



Memory and Realtime Log

Multiple Propagation Resistivity
Gamma Ray

Scale:
1:240 MD
Measured Depth

Company: Anadarko

Well: Howard 29N-21HZ

Field: Weld County

County: Weld State: Colorado

Surface Location:

Latitude: 40° 1' 49.811" N

Longitude: 104° 53' 58.376" W

Other Services:

API Number:

05-123-96792-0

SEC: 21

TWP: 1N

RNG: 67W

Directional
VSS

Permanent Datum (P.D.):

Ground Level

Elevation: 5024.00 ft.

Rig Floor 17.00 ft.

Above P.D.

Elevations:

N/A

Log Measured From:

Drillers Depth

KB:

DF:

GL:

5041.00 ft.

5024.00 ft.

Interval Logged

Dates

Magnetic Field Reference

Top: 6900.0 ft.

Date From: 27/Aug/13

Dip Angle: 66.65 °

Azi Reference North: True

Bottom: 12009.0 ft.

Date To: 08/Sep/13

Total

Mag to Reference

Spud Date: 31/Aug/13

Field Strength: 52675.6 nT

North Correction: 8.64 °

Borehole Record

Casing Record

Hole Size	From	To	Size	Weight	From	To
13.500 in.	Surface	941.0 ft.	9.625 in.	36.00 lb/ft	Surface	931.0 ft.
8.750 in.	931.0 ft.	8003.0 ft.	7.000 in.	26.00 lb/ft	Surface	7993.0 ft.
6.125 in.	7993.0 ft.	12009.0 ft.				

Mud Record

Deviation Record

Type	From	To	Hole Size	Interval	Inc / Az (Start)	Inc / Az (End)
Water Based Mud	Surface	12009.0 ft.	13.500 in.	941.0 ft.	0.0 ° / 0.0 °	1.2 ° / 3.4 °
			8.750 in.	7072.0 ft.	1.2 ° / 4.8 °	89.6 ° / 1.0 °
			6.125 in.	4016.0 ft.	89.2 ° / 1.0 °	91.1 ° / 359.2 °
					/	/
					/	/
					/	/
					/	/

Acquisition System

Software Version

Other

Advantage 2.20U4 Rig: Xtreme 6 / Xtreme Coil Drilling

PATS 6.4.1.34 Job No: 5590089

District / Unit: RMD / D&E

INTEQ does not guarantee the accuracy or correctness of interpretations provided in or from this log. Since all interpretations are opinions based on measurements, INTEQ shall under no circumstances be responsible for consequential damages or any other loss, costs, damages or expenses incurred or sustained in connection with the use of any such interpretations. INTEQ disclaims all expressed and implied warranties related to this service. INTEQ's liabilities and obligations shall be governed by INTEQ's Standard Terms and Conditions.

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	2	8.750	PDC Core	0.750	Steerable	6900.0	8003.0	941.0	8003.0	31/Aug/2013 06:30	04/Sep/2013 5:00		53.4
2	2	3	6.125	PDC Core	0.700	Steerable	7960.0	12009.0	7993.0	12009.0	05/Sep/2013 08:30	08/Sep/2014 7:00		38.7

Crew

Name	Arrive	Depart	Name	Arrive	Depart	Name	Arrive	Depart
	Wellsite	Wellsite		Wellsite	Wellsite		Wellsite	Wellsite
Matthew Delmore	02/Sep/2013	08/Sep/2013	Donald Delay	27/Aug/2013	08/Sep/2013	Jeremiah Davidson	27/Aug/2013	02/Sep/2013

Mud Properties Record

Date / Time		LWD	Measured	Mud	Density	Viscosity	pH	Fluid	Oil /	Source	Total	K+
		Run No.	Depth	Type				Loss	Water		Chlorides	
			(ft.)		(ppg)	(cp)		(cc)			(ppm)	(%)
02/Sep/2013	22:00	1	7025.0	Water Based Mud	9.8	43	8.5	5.4	0 / 95	Active Mud Pit	300	0.0
03/Sep/2013	22:00	1	4386.0	Water Based Mud	8.5	43	8.5	5.4	0 / 100	Active Mud Pit	300	0.0
04/Sep/2013	22:00	1	7025.0	Water Based Mud	9.8	43	8.5	5.4	0 / 95	Active Mud Pit	300	0.0
05/Sep/2013	22:00	1	8003.0	Water Based Mud	9.8	40	8.5	5.0	0 / 93	Active Mud Pit	300	0.0
05/Sep/2013	08:00	2	8003.0	Water Based Mud	9.8	41	8.5	5.4	2 / 92	Active Mud Pit	300	0.0
05/Sep/2013	15:00	2	8197.0	Water Based Mud	9.8	38	9.0	5.6	2 / 91	Active Mud Pit	500	0.0
06/Sep/2013	07:30	2	9170.0	Water Based Mud	9.0	41	9.0	4.8	2 / 95	Active Mud Pit	600	0.0
06/Sep/2013	15:00	2	10102.0	Water Based Mud	9.0	41	9.0	4.6	2 / 95	Active Mud Pit	600	0.0
06/Sep/2013	22:00	2	10703.0	Water Based Mud	8.9	42	9.0	4.6	2 / 96	Active Mud Pit	600	0.0
07/Sep/2013	07:30	2	11776.0	Water Based Mud	8.9	40	9.0	4.6	2 / 96	Active Mud Pit	600	0.0
07/Sep/2013	15:00	2	12009.0	Water Based Mud	8.9	41	9.0	4.4	2 / 96	Active Mud Pit	600	0.0
07/Sep/2013	20:30	2	12009.0	Water Based Mud	8.9	40	8.5	4.4	2 / 96	Active Mud Pit	600	0.0

Mud Resistivity Record					Surface				Downhole		
Date / Time		LWD Run No.	Measured Depth (ft.)	Surface Temp (deg F)	Rm (ohm.m)	Rmf (ohm.m)	Rmc (ohm.m)	BHCT (deg F)	Rm @ BHCT (ohm.m)	Rmf @ BHCT (ohm.m)	Rmc @ BHCT (ohm.m)
05/Sep/2013	10:17	2	8003.0	75	1.00	N/A	N/A	165	0.47	N/A	N/A
05/Sep/2013	19:56	2	8018.0	71	1.38	N/A	N/A	185	0.54	N/A	N/A
06/Sep/2013	00:45	2	8318.0	74	1.22	N/A	N/A	191	0.49	N/A	N/A
06/Sep/2013	11:05	2	9675.0	88	0.83	N/A	N/A	196	0.38	N/A	N/A
06/Sep/2013	12:52	2	9831.0	71	1.17	N/A	N/A	199	0.43	N/A	N/A
07/Sep/2013	00:24	2	10967.0	76	0.97	N/A	N/A	207	0.37	N/A	N/A
07/Sep/2013	08:08	2	11876.0	71	1.06	N/A	N/A	223	0.35	N/A	N/A

Mnemonics		
Curve	Description	Units
CACHM	Conductivity (AT) (LS) 2 MHZ - Compensated Borehole Corrected	mho/o
GRAM	Gamma Ray Apparent, 0.5 ft. Avg	API
GRAX	Gamma Ray Apparent, 0.5 ft. Avg	API
GRIM	Gamma Ray Density	points
GRIX	Gamma Ray Density	points
RACHM	Resistivity, Attenuation (LS) 2 MHZ - Compensated Borehole Corrected	ohm.m
RACLM	Resistivity, Attenuation (LS) 400 kHz - Compensated Borehole Corrected	ohm.m
ROPA	Rate of Penetration, 3.0 ft. Avg	ft/hr
RPCHM	Resistivity, Phase Difference (LS) 2 MHZ - Compensated Borehole Corrected	ohm.m
RPCLM	Resistivity, Phase Difference (LS) 400 kHz - Compensated Borehole Corrected	ohm.m
RPSIHM	Resistivity Slide Indicator	unitless
RPTHM	Time Since Drilled (RPCHM)	min

Equipment and Service Data

LWD Run No.	Tool	Serial Number	Measurement	Bit Offset (ft)	Max O.D. (in.)	Min I.D. (in.)
1	DIR	12859420	Directional	47.23	6.750	2.313
1	SRIG	12131378	Gamma	43.85	6.750	2.313
2	CS	12727227	-	74.11	4.843	2.569
2	BCPM	11655055	Telemetry	63.02	4.843	2.569
2	STAB	11853042	-	59.84	0.000	2.569
2	OTK	12909192	Directional	55.37	4.843	2.569
2	OTK	12909192	Resistivity	49.40	4.843	2.569
2	OTK	12909192	Gamma	42.21	4.843	2.569
2	OTK	12909192	Pressure	44.84	4.843	2.569
2	CS	12202693	-	36.95	4.843	2.569

Service and Tool Mnemonics

Mnemonic	Name	Description
BCPM	BCPM	Mud pulse telemetry and downhole tool power module
DIR	Directional	Wellbore directional survey
OTK	OnTrak	Propagation resistivity, propagation conductivity, gamma ray, directional, annular pressure, system memory and VSS
SRIG	Inclination and Gamma	Probe based gamma ray and inclination module
STAB	Stabilizer	Stabilizer assembly
CS	Closure Sub	BHA power ring isolator allowing insertion of inert sub into electrically powered BHA

Comments

1. Baker Hughes INTEQ run 1 utilized 6 3/4 inch NaviTrak and NaviGamma Services. NaviTrak services (VSS, Directional) were provided behind an 8 3/4 inch bit and steerable assembly from 941 to 6950 ft MD (940.94 to 6890.78 feet TVD). NaviGamma services (VSS, Directional, Gamma Ray) were provided behind an 8 3/4 inch bit and steerable assembly from 6950 to 8003 ft MD (6890.78 to 7495.87 feet TVD).
2. Baker Hughes INTEQ run 2 utilized 4 3/4 inch Ontrak Services. (Multiple Propagation Resistivity, Azimuthal Gamma Ray, VSS, Directional, Pressure) behind an 6 1/8 inch bit and steerable assembly from 8003 to 12009 feet MD (7595.87 to 7413.37 feet TVD).
3. A sliding indicator is shown to the right of track 2 as a heavy red line. The indicator has been depth-shifted to the resistivity sensor offset to correspond with data acquired while sliding.
4. Depth measurements were obtained from a depth tracking system not supplied or operated by Baker Hughes. Due to the lack of control by Baker Hughes LWD 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.

Remarks

Number	Measured Depth (ft)	Hole Section (in.)	LWD Run No.	Remark
1	6900	8.750	1	The interval from 6900 to 8000 feet MD (6840.80 to 7495.84 feet TVD) contains no resistivity logging data due to the fact that run 1 used NaviGamma services
2	7980	6.125	2	The interval from 7958 to 8003 feet MD (7494.89 to 7495.87 feet TVD) was logged up to 49 hours after being drilled due to casing operations.
3	11985	6.125	2	The interval from 11963 to 12009 feet MD (7414.32 to 7413.37 feet TVD) contains no logging data due to sensor to bit offset at the end of the run.

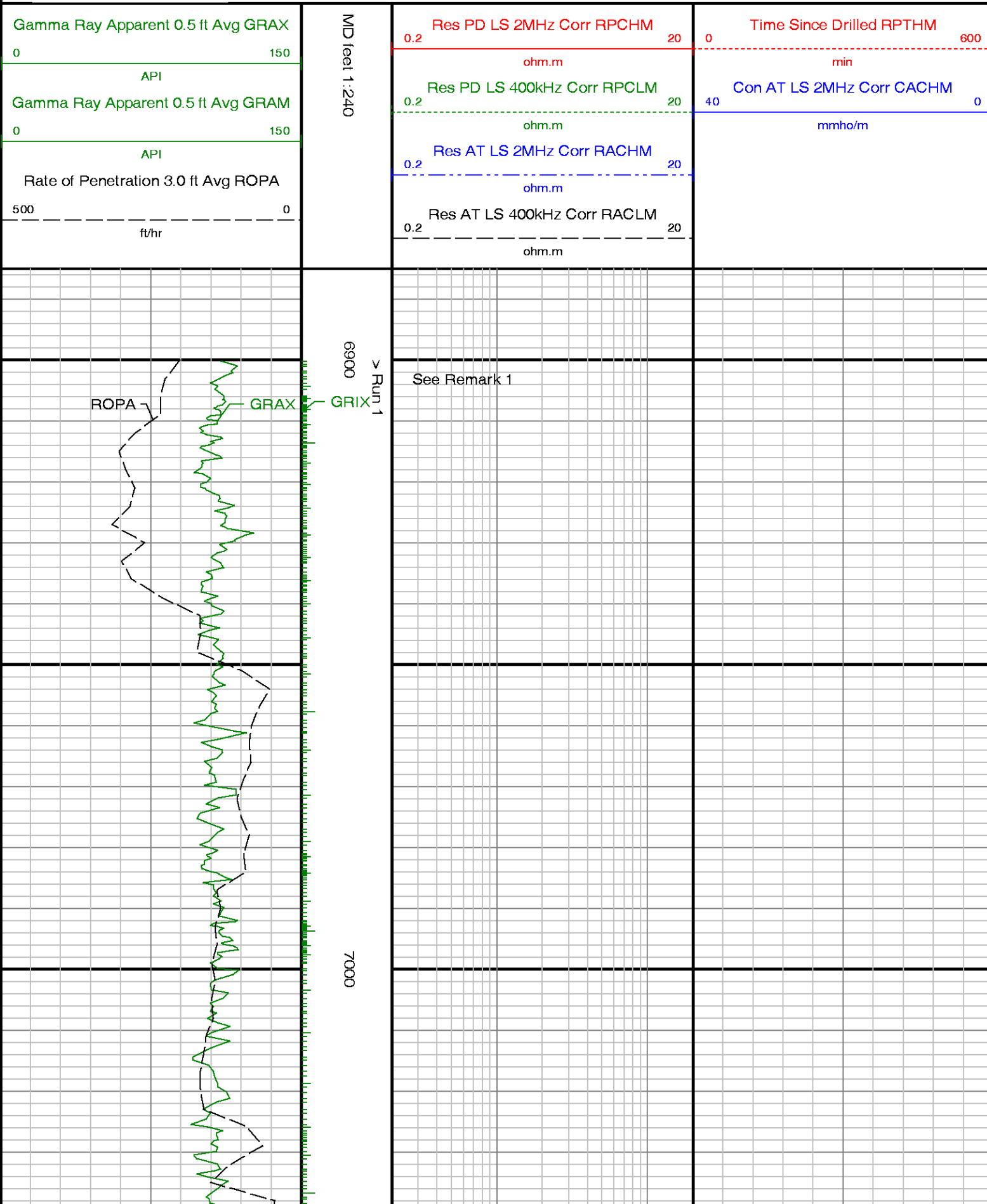


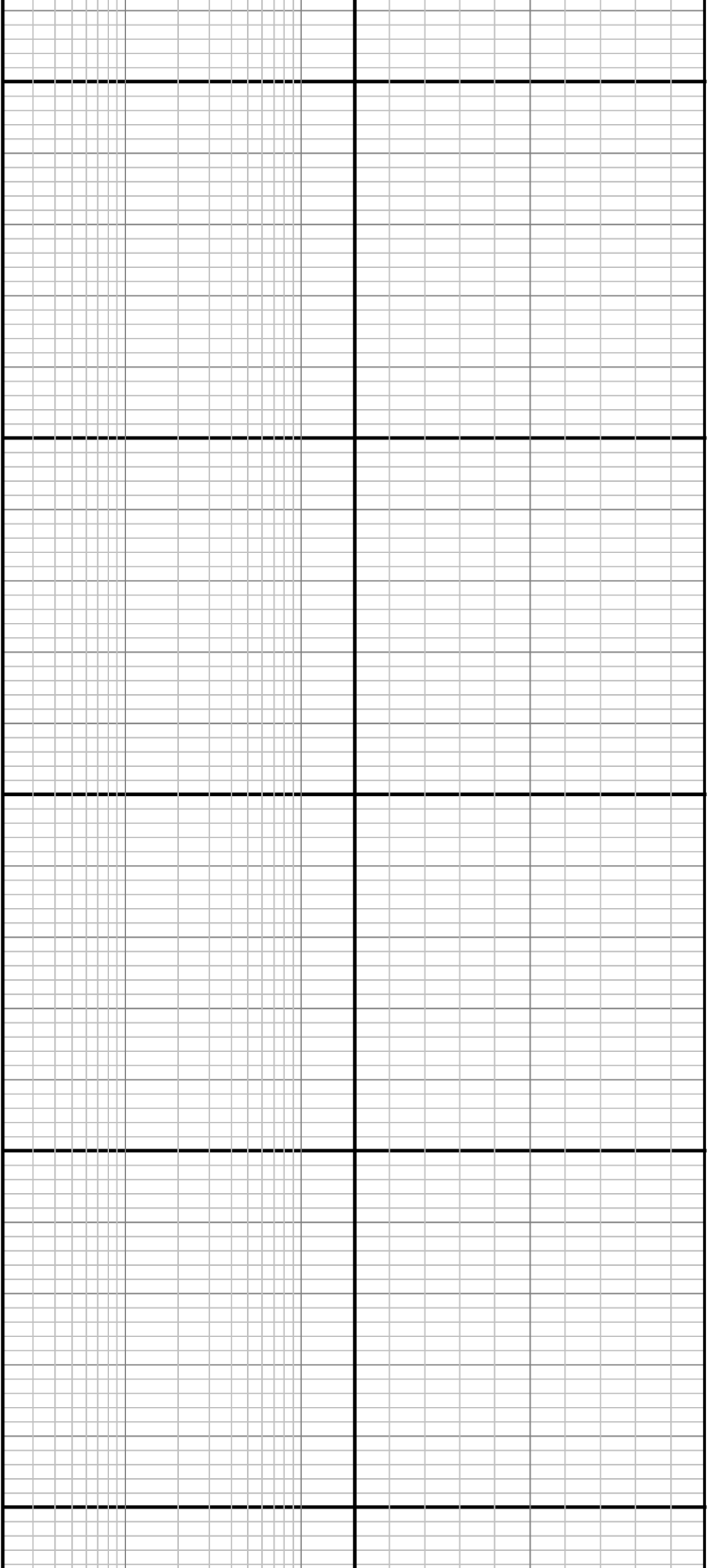
Company : Anadarko

Well : HOWARD 29N-21HZ

Interval : 6885.00 - 12045.00 feet

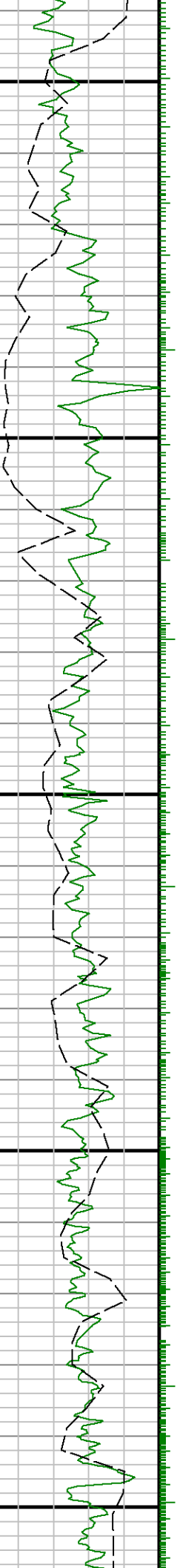
Created : 08/Sep/2013 1:49:00 PM

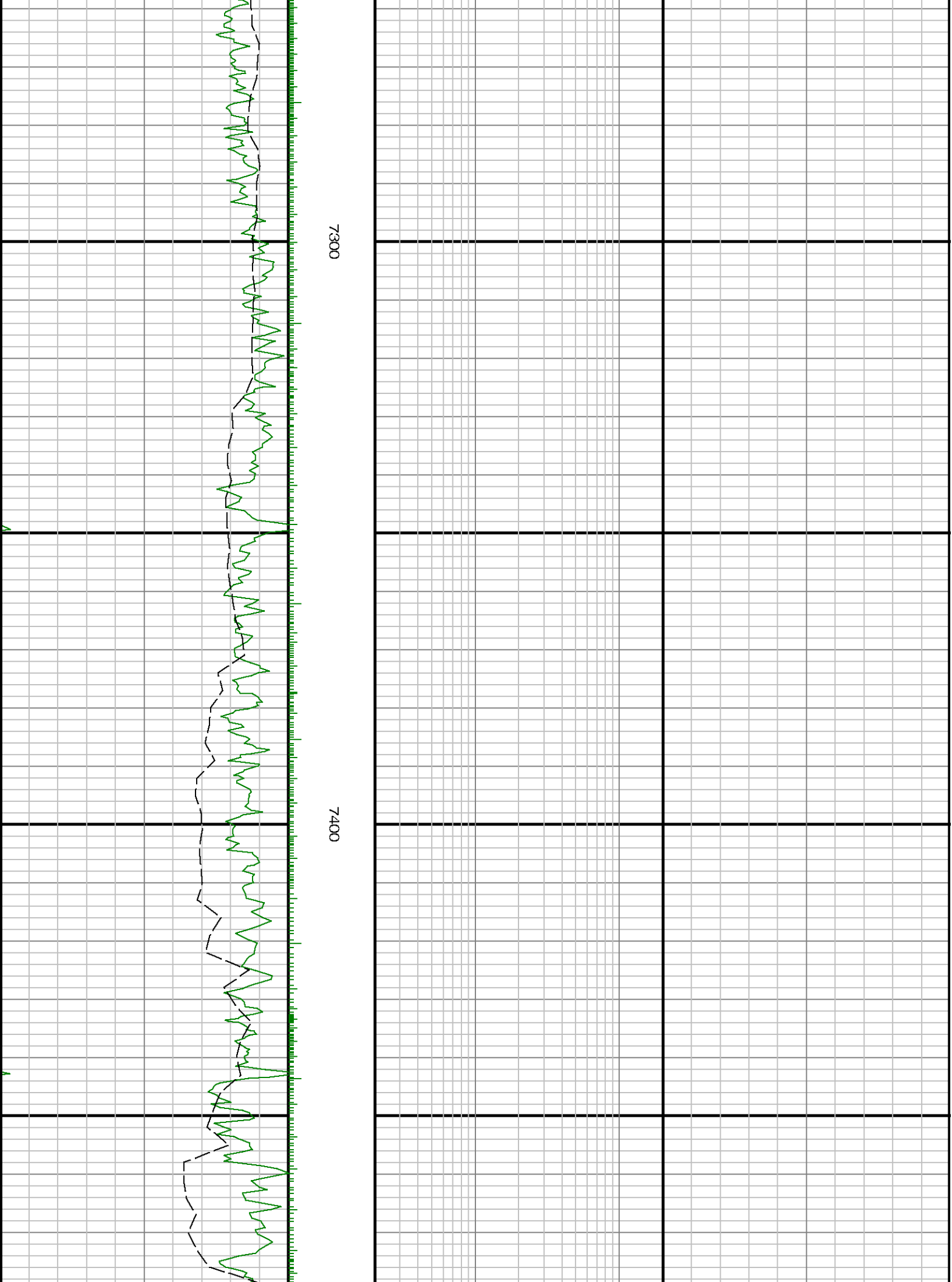


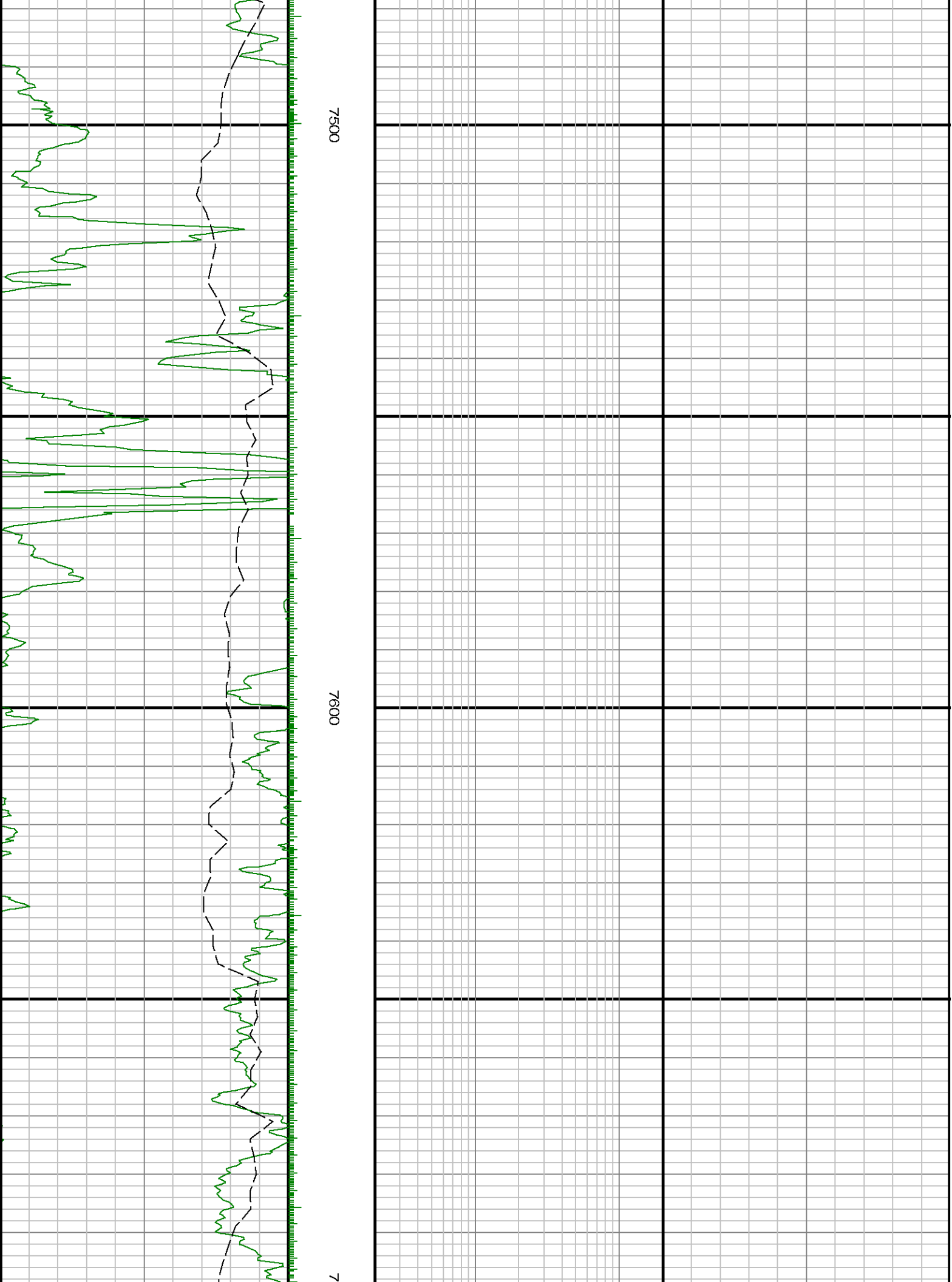


7100

7200



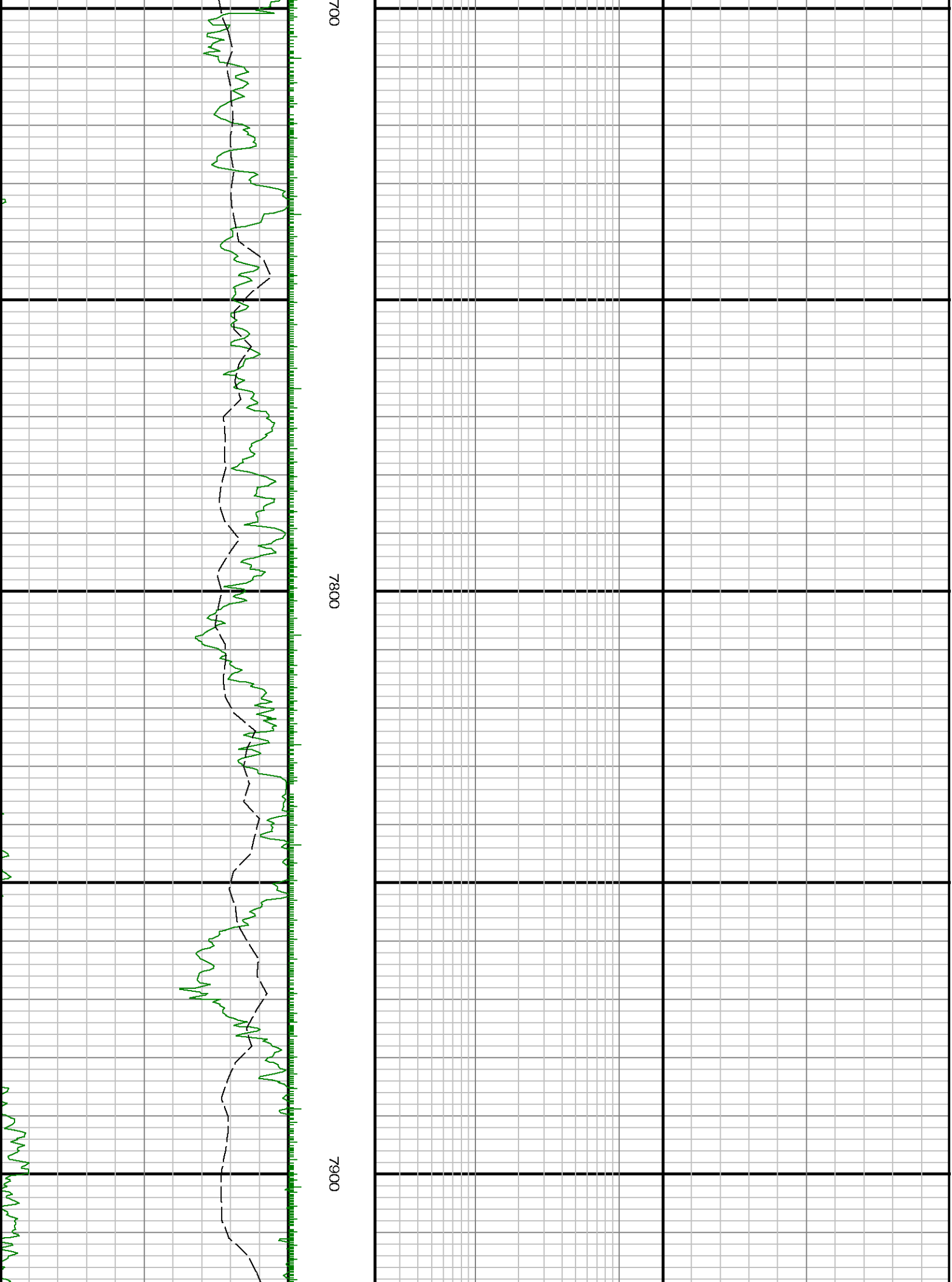


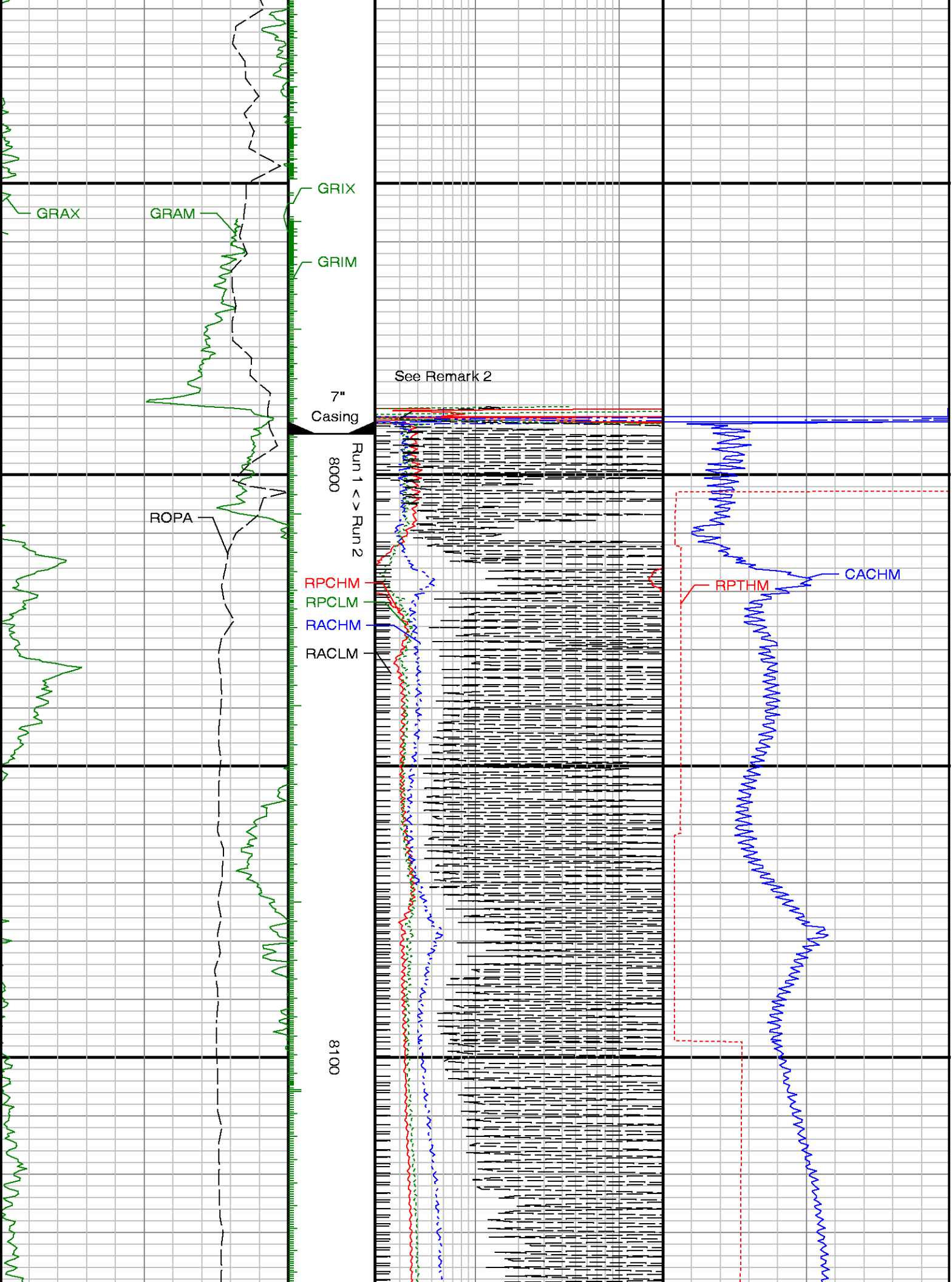


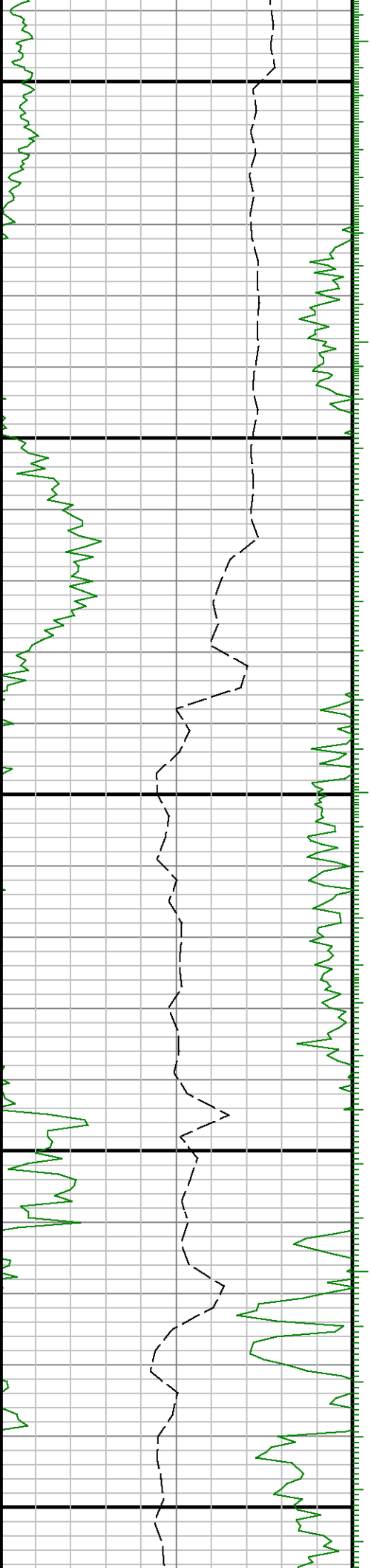
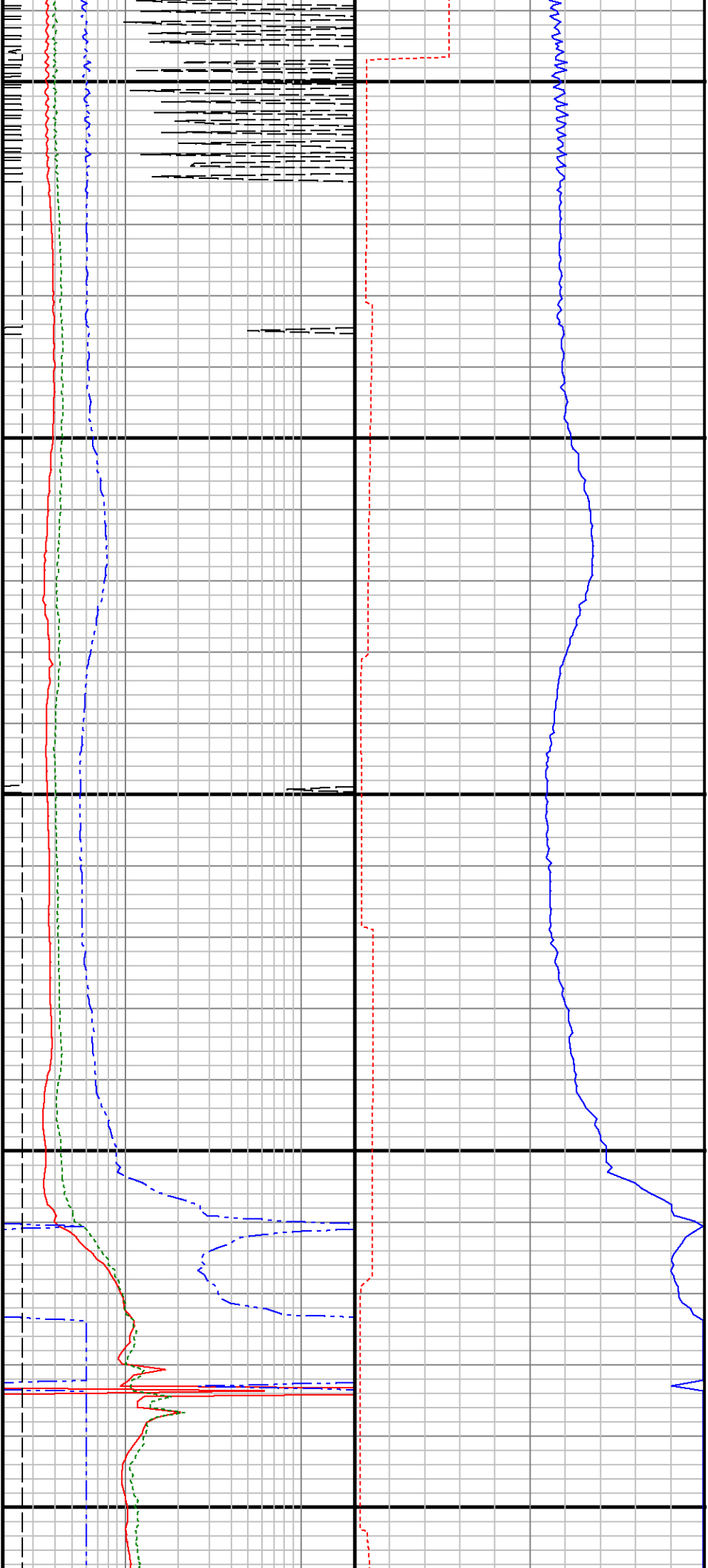
7500

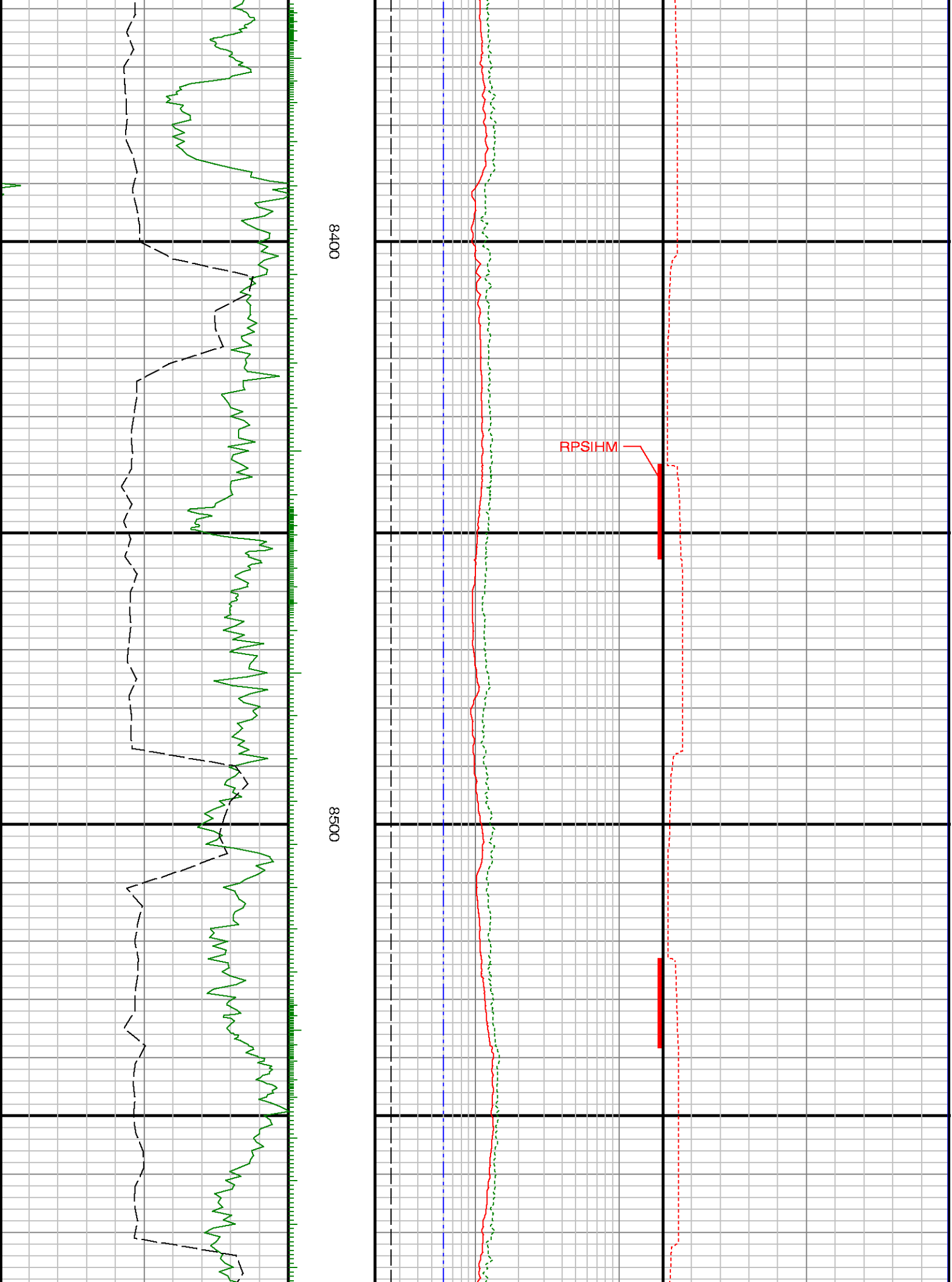
7600

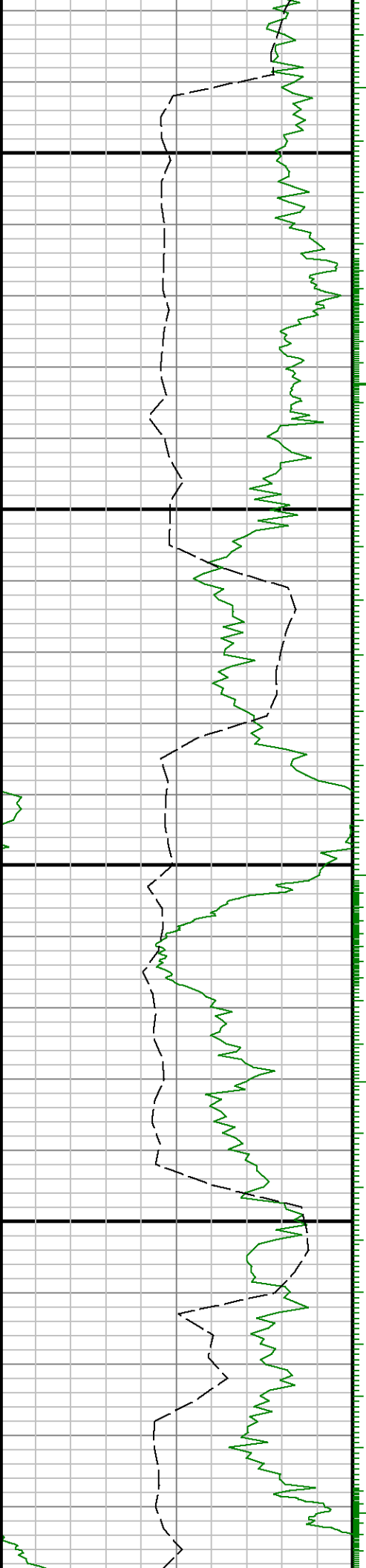
7







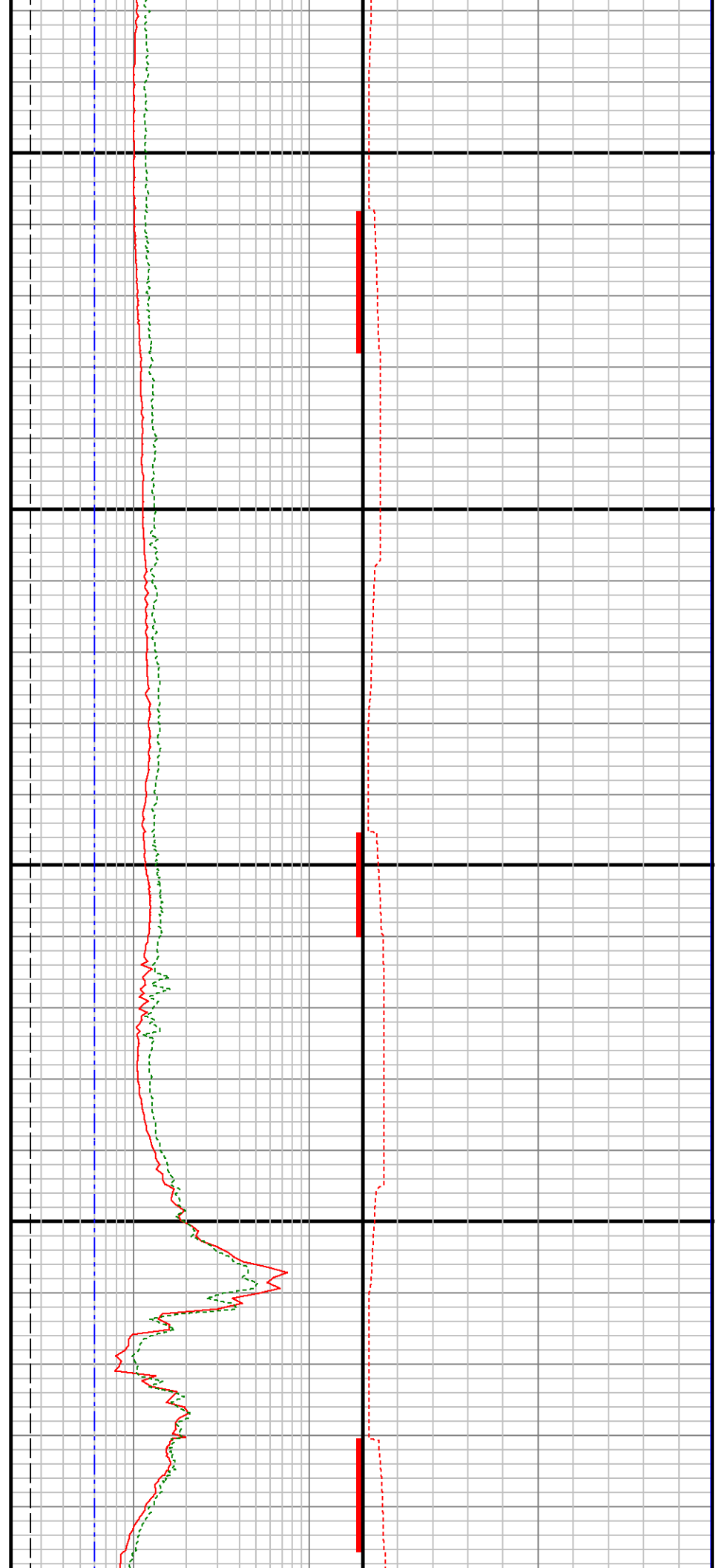


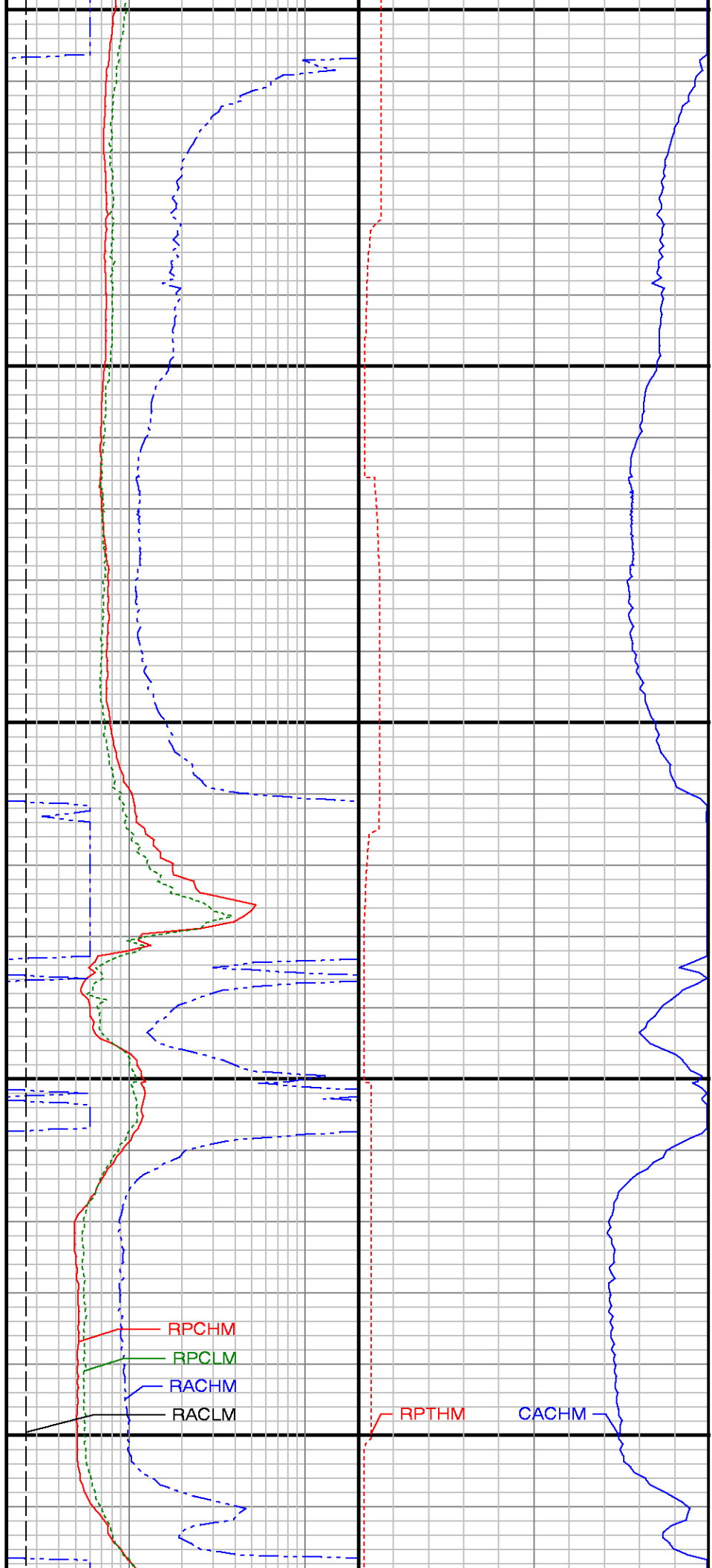
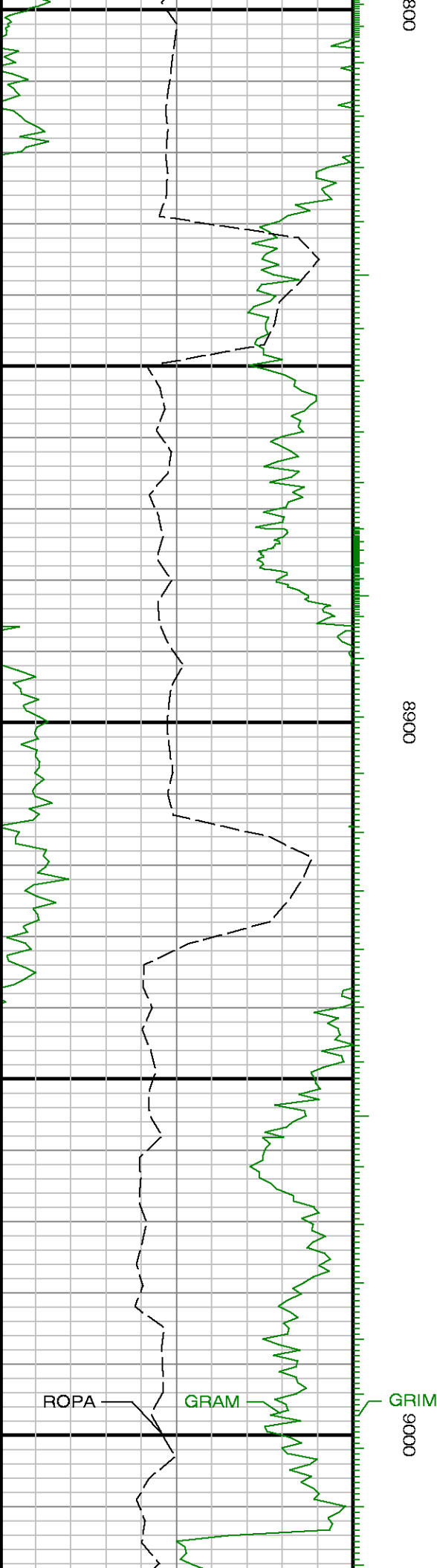


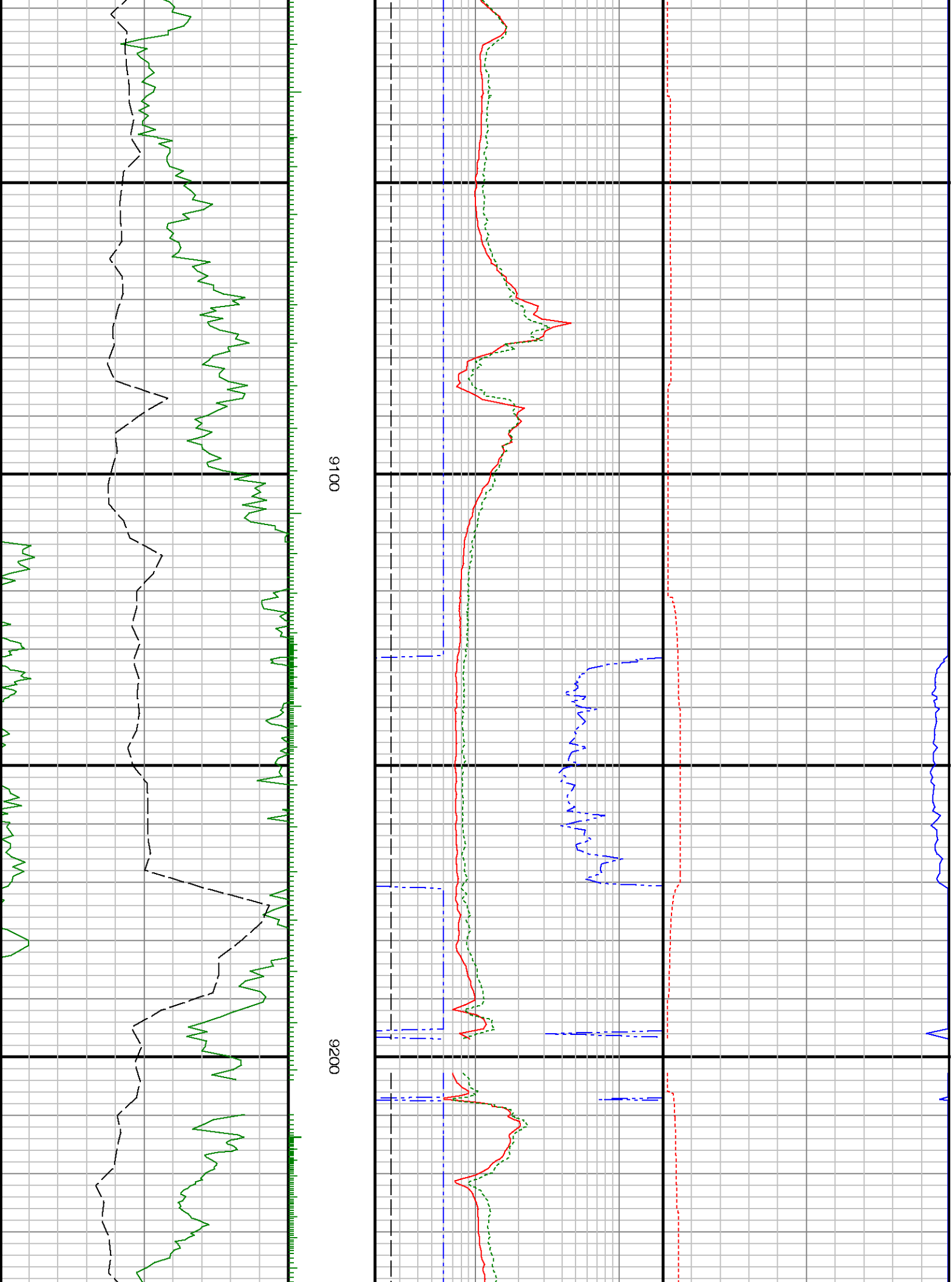
8600

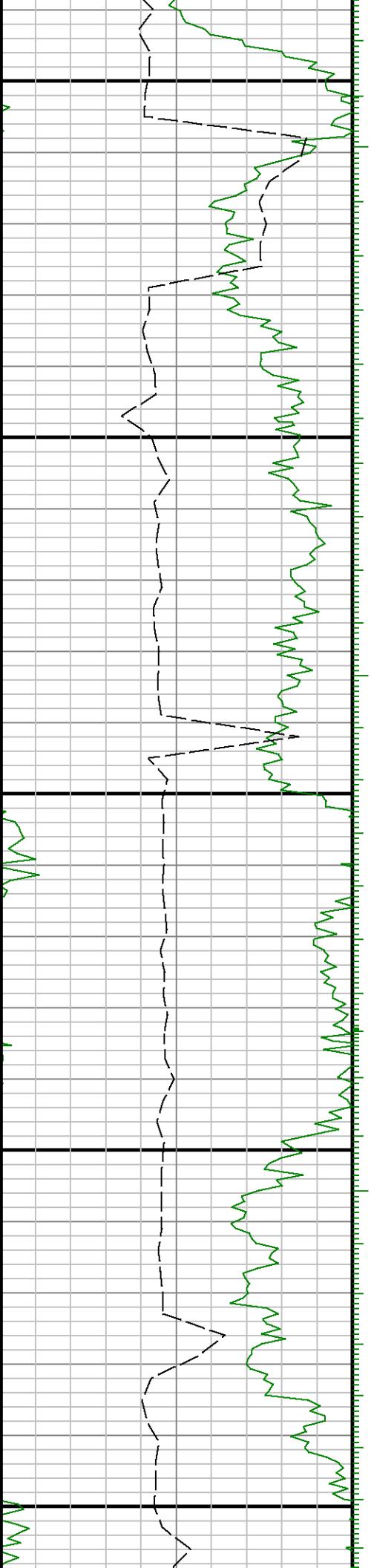
8700

8



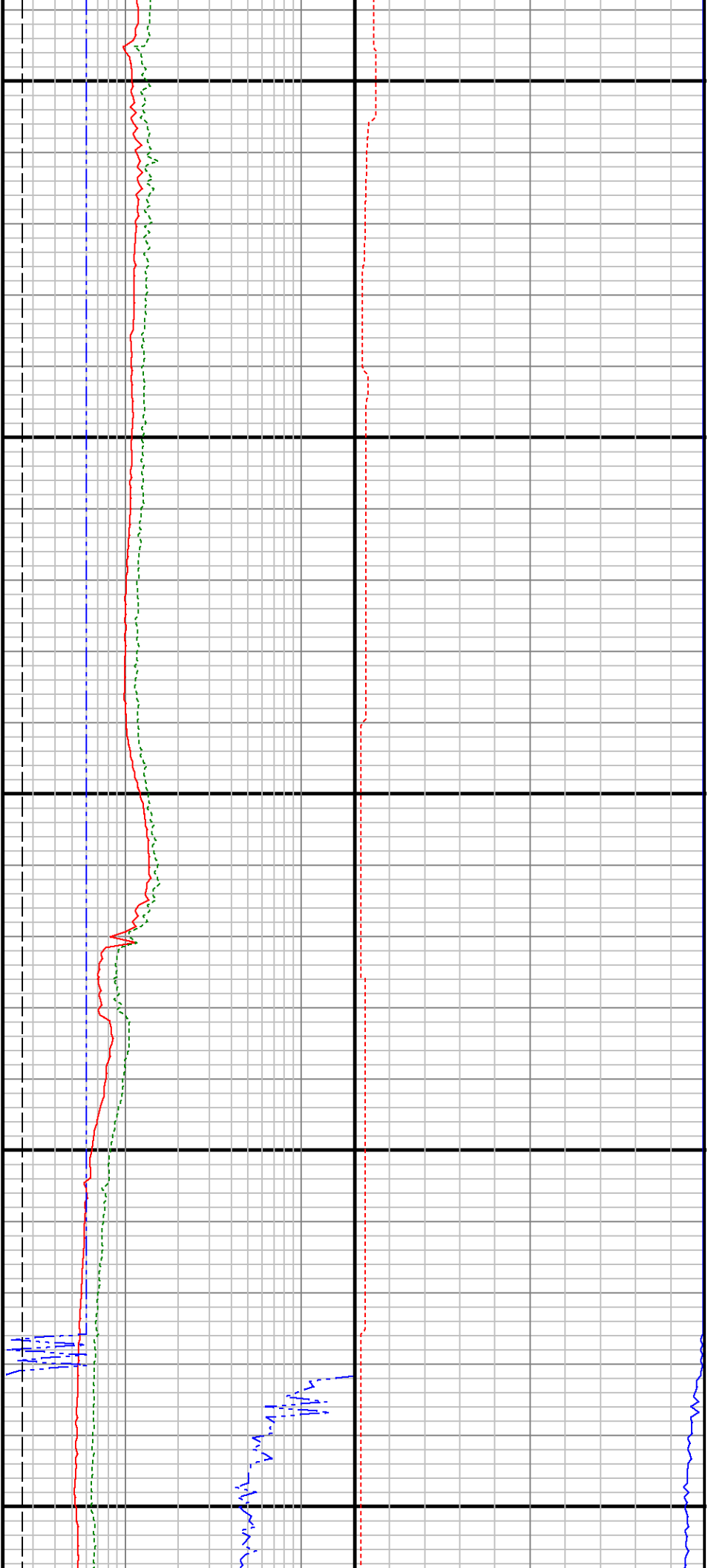


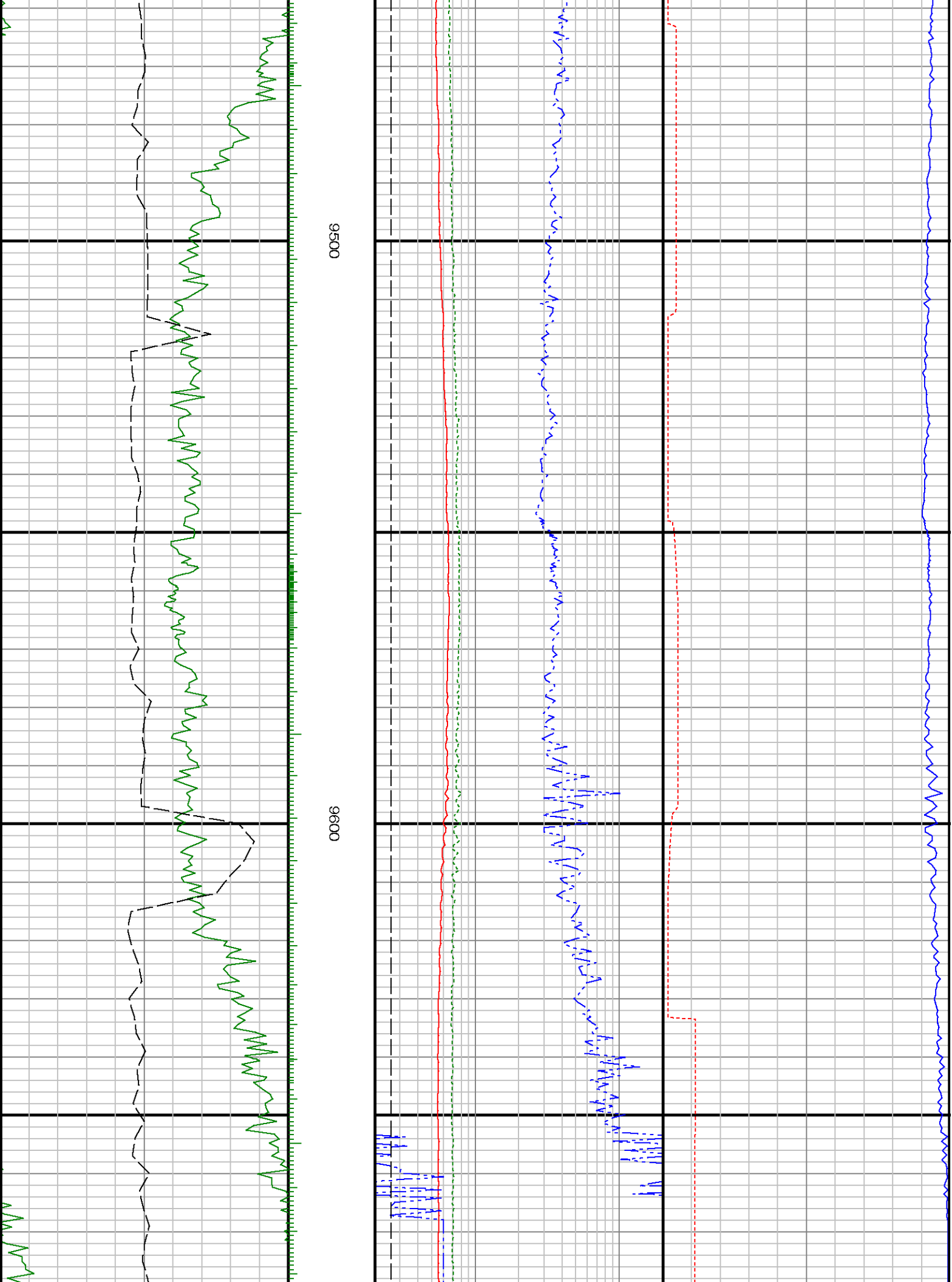


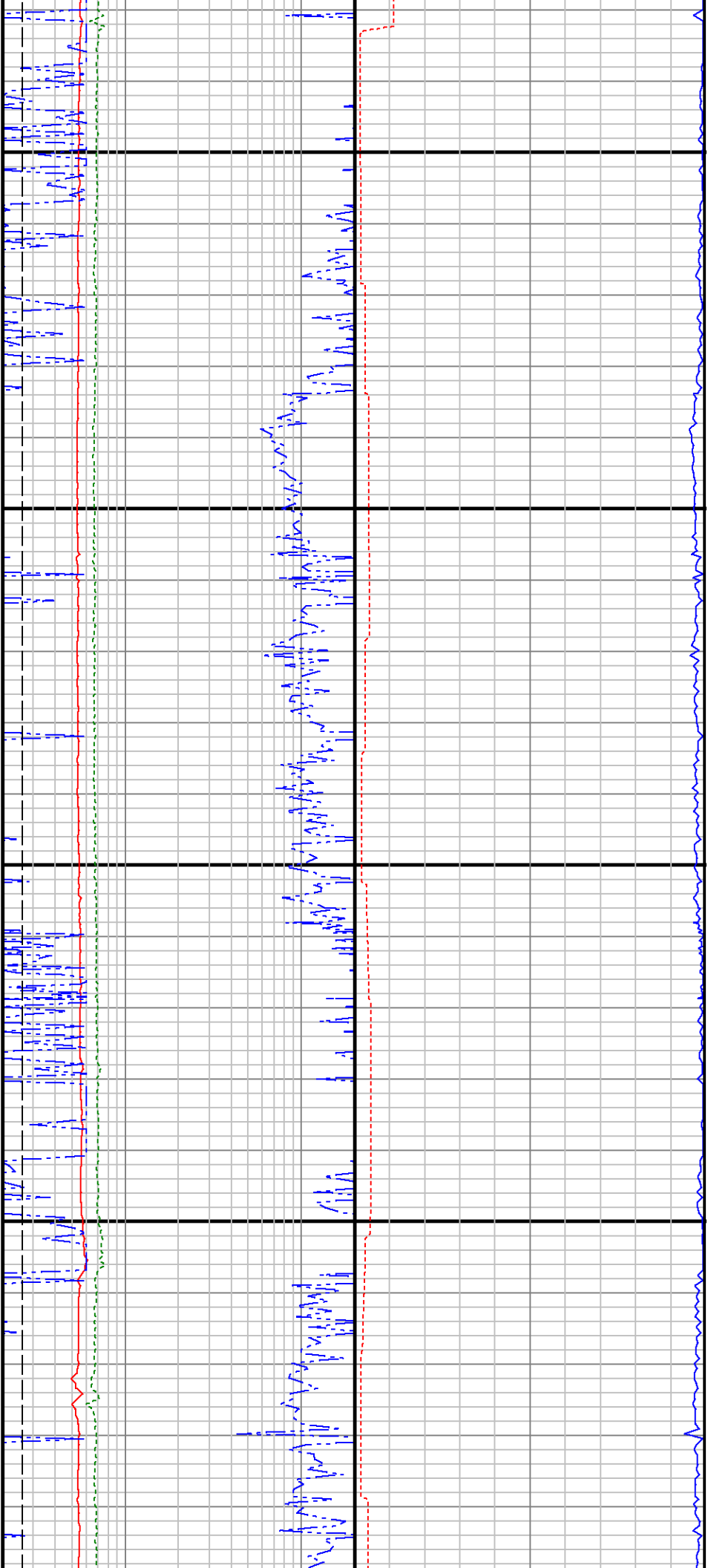


9300

9400



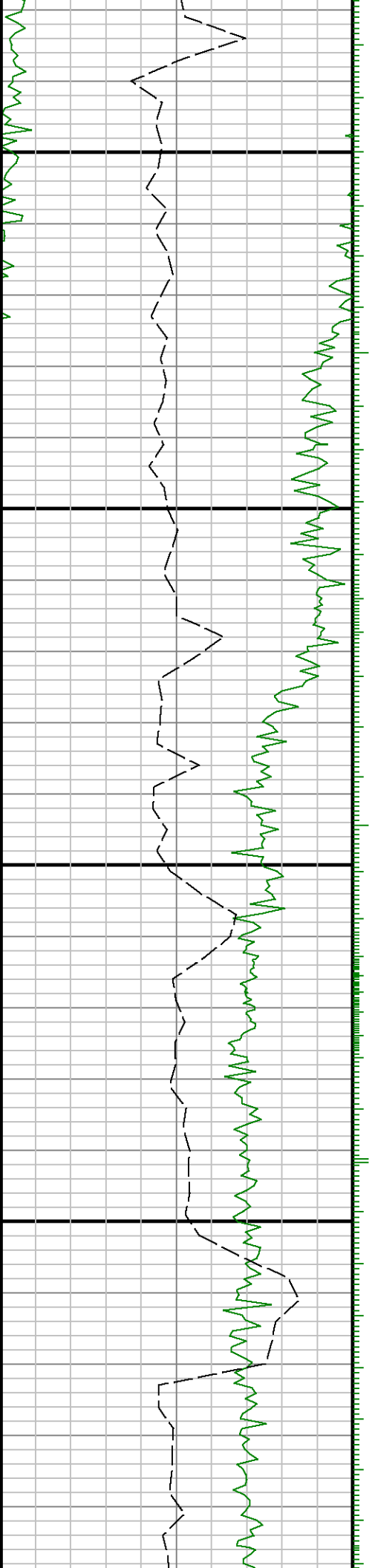


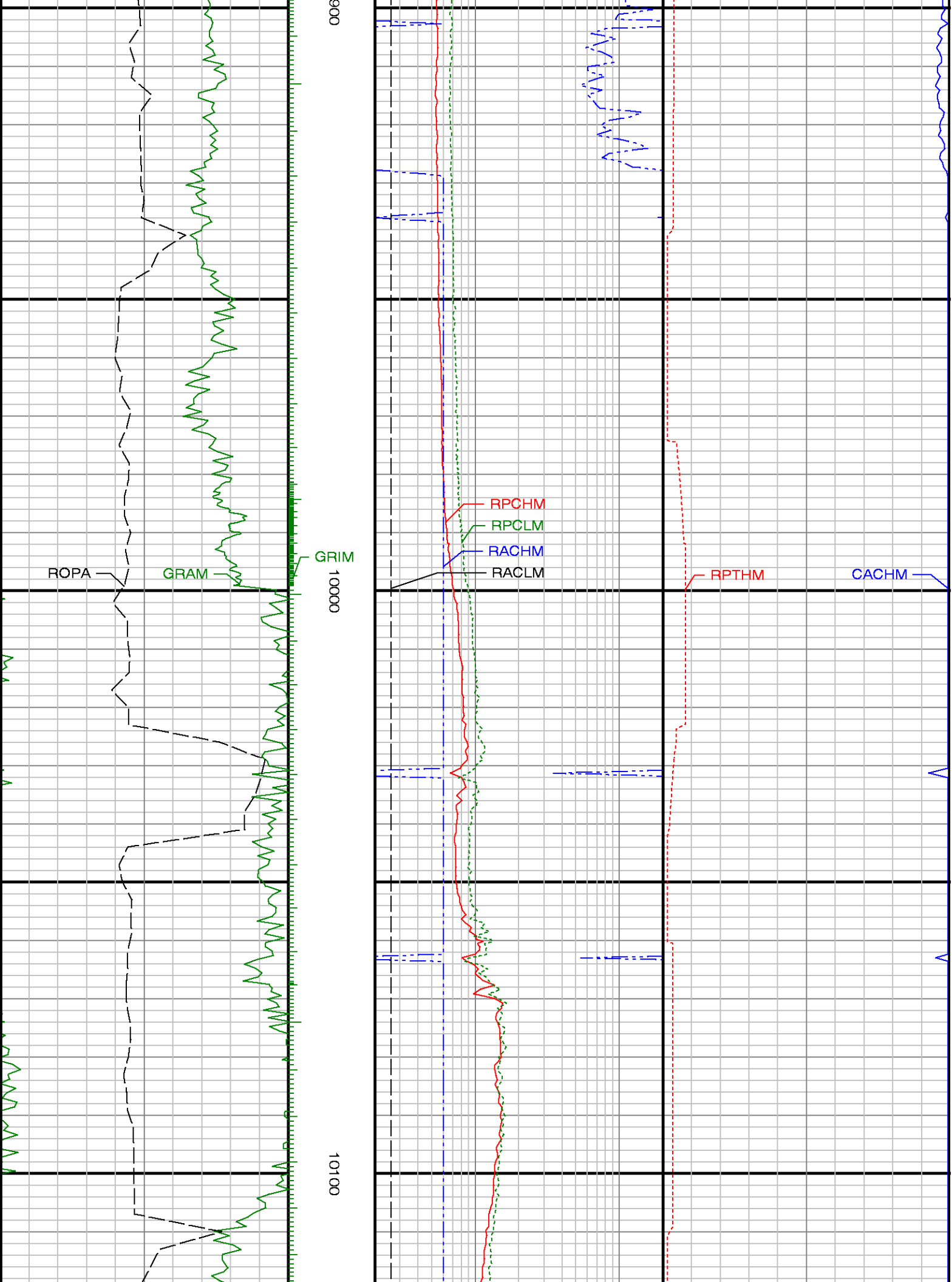


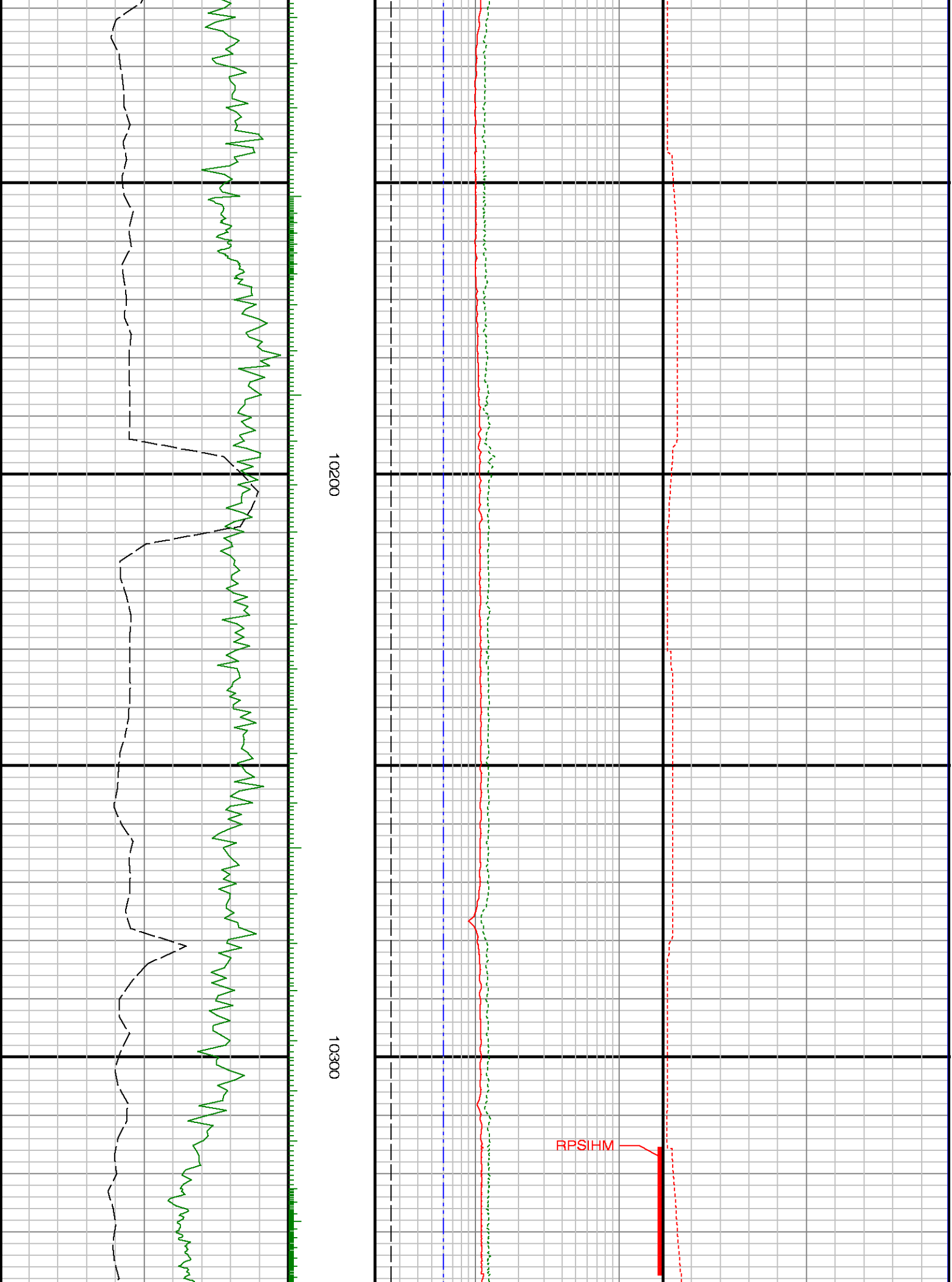
9700

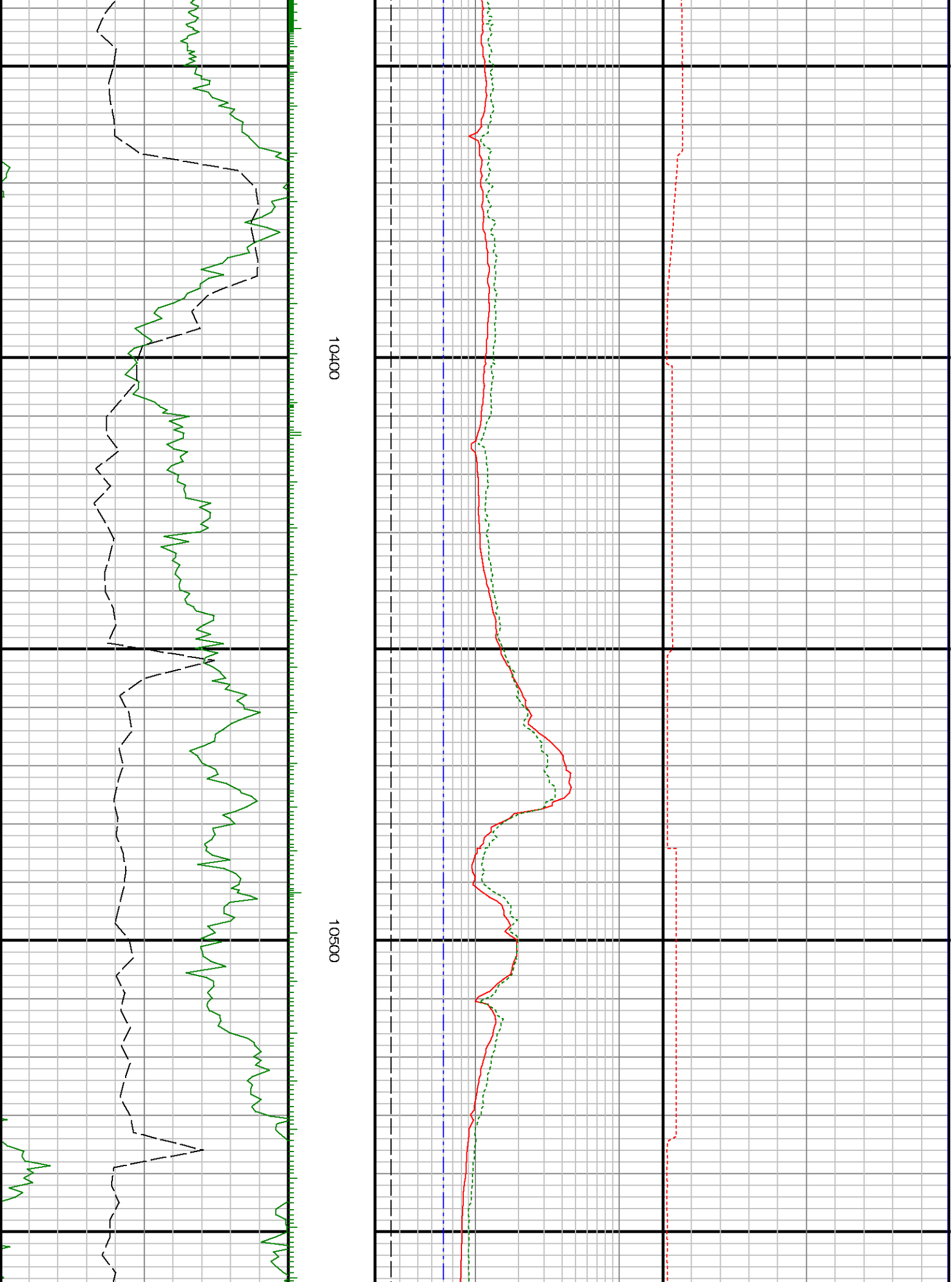
9800

9900





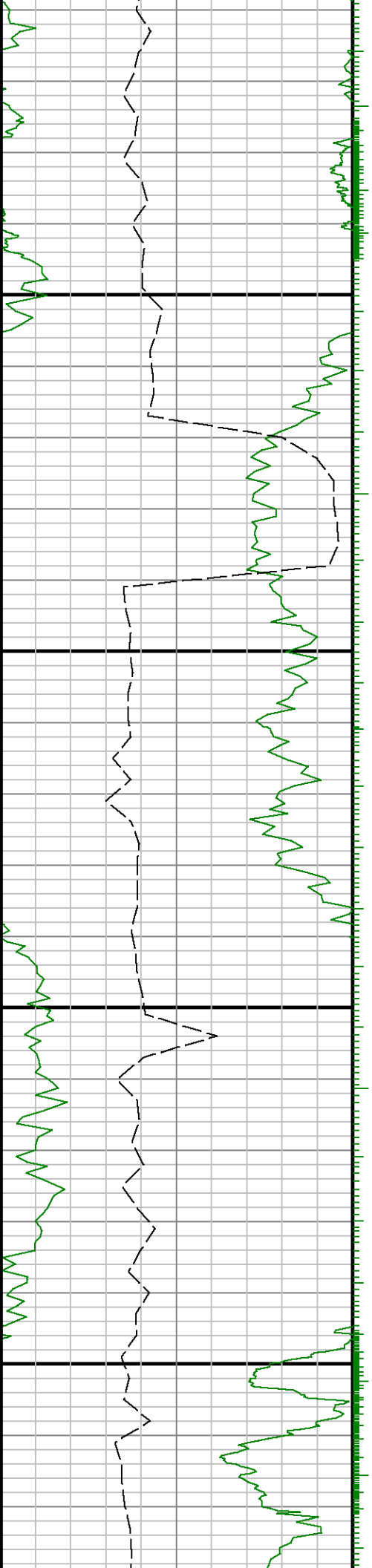


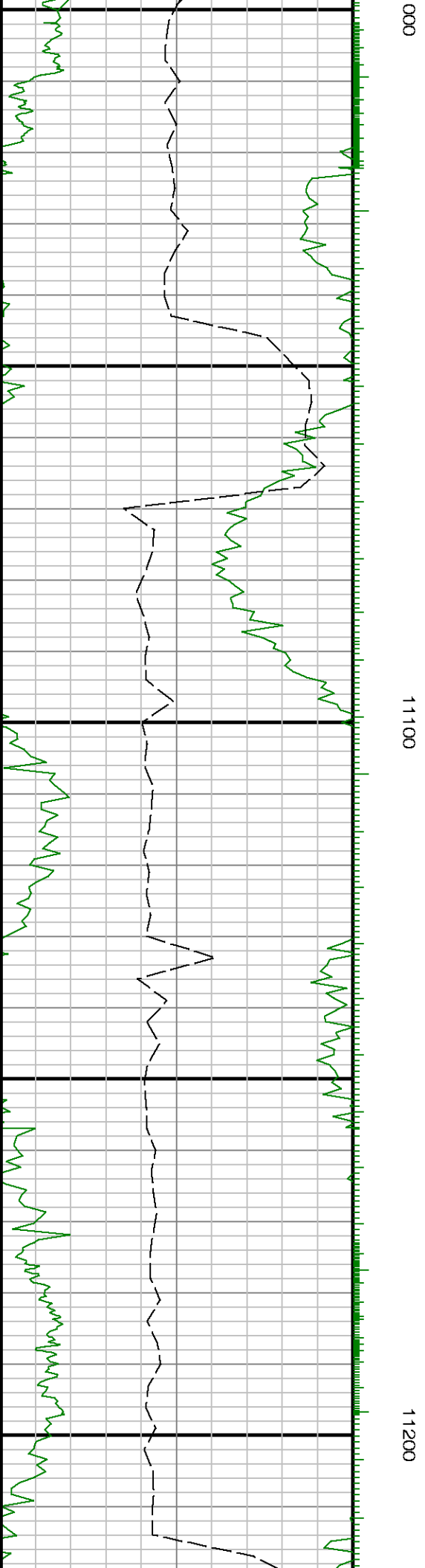
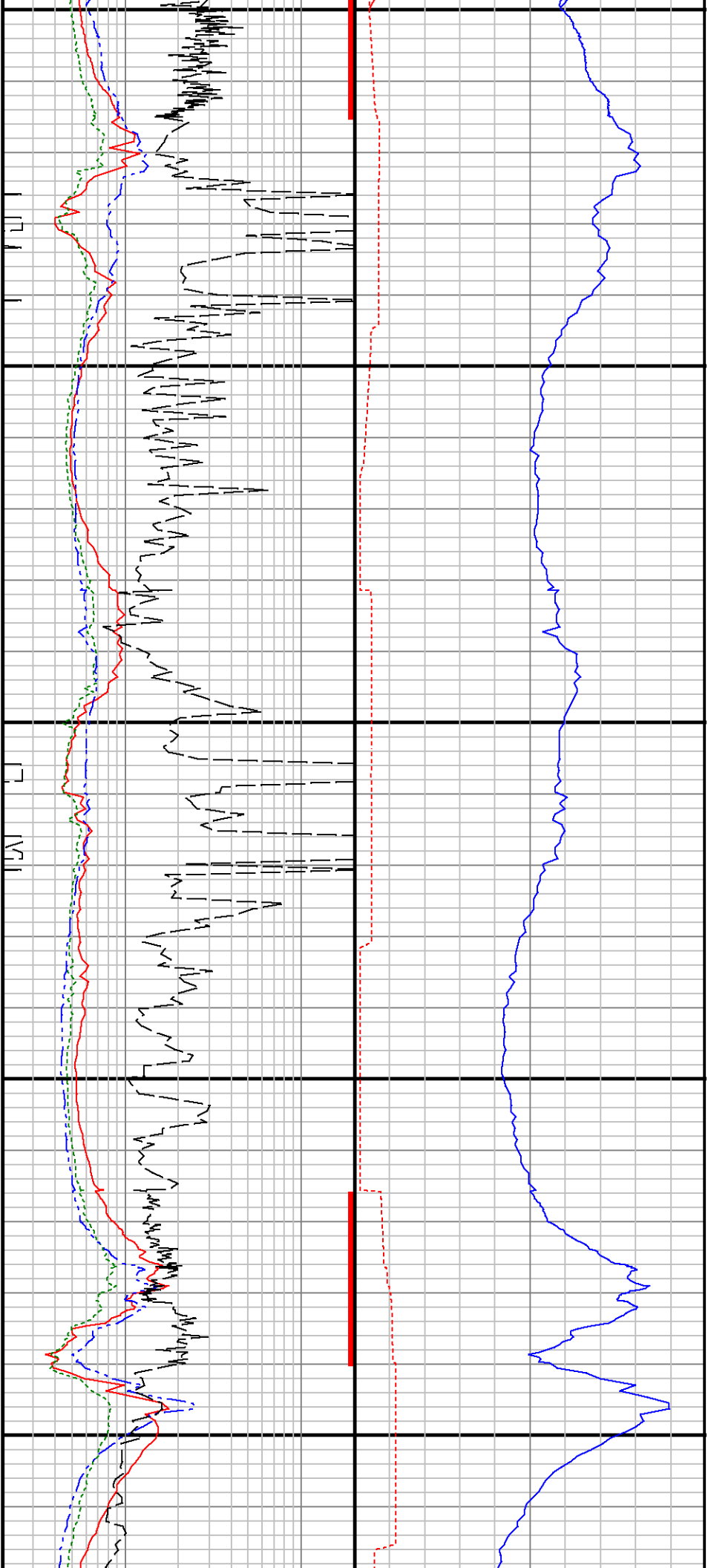


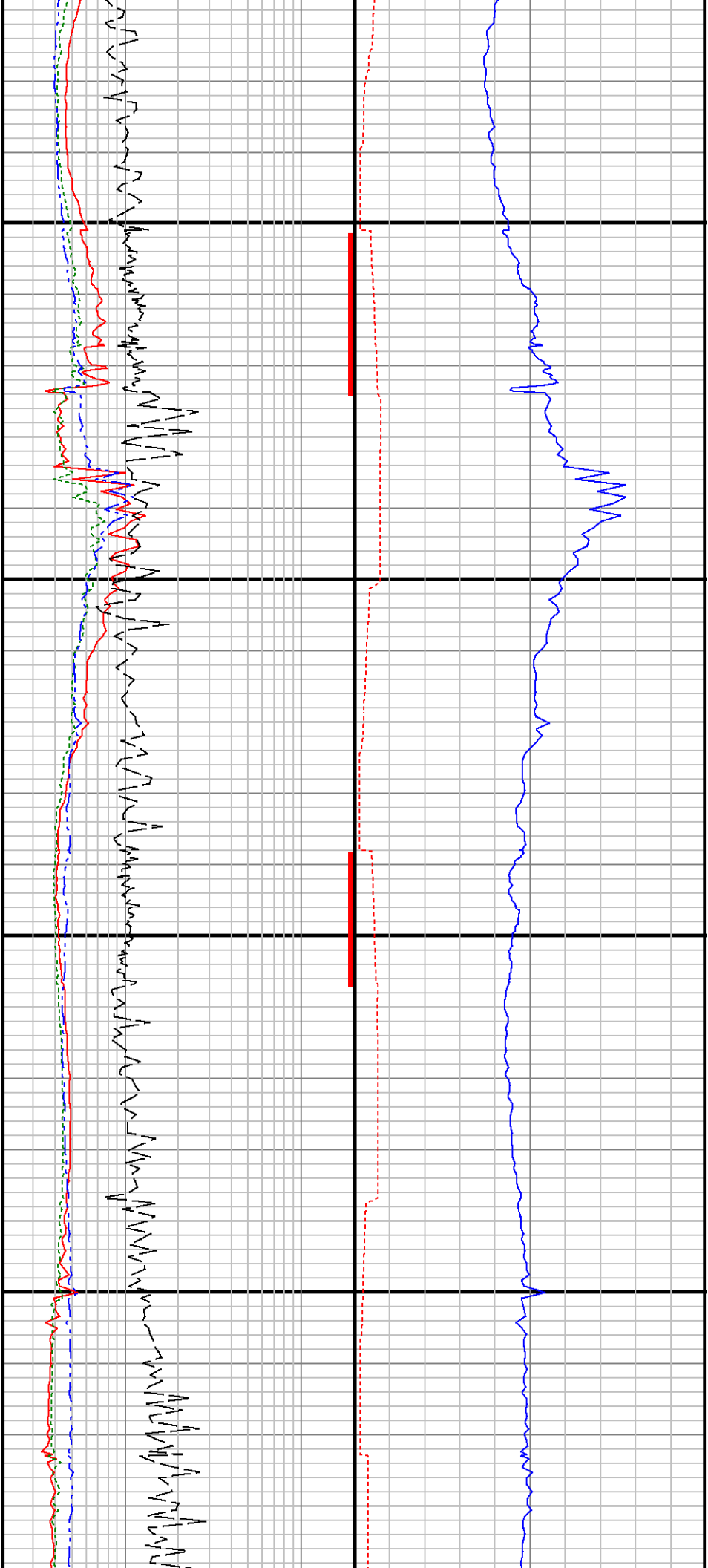


10600

10700

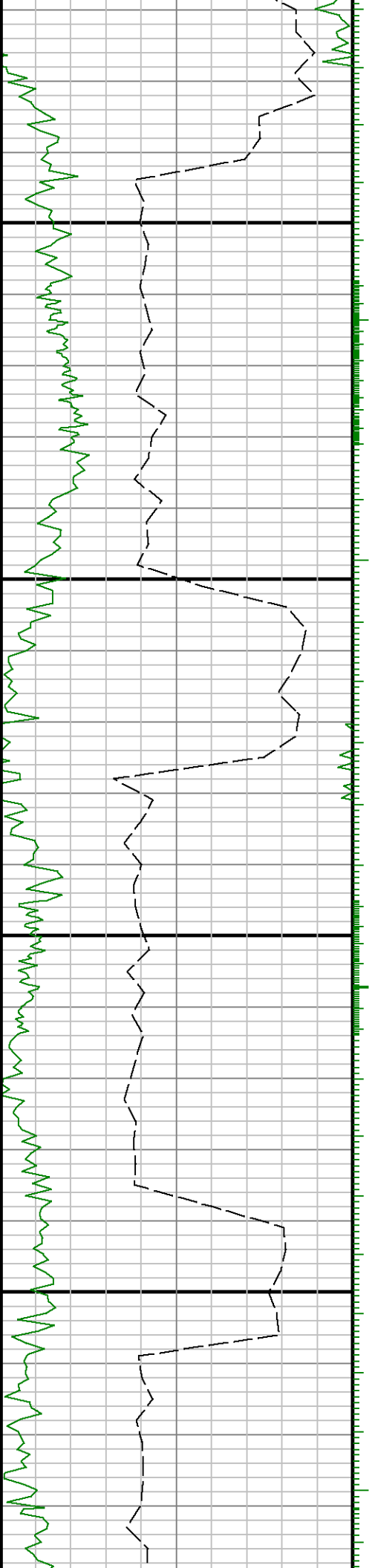


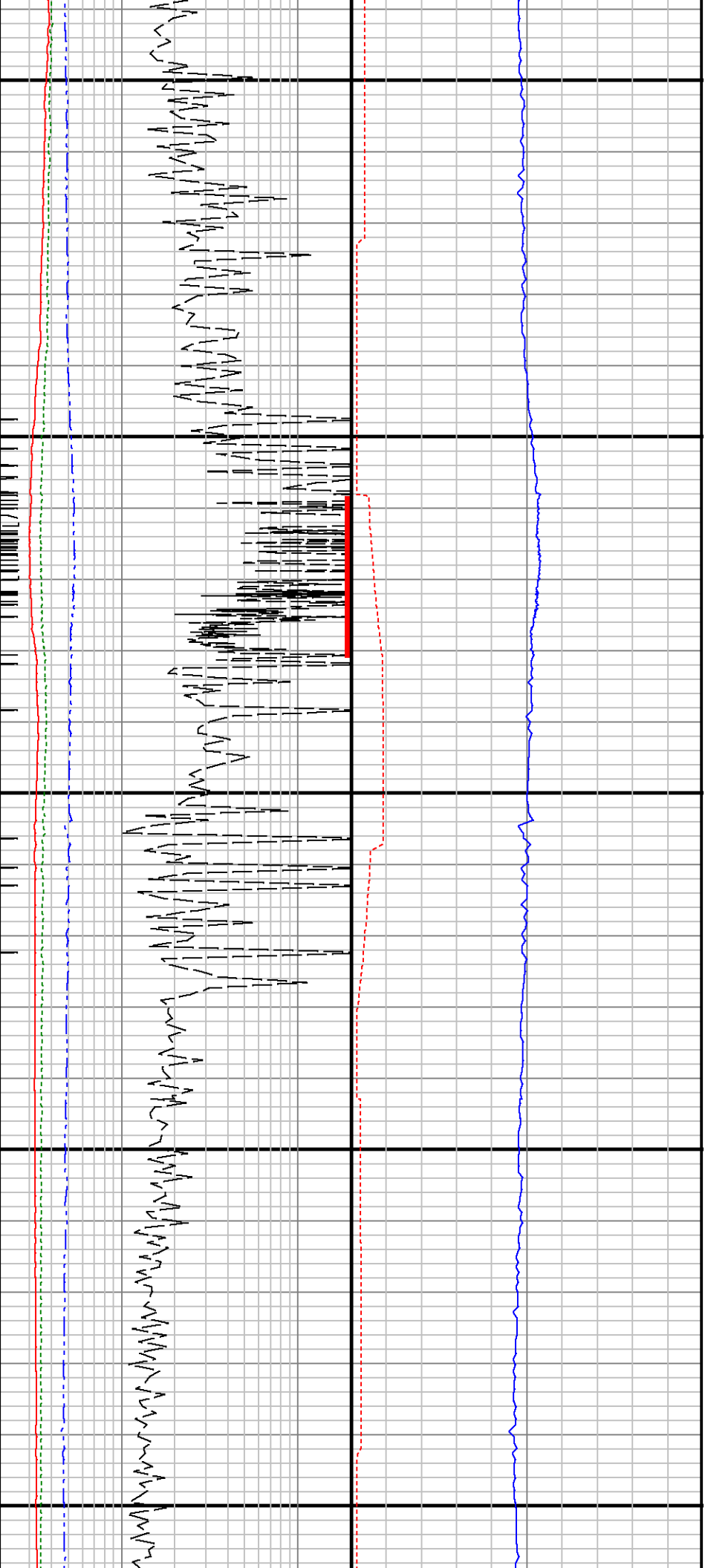




11300

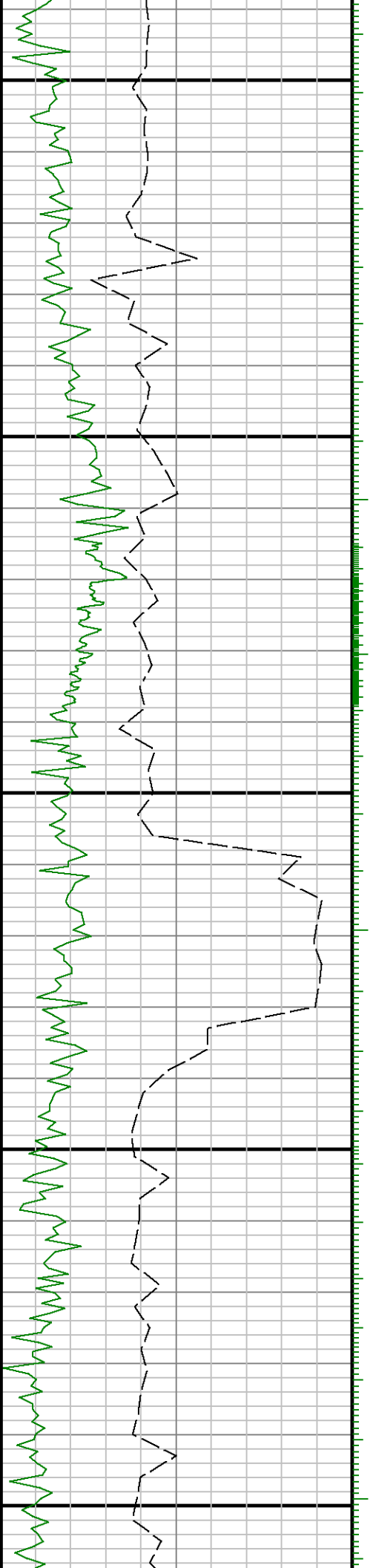
11400

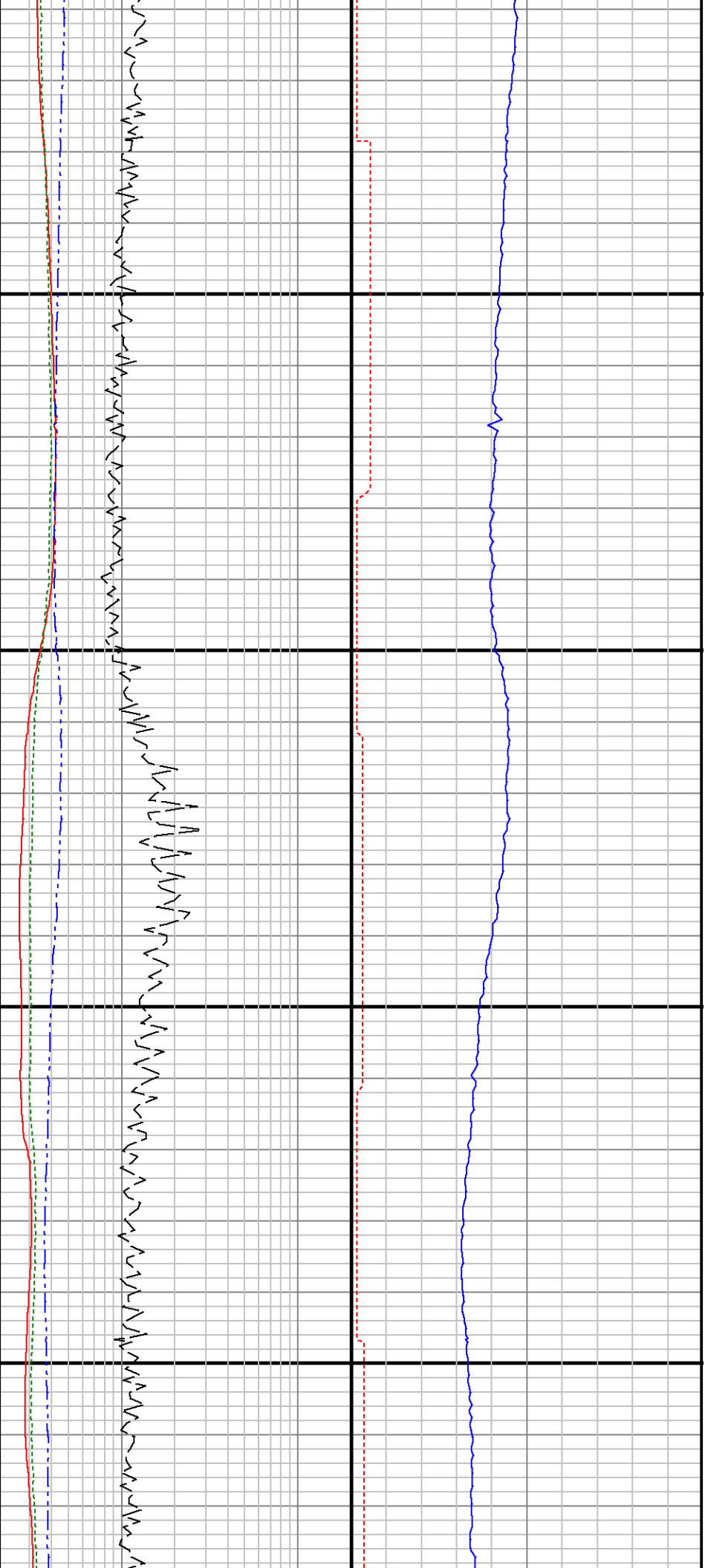




11500

11600





11700

11800

