

**PCDC - Pressure Case Directional**  
**PCGK - Pressure Case Gamma**

**1 : 600 / 1 : 240**

Country : <b>USA</b>		
Field : <b>Wattenburg</b>		
Location : <b>Lat: 40°28' 33.56" North</b> <b>Long: 104°21' 18.72" West</b>		
Well : <b>Wells Ranch AE20-66HN</b>		
Company : <b>Noble Energy</b>		
Rig : <b>H&amp;P 321</b>		
<b>LOCATION</b> Company : <b>Noble Energy</b> Rig : <b>H&amp;P 321</b> Well : <b>Wells Ranch AE20-66HN</b> Field : <b>Wattenburg</b> Country : <b>USA</b> API Number : <b>05-123-37561</b>		
	Latitude : <b>40°28' 33.56" North</b> Longitude : <b>104°21' 18.72" West</b>	Other Services <b>Directional Drilling</b>
	UTM Easting = <b>3,318,472.417 ft</b>	
	UTM Northing = <b>1,418,299.331 ft</b>	
Permanent Datum : <b>Ground Level</b>	Elevation : <b>4840.00 ft</b>	Elev. KB <b>N/A</b>
Log Measured From : <b>Drill Floor</b>	<b>30.00 ft</b> Above Permanent Datum	DF <b>4870.00 ft</b> GL <b>4840.00 ft</b> WD <b>N/A</b>
Drilling Measured From : <b>Drill Floor</b>	<div><b>TVD LOG</b></div>	
Depth Logged : <b>979.98 ft</b> To <b>6,563.77 ft</b>	Unit No. : <b>11210424</b>	Job No. : <b>CA-XX-0900735963</b>
Date Logged : <b>21-Sep-13</b> To <b>24-Sep-13</b>	Plot Type : <b>Final</b> Plot Date : <b>26-Sep-13</b>	
Total Depth MD : <b>7,010.00 ft</b> TVD : <b>6,563.77 ft</b>		
Spud Date : <b>20-Sep-13</b>		
Run No.	Borehole Record (TVD) Size From To 8.750 in 979.98 ft 5,791.94 ft 200 8.750 in 5,791.94 ft 6,563.77 ft	Borehole Record (TVD) Run No. Size From To
		Casing Record (TVD) Size Weight From To 9.625 36.00 0.00 980.00

**WELL INFORMATION**

MWD Run Number	100	200		
Date run completed	22-Sep-13	24-Sep-13		
Rig Bit Number	2	3		
Bit Size (in)	8.750	8.750		
Tool Nominal OD (in)	6.840	6.840		
Log Start Depth (MD, ft)	980.00	5,878.00		
Log End Depth (MD, ft)	5,878.00	7,010.00		
Drill or Wipe	Drill	Drill		
Drill/Wipe Start Date and Time	21-Sep-13 22:31	23-Sep-13 01:31		
Drill/Wipe End Date and Time	22-Sep-13 15:34	23-Sep-13 21:04		
Min Inc (deg) @ Depth (MD, ft)	0.24 @ 5,537.00	0.44 @ 5,916.00		
Max Inc (deg) @ Depth (MD, ft)	17.43 @ 3,735.00	82.21 @ 6,955.00		
Bit TFA(in2) / Bit Type	0.78 / PDC	0.98 / PDC		
Flow Rate (gpm)	591.28	534.46		
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A		
Fluid Type	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	9.10 / 31.00	10.50 / 39.00		
Filtrate CL (ppm)	1,800.00	1,900.00		
pH / Fluid Loss (mptm)	9.10 / 37	9.50 / 10		
PV (cP) / YP (lbf2)	2 / 4.00	10 / 11.00		
% Solids / % Sand	5.00 / 1.50	10.00 / 0.20		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / 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 (degF) / Source	150.10 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 150.10	N/A @ 162.80			
Lead MWD Engineer	Kyle Wass	Kyle Wass			
Customer Representative	Stetson Nielsen	Stetson Nielsen			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11342302	11342302			
Insert Serial Number	11680773	11680773			
Date and Time Initialized	21-Sep-13 10:51	21-Sep-13 10:51			
Date and Time Read	24-Jan-13 04:38	24-Sep-13 04:38			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	58.00	55.00			
Software Version	6.21	6.21			
Sub Serial Number	11342302	11342302			
Sonde Serial Number	11297617	11297617			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	165.64	282.97			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.79	48.46			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11342302	11342302			
Insert/Sonde Serial Number	11293386	11293386			

## 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: 0.1 ft  
Interval Distance: 1.2 ft

6. Insite Version v8.0.0

## WARRANTY

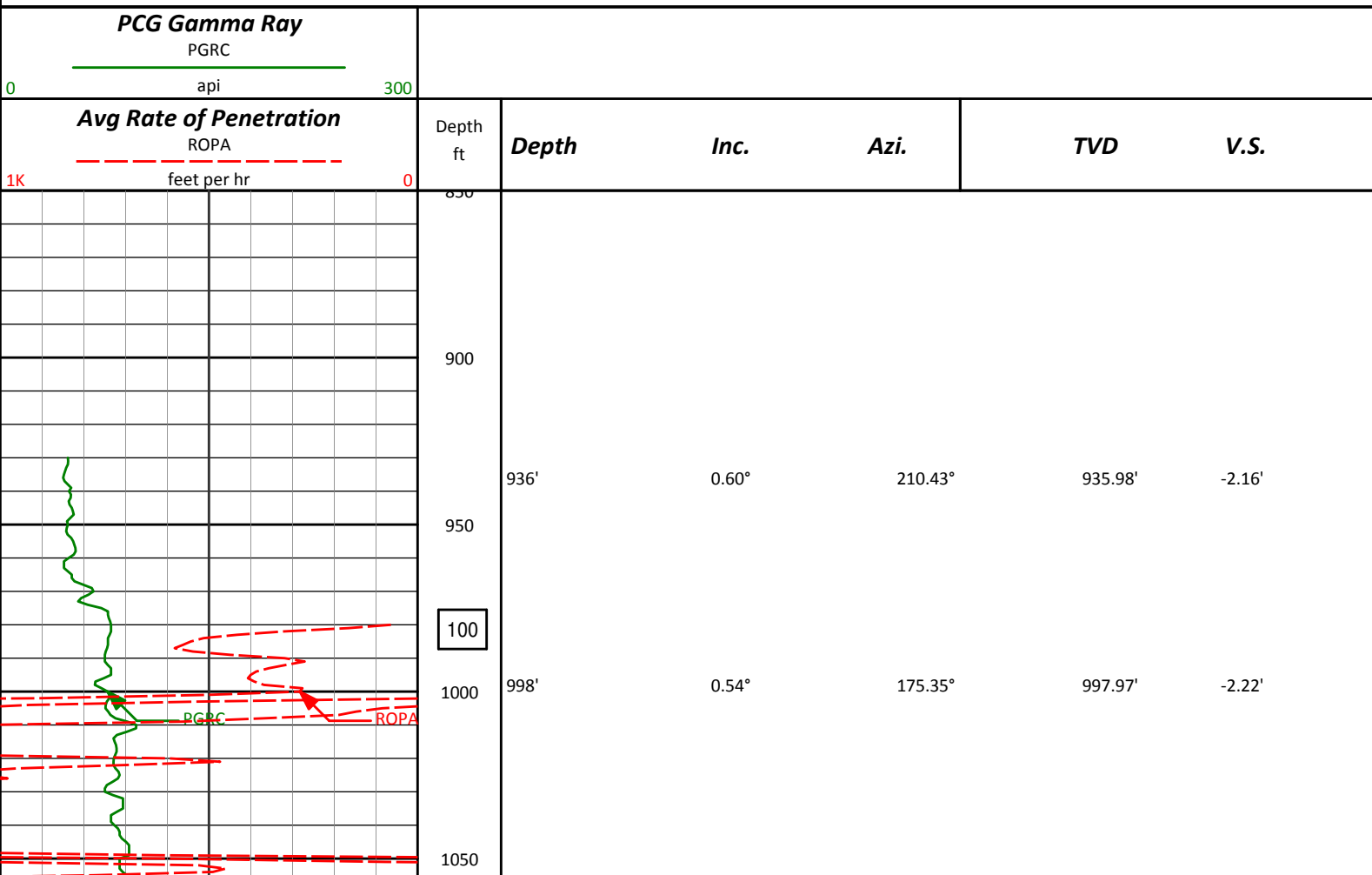
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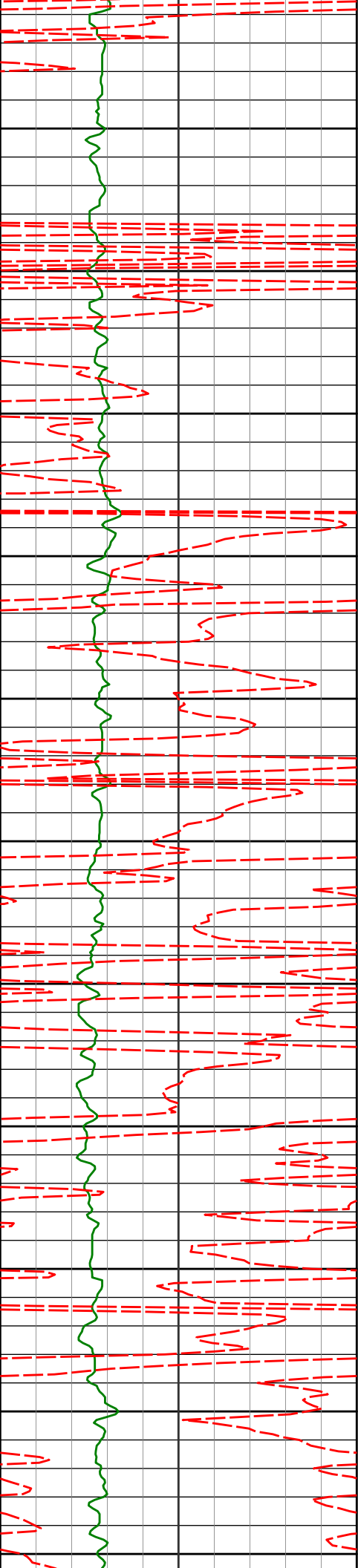
# HALLIBURTON

## Sperry Drilling Services

### TVD Correlation Log 1:600

Noble Energy  
Wells Ranch AE20-66HN  
H&P 321  
Sec. 20-T6N-R62W





1091'

0.59°

198.72°

1090.97'

-2.23'

1100

1150

1184'

0.41°

221.43°

1183.97'

-2.51'

1200

1250

1275'

1.78°

232.14°

1274.95'

-3.69'

1300

1350

1368'

3.63°

253.75°

1367.84'

-7.41'

1400

1450

1460'

6.51°

247.66°

1459.47'

-14.62'

1500

1550

1555'

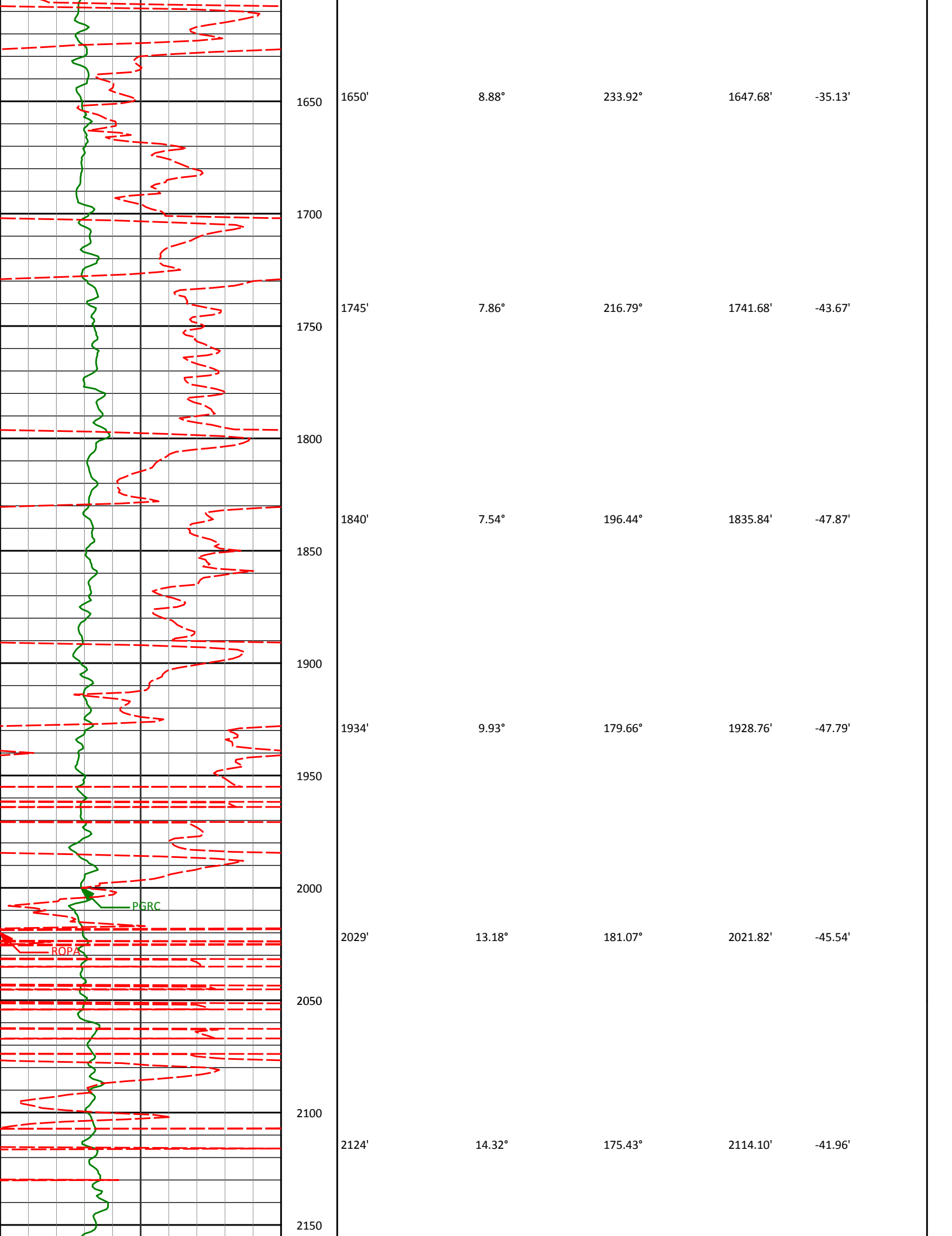
8.01°

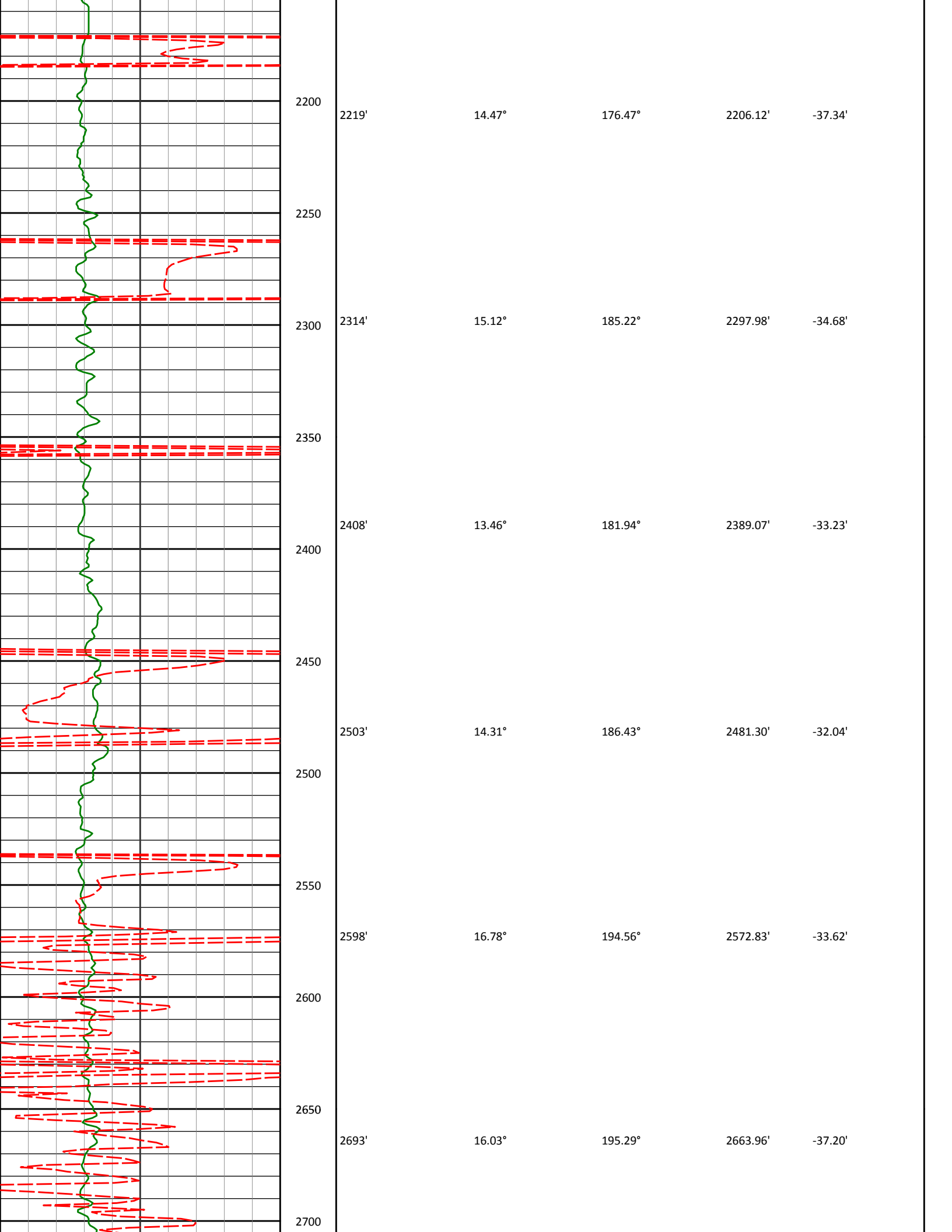
239.73°

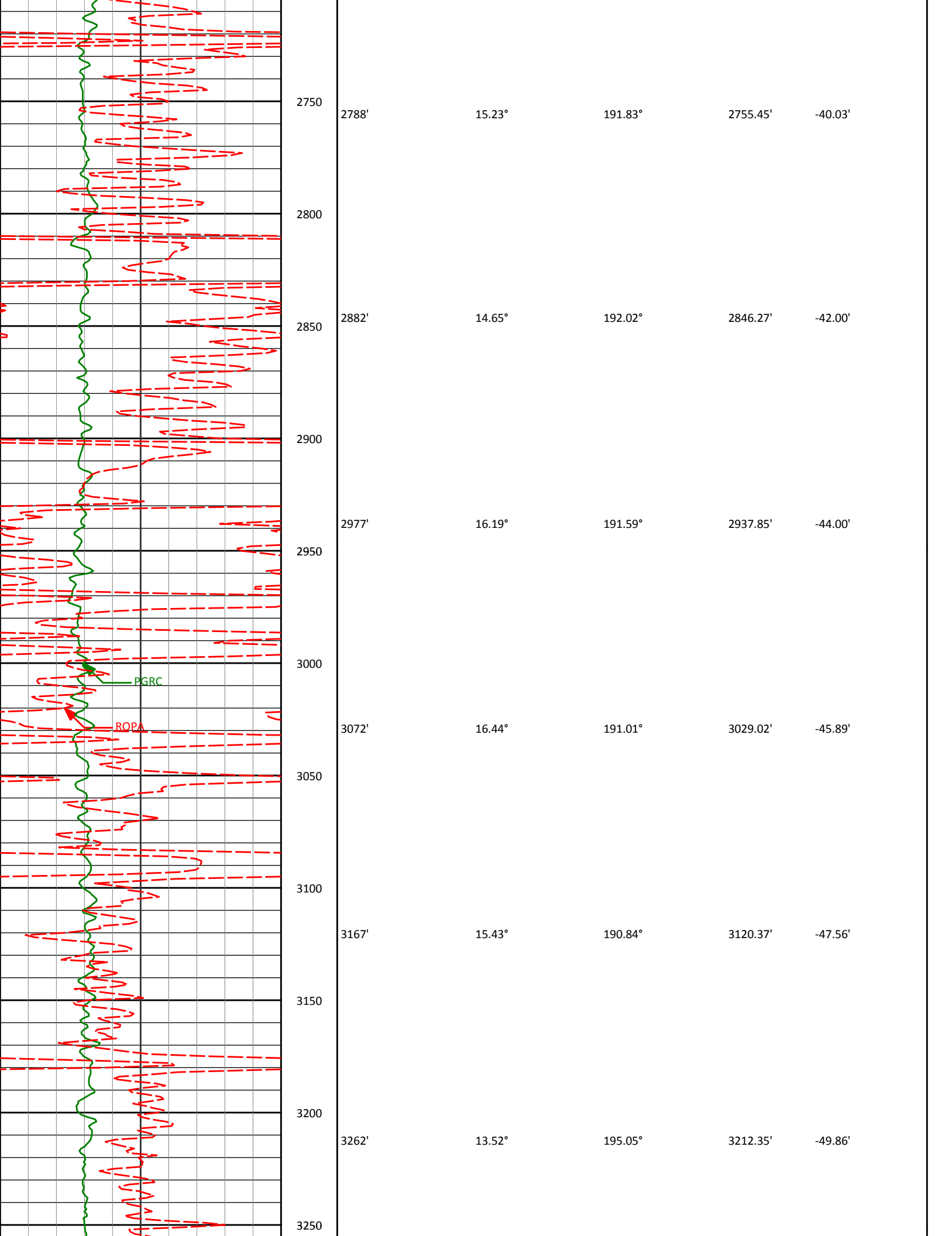
1553.71'

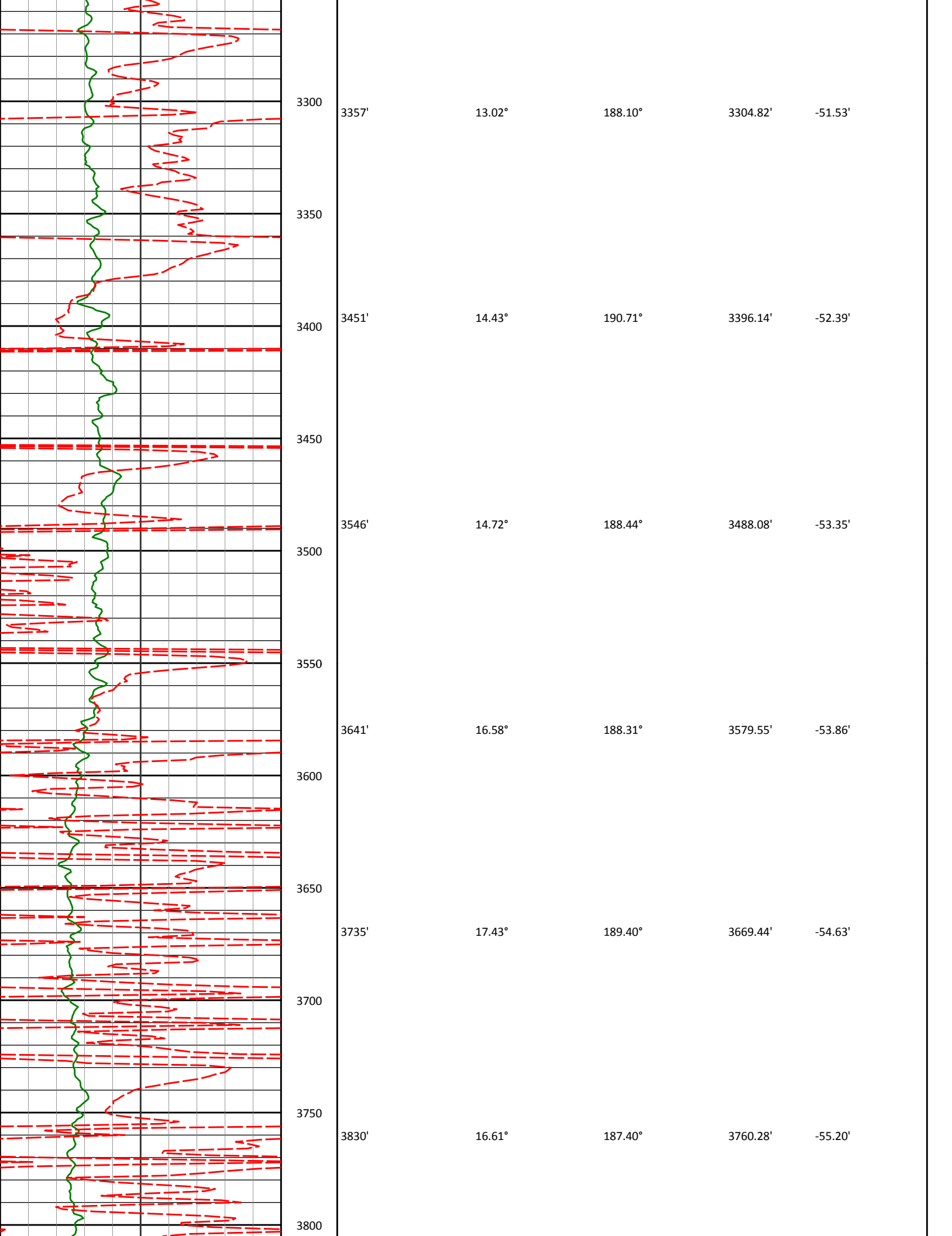
-24.55'

1600

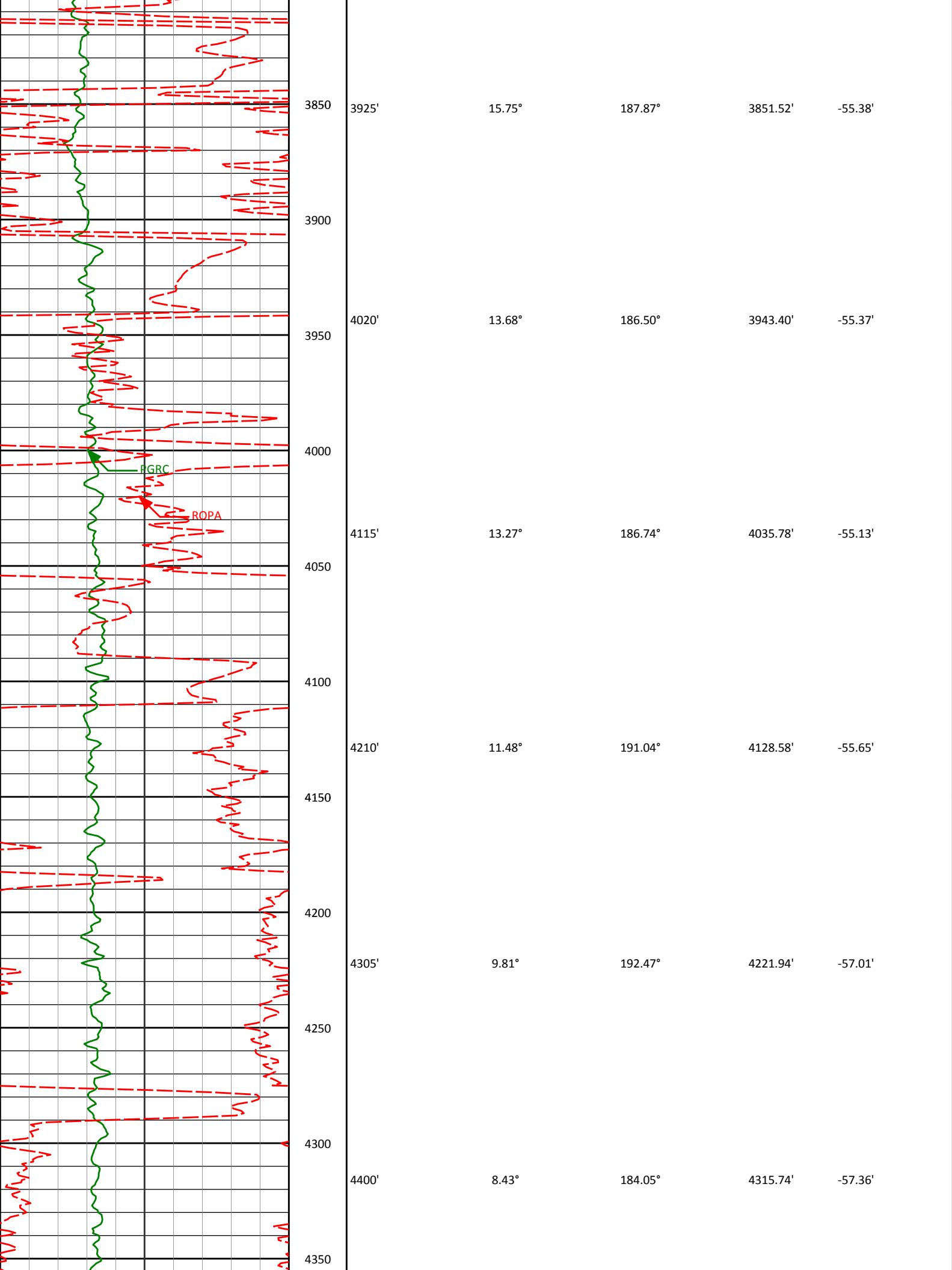


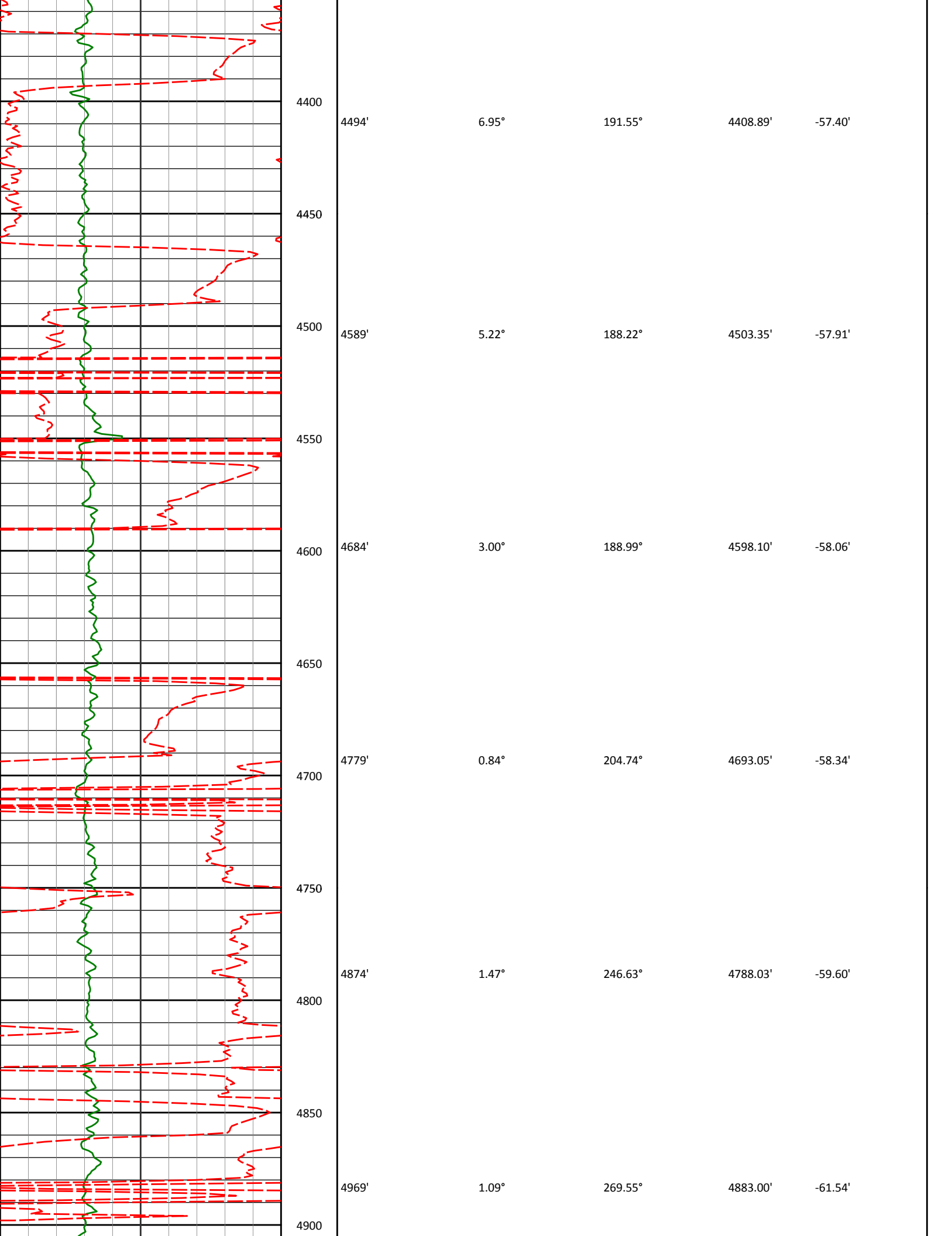


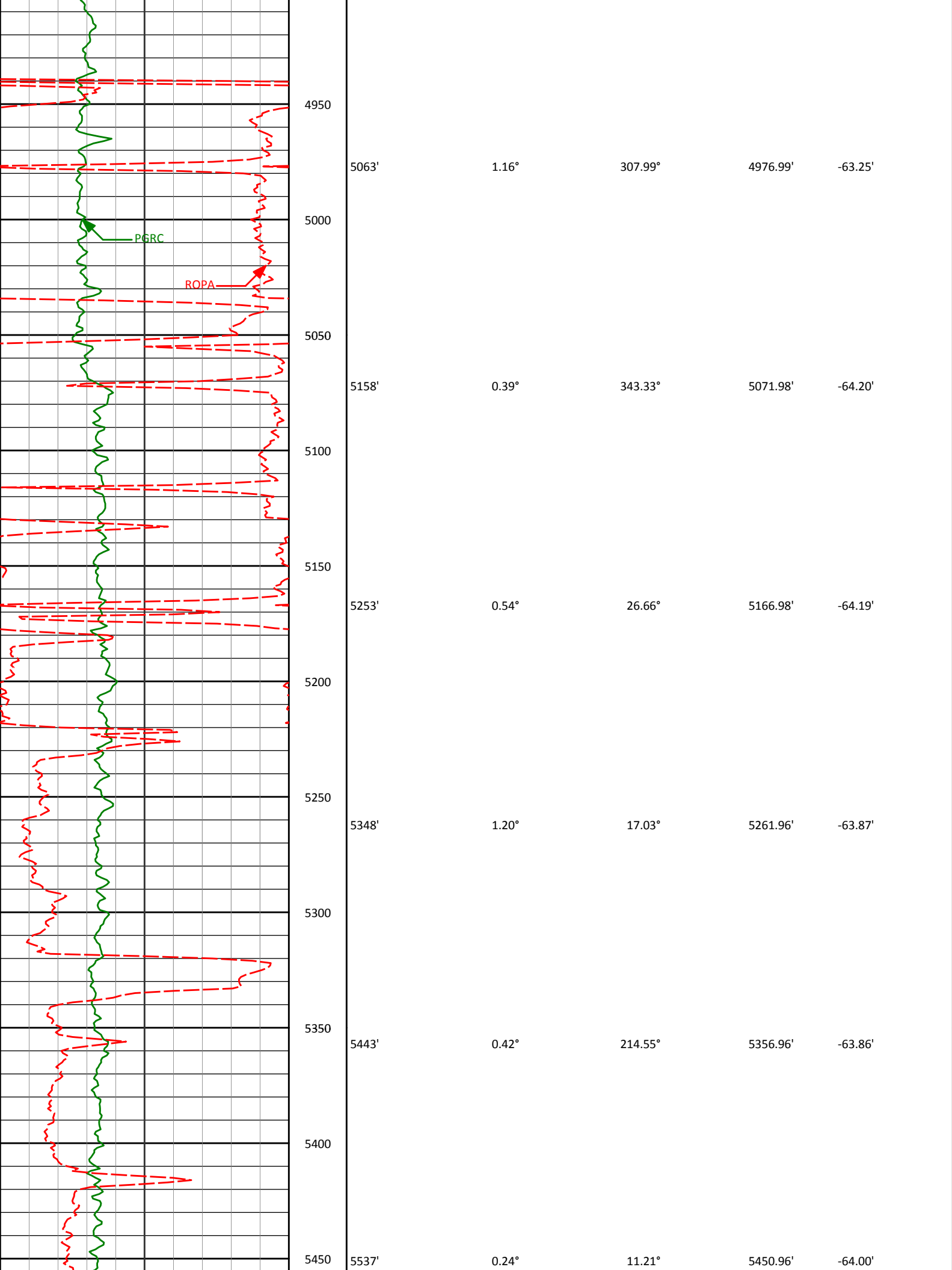


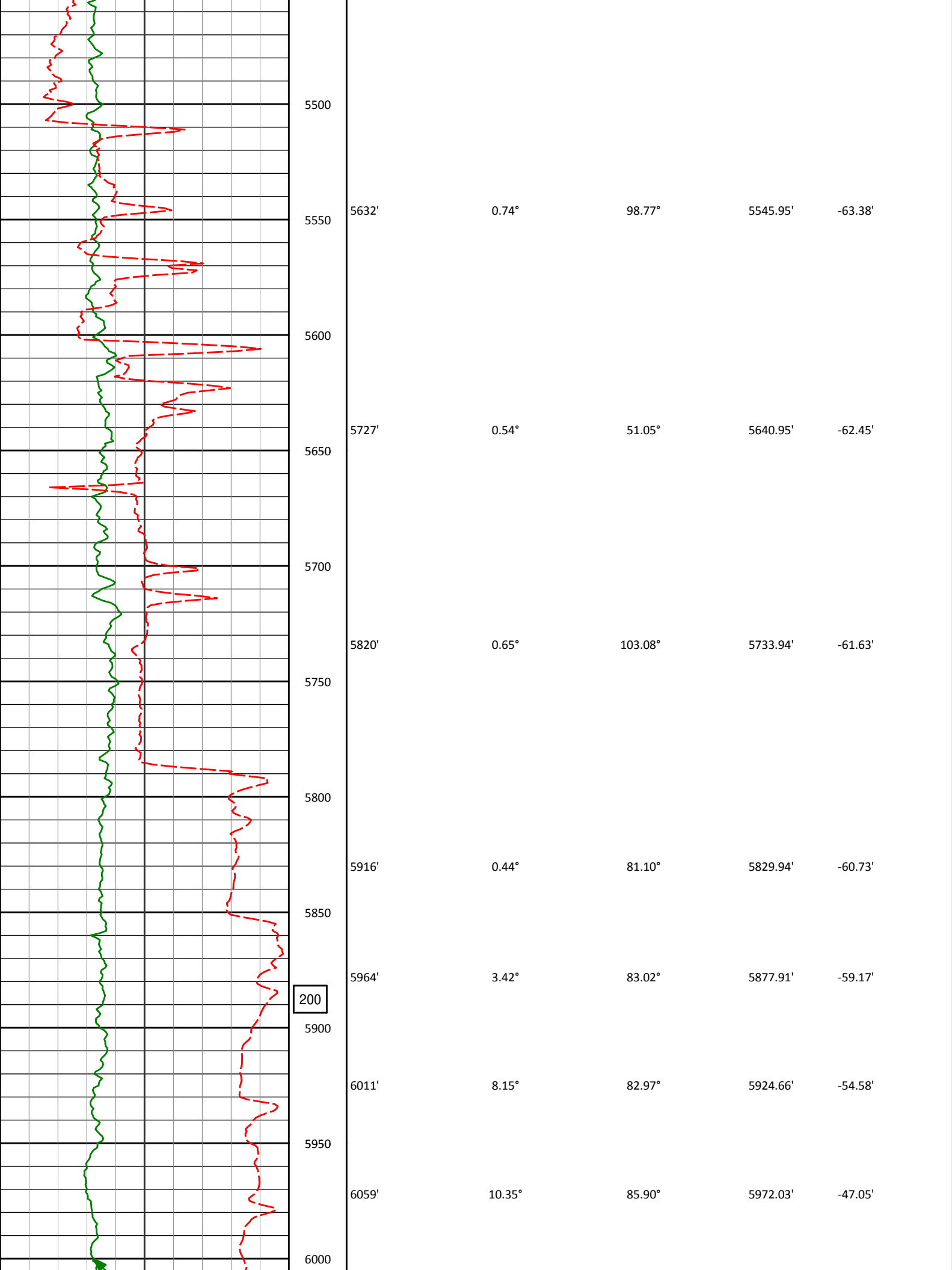


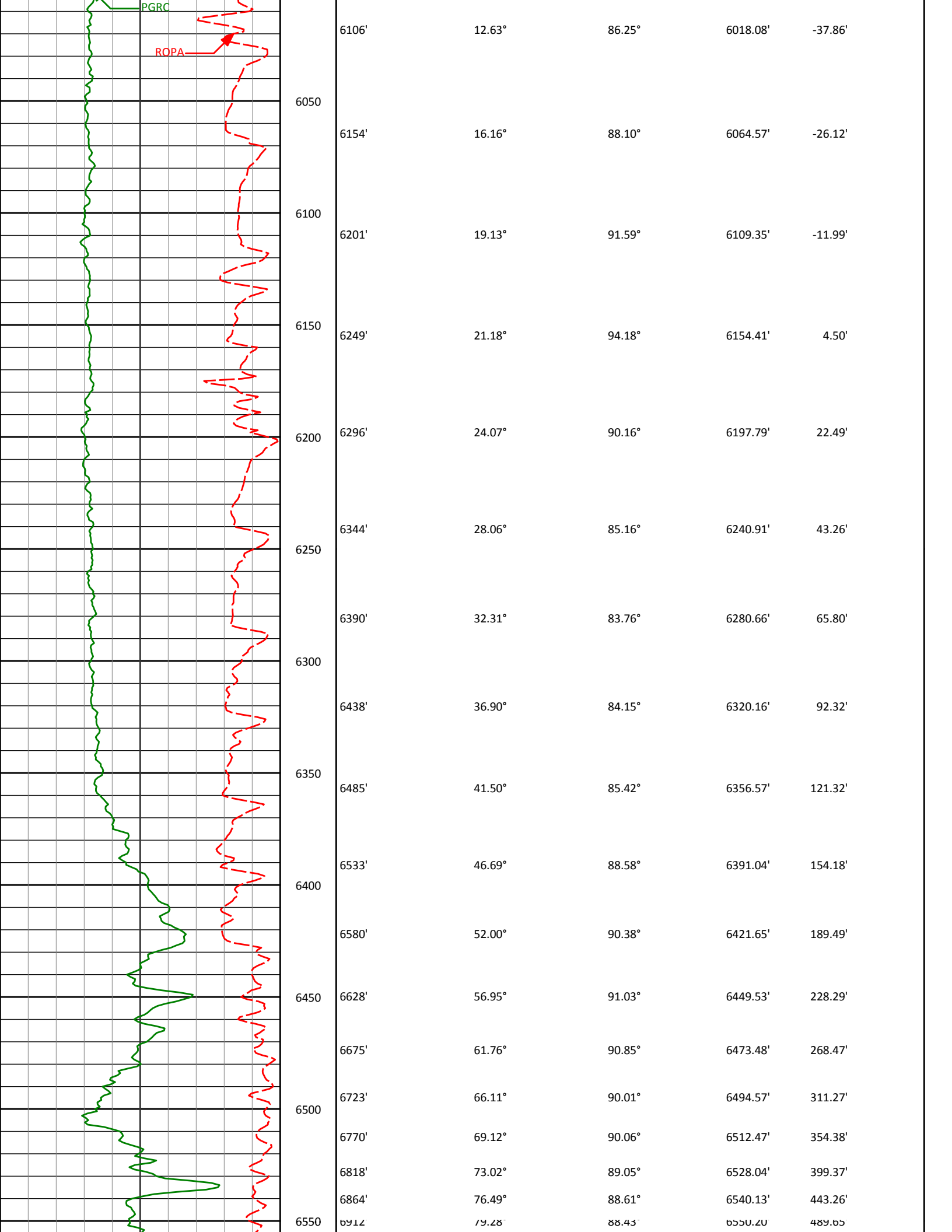












1K feet per hr 0

300

***V.S.***

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

Noble Energy  
Wells Ranch AE20-66HN  
H&P 321  
Sec. 20-T6N-R62W

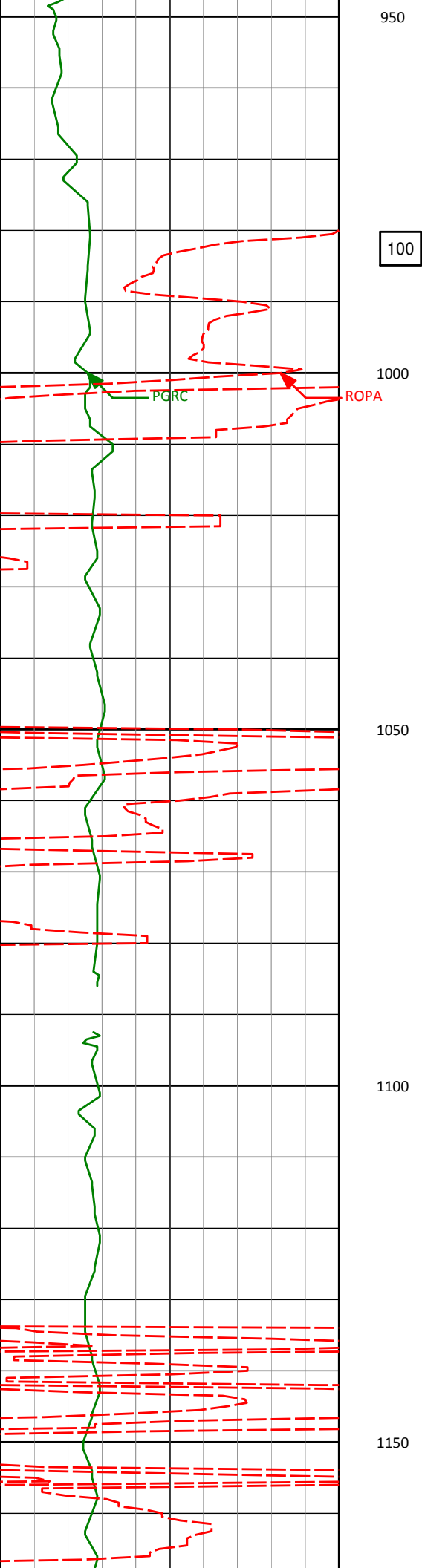
Noble Energy  
h AE20-66HN  
H&P 321  
Sec. 20-T6N-R62W

300

feet per hr

**V.S.**

-2.16'



998'

0.54°

175.35°

997.97'

-2.22'

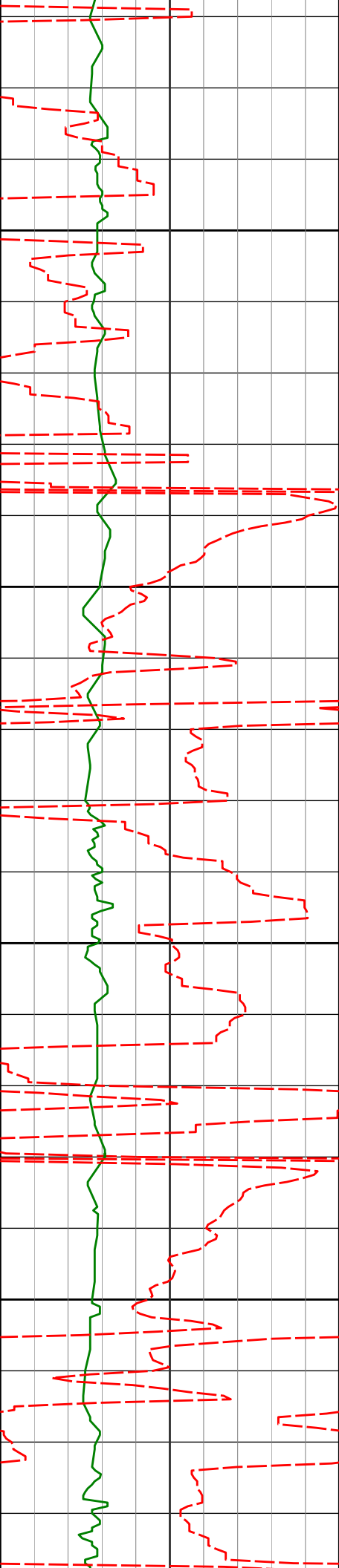
1091'

0.59°

198.72°

1090.97'

-2.23'



1184'

0.41°

221.43°

1183.97'

-2.51'

1200

1250

1275'

1.78°

232.14°

1274.95'

-3.69'

1300

1350

1368'

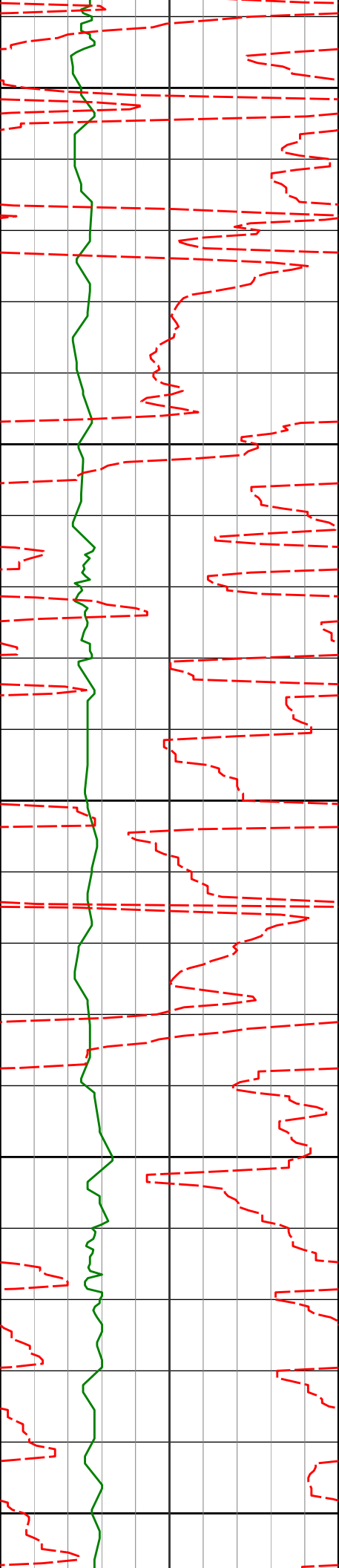
3.63°

253.75°

1367.84'

-7.41'





1400

1450

1500

1550

1600

1460'

6.51°

247.66°

1459.47'

-14.62'

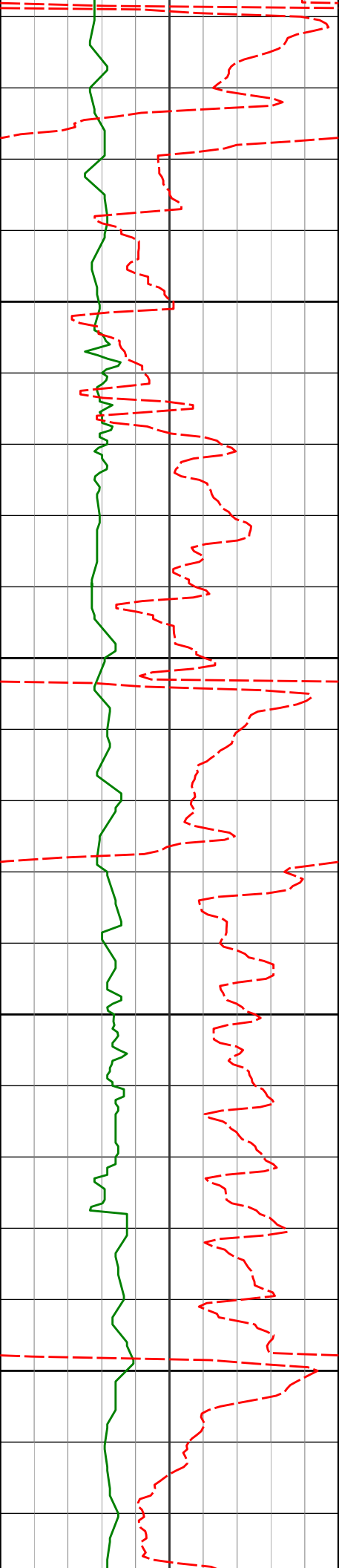
1555'

8.01°

239.73°

1553.71'

-24.55'



1650

1700

1750

1800

1650'

1745'

8.88°

7.86°

233.92°

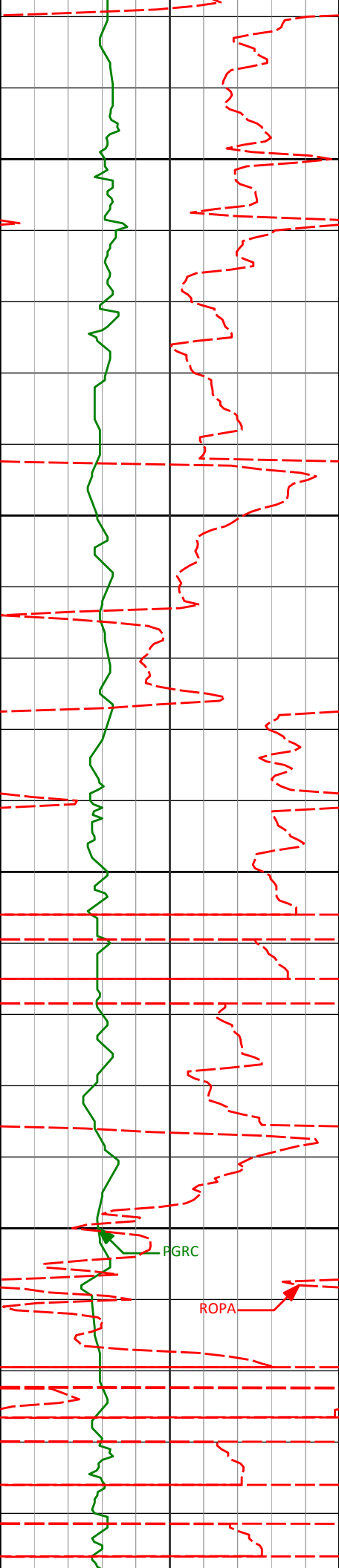
216.79°

1647.68'

1741.68'

-35.13'

-43.67'



1850

1900

1950

2000

FGRC

ROPA

1840'

7.54°

196.44°

1835.84'

-47.87'

1934'

9.93°

179.66°

1928.76'

-47.79'

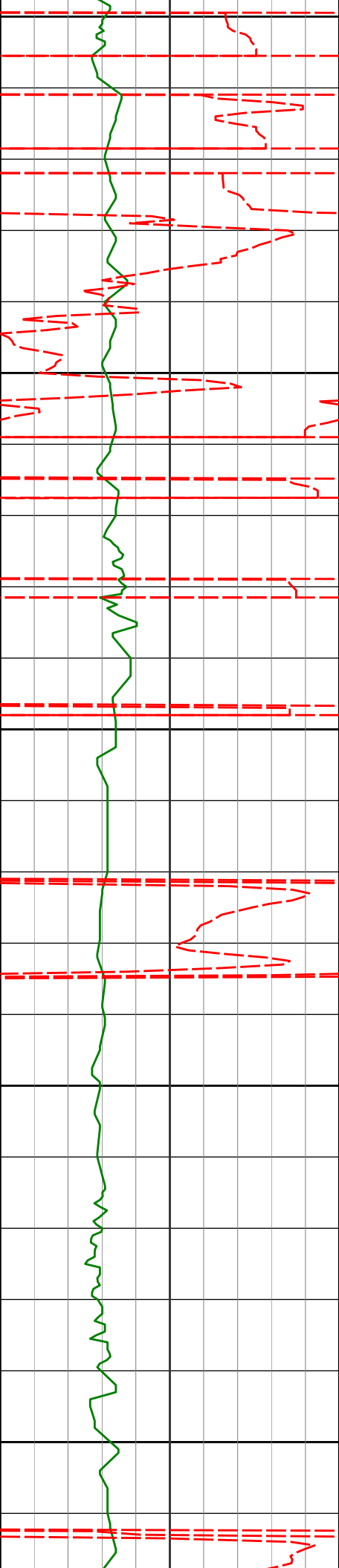
2029'

13.18°

181.07°

2021.82'

-45.54'



2050

2100

2150

2200

2250

2124'

14.32°

175.43°

2114.10'

-41.96'

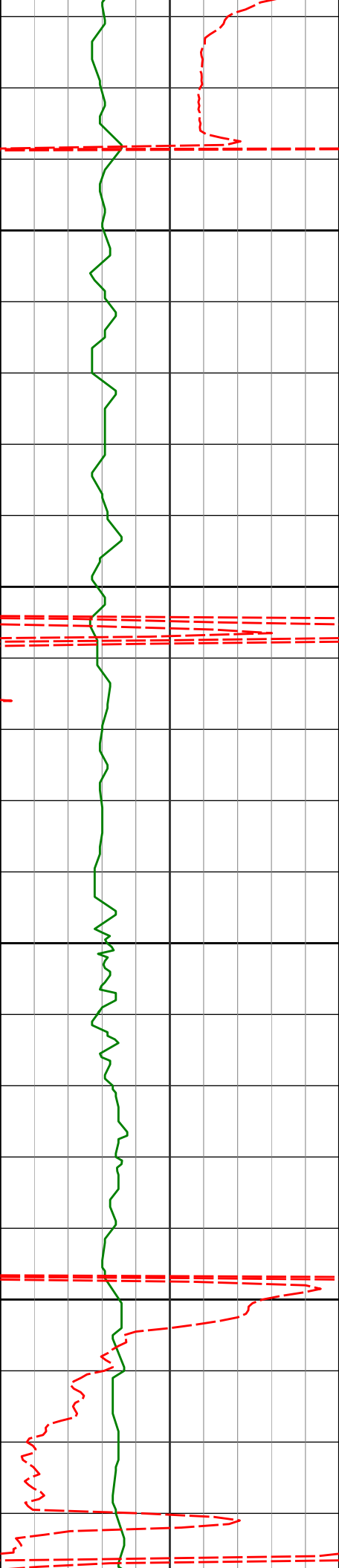
2219'

14.47°

176.47°

2206.12'

-37.34'



2300

2350

2400

2450

2314'

15.12°

185.22°

2297.98'

-34.68'

2408'

13.46°

181.94°

2389.07'

-33.23'

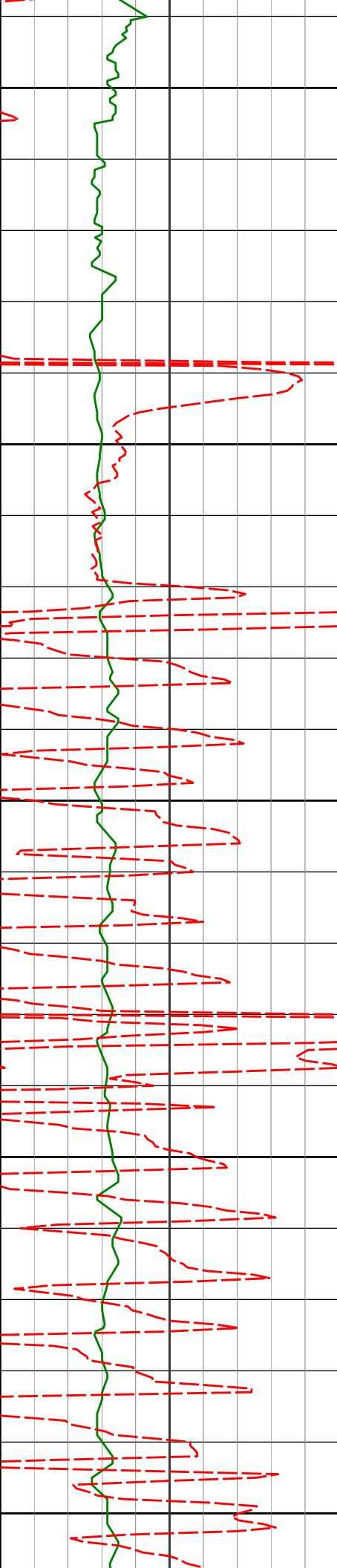
2503'

14.31°

186.43°

2481.30'

-32.04'



2500

2550

2600

2650

2700

2598'

16.78°

194.56°

2572.83'

-33.62'

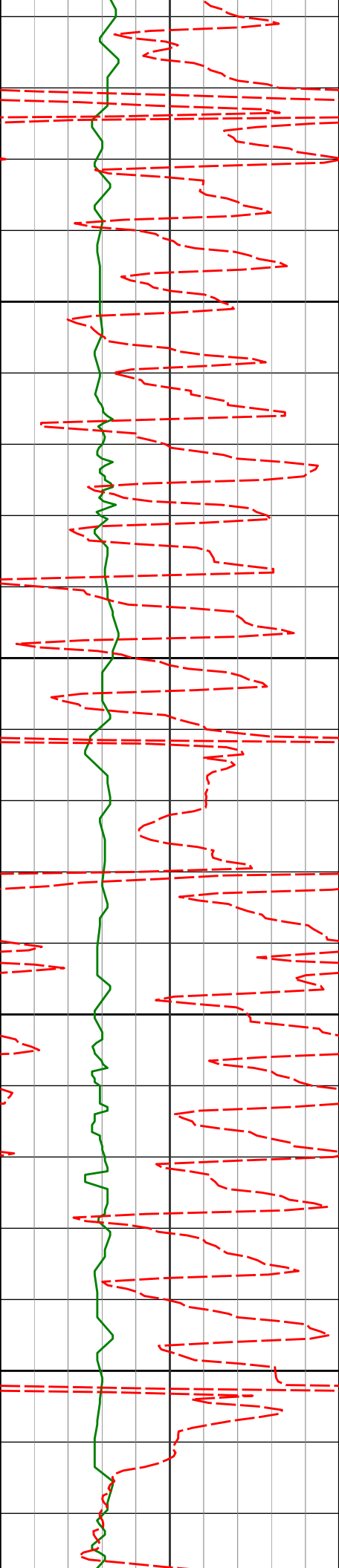
2693'

16.03°

195.29°

2663.96'

-37.20'



2750

2788'

15.23°

191.83°

2755.45'

-40.03'

2800

2882'

14.65°

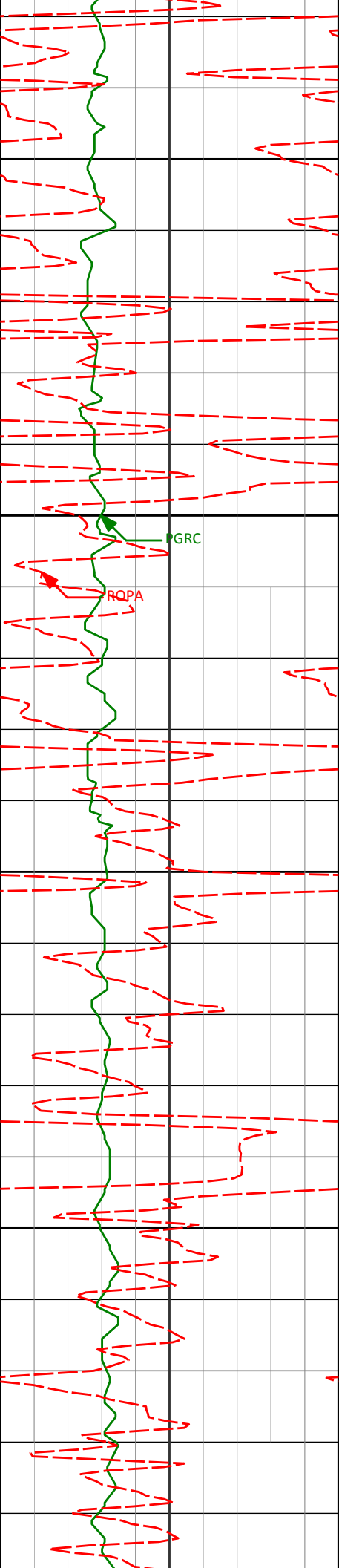
192.02°

2846.27'

-42.00'

2850

2900



2977'

16.19°

191.59°

2937.85'

-44.00'

2950

3000

GRC

RQPA

3072'

16.44°

191.01°

3029.02'

-45.89'

3050

3100

3167'

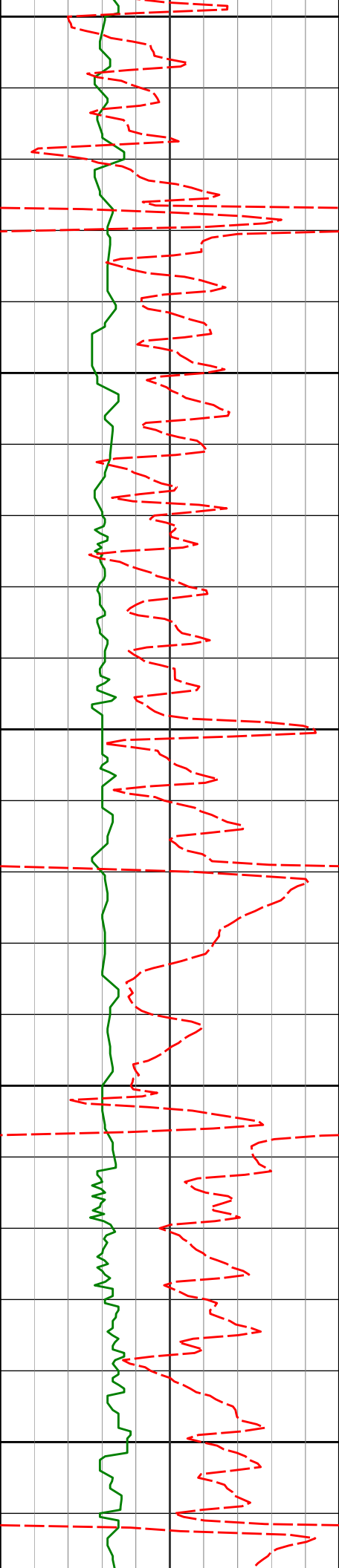
15.43°

190.84°

3120.37'

-47.56'





3150

3200

3250

3300

3350

3262'

13.52°

195.05°

3212.35'

-49.86'

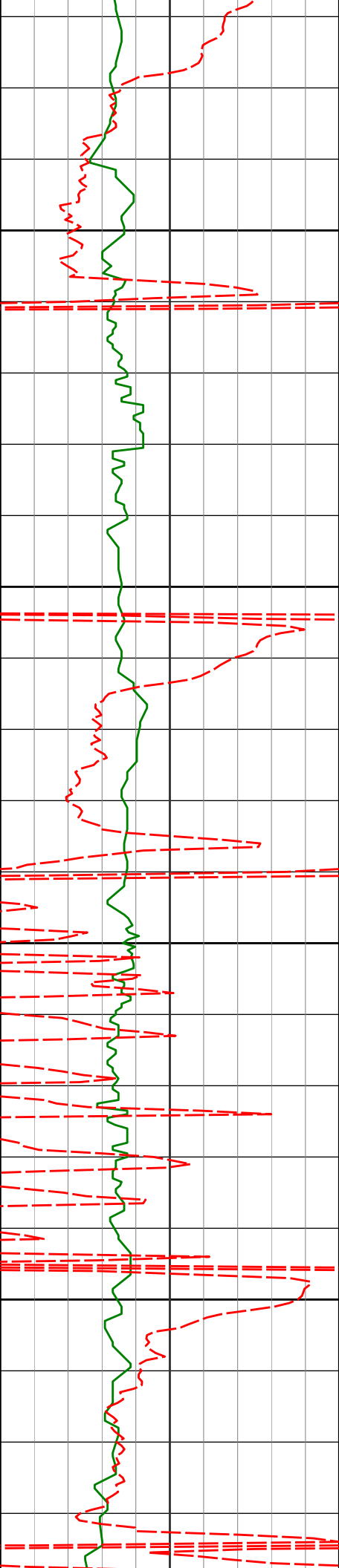
3357'

13.02°

188.10°

3304.82'

-51.53'



3400

3450

3500

3550

3451'

14.43°

190.71°

3396.14'

-52.39'

3546'

14.72°

188.44°

3488.08'

-53.35'

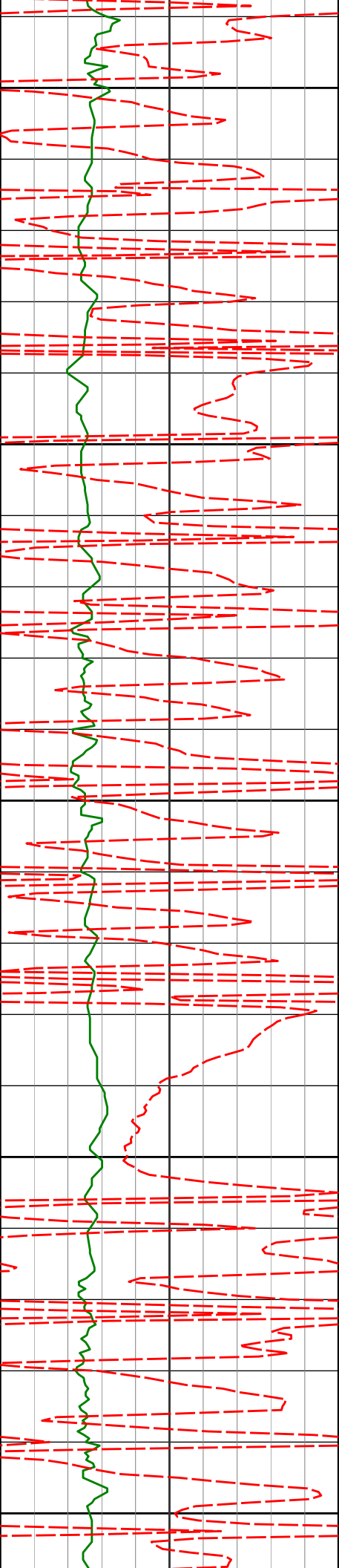
3641'

16.58°

188.31°

3579.55'

-53.86'



3600

3650

3700

3750

3800

3735'

17.43°

189.40°

3669.44'

-54.63'

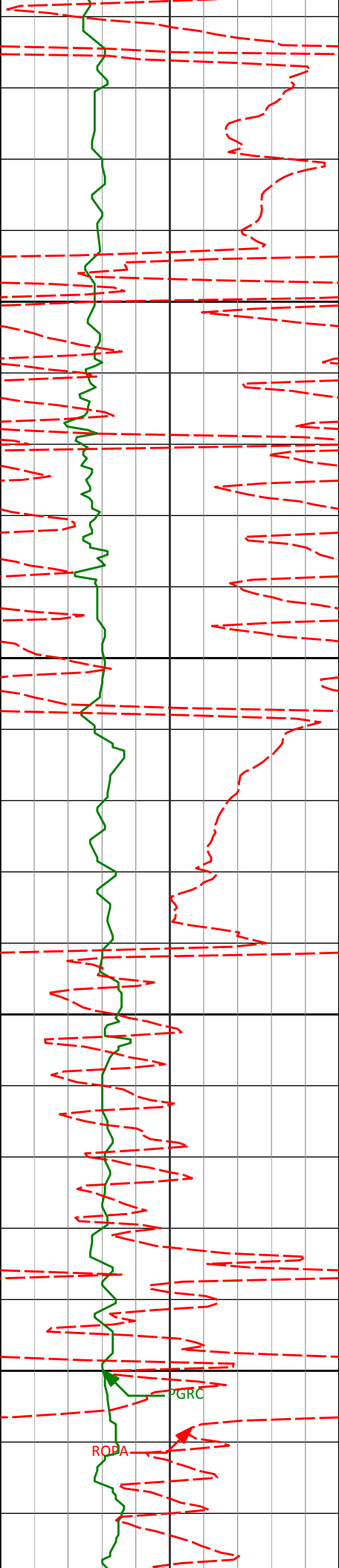
3830'

16.61°

187.40°

3760.28'

-55.20'



3850

3925'

15.75°

187.87°

3851.52'

-55.38'

3900

3950

4020'

13.68°

186.50°

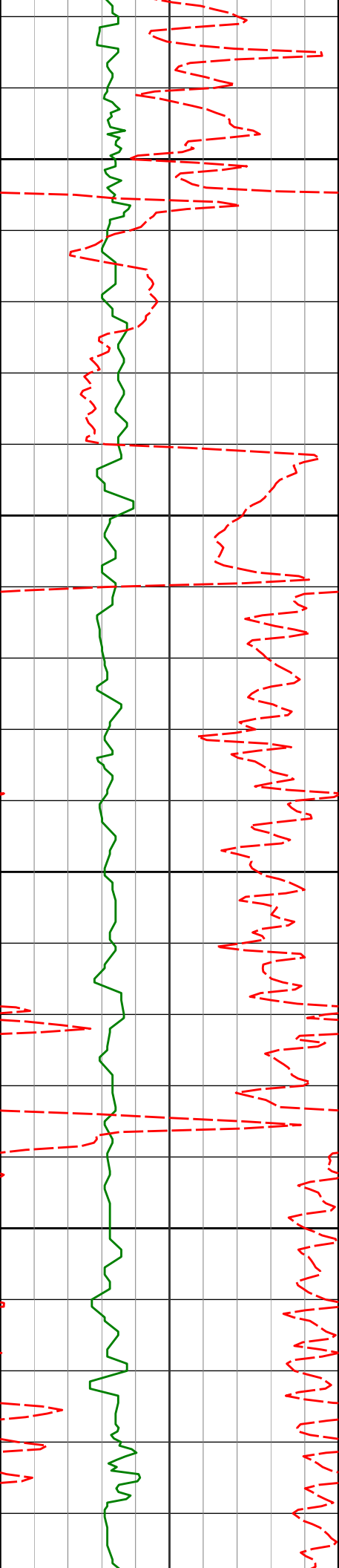
3943.40'

-55.37'

4000

PGR

RODA



4050

4100

4150

4200

4115'

13.27°

186.74°

4035.78'

-55.13'

4210'

11.48°

191.04°

4128.58'

-55.65'

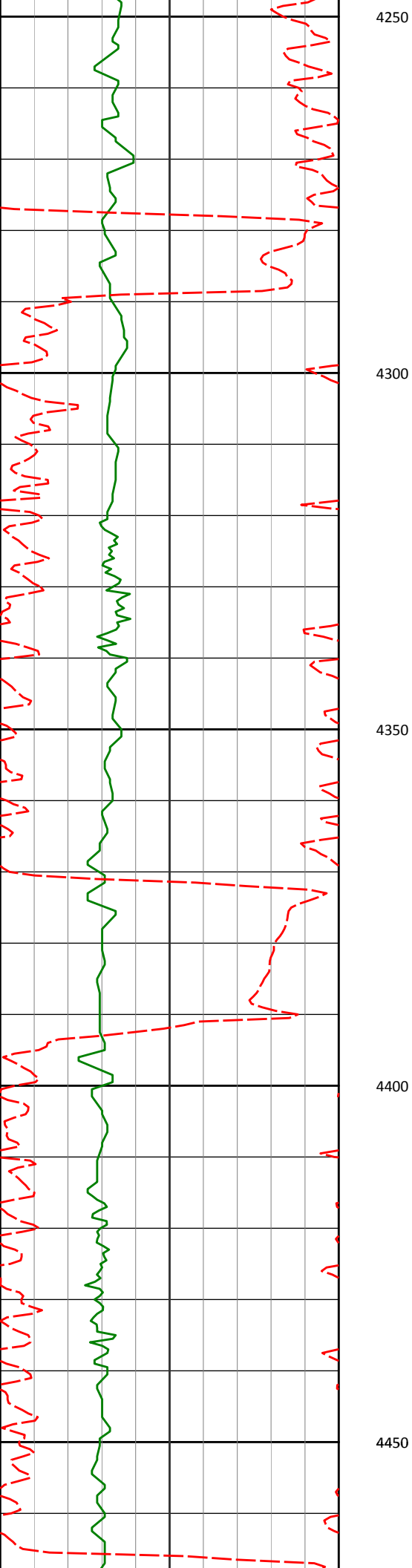
4305'

9.81°

192.47°

4221.94'

-57.01'



4400'

8.43°

184.05°

4315.74'

-57.36'

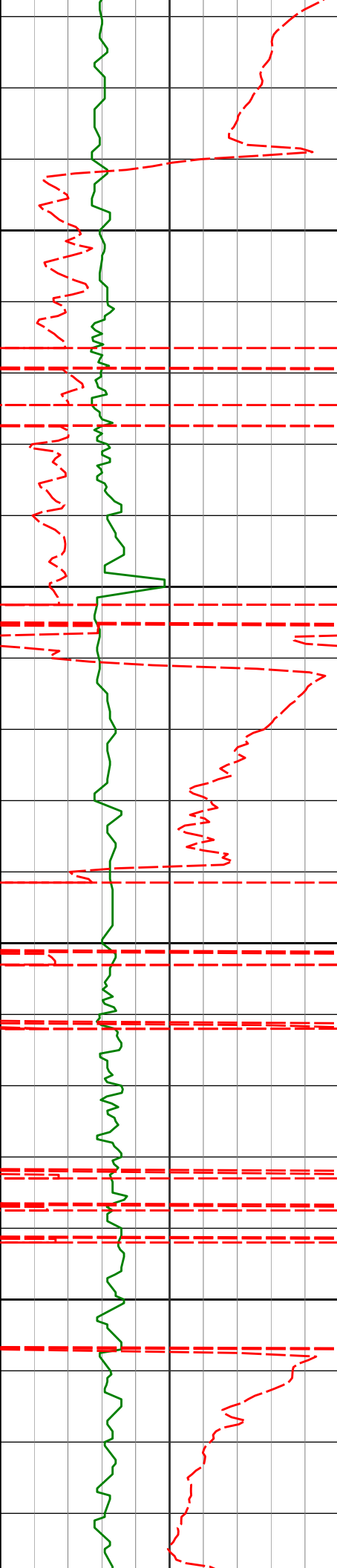
4494'

6.95°

191.55°

4408.89'

-57.40'



4500

4589'

5.22°

188.22°

4503.35'

-57.91'

4550

4600

4684'

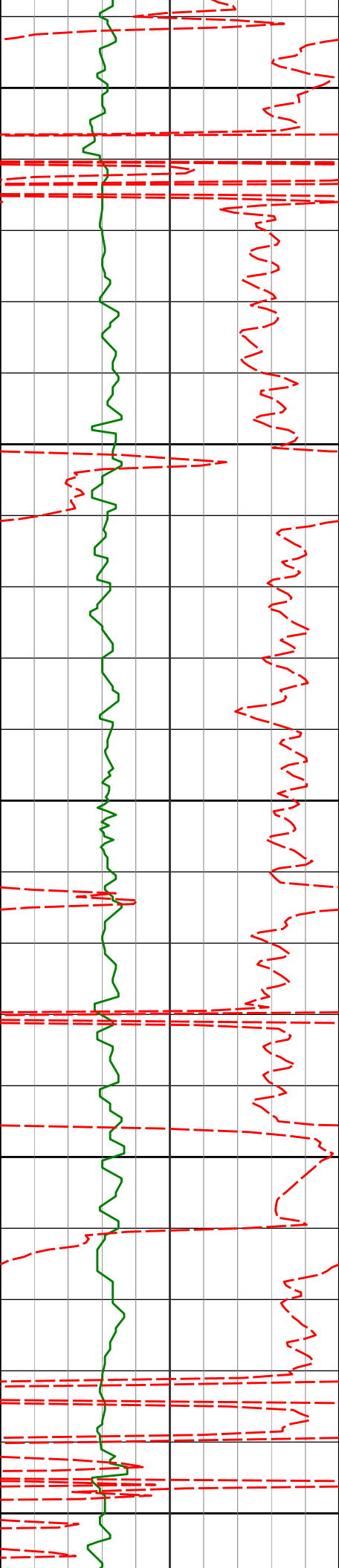
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188.99°

4598.10'

-58.06'

4650



4779'

0.84°

204.74°

4693.05'

-58.34'

4700

4750

4874'

1.47°

246.63°

4788.03'

-59.60'

4800

4850

4969'

1.09°

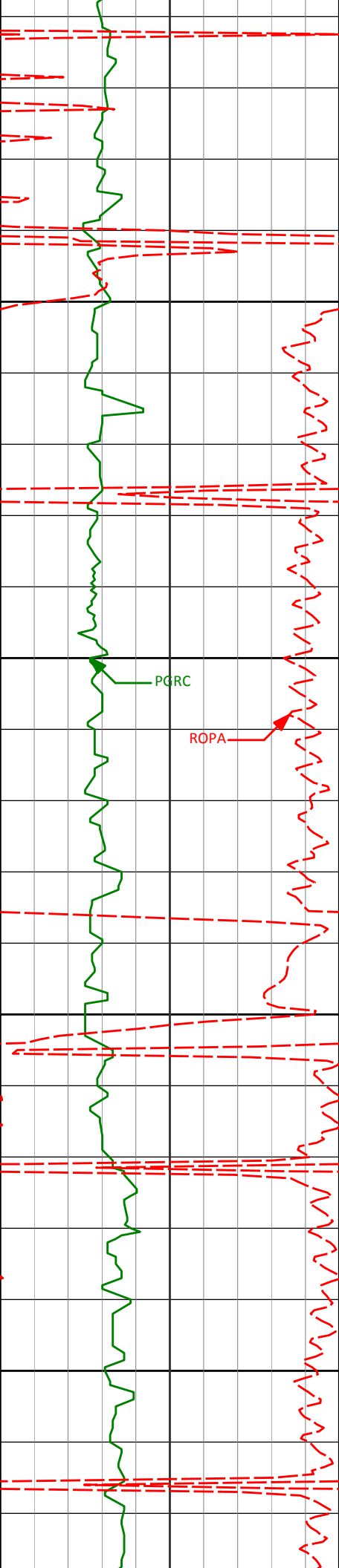
269.55°

4883.00'

-61.54'

4900





4950

5063'

1.16°

307.99°

4976.99'

-63.25'

5000

PGRC

ROPA

5050

5158'

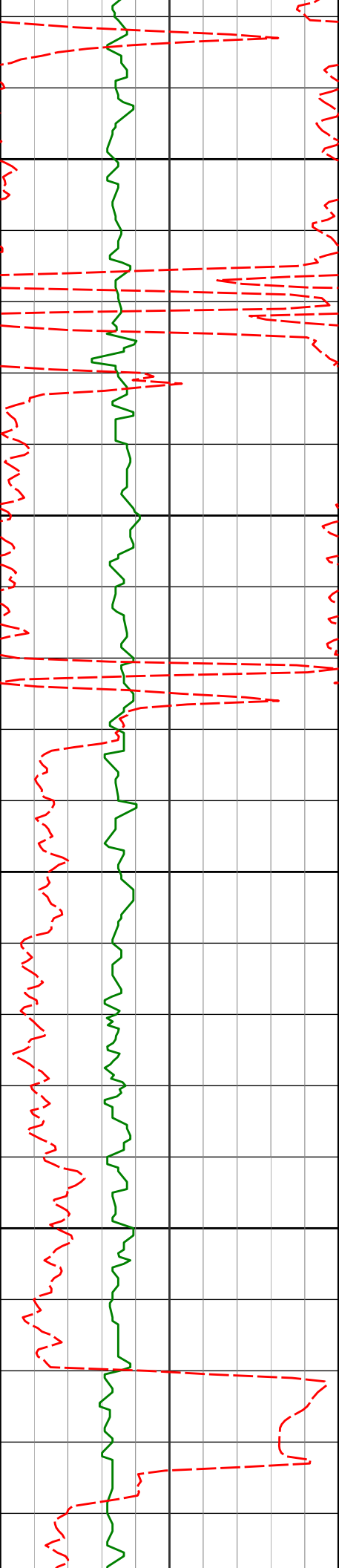
0.39°

343.33°

5071.98'

-64.20'

5100



5150

5253'

0.54°

26.66°

5166.98'

-64.19'

5200

5250

5348'

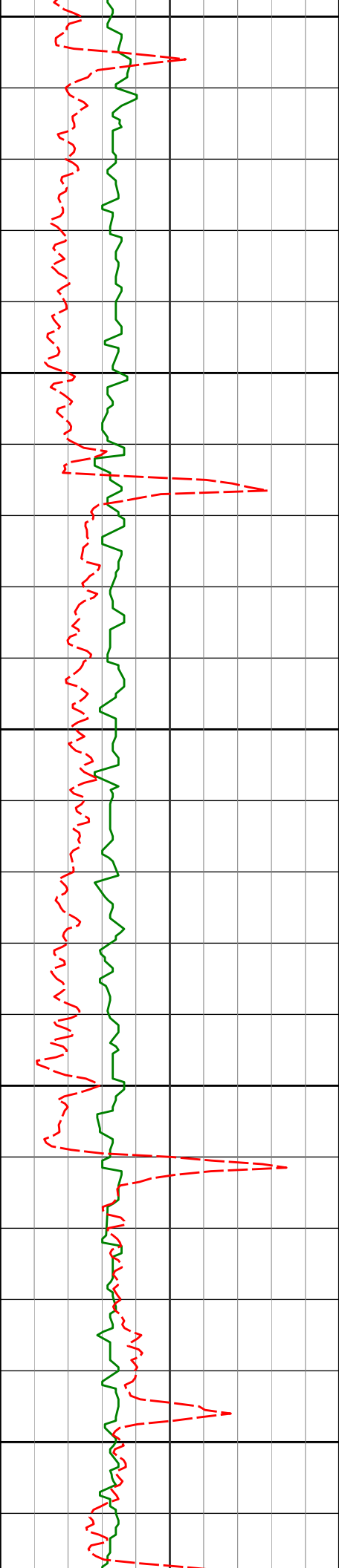
1.20°

17.03°

5261.96'

-63.87'

5300



5350

5443'

0.42°

214.55°

5356.96'

-63.86'

5400

5450

5537'

0.24°

11.21°

5450.96'

-64.00'

5500

5550

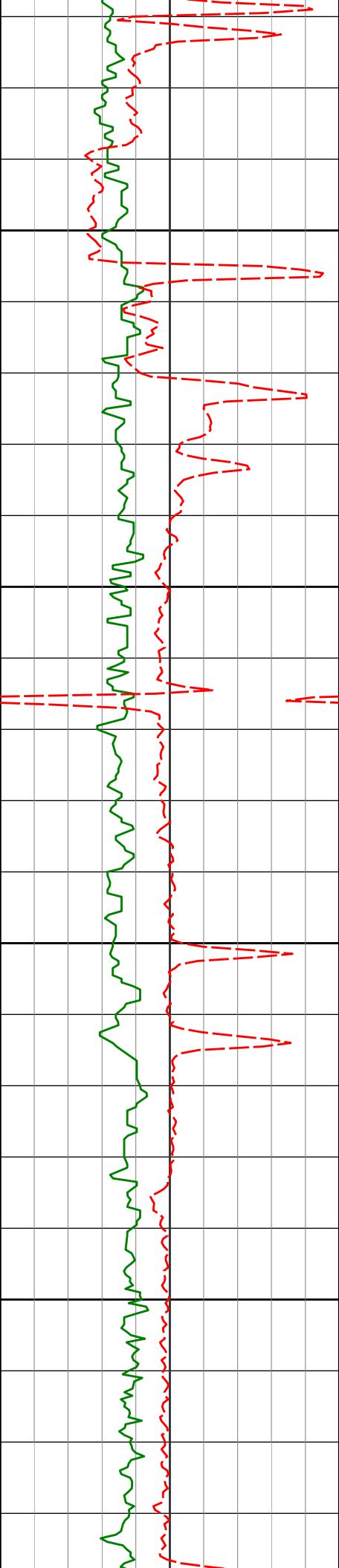
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0.74°

98.77°

5545.95'

-63.38'



5600

5727'

0.54°

51.05°

5640.95'

-62.45'

5650

5700

5820'

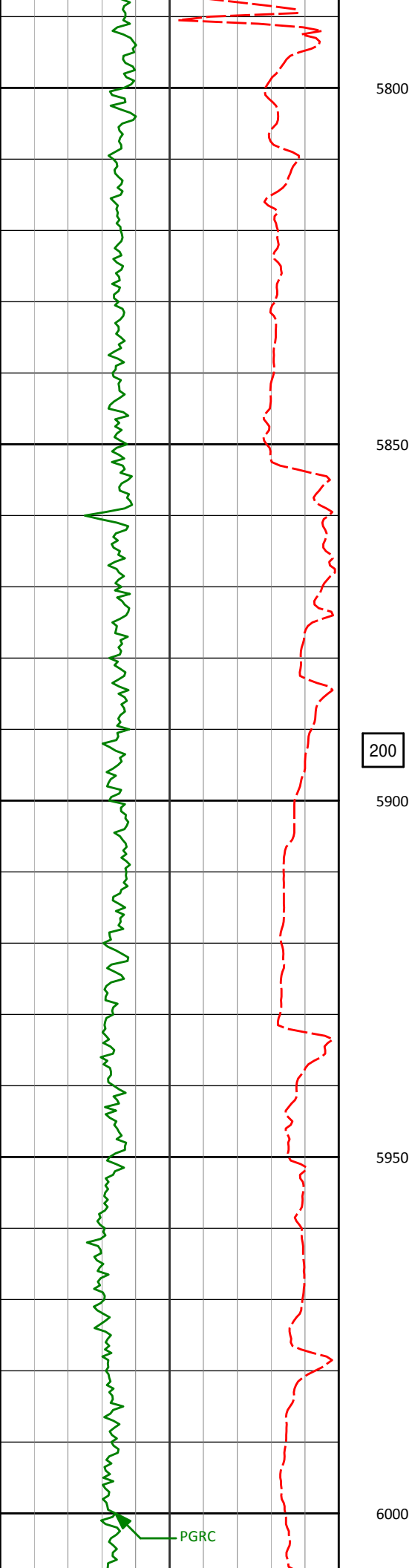
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103.08°

5733.94'

-61.63'

5750



5800

5916'

0.44°

81.10°

5829.94'

-60.73'

5850

5964'

3.42°

83.02°

5877.91'

-59.17'

5900

6011'

8.15°

82.97°

5924.66'

-54.58'

5950

6059'

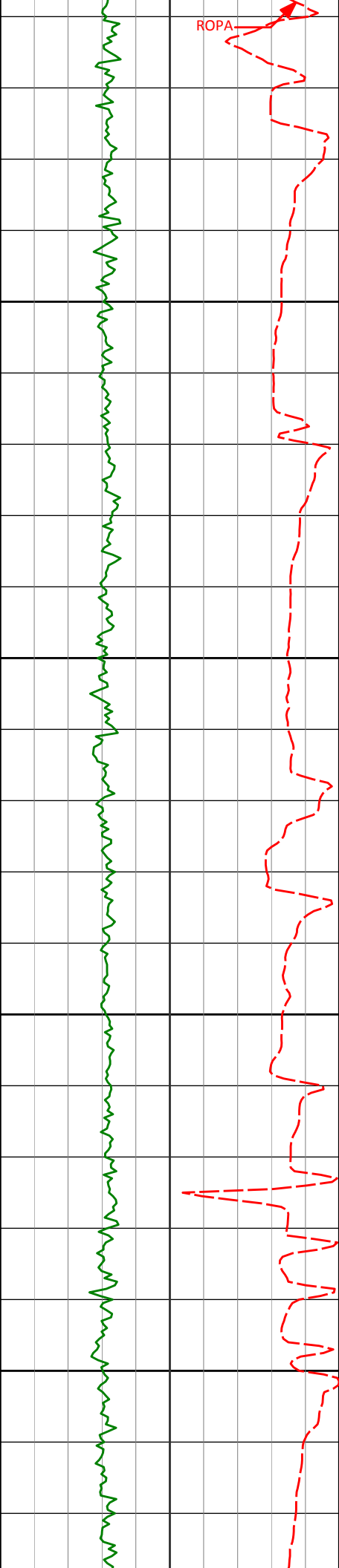
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85.90°

5972.03'

-47.05'

6000



6050

6100

6150

6200

6106'

12.63°

86.25°

6018.08'

-37.86'

6154'

16.16°

88.10°

6064.57'

-26.12'

6201'

19.13°

91.59°

6109.35'

-11.99'

6249'

21.18°

94.18°

6154.41'

4.50'

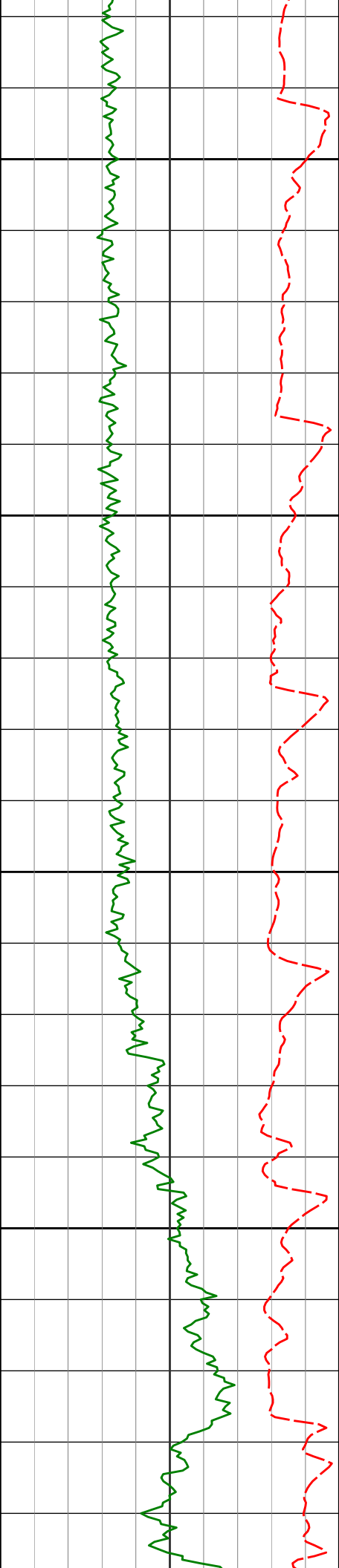
6296'

24.07°

90.16°

6197.79'

22.49'



6250

6344'

28.06°

85.16°

6240.91'

43.26'

6390'

32.31°

83.76°

6280.66'

65.80'

6300

6438'

36.90°

84.15°

6320.16'

92.32'

6350

6485'

41.50°

85.42°

6356.57'

121.32'

6400

6533'

46.69°

88.58°

6391.04'

154.18'

6580'

52.00°

90.38°

6421.65'

189.49'





# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

**Noble Energy**  
**Wells Ranch AE20-66HN**  
**Wattenburg**  
**Weld Colorado**  
**USA**  
**CA-XX-0900735963**

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
323.00	0.70	265.83	322.99	0.14 S	1.97 W	-1.93	0.22
569.00	0.30	54.43	568.99	0.12 N	2.94 W	-2.93	0.39
813.00	0.60	24.33	812.98	1.66 N	1.90 W	-2.09	0.15
936.00	0.60	210.43	935.98	1.69 N	1.96 W	-2.16	0.97
998.00	0.54	175.35	997.97	1.12 N	2.10 W	-2.22	0.56
1091.00	0.59	198.72	1090.97	0.23 N	2.22 W	-2.23	0.25
1184.00	0.41	221.43	1183.97	0.48 S	2.59 W	-2.51	0.28
1275.00	1.78	232.14	1274.95	1.59 S	3.92 W	-3.69	1.52
1368.00	3.63	253.75	1367.84	3.30 S	7.89 W	-7.41	2.24
1460.00	6.51	247.66	1459.47	6.10 S	15.51 W	-14.62	3.18
1555.00	8.01	239.73	1553.71	11.48 S	26.21 W	-24.55	1.90
1650.00	8.88	233.92	1647.68	19.13 S	37.85 W	-35.13	1.28
1745.00	7.86	216.79	1741.68	28.66 S	47.67 W	-43.67	2.82
1840.00	7.54	196.44	1835.84	39.84 S	53.33 W	-47.87	2.87
1934.00	9.93	179.66	1928.76	53.86 S	55.02 W	-47.79	3.69
2029.00	13.18	181.07	2021.82	72.89 S	55.18 W	-45.54	3.43
2124.00	14.32	175.43	2114.10	95.43 S	54.44 W	-41.96	1.85
2219.00	14.47	176.47	2206.12	118.99 S	52.78 W	-37.34	0.31
2314.00	15.12	185.22	2297.98	143.17 S	53.17 W	-34.68	2.45
2408.00	13.46	181.94	2389.07	166.32 S	54.66 W	-33.23	1.96
2503.00	14.31	186.43	2481.30	189.04 S	56.35 W	-32.04	1.44
2598.00	16.78	194.56	2572.83	213.98 S	61.11 W	-33.62	3.46
2693.00	16.03	195.29	2663.96	239.91 S	68.02 W	-37.20	0.82
2788.00	15.23	191.83	2755.45	264.77 S	74.03 W	-40.03	1.29
2882.00	14.65	192.02	2846.27	288.49 S	79.04 W	-42.00	0.62
2977.00	16.19	191.59	2937.85	313.21 S	84.20 W	-44.00	1.63
3072.00	16.44	191.01	3029.02	339.38 S	89.43 W	-45.89	0.31
3167.00	15.43	190.84	3120.37	364.99 S	94.38 W	-47.56	1.06
3262.00	13.52	195.05	3212.35	388.13 S	99.64 W	-49.86	2.29
3357.00	13.02	188.10	3304.82	409.45 S	104.03 W	-51.53	1.76
3451.00	14.43	190.71	3396.14	431.44 S	107.70 W	-52.39	1.64
3546.00	14.72	188.44	3488.08	455.01 S	111.67 W	-53.35	0.67
3641.00	16.58	188.31	3579.55	480.36 S	115.40 W	-53.86	1.96
3735.00	17.43	189.40	3669.44	507.53 S	119.64 W	-54.63	0.97
3830.00	16.61	187.40	3760.28	535.03 S	123.71 W	-55.20	1.06
3925.00	15.75	187.87	3851.52	561.27 S	127.22 W	-55.38	0.92
4020.00	13.68	186.50	3943.40	585.20 S	130.26 W	-55.37	2.21
4115.00	13.27	186.74	4035.78	607.19 S	132.81 W	-55.13	0.44
4210.00	11.48	191.04	4128.58	627.30 S	135.90 W	-55.65	2.12
4305.00	9.81	192.47	4221.94	644.48 S	139.46 W	-57.01	1.78
4400.00	8.43	184.05	4315.74	659.33 S	141.70 W	-57.36	2.02
4494.00	6.95	191.55	4408.89	671.78 S	143.33 W	-57.40	1.90
4589.00	5.22	188.22	4503.35	681.69 S	145.10 W	-57.91	1.86
4684.00	3.00	188.99	4598.10	688.42 S	146.10 W	-58.06	2.34
4779.00	0.84	204.74	4693.05	691.51 S	146.78 W	-58.34	2.32
4874.00	1.47	246.63	4788.03	692.62 S	148.19 W	-59.60	1.07
4969.00	1.09	269.55	4883.00	693.11 S	150.21 W	-61.54	0.66
5063.00	1.16	307.99	4976.99	692.54 S	151.86 W	-63.25	0.79
5158.00	0.39	343.33	5071.98	691.63 S	152.71 W	-64.20	0.92
5253.00	0.54	26.66	5166.98	690.92 S	152.60 W	-64.19	0.39
5348.00	1.20	17.03	5261.96	689.57 S	152.11 W	-63.87	0.71

<b>5443.00</b>	<b>0.42</b>	<b>214.55</b>	<b>5356.96</b>	<b>688.91 S</b>	<b>152.01 W</b>	<b>-63.86</b>	<b>1.69</b>
<b>5537.00</b>	<b>0.24</b>	<b>11.21</b>	<b>5450.96</b>	<b>689.00 S</b>	<b>152.17 W</b>	<b>-64.00</b>	<b>0.69</b>
<b>5632.00</b>	<b>0.74</b>	<b>98.77</b>	<b>5545.95</b>	<b>688.90 S</b>	<b>151.53 W</b>	<b>-63.38</b>	<b>0.81</b>
<b>5727.00</b>	<b>0.54</b>	<b>51.05</b>	<b>5640.95</b>	<b>688.71 S</b>	<b>150.57 W</b>	<b>-62.45</b>	<b>0.58</b>
<b>5820.00</b>	<b>0.65</b>	<b>103.08</b>	<b>5733.94</b>	<b>688.55 S</b>	<b>149.72 W</b>	<b>-61.63</b>	<b>0.57</b>
<b>5916.00</b>	<b>0.44</b>	<b>81.10</b>	<b>5829.94</b>	<b>688.62 S</b>	<b>148.82 W</b>	<b>-60.73</b>	<b>0.30</b>
<b>5964.00</b>	<b>3.42</b>	<b>83.02</b>	<b>5877.91</b>	<b>688.42 S</b>	<b>147.22 W</b>	<b>-59.17</b>	<b>6.21</b>
<b>6011.00</b>	<b>8.15</b>	<b>82.97</b>	<b>5924.66</b>	<b>687.84 S</b>	<b>142.52 W</b>	<b>-54.58</b>	<b>10.06</b>
<b>6059.00</b>	<b>10.35</b>	<b>85.90</b>	<b>5972.03</b>	<b>687.11 S</b>	<b>134.84 W</b>	<b>-47.05</b>	<b>4.69</b>
<b>6106.00</b>	<b>12.63</b>	<b>86.25</b>	<b>6018.08</b>	<b>686.48 S</b>	<b>125.50 W</b>	<b>-37.86</b>	<b>4.85</b>
<b>6154.00</b>	<b>16.16</b>	<b>88.10</b>	<b>6064.57</b>	<b>685.91 S</b>	<b>113.58 W</b>	<b>-26.12</b>	<b>7.42</b>
<b>6201.00</b>	<b>19.13</b>	<b>91.59</b>	<b>6109.35</b>	<b>685.91 S</b>	<b>99.35 W</b>	<b>-11.99</b>	<b>6.71</b>
<b>6249.00</b>	<b>21.18</b>	<b>94.18</b>	<b>6154.41</b>	<b>686.76 S</b>	<b>82.83 W</b>	<b>4.50</b>	<b>4.66</b>
<b>6296.00</b>	<b>24.07</b>	<b>90.16</b>	<b>6197.79</b>	<b>687.40 S</b>	<b>64.78 W</b>	<b>22.49</b>	<b>6.97</b>
<b>6344.00</b>	<b>28.06</b>	<b>85.16</b>	<b>6240.91</b>	<b>686.48 S</b>	<b>43.73 W</b>	<b>43.26</b>	<b>9.48</b>
<b>6390.00</b>	<b>32.31</b>	<b>83.76</b>	<b>6280.66</b>	<b>684.23 S</b>	<b>20.72 W</b>	<b>65.80</b>	<b>9.36</b>
<b>6438.00</b>	<b>36.90</b>	<b>84.15</b>	<b>6320.16</b>	<b>681.36 S</b>	<b>6.39 E</b>	<b>92.32</b>	<b>9.57</b>
<b>6485.00</b>	<b>41.50</b>	<b>85.42</b>	<b>6356.57</b>	<b>678.68 S</b>	<b>35.96 E</b>	<b>121.32</b>	<b>9.93</b>
<b>6533.00</b>	<b>46.69</b>	<b>88.58</b>	<b>6391.04</b>	<b>676.98 S</b>	<b>69.30 E</b>	<b>154.18</b>	<b>11.74</b>
<b>6580.00</b>	<b>52.00</b>	<b>90.38</b>	<b>6421.65</b>	<b>676.68 S</b>	<b>104.94 E</b>	<b>189.49</b>	<b>11.66</b>
<b>6628.00</b>	<b>56.95</b>	<b>91.03</b>	<b>6449.53</b>	<b>677.16 S</b>	<b>143.99 E</b>	<b>228.29</b>	<b>10.37</b>
<b>6675.00</b>	<b>61.76</b>	<b>90.85</b>	<b>6473.48</b>	<b>677.82 S</b>	<b>184.41 E</b>	<b>268.47</b>	<b>10.24</b>
<b>6723.00</b>	<b>66.11</b>	<b>90.01</b>	<b>6494.57</b>	<b>678.14 S</b>	<b>227.51 E</b>	<b>311.27</b>	<b>9.20</b>
<b>6770.00</b>	<b>69.12</b>	<b>90.06</b>	<b>6512.47</b>	<b>678.17 S</b>	<b>270.97 E</b>	<b>354.38</b>	<b>6.41</b>
<b>6818.00</b>	<b>73.02</b>	<b>89.05</b>	<b>6528.04</b>	<b>677.81 S</b>	<b>316.36 E</b>	<b>399.37</b>	<b>8.37</b>
<b>6864.00</b>	<b>76.49</b>	<b>88.61</b>	<b>6540.13</b>	<b>676.90 S</b>	<b>360.72 E</b>	<b>443.26</b>	<b>7.60</b>
<b>6912.00</b>	<b>79.28</b>	<b>88.43</b>	<b>6550.20</b>	<b>675.69 S</b>	<b>407.63 E</b>	<b>489.65</b>	<b>5.82</b>
<b>6955.00</b>	<b>82.21</b>	<b>88.04</b>	<b>6557.12</b>	<b>674.38 S</b>	<b>450.05 E</b>	<b>531.56</b>	<b>6.87</b>

# **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 97.25 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 6955.00 FEET  
IS 810.76 FEET ALONG 146.28 DEGREES (GRID)**

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

**Depth 323 Inc 0.70 Azi 265.83**

**Depth 569 Inc 0.30 Azi 54.53**

**Depth 813 Inc 0.60 Azi 24.33**

**Depth 936 Inc 0.60 Azi 210.43**

**Tied in @ Surface**

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