



LWD MEMORY LOG

Gamma Ray

Scale: **1:240 MD** Company: **Noble Energy**

Well: **Hurley H26-768**

Field: **Wattenberg**

Driller's Depth: **Country: Weld** **Country: United States**

Status: **Final Print** State: **Colorado**

API No: **05-123-46766-00** Surface Location: **Latitude: 040° 11' 49.560" N** **Longitude: 104° 38' 07.764" W** Other Services:

Job ID: **9172372** SEC: **26** TWN: **3N** RGE: **65W** Directional

Permanent Datum (P.D.): **Ground Level** Elevation: **4822.00 ft** Elev. KB: **4852.00 ft**

Log Measured From: **Rig Floor** Above P.D. **30.00 ft** Elev. D.F.: **4822.00 ft**

Dates: **Interval Drilled** **Magnetic Field Reference**

Date From: **2018-06-07** Top: (ft) **1943.00** Azi Reference North: **Grid** Dip Angle: (deg) **66.73**

Date To: **2018-06-10** Bottom: (ft) **16146.00** Total Magnetic Field Strength: (nT) **52121**

Spud Date: **2018-06-06** Mag to Reference North Correction: (deg) **7.56**

Borehole Record **Casing Record**

Hole Size (in)	From (ft)	To (ft)	Size (in)	Weight (lb/ft)	From (ft)	To (ft)
13.500	30.00	1943.00	9.625	36.00	30.00	1933.00
8.500	1943.00	16146.00				

Mud Record **Deviation Record**

Type	From (ft)	To (ft)	Hole Size (in)	Interval (ft)	Inc Az (Start)	Inc Az (End)
Oil Based Mud	1943.00	16146.00	8.500	14203.00	0.51 317.84	90.03 354.80

Acquisition System: **Baker Hughes Cadence** Software Version: **RT 4.2** Rig: **H&P 517**

Plot Studio: **4.2.8155.1** 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	1943.00	16133.00	1943.00	16146.00	2018-06-07 13:25	2018-06-09 17:42	47.91

Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Adam Schlenz	2018-06-06	2018-06-10						

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+ (%)
2018-06-07 13:45	1	2032.00	Oil Based Mud	9.4	13	N/A	16.4	70/18	Active Pit	30000	0.00
2018-06-08 02:30	1	6055.00	Oil Based Mud	9.2	11	N/A	16.0	75/14	Active Pit	21500	0.00
2018-06-08 10:45	1	7864.00	Oil Based Mud	9.3	11	N/A	16.0	74/15	Active Pit	20000	0.00
2018-06-09 02:30	1	12497.00	Oil Based Mud	9.7	14	N/A	16.0	73/14	Active Pit	23500	0.00
2018-06-09 13:30	1	15226.00	Oil Based Mud	9.6	15	N/A	23.8	73.5/13	Active Pit	24000	0.00

Equipment and Service Data

Run	Tool	Serial	Measurement	Sensor	Bit	Max	Min
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No.		Number		Offset (ft)	Offset (ft)	O.D. (in)	I.D. (in)
1	ATC_SU	14186736	Near Bit Inclination	5.93	6.73	7.000	4.330
1	ATC_SU	14186736	Near Bit VSS	5.93	6.73	7.000	4.330
1	ATC_MWD	14269330	Gamma (single)	2.76	12.90	7.000	3.250
1	ATC_MWD	14269330	Directional (mag)	12.27	22.41	7.000	3.250

Service and Tool Mnemonics

Mnemonic	Name	Description
ATC_SU	ATC_SU	Auto Trak Curve Steering Unit
ATC_MWD	ATC_MWD	Auto Trak Curve MWD
ATC_LCPM	ATC_LCPM	Auto Trak Curve LCPM

Comments


- 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.
- 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 1943 to 16146 feet MD (1943 to 6978 feet TVD).
- The Gamma Ray Apparent (GRAM) data is presented 0 to 300 API, per the customer's request.

Remarks

Number	Measured Depth (ft)	Hole Section (in)	Run No.	Remark
1	15132.00	8.500	1	The interval from 15038 to 15132 feet MD (6977 to 6977 feet TVD) does not have gamma ray data, due to a communication issue within the rotary steerable assembly.
2	15890.00	8.500	1	The interval from 15794 to 15890 feet MD (6977 to 6977 feet TVD) does not have gamma ray data, due to a communication issue within the rotary steerable assembly.
3	16077.00	8.500	1	The interval from 15984 to 16077 feet MD (6977 to 6978 feet TVD) does not have gamma ray data, due to a communication issue within the rotary steerable assembly.
4	16146.00	8.500	1	The interval from 16133 to 16146 feet MD (6978 feet TVD) was not logged after being drilled due to sensor to bit offset at well TD.

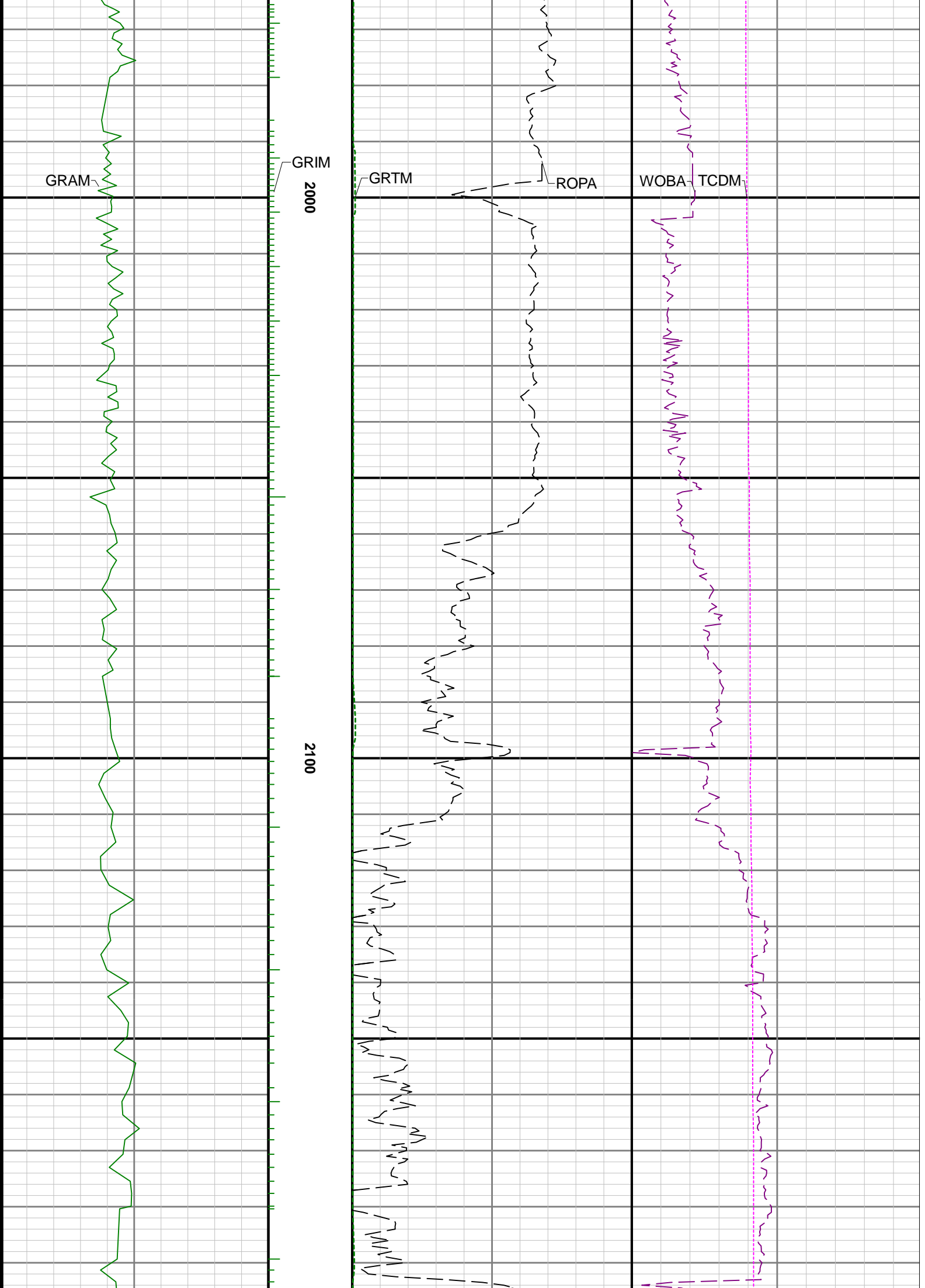
Curve Mnemonics

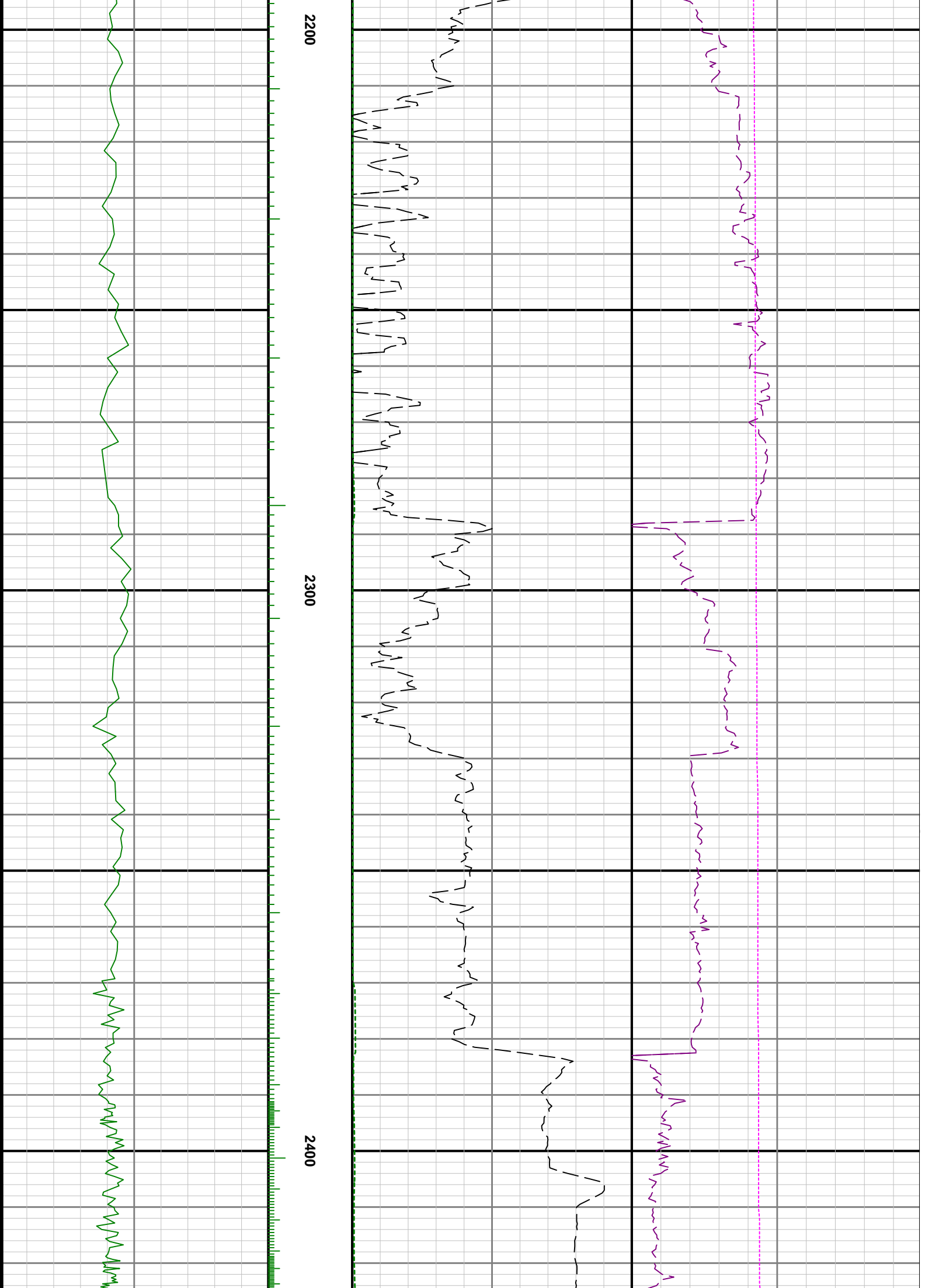
Presented Curves	Description	Units
ROPA	Depth Averaged ROP 3 ft Average	ft/h
TVD	True Vertical Depth	ft
WOBA	Weight On Bit, Average 1 ft Average	klb
GRAM	Gamma Ray - Apparent - Memory 0.5 ft Average	API
GRIM	Gamma Ray - Data Point Indicator - Memory	unitless
GRTM	Gamma Ray - Time Since Drilled - Memory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

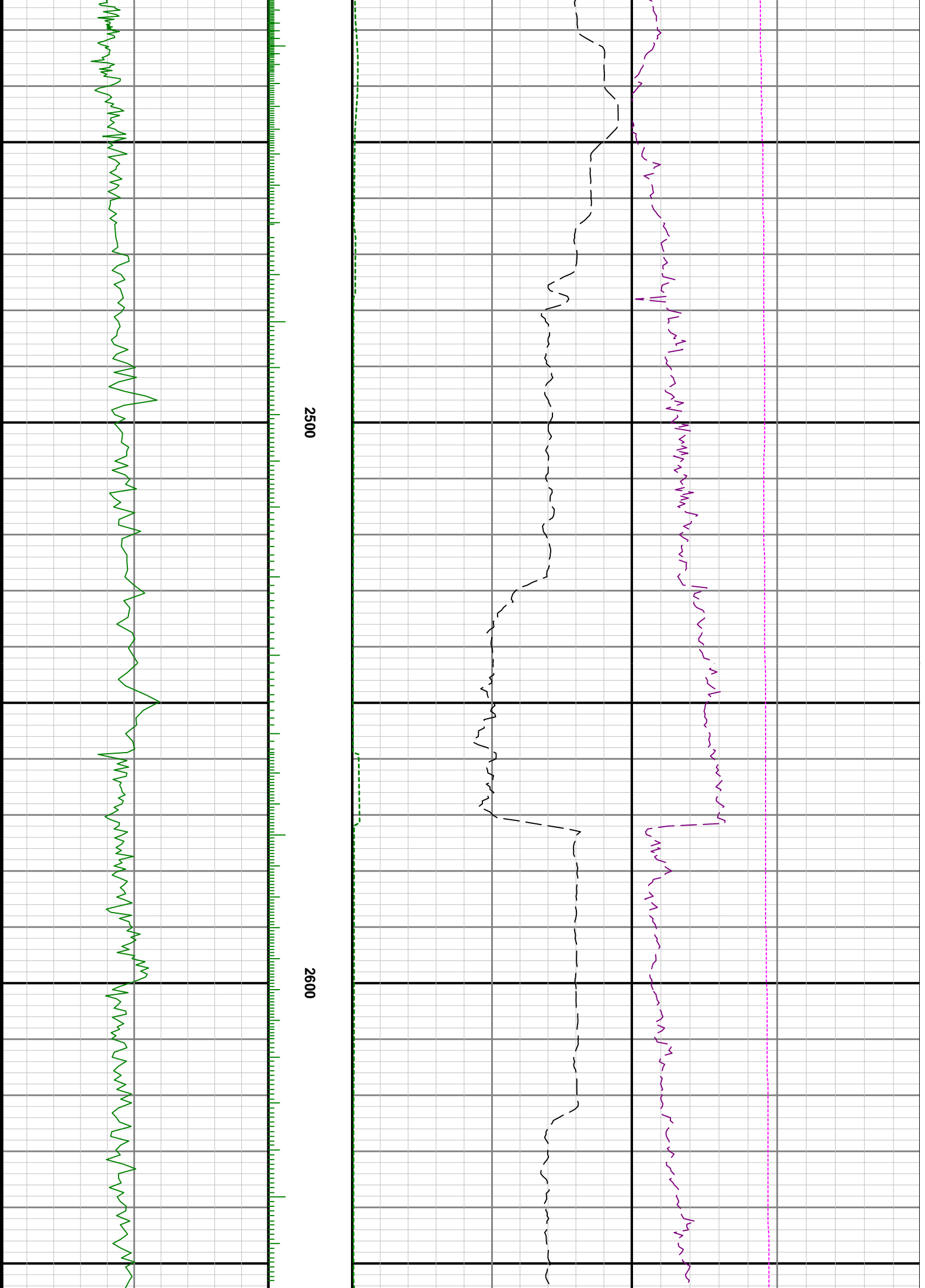
	Company	Noble Energy	
	Well	Hurley H26-768	
	Interval	Date From: 2018-06-07 12:15	Top: 1943.00 ft
	Created	Date To: 2018-06-10 02:37	Bottom: 16146.00 ft
		Created	2018-06-10 03:35:48

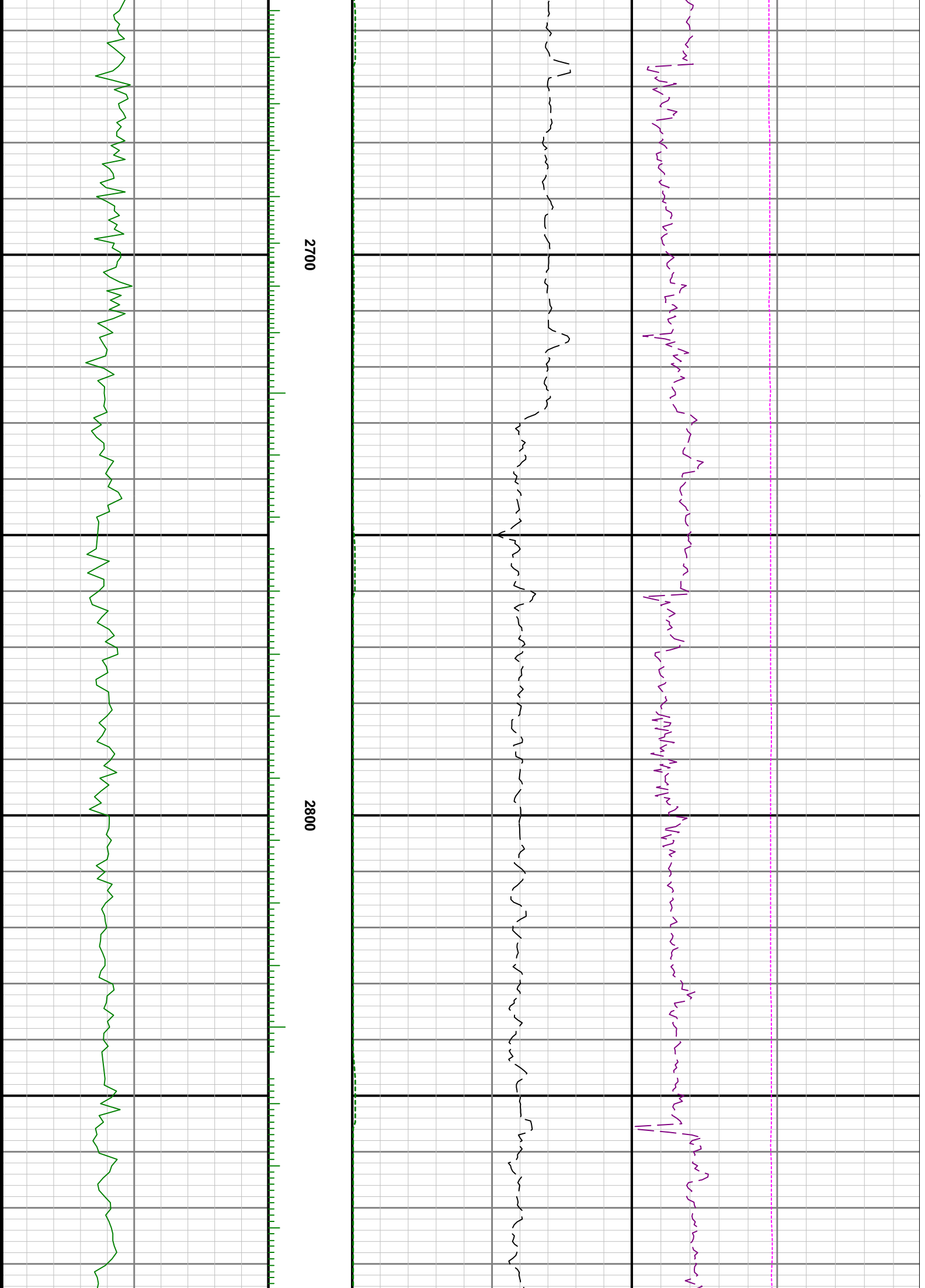
Gamma Ray - Apparent 0.5 ft Average GRAM 0 300	MD 1:240 feet	Depth Averaged ROP 3 ft Average ROPA 1000 0	Weight On Bit, Average 1 ft Average WOBA 0 50
API		ft/h	klb
True Vertical Depth TVD 7100 6100		Gamma Time Since Drilled GRTM 0 600	Downhole Temperature TCDM 0 300
ft		min	degF

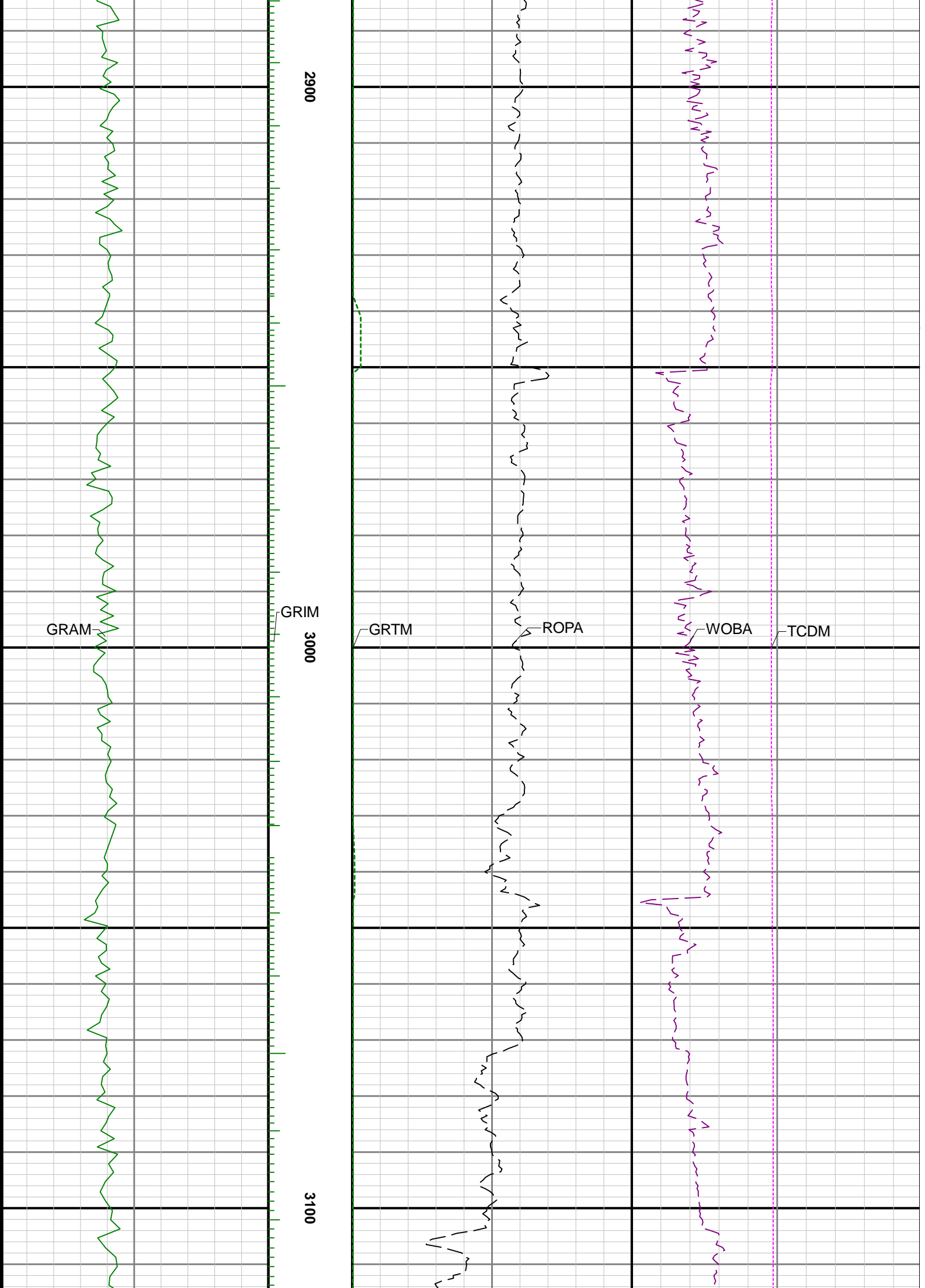


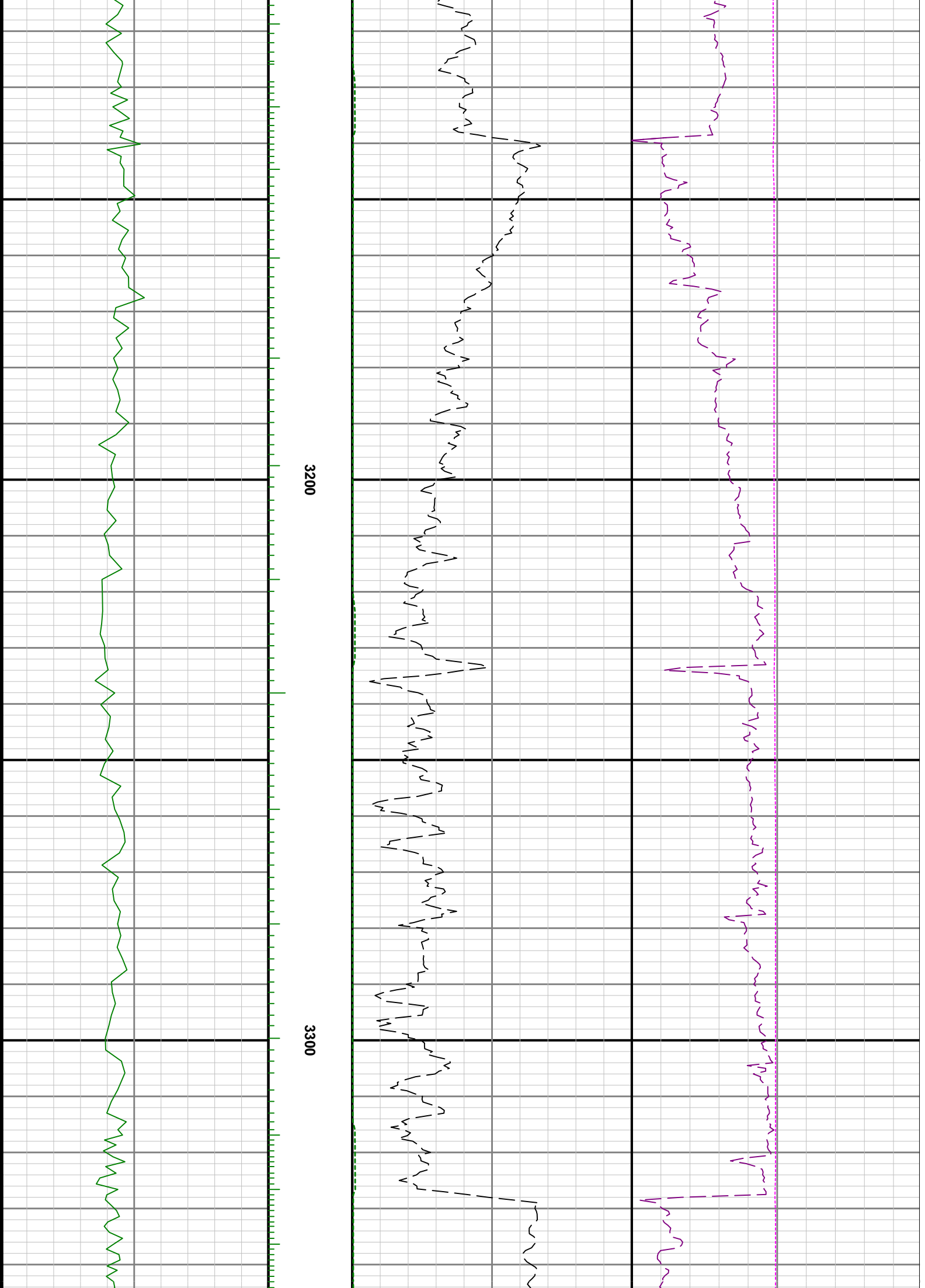


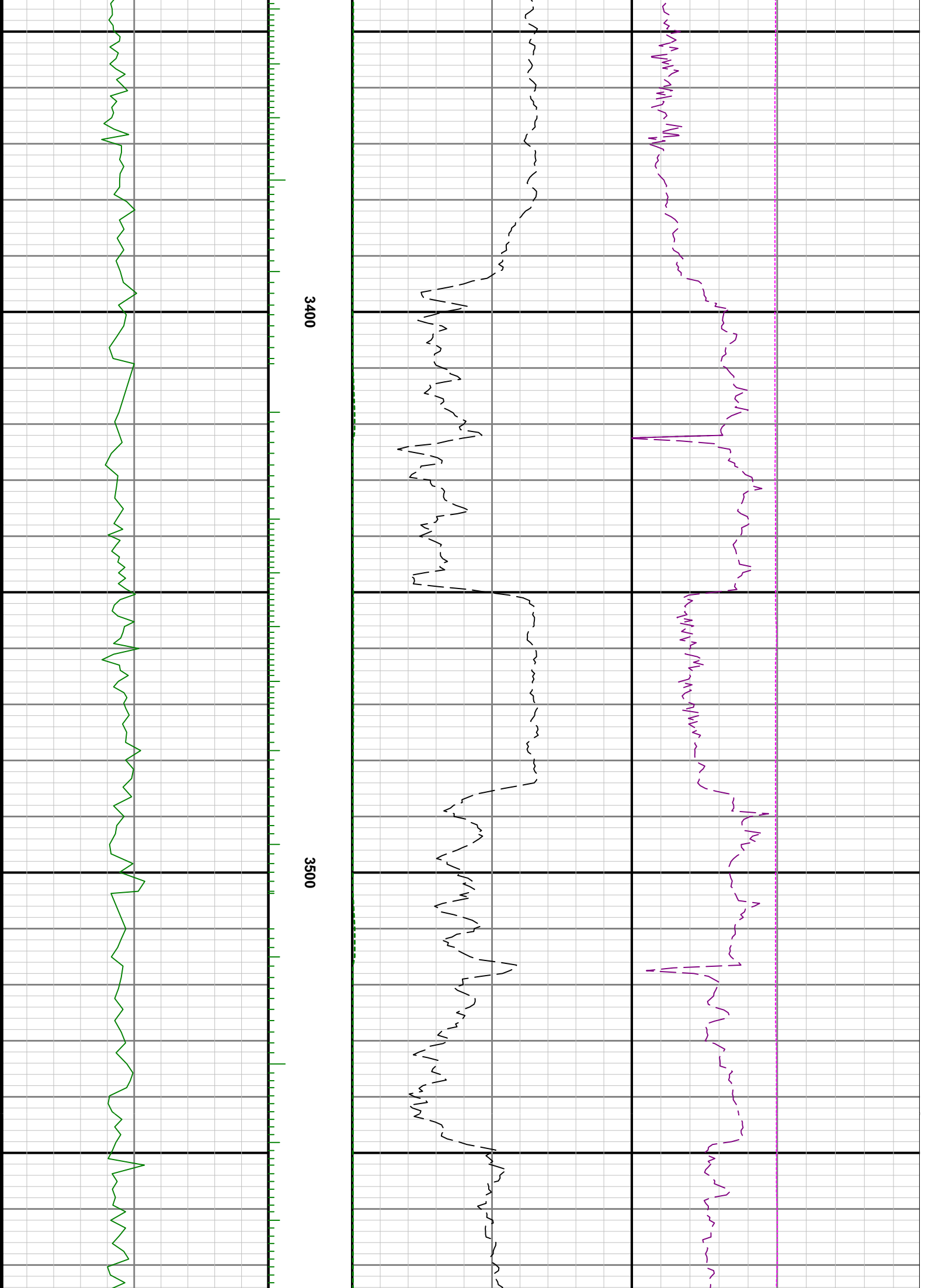


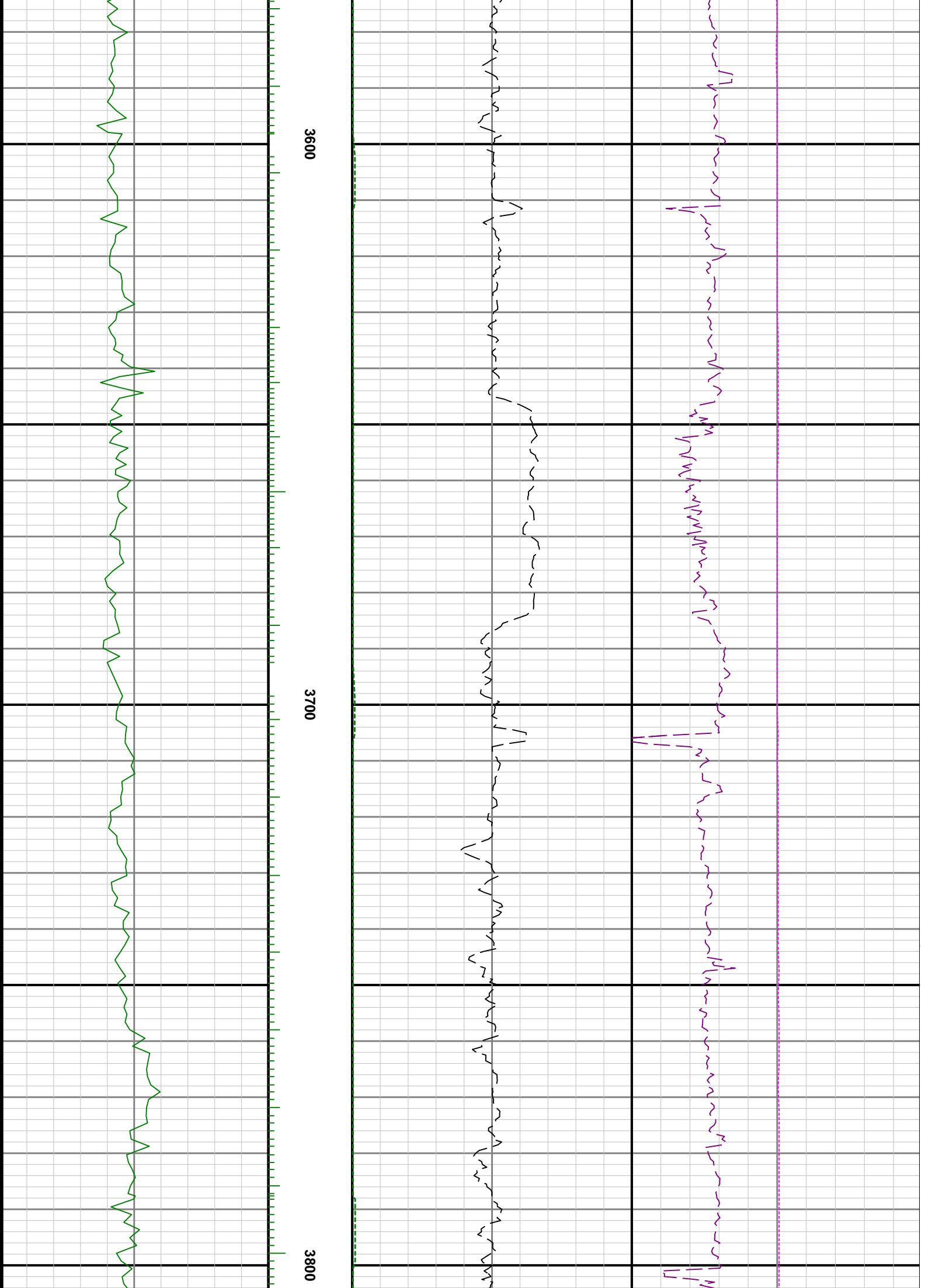


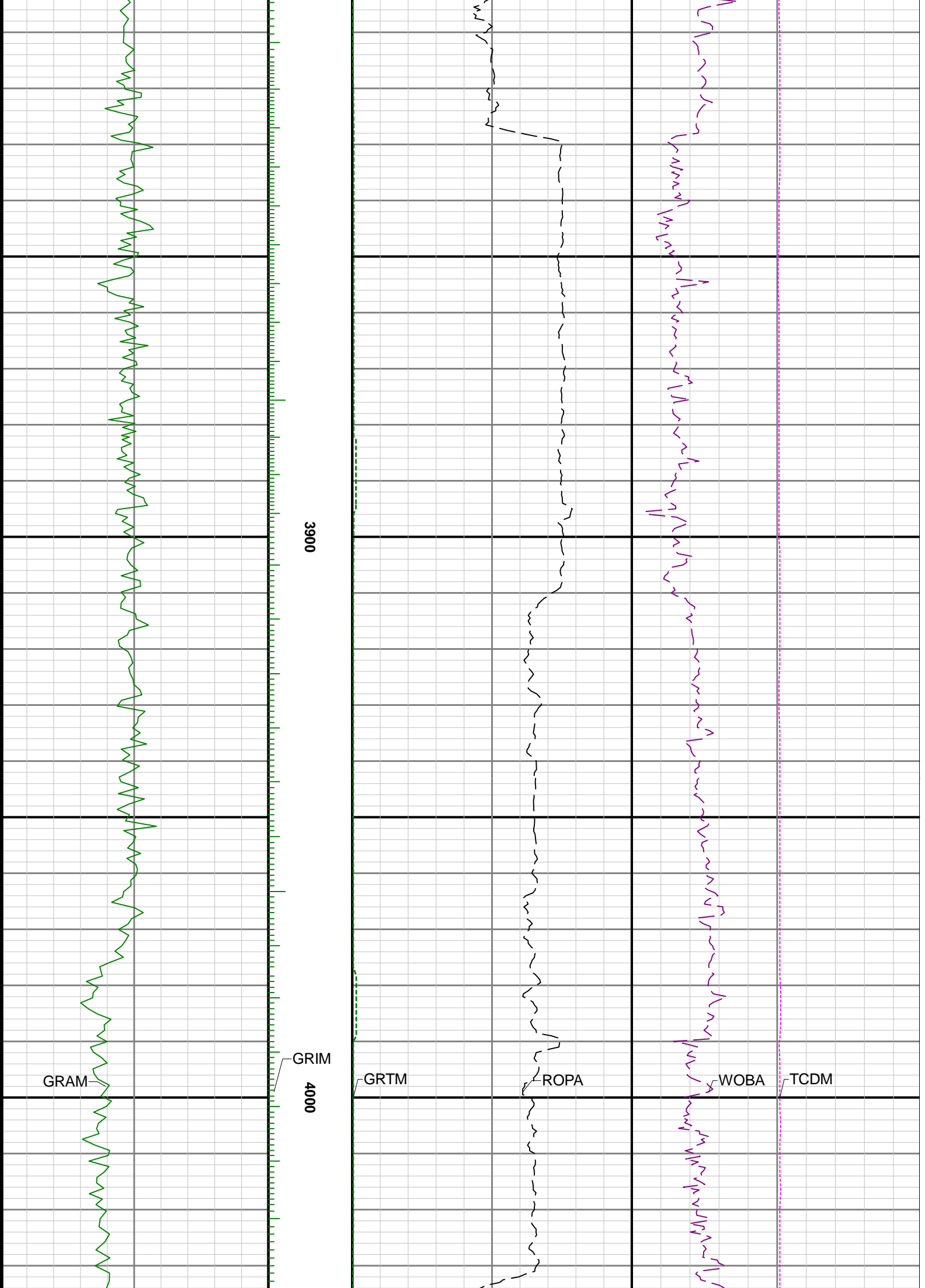


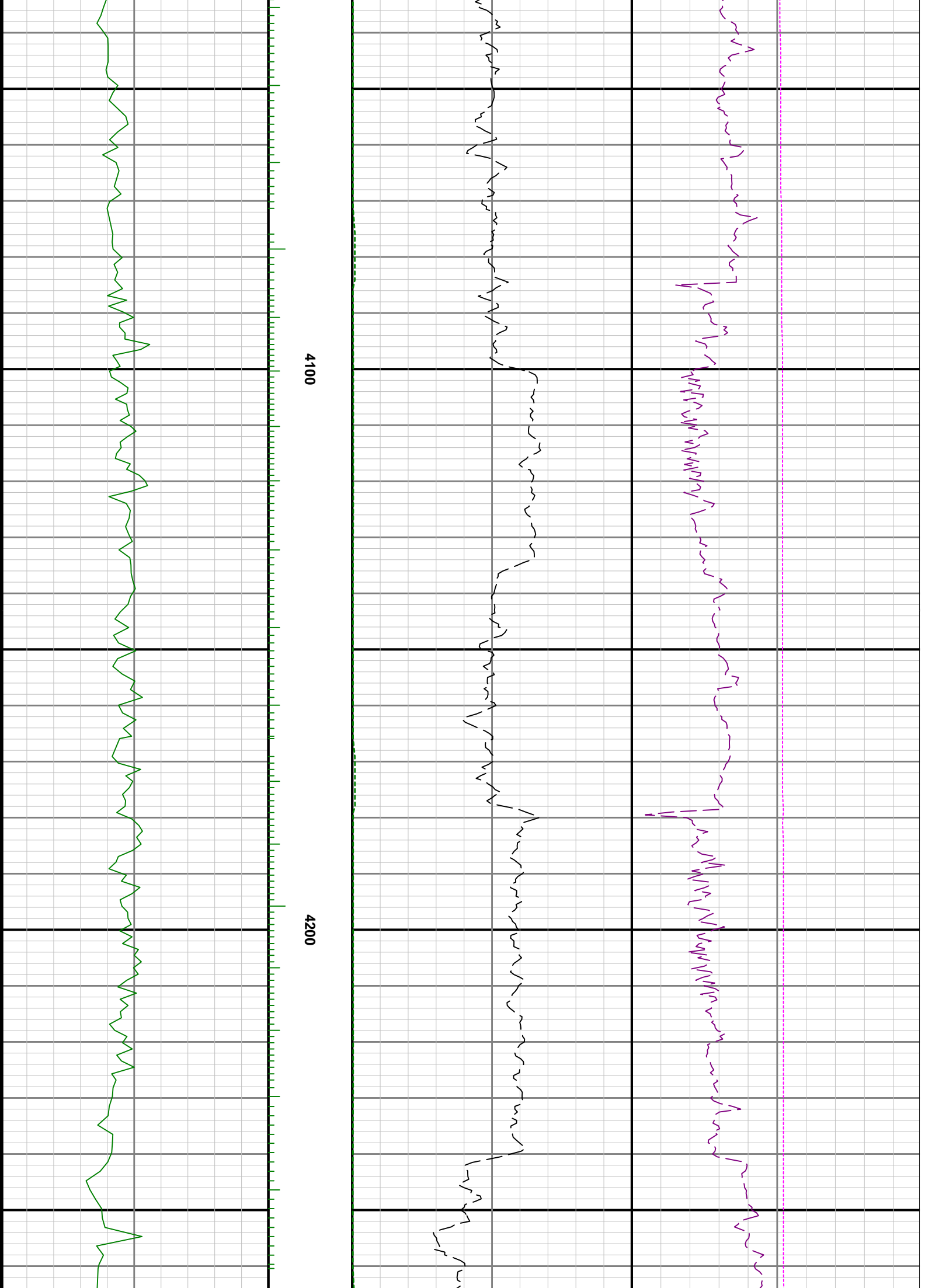






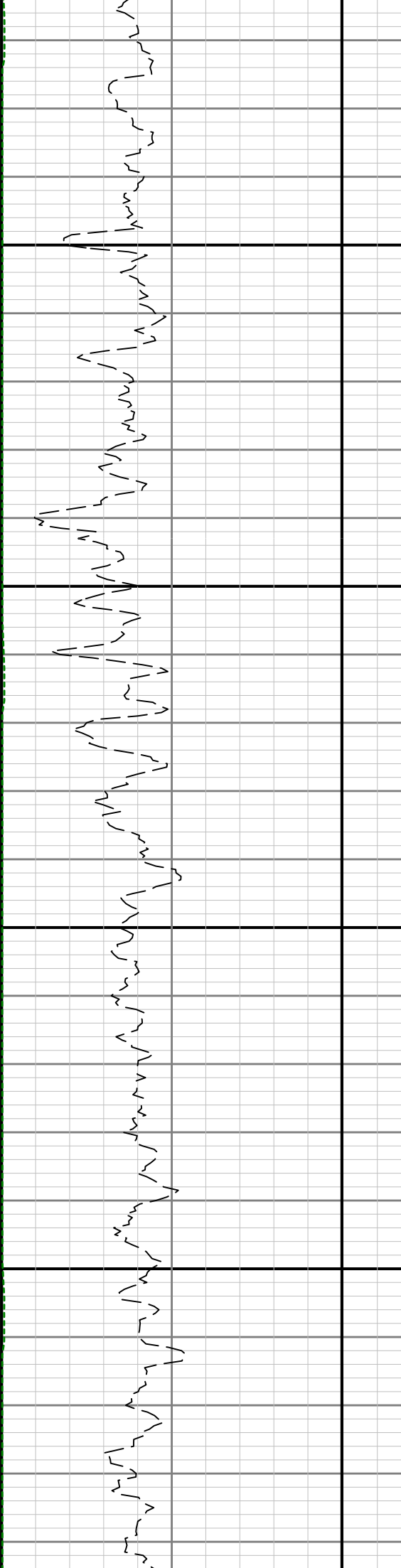
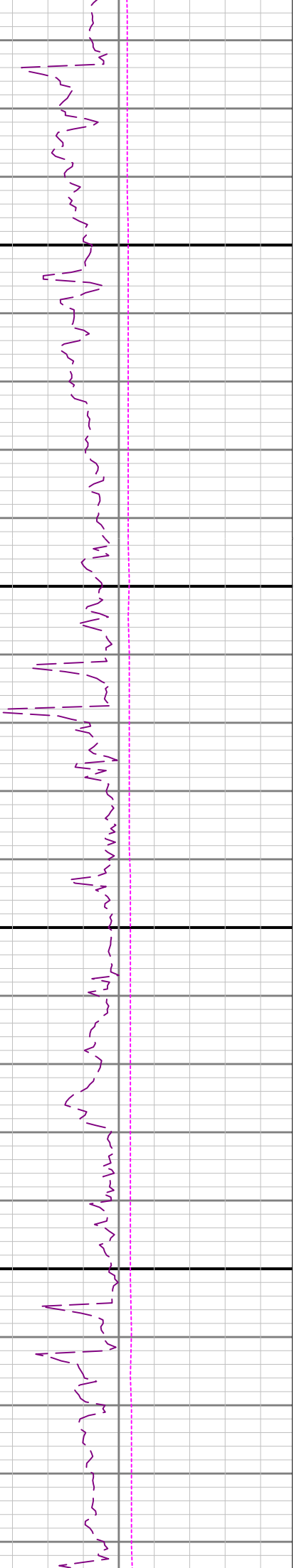






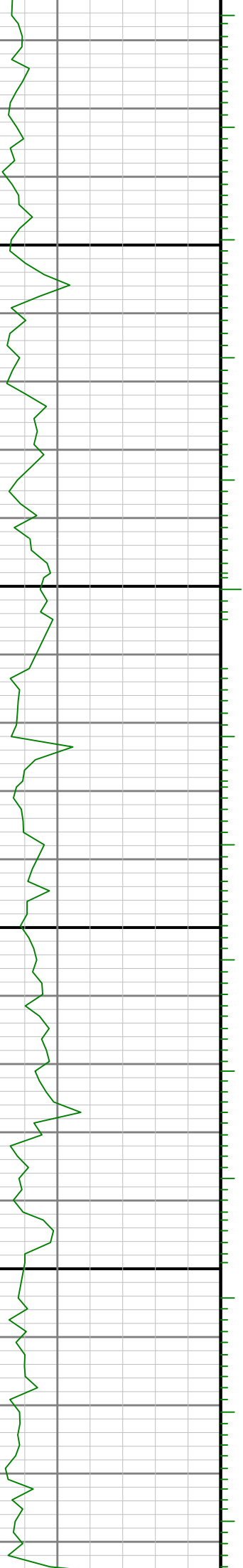
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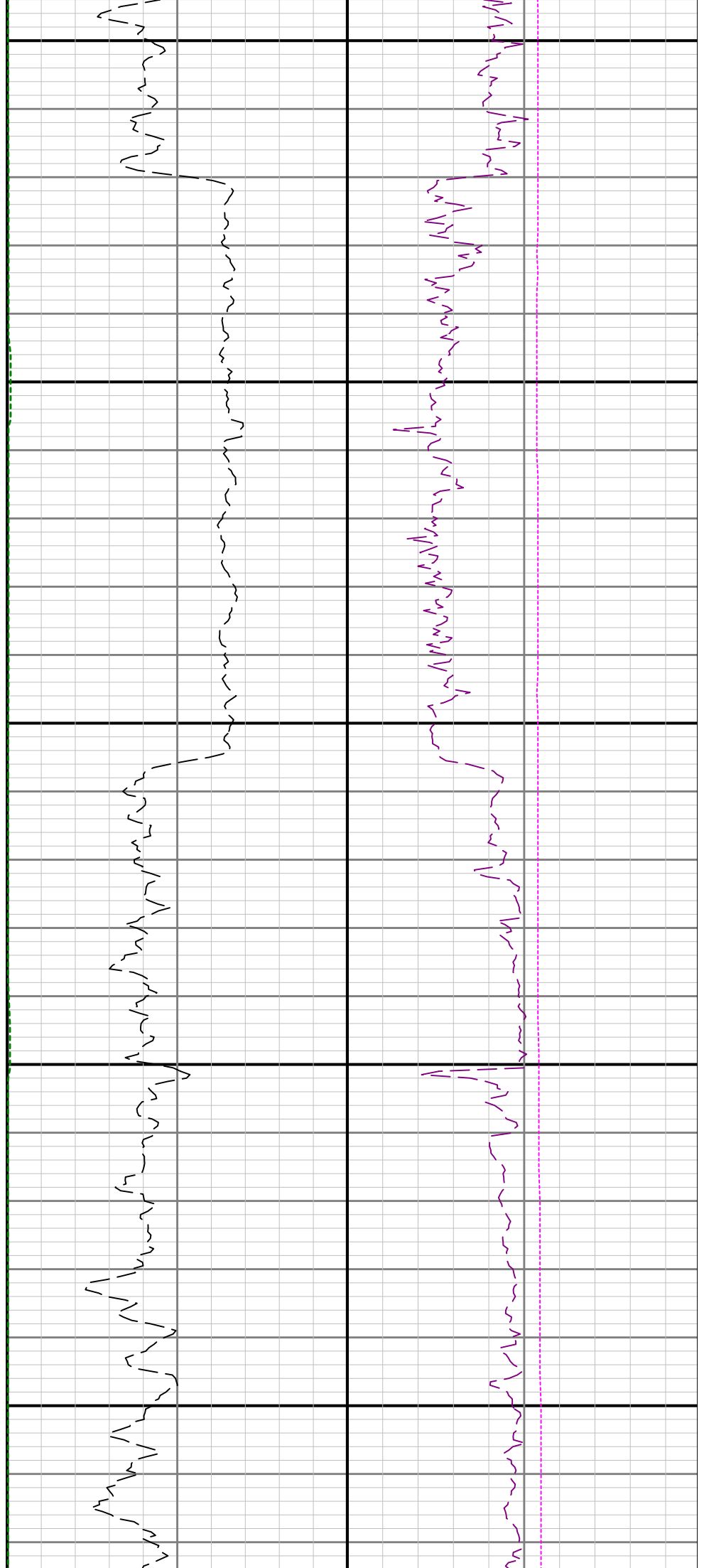
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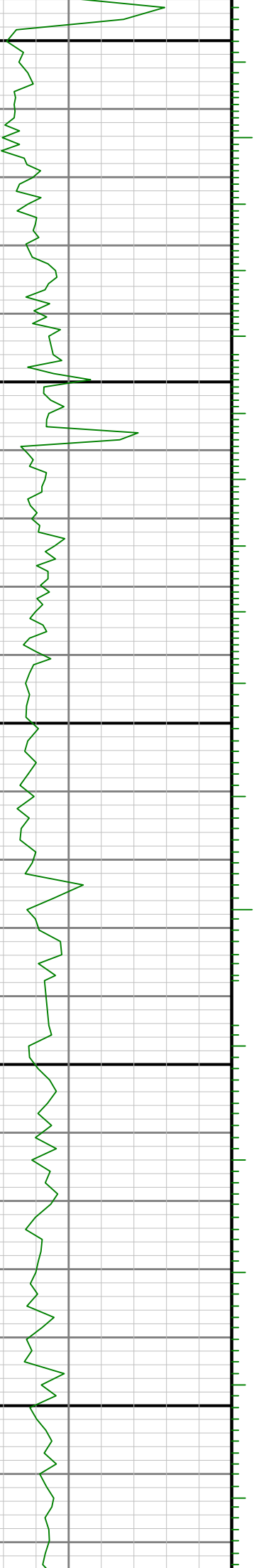


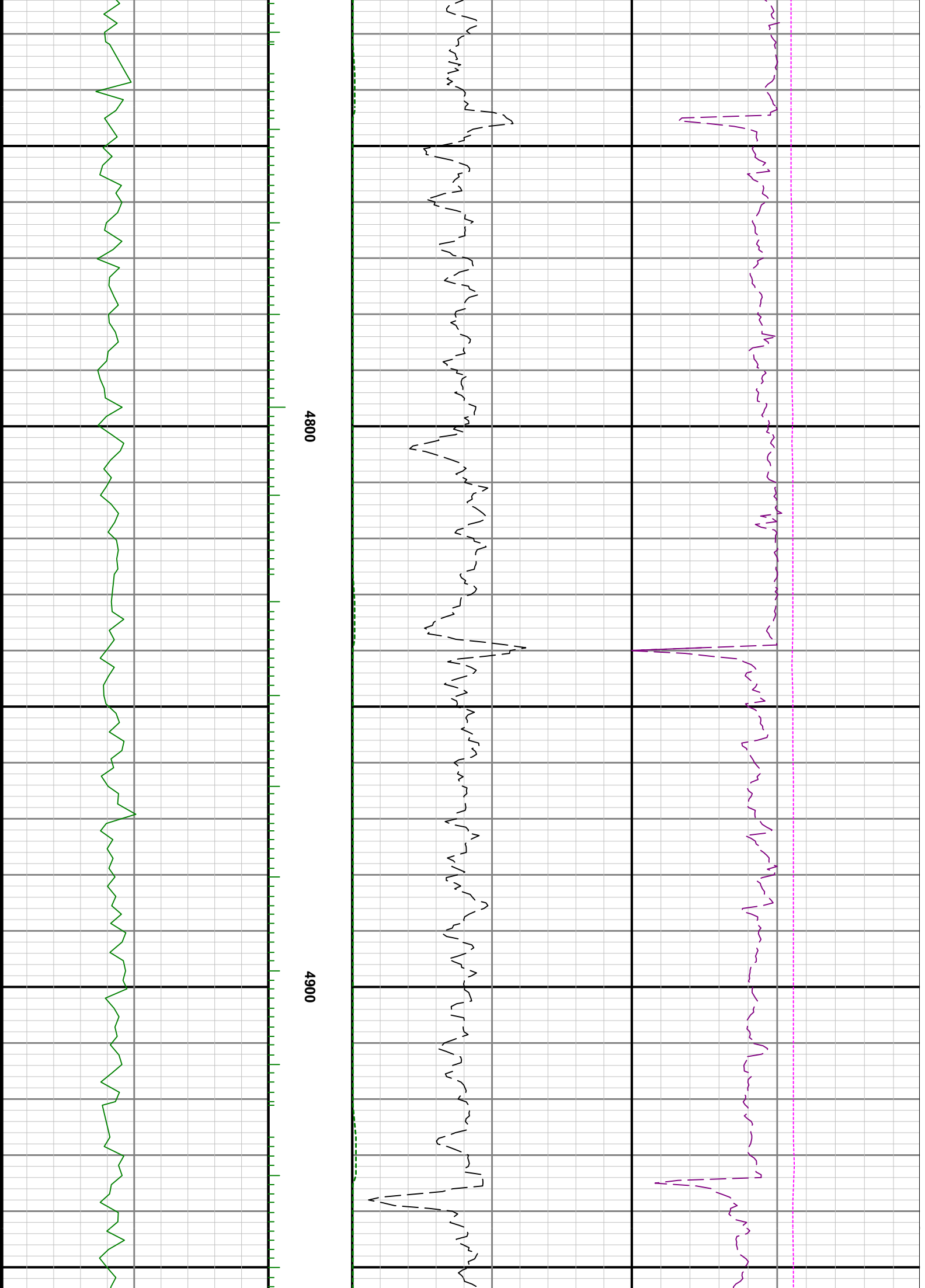


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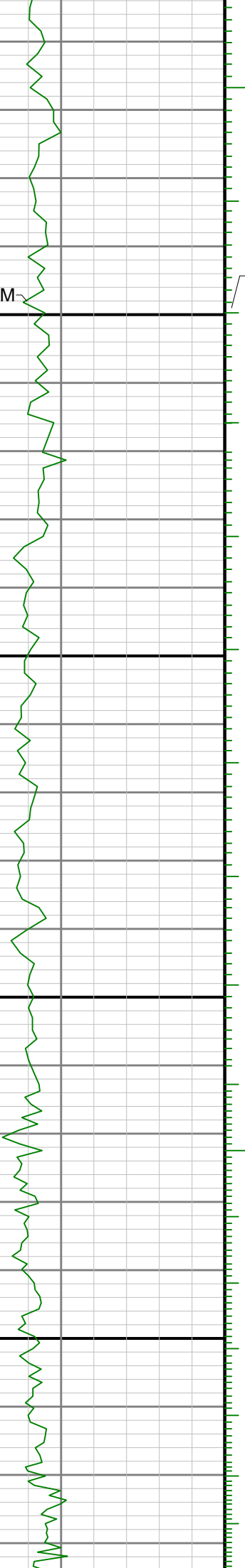
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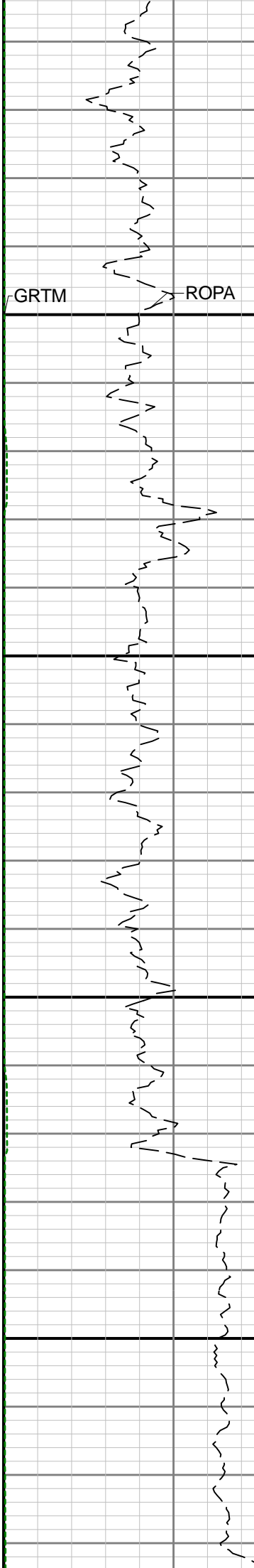
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GRTM

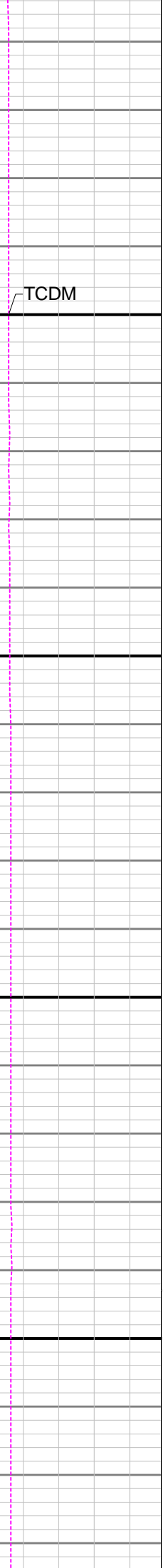


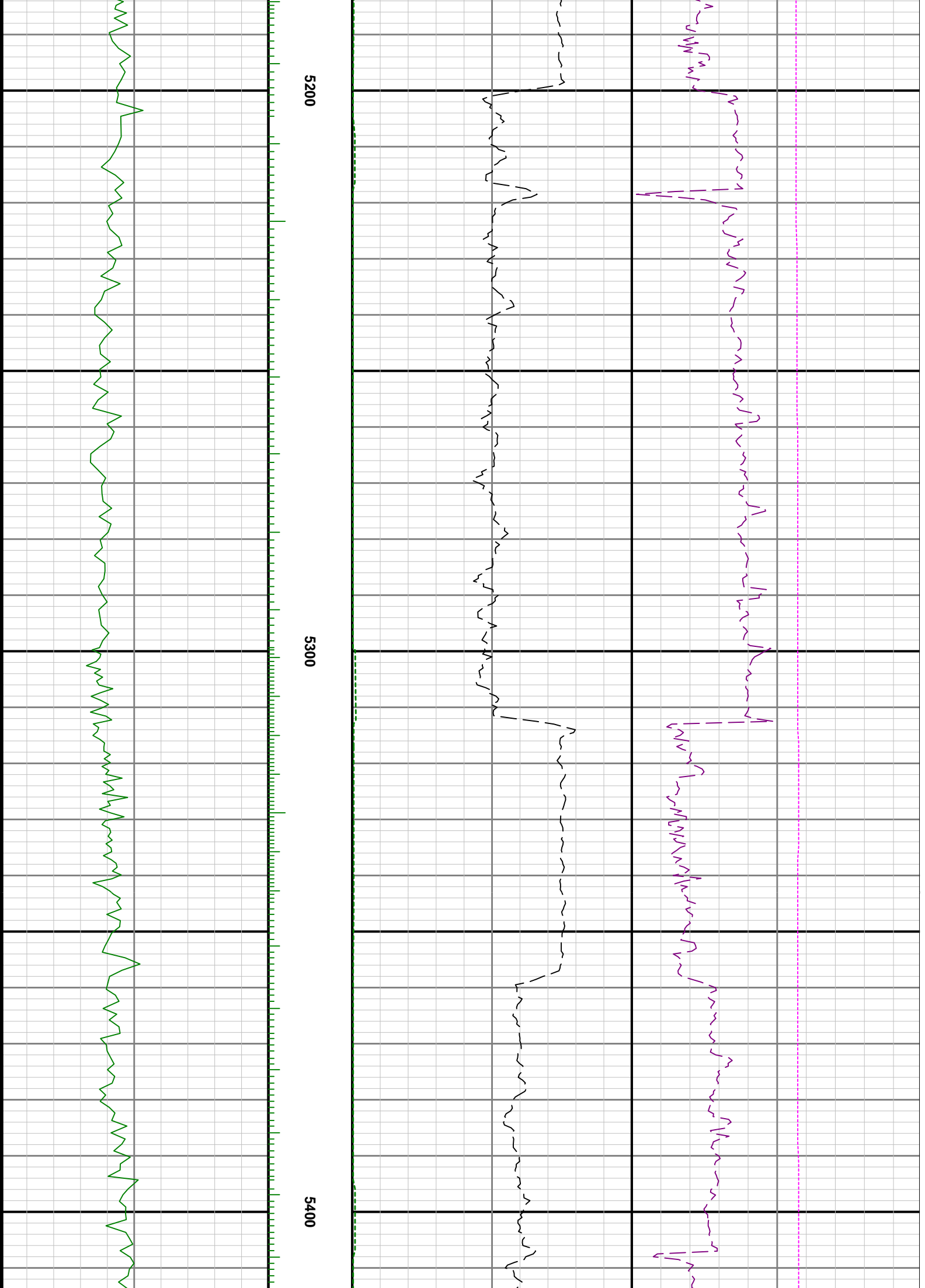
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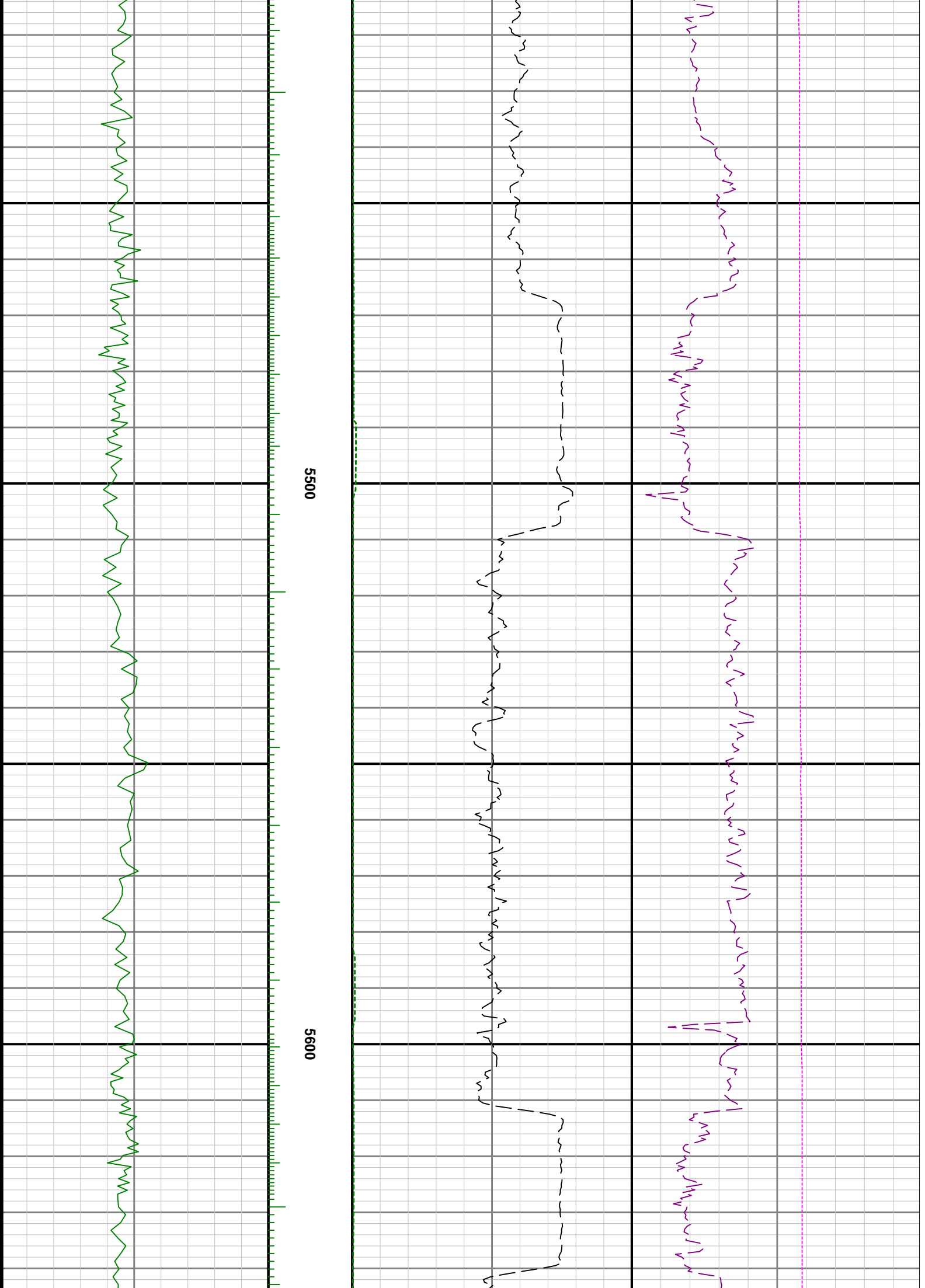
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TCDM

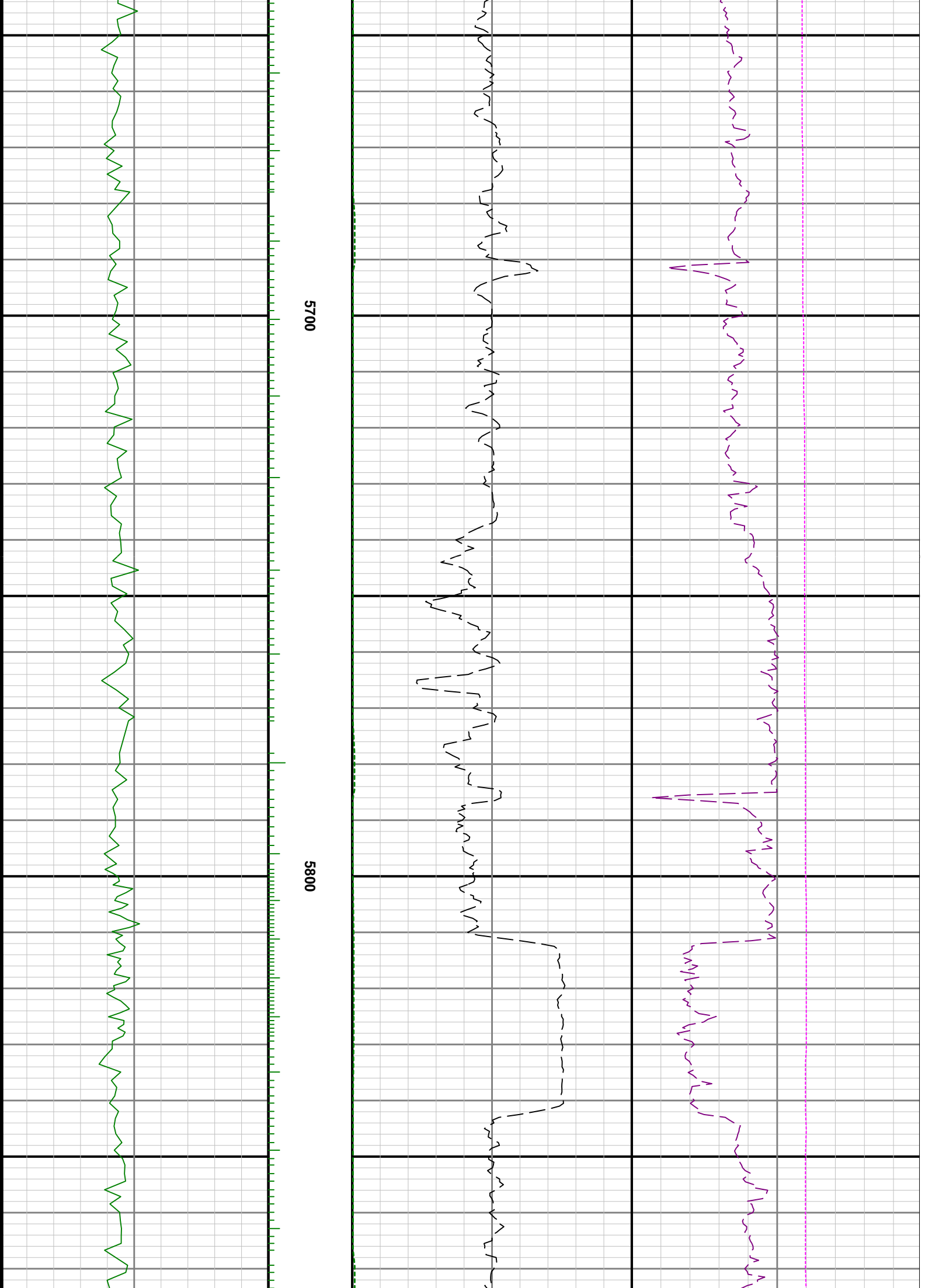


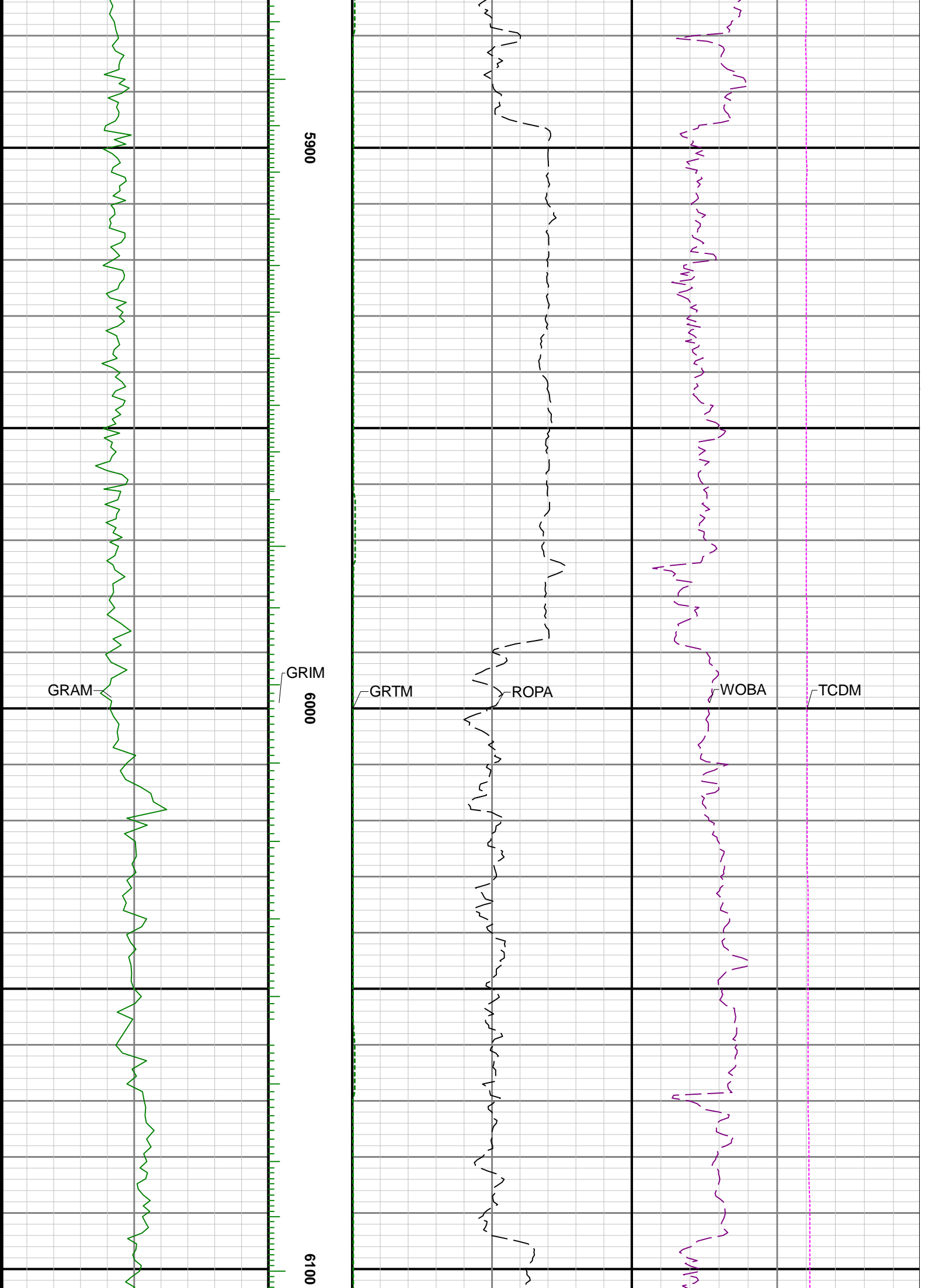


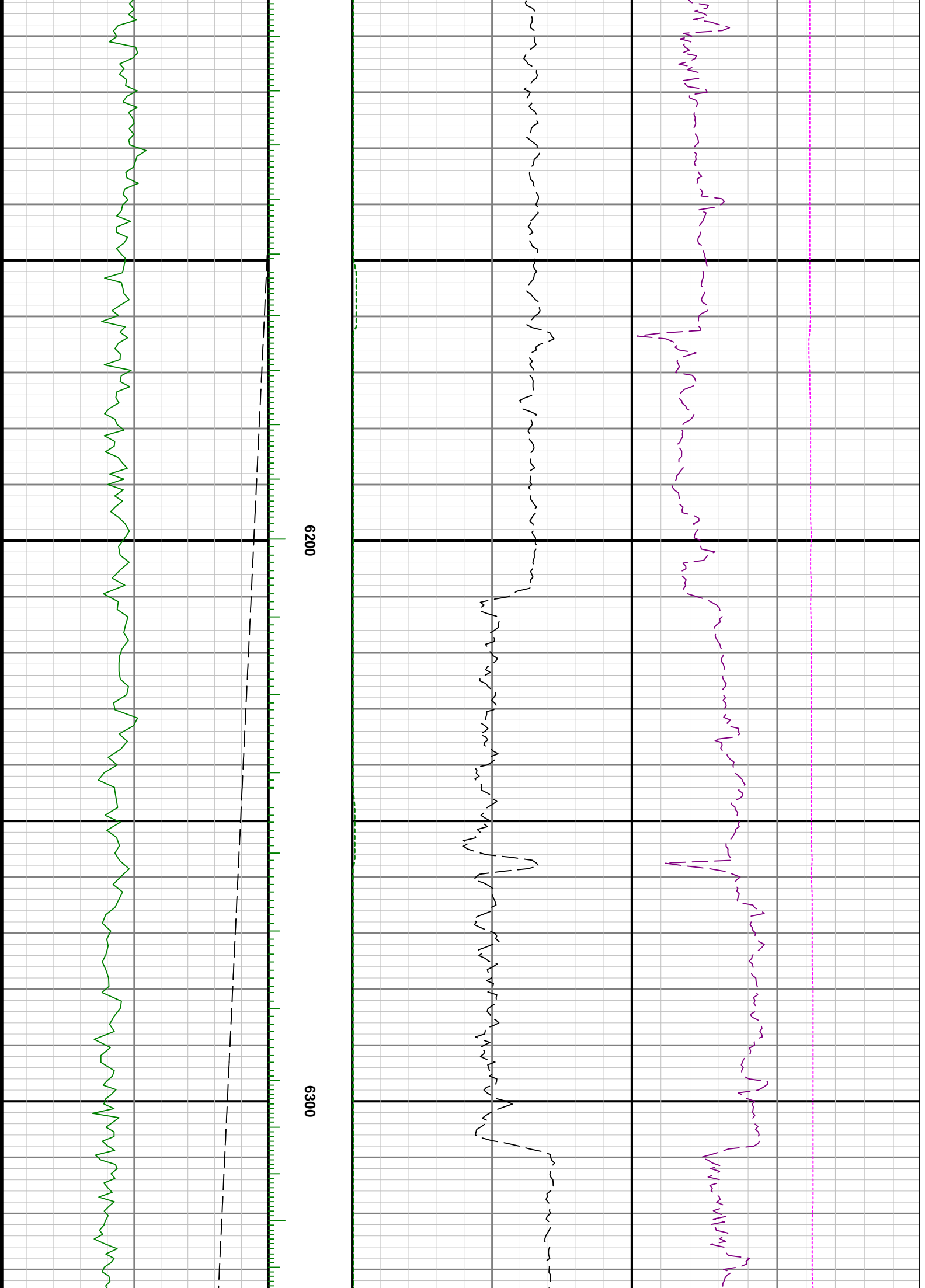


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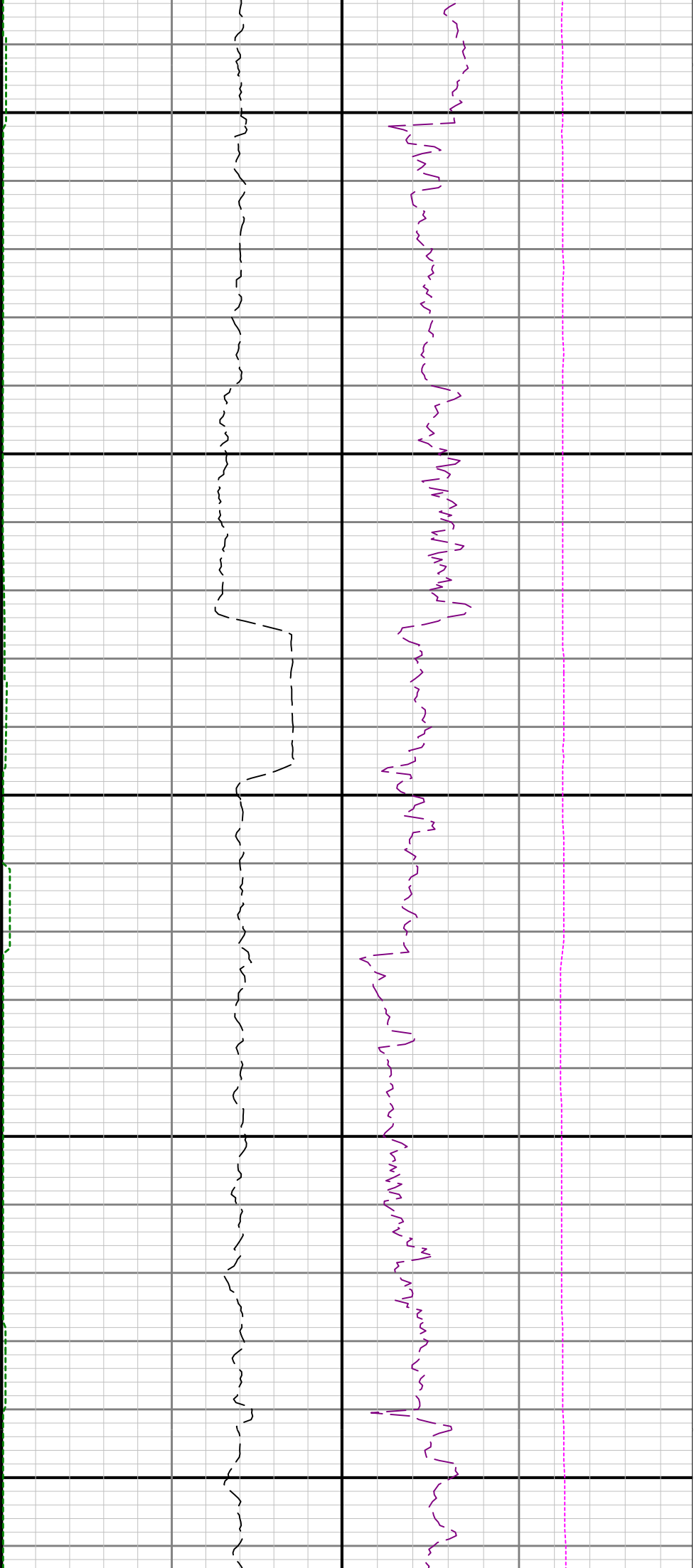






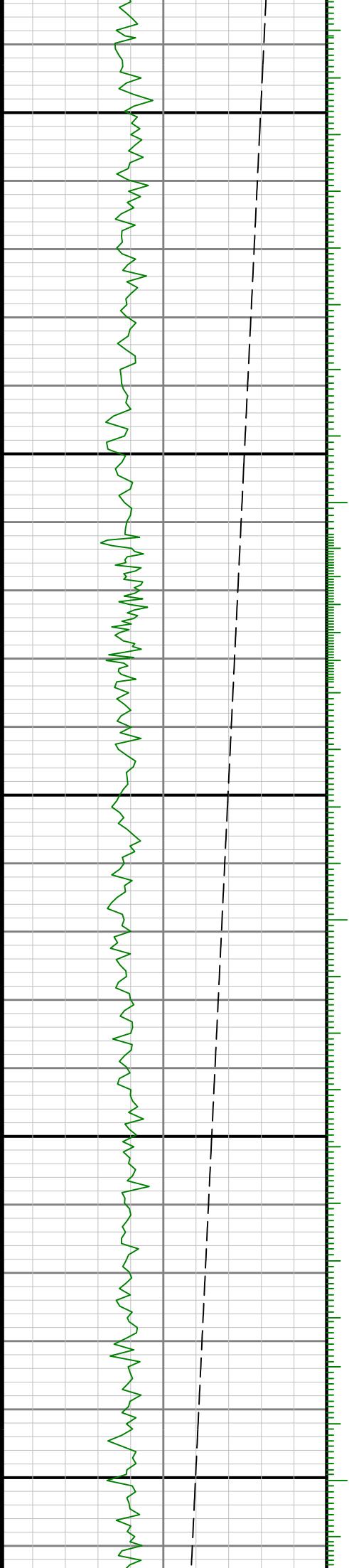
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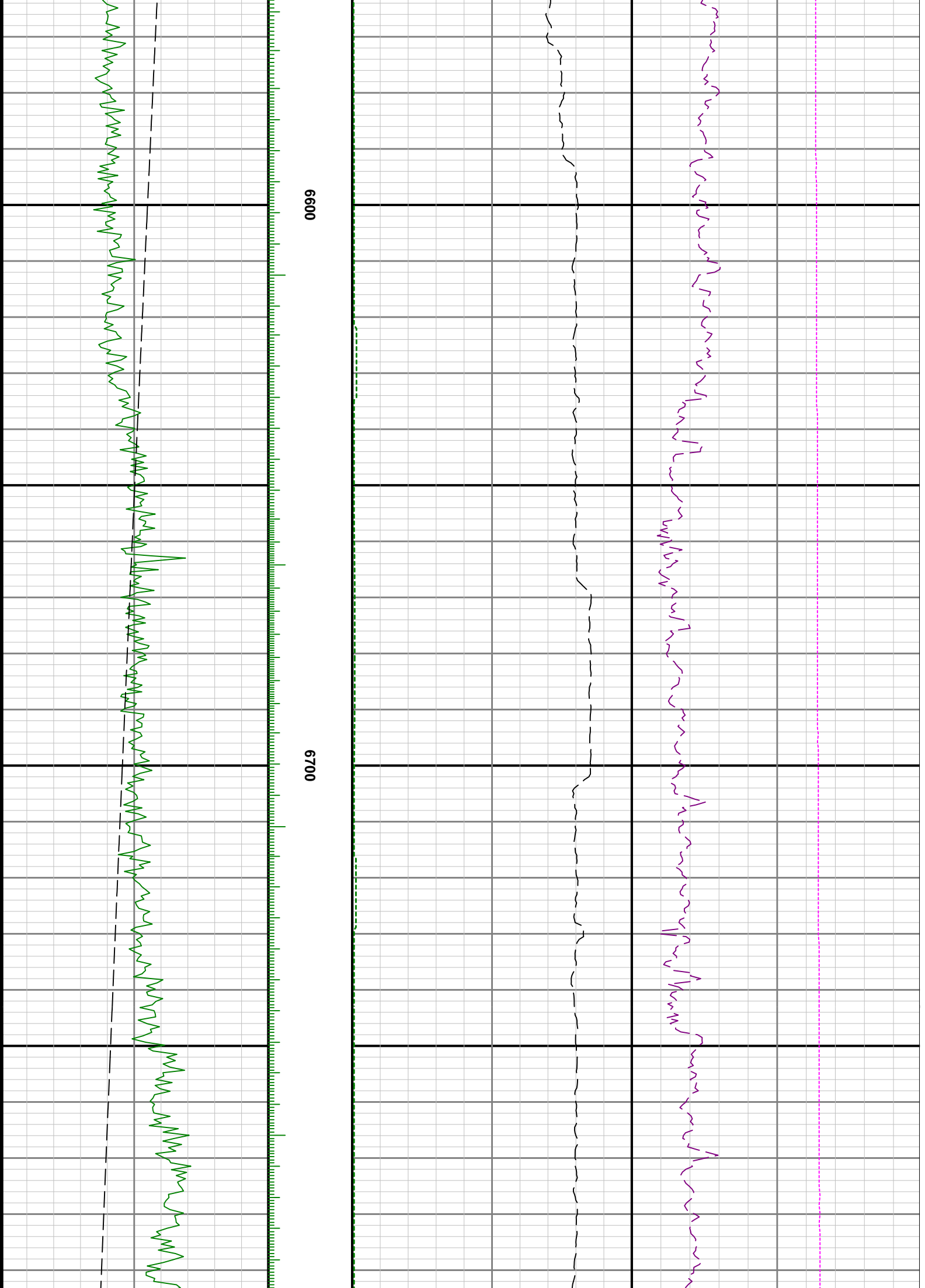
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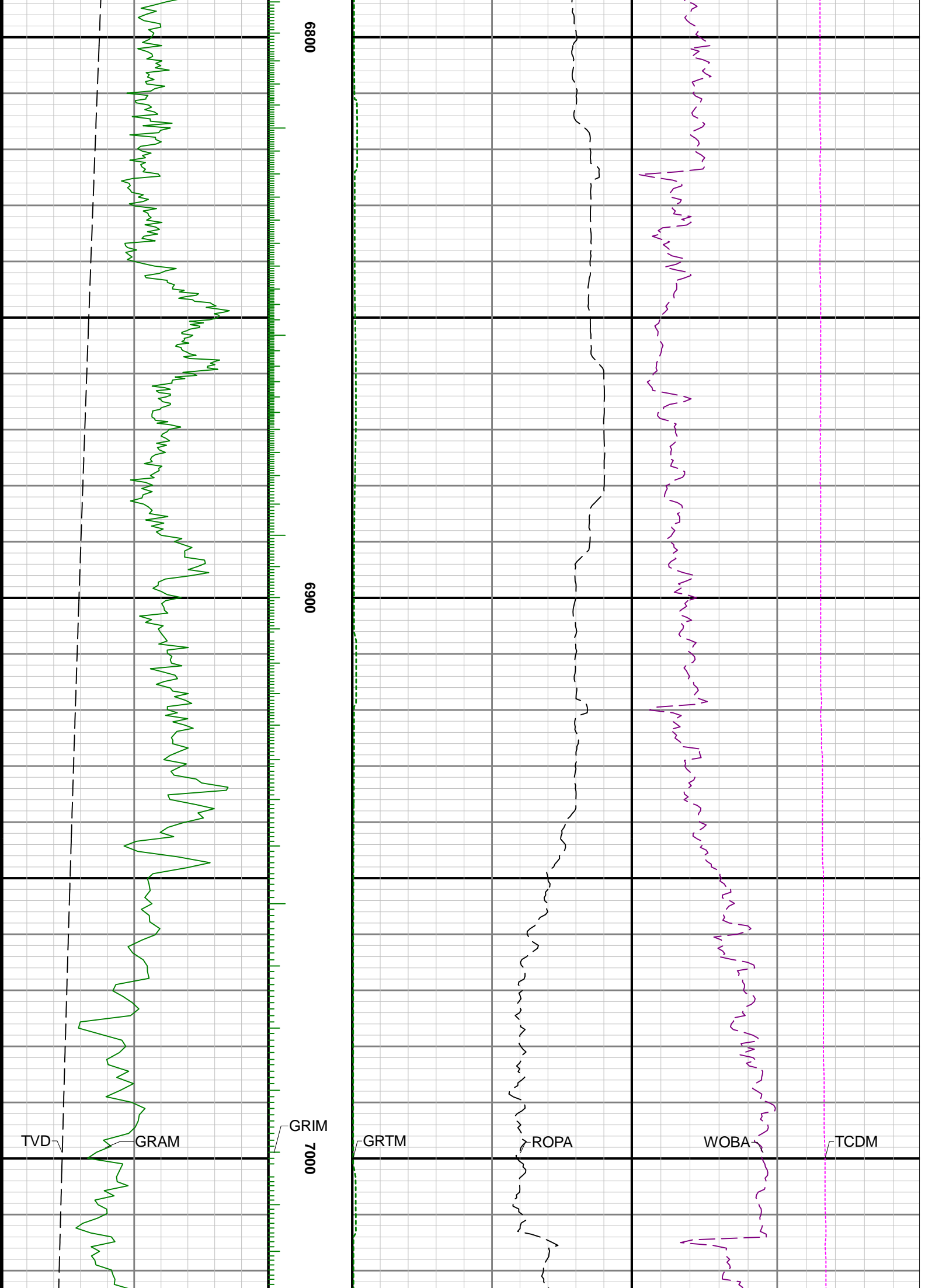
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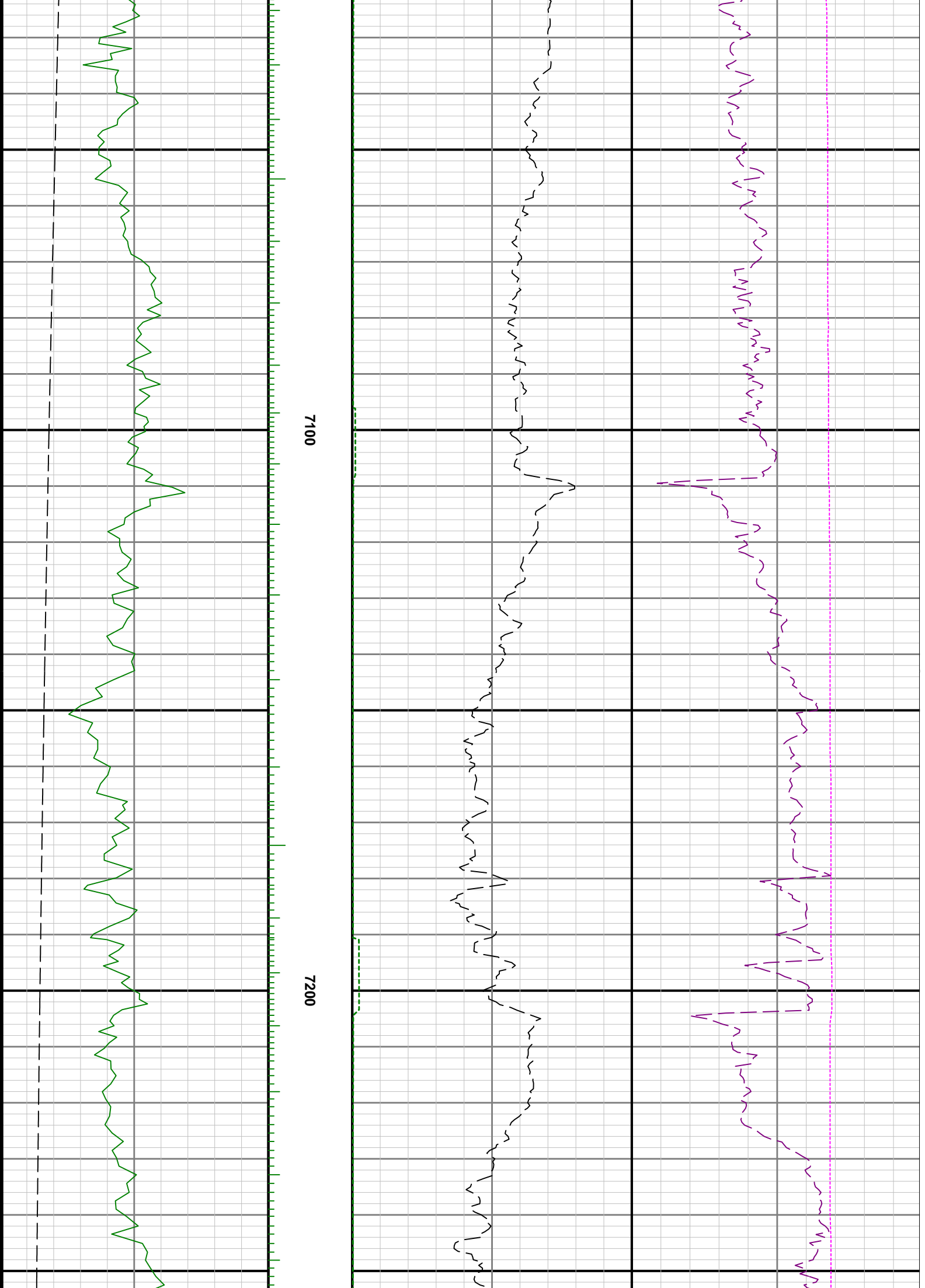


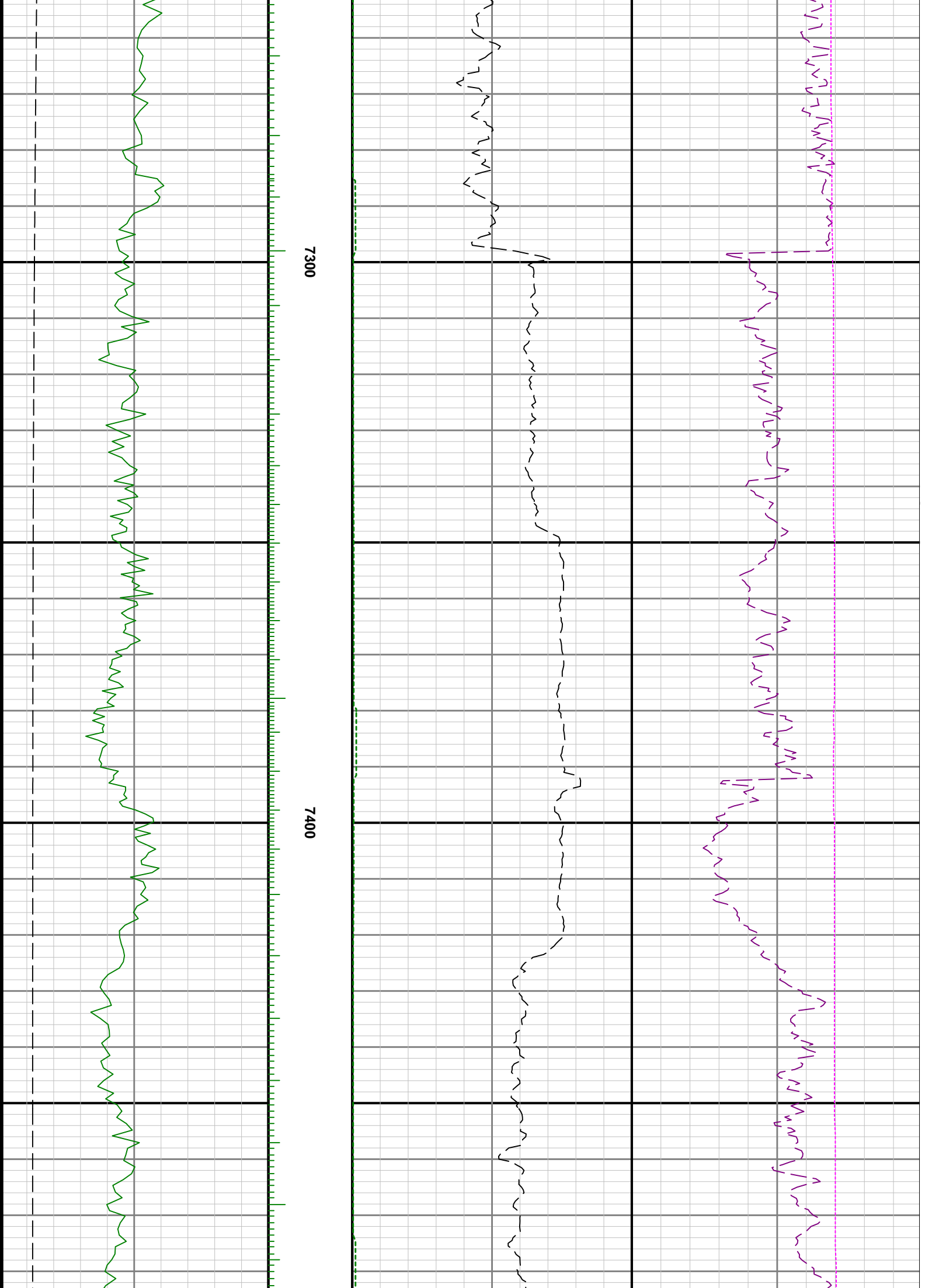


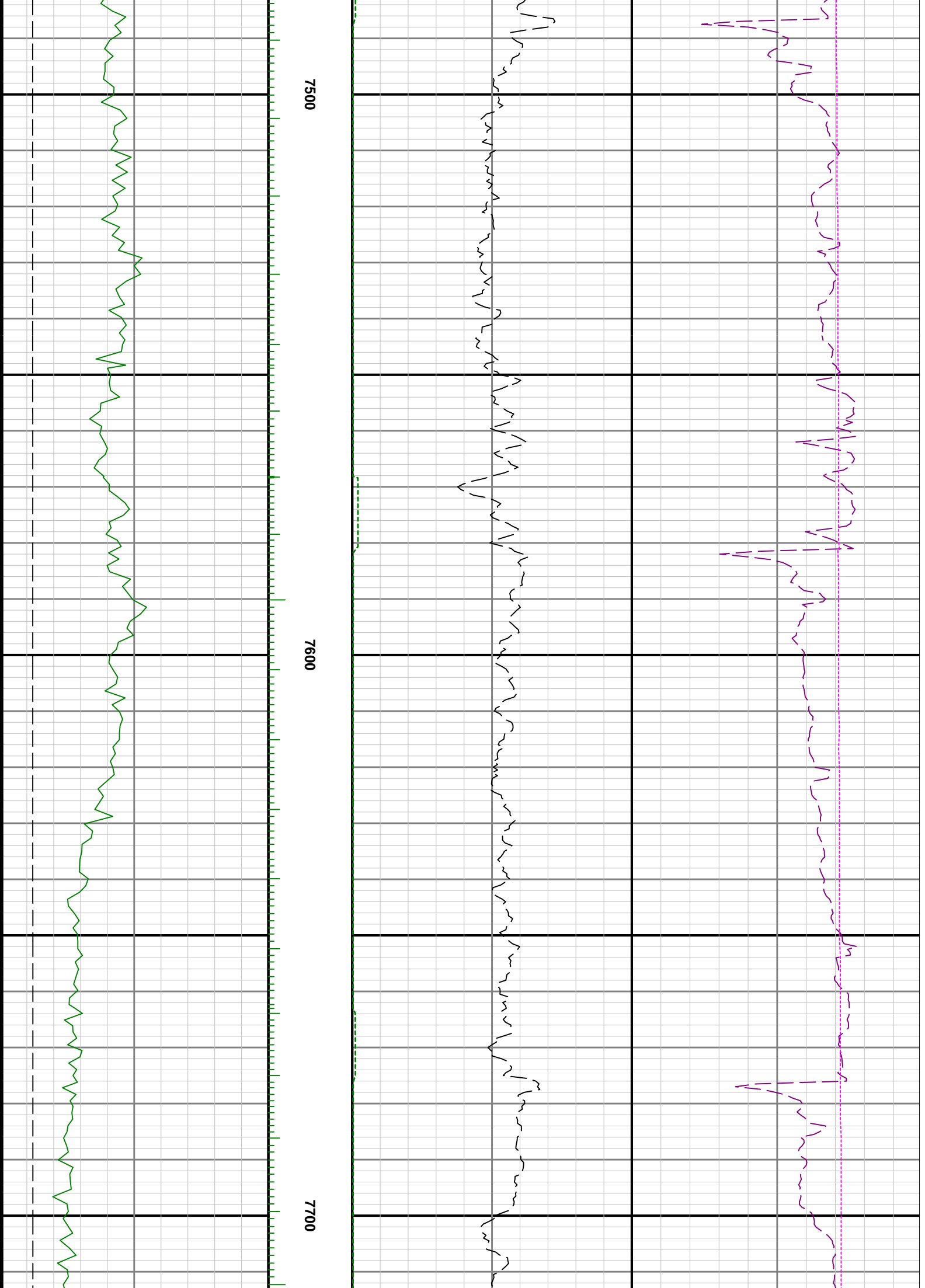
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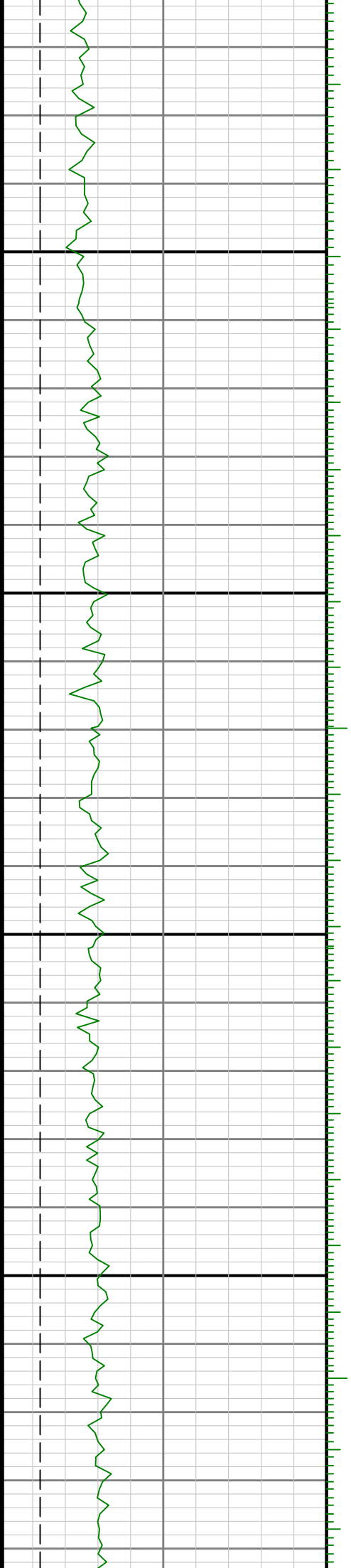
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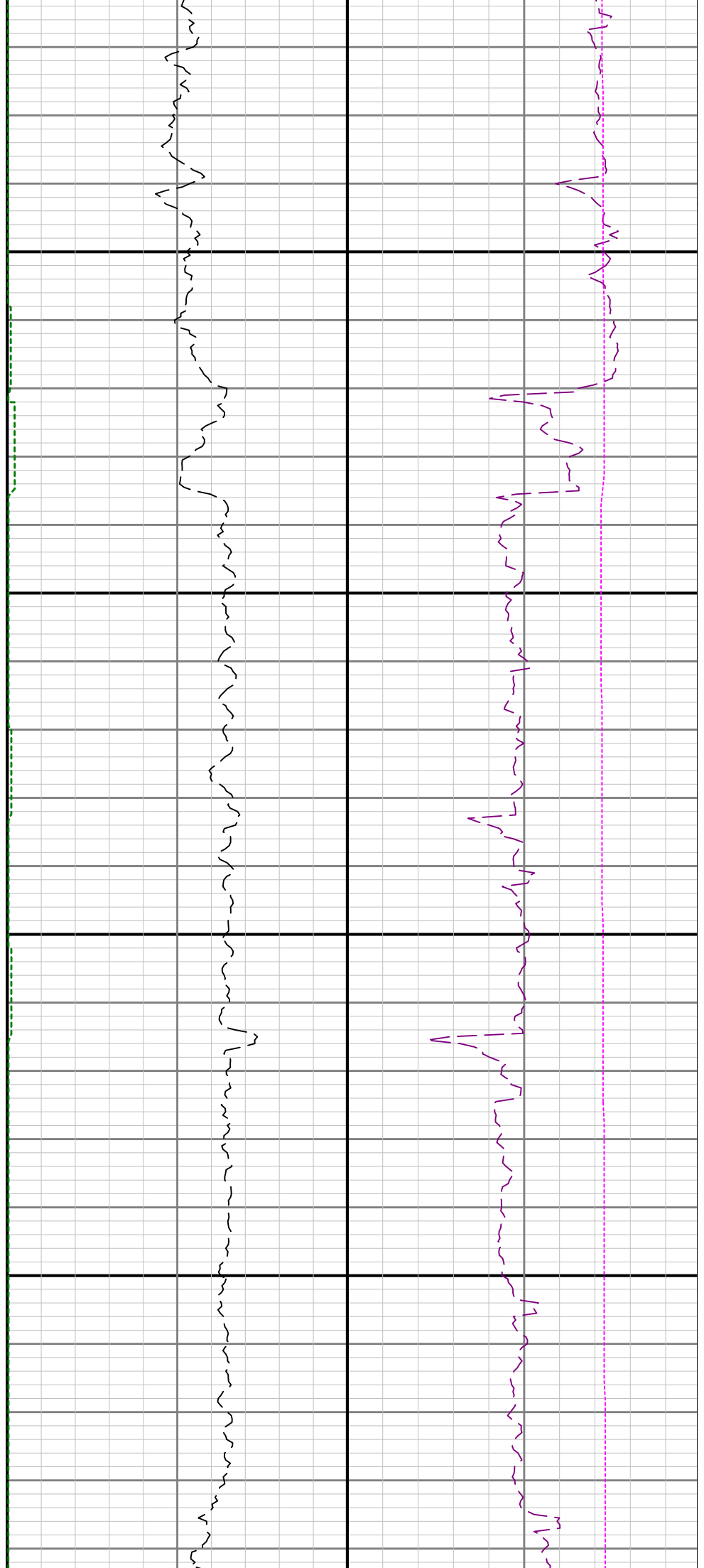


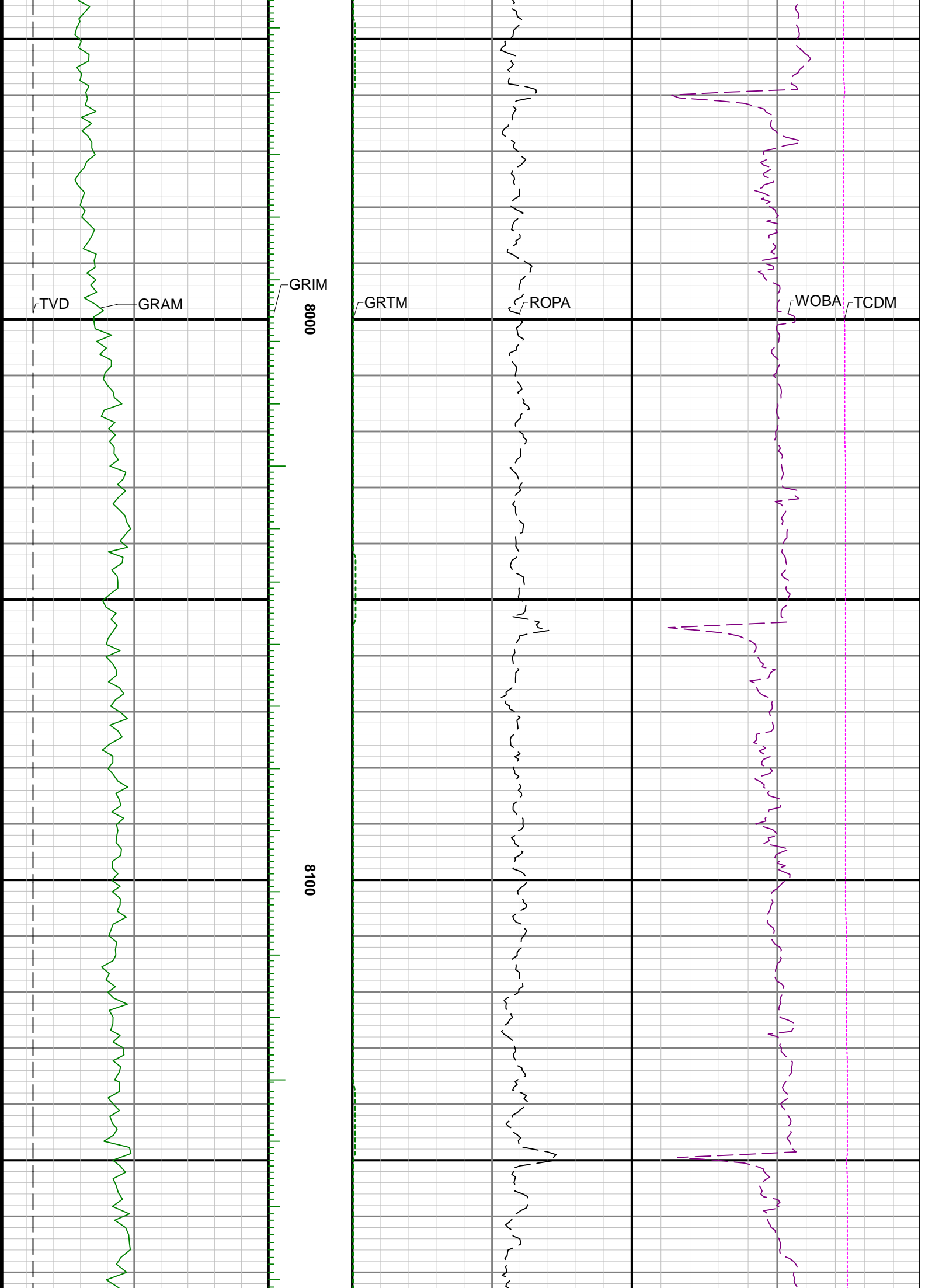




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7900





GRIM
8000

8100

TVD

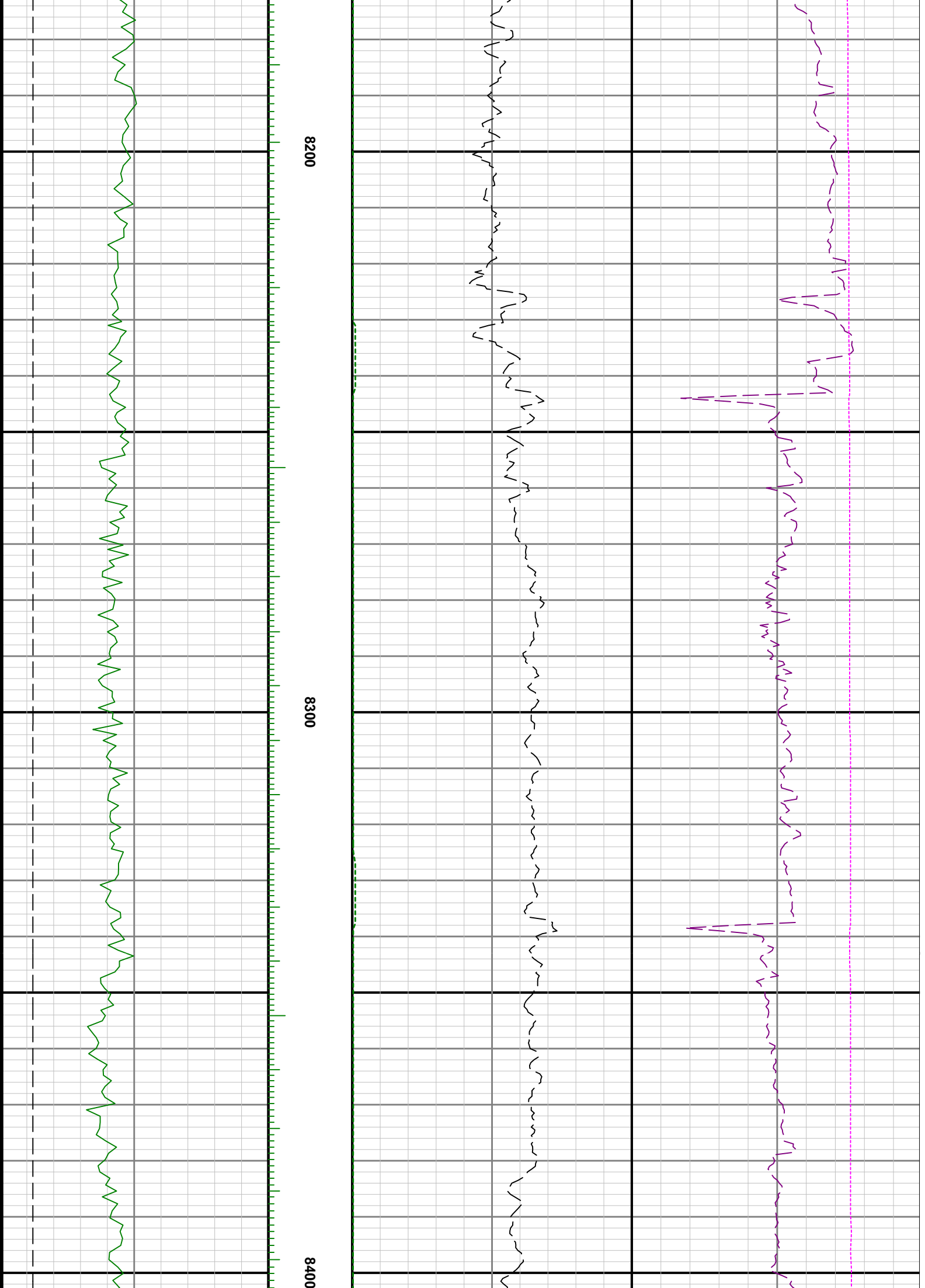
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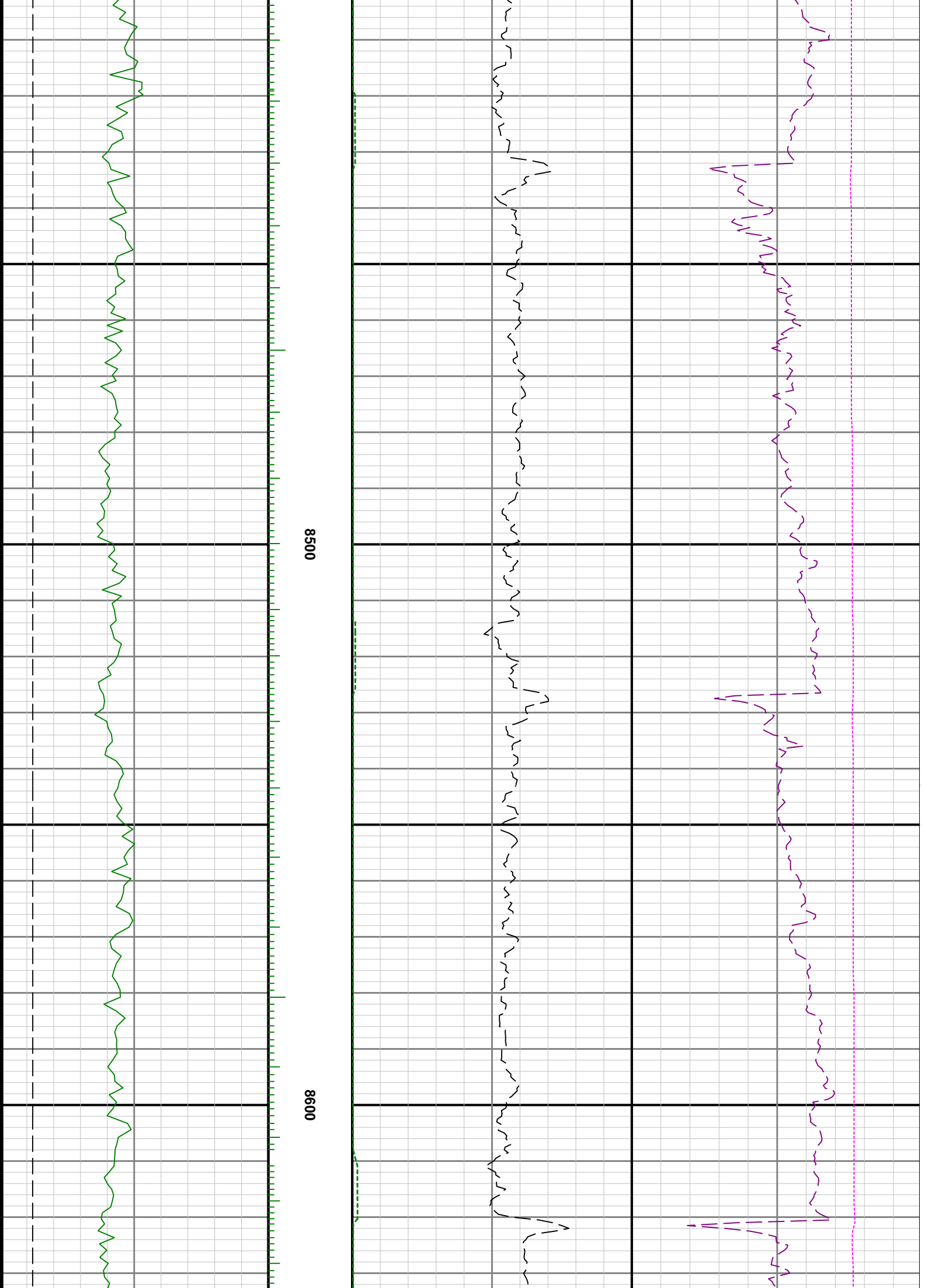
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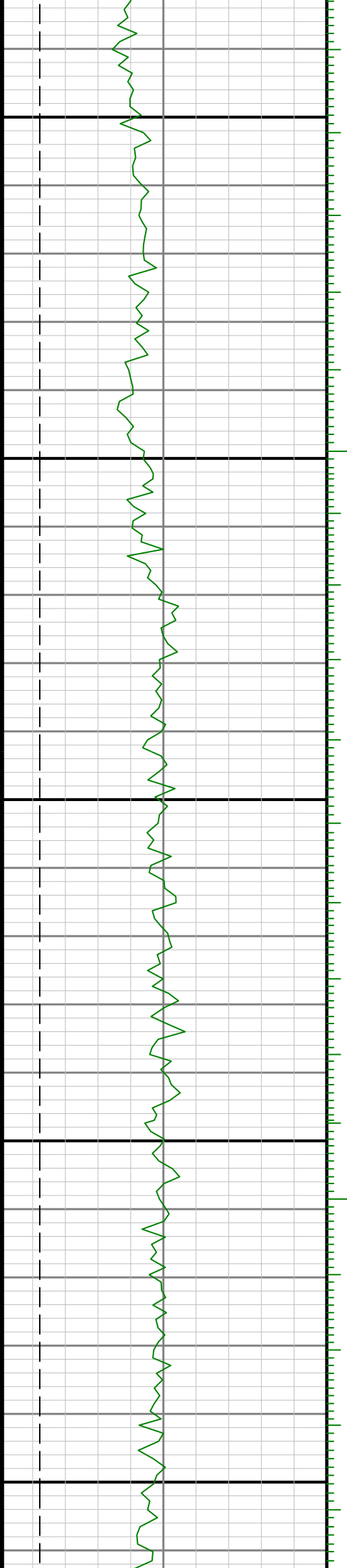
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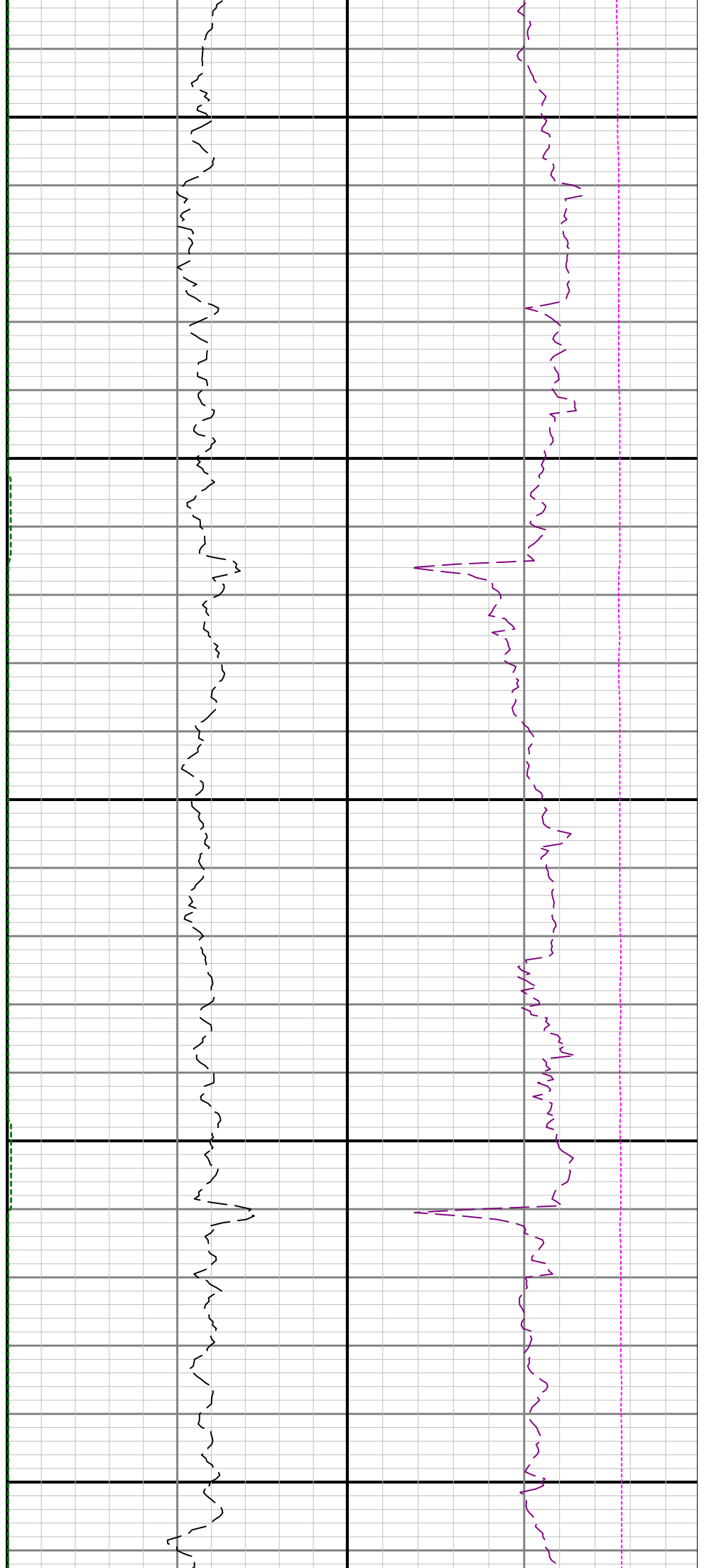
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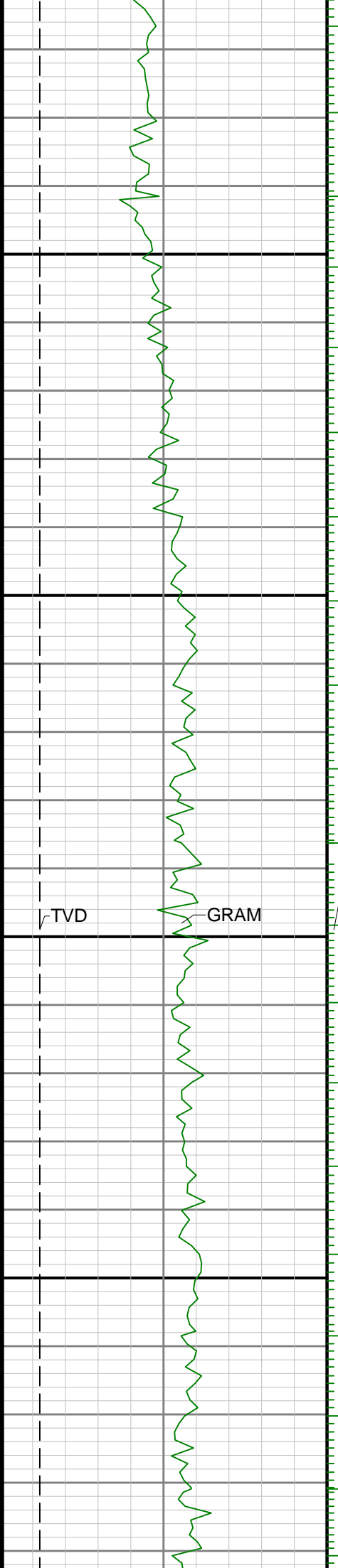
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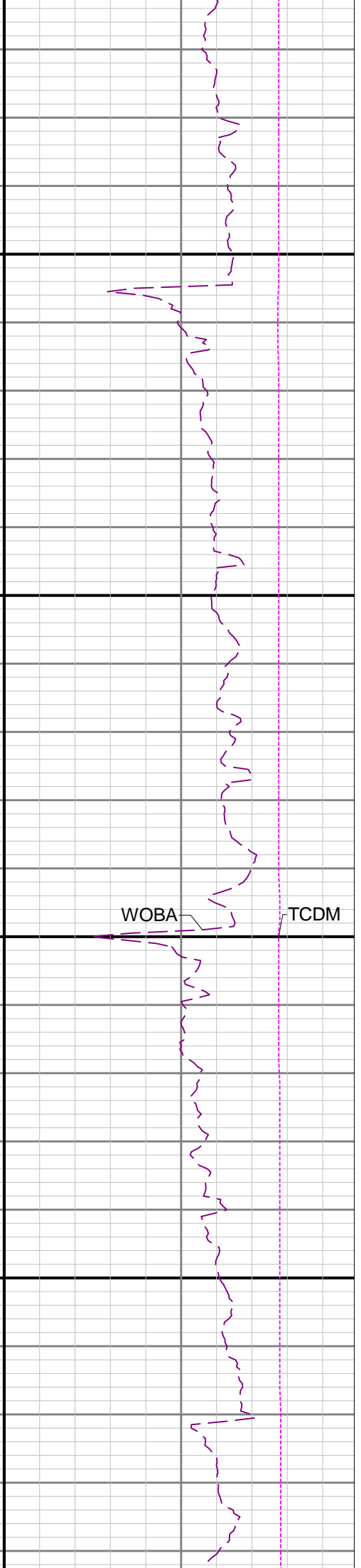
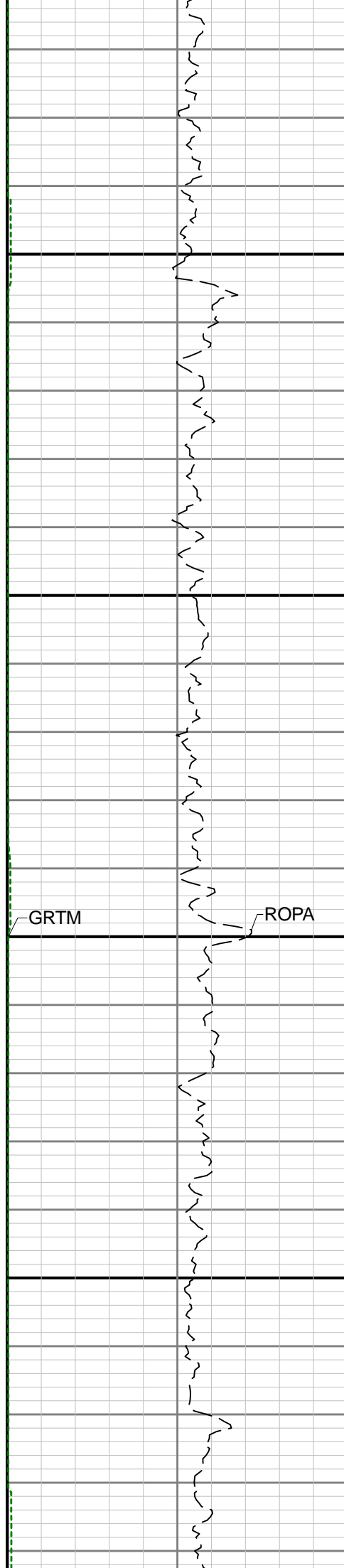
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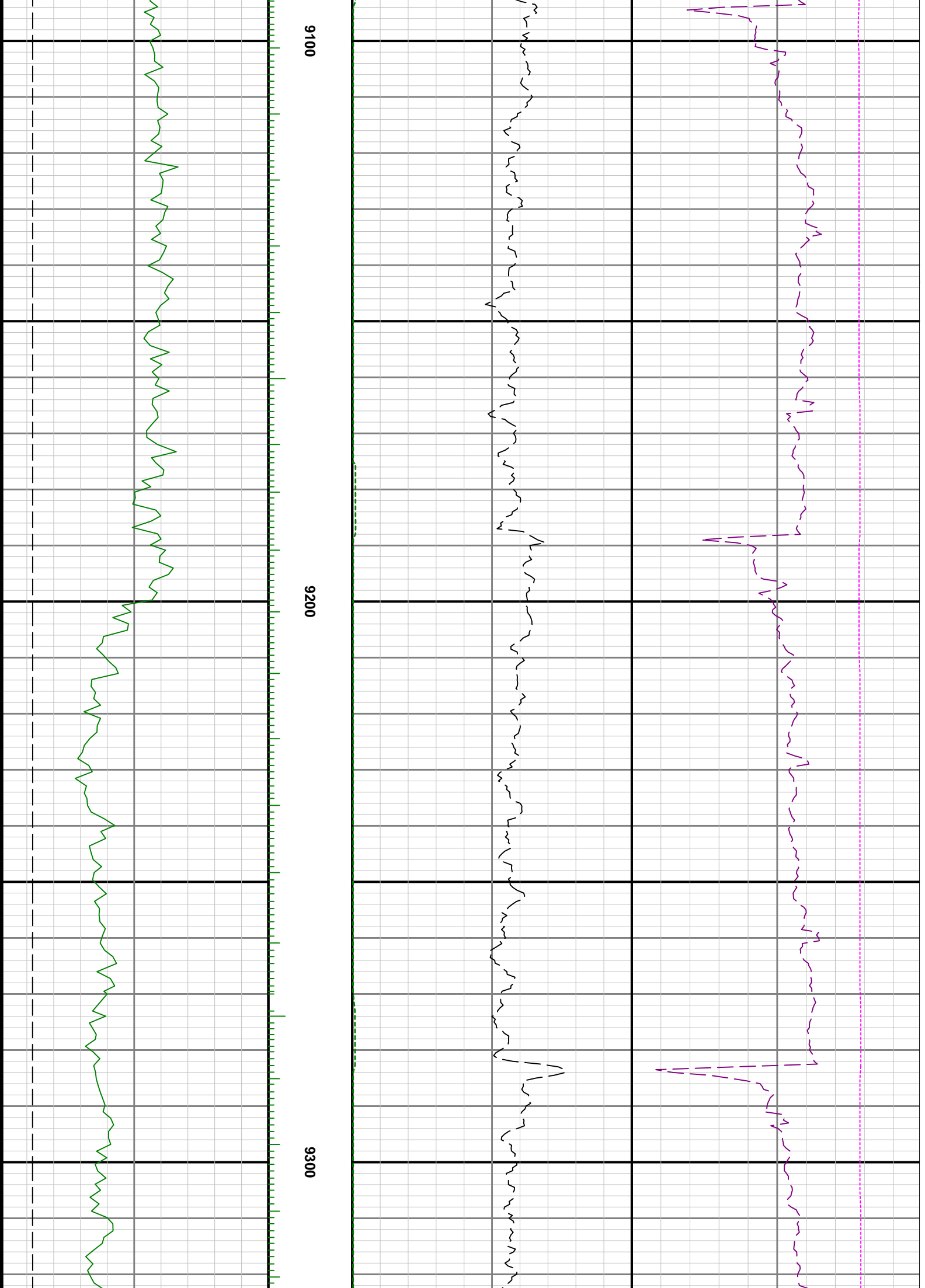


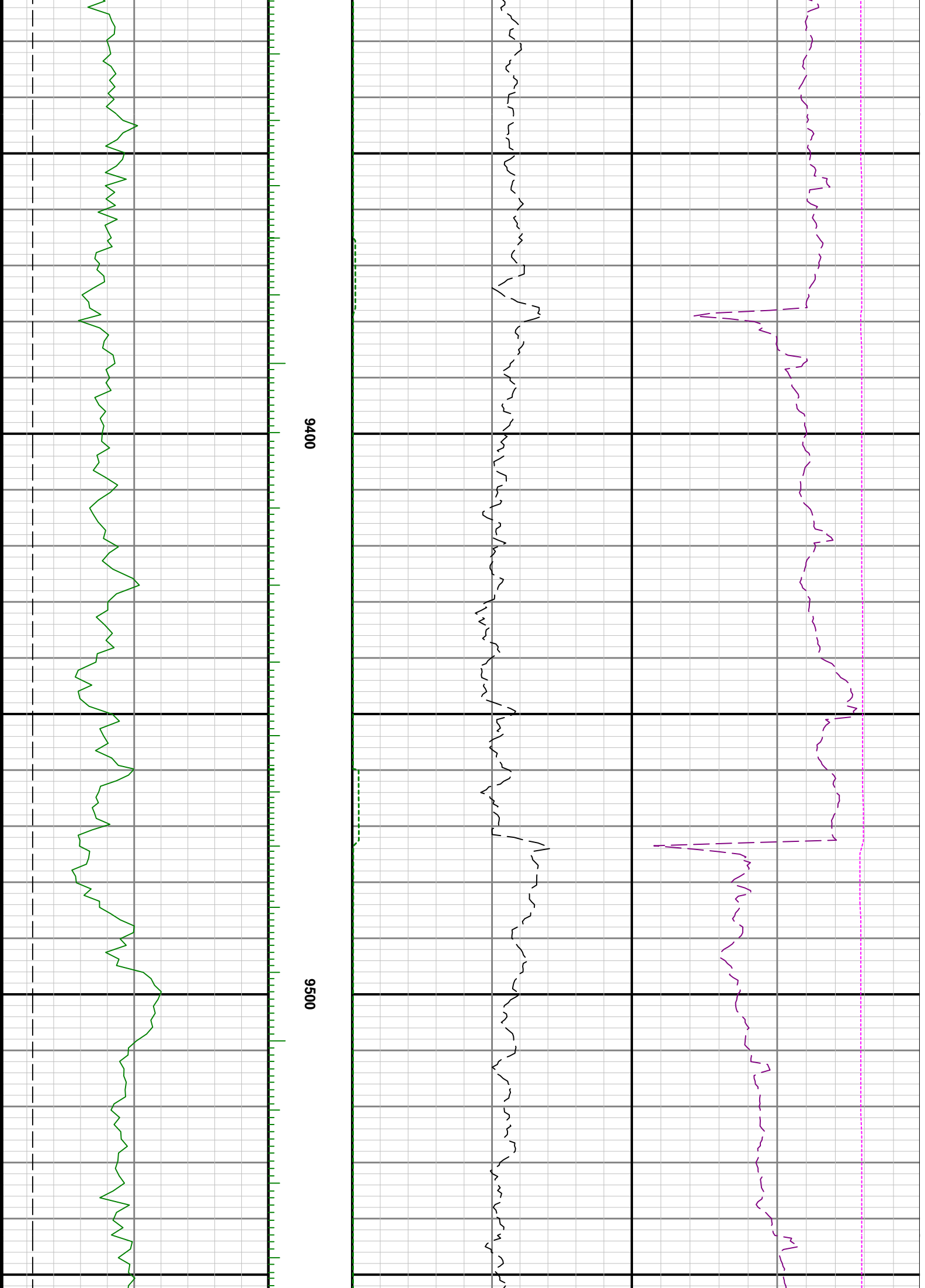


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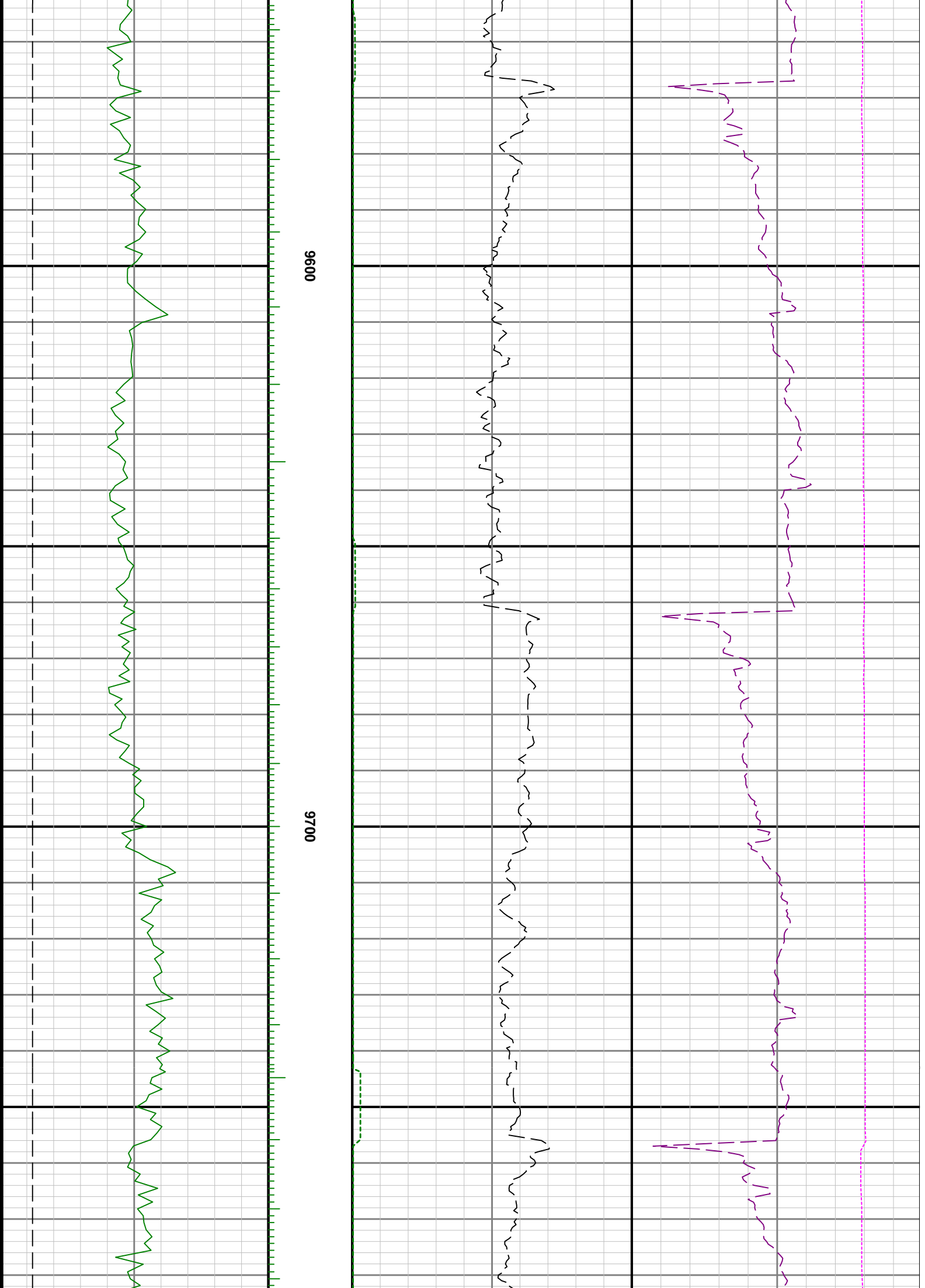


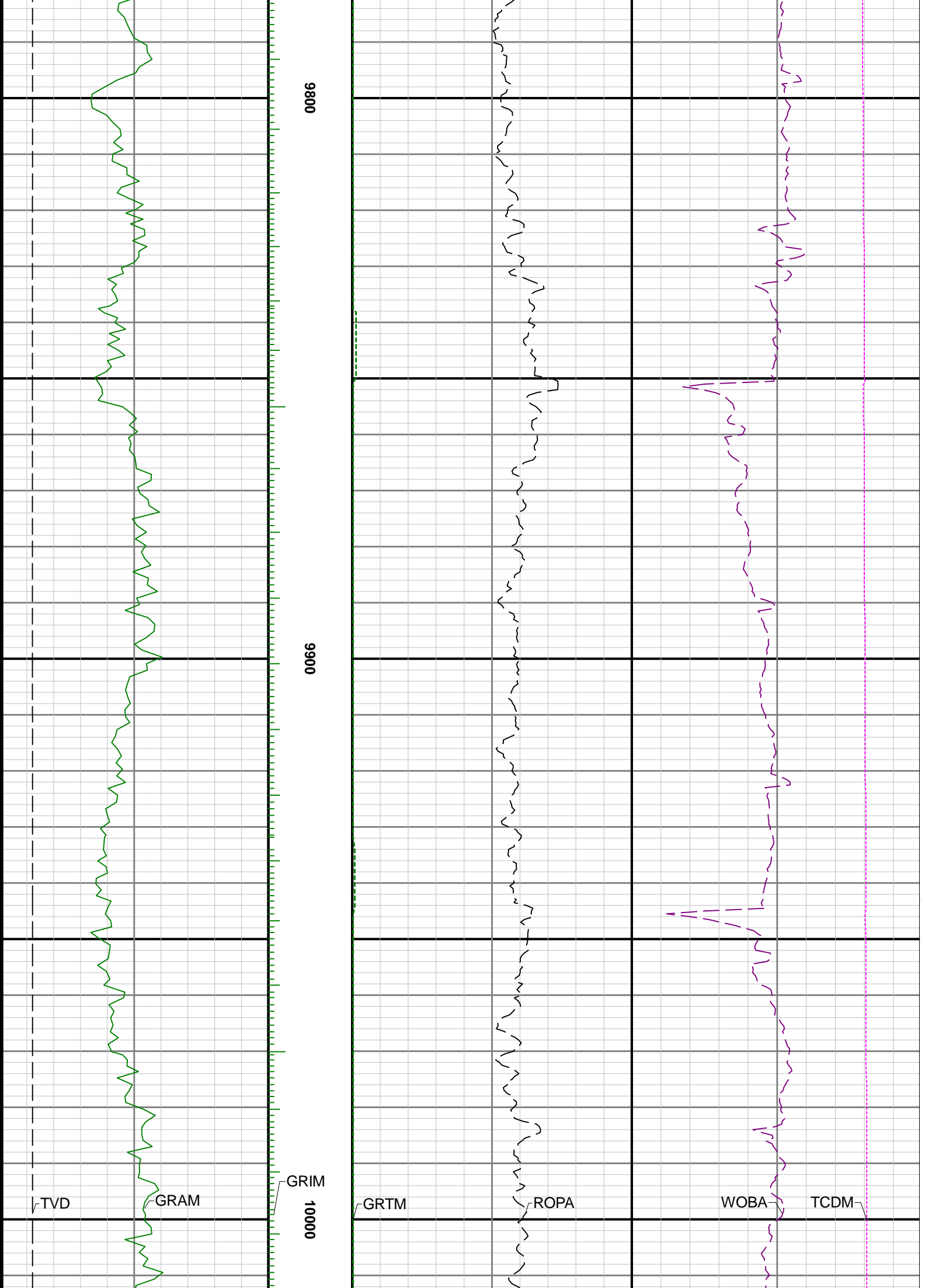


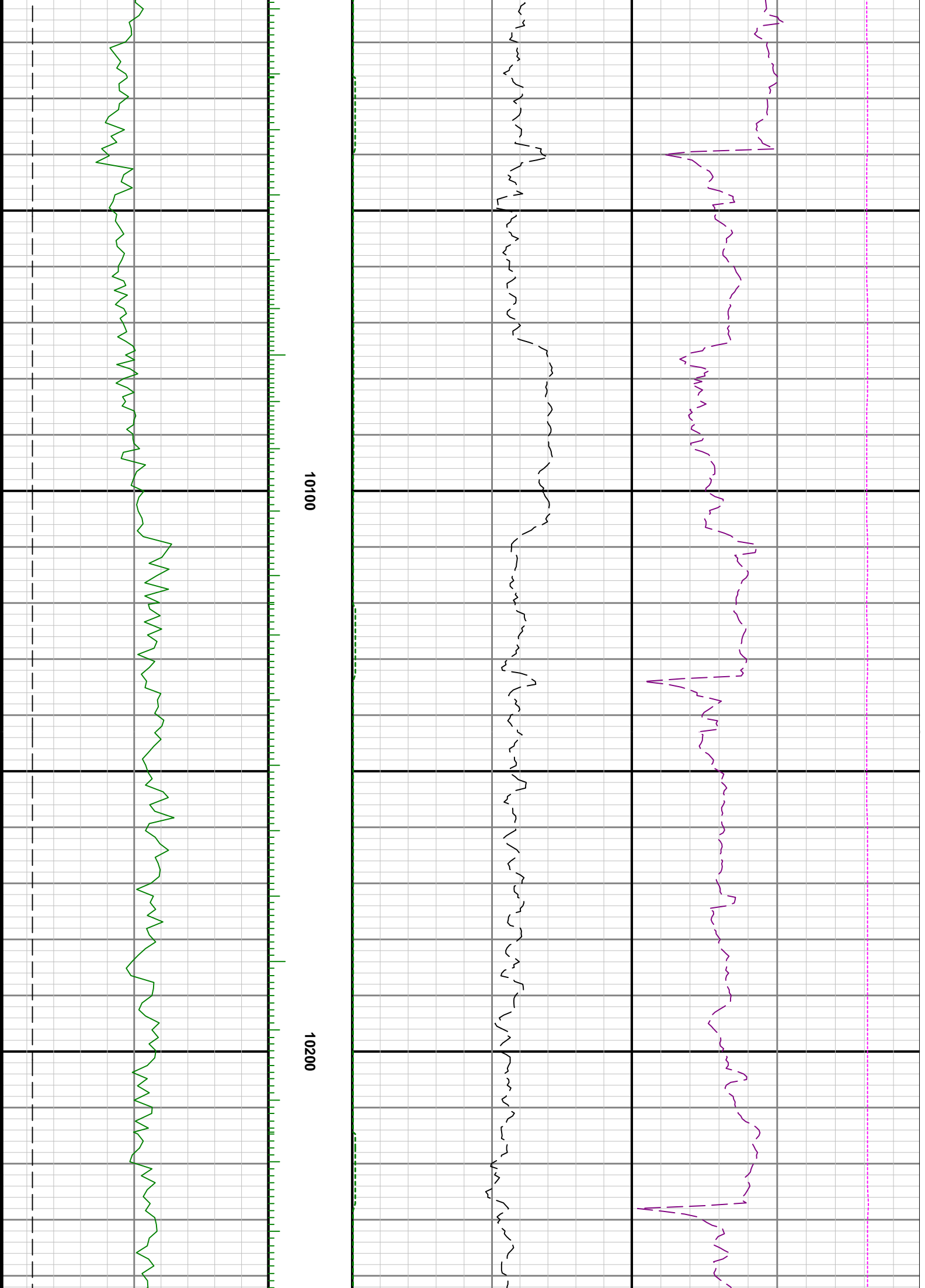


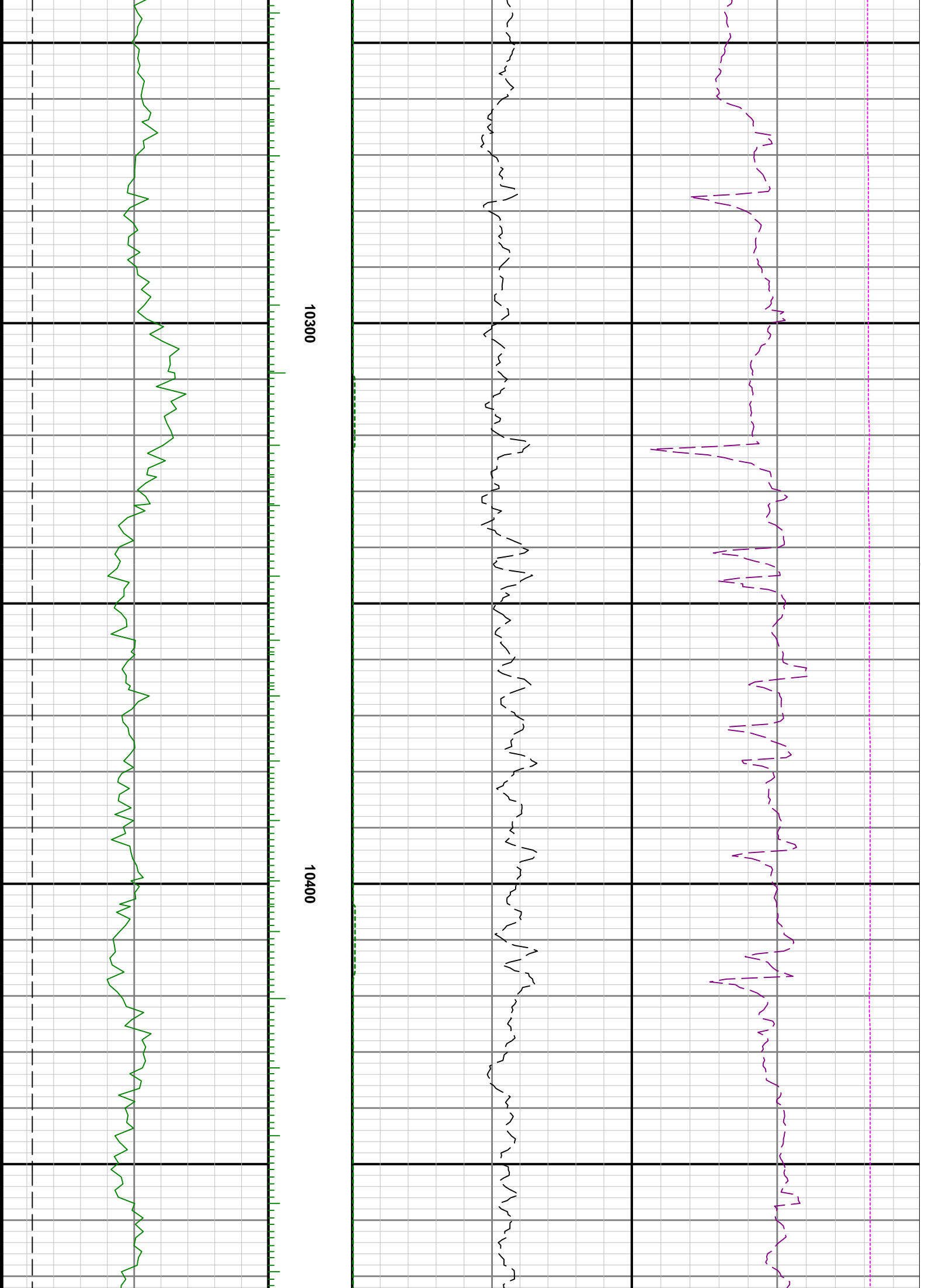
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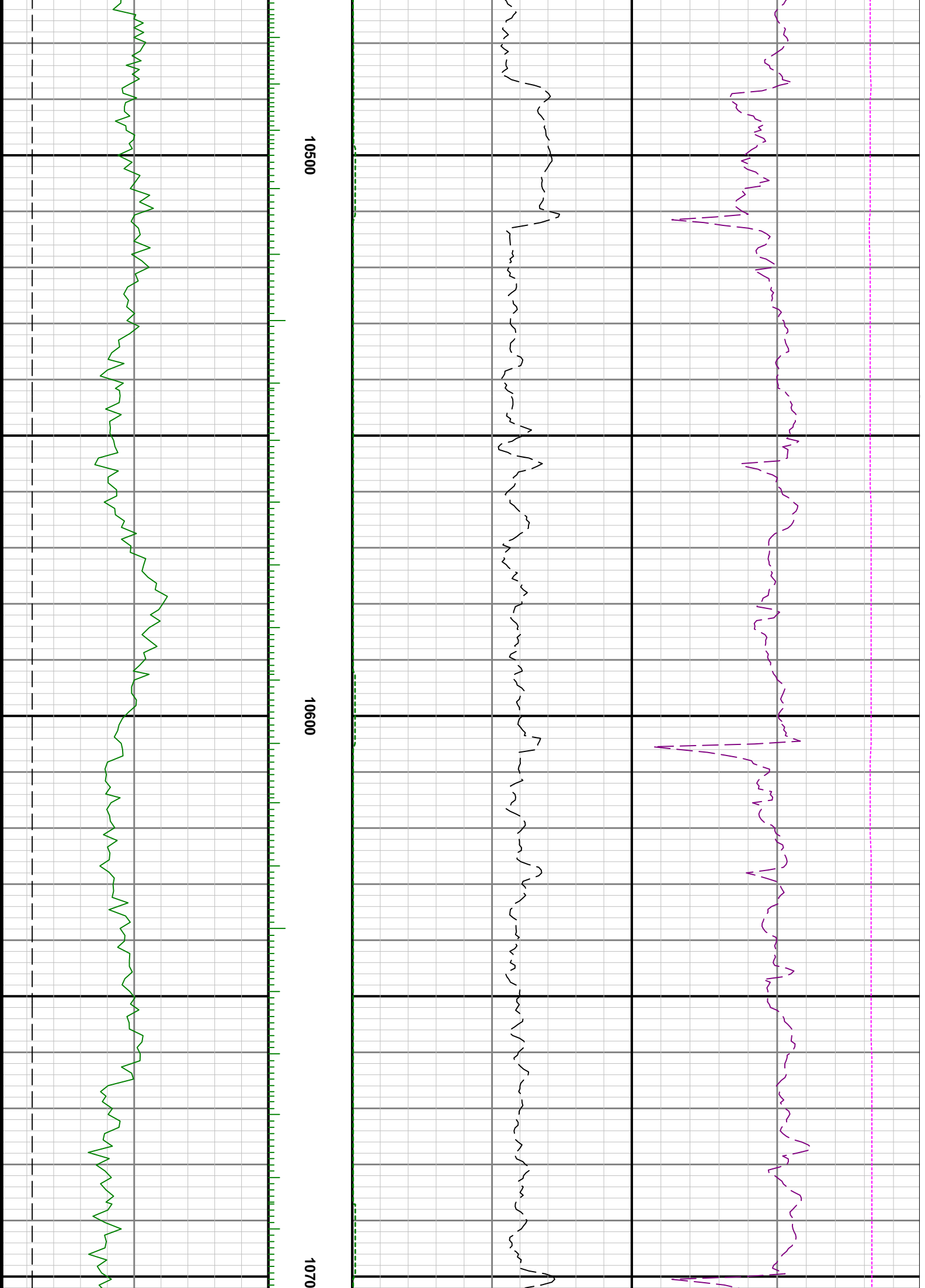
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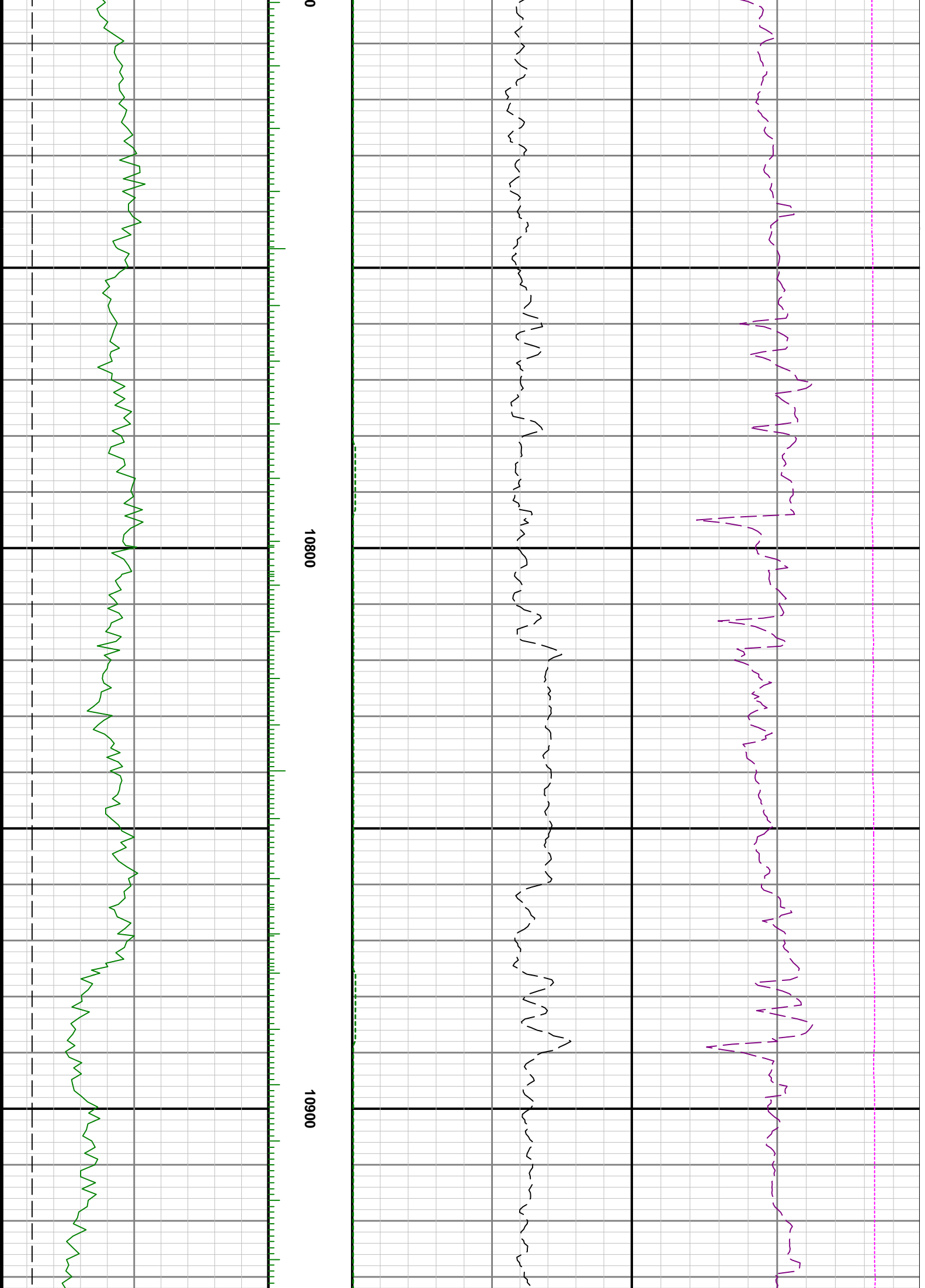


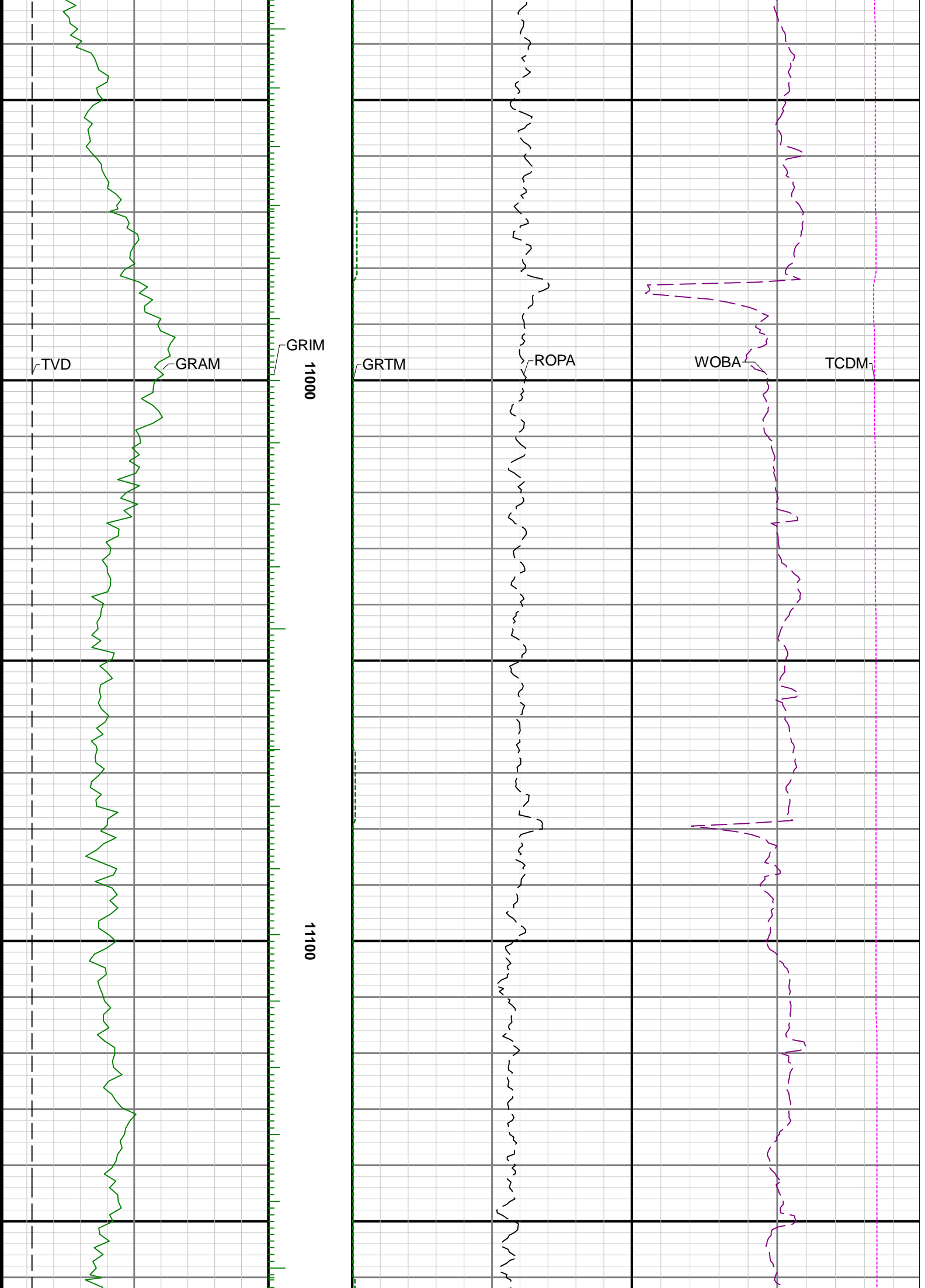


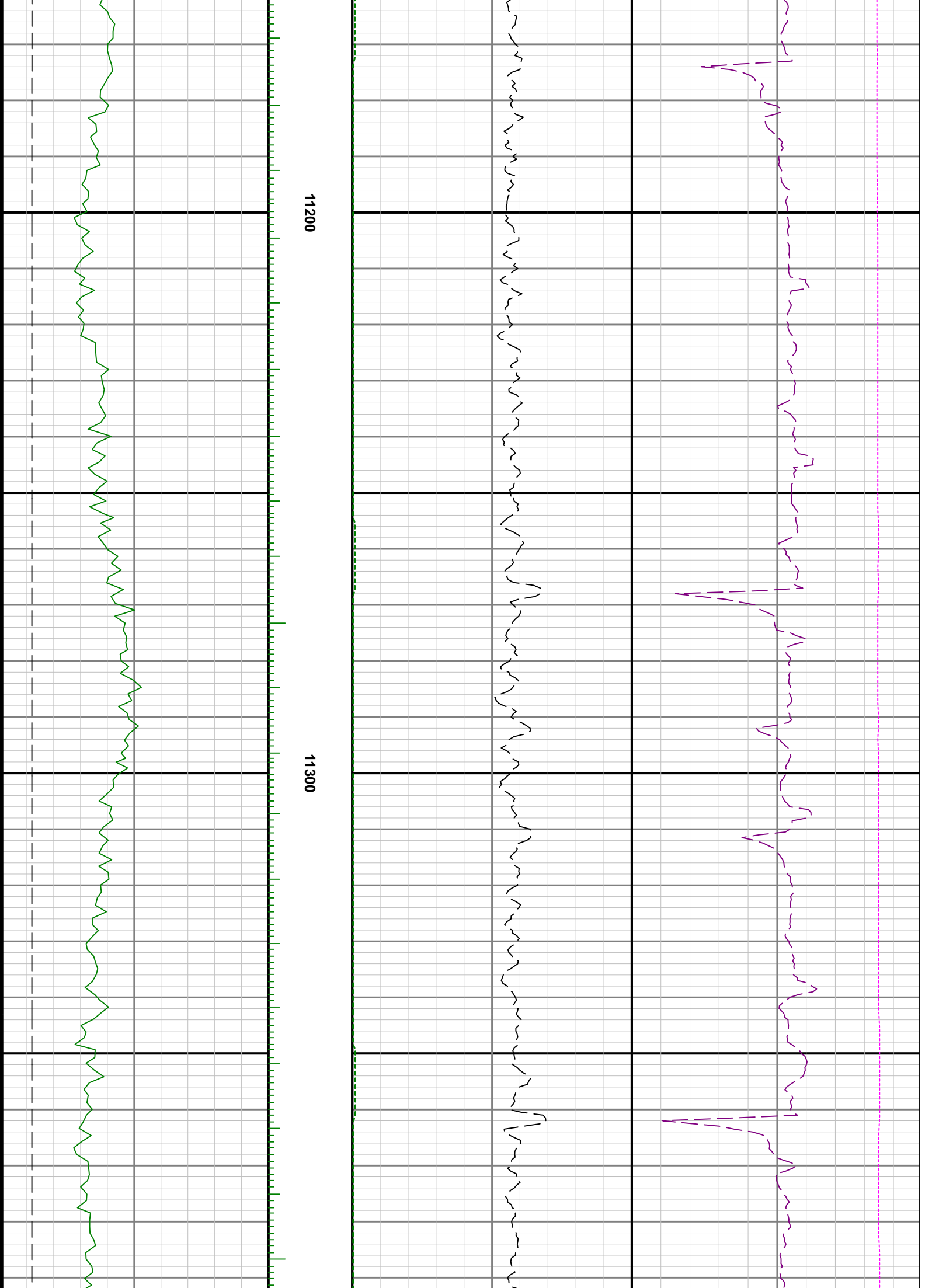












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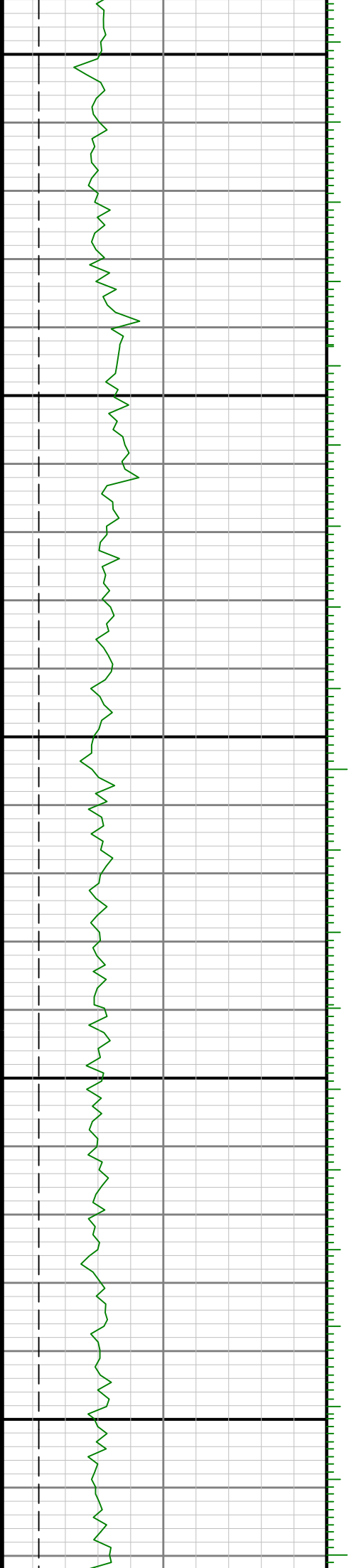
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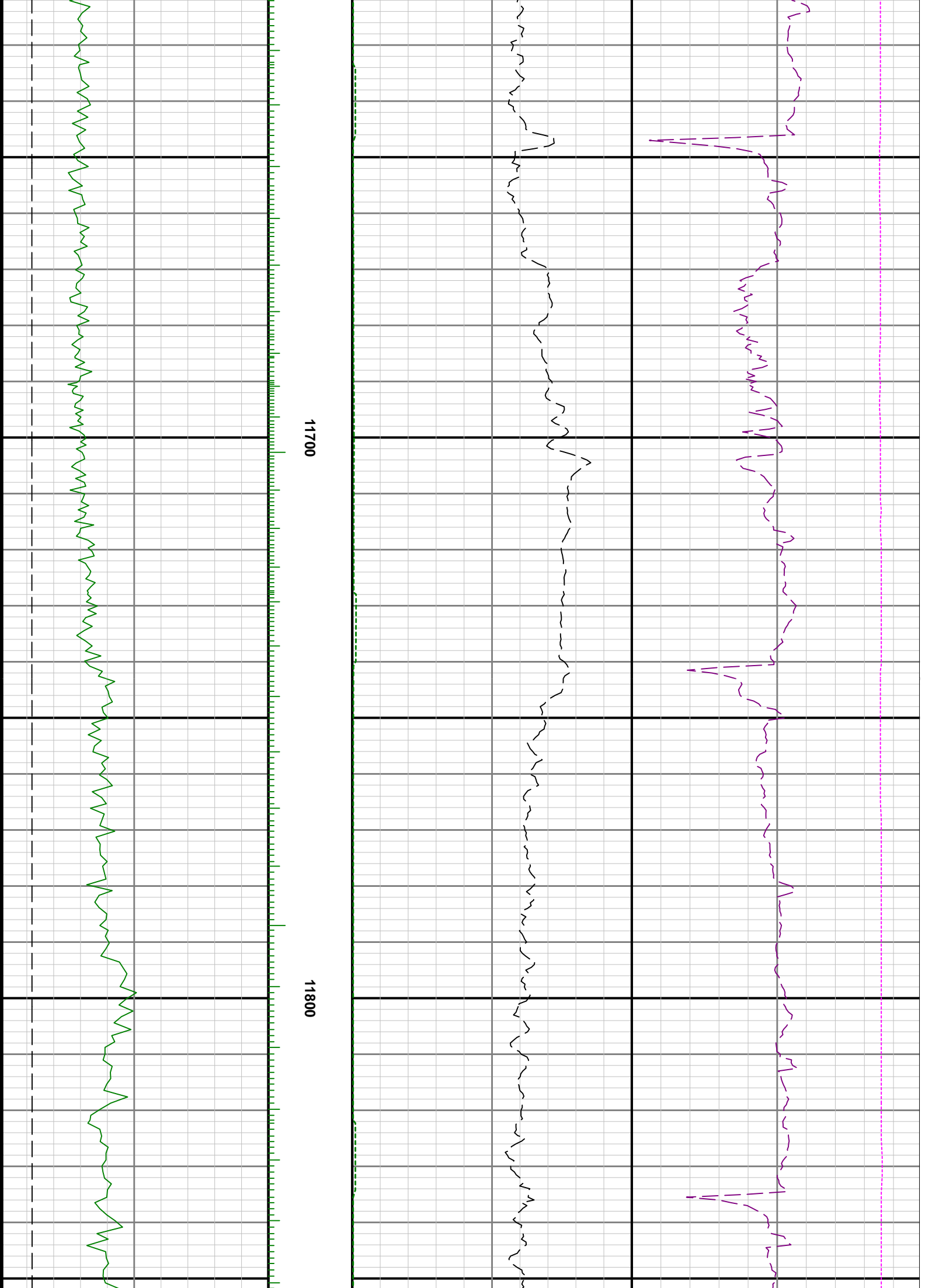


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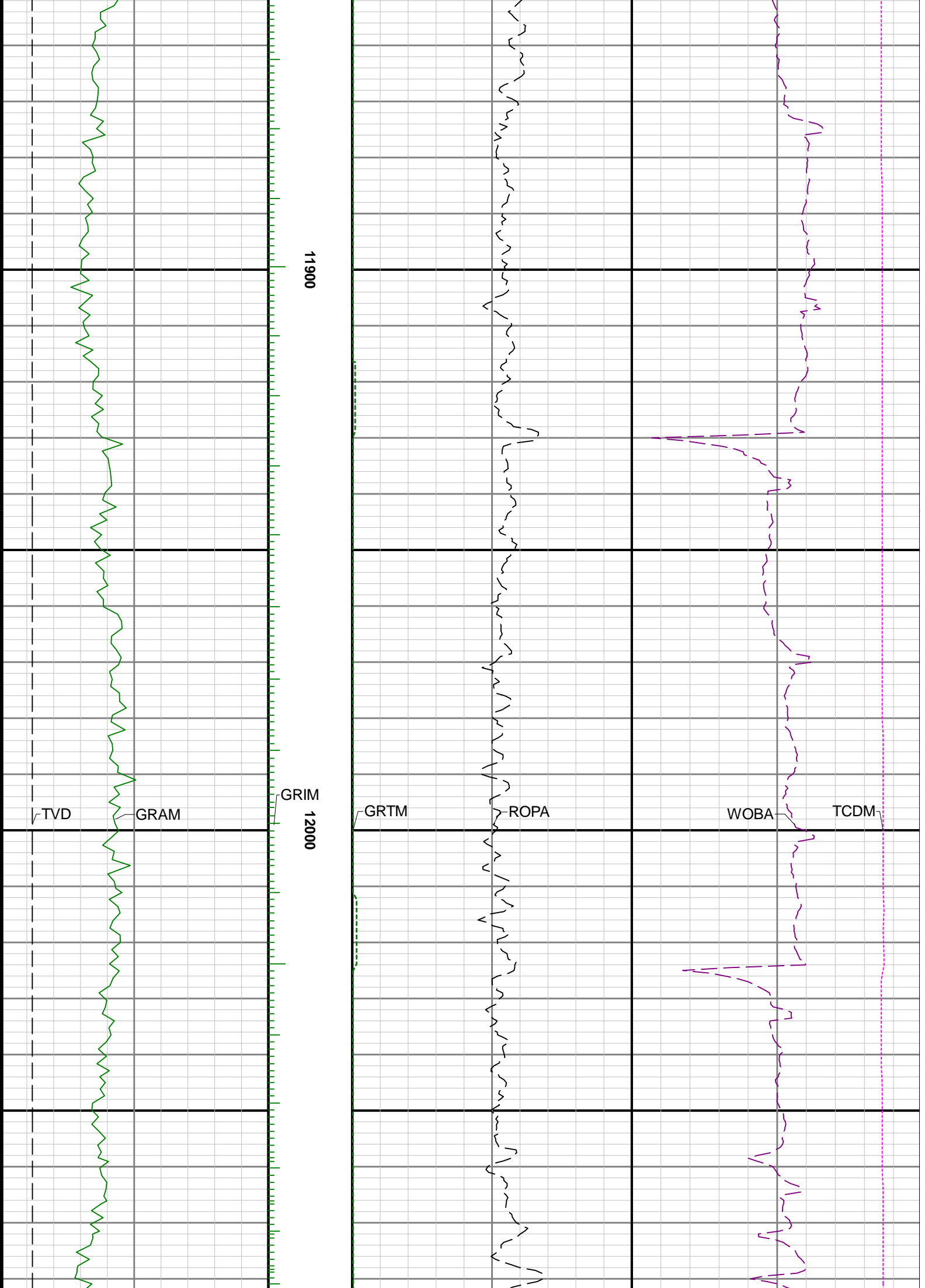
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GRAM

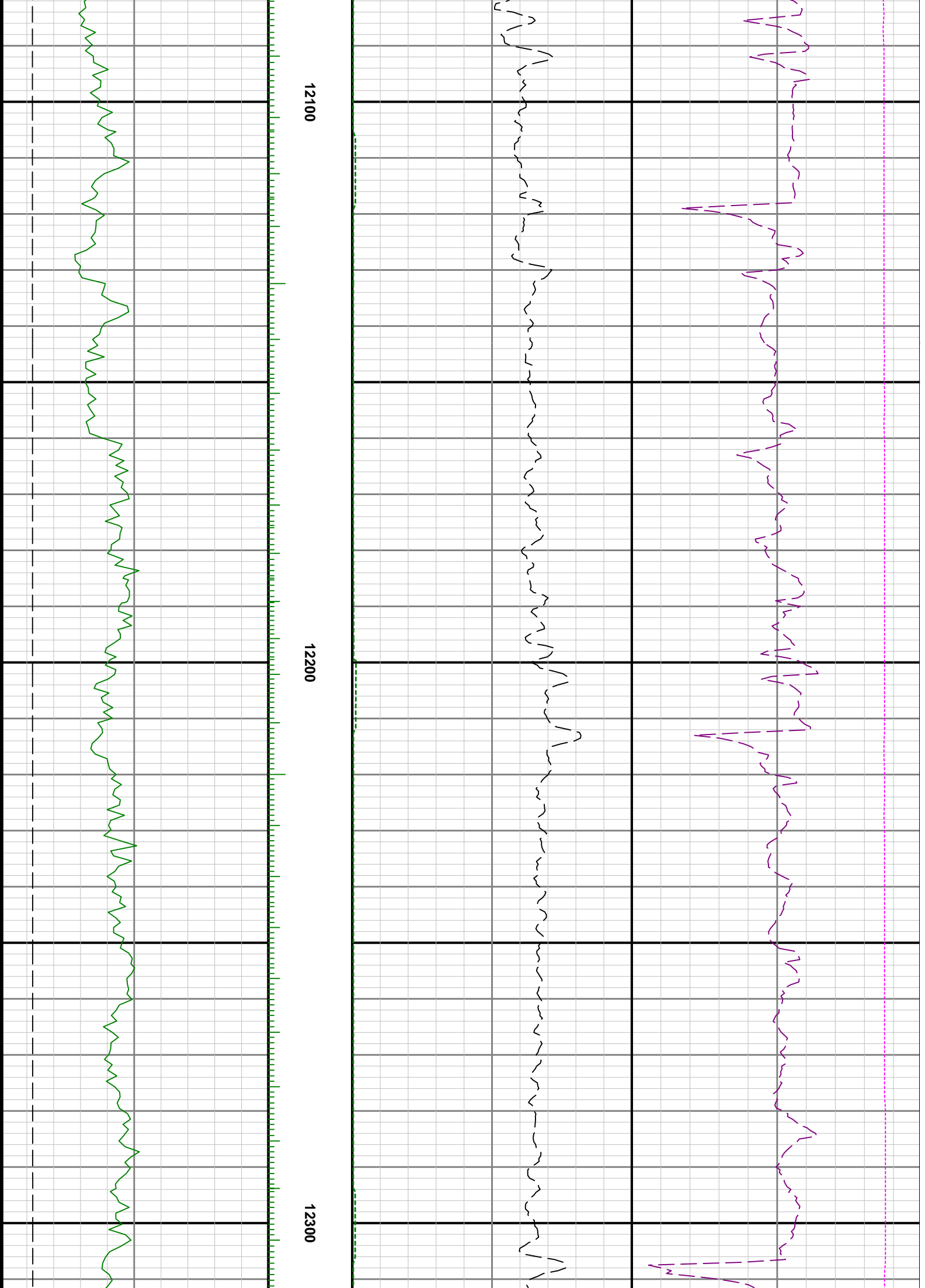
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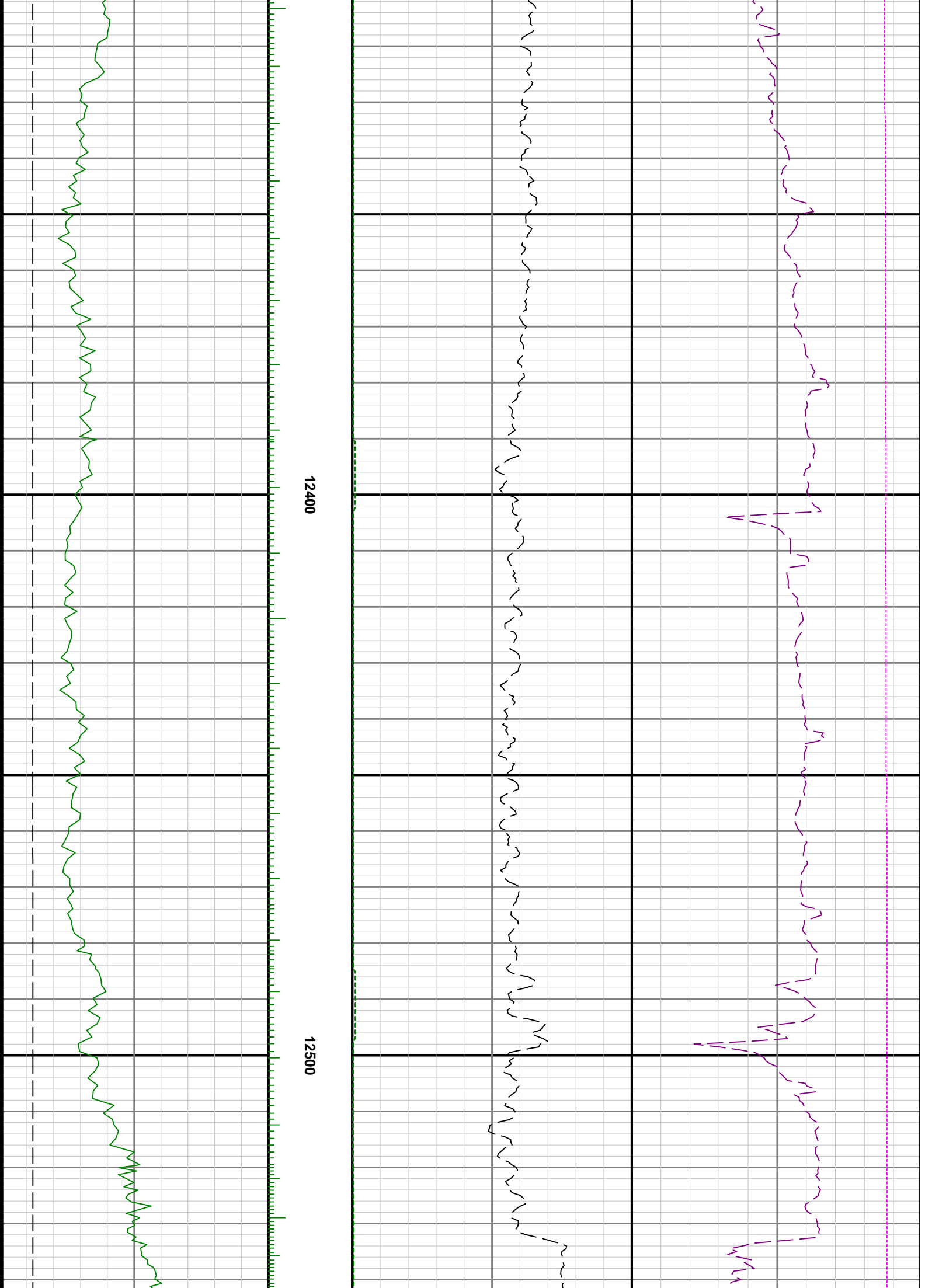
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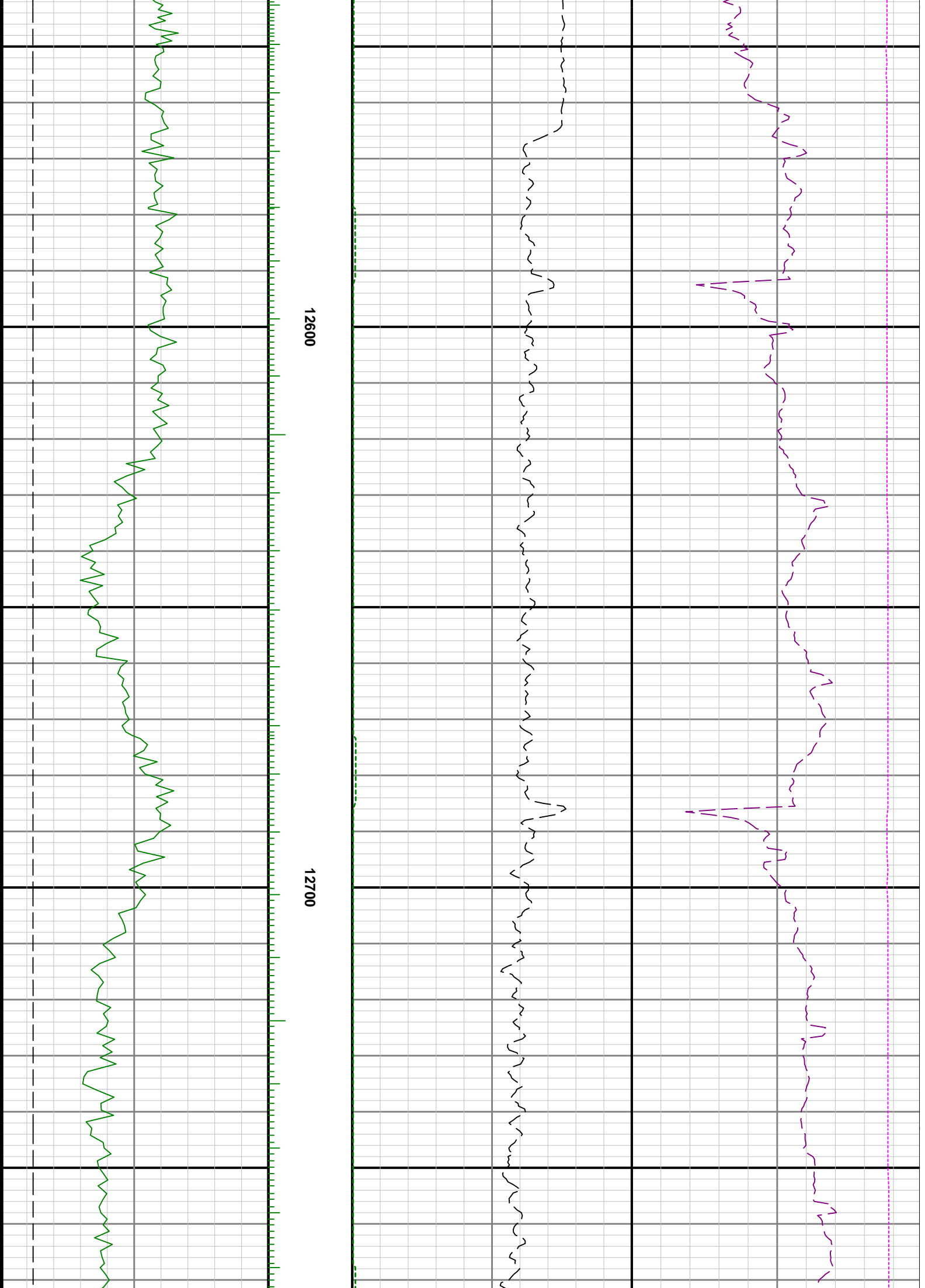
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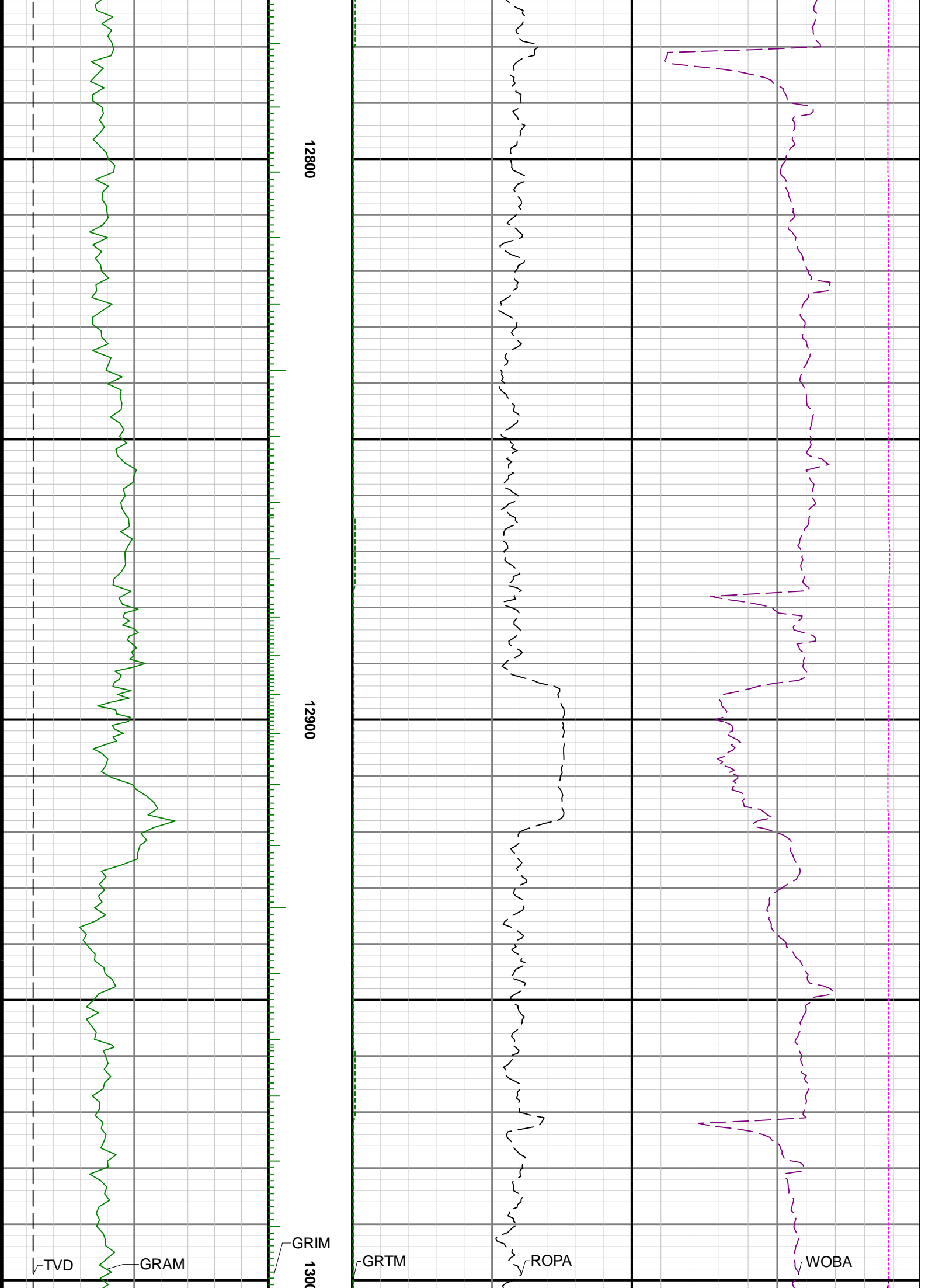




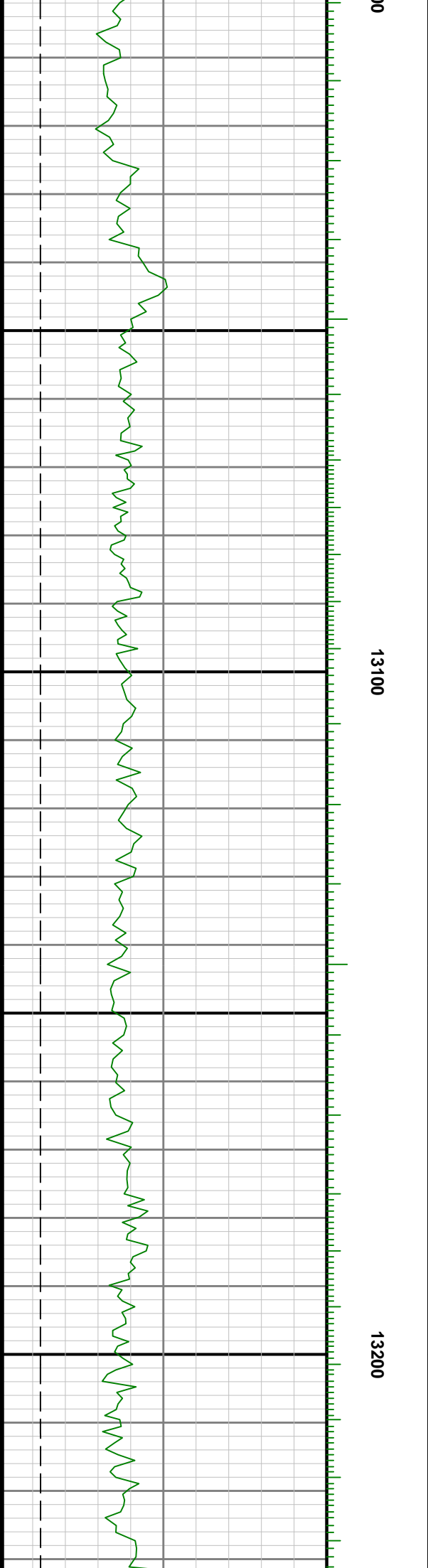
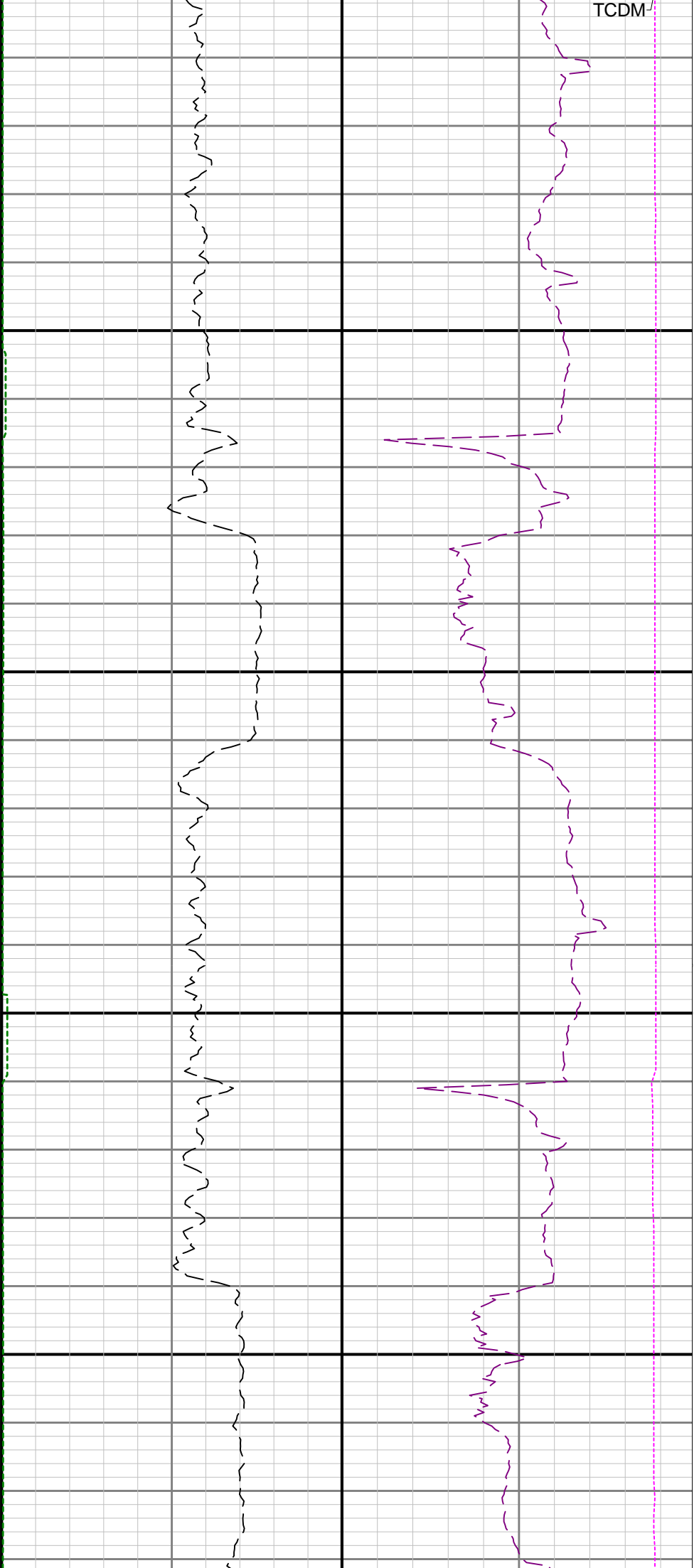


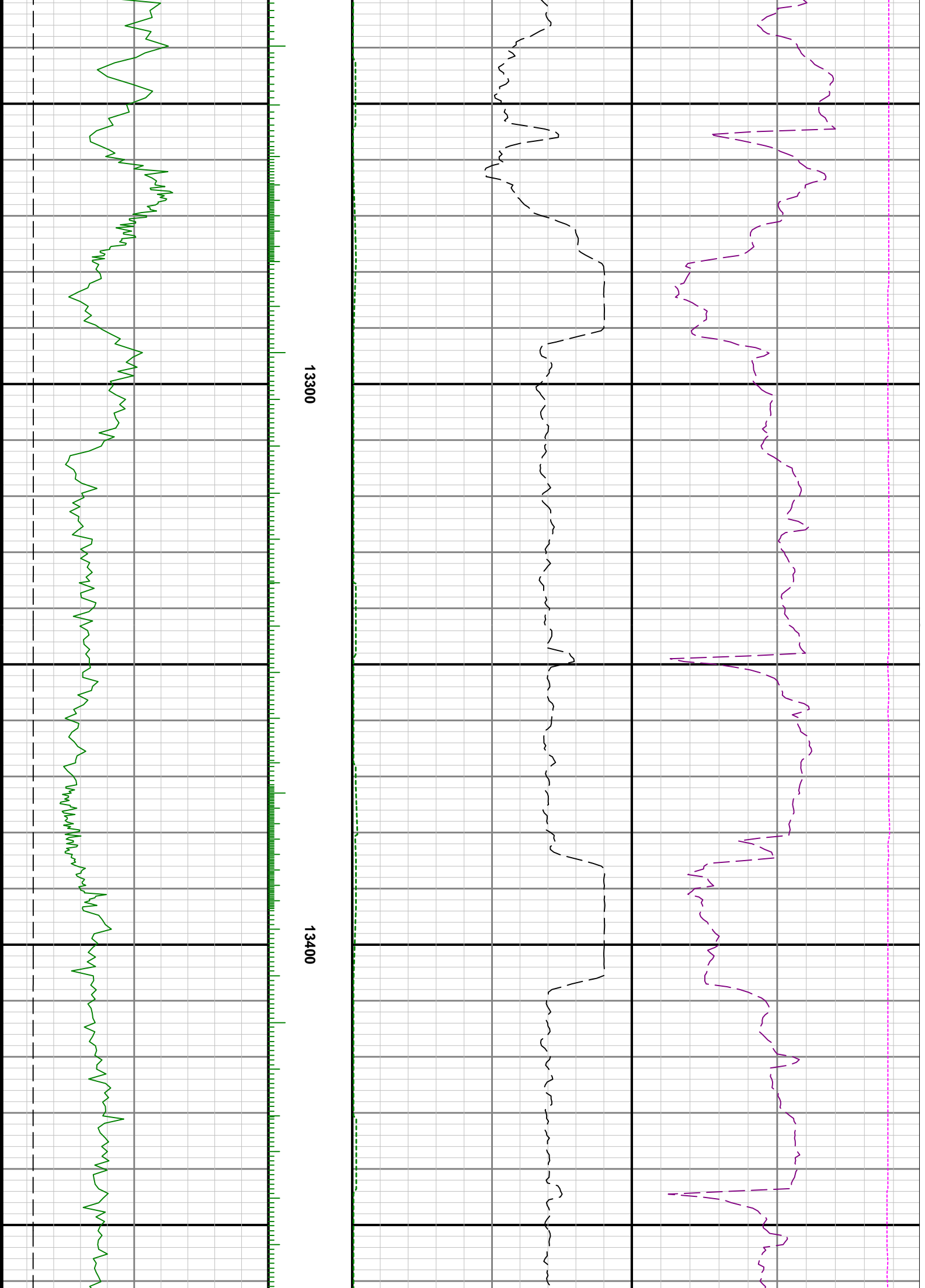
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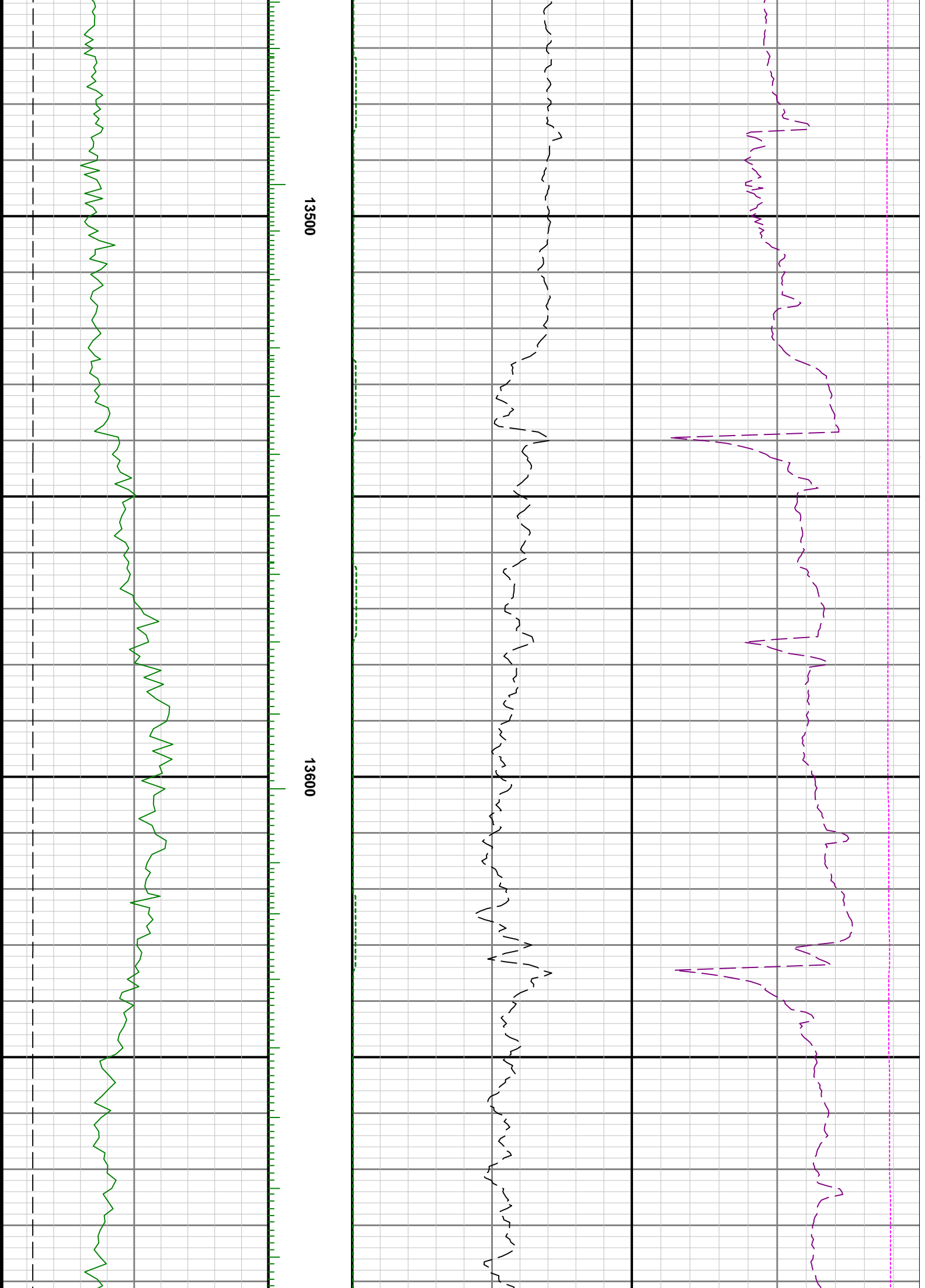
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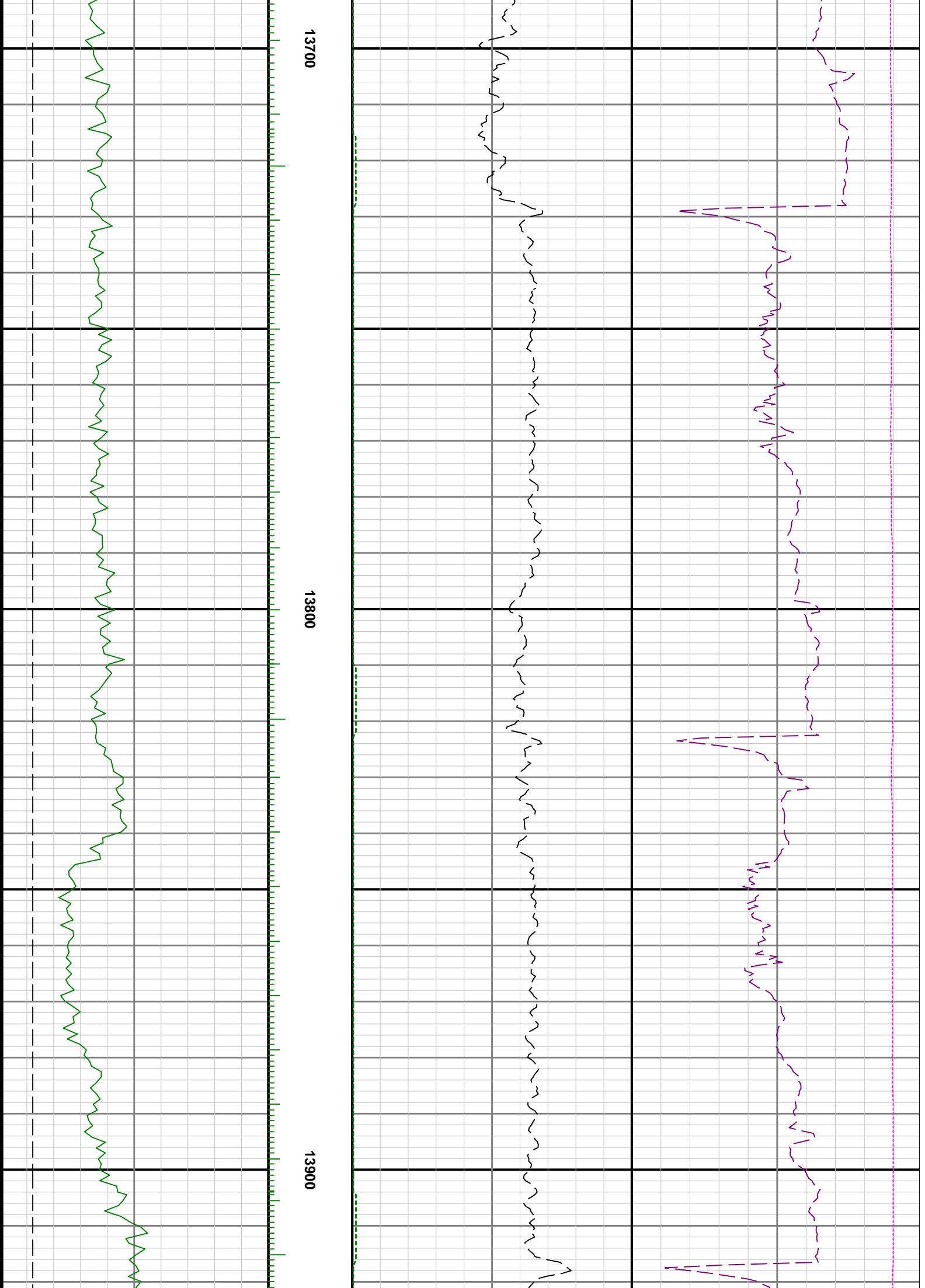


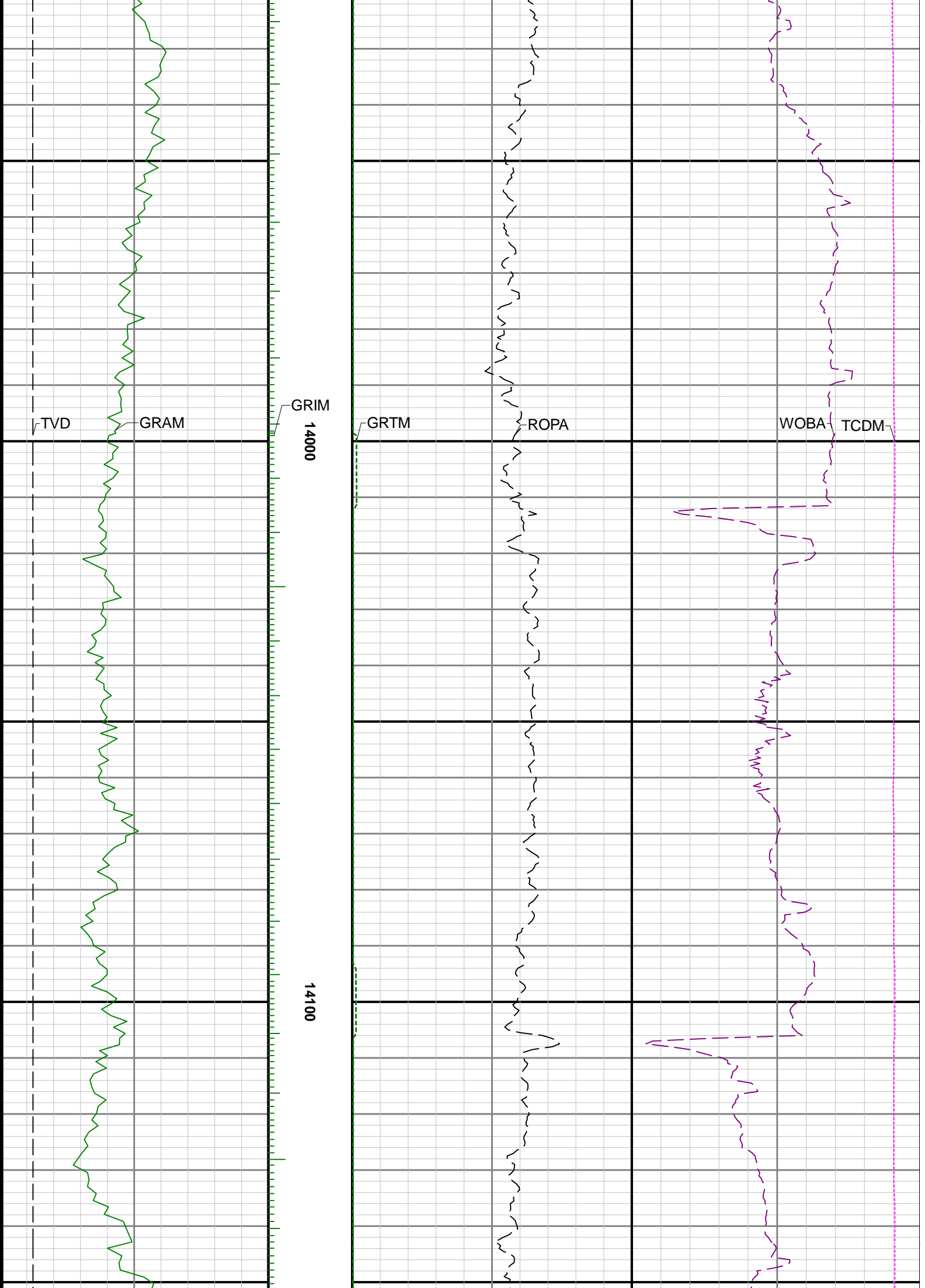


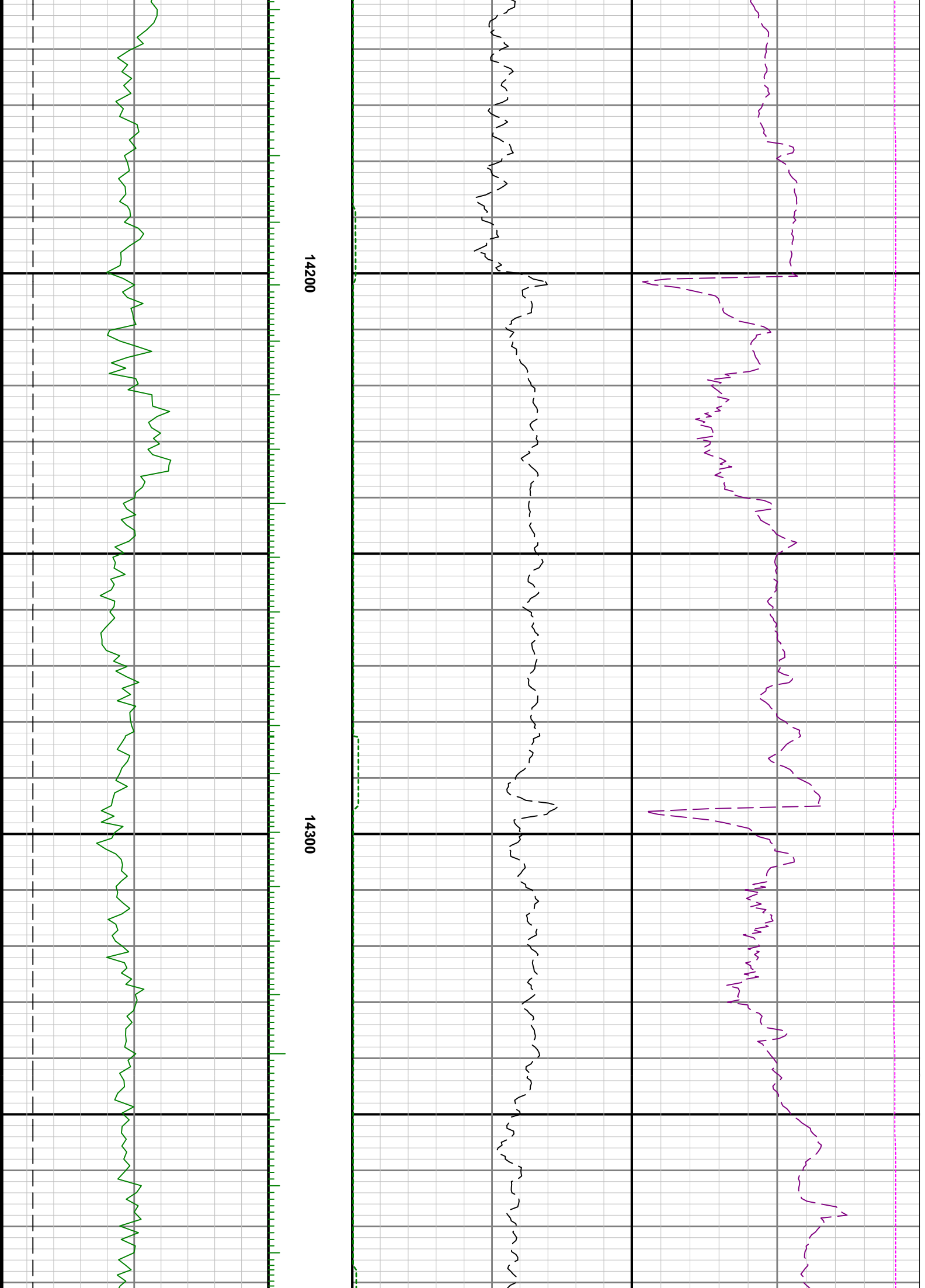


13500

13600

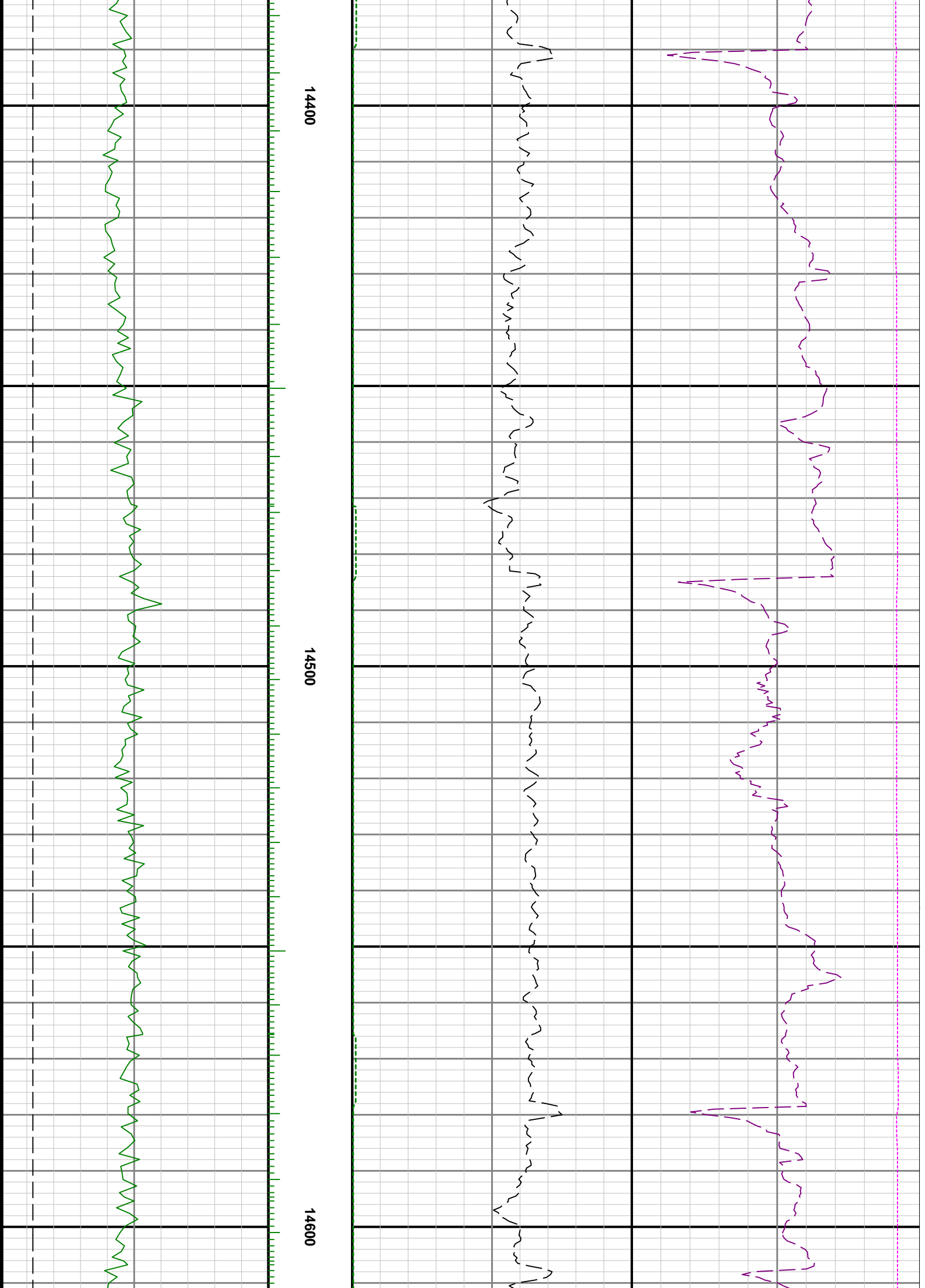






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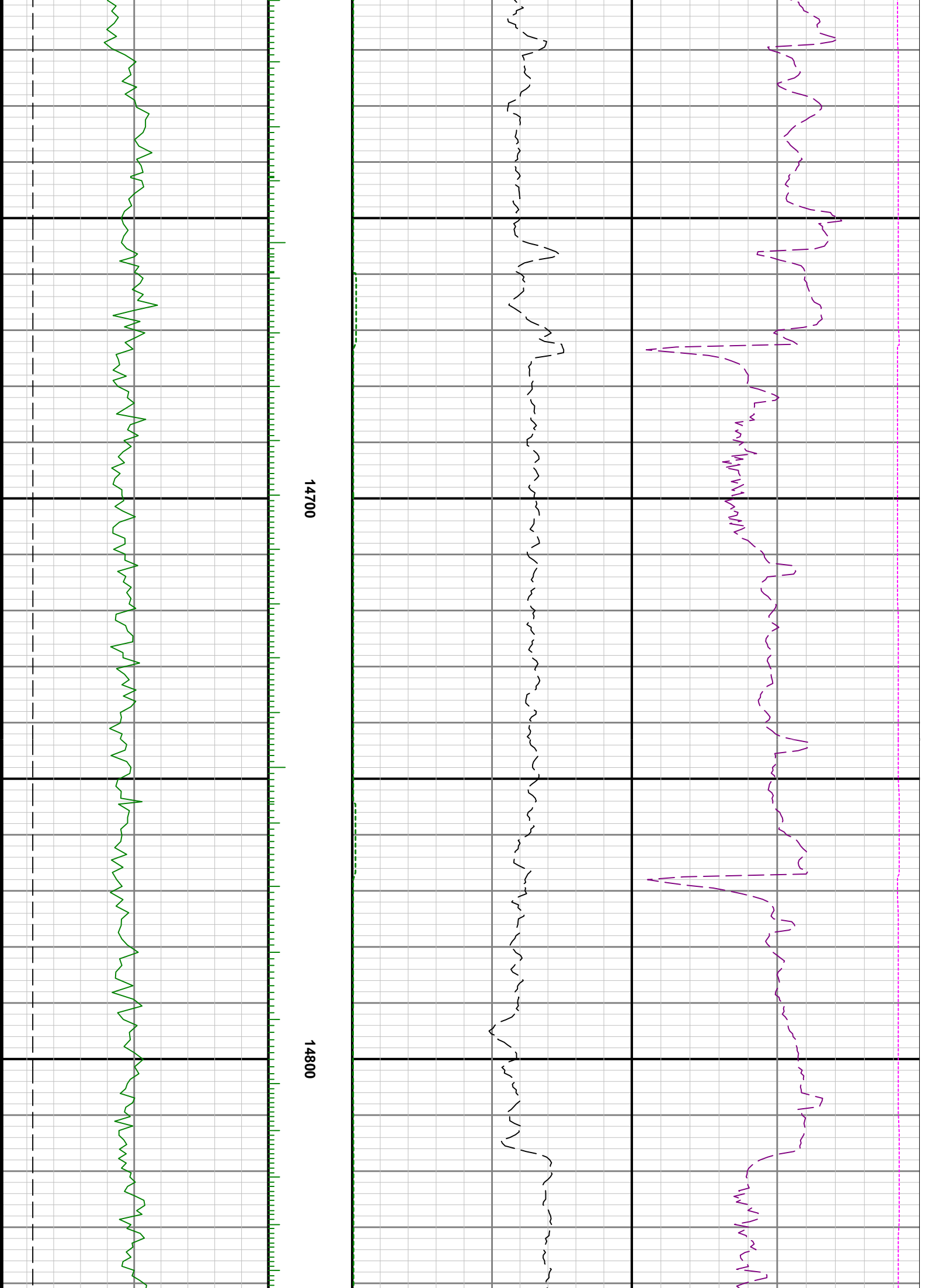
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14400

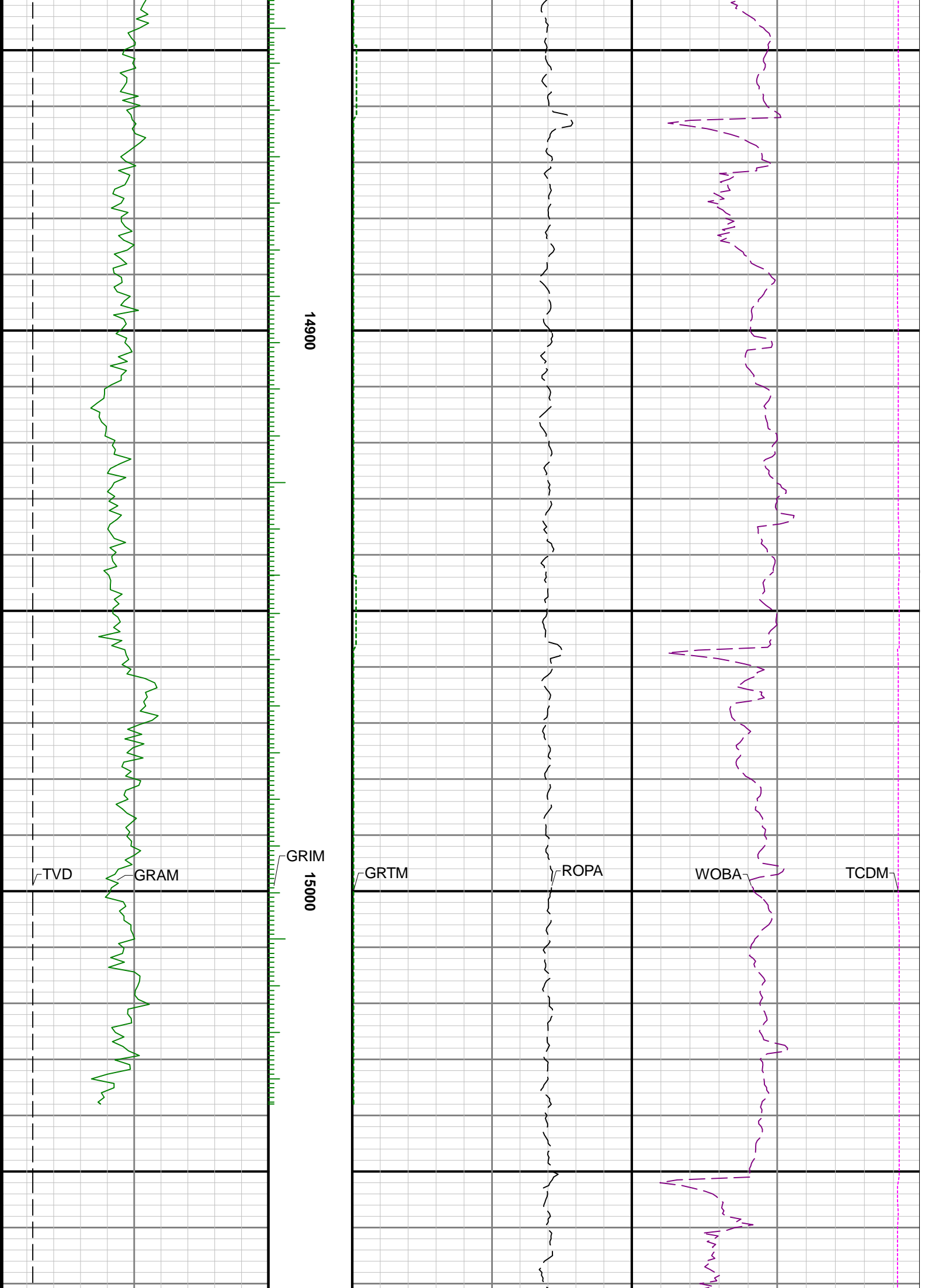
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14700

14800

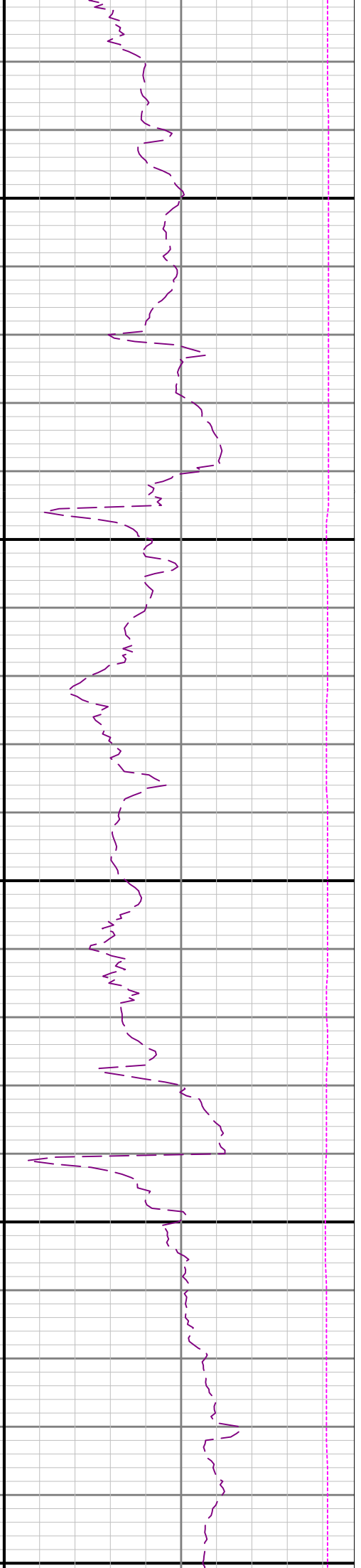
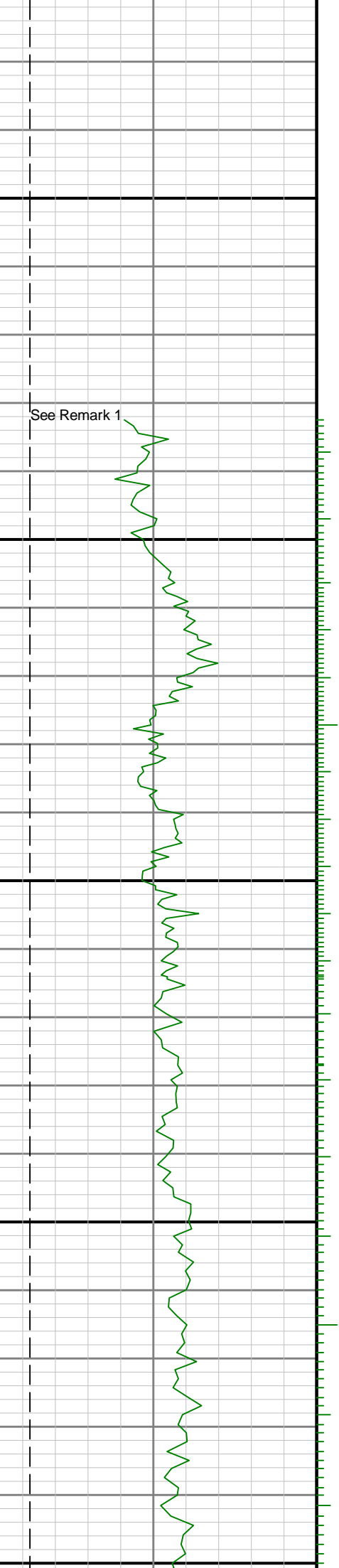


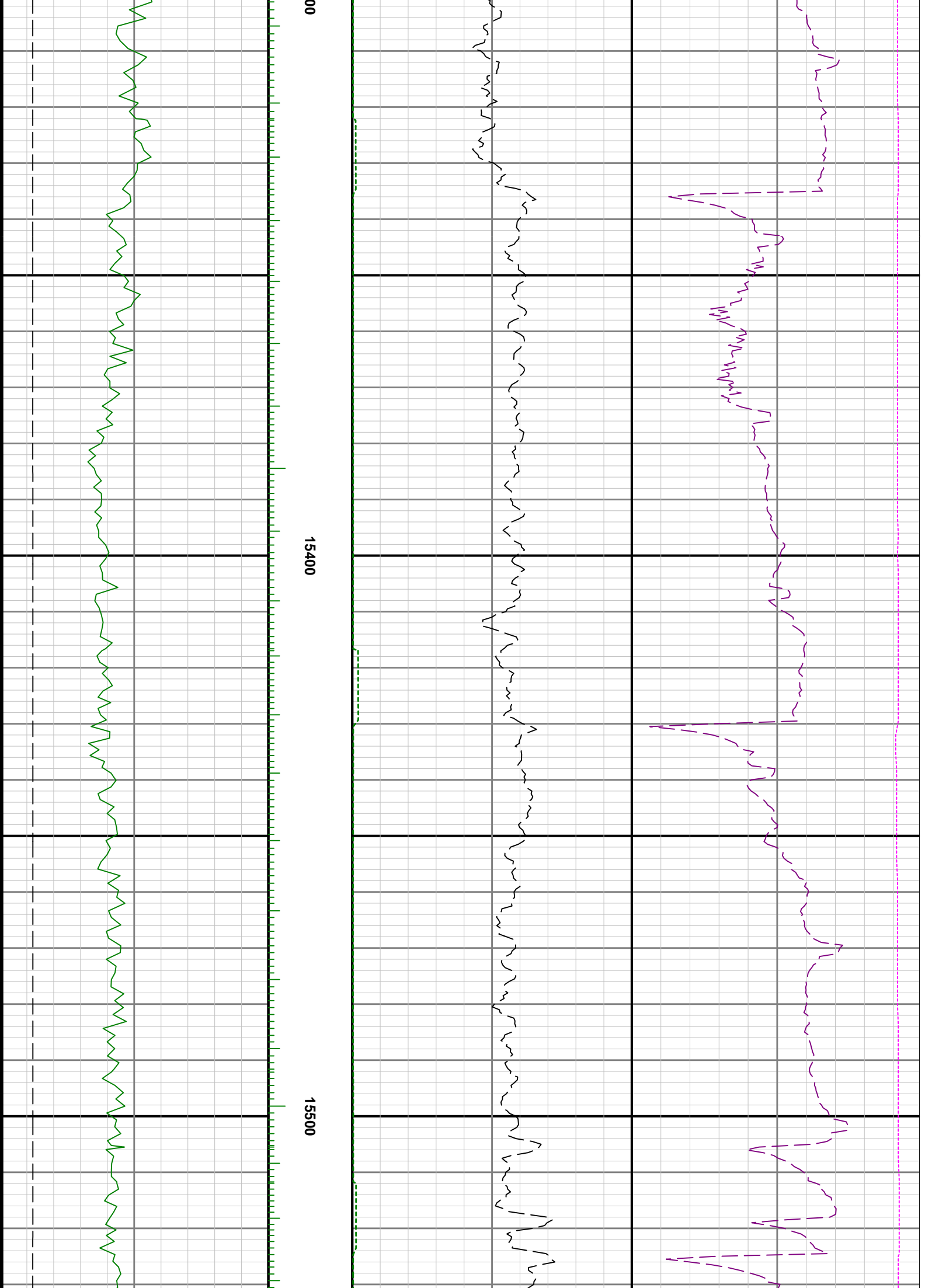
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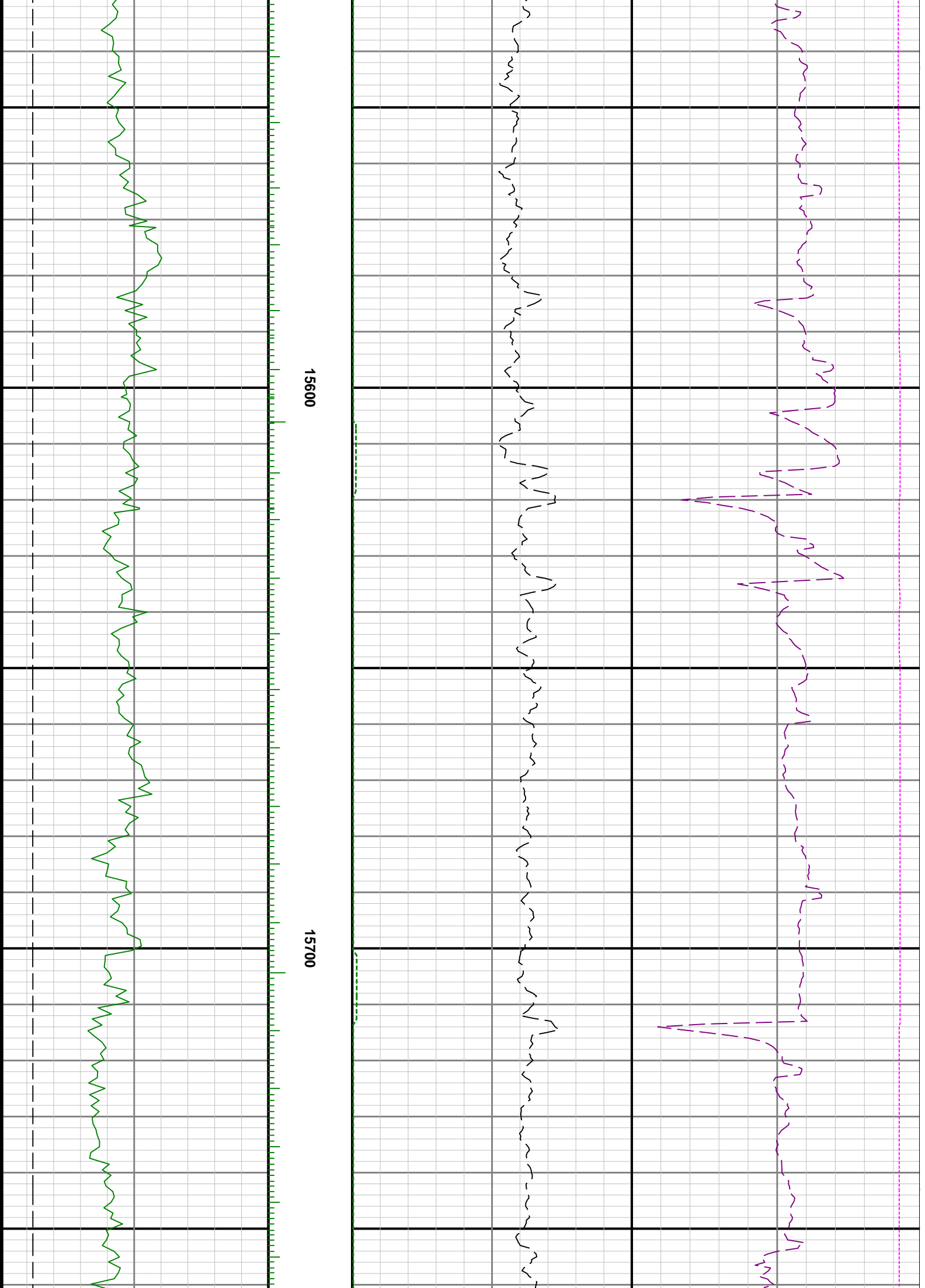
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153

See Remark 1

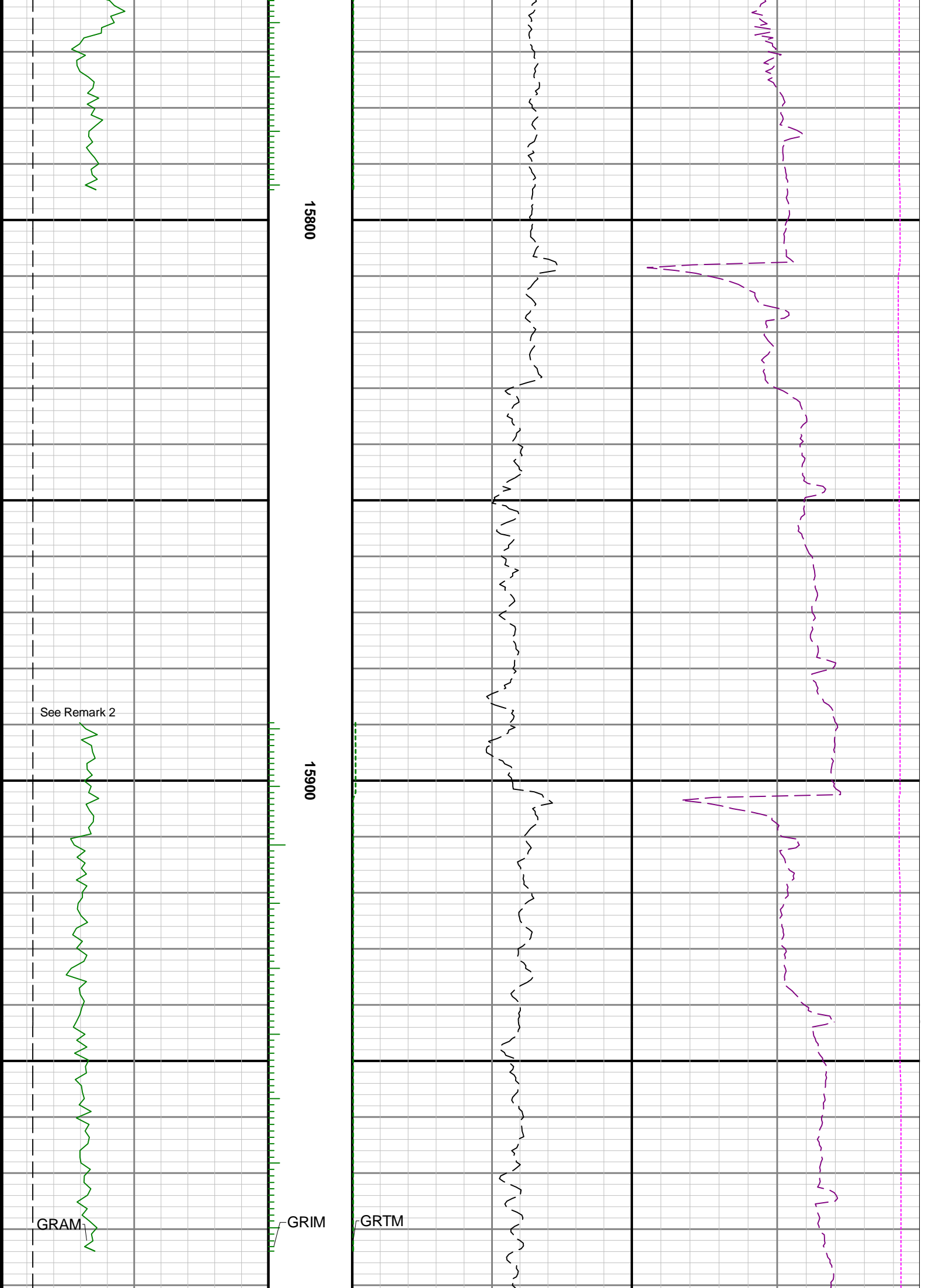






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15700



15800

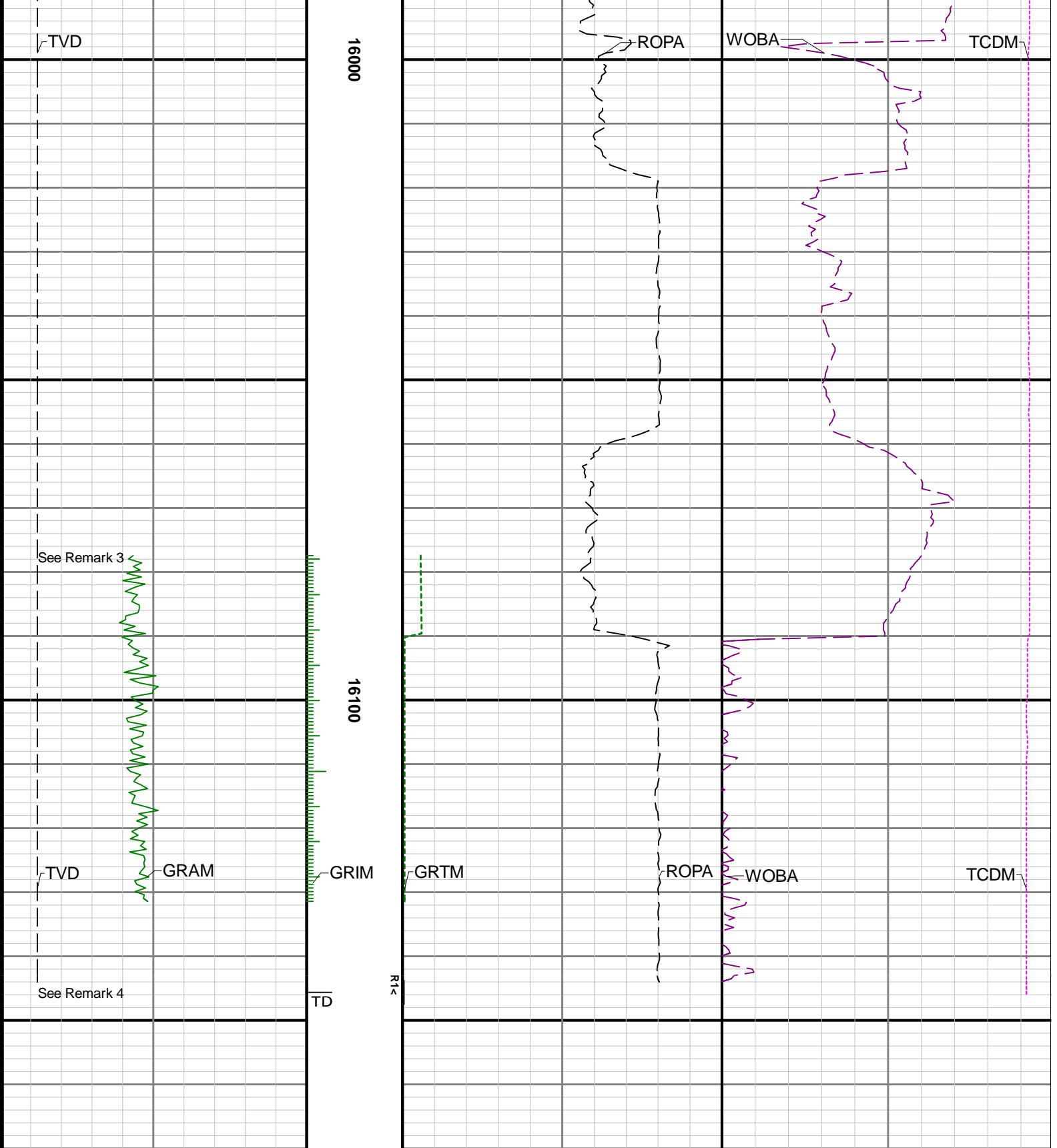
15900

See Remark 2

GRAM

GRIM

GRTM



Gamma Ray - Apparent 0.5 ft Average GRAM 0 300	MD 1:240 feet	Depth Averaged ROP 3 ft Average ROPA 1000 0 ft/h	Weight On Bit, Average 1 ft Average WOBA 0 50 klb
API True Vertical Depth TVD 7100 6100 ft		Gamma Time Since Drilled GRTM 0 600 min	Downhole Temperature TCDM 0 300 degF