

DC - Pressure Case Directional
PCGK - Pressure Case Gamma



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	13-Dec-14	15-Dec-14			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.820	6.820			
Log Start Depth (TVD, ft)	758.90	1,254.86			
Log End Depth (TVD, ft)	1,254.86	6,687.65			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	13-Dec-14 05:16	13-Dec-14 10:22			
Drill/Wipe End Date and Time	13-Dec-14 06:51	14-Dec-14 21:26			
Min Inc (deg) @ Depth (TVD, ft)	0.66 @ 919.89	0.22 @ 2,034.75			
Max Inc (deg) @ Depth (TVD, ft)	0.85 @ 1,194.87	83.27 @ 6,682.75			
Bit TFA(in2) / Bit Type	1.04 / PDC	1.74 / PDC			
Flow Rate (gpm)	566.67	582.31			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	8.50 / 32.00	9.80 / 11.00			
Filtrate CL (ppm)	1,200.00	1,700.00			
pH / Fluid Loss (mptm)	8.10 / 12	9.40 / 7			
PV (cP) / YP (lbf2)	2 / 2.00	11 / 9.00			
% Solids / % Sand	1.20 / 0.20	12.50 / 0.25			
% Oil / Oil:Water Ratio	N/A / N/A	0.50 / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (deg F) @ 100 ft	51.00 / 50M	100.00 / 50M			

Max Tool Temp (degF) / Source	74.20 / PCM	160.83 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 74.20	N/A @ 160.83			
Lead MWD Engineer	Robert Barnes	Robert Barnes			
Customer Representative	Stetson Nielsen	Stetson Nielsen			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11341320	11341320			
Insert Serial Number	11400994	11400994			
Date and Time Initialized	12-Dec-14 17:04	01-Jan-70 00:00			
Date and Time Read	15-Dec-14 04:10	15-Dec-14 04:15			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	60.00	60.00			
Software Version	6.21	6.21			
Sub Serial Number	11341320	11341320			
Sonde Serial Number	11833222	11833222			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	62.98	59.01			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	53.18	53.18			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11341320	11341320			
Insert/Sonde Serial Number	11579773	11579773			

REMARKS

1. All depths are calibrated to driller's pipe tally and are true vertical depth 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

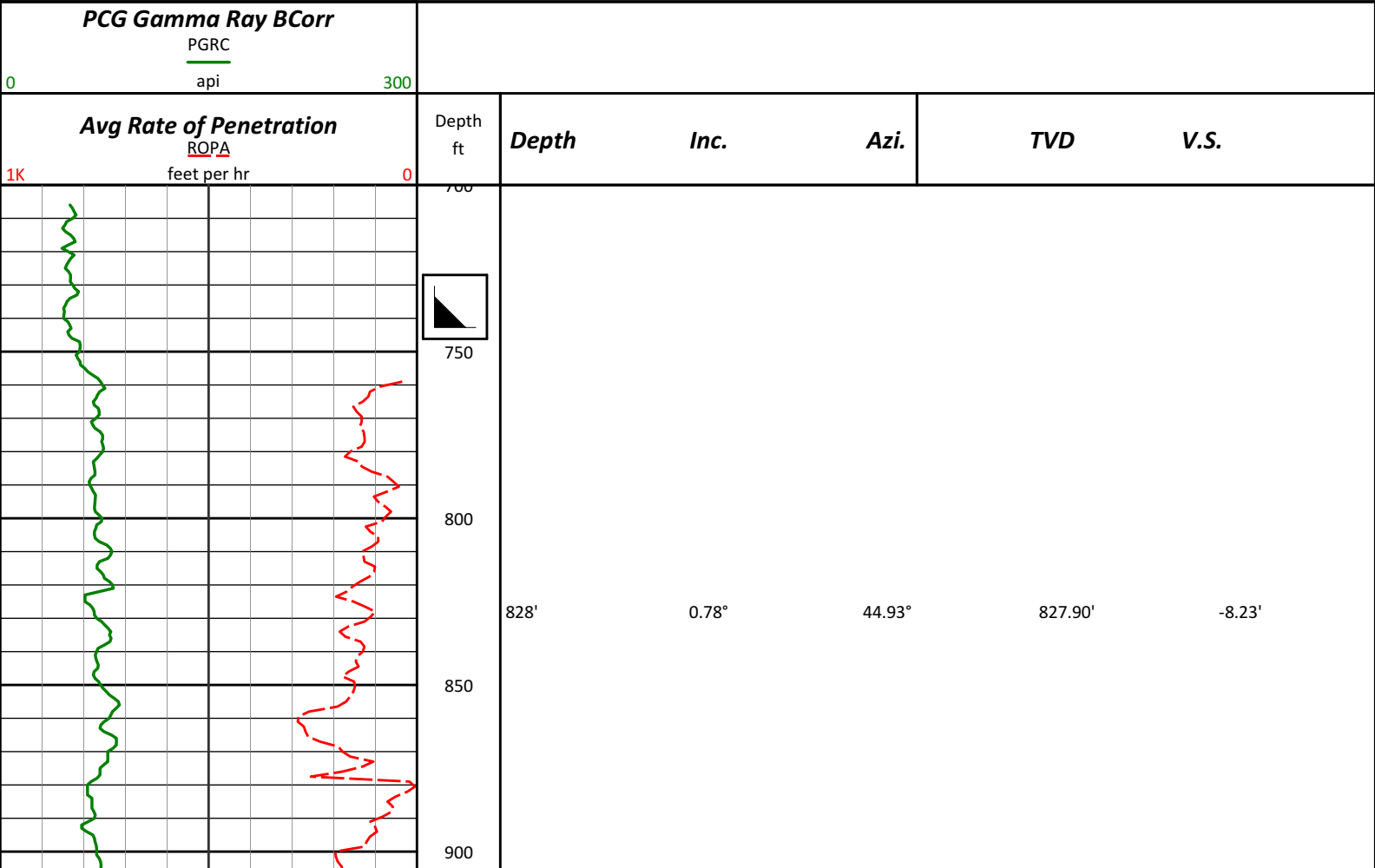
6. Insite Version v8.0.20

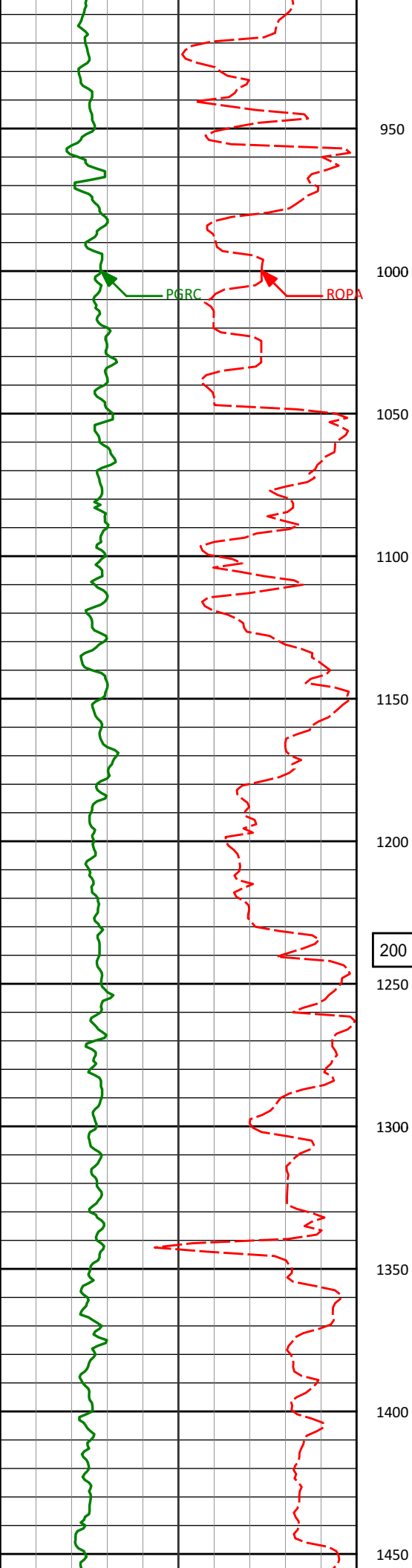
WARRANTY

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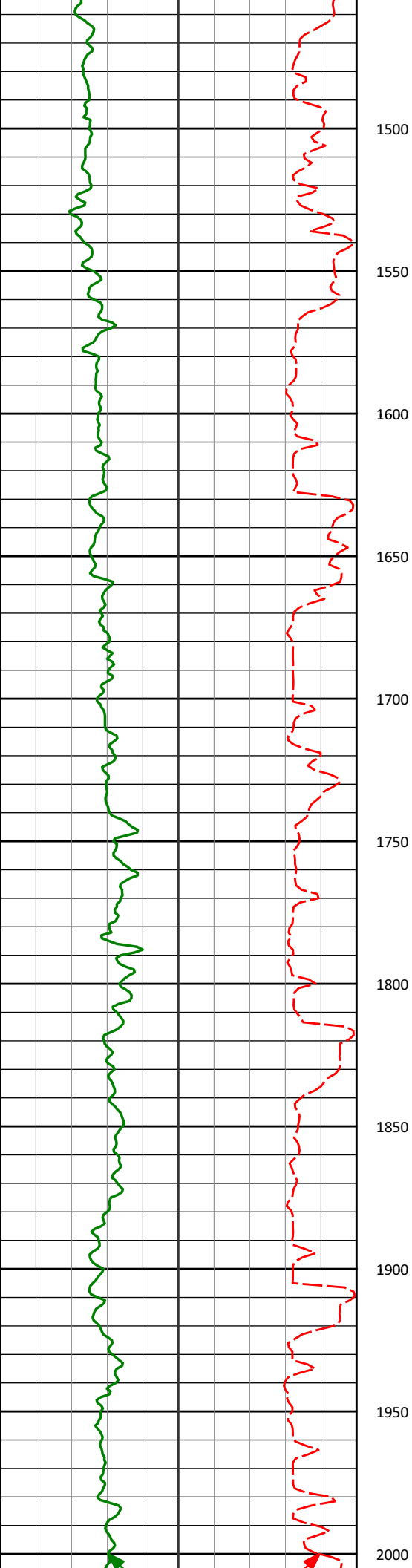
HALLIBURTON
Sperry Drilling Services
TVD Correlation Log 1:600

Noble Energy
Wells Ranch AE19-689
H&P 321
Sec.20-T6N-R62W

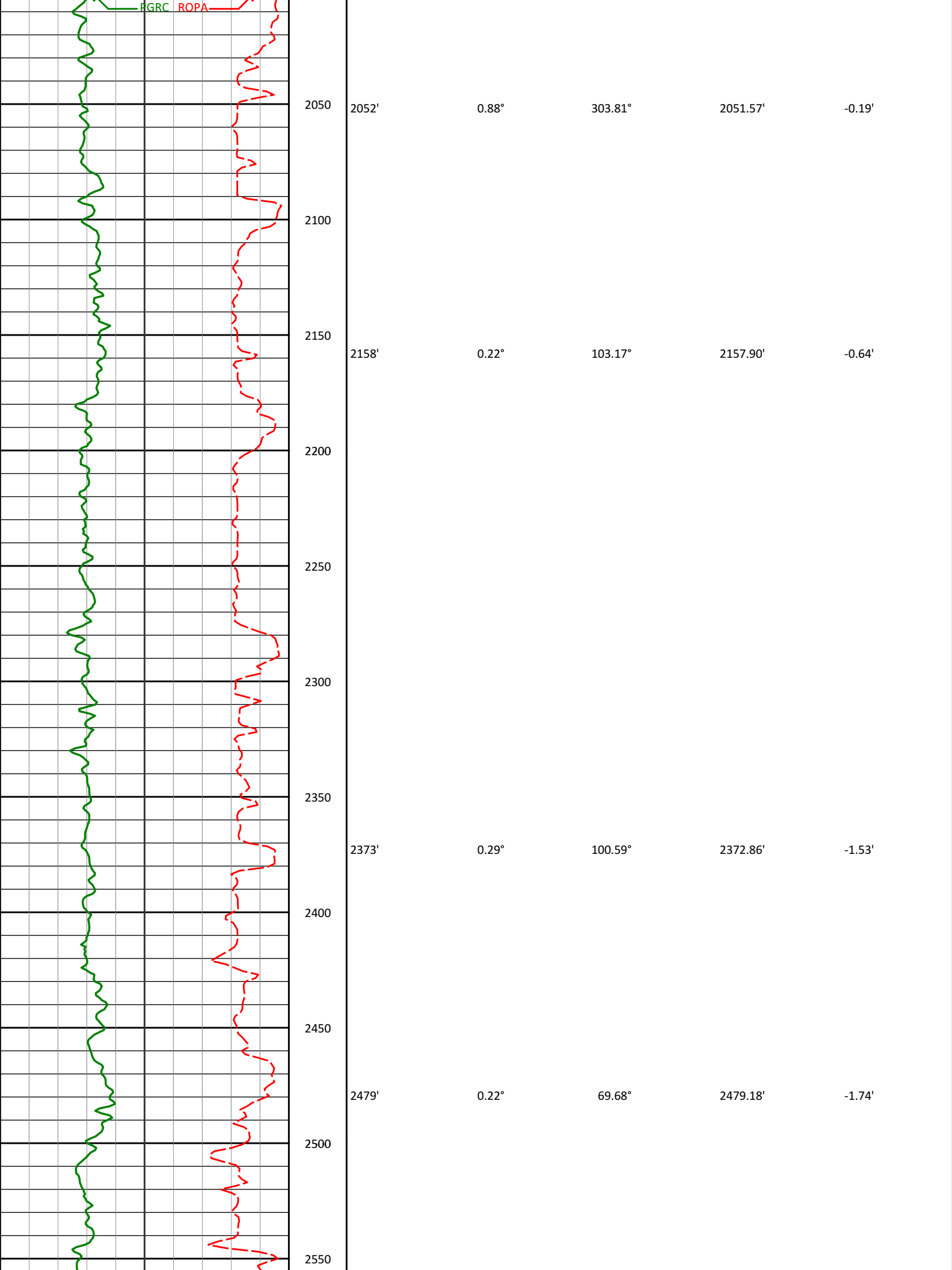


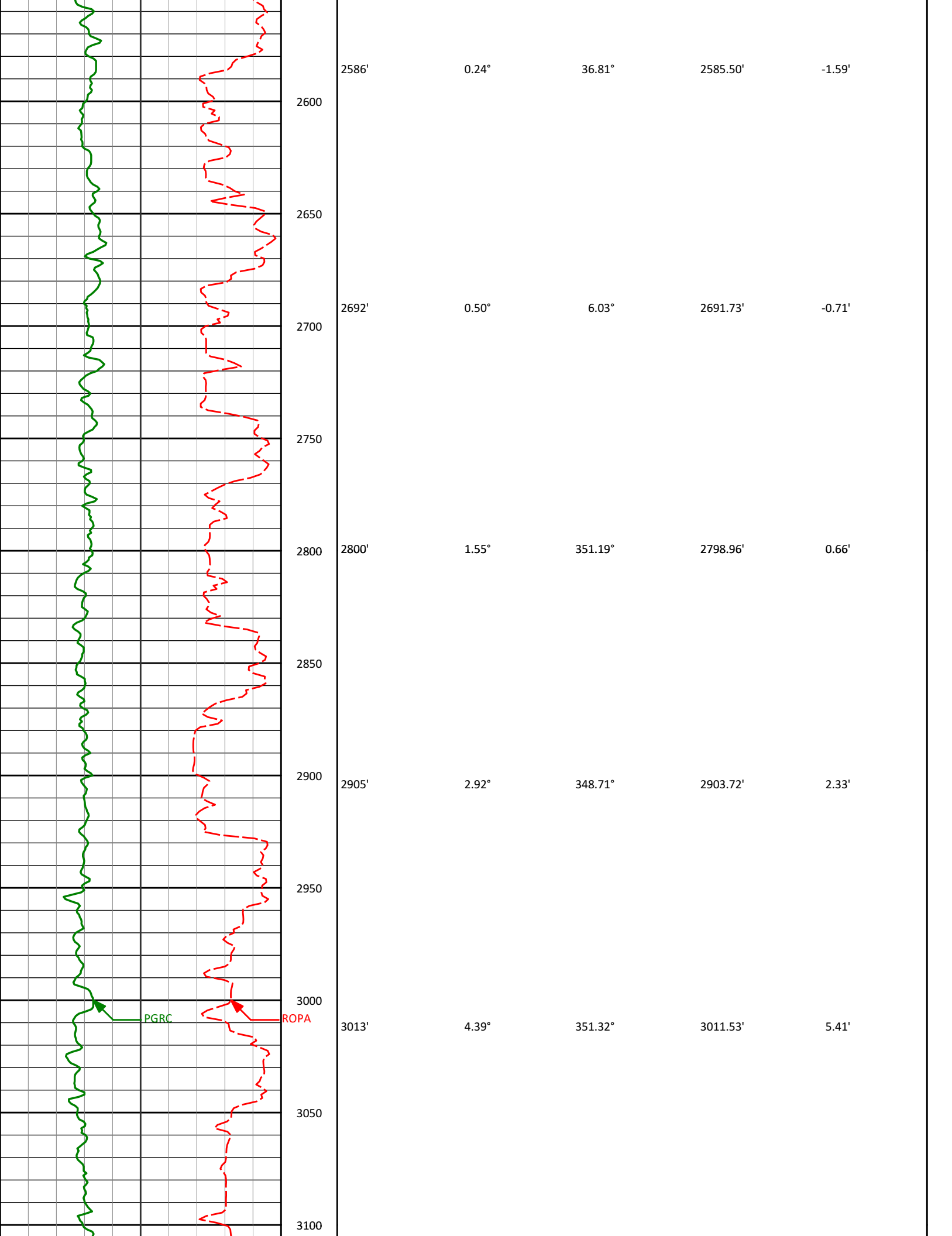


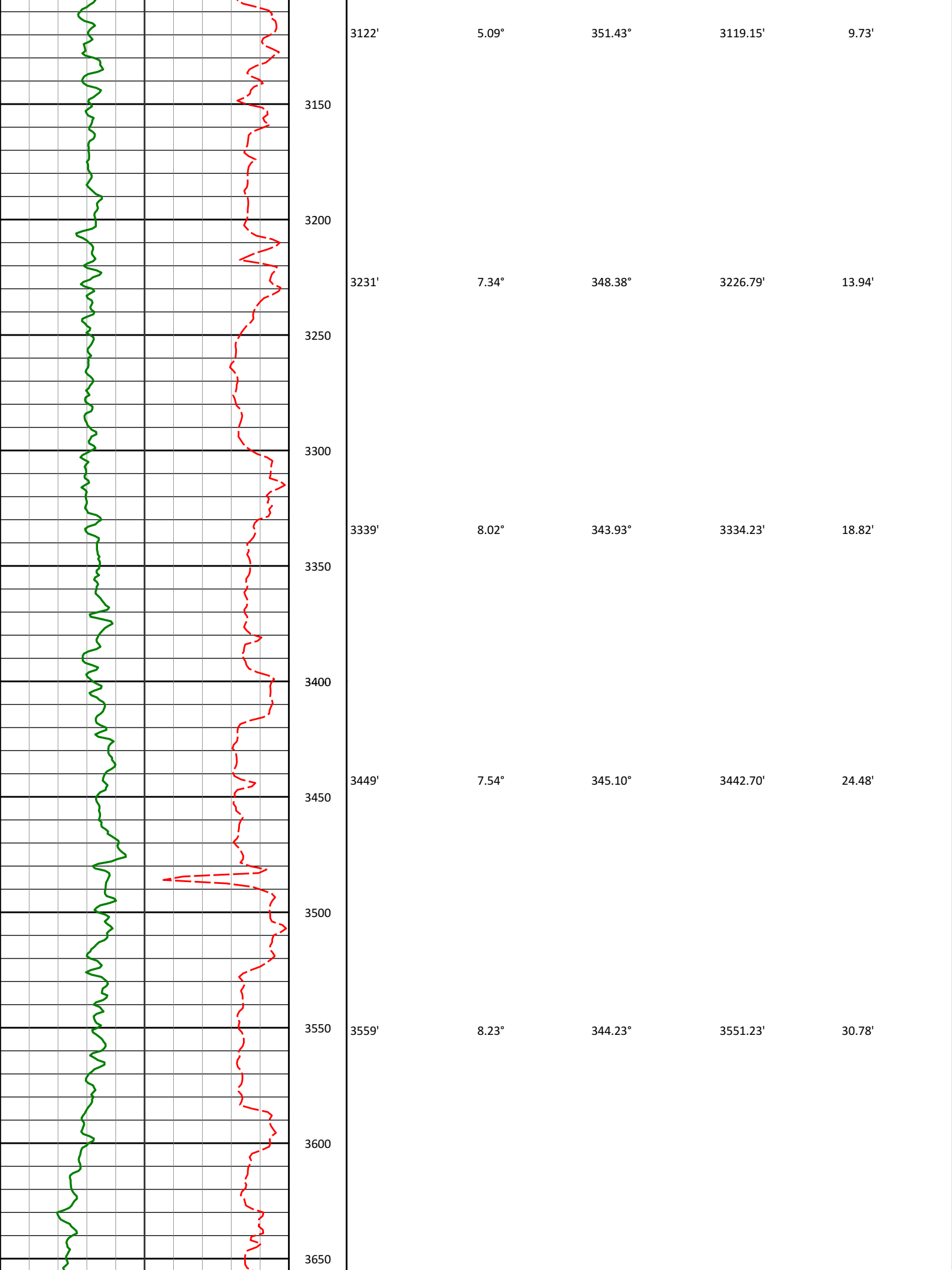
920'	0.66°	43.17°	919.89'	-9.01'
950				
1000				
1012'	0.78°	33.73°	1011.88'	-9.70'
1050				
1100				
1104'	0.73°	37.69°	1103.87'	-10.38'
1150				
1195'	0.85°	62.41°	1194.87'	-11.31'
1200				
200				
1250				
1300				
1310'	0.51°	270.35°	1309.71'	-11.45'
1350				
1400				
1417'	0.58°	321.53°	1417.19'	-10.62'
1450				

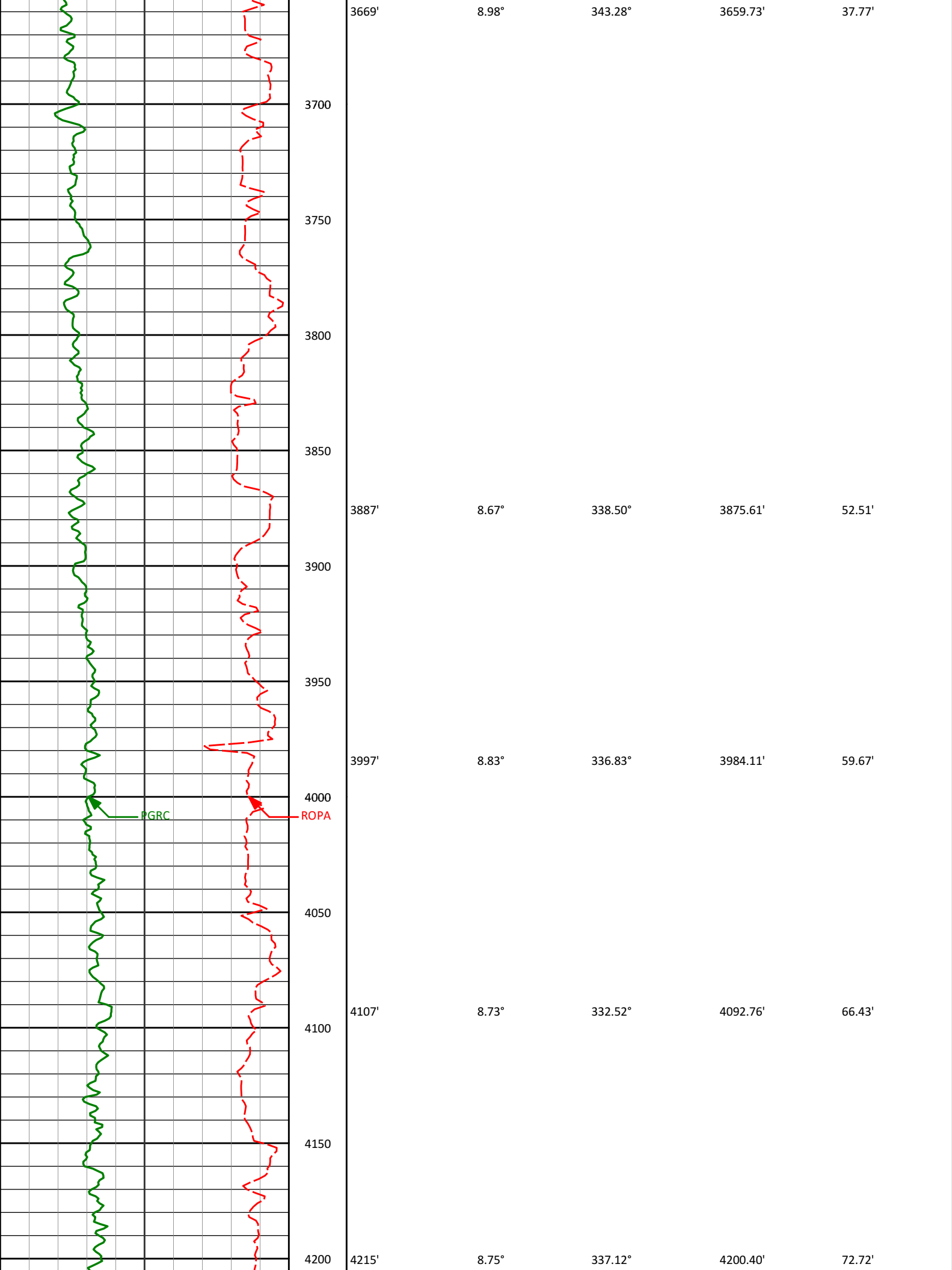


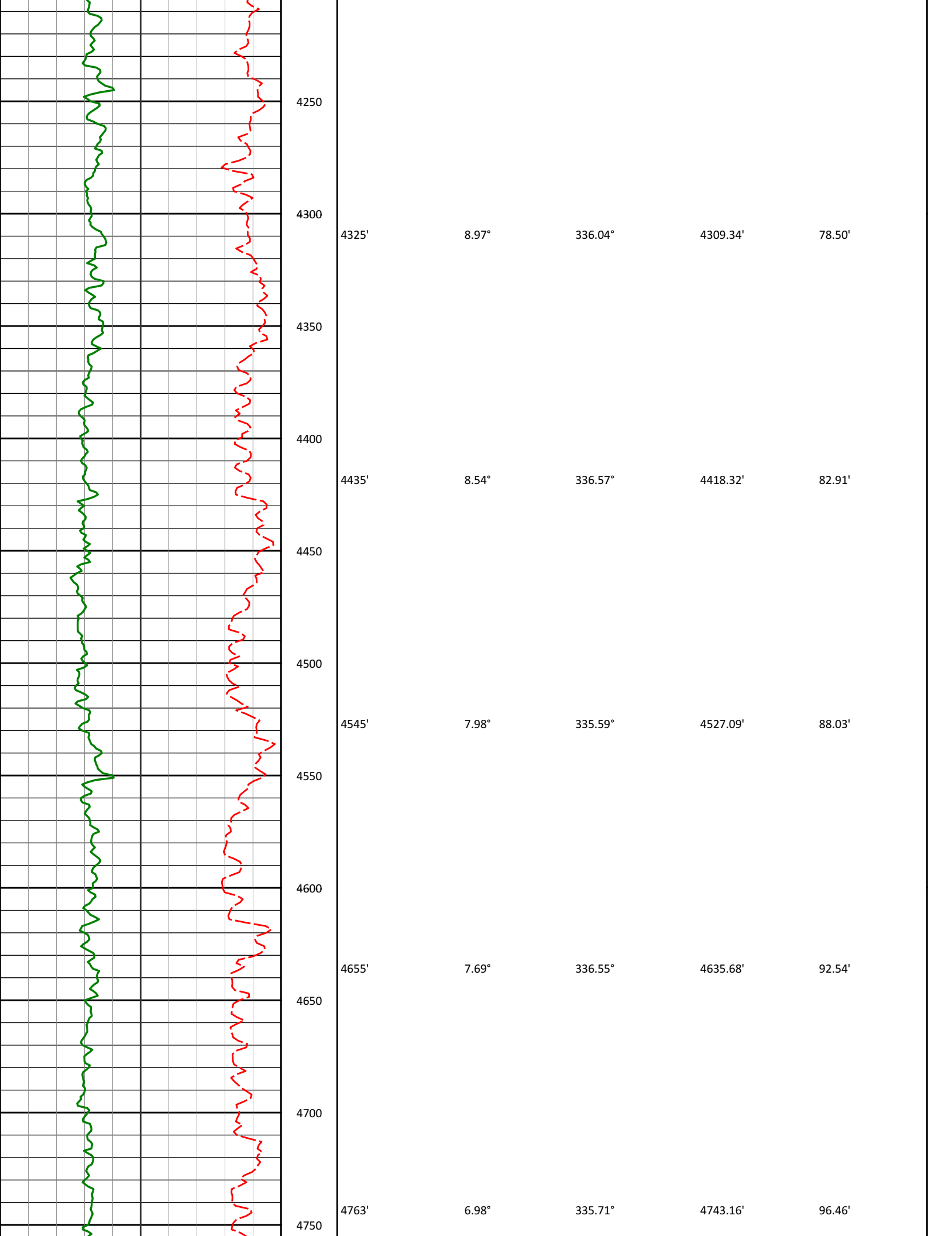
1523'	1.26°	302.17°	1522.34'	-8.89'
1550				
1600				
1629'	1.57°	256.77°	1628.63'	-6.24'
1650				
1700				
1750				
1800				
1840'	1.12°	275.65°	1840.09'	-1.97'
1850				
1900				
1947'	0.85°	285.63°	1946.40'	-0.51'
2000				

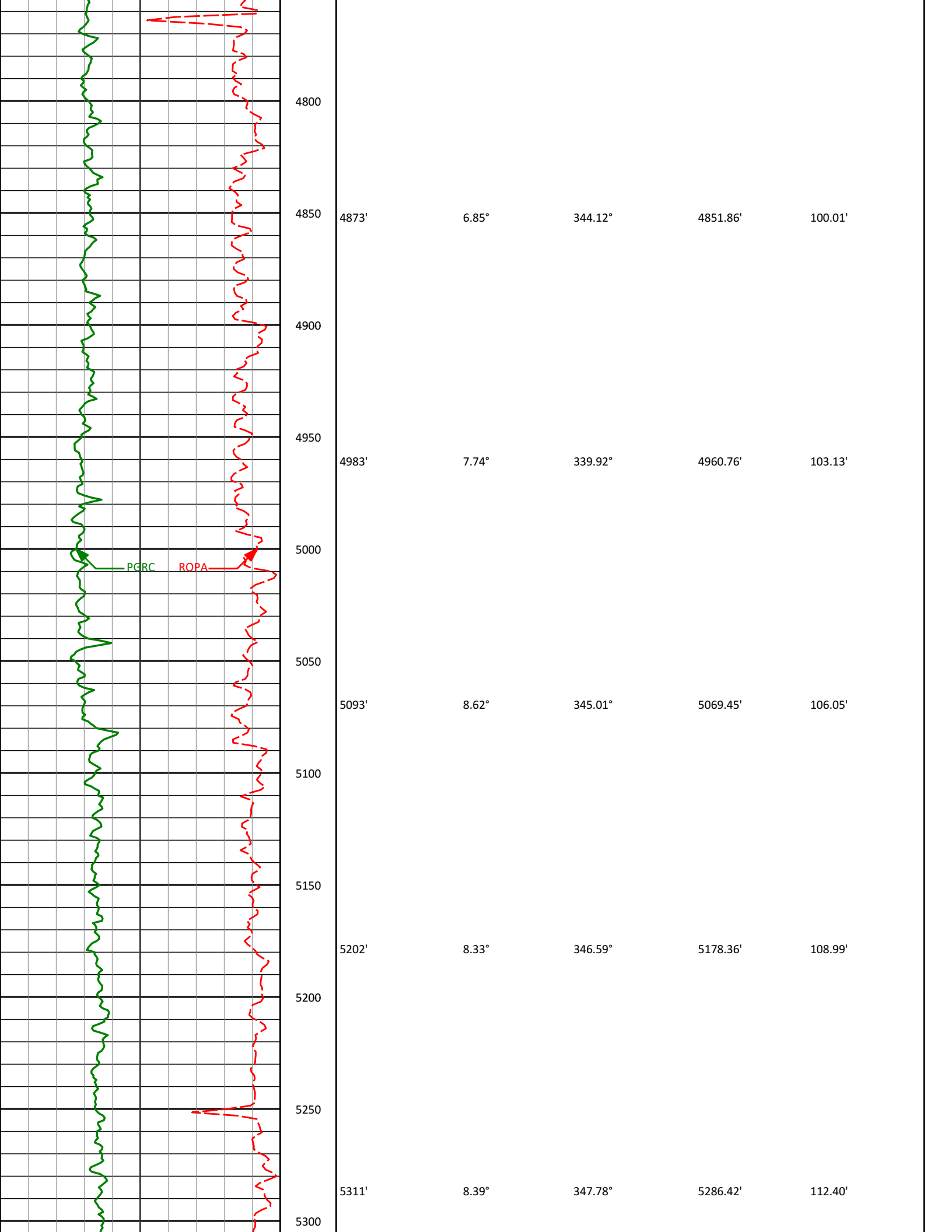


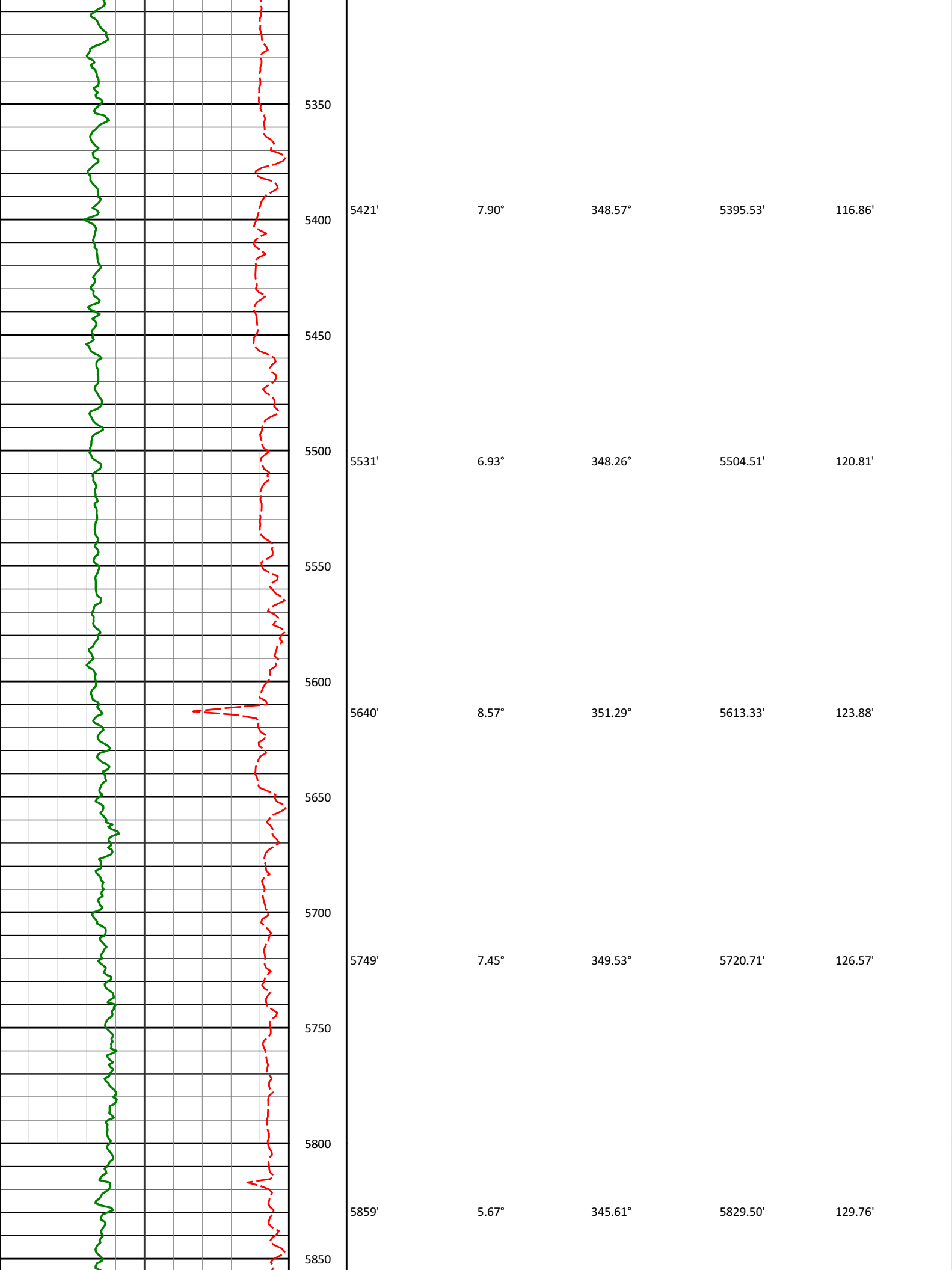


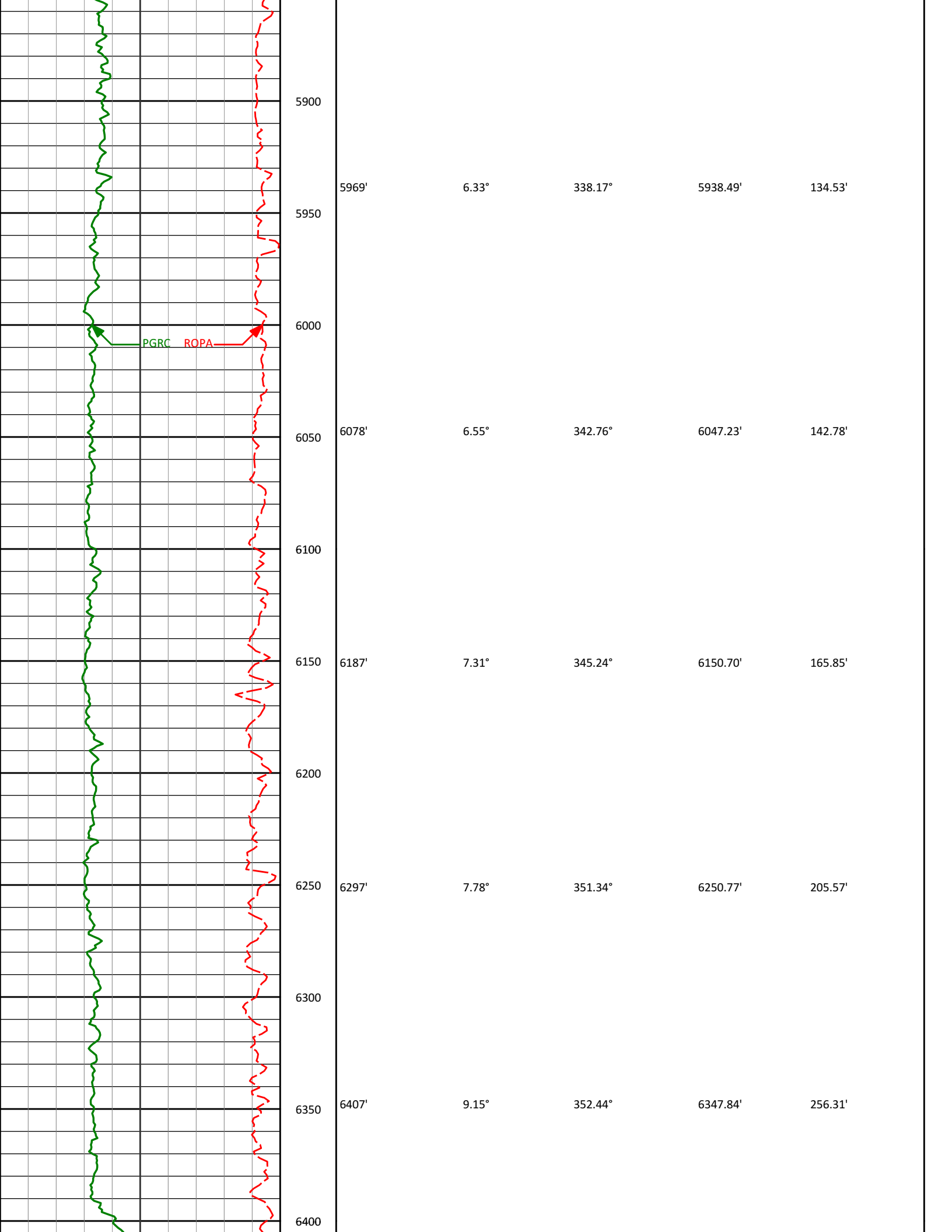


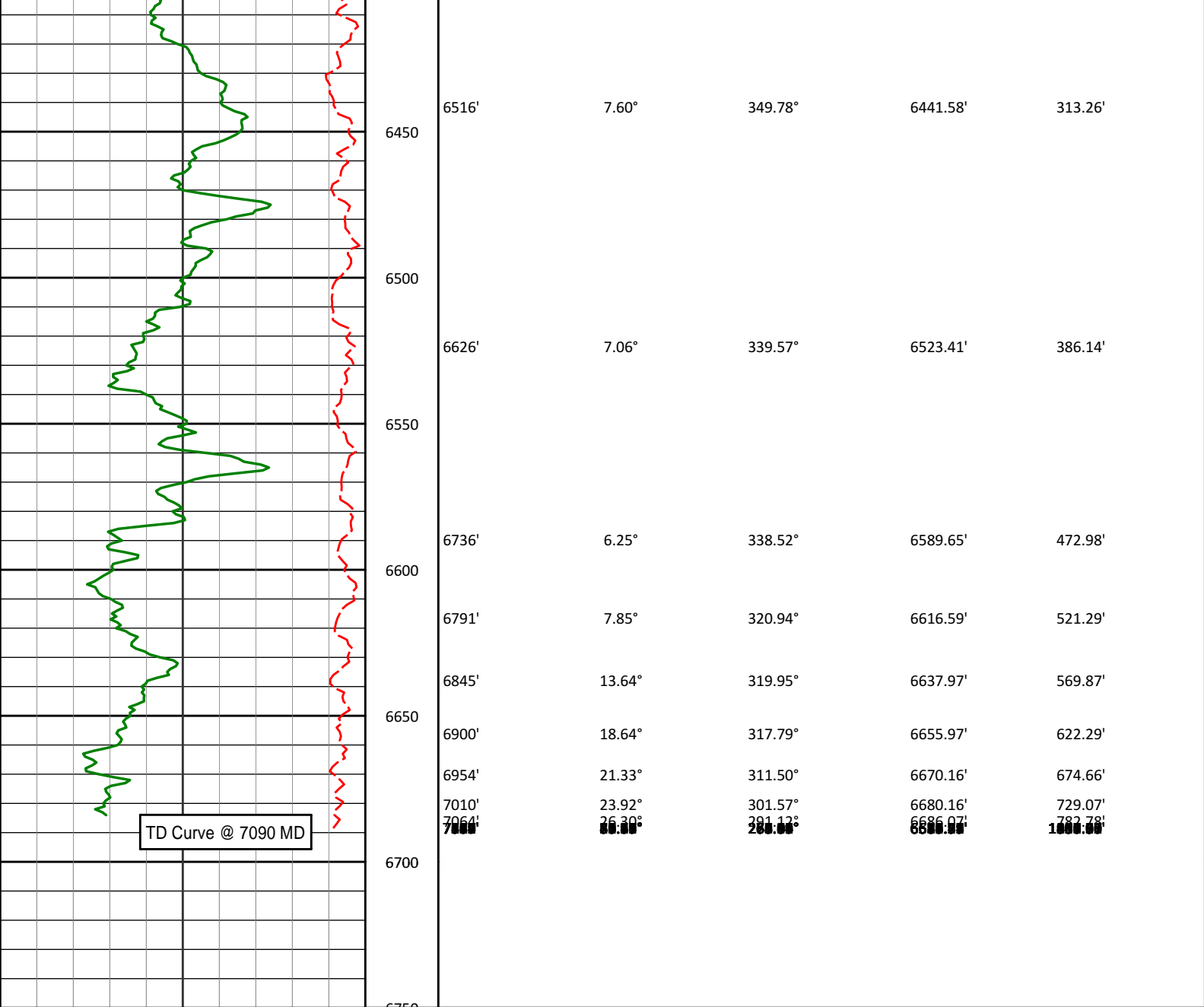












Avg Rate of Penetration ROPA feet per hr	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
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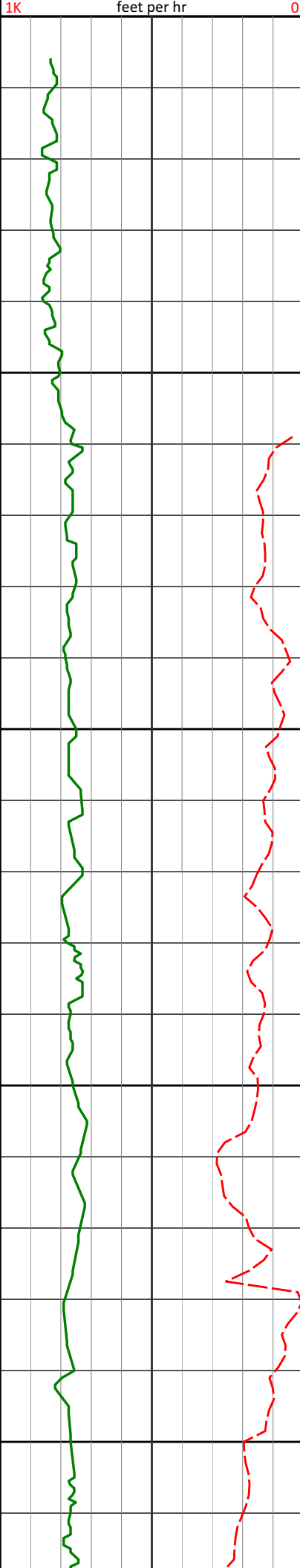
PCG Gamma Ray BCorr PGRC api					
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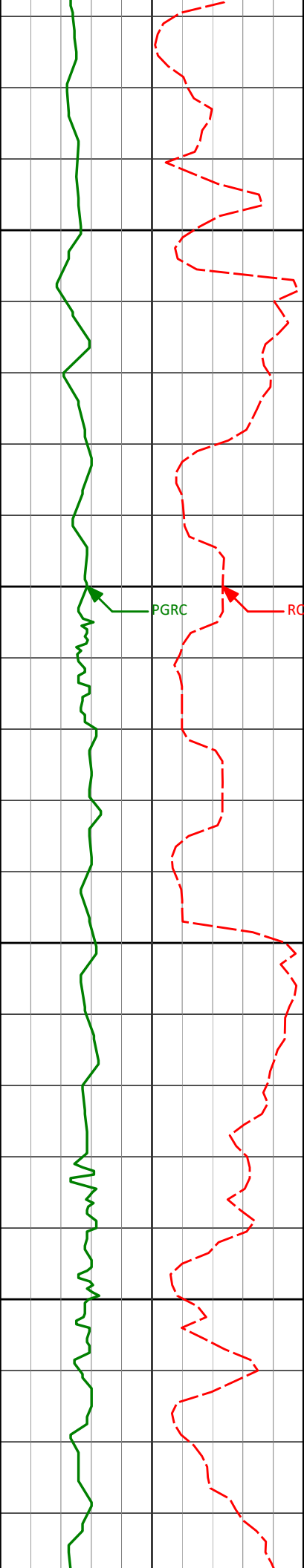
HALLIBURTON
Sperry Drilling Services
TVD Detail Log 1:240

Noble Energy
Wells Ranch AE19-689
H&P 321
Sec. 20-T6N-R62W

PCG Gamma Ray BCorr PGRC api					
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Avg Rate of Penetration ROPA	Depth ft	Depth	Inc.	Azi.	TVD	V.S.
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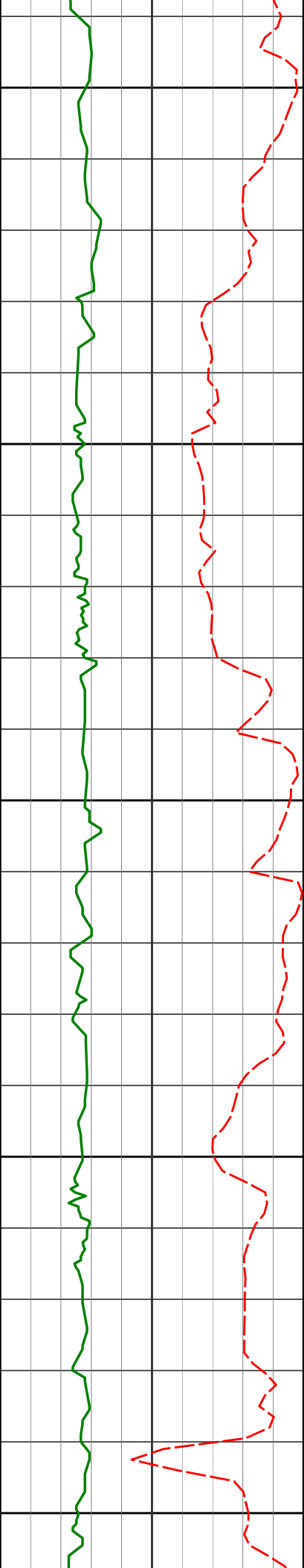
950

1000

1050

1100

920'	0.66°	43.17°	919.89'	-9.01'
1012'	0.78°	33.73°	1011.88'	-9.70'
1104'	0.73°	37.69°	1103.87'	-10.38'



1150

1195'

0.85°

62.41°

1194.87'

-11.31'

1200

200

1250

1300

1310'

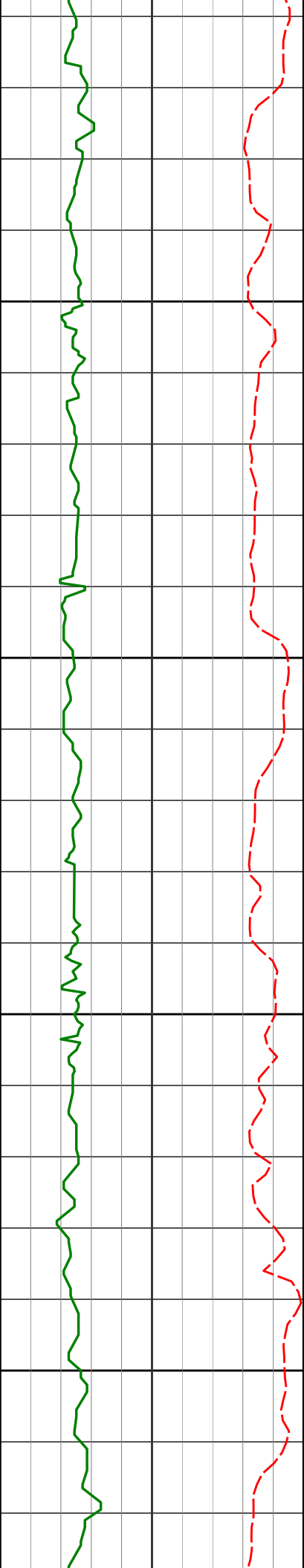
0.51°

270.35°

1309.71'

-11.45'

1350



1400

1450

1500

1550

1417'

0.58°

321.53°

1417.19'

-10.62'

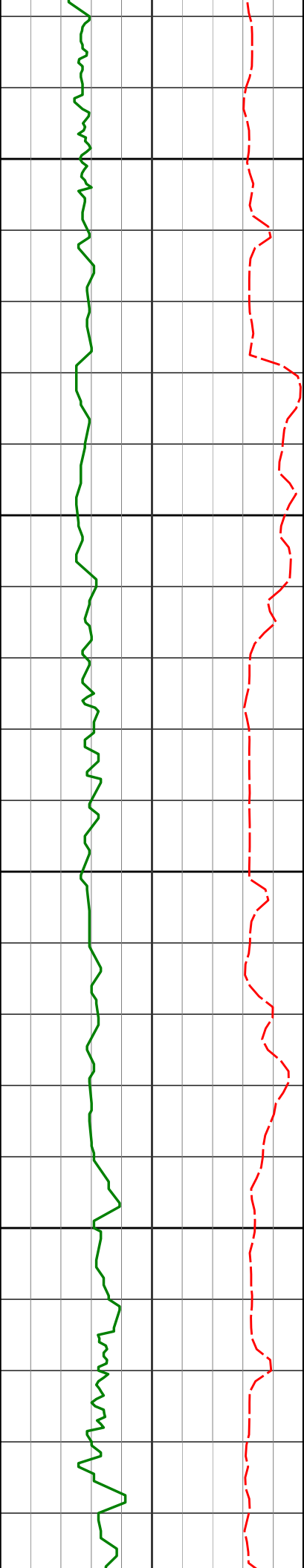
1523'

1.26°

302.17°

1522.34'

-8.89'



1600

1629'

1.57°

256.77°

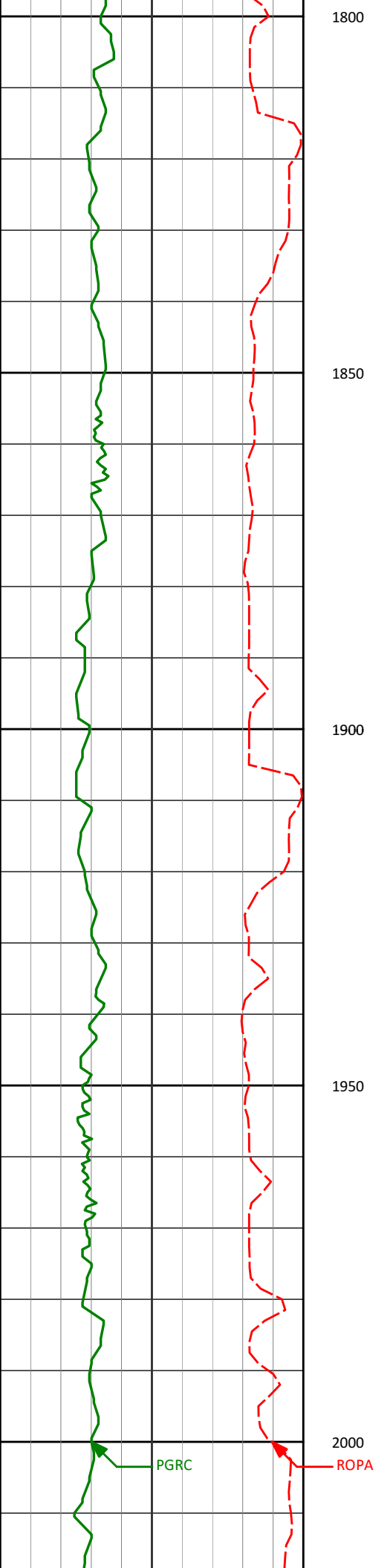
1628.63'

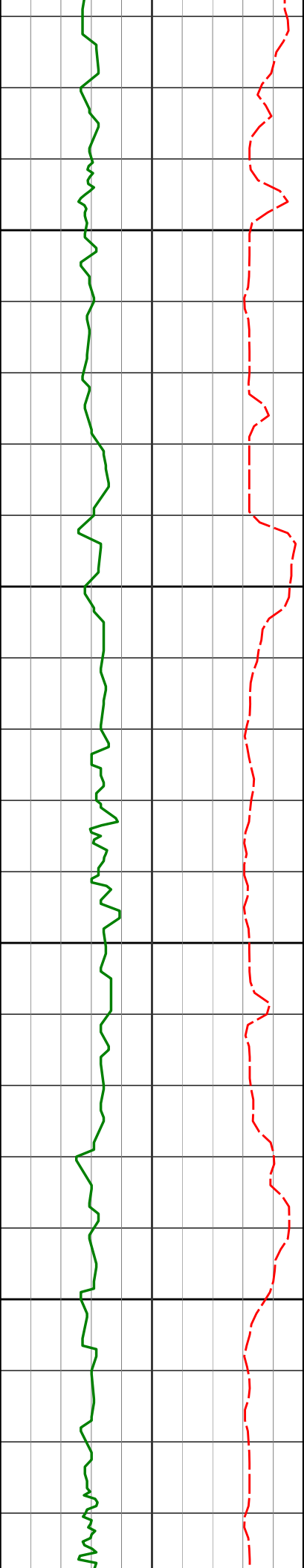
-6.24'

1650

1700

1750





2050

2100

2150

2200

2052'

0.88°

303.81°

2051.57'

-0.19'

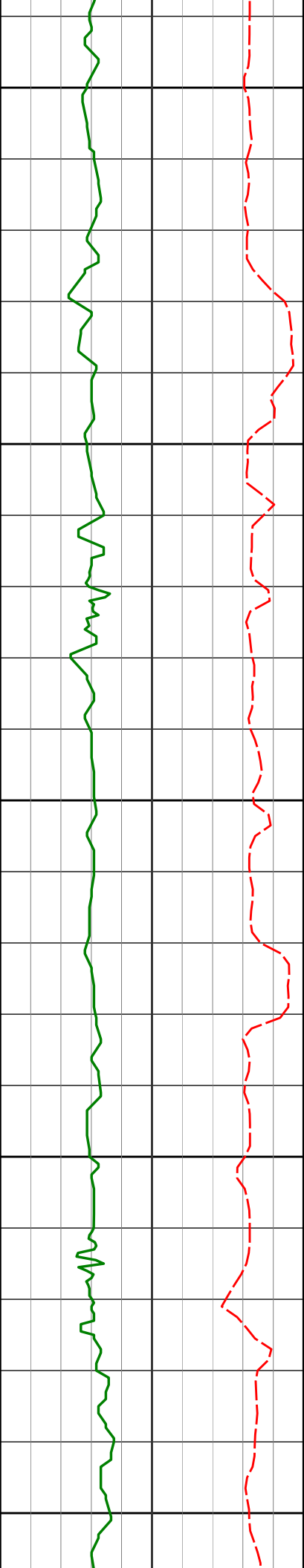
2158'

0.22°

103.17°

2157.90'

-0.64'



2250

2300

2350

2400

2450

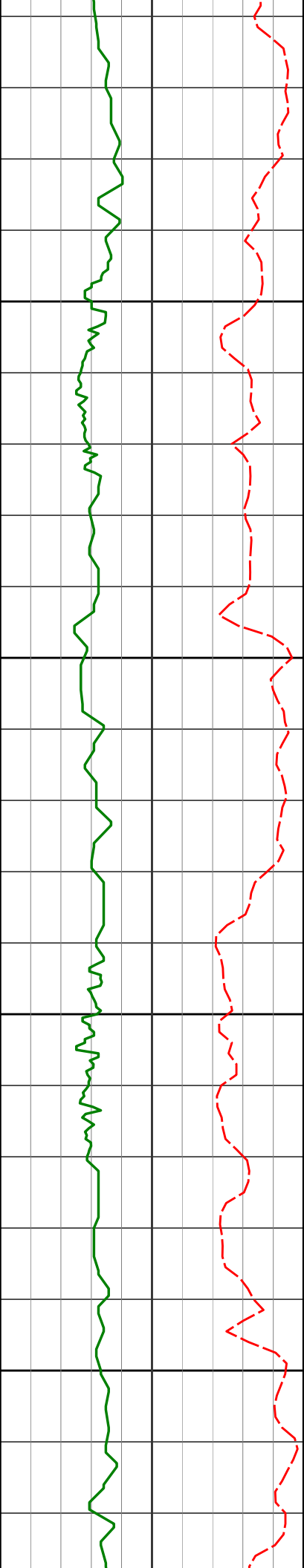
2373'

0.29°

100.59°

2372.86'

-1.53'



2479'

2500

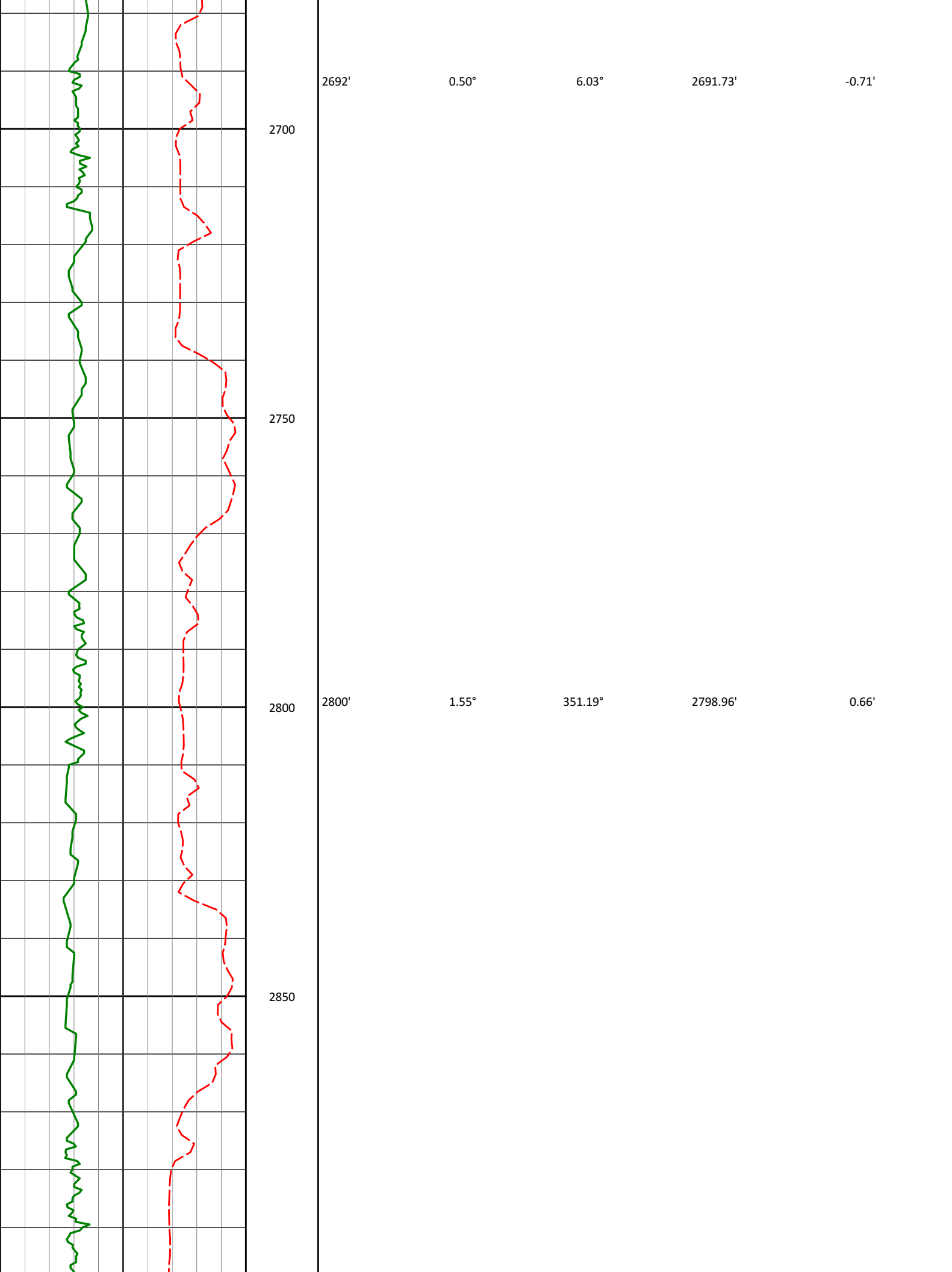
2550

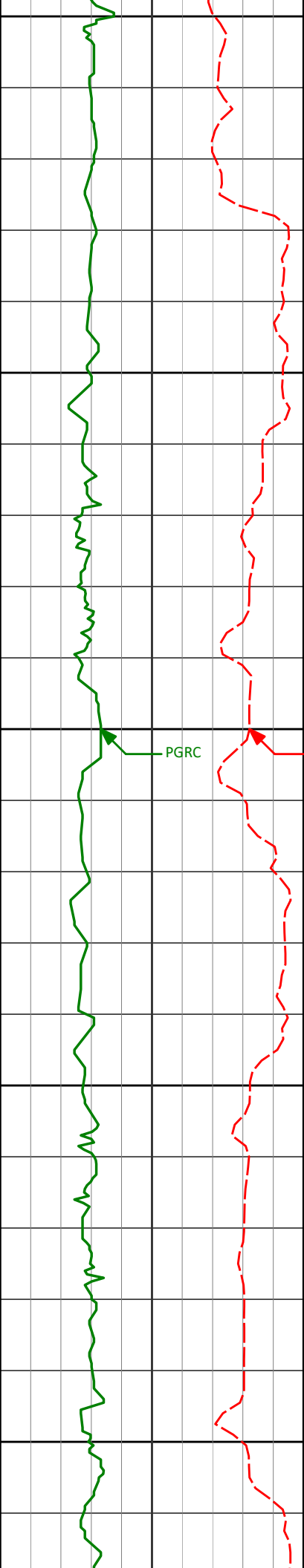
2586'

2600

2650

0.22°	69.68°	2479.18'	-1.74'
0.24°	36.81°	2585.50'	-1.59'





2900

2905'

2.92°

348.71°

2903.72'

2.33'

2950

3000

PGRC

ROPA

3013'

4.39°

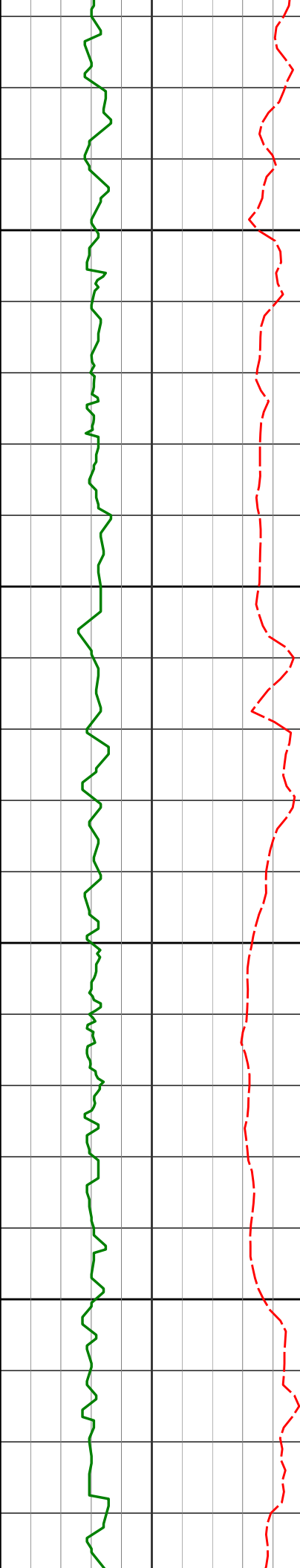
351.32°

3011.53'

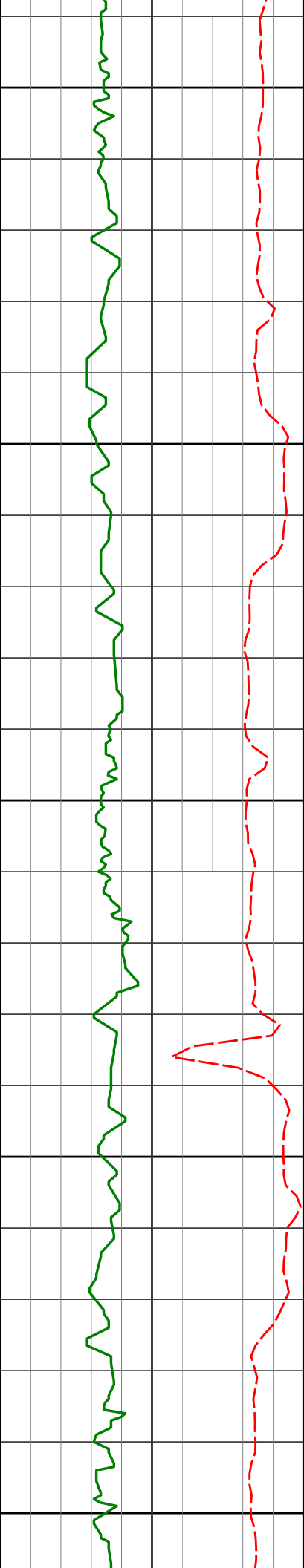
5.41'

3050

3100



3122'	5.09°	351.43°	3119.15'	9.73'
3150				
3200				
3231'	7.34°	348.38°	3226.79'	13.94'
3250				
3300				
3339'	8.02°	343.93°	3334.23'	18.82'



3350

3400

3450

3500

3550

3449'

7.54°

345.10°

3442.70'

24.48'

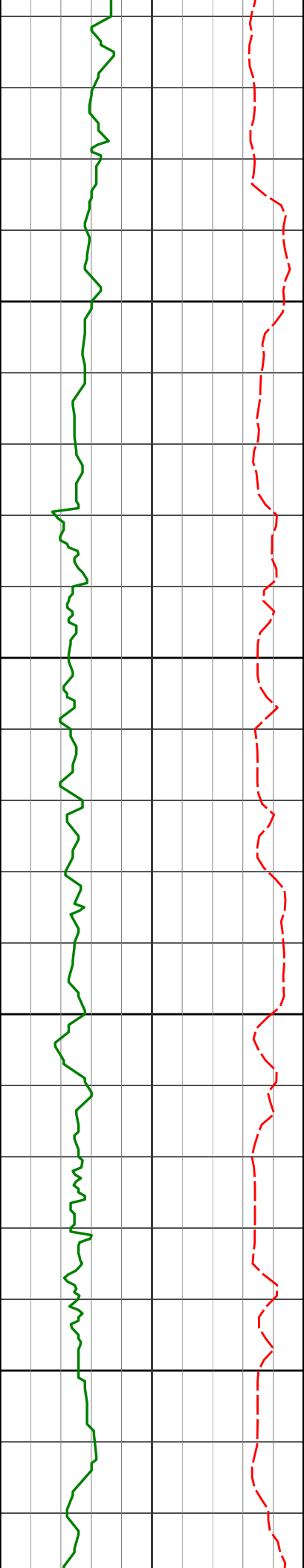
3559'

8.23°

344.23°

3551.23'

30.78'



3600

3650

3700

3750

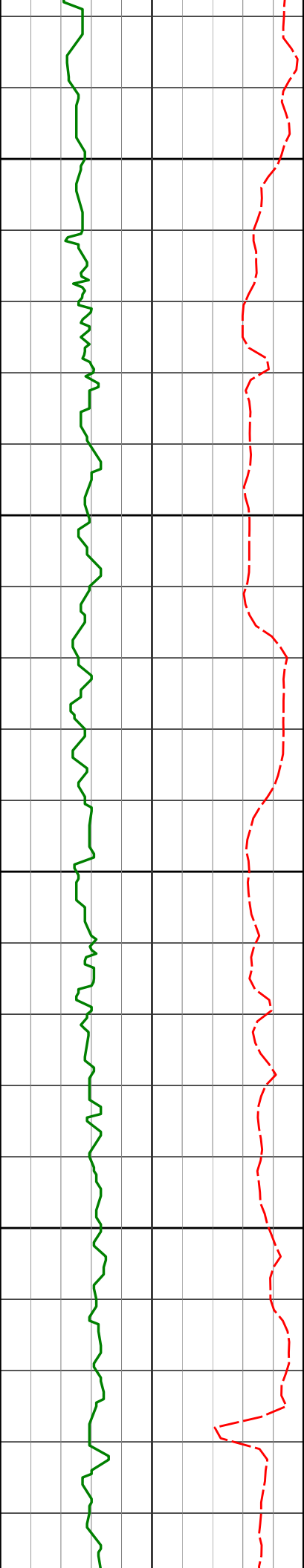
3669'

8.98°

343.28°

3659.73'

37.77'



3800

3850

3900

3950

3887'

8.67°

338.50°

3875.61'

52.51'

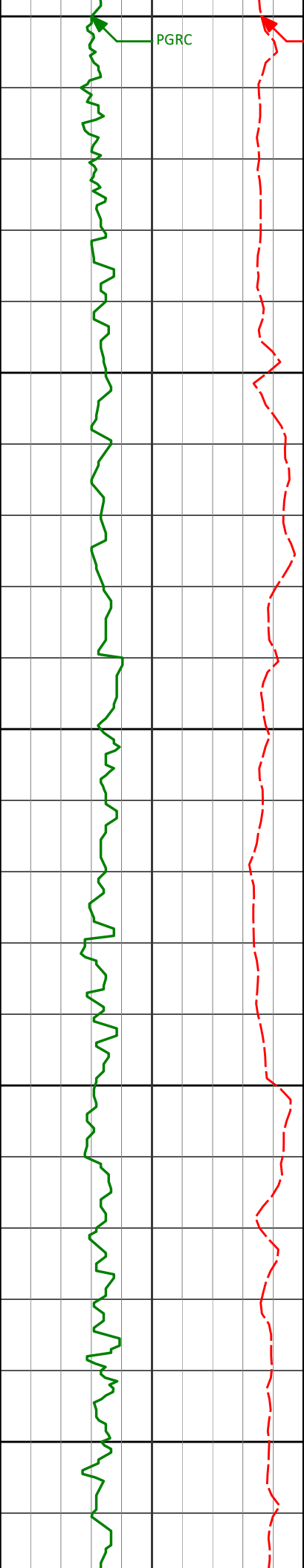
3997'

8.83°

336.83°

3984.11'

59.67'



4000

4050

4100

4150

4200

PGRC

ROPA

4107'

8.73°

332.52°

4092.76'

66.43'

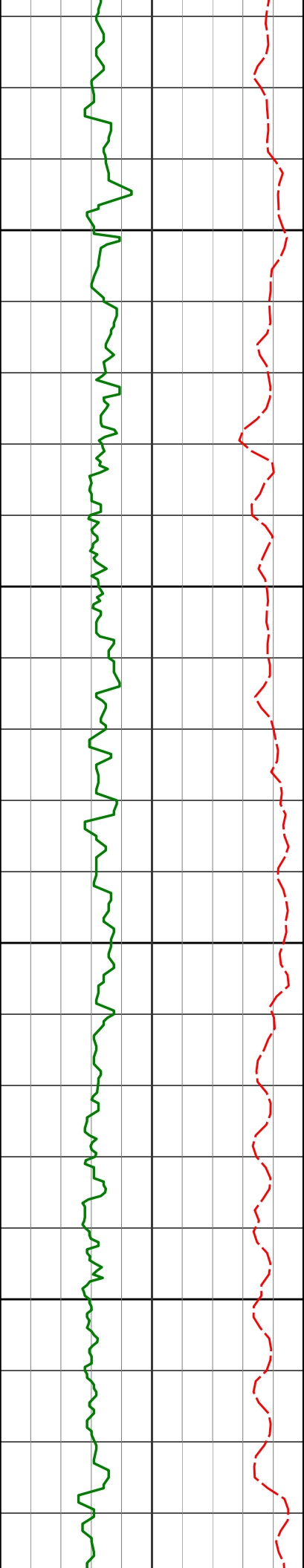
4215'

8.75°

337.12°

4200.40'

72.72'



4250

4300

4350

4400

4325'

8.97°

336.04°

4309.34'

78.50'

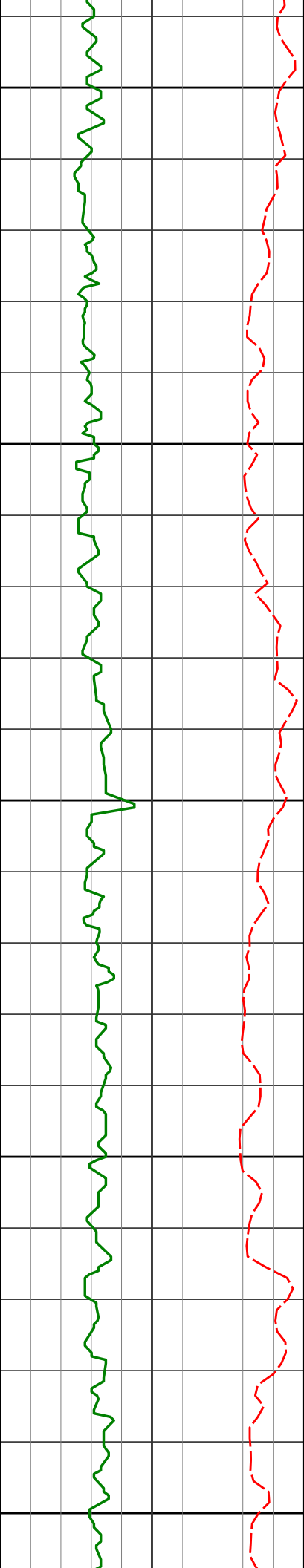
4435'

8.54°

336.57°

4418.32'

82.91'



4450

4500

4550

4600

4650

4545'

7.98°

335.59°

4527.09'

88.03'

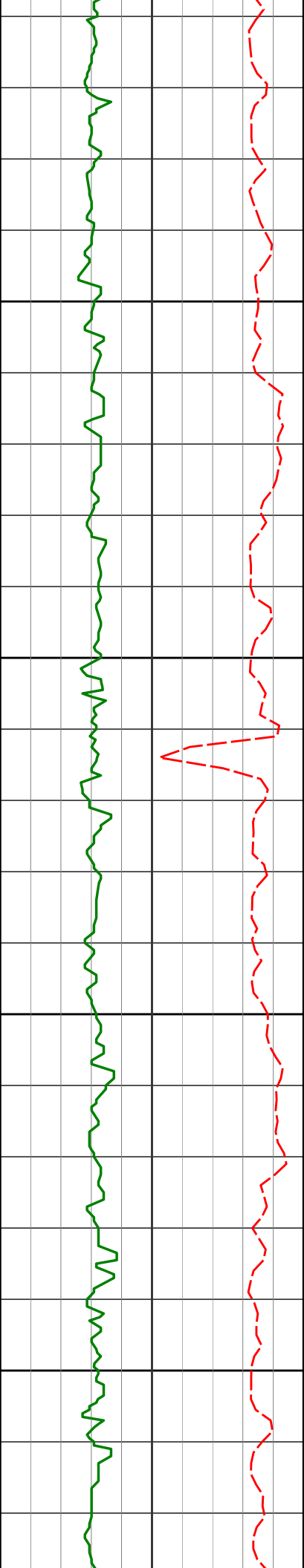
4655'

7.69°

336.55°

4635.68'

92.54'



4700

4763'

6.98°

335.71°

4743.16'

96.46'

4750

4800

4850

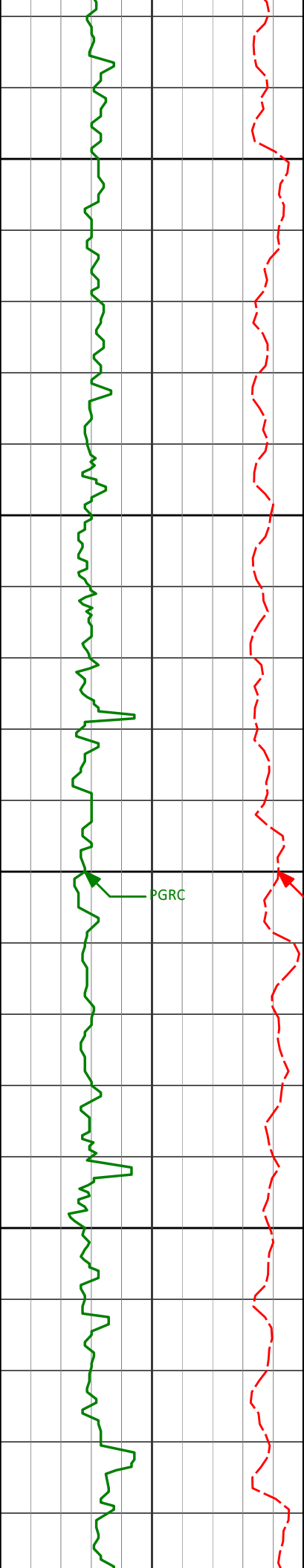
4873'

6.85°

344.12°

4851.86'

100.01'



4900

4950

5000

5050

4983'

7.74°

339.92°

4960.76'

103.13'

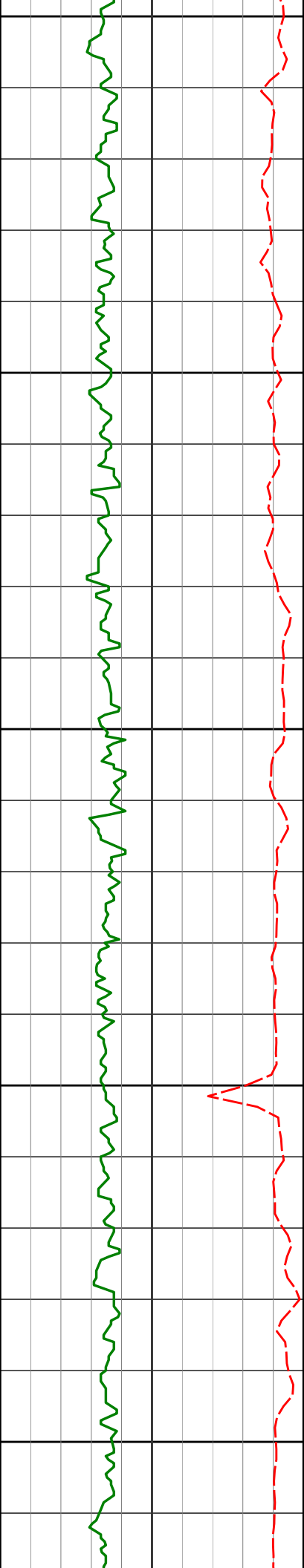
5093'

8.62°

345.01°

5069.45'

106.05'



5100

5150

5202'

8.33°

346.59°

5178.36'

108.99'

5200

5250

5311'

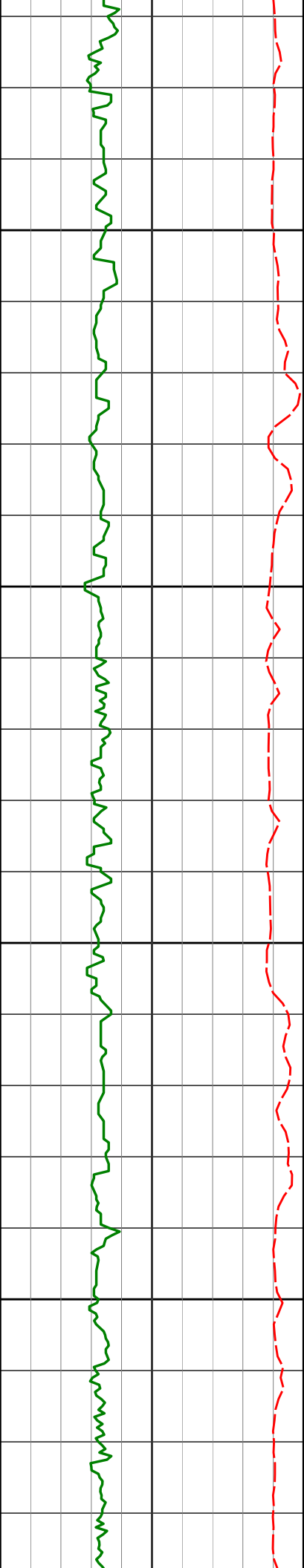
8.39°

347.78°

5286.42'

112.40'

5300



5350

5400

5450

5500

5421'

7.90°

348.57°

5395.53'

116.86'

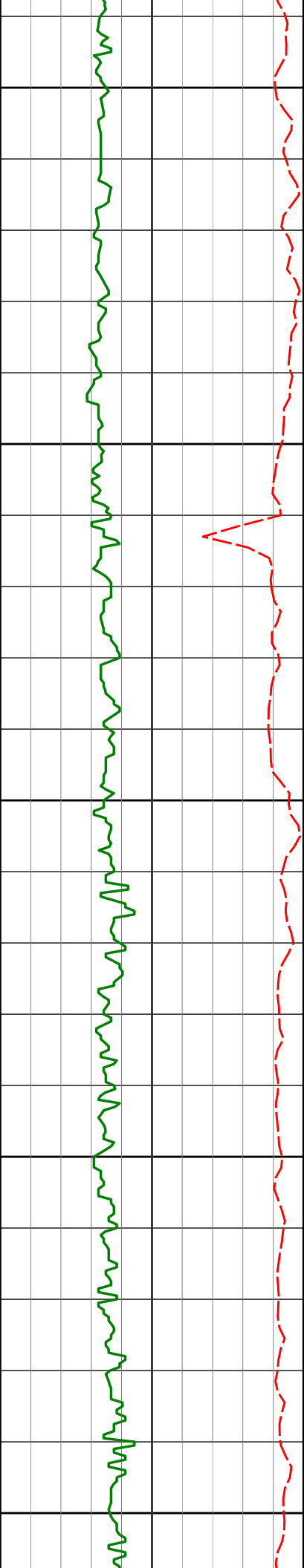
5531'

6.93°

348.26°

5504.51'

120.81'



5550

5600

5650

5700

5750

5640'

8.57°

351.29°

5613.33'

123.88'

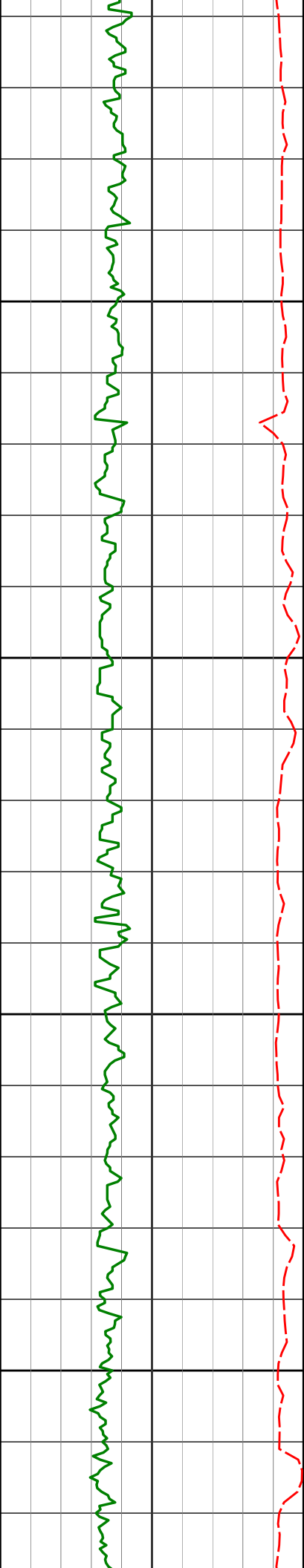
5749'

7.45°

349.53°

5720.71'

126.57'



5800

5859'

5.67°

345.61°

5829.50'

129.76'

5850

5900

5969'

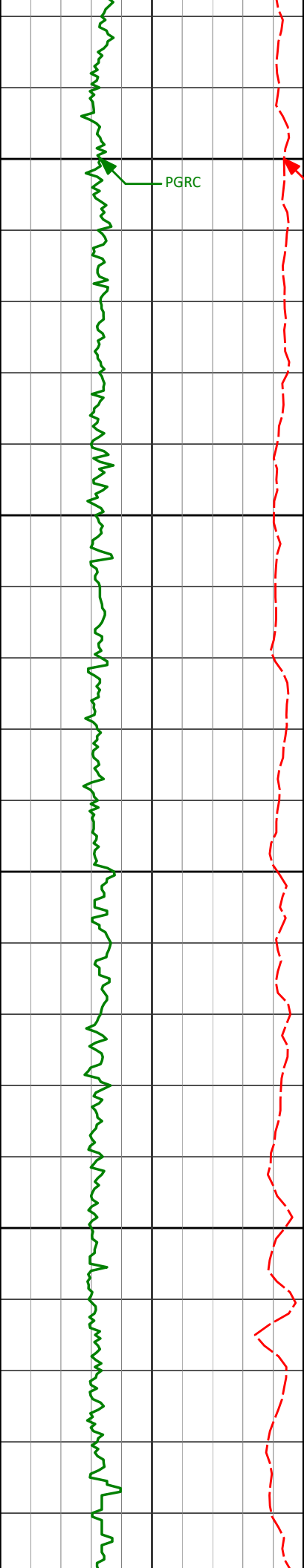
6.33°

338.17°

5938.49'

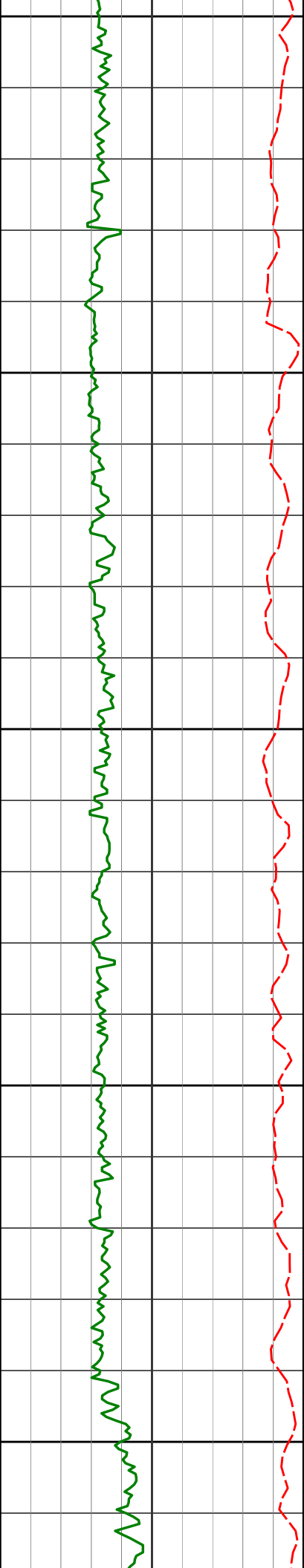
134.53'

5950



6000
PGRC
ROPA
6050
6100
6150

6078'	6.55°	342.76°	6047.23'	142.78'
6187'	7.31°	345.24°	6150.70'	165.85'



6200

6250

6300

6350

6400

6297'

7.78°

351.34°

6250.77'

205.57'

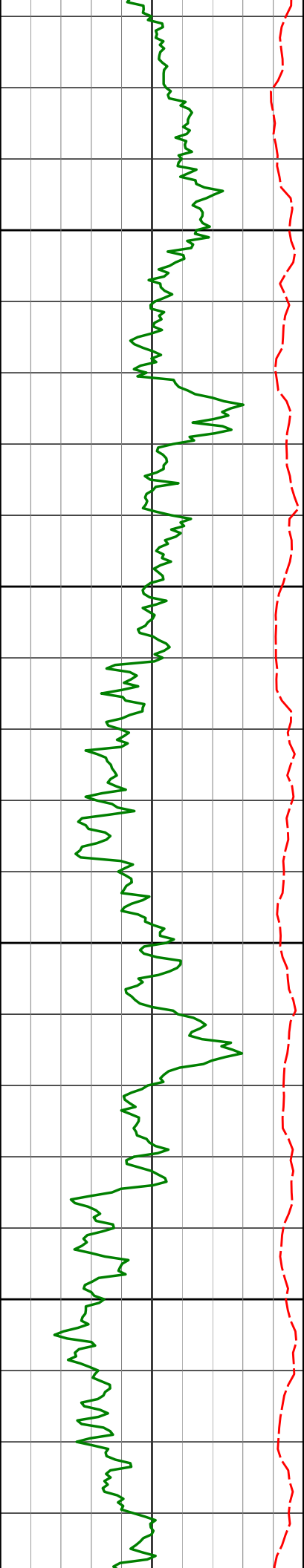
6407'

9.15°

352.44°

6347.84'

256.31'



6516'	7.60°	349.78°	6441.58'	313.26'
6626'	7.06°	339.57°	6523.41'	386.14'
6736'	6.25°	338.52°	6589.65'	472.98'
6791'	7.85°	320.94°	6616.59'	521.29'
6845'	12.61°	310.05°	6627.07'	560.07'

3152.00	7.54	345.10	3148.86	61.42 N	9.30 W	10.86	0.53
3247.00	8.23	344.23	3242.96	73.99 N	12.75 W	14.63	0.74
3342.00	8.98	343.28	3336.89	87.64 N	16.73 W	18.95	0.80
3531.00	8.67	338.50	3523.66	115.02 N	26.19 W	29.11	0.42
3626.00	8.83	336.83	3617.55	128.38 N	31.69 W	34.95	0.32
3721.00	8.73	332.52	3711.44	141.48 N	37.88 W	41.47	0.70
3815.00	8.75	337.12	3804.35	154.40 N	43.95 W	47.87	0.74
3910.00	8.97	336.04	3898.22	167.82 N	49.77 W	54.03	0.29
4005.00	8.54	336.57	3992.11	181.06 N	55.58 W	60.18	0.46
4100.00	7.98	335.59	4086.12	193.54 N	61.11 W	66.02	0.61
4195.00	7.69	336.55	4180.24	205.38 N	66.37 W	71.58	0.33
4289.00	6.98	335.71	4273.47	216.35 N	71.22 W	76.71	0.76
4384.00	6.85	344.12	4367.78	227.06 N	75.14 W	80.90	1.07
4479.00	7.74	339.92	4462.01	238.52 N	78.89 W	84.94	1.09
4574.00	8.62	345.01	4556.04	251.41 N	82.93 W	89.31	1.20
4669.00	8.33	346.59	4650.00	264.98 N	86.37 W	93.09	0.39
4763.00	8.39	347.78	4743.01	278.30 N	89.40 W	96.46	0.19
4858.00	7.90	348.57	4837.05	291.48 N	92.16 W	99.55	0.53
4953.00	6.93	348.26	4931.25	303.49 N	94.62 W	102.32	1.02
5048.00	8.57	351.29	5025.38	316.10 N	96.86 W	104.88	1.78
5142.00	7.45	349.53	5118.46	329.01 N	99.02 W	107.37	1.22
5237.00	5.67	345.61	5212.84	339.62 N	101.31 W	109.93	1.93
5332.00	6.33	338.17	5307.32	349.02 N	104.42 W	113.28	1.07
5427.00	6.55	342.76	5401.72	359.06 N	107.98 W	117.09	0.59
5521.00	7.31	345.24	5495.03	369.96 N	111.09 W	120.48	0.87
5616.00	7.78	351.34	5589.21	382.16 N	113.60 W	123.30	0.98
5711.00	9.15	352.44	5683.17	396.01 N	115.56 W	125.61	1.45
5806.00	7.60	349.78	5777.16	409.68 N	117.67 W	128.07	1.68
5901.00	7.06	339.57	5871.38	421.33 N	120.82 W	131.52	1.48
5996.00	6.25	338.52	5965.74	431.62 N	124.75 W	135.71	0.86
6044.00	7.85	320.94	6013.38	436.60 N	127.77 W	138.86	5.56
6090.00	13.64	319.95	6058.56	443.19 N	133.25 W	144.50	12.59
6138.00	18.64	317.79	6104.65	453.21 N	142.05 W	153.55	10.49
6185.00	21.33	311.50	6148.82	464.44 N	153.50 W	165.29	7.32
6233.00	23.92	301.57	6193.14	475.33 N	168.34 W	180.39	9.60
6280.00	26.30	291.12	6235.72	484.07 N	186.18 W	198.45	10.69
6328.00	27.29	281.76	6278.58	490.15 N	206.88 W	219.30	9.02
6375.00	28.61	273.41	6320.12	493.02 N	228.67 W	241.16	8.78
6423.00	28.83	275.05	6362.21	494.72 N	251.67 W	264.20	1.70
6470.00	31.10	273.90	6402.93	496.54 N	275.08 W	287.64	4.98
6518.00	36.17	271.66	6442.88	497.80 N	301.62 W	314.21	10.87
6565.00	41.27	270.09	6479.54	498.22 N	331.01 W	343.59	11.05
6613.00	45.82	267.16	6514.33	497.40 N	364.05 W	376.60	10.37
6659.00	50.39	265.31	6545.04	495.13 N	398.20 W	410.69	10.38
6707.00	55.71	264.99	6573.88	491.88 N	436.41 W	448.80	11.10
6754.00	59.97	266.42	6598.89	488.91 N	476.08 W	488.38	9.42
6802.00	64.64	268.02	6621.20	486.87 N	518.51 W	530.75	10.17
6849.00	69.45	268.94	6639.52	485.73 N	561.76 W	573.96	10.39
6897.00	72.77	269.64	6655.06	485.17 N	607.17 W	619.33	7.05
6944.00	75.95	268.69	6667.73	484.50 N	652.42 W	664.55	7.04
6992.00	80.68	267.04	6677.45	482.75 N	699.37 W	711.45	10.41
7030.00	83.27	265.87	6682.75	480.42 N	736.93 W	748.93	7.47

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 271.46 DEGREES (GRID)
A TOTAL CORRECTION OF 7.40 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7030.00 FEET
IS 879.69 FEET ALONG 303.10 DEGREES (GRID)**

**Tied in @ Surface
First two Survey's from 3rd party source (Muilti Shot EMS)**

Final survey projected to bit.

