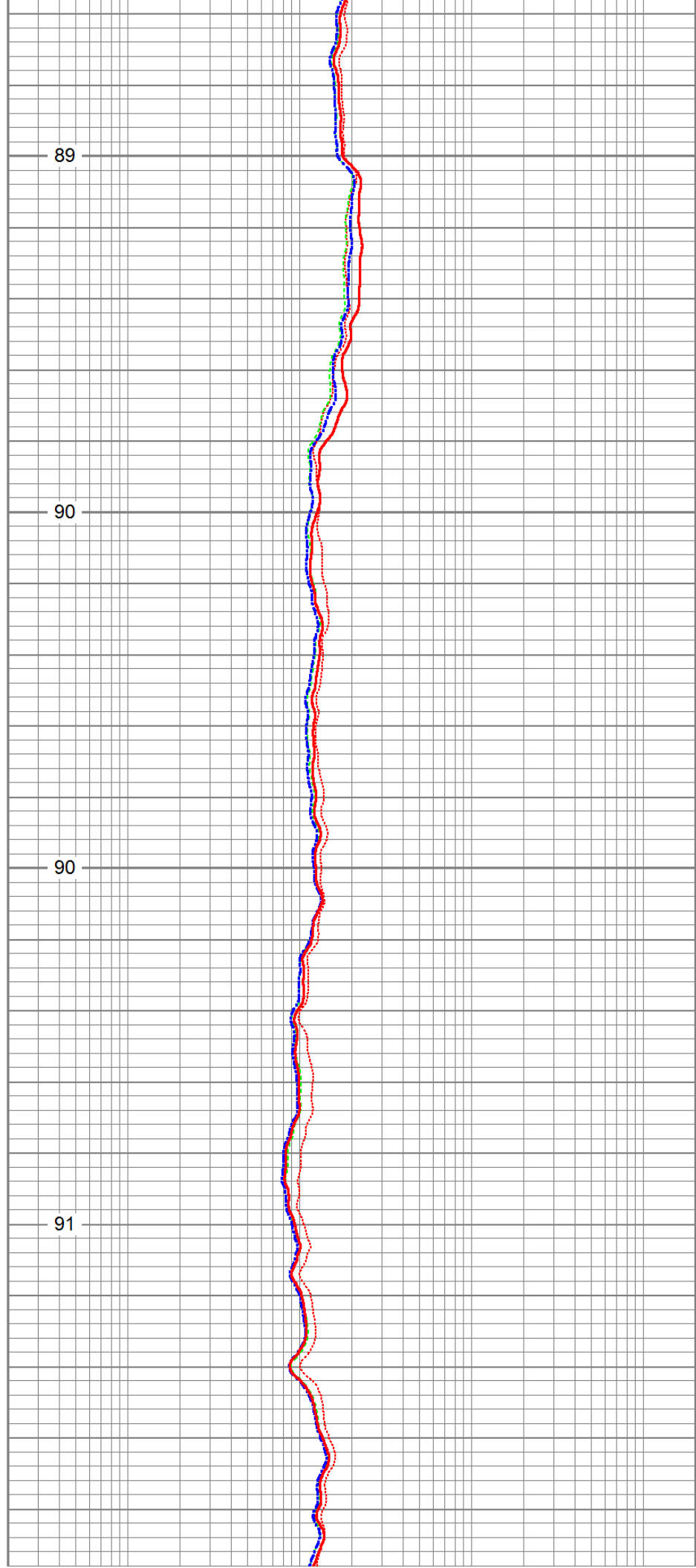
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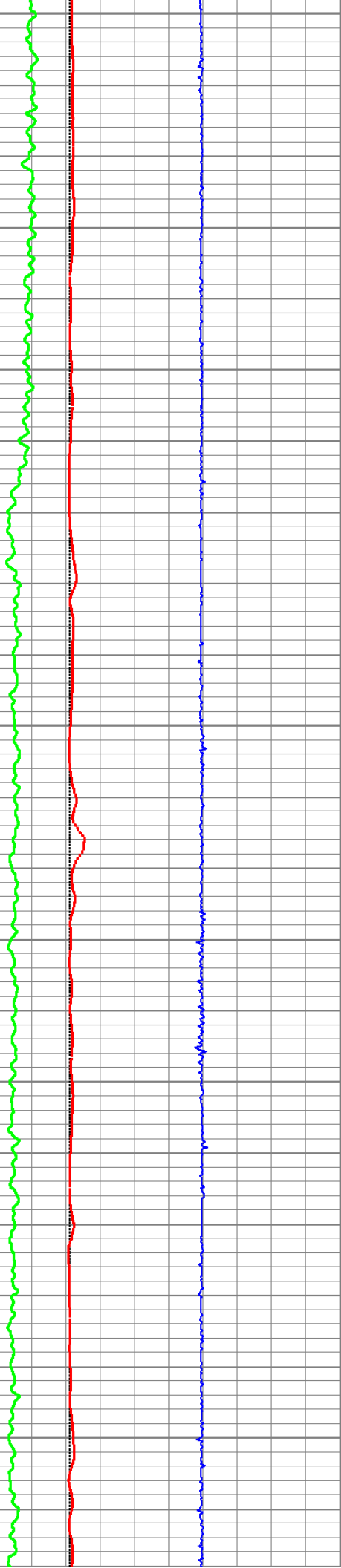
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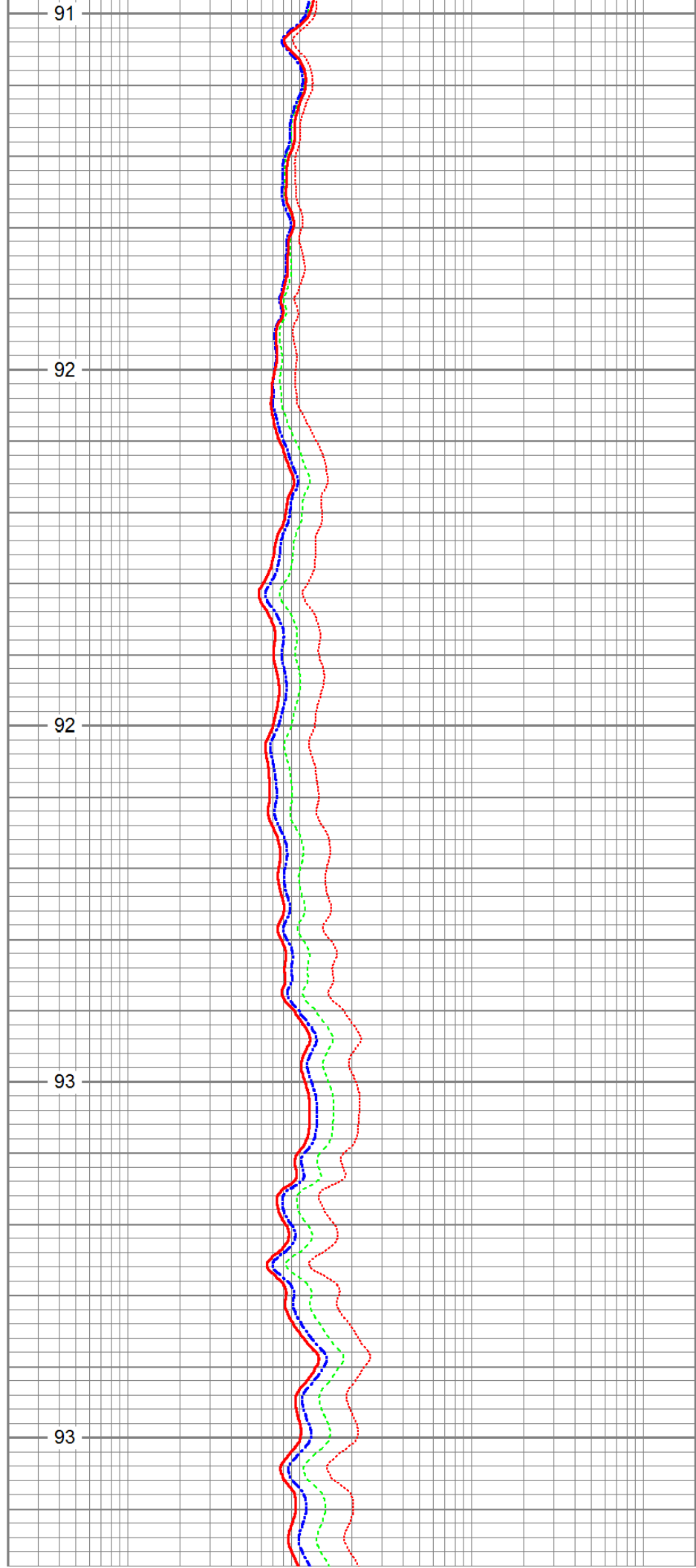
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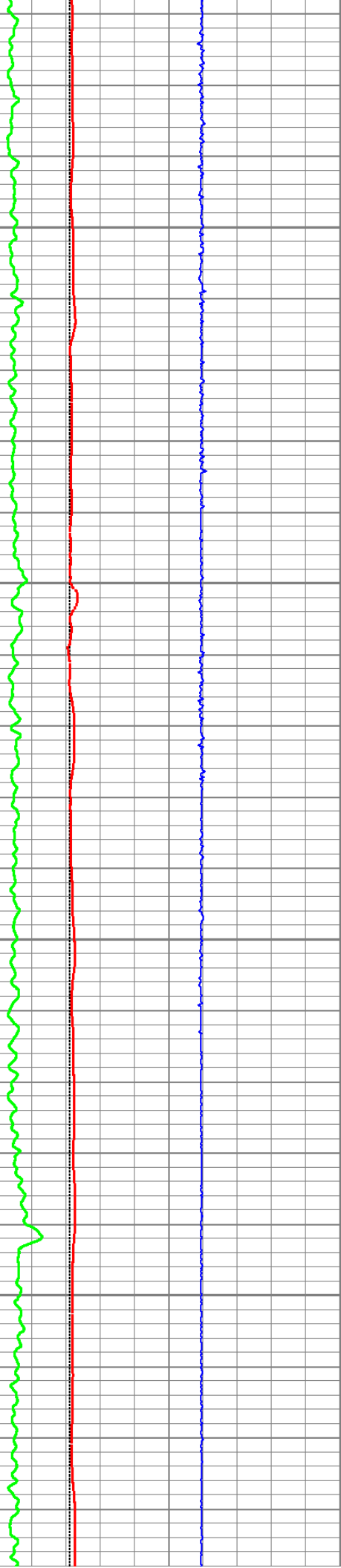
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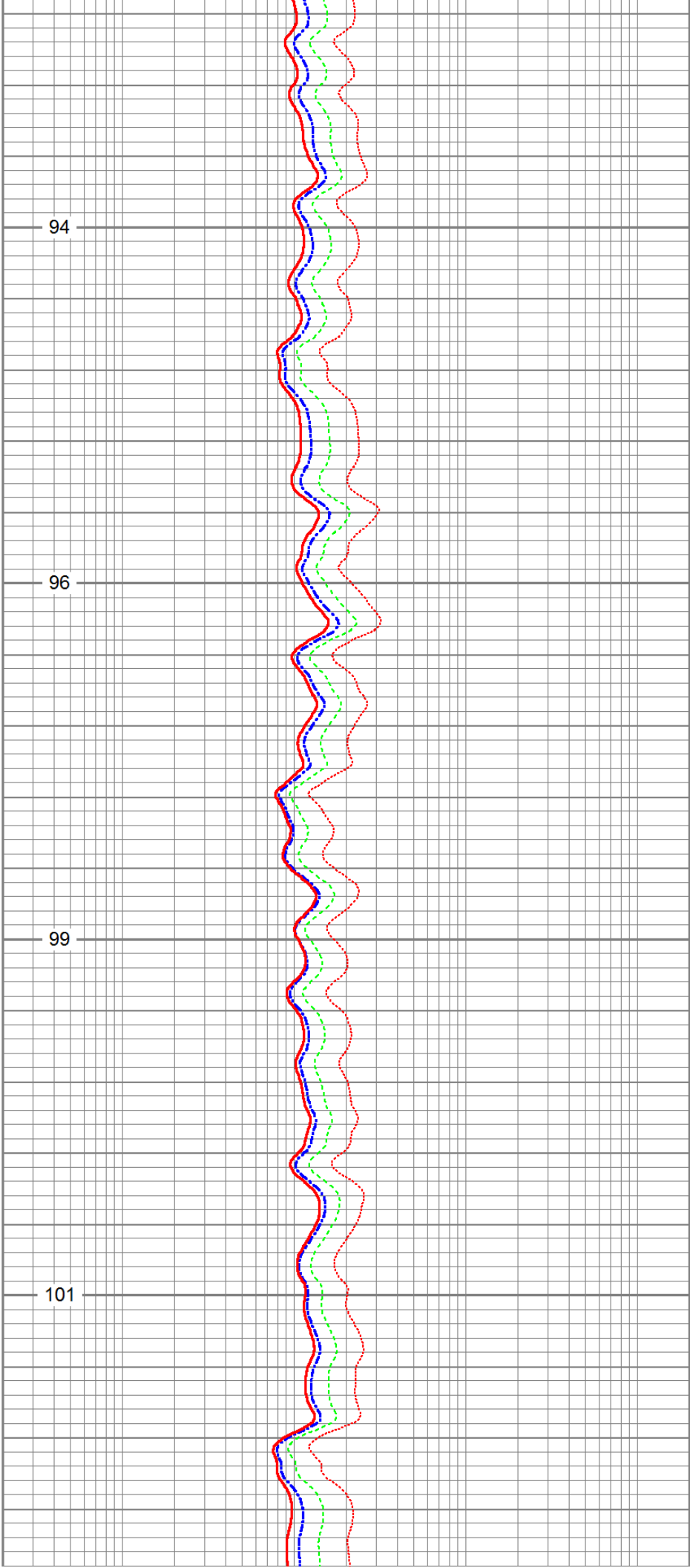
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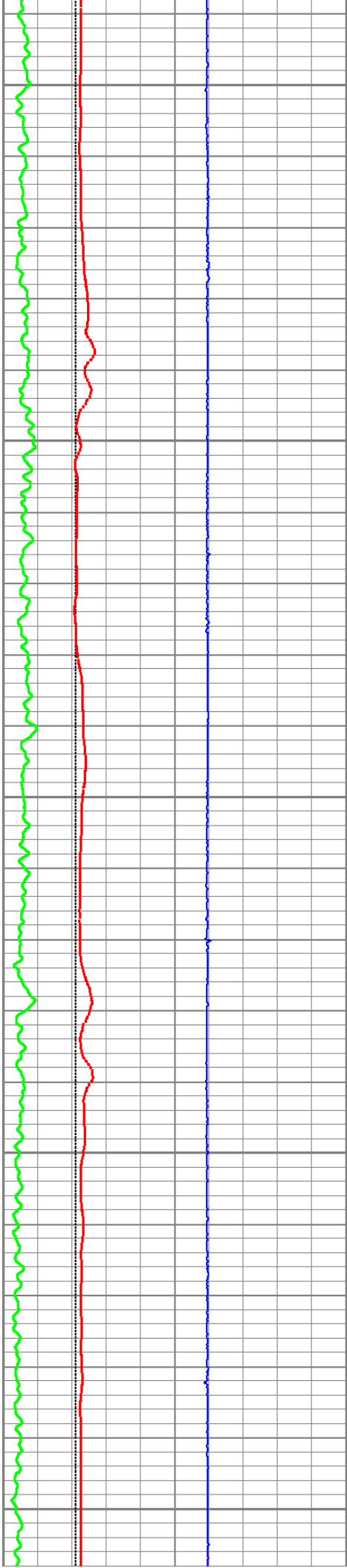
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99

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101





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7300

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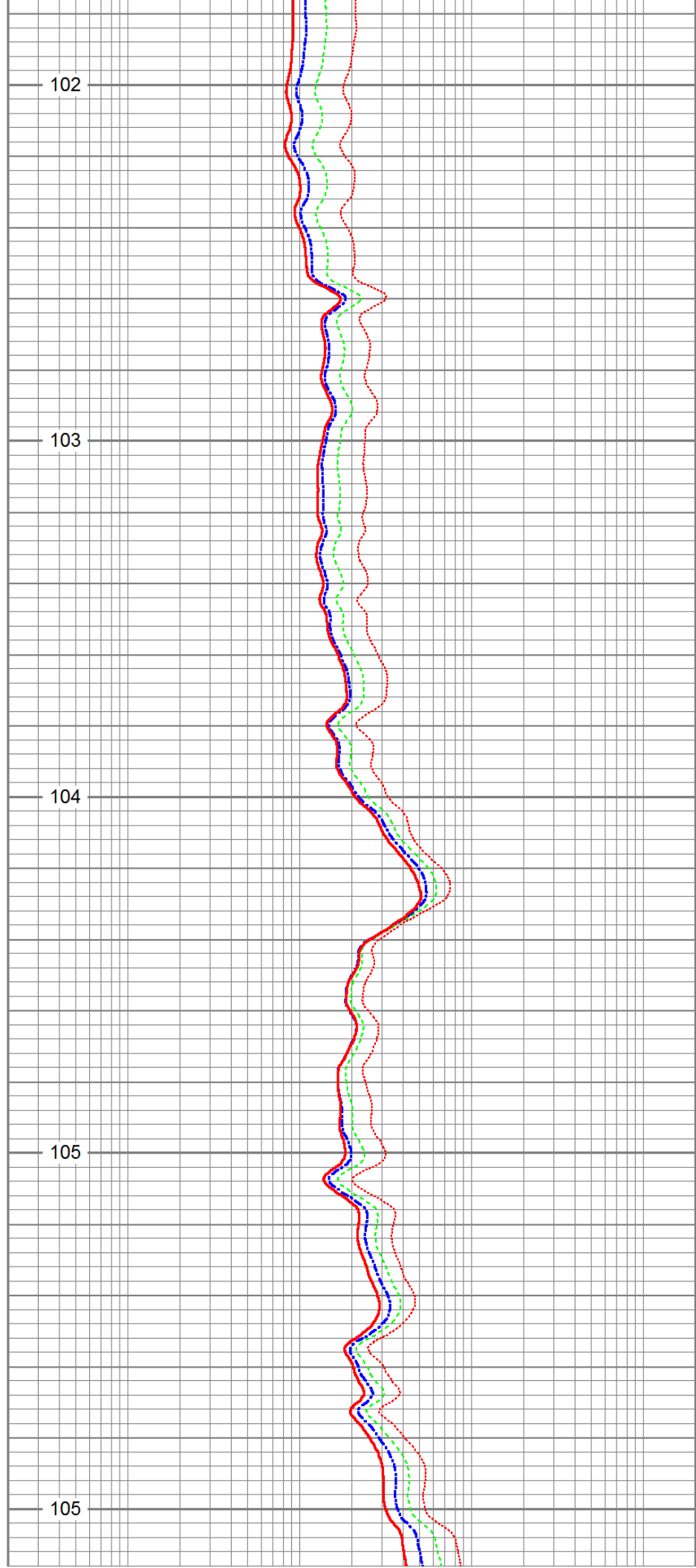
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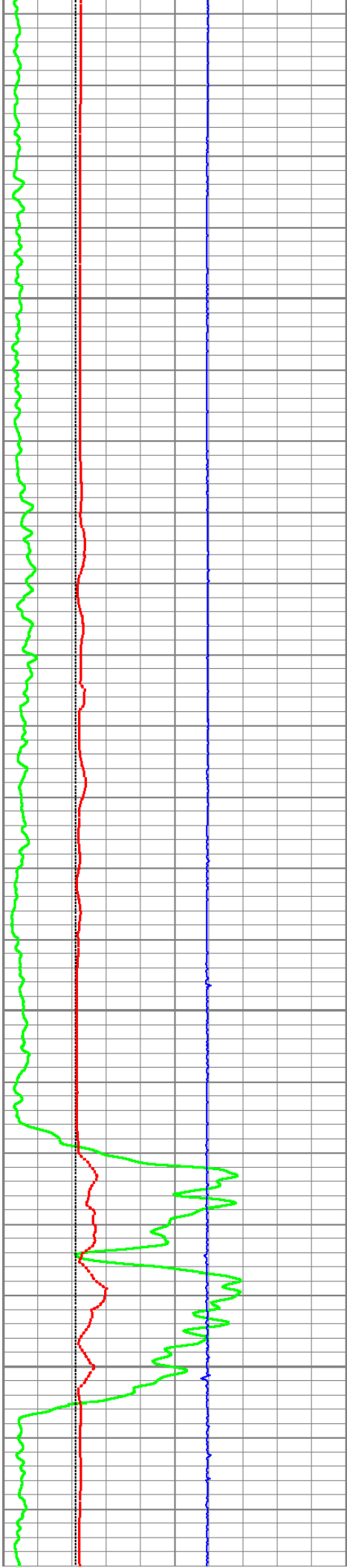
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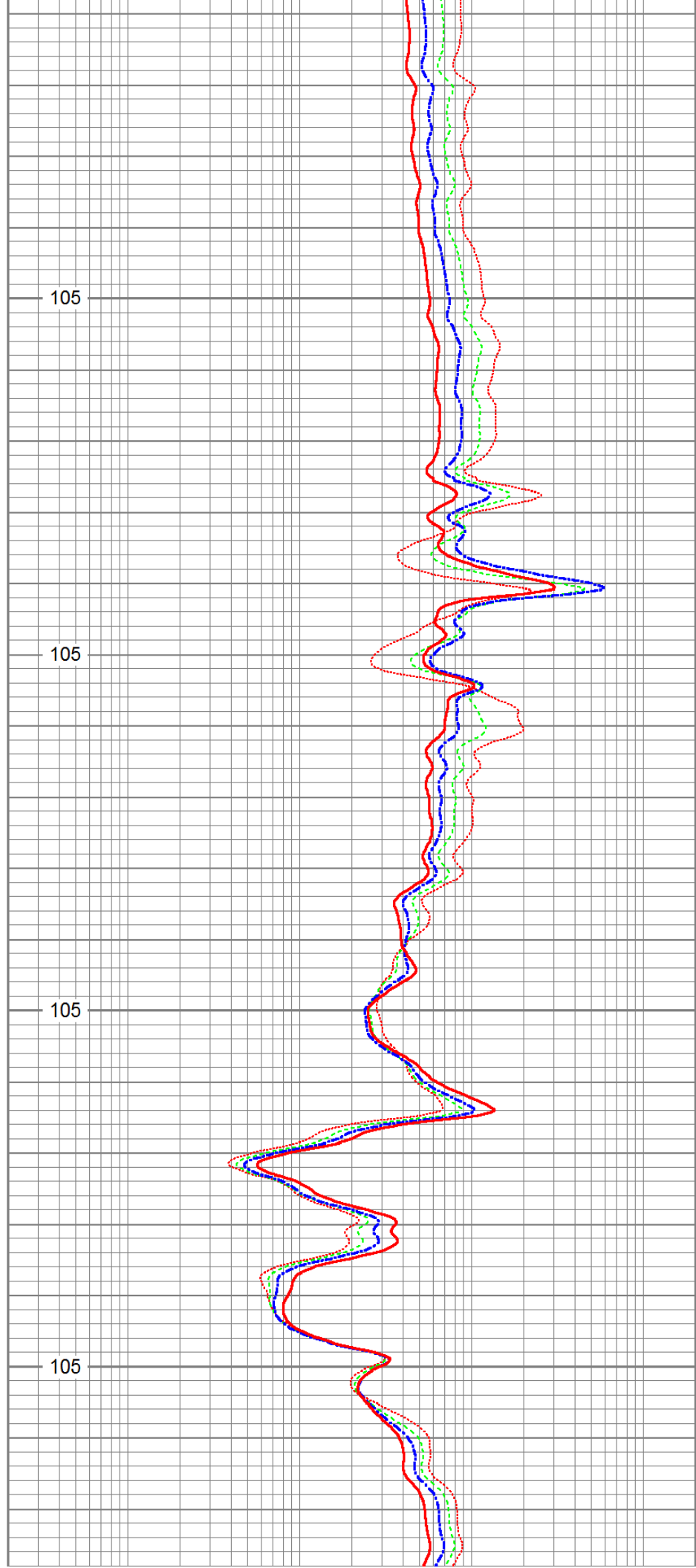
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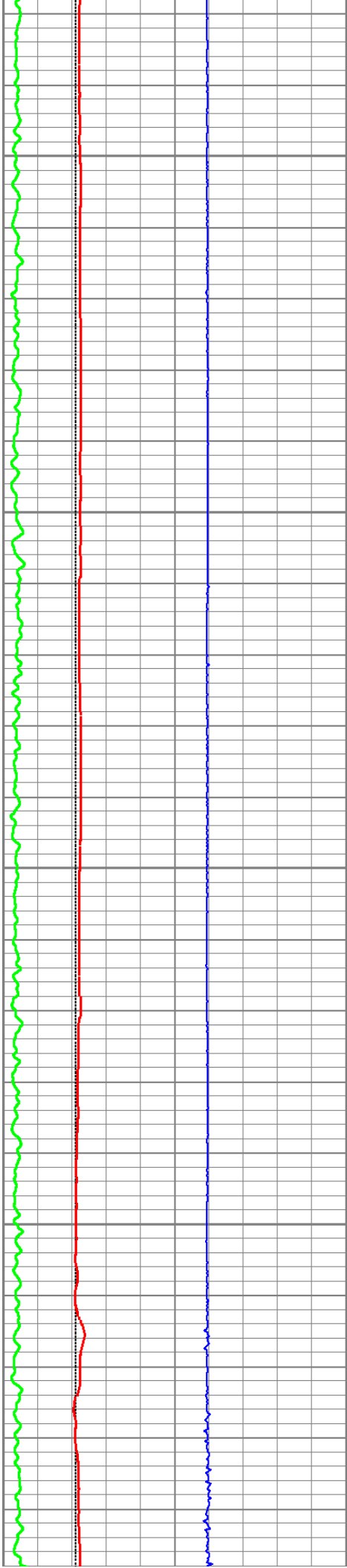
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7700

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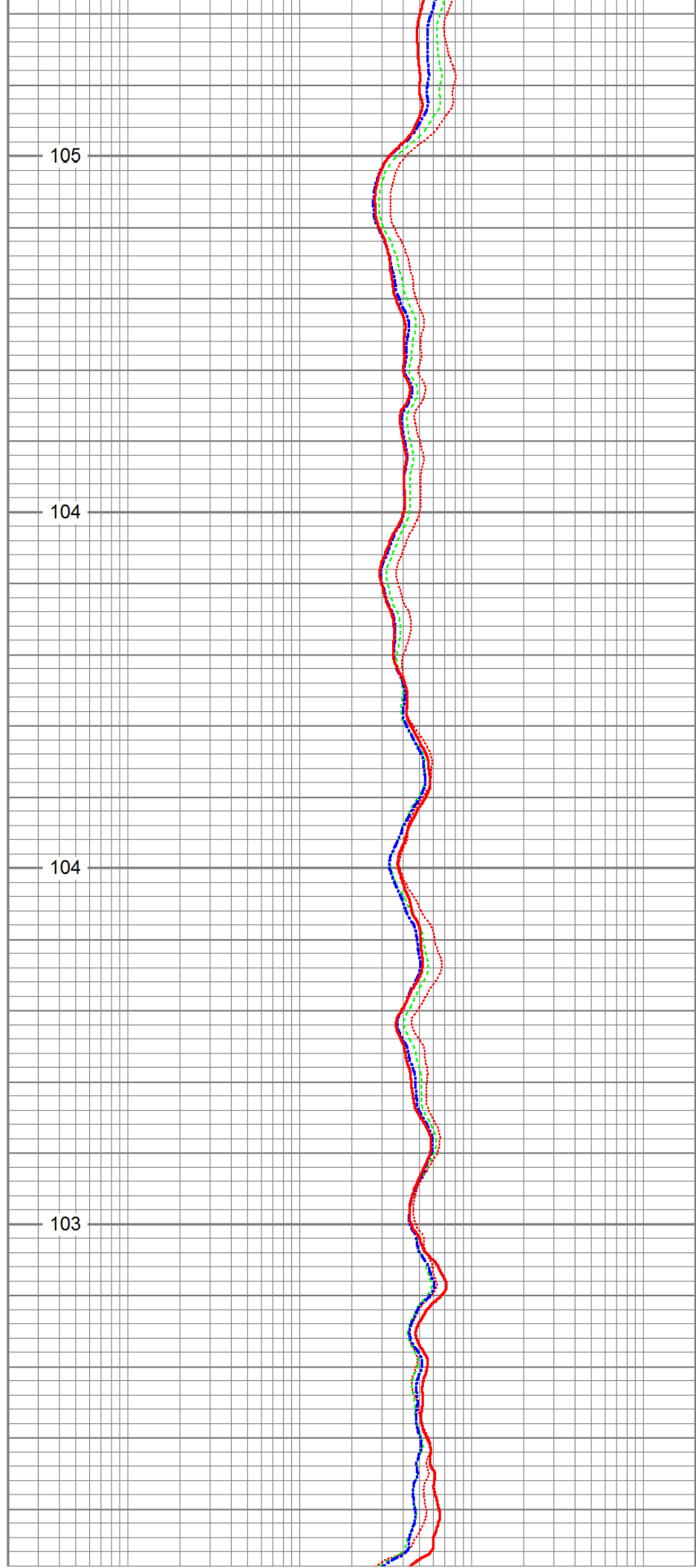
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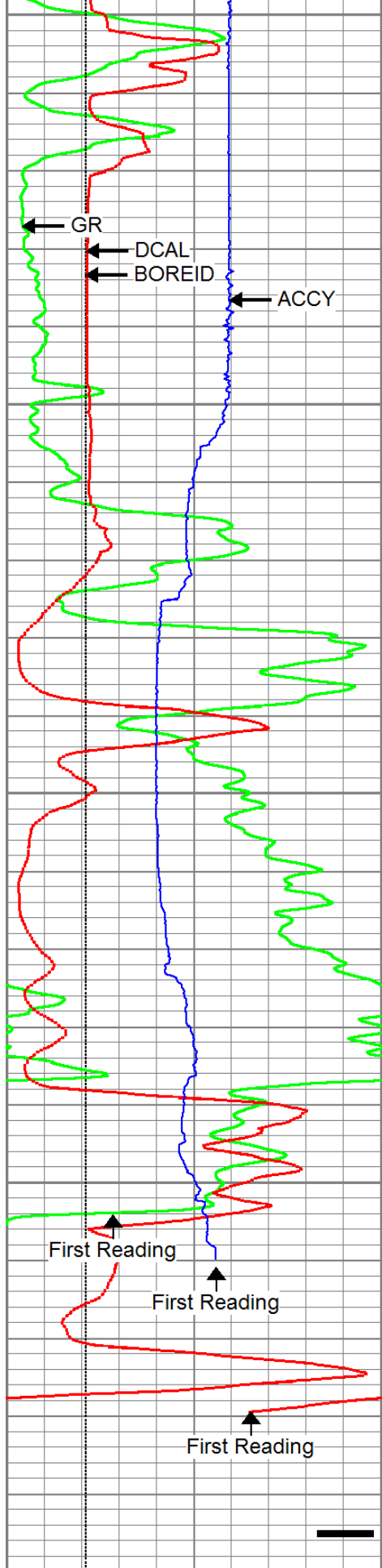
7800

104

7850

103





0	GR (GAPI)	150
4	BOREID (in)	14
4	DCAL (in)	14
-5	ACCY	5



0.2	20inRadial (Ohm-m)	2000
0.2	30inRadial (Ohm-m)	2000
0.2	60inRadial (Ohm-m)	2000
0.2	90inRadial (Ohm-m)	2000

Total Depth
8100

8100

GRTEMP
(degF)

Log Variables

Database: c:\users\t010\desktop\cather 3507 2-4h\sdr_g_cather_mem.db
Dataset: field/well/proc1/pass1.3

Top - Bottom

A 1	BHCOR On	BHFL_TYPE WBM	BHFLRES Ohm-m 1	BHFLRESSRC MUDCELL	BHIDSRC CURVE	BOREID in 6.125
BOTTEMP degF 105	CASED? No	CASEOD in 4.5	CASETHCK in 0	CEMWATERSA kppm 0	CMNTTHCK in 0	DNBHC? NO
DPORSEL RHOB	FLUIDDEN g/cc 1	FRMSALIN kppm 0	LATNOR Off	M 2	MATRXDEN g/cc 2.71	MUDSALIN kppm 0.8
MudWgt lb/gal 8.5	NPORSEL Limestone	PEBHC? YES	PERFS 0	RESTMP SRC INTERNAL	SO in 0.5	SRFTEMP degF 65
SZCOR On	TDEPTH ft 8122	TMPCOR On	TOOLPOS Free			

Calibration Report

Database File: c:\users\t010\desktop\cather 3507 2-4h\sdr_g_cather_mem.db
Dataset Pathname: proc1/pass1.3
Dataset Creation: Mon Nov 25 12:18:53 2013

ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS15R
Shop Calibration Performed: Tue Sep 24 08:36:59 2013

BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-446.0340	[-500.00, -400.00]	156.3040	[-500.00, 500.00]
A2	-152.0180	[-180.00, -100.00]	16.5327	[-500.00, 500.00]
A3	-35.7402	[-50.00, -10.00]	-141.3930	[-500.00, 500.00]
A4	-15.8976	[-30.00, -10.00]	209.5470	[-500.00, 500.00]
A5	-13.3007	[-30.00, -10.00]	132.7320	[-500.00, 500.00]
Freq 2				
A1	-231.8750	[-280.00, -180.00]	68.0321	[-500.00, 500.00]
A2	-97.8308	[-130.00, -50.00]	-19.0236	[-500.00, 500.00]
A3	-25.2110	[-50.00, -10.00]	-146.3820	[-500.00, 500.00]
A4	-19.1524	[-30.00, -10.00]	53.1096	[-500.00, 500.00]
A5	-18.1899	[-30.00, -10.00]	-6.1345	[-500.00, 500.00]
Freq 3				
A1	-145.5070	[-180.00, -80.00]	-20.2509	[-500.00, 500.00]
A2	-72.8319	[-130.00, -30.00]	-57.3178	[-500.00, 500.00]
A3	-19.6761	[-50.00, -10.00]	-168.2330	[-500.00, 500.00]
A4	-19.9772	[-30.00, -10.00]	-52.1516	[-500.00, 500.00]
A5	-20.0964	[-30.00, -10.00]	-106.2330	[-500.00, 500.00]

Freq 4				
A1	-77.7044	[-120.00, -40.00]	-172.1640	[-500.00, 500.00]
A2	-51.8524	[-110.00, -10.00]	-125.2290	[-500.00, 500.00]
A3	-15.1353	[-50.00, -10.00]	-222.2020	[-500.00, 500.00]
A4	-22.7003	[-30.00, -10.00]	-209.4270	[-500.00, 500.00]
A5	-24.8546	[-30.00, -10.00]	-272.1340	[-500.00, 500.00]

CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9910	[0.95, 1.05]	0.0027	[-0.05, 0.05]
A2	0.9893	[0.95, 1.05]	0.0026	[-0.05, 0.05]
A3	0.9969	[0.95, 1.05]	-0.0044	[-0.05, 0.05]
A4	0.9865	[0.95, 1.05]	0.0044	[-0.05, 0.05]
A5	0.9908	[0.95, 1.05]	0.0039	[-0.05, 0.05]
Freq 2				
A1	0.9854	[0.95, 1.05]	-0.0073	[-0.05, 0.05]
A2	0.9833	[0.95, 1.05]	-0.0071	[-0.05, 0.05]
A3	0.9853	[0.95, 1.05]	-0.0068	[-0.05, 0.05]
A4	0.9804	[0.95, 1.05]	-0.0053	[-0.05, 0.05]
A5	0.9881	[0.95, 1.05]	-0.0049	[-0.05, 0.05]
Freq 3				
A1	0.9918	[0.95, 1.05]	-0.0076	[-0.05, 0.05]
A2	0.9899	[0.95, 1.05]	-0.0072	[-0.05, 0.05]
A3	0.9918	[0.95, 1.05]	-0.0075	[-0.05, 0.05]
A4	0.9836	[0.95, 1.05]	-0.0054	[-0.05, 0.05]
A5	0.9957	[0.95, 1.05]	-0.0040	[-0.05, 0.05]
Freq 4				
A1	0.9866	[0.95, 1.05]	-0.0110	[-0.05, 0.05]
A2	0.9856	[0.95, 1.05]	-0.0101	[-0.05, 0.05]
A3	0.9895	[0.95, 1.05]	-0.0119	[-0.05, 0.05]
A4	0.9745	[0.95, 1.05]	-0.0083	[-0.05, 0.05]
A5	1.0034	[0.95, 1.05]	-0.0075	[-0.05, 0.05]
Temperature	27.7897 degC			

ThruBit Density Calibration Report

Tool Model-Serial Number: PS-PS43D
Source Number:
Shop Calibration Performed: Fri Nov 08 10:57:42 2013

REFERENCE

	Density	Units
Aluminium	2.607	g/cc
Magnesium	1.752	g/cc

READINGS

Outputs	Counts	Units	Expected
SS1 Background	135.84	cps	[130.00, 170.00]
LS1 Background	146.41	cps	[130.00, 170.00]
LS4 Background	29.84	cps	[27.00, 35.00]
SS1 Aluminium	4478.32	cps	[4500.00, 5500.00]
LS1 Aluminium	898.25	cps	[750.00, 950.00]

LS1 Aluminium	948.42	cps	[700.00, 800.00]
LS4 Aluminium	948.42	cps	[843.00, 1068.00]
SS1 Magnesium	7466.94	cps	[7000.00, 9000.00]
LS1 Magnesium	5867.16	cps	[5250.00, 6250.00]
LS1 Al + Fe	808.16	cps	[650.00, 800.00]
LS4 Al + Fe	454.68	cps	[382.00, 471.00]

RESULTS

SS Slope	1.63	[1.52, 1.77]
LS Slope	0.42	[0.38, 0.45]
PEF K Factor	4.655	[3.510, 6.170]
PEF B Factor	-0.534	[-0.700, -0.410]

Caliper Shop Calibration performed: Fri Nov 08 10:57:42 2013

RESULTS

Reference	Reading	Units
12.00	1883.87	in
9.00	2044.17	in
6.00	2204.76	in

DENSITY PRE-SURVEY CHECK Performed: Sat Nov 23 12:42:10 2013

Outputs	Counts	Units	Expected
SS1 Background	137.54	cps	[131.76, 139.91]
LS1 Background	147.19	cps	[142.01, 150.80]
LS4 Background	29.23	cps	[28.05, 31.63]

CALIPER PRE-SURVEY CHECK Performed: Sat Nov 23 12:39:43 2013

Reference	Readings	Units	Expected
6.00	6.05	in	[5.80, 6.20]

Compensated Neutron Calibration Report

Tool Model-Serial Number: PS-PS29N
 Source Number:
 Calibration Tank Temperature: 60.0 degF
 Shop Calibration Performed: Fri Nov 08 09:52:11 2013

BACKGROUND MEASUREMENT

Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

WATER TANK REFERENCE

Outputs	Measured	Units	Expected
SS Counts	2314.2	cps	
LS Counts	79.4	cps	
Tank Ratio Ref	30.9580	SS/LS	

Tank Ratio	29.1513	SS/LS	
Tank Ratio Gain	1.0620		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
SS Counts	27460.9	cps	
LS Counts	2600.3	cps	
AI Ratio Ref	10.797	SS/LS	
AI Ratio	11.215	SS/LS	
AI Ratio Gain	0.96		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed: Sat Nov 23 12:47:09 2013

Outputs	Measured	Units	Expected
SS Counts	0.0	cps	<10
LS Counts	0.1	cps	<4

Gamma Ray Calibration Report

Tool Model-Serial Number:	PS-PS24T	
Performed:	Fri Nov 08 12:35:25 2013	
Calibrator Value:	162.7	GAPI
Background Reading:	65.6	cps
Calibrator Reading:	462.9	cps
Sensitivity:	0.3750	GAPI/cps

Inclinometer Calibration Report

Performed:	Sun Jun 13 14:33:21 1993				
	Low Read.	High Read.	Low Ref.	High Ref.	
X Accelerometer	0.00	1.00	0.00	1.00	gee
Y Accelerometer	0.00	1.00	0.00	1.00	gee
Z Accelerometer	0.00	1.00	0.00	1.00	gee

Sensor	Offset (ft)	Schematic	Description	Len (ft)	OD (in)	Wt (lb)
Thru-bit	67.59		Cablehead-S	2.31	2.13	5.00
Thru-bit	65.28		Solid Weakpoint			
			PSBDOT	3.87	2.25	35.00
Thru-bit	61.41		HangOff_Tool	5.00	2.38	60.00
Thru-bit	56.41					

ThruBit	54.16		Swivel	2.25	2.06	25.00
TBBAT	53.41		10-1	0.75	2.13	3.95
			TBBAT-A (PS30B) ThruBit Battery	6.13	2.13	38.20
TBBAT2	47.29					
			TBBAT2-A (PS29B) ThruBit Battery	6.13	2.13	40.00
TMG	41.16					
GR	41.04					
GRTEMP	40.20		TMG-PS (PS24T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
ThruBit	35.04					
			Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60					
			TBN-PS (PS29N) ThruBit Neutron	4.77	2.13	63.00
			TBD-PS (PS43D) ThruBit Density	10.48	2.13	91.00
LSW1	18.04					
DCAL	17.13					
A1_P	10.60					
A2_P	10.10					
A3_P	9.35					
A4_P	8.35					
A5_P	6.60		TBI-PS (PS15R) ThruBit Induction	15.29	2.13	94.00

Dataset: sdrg_cather_mem.db: field/well/proc1/pass1.3
 Total Length: 67.59 ft
 Total Weight: 570.15 lb
 O.D.: 2.38 in

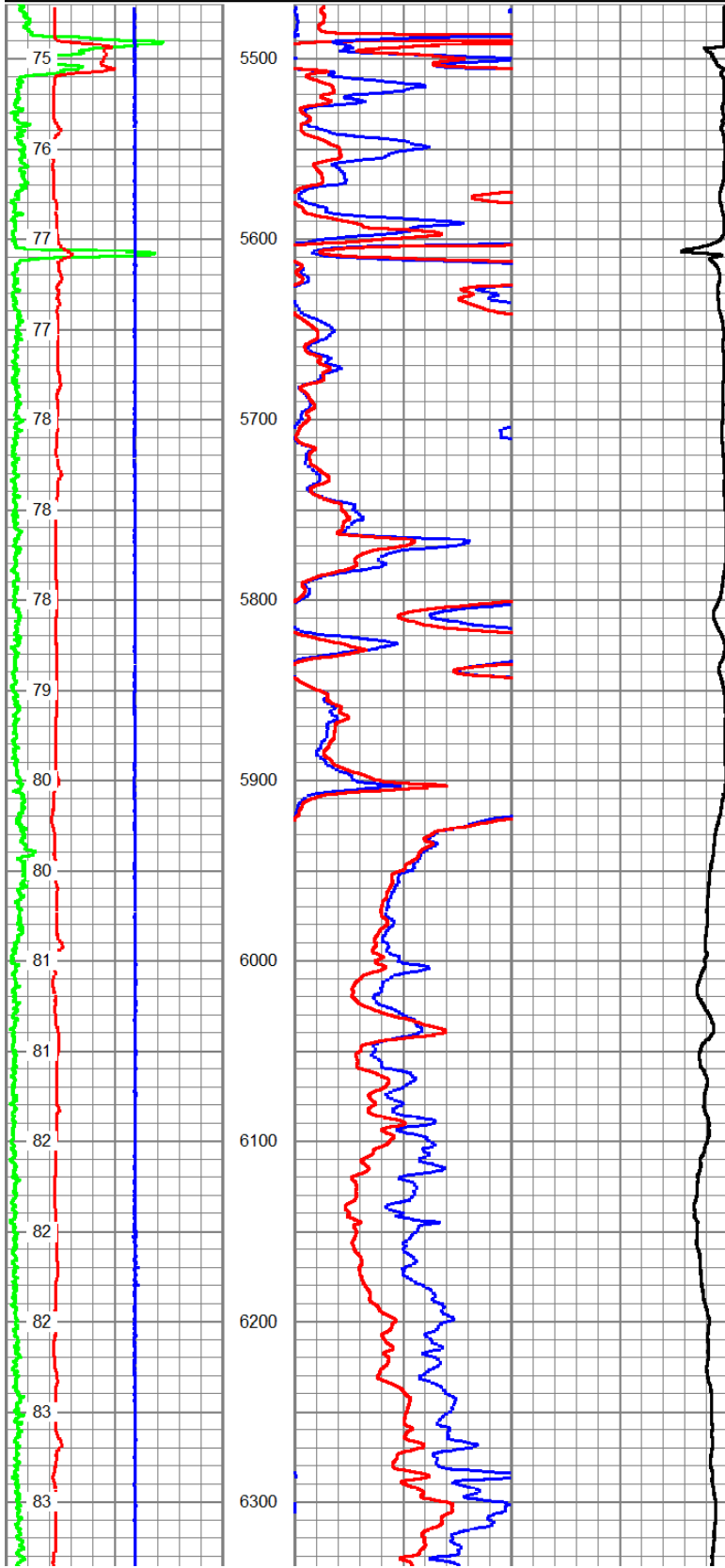


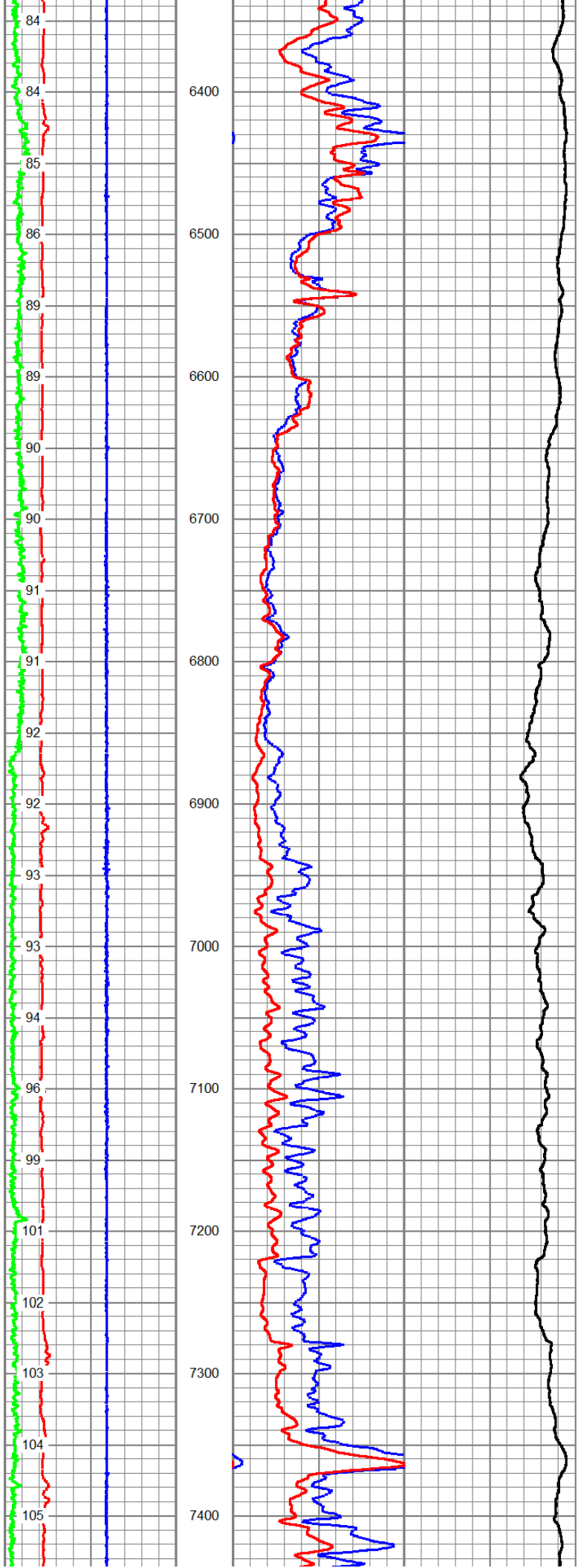
Company SANDRIDGE ENERGY
 Well CATHER 3507 2-4H
 Field WALDRON
 County HARPER
 State KANSAS

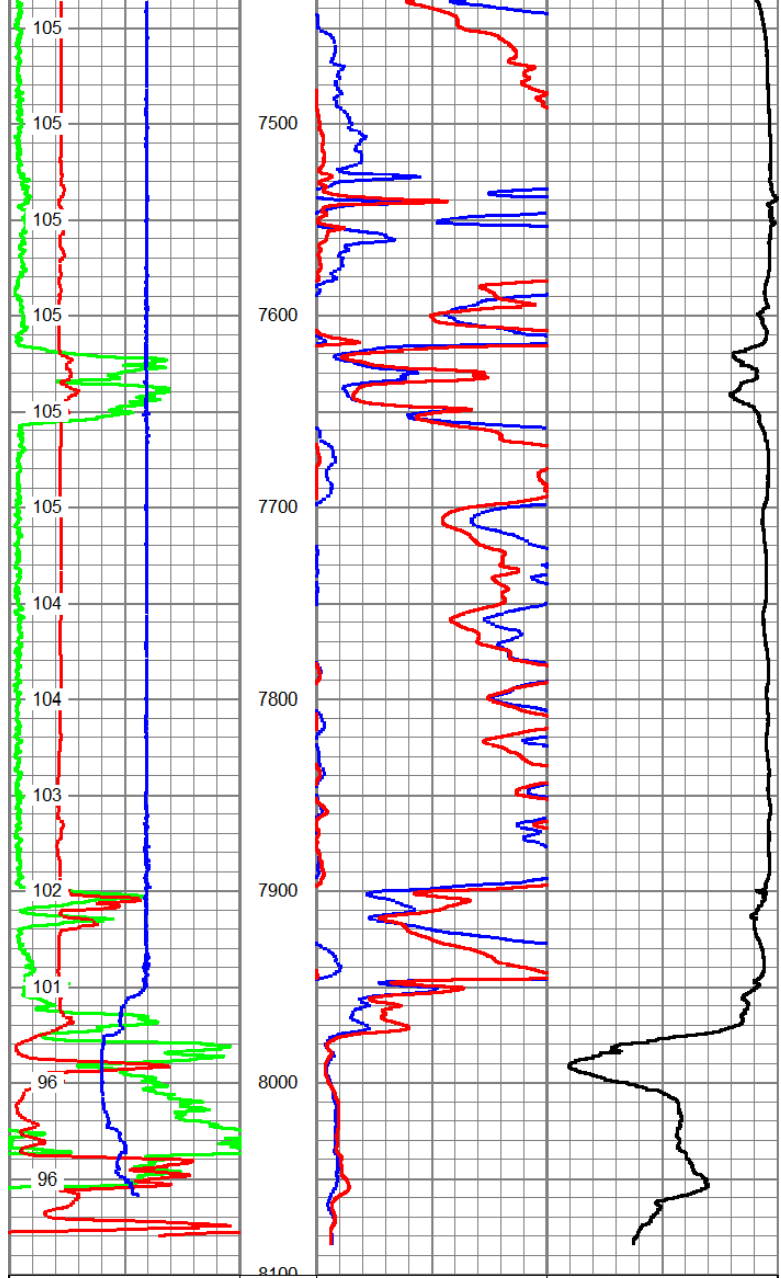
MAIN PASS

Database File: c:\users\t010\desktop\cather 3507 2-4\sdrg_cather_mem.db
 Dataset Pathname: proc1/pass1.3
 Presentation Format: 6_1r_chk
 Dataset Creation: Mon Nov 25 12:18:53 2013
 Charted by: Depth in Feet scaled 1:1200

0	GR (GAPI)	150	20in 2ft Res	
4	DCAL (in)	14	(Ohm-m)	500
-5	ACCY	5	90in 2ft Res	
			(Ohm-m)	500
GRTEMP			1000	DEEP COND (mmho/m)
(degF)				0
			0	20in 2ft Res (Ohm-m) 50
			0	90in 2ft Res (Ohm-m) 50







0	GR (GAPI)	150
4	DCAL (in)	14
-5	ACCY	5

GRTEMP
(degF)

20in 2ft Res		
50	(Ohm-m)	500
90in 2ft Res		
50	(Ohm-m)	500
1000	DEEP COND (mmho/m)	0
0	20in 2ft Res (Ohm-m)	50
0	90in 2ft Res (Ohm-m)	50