

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



**1 : 240**

Country	: USA													
Field	: Watenburg													
Location	: Lat: 40° 11' 24.68" North Long: 104° 41' 0.80" West													
Well	: RW 1N-5HZ													
Company	: Anadarko Petroleum Corp													
Rig	: Precision 464													
<table border="1"> <tr> <td>Company</td> <td>: Anadarko Petroleum Corp</td> </tr> <tr> <td>Rig</td> <td>: Precision 464</td> </tr> <tr> <td>Well</td> <td>: RW 1N-5HZ</td> </tr> <tr> <td>Field</td> <td>: Watenburg</td> </tr> <tr> <td>Country</td> <td>: USA</td> </tr> <tr> <td>API Number</td> <td>: 05-123-44751</td> </tr> </table>		Company	: Anadarko Petroleum Corp	Rig	: Precision 464	Well	: RW 1N-5HZ	Field	: Watenburg	Country	: USA	API Number	: 05-123-44751	
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Longitude	: 104° 41' 0.80" West													
UTM Easting	= 1,728,791.108 usft													
UTM Northing	= 14,596,147.970 usft													

Permanent Datum	: Ground Level	Elevation	: 4869.00 ft
Log Measured From	: Drill Floor	21.00 ft Above Permanent Datum	
Drilling Measured From	: Drill Floor		

**MD LOG**

Depth Logged	: 1,863.00 ft To 13,666.00 ft	Unit No.	: 11852261	Job No.	: CA-XX-0904218782
Date Logged	: 14-Sep-17 To 15-Sep-17	Plot Type	: Final		
Total Depth MD	: 13,666.00 ft TWD: 7,012.10 ft	Plot Date	: 22-Sep-17		

Run No.	Borehole Record (MD)		Run No.	Borehole Record (MD)	
	Size	From To		Size	From To
2	7.875 in	1,863.00 ft 13,666.00 ft			
			Casing Record (MD)		
			Size	Weight	From To
			9.675 in	36.00 lb/ft	SURFACE 1,852.00 ft

**WELL INFORMATION**

MWD Run Number	100
Date run completed	17-Sep-17
Rig Bit Number	2
Bit Size (in)	7.875
Tool Nominal OD (in)	6.750
Log Start Depth (MD, ft)	1,863.00
Log End Depth (MD, ft)	13,666.00
Drill or Wipe	Drill
Drill/Wipe Start Date and Time	15-Sep-17 09:00
Drill/Wipe End Date and Time	17-Sep-17 17:30
Min Inc (deg) @ Depth (MD, ft)	0.48 @ 6,440.00
Max Inc (deg) @ Depth (MD, ft)	92.53 @ 11,909.00
Bit TFA(in2) / Bit Type	1.05 / PDC
Flow Rate (gpm)	581.90
Max AV (fpm) / CV (fpm) @ MWD	N/A
Fluid Type	Diesel Mud Base
Density (ppg) / Viscosity (spqt)	9.30 / 59.00
Filtrate CL (ppm)	17,000.00
pH / API Filtrate (mptm)	N/A / 4
PV (cP) / YP (lhf2)	20 / 10.00
% Solids / % Sand	10.00 / .01
% Oil / Oil:Water Ratio	77.00 / 3:1
Rm @ Measured Temp (degF)	N/A @ N/A
Rmf @ Measured Temp (degF)	N/A @ N/A
Rmc @ Measured Temp (degF)	N/A @ N/A

Max Tool Temp (degF) / Source	250.56 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 250.56				
Lead MWD Engineer	Brian Neu				
Customer Representative	Luke Rains				

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	12004211				
Insert Serial Number	11227490				
Date and Time Initialized	15-Sep-17 03:30				
Date and Time Read	18-Sep-17 00:04				
ECMB SW Version	N/A				

### Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	45.00				
Software Version	6.33				
Sub Serial Number	12004211				
Sonde Serial Number	12174344				
Sensor ID Number	N/A				
Toolface Offset (deg)	230.40				

### Gamma Ray Sensor Information

Tool Type	PCGK				
Distance From Bit (ft)	48.25				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	12004211				
Insert/Sonde Serial Number	11680954				

## REMARKS

1. All depths are measured depths, referenced to the Driller's pipe tally and are measured from the drill floor, unless otherwise specified.

2. No depth corrections have been made for pipe stretch or compression.

3. All data presented is recorded data unless otherwise specified.

4. The following smoothing parameters have been applied to the data:

PGRC (Gamma Ray Corrected):

Interval Resolution: 0.5ft

Interval Distance: 0.6ft

Gap Fill: 3.0ft

ROPA (Average Rate of Penetration):

Interval Resolution: 0.5ft

Interval Distance: 1.2ft

Gap Fill: 3.0ft

5. Gaps in gamma due to high rop at connection.

6. Gap in gamma due to computer depth tracking error.

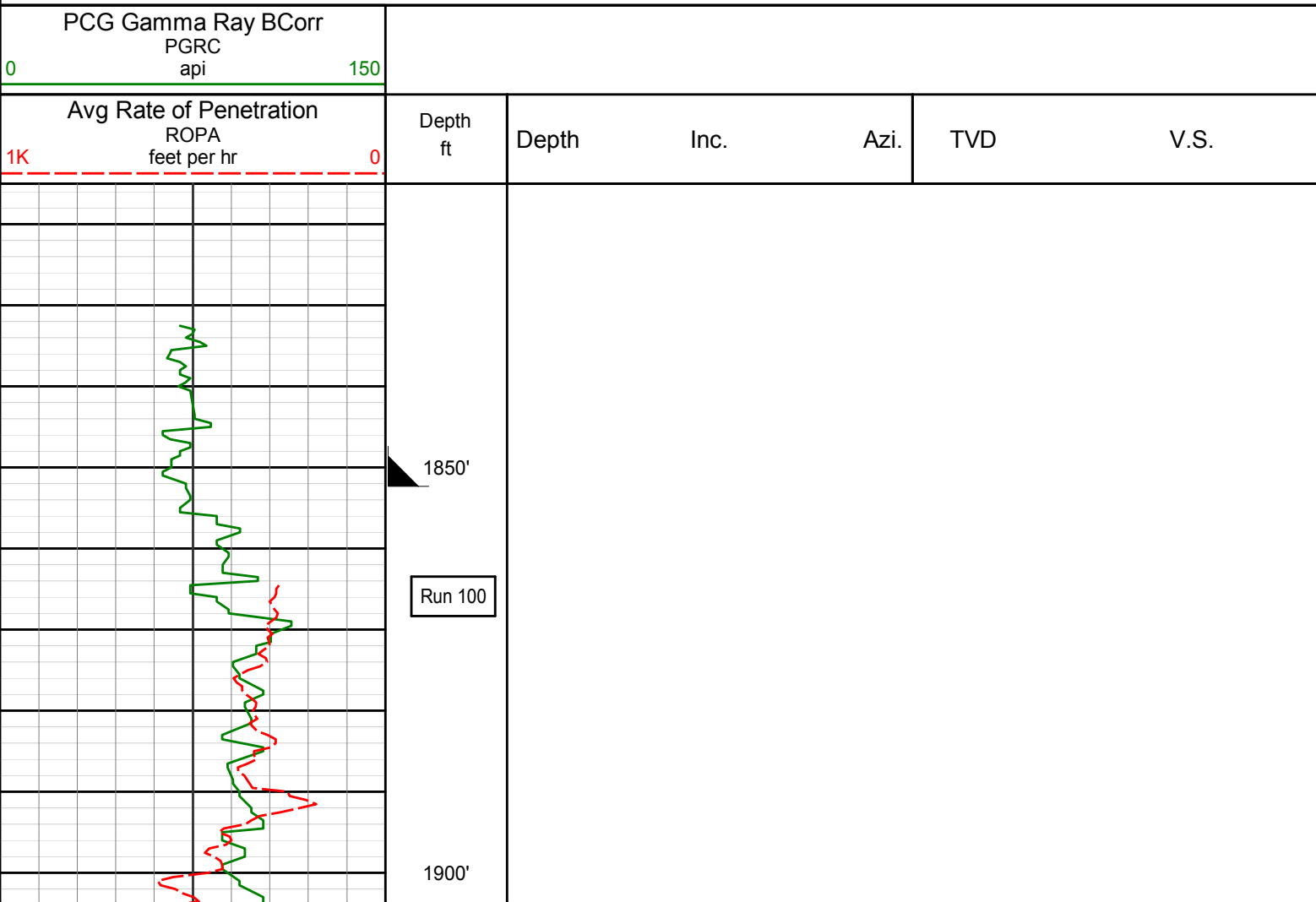
7. wipe data from 10533-10552'MD.

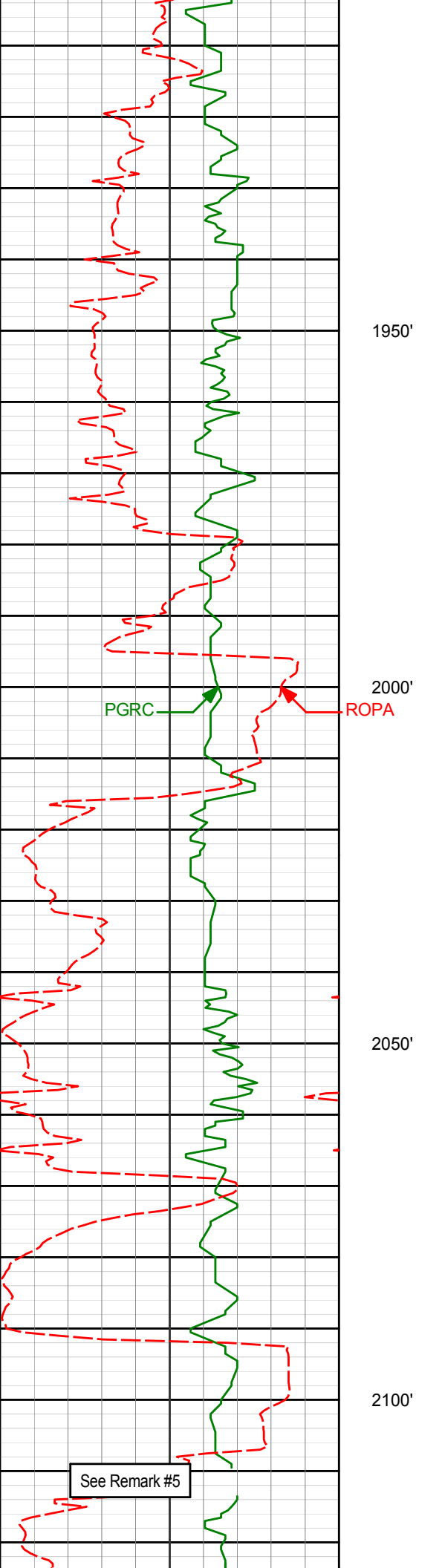
8. wipe data from 10605-10610'MD

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# Detail Log 1:240





1934'      8.74°      36.09°      1904.83'      -232.32'

1950'

2000'

PGRC

ROPA

2023'      10.61°      43.45°      1992.56'      -243.83'

2050'

2100'

See Remark #5

2113'      12.16°      35.58°      2080.80'      -257.67'



2150'

2200'

2250'

2300'

2202'

12.69°

37.29°

2167.71'

-273.18'

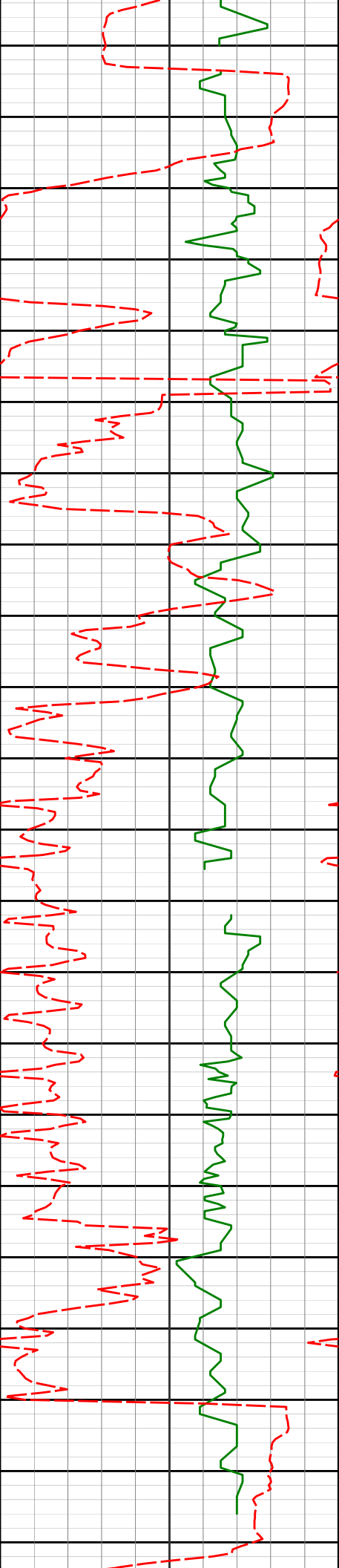
2291'

14.02°

37.19°

2254.30'

-289.66'



2350'

2381'

14.51°

38.79°

2341.53'

-307.27'

2400'

2450'

2471'

13.33°

36.14°

2428.88'

-324.57'

2500'

2550'

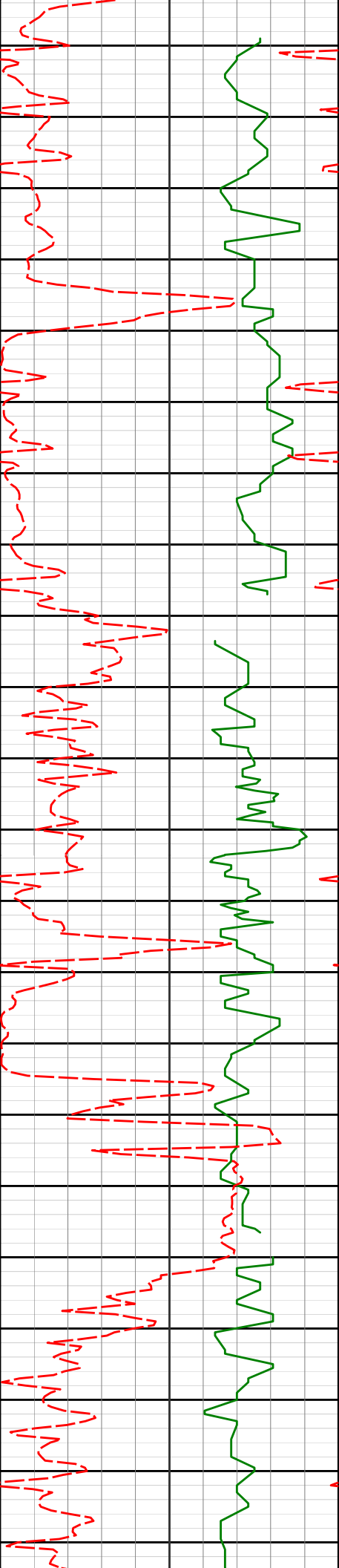
2560'

14.72°

44.18°

2515.24'

-341.10'



2600'

2650'

2700'

2750'

2650'

13.21°

40.47°

2602.58'

-357.27'

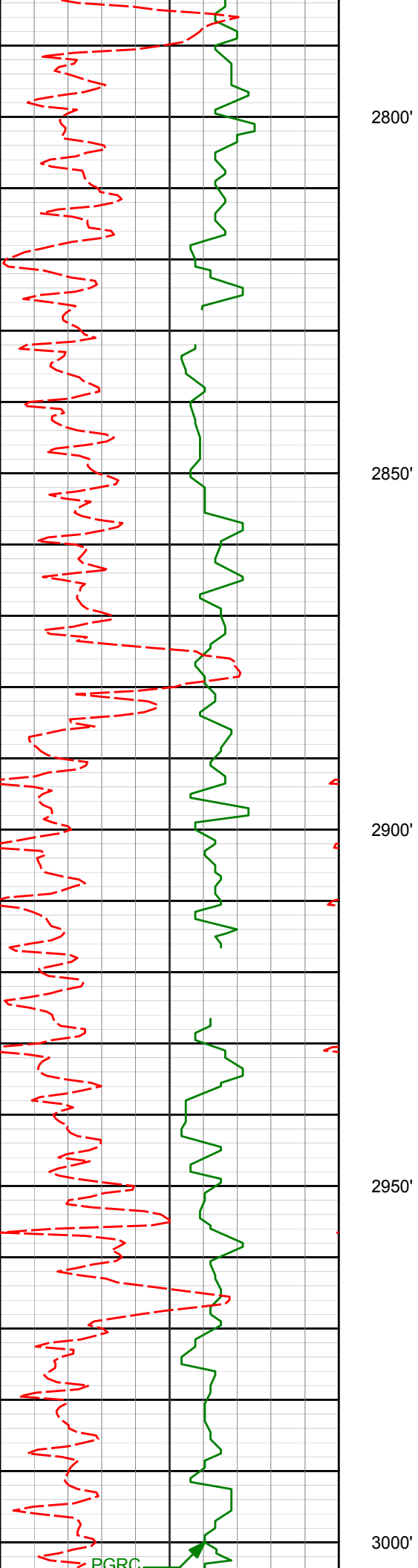
2739'

15.22°

42.57°

2688.85'

-373.75'



2829'

15.06°

41.05°

2775.73'

-391.42'

2800'

2850'

2900'

2918'

14.71°

40.92°

2861.74'

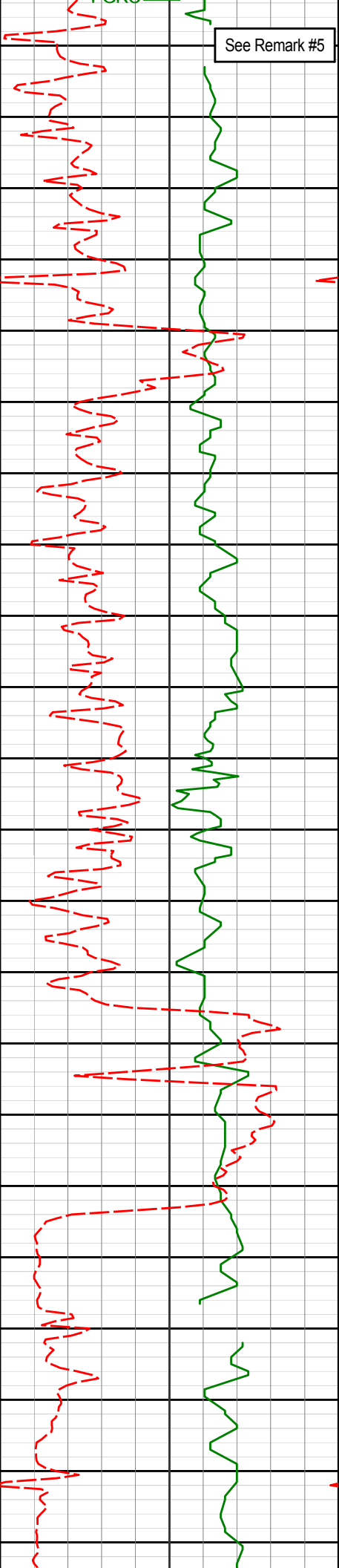
-408.83'

2950'

3000'

PGRC





See Remark #5

3008'

14.06°

39.18°

2948.92'

-426.08'

3050'

3100'

3097'

13.67°

37.54°

3035.33'

-442.93'

3150'

3200'

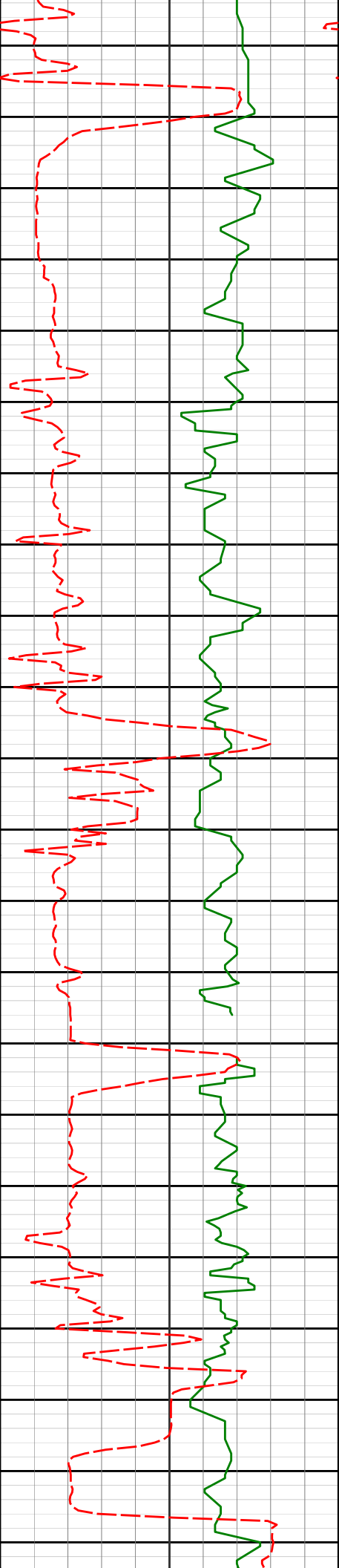
3187'

15.89°

37.21°

3122.34'

-461.31'



3250'

3277'

14.07°

32.38°

3209.28'

-480.50'

3300'

3350'

3366'

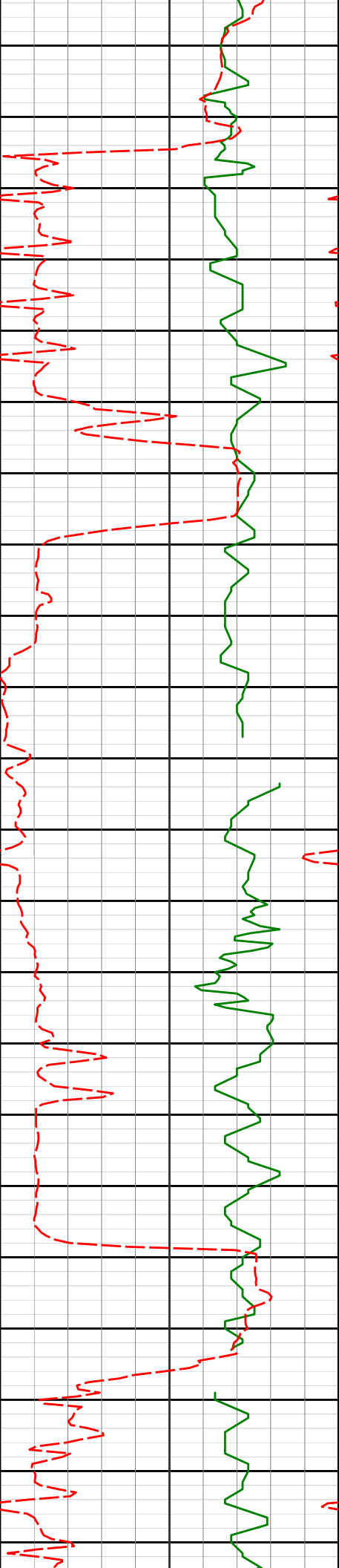
13.01°

30.66°

3295.81'

-498.36'

3400'



3450'

3456'

14.68°

44.36°

3383.22'

-515.35'

3500'

3550'

3546'

13.21°

40.05°

3470.57'

-531.52'

3600'

3650'

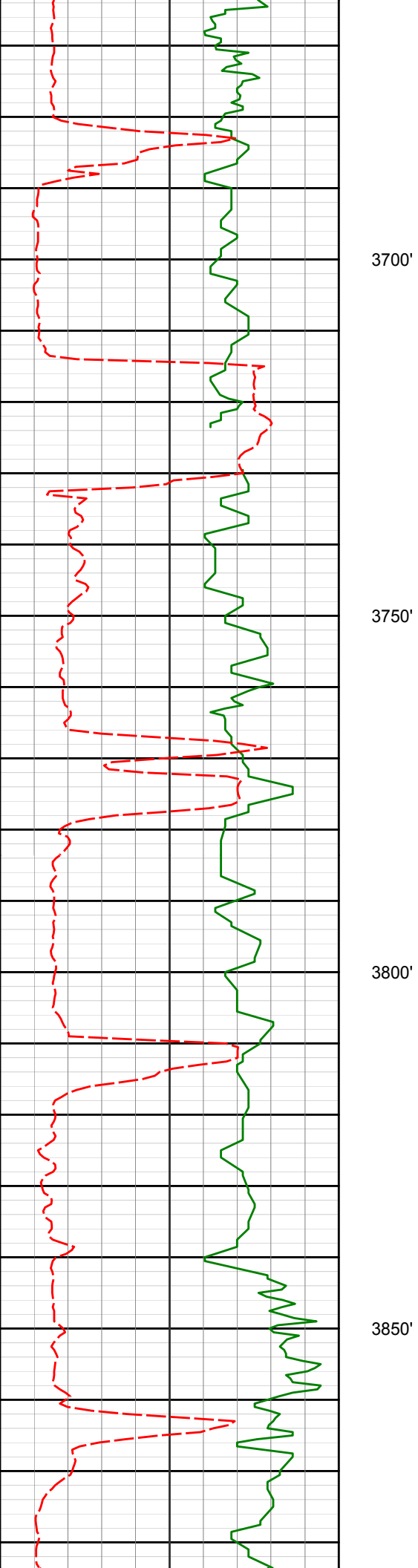
3635'

13.94°

41.53°

3557.08'

-547.46'



3700'

3725'

14.86°

40.05°

3644.25'

-564.55'

3750'

3800'

3815'

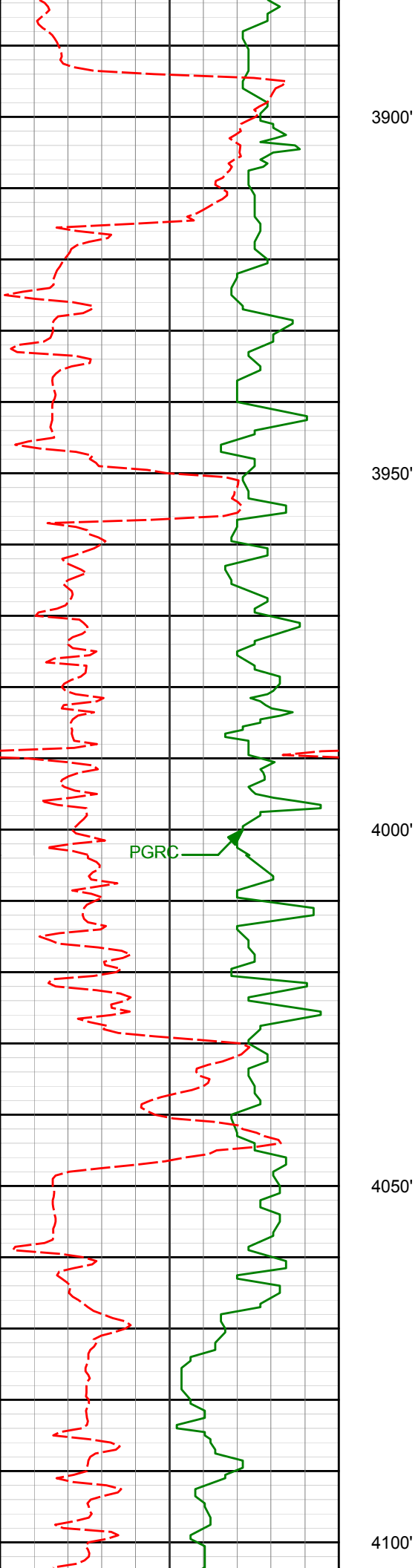
13.84°

38.12°

3731.44'

-582.00'

3850'



3993'

14.75°

38.11°

3903.93'

-616.85'

4000'

PGRC

4050'

4083'

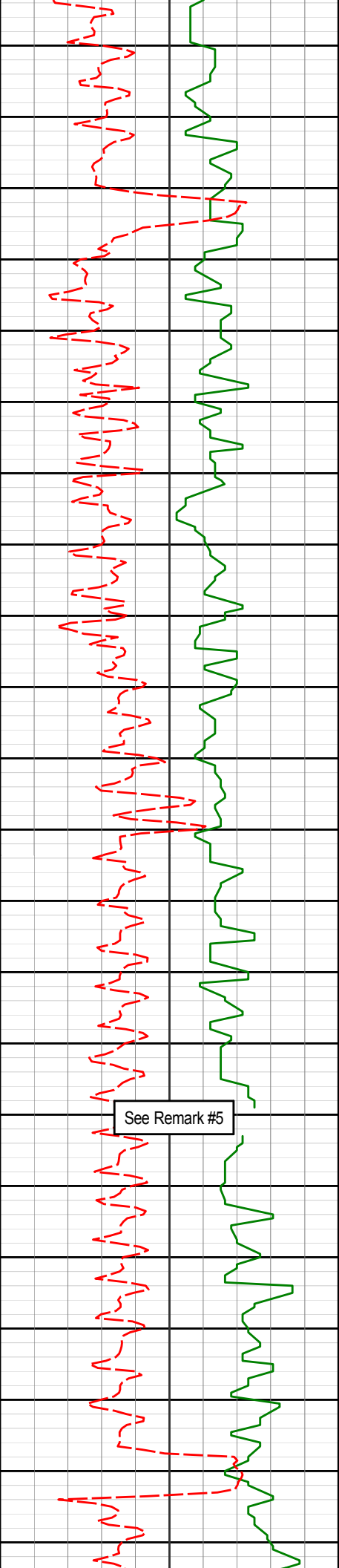
13.98°

37.46°

3991.12'

-634.63'

4100'



4150'

4172'

14.14°

36.59°

4077.45'

-652.02'

4200'

4250'

See Remark #5

4262'

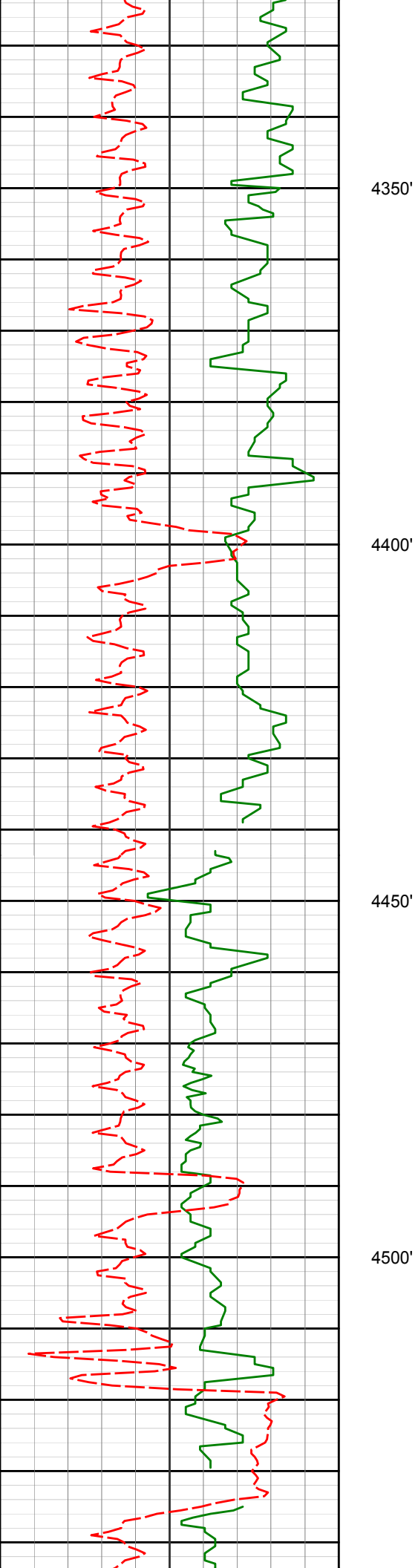
13.53°

36.98°

4164.84'

-669.39'

4300'



4441'

10.99°

34.75°

4339.74'

-700.36'

4450'

4500'

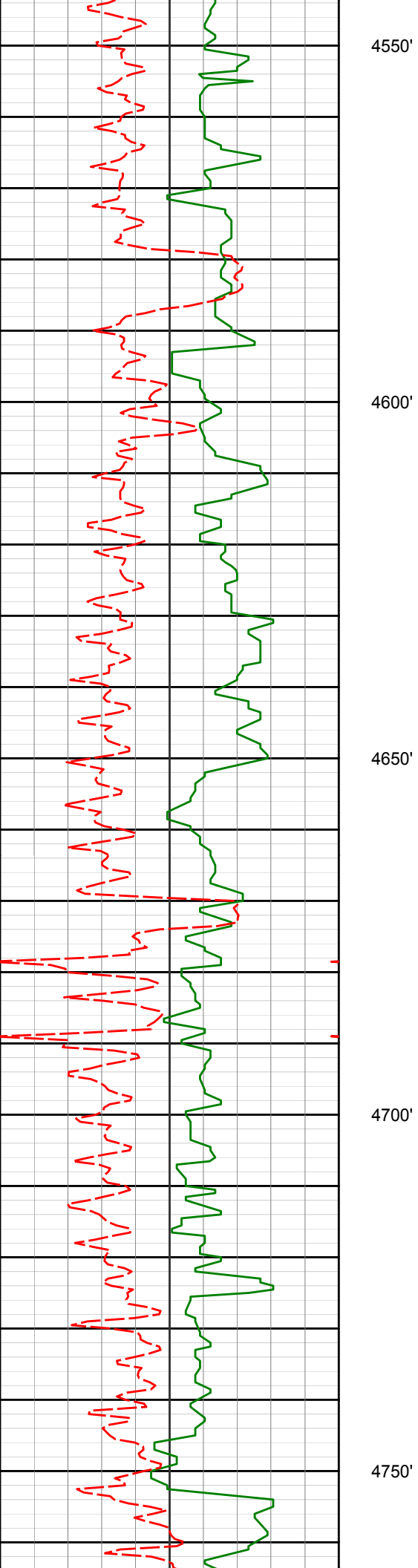
4531'

13.18°

39.17°

4427.74'

-715.47'



4621'

12.19°

37.90°

4515.55'

-731.05'

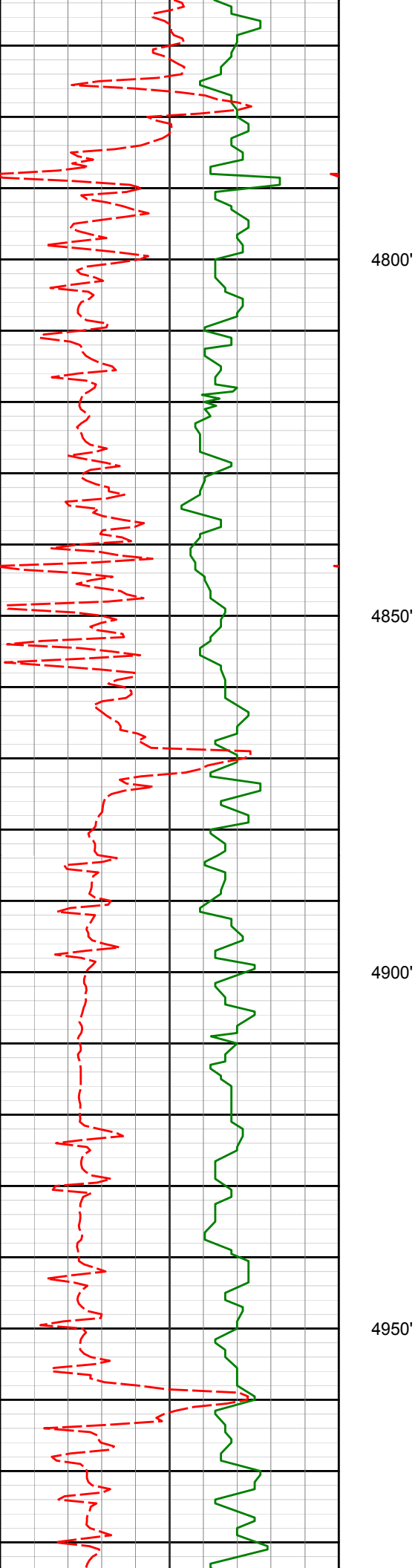
4710'

11.60°

37.94°

4602.64'

-745.63'



4826'

10.13°

32.66°

4716.56'

-763.55'

4800'

4850'

4900'

4915'

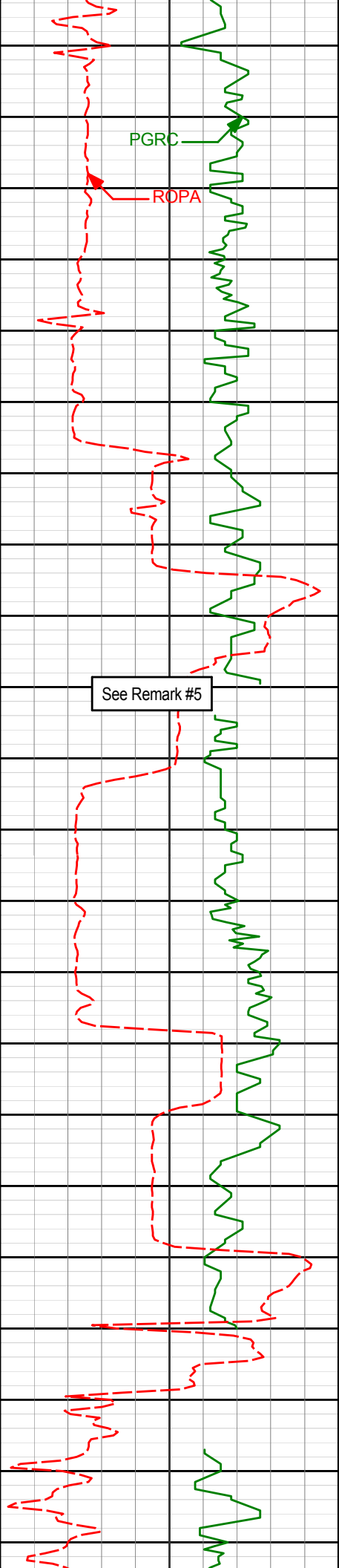
8.64°

31.21°

4804.36'

-775.93'

4950'



PGRC

ROPA

See Remark #5

5000'

5005'

7.41°

23.56°

4893.48'

-787.09'

5050'

5100'

5095'

5.58°

35.89°

4982.90'

-796.01'

5150'

5200'

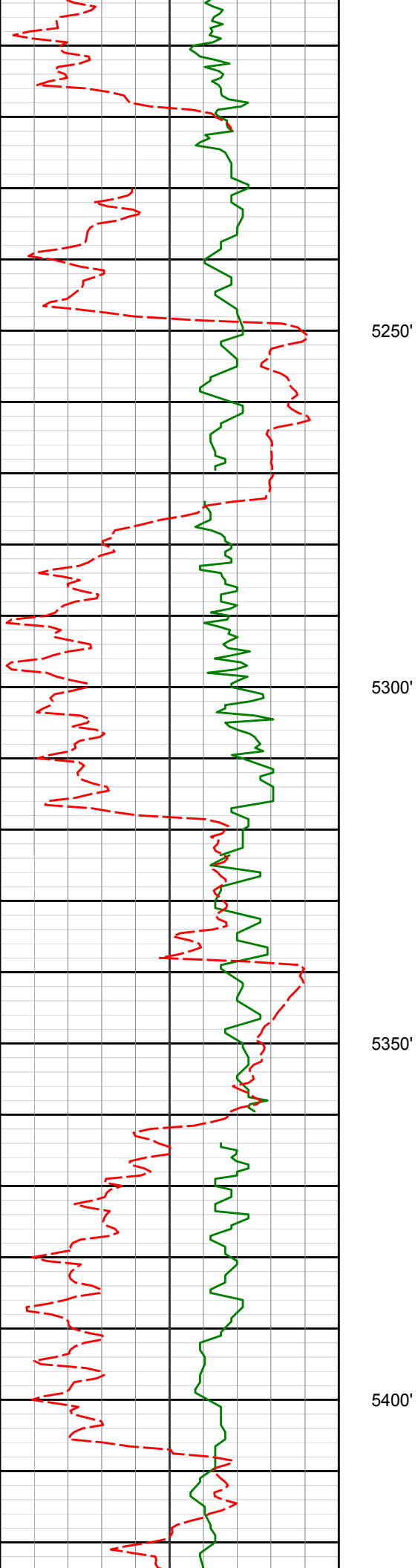
5185'

3.00°

48.81°

5072.65'

-801.15'



5274'

1.63°

282.75°

5161.61'

-802.96'

5250'

5300'

5350'

5364'

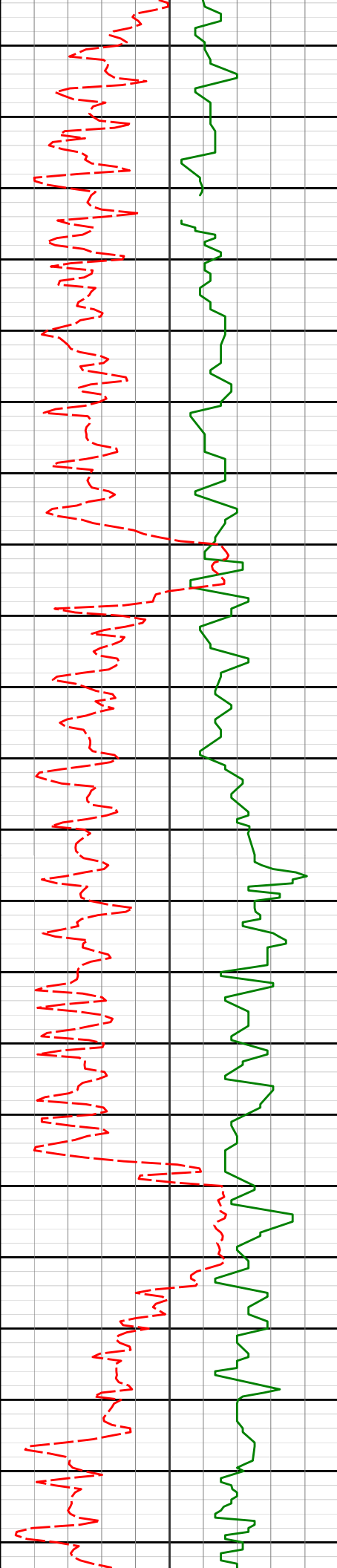
2.06°

141.10°

5251.59'

-801.98'

5400'



5450'

5454'

1.69°

142.36°

5341.54'

-799.69'

5500'

5543'

1.55°

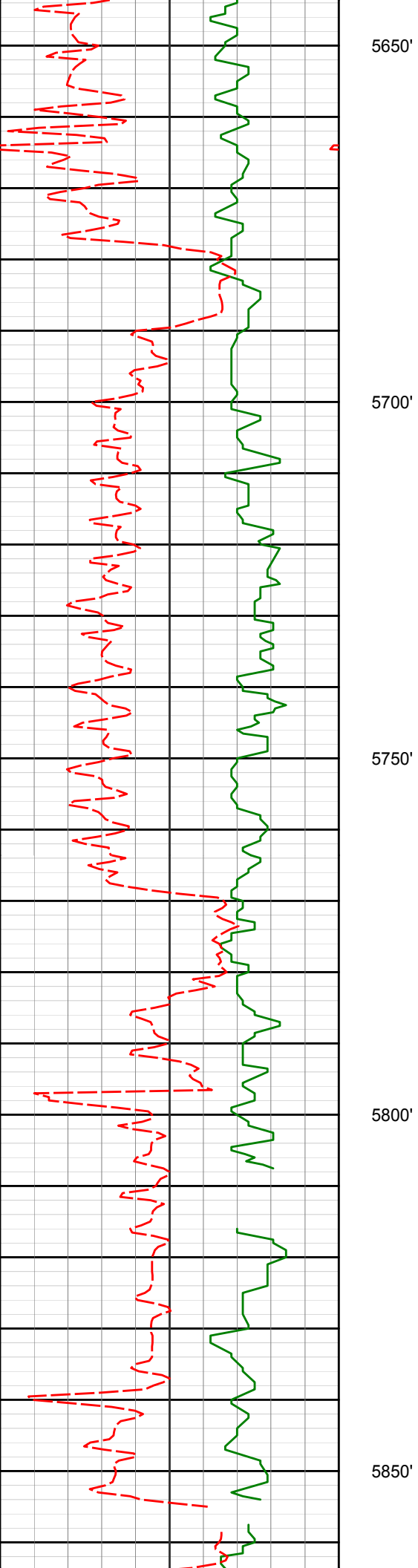
148.41°

5430.50'

-797.64'

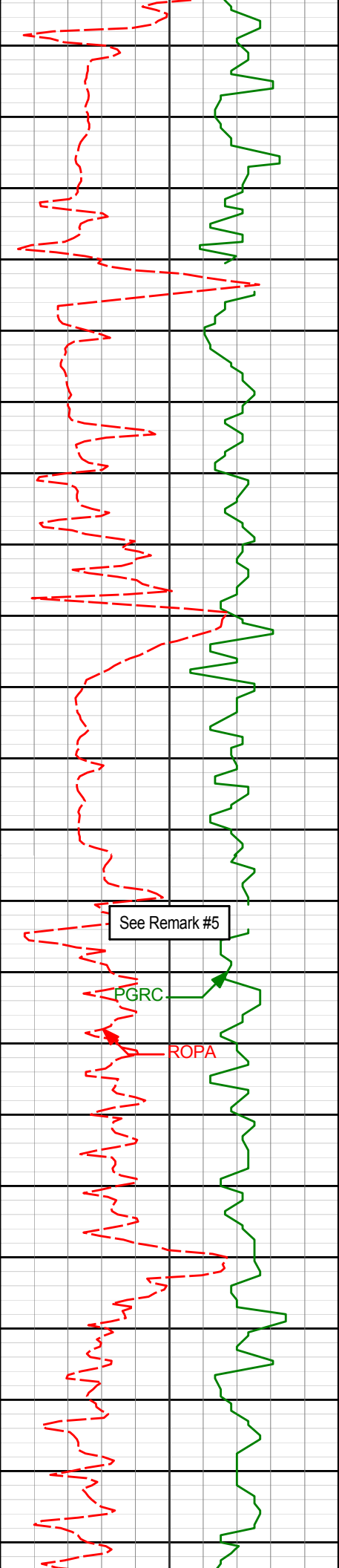
5550'

5600'



5723'      1.25°      150.35°      5610.45'      -793.89'

5813'      1.05°      146.39°      5700.43'      -792.36'



5900' 5902' 0.65° 117.55° 5789.42' -791.46'

5950'

6000' 5992' 0.63° 46.22° 5879.42' -791.57'

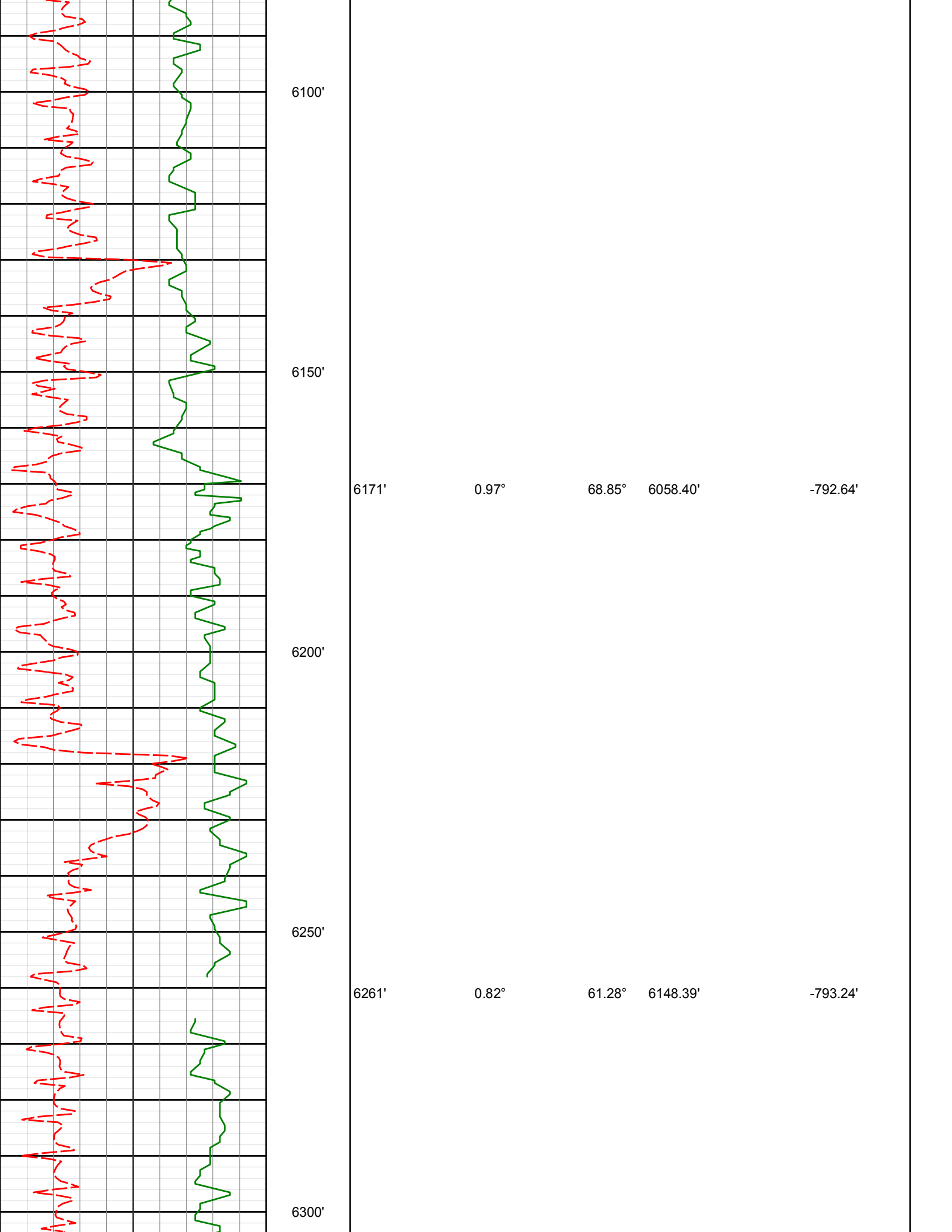
See Remark #5

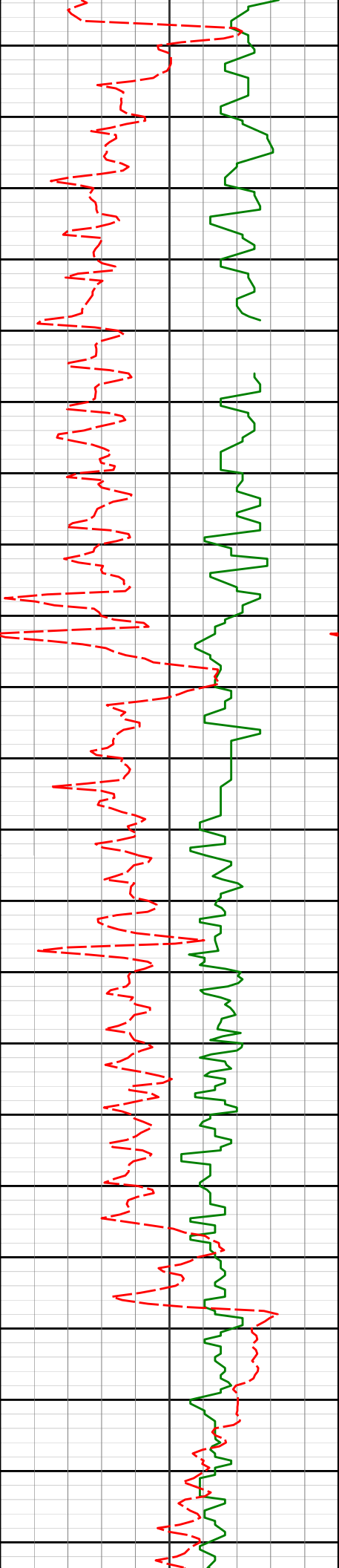
PGRC

ROPA

6050'

6082' 0.76° 68.88° 5969.41' -792.14'





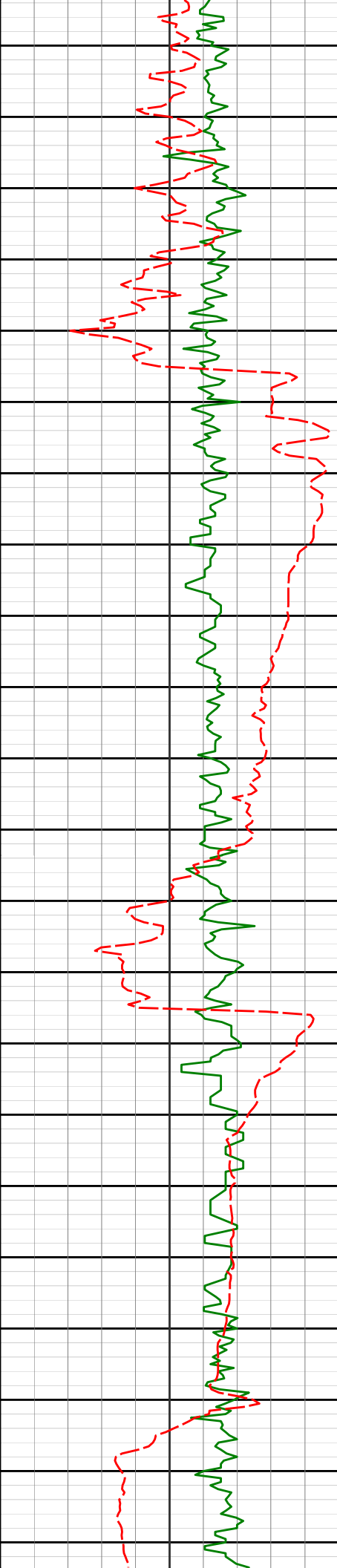
6350' 6351' 0.68° 78.04° 6238.38' -793.67'

6400'

6440' 0.48° 85.24° 6327.38' -793.82'

6450'

6500'



6530'

8.64°

169.54°

6417.03'

-787.20'

6550'

6600'

6620'

13.08°

196.36°

6505.45'

-770.75'

6650'

6700'

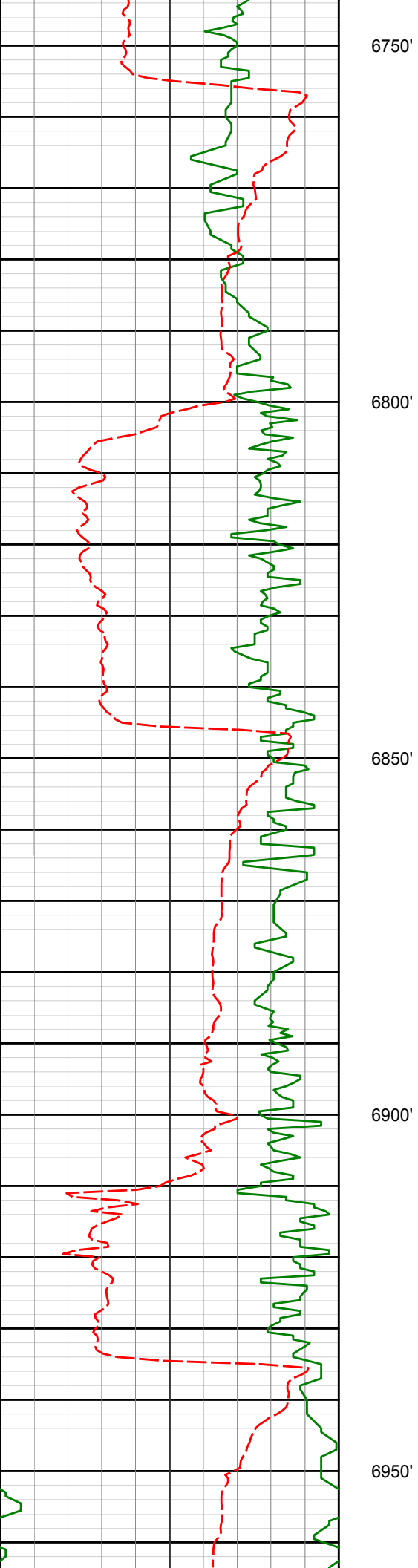
6709'

23.61°

195.31°

6589.81'

-743.75'



6750'

6800'

6850'

6900'

6950'

6799'

28.73°

183.22°

6670.62'

-704.65'

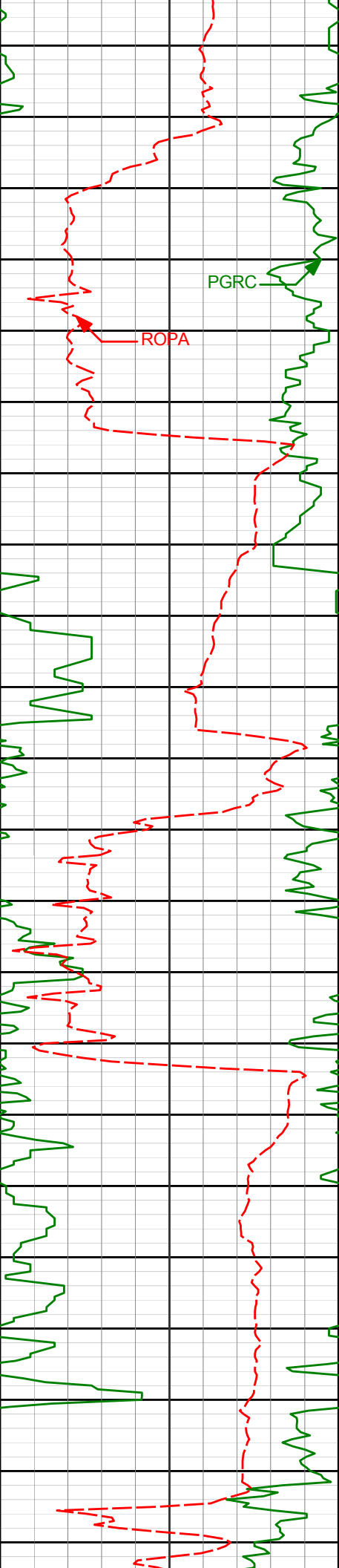
6889'

35.86°

179.57°

6746.65'

-656.62'



6978'

44.34°

181.20°

6814.67'

-599.35'

7000'

PGRC

ROPA

7050'

7068'

49.48°

181.43°

6876.13'

-533.65'

7100'

7150'

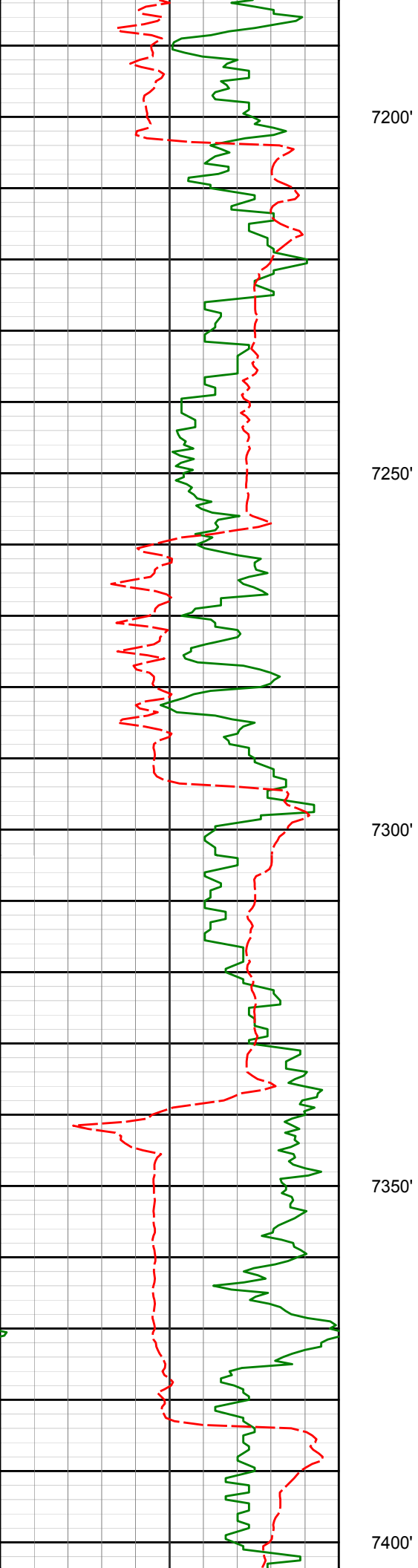
7158'

56.88°

176.22°

6930.06'

-461.74'



7247'

65.87°

178.03°

6972.66'

-383.85'

7337'

72.22°

181.70°

7004.85'

-299.87'

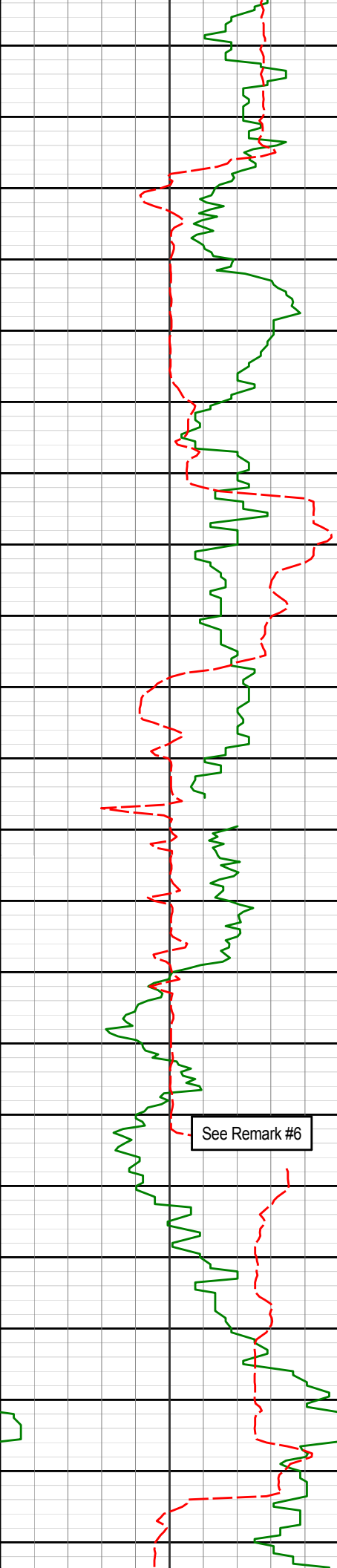
7200'

7250'

7300'

7350'

7400'



7427'

79.43°

181.97°

7026.88'

-212.69'

7450'

7500'

7517'

82.71°

181.61°

7040.85'

-123.81'

7550'

See Remark #6

7600'

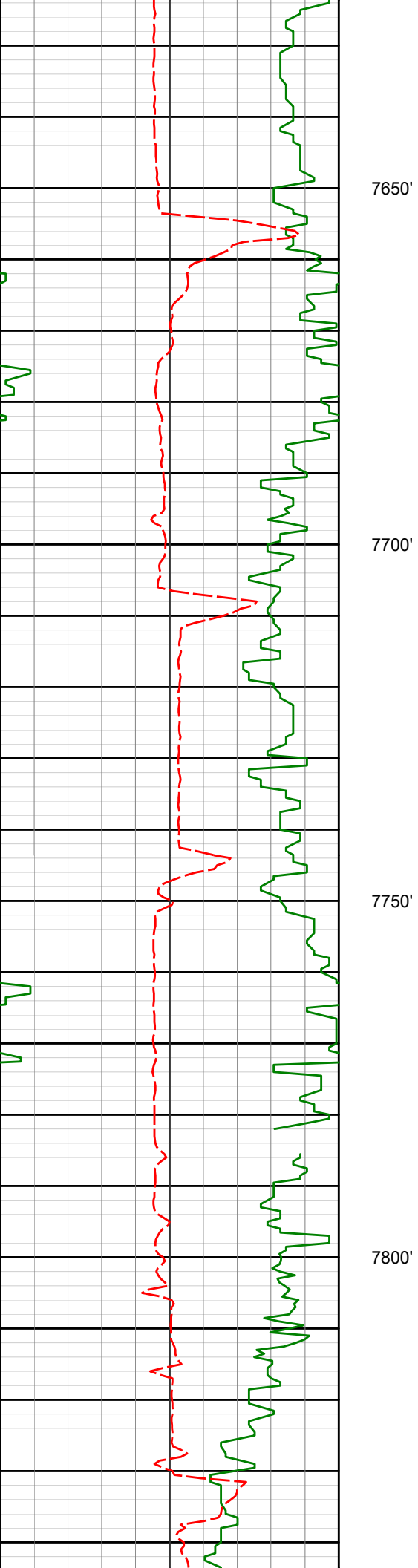
7606'

89.29°

180.60°

7047.06'

-35.08'



7695'

89.94°

180.08°

7047.65'

53.91'

7650'

7700'

7750'

7785'

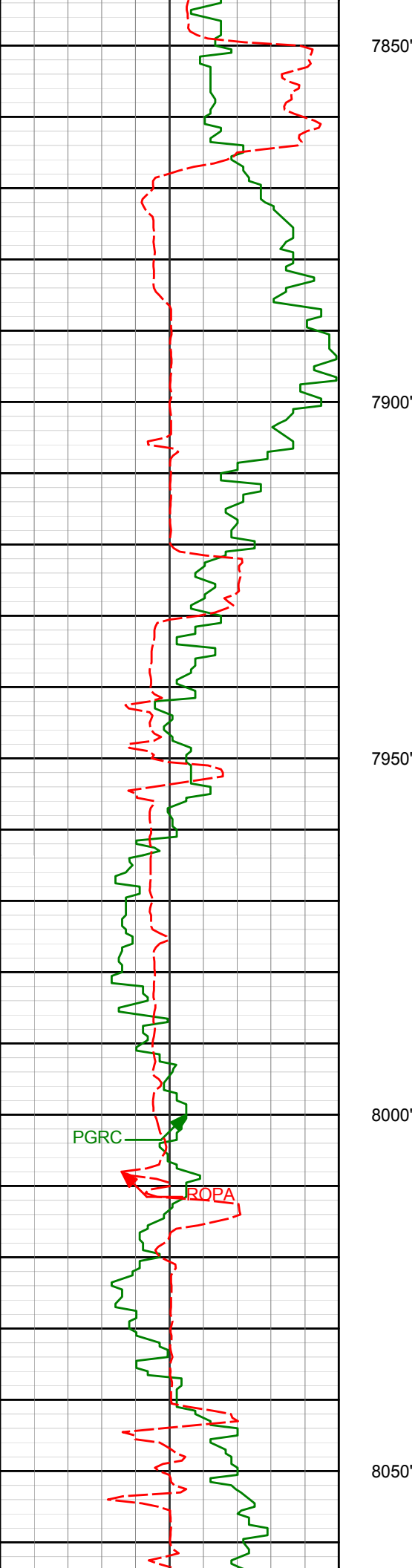
88.83°

179.44°

7048.62'

143.90'

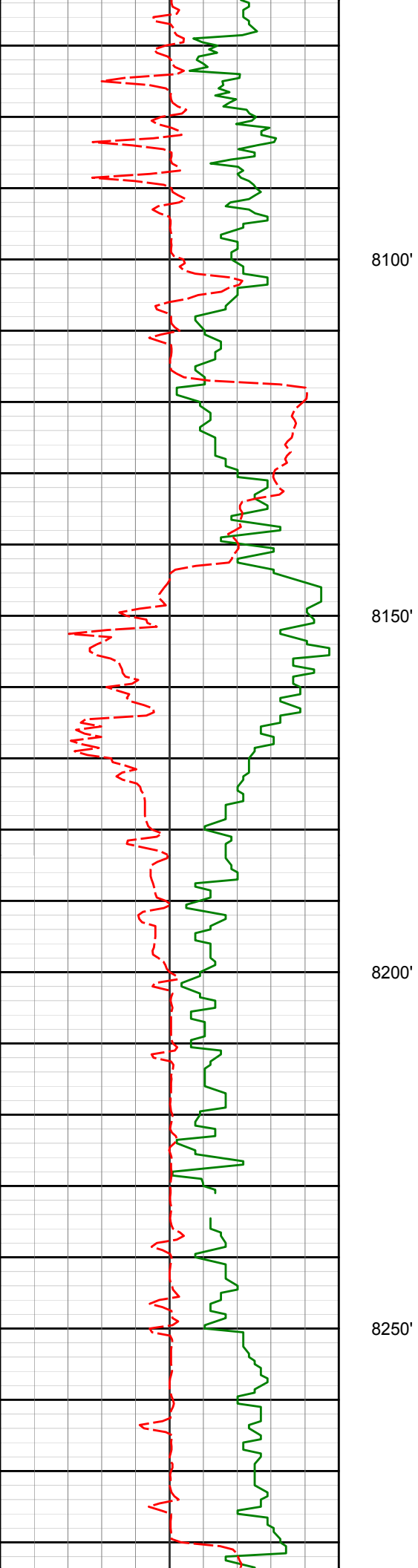
7800'



7875' 91.14° 179.76° 7048.65' 233.88'

7965' 91.17° 179.59° 7046.83' 323.85'

8054' 91.76° 179.14° 7044.56' 412.80'



8144'

89.85°

179.76°

7043.30'

502.77'

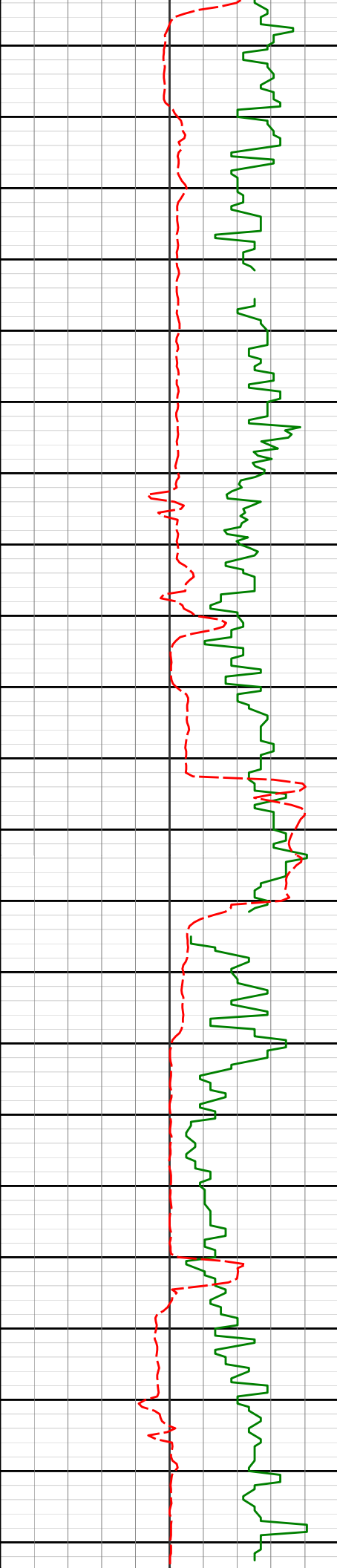
8234'

89.69°

179.70°

7043.66'

592.76'



8300'

8323'

89.20°

179.77°

7044.52'

681.75'

8350'

8400'

8413'

89.51°

182.50°

7045.54'

771.73'

8450'

8500'

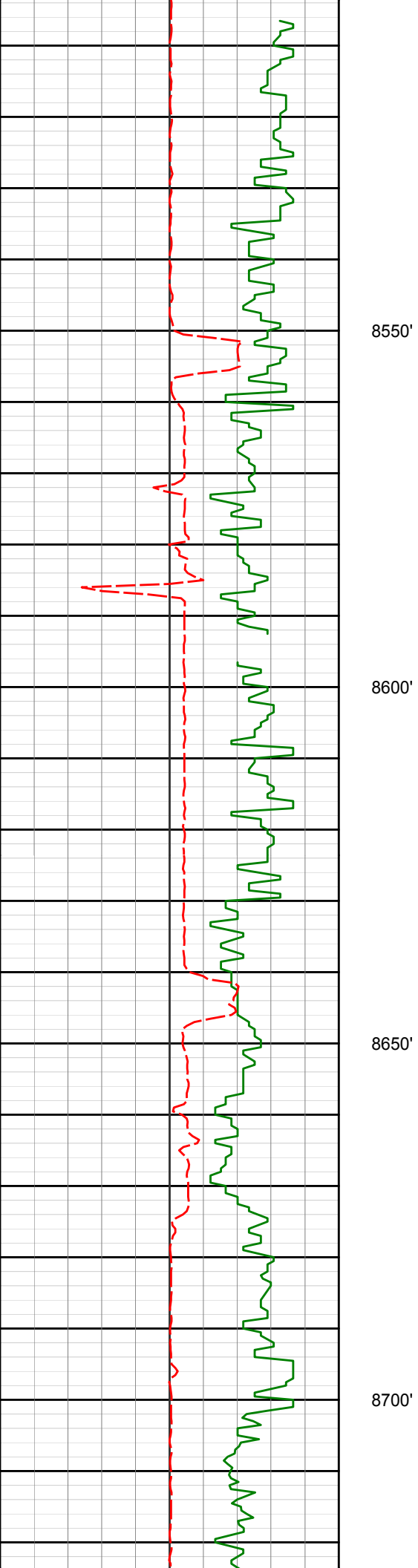
8502'

89.94°

182.82°

7045.97'

860.67'



8592'

89.63°

182.68°

7046.31'

950.60'

8550'

8600'

8650'

8682'

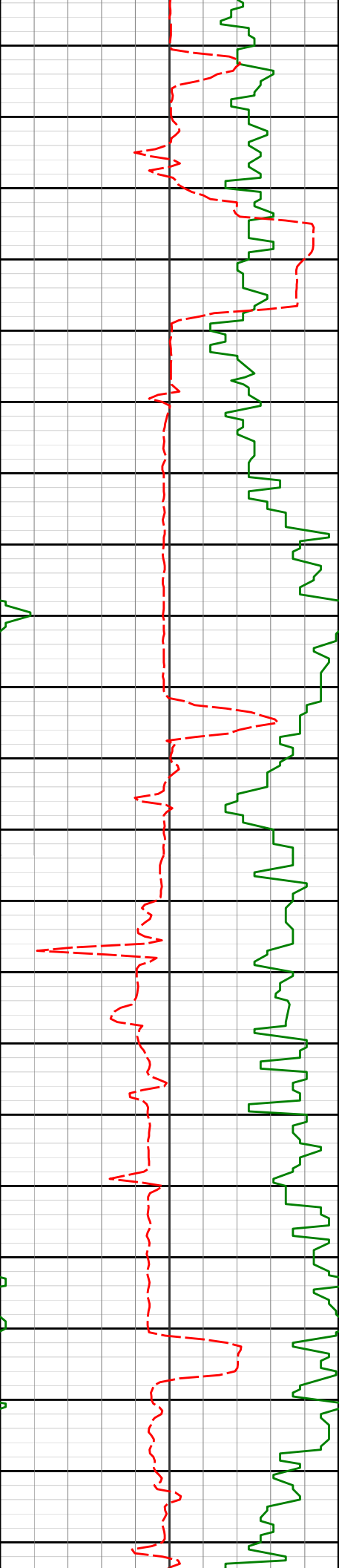
89.94°

182.51°

7046.65'

1040.54'

8700'



8750'

8772'

91.91°

182.14°

7045.20'

1130.49'

8800'

8850'

8861'

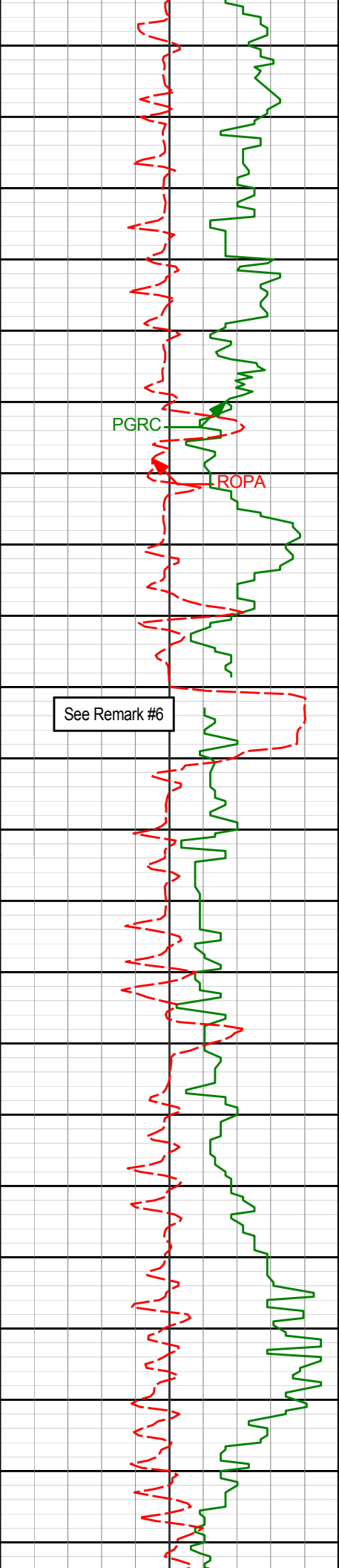
91.63°

182.09°

7042.44'

1219.41'

8900'



8950' 8951' 91.82° 181.90° 7039.73' 1309.34'

9000'

PGRC

ROPA

See Remark #6

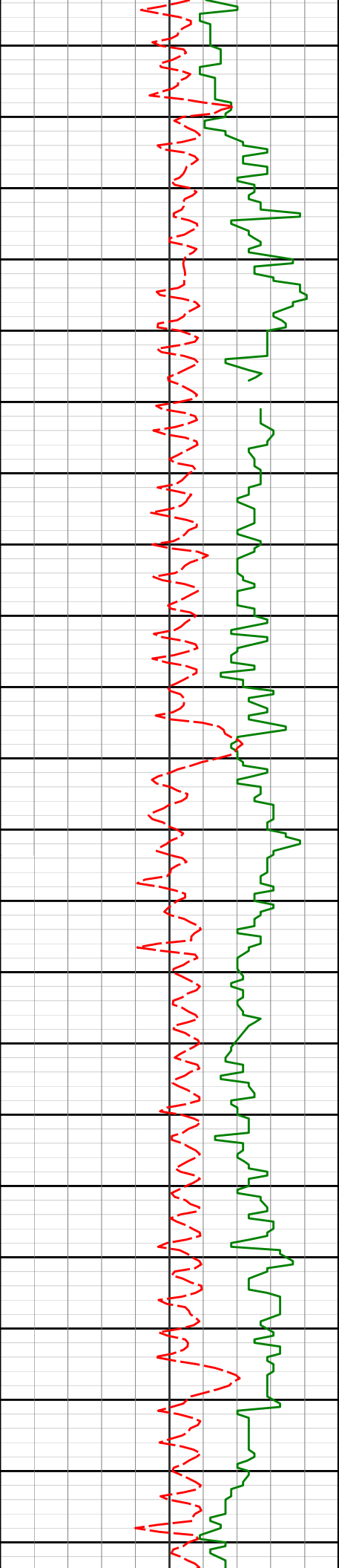
9041' 91.02° 181.10° 7037.51' 1399.30'

9050'

9100'

9130' 90.86° 180.96° 7036.05' 1488.29'

9150'



9200'

9220'

90.52°

180.58°

7034.96'

1578.28'

9250'

9300'

9310'

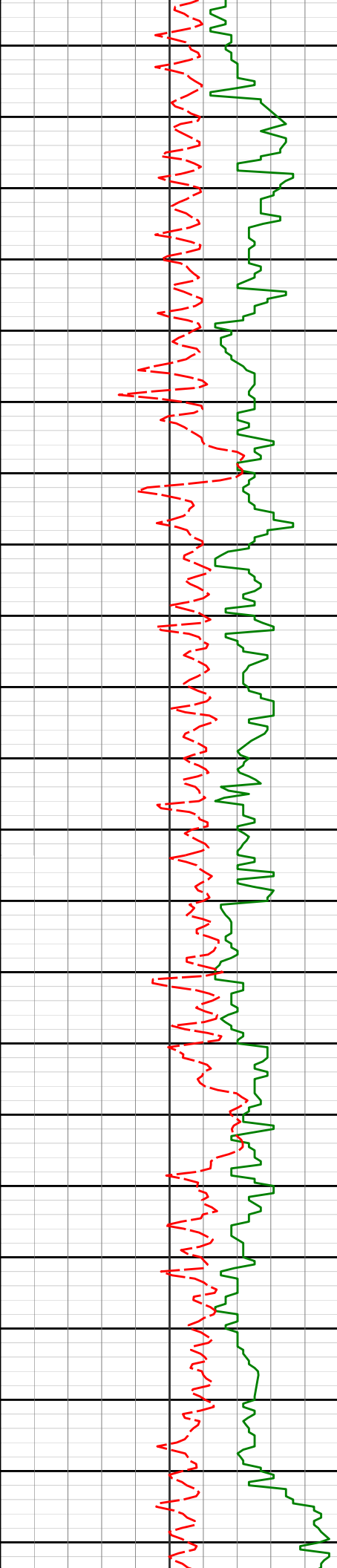
90.37°

180.27°

7034.26'

1668.28'

9350'



9400'

9399'

90.09°

179.82°

7033.90'

1757.27'

9450'

9489'

90.09°

180.35°

7033.75'

1847.27'

9500'

9550'

9579'

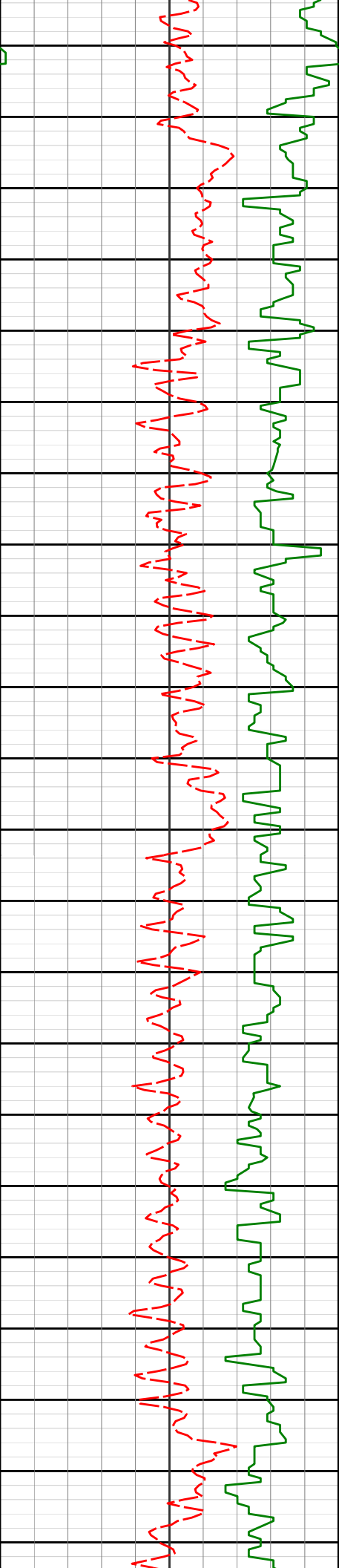
89.97°

180.04°

7033.70'

1937.27'

9600'



9650'

9668'

89.82°

179.71°

7033.87'

2026.26'

9700'

9750'

9758'

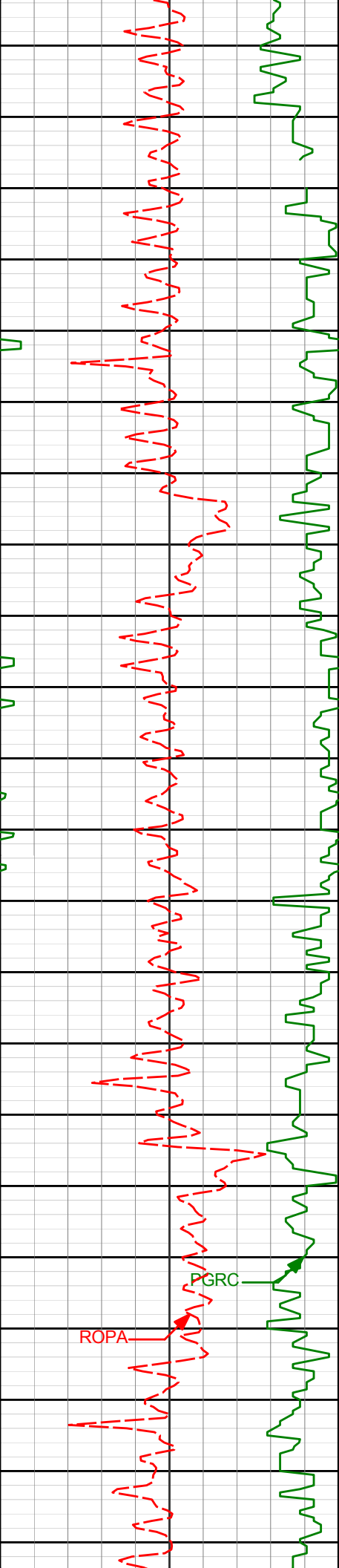
90.12°

179.82°

7033.92'

2116.25'

9800'



9850'

9900'

9950'

10000'

10027'

9847'

9937'

10027'

89.94°

89.94°

89.85°

179.80°

180.38°

180.21°

7033.87'

7033.97'

7034.14'

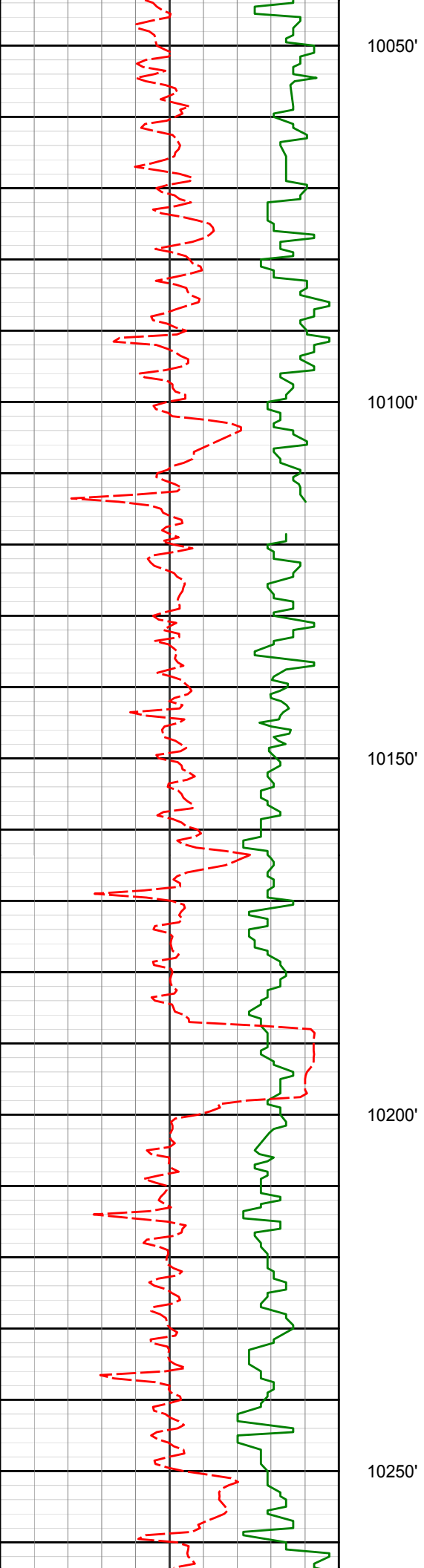
2205.24'

2295.24'

2385.24'

ROPA

PGRC



10050'

10100'

10150'

10200'

10250'

10116'

89.72°

179.90°

7034.47'

2474.23'

10206'

90.96°

180.34°

7033.94'

2564.23'



10295'

90.89°

180.20°

7032.50'

2653.21'

10300'

10350'

10385'

90.37°

180.32°

7031.51'

2743.21'

10400'

10450'

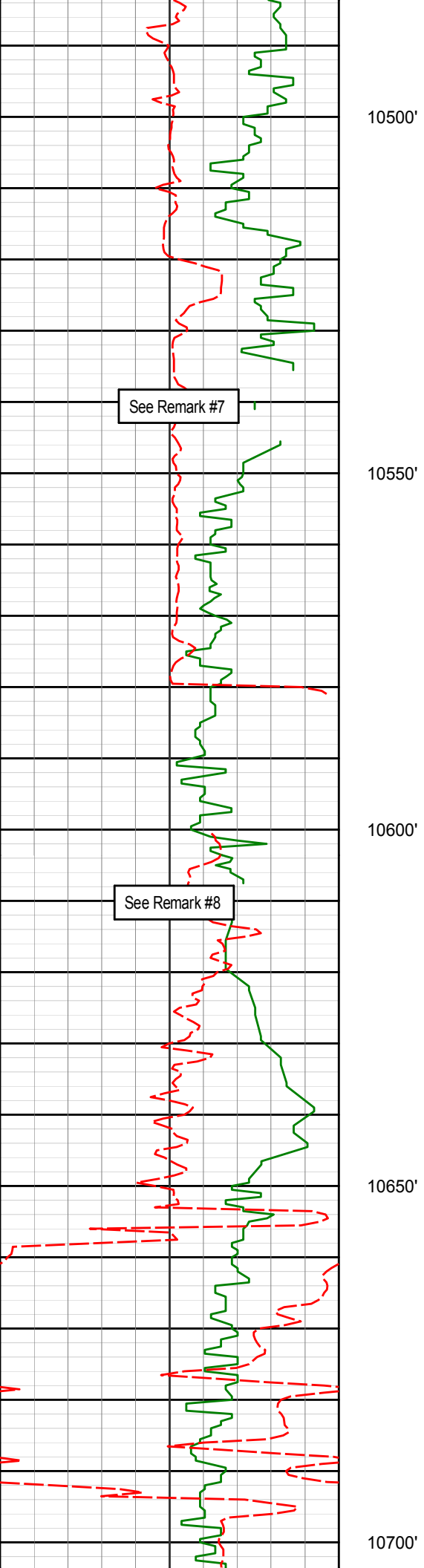
10474'

90.28°

179.91°

7031.01'

2832.20'



10500'

10550'

10600'

10650'

10700'

See Remark #7

See Remark #8

10564'

90.09°

180.45°

7030.72'

2922.20'

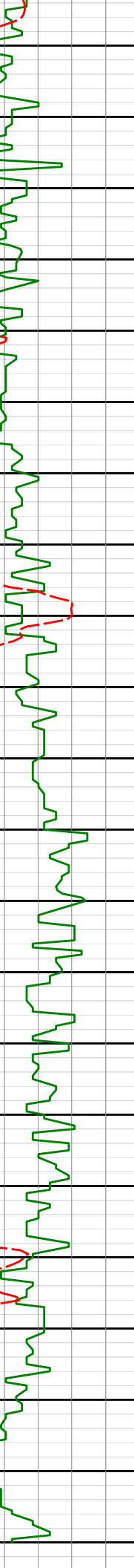
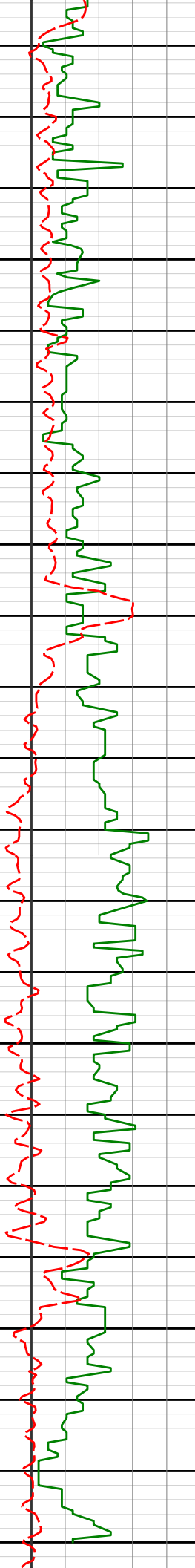
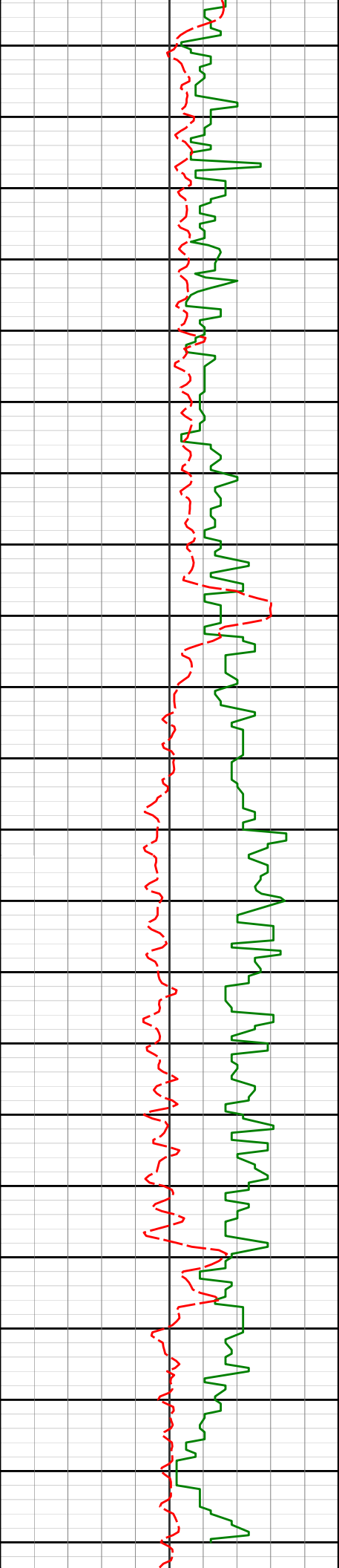
10654'

90.40°

180.19°

7030.33'

3012.20'



10743'

90.77°

180.42°

7029.42'

3101.19'

10750'

10800'

10850'

10900'

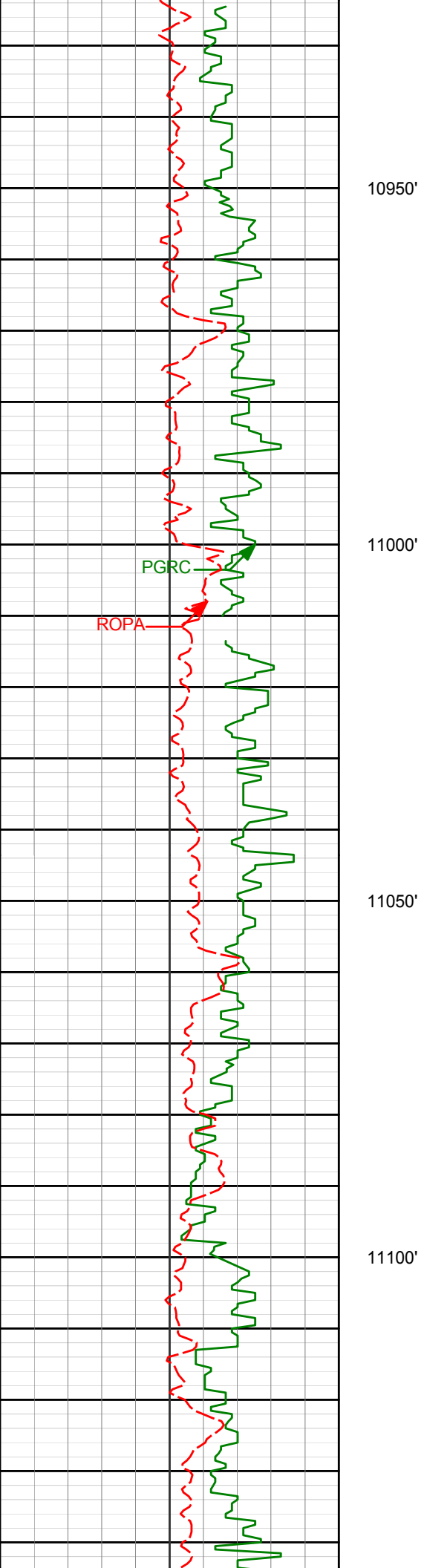
10922'

90.25°

180.31°

7027.83'

3280.18'



11012'

89.94°

180.03°

7027.69'

3370.18'

11100'

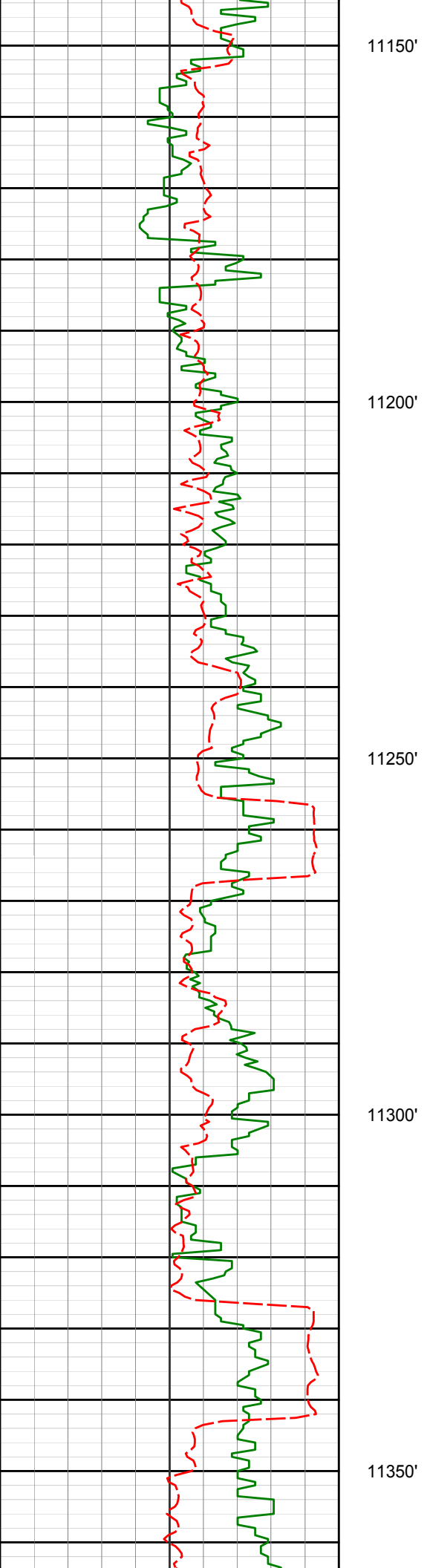
11102'

90.31°

180.22°

7027.49'

3460.18'



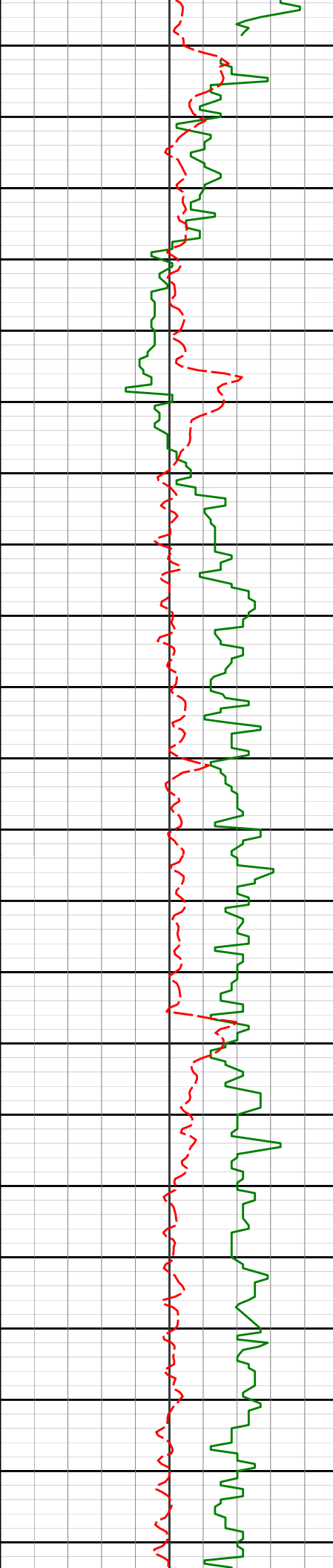
11236'      88.55°      180.21°      7028.83'      3594.16'

11250'

11281'      88.52°      181.44°      7029.98'      3639.15'

11300'

11350'



11371'

90.68°

181.61°

7030.61'

3729.13'

11400'

11450'

11460'

91.26°

181.67°

7029.10'

3818.10'

11500'

11550'

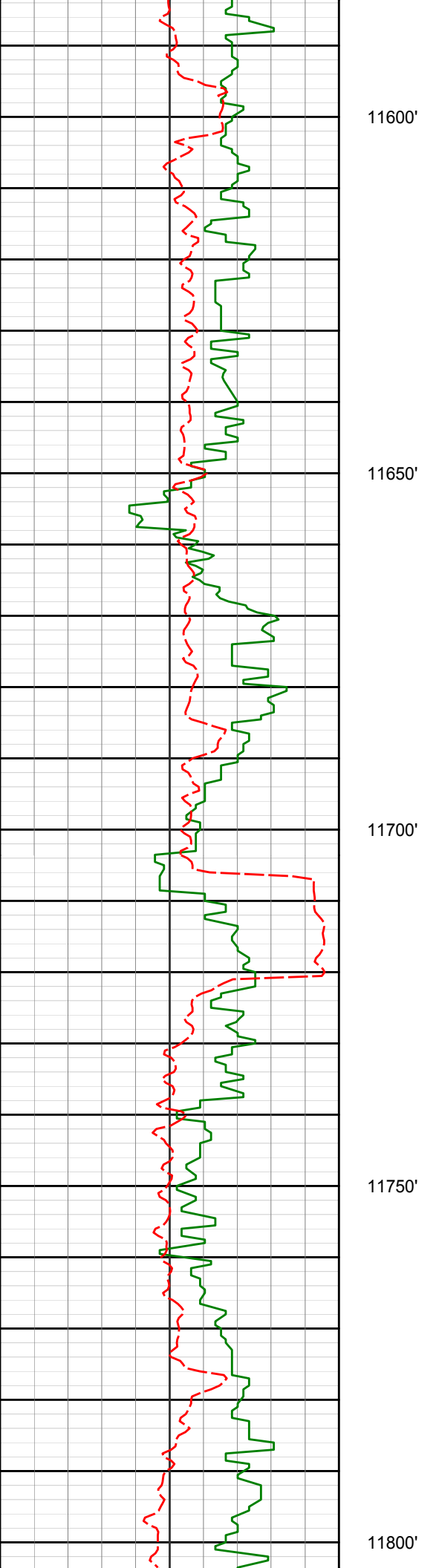
11550'

91.54°

182.47°

7026.90'

3908.04'



11640'

92.00°

182.84°

7024.11'

3997.94'

11600'

11650'

11700'

11729'

91.23°

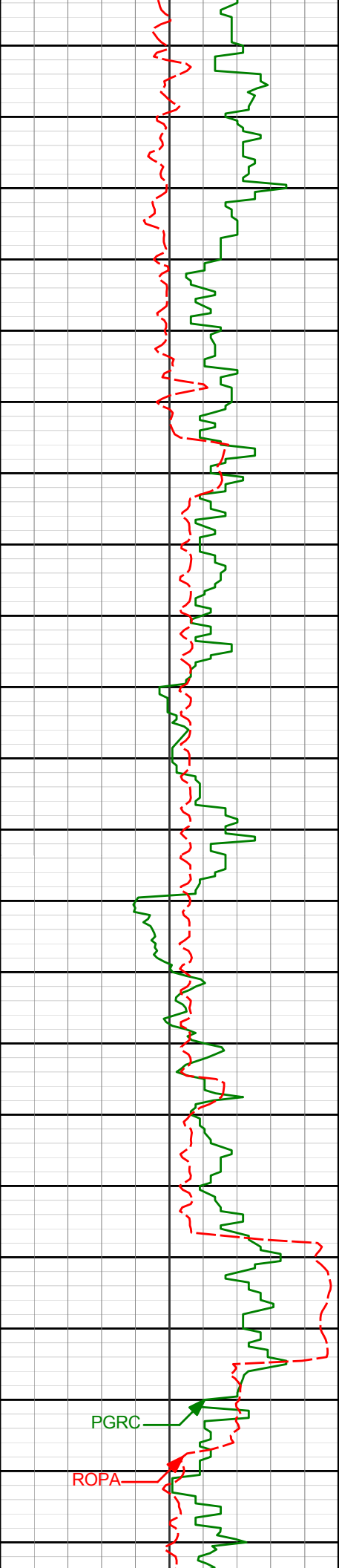
181.68°

7021.60'

4086.86'

11750'

11800'



11819'

91.70°

181.59°

7019.30'

4176.81'

11850'

11900'

11909'

92.53°

181.75°

7015.99'

4266.74'

11950'

12000'

11998'

91.97°

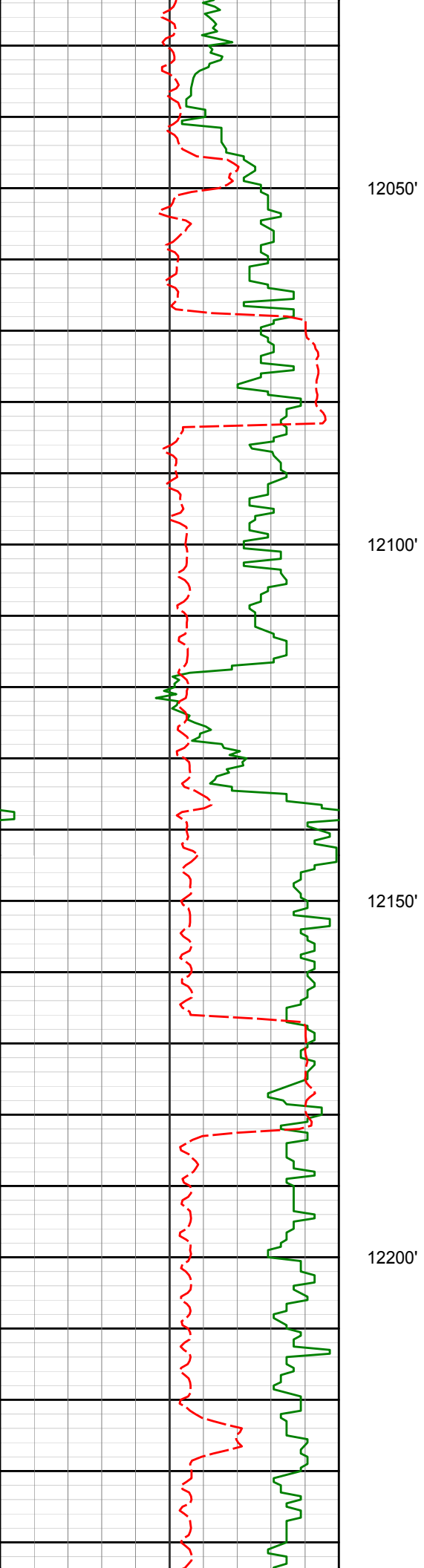
179.44°

7012.49'

4355.66'

PGRC

ROPA



12050'

12088'

90.74°

179.46°

7010.36'

4445.62'

12100'

12150'

12178'

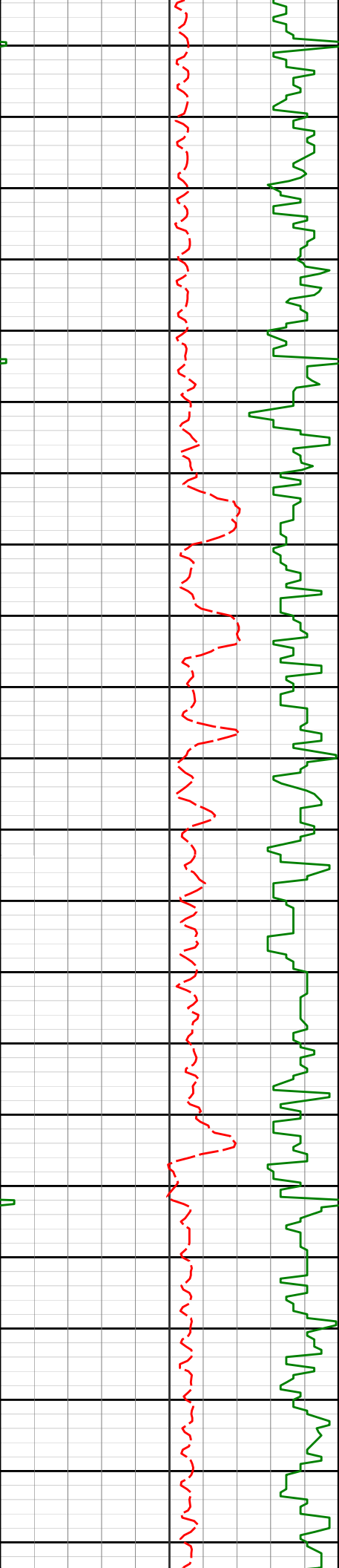
89.57°

179.10°

7010.12'

4535.59'

12200'



12250'

12267'

89.08°

179.13°

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4624.56'

12300'

12350'

12357'

89.11°

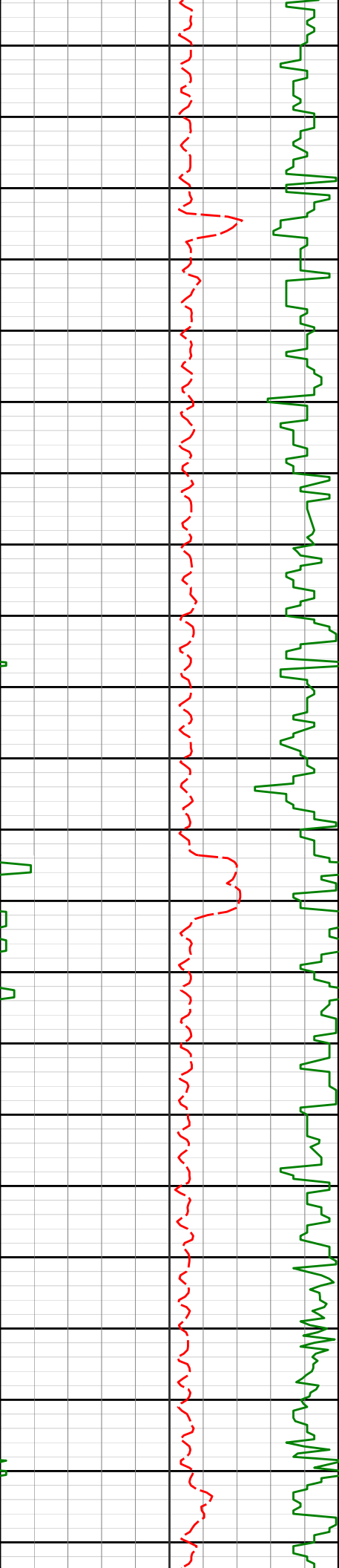
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4714.53'

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12450'



12500'

12536'

89.23°

179.35°

7015.20'

4893.50'

12550'

12600'

12626'

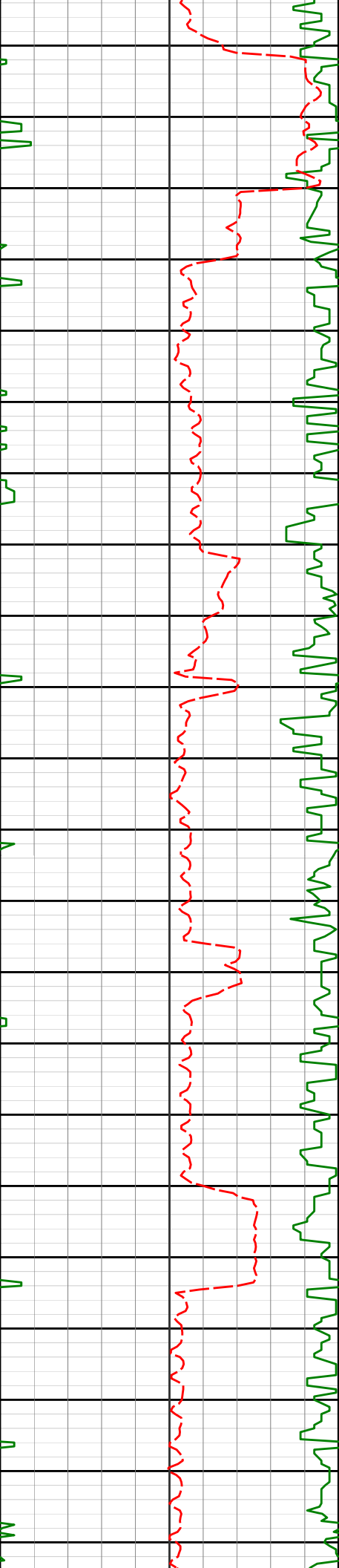
89.20°

178.88°

7016.43'

4983.46'

12650'



12700'

12716'

89.41°

181.31°

7017.52'

5073.44'

12750'

12800'

12805'

89.57°

182.63°

7018.31'

5162.41'

12850'

12895'

89.29°

182.92°

7019.21'

5252.34'

12900'



12950'

13000'

13050'

13100'

12984'

91.57°

182.28°

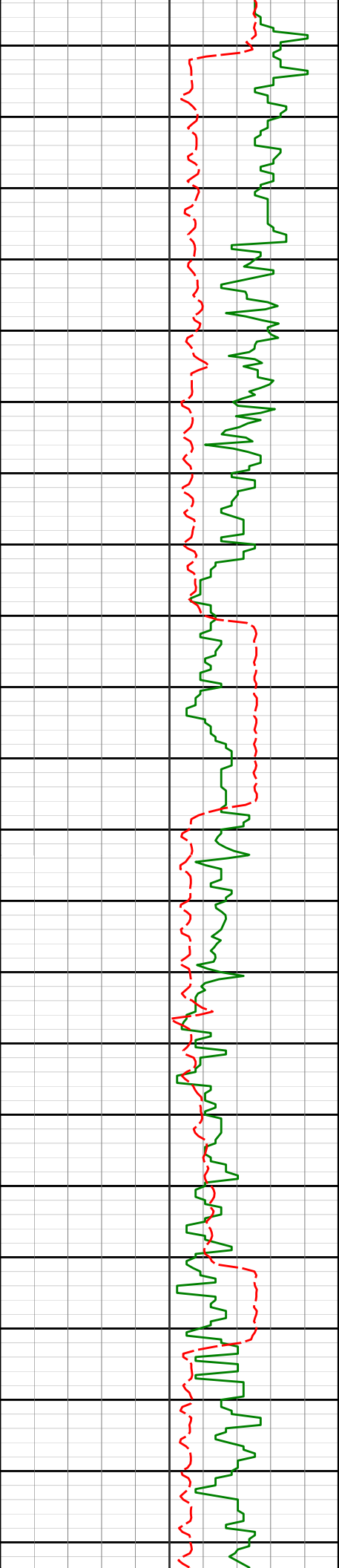
7018.54'

5341.28'

ROPA

PGRC





13150'

13164'

91.60°

182.14°

7013.55'

5521.13'

13200'

13250'

13253'

91.42°

182.07°

7011.20'

5610.07'

13300'

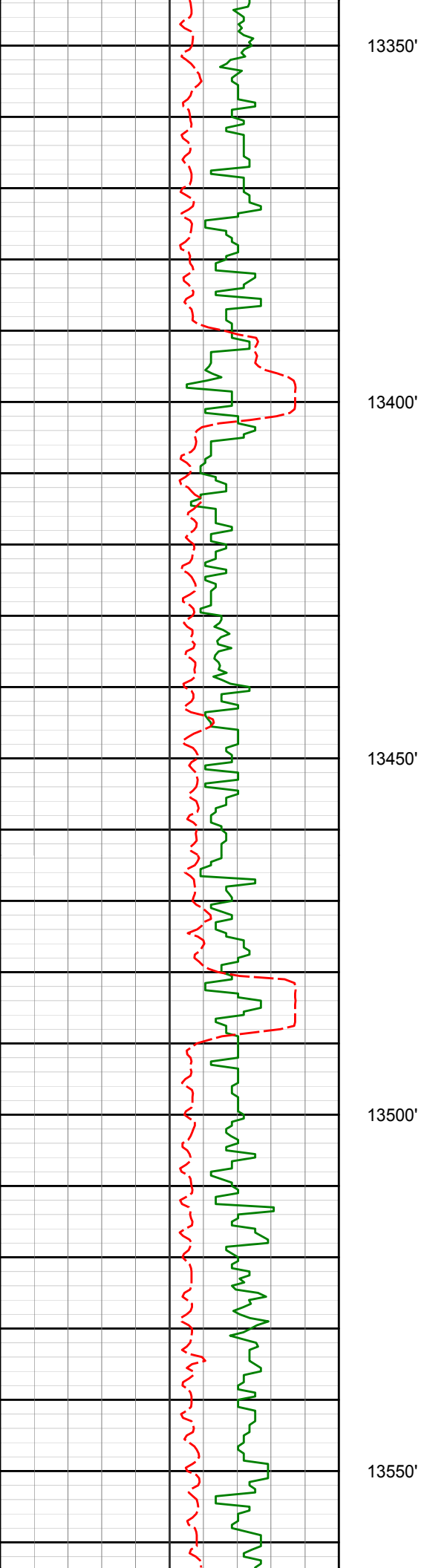
13343'

90.89°

181.61°

7009.39'

5700.03'



13350'

13400'

13500'

13550'

13433'

89.63°

181.69°

7008.98'

5790.01'

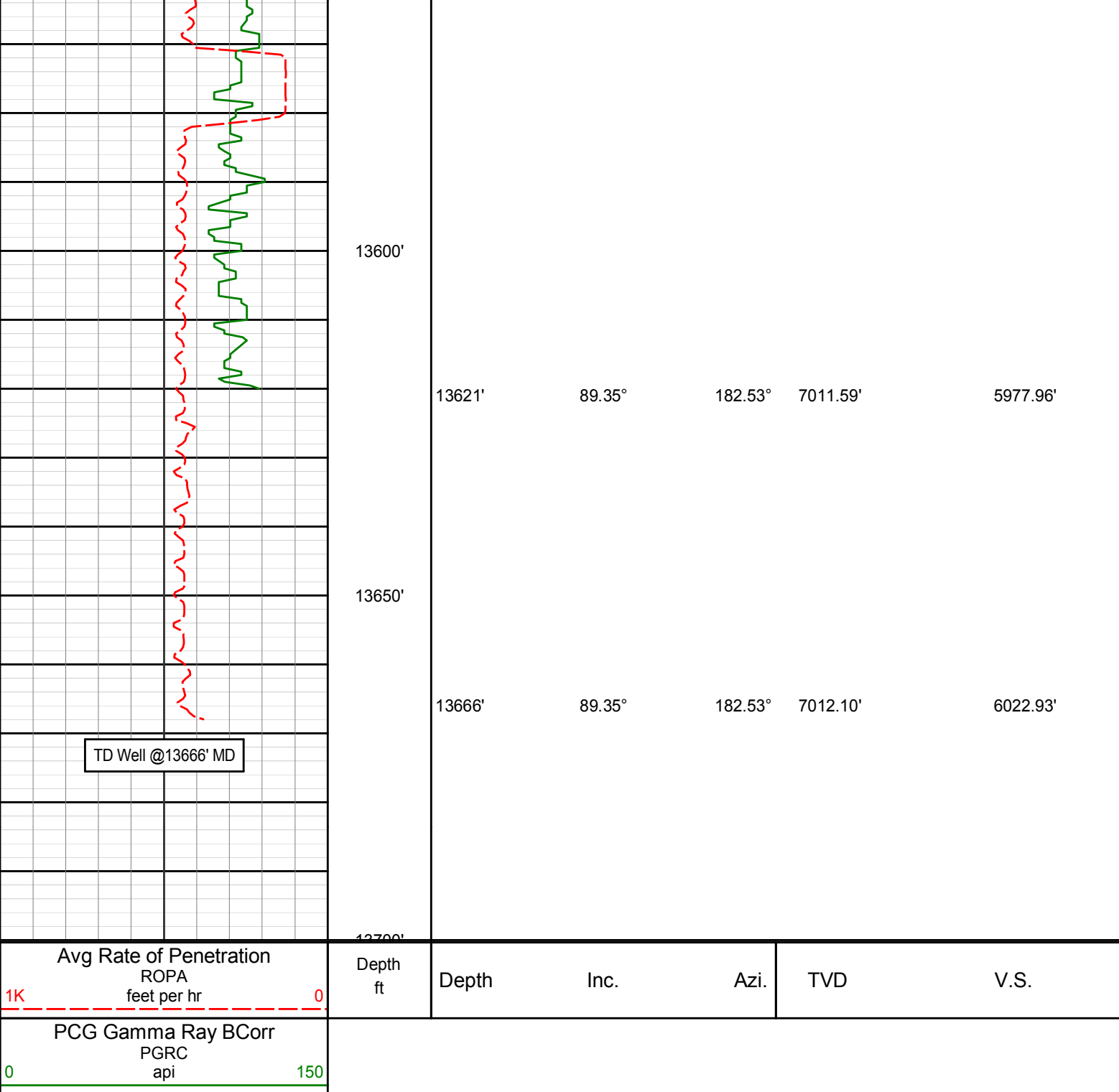
13522'

88.92°

180.85°

7010.10'

5879.00'



# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp  
 RW 1N-5HZ  
 Watenburg  
 Weld Colorado  
 USA  
 CA-XX-0904218782

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
13.00	0.00	0.00	13.00	0.00 N	0.00 E	0.00	0.00
136.00	1.48	89.52	134.00	0.05 N	0.00 E	0.05	0.00

132.00	1.10	326.50	131.99	0.95 N	0.63 W	-0.95	0.92
163.00	0.79	328.08	162.99	1.38 N	0.91 W	-1.37	1.00
195.00	1.49	347.06	194.98	1.97 N	1.12 W	-1.96	2.46
227.00	1.19	18.00	226.97	2.70 N	1.11 W	-2.69	2.41
259.00	1.80	12.20	258.96	3.50 N	0.90 W	-3.49	1.96
290.00	1.63	20.55	289.95	4.39 N	0.64 W	-4.39	0.97
322.00	2.37	31.54	321.93	5.38 N	0.14 W	-5.38	2.59
354.00	2.64	37.34	353.90	6.53 N	0.66 E	-6.54	1.16
385.00	3.21	32.42	384.86	7.83 N	1.56 E	-7.85	2.01
417.00	4.31	35.93	416.79	9.56 N	2.74 E	-9.59	3.51
449.00	5.05	41.73	448.68	11.59 N	4.38 E	-11.63	2.74
512.00	5.89	39.89	511.39	16.14 N	8.30 E	-16.22	1.36
544.00	6.72	41.91	543.20	18.79 N	10.61 E	-18.89	2.68
575.00	7.25	45.92	573.97	21.50 N	13.22 E	-21.63	2.32
607.00	8.13	47.80	605.68	24.43 N	16.35 E	-24.59	2.86
638.00	8.75	46.39	636.35	27.52 N	19.68 E	-27.72	2.11
670.00	9.40	48.06	667.95	30.95 N	23.39 E	-31.18	2.19
702.00	9.98	44.90	699.49	34.66 N	27.29 E	-34.93	2.46
734.00	10.50	47.27	730.98	38.60 N	31.39 E	-38.91	2.09
765.00	11.03	47.62	761.43	42.52 N	35.65 E	-42.87	1.72
797.00	10.85	43.05	792.85	46.78 N	39.97 E	-47.18	2.77
829.00	11.38	39.71	824.25	51.41 N	44.04 E	-51.85	2.61
860.00	11.91	40.15	854.62	56.21 N	48.06 E	-56.69	1.73
892.00	12.30	38.92	885.90	61.39 N	52.33 E	-61.90	1.46
955.00	13.93	35.49	947.26	72.78 N	60.95 E	-73.39	2.87
987.00	14.63	34.26	978.27	79.26 N	65.46 E	-79.91	2.38
1018.00	14.06	34.35	1008.30	85.60 N	69.79 E	-86.29	1.84
1050.00	14.50	35.58	1039.32	92.07 N	74.31 E	-92.81	1.67
1082.00	14.41	36.55	1070.30	98.53 N	79.02 E	-99.31	0.81
1113.00	14.06	39.36	1100.35	104.54 N	83.70 E	-105.37	2.50
1145.00	13.67	41.73	1131.42	110.37 N	88.68 E	-111.24	2.15
1177.00	12.79	41.12	1162.57	115.86 N	93.53 E	-116.78	2.78
1208.00	12.61	43.40	1192.81	120.90 N	98.11 E	-121.87	1.72
1240.00	11.87	44.11	1224.08	125.80 N	102.80 E	-126.82	2.36
1272.00	11.73	43.67	1255.41	130.52 N	107.34 E	-131.58	0.52
1303.00	12.35	41.64	1285.72	135.27 N	111.72 E	-136.38	2.42
1335.00	12.44	38.30	1316.98	140.54 N	116.13 E	-141.68	2.26
1366.00	12.74	39.29	1347.23	145.80 N	120.36 E	-146.99	1.19
1398.00	12.26	40.94	1378.48	151.10 N	124.82 E	-152.33	1.87
1430.00	11.03	40.68	1409.82	155.99 N	129.04 E	-157.26	3.85
1461.00	11.34	38.30	1440.23	160.63 N	132.87 E	-161.94	1.79
1493.00	10.72	36.81	1471.64	165.48 N	136.60 E	-166.83	2.13
1525.00	11.38	37.33	1503.04	170.37 N	140.30 E	-171.76	2.09
1557.00	11.34	37.07	1534.42	175.39 N	144.11 E	-176.82	0.20
1588.00	11.47	36.46	1564.80	180.30 N	147.78 E	-181.76	0.57
1620.00	12.08	36.63	1596.13	185.55 N	151.67 E	-187.05	1.91
1650.00	12.04	40.33	1625.47	190.45 N	155.56 E	-191.99	2.58
1682.00	11.87	40.59	1656.77	195.50 N	159.87 E	-197.08	0.56
1746.00	11.25	39.36	1719.48	205.32 N	168.11 E	-206.99	1.04
1778.00	10.37	38.66	1750.91	209.99 N	171.89 E	-211.69	2.78
1809.00	9.45	36.55	1781.45	214.21 N	175.14 E	-215.94	3.19
1813.00	9.67	35.31	1785.39	214.75 N	175.53 E	-216.48	7.53
1934.00	8.74	36.09	1904.83	230.47 N	186.83 E	-232.32	0.77
2023.00	10.61	43.45	1992.56	241.89 N	196.44 E	-243.83	2.51
2113.00	12.16	35.58	2080.80	255.61 N	207.66 E	-257.67	2.44
2202.00	12.69	37.29	2167.71	271.01 N	219.03 E	-273.18	0.72
2291.00	14.02	37.19	2254.30	287.38 N	231.47 E	-289.66	1.49
2381.00	14.51	38.79	2341.53	304.85 N	245.12 E	-307.27	0.70
2471.00	13.33	36.14	2428.88	322.02 N	258.31 E	-324.57	1.50
2560.00	14.72	44.18	2515.24	338.41 N	272.24 E	-341.10	2.69
2650.00	13.21	40.47	2602.58	354.43 N	286.88 E	-357.27	1.95
2739.00	15.22	42.57	2688.85	370.77 N	301.38 E	-373.75	2.34
2829.00	15.06	41.05	2775.73	388.29 N	317.05 E	-391.42	0.47
2918.00	14.71	40.92	2861.74	405.54 N	332.04 E	-408.83	0.39
3008.00	14.06	39.18	2948.92	422.65 N	346.44 E	-426.08	0.86
3097.00	13.67	37.54	3035.33	439.37 N	359.67 E	-442.93	0.63
3187.00	15.89	37.21	3122.34	457.62 N	373.61 E	-461.31	2.47
3277.00	14.07	32.38	3209.28	476.67 N	386.92 E	-480.50	2.45
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3546.00	13.21	40.05	3470.57	527.31 N	425.55 E	-531.52	2.00
3635.00	13.94	41.53	3557.08	543.12 N	439.19 E	-547.46	0.91
3725.00	14.86	40.05	3644.25	560.07 N	453.80 E	-564.55	1.11
3815.00	13.84	38.12	3731.44	577.37 N	467.88 E	-582.00	1.25
3993.00	14.75	38.11	3903.93	611.96 N	495.01 E	-616.85	0.51

4083.00	13.98	37.46	3991.12	629.60 N	508.70 E	-634.63	0.88
4172.00	14.14	36.59	4077.45	646.86 N	521.71 E	-652.02	0.30
4262.00	13.53	36.98	4164.84	664.10 N	534.60 E	-669.39	0.69
4441.00	10.99	34.75	4339.74	694.85 N	556.93 E	-700.36	1.44
4531.00	13.18	39.17	4427.74	709.86 N	568.30 E	-715.47	2.64
4621.00	12.19	37.90	4515.55	725.31 N	580.61 E	-731.05	1.14
4710.00	11.60	37.94	4602.64	739.78 N	591.89 E	-745.63	0.66
4826.00	10.13	32.66	4716.56	757.57 N	604.56 E	-763.55	1.53
4915.00	8.64	31.21	4804.36	769.88 N	612.25 E	-775.93	1.70
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5095.00	5.58	35.89	4982.90	789.85 N	622.96 E	-796.01	2.54
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5454.00	1.69	142.36	5341.54	793.47 N	629.42 E	-799.69	0.42
5543.00	1.55	148.41	5430.50	791.41 N	630.85 E	-797.64	0.24
5723.00	1.25	150.35	5610.45	787.63 N	633.10 E	-793.89	0.17
5813.00	1.05	146.39	5700.43	786.09 N	634.04 E	-792.36	0.24
5902.00	0.65	117.55	5789.42	785.18 N	634.93 E	-791.46	0.64
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6171.00	0.97	68.85	6058.40	786.33 N	637.92 E	-792.64	0.24
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6530.00	8.64	169.54	6417.03	780.85 N	642.76 E	-787.20	9.56
6620.00	13.08	196.36	6505.45	764.41 N	641.12 E	-770.75	7.35
6709.00	23.61	195.31	6589.81	737.48 N	633.56 E	-743.75	11.84
6799.00	28.73	183.22	6670.62	698.45 N	627.57 E	-704.65	8.19
6889.00	35.86	179.57	6746.65	650.42 N	626.55 E	-656.62	8.20
6978.00	44.34	181.20	6814.67	593.15 N	626.09 E	-599.35	9.61
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7247.00	65.87	178.03	6972.66	377.60 N	630.08 E	-383.85	10.26
7337.00	72.22	181.70	7004.85	293.61 N	630.21 E	-299.87	8.02
7427.00	79.43	181.97	7026.88	206.46 N	627.42 E	-212.69	8.02
7517.00	82.71	181.61	7040.85	117.60 N	624.64 E	-123.81	3.67
7606.00	89.29	180.60	7047.06	28.89 N	622.94 E	-35.08	7.48
7695.00	89.94	180.08	7047.65	60.11 S	622.41 E	53.91	0.93
7785.00	88.83	179.44	7048.62	150.10 S	622.79 E	143.90	1.42
7875.00	91.14	179.76	7048.65	240.09 S	623.42 E	233.88	2.59
7965.00	91.17	179.59	7046.83	330.07 S	623.94 E	323.85	0.20
8054.00	91.76	179.14	7044.56	419.04 S	624.93 E	412.80	0.83
8144.00	89.85	179.76	7043.30	509.02 S	625.78 E	502.77	2.23
8234.00	89.69	179.70	7043.66	599.02 S	626.20 E	592.76	0.18
8323.00	89.20	179.77	7044.52	688.01 S	626.61 E	681.75	0.56
8413.00	89.51	182.50	7045.54	777.98 S	624.84 E	771.73	3.05
8502.00	89.94	182.82	7045.97	866.88 S	620.71 E	860.67	0.60
8592.00	89.63	182.68	7046.31	956.78 S	616.39 E	950.60	0.38
8682.00	89.94	182.51	7046.65	1046.69 S	612.32 E	1040.54	0.39
8772.00	91.91	182.14	7045.20	1136.60 S	608.68 E	1130.49	2.23
8861.00	91.63	182.09	7042.44	1225.49 S	605.40 E	1219.41	0.32
8951.00	91.82	181.90	7039.73	1315.40 S	602.26 E	1309.34	0.29
9041.00	91.02	181.10	7037.51	1405.34 S	599.90 E	1399.30	1.26
9130.00	90.86	180.96	7036.05	1494.31 S	598.30 E	1488.29	0.24
9220.00	90.52	180.58	7034.96	1584.30 S	597.10 E	1578.28	0.57
9310.00	90.37	180.27	7034.26	1674.29 S	596.44 E	1668.28	0.39
9399.00	90.09	179.82	7033.90	1763.29 S	596.37 E	1757.27	0.59
9489.00	90.09	180.35	7033.75	1853.29 S	596.24 E	1847.27	0.59
9579.00	89.97	180.04	7033.70	1943.29 S	595.93 E	1937.27	0.37
9668.00	89.82	179.71	7033.87	2032.29 S	596.12 E	2026.26	0.41
9758.00	90.12	179.82	7033.92	2122.29 S	596.50 E	2116.25	0.36
9847.00	89.94	179.80	7033.87	2211.29 S	596.79 E	2205.24	0.21
9937.00	89.94	180.38	7033.97	2301.29 S	596.65 E	2295.24	0.64
10027.00	89.85	180.21	7034.14	2391.29 S	596.20 E	2385.24	0.22
10116.00	89.72	179.90	7034.47	2480.28 S	596.11 E	2474.23	0.37
10206.00	90.96	180.34	7033.94	2570.28 S	595.93 E	2564.23	1.45
10295.00	90.89	180.20	7032.50	2659.27 S	595.51 E	2653.21	0.17
10385.00	90.37	180.32	7031.51	2749.26 S	595.10 E	2743.21	0.60
10474.00	90.28	179.91	7031.01	2838.26 S	594.93 E	2832.20	0.47
10564.00	90.09	180.45	7030.72	2928.26 S	594.65 E	2922.20	0.64
10654.00	90.40	180.19	7030.33	3018.26 S	594.15 E	3012.20	0.45
10743.00	90.77	180.42	7029.42	3107.25 S	593.67 E	3101.19	0.49
10922.00	90.25	180.31	7027.83	3286.24 S	592.53 E	3280.18	0.30

11012.00	89.94	180.03	7027.69	3376.24 S	592.26 E	3370.18	0.46
11102.00	90.31	180.22	7027.49	3466.24 S	592.07 E	3460.18	0.46
11236.00	88.55	180.21	7028.83	3600.22 S	591.56 E	3594.16	1.31
11281.00	88.52	181.44	7029.98	3645.20 S	590.91 E	3639.15	2.73
11371.00	90.68	181.61	7030.61	3735.17 S	588.52 E	3729.13	2.40
11460.00	91.26	181.67	7029.10	3824.12 S	585.97 E	3818.10	0.66
11550.00	91.54	182.47	7026.90	3914.03 S	582.72 E	3908.04	0.95
11640.00	92.00	182.84	7024.11	4003.89 S	578.55 E	3997.94	0.66
11729.00	91.23	181.68	7021.60	4092.78 S	575.04 E	4086.86	1.57
11819.00	91.70	181.59	7019.30	4182.72 S	572.48 E	4176.81	0.52
11909.00	92.53	181.75	7015.99	4272.62 S	569.85 E	4266.74	0.94
11998.00	91.97	179.44	7012.49	4361.54 S	568.92 E	4355.66	2.67
12088.00	90.74	179.46	7010.36	4451.50 S	569.79 E	4445.62	1.37
12178.00	89.57	179.10	7010.12	4541.50 S	570.92 E	4535.59	1.36
12267.00	89.08	179.13	7011.17	4630.48 S	572.29 E	4624.56	0.56
12357.00	89.11	180.36	7012.60	4720.46 S	572.69 E	4714.53	1.37
12536.00	89.23	179.35	7015.20	4899.44 S	573.14 E	4893.50	0.57
12626.00	89.20	178.88	7016.43	4989.42 S	574.53 E	4983.46	0.52
12716.00	89.41	181.31	7017.52	5079.41 S	574.38 E	5073.44	2.71
12805.00	89.57	182.63	7018.31	5168.35 S	571.32 E	5162.41	1.49
12895.00	89.29	182.92	7019.21	5258.24 S	566.97 E	5252.34	0.44
12984.00	91.57	182.28	7018.54	5347.14 S	562.93 E	5341.28	2.66
13164.00	91.60	182.14	7013.55	5526.94 S	555.98 E	5521.13	0.08
13253.00	91.42	182.07	7011.20	5615.85 S	552.71 E	5610.07	0.23
13343.00	90.89	181.61	7009.39	5705.78 S	549.83 E	5700.03	0.77
13433.00	89.63	181.69	7008.98	5795.74 S	547.24 E	5790.01	1.41
13522.00	88.92	180.85	7010.10	5884.71 S	545.26 E	5879.00	1.24
13621.00	89.35	182.53	7011.59	5983.65 S	542.34 E	5977.96	1.75
13666.00	89.35	182.53	7012.10	6028.61 S	540.36 E	6022.93	0.01

**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 180.57 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.22 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 13666.00 FEET  
IS 6052.77 FEET ALONG 174.88 DEGREES (TRUE)**

**Surveys from 13' to 1813' provided by third party  
First Sperry Survey at 1934'.  
Last survey is a projection to bit at TD.**