

## PCGK - Pressure Case Gamma

**1 : 600 / 1 : 240**

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200	300		
<b>Date run completed</b>	17-Feb-14	18-Feb-14	22-Feb-14		
<b>Rig Bit Number</b>	2	3	4		
<b>Bit Size (in)</b>	8.750	8.750	6.125		
<b>Tool Nominal OD (in)</b>	6.860	6.860	4.750		
<b>Log Start Depth (TVD, ft)</b>	647.94	5,947.14	6,645.08		
<b>Log End Depth (TVD, ft)</b>	5,947.14	6,645.08	6,655.59		
<b>Drill or Wipe</b>	Drill	Drill	Drill		
<b>Drill/Wipe Start Date and Time</b>	16-Feb-14 10:30	17-Feb-14 16:00	19-Feb-14 14:27		
<b>Drill/Wipe End Date and Time</b>	17-Feb-14 09:10	18-Feb-14 03:43	21-Feb-14 23:32		
<b>Min Inc (deg) @ Depth (TVD, ft)</b>	0.20 @ 5,514.22	1.38 @ 5,986.13	86.52 @ 6,664.22		
<b>Max Inc (deg) @ Depth (TVD, ft)</b>	9.87 @ 3,718.60	84.76 @ 6,641.12	92.56 @ 6,654.83		
<b>Bit TFA(in2) / Bit Type</b>	0.91 / PDC	1.74 / PDC	0.65 / PDC		
<b>Flow Rate (gpm)</b>	600.00	596.19	312.28		
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	NA /	0.0 / 0.0	NA / 0.0		
<b>Fluid Type</b>	Native/Spud Mud	Fresh Water Gel	Fresh Water Gel		
<b>Density (ppg) / Viscosity (spqt)</b>	8.65 / 29.00	9.40 / 38.00	9.35 / 36.00		
<b>Filtrate CL (ppm)</b>	1,600.00	2,000.00	2,700.00		
<b>pH / Fluid Loss (mptm)</b>	10.30 / 26	10.10 / 8	8.50 / 8		
<b>PV (cP) / YP (lbf2)</b>	2 / 2.00	10 / 10.00	6 / 4.00		
<b>% Solids / % Sand</b>	2.10 / 0.60	5.90 / 0.25	3.80 / 0.05		
<b>% Oil / Oil:Water Ratio</b>	NA / NA	NA / NA	NA / NA		
<b>Rm @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	NA @ NA		
<b>Rmf @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	NA @ NA		
<b>Rmc @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	NA @ NA		
<b>Max Tool Temp (degF) / S</b>	107.50 / PCM	151.00 / PCM	210.10 / PCM		

Max Tool Temp (degF) / Source	137.50 / PCM	154.30 / PCM	213.40 / PCM		
Rm @ Max Tool Temp (degF)	NA @ 137.50	NA @ 154.30	NA @ 213.40		
Lead MWD Engineer	Kyle Wass	Kyle Wass	Kyle Wass		
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	11342293	11342293	12177826		
Insert Serial Number	11680794	11680794	11680794		
Date and Time Initialized	15-Feb-14 21:24	15-Feb-14 21:24	18-Feb-14 18:28		
Date and Time Read	18-Feb-14 08:44	18-Feb-14 08:43	22-Feb-14 08:57		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	56.00	54.00	65.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11342293	11342293	12177826		
Sonde Serial Number	12177556	12177556	12177556		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	73.78	5.86	205.50		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	49.71	47.32	67.58		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11342293	11342293	12177826		
Insert/Sonde Serial Number	11293391	11293391	11293391		

## REMARKS

1. All depths are calibrated to driller's pipe tally and are measured 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" model for water based fluids and the "Brigham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise 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 Resolution: 0.5 ft  
Interval Distance: 1.2 ft

6. Insite Version V8.0.10

## WARRANTY

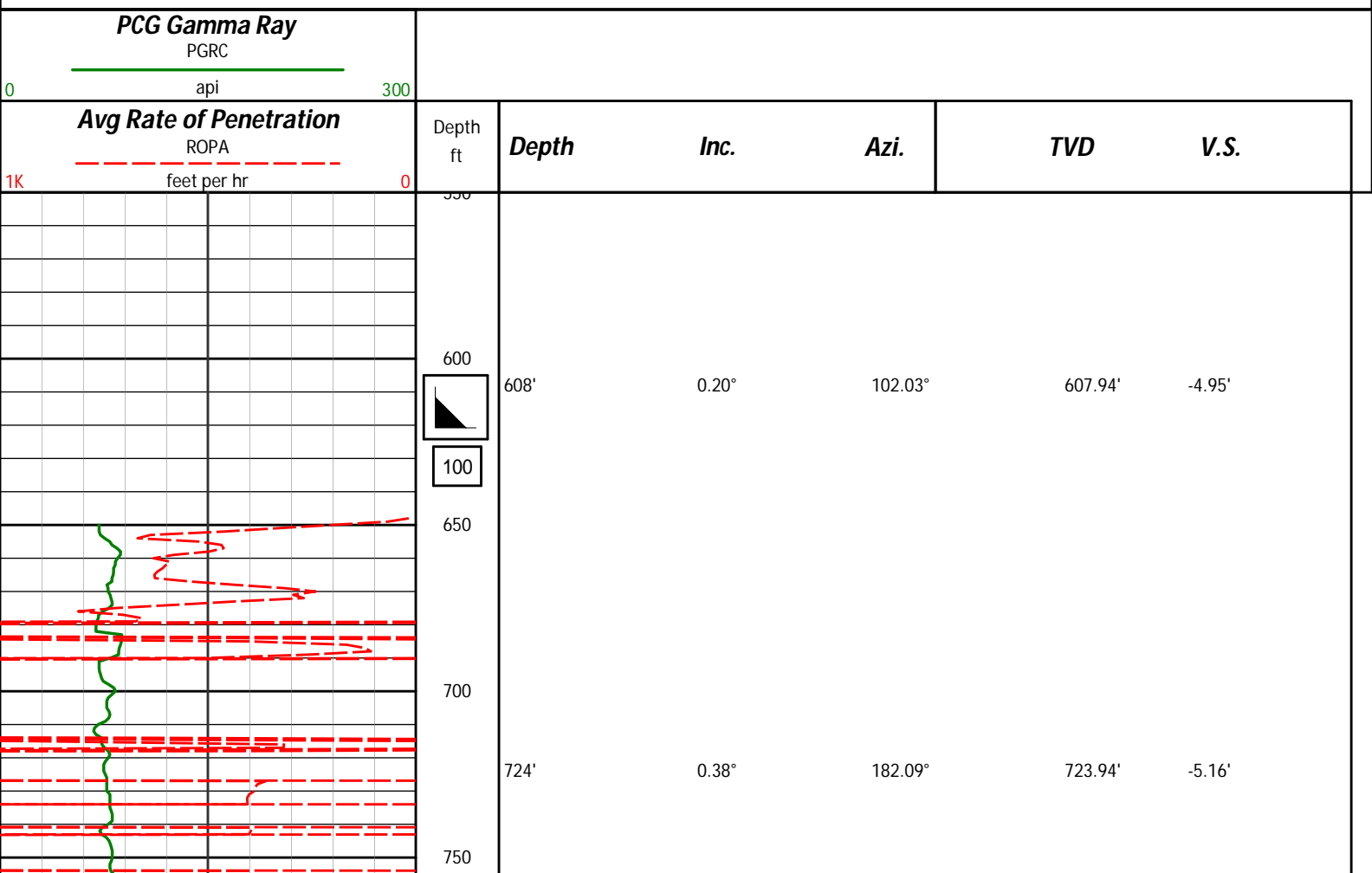
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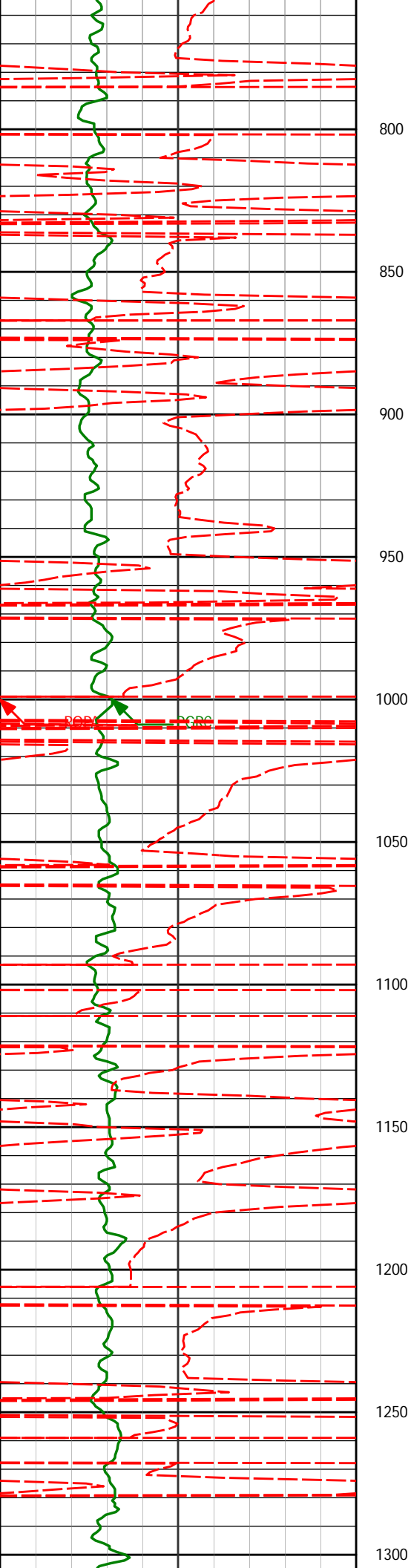
# HALLIBURTON

## Sperry Drilling Services

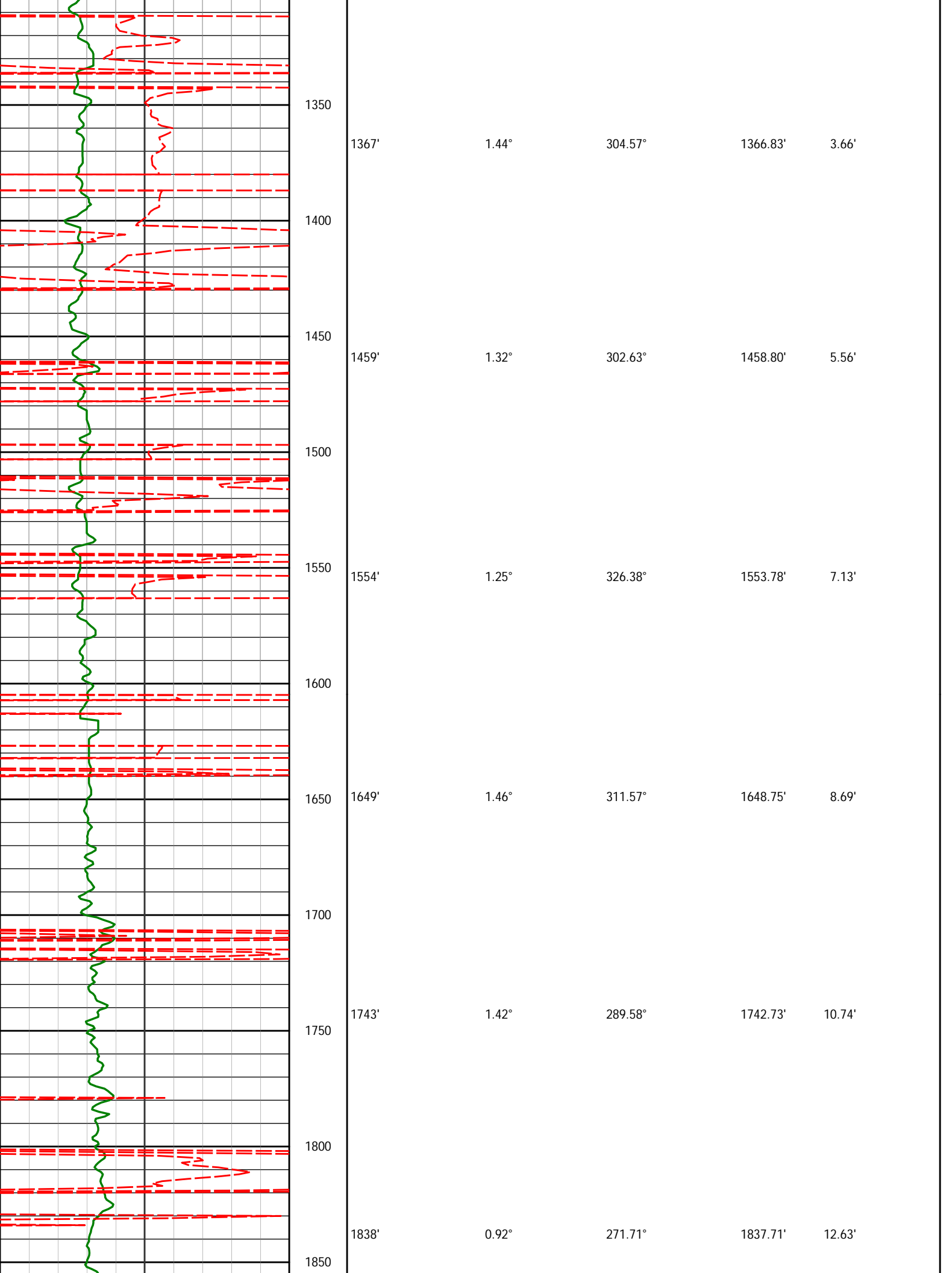
### TVD Correlation Log 1:600

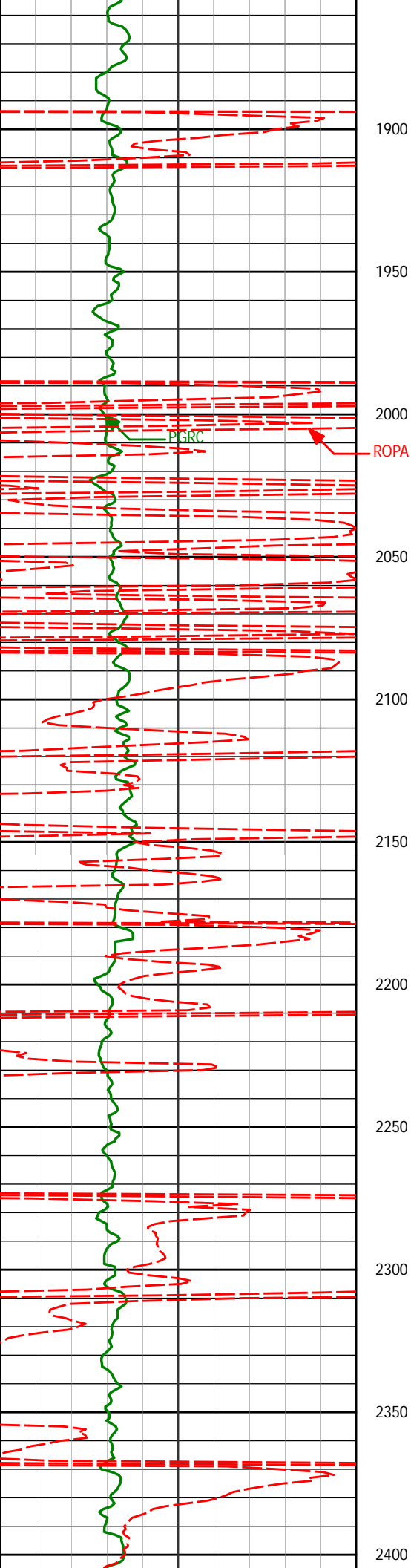
Noble Energy  
Wells Ranch AA35-69-1AHNB  
H&P 321  
Sec. 36-T6N-R63W



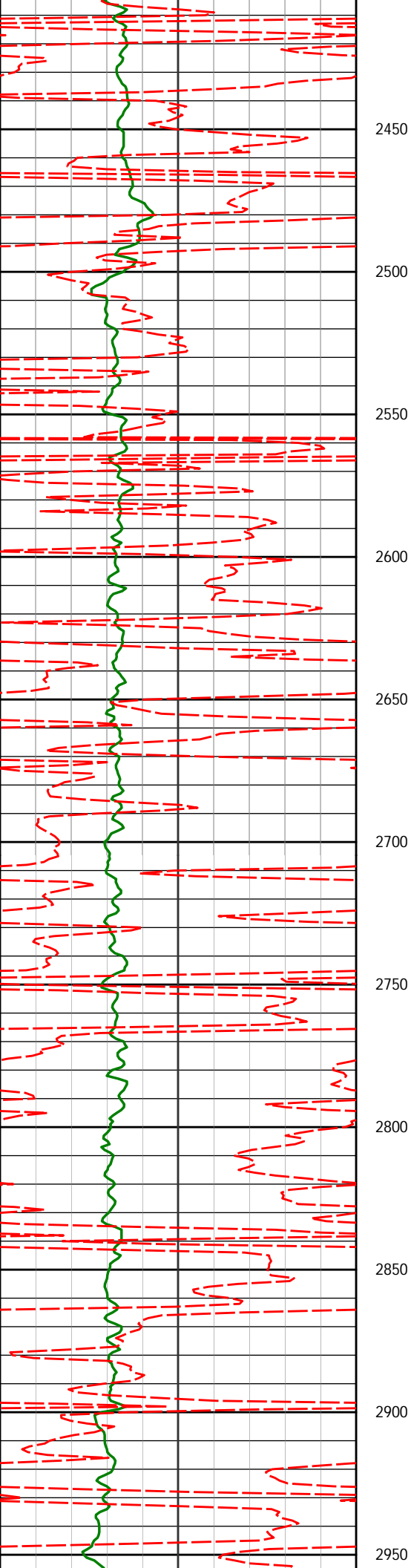


816'	0.25°	134.62°	815.94'	-5.31'
909'	0.83°	304.55°	908.93'	-4.89'
1000'	1.13°	309.90°	999.92'	-3.61'
1092'	1.64°	290.73°	1091.89'	-1.64'
1183'	0.93°	289.64°	1182.87'	0.31'
1275'	1.14°	298.43°	1274.85'	1.85'

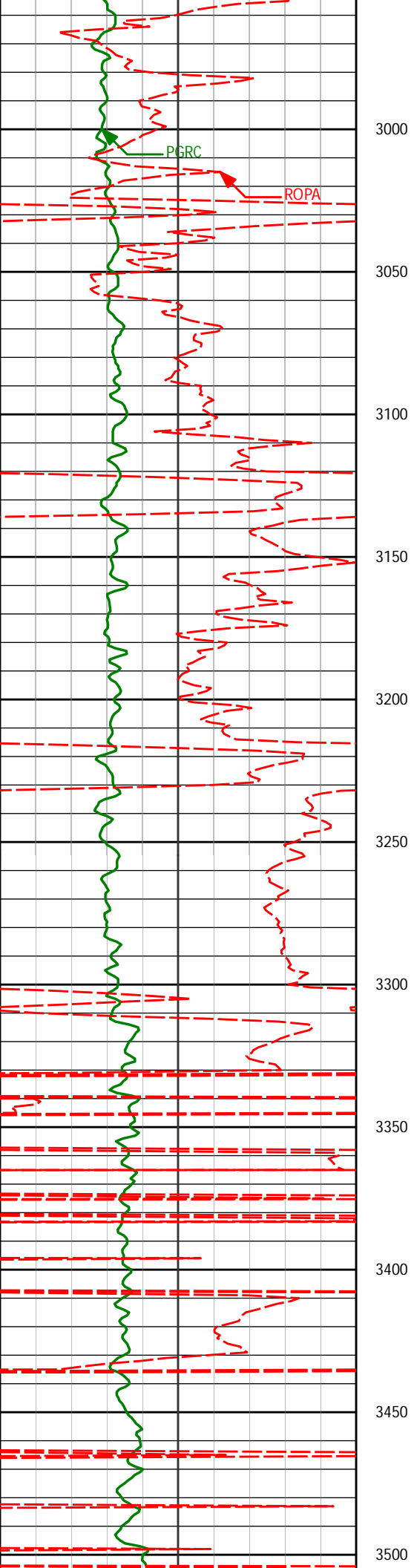




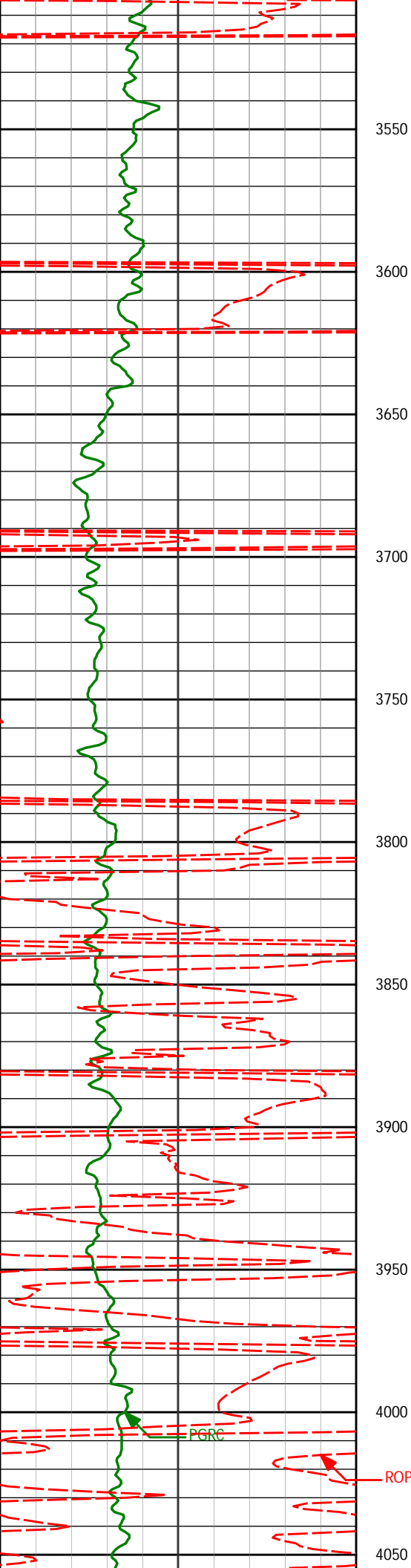
1900				
1933'	0.38°	21.81°	1932.70'	13.29'
1950				
2000				
2027'	0.56°	118.97°	2026.70'	12.77'
2050				
2100				
2120'	1.56°	346.42°	2119.69'	12.72'
2150				
2200				
2215'	3.61°	336.41°	2214.59'	14.42'
2250				
2300				
2310'	4.83°	349.67°	2309.33'	16.66'
2350				
2400				



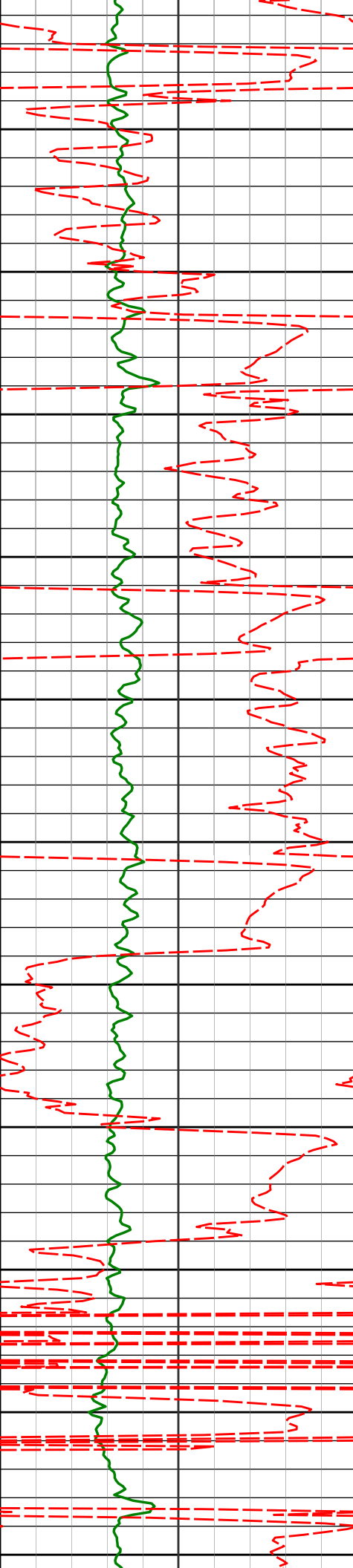
2403	7.93°	330.10°	2403.73'	19.03'
2500'	8.37°	348.64°	2497.77'	22.17'
2595'	8.54°	349.98°	2591.73'	25.44'
2689'	7.56°	346.62°	2684.81'	28.73'
2784'	7.55°	344.58°	2778.98'	32.43'
2879'	8.13°	348.40°	2873.10'	36.06'



2974'	8.88°	347.58°	2967.05'	39.67'
3068'	9.07°	345.48°	3059.90'	43.79'
3163'	7.31°	343.12°	3153.93'	48.07'
3258'	7.25°	343.71°	3248.16'	52.07'
3353'	7.37°	341.14°	3342.39'	56.29'
3448'	7.52°	343.37°	3436.59'	60.62'



3543'	7.31°	342.79°	3530.79'	64.77'
3638'	8.82°	354.09°	3624.86'	67.95'
3733'	9.87°	353.50°	3718.60'	70.38'
3828'	9.56°	350.80°	3812.23'	73.35'
3923'	9.18°	347.52°	3905.97'	77.00'
4018'	7.12°	345.12°	4000.00'	80.80'



4100

4112'

6.64°

348.51°

4093.33'

83.92'

4150

4200

4207'

5.06°

353.77°

4187.83'

85.94'

4250

4300

4302'

3.82°

346.34°

4282.54'

87.50'

4350

4400

4396'

2.17°

347.26°

4376.41'

88.87'

4450

4500

4491'

0.76°

15.47°

4471.38'

89.21'

4550

4600

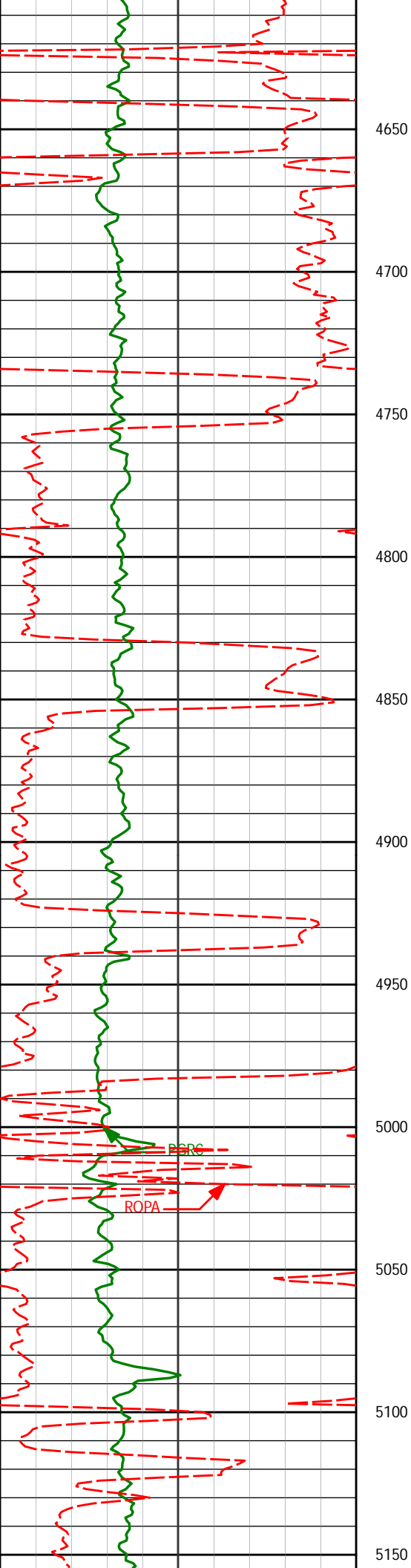
4586'

1.68°

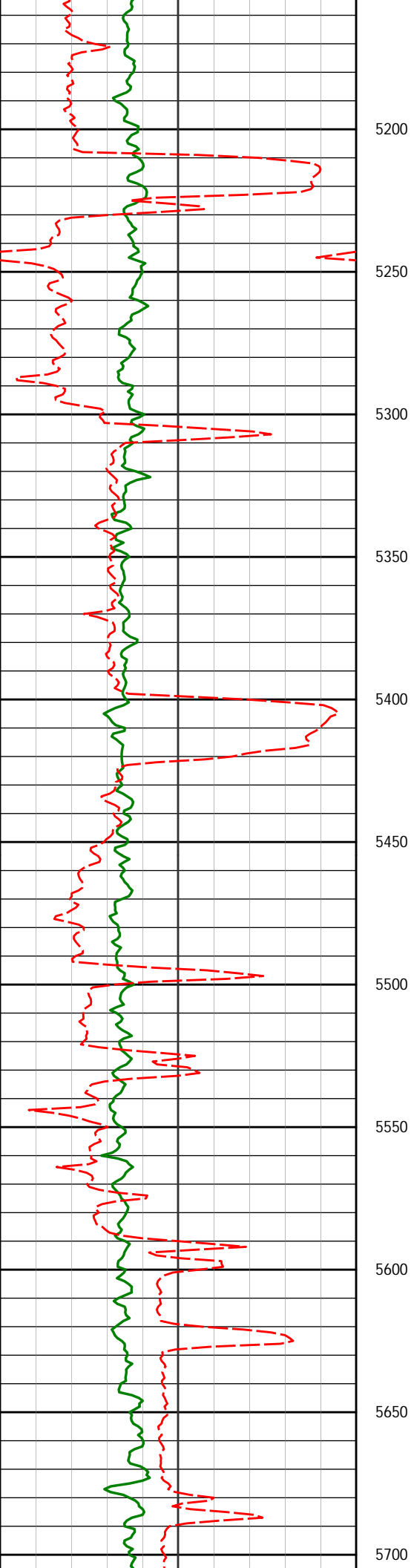
32.23°

4566.36'

88.39'



4681'	1.02°	12.20°	4661.33'	87.57'
4775'	0.80°	356.42°	4755.32'	87.51'
4870'	0.57°	257.10°	4850.31'	88.04'
4965'	1.11°	210.84°	4945.30'	88.93'
5060'	1.05°	177.30°	5040.29'	89.27'



5200

5250

5300

5350

5400

5450

5500

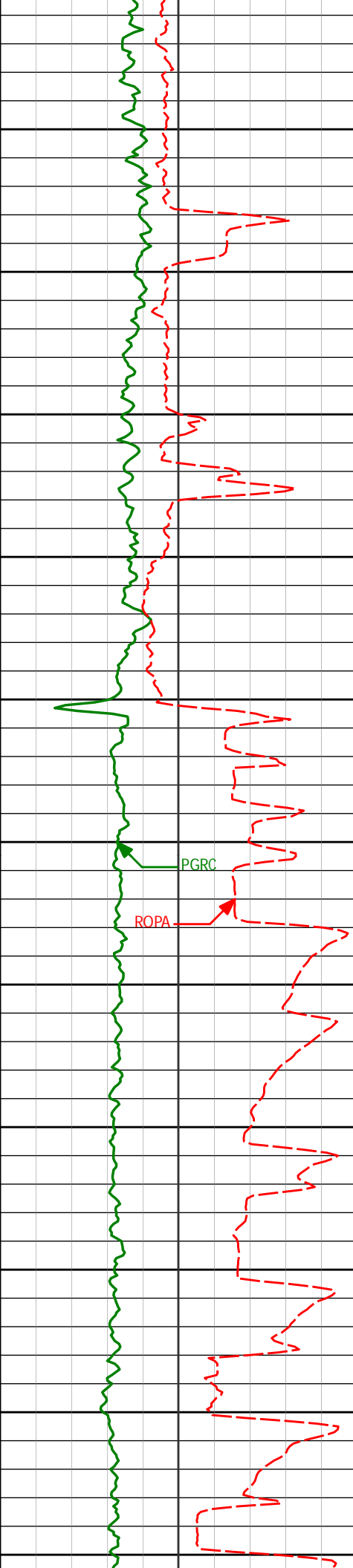
5550

5600

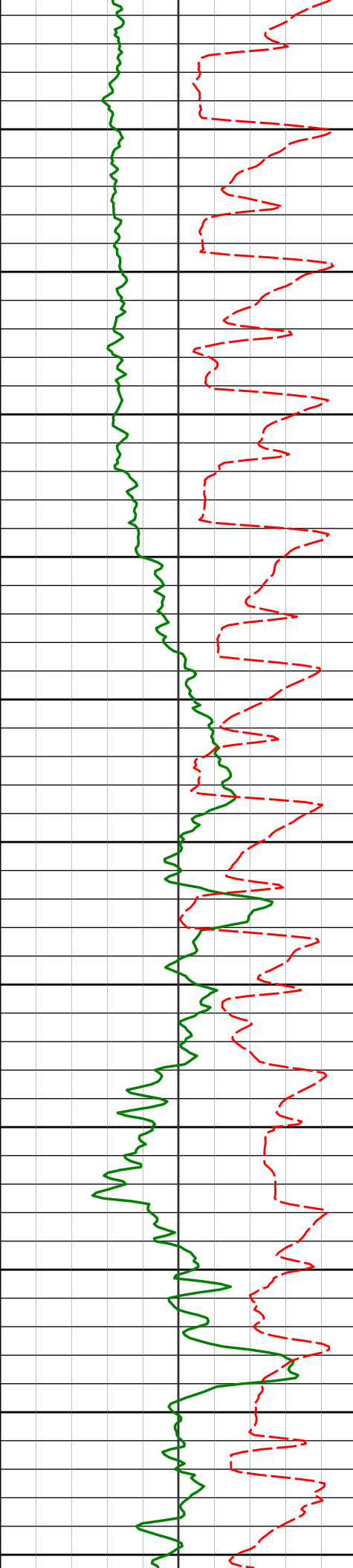
5650

5700

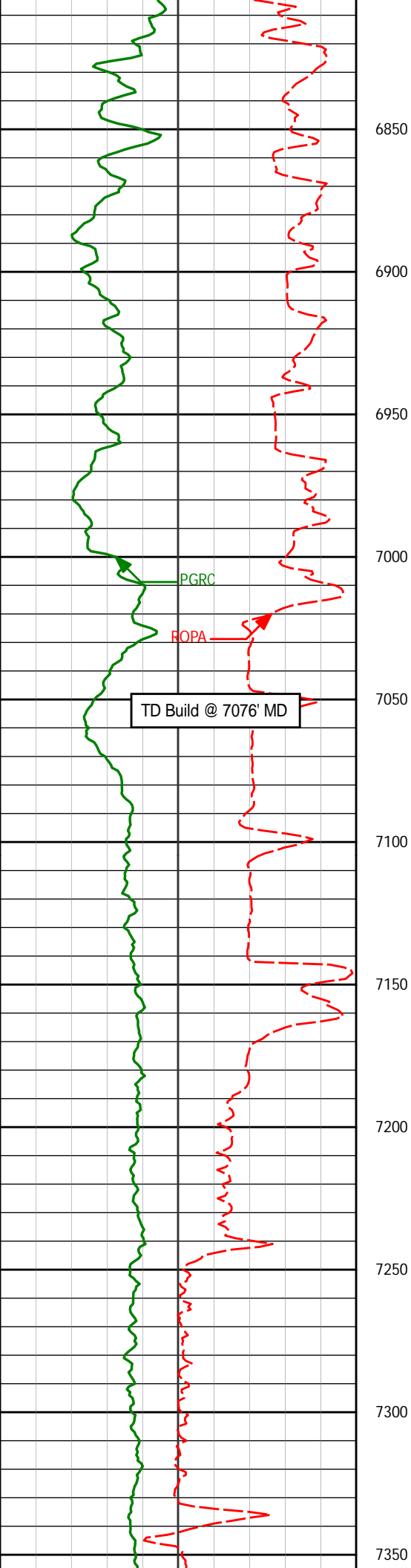
5135	0.08	107.43	5135.28	88.64
5250'	1.21°	140.23°	5230.27'	87.42'
5344'	1.63°	128.23°	5324.24'	85.66'
5439'	0.50°	163.97°	5419.22'	84.42'
5534'	0.20°	153.46°	5514.22'	84.21'
5629'	1.08°	124.36°	5609.21'	83.36'



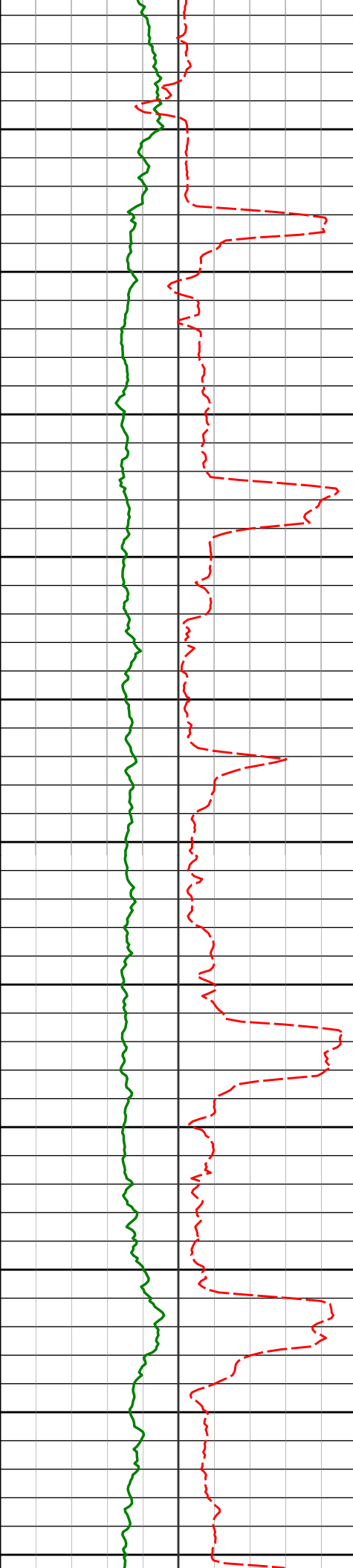
5723'	0.91°	158.42°	5703.20'	82.30'
5750				
5800				
5818'	1.09°	155.78°	5798.18'	81.57'
5850				
5900				
5911'	1.63°	123.08°	5891.16'	80.03'
5950				
5976'	1.46°	110.23°	5956.14'	78.44'
6000				
6006'	1.38°	114.36°	5986.13'	77.74'
6050				
6054'	3.76°	247.26°	6034.10'	78.62'
6100				
6101'	12.10°	258.84°	6080.61'	84.80'
6149'	14.50°	258.97°	6127.32'	95.52'
6200				
6196'	17.75°	262.13°	6172.46'	108.27'
6250				
6244'	20.34°	268.95°	6217.84'	123.79'



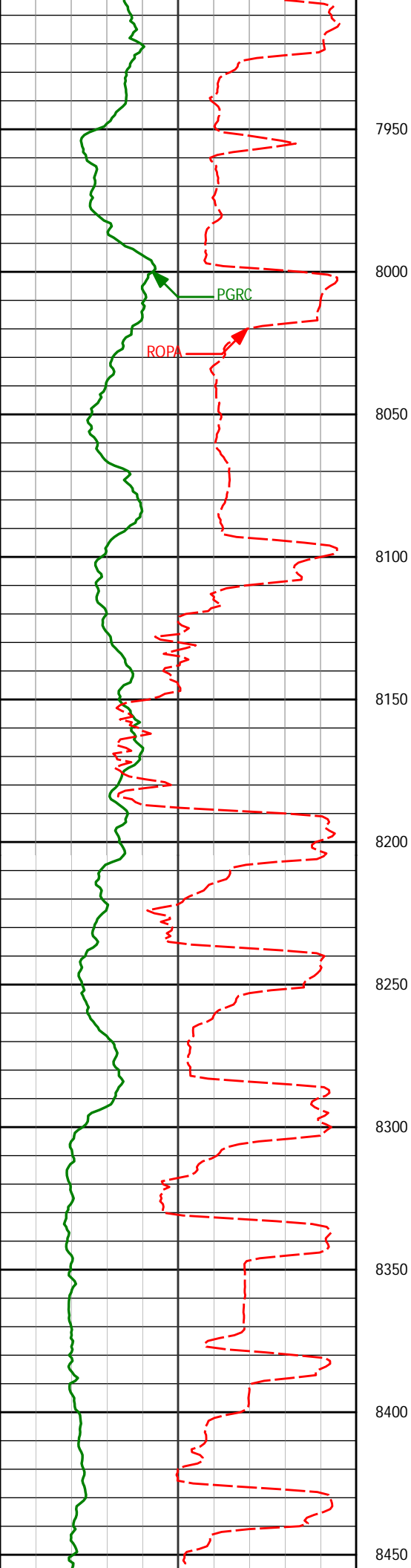
6291'	23.47°	266.13°	6261.44'	141.24'
6300				
6339'	28.03°	269.67°	6304.66'	162.00'
6350				
6385'	31.39°	273.62°	6344.62'	184.78'
6400				
6433'	34.79°	273.97°	6384.82'	210.98'
6450				
6480'	39.09°	273.21°	6422.38'	239.22'
6500				
6528'	44.26°	272.61°	6458.22'	271.12'
6550				
6575'	50.44°	271.77°	6490.05'	305.67'
6600				
6623'	54.24°	271.35°	6519.37'	343.65'
6650				
6670'	56.32°	271.77°	6546.14'	382.27'
6700				
6718'	59.38°	271.22°	6571.68'	422.90'
6750				
6764'	64.80°	268.93°	6593.21'	463.48'
6800				



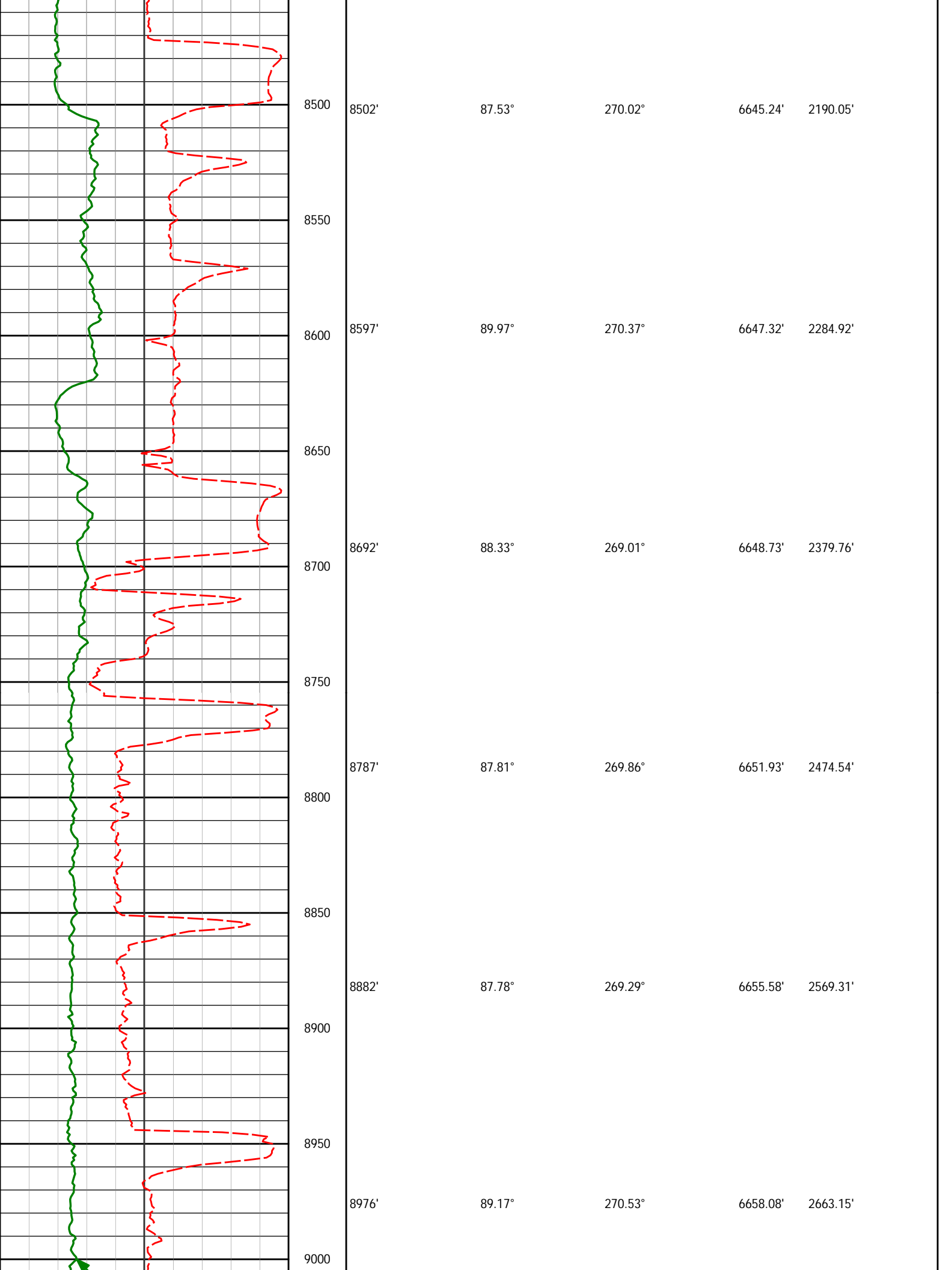
6812'	69.92°	265.73°	6611.68'	507.55'
6859'	75.50°	267.26°	6625.64'	552.13'
6907'	80.68°	268.83°	6635.55'	598.92'
6951'	84.76°	270.56°	6641.12'	642.49'
7034'	87.94°	270.33°	6646.41'	725.23'
7081'	88.06°	270.26°	6648.05'	772.16'
7175'	89.08°	270.24°	6650.39'	866.03'
7270'	89.63°	270.48°	6651.46'	960.94'

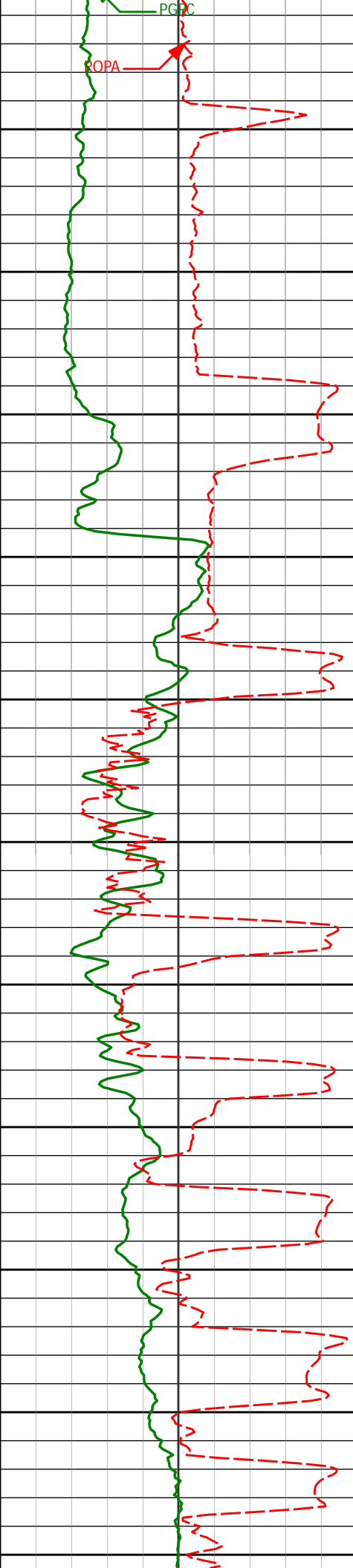


7364'	88.92°	270.30°	6652.65'	1054.84'
7400				
7459'	88.74°	269.31°	6654.59'	1149.69'
7500				
7554'	90.62°	268.70°	6655.12'	1244.47'
7600				
7649'	89.32°	266.27°	6655.17'	1339.04'
7700				
7744'	90.61°	266.67°	6655.23'	1433.45'
7800				
7839'	91.91°	268.57°	6653.14'	1528.02'
7900				

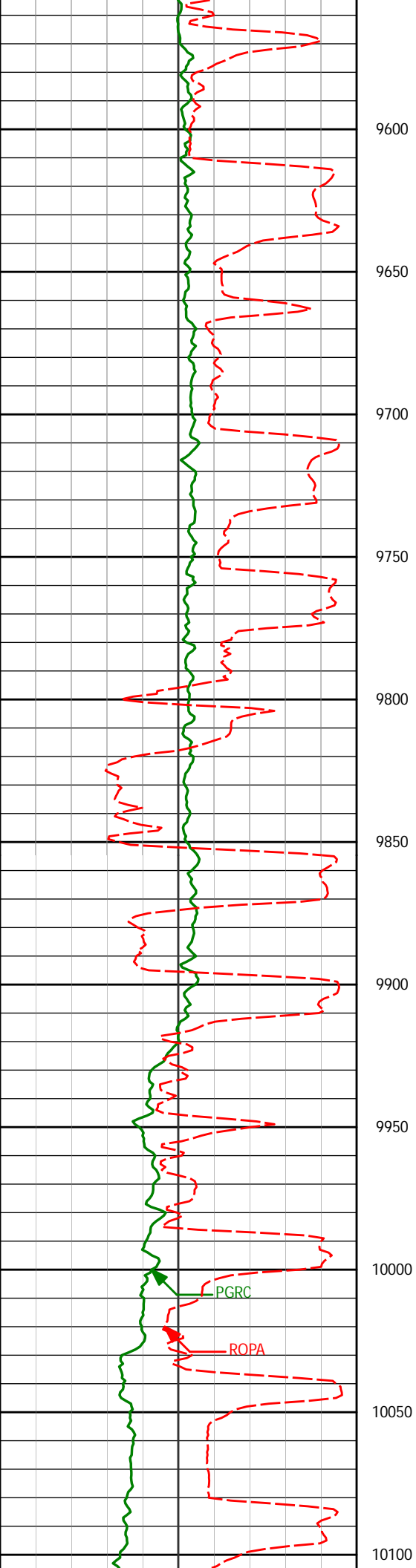


7934'	91.05°	268.17°	6650.69'	1622.70'
7950				
8000				
8029'	90.68°	269.31°	6649.25'	1717.44'
8050				
8100				
8123'	91.45°	270.22°	6647.51'	1811.29'
8150				
8200				
8218'	91.82°	270.60°	6644.79'	1906.17'
8250				
8300				
8313'	90.19°	272.46°	6643.13'	2001.12'
8350				
8400				
8408'	89.85°	273.13°	6643.10'	2096.12'
8450				

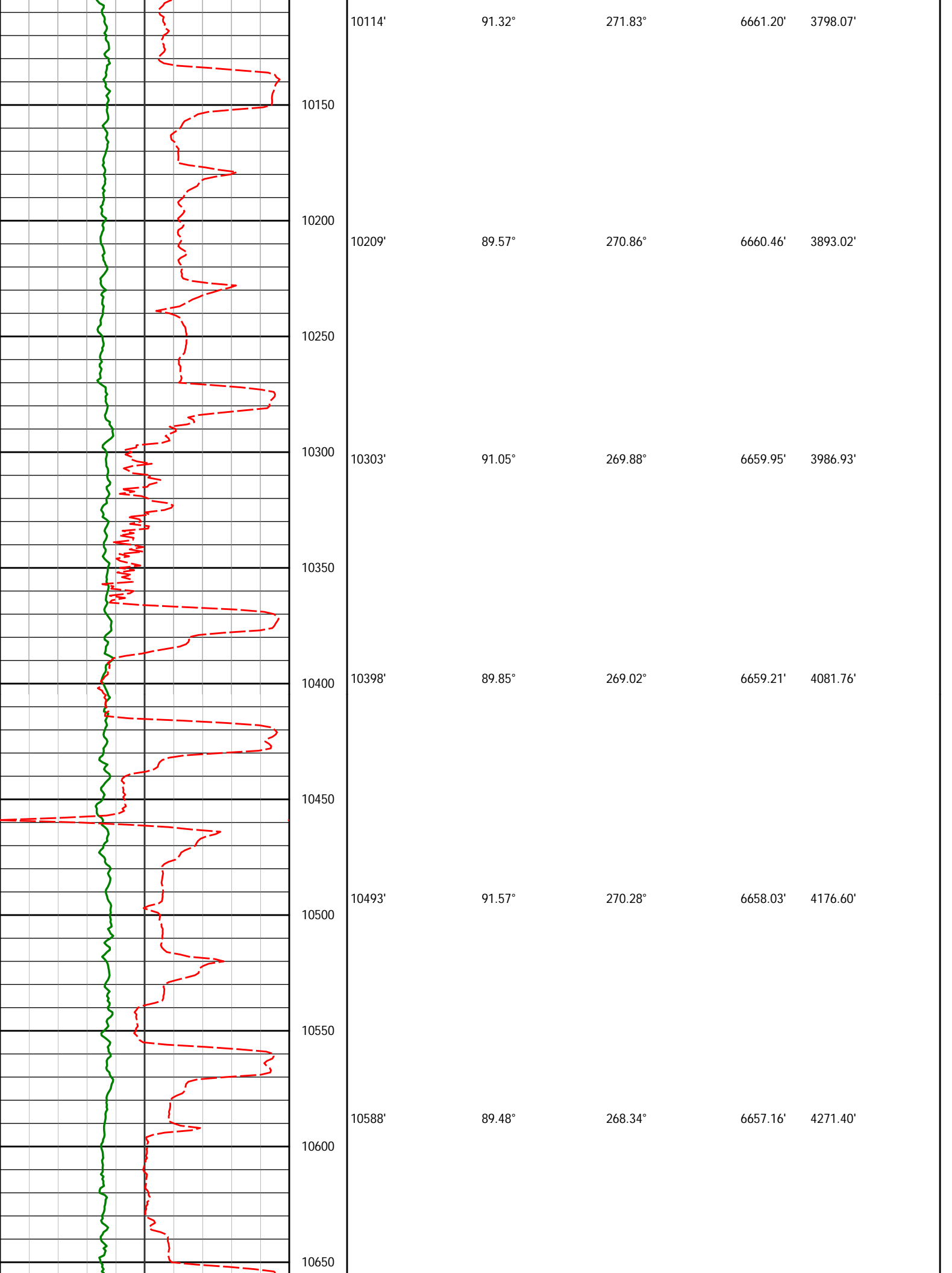


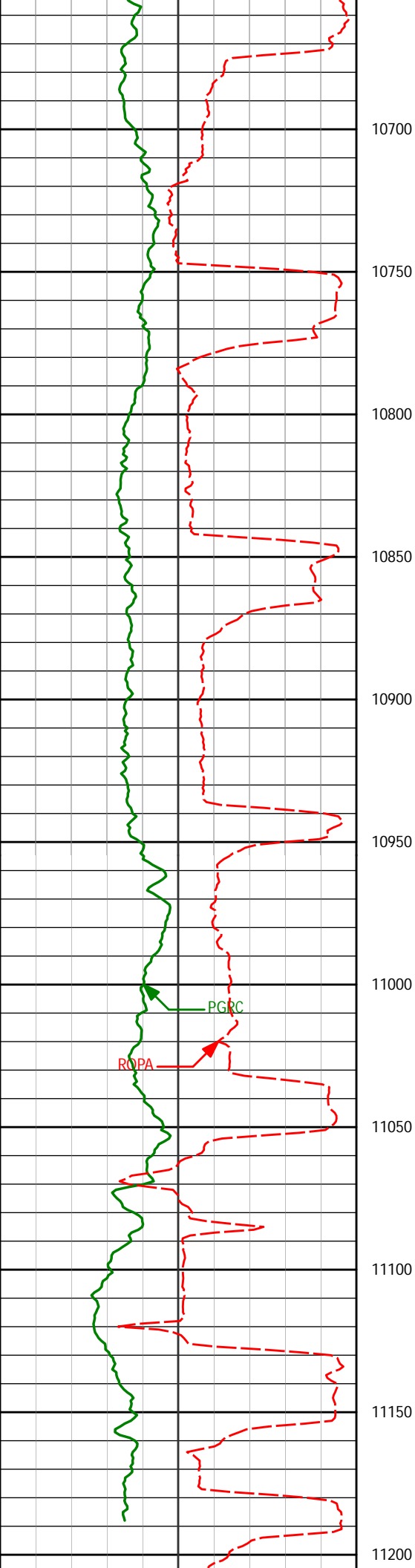


9071'	91.02°	272.17°	6657.93'	2758.11'
9166'	90.12°	269.77°	6656.98'	2853.05'
9261'	87.31°	268.66°	6659.11'	2947.82'
9356'	86.52°	268.78°	6664.22'	3042.43'
9451'	87.32°	266.92°	6669.33'	3136.93'
9545'	90.12°	266.91°	6671.43'	3230.39'

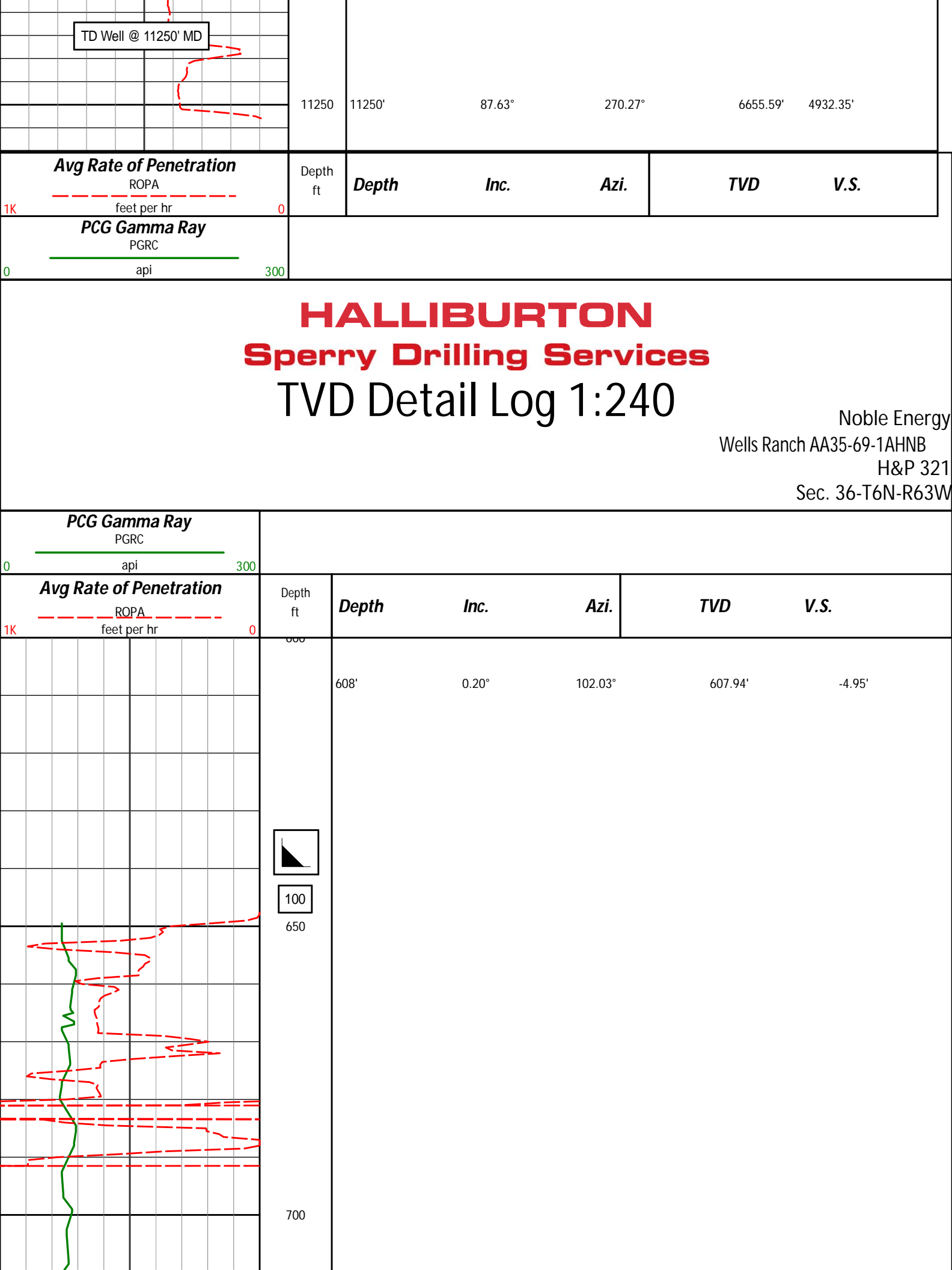


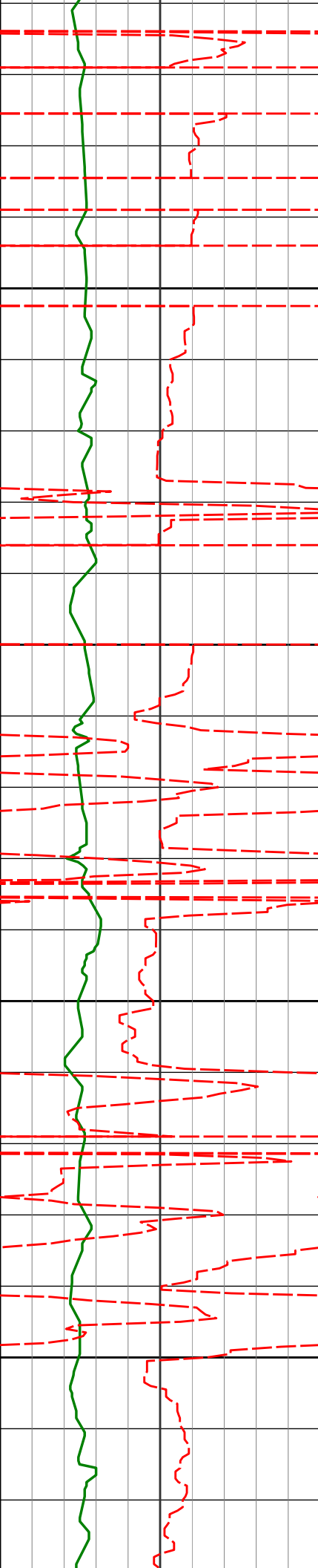
9640'	90.49°	267.76°	6670.92'	3324.95'
9735'	91.05°	269.69°	6669.65'	3419.69'
9830'	90.40°	267.93°	6668.44'	3514.45'
9924'	91.70°	270.41°	6666.72'	3608.23'
10019'	91.82°	271.35°	6663.80'	3703.12'





10683'	90.40°	268.38°	6657.26'	4366.11'
10700				
10750				
10777'	92.56°	270.43°	6654.83'	4459.90'
10800				
10850				
10872'	90.22°	270.25°	6652.53'	4554.77'
10900				
10950				
10967'	90.49°	270.79°	6651.94'	4649.69'
11000				
11050				
11062'	90.34°	270.30°	6651.25'	4744.61'
11100				
11150				
11157'	88.74°	270.29°	6652.01'	4839.51'
11185'	87.63°	270.27°	6652.90'	4867.47'
11200				





724'

0.38°

182.09°

723.94'

-5.16'

750

800

816'

0.25°

134.62°

815.94'

-5.31'

850

900

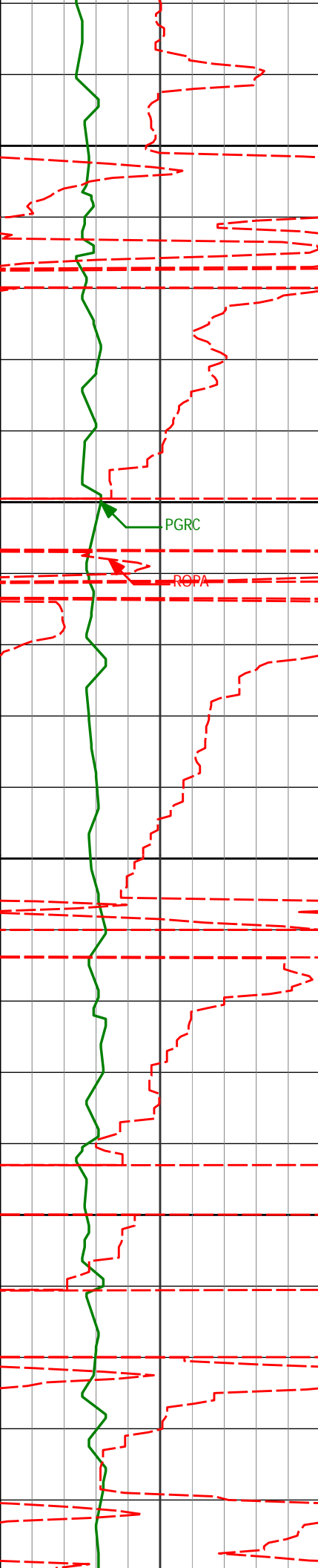
909'

0.83°

304.55°

908.93'

-4.89'



950

1000

1050

1100

1150

1000'

1092'

1.13°

1.64°

309.90°

290.73°

999.92'

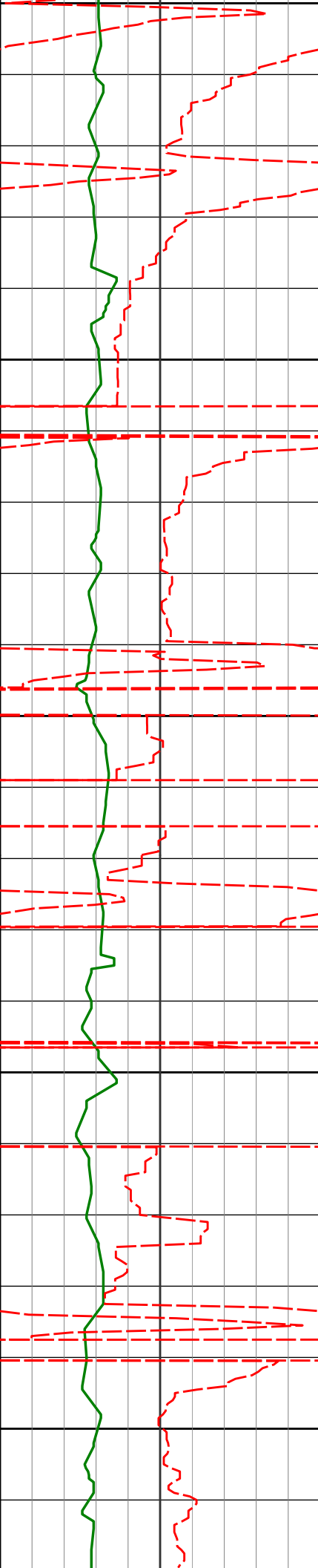
1091.89'

-3.61'

-1.64'

PGRC

ROPA



1150

1183'

0.93°

289.64°

1182.87'

0.31'

1200

1250

1275'

1.14°

298.43°

1274.85'

1.85'

1300

1350

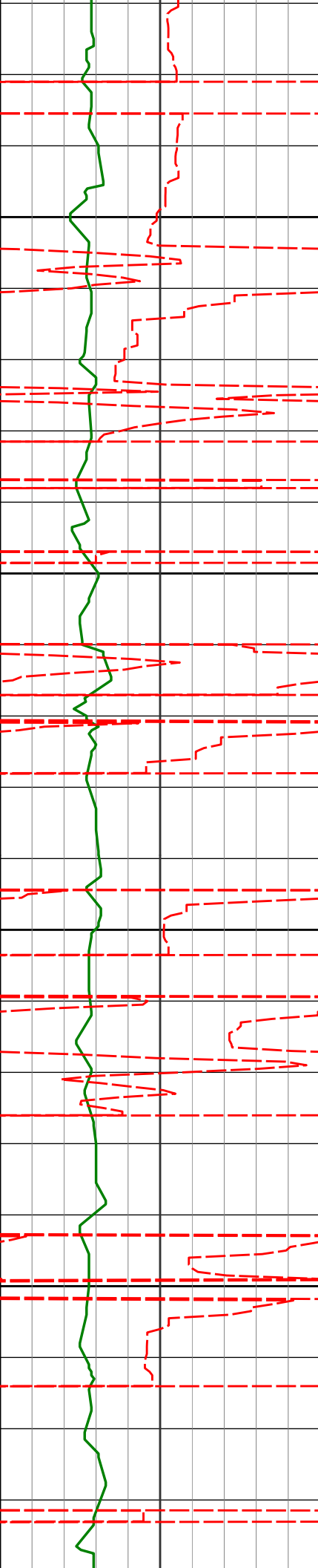
1367'

1.44°

304.57°

1366.83'

3.66'



1400

1450

1500

1550

1459'

1.32°

302.63°

1458.80'

5.56'

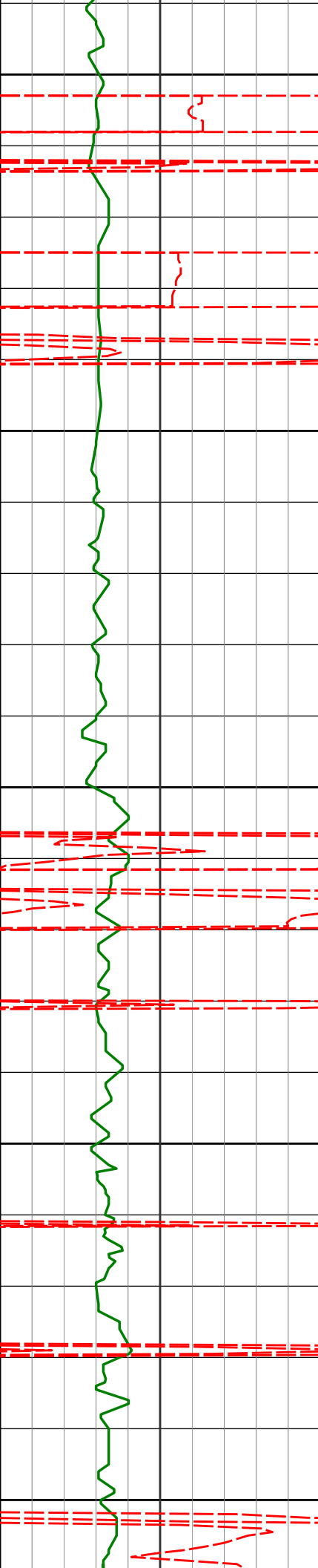
1554'

1.25°

326.38°

1553.78'

7.13'



1600

1650

1700

1750

1800

1649'

1.46°

311.57°

1648.75'

8.69'

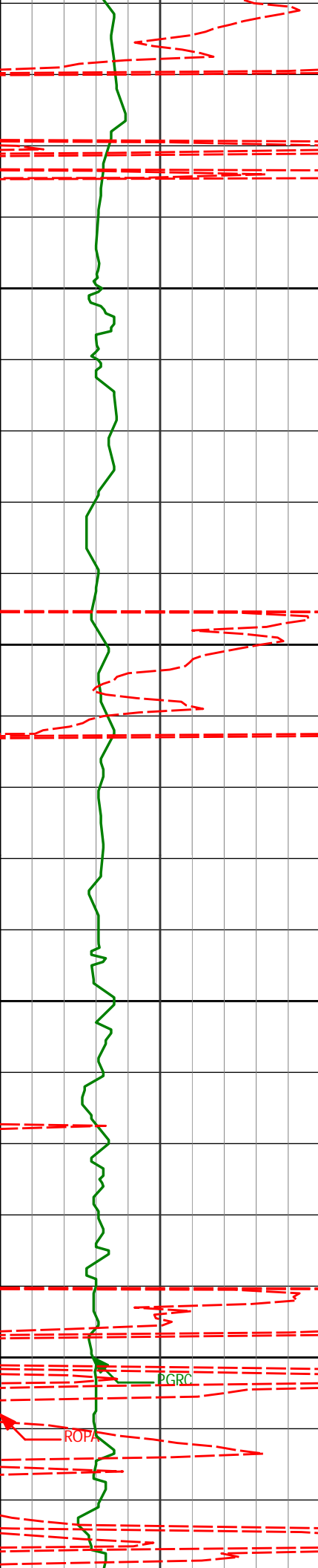
1743'

1.42°

289.58°

1742.73'

10.74'



1850

1900

1950

2000

1838'

0.92°

271.71°

1837.71'

12.63'

1933'

0.38°

21.81°

1932.70'

13.29'

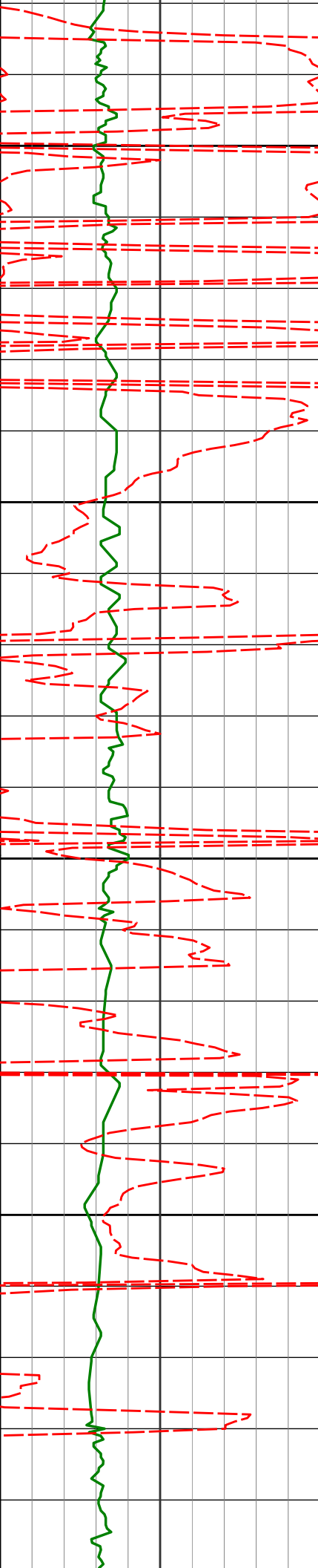
2027'

0.56°

118.97°

2026.70'

12.77'



2050

2100

2120'

1.56°

346.42°

2119.69'

12.72'

2150

2200

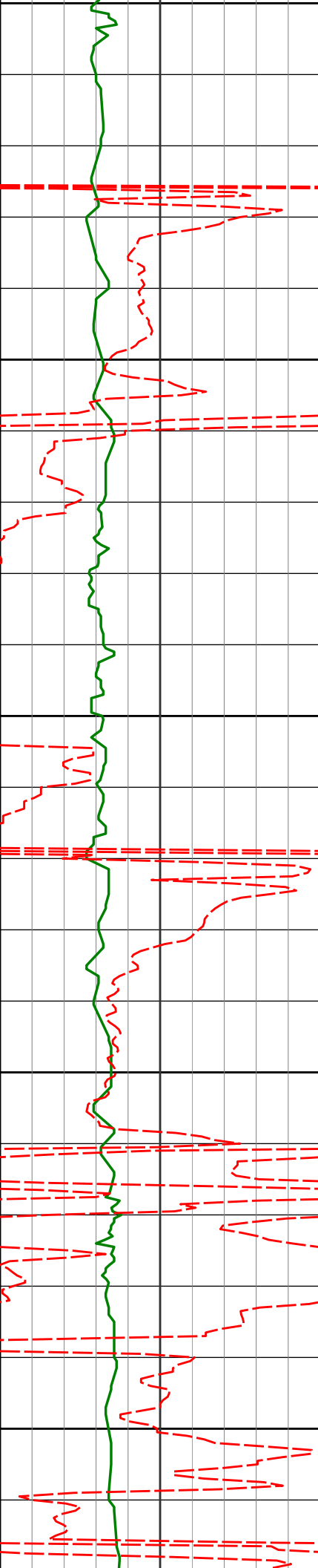
2215'

3.61°

336.41°

2214.59'

14.42'



2250

2300

2350

2400

2450

2310'

4.83°

349.67°

2309.33'

16.66'

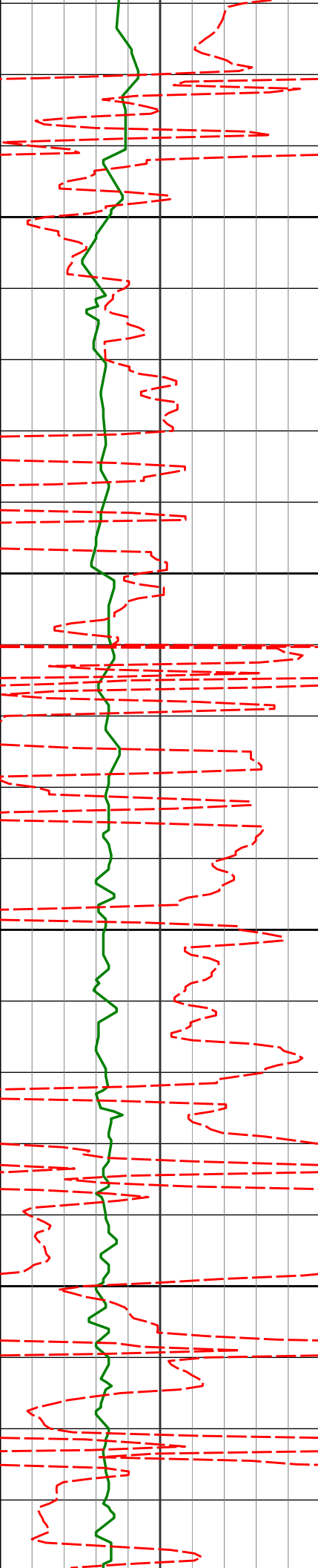
2405'

7.95°

350.10°

2403.73'

19.03'



2500

2500'

8.37°

348.64°

2497.77'

22.17'

2550

2600

2595'

8.54°

349.98°

2591.73'

25.44'

2650

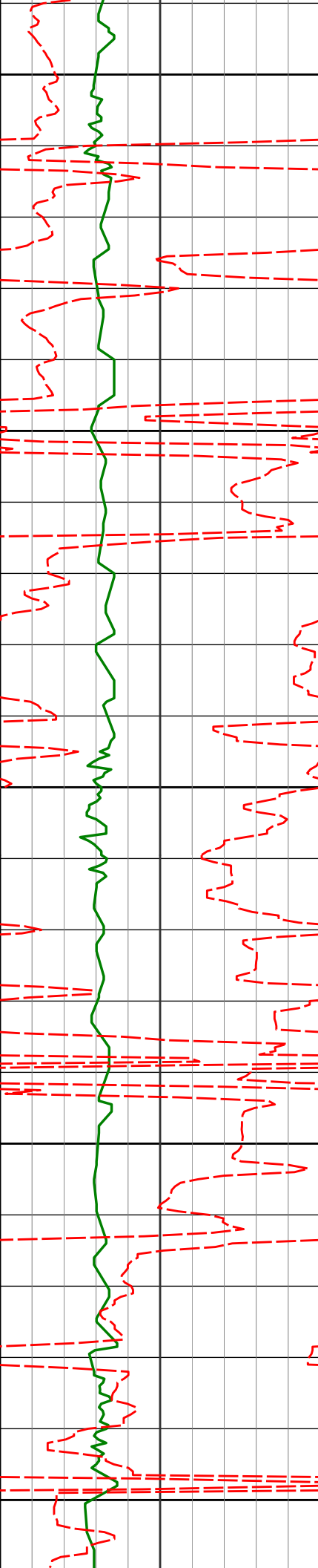
2689'

7.56°

346.62°

2684.81'

28.73'



2700

2750

2800

2850

2900

2784'

7.55°

344.58°

2778.98'

32.43'

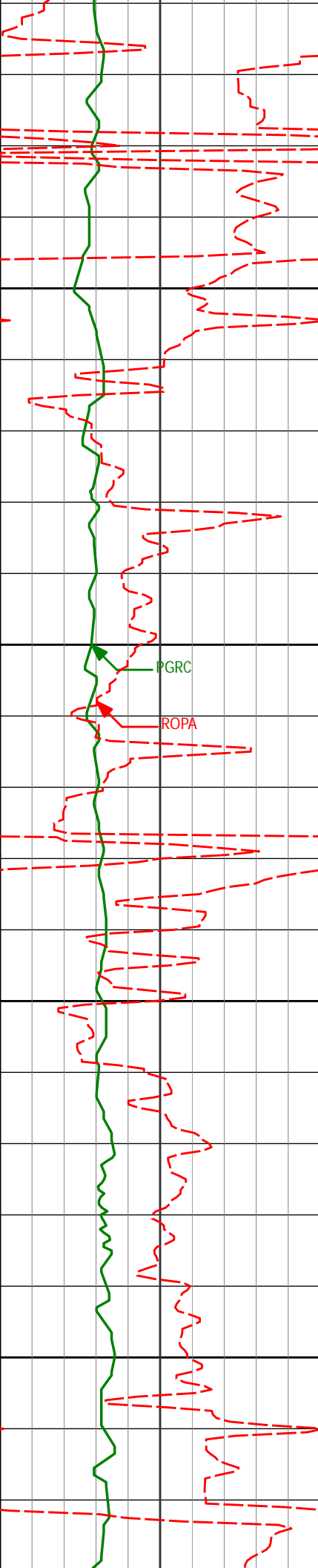
2879'

8.13°

348.40°

2873.10'

36.06'



2950

2974'

8.88°

347.58°

2967.05'

39.67'

3000

PGRC

ROPA

3050

3068'

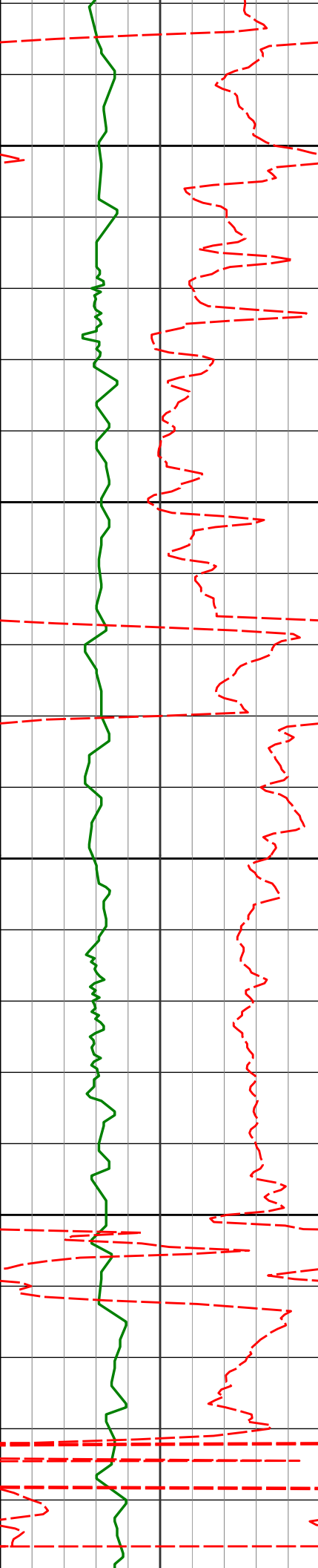
9.07°

345.48°

3059.90'

43.79'

3100



3150

3163'

7.31°

343.12°

3153.93'

48.07'

3200

3250

3258'

7.25°

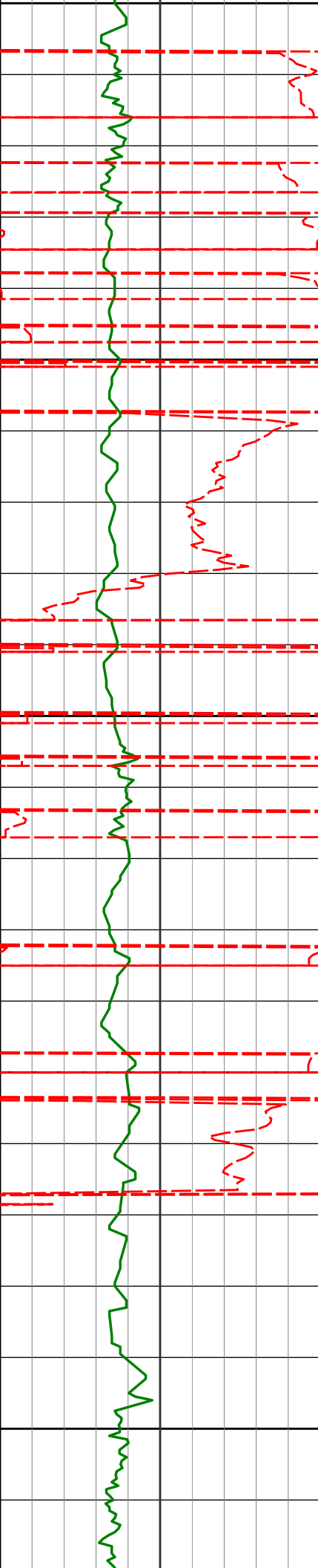
343.71°

3248.16'

52.07'

3300

3350



3350

3353'

7.37°

341.14°

3342.39'

56.29'

3400

3450

3448'

7.52°

343.37°

3436.59'

60.62'

3500

3550

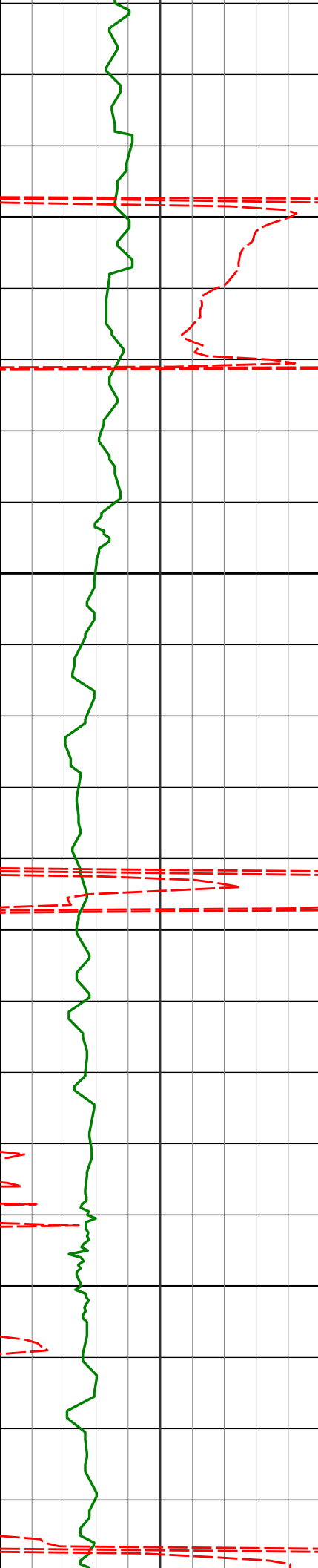
3543'

7.31°

342.79°

3530.79'

64.77'



3600

3650

3700

3750

3638'

8.82°

354.09°

3624.86'

67.95'

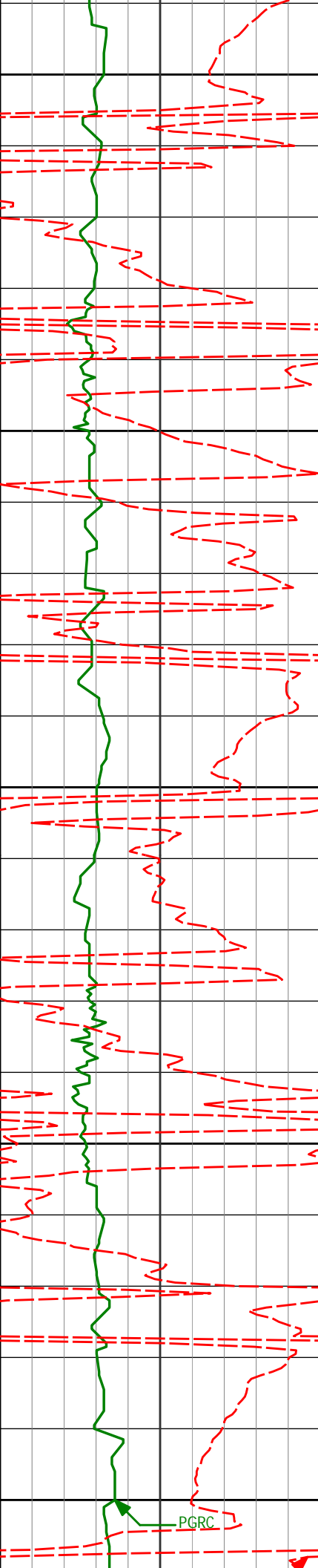
3733'

9.87°

353.50°

3718.60'

70.38'



3800

3828'

9.56°

350.80°

3812.23'

73.35'

3850

3900

3923'

9.18°

347.52°

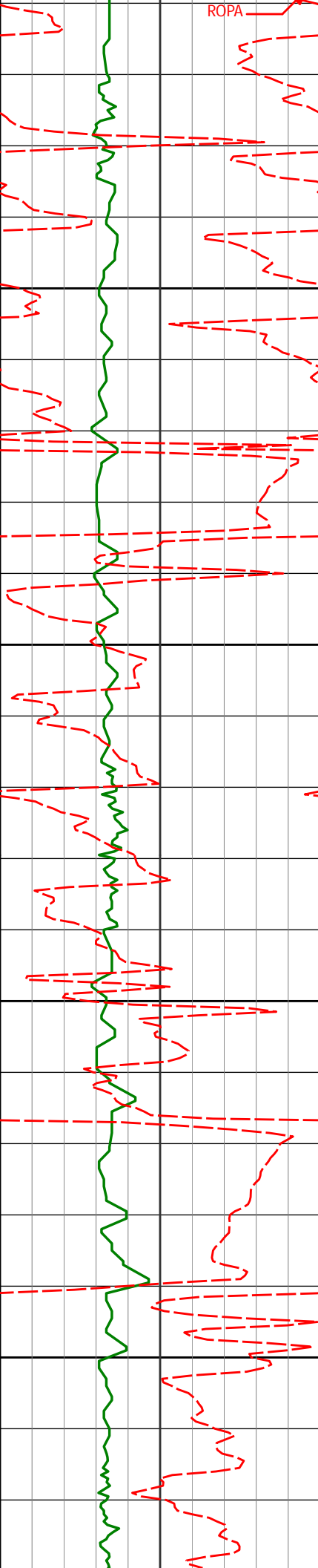
3905.97'

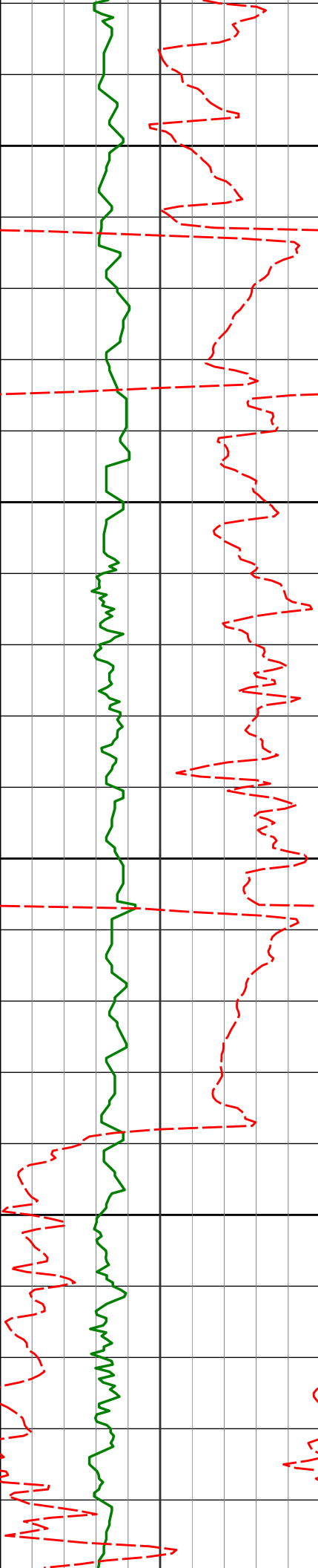
77.00'

3950

4000

PGRC





4250

4300

4350

4400

4302'

3.82°

346.34°

4282.54'

87.50'

4396'

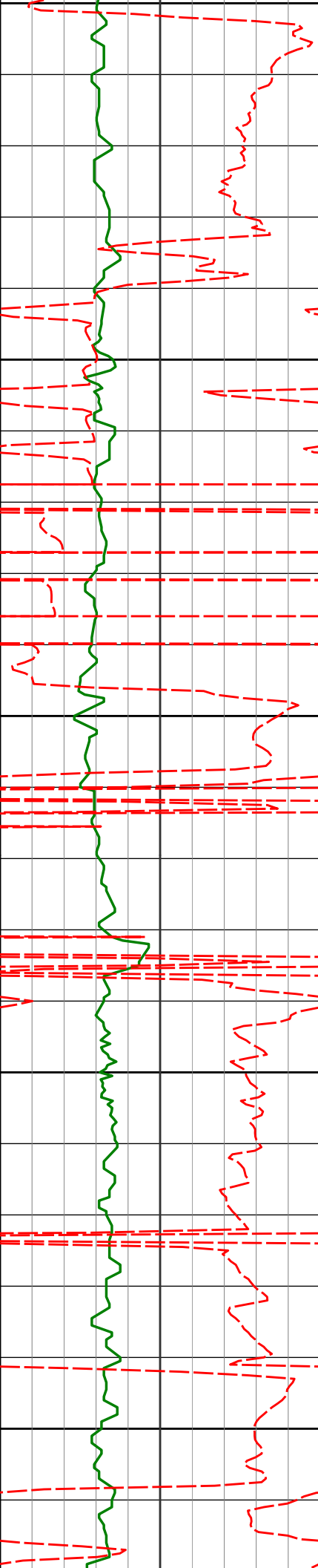
2.17°

347.26°

4376.41'

88.87'

4450



4450

4491'

0.76°

15.47°

4471.38'

89.21'

4500

4550

4586'

1.68°

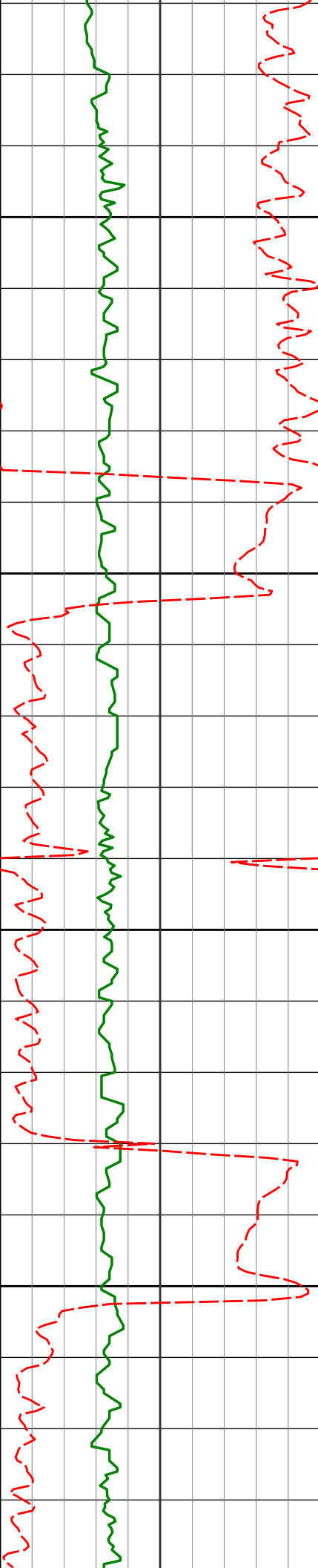
32.23°

4566.36'

88.39'

4600

4650



4700

4750

4800

4850

4681'

1.02°

12.20°

4661.33'

87.57'

4775'

0.80°

356.42°

4755.32'

87.51'

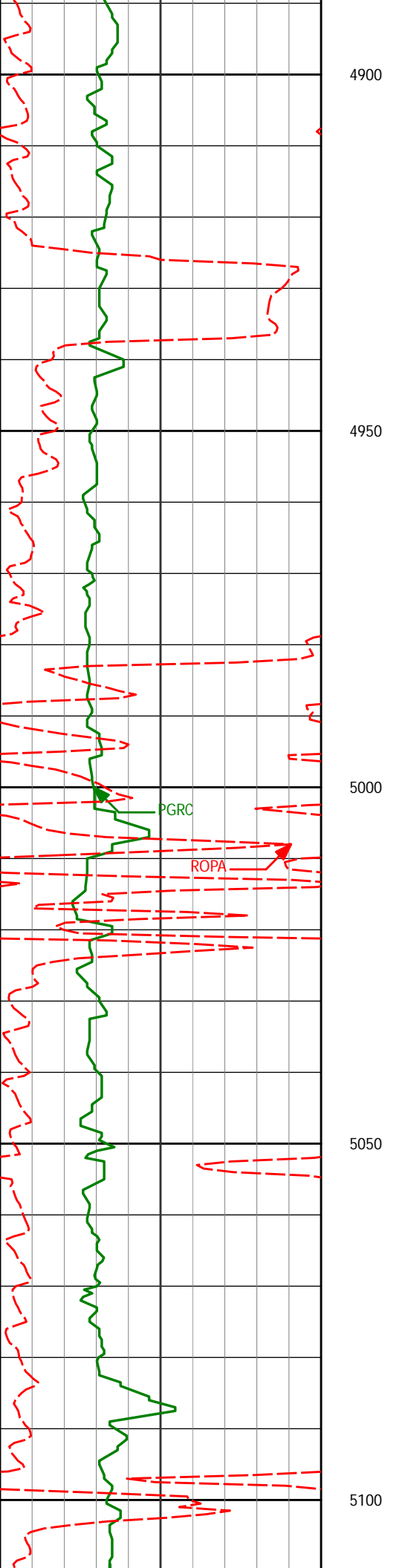
4870'

0.57°

257.10°

4850.31'

88.04'



4965'

1.11°

210.84°

4945.30'

88.93'

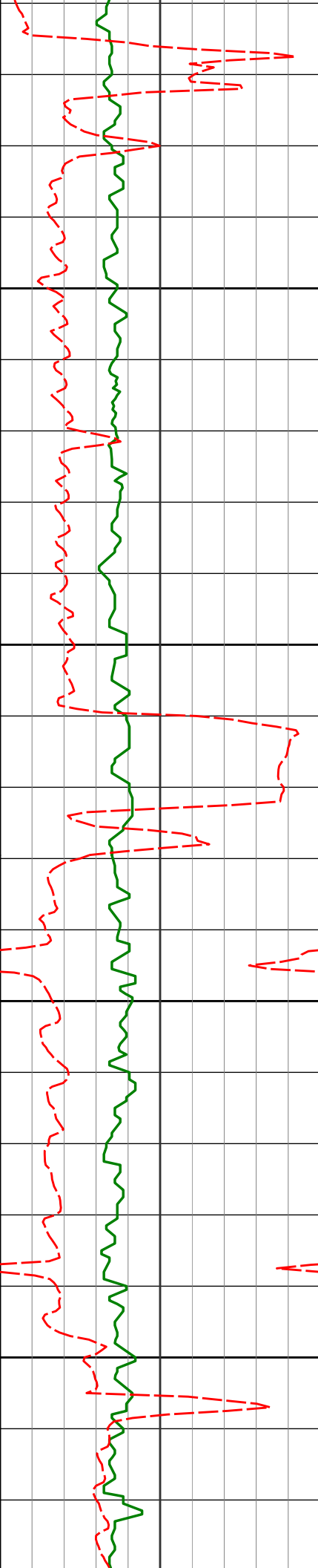
5060'

1.05°

177.30°

5040.29'

89.27'



5150

5200

5250

5300

5155'

0.68°

107.45°

5135.28'

88.64'

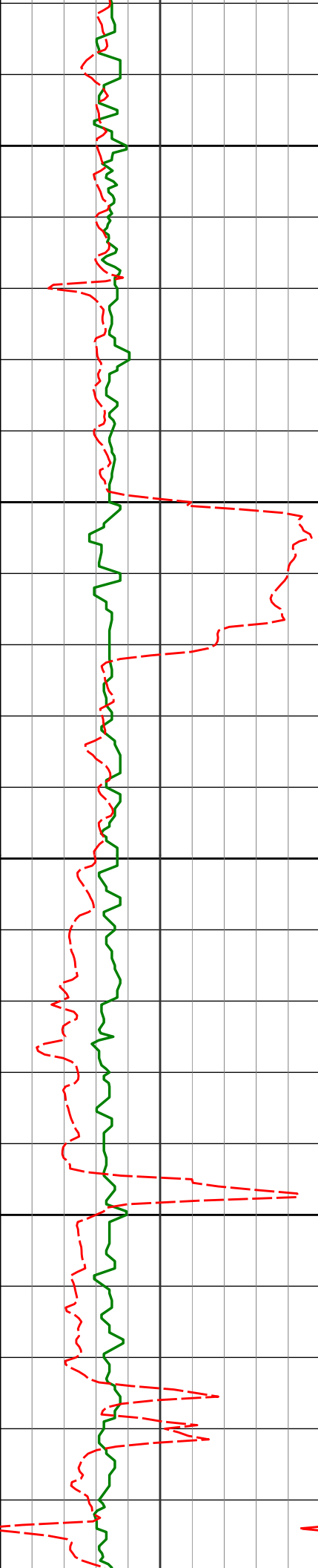
5250'

1.21°

140.23°

5230.27'

87.42'



5350

5400

5450

5500

5344'

1.63°

128.23°

5324.24'

85.66'

5439'

0.50°

163.97°

5419.22'

84.42'

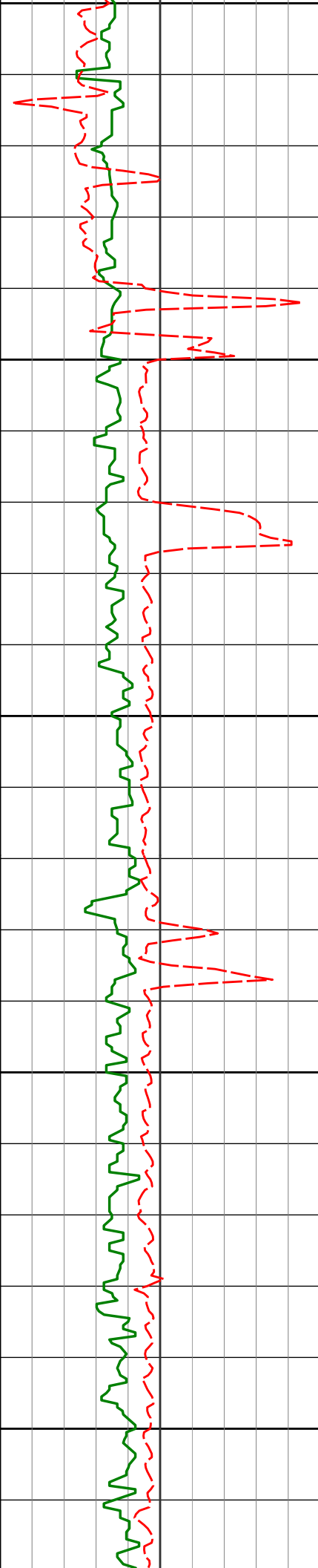
5534'

0.20°

153.46°

5514.22'

84.21'



5550

5600

5650

5700

5750

5629'

1.08°

124.36°

5609.21'

83.36'

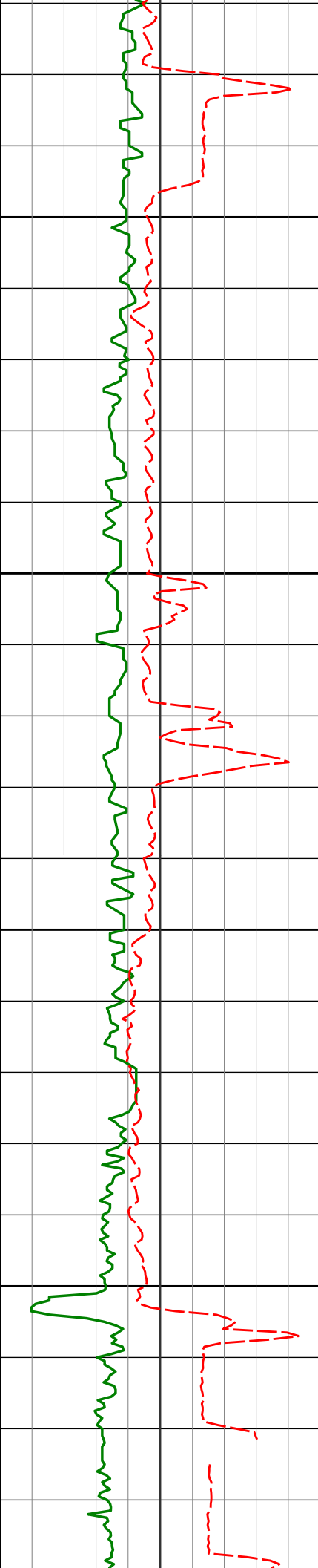
5723'

0.91°

158.42°

5703.20'

82.30'



5800

5818'

1.09°

155.78°

5798.18'

81.57'

5850

5900

5911'

1.63°

123.08°

5891.16'

80.03'

5950

200

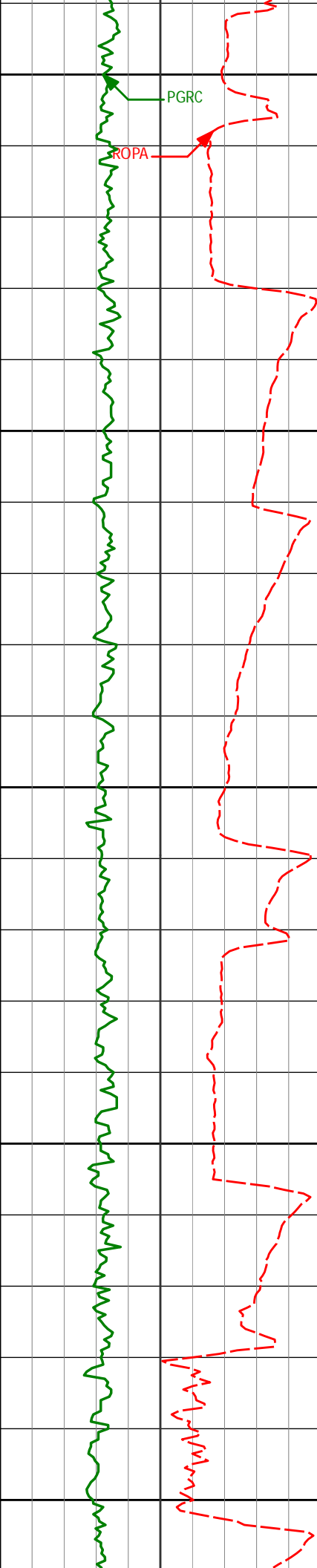
5976'

1.46°

110.23°

5956.14'

78.44'



6000

6006'

1.38°

114.36°

5986.13'

77.74'

6050

6054'

3.76°

247.26°

6034.10'

78.62'

6100

6101'

12.10°

258.84°

6080.61'

84.80'

6150

6149'

14.50°

258.97°

6127.32'

95.52'

6200

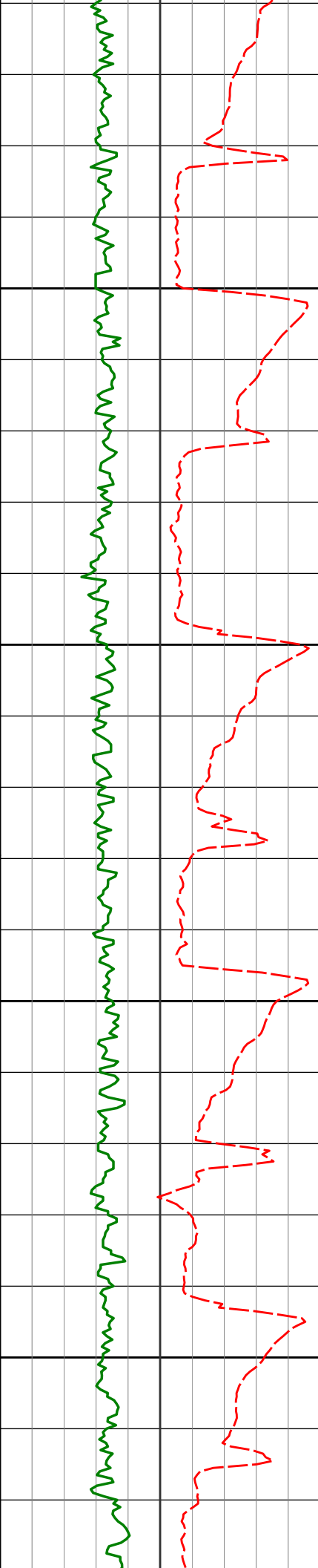
6196'

17.75°

262.13°

6172.46'

108.27'



6250

6300

6350

6400

6244'

20.34°

268.95°

6217.84'

123.79'

6291'

23.47°

266.13°

6261.44'

141.24'

6339'

28.03°

269.67°

6304.66'

162.00'

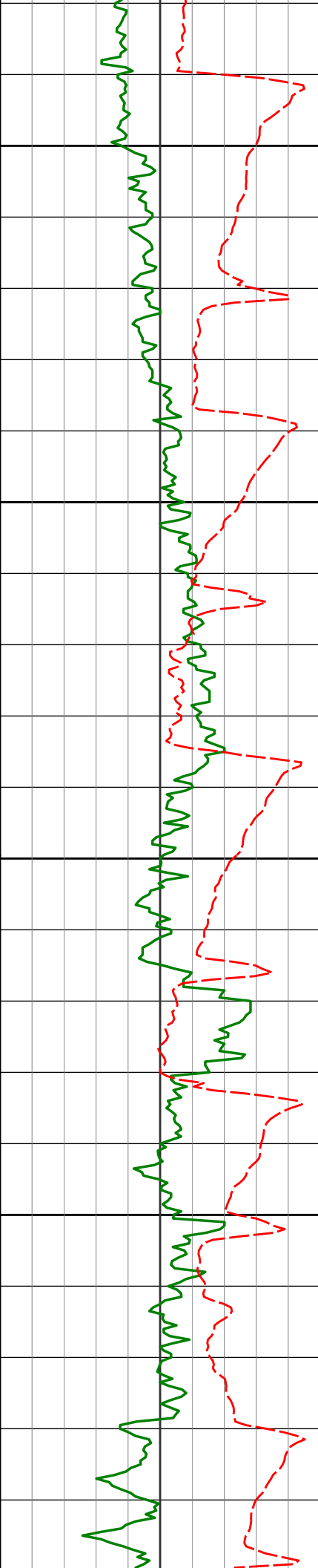
6385'

31.39°

273.62°

6344.62'

184.78'



6450

6500

6550

6600

6433'

34.79°

273.97°

6384.82'

210.98'

6480'

39.09°

273.21°

6422.38'

239.22'

6528'

44.26°

272.61°

6458.22'

271.12'

6575'

50.44°

271.77°

6490.05'

305.67'

6623'

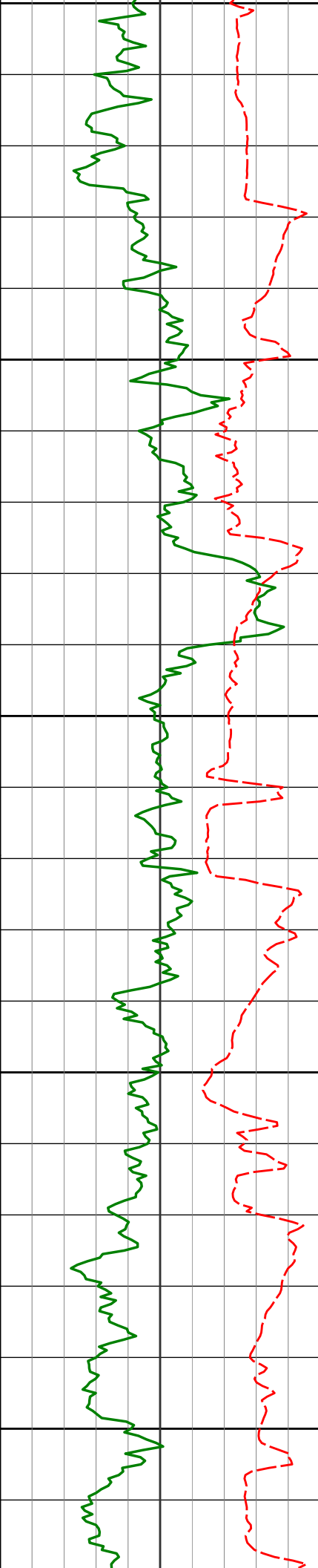
54.24°

271.35°

6519.37'

343.65'

6650



6650

6670'

56.32°

271.77°

6546.14'

382.27'

6700

6718'

59.38°

271.22°

6571.68'

422.90'

6750

6764'

64.80°

268.93°

6593.21'

463.48'

6800

6812'

69.92°

265.73°

6611.68'

507.55'

6850

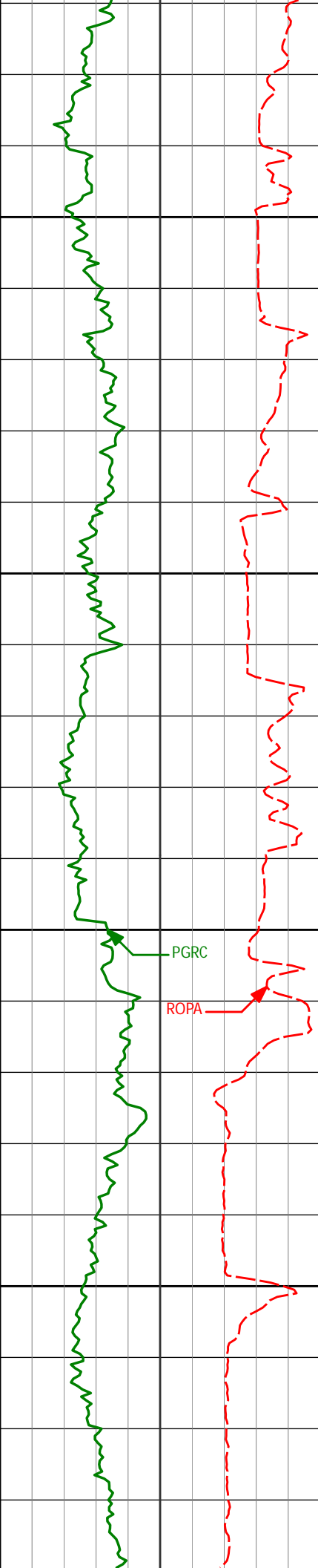
6859'

75.50°

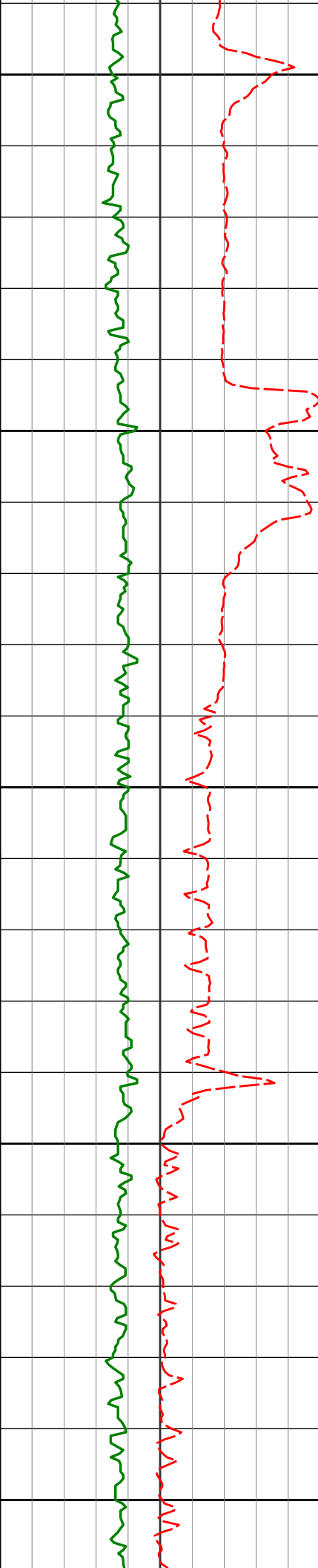
267.26°

6625.64'

552.13'



300



7100

7150

7175'

7200

7250

7270'

7300

89.08°

270.24°

6650.39'

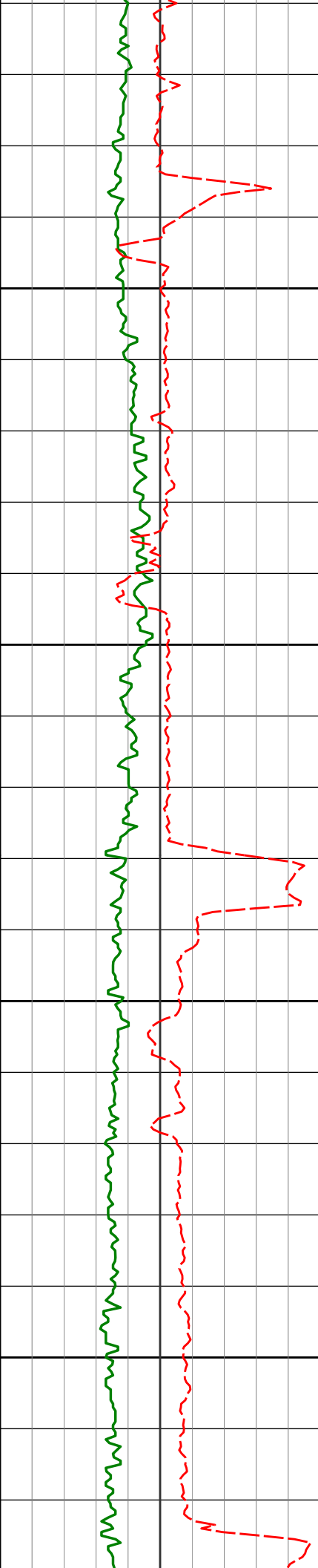
866.03'

89.63°

270.48°

6651.46'

960.94'



7350

7364'

88.92°

270.30°

6652.65'

1054.84'

7400

7450

7459'

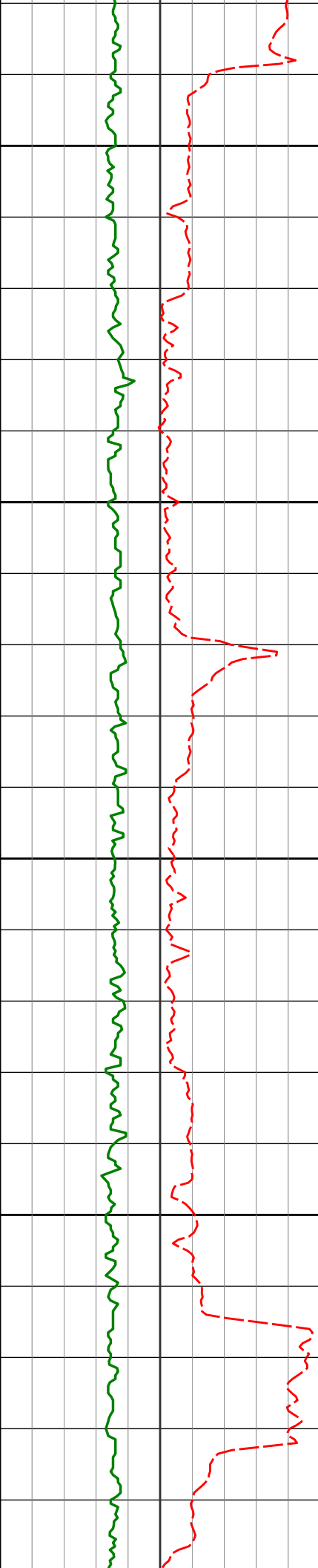
88.74°

269.31°

6654.59'

1149.69'

7500



7550

7554'

90.62°

268.70°

6655.12'

1244.47'

7600

7650

7649'

89.32°

266.27°

6655.17'

1339.04'

7700

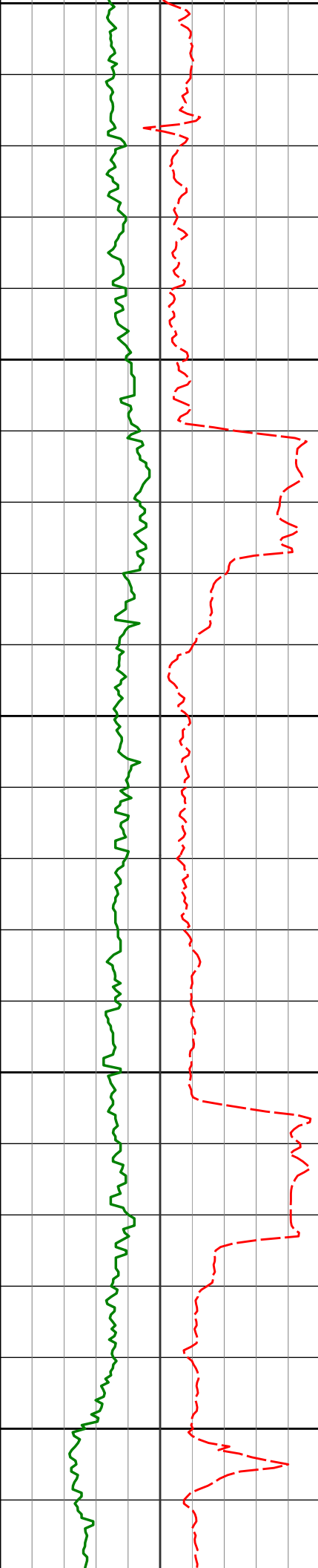
7744'

90.61°

266.67°

6655.23'

1433.45'



7750

7800

7850

7900

7950

7839'

91.91°

268.57°

6653.14'

1528.02'

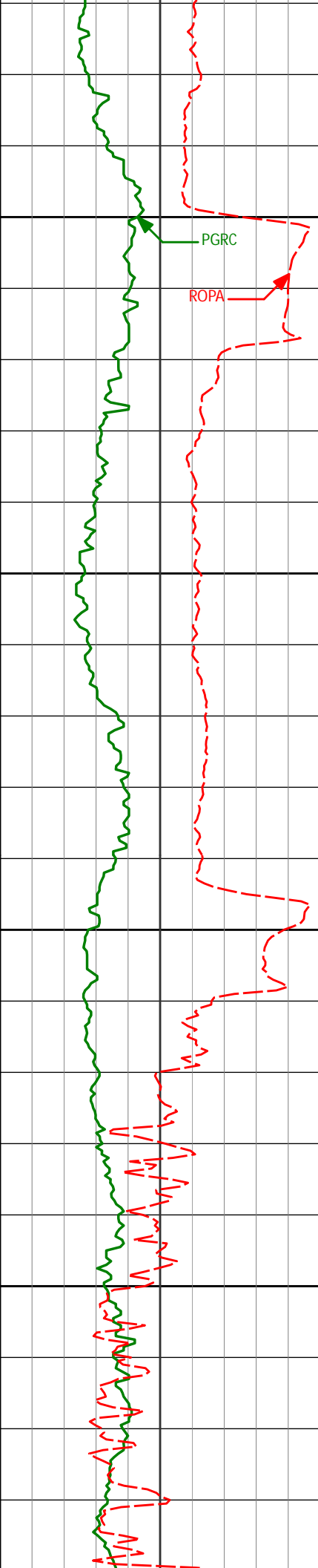
7934'

91.05°

268.17°

6650.69'

1622.70'



8000

8029'

90.68°

269.31°

6649.25'

1717.44'

8050

8100

8123'

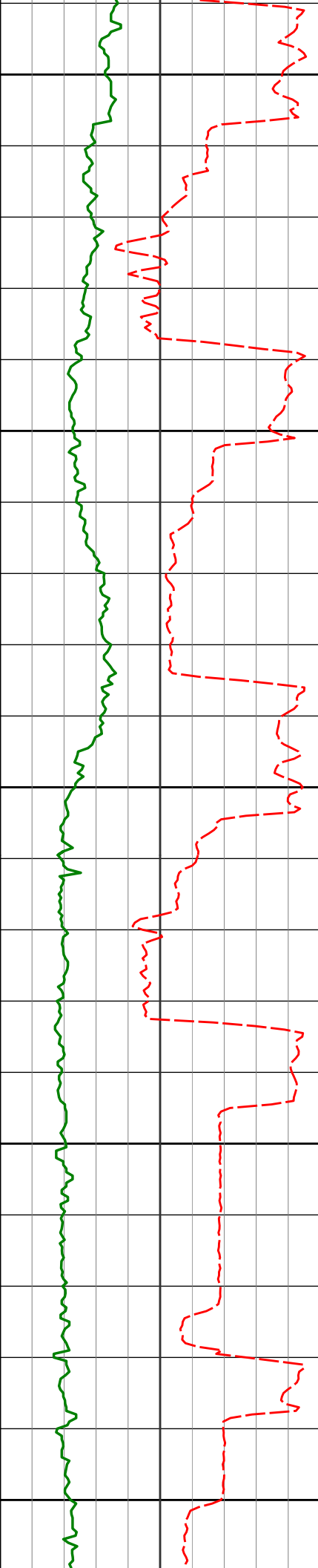
91.45°

270.22°

6647.51'

1811.29'

8150



8200

8218'

91.82°

270.60°

6644.79'

1906.17'

8250

8300

8313'

90.19°

272.46°

6643.13'

2001.12'

8350

8400

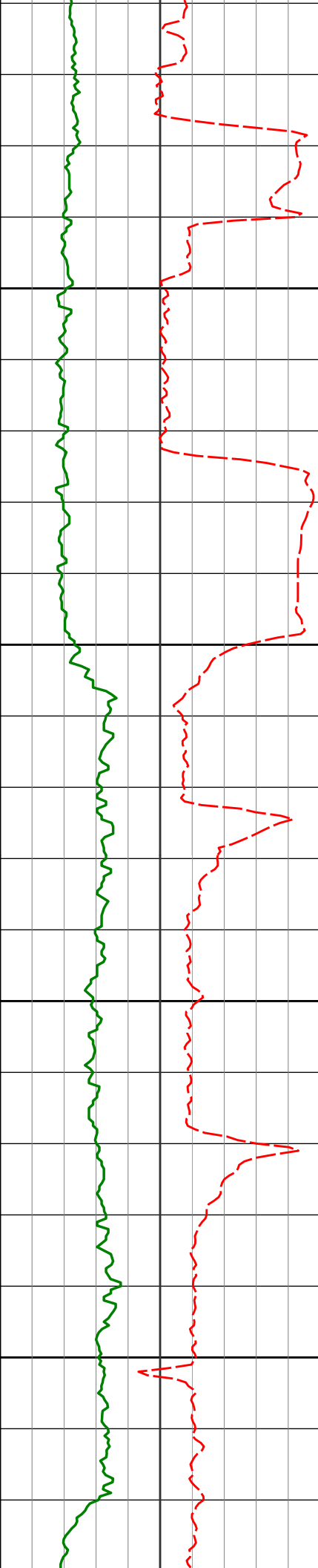
8408'

89.85°

273.13°

6643.10'

2096.12'



8450

8500

8550

8600

8502'

87.53°

270.02°

6645.24'

2190.05'

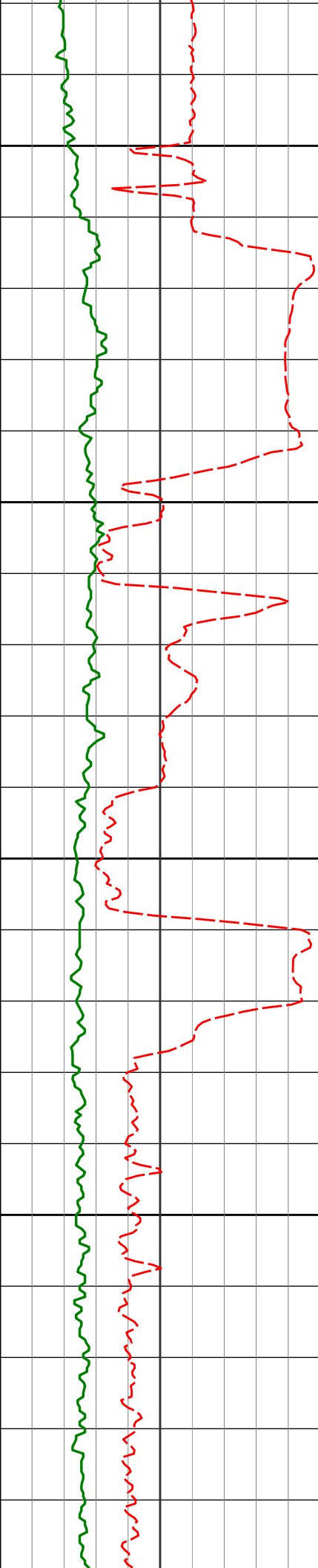
8597'

89.97°

270.37°

6647.32'

2284.92'



8650

8692'

88.33°

269.01°

6648.73'

2379.76'

8700

8750

8787'

87.81°

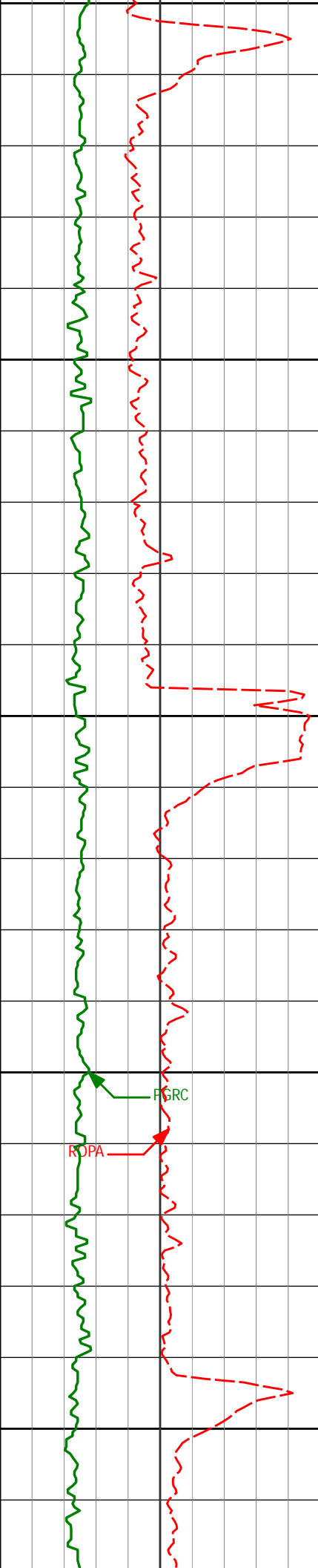
269.86°

6651.93'

2474.54'

8800

8850



8850

8882'

87.78°

269.29°

6655.58'

2569.31'

8900

8950

8976'

89.17°

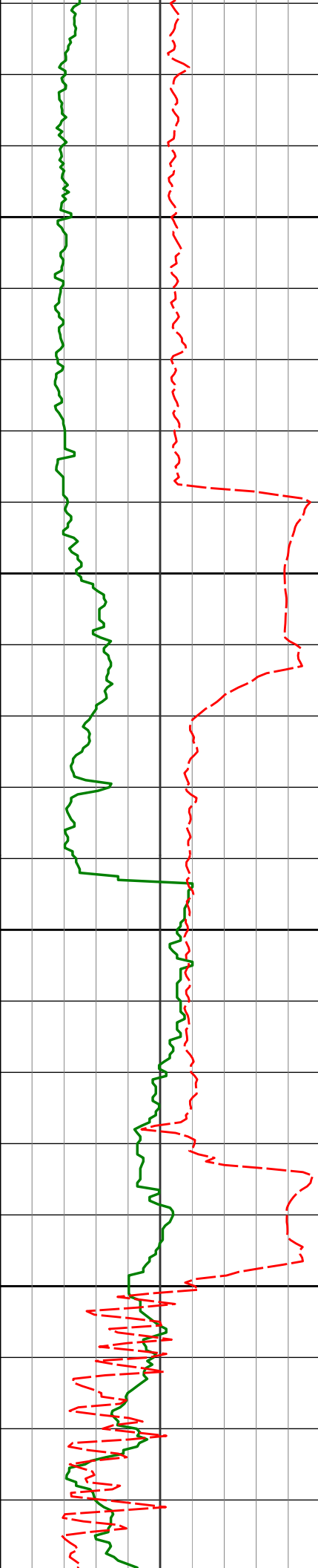
270.53°

6658.08'

2663.15'

9000

9050



9100

9150

9200

9250

9071'

91.02°

272.17°

6657.93'

2758.11'

9166'

90.12°

269.77°

6656.98'

2853.05'

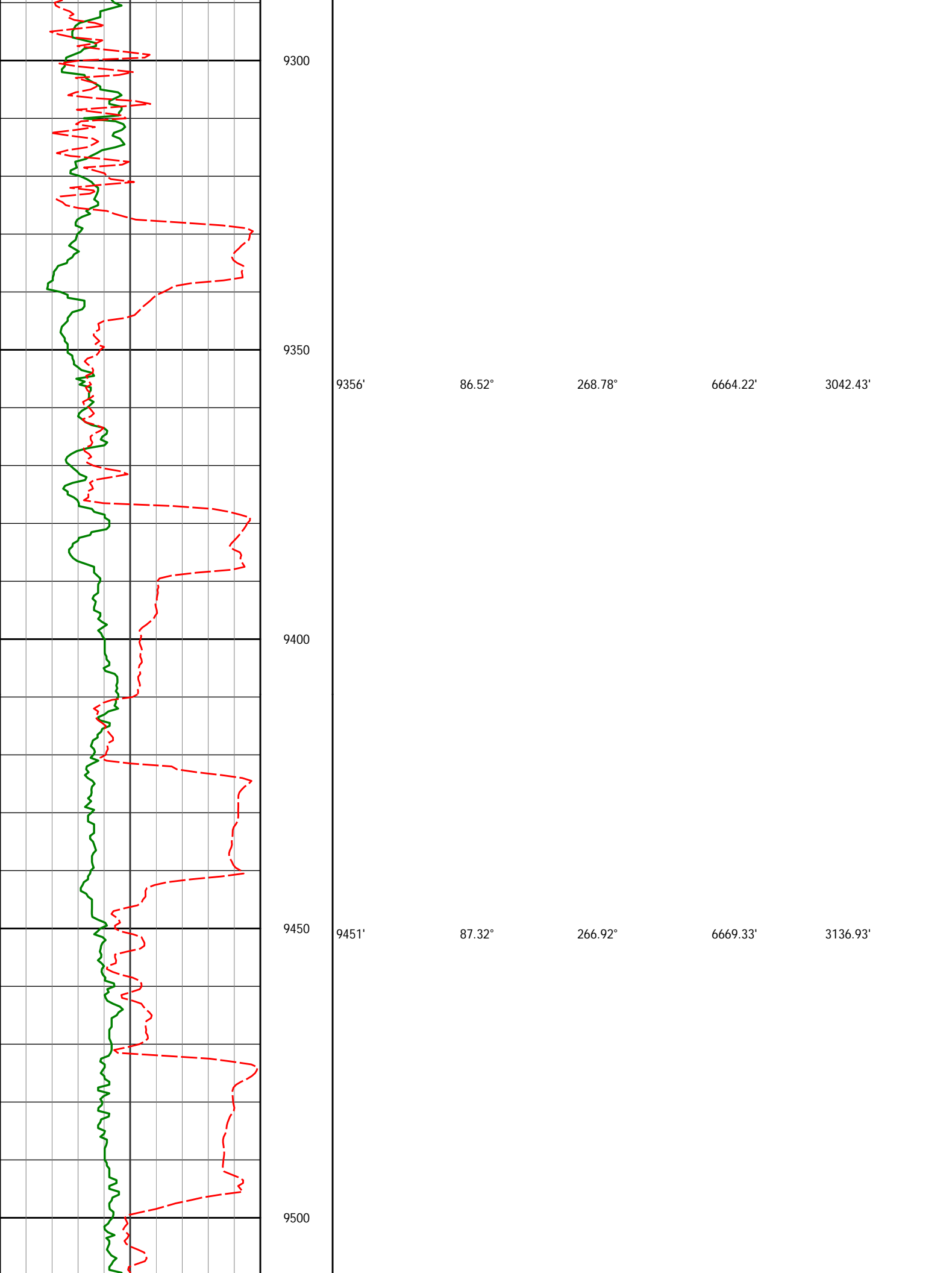
9261'

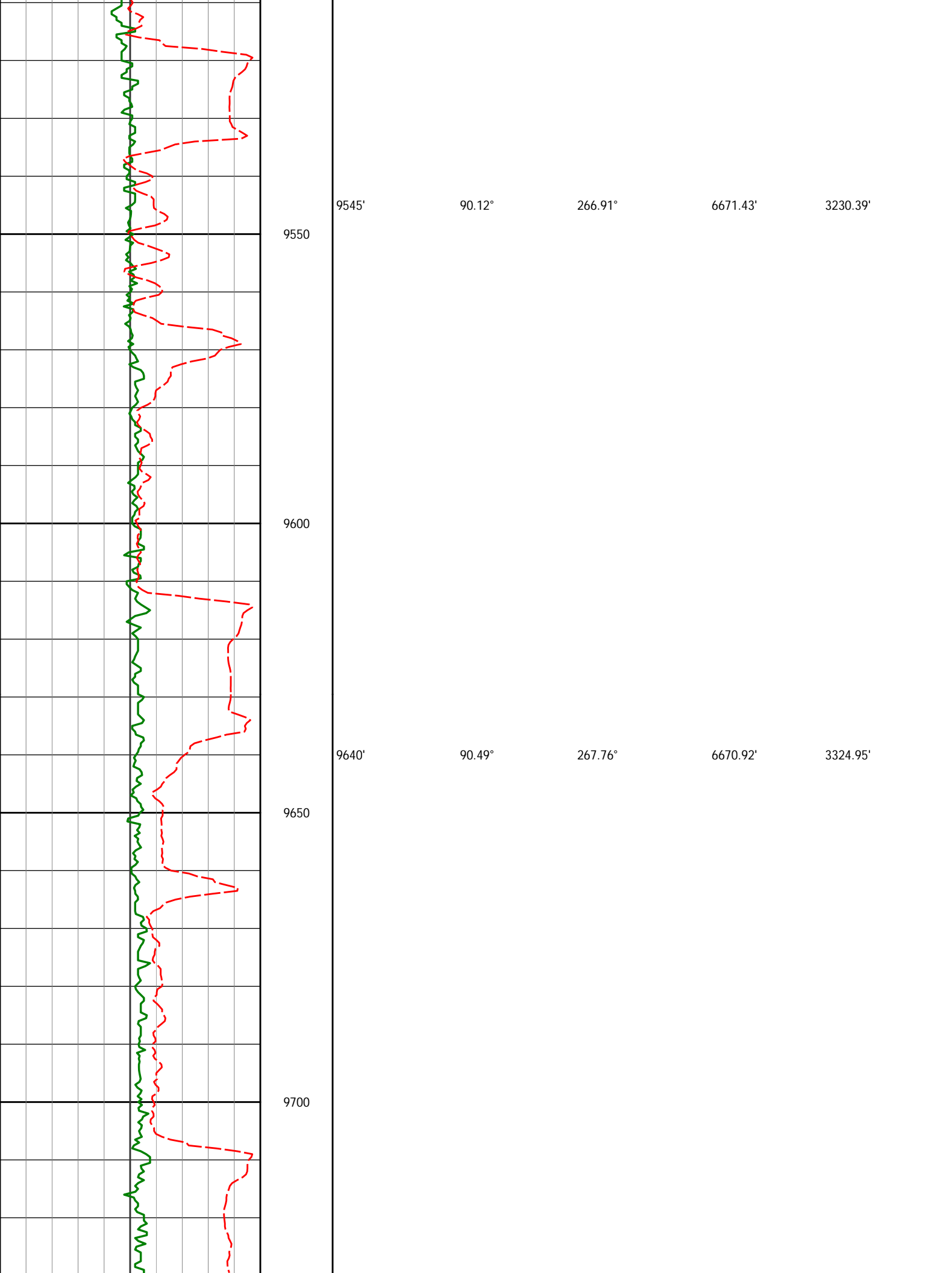
87.31°

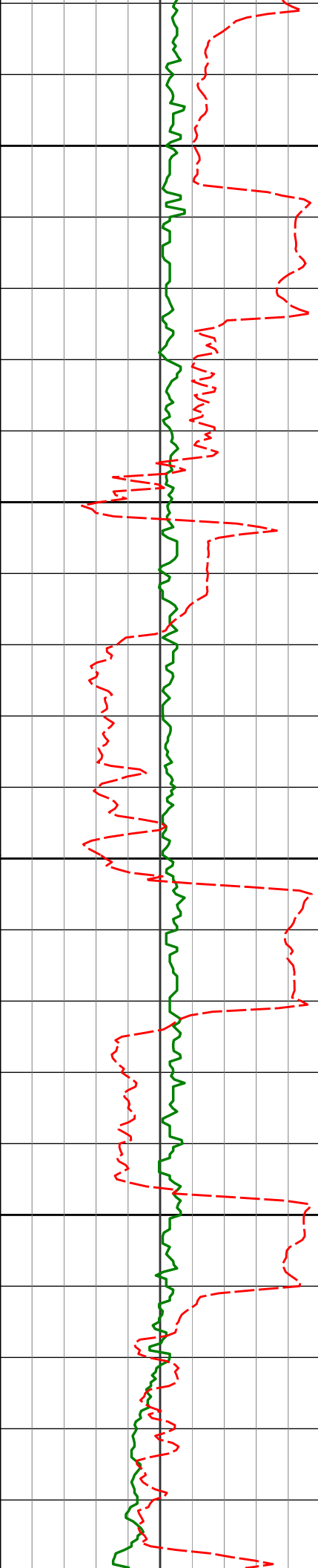
268.66°

6659.11'

2947.82'







9735'

91.05°

269.69°

6669.65'

3419.69'

9750

9800

9830'

90.40°

267.93°

6668.44'

3514.45'

9850

9900

9924'

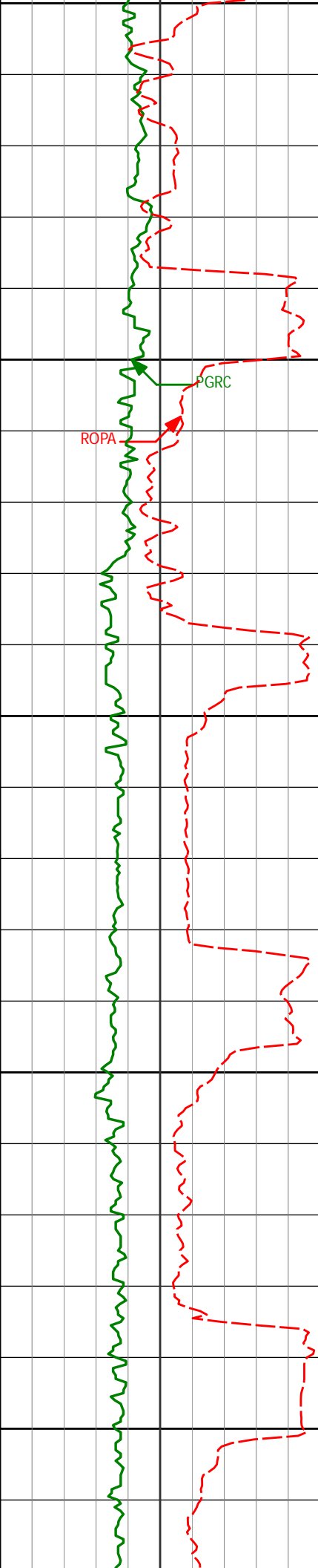
91.70°

270.41°

6666.72'

3608.23'

9950



9950

10000

10050

10100

10150

10019'

91.82°

271.35°

6663.80'

3703.12'

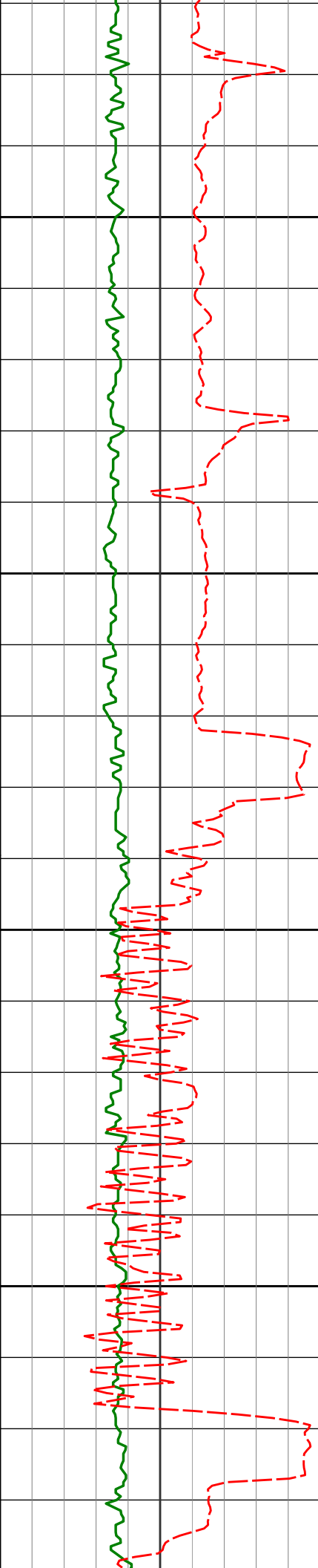
10114'

91.32°

271.83°

6661.20'

3798.07'



10200

10209'

89.57°

270.86°

6660.46'

3893.02'

10250

10300

10303'

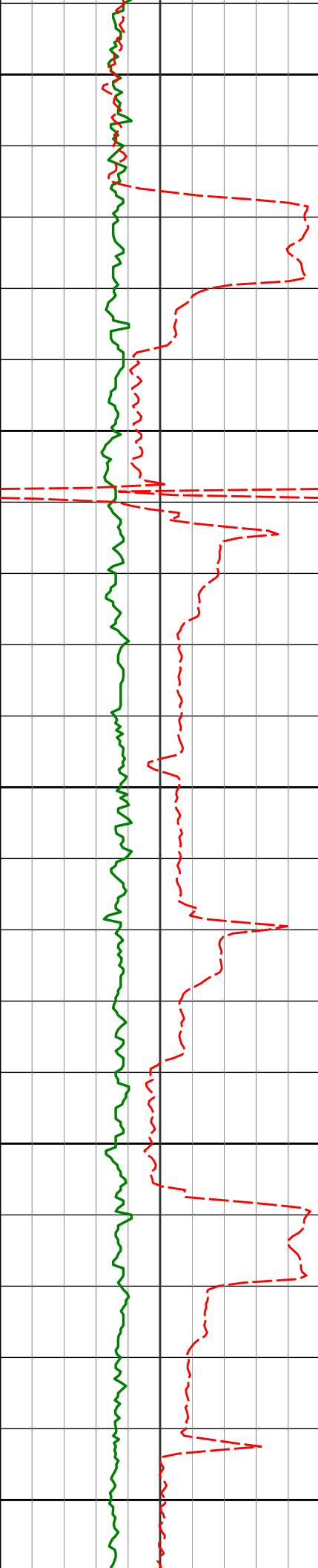
91.05°

269.88°

6659.95'

3986.93'

10350



10400

10450

10500

10550

10600

10398'

10493'

10588'

89.85°

91.57°

89.48°

269.02°

270.28°

268.34°

6659.21'

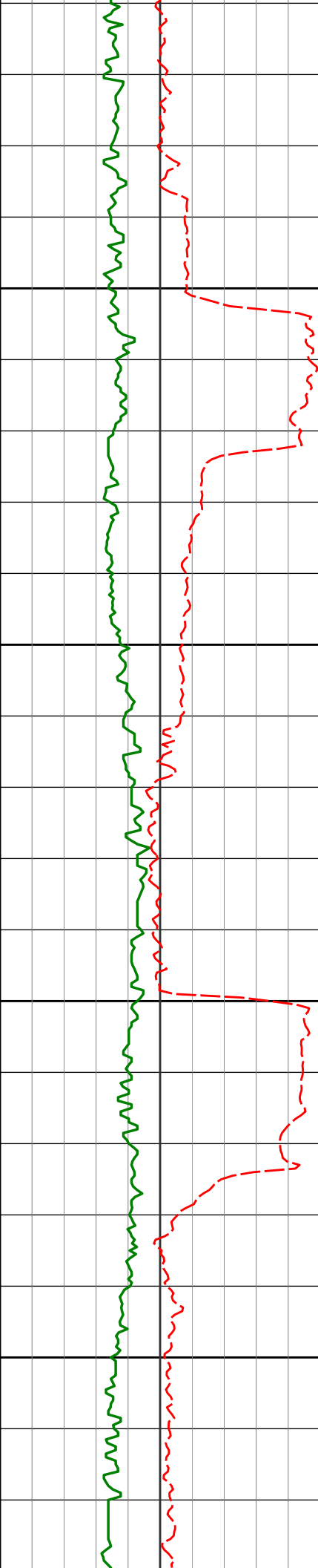
6658.03'

6657.16'

4081.76'

4176.60'

4271.40'



10650

10683'

90.40°

268.38°

6657.26'

4366.11'

10700

10750

10777'

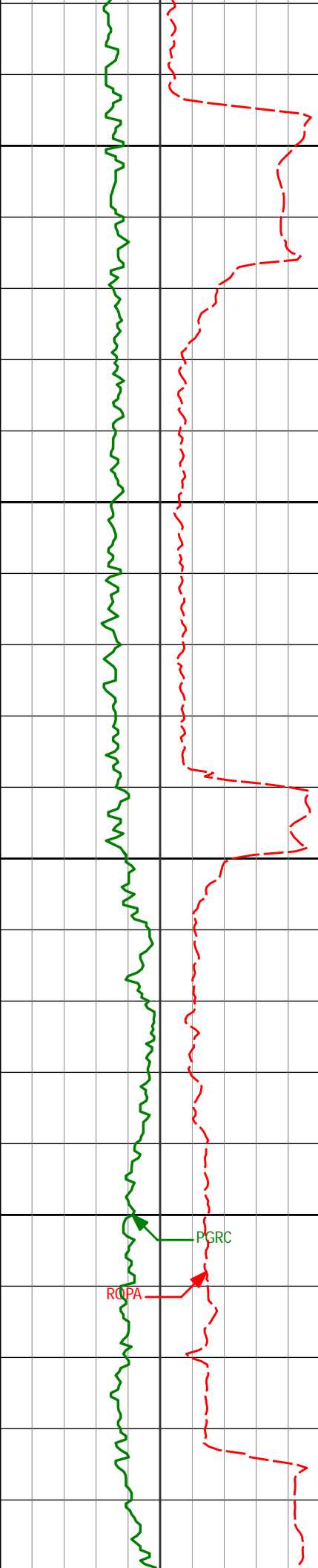
92.56°

270.43°

6654.83'

4459.90'

10800



10850

10872'

90.22°

270.25°

6652.53'

4554.77'

10900

10950

10967'

90.49°

270.79°

6651.94'

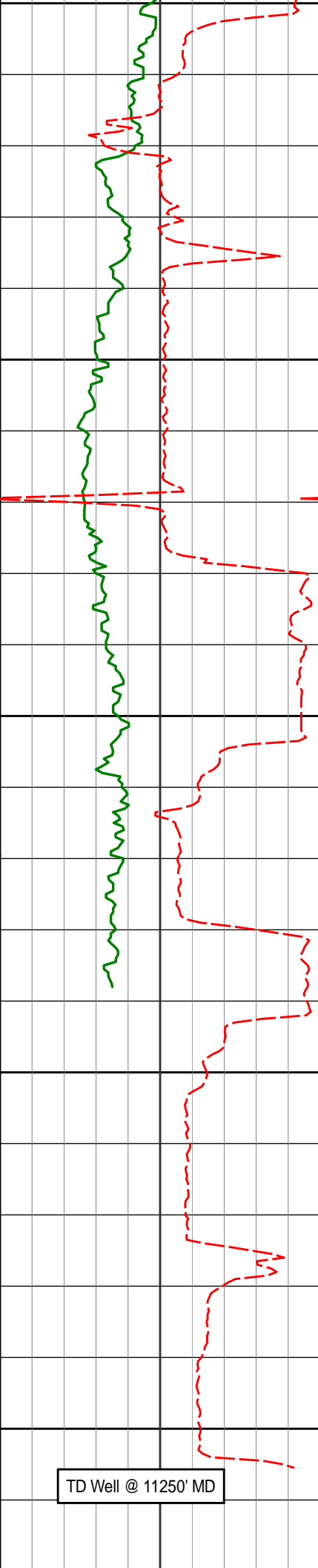
4649.69'

11000

PGRC

RCPA

11050



11050  
11100  
11150  
11200  
11250

11062'	90.34°	270.30°	6651.25'	4744.61'
11157'	88.74°	270.29°	6652.01'	4839.51'
11185'	87.63°	270.27°	6652.90'	4867.47'
11250'	87.63°	270.27°	6655.59'	4932.35'

TD Well @ 11250' MD

<div> <div>Avg Rate of Penetration</div> <div> <div>ROPA</div> <div>feet per hr</div> </div> </div> <div> <div>PCG Gamma Ray</div> <div>PGRC</div> <div>api</div> </div>		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
1K	0						
0	300						
<div> <div>HALLIBURTON</div> <div> <div>DIRECTIONAL SURVEY REPORT</div> <div> <div>Noble Energy</div> <div>Wells Ranch AA35-69-1HNB</div> <div>Wattenburg</div> <div>Weld Colorado</div> <div>USA</div> <div>CA-XX-0901058459</div> </div> </div> </div>							
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
241.00	1.00	145.13	240.99	1.73 S	1.20 E	-1.29	0.41
487.00	1.10	145.33	486.95	5.43 S	3.77 E	-4.04	0.04
608.00	0.20	102.03	607.94	6.43 S	4.64 E	-4.95	0.80
724.00	0.38	182.09	723.94	6.85 S	4.82 E	-5.16	0.34
816.00	0.25	134.62	815.94	7.30 S	4.96 E	-5.31	0.30
909.00	0.83	304.55	908.93	7.06 S	4.55 E	-4.89	1.16
1000.00	1.13	309.90	999.92	6.11 S	3.31 E	-3.61	0.34
1092.00	1.64	290.73	1091.89	5.06 S	1.39 E	-1.64	0.74
1183.00	0.93	289.64	1182.87	4.35 S	0.53 W	0.31	0.78
1275.00	1.14	298.43	1274.85	3.67 S	2.03 W	1.85	0.29
1367.00	1.44	304.57	1366.83	2.58 S	3.79 W	3.66	0.36
1459.00	1.32	302.63	1458.80	1.35 S	5.64 W	5.56	0.14
1554.00	1.25	326.38	1553.78	0.10 N	7.13 W	7.13	0.56
1649.00	1.46	311.57	1648.75	1.77 N	8.61 W	8.69	0.43
1743.00	1.42	289.58	1742.73	2.95 N	10.60 W	10.74	0.59
1838.00	0.92	271.71	1837.71	3.37 N	12.47 W	12.63	0.65
1933.00	0.38	21.81	1932.70	3.69 N	13.12 W	13.29	1.17
2027.00	0.56	118.97	2026.70	3.75 N	12.60 W	12.77	0.76
2120.00	1.56	346.42	2119.69	4.76 N	12.50 W	12.72	2.13
2215.00	3.61	336.41	2214.59	8.76 N	14.00 W	14.42	2.20
2310.00	4.83	349.67	2309.33	15.44 N	15.92 W	16.66	1.64
2405.00	7.95	350.10	2403.73	25.85 N	17.76 W	19.03	3.28
2500.00	8.37	348.64	2497.77	39.10 N	20.26 W	22.17	0.49
2595.00	8.54	349.98	2591.73	52.82 N	22.84 W	25.44	0.27
2689.00	7.56	346.62	2684.81	65.71 N	25.49 W	28.73	1.16
2784.00	7.55	344.58	2778.98	77.81 N	28.60 W	32.43	0.28
2879.00	8.13	348.40	2873.10	90.41 N	31.61 W	36.06	0.82
2974.00	8.88	347.58	2967.05	104.15 N	34.53 W	39.67	0.80
3068.00	9.07	345.48	3059.90	118.41 N	37.95 W	43.79	0.40
3163.00	7.31	343.12	3153.93	131.44 N	41.58 W	48.07	1.89
3258.00	7.25	343.71	3248.16	142.98 N	45.02 W	52.07	0.10
3353.00	7.37	341.14	3342.39	154.50 N	48.67 W	56.29	0.37
3448.00	7.52	343.37	3436.59	166.22 N	52.42 W	60.62	0.34
3543.00	7.31	342.79	3530.79	177.95 N	55.99 W	64.77	0.23
3638.00	8.82	354.09	3624.86	190.97 N	58.53 W	67.95	2.30
3733.00	9.87	353.50	3718.60	206.30 N	60.20 W	70.38	1.11
3828.00	9.56	350.80	3812.23	222.18 N	62.38 W	73.35	0.58
3923.00	9.18	347.52	3905.97	237.37 N	65.28 W	77.00	0.69
4018.00	7.12	345.12	4000.00	250.46 N	68.43 W	80.80	2.20
4112.00	6.64	348.51	4093.33	261.41 N	71.01 W	83.92	0.67
4207.00	5.06	353.77	4187.83	270.96 N	72.56 W	85.94	1.75
4302.00	3.82	346.34	4282.54	278.20 N	73.76 W	87.50	1.44
4396.00	2.17	347.26	4376.41	282.98 N	74.89 W	88.87	1.76
4491.00	0.76	15.47	4471.38	285.34 N	75.12 W	89.21	1.62
4586.00	1.68	32.23	4566.36	287.13 N	74.21 W	88.39	1.03
4681.00	1.02	12.20	4661.33	289.13 N	73.29 W	87.57	0.84
4775.00	0.80	356.42	4755.32	290.60 N	73.15 W	87.51	0.35
4870.00	0.57	257.10	4850.31	291.16 N	73.65 W	88.04	1.11

4876.00	0.37	237.10	4630.31	291.18 N	73.83 W	88.84	1.11
4965.00	1.11	210.84	4945.30	290.26 N	74.59 W	88.93	0.87
5060.00	1.05	177.30	5040.29	288.60 N	75.02 W	89.27	0.66
5155.00	0.68	107.45	5135.28	287.57 N	74.44 W	88.64	1.09
5250.00	1.21	140.23	5230.27	286.63 N	73.26 W	87.42	0.78
5344.00	1.63	128.23	5324.24	285.03 N	71.57 W	85.66	0.55
5439.00	0.50	163.97	5419.22	283.80 N	70.40 W	84.42	1.32
5534.00	0.20	153.46	5514.22	283.25 N	70.21 W	84.21	0.32
5629.00	1.08	124.36	5609.21	282.60 N	69.40 W	83.36	0.96
5723.00	0.91	158.42	5703.20	281.41 N	68.39 W	82.30	0.64
5818.00	1.09	155.78	5798.18	279.88 N	67.74 W	81.57	0.20
5911.00	1.63	123.08	5891.16	278.35 N	66.27 W	80.03	0.99
5976.00	1.46	110.23	5956.14	277.56 N	64.72 W	78.44	0.59
6006.00	1.38	114.36	5986.13	277.28 N	64.03 W	77.74	0.43
6054.00	3.76	247.26	6034.10	276.43 N	64.96 W	78.62	10.01
6101.00	12.10	258.84	6080.61	274.88 N	71.22 W	84.80	17.98
6149.00	14.50	258.97	6127.32	272.76 N	82.06 W	95.52	5.00
6196.00	17.75	262.13	6172.46	270.65 N	94.93 W	108.27	7.16
6244.00	20.34	268.95	6217.84	269.49 N	110.53 W	123.79	7.11
6291.00	23.47	266.13	6261.44	268.71 N	128.04 W	141.24	7.02
6339.00	28.03	269.67	6304.66	268.00 N	148.86 W	162.00	10.02
6385.00	31.39	273.62	6344.62	268.70 N	171.64 W	184.78	8.45
6433.00	34.79	273.97	6384.82	270.43 N	197.78 W	210.98	7.09
6480.00	39.09	273.21	6422.38	272.19 N	225.96 W	239.22	9.20
6528.00	44.26	272.61	6458.22	273.80 N	257.83 W	271.12	10.80
6575.00	50.44	271.77	6490.05	275.11 N	292.36 W	305.67	13.21
6623.00	54.24	271.35	6519.37	276.14 N	330.33 W	343.65	7.95
6670.00	56.32	271.77	6546.14	277.20 N	368.95 W	382.27	4.49
6718.00	59.38	271.22	6571.68	278.25 N	409.57 W	422.90	6.45
6764.00	64.80	268.93	6593.21	278.29 N	450.20 W	463.48	12.58
6812.00	69.92	265.73	6611.68	276.20 N	494.43 W	507.55	12.31
6859.00	75.50	267.26	6625.64	273.47 N	539.20 W	552.13	12.27
6907.00	80.68	268.83	6635.55	271.87 N	586.12 W	598.92	11.26
6951.00	84.76	270.56	6641.12	271.64 N	629.76 W	642.49	10.06
7034.00	87.94	270.33	6646.41	272.28 N	712.58 W	725.23	3.84
7081.00	88.06	270.26	6648.05	272.53 N	759.55 W	772.16	0.30
7175.00	89.08	270.24	6650.39	272.94 N	853.52 W	866.03	1.09
7270.00	89.63	270.48	6651.46	273.53 N	948.51 W	960.94	0.63
7364.00	88.92	270.30	6652.65	274.17 N	1042.50 W	1054.84	0.78
7459.00	88.74	269.31	6654.59	273.85 N	1137.48 W	1149.69	1.06
7554.00	90.62	268.70	6655.12	272.20 N	1232.46 W	1244.47	2.08
7649.00	89.32	266.27	6655.17	268.03 N	1327.35 W	1339.04	2.90
7744.00	90.61	266.67	6655.23	262.18 N	1422.17 W	1433.45	1.42
7839.00	91.91	268.57	6653.14	258.24 N	1517.06 W	1528.02	2.42
7934.00	91.05	268.17	6650.69	255.54 N	1611.99 W	1622.70	1.00

# **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 272.85 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.63 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7934.00 FEET  
IS 1632.12 FEET ALONG 279.01 DEGREES (GRID)**

**First Three survey's are from 3rd party source (Muulti Shot EMS) and provided by CO-man on location before drilling.  
MD 241 Inc 1.0 Azi 145.13  
MD 487 Inc 1.1 Azi 145.33  
MD 608 Inc 0.2 Azi 102.03**

**Tied in @ Surface  
Magnetic direction of 7.633 has been added to AZI for grid direction correction.**