



**Natural Formation Evaluation  
Gamma Ray**

**Real Time Log**

Scale: **Company: Anadarko E & P Company LP**

**1:240**  
**Measured Depth**

**Well: Sack 16N-6HZ**  
**Field: Wattenburg**  
**State: Continental US**    **Country: United States**

**Status: FIELD PRINT**

**API Number: 05-123-396230000**

**Permanent Datum (P.D.): Ground Level**    **Elevation: 5055.00 ft.**

**Log Measured From: Rig Floor**    **25.00 ft.**    **Above P.D.**

**Depth Reference: Drillers Depth**

**Surface Location: Latitude: 40° 0' 7.873" N**  
**Longitude: 104° 55' 34.338" W**

**Other Services: Directional VSS Gamma Ray Downhole Dynamics**

**Section: 1**    **TWN: 1N**    **Range: 67W**

**Elevations: N/A**

**KB: / DF: / GL: /**

**Interval Logged**    **Dates**    **Magnetic Field Reference**

**Top: 7100.0 ft. Date From: 05/Sep/14 Date To: 30/Sep/14 Dip Angle: 66.28° Azi Reference North: True**

**Bottom: 12820.0 ft. Date To: 30/Sep/14 Total Mag to Reference**

**Spud Date: 03/Sep/14 Field Strength: 52500.6 nT North Correction: 8.40°**

**Borehole Record**    **Casing Record**

Hole Size	From	To	Size	Weight	From	To
13.500 in.	25.0 ft.	1258.0 ft.	9.625 in.	36.00 lb/ft	Surface	1258.0 ft.
8.750 in.	1258.0 ft.	8113.0 ft.	7.000 in.	23.00 lb/ft	Surface	8258.0 ft.
6.125 in.	8113.0 ft.	12870.0 ft.				

**Mud Record**    **Deviation Record**

Type	From	To	Hole Size	Interval	Inc / Az (Start)	Inc / Az (End)
Water Based Mud	1258.0 ft.	8113.0 ft.	13.500 in.	6855.0 ft.	0.4° / 197.3°	89.2° / 180.4°
Synthetic Based Mud	8113.0 ft.	12870.2 ft.	8.750 in.	4757.0 ft.	89.2° / 180.4°	89.6° / 179.7°

**Acquisition System**    **Software Version**    **Other**

**Advantage**    **2.20U4**    **Rig: / Contractor: Precision 595**    **Anadarko E & P Company LP**

**PATS**    **6.4.1.34**    **Job No.: 6590146**    **District: / Unit: RMD**    **/ D&E**

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**Log Run Summary**

LWD Run No.	BHA Run No.	Bit Run No.	Bit Size (in.)	Bit Type	Bit Gauge Length (in.)	Assembly Type	Logged Interval		Bit Depth Interval		Date / Time		Circ. Time (hrs.)
							Top (ft.)	Bottom (ft.)	From (ft.)	To (ft.)	Start	End	
1	1	1	8.750	PDC	3.500	Steer Bent Sub	7013.0	8068.0	1258.0	8113.0	05/Sep/2014 07:07	05/Sep/2015 21:43	37.7
2	2	2	6.125	PDC	3.000	Steer Bent Sub	8068.0	12820.0	8113.0	12870.0	28/Sep/2014 17:26	30/Sep/2015 17:05	45.8

**Crew**

Name	Arrive	Depart	Name	Arrive	Depart	Name	Arrive	Depart
	Wellsite	Wellsite		Wellsite	Wellsite		Wellsite	Wellsite
Ely Danner	02/Sep/2014	07/Sep/2014	Jason Cross	02/Sep/2014	07/Sep/2014	Alexander Janorschke	24/Sep/2014	01/Oct/2014
Ely Danner	27/Sep/2014	01/Oct/2014	Jason Cross	24/Sep/2014	26/Sep/2014	Kevin McGuire	25/Sep/2014	01/Oct/2014
Matthew Leopold	24/Sep/2014	24/Sep/2014	Robert Klos	02/Sep/2014	07/Sep/2014			

Matthew Leopold	02/Sept/2014	07/Sept/2014	LB Vavra	24/Sept/2014	01/Oct/2014			
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### Mud Properties Record

Date / Time	LWD Run No.	Measured Depth (ft.)	Mud Type	Density (lb/gal)	Viscosity (s/qt)	pH	Fluid Loss (cc)	Oil / Water	Source	Total Chlorides (mg/L)	K+ (%)
04/Sept/2014 06:00	1	5011.0	Water Based Mud	8.5	27	7.9	N/A	0/100	Active Mud Pit	1300	N/A
09/Sept/2014 06:00	1	7959.0	Water Based Mud	10.2	44	9.0	N/A	3/88	Active Mud Pit	1600	N/A
28/Sept/2014 06:04	2	8113.0	Synthetic Base Mud	9.4	N/A	N/A	N/A	95 / 0	Active Mud Pit	16000	N/A

### Mnemonics

Curve	Description	Units
GRAX	Gamma Ray Apparent, 0.5 ft Avg.	API
GRIX	Gamma Ray Data Density	Points
GRSI	Gamma Ray Sliding Indicator	Unitless
GRTX	Gamma Ray Time Since Drilled	Min
ROPA	Rate of Penetration, 3.0 ft. Avg.	ft/hr
TCDX	Downhole Temperature	degF
TVD	True Vertical Depth	ft
WOBA	Surface Weight on Bit, 1.0 ft. Avg.	klbs

### Equipment and Service Data

LWD Run No.	Tool	Serial Number	Measurement	Bit Offset (ft.)	Max O.D. (in.)	Min I.D. (in.)
1	DIR	11946290	Directional	46.21	6.750	3.793
1	SRIG	11734840	Gamma	42.84	6.750	3.793
2	DIR	12373466	Directional	52.70	4.750	2.688
2	SRIG	12604926	Gamma	49.32	4.750	2.688

### Service and Tool Mnemonics

Mnemonic	Name	Description
DIR	Directional	Wellbore directional survey
SRIG	Inclination and Gamma	Probe based gamma ray and inclination module

### Comments

- 1) Baker Hughes INTEQ run 1 utilized 6 1/2 inch NaviGamma services, (Directional and Gamma Ray tool) behind an 8 3/4 inch bit and steerable assembly from 1258 ft MD to 8113 ft MD (1257.98 to 7649.33 ft TVD) for the vertical and curve section.
- 2) Baker Hughes INTEQ run 2 utilized a 4 3/4 inch NaviGamma services, (Directional and Gamma Ray tool) behind a 6 1/8 inch bit and steerable assembly from 8113 ft MD to 12870 ft MD (7649.33 to 7645.79 ft TVD) for the lateral section.
- 3) Depth measurements are obtained from a depth control system not supplied or operated by Baker Hughes INTEQ, due to a lack of control by Baker Hughes INTEQ logging engineers, depth calibrations and measurements could not be independently verified. Unverified depths supplied to Baker Hughes INTEQ are being used in present logging data.
- 4) A Sliding indicator is shown on the left side of track 1 as a heavy line. This indicator has been shifted to the Gamma Ray sensor offset to correspond with Gamma Ray data acquired while sliding.

Remarks

Number	Measured Depth (ft.)	Hole Section (in.)	LWD Run No.	Remark
1	8080	8.750	1	The interval from 8071 to 8113 ft. MD (7647.03 to 7649.33 ft. TVD) was not logged up to 547.2 hours after being drilled due to a casing and cement operations and BHA change.
2	9475	6.125	2	The GRAX appears erratic in the interval from 9470 to 9750 ft. MD (7657.40 to 7655.29 ft. MD TVD), due to the agitator being in casing causing in high vibration levels resulting in poor gamma density recording.
3	12835	6.125	2	The interval from 12820 to 12870 ft. MD (7645.44 to 7645.79 ft. TVD) has no GRAX, GRIX, and GRTX due to Gamma Ray sensor to bit offset.



Company : Anadarko E & P Company LP

Well : Sack 16N-6HZ

Interval : 6995.00 - 12885.00 feet

Created : 01/Oct/2014 9:20:10 AM

Gamma Ray Apparent 0.5 ft Avg GRAX

0 200

API

True Vertical Depth TVD

7750 6925

ft

MD feet 1:240

Gamma Time Since Drilled GRTX

0 600

min

Rate of Penetration 3.0 ft Avg ROPA

500 0

ft/hr

Surface Weight On Bit 1.0 ft Avg WOBA

0 100

kbf

Downhole Temperature TCDX

100 275

degF

7000

710

GRAX

GRSI

TVD

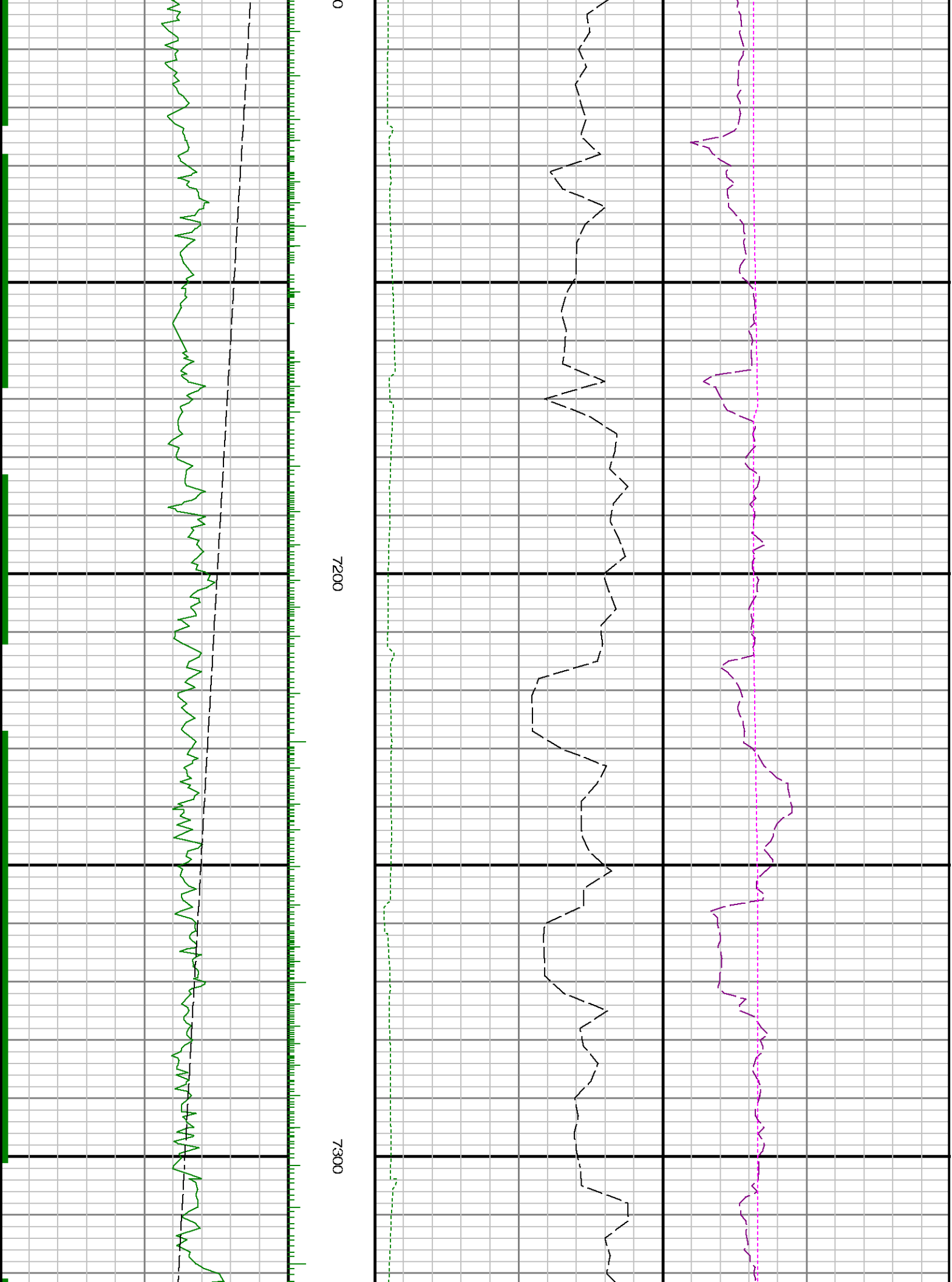
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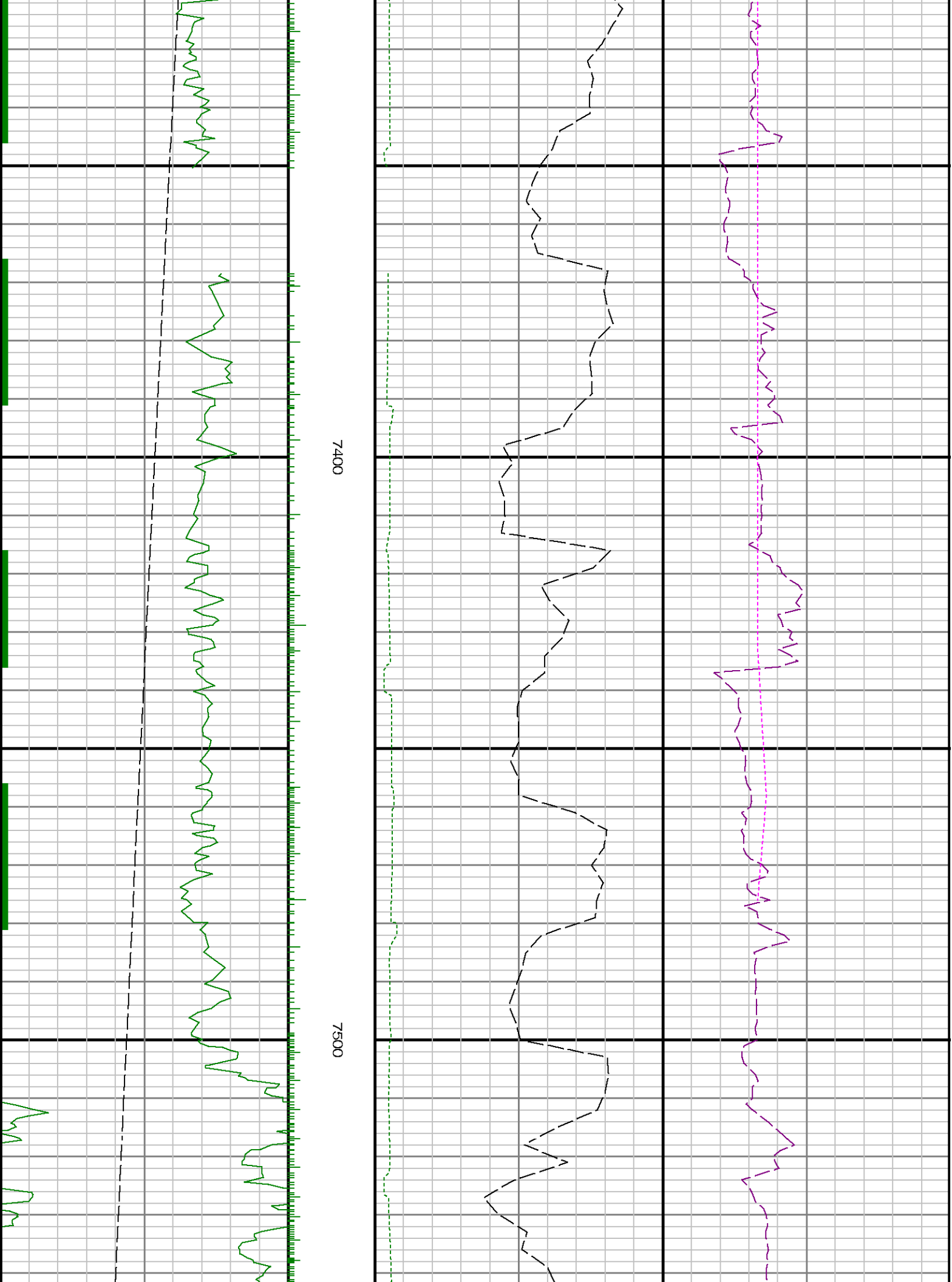
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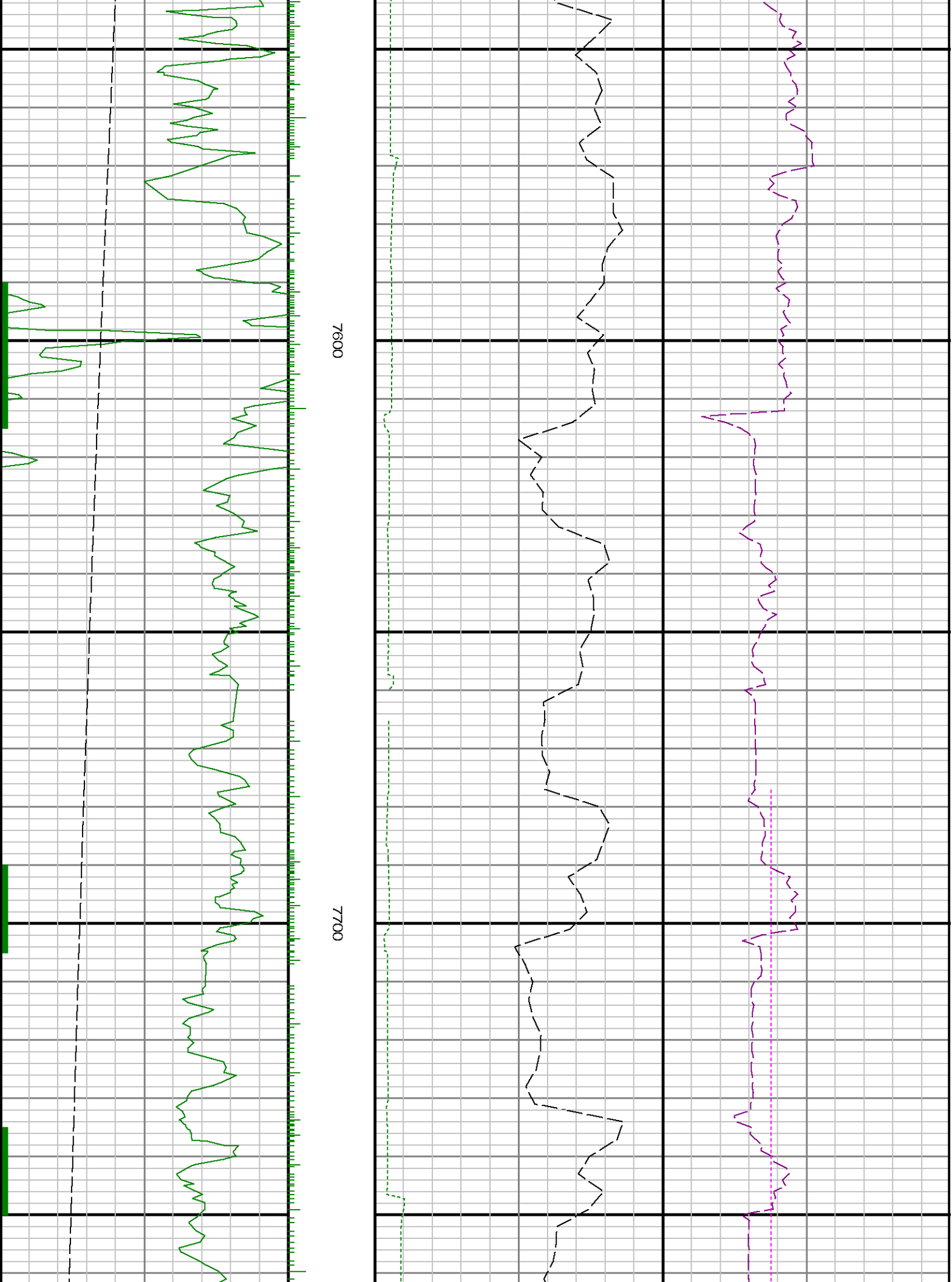
GRTX

TCDX

WOBA

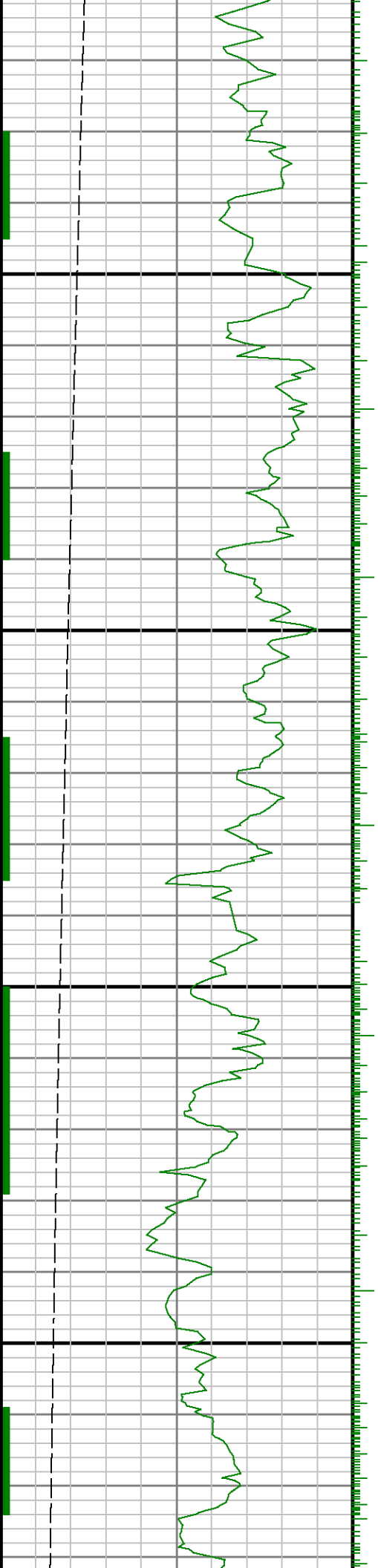






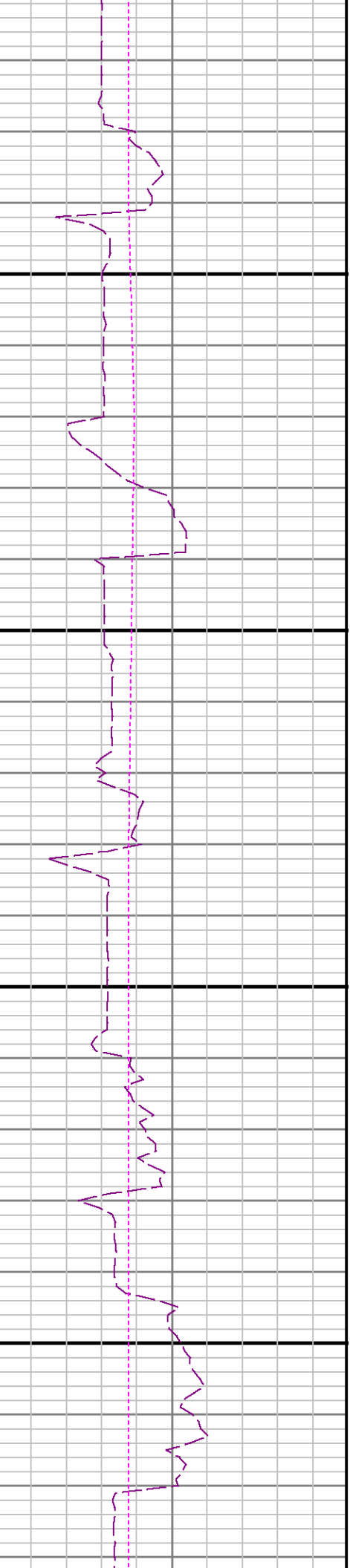
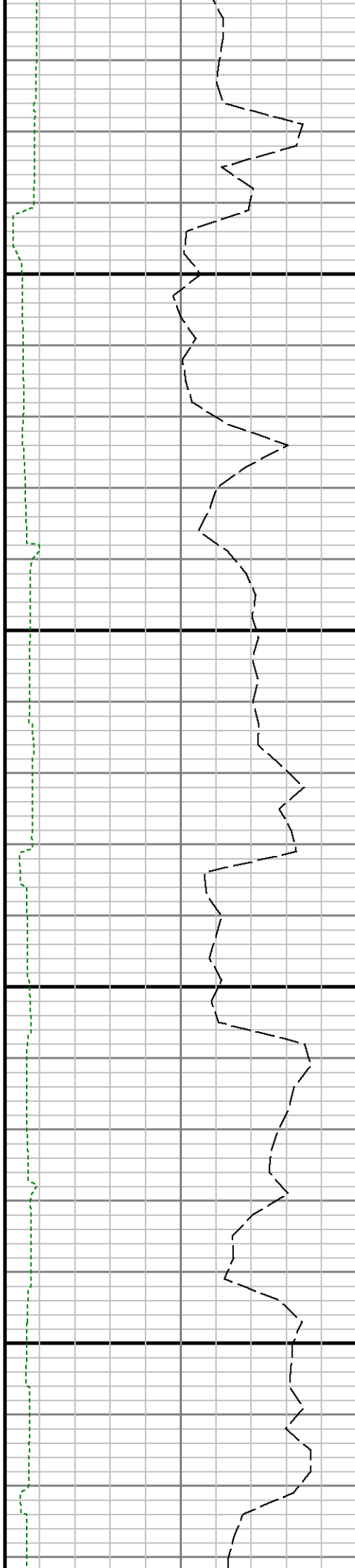
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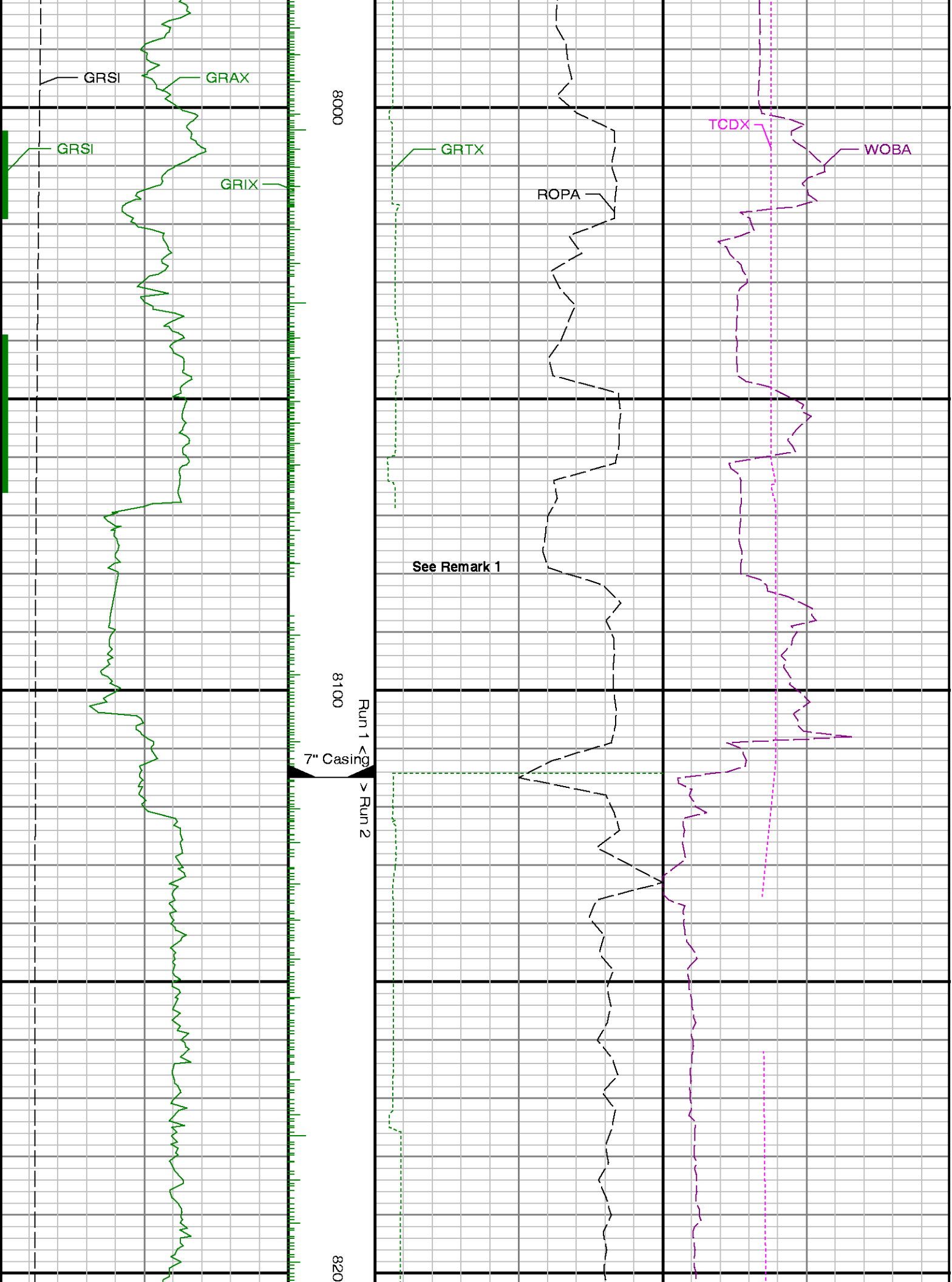
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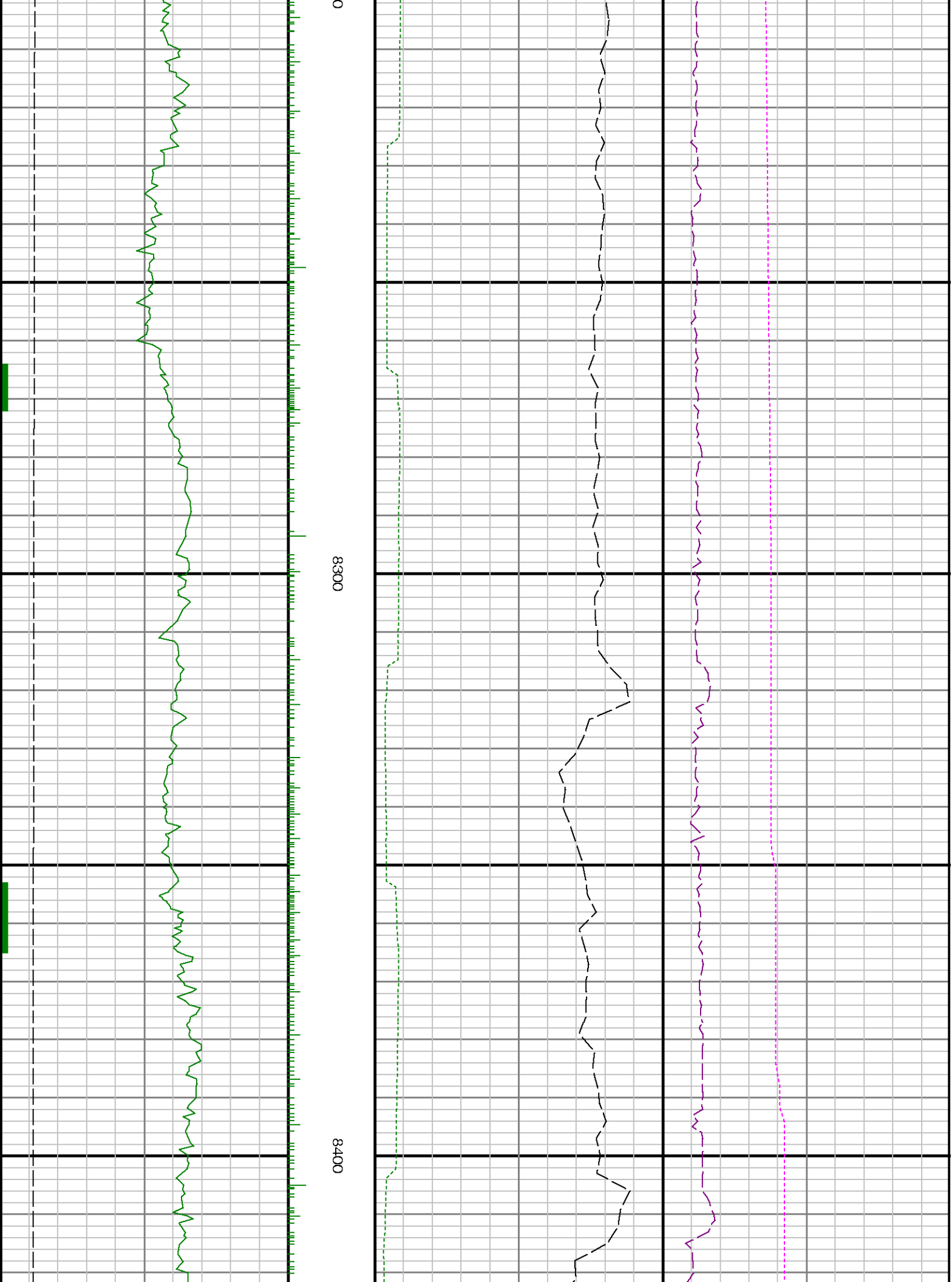
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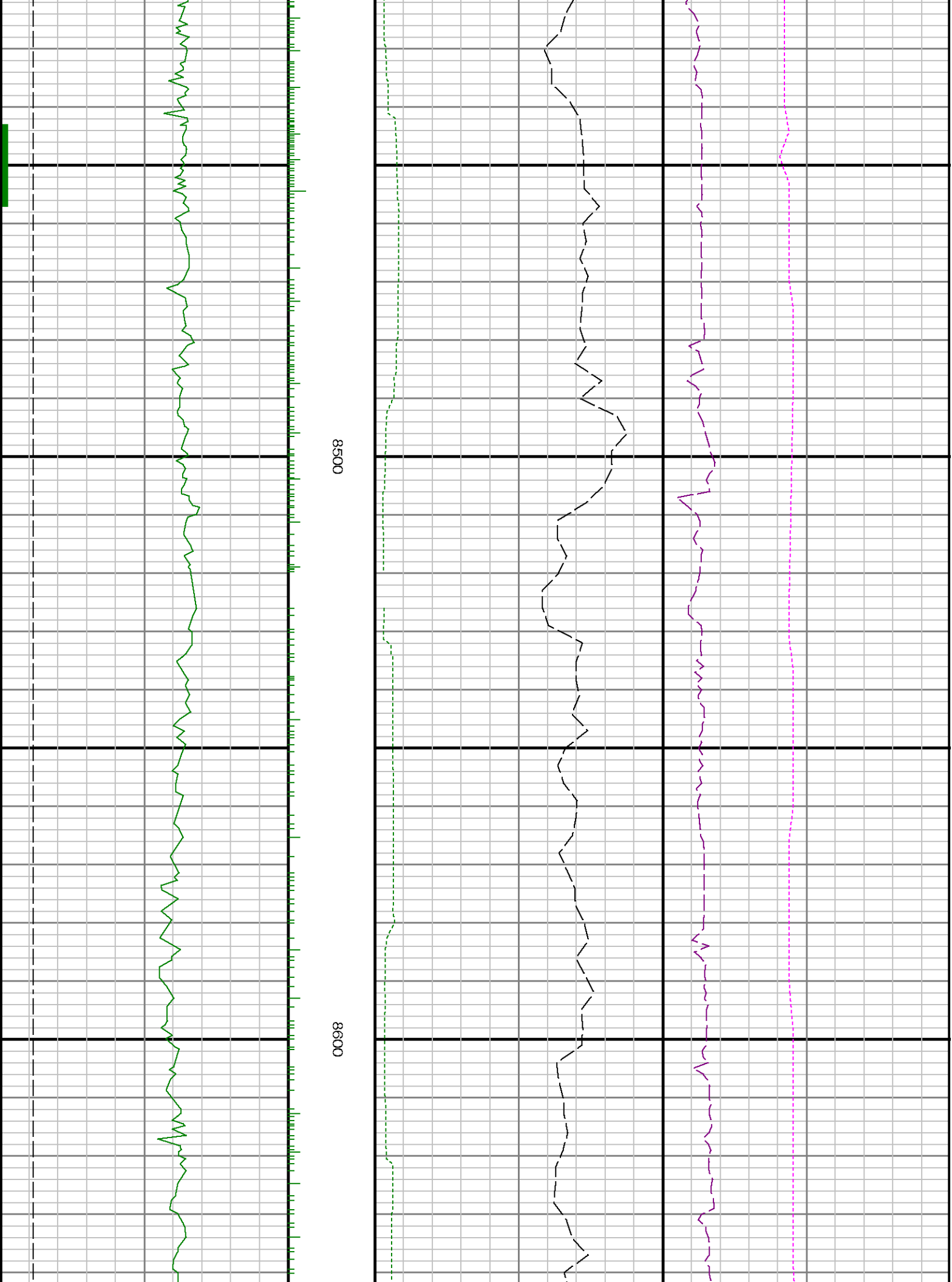
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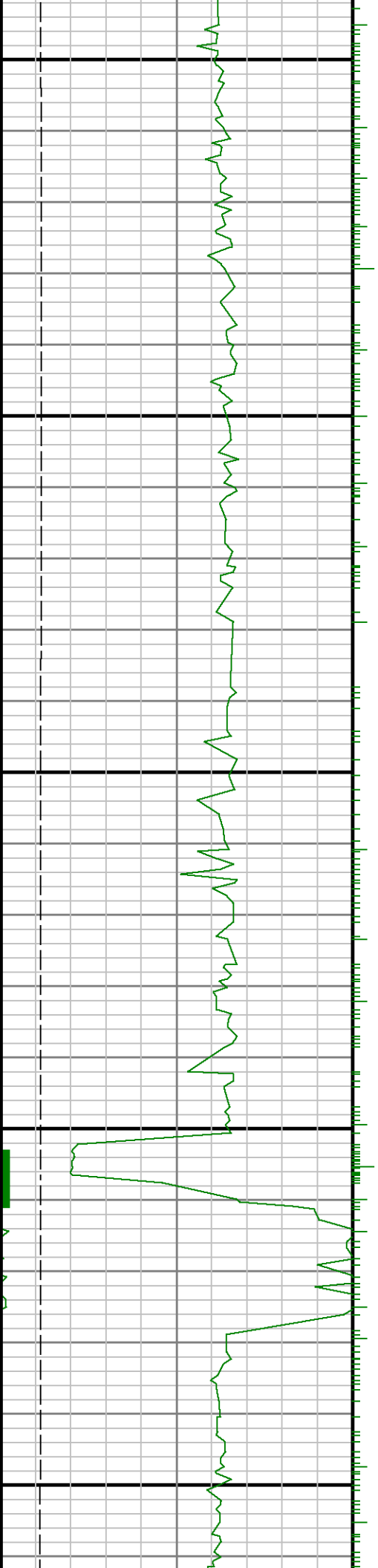






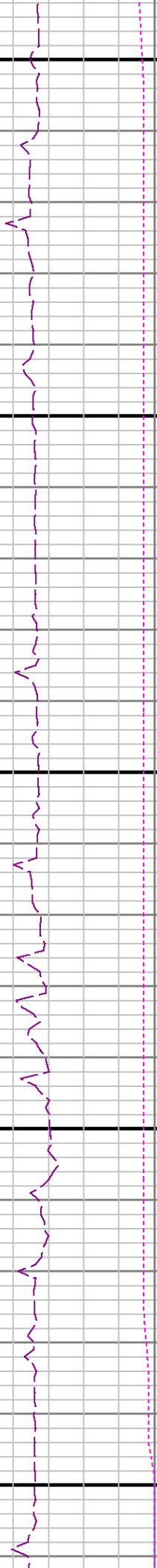


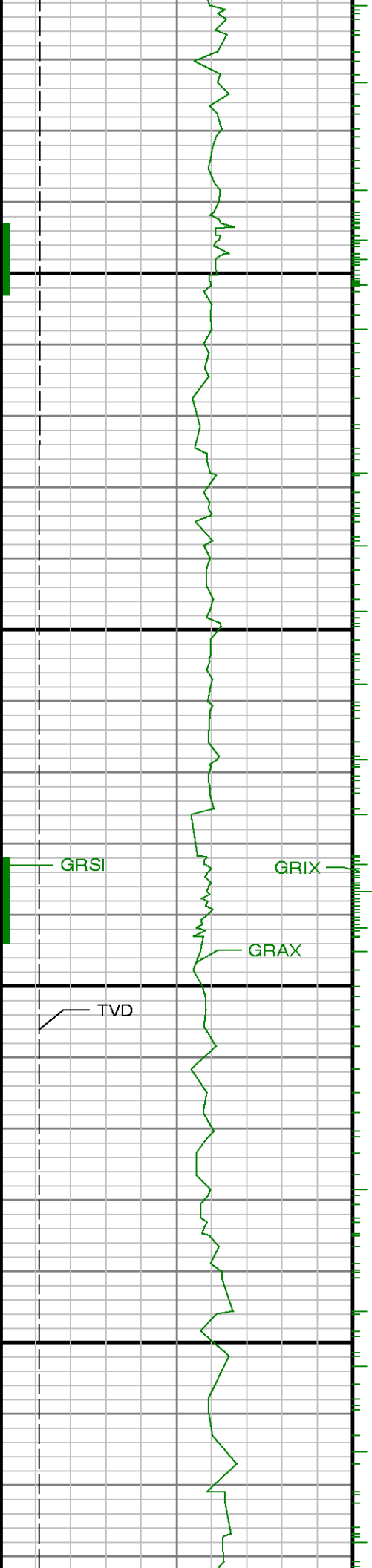




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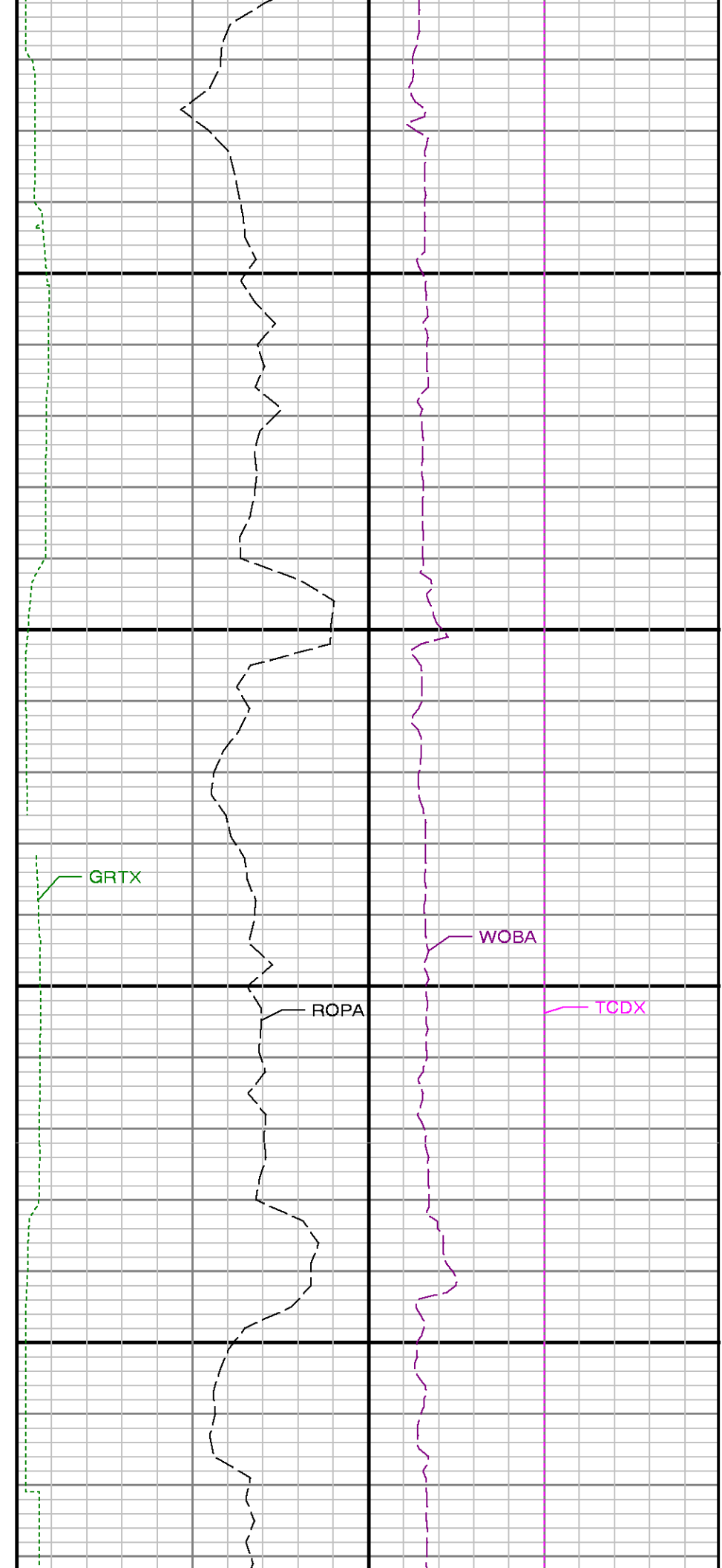
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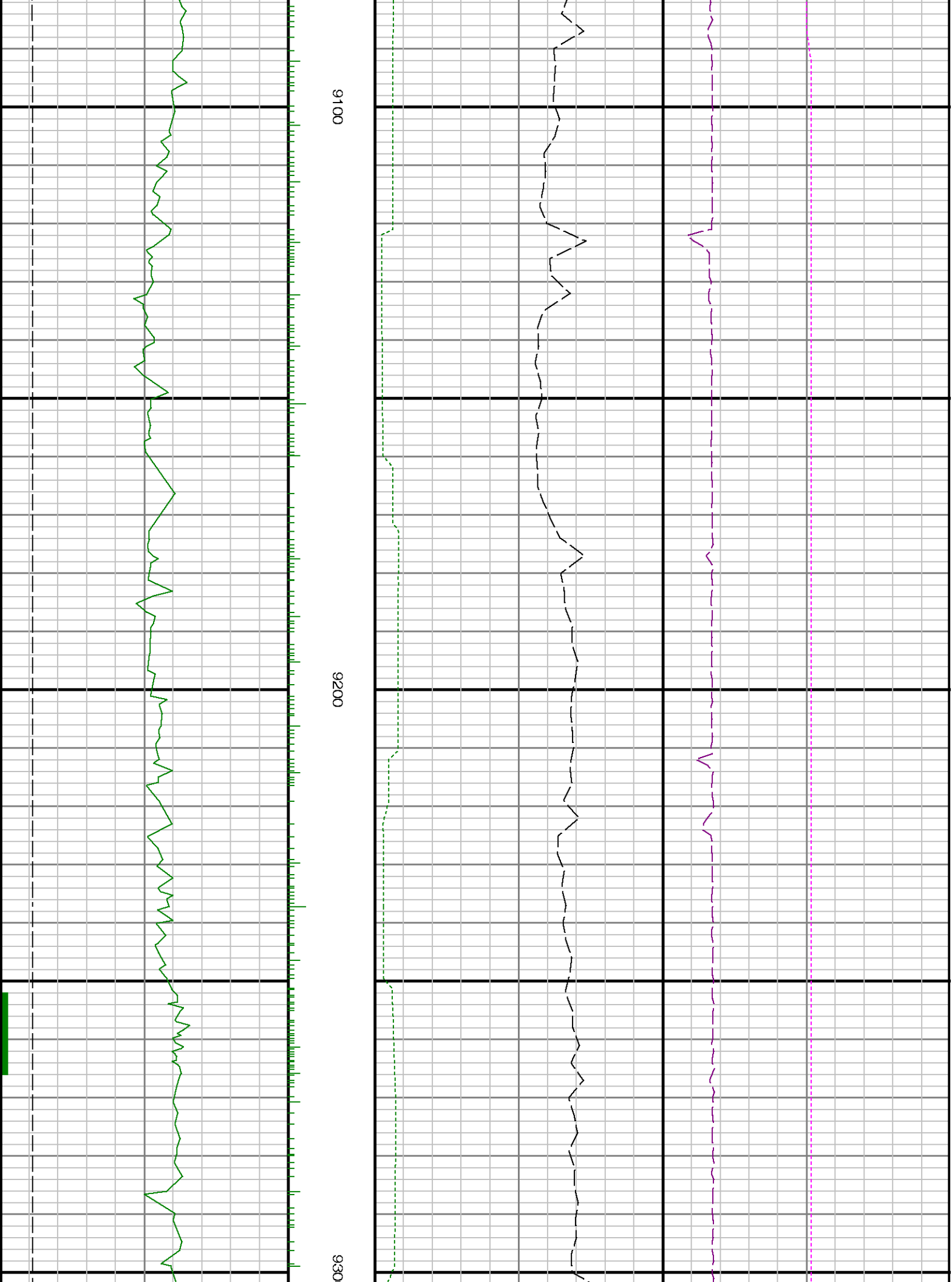


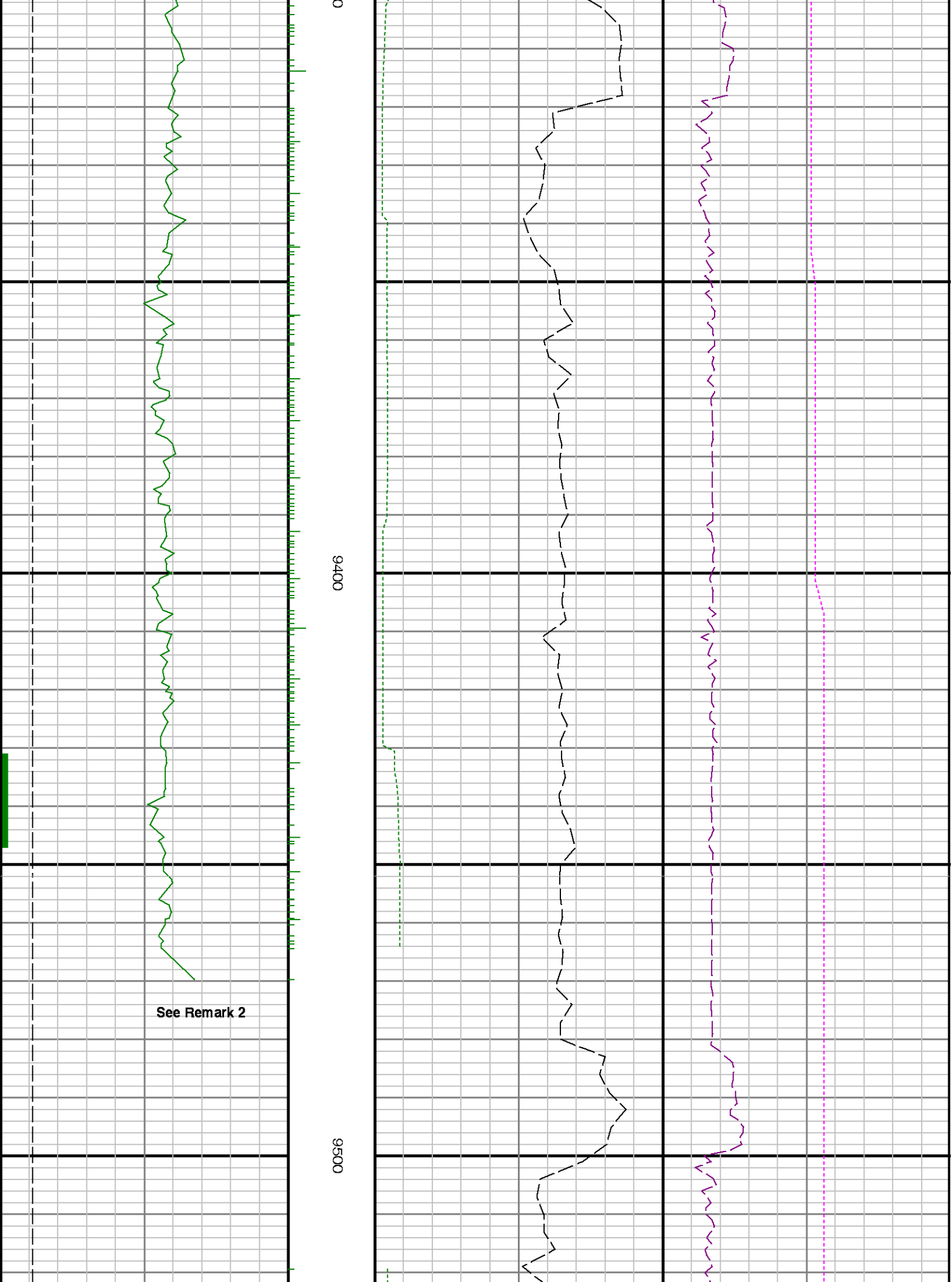


0068

0006





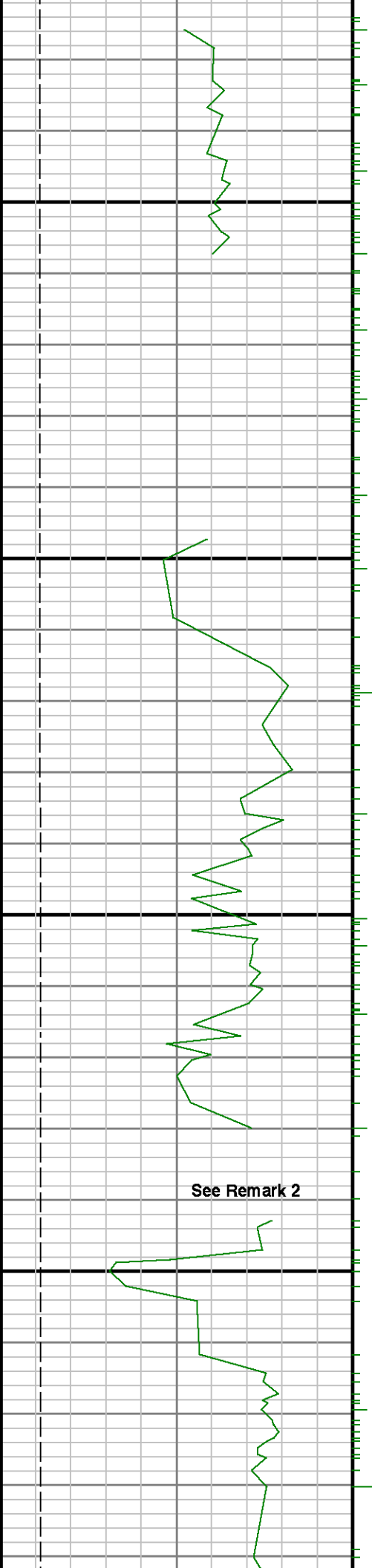


0

9400

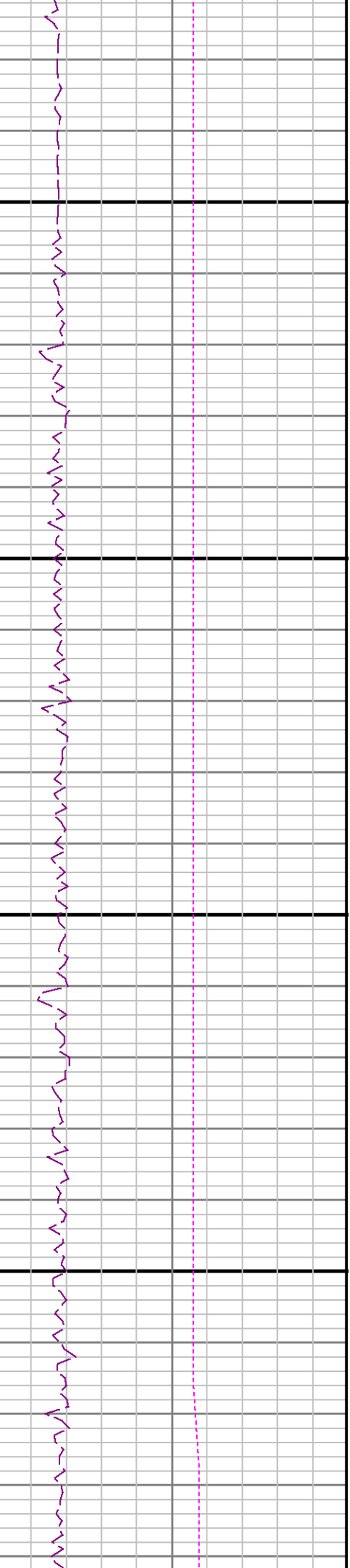
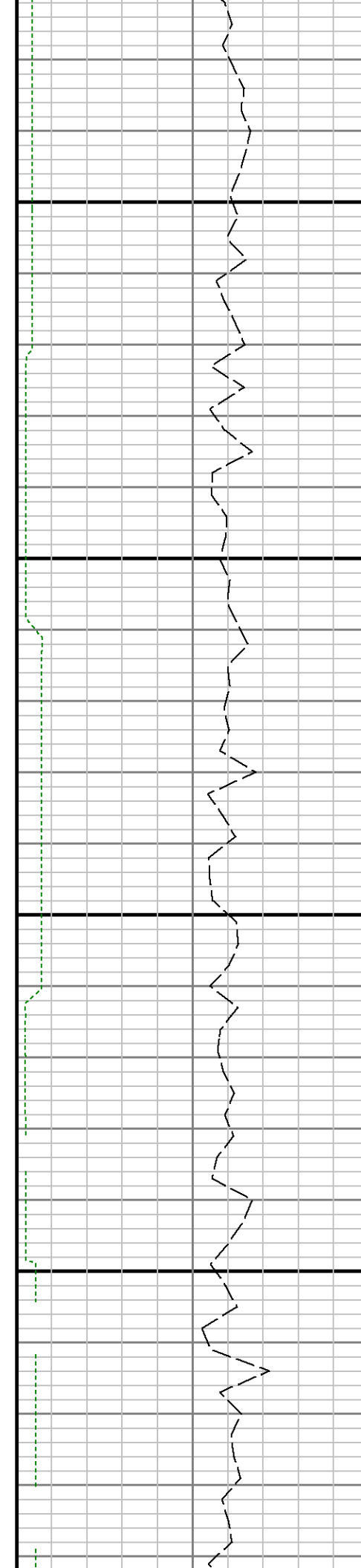
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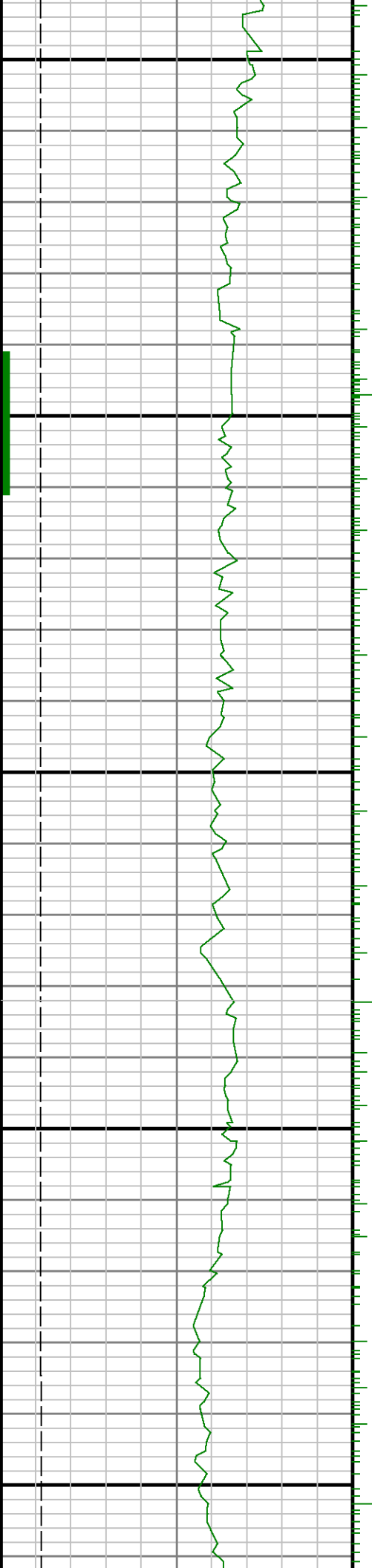
See Remark 2



0096

9700



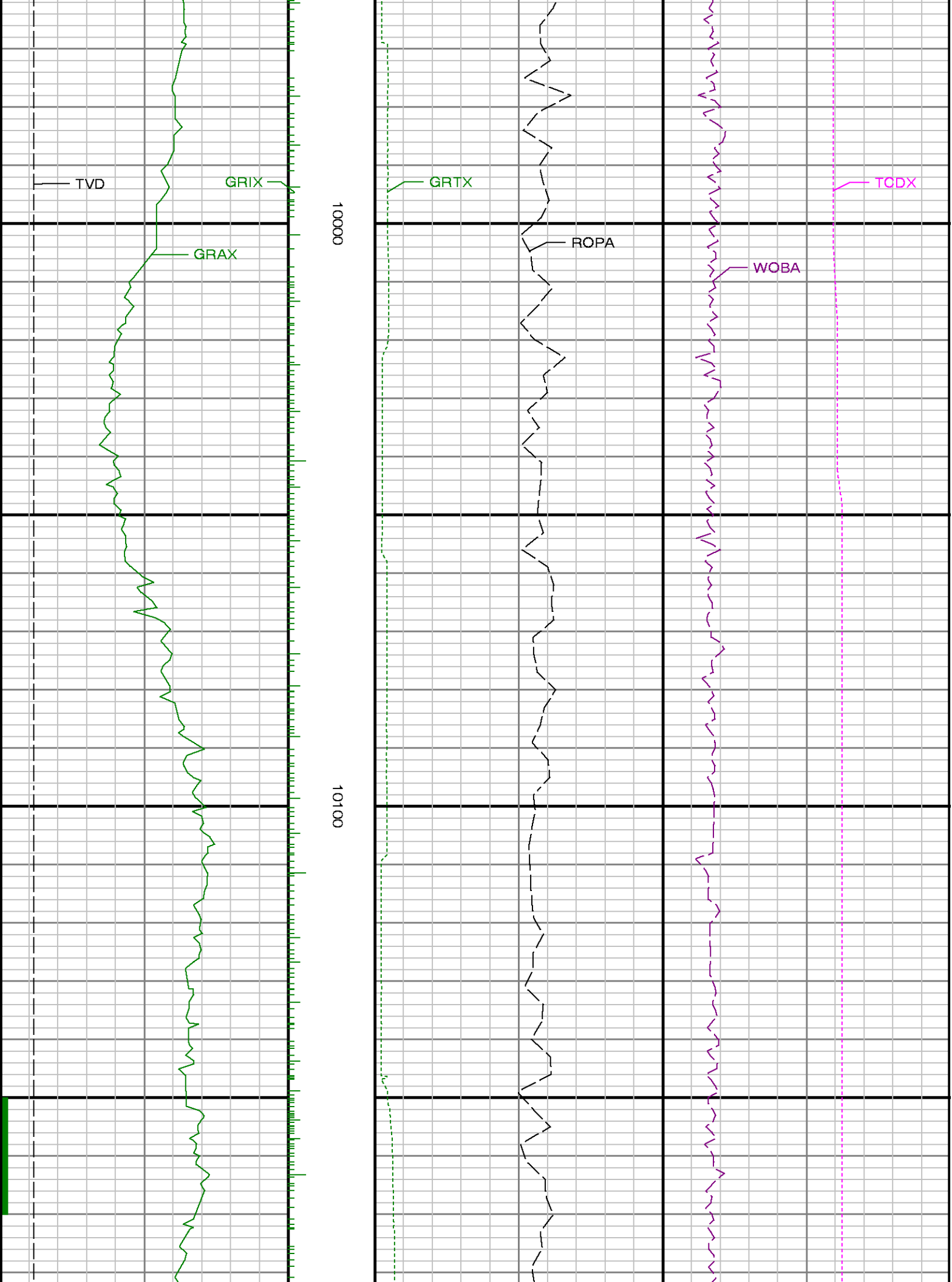


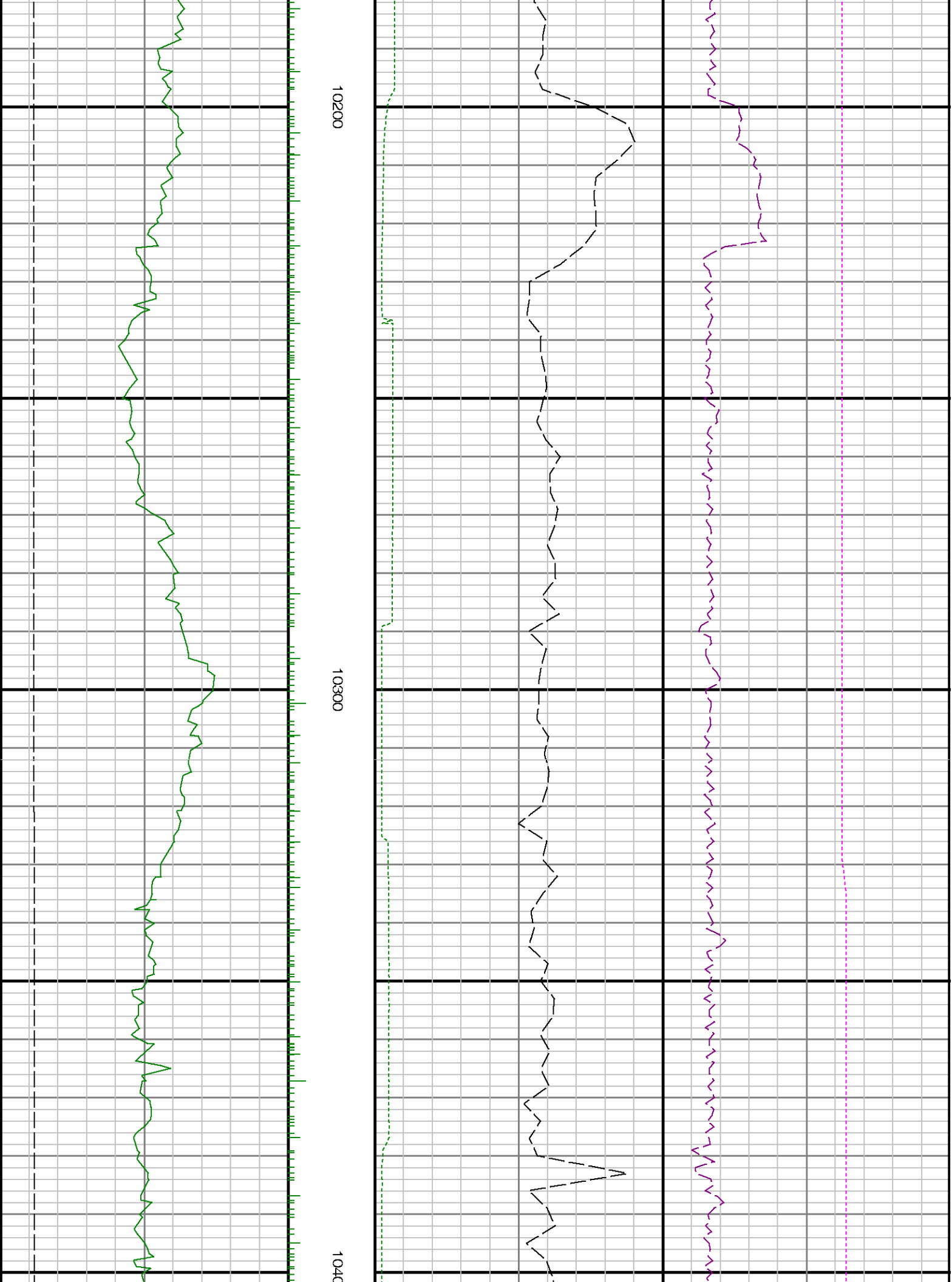
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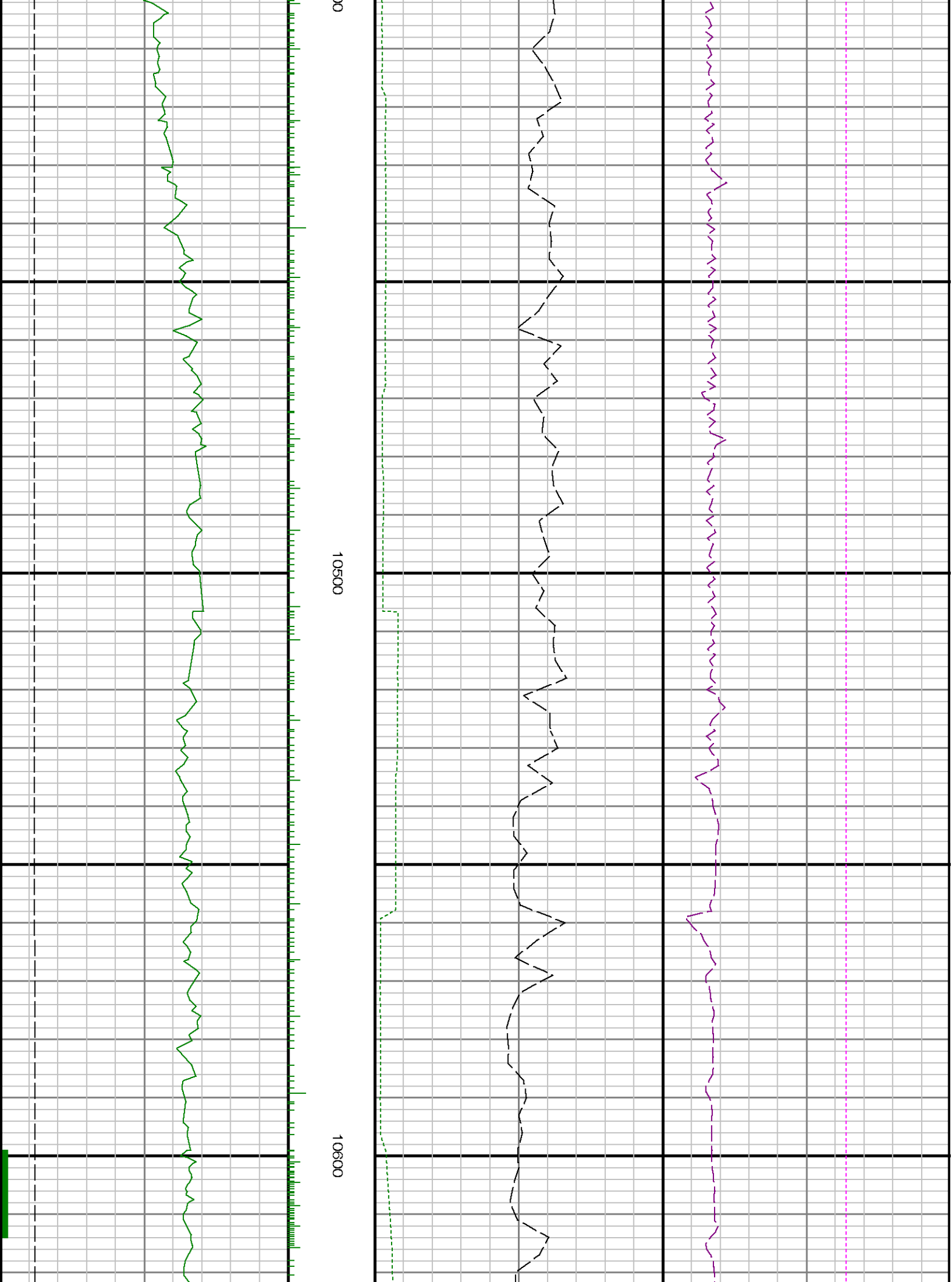
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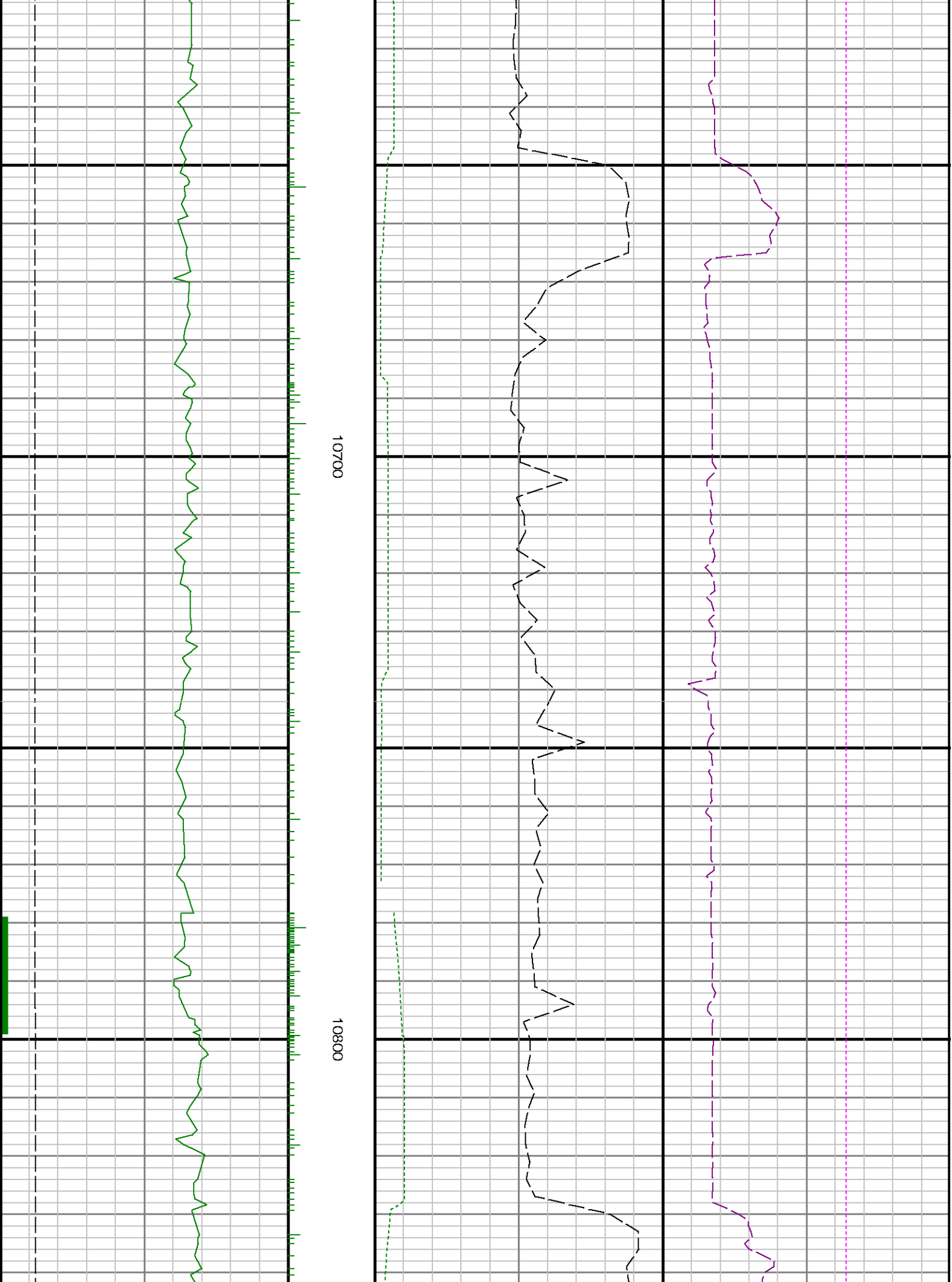


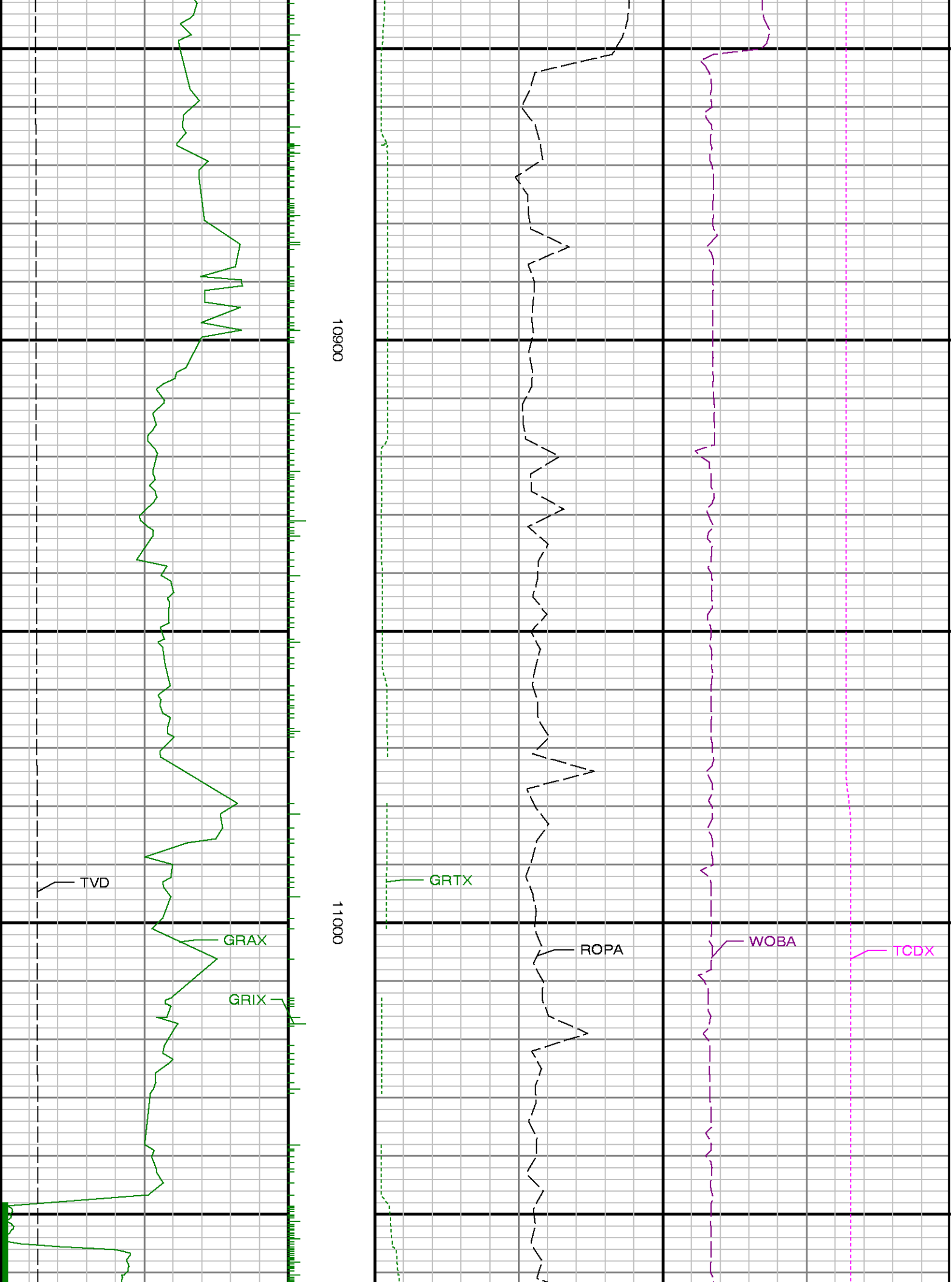












10900

11000

TVD

GRAX

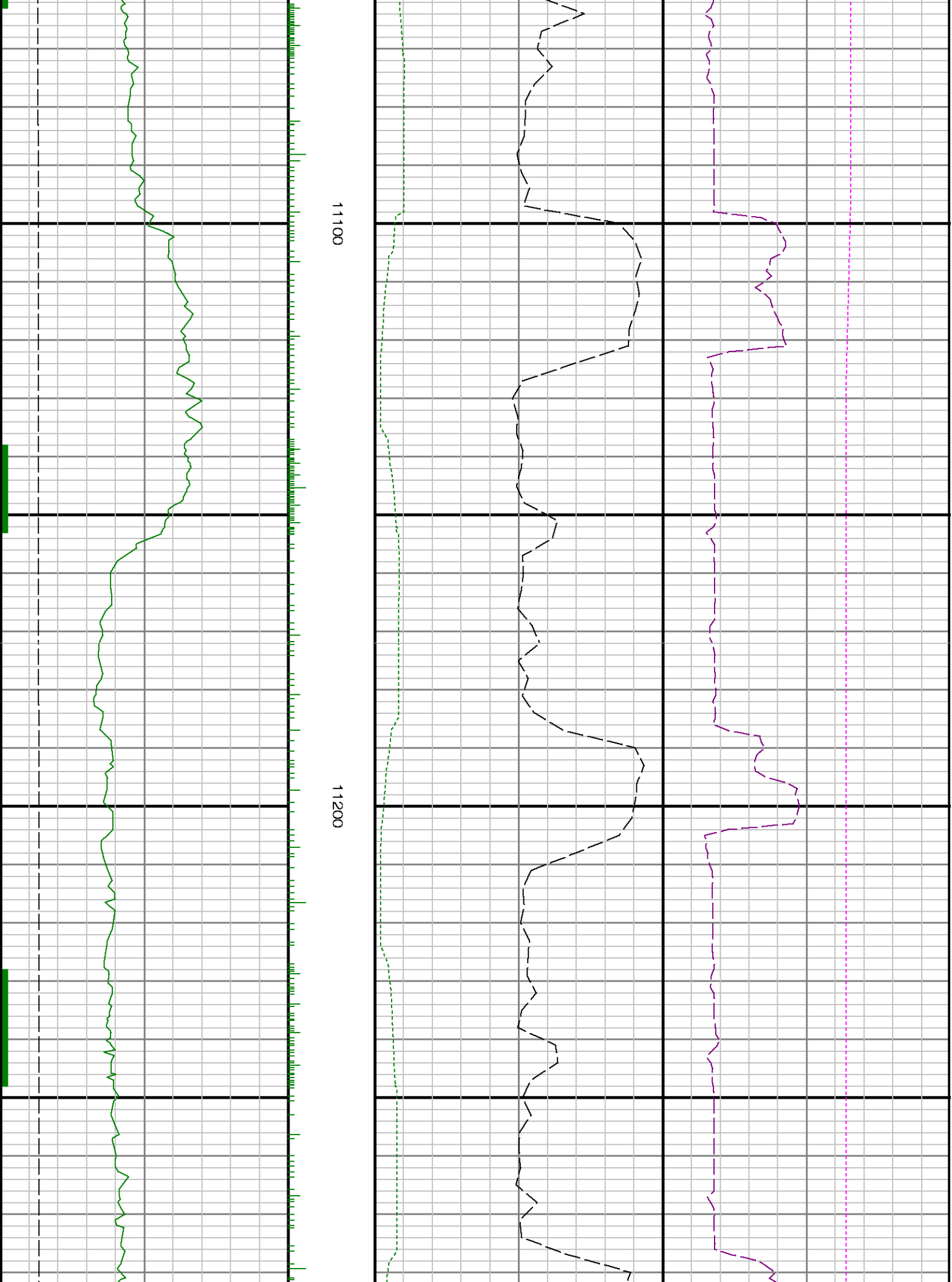
GRIX

GRTX

ROPA

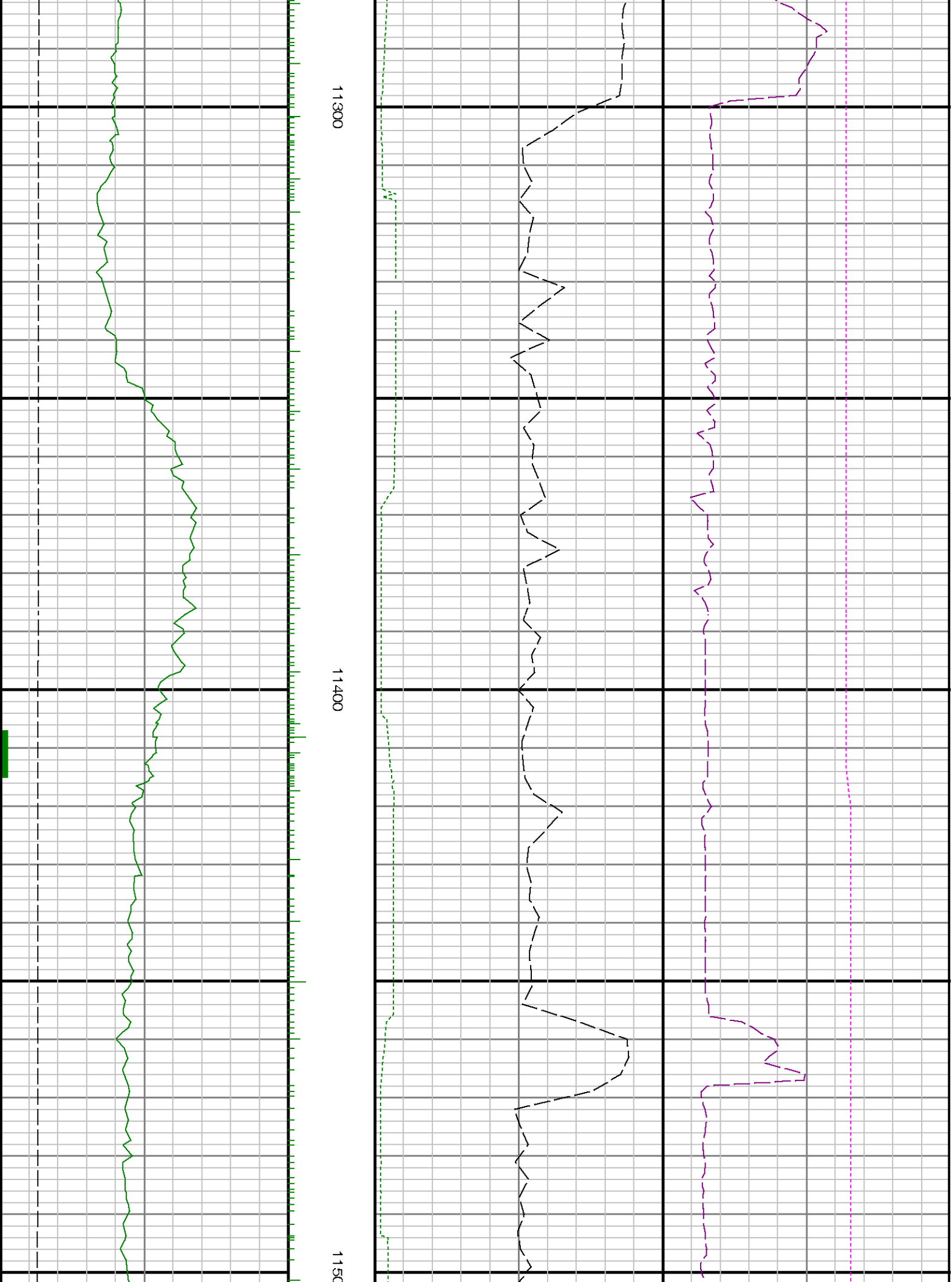
WOBA

TCDX



11100

11200



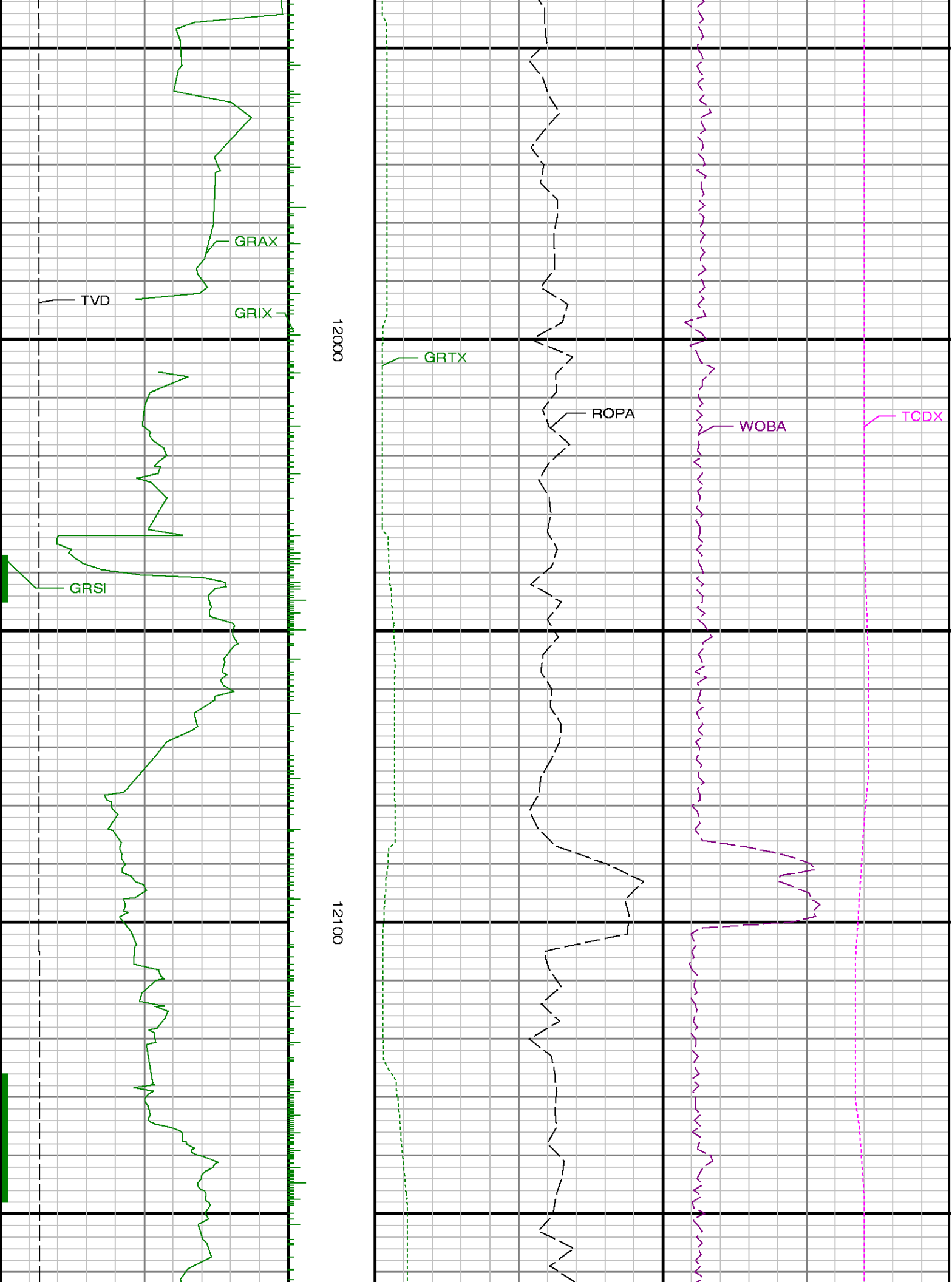


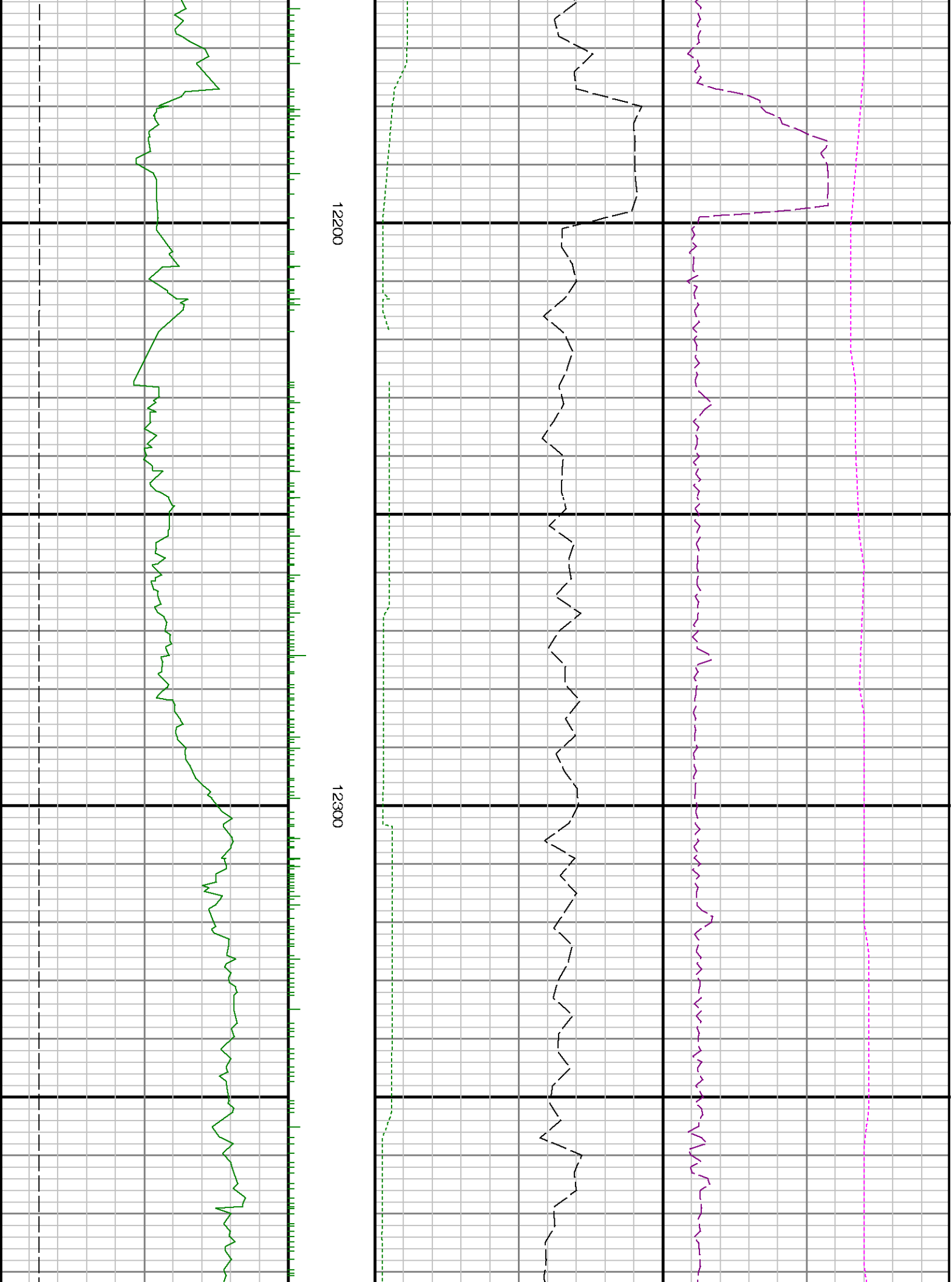


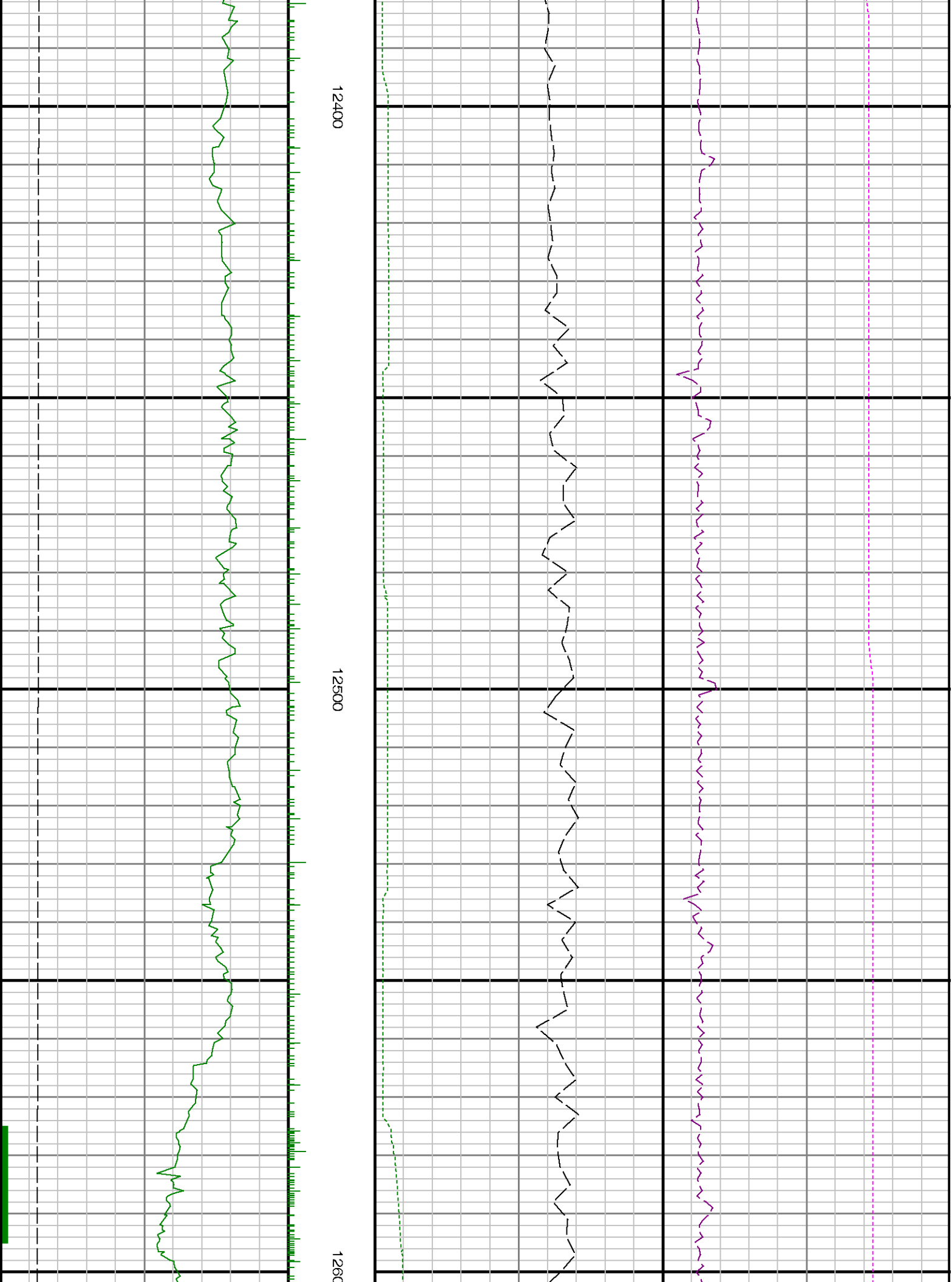


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11900



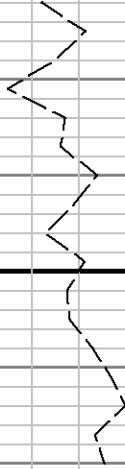






See Remark 3

Run 2 <



Gamma Ray Apparent 0.5 ft Avg GRAX

0 200

API

True Vertical Depth TVD

7750 6925

ft

MD feet 1:240

Gamma Time Since Drilled GRTX

0 600

min

Rate of Penetration 3.0 ft Avg ROPA

500 0

ft/hr

Surface Weight On Bit 1.0 ft Avg WOBA

0 100

kbf

Downhole Temperature TCDX

100 275

degF