



Natural Formation Evaluation
Gamma Ray

Realtime Log

Scale: 1:240
Measured Depth

Company: Kerr McGee Oil & Gas Onshore LP
Well: Howard 1C-28HZ
Field: Weld County (Kerr McGee)
Region: RMD
Country: United States

Status: Final Print
API Number: 051233693300

Surface Location: Latitude: 40° 1' 42.802" N
Longitude: 104° 53' 24.108" W
Section 28
TWN: 1N
Range 67W

Other Services: Directional VSS

Permanent Datum (P.D.): Ground Level
Elevation: 4999.00 ft.
Log Measured From: Drill Floor
13.00 ft.
Above P.D.
Depth Reference: Driller's Depth

Elevations: KB: N/A
DF: 4999.00 ft.
GL: 4986.00 ft.

Interval Logged
Top: 7100 ft.
Bottom: 12278 ft.

Dates
Date From: 07/Oct/13
Date To: 16/Oct/13
Spud Date: 07/Oct/13

Magnetic Field Reference
Dip Angle: 66.36 °
Total
Field Strength: 52794.0 nT
North Correction: 8.45 °

Borehole Record			Casing Record			
Hole Size	From	To	Size	Weight	From	To
13,500 in.	Surface	916 ft.	9.625 in.	36.00 lb/ft	Surface	1018 ft.
8,750 in.	916 ft.	8006 ft.	7.000 in.	26.00 lb/ft	Surface	7909 ft.
6,125 in.	8075 ft.	12330 ft.				

Mud Record			Deviation Record			
Type	From	To	Hole Size	Interval	Inc / Az (Start)	Inc / Az (End)
Water Based Mud	4751 ft.	11869 ft.	13,500 in.	916 ft.	0.1 ° / 195.5 °	0.4 ° / 290.4 °
			8,750 in.	7159 ft.	0.4 ° / 290.4 °	92.2 ° / 179.3 °
			6,125 in.	4255 ft.	90.8 ° / 179.1 °	92.0 ° / 180.8 °
					/	/
					/	/
					/	/

Acquisition System			Software Version			Other	
Advantage	2.20U4	Rig / Contractor:	Xtreme 20	/ Ensign Drilling			
PATS	6.4.1.34	Job No:	5769815				
		District / Unit:	RMD	/ D&E			

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Log Run Summary															
LWD	BHA	Bit	Bit	Bit	Bit	Assembly	Logged Interval		Bit Depth Interval		Date / Time				Circ.
Run	Run	Run	Size	Type	Gauge	Type	Top	Bottom	From	To	Start		End		Time
No.	No.	No.	(in.)		Length		(ft.)	(ft.)	(ft.)	(ft.)					(hrs.)
1	2	1	8.750	PDC	2.000	Steerable	7100	7428.5	1038	7481	08/Oct/2013 09:10		10/Oct/2013 04:45		29.55
2	2	2	8.750	PDC	3.000	Steerable	7432	8022	7481	8075	10/Oct/2013 06:15		11/Oct/2013 21:04		16
3	3	3	6.125	PDC	4.000	Steerable	8022	11718	8073	11869	12/Oct/2013 22:24		15/Oct/2013 23:10		45
4	4	4	6.125	PDC	4.000	Steerable	11718	12278	11869	12330	15/Oct/2013 23:40		16/Oct/2013 13:17		53

Crew										
Name	Arrive	Depart		Name	Arrive	Depart		Name	Arrive	Depart
	Wellsite	Wellsite			Wellsite	Wellsite			Wellsite	Wellsite
David Campbell	Oct 07 2013	Oct 10 2013		Greg Dore	Oct 07 2013	Oct 17 2013		Travis Wilcox	Oct 07 2013	Oct 17 2013

Adam Schlenz	Oct 07 2013	Oct 15 2013	Barry Combs	Oct 07 2013	Oct 17 2013	David Campbell	Oct 15 2013	Oct 17 2013				

Mud Properties Record

Date / Time	LWD Run No.	Measured Depth (ft.)	Mud Type	Density (sg)	Viscosity (cp)	pH	Fluid Loss (cc)	Oil / Water	Source	Total Chlorides (ppm)	K+ (%)
15/Oct/2013 17:57	3	4751	Water Based - Fresh	8.5	1	7.6	0.0	0 / 98	Active Mud Pit	1200	0.0
15/Oct/2013 17:57	3	7481	Water Based - Fresh	10.0	13	7.7	28.8	2 / 92	Active Mud Pit	1200	0.0
15/Oct/2013 17:57	3	8351	Water Based - Fresh	9.9	14	7.7	0.0	4 / 88	Active Mud Pit	1000	0.0
15/Oct/2013 17:57	3	10920	Water Based - Fresh	9.0	10	8.6	0.0	4 / 91	Active Mud Pit	1200	0.0

Mnemonics

Curve	Description	Units
GRAX	Gamma Ray Apparent, 0.5 ft. Avg.	API
GRIX	Gamma Ray Data Density	point
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 (m.)	Max O.D. (in.)	Min I.D. (in.)
1	DIR	11954360	Directional	55.88	6.750	0.000
1	SRIG	12354931	Gamma	52.50	6.750	0.000
2	DIR	11954360	Directional	53.08	6.750	0.000
2	SRIG	12354931	Gamma	49.70	6.750	0.000
3	DIR	12323368	Directional	54.47	4.750	2.750
3	SRIG	11932890	Gamma	51.09	4.750	2.750
4	DIR	12323368	Directional	54.48	4.750	2.750
4	SRIG	11932890	Gamma	51.10	4.750	2.750

Service and Tool Mnemonics

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

Comments

<p>1.) Depth measurements obtained from a depth control system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes logging engineers, depth calibrations and measurements could not be independently verified.</p>

2.) Baker Hughes run 1 and 2 utilized 6 3/4 inch NaviGamma services (Gamma Ray and Directional) behind an 8 3/4 inch bit and steerable assembly from 916 to 8075 feet MD (916 to 7703.20 feet TVD).

3.) Baker Hughes run 3 and 4 utilized 4 3/4 inch NaviGamma services (Gamma Ray and Directional) behind an 6 1/8 inch bit and steerable assembly from 8075 to 12330 feet MD (7703 to 7708 feet TVD).

4.) The interval from 916 to 7100 feet MD (916 to 7039 feet TVD) was not logged due to directional only services being provided through the straight-hole and nudge section for Baker Hughes run 1.

Remarks

Number	Measured Depth (m.)	Hole Section (in.)	LWD Run No.	Remark
1	7100	8.750	1	Begin logging due to directional only service provided thru vertical section.
2	7427	8.750	1	The interval between 7427 ft and 7484 ft MD (7364 and 7418 ft TVD) was relogged up to 16 hrs due to trip out for motor. The motor was not getting the required build rates.
3	8023	8.750	2	The interval between 8023 ft and 8075 ft MD (7702 and 7703 ft TVD) was relogged up to 26 hrs due to casing and cement ops.
4	11817	6.125	3	The interval between 11817 ft and 11871 ft MD (7719 and 7719 ft TVD) was relogged up to 18 hrs due to motor failure in lateral section.
5		6.125	4	No sensor data logged from 12280 ft to 12330 ft MD (7710 ft to 7708 ft TVD) due to sensor to bit offset.

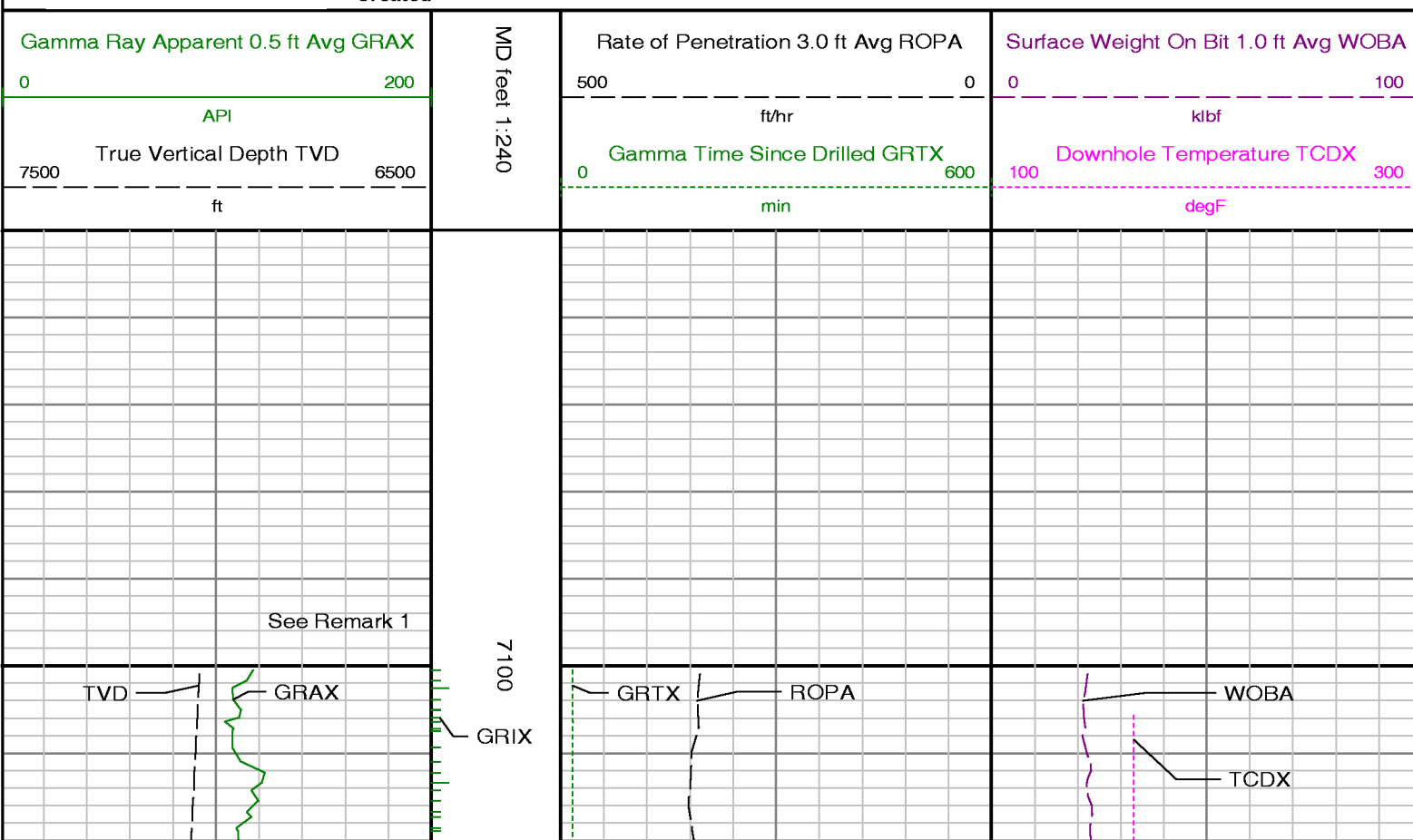


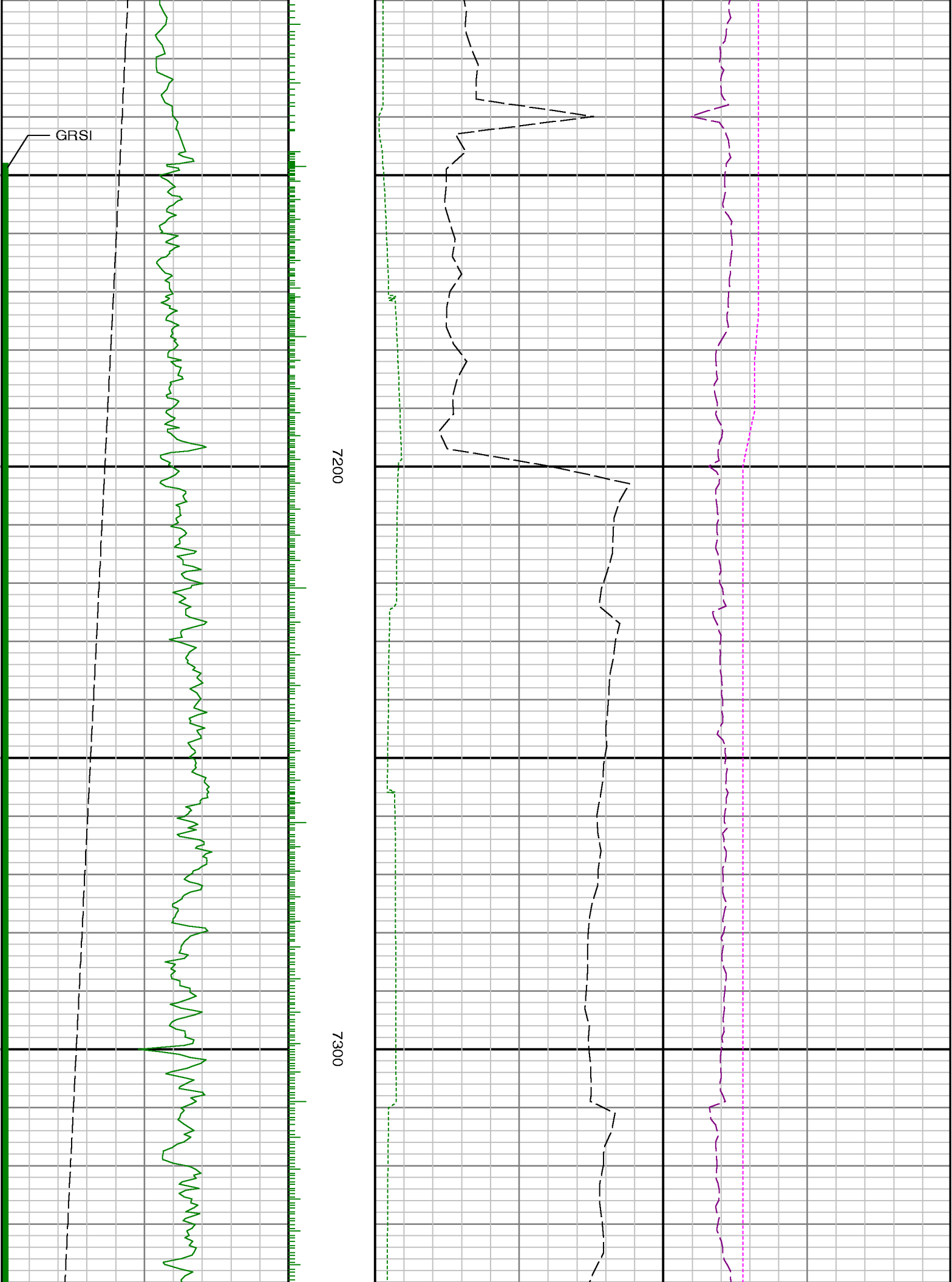
Company : Kerr McGee Oil & Gas Onshore LP

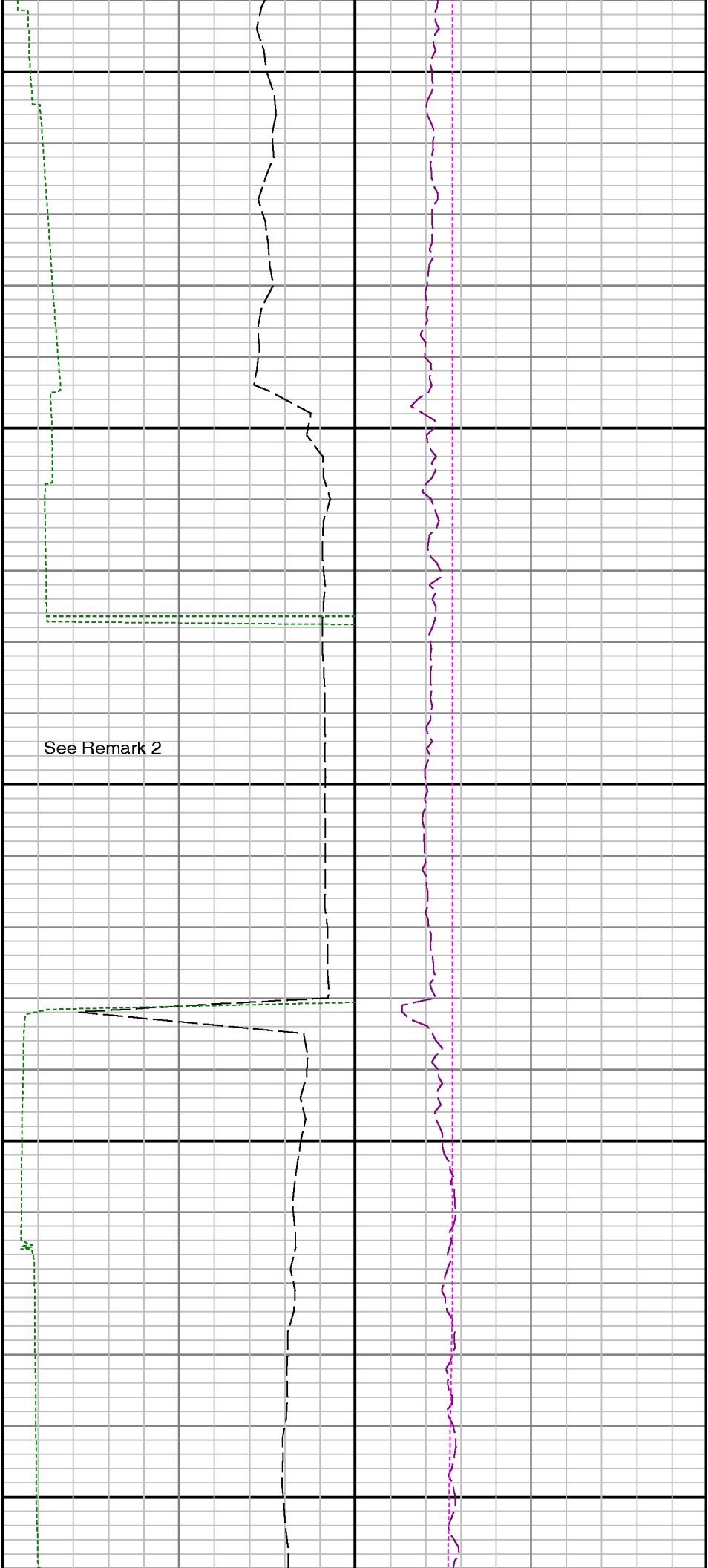
Well : Howard 1C-28HZ

Interval : 7050.00 - 12400.00 feet

Created : 16/Oct/2013 1:53:05 PM



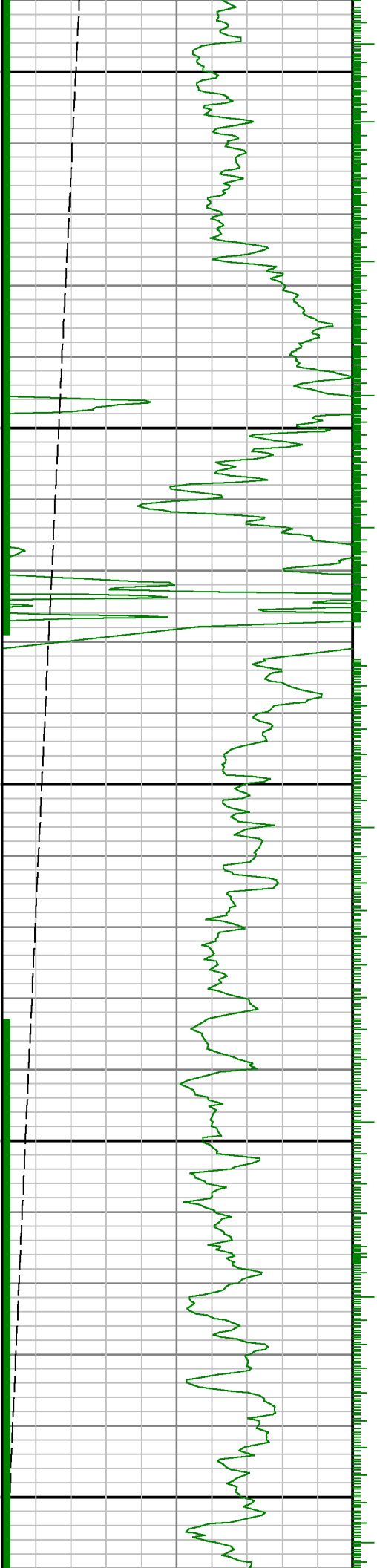


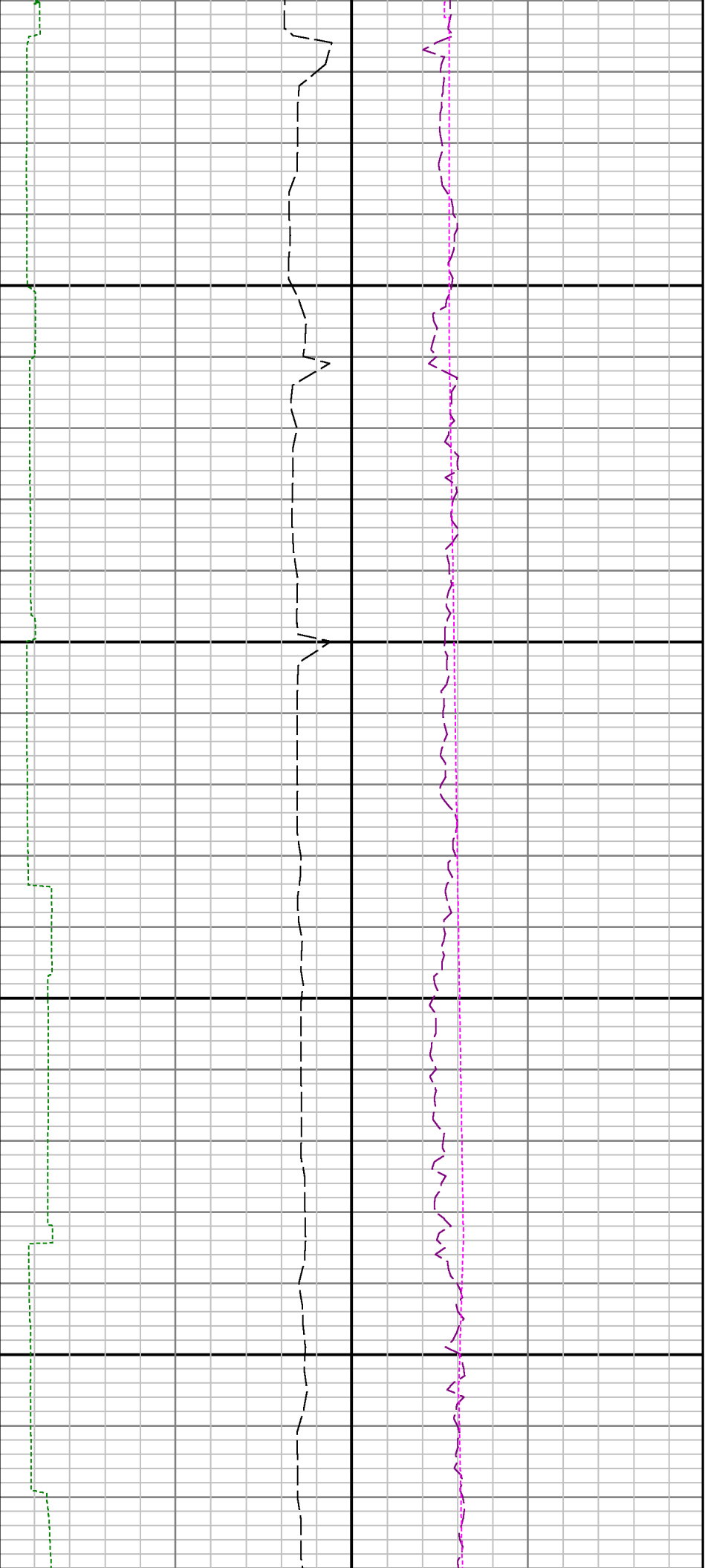


7400

Run 1 ⇔ Run 2

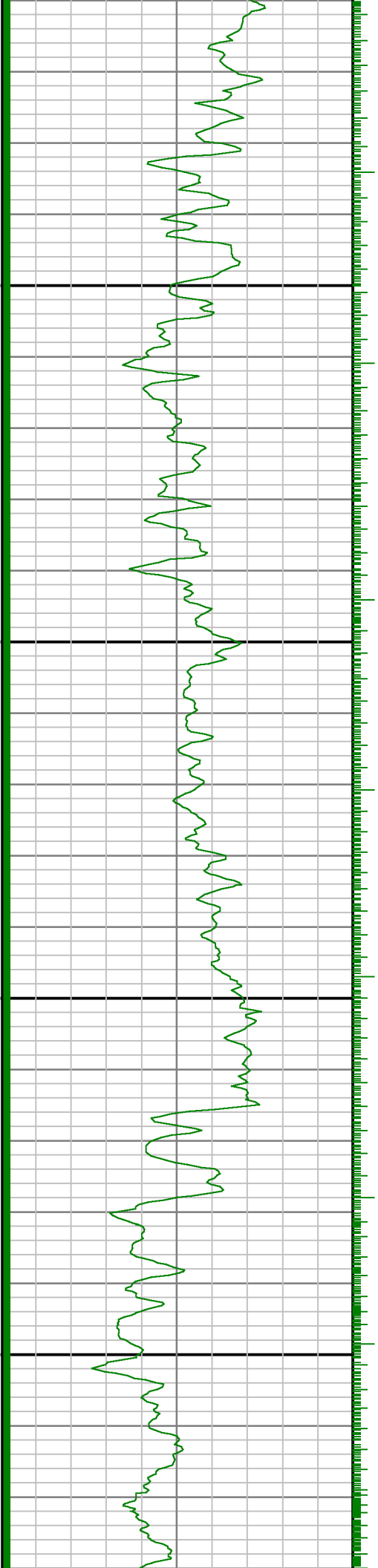
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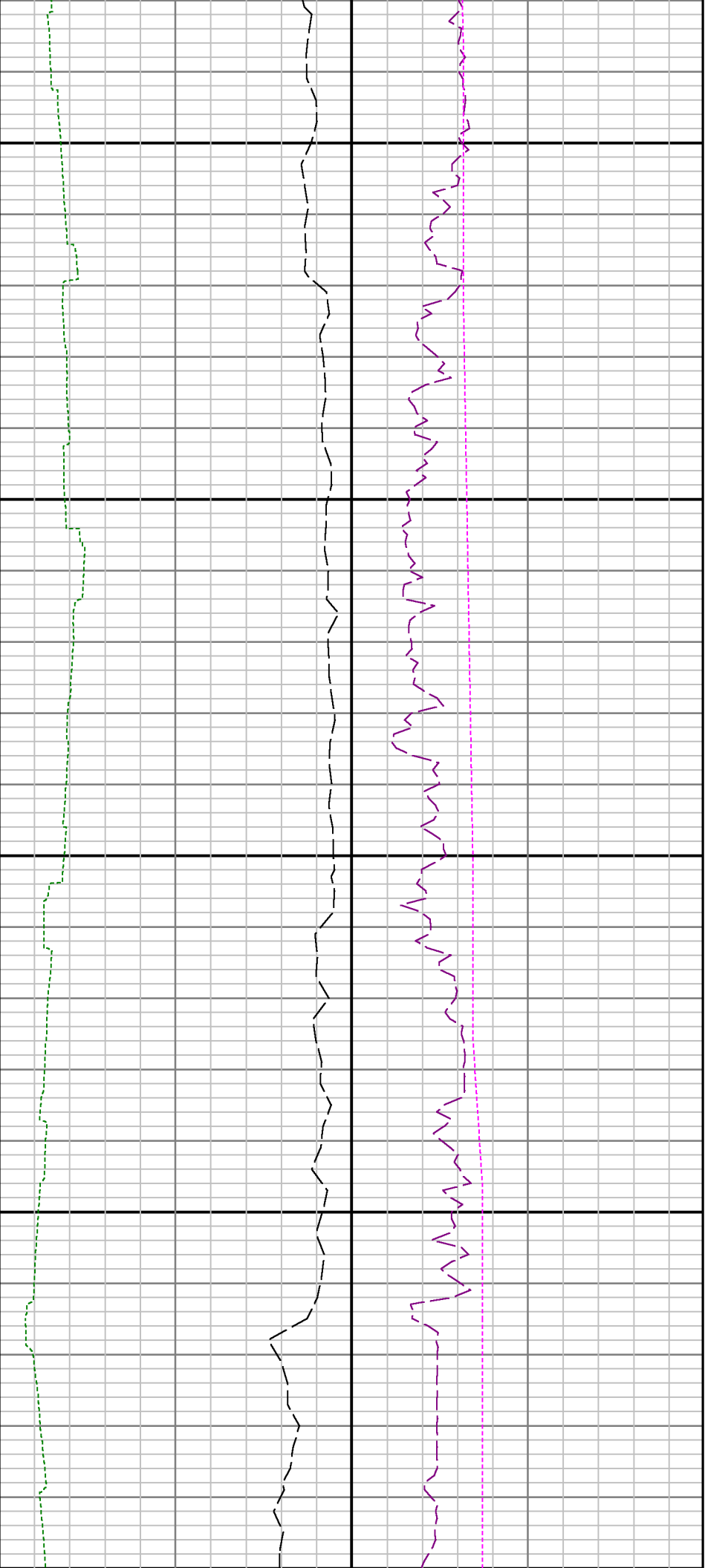




7600

7700

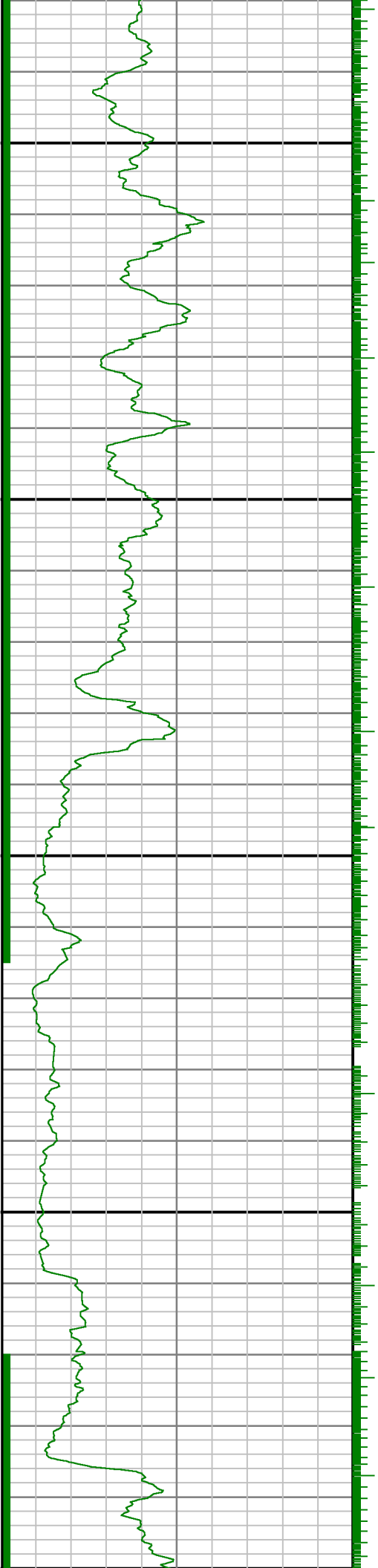


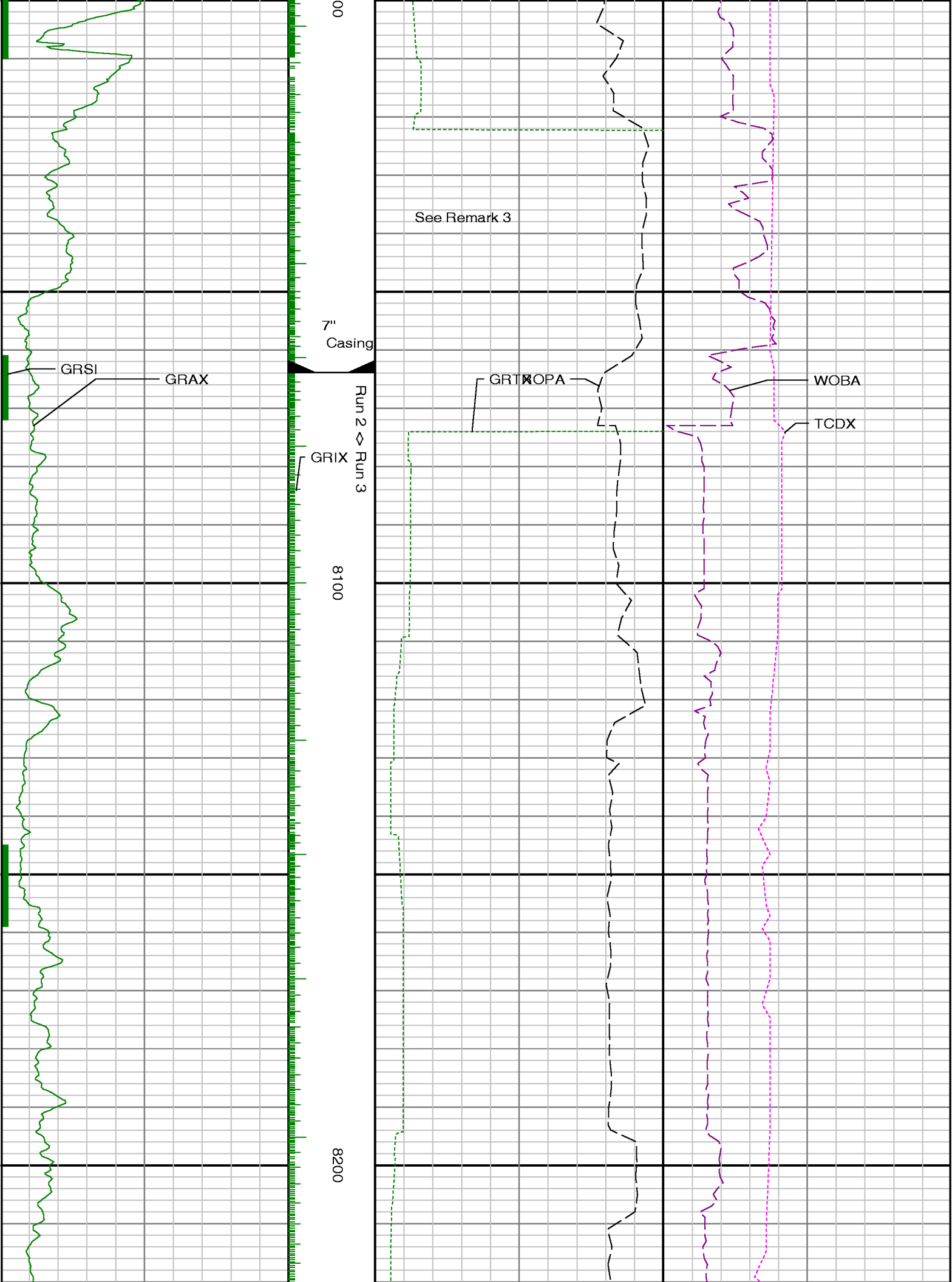


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7900

80

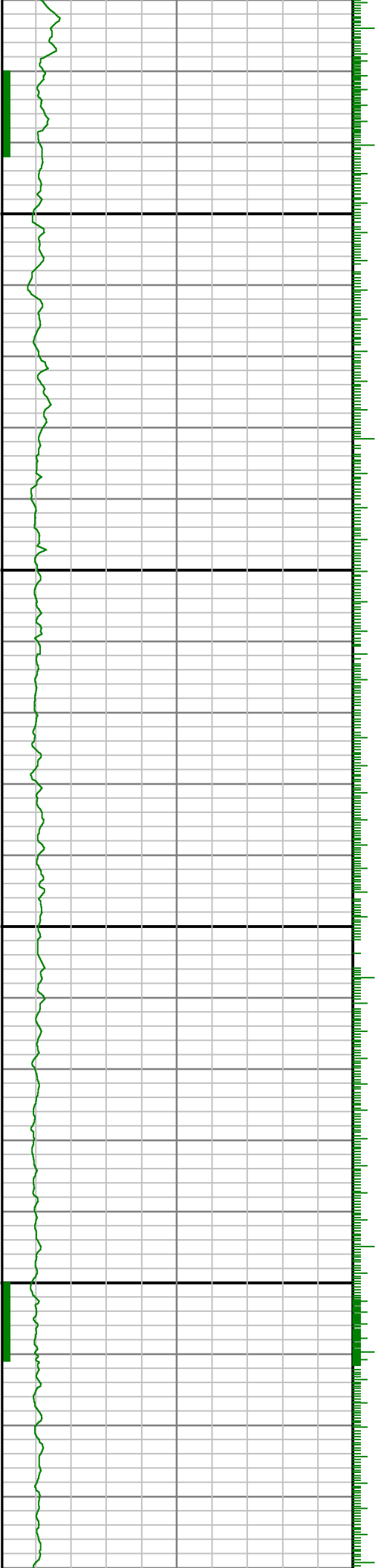


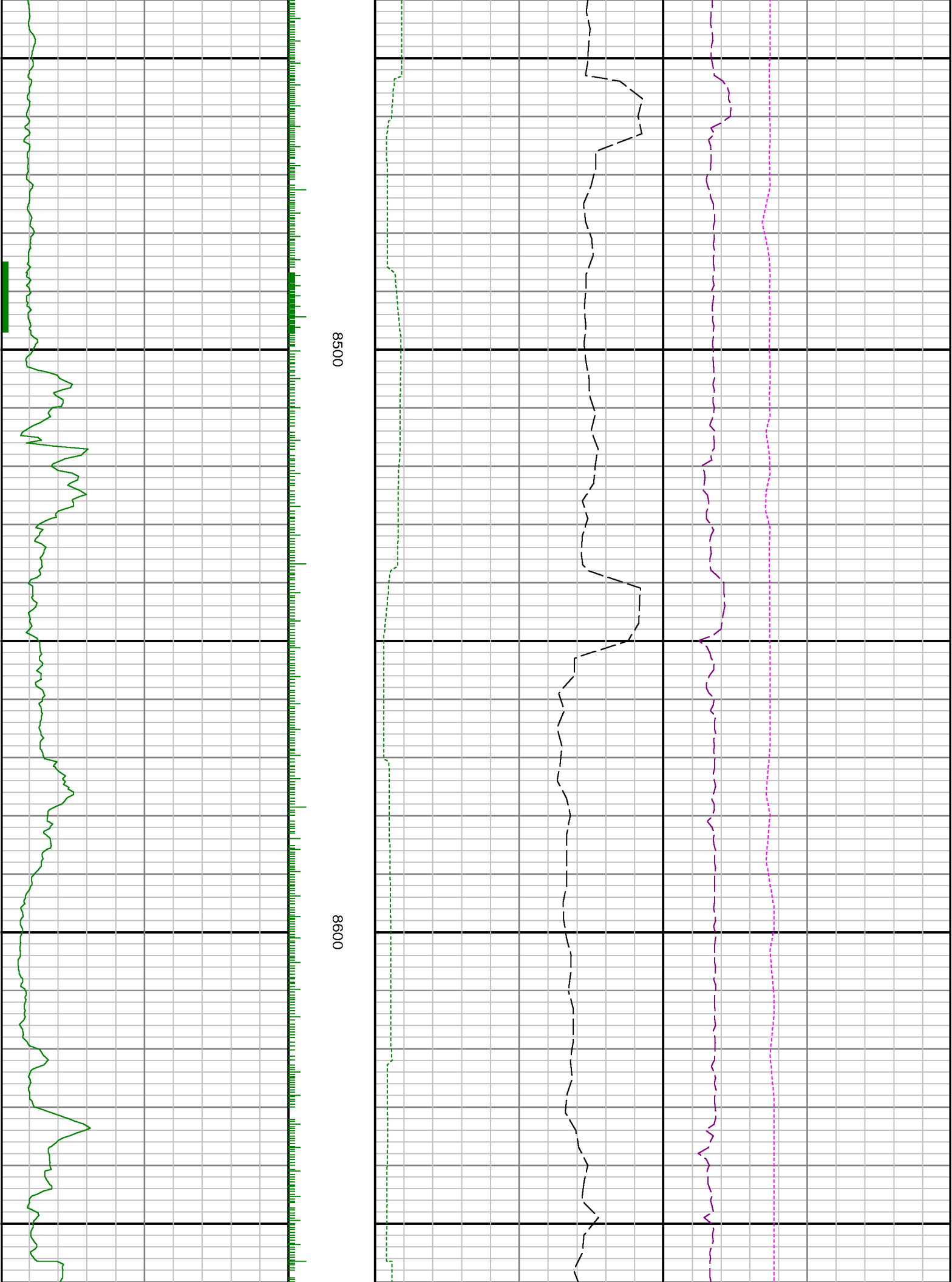


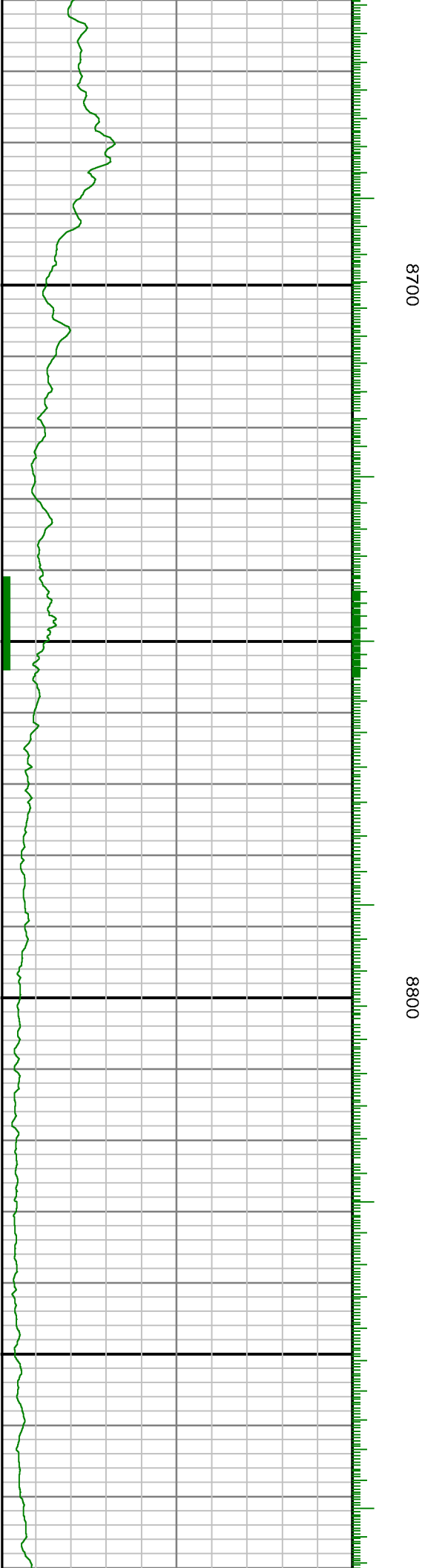
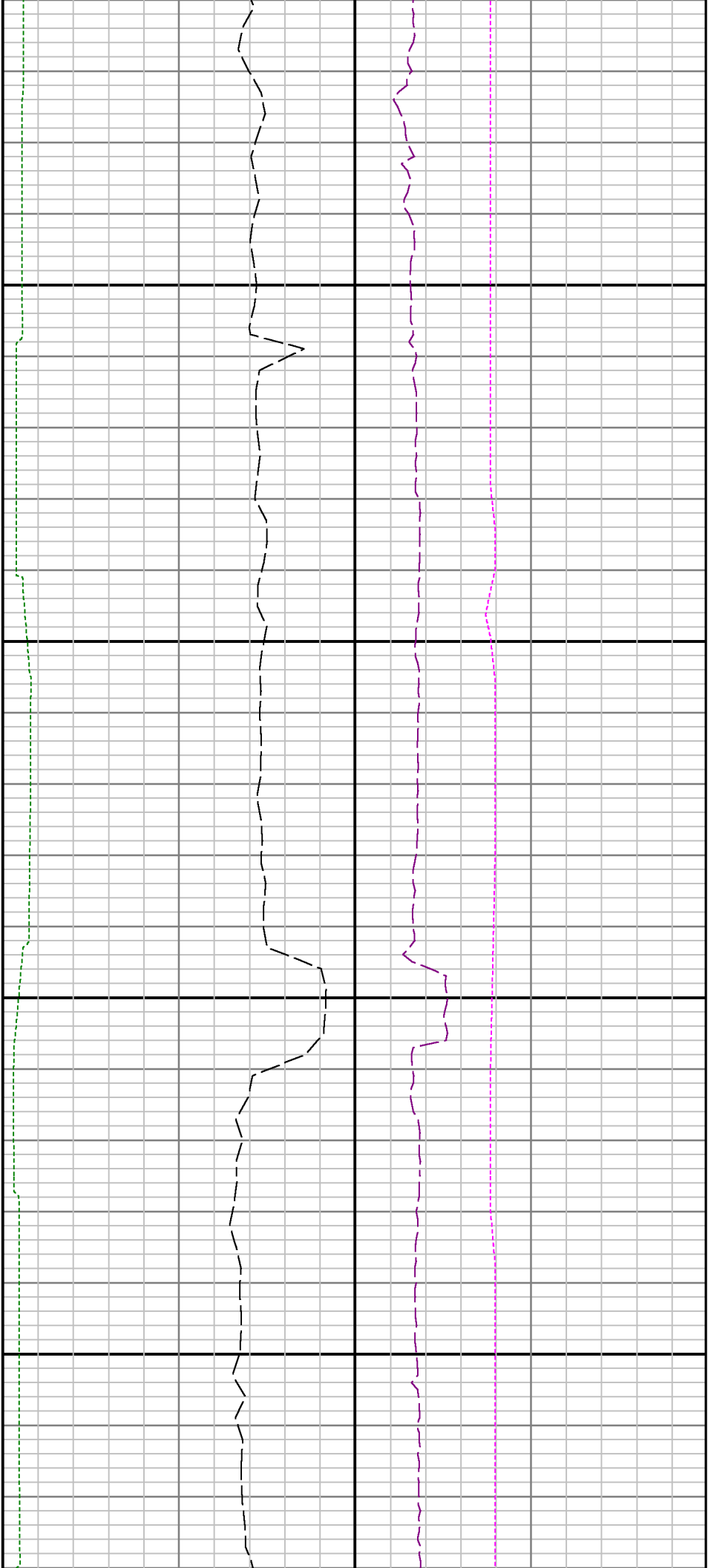


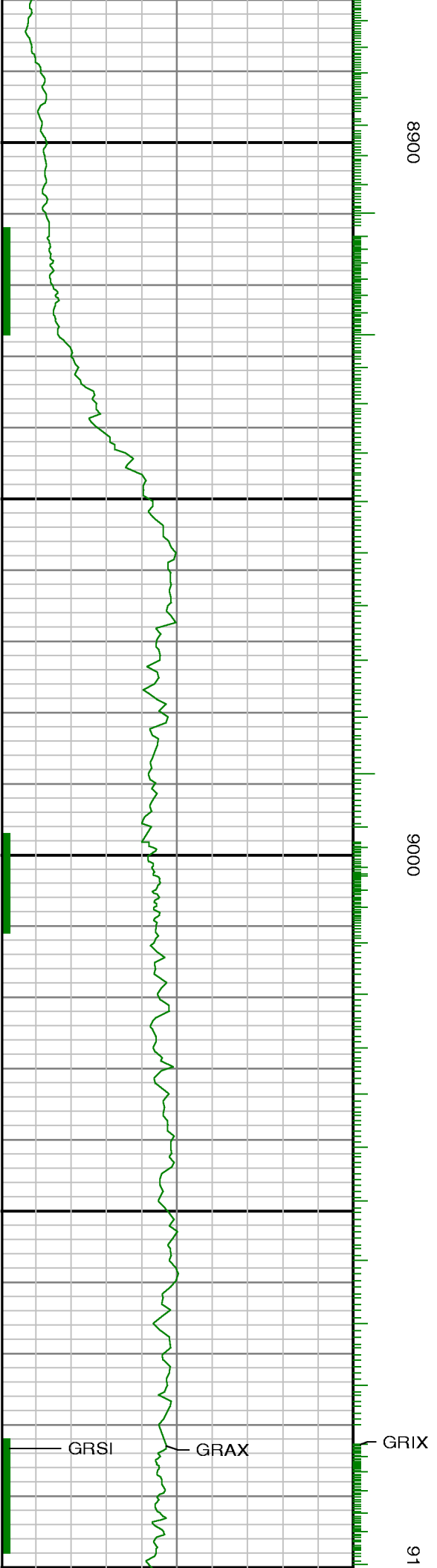
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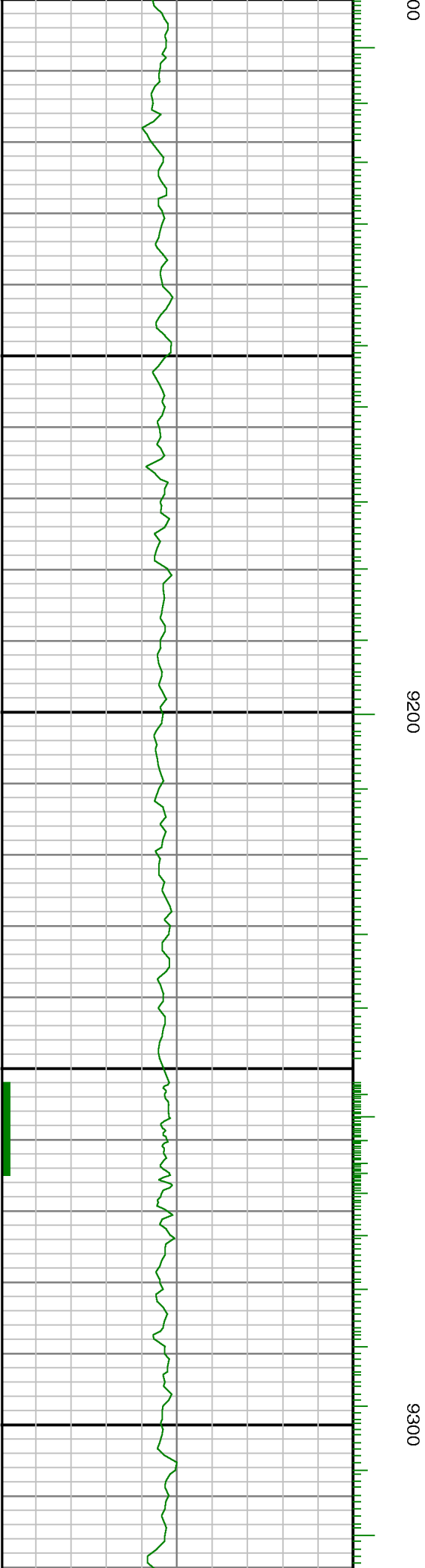
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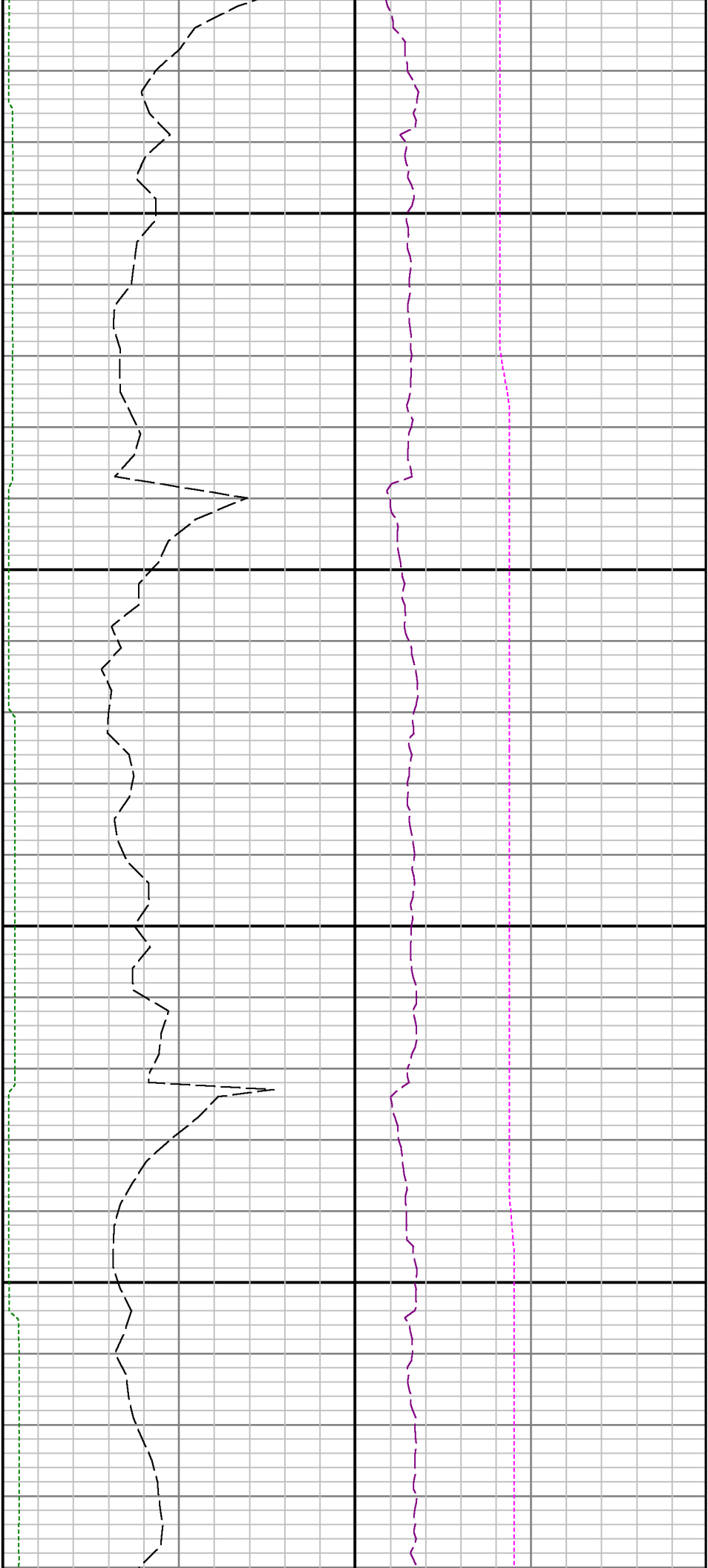






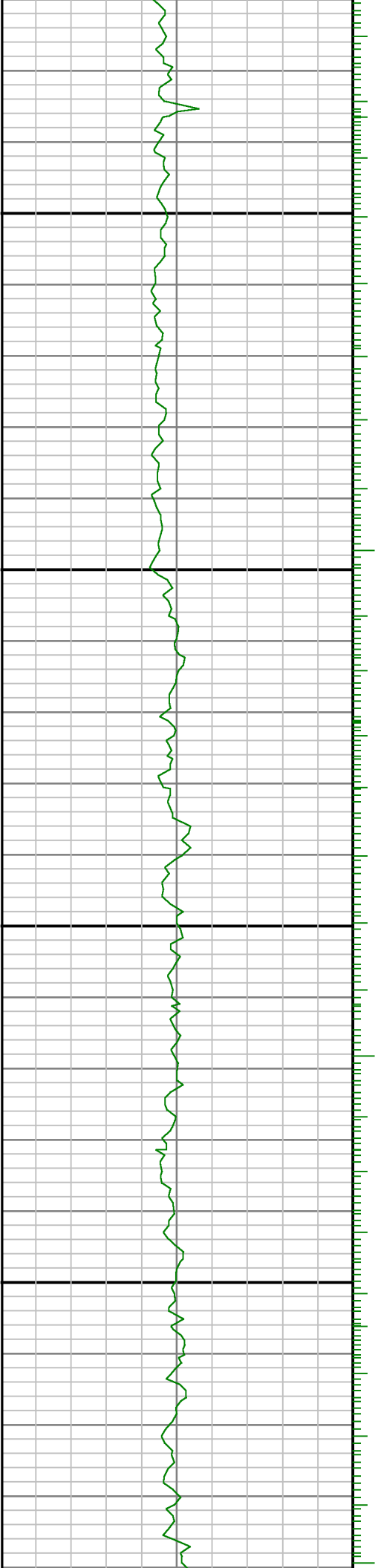


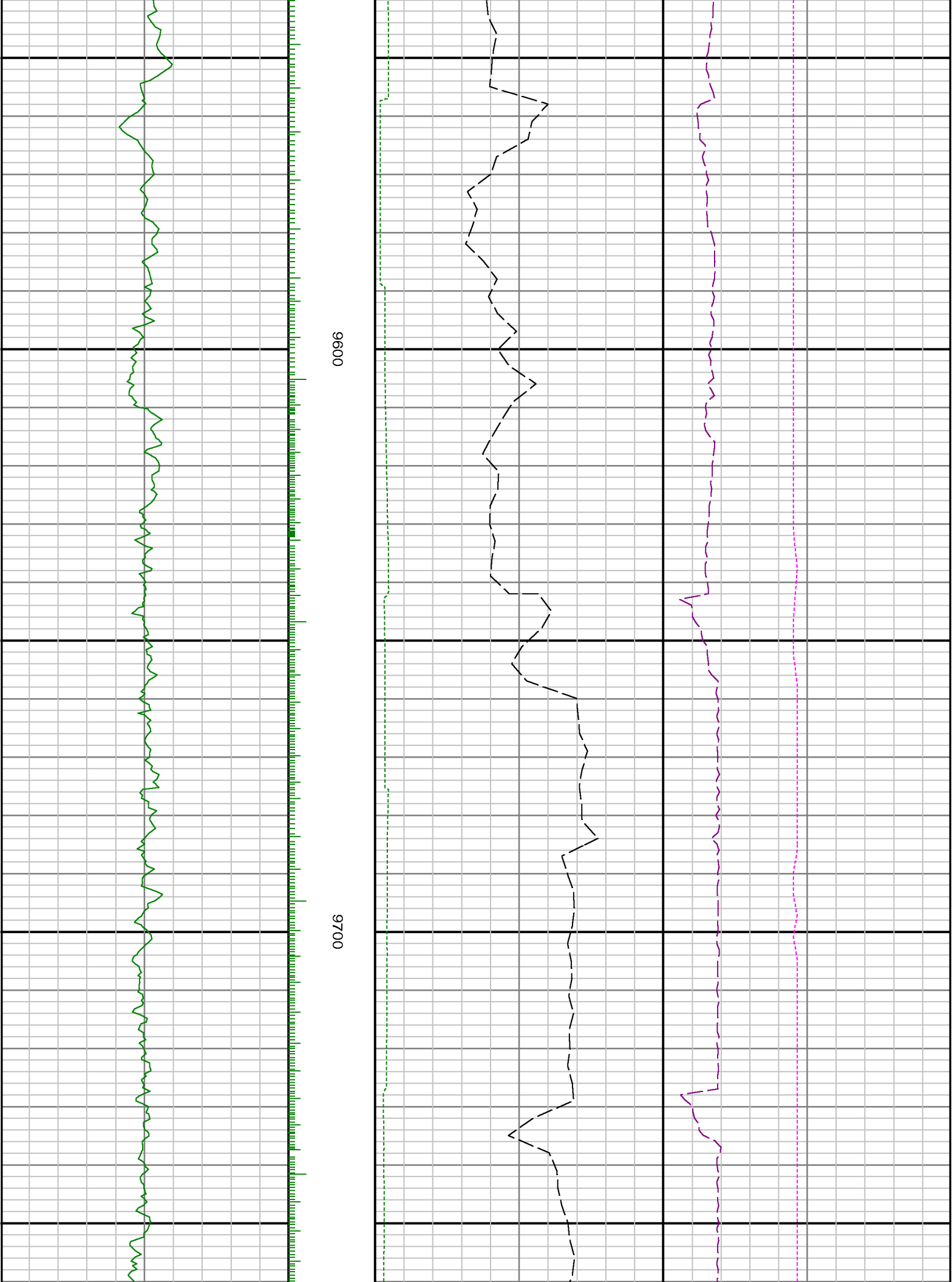


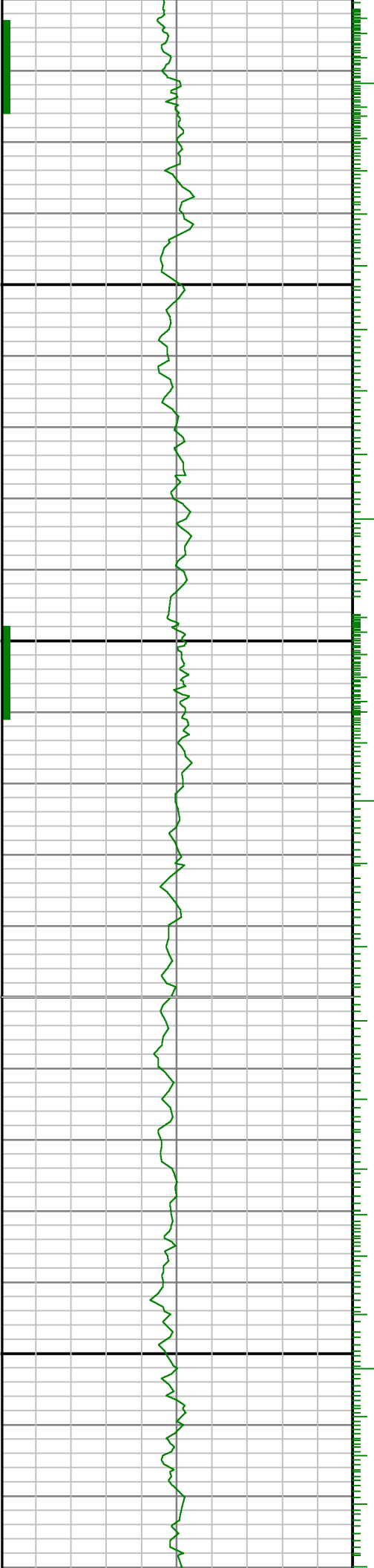


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9500



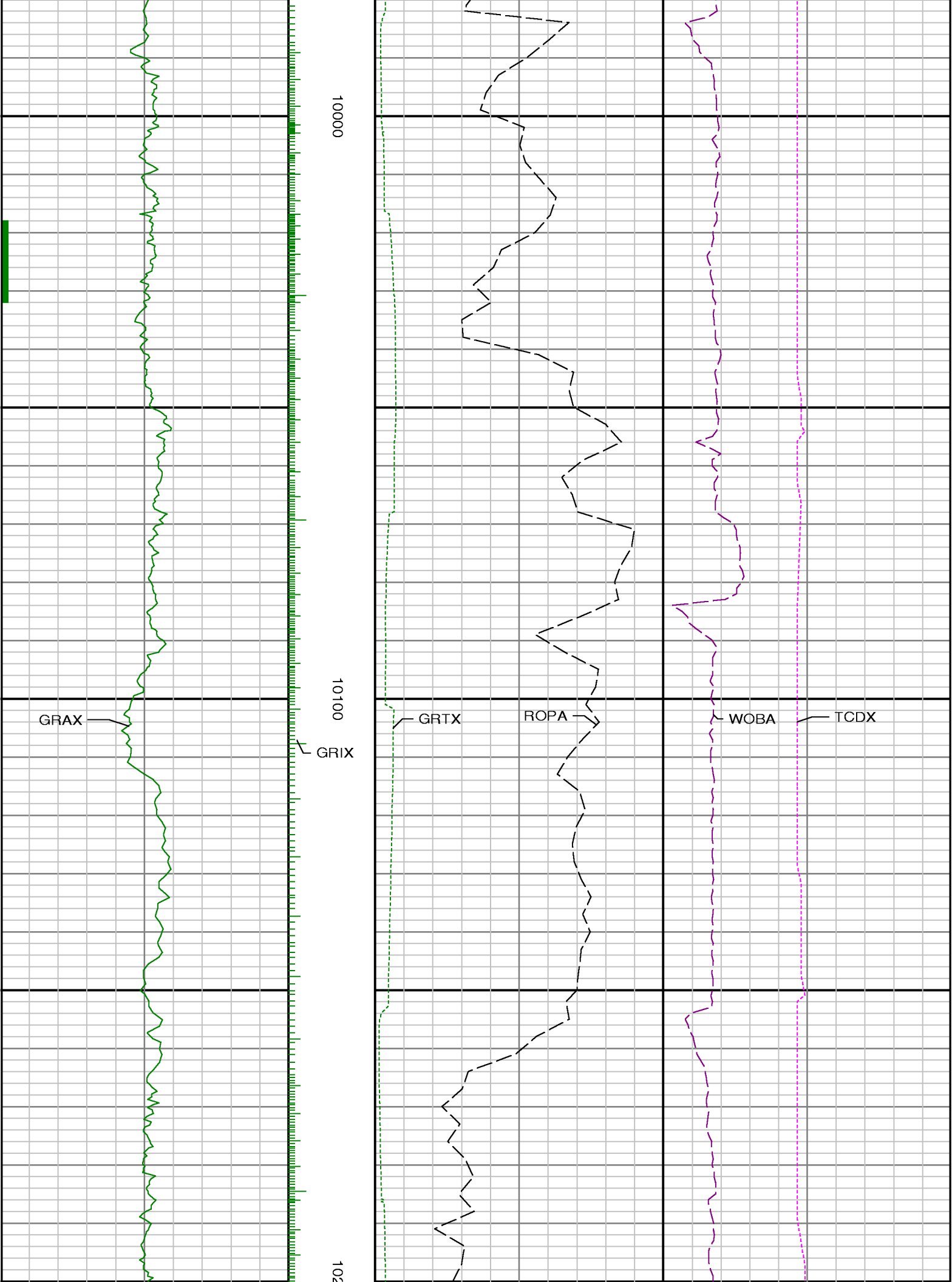


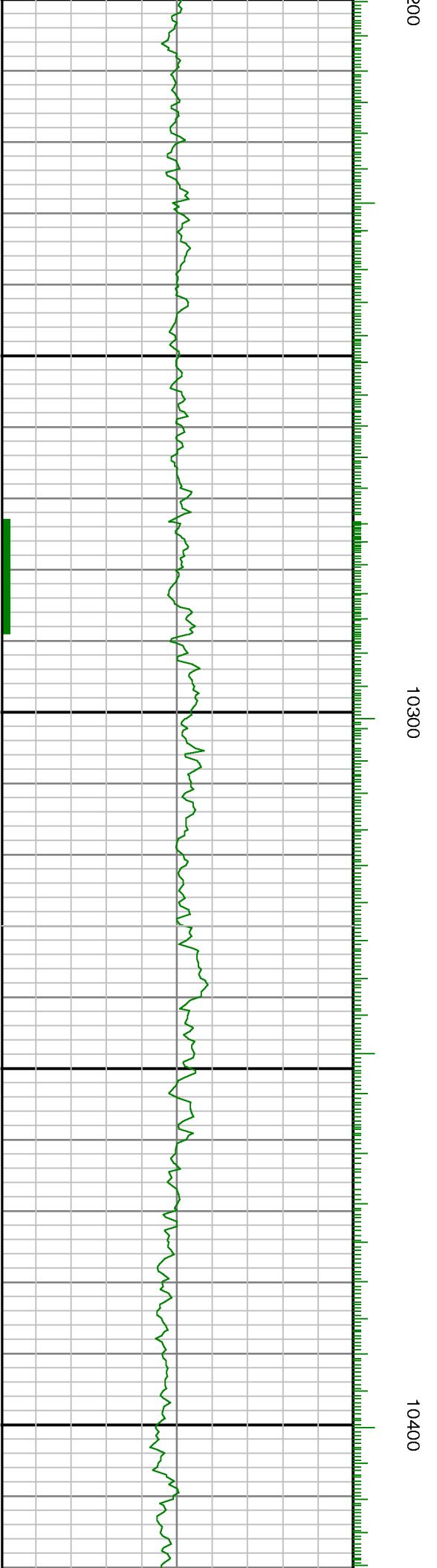
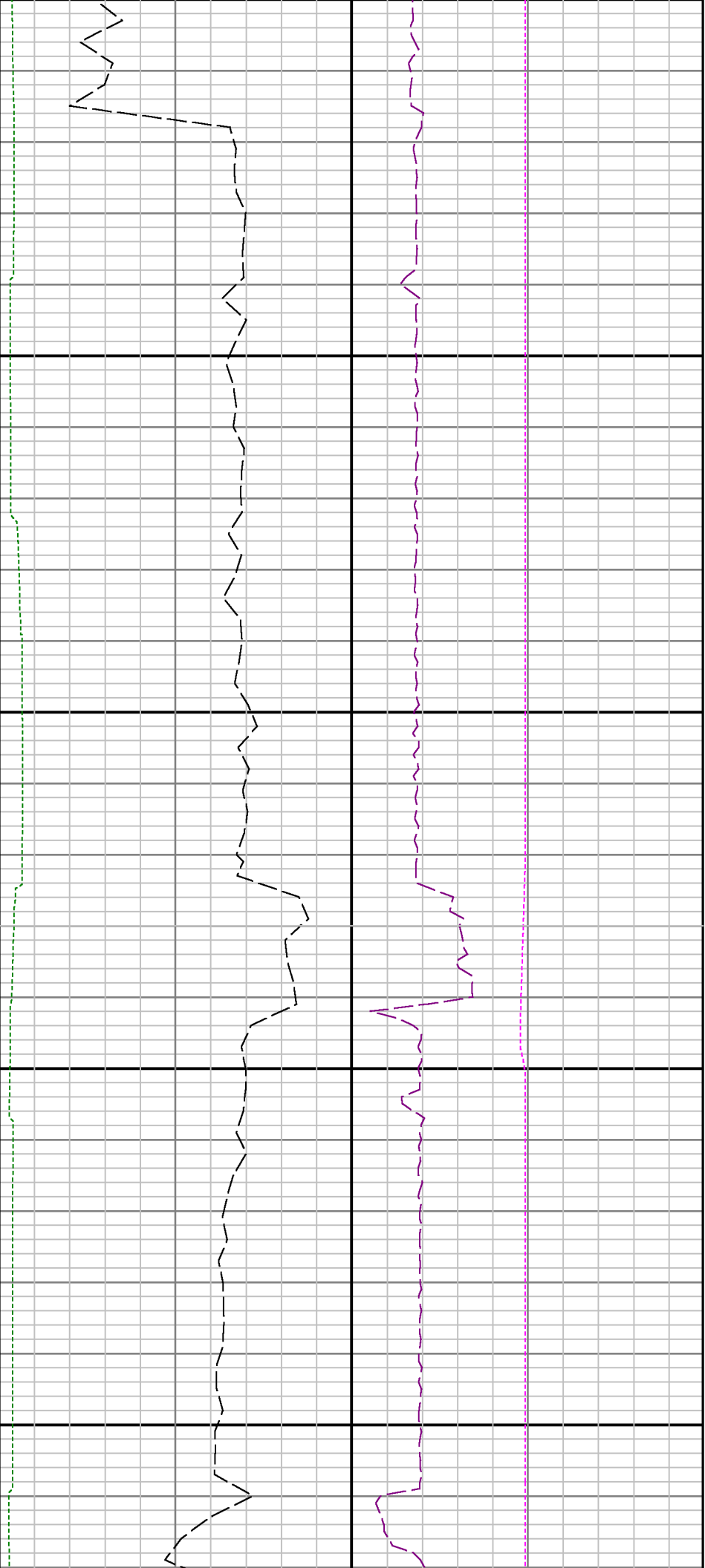


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0066



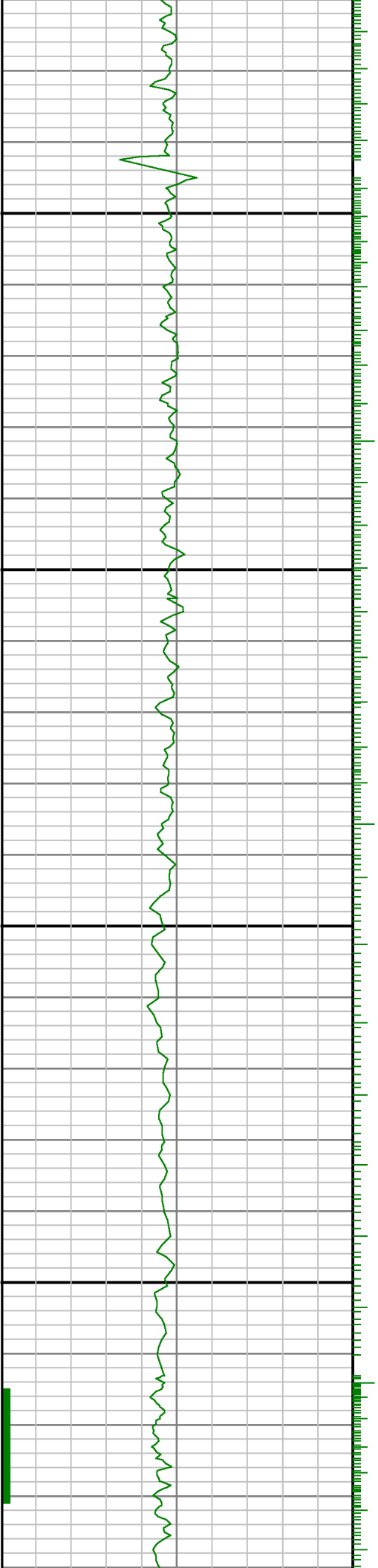






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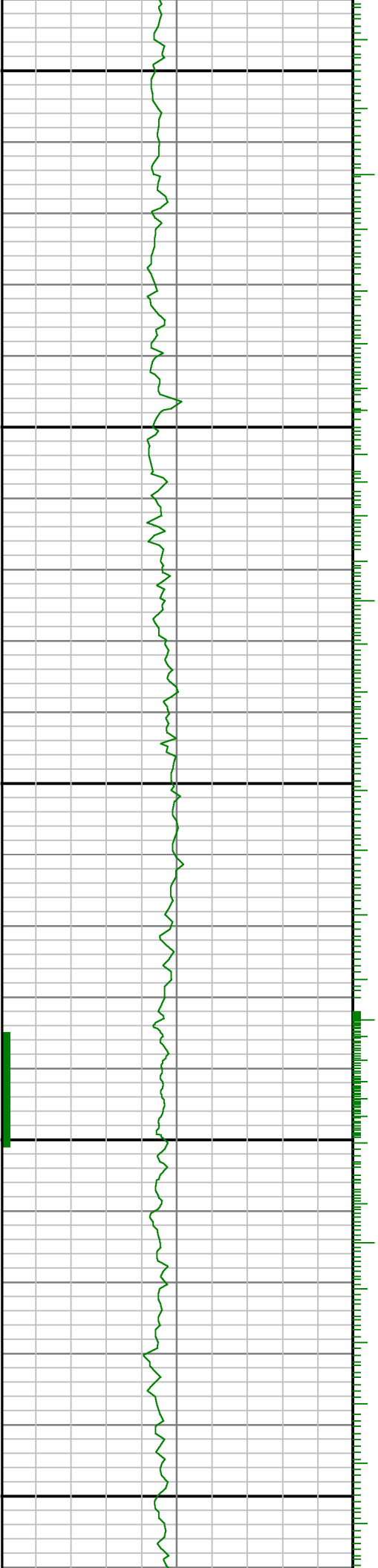
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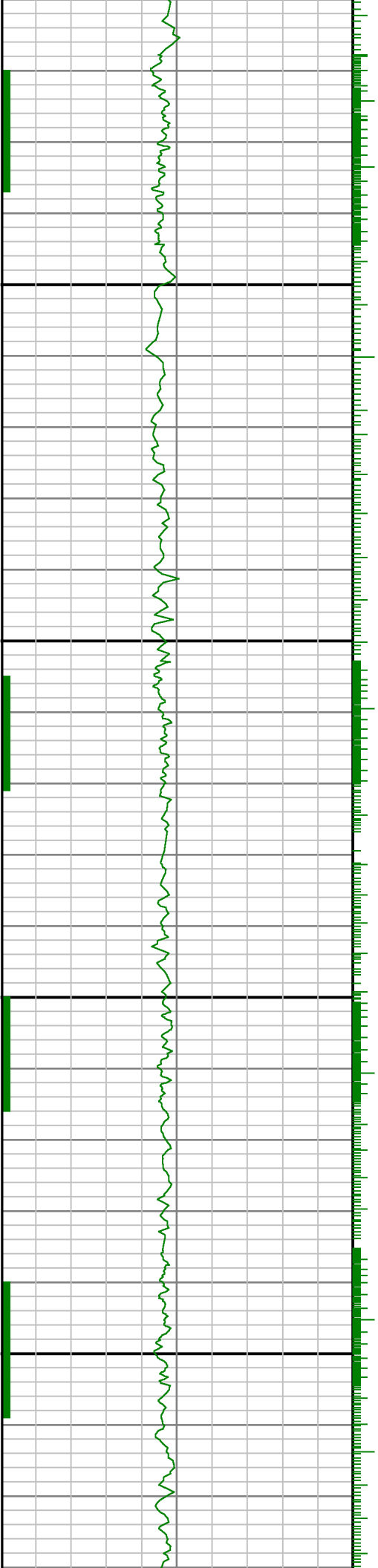
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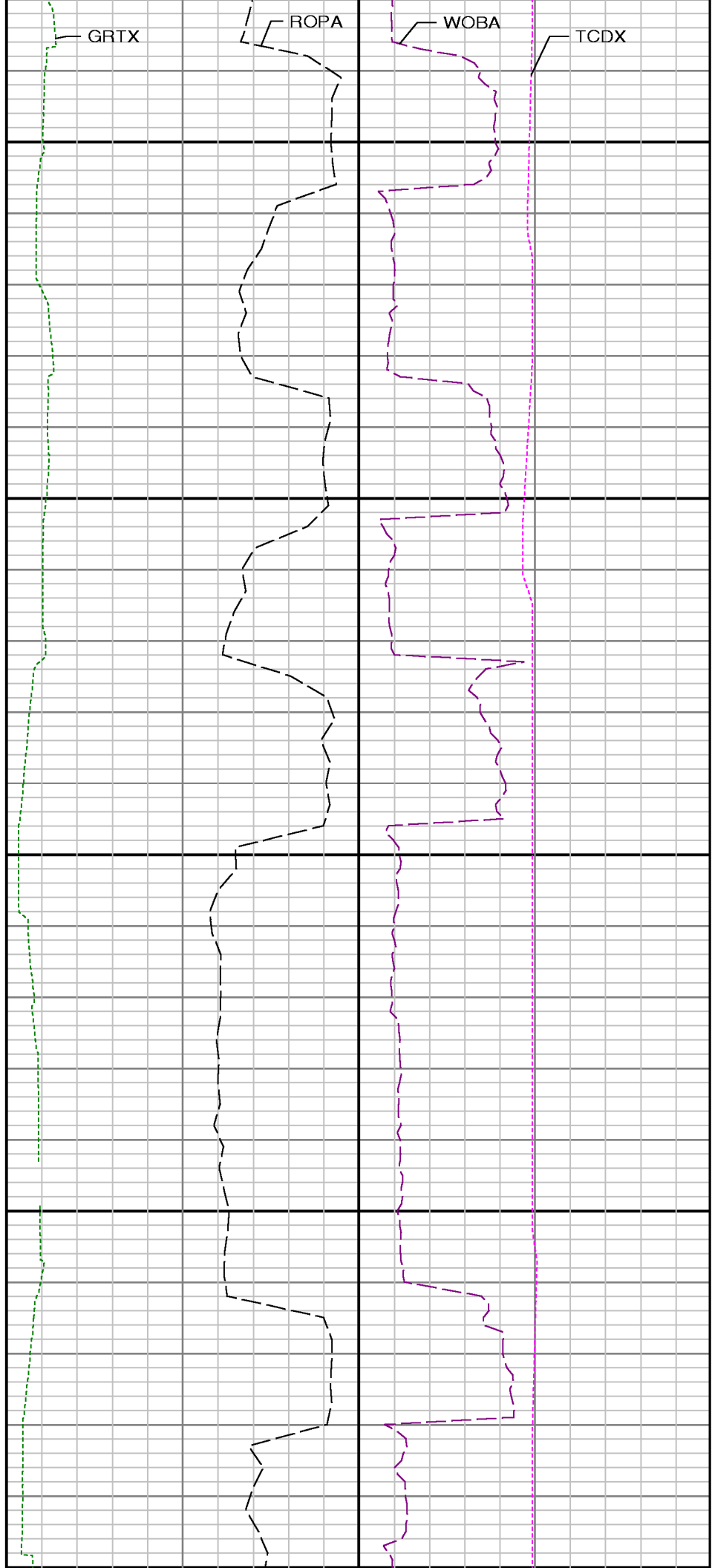
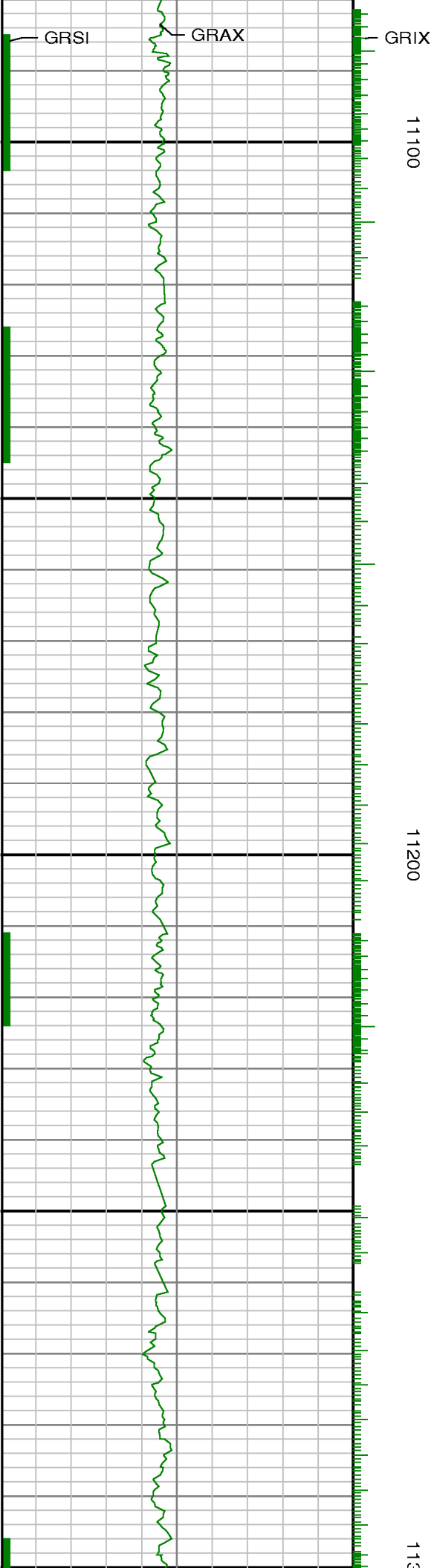


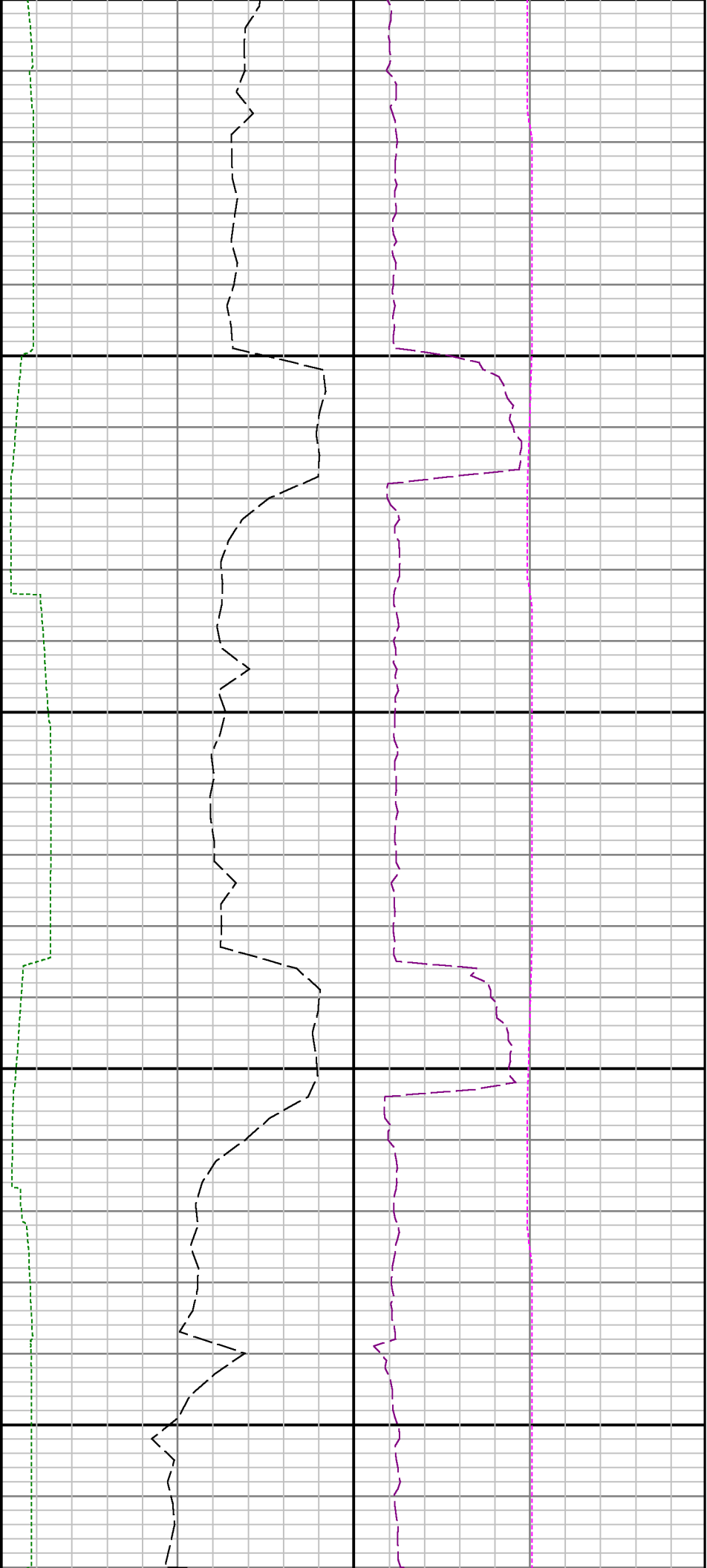


10900

11000



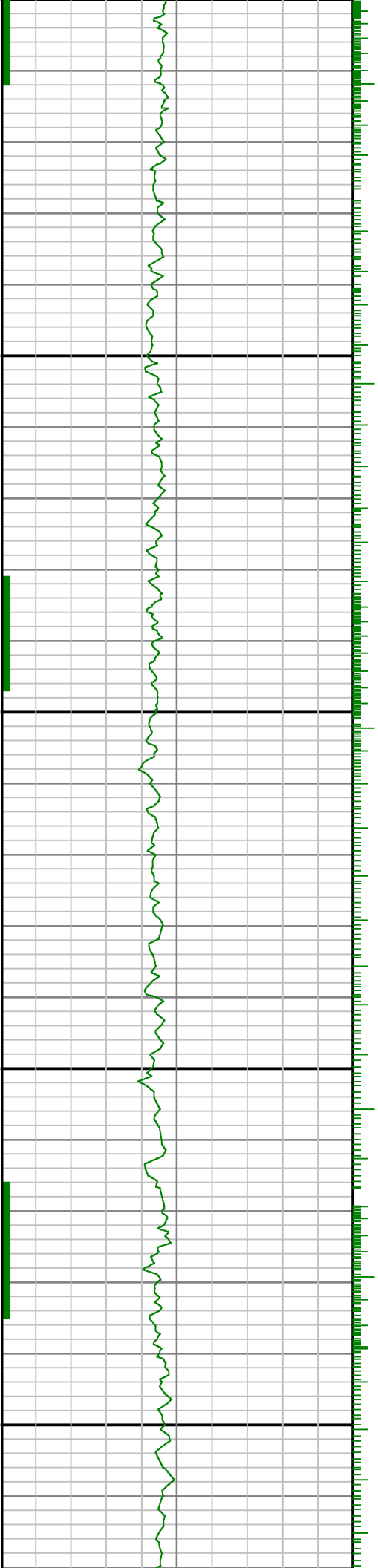


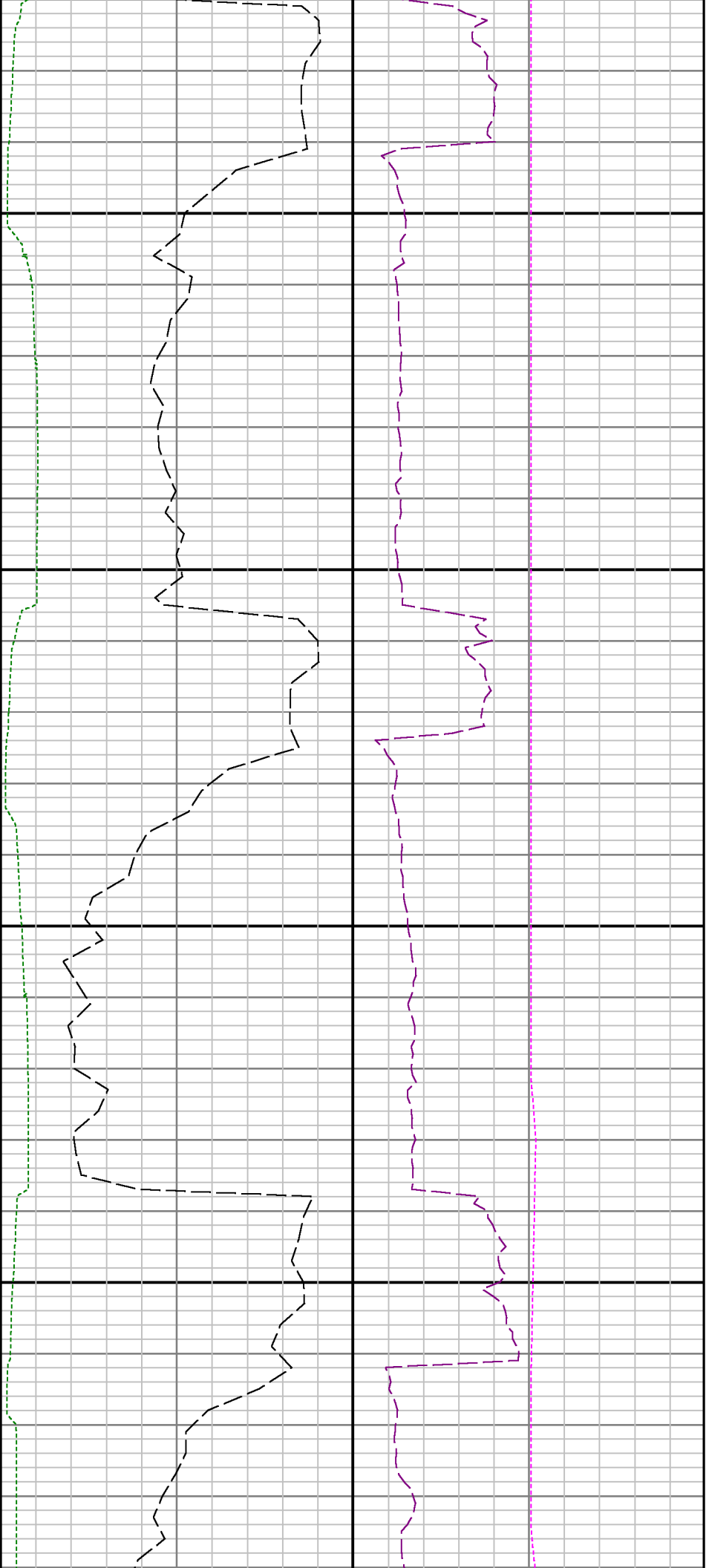


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11400

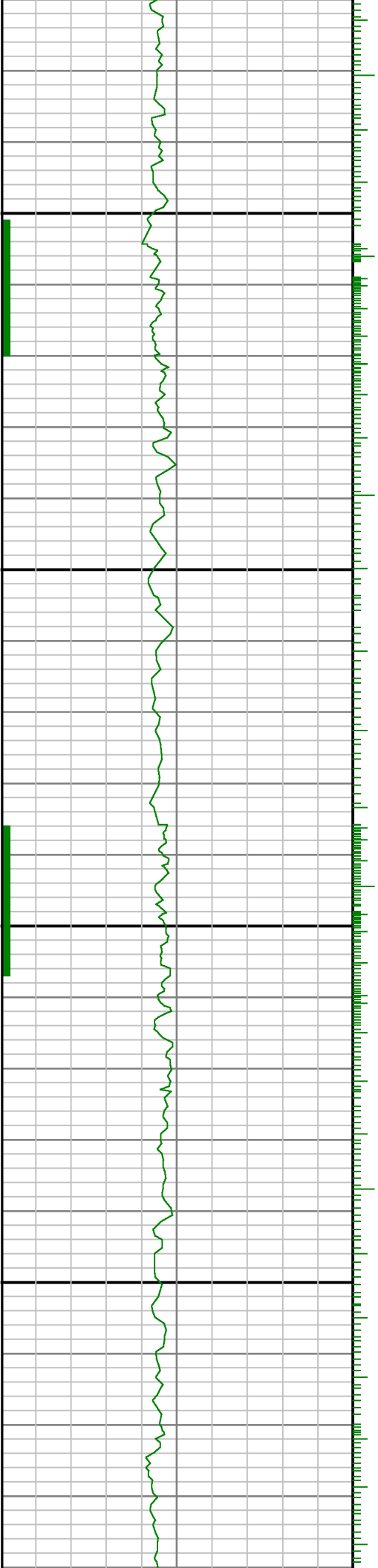
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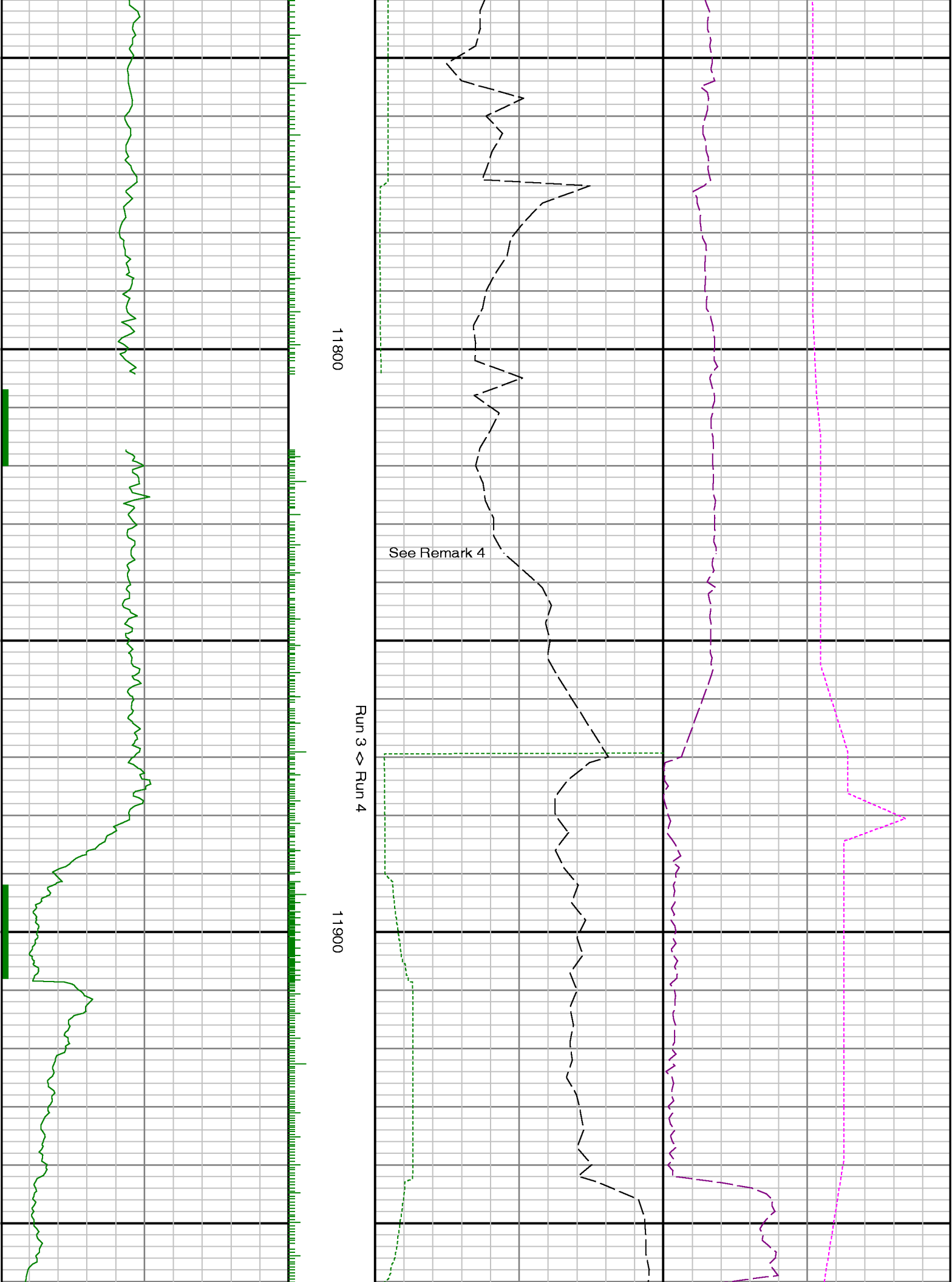


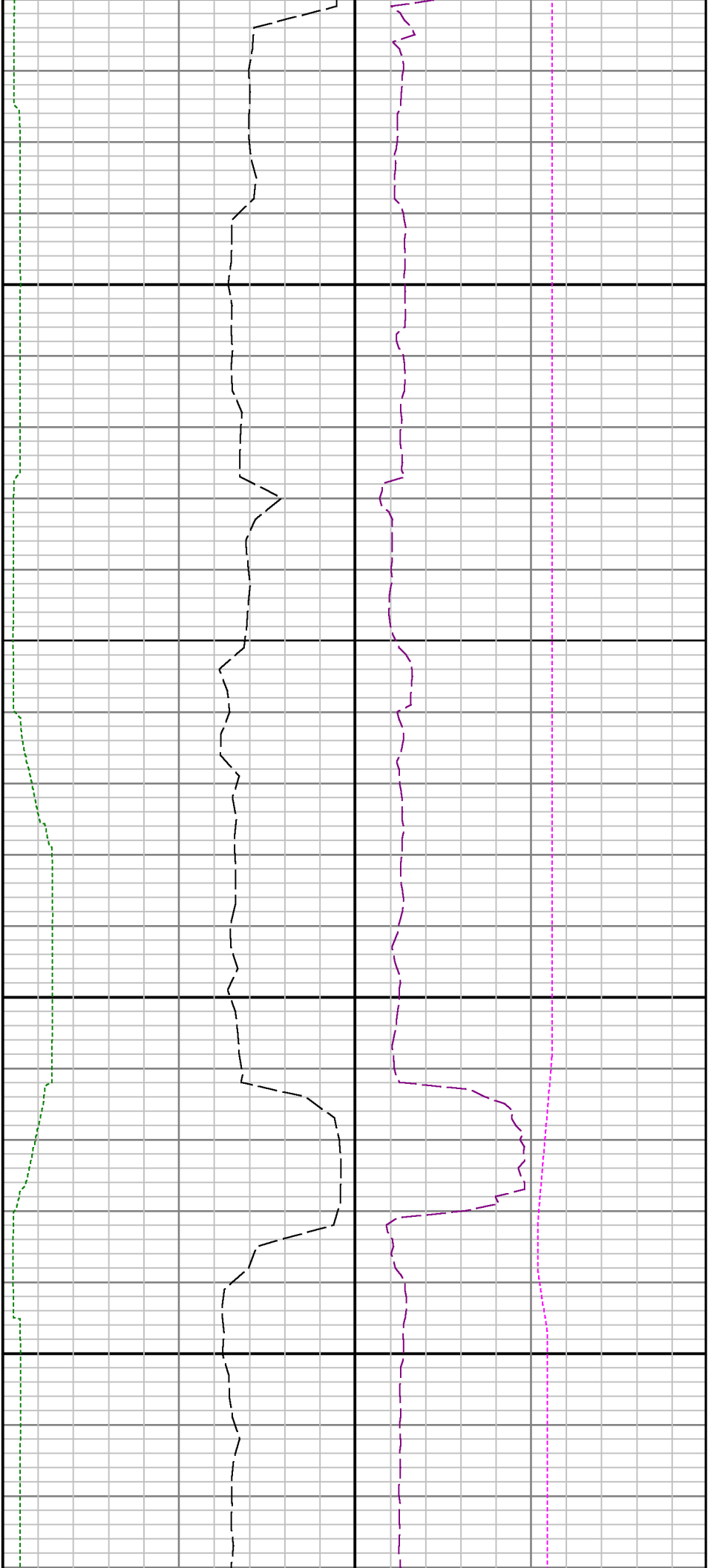


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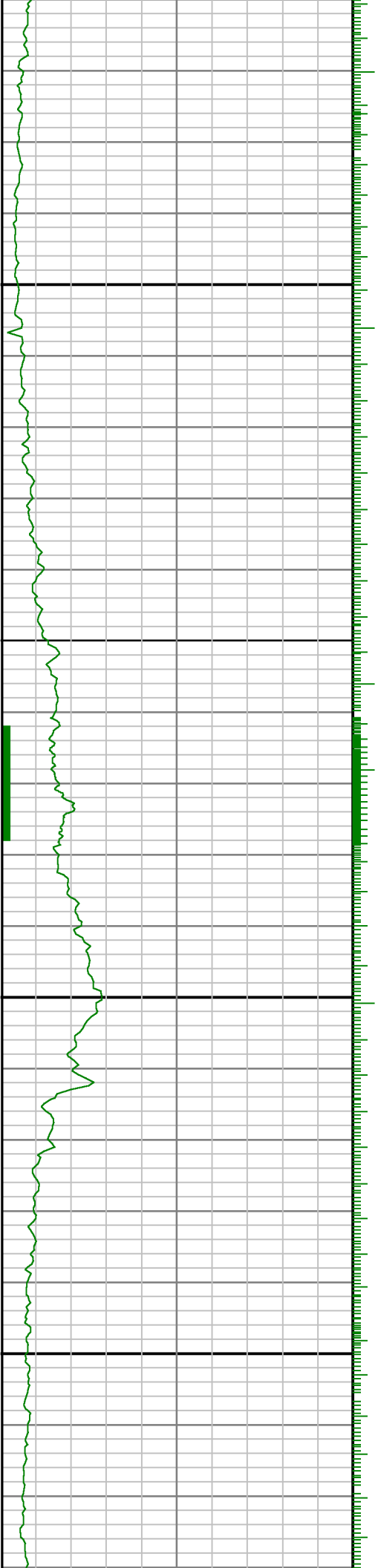


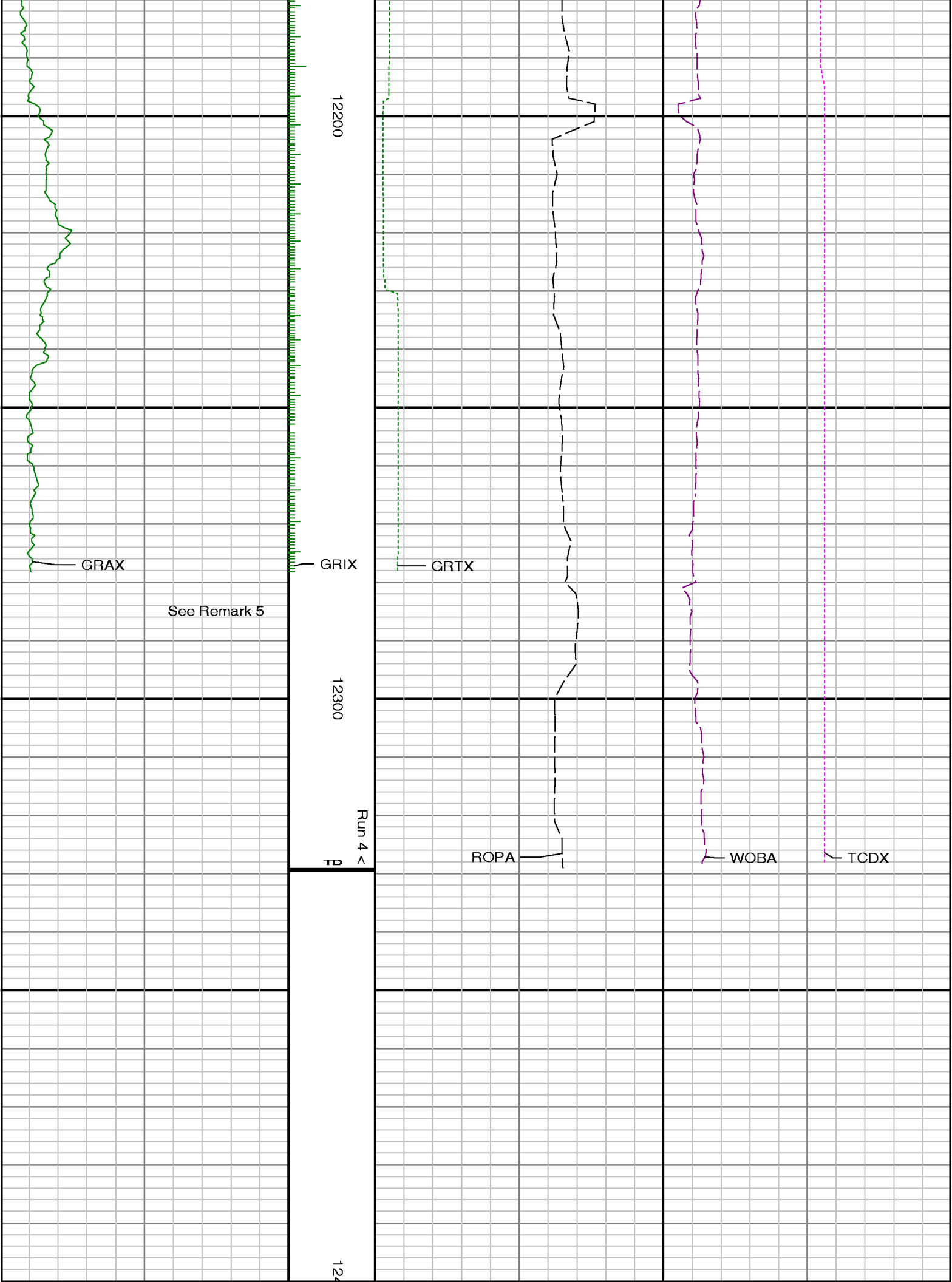




12000

12100





Gamma Ray Apparent 0.5 ft Avg GRAX	LOG MD feet 1:240	Rate of Penetration 3.0 ft Avg ROPA	Surface Weight On Bit 1.0 ft Avg WOBA
0200		5000	0100
API		ft/hr	klbf
True Vertical Depth TVD		Gamma Time Since Drilled GRTX	Downhole Temperature TCDX
75006500		0600	100300
ft		min	degF