

**PCG Pressure Case Gamma Ray  
PCDC Pressure Case Directional**



Country	: USA
Field	: Redtail
Location	: Lat: 40° 48' 31.99" North Long: 103° 50' 4.72" West
Well	: Razor 26K-2306B
Company	: Whiting Oil and Gas
Rig	: Frontier 26
LOCATION	Company : Whiting Oil and Gas Rig : Frontier 26 Well : Razor 26K-2306B Field : Redtail Country : USA API Number : 05-123-37878
Latitude	: 40° 48' 31.99" North
Longitude	: 103° 50' 4.72" West
UTM Easting	= 3,460,994.056 ft
UTM Northing	= 1,541,853.231 ft
Other Services	Directional Drilling

Permanent Datum	: Ground Level	Elevation	: 4737.50 ft
Log Measured From	: Drill Floor	Elevation	: 22.00 ft Above Permanent Datum
Drilling Measured From	: Drill Floor		

Depth Logged	: 0 ft	To	: 6,100.00 ft
Date Logged	: 11-Jan-14	To	: 16-Jan-14
Total Depth MD	: 6,100.00 ft	TVD	: 5,679.75 ft
Spud Date	: 10-Jan-14	Plot Type	: Final
		Plot Date	: 22-Jan-14
		Job No.	: CA-XX-0900996448

Run No.	Borehole Record (MD)		Run No.		Borehole Record (MD)	
	Size	From	To	Size	From	To
0100	13,500 in	SURFACE	1,545.00 ft			
0200	8,750 in	1,545.93 ft	6,100.00 ft			
0300	6,000 in	6,100.00 ft	11,434.00 ft			

Run No.	Casing Record (MD)		Run No.		Borehole Record (MD)	
	Size	Weight	From	To	Size	From
	9.625 in	36.00 lbpf	SURFACE	1,527.00 ft		
	7.000 in	29.00 lbpf	SURFACE	6,088.00 ft		

**WELL INFORMATION**

MWD Run Number	100	200	300	400
Date run completed	11-Jan-14	14-Jan-14	17-Jan-14	21-Jan-14
Rig Bit Number	0100	0200	0300	0400
Bit Size (in)	13.500	8.750	6.000	6.000
Tool Nominal OD (in)	6.750	6.750	4.750	4.750
Log Start Depth (MD, ft)	81.00	1,545.00	6,100.00	9,515.00
Log End Depth (MD, ft)	1,545.00	6,100.00	11,436.00	13,220.00
Drill or Wipe	Drill	Drill and Wipe	Drill	Drill
Drill/Wipe Start Date and Time	11-Jan-14 09:45	12-Jan-14 16:00	15-Jan-14 06:30	18-Jan-14 09:45
Drill/Wipe End Date and Time	11-Jan-14 15:20	13-Jan-14 20:00	17-Jan-14 13:00	20-Jan-14 17:00
Min Inc (deg) @ Depth (MD, ft)	0.45 @ 173.00	3.01 @ 2,551.00	86.36 @ 8,002.00	85.59 @ 9,556.00
Max Inc (deg) @ Depth (MD, ft)	6.72 @ 1,490.00	87.94 @ 6,049.00	92.85 @ 8,521.00	92.87 @ 10,197.00
Bit TFA(in2) / Bit Type	2.23 / PDC	0.74 / PDC	0.84 / PDC	0.75 / PDC
Flow Rate (gpm)	700.00	500.00	250.00	245.00
Max AV (fpm) / CV (fpm) @ MWD	NA / NA	NA / NA	NA / NA	NA / NA
Fluid Type	NA	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel
Density (ppg) / Viscosity (spqt)	9.00 / 32.00	9.00 / 39.00	10.20 / 46.00	10.25 / 45.00
Filtrate CL (ppm)	0.00	2,100.00	1,800.00	2,300.00
pH / Fluid Loss (mptm)	7.00 / 0	10.30 / 0	10.00 / 0	8.40 / 0
PV (cP) / YP (Ihf2)	NA / NA	9 / 10.00	12 / 11.00	16 / 21.00
% Solids / % Sand	0 / 0	5.50 / 0.05	10.00 / 0.05	11 / 0.05
% Oil / Oil:Water Ratio	NA / NA	NA / NA	NA / NA	NA / NA
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA

<b>Max Tool Temp (degF) / Source</b>	96.42 / PCM	163.20 / PCM	218.14 / PCM	228.74 / PCM	
<b>Rm @ Max Tool Temp (degF)</b>	NA @ 96.42	NA @ 163.20	NA @ 218.14	NA @ 228.74	
<b>Lead MWD Engineer</b>	Cody Wurdeman	Tyrell Foran	Tyrell Foran	Tyrell Foran	
<b>Customer Representative</b>	Ken Wilkerson	Ken Wilkerson	Ken Wilkerson	Ken Wilkerson	

## SENSOR INFORMATION

### Downhole Processor Information

<b>Tool Type</b>	PCM	PCM	PCM	PCM	
<b>Software Version</b>	5.84	5.84	5.84	5.84	
<b>Sub Serial Number</b>	11404301	11404301	12334786	12334786	
<b>Insert Serial Number</b>	10868872	11619990	10868872	11619990	
<b>Date and Time Initialized</b>	10-Jan-14 21:36	12-Jan-14 07:00	14-Jan-14 09:28	17-Jan-14 16:50	
<b>Date and Time Read</b>	12-Jan-14 02:22	14-Jan-14 06:48	18-Jan-14 01:55	21-Jan-14 16:05	
<b>ECMB SW Version</b>	N/A	N/A	N/A	N/A	

### Directional Sensor Information

<b>Tool Type</b>	PCDC	PCDC	PCDC	PCDC	
<b>Distance From Bit (ft)</b>	53.27	48.61	47.40	47.32	
<b>Software Version</b>	6.21	6.21	6.21	6.21	
<b>Sub Serial Number</b>	11404301	11404301	12334786	12334786	
<b>Sonde Serial Number</b>	11297577	11638497	11297577	11638497	
<b>Sensor ID Number</b>	N/A	N/A	N/A	N/A	
<b>Toolface Offset (deg)</b>	7.52	125.54	333.47	288.91	

### Gamma Ray Sensor Information

<b>Tool Type</b>		PCG	PCG	PCG	
<b>Distance From Bit (ft)</b>		53.56	41.70	42.22	
<b>Recorded Sample Period (sec)</b>		10	10	10	
<b>Software Version</b>		8.15	8.15	8.15	
<b>Sub Serial Number</b>		11404301	12334786	12334786	
<b>Insert/Sonde Serial Number</b>		11680942	12037414	11680942	

## REMARKS

1. All depths are true vertical bit depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.
4. All data is stored data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:  
PCG Gamma Ray BCorr (PGRC)  
Interval Resolution: .5  
Interval Distance: .6  
Gap Fill: 3  
Average Rate of Penetration (ROPA)  
Interval Resolution: .5  
Interval Distance: 1.2  
Gap Fill: 3
6. INSITE Version 8.0.10

# WARRANTY

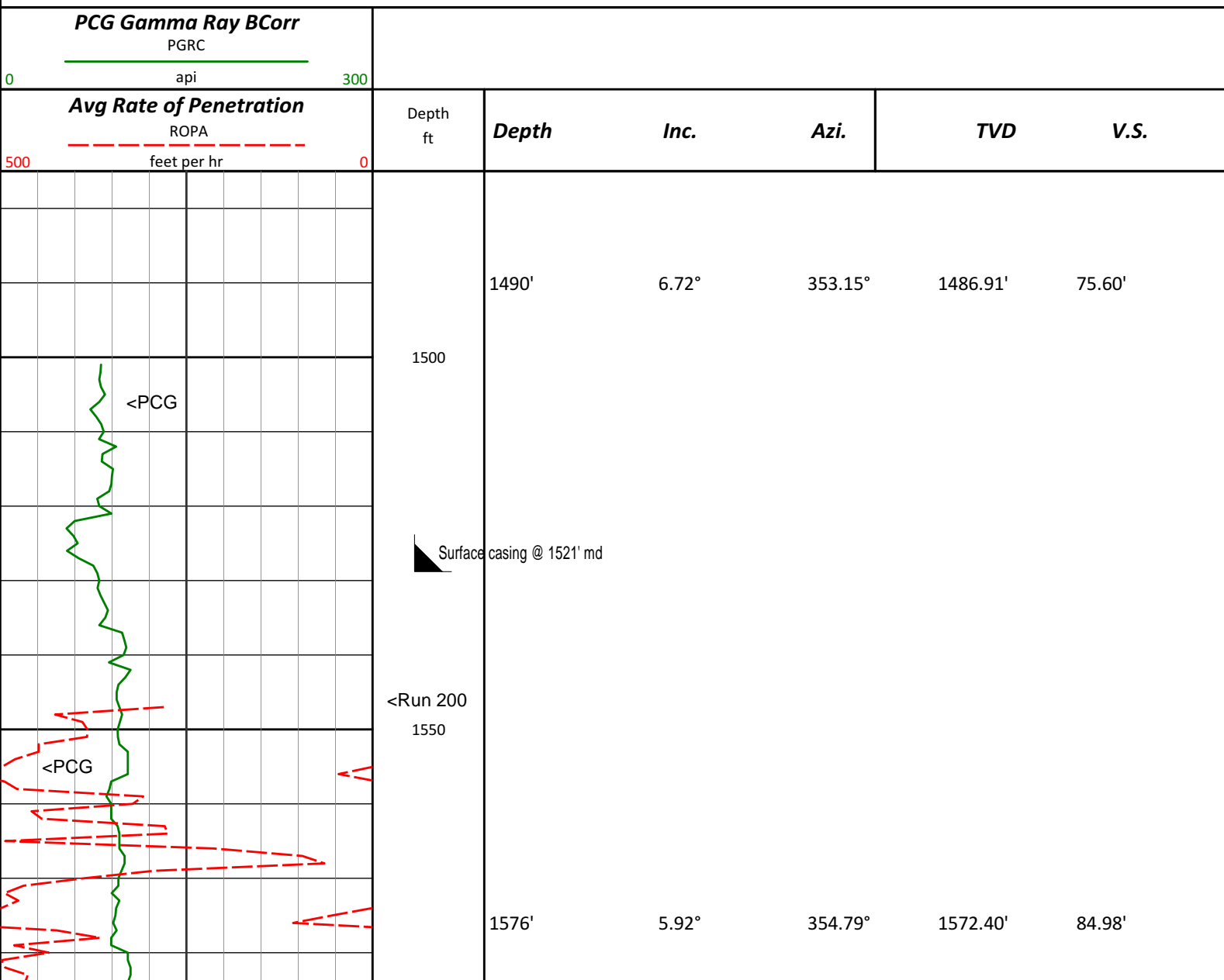
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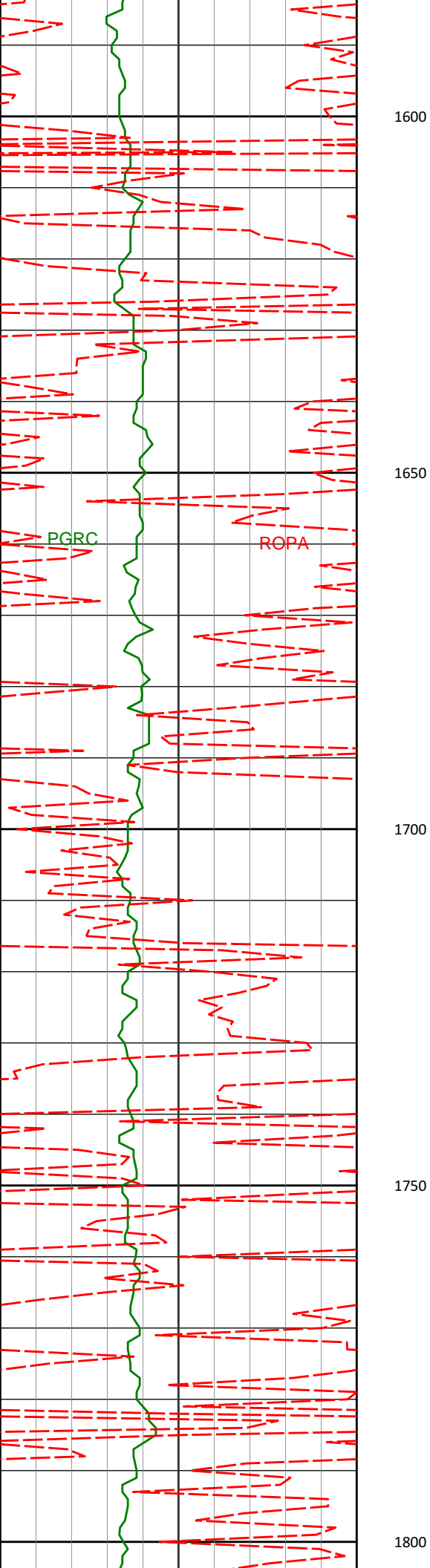
## HALLIBURTON

### Sperry Drilling Services

# MD Main Log 1:240

Whiting Oil and Gas  
Razor 26K-2806B  
Frontier 26  
Sec. 26-T10N-R58W





1600

1650

1700

1750

1800

PGRC

ROPA

1668'

5.80°

349.74°

1663.92'

94.31'

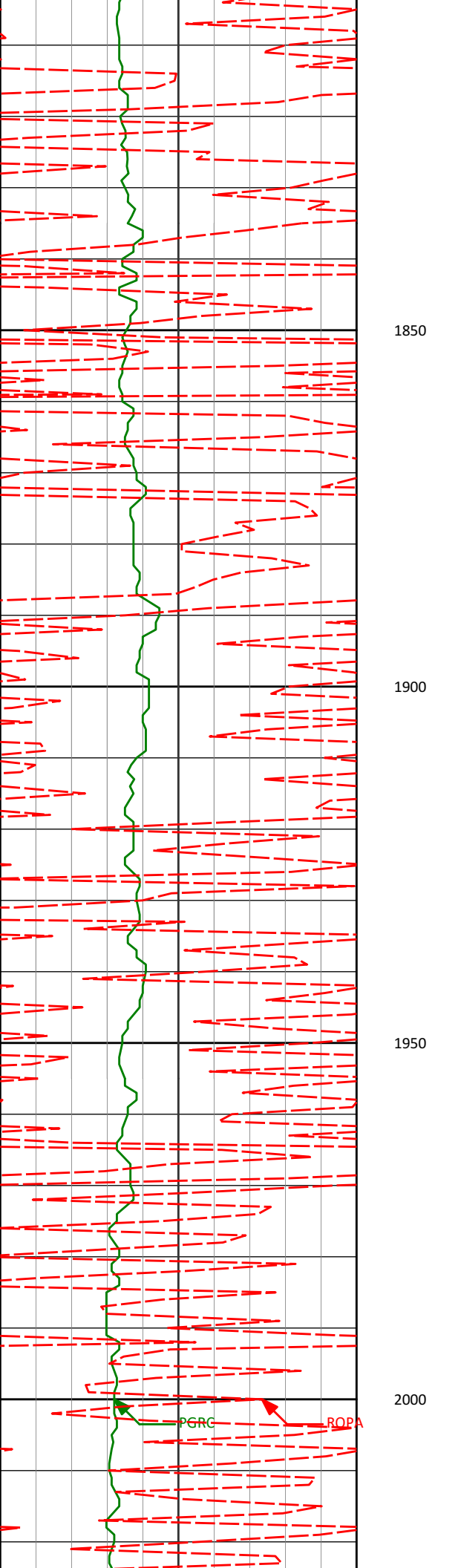
1729'

5.05°

353.71°

1724.64'

100.03'



1820'

5.06°

357.75°

1815.29'

108.03'

1850

1900

1911'

3.36°

0.28°

1906.04'

114.70'

1950

2000

2002'

4.18°

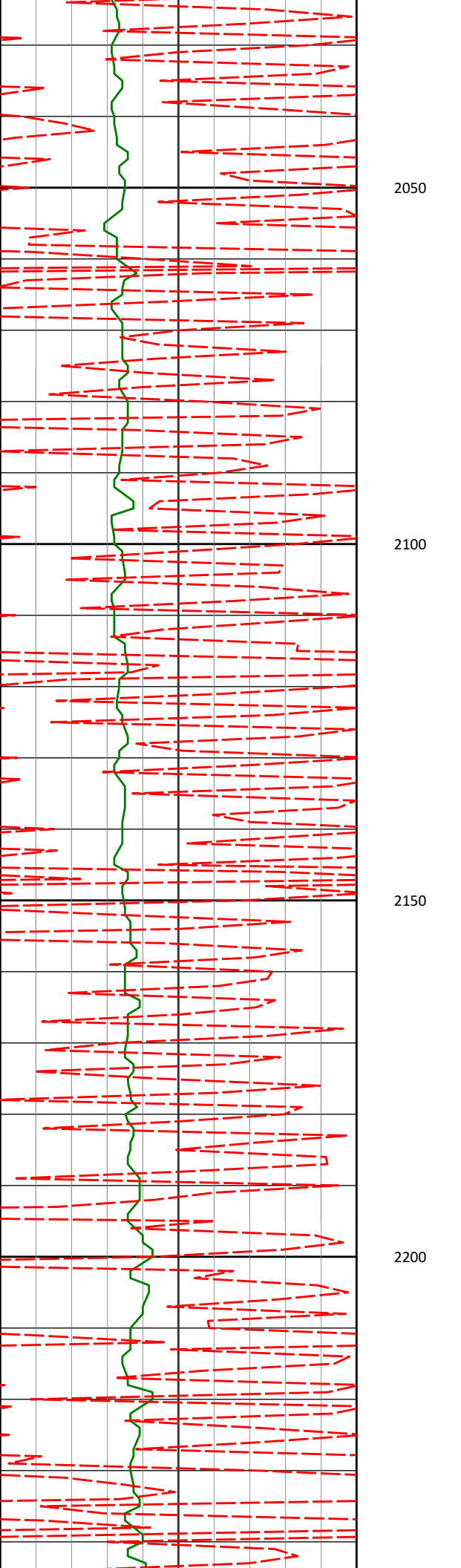
351.85°

1996.85'

120.66'

PGRC

ROPA



2093'

3.72°

1.78°

2087.63'

126.90'

2050

2100

2150

2185'

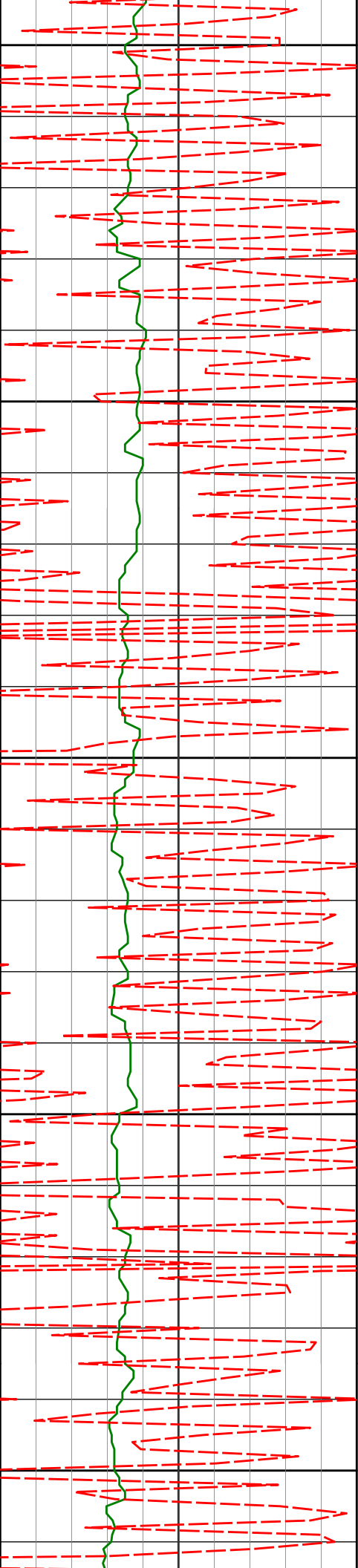
3.73°

353.57°

2179.44'

132.75'

2200



2250

2277'

3.46°

351.22°

2271.27'

138.37'

2300

2350

2368'

3.52°

343.69°

2362.10'

143.78'

2400

2450

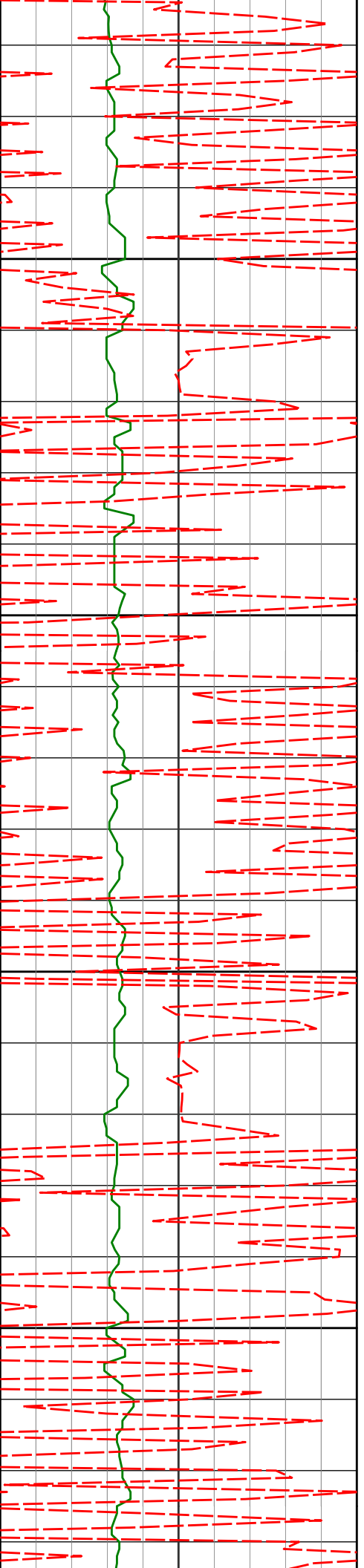
2460'

3.05°

10.32°

2453.96'

148.88'



2500

2550

2600

2650

2551'

3.06°

17.71°

2544.83'

153.50'

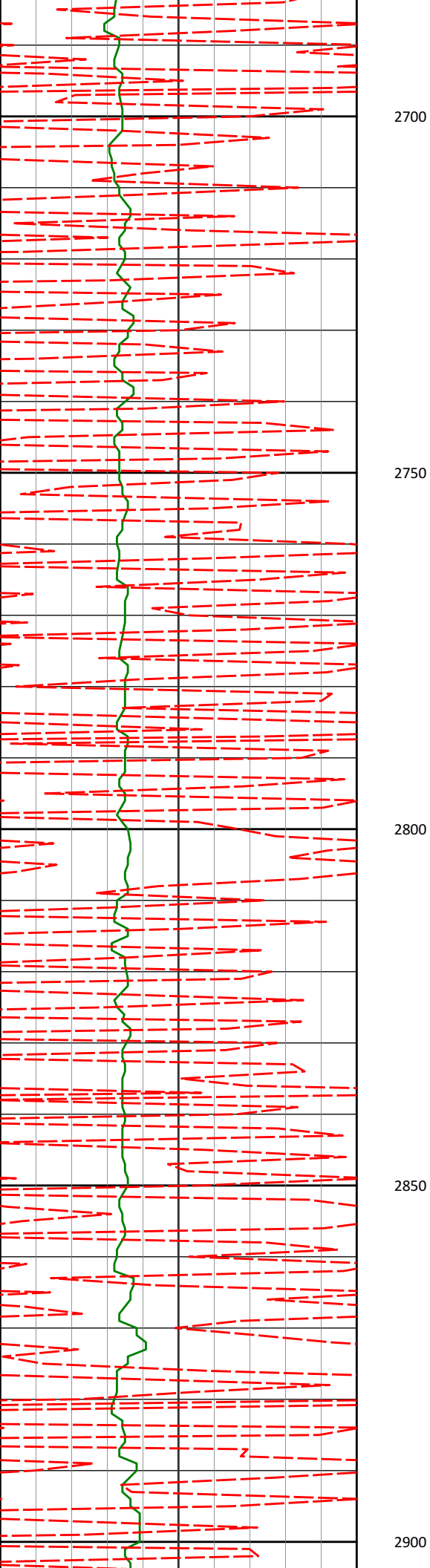
2643'

4.53°

358.21°

2636.64'

159.32'



2734'

4.42°

354.62°

2727.37'

166.33'

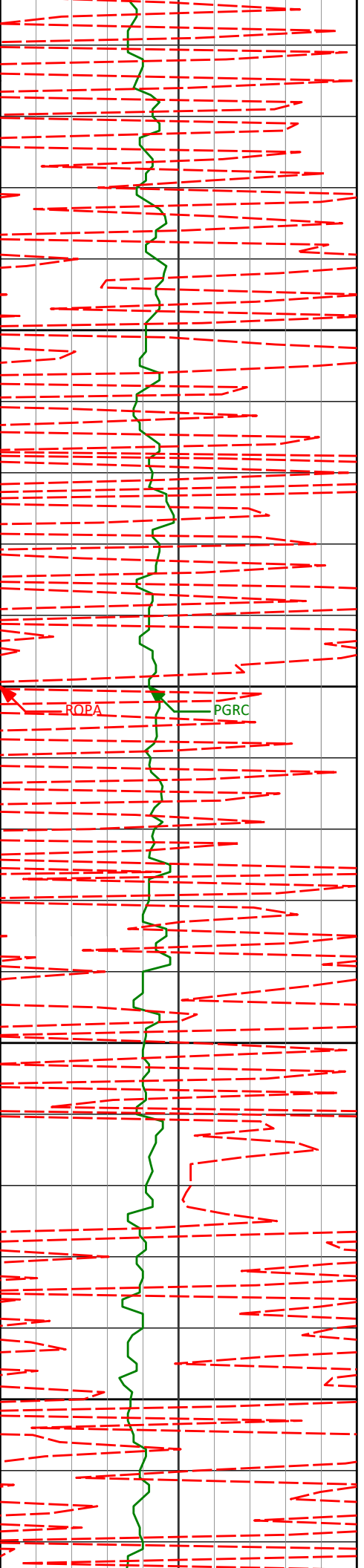
2826'

4.04°

350.79°

2819.13'

172.94'



2916'

4.00°

347.39°

2908.92'

179.02'

2950

3000

ROBA

PGRC

3008'

3.05°

343.07°

3000.74'

184.52'

3050

3100

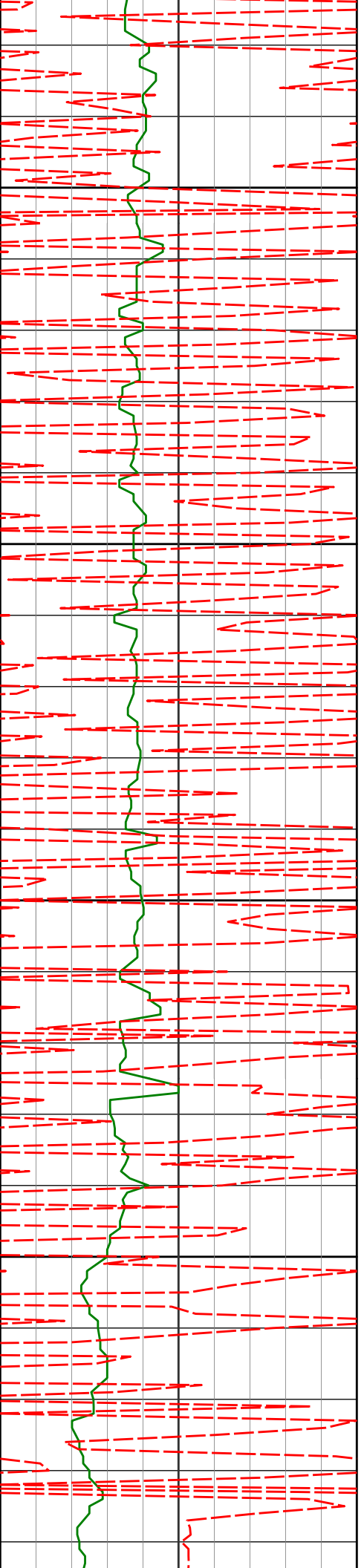
3100'

3.88°

335.94°

3092.57'

189.75'



3150

3191'

3.61°

341.53°

3183.38'

195.32'

3200

3250

3283'

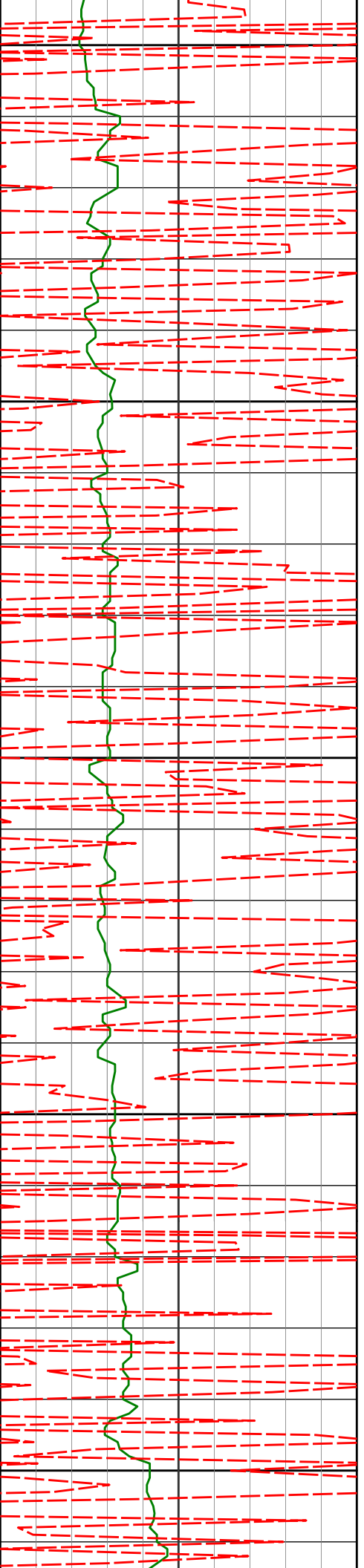
3.46°

328.99°

3275.21'

200.47'

3300



3350

3375'

4.18°

344.94°

3367.01'

206.12'

3400

3450

3466'

5.14°

342.45°

3457.72'

213.12'

3500

3550

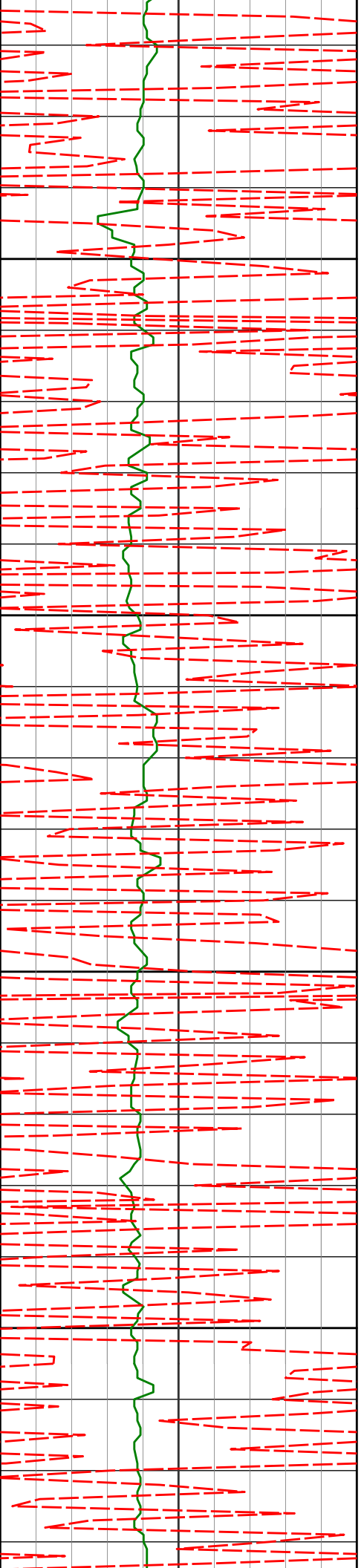
3558'

4.86°

346.20°

3549.38'

220.76'



3600

3650

3700

3750

3650'

3741'

4.70°

4.41°

347.27°

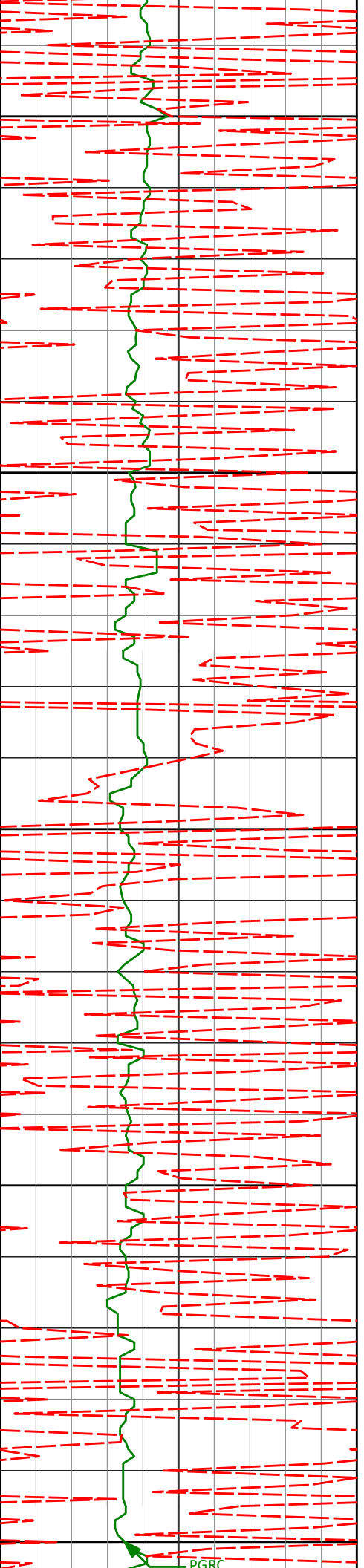
350.46°

3641.06'

3731.77'

228.24'

235.34'



3800

3833'

3.15°

336.24°

3823.57'

241.18'

3850

3900

3925'

4.28°

330.33°

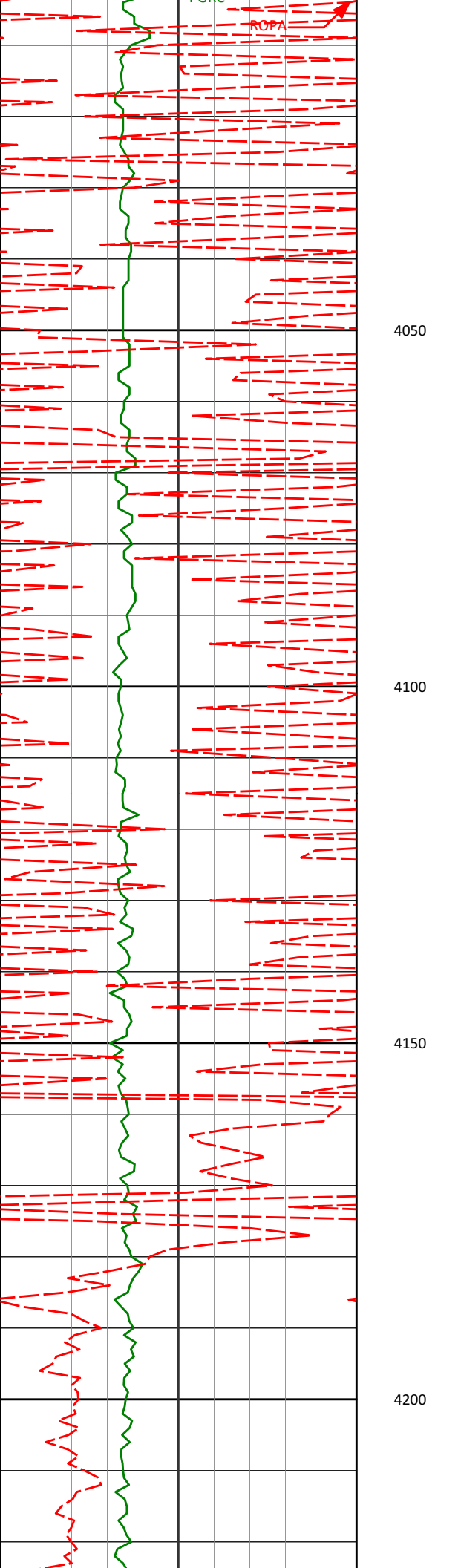
3915.38'

246.53'

3950

4000

PGRC



4016'

4.05°

338.52°

4006.14'

252.53'

4050

4100

4108'

3.79°

340.85°

4097.93'

258.46'

4150

4200

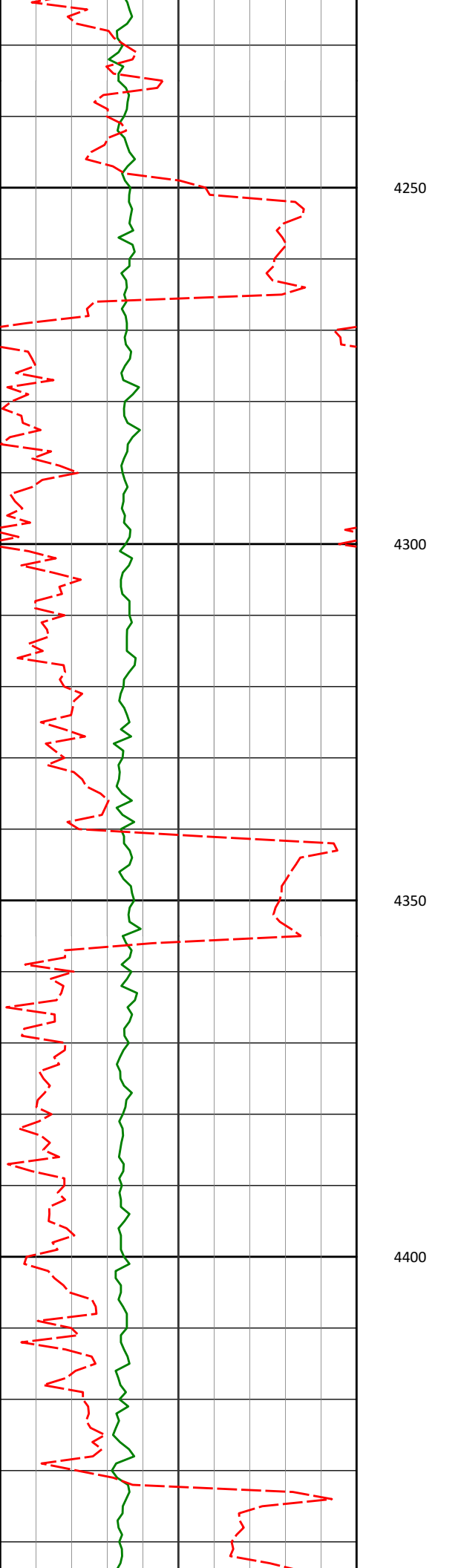
4200'

3.85°

323.26°

4189.73'

263.86'



4250

4291'

5.78°

329.49°

4280.40'

270.35'

4300

4350

4382'

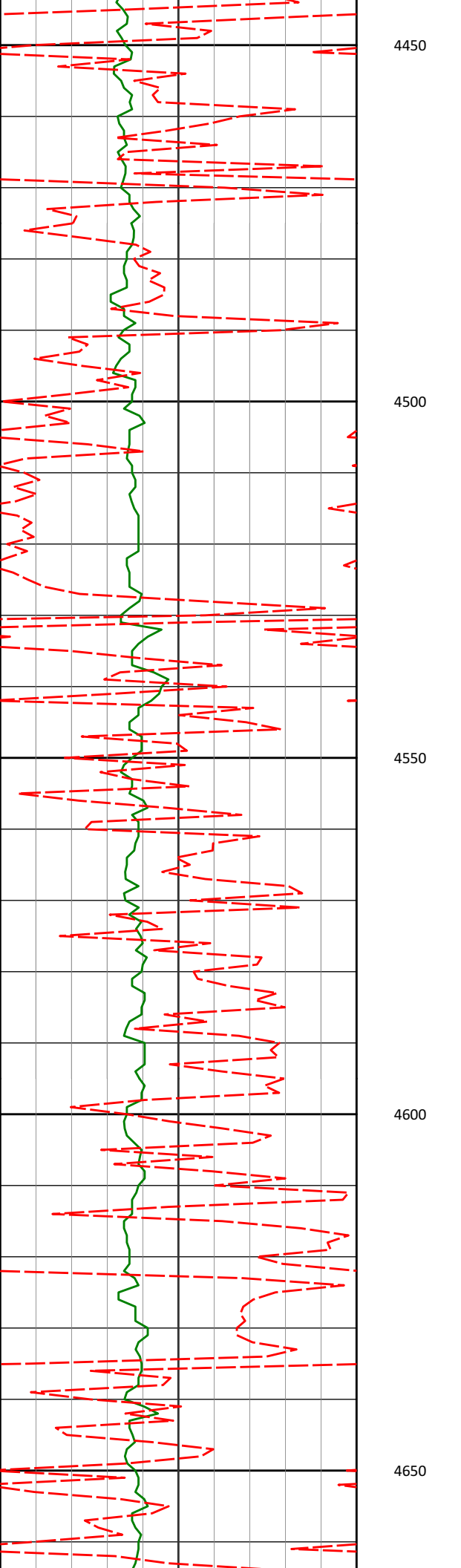
3.20°

348.08°

4371.13'

276.72'

4400



4477'

4.23°

350.76°

4465.94'

282.62'

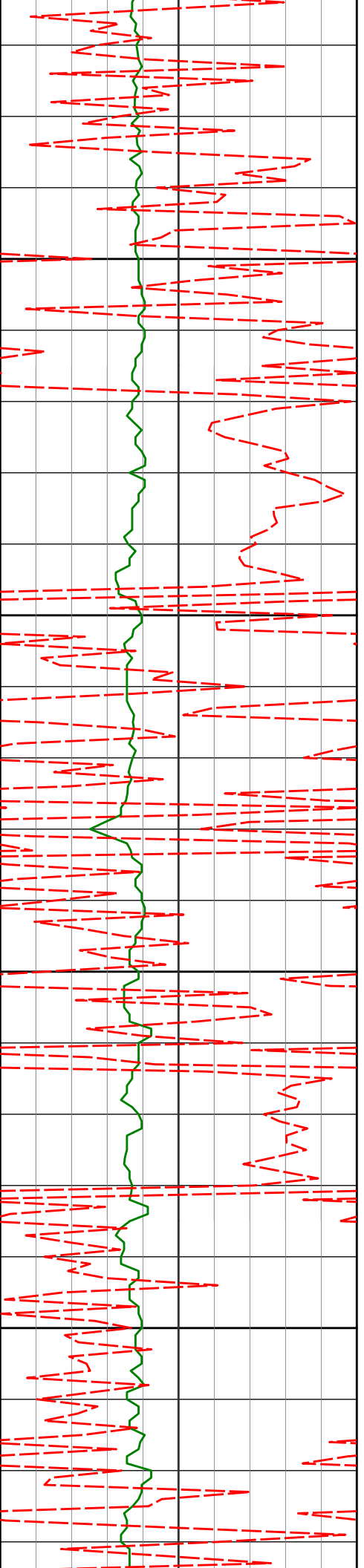
4572'

3.53°

347.43°

4560.72'

288.91'



4667'

4.41°

350.32°

4655.50'

295.37'

4700

4750

4762'

4.93°

348.95°

4750.18'

302.97'

4800

4850

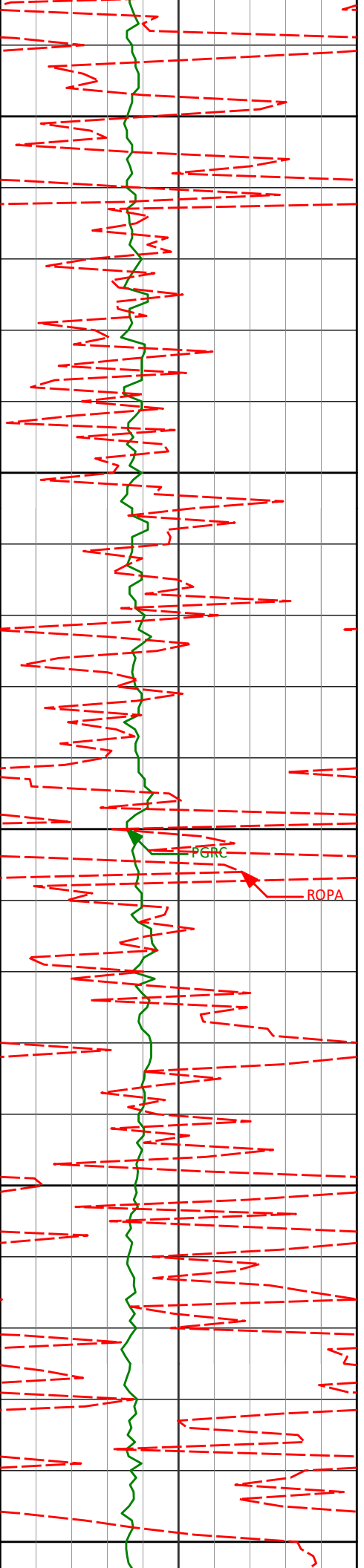
4857'

4.84°

6.50°

4844.85'

310.91'



4900

4950

5000

5050

5100

4952'

4.30°

10.40°

4939.55'

318.33'

PGRC

ROPA

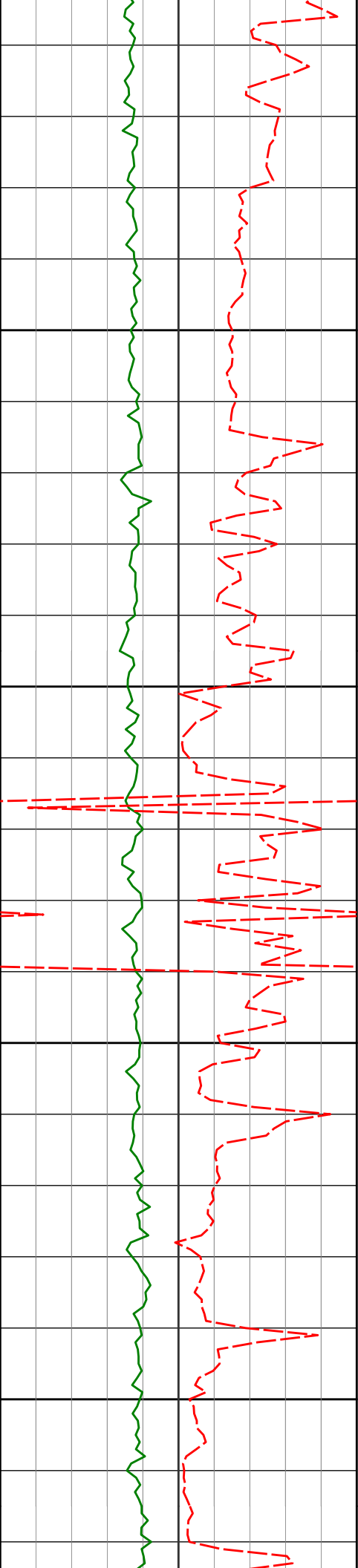
5047'

3.78°

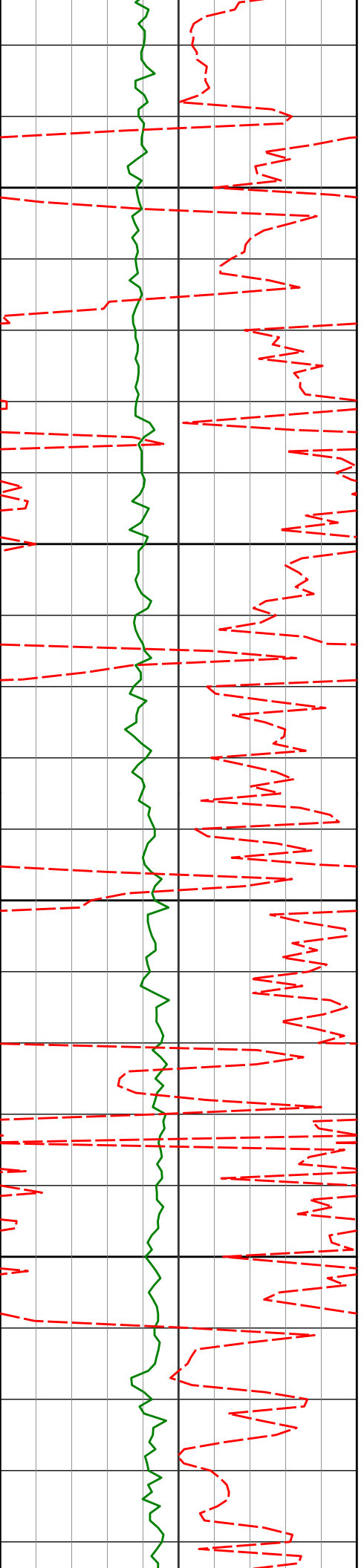
7.07°

5034.31'

324.90'



	5111'	4.32°	5.83°	5098.15'	329.37'
	5142'	9.89°	0.65°	5128.91'	333.18'
5150					
	5174'	14.87°	350.20°	5160.17'	339.93'
	5206'	18.16°	353.97°	5190.87'	348.87'
5200					
	5237'	18.45°	354.07°	5220.32'	358.54'
	5269'	22.94°	353.62°	5250.27'	369.74'
5250					
	5301'	29.61°	354.29°	5278.97'	383.80'
5300					



5332' 35.84° 354.30° 5305.05' 400.46'

5350

5364' 38.81° 353.93° 5330.53' 419.74'

5400

5396' 39.43° 354.18° 5355.36' 439.84'

5427' 39.26° 353.80° 5379.34' 459.41'

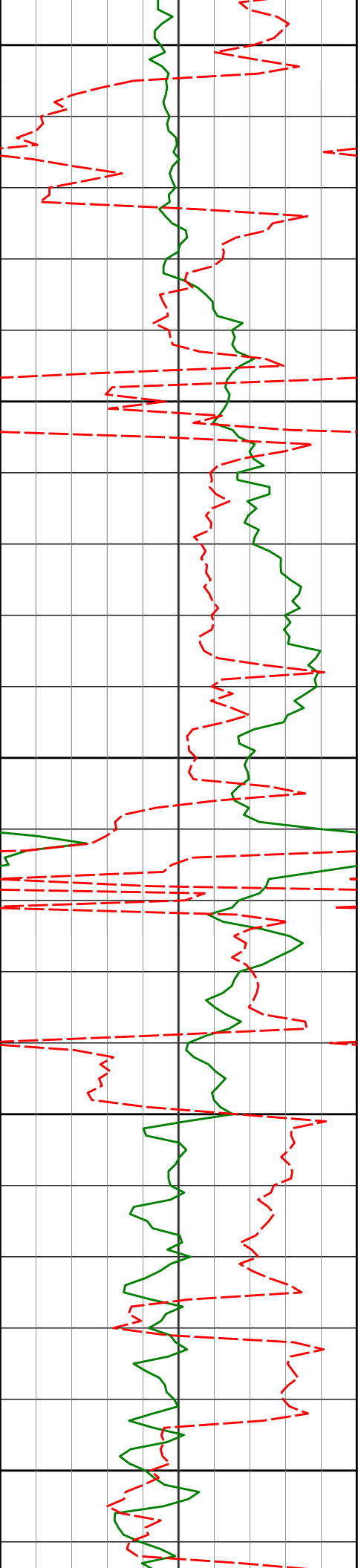
5450

5459' 39.16° 354.08° 5404.14' 479.55'

5490' 39.50° 353.68° 5428.12' 499.11'

5500

5522' 39.26° 353.67° 5452.85' 519.31'



5550

5554'

41.77°

351.94°

5477.18'

539.96'

5585'

44.66°

349.82°

5499.77'

560.95'

5600

5617'

47.93°

349.90°

5521.88'

583.75'

5650

5649'

51.65°

354.46°

5542.55'

607.97'

5680'

54.55°

353.25°

5561.16'

632.64'

5700

5712'

58.72°

351.81°

5578.76'

659.16'

5744'

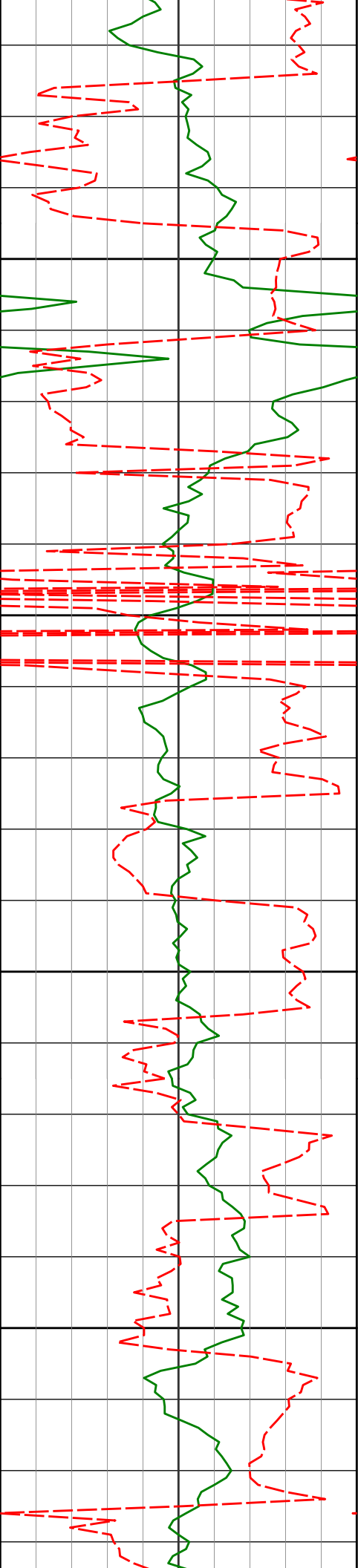
62.36°

350.98°

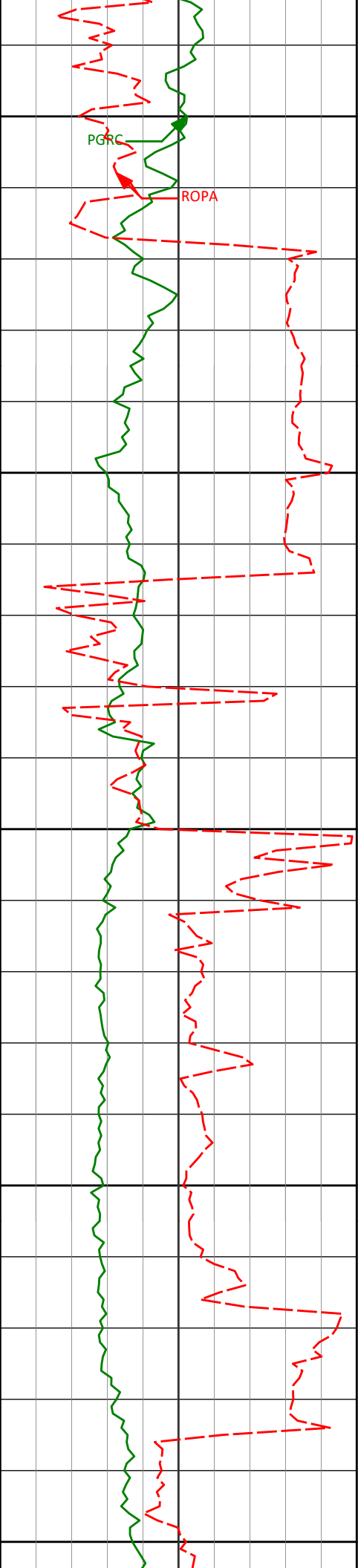
5594.49'

686.73'

5750

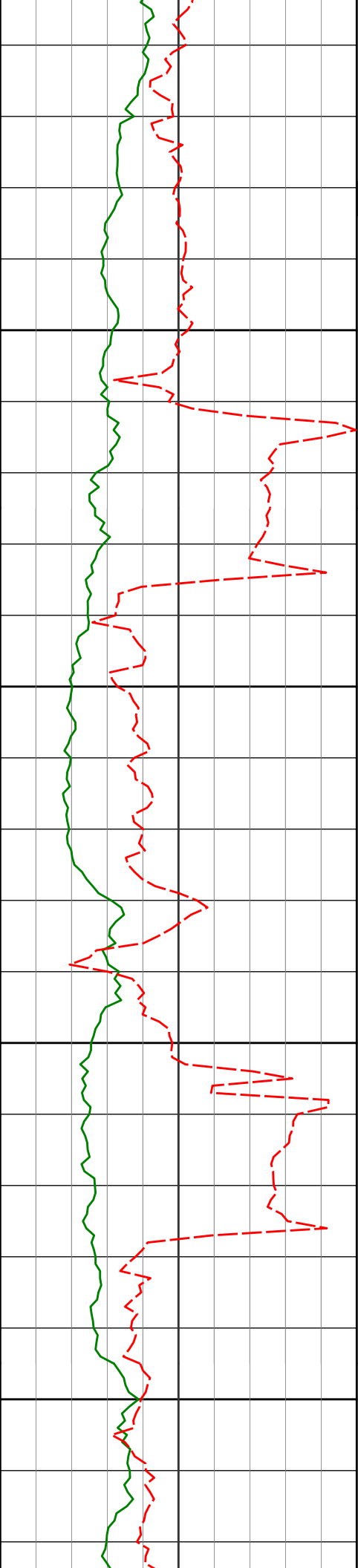


5775'	63.97°	350.64°	5608.49'	714.06'
5800				
5807'	66.15°	350.04°	5621.99'	742.68'
5839'	69.62°	349.55°	5634.03'	771.87'
5850				
5870'	72.56°	350.45°	5644.08'	800.77'
5900				
5902'	74.73°	349.46°	5653.09'	831.02'
5934'	76.46°	349.18°	5661.05'	861.50'
5950				
5965'	79.21°	349.69°	5667.58'	891.31'



6000	5997'	80.44°	348.92°	5673.23'	922.29'
	6029'	84.13°	348.95°	5677.53'	953.43'
6050	6049'	87.94°	349.36°	5678.91'	973.03'
	6119'	90.99°	350.01°	5679.56'	1042.04'
6150					
6200					

▲ Casing @ 6088' MD  
 <Run 300



6214'

89.85°

350.50°

5678.87'

1135.97'

Casing shoe at 6242' MD



6250

Run 300

6300

6309'

89.14°

353.58°

5679.70'

1230.28'

6350

6400

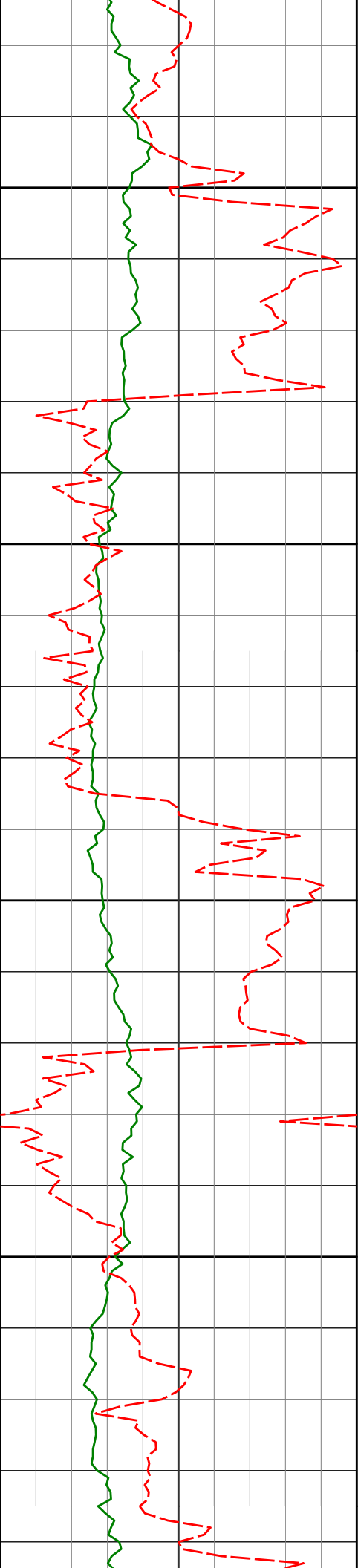
6404'

88.92°

355.34°

5681.31'

1324.99'



6450

6500

6550

6600

6498'

90.31°

357.78°

5681.94'

1418.91'

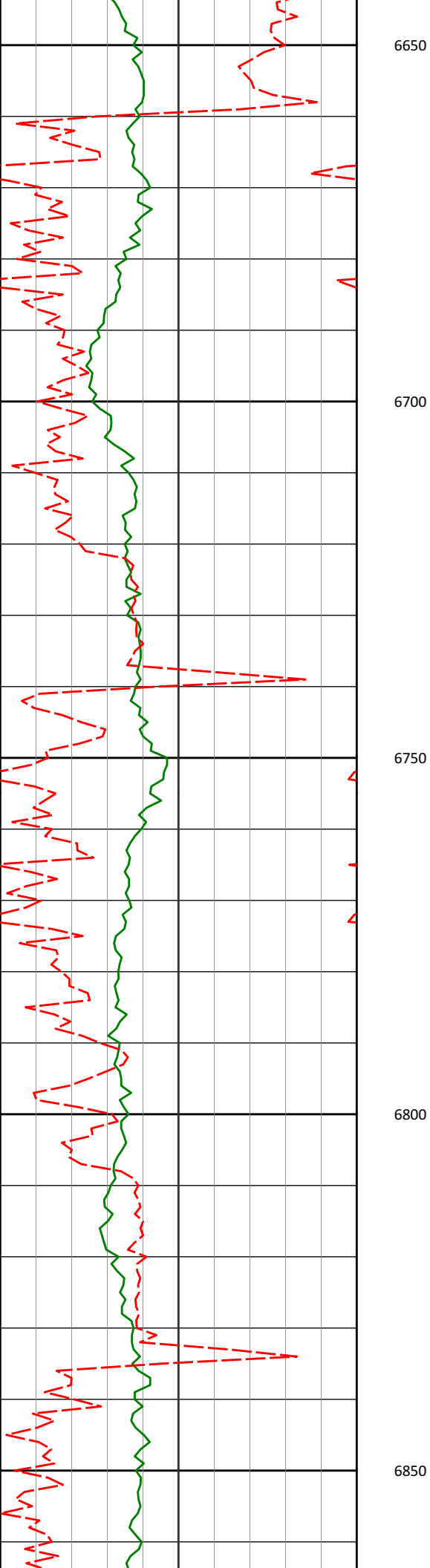
6593'

89.72°

1.13°

5681.89'

1513.89'



6650

6688'

89.75°

3.61°

5682.29'

1608.68'

6700

6750

6783'

88.80°

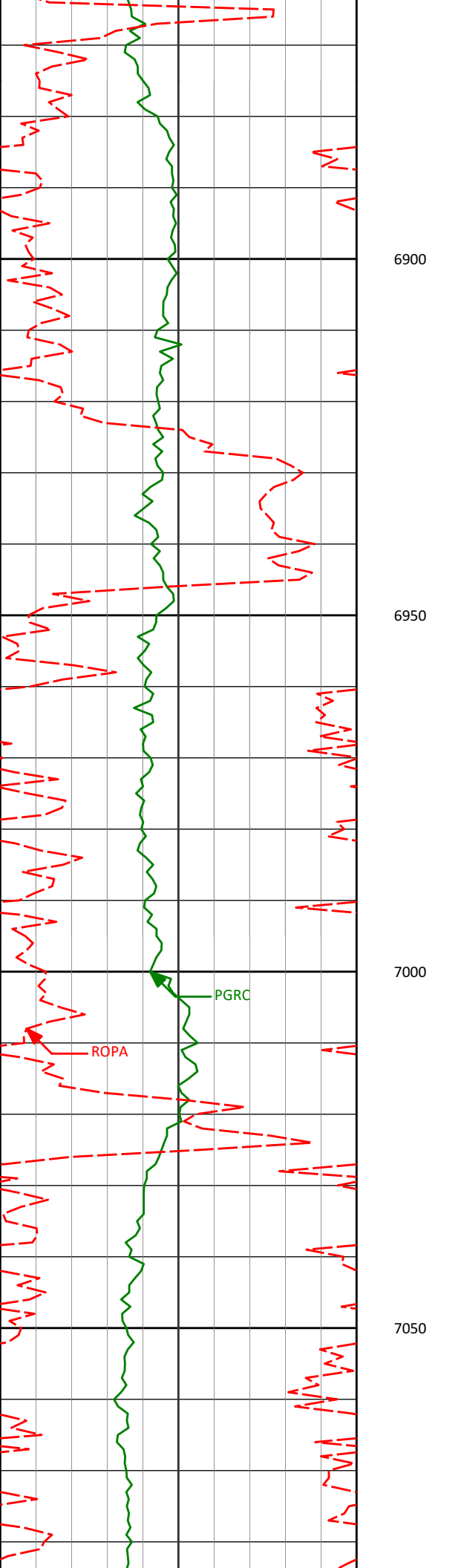
3.64°

5683.48'

1703.32'

6800

6850



6878'      88.06°      3.21°      5686.08'      1797.96'

6900

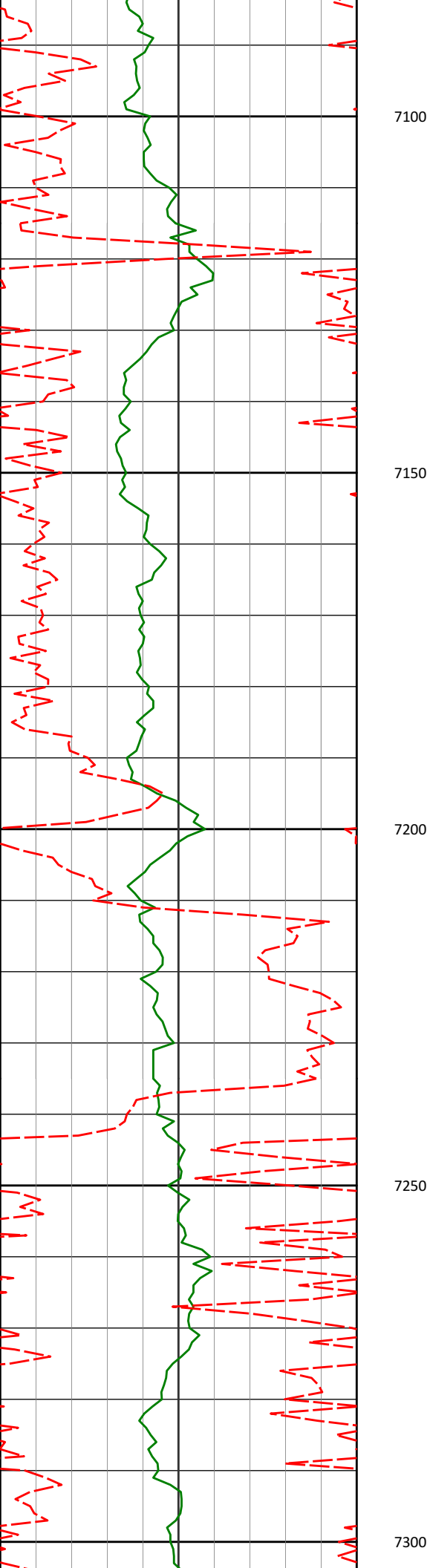
6950

6973'      89.17°      2.27°      5688.37'      1892.70'

7000

7050

7068'      89.14°      2.56°      5689.76'      1987.49'



7163'

88.00°

1.82°

5692.12'

2082.28'

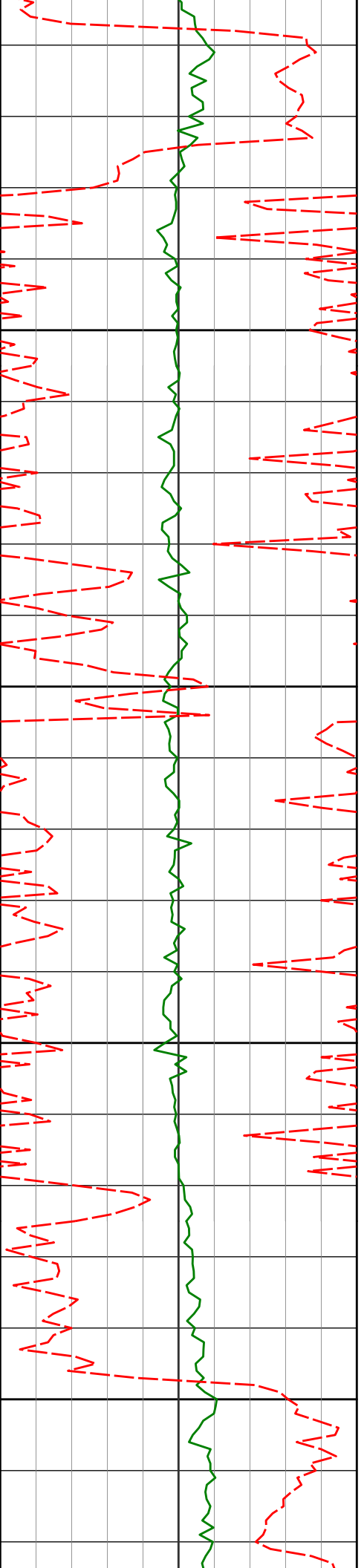
7258'

89.17°

0.60°

5694.45'

2177.16'



7350

7352'

90.59°

359.93°

5694.64'

2271.12'

7400

7450

7447'

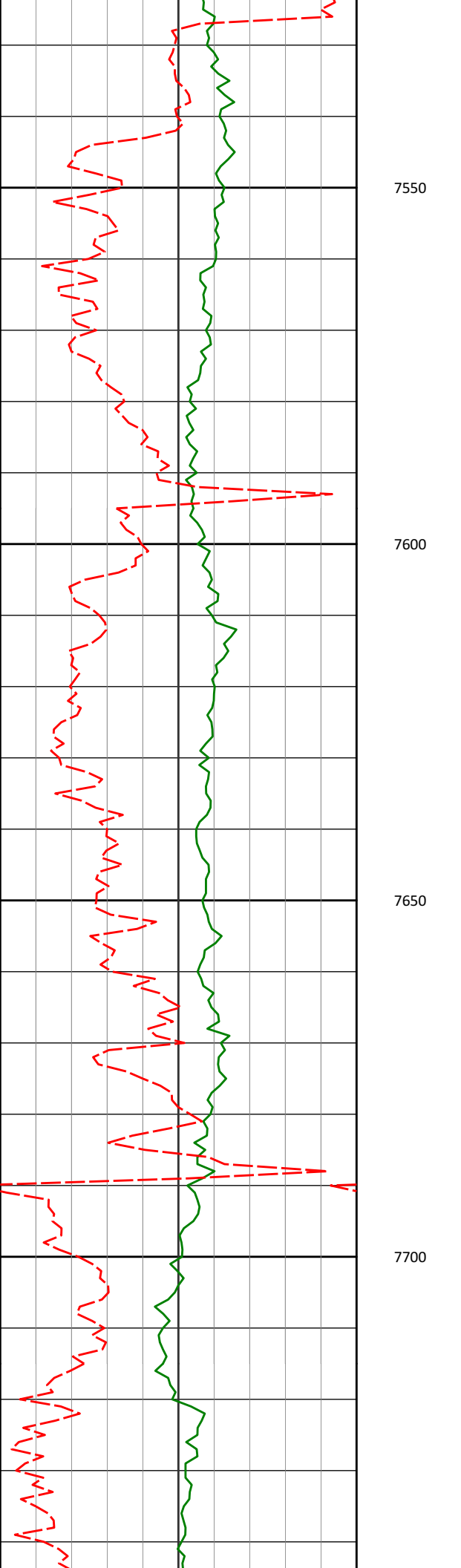
88.80°

357.76°

5695.14'

2366.11'

7500



7542'

90.77°

1.43°

5695.49'

2461.07'

7550

7600

7637'

90.52°

0.10°

5694.42'

2556.00'

7650

7700

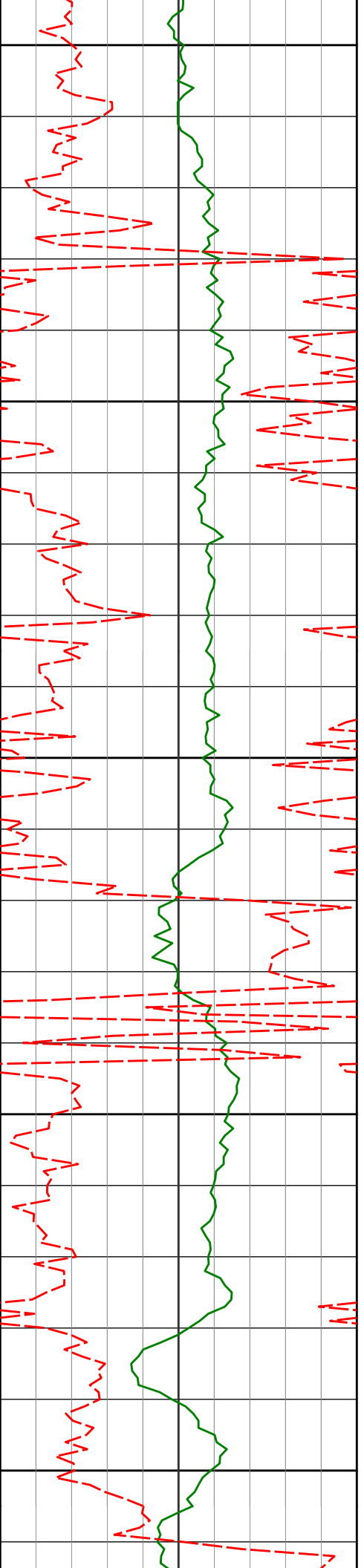
7728'

90.19°

359.73°

5693.85'

2646.98'



7750

7800

7850

7900

7950

7819'

90.65°

359.62°

5693.17'

2737.97'

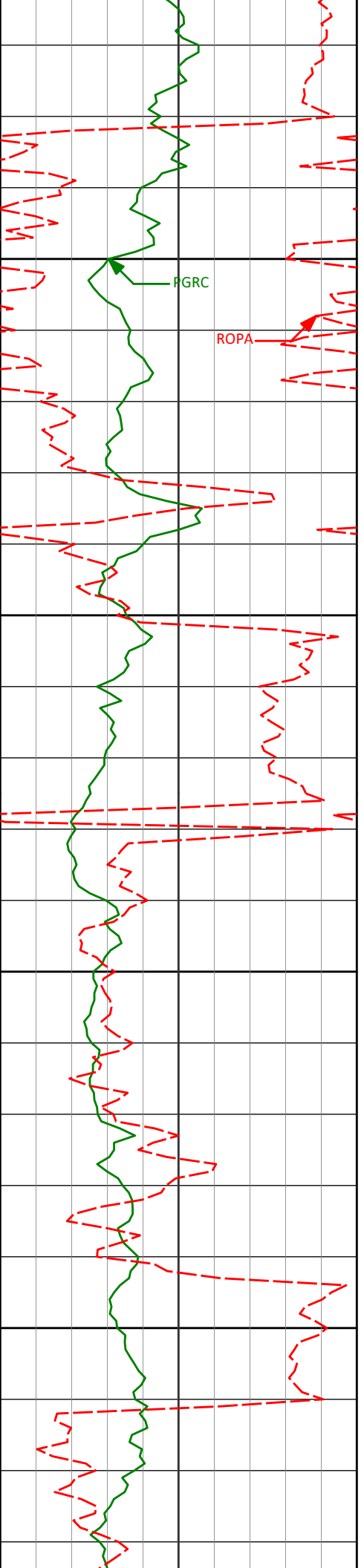
7911'

88.89°

359.64°

5693.54'

2829.95'



8000

8002'

86.36°

359.73°

5697.31'

2920.85'

FGRC

ROPA

8050

8100

8093'

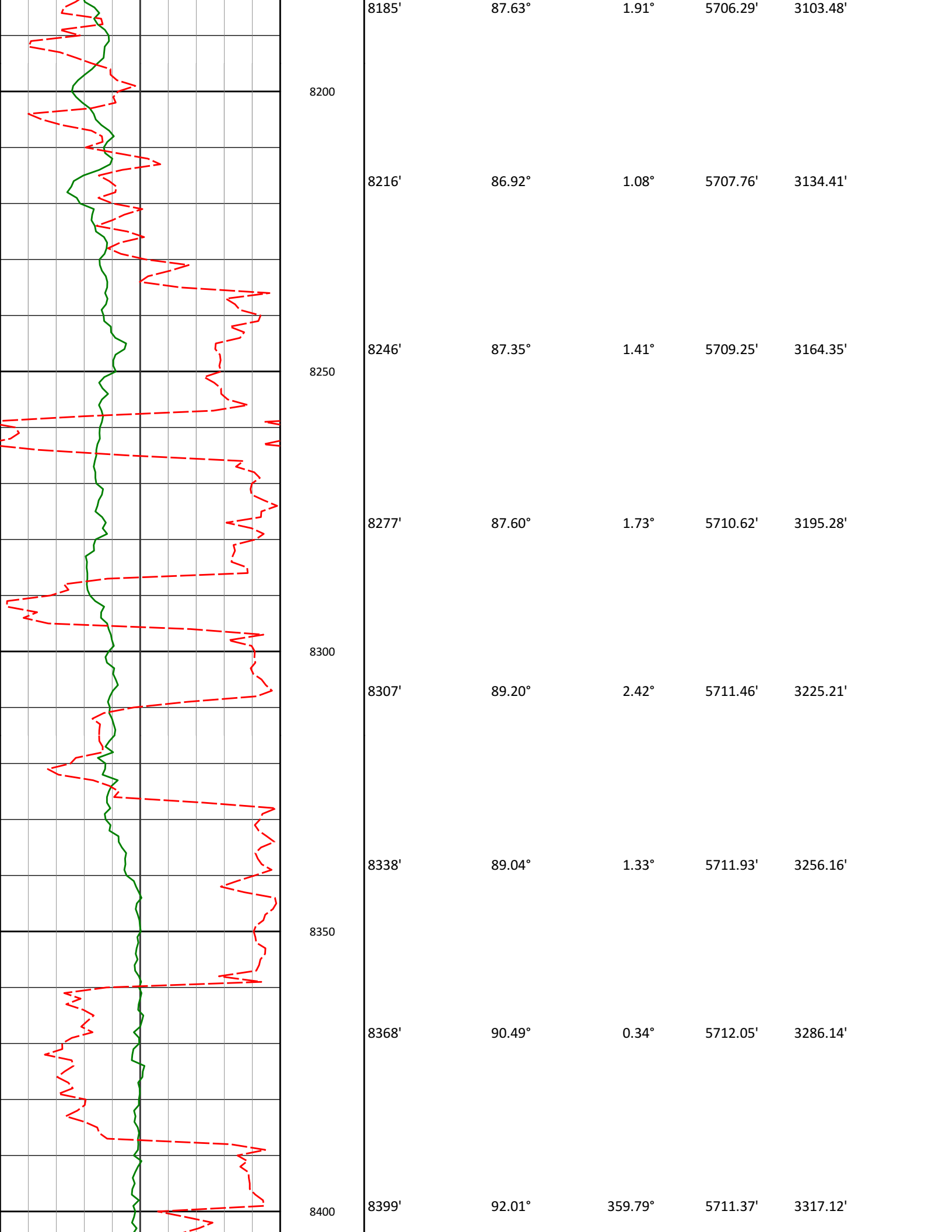
87.38°

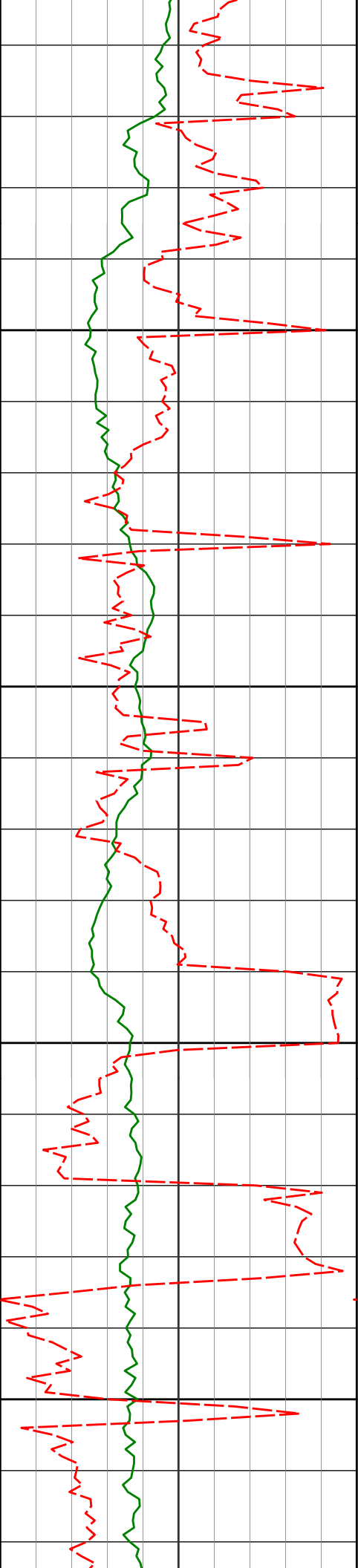
1.03°

5702.28'

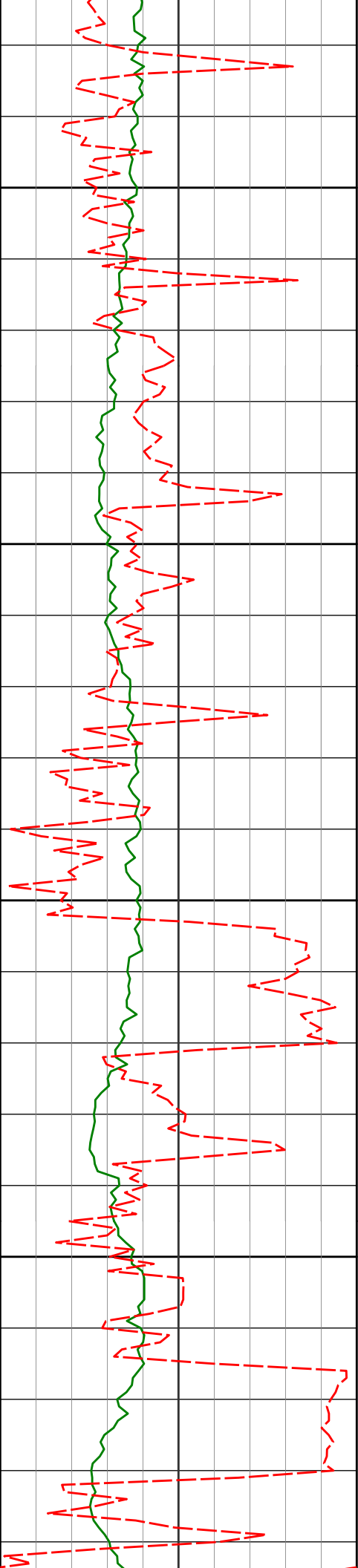
3011.68'

8150





8429'	92.19°	359.30°	5710.27'	3347.10'
8450				
8460'	92.41°	359.79°	5709.02'	3378.07'
8490'	92.56°	359.50°	5707.72'	3408.04'
8500				
8521'	92.84°	359.35°	5706.26'	3439.00'
8550				
8551'	92.19°	0.56°	5704.94'	3468.96'
8582'	91.14°	2.52°	5704.03'	3499.91'
8600				
8613'	90.89°	3.52°	5703.48'	3530.82'



8650

8643'

90.68°

3.28°

5703.07'

3560.71'

8673'

91.20°

3.67°

5702.57'

3590.61'

8700

8704'

91.85°

3.82°

5701.73'

3621.47'

8750

8765'

90.77°

5.45°

5700.33'

3682.13'

8800

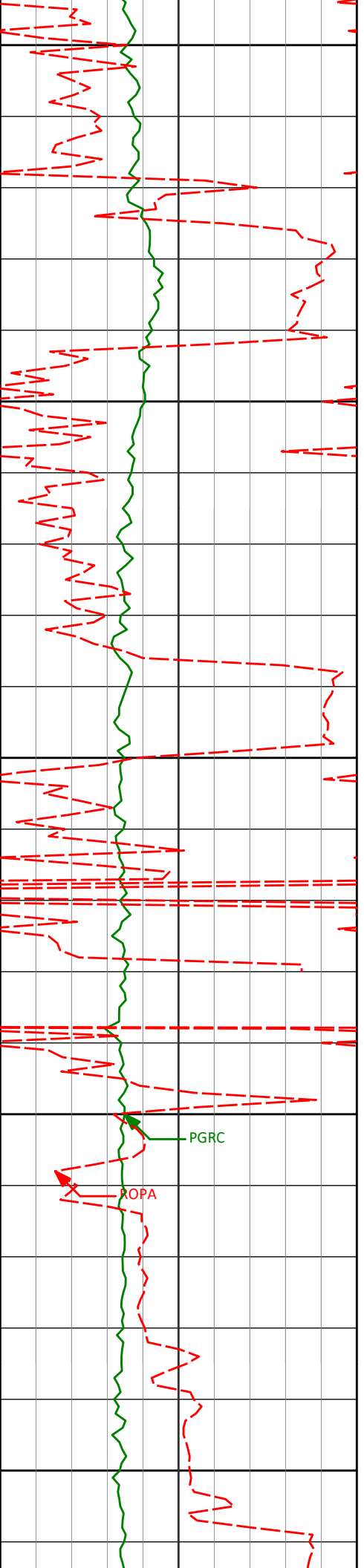
8826'

88.92°

2.82°

5700.49'

3742.84'



8850

8886'

89.51°

1.13°

5701.32'

3802.74'

8900

8947'

91.20°

0.82°

5700.93'

3863.69'

8950

9000

9008'

91.60°

1.56°

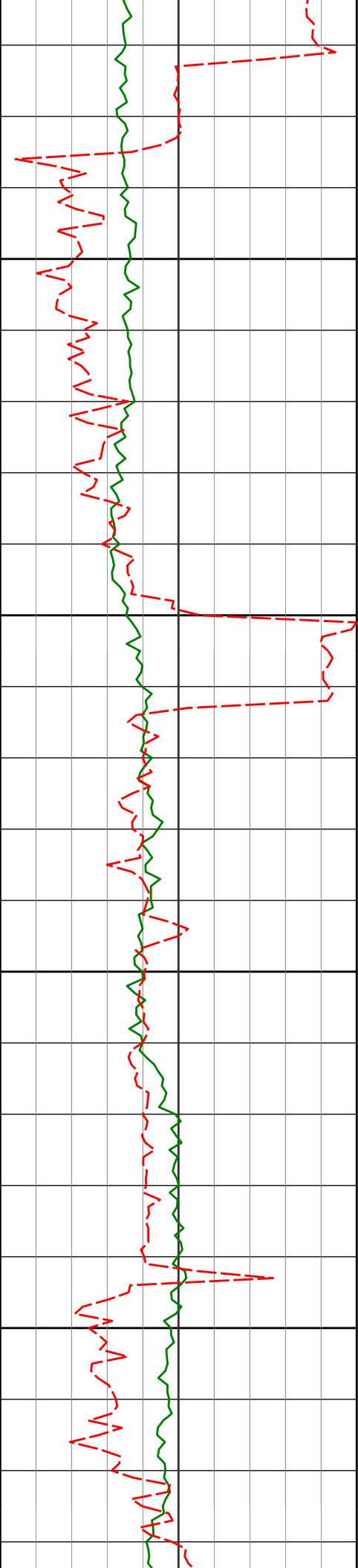
5699.43'

3924.61'

9050

PGRC

ROPA



9100 9100' 90.55° 0.28° 5697.70' 4016.52'

9150

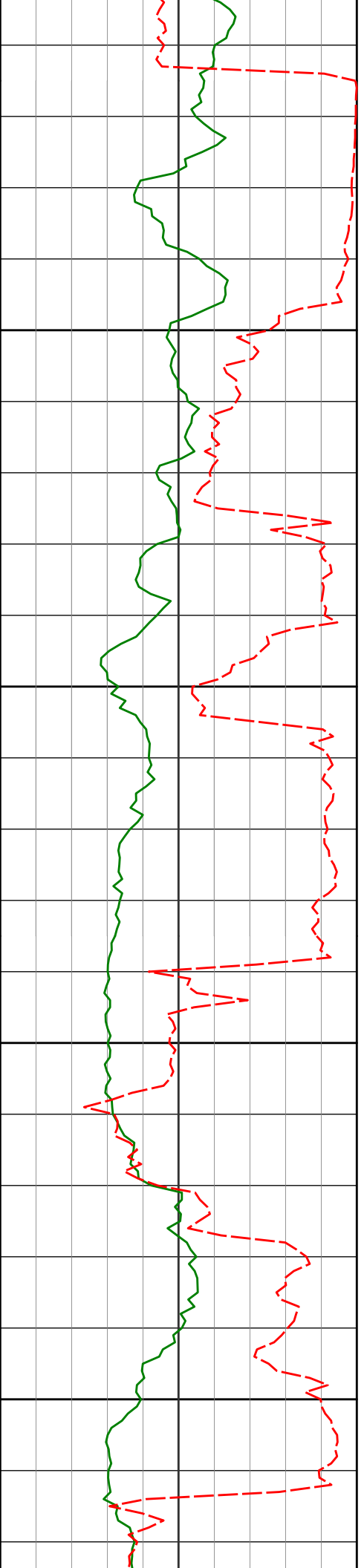
9191' 89.63° 358.68° 5697.55' 4107.51'

9200

9250

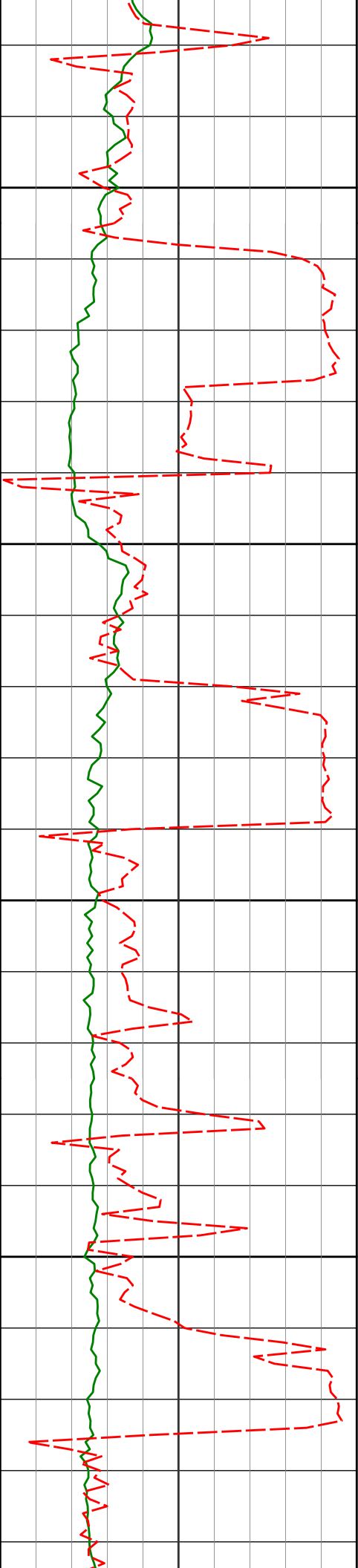
9283' 88.70° 358.64° 5698.88' 4199.50'





<Begin Sidetrack 9515MD

9526'	86.88°	358.51°	5703.01'	4442.43'
9550				
9556'	85.59°	356.47°	5704.97'	4472.35'
9600				
9647'	91.57°	355.71°	5707.22'	4563.18'
9650				
9700				
9709'	89.35°	356.73°	5706.73'	4625.11'



9750

9770'

90.34°

356.95°

5706.89'

4686.08'

9800

9831'

92.16°

357.03°

5705.55'

4747.03'

9850

9900

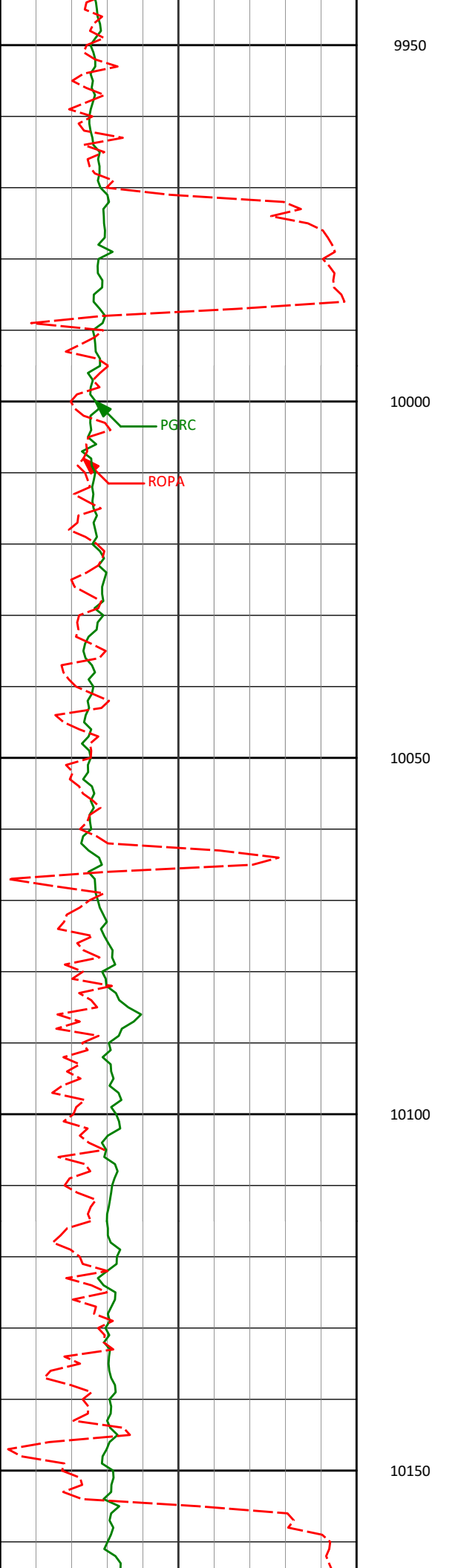
9923'

90.95°

358.31°

5703.04'

4838.98'



10014'

92.83°

359.04°

5700.04'

4929.92'

10105'

92.49°

358.10°

5695.81'

5020.82'

9950

10000

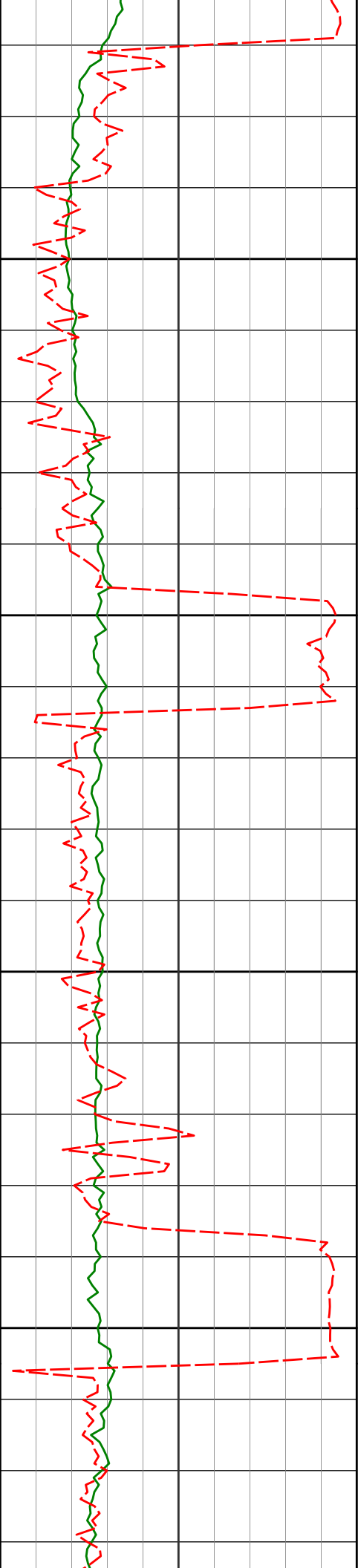
10050

10100

10150

PGRC

ROPA



10200

10197'

92.87°

355.58°

5691.50'

5112.66'

10250

10288'

91.08°

355.04°

5688.36'

5203.43'

10300

10350

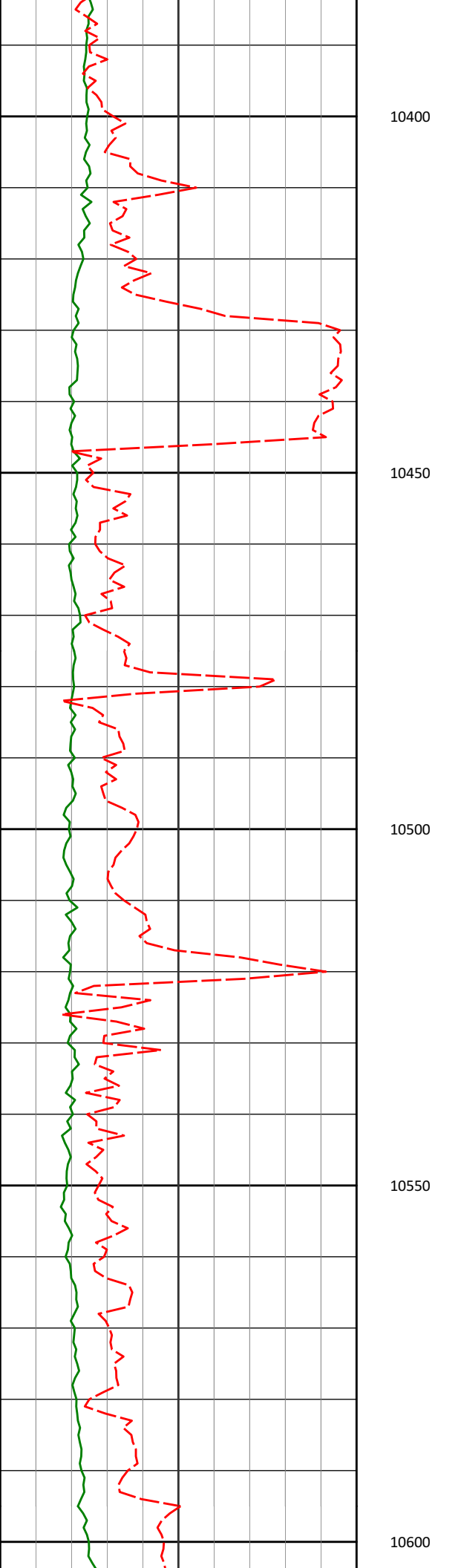
10380'

90.37°

356.86°

5687.20'

5295.30'



10471'

90.83°

0.20°

5686.24'

5386.28'

10562'

90.49°

359.48°

5685.20'

5477.26'

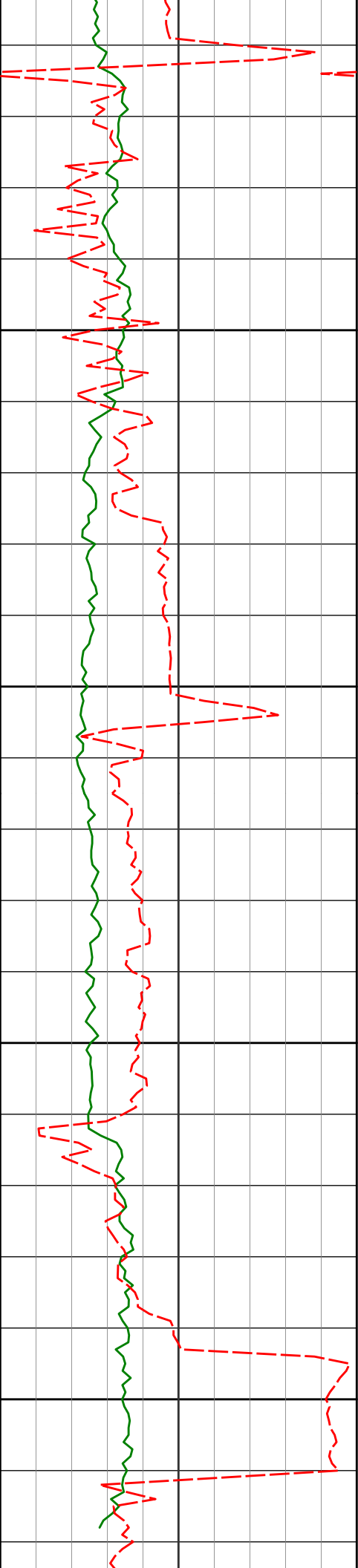
10400

10450

10500

10550

10600



10650

10654'

89.94°

358.46°

5684.85'

5569.26'

10700

10750

10745'

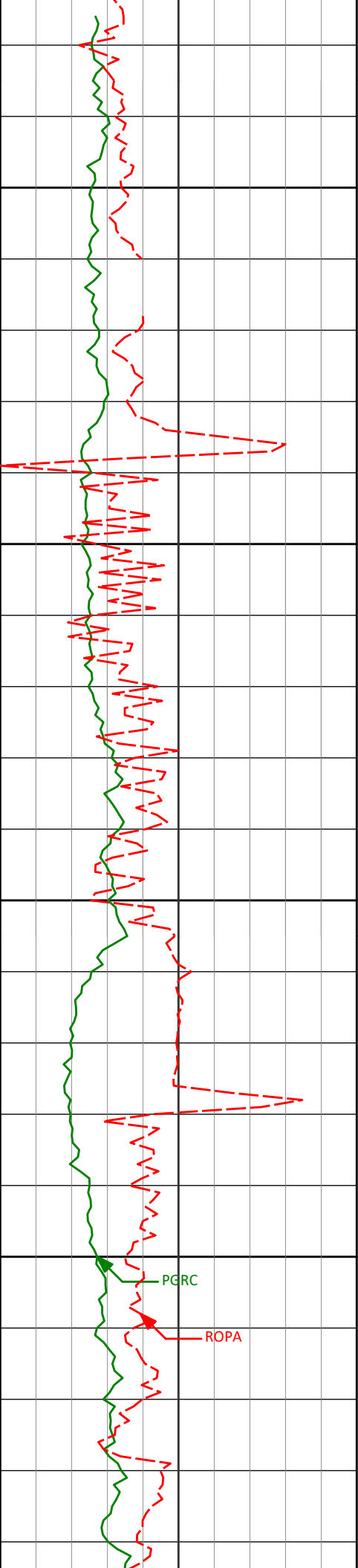
89.60°

358.00°

5685.21'

5660.25'

10800



10837' 91.39° 0.58° 5684.41' 5752.23'

10850

10900

10929' 90.99° 359.69° 5682.50' 5844.19'

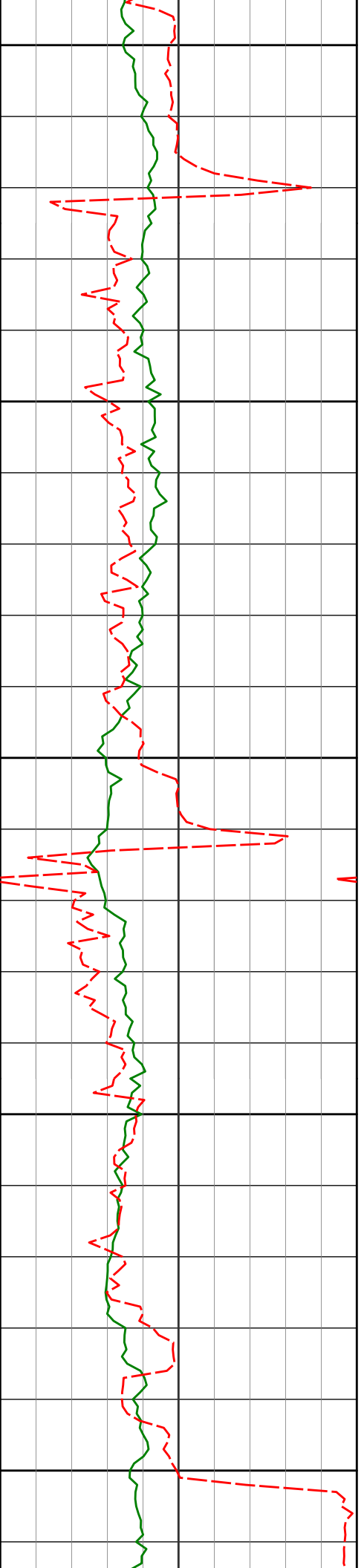
10950

11000

PGRC

ROPA

11020' 90.89° 359.31° 5681.00' 5935.16'



11050

11100

11150

11200

11250

11112'

90.62°

359.64°

5679.79'

6027.15'

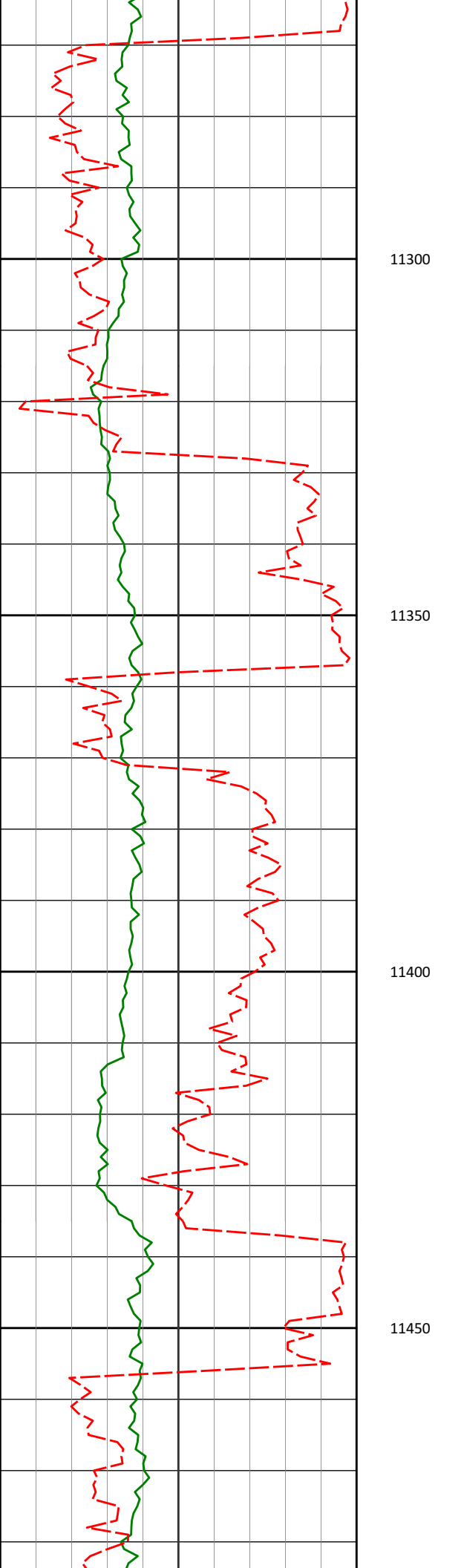
11204'

89.66°

358.58°

5679.56'

6119.14'



11295'

89.85°

0.52°

5679.95'

6210.13'

11300

11350

11387'

90.68°

358.43°

5679.52'

6302.12'

11400

11450

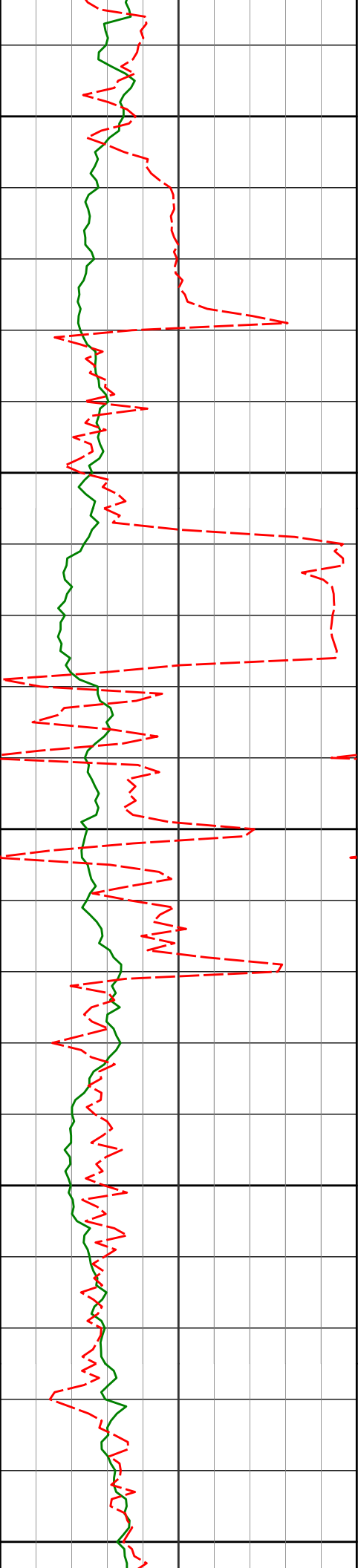
11479'

91.85°

1.82°

5677.48'

6394.05'



1150

1155

1160

1165

1170

11570'

91.05°

2.69°

5675.17'

6484.85'

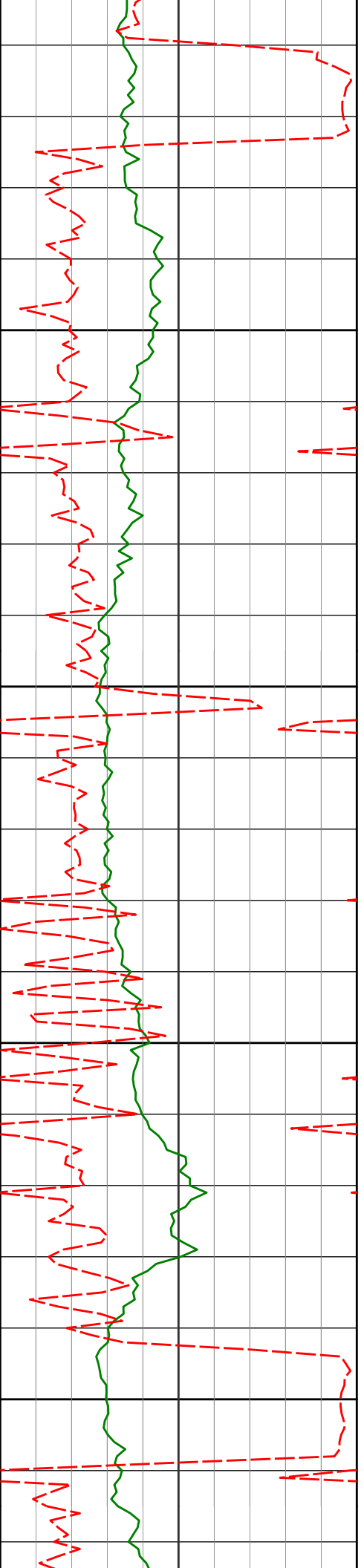
11662'

90.80°

2.41°

5673.68'

6576.63'



11750

11754'

88.71°

0.91°

5674.07'

6668.50'

11800

11850

11845'

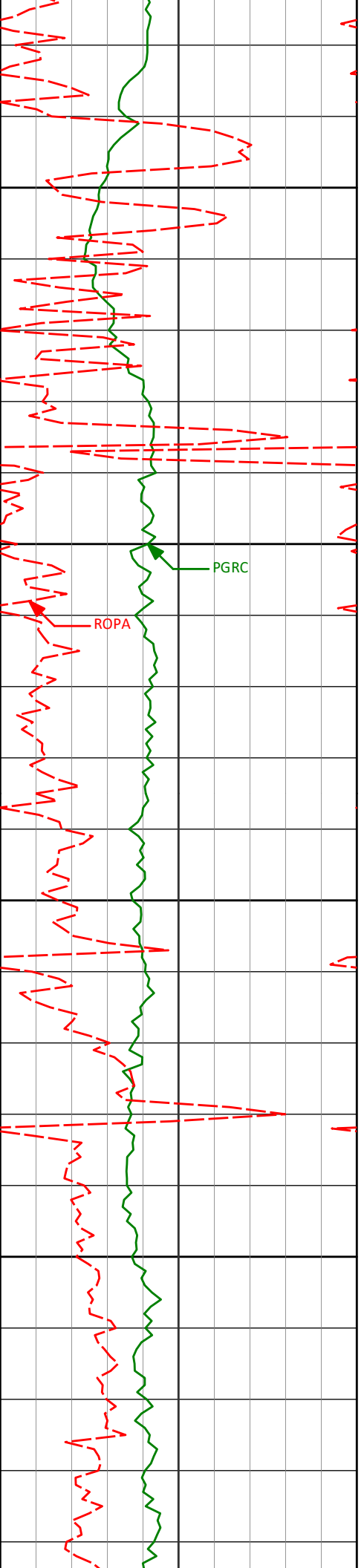
88.77°

359.53°

5676.07'

6759.44'

11900



11937'

88.55°

1.75°

5678.22'

6851.36'

11950

12000

PGRC

ROPA

12031'

89.35°

3.77°

5679.95'

6945.11'

12050

12100

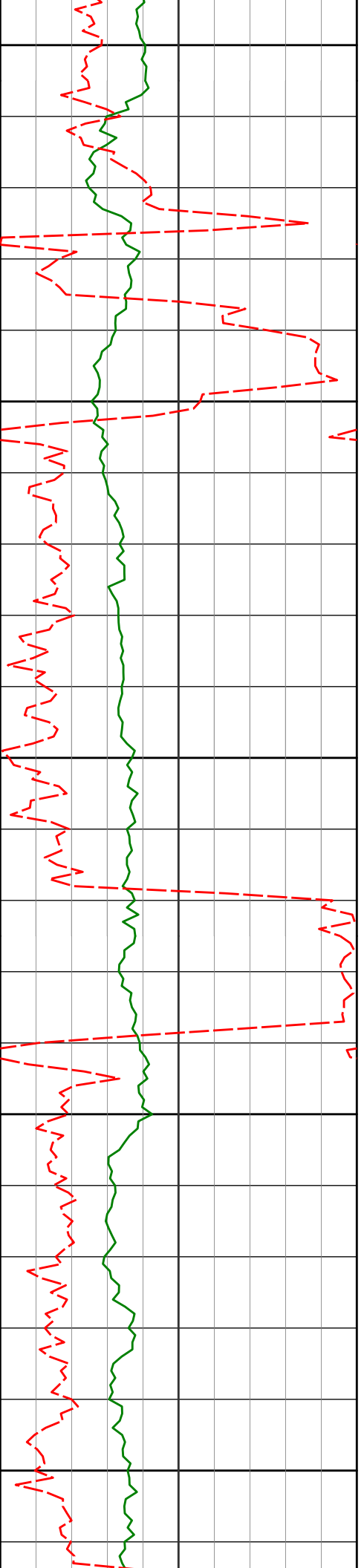
12126'

89.14°

3.88°

5681.20'

7039.72'



12150

12200

12250

12300

12350

12221'

88.67°

4.15°

5683.01'

7134.29'

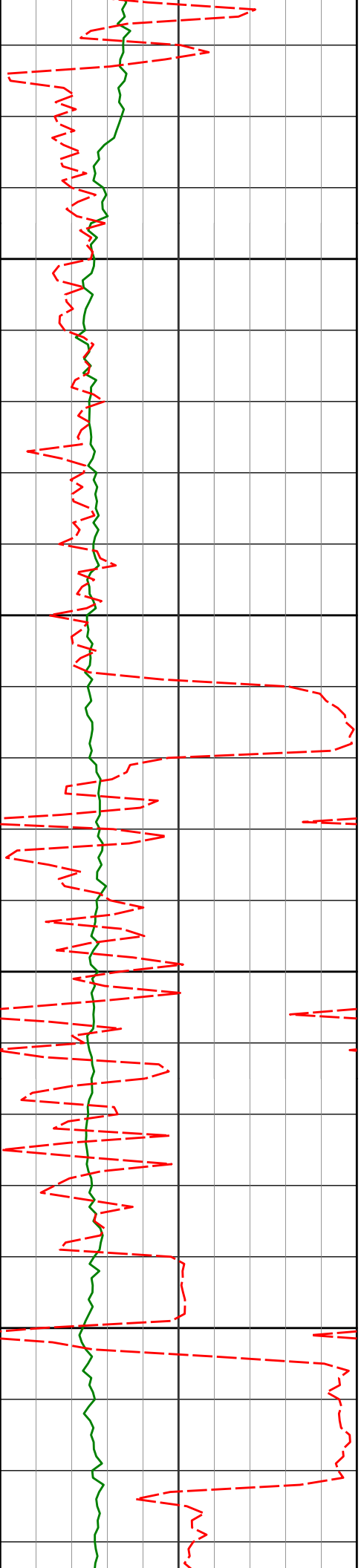
12316'

89.78°

2.29°

5684.27'

7228.99'



12400

12411'

88.89°

358.75°

5685.35'

7323.92'

12450

12500

12506'

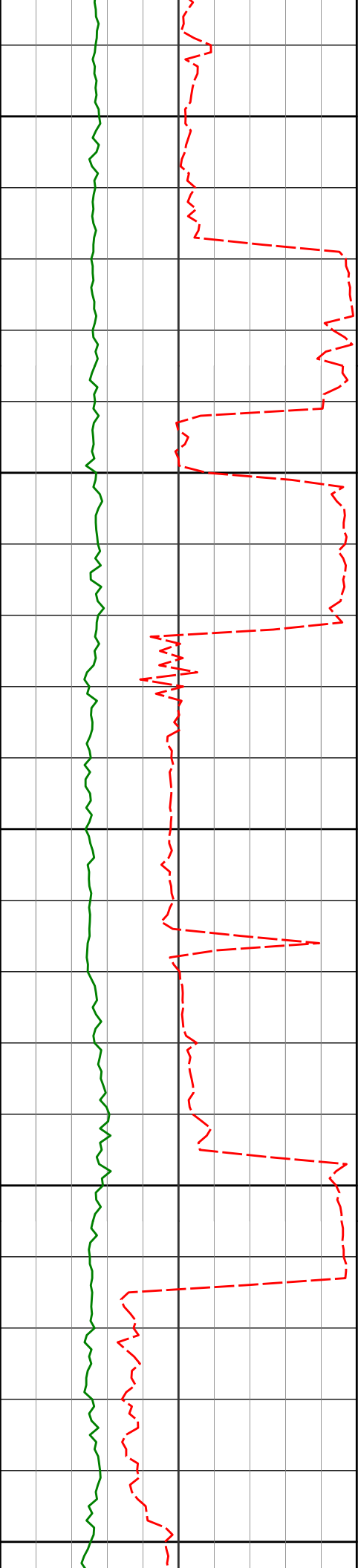
89.29°

358.38°

5686.86'

7418.91'

12550



12600

12601'

90.59°

358.52°

5686.96'

7513.90'

12650

12700

12696'

89.51°

0.22°

5686.87'

7608.89'

12750

12800

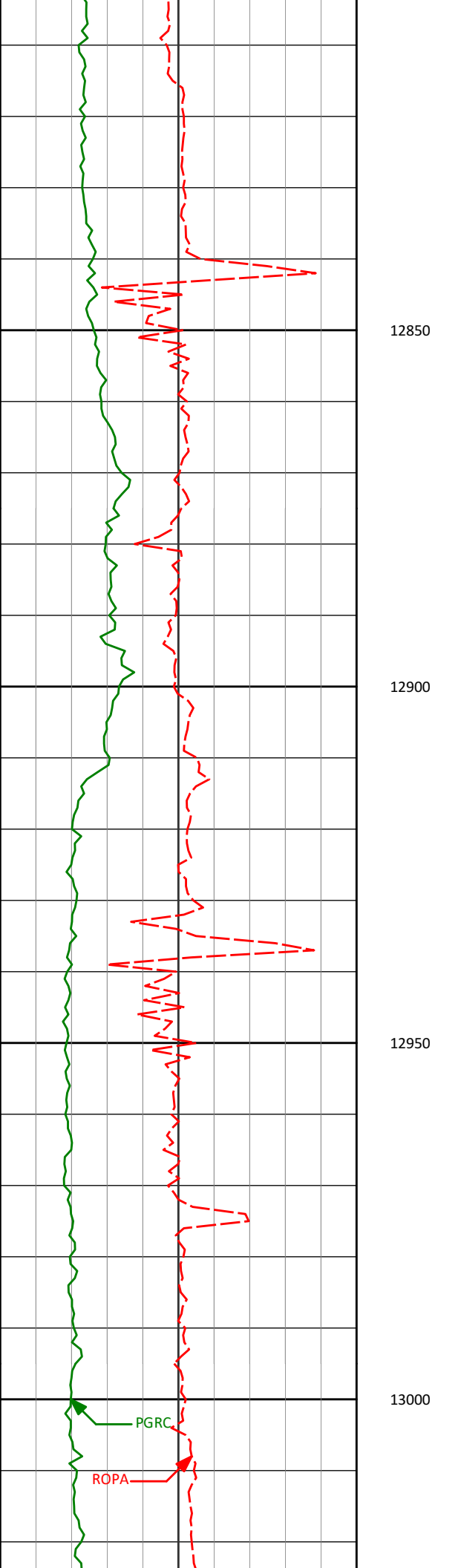
12791'

90.59°

2.79°

5686.78'

7703.77'



12850

12900

12950

13000

12886'

90.96°

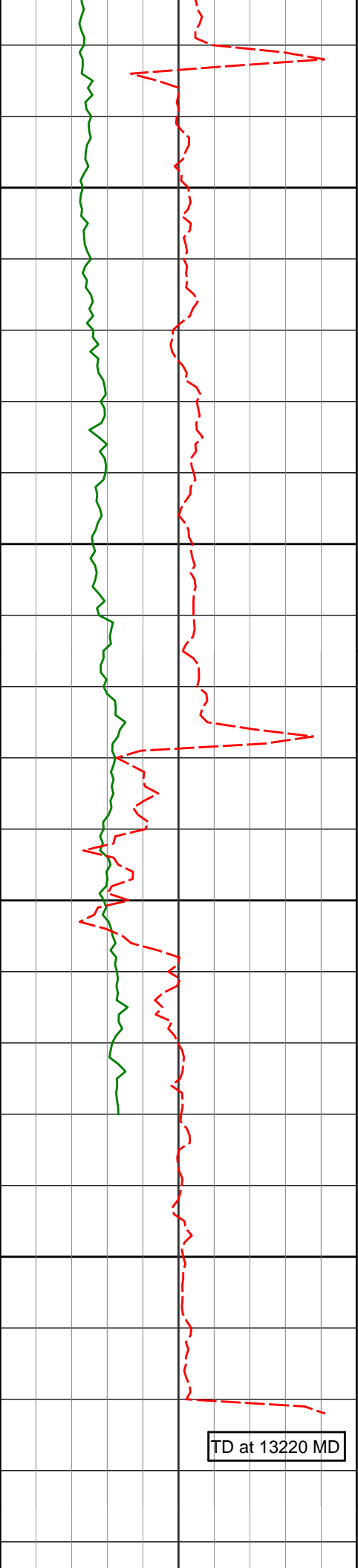
1.75°

5685.48'

7798.58'

PGRC

ROPA



13050

13076'

90.34°

0.65°

5683.54'

7988.42'

13100

13150

13171'

89.85°

359.91°

5683.38'

8083.38'

13200

TD at 13220 MD

<b>Avg Rate of Penetration</b> ROPA ----- 500 feet per hr 0		Depth ft	<b>Depth</b>	<b>Inc.</b>	<b>Azi.</b>	<b>TVD</b>	<b>V.S.</b>
<b>PCG Gamma Ray BCorr</b> PGRC ----- 0 api 300							

## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas

Razor 26K-2306B

Redtail

Weld Colorado

USA

CA-XX-0900996448

Surveys are Sag, IFR and MS corrected.

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
173.00	0.45	28.47	173.00	0.60 N	0.32 E	0.59	0.26
265.00	0.50	12.38	265.00	1.31 N	0.58 E	1.29	0.15
356.00	0.64	16.39	355.99	2.18 N	0.81 E	2.15	0.16
448.00	1.28	347.88	447.98	3.68 N	0.74 E	3.65	0.85
538.00	1.25	345.50	537.96	5.61 N	0.28 E	5.60	0.07
630.00	1.98	343.59	629.92	8.11 N	0.42 W	8.12	0.80
722.00	3.24	344.09	721.82	12.13 N	1.58 W	12.18	1.37
813.00	3.34	344.35	812.67	17.16 N	3.00 W	17.25	0.11
905.00	3.78	336.17	904.49	22.51 N	4.95 W	22.67	0.73
996.00	3.79	340.40	995.30	28.09 N	7.17 W	28.32	0.31
1088.00	4.56	349.40	1087.05	34.55 N	8.86 W	34.84	1.10
1180.00	5.29	349.61	1178.71	42.32 N	10.30 W	42.65	0.79
1271.00	5.91	349.26	1269.28	51.05 N	11.93 W	51.43	0.68
1362.00	6.44	349.90	1359.75	60.67 N	13.70 W	61.11	0.59
1490.00	6.65	352.64	1486.91	75.09 N	15.90 W	75.60	0.29
1576.00	5.92	354.15	1572.40	84.44 N	16.99 W	84.98	0.87
1668.00	5.80	349.11	1663.92	93.73 N	18.36 W	94.31	0.57
1729.00	5.05	353.10	1724.64	99.42 N	19.26 W	100.03	1.38
1820.00	5.05	357.15	1815.29	107.40 N	19.94 W	108.03	0.39
1911.00	3.36	359.69	1906.04	114.06 N	20.15 W	114.70	1.87
2002.00	4.18	351.24	1996.85	120.01 N	20.67 W	120.66	1.09
2093.00	3.72	1.19	2087.63	126.24 N	21.12 W	126.90	0.91
2185.00	3.59	352.97	2179.44	132.08 N	21.41 W	132.75	0.59
2277.00	3.46	350.62	2271.27	137.68 N	22.21 W	138.37	0.21
2368.00	3.51	343.06	2362.10	143.05 N	23.47 W	143.78	0.51
2460.00	3.03	9.76	2453.96	148.14 N	23.88 W	148.88	1.72
2551.00	3.01	17.18	2544.83	152.79 N	22.77 W	153.50	0.43
2643.00	4.42	357.61	2636.64	158.64 N	22.20 W	159.32	2.04
2734.00	4.42	354.00	2727.37	165.64 N	22.72 W	166.33	0.31
2826.00	3.87	350.17	2819.13	172.22 N	23.62 W	172.94	0.67
2916.00	3.99	346.76	2908.92	178.26 N	24.85 W	179.02	0.29
3008.00	3.05	342.45	3000.74	183.71 N	26.32 W	184.52	1.06
3100.00	3.88	335.27	3092.57	188.87 N	28.36 W	189.75	1.02
3191.00	3.60	340.90	3183.38	194.37 N	30.59 W	195.32	0.51
3283.00	3.43	328.33	3275.21	199.44 N	32.98 W	200.47	0.86
3375.00	4.18	344.29	3367.01	205.01 N	35.33 W	206.12	1.40
3466.00	4.97	341.78	3457.72	211.95 N	37.46 W	213.12	0.90
3558.00	4.86	345.55	3549.38	219.51 N	39.68 W	220.76	0.37
3650.00	4.68	346.63	3641.06	226.93 N	41.52 W	228.24	0.22
3741.00	4.41	349.83	3731.77	233.99 N	42.99 W	235.34	0.41
3833.00	3.15	335.59	3823.57	239.77 N	44.66 W	241.18	1.70
3925.00	4.27	329.64	3915.38	245.03 N	47.44 W	246.53	1.29
4016.00	4.05	337.86	4006.14	250.93 N	50.36 W	252.53	0.70

4010.00	4.99	337.30	4000.14	200.00 N	00.00 W	200.00	0.00
4108.00	3.77	340.20	4097.93	256.78 N	52.61 W	258.46	0.35
4200.00	3.85	322.56	4189.73	262.08 N	55.51 W	263.86	1.27
4291.00	5.78	328.76	4280.40	268.42 N	59.75 W	270.35	2.19
4382.00	3.04	347.45	4371.13	274.70 N	62.65 W	276.72	3.36
4477.00	4.17	350.13	4465.94	280.56 N	63.79 W	282.62	1.20
4572.00	3.53	346.81	4560.72	286.81 N	65.05 W	288.91	0.71
4667.00	4.39	349.69	4655.50	293.24 N	66.37 W	295.37	0.93
4762.00	4.90	348.30	4750.18	300.79 N	67.84 W	302.97	0.55
4857.00	4.80	5.92	4844.85	308.71 N	68.25 W	310.91	1.57
4952.00	4.30	9.85	4939.55	316.18 N	67.23 W	318.33	0.62
5047.00	3.77	6.51	5034.31	322.79 N	66.27 W	324.90	0.61
5111.00	4.30	5.25	5098.15	327.27 N	65.81 W	329.37	0.84
5142.00	9.89	0.00	5128.91	331.09 N	65.71 W	333.18	18.13
5174.00	14.64	349.34	5160.17	337.82 N	66.45 W	339.93	16.38
5206.00	18.04	353.11	5190.87	346.71 N	67.80 W	348.87	11.12
5237.00	18.44	353.20	5220.32	356.35 N	68.95 W	358.54	1.29
5269.00	22.74	352.69	5250.27	367.51 N	70.34 W	369.74	13.45
5301.00	29.61	353.21	5278.97	381.51 N	72.06 W	383.80	21.48
5332.00	35.70	353.14	5305.05	398.11 N	74.05 W	400.46	19.65
5364.00	38.76	352.70	5330.53	417.33 N	76.44 W	419.74	9.60
5396.00	39.43	352.95	5355.36	437.35 N	78.96 W	439.84	2.15
5427.00	39.26	352.54	5379.34	456.84 N	81.44 W	459.41	1.00
5459.00	39.15	352.85	5404.14	476.91 N	84.01 W	479.55	0.70
5490.00	39.50	352.42	5428.12	496.39 N	86.53 W	499.11	1.43
5522.00	39.26	352.42	5452.85	516.51 N	89.21 W	519.31	0.75
5554.00	41.77	350.59	5477.18	537.07 N	92.29 W	539.96	8.68
5585.00	44.66	348.31	5499.77	557.93 N	96.19 W	560.95	10.59
5617.00	47.92	348.31	5521.88	580.58 N	100.87 W	583.75	10.19
5649.00	51.63	353.14	5542.55	604.68 N	104.78 W	607.97	16.34
5680.00	54.55	351.83	5561.16	629.25 N	108.03 W	632.64	10.01
5712.00	58.72	350.24	5578.76	655.64 N	112.20 W	659.16	13.68
5744.00	62.36	349.32	5594.49	683.05 N	117.15 W	686.73	11.65
5775.00	63.96	348.98	5608.49	710.22 N	122.35 W	714.06	5.25
5807.00	66.15	348.28	5621.99	738.66 N	128.07 W	742.68	7.13
5839.00	69.62	347.71	5634.03	767.65 N	134.24 W	771.87	10.97
5870.00	72.56	348.70	5644.08	796.36 N	140.23 W	800.77	9.95
5902.00	74.73	347.68	5653.09	826.41 N	146.52 W	831.02	7.44
5934.00	76.46	347.38	5661.05	856.67 N	153.21 W	861.50	5.48
5965.00	79.21	348.09	5667.58	886.28 N	159.65 W	891.31	9.15
5997.00	80.44	347.11	5673.23	917.04 N	166.41 W	922.29	4.88
6029.00	84.13	347.15	5677.53	947.95 N	173.47 W	953.43	11.53
6049.00	87.94	347.56	5678.91	967.42 N	177.84 W	973.03	19.16
6119.00	90.99	349.23	5679.56	1035.97 N	191.92 W	1042.04	4.97
6214.00	89.85	349.56	5678.87	1129.35 N	209.40 W	1135.97	1.25
6309.00	89.14	352.80	5679.70	1223.20 N	223.96 W	1230.28	3.49
6404.00	88.92	354.59	5681.31	1317.61 N	234.40 W	1324.99	1.90
6498.00	90.32	357.05	5681.94	1411.35 N	241.25 W	1418.91	3.01
6593.00	89.74	0.43	5681.89	1506.31 N	243.34 W	1513.89	3.61
6688.00	89.77	2.93	5682.29	1601.26 N	240.55 W	1608.68	2.63
6783.00	88.80	2.96	5683.48	1696.13 N	235.67 W	1703.32	1.02
6878.00	88.06	2.52	5686.08	1790.99 N	231.13 W	1797.96	0.91
6973.00	89.18	1.56	5688.37	1885.90 N	227.75 W	1892.70	1.55
7068.00	89.14	1.87	5689.76	1980.84 N	224.91 W	1987.49	0.33
7163.00	88.01	1.11	5692.12	2075.78 N	222.44 W	2082.28	1.43
7258.00	89.18	359.89	5694.45	2170.74 N	221.61 W	2177.16	1.78
7352.00	90.59	359.22	5694.64	2264.74 N	222.34 W	2271.12	1.66
7447.00	88.81	357.02	5695.14	2359.68 N	225.46 W	2366.11	2.98
7542.00	90.77	0.72	5695.49	2454.63 N	227.33 W	2461.07	4.41
7637.00	90.52	359.37	5694.42	2549.63 N	227.25 W	2556.00	1.45
7728.00	90.20	358.99	5693.85	2640.62 N	228.56 W	2646.98	0.55
7819.00	90.65	358.88	5693.17	2731.60 N	230.25 W	2737.97	0.51
7911.00	88.89	358.91	5693.54	2823.58 N	232.02 W	2829.95	1.91
8002.00	86.36	358.99	5697.31	2914.47 N	233.69 W	2920.85	2.78
8093.00	87.38	0.31	5702.28	3005.33 N	234.24 W	3011.68	1.83
8185.00	87.63	1.19	5706.29	3097.24 N	233.04 W	3103.48	0.99
8216.00	86.93	0.35	5707.76	3128.20 N	232.62 W	3134.41	3.52
8246.00	87.35	0.69	5709.25	3158.16 N	232.35 W	3164.35	1.80
8277.00	87.60	1.02	5710.62	3189.13 N	231.89 W	3195.28	1.33
8307.00	89.20	1.72	5711.46	3219.11 N	231.17 W	3225.21	5.82
8338.00	89.06	0.62	5711.93	3250.10 N	230.54 W	3256.16	3.58
8368.00	90.49	359.62	5712.05	3280.09 N	230.48 W	3286.14	5.82

8399.00	92.02	359.07	5711.37	3311.08 N	230.83 W	3317.12	5.24
8429.00	92.19	358.57	5710.27	3341.06 N	231.45 W	3347.10	1.76
8460.00	92.41	359.07	5709.02	3372.02 N	232.09 W	3378.07	1.76
8490.00	92.56	358.78	5707.72	3401.99 N	232.65 W	3408.04	1.09
8521.00	92.85	358.61	5706.26	3432.95 N	233.35 W	3439.00	1.08
8551.00	92.20	359.83	5704.94	3462.92 N	233.76 W	3468.96	4.60
8582.00	91.15	1.82	5704.03	3493.90 N	233.32 W	3499.91	7.26
8613.00	90.89	2.82	5703.48	3524.87 N	232.06 W	3530.82	3.33
8643.00	90.68	2.58	5703.07	3554.83 N	230.65 W	3560.71	1.06
8673.00	91.22	2.98	5702.57	3584.79 N	229.19 W	3590.61	2.24
8704.00	91.87	3.13	5701.73	3615.74 N	227.54 W	3621.47	2.15
8765.00	90.77	4.78	5700.33	3676.57 N	223.34 W	3682.13	3.25
8826.00	88.92	2.12	5700.49	3737.45 N	219.66 W	3742.84	5.31
8886.00	89.51	0.40	5701.32	3797.43 N	218.35 W	3802.74	3.03
8947.00	91.22	0.09	5700.93	3858.43 N	218.08 W	3863.69	2.85
9008.00	91.60	0.84	5699.43	3919.40 N	217.59 W	3924.61	1.38
9100.00	90.55	359.55	5697.70	4011.38 N	217.28 W	4016.52	1.81
9191.00	89.64	357.93	5697.55	4102.36 N	219.28 W	4107.51	2.04
9283.00	88.70	357.89	5698.88	4194.29 N	222.63 W	4199.50	1.02
9374.00	89.18	358.98	5700.57	4285.24 N	225.12 W	4290.48	1.31
9466.00	89.88	359.14	5701.32	4377.22 N	226.63 W	4382.46	0.78
9526.00	86.90	357.74	5703.01	4437.17 N	228.26 W	4442.43	5.49
9556.00	85.59	355.68	5704.97	4467.05 N	229.98 W	4472.35	8.12
9647.00	91.57	354.93	5707.22	4557.67 N	237.42 W	4563.18	6.62
9709.00	89.35	355.93	5706.73	4619.47 N	242.36 W	4625.11	3.93
9770.00	90.35	356.21	5706.89	4680.33 N	246.54 W	4686.08	1.70
9831.00	92.17	356.26	5705.55	4741.18 N	250.55 W	4747.03	2.98
9923.00	90.95	357.53	5703.04	4833.00 N	255.53 W	4838.98	1.91
10014.00	92.83	358.24	5700.04	4923.89 N	258.88 W	4929.92	2.21
10105.00	92.50	357.32	5695.81	5014.72 N	262.40 W	5020.82	1.07
10197.00	92.87	354.75	5691.50	5106.39 N	268.76 W	5112.66	2.82
10288.00	91.08	354.20	5688.36	5196.91 N	277.51 W	5203.43	2.06
10380.00	90.37	356.06	5687.20	5288.57 N	285.32 W	5295.30	2.16
10471.00	90.83	359.45	5686.24	5379.48 N	288.89 W	5386.28	3.76
10562.00	90.49	358.72	5685.20	5470.46 N	290.34 W	5477.26	0.88
10654.00	89.94	357.69	5684.85	5562.41 N	293.22 W	5569.26	1.27
10745.00	89.61	357.22	5685.21	5653.32 N	297.26 W	5660.25	0.63
10837.00	91.39	359.85	5684.41	5745.28 N	299.62 W	5752.23	3.45
10929.00	90.99	358.94	5682.50	5837.25 N	300.59 W	5844.19	1.08
11020.00	90.89	358.56	5681.00	5928.22 N	302.57 W	5935.16	0.43
11112.00	90.62	358.90	5679.79	6020.19 N	304.61 W	6027.15	0.47
11204.00	89.66	357.84	5679.56	6112.15 N	307.23 W	6119.14	1.55
11295.00	89.85	359.80	5679.95	6203.12 N	309.10 W	6210.13	2.16
11387.00	90.69	357.67	5679.52	6295.09 N	311.13 W	6302.12	2.49
11479.00	91.85	1.10	5677.48	6387.05 N	312.12 W	6394.05	3.93
11570.00	91.06	1.98	5675.17	6477.98 N	309.68 W	6484.85	1.30
11662.00	90.80	1.70	5673.68	6569.92 N	306.72 W	6576.63	0.42
11754.00	88.71	0.17	5674.07	6661.90 N	305.22 W	6668.50	2.82
11845.00	88.77	358.77	5676.07	6752.88 N	306.06 W	6759.44	1.54
11937.00	88.55	1.02	5678.22	6844.84 N	306.23 W	6851.36	2.46
12031.00	89.35	3.06	5679.95	6938.76 N	302.89 W	6945.11	2.33
12126.00	89.14	3.17	5681.20	7033.61 N	297.72 W	7039.72	0.25
12221.00	88.68	3.45	5683.01	7128.44 N	292.24 W	7134.29	0.57
12316.00	89.80	1.56	5684.27	7223.33 N	288.09 W	7228.99	2.31
12411.00	88.89	357.98	5685.35	7318.31 N	288.47 W	7323.92	3.89
12506.00	89.29	357.61	5686.86	7413.23 N	292.12 W	7418.91	0.57
12601.00	90.59	357.75	5686.96	7508.15 N	295.97 W	7513.90	1.38
12696.00	89.52	359.48	5686.87	7603.11 N	298.27 W	7608.89	2.14
12791.00	90.59	2.08	5686.78	7698.10 N	296.97 W	7703.77	2.96
12886.00	90.97	1.03	5685.48	7793.05 N	294.39 W	7798.58	1.18
12981.00	90.52	359.99	5684.25	7888.04 N	293.55 W	7893.48	1.19
13076.00	90.34	359.91	5683.54	7983.03 N	293.63 W	7988.42	0.21
13171.00	89.85	359.15	5683.38	8078.03 N	294.41 W	8083.38	0.95
13220.00	89.85	359.15	5683.51	8127.03 N	295.14 W	8132.37	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 RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 358.00 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.07 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 13220.00 FEET  
IS 8132.38 FEET ALONG 357.92 DEGREES (TRUE)

Tie onto surface at 0' MD  
Final Survey is a projection to bit at TD

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