

PCG Pressure Case Gamma Ray
PCDC Pressure Case Directional

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	11-Oct-14	13-Oct-14	18-Oct-14		
Rig Bit Number	0100	0200	0300		
Bit Size (in)	13.500	8.750	6.000		
Tool Nominal OD (in)	6.750	6.750	4.750		
Log Start Depth (MD, ft)	80.00	1,615.00	6,100.00		
Log End Depth (MD, ft)	1,615.00	6,100.00	13,677.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	10-Oct-14 06:06	11-Oct-14 22:10	14-Oct-14 10:55		
Drill/Wipe End Date and Time	10-Oct-14 23:36	13-Oct-14 02:30	17-Oct-14 07:22		
Min Inc (deg) @ Depth (MD, ft)	0.59 @ 725.00	1.38 @ 4,935.00	85.95 @ 11,367.00		
Max Inc (deg) @ Depth (MD, ft)	8.21 @ 1,559.00	85.80 @ 6,052.00	92.93 @ 12,743.00		
Bit TFA(in2) / Bit Type	1.53 / PDC	0.88 / PDC	0.86 / PDC		
Flow Rate (gpm)	765.60	508.52	256.26		
Max AV (fpm) / CV (fpm) @ MWD	NA / NA	NA / NA	NA / NA		
Fluid Type	Native/Spud Mud	Polymer	Polymer		
Density (ppg) / Viscosity (spqt)	8.50 / 27.00	10.00 / 60.00	10.30 / 54.00		
Filtrate CL (ppm)	1,500.00	2,000.00	1,900.00		
pH / Fluid Loss (mptm)	8.00 / 0	9.00 / 0	9.00 / 0		
PV (cP) / YP (lbf2)	NA / NA	15 / 14.00	19 / 23.00		
% Solids / % Sand	2 / 0.25	10.00 / 0.25	12.5 / 0.25		
% Oil / Oil:Water Ratio	NA / NA	NA / NA	NA / NA		
Rm @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA		
Rmf @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA		
Rmc @ Measured Temp (degF)	NA @ NA	NA @ NA	NA @ NA		
Max Tool Temp (in F) / S	104.00 / PDM	170.07 / PDM	234.12 / PDM		

Max Tool Temp (degF) / Source	124.30 / PCM	170.37 / PCM	231.42 / PCM		
Rm @ Max Tool Temp (degF)	NA @ 124.30	NA @ 170.37	NA @ 231.42		
Lead MWD Engineer	Scott Trowbridge	Scott Trowbridge	Scott Trowbridge		
Customer Representative	Kennith Wilkerson	Kennith Wilkerson	Kennith Wilkerson		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.93	5.93	5.93		
Sub Serial Number	11404299	11404299	12463931		
Insert Serial Number	11400994	11227504	11400994		
Date and Time Initialized	09-Oct-14 20:50	11-Oct-14 15:44	13-Oct-14 21:08		
Date and Time Read	11-Oct-14 03:40	13-Oct-14 14:02	18-Oct-14 07:29		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	53.53	45.70	41.44		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11404299	11404299	12463931		
Sonde Serial Number	11638567	11297622	11297622		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	49.66	274.29	37.89		

Gamma Ray Sensor Information

Tool Type		PCG	PCG		
Distance From Bit (ft)		50.65	36.34		
Recorded Sample Period (sec)		10	10		
Software Version		8.15	8.15		
Sub Serial Number		11404299	12463931		
Insert/Sonde Serial Number		11681029	11681054		

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 data 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

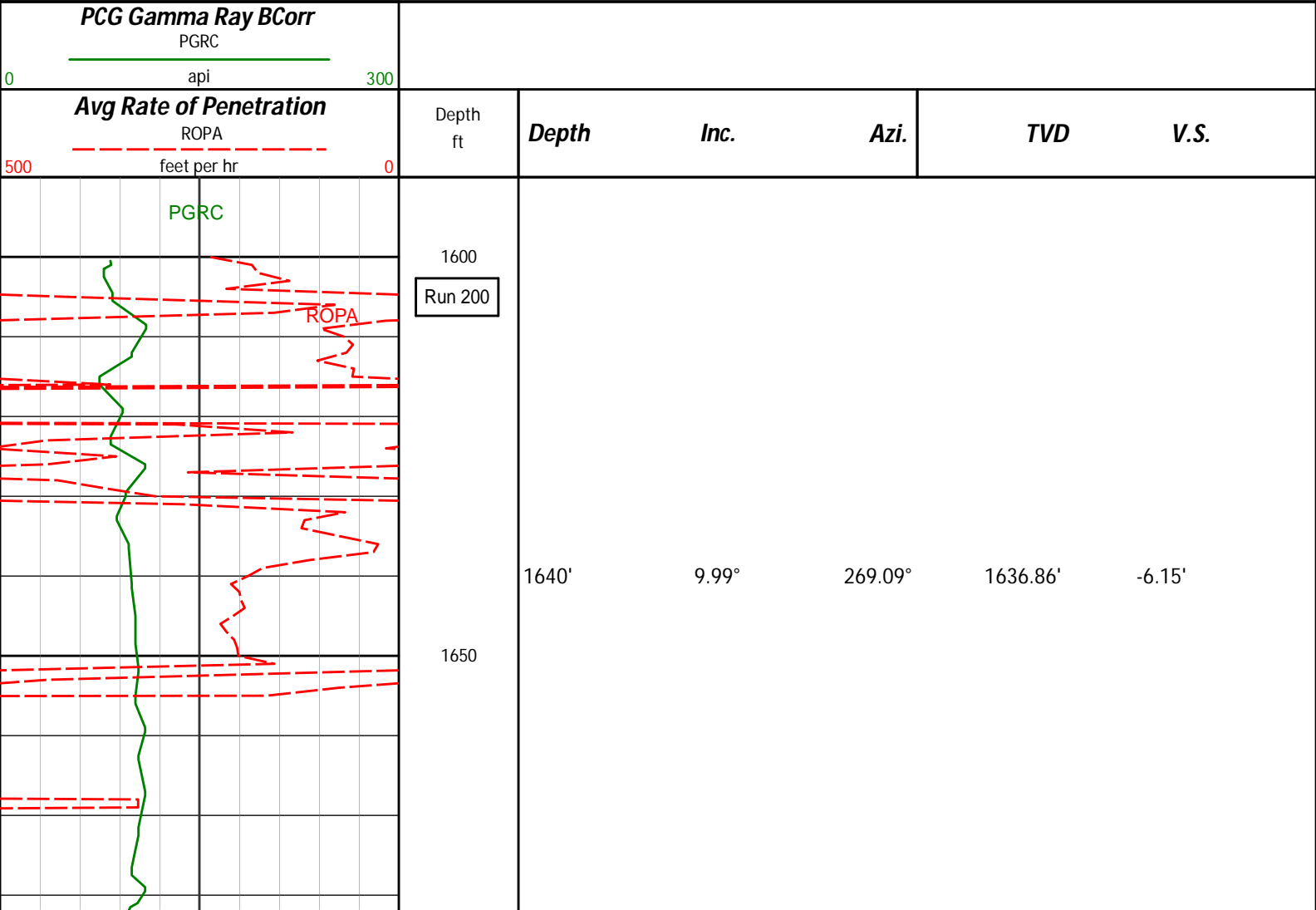
Average Rate of Penetration (ROPA)
Interval Resolution: .5
Interval Distance: 1.2
Gap Fill: 3

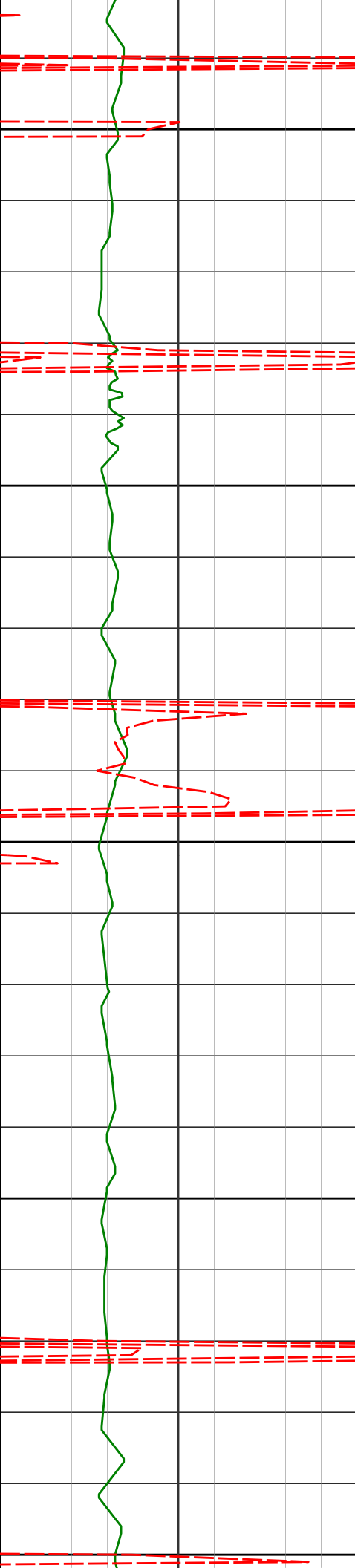
WARRANTY

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HALLIBURTON
Sperry Drilling Services
MD Main Log 1:240

Whiting Oil and Gas
Razor 27J-2209A
Frontier 26
Sec. 27-T10N-R58W





1700

1731'

9.73°

270.52°

1726.52'

-4.98'

1750

1800

1824'

11.17°

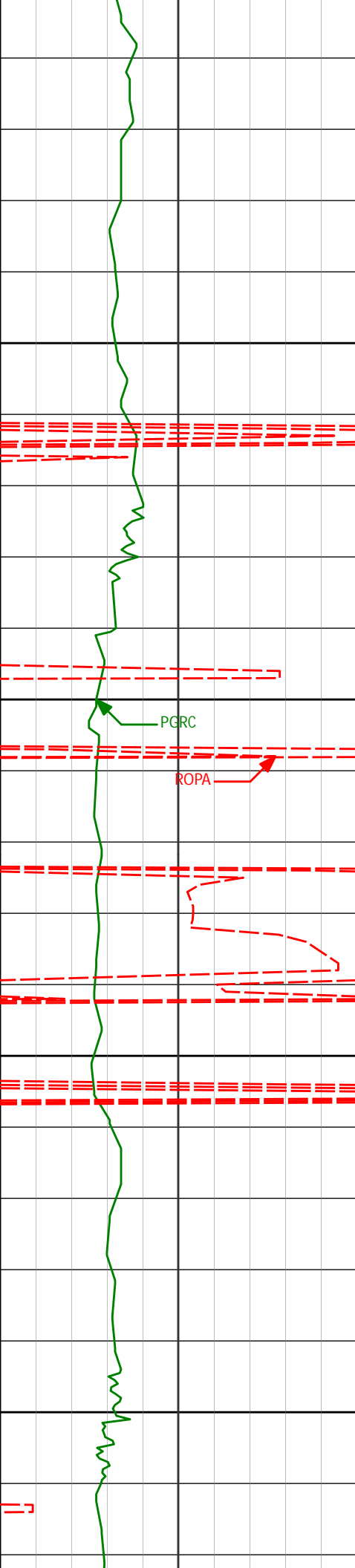
272.35°

1817.97'

-3.21'

1850

1900



1950

2000

2050

2100

1915'

10.13°

268.08°

1907.40'

-1.79'

2006'

9.14°

263.78°

1997.12'

-1.64'

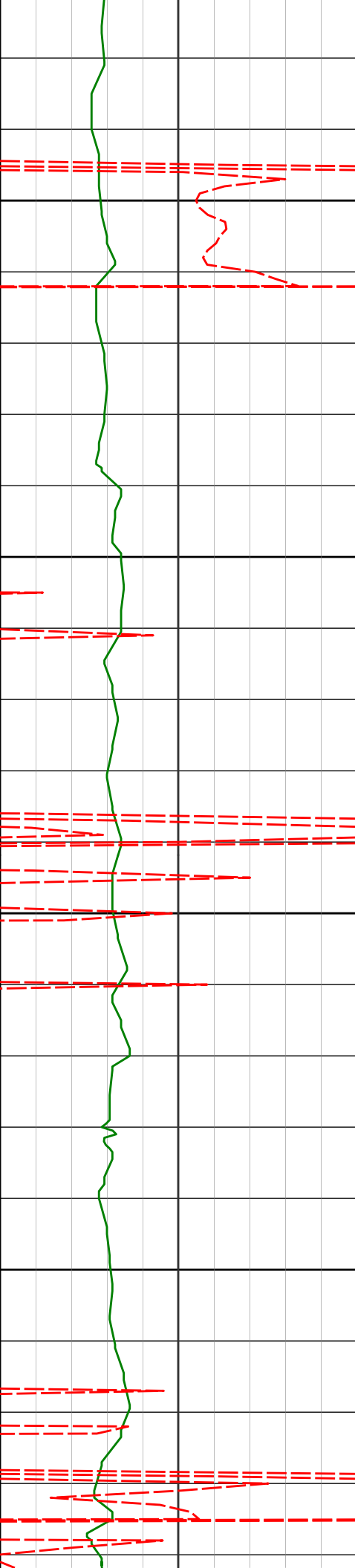
2098'

10.87°

268.55°

2087.72'

-1.38'



2150

2200

2250

2300

2189'

12.62°

267.85°

2176.81'

-0.51'

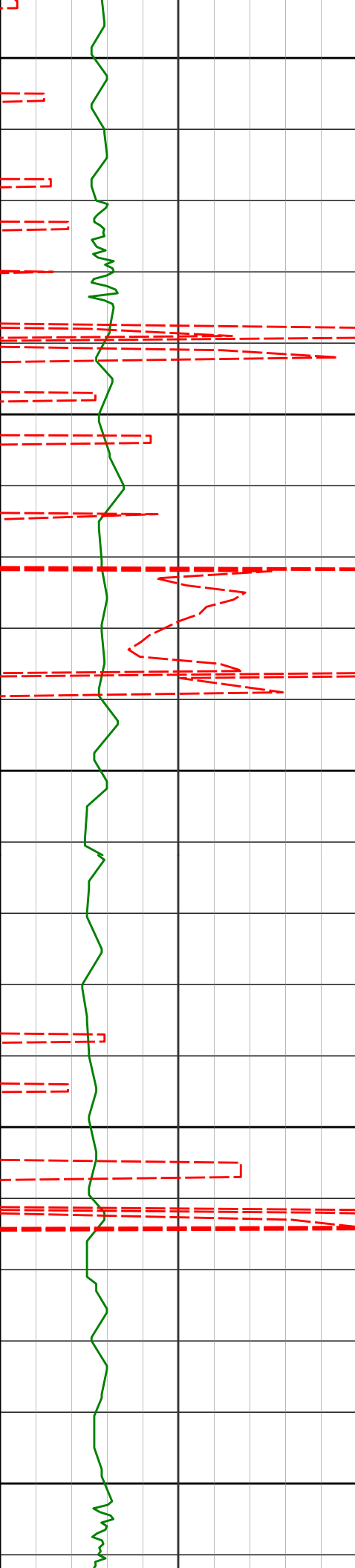
2281'

11.51°

267.22°

2266.78'

0.19'



2350

2373'

10.75°

267.44°

2357.05'

0.76'

2400

2450

2464'

10.74°

255.00°

2446.46'

-0.49'

2500

2550

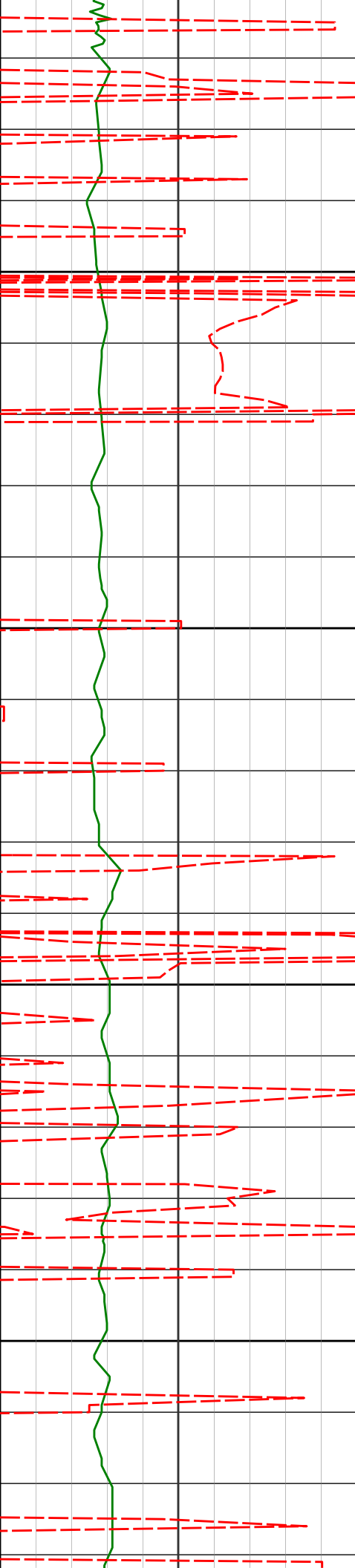
2555'

10.60°

254.76°

2535.89'

-3.58'



2600

2650

2700

2750

2647'

12.61°

258.00°

2626.00'

-6.46'

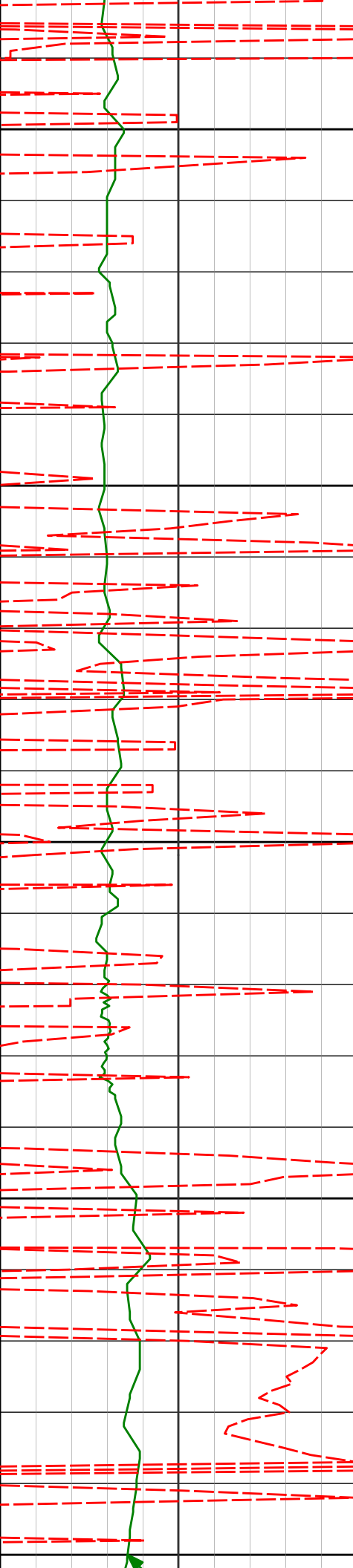
2738'

12.01°

257.30°

2714.91'

-9.10'



2800

2850

2900

2950

3000

2829'

11.51°

255.54°

2804.00'

-12.01'

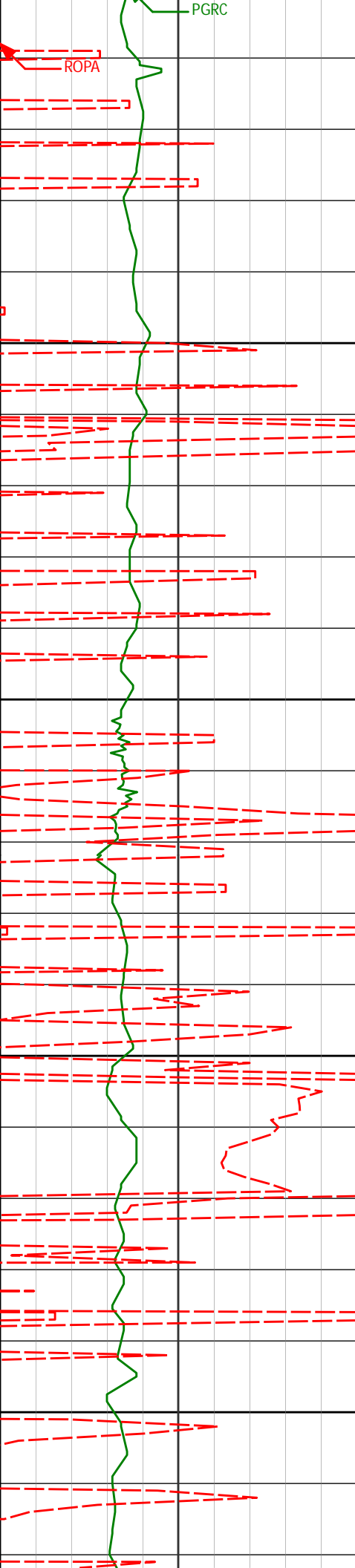
2921'

10.67°

255.65°

2894.28'

-15.05'



3013'	11.36°	260.01°	2984.59'	-17.36'
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3050

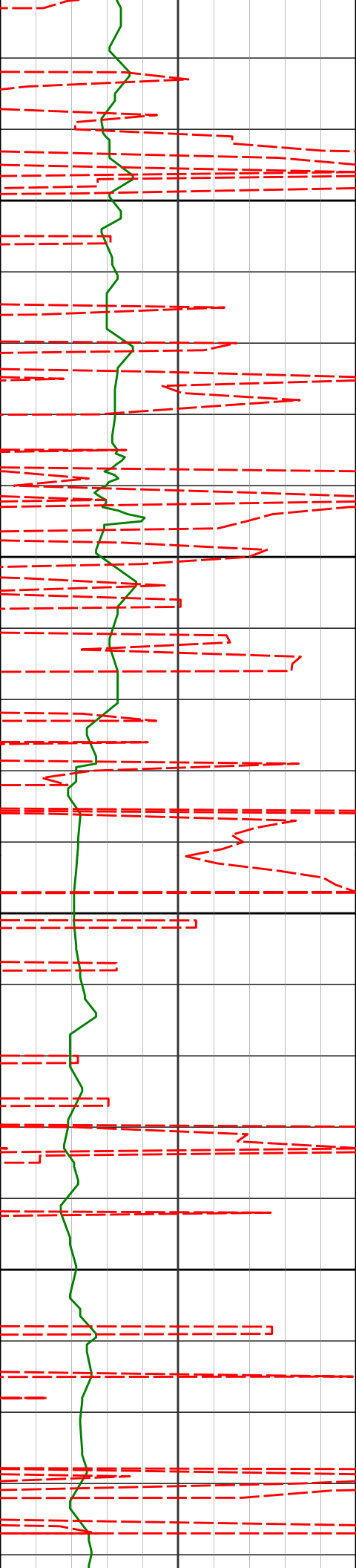
3100

3104'	9.68°	260.62°	3074.06'	-18.86'
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3150

3200

3195'	11.52°	262.45°	3163.50'	-19.99'
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3250

3300

3350

3400

3288'

11.57°

261.71°

3254.62'

-21.09'

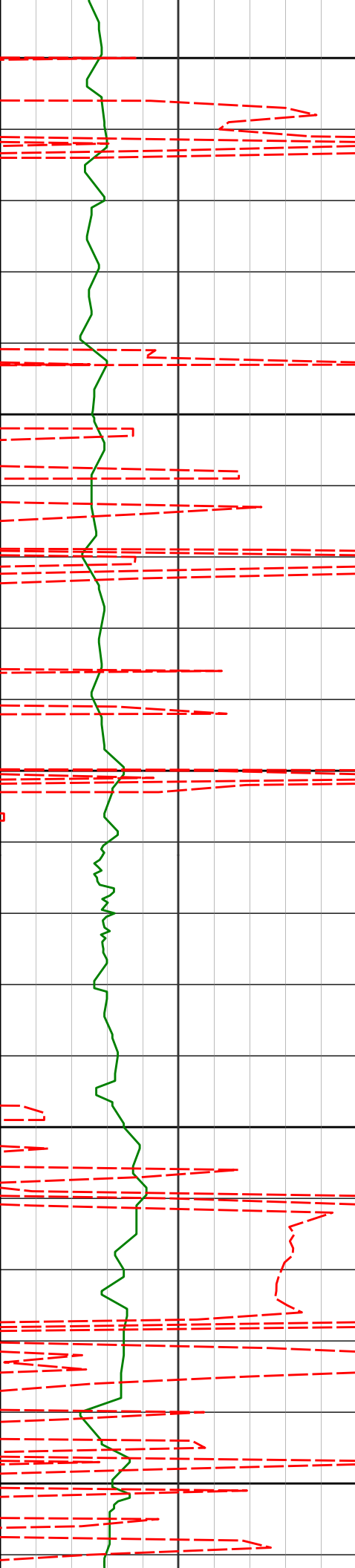
3379'

12.66°

261.67°

3343.59'

-22.35'



3450

3471'

12.84°

259.21°

3433.32'

-24.13'

3500

3550

3502

13.08

258.49

3521.91

-20.55

3600

3650

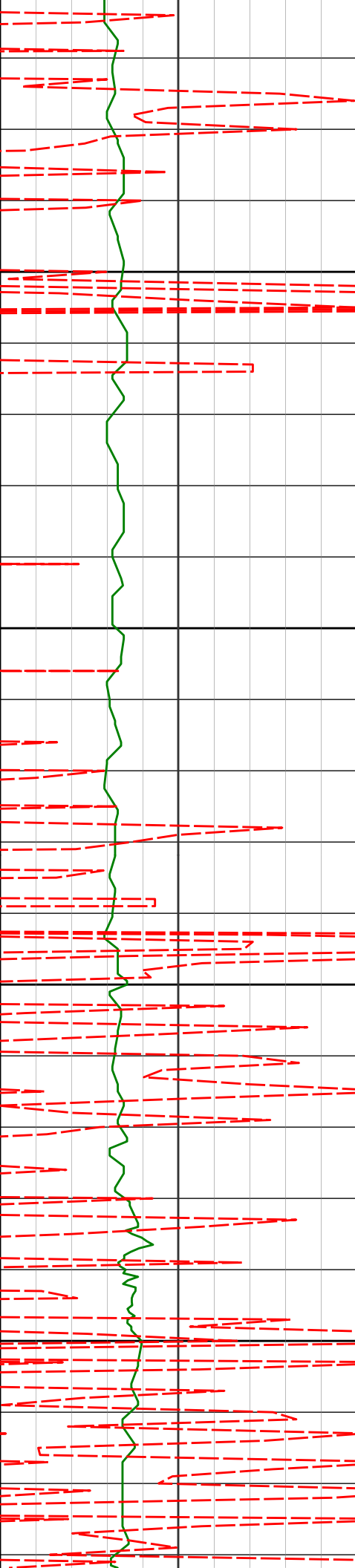
3653'

10.98°

261.73°

3610.83'

-28.39'



3700

3750

3800

3850

3745'

10.75°

259.10°

3701.18'

-29.92'

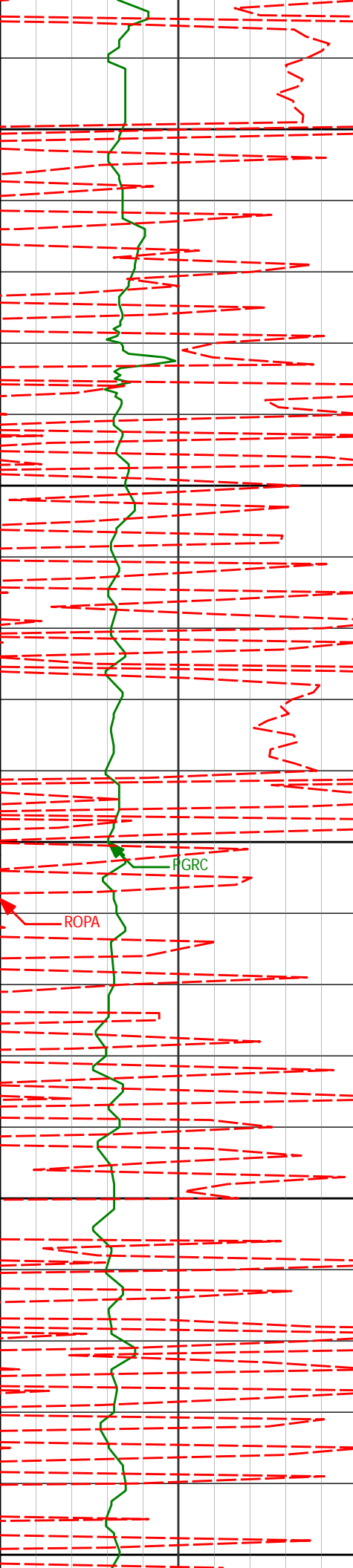
3836'

9.60°

256.26°

3790.74'

-32.07'



3900

3928'

10.58°

259.89°

3881.32'

-34.12'

3950

4000

PGRC

ROPA

4019'

11.49°

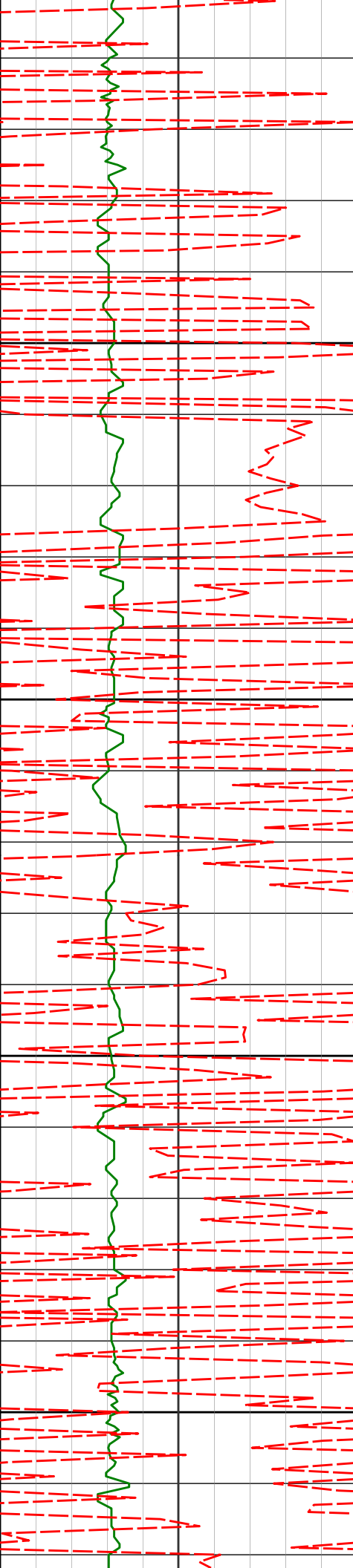
265.03°

3970.64'

-35.00'

4050

4100



4111'

10.29°

264.89°

4060.98'

-35.16'

4150

4200

4202'

11.69°

261.65°

4150.31'

-35.85'

4250

4293'

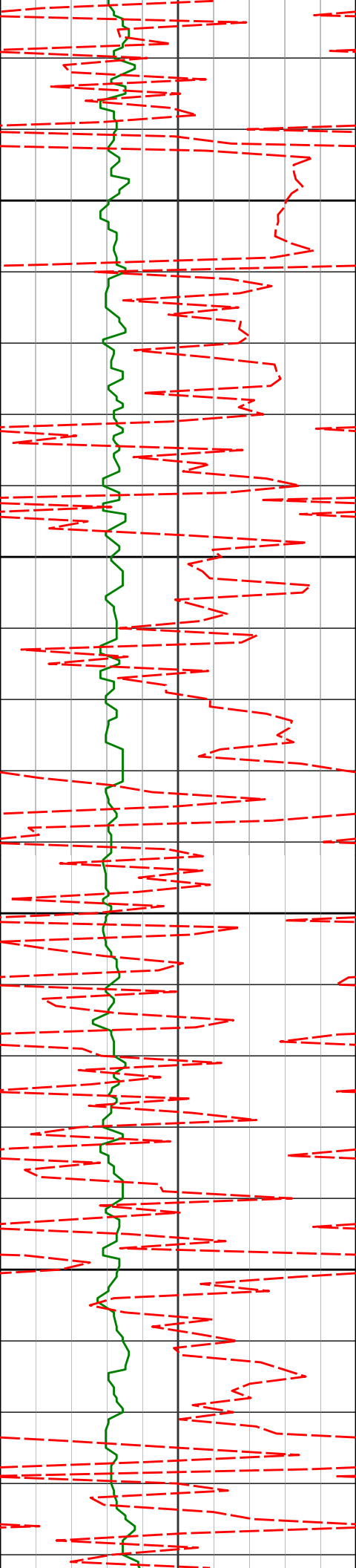
10.66°

261.91°

4239.58'

-36.99'

4300



4350

4384'

10.63°

266.70°

4329.02'

-37.33'

4400

4450

4477'

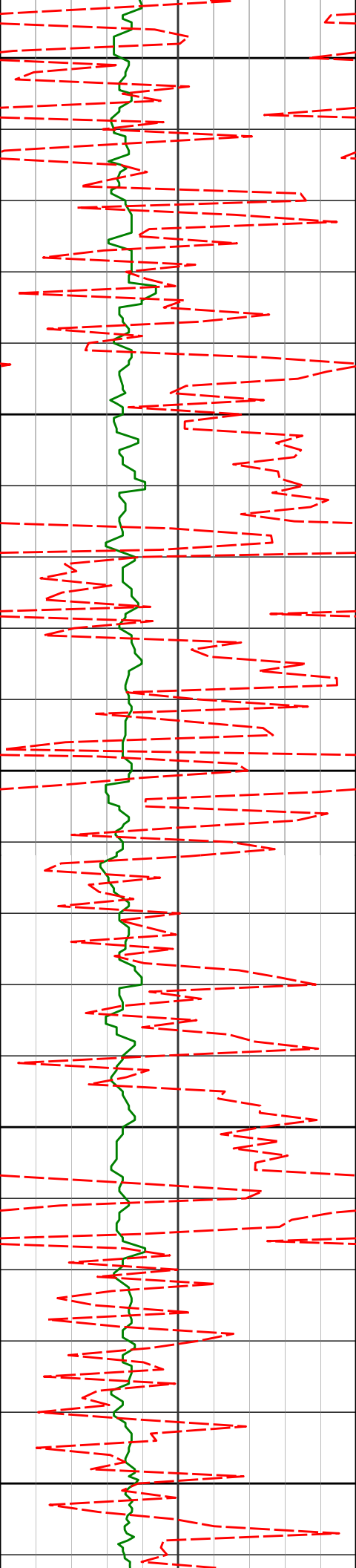
9.03°

262.71°

4420.65'

-37.50'

4500



4550

4567'

8.23°

260.70°

4509.63'

-38.38'

4600

4650

4659'

6.93°

258.20°

4600.83'

-39.63'

4700

4750

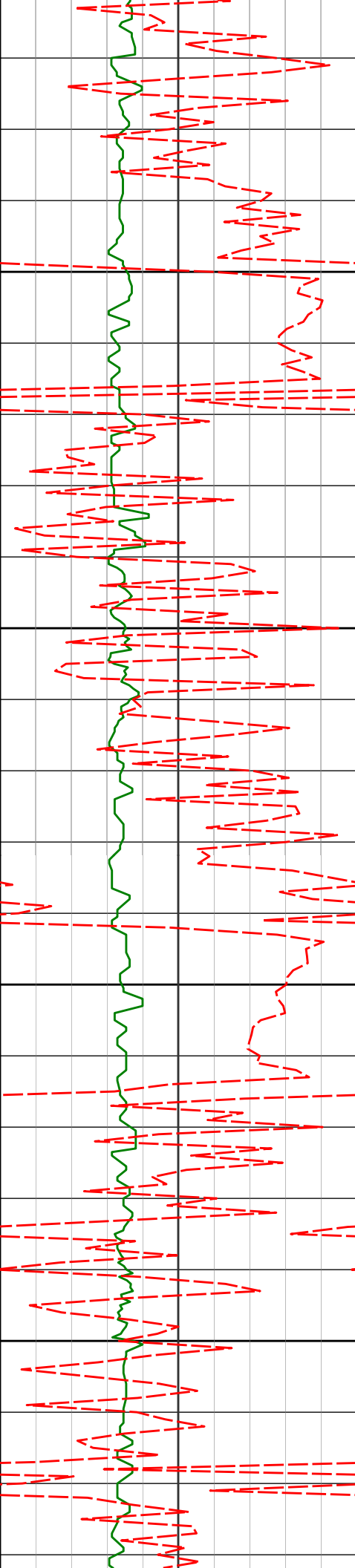
4751'

5.40°

256.75°

4692.29'

-40.99'



4800

4850

4900

4950

4843'

3.15°

260.21°

4784.03'

-41.87'

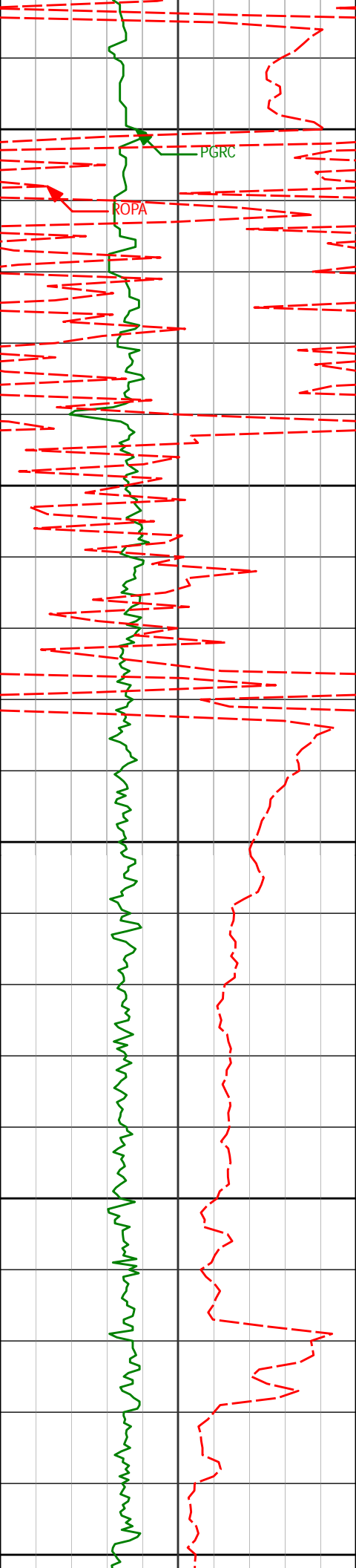
4935'

1.38°

329.06°

4875.97'

-41.11'



5000

PGRC

ROPA

5026'

1.62°

42.53°

4966.95'

-39.25'

5050

5057'

1.69°

50.23°

4997.93'

-38.69'

KOP 5080' MD

5088'

3.17°

25.27°

5028.90'

-37.69'

5100

5119'

6.71°

1.37°

5059.79'

-35.14'

5150

5149'

11.82°

354.58°

5089.39'

-30.32'

5180'

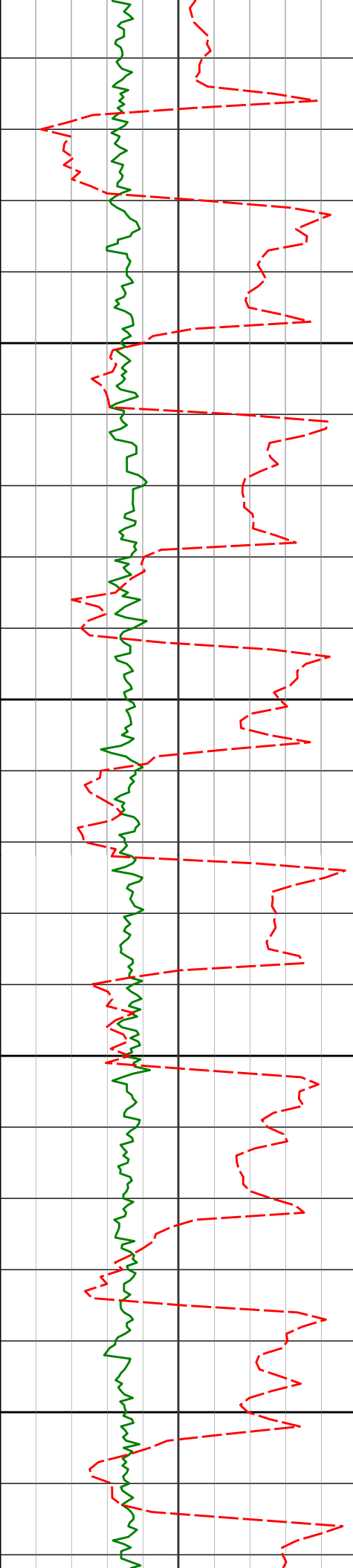
16.08°

352.56°

5119.47'

-22.85'

5200



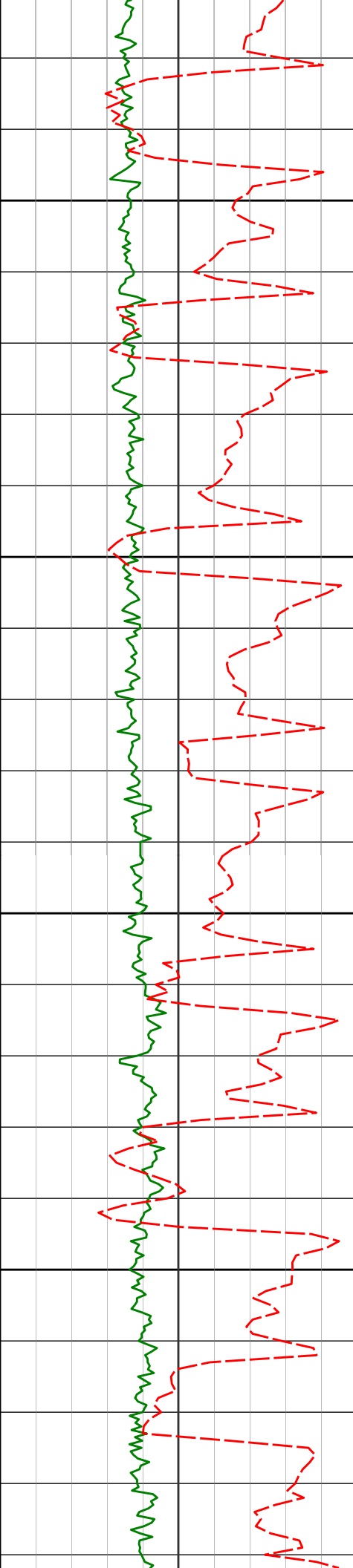
5250

5300

5350

5400

5210'	19.64°	354.07°	5148.02'	-13.66'
5241'	21.73°	355.26°	5177.02'	-2.71'
5272'	23.80°	356.74°	5205.60'	9.28'
5302'	25.26°	357.79°	5232.89'	21.73'
5333'	26.53°	358.70°	5260.78'	35.25'
5363'	28.23°	358.55°	5287.42'	49.02'
5393'	29.78°	357.64°	5313.65'	63.56'



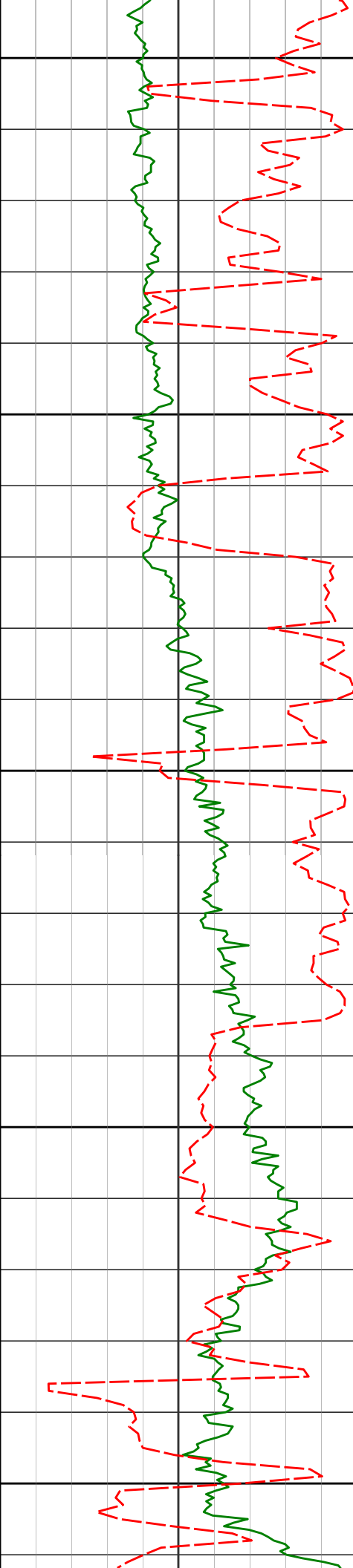
5450

5500

5550

5600

5424'	31.67°	356.19°	5340.30'	79.39'
5455'	33.94°	356.64°	5366.36'	96.18'
5486'	36.70°	357.47°	5391.65'	114.09'
5516'	40.02°	358.76°	5415.17'	132.69'
5547'	43.38°	359.51°	5438.31'	153.26'
5578'	46.19°	359.45°	5460.31'	175.05'
5609'	48.31°	359.45°	5481.35'	197.75'
5641'	51.27°	359.29°	5502.01'	222.13'



5650

5673'

53.45°

359.03°

5521.55'

247.42'

5700

5705'

56.16°

359.29°

5539.99'

273.51'

5736'

58.72°

359.72°

5556.67'

299.57'

5750

5768'

61.25°

358.35°

5572.68'

327.22'

5800

5799'

66.37°

358.81°

5586.36'

354.99'

5831'

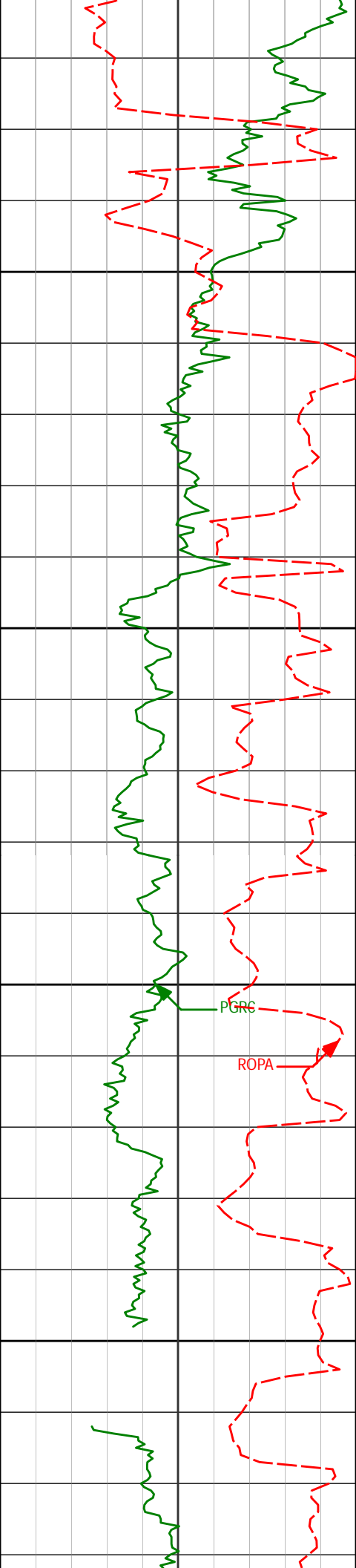
71.71°

358.77°

5597.80'

384.81'

5850



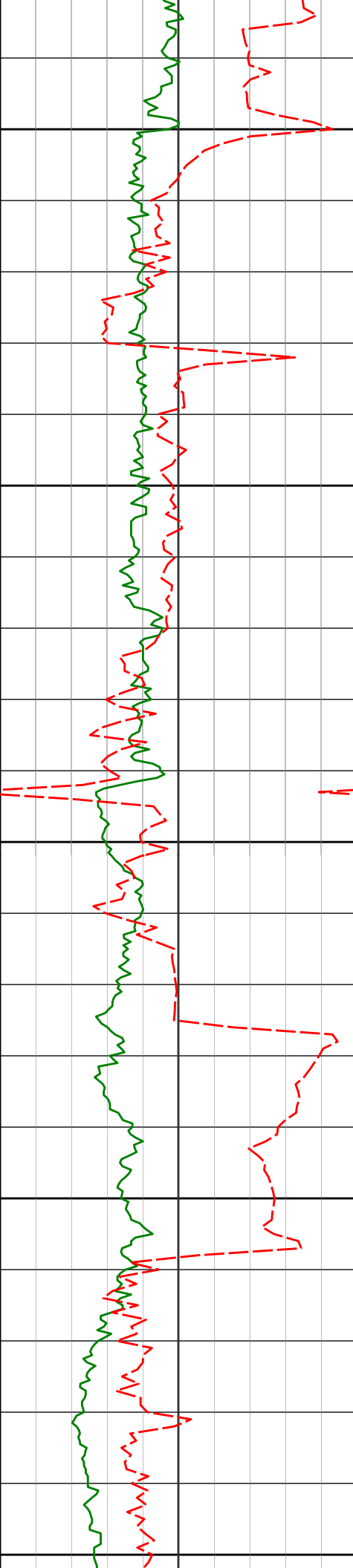
5900

5950

6000

6050

5863'	72.24°	359.21°	5607.70'	415.18'
5894'	73.02°	359.63°	5616.96'	444.70'
5926'	76.50°	359.98°	5625.37'	475.48'
5957'	79.21°	0.41°	5631.89'	505.68'
5989'	80.86°	0.56°	5637.43'	537.08'
6020'	82.92°	0.01°	5641.80'	567.66'
6052'	85.80°	359.99°	5644.94'	599.40'



▲ Casing at 6082' MD

6100
Run 300

6089'	88.86°	359.84°	5646.67'	636.24'
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6150

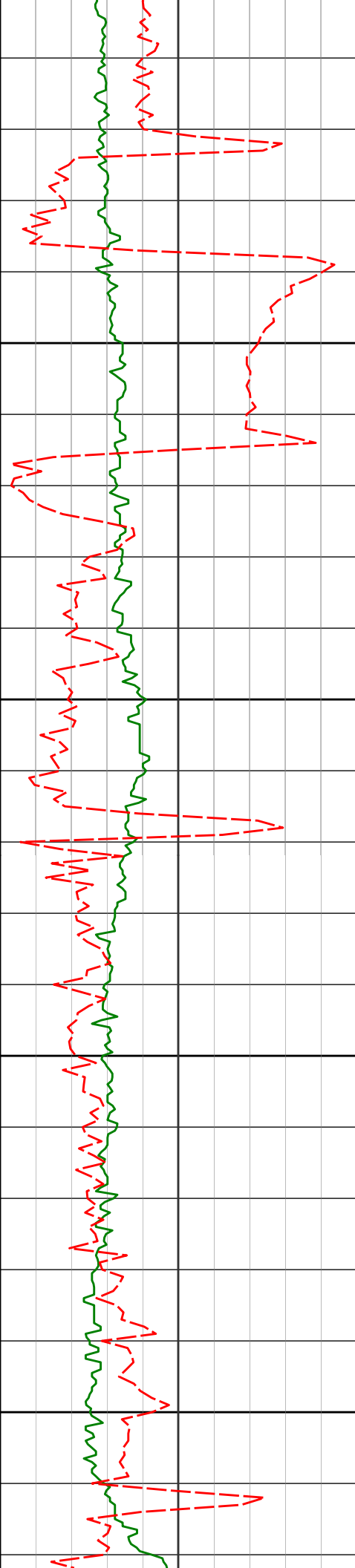
6184'	87.69°	357.21°	5649.53'	731.06'
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6200

6250

6278'	89.01°	358.29°	5652.23'	824.94'
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6300



6350

6400

6450

6500

6373'

91.23°

0.26°

5652.04'

919.72'

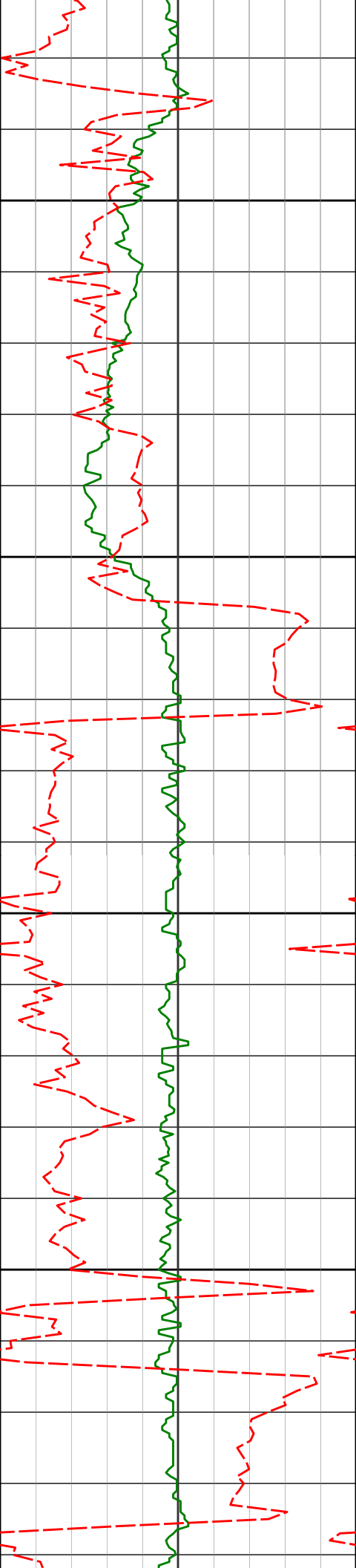
6467'

91.48°

359.28°

5649.81'

1013.43'



6550

6562'

92.71°

359.13°

5646.34'

1108.16'

6600

6650

6656'

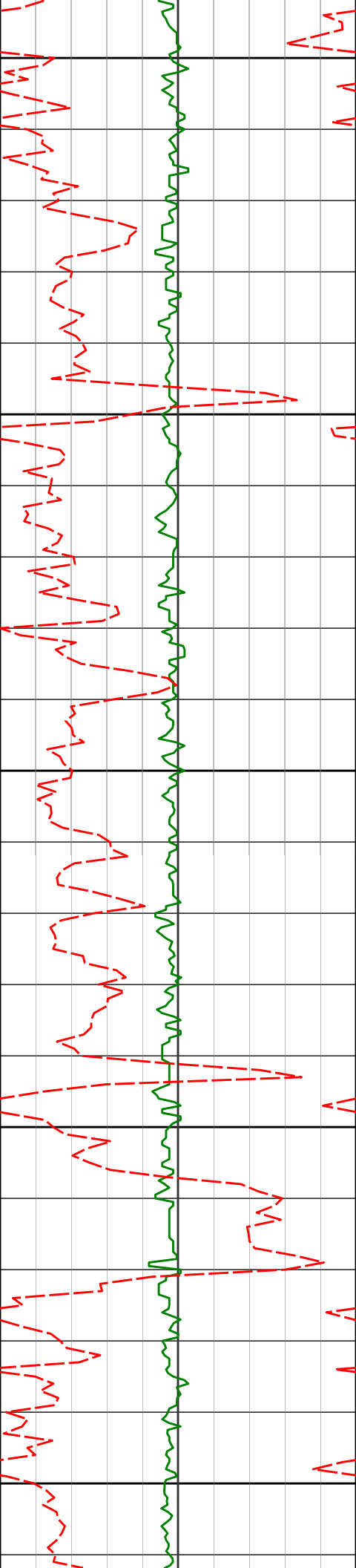
89.38°

357.96°

5644.63'

1201.99'

6700



6750

6751'

90.15°

1.75°

5645.02'

1296.70'

6800

6850

6846'

90.99°

0.59°

5644.07'

1391.22'

6900

6950

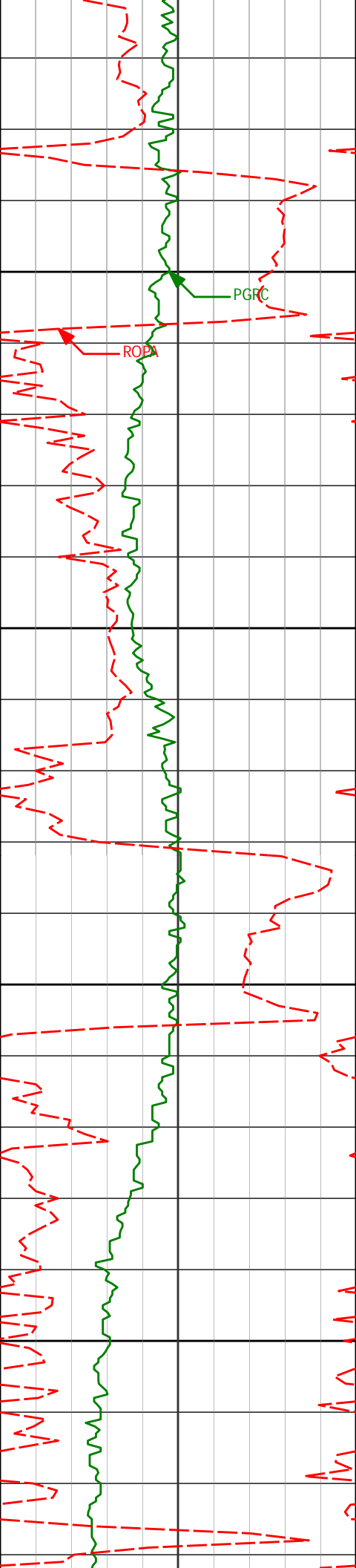
6941'

90.92°

2.18°

5642.49'

1485.70'



7000

PGFC

RODA

7035'

90.22°

3.26°

5641.55'

1578.94'

7050

7100

7129'

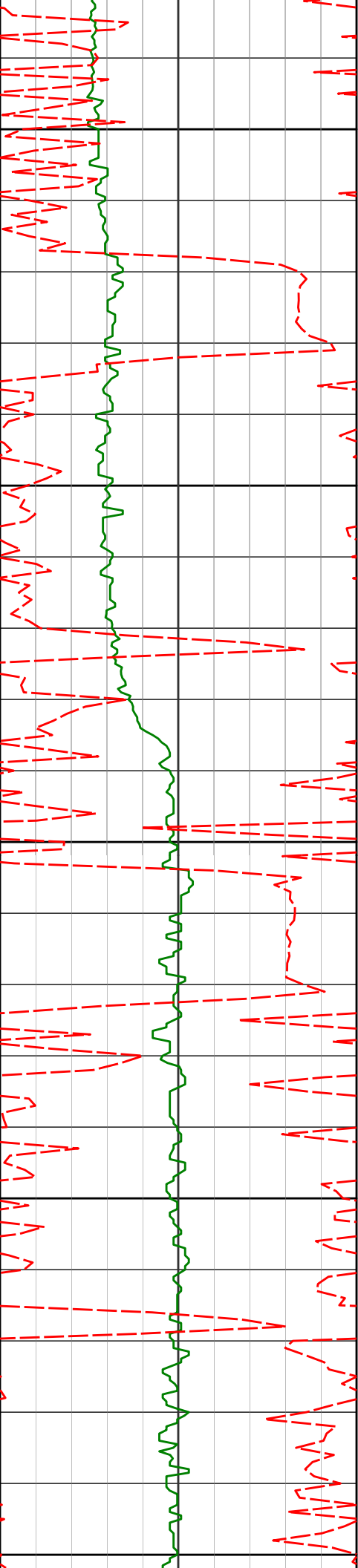
89.41°

2.31°

5641.86'

1672.17'

7150



7200

7224'

89.82°

2.52°

5642.49'

1766.47'

7250

7300

7318'

88.83°

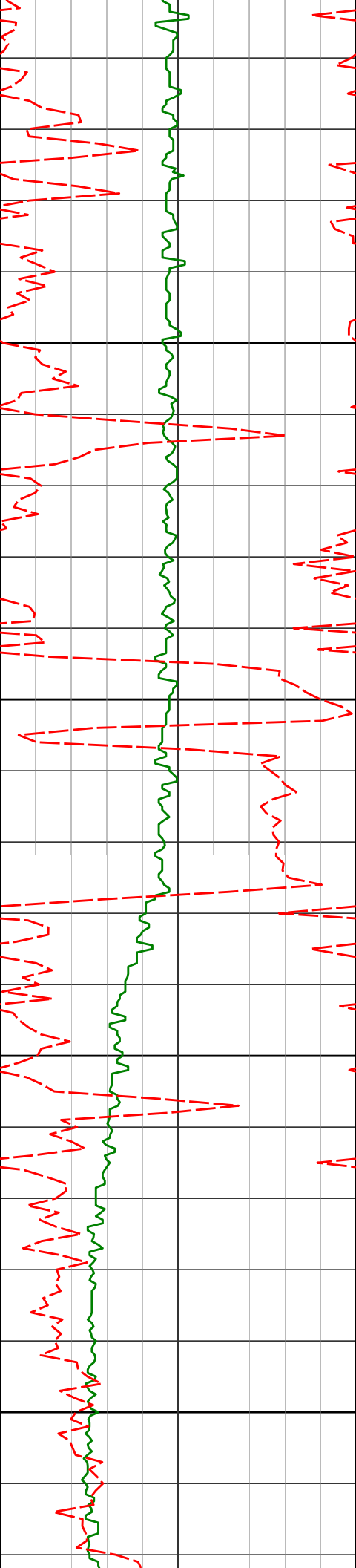
1.27°

5643.60'

1859.87'

7350

7400



7413'

89.48°

1.82°

5645.00'

1954.33'

7450

7500

7508'

88.67°

359.39°

5646.54'

2048.93'

7550

7600

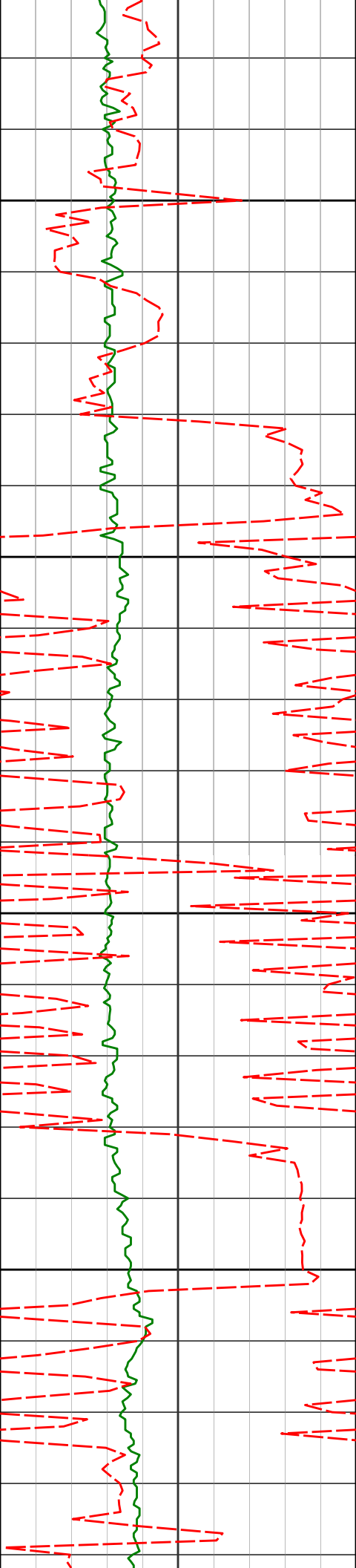
7602'

90.12°

359.73°

5647.53'

2142.68'



7650

7700

7750

7800

7697'

89.63°

359.33°

5647.74'

2237.44'

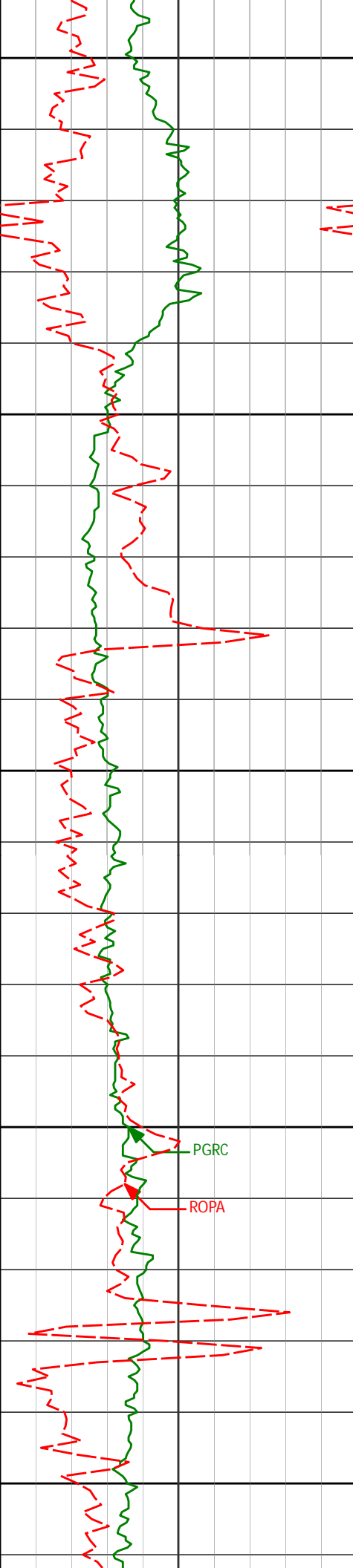
7792'

88.92°

357.63°

5648.94'

2332.30'



7850

7886'

88.09°

356.18°

5651.39'

2426.23'

7900

7950

7981'

88.86°

356.14°

5653.92'

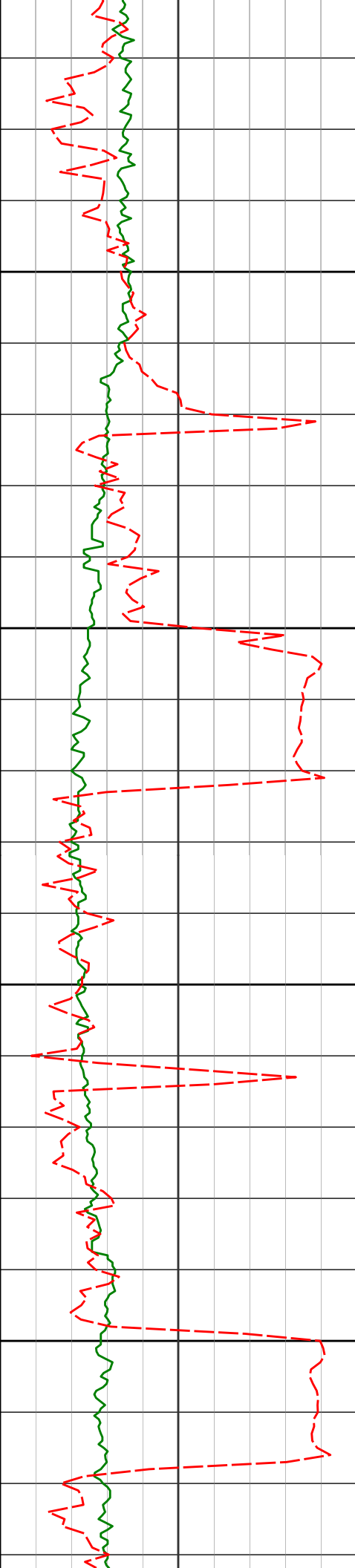
2521.19'

8000

PGRC

ROPA

8050



8076'

88.89°

355.25°

5655.78'

2616.17'

8100

8150

8168'

89.41°

356.73°

5657.15'

2708.15'

8200

8250

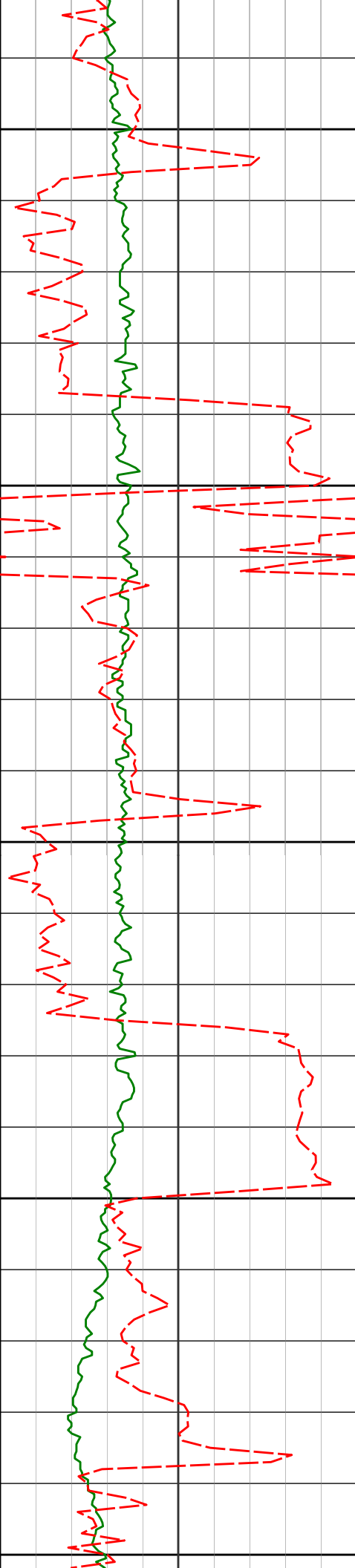
8260'

90.49°

359.04°

5657.23'

2800.07'



8300

8350

8400

8450

8500

8351'

90.06°

0.67°

5656.79'

2890.79'

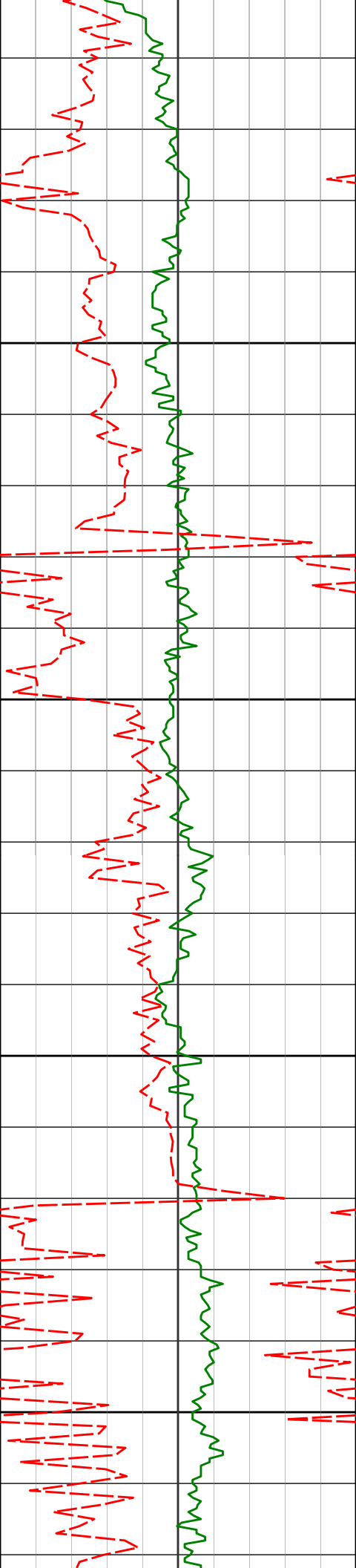
8442'

88.37°

1.50°

5658.04'

2981.35'



8533'

87.63°

0.64°

5661.22'

3071.85'

8550

8600

8624'

87.44°

359.77°

5665.13'

3162.46'

8650

8700

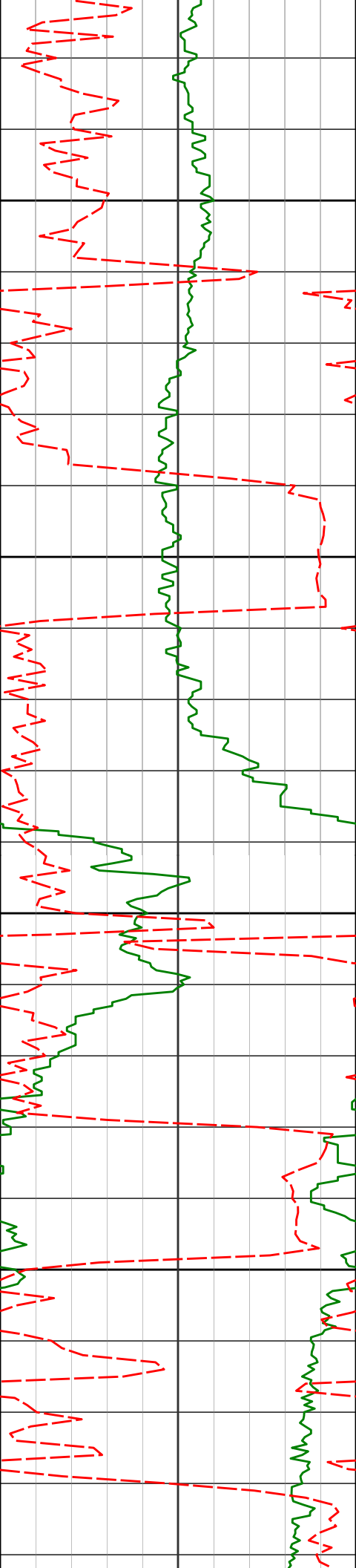
8715'

87.23°

359.26°

5669.36'

3253.13'



8750

8800

8850

8900

8806'

88.80°

358.80°

5672.51'

3343.90'

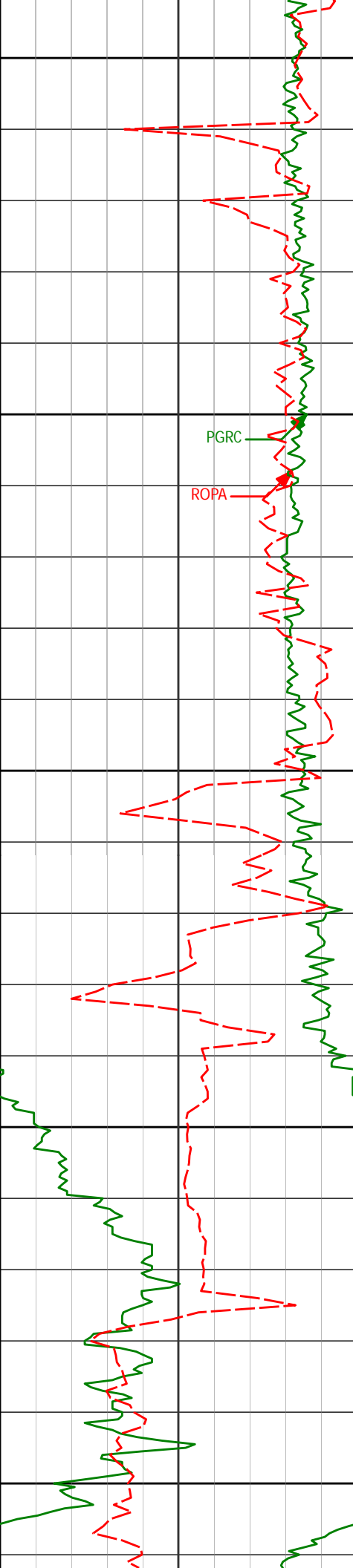
8897'

89.11°

0.54°

5674.17'

3434.64'



8950

8988'

90.22°

1.91°

5674.70'

3525.17'

9000

PGRC

ROPA

9050

9080'

91.45°

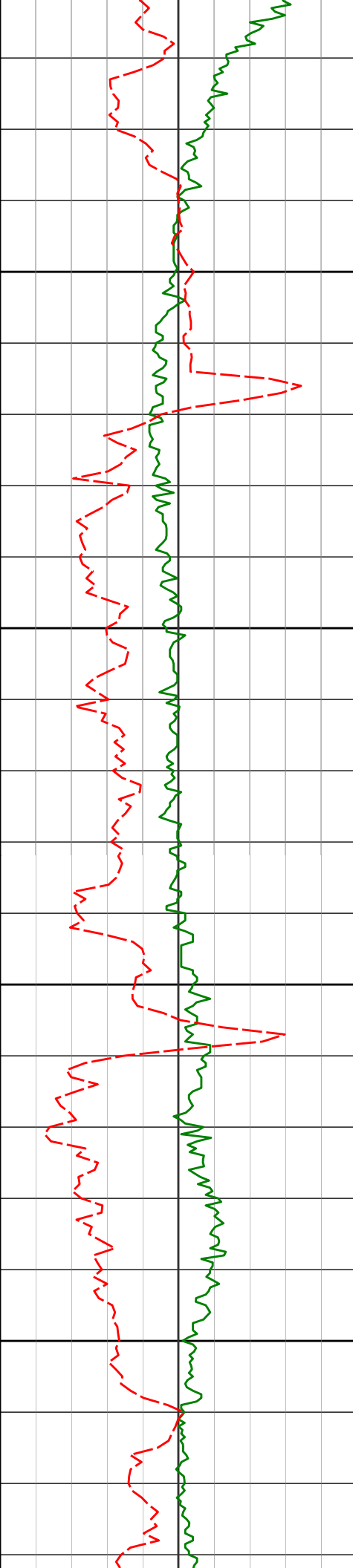
1.71°

5673.36'

3616.60'

9100

9150



9171'	91.20°	0.97°	5671.26'	3707.10'
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9200

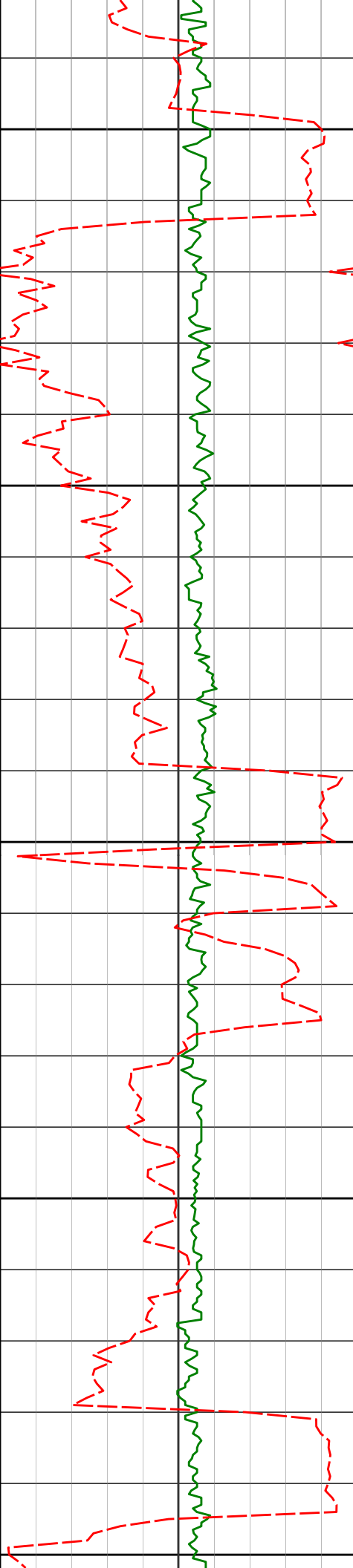
9250

9263'	91.42°	0.92°	5669.16'	3798.65'
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9300

9350

9355'	91.82°	0.72°	5666.56'	3890.22'
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9400

9450

9500

9550

9600

9446'

90.56°

0.73°

5664.67'

3980.81'

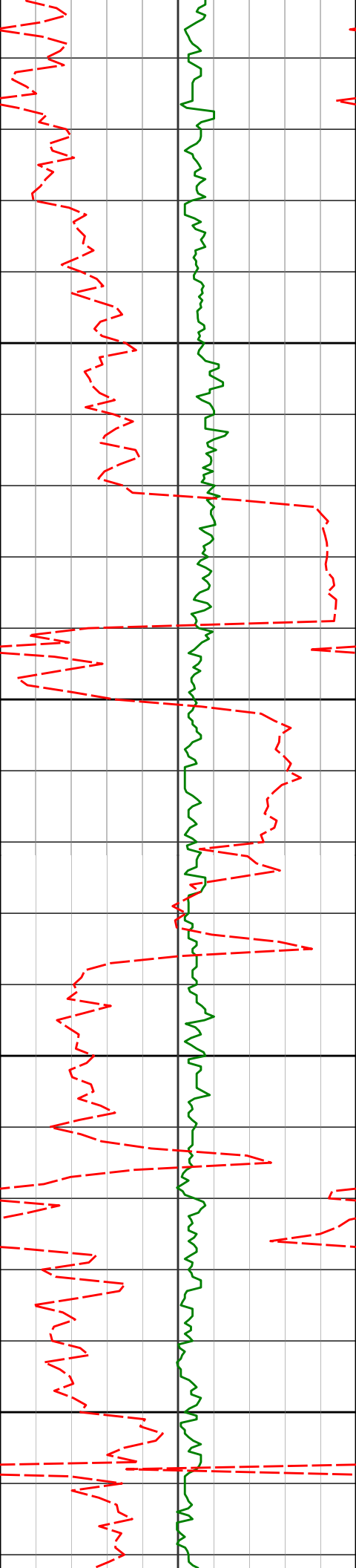
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1.47°

5664.61'

4071.37'



9627'

90.40°

2.77°

5664.68'

4160.76'

9650

9700

9718'

88.86°

0.54°

5665.27'

4251.22'

9750

9800

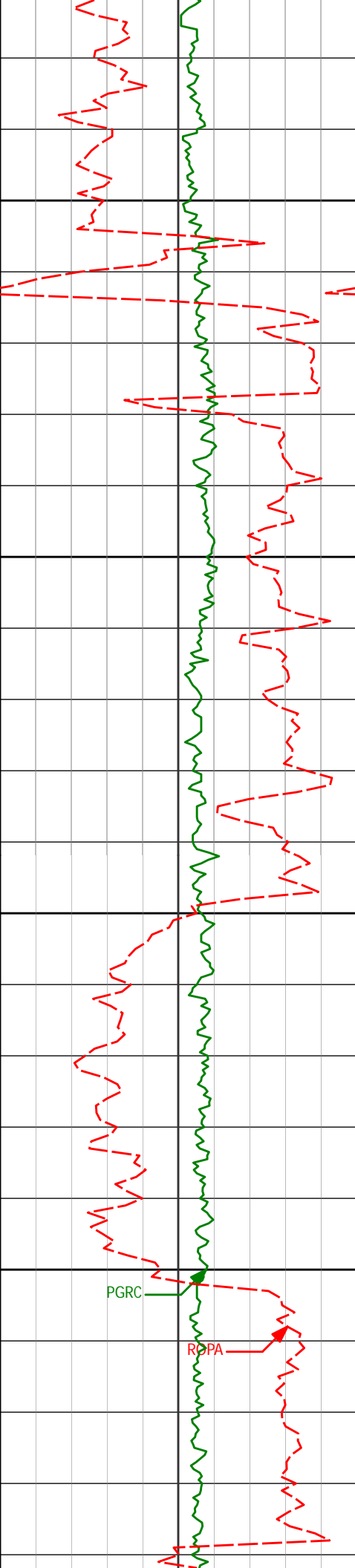
9811'

88.92°

0.01°

5667.07'

4343.88'



9850

9900

9950

10000

9902'

88.74°

359.61°

5668.93'

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9993'

88.15°

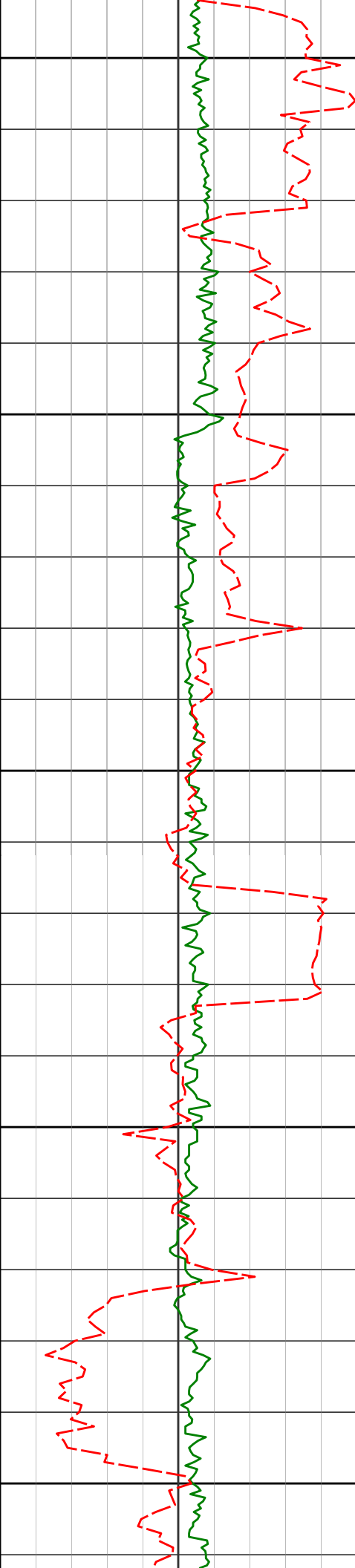
359.56°

5671.40'

4525.33'

PGRC

RCPA



10050

10085'

88.40°

359.06°

5674.17'

4617.08'

10100

10150

10176'

88.55°

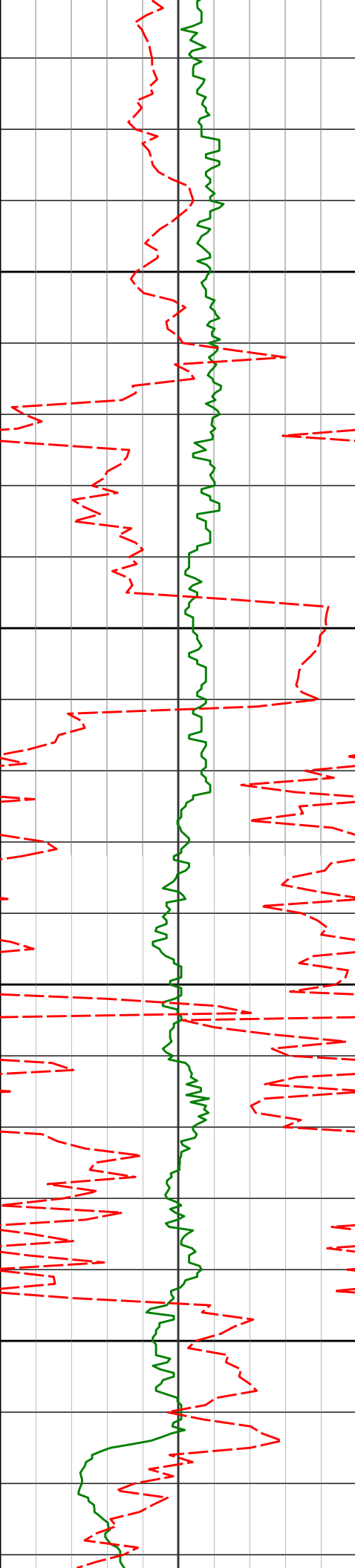
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10200

10250



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88.89°

358.06°

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10300

10350

10360'

89.20°

359.54°

5680.18'

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10400

10450

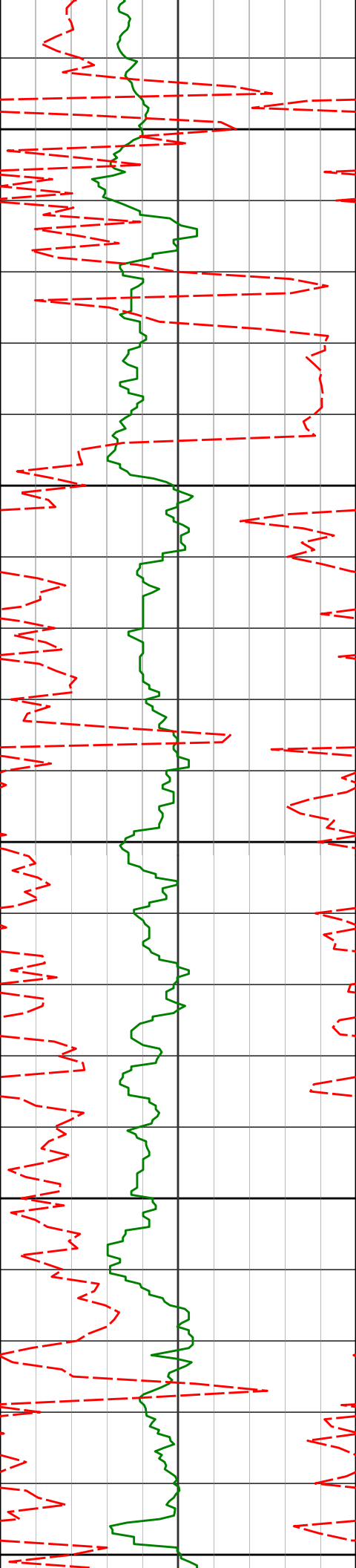
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359.82°

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4982.31'



10500

10542'

89.48°

0.80°

5681.62'

5072.98'

10550

10600

10634'

90.31°

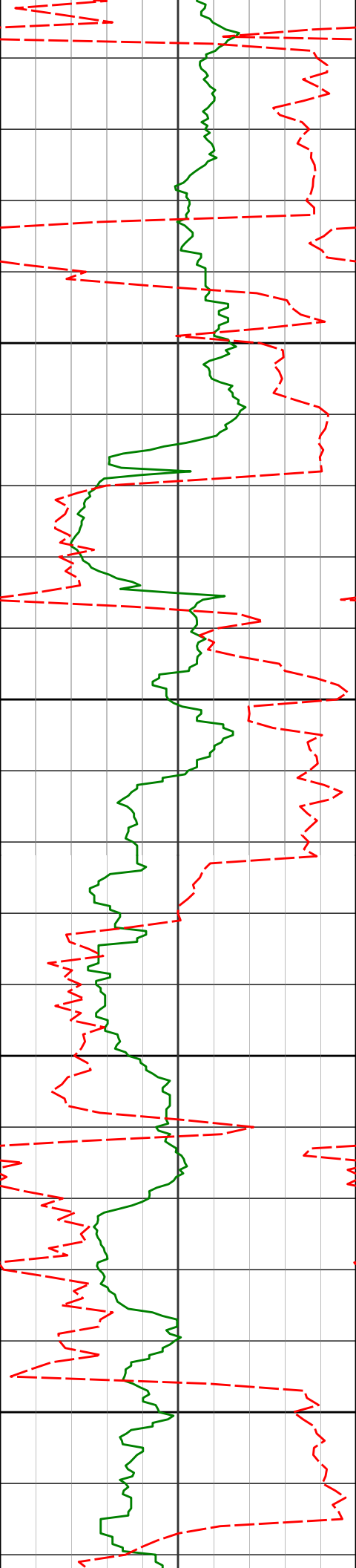
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5164.57'

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10700



10725'

89.38°

0.90°

5682.04'

5255.15'

10750

10800

10816'

88.74°

1.77°

5683.53'

5345.66'

10850

10900

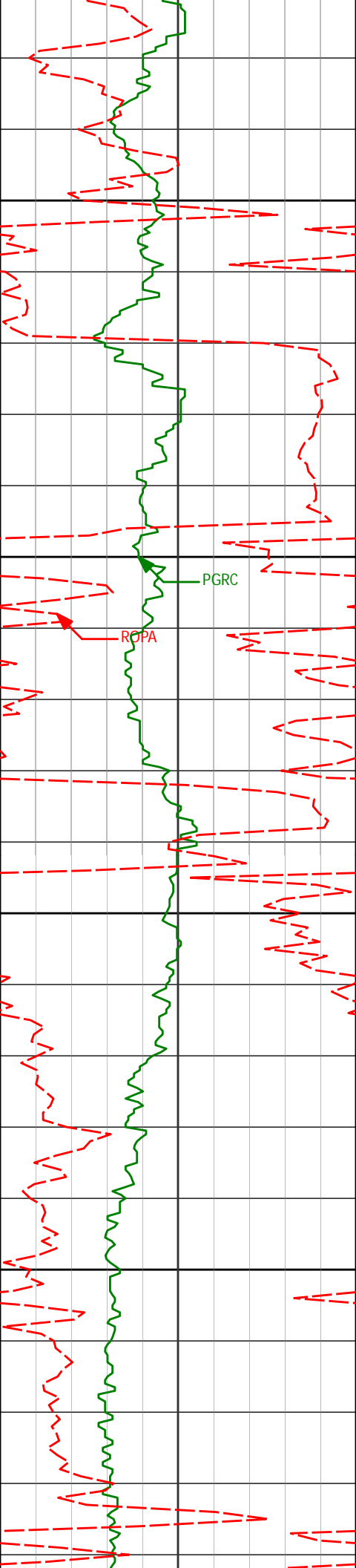
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0.61°

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10950

11000

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11100

11000'

11091'

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87.38°

0.89°

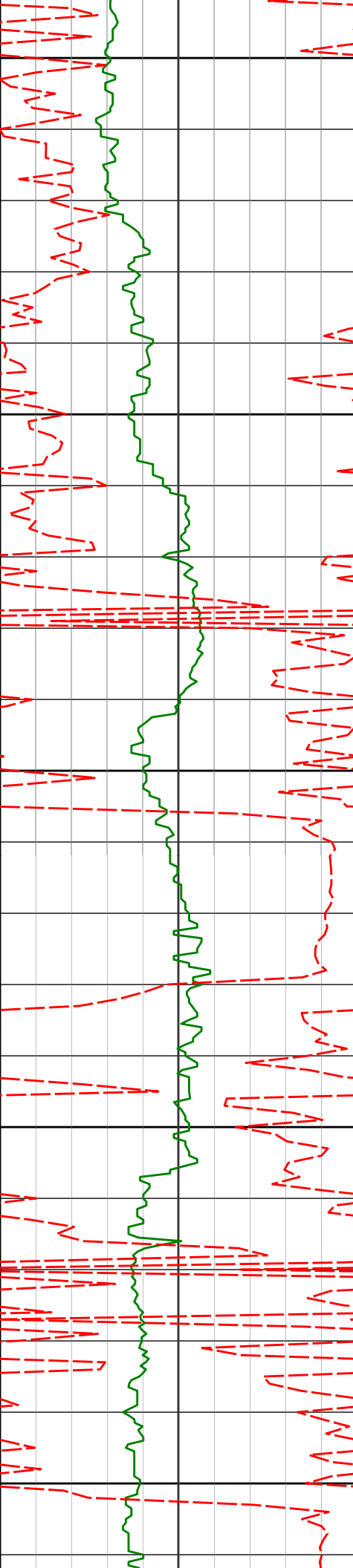
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11150

11182'

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358.49°

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5710.14'

11200

11250

11274'

87.93°

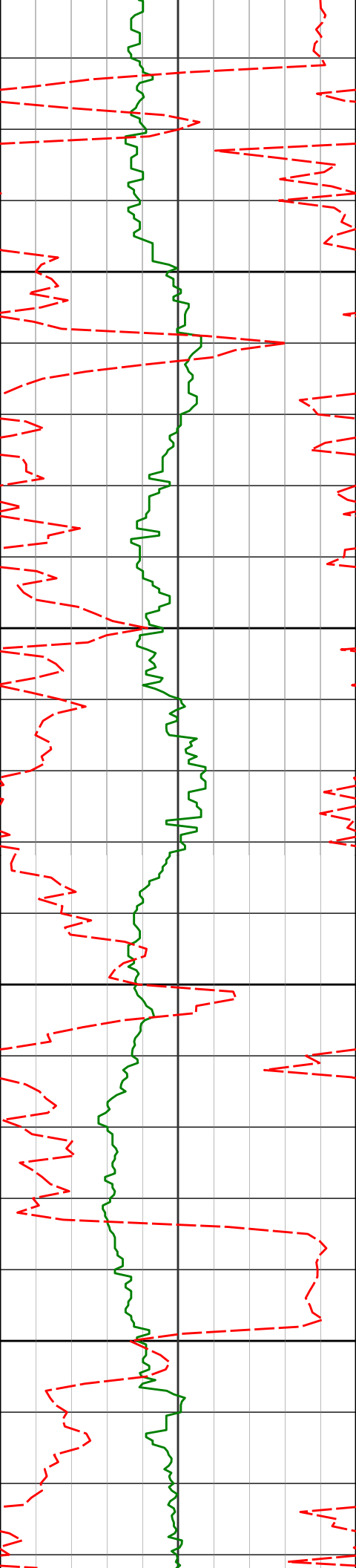
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11350



11367'

85.95°

358.59°

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5894.63'

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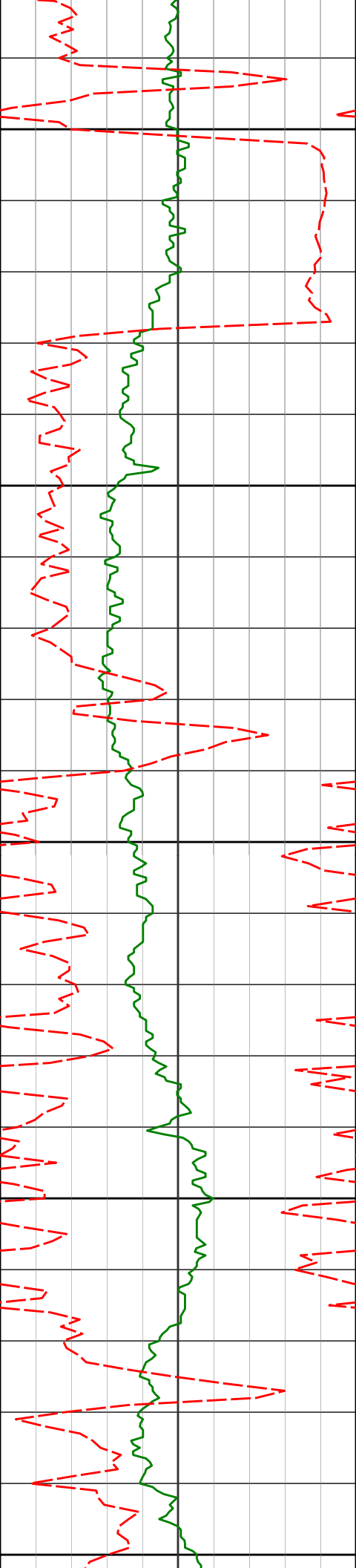
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86.67°

358.42°

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11600

11641'

88.58°

359.32°

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6167.69'

11650

11700

11733'

89.94°

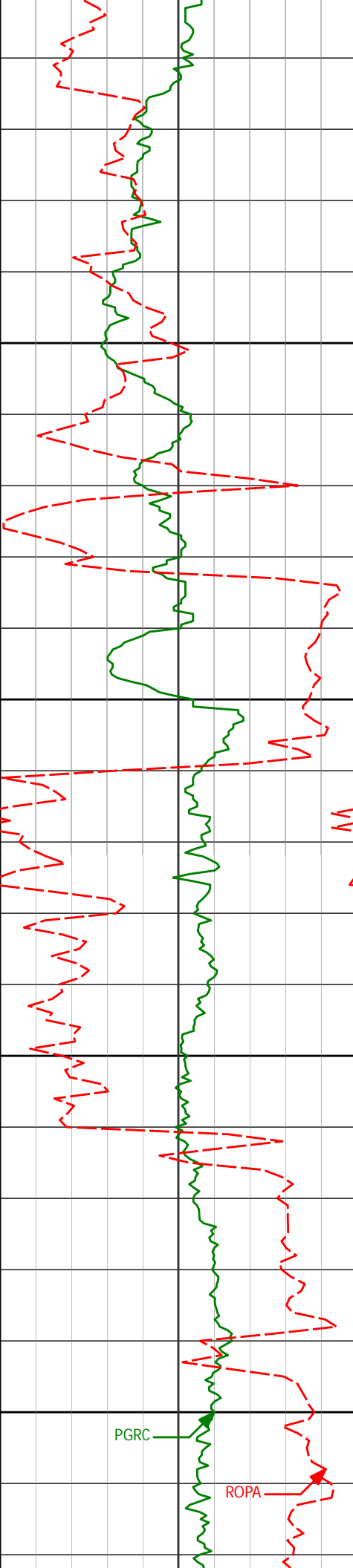
359.05°

5719.64'

6259.49'

11750

11800



11850

11900

11950

12000

PGRC

ROPA

11825'

90.93°

358.25°

5718.94'

6351.34'

11917'

91.88°

0.45°

5716.68'

6443.10'

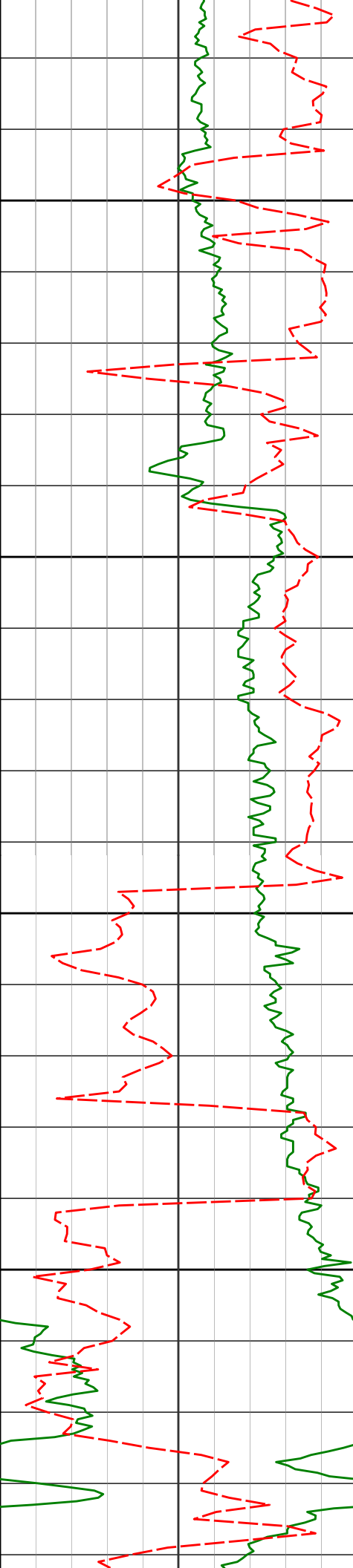
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92.07°

0.98°

5713.51'

6534.66'



12050

12100

12150

12200

12100'

91.82°

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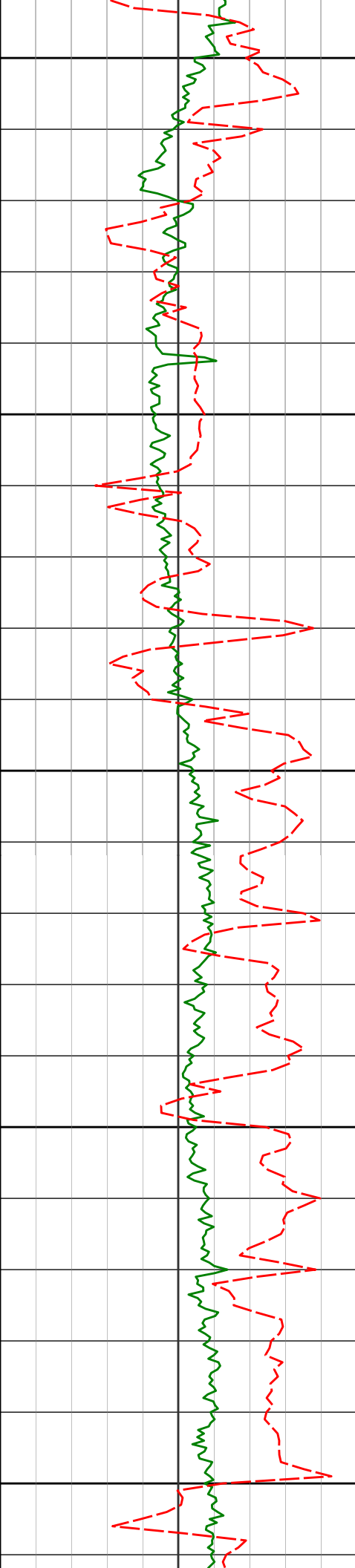
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0.45°

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89.97°

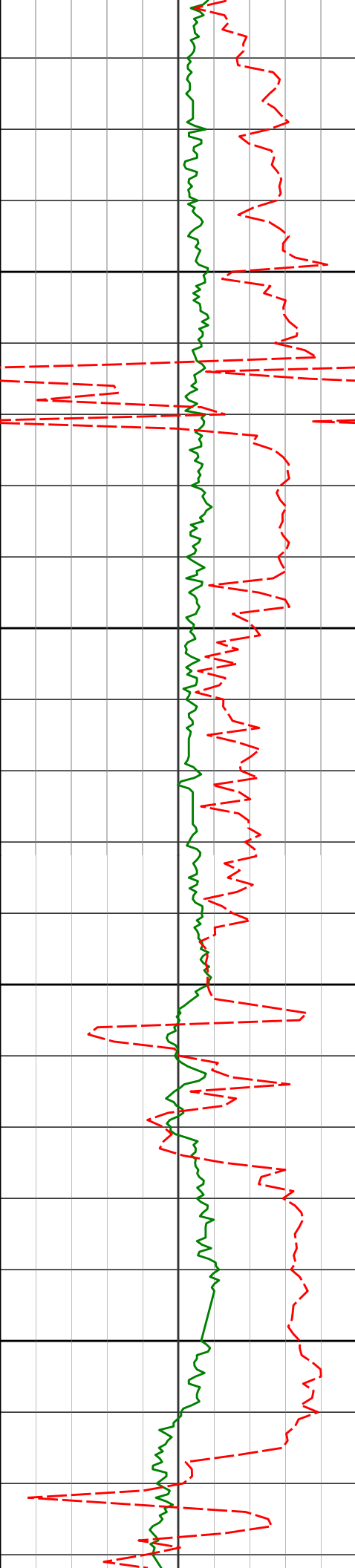
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12600

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0.31°

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0.38°

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7082.04'

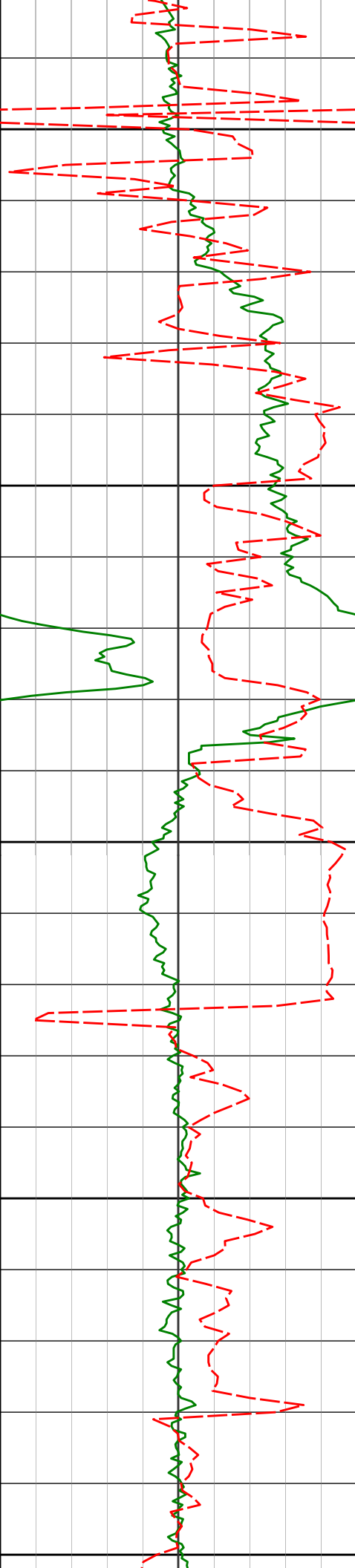
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7173.71'



12700

12750

12800

12850

12900

12743'

92.93°

0.86°

5706.64'

7265.30'

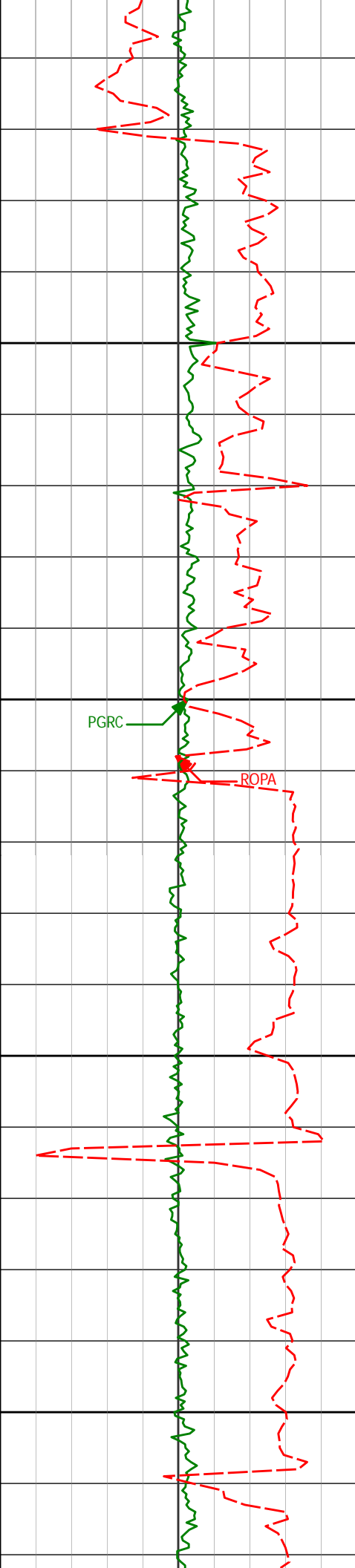
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7355.85'



12926'

90.34°

0.95°

5703.00'

7447.45'

12950

13000

PGRC

ROPA

13017'

89.51°

0.24°

5703.12'

7538.08'

13050

13100

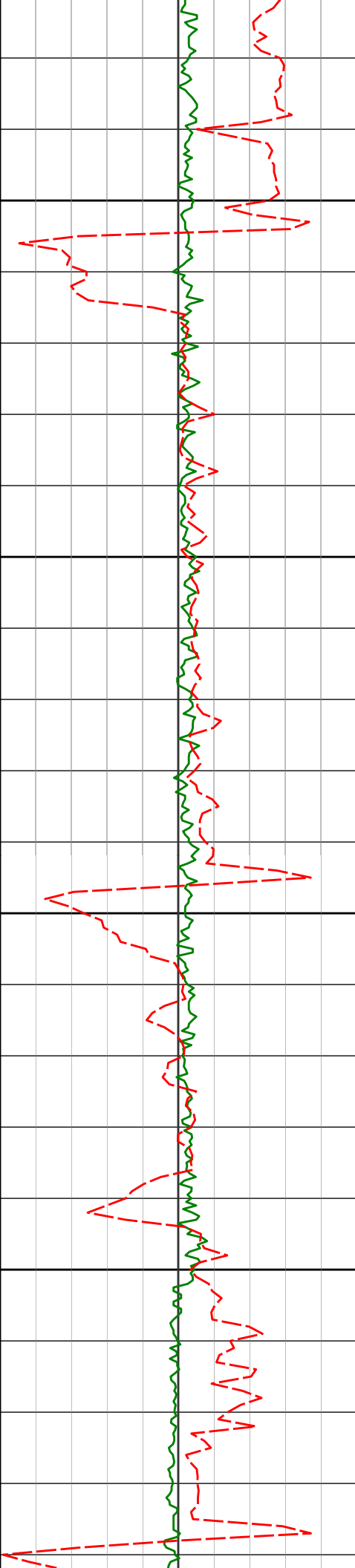
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0.62°

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13150

13200

13250

13300

13200'

13291'

89.78°

88.98°

359.92°

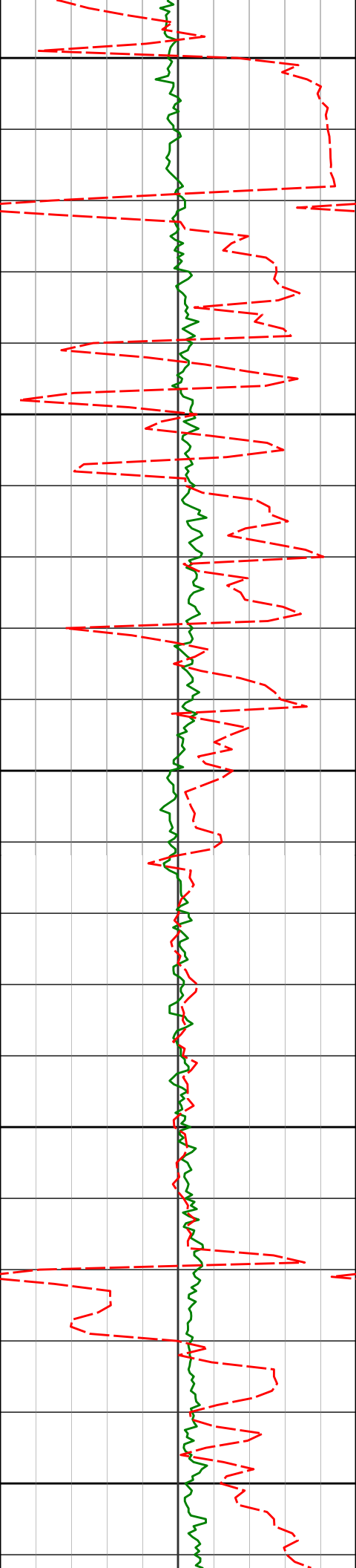
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13350

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91.27°

359.39°

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7903.01'

13400

13450

13473'

91.30°

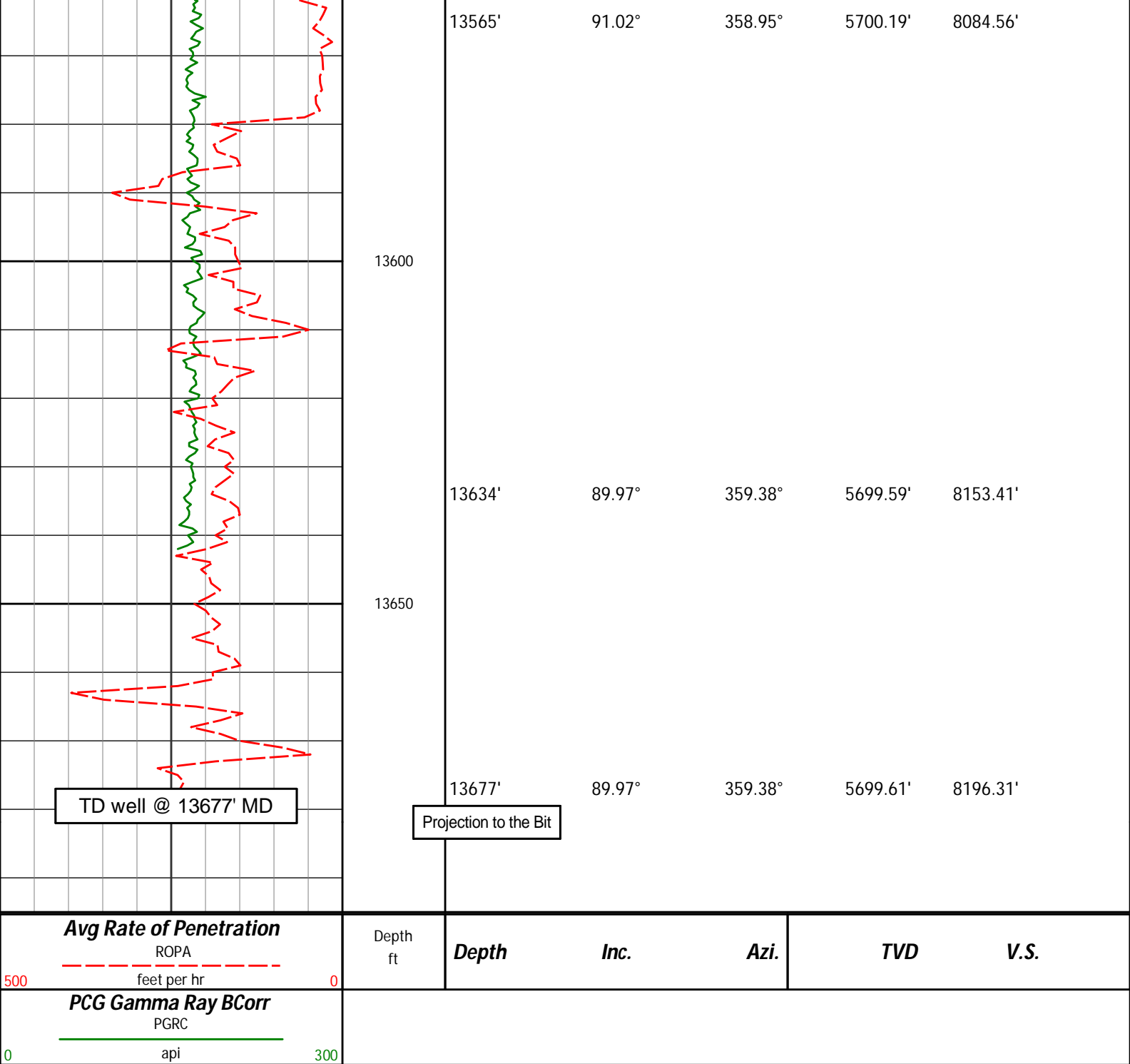
359.39°

5702.05'

7992.77'

13500

13550



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Whiting Oil and Gas
Razor 27J-2209A
Redtail
Weld Colorado
USA
CA-XX-0901619288
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
175.00	0.60	124.76	175.00	0.52 S	0.75 E	-0.58	0.34
266.00	0.84	124.27	265.00	1.47 S	1.70 E	1.20	0.26

286.00	0.84	124.27	283.99	1.17 S	1.70 E	-1.30	0.26
357.00	0.97	128.19	356.98	2.02 S	2.85 E	-2.24	0.16
449.00	1.78	142.58	448.95	3.64 S	4.33 E	-3.97	0.95
541.00	0.92	165.11	540.93	5.49 S	5.39 E	-5.90	1.08
633.00	0.80	168.46	632.91	6.83 S	5.71 E	-7.26	0.14
725.00	0.59	173.46	724.91	7.93 S	5.89 E	-8.37	0.24
817.00	0.62	166.37	816.90	8.88 S	6.06 E	-9.33	0.09
909.00	0.63	161.35	908.90	9.85 S	6.34 E	-10.32	0.06
1001.00	1.13	256.83	1000.89	10.53 S	5.62 E	-10.94	1.46
1092.00	2.08	266.38	1091.85	10.84 S	3.10 E	-11.05	1.08
1184.00	2.73	280.35	1183.77	10.55 S	0.72 W	-10.46	0.95
1276.00	4.01	276.38	1275.61	9.80 S	6.08 W	-9.29	1.41
1368.00	5.40	274.55	1367.30	9.10 S	13.59 W	-8.00	1.52
1459.00	7.05	267.83	1457.76	8.97 S	23.44 W	-7.09	1.98
1550.00	8.04	266.69	1547.97	9.55 S	35.37 W	-6.73	1.10
1559.00	8.21	266.52	1556.88	9.63 S	36.64 W	-6.70	1.91
1640.00	9.99	269.09	1636.86	10.09 S	49.44 W	-6.15	2.25
1731.00	9.73	270.52	1726.52	10.15 S	65.02 W	-4.98	0.39
1824.00	11.17	272.35	1817.97	9.70 S	81.88 W	-3.21	1.59
1915.00	10.13	268.08	1907.40	9.61 S	98.69 W	-1.79	1.43
2006.00	9.14	263.78	1997.12	10.66 S	113.87 W	-1.64	1.34
2098.00	10.87	268.55	2087.72	11.67 S	129.81 W	-1.38	2.08
2189.00	12.62	267.85	2176.81	12.26 S	148.32 W	-0.51	1.93
2281.00	11.51	267.22	2266.78	13.09 S	167.53 W	0.19	1.21
2373.00	10.75	267.44	2357.05	13.91 S	185.27 W	0.76	0.83
2464.00	10.74	255.00	2446.46	16.49 S	201.94 W	-0.49	2.54
2555.00	10.60	254.76	2535.89	20.88 S	218.21 W	-3.58	0.16
2647.00	12.61	258.00	2626.00	25.20 S	236.20 W	-6.46	2.30
2738.00	12.01	257.30	2714.91	29.34 S	255.15 W	-9.10	0.68
2829.00	11.51	255.54	2804.00	33.69 S	273.18 W	-12.01	0.68
2921.00	10.67	255.65	2894.28	38.09 S	290.32 W	-15.05	0.91
3013.00	11.36	260.01	2984.59	41.78 S	307.49 W	-17.36	1.18
3104.00	9.68	260.62	3074.06	44.58 S	323.87 W	-18.86	1.85
3195.00	11.52	262.45	3163.50	47.02 S	340.43 W	-19.99	2.06
3288.00	11.57	261.71	3254.62	49.59 S	358.86 W	-21.09	0.17
3379.00	12.66	261.67	3343.59	52.35 S	377.76 W	-22.35	1.20
3471.00	12.84	259.21	3433.32	55.72 S	397.78 W	-24.13	0.62
3562.00	13.58	258.49	3521.91	59.74 S	418.18 W	-26.53	0.83
3653.00	10.98	261.73	3610.83	63.12 S	437.23 W	-28.39	2.95
3745.00	10.75	259.10	3701.18	66.01 S	454.32 W	-29.92	0.59
3836.00	9.60	256.26	3790.74	69.41 S	470.03 W	-32.07	1.38
3928.00	10.58	259.89	3881.32	72.72 S	485.80 W	-34.12	1.27
4019.00	11.49	265.03	3970.64	74.97 S	503.05 W	-35.00	1.47
4111.00	10.29	264.89	4060.98	76.50 S	520.36 W	-35.16	1.30
4202.00	11.69	261.65	4150.31	78.56 S	537.58 W	-35.85	1.68
4293.00	10.66	261.91	4239.58	81.08 S	555.04 W	-36.99	1.13
4384.00	10.63	266.70	4329.02	82.75 S	571.75 W	-37.33	0.97
4477.00	9.03	262.71	4420.65	84.17 S	587.55 W	-37.50	1.87
4567.00	8.23	260.70	4509.63	86.11 S	600.92 W	-38.38	0.95
4659.00	6.93	258.20	4600.83	88.31 S	612.85 W	-39.63	1.46
4751.00	5.40	256.75	4692.29	90.43 S	622.49 W	-40.99	1.67
4843.00	3.15	260.21	4784.03	91.86 S	629.20 W	-41.87	2.46
4935.00	1.38	329.06	4875.97	91.34 S	632.26 W	-41.11	3.20
5026.00	1.62	42.53	4966.95	89.45 S	631.96 W	-39.25	1.98
5057.00	1.69	50.23	4997.93	88.83 S	631.31 W	-38.69	0.75
5088.00	3.17	25.27	5028.90	87.76 S	630.59 W	-37.69	5.76
5119.00	6.71	1.37	5059.79	85.18 S	630.18 W	-35.14	12.97
5149.00	11.82	354.58	5089.39	80.36 S	630.43 W	-30.32	17.39
5180.00	16.08	352.56	5119.47	72.94 S	631.29 W	-22.85	13.83
5210.00	19.64	354.07	5148.02	63.80 S	632.34 W	-13.66	11.97
5241.00	21.73	355.26	5177.02	52.90 S	633.36 W	-2.71	6.88
5272.00	23.80	356.74	5205.60	40.94 S	634.19 W	9.28	6.93
5302.00	25.26	357.79	5232.89	28.50 S	634.78 W	21.73	5.08
5333.00	26.53	358.70	5260.78	14.97 S	635.19 W	35.25	4.29
5363.00	28.23	358.55	5287.42	1.17 S	635.52 W	49.02	5.67
5393.00	29.78	357.64	5313.65	13.36 N	636.01 W	63.56	5.37
5424.00	31.67	356.19	5340.30	29.18 N	636.87 W	79.39	6.55
5455.00	33.94	356.64	5366.36	45.94 N	637.91 W	96.18	7.36
5486.00	36.70	357.47	5391.65	63.84 N	638.83 W	114.09	9.04
5516.00	40.02	358.76	5415.17	82.44 N	639.44 W	132.69	11.38
5547.00	43.38	359.51	5438.31	103.06 N	639.74 W	153.26	10.96
5578.00	46.19	359.45	5460.31	124.89 N	639.94 W	175.05	9.07
5609.00	48.31	359.45	5481.35	147.65 N	640.16 W	197.75	6.84
5641.00	51.27	359.29	5502.01	172.09 N	640.43 W	222.13	9.26
5673.00	53.45	359.03	5521.55	197.42 N	640.80 W	247.42	6.84

5705.00	56.16	359.29	5539.99	223.57 N	641.18 W	273.51	8.49
5736.00	58.72	359.72	5556.67	249.69 N	641.41 W	299.57	8.34
5768.00	61.25	358.35	5572.68	277.39 N	641.88 W	327.22	8.73
5799.00	66.37	358.81	5586.36	305.19 N	642.57 W	354.99	16.57
5831.00	71.71	358.77	5597.80	335.06 N	643.20 W	384.81	16.69
5863.00	72.24	359.21	5607.70	365.48 N	643.73 W	415.18	2.11
5894.00	73.02	359.63	5616.96	395.07 N	644.03 W	444.70	2.83
5926.00	76.50	359.98	5625.37	425.94 N	644.14 W	475.48	10.93
5957.00	79.21	0.41	5631.89	456.24 N	644.03 W	505.68	8.85
5989.00	80.86	0.56	5637.43	487.75 N	643.77 W	537.08	5.18
6020.00	82.92	0.01	5641.80	518.44 N	643.61 W	567.66	6.87
6052.00	85.80	359.99	5644.94	550.28 N	643.61 W	599.40	9.00
6089.00	88.86	359.84	5646.67	587.24 N	643.67 W	636.24	8.28
6184.00	87.69	357.21	5649.53	682.16 N	646.11 W	731.06	3.03
6278.00	89.01	358.29	5652.23	776.04 N	649.80 W	824.94	1.81
6373.00	91.23	0.26	5652.04	871.02 N	651.00 W	919.72	3.12
6467.00	91.48	359.28	5649.81	964.99 N	651.38 W	1013.43	1.08
6562.00	92.71	359.13	5646.34	1059.92 N	652.70 W	1108.16	1.30
6656.00	89.38	357.96	5644.63	1153.86 N	655.08 W	1201.99	3.75
6751.00	90.15	1.75	5645.02	1248.84 N	655.32 W	1296.70	4.07
6846.00	90.99	0.59	5644.07	1343.81 N	653.38 W	1391.22	1.51
6941.00	90.92	2.18	5642.49	1438.77 N	651.09 W	1485.70	1.68
7035.00	90.22	3.26	5641.55	1532.66 N	646.63 W	1578.94	1.37
7129.00	89.41	2.31	5641.86	1626.54 N	642.06 W	1672.17	1.33
7224.00	89.82	2.52	5642.49	1721.46 N	638.06 W	1766.47	0.48
7318.00	88.83	1.27	5643.60	1815.39 N	634.95 W	1859.87	1.70
7413.00	89.48	1.82	5645.00	1910.35 N	632.39 W	1954.33	0.90
7508.00	88.67	359.39	5646.54	2005.32 N	631.39 W	2048.93	2.70
7602.00	90.12	359.73	5647.53	2099.31 N	632.11 W	2142.68	1.58
7697.00	89.63	359.33	5647.74	2194.31 N	632.89 W	2237.44	0.67
7792.00	88.92	357.63	5648.94	2289.26 N	635.41 W	2332.30	1.94
7886.00	88.09	356.18	5651.39	2383.09 N	640.48 W	2426.23	1.78
7981.00	88.86	356.14	5653.92	2477.84 N	646.84 W	2521.19	0.81
8076.00	88.89	355.25	5655.78	2572.56 N	653.97 W	2616.17	0.94
8168.00	89.41	356.73	5657.15	2664.32 N	660.40 W	2708.15	1.70
8260.00	90.49	359.04	5657.23	2756.25 N	663.80 W	2800.07	2.77
8351.00	90.06	0.67	5656.79	2847.24 N	664.03 W	2890.79	1.85
8442.00	88.37	1.50	5658.04	2938.21 N	662.30 W	2981.35	2.07
8533.00	87.63	0.64	5661.22	3029.14 N	660.61 W	3071.85	1.25
8624.00	87.44	359.77	5665.13	3120.06 N	660.28 W	3162.46	0.98
8715.00	87.23	359.26	5669.36	3210.95 N	661.05 W	3253.13	0.61
8806.00	88.80	358.80	5672.51	3301.88 N	662.59 W	3343.90	1.80
8897.00	89.11	0.54	5674.17	3392.86 N	663.11 W	3434.64	1.94
8988.00	90.22	1.91	5674.70	3483.84 N	661.17 W	3525.17	1.94
9080.00	91.45	1.71	5673.36	3575.78 N	658.26 W	3616.60	1.35
9171.00	91.20	0.97	5671.26	3666.73 N	656.14 W	3707.10	0.86
9263.00	91.42	0.92	5669.16	3758.69 N	654.62 W	3798.65	0.25
9355.00	91.82	0.72	5666.56	3850.65 N	653.30 W	3890.22	0.49
9446.00	90.56	0.73	5664.67	3941.62 N	652.15 W	3980.81	1.38
9537.00	89.51	1.47	5664.61	4032.60 N	650.40 W	4071.37	1.41
9627.00	90.40	2.77	5664.68	4122.53 N	647.08 W	4160.76	1.75
9718.00	88.86	0.54	5665.27	4213.49 N	644.45 W	4251.22	2.98
9811.00	88.92	0.01	5667.07	4306.47 N	644.00 W	4343.88	0.57
9902.00	88.74	359.61	5668.93	4397.45 N	644.30 W	4434.60	0.48
9993.00	88.15	359.56	5671.40	4488.41 N	644.96 W	4525.33	0.65
10085.00	88.40	359.06	5674.17	4580.36 N	646.07 W	4617.08	0.61
10176.00	88.55	358.88	5676.59	4671.32 N	647.70 W	4707.88	0.26
10268.00	88.89	358.06	5678.64	4763.26 N	650.16 W	4799.73	0.96
10360.00	89.20	359.54	5680.18	4855.22 N	652.09 W	4891.56	1.64
10451.00	89.75	359.82	5681.01	4946.22 N	652.60 W	4982.31	0.68
10542.00	89.48	0.80	5681.62	5037.21 N	652.10 W	5072.98	1.12
10634.00	90.31	1.00	5681.79	5129.20 N	650.66 W	5164.57	0.93
10725.00	89.38	0.90	5682.04	5220.19 N	649.15 W	5255.15	1.03
10816.00	88.74	1.77	5683.53	5311.15 N	647.03 W	5345.66	1.19
10908.00	89.32	0.61	5685.09	5403.11 N	645.12 W	5437.19	1.41
11000.00	87.47	0.89	5687.67	5495.07 N	643.92 W	5528.76	2.03
11091.00	87.38	359.40	5691.75	5585.97 N	643.69 W	5619.36	1.64
11182.00	88.80	358.49	5694.79	5676.90 N	645.36 W	5710.14	1.85
11274.00	87.93	359.32	5697.41	5768.85 N	647.12 W	5801.93	1.31
11367.00	85.95	358.59	5702.38	5861.69 N	648.81 W	5894.63	2.27
11457.00	85.96	358.72	5708.72	5951.44 N	650.92 W	5984.26	0.14
11549.00	86.67	358.42	5714.64	6043.22 N	653.21 W	6075.94	0.84
11641.00	88.58	359.32	5718.45	6135.12 N	655.02 W	6167.69	2.29
11733.00	89.94	359.05	5719.64	6227.10 N	656.33 W	6259.49	1.51
11825.00	89.22	359.05	5719.81	6319.03 N	657.53 W	6351.33	1.82

11825.00	90.93	358.25	5718.94	6319.07 N	658.50 W	6351.34	1.38
11917.00	91.88	0.45	5716.68	6411.03 N	659.54 W	6443.10	2.60
12009.00	92.07	0.98	5713.51	6502.97 N	658.39 W	6534.66	0.61
12100.00	91.82	2.34	5710.42	6593.88 N	655.76 W	6625.07	1.52
12193.00	88.61	0.88	5710.08	6686.82 N	653.15 W	6717.52	3.79
12283.00	88.89	0.45	5712.04	6776.80 N	652.10 W	6807.13	0.57
12376.00	89.97	0.84	5712.96	6869.79 N	651.06 W	6899.75	1.23
12468.00	90.65	0.31	5712.47	6961.78 N	650.13 W	6991.38	0.94
12559.00	90.92	0.38	5711.22	7052.77 N	649.58 W	7082.04	0.31
12651.00	90.93	0.13	5709.73	7144.76 N	649.18 W	7173.71	0.27
12743.00	92.93	0.86	5706.64	7236.69 N	648.38 W	7265.30	2.31
12834.00	90.65	0.74	5703.79	7327.63 N	647.11 W	7355.85	2.51
12926.00	90.34	0.95	5703.00	7419.62 N	645.76 W	7447.45	0.41
13017.00	89.51	0.24	5703.12	7510.61 N	644.81 W	7538.08	1.20
13108.00	90.25	0.62	5703.31	7601.61 N	644.13 W	7628.74	0.91
13200.00	89.78	359.92	5703.28	7693.61 N	643.69 W	7720.42	0.92
13291.00	88.98	358.82	5704.27	7784.60 N	644.69 W	7811.20	1.49
13383.00	91.27	359.39	5704.07	7876.58 N	646.13 W	7903.01	2.57
13473.00	91.30	359.39	5702.05	7966.55 N	647.09 W	7992.77	0.03
13565.00	91.02	358.95	5700.19	8058.52 N	648.42 W	8084.56	0.57
13634.00	89.97	359.38	5699.59	8127.51 N	649.43 W	8153.41	1.64
13677.00	89.97	359.38	5699.61	8170.51 N	649.89 W	8196.31	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 355.47 DEGREES (TRUE)
A TOTAL CORRECTION OF 7.52 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 13677.00 FEET
IS 8196.31 FEET ALONG 355.45 DEGREES (TRUE)**

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