

## PCGK - Pressure Case Gamma



**1 : 600 / 1 : 240**

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200	300		
<b>Date run completed</b>	16-Mar-14	17-Mar-14	20-Mar-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>	6.850	6.850	4.850		
<b>Log Start Depth (MD, ft)</b>	633.00	6,040.00	7,091.00		
<b>Log End Depth (MD, ft)</b>	6,040.00	7,091.00	11,307.00		
<b>Drill or Wipe</b>	Drill	Drill	Drill		
<b>Drill/Wipe Start Date and Time</b>	13-Mar-14 11:26	17-Mar-14 02:36	18-Mar-14 21:40		
<b>Drill/Wipe End Date and Time</b>	13-Mar-14 11:26	17-Mar-14 15:45	20-Mar-14 06:36		
<b>Min Inc (deg) @ Depth (MD, ft)</b>	0.07 @ 815.00	0.13 @ 6,046.00	87.72 @ 7,554.00		
<b>Max Inc (deg) @ Depth (MD, ft)</b>	13.44 @ 3,826.00	83.85 @ 7,037.00	92.43 @ 9,451.00		
<b>Bit TFA(in2) / Bit Type</b>	1.05 / PDC	1.74 / PDC	0.65 / PDC		
<b>Flow Rate (gpm)</b>	566.01	560.49	306.04		
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	NA / NA	NA / NA	N/A / N/A		
<b>Fluid Type</b>	Native/Spud Mud	Fresh Water Gel	Fresh Water Gel		
<b>Density (ppg) / Viscosity (spqt)</b>	8.80 / 31.00	10.80 / 39.00	9.50 / 38.00		
<b>Filtrate CL (ppm)</b>	1,900.00	2,000.00	2,500.00		
<b>pH / Fluid Loss (mptm)</b>	8.70 / 16	9.30 / 8	9.10 / 8		
<b>PV (cP) / YP (lbf2)</b>	4 / 4.00	12 / 11.00	10 / 6.00		
<b>% Solids / % Sand</b>	3.10 / 0.30	11.30 / 0.20	6.40 / 0.35		
<b>% Oil / Oil:Water Ratio</b>	NA / NA	NA / NA	N/A / N/A		
<b>Rm @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	N/A @ N/A		
<b>Rmf @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	N/A @ N/A		
<b>Rmc @ Measured Temp (degF)</b>	NA @ NA	NA @ NA	N/A @ N/A		
<b>Min Tool Temp (deg F) @ C</b>	115.00 / 46.11	150.00 / 65.56	224.00 / 84.44		

Max Tool Temp (degF) / Source	145.90 / PCM	158.60 / PCM	221.80 / PCM		
Rm @ Max Tool Temp (degF)	NA @ 145.90	NA @ 158.60	N/A @ 221.80		
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	11404283	11404283	12361802		
Insert Serial Number	11400849	11400849	11680794		
Date and Time Initialized	15-Mar-14 10:56	15-Mar-14 10:56	18-Mar-14 09:04		
Date and Time Read	17-Mar-14 21:39	17-Mar-14 21:39	20-Mar-14 18:35		
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	66.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11404283	11404283	12361802		
Sonde Serial Number	11638605	11638605	12177556		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	23.56	219.94	84.57		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	48.41	46.50	68.58		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11404283	11404283	12361802		
Insert/Sonde Serial Number	11579852	11579852	11293391		

## 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" 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: 1.2 ft

6. Insite Version v8.0.10

## WARRANTY

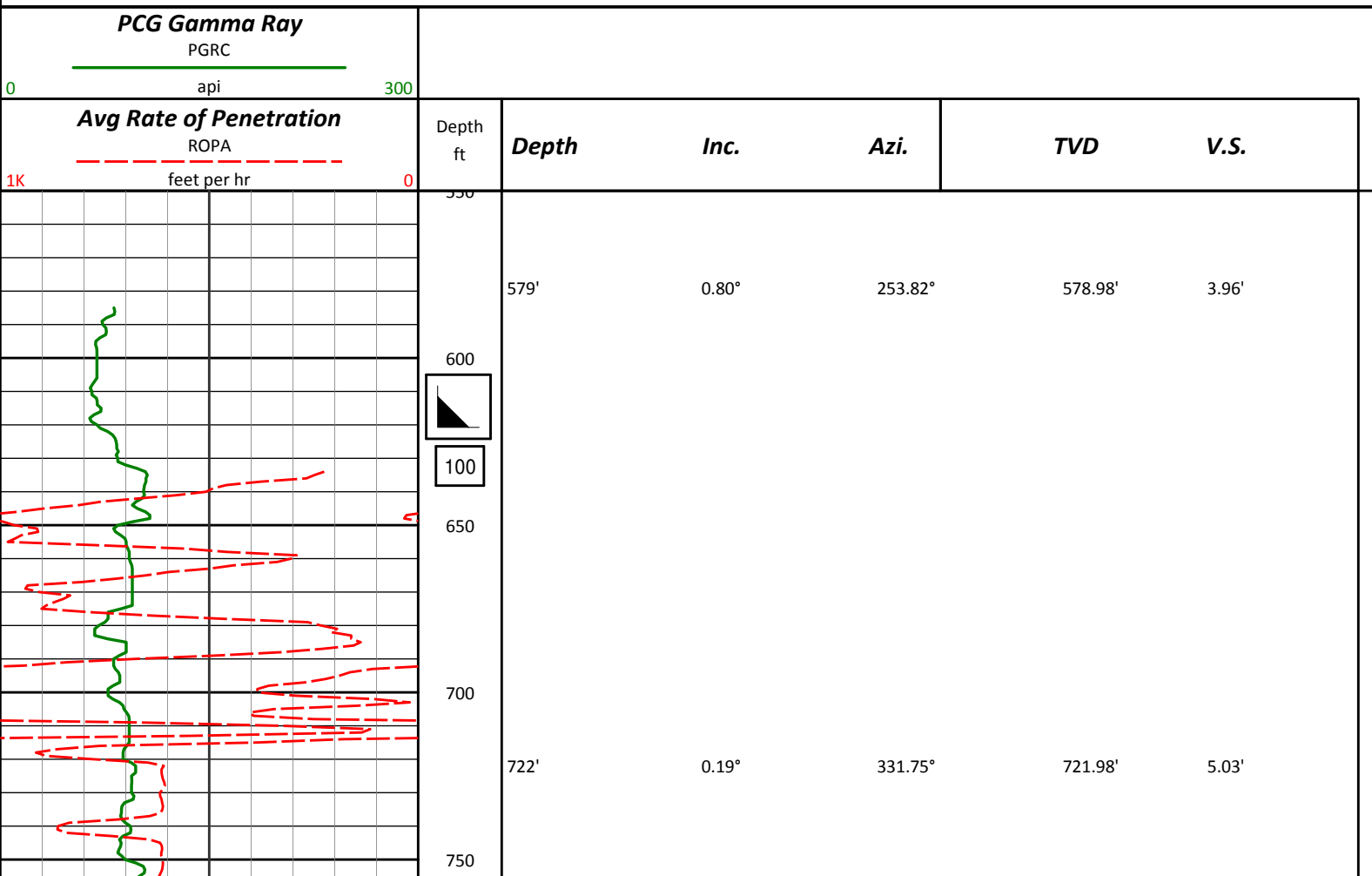
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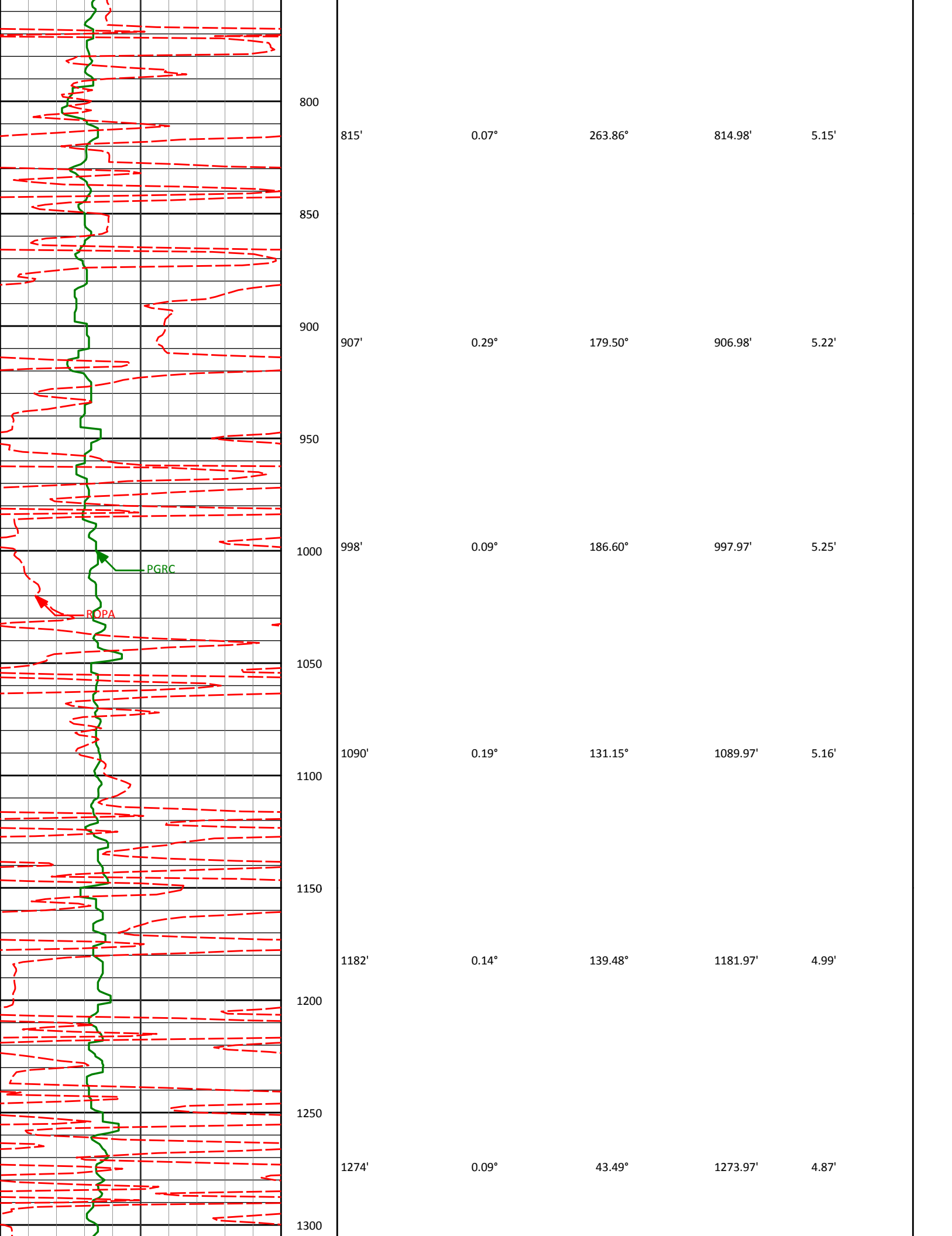
# HALLIBURTON

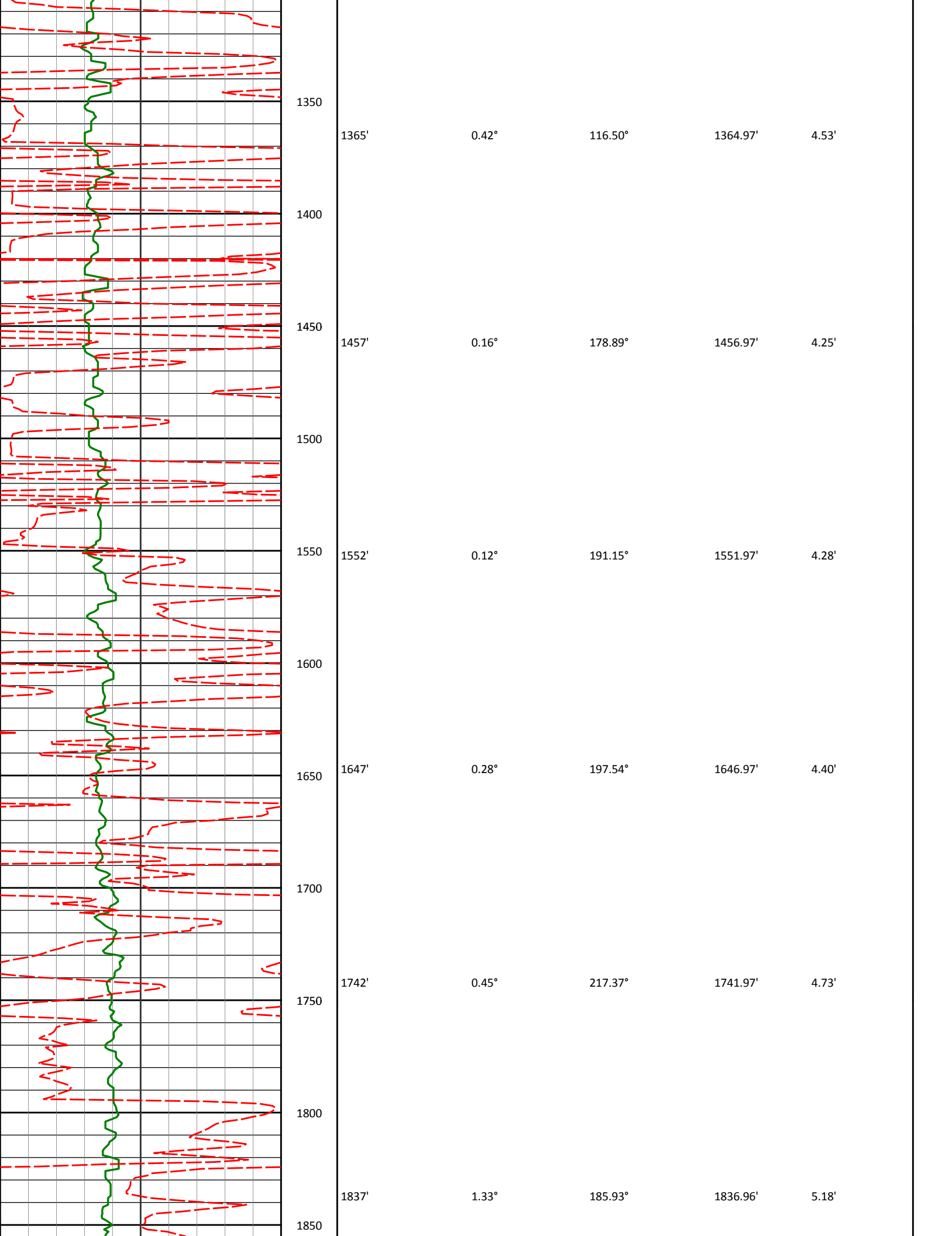
## Sperry Drilling Services

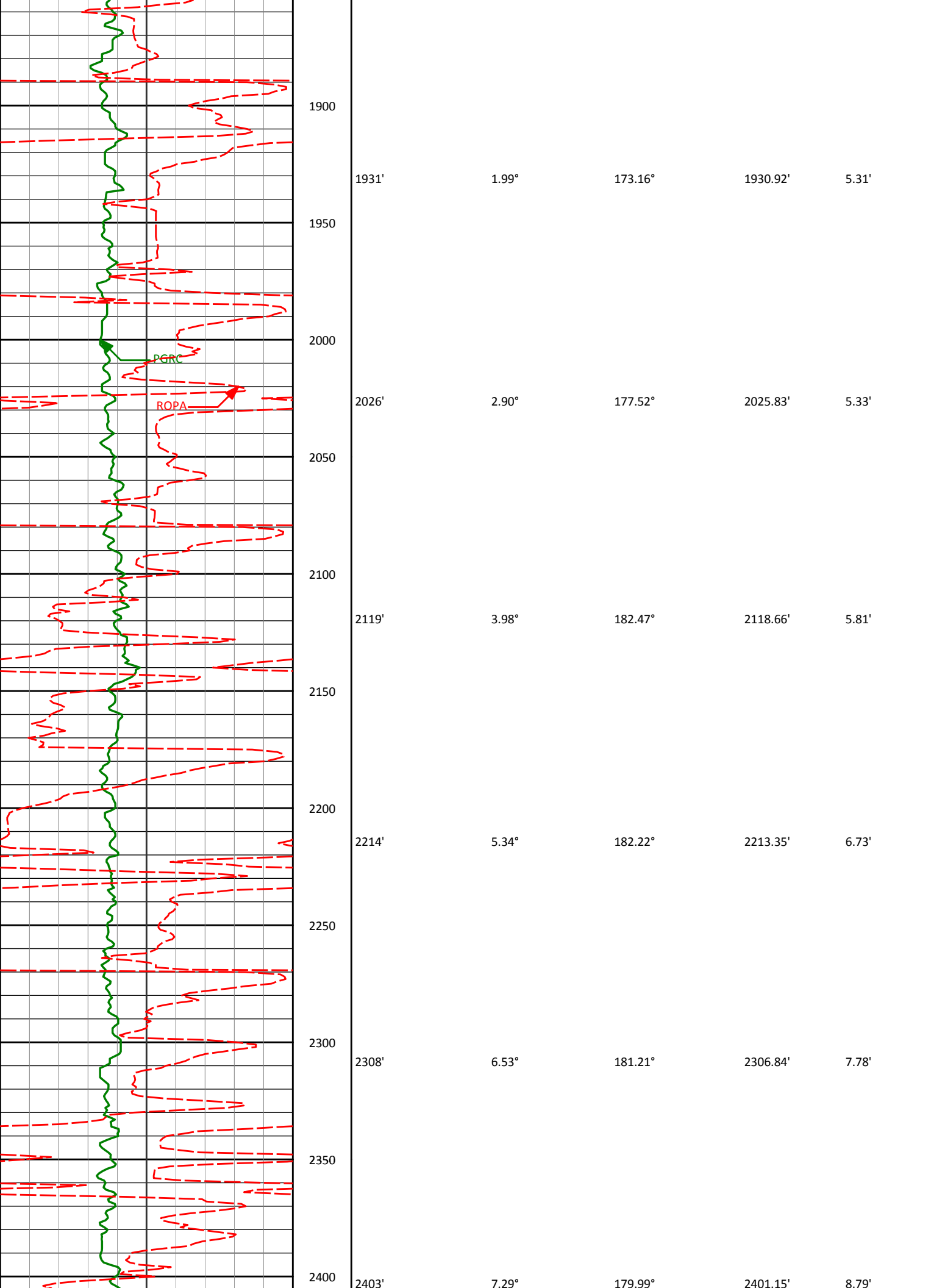
### MD Correlation Log 1:600

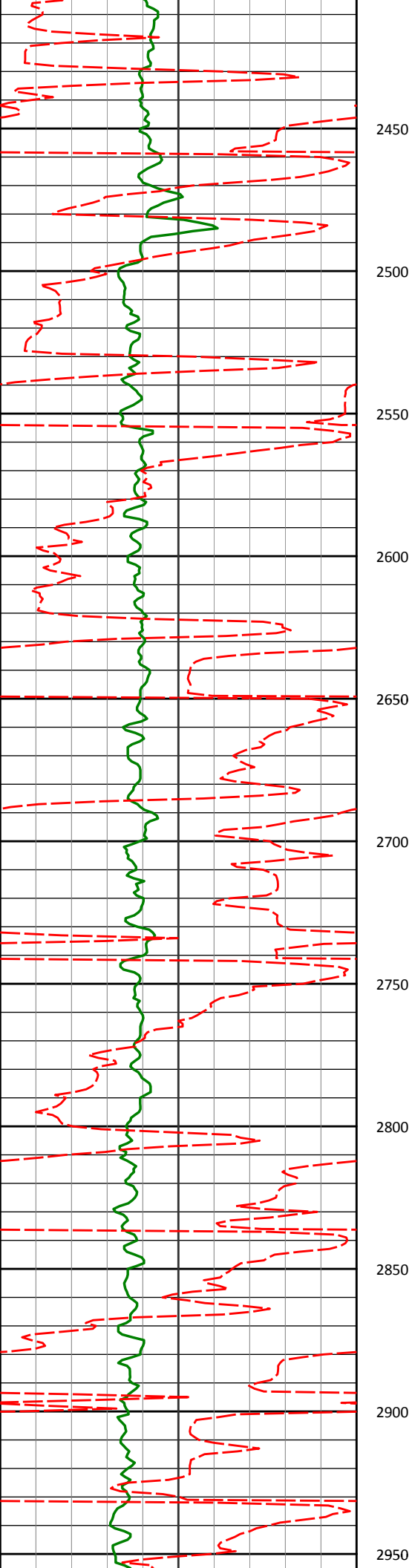
Noble Energy  
Wells Ranch AA35-68-1BHNC  
H&P 321  
Sec. 36-T6N-R63W



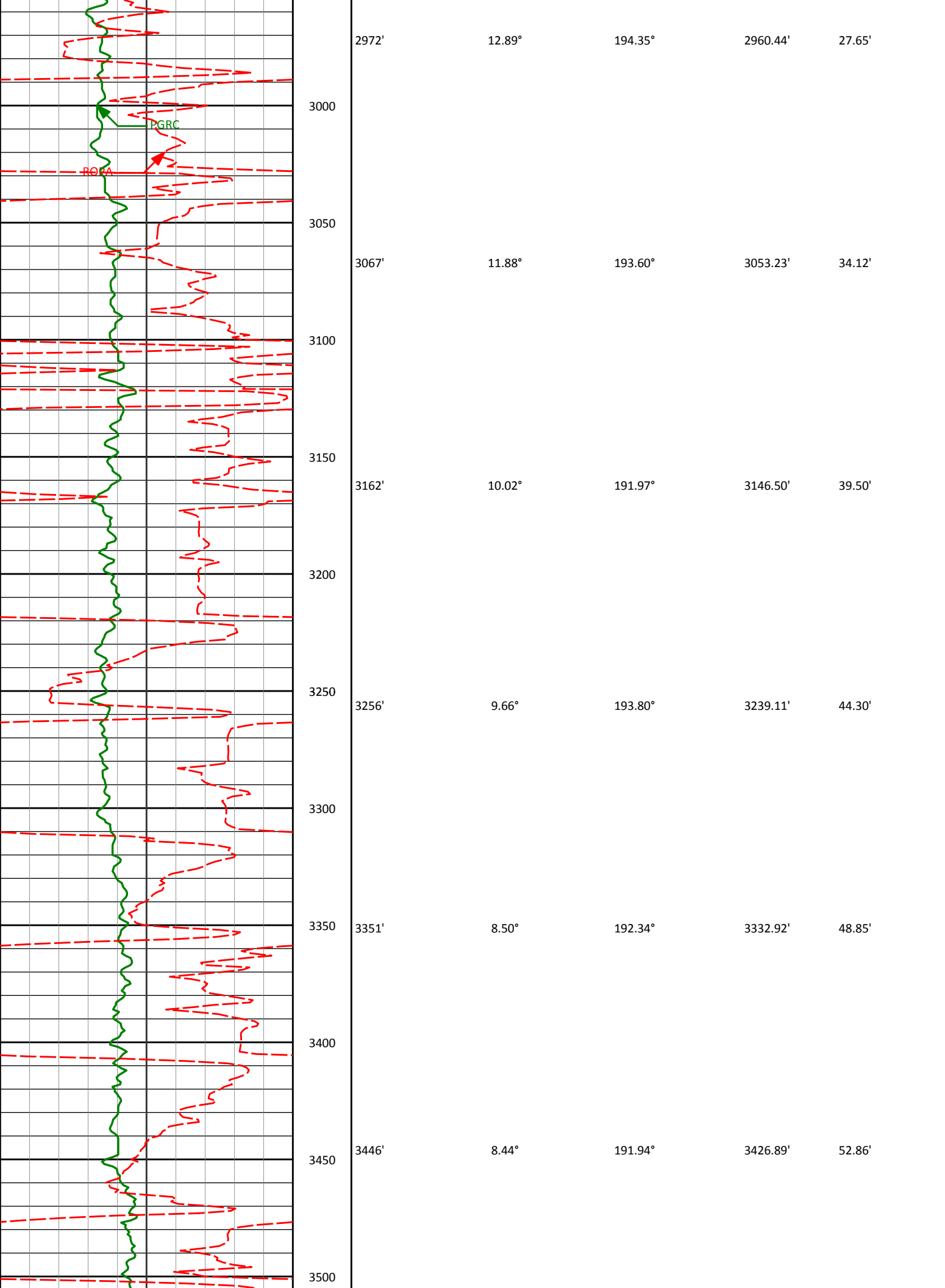




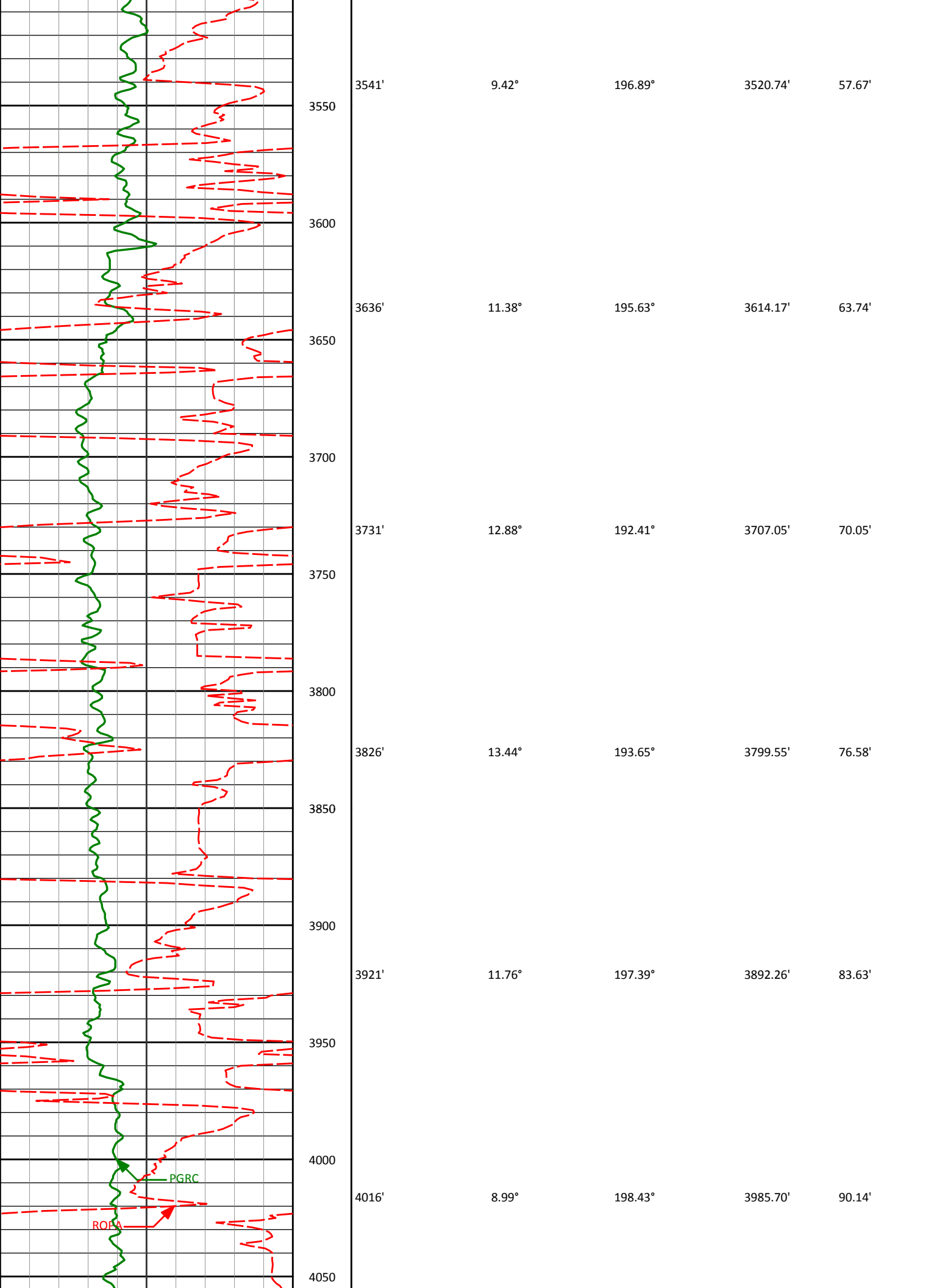


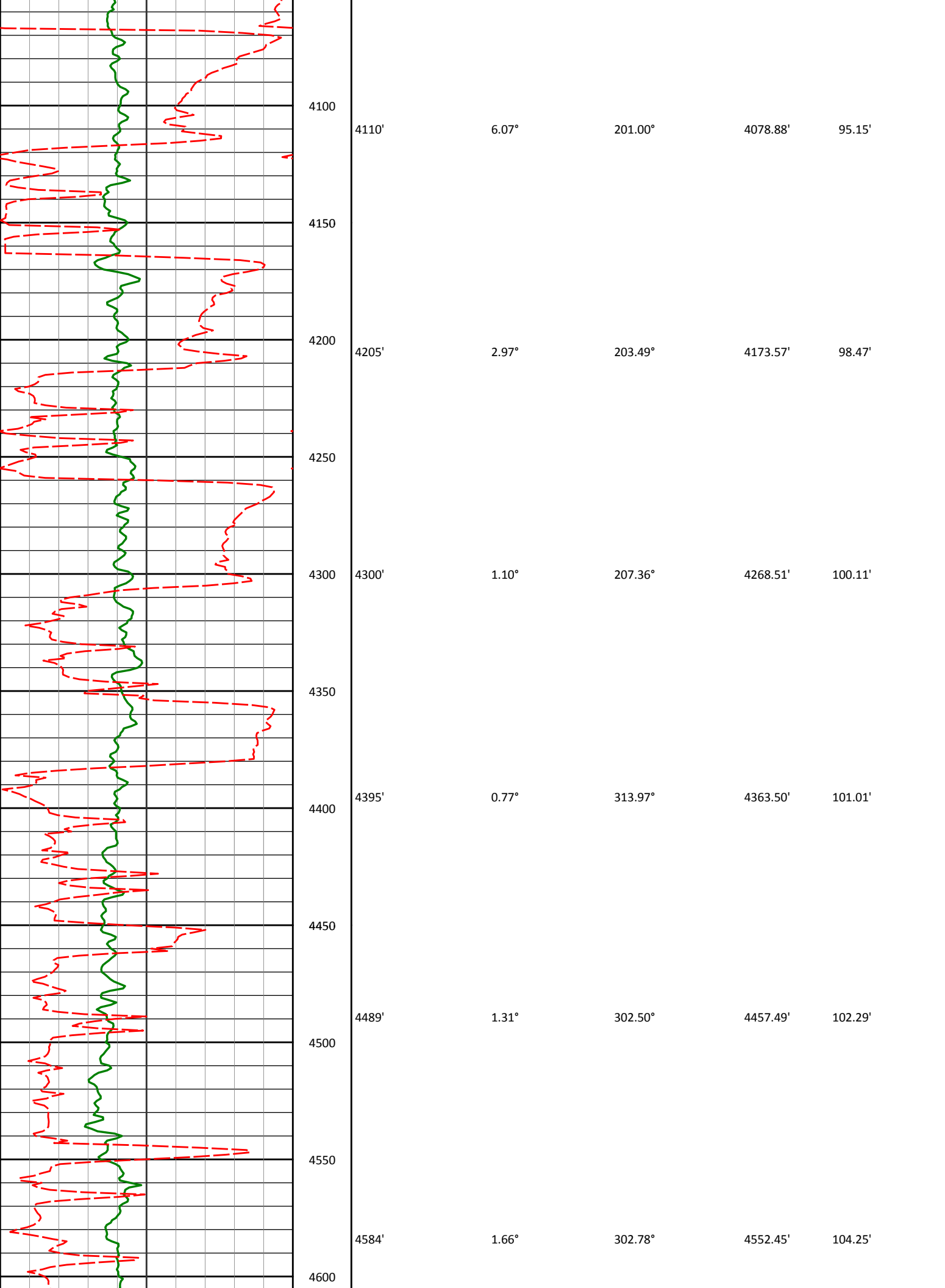


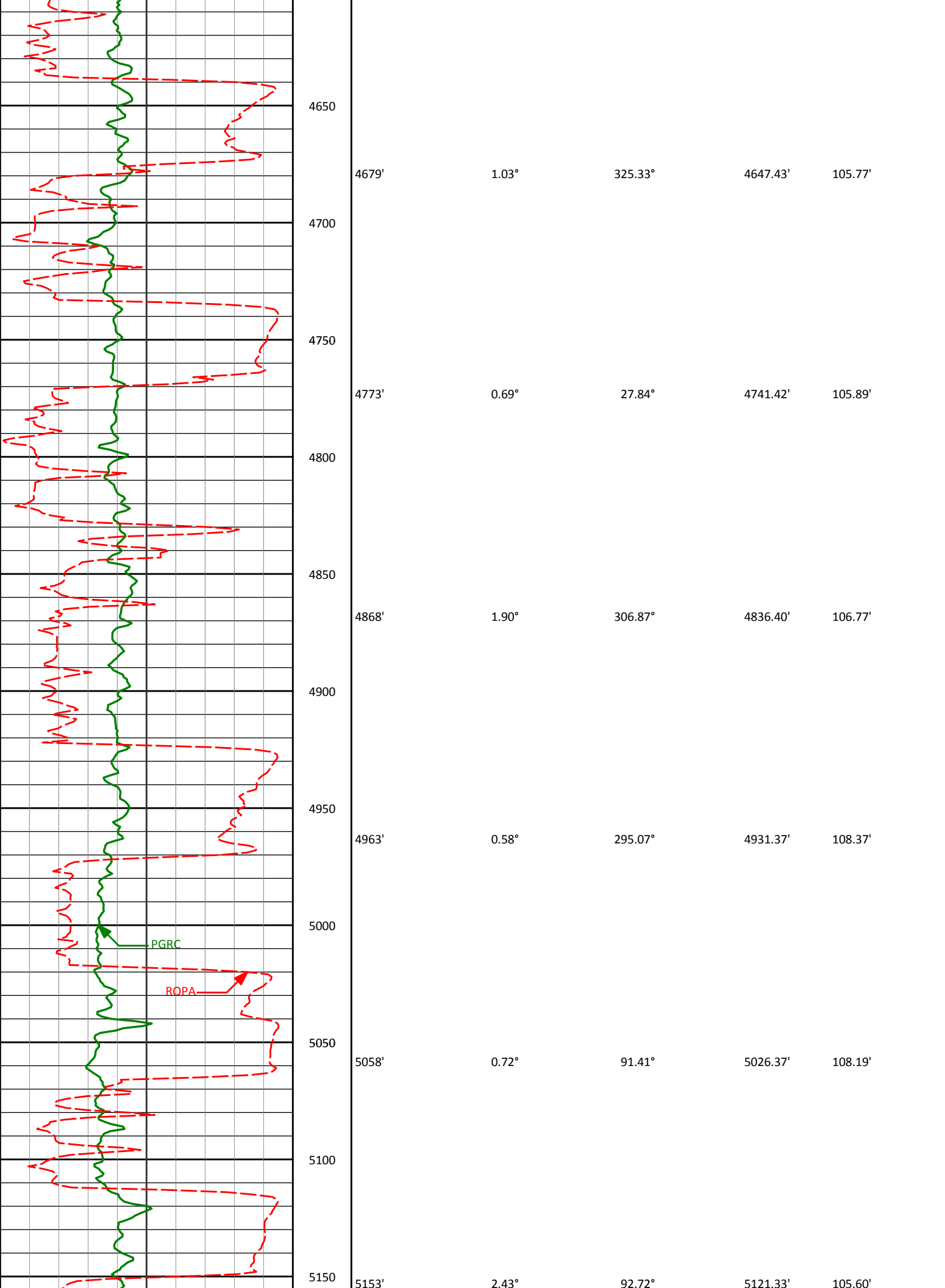
2498'	8.50°	188.39°	2495.25'	10.83'
2593'	10.55°	179.70°	2588.94'	13.04'
2688'	10.55°	183.30°	2682.34'	14.86'
2783'	11.70°	186.79°	2775.55'	17.94'
2877'	11.63°	188.88°	2867.61'	22.00'

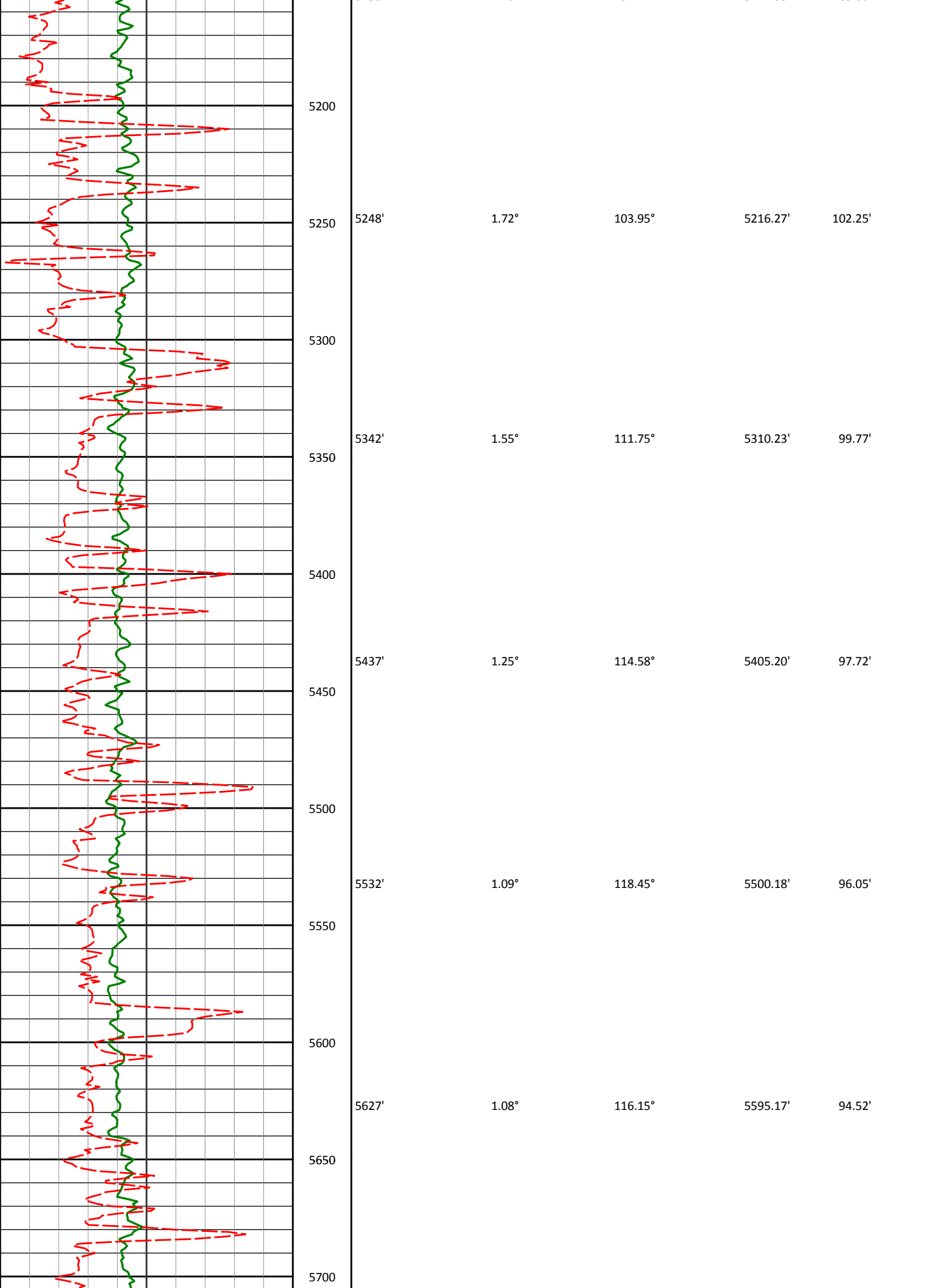


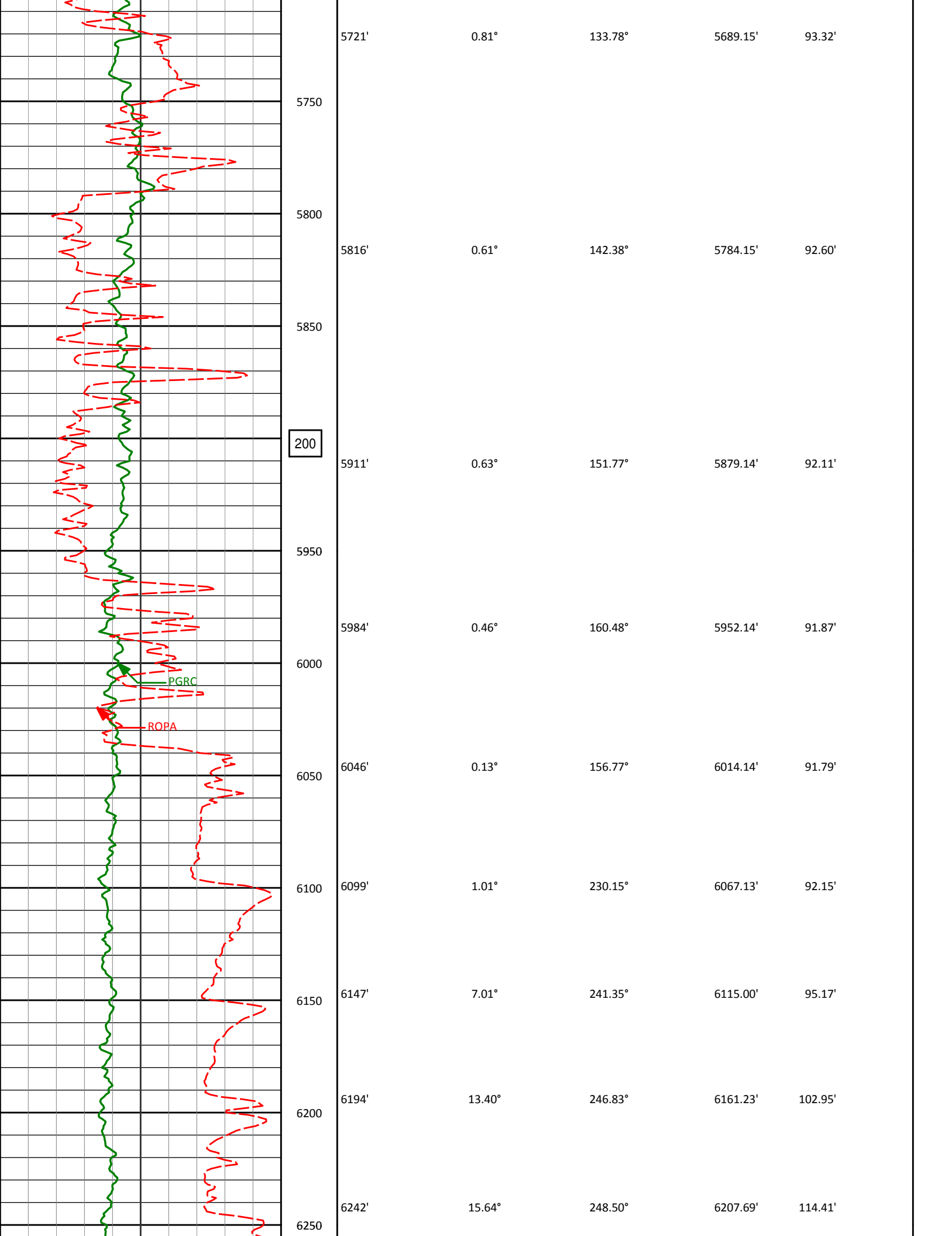


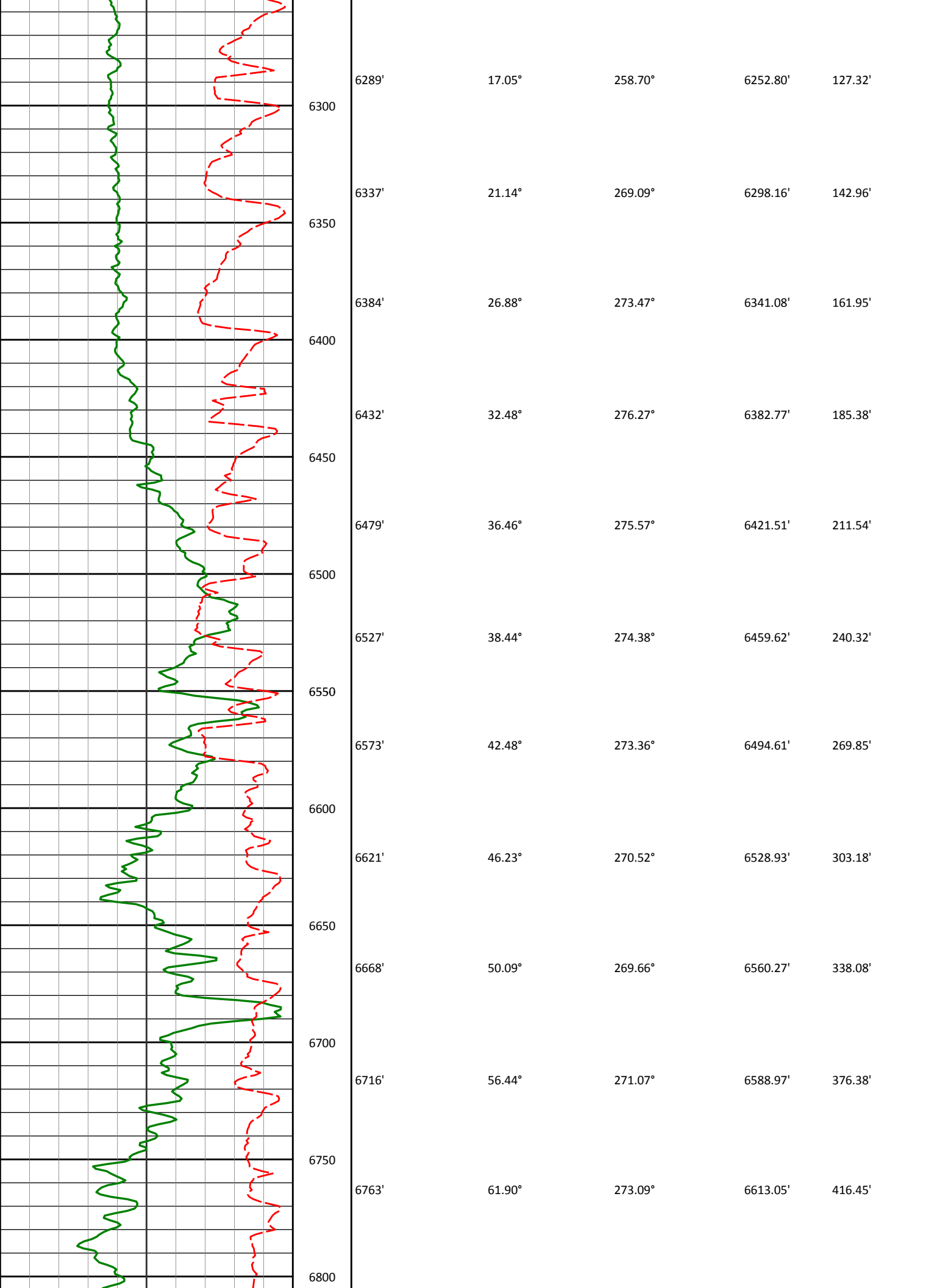


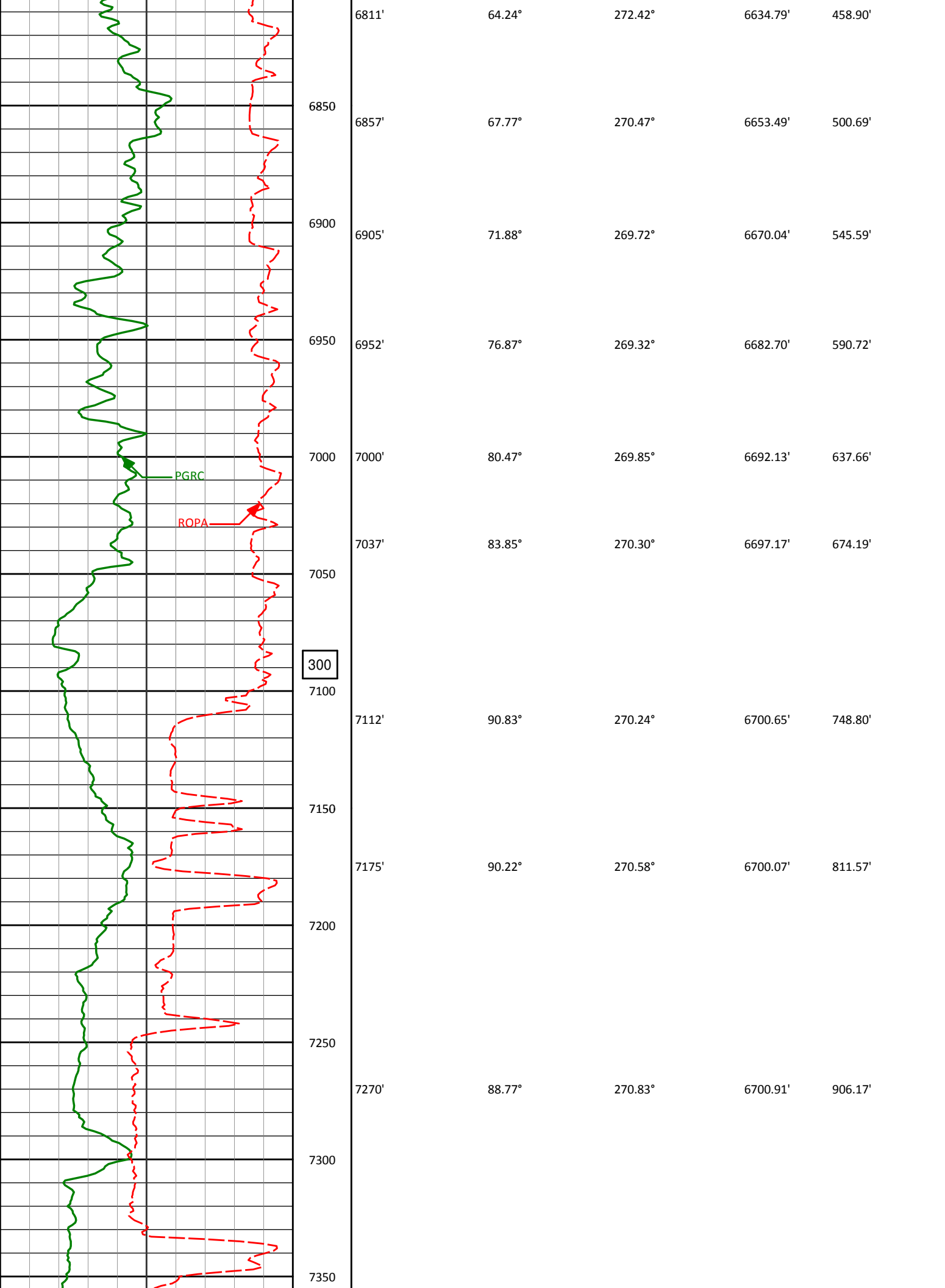




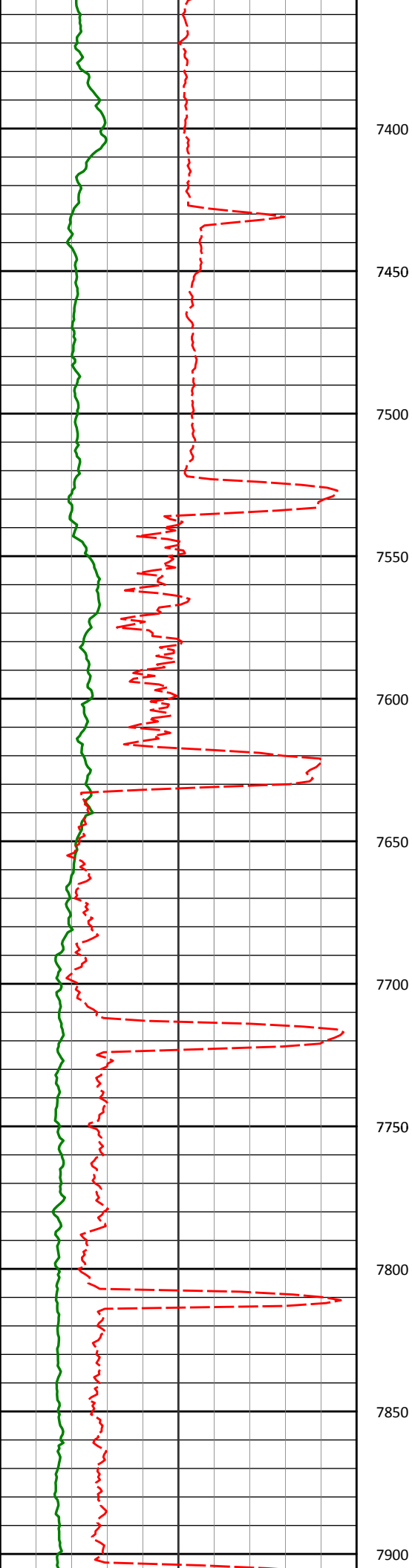






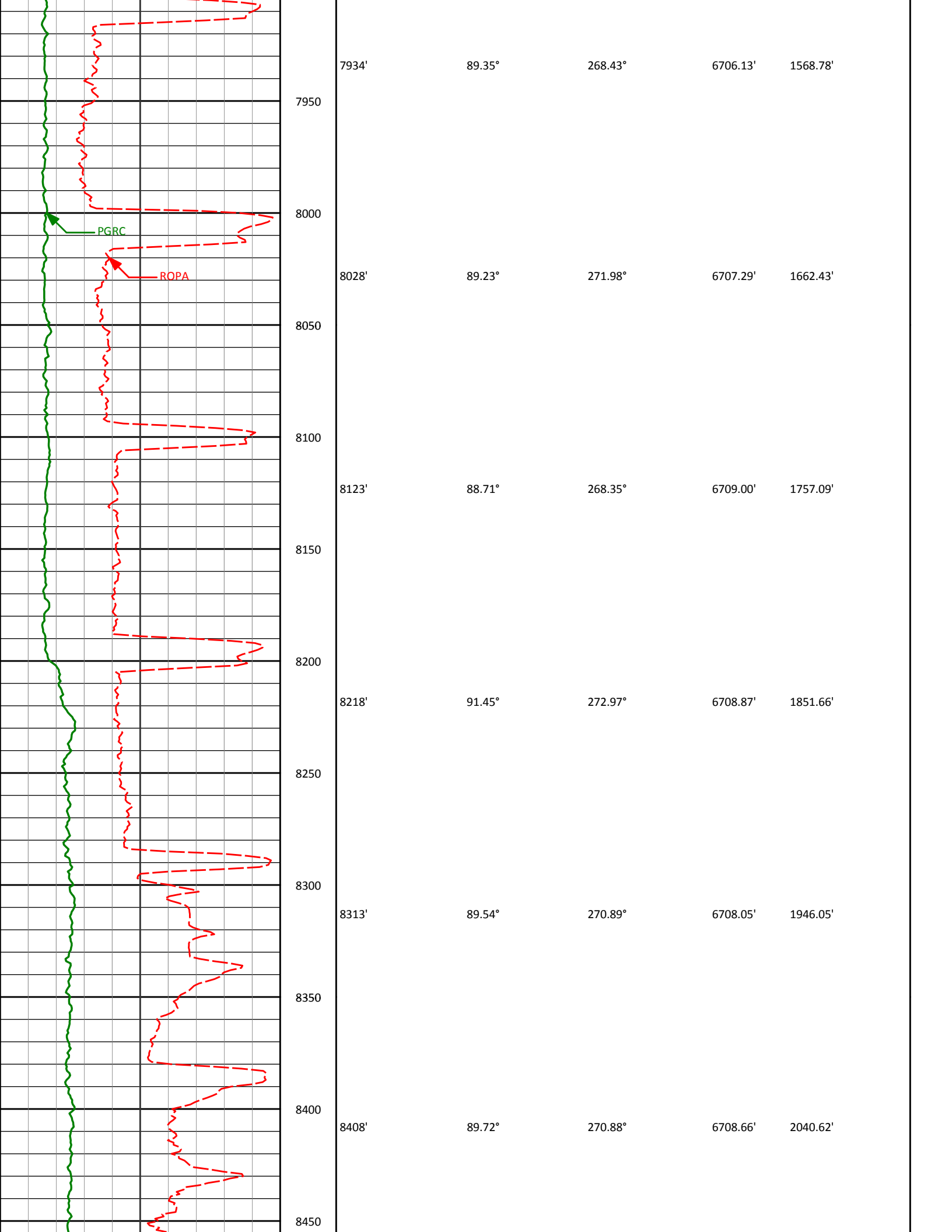


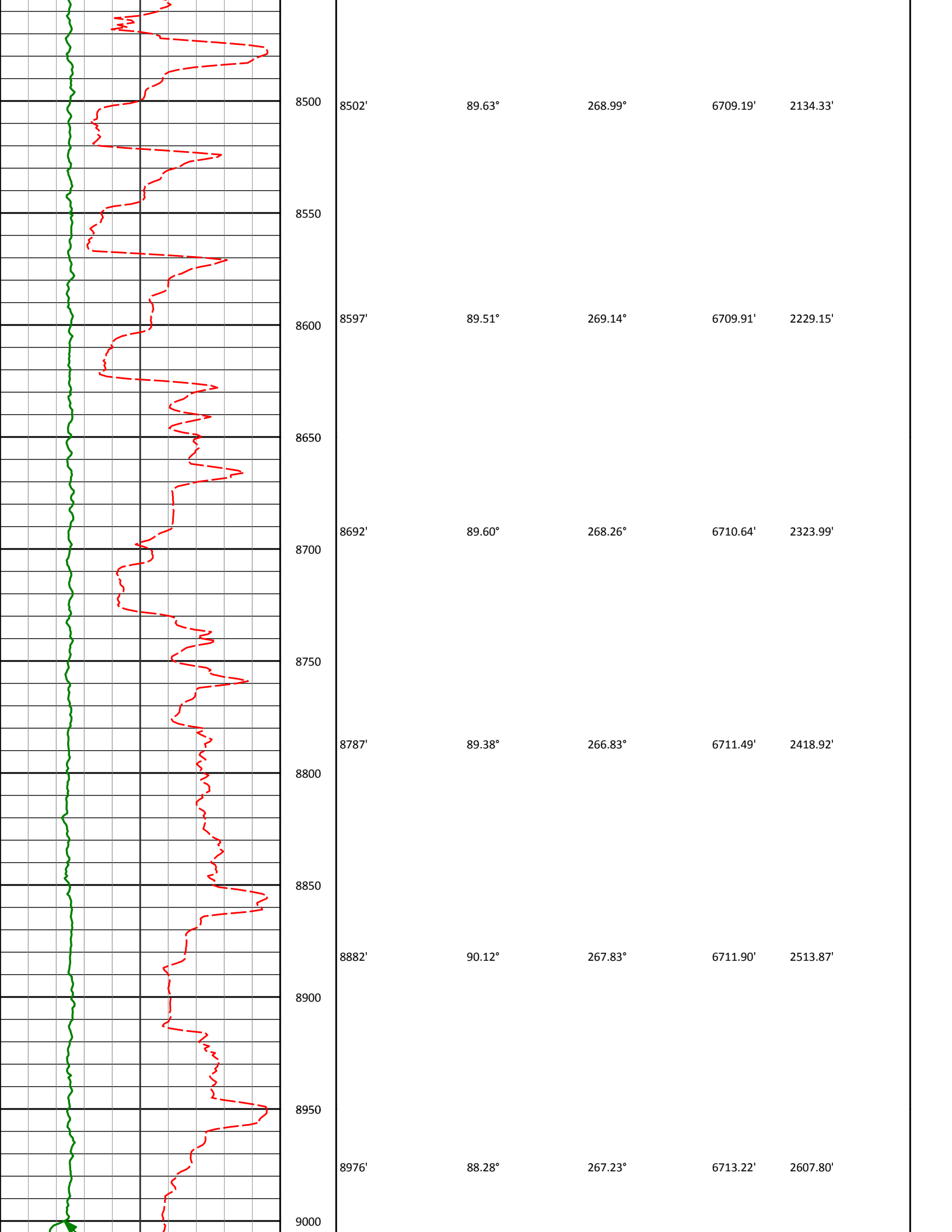
6811'	64.24°	272.42°	6634.79'	458.90'
6850				
6857'	67.77°	270.47°	6653.49'	500.69'
6900				
6905'	71.88°	269.72°	6670.04'	545.59'
6950				
6952'	76.87°	269.32°	6682.70'	590.72'
7000				
7000'	80.47°	269.85°	6692.13'	637.66'
7037'	83.85°	270.30°	6697.17'	674.19'
7050				
300				
7100				
7112'	90.83°	270.24°	6700.65'	748.80'
7150				
7175'	90.22°	270.58°	6700.07'	811.57'
7200				
7250				
7270'	88.77°	270.83°	6700.91'	906.17'
7300				
7350				

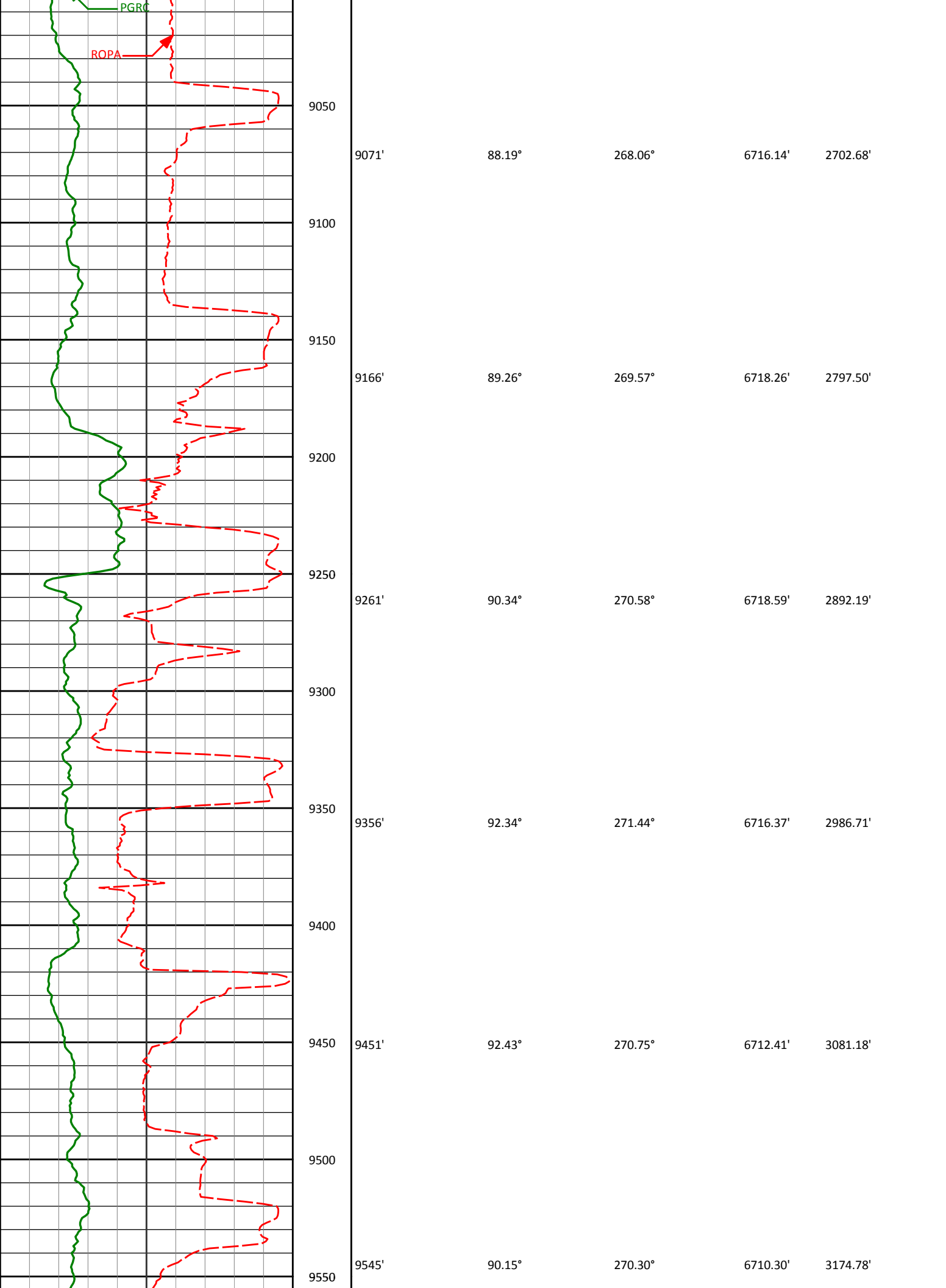


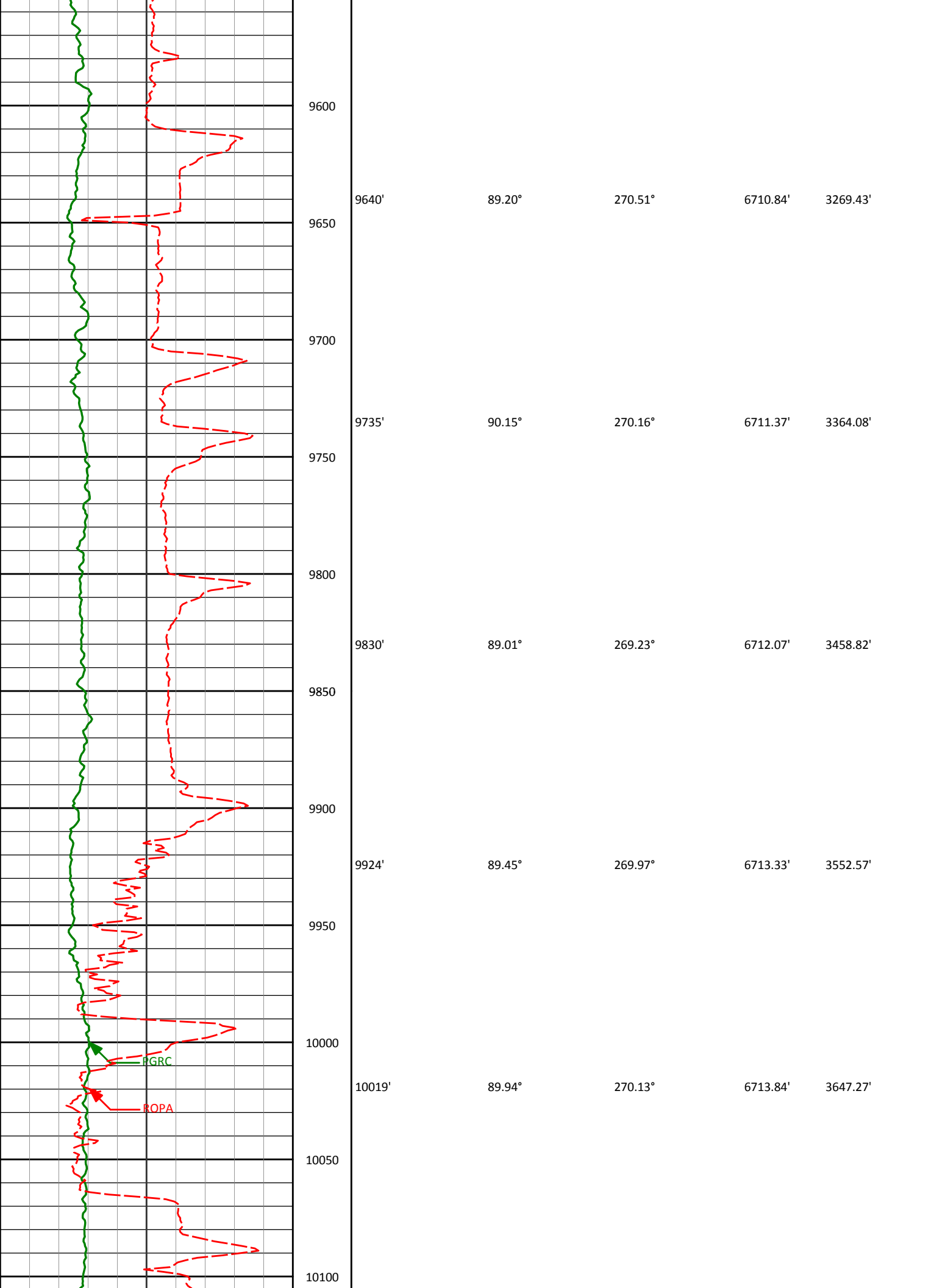
7364'	90.31°	269.48°	6701.67'	999.84'
7400				
7450				
7459'	90.25°	269.53°	6701.20'	1094.61'
7500				
7550				
7554'	87.72°	268.45°	6702.88'	1189.41'
7600				
7650				
7649'	88.80°	268.87°	6705.77'	1284.22'
7700				
7750				
7744'	90.80°	268.77°	6706.10'	1379.05'
7800				
7850				
7839'	89.91°	268.43°	6705.51'	1473.90'
7900				

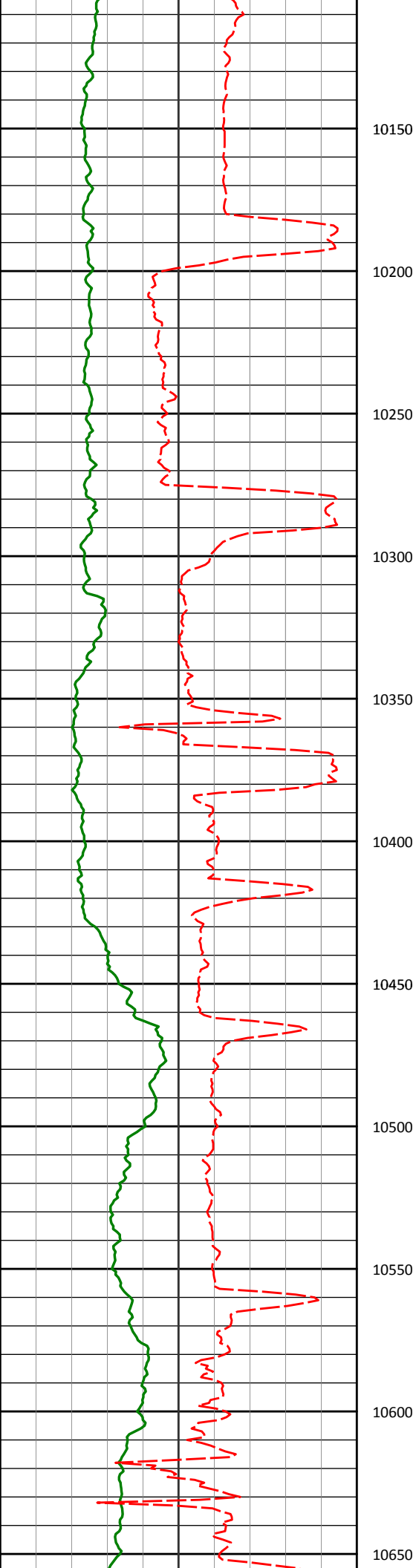




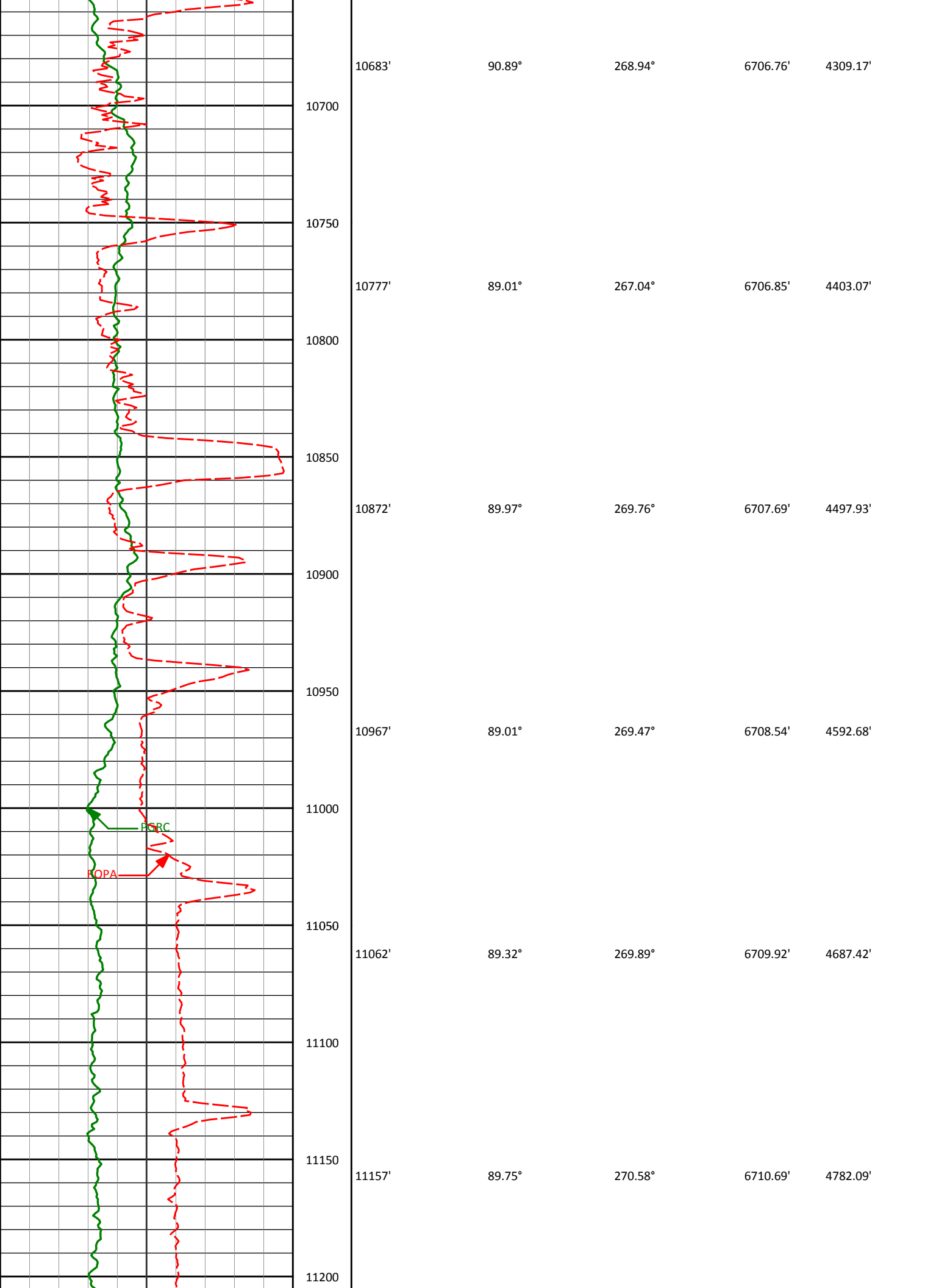


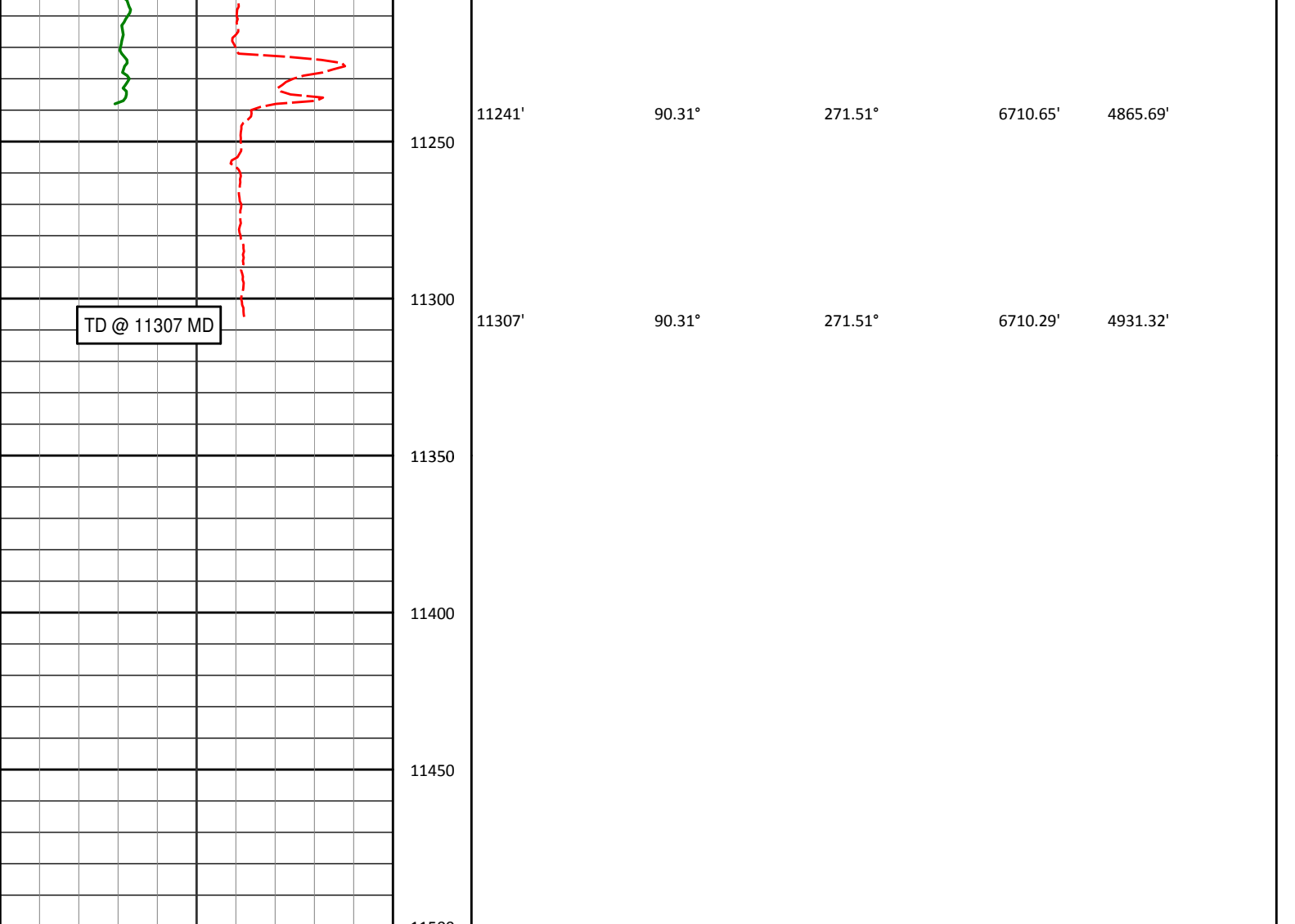






10114'	88.89°	269.29°	6714.81'	3742.00'
10209'	89.29°	269.19°	6716.32'	3836.78'
10303'	92.10°	272.19°	6715.18'	3930.37'
10398'	91.02°	269.80°	6712.59'	4024.89'
10493'	91.45°	269.75°	6710.54'	4119.60'
10588'	91.11°	268.92°	6708.42'	4214.36'



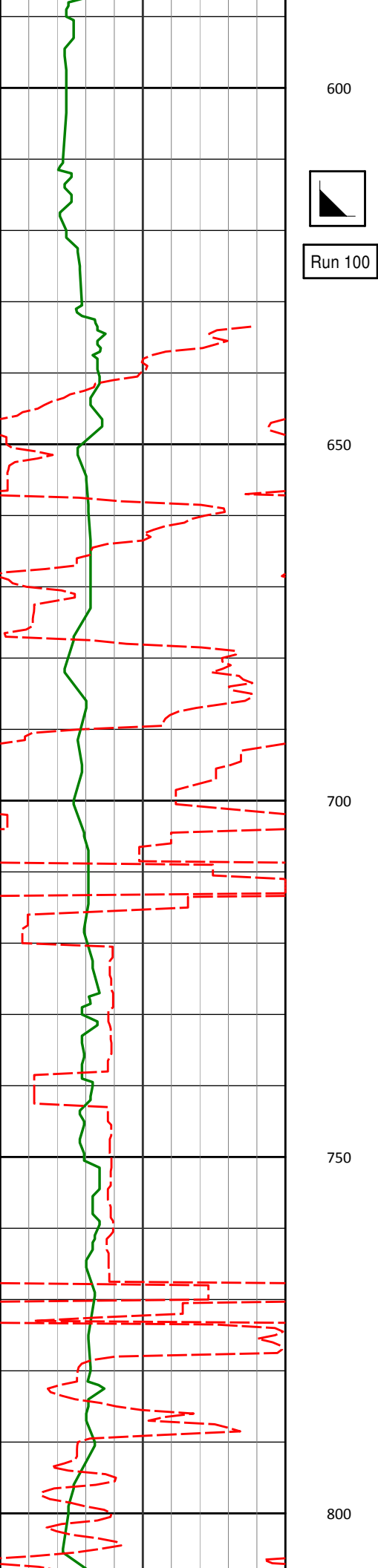


<b>Avg Rate of Penetration</b> ROPA feet per hr	Depth ft	<b>Depth</b>	<b>Inc.</b>	<b>Azi.</b>	<b>TVD</b>	<b>V.S.</b>
1K 0						
<b>PCG Gamma Ray</b> PGRC api						
0 300						

**HALLIBURTON**  
**Sperry Drilling Services**  
**TVD Detail Log 1:240**

Noble Energy  
Wells Ranch AA35-68-1BHNC  
H&P 321  
Sec. 36-T6N-R63W

<div><div>PCG Gamma Ray</div><div>PGRC</div><div><div>0</div><div>api</div><div>300</div></div></div>																			
<div><div>Avg Rate of Penetration</div><div>ROPA</div><div><div>1K</div><div>feet per hr</div><div>0</div></div></div>										Depth ft	DepthInc.Azi.			TVDV.S.					



722'

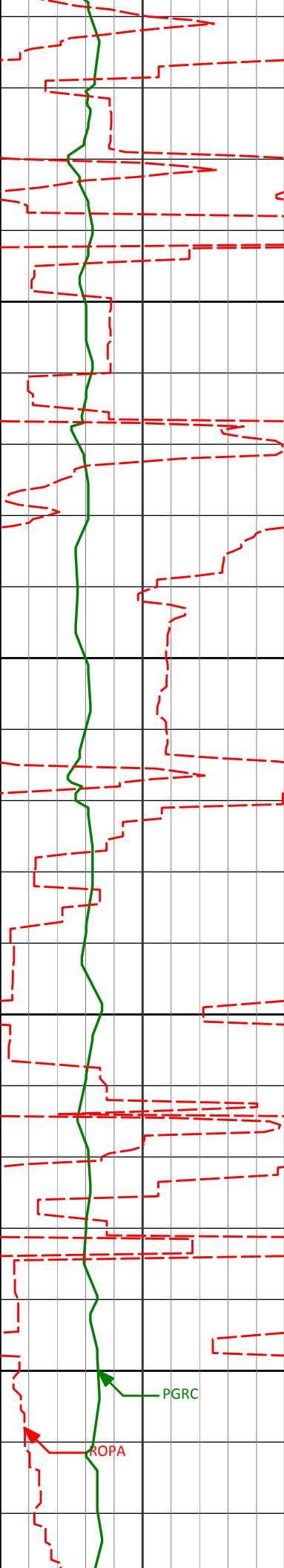
0.19°

331.75°

721.98'

5.03'





815'

0.07°

263.86°

814.98'

5.15'

850

900

907'

0.29°

179.50°

906.98'

5.22'

950

1000

998'

0.09°

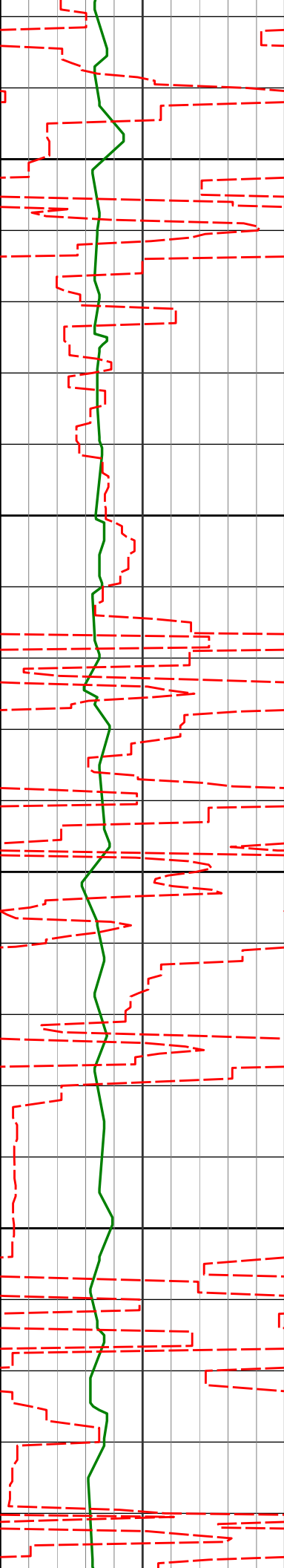
186.60°

997.97'

5.25'

PGRC

ROPA



1050

1090'

0.19°

131.15°

1089.97'

5.16'

1100

1150

1182'

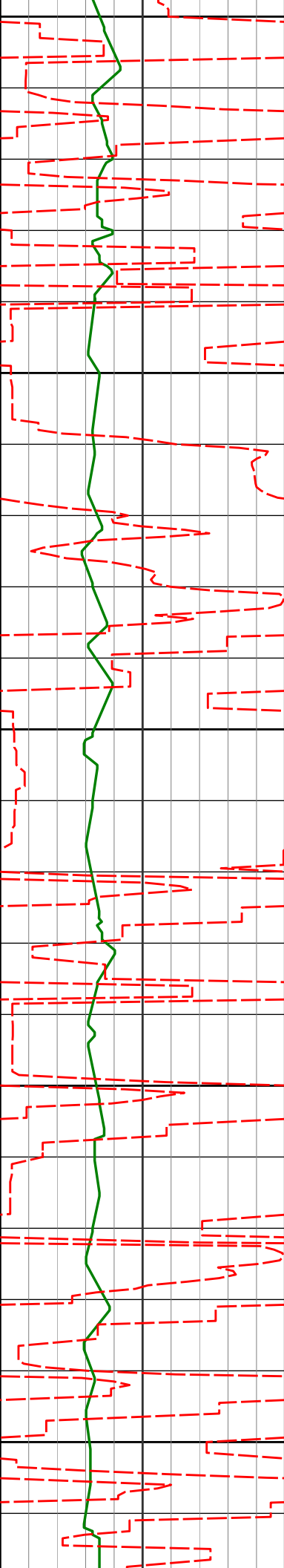
0.14°

139.48°

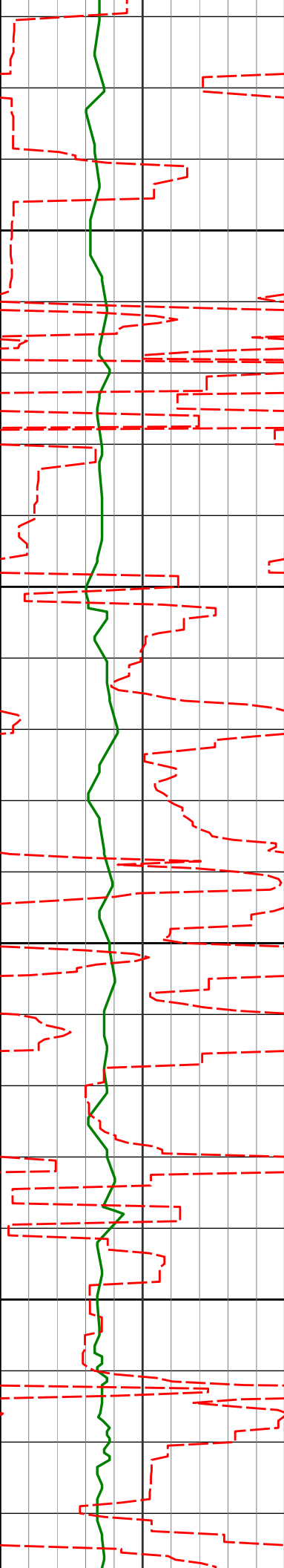
1181.97'

4.99'

1200



1250				
1274'	0.09°	43.49°	1273.97'	4.87'
1300				
1350				
1365'	0.42°	116.50°	1364.97'	4.53'
1400				
1450				
1457'	0.16°	178.89°	1456.97'	4.25'



1500

1550

1600

1650

1552'

0.12°

191.15°

1551.97'

4.28'

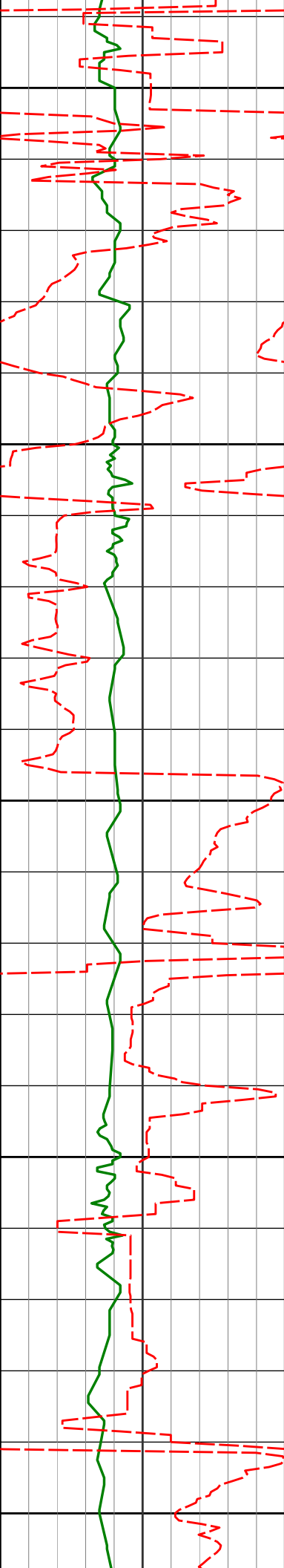
1647'

0.28°

197.54°

1646.97'

4.40'



1700

1742'

0.45°

217.37°

1741.97'

4.73'

1750

1800

1837'

1.33°

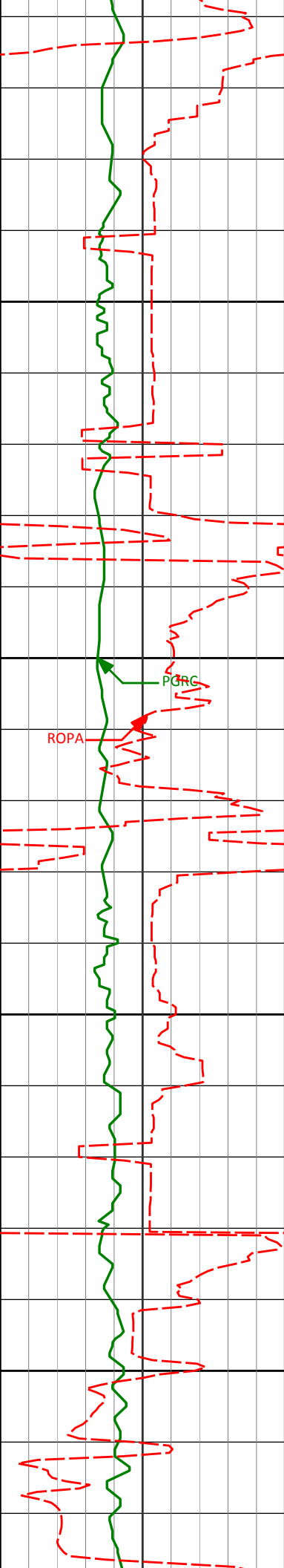
185.93°

1836.96'

5.18'

1850

1900



1950

2000

2050

2100

1931'

1.99°

173.16°

1930.92'

5.31'

2026'

2.90°

177.52°

2025.83'

5.33'

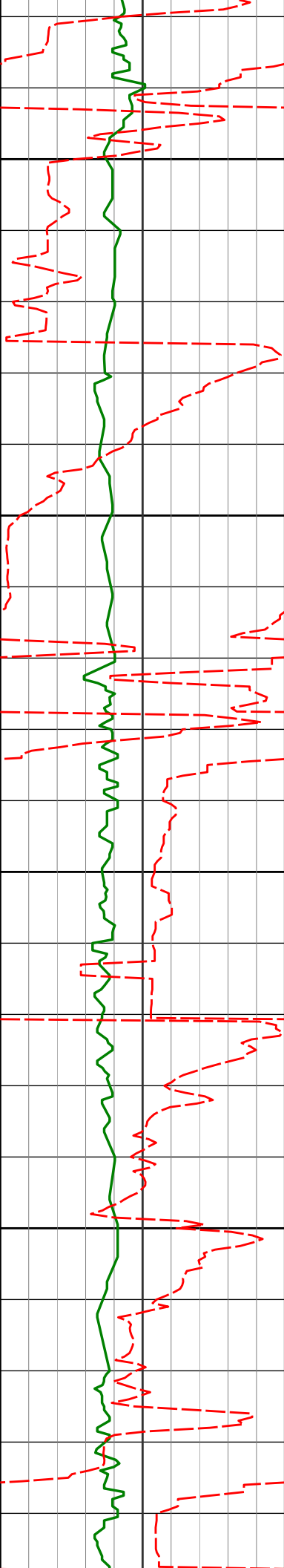
2119'

3.98°

182.47°

2118.66'

5.81'



2150

2200

2250

2300

2214'

5.34°

182.22°

2213.35'

6.73'

2308'

6.53°

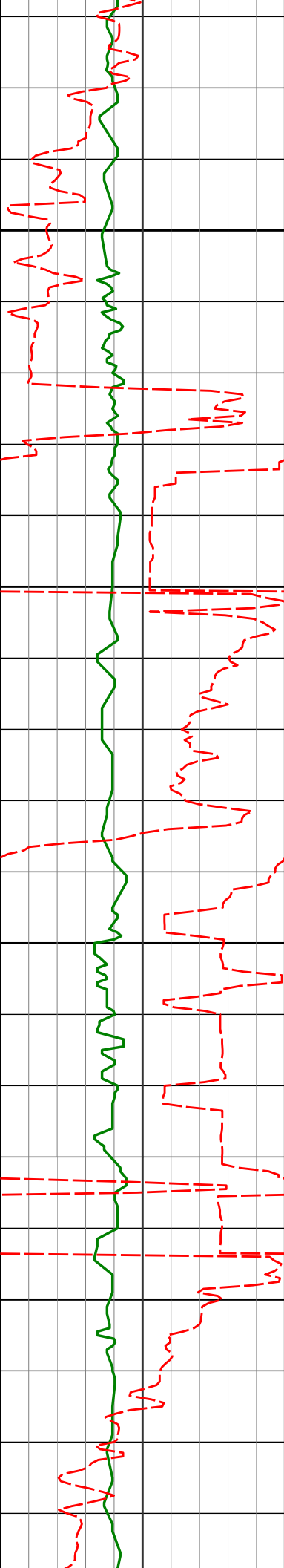
181.21°

2306.84'

7.78'







2593'	10.55°	179.70°	2588.94'	13.04'
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2600

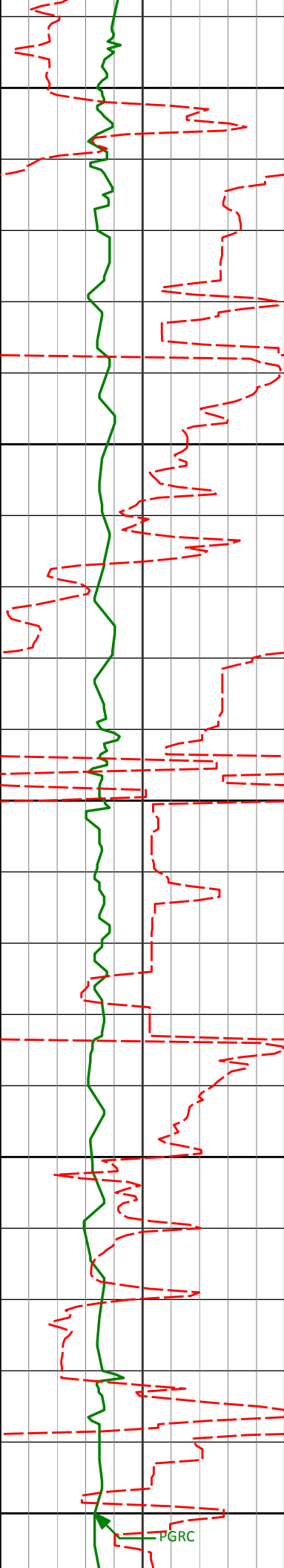
2650

2688'	10.55°	183.30°	2682.34'	14.86'
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2700

2750

2783'	11.70°	186.79°	2775.55'	17.94'
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2800

2850

2900

2950

3000

2877'

11.63°

188.88°

2867.61'

22.00'

2972'

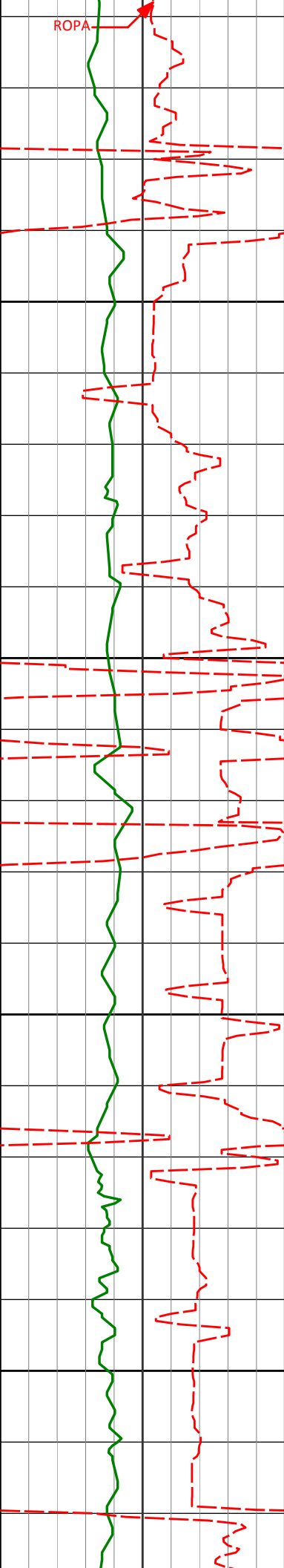
12.89°

194.35°

2960.44'

27.65'

PGRC



3067'

11.88°

193.60°

3053.23'

34.12'

3100

3150

3162'

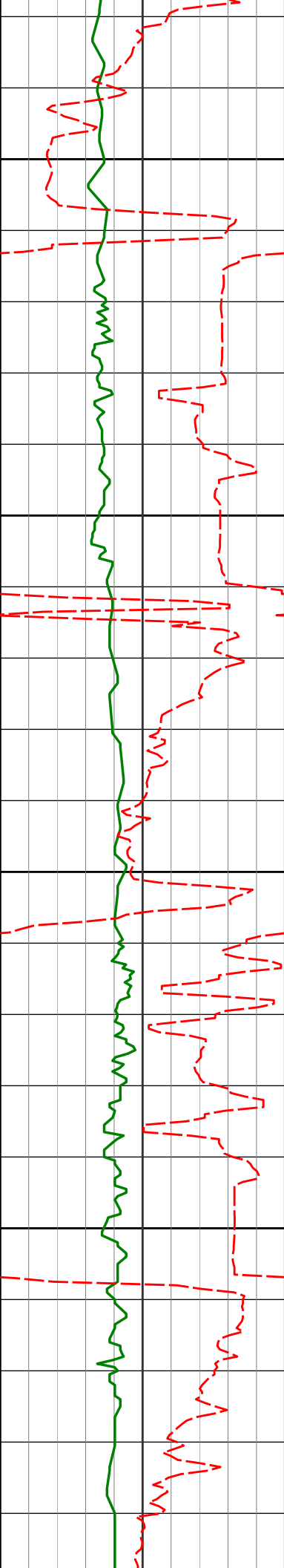
10.02°

191.97°

3146.50'

39.50'

3200



3250

3256'

9.66°

193.80°

3239.11'

44.30'

3300

3350

3351'

8.50°

192.34°

3332.92'

48.85'

3400

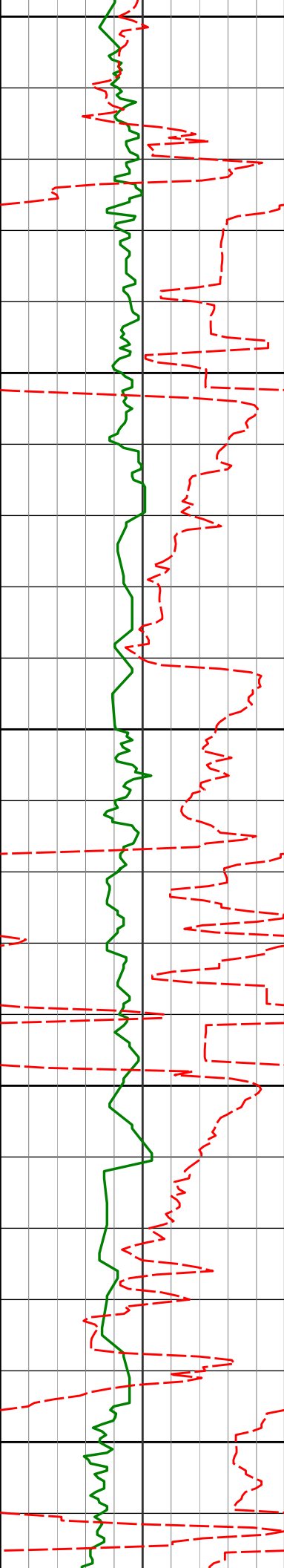
3446'

8.44°

191.94°

3426.89'

52.86'



3450

3500

3550

3600

3650

3541'

9.42°

196.89°

3520.74'

57.67'

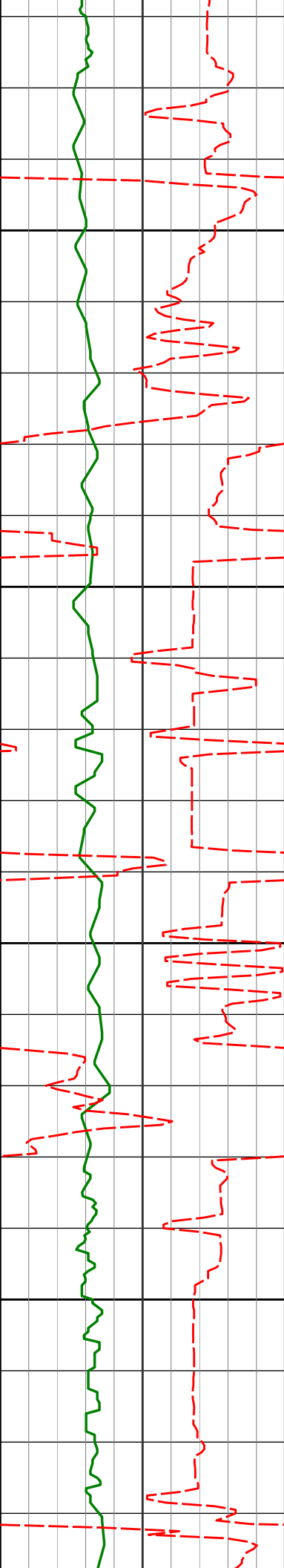
3636'

11.38°

195.63°

3614.17'

63.74'



3700

3731'

12.88°

192.41°

3707.05'

70.05'

3750

3800

3826'

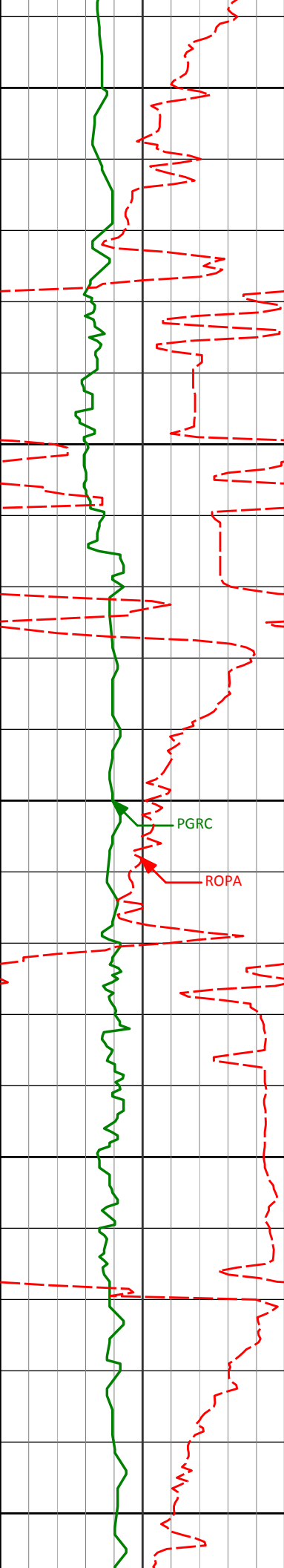
13.44°

193.65°

3799.55'

76.58'

3850



3900

3921'

11.76°

197.39°

3892.26'

83.63'

3950

4000

PGRC

ROPA

4016'

8.99°

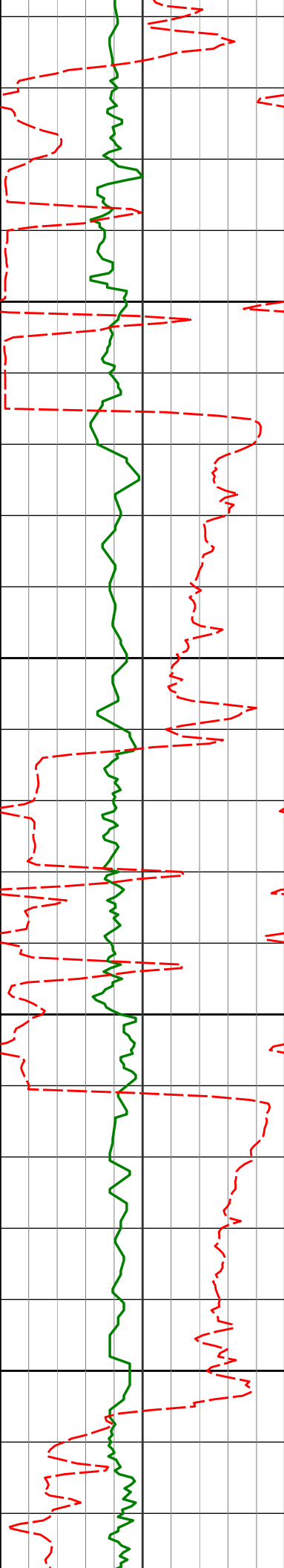
198.43°

3985.70'

90.14'

4050

4100



4150

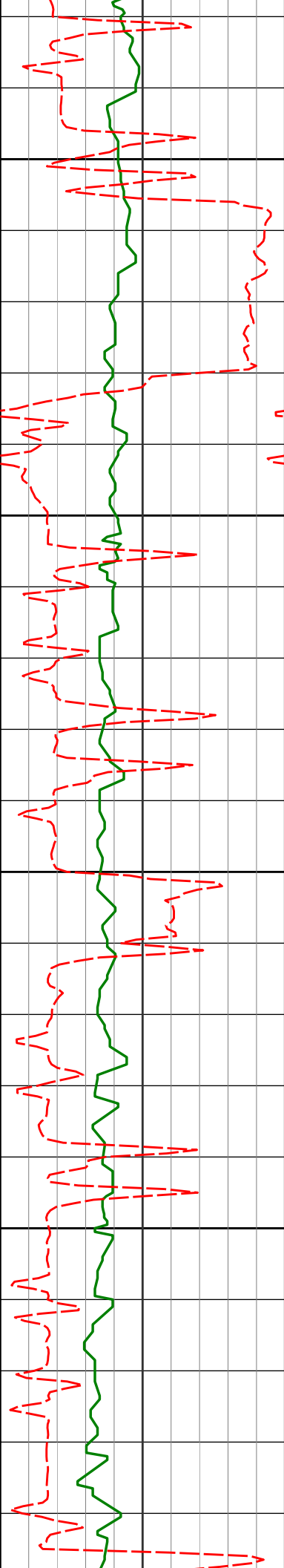
4200

4250

4300

4110'	6.07°	201.00°	4078.88'	95.15'
4205'	2.97°	203.49°	4173.57'	98.47'
4300'	1.10°	207.36°	4268.51'	100.11'





4350

4395'

0.77°

313.97°

4363.50'

101.01'

4400

4450

4489'

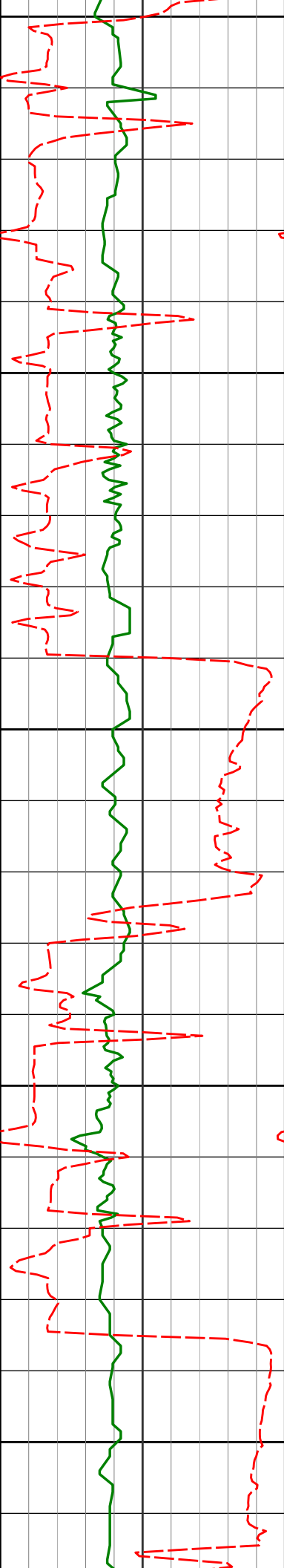
1.31°

302.50°

4457.49'

102.29'

4500



4550

4584'

1.66°

302.78°

4552.45'

104.25'

4600

4650

4679'

1.03°

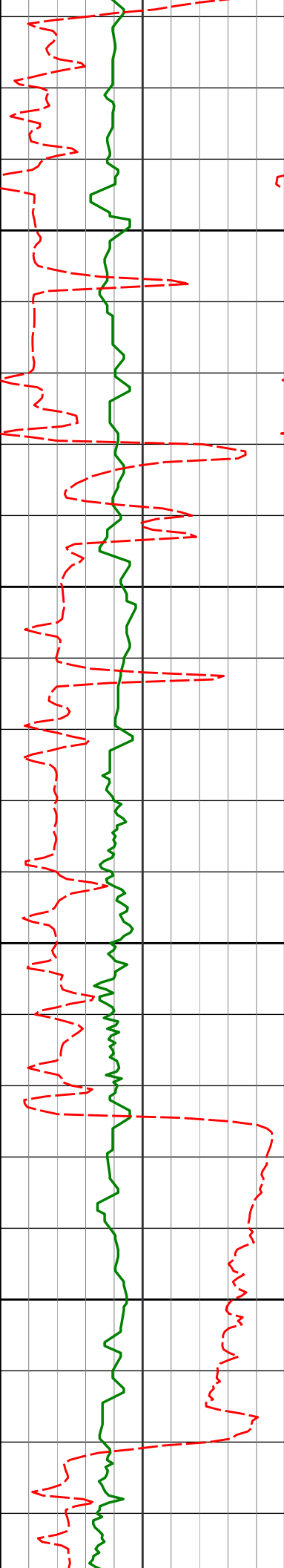
325.33°

4647.43'

105.77'

4700

4750



4773'

0.69°

27.84°

4741.42'

105.89'

4800

4850

4868'

1.90°

306.87°

4836.40'

106.77'

4900

4950

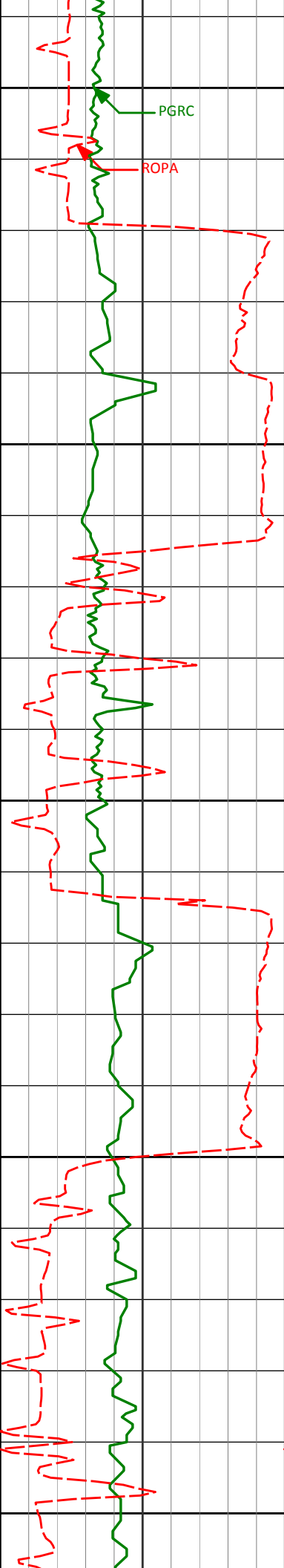
4963'

0.58°

295.07°

4931.37'

108.37'



PGRC

ROPA

5000

5050

5100

5150

5200

5058'

0.72°

91.41°

5026.37'

108.19'

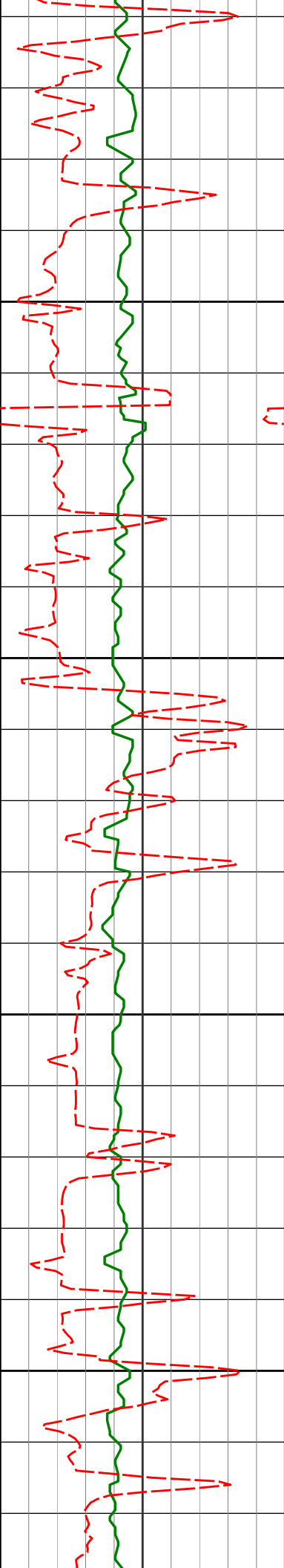
5153'

2.43°

92.72°

5121.33'

105.60'



5250

5300

5350

5400

5248'

5342'

1.72°

1.55°

103.95°

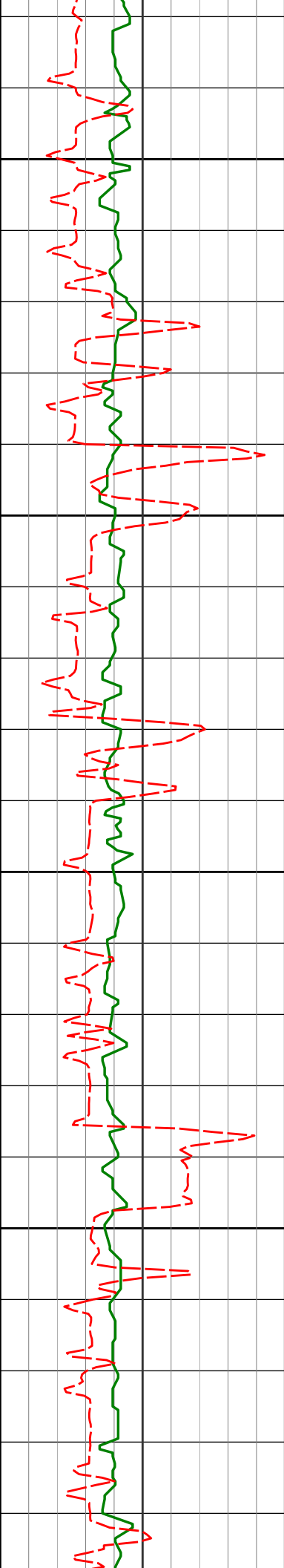
111.75°

5216.27'

5310.23'

102.25'

99.77'



5437'

1.25°

114.58°

5405.20'

97.72'

5450

5500

5532'

1.09°

118.45°

5500.18'

96.05'

5550

5600

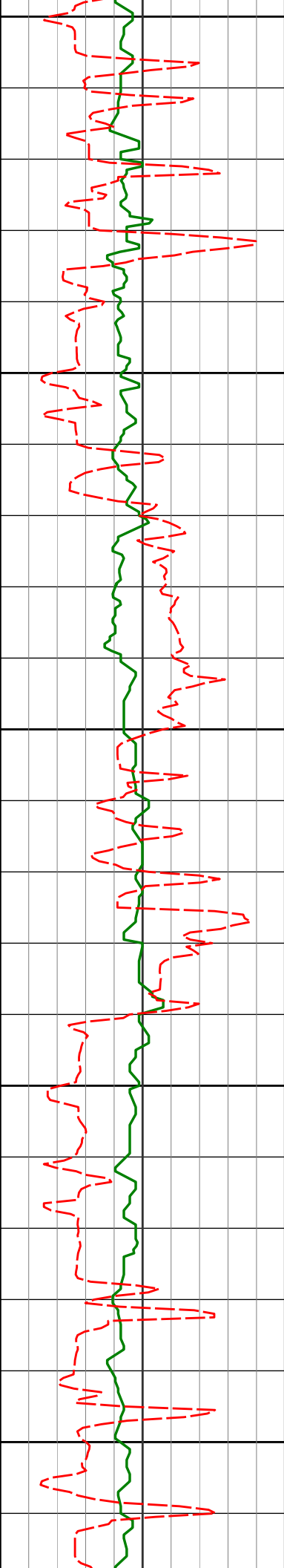
5627'

1.08°

116.15°

5595.17'

94.52'



5650

5700

5750

5800

5850

5721'

0.81°

133.78°

5689.15'

93.32'

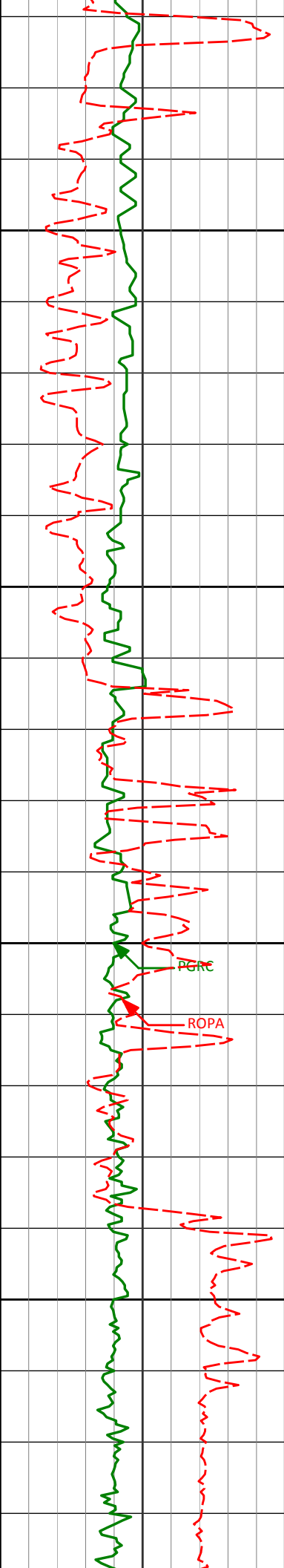
5816'

0.61°

142.38°

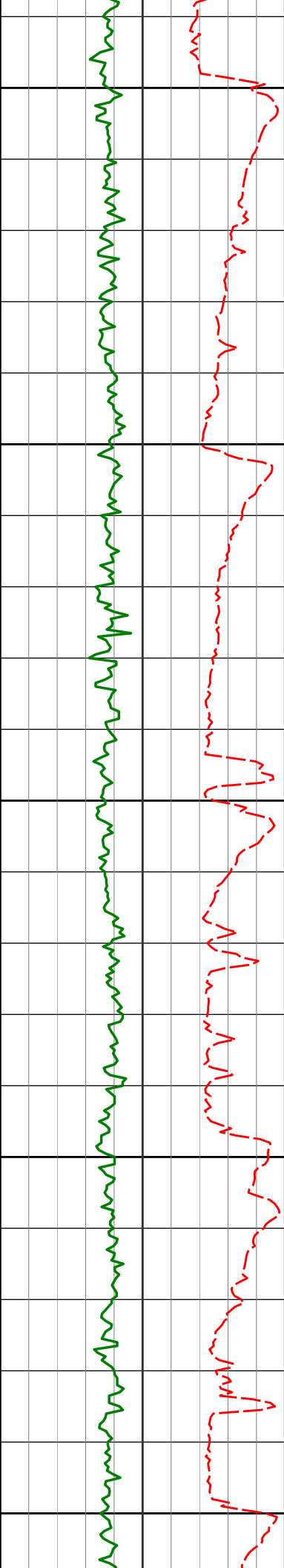
5784.15'

92.60'



5900				
5911'	0.63°	151.77°	5879.14'	92.11'
5950				
5984'	0.46°	160.48°	5952.14'	91.87'
6000				
6046'	0.13°	156.77°	6014.14'	91.79'
6050				





6100

6099'

1.01°

230.15°

6067.13'

92.15'

6150

6147'

7.01°

241.35°

6115.00'

95.17'

6200

6194'

13.40°

246.83°

6161.23'

102.95'

6250

6242'

15.64°

248.50°

6207.69'

114.41'

6300

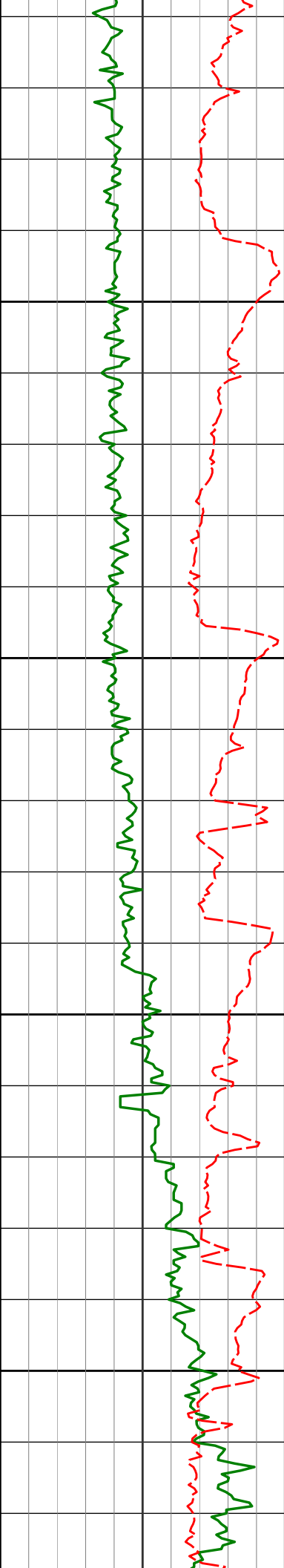
6289'

17.05°

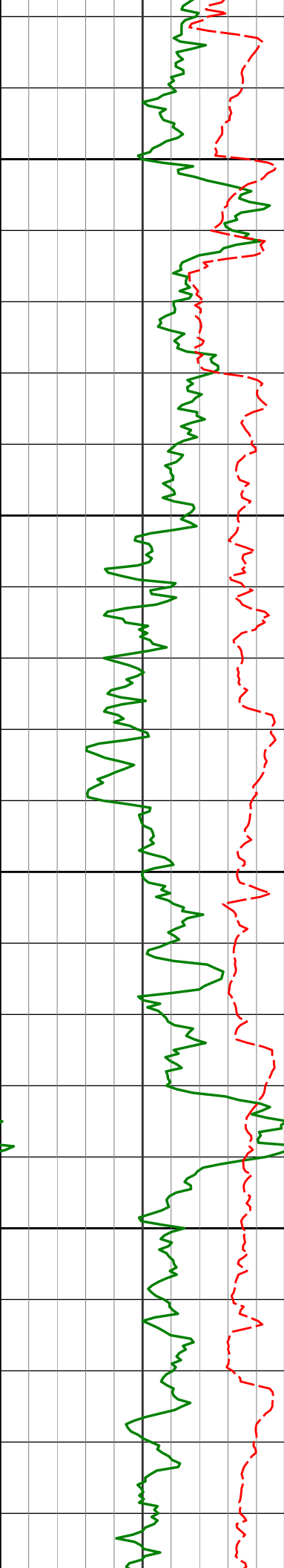
258.70°

6252.80'

127.32'



6337'	21.14°	269.09°	6298.16'	142.96'
6384'	26.88°	273.47°	6341.08'	161.95'
6432'	32.48°	276.27°	6382.77'	185.38'
6479'	36.46°	275.57°	6421.51'	211.54'
6527'	38.44°	274.38°	6459.62'	240.32'



6550

6573'

42.48°

273.36°

6494.61'

269.85'

6600

6621'

46.23°

270.52°

6528.93'

303.18'

6650

6668'

50.09°

269.66°

6560.27'

338.08'

6700

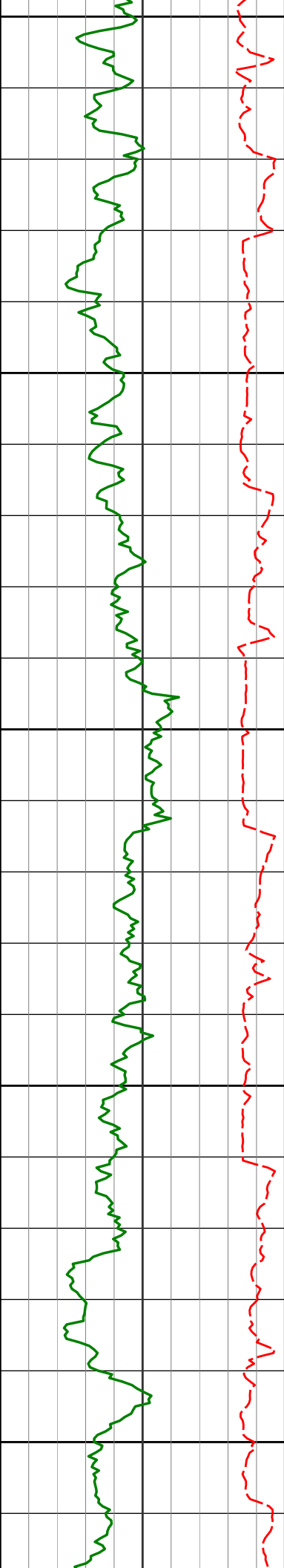
6716'

56.44°

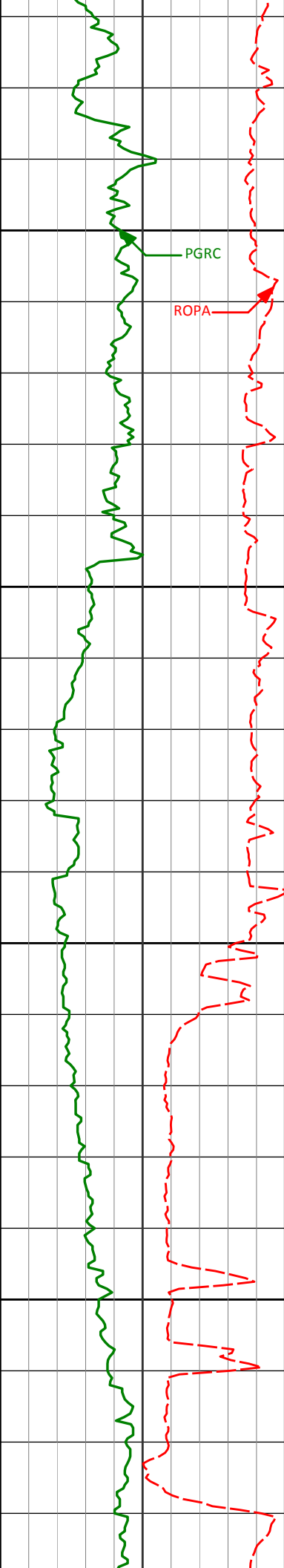
271.07°

6588.97'

376.38'



6750					
6763'	61.90°	273.09°	6613.05'	416.45'	
6800					
6811'	64.24°	272.42°	6634.79'	458.90'	
6850					
6857'	67.77°	270.47°	6653.49'	500.69'	
6900					
6905'	71.88°	269.72°	6670.04'	545.59'	
6950					
6952'	76.87°	269.32°	6682.70'	590.72'	



7000

7000'

80.47°

269.85°

6692.13'

637.66'

7037'

83.85°

270.30°

6697.17'

674.19'

7050

300

7100

7112'

90.83°

270.24°

6700.65'

748.80'

7150

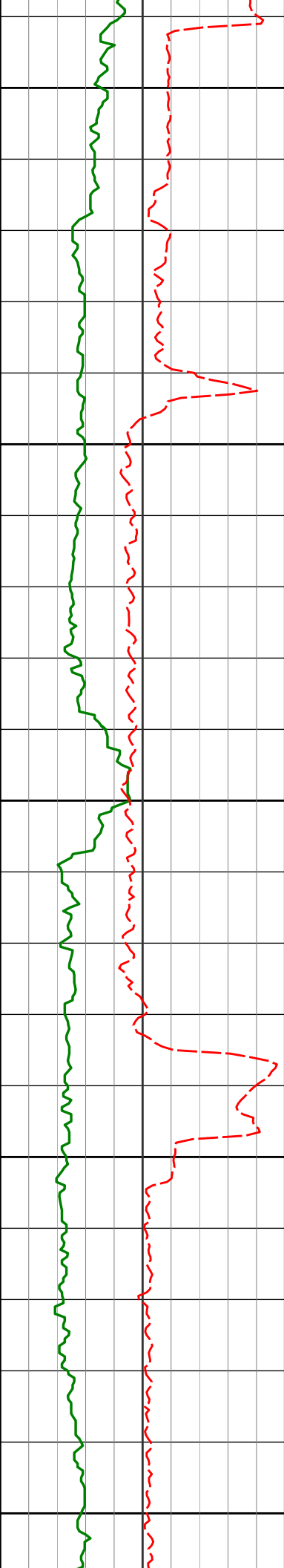
7175'

90.22°

270.58°

6700.07'

811.57'



7200

7250

7300

7350

7400

7270'

88.77°

270.83°

6700.91'

906.17'

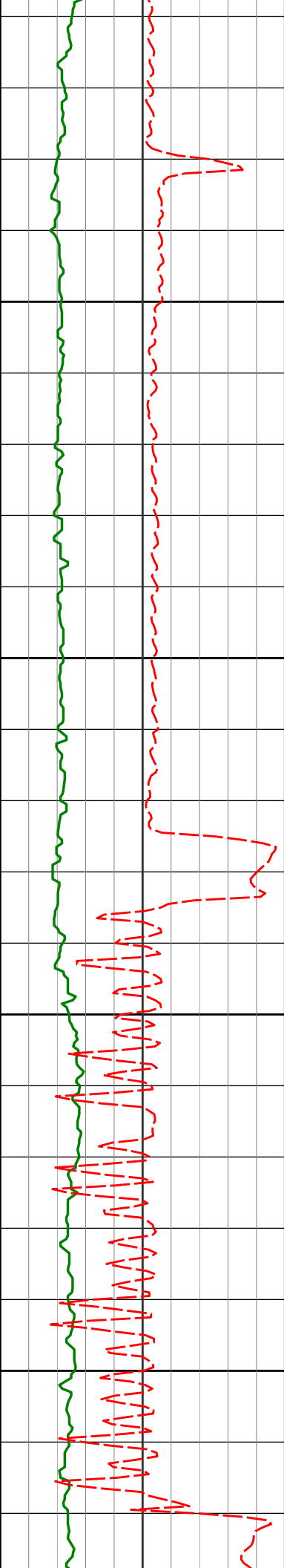
7364'

90.31°

269.48°

6701.67'

999.84'



7450

7459'

90.25°

269.53°

6701.20'

1094.61'

7500

7550

7554'

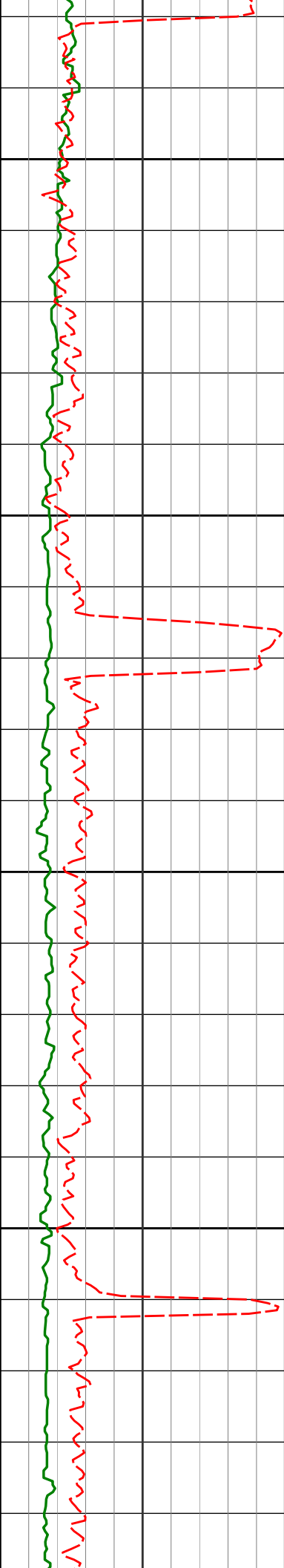
87.72°

268.45°

6702.88'

1189.41'

7600



7650

7700

7750

7800

7649'

7744'

7839'

88.80°

90.80°

89.91°

268.87°

268.77°

268.43°

6705.77'

6706.10'

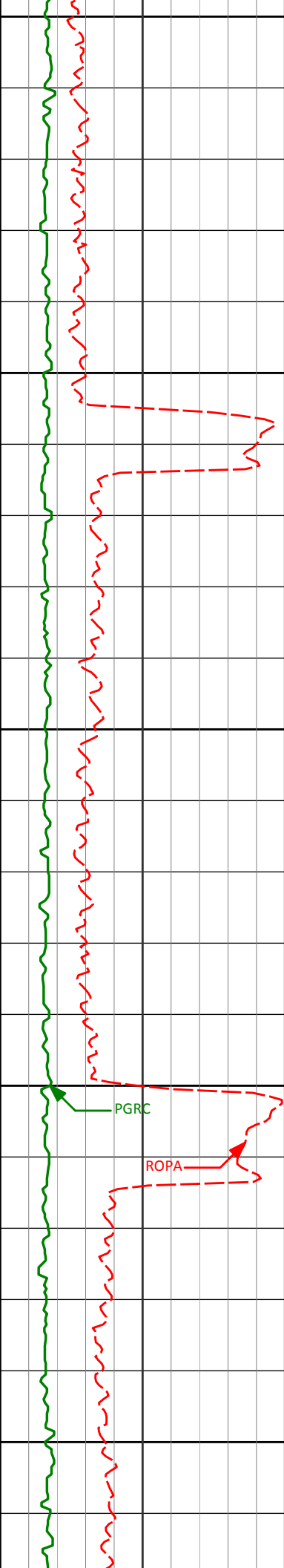
6705.51'

1284.22'

1379.05'

1473.90'





7850

7900

7934'

7950

8000

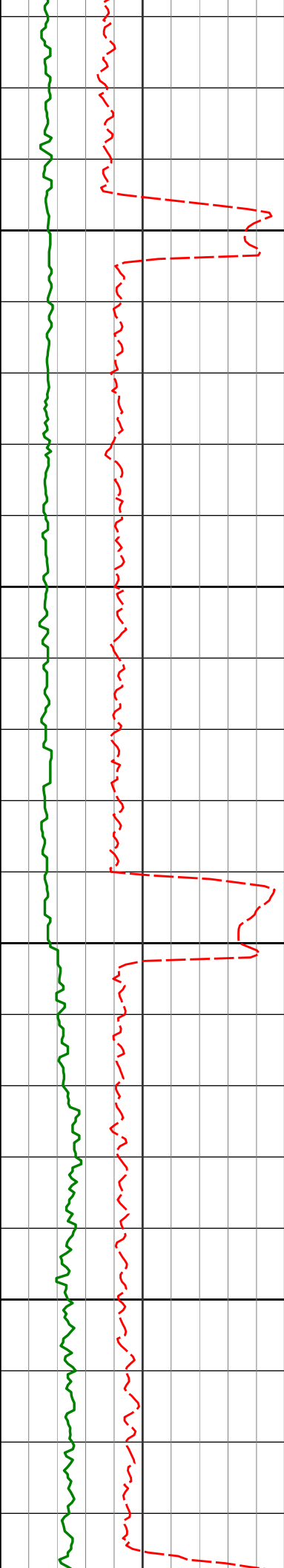
8028'

8050

7934'	89.35°	268.43°	6706.13'	1568.78'
8028'	89.23°	271.98°	6707.29'	1662.43'

PGRC

ROPA



8100

8123'

88.71°

268.35°

6709.00'

1757.09'

8150

8200

8218'

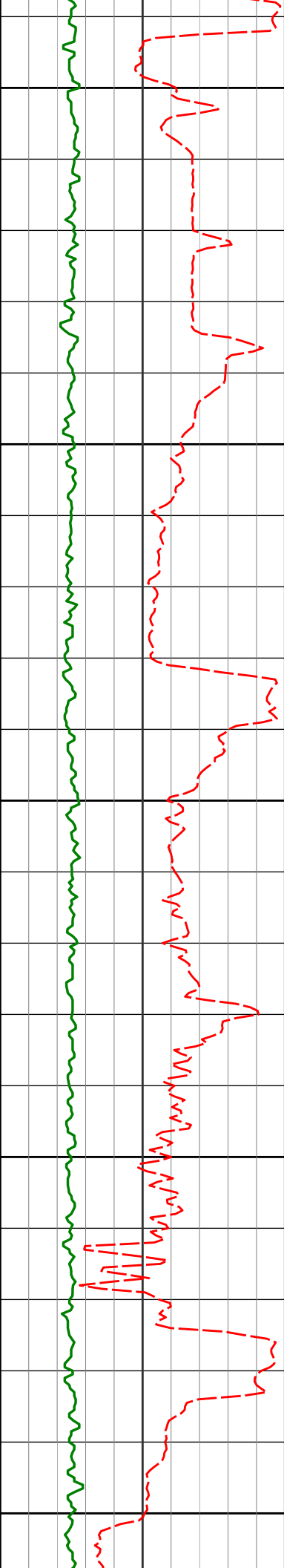
91.45°

272.97°

6708.87'

1851.66'

8250



8300

8313'

89.54°

270.89°

6708.05'

1946.05'

8350

8400

8408'

89.72°

270.88°

6708.66'

2040.62'

8450

8500

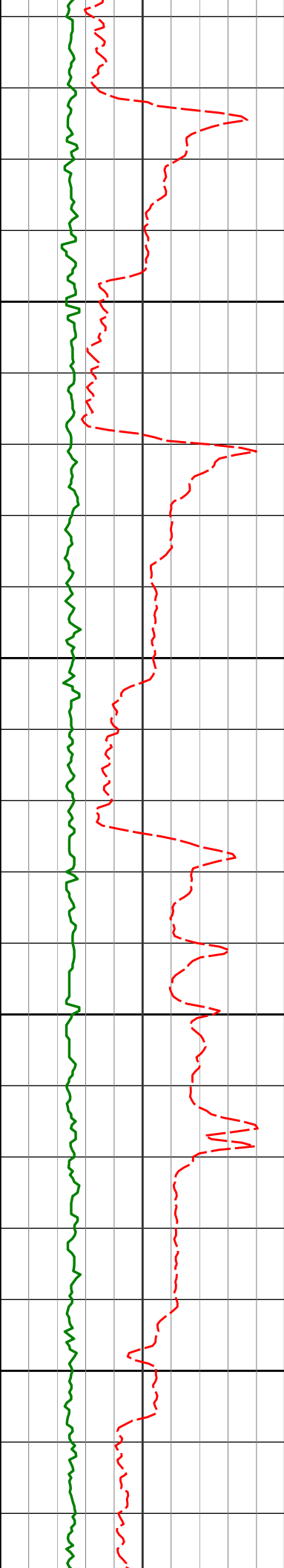
8502'

89.63°

268.99°

6709.19'

2134.33'



8550

8600

8650

8700

8597'

89.51°

269.14°

6709.91'

2229.15'

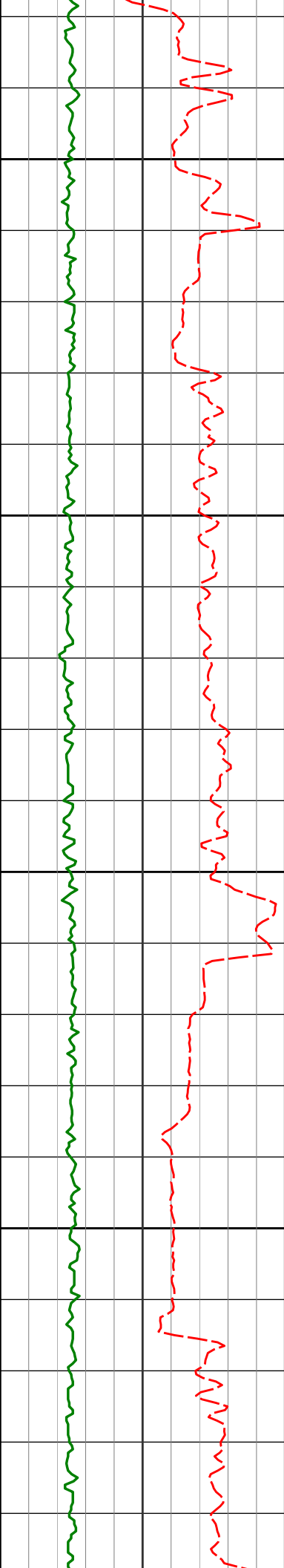
8692'

89.60°

268.26°

6710.64'

2323.99'



8750

8787'

89.38°

266.83°

6711.49'

2418.92'

8800

8850

8882'

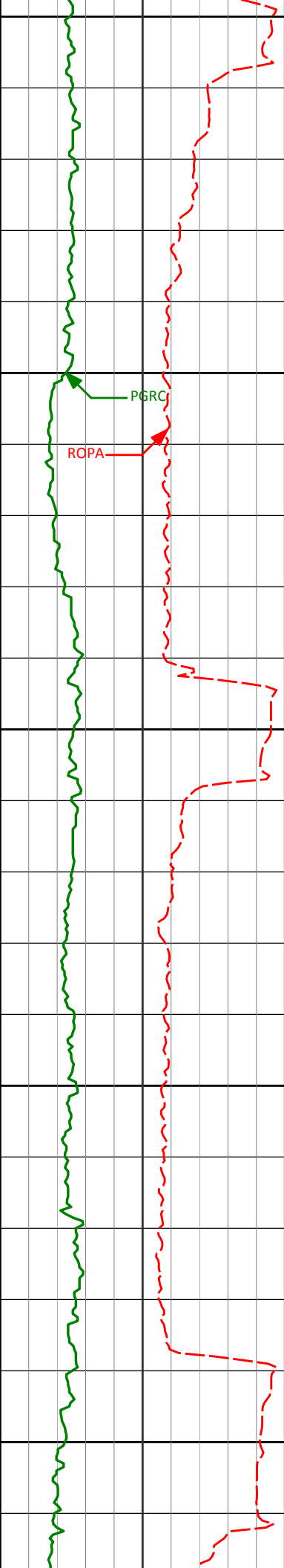
90.12°

267.83°

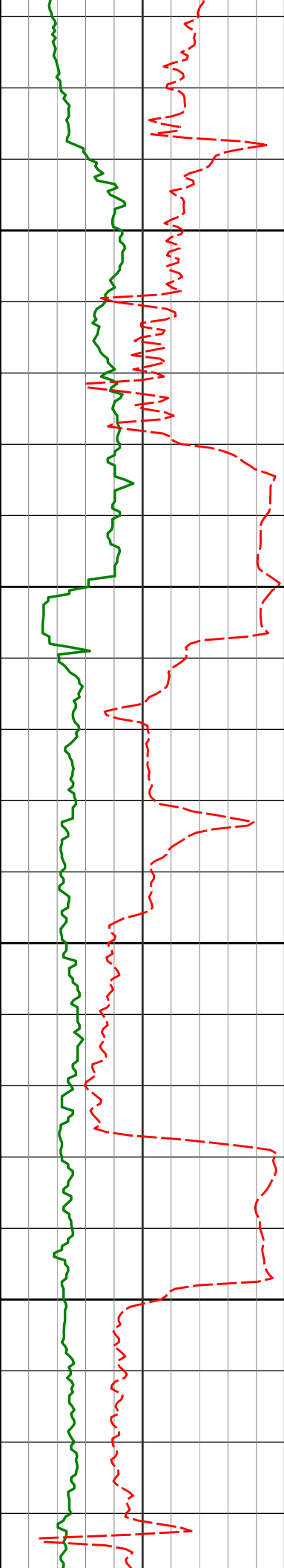
6711.90'

2513.87'

8900



8950				
8976'	88.28°	267.23°	6713.22'	2607.80'
9000				
9050				
9071'	88.19°	268.06°	6716.14'	2702.68'
9100				
9150				
9166'	89.26°	269.57°	6718.26'	2797.50'



9200

9250

9300

9350

9261'

90.34°

270.58°

6718.59'

2892.19'

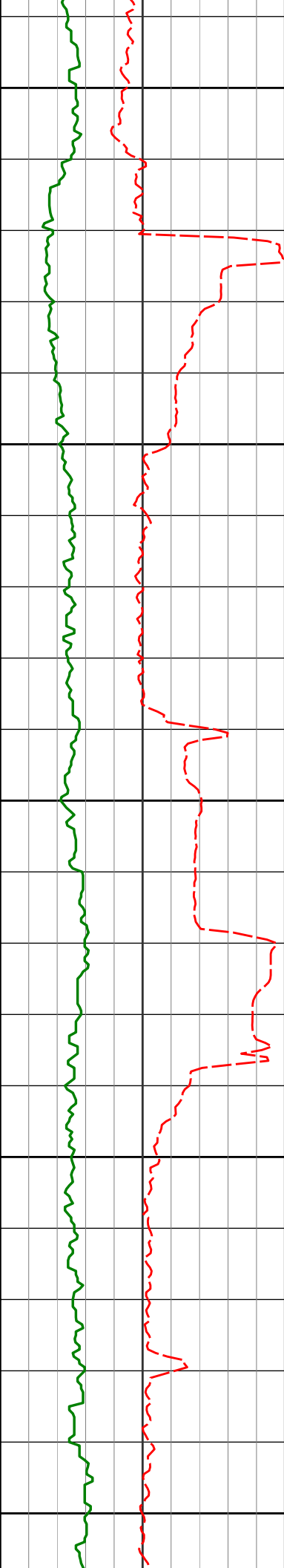
9356'

92.34°

271.44°

6716.37'

2986.71'



9400

9450

9500

9550

9600

9451'

92.43°

270.75°

6712.41'

3081.18'

9545'

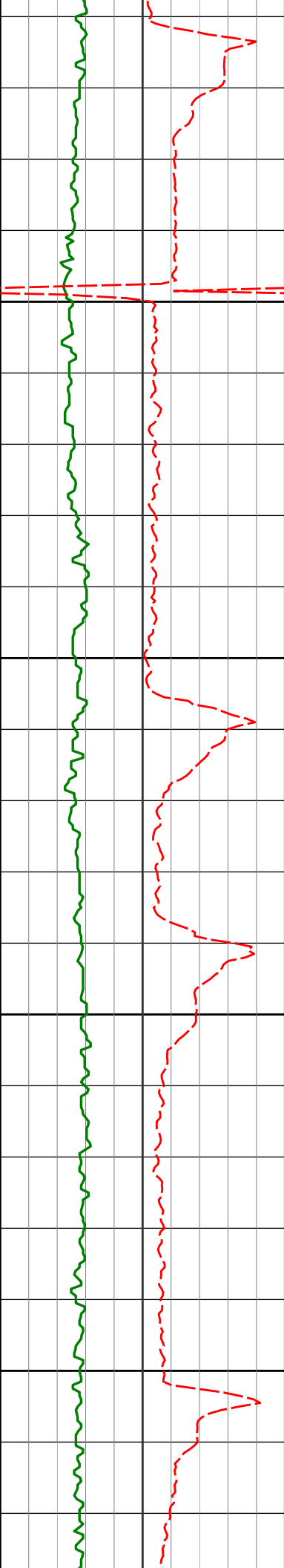
90.15°

270.30°

6710.30'

3174.78'





9650

9700

9750

9800

9640'

89.20°

270.51°

6710.84'

3269.43'

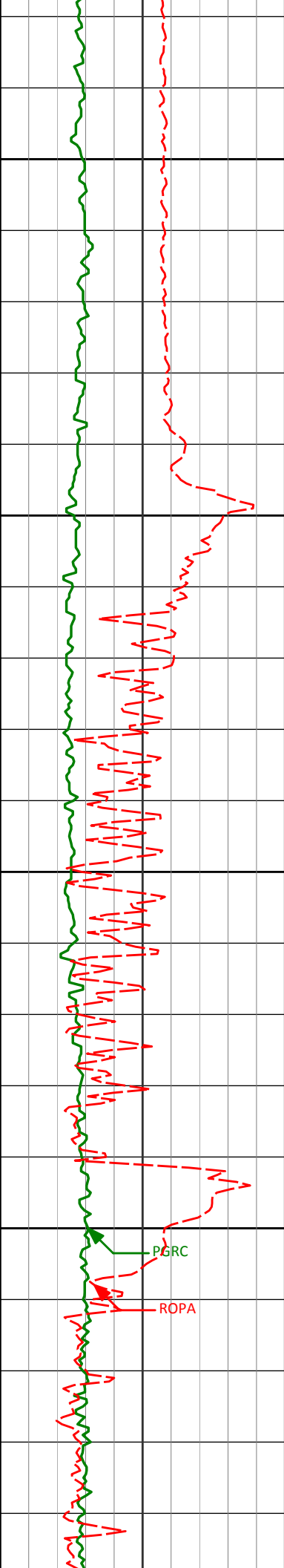
9735'

90.15°

270.16°

6711.37'

3364.08'



9850

9900

9950

10000

PGRC

ROPA

9830'

89.01°

269.23°

6712.07'

3458.82'

9924'

89.45°

269.97°

6713.33'

3552.57'

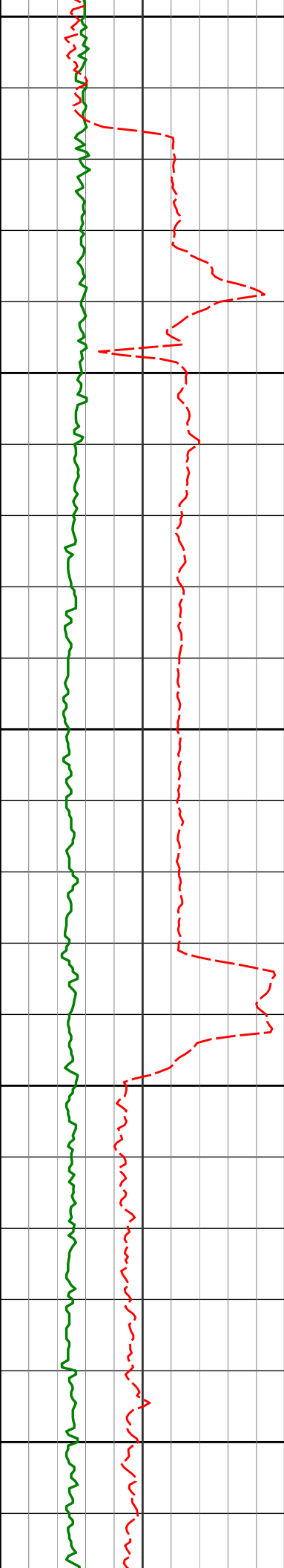
10019'

89.94°

270.13°

6713.84'

3647.27'



10050

10100

10150

10200

10250

10114'

88.89°

269.29°

6714.81'

3742.00'

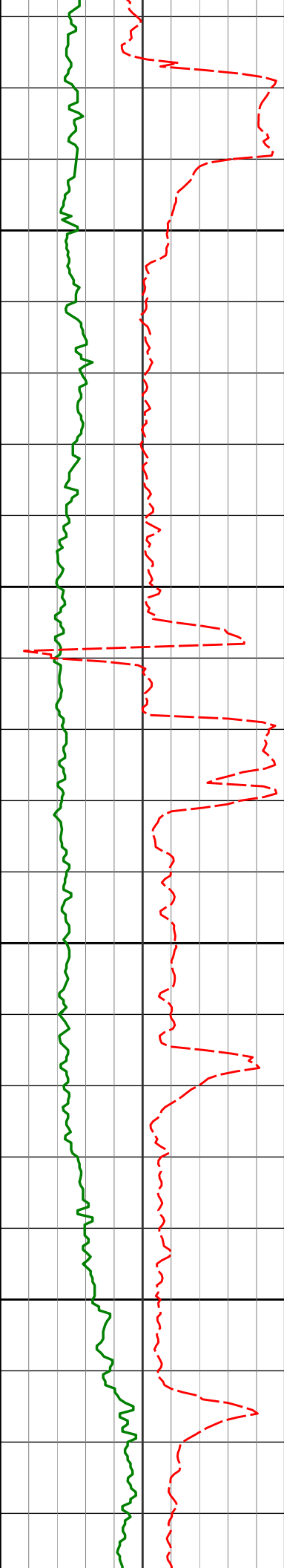
10209'

89.29°

269.19°

6716.32'

3836.78'



10300

10350

10400

10450

10303'

10398'

92.10°

91.02°

272.19°

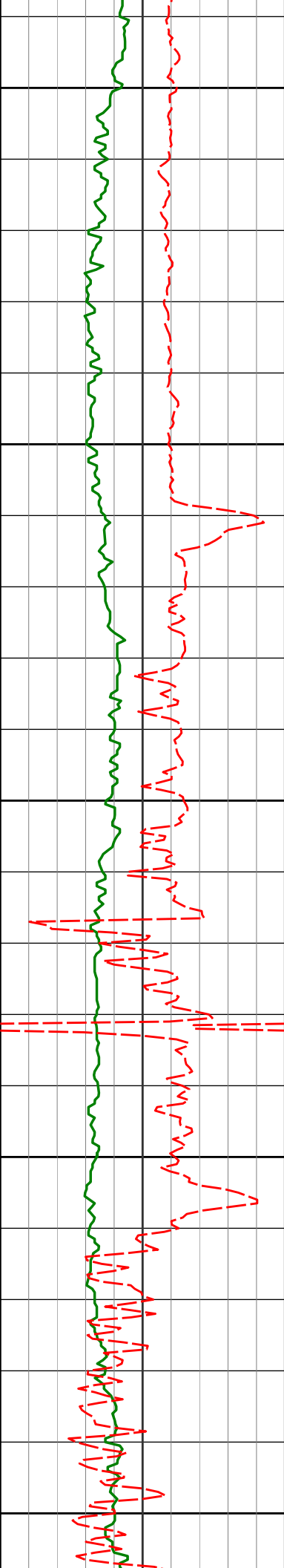
269.80°

6715.18'

6712.59'

3930.37'

4024.89'



10500

10550

10600

10650

10700

10493'

91.45°

269.75°

6710.54'

4119.60'

10588'

91.11°

268.92°

6708.42'

4214.36'

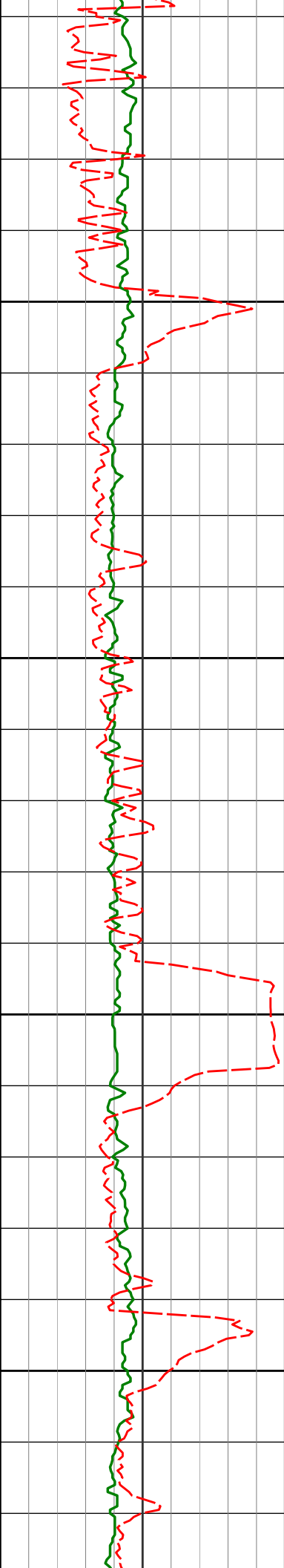
10683'

90.89°

268.94°

6706.76'

4309.17'



10750

10777'

89.01°

267.04°

6706.85'

4403.07'

10800

10850

10872'

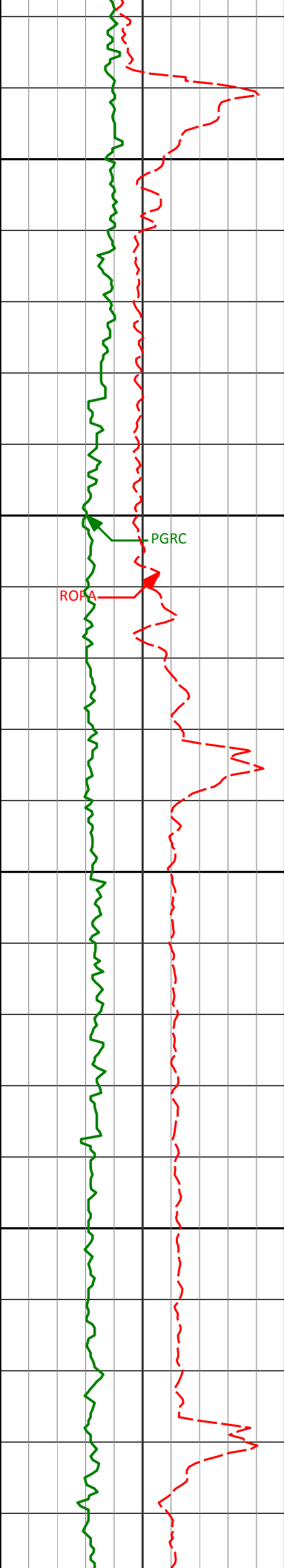
89.97°

269.76°

6707.69'

4497.93'

10900



10950

10967'

89.01°

269.47°

6708.54'

4592.68'

11000

PGRC

ROFA

11050

11062'

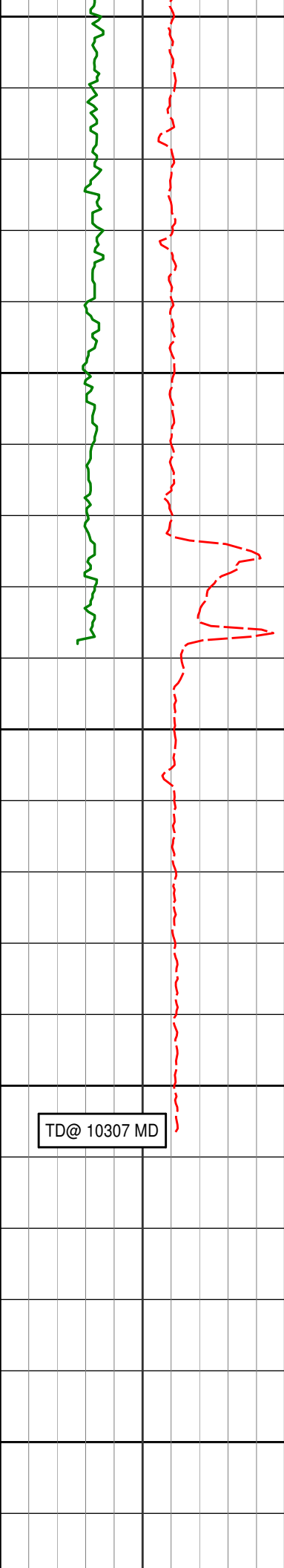
89.32°

269.89°

6709.92'

4687.42'

11100



11150				
11157'	89.75°	270.58°	6710.69'	4782.09'
11200				
11241'	90.31°	271.51°	6710.65'	4865.69'
11250				
11300				
11307'	90.31°	271.51°	6710.29'	4931.32'
11350				



[illegible]

# HALLIBURTON

# DIRECTIONAL SURVEY REPORT

**Noble Energy**  
**Wells Ranch AA35-68-1BHNC**  
**Wattenburg**  
**Weld Colorado**  
**USA**  
**CA-XX-0901058465**

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
579.00	0.80	253.82	578.98	1.13 S	3.88 W	3.96	0.14
722.00	0.19	331.75	721.98	1.20 S	4.95 W	5.03	0.55
815.00	0.07	263.86	814.98	1.07 S	5.08 W	5.15	0.19

907.00	0.29	179.50	906.98	1.30 S	5.14 W	5.22	0.32
998.00	0.09	186.60	997.97	1.61 S	5.14 W	5.25	0.22
1090.00	0.19	131.15	1089.97	1.78 S	5.04 W	5.16	0.17
1182.00	0.14	139.48	1181.97	1.96 S	4.85 W	4.99	0.06
1274.00	0.09	43.49	1273.97	2.00 S	4.73 W	4.87	0.19
1365.00	0.42	116.50	1364.97	2.09 S	4.38 W	4.53	0.44
1457.00	0.16	178.89	1456.97	2.37 S	4.07 W	4.25	0.41
1552.00	0.12	191.15	1551.97	2.60 S	4.09 W	4.28	0.05
1647.00	0.28	197.54	1646.97	2.92 S	4.18 W	4.40	0.17
1742.00	0.45	217.37	1741.97	3.44 S	4.48 W	4.73	0.22
1837.00	1.33	185.93	1836.96	4.83 S	4.82 W	5.18	1.03
1931.00	1.99	173.16	1930.92	7.54 S	4.73 W	5.31	0.80
2026.00	2.90	177.52	2025.83	11.58 S	4.43 W	5.33	0.98
2119.00	3.98	182.47	2118.66	17.15 S	4.47 W	5.81	1.20
2214.00	5.34	182.22	2213.35	24.86 S	4.78 W	6.73	1.43
2308.00	6.53	181.21	2306.84	34.58 S	5.07 W	7.78	1.27
2403.00	7.29	179.99	2401.15	46.01 S	5.18 W	8.79	0.81
2498.00	8.50	188.39	2495.25	58.98 S	6.20 W	10.83	1.76
2593.00	10.55	179.70	2588.94	74.63 S	7.18 W	13.04	2.63
2688.00	10.55	183.30	2682.34	92.01 S	7.64 W	14.86	0.69
2783.00	11.70	186.79	2775.55	110.25 S	9.28 W	17.94	1.40
2877.00	11.63	188.88	2867.61	129.08 S	11.87 W	22.00	0.46
2972.00	12.89	194.35	2960.44	148.81 S	15.97 W	27.65	1.80
3067.00	11.88	193.60	3053.23	168.58 S	20.90 W	34.12	1.08
3162.00	10.02	191.97	3146.50	186.17 S	24.91 W	39.50	1.98
3256.00	9.66	193.80	3239.11	201.83 S	28.49 W	44.30	0.51
3351.00	8.50	192.34	3332.92	216.43 S	31.89 W	48.85	1.24
3446.00	8.44	191.94	3426.89	230.11 S	34.83 W	52.86	0.09
3541.00	9.42	196.89	3520.74	244.37 S	38.53 W	57.67	1.31
3636.00	11.38	195.63	3614.17	260.83 S	43.32 W	63.74	2.08
3731.00	12.88	192.41	3707.05	280.20 S	48.12 W	70.05	1.73
3826.00	13.44	193.65	3799.55	301.27 S	53.00 W	76.58	0.66
3921.00	11.76	197.39	3892.26	321.24 S	58.50 W	83.63	1.97
4016.00	8.99	198.43	3985.70	337.52 S	63.74 W	90.14	2.92
4110.00	6.07	201.00	4078.88	349.13 S	67.84 W	95.15	3.13
4205.00	2.97	203.49	4173.57	356.08 S	70.63 W	98.47	3.27
4300.00	1.10	207.36	4268.51	359.15 S	72.03 W	100.11	1.97
4395.00	0.77	313.97	4363.50	359.52 S	72.90 W	101.01	1.59
4489.00	1.31	302.50	4457.49	358.50 S	74.27 W	102.29	0.61
4584.00	1.66	302.78	4552.45	357.17 S	76.34 W	104.25	0.37
4679.00	1.03	325.33	4647.43	355.72 S	77.98 W	105.77	0.85
4773.00	0.69	27.84	4741.42	354.53 S	78.20 W	105.89	1.00
4868.00	1.90	306.87	4836.40	353.08 S	79.19 W	106.77	2.02
4963.00	0.58	295.07	4931.37	351.93 S	80.89 W	108.37	1.41
5058.00	0.72	91.41	5026.37	351.74 S	80.72 W	108.19	1.34
5153.00	2.43	92.72	5121.33	351.85 S	78.12 W	105.60	1.80
5248.00	1.72	103.95	5216.27	352.29 S	74.72 W	102.25	0.86
5342.00	1.55	111.75	5310.23	353.10 S	72.17 W	99.77	0.30
5437.00	1.25	114.58	5405.20	354.01 S	70.03 W	97.72	0.32
5532.00	1.09	118.45	5500.18	354.87 S	68.30 W	96.05	0.19
5627.00	1.08	116.15	5595.17	355.69 S	66.70 W	94.52	0.05
5721.00	0.81	133.78	5689.15	356.54 S	65.42 W	93.32	0.42
5816.00	0.61	142.38	5784.15	357.41 S	64.63 W	92.60	0.24
5911.00	0.63	151.77	5879.14	358.27 S	64.08 W	92.11	0.11
5984.00	0.46	160.48	5952.14	358.90 S	63.79 W	91.87	0.26
6046.00	0.13	156.77	6014.14	359.20 S	63.68 W	91.79	0.53
6099.00	1.01	230.15	6067.13	359.55 S	64.01 W	92.15	1.85
6147.00	7.01	241.35	6115.00	361.23 S	66.91 W	95.17	12.55
6194.00	13.40	246.83	6161.23	364.75 S	74.44 W	102.95	13.74
6242.00	15.64	248.50	6207.69	369.31 S	85.58 W	114.41	4.75
6289.00	17.05	258.70	6252.80	372.99 S	98.23 W	127.32	6.79
6337.00	21.14	269.09	6298.16	374.50 S	113.80 W	142.96	11.05
6384.00	26.88	273.47	6341.08	373.99 S	132.89 W	161.95	12.78
6432.00	32.48	276.27	6382.77	371.93 S	156.56 W	185.38	12.02
6479.00	36.46	275.57	6421.51	369.19 S	183.01 W	211.54	8.51
6527.00	38.44	274.38	6459.62	366.67 S	212.09 W	240.32	4.39
6573.00	42.48	273.36	6494.61	364.67 S	241.86 W	269.85	8.90
6621.00	46.23	270.52	6528.93	363.56 S	275.39 W	303.18	8.84
6668.00	50.09	269.66	6560.27	363.51 S	310.39 W	338.08	8.32
6716.00	56.44	271.07	6588.97	363.25 S	348.84 W	376.38	13.44
6763.00	61.90	273.09	6613.05	361.76 S	389.15 W	416.45	12.19

6811.00	64.24	272.42	6634.79	359.71 S	431.90 W	458.90	5.03
6857.00	67.77	270.47	6653.49	358.66 S	473.90 W	500.69	8.60
6905.00	71.88	269.72	6670.04	358.59 S	518.94 W	545.59	8.69
6952.00	76.87	269.32	6682.70	358.97 S	564.19 W	590.72	10.65
7000.00	80.47	269.85	6692.13	359.31 S	611.24 W	637.66	7.58
7037.00	83.85	270.30	6697.17	359.26 S	647.89 W	674.19	9.21
7112.00	90.83	270.24	6700.65	358.91 S	722.77 W	748.80	9.31
7175.00	90.22	270.58	6700.07	358.46 S	785.76 W	811.57	1.11
7270.00	88.77	270.83	6700.91	357.29 S	880.75 W	906.17	1.55
7364.00	90.31	269.48	6701.67	357.03 S	974.74 W	999.84	2.18
7459.00	90.25	269.53	6701.20	357.85 S	1069.73 W	1094.61	0.08
7554.00	87.72	268.45	6702.88	359.53 S	1164.70 W	1189.41	2.90
7649.00	88.80	268.87	6705.77	361.75 S	1259.62 W	1284.22	1.22
7744.00	90.80	268.77	6706.10	363.71 S	1354.60 W	1379.05	2.11
7839.00	89.91	268.43	6705.51	366.03 S	1449.57 W	1473.90	1.00
7934.00	89.35	268.43	6706.13	368.63 S	1544.53 W	1568.78	0.59
8028.00	89.23	271.98	6707.29	368.29 S	1638.51 W	1662.43	3.78
8123.00	88.71	268.35	6709.00	368.02 S	1733.47 W	1757.09	3.86
8218.00	91.45	272.97	6708.87	366.93 S	1828.43 W	1851.66	5.65
8313.00	89.54	270.89	6708.05	363.73 S	1923.37 W	1946.05	2.97
8408.00	89.72	270.88	6708.66	362.26 S	2018.35 W	2040.62	0.19
8502.00	89.63	268.99	6709.19	362.37 S	2112.35 W	2134.33	2.01
8597.00	89.51	269.14	6709.91	363.92 S	2207.33 W	2229.15	0.20
8692.00	89.60	268.26	6710.64	366.07 S	2302.30 W	2323.99	0.93
8787.00	89.38	266.83	6711.49	370.14 S	2397.21 W	2418.92	1.52
8882.00	90.12	267.83	6711.90	374.57 S	2492.10 W	2513.87	1.31
8976.00	88.28	267.23	6713.22	378.62 S	2586.00 W	2607.80	2.06
9071.00	88.19	268.06	6716.14	382.52 S	2680.88 W	2702.68	0.88
9166.00	89.26	269.57	6718.26	384.48 S	2775.83 W	2797.50	1.95
9261.00	90.34	270.58	6718.59	384.36 S	2870.83 W	2892.19	1.56
9356.00	92.34	271.44	6716.37	382.68 S	2965.78 W	2986.71	2.29
9451.00	92.43	270.75	6712.41	380.87 S	3060.68 W	3081.18	0.73
9545.00	90.15	270.30	6710.30	380.01 S	3154.65 W	3174.78	2.47
9640.00	89.20	270.51	6710.84	379.34 S	3249.64 W	3269.43	1.02
9735.00	90.15	270.16	6711.37	378.78 S	3344.64 W	3364.08	1.07
9830.00	89.01	269.23	6712.07	379.29 S	3439.63 W	3458.82	1.55
9924.00	89.45	269.97	6713.33	379.95 S	3533.62 W	3552.57	0.92
10019.00	89.94	270.13	6713.84	379.86 S	3628.62 W	3647.27	0.54
10114.00	88.89	269.29	6714.81	380.34 S	3723.61 W	3742.00	1.42
10209.00	89.29	269.19	6716.32	381.60 S	3818.59 W	3836.78	0.43
10303.00	92.10	272.19	6715.18	380.47 S	3912.55 W	3930.37	4.37
10398.00	91.02	269.80	6712.59	378.82 S	4007.50 W	4024.89	2.76
10493.00	91.45	269.75	6710.54	379.20 S	4102.47 W	4119.60	0.46
10588.00	91.11	268.92	6708.42	380.30 S	4197.44 W	4214.36	0.94
10683.00	90.89	268.94	6706.76	382.07 S	4292.41 W	4309.17	0.23
10777.00	89.01	267.04	6706.85	385.37 S	4386.34 W	4403.07	2.84
10872.00	89.97	269.76	6707.69	388.02 S	4481.29 W	4497.93	3.04
10967.00	89.01	269.47	6708.54	388.66 S	4576.29 W	4592.68	1.06
11062.00	89.32	269.89	6709.92	389.19 S	4671.27 W	4687.42	0.55
11157.00	89.75	270.58	6710.69	388.80 S	4766.27 W	4782.09	0.86
11241.00	90.31	271.51	6710.65	387.27 S	4850.25 W	4865.69	1.29
11307.00	90.31	271.51	6710.29	385.53 S	4916.23 W	4931.32	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 265.48 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 11307.00 FEET  
IS 4931.32 FEET ALONG 265.52 DEGREES (GRID)**

First survey from 3rd party source (Multi Shot EMS) and provided by CO-man on location before drilling.  
Survey Depth 579' Inc 0.08° Azi 253.82°

Tied in @ Surface

Magnetic direction of 7.621 has been added to AZI for grid direction correction.

Final survey @ 11307 projected to Bit.

