HALLIBURTON | Sperry Drilling

PCDC - Pressure Case Directional
PCGK - Pressure Case Gamma

Powered by INSITE™

1 : 600 / 1 : 240

Country : USA
Field : Wattenburg
Location : Lat: 40° 28' 35.04" North Long: 104° 21' 18.68" West
Well : Wells Ranch AE20-68HN
Company : Noble Energy
Rig : H&P 321

Company : **Noble Energy**
Rig : **H&P 321**
Well : **Wells Ranch AE20-68HN**
Field : **Wattenburg**
Country : **USA**
API Number : **05-123-37216**

LOCATION
Latitude : **40° 28' 35.04" North**
Longitude : **104° 21' 18.68" West**
UTM Easting = **3,318,473.579 ft**
UTM Northing = **1,418,448.723 ft**

Other Services
Directional Drilling

Permanent Datum : **Ground Level**
Elevation : **4840.00 ft**
Log Measured From : **Drill Floor** **30.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

MD LOG

Elev. KB **N/A**
DF **4870.00 ft**
GL **4840.00 ft**
WD **N/A**

Depth Logged : **990.00 ft** To **10,886.00 ft**
Date Logged : **21-Oct-13** To **27-Oct-13**
Total Depth MD : **10,886.00 ft** TVD : **6,576.88 ft**
Spud Date : **07-Oct-13**

Unit No. : **11210424**
Job No. : **CA-XX-0900775412**

Plot Type : **Final**
Plot Date : **30-Oct-13**

Run No.	Borehole Record (MD) Size	From	To
100	8.750 in	990.00 ft	5,879.00 ft
200	8.750 in	5,879.00 ft	7,020.00 ft
300	6.125 in	7,020.00 ft	10,886.00 ft

Run No.	Borehole Record (MD) Size	From	To

Casing Record (MD) Size	Weight	From	To
9.625	36.00	0.00	990.00

WELL INFORMATION

MWD Run Number	100	200	300
Date run completed	23-Oct-13	25-Oct-13	27-Oct-13
Rig Bit Number	2	3	4
Bit Size (in)	8.750	8.750	6.125
Tool Nominal OD (in)	6.870	6.870	4.790
Log Start Depth (MD, ft)	1,000.00	5,879.00	7,020.00
Log End Depth (MD, ft)	5,879.00	7,020.00	10,886.00
Drill or Wipe	Drill	Drill	Drill
Drill/Wipe Start Date and Time	22-Oct-13 20:39	23-Oct-13 22:59	26-Oct-13 01:49
Drill/Wipe End Date and Time	23-Oct-13 14:31	24-Oct-13 19:15	27-Oct-13 12:01
Min Inc (deg) @ Depth (MD, ft)	0.34 @ 4,305.00	1.47 @ 5,916.00	86.26 @ 7,092.00
Max Inc (deg) @ Depth (MD, ft)	16.19 @ 3,072.00	83.38 @ 6,965.00	92.86 @ 8,324.00
Bit TFA(in2) / Bit Type	0.75 / PDC	0.86 / PDC	0.63 / PDC
Flow Rate (gpm)	595.86	542.67	306.72
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	N/A / N/A
Fluid Type	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel
Density (ppg) / Viscosity (spqt)	8.95 / 32.00	10.50 / 41.00	9.20 / 34.00
Filtrate CL (ppm)	2,300.00	2,450.00	N/A
pH / Fluid Loss (mptm)	10.00 / 15	9.60 / 9	10.60 / 11
PV (cP) / YP (lhf2)	5 / 3.00	12 / 10.00	7 / 5.00
% Solids / % Sand	1.80 / 0.50	10.00 / 0.20	4.70 / 0.10
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	N/A / N/A
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A

Max Tool Temp (degF) / Source	145.90 / PCM	162.80 / PCM	213.40 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 145.90	N/A @ 162.80	N/A @ 213.40		
Lead MWD Engineer	Robert Barnes	Robert Barnes	Robert Barnes		
Customer Representative	Jim Turner	Jim Turner	Jim Turner		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11341336	11341336	11768602		
Insert Serial Number	11620297	11620297	11680773		
Date and Time Initialized	21-Oct-13 23:09	21-Oct-13 23:09	25-Oct-13 10:51		
Date and Time Read	25-Oct-13 02:01	25-Oct-13 02:01	27-Oct-13 21:20		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	58.00	55.00	64.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11341336	11341336	11768602		
Sonde Serial Number	10859920	10859920	11297617		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	15.48	20.36	163.11		

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	51.24	48.62	66.91		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11341336	11341336	11768602		
Insert/Sonde Serial Number	12037423	12037423	11293386		

REMARKS

1. All depths are calibrated to driller's pipe tally and are measured depth's from the Drill Floor.

2. No depth corrections have been made for pipe stretch or compression.

3. Critical annular velocities are calculated using the "Power Law" modelforwater based fluids and the "Brigham Plastic"model for oil and synthetic based fluids.

4. All data presented is recorded data unless otherwice specified.

5. The following smoothing parameters have been applied to the data:

1:600 Log
PGRC (Gamma CG) and ROPA (Average Rate of Penetration)
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft

1:240 Log
PGRC (Gamma CG):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft

ROPA (Average Rate Of Penetration):
Interval Resolution: 0.5 ft

Interval Distance: 1.2 ft

6. Insite Version V8.0.0

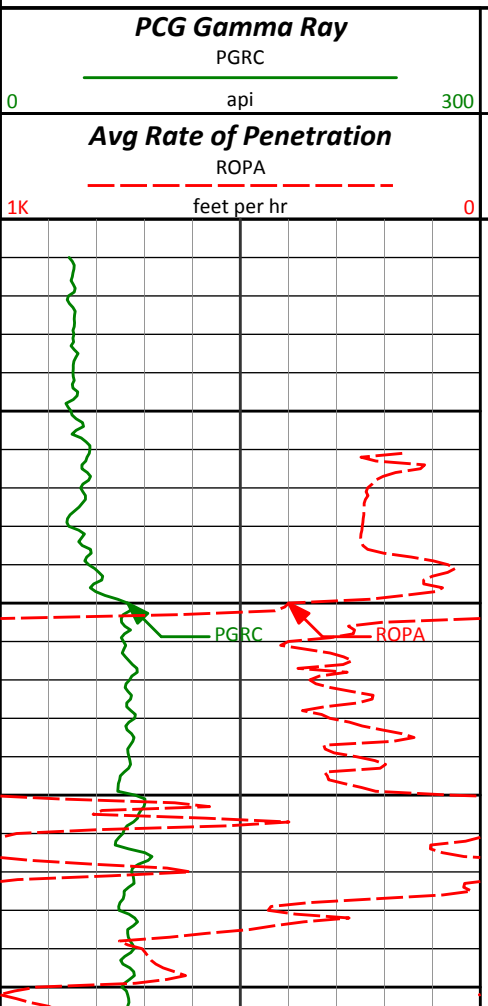
WARRANTY

HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

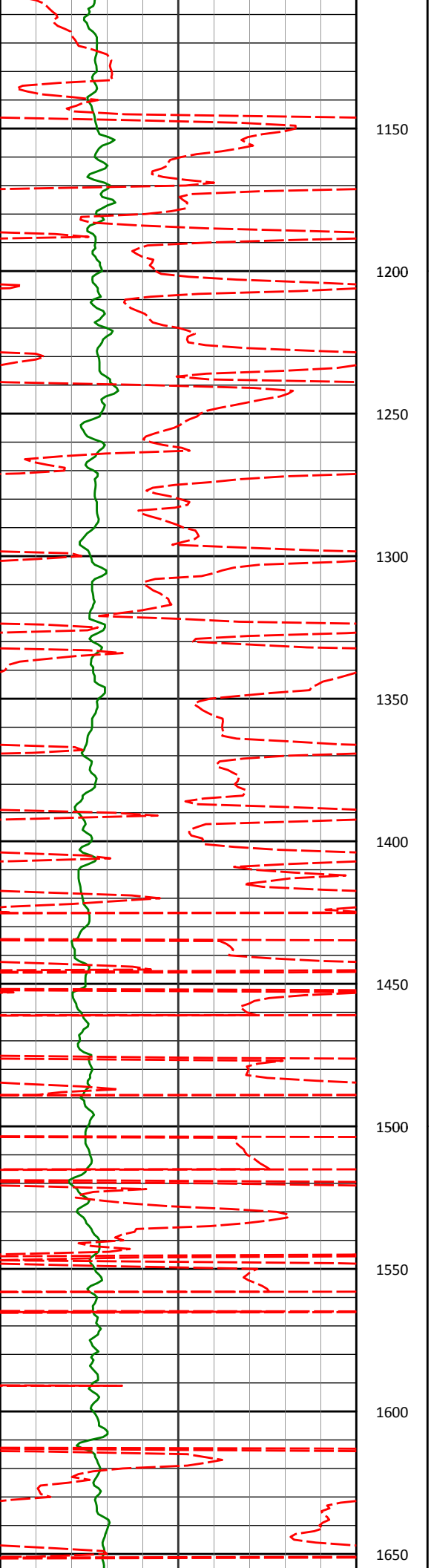
HALLIBURTON
Sperry Drilling Services

MD Correlation Log 1:600

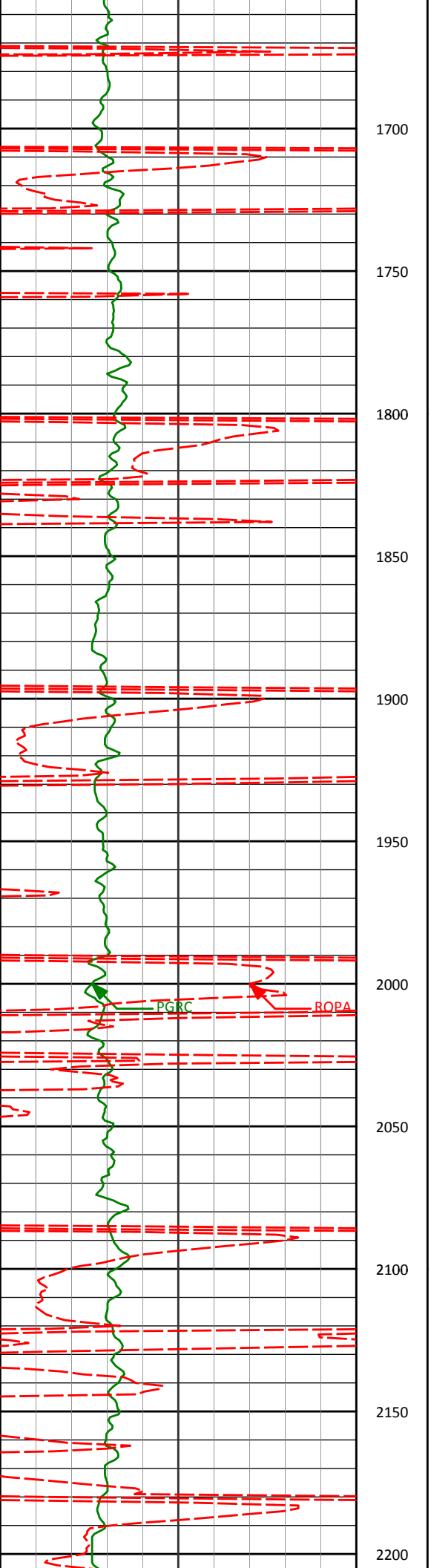
Noble Energy
Wells Ranch AE20-68HN
H&P 321
Sec. 20-T6N-R62W



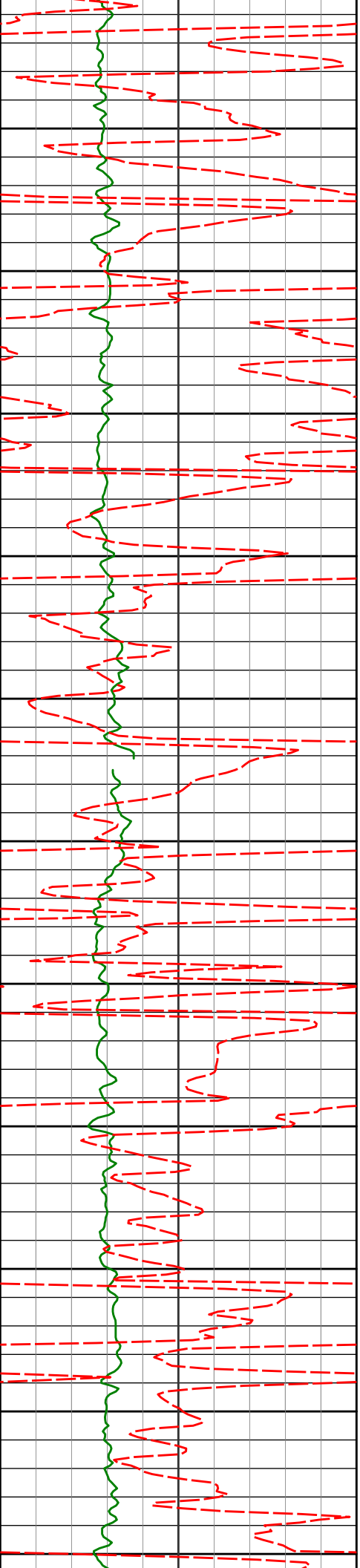
Depth ft	Depth	Inc.	Azi.	TVD	V.S.
900					
950					
100	967'	0.50°	185.52°	966.97'	-0.55'
1000					
1050					
	1091'	2.18°	223.70°	1090.93'	-2.53'
1100					



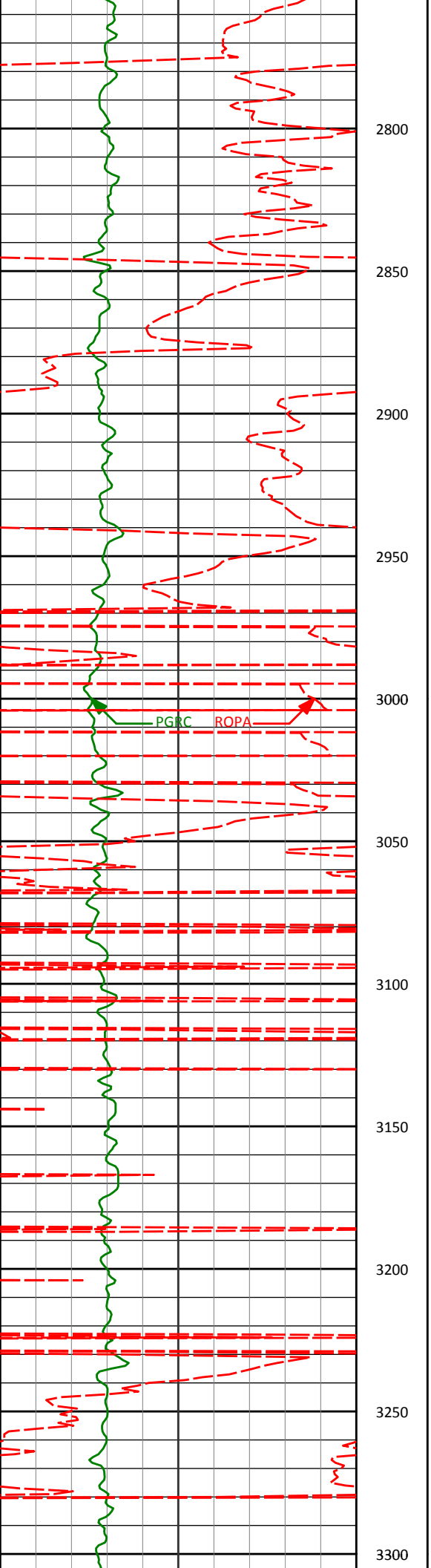
1184'	1.28°	236.50°	1183.89'	-4.85'
1276'	1.27°	28.98°	1275.88'	-5.16'
1369'	1.36°	79.57°	1368.86'	-3.44'
1461'	1.24°	63.21°	1460.84'	-1.41'
1556'	1.85°	25.81°	1555.81'	0.41'
1650'	4.20°	342.17°	1649.68'	0.66'



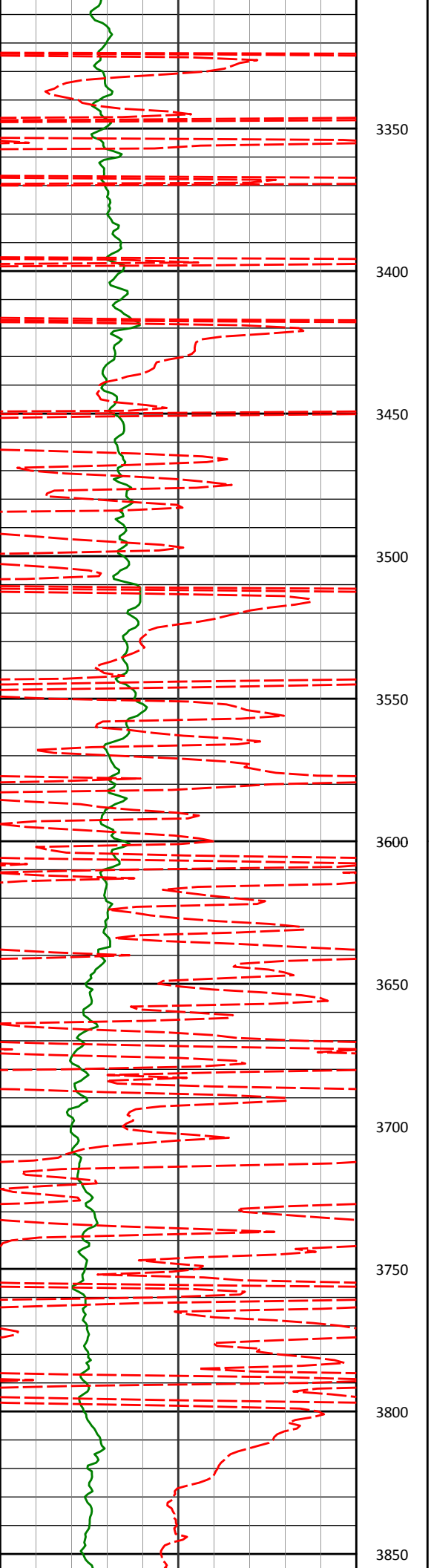
1745'	5.87°	326.57°	1744.31'	-2.04'
1840'	7.23°	314.59°	1838.69'	-7.78'
1935'	8.85°	312.20°	1932.76'	-16.12'
2030'	8.41°	308.14°	2026.68'	-25.64'
2124'	10.91°	314.19°	2119.35'	-35.88'



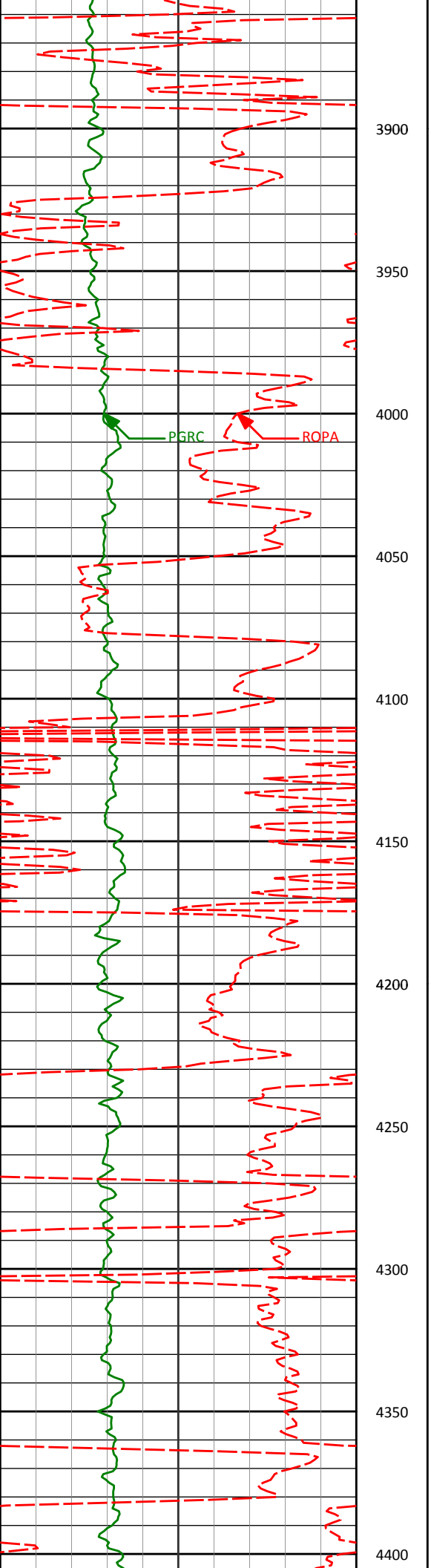
2219'	11.63°	321.27°	2212.52'	-46.33'
2314'	12.66°	327.37°	2305.39'	-55.60'
2409'	13.04°	333.73°	2398.02'	-63.35'
2504'	13.44°	342.96°	2490.50'	-68.49'
2598'	15.50°	348.48°	2581.52'	-71.04'
2693'	14.76°	353.85°	2673.23'	-71.49'



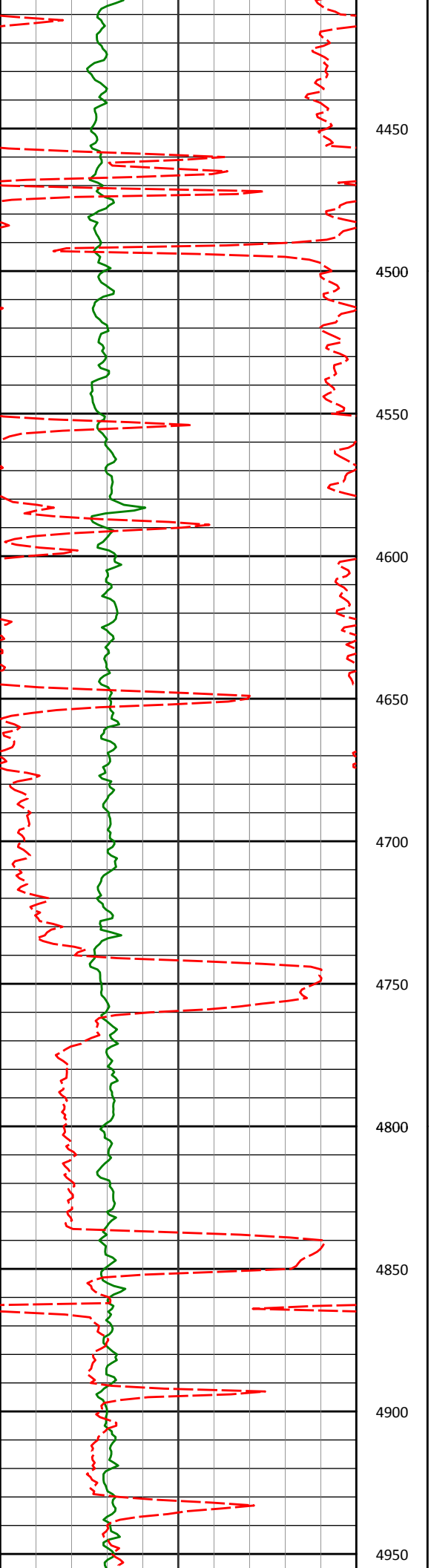
2788'	14.97°	350.74°	2765.05'	-71.43'
2883'	15.22°	348.88°	2856.78'	-72.44'
2978'	15.05°	352.82°	2948.48'	-73.00'
3072'	16.19°	351.83°	3039.01'	-72.93'
3167'	13.46°	349.68°	3130.84'	-73.47'
3262'	15.07°	351.00°	3222.91'	-74.19'



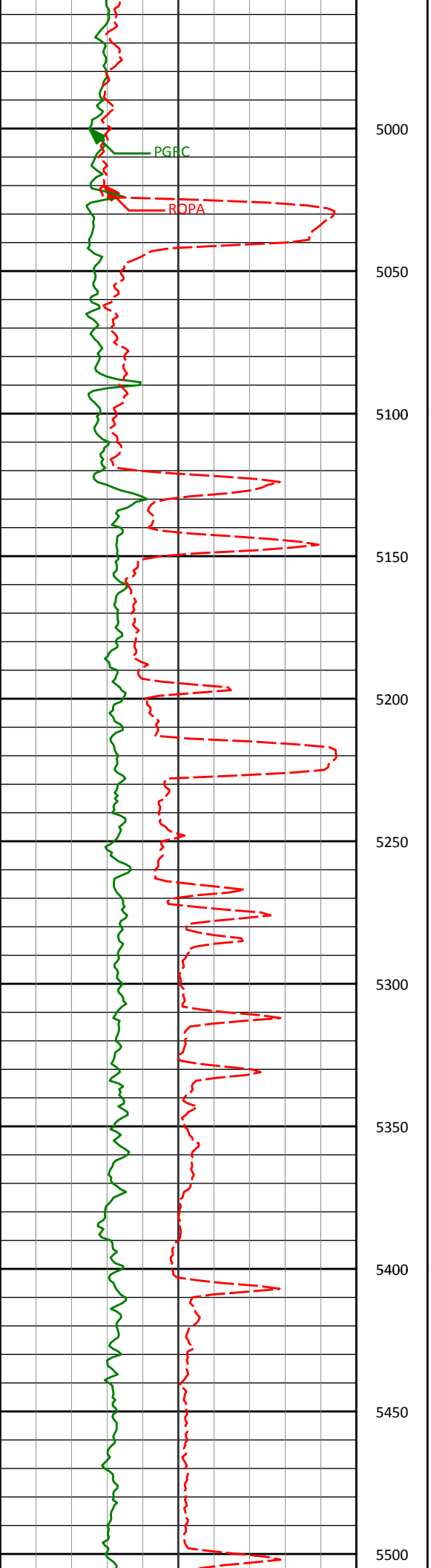
3357'	14.72°	346.45°	3314.72'	-75.63'
3451'	14.26°	346.26°	3405.73'	-78.00'
3546'	14.35°	354.43°	3497.79'	-78.73'
3641'	14.52°	351.79°	3589.80'	-78.34'
3736'	15.91°	349.50°	3681.46'	-79.01'
3831'	13.60°	349.11°	3773.33'	-80.20'



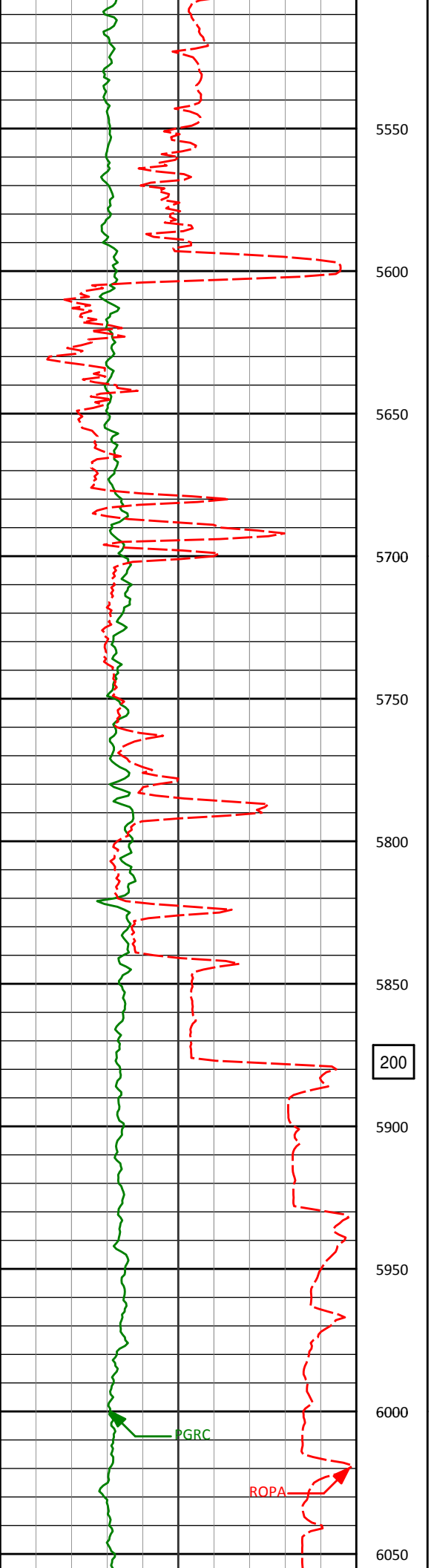
3926'	11.46°	345.01°	3866.06'	-81.96'
4020'	8.73°	349.80°	3958.60'	-83.41'
4115'	5.66°	350.53°	4052.84'	-83.84'
4210'	1.88°	316.37°	4147.62'	-84.88'
4305'	0.34°	291.03°	4242.60'	-86.04'
4400'	0.94°	184.04°	4337.60'	-86.44'



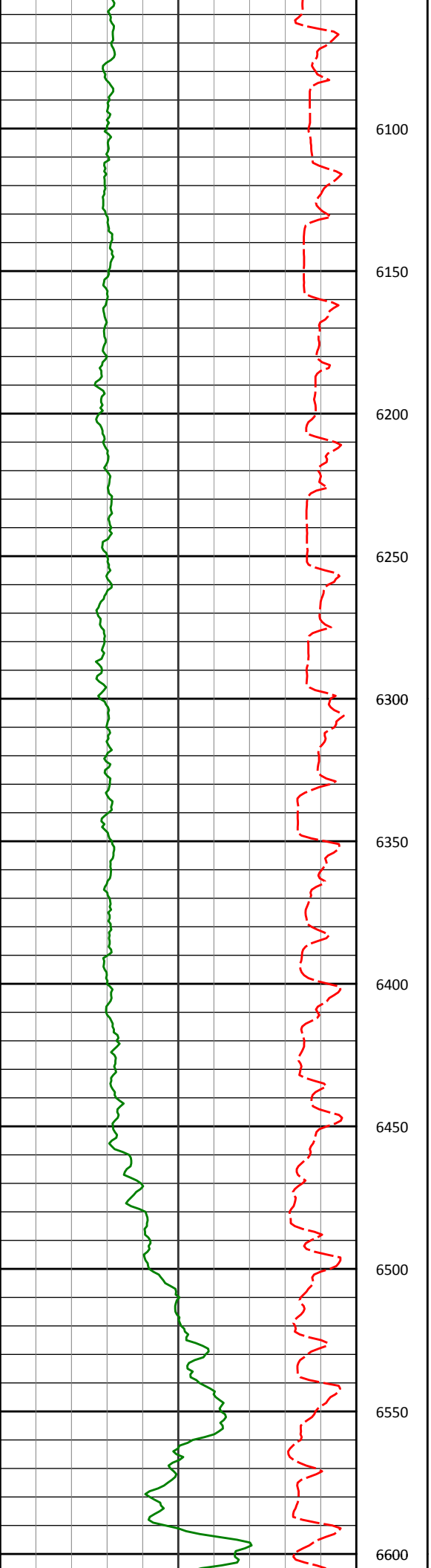
4495'	0.98°	143.40°	4432.59'	-86.22'
4590'	1.17°	156.87°	4527.57'	-85.57'
4685'	1.22°	98.03°	4622.55'	-84.34'
4780'	0.89°	138.96°	4717.54'	-82.96'
4874'	1.34°	181.56°	4811.52'	-82.74'



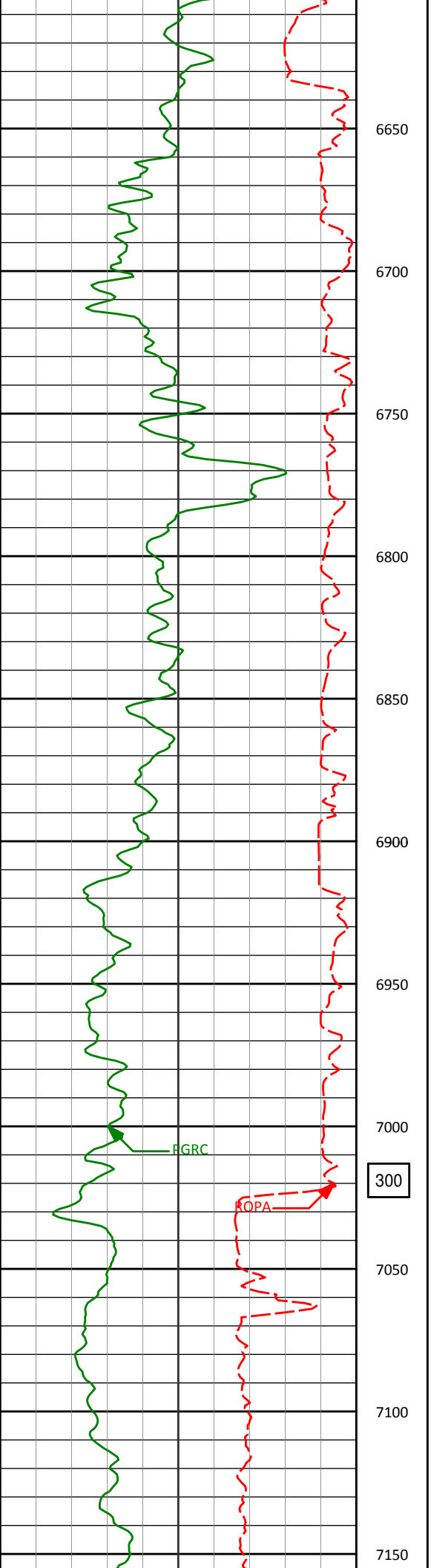
4969'	1.11°	125.80°	4906.50'	-82.26'
5064'	1.59°	178.57°	5001.48'	-81.74'
5159'	0.62°	163.87°	5096.46'	-81.82'
5254'	1.26°	215.74°	5191.45'	-82.46'
5348'	1.49°	161.49°	5285.43'	-82.95'
5443'	0.51°	169.91°	5380.41'	-82.70'



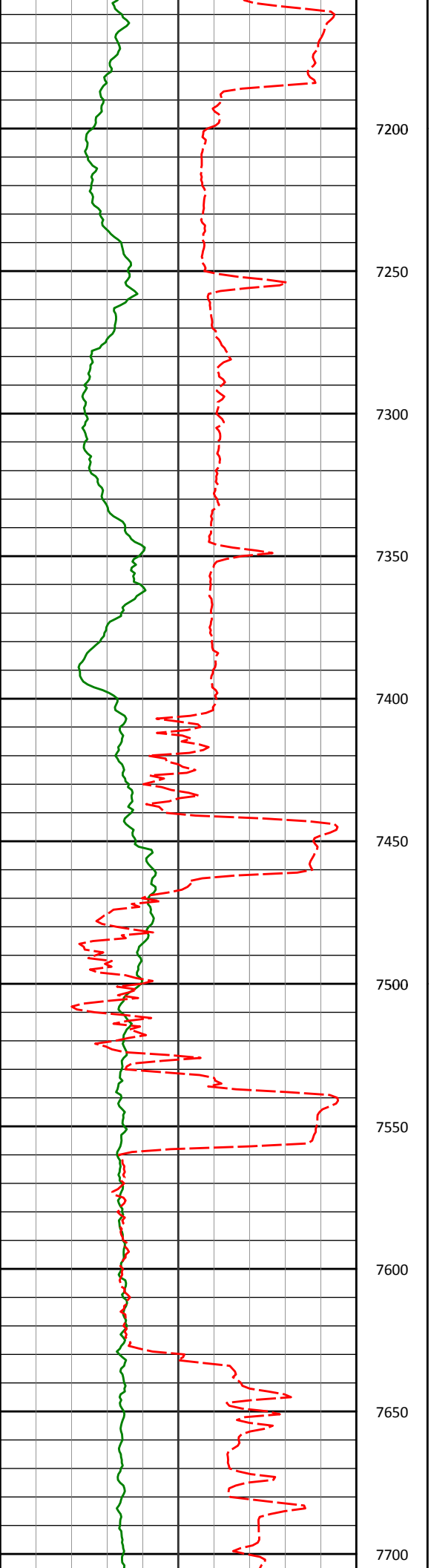
5538'	0.58°	108.99°	5475.41'	-82.26'
5633'	0.56°	162.54°	5570.40'	-81.75'
5728'	0.67°	107.14°	5665.40'	-81.17'
5821'	0.78°	118.03°	5758.39'	-80.17'
5916'	1.47°	80.81°	5853.37'	-78.42'
5964'	5.48°	83.44°	5901.27'	-75.52'
6011'	12.63°	80.37°	5947.66'	-68.13'



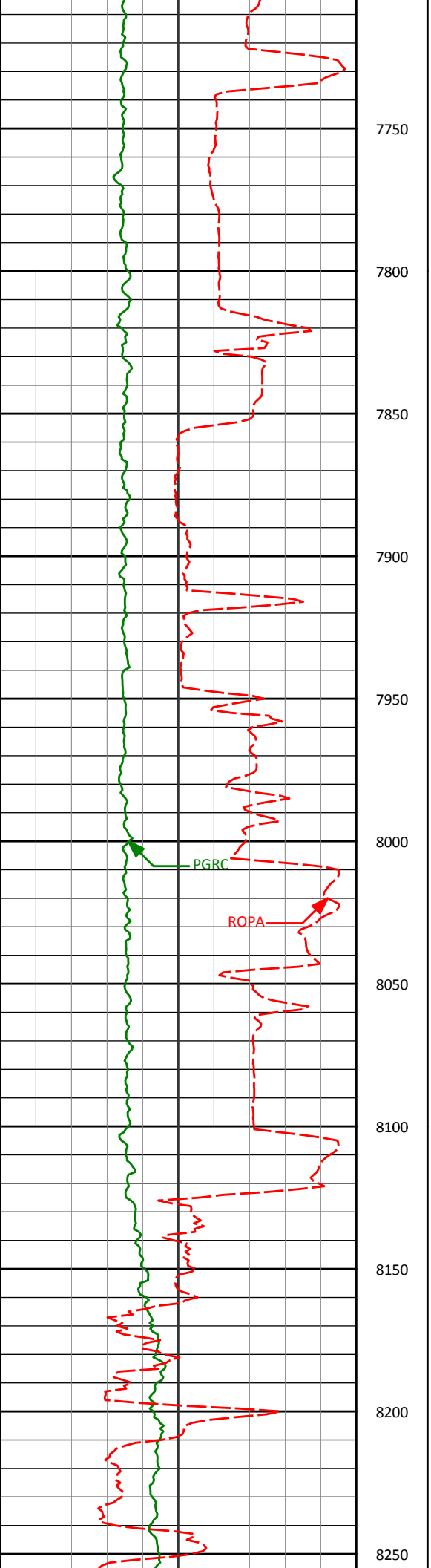
6059'	16.76°	83.85°	5994.08'	-55.96'
6106'	17.80°	88.15°	6038.96'	-42.04'
6154'	19.25°	93.43°	6084.47'	-26.98'
6201'	21.79°	92.21°	6128.49'	-10.79'
6249'	23.37°	88.78°	6172.81'	7.44'
6296'	25.16°	87.60°	6215.66'	26.64'
6344'	28.31°	87.98°	6258.52'	48.13'
6391'	31.97°	89.43°	6299.16'	71.57'
6439'	36.76°	91.62°	6338.77'	98.35'
6485'	42.36°	86.66°	6374.23'	127.41'
6533'	48.01°	87.69°	6408.05'	161.31'
6580'	53.37°	88.04°	6437.81'	197.48'



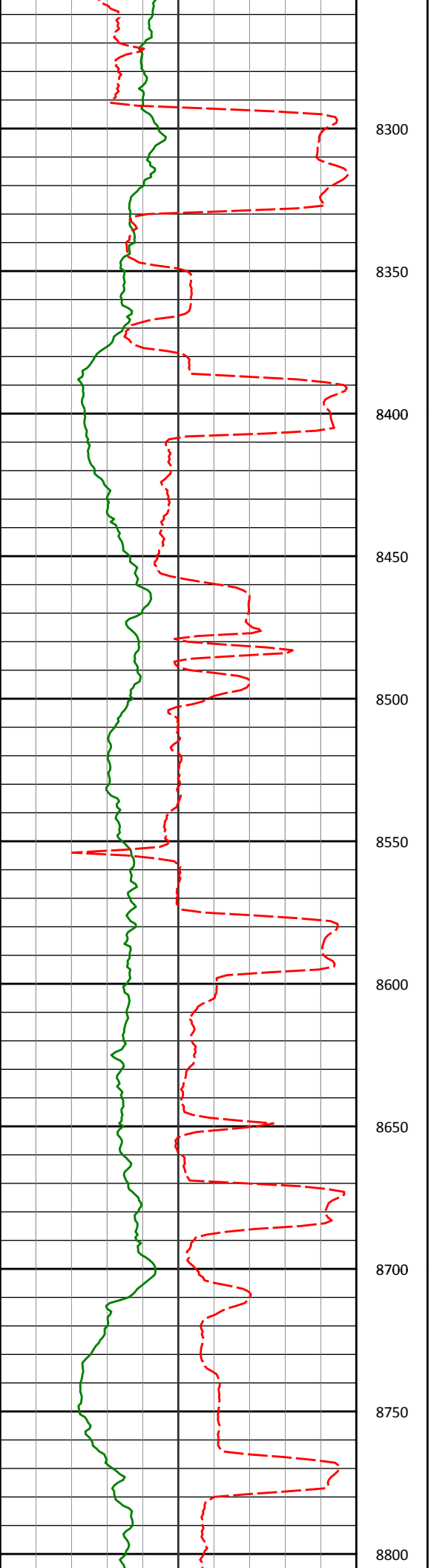
6628'	56.20°	89.91°	6465.49'	236.41'
6675'	58.47°	89.74°	6490.86'	275.62'
6723'	60.91°	89.61°	6515.08'	316.70'
6770'	65.41°	88.53°	6536.29'	358.32'
6818'	70.78°	88.05°	6554.19'	402.58'
6865'	75.86°	88.30°	6567.68'	447.34'
6913'	78.39°	88.04°	6578.38'	493.87'
6965'	83.38°	88.49°	6586.61'	544.90'
7092'	86.26°	88.19°	6598.08'	670.63'



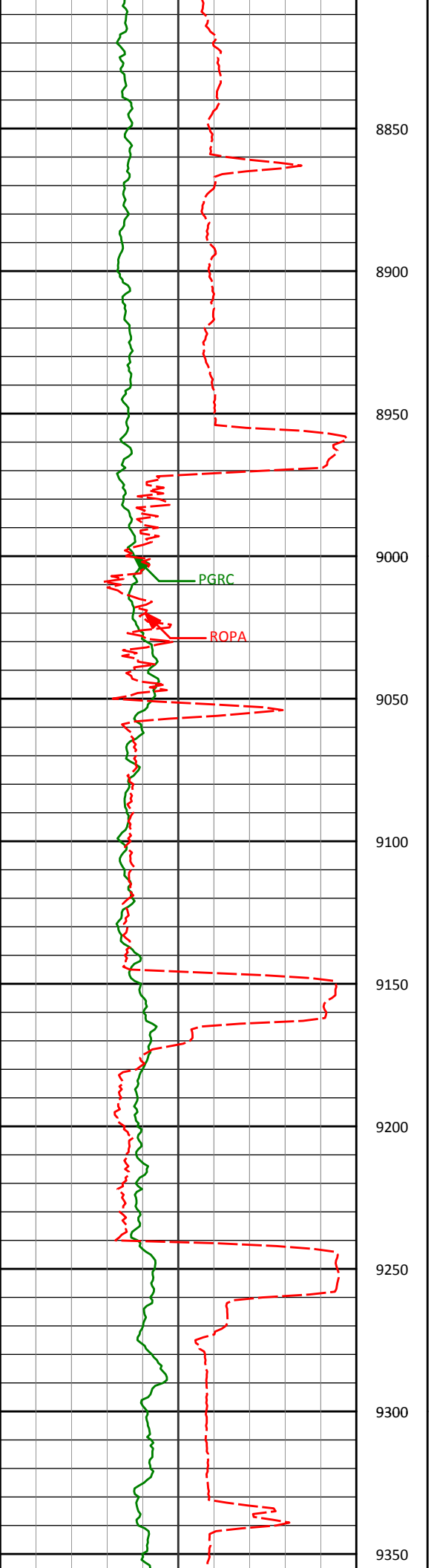
7187'	88.98°	88.97°	6602.02'	764.94'
7282'	89.29°	88.69°	6603.45'	859.28'
7377'	88.40°	87.79°	6605.37'	953.72'
7472'	89.08°	87.95°	6607.46'	1048.23'
7566'	91.33°	88.37°	6607.12'	1141.70'
7661'	90.25°	88.02°	6605.81'	1236.16'



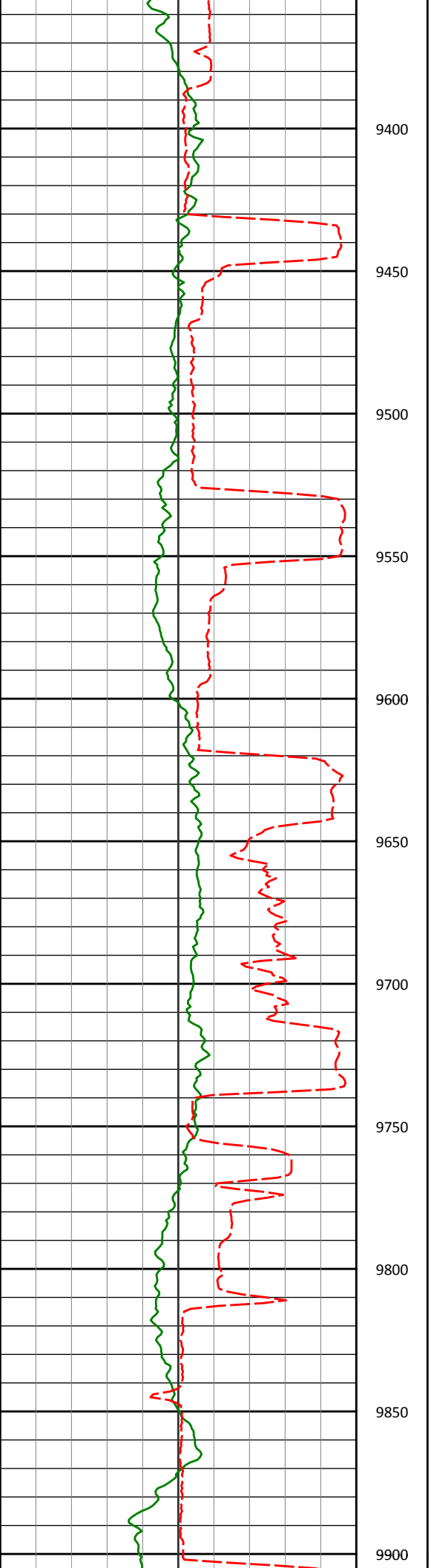
7756'	90.83°	89.00°	6604.92'	1330.57'
7850'	90.90°	88.63°	6603.50'	1423.92'
7945'	90.43°	92.55°	6602.40'	1517.86'
8040'	90.18°	89.50°	6601.89'	1611.71'
8135'	91.26°	87.10°	6600.70'	1706.15'
8230'	89.81°	85.53°	6599.81'	1800.89'



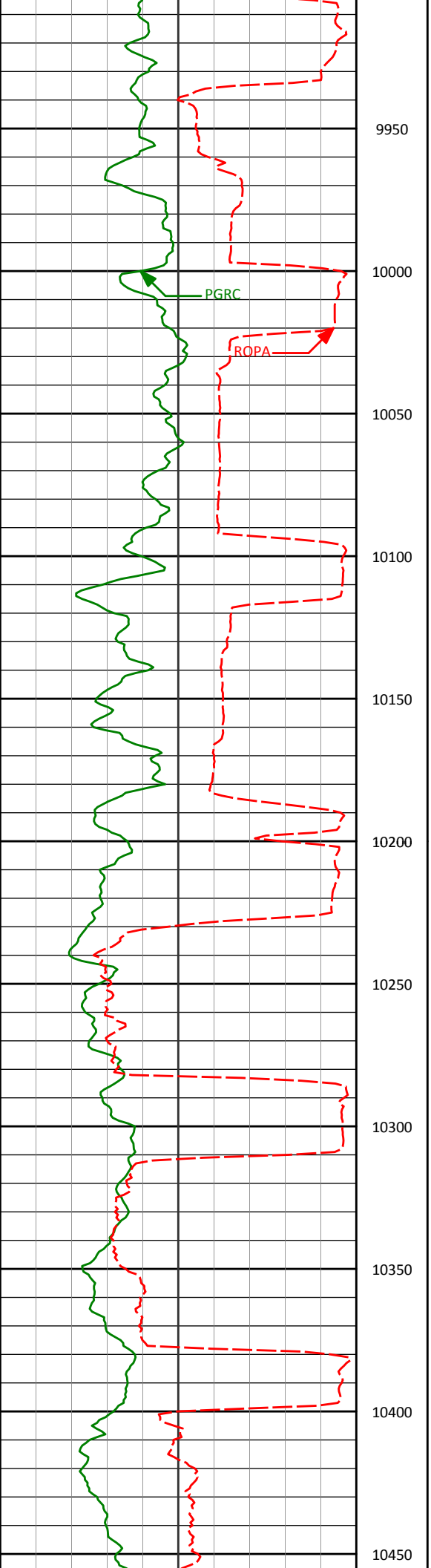
8324'	92.86°	88.40°	6597.62'	1894.51'
8419'	91.11°	88.81°	6594.33'	1988.84'
8514'	91.26°	86.94°	6592.36'	2083.34'
8609'	91.14°	89.87°	6590.37'	2177.74'
8704'	89.11°	87.86°	6590.17'	2272.08'
8799'	89.91°	89.29°	6590.98'	2366.47'



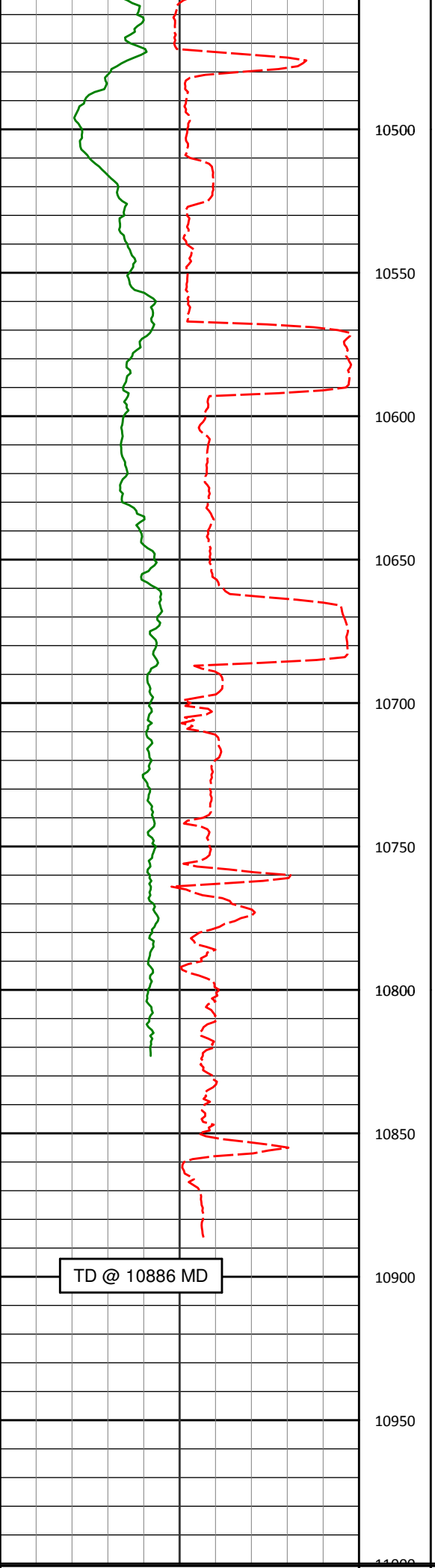
8893'	91.02°	89.68°	6590.21'	2459.70'
8988'	89.26°	89.93°	6589.98'	2553.85'
9083'	88.68°	89.83°	6591.69'	2647.96'
9178'	91.57°	89.57°	6591.48'	2742.13'
9273'	90.06°	85.83°	6590.13'	2836.65'



9368'	89.01°	85.20°	6590.90'	2931.48'
9462'	89.32°	85.01°	6592.27'	3025.35'
9557'	90.37°	86.39°	6592.53'	3120.16'
9652'	89.69°	87.06°	6592.48'	3214.85'
9747'	90.52°	88.49°	6592.31'	3309.39'
9841'	89.82°	86.40°	6592.03'	3402.98'



9936'	88.83°	89.04°	6593.15'	3497.52'
10031'	90.06°	88.99°	6594.07'	3591.83'
10126'	90.09°	89.13°	6593.94'	3686.14'
10221'	90.68°	88.23°	6593.30'	3780.51'
10315'	91.79°	88.88°	6591.28'	3873.90'
10410'	91.82°	89.60°	6588.29'	3968.13'



10505'	90.68°	88.62°	6586.21'	4062.40'
10599'	90.46°	89.94°	6585.28'	4155.66'
10694'	92.19°	88.53°	6583.08'	4249.90'
10789'	91.79°	87.28°	6579.78'	4344.36'
10822'	91.70°	86.44°	6578.78'	4377.24'
10886'	91.70°	86.44°	6576.88'	4441.03'

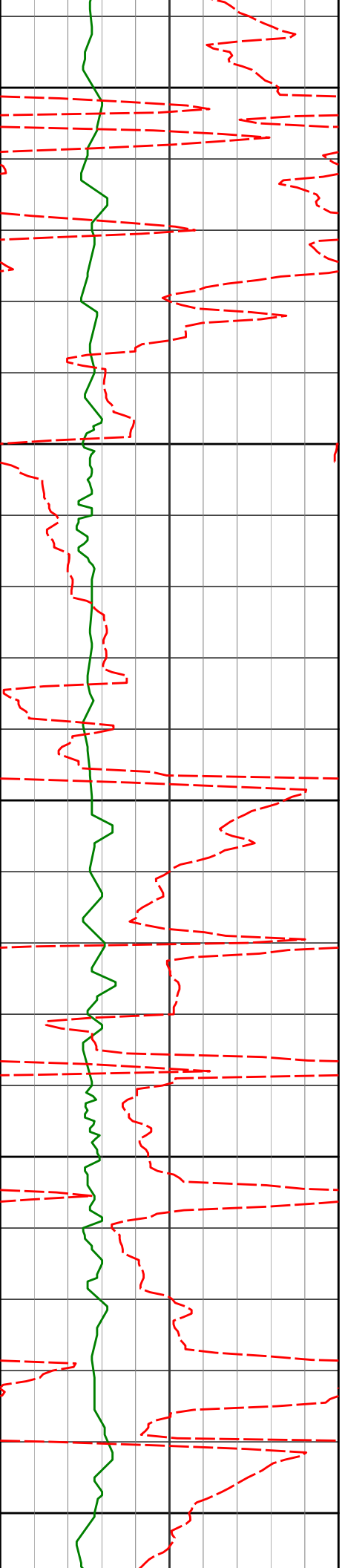
Avg Rate of Penetration ROPA 1K feet per hr 0	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
PCG Gamma Ray PGRC 0 api 300						

HALLIBURTON
Sperry Drilling Services
MD Detail Log 1:240

Noble Energy
Wells Ranch AE20-68HN
H&P 321
Sec. 20-T6N-R62W

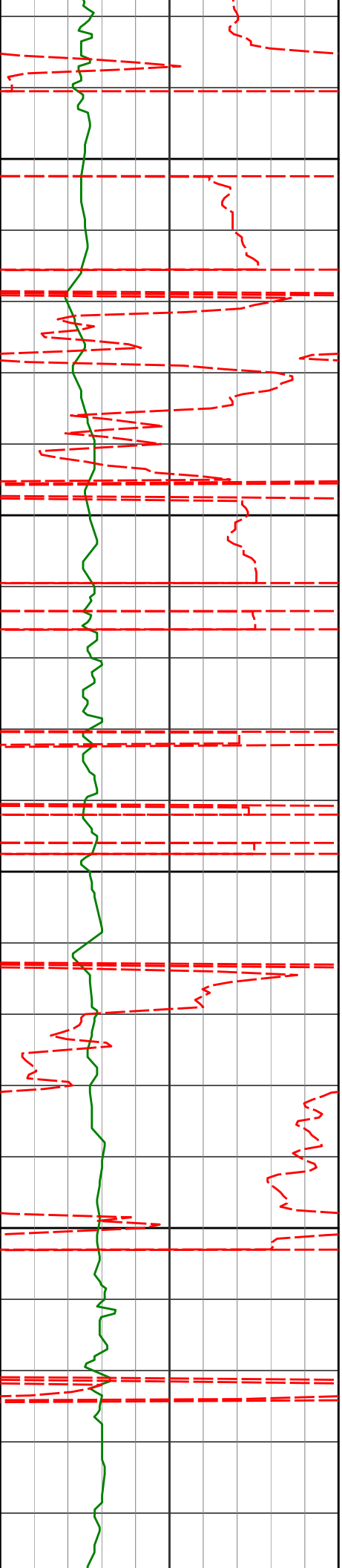
PCG Gamma Ray PGRC 0 api 300						
Avg Rate of Penetration ROPA 1K feet per hr 0	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
	900					
	950					
	100	967'	0.50°	185.52°	966.97'	-0.55'
	1000					

PGRC
ROPA

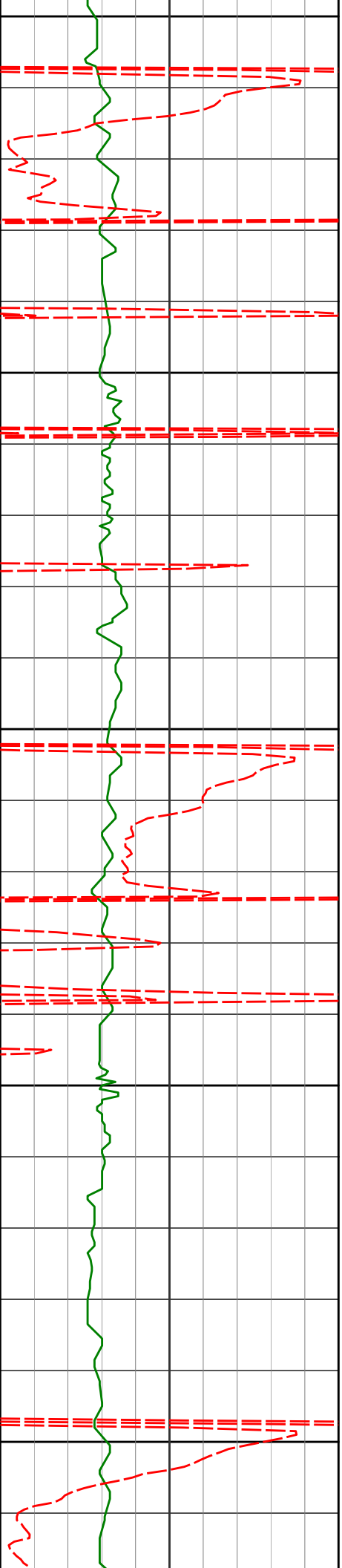


1091'	2.18°	223.70°	1090.93'	-2.53'
1184'	1.28°	236.50°	1183.89'	-4.85'

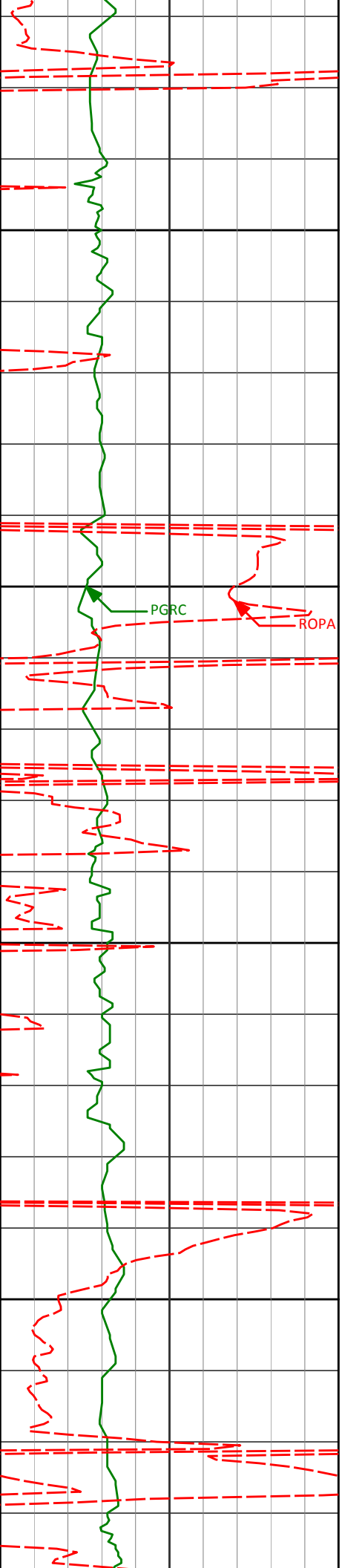
1276'	1.27°	28.98°	1275.88'	-5.16'
1369'	1.36°	79.57°	1368.86'	-3.44'
1461'	1.24°	63.21°	1460.84'	-1.41'



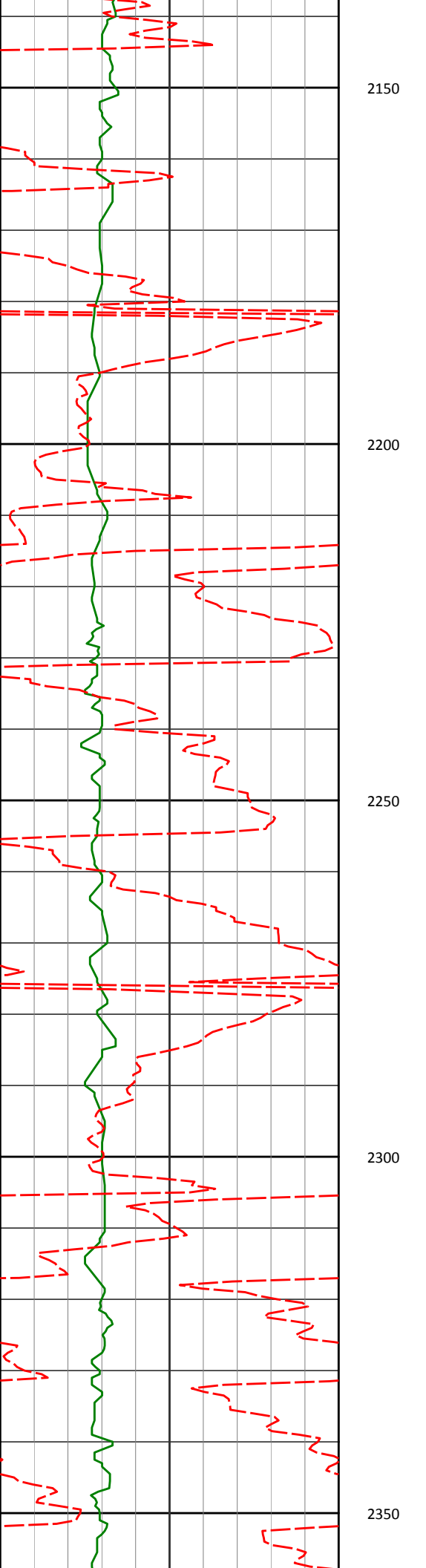
1556'	1.85°	25.81°	1555.81'	0.41'
1650'	4.20°	342.17°	1649.68'	0.66'



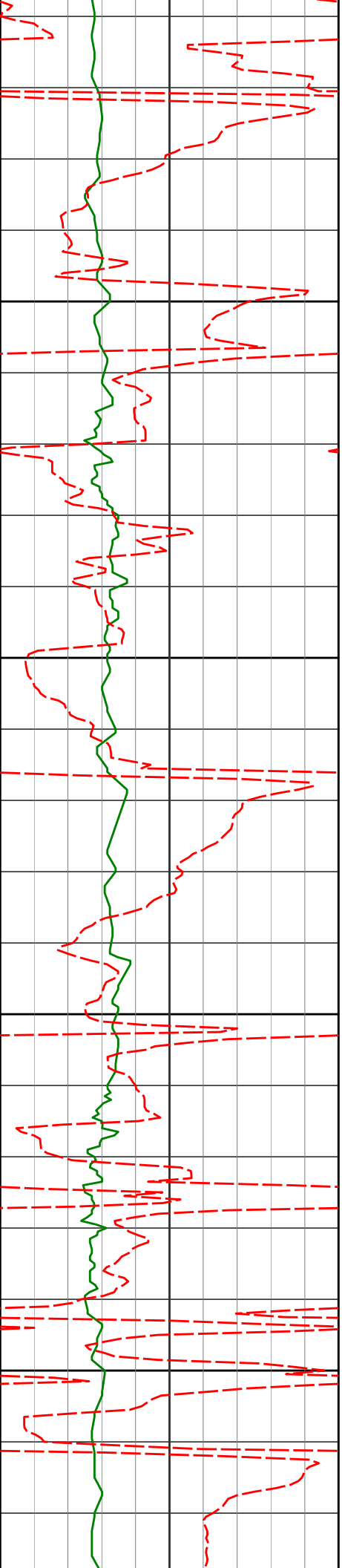
1745'	5.87°	326.57°	1744.31'	-2.04'
1840'	7.23°	314.59°	1838.69'	-7.78'



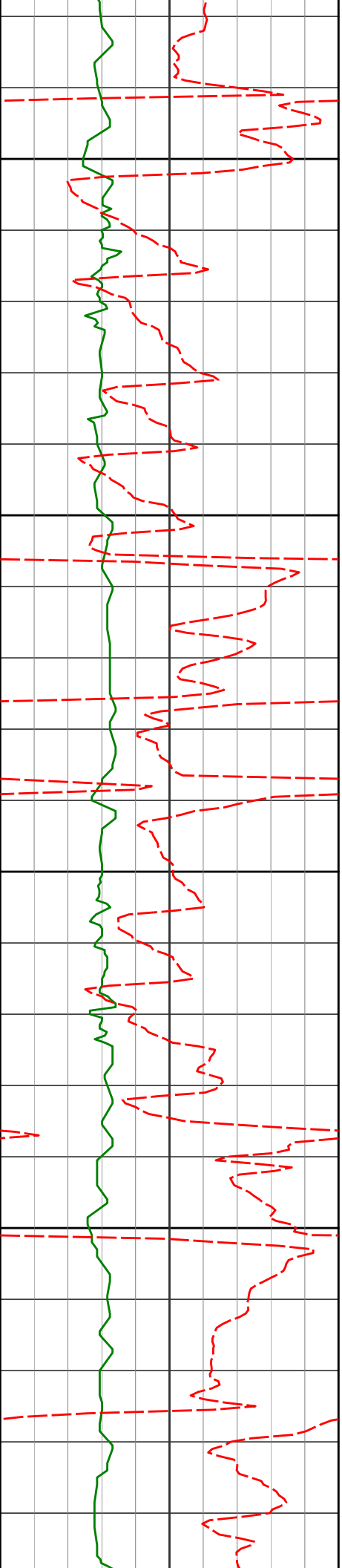
1935'	8.85°	312.20°	1932.76'	-16.12'
2030'	8.41°	308.14°	2026.68'	-25.64'
2124'	10.91°	314.19°	2119.35'	-35.88'



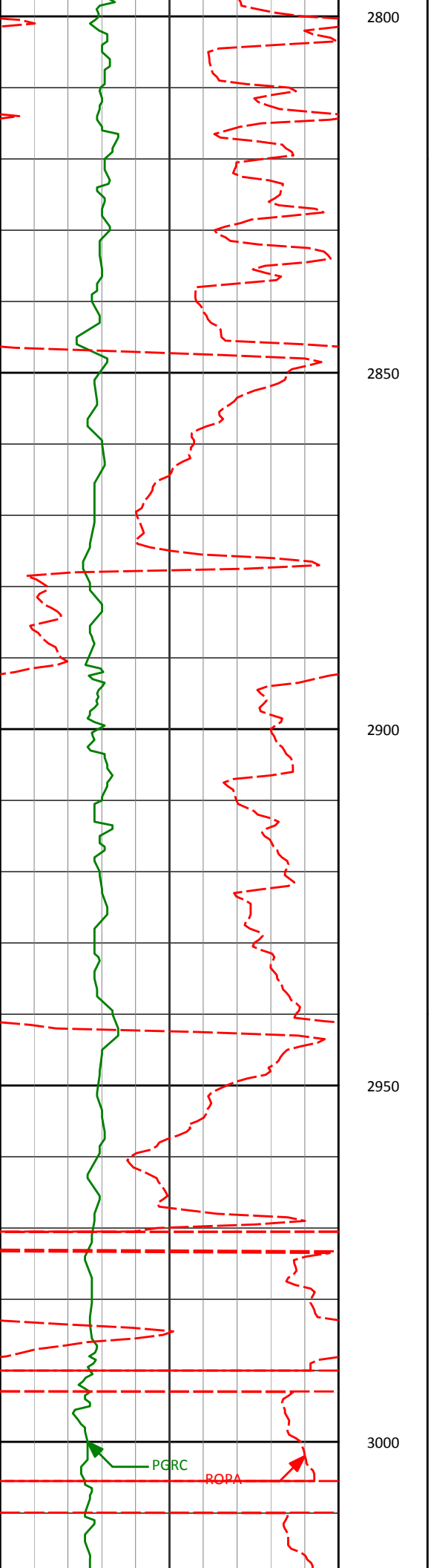
2219'	11.63°	321.27°	2212.52'	-46.33'
2314'	12.66°	327.37°	2305.39'	-55.60'



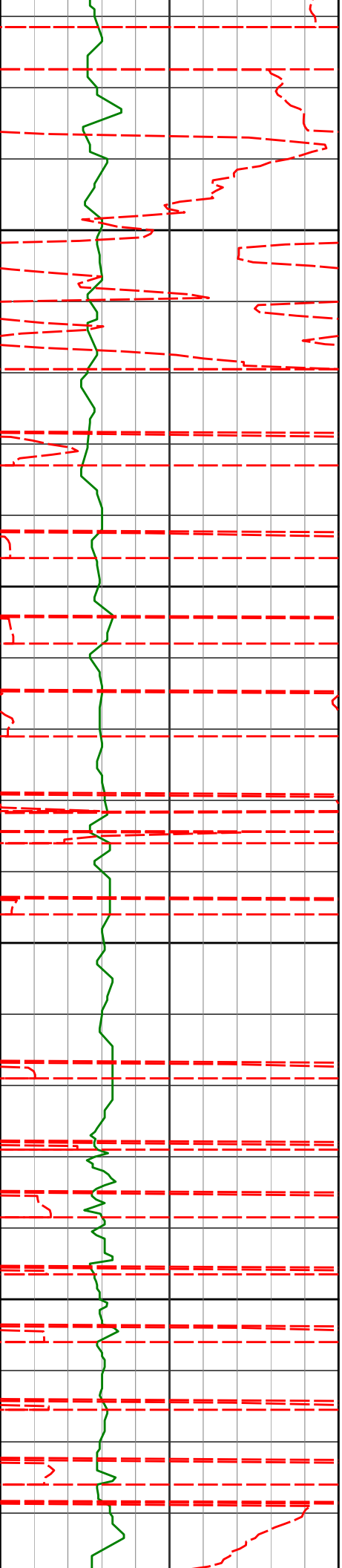
2409'	13.04°	333.73°	2398.02'	-63.35'
2504'	13.44°	342.96°	2490.50'	-68.49'



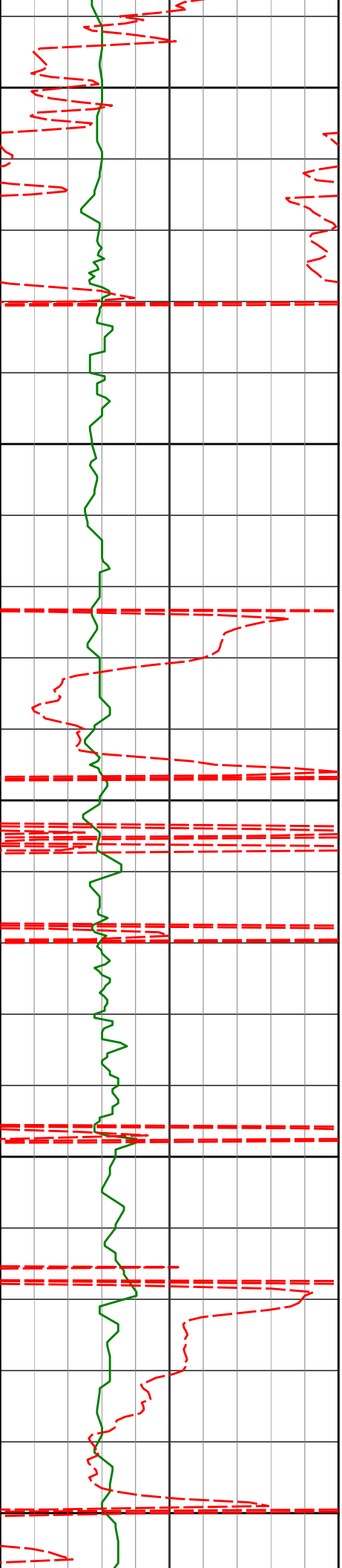
2598'	15.50°	348.48°	2581.52'	-71.04'
2693'	14.76°	353.85°	2673.23'	-71.49'
2788'	14.97°	350.74°	2765.05'	-71.43'



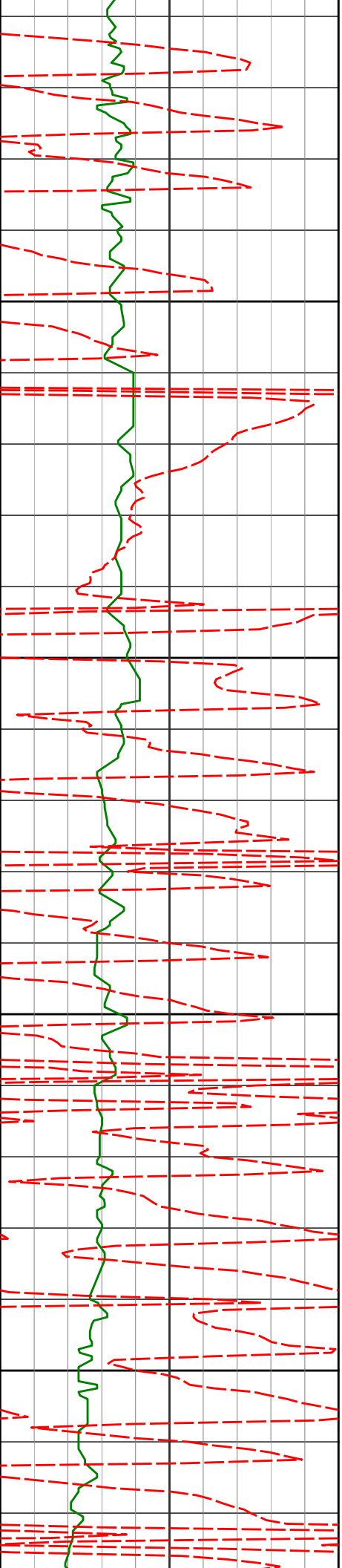
2883'	15.22°	348.88°	2856.78'	-72.44'
2978'	15.05°	352.82°	2948.48'	-73.00'



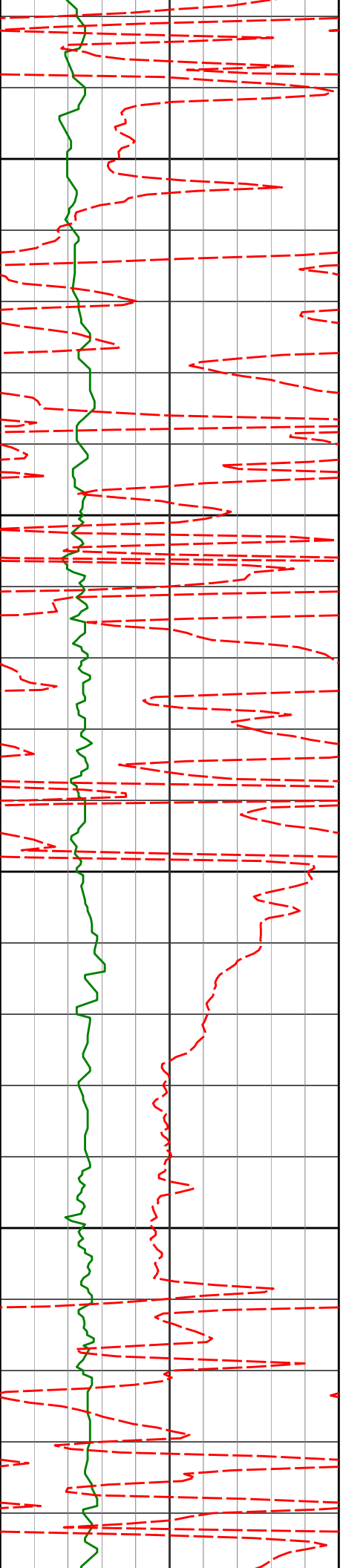
3072'	16.19°	351.83°	3039.01'	-72.93'
3167'	13.46°	349.68°	3130.84'	-73.47'



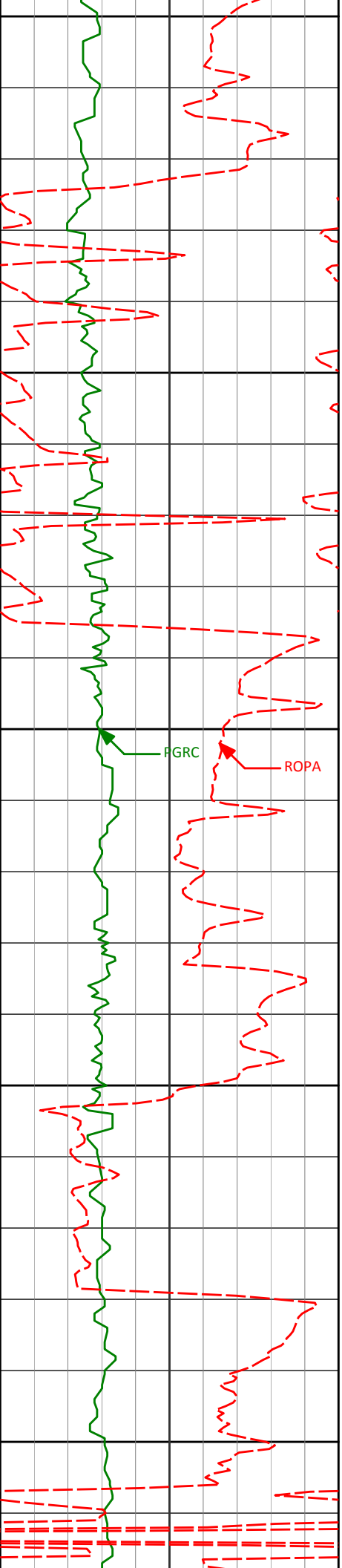
3262'	15.07°	351.00°	3222.91'	-74.19'
3357'	14.72°	346.45°	3314.72'	-75.63'
3451'	14.26°	346.26°	3405.73'	-78.00'



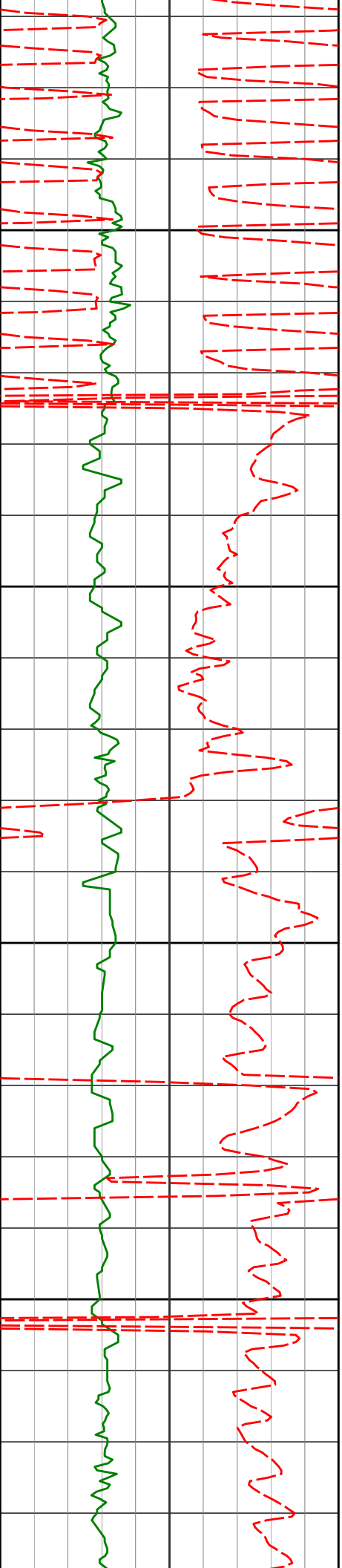
3546'	14.35°	354.43°	3497.79'	-78.73'
3641'	14.52°	351.79°	3589.80'	-78.34'



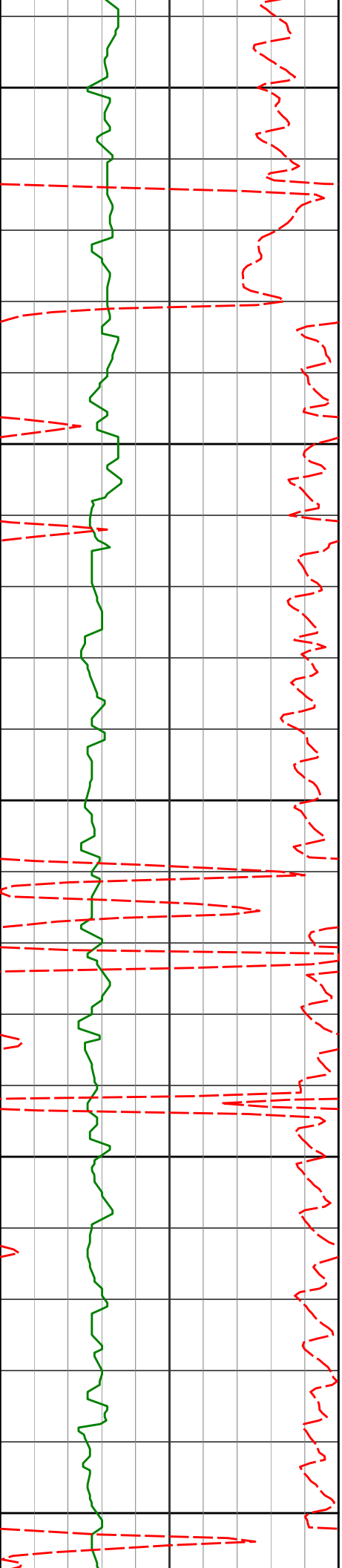
3736'	15.91°	349.50°	3681.46'	-79.01'
3831'	13.60°	349.11°	3773.33'	-80.20'



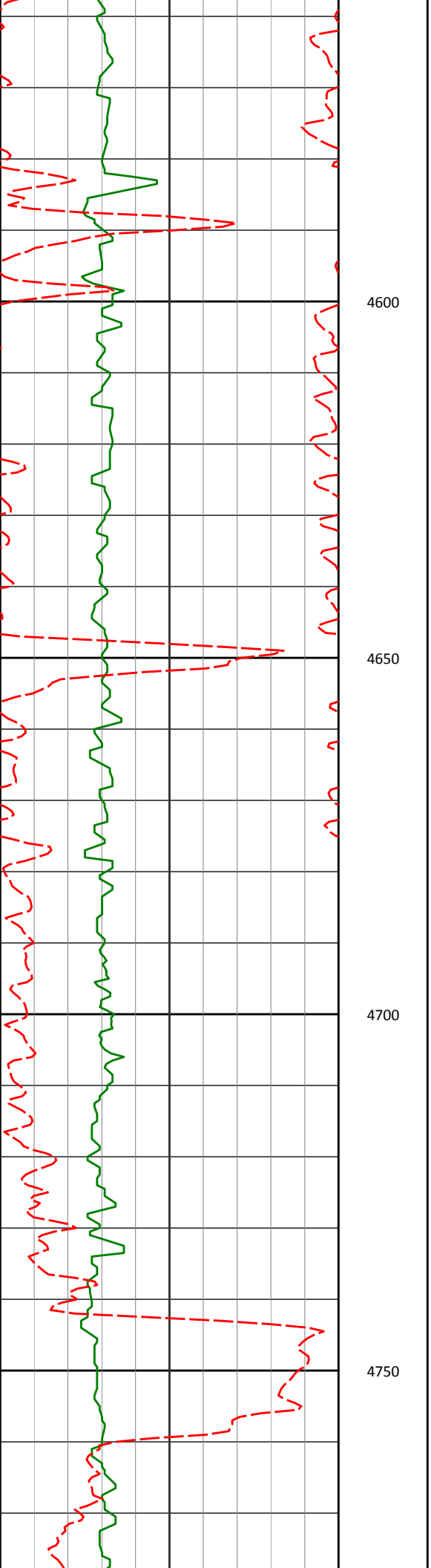
3926'	11.46°	345.01°	3866.06'	-81.96'
4020'	8.73°	349.80°	3958.60'	-83.41'
4115'	5.66°	350.53°	4052.84'	-83.84'



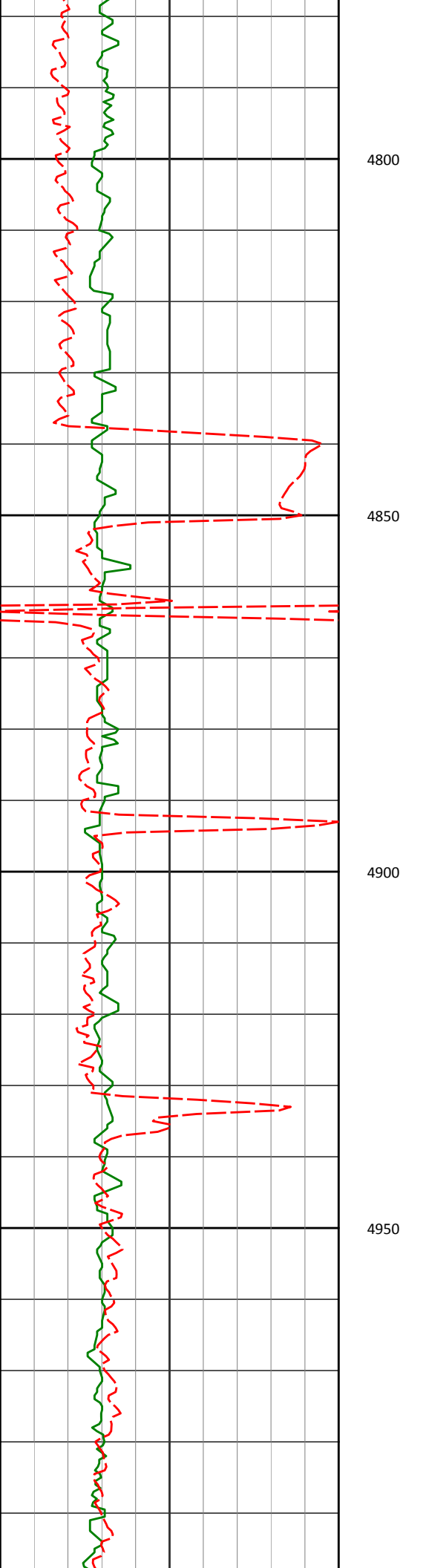
4210'	1.88°	316.37°	4147.62'	-84.88'
4305'	0.34°	291.03°	4242.60'	-86.04'



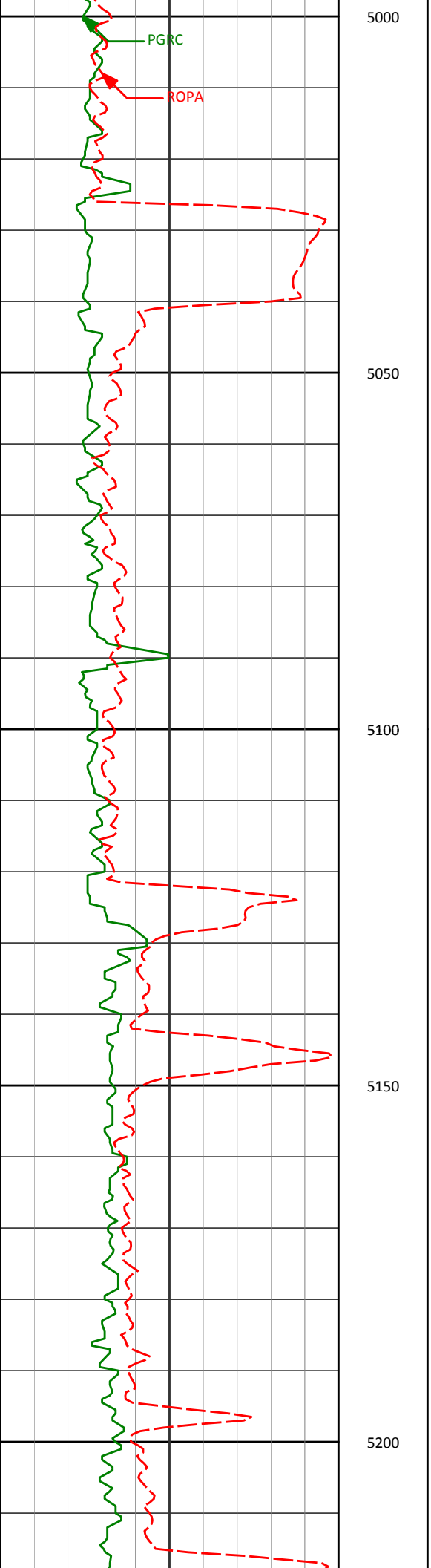
4400	4400'	0.94°	184.04°	4337.60'	-86.44'
	4495'	0.98°	143.40°	4432.59'	-86.22'



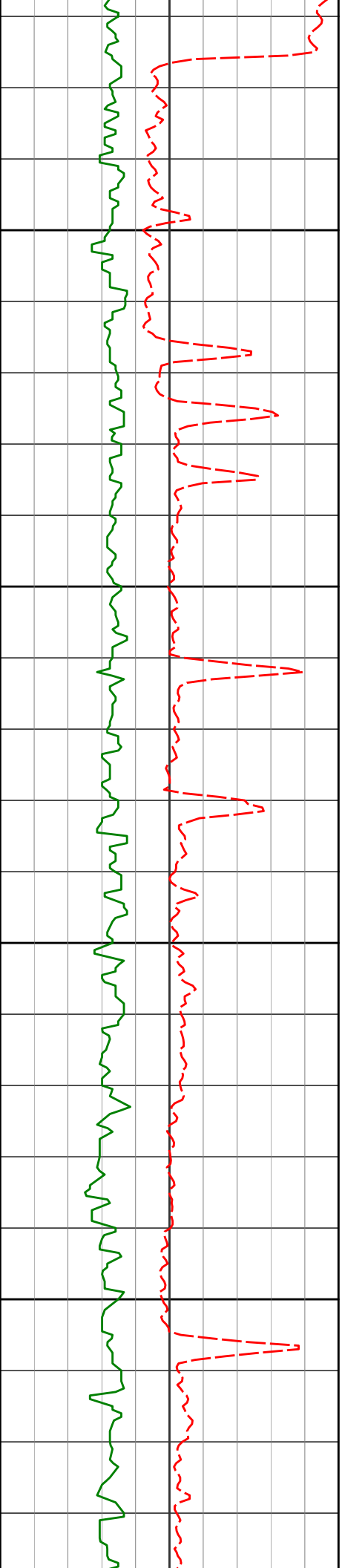
4590'	1.17°	156.87°	4527.57'	-85.57'
4685'	1.22°	98.03°	4622.55'	-84.34'



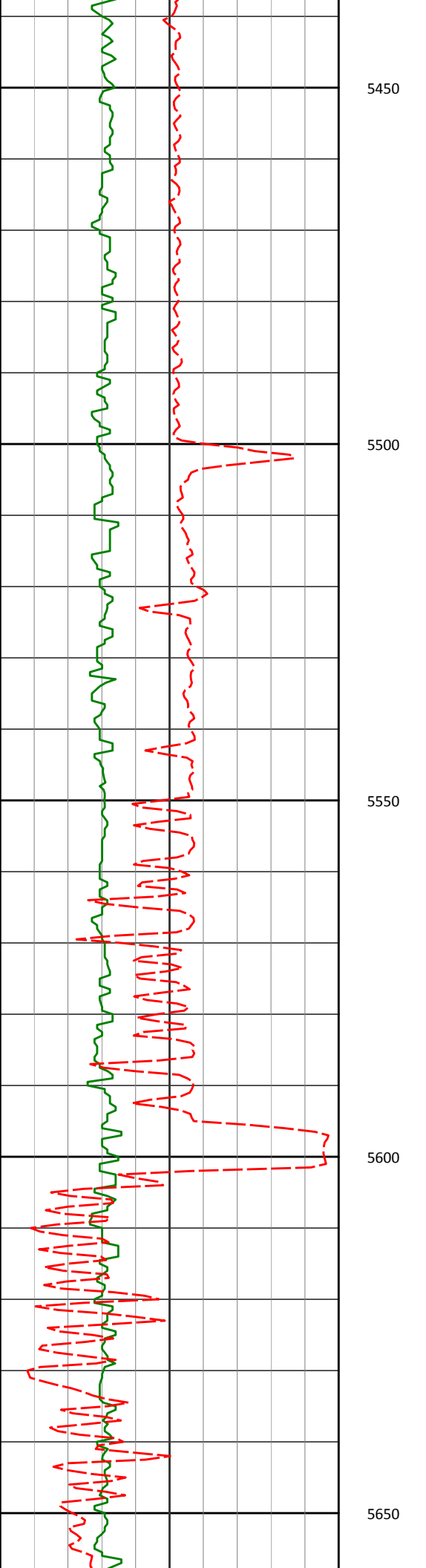
4780'	0.89°	138.96°	4717.54'	-82.96'
4874'	1.34°	181.56°	4811.52'	-82.74'
4969'	1.11°	125.80°	4906.50'	-82.26'



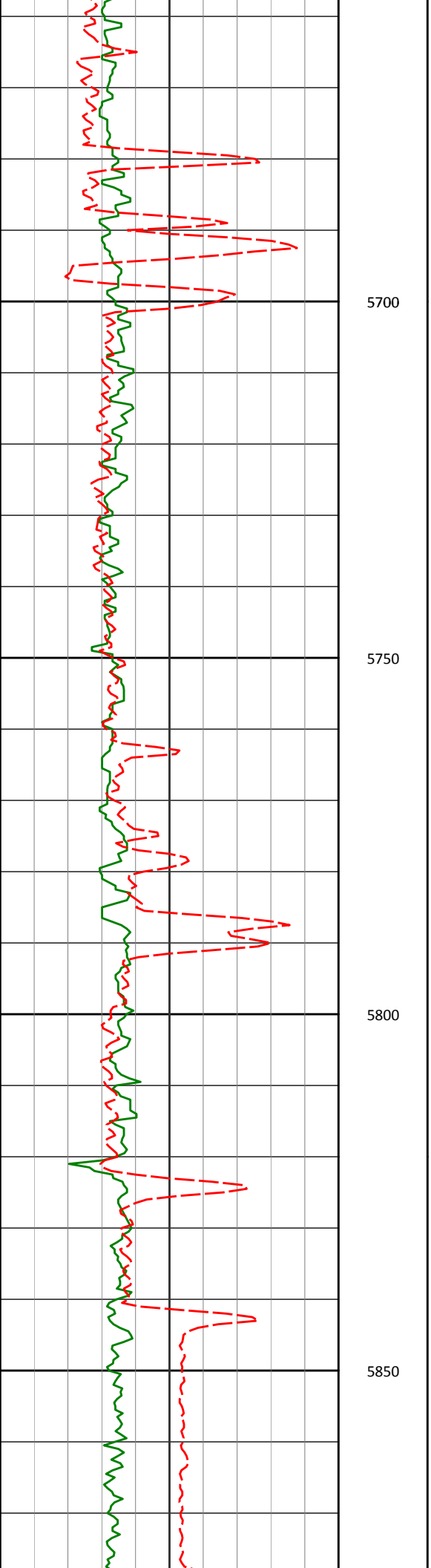
5064'	1.59°	178.57°	5001.48'	-81.74'
5159'	0.62°	163.87°	5096.46'	-81.82'



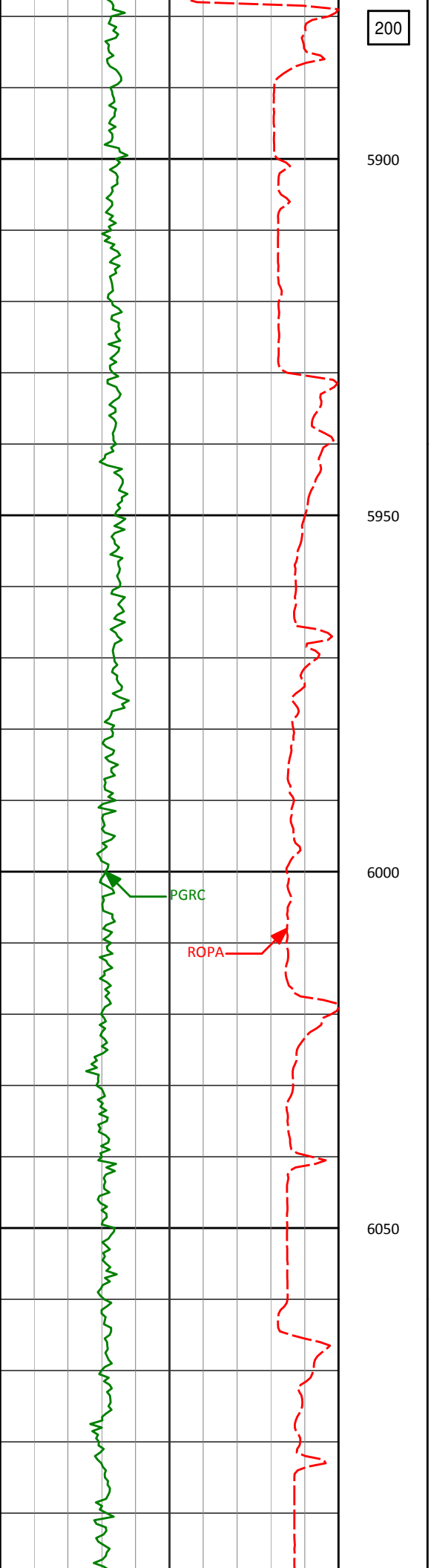
5254'	1.26°	215.74°	5191.45'	-82.46'
5348'	1.49°	161.49°	5285.43'	-82.95'



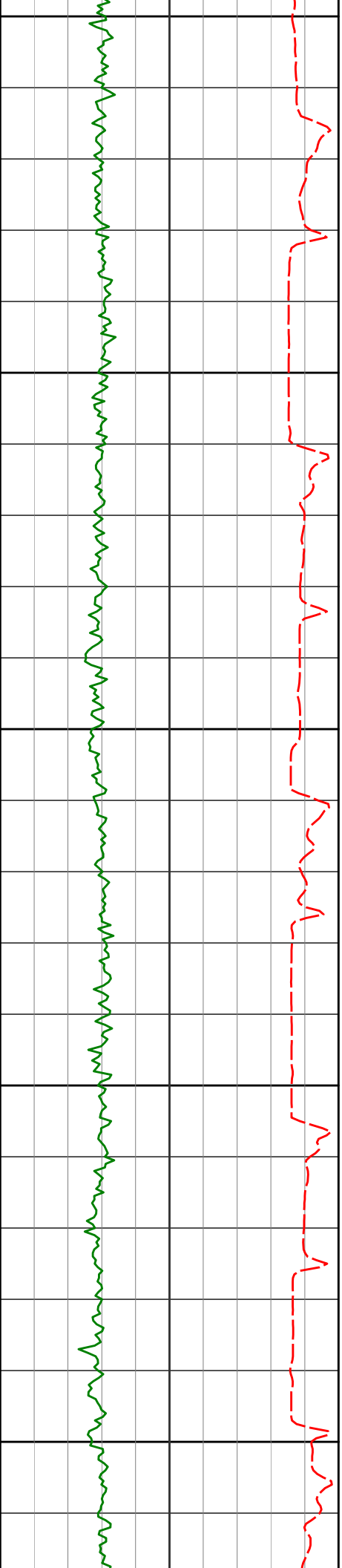
5443'	0.51°	169.91°	5380.41'	-82.70'
5538'	0.58°	108.99°	5475.41'	-82.26'
5633'	0.56°	162.54°	5570.40'	-81.75'



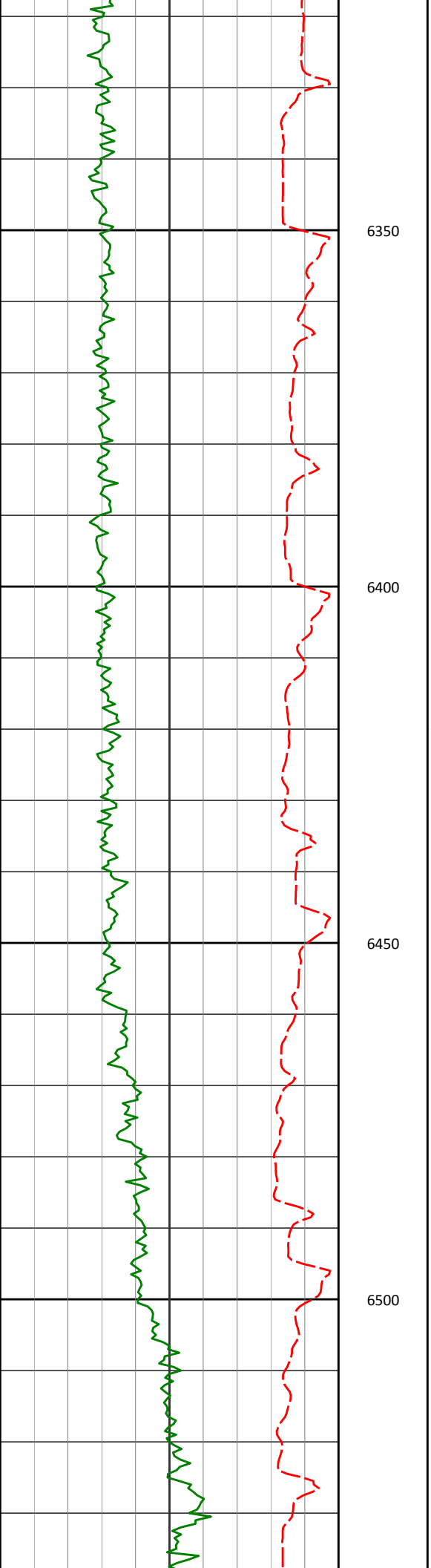
5728'	0.67°	107.14°	5665.40'	-81.17'
5821'	0.78°	118.03°	5758.39'	-80.17'



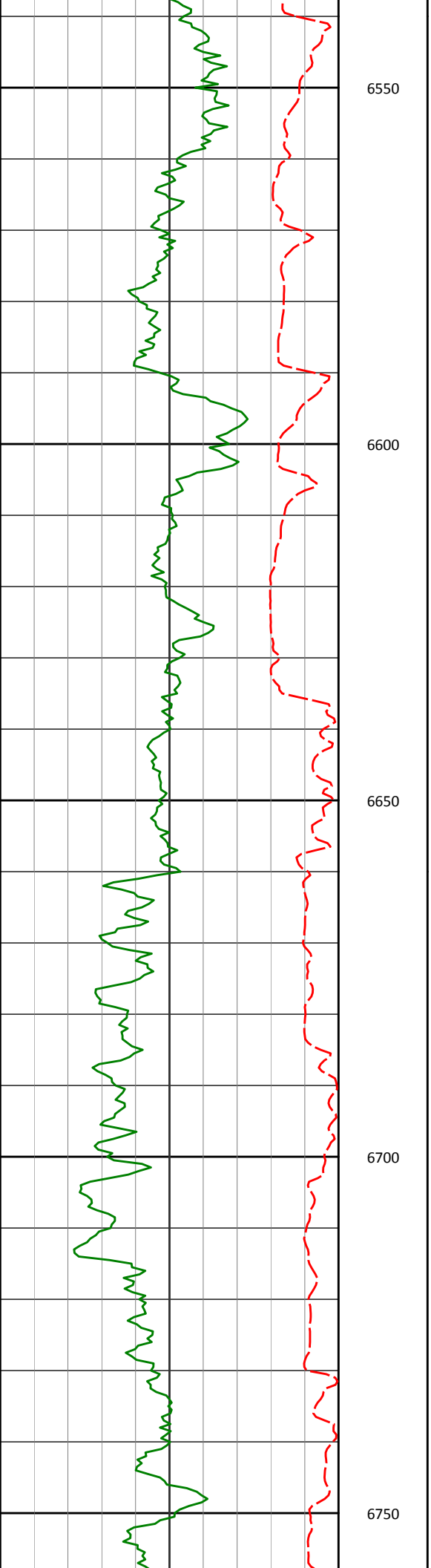
5916'	1.47°	80.81°	5853.37'	-78.42'
5964'	5.48°	83.44°	5901.27'	-75.52'
6011'	12.63°	80.37°	5947.66'	-68.13'
6059'	16.76°	83.85°	5994.08'	-55.96'



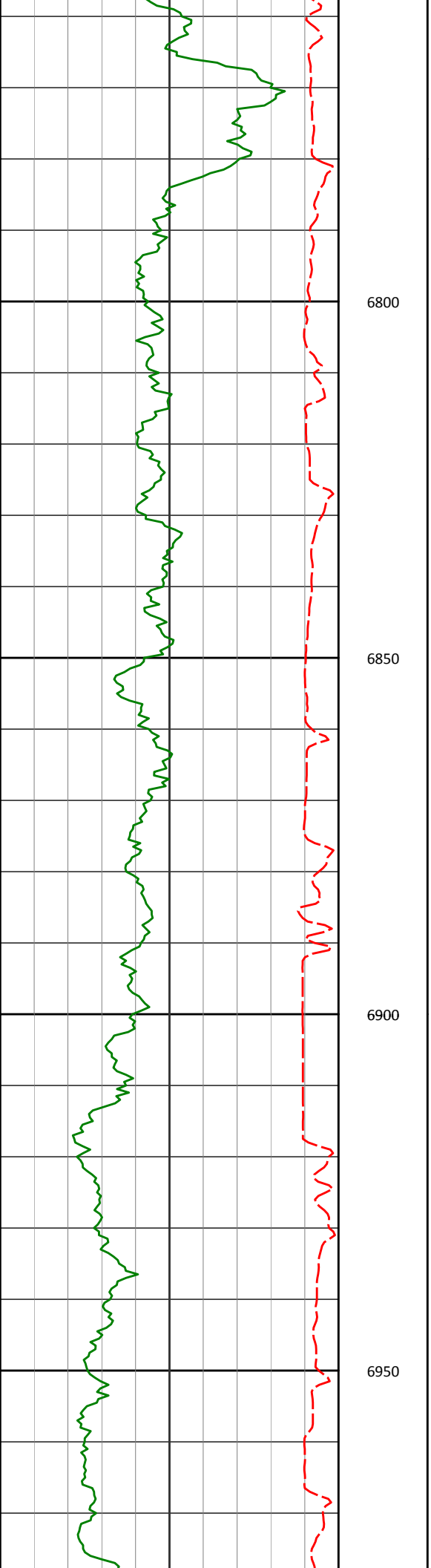
6106'	17.80°	88.15°	6038.96'	-42.04'
6154'	19.25°	93.43°	6084.47'	-26.98'
6201'	21.79°	92.21°	6128.49'	-10.79'
6249'	23.37°	88.78°	6172.81'	7.44'
6296'	25.16°	87.60°	6215.66'	26.64'



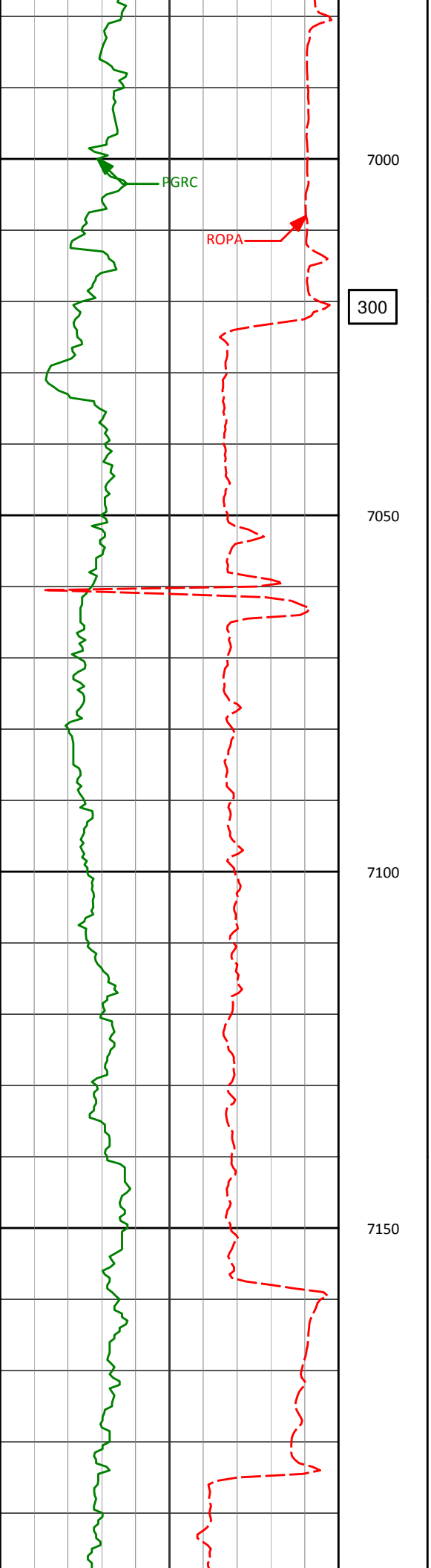
6344'	28.31°	87.98°	6258.52'	48.13'
6391'	31.97°	89.43°	6299.16'	71.57'
6439'	36.76°	91.62°	6338.77'	98.35'
6485'	42.36°	86.66°	6374.23'	127.41'
6533'	48.01°	87.69°	6408.05'	161.31'



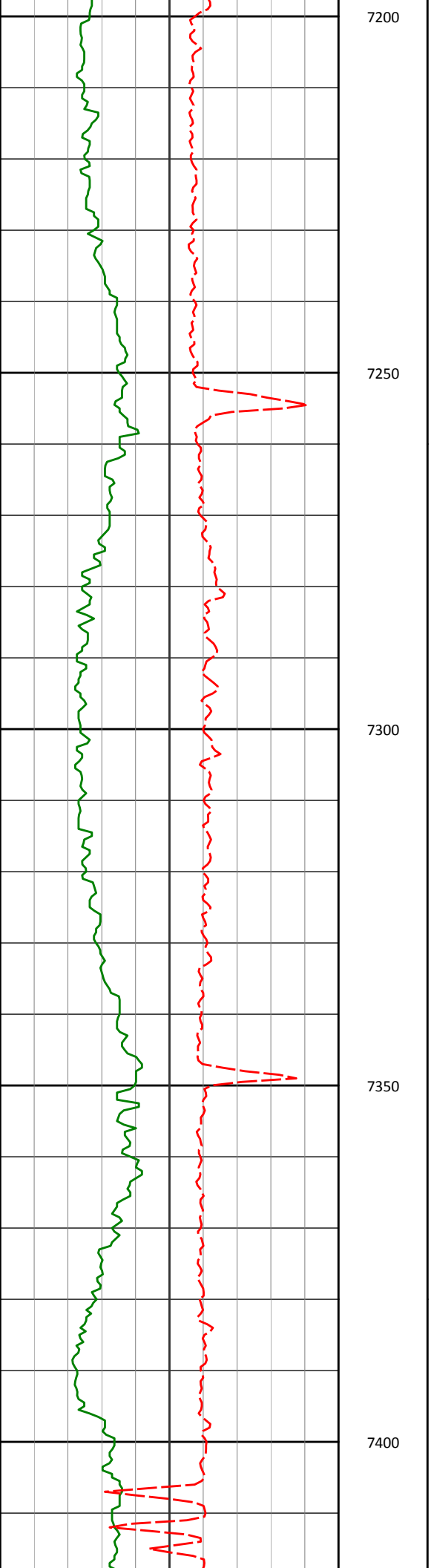
6580'	53.37°	88.04°	6437.81'	197.48'
6628'	56.20°	89.91°	6465.49'	236.41'
6675'	58.47°	89.74°	6490.86'	275.62'
6723'	60.91°	89.61°	6515.08'	316.70'



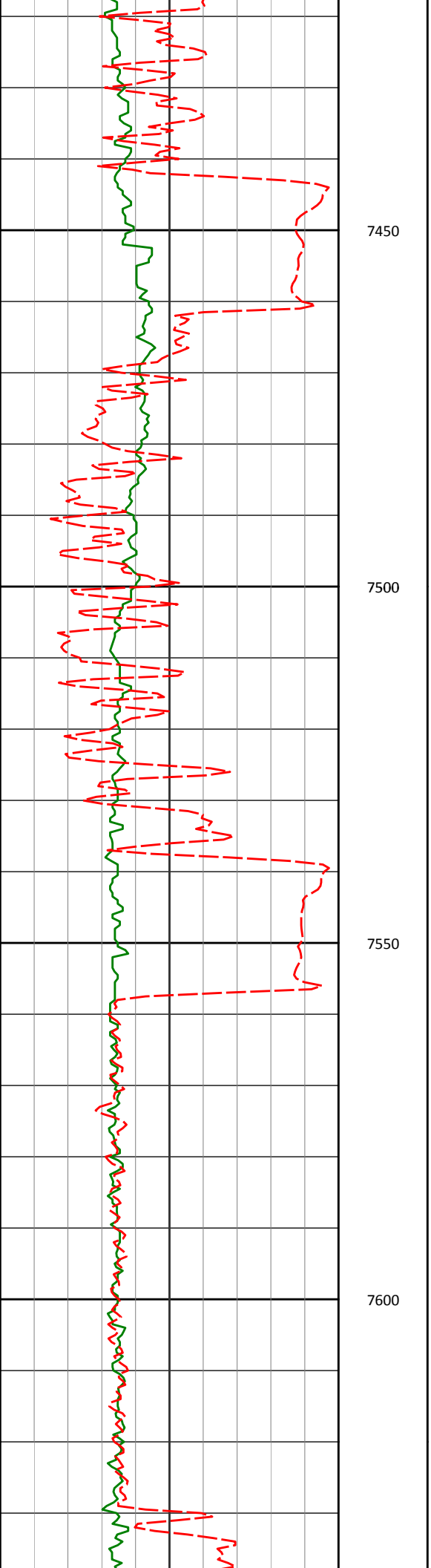
6770'	65.41°	88.53°	6536.29'	358.32'
6818'	70.78°	88.05°	6554.19'	402.58'
6865'	75.86°	88.30°	6567.68'	447.34'
6913'	78.39°	88.04°	6578.38'	493.87'
6965'	83.38°	88.49°	6586.61'	544.90'



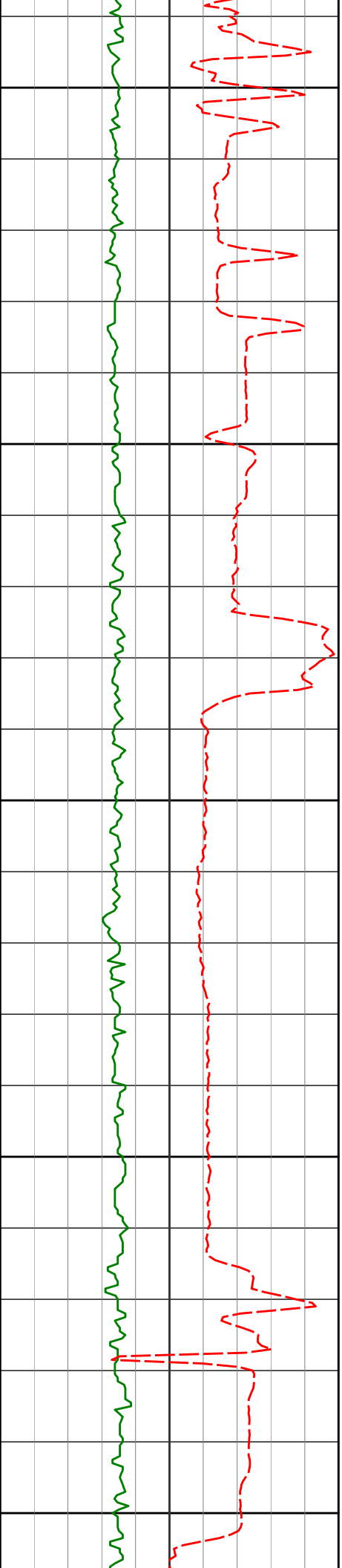
7092'	86.26°	88.19°	6598.08'	670.63'
7187'	88.98°	88.97°	6602.02'	764.94'



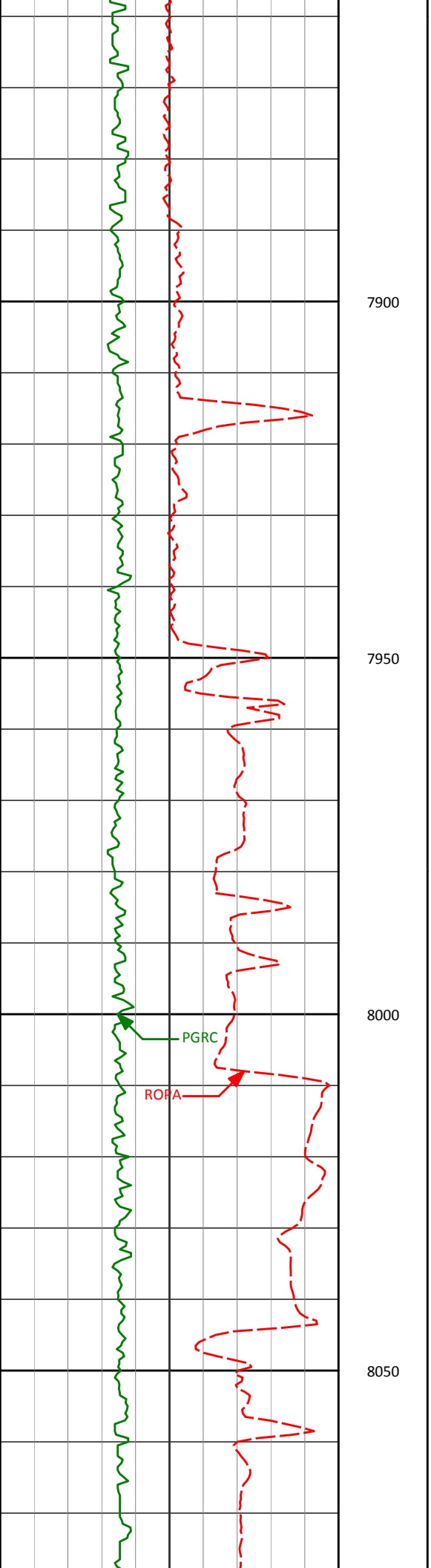
7282'	89.29°	88.69°	6603.45'	859.28'
7377'	88.40°	87.79°	6605.37'	953.72'



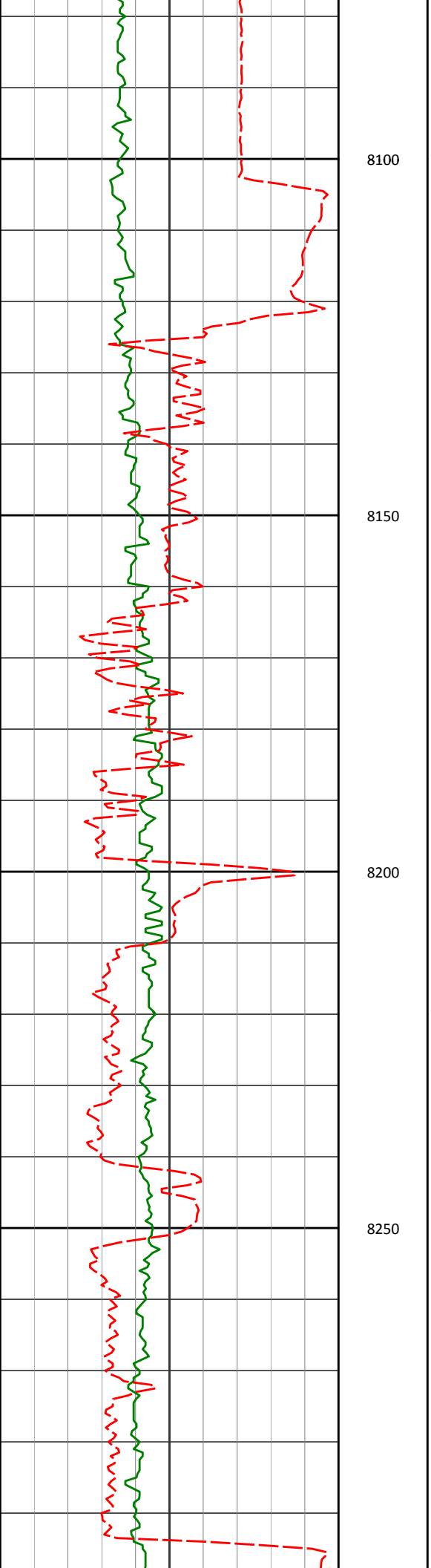
7472'	89.08°	87.95°	6607.46'	1048.23'
7566'	91.33°	88.37°	6607.12'	1141.70'



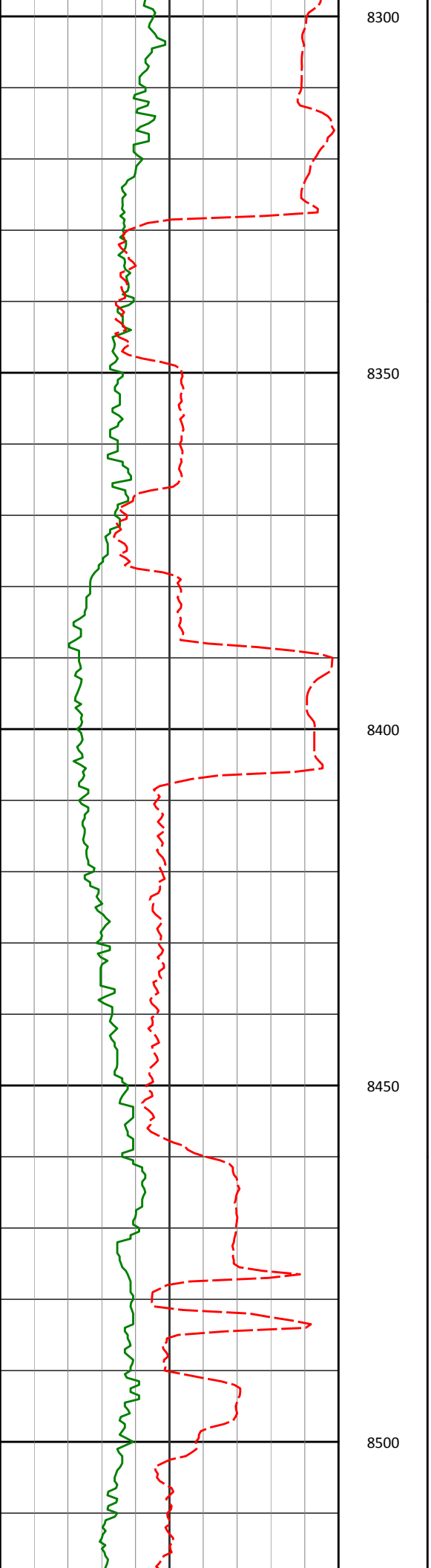
7661'	90.25°	88.02°	6605.81'	1236.16'
7756'	90.83°	89.00°	6604.92'	1330.57'
7850'	90.90°	88.63°	6603.50'	1423.92'



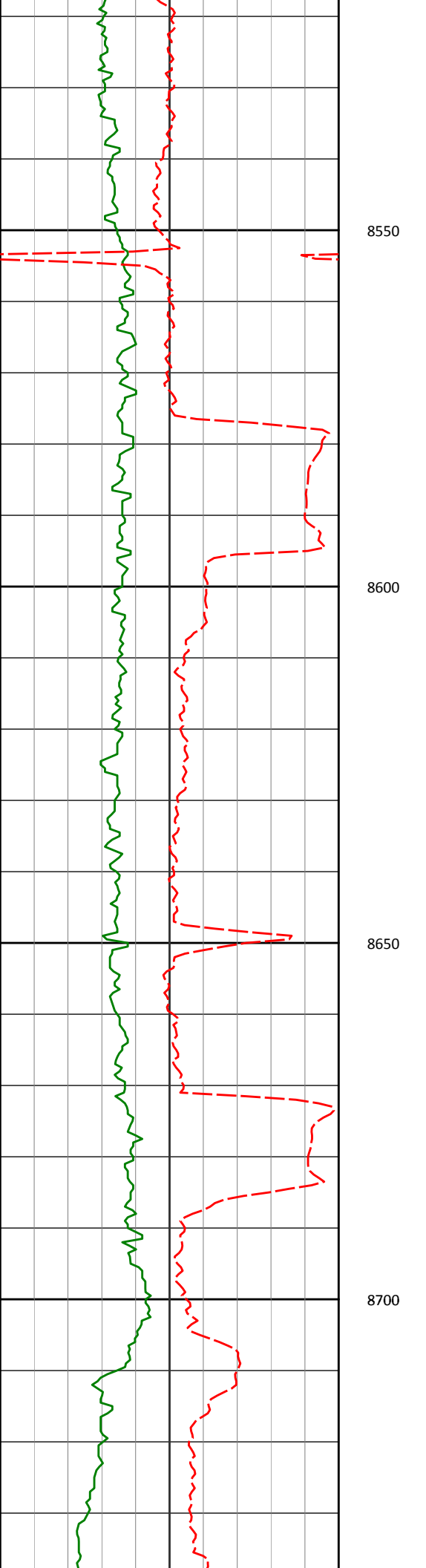
7945'	90.43°	92.55°	6602.40'	1517.86'
8040'	90.18°	89.50°	6601.89'	1611.71'



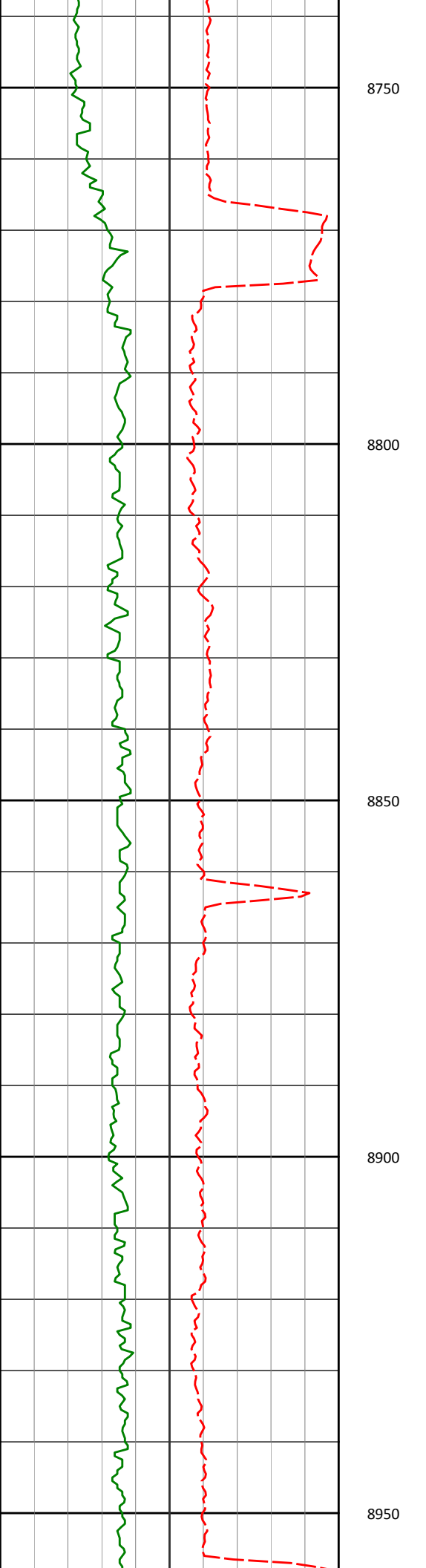
8135'	91.26°	87.10°	6600.70'	1706.15'
8230'	89.81°	85.53°	6599.81'	1800.89'



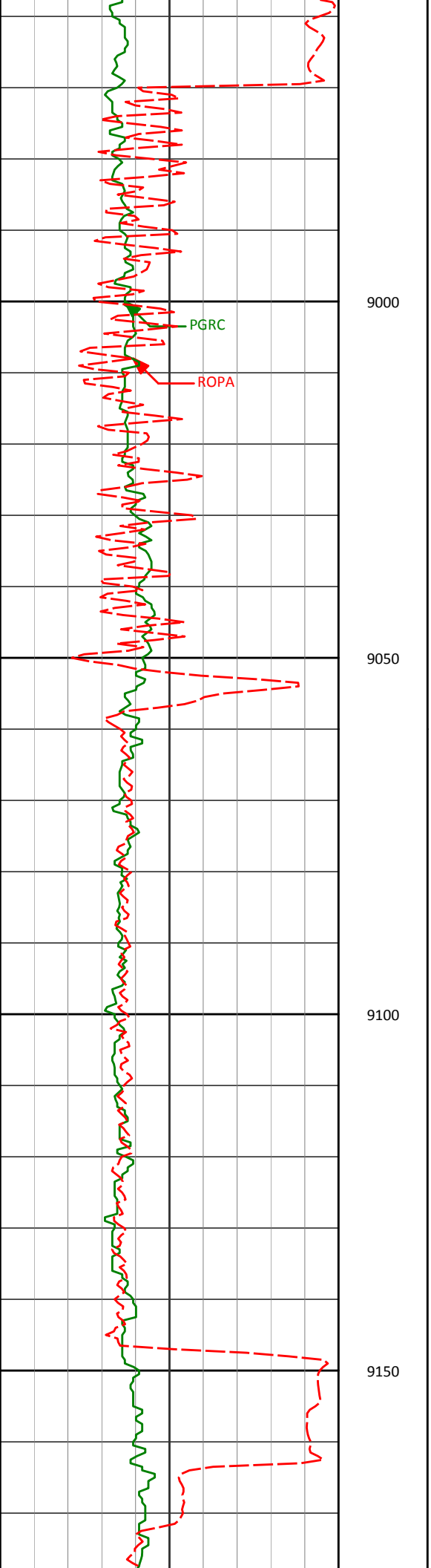
8324'	92.86°	88.40°	6597.62'	1894.51'
8419'	91.11°	88.81°	6594.33'	1988.84'
8514'	91.26°	86.94°	6592.36'	2083.34'



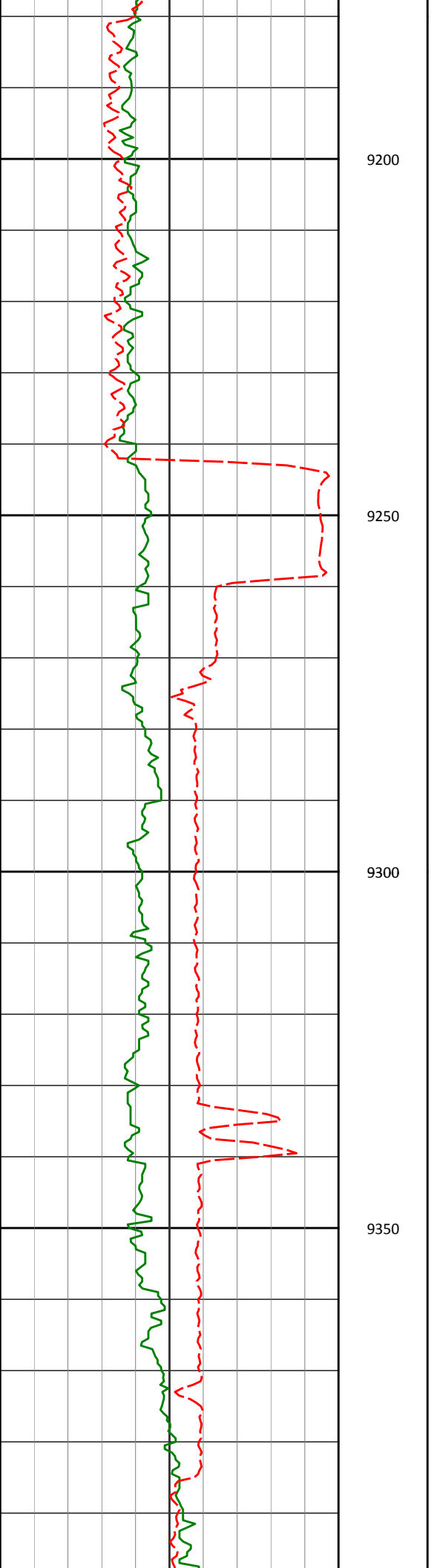
8609'	91.14°	89.87°	6590.37'	2177.74'
8704'	89.11°	87.86°	6590.17'	2272.08'



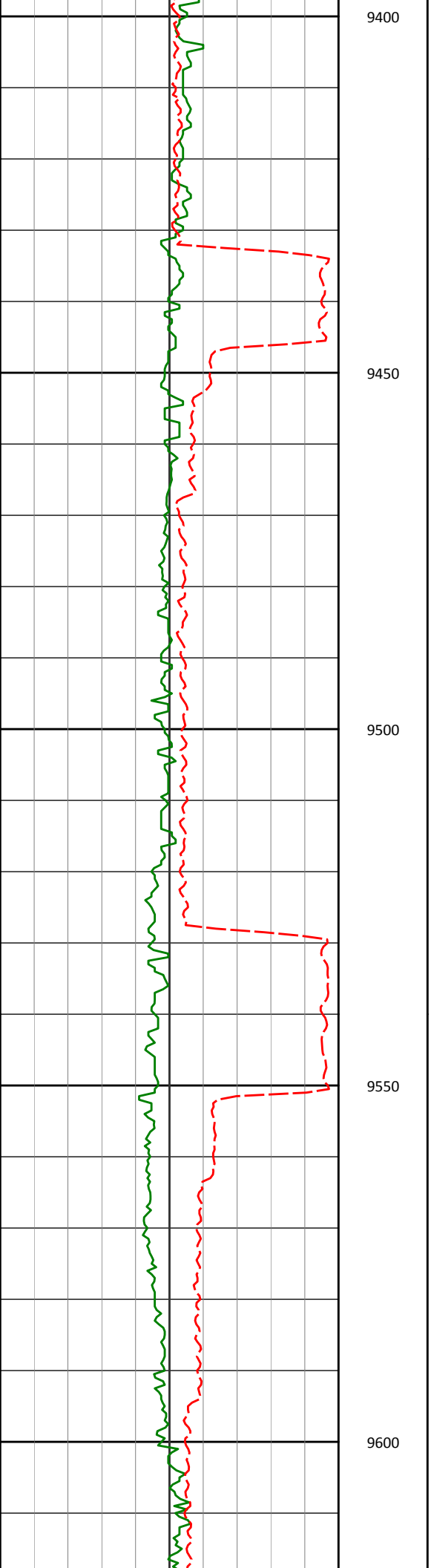
8799'	89.91°	89.29°	6590.98'	2366.47'
8893'	91.02°	89.68°	6590.21'	2459.70'



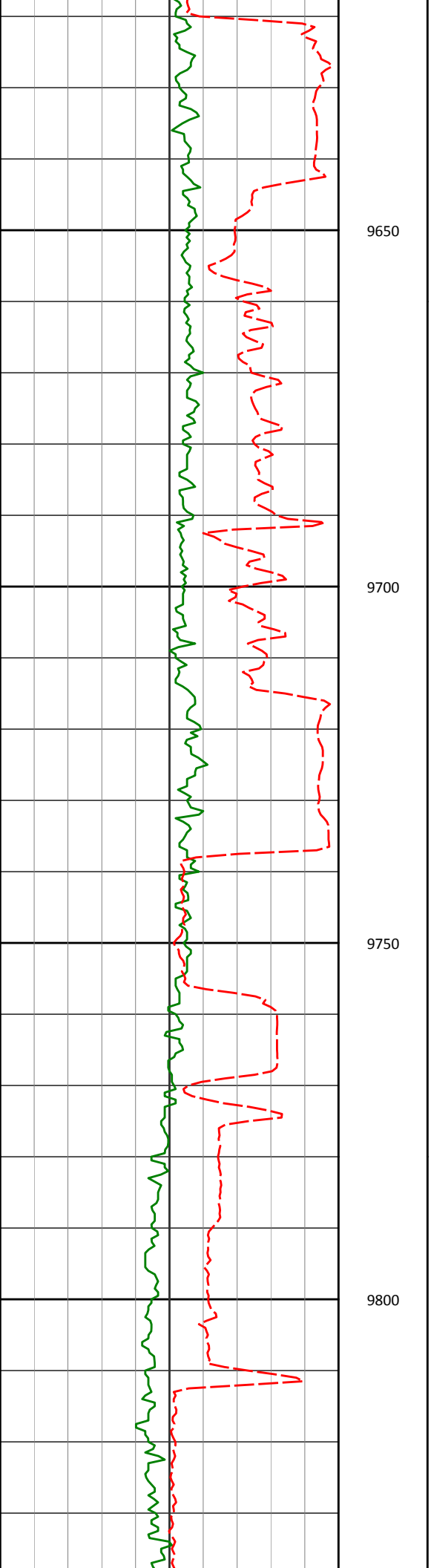
8988'	89.26°	89.93°	6589.98'	2553.85'
9083'	88.68°	89.83°	6591.69'	2647.96'



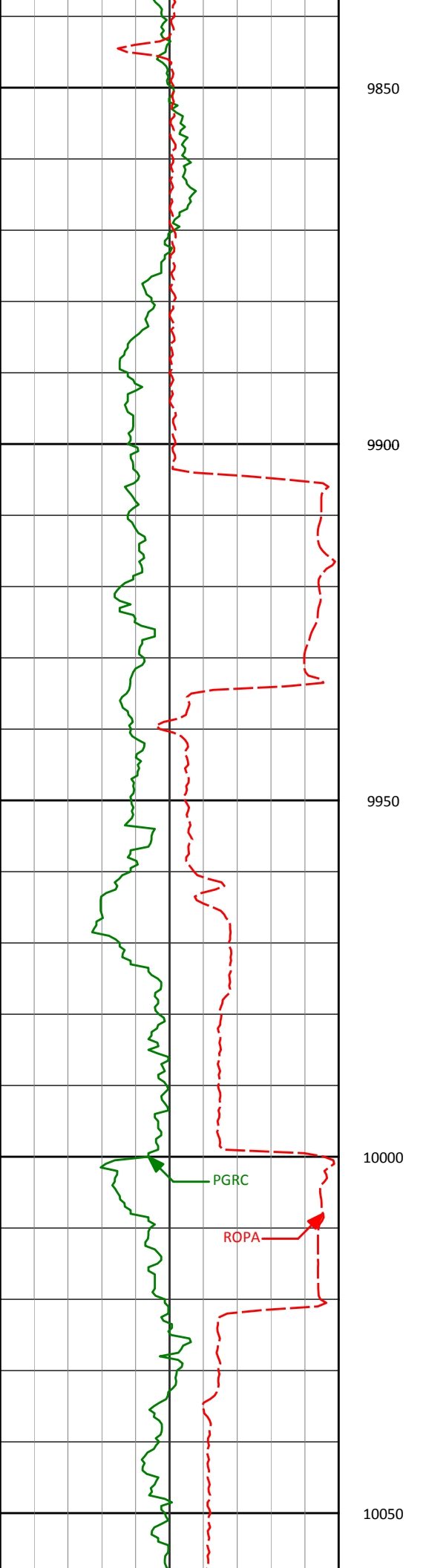
9178'	91.57°	89.57°	6591.48'	2742.13'
9273'	90.06°	85.83°	6590.13'	2836.65'
9368'	89.01°	85.20°	6590.90'	2931.48'



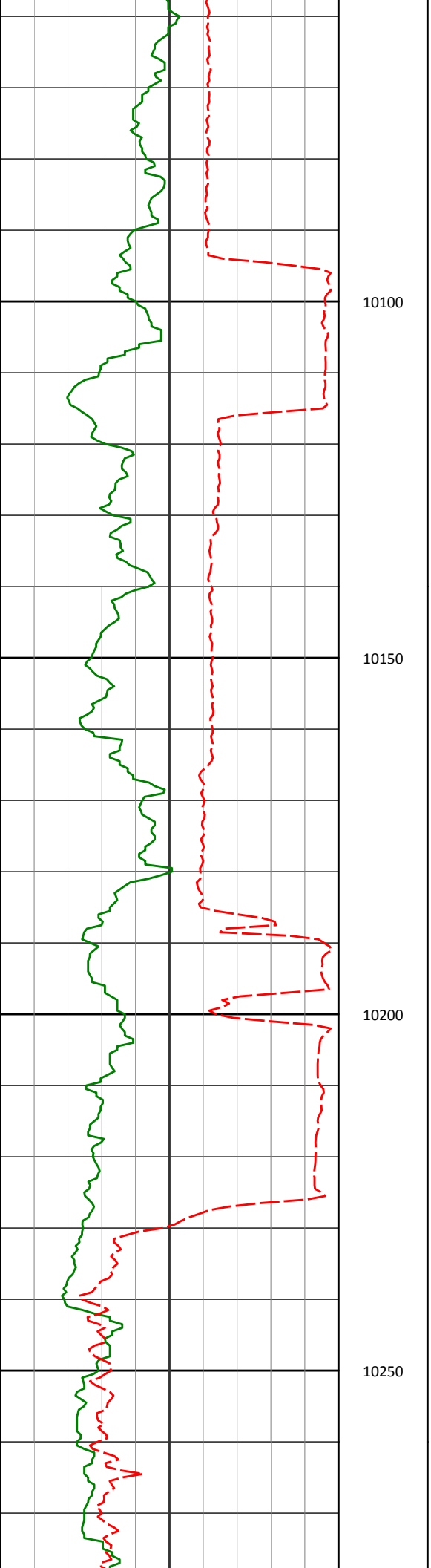
9462'	89.32°	85.01°	6592.27'	3025.35'
9557'	90.37°	86.39°	6592.53'	3120.16'



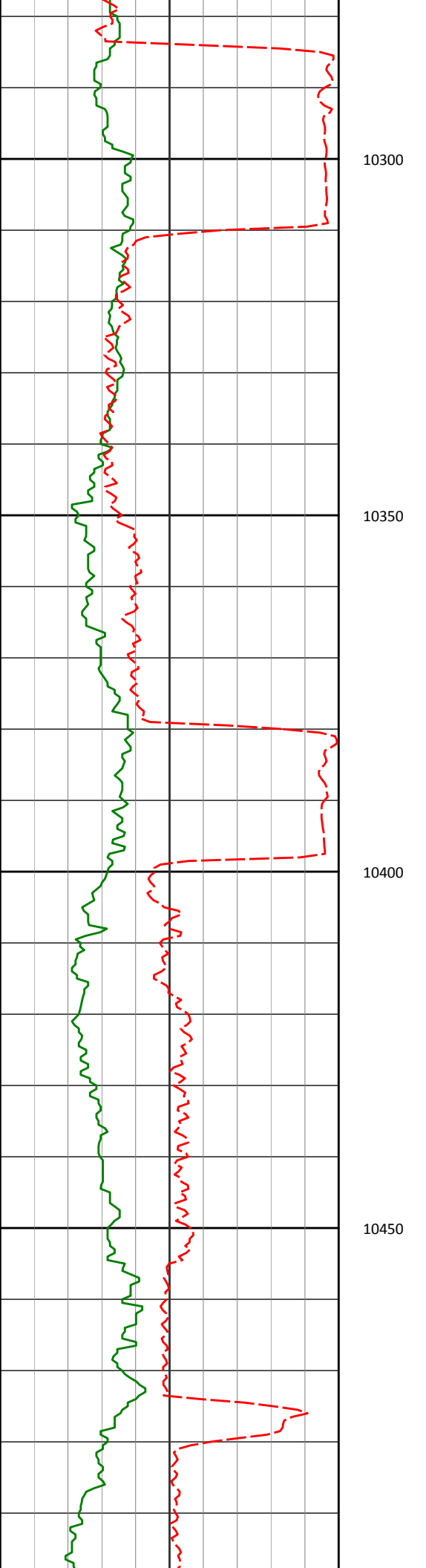
9652'	89.69°	87.06°	6592.48'	3214.85'
9747'	90.52°	88.49°	6592.31'	3309.39'



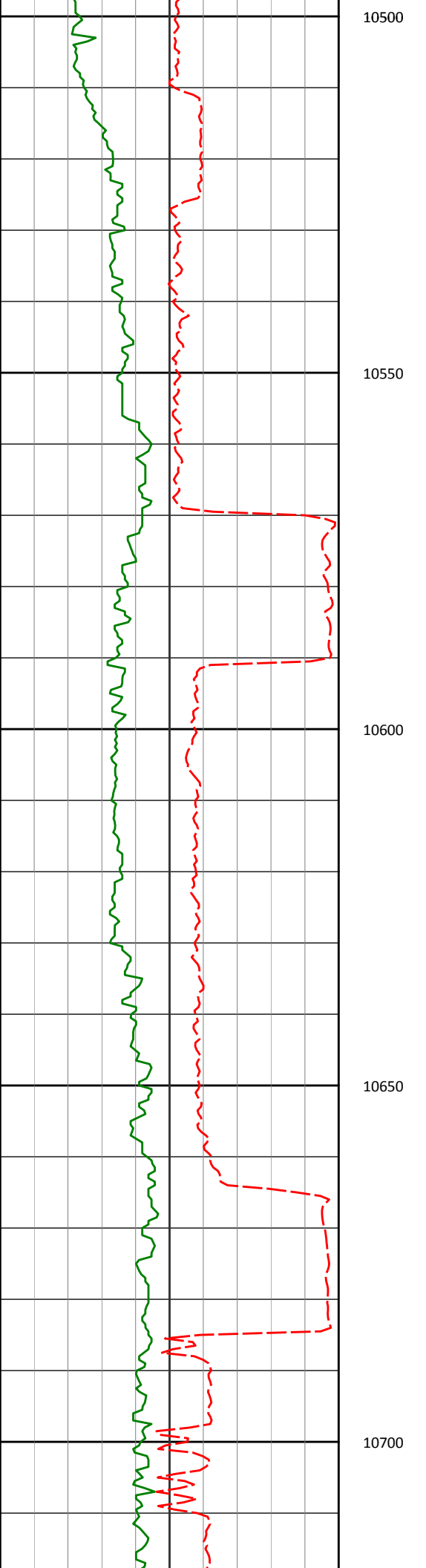
9841'	89.82°	86.40°	6592.03'	3402.98'
9936'	88.83°	89.04°	6593.15'	3497.52'
10031'	90.06°	88.99°	6594.07'	3591.83'



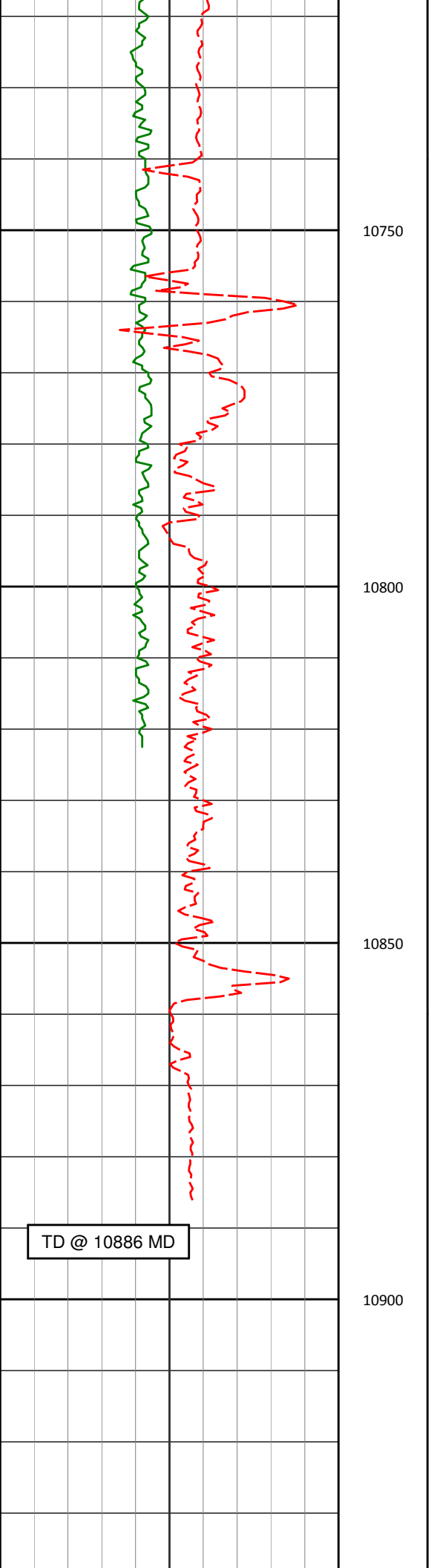
10126'	90.09°	89.13°	6593.94'	3686.14'
10221'	90.68°	88.23°	6593.30'	3780.51'



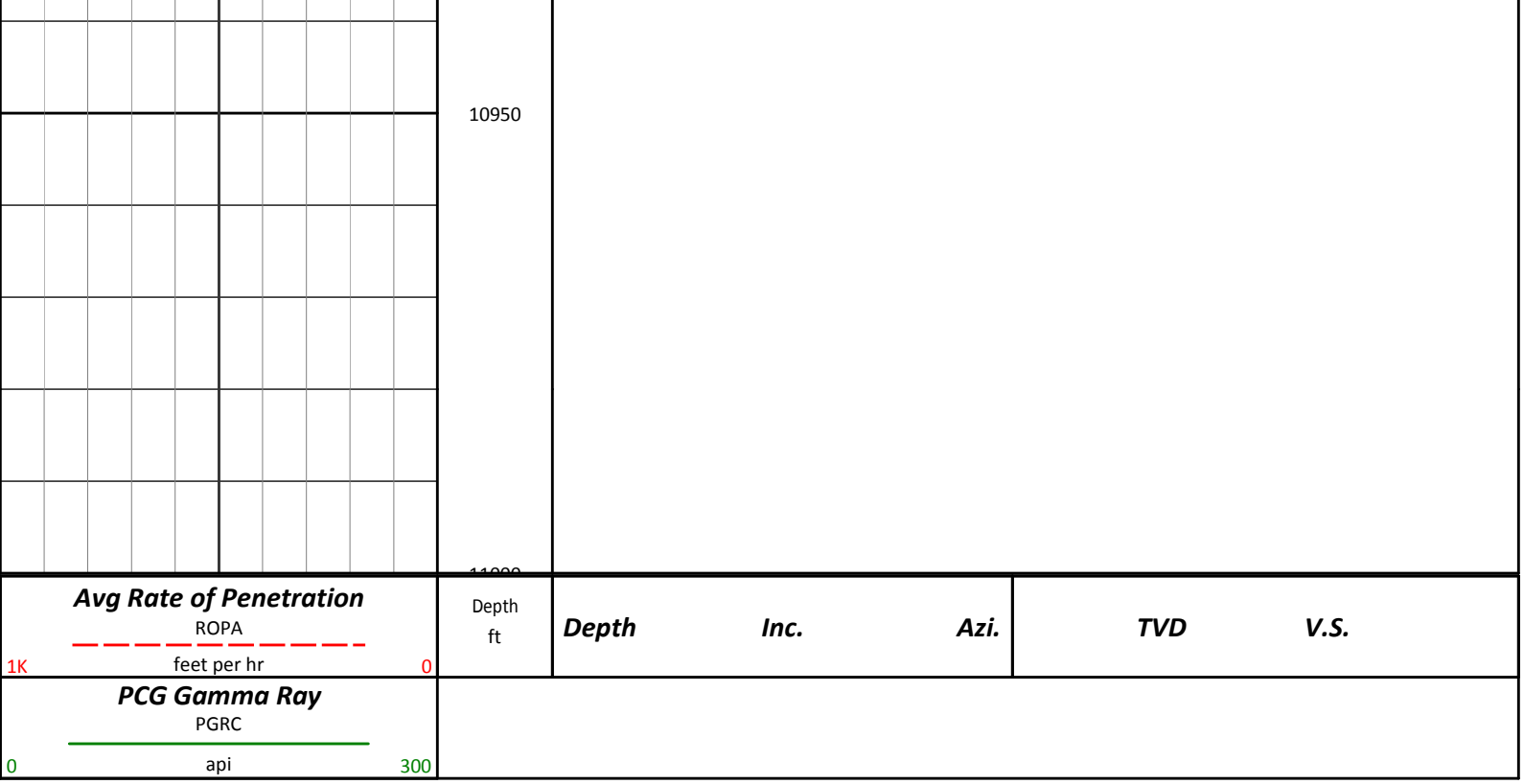
10315'	91.79°	88.88°	6591.28'	3873.90'
10410'	91.82°	89.60°	6588.29'	3968.13'



10505'	90.68°	88.62°	6586.21'	4062.40'
10599'	90.46°	89.94°	6585.28'	4155.66'
10694'	92.19°	88.53°	6583.08'	4249.90'



10789'	91.79°	87.28°	6579.78'	4344.36'
10822'	91.70°	86.44°	6578.78'	4377.24'
10886'	91.70°	86.44°	6576.88'	4441.03'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch AE20-68HN
Wattenburg
Weld Colorado
USA
CA-XX-0900775412

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
356.00	0.70	225.72	355.99	1.52 S	1.56 W	-1.75	0.20
663.00	0.60	101.82	662.98	3.16 S	1.33 W	-1.75	0.37
967.00	0.50	185.52	966.97	4.80 S	0.10 E	-0.55	0.24
1091.00	2.18	223.70	1090.93	7.05 S	1.58 W	-2.53	1.46
1184.00	1.28	236.50	1183.89	8.90 S	3.67 W	-4.85	1.05
1276.00	1.27	28.98	1275.88	8.57 S	4.03 W	-5.16	2.69
1369.00	1.36	79.57	1368.86	7.47 S	2.44 W	-3.44	1.21
1461.00	1.24	63.21	1460.84	6.83 S	0.48 W	-1.41	0.42
1556.00	1.85	25.81	1555.81	4.98 S	1.10 E	0.41	1.21
1650.00	4.20	342.17	1649.68	0.34 S	0.71 E	0.66	3.33
1745.00	5.87	326.57	1744.31	7.03 N	3.03 W	-2.04	2.26
1840.00	7.23	314.59	1838.69	15.28 N	9.97 W	-7.78	2.02
1935.00	8.85	312.20	1932.76	24.39 N	19.64 W	-16.12	1.74
2030.00	8.41	308.14	2026.68	33.59 N	30.52 W	-25.64	0.79
2124.00	10.91	314.19	2119.35	44.03 N	42.30 W	-35.88	2.87
2219.00	11.63	321.27	2212.52	57.77 N	54.74 W	-46.33	1.64
2314.00	12.66	327.37	2305.39	74.01 N	66.35 W	-55.60	1.73
2409.00	13.04	333.73	2398.02	92.39 N	76.70 W	-63.35	1.54
2504.00	13.44	342.96	2490.50	112.56 N	84.68 W	-68.49	2.26
2598.00	15.50	348.48	2581.52	135.31 N	90.39 W	-71.04	2.64
2693.00	14.76	353.85	2673.23	159.78 N	94.22 W	-71.49	1.67
2788.00	14.97	350.74	2765.05	183.93 N	97.50 W	-71.43	0.87
2883.00	15.22	348.88	2856.78	208.27 N	101.88 W	-72.44	0.57
2978.00	15.05	352.82	2948.48	232.74 N	105.82 W	-73.00	1.10
3072.00	16.19	351.83	3039.01	257.83 N	109.21 W	-72.93	1.25

3167.00	13.46	349.68	3130.84	281.82 N	113.07 W	-73.47	2.93
3262.00	15.07	351.00	3222.91	304.89 N	116.99 W	-74.19	1.73
3357.00	14.72	346.45	3314.72	328.83 N	121.75 W	-75.63	1.28
3451.00	14.26	346.26	3405.73	351.68 N	127.29 W	-78.00	0.49
3546.00	14.35	354.43	3497.79	374.77 N	131.22 W	-78.73	2.13
3641.00	14.52	351.79	3589.80	398.27 N	134.06 W	-78.34	0.72
3736.00	15.91	349.50	3681.46	422.86 N	138.13 W	-79.01	1.59
3831.00	13.60	349.11	3773.33	446.64 N	142.62 W	-80.20	2.43
3926.00	11.46	345.01	3866.06	466.73 N	147.17 W	-81.96	2.44
4020.00	8.73	349.80	3958.60	482.77 N	150.85 W	-83.41	3.04
4115.00	5.66	350.53	4052.84	494.49 N	152.90 W	-83.84	3.23
4210.00	1.88	316.37	4147.62	500.24 N	154.74 W	-84.88	4.46
4305.00	0.34	291.03	4242.60	501.47 N	156.08 W	-86.04	1.66
4400.00	0.94	184.04	4337.60	500.79 N	156.40 W	-86.44	1.15
4495.00	0.98	143.40	4432.59	499.36 N	155.97 W	-86.22	0.70
4590.00	1.17	156.87	4527.57	497.82 N	155.10 W	-85.57	0.33
4685.00	1.22	98.03	4622.55	496.79 N	153.72 W	-84.34	1.24
4780.00	0.89	138.96	4717.54	496.09 N	152.24 W	-82.96	0.84
4874.00	1.34	181.56	4811.52	494.44 N	151.79 W	-82.74	0.97
4969.00	1.11	125.80	4906.50	492.79 N	151.07 W	-82.26	1.22
5064.00	1.59	178.57	5001.48	490.93 N	150.29 W	-81.74	1.34
5159.00	0.62	163.87	5096.46	489.12 N	150.12 W	-81.82	1.06
5254.00	1.26	215.74	5191.45	487.78 N	150.58 W	-82.46	1.06
5348.00	1.49	161.49	5285.43	485.78 N	150.80 W	-82.95	1.35
5443.00	0.51	169.91	5380.41	484.20 N	150.33 W	-82.70	1.04
5538.00	0.58	108.99	5475.41	483.62 N	149.80 W	-82.26	0.59
5633.00	0.56	162.54	5570.40	483.02 N	149.21 W	-81.75	0.54
5728.00	0.67	107.14	5665.40	482.42 N	148.54 W	-81.17	0.61
5821.00	0.78	118.03	5758.39	481.96 N	147.46 W	-80.17	0.19
5916.00	1.47	80.81	5853.37	481.85 N	145.69 W	-78.42	1.02
5964.00	5.48	83.44	5901.27	482.21 N	142.80 W	-75.52	8.36
6011.00	12.63	80.37	5947.66	483.33 N	135.50 W	-68.13	15.24
6059.00	16.76	83.85	5994.08	484.95 N	123.44 W	-55.96	8.79
6106.00	17.80	88.15	6038.96	485.91 N	109.52 W	-42.04	3.50
6154.00	19.25	93.43	6084.47	485.67 N	94.29 W	-26.98	4.62
6201.00	21.79	92.21	6128.49	484.87 N	77.83 W	-10.79	5.48
6249.00	23.37	88.78	6172.81	484.73 N	59.41 W	7.44	4.28
6296.00	25.16	87.60	6215.66	485.35 N	40.11 W	26.64	3.95
6344.00	28.31	87.98	6258.52	486.17 N	18.53 W	48.13	6.57
6391.00	31.97	89.43	6299.16	486.69 N	5.06 E	71.57	7.94
6439.00	36.76	91.62	6338.77	486.41 N	32.14 E	98.35	10.30
6485.00	42.36	86.66	6374.23	486.93 N	61.40 E	127.41	13.97
6533.00	48.01	87.69	6408.05	488.59 N	95.39 E	161.31	11.87
6580.00	53.37	88.04	6437.81	489.94 N	131.72 E	197.48	11.42
6628.00	56.20	89.91	6465.49	490.63 N	170.92 E	236.41	6.70
6675.00	58.47	89.74	6490.86	490.75 N	210.49 E	275.62	4.84
6723.00	60.91	89.61	6515.08	490.99 N	251.92 E	316.70	5.09
6770.00	65.41	88.53	6536.29	491.67 N	293.84 E	358.32	9.79
6818.00	70.78	88.05	6554.19	493.01 N	338.34 E	402.58	11.23
6865.00	75.86	88.30	6567.68	494.44 N	383.32 E	447.34	10.82
6913.00	78.39	88.04	6578.38	495.93 N	430.09 E	493.87	5.30
6965.00	83.38	88.49	6586.61	497.49 N	481.39 E	544.90	9.63
7092.00	86.26	88.19	6598.08	501.15 N	607.81 E	670.63	2.28
7187.00	88.98	88.97	6602.02	503.50 N	702.69 E	764.94	2.98
7282.00	89.29	88.69	6603.45	505.44 N	797.66 E	859.28	0.44
7377.00	88.40	87.79	6605.37	508.36 N	892.59 E	953.72	1.33
7472.00	89.08	87.95	6607.46	511.89 N	987.50 E	1048.23	0.74
7566.00	91.33	88.37	6607.12	514.91 N	1081.45 E	1141.70	2.43
7661.00	90.25	88.02	6605.81	517.90 N	1176.39 E	1236.16	1.20
7756.00	90.83	89.00	6604.92	520.37 N	1271.35 E	1330.57	1.20
7850.00	90.90	88.63	6603.50	522.31 N	1365.32 E	1423.92	0.40
7945.00	90.43	92.55	6602.40	521.33 N	1460.29 E	1517.86	4.16
8040.00	90.18	89.50	6601.89	519.63 N	1555.26 E	1611.71	3.22
8135.00	91.26	87.10	6600.70	522.45 N	1650.20 E	1706.15	2.77
8230.00	89.81	85.53	6599.81	528.56 N	1745.00 E	1800.89	2.25
8324.00	92.86	88.40	6597.62	533.53 N	1838.82 E	1894.51	4.45
8419.00	91.11	88.81	6594.33	535.84 N	1933.73 E	1988.84	1.89
8514.00	91.26	86.94	6592.36	539.37 N	2028.64 E	2083.34	1.97
8609.00	91.14	89.87	6590.37	542.01 N	2123.57 E	2177.74	3.09
8704.00	89.11	87.86	6590.17	543.89 N	2218.54 E	2272.08	3.01
8799.00	89.91	89.29	6590.98	546.25 N	2313.51 E	2366.47	1.72

8893.00	*91.02*	*89.68*	*6590.21*	*547.10 N*	*2407.50 E*	*2459.70*	*1.25*
8988.00	*89.26*	*89.93*	*6589.98*	*547.42 N*	*2502.49 E*	*2553.85*	*1.87*
9083.00	*88.68*	*89.83*	*6591.69*	*547.62 N*	*2597.48 E*	*2647.96*	*0.62*
9178.00	*91.57*	*89.57*	*6591.48*	*548.12 N*	*2692.47 E*	*2742.13*	*3.05*
9273.00	*90.06*	*85.83*	*6590.13*	*551.93 N*	*2787.36 E*	*2836.65*	*4.25*
9368.00	*89.01*	*85.20*	*6590.90*	*559.36 N*	*2882.07 E*	*2931.48*	*1.29*
9462.00	*89.32*	*85.01*	*6592.27*	*567.38 N*	*2975.71 E*	*3025.35*	*0.39*
9557.00	*90.37*	*86.39*	*6592.53*	*574.50 N*	*3070.44 E*	*3120.16*	*1.83*
9652.00	*89.69*	*87.06*	*6592.48*	*579.93 N*	*3165.28 E*	*3214.85*	*1.00*
9747.00	*90.52*	*88.49*	*6592.31*	*583.62 N*	*3260.21 E*	*3309.39*	*1.74*
9841.00	*89.82*	*86.40*	*6592.03*	*587.81 N*	*3354.11 E*	*3402.98*	*2.34*
9936.00	*88.83*	*89.04*	*6593.15*	*591.59 N*	*3449.02 E*	*3497.52*	*2.97*
10031.00	*90.06*	*88.99*	*6594.07*	*593.22 N*	*3544.00 E*	*3591.83*	*1.30*
10126.00	*90.09*	*89.13*	*6593.94*	*594.78 N*	*3638.99 E*	*3686.14*	*0.15*
10221.00	*90.68*	*88.23*	*6593.30*	*596.97 N*	*3733.96 E*	*3780.51*	*1.13*
10315.00	*91.79*	*88.88*	*6591.28*	*599.34 N*	*3827.90 E*	*3873.90*	*1.37*
10410.00	*91.82*	*89.60*	*6588.29*	*600.60 N*	*3922.85 E*	*3968.13*	*0.76*
10505.00	*90.68*	*88.62*	*6586.21*	*602.07 N*	*4017.81 E*	*4062.40*	*1.58*
10599.00	*90.46*	*89.94*	*6585.28*	*603.25 N*	*4111.80 E*	*4155.66*	*1.42*
10694.00	*92.19*	*88.53*	*6583.08*	*604.52 N*	*4206.76 E*	*4249.90*	*2.35*
10789.00	*91.79*	*87.28*	*6579.78*	*607.99 N*	*4301.63 E*	*4344.36*	*1.38*
10822.00	*91.70*	*86.44*	*6578.78*	*609.80 N*	*4334.57 E*	*4377.24*	*2.56*
10886.00	*91.70*	*86.44*	*6576.88*	*613.77 N*	*4398.42 E*	*4441.03*	*0.00*

CALCULATION BASED ON MINIMUM CURVATURE METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 82.14 DEGREES (GRID)
A TOTAL CORRECTION OF 7.62 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10886.00 FEET
IS 4441.03 FEET ALONG 82.06 DEGREES (GRID)

First three survey's are from 3rd party source (Muilti Shot EMS) and provided by CO-man on location before drilling.
Depth 356 Inc 0.70 Azi 225.72
Depth 663 Inc 0.60 Azi 101.82
Depth 967 Inc 0.50 Azi 185.52
Tied in @ Surface
Magnettic direction of 7.621 has been added to AZI for grid direction correction.

Date Printed:29 October 2013