

PCG Pressure Case Gamma Ray  
PCDC Pressure Case Directional

[illegible]

## WELL INFORMATION

MWD Run Number	100	200	300	400	500
Date run completed	27-Jul-14	29-Jul-14	29-Jul-14	30-Jul-14	05-Aug-14
Rig Bit Number	0100	0200	0300	0400	0500
Bit Size (in)	13.500	8.750	8.750	8.750	6.125
Tool Nominal OD (in)	6.750	6.750	6.750	6.750	4.750
Log Start Depth (MD, ft)	81.00	1,615.00	5,560.00	5,745.00	6,078.00
Log End Depth (MD, ft)	1,615.00	5,560.00	5,745.00	6,078.00	13,500.00
Drill or Wipe	Drill	Drill	Drill	Drill	Drill
Drill/Wipe Start Date and Time	26-Jul-14 18:51	28-Jul-14 02:19	29-Jul-14 07:51	29-Jul-14 20:45	01-Aug-14 00:40
Drill/Wipe End Date and Time	27-Jul-14 02:41	28-Jul-14 22:17	29-Jul-14 11:40	30-Jul-14 15:08	04-Aug-14 12:22
Min Inc (deg) @ Depth (MD, ft)	0.34 @ 177.00	0.29 @ 5,254.00	15.40 @ 5,538.00	33.25 @ 5,727.00	85.60 @ 10,124.00
Max Inc (deg) @ Depth (MD, ft)	15.74 @ 1,364.00	14.82 @ 3,647.00	30.84 @ 5,696.00	88.50 @ 6,028.00	93.67 @ 8,385.00
Bit TFA(in2) / Bit Type	1.84 / PDC	0.74 / PDC	0.74 / PDC	0.92 / PDC	0.98 / PDC
Flow Rate (gpm)	688.25	483.00	397.00	433.29	247.15
Max AV (fpm) / CV (fpm) @ MWD	NA / NA	314.0 / NA	314.0 / NA	NA / NA	NA / NA
Fluid Type	Native/Spud Mud	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel
Density (ppg) / Viscosity (spqt)	8.50 / 31.00	9.20 / 28.00	10.10 / 49.00	9.00 / 49.00	10.50 / 48.00
Filtrate CL (ppm)	0.00	2,000.00	2,000.00	2,000.00	2,000.00
pH / Fluid Loss (mptm)	9.00 / 0	9.00 / 0	9.00 / 0	9.70 / 0	9.00 / 0
PV (cP) / YP (lbf2)	NA / NA	0 / 0.00	18 / 15.00	18 / 15.00	21 / 11.00
% Solids / % Sand	0 / 0.25	1 / 0.25	8 / 0.25	8.0 / 0.25	12.00 / 0.25
% Oil / Oil:Water Ratio	NA / NA	NA / NA	NA / NA	NA / NA	NA / NA
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA	NA @ NA
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA	NA @ NA
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA	NA @ NA	NA @ NA
Max Tool Temp (in F) / S	104.00 / PDM	105.50 / PDM	170.07 / PDM	170.07 / PDM	620.00 / PDM

Max Tool Temp (degF) / Source	124.30 / PCM	165.58 / PCM	170.37 / PCM	170.37 / PCM	226.08 / PCM
Rm @ Max Tool Temp (degF)	NA @ 124.30	NA @ 165.58	NA @ 170.37	NA @ 170.37	NA @ 226.08
Lead MWD Engineer	Scott Trowbridge	Scott Trowbridge	Scott Trowbridge	Scott Trowbridge	Scott Trowbridge
Customer Representative	Kennith Wilkerson	Kennith Wilkerson	Kennith Wilkerson	Kennith Wilkerson	Kennith Wilkerson

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM	PCM	PCM
Software Version	5.93	5.93	5.93	5.93	5.93
Sub Serial Number	11341319	11341319	11341319	11341319	12463936
Insert Serial Number	11400991	10996900	11400991	11400991	10996900
Date and Time Initialized	25-Jul-14 22:44	27-Jul-14 15:18	29-Jul-14 01:23	29-Jul-14 01:23	31-Jul-14 06:50
Date and Time Read	27-Jul-14 06:12	29-Jul-14 06:42	30-Jul-14 23:21	30-Jul-14 23:05	05-Aug-14 11:10
ECMB SW Version	N/A	N/A	N/A	N/A	N/A

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC	PCDC	PCDC
Distance From Bit (ft)	56.04	51.10	47.80	47.80	47.21
Software Version	6.21	6.21	6.21	6.21	6.21
Sub Serial Number	11341319	11341319	11341319	11341319	12463936
Sonde Serial Number	11478070	11638472	11478070	11478070	11638472
Sensor ID Number	N/A	N/A	N/A	N/A	N/A
Toolface Offset (deg)	335.82	57.60	166.97	188.83	56.84

### Gamma Ray Sensor Information

Tool Type		PCG	PCG	PCG	PCG
Distance From Bit (ft)		46.00	42.70	42.70	36.61
Recorded Sample Period (sec)		10	10	10	10
Software Version		8.15	8.15	8.15	8.15
Sub Serial Number		11341319	11341319	11341319	12463936
Insert/Sonde Serial Number		11293268	12071301	12071301	11293268

## REMARKS

1. All depths are measured bit 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. Critical annular velocities are calculated using the "Power Law" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

4. All data is stored unless otherwise specified.

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

PCG Gamma Ray BCorr (PGRC)  
Interval Resolution: .5  
Interval Distance: .6  
Gap Fill: 3

Average Rate of Penetration (ROPA)  
Interval Resolution: .5  
Interval Distance: 1.2  
Gap Fill: 3

6. INSITE Version 8.0.20
7. Marker joint set at 6178' MD. This joint signifies the point at which the well bore passed N/S 308.0

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Sperry Drilling Services

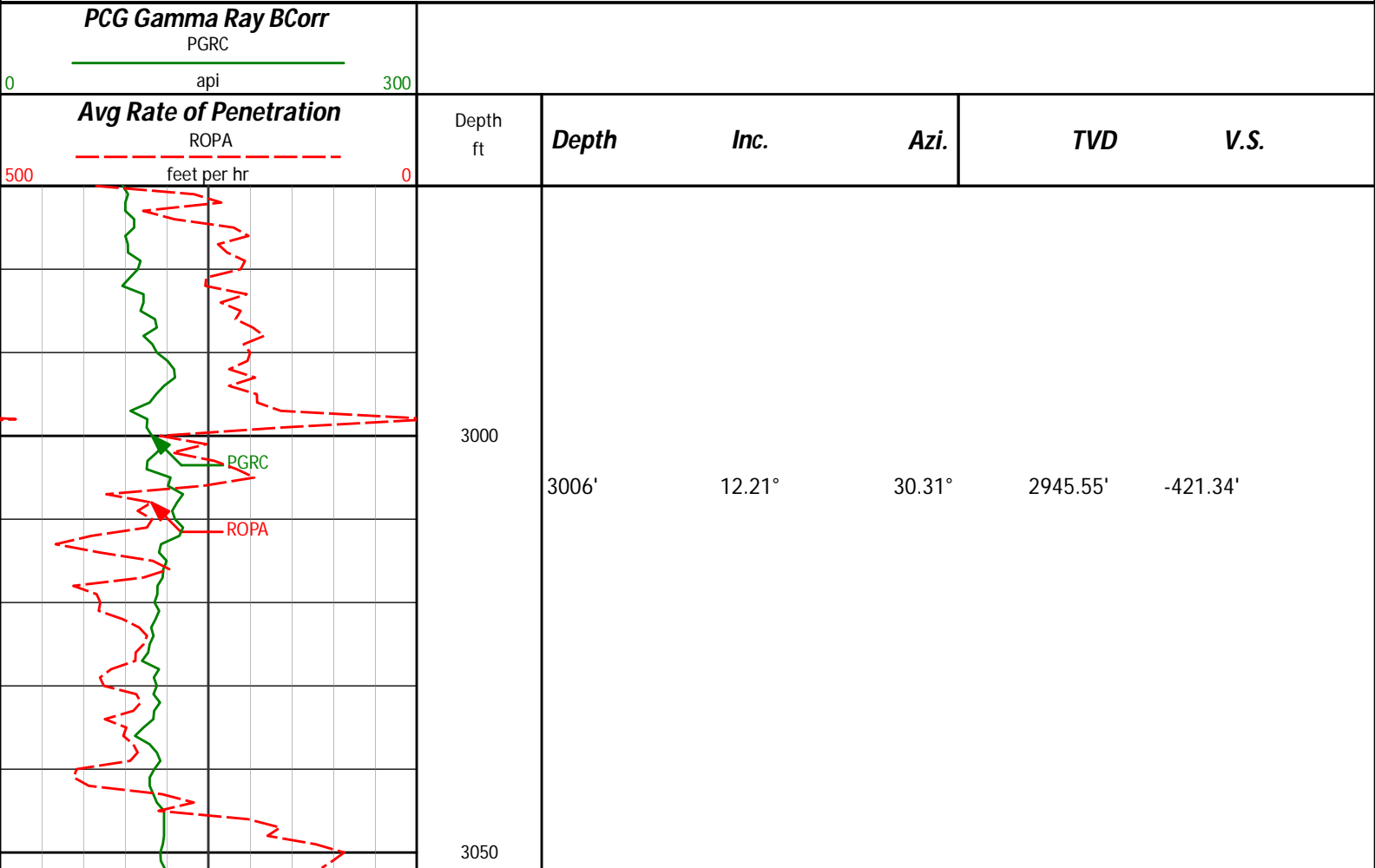
MD Main Log 1:240

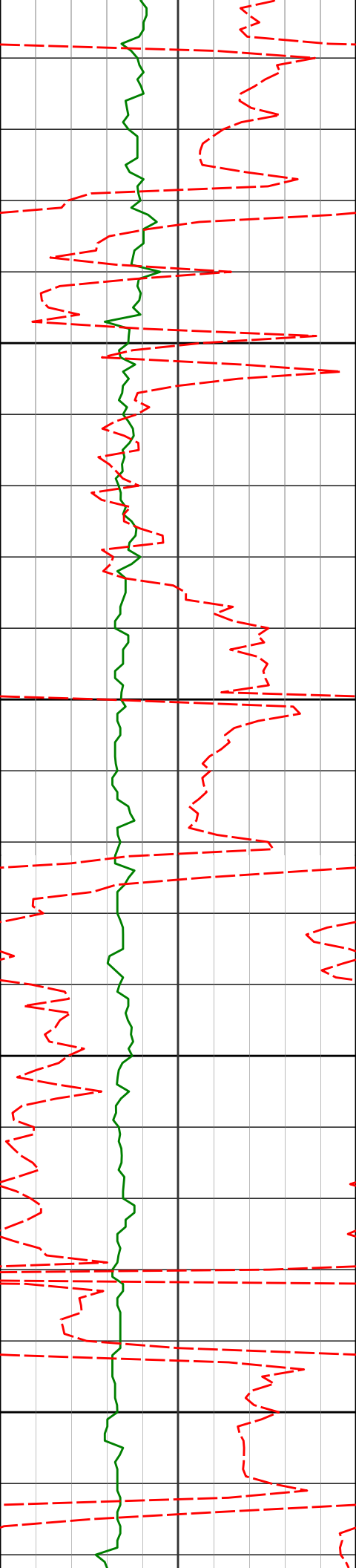
Whiting Oil and Gas

Razor 27J-3412B

Frontier 26

Sec. 27-T10N-R58W





3100

3150

3200

3250

3097'

12.31°

32.84°

3034.48'

-436.96'

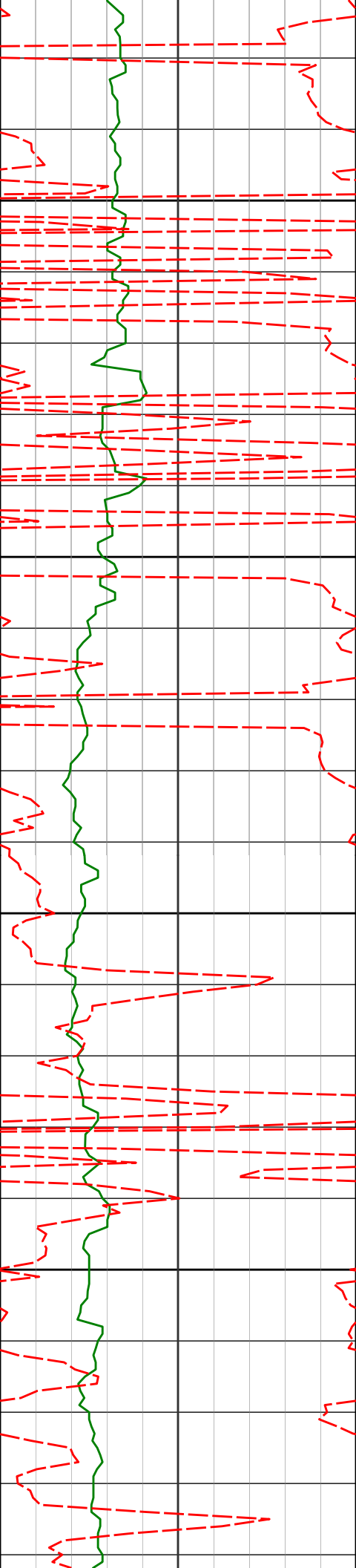
3189'

12.87°

40.55°

3124.27'

-452.01'



3281'

14.63°

41.48°

3213.63'

-467.33'

3300

3350

3372'

14.21°

41.18°

3301.77'

-483.13'

3400

3450

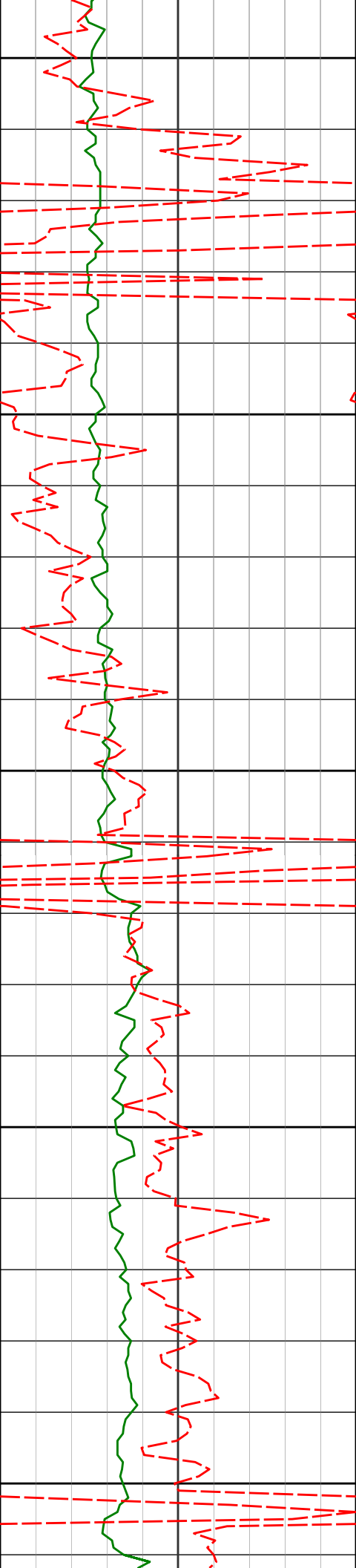
3464'

14.49°

40.63°

3390.90'

-499.15'



3500

3550

3600

3650

3700

3555'

14.47°

40.33°

3479.00'

-515.26'

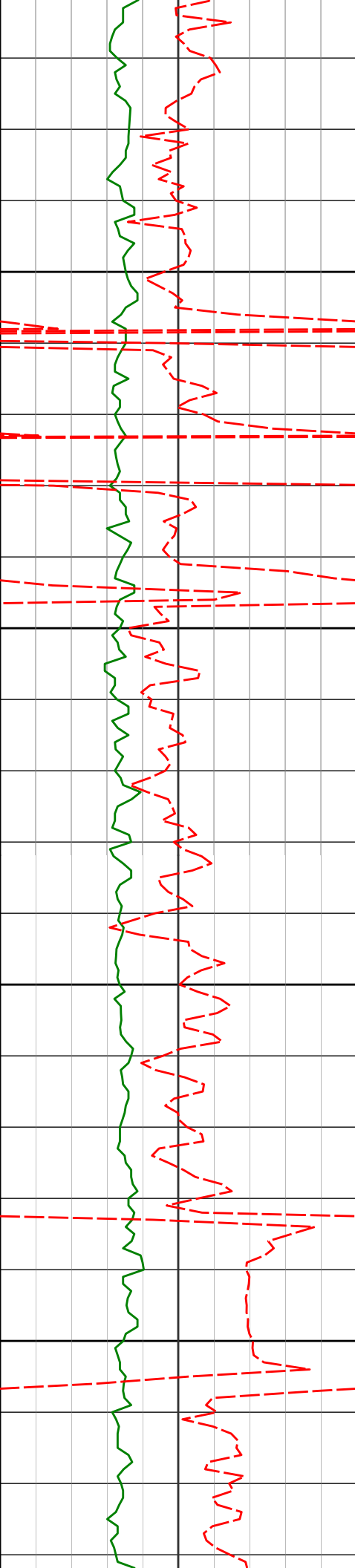
3647'

14.82°

41.15°

3568.02'

-531.65'



3739'

13.87°

39.03°

3657.15'

-547.88'

3750

3800

3830'

12.36°

38.42°

3745.77'

-562.93'

3850

3900

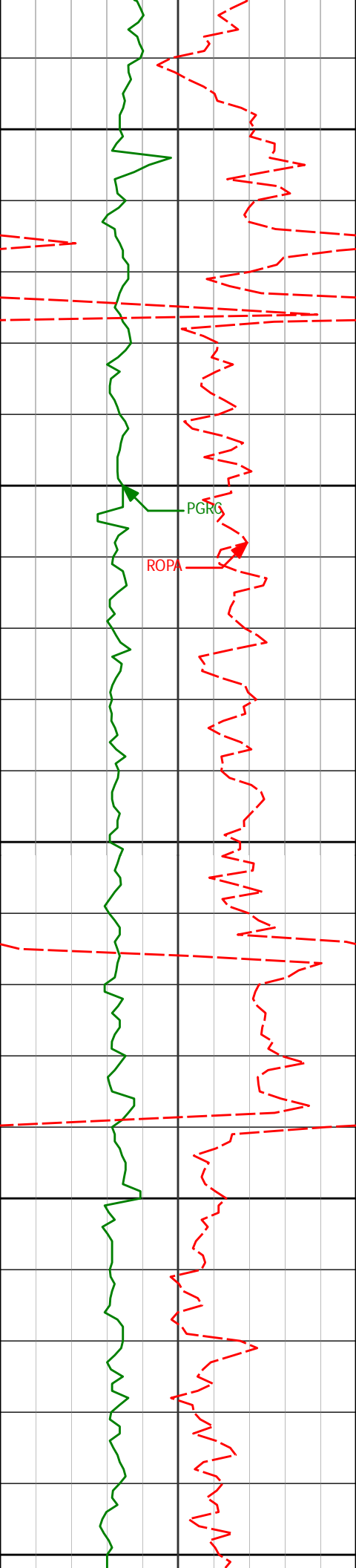
3922'

13.42°

37.47°

3835.45'

-578.09'



3950

4000

4050

4100

4150

PGRG

ROPA

4013'

12.30°

37.31°

3924.17'

-593.17'

4104'

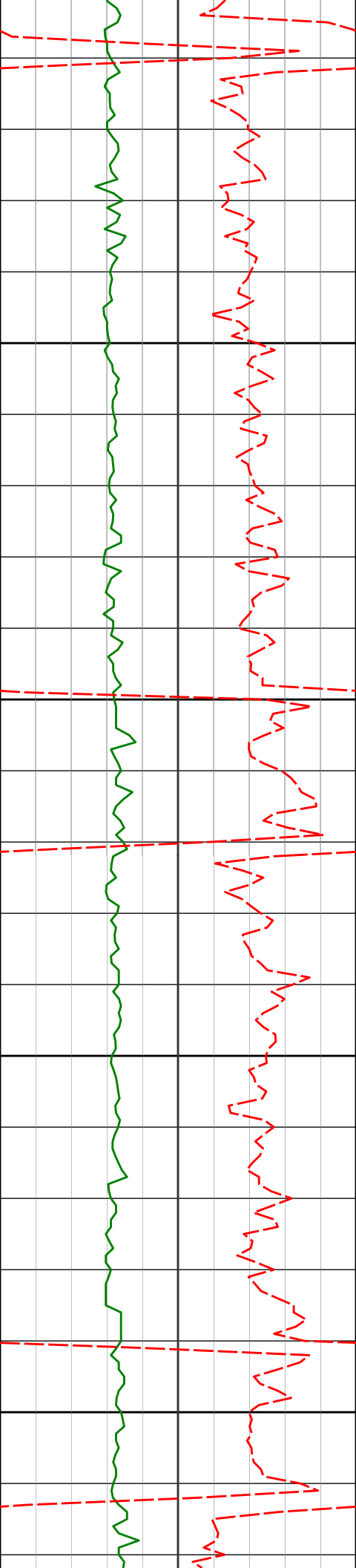
13.80°

32.01°

4012.82'

-609.13'





4196'

12.72°

30.82°

4102.36'

-626.22'

4200

4250

4287'

12.79°

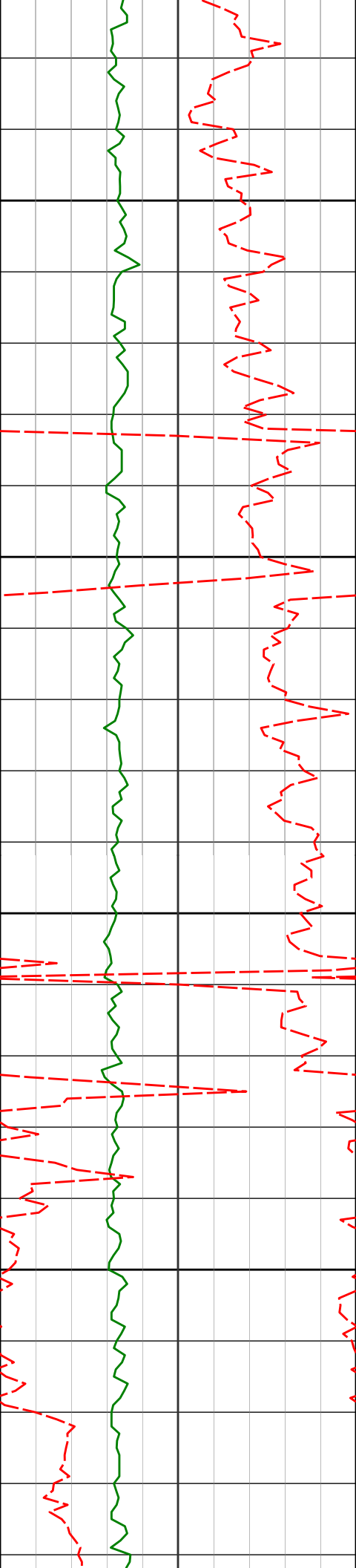
35.23°

4191.12'

-642.15'

4300

4350



4379'

12.92°

33.51°

4280.81'

-658.10'

4400

4450

4469'

13.31°

28.85°

4368.47'

-674.69'

4500

4550

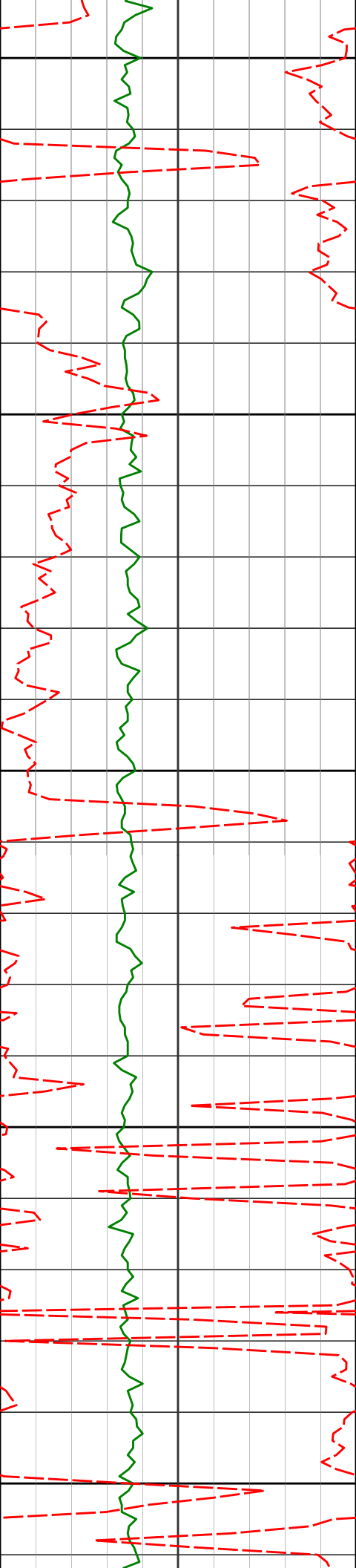
4561'

11.79°

26.32°

4458.27'

-691.62'



4600

4650

4700

4750

4800

4653'

10.54°

19.56°

4548.53'

-707.38'

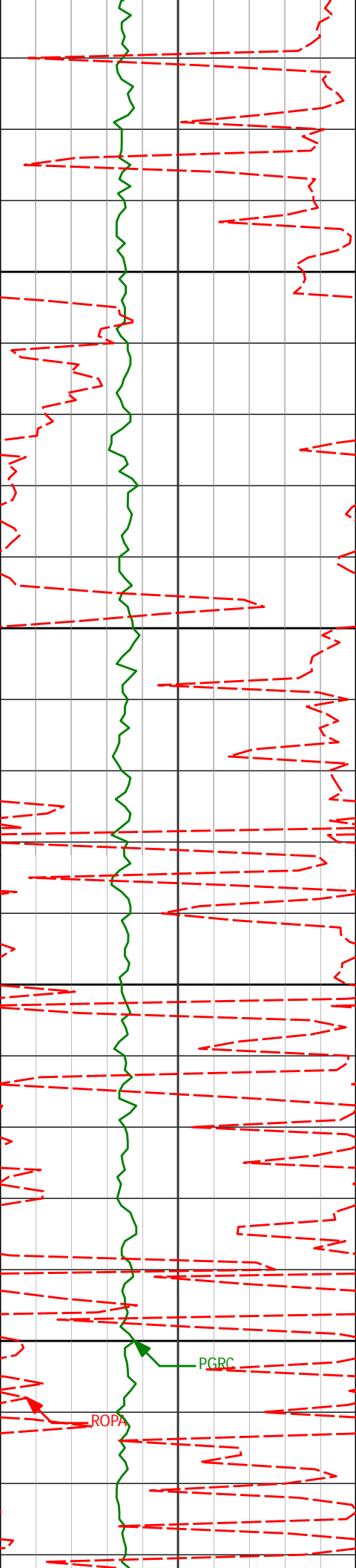
4747'

8.92°

20.56°

4641.17'

-721.84'



4842'

7.72°

21.59°

4735.17'

-734.24'

4850

4900

4937'

6.48°

18.50°

4829.44'

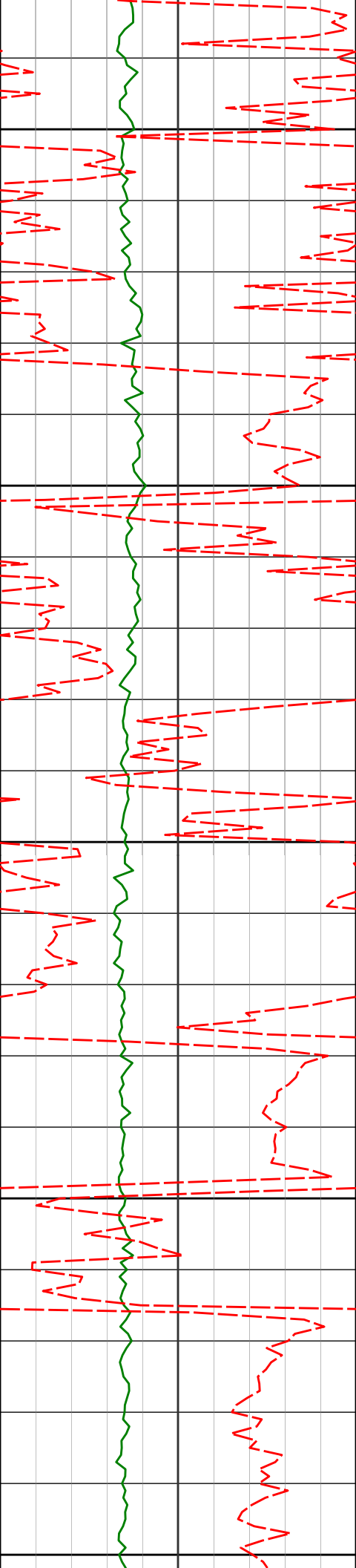
-744.91'

4950

5000

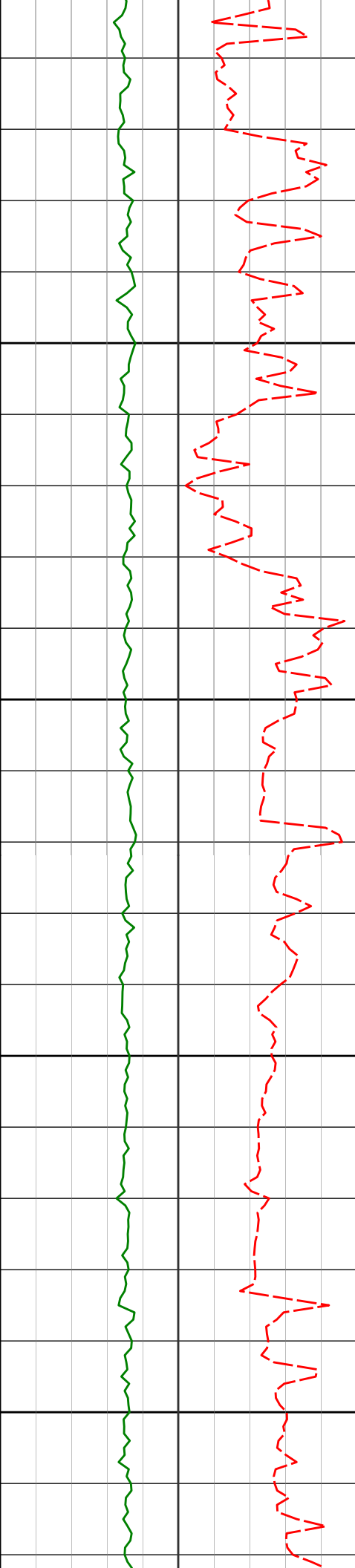
PGRC

ROPA

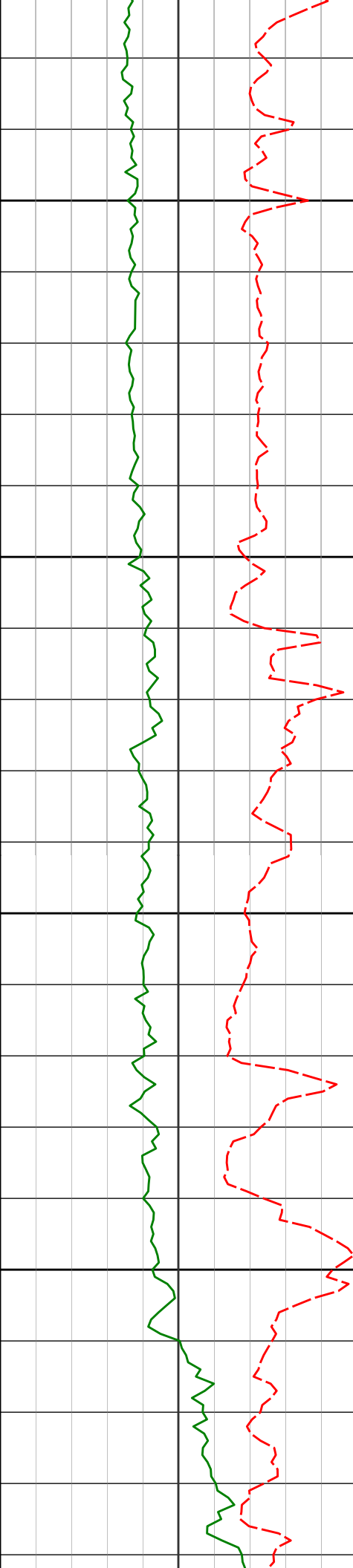


KOP 5217' MD

5052	5.10	14.62	4923.96	-753.64
5050				
5100				
5127'	4.23°	358.96°	5018.65'	-761.33'
5150				
5200				
5222'	2.38°	12.12°	5113.48'	-766.71'
5250				



5254'	0.29°	241.41°	5145.48'	-767.32'
5285'	2.54°	196.00°	5176.46'	-766.64'
5317'	2.46°	190.76°	5208.43'	-765.32'
5348'	3.08°	189.15°	5239.40'	-763.86'
5380'	4.83°	193.33°	5271.32'	-761.75'
5412'	7.38°	188.20°	5303.14'	-758.46'
5443'	9.26°	191.74°	5333.81'	-754.12'



R300

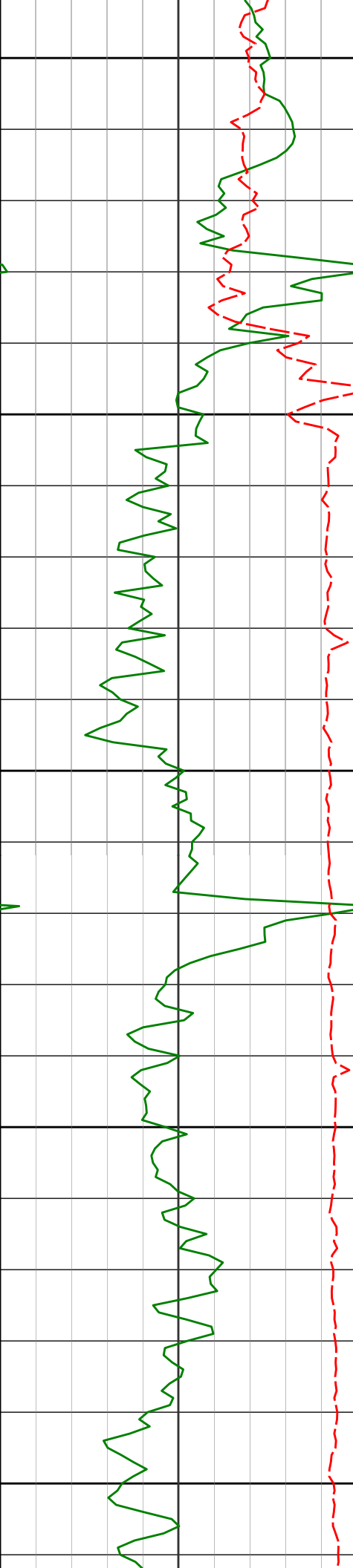
5500

5550

5600

5650

5475'	10.70°	195.85°	5365.32'	-748.86'
5507'	12.83°	198.28°	5396.65'	-742.80'
5538'	15.40°	197.59°	5426.71'	-735.81'
5569'	16.93°	190.30°	5456.49'	-727.63'
5601'	20.99°	189.79°	5486.75'	-717.56'
5633'	23.50°	195.21°	5516.37'	-706.00'
5664'	27.41°	196.56°	5544.35'	-693.51'



R400

5750

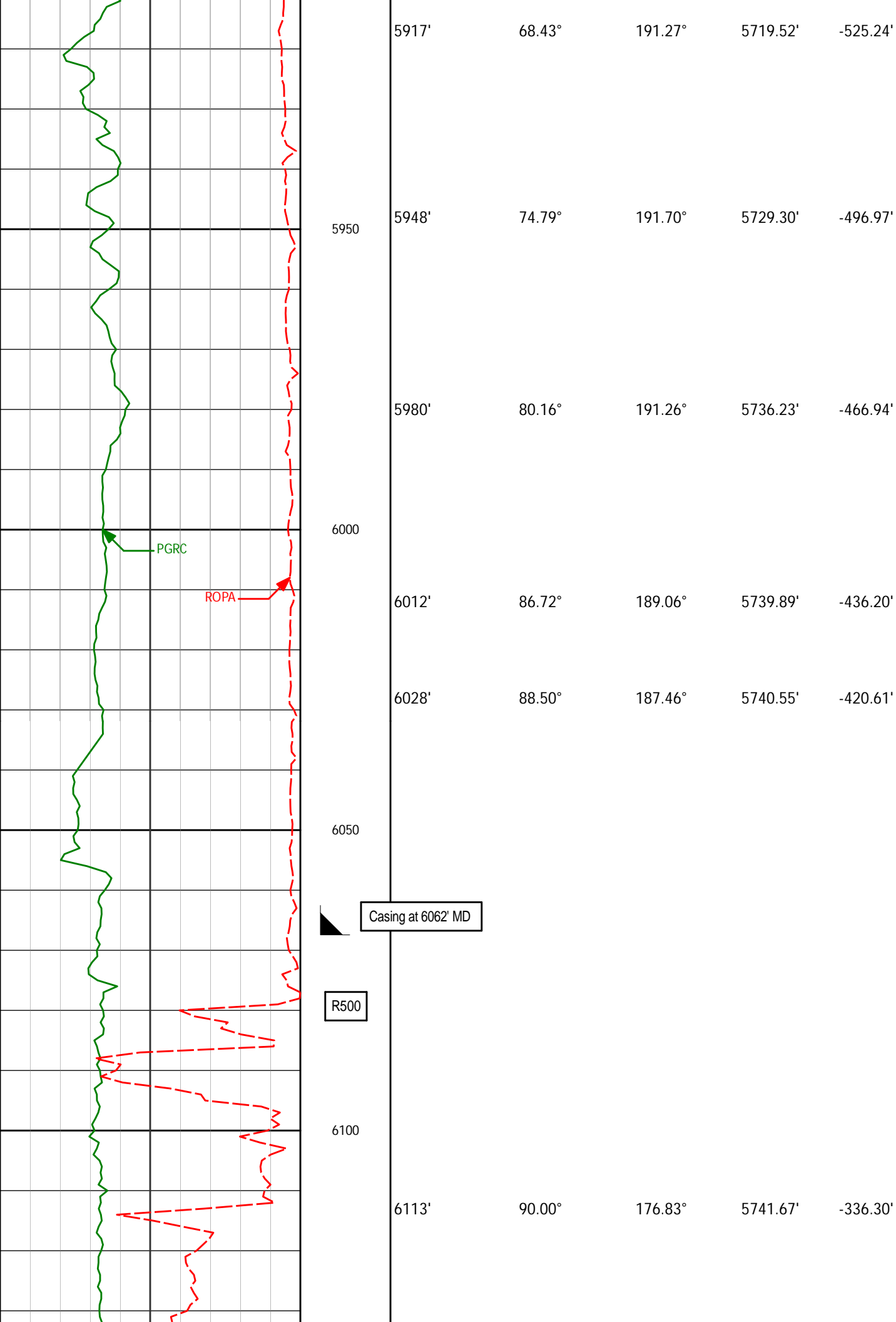
5800

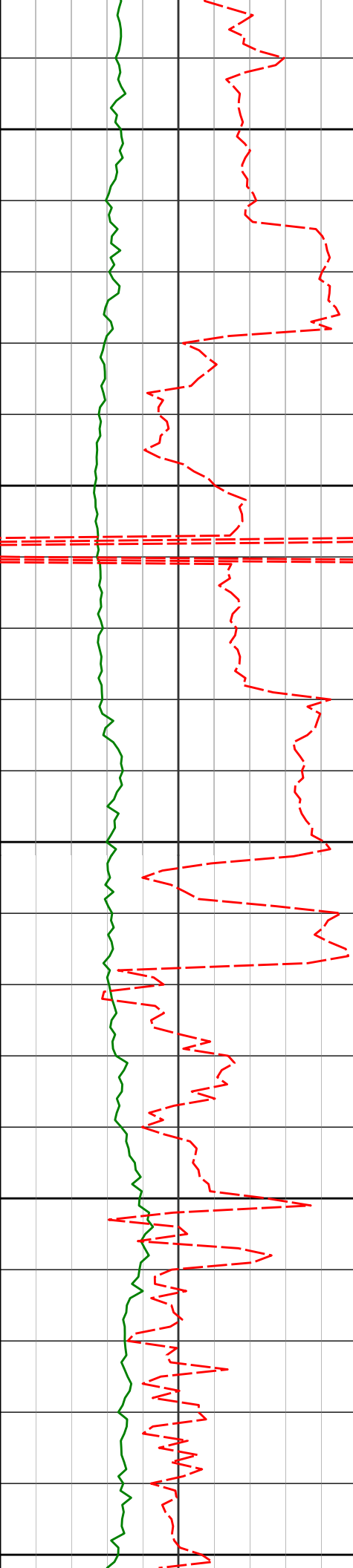
5850

5900

5696'	30.84°	192.35°	5572.30'	-678.78'
5727'	33.25°	191.68°	5598.58'	-663.00'
5759'	37.56°	189.72°	5624.66'	-645.11'
5790'	42.99°	189.65°	5648.30'	-625.69'
5822'	49.87°	190.53°	5670.34'	-603.26'
5854'	55.45°	190.15°	5689.74'	-578.67'
5885'	61.41°	190.67°	5705.96'	-553.16'







6150

Marker Joint 6178' MD

See Remark 7

6200

6208'

90.65°

174.88°

5741.13'

-241.31'

6250

6300

6302'

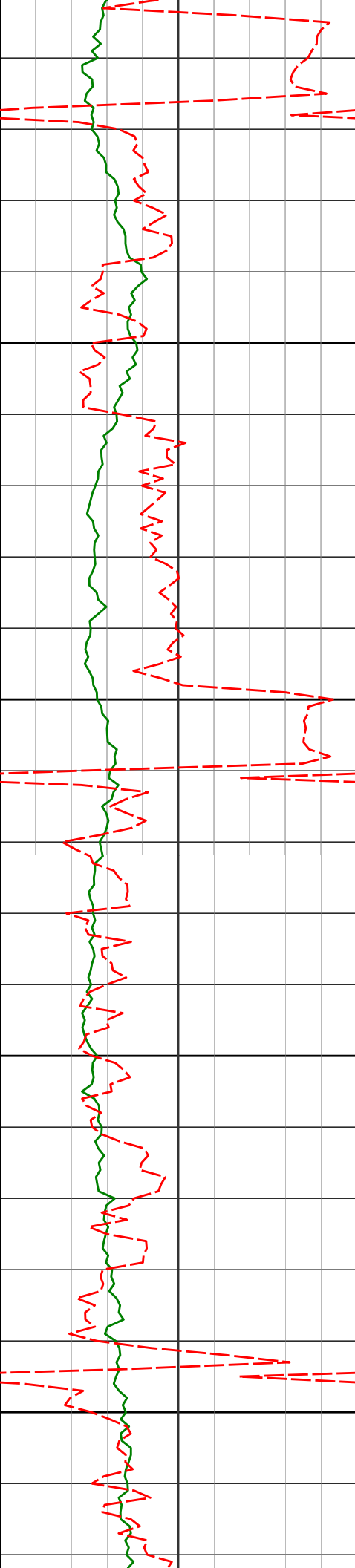
93.60°

174.97°

5737.65'

-147.39'

6350



6400

6450

6500

6550

6397'

92.53°

175.15°

5732.57'

-52.53'

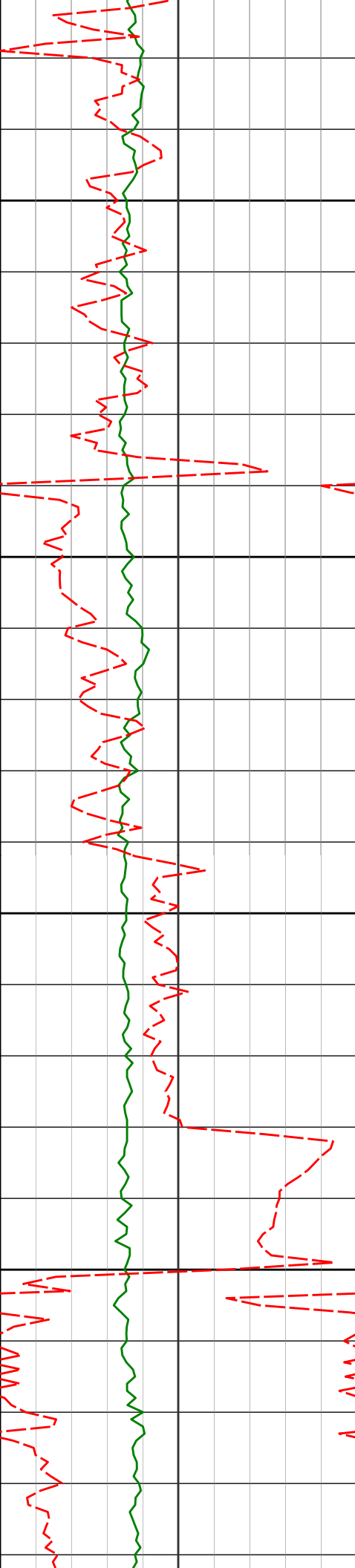
6491'

91.60°

174.46°

5729.18'

41.40'



6586'

91.99°

174.48°

5726.20'

136.34'

6600

6650

6680'

89.78°

172.17°

5724.75'

230.24'

6700

6750

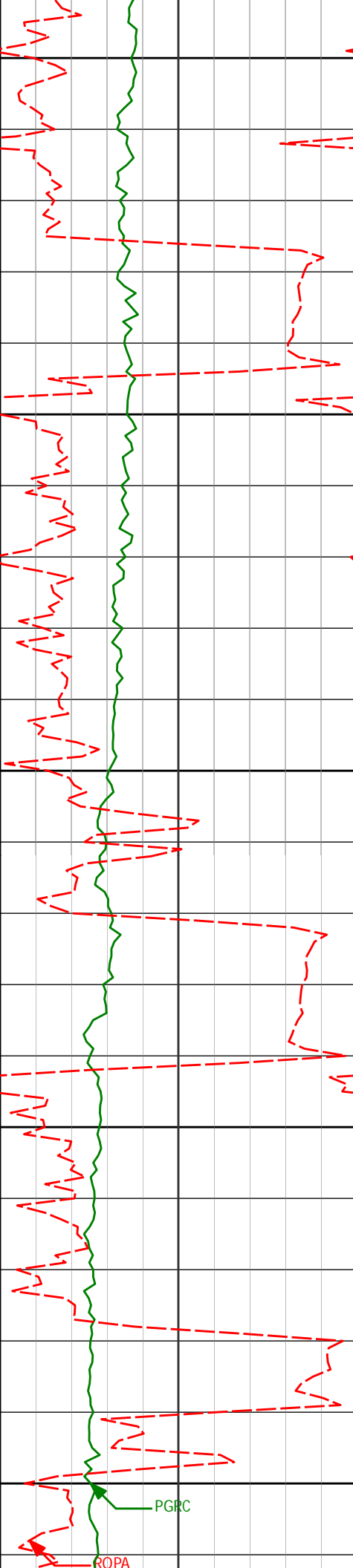
6775'

90.83°

173.67°

5724.25'

325.14'



6800

6850

6870'

89.85°

173.90°

5723.68'

420.09'

6900

6950

6964'

89.82°

176.40°

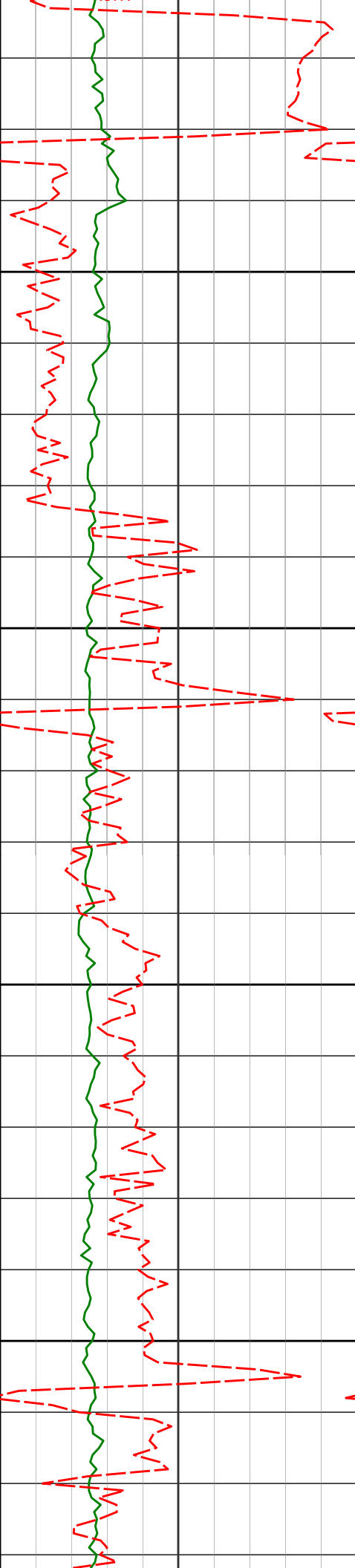
5723.95'

514.08'

7000

PGRC

ROPA



7050

7059'

90.43°

179.38°

5723.75'

608.99'

7100

7150

7154'

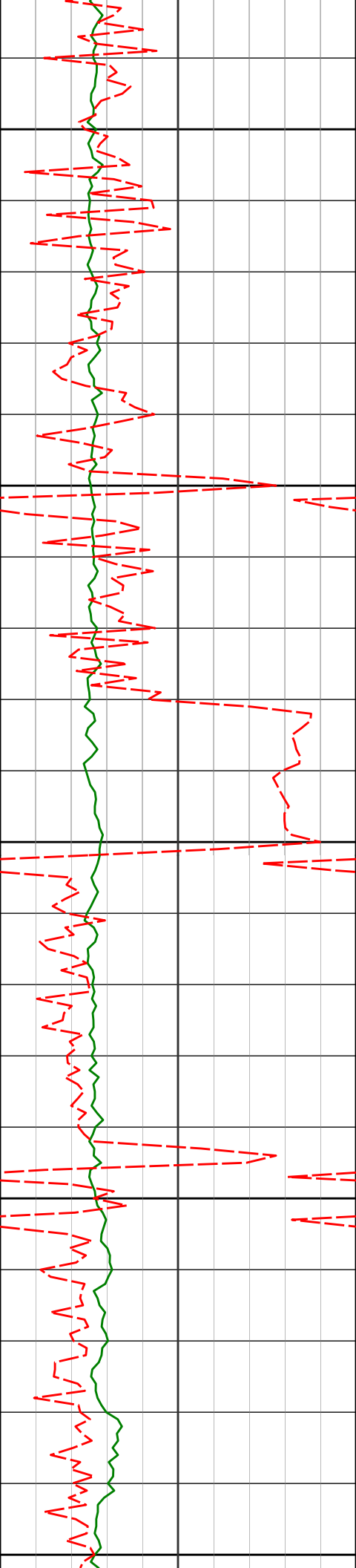
90.32°

179.17°

5723.12'

703.79'

7200



7250

7300

7350

7400

7450

7248'

7343'

7438'

90.59°

90.52°

90.56°

178.21°

179.60°

179.25°

5722.38'

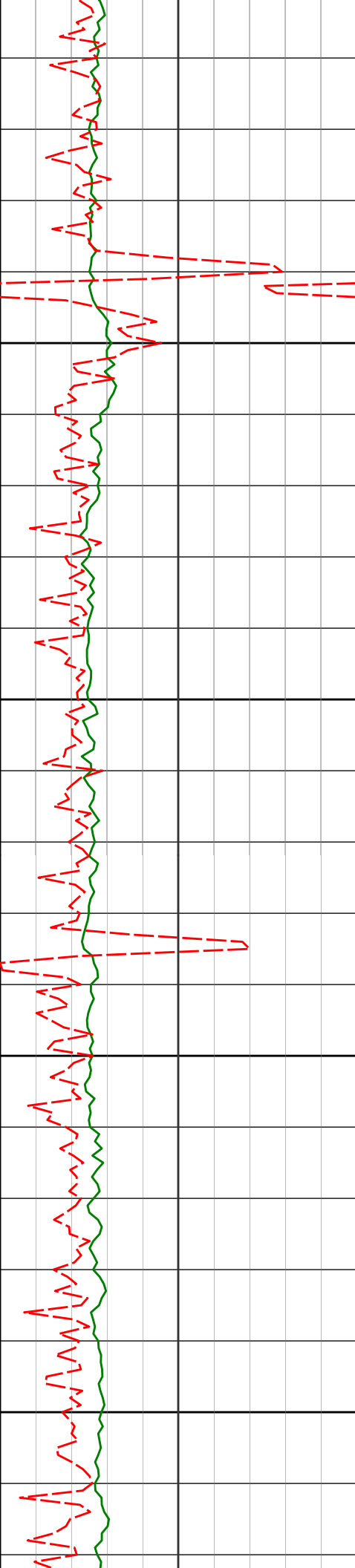
5721.46'

5720.56'

797.64'

892.47'

987.25'



7500

7533'

90.86°

179.33°

5719.39'

1082.04'

7550

7600

7628'

89.91°

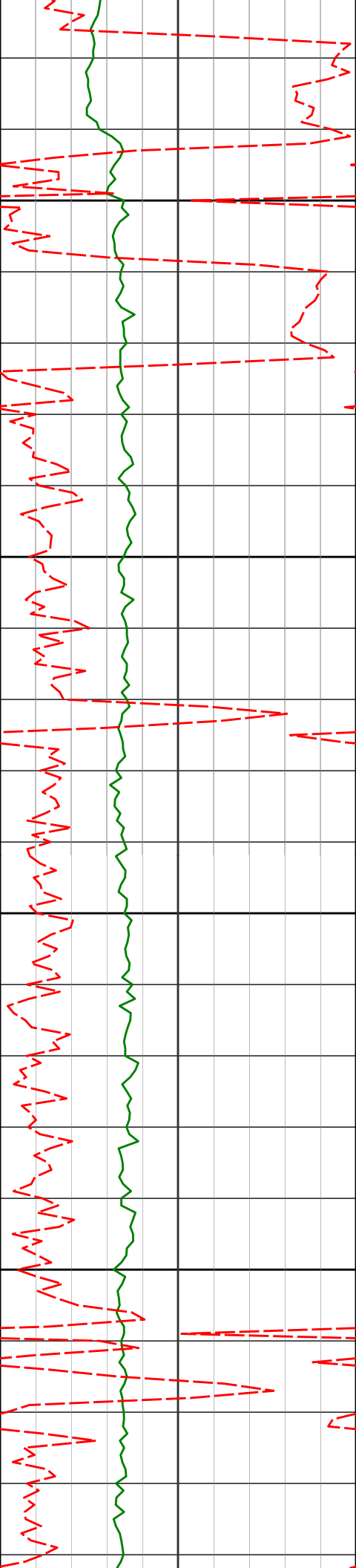
178.89°

5718.75'

1176.85'

7650





7700

7723'

89.45°

180.48°

5719.28'

1271.59'

7750

7800

7817'

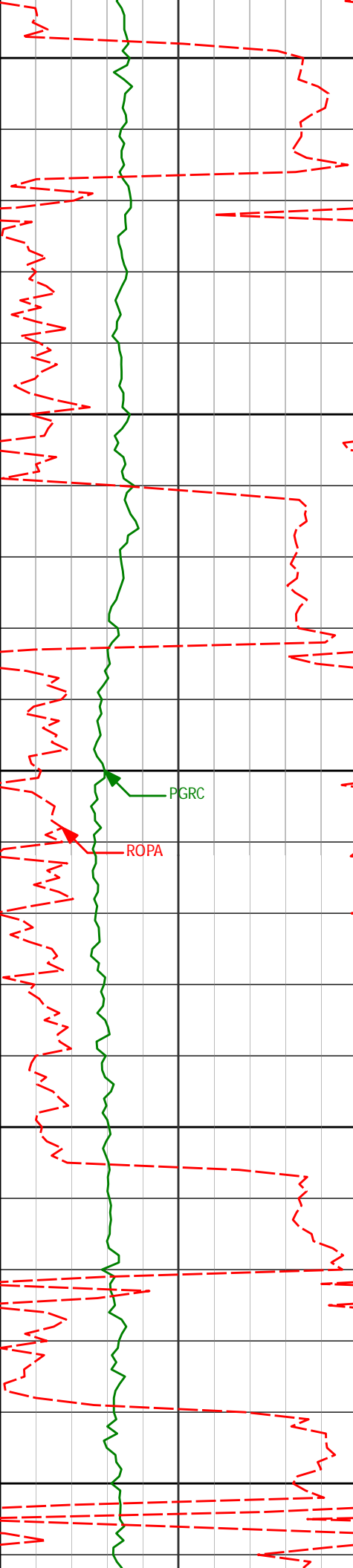
90.34°

185.04°

5719.45'

1364.82'

7850



7900

7912'

90.15°

185.33°

5719.04'

1458.48'

7950

8000

8007'

90.14°

183.34°

5718.80'

1552.36'

8050

8100

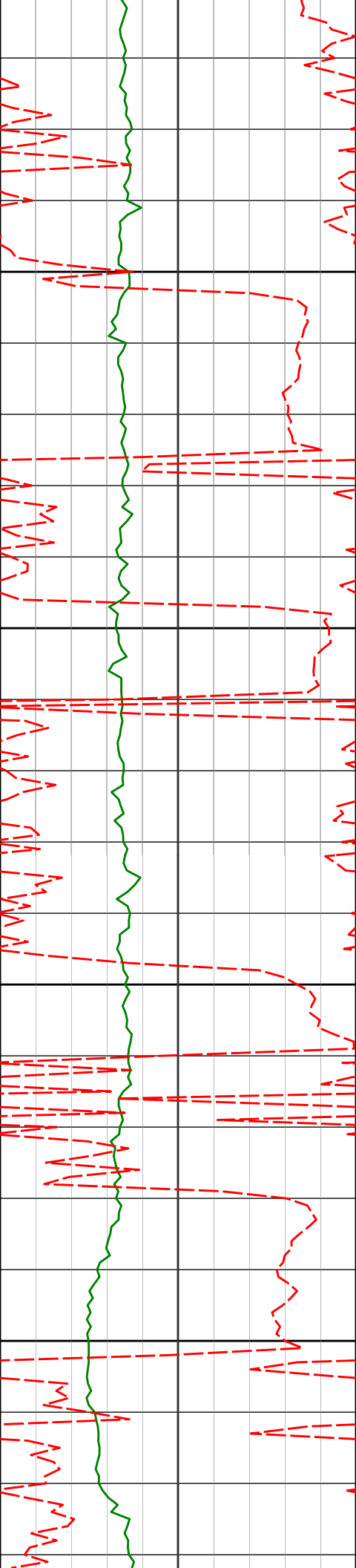
8102'

89.72°

181.39°

5718.92'

1646.68'



8150

8200

8250

8300

8197'

89.92°

178.33°

5719.22'

1741.40'

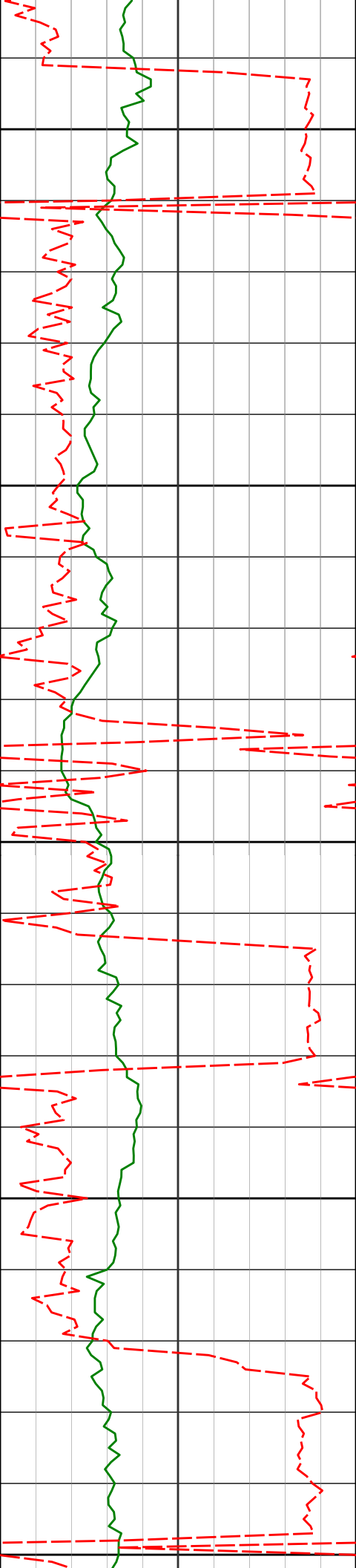
8292'

91.33°

177.31°

5718.18'

1836.31'



8350

8385'

93.67°

176.94°

5714.13'

1929.18'

8400

8450

8475'

92.58°

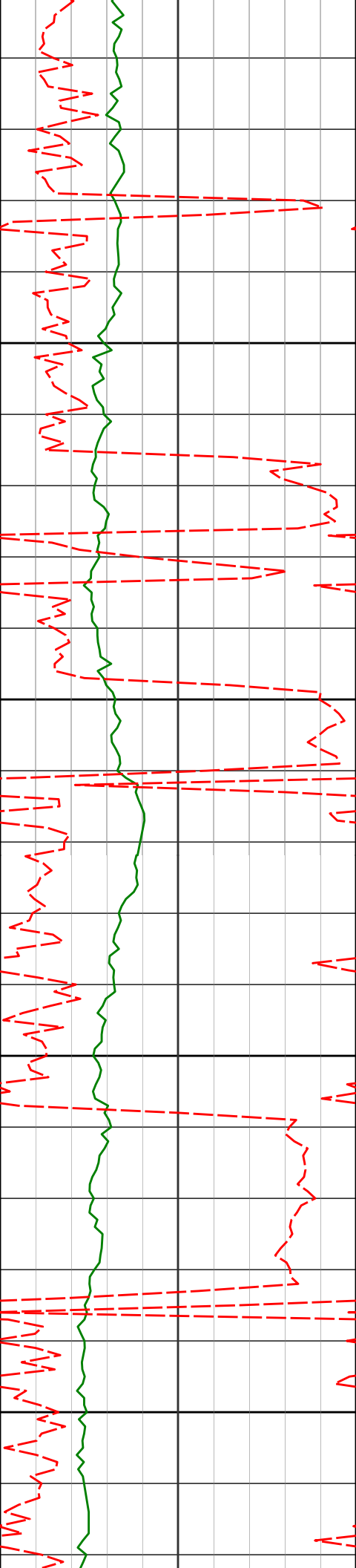
177.35°

5709.22'

2019.01'

8500

8550



8567'

89.84°

177.69°

5707.28'

2110.93'

8600

8650

8659'

87.78°

176.53°

5709.19'

2202.87'

8700

8750

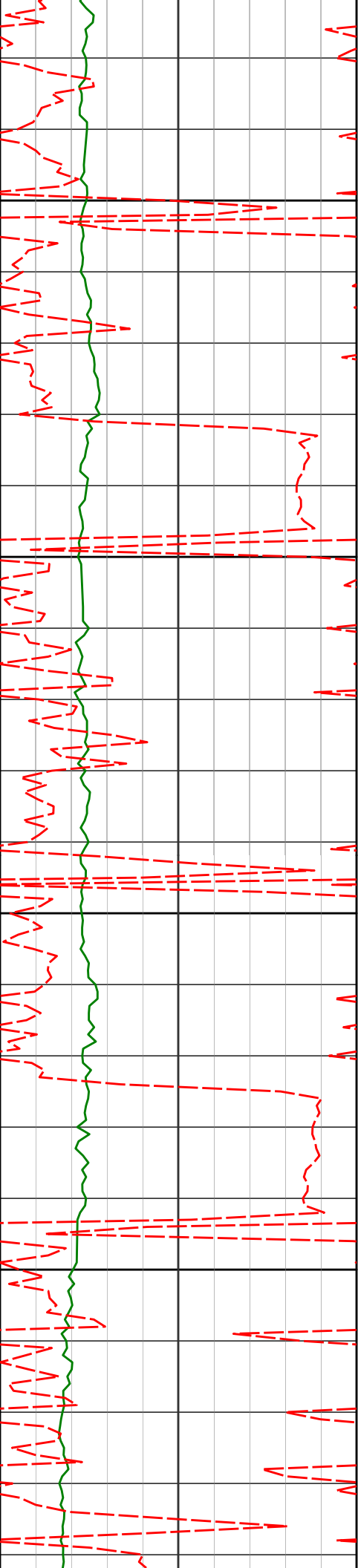
8751'

89.04°

178.98°

5711.74'

2294.75'



8800

8843'

89.15°

180.35°

5713.19'

2386.50'

8850

8900

8934'

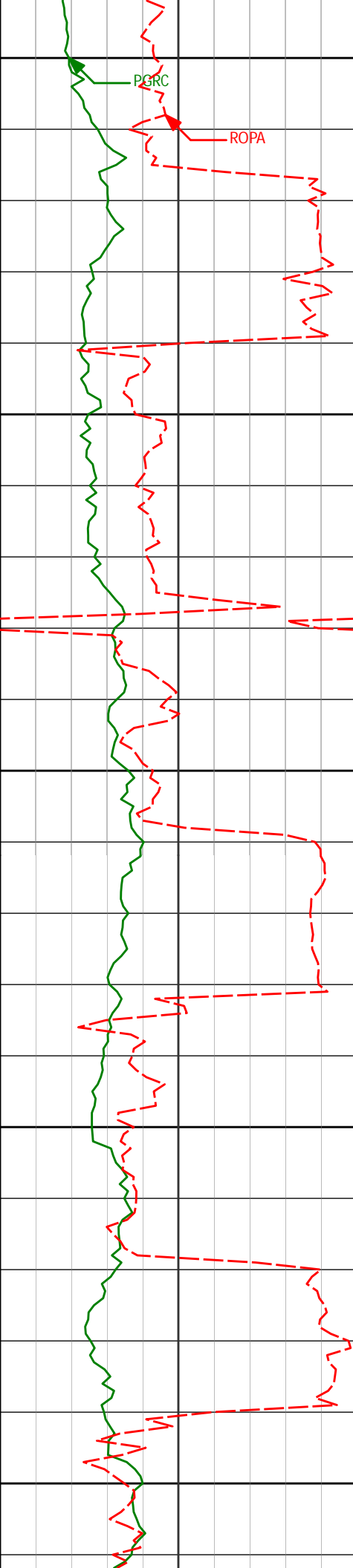
88.72°

182.15°

5714.89'

2477.03'

8950



9000

PGRC

ROPA

9050

9100

9150

9200

9027'

86.90°

180.86°

5718.44'

2569.45'

9118'

86.90°

179.07°

5723.36'

2660.05'

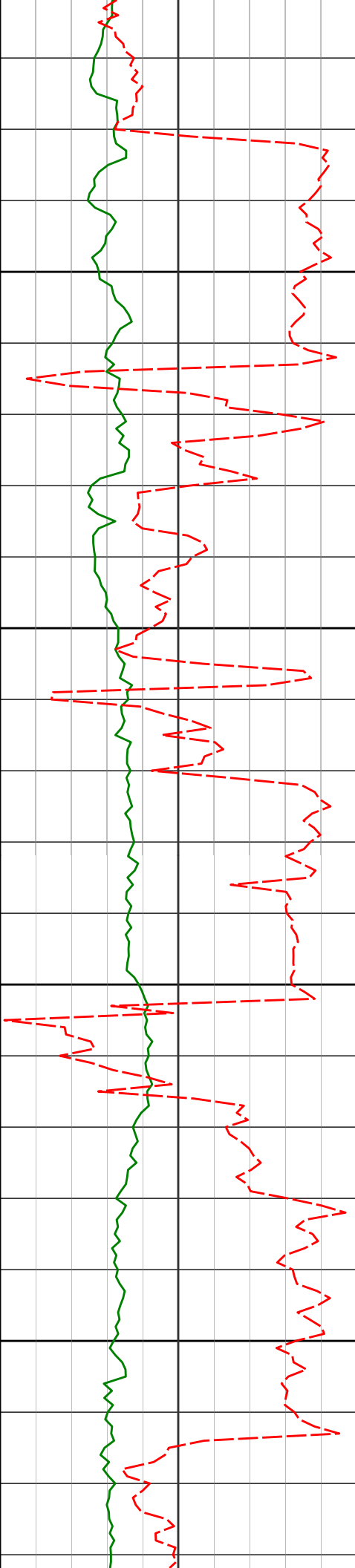
9210'

86.21°

178.27°

5728.89'

2751.74'



9250

9300

9350

9400

9301'

87.49°

178.18°

5733.89'

2842.50'

9393'

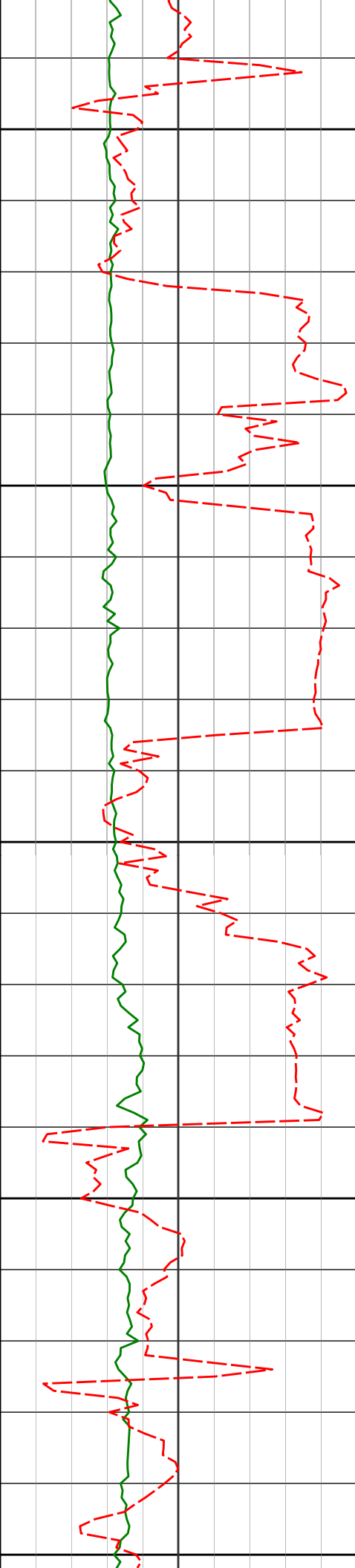
89.11°

178.85°

5736.62'

2934.33'





9450

9485'

89.72°

179.62°

5737.56'

3026.14'

9500

9550

9576'

92.38°

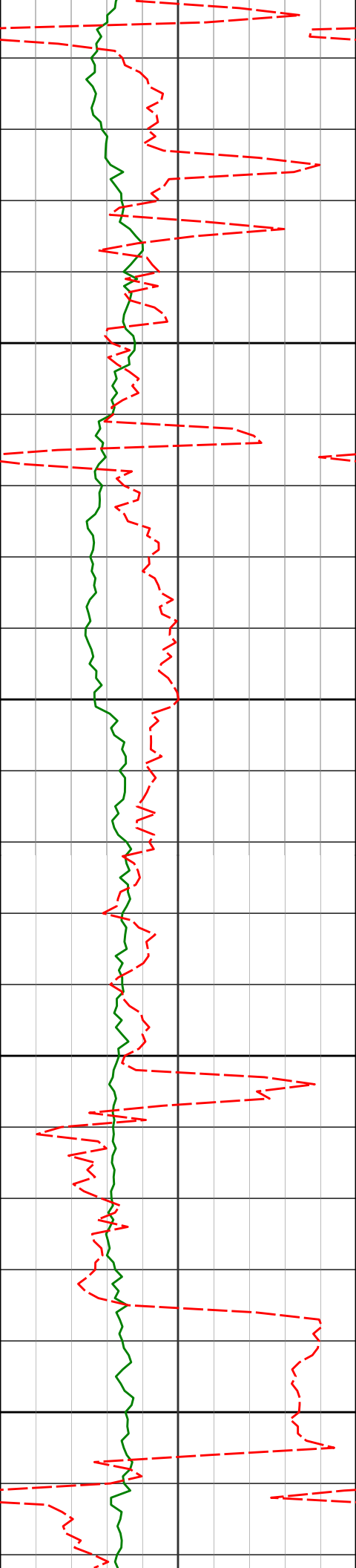
180.48°

5735.89'

3116.83'

9600

9650



9668'

92.18°

180.13°

5732.23'

3208.44'

9700

9750

9760'

91.66°

178.79°

5729.15'

3300.17'

9800

9850

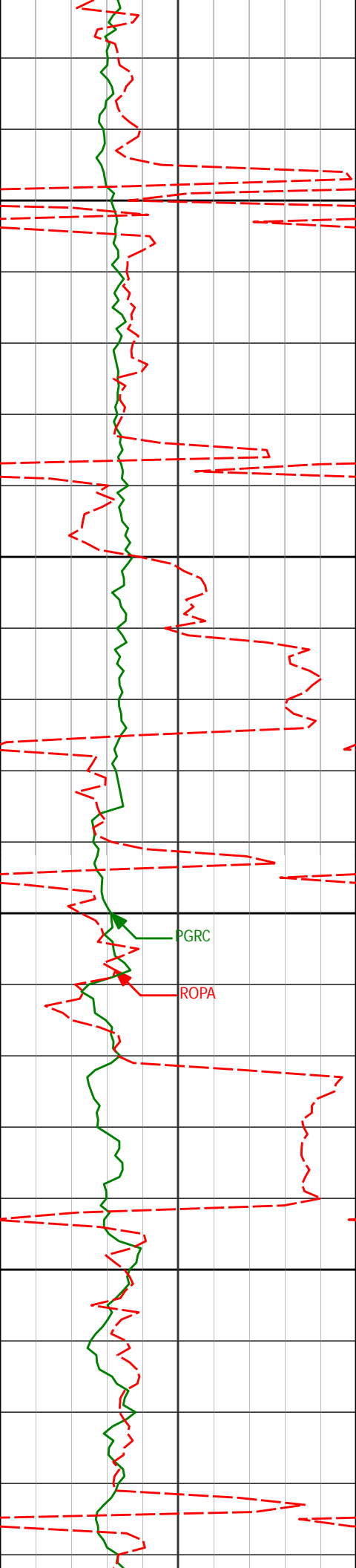
9851'

89.69°

178.99°

5728.08'

3391.00'



9900

9942'

91.22°

182.89°

5727.35'

3481.58'

9950

10000

PGRC

ROPA

10032'

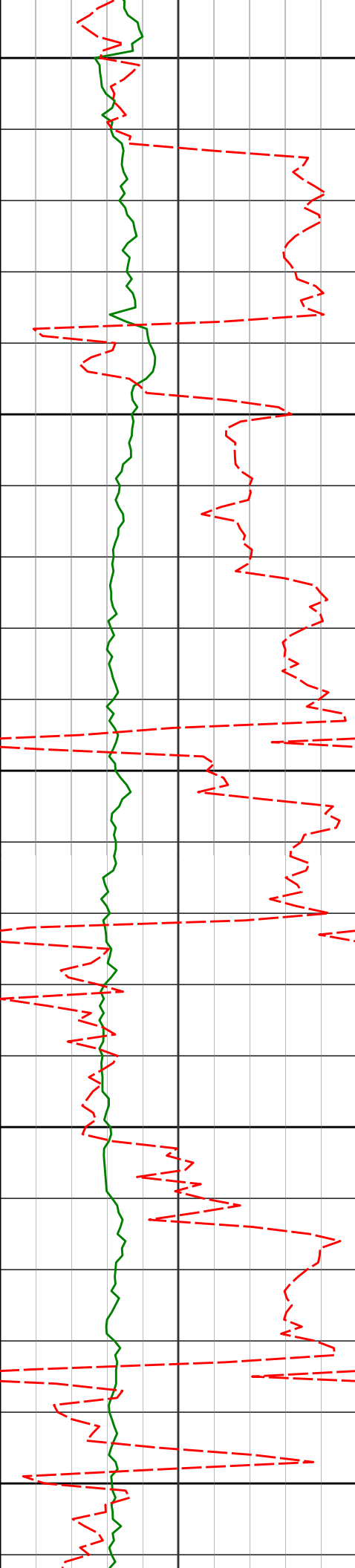
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3571.00'

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10100

10124'

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179.98°

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10150

10200

10215'

87.78°

178.81°

5739.07'

3753.12'

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10300

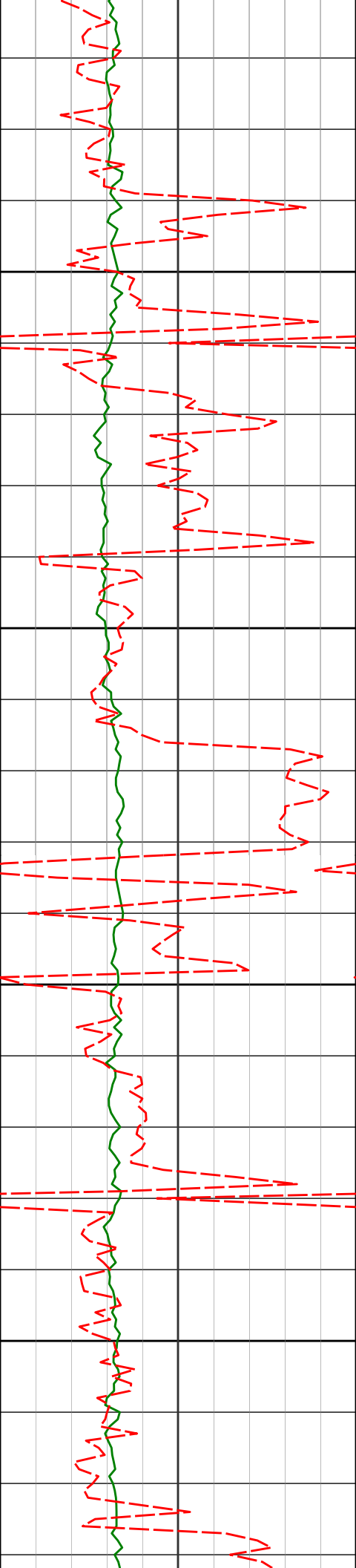
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178.76°

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10350

10400

10450

10500

10397'

91.05°

179.30°

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3934.78'

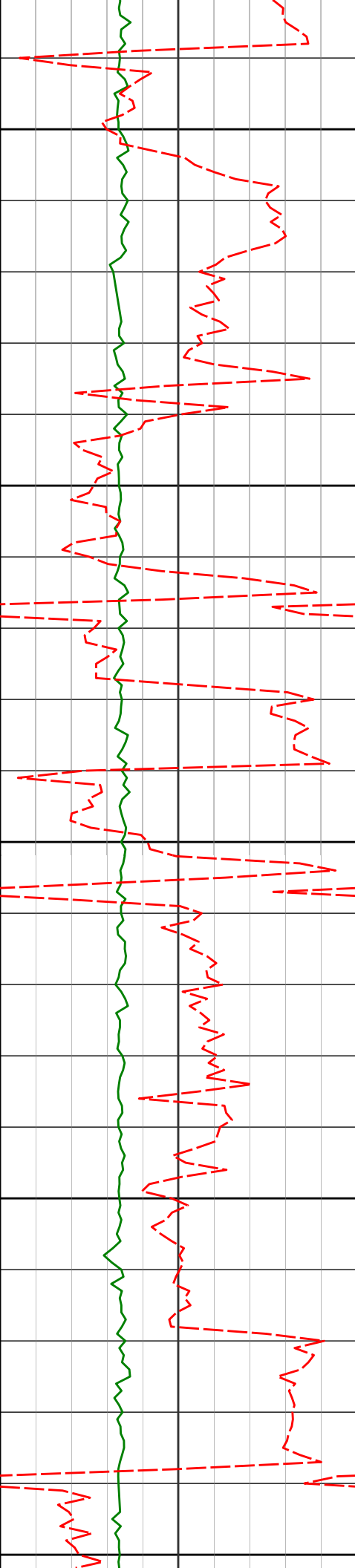
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4026.53'



10550

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89.99°

179.82°

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4117.28'

10600

10650

10671'

89.00°

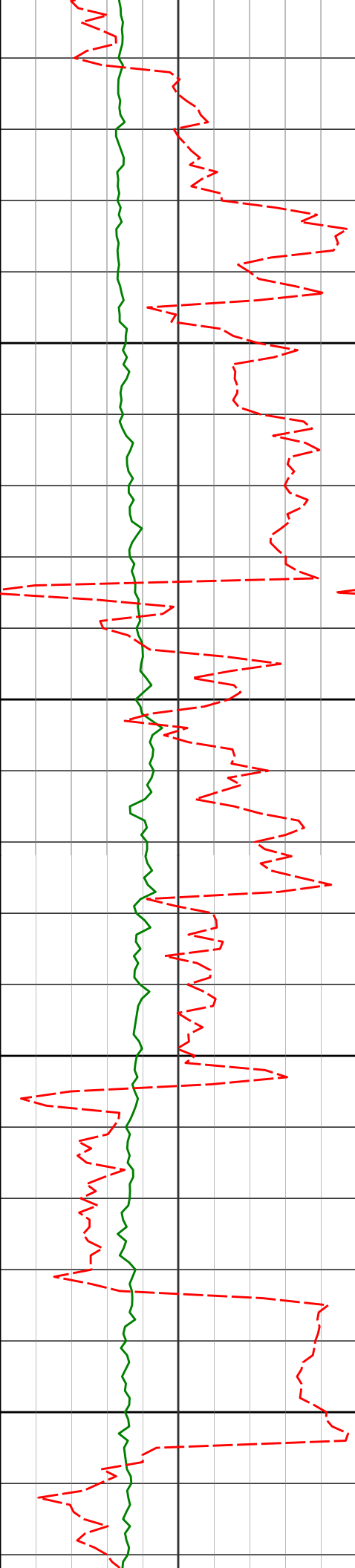
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4208.11'

10700

10750



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89.60°

178.76°

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10800

10850

10854'

90.65°

178.30°

5737.37'

4390.86'

10900

10950

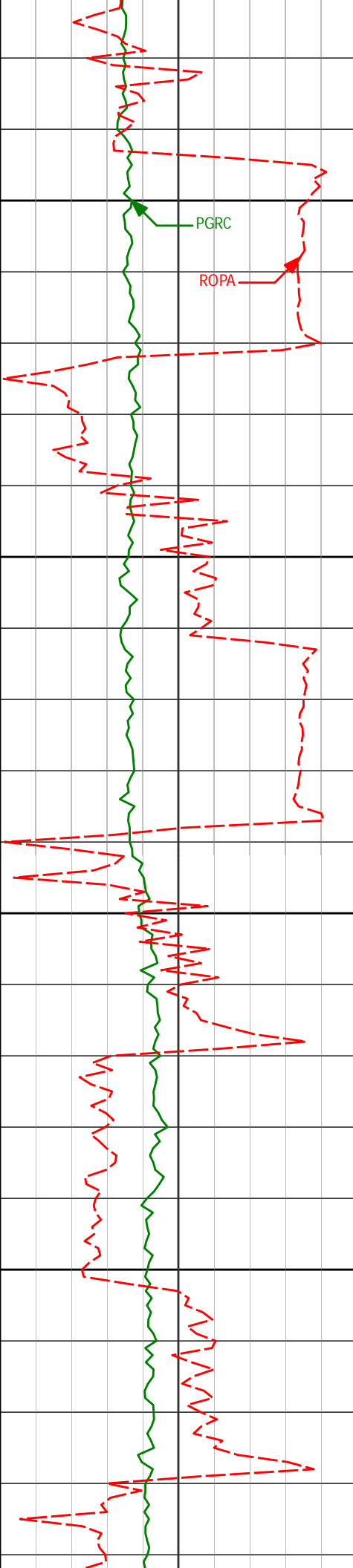
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179.30°

5736.40'

4481.71'



11000

11035'

11050

11100

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11150

88.40°

179.09°

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4571.51'

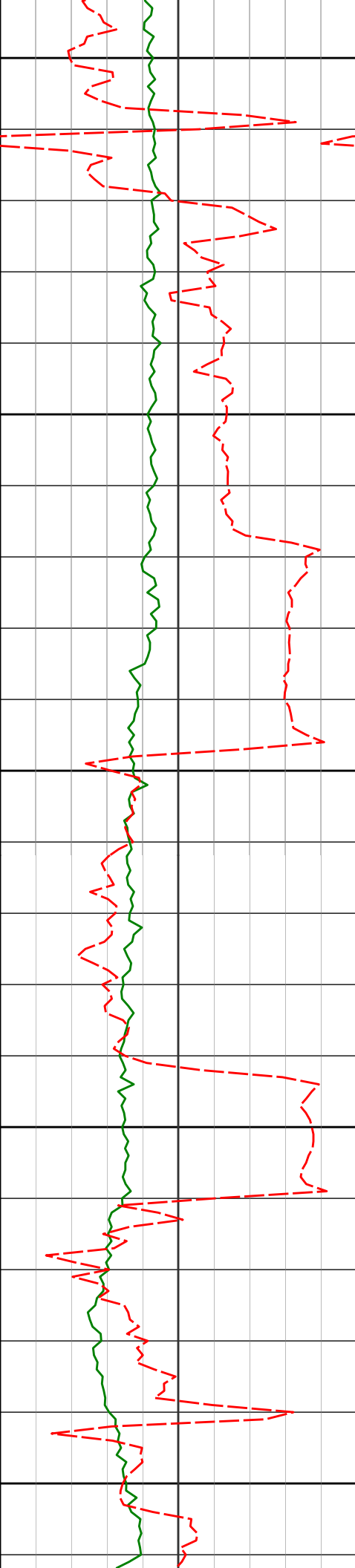
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89.28°

180.37°

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11250

11300

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91.53°

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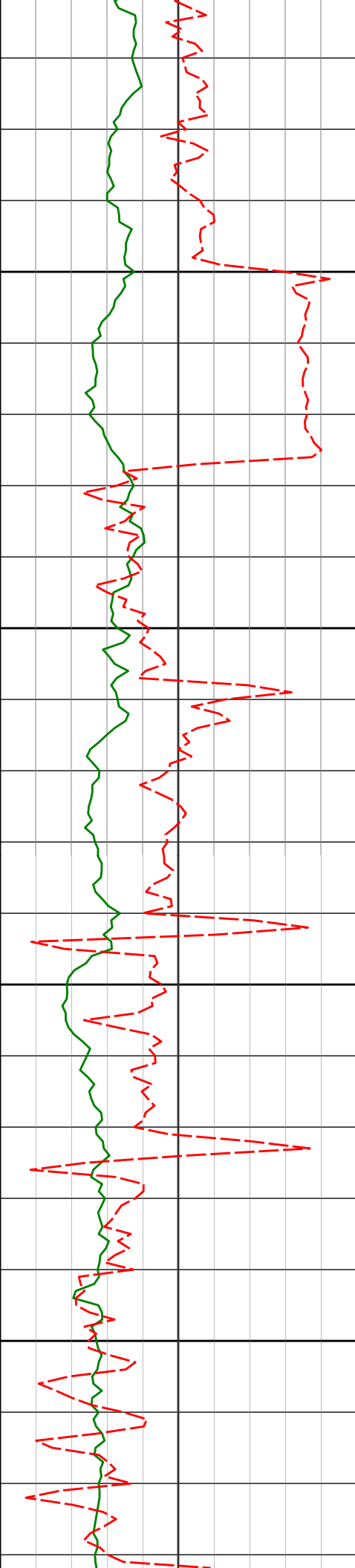
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181.38°

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11450

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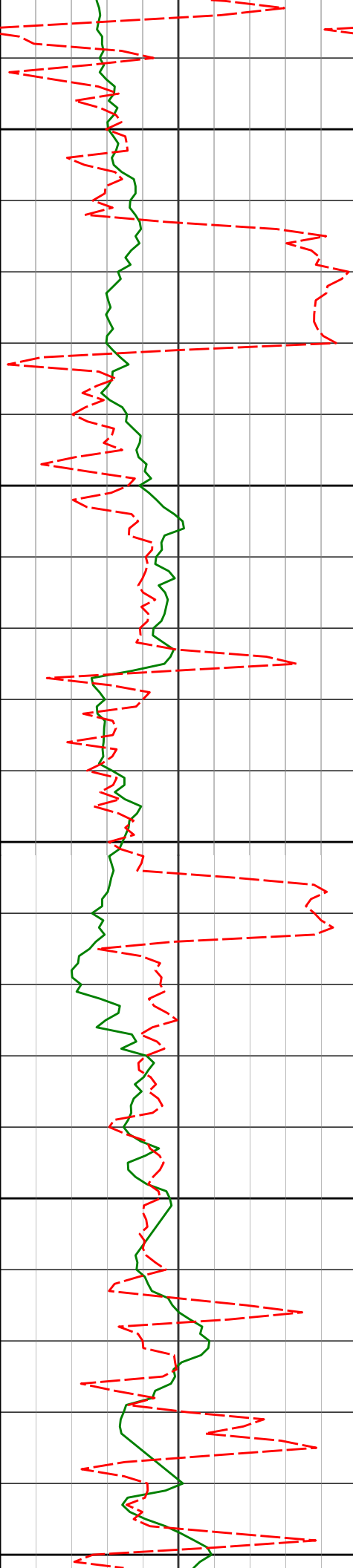
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11650

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181.57°

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11767'

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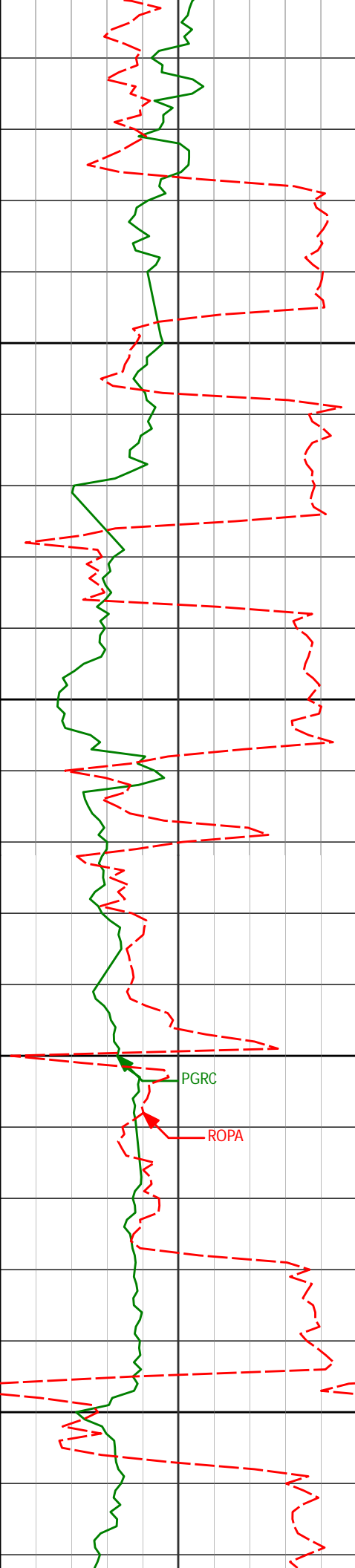
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11850



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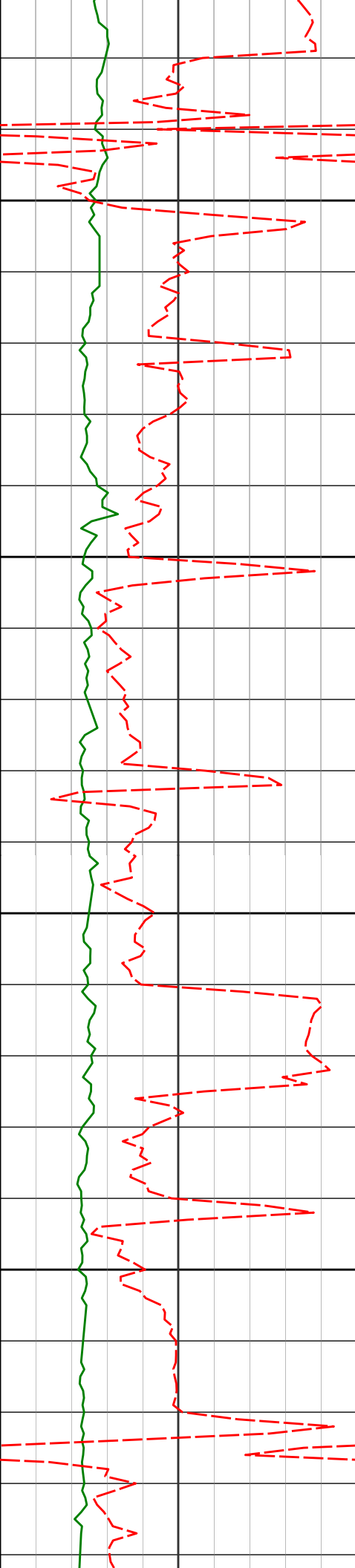
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PGRC

ROPA



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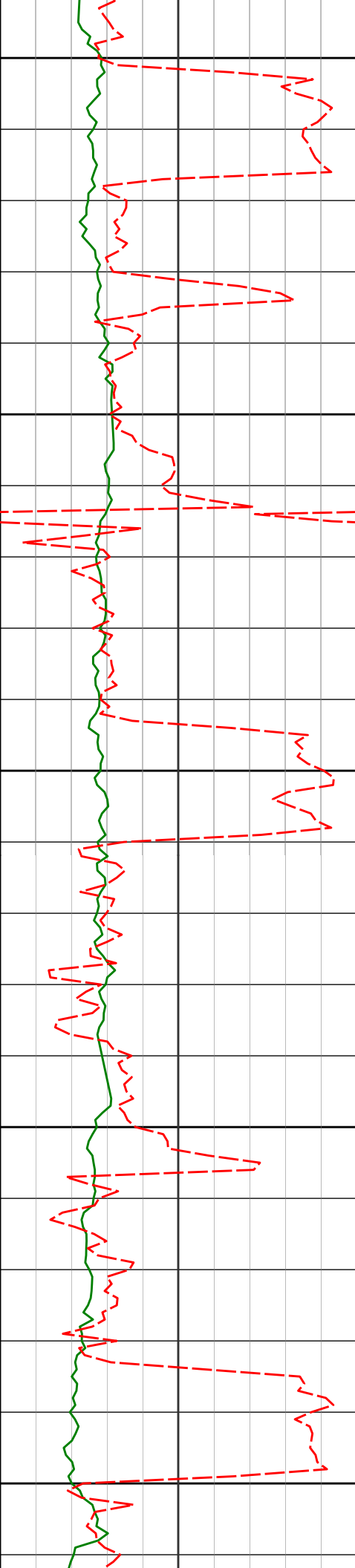
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12450

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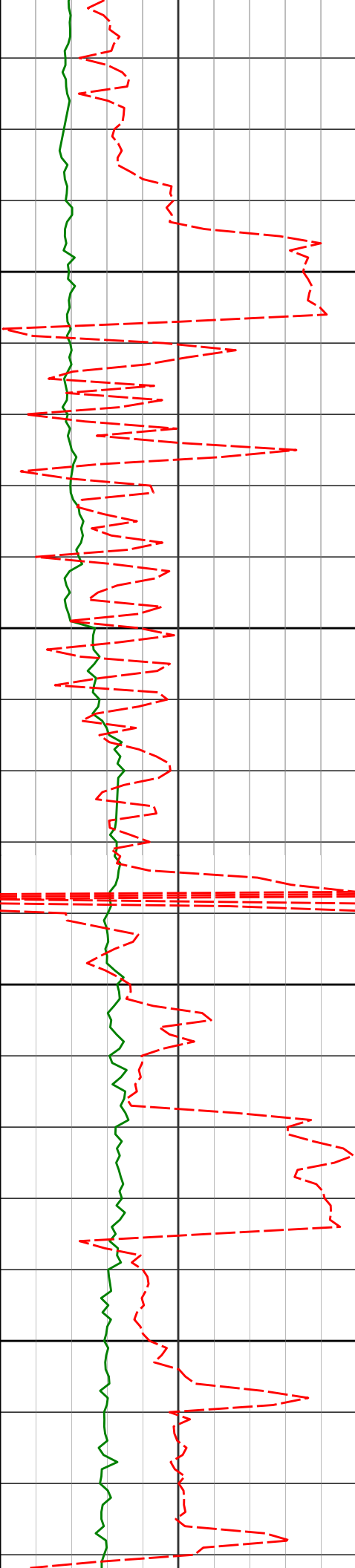
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179.36°

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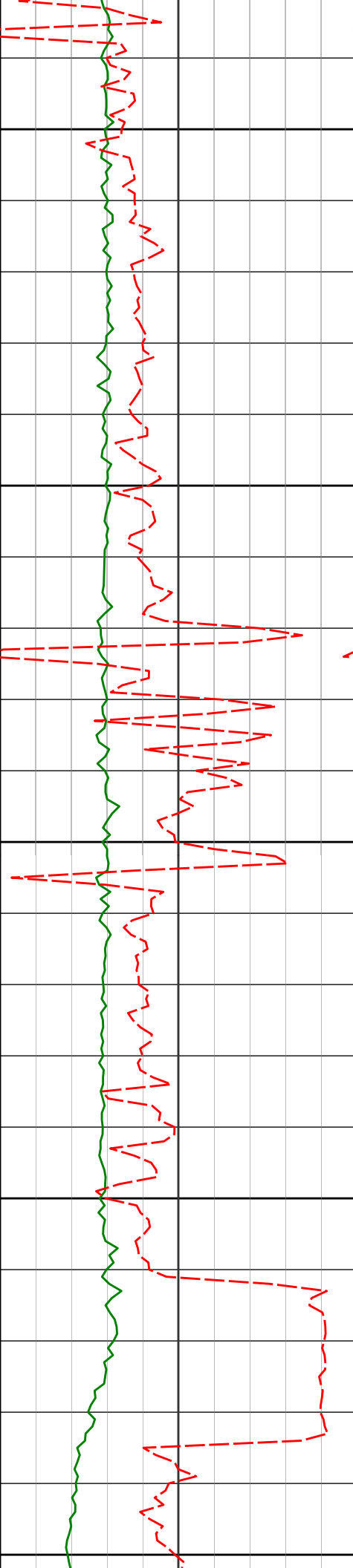
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12850

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180.21°

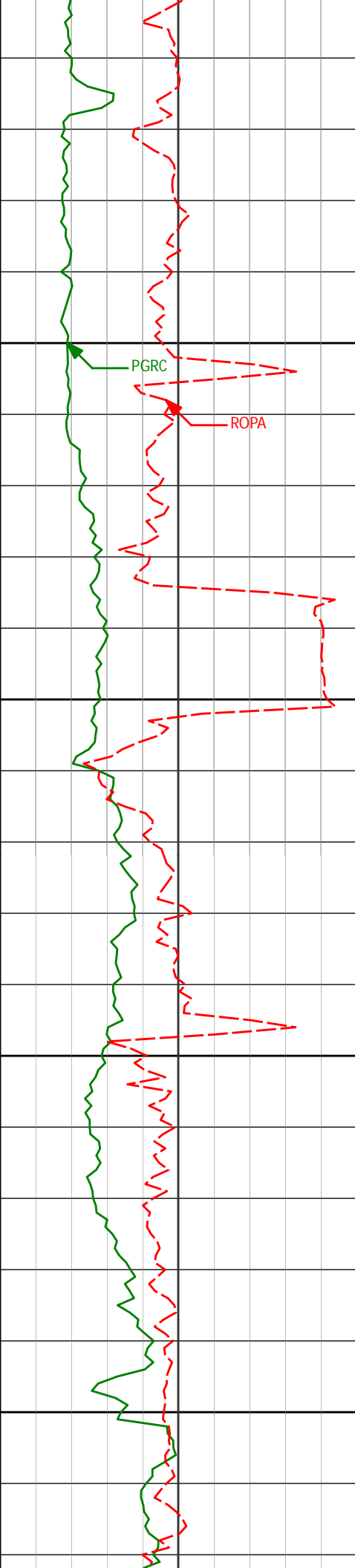
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13139'

90.40°

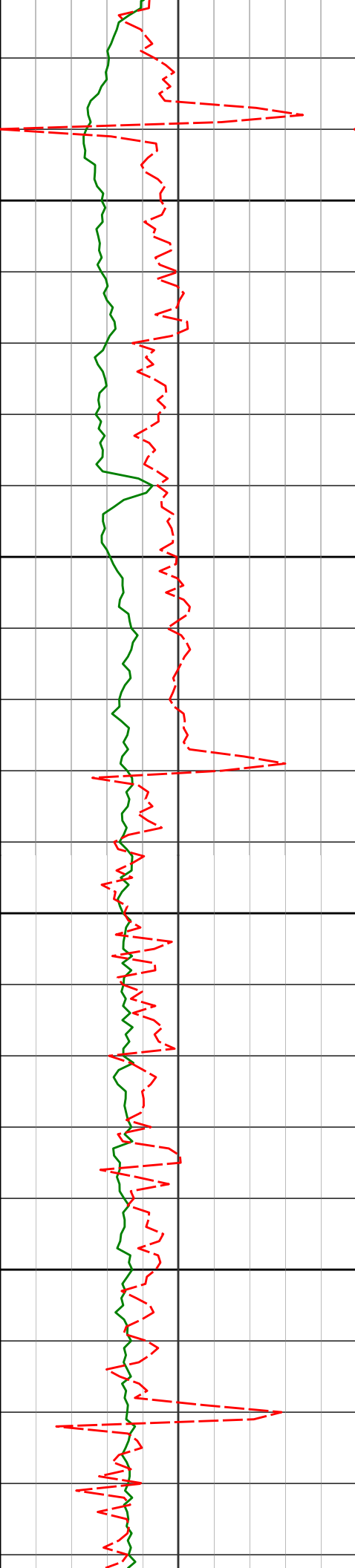
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6666.78'

PGRC

ROPA



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179.36°

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13250

13300

13322'

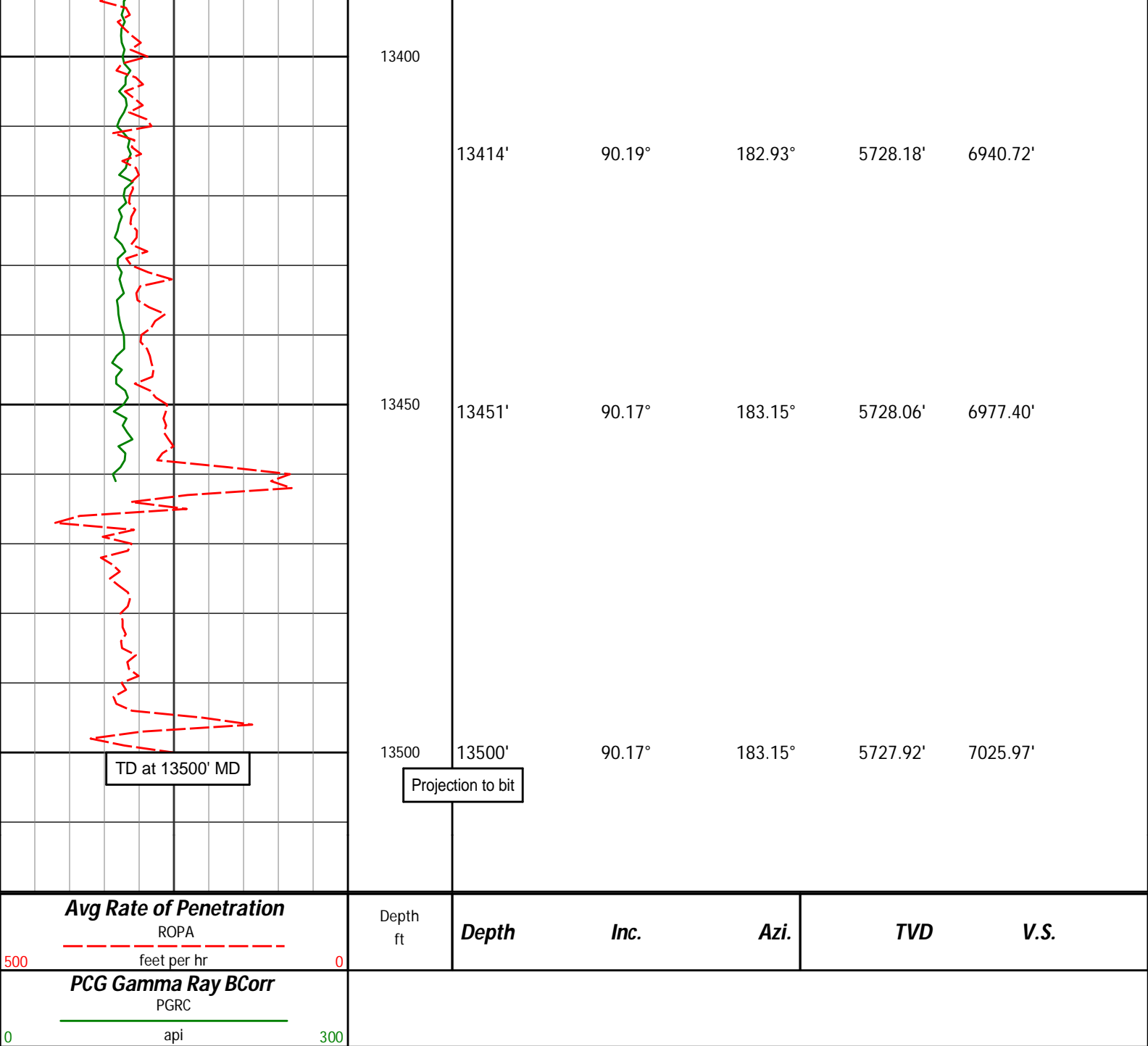
89.64°

180.63°

5728.04'

6849.27'

13350



## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas  
Razor 27J-3412B  
Redtail  
Weld Colorado  
USA  
CA-XX-0901525396  
Surveys are Sag, IFR and MS corrected.

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
177.00	0.34	55.34	177.00	0.30 N	0.43 E	-0.26	0.19
268.00	0.40	46.11	268.00	0.67 N	0.88 E	-0.60	0.09
360.00	0.50	58.96	359.99	1.10 N	1.46 E	-0.99	0.15
452.00	1.24	24.12	451.98	2.12 N	2.26 E	1.04	0.88

432.00	1.24	34.13	431.98	2.13 N	2.36 E	-1.94	0.88
543.00	1.92	5.56	542.95	4.47 N	3.06 E	-4.21	1.12
634.00	3.56	355.26	633.84	8.80 N	2.98 E	-8.54	1.87
726.00	4.73	2.12	725.60	15.44 N	2.88 E	-15.17	1.38
818.00	6.81	10.23	817.13	24.60 N	3.99 E	-24.21	2.42
909.00	8.81	20.07	907.29	36.45 N	7.34 E	-35.77	2.64
1000.00	10.61	28.04	996.98	50.39 N	13.67 E	-49.18	2.46
1091.00	12.99	33.65	1086.06	66.30 N	23.28 E	-64.29	2.90
1181.00	14.66	35.58	1173.45	83.99 N	35.51 E	-80.97	1.92
1273.00	15.71	36.94	1262.23	103.41 N	49.77 E	-99.23	1.21
1364.00	15.74	36.52	1349.83	123.18 N	64.52 E	-117.79	0.13
1455.00	15.05	35.07	1437.56	142.77 N	78.65 E	-136.22	0.87
1557.00	14.46	30.26	1536.20	164.61 N	92.68 E	-156.90	1.33
1636.00	14.15	28.54	1612.75	181.61 N	102.26 E	-173.11	0.67
1727.00	12.07	32.02	1701.38	199.45 N	112.62 E	-190.09	2.44
1818.00	12.23	33.88	1790.34	215.52 N	123.04 E	-205.30	0.46
1908.00	12.82	37.67	1878.20	231.34 N	134.46 E	-220.18	1.12
2000.00	14.00	33.18	1967.69	248.73 N	146.79 E	-236.56	1.71
2092.00	13.90	31.33	2056.98	267.49 N	158.62 E	-254.34	0.50
2183.00	13.31	28.89	2145.43	285.99 N	169.37 E	-271.96	0.90
2274.00	12.50	32.42	2234.13	303.48 N	179.71 E	-288.58	1.24
2366.00	14.27	38.04	2323.63	320.82 N	192.03 E	-304.91	2.39
2458.00	13.17	34.39	2413.00	338.39 N	204.94 E	-321.43	1.52
2549.00	14.75	38.48	2501.32	356.02 N	218.01 E	-337.99	2.05
2640.00	14.36	35.82	2589.40	374.24 N	231.82 E	-355.08	0.85
2732.00	13.79	34.66	2678.63	392.51 N	244.73 E	-372.29	0.69
2823.00	13.33	32.74	2767.10	410.25 N	256.57 E	-389.06	0.71
2914.00	12.82	33.85	2855.74	427.46 N	267.87 E	-405.34	0.62
3006.00	12.21	30.31	2945.55	444.34 N	278.46 E	-421.34	1.07
3097.00	12.31	32.84	3034.48	460.80 N	288.58 E	-436.96	0.60
3189.00	12.87	40.55	3124.27	476.82 N	300.56 E	-452.01	1.92
3281.00	14.63	41.48	3213.63	493.31 N	314.92 E	-467.33	1.93
3372.00	14.21	41.18	3301.77	510.33 N	329.89 E	-483.13	0.47
3464.00	14.49	40.63	3390.90	527.56 N	344.82 E	-499.15	0.34
3555.00	14.47	40.33	3479.00	544.87 N	359.59 E	-515.26	0.09
3647.00	14.82	41.15	3568.02	562.49 N	374.77 E	-531.65	0.44
3739.00	13.87	39.03	3657.15	579.92 N	389.46 E	-547.88	1.18
3830.00	12.36	38.42	3745.77	596.02 N	402.38 E	-562.93	1.67
3922.00	13.42	37.47	3835.45	612.21 N	414.99 E	-578.09	1.17
4013.00	12.30	37.31	3924.17	628.30 N	427.29 E	-593.17	1.23
4104.00	13.80	32.01	4012.82	645.22 N	438.92 E	-609.13	2.11
4196.00	12.72	30.82	4102.36	663.22 N	449.93 E	-626.22	1.21
4287.00	12.79	35.23	4191.12	680.05 N	460.87 E	-642.15	1.07
4379.00	12.92	33.51	4280.81	696.95 N	472.42 E	-658.10	0.44
4469.00	13.31	28.85	4368.47	714.41 N	482.98 E	-674.69	1.25
4561.00	11.79	26.32	4458.27	732.11 N	492.25 E	-691.62	1.76
4653.00	10.54	19.56	4548.53	748.47 N	499.24 E	-707.38	1.97
4747.00	8.92	20.56	4641.17	763.39 N	504.68 E	-721.84	1.73
4842.00	7.72	21.59	4735.17	776.22 N	509.61 E	-734.24	1.27
4937.00	6.48	18.50	4829.44	787.24 N	513.66 E	-744.91	1.37
5032.00	5.10	14.62	4923.96	796.41 N	516.43 E	-753.84	1.51
5127.00	4.23	358.96	5018.65	804.00 N	517.43 E	-761.33	1.62
5222.00	2.38	12.12	5113.48	809.43 N	517.78 E	-766.71	2.09
5254.00	0.29	241.41	5145.48	810.04 N	517.85 E	-767.32	8.06
5285.00	2.54	196.00	5176.46	809.34 N	517.59 E	-766.64	7.57
5317.00	2.46	190.76	5208.43	807.99 N	517.27 E	-765.32	0.76
5348.00	3.08	189.15	5239.40	806.51 N	517.01 E	-763.86	2.02
5380.00	4.83	193.33	5271.32	804.35 N	516.56 E	-761.75	5.54
5412.00	7.38	188.20	5303.14	801.01 N	515.96 E	-758.46	8.14
5443.00	9.26	191.74	5333.81	796.59 N	515.17 E	-754.12	6.28
5475.00	10.70	195.85	5365.32	791.21 N	513.83 E	-748.86	5.02
5507.00	12.83	198.28	5396.65	784.98 N	511.91 E	-742.80	6.83
5538.00	15.40	197.59	5426.71	777.79 N	509.58 E	-735.81	8.31
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5633.00	23.50	195.21	5516.37	747.38 N	503.07 E	-706.00	10.12
5664.00	27.41	196.56	5544.35	734.57 N	499.42 E	-693.51	12.75
5696.00	30.84	192.35	5572.30	719.49 N	495.56 E	-678.78	12.48
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5759.00	37.56	189.72	5624.66	685.19 N	488.72 E	-645.11	13.93
5790.00	42.99	189.65	5648.30	665.44 N	485.35 E	-625.69	17.52
5822.00	49.87	190.53	5670.34	642.63 N	481.28 E	-603.26	21.59
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5917.00	68.43	191.27	5719.52	563.21 N	466.43 E	-525.24	22.00

5948.00	74.79	191.70	5729.30	534.40 N	460.57 E	-496.97	20.56
5980.00	80.16	191.26	5736.23	503.80 N	454.36 E	-466.94	16.83
6012.00	86.72	189.06	5739.89	472.53 N	448.76 E	-436.20	21.61
6028.00	88.50	187.46	5740.55	456.71 N	446.46 E	-420.61	14.95
6113.00	90.00	176.83	5741.67	371.90 N	443.28 E	-336.30	12.63
6208.00	90.65	174.88	5741.13	277.15 N	450.15 E	-241.31	2.16
6302.00	93.60	174.97	5737.65	183.60 N	458.46 E	-147.39	3.14
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6491.00	91.60	174.46	5729.18	4.47 S	475.13 E	41.40	1.23
6586.00	91.99	174.48	5726.20	98.98 S	484.28 E	136.34	0.41
6680.00	89.78	172.17	5724.75	192.32 S	495.21 E	230.24	3.40
6775.00	90.83	173.67	5724.25	286.59 S	506.92 E	325.14	1.93
6870.00	89.85	173.90	5723.68	381.03 S	517.20 E	420.09	1.06
6964.00	89.82	176.40	5723.95	474.68 S	525.15 E	514.08	2.66
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7438.00	90.56	179.25	5720.56	948.53 S	534.77 E	987.25	0.37
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7628.00	89.91	178.89	5718.75	1138.50 S	537.42 E	1176.85	1.10
7723.00	89.45	180.48	5719.28	1233.50 S	537.94 E	1271.59	1.74
7817.00	90.34	185.04	5719.45	1327.36 S	533.42 E	1364.82	4.94
7912.00	90.15	185.33	5719.04	1421.97 S	524.83 E	1458.48	0.36
8007.00	90.14	183.34	5718.80	1516.70 S	517.65 E	1552.36	2.09
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8197.00	89.92	178.33	5719.22	1706.60 S	513.96 E	1741.40	3.23
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8475.00	92.58	177.35	5709.22	1984.06 S	526.71 E	2019.01	1.29
8567.00	89.84	177.69	5707.28	2075.95 S	530.69 E	2110.93	3.00
8659.00	87.78	176.53	5709.19	2167.80 S	535.33 E	2202.87	2.57
8751.00	89.04	178.98	5711.74	2259.69 S	538.93 E	2294.75	2.99
8843.00	89.15	180.35	5713.19	2351.67 S	539.47 E	2386.50	1.49
8934.00	88.72	182.15	5714.89	2442.63 S	537.48 E	2477.03	2.03
9027.00	86.90	180.86	5718.44	2535.52 S	535.04 E	2569.45	2.40
9118.00	86.90	179.07	5723.36	2626.39 S	535.10 E	2660.05	1.96
9210.00	86.21	178.27	5728.89	2718.20 S	537.23 E	2751.74	1.15
9301.00	87.49	178.18	5733.89	2809.01 S	540.04 E	2842.50	1.41
9393.00	89.11	178.85	5736.62	2900.94 S	542.43 E	2934.33	1.91
9485.00	89.72	179.62	5737.56	2992.92 S	543.65 E	3026.14	1.07
9576.00	92.38	180.48	5735.89	3083.90 S	543.57 E	3116.83	3.07
9668.00	92.18	180.13	5732.23	3175.82 S	543.09 E	3208.44	0.44
9760.00	91.66	178.79	5729.15	3267.77 S	543.95 E	3300.17	1.56
9851.00	89.69	178.99	5728.08	3358.74 S	545.71 E	3391.00	2.18
9942.00	91.22	182.89	5727.35	3449.70 S	544.22 E	3481.58	4.60
10032.00	87.55	180.94	5728.32	3539.63 S	541.22 E	3571.00	4.62
10124.00	85.60	179.98	5733.82	3631.46 S	540.48 E	3662.49	2.36
10215.00	87.78	178.81	5739.07	3722.29 S	541.44 E	3753.12	2.72
10306.00	91.15	178.76	5739.92	3813.25 S	543.37 E	3843.96	3.70
10397.00	91.05	179.30	5738.17	3904.22 S	544.91 E	3934.78	0.60
10489.00	91.06	179.79	5736.48	3996.20 S	545.64 E	4026.53	0.53
10580.00	89.99	179.82	5735.64	4087.20 S	545.95 E	4117.28	1.18
10671.00	89.00	178.08	5736.45	4178.18 S	547.62 E	4208.11	2.20
10763.00	89.60	178.76	5737.57	4270.13 S	550.15 E	4299.98	0.99
10854.00	90.65	178.30	5737.37	4361.10 S	552.49 E	4390.86	1.26
10945.00	90.57	179.30	5736.40	4452.08 S	554.39 E	4481.71	1.10
11035.00	88.40	179.09	5737.21	4542.06 S	555.66 E	4571.51	2.42
11126.00	90.70	181.49	5737.93	4633.04 S	555.20 E	4662.18	3.65
11218.00	89.28	180.37	5737.94	4725.02 S	553.70 E	4753.77	1.97
11309.00	91.53	180.24	5737.30	4816.02 S	553.22 E	4844.45	2.48
11401.00	90.74	181.38	5735.48	4907.99 S	551.92 E	4936.04	1.51
11492.00	91.70	182.46	5733.54	4998.91 S	548.87 E	5026.46	1.59
11584.00	92.68	181.49	5730.02	5090.79 S	545.70 E	5117.81	1.50
11675.00	91.31	181.57	5726.86	5181.70 S	543.27 E	5208.25	1.51
11767.00	91.60	180.34	5724.52	5273.65 S	541.74 E	5299.81	1.37
11858.00	93.49	178.66	5720.48	5364.55 S	542.53 E	5390.50	2.78
11949.00	90.34	180.27	5717.44	5455.48 S	543.38 E	5481.22	3.89
12041.00	90.31	180.16	5716.92	5547.48 S	543.03 E	5572.91	0.12
12132.00	88.06	181.14	5718.21	5638.46 S	542.00 E	5663.53	2.70
12223.00	88.83	180.03	5720.68	5729.42 S	541.07 E	5754.15	1.48
12315.00	90.39	180.93	5721.31	5821.41 S	540.30 E	5845.80	1.96
12407.00	88.46	178.74	5722.23	5913.39 S	540.57 E	5937.52	3.17
12498.00	88.79	179.60	5724.41	6004.36 S	541.89 E	6028.31	1.01
12589.00	88.48	178.88	5725.88	6095.34 S	542.58 E	6119.30	0.78

12590.00	89.48	179.36	5725.80	6096.34 S	542.72 E	6120.09	0.79
12682.00	89.94	179.55	5726.27	6188.34 S	543.60 E	6211.87	0.54
12773.00	90.40	182.44	5726.00	6279.31 S	542.02 E	6302.45	3.22
12865.00	88.54	180.21	5726.85	6371.28 S	539.89 E	6393.97	3.16
12957.00	89.41	181.11	5728.50	6463.25 S	538.83 E	6485.58	1.36
13048.00	90.62	181.22	5728.47	6554.23 S	536.98 E	6576.14	1.34
13139.00	90.40	179.95	5727.66	6645.22 S	536.05 E	6666.78	1.42
13231.00	89.74	179.36	5727.55	6737.22 S	536.60 E	6758.55	0.96
13322.00	89.64	180.63	5728.04	6828.22 S	536.61 E	6849.27	1.40
13414.00	90.19	182.93	5728.18	6920.16 S	533.75 E	6940.72	2.57
13451.00	90.17	183.15	5728.06	6957.11 S	531.79 E	6977.40	0.60
13500.00	90.17	183.15	5727.92	7006.04 S	529.10 E	7025.97	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 175.54 DEGREES (TRUE)  
A TOTAL CORRECTION OF 7.54 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 13500.00 FEET  
IS 7025.99 FEET ALONG 175.68 DEGREES (TRUE)**

**Tie onto surface at 0' MD  
Final Survey is a projection to bit at TD**