

PCDC - Pressure Case Directional
PCGK - Pressure Case Gamma

1 : 600 / 1 : 240

Country		: USA					
Field		: Wattenburg					
Location		: Lat: 40° 28' 34.32" North Long: 104° 21' 18.68" West					
Well		: Wells Ranch AE20-67HN					
Company		: Noble Energy					
Rig		: H&P 321					
LOCATION		Latitude : 40° 28' 34.32" North Longitude : 104° 21' 18.68" West		Other Services Directional Drilling			
		UTM Easting = 3,318,474.520 ft UTM Northing = 1,418,375.868 ft					
Permanent Datum		: Ground Level		Elevation : 4841.00 ft		Elev. KB N/A	
Log Measured From		: Drill Floor		30.00 ft Above Permanent Datum		DF 4871.00 ft GL 4841.00 ft WD N/A	
Drilling Measured From		: Drill Floor		MD LOG			
Depth Logged		: 983.00 ft To 10,861.00 ft		Unit No. : 11210424		Job No. :CA-XX-0900775409	
Date Logged		: 08-Oct-13 To 14-Oct-13		Plot Type : Final			
Total Depth MD		: 10,861.00 ft TVD: 6,577.94 ft		Plot Date : 14-Oct-13			
Spud Date		: 08-Oct-13					
Run No.		Borehole Record (MD)		Run No.		Borehole Record (MD)	
		Size From To		Size From To			
100		8.750 in 983.00 ft 5,840.00 ft					
200		8.750 in 5,840.00 ft 6,980.00 ft					
300		6.125 in 6,980.00 ft 10,861.00 ft					
				Size From To		Casing Record (MD)	
				9.625 36.00 972.00			

Max Tool Temp (degF) / Source	141.70 / PCM	162.80 / PCM	221.80 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 141.70	N/A @ 162.80	N/A @ 221.80		
Lead MWD Engineer	Robert Barnes	Robert Barnes	Kyle Wass		
Customer Representative	Jim Turner	Stetson Nielson	Stetson Nielson		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11107082	11107082	11768602		
Insert Serial Number	11680773	11680773	11680773		
Date and Time Initialized	08-Oct-13 15:06	08-Oct-13 15:06	11-Oct-13 18:37		
Date and Time Read	11-Oct-13 12:47	11-Oct-13 12:54	14-Oct-13 08:01		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	57.00	54.00	64.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11107082	11107082	11768602		
Sonde Serial Number	11297617	11297617	11297617		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	220.97	319.53	0.00		

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	49.81	46.84	66.70		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11107082	11107082	11768602		
Insert/Sonde Serial Number	11293386	11293386	11293386		

REMARKS

1. All depths are calibrated to driller's pipe tally and are measured depth's from the Drill Floor.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" 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 v8.0.0

WARRANTY

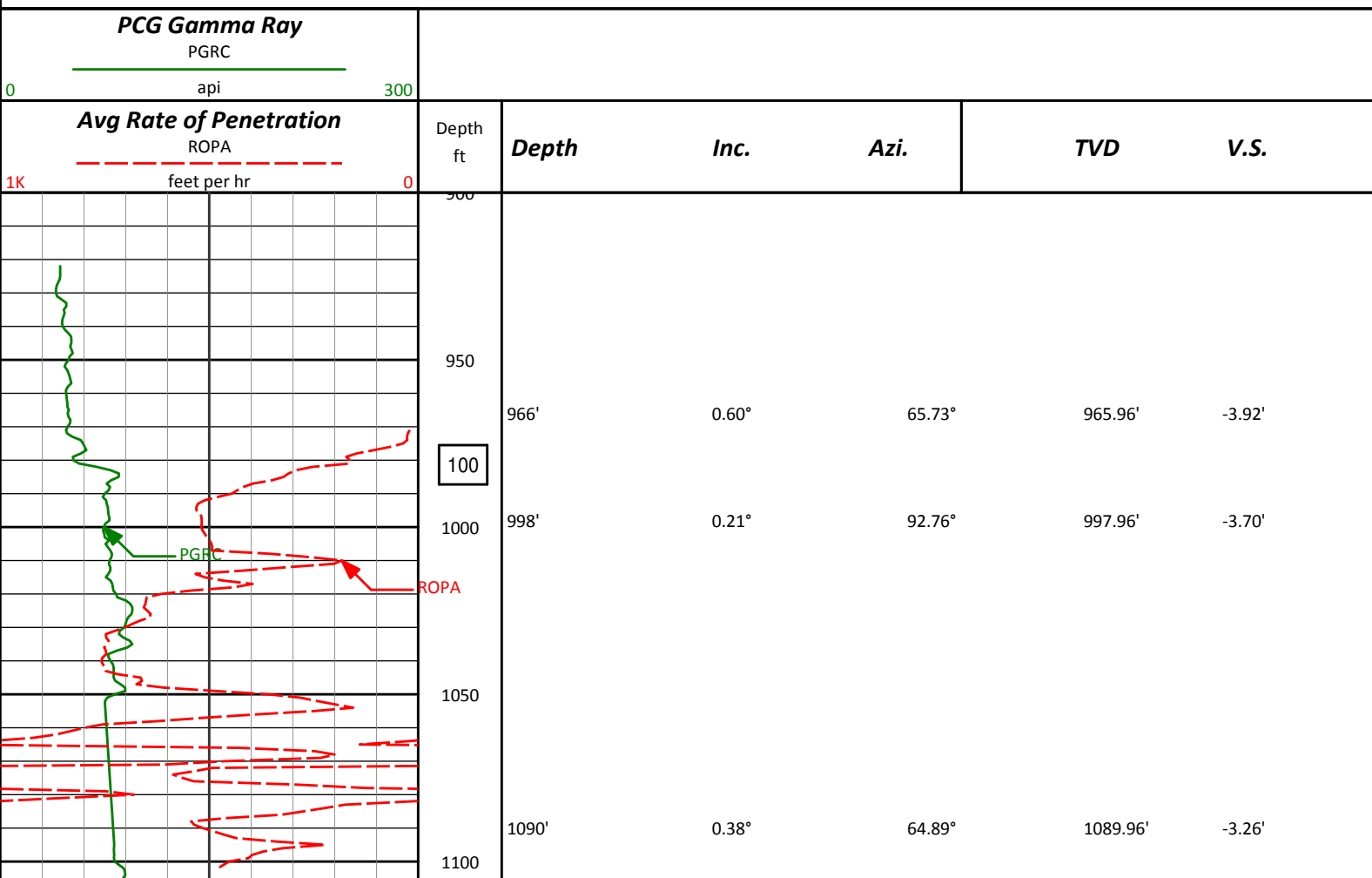
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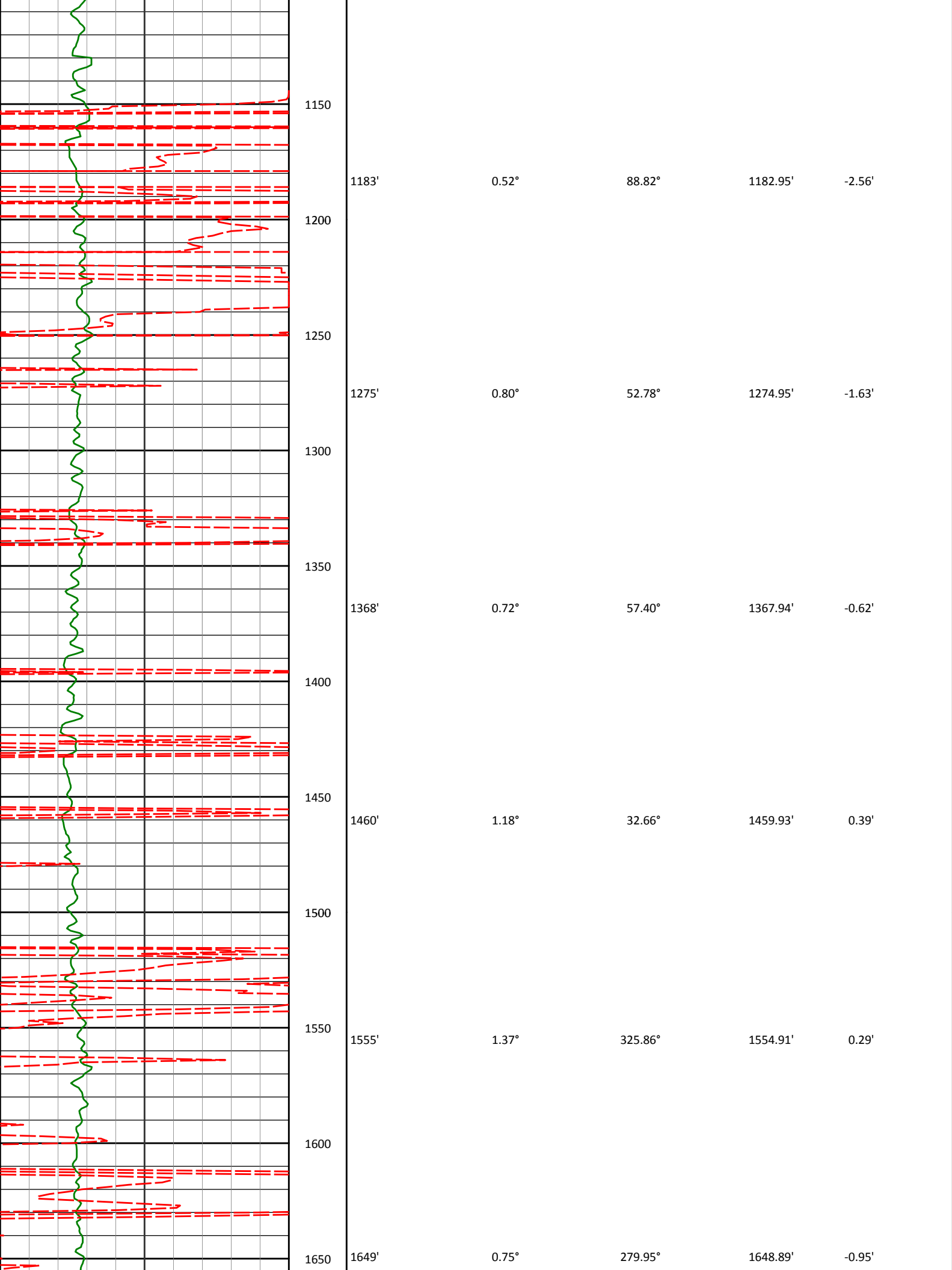
HALLIBURTON

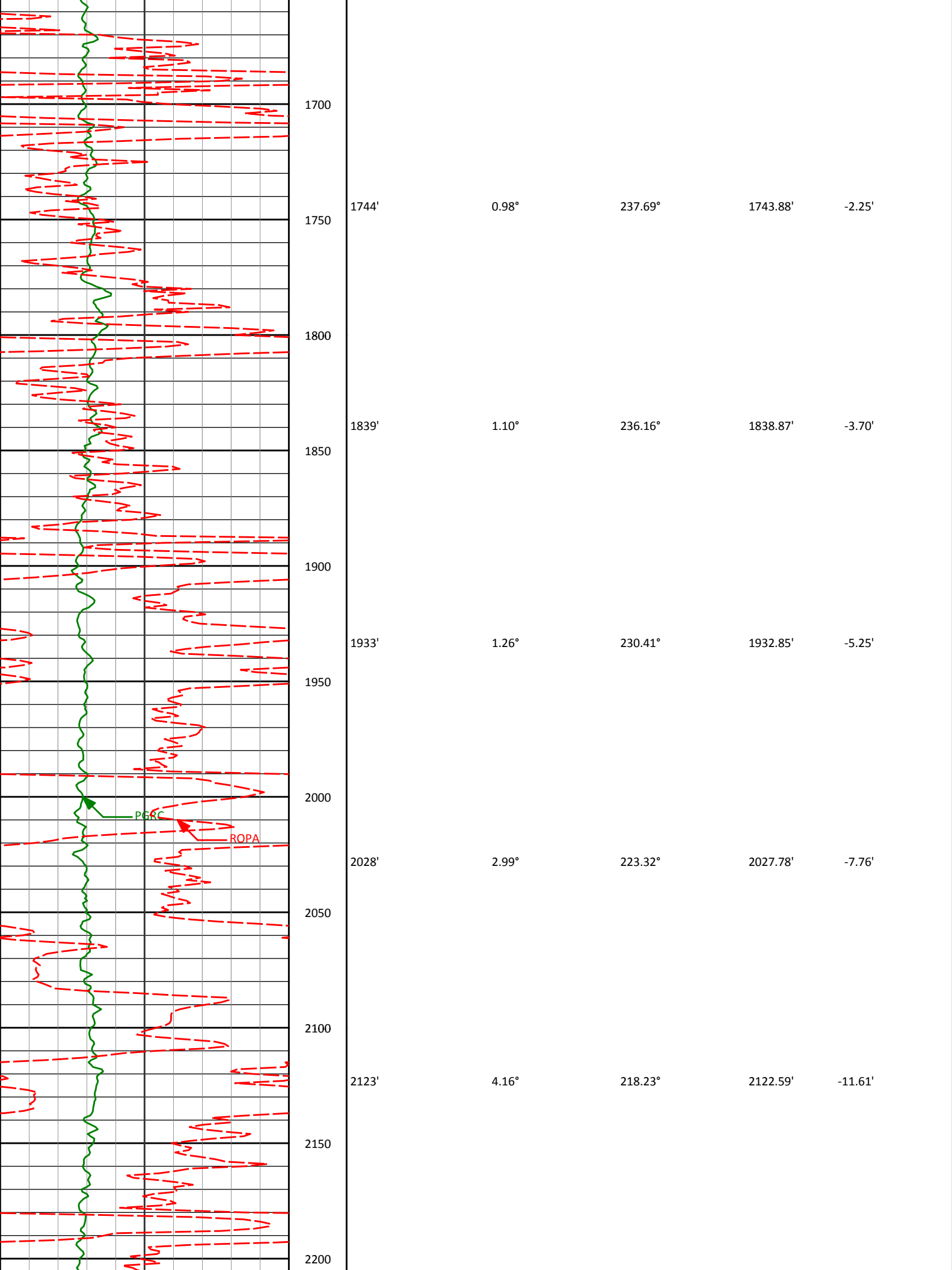
Sperry Drilling Services

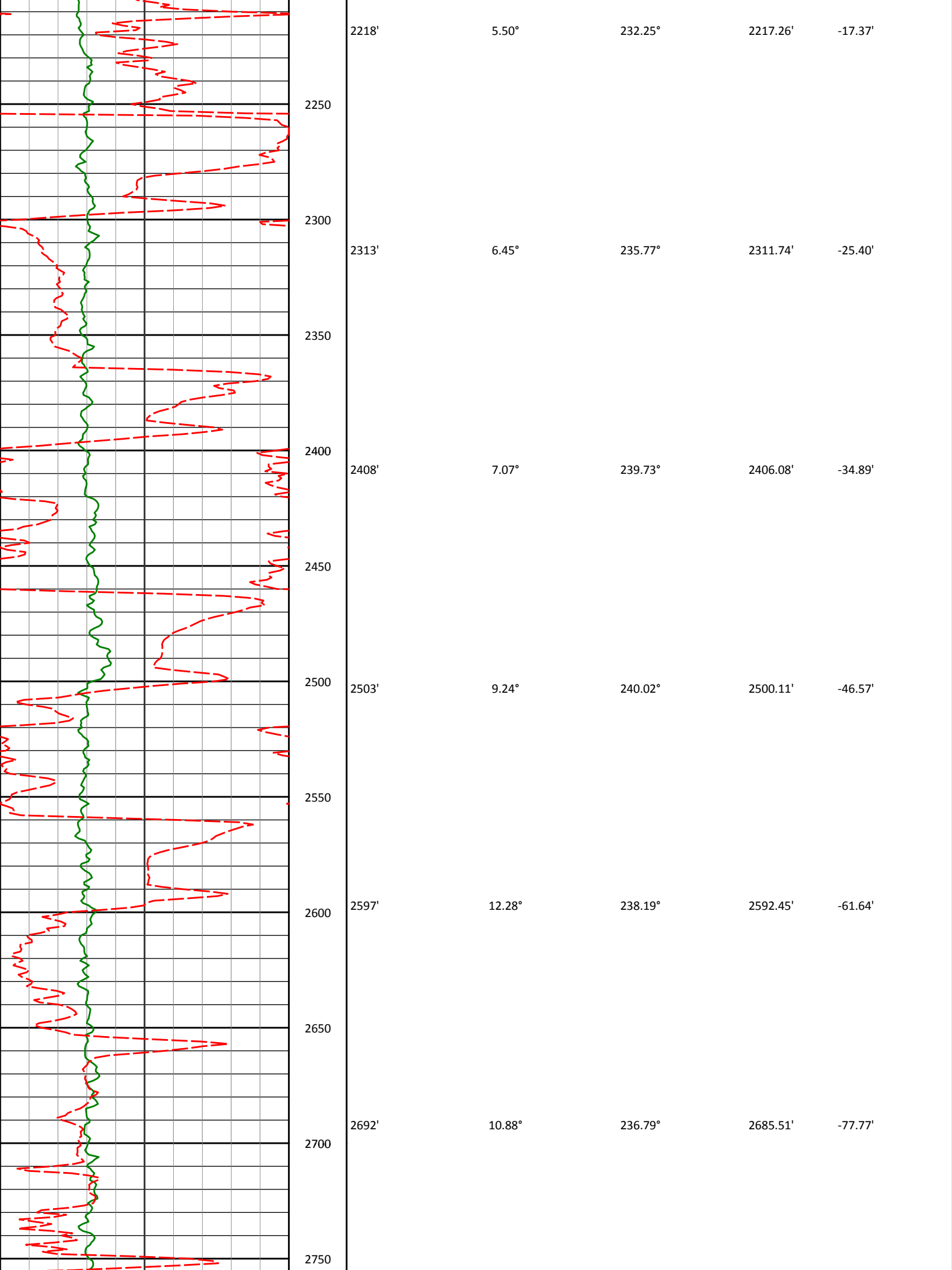
MD Correlation Log 1:600

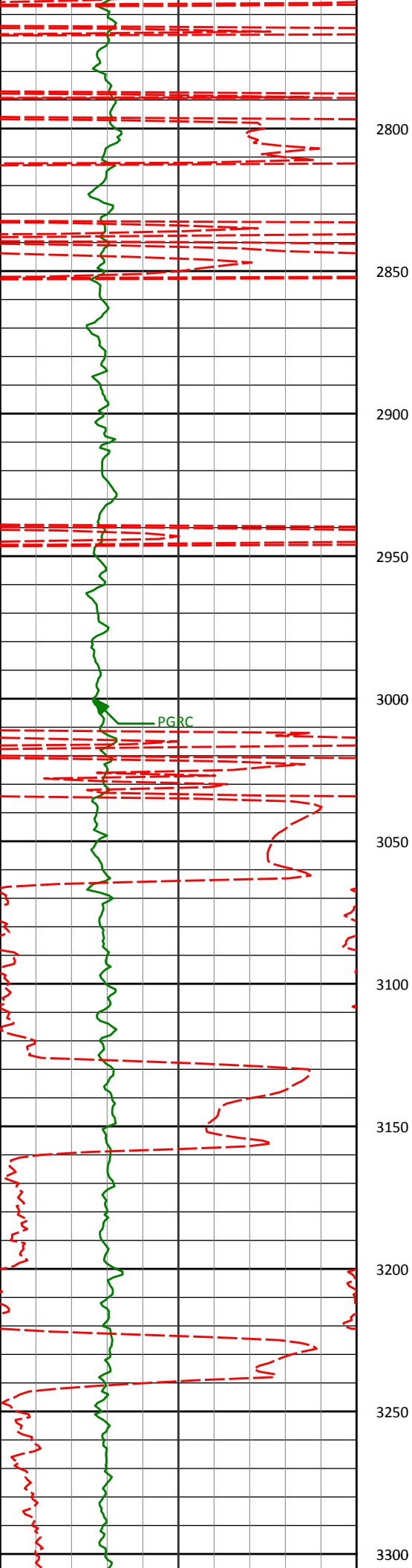
Noble Energy
Wells Ranch AE20-67HN
H&P 321
Sec. 20-T6N-R62W



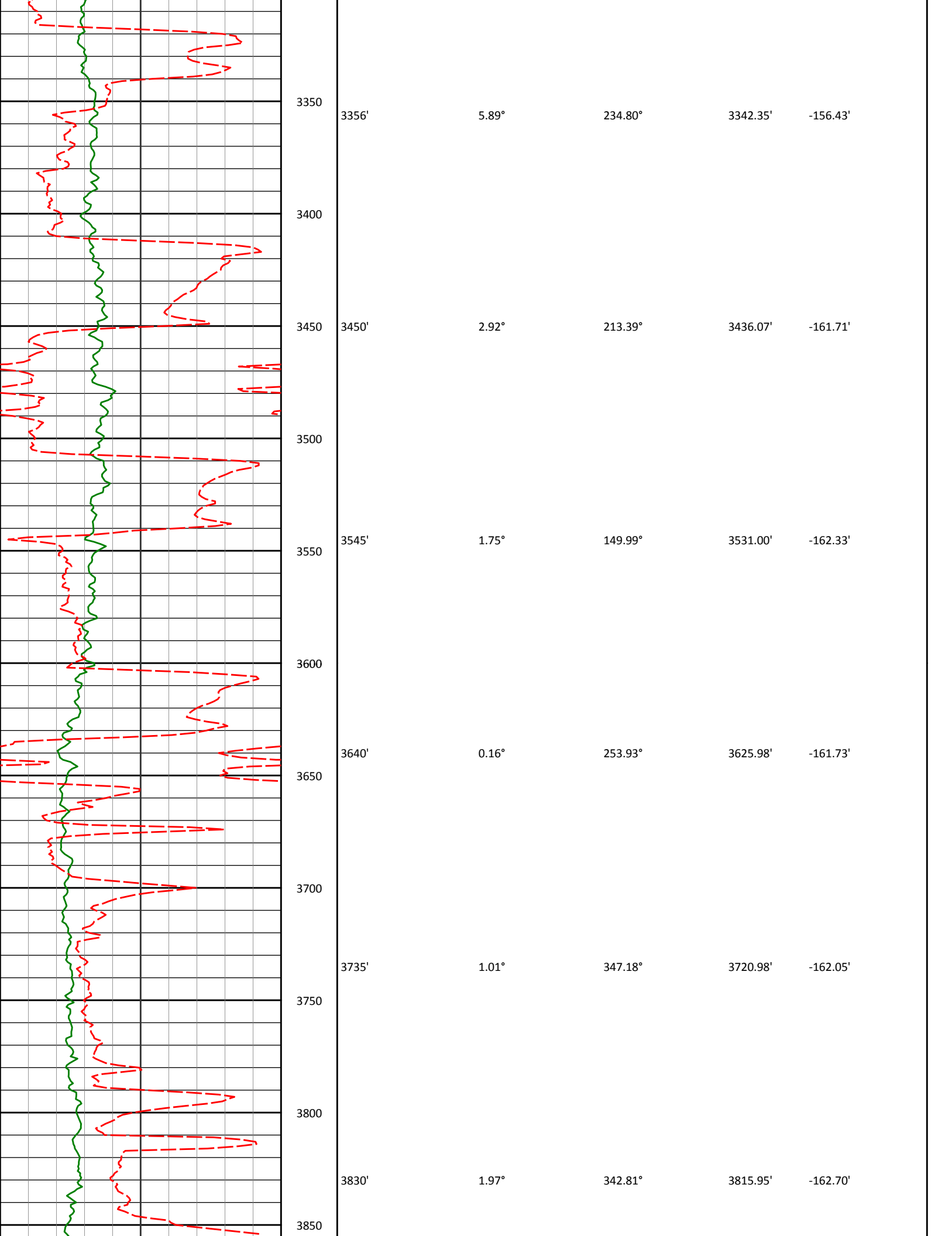


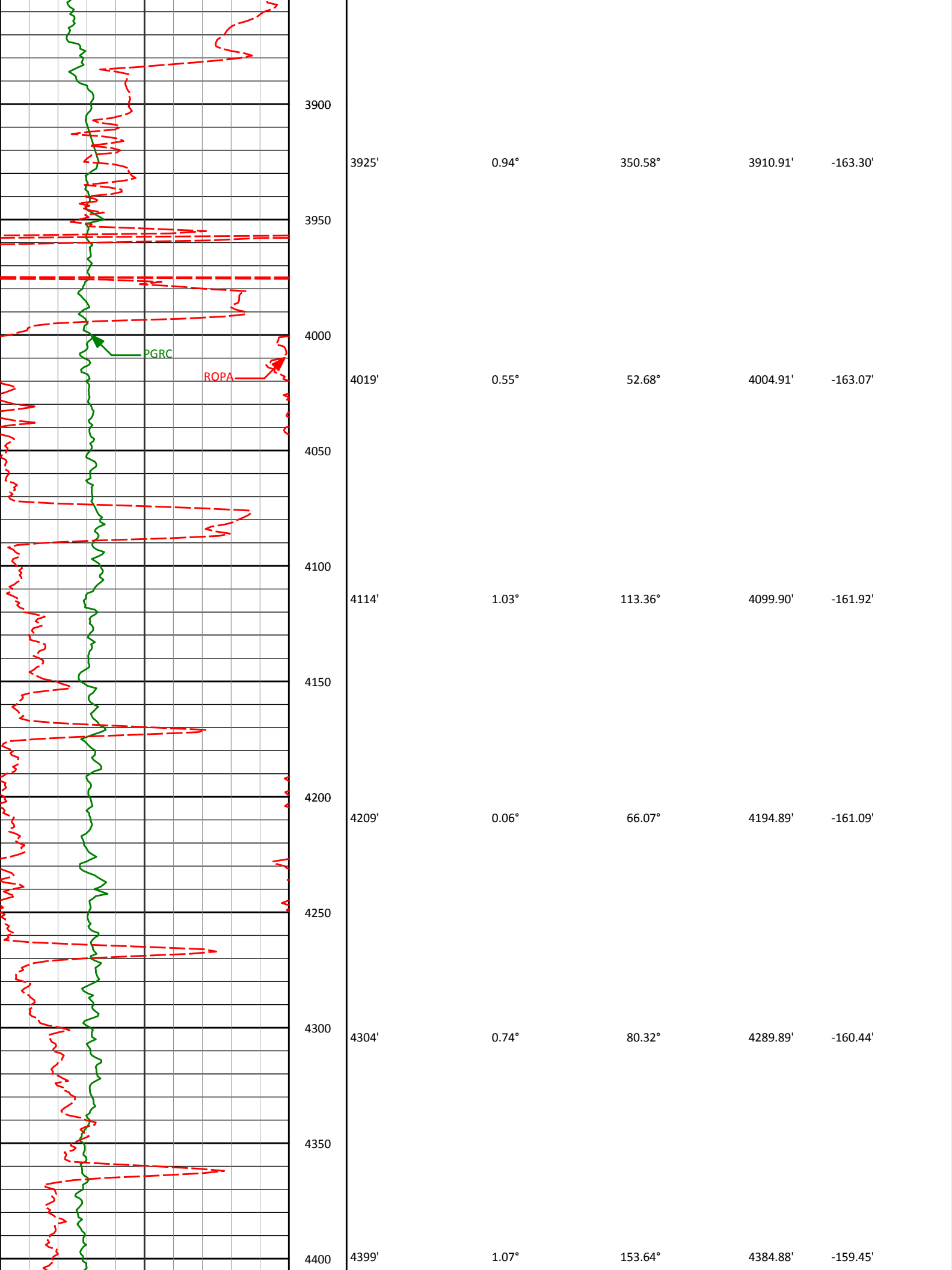


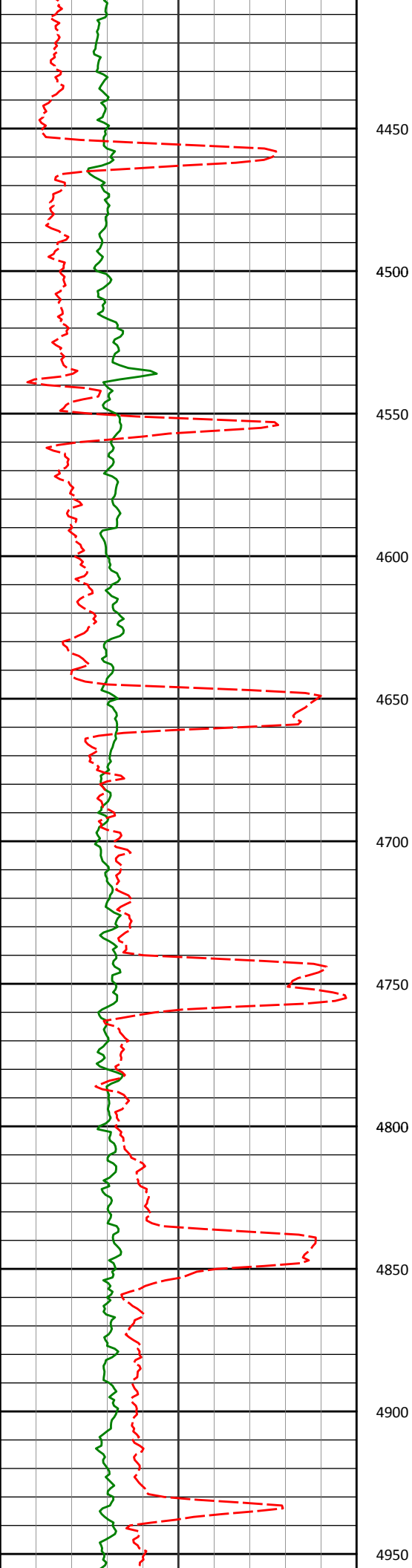




2787'	9.87°	238.85°	2778.96'	-92.28'
2800				
2850				
2882'	9.56°	242.28°	2872.60'	-106.26'
2900				
2950				
2976'	9.71°	242.10°	2965.27'	-120.20'
3000				
3050				
3071'	9.09°	230.84°	3059.00'	-133.14'
3100				
3150				
3166'	5.82°	224.52°	3153.19'	-142.37'
3200				
3250				
3261'	4.93°	234.59°	3247.77'	-149.10'
3300				







4450

4494'

1.38°

152.39°

4479.86'

-158.53'

4500

4550

4589'

1.70°

125.27°

4574.83'

-156.86'

4600

4650

4684'

1.52°

134.23°

4669.79'

-154.81'

4700

4750

4779'

0.77°

99.41°

4764.77'

-153.28'

4800

4850

4873'

0.49°

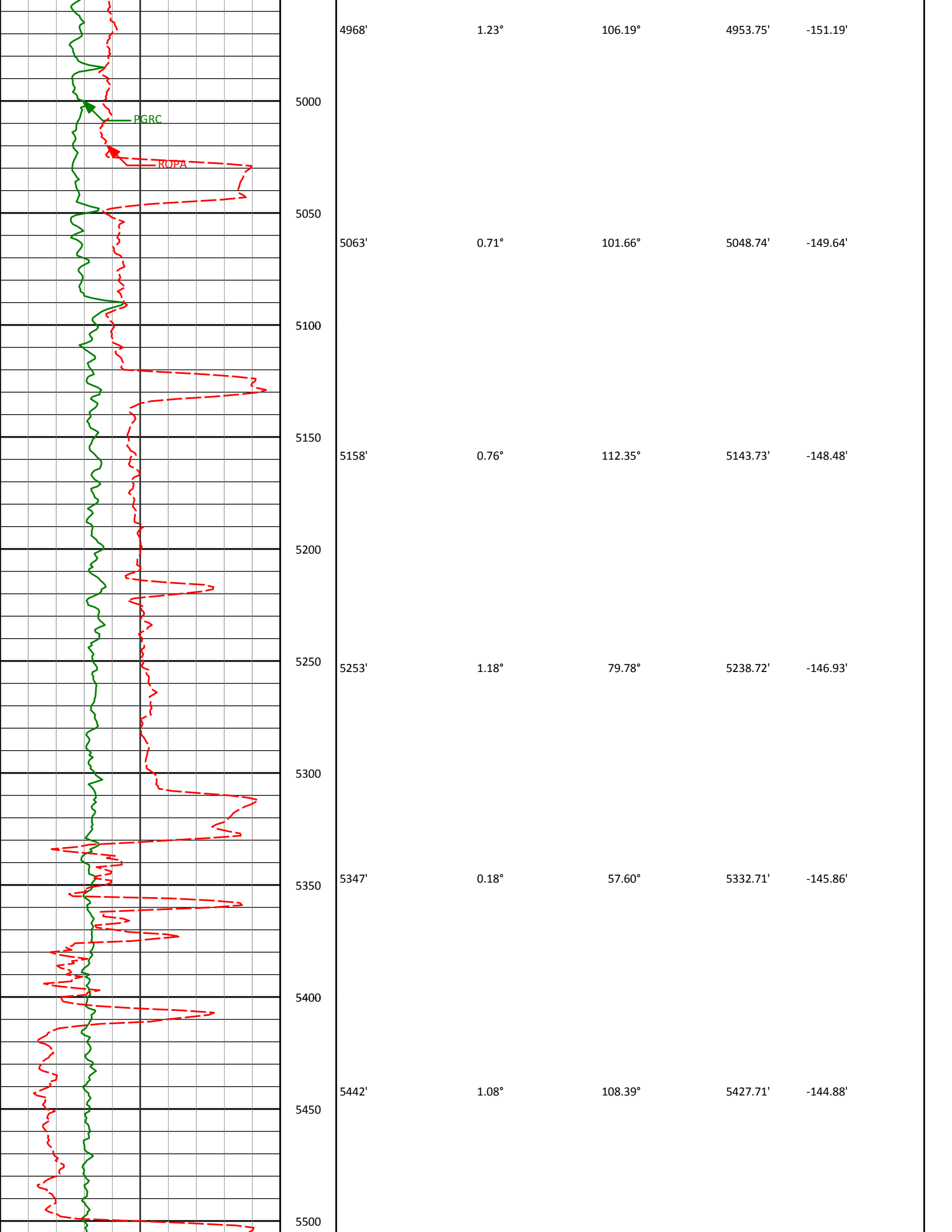
142.39°

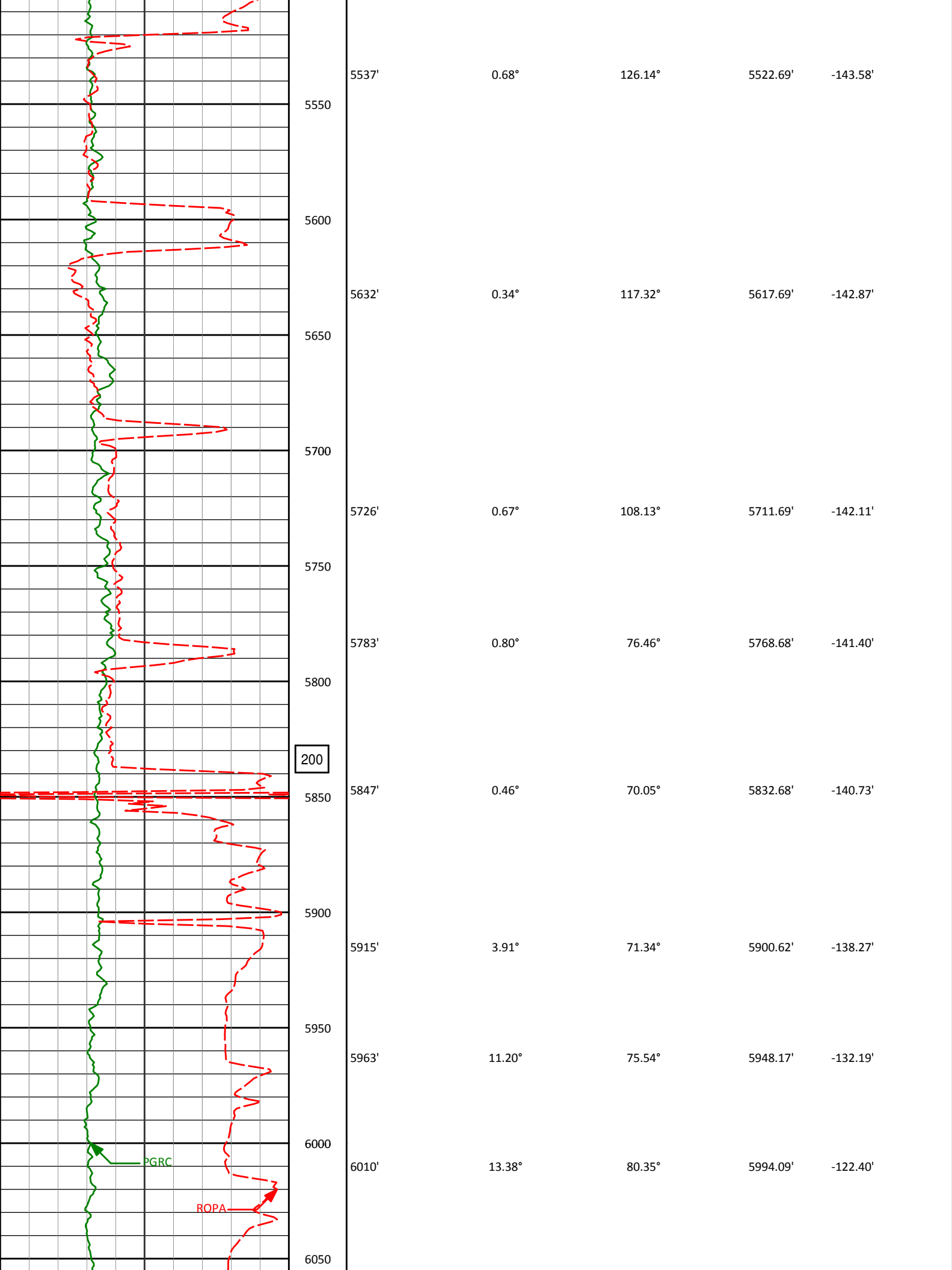
4858.77'

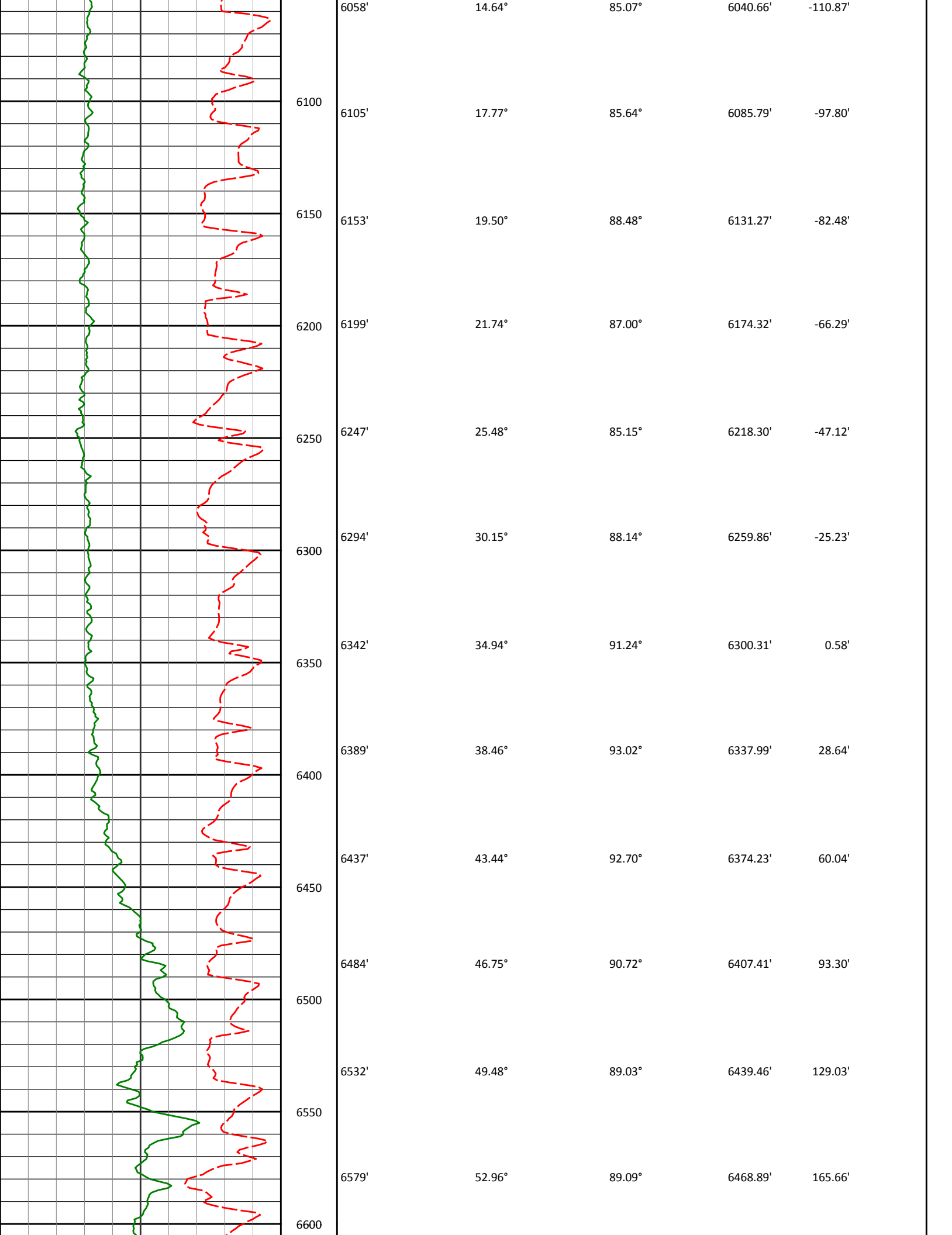
-152.42'

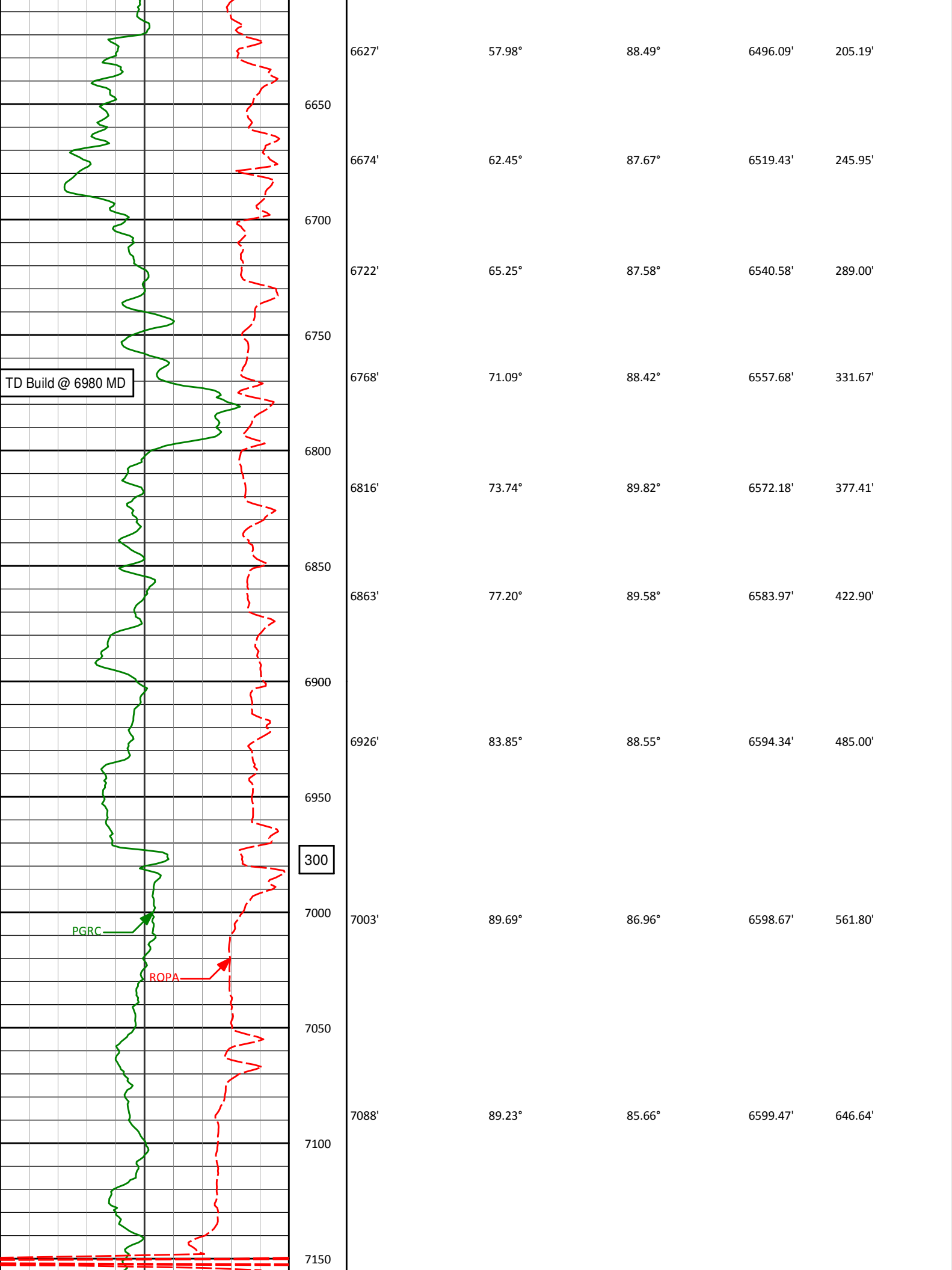
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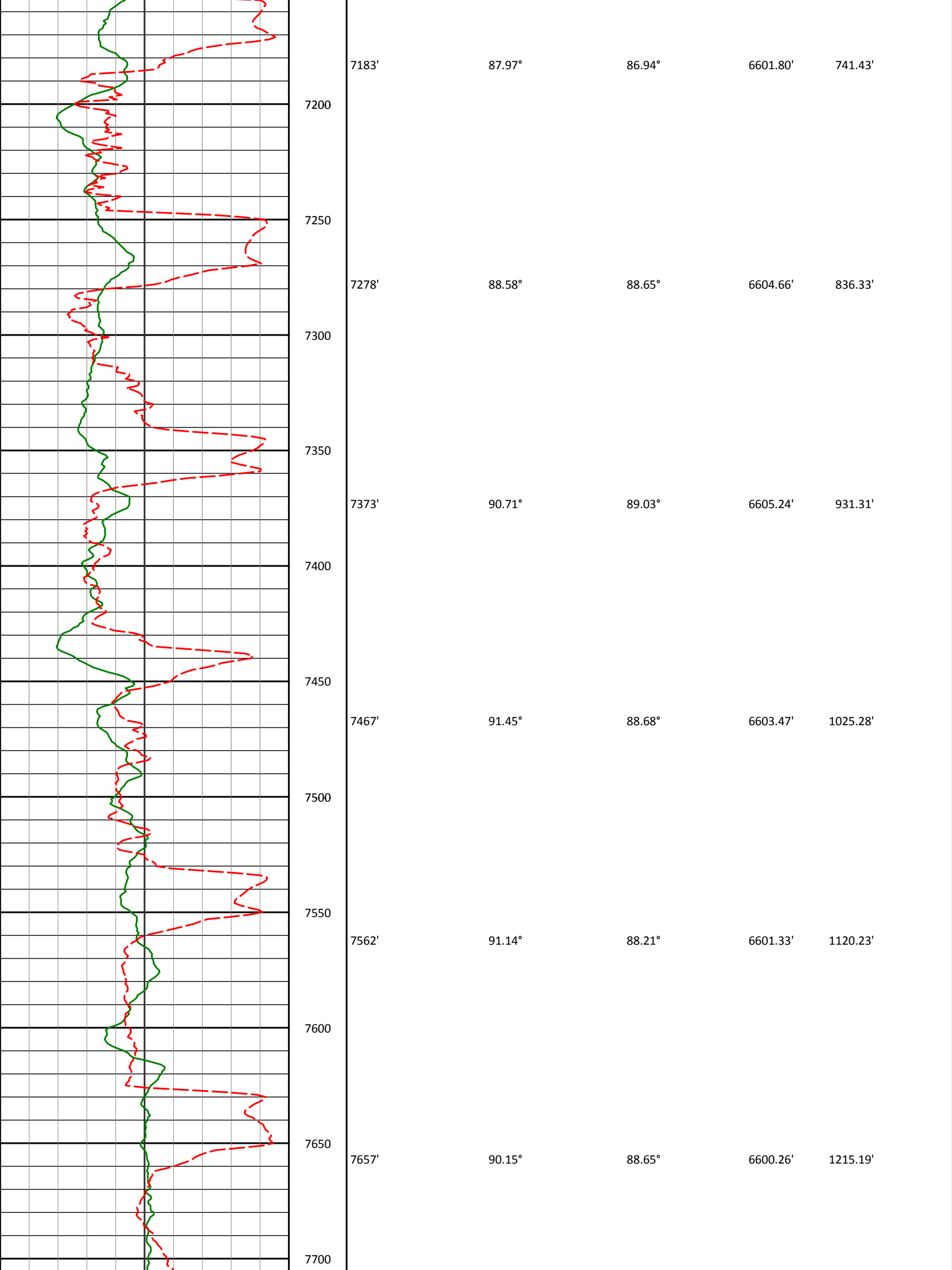
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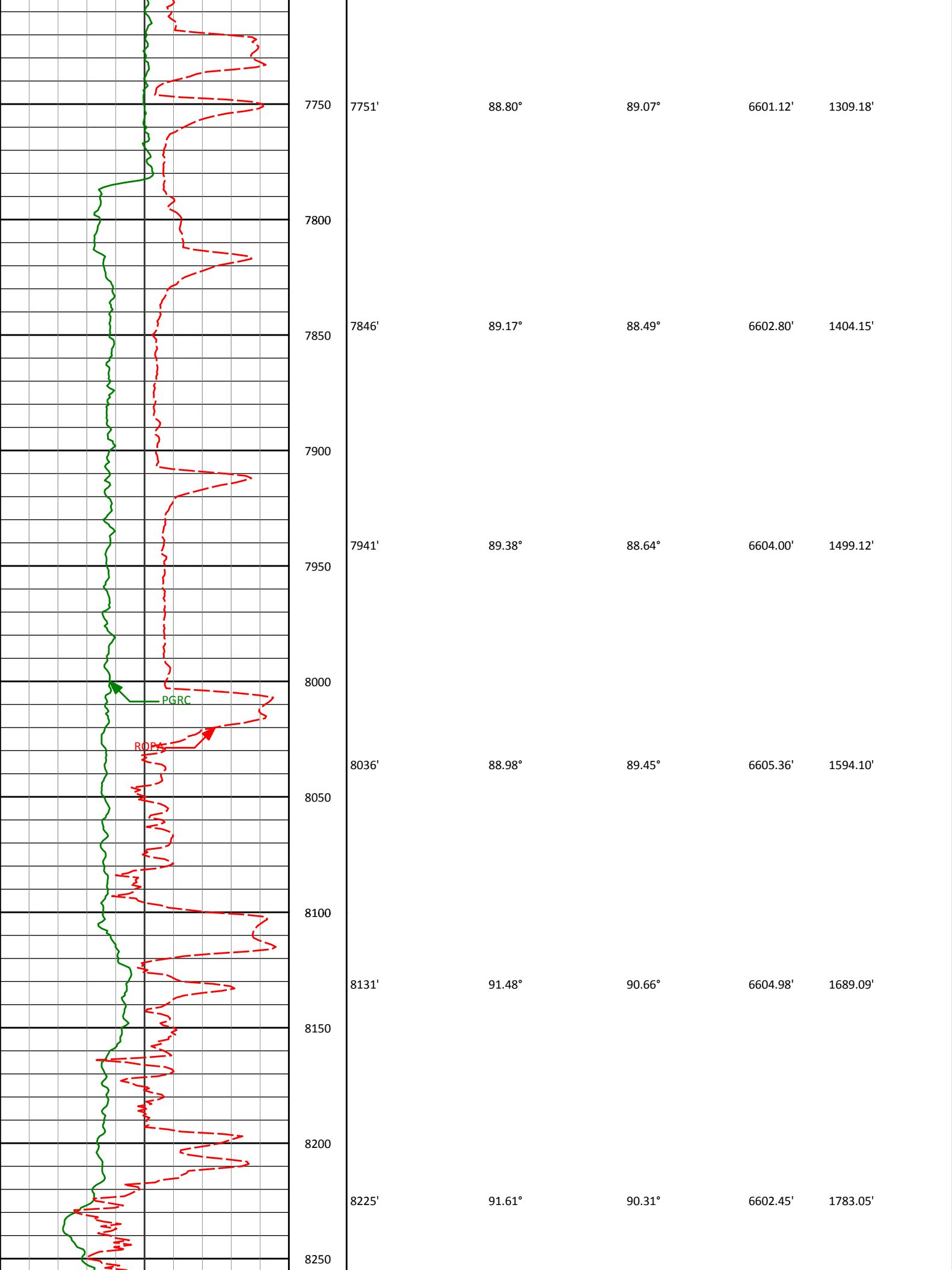


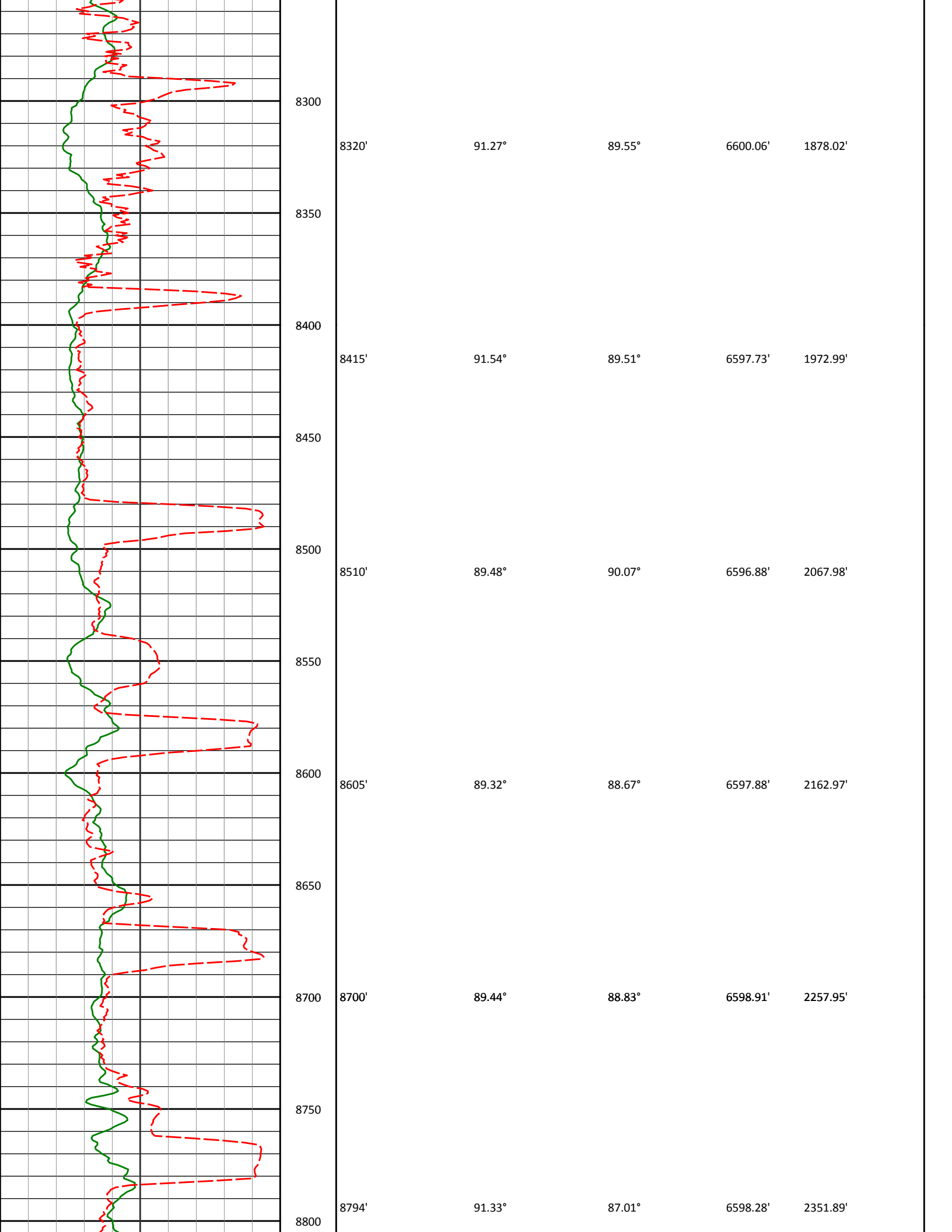


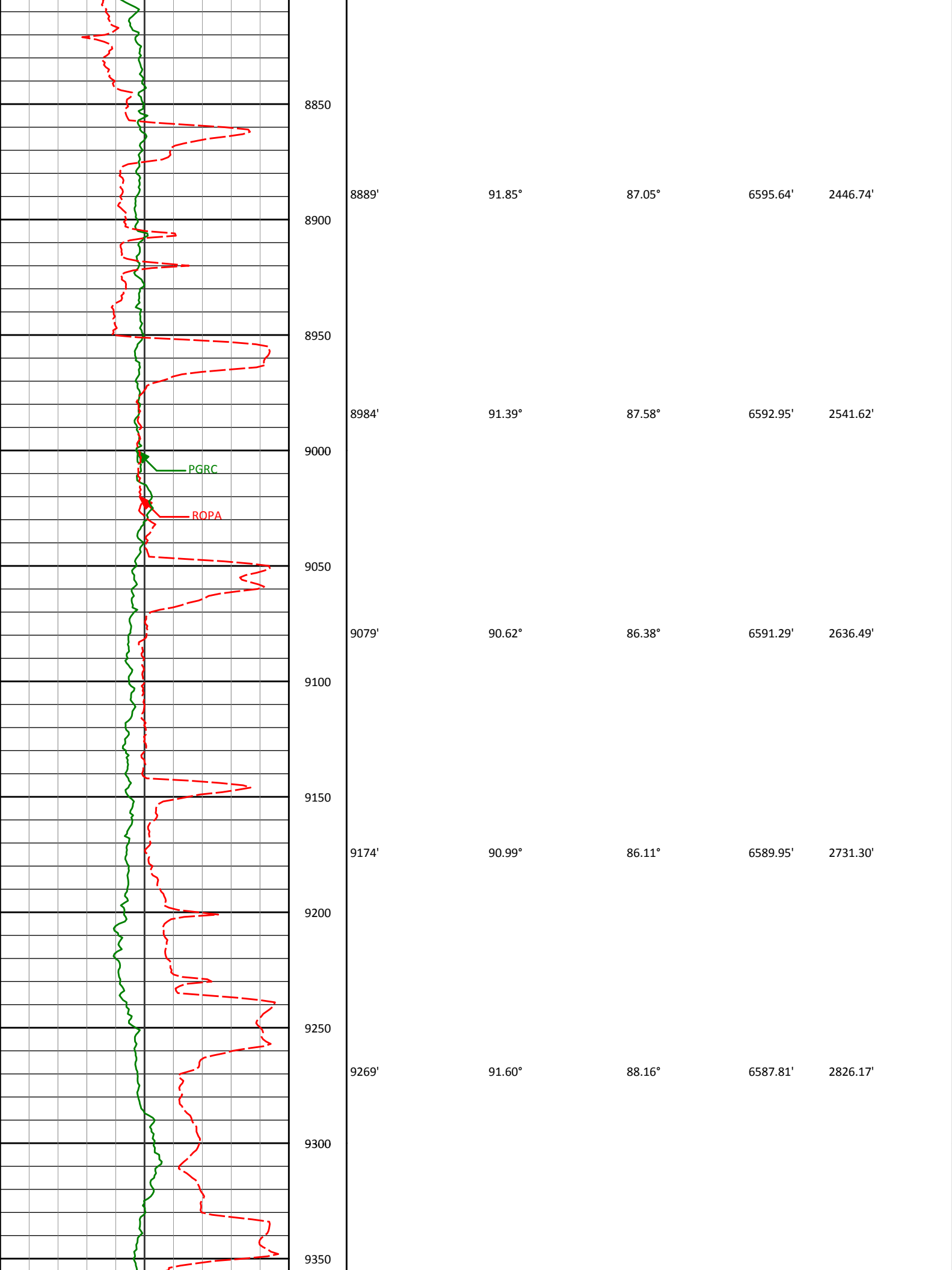


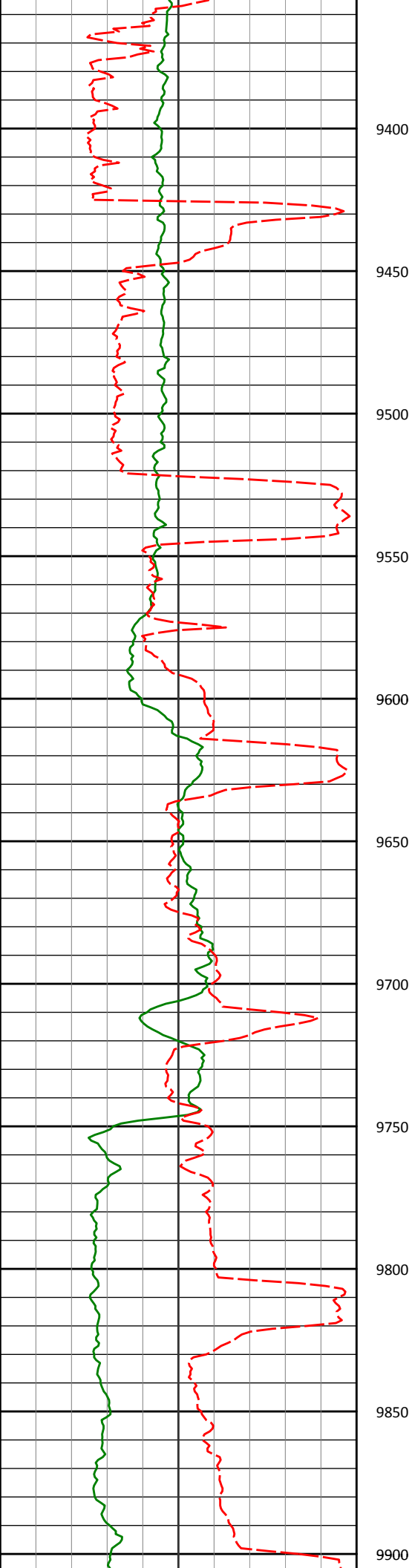




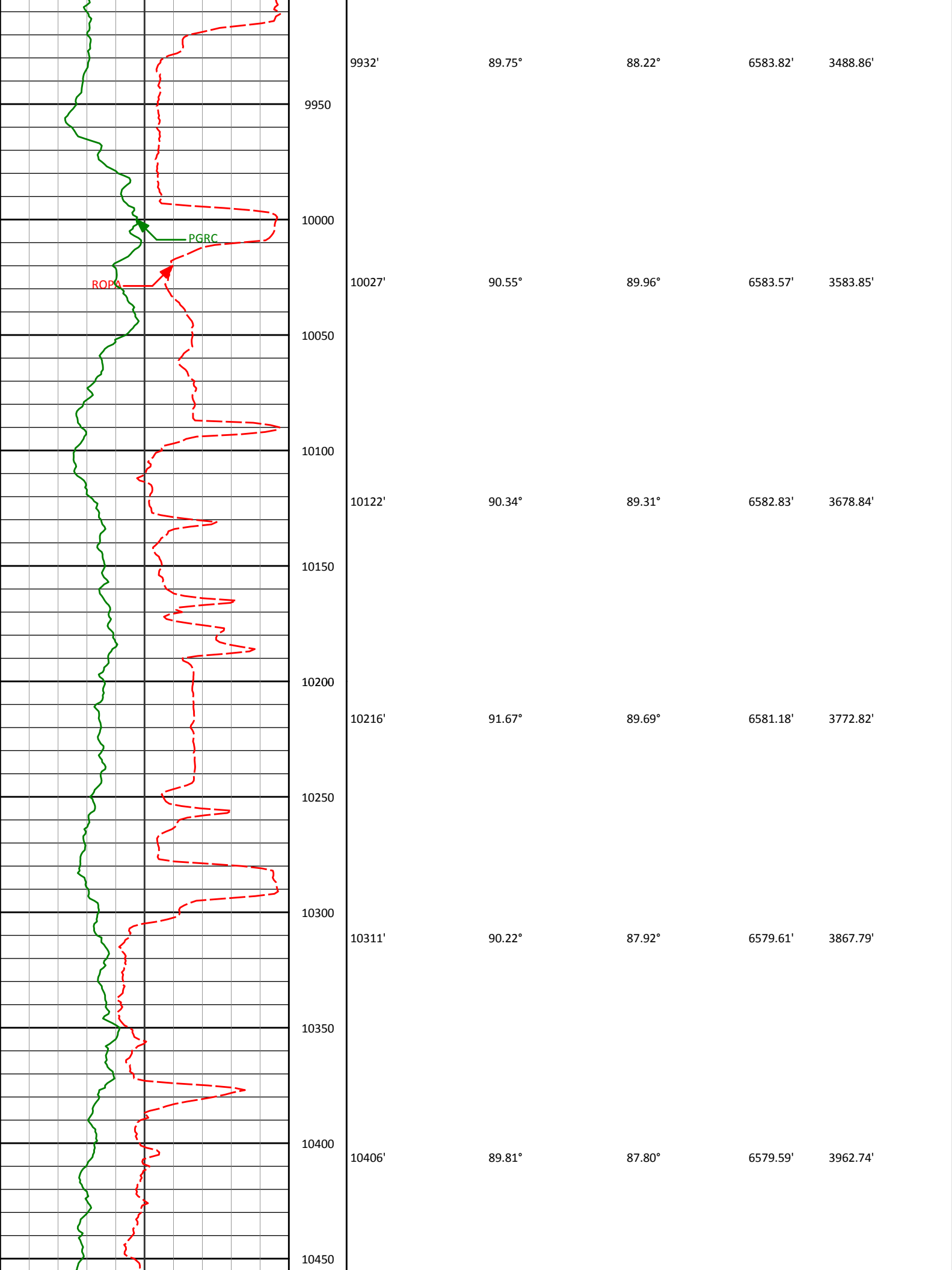


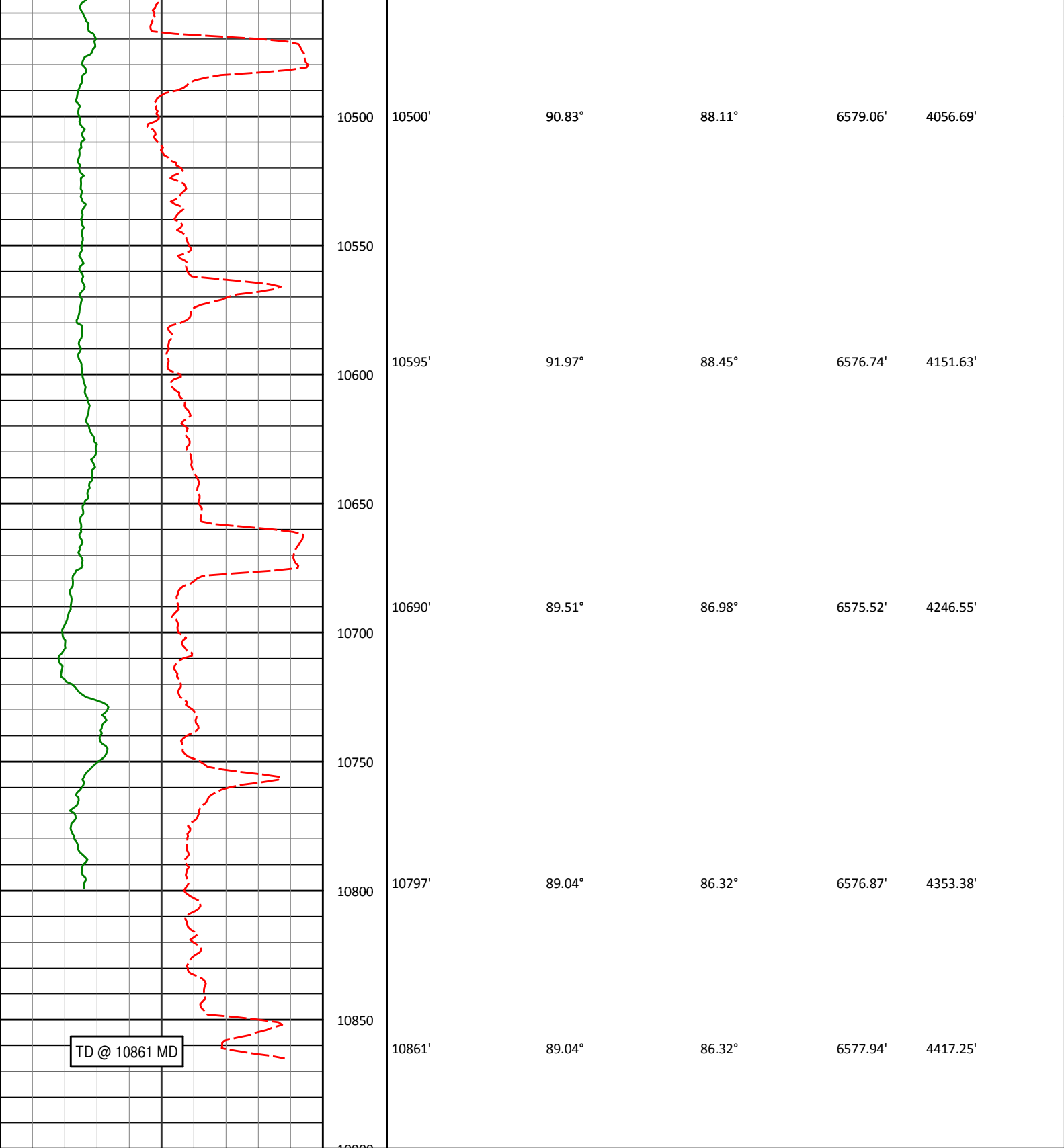






9364'	90.22°	87.89°	6586.30'	2921.11'
9458'	89.85°	86.87°	6586.24'	3015.02'
9553'	89.35°	88.31°	6586.90'	3109.95'
9648'	90.56°	88.88°	6586.98'	3204.93'
9742'	91.02°	88.51°	6585.68'	3298.90'
9837'	90.74°	89.11°	6584.22'	3393.88'





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

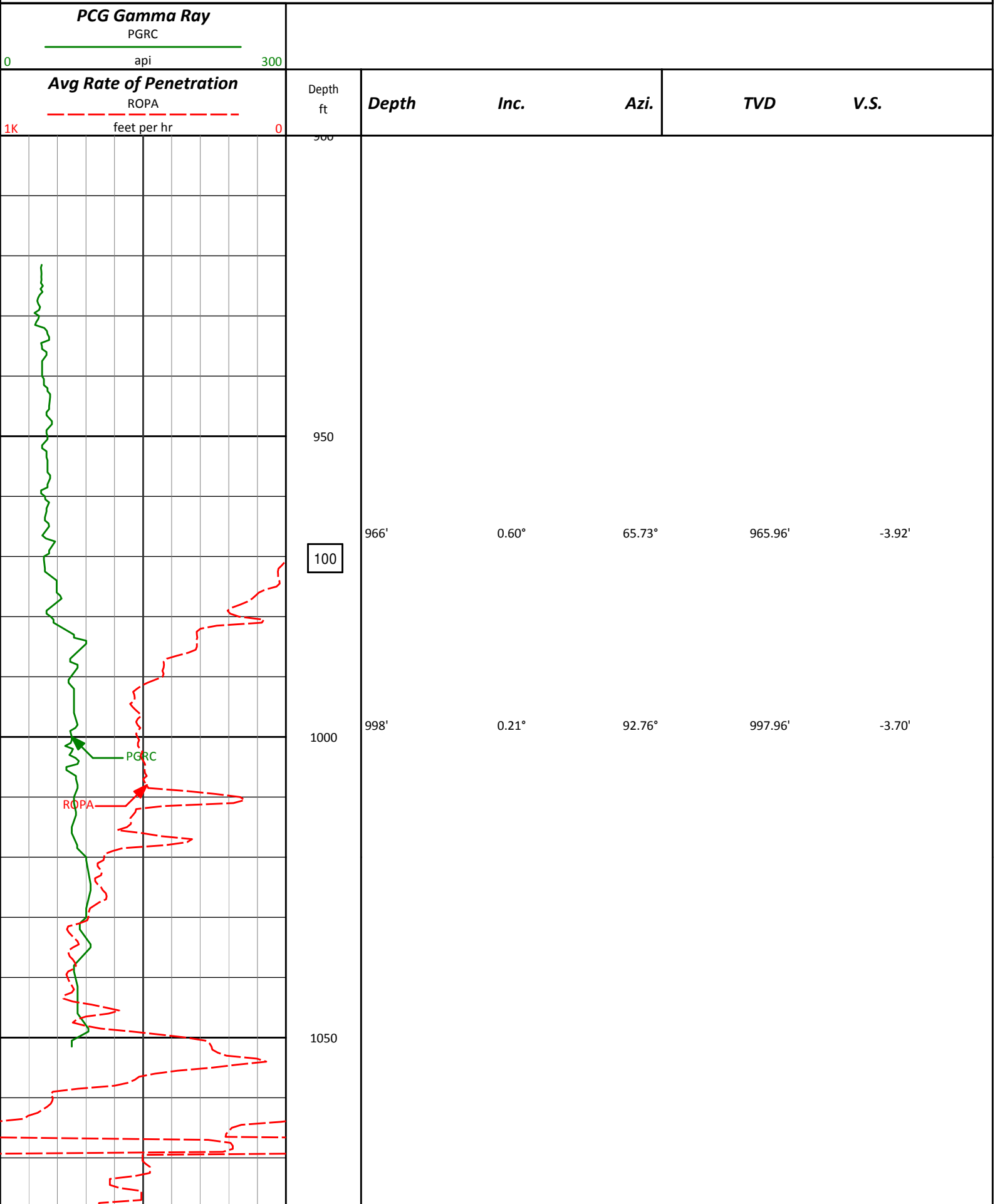
MID Detail Log 1:240

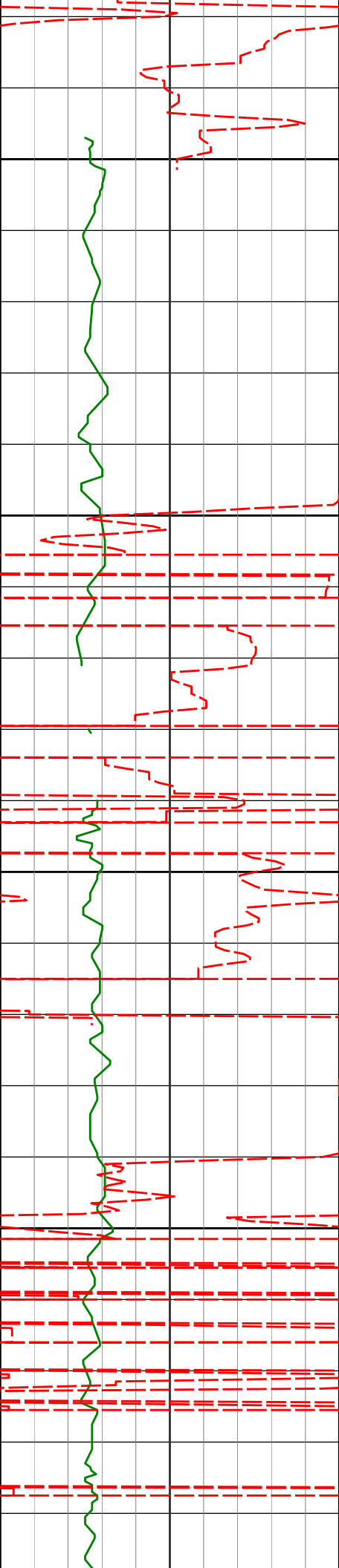
Noble Energy

Wells Ranch AE20-67HN

H&P 321

Sec. 20-T6N-R62W





1100

1150

1200

1250

1090'

0.38°

64.89°

1089.96'

-3.26'

1183'

0.52°

88.82°

1182.95'

-2.56'

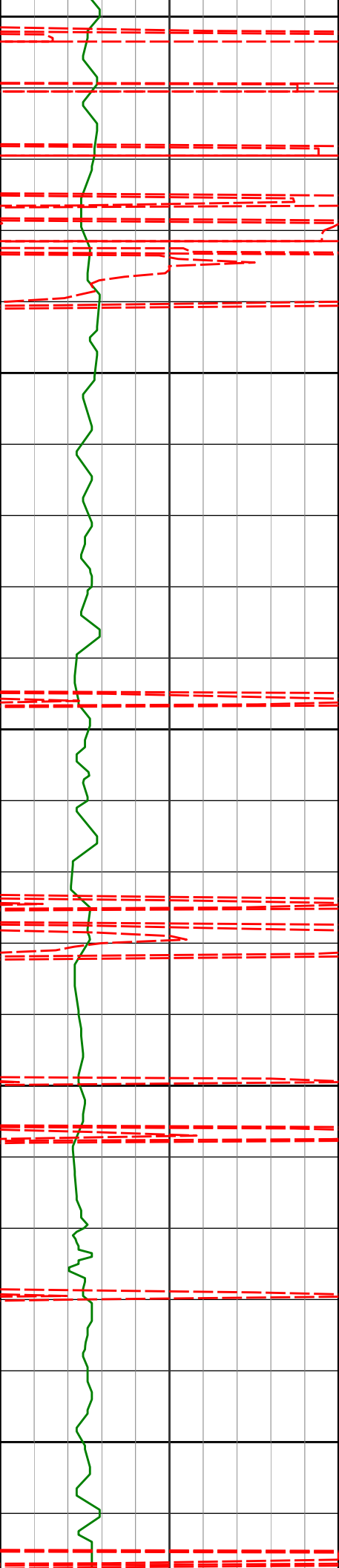
1275'

0.80°

52.78°

1274.95'

-1.63'



1300

1350

1400

1450

1500

1368'

0.72°

57.40°

1367.94'

-0.62'

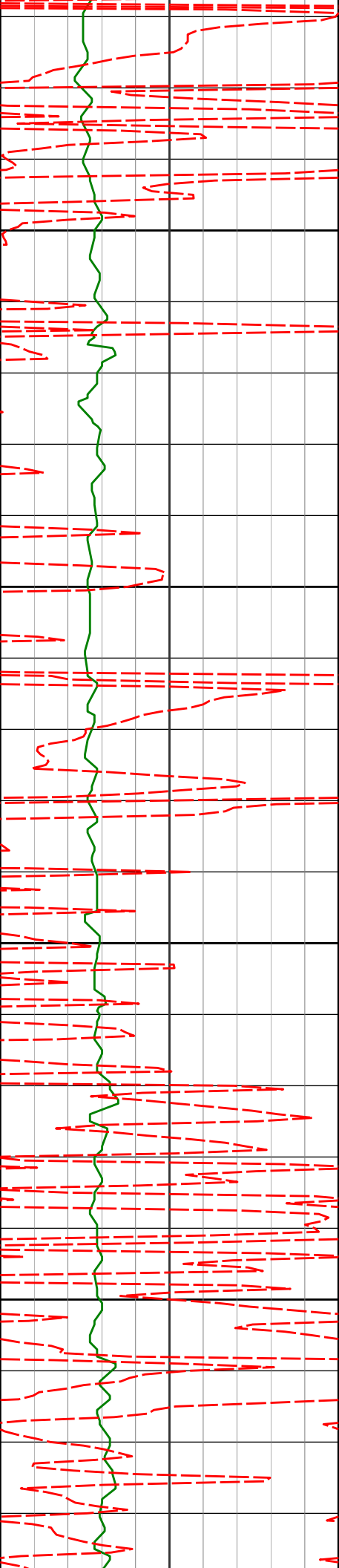
1460'

1.18°

32.66°

1459.93'

0.39'



1550

1600

1650

1700

1555'

1.37°

325.86°

1554.91'

0.29'

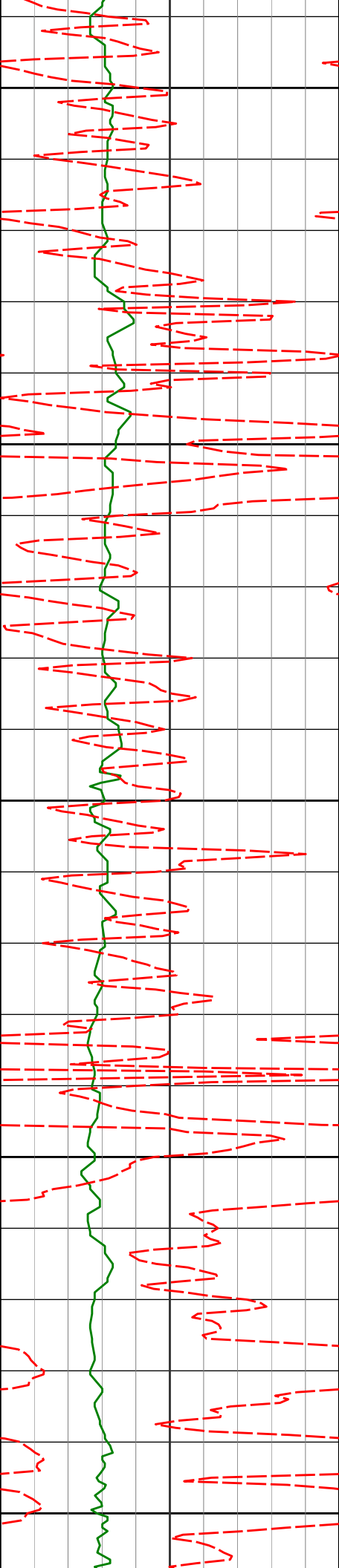
1649'

0.75°

279.95°

1648.89'

-0.95'



1744'

0.98°

237.69°

1743.88'

-2.25'

1750

1800

1839'

1.10°

236.16°

1838.87'

-3.70'

1850

1900

1933'

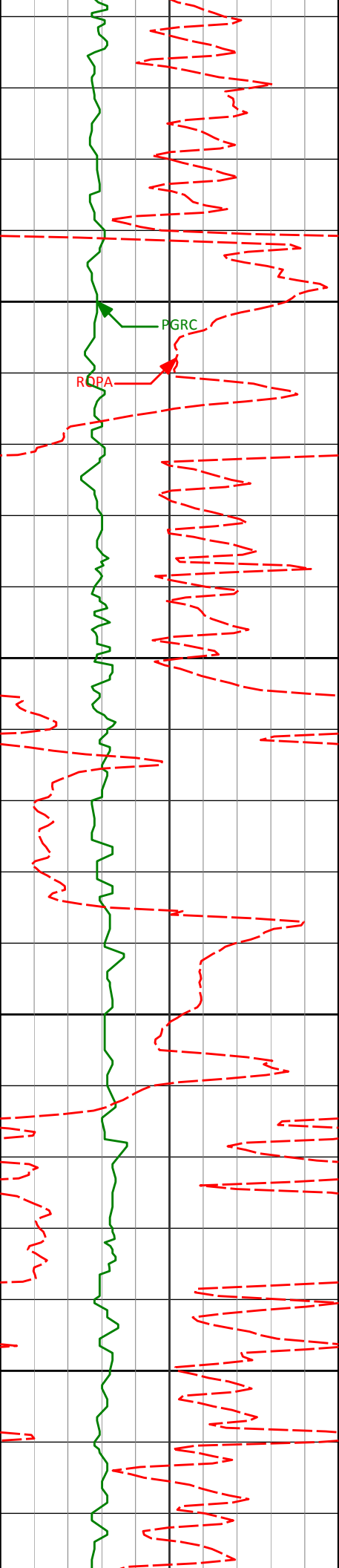
1.26°

230.41°

1932.85'

-5.25'

1950



2000

2050

2100

2150

2028'

2.99°

223.32°

2027.78'

-7.76'

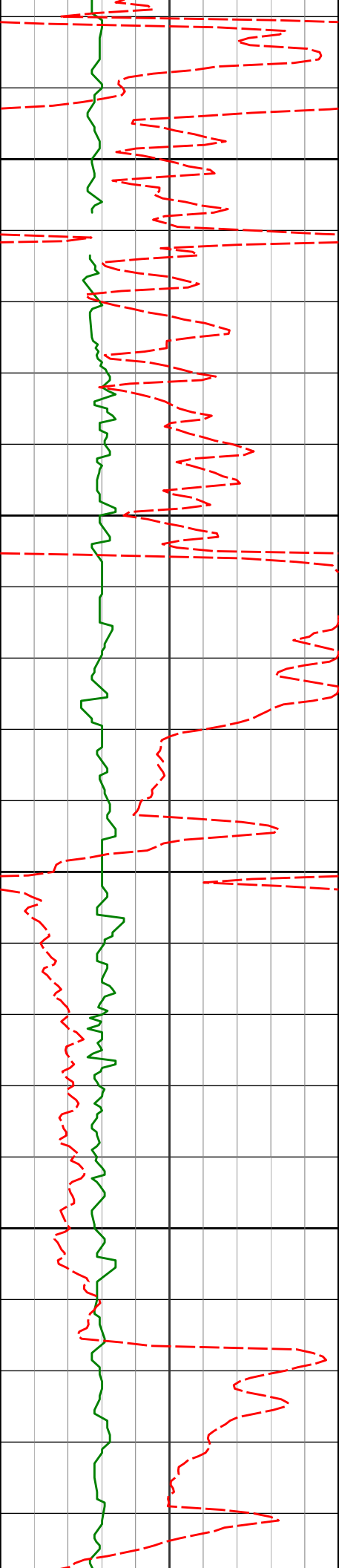
2123'

4.16°

218.23°

2122.59'

-11.61'



2200

2218'

5.50°

232.25°

2217.26'

-17.37'

2250

2300

2313'

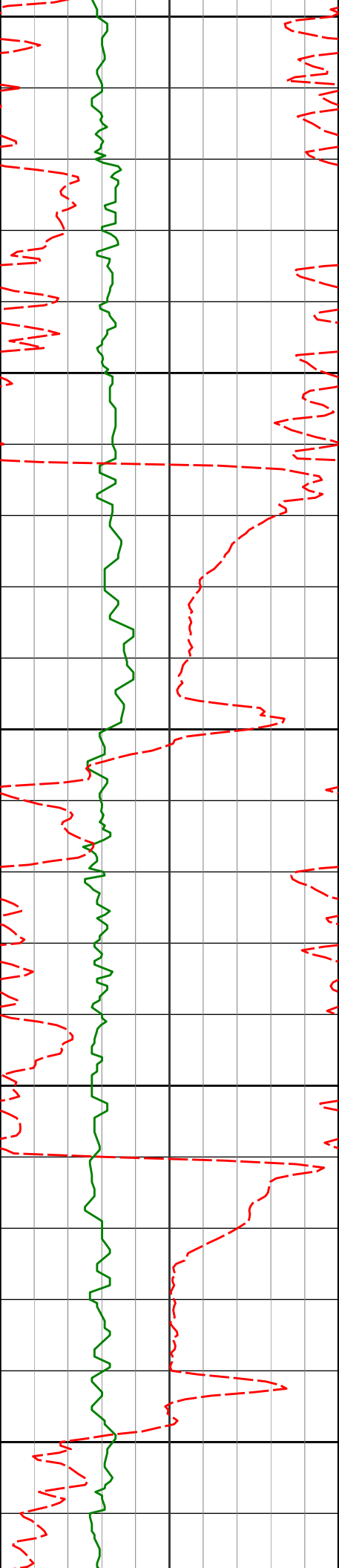
6.45°

235.77°

2311.74'

-25.40'

2350



2408'

7.07°

239.73°

2406.08'

-34.89'

2450

2500

2503'

9.24°

240.02°

2500.11'

-46.57'

2550

2600

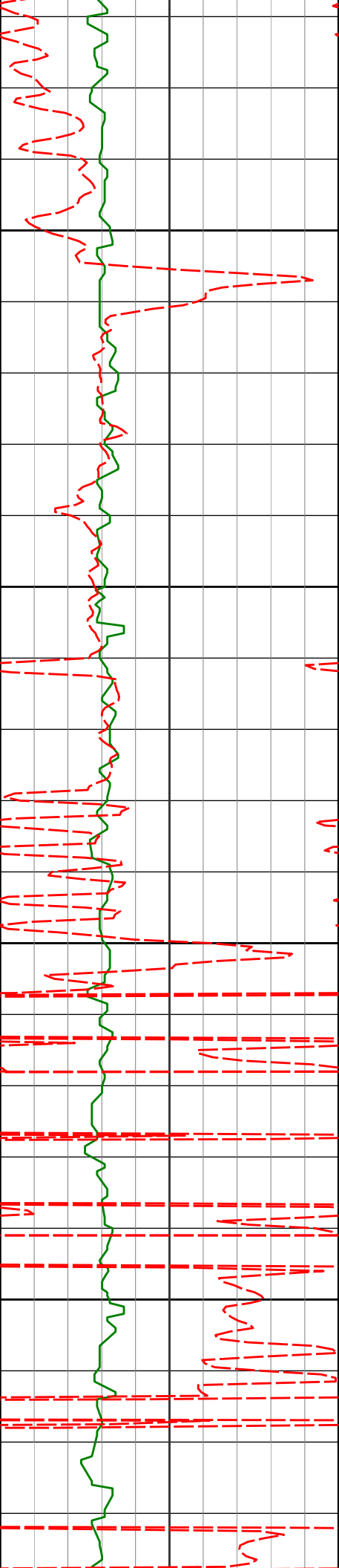
2597'

12.28°

238.19°

2592.45'

-61.64'



2650

2692'

10.88°

236.79°

2685.51'

-77.77'

2700

2750

2787'

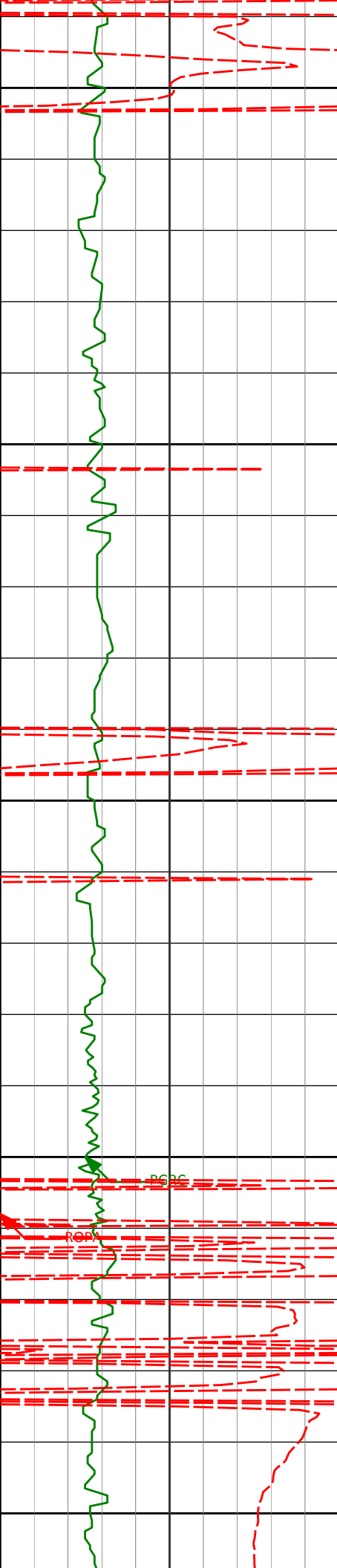
9.87°

238.85°

2778.96'

-92.28'

2800



2850

2882'

9.56°

242.28°

2872.60'

-106.26'

2900

2950

2976'

9.71°

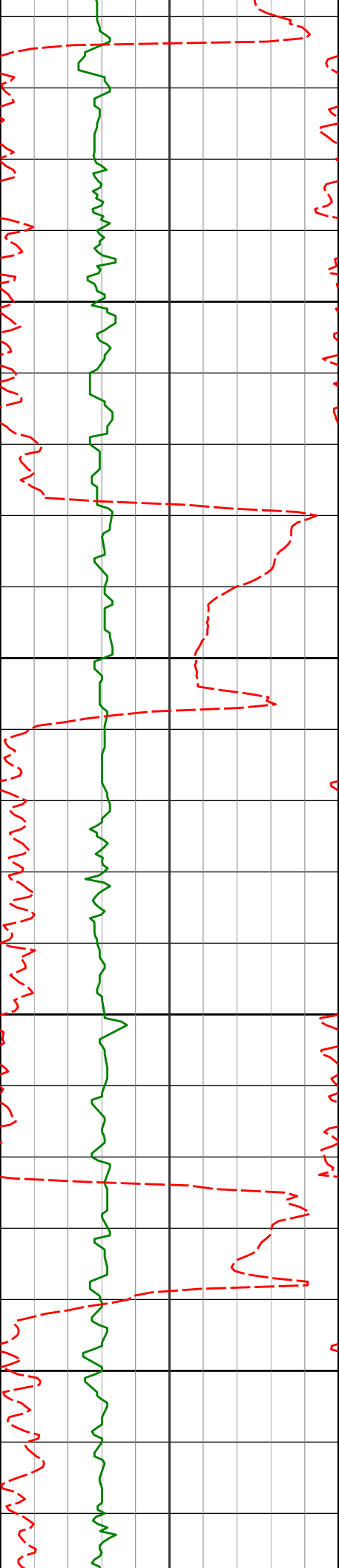
242.10°

2965.27'

-120.20'

3000

3050



3071'

9.09°

230.84°

3059.00'

-133.14'

3100

3150

3166'

5.82°

224.52°

3153.19'

-142.37'

3200

3250

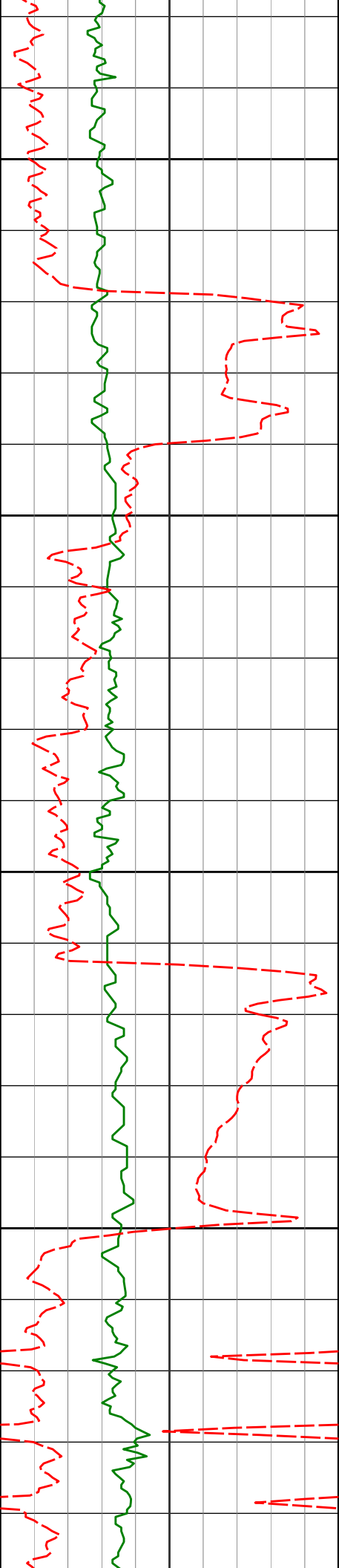
3261'

4.93°

234.59°

3247.77'

-149.10'



3300

3350

3400

3450

3356'

5.89°

234.80°

3342.35'

-156.43'

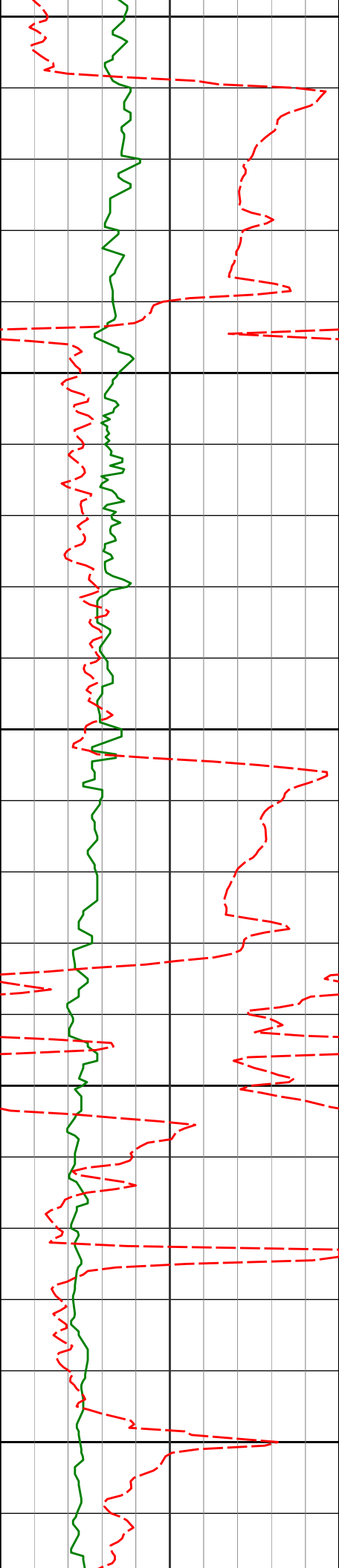
3450'

2.92°

213.39°

3436.07'

-161.71'



3500

3545'

1.75°

149.99°

3531.00'

-162.33'

3550

3600

3640'

0.16°

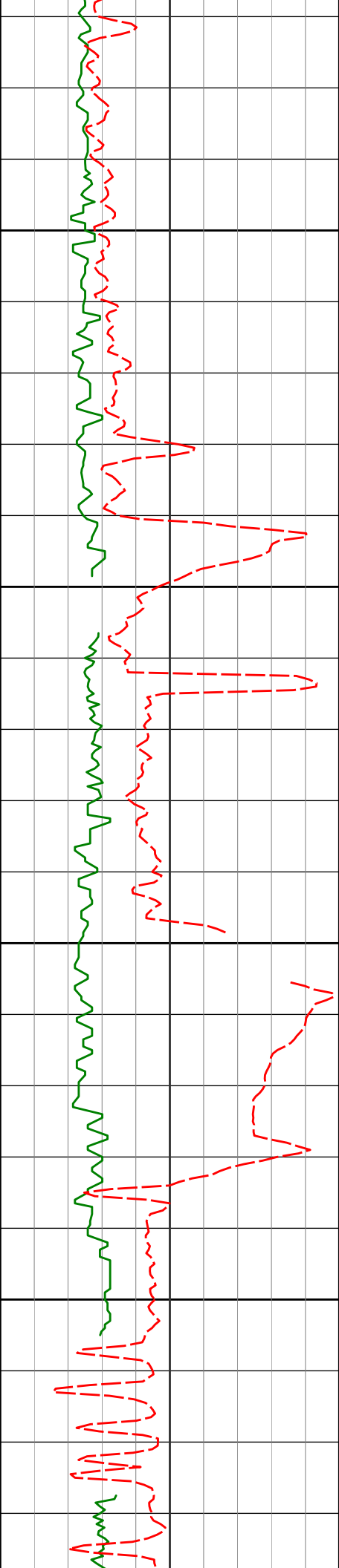
253.93°

3625.98'

-161.73'

3650

3700



3735'

1.01°

347.18°

3720.98'

-162.05'

3750

3800

3830'

1.97°

342.81°

3815.95'

-162.70'

3850

3900

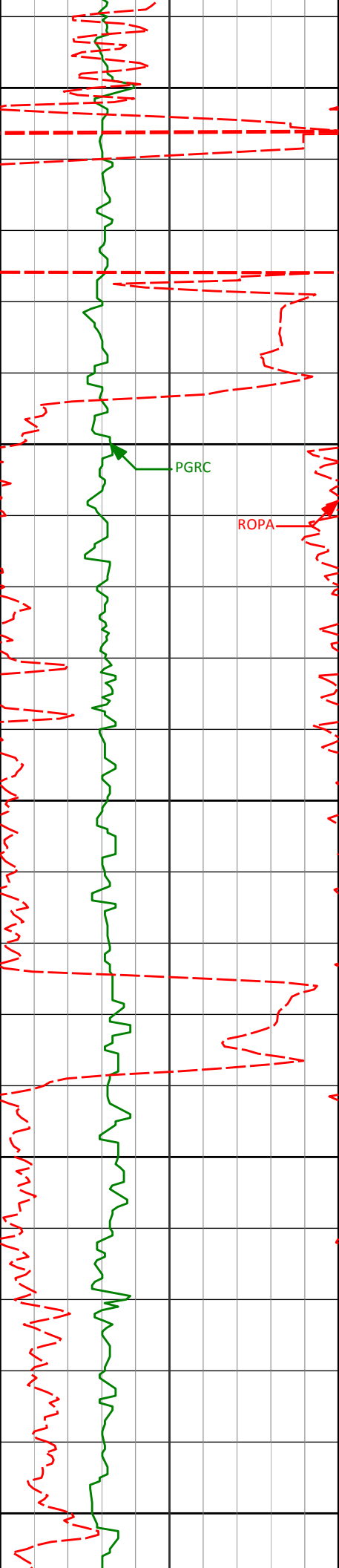
3925'

0.94°

350.58°

3910.91'

-163.30'



3950

4000

4050

4100

4150

PGRC

ROPA

4019'

0.55°

52.68°

4004.91'

-163.07'

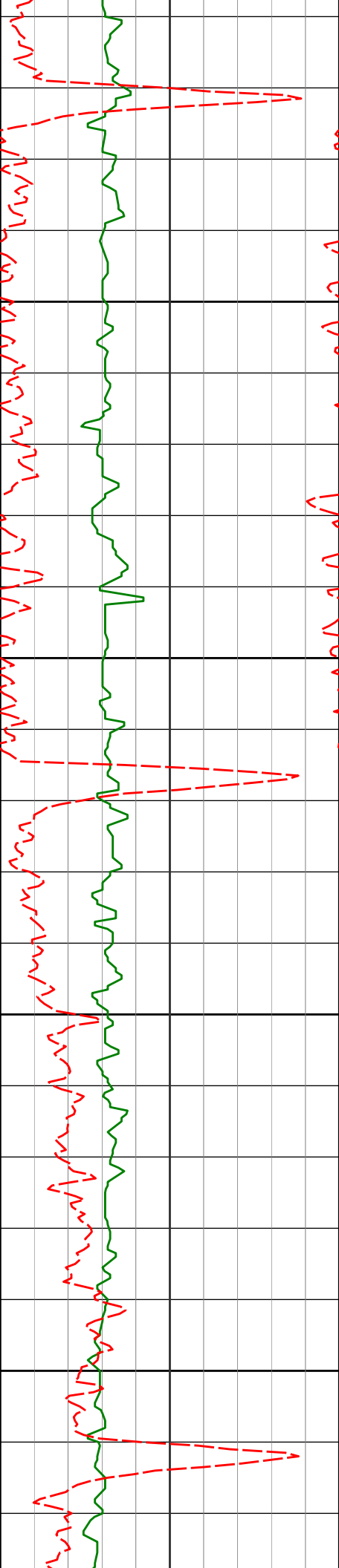
4114'

1.03°

113.36°

4099.90'

-161.92'



4209'

0.06°

66.07°

4194.89'

-161.09'

4200

4250

4300

4304'

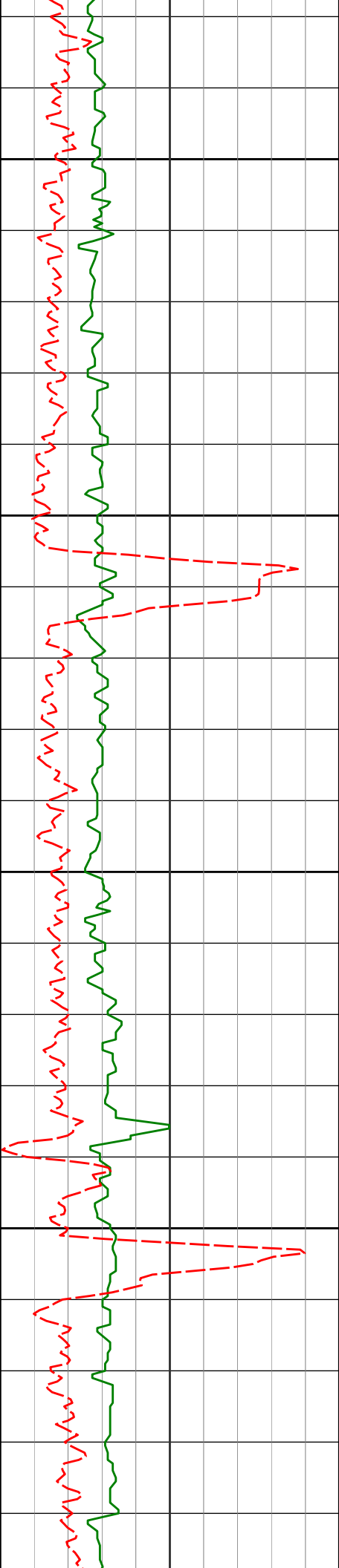
0.74°

80.32°

4289.89'

-160.44'

4350



4400

4399'

1.07°

153.64°

4384.88'

-159.45'

4450

4494'

1.38°

152.39°

4479.86'

-158.53'

4500

4550

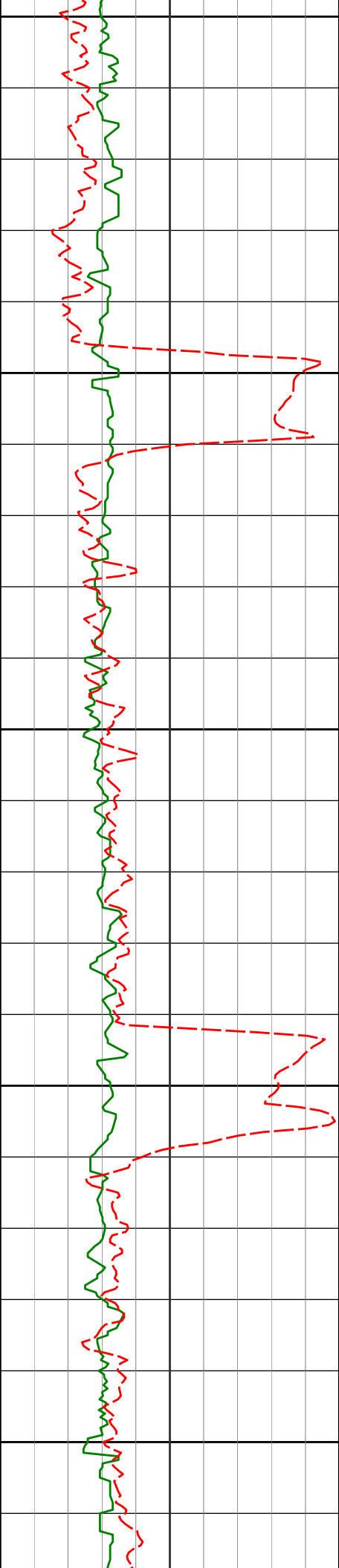
4589'

1.70°

125.27°

4574.83'

-156.86'



4600

4650

4700

4750

4800

4684'

1.52°

134.23°

4669.79'

-154.81'

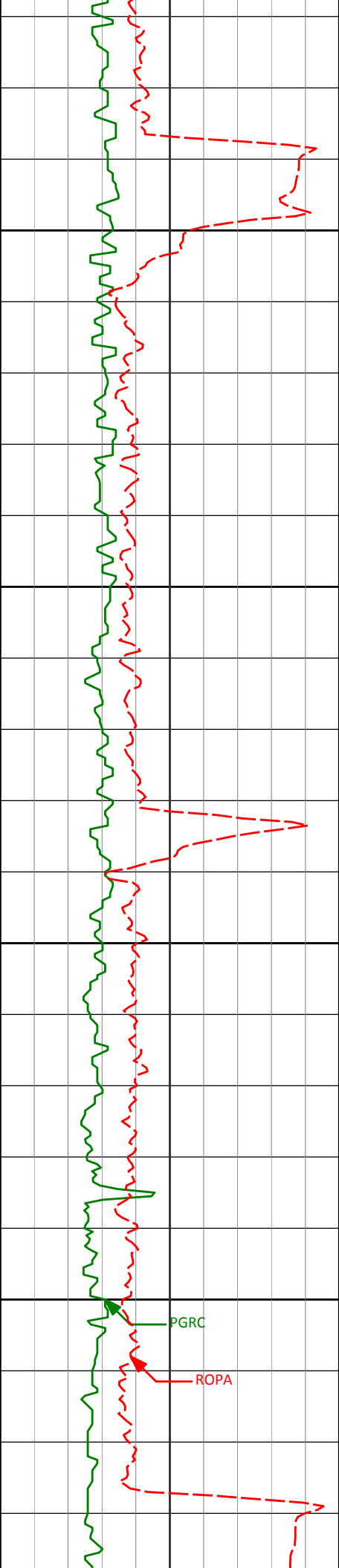
4779'

0.77°

99.41°

4764.77'

-153.28'



4850

4873'

0.49°

142.39°

4858.77'

-152.42'

4900

4950

4968'

1.23°

106.19°

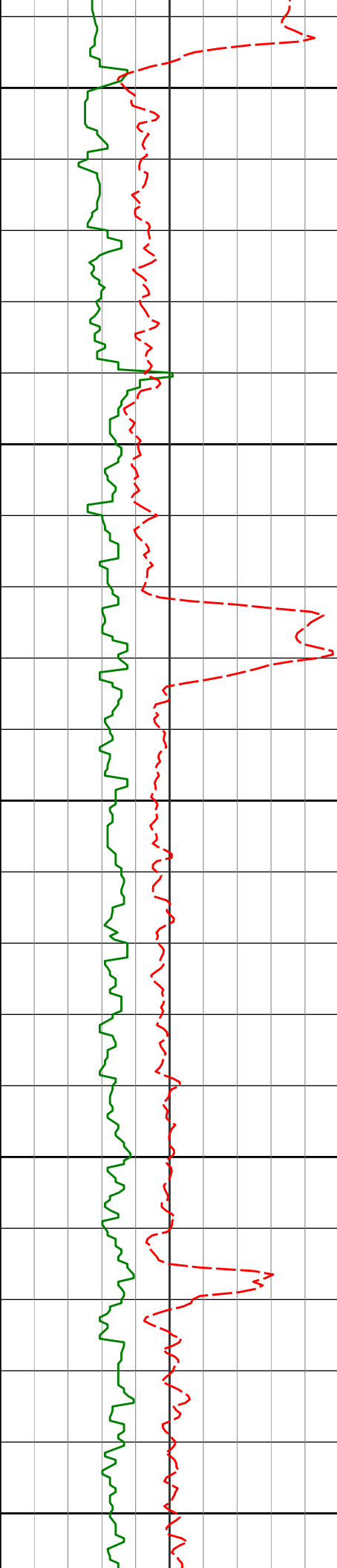
4953.75'

-151.19'

5000

PGRC

ROPA



5050

5063'

0.71°

101.66°

5048.74'

-149.64'

5100

5150

5158'

0.76°

112.35°

5143.73'

-148.48'

5200

5250

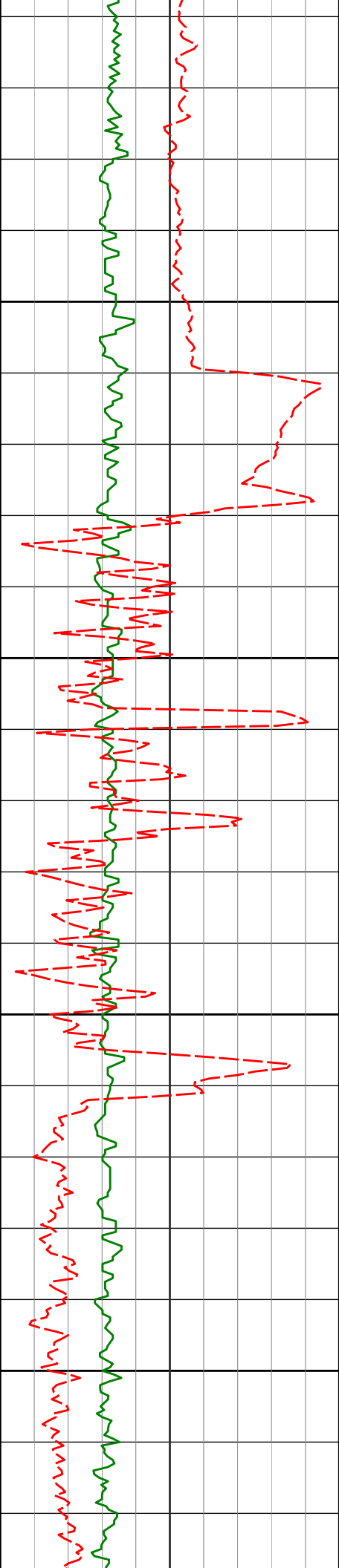
5253'

1.18°

79.78°

5238.72'

-146.93'



5300

5350

5400

5450

5347'

0.18°

57.60°

5332.71'

-145.86'

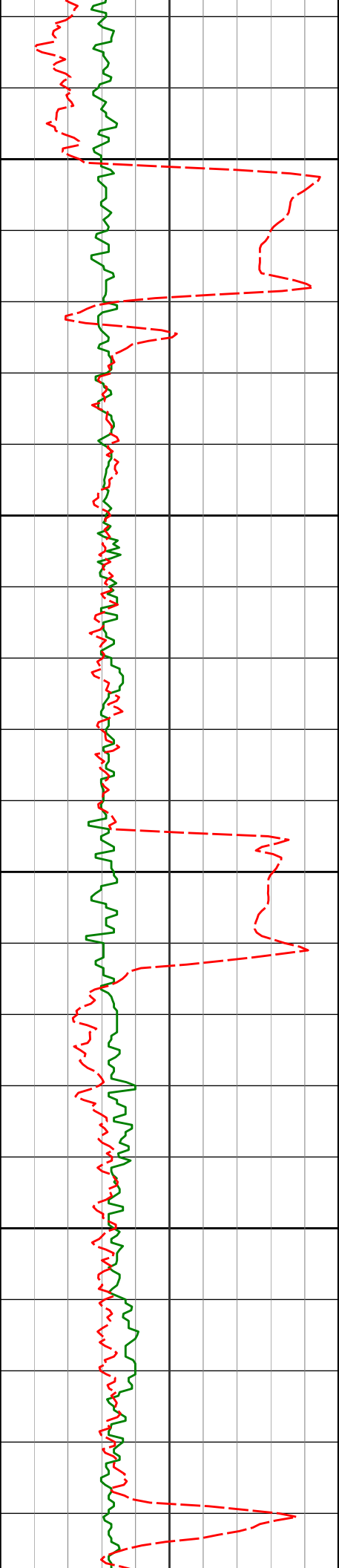
5442'

1.08°

108.39°

5427.71'

-144.88'



5500

5550

5600

5650

5537'

0.68°

126.14°

5522.69'

-143.58'

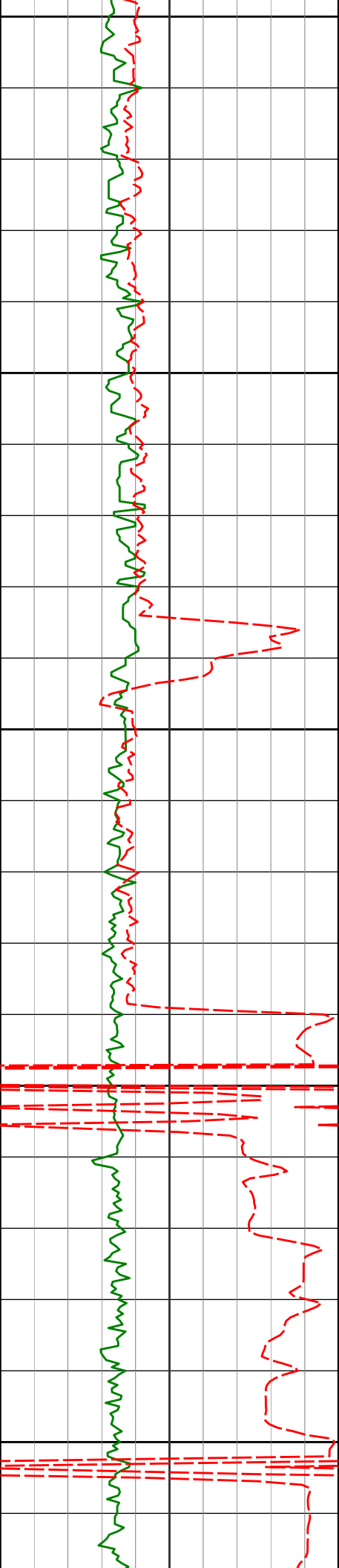
5632'

0.34°

117.32°

5617.69'

-142.87'



5700

5726'

0.67°

108.13°

5711.69'

-142.11'

5750

5783'

0.80°

76.46°

5768.68'

-141.40'

5800

200

5847'

0.46°

70.05°

5832.68'

-140.73'

5850

5900

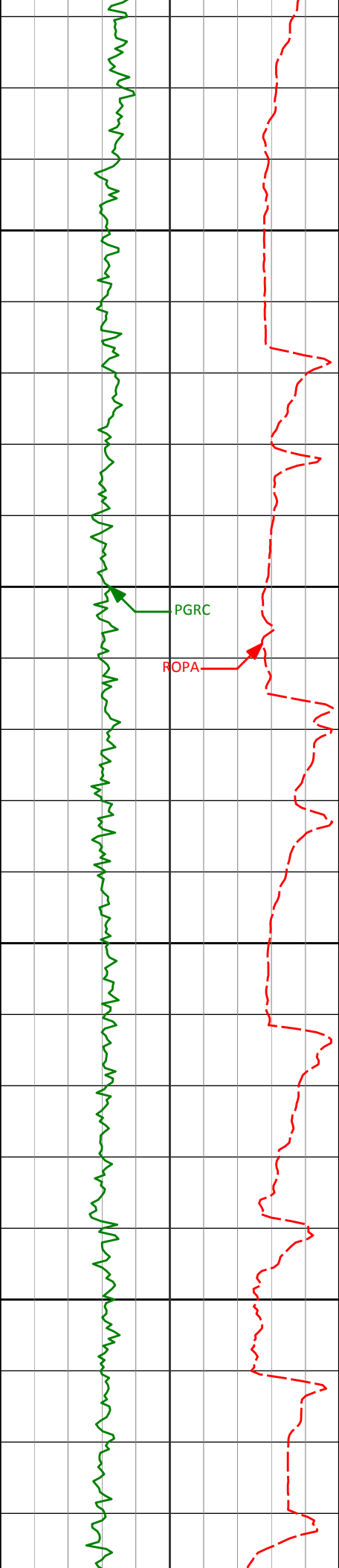
5915'

3.91°

71.34°

5900.62'

-138.27'



5950

5963'

11.20°

75.54°

5948.17'

-132.19'

6000

6010'

13.38°

80.35°

5994.09'

-122.40'

6050

6058'

14.64°

85.07°

6040.66'

-110.87'

6100

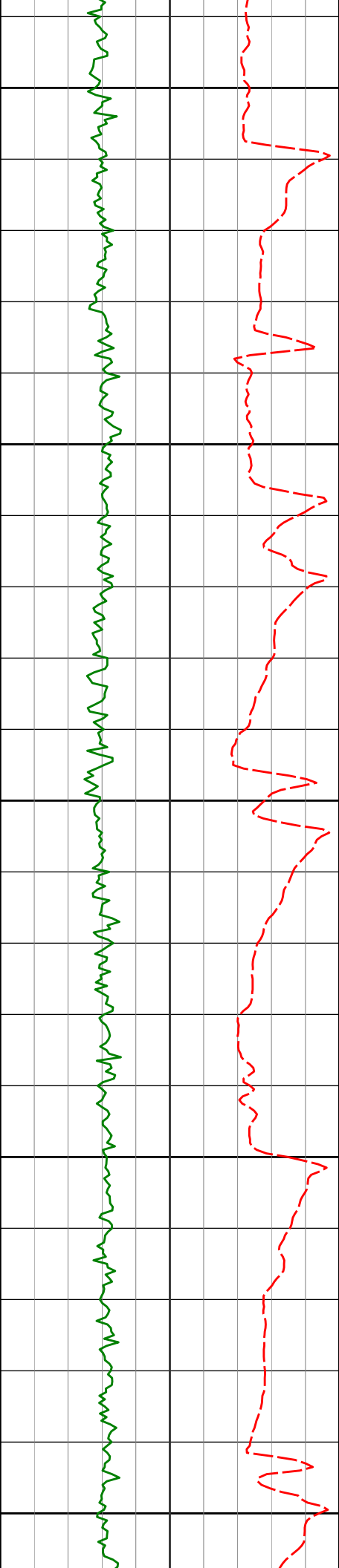
6105'

17.77°

85.64°

6085.79'

-97.80'



6150

6153'

19.50°

88.48°

6131.27'

-82.48'

6200

6199'

21.74°

87.00°

6174.32'

-66.29'

6250

6247'

25.48°

85.15°

6218.30'

-47.12'

6300

6294'

30.15°

88.14°

6259.86'

-25.23'

6350

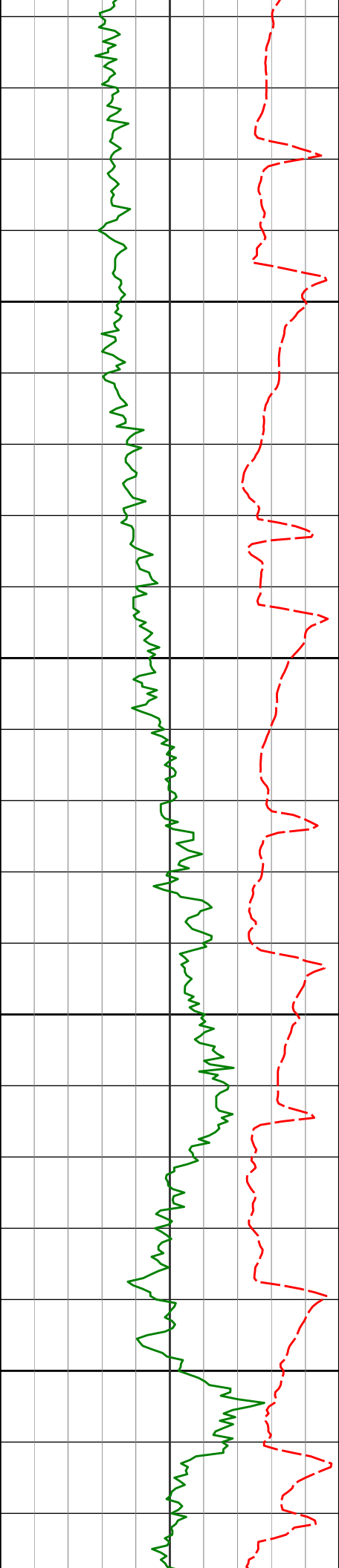
6342'

34.94°

91.24°

6300.31'

0.58'



6389'

38.46°

93.02°

6337.99'

28.64'

6400

6437'

43.44°

92.70°

6374.23'

60.04'

6450

6484'

46.75°

90.72°

6407.41'

93.30'

6500

6532'

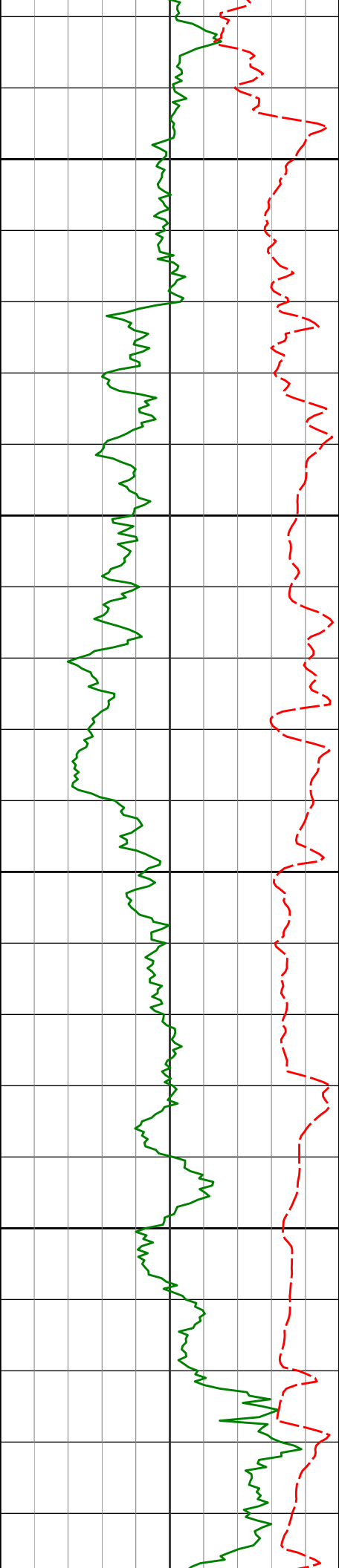
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89.03°

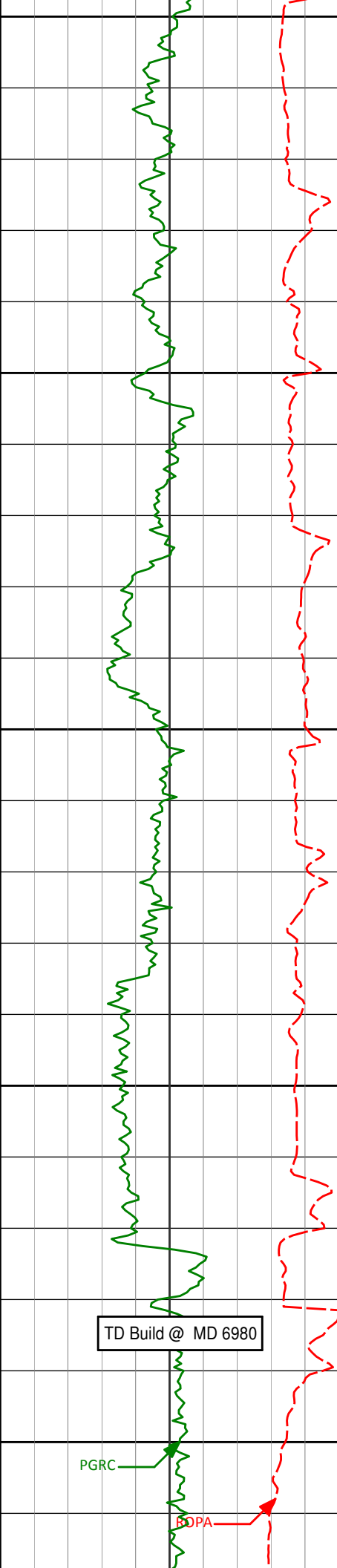
6439.46'

129.03'

6550



6579'	52.96°	89.09°	6468.89'	165.66'
6600				
6627'	57.98°	88.49°	6496.09'	205.19'
6650				
6674'	62.45°	87.67°	6519.43'	245.95'
6700				
6722'	65.25°	87.58°	6540.58'	289.00'
6750				
6768'	71.09°	88.42°	6557.68'	331.67'



6800

6816'

73.74°

89.82°

6572.18'

377.41'

6850

6863'

77.20°

89.58°

6583.97'

422.90'

6900

6926'

83.85°

88.55°

6594.34'

485.00'

6950

300

TD Build @ MD 6980

PGRC

BOPA

7000

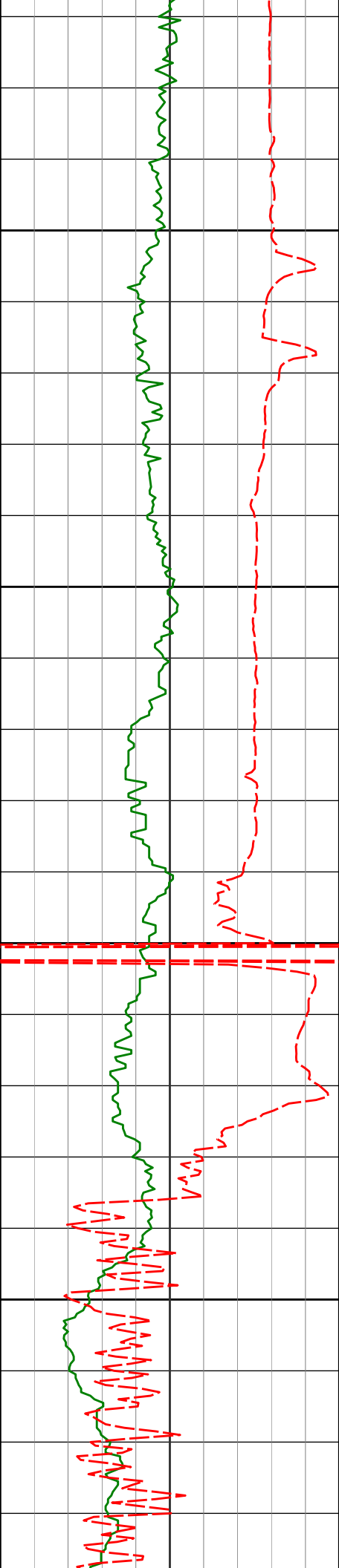
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89.69°

86.96°

6598.67'

561.80'



7050

7100

7150

7200

7088'

89.23°

85.66°

6599.47'

646.64'

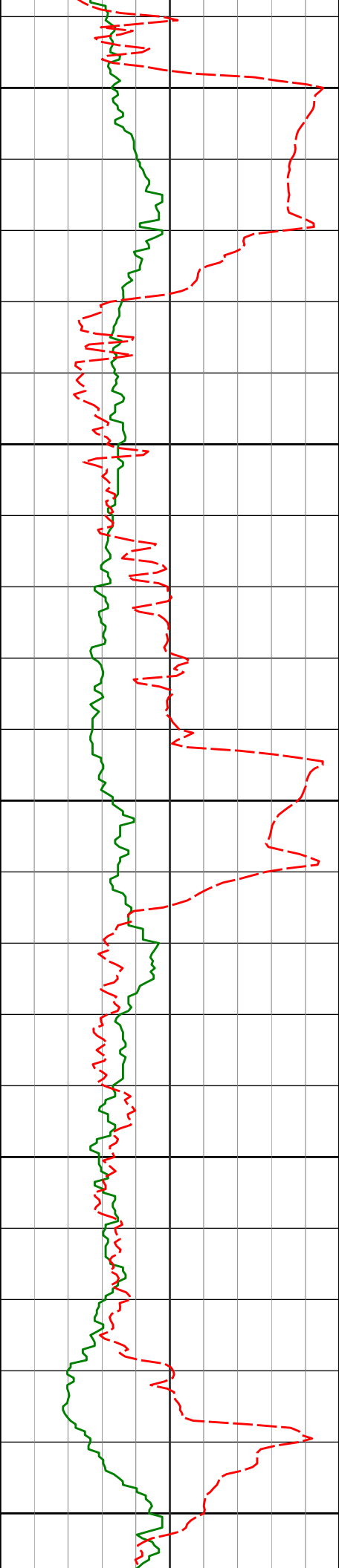
7183'

87.97°

86.94°

6601.80'

741.43'



7250

7278'

88.58°

88.65°

6604.66'

836.33'

7300

7350

7373'

90.71°

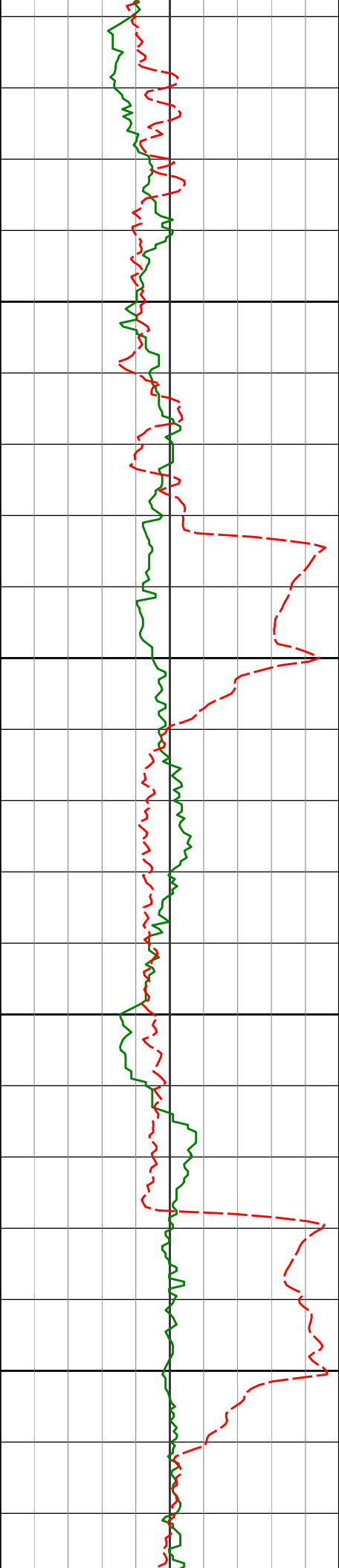
89.03°

6605.24'

931.31'

7400

7450



7467'

91.45°

88.68°

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7500

7550

7562'

91.14°

88.21°

6601.33'

1120.23'

7600

7650

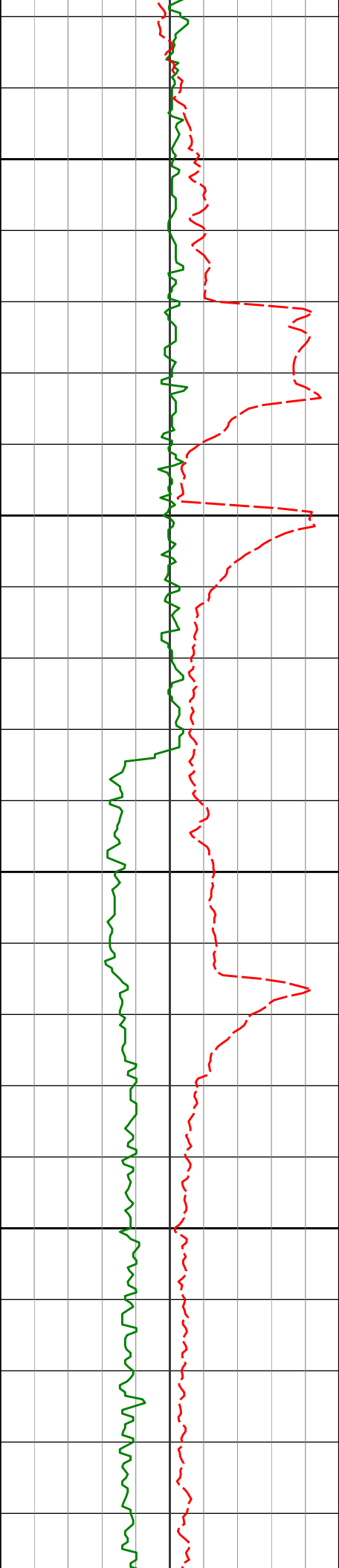
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88.65°

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1215.19'



7700

7750

7800

7850

7751'

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6601.12'

1309.18'

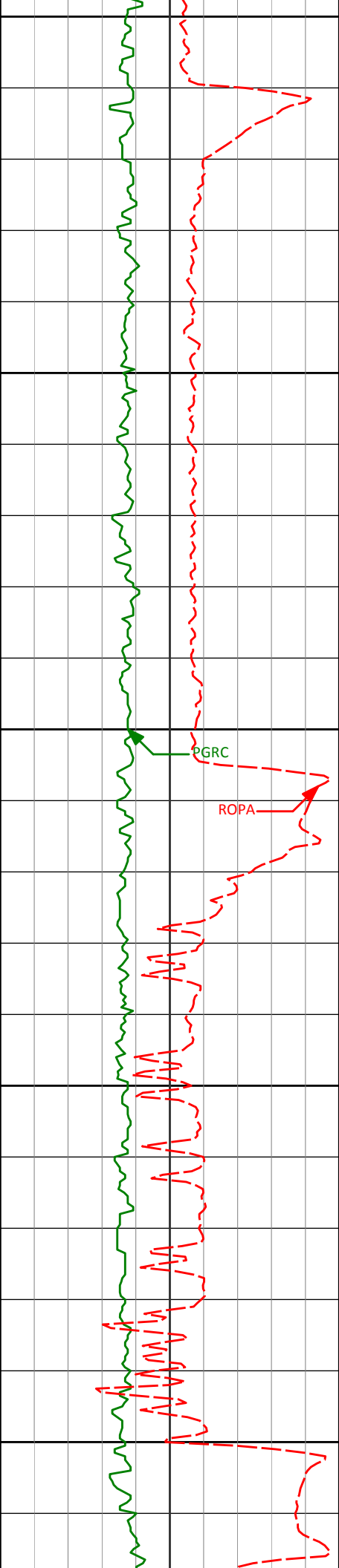
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1404.15'



7900

7941'

89.38°

88.64°

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1499.12'

7950

8000

8036'

88.98°

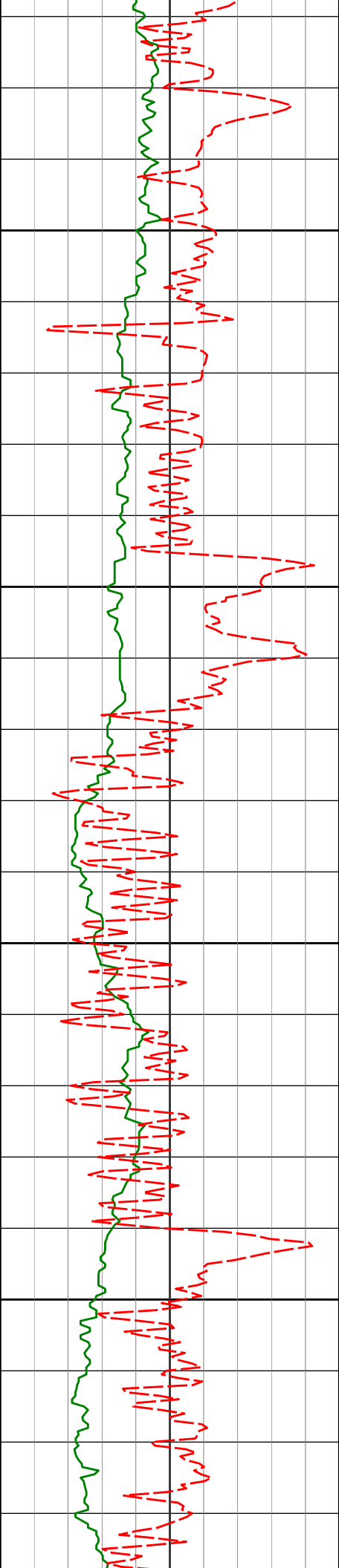
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1594.10'

8050

8100



8131'

91.48°

90.66°

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1689.09'

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8200

8225'

91.61°

90.31°

6602.45'

1783.05'

8250

8300

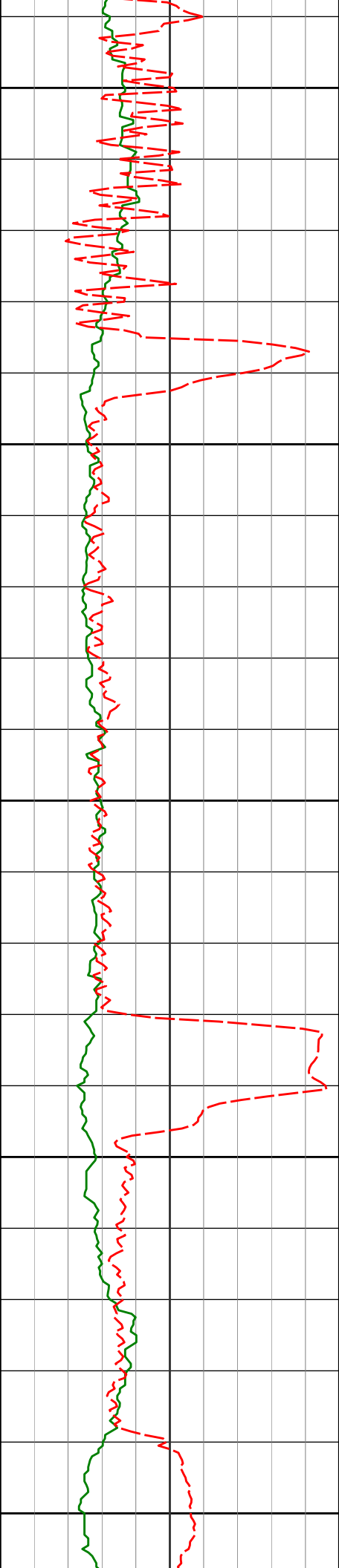
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91.27°

89.55°

6600.06'

1878.02'



8350

8400

8450

8500

8550

8415'

91.54°

89.51°

6597.73'

1972.99'

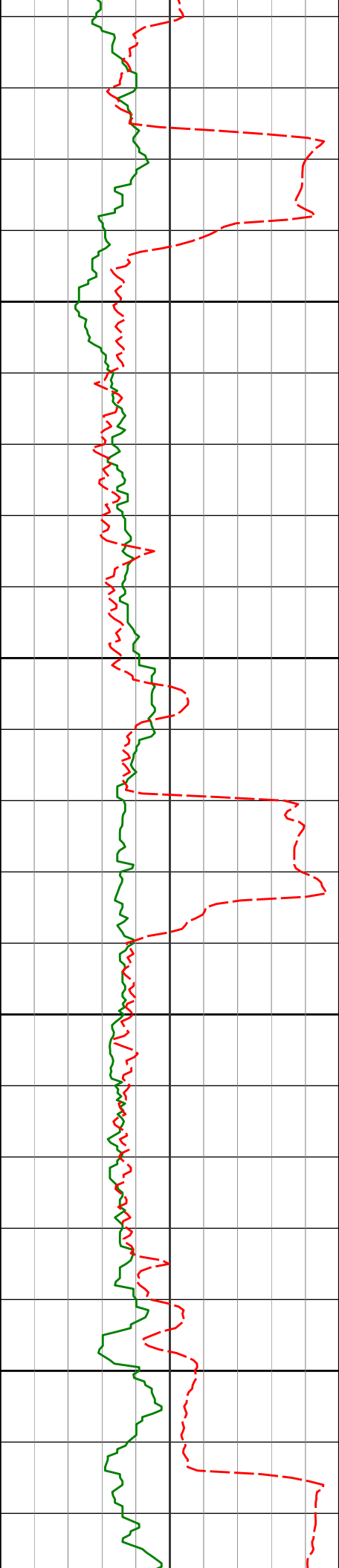
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90.07°

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2067.98'



8600

8605'

89.32°

88.67°

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2162.97'

8650

8700

8700'

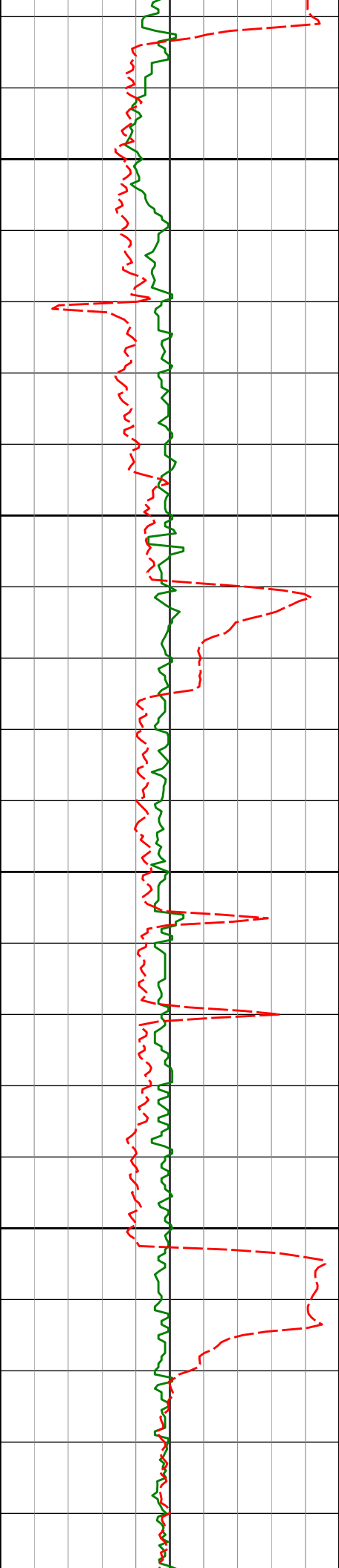
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6598.91'

2257.95'

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8794'

91.33°

87.01°

6598.28'

2351.89'

8800

8850

8889'

91.85°

87.05°

6595.64'

2446.74'

8900

8950

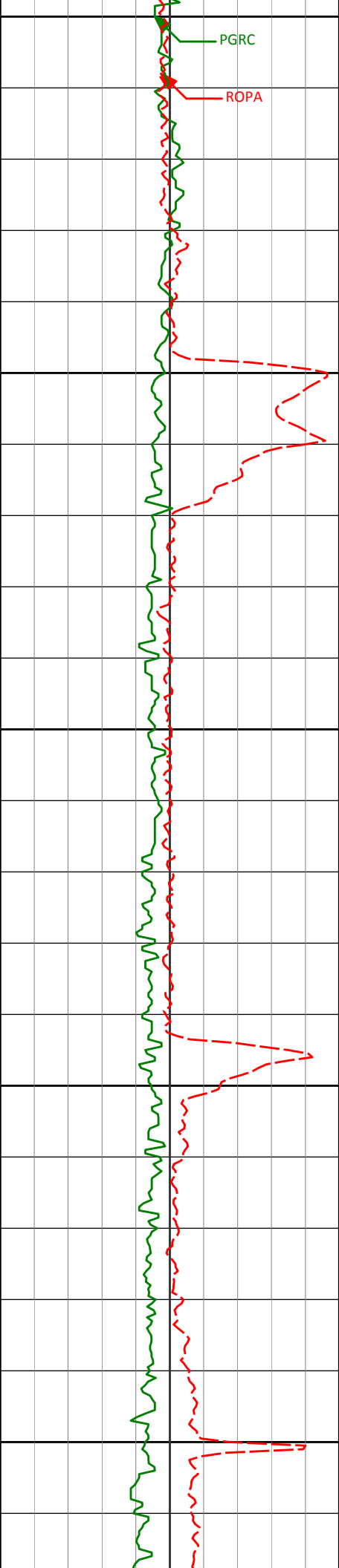
8984'

91.39°

87.58°

6592.95'

2541.62'



PGRC

ROPA

9000

9050

9100

9150

9200

9079'

90.62°

86.38°

6591.29'

2636.49'

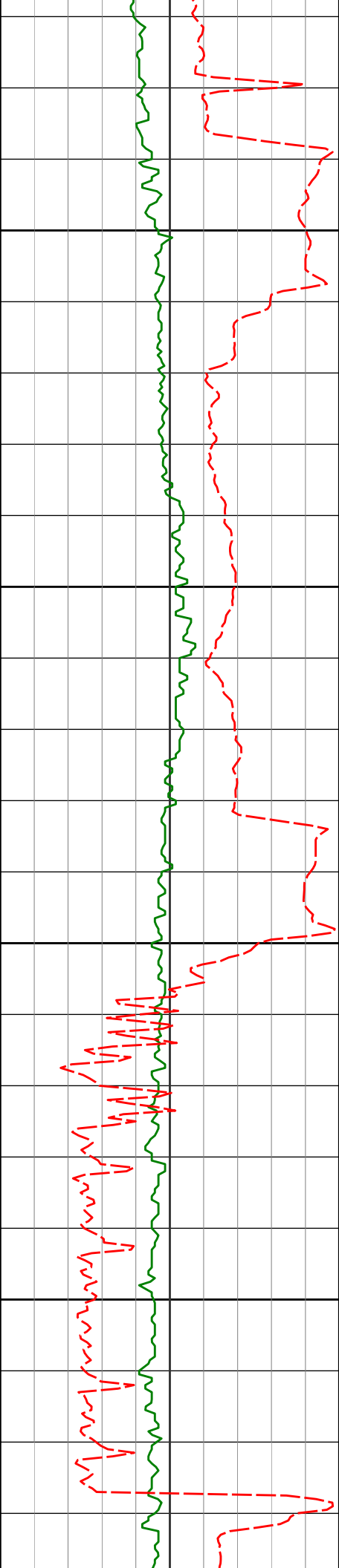
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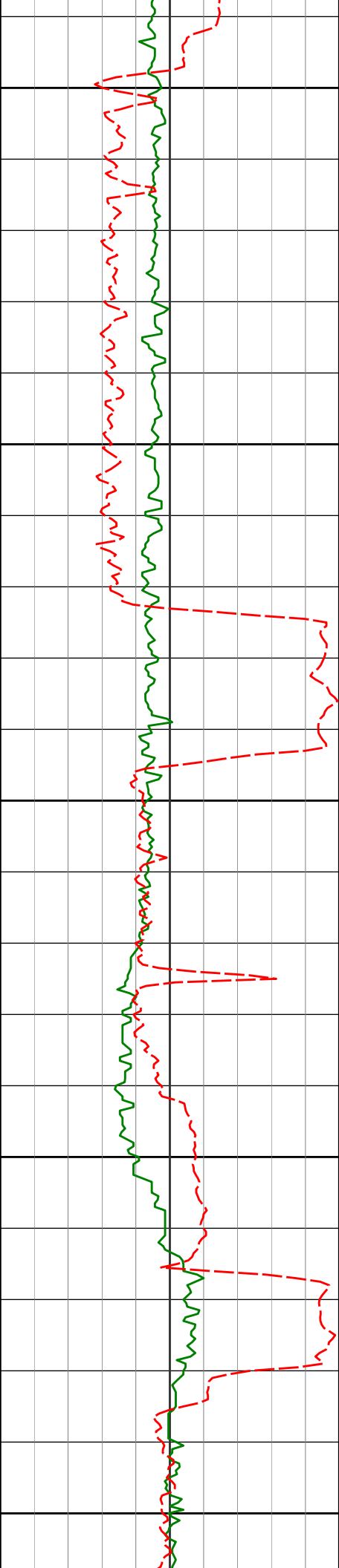
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86.11°

6589.95'

2731.30'





9450

9458'

89.85°

86.87°

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3015.02'

9500

9550

9553'

89.35°

88.31°

6586.90'

3109.95'

9600

9650

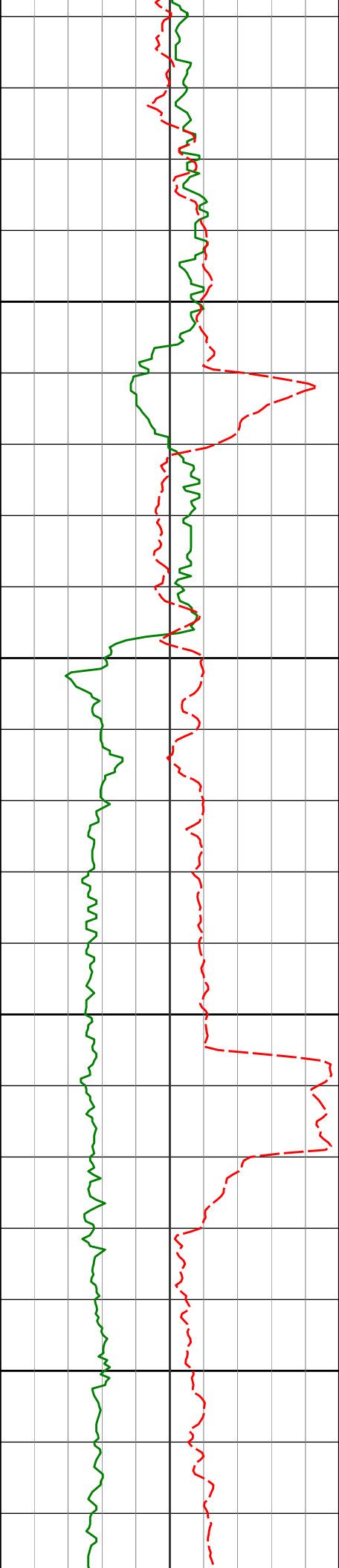
9648'

90.56°

88.88°

6586.98'

3204.93'



9700

9742'

91.02°

88.51°

6585.68'

3298.90'

9750

9800

9837'

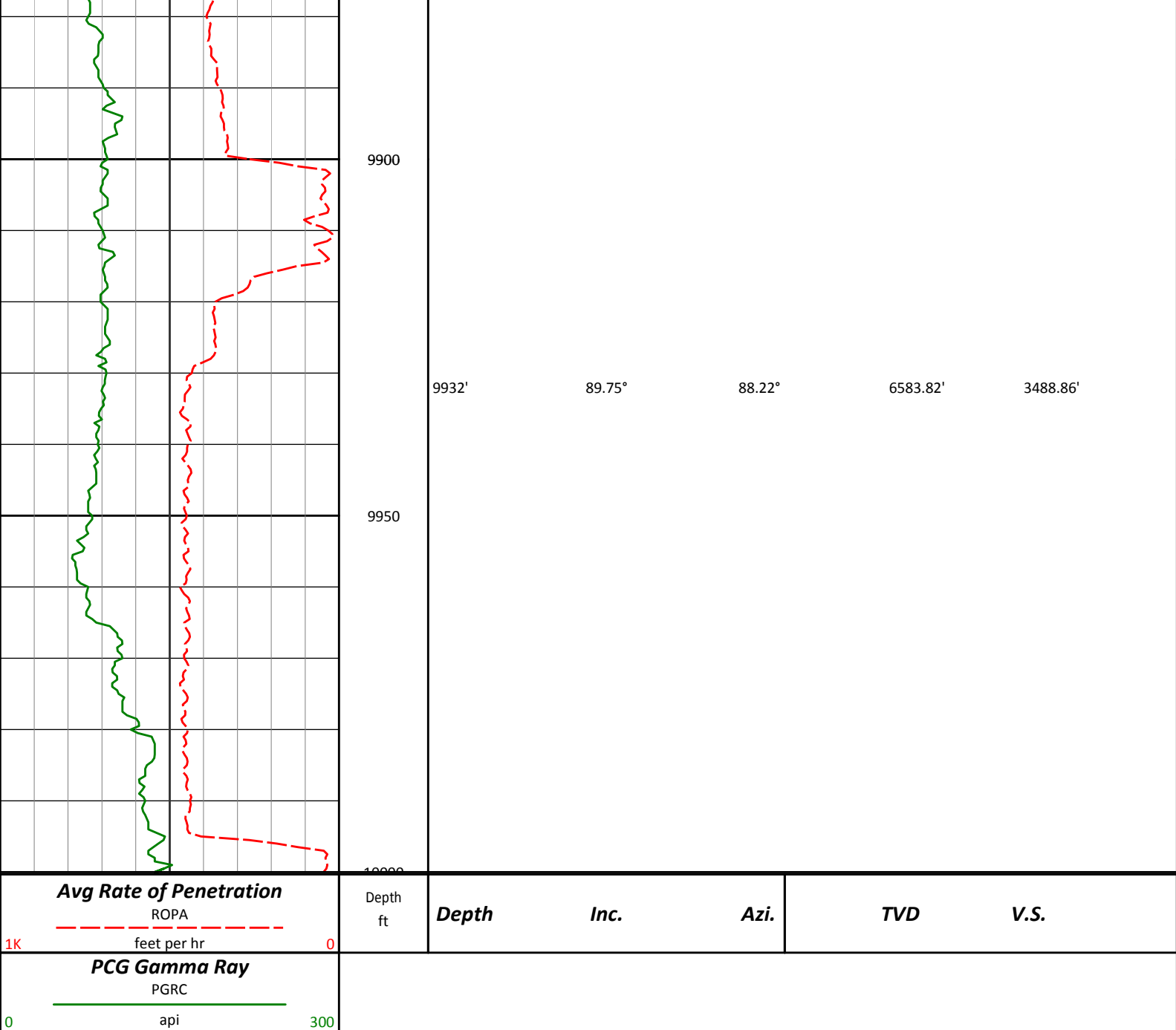
90.74°

89.11°

6584.22'

3393.88'

9850



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch AE20-67HN
Wattenburg
Weld Colorado
USA
CA-XX-0900775409

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
356.00	0.80	324.63	355.99	2.03 N	1.44 W	-1.43	0.22
663.00	0.60	302.03	662.97	4.63 N	4.04 W	-4.02	0.11
966.00	0.60	65.73	965.96	6.12 N	3.94 W	-3.92	0.35
998.00	0.21	92.76	997.96	6.19 N	3.73 W	-3.70	1.32
1090.00	0.38	64.89	1089.96	6.31 N	3.28 W	-3.26	0.24
1183.00	0.52	88.82	1182.95	6.45 N	2.58 W	-2.56	0.25

1275.00	0.80	52.78	1274.95	6.84 N	1.65 W	-1.63	0.53
1368.00	0.72	57.40	1367.94	7.55 N	0.65 W	-0.62	0.11
1460.00	1.18	32.66	1459.93	8.66 N	0.35 E	0.39	0.66
1555.00	1.37	325.86	1554.91	10.42 N	0.24 E	0.29	1.49
1649.00	0.75	279.95	1648.89	11.46 N	0.99 W	-0.95	1.07
1744.00	0.98	237.69	1743.88	11.13 N	2.29 W	-2.25	0.69
1839.00	1.10	236.16	1838.87	10.19 N	3.74 W	-3.70	0.13
1933.00	1.26	230.41	1932.85	9.03 N	5.28 W	-5.25	0.21
2028.00	2.99	223.32	2027.78	6.56 N	7.79 W	-7.76	1.84
2123.00	4.16	218.23	2122.59	2.05 N	11.62 W	-11.61	1.27
2218.00	5.50	232.25	2217.26	3.44 S	17.35 W	-17.37	1.87
2313.00	6.45	235.77	2311.74	9.23 S	25.36 W	-25.40	1.07
2408.00	7.07	239.73	2406.08	15.18 S	34.82 W	-34.89	0.82
2503.00	9.24	240.02	2500.11	21.94 S	46.48 W	-46.57	2.28
2597.00	12.28	238.19	2592.45	30.98 S	61.52 W	-61.64	3.25
2692.00	10.88	236.79	2685.51	41.22 S	77.61 W	-77.77	1.50
2787.00	9.87	238.85	2778.96	50.34 S	92.08 W	-92.28	1.13
2882.00	9.56	242.28	2872.60	58.22 S	106.03 W	-106.26	0.69
2976.00	9.71	242.10	2965.27	65.56 S	119.94 W	-120.20	0.16
3071.00	9.09	230.84	3059.00	74.05 S	132.84 W	-133.14	2.04
3166.00	5.82	224.52	3153.19	82.23 S	142.04 W	-142.37	3.54
3261.00	4.93	234.59	3247.77	88.03 S	148.75 W	-149.10	1.36
3356.00	5.89	234.80	3342.35	93.20 S	156.06 W	-156.43	1.01
3450.00	2.92	213.39	3436.07	97.98 S	161.32 W	-161.71	3.56
3545.00	1.75	149.99	3531.00	101.26 S	161.92 W	-162.33	2.79
3640.00	0.16	253.93	3625.98	102.55 S	161.32 W	-161.73	1.89
3735.00	1.01	347.18	3720.98	101.77 S	161.64 W	-162.05	1.09
3830.00	1.97	342.81	3815.95	99.39 S	162.31 W	-162.70	1.02
3925.00	0.94	350.58	3910.91	97.07 S	162.92 W	-163.30	1.10
4019.00	0.55	52.68	4004.91	96.03 S	162.68 W	-163.07	0.89
4114.00	1.03	113.36	4099.90	96.09 S	161.54 W	-161.92	0.95
4209.00	0.06	66.07	4194.89	96.41 S	160.71 W	-161.09	1.04
4304.00	0.74	80.32	4289.89	96.29 S	160.06 W	-160.44	0.72
4399.00	1.07	153.64	4384.88	96.98 S	159.06 W	-159.45	1.17
4494.00	1.38	152.39	4479.86	98.79 S	158.14 W	-158.53	0.33
4589.00	1.70	125.27	4574.83	100.62 S	156.45 W	-156.86	0.83
4684.00	1.52	134.23	4669.79	102.31 S	154.40 W	-154.81	0.33
4779.00	0.77	99.41	4764.77	103.29 S	152.87 W	-153.28	1.04
4873.00	0.49	142.39	4858.77	103.71 S	152.00 W	-152.42	0.56
4968.00	1.23	106.19	4953.75	104.32 S	150.77 W	-151.19	0.93
5063.00	0.71	101.66	5048.74	104.72 S	149.22 W	-149.64	0.55
5158.00	0.76	112.35	5143.73	105.08 S	148.06 W	-148.48	0.15
5253.00	1.18	79.78	5238.72	105.15 S	146.51 W	-146.93	0.71
5347.00	0.18	57.60	5332.71	104.90 S	145.44 W	-145.86	1.08
5442.00	1.08	108.39	5427.71	105.10 S	144.46 W	-144.88	1.03
5537.00	0.68	126.14	5522.69	105.71 S	143.15 W	-143.58	0.50
5632.00	0.34	117.32	5617.69	106.18 S	142.45 W	-142.87	0.37
5726.00	0.67	108.13	5711.69	106.48 S	141.68 W	-142.11	0.36
5783.00	0.80	76.46	5768.68	106.49 S	140.98 W	-141.40	0.74
5847.00	0.46	70.05	5832.68	106.29 S	140.30 W	-140.73	0.54
5915.00	3.91	71.34	5900.62	105.46 S	137.85 W	-138.27	5.07
5963.00	11.20	75.54	5948.17	103.77 S	131.77 W	-132.19	15.22
6010.00	13.38	80.35	5994.09	101.72 S	121.99 W	-122.40	5.12
6058.00	14.64	85.07	6040.66	100.26 S	110.47 W	-110.87	3.54
6105.00	17.77	85.64	6085.79	99.21 S	97.40 W	-97.80	6.67
6153.00	19.50	88.48	6131.27	98.44 S	82.09 W	-82.48	4.07
6199.00	21.74	87.00	6174.32	97.79 S	65.90 W	-66.29	5.00
6247.00	25.48	85.15	6218.30	96.45 S	46.73 W	-47.12	7.94
6294.00	30.15	88.14	6259.86	95.21 S	24.85 W	-25.23	10.37
6342.00	34.94	91.24	6300.31	95.12 S	0.96 E	0.58	10.56
6389.00	38.46	93.02	6337.99	96.18 S	29.02 E	28.64	7.82
6437.00	43.44	92.70	6374.23	97.74 S	60.43 E	60.04	10.38
6484.00	46.75	90.72	6407.41	98.72 S	93.70 E	93.30	7.65
6532.00	49.48	89.03	6439.46	98.63 S	129.43 E	129.03	6.26
6579.00	52.96	89.09	6468.89	98.03 S	166.06 E	165.66	7.40
6627.00	57.98	88.49	6496.09	97.19 S	205.58 E	205.19	10.51
6674.00	62.45	87.67	6519.43	95.82 S	246.34 E	245.95	9.63
6722.00	65.25	87.58	6540.58	94.03 S	289.38 E	289.00	5.84
6768.00	71.09	88.42	6557.68	92.55 S	332.04 E	331.67	12.81
6816.00	73.74	89.82	6572.18	91.85 S	377.79 E	377.41	6.18
6863.00	77.20	89.58	6583.97	91.61 S	423.27 E	422.90	7.38

6926.00 7003.00	83.85 89.69	88.55 86.96	6594.34 6598.67	90.59 S 87.58 S	485.37 E 562.15 E	485.00 561.80	10.68 7.86
7088.00 7183.00 7278.00 7373.00 7467.00	89.23 87.97 88.58 90.71 91.45	85.66 86.94 88.65 89.03 88.68	6599.47 6601.80 6604.66 6605.24 6603.47	82.11 S 75.98 S 72.33 S 70.40 S 68.53 S	646.97 E 741.74 E 836.62 E 931.60 E 1025.56 E	646.64 741.43 836.33 931.31 1025.28	1.62 1.89 1.91 2.28 0.87
7562.00 7657.00 7751.00 7846.00 7941.00	91.14 90.15 88.80 89.17 89.38	88.21 88.65 89.07 88.49 88.64	6601.33 6600.26 6601.12 6602.80 6604.00	65.95 S 63.35 S 61.48 S 59.45 S 57.07 S	1120.50 E 1215.46 E 1309.43 E 1404.40 E 1499.36 E	1120.23 1215.19 1309.18 1404.15 1499.12	0.59 1.14 1.50 0.72 0.27
8036.00 8131.00 8225.00 8320.00 8415.00	88.98 91.48 91.61 91.27 91.54	89.45 90.66 90.31 89.55 89.51	6605.36 6604.98 6602.45 6600.06 6597.73	55.49 S 55.58 S 56.38 S 56.26 S 55.48 S	1594.34 E 1689.32 E 1783.29 E 1878.26 E 1973.22 E	1594.10 1689.09 1783.05 1878.02 1972.99	0.95 2.92 0.40 0.88 0.29
8510.00 8605.00 8700.00 8794.00 8889.00	89.48 89.32 89.44 91.33 91.85	90.07 88.67 88.83 87.01 87.05	6596.88 6597.88 6598.91 6598.28 6595.64	55.13 S 54.09 S 52.02 S 48.61 S 43.69 S	2068.21 E 2163.20 E 2258.17 E 2352.10 E 2446.94 E	2067.98 2162.97 2257.95 2351.89 2446.74	2.25 1.48 0.21 2.79 0.55
8984.00 9079.00 9174.00 9269.00 9364.00	91.39 90.62 90.99 91.60 90.22	87.58 86.38 86.11 88.16 87.89	6592.95 6591.29 6589.95 6587.81 6586.30	39.24 S 34.23 S 28.01 S 23.27 S 19.99 S	2541.79 E 2636.64 E 2731.43 E 2826.28 E 2921.21 E	2541.62 2636.49 2731.30 2826.17 2921.11	0.74 1.50 0.48 2.25 1.48
9458.00 9553.00 9648.00 9742.00 9837.00	89.85 89.35 90.56 91.02 90.74	86.87 88.31 88.88 88.51 89.11	6586.24 6586.90 6586.98 6585.68 6584.22	15.70 S 11.70 S 9.37 S 7.23 S 5.26 S	3015.11 E 3110.02 E 3204.99 E 3298.96 E 3393.93 E	3015.02 3109.95 3204.93 3298.90 3393.88	1.15 1.60 1.41 0.63 0.70
9932.00 10027.00 10122.00 10216.00 10311.00	89.75 90.55 90.34 91.67 90.22	88.22 89.96 89.31 89.69 87.92	6583.82 6583.57 6582.83 6581.18 6579.61	3.04 S 1.54 S 0.93 S 0.11 S 1.87 N	3488.90 E 3583.88 E 3678.88 E 3772.85 E 3867.82 E	3488.86 3583.85 3678.84 3772.82 3867.79	1.40 2.02 0.72 1.47 2.41
10406.00 10500.00 10595.00 10690.00 10797.00	89.81 90.83 91.97 89.51 89.04	87.80 88.11 88.45 86.98 86.32	6579.59 6579.06 6576.74 6575.52 6576.87	5.42 N 8.77 N 11.62 N 15.41 N 21.66 N	3962.75 E 4056.69 E 4151.61 E 4246.52 E 4353.33 E	3962.74 4056.69 4151.63 4246.55 4353.38	0.45 1.13 1.25 3.02 0.76
10861.00	89.04	86.32	6577.94	25.77 N	4417.19 E	4417.25	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 89.77 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 10861.00 FEET
IS 4417.26 FEET ALONG 89.67 DEGREES (GRID)**

First three survey's are from 3rd party source (Muilti Shot EMS) and provided by CO-man on location before drilling.

Depth 356 Inc 0.80 Azi 324.63

Depth 663 Inc 0.60 Azi 302.03

Depth 966 Inc 0.60 Azi 65.73

Tied in @ Surface

Magnettic direction of 7.631 has been added to AZI for grid direction correction.