



# LWD MEMORY LOG

# Gamma Ray

LWD MEMORY LOG														
<div><div><div><div><div><div>BAKER HUGHES</div><div>a GE company</div></div><div></div></div></div><div>Scale:</div><div>1:240</div><div>Measured Depth</div></div></div>			<div><div>Company: Noble Energy</div><div>Well: Guttersen State DD30-745</div><div>Field: Wattenberg</div><div>County: WeldCountry: United States</div><div>State: Colorado</div></div>											
<div><div>Depth Reference:</div><div>Driller's Depth</div></div>			<div><div>Surface Location:</div><div>Latitude: 40° 11' 25.656" N</div><div>Longitude: 104° 28' 27.912" W</div><div>Other Services:</div></div>											
<div><div>Status:</div><div>Final Print</div></div>			<div><div>Directional</div></div>											
<div><div>API No:</div><div>05-123-48666-00</div></div>			<div><div>Directional</div></div>											
<div><div>Job ID:</div><div>110097035</div></div>			<div><div>SEC:</div><div>30 TWN:</div><div>3N RGE:</div><div>63W</div></div>											
<div><div>Permanent Datum (P.D.):</div><div>Mean Sea Level</div></div>			<div><div>Elevation:</div><div>0.00 ft</div></div>											
<div><div>Log Measured From:</div><div>Rig Floor</div></div>			<div><div>Above P.D.:</div><div>4853.00 ft</div><div>Elev. KB:</div><div>4853.00 ft</div><div>Elev. DF:</div><div>4823.00 ft</div><div>Elev. GL:</div><div></div></div>											
<div>Dates</div>			<div>Interval</div>		<div>Magnetic Field Reference</div>									
<div><div>From:</div><div>2019-11-26</div></div>			<div><div>Drilled (ft)</div><div>1932.00</div></div>		<div><div>Logged (ft)</div><div>1932.00</div></div>		<div><div>Azi Reference North:</div><div>Grid Dip Angle: (deg)</div><div>66.58</div></div>							
<div><div>To:</div><div>2019-11-28</div></div>			<div><div>Top:</div><div>1932.00</div></div>		<div><div>Bottom:</div><div>1722.00</div></div>		<div><div>Total Magnetic Field Strength: (nT)</div><div>52079</div></div>							
<div><div>Sputd:</div><div>2019-11-23</div></div>			<div><div>Bottom:</div><div>1722.00</div></div>		<div><div>Mag to Reference North Correction: (deg)</div><div>7.33</div></div>									
<div>Borehole RecordCasing Record</div>														
<div>Hole Size (in)</div>			<div>From (ft)</div>		<div>To (ft)</div>		<div>Size (in)</div>		<div>Weight (lb/ft)</div>		<div>From (ft)</div>		<div>To (ft)</div>	
<div>13.500</div>			<div>30.00</div>		<div>1932.00</div>		<div>9.625</div>		<div>36.00</div>		<div>30.00</div>		<div>1922.00</div>	
<div>8.500</div>			<div>1932.00</div>		<div>17224.00</div>									
<div>Mud RecordDeviation Record</div>														
<div>Type</div>			<div>From (ft)</div>		<div>To (ft)</div>		<div>Hole Size (in)</div>		<div>Interval (ft)</div>		<div>Inc   Az (Start)</div>		<div>Inc   Az (End)</div>	
<div>Oil Based Mud</div>			<div>1932.00</div>		<div>17224.00</div>		<div>8.500</div>		<div>15292.00</div>		<div>0.09   247.52</div>		<div>90.31   0.03</div>	
<div>Acquisition SystemSoftware VersionOther</div>														
<div>Cadence</div>			<div>RT 5.4</div>			<div>H&amp;P 321</div>								
<div>Pilot Studio</div>			<div>5.4.8632.4</div>			<div>Contractor: Helmerich &amp; Payne Drilling Co</div>								
						<div>District: RMA</div>								
						<div>Unit: D&amp;E</div>								

(C) 2019 Baker Hughes, a GE company, LLC - All rights reserved. Baker Hughes, a GE company, LLC and its affiliates ("BHGE") provides this information on an "as is" basis for general information purposes and believes it to be accurate as of the date of publication. BHGE does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. BHGE hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. The BHGE logo is a trademark of Baker Hughes, a GE company, LLC. GE and the GE monogram are trademarks of General Electric Company used under trademark license.

## 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	1932.00	17211.00	1932.00	17224.00	2019-11-24 18:37	2019-11-26 22:38	52.60

## Crew

Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite	Name	Arrive Wellsite	Depart Wellsite
Tien Bui	2019-11-23	2019-11-25	Andrew Hays	2019-11-25	2019-11-27			

## 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+ (%)
2019-11-23 16:51	1	1932.00	Oil Based Mud	9.2	10	N/A	19.5	76.8/23.2	Active Pit	30000	0.00
2019-11-25 07:07	1	6260.00	Oil Based Mud	9.1	11	N/A	17.6	78/22	Active Pit	33000	0.00
2019-11-26 16:00	1	15267.00	Oil Based Mud	9.7	14	N/A	17.2	68.3/19	Active Pit	29000	0.00
2019-11-27 05:00	1	17224.00	Oil Based Mud	9.6	16	N/A	17.8	67.5/20	Active Pit	29000	0.00

## Mud Resistivity Record

Mud Resistivity Record				Surface				Downhole		
Date / Time	Run No.	Depth (ft)	Surface Temp (degF)	Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)	BHCT (degF)	Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
2019-11-25 16:00	1	1932.00	98.0	100.000	N/A	N/A	225.0	100.000	N/A	N/A

## Equipment and Service Data

Run No.	Tool	Serial Number	Measurement	Sensor Offset	Bit Offset	Max Q.D.	Min I.D.
------------	------	------------------	-------------	------------------	---------------	-------------	-------------

No.		Number		Offset (ft)	Offset (ft)	O.D. (in)	I.D. (in)
1	AutoTrak Curve Steering Unit	14921839	Near Bit Inclination	5.93	6.78	7.000	4.330
1	AutoTrak Curve Steering Unit	14921839	Near Bit VSS	5.93	6.78	7.000	4.330
1	AutoTrak Curve MWD	14219765	Gamma (single)	2.76	12.95	6.938	3.250
1	AutoTrak Curve MWD	14219765	Directional (mag)	12.27	22.46	6.938	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
BCPM	BCPM	Bi-Directional Communication and Power Module, OnTrak Platform

Comments

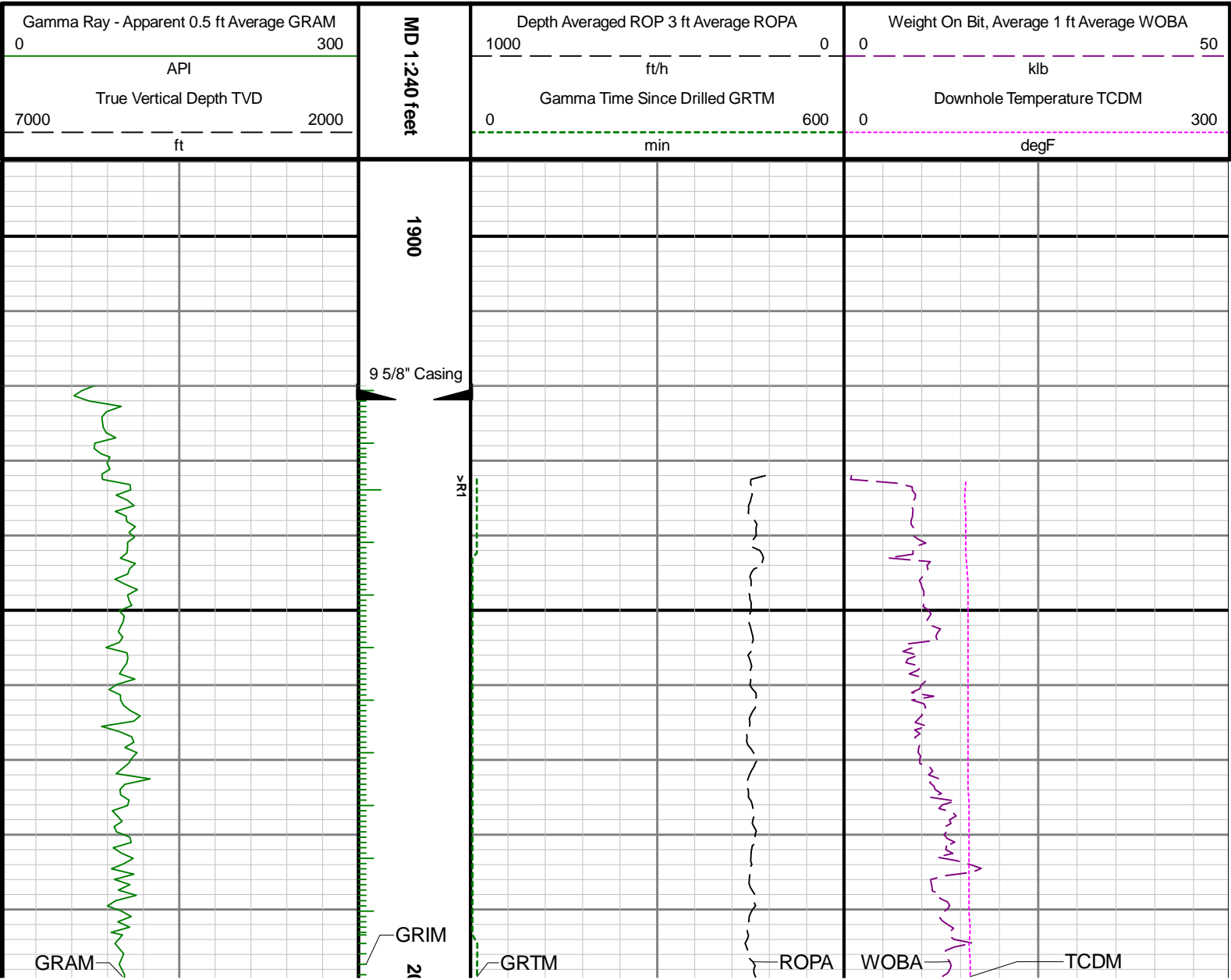
1	Depth measurements were obtained from a depth control system not supplied or operated by Baker Hughes. Due to lack of control by Baker Hughes, depth calibrations and measurements could not be independently verified.
2	Baker Hughes LWD Run 1 utilized a 6.75 inch AutoTrak Curve service (Directional and Gamma Ray) behind an 8.5 inch bit and rotary steerable assembly from 1932 to 17224 feet MD (1932 to 6725 feet TVD).
3	The Gamma Ray Apparent (GRAM) is presented 0 to 300 API, as per the customers request.
4	Several gaps appear in the log due to drilling ahead before the assembly had time to properly power on.

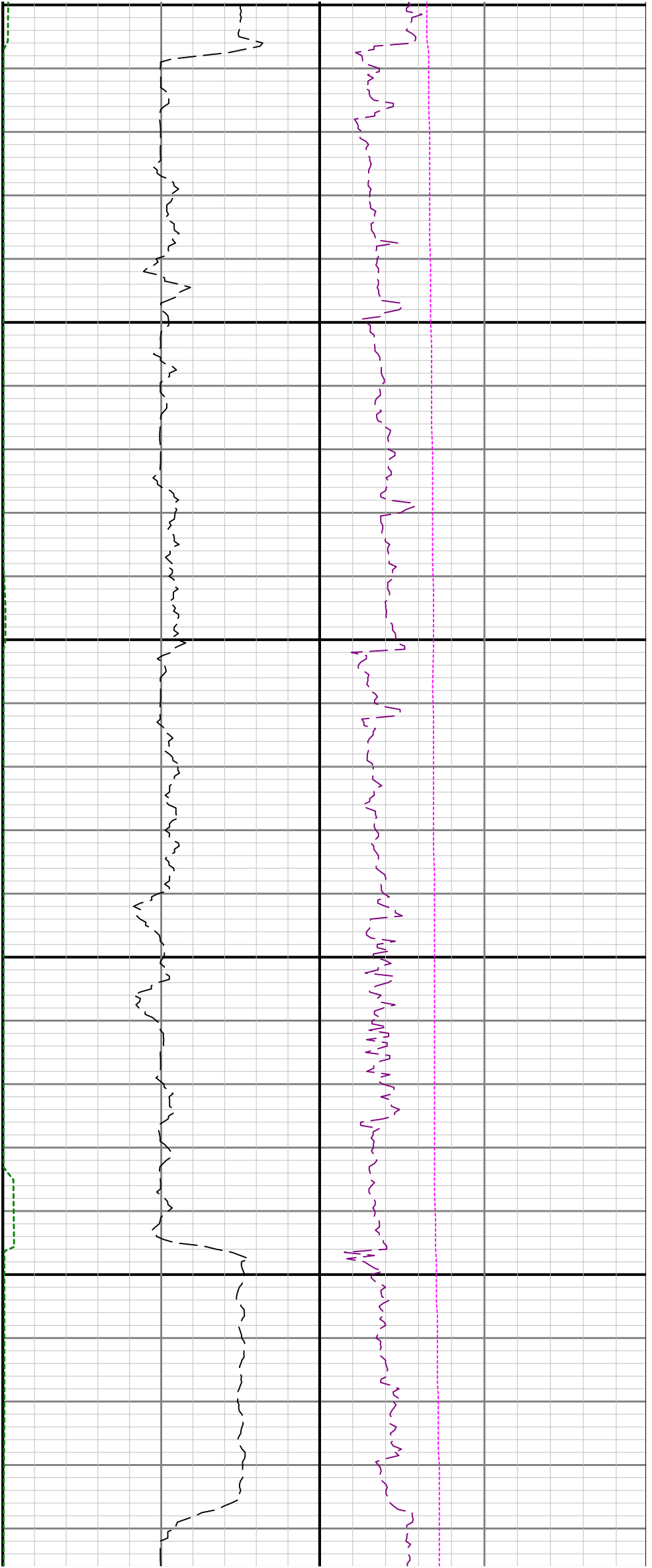
Remarks

Number	Depth (ft)	Hole Section (in)	Run No.	Remark
1	17211.00	8.500	1	The interval from 17211 to 17224 feet MD (6725 feet TVD) was not logged due to the sensor offset to bit.

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



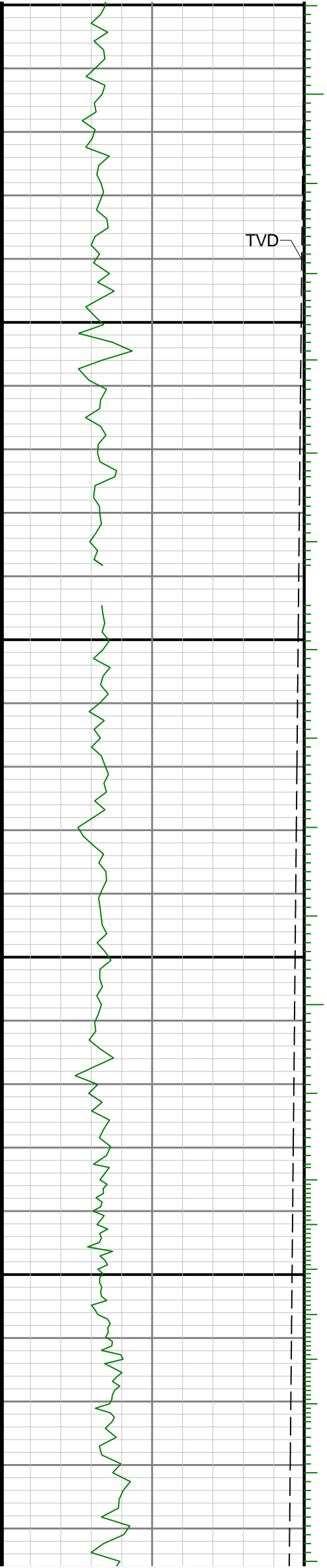


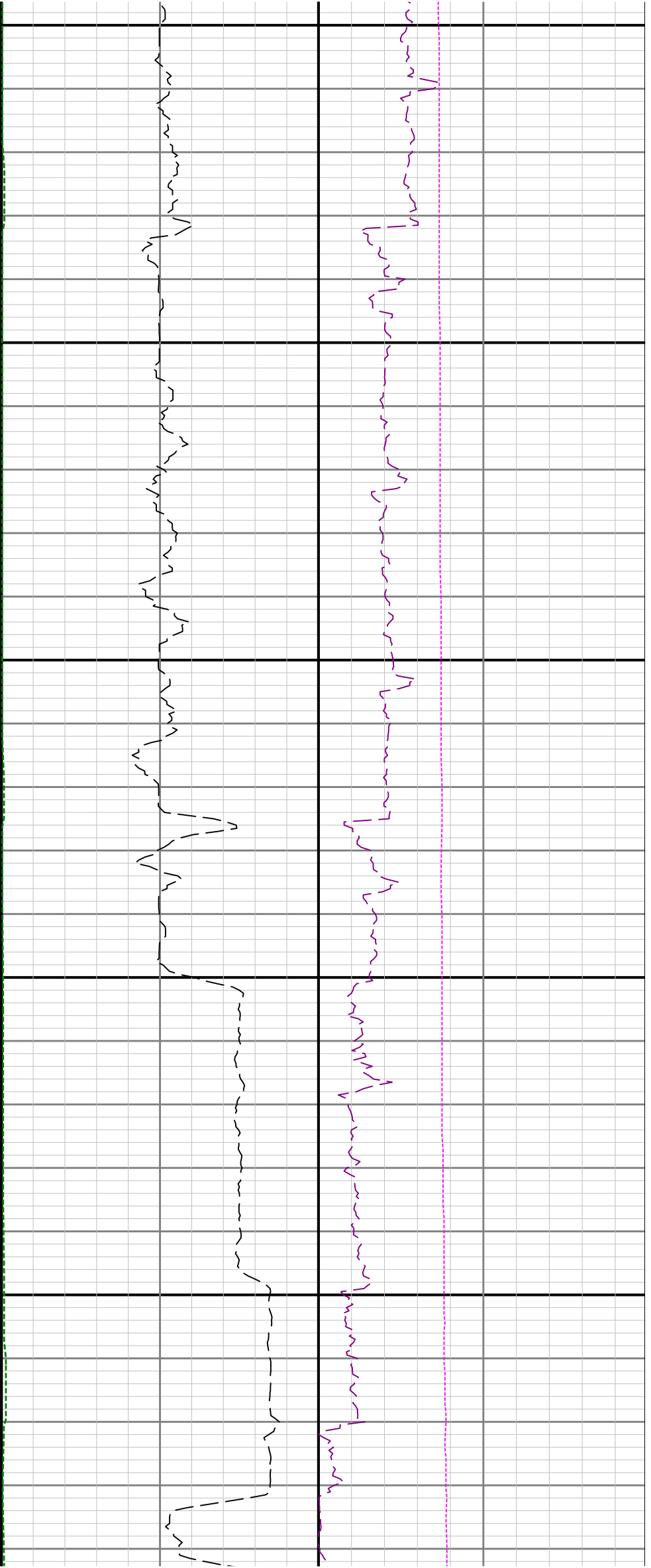
100

2100

2200

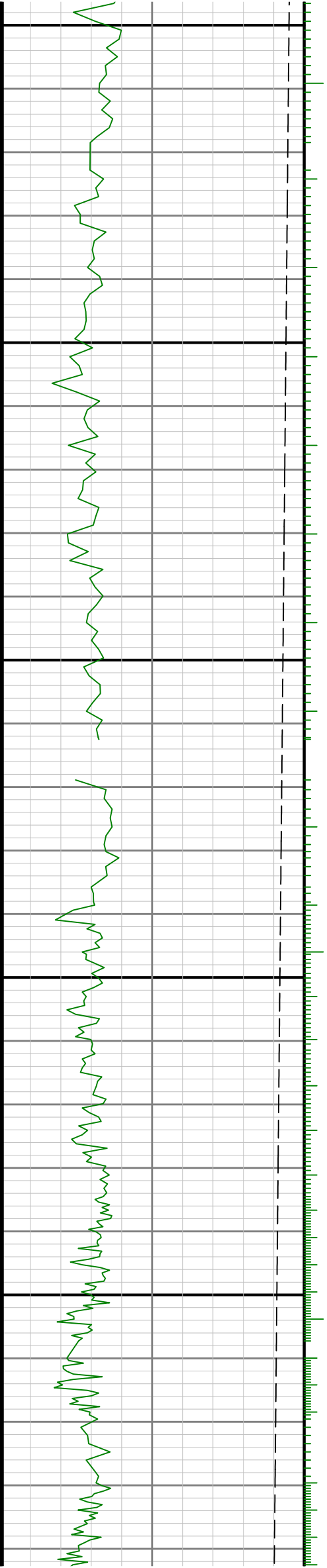
TVD

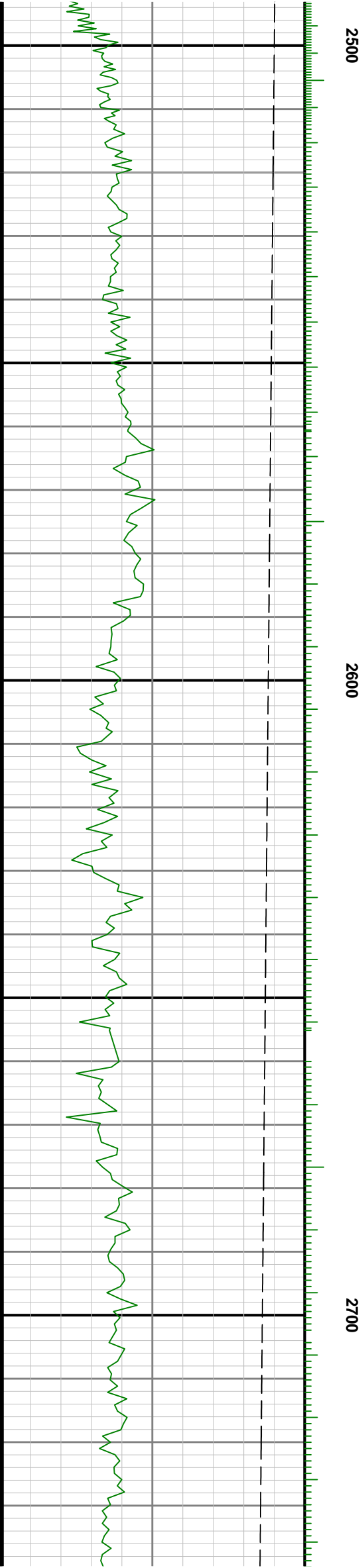
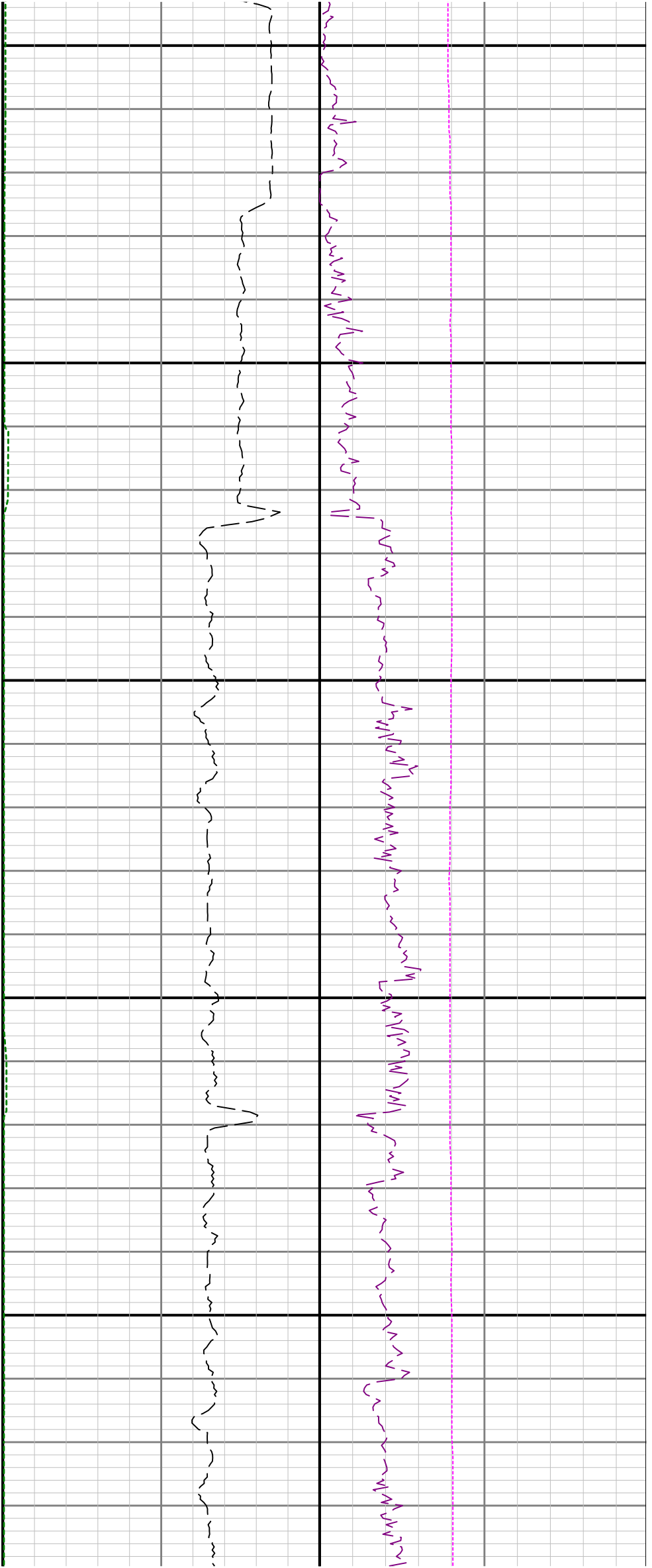


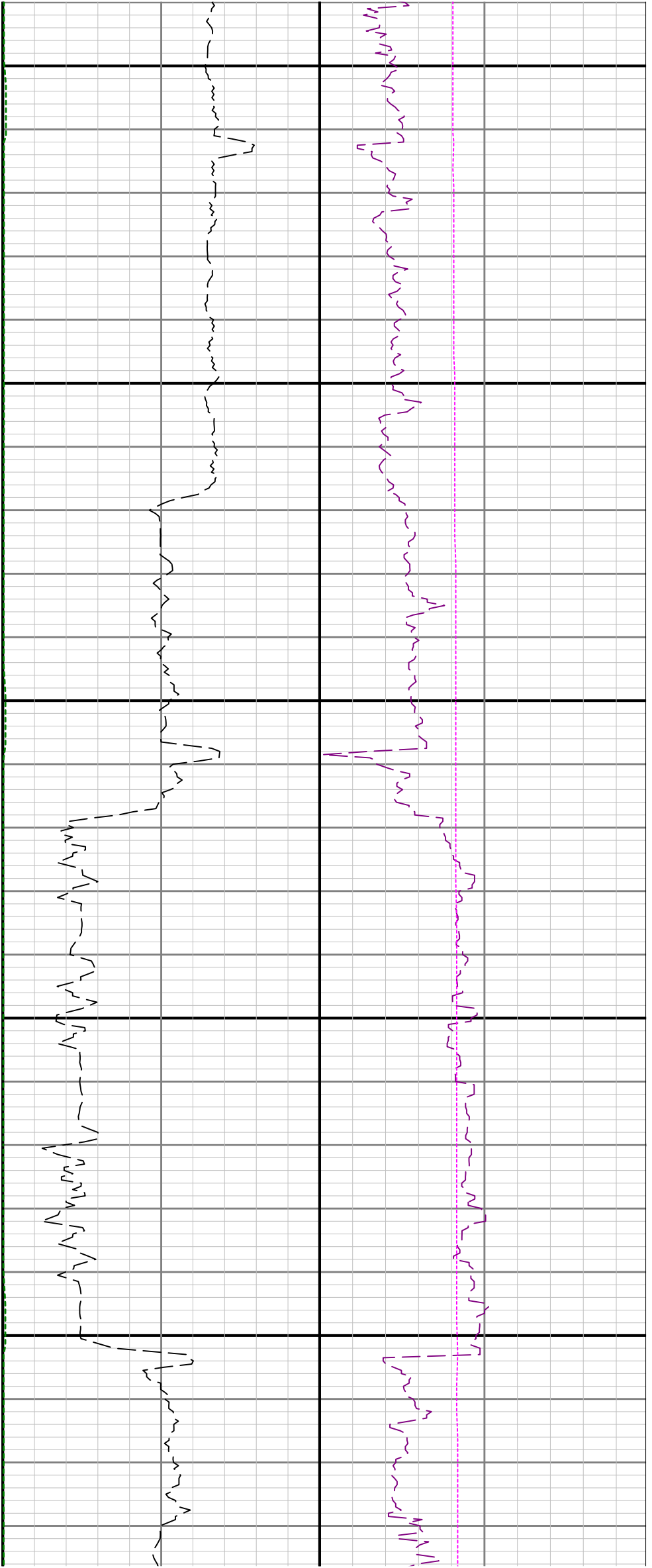


2300

2400

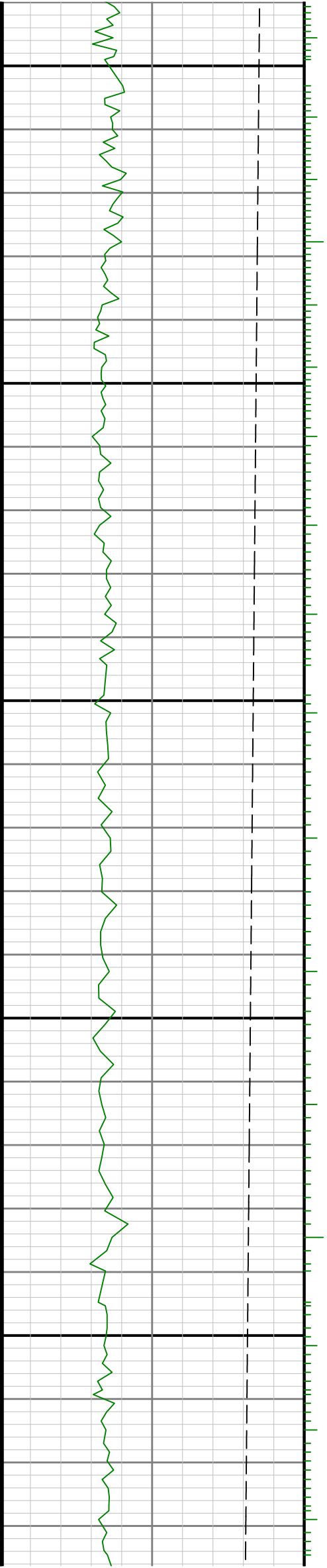


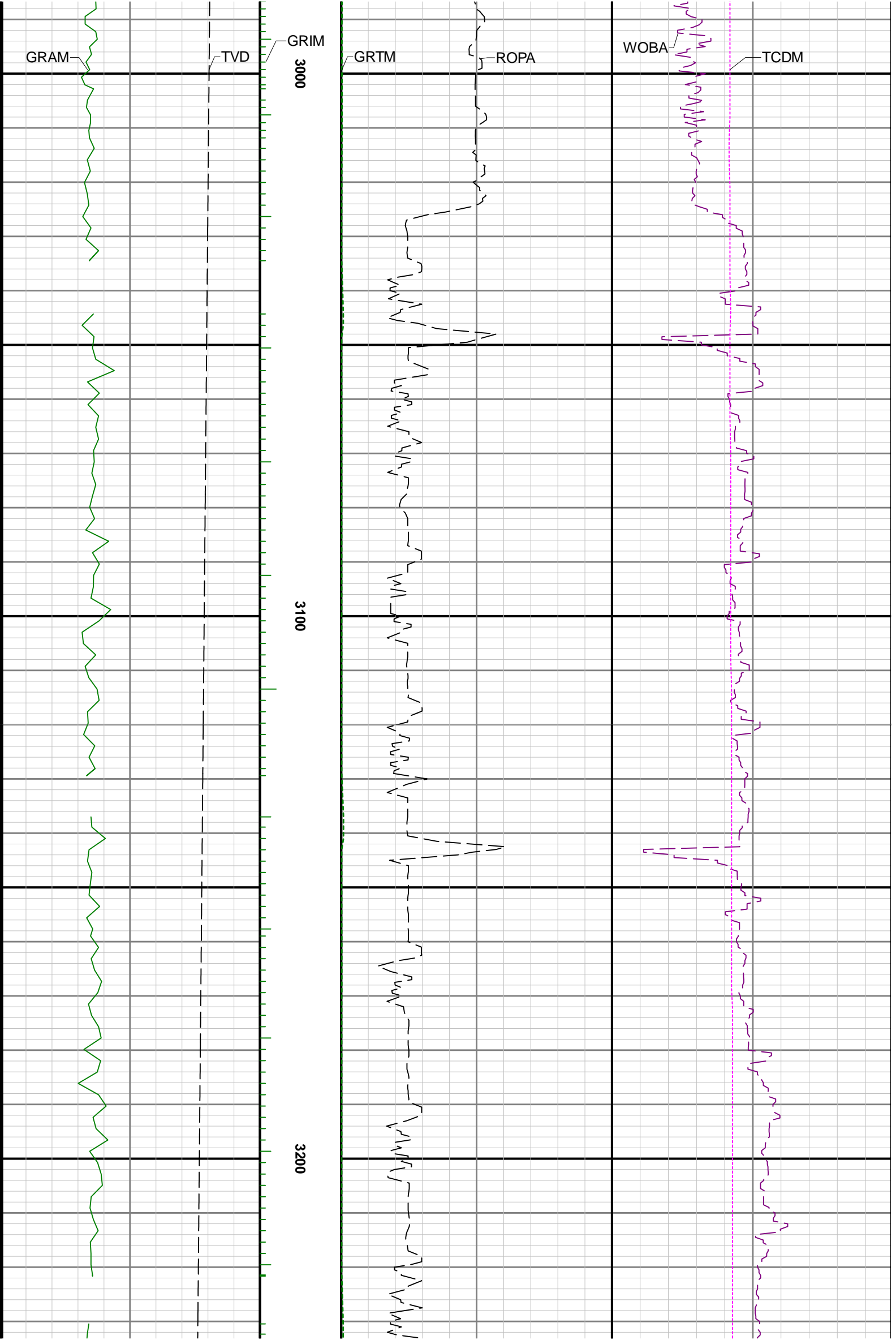




2800

2900

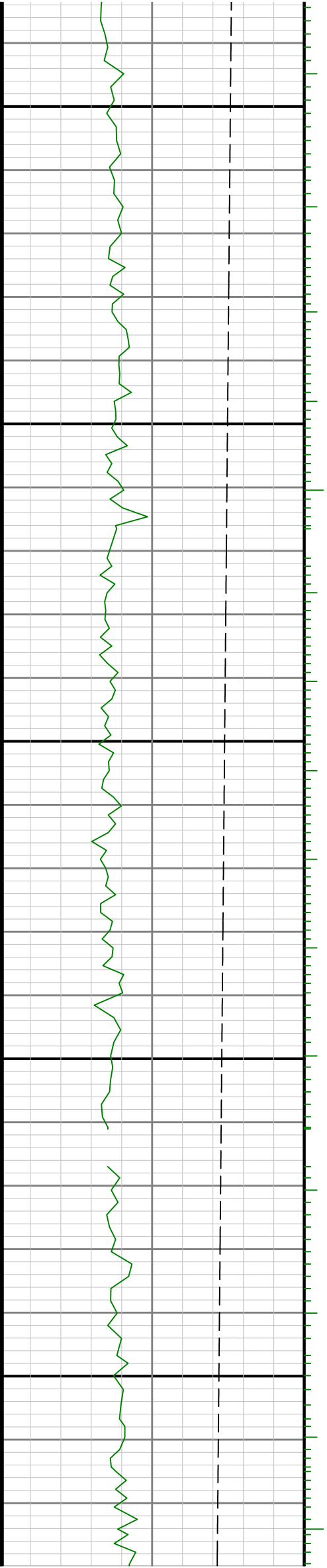




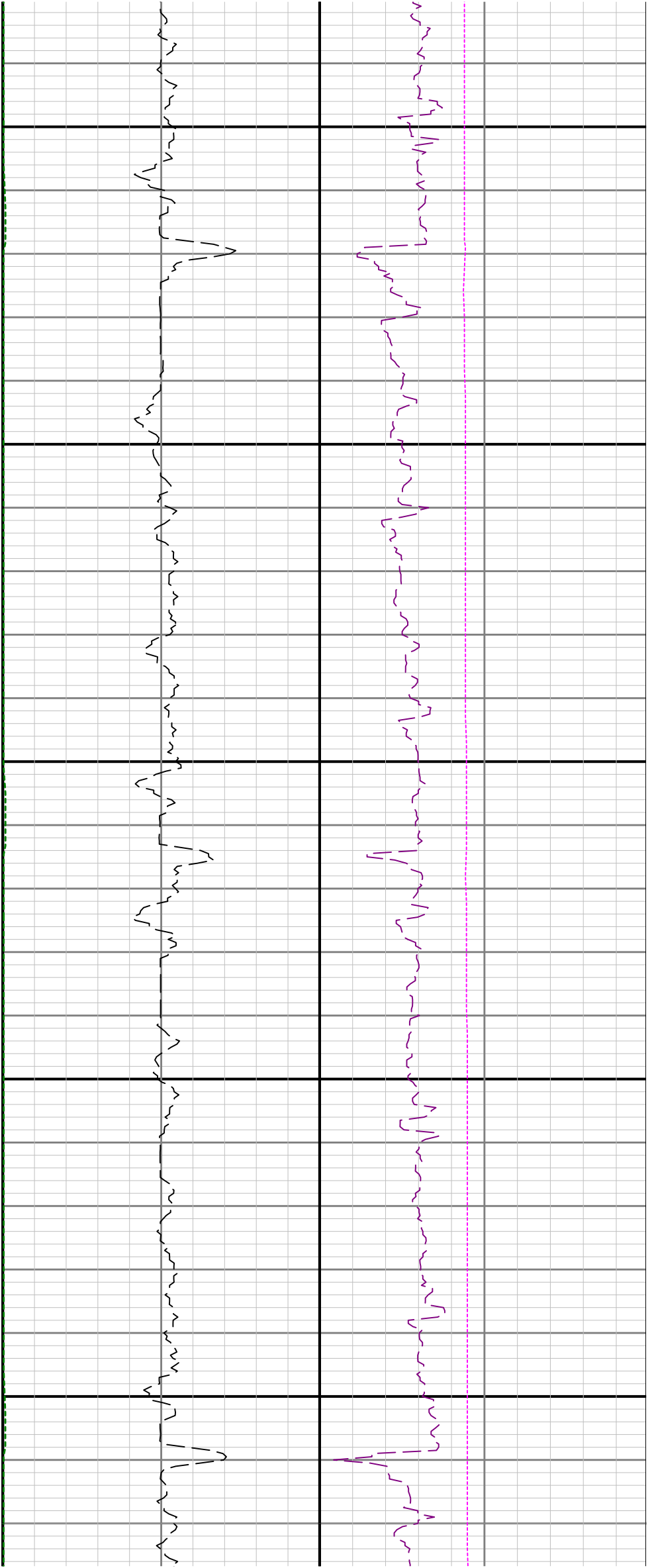


3300

3400



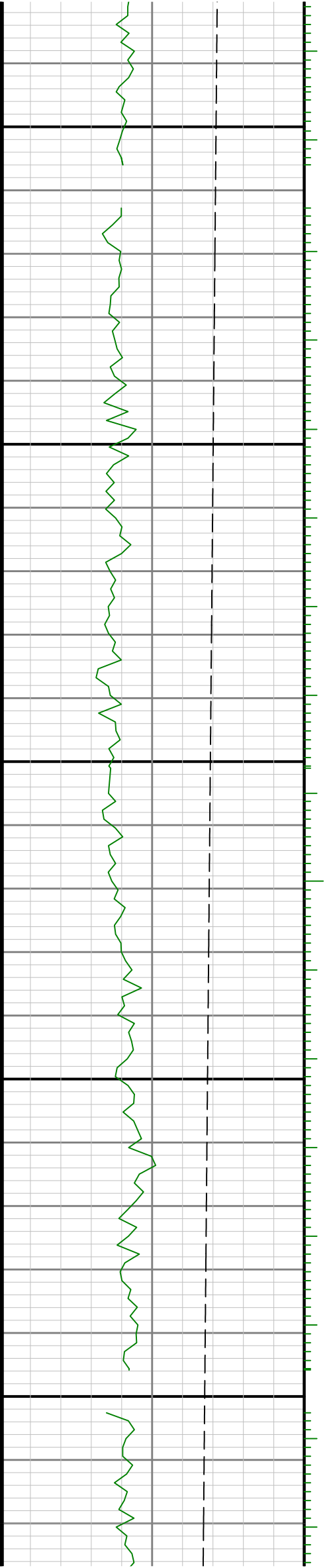


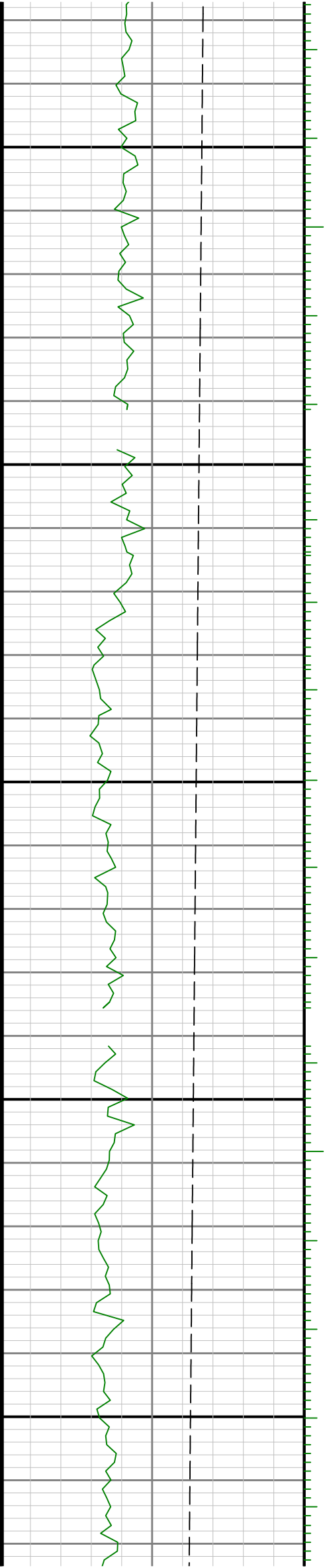
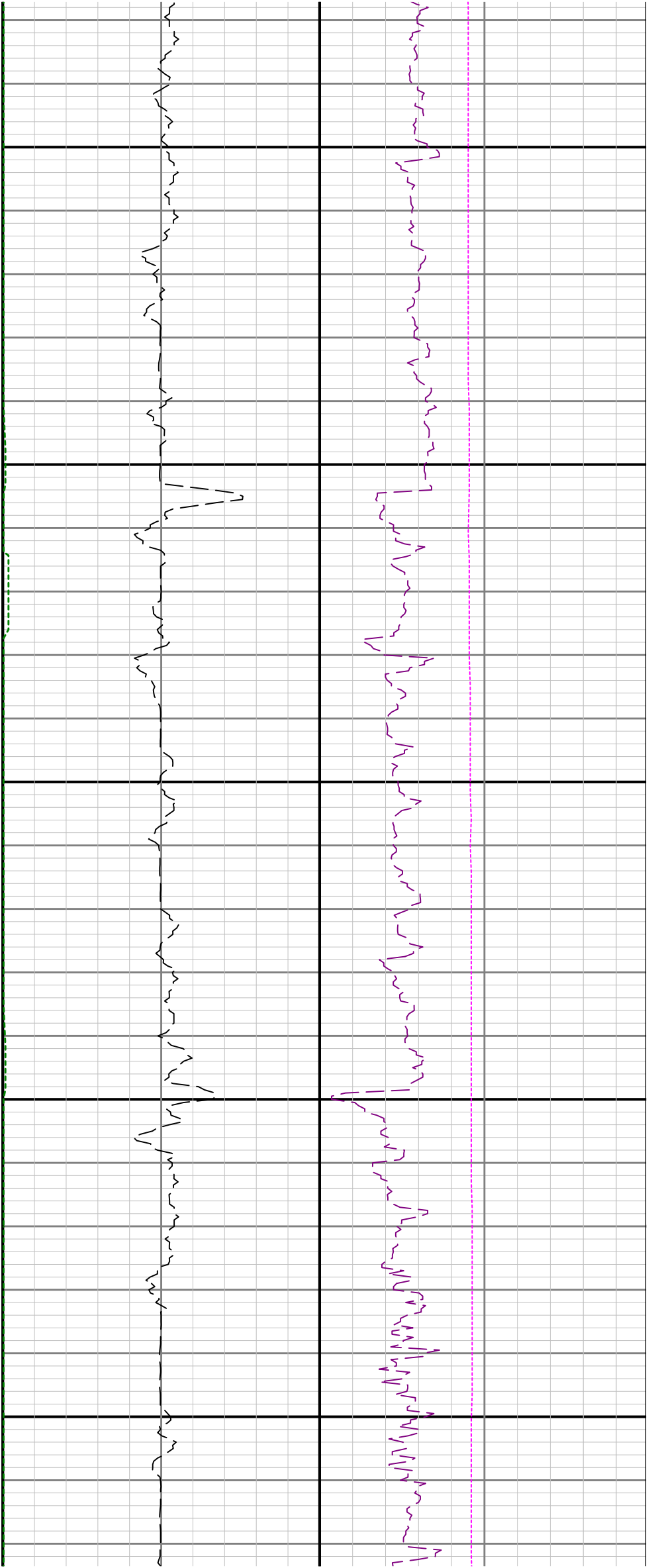


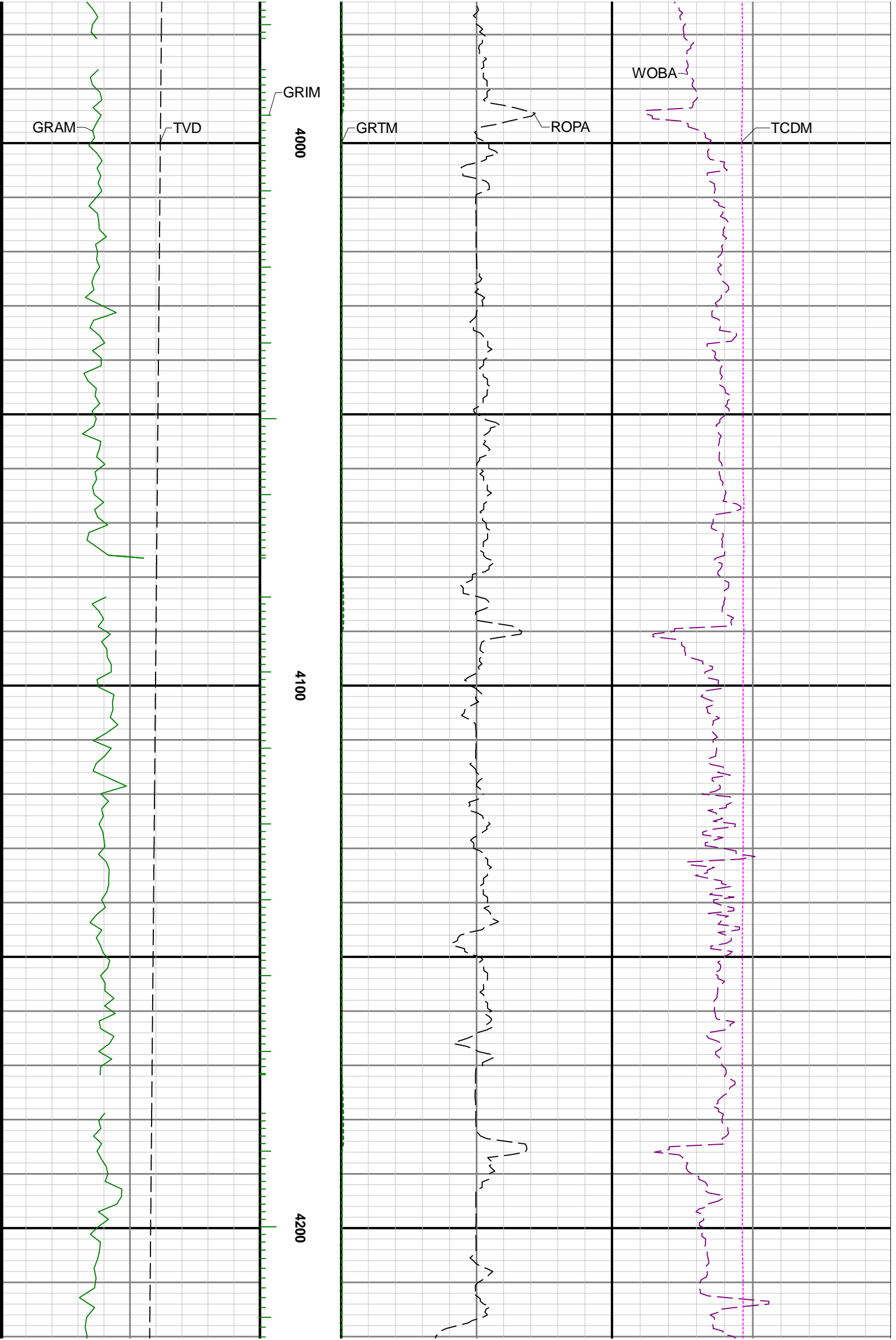
3500

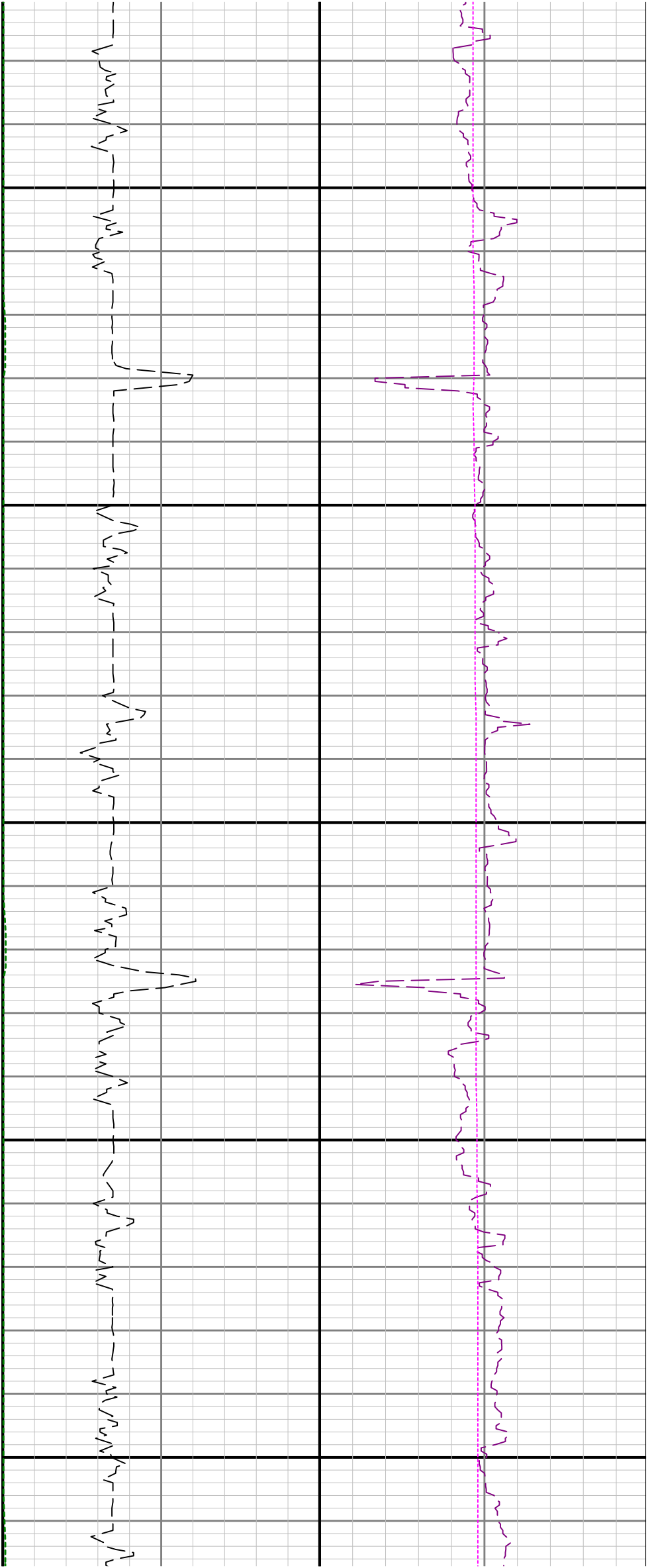
3600

3700



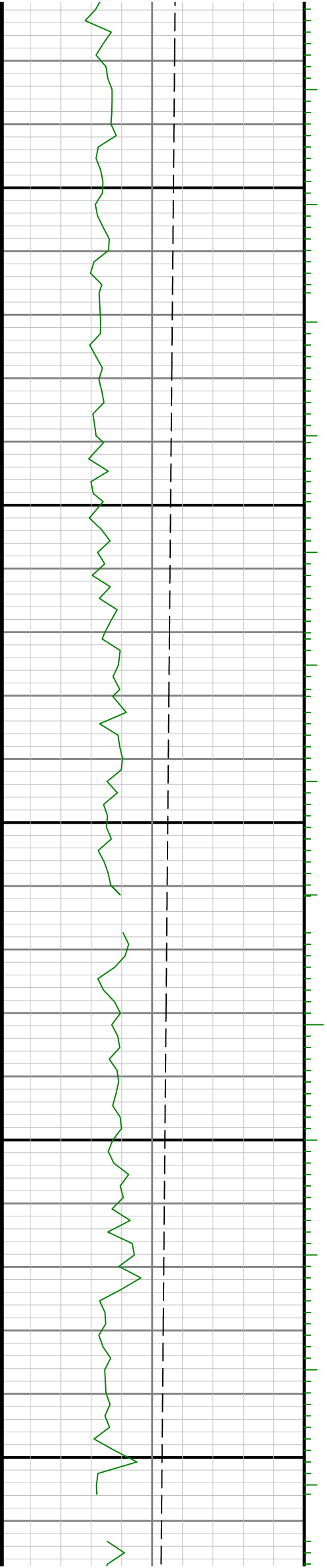


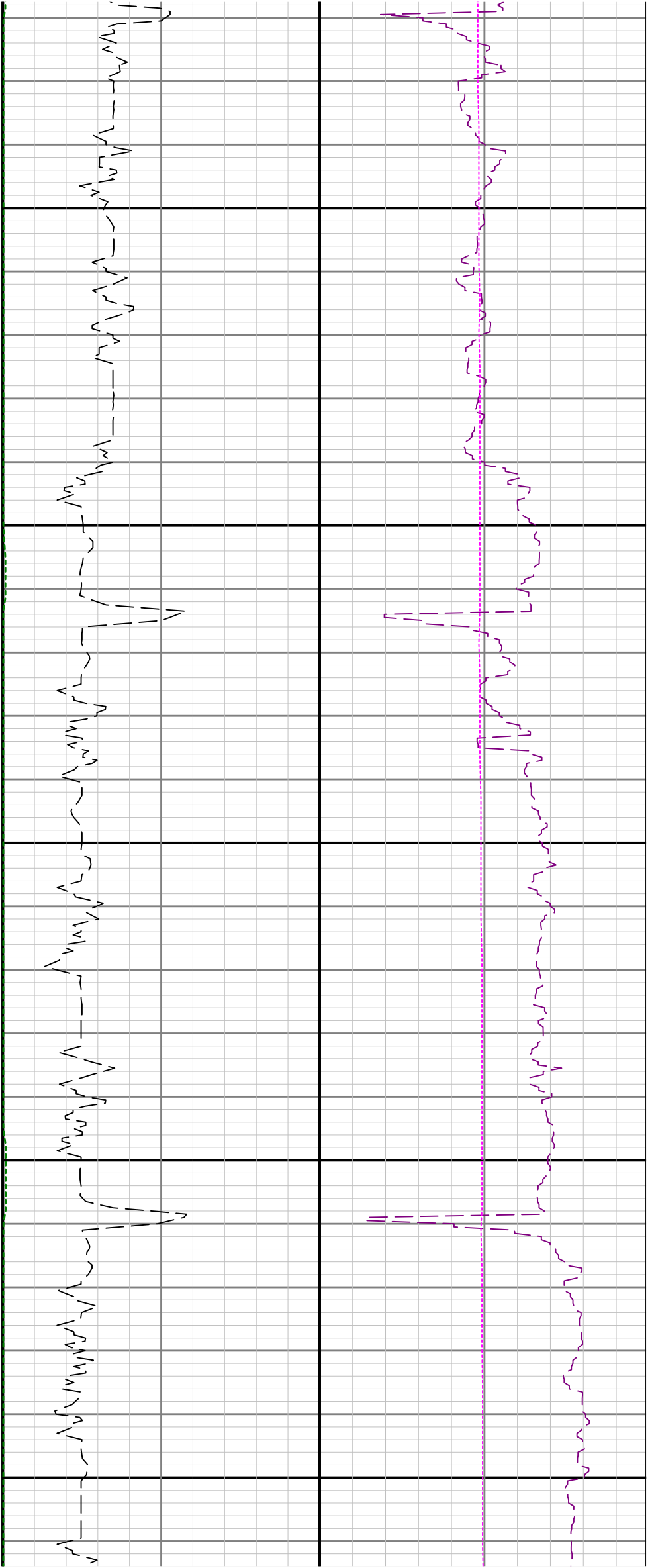




4300

4400

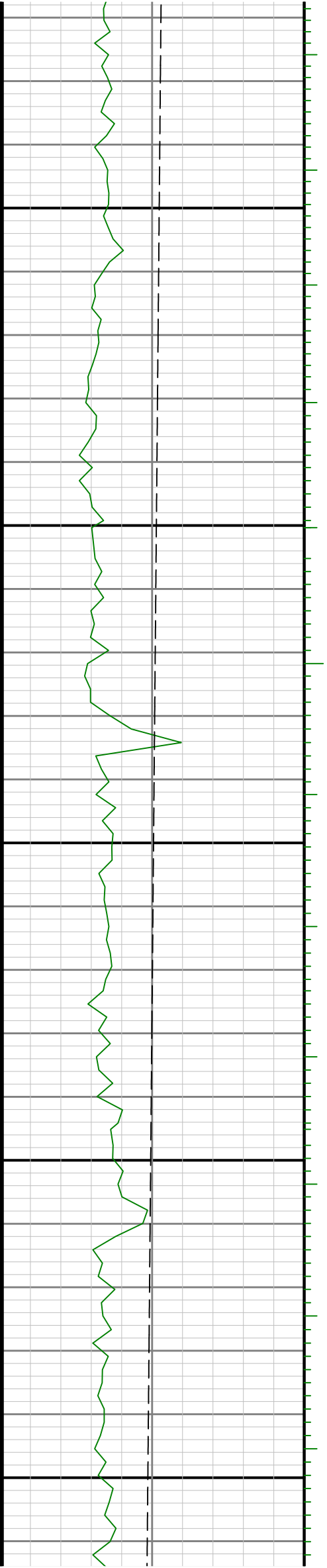


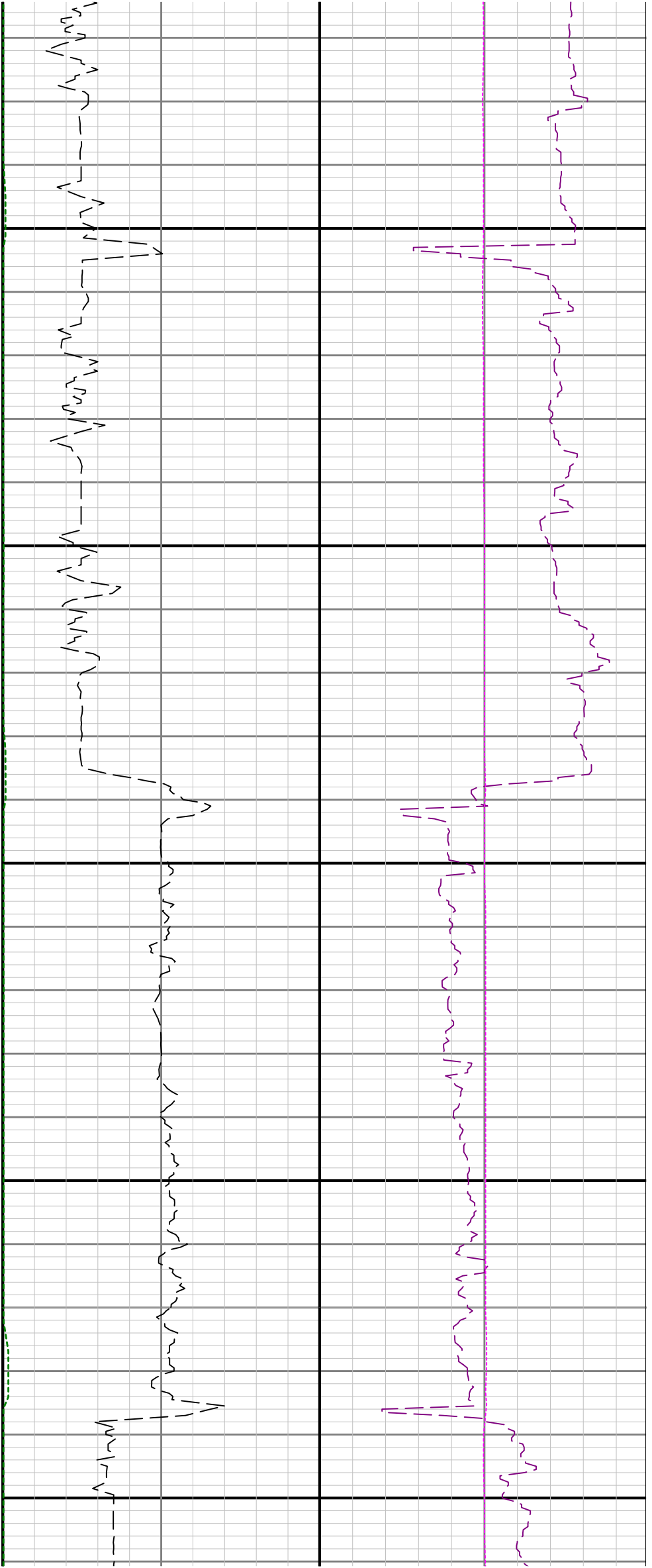


4500

4600

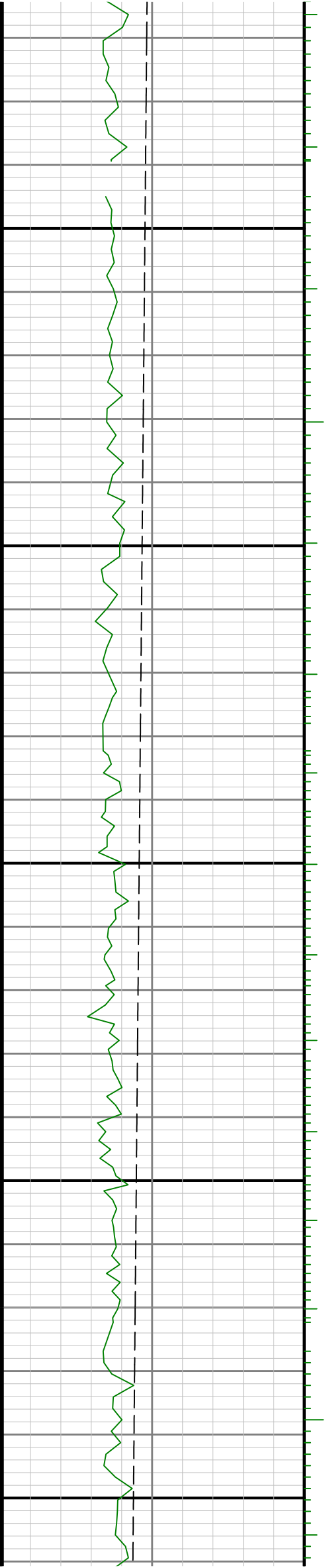
4700

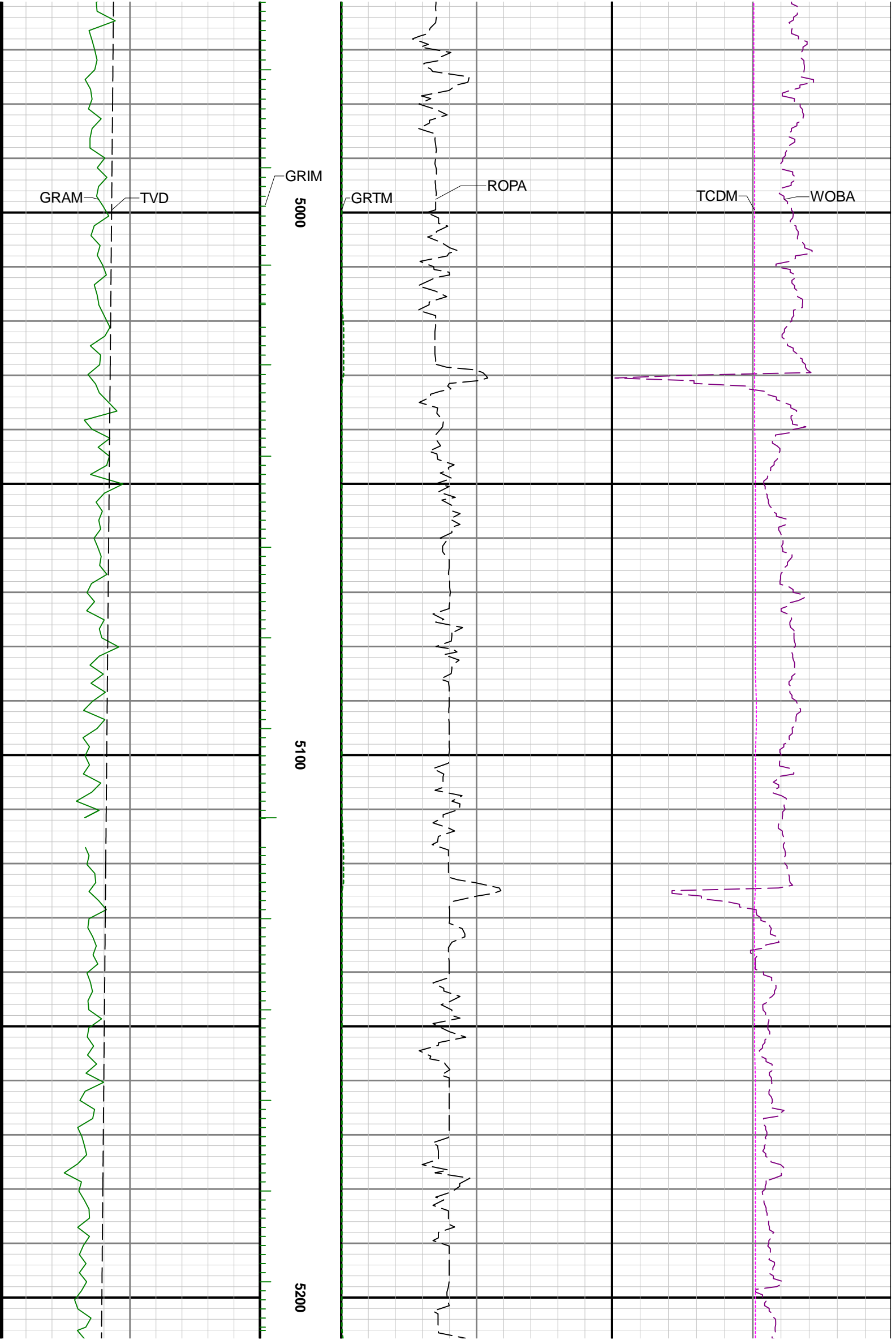


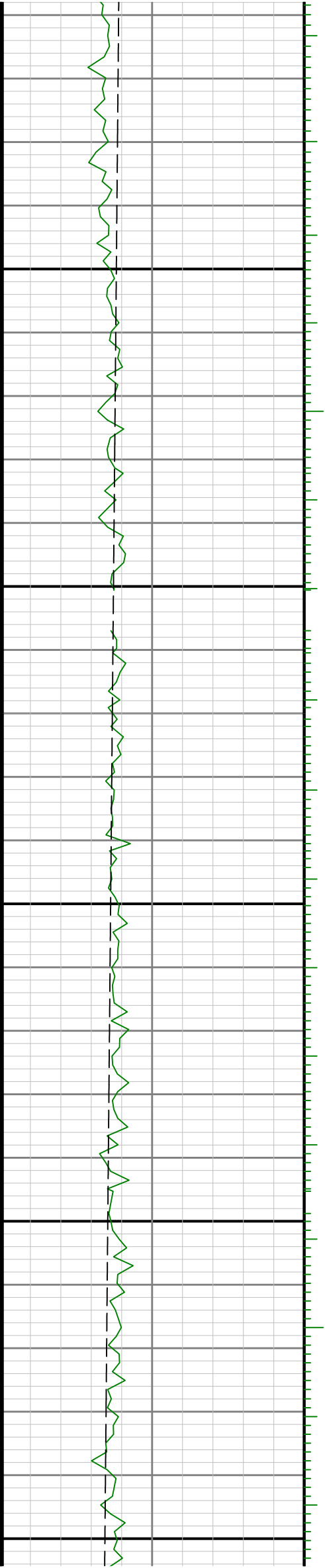
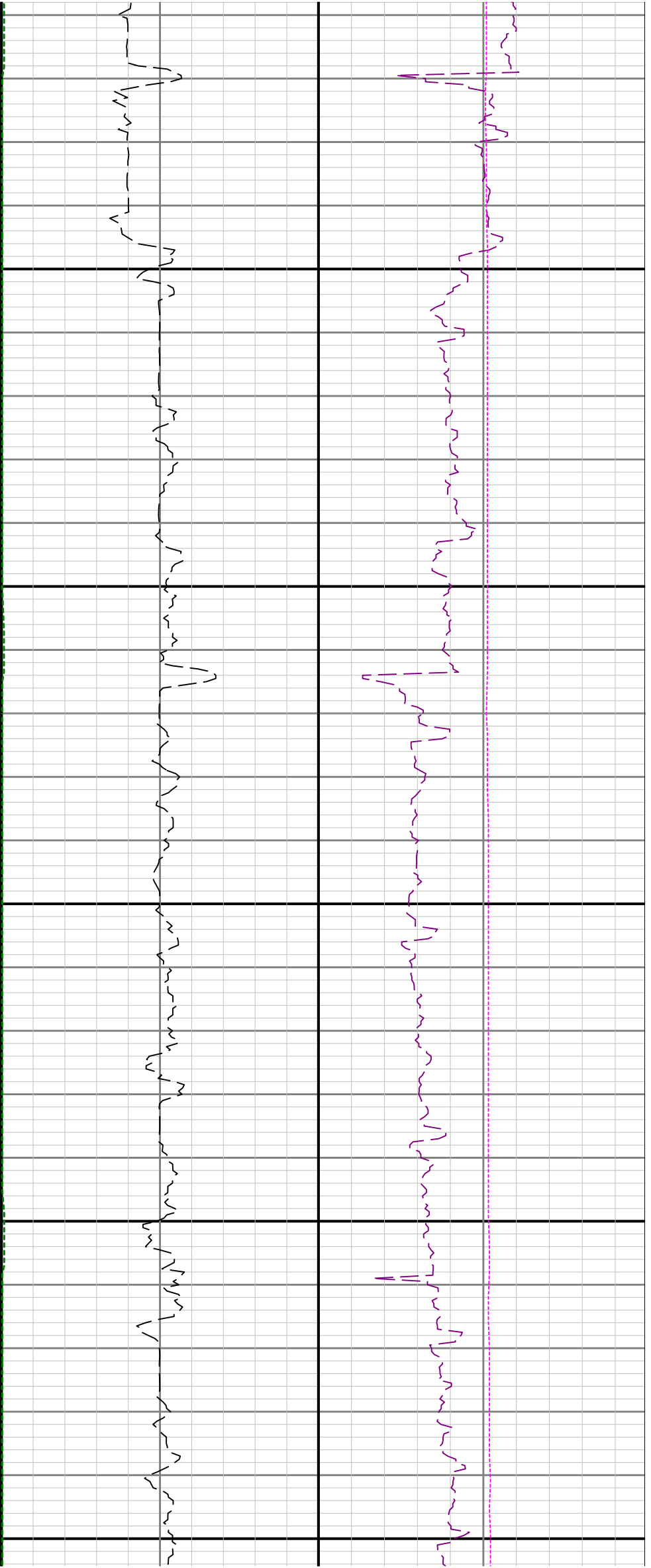


4800

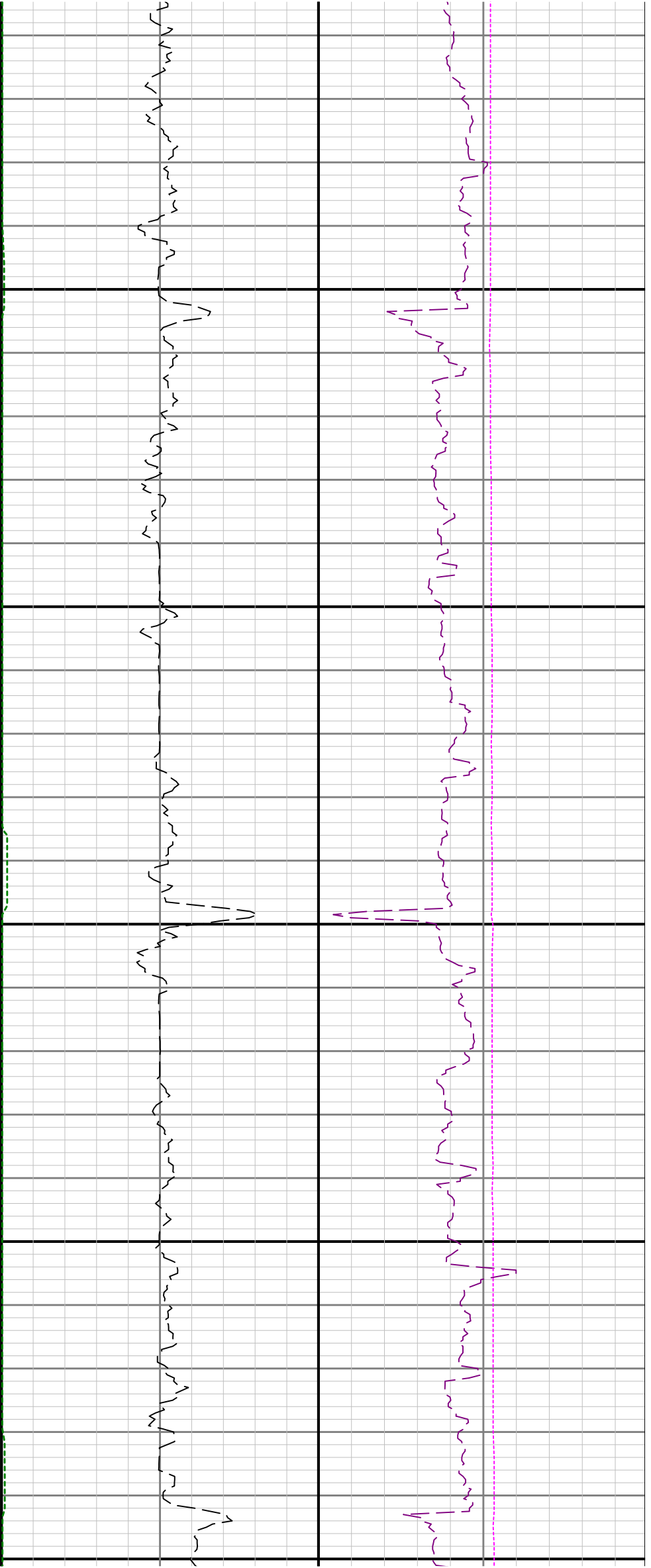
4900







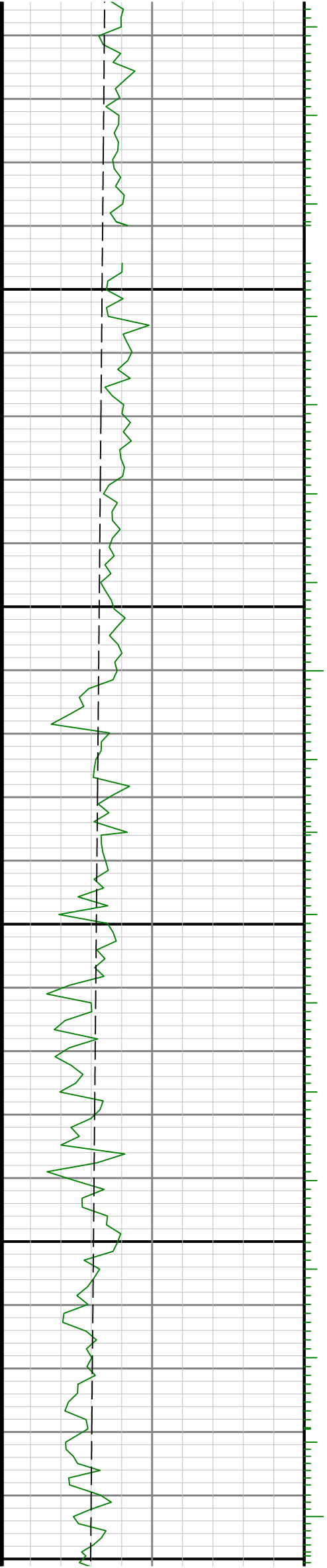




5500

5600

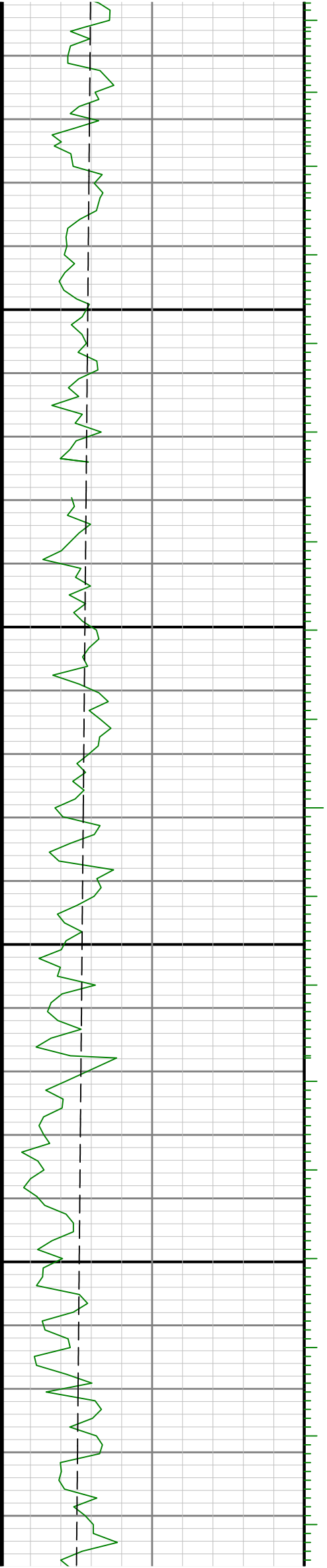
5700

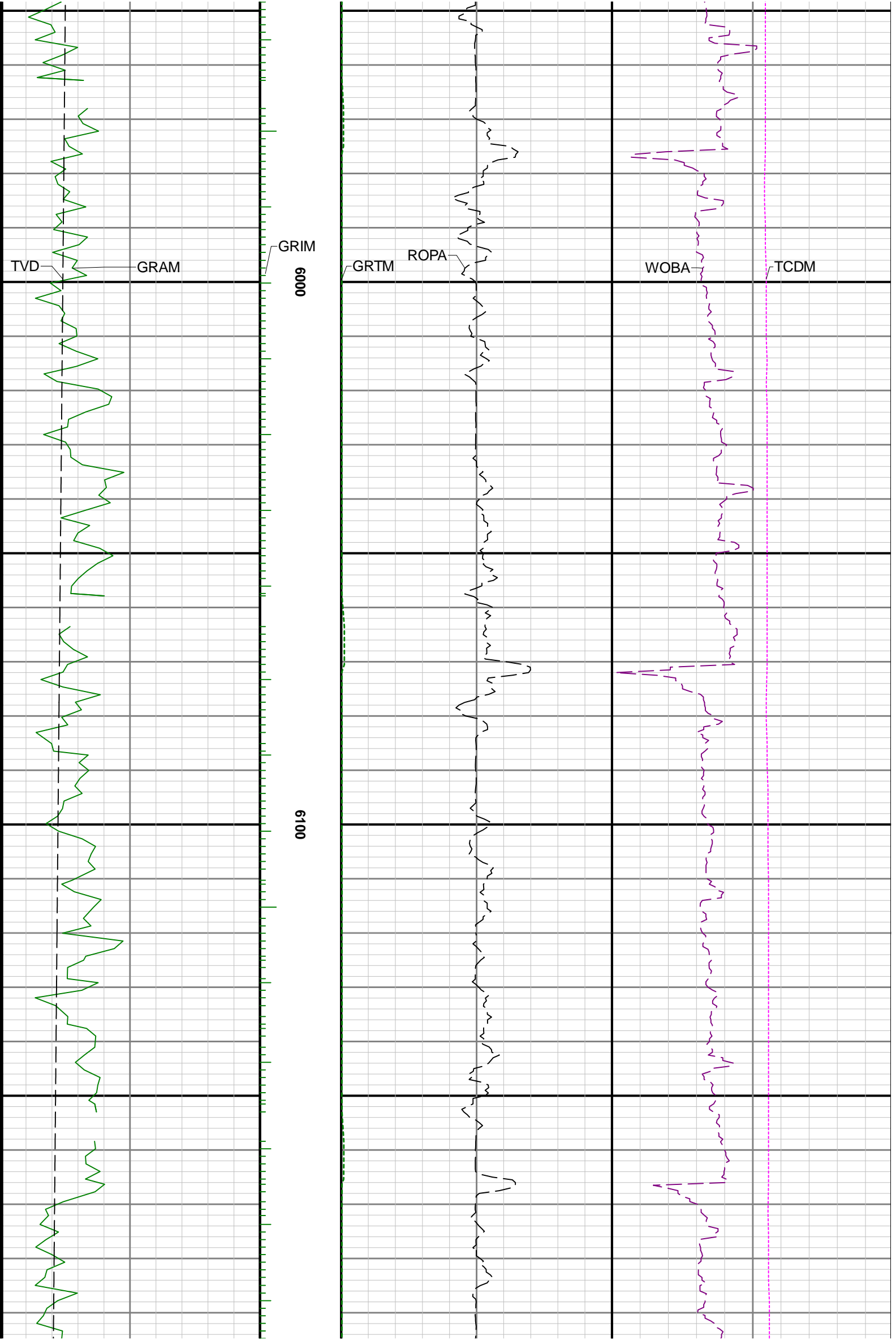


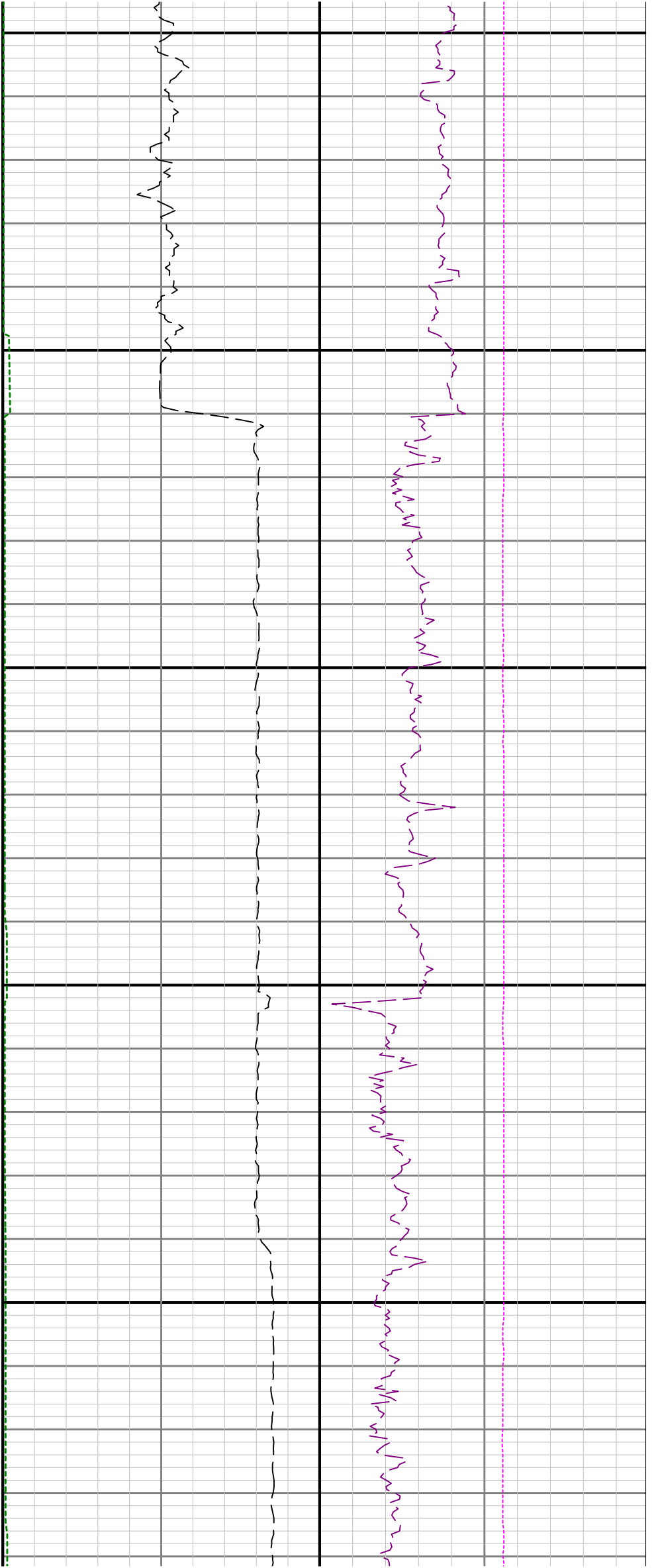


0 5800

5900



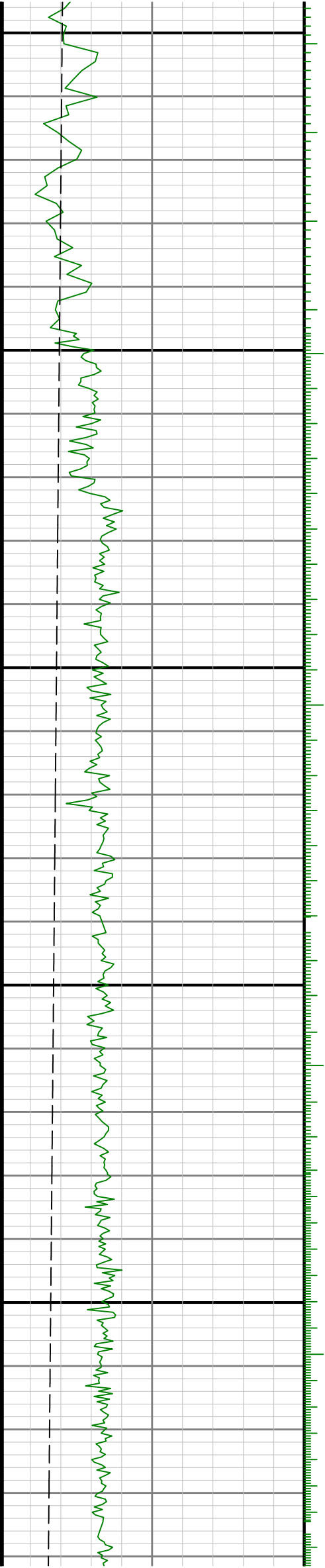


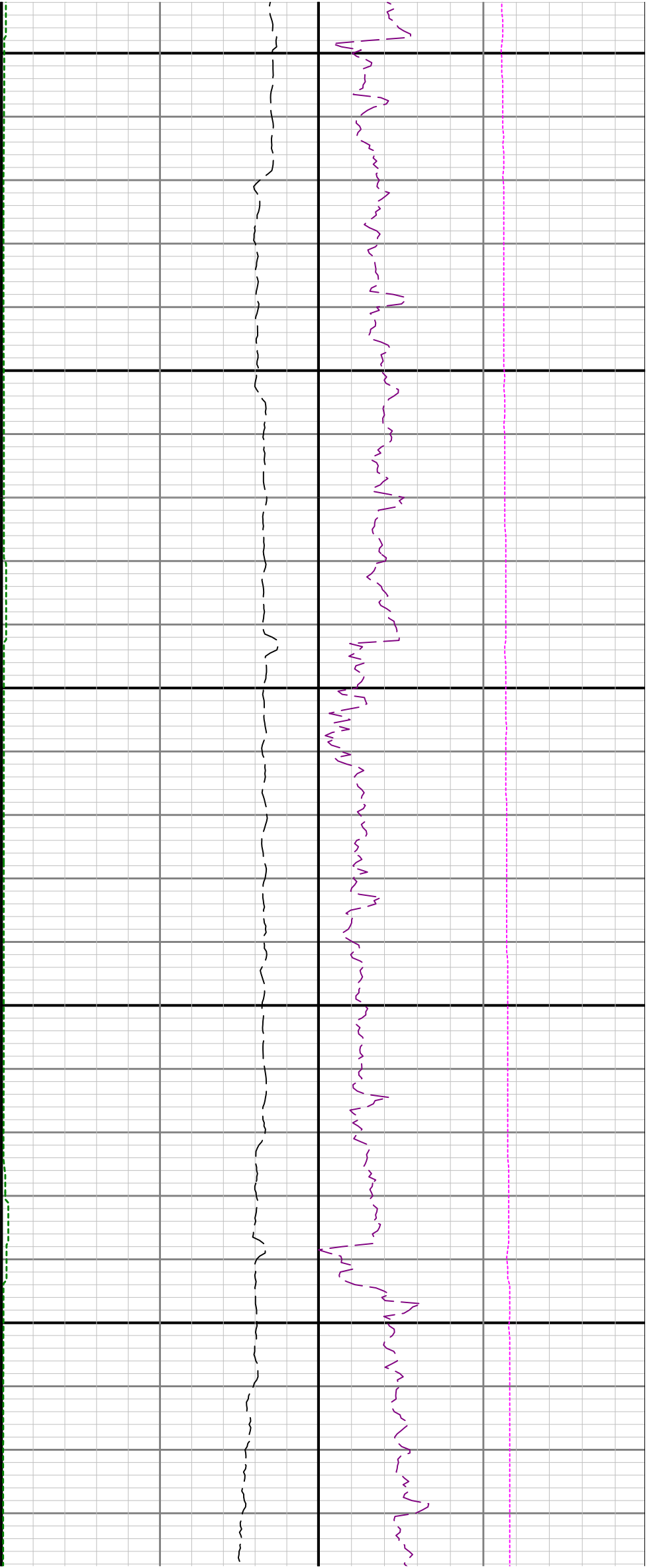


6200

6300

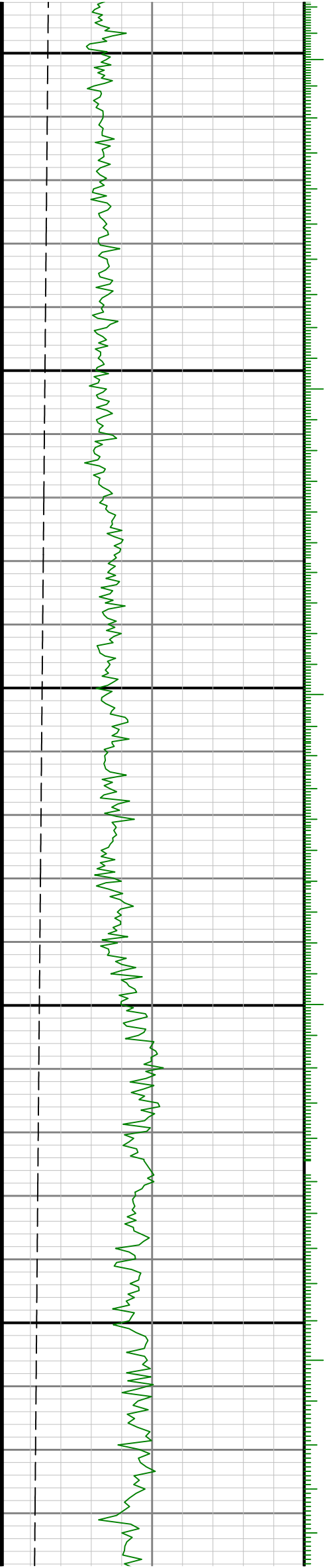
6400

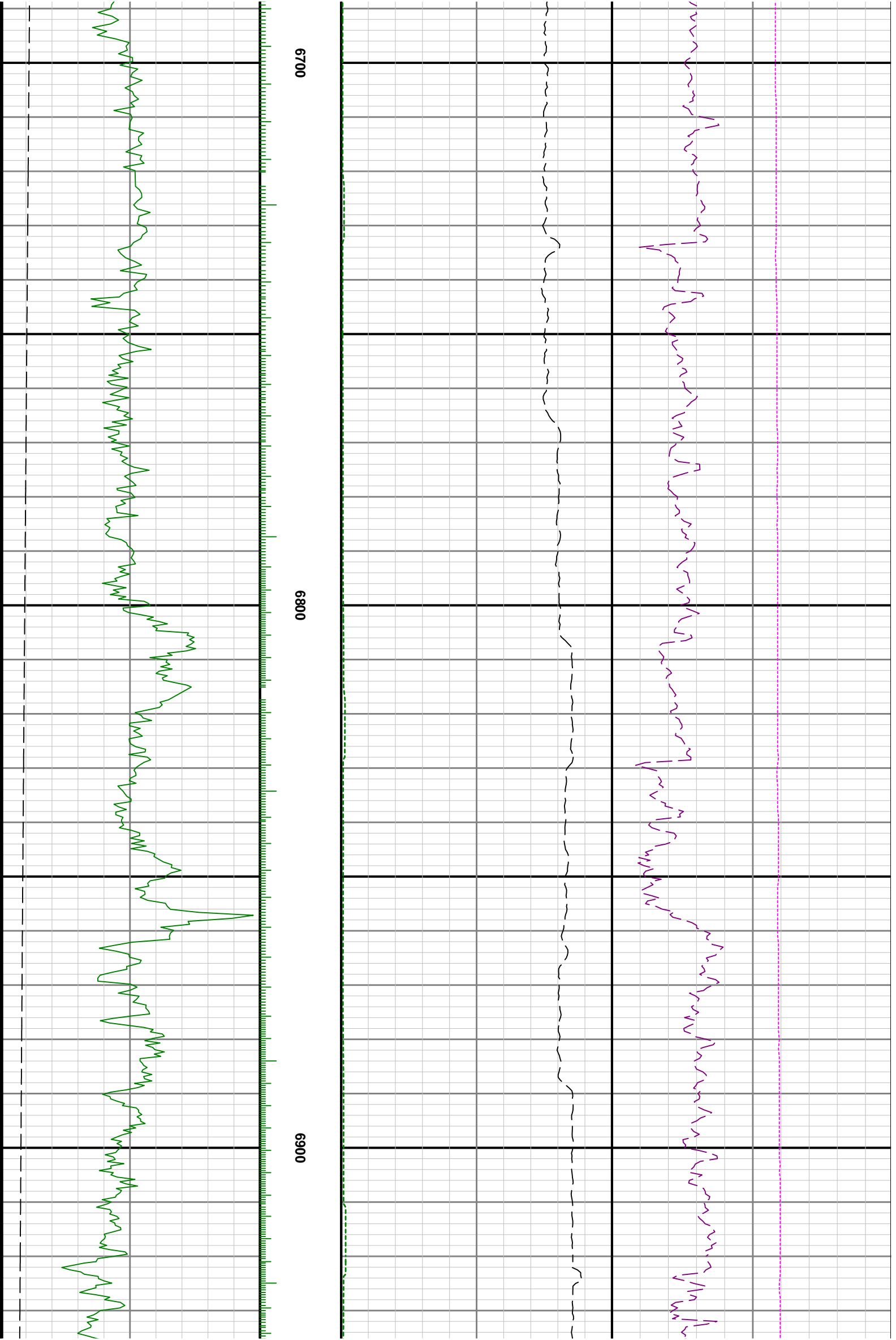


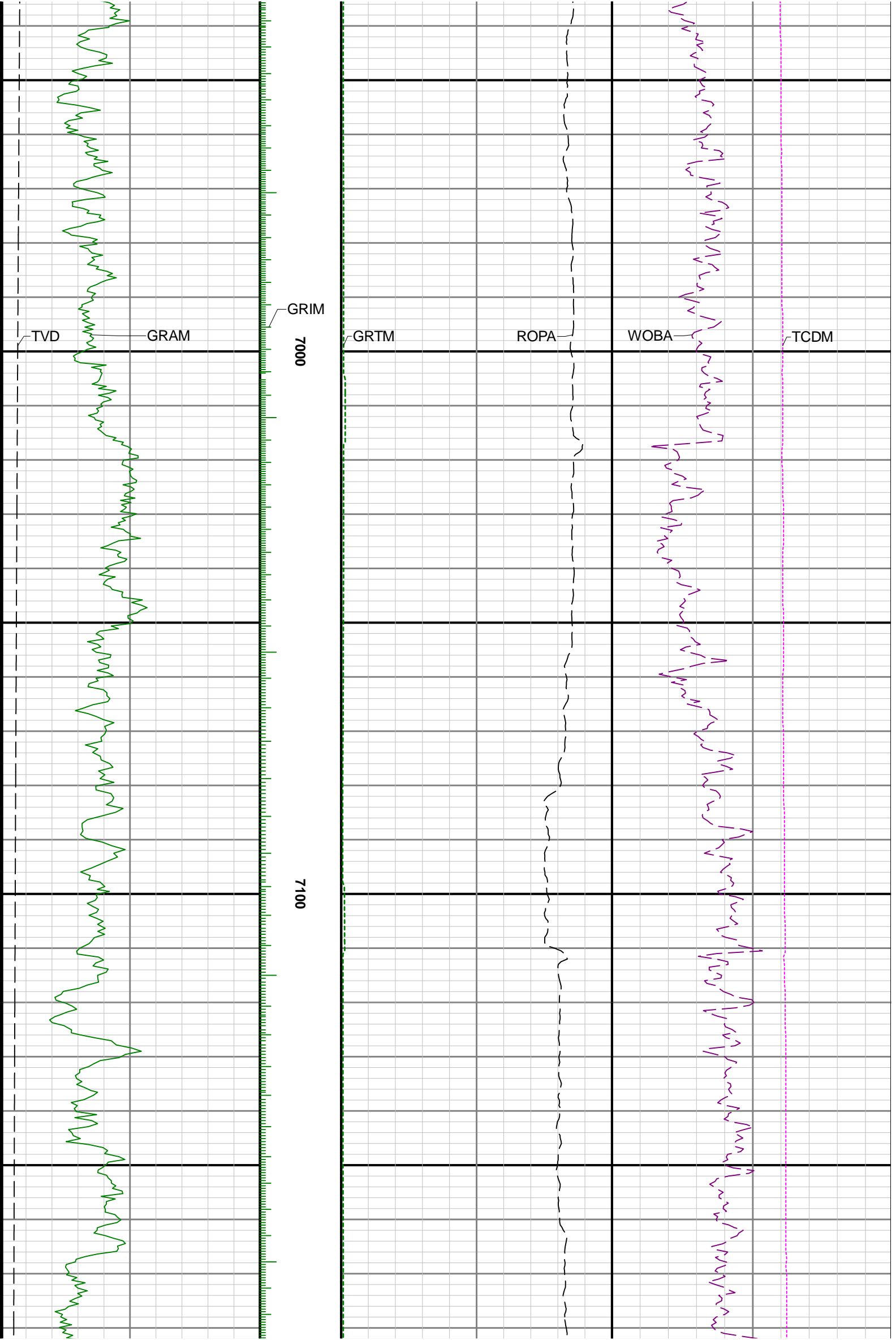


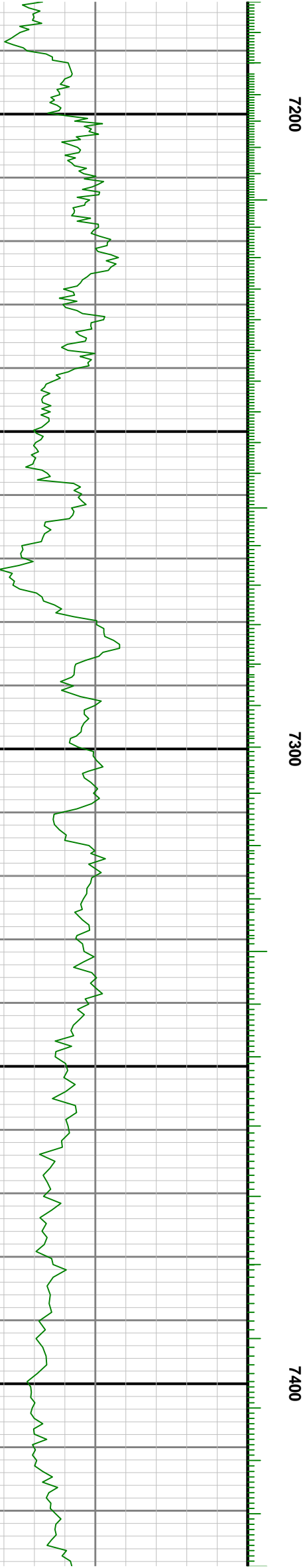
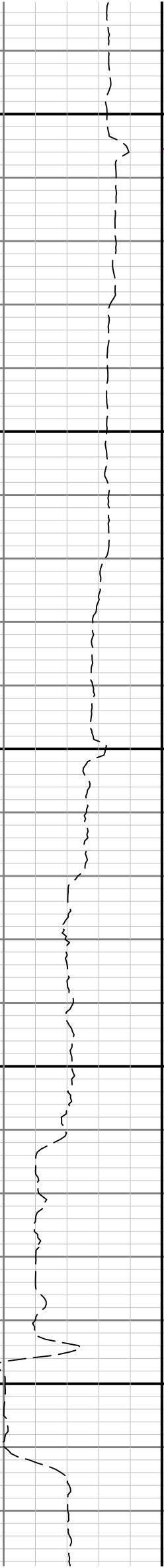
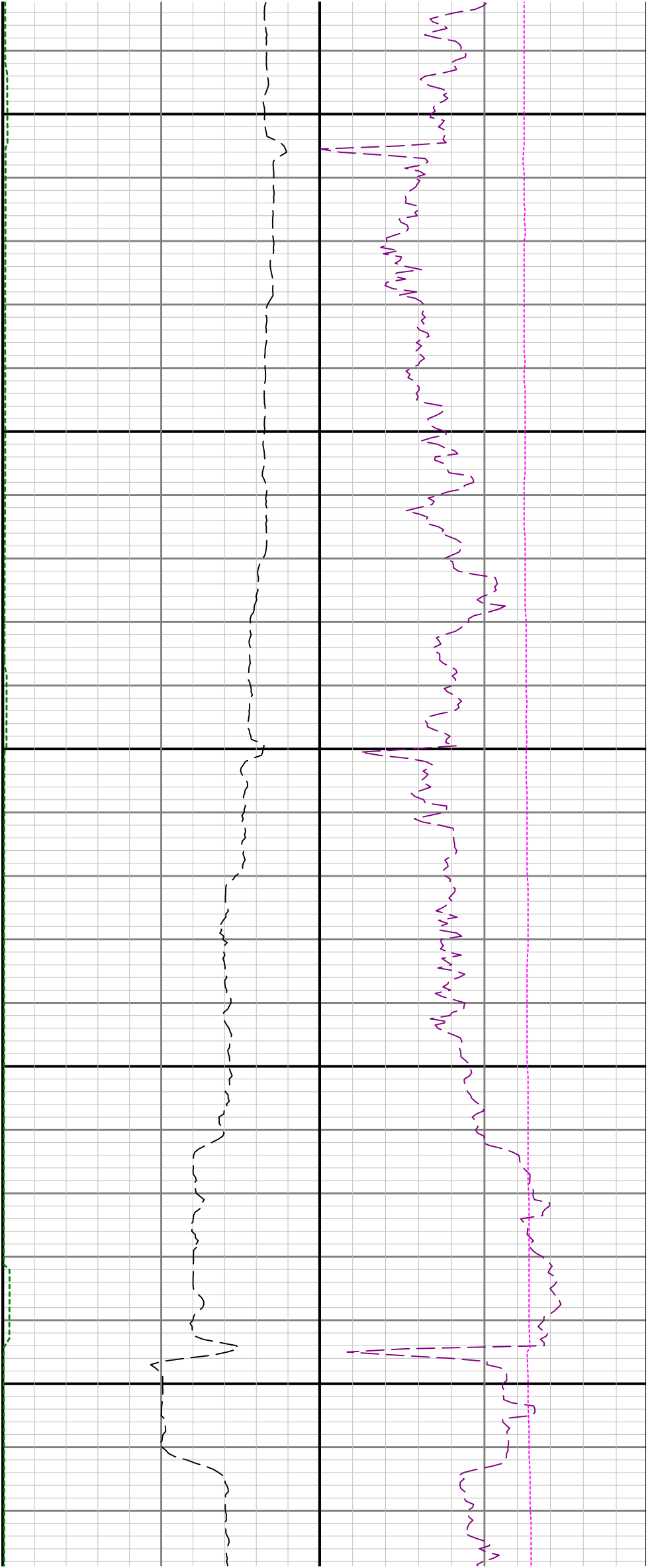
6500

6600

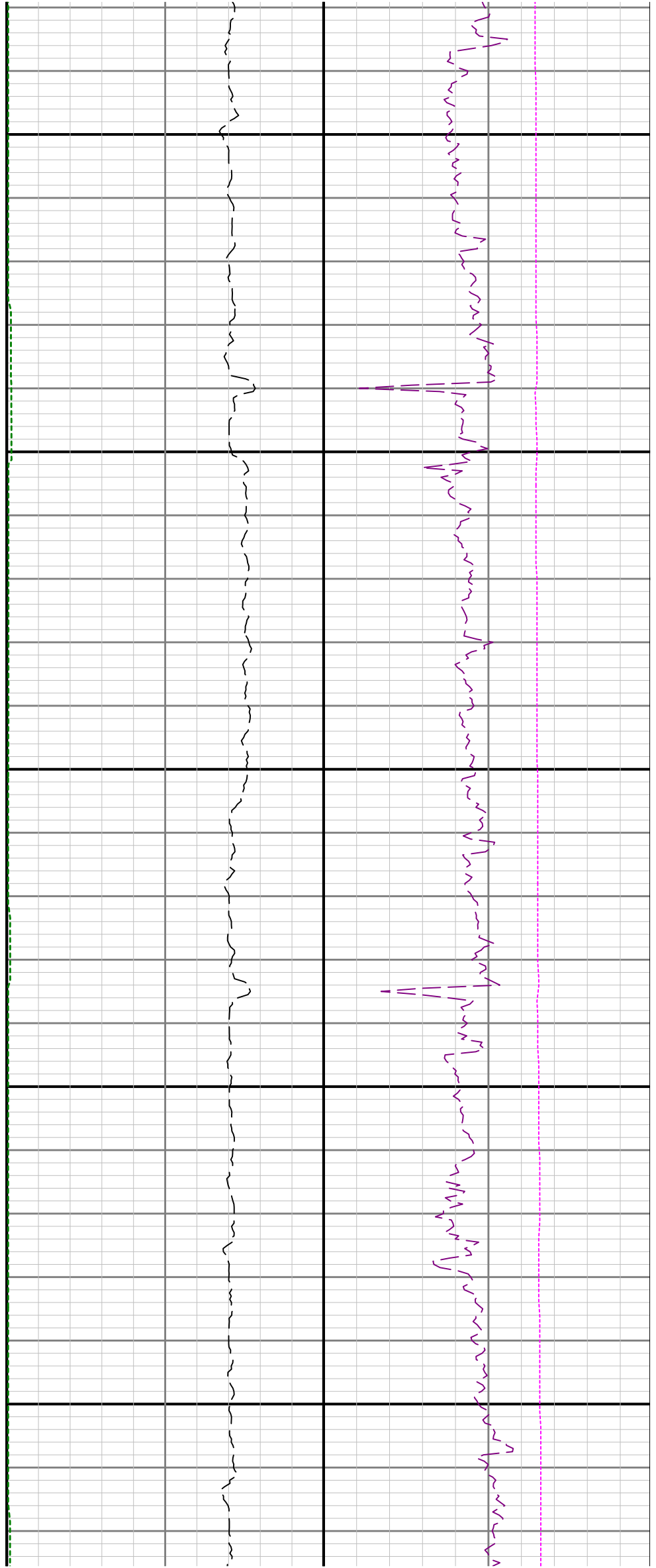






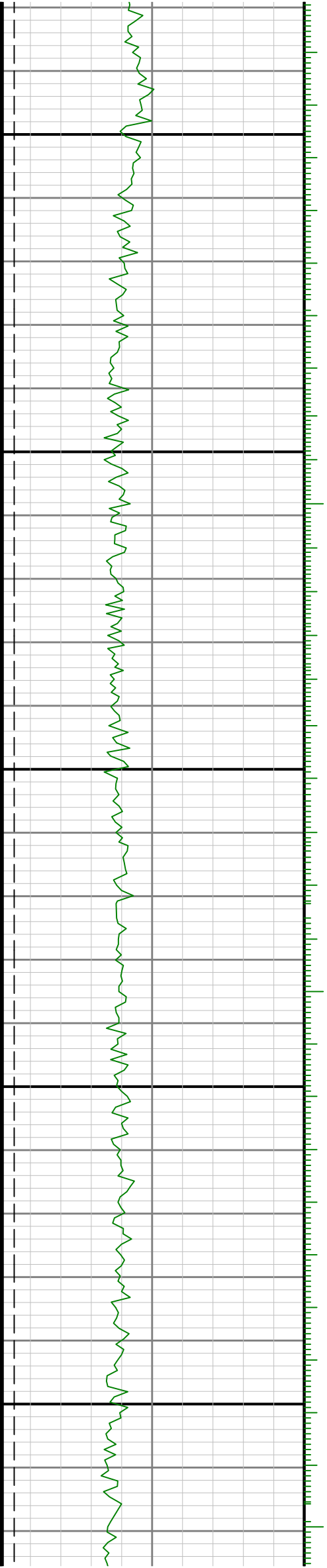


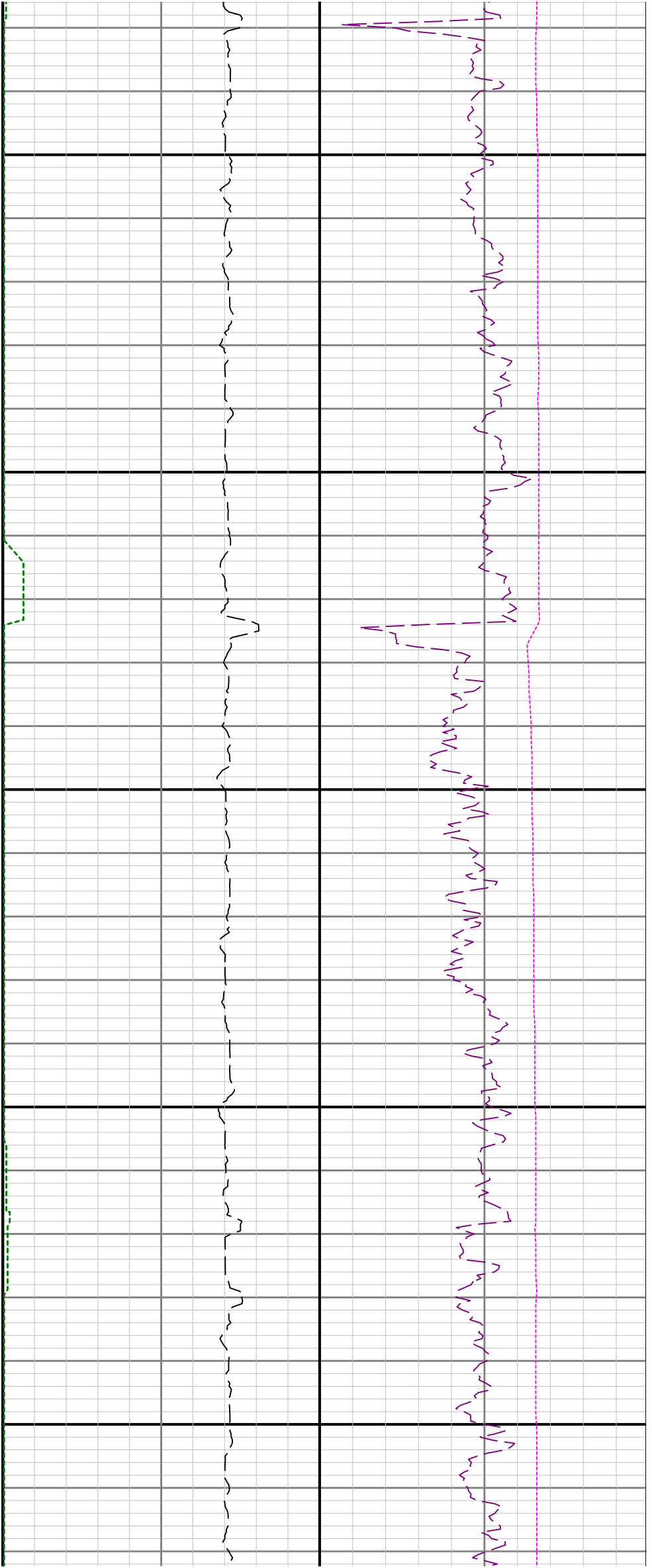




7500

7600

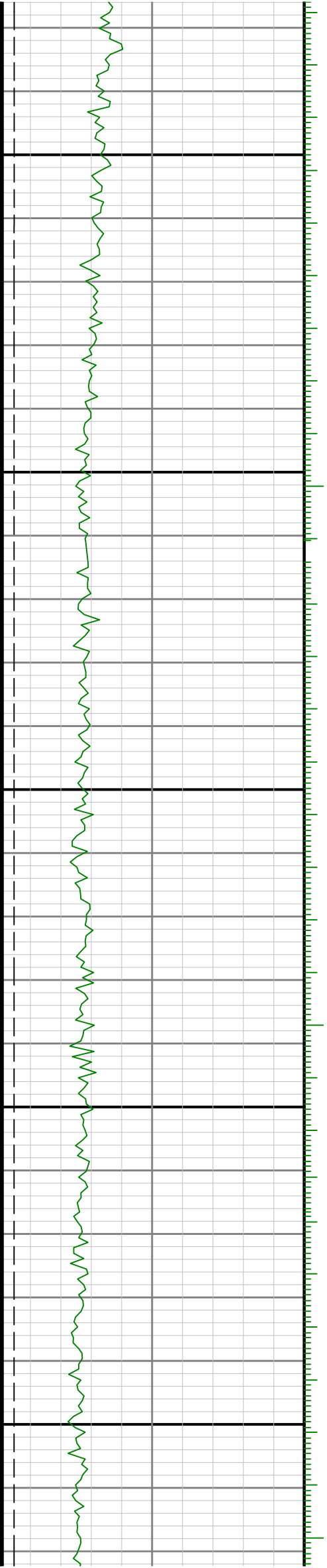


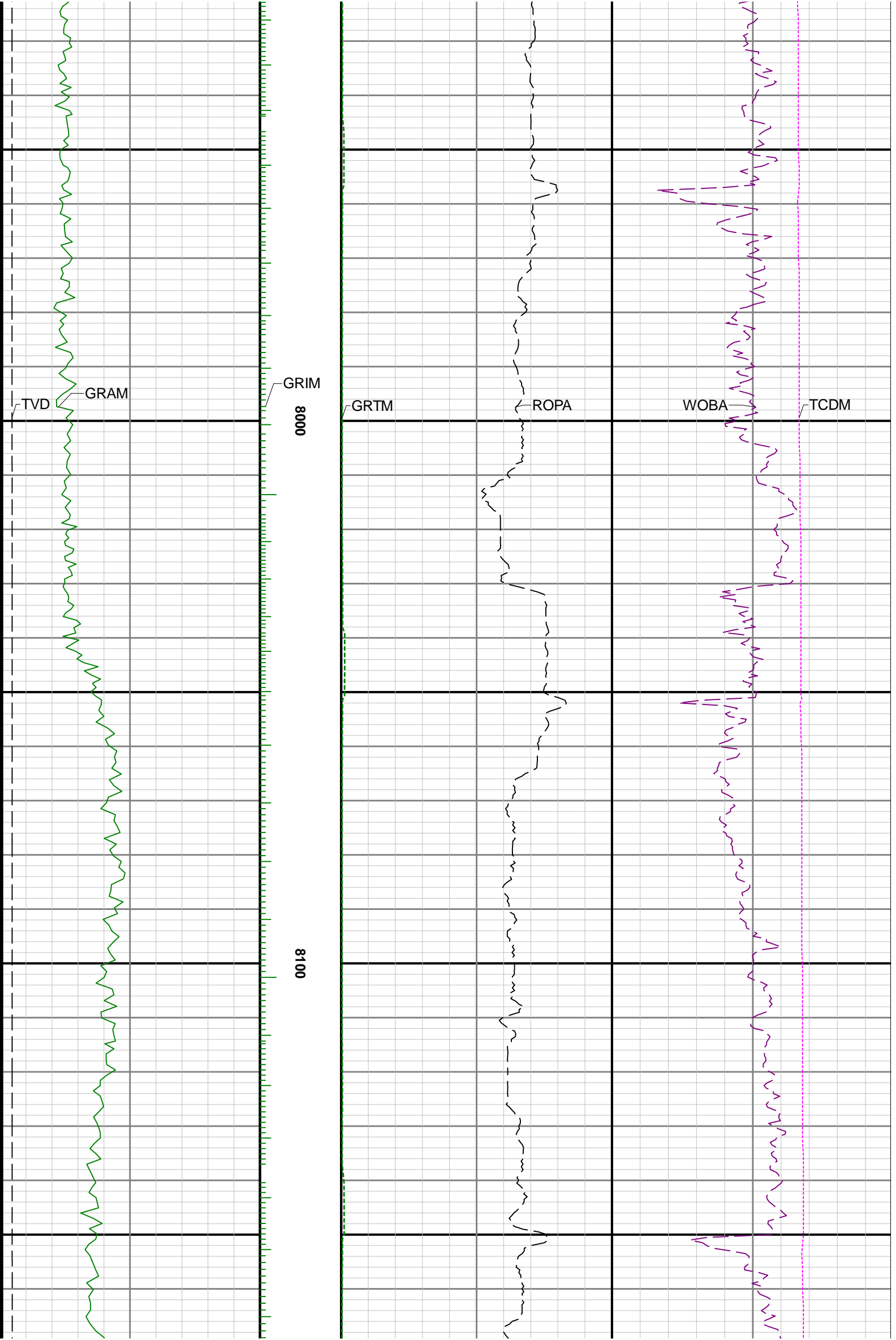


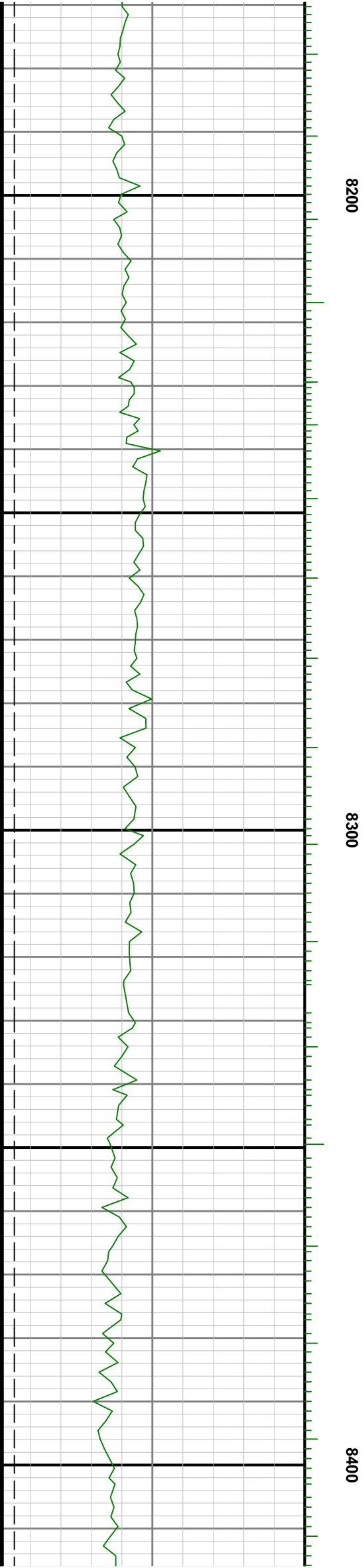
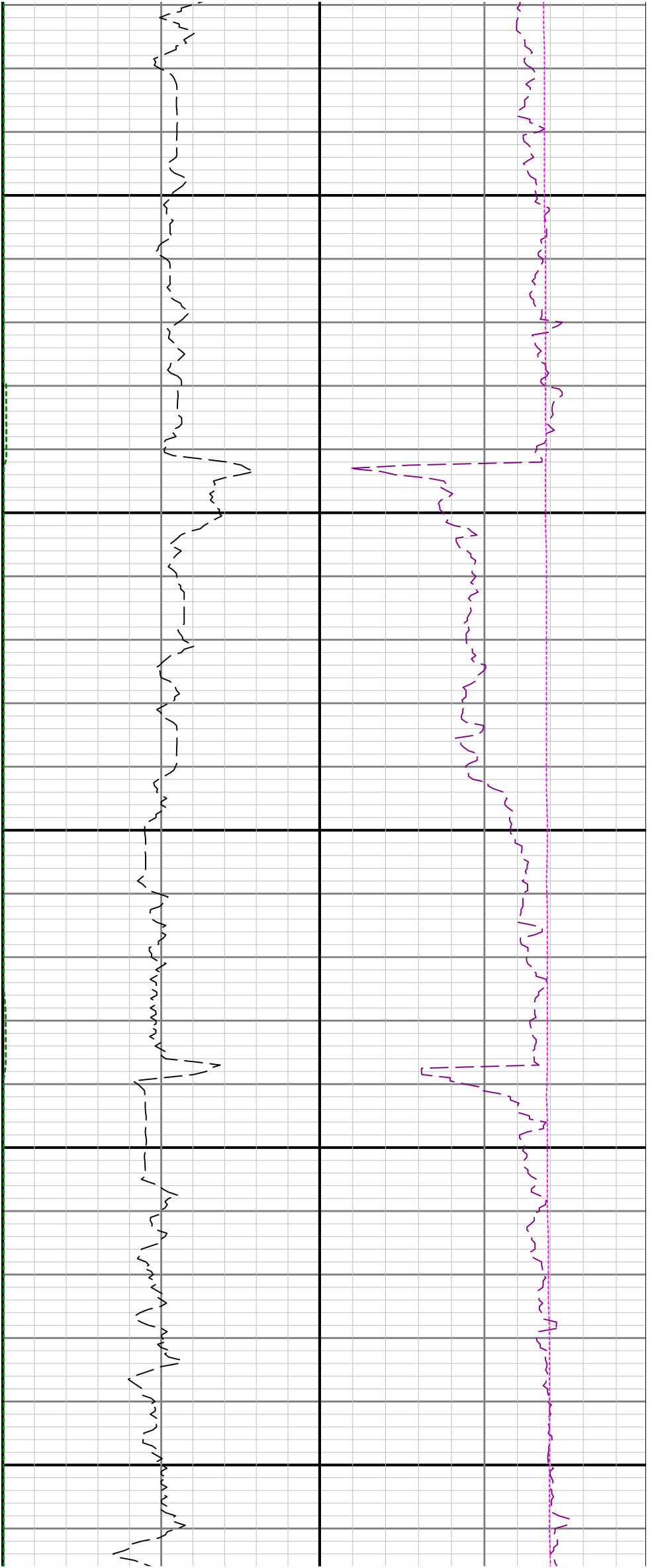
7700

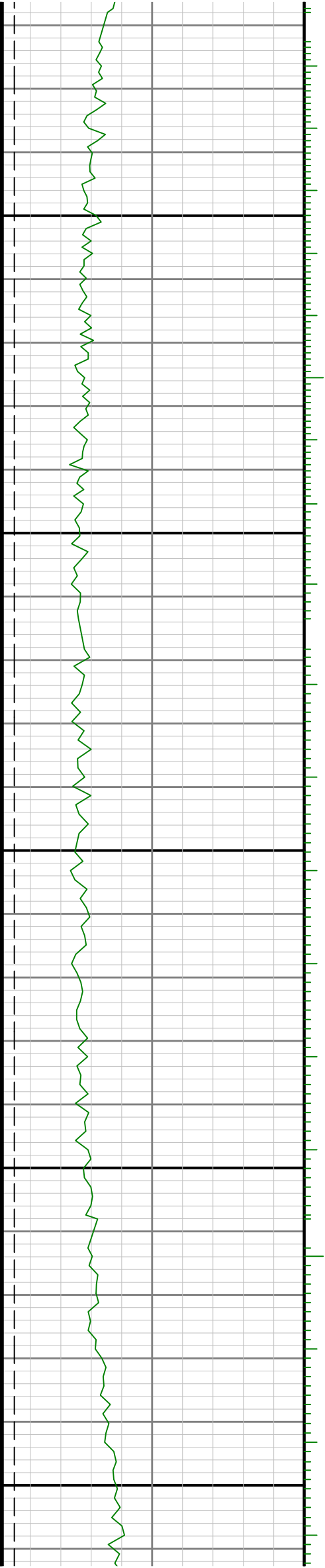
7800

7900



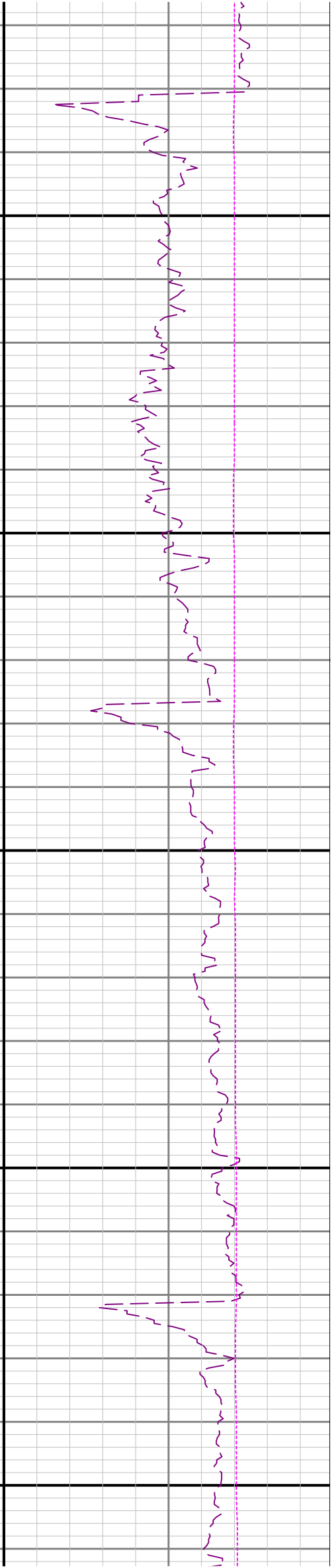
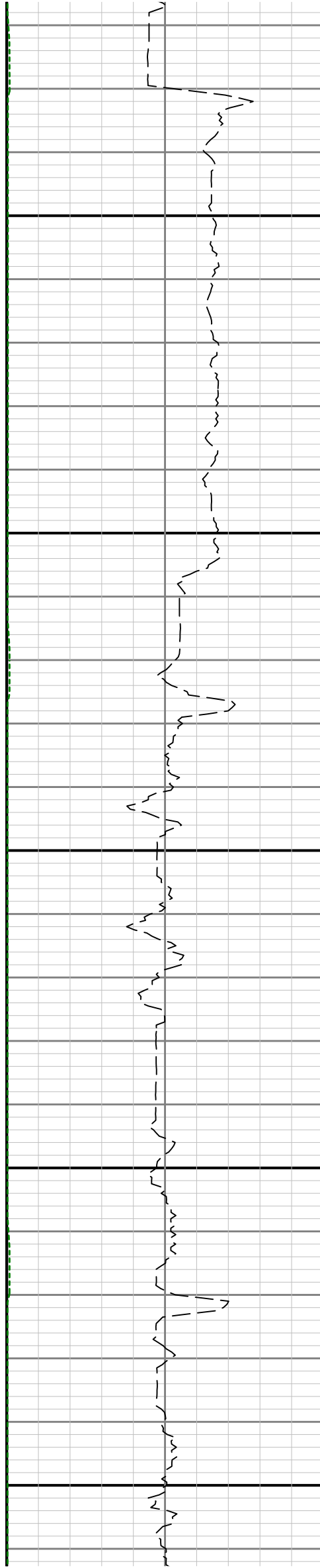


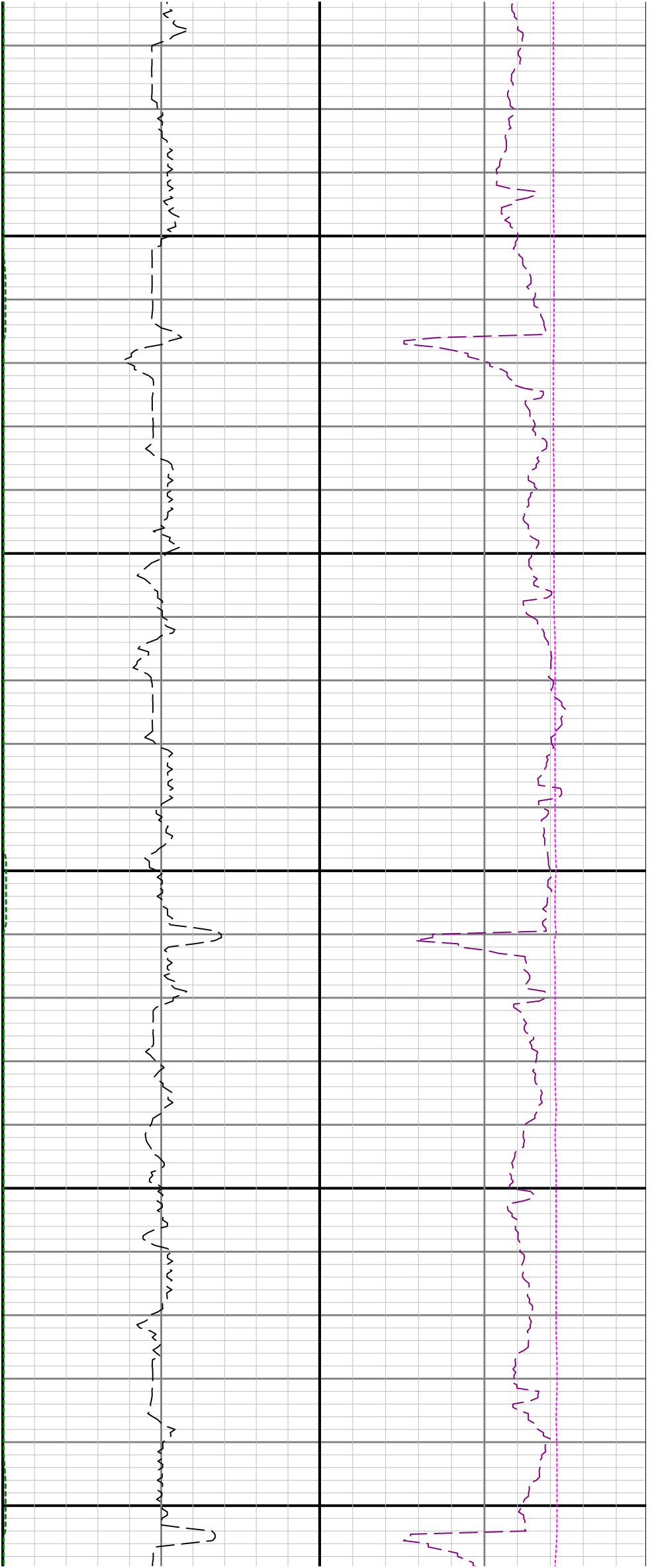
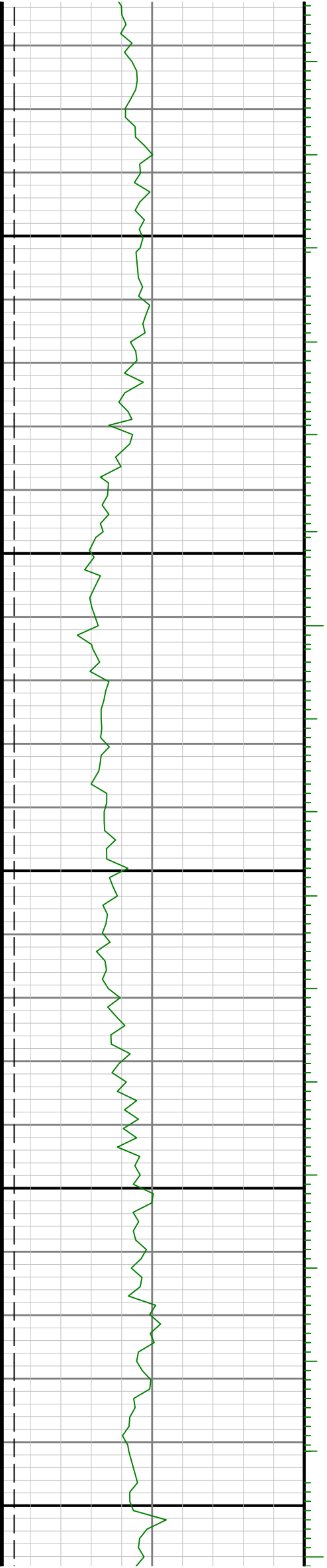


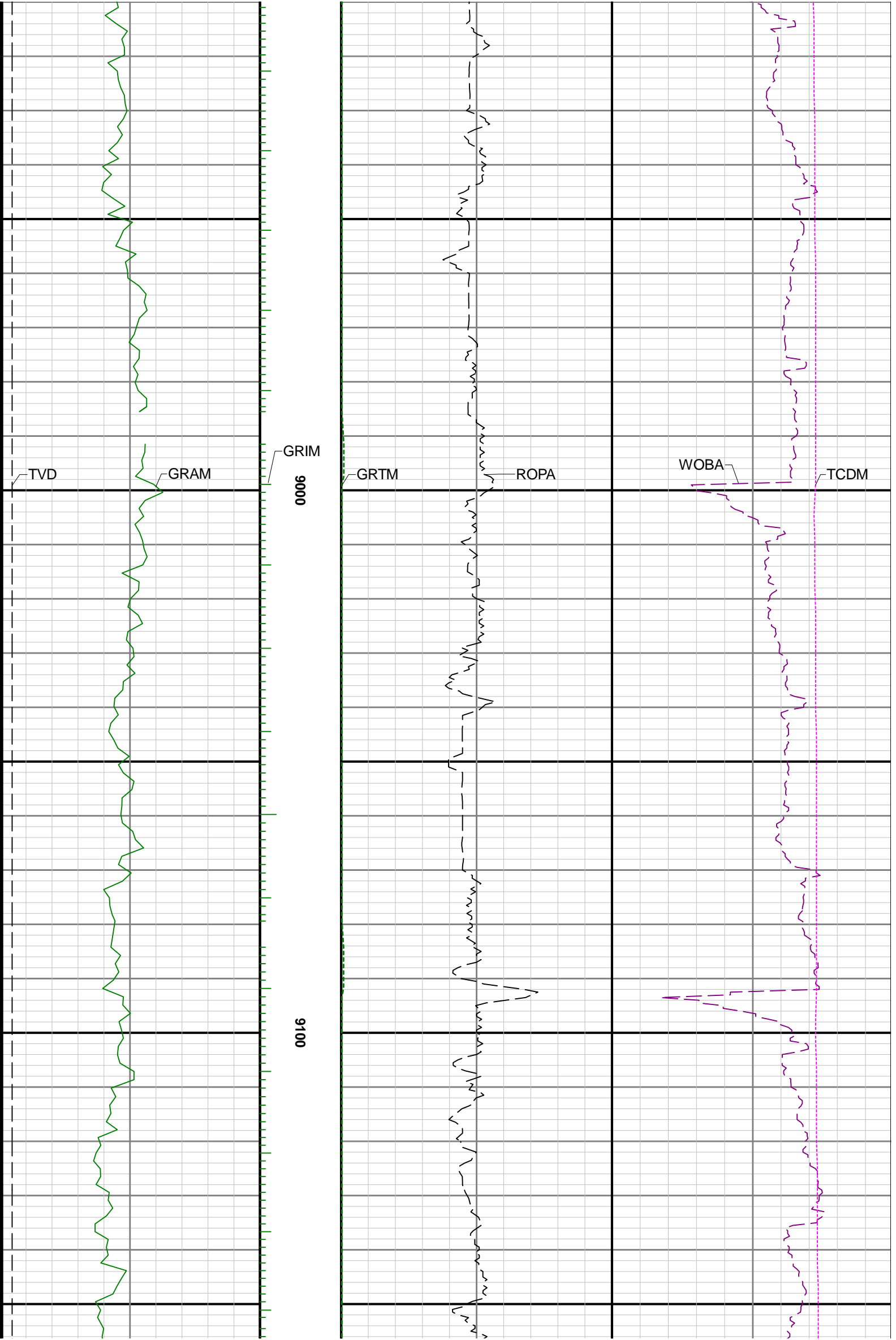


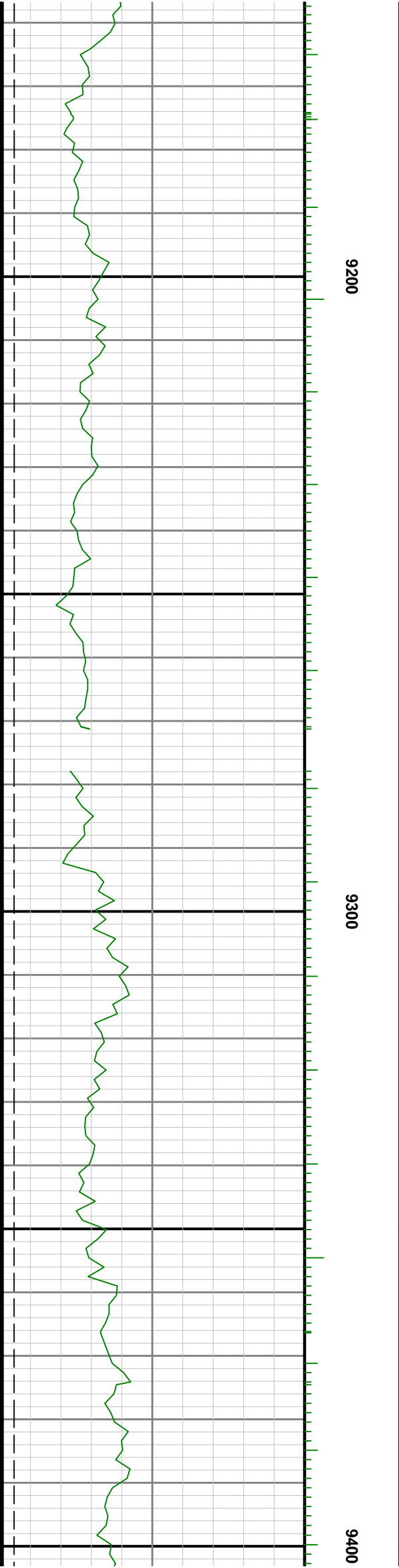
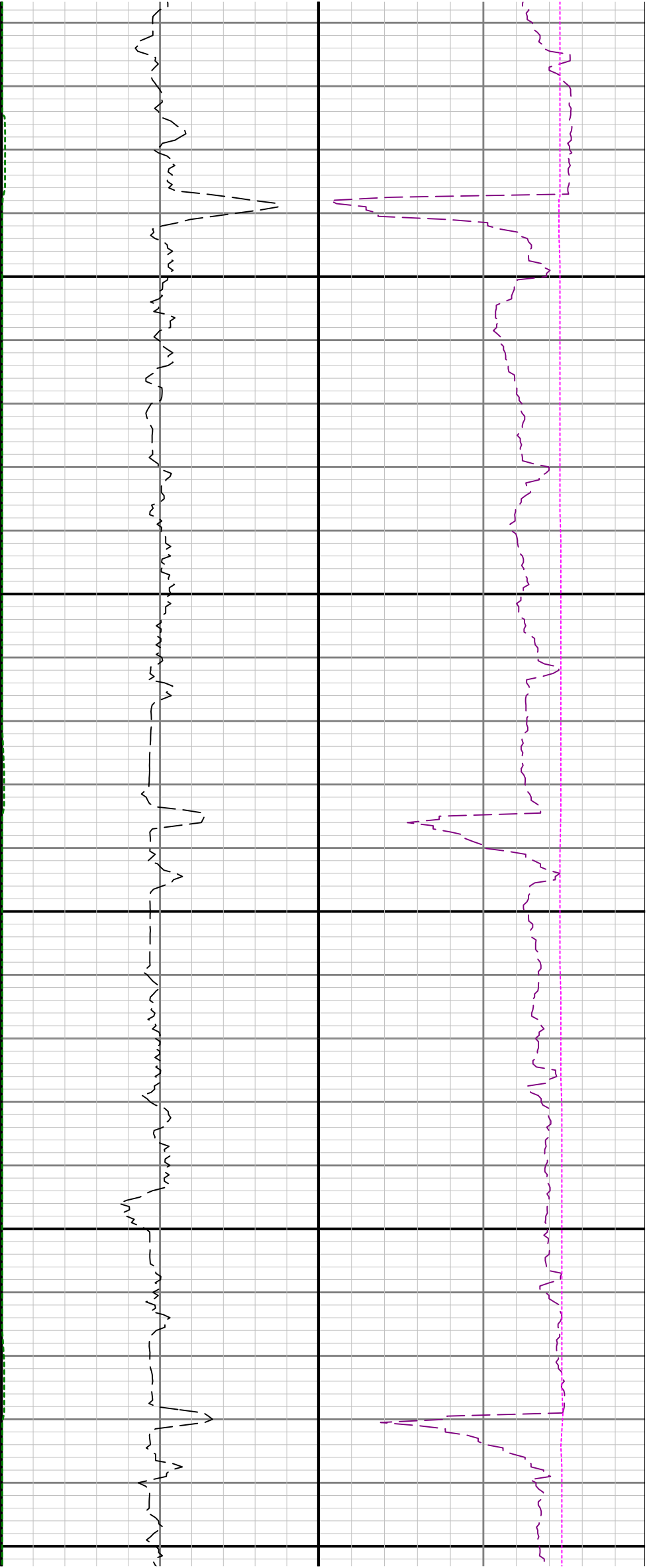
8500

8600

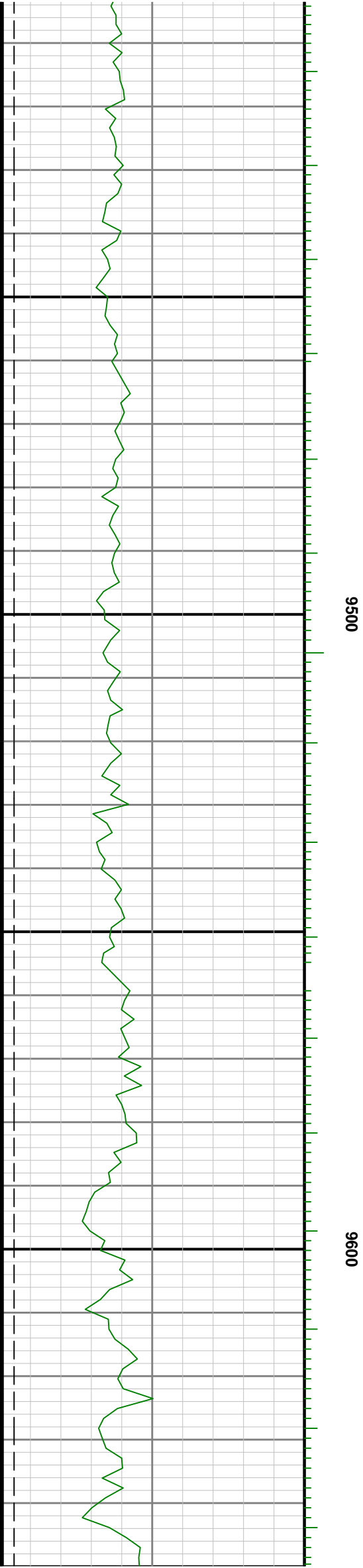
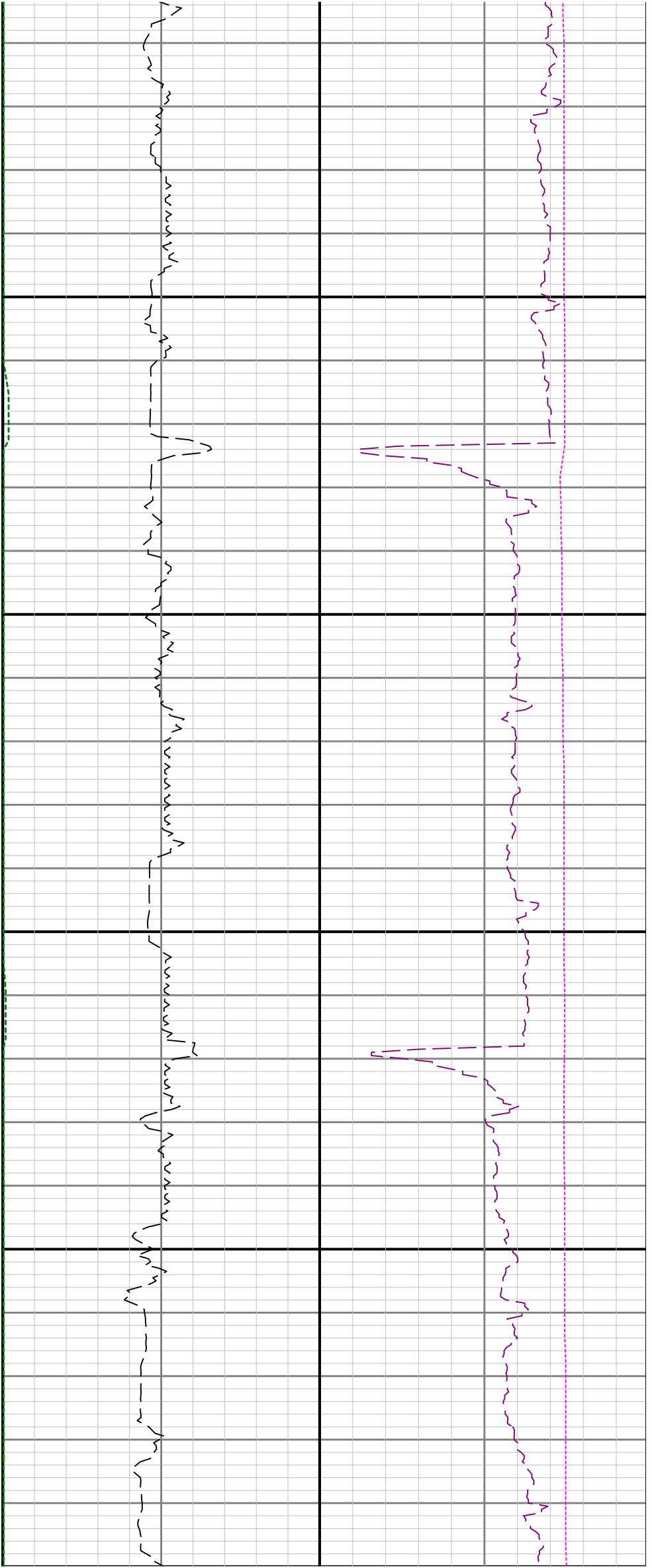


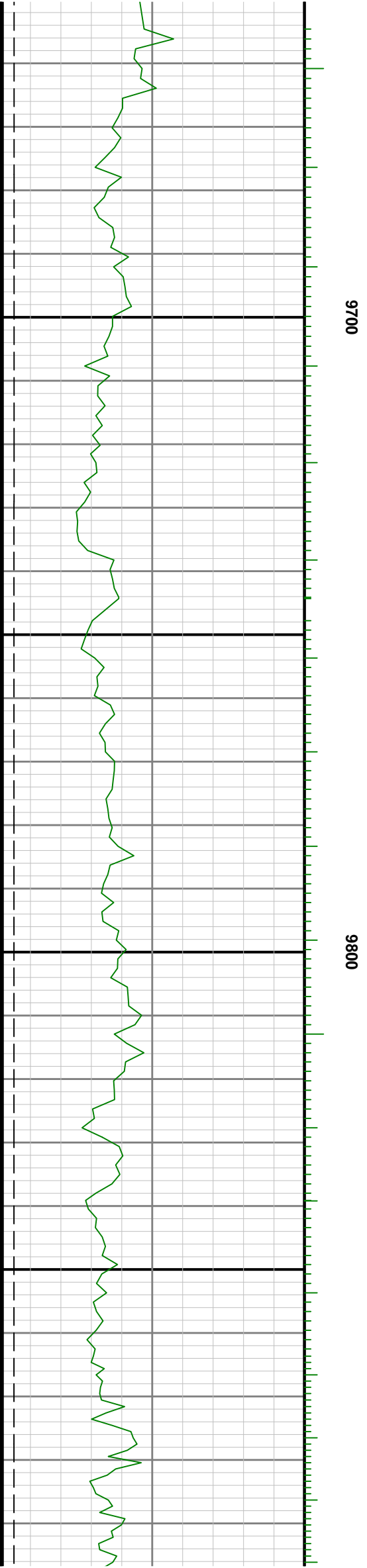
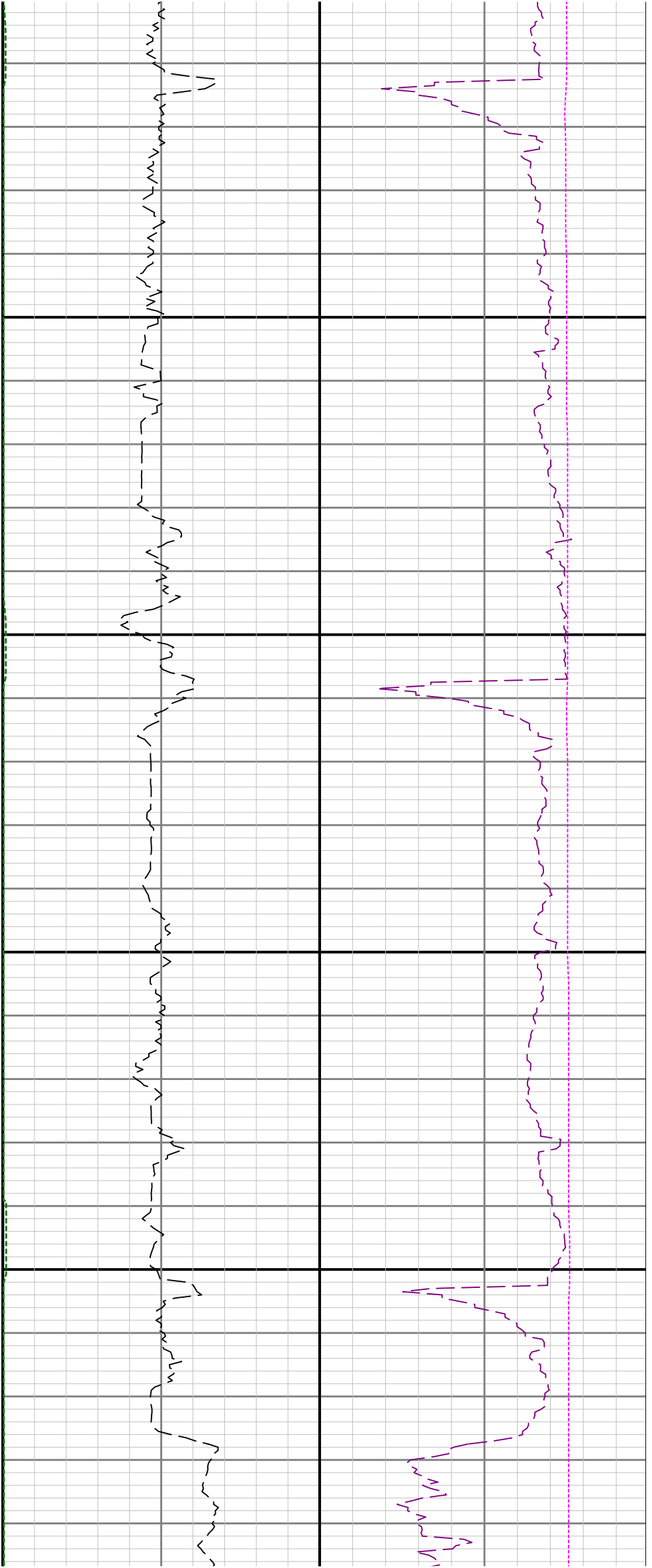


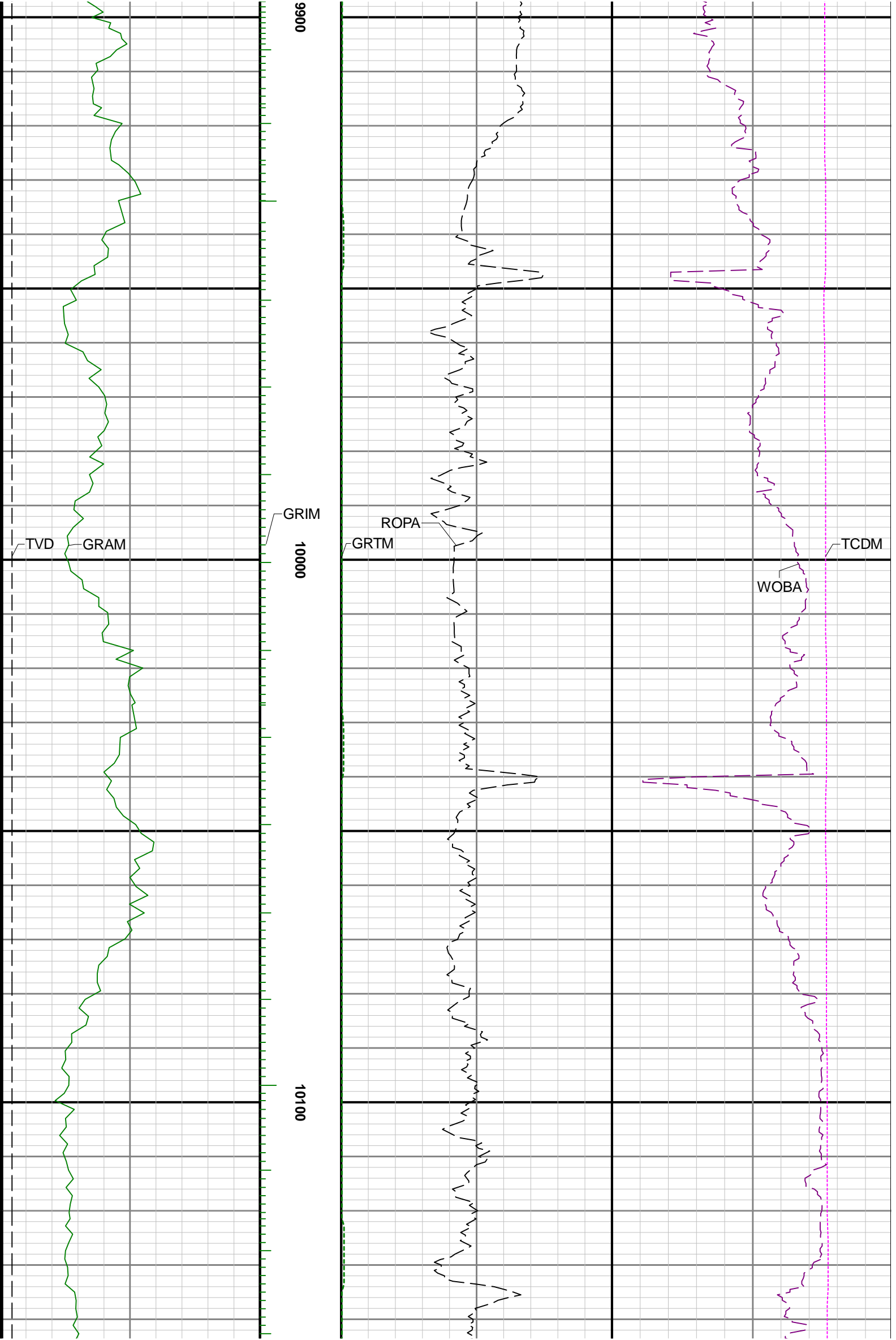








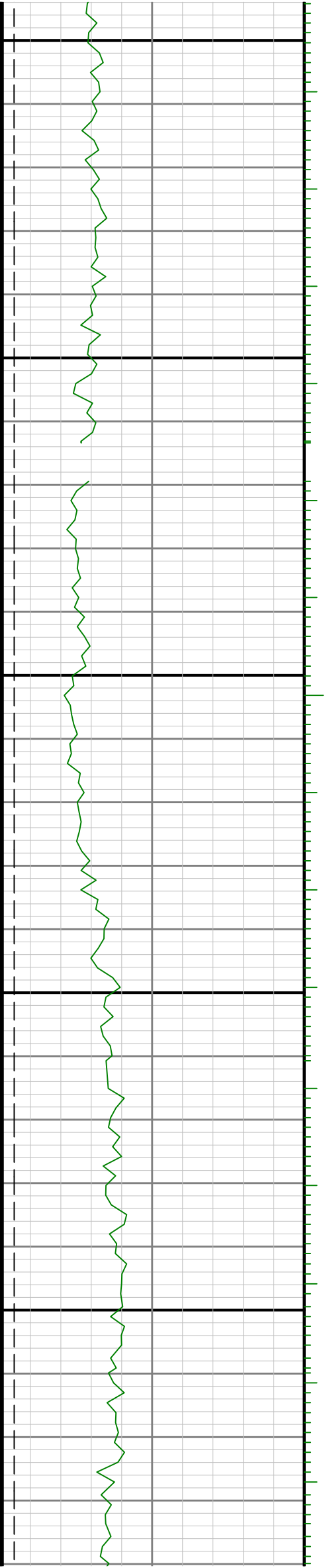






10200

10300

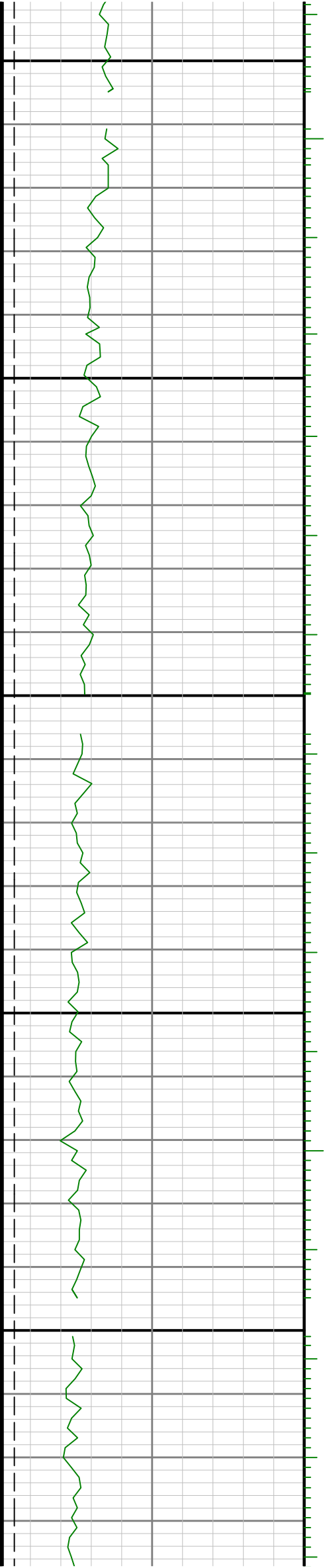


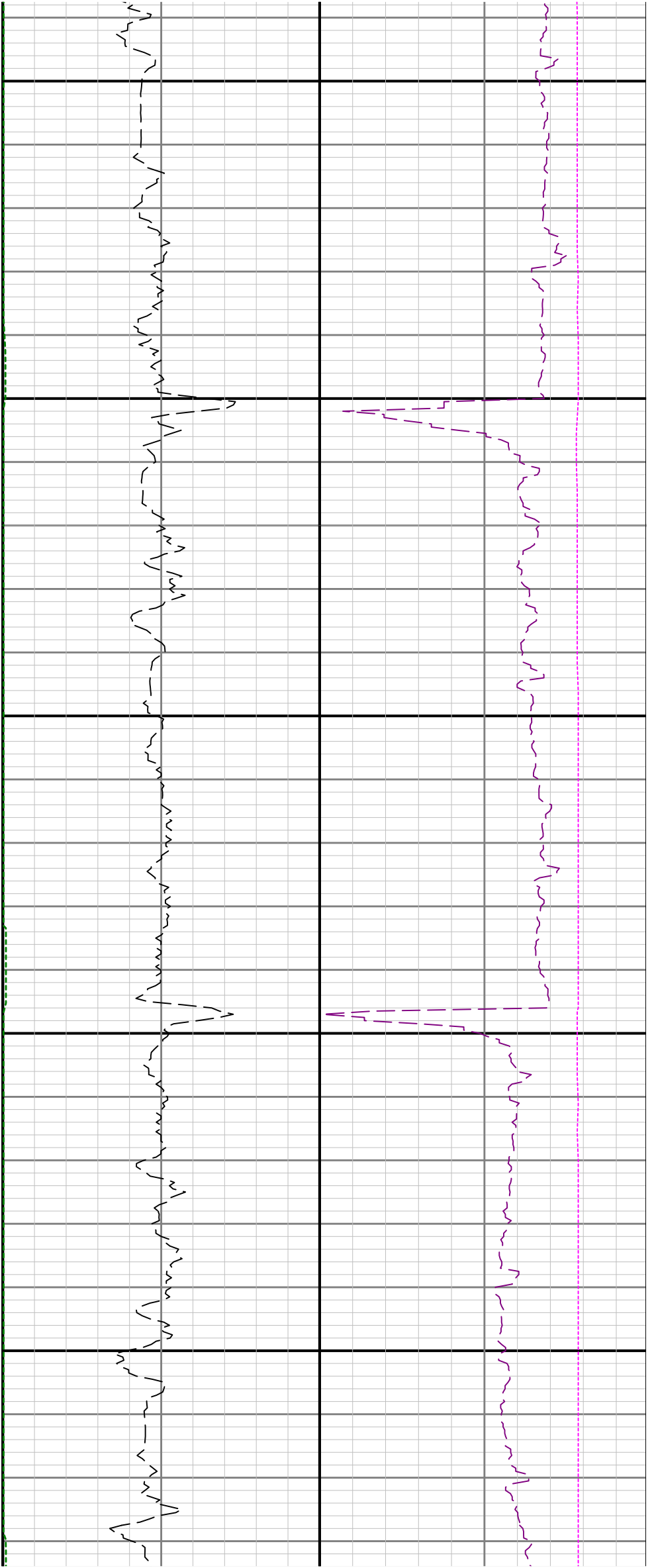


10400

10500

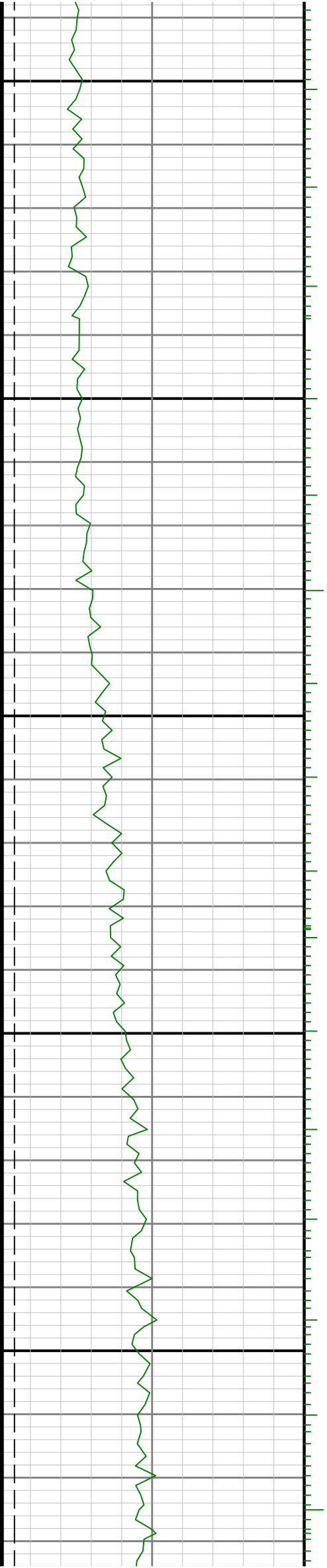
10600

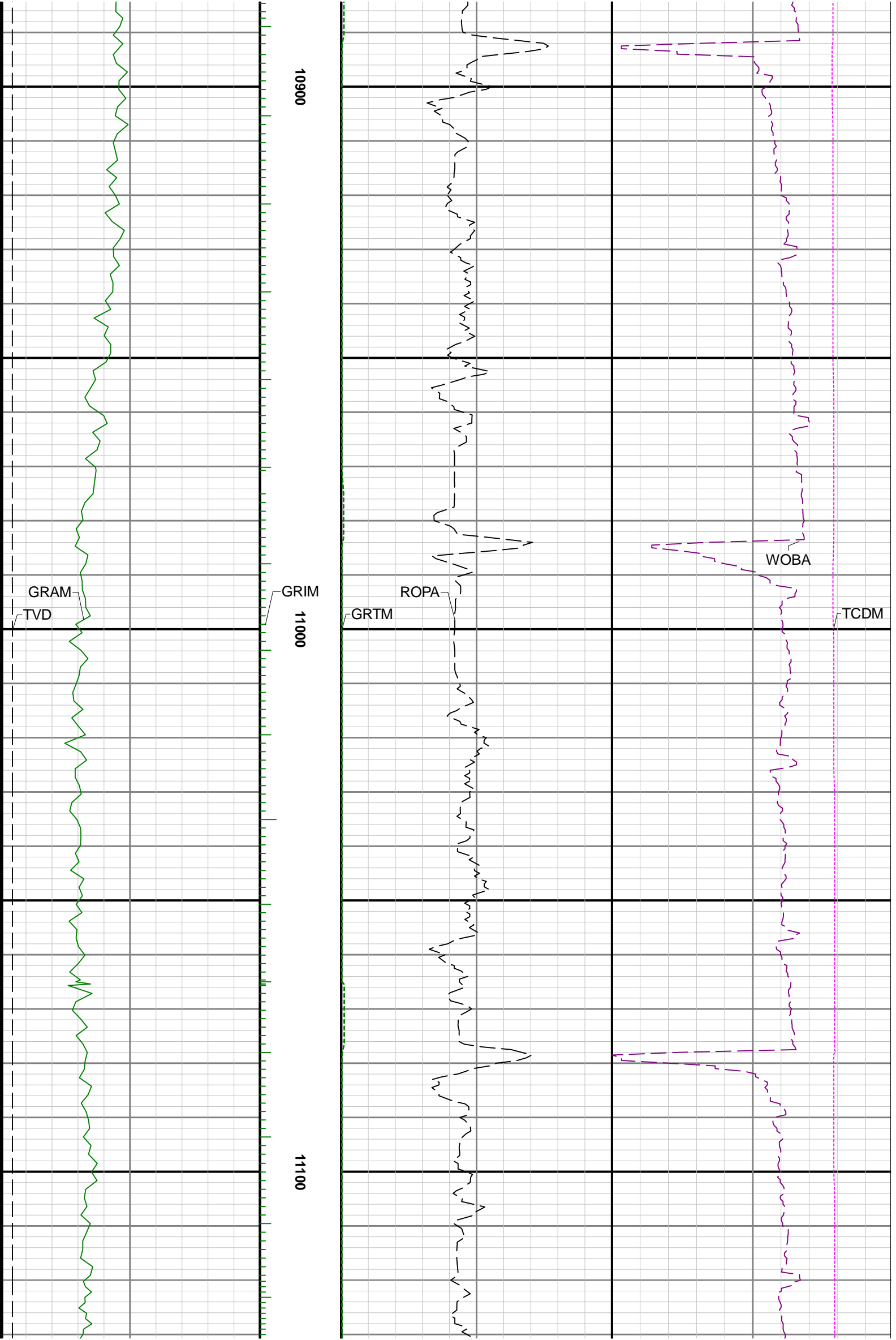


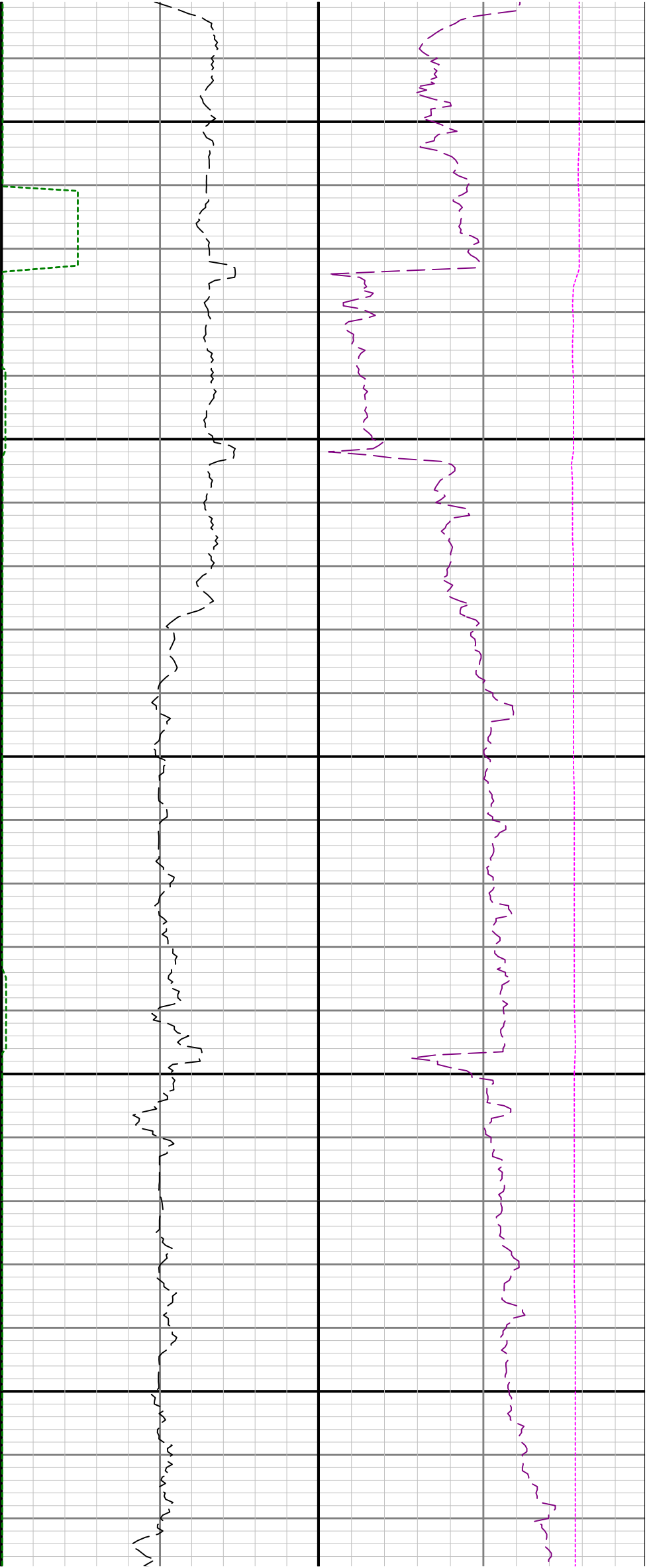


10700

10800

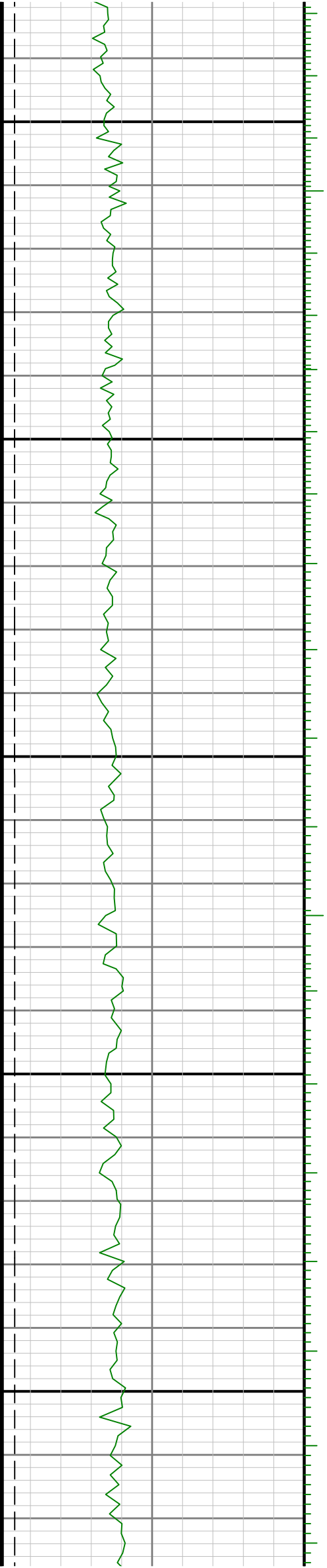




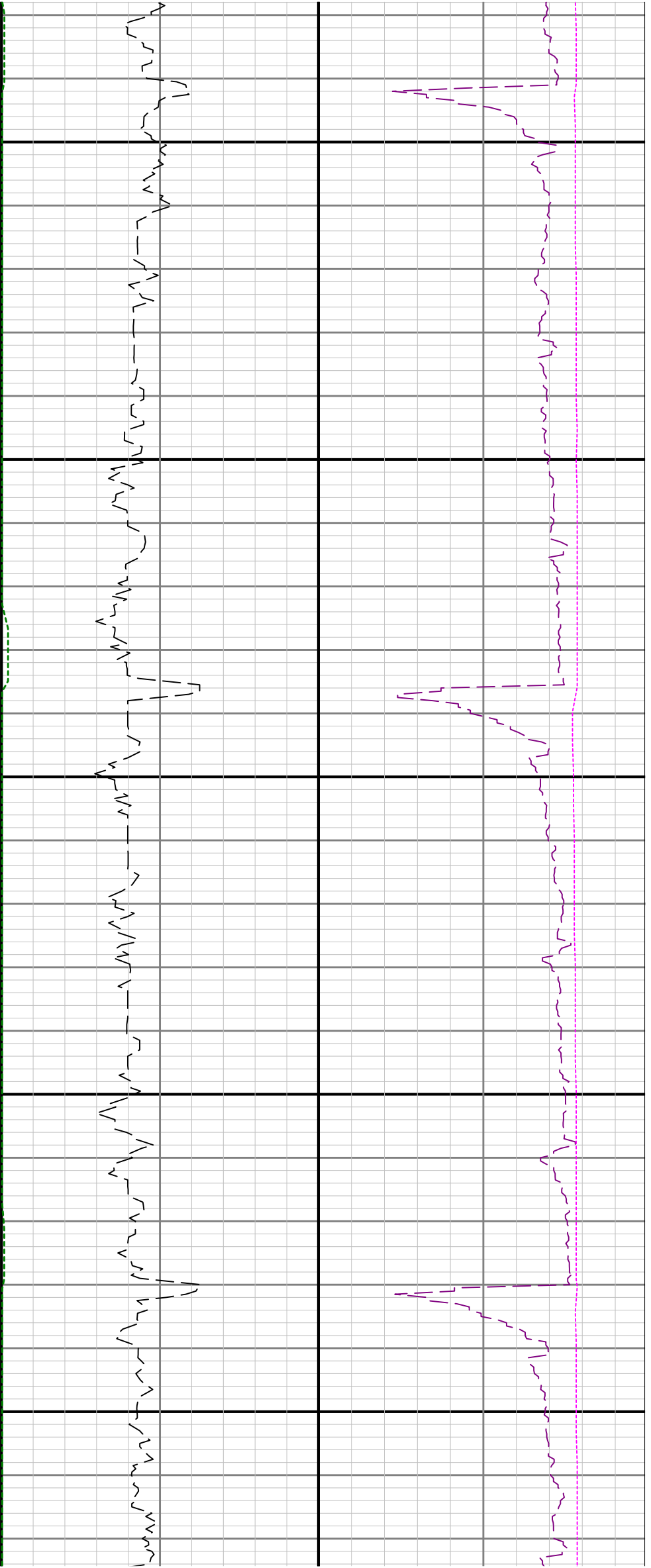


11200

11300



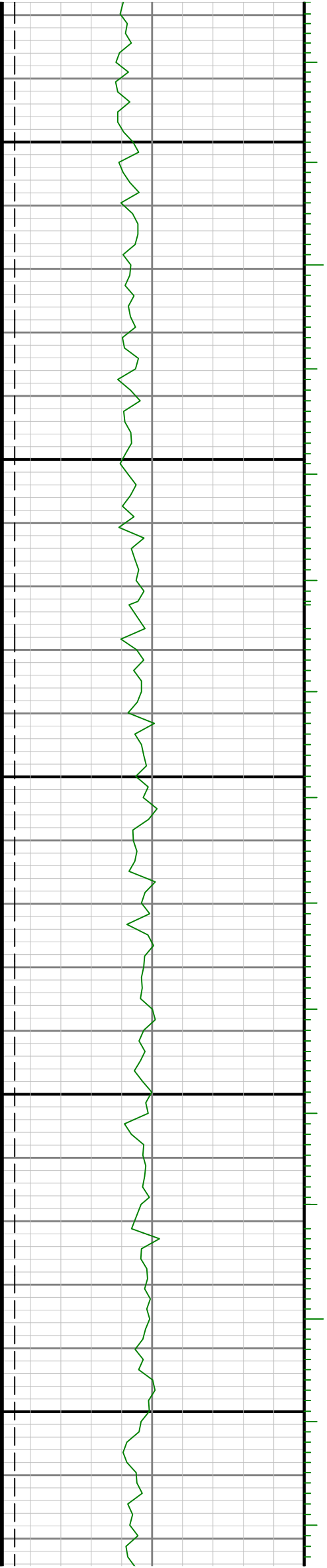


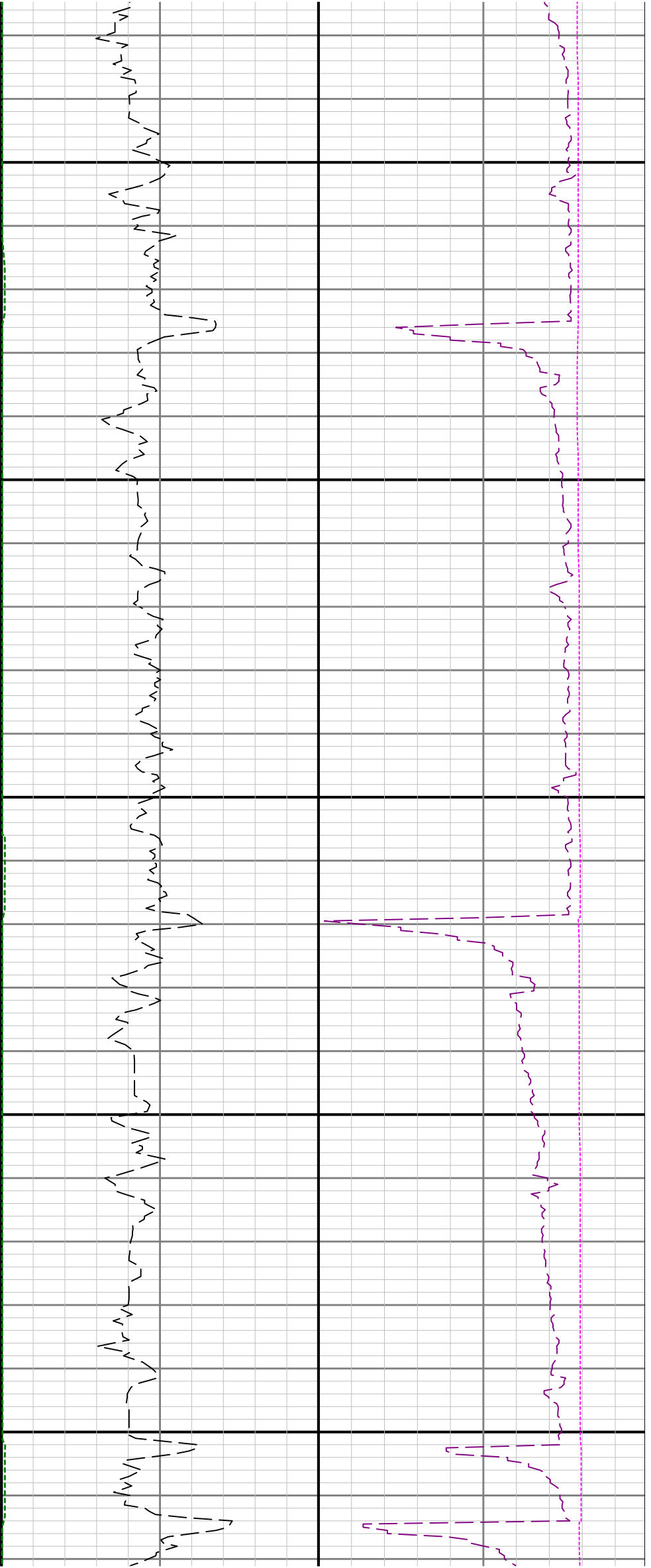


11400

11500

11600

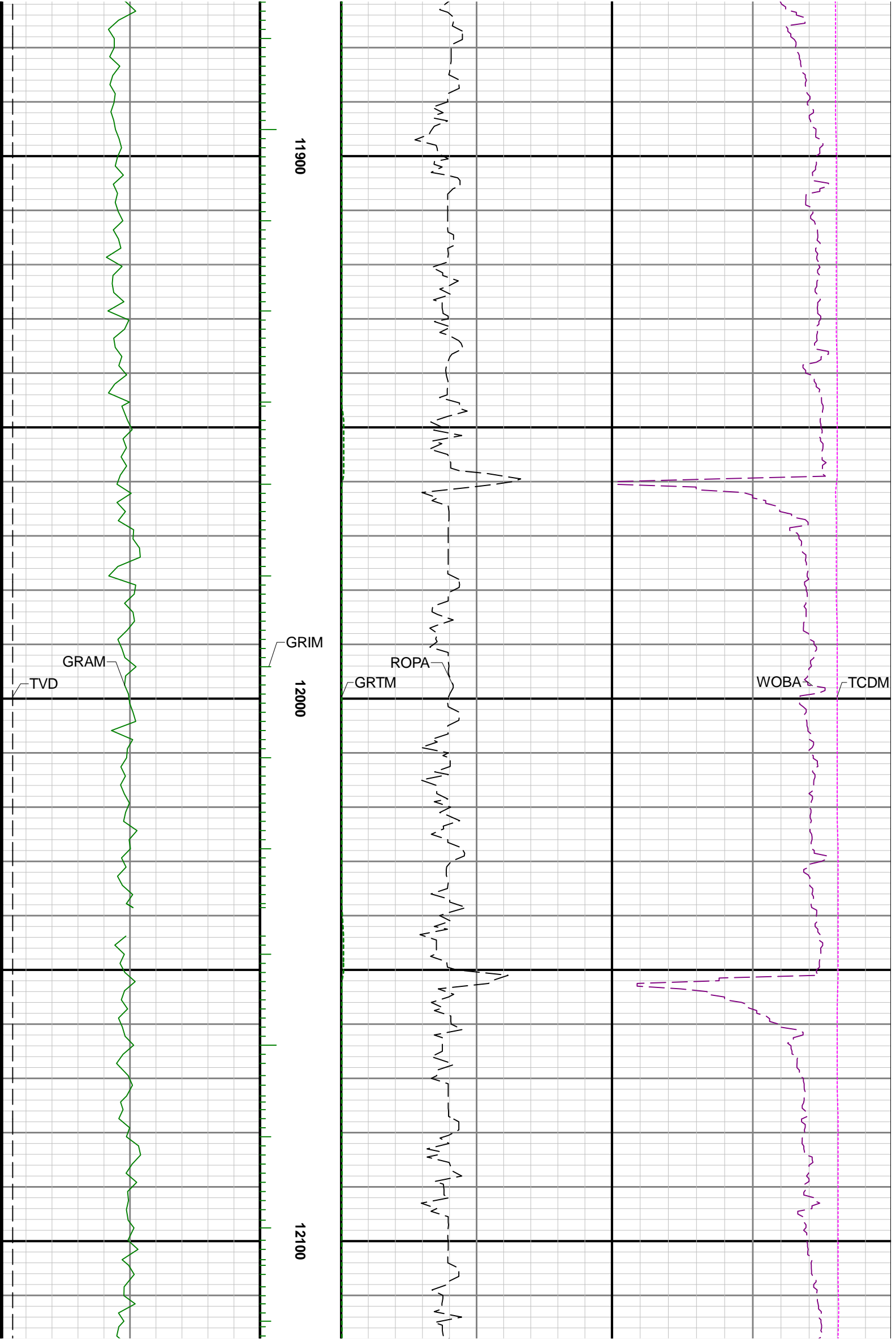


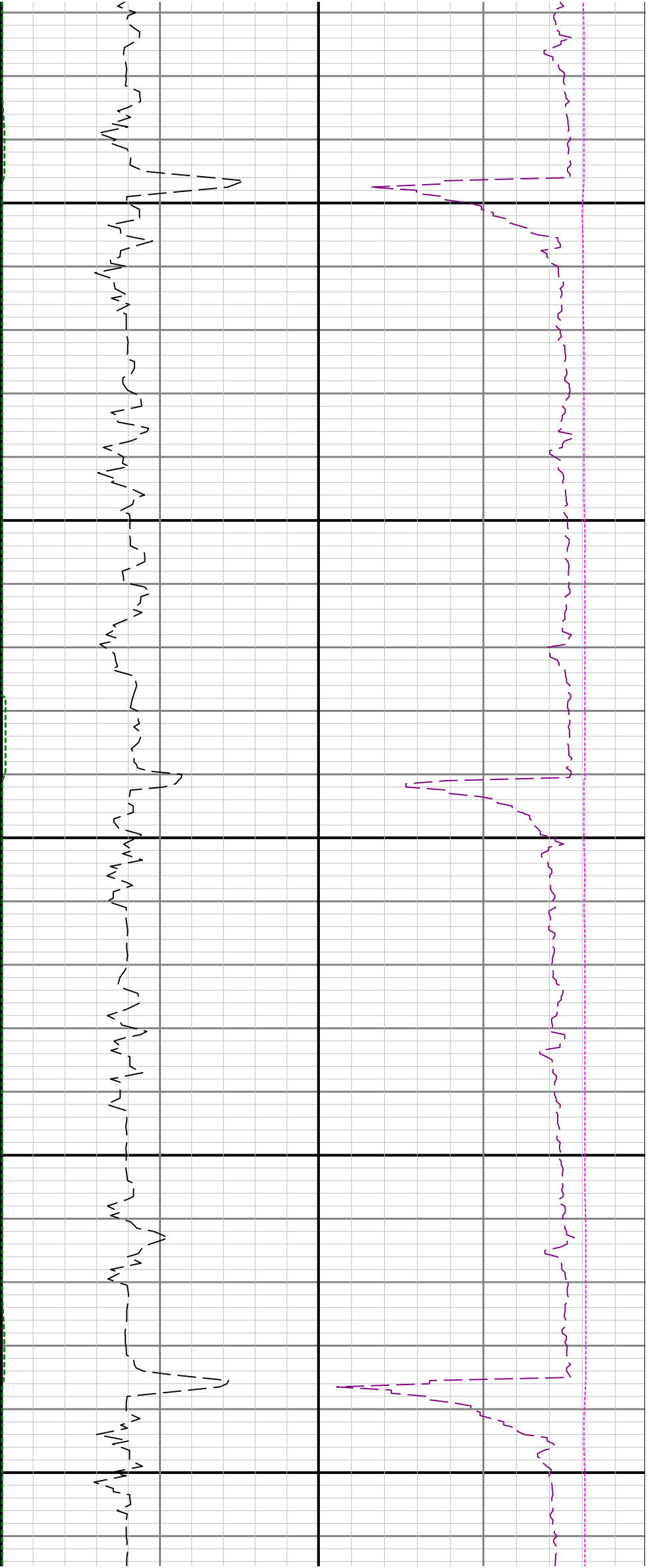


11700

11800

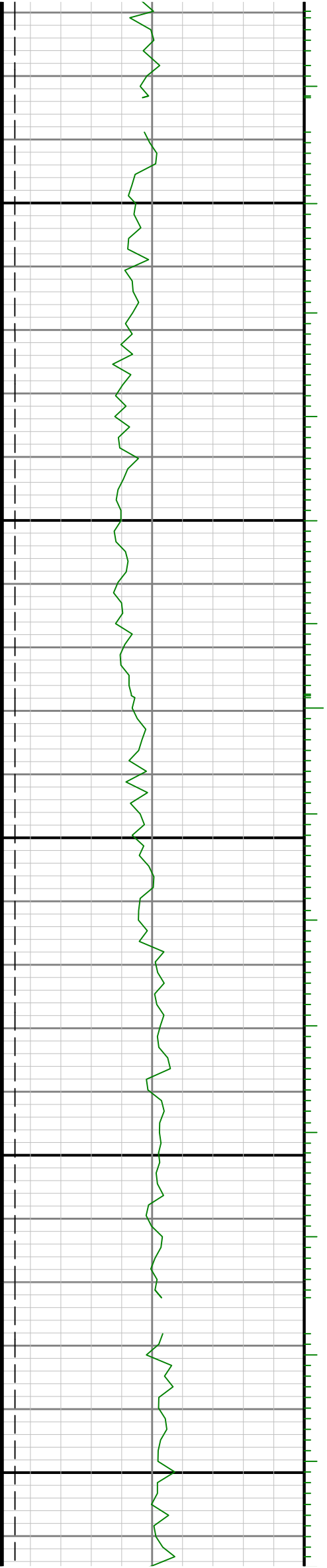


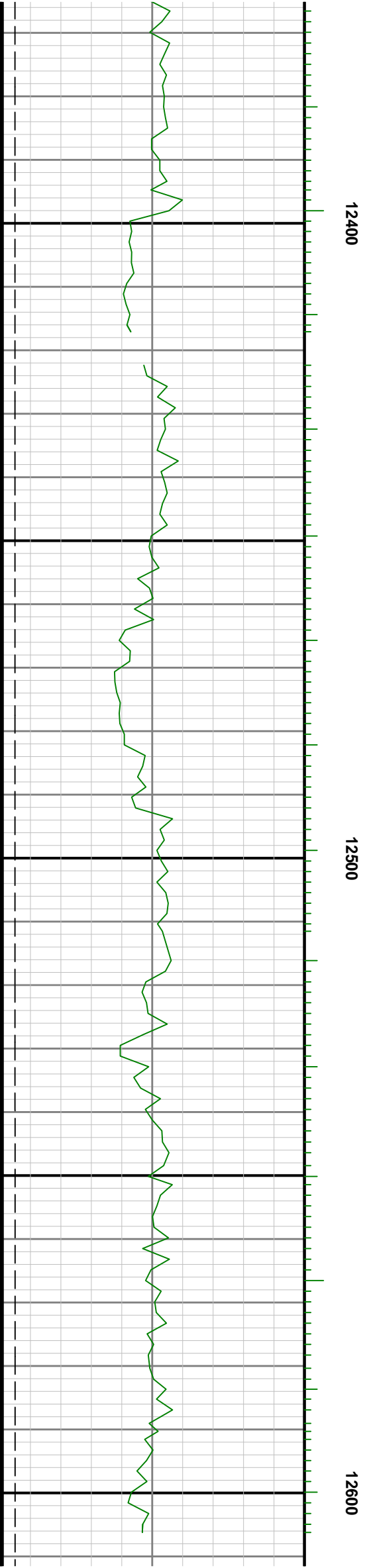
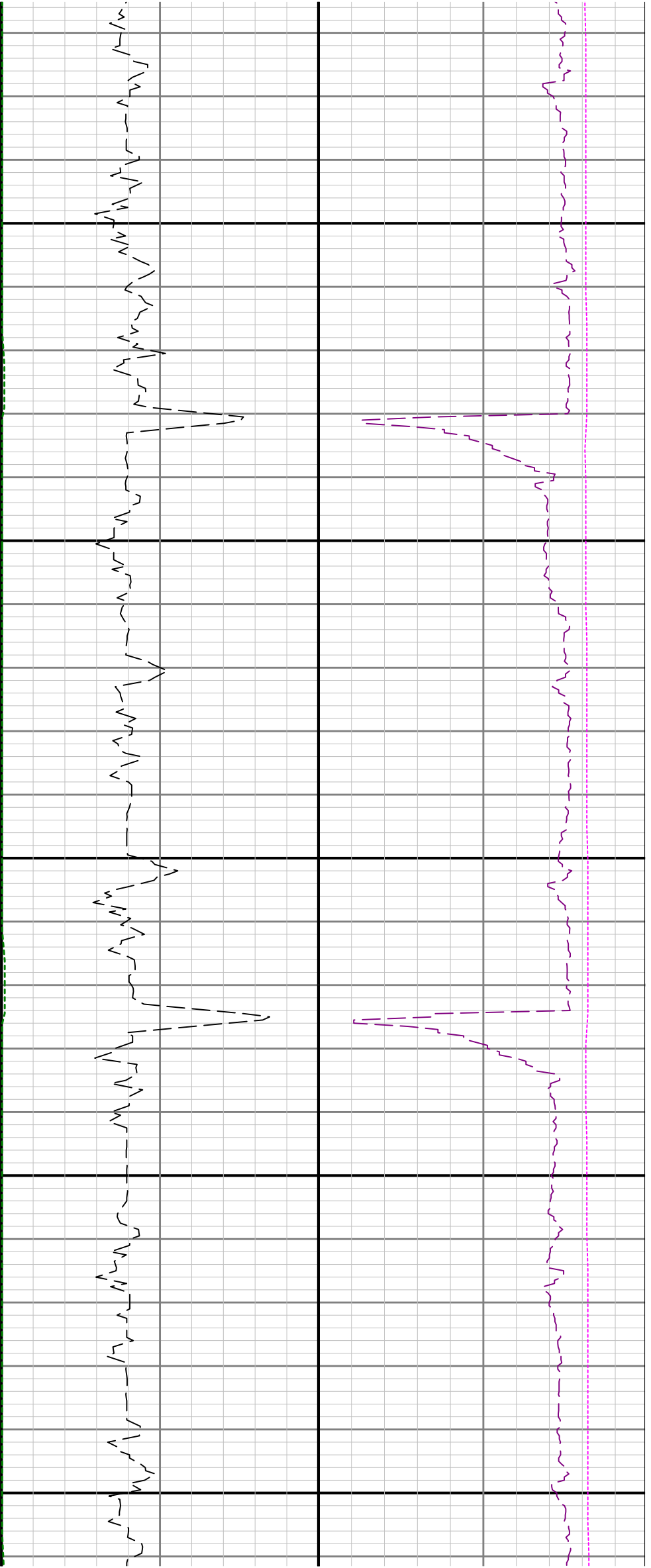


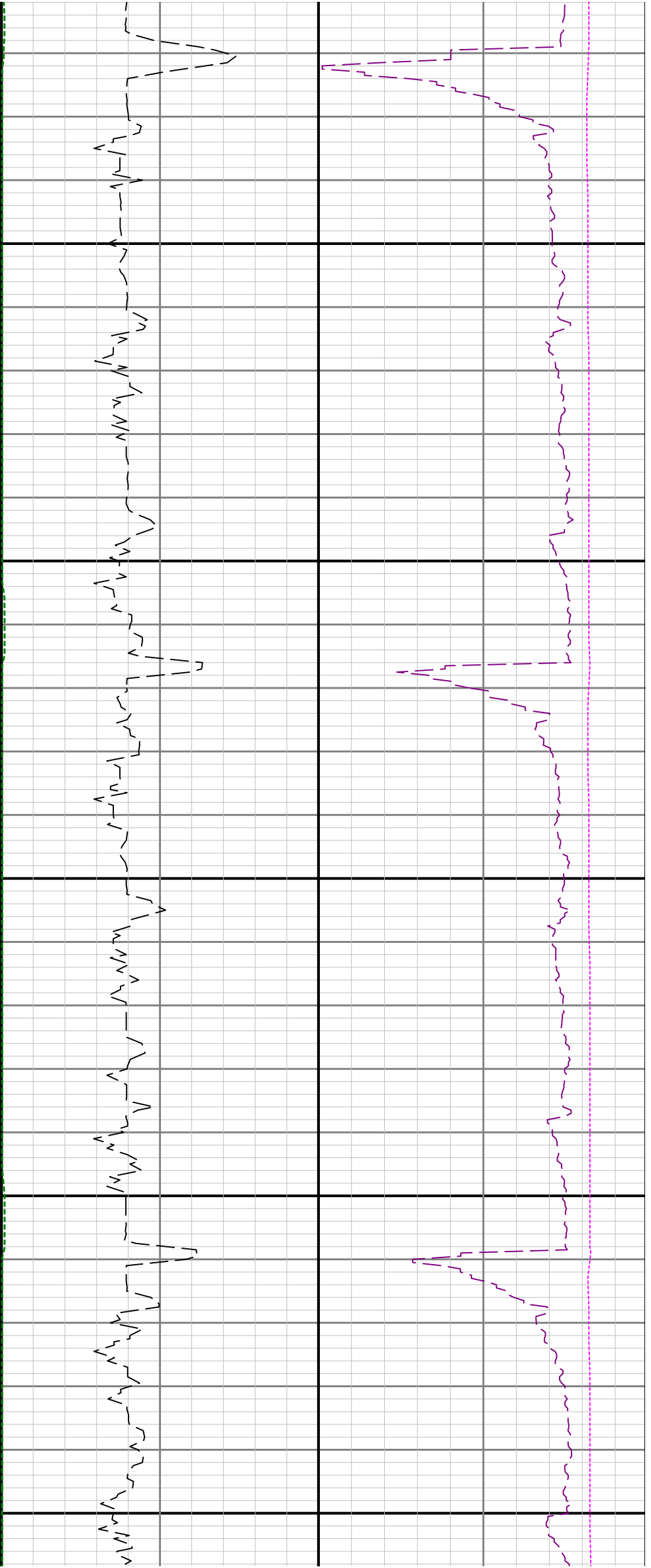


12200

12300

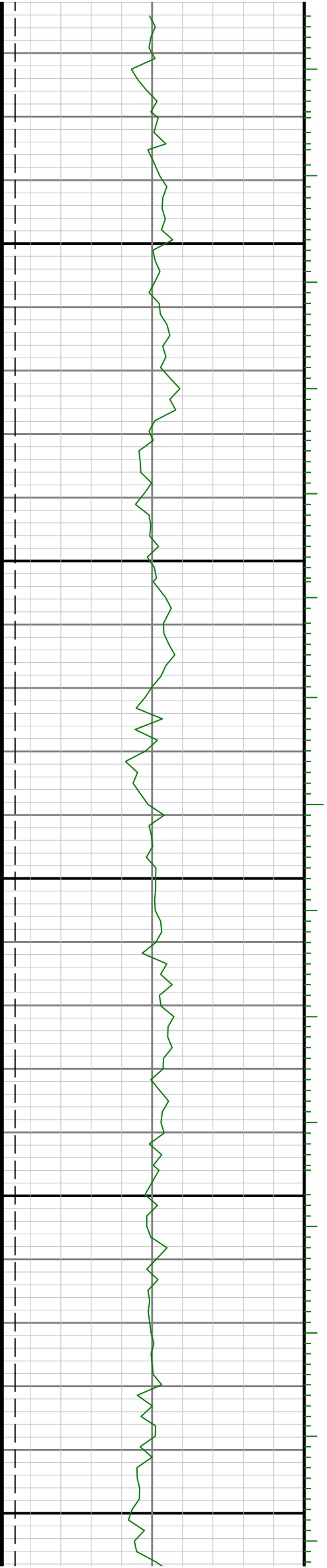


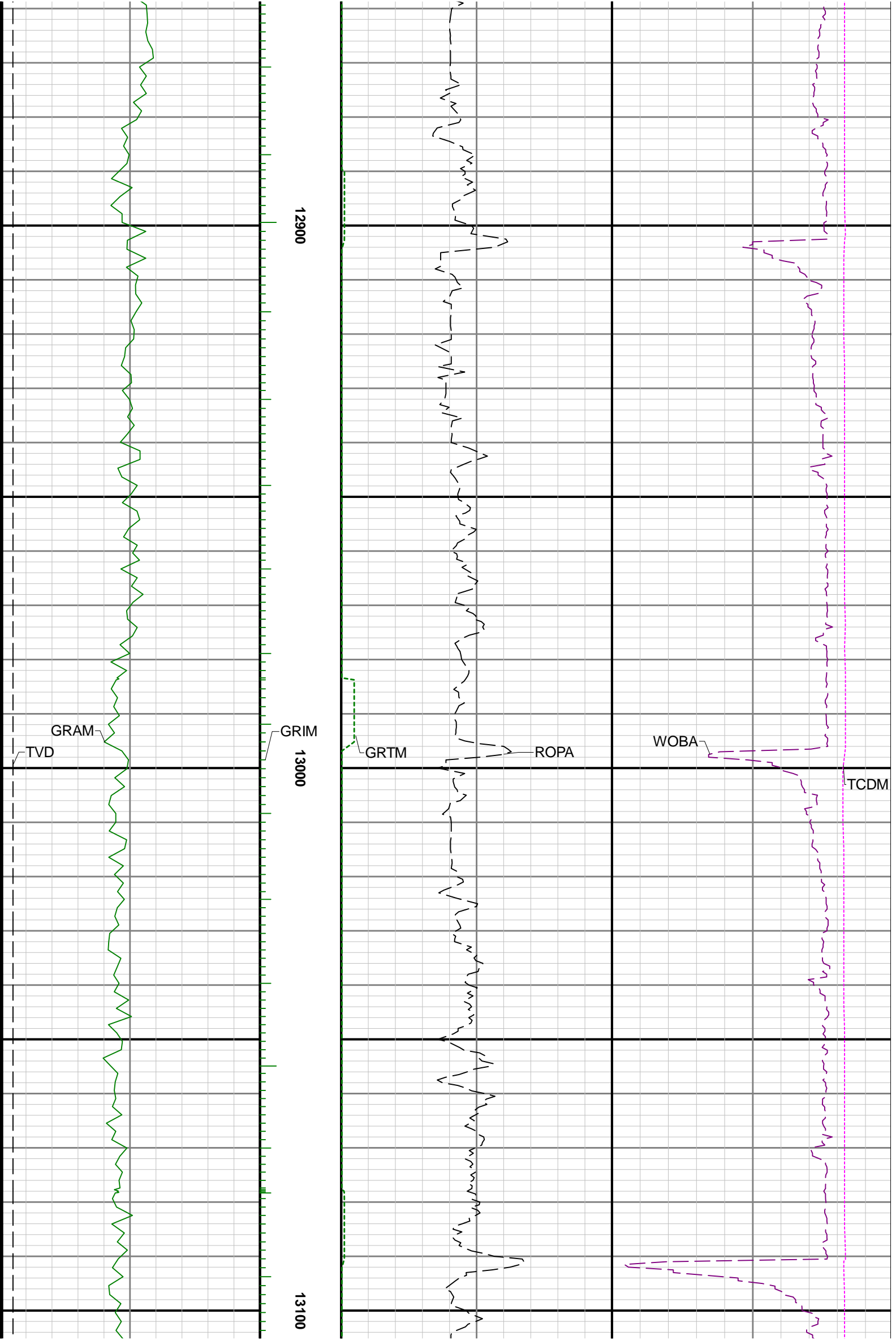


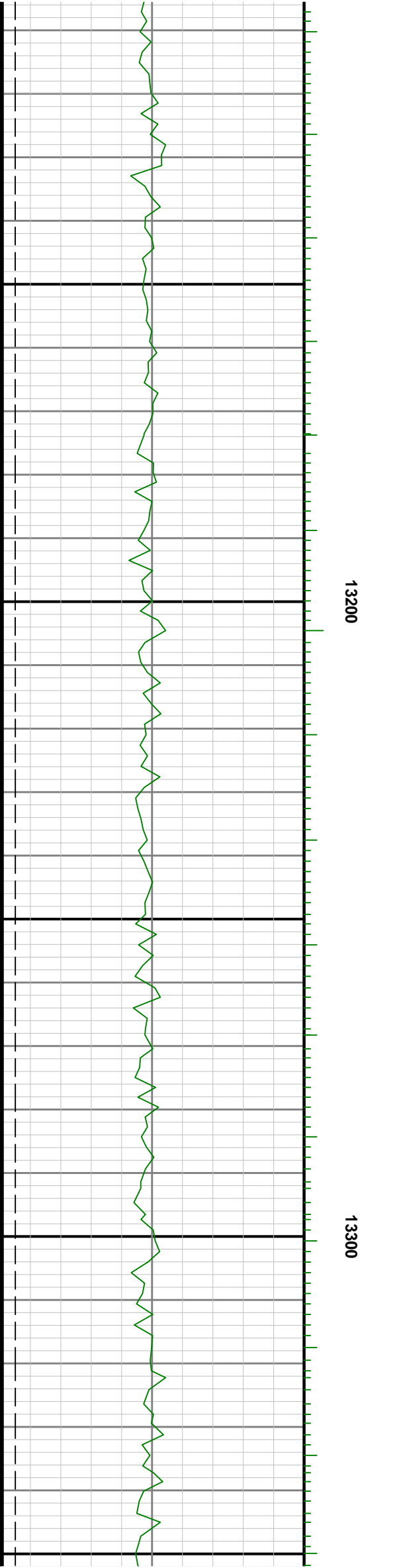
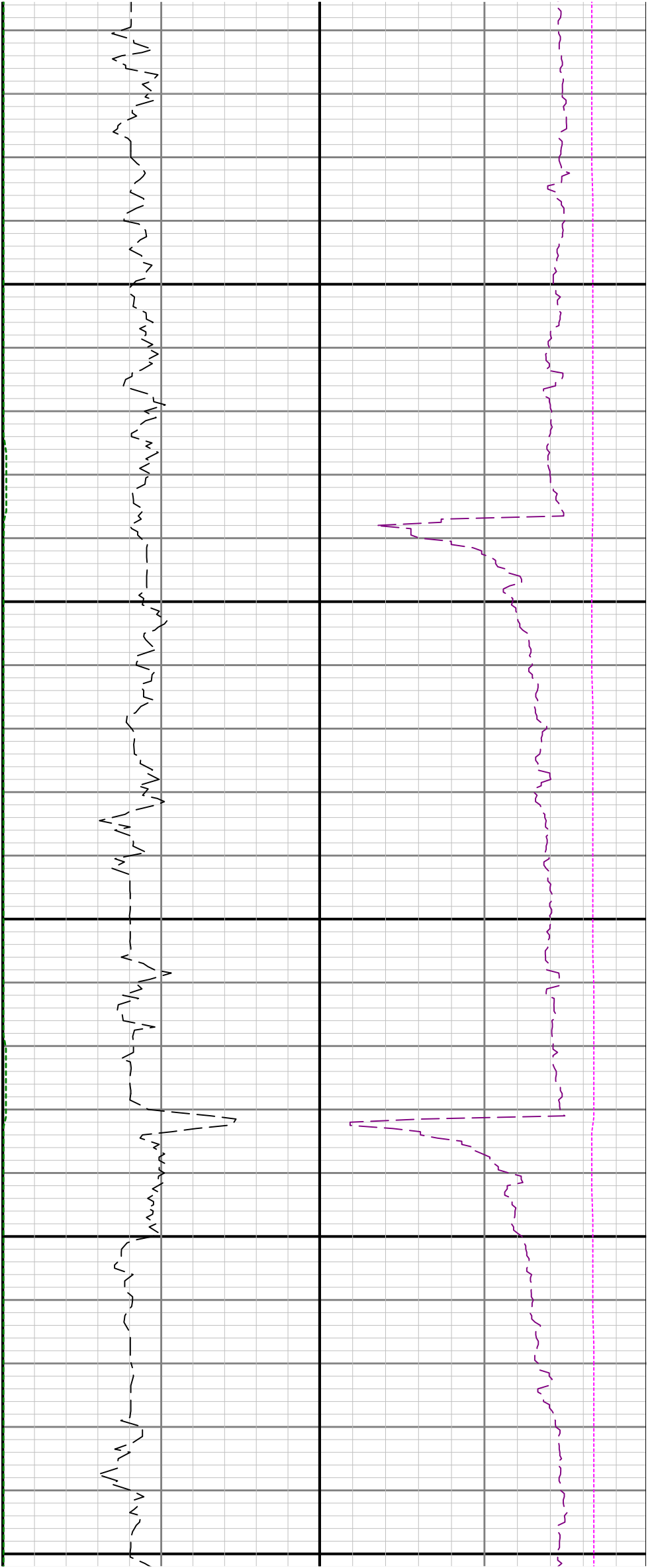


12700

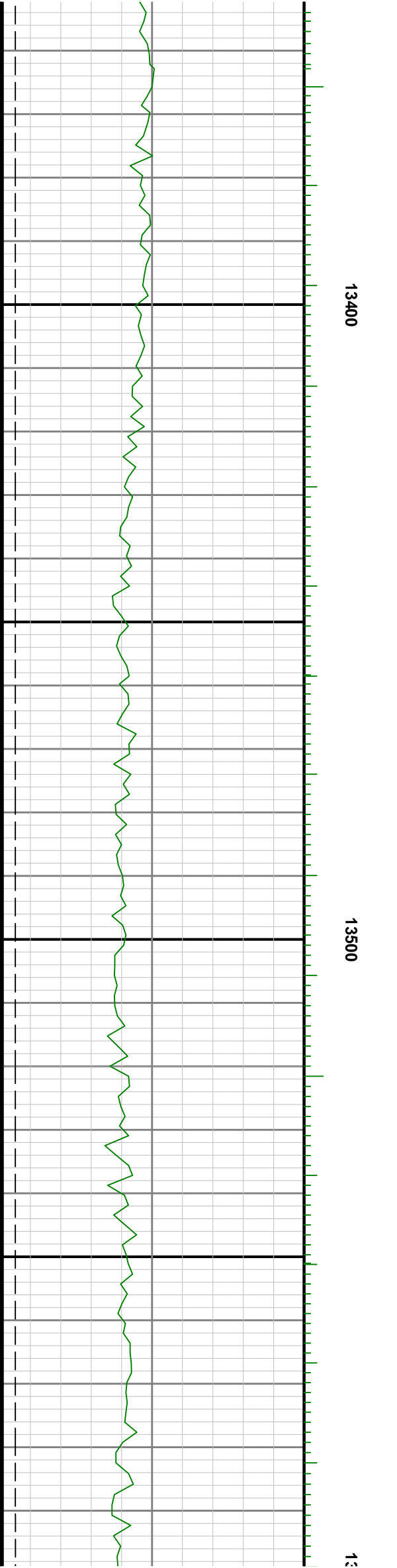
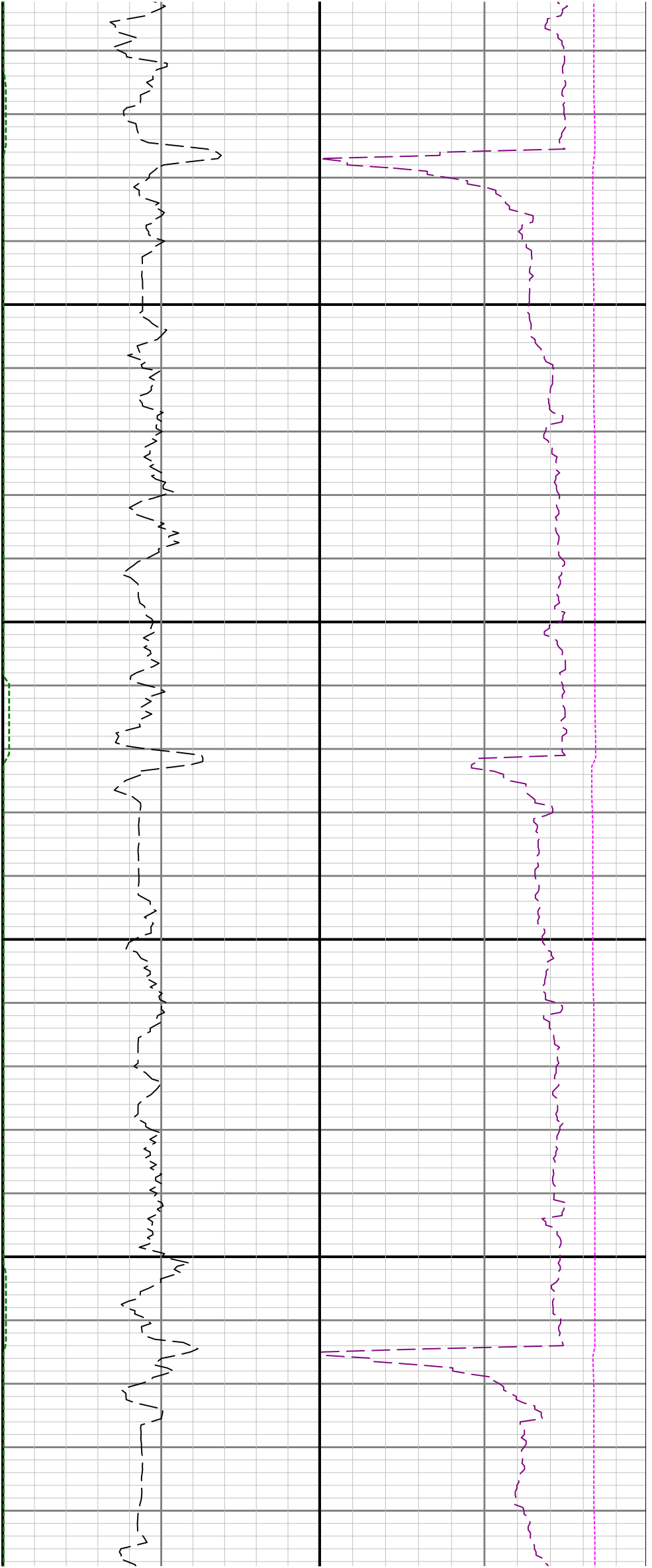
12800

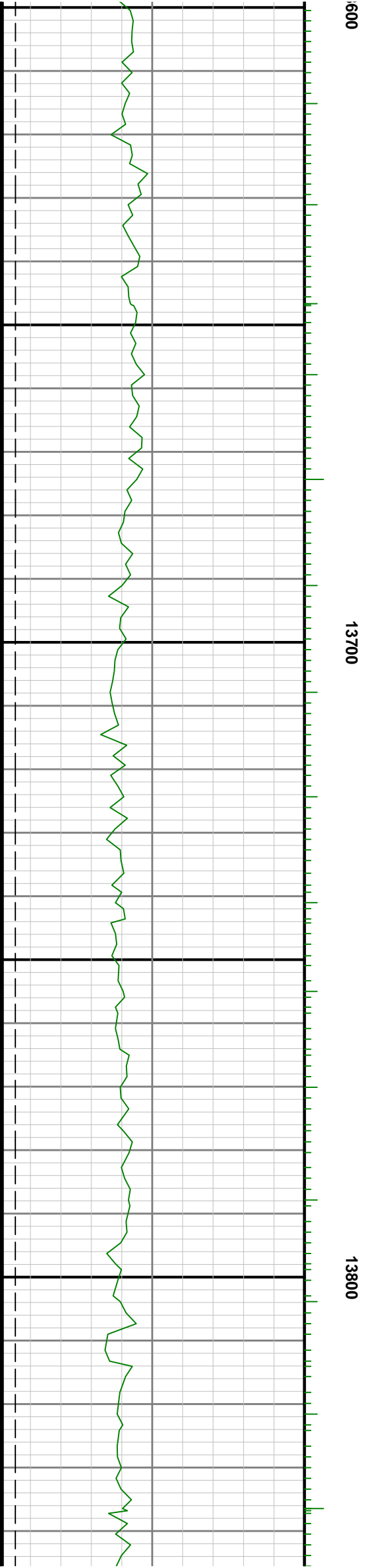
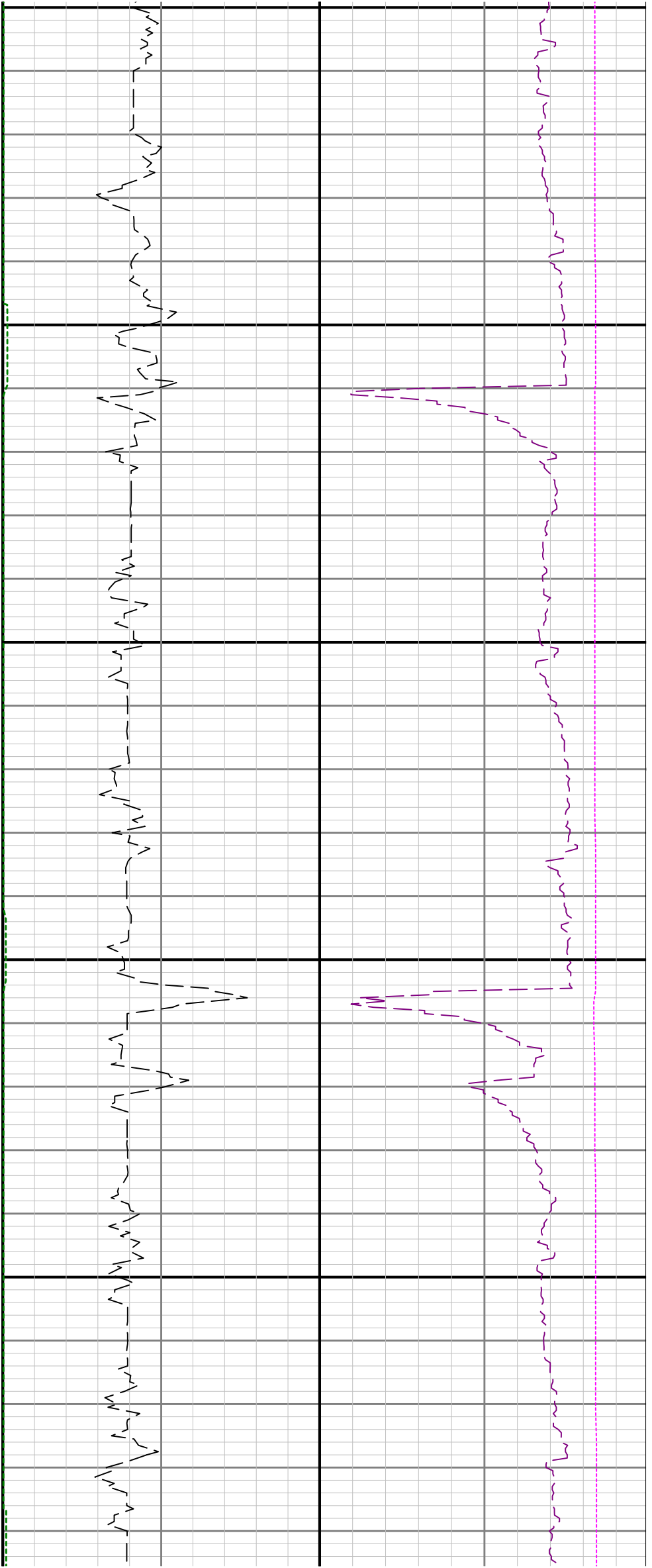


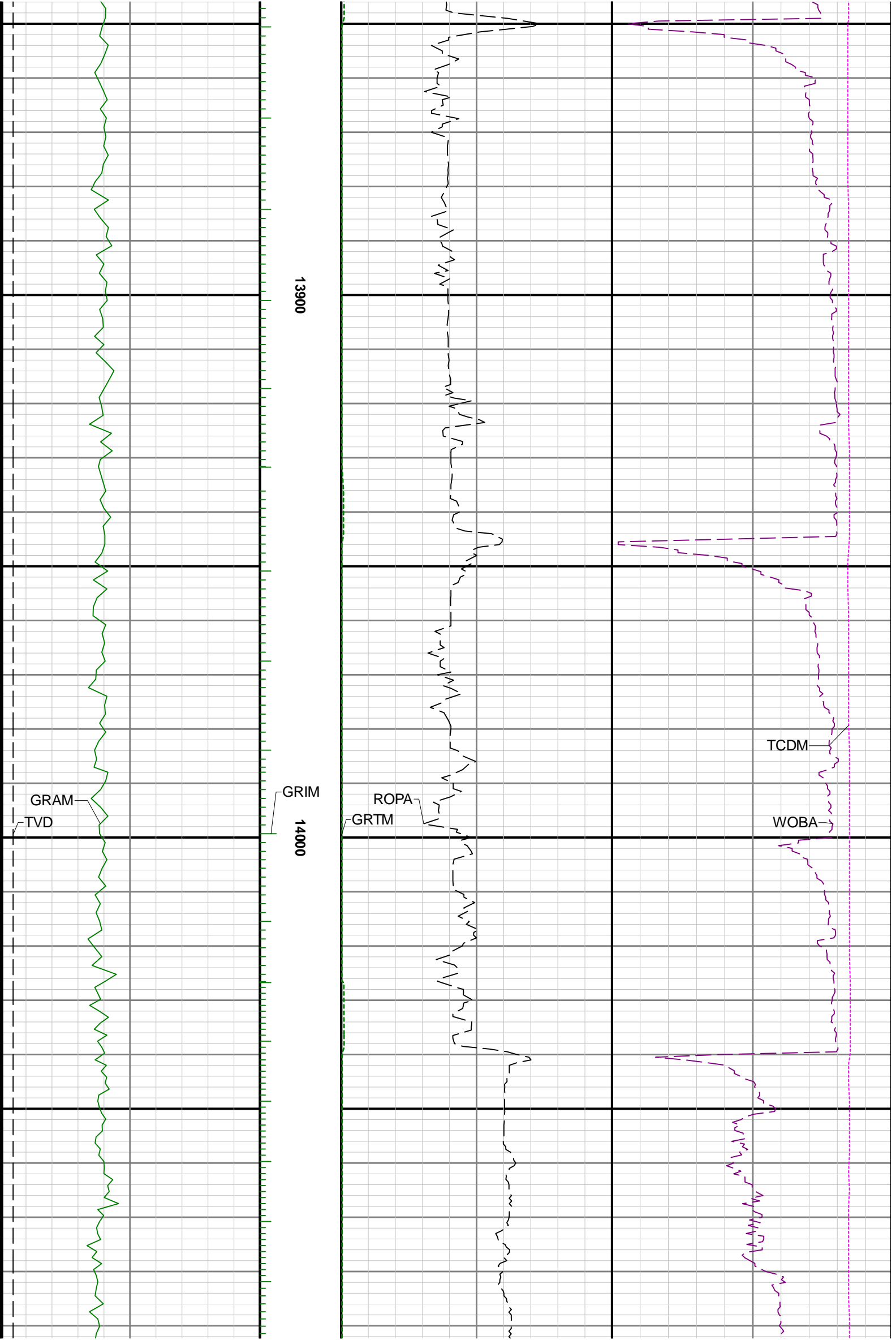


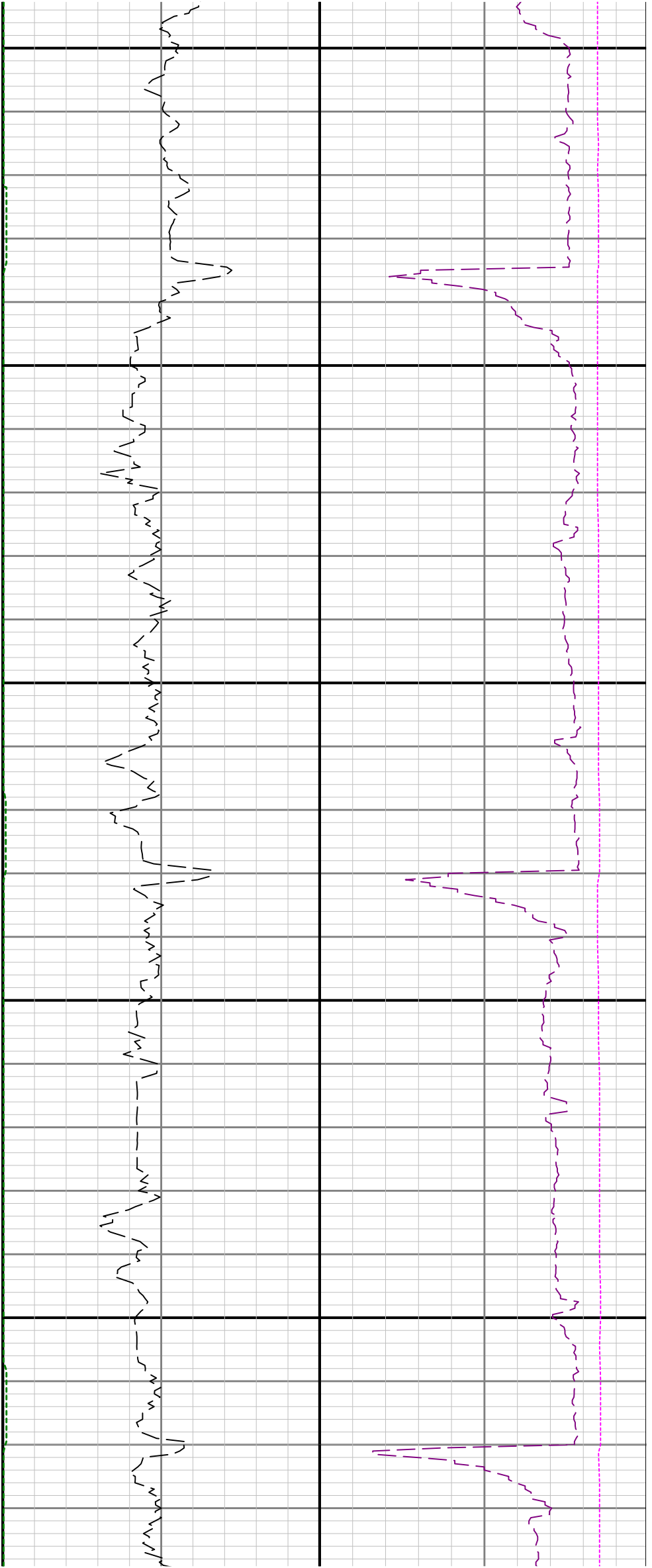








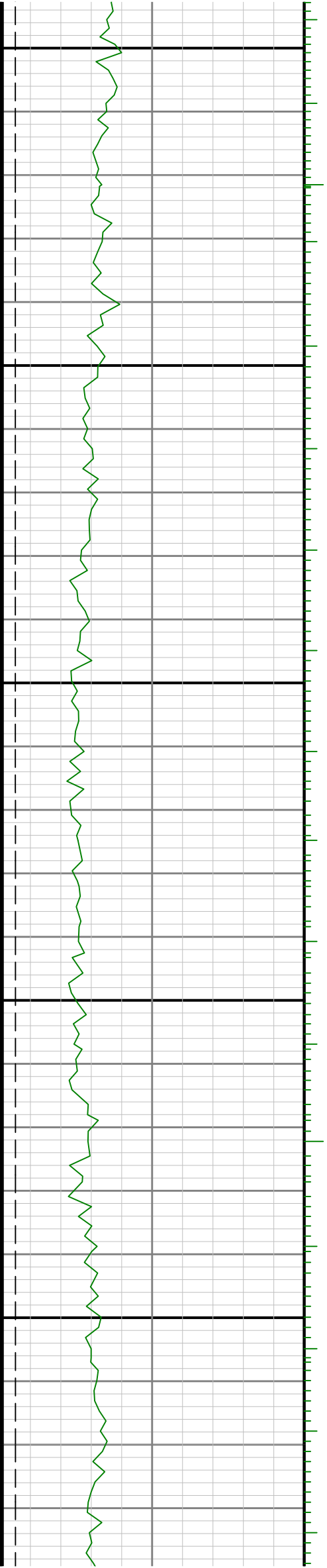


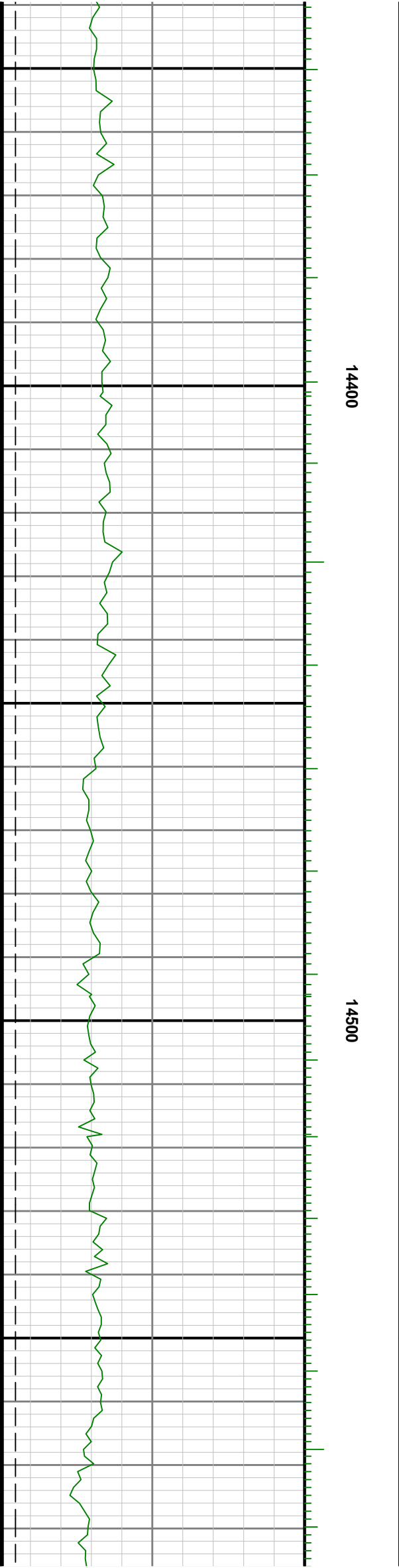
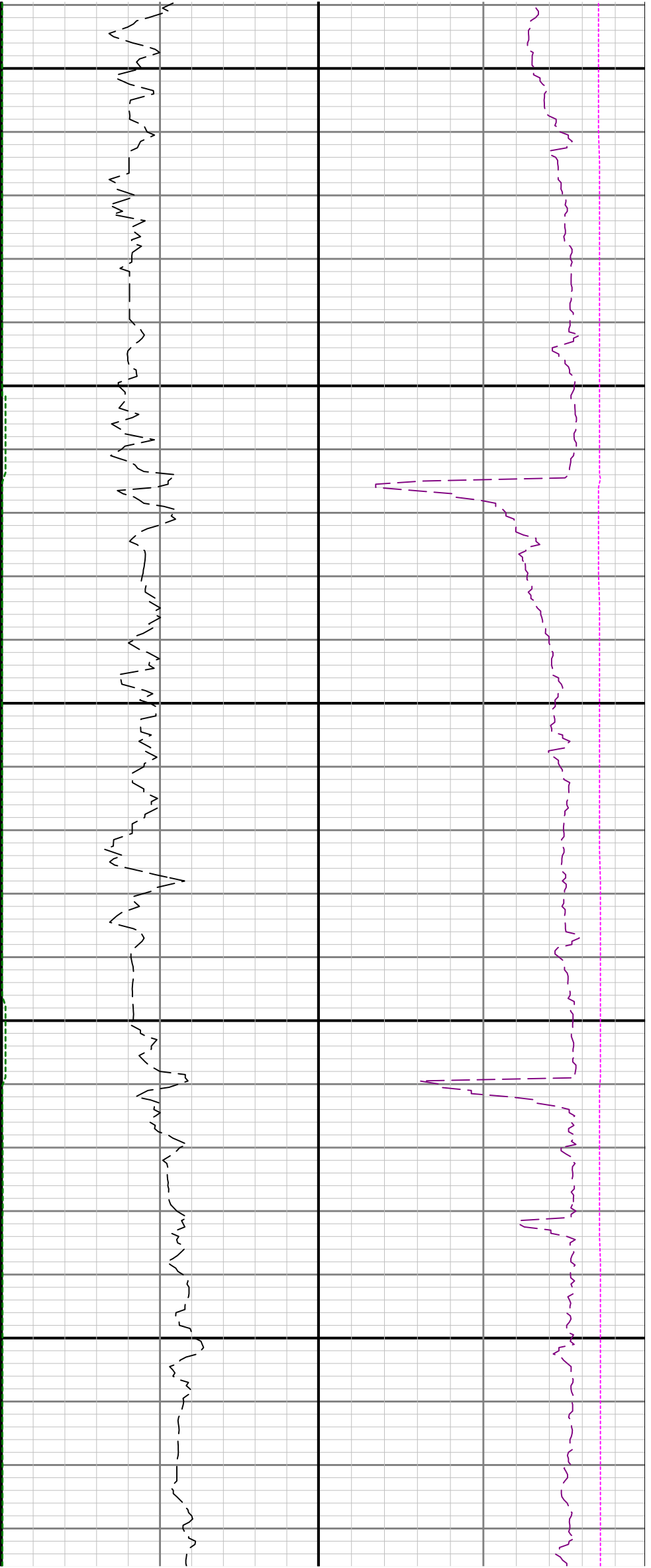


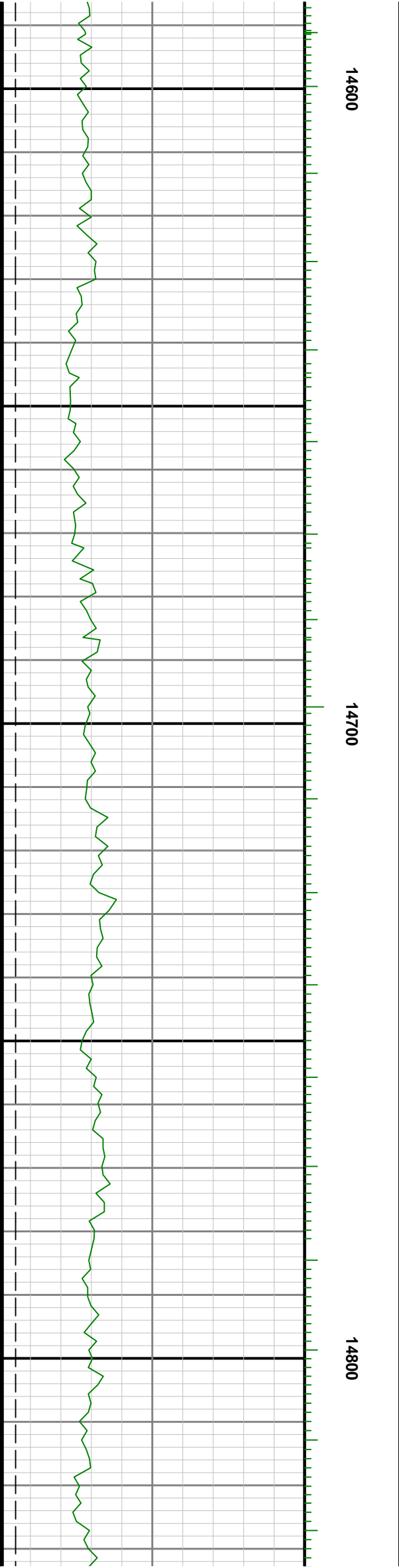
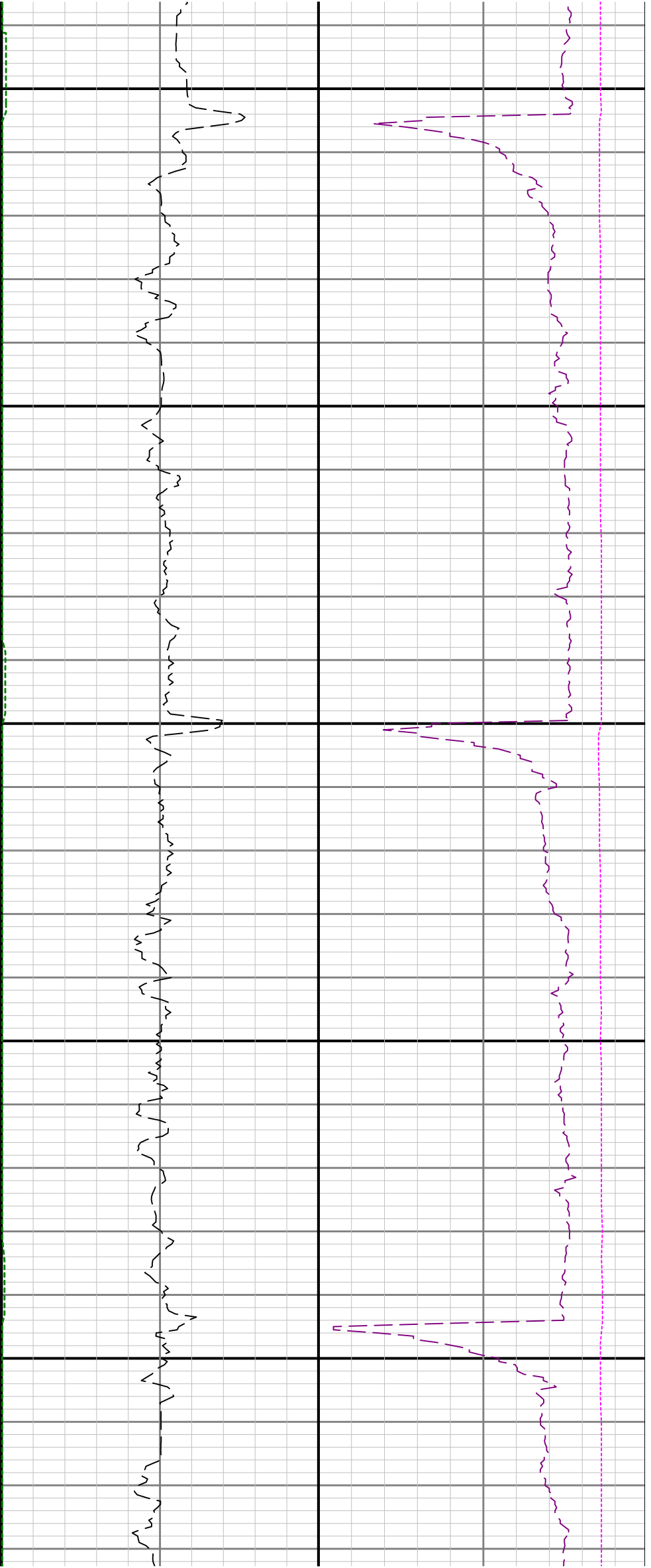
14100

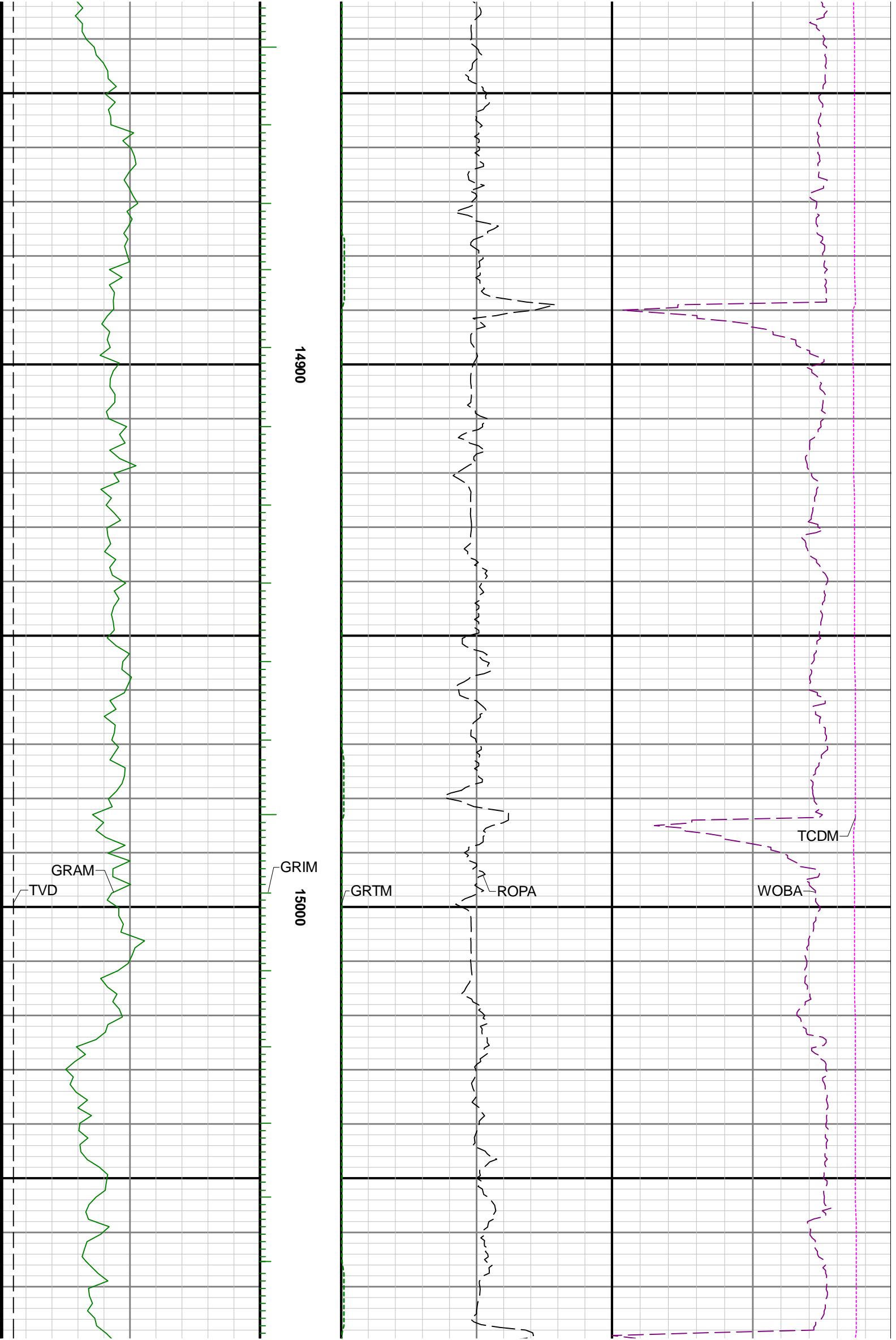
14200

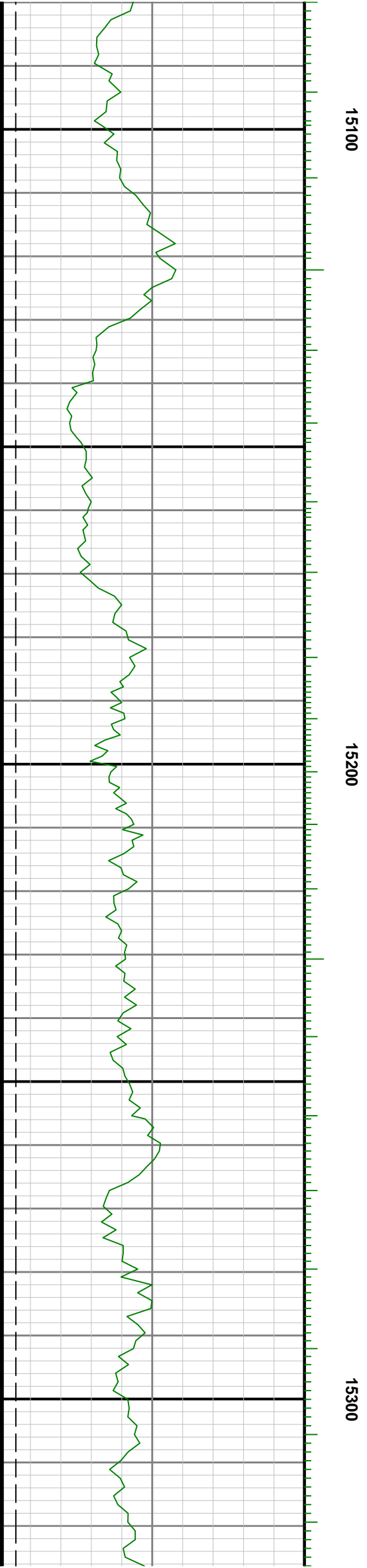
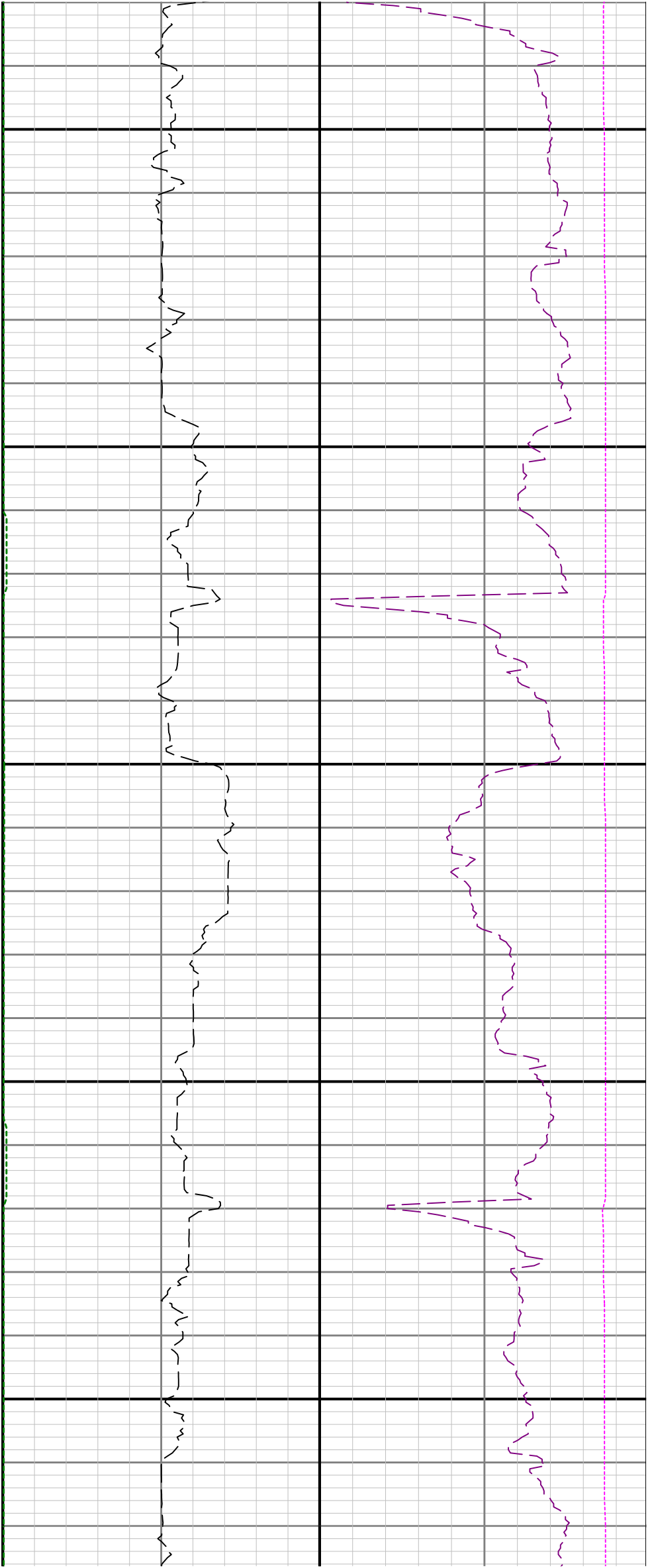
14300



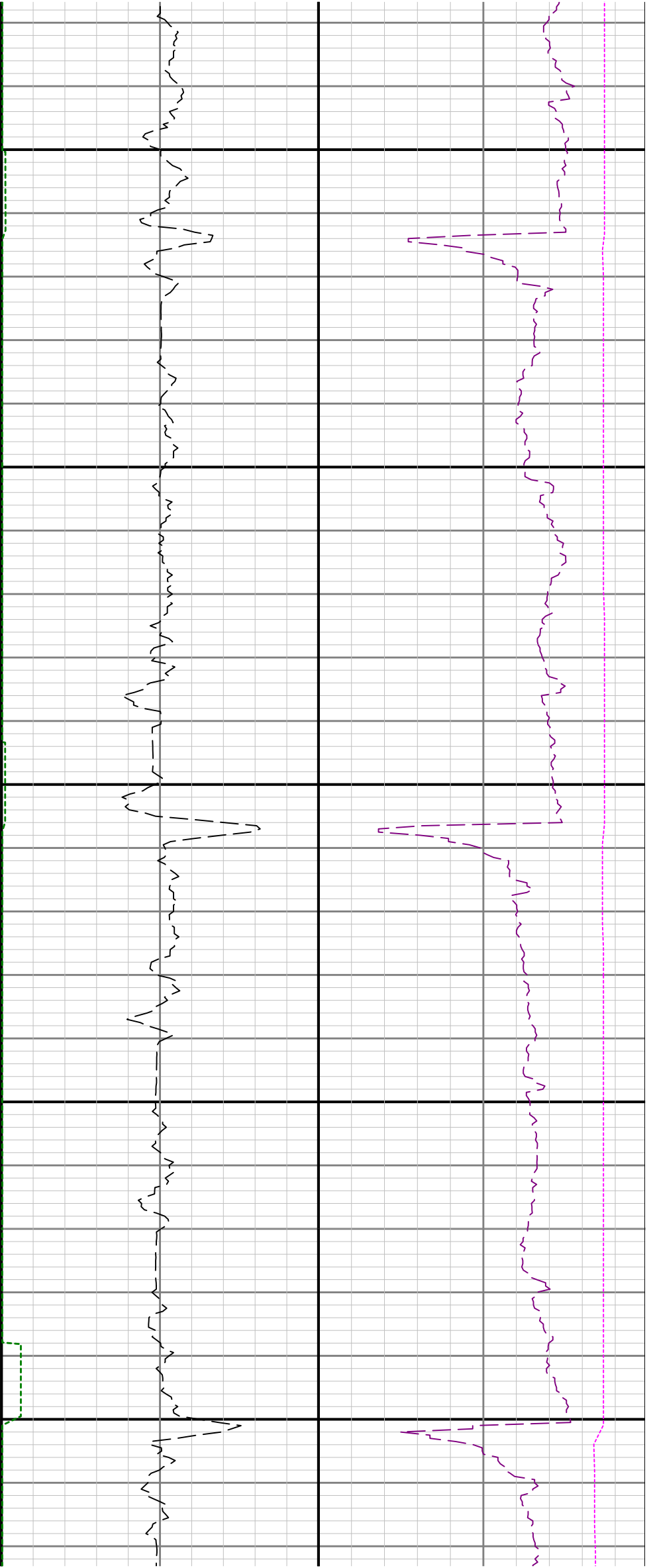






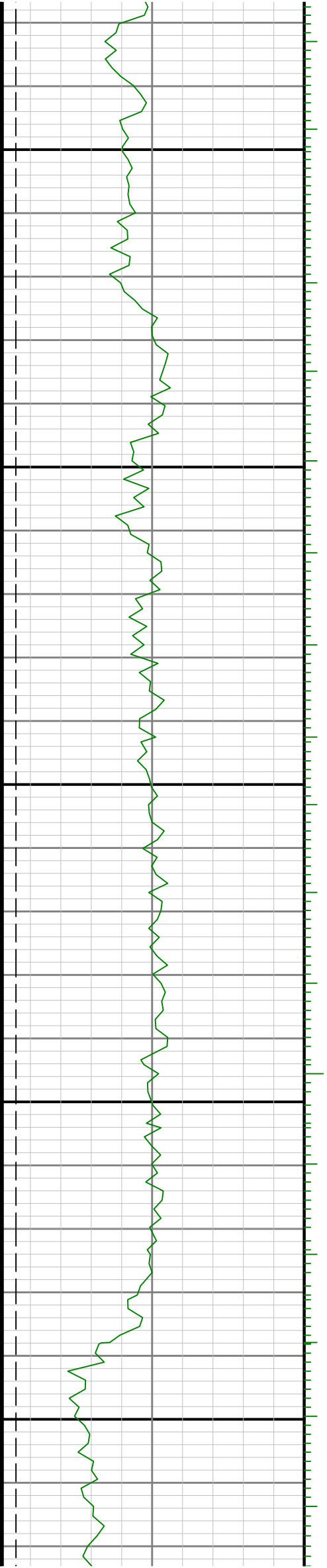


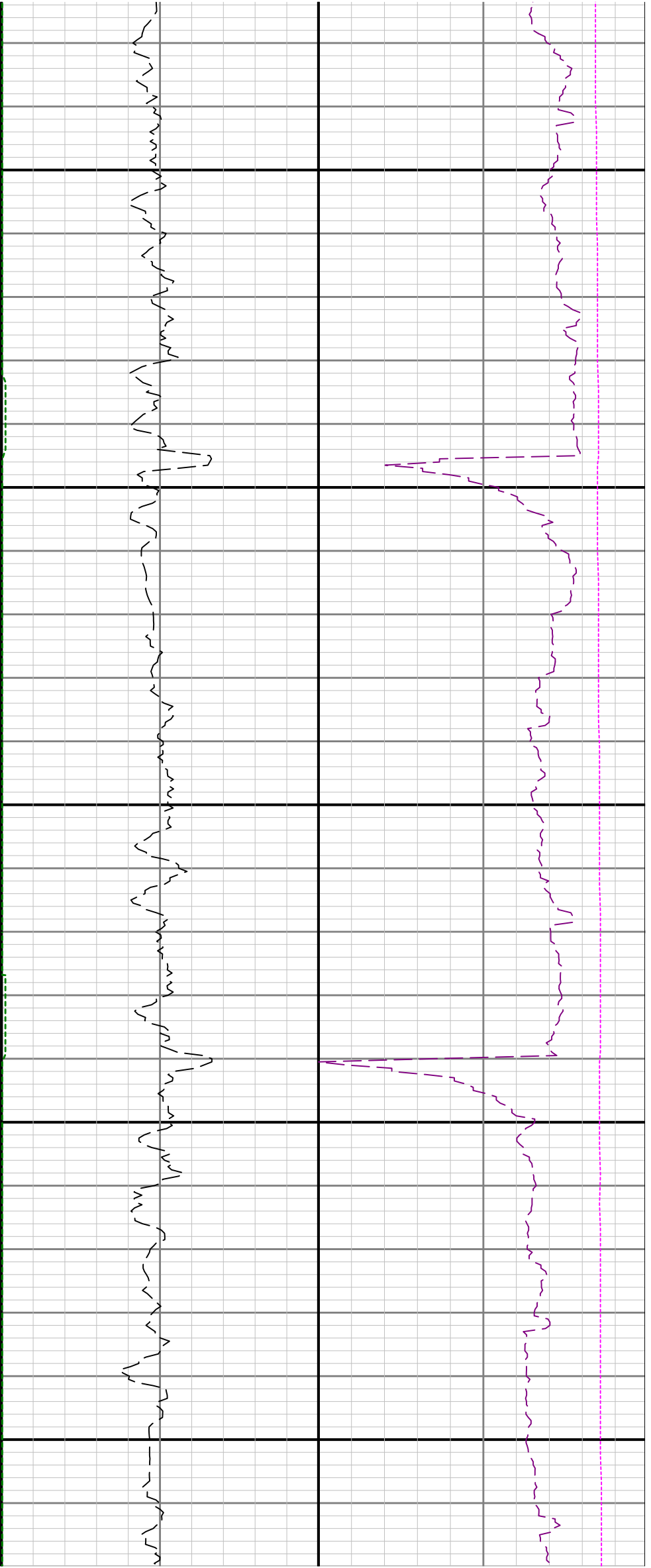




15400

15500

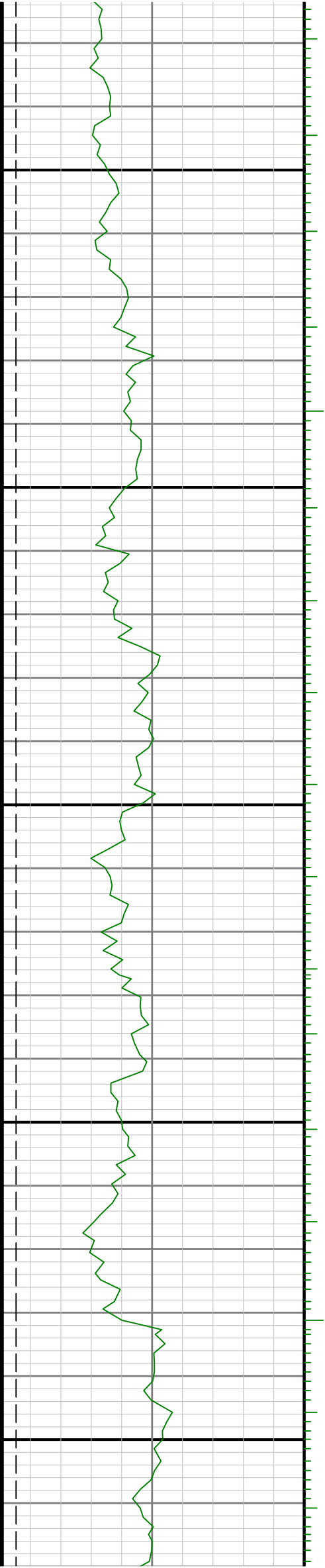


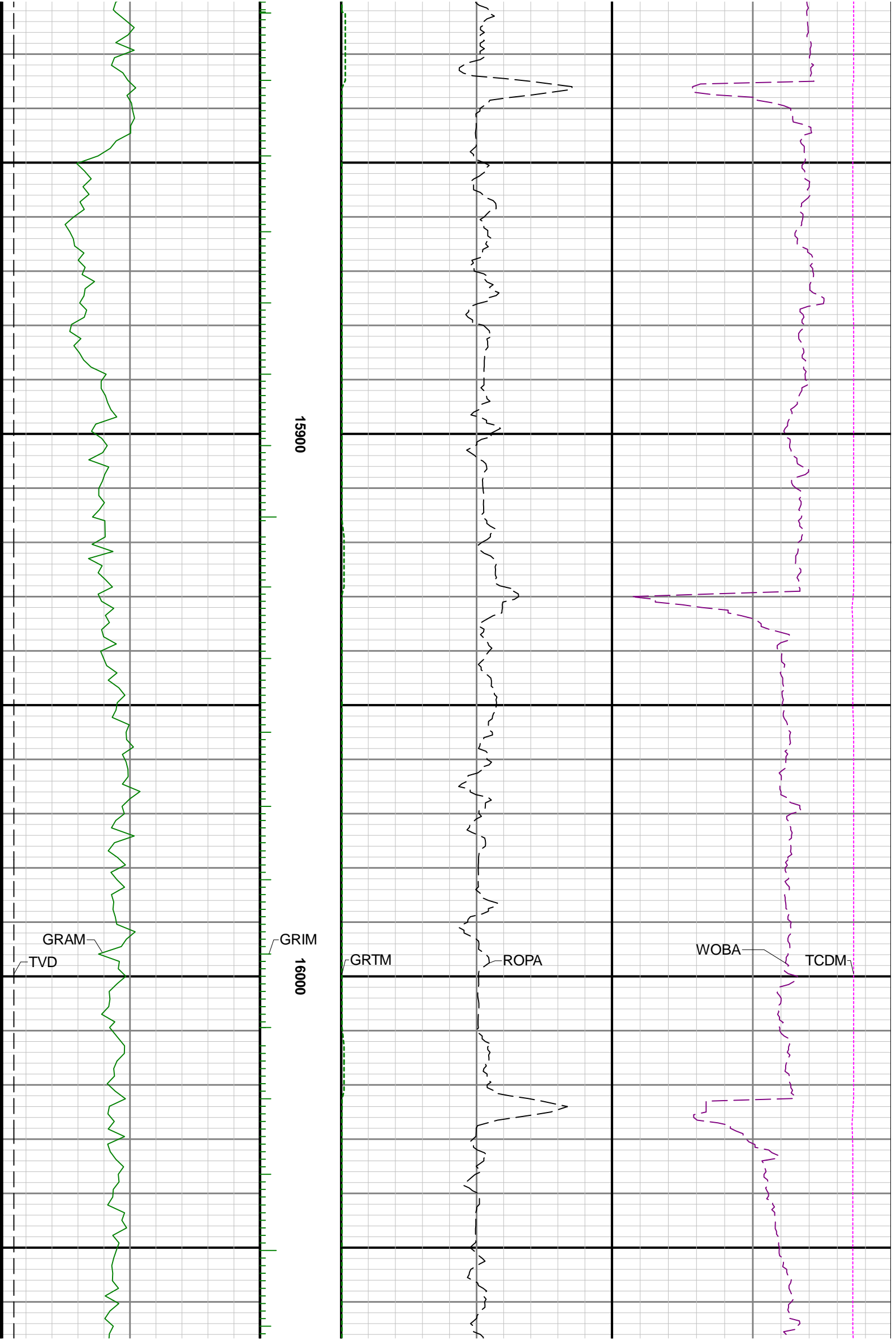


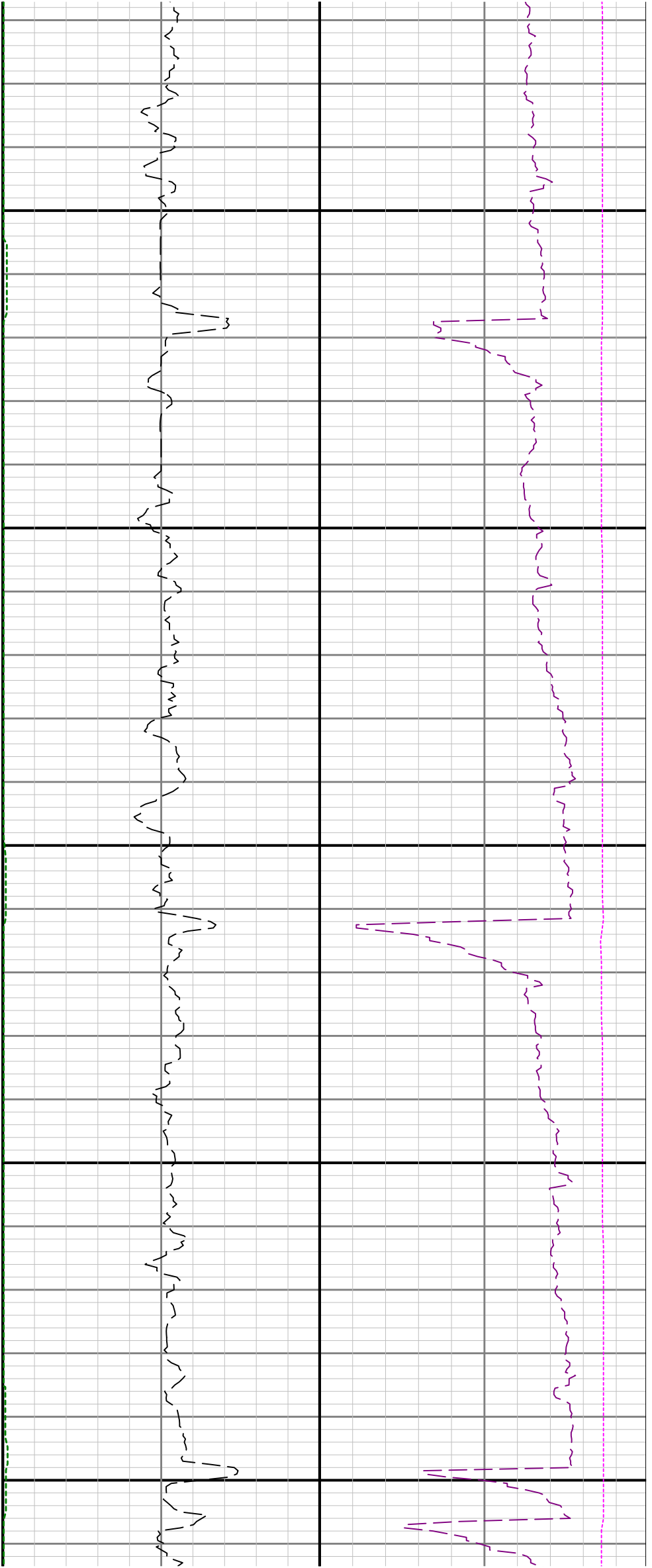
15600

15700

15800



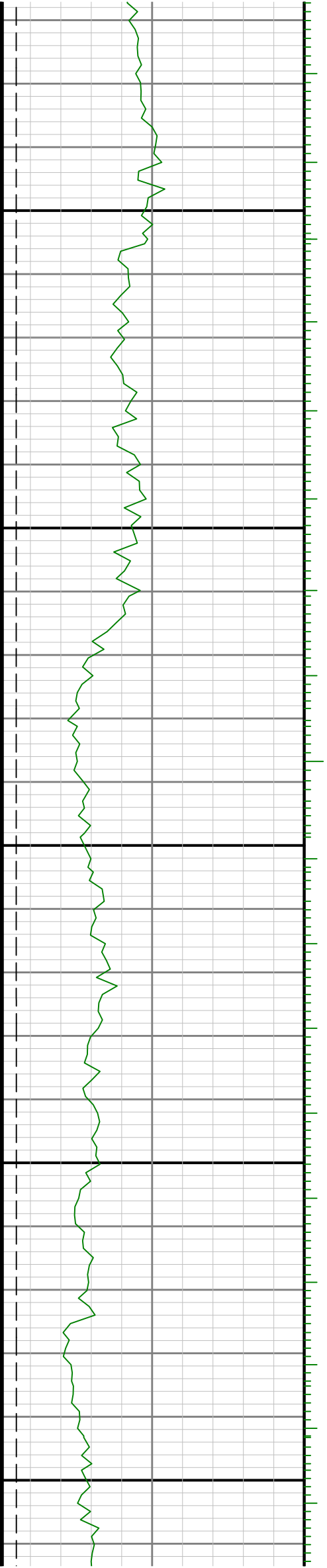


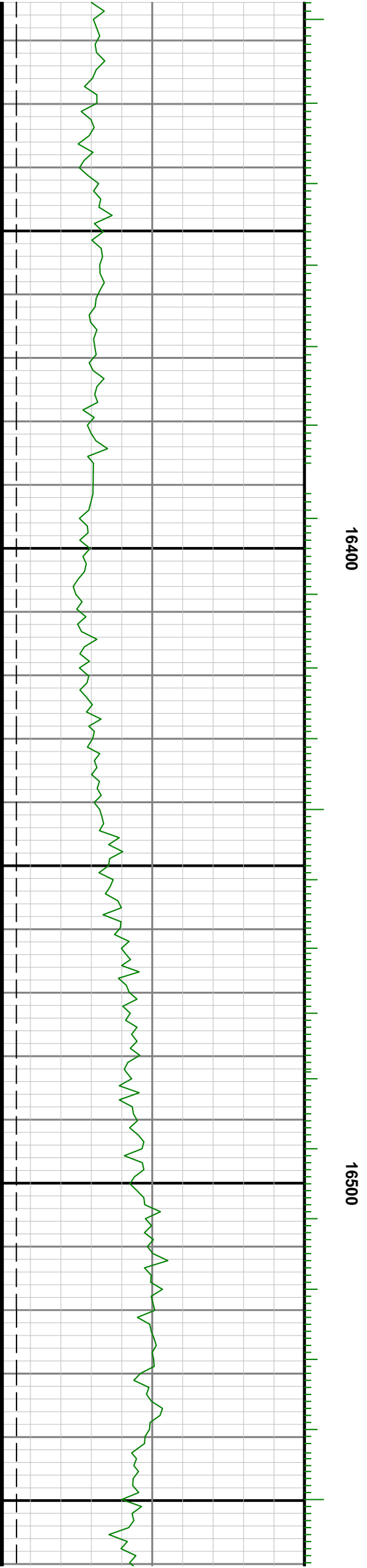


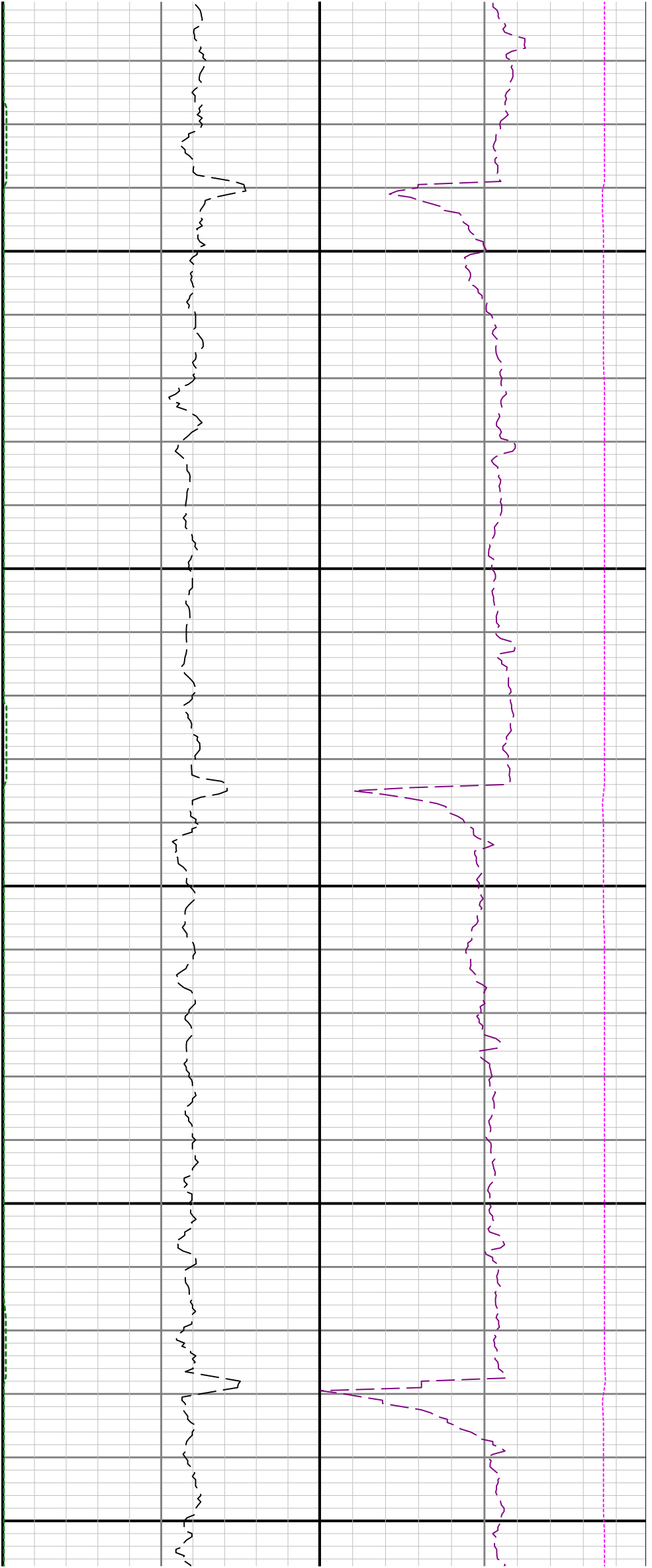
16100

16200

16300







16600

16700

16800



