



LWD MEMORY LOG

Gamma Ray

Scale: **Company: Noble Energy**

Well:	Roth A32-60
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Measured Depth	Field:	Wattenberg
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Depth Reference:	County:	Weld	Country:	United States

Driller's Depth **State:** **Colorado**

Status:	Surface Location:	Other Services:
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Latitude: 40° 27' 41.112" N

API No:	05-123-51330-00	Directional
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Job ID: 111055131

SEC: 30 TWN: 6N RGE: 64W

Permanent Datum (P.D.):	Mean Sea Level	Elevation:	0.00 ft	Elev. KB:	N/A
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Log Measured From:	Rig Floor	Above P.D.:	4727.00 ft	Elev. GL:	4697.00 ft
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From: 2021-10-28	Drilled (ft)	Logged (ft)	Azi Reference North:	Grid	Dip Angle: (deg)	66.75
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Sum:	2021-10-01	Bottom:	1Z605.00	Bottom:	1Z591.00	Mag to Reference North Correction: (dec)	Z 01
10:	2021-10-31	10p:	1940.00	10p:	1940.00	Total Magnetic Field Strength: (H)	51886

Borehole Record	Casino Record
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Borehole Record Casing Record

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
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13.500	30.00	1940.00	9.625	36.00	30.00	1930.00
0.500	40.00	4200.00				

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		○ ○ ○ ○
		○ ○ ○ ○

[illegible]

Mud Record

Deviation Record

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
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Oil Based Mud	1940.00	17605.00	8.500	15665.00	0.39	189.31	90.03	177.00
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Acquisition System	Software Version	Other

Cadence	RT 6.1	Rig: H&P 517
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DeliverableGen	6.1.9214.1	Contractor:	Helmerich & Payne Drilling Co
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District:	RMA	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
						Top	Bottom	From	To	Start Logging	End Logging	
						(ft)	(ft)	(ft)	(ft)			
1	1	8.500	PDC	3.00	AutoTrak Curve	1940.00	12498.00	1940.00	12511.00	2021-10-28 12:13	2021-10-30 07:00	39.49
2	2	8.500	PDC	3.00	AutoTrak Curve	12498.00	17592.00	12511.00	17605.00	2021-10-30 22:17	2021-10-31 16:07	18.97

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Carl Riehn	2021-10-28	2021-11-01	Marco Favela	2021-10-28	2021-11-01	Michael Gurnsey	2021-10-28	2021-11-01
Sherman Pugh	2021-10-28	2021-11-01	Tien Bui	2021-10-28	2021-11-01			

Witness

Name	Run
Drew Greedes	1,2

Mud Properties Record

Date / Time	Run No.	Depth (ft)	Mud Type	Density (ppg)	Viscosity (cP)	pH	Fluid Loss (cm3)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
2021-10-27 21:25	1	1940.00	Oil Based Mud	9.3	10	N/A	17.5	79.5/20.5	Active Pit	25500	0.00
2021-10-30 08:14	1	12230.00	Oil Based Mud	10.2	15	N/A	18.0	78.6/21.4	Active Pit	27500	0.00
2021-10-30 16:25	2	12511.00	Oil Based Mud	10.2	15	N/A	18.0	78.6/21.4	Active Pit	27500	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	12099245	Near Bit Inclination	5.93	6.77	7.000	4.330
1	AutoTrak Curve Steering Unit	12099245	Near Bit WCC	5.93	6.77	7.000	4.330

1	AutoTrak Curve Steering Unit	12099245	Near Bit VSS	5.93	6.77	7.000	4.330
1	AutoTrak Curve MWD	12304801	Gamma (single)	2.78	12.94	7.000	3.250
1	AutoTrak Curve MWD	12304801	Directional (mag)	12.27	22.43	7.000	3.250
2	AutoTrak Curve Steering Unit	15141454	Near Bit VSS	5.93	6.77	7.000	4.330
2	AutoTrak Curve Steering Unit	15141454	Near Bit Inclination	5.93	6.77	7.000	4.330
2	AutoTrak Curve MWD	14880556	Gamma (single)	2.76	12.94	7.000	3.250
2	AutoTrak Curve MWD	14880556	Directional (mag)	12.27	22.45	7.000	3.250

Service and Tool Mnemonics

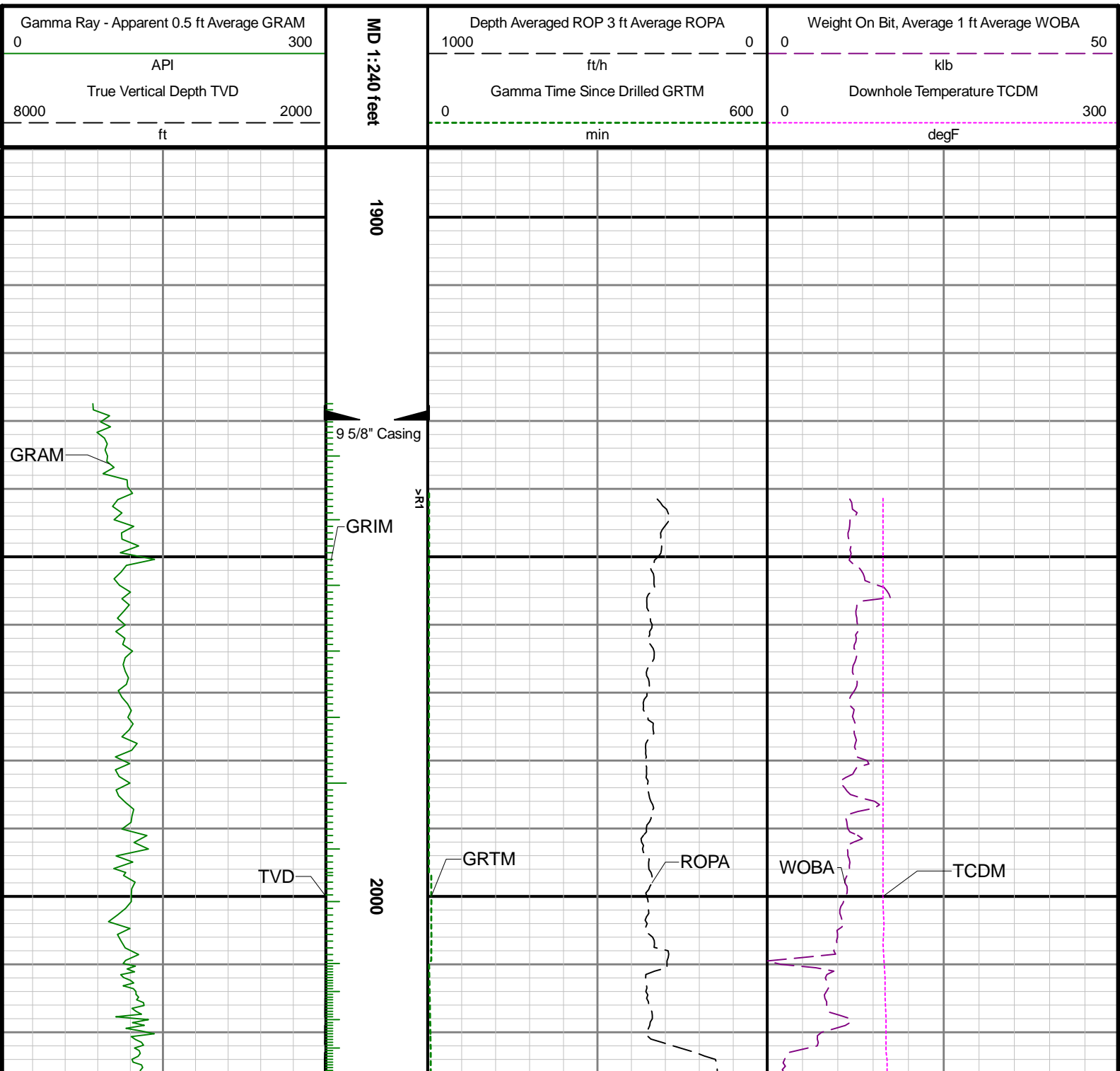
Mnemonic	Name	Description
ATC SU	AutoTrak Curve SU	Auto Trak Curve Steering Unit
ATC MWD	AutoTrak Curve MWD	Auto Trak Curve MWD
ATC LCPM	AutoTrak Curve LCPM	Auto Trak Curve LCPM

Comments

- Baker Hughes Company runs 1 and2 utilized 6 ¾ inch NaviGamma services (Gamma Ray and Directional) behind an 8 ½ inch PDC bit and rotary steerable assembly from 1940 to 17605 feet MD (1940 to 6811 feet TVD).
- Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to a lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified and the unverified depths as supplied to Baker Hughes are being used to present logging data.
- The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API per the customer's request.
- Several gaps appear in the log due to drilling ahead before the assembly had time to properly power on.

Remarks

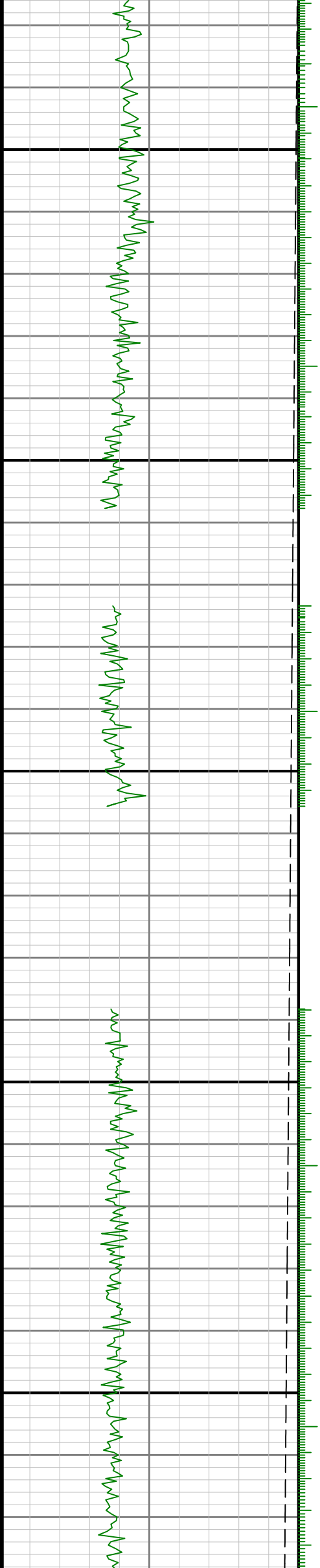
Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	12498.00	8.500	1	The interval from 12498 to 12511 feet MD (6795 to 6795 feet TVD) was logged up to 15 hours after being drilled due to a trip out of the hole for MWD tool failure.
2	17592.00	8.500	2	The interval from 17592 to 17605 feet MD (6811 to 6811 feet TVD) was not logged due to sensor to bit offset at well TD.

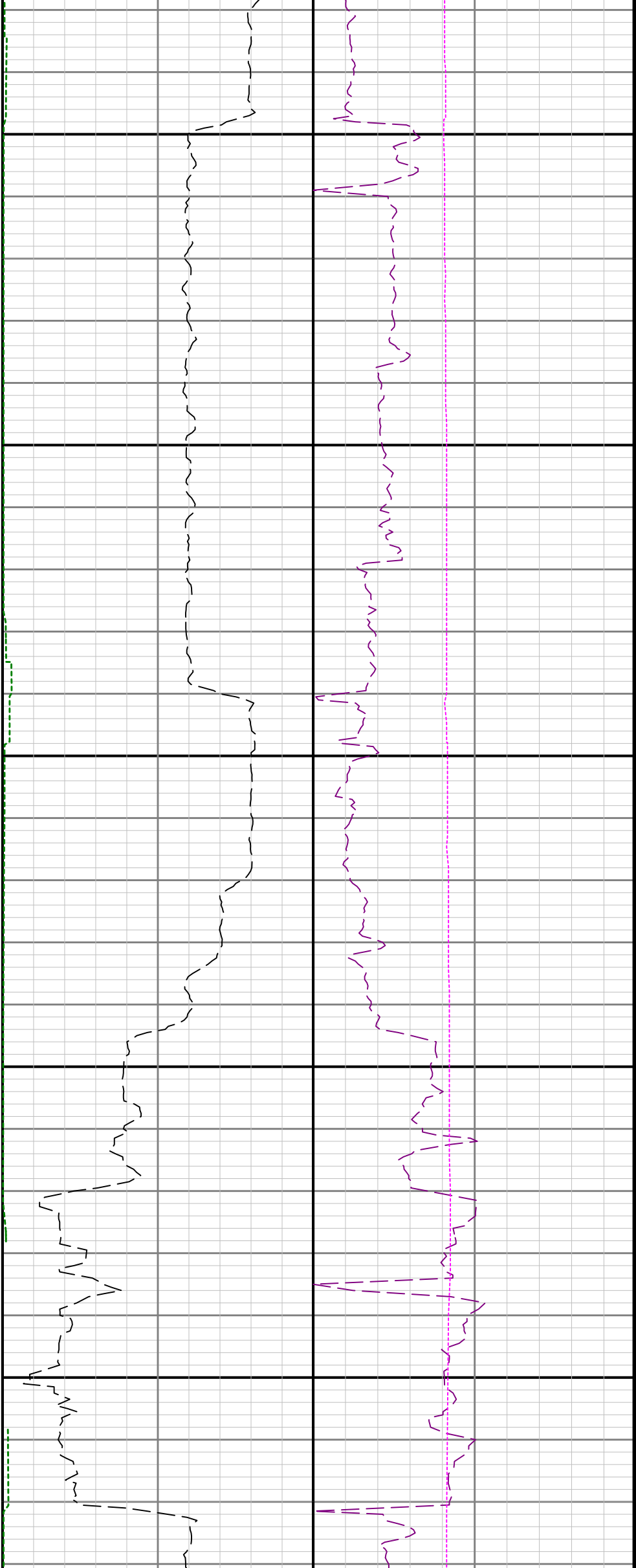




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2200

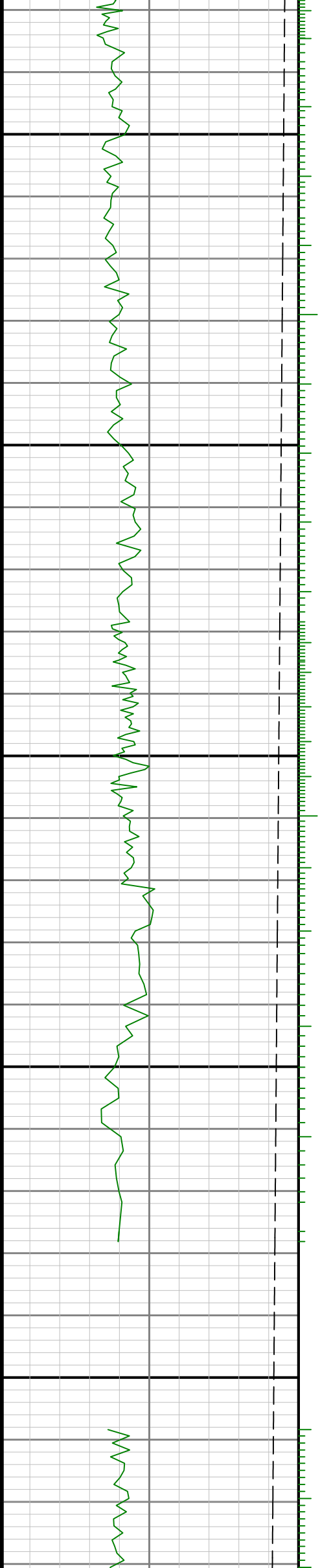


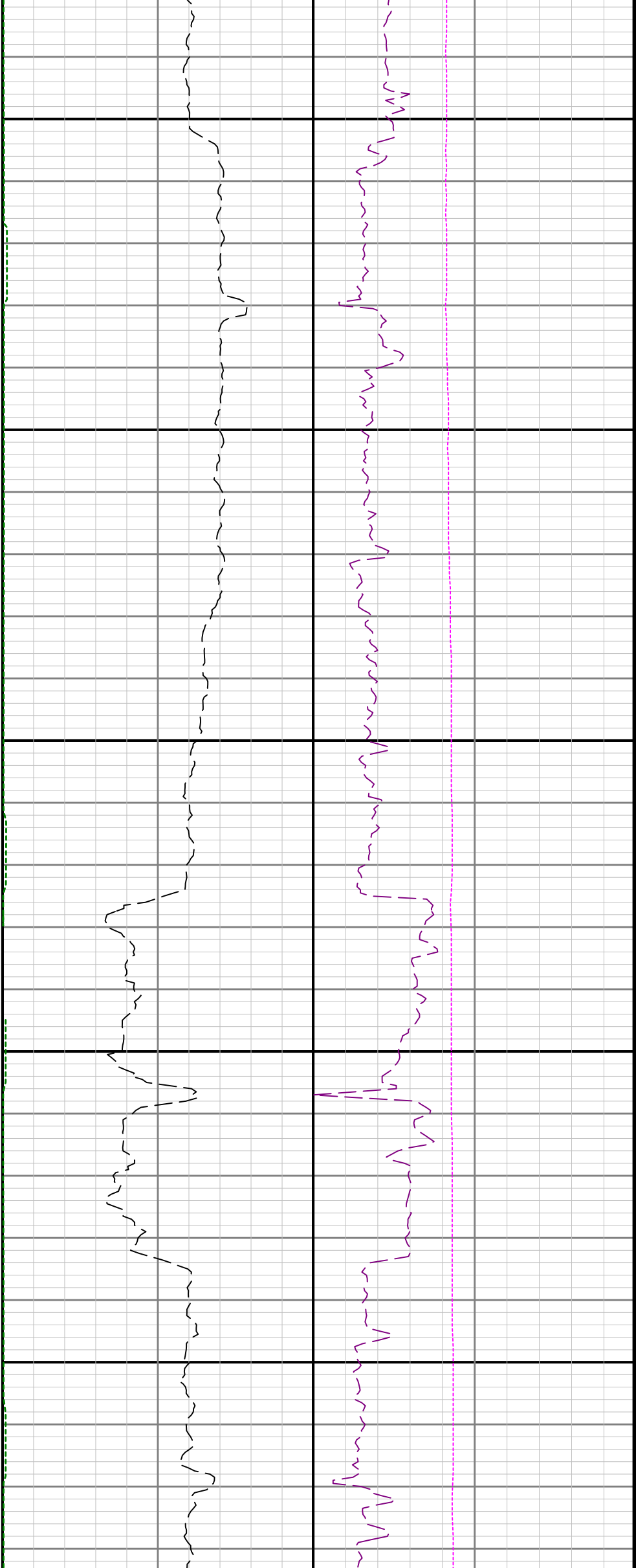


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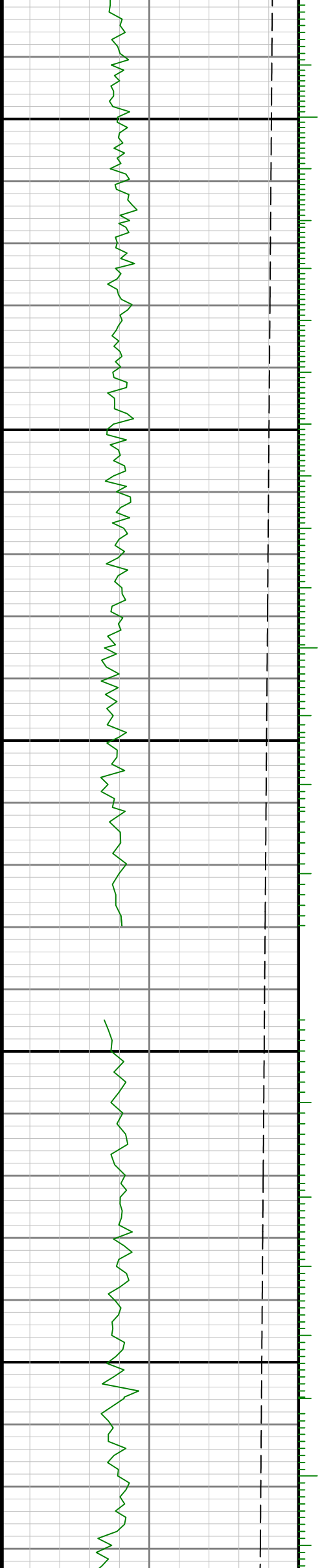
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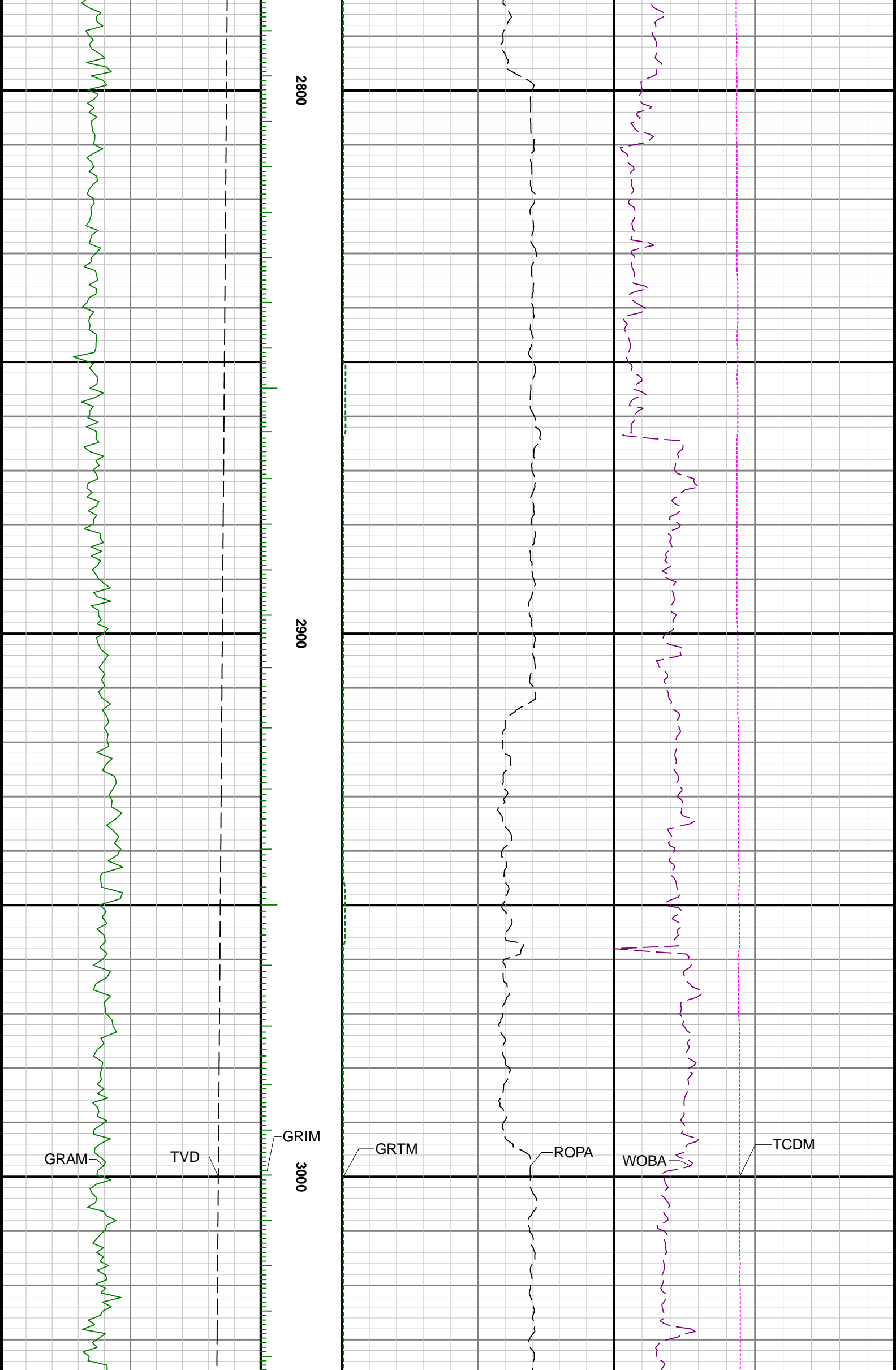


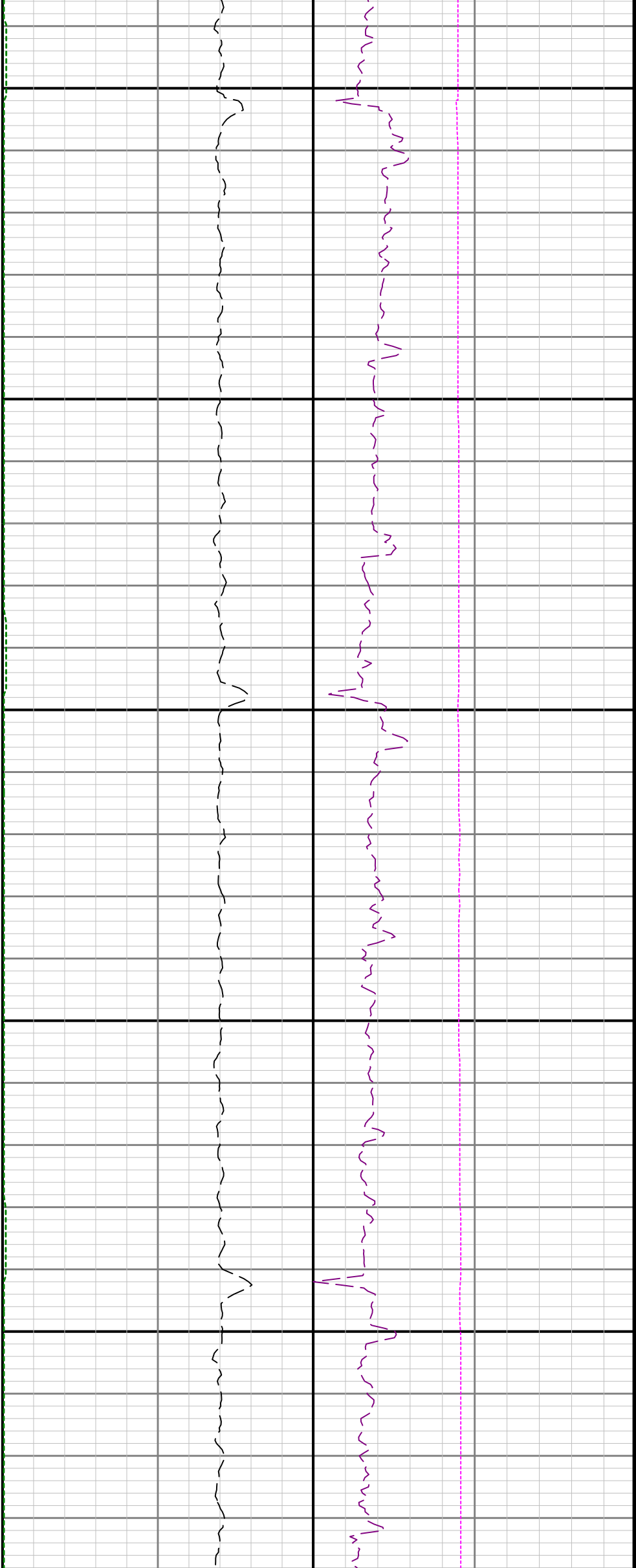


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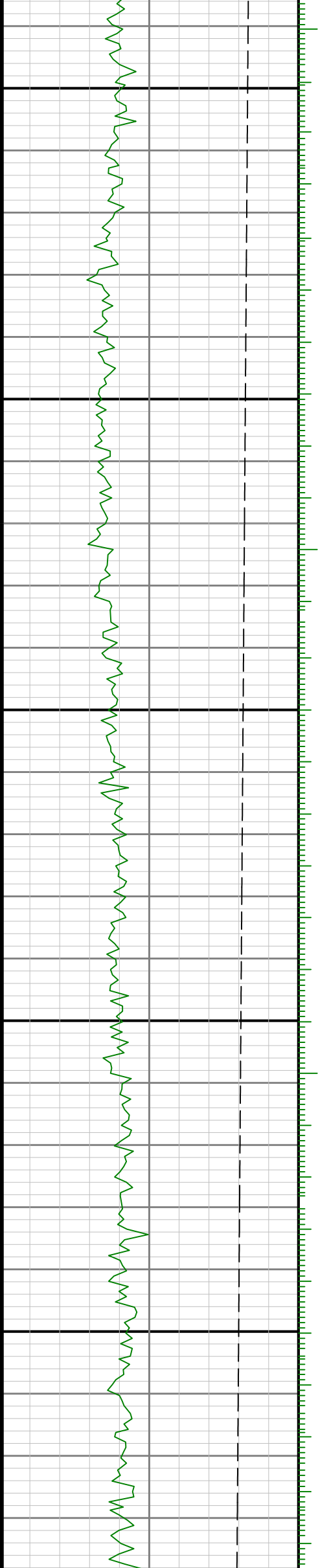


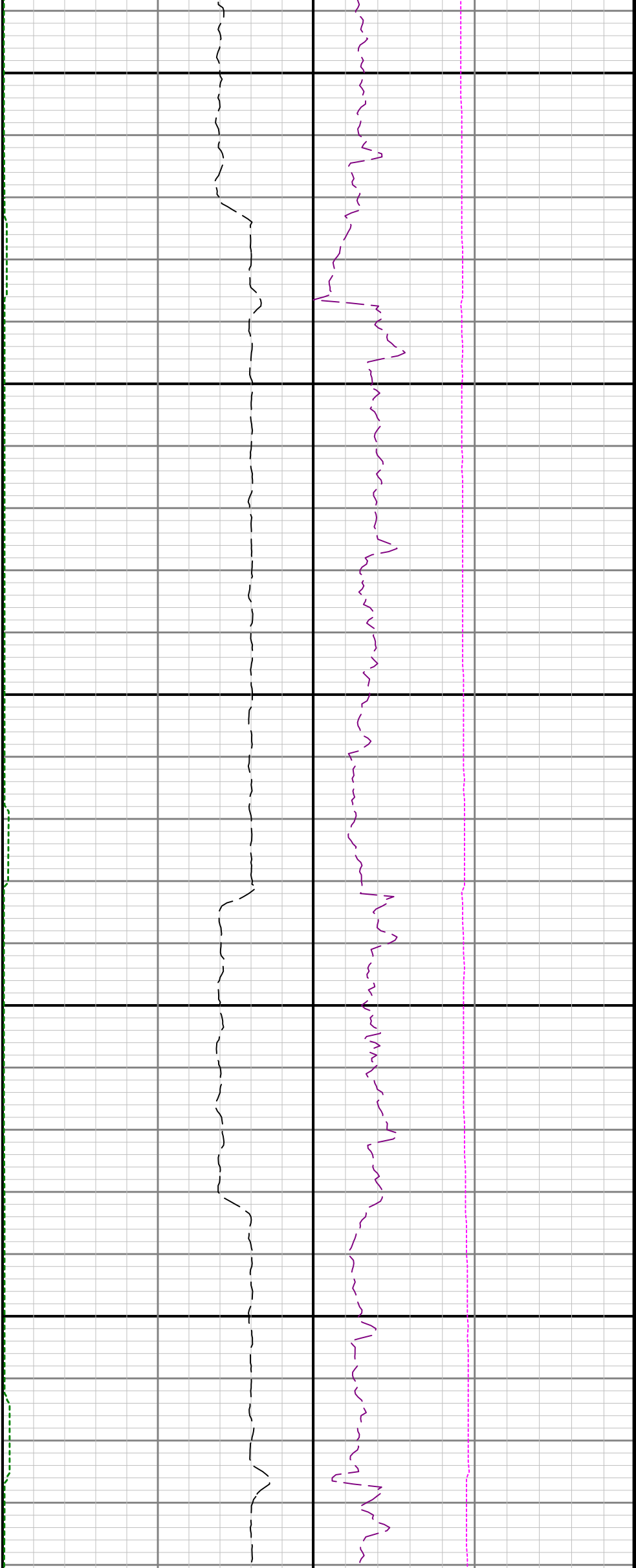




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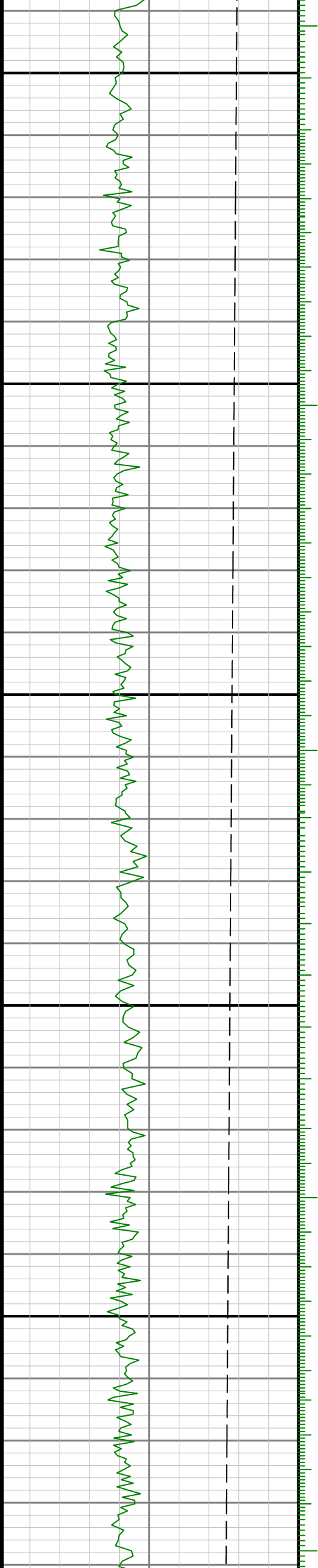


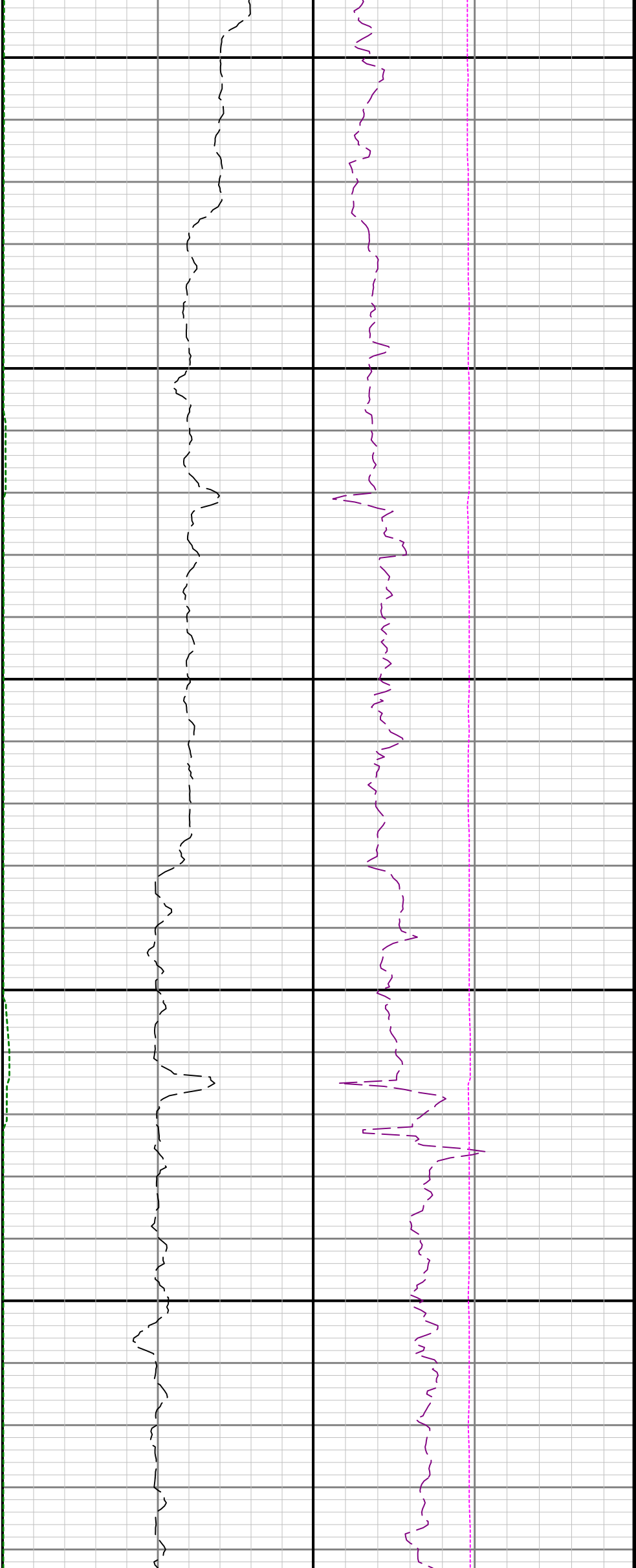


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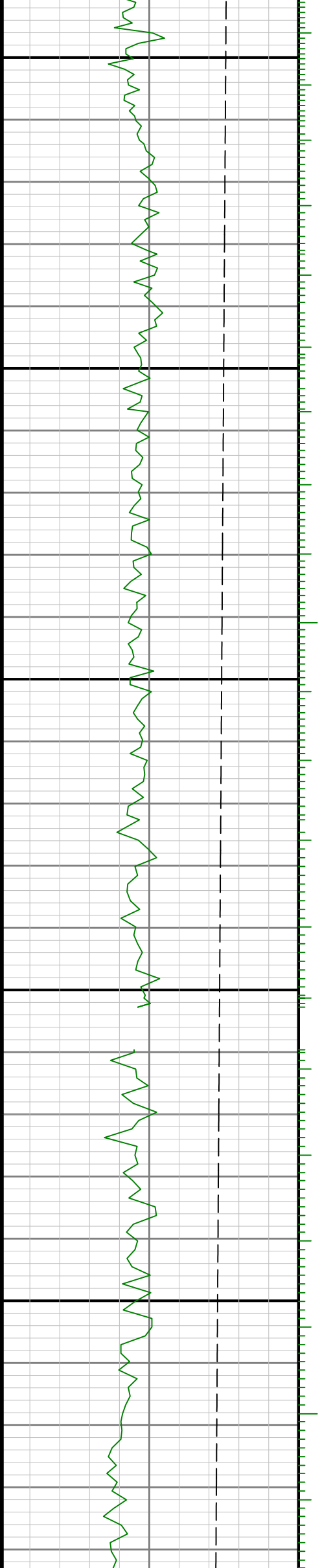
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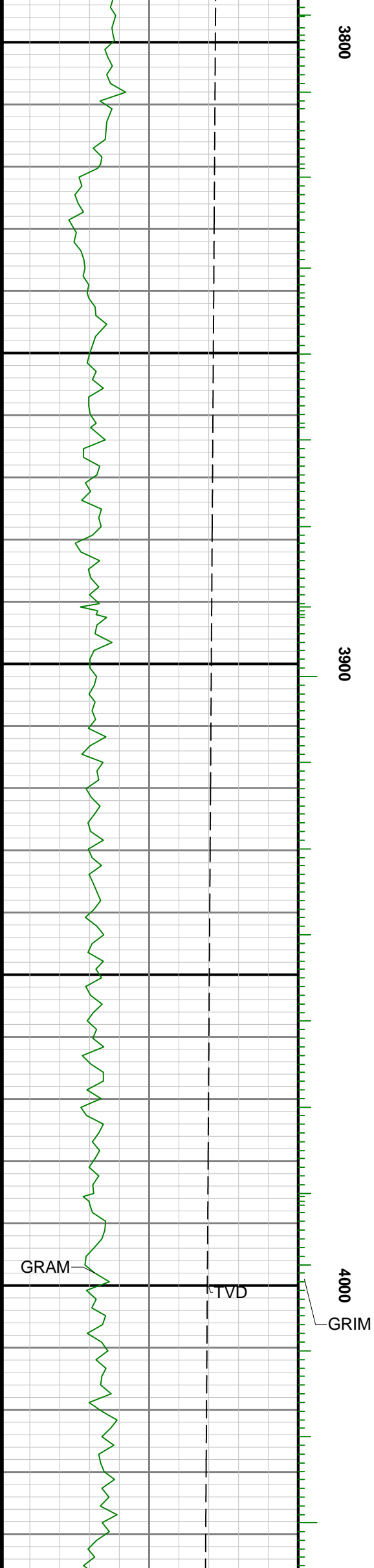
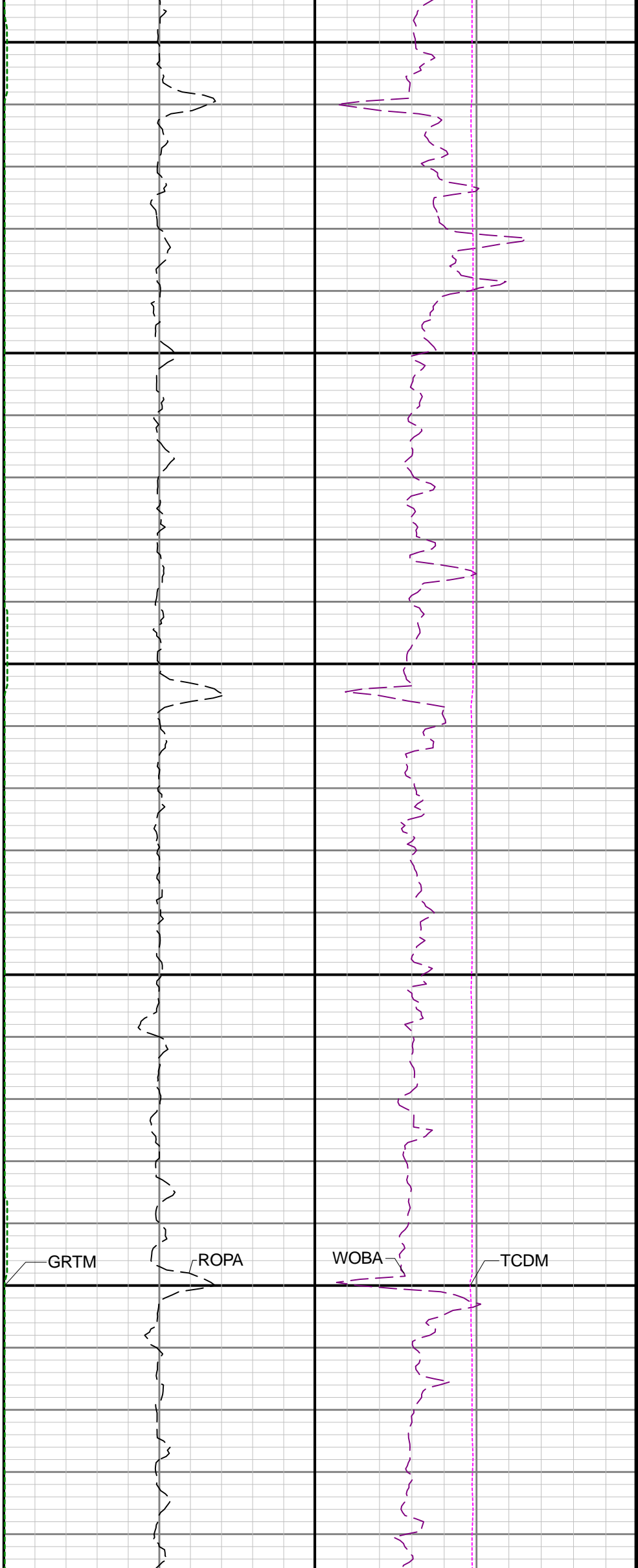


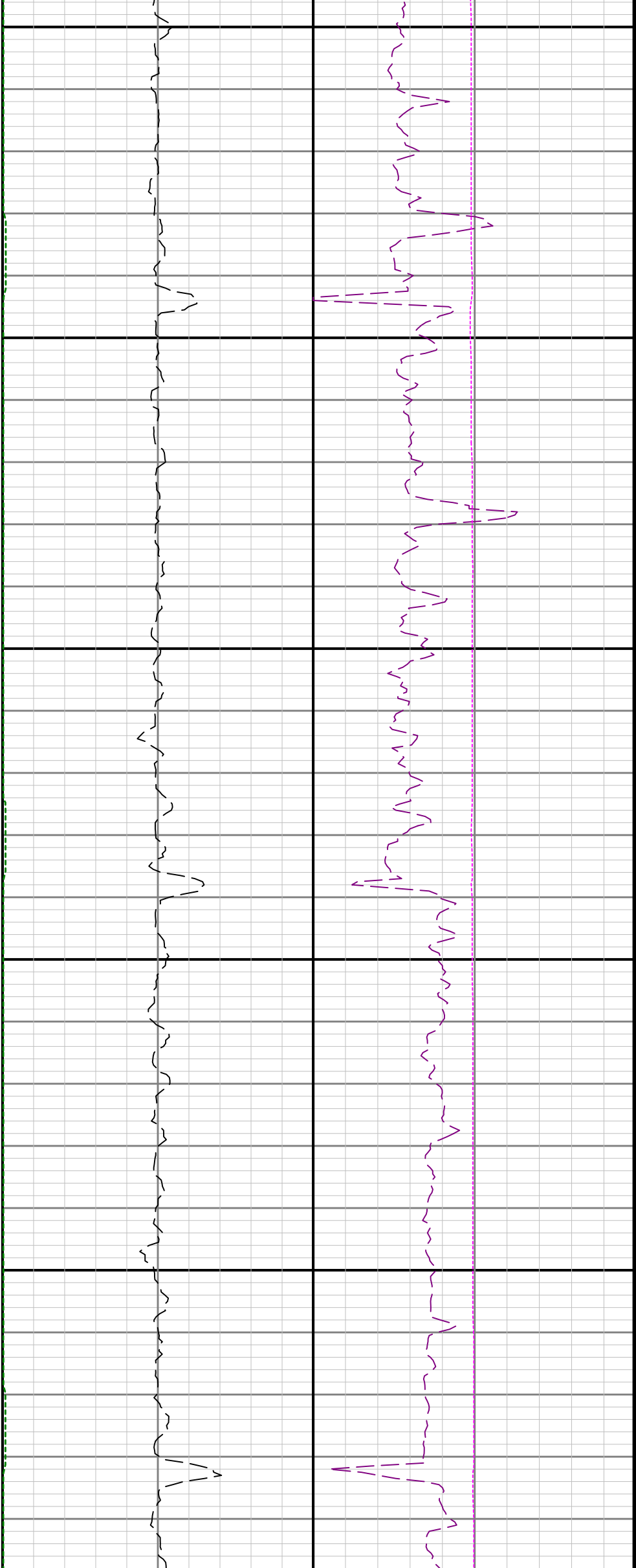


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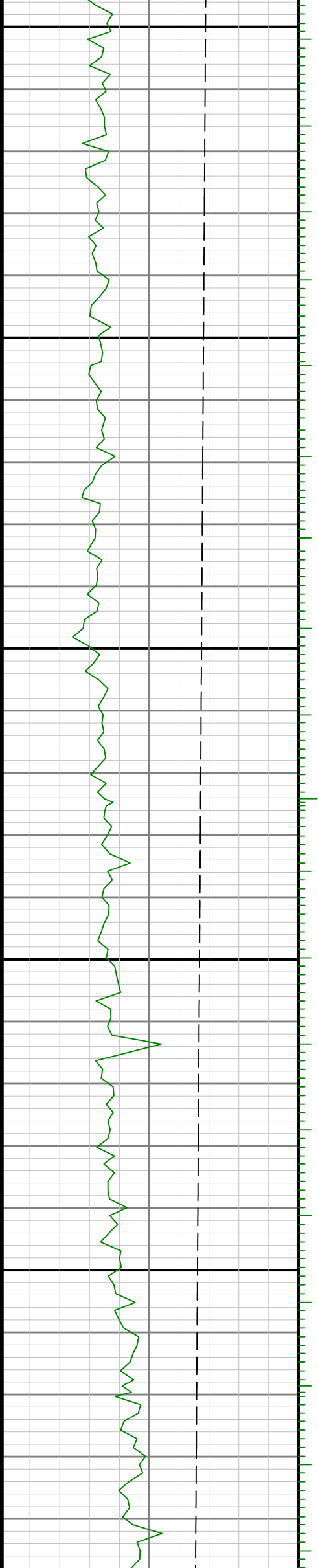


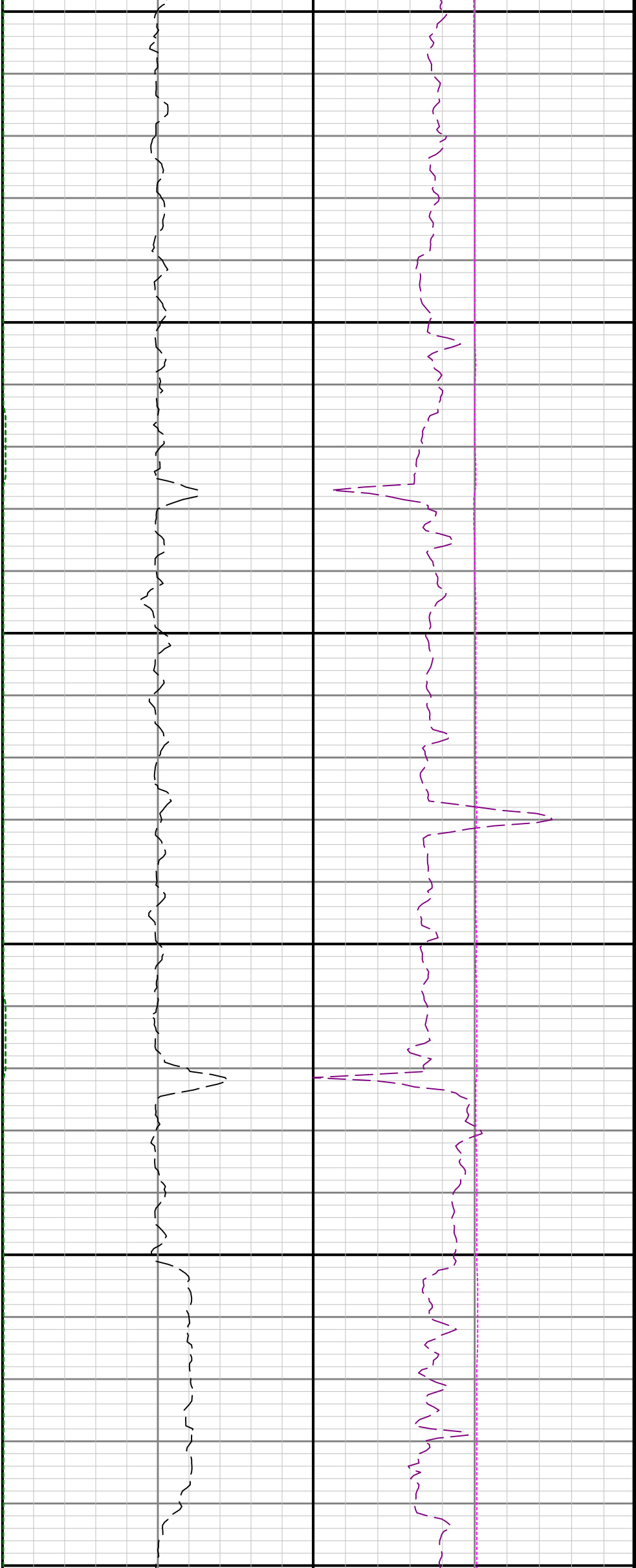




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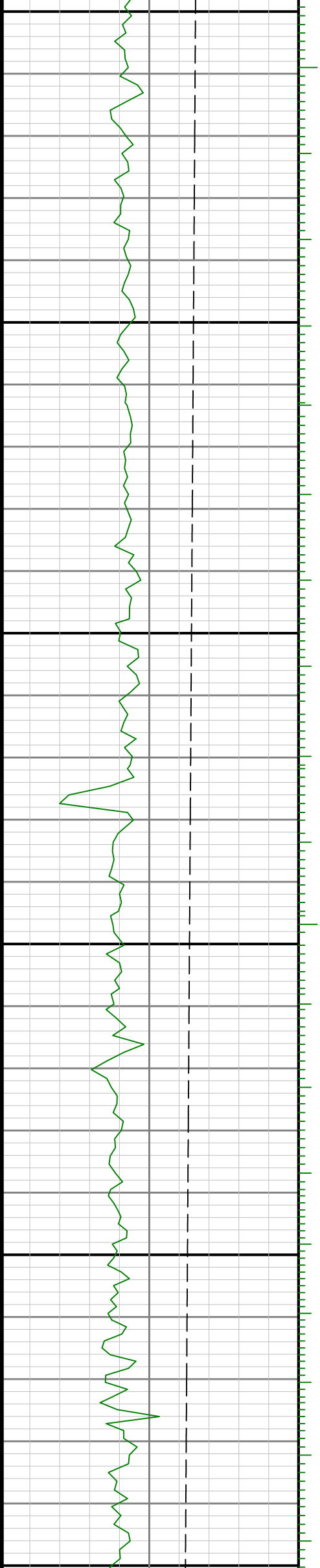


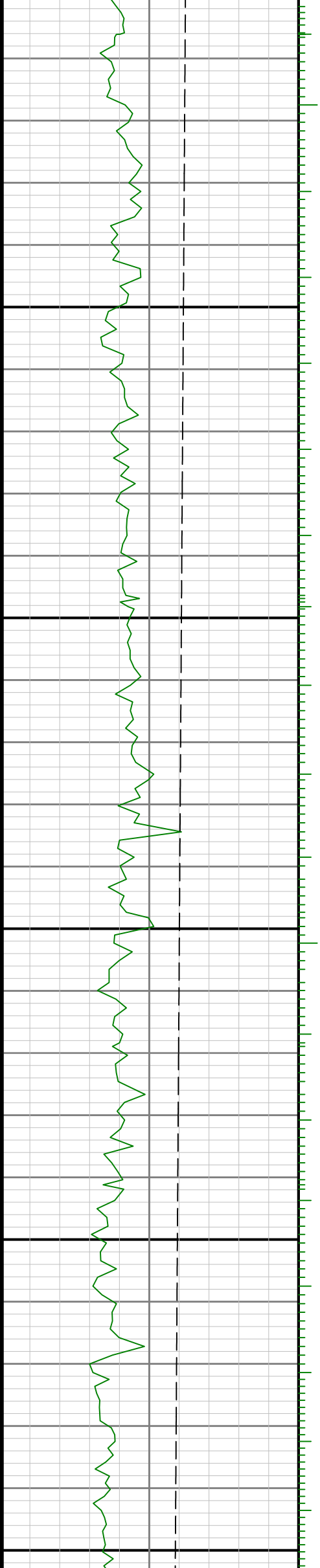
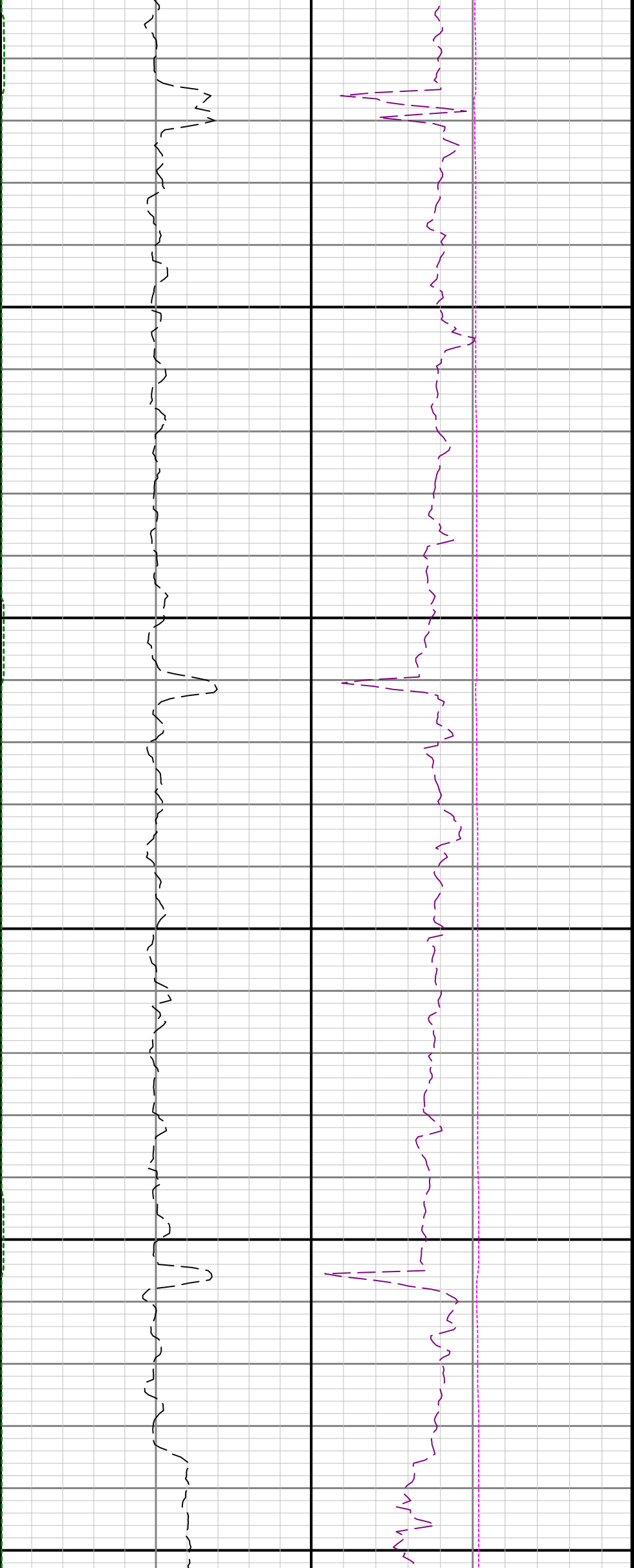


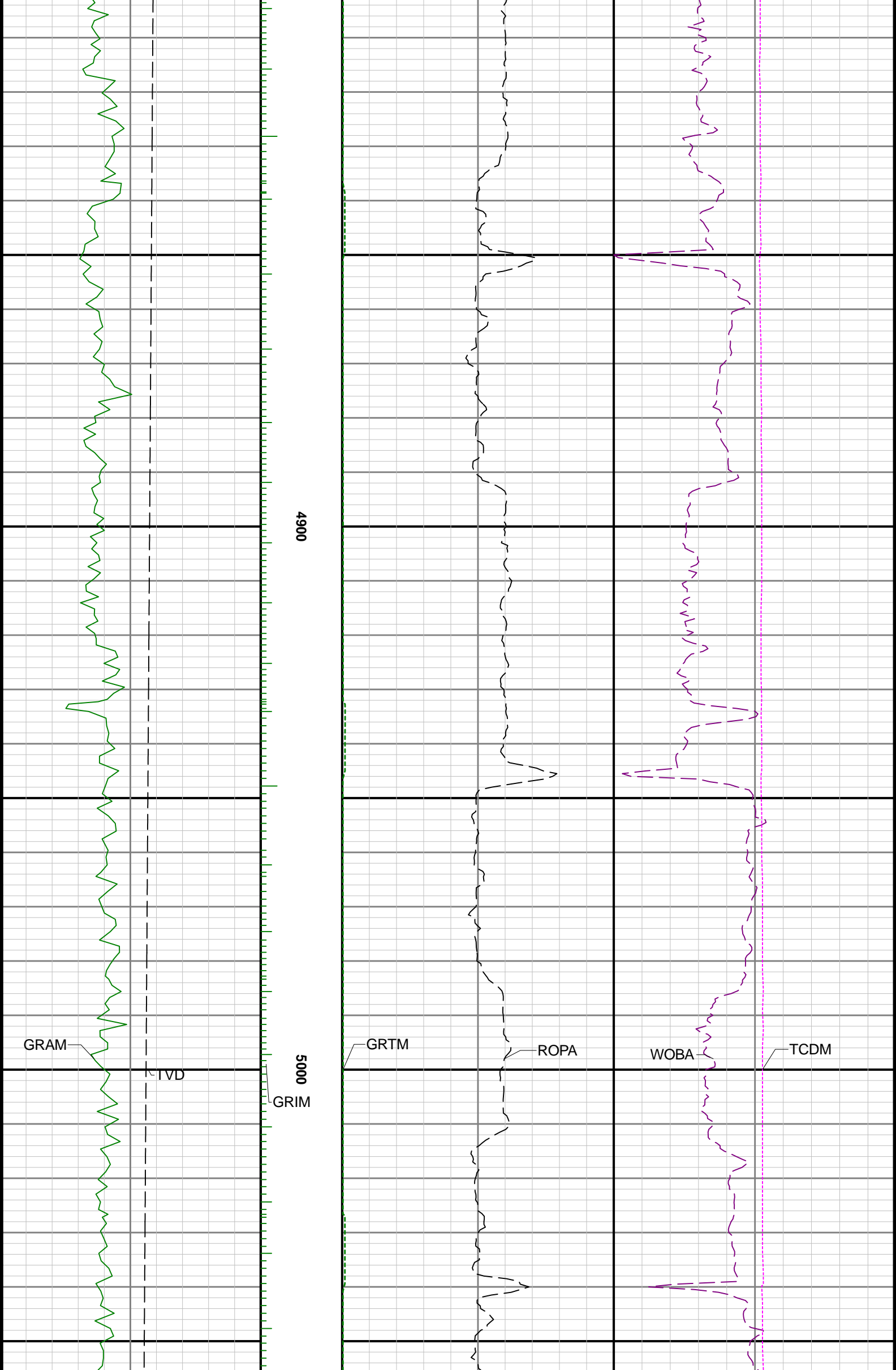
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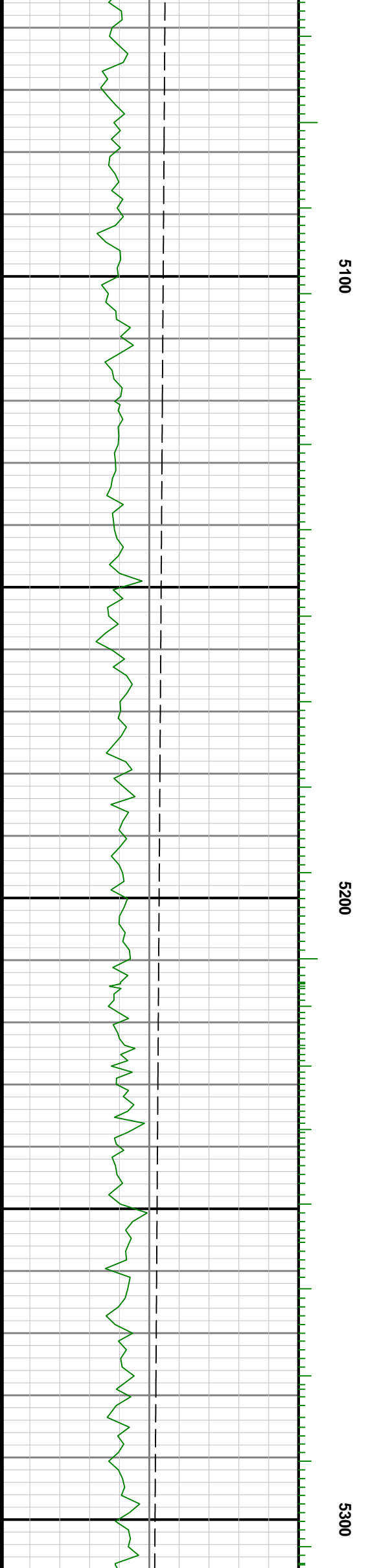
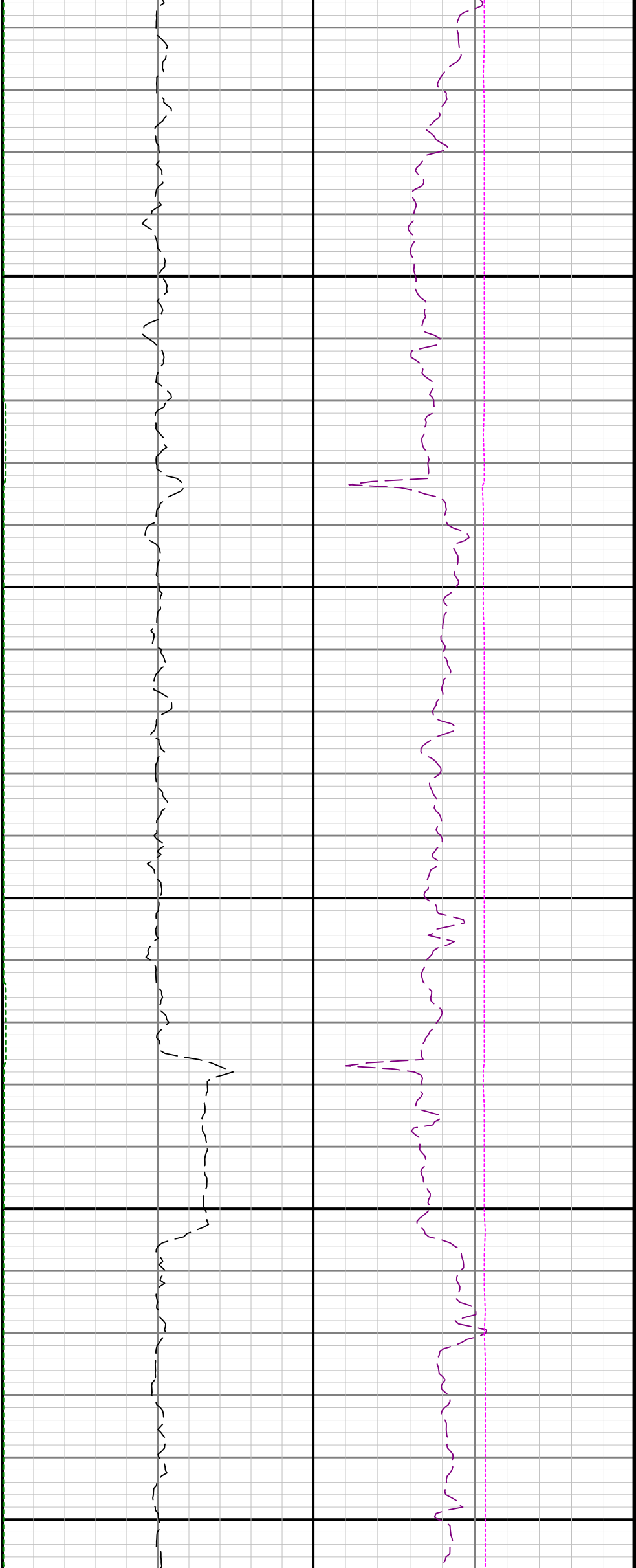
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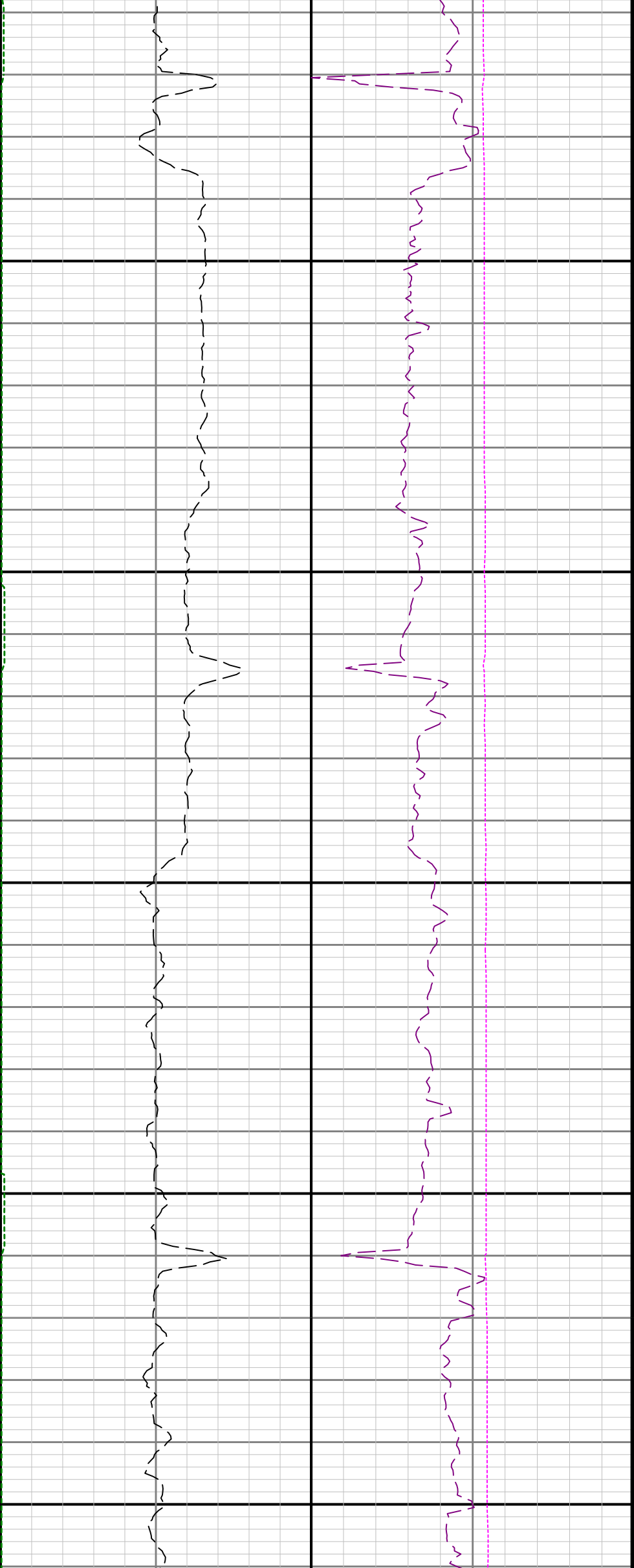
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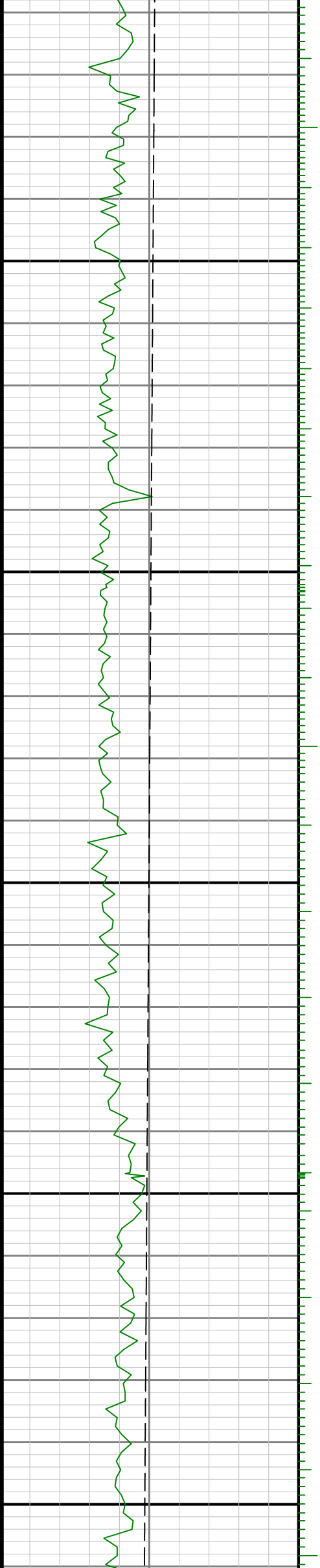


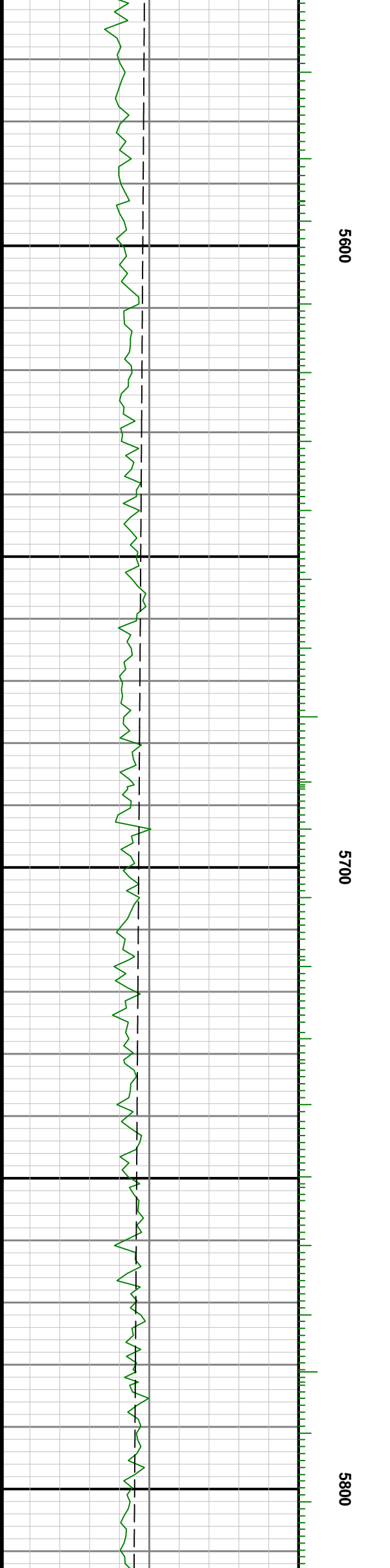


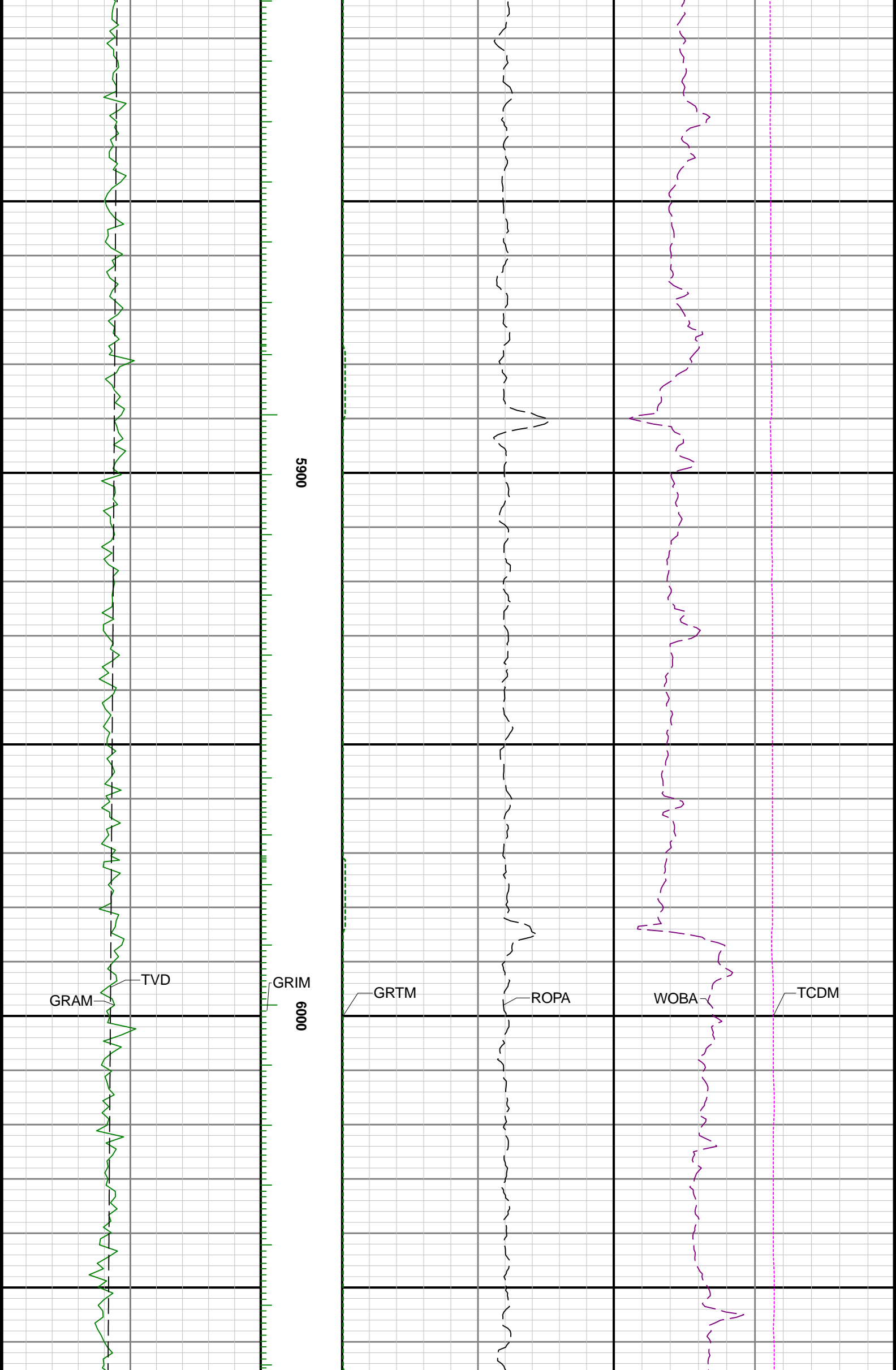


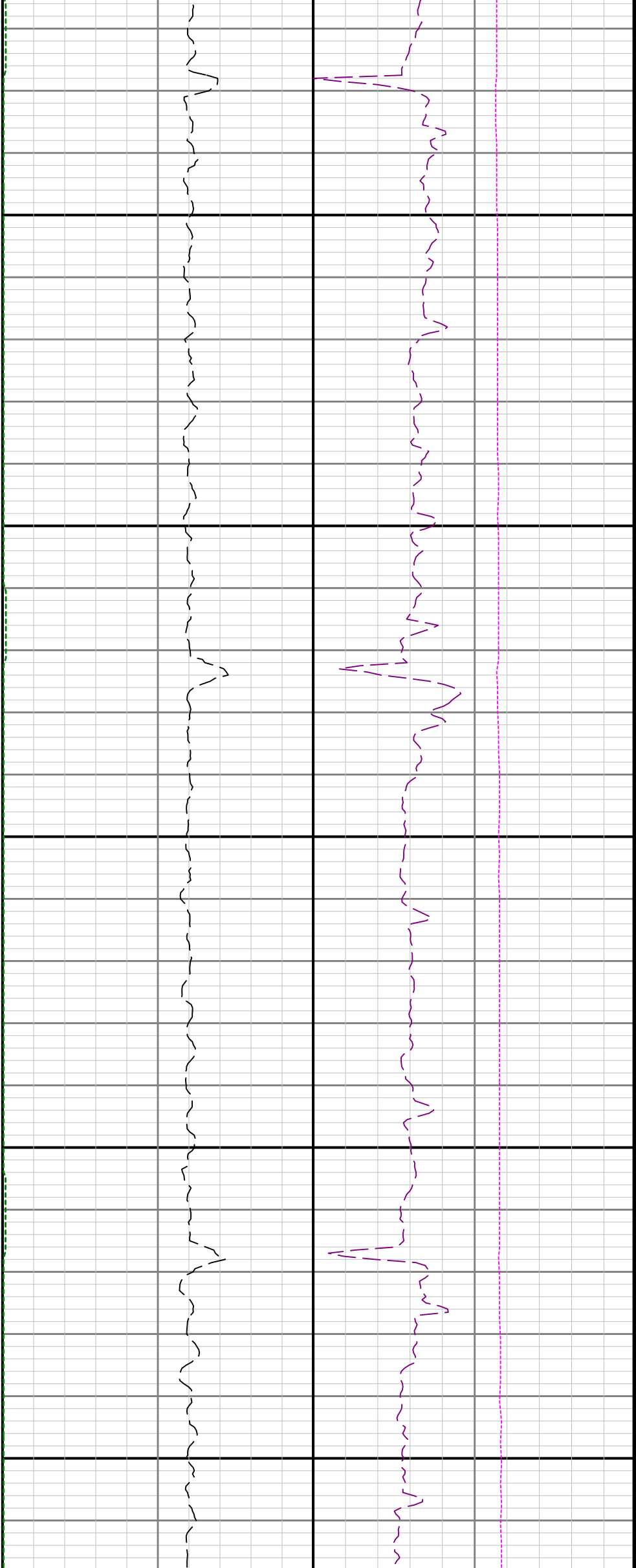
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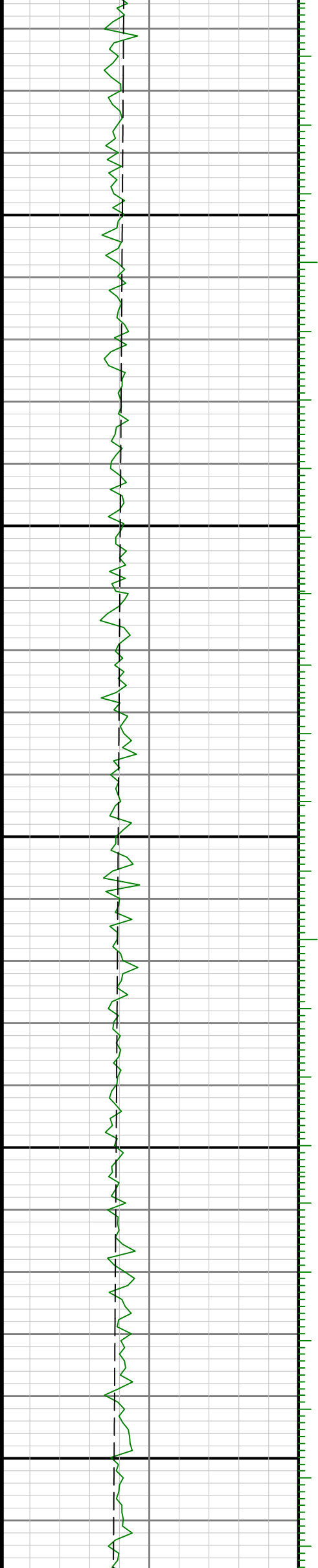


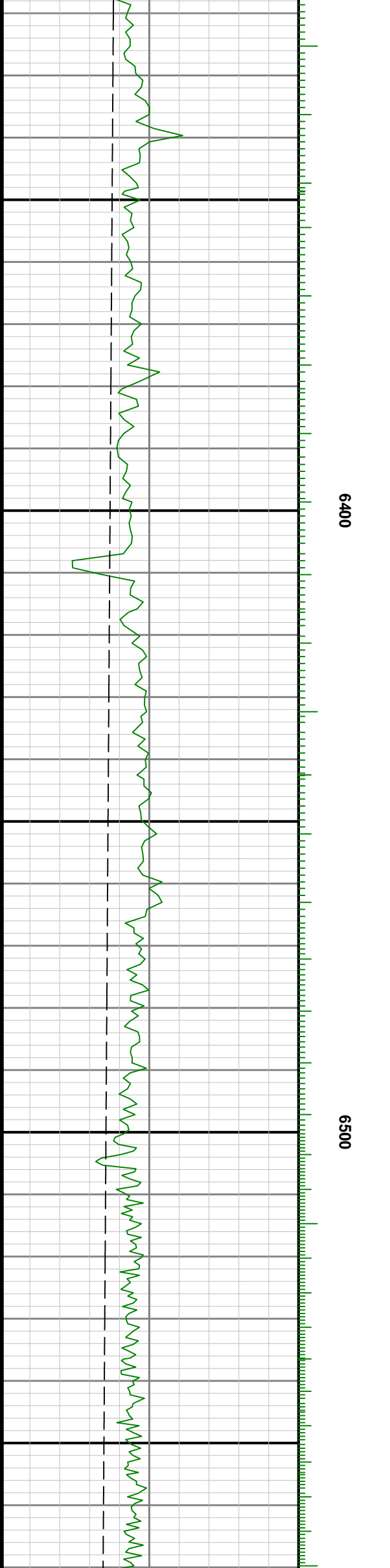
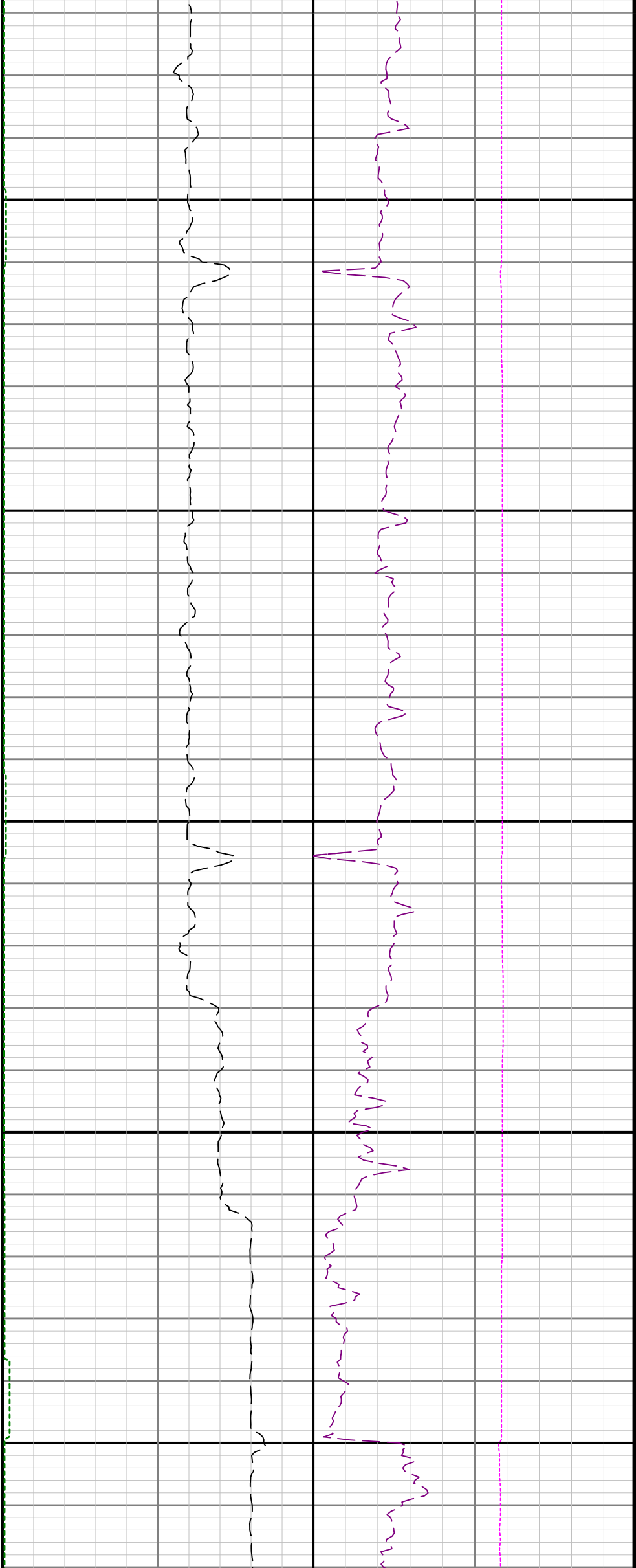


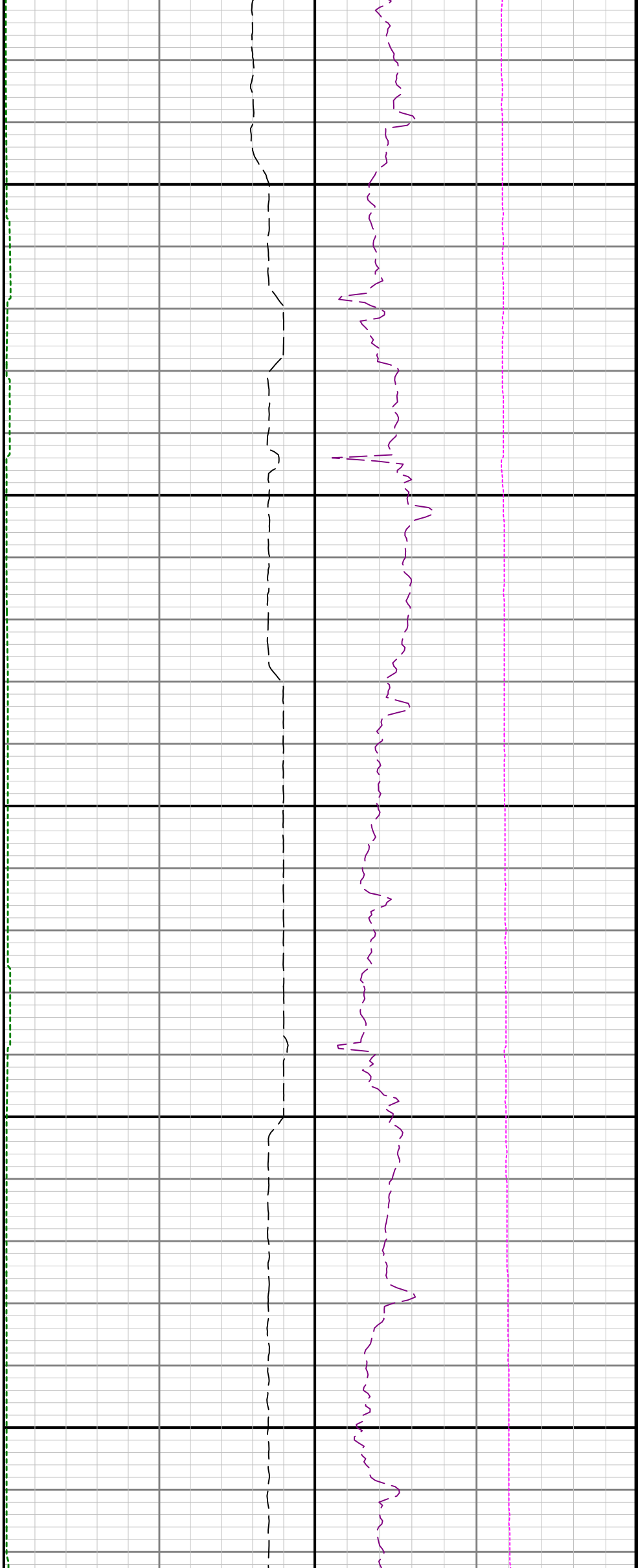
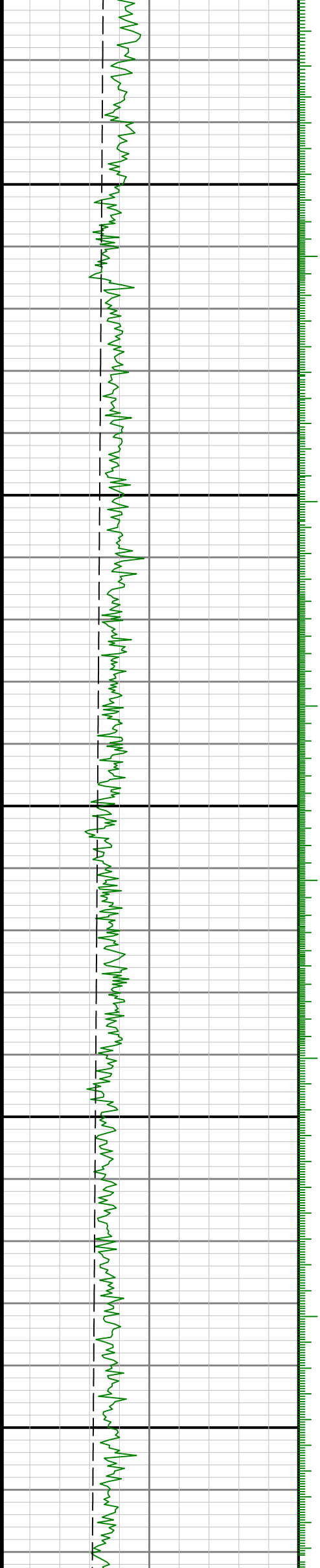
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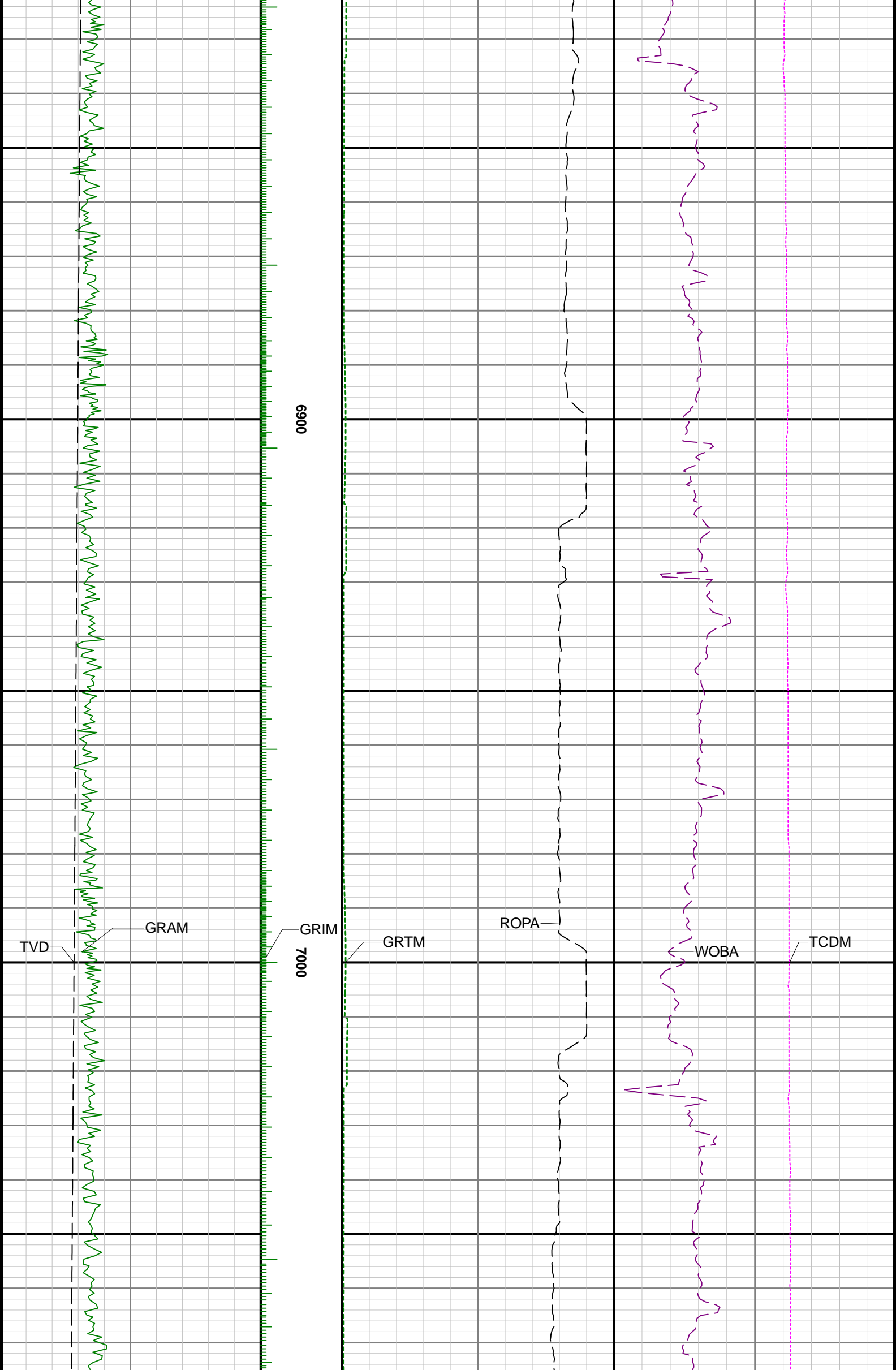
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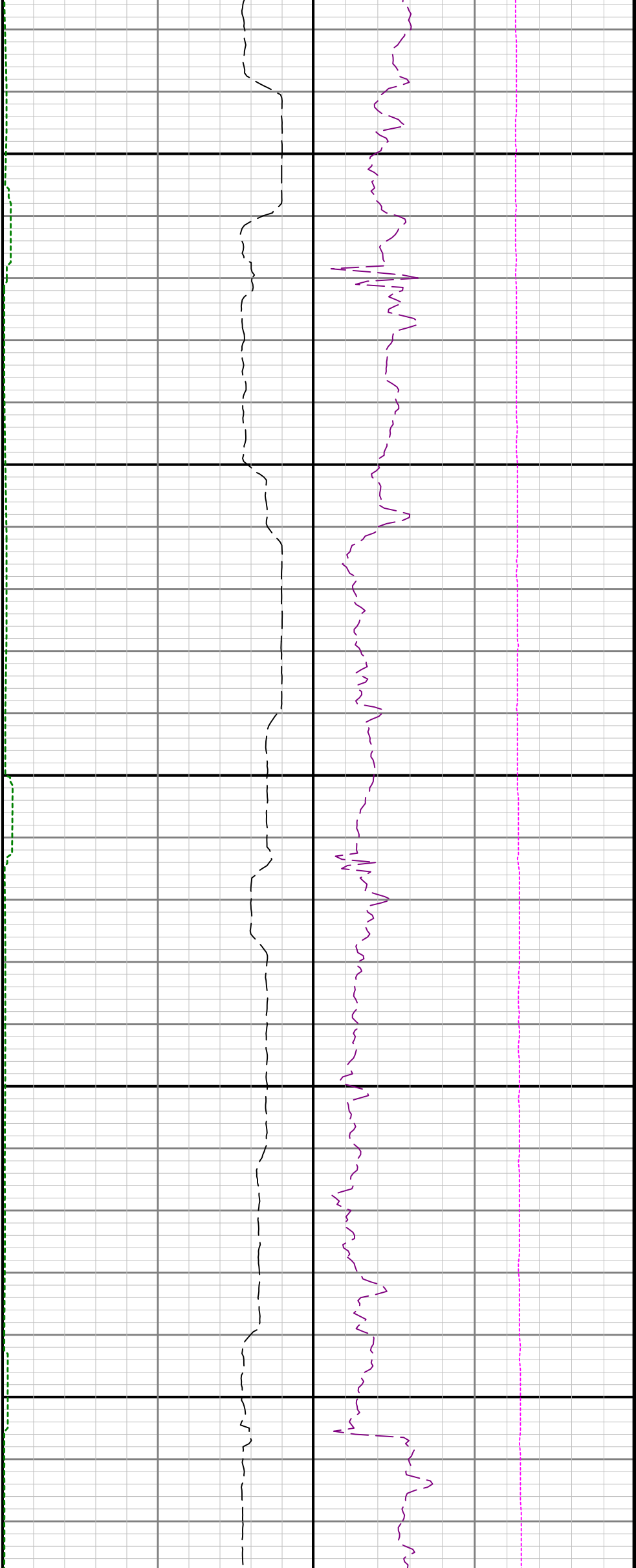
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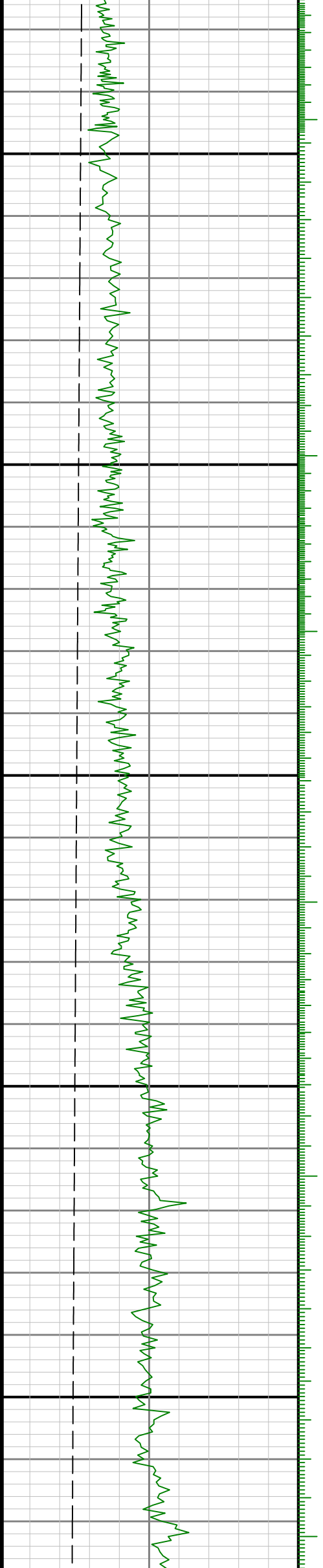


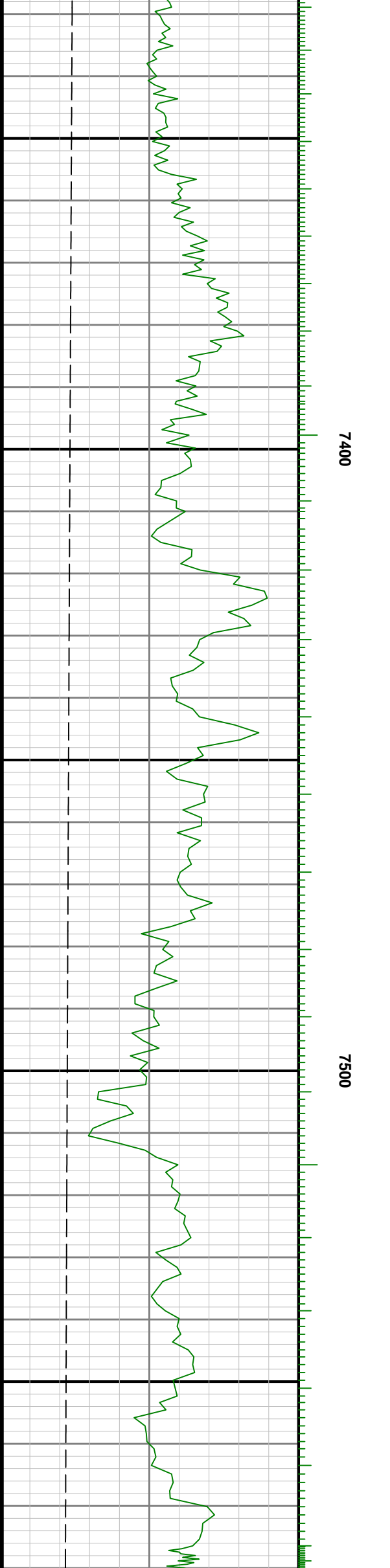
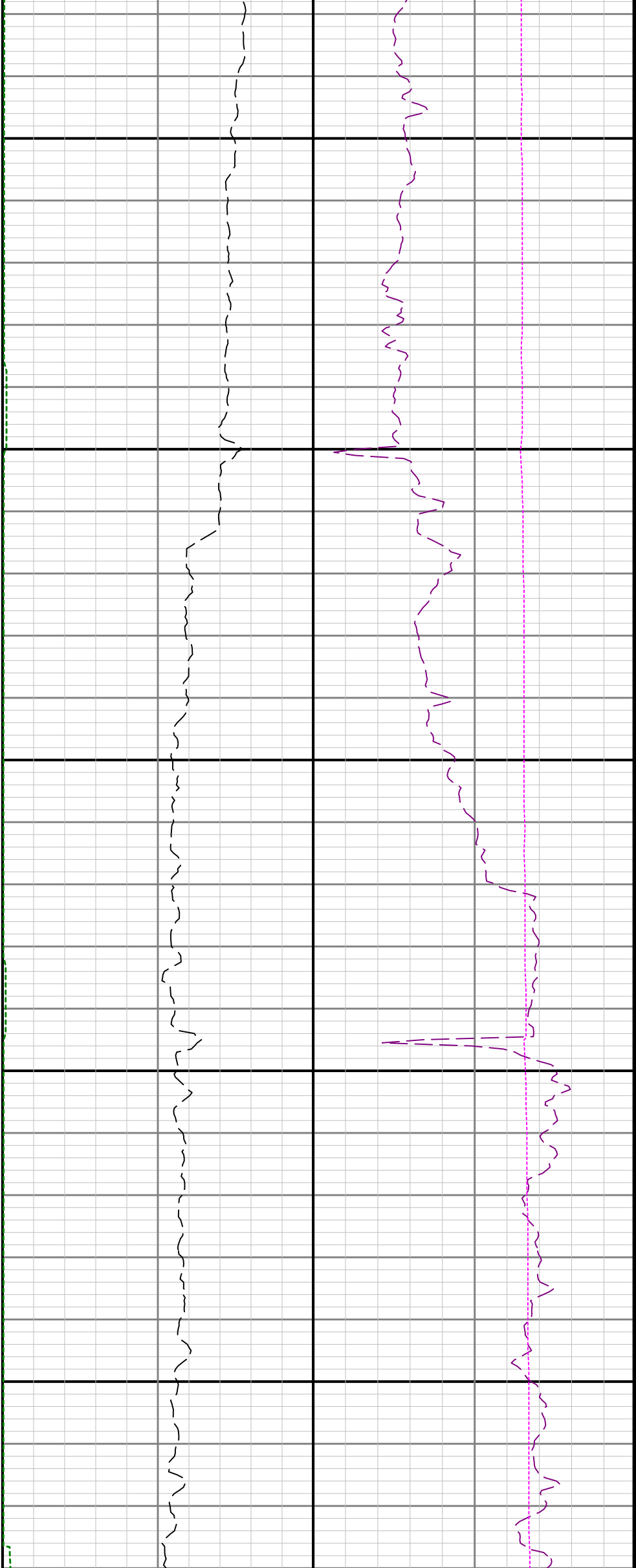


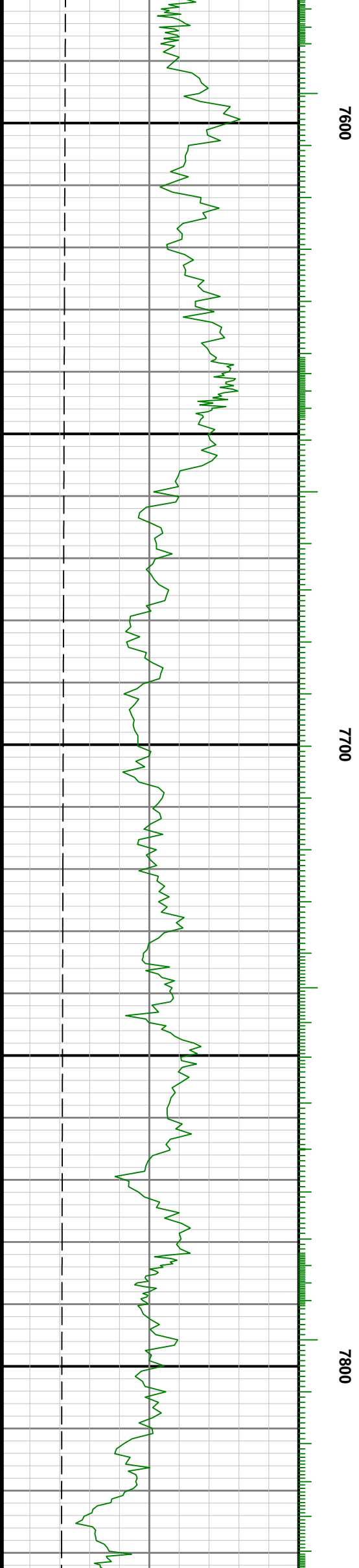
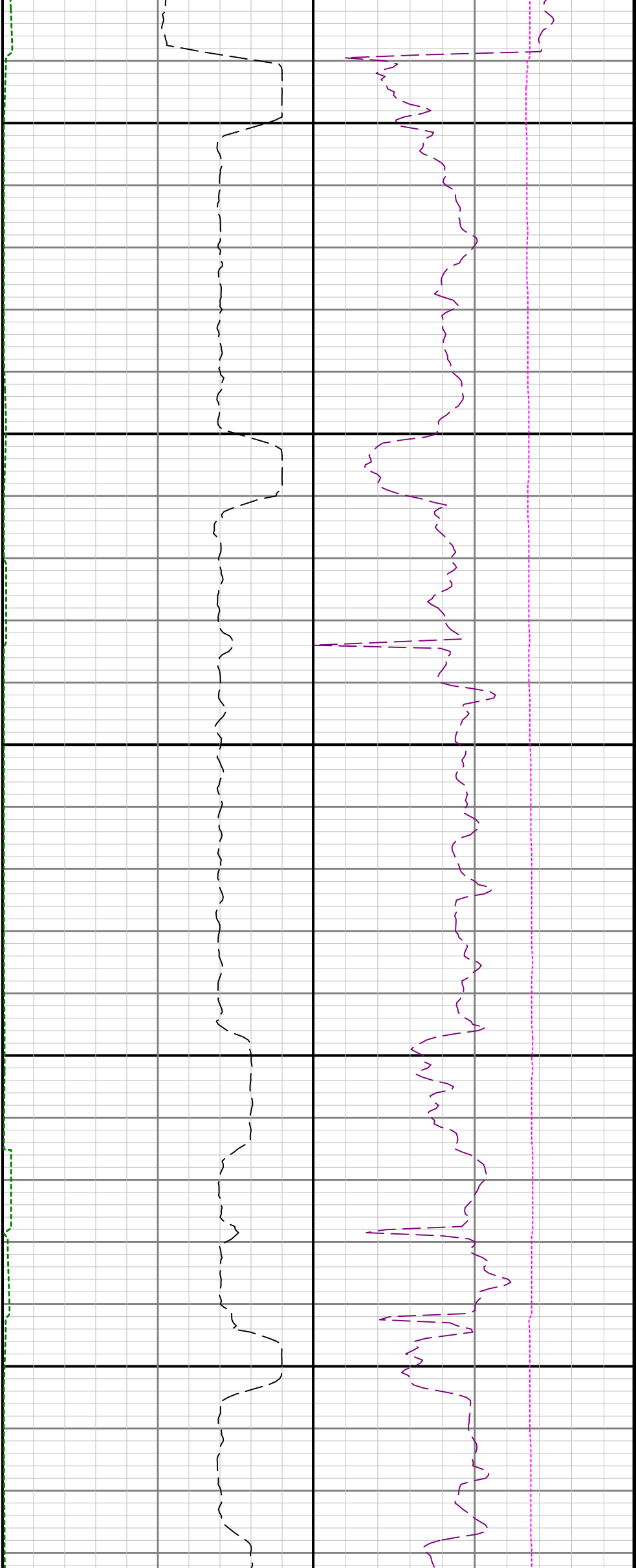
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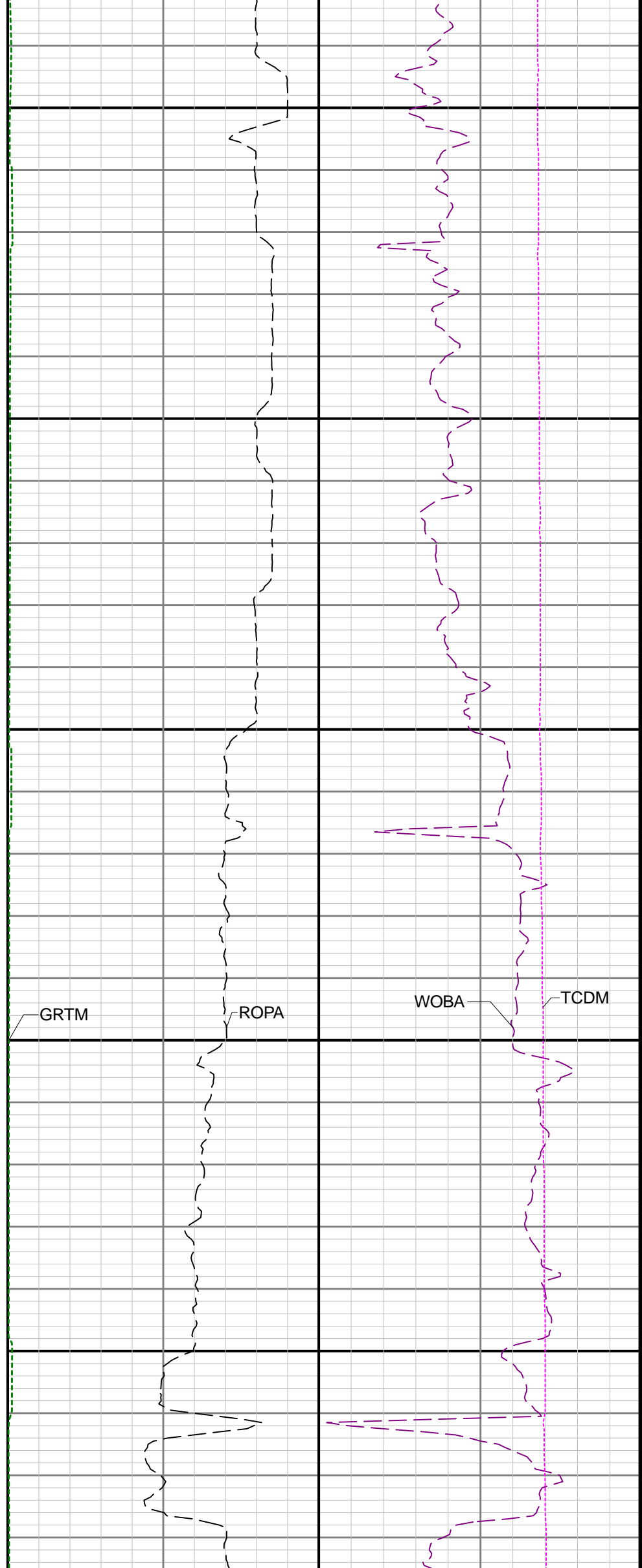
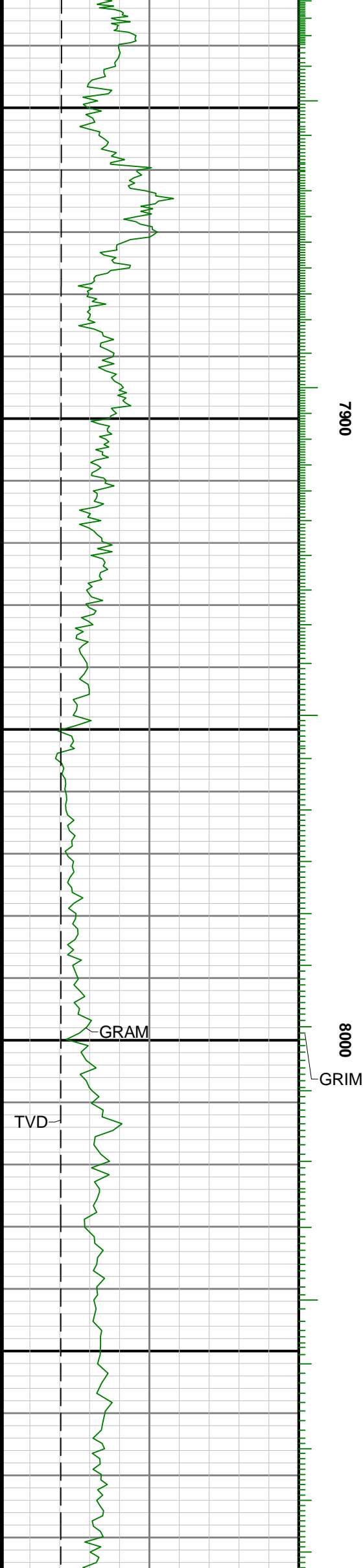
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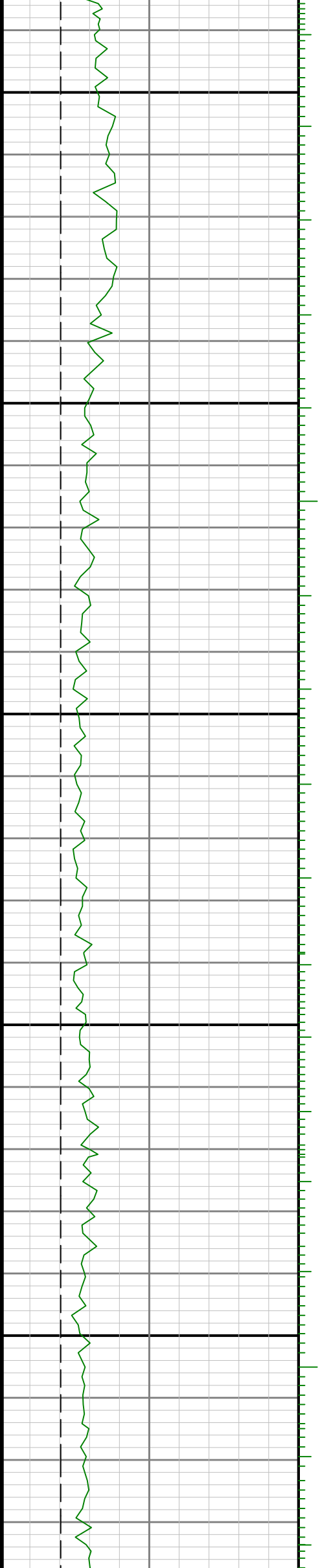




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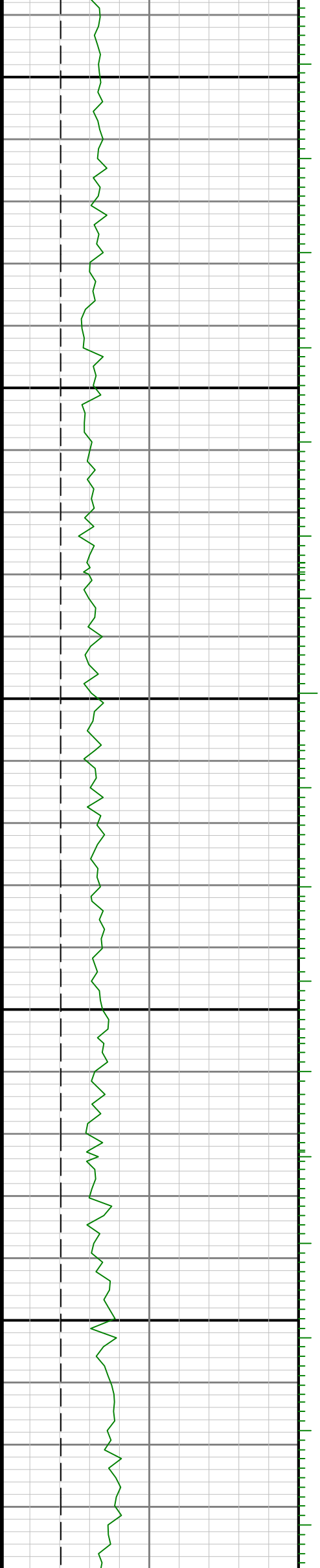
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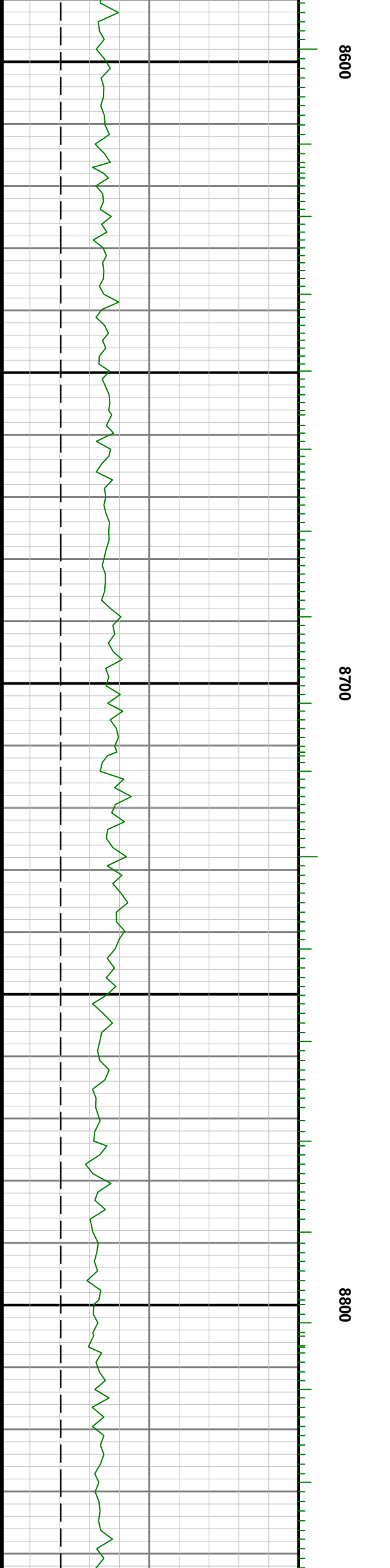


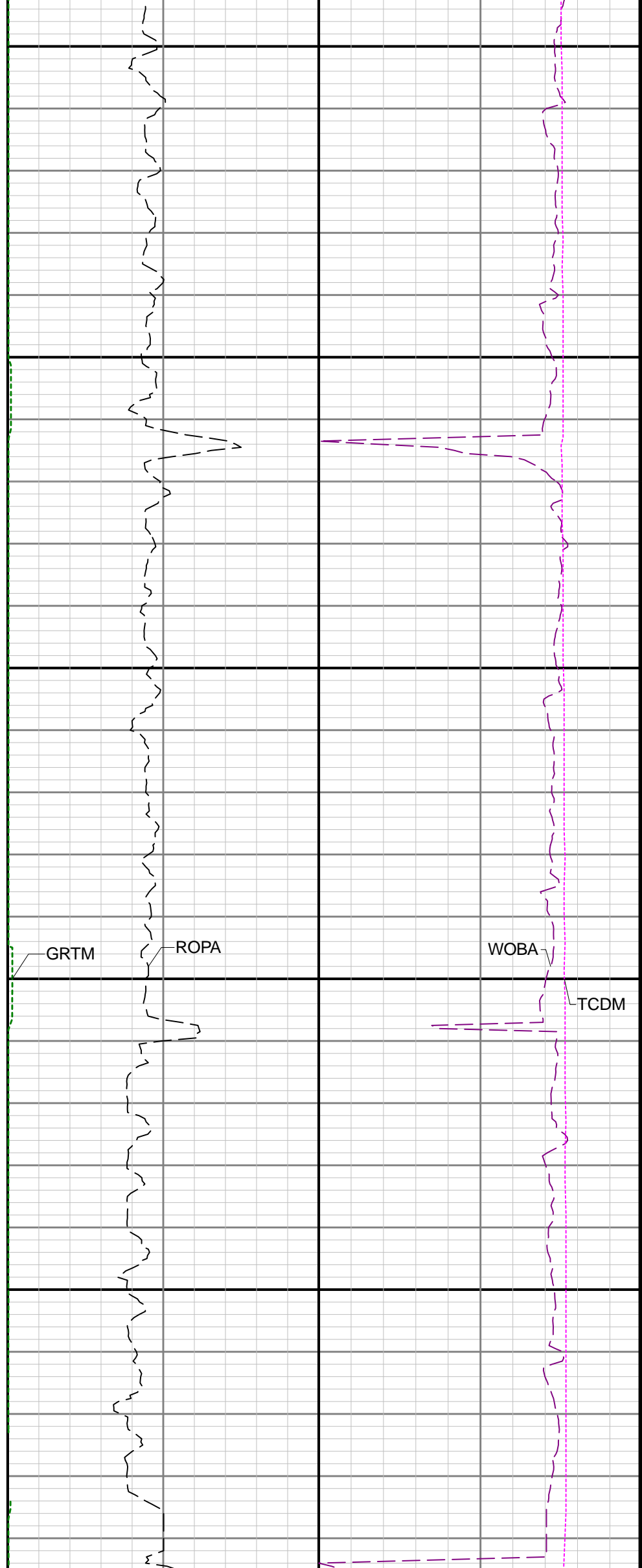
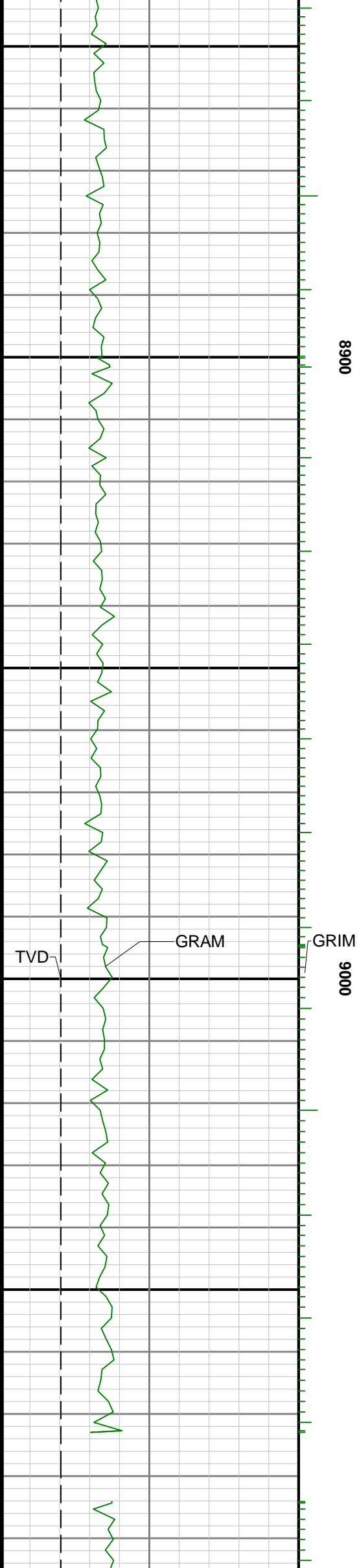


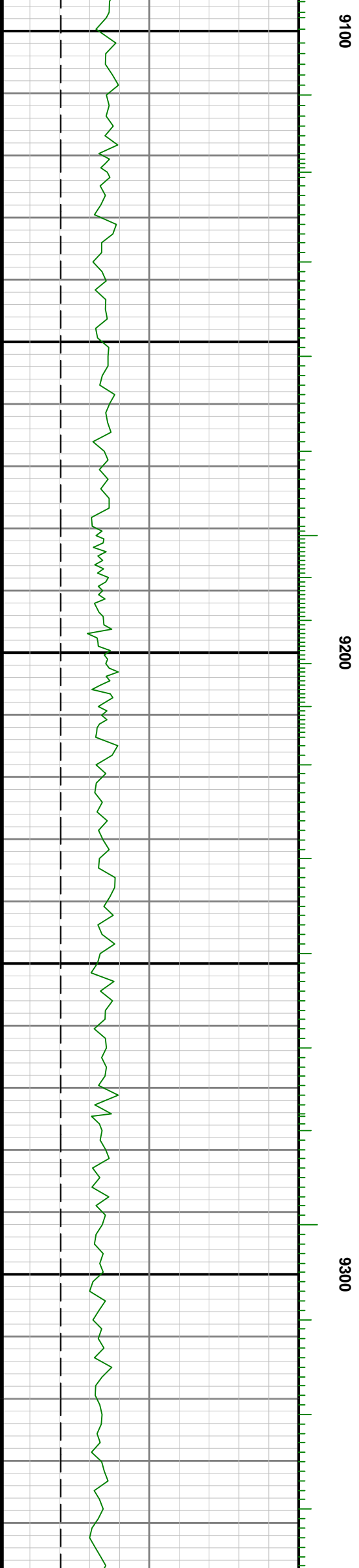
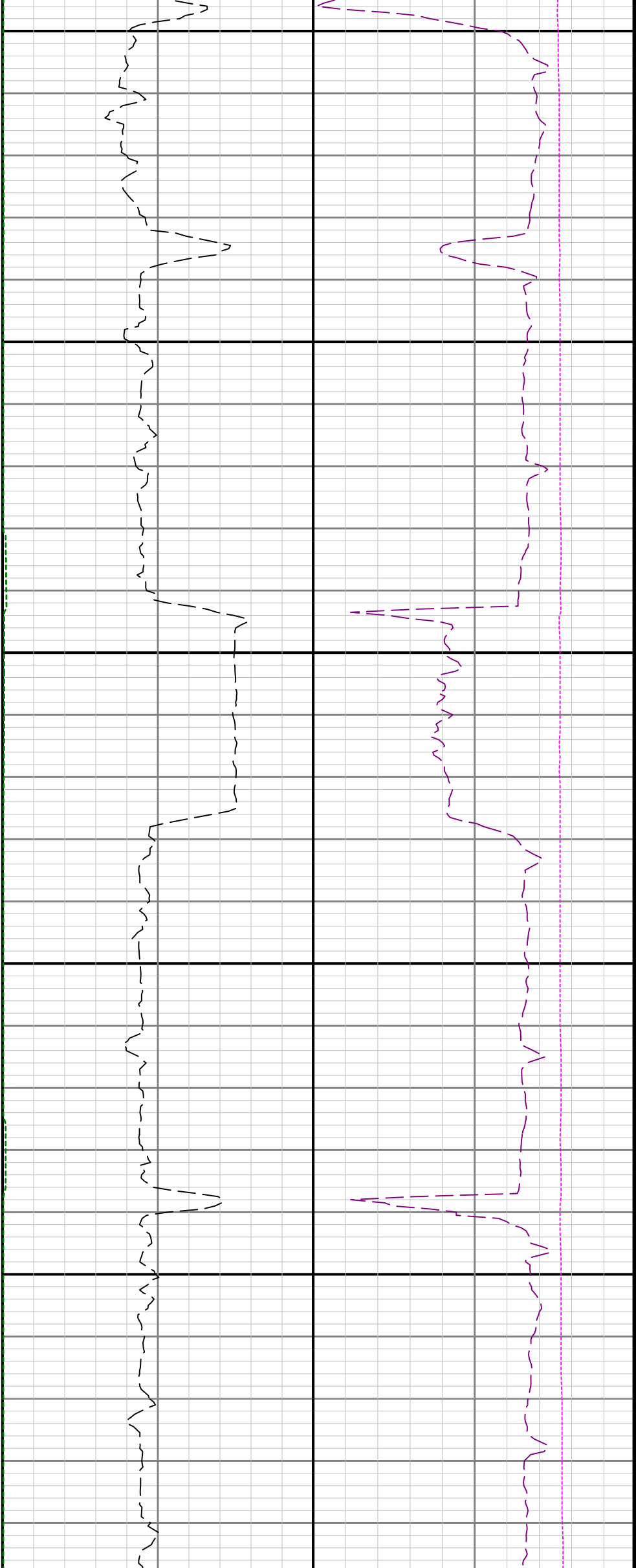
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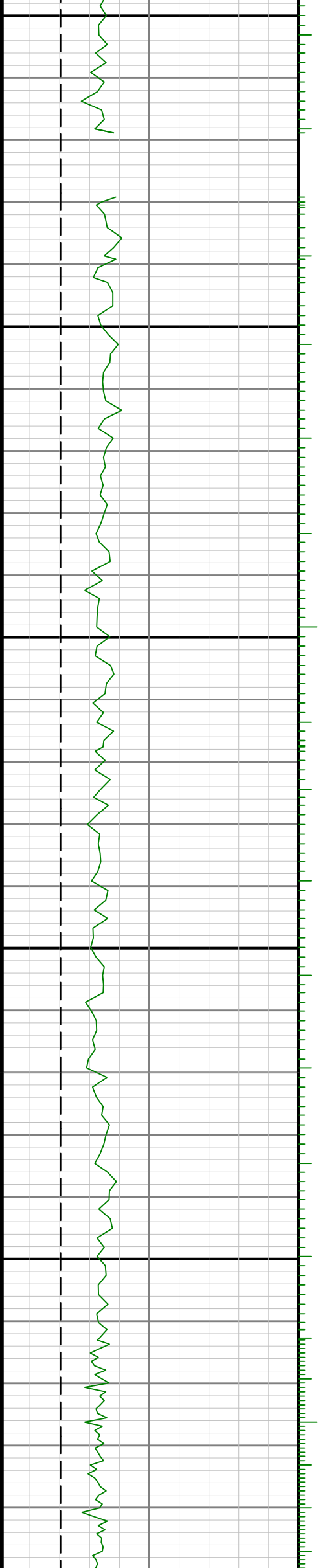


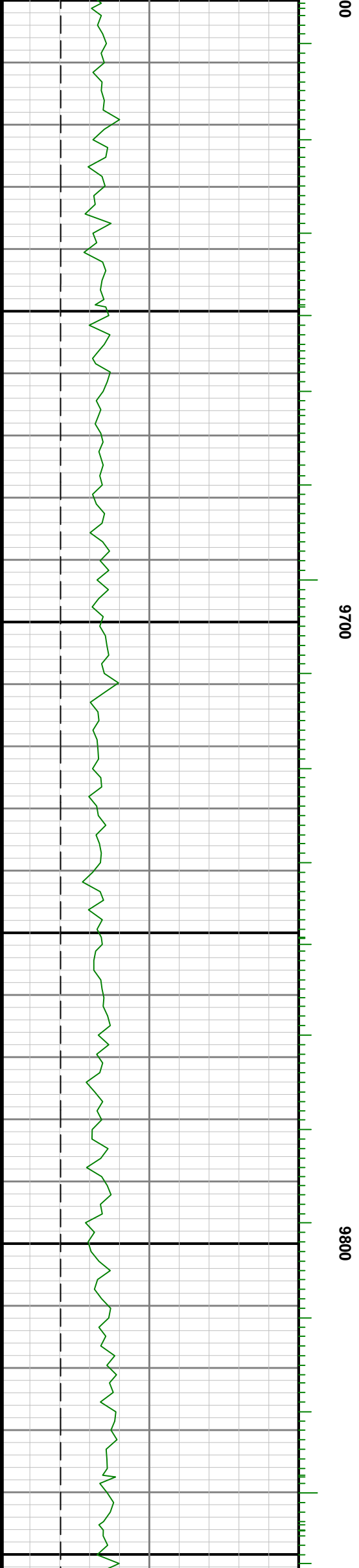


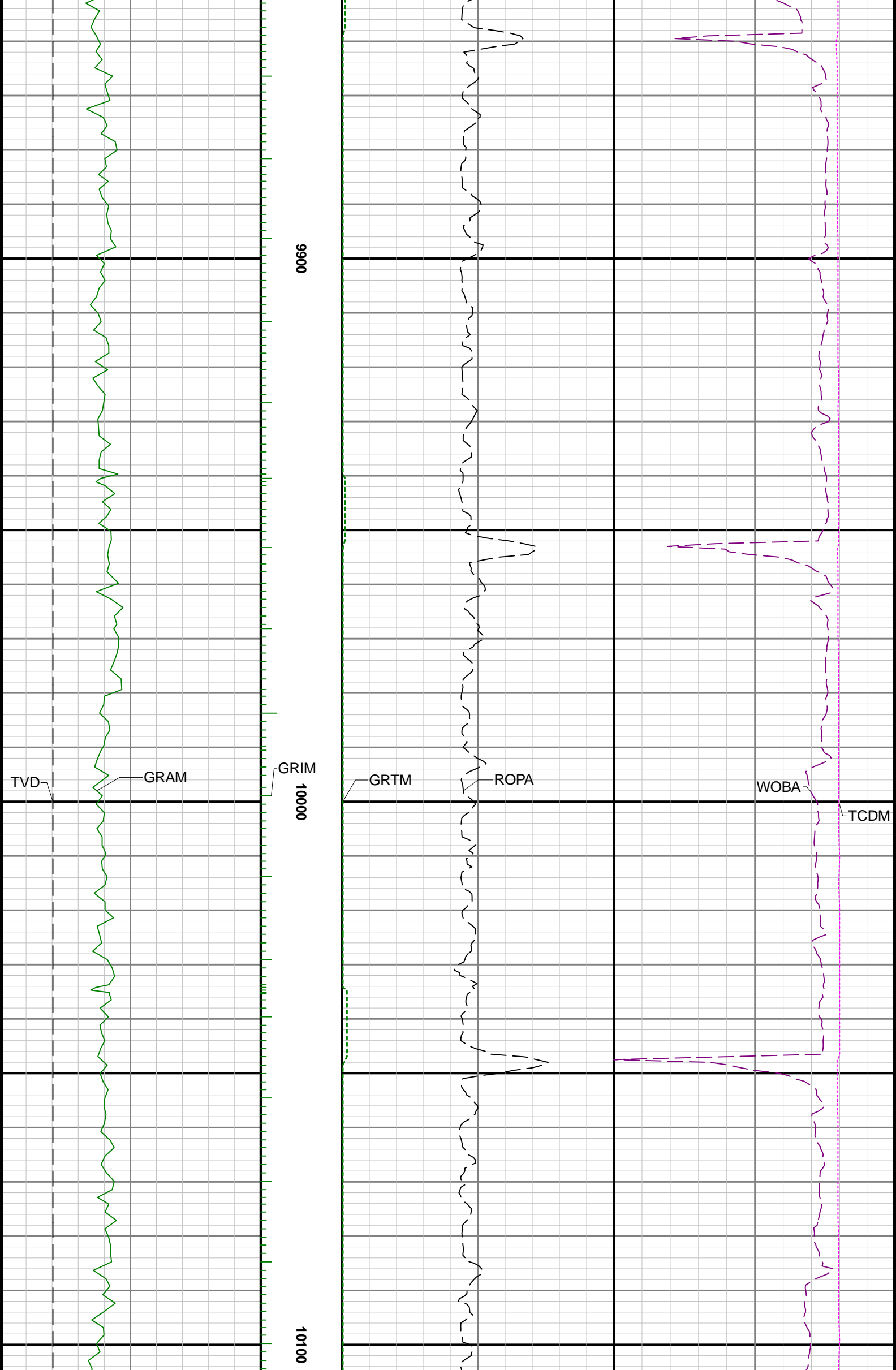
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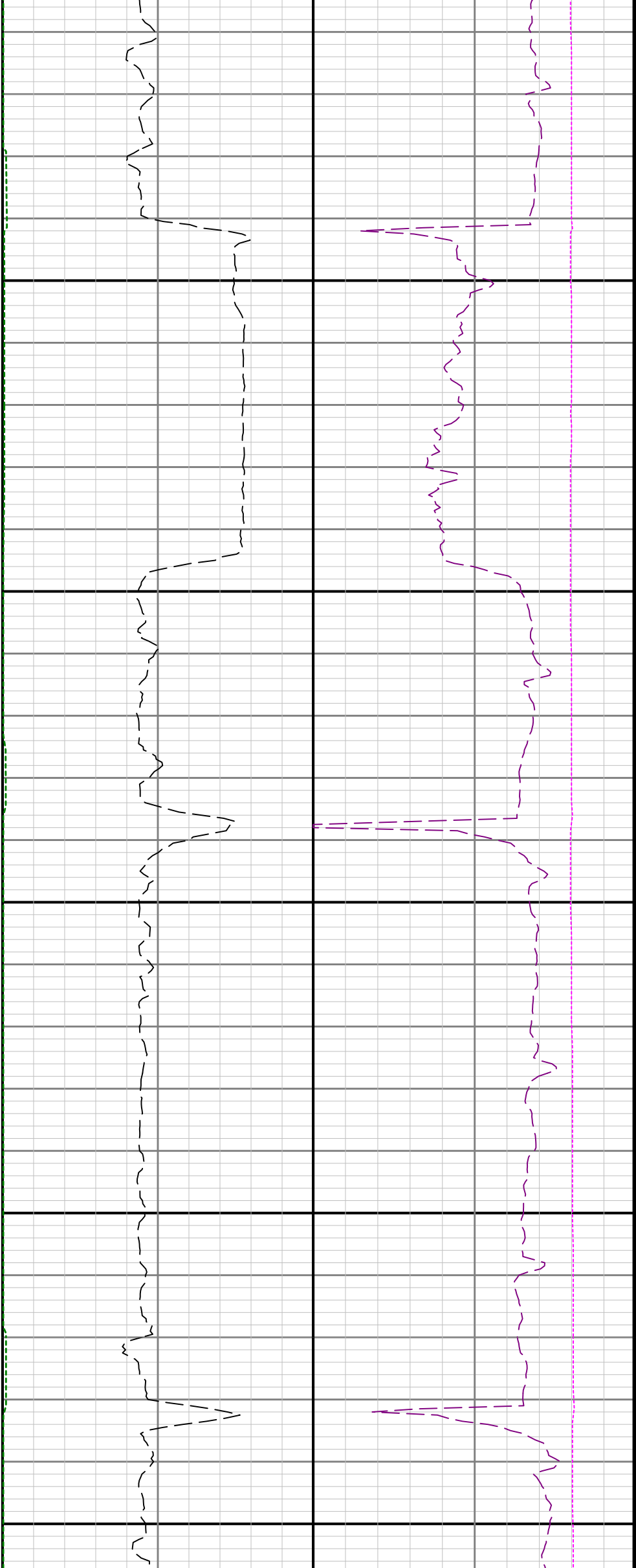
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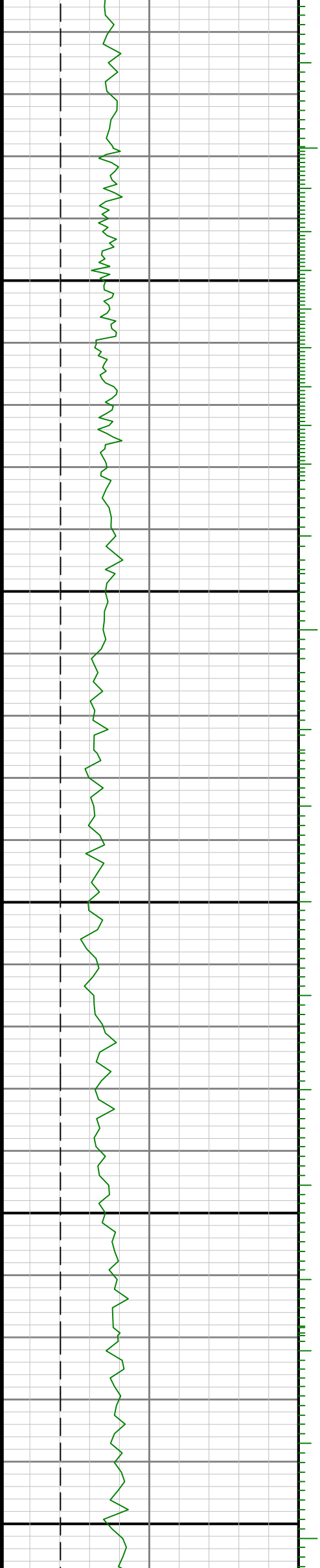


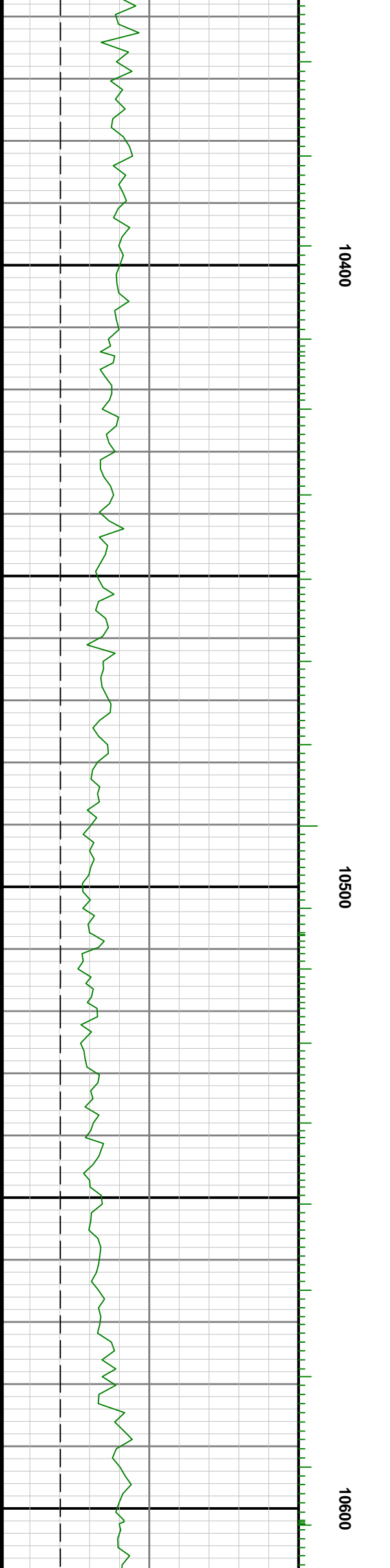
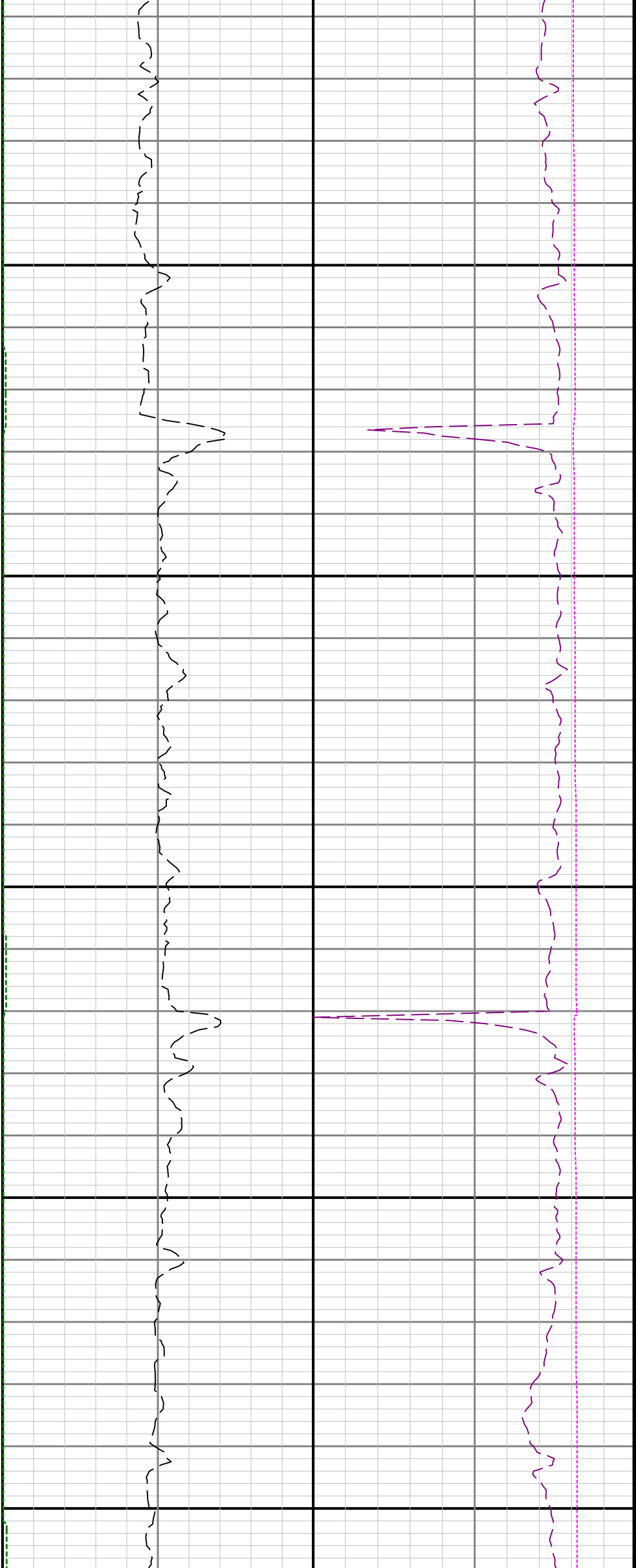


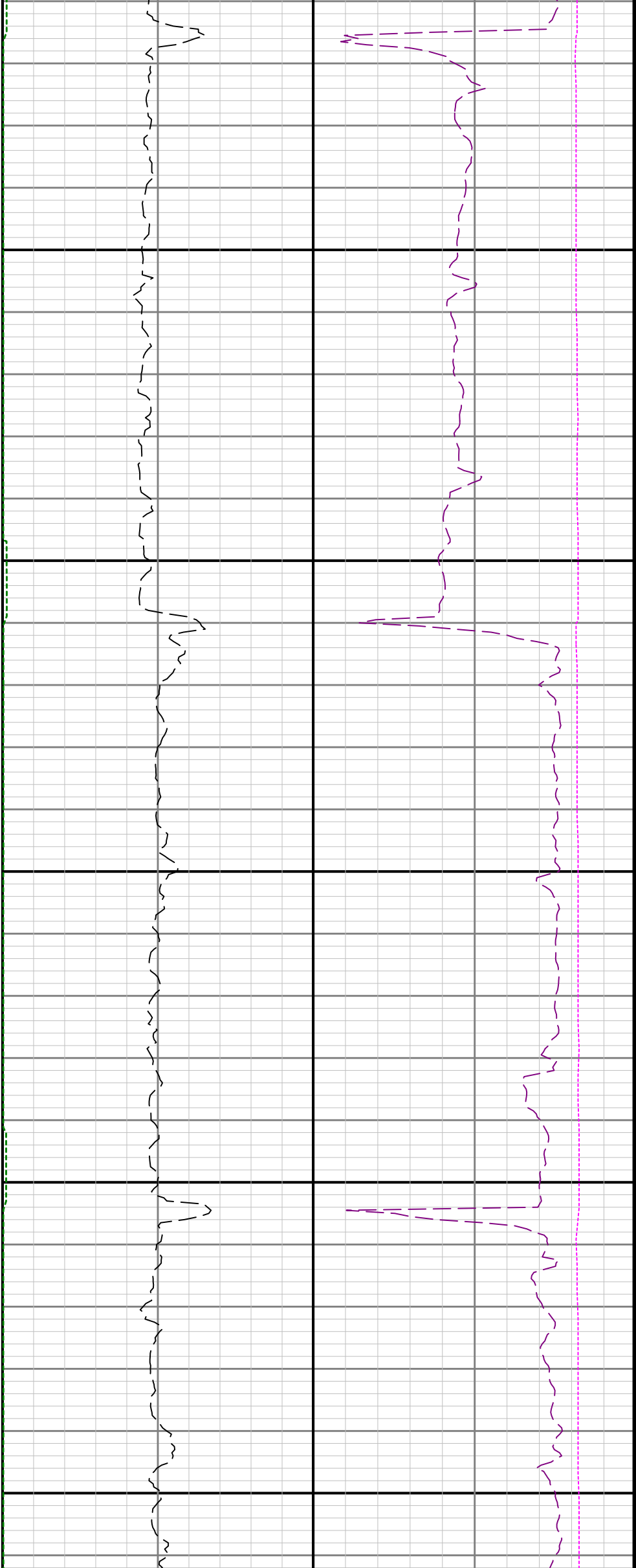


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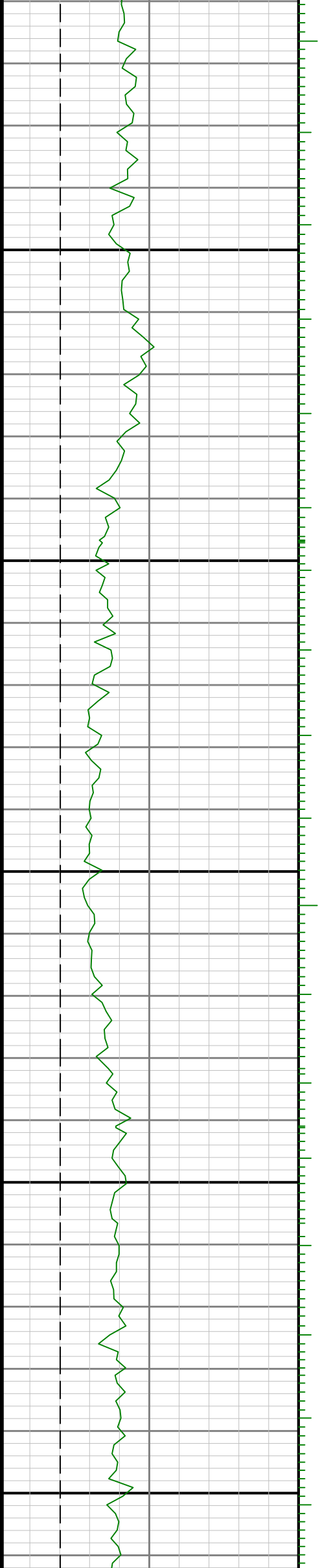


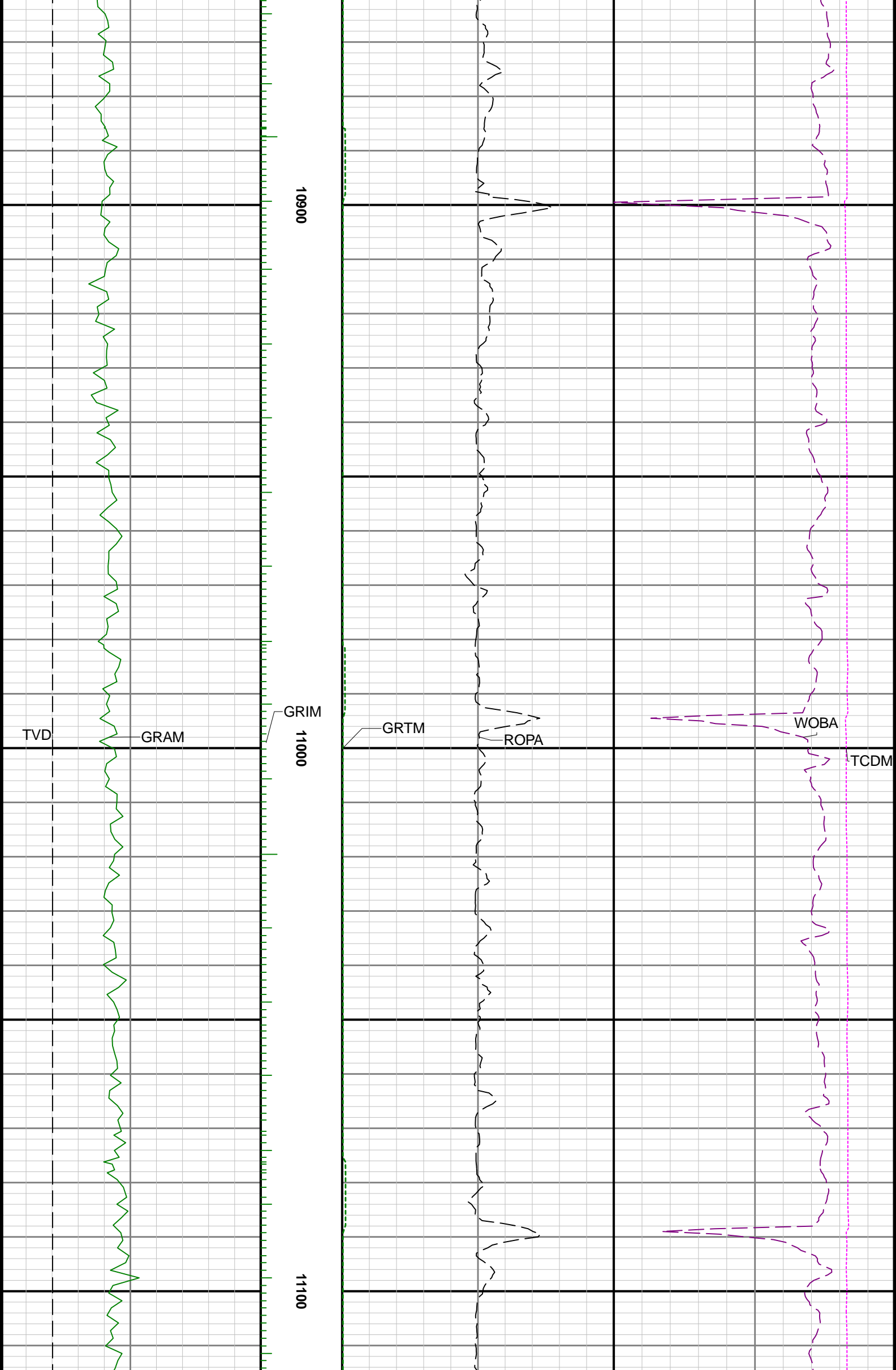




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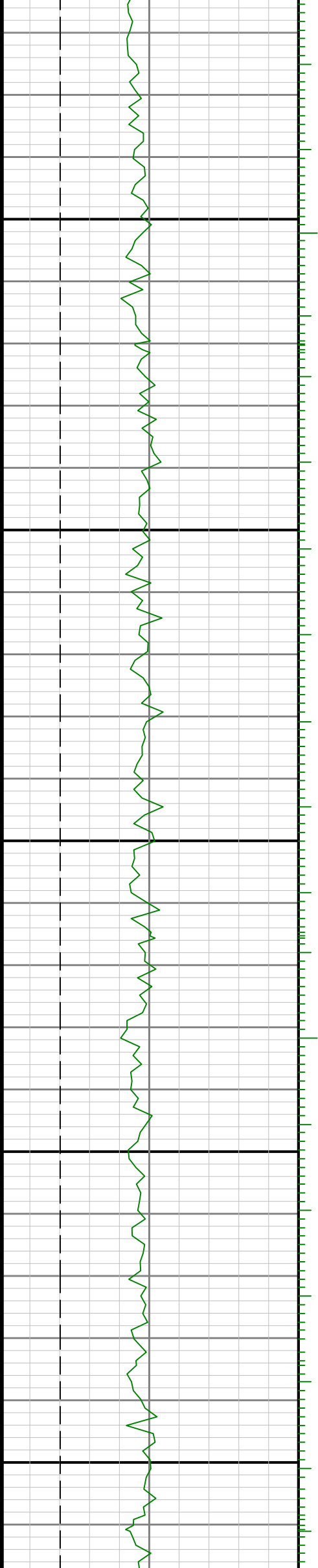


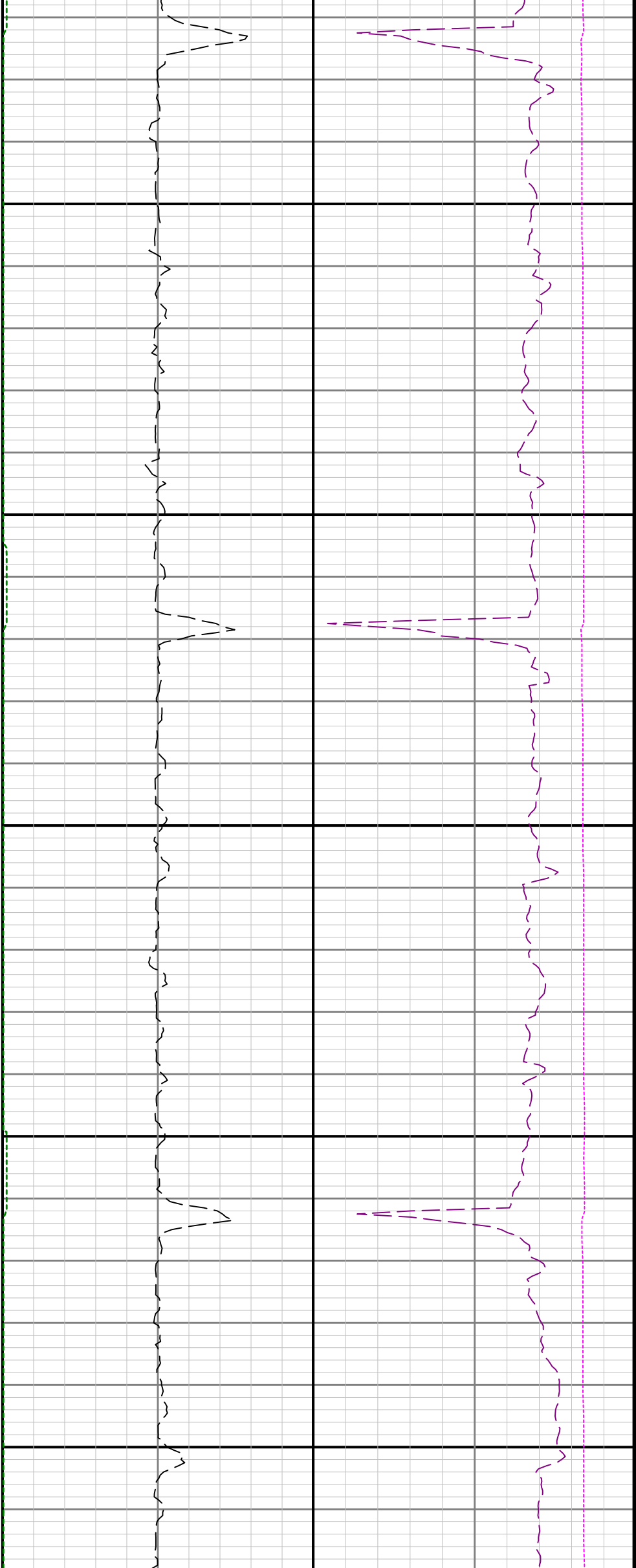




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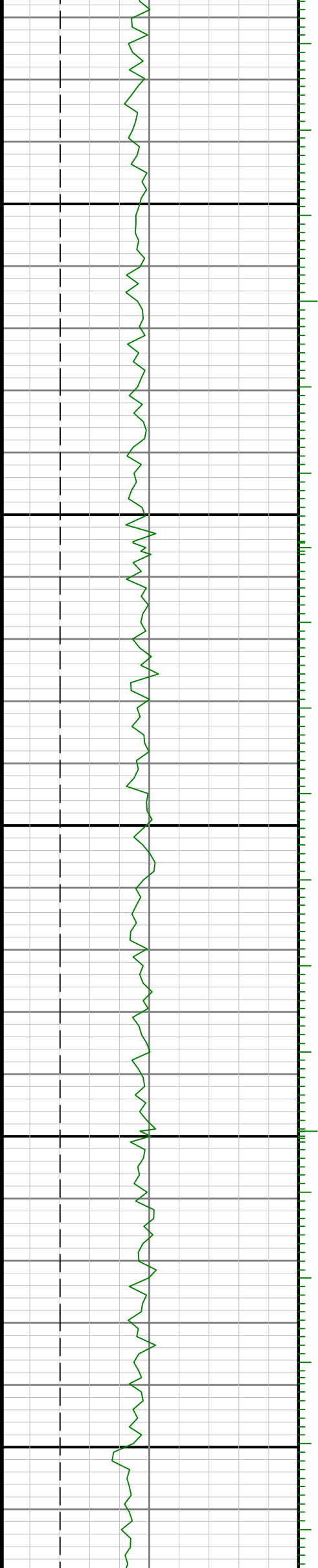




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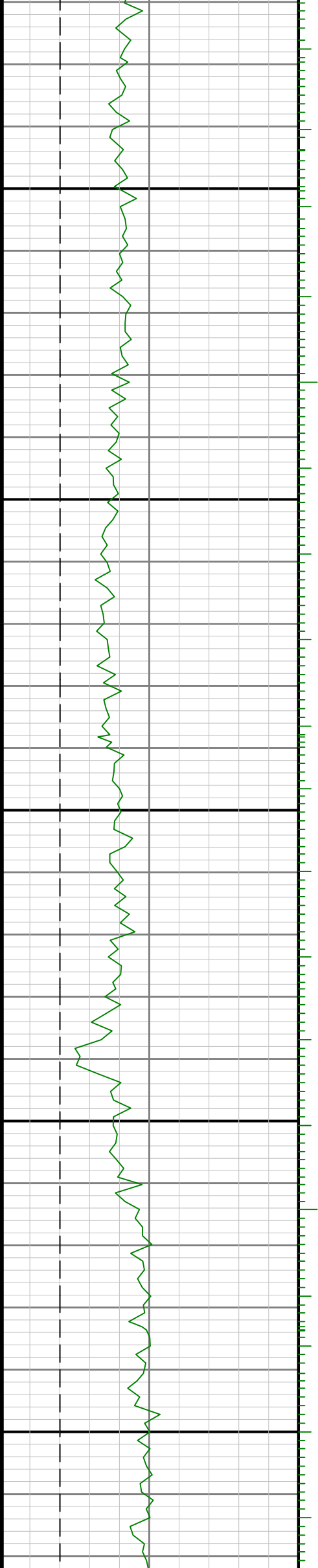
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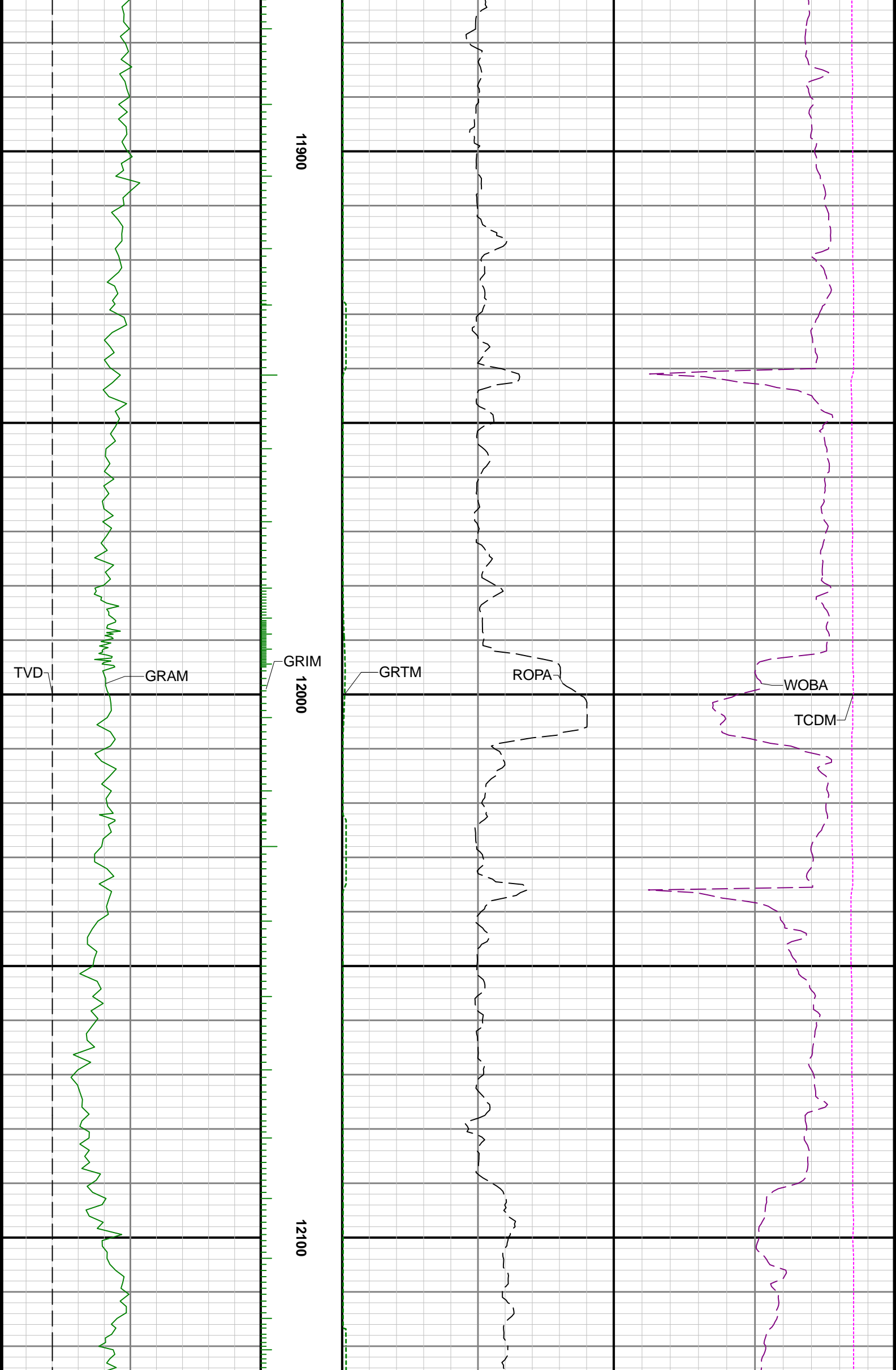


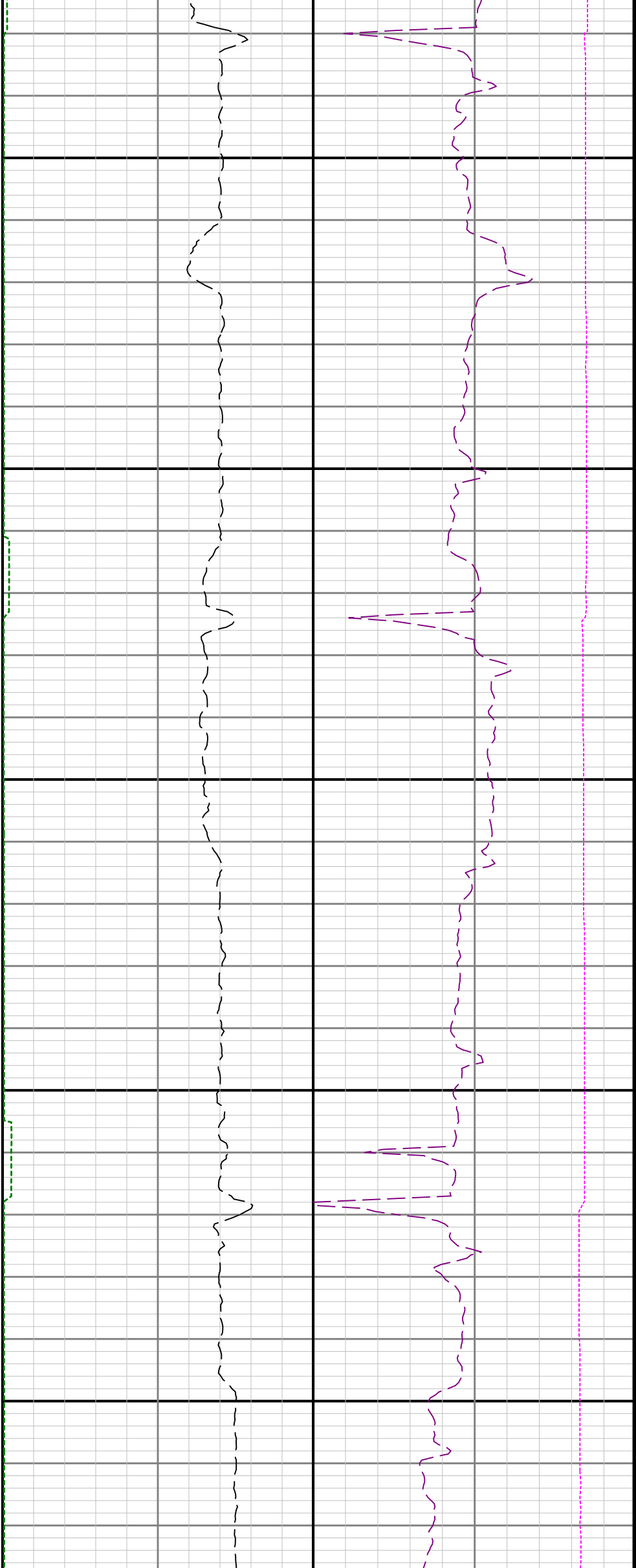


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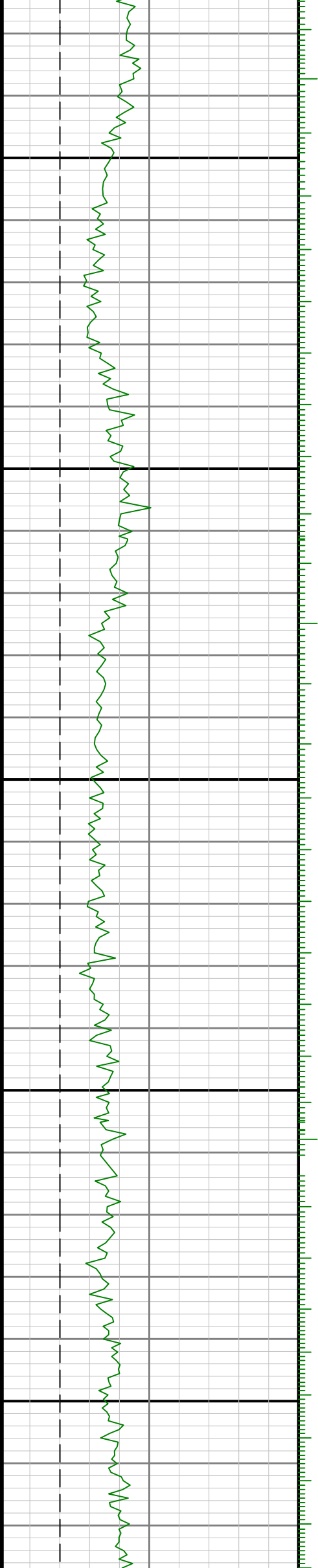






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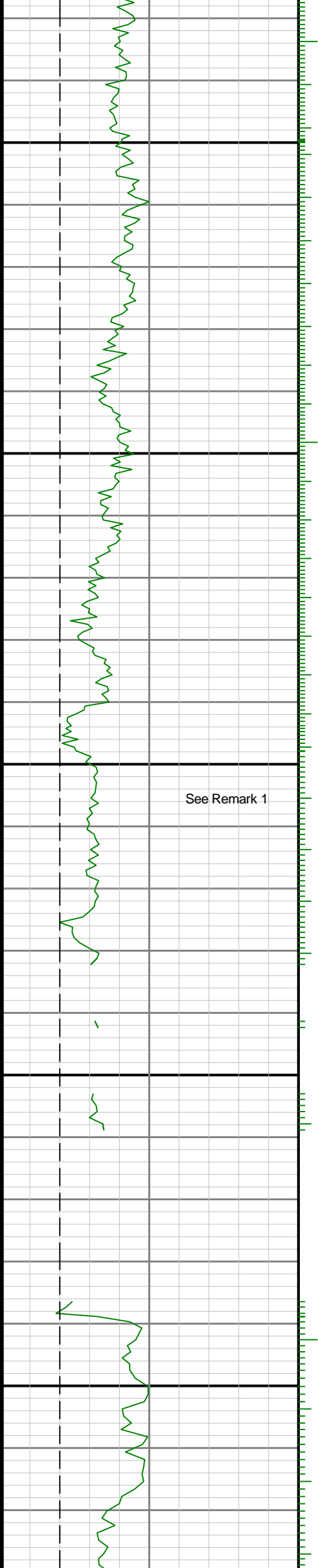
R1 <=> R2

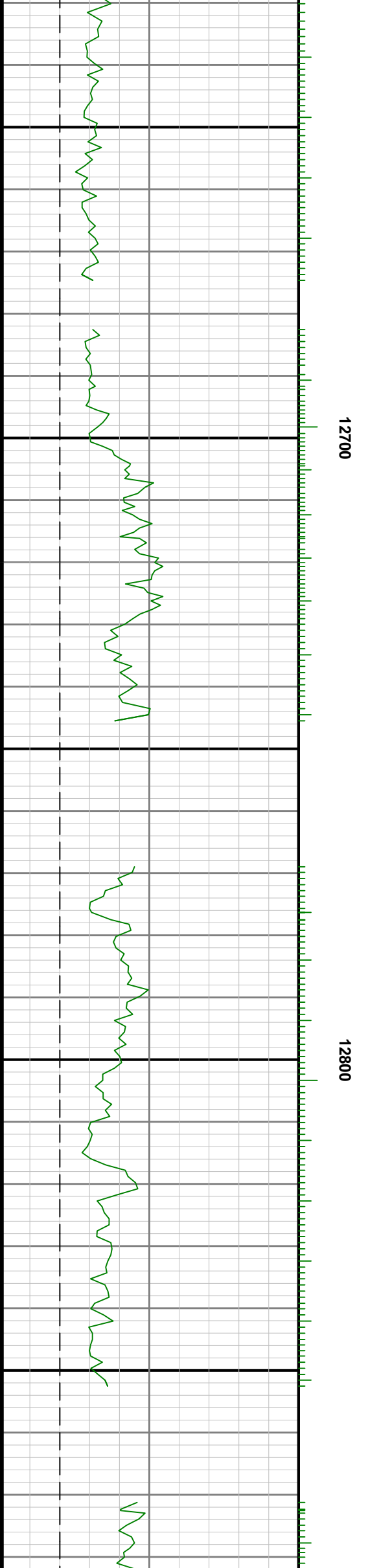
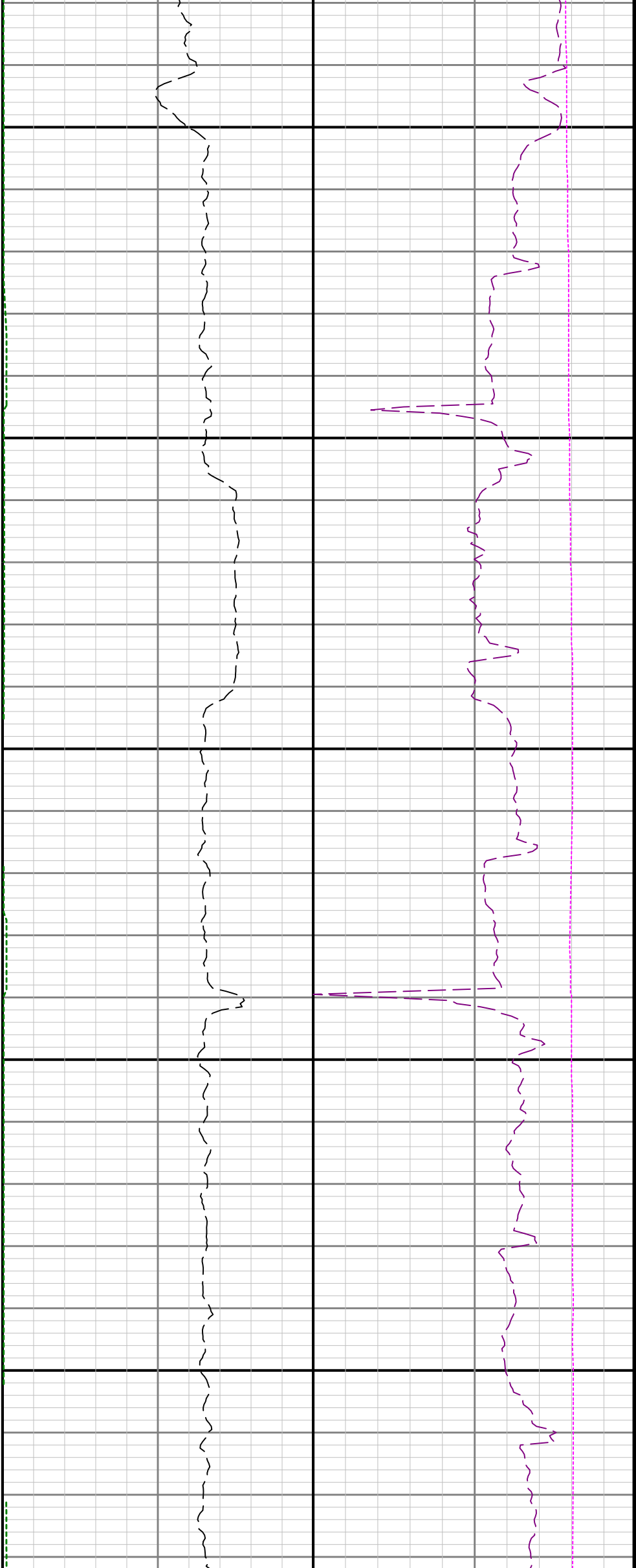
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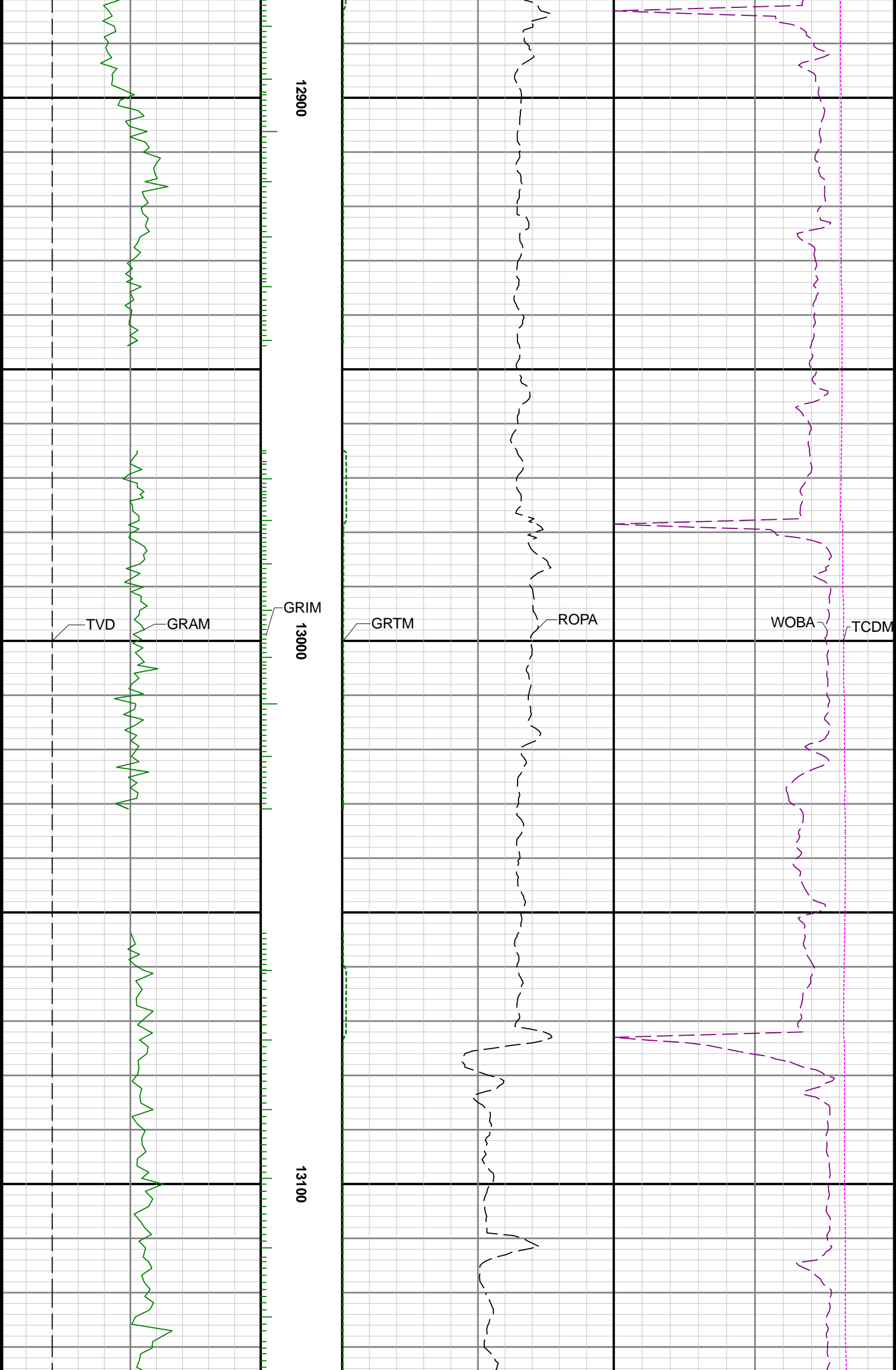
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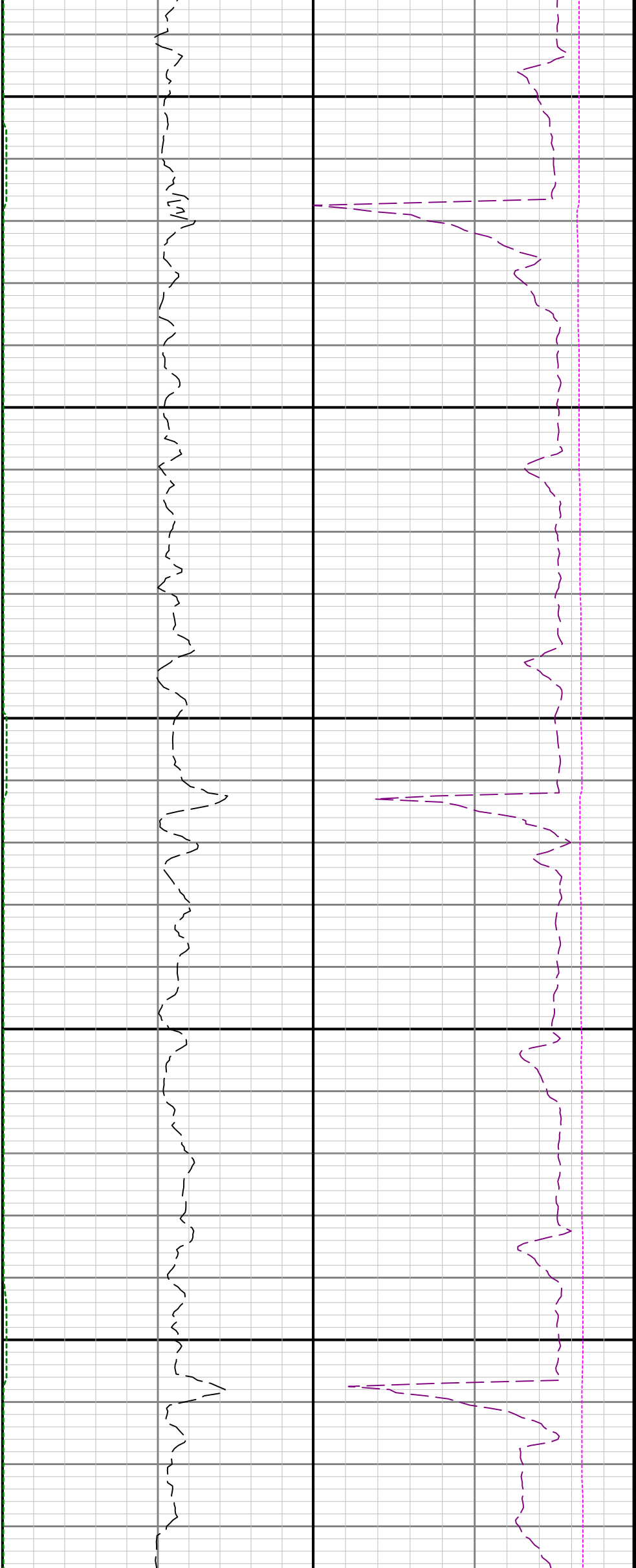
12600

See Remark 1



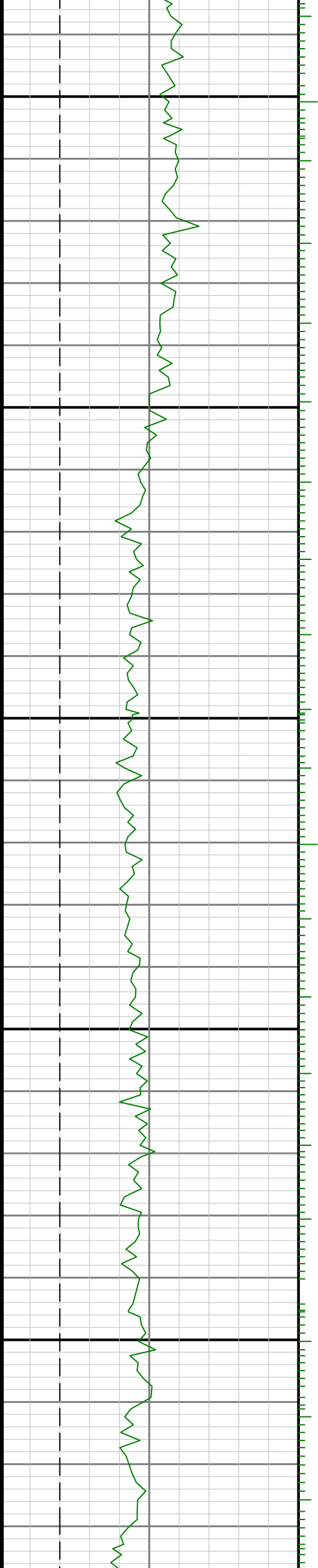


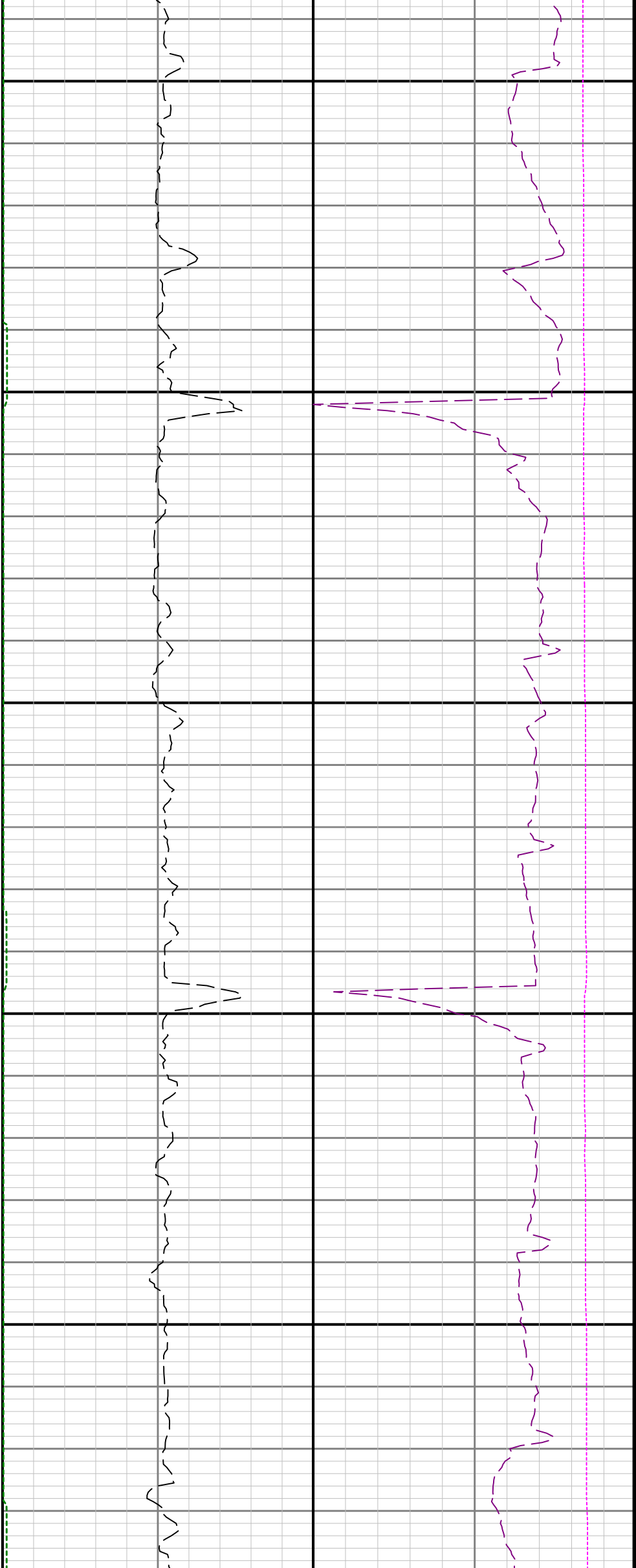




13200

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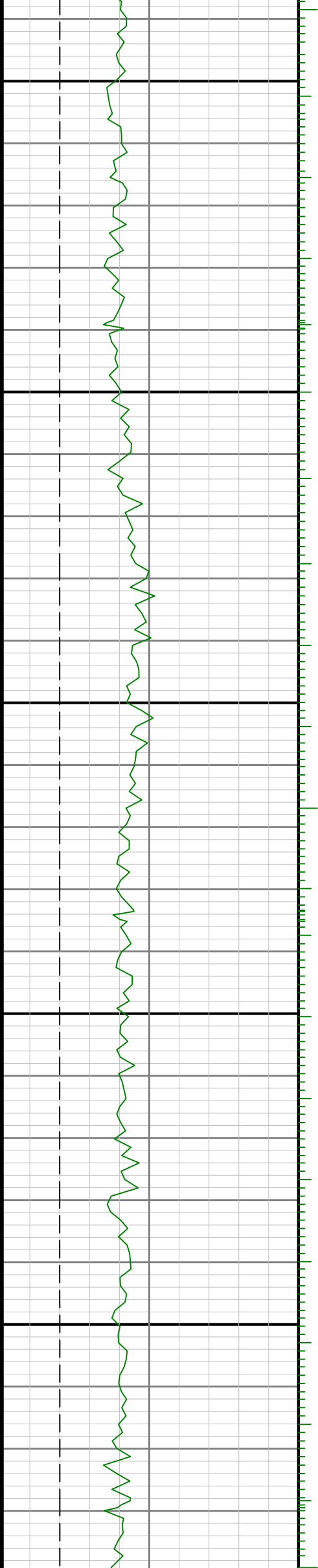




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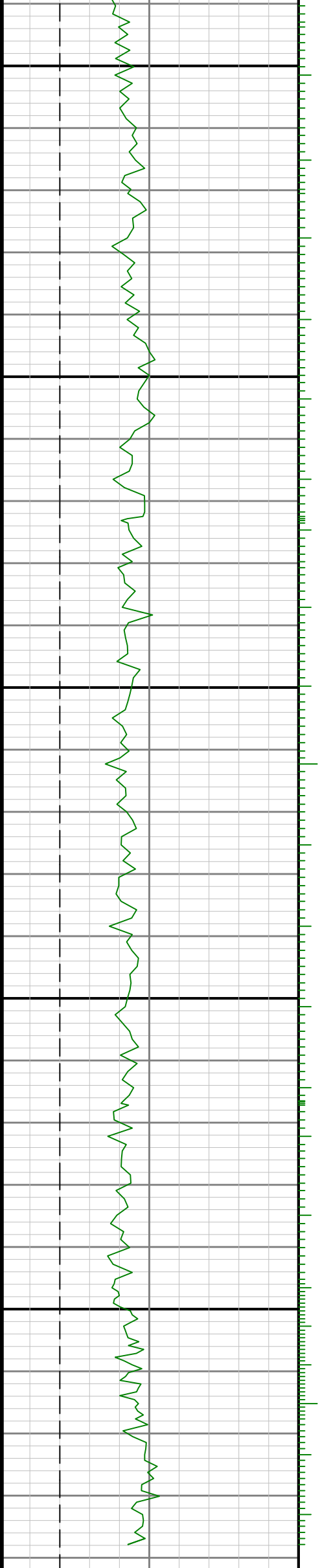
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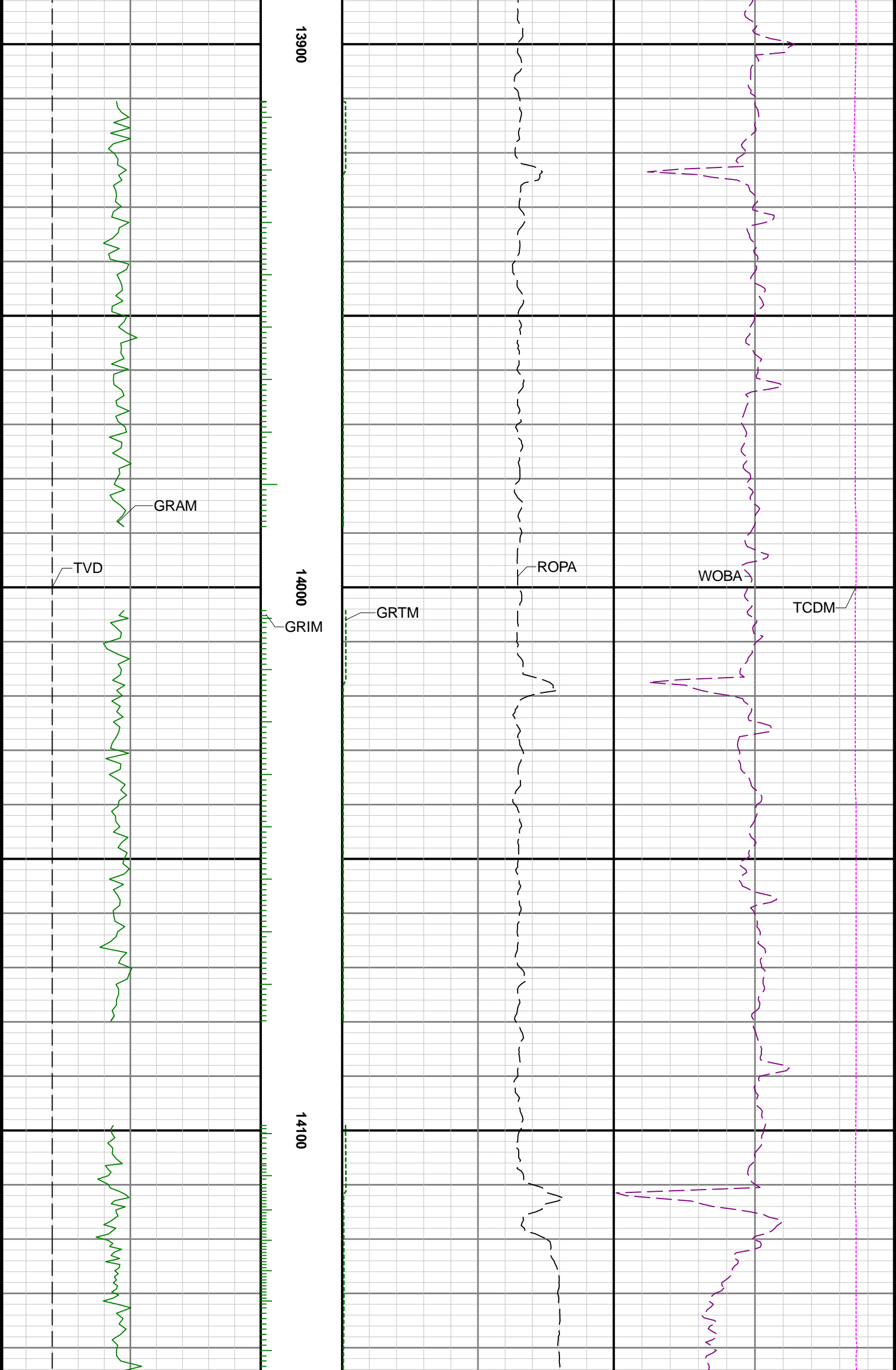


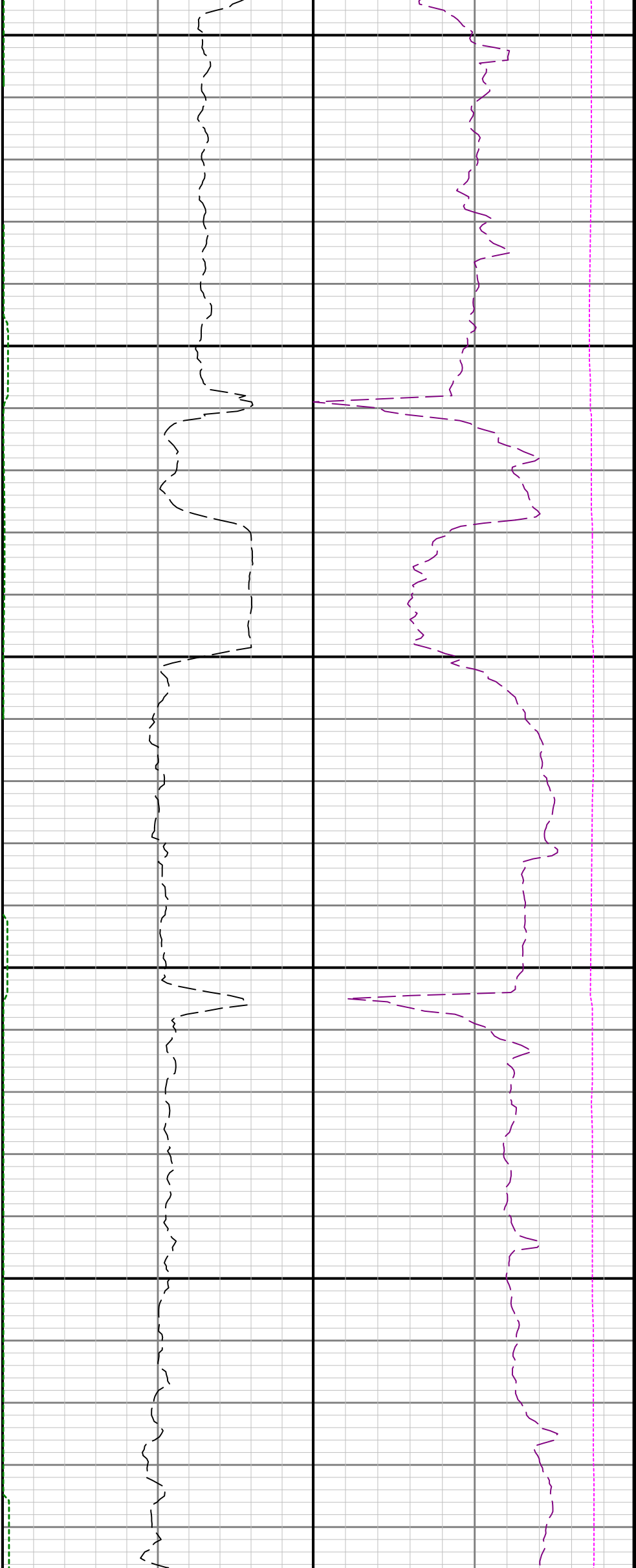


13700

13800

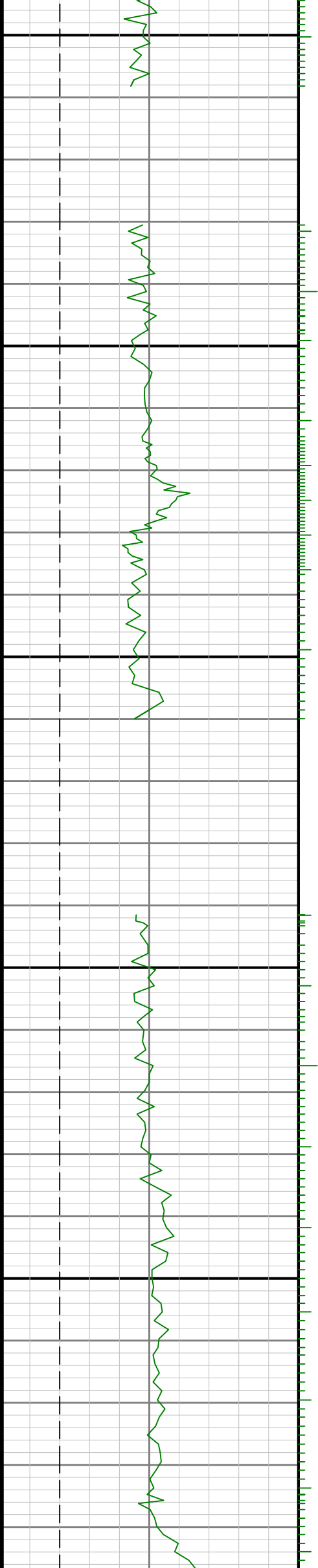


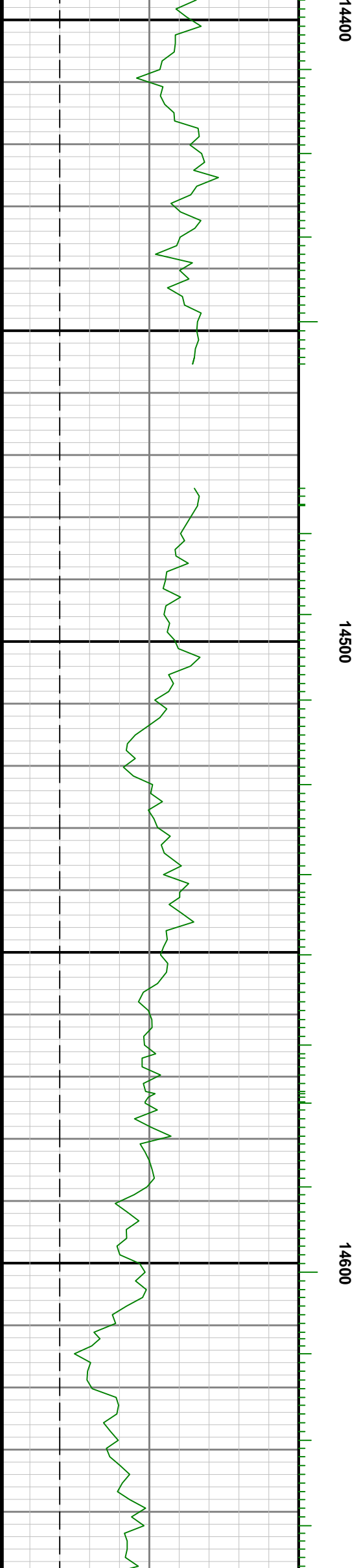


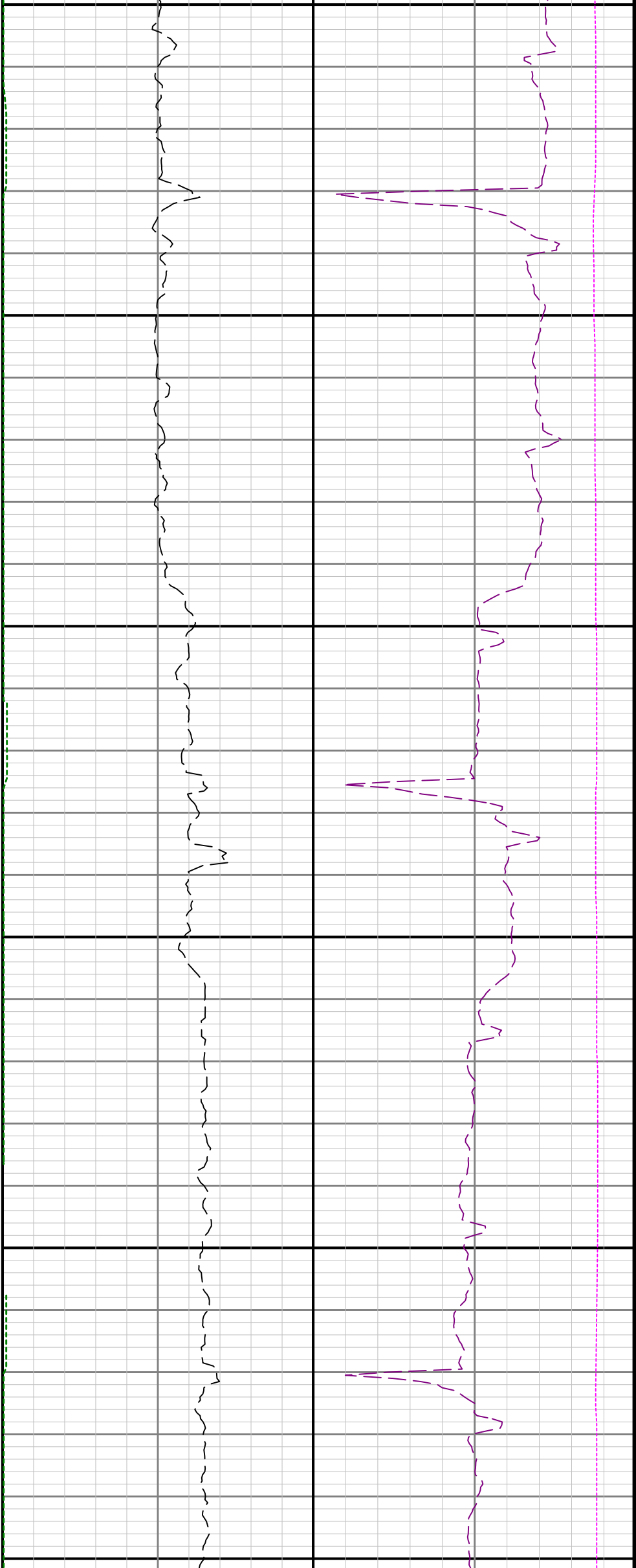


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14300



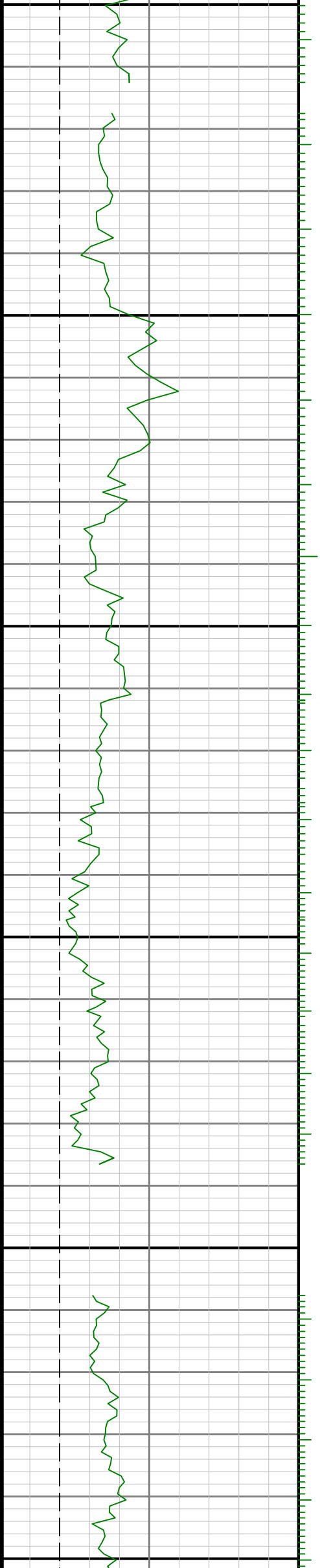


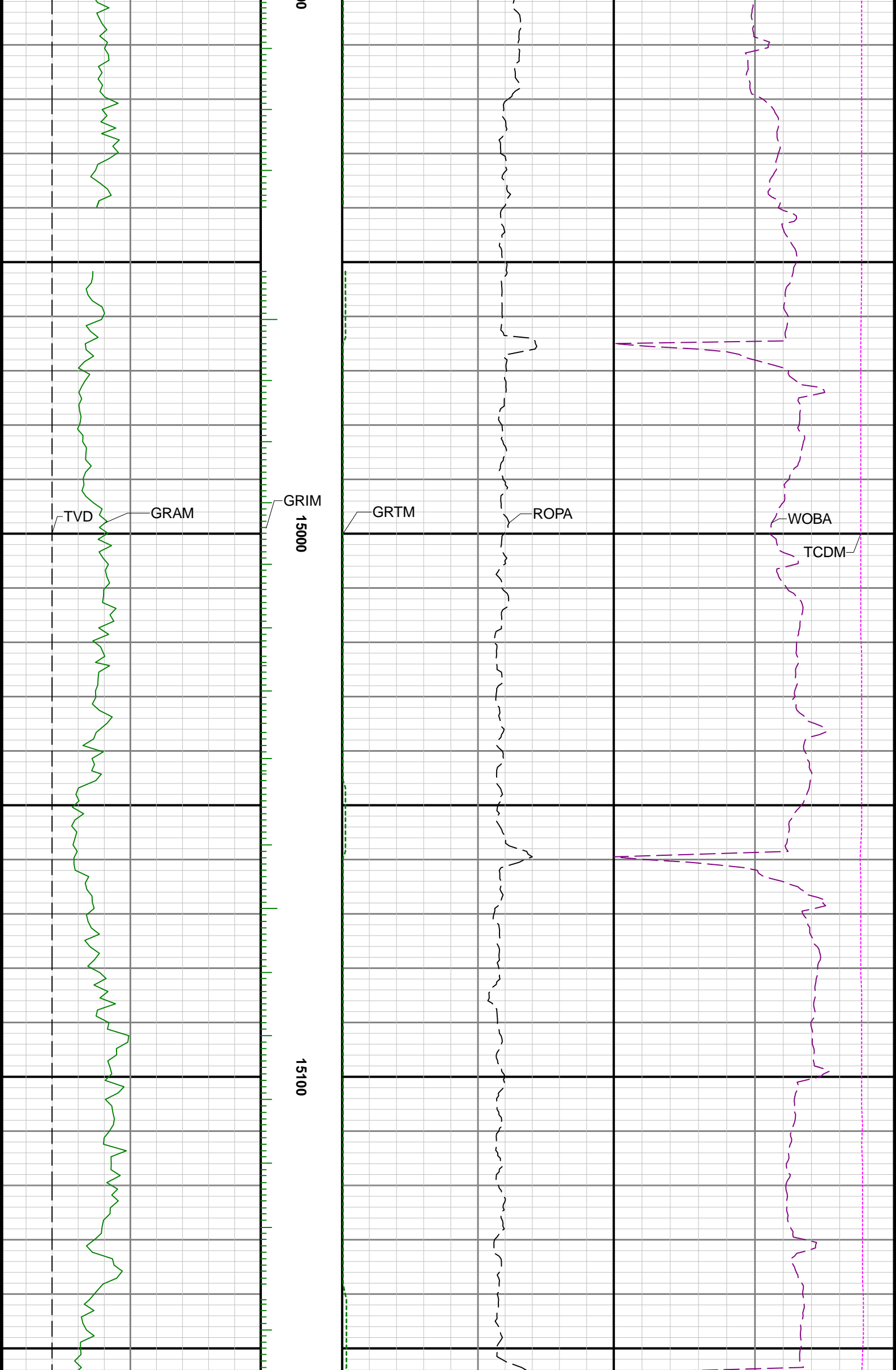


14700

14800

14900



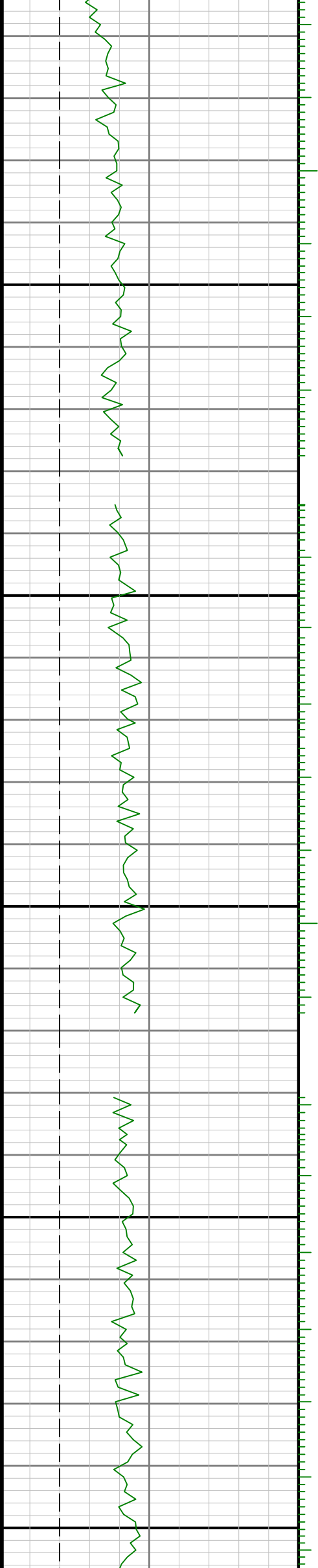




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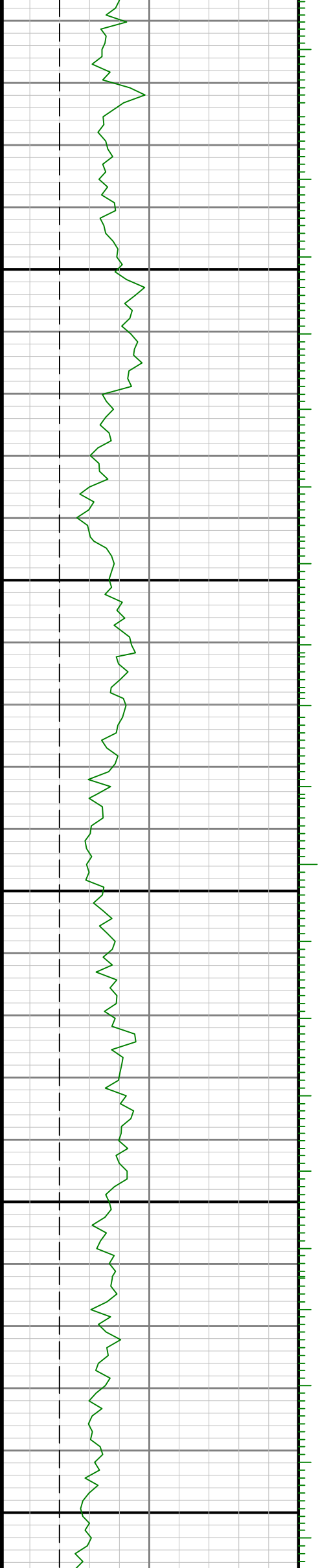
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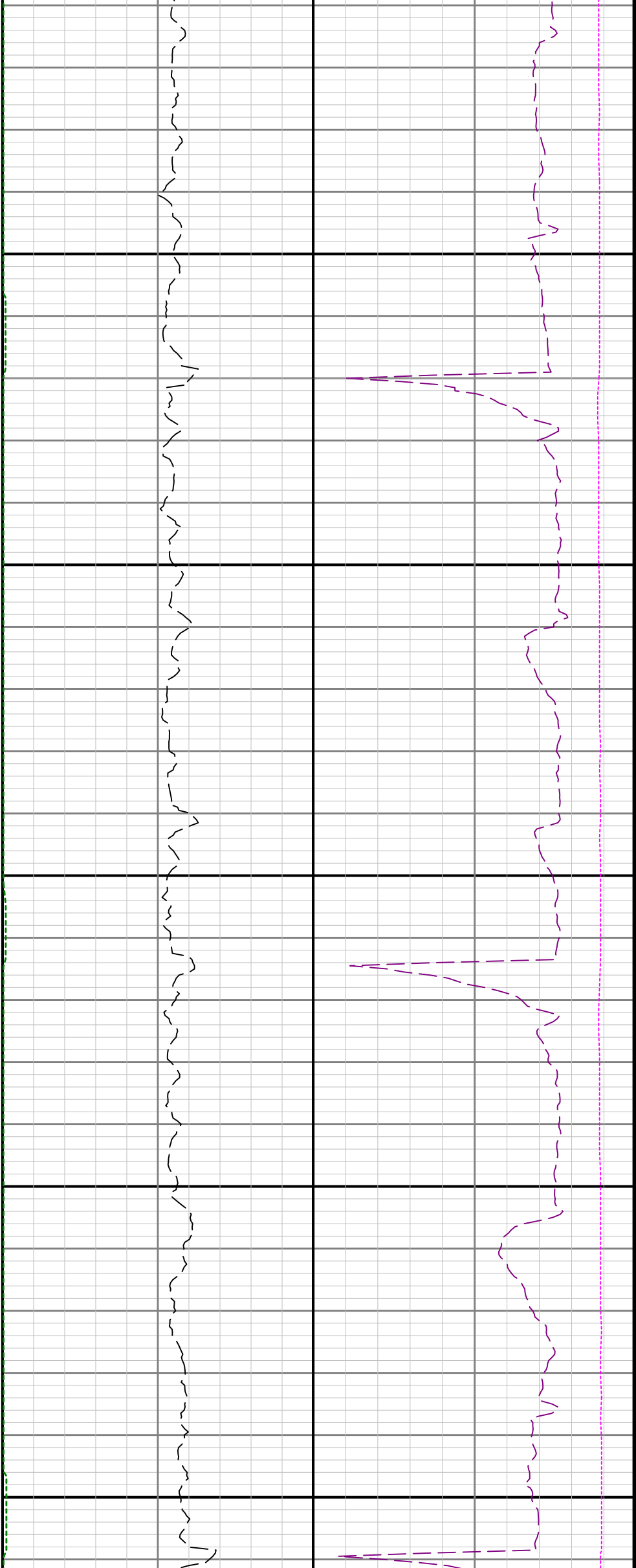




15500

15600

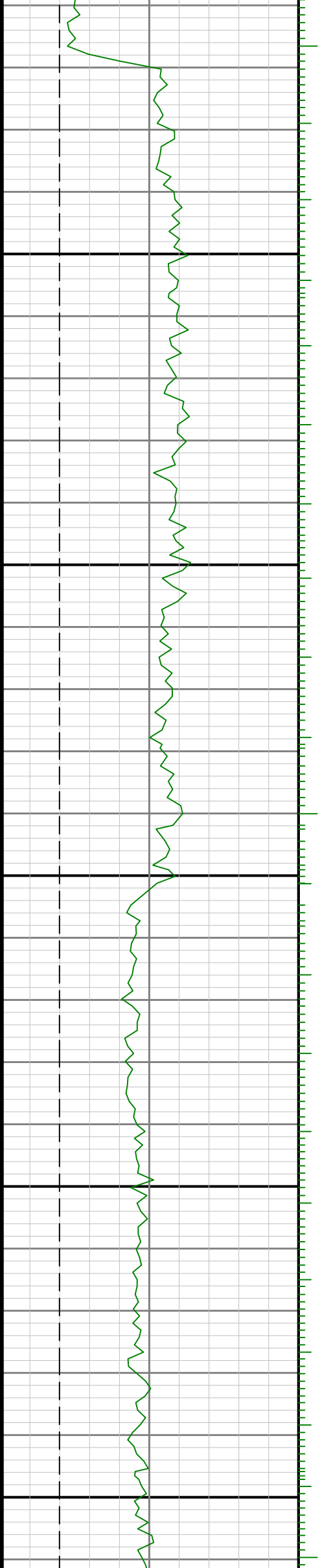


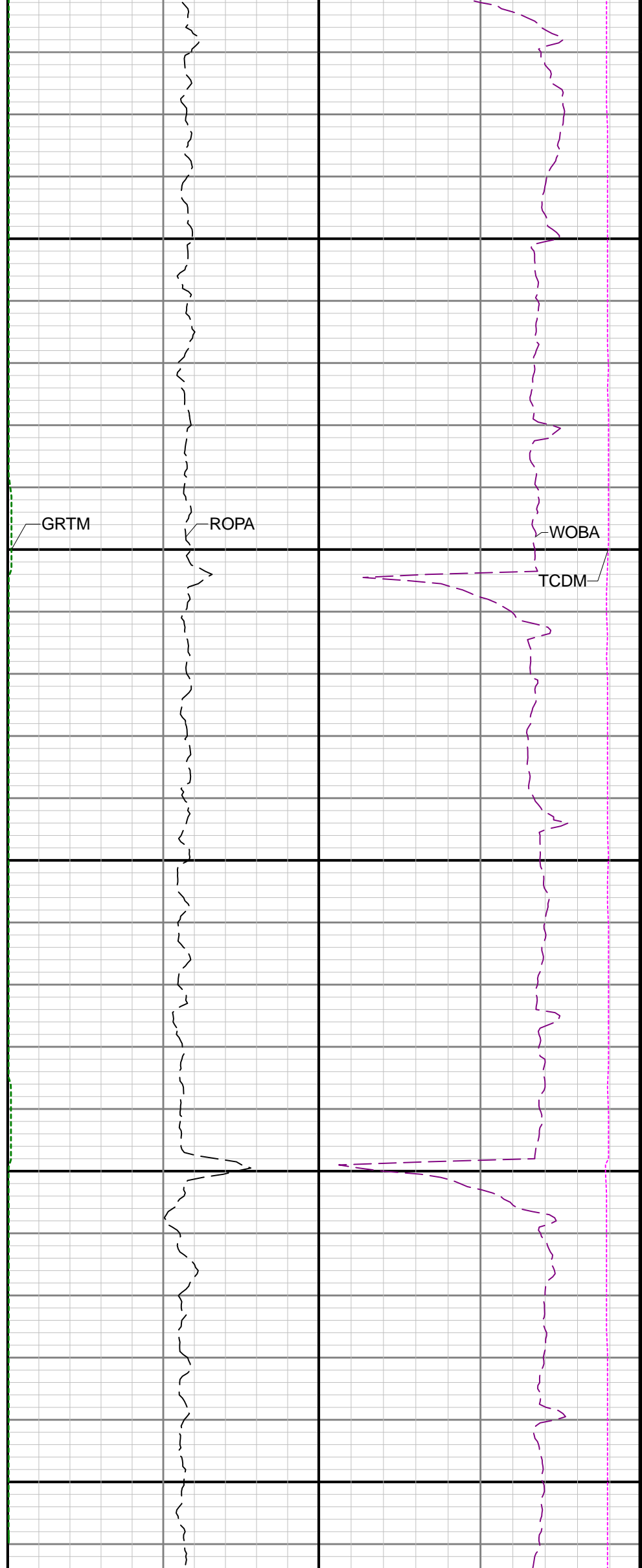
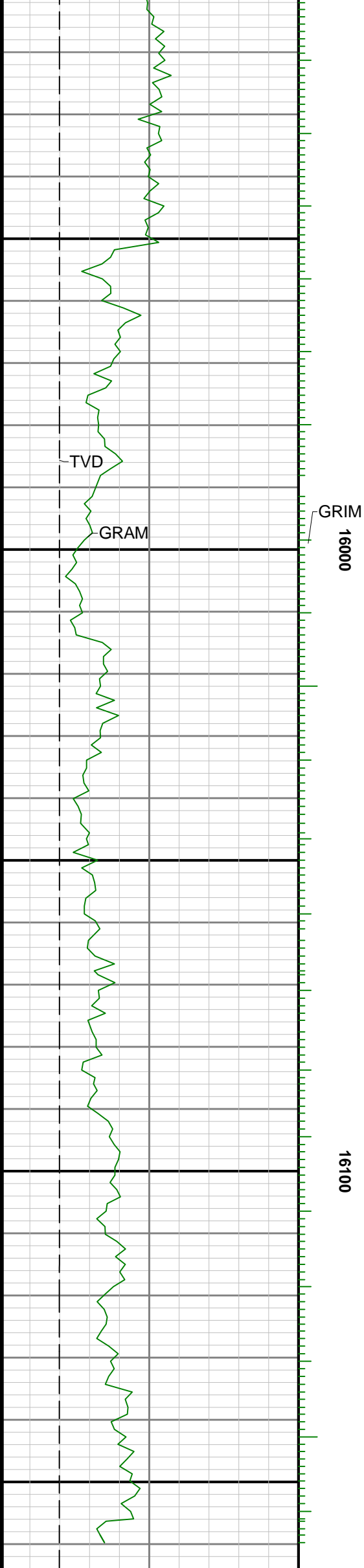


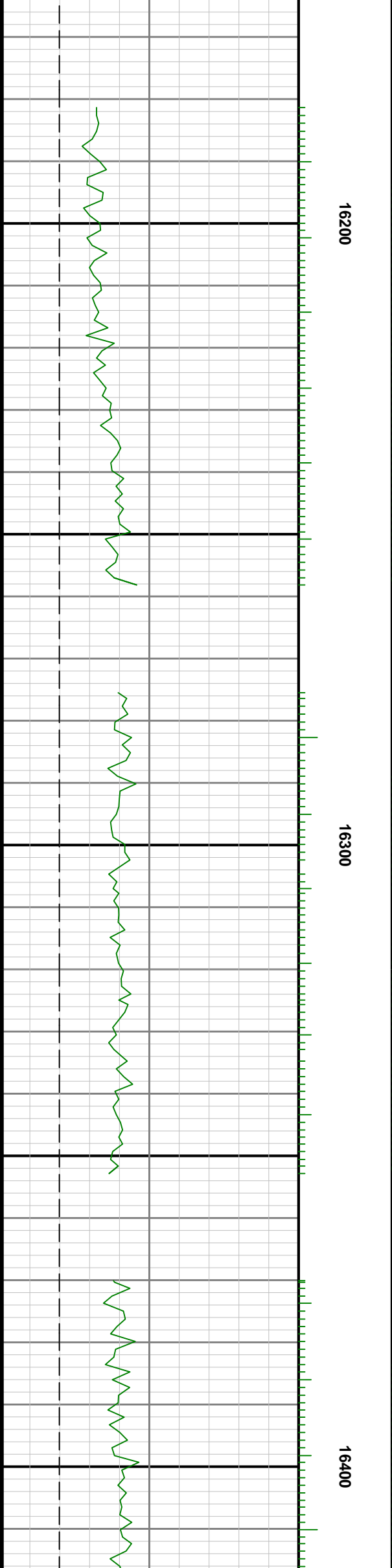
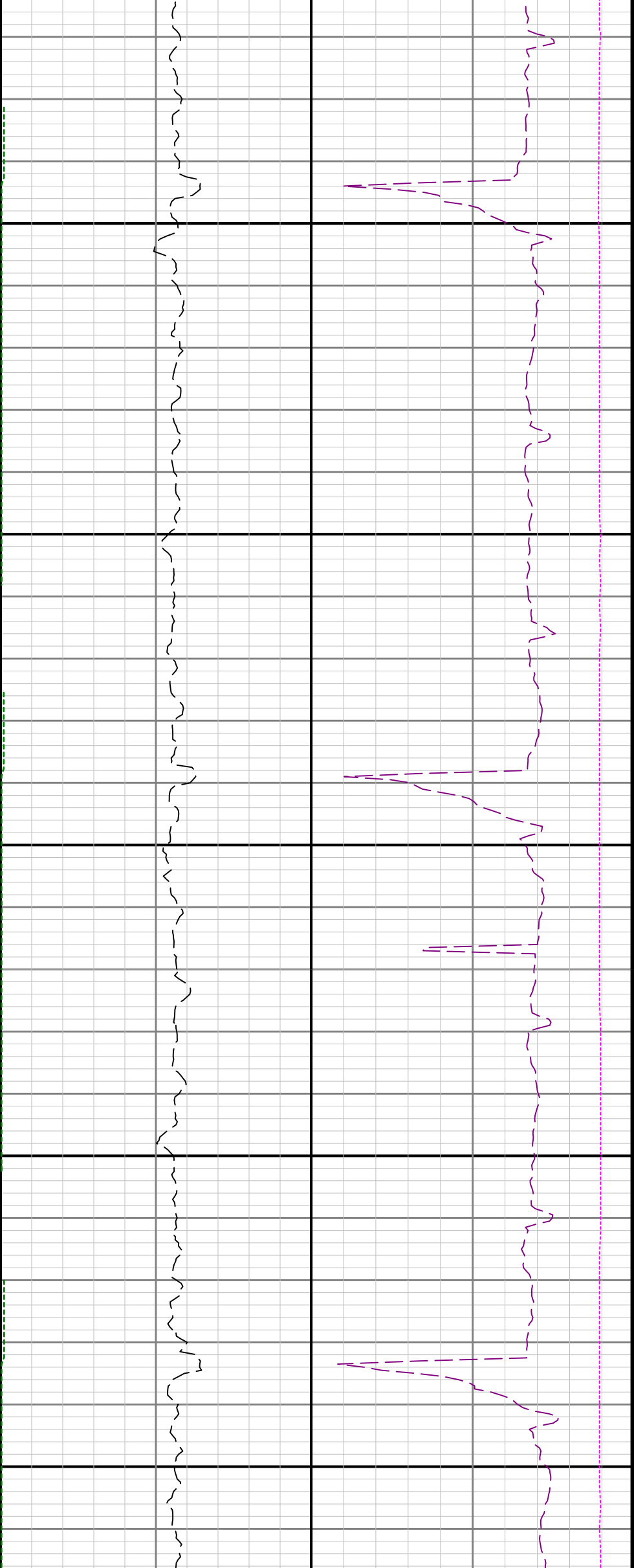
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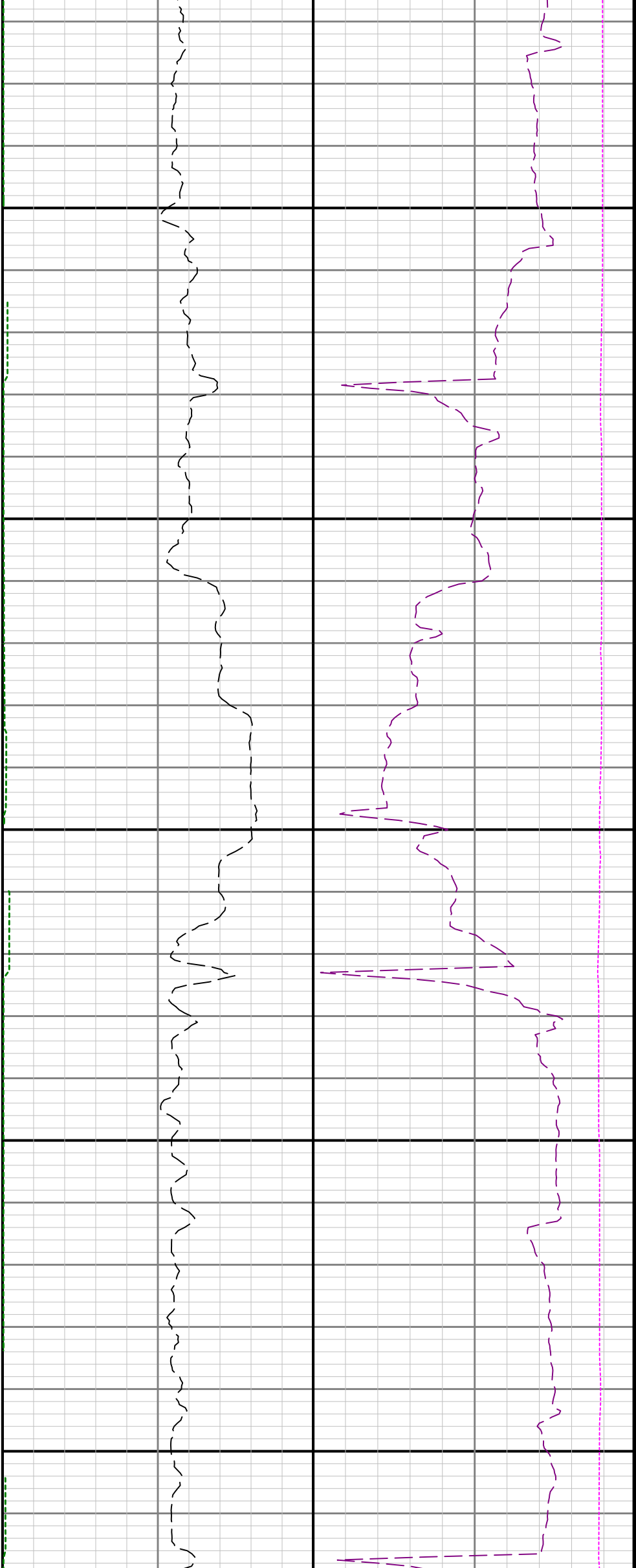
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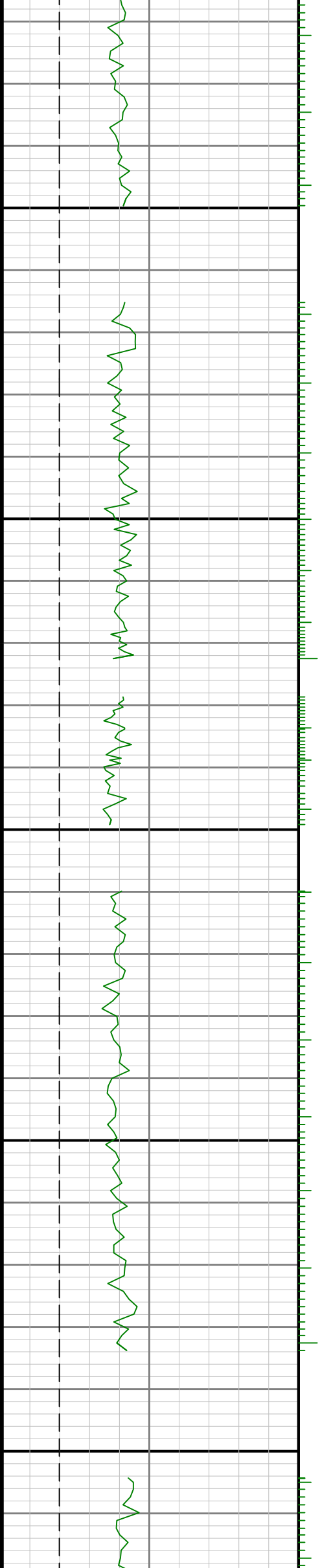


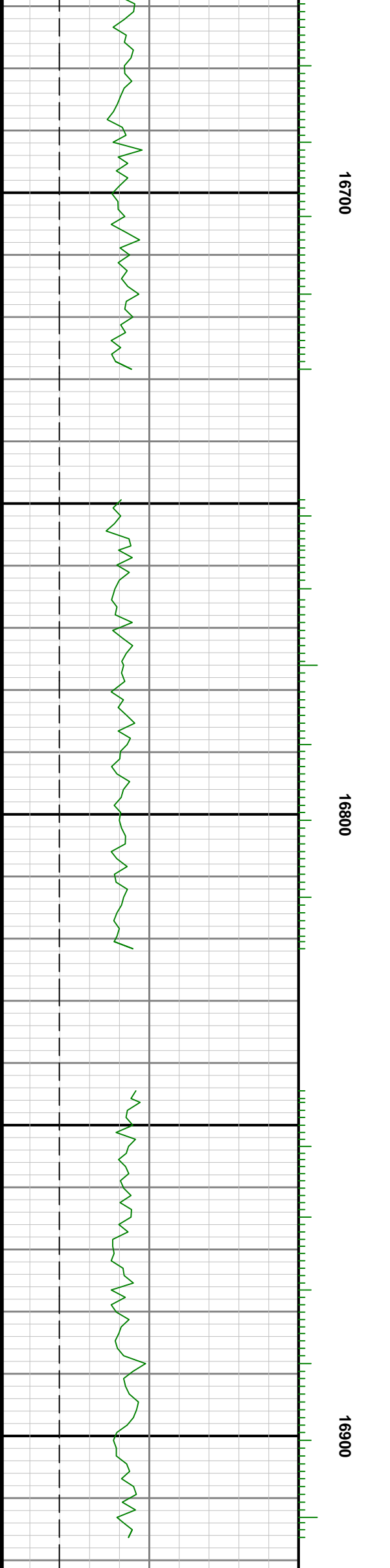


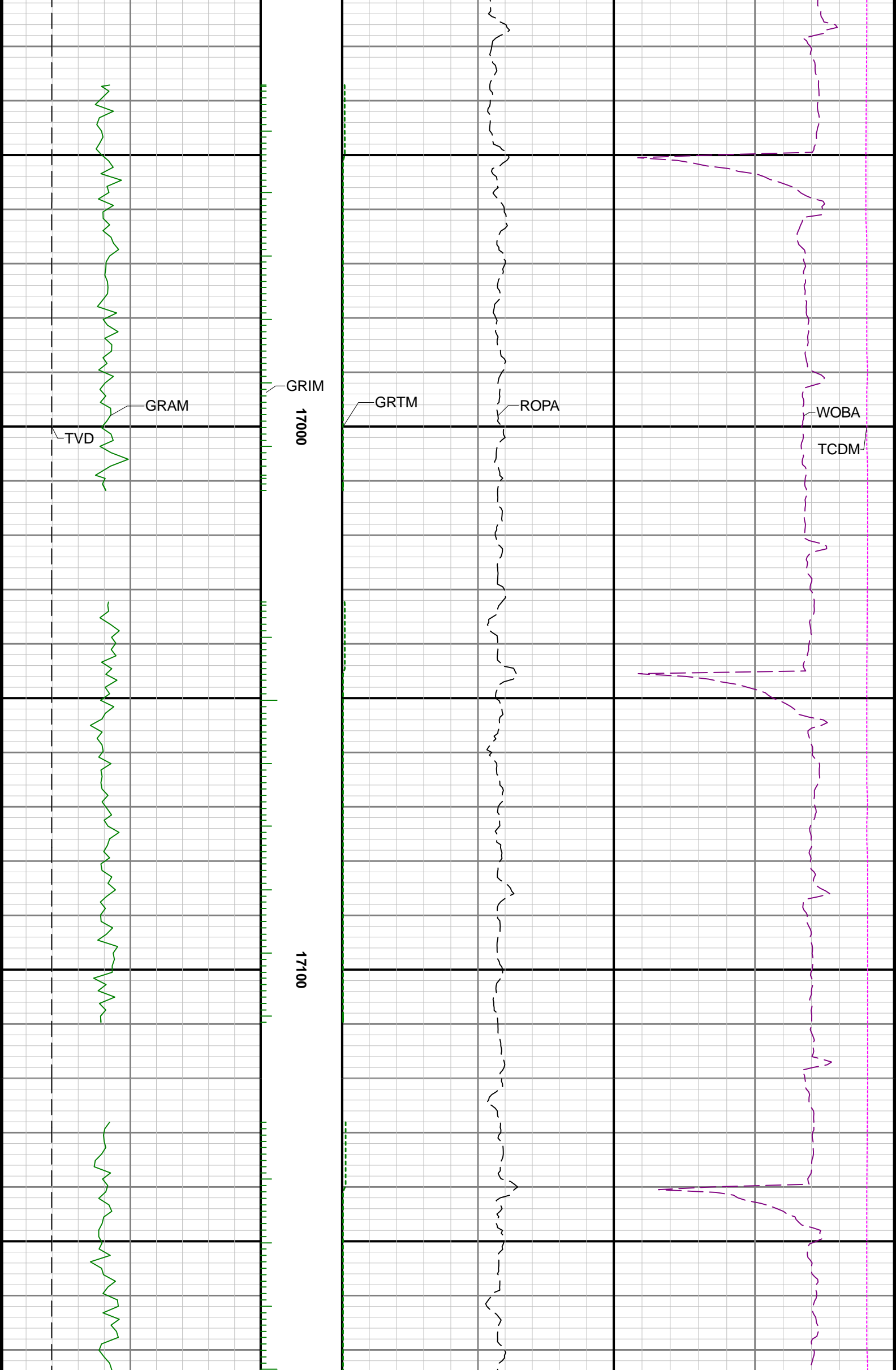


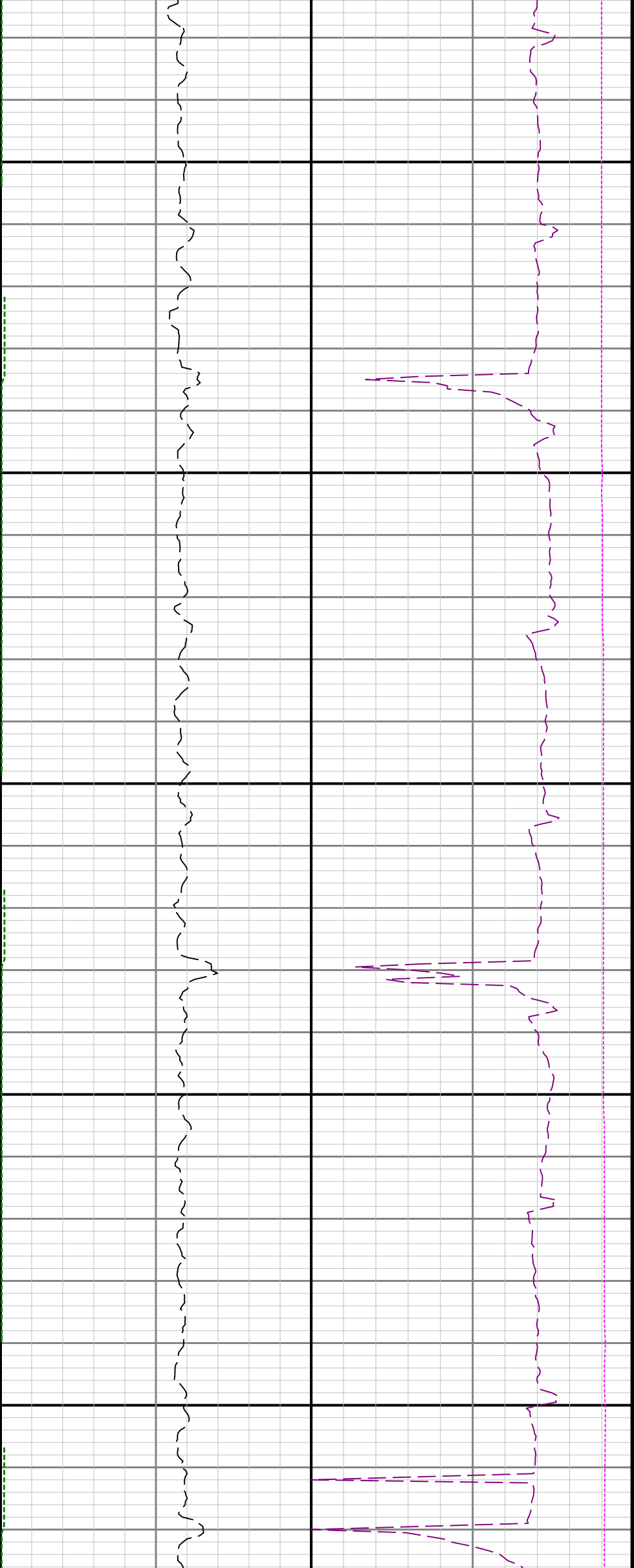
16500

16600









17200

17300

17400

