



LWD MEMORY LOG

Gamma Ray

Company: Noble Energy

Well: Vogler State D21-760

Field: Wattenberg

County: Weld Country: United States

State: Colorado

Other Services:

Surface Location: Latitude: 040° 12' 22.464" N Longitude: 104° 33' 43.056" W

SEC: 21 TWN: 3N RGE: 64W

Elevation: 4794.00 ft Elev. KB: N/A Elev. DF: 4824.00 ft Elev. GL: 4794.00 ft

Magnetic Field Reference

Interval Drilled: Date From: 2019-03-08 Top: (ft) 1959.00 Date To: 2019-03-11 Bottom: (ft) 17761.00 Spud Date: 2019-03-08

Casing Record

Borehole Record: Hole Size (in) From (ft) To (ft) Size (in) Weight (lb/ft) From (ft) To (ft)

13.500 30.00 1959.00 9.625 36.00 30.00 1949.00

8.500 1959.00 17761.00

Deviation Record

Mud Record: Type From (ft) To (ft) Hole Size (in) Interval (ft) Inc | Az (Start) Inc | Az (End)

Oil Based Mud 1959.00 17761.00 8.500 15602.00 0.061 99.47 89.851 2.78

Software Version

RT 5.0 H&P 517 Contractor: Helmerich & Payne Drilling Co Unit: D&E

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Log Run Summary

Run No	Bit Run No.	Bit Size (in)	Bit Type	Bit Gauge Length (in)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Hours (h)
						Top (ft)	Bottom (ft)	From (ft)	To (ft)	Start Logging	End Logging	
1	1	8.500	PDC	3.00	Rotary Steerable	1959.00	17748.00	1959.00	17761.00	2019-03-08 17:30	2019-03-11 00:05	53.10

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Adam Schlenz	2019-03-07	2019-03-11						

Mud Properties Record

Date / Time	Run No.	Measured Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2019-03-08 13:00	1	1959.00	Oil Based Mud	9.0	11	N/A	17.8	74/17	Active Pit	21380	0.00
2019-03-09 02:00	1	4958.00	Oil Based Mud	9.0	13	N/A	13.6	71/20	Active Pit	23324	0.00
2019-03-10 04:00	1	11769.00	Oil Based Mud	9.5	14	N/A	15.0	72/16	Active Pit	22352	0.00
2019-03-10 15:00	1	15011.00	Oil Based Mud	9.5	16	N/A	16.0	72/16	Active Pit	21380	0.00

Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset (ft)	Bit Offset (ft)	Max O.D. (in)	Min I.D. (in)
1	AutoTrak Curve Steering Unit	11994997	Near Bit Inclination	5.93	6.73	7.000	4.330
1	AutoTrak Curve Steering Unit	11994997	Near Bit VSS	5.93	6.73	7.000	4.330
1	AutoTrak Curve MWD	14305965	Gamma (single)	2.77	12.90	7.000	3.250
1	AutoTrak Curve MWD	14305965	Directional (mag)	12.27	22.40	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
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ATC SU	AutoTrak Curve SU	Auto Trak Curve Steering Unit
ATC MWD	AutoTrak Curve MWD	Auto Trak Curve MWD
ATC LCPM	AutoTrak Curve LCPM	Auto Trak Curve LCPM

Comments

- 1
- Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
- 2
- Baker Hughes LWD run 1 utilized a 6.75 inch NaviGamma service (Directional and Gamma Ray) behind a 8.5 inch bit and rotary steerable assembly from 1959 to 17761 feet MD (1959 to 6902 feet TVD).
- 3
- The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.

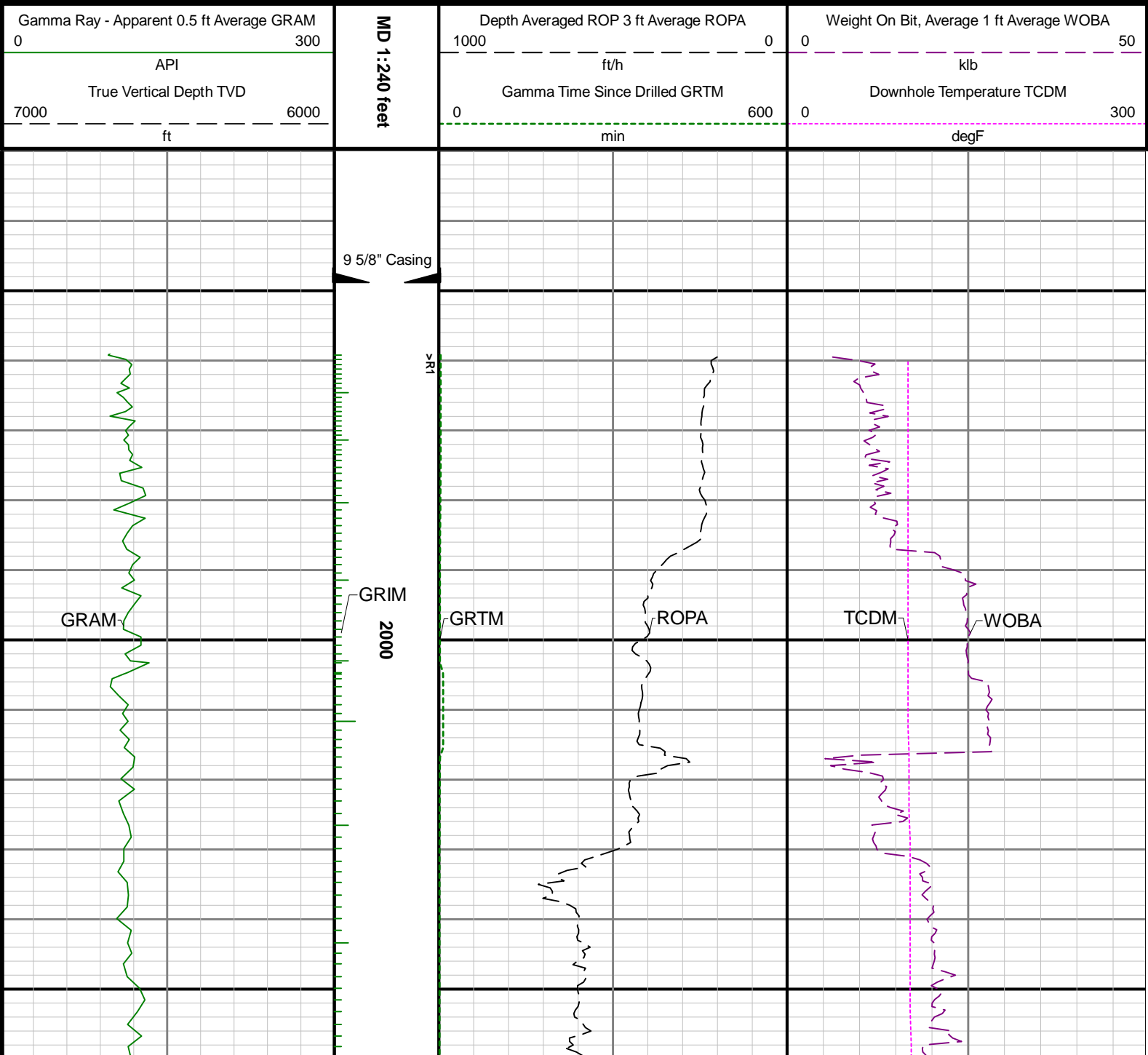
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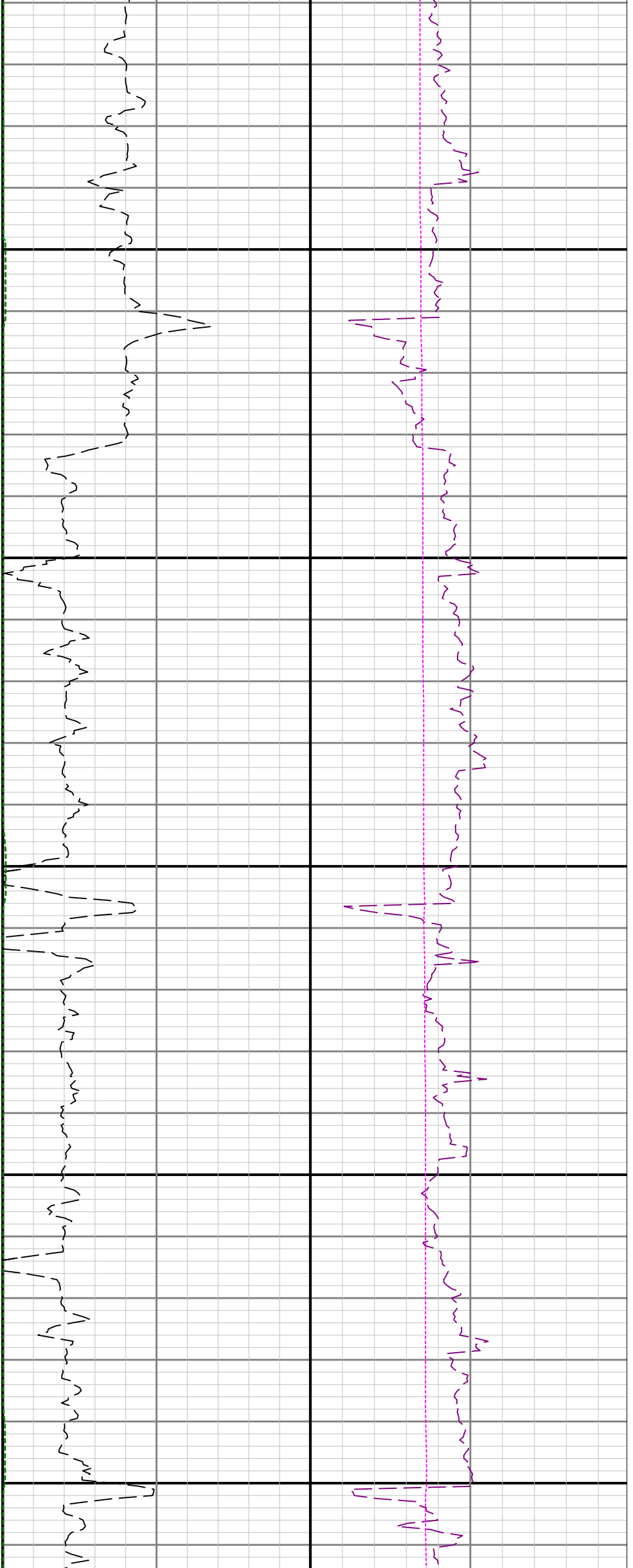
Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	17761.00	8.500	1	The interval from 17748 to 17761 feet MD (6902 feet TVD) was not logged after being drilled due to sensor to bit offset at well TD.

Curve Mnemonics

Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	Gamma Ray - Time Since Drilled - Memory	min
TCDM	Directional Real-Time Survey Temperature	degF

<div><div><div>BAKER HUGHES</div><div>a GE company</div></div><div><div>GE</div></div></div>	Company	Noble Energy				
	Well	Vogler State D21-760				
	Interval	Date From:	2019-03-08 14:31	Top:	1959.00 ft	
		Date To:	2019-03-11 08:56	Bottom:	17761.00 ft	
	Created	2019-03-11 13:42:41				

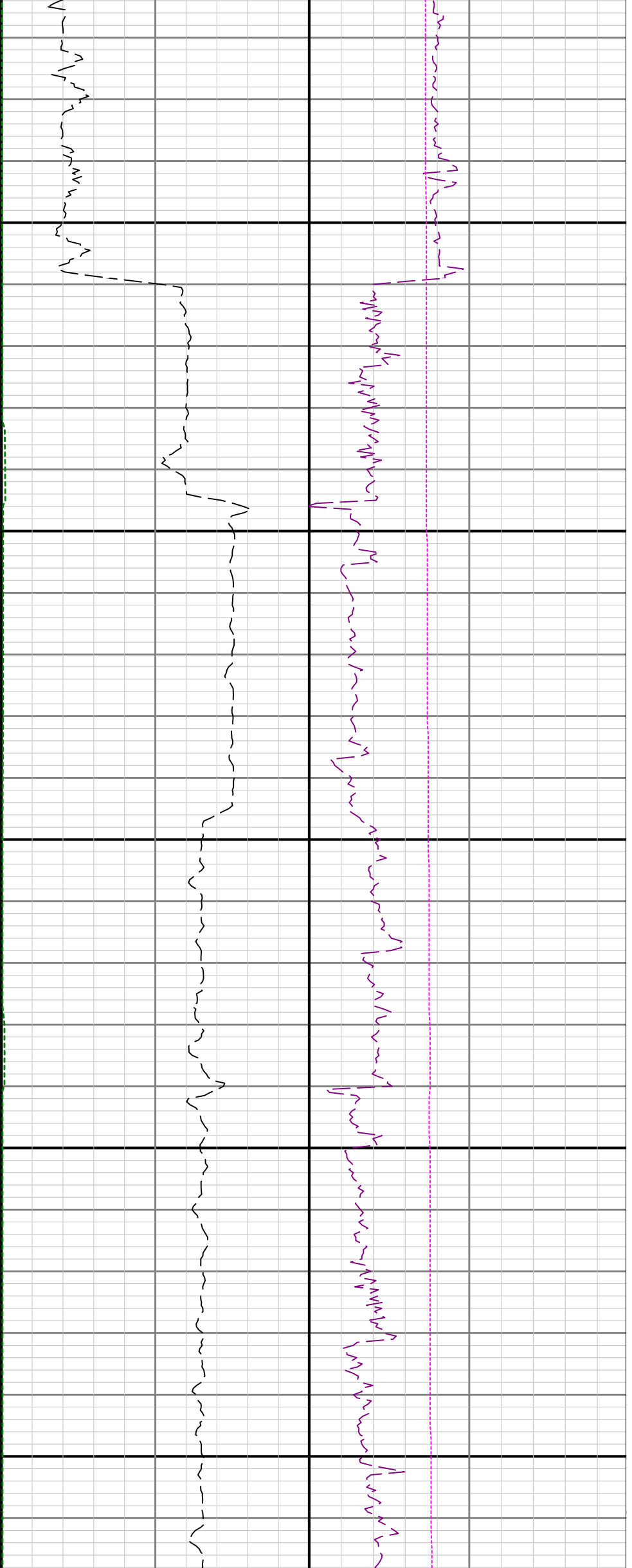




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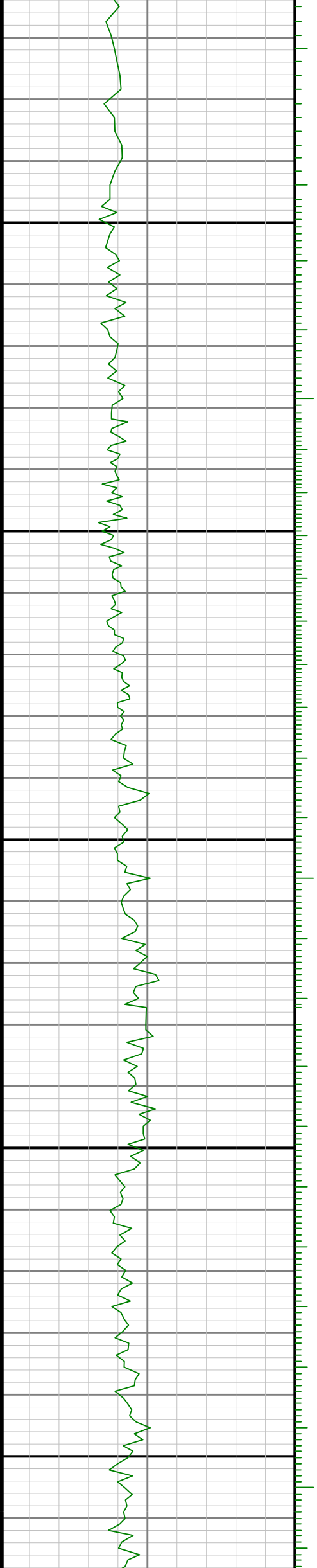
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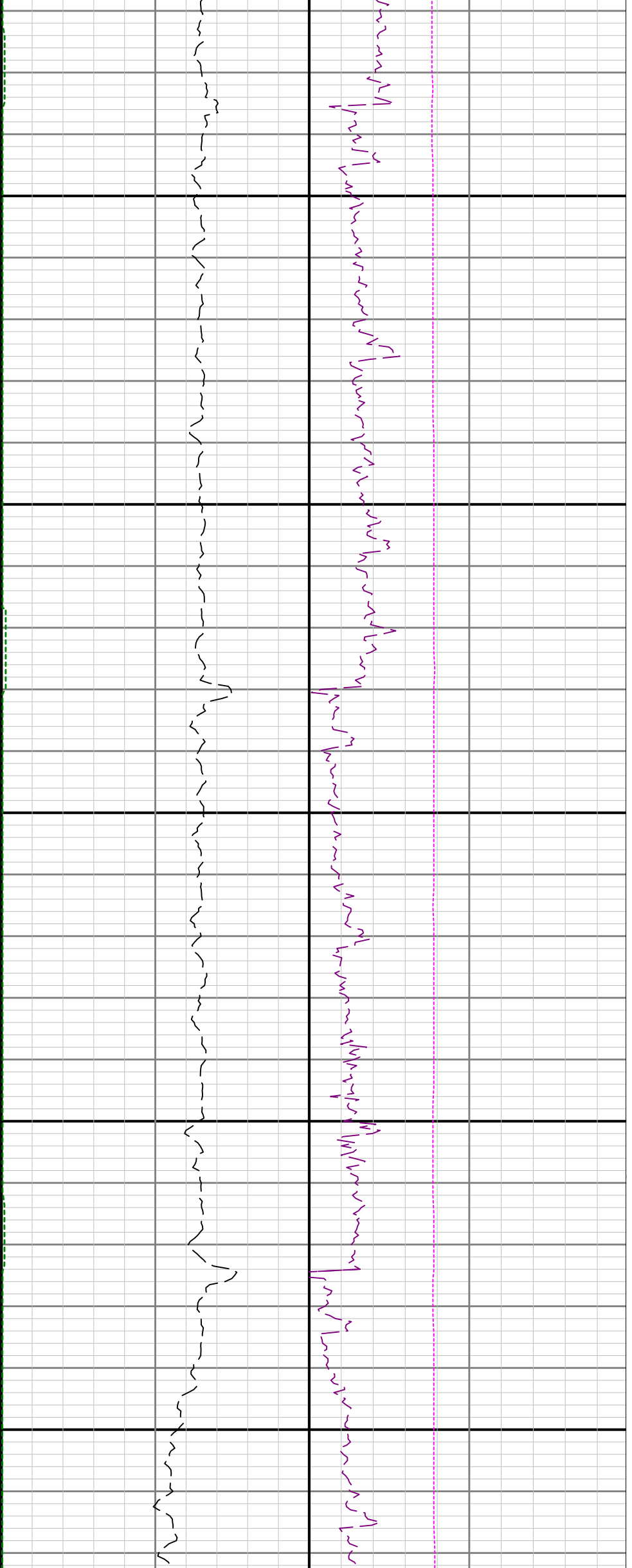
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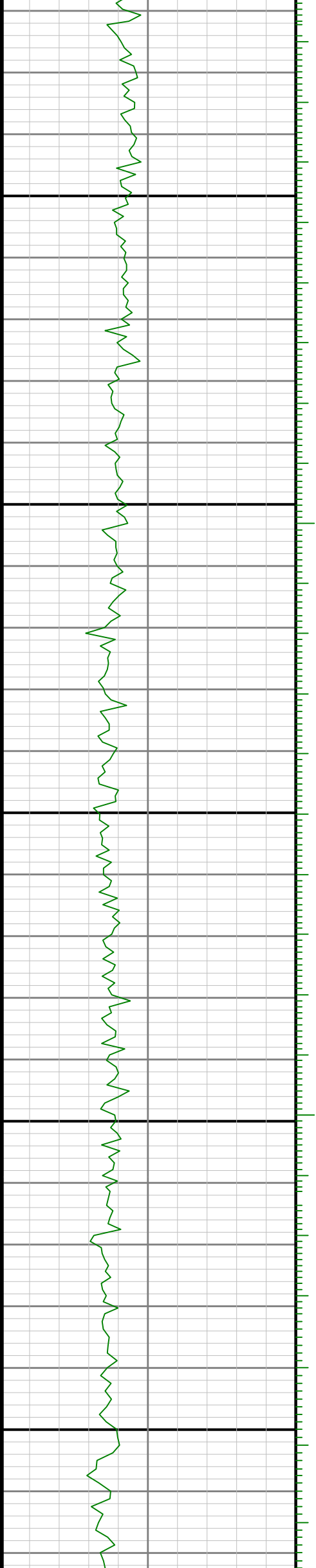


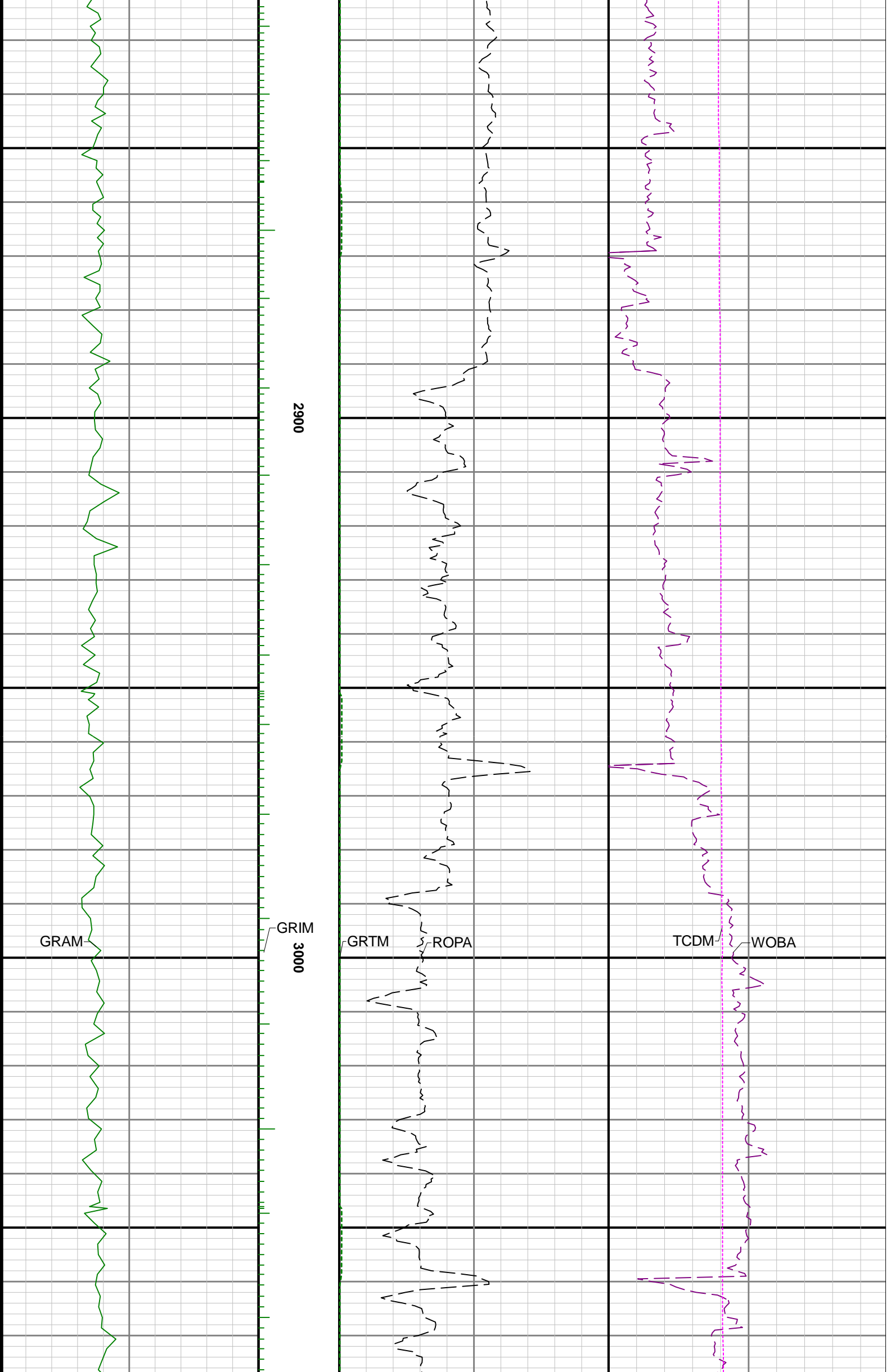


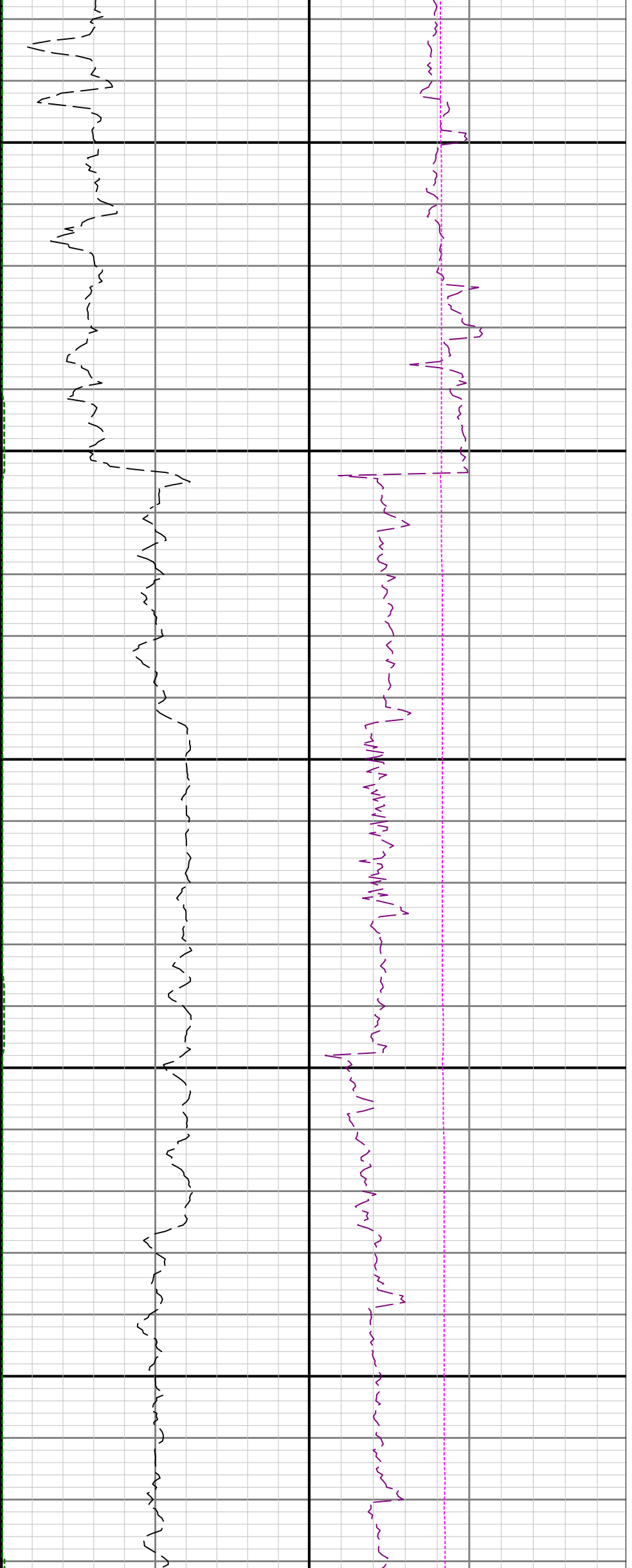
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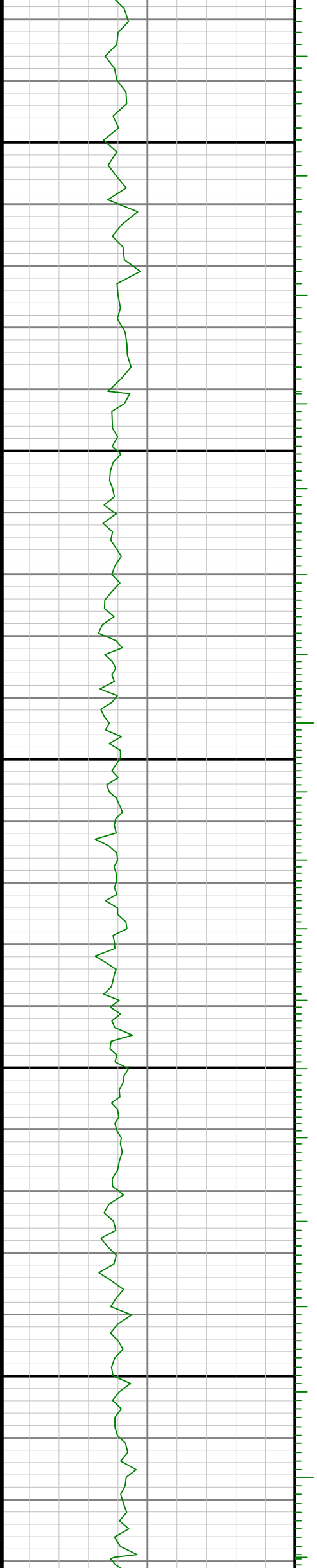


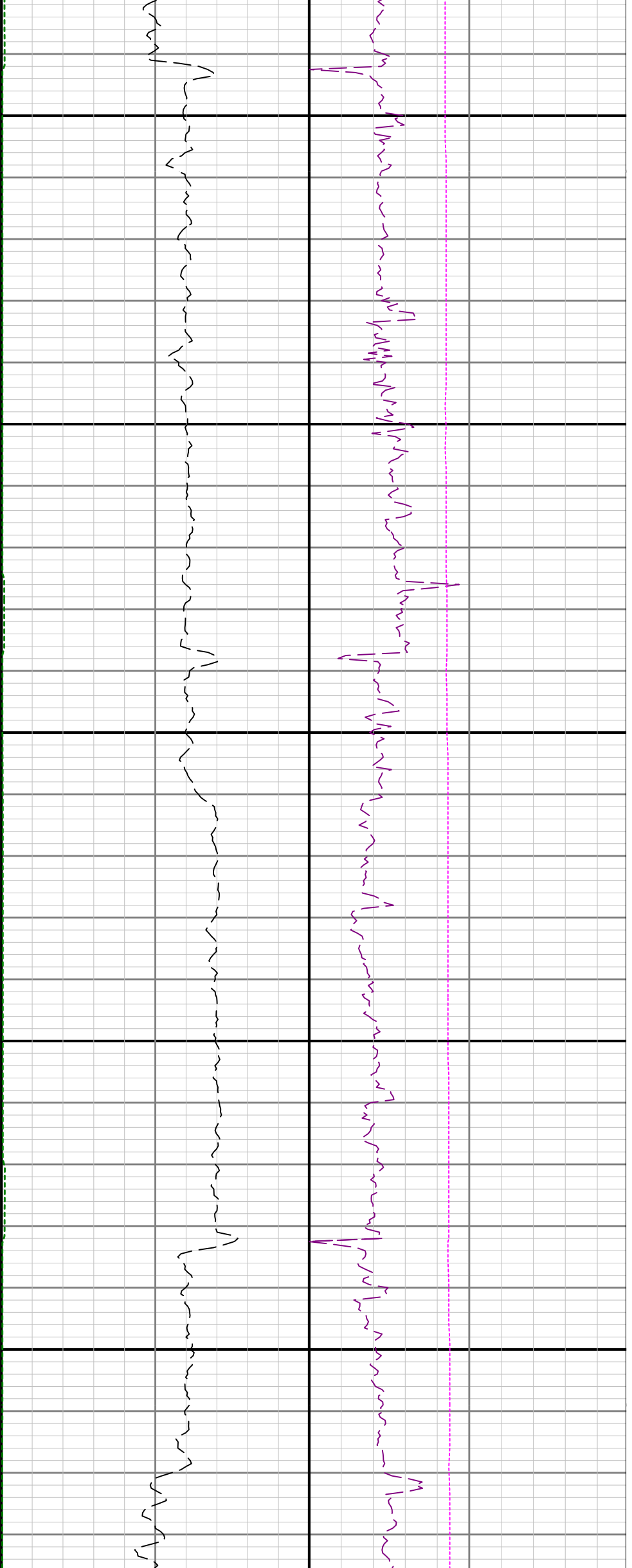


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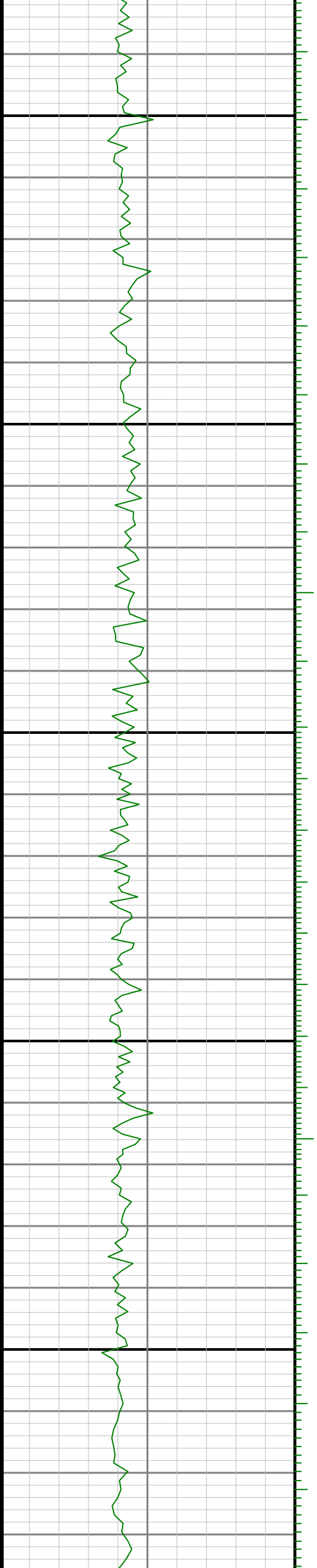
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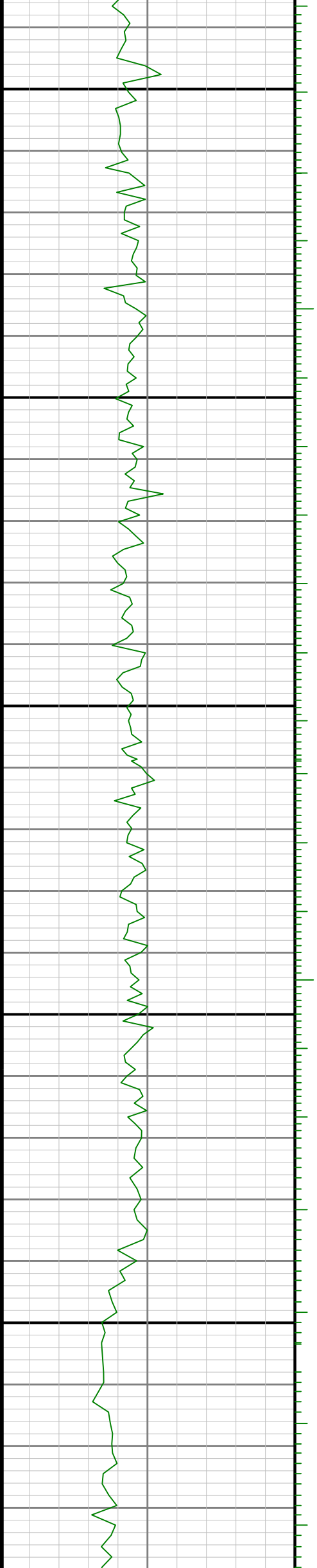
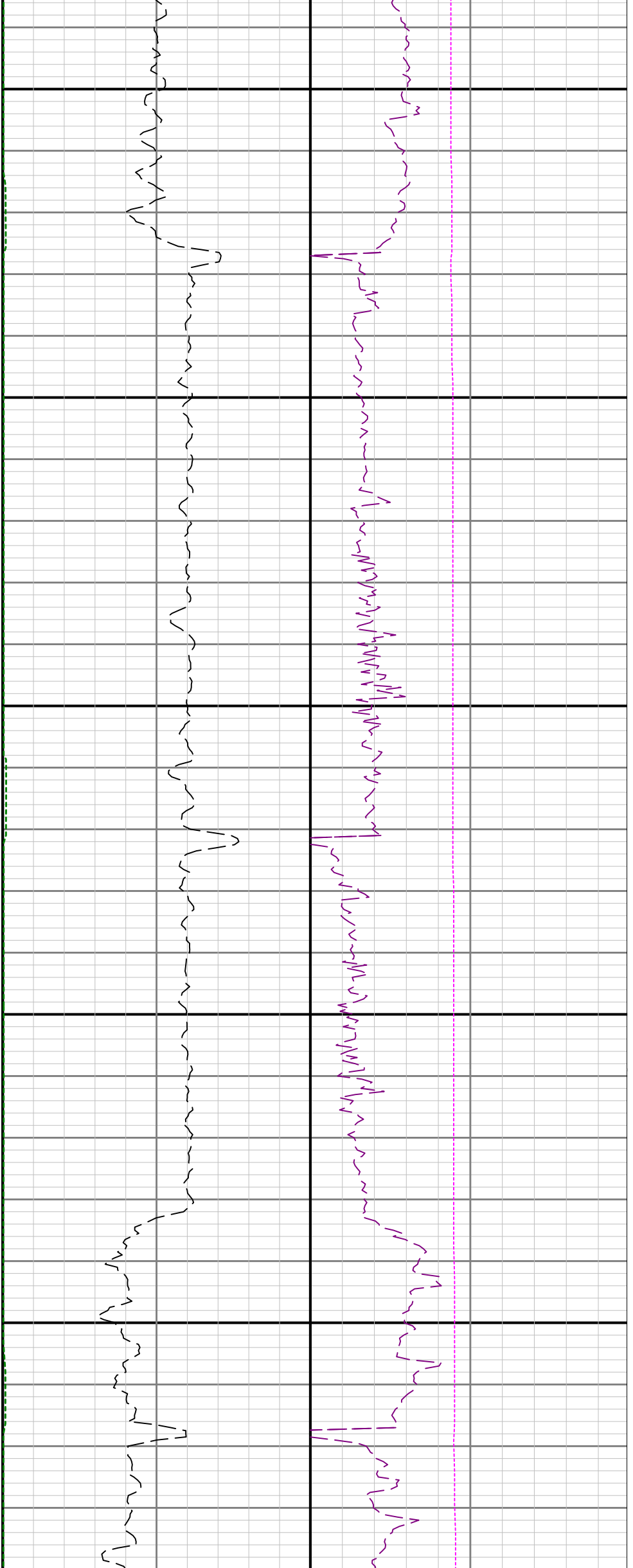


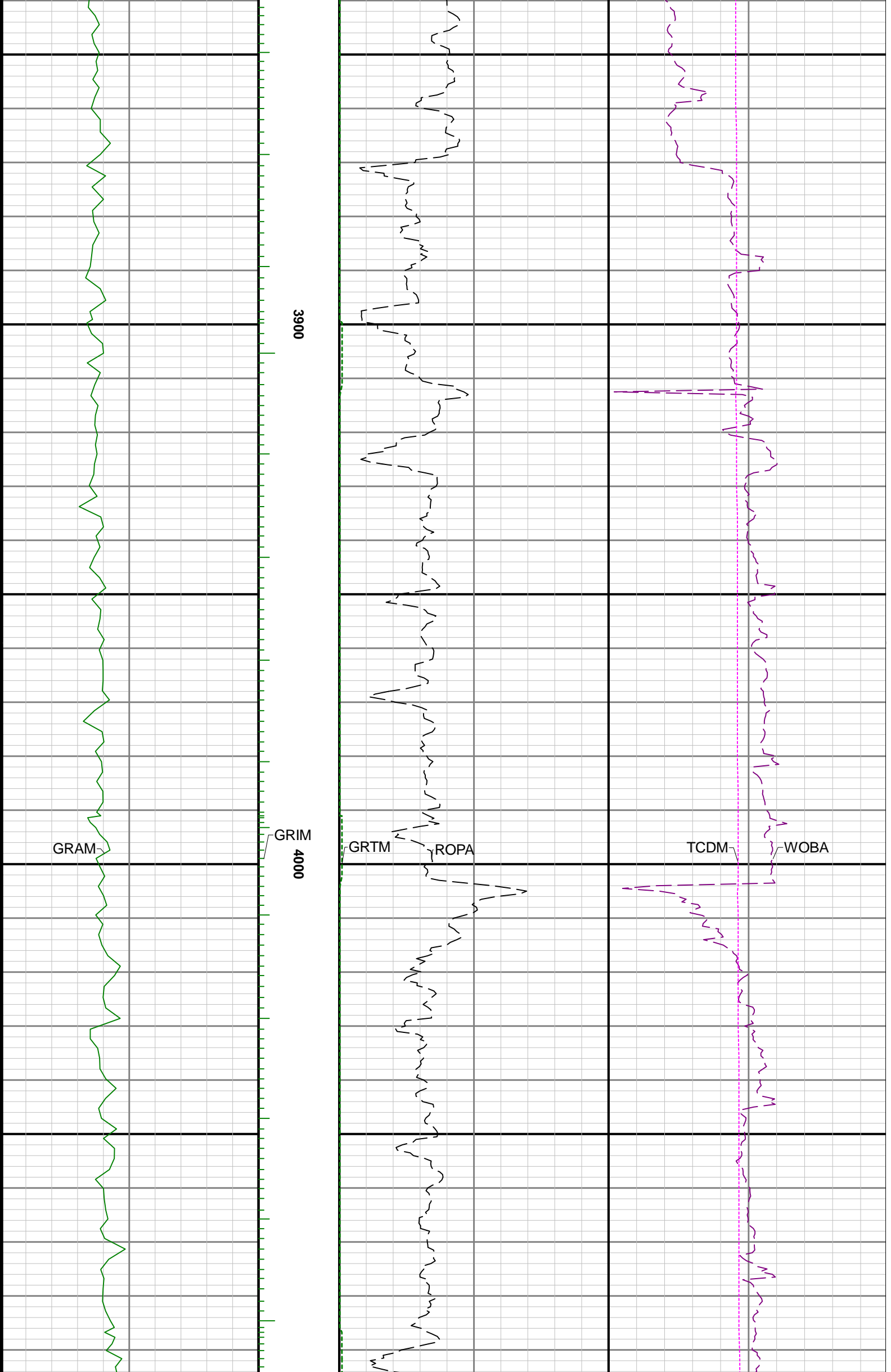


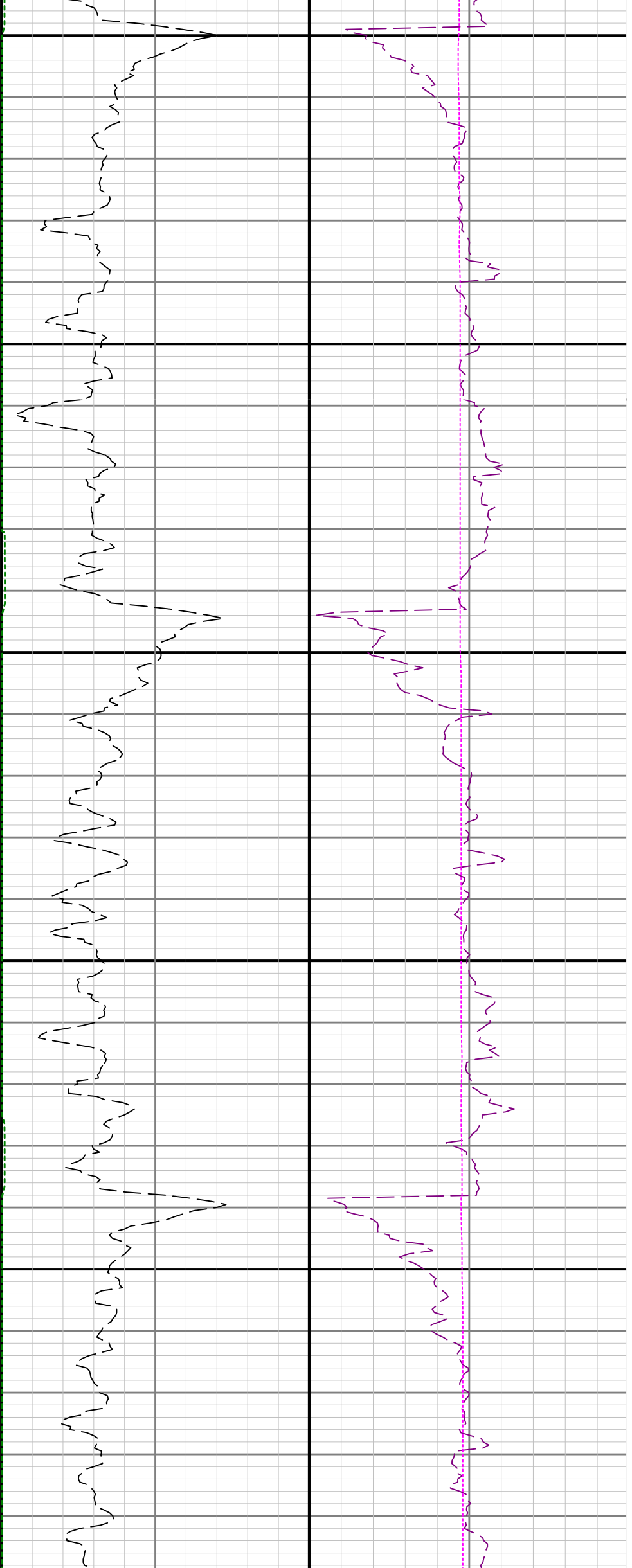
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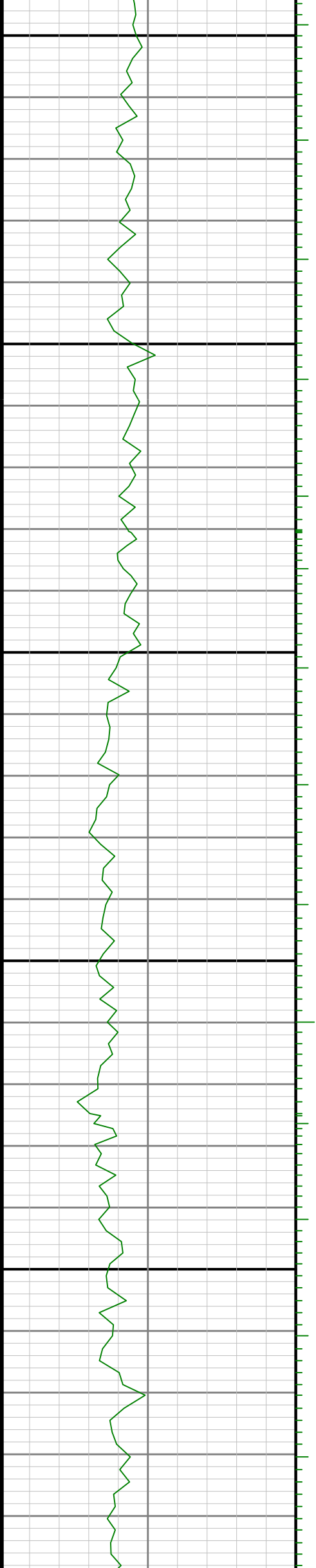


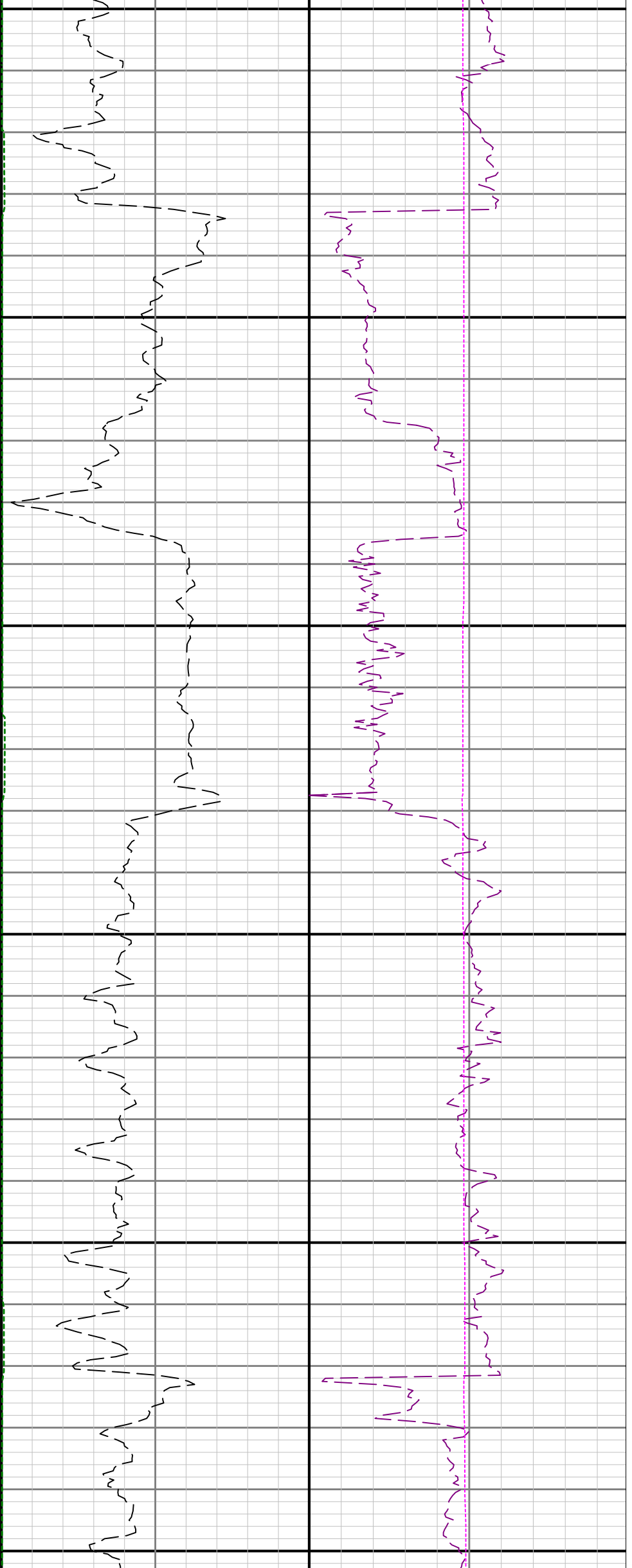


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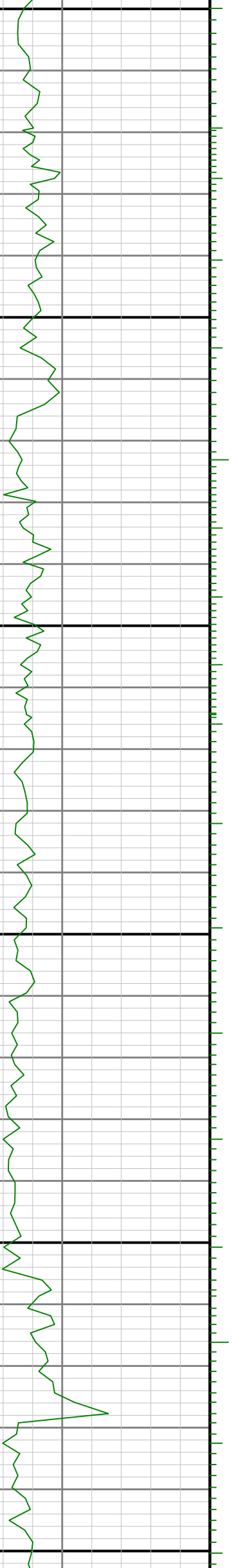


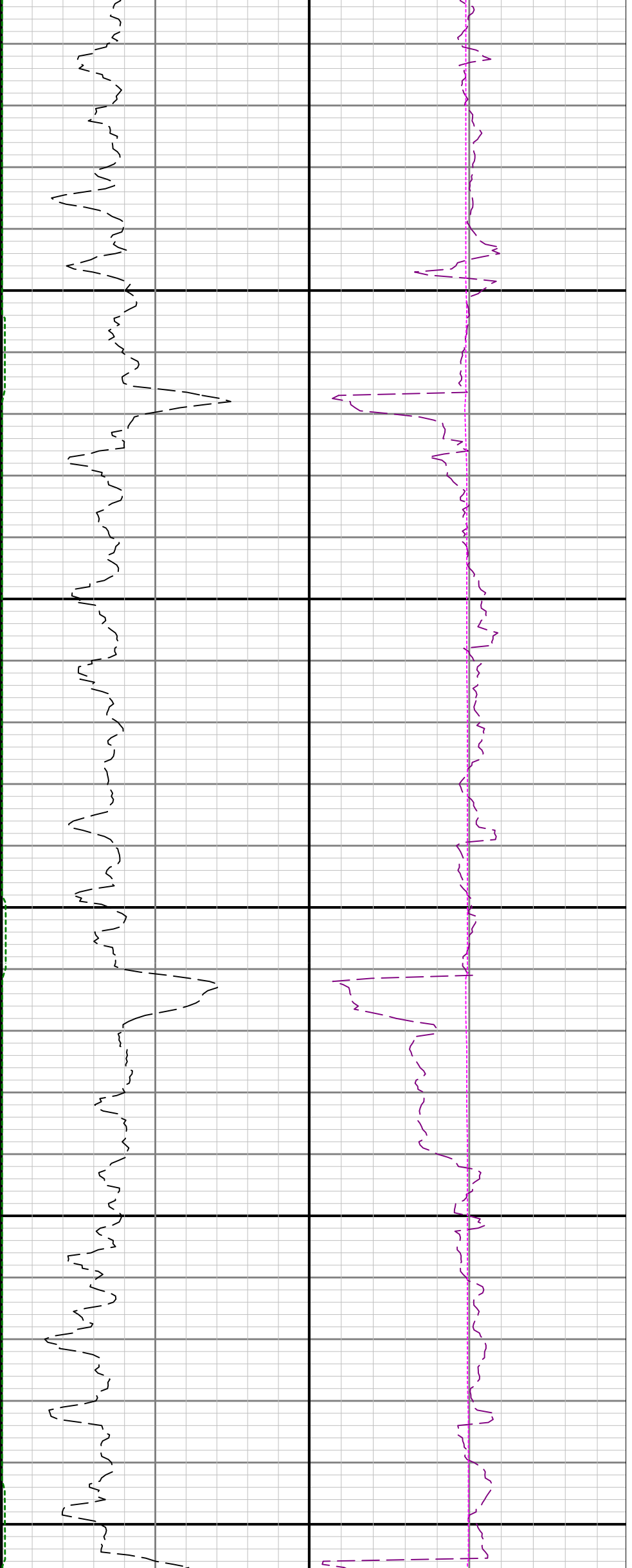


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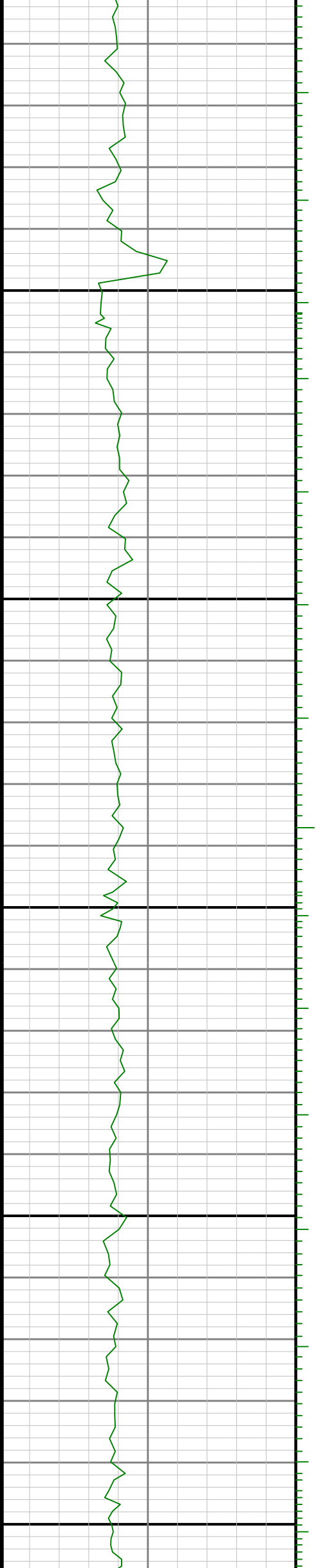
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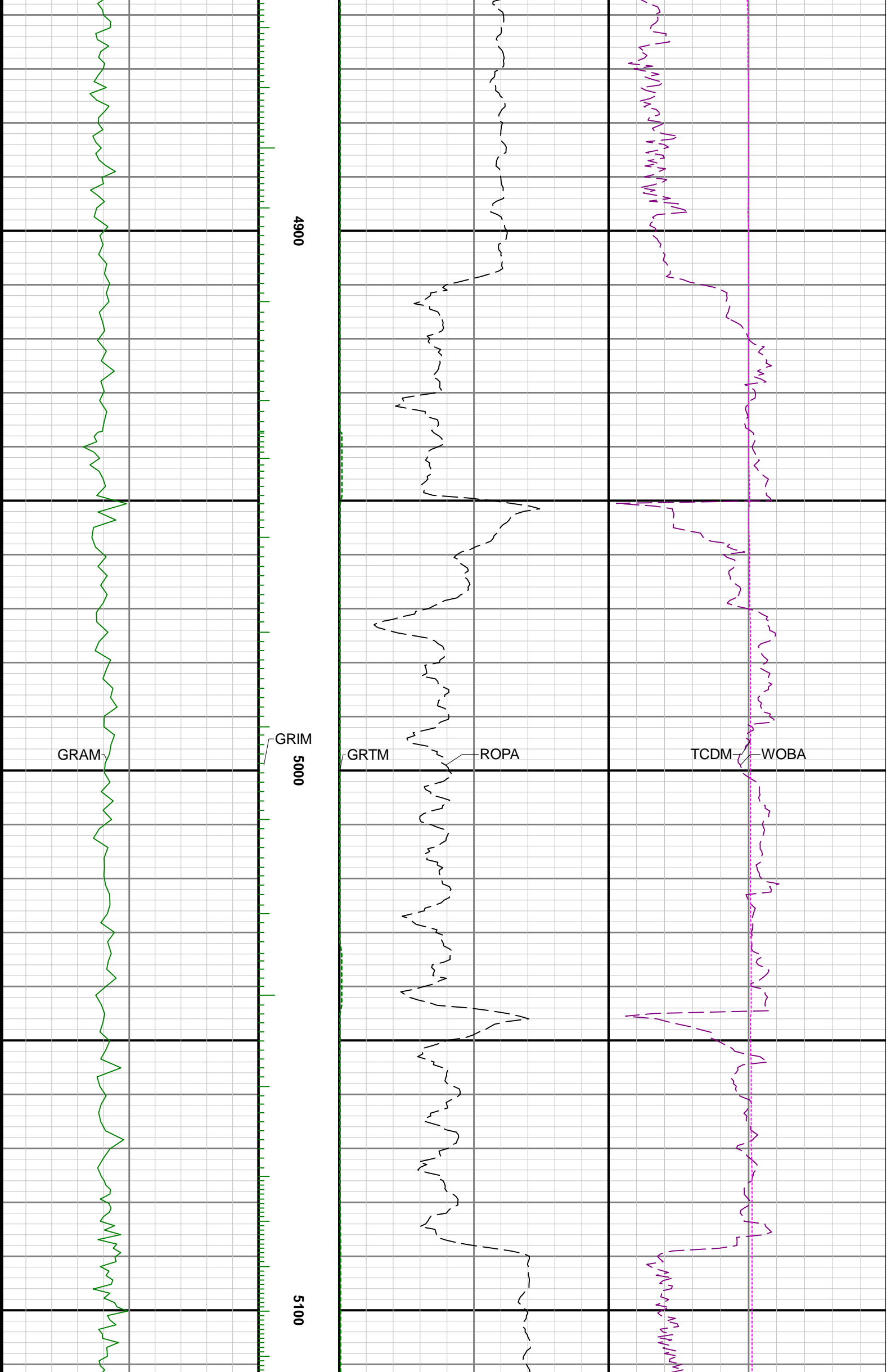


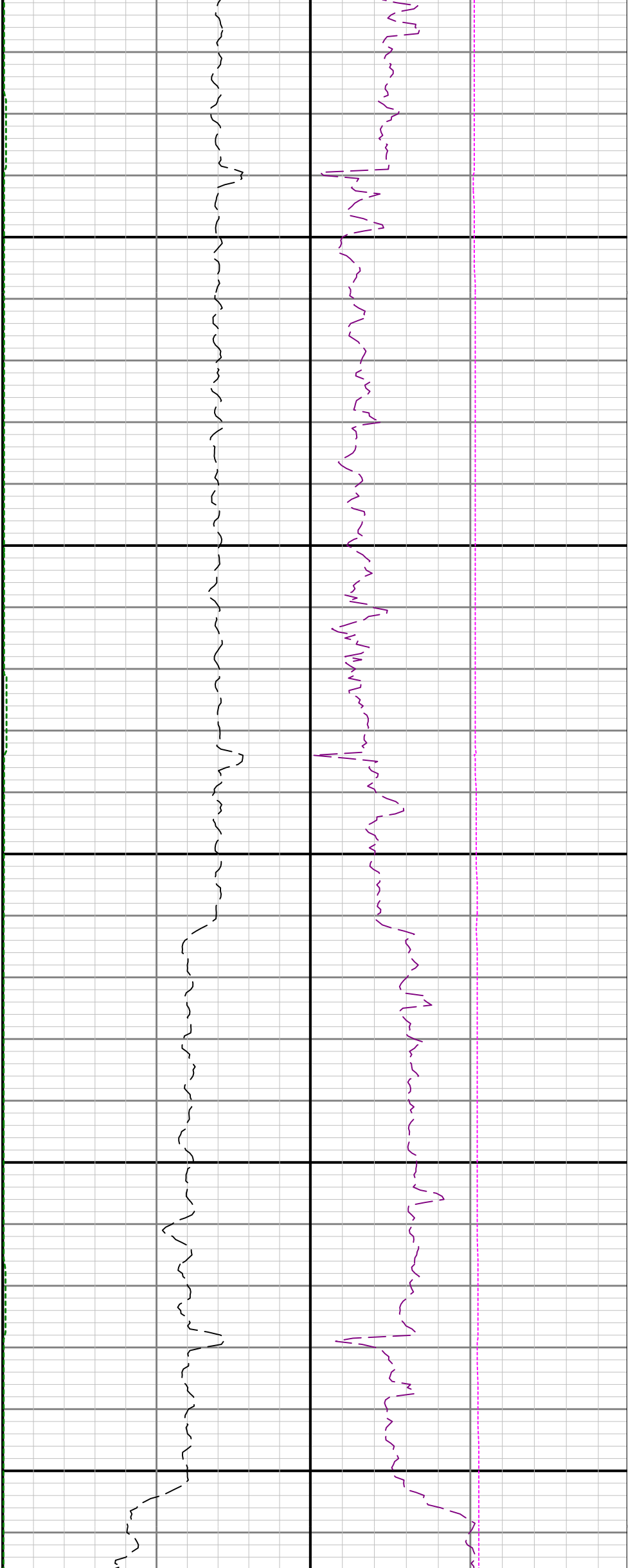


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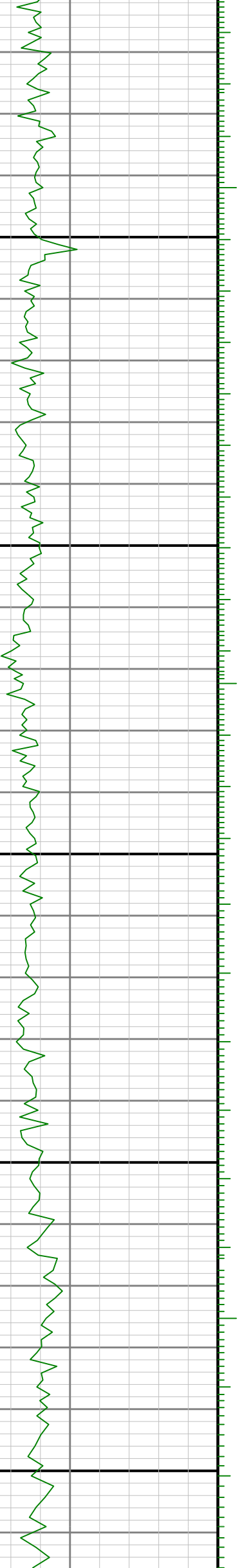


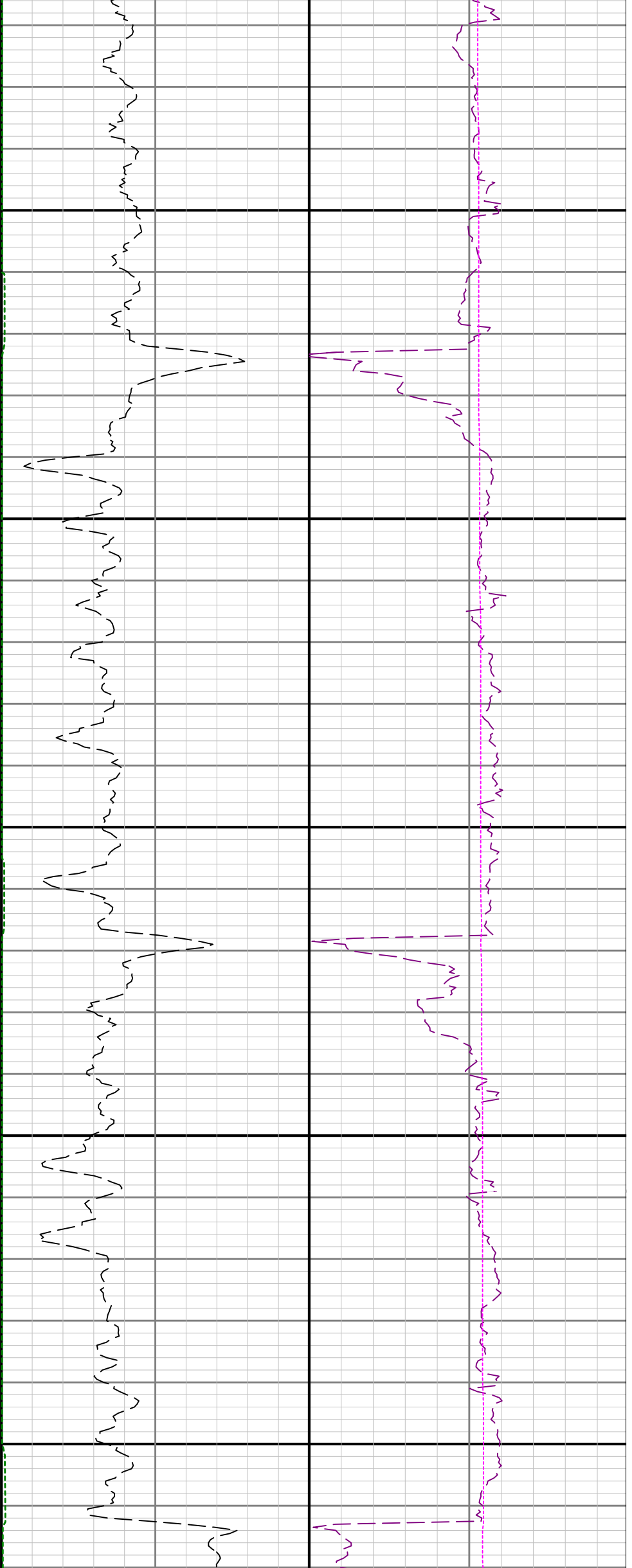




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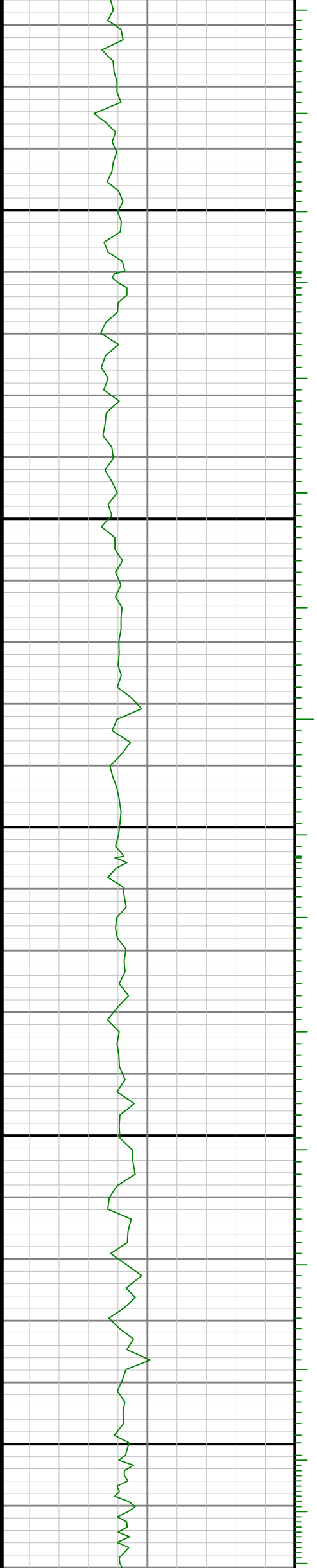


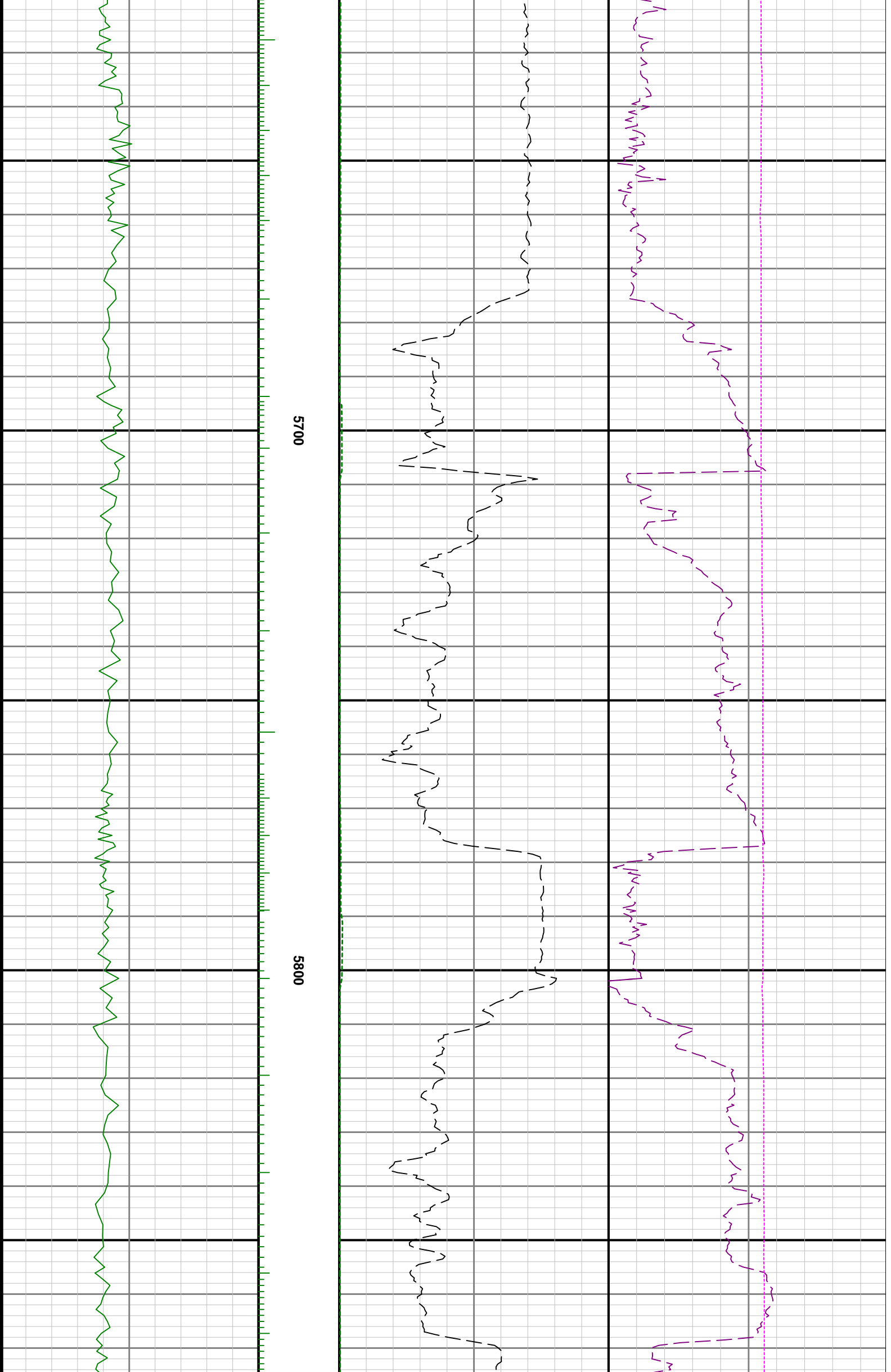


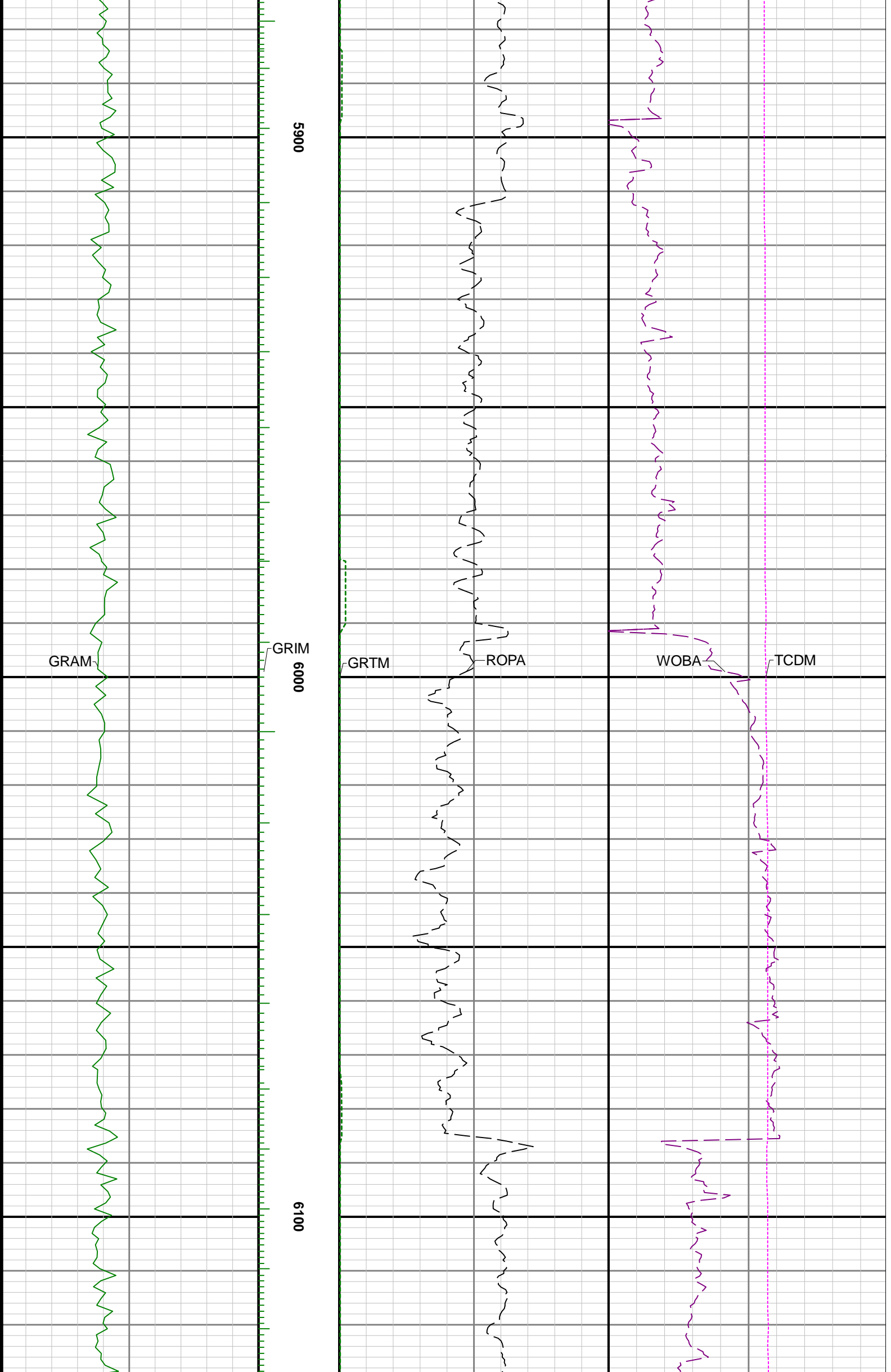
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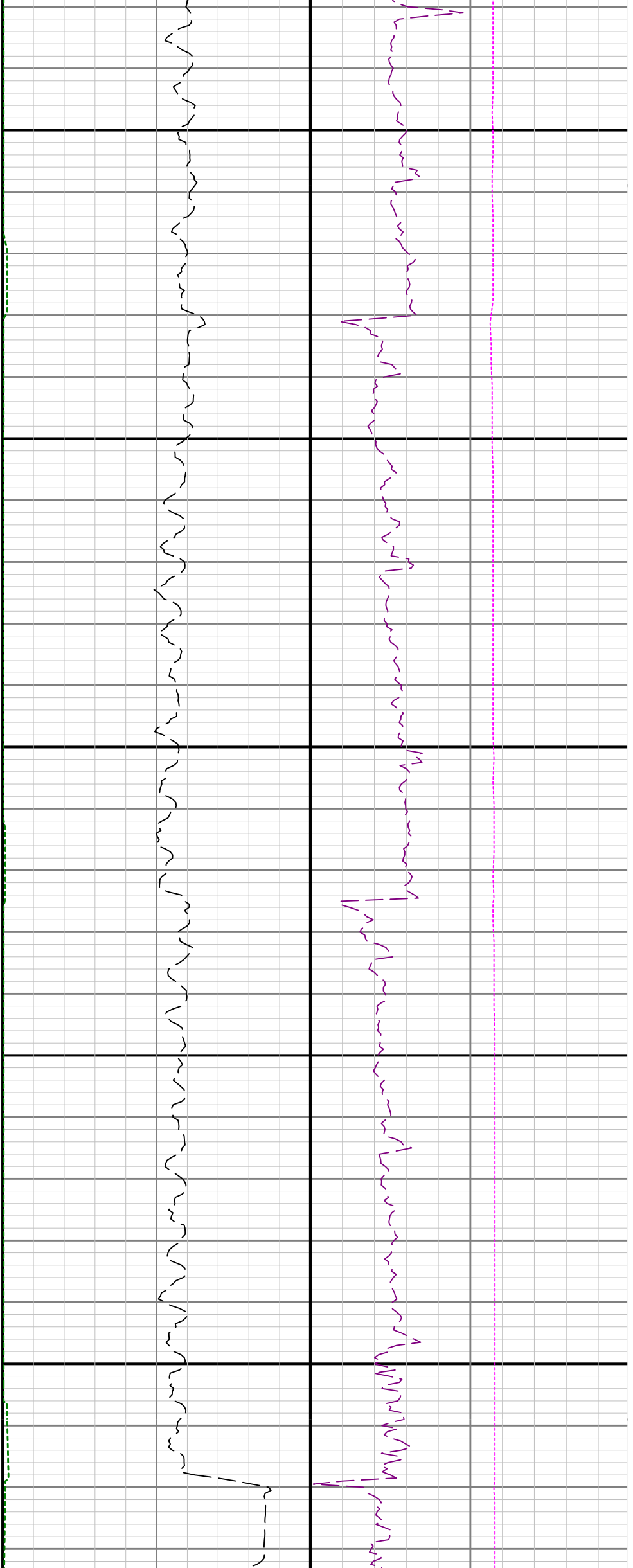
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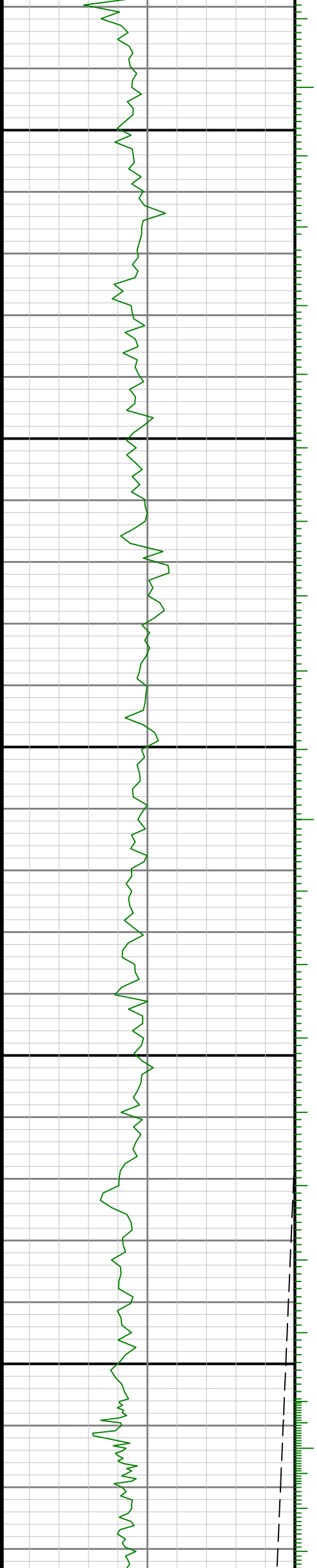


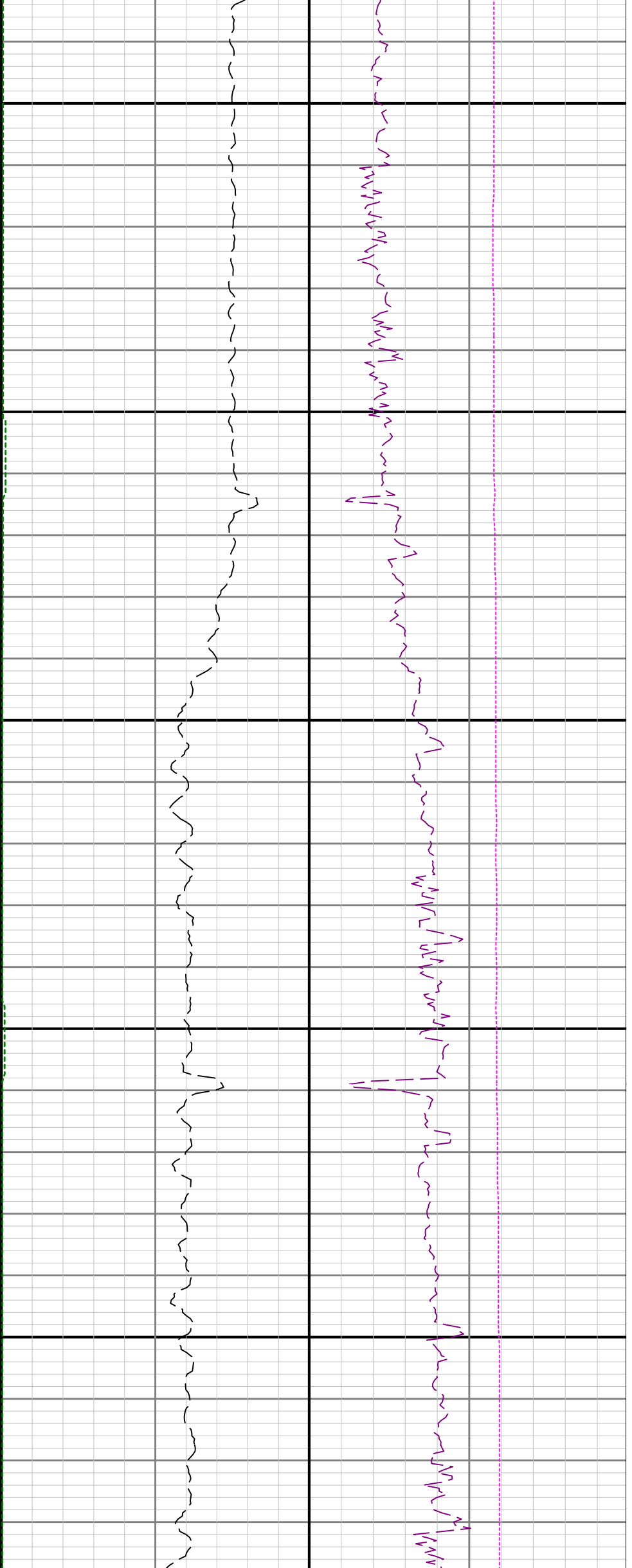




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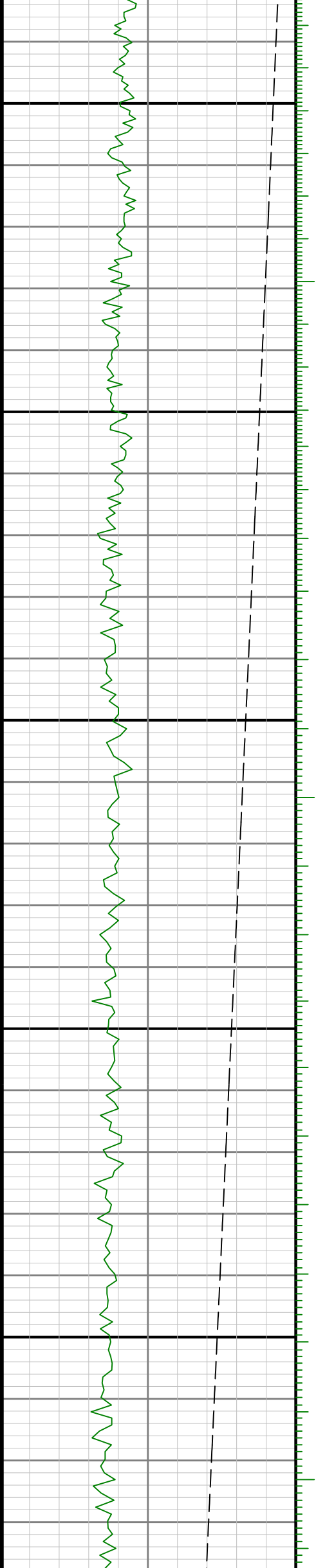


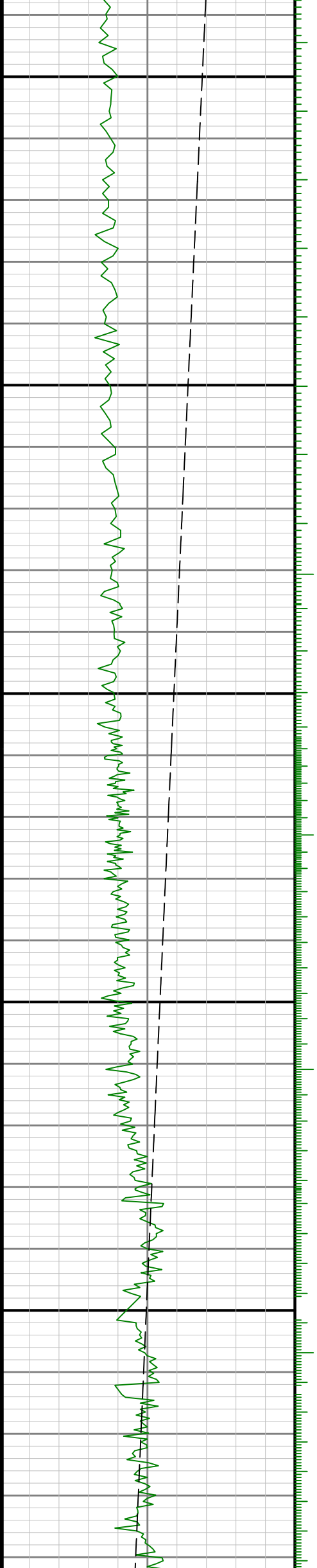
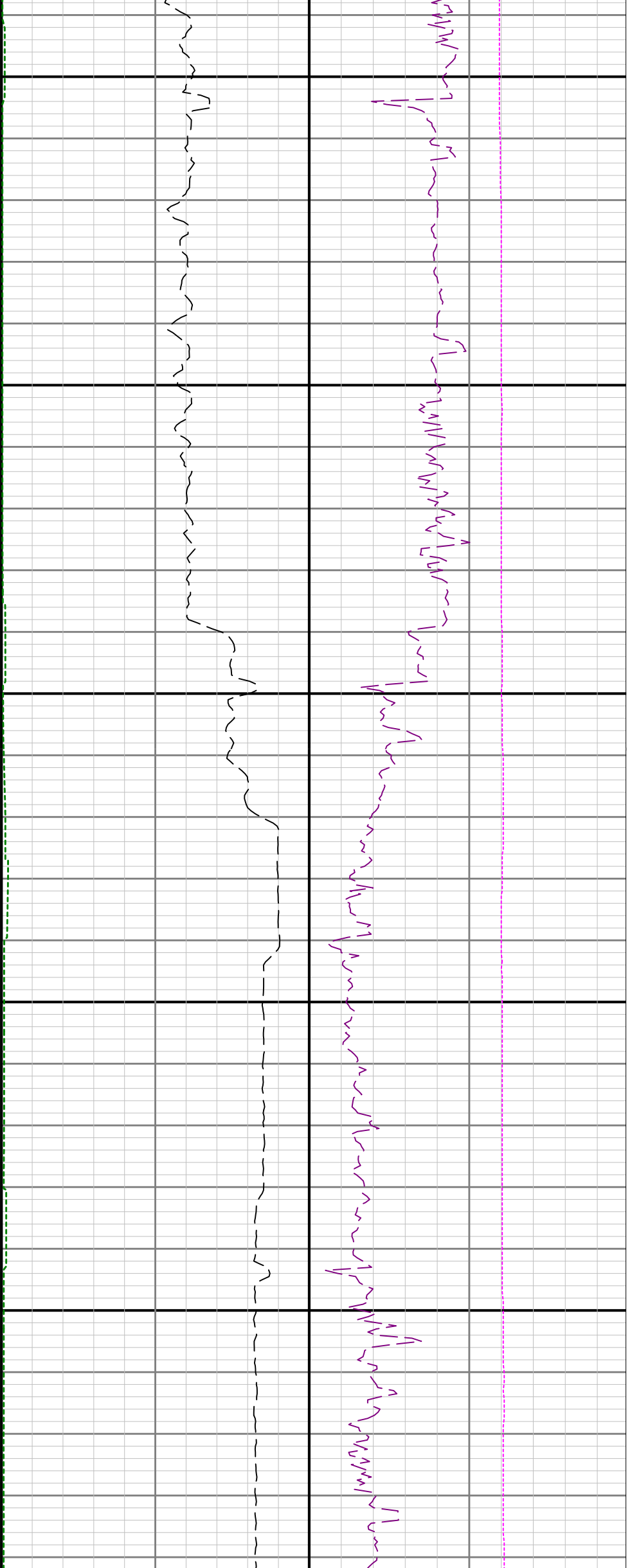


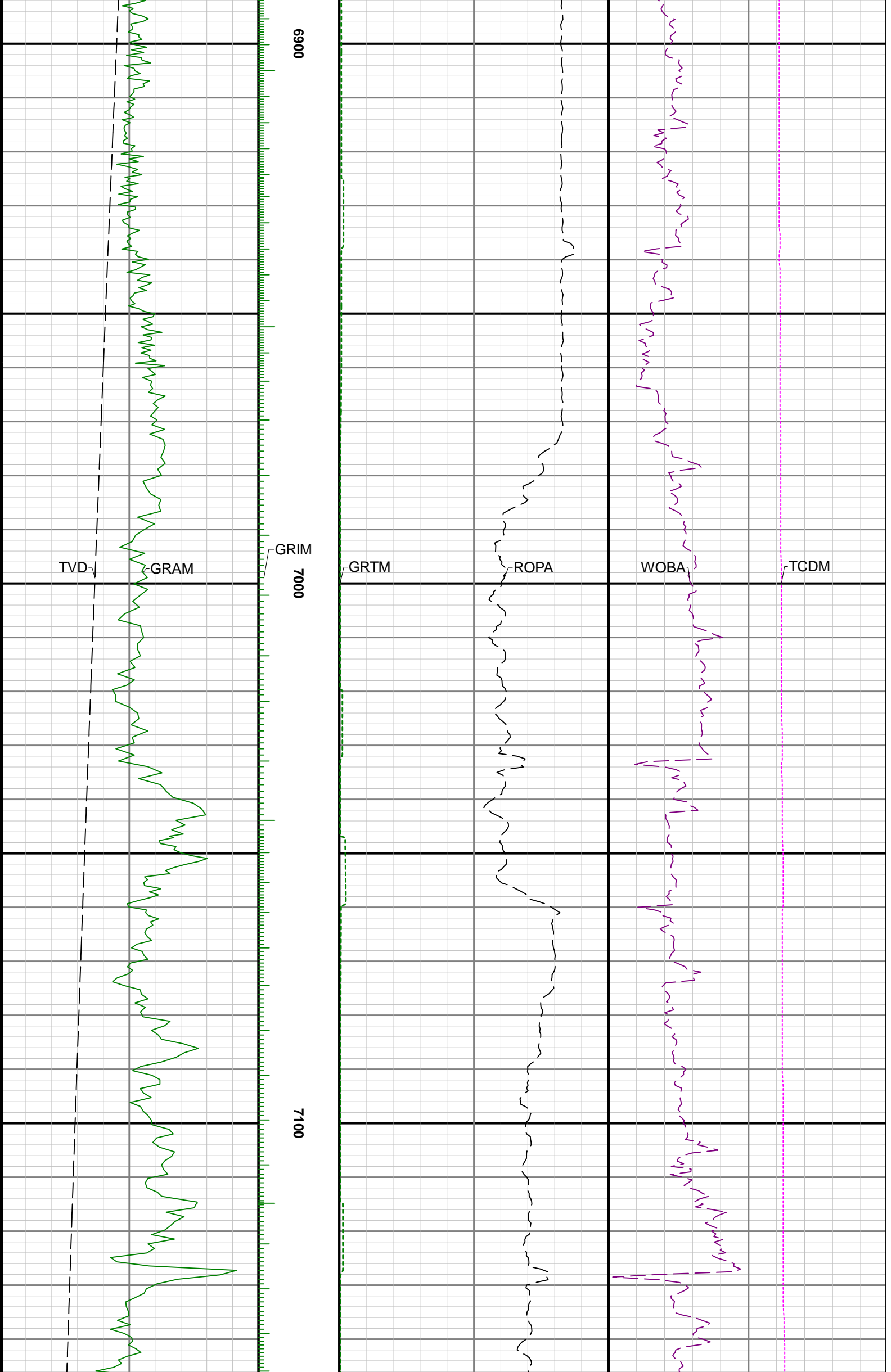
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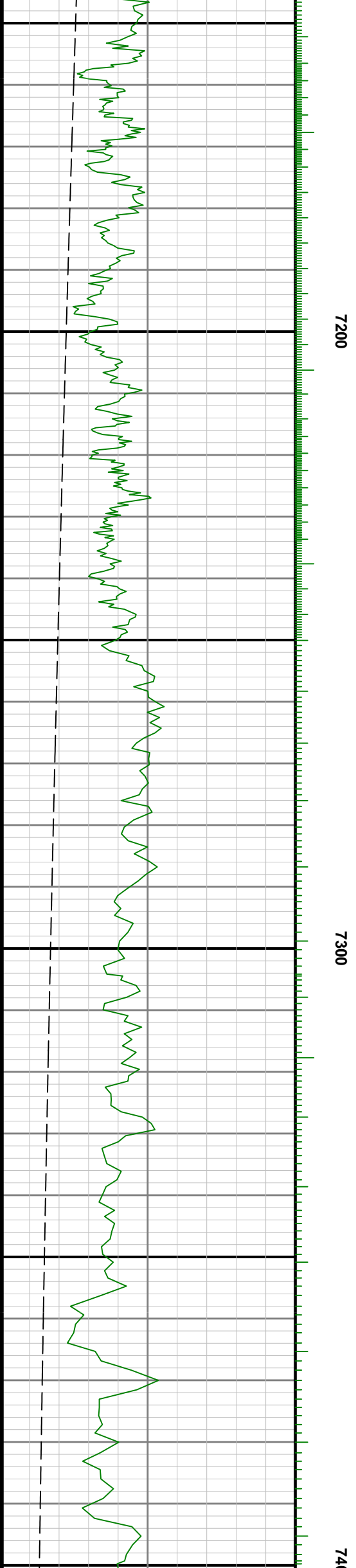
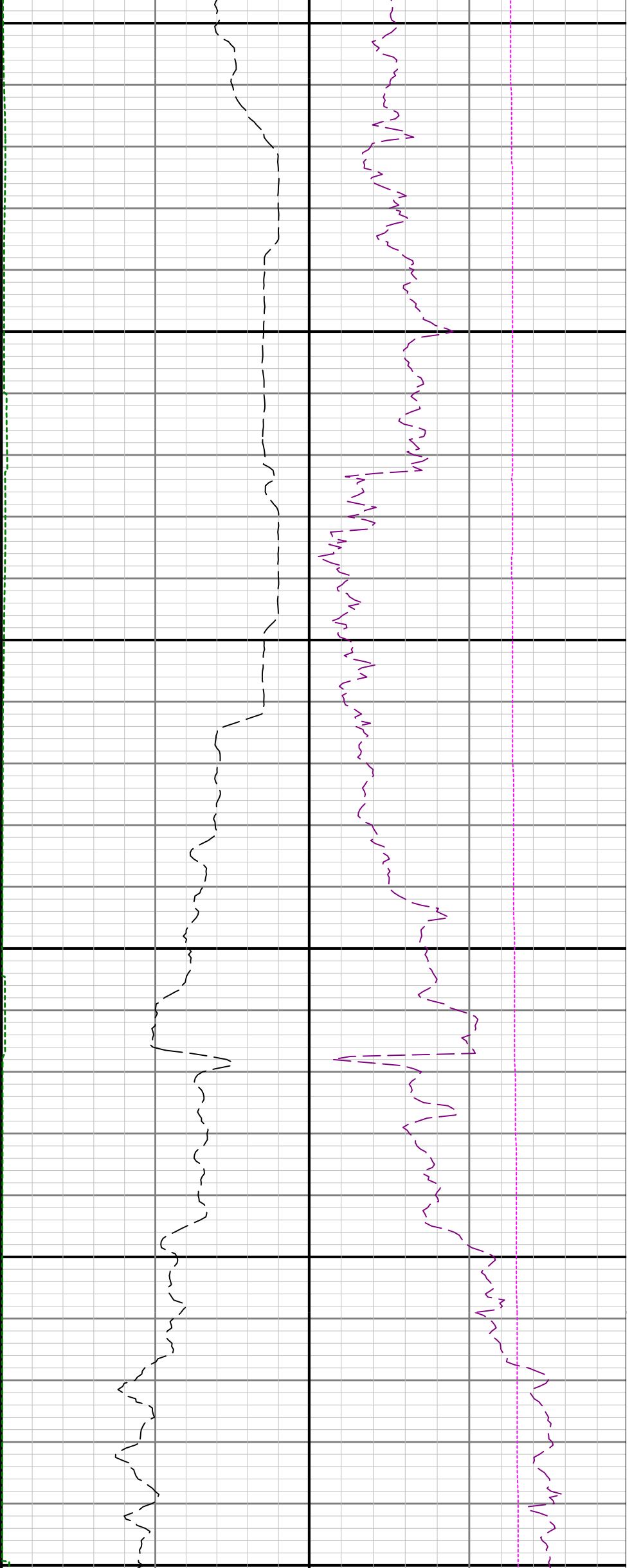
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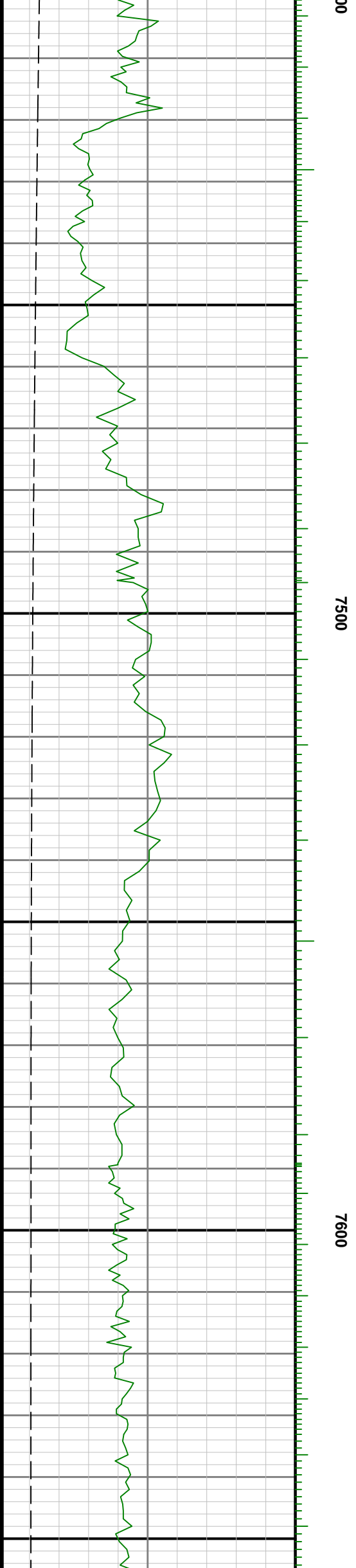
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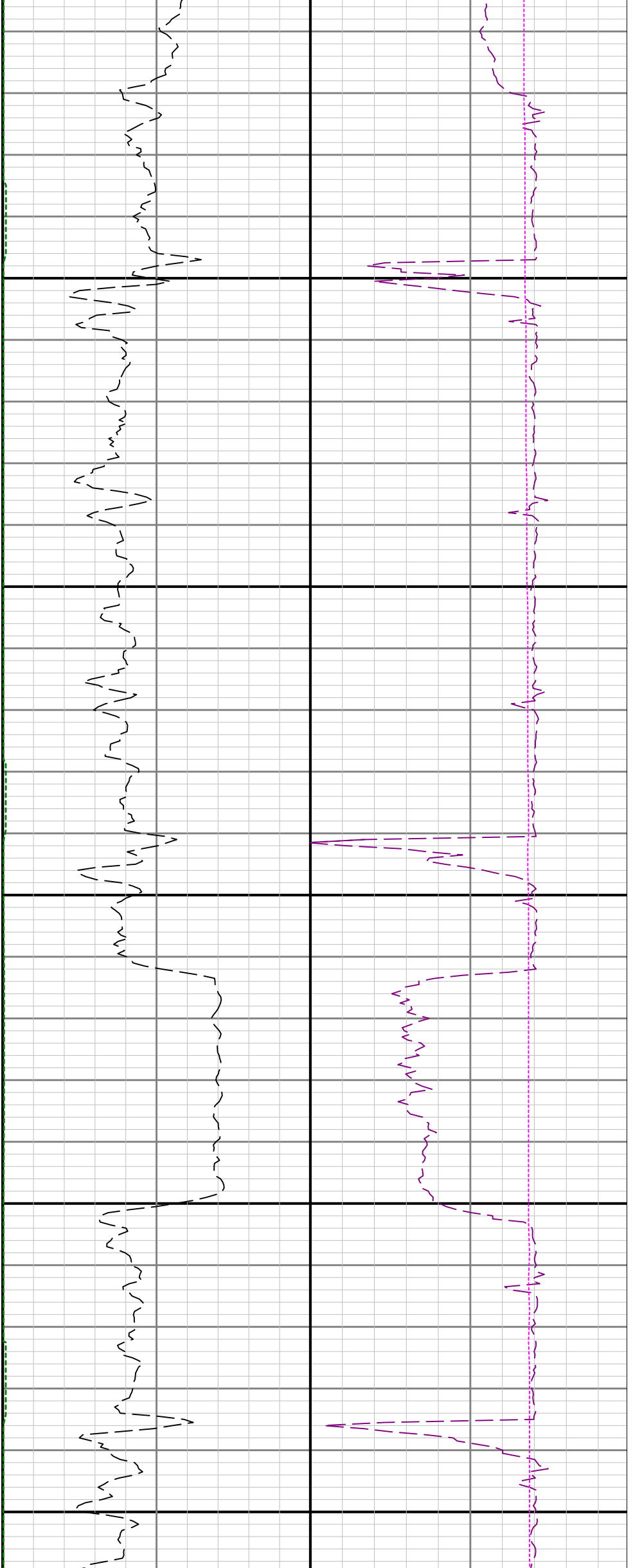








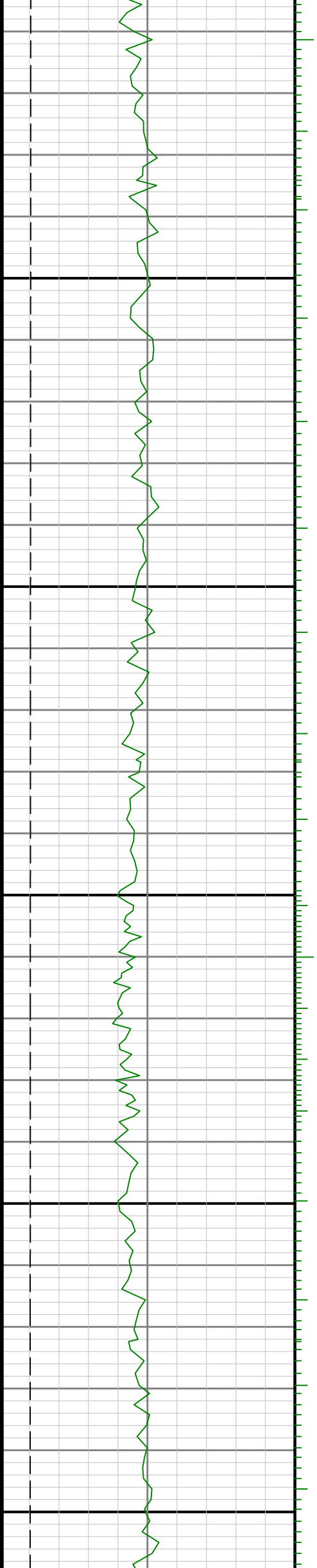


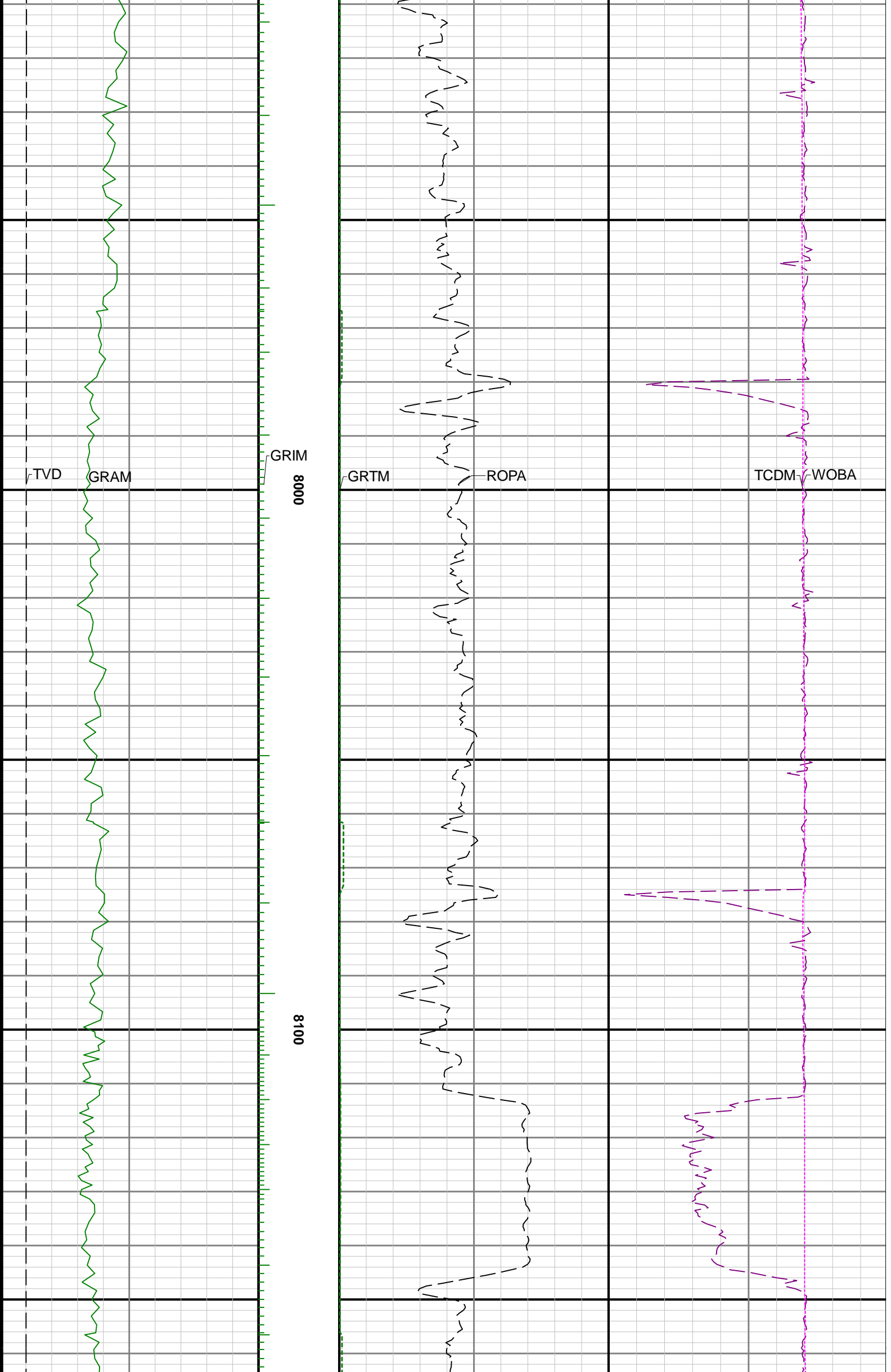


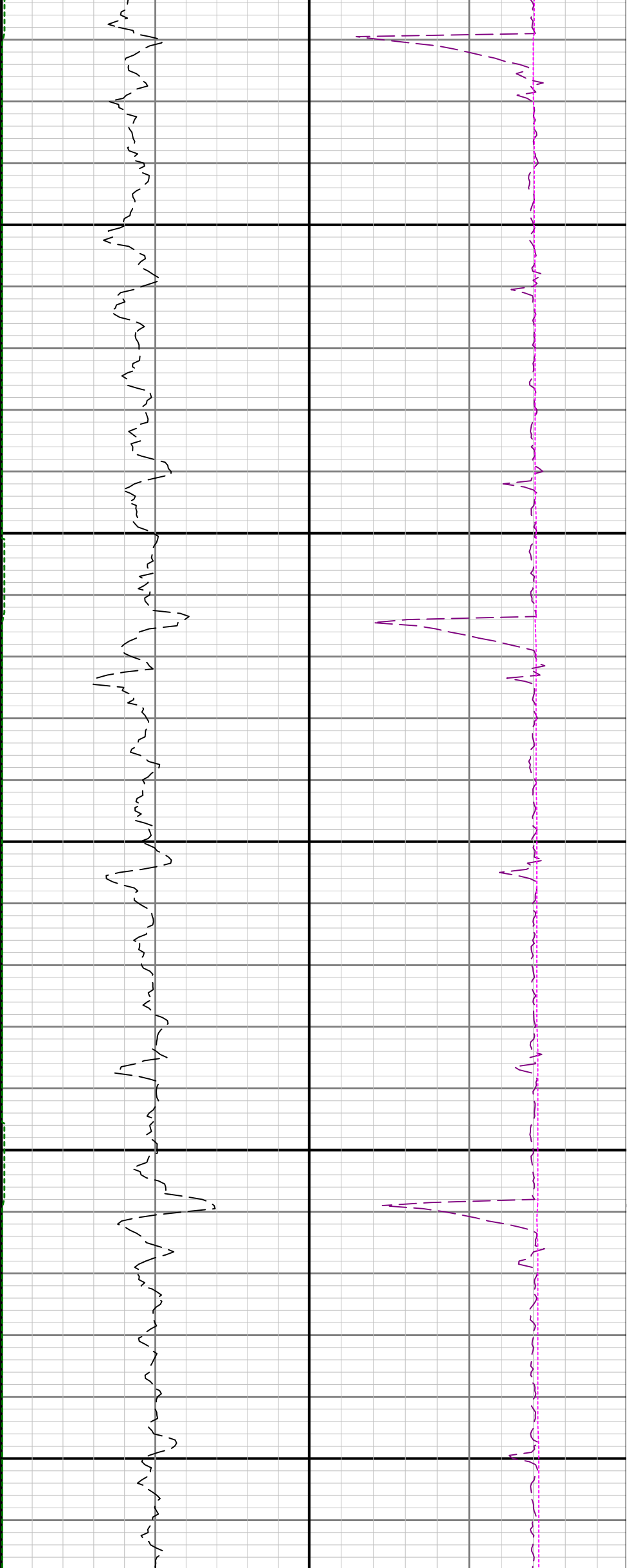
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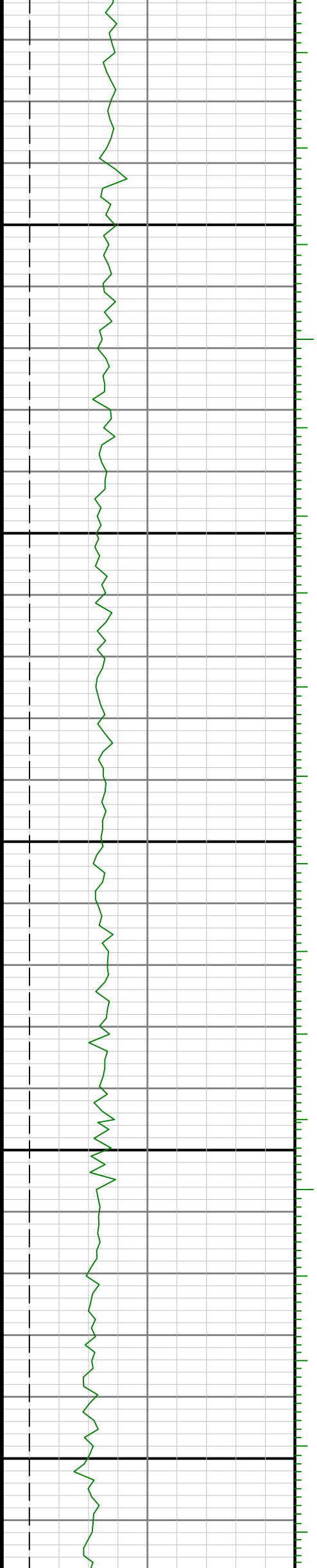


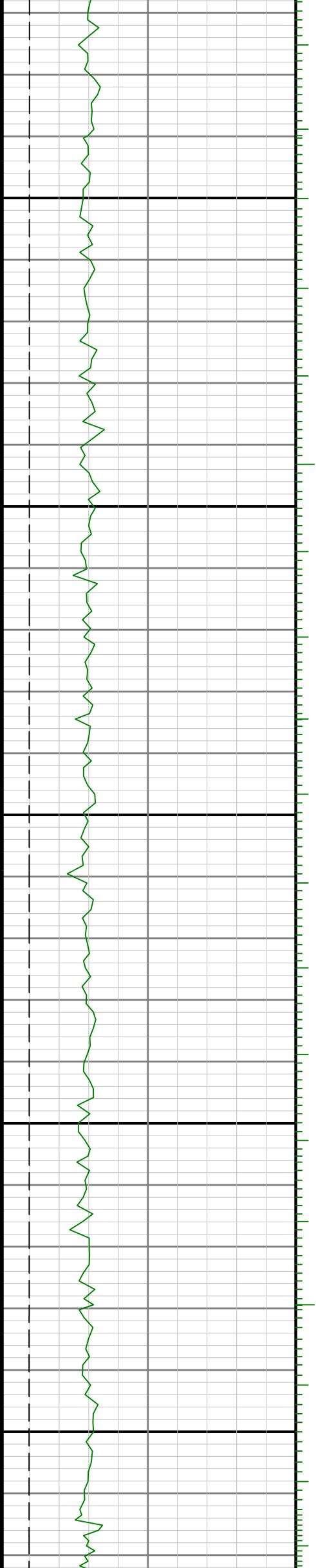


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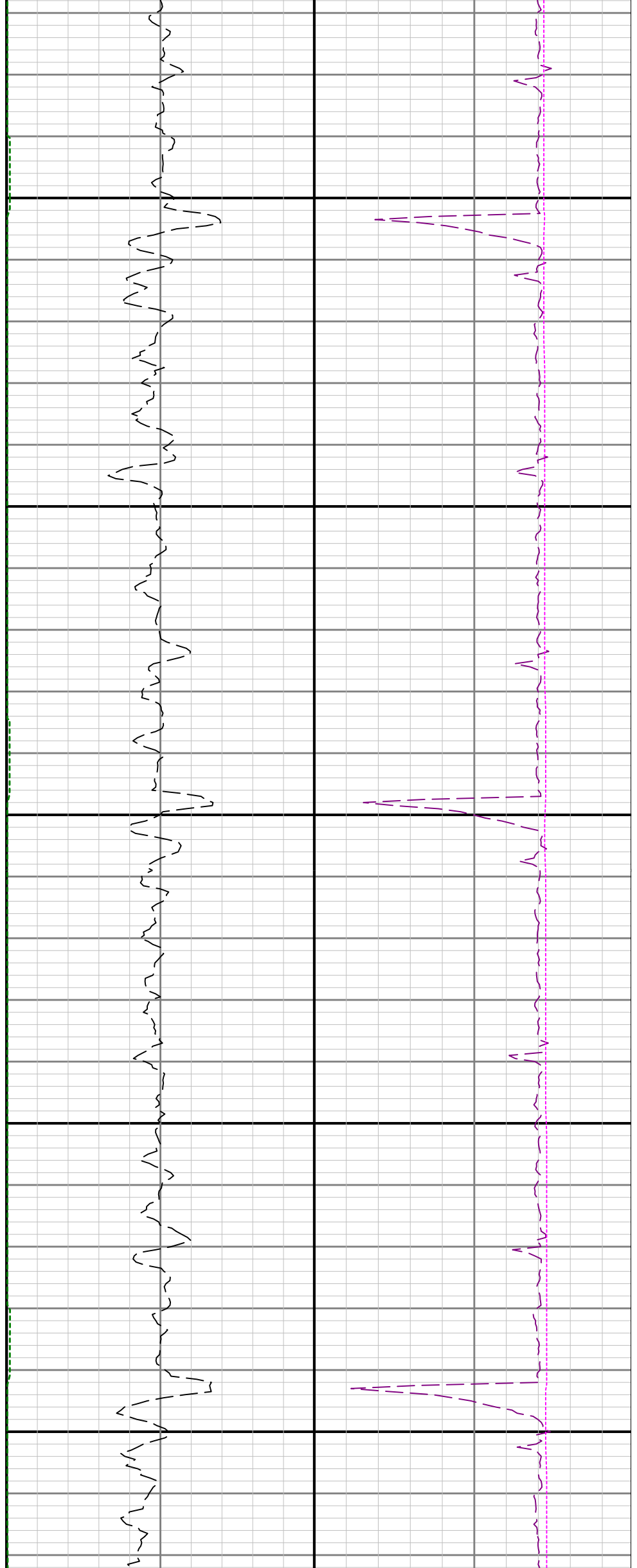
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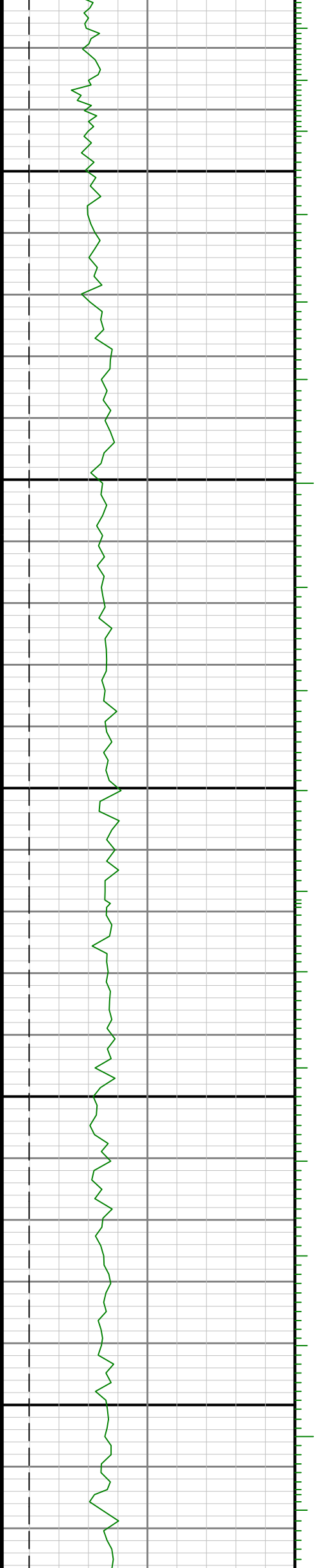




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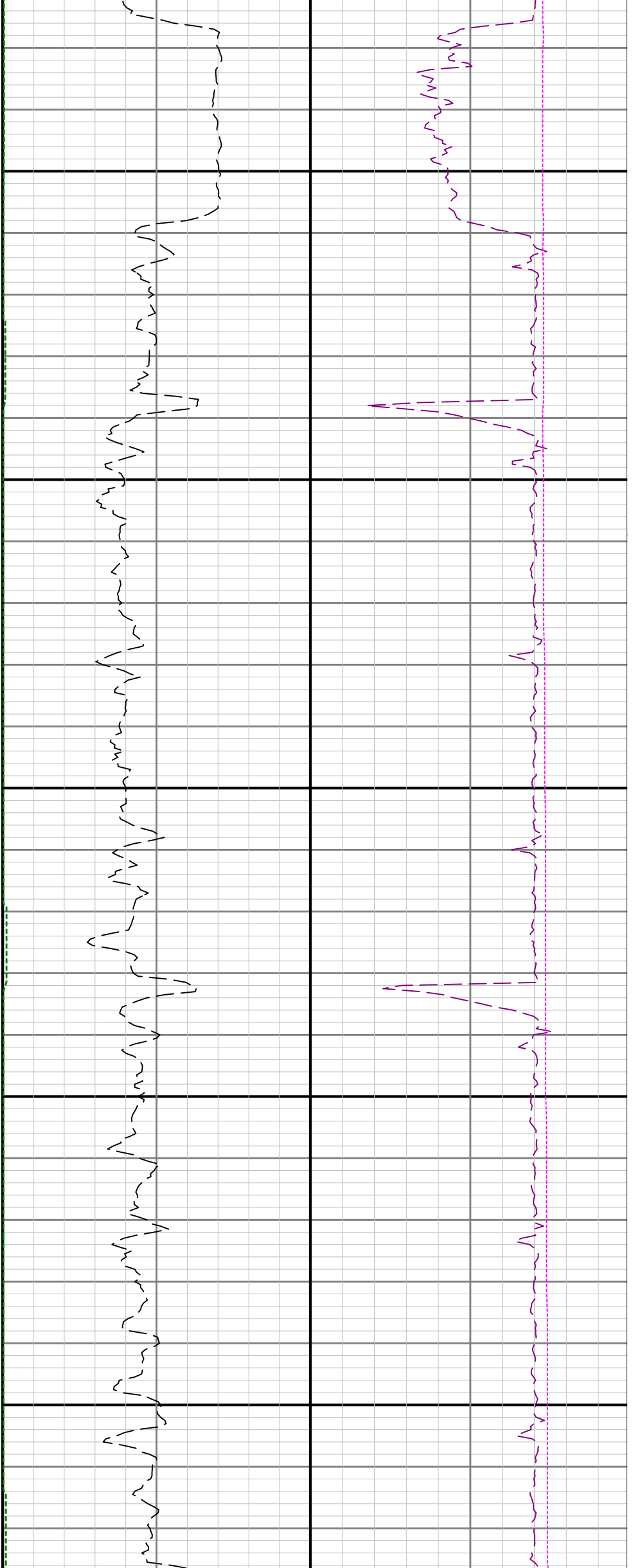


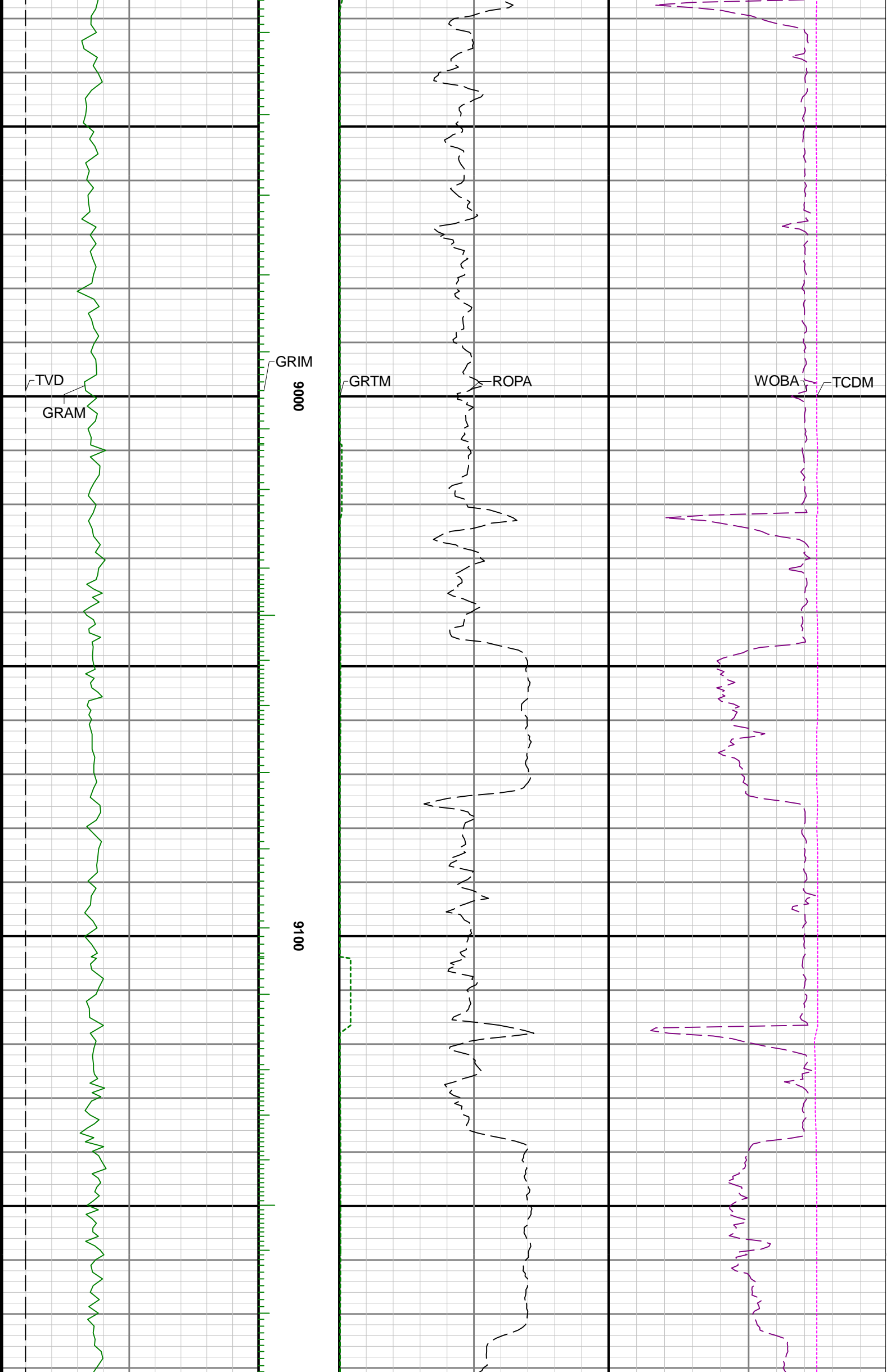


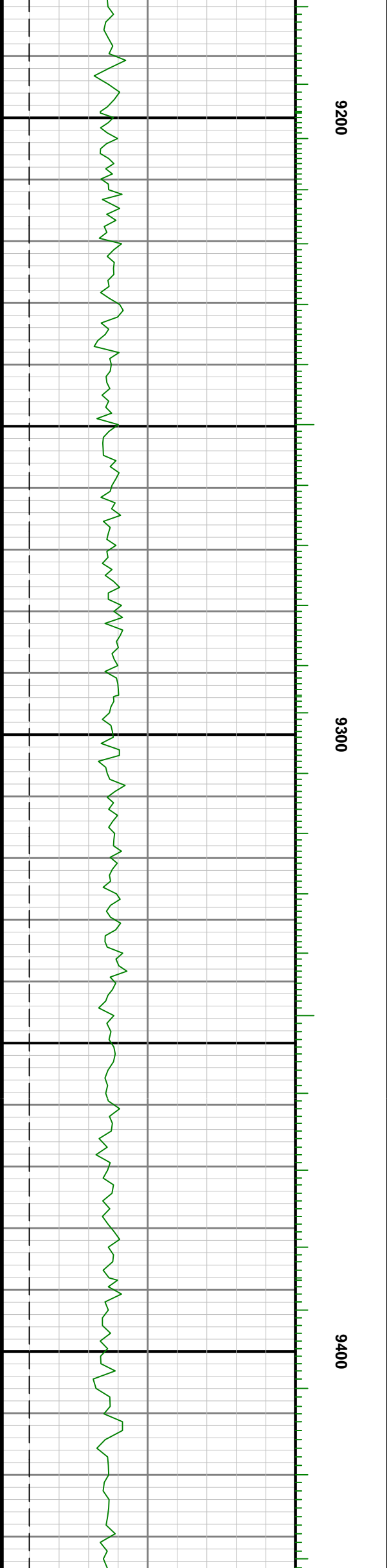
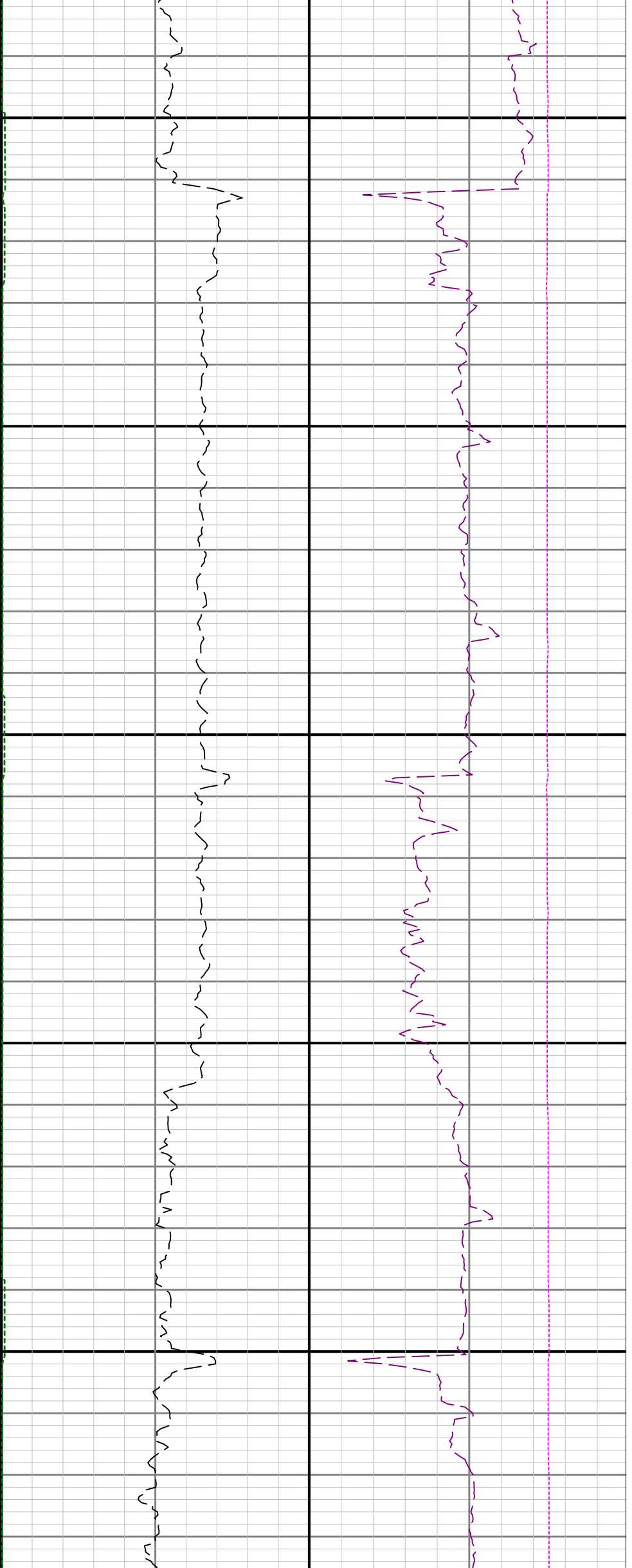
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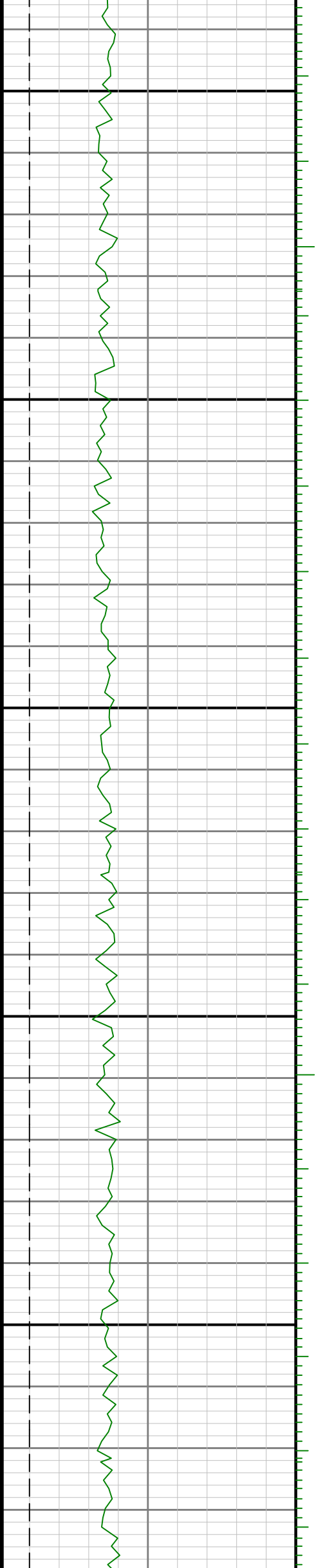
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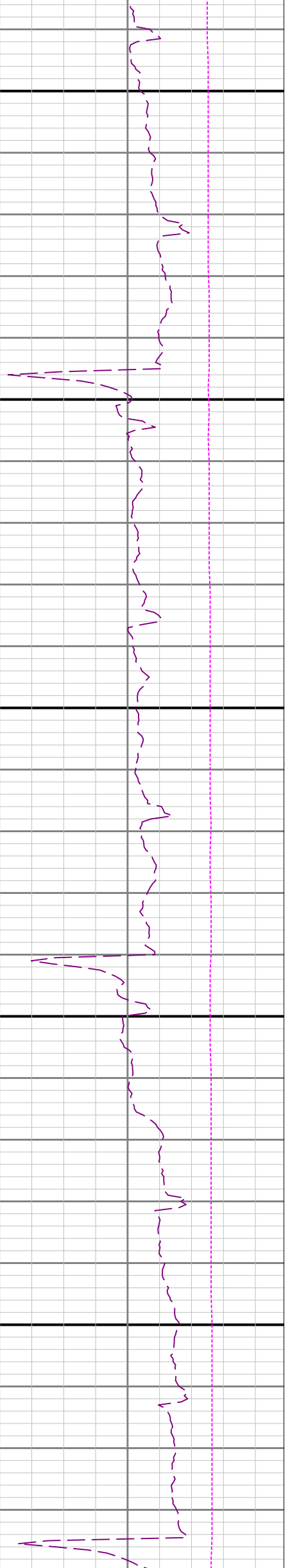
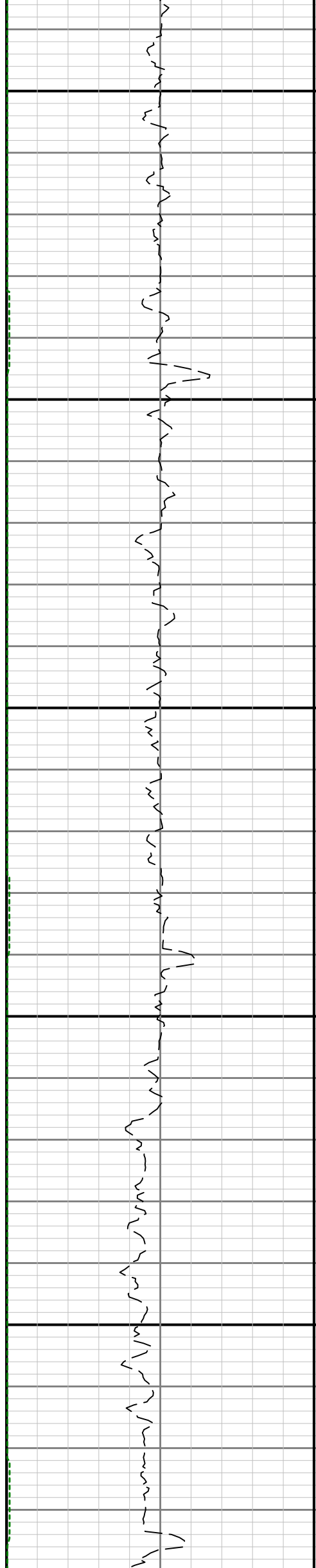


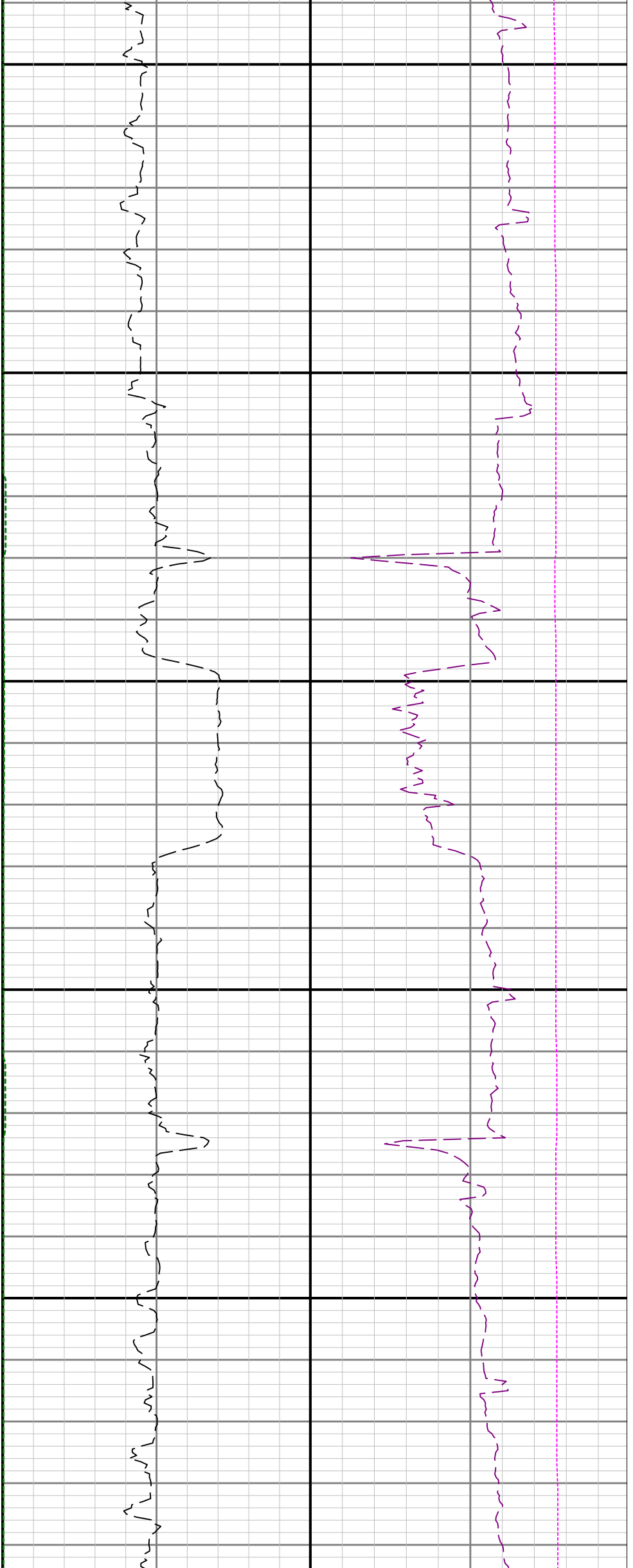




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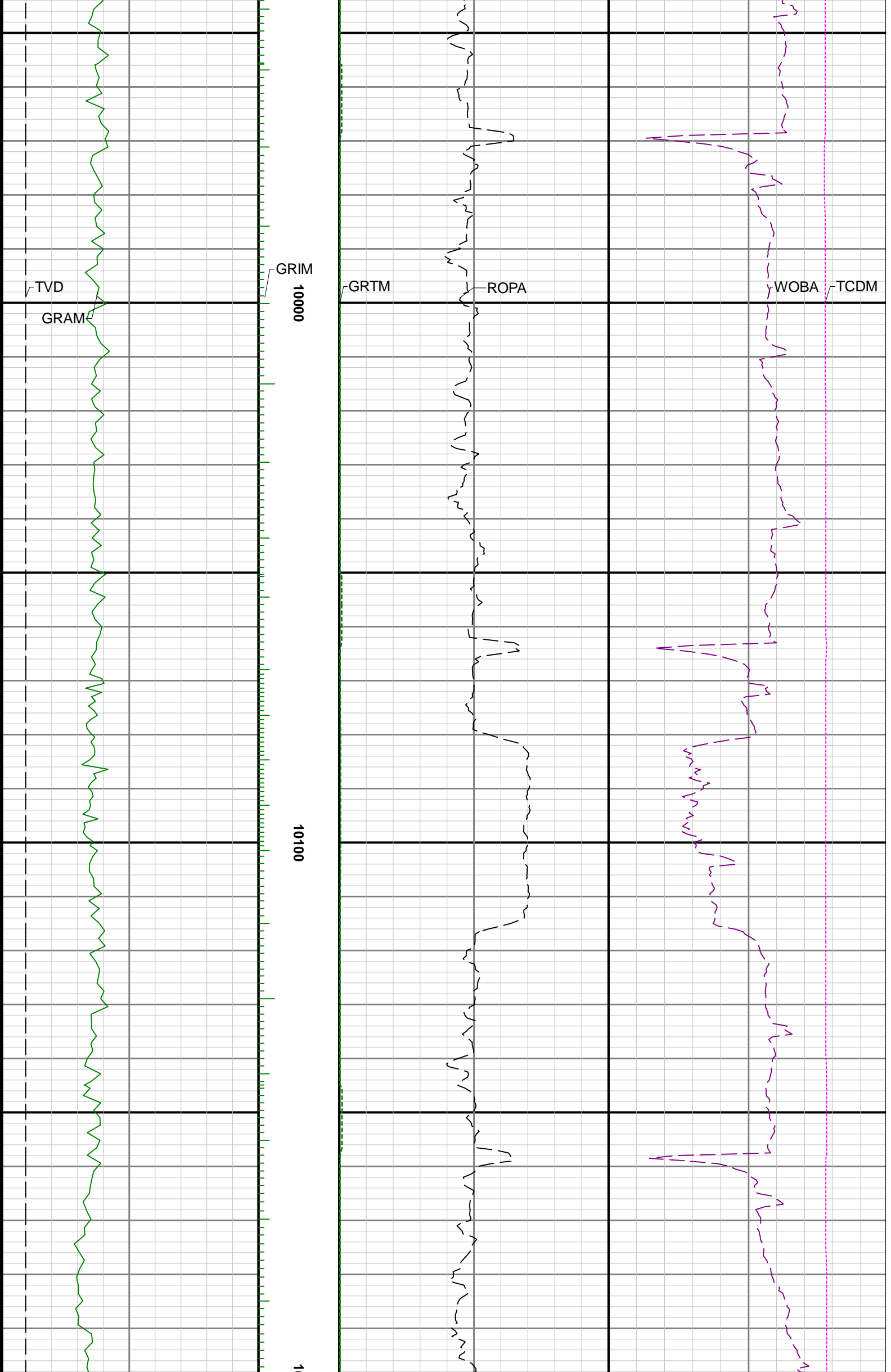


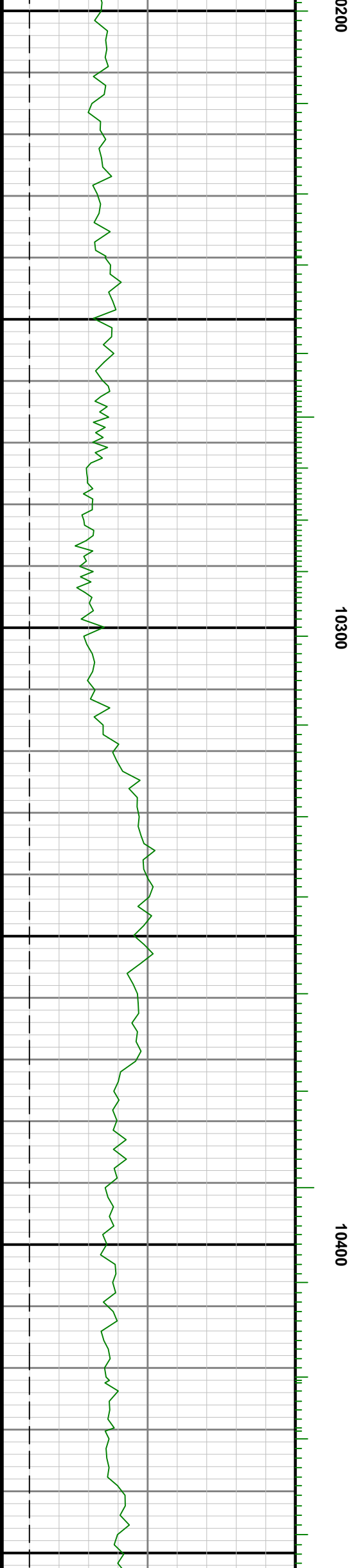


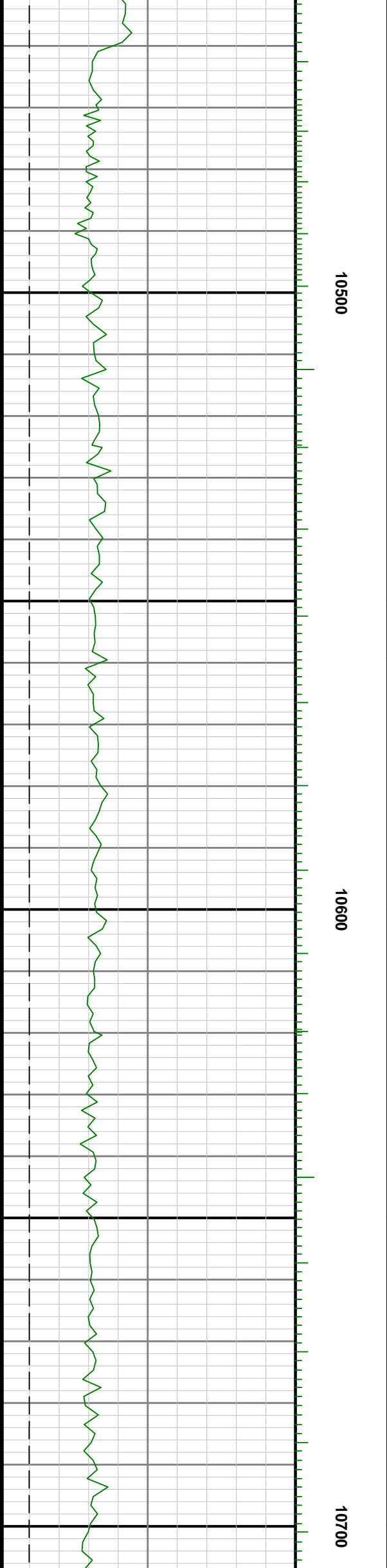
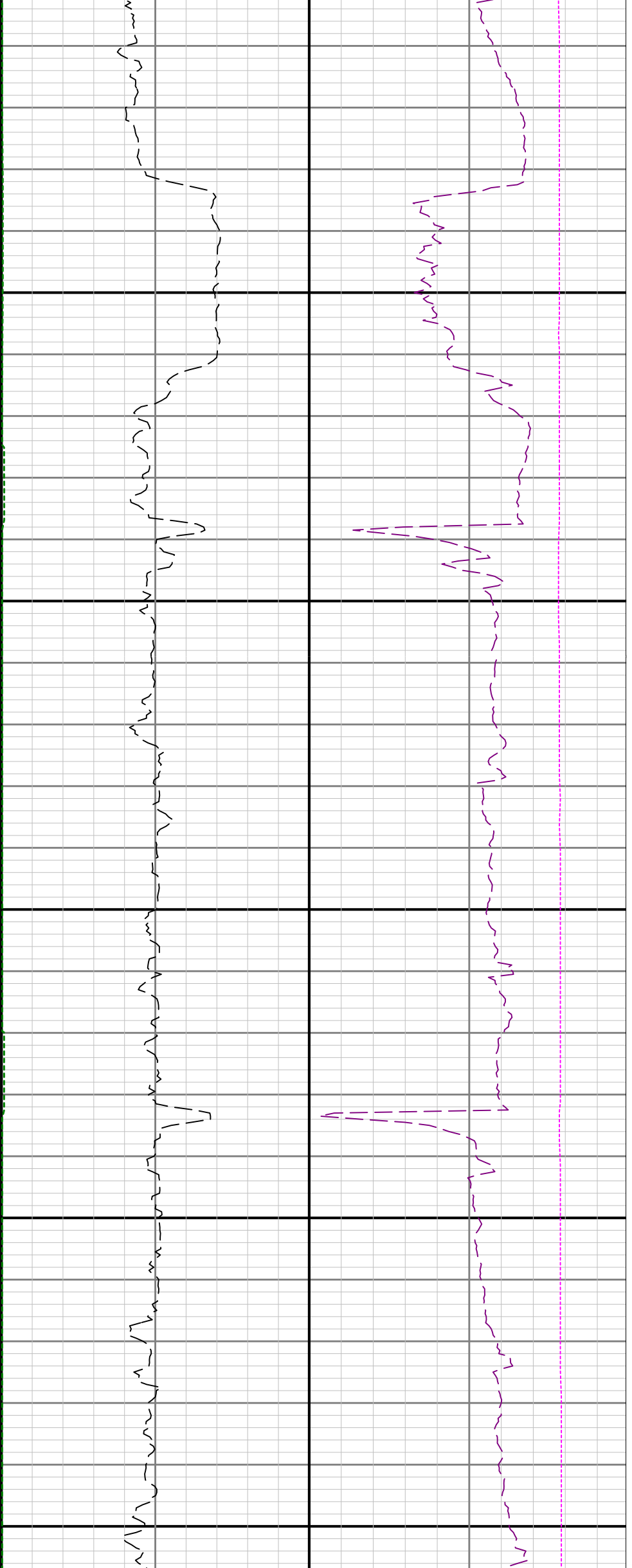
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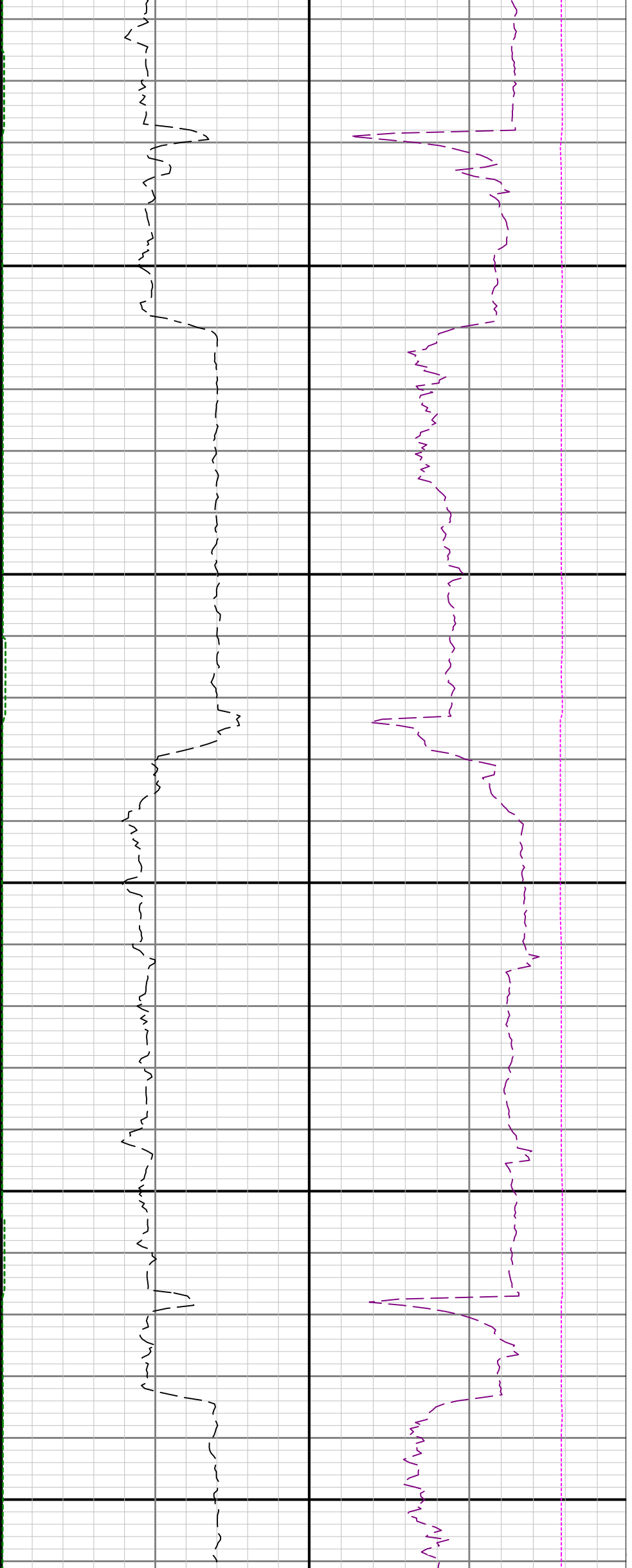
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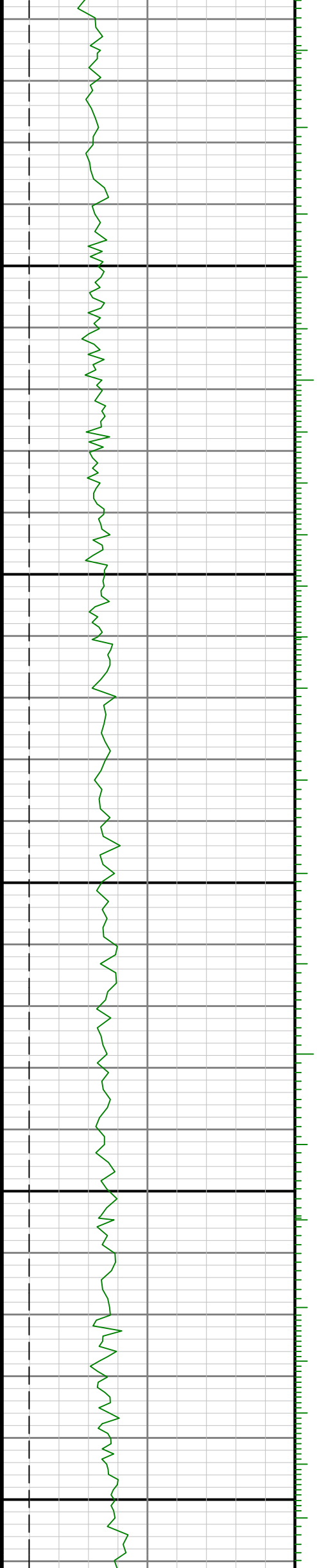


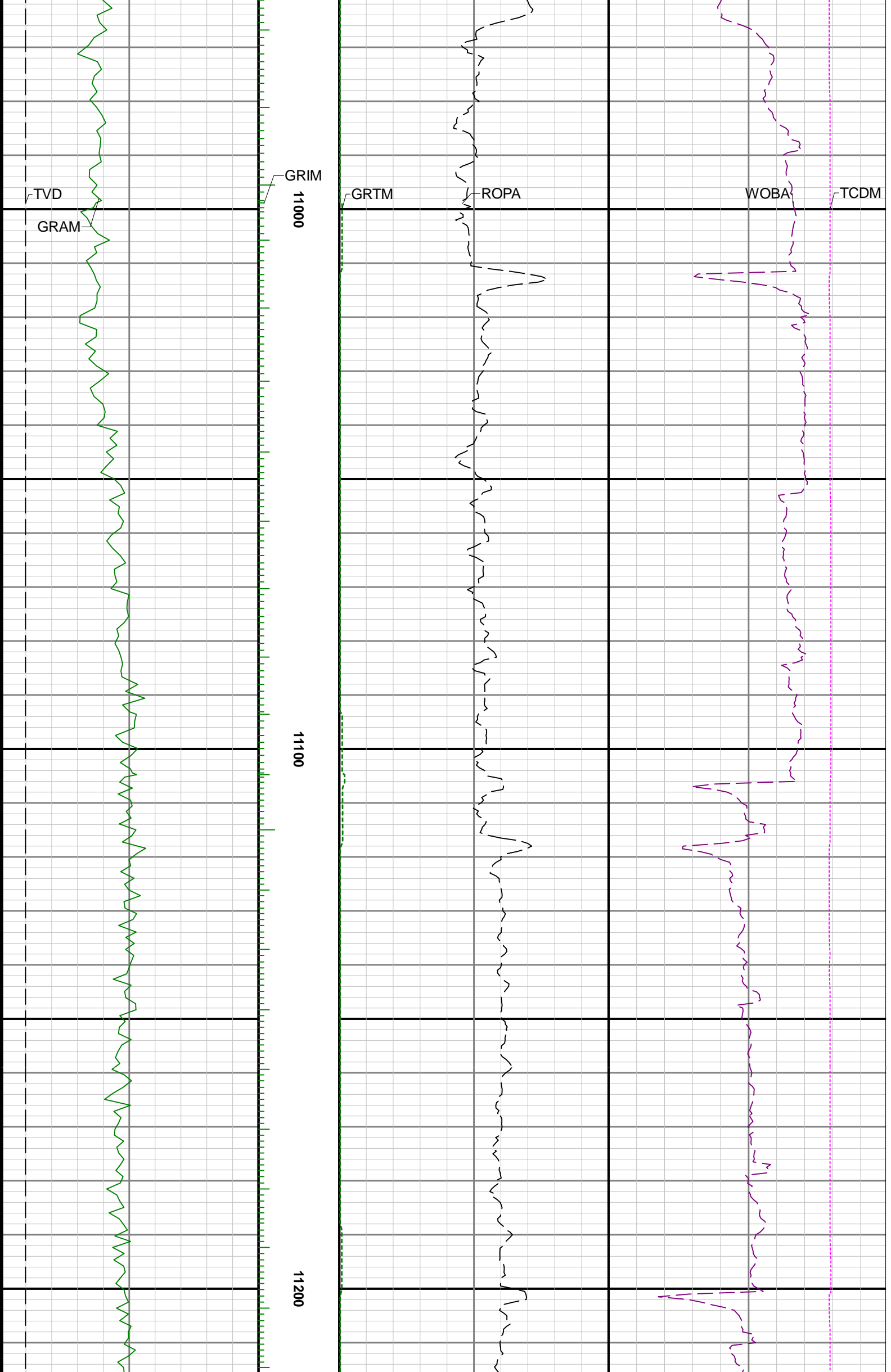


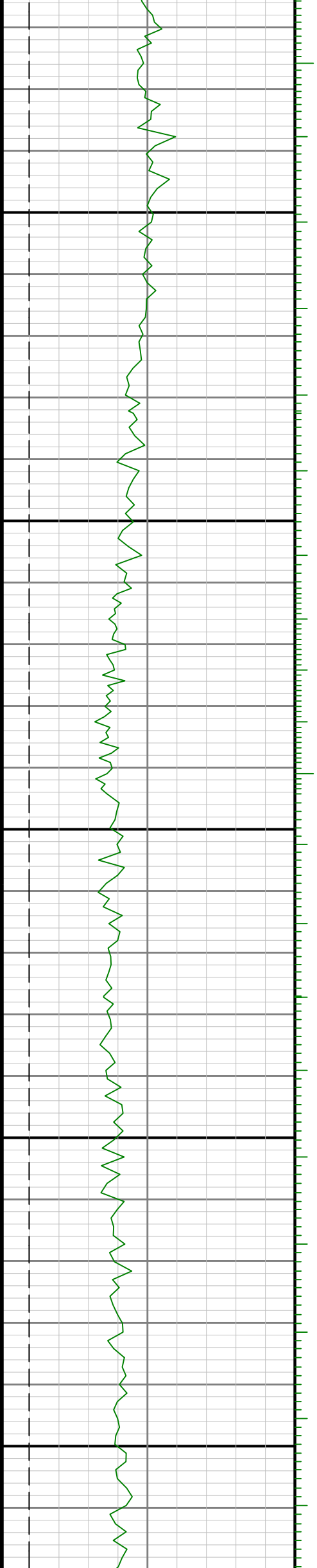
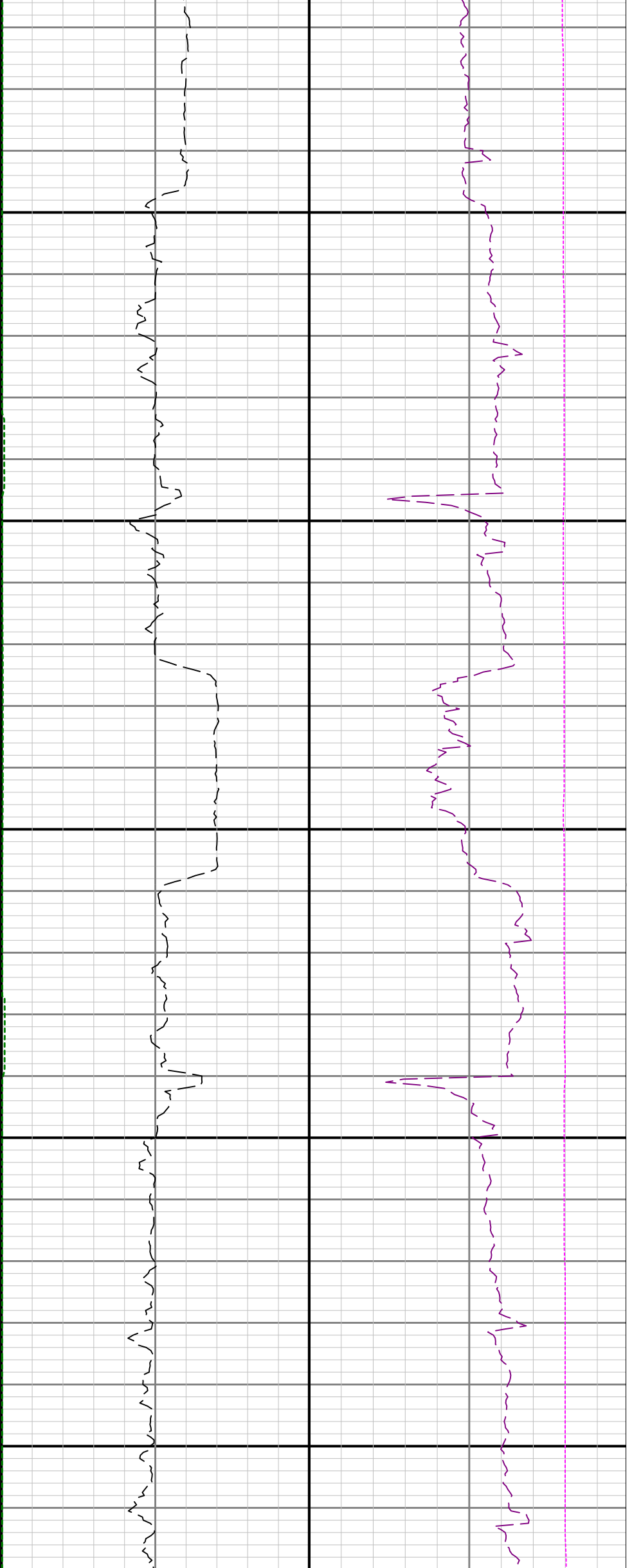


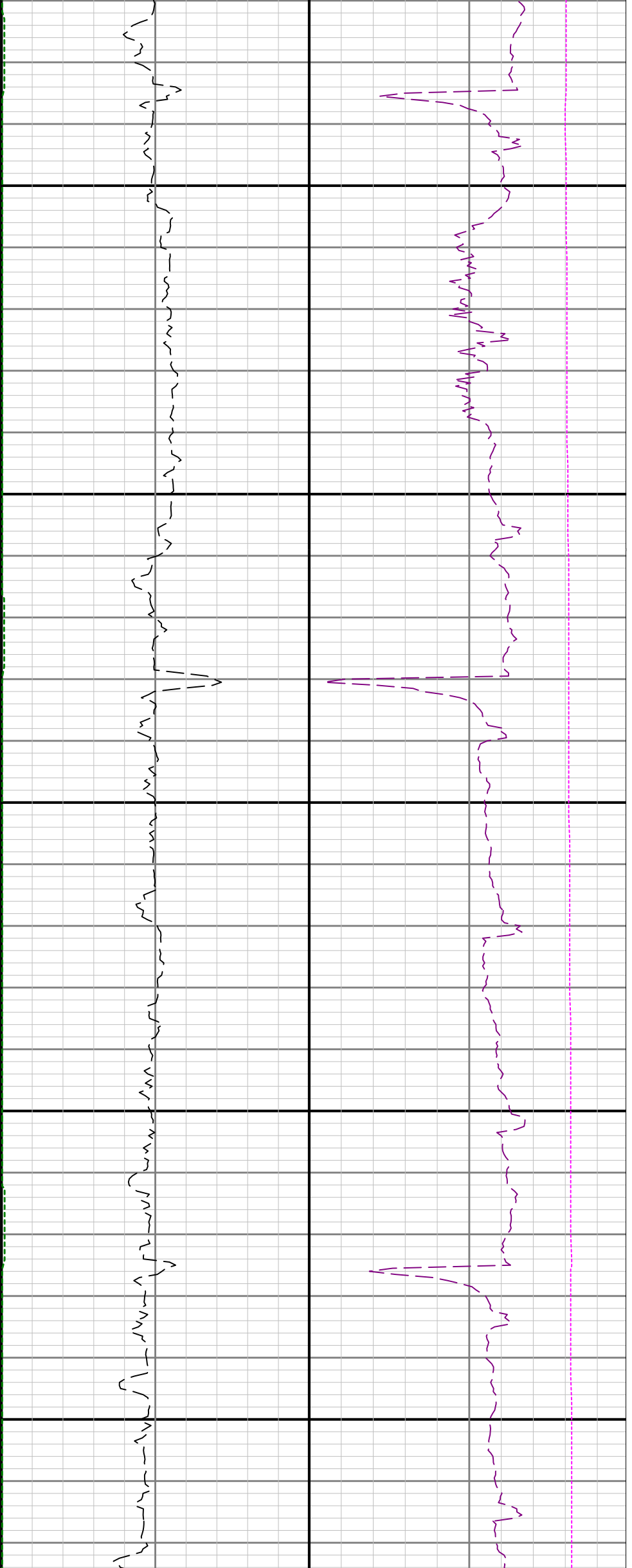
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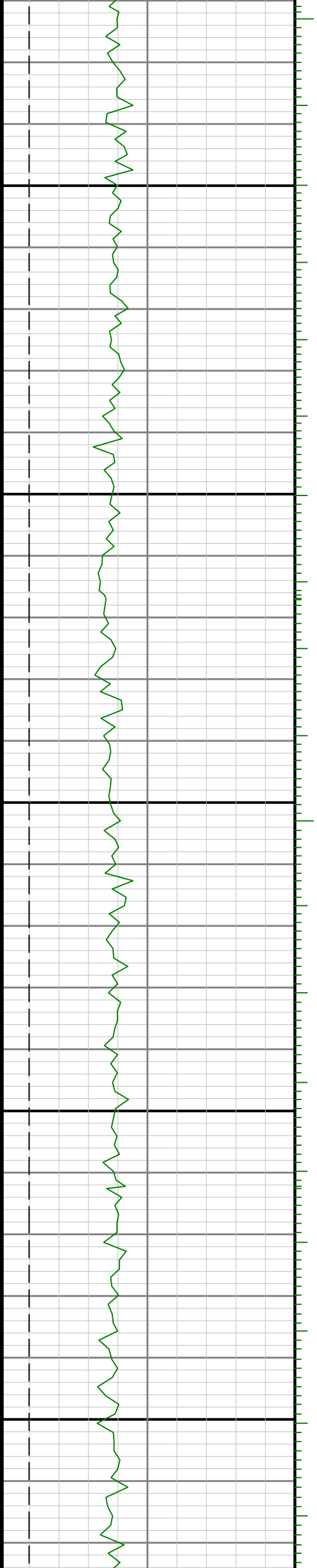


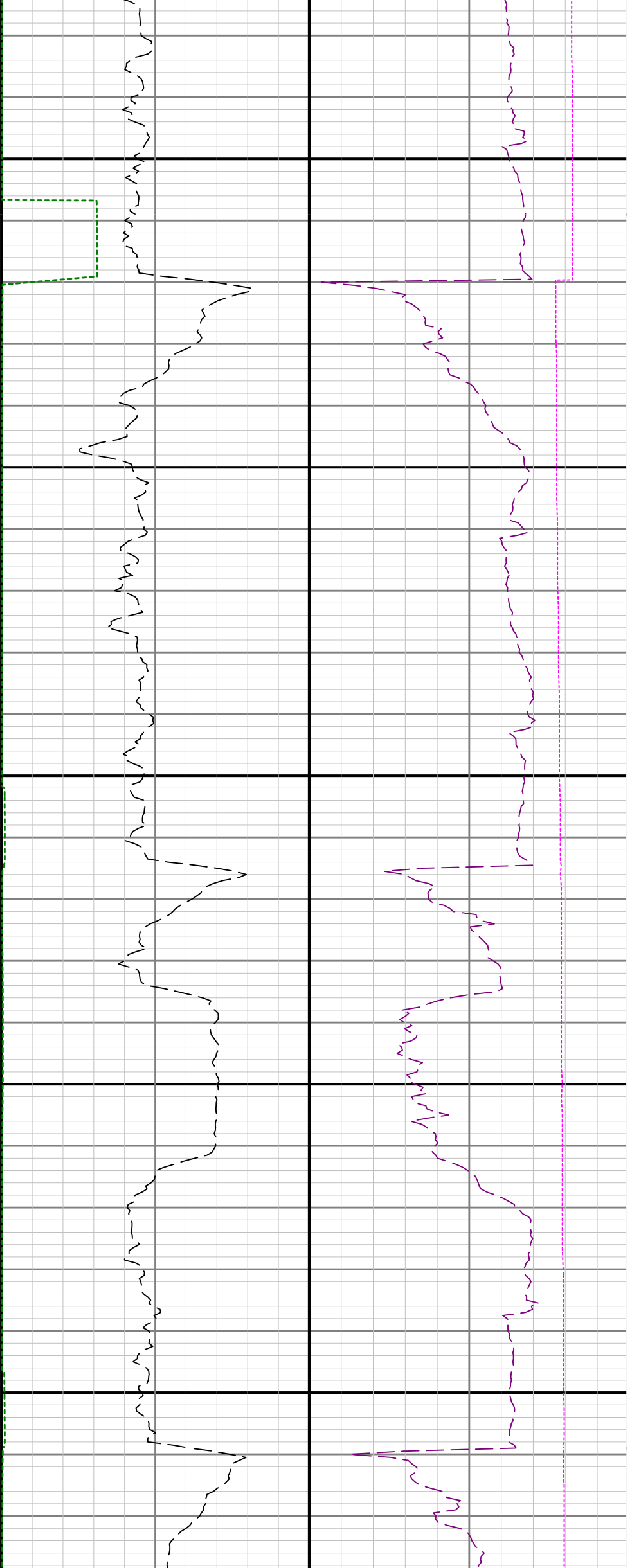


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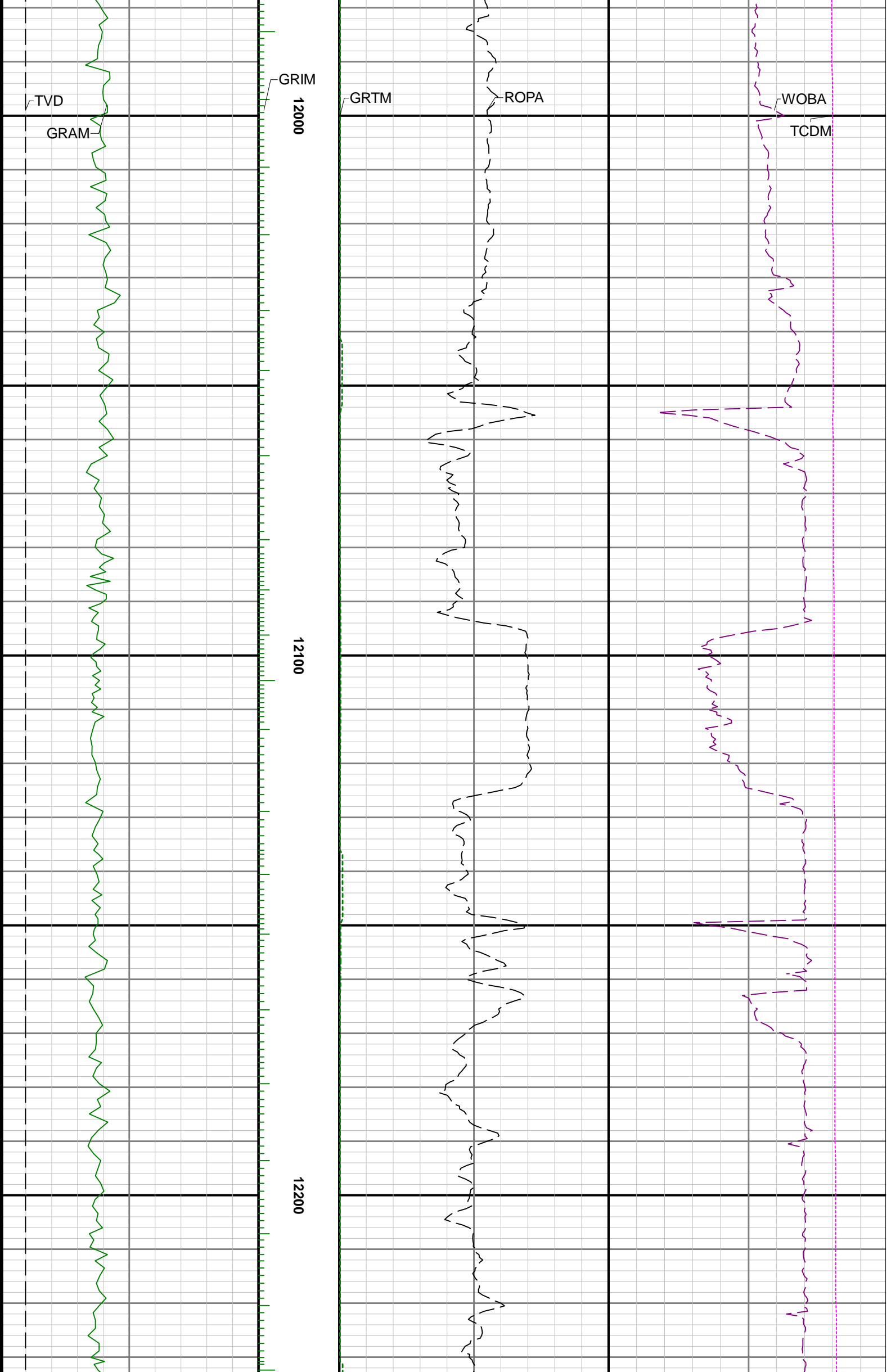
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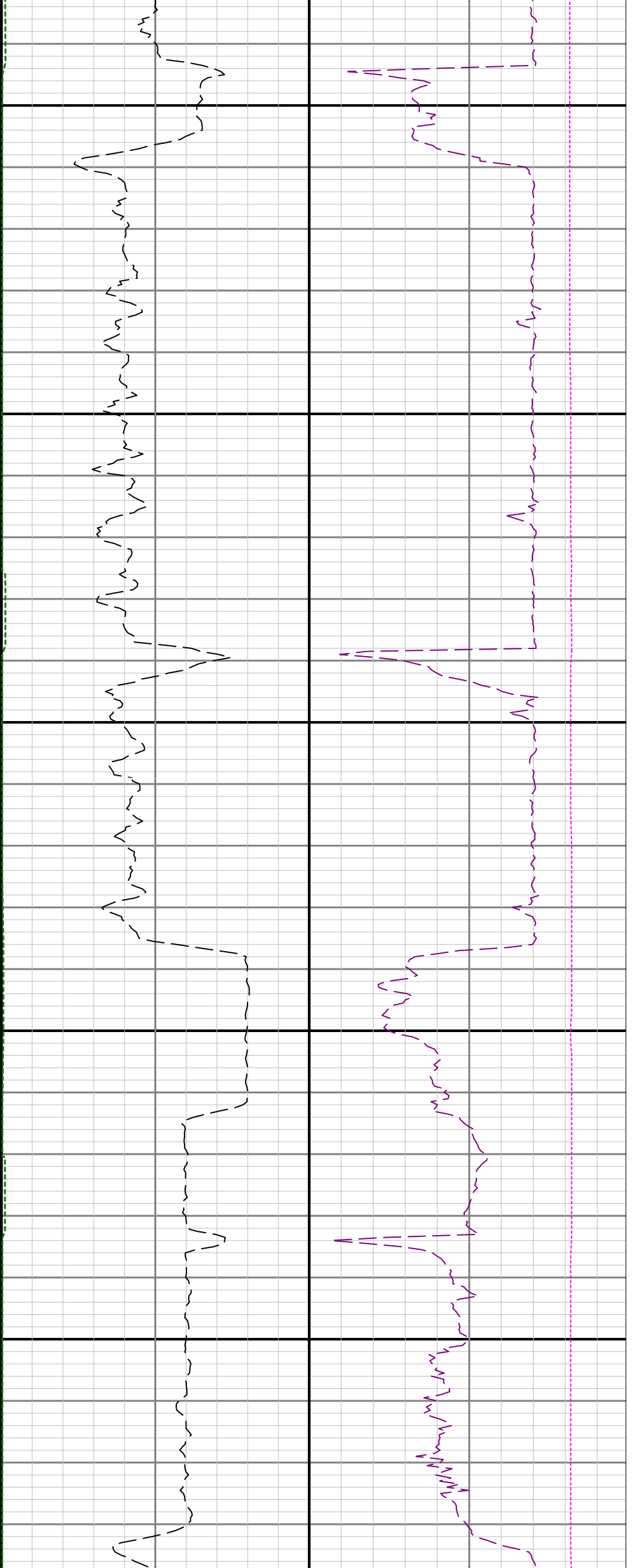




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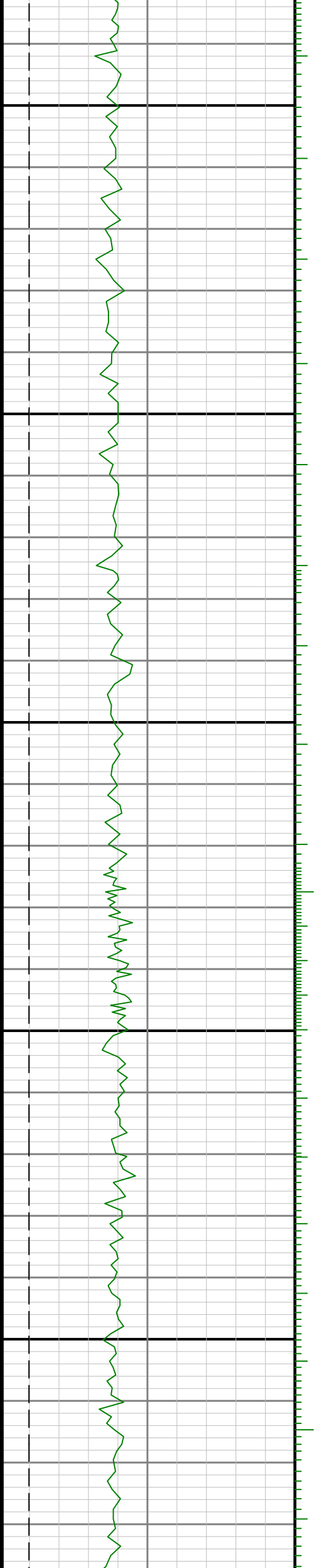
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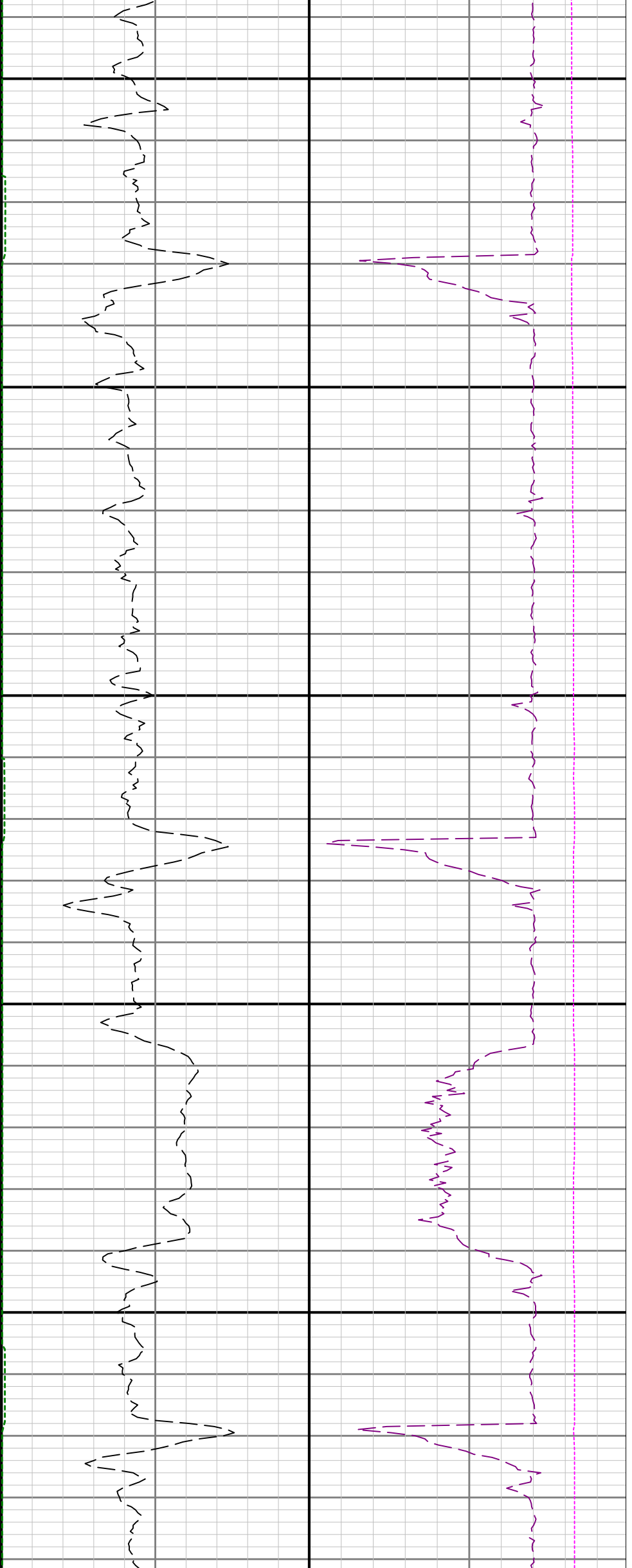




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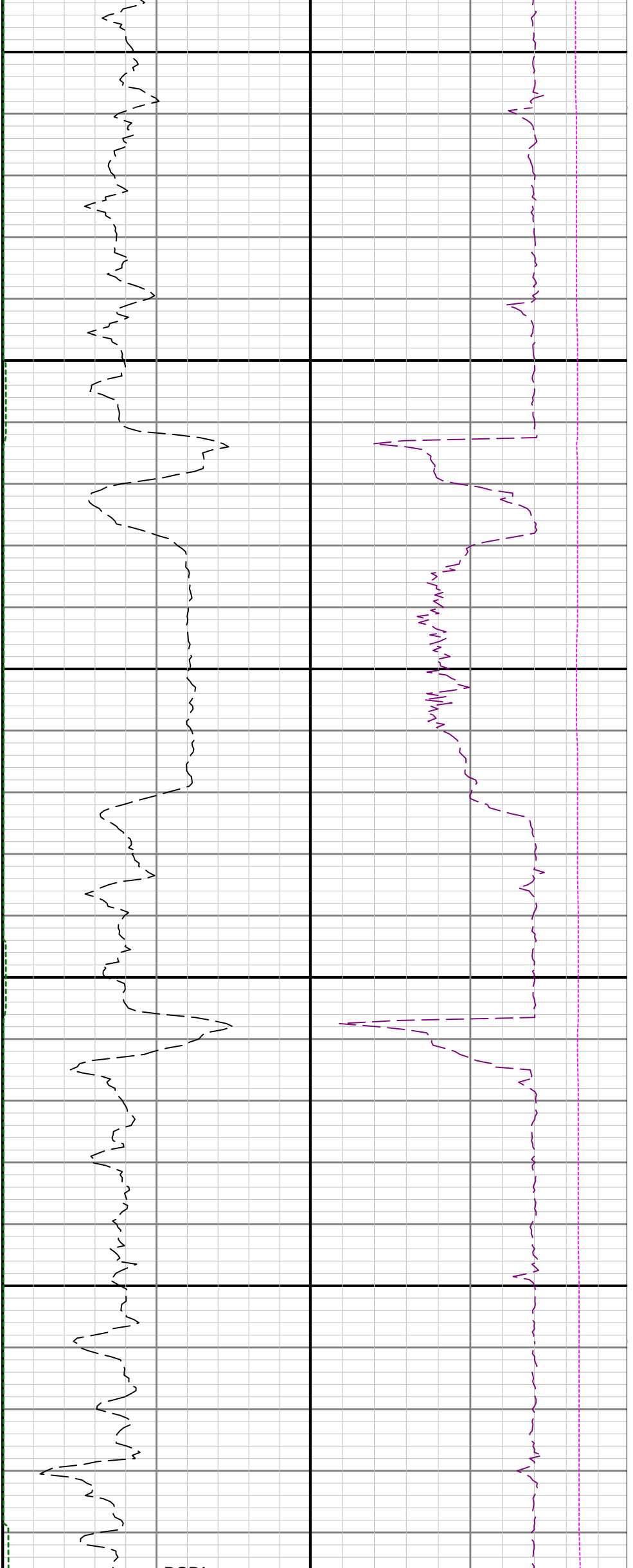




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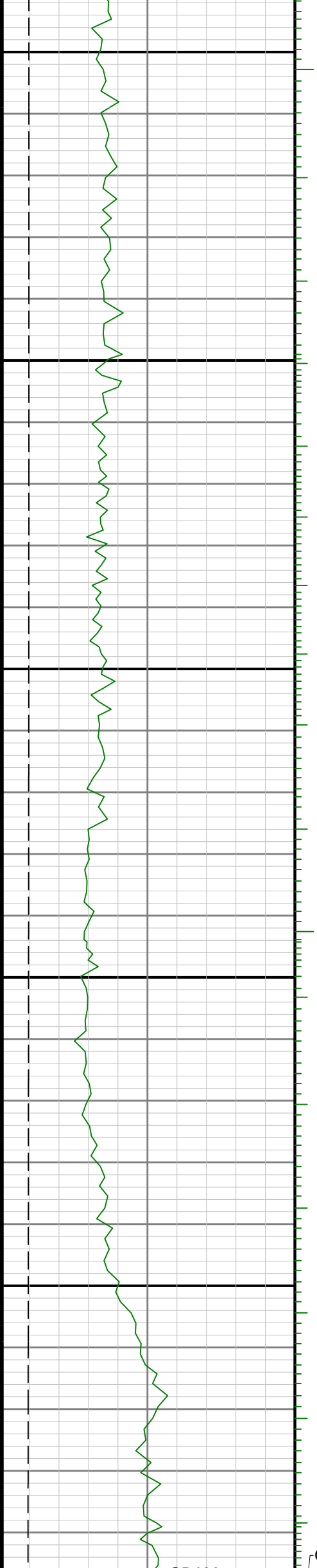
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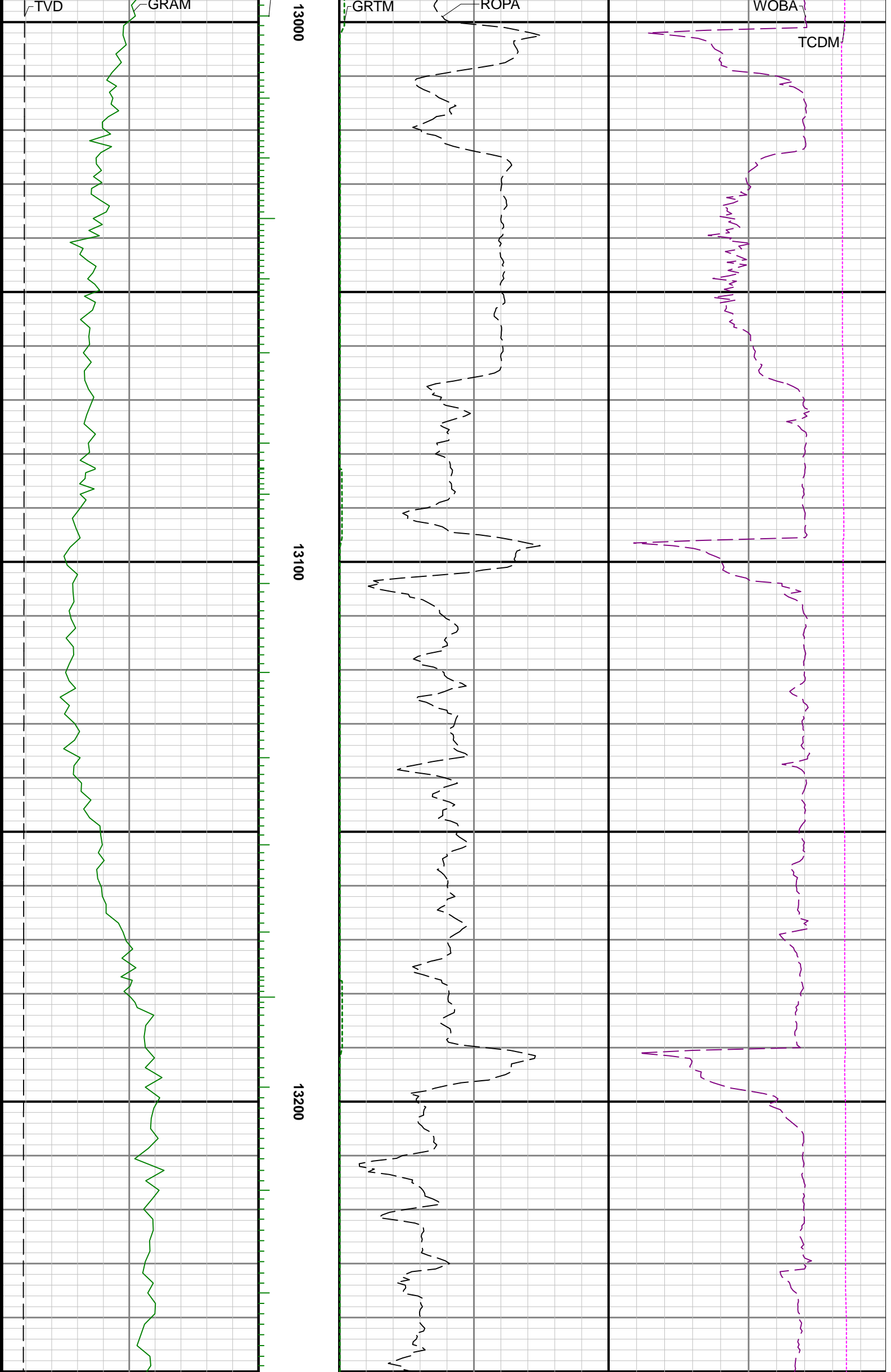


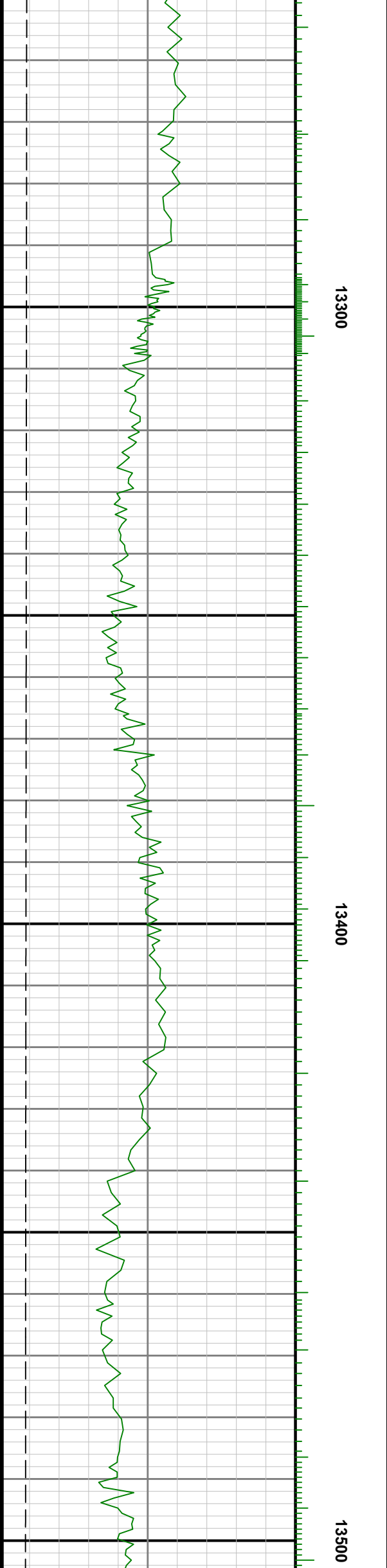
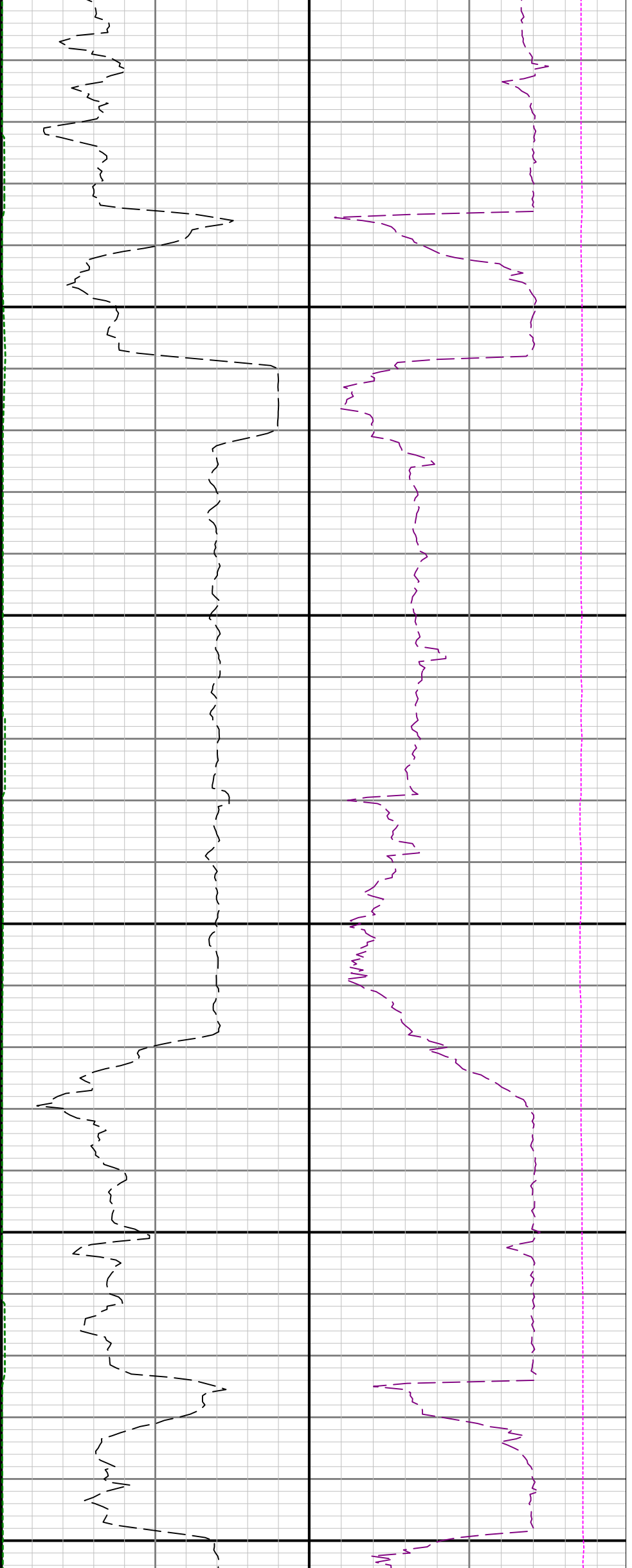
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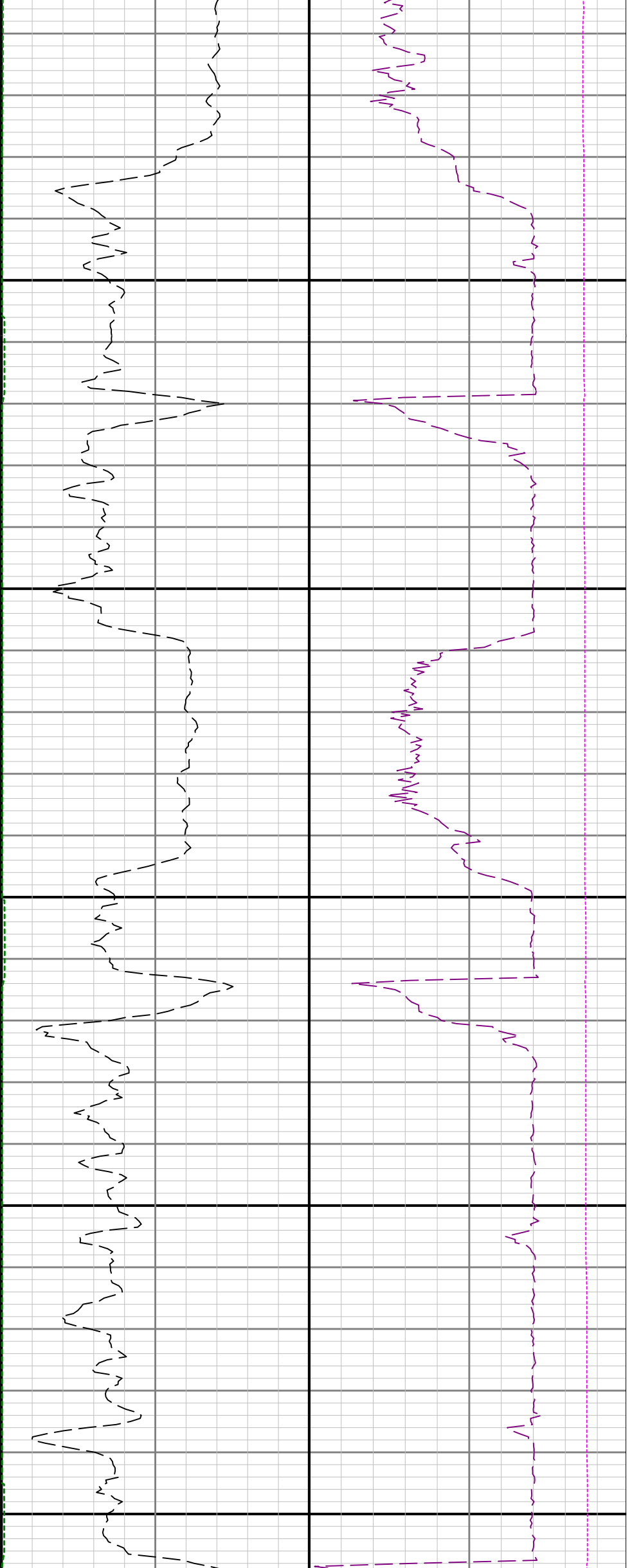
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GRIM



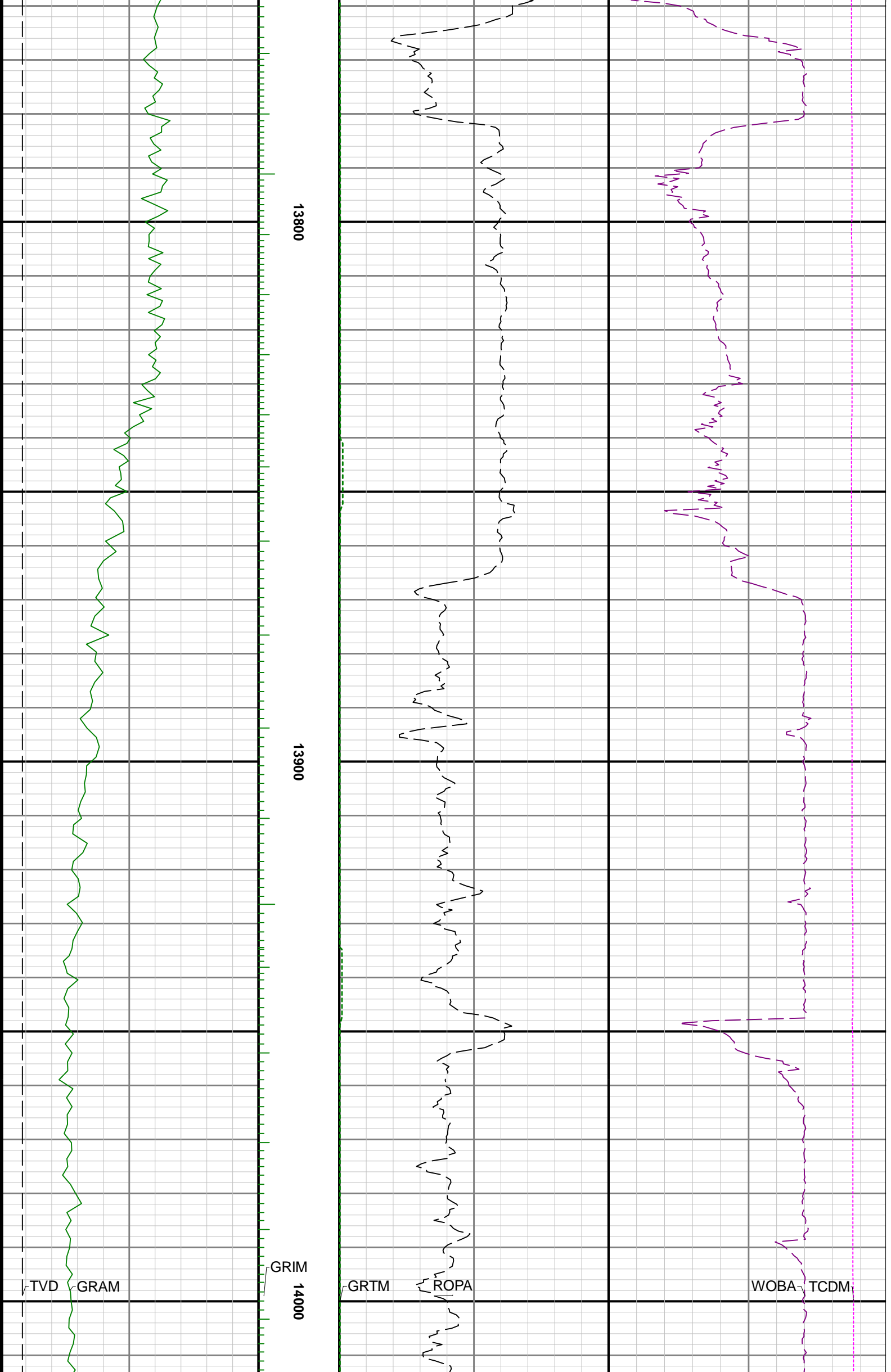


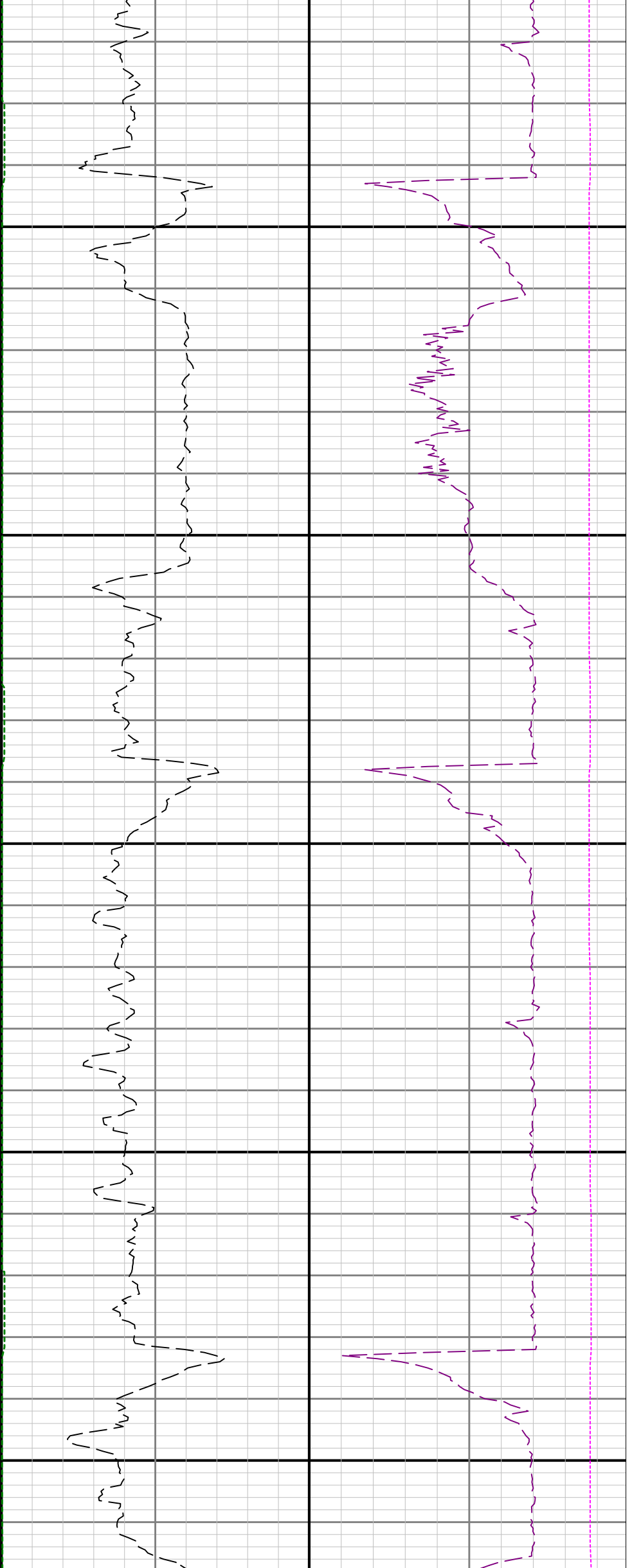




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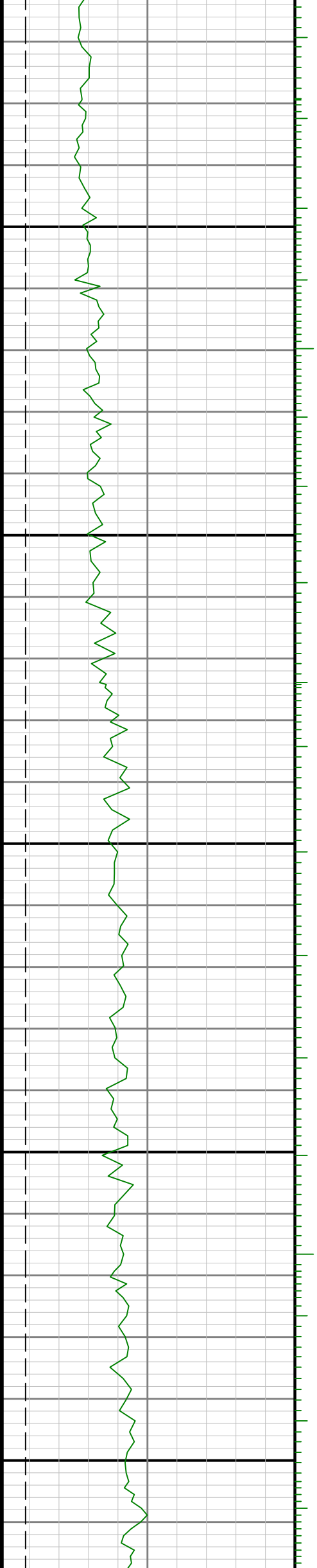
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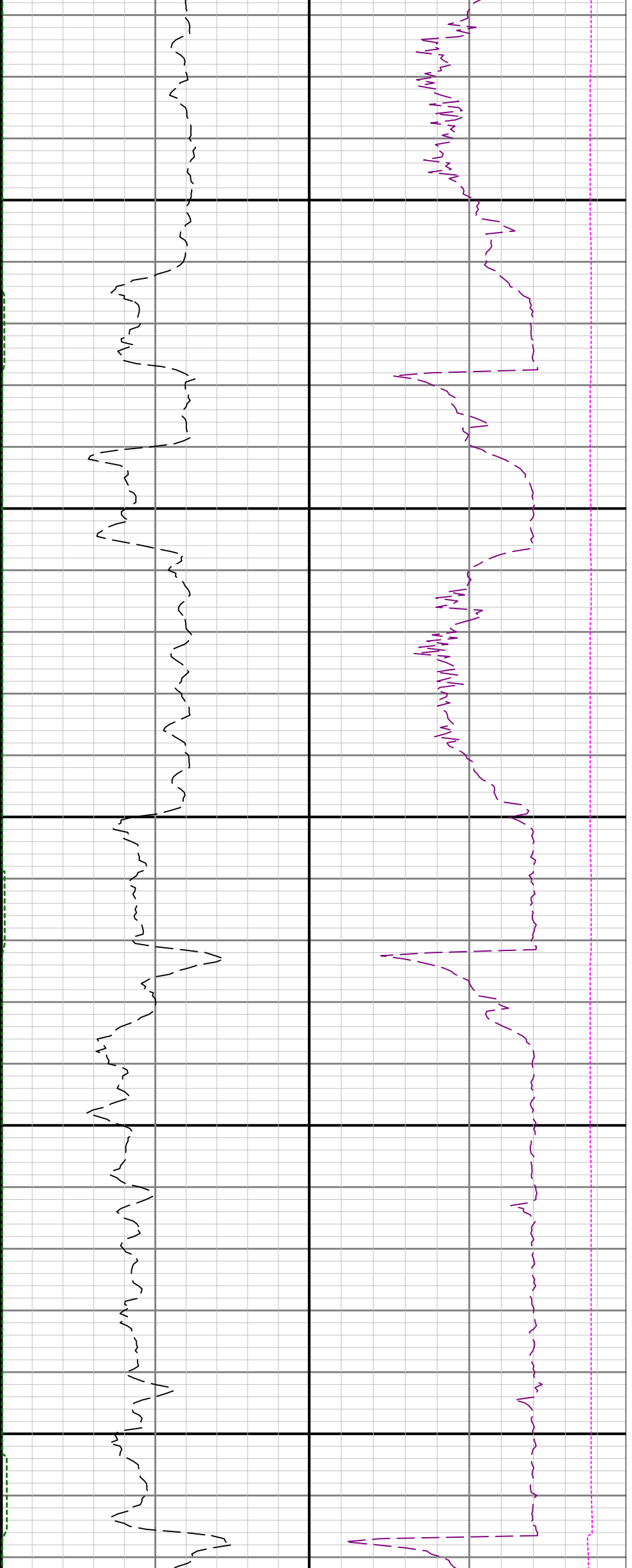




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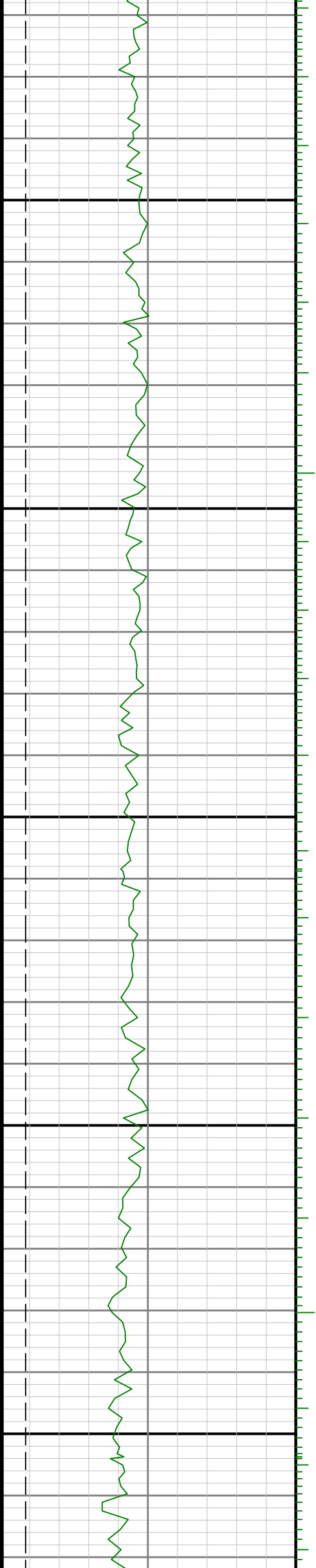


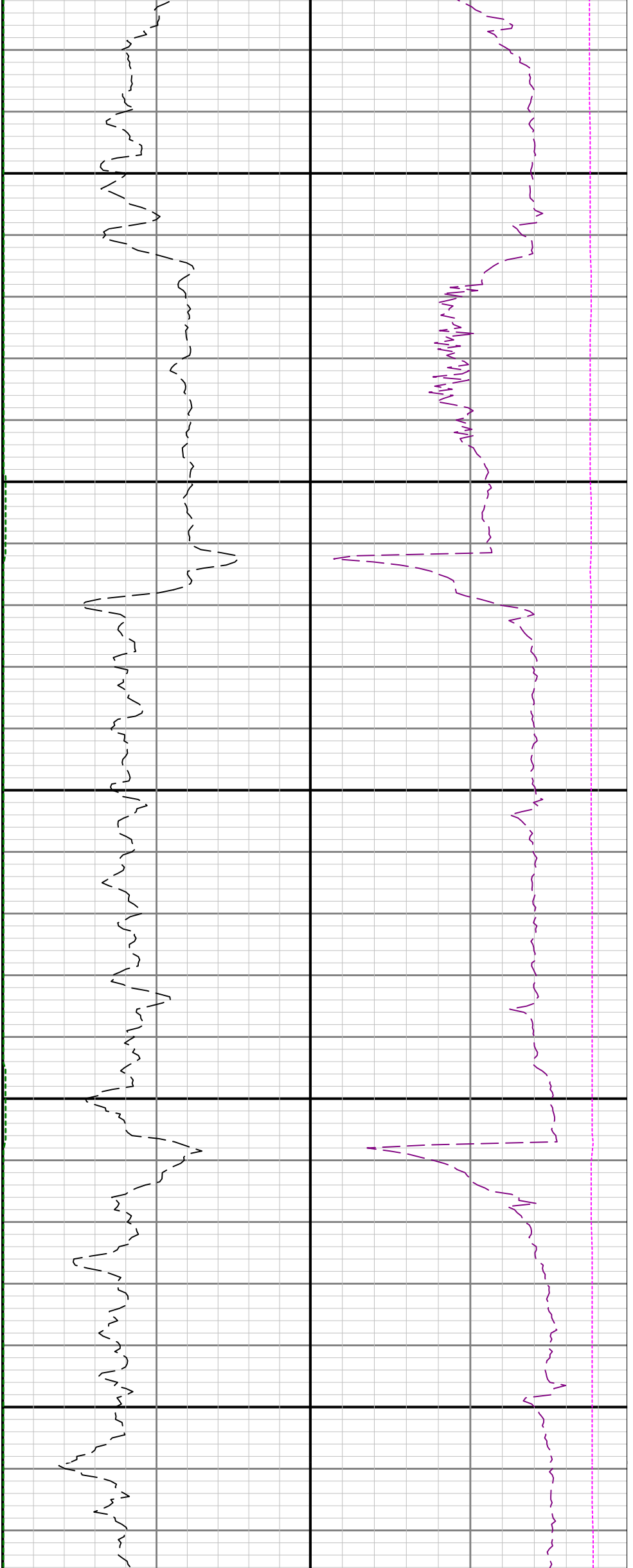


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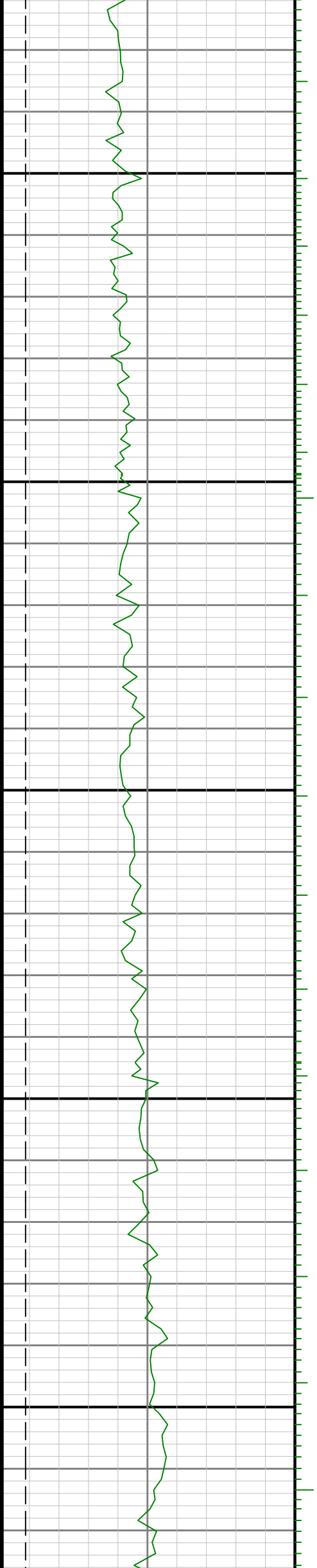
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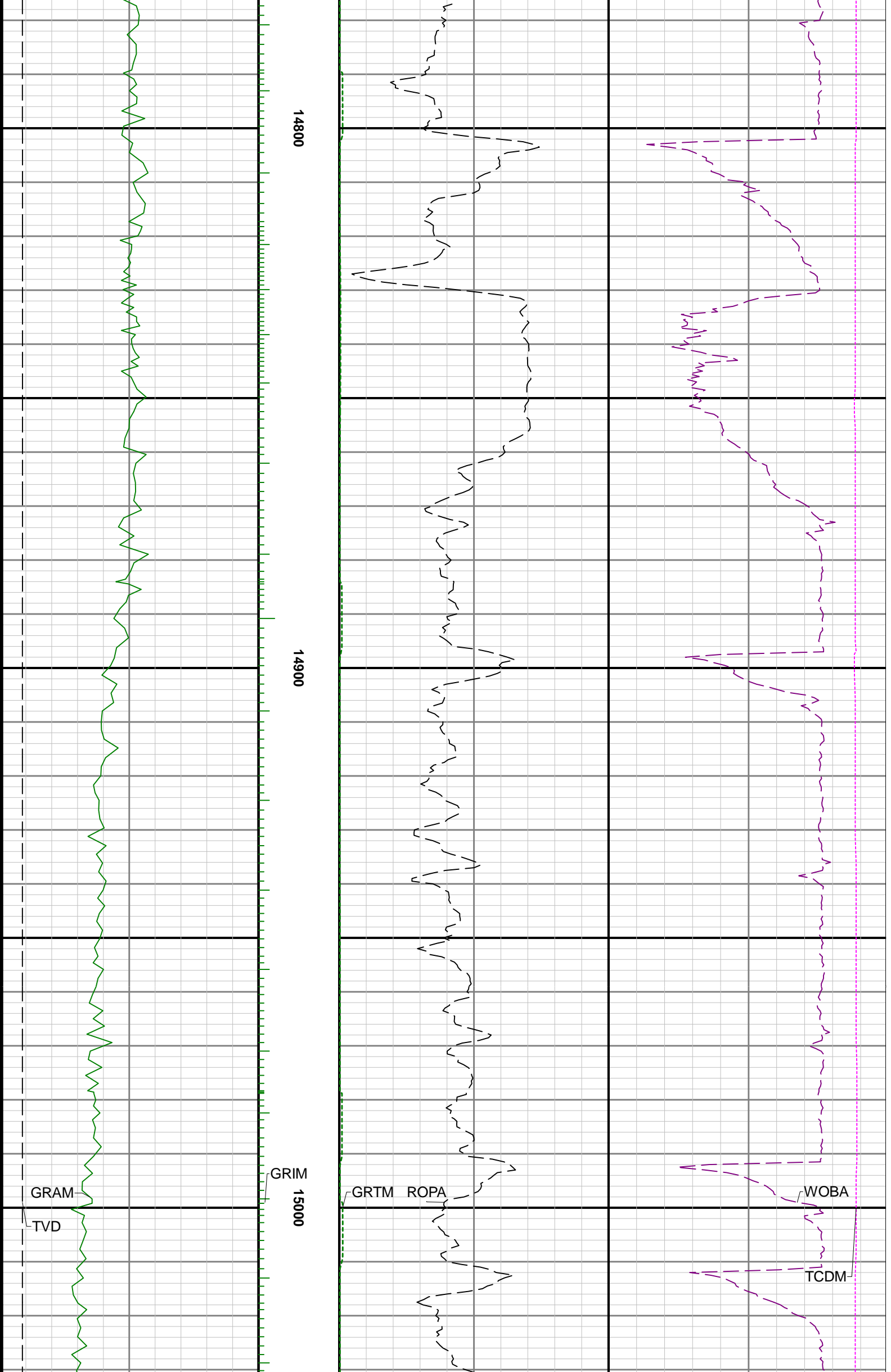


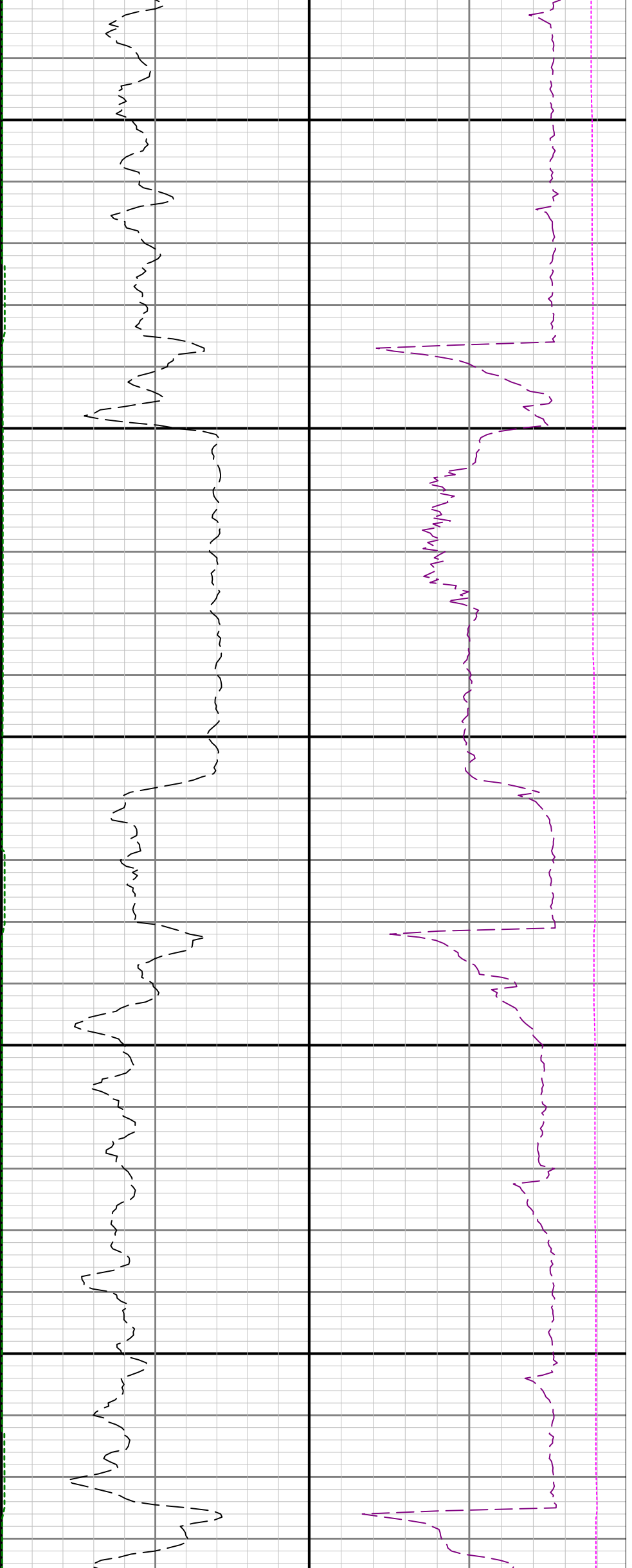


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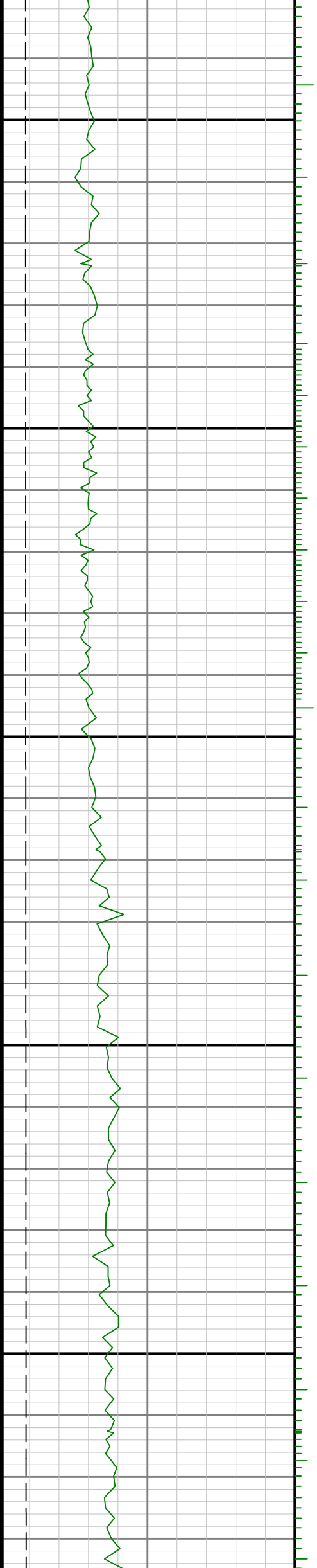


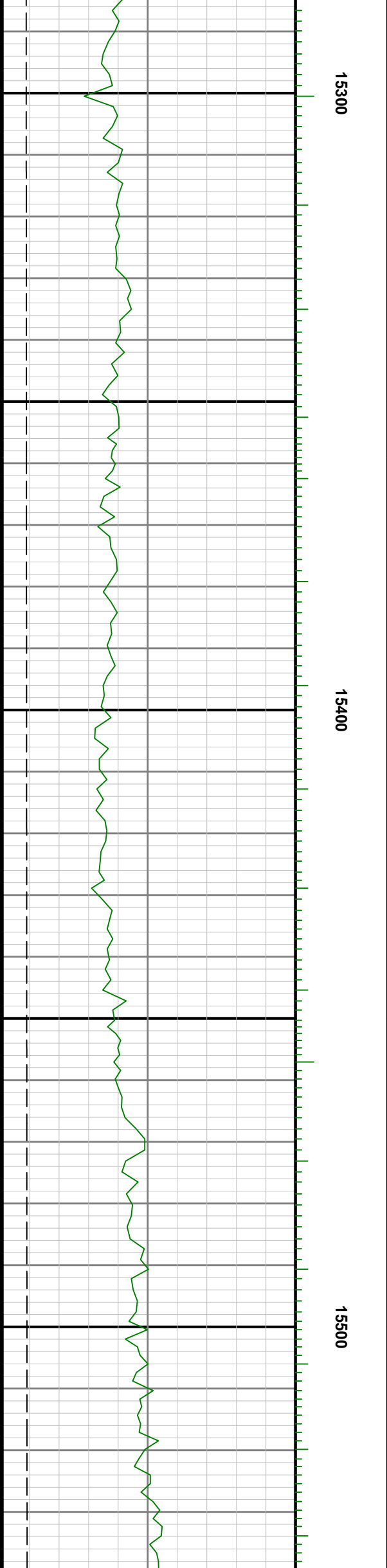
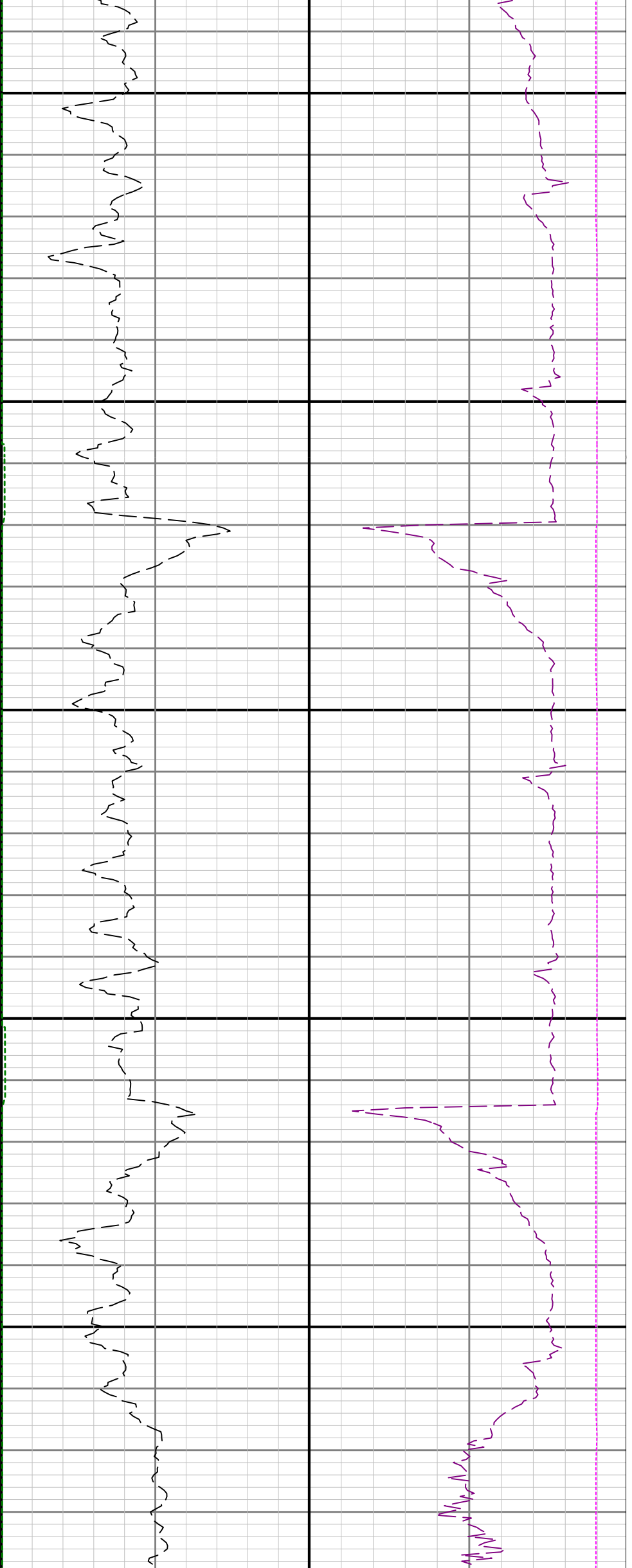


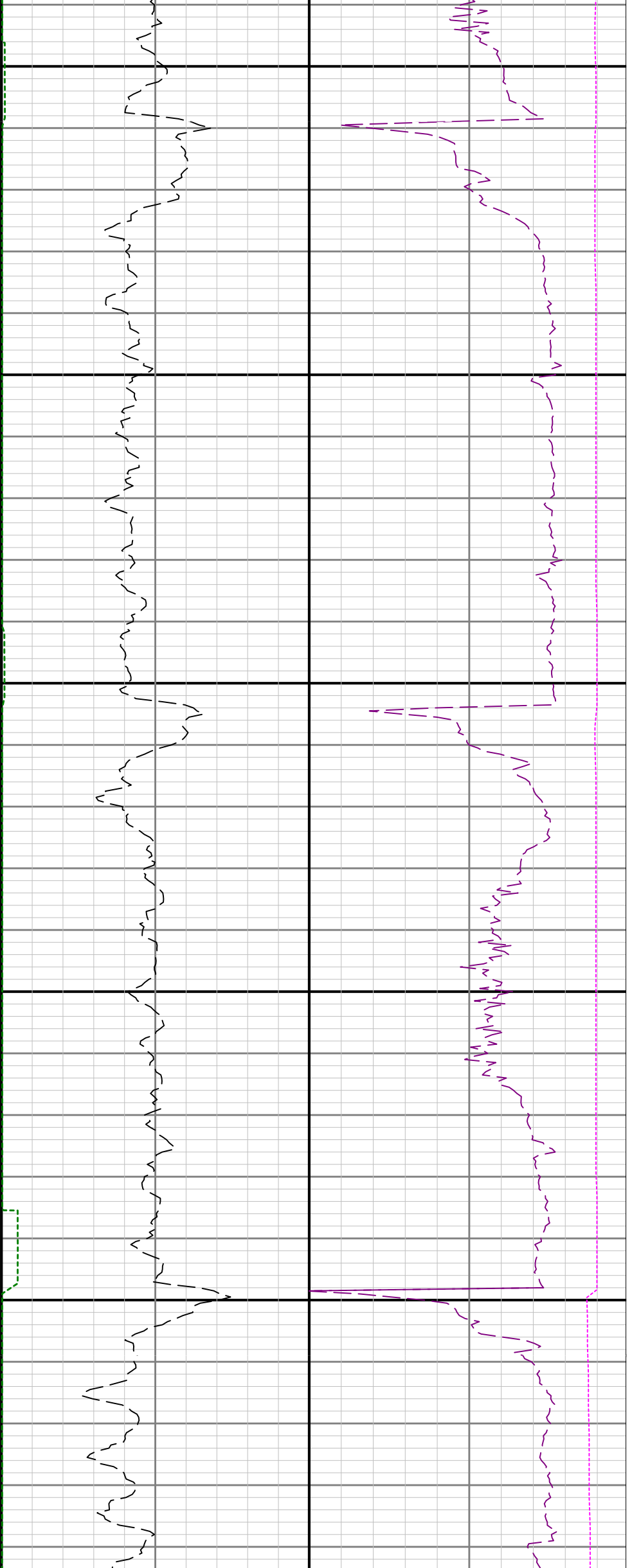


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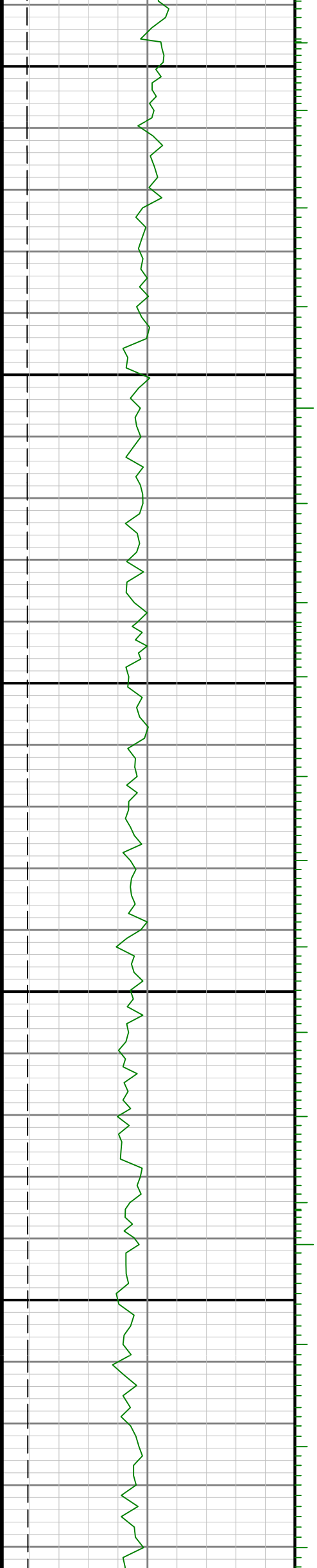


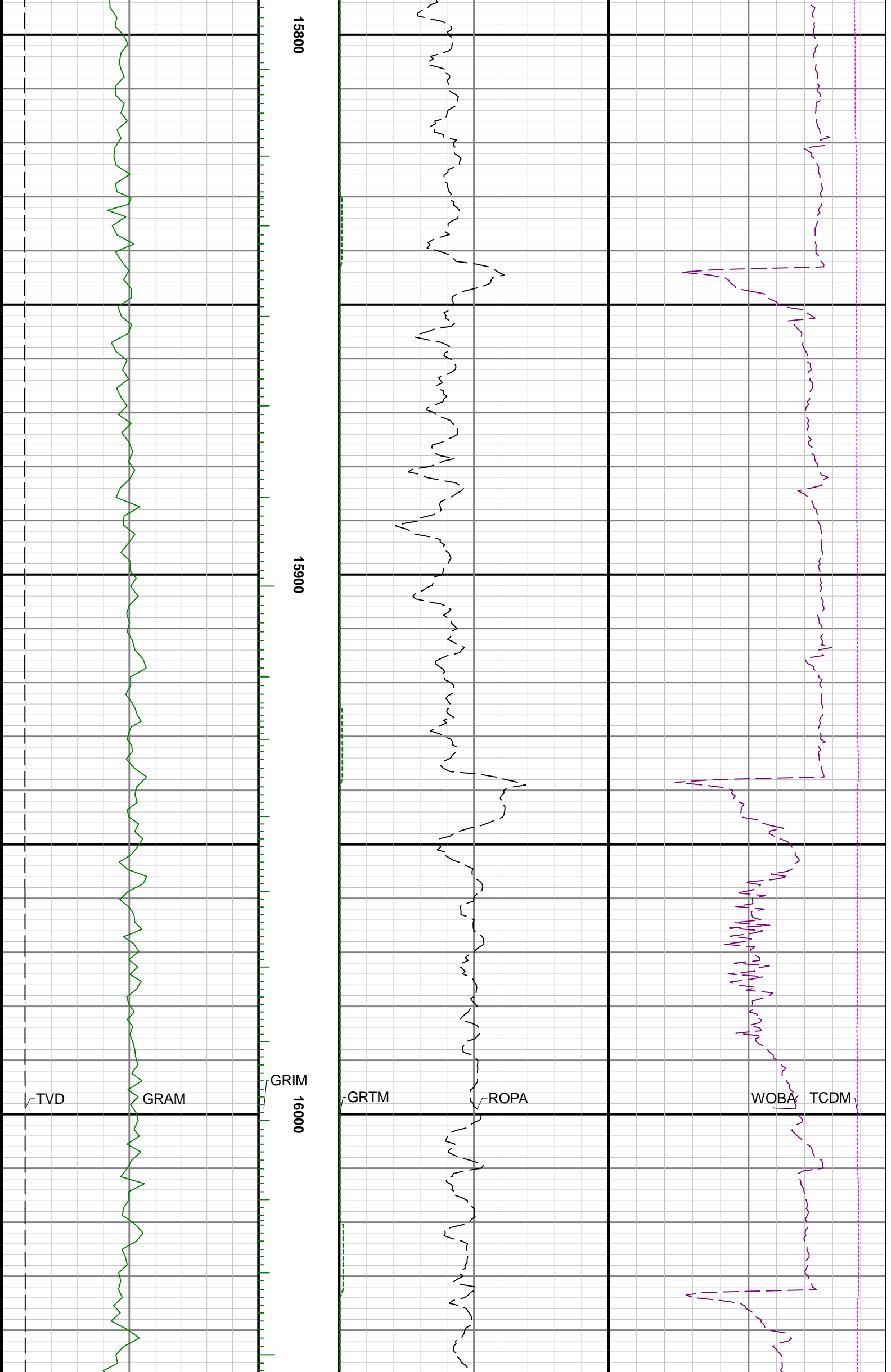


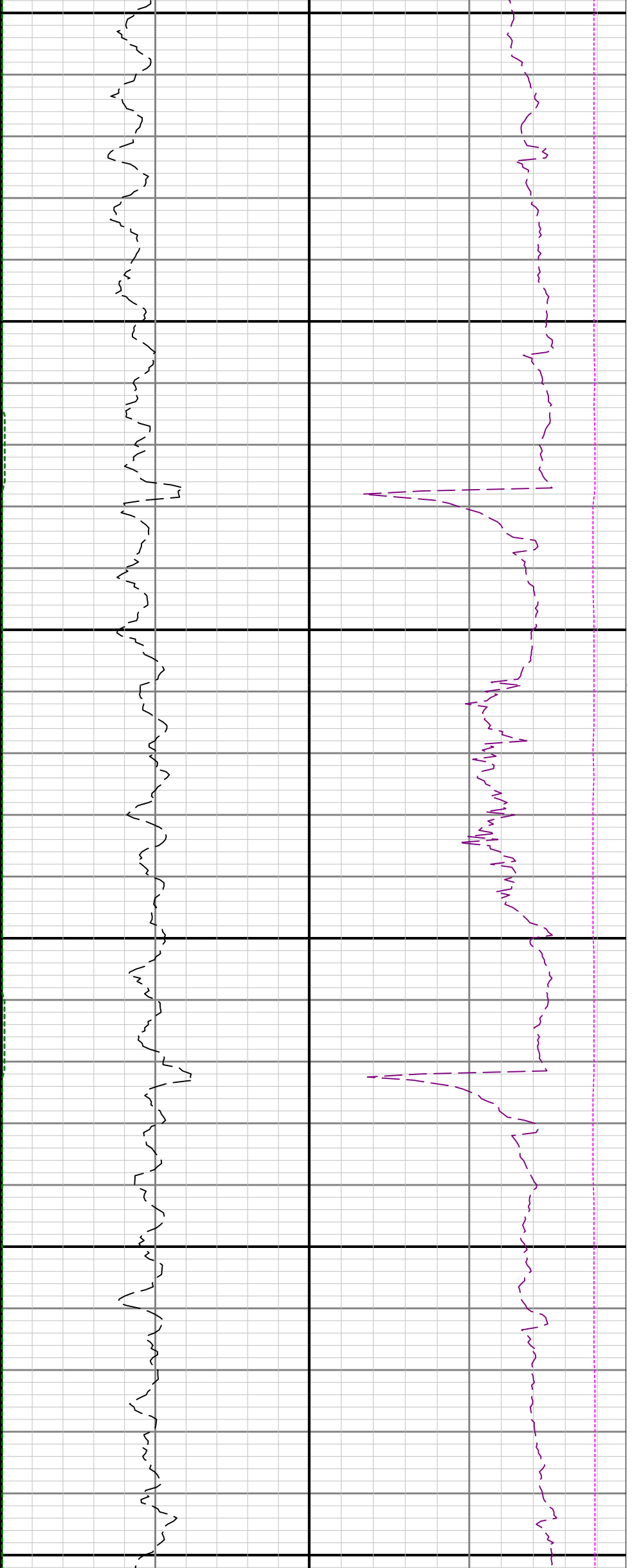


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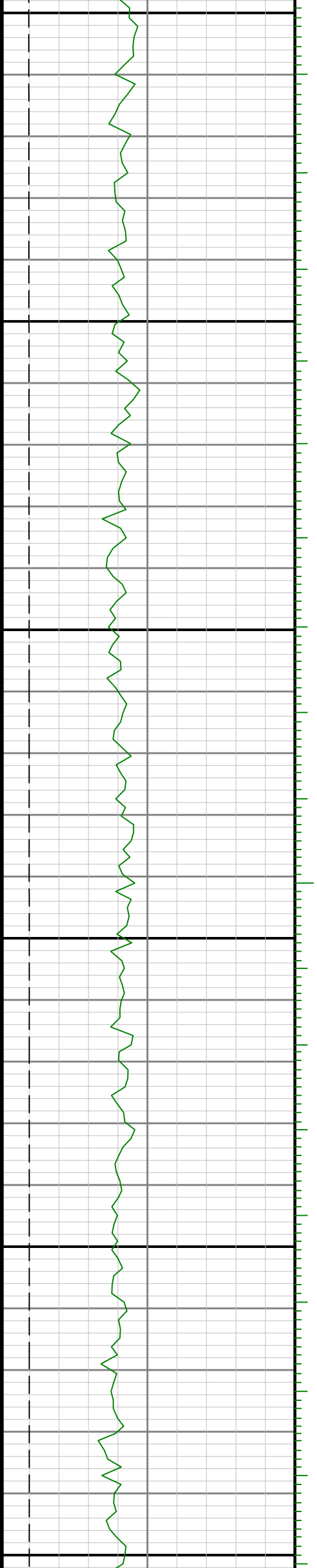


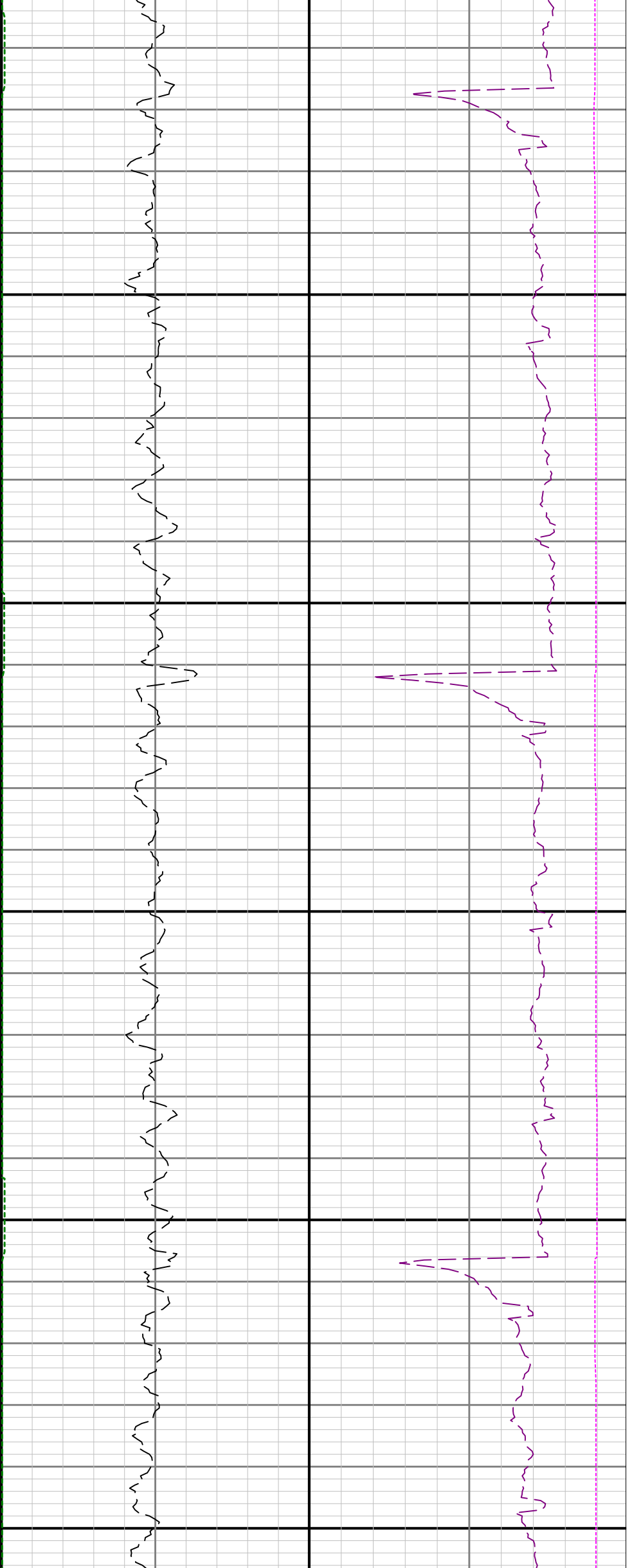


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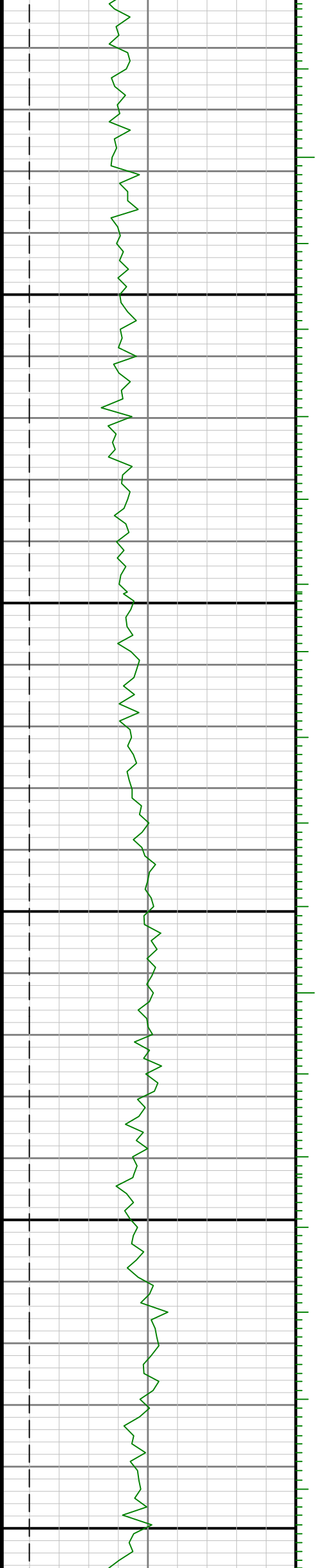
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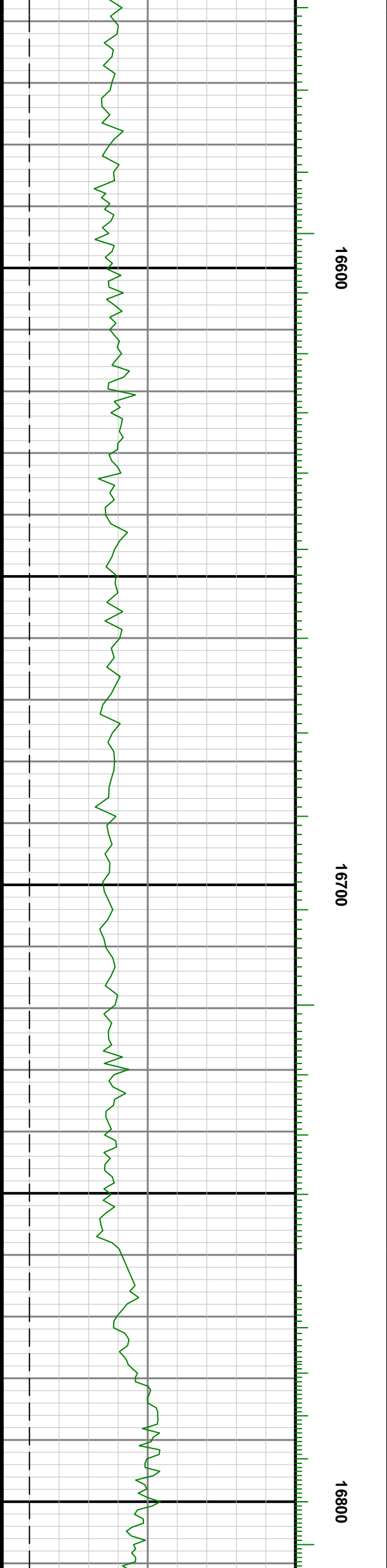
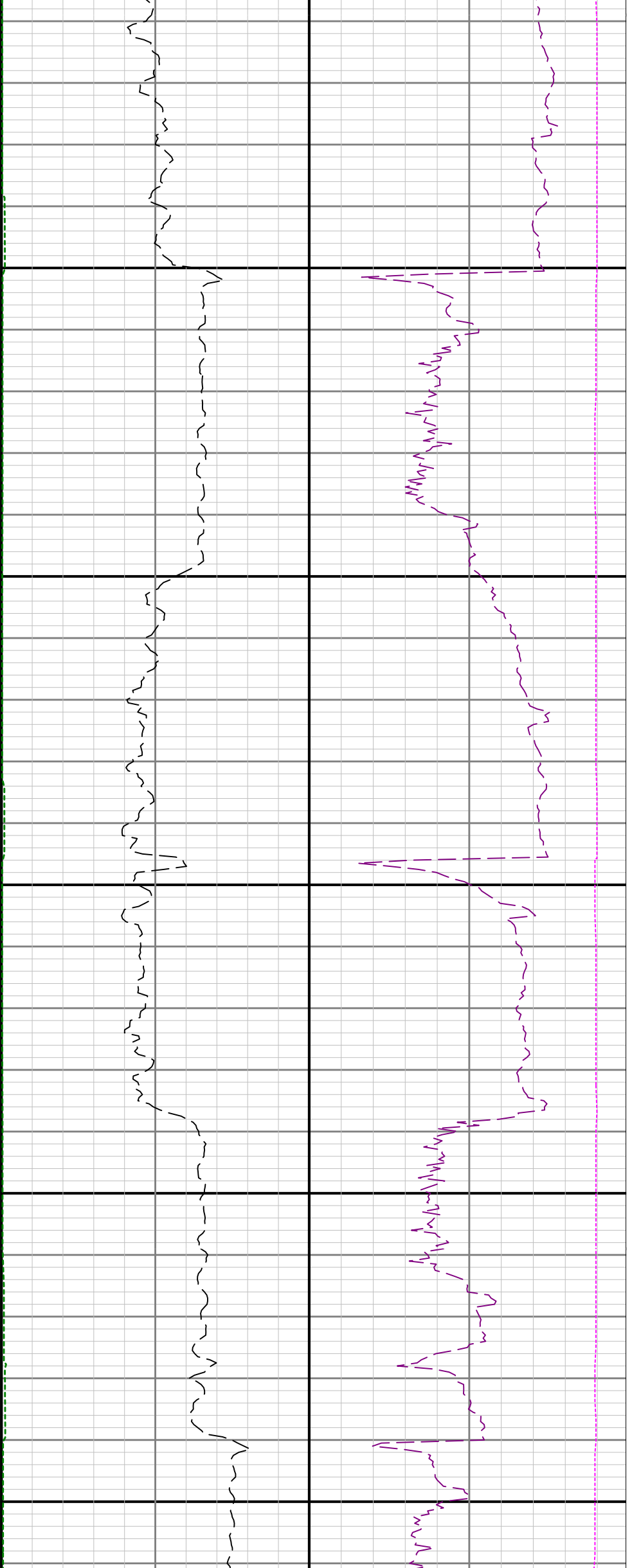
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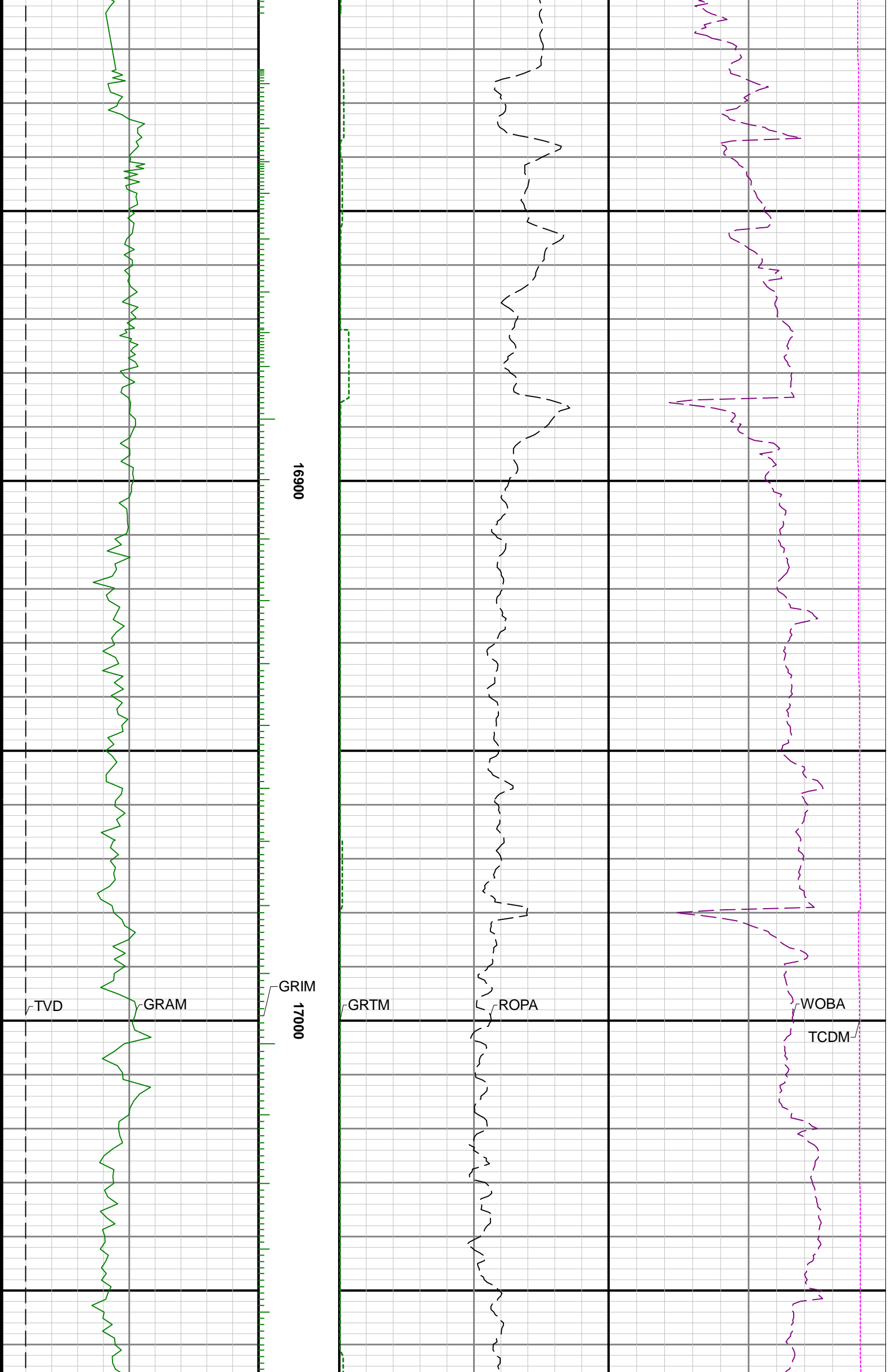


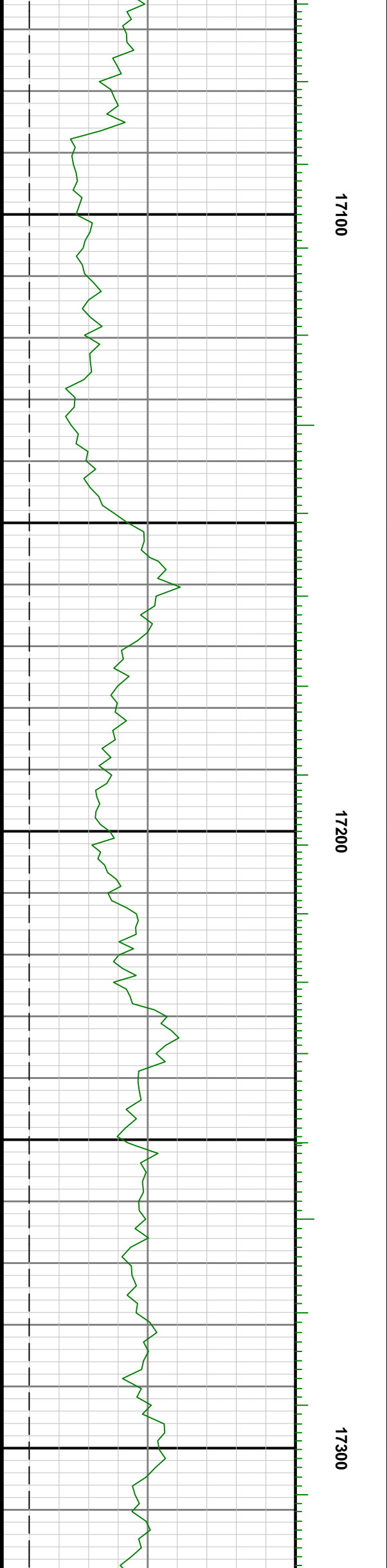
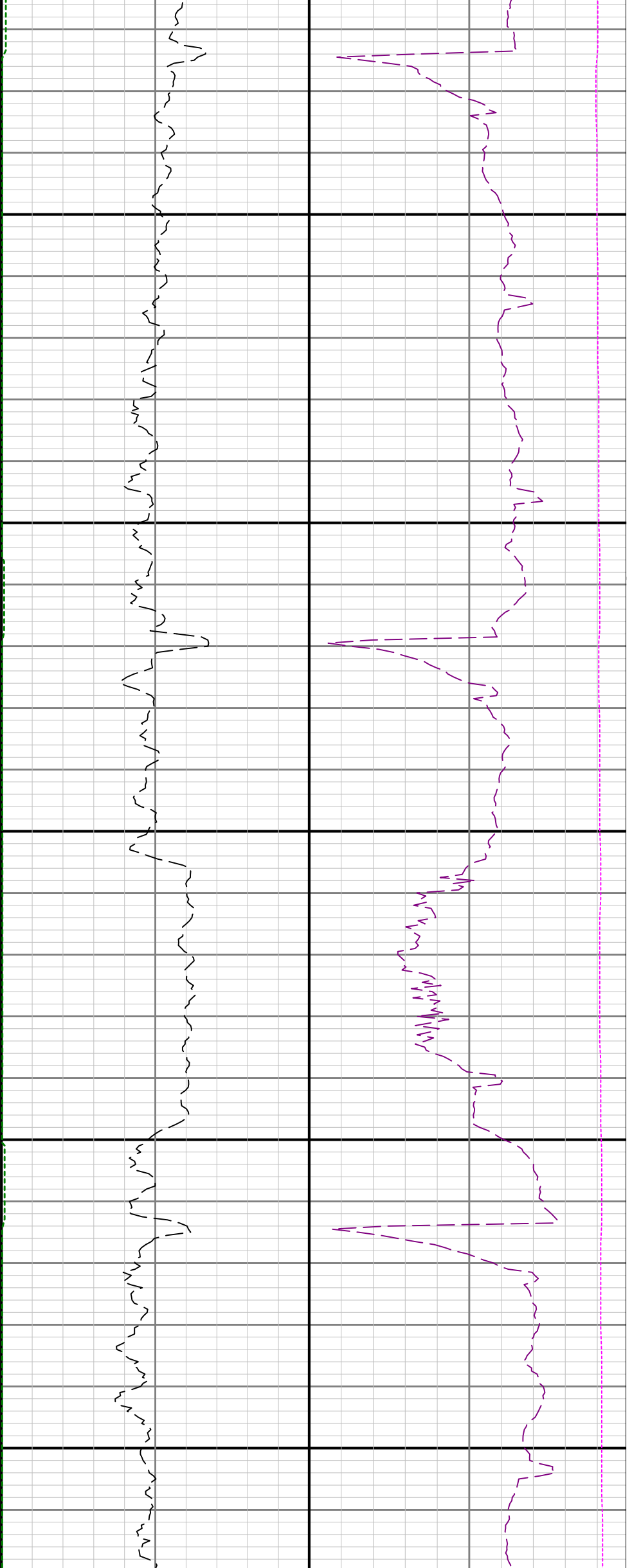


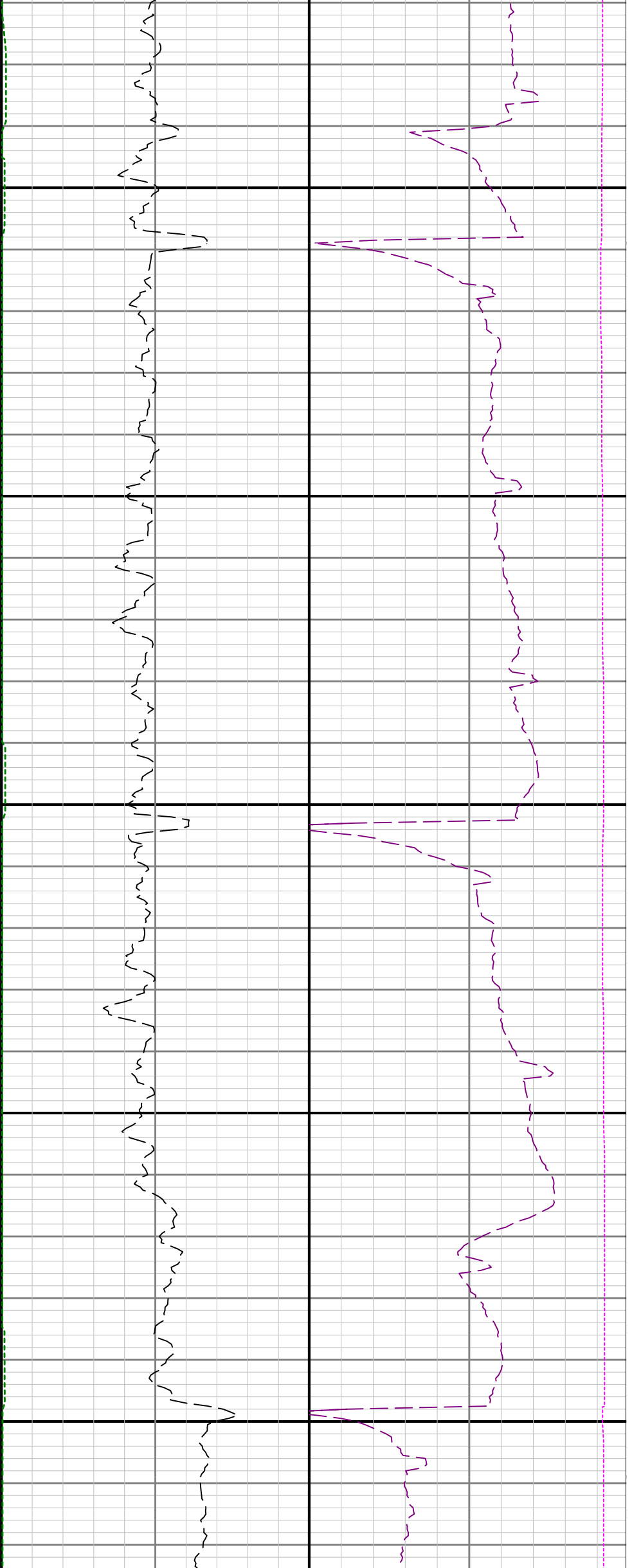
0 16400 16500











17400

17500

