



**ThruBit**  
A Schlumberger Company

**DUAL SPACED NEUTRON  
SPECTRAL DENSITY  
GAMMA RAY  
MEMORY LOG**

Company SANDRIDGE ENERGY  
Well GARLOW 3406 2-16H  
Field EASTHAM  
County HARPER  
State KANSAS

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Well GARLOW 3406 2-16H  
Field EASTHAM  
County HARPER State KANSAS

Location: API #: 15-077-21904-0100  
225' FNL & 660' FWL  
SEC 16 TWP 34S RGE 6W  
Permanent Datum G.L. Elevation 1303'  
Log Measured From K.B. 15' ABOVE PERM DATUM  
Drilling Measured From K.B.

Other Services  
THRUBIT  
PORTAL  
BIT  
Elevation  
K.B. 1318'  
D.F. 1318'  
G.L. 1303'

Date	27 FEB 2013
Run Number	ONE
Depth Driller	8903'
Depth Logger	8863'
Bottom Logged Interval	8845'
Top Log Interval	2500'
Casing Driller	7" @ 5039'
Casing Logger	5046
Bit Size	6.125"
Type Fluid in Hole	WBM
Density / Viscosity	8.3 / 28
PH / Fluid Loss	8.0 / N.C.
Source of Sample	MUD SENSOR
Rm @ Meas. Temp	2.15 OHM @ 65 DEGF
Rmf @ Meas. Temp	1.98 OHM @ 65 DEGF
Rmc @ Meas. Temp	2.37 OHM @ 65 DEGF
Source of Rmf / Rmc	CALCULATED
Rm @ BHT	1.68 OHM @ 140 DEGF
Time Circulation Stopped	20:10 26 FEB 2013
Time Logger on Bottom	21:01 26 FEB 2013
Maximum Recorded Temperature	140 DEGF
Equipment Number	T005
Location	OKC, OK
Recorded By	C.PARKER
Witnessed By	B.LAROUX

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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: HORIZONTAL PUMP DOWN MEMORY BIT DEPTH: 8797' LOGGED TO: 2500'**  
**ALL SCALES AND PRESENTATIONS PER CLIENT REQUEST**  
**LIMESTONE MATRIX, 2.71 g/cc. USED FOR POROSITY MEASUREMENTS**  
**TOOLSTING RAN WITH SWIVEL AND SMALL DE-CENTRALIZER**  
**TBHV REPRESENTS TOTAL BOREHOLE VOLUME, ft<sup>3</sup>**  
**ABHV REPRESENTS ANNULAR HOLE VOLUME, CALCULATED FOR 4.5" CSG., ft<sup>3</sup>**  
**RIGMINDER USED TO ACQUIRE LOG DEPTH**  
**LOG CORRELATED TO MWD GR**  
**RIG: UNIT 310**  
  
**CREW: C.PARKER I.HERNADEZ R.WILSON**

Service Ticket No. 1772      API No. 15-077-21904-0100      PGM Ver WARRIOR 7.0

The Well Name, Location, Borehole Description, and / or Cementing Data Furnished by Client

**EQUIPMENT DATA**

GAMMA	NEUTRON	DENSITY	INDUCTION
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Run No.	ONE	Run No.	ONE	Run No.	ONE	Run No.	ONE
Serial No.	PS27T	Serial No.	PS14N	Serial No.	PS05D	Serial No.	PS33R
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	8865'	2500'	0 PSI	35 FPM			

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

DIRECTIONAL INFORMATION

Maximum Deviation	92.53	deg. @	8469'	KOP	3702'	
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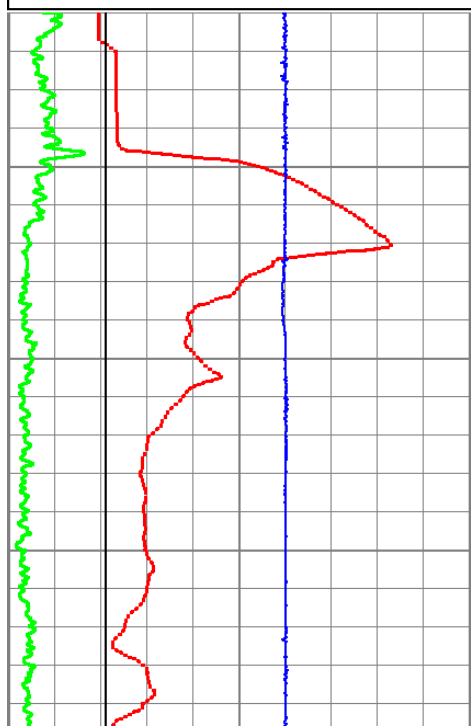


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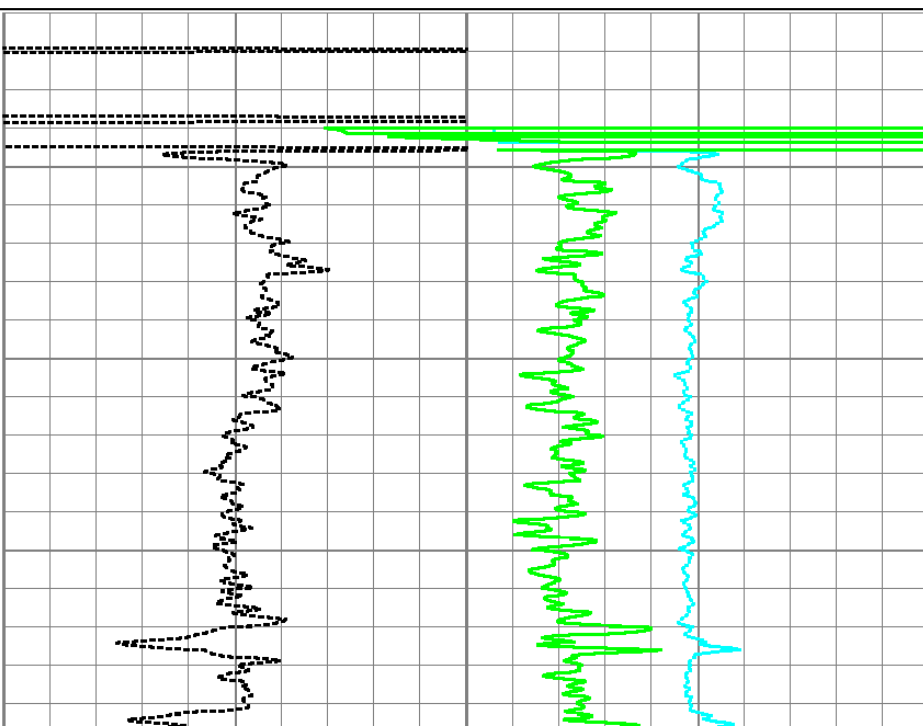
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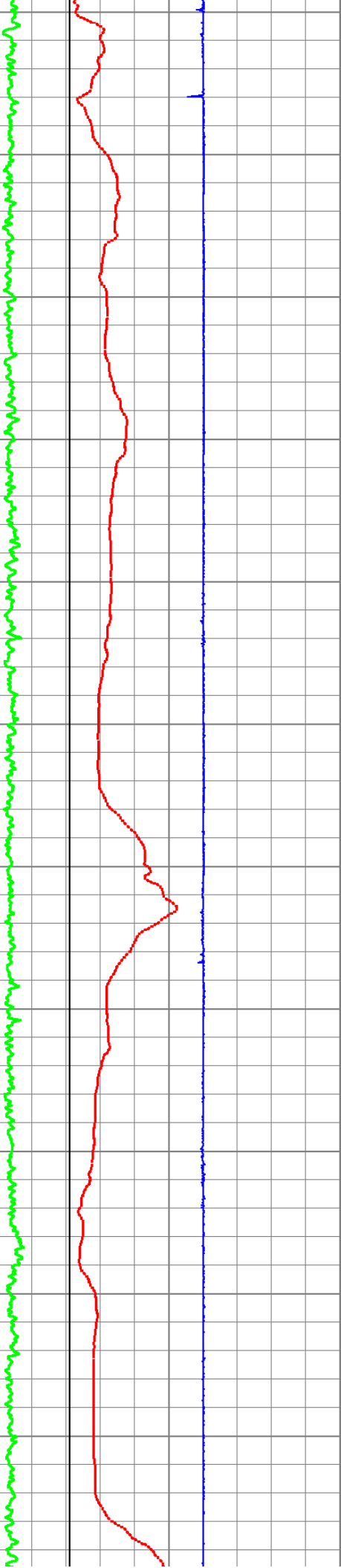
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4	DCAL (in)	14
4	BOREID (in)	14
-5	ACCY	5

0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
2	RHOB (g/cc)		3		



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5200

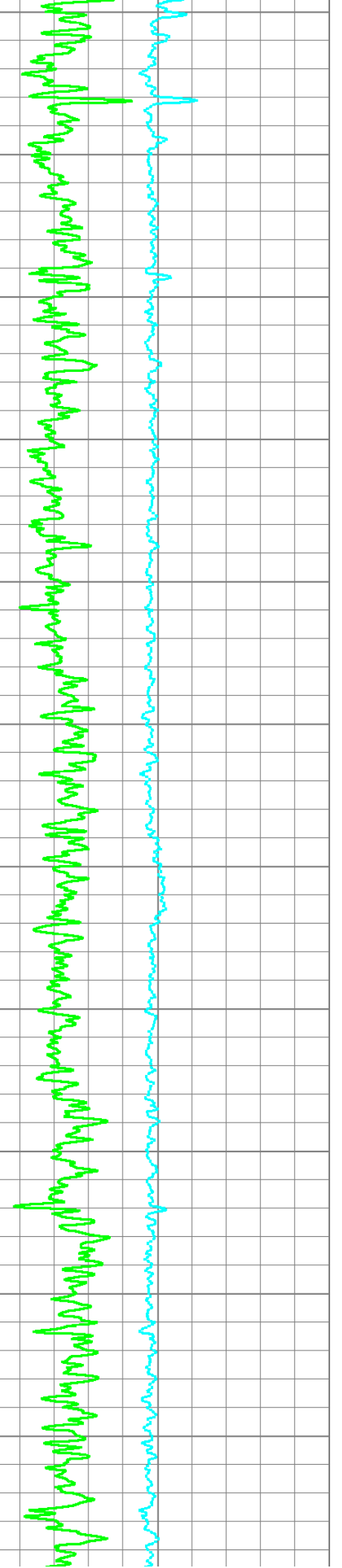
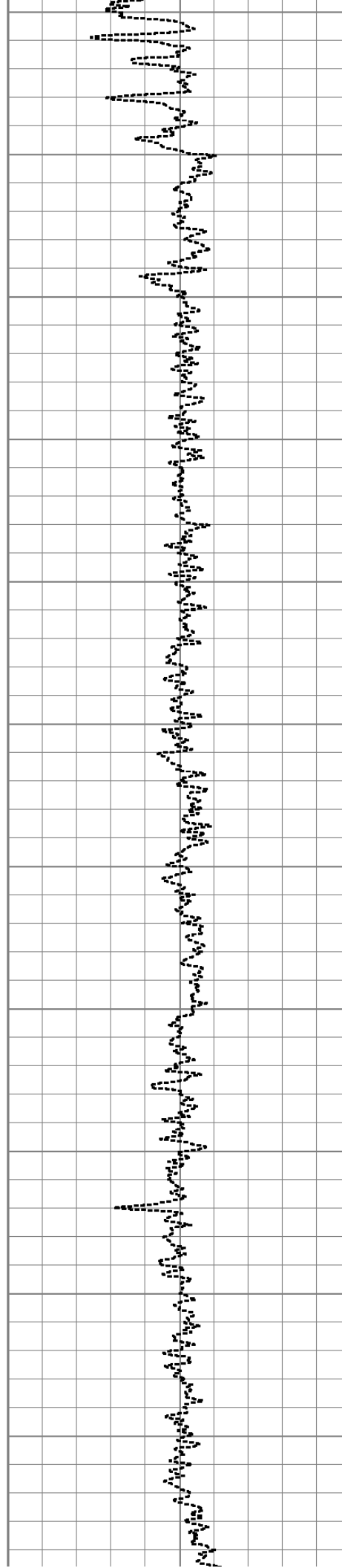
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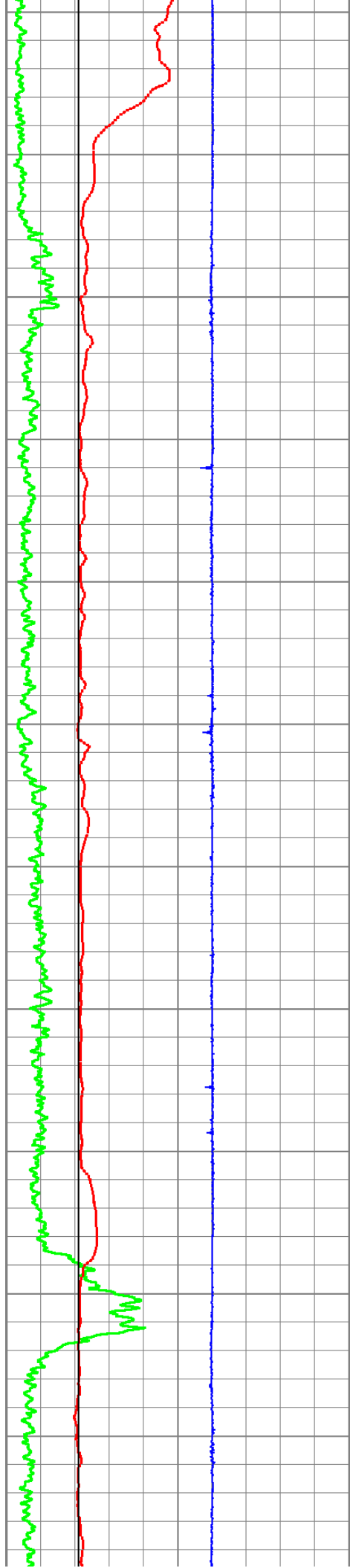
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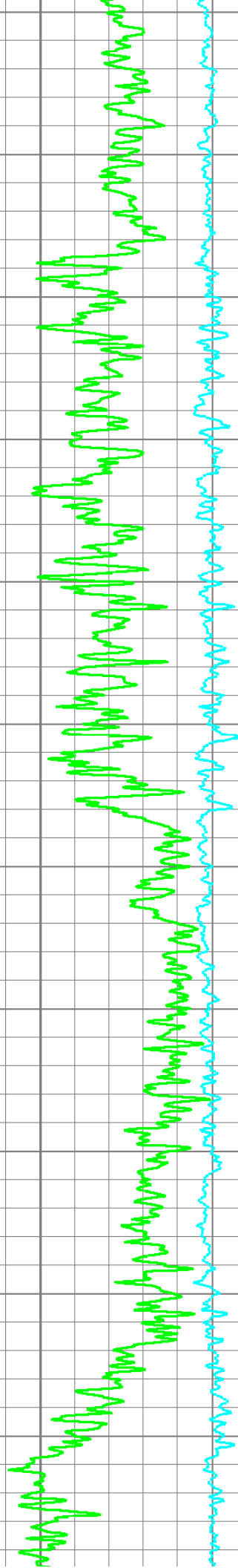
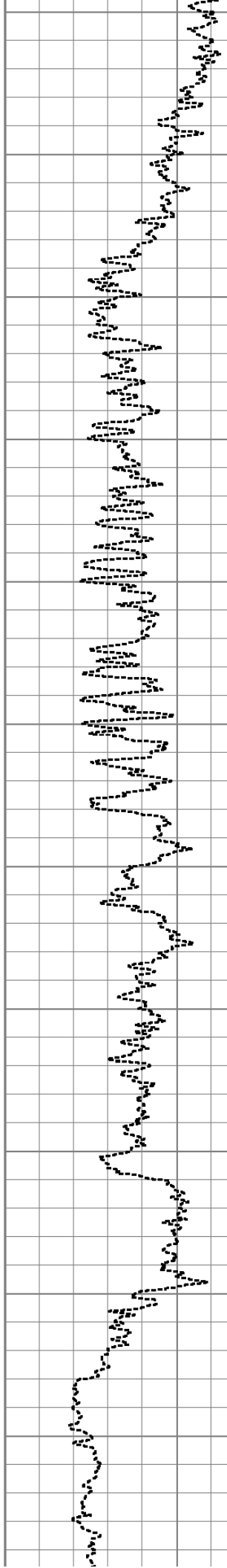
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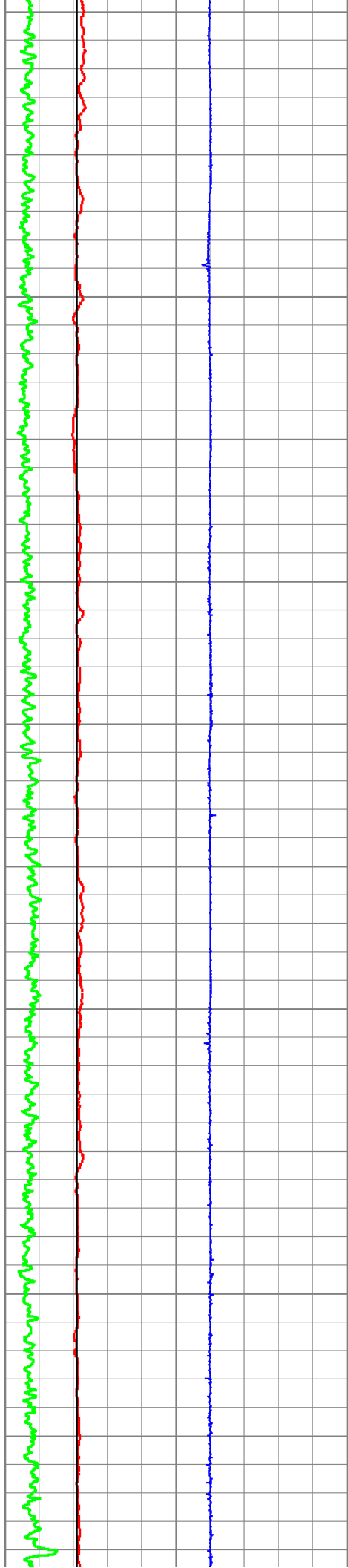
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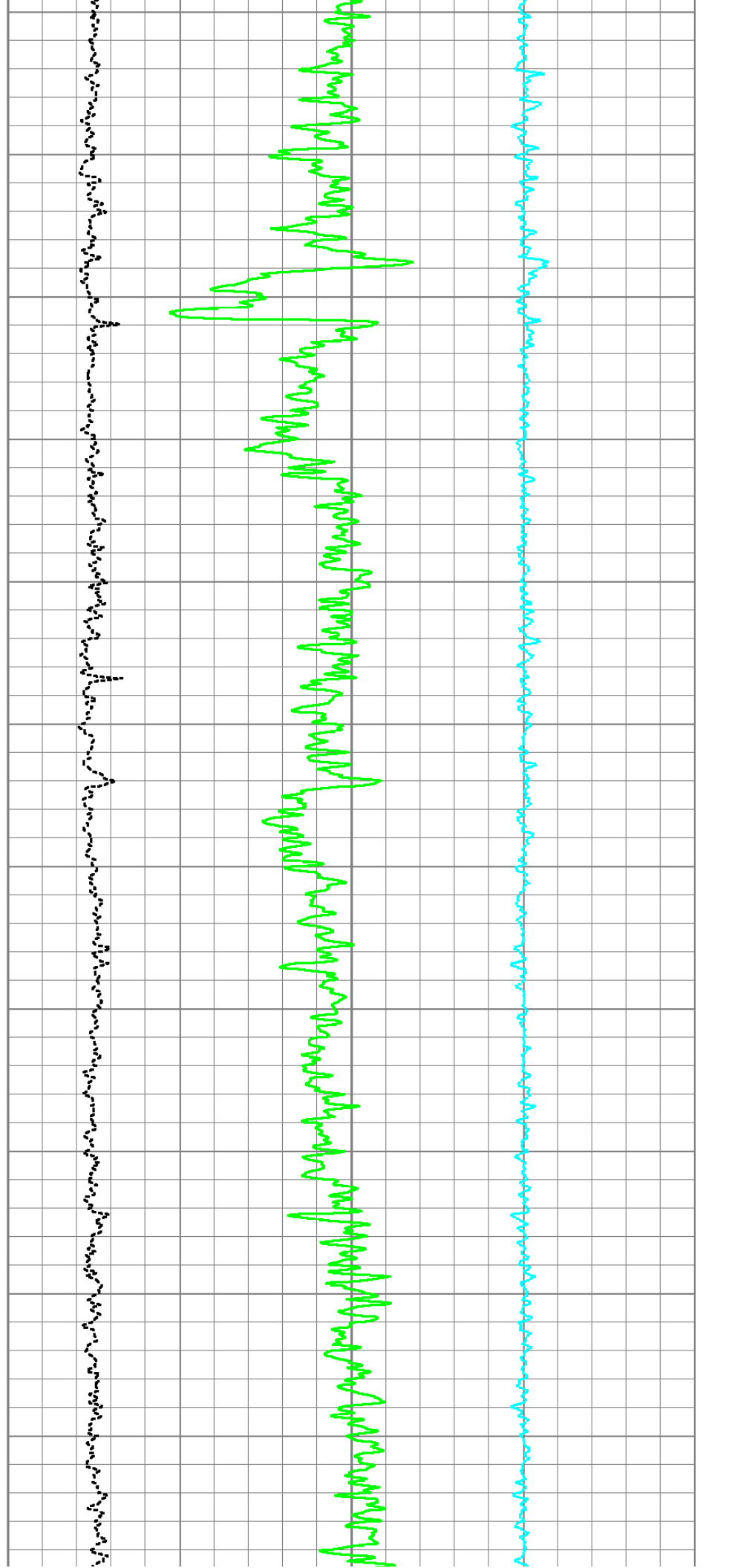
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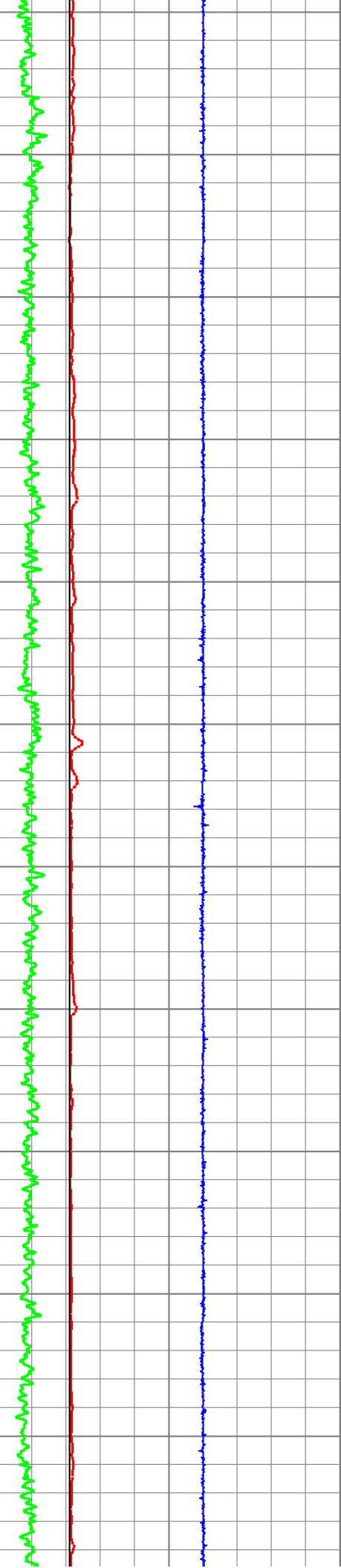
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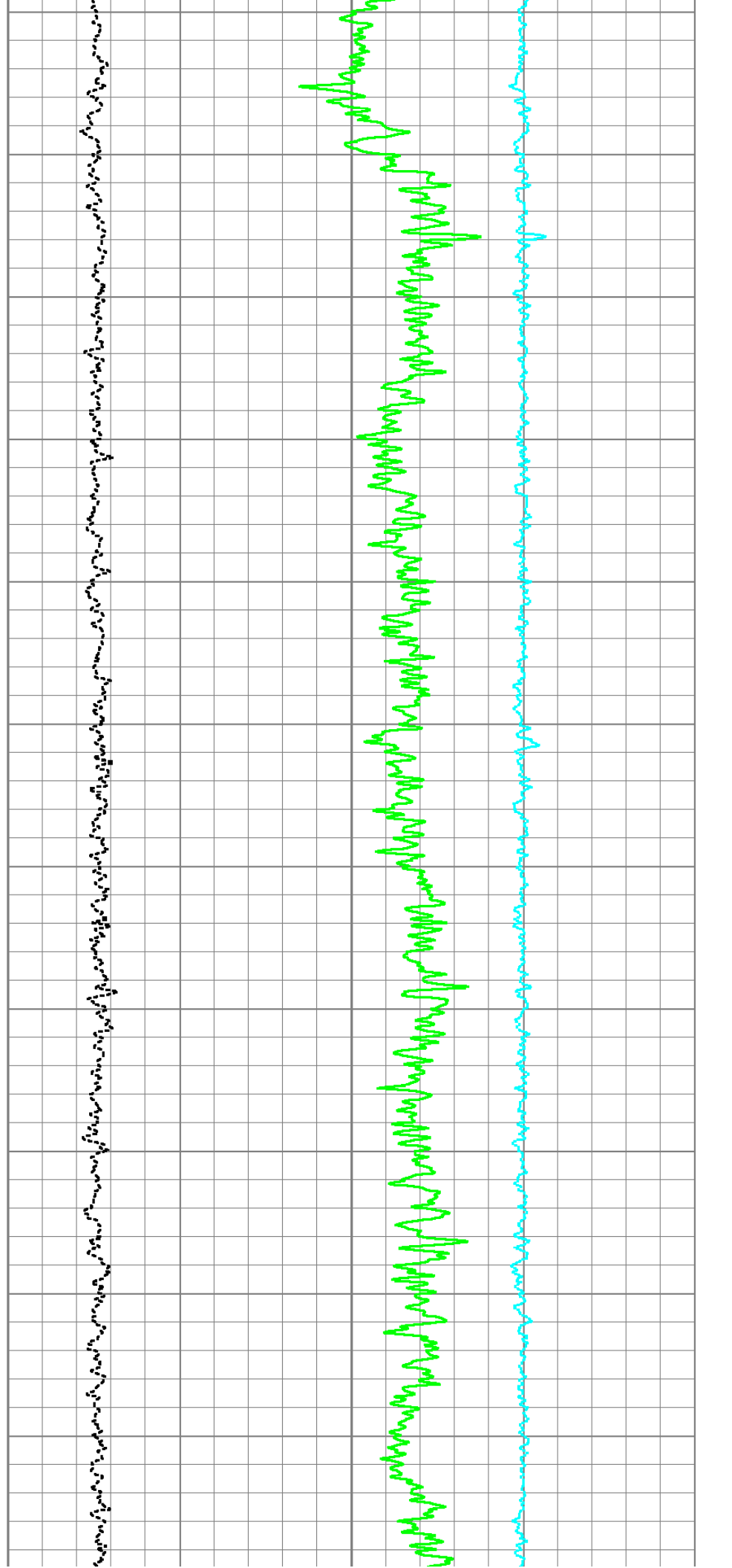
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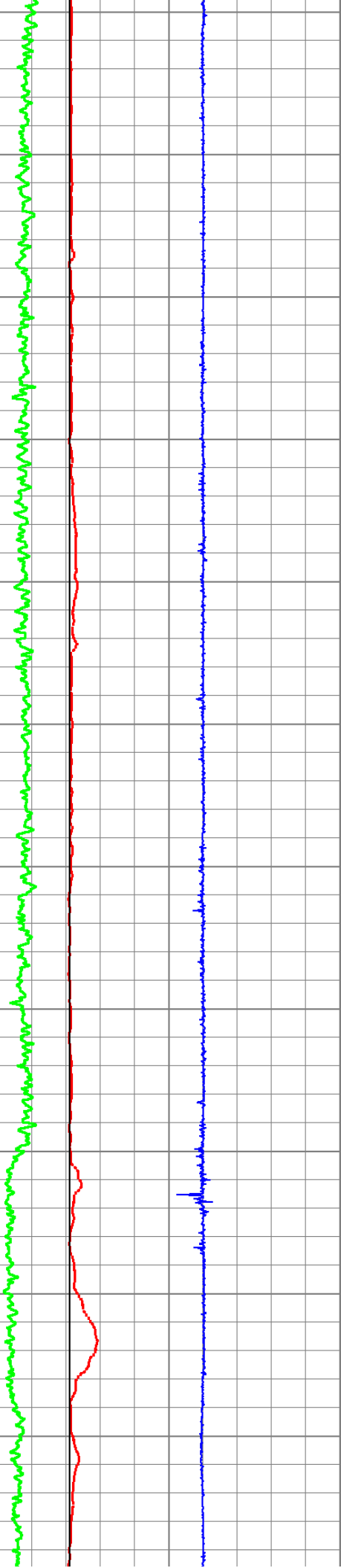
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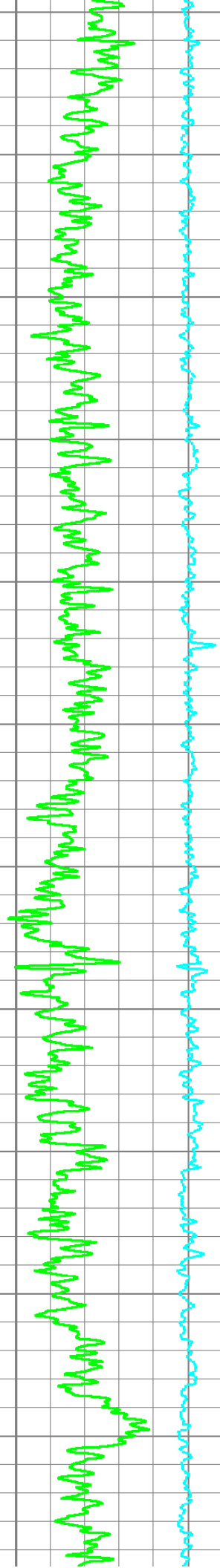
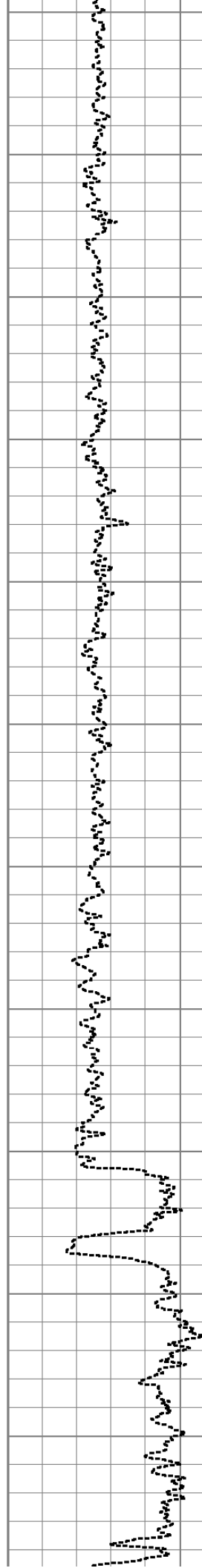
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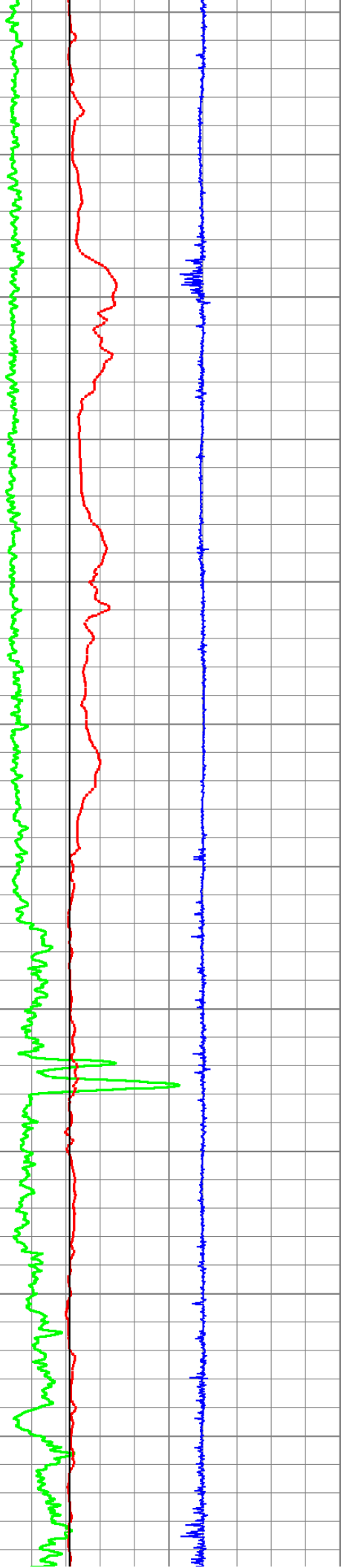
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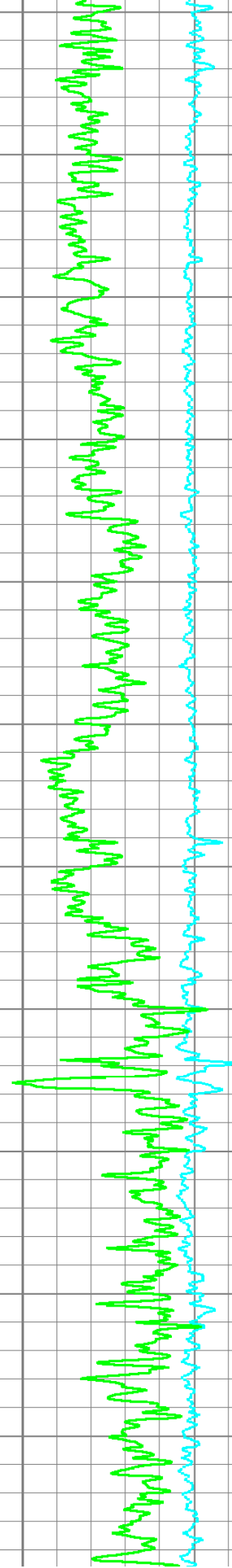
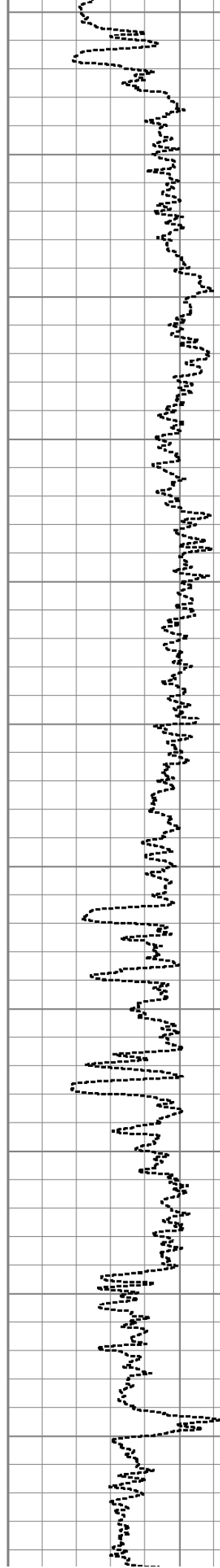
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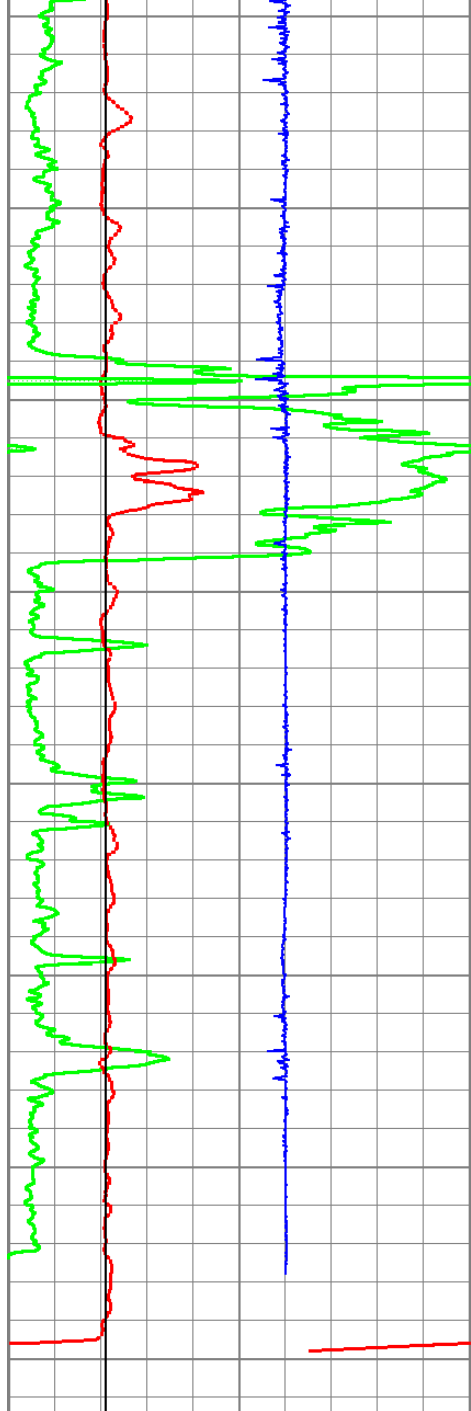
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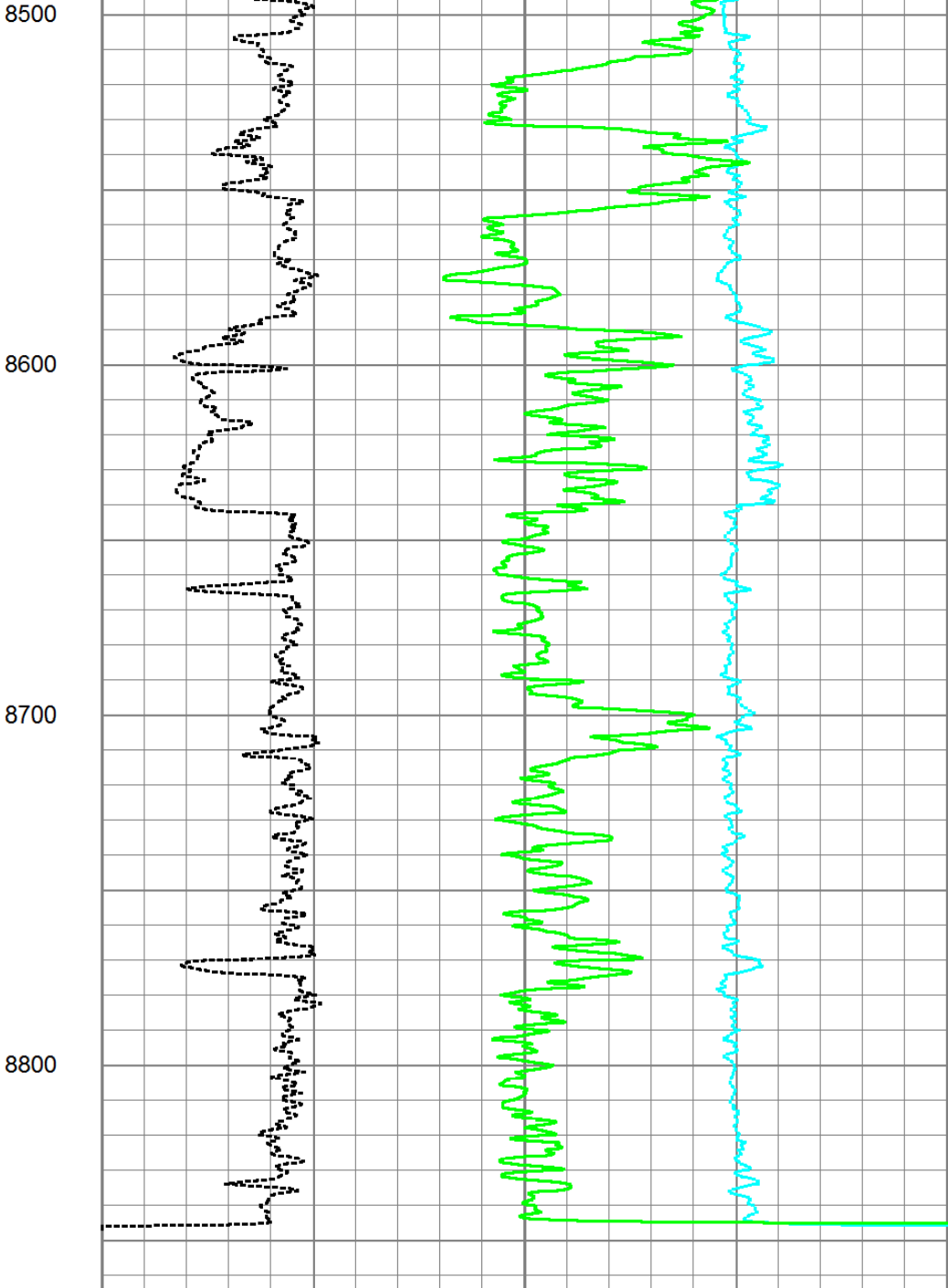
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0	GR (GAPI)	150
4	DCAL (in)	14
4	BOREID (in)	14
-5	ACCY	5



0	PEF (barn)	10	-0.5	DRHO (g/cc)	0.5
2			RHOB (g/cc)		3



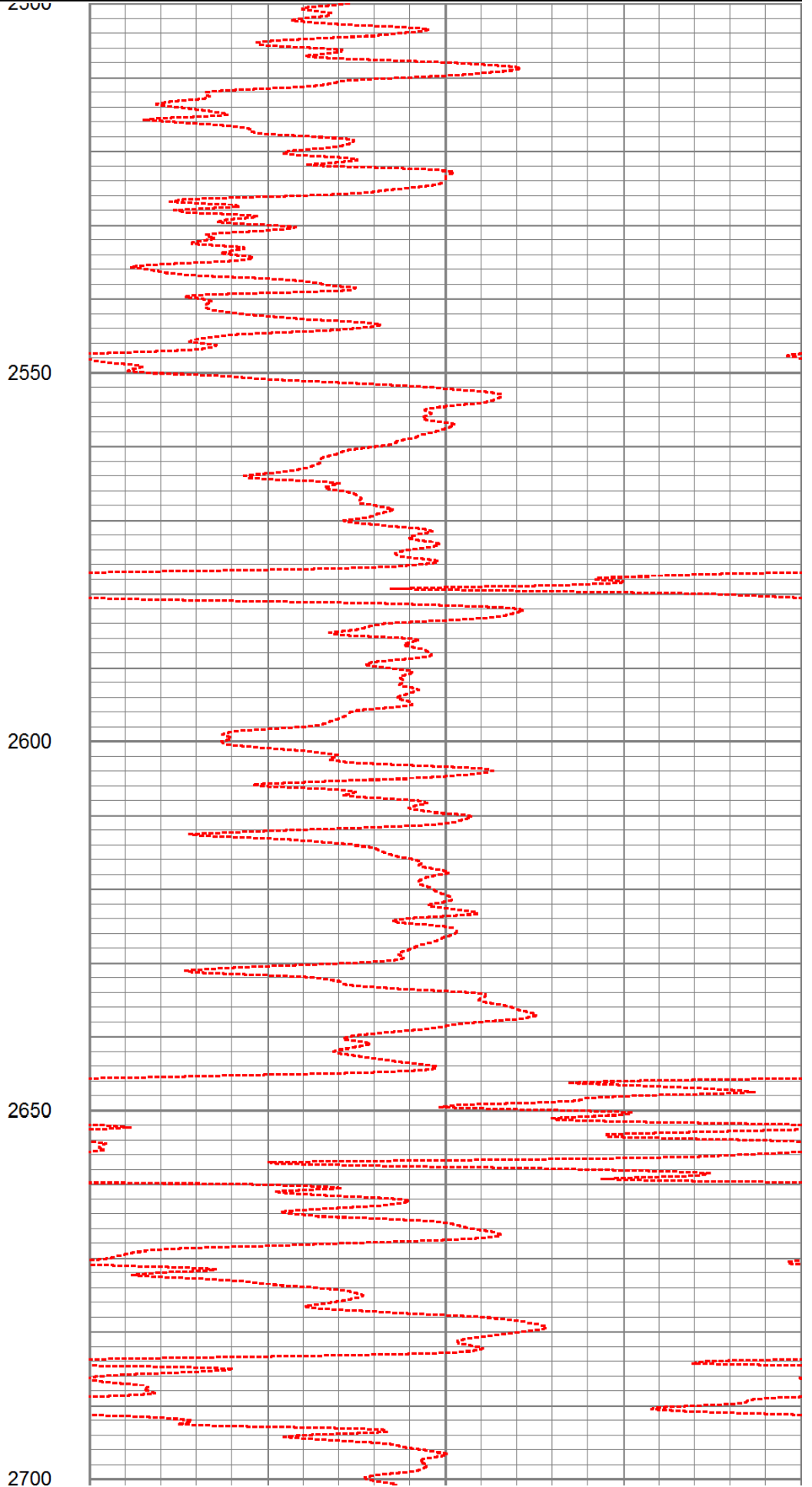
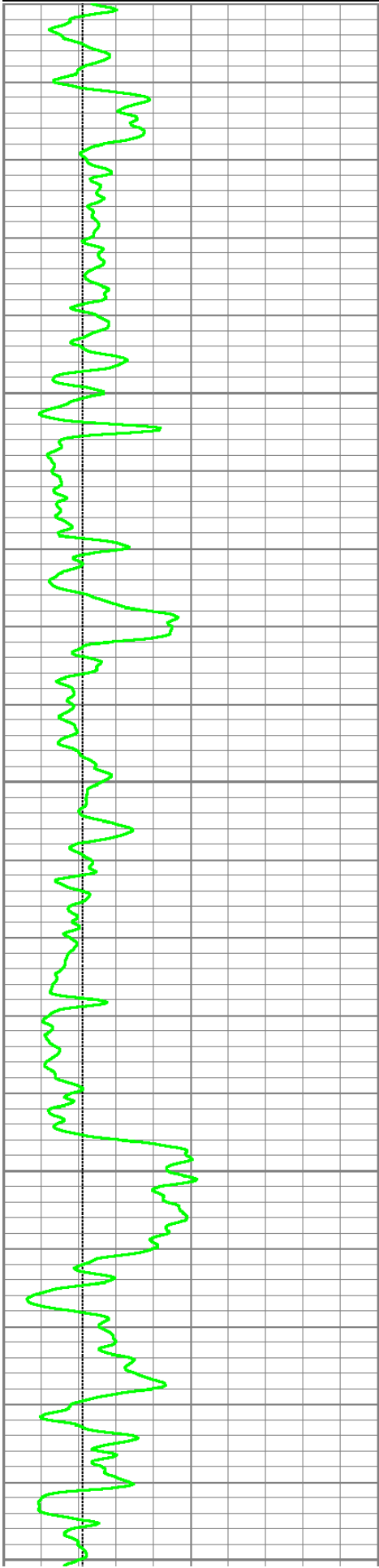
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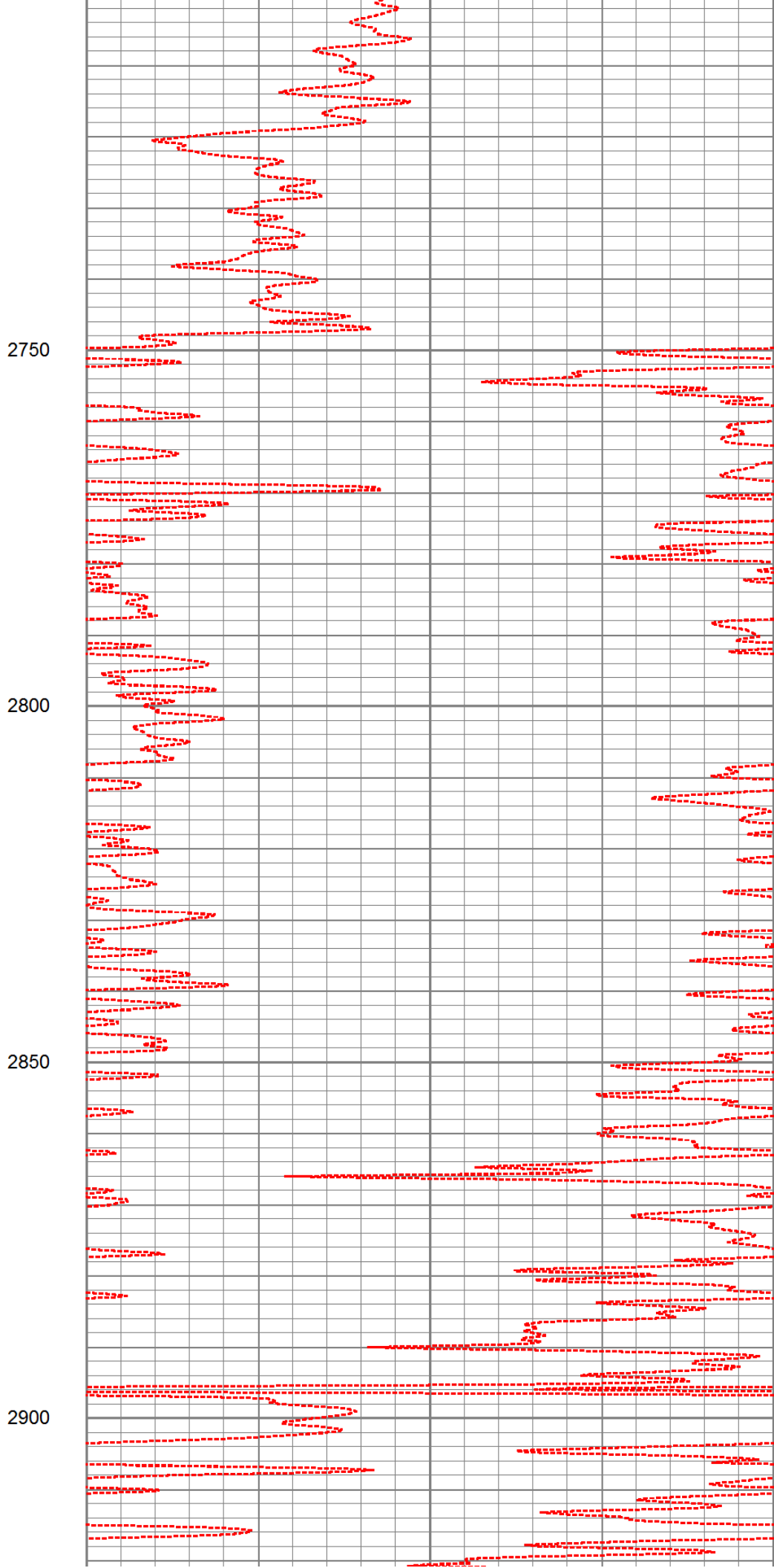
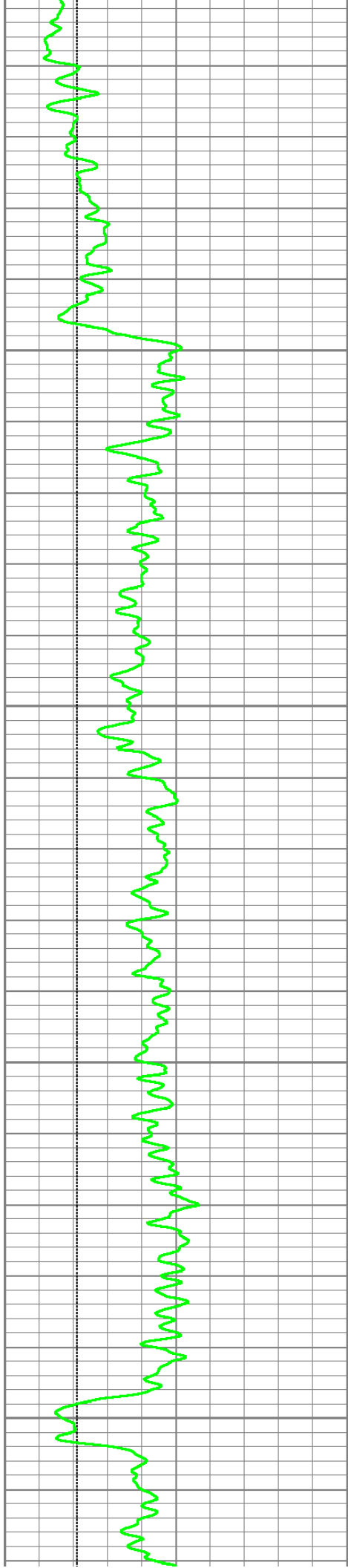
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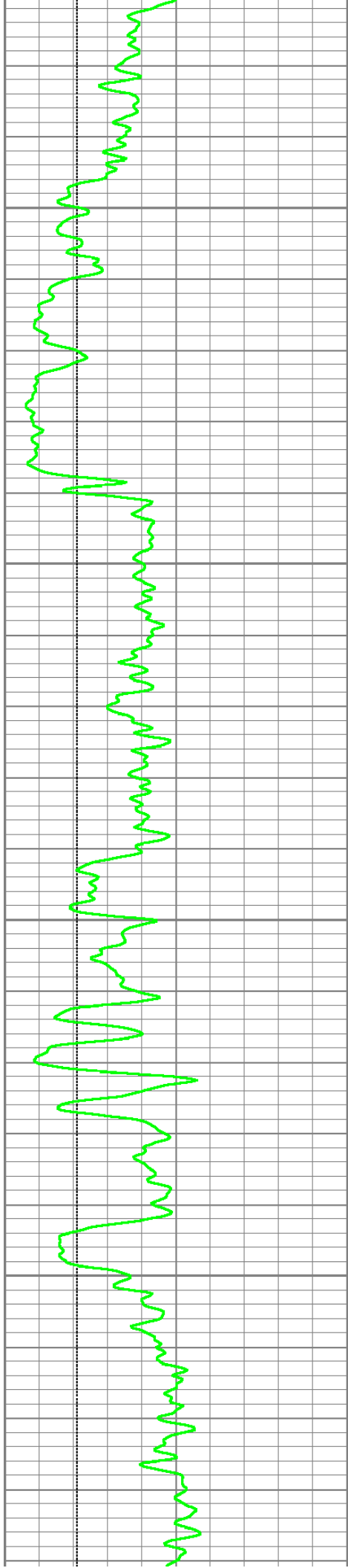
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4	BOREID (in)	14
0	GR (GAPI)	150
-5	ACCY	5
	TBHV (ft3)	

30	PEF (barn)	10	-0.5	DRHO (g/cc)	-10
	ABHV (ft3)				





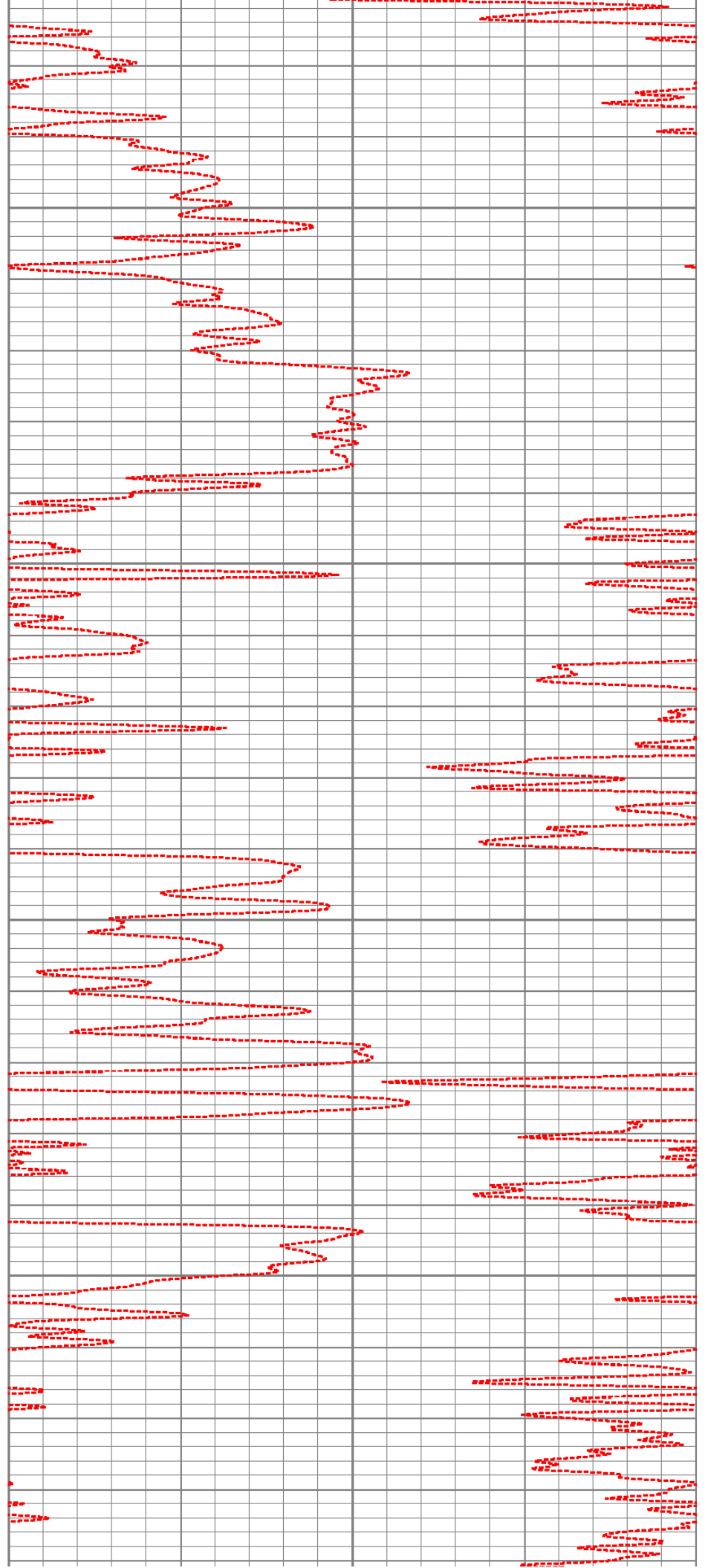


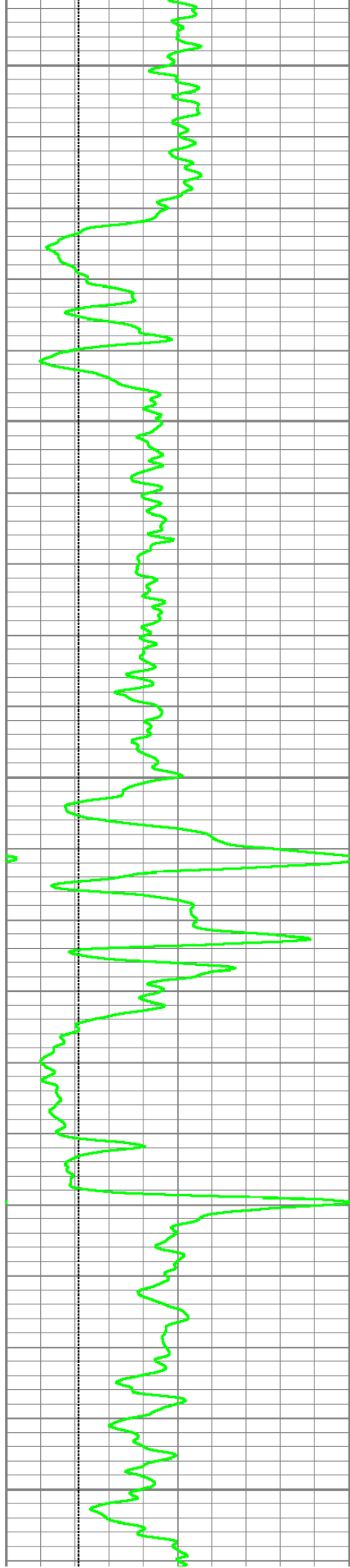
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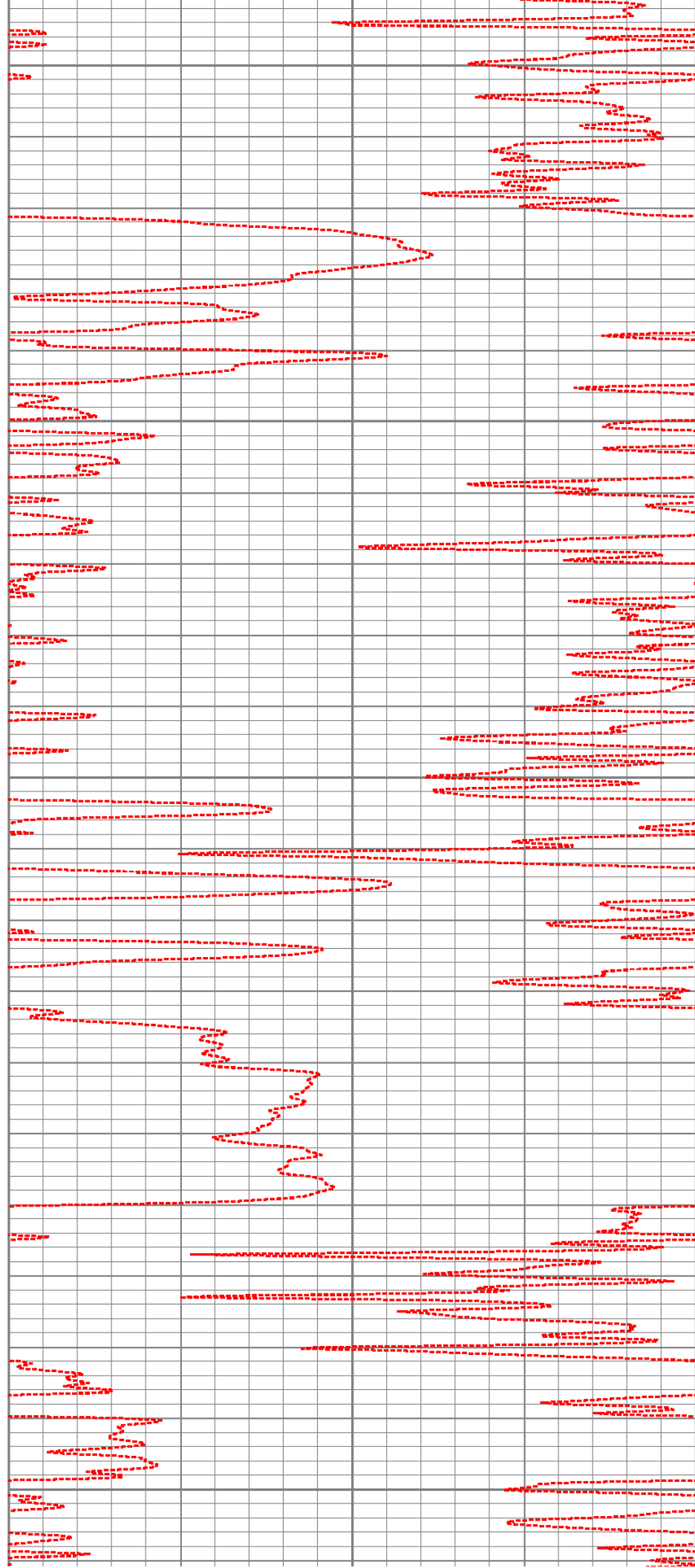
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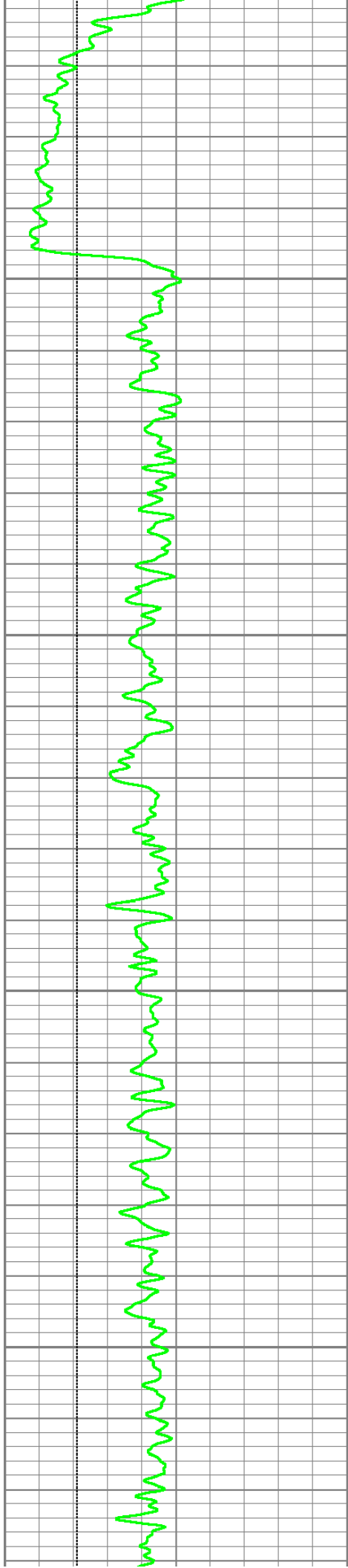
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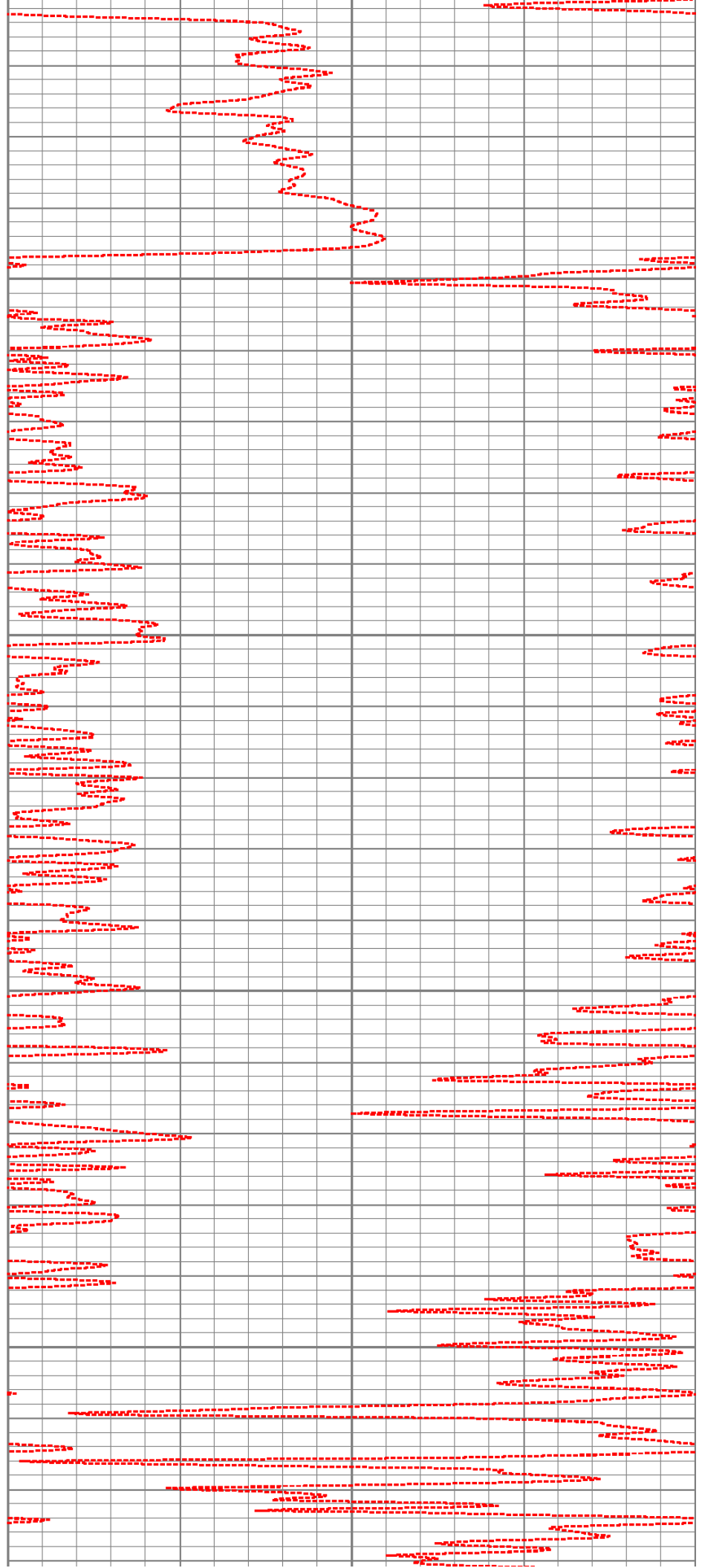


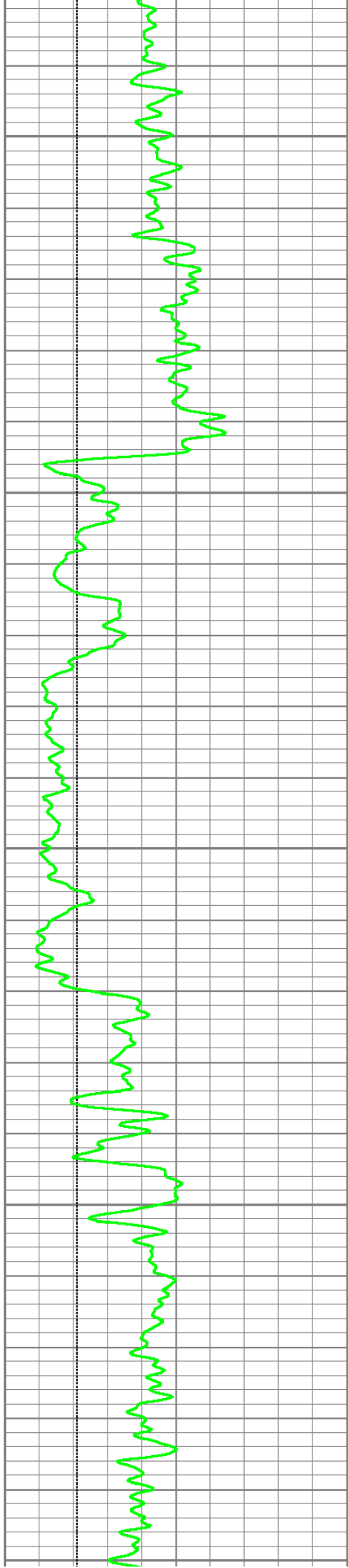
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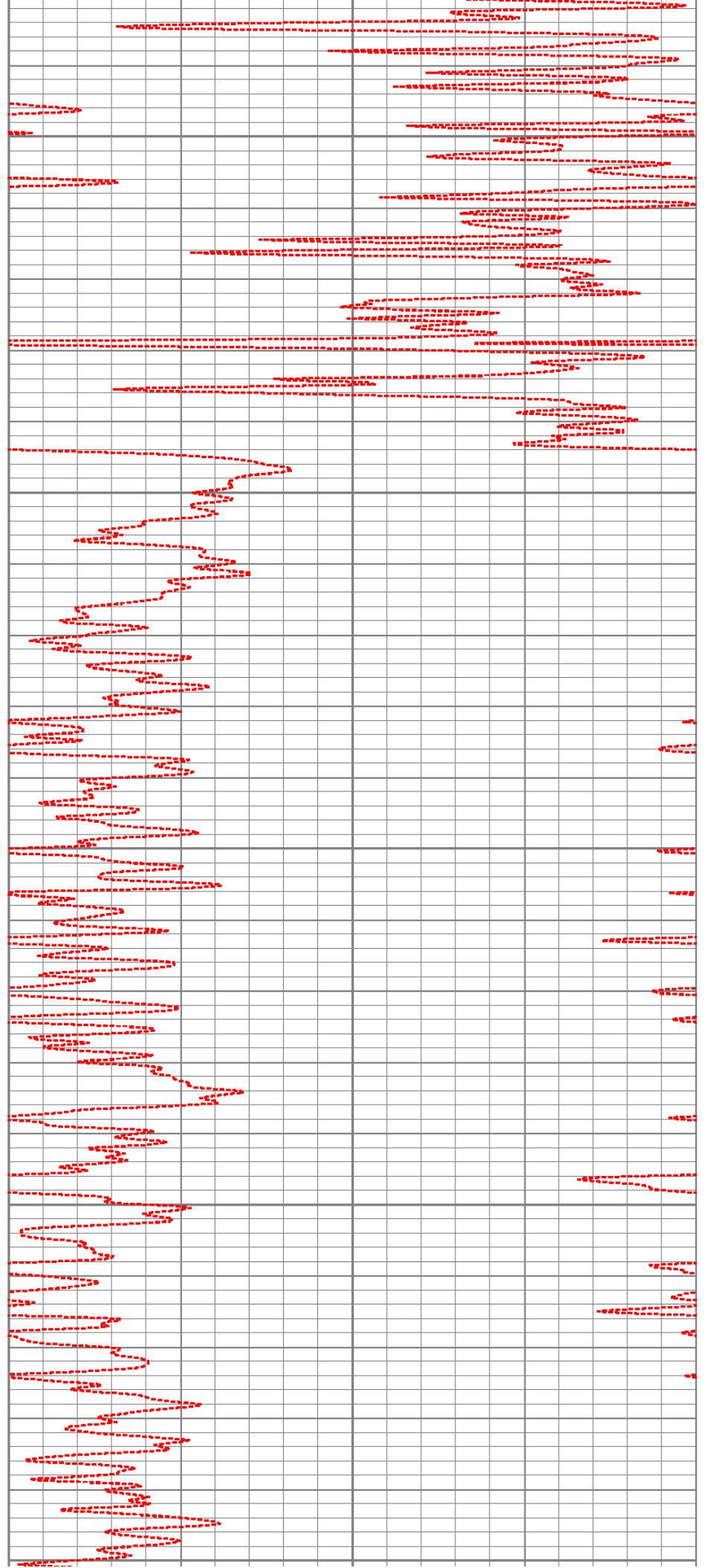
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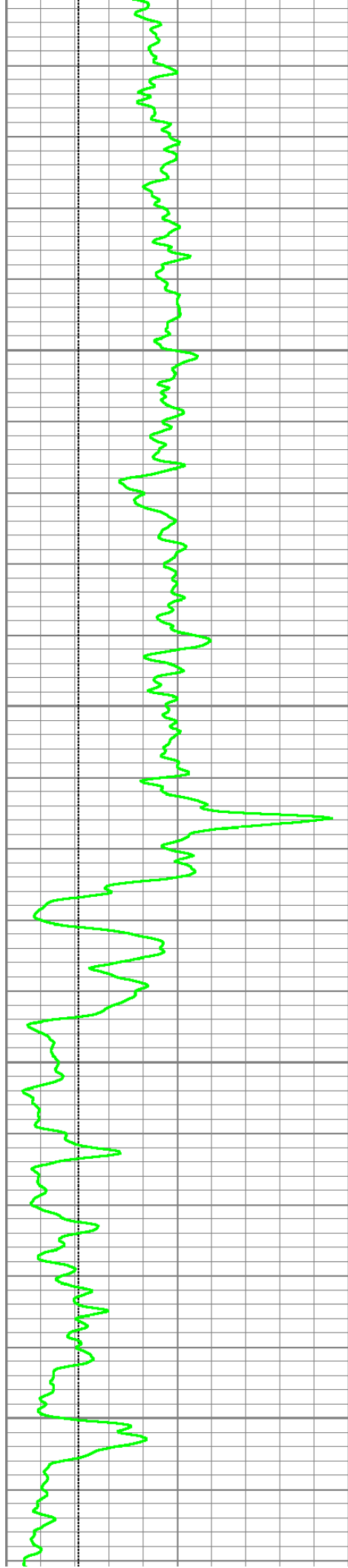
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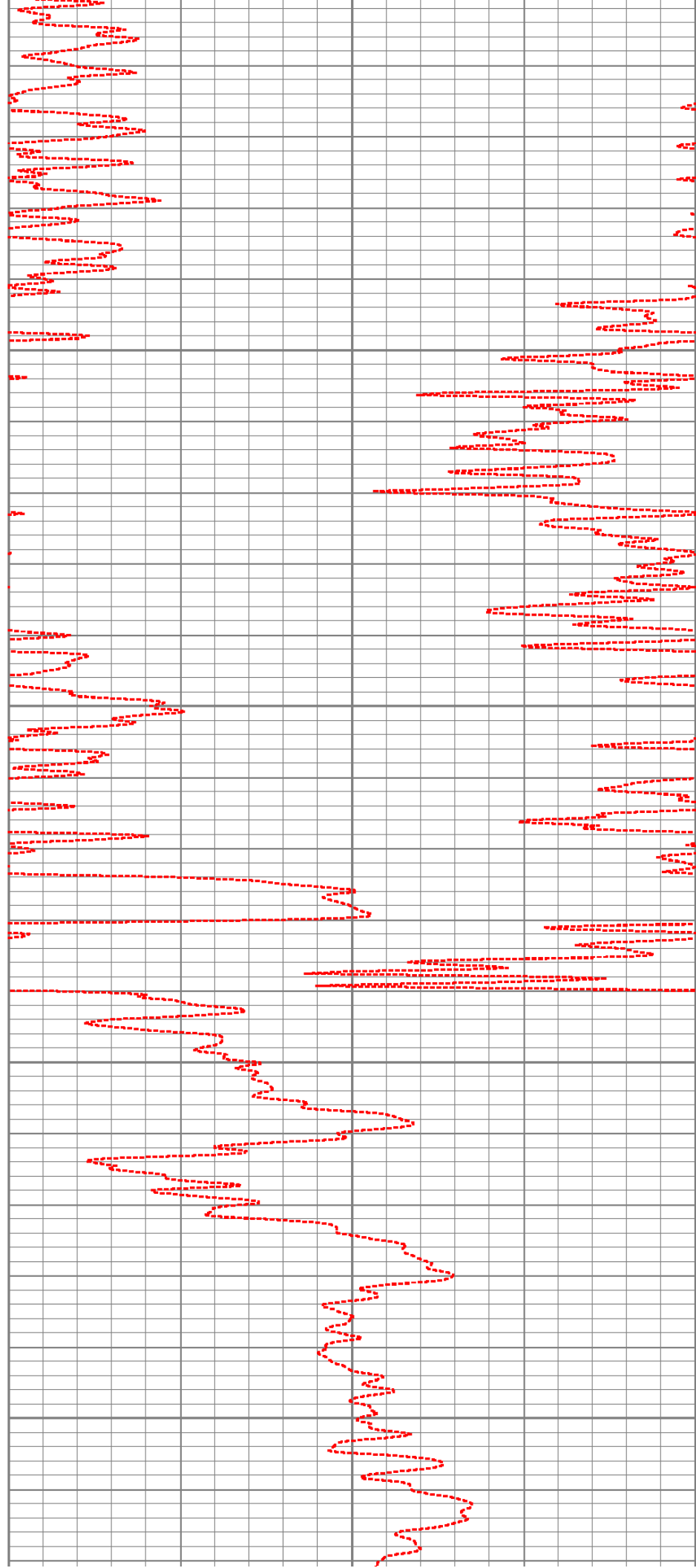


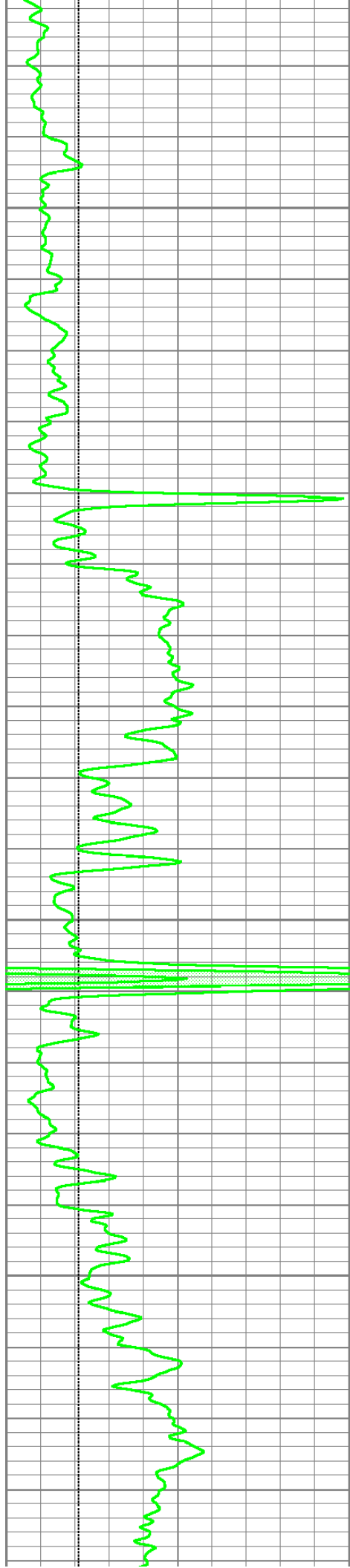
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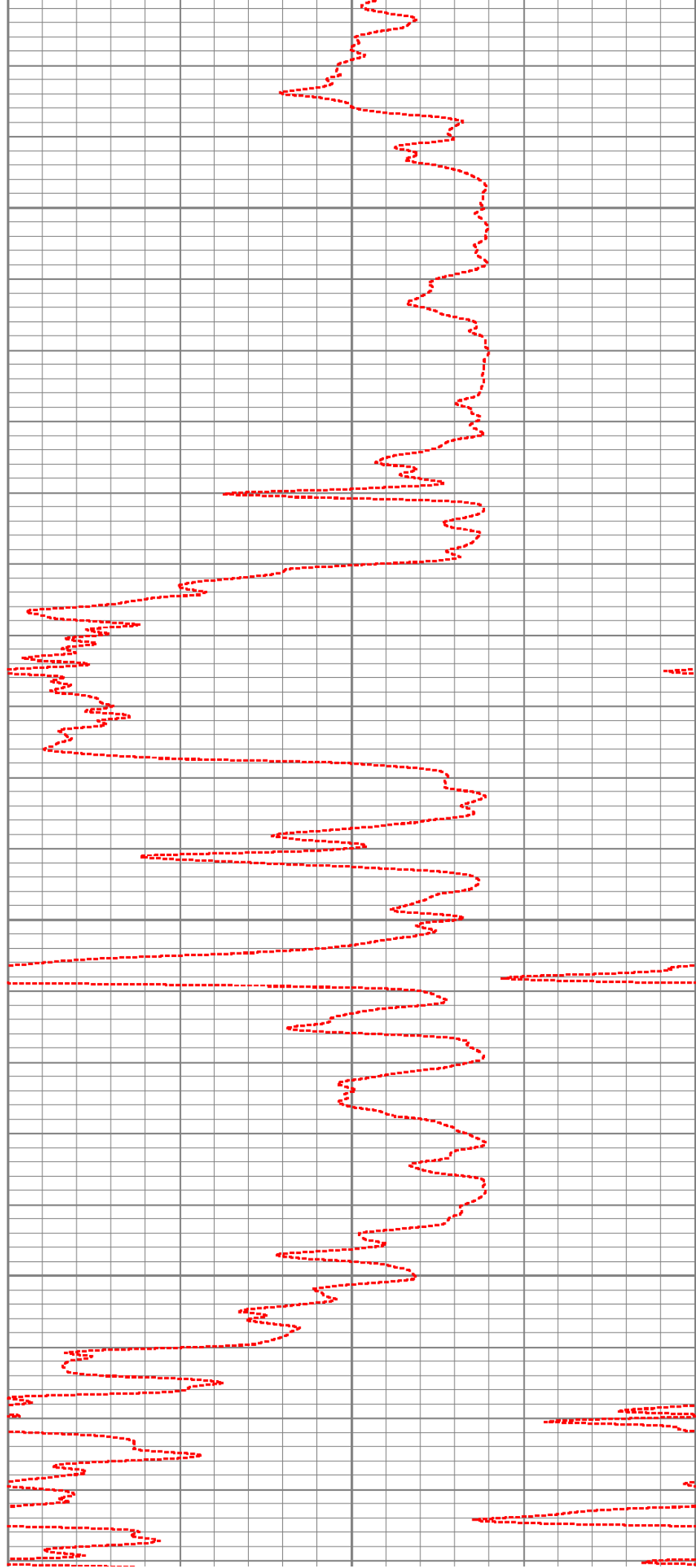


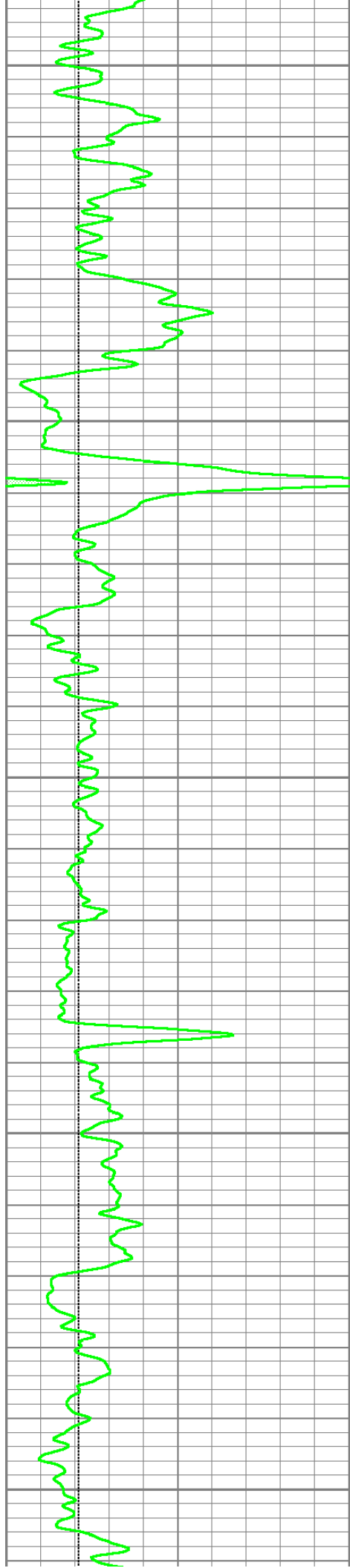
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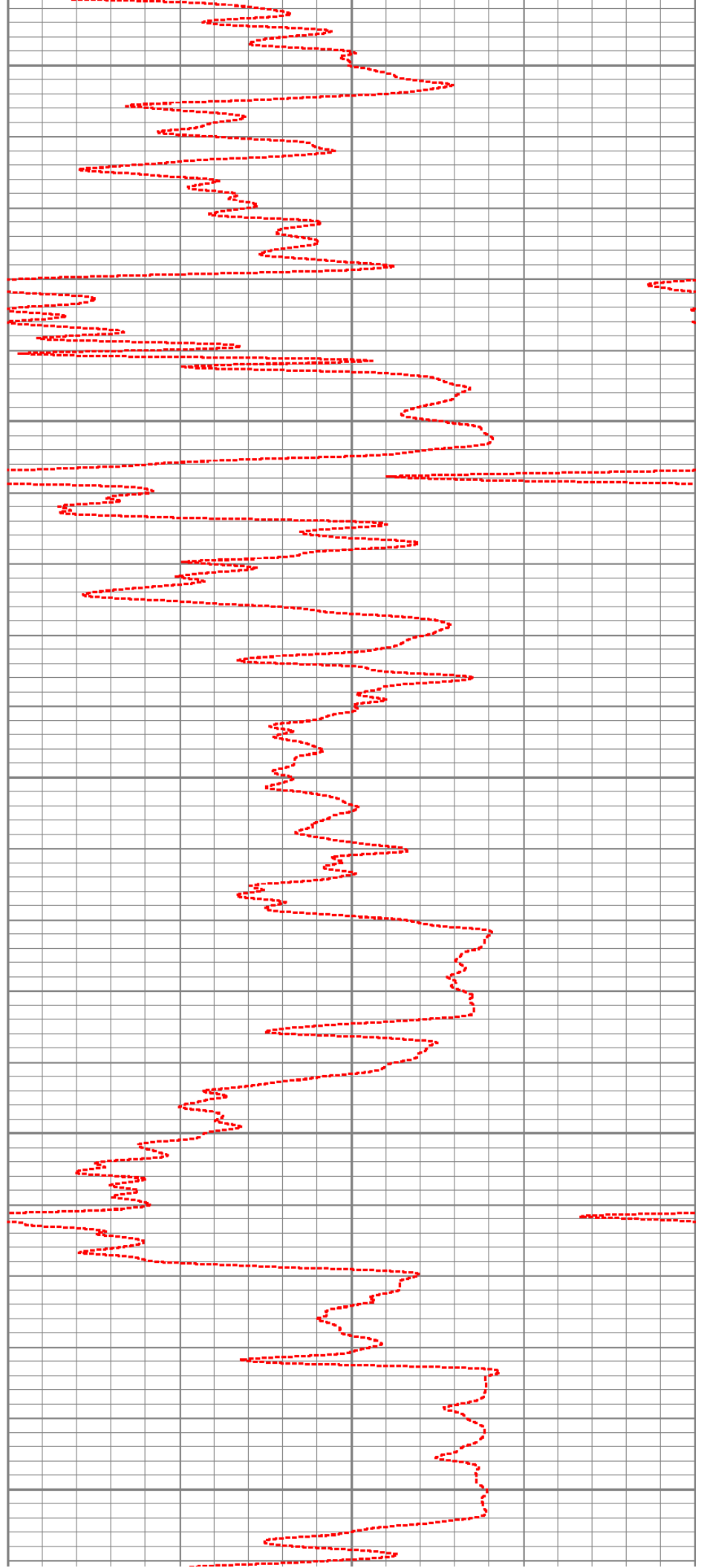
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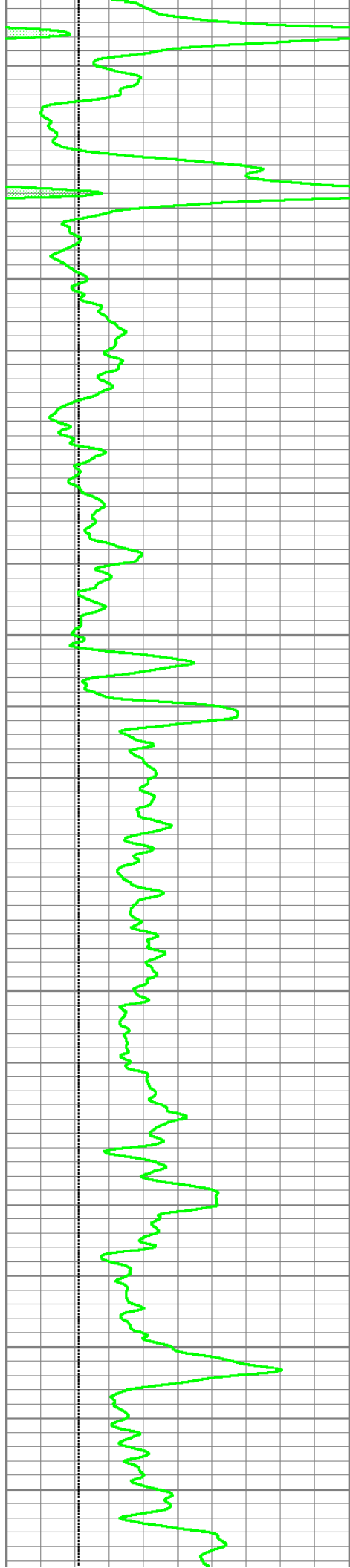
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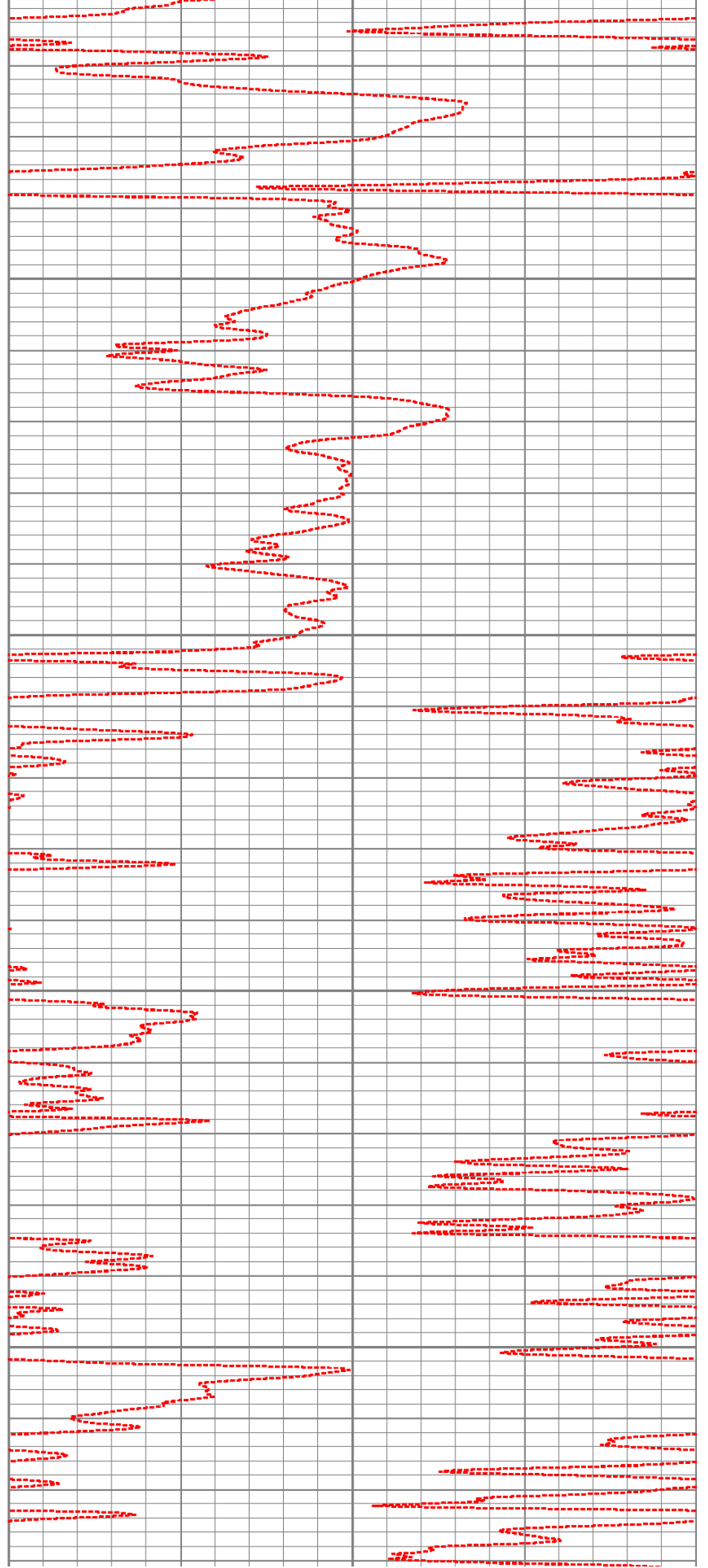


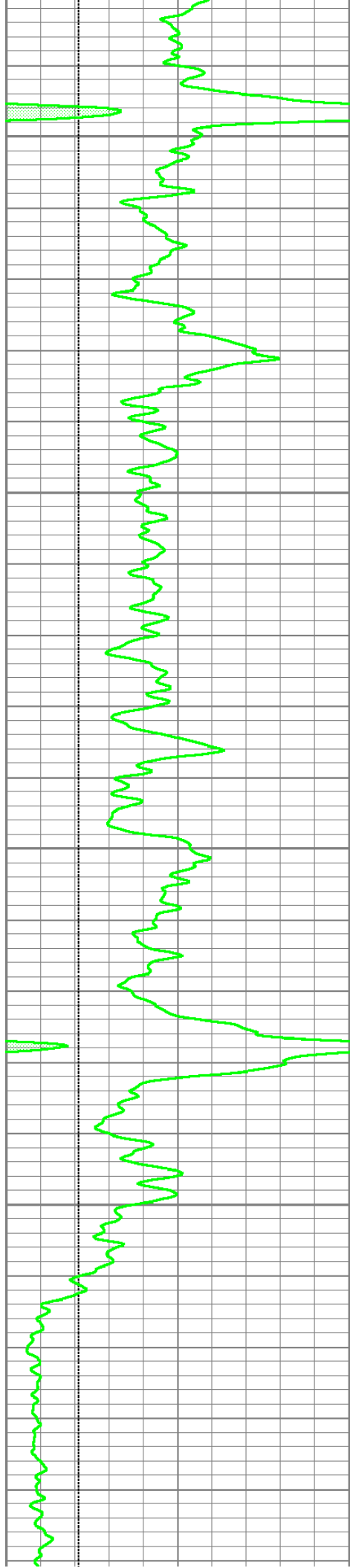
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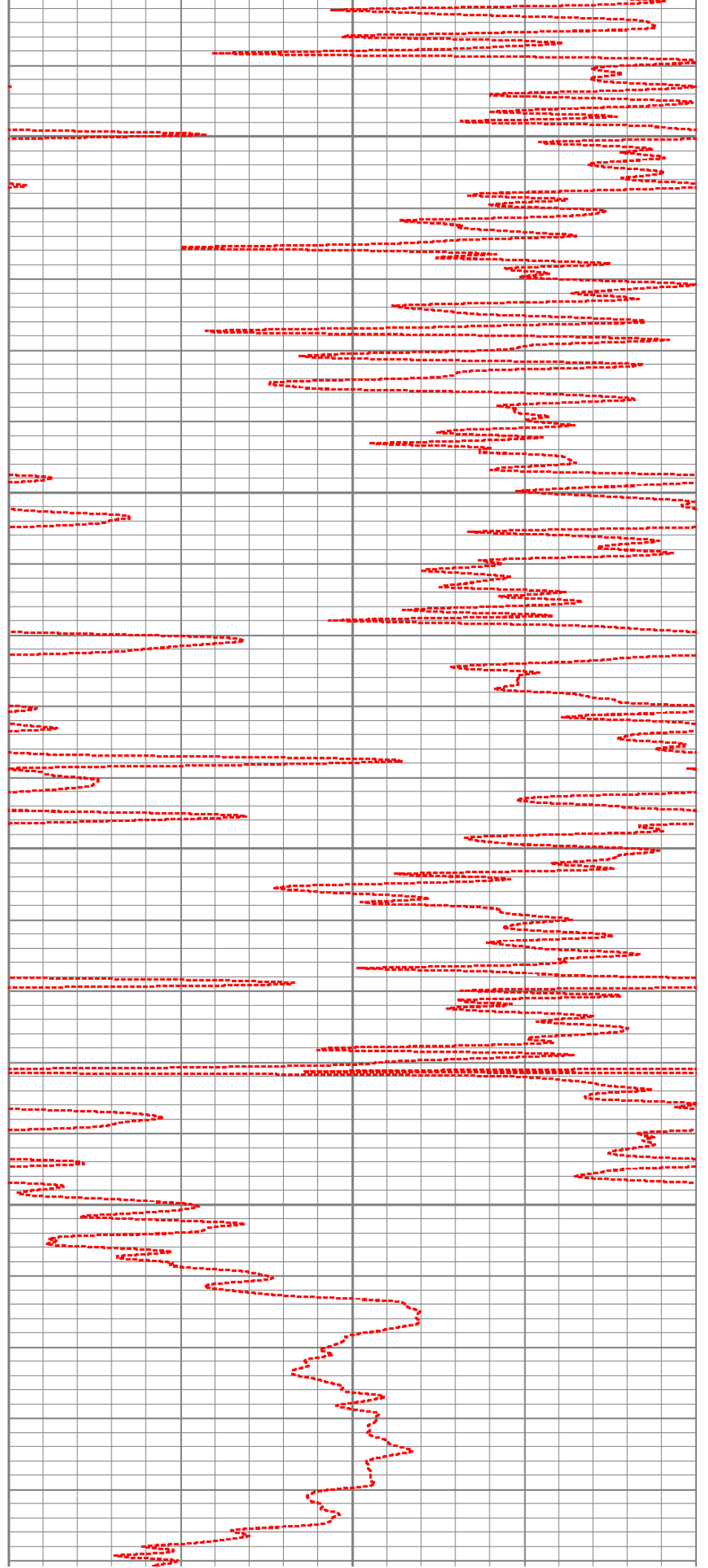
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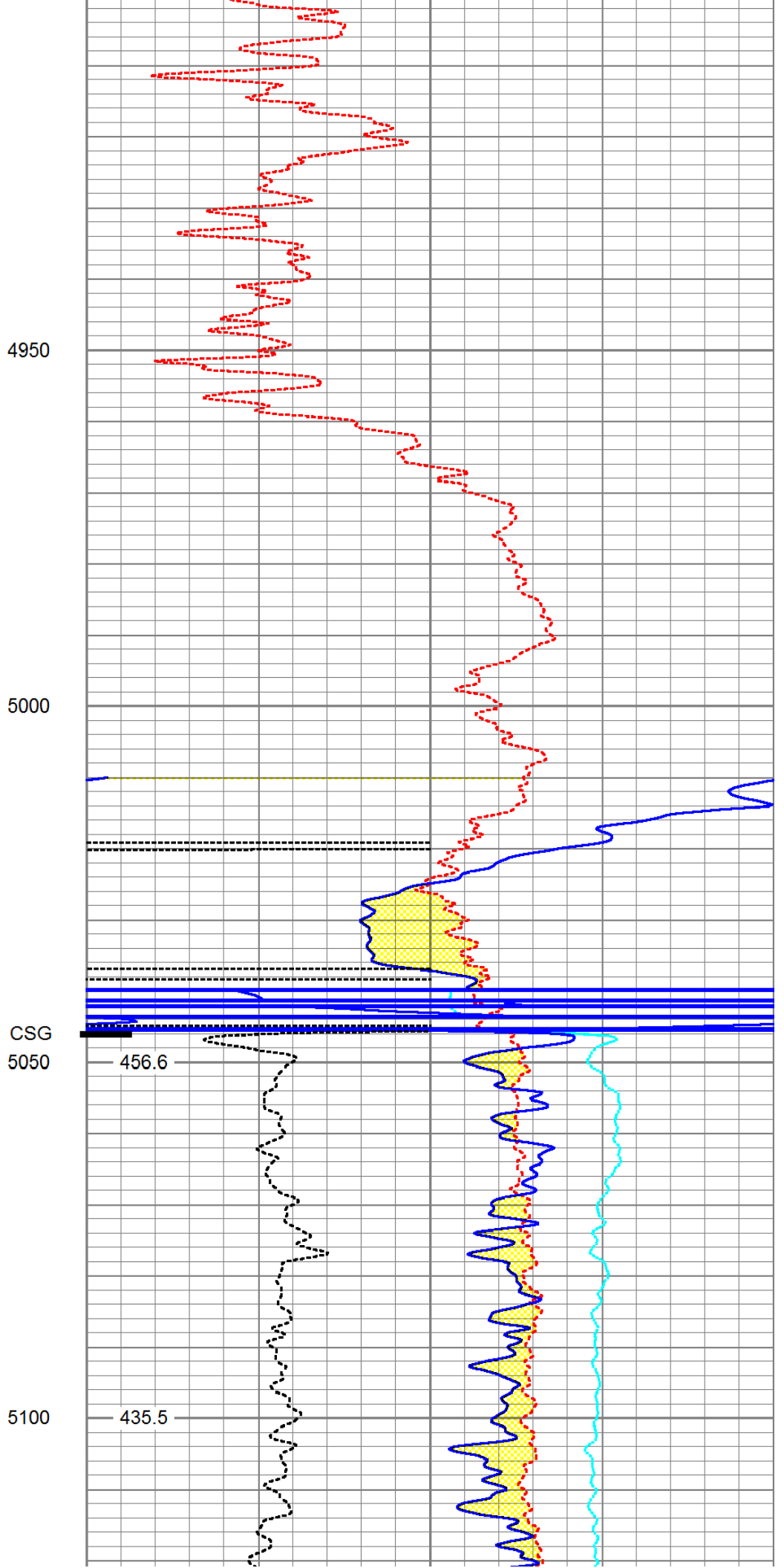
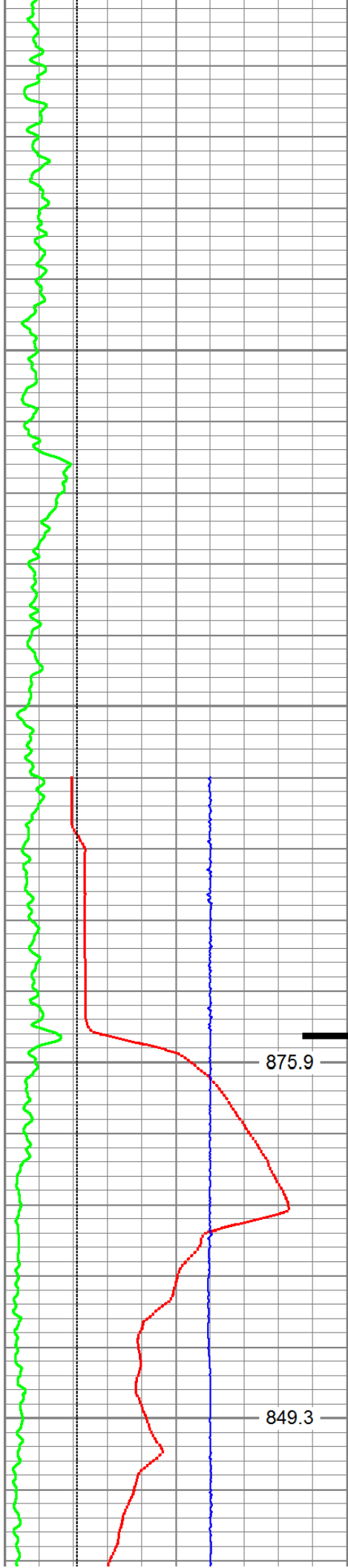
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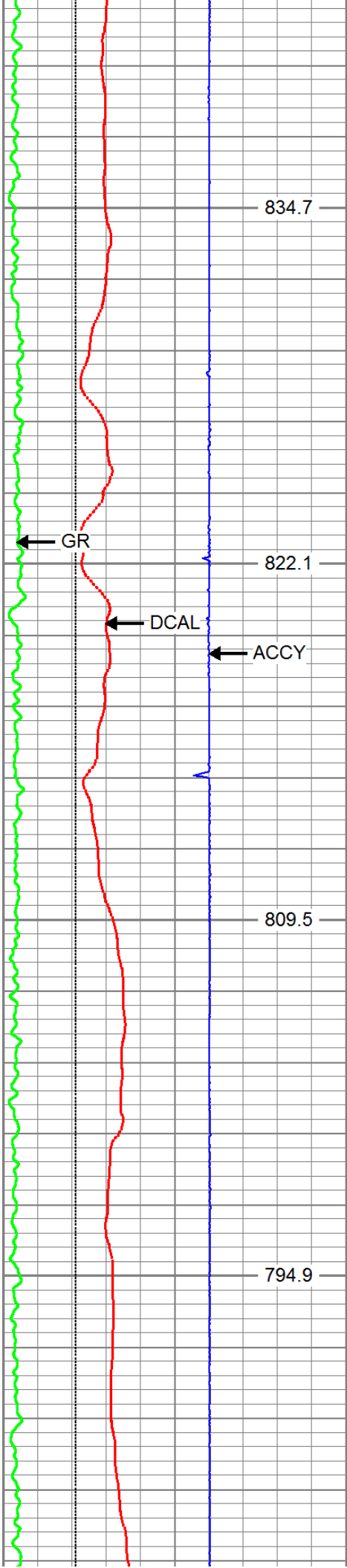
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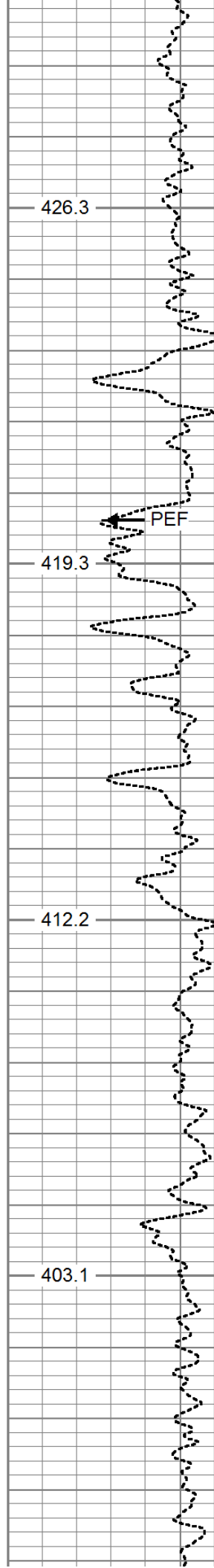


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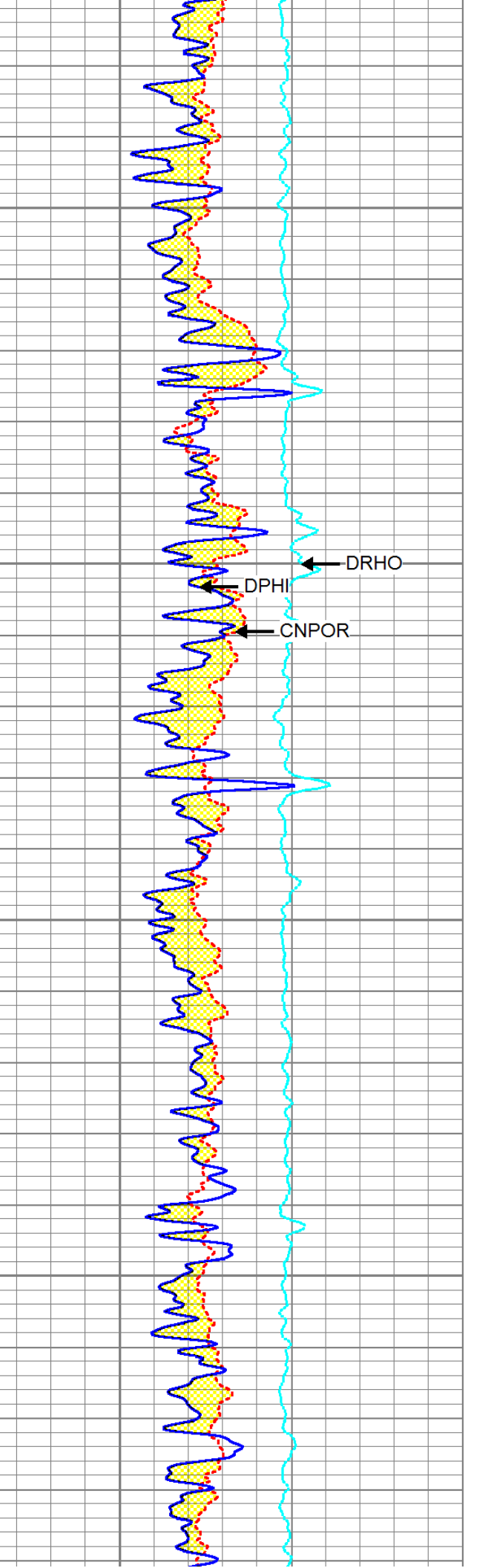


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PEF

DRHO

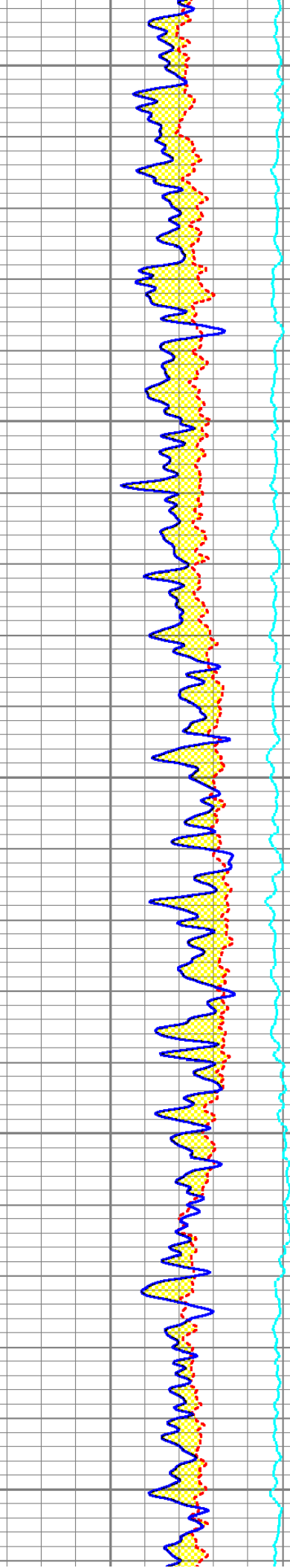
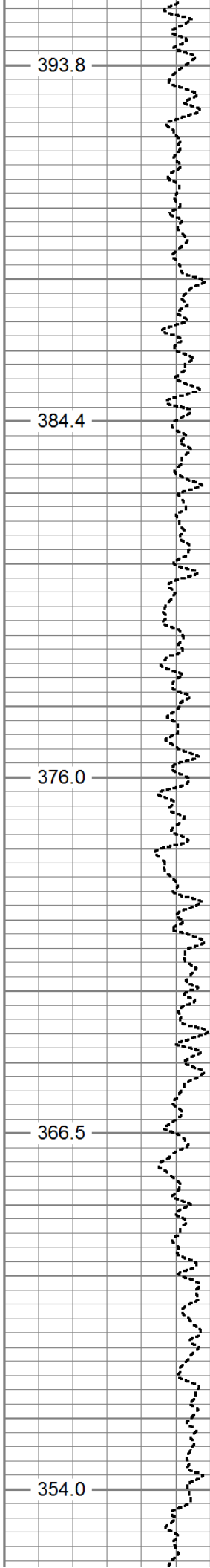
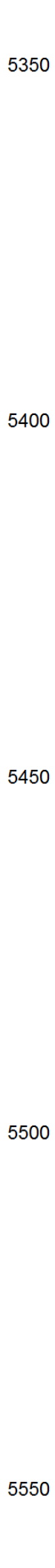
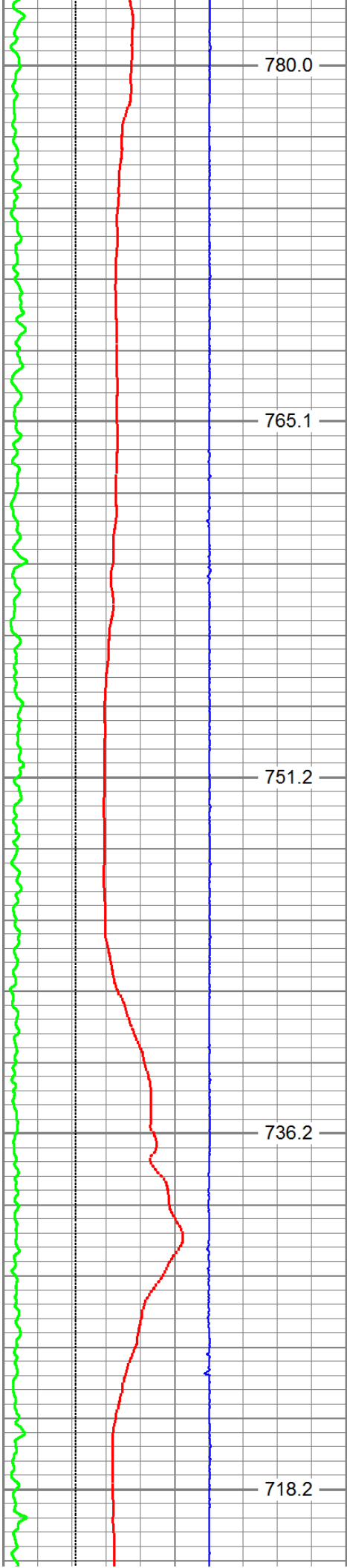
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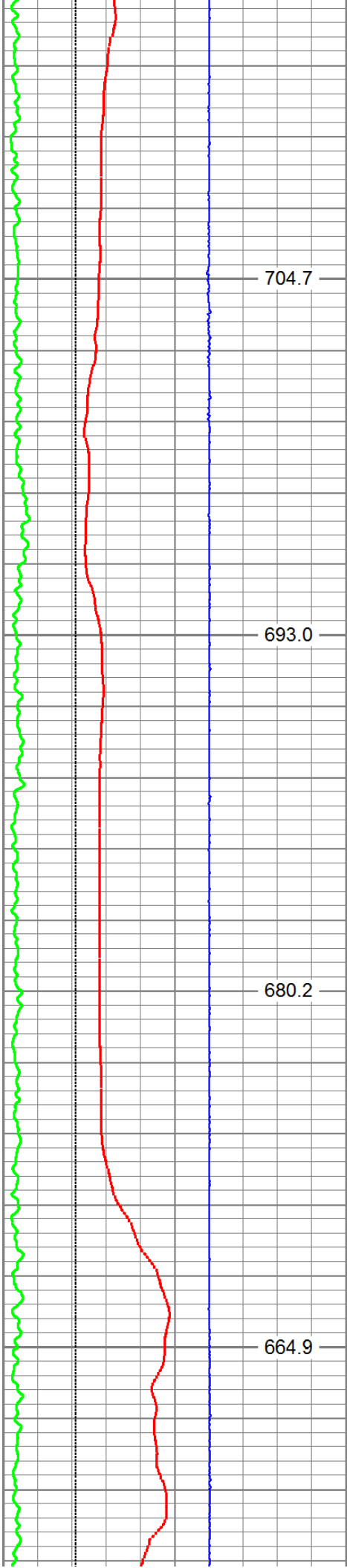
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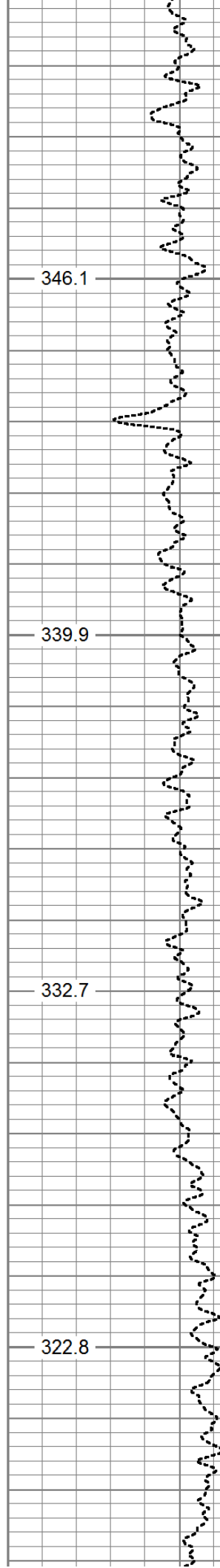
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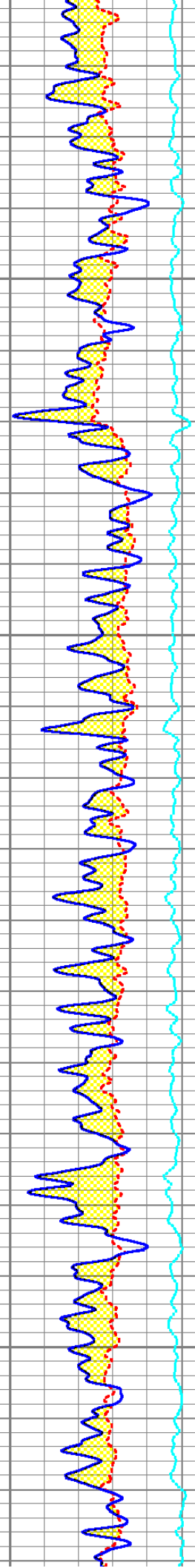


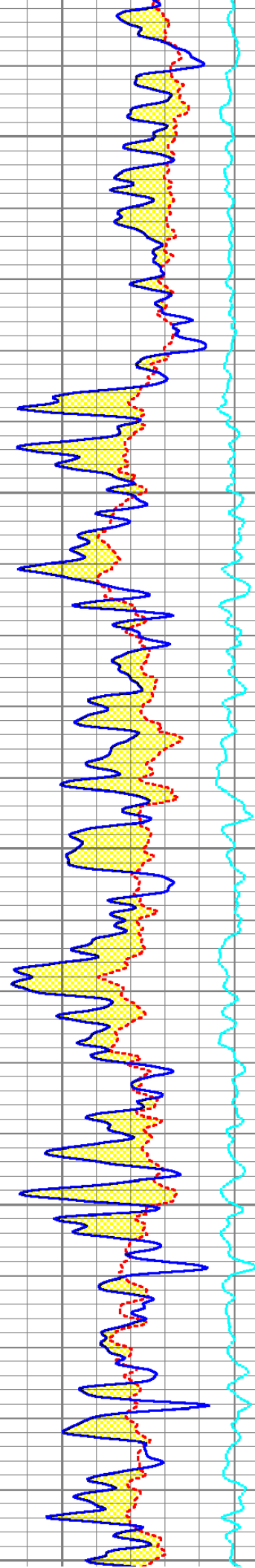
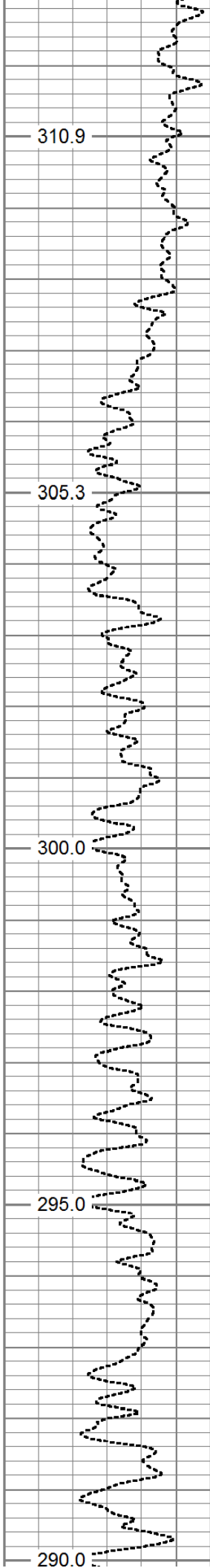
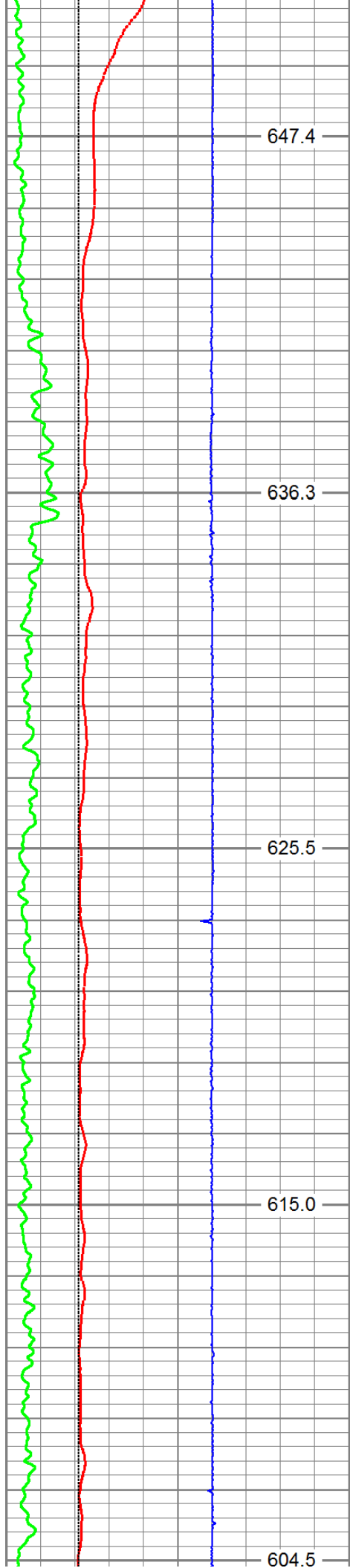
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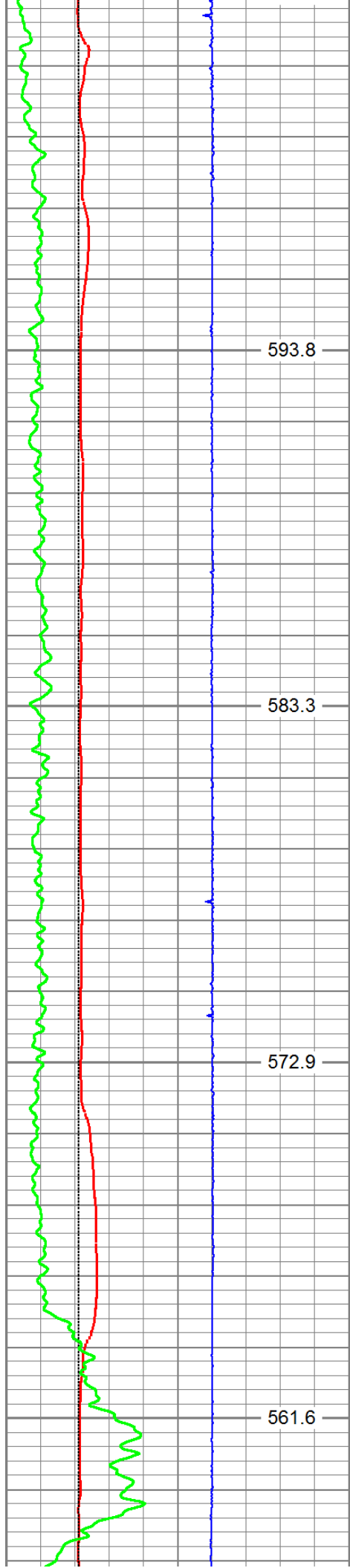
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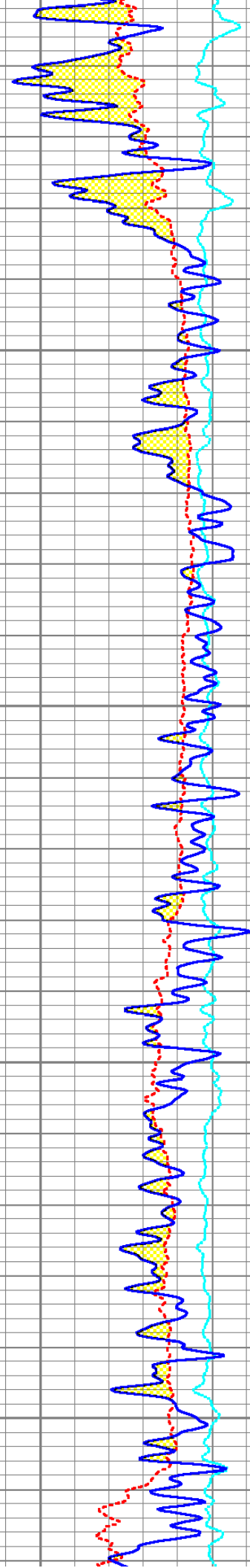
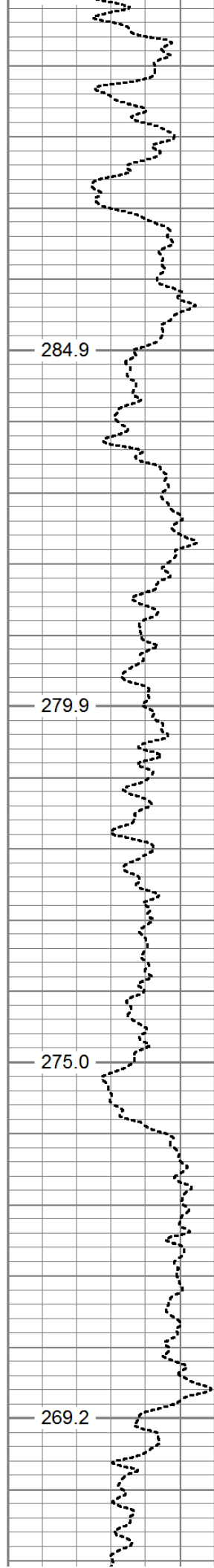
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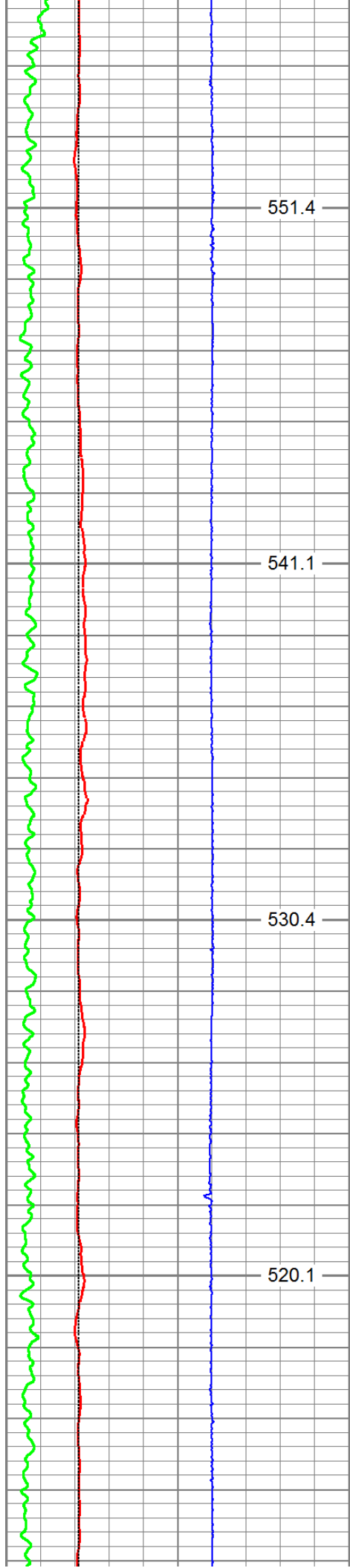






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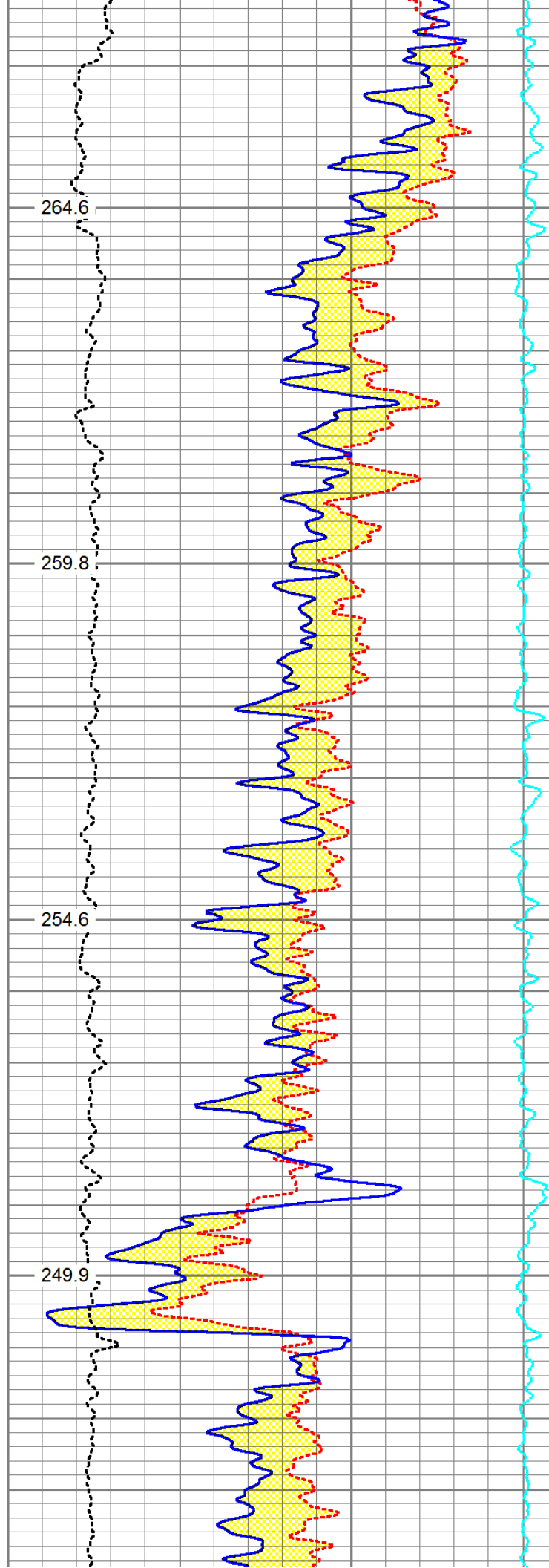
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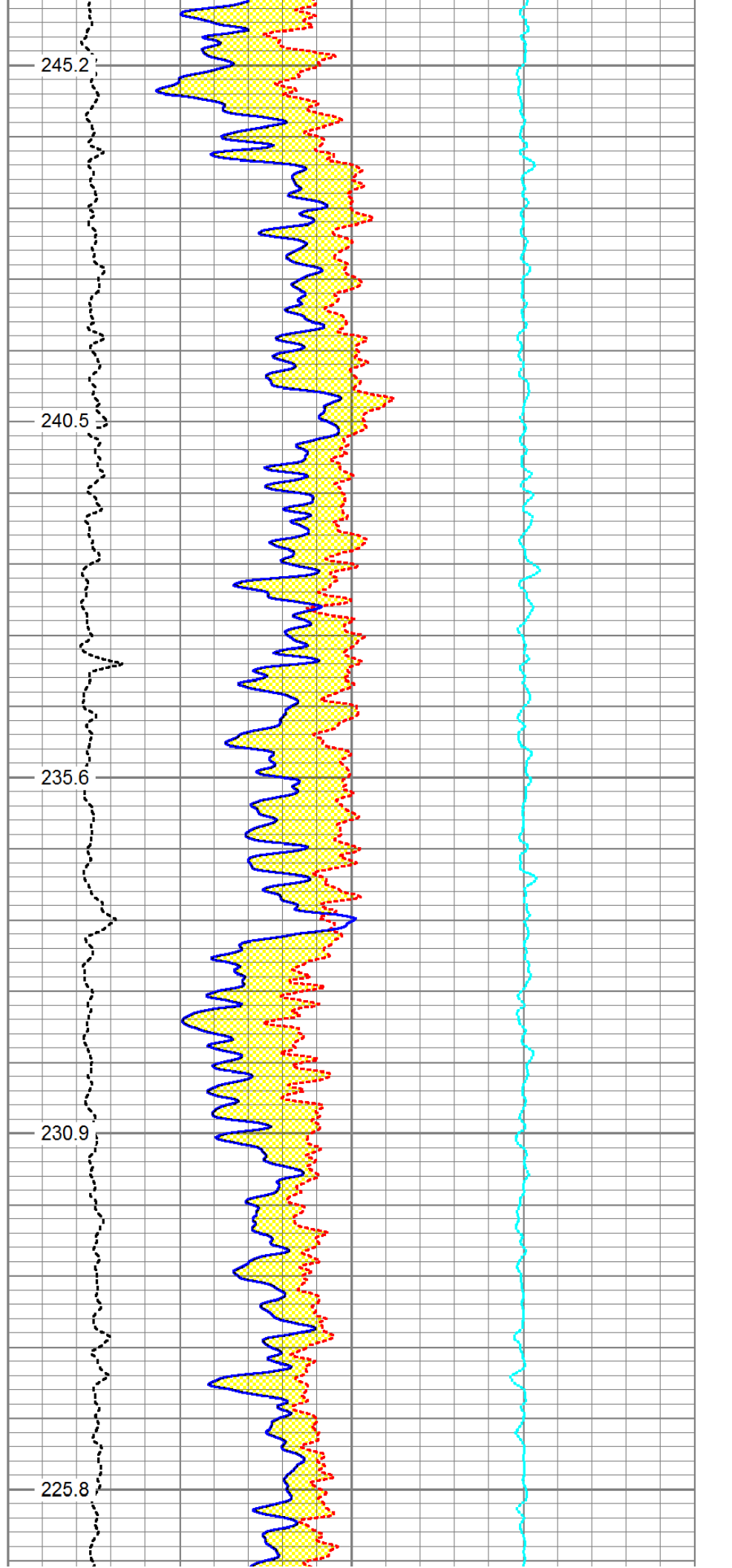
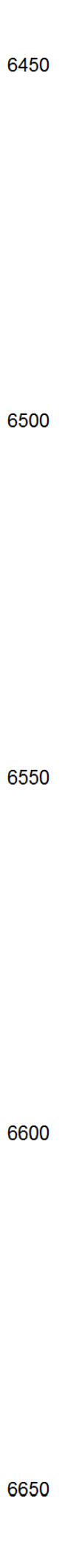
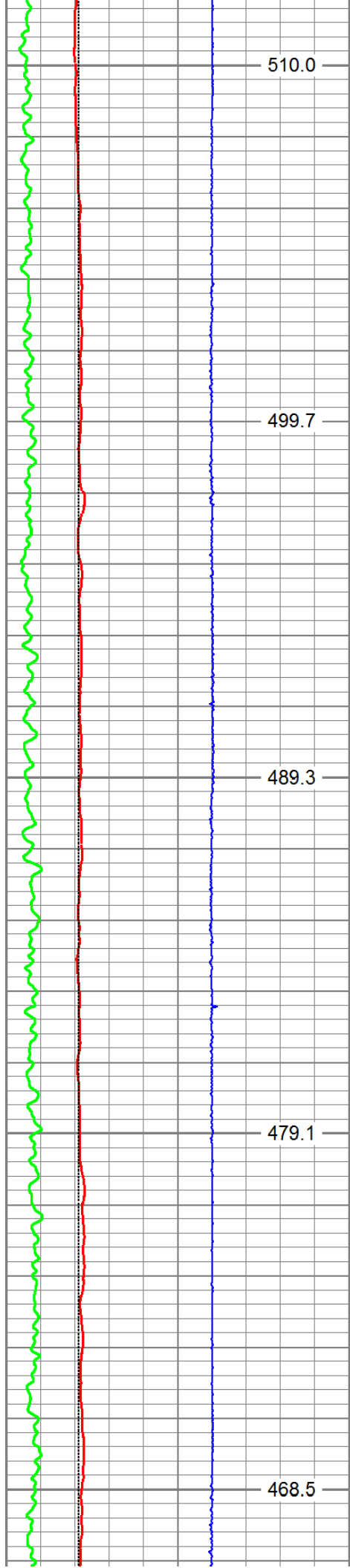


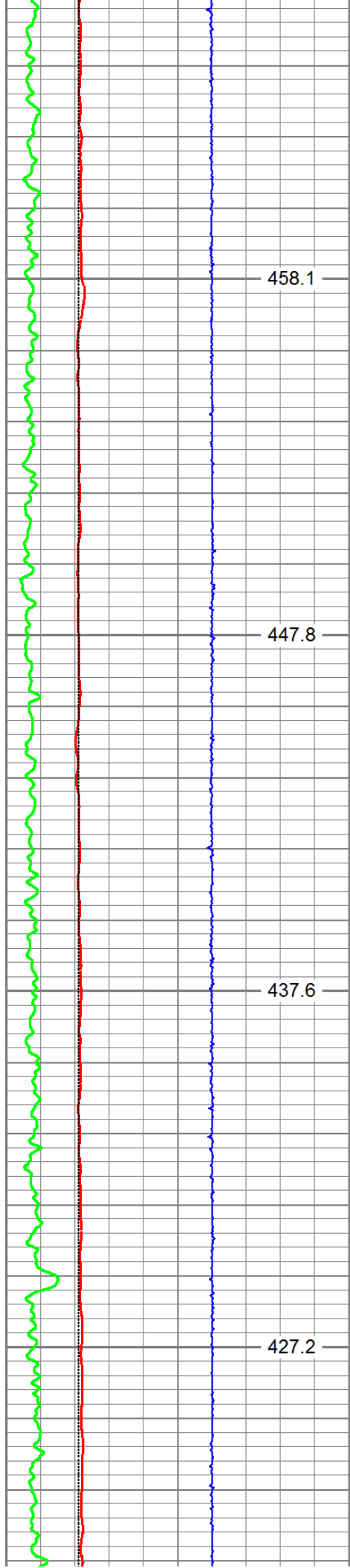
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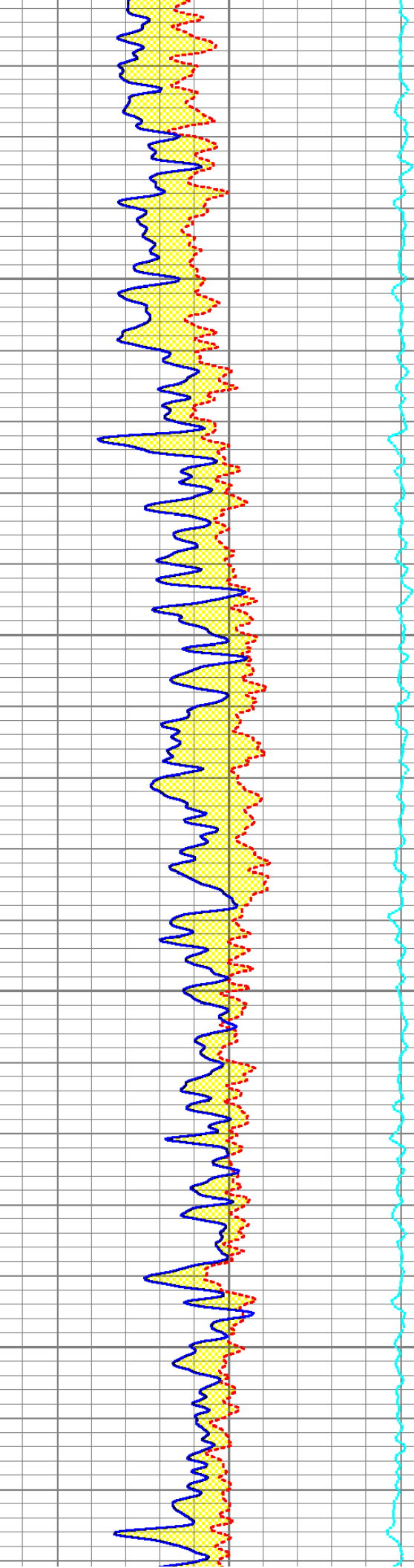
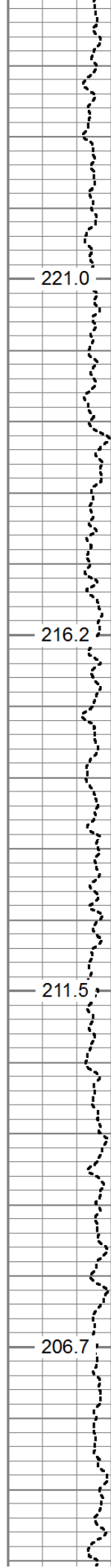


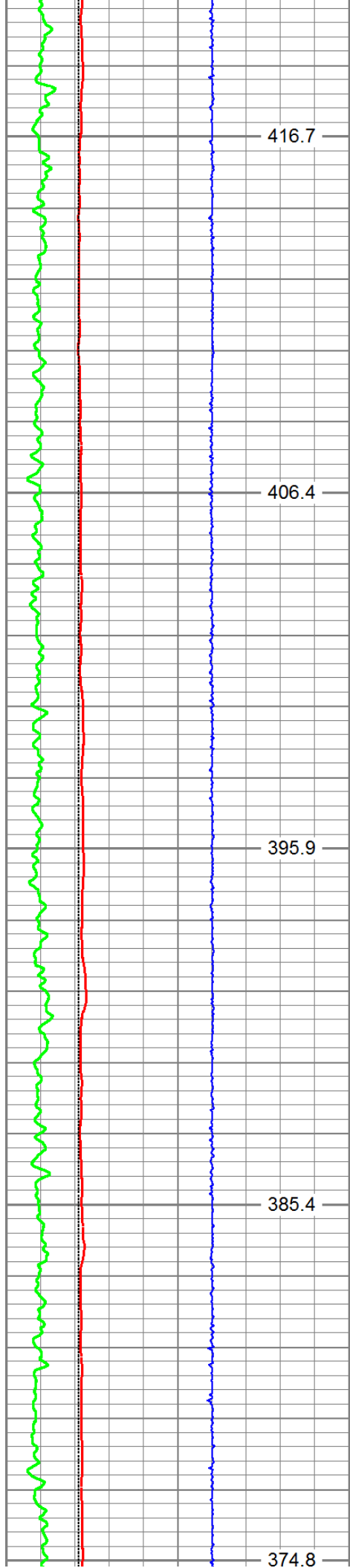
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6750

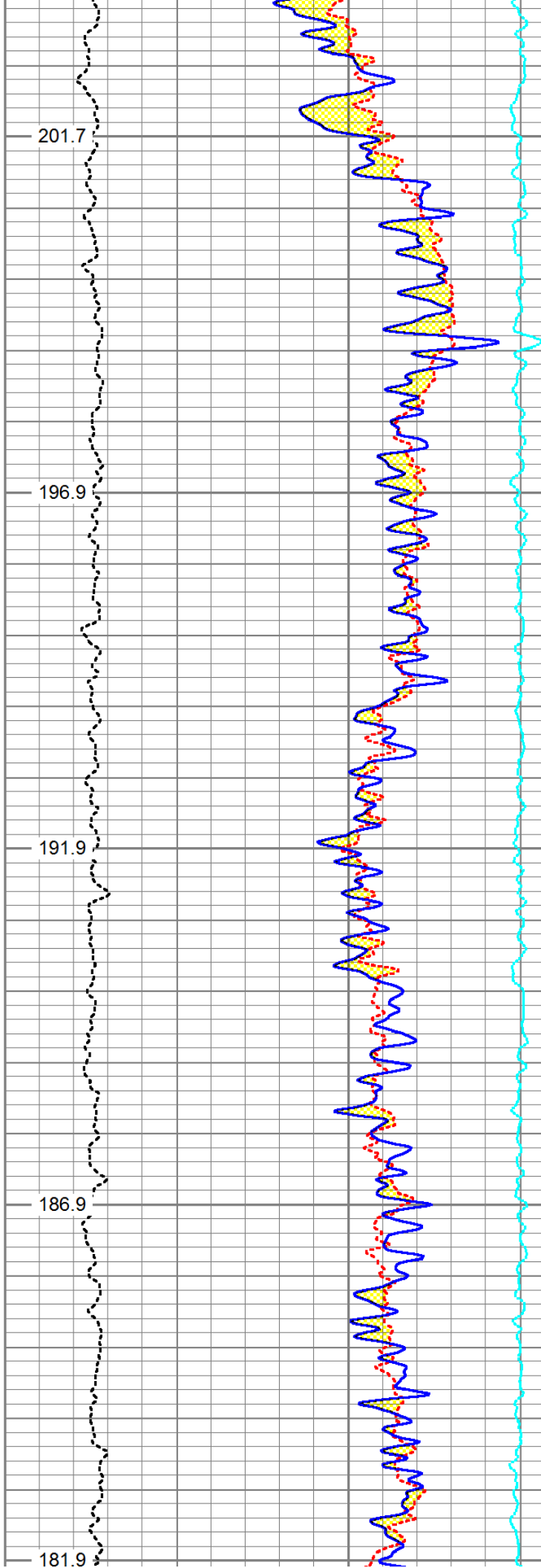
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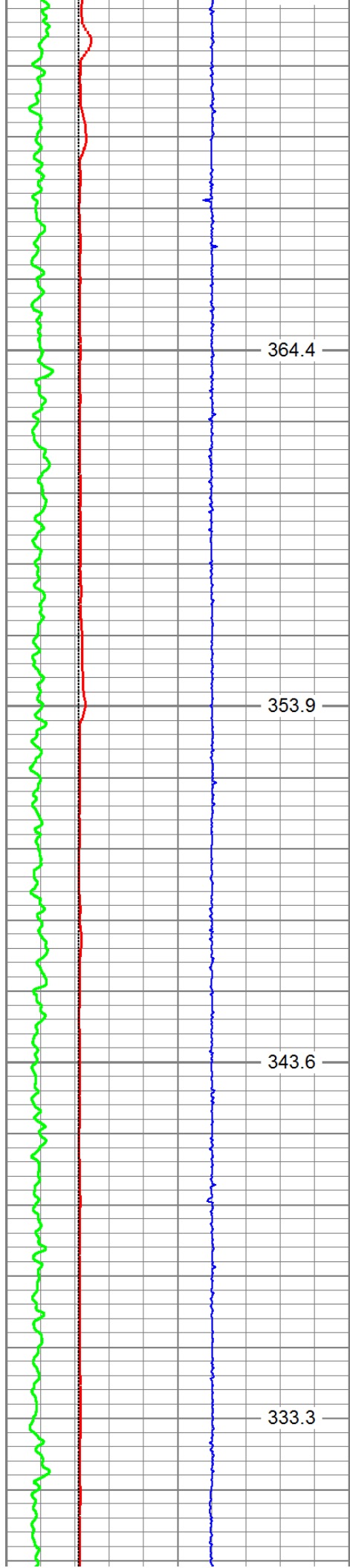
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6900  
6950  
7000  
7050  
7100



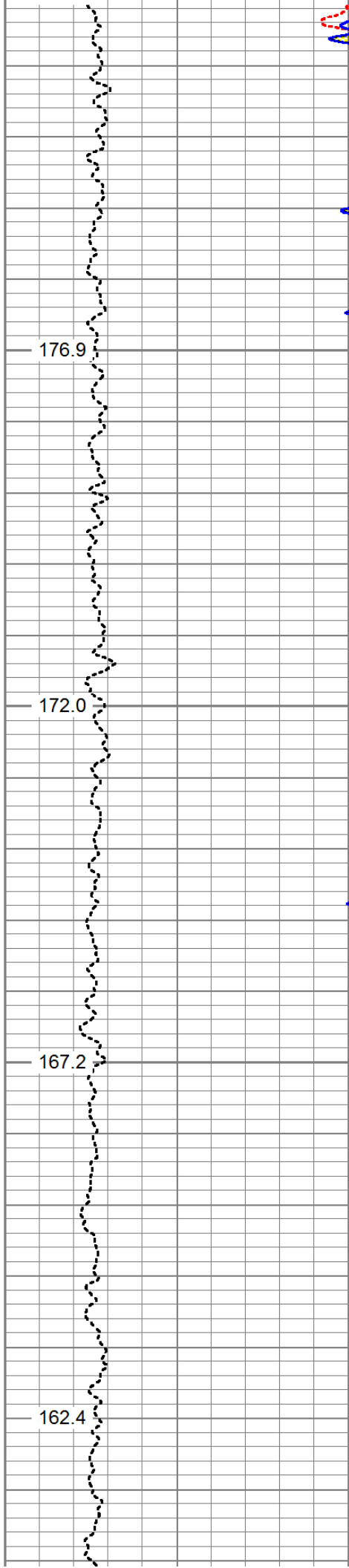


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7200

7250

7300

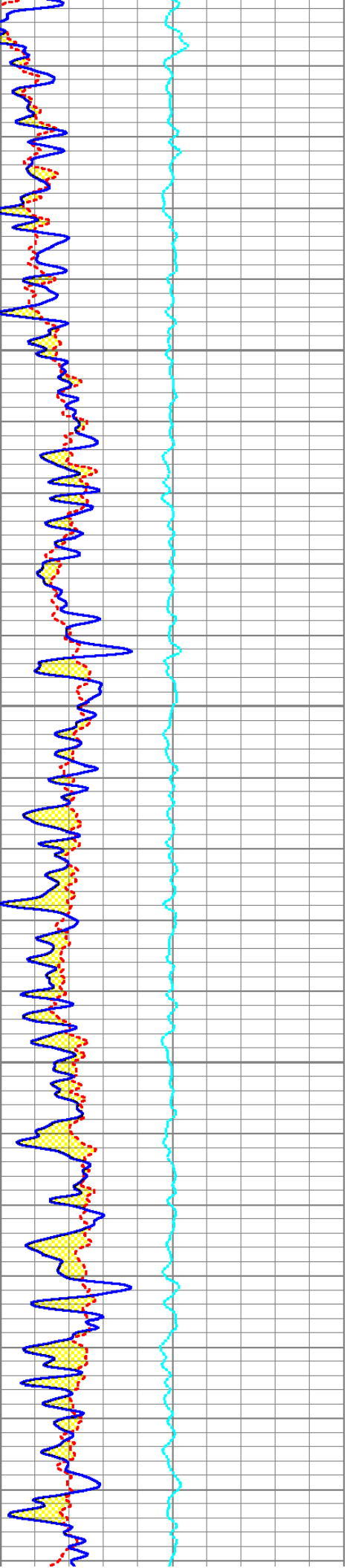


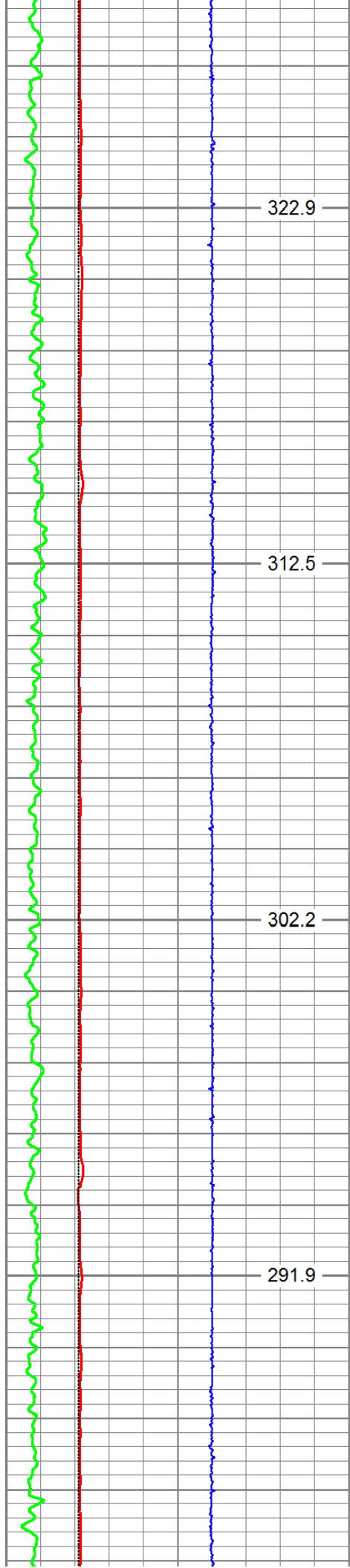
176.9

172.0

167.2

162.4





7350

7400

7450

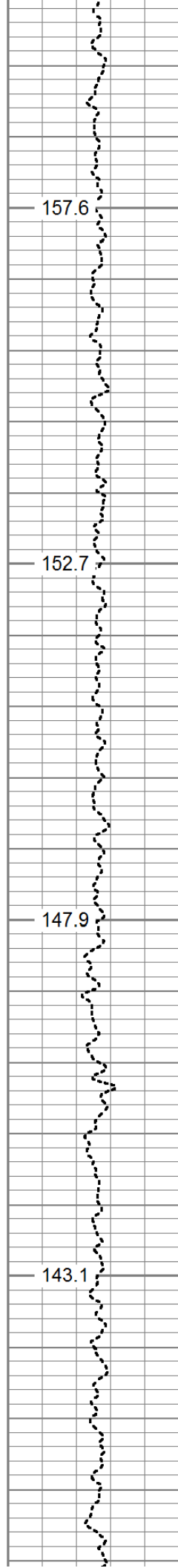
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322.9

312.5

302.2

291.9

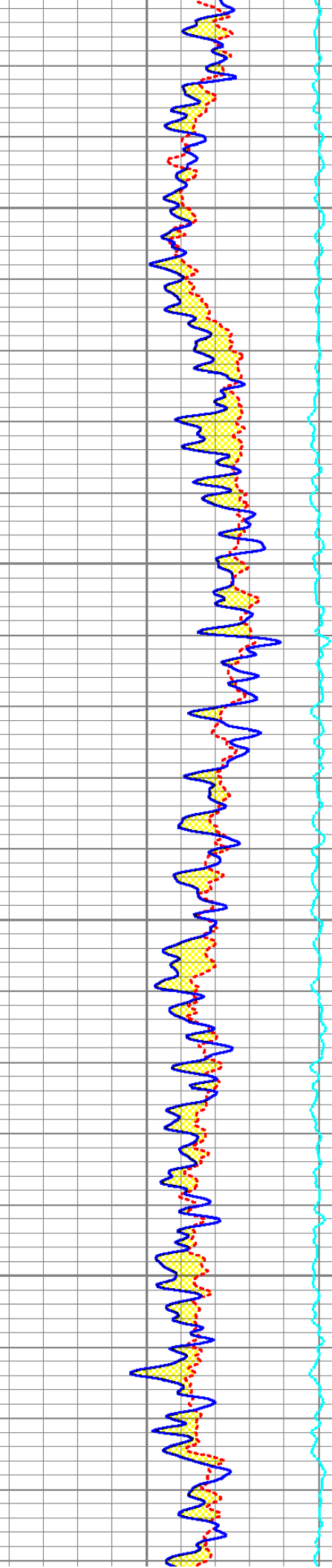


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152.7

147.9

143.1

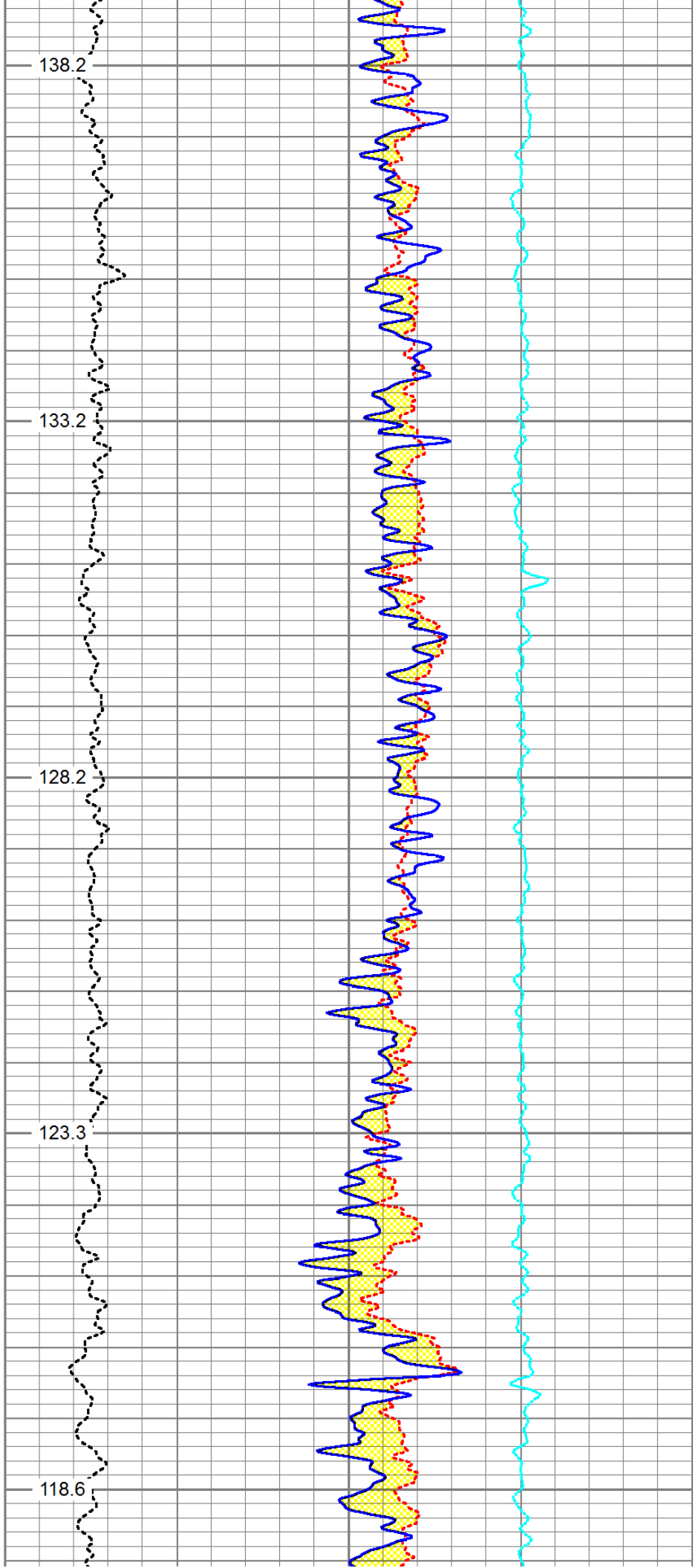
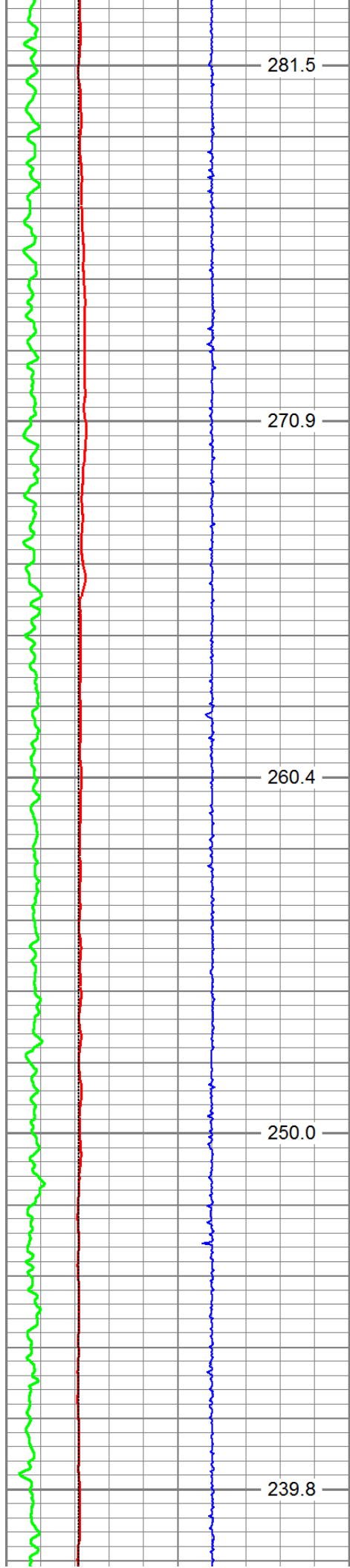


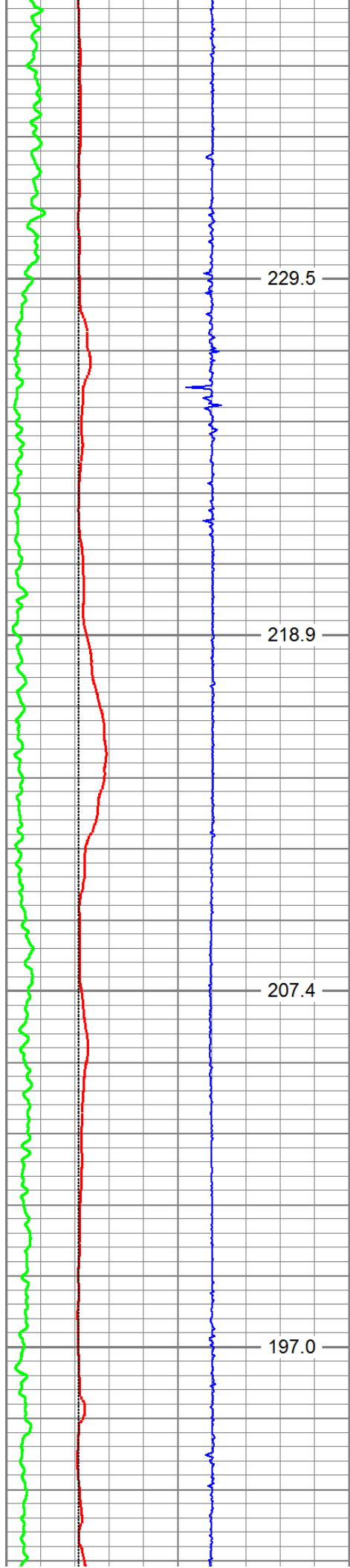
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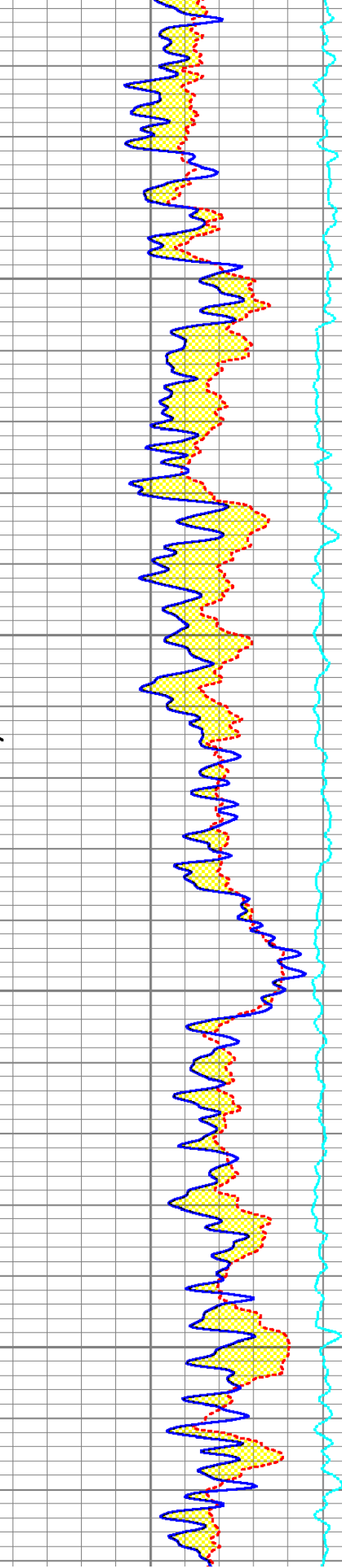
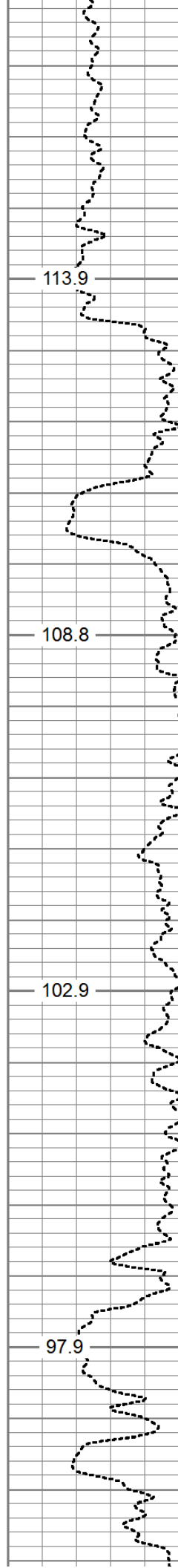
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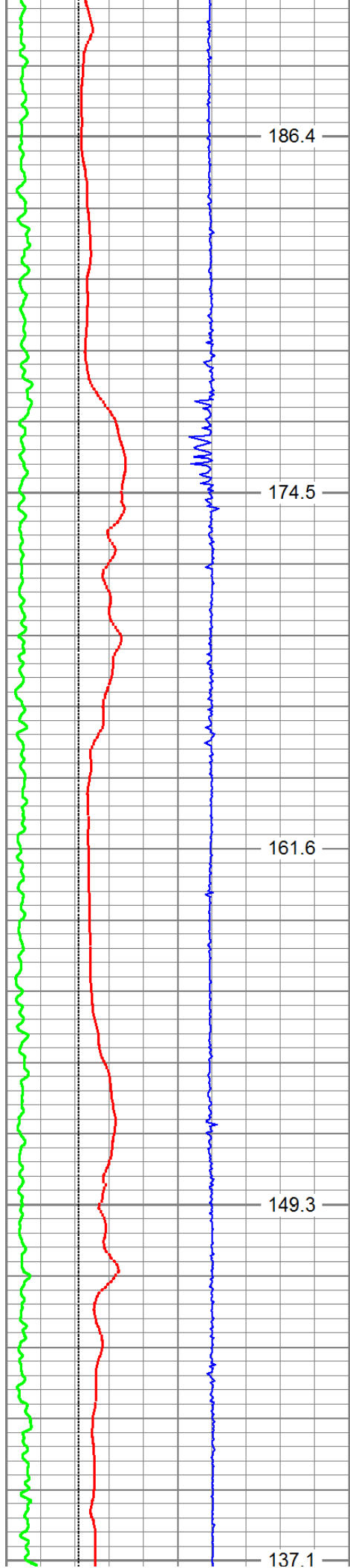
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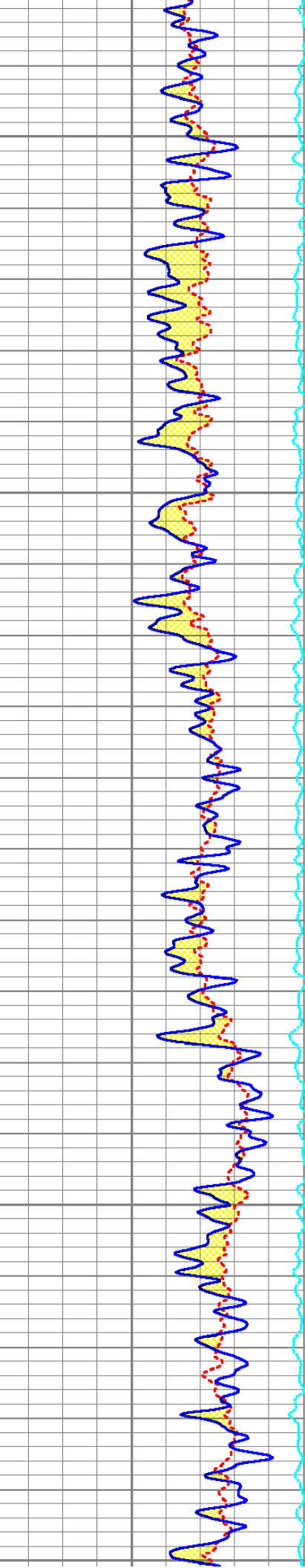
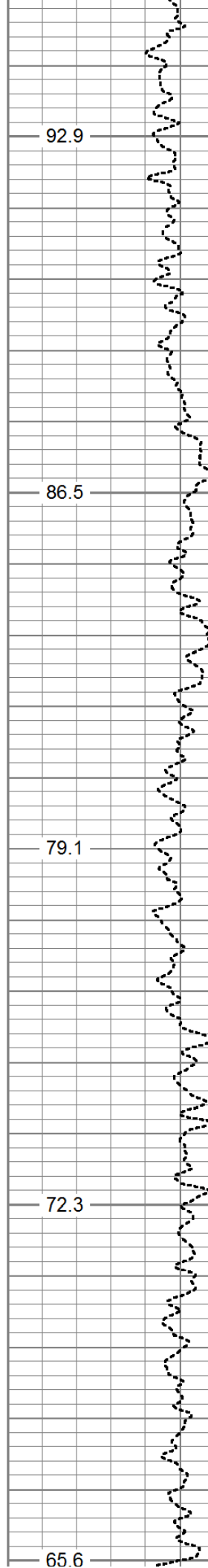


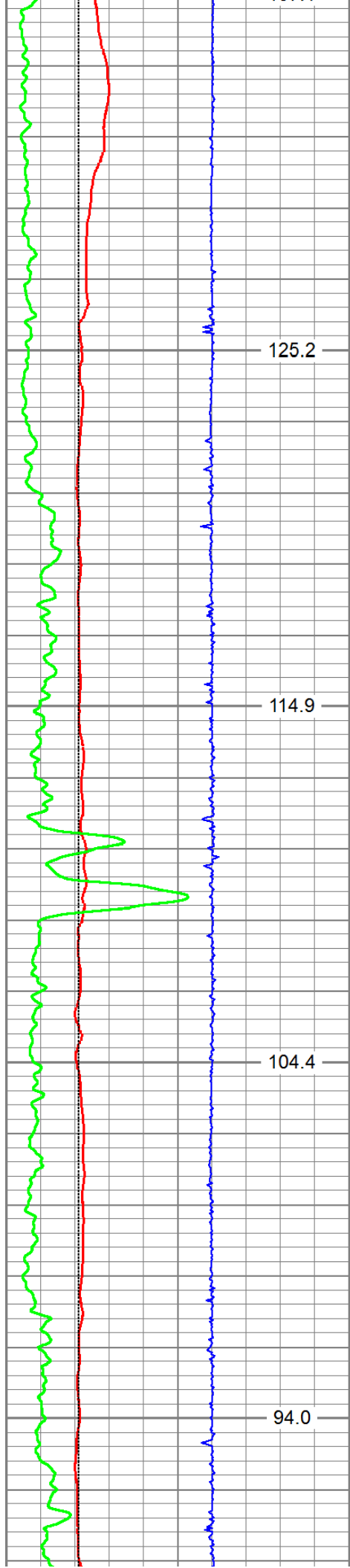
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7850  
7900  
7950



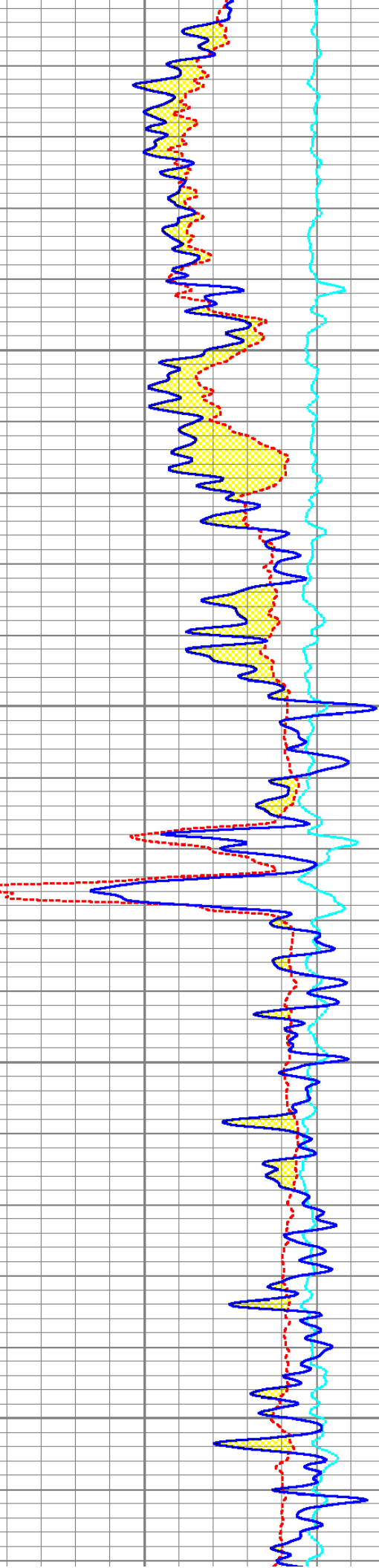
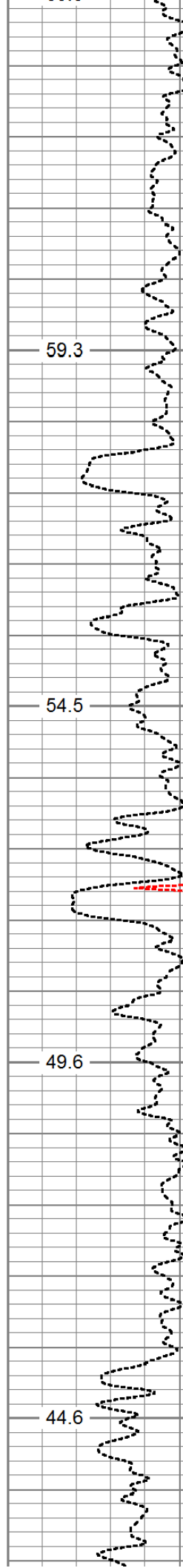


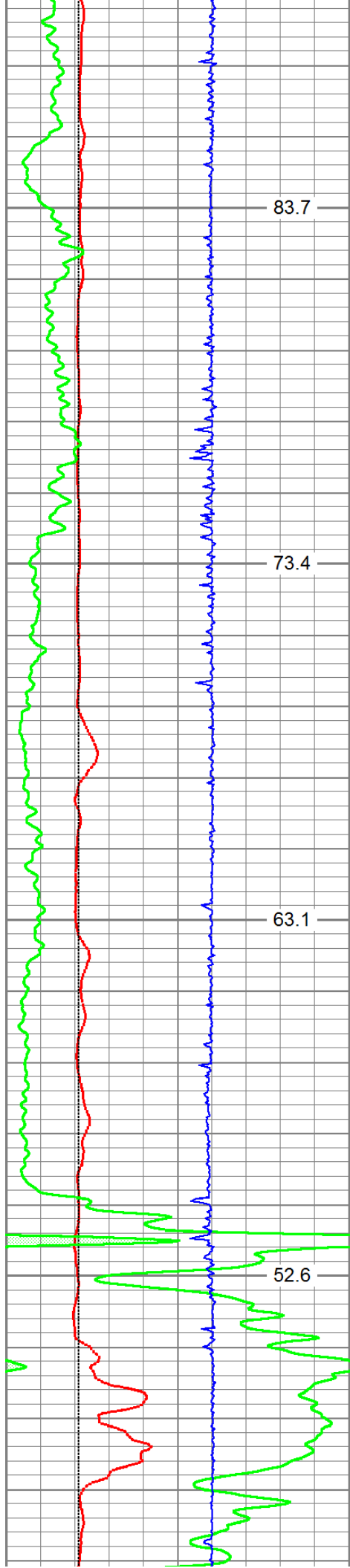
8000  
8050  
8100  
8150  
8200





8250  
8300  
8350  
8400





8450

8500

8550

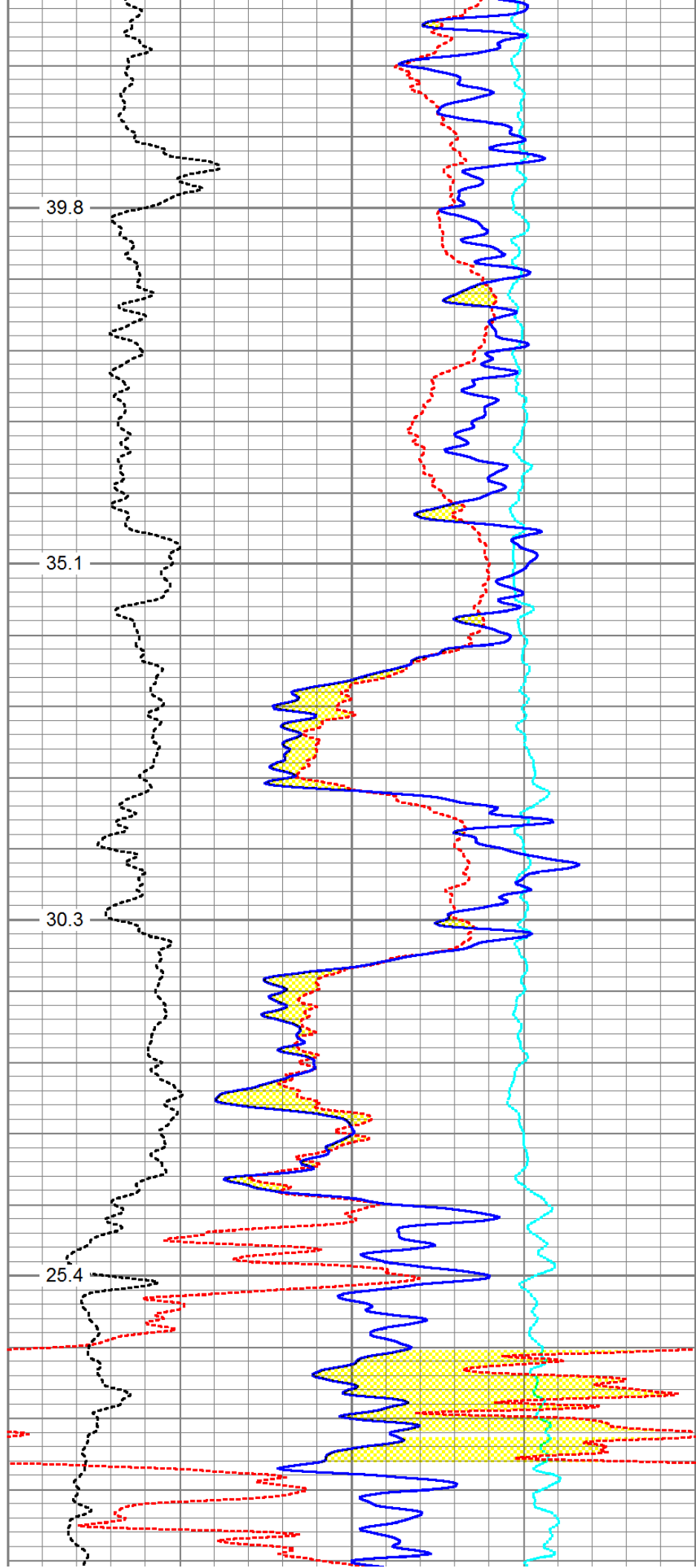
8600

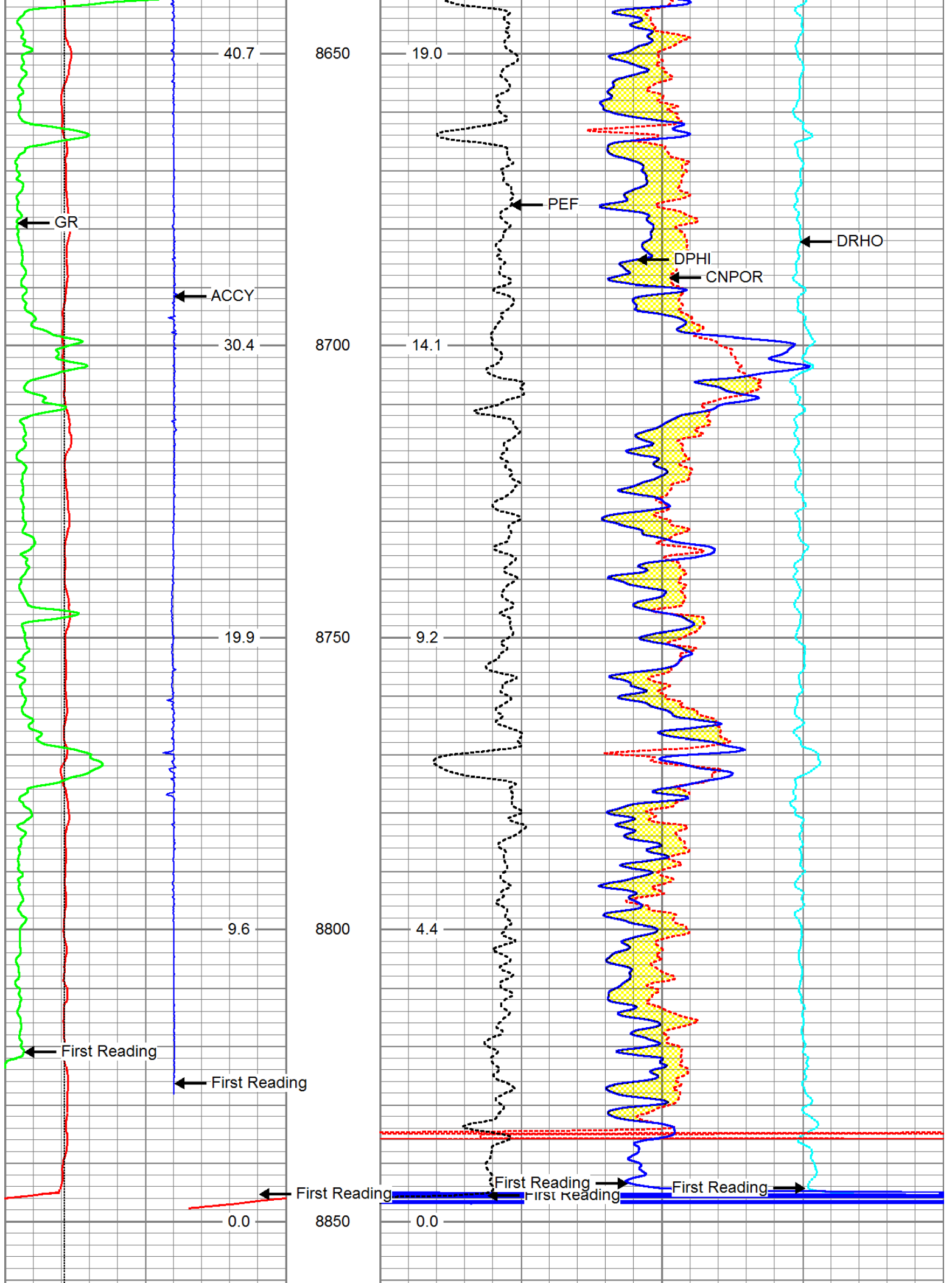
39.8

35.1

30.3

25.4





4	DCAL (in)	14	30	CNPOR (pu)		-10
4	BOREID (in)	14	30	DPHI (pu)		-10
0	GR (GAPI)	150	0	PEF (barn)	10	-0.5
-5	ACCY	5	DRHO (g/cc)		0.5	
	TBHV (ft3)		ABHV (ft3)			
			Total Depth			

# Log Variables

Database: c:\users\kris.wetzel\desktop\garlow 3406 2-16h\sandridge\_garlow3406\_2\_16h\_mem.db  
 Dataset: field/well/proc1/pass1.2

## Top - Bottom

A	BHCOR	BHFL_TYPE	BHFLRES Ohm-m	BHFLRESSRC	BHIDSRC	BOREID in
1	On	WBM	1	MUDCELL	CURVE	6.125
BOTTEMP degF	CASED?	CASEOD in	CASETHCK in	CEMWATERSA kppm	CMNTTHCK in	DNBHC?
140	No	4.5	0	0	0	NO
DPORSEL	FLUIDDEN g/cc	FRMSALIN kppm	LATNOR	M	MATRXDEN g/cc	MUDSALIN kppm
RHOB	1	0	Off	2	2.71	0.8
MudWgt lb/gal	NPORSEL	PEBHC?	PERFS	RESTMP SRC	SO in	SRFTEMP degF
8.3	Limestone	YES	0	INTERNAL	0.5	65
SZCOR	TDEPTH ft	TMPCOR	TOOLPOS			
On	8903	On	Ec-centered			

## Calibration Report

Database File: c:\users\kris.wetzel\desktop\garlow 3406 2-16h\sandridge\_garlow3406\_2\_16h\_mem.db  
 Dataset Pathname: proc1/pass1.2  
 Dataset Creation: Wed Feb 27 03:44:15 2013

## ThruBit Induction Calibration Report

Tool Model-Serial Number: PS-PS33R  
 Shop Calibration Performed: Tue Jan 08 10:46:39 2013

### BASELINE

	R	Expected	X	Expected
Freq 1				
A1	-463.3680	[-500.00, -400.00]	311.2600	[-500.00, 500.00]
A2	-141.3160	[-180.00, -100.00]	316.8420	[-500.00, 500.00]
A3	-21.9229	[-50.00, -10.00]	43.8285	[-500.00, 500.00]
A4	-15.1666	[-30.00, -10.00]	222.9180	[-500.00, 500.00]
A5	-13.2859	[-30.00, -10.00]	105.1840	[-500.00, 500.00]
Freq 2				
A1	-240.3950	[-280.00, -180.00]	176.7200	[-500.00, 500.00]
A2	-90.2075	[-130.00, -50.00]	180.9770	[-500.00, 500.00]
A3	-16.5750	[-50.00, -10.00]	-20.9807	[-500.00, 500.00]
A4	-18.4833	[-30.00, -10.00]	58.7005	[-500.00, 500.00]
A5	-18.5868	[-30.00, -10.00]	-29.5220	[-500.00, 500.00]
Freq 3				

A1	-150.2440	[-180.00, -80.00]	64.6455	[-500.00, 500.00]
A2	-68.1857	[-130.00, -30.00]	93.5402	[-500.00, 500.00]
A3	-14.0019	[-50.00, -10.00]	-70.7568	[-500.00, 500.00]
A4	-20.3404	[-30.00, -10.00]	-52.2991	[-500.00, 500.00]
A5	-21.4224	[-30.00, -10.00]	-130.4870	[-500.00, 500.00]
Freq 4				
A1	-79.3905	[-120.00, -40.00]	-109.0000	[-500.00, 500.00]
A2	-48.2501	[-110.00, -10.00]	-22.4521	[-500.00, 500.00]
A3	-11.3843	[-50.00, -10.00]	-150.7110	[-500.00, 500.00]
A4	-23.3471	[-30.00, -10.00]	-218.6140	[-500.00, 500.00]
A5	-27.3968	[-30.00, -10.00]	-303.1140	[-500.00, 500.00]

#### CALIBRATION COEFFICIENTS

	R	Expected	X	Expected
Freq 1				
A1	0.9942	[0.95, 1.05]	0.0022	[-0.05, 0.05]
A2	0.9952	[0.95, 1.05]	0.0020	[-0.05, 0.05]
A3	1.0076	[0.95, 1.05]	-0.0053	[-0.05, 0.05]
A4	0.9969	[0.95, 1.05]	0.0043	[-0.05, 0.05]
A5	1.0018	[0.95, 1.05]	0.0014	[-0.05, 0.05]
Freq 2				
A1	0.9890	[0.95, 1.05]	-0.0065	[-0.05, 0.05]
A2	0.9894	[0.95, 1.05]	-0.0064	[-0.05, 0.05]
A3	0.9962	[0.95, 1.05]	-0.0066	[-0.05, 0.05]
A4	0.9930	[0.95, 1.05]	-0.0041	[-0.05, 0.05]
A5	0.9988	[0.95, 1.05]	-0.0087	[-0.05, 0.05]
Freq 3				
A1	0.9974	[0.95, 1.05]	-0.0011	[-0.05, 0.05]
A2	0.9984	[0.95, 1.05]	-0.0009	[-0.05, 0.05]
A3	1.0049	[0.95, 1.05]	-0.0013	[-0.05, 0.05]
A4	1.0010	[0.95, 1.05]	0.0018	[-0.05, 0.05]
A5	1.0073	[0.95, 1.05]	-0.0038	[-0.05, 0.05]
Freq 4				
A1	0.9848	[0.95, 1.05]	-0.0103	[-0.05, 0.05]
A2	0.9852	[0.95, 1.05]	-0.0102	[-0.05, 0.05]
A3	0.9936	[0.95, 1.05]	-0.0127	[-0.05, 0.05]
A4	0.9895	[0.95, 1.05]	-0.0078	[-0.05, 0.05]
A5	1.0000	[0.95, 1.05]	-0.0163	[-0.05, 0.05]
Temperature	17.8769 degC			

#### ThruBit Density Calibration Report

Tool Model-Serial Number: PS-PS05D  
Source Number:  
Shop Calibration Performed: Fri Feb 01 11:01:43 2013

#### REFERENCE

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

#### READINGS

Outputs	Counts	Units	Expected
CC1 Background	146.00	cts	500.00 - 170.00

SS1 Background	146.60	cps	[130.00, 170.00]
LS1 Background	145.22	cps	[130.00, 170.00]
LS4 Background	30.02	cps	[27.00, 35.00]
SS1 Aluminium	5214.27	cps	[4500.00, 5500.00]
LS1 Aluminium	935.89	cps	[750.00, 950.00]
LS4 Aluminium	1010.88	cps	[843.00, 1068.00]
SS1 Magnesium	8742.35	cps	[7000.00, 9000.00]
LS1 Magnesium	6179.35	cps	[5250.00, 6250.00]
LS1 Al + Fe	798.48	cps	[650.00, 800.00]
LS4 Al + Fe	457.12	cps	[382.00, 471.00]

RESULTS

SS Slope	1.62		[1.52, 1.77]
LS Slope	0.42		[0.38, 0.45]
PEF K Factor	4.768		[3.510, 6.170]
PEF B Factor	-0.539		[-0.700, -0.410]

Caliper Shop Calibration performed: Fri Feb 01 11:01:43 2013

RESULTS

Reference	Reading	Units
12.00	1906.84	in
9.00	2059.23	in
6.00	2224.26	in

DENSITY PRE-SURVEY CHECK Performed: Fri Feb 22 11:04:00 2013

Outputs	Counts	Units	Expected
SS1 Background	147.15	cps	[142.20, 151.00]
LS1 Background	144.78	cps	[140.87, 149.58]
LS4 Background	29.59	cps	[28.22, 31.82]

CALIPER PRE-SURVEY CHECK Performed: Fri Feb 22 11:04:21 2013

Reference	Readings	Units	Expected
6.00	6.04	in	[5.80, 6.20]

Compensated Neutron Calibration Report

Tool Model-Serial Number: PS-PS14N  
 Source Number:  
 Calibration Tank Temperature: 61.1 degF  
 Shop Calibration Performed: Tue Feb 19 10:08:35 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	0.0	cps	<10

SS Counts	800.2	cps	
LS Counts	26.1	cps	
Tank Ratio Ref	30.9580	SS/LS	
Tank Ratio	30.6057	SS/LS	
Tank Ratio Gain	1.0115		[0.85, 1.15]

ALUMINUM SLEEVE REFERENCE

Outputs	Measured	Units	Expected
SS Counts	9004.3	cps	
LS Counts	848.2	cps	
AI Ratio Ref	10.797	SS/LS	
AI Ratio	10.738	SS/LS	
AI Ratio Gain	1.01		[0.90, 1.10]
Sleeve Porosity	14.46	pu	

PRE-SURVEY BACKGROUND CHECK Performed: Fri Feb 22 11:09:40 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-PS27T		
Performed:	Sat Jan 19 09:53:07 2013		
Calibrator Value:	0.0	GAPI	
Background Reading:	0.0	cps	
Calibrator Reading:	0.0	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	66.92		Cablehead-S	2.31	2.13	5.00
Thru-bit	64.61		Solid Weakpoint			

ThruBit	60.75		PSBDOT	3.87	2.25	35.00
			HangOff_Tool	5.00	2.38	60.00
ThruBit	55.75		10-1	0.88	2.13	3.95
ThruBit	54.87		Universal Joint	1.46	2.06	15.00
TBBAT	53.41		TBBAT-A (PS13B) ThruBit Battery	6.13	2.13	38.20
TBBAT2	47.29		TBBAT2-A (PS33B) ThruBit Battery	6.13	2.13	40.00
TMG	41.16		TMG-PS (PS27T) ThruBit Telemetry Gamma Ray	6.13	2.13	45.00
GR	41.04					
GRTEMP	40.20					
ThruBit	35.04		Decentralizer Decentralizer (Small)	4.50	2.13	70.00
CNLSC	28.60		TBN-PS (PS14N) ThruBit Neutron	4.77	2.13	63.00
LSW1	18.04		TBD-PS (PS05D) ThruBit Density	10.48	2.13	91.00
DCAL	17.13					
A1_P	10.60		TBI-PS (PS33R) ThruBit Induction	15.29	2.13	94.00
A2_P	10.10					
A3_P	9.35					
A4_P	8.35					
A5_P	6.60					

Dataset: sandridge\_garlow3406\_2\_16h\_mem.db: field/well/proc1/pass1.2  
 Total Length: 66.92 ft  
 Total Weight: 560.15 lb  
 O.D.: 2.38 in



Well	GARLOW 3406 2-16H
Field	EASTHAM
County	HARPER
State	KANSAS