

PCG Pressure Case Gamma PCD Pressure Case Directional

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	16-Jan-15	19-Jan-15			
Rig Bit Number	2	3			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.750	4.750			
Log Start Depth (MD, ft)	1,208.00	5,868.00			
Log End Depth (MD, ft)	5,868.00	10,443.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	15-Jan-15 12:00	17-Jan-15 09:30			
Drill/Wipe End Date and Time	16-Jan-15 04:00	18-Jan-15 15:30			
Min Inc (deg) @ Depth (MD, ft)	0.10 @ 1,296.00	87.10 @ 7,689.00			
Max Inc (deg) @ Depth (MD, ft)	81.06 @ 5,811.00	93.30 @ 8,450.00			
Bit TFA(in2) / Bit Type	1.21 / PDC	0.65 / PDC			
Flow Rate (gpm)	638.17	299.32			
Max AV (fpm) / CV (fpm) @ MWD	445.9 / NA	444.6 / NA			
Fluid Type	Fresh Water Gel	Fresh Water Gel			
Density (ppg) / Viscosity (spqt)	11.10 / 39.00	10.00 / 37.00			
Filtrate CL (ppm)	2,200.00	2,400.00			
pH / Fluid Loss (mptm)	9.00 / 6	9.50 / 7			
PV (cP) / YP (lbf2)	14 / 12.00	11 / 14.00			
% Solids / % Sand	12.7 / 0.25	7.7 / 0.25			
% Oil / Oil:Water Ratio	N/A / N/A	NA / NA			
Rm @ Measured Temp (degF)	N/A @ N/A	NA @ NA			
Rmf @ Measured Temp (degF)	N/A @ N/A	NA @ NA			
Rmc @ Measured Temp (degF)	N/A @ N/A	NA @ NA			
Min Tool Temp (in F) / S	100.00 / PCM	225.00 / PCM			

Max Tool Temp (degF) / Source	160.83 / PCM	205.00 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	NA @ NA			
Lead MWD Engineer	Brett Vandergon	Brett Vandergon			
Customer Representative	Seth Mulherin	Seth Mulherin			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	10789247	11768602			
Insert Serial Number	11400880	11619985			
Date and Time Initialized	15-Jan-15 01:46	16-Jan-15 11:45			
Date and Time Read	16-Jan-15 09:25	19-Jan-15 07:56			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	57.00	51.00			
Software Version	6.33	6.21			
Sub Serial Number	10789247	11768602			
Sonde Serial Number	10993517	11478016			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	225.00	332.90			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.14	44.67			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	10789247	11768602			
Insert/Sonde Serial Number	11293261	12037419			

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 annual velocities are calculated using the "Power Law" model for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.
4. All data presented is recorded data unless otherwise specified.
5. The following smoothing parameters have been applied to the data:
1: 600
PGRC (Corrected Gamma Ray):
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 1.0 ft
Interval Distance: 3.0 ft
Gap Fill: 5.0 ft
1: 240
PGRC (Corrected Gamma Ray):
Interval Resolution: 0.5 ft
Interval Distance: 0.6 ft
Gap Fill: 3.0 ft

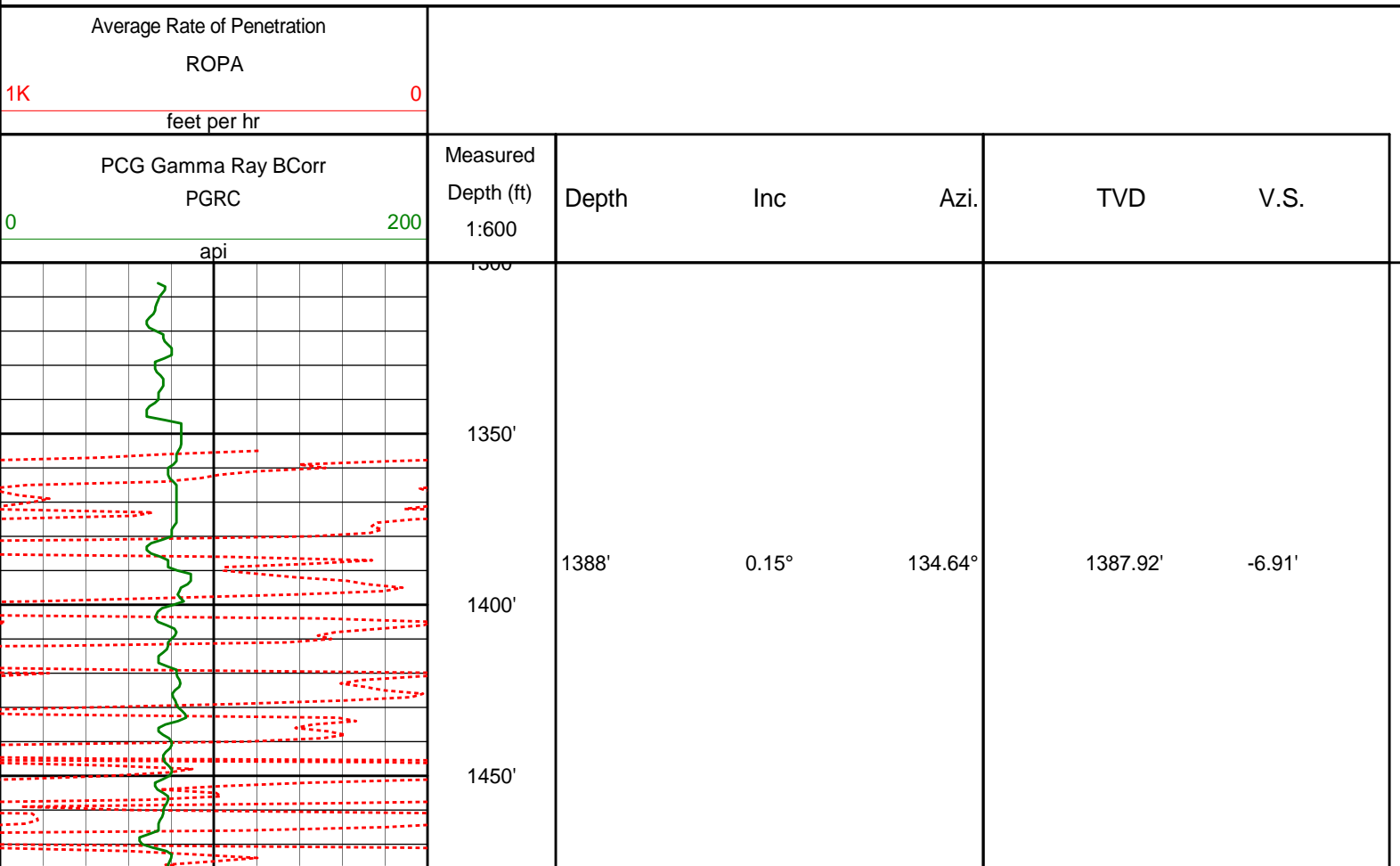
Gap Fill: 3.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill: 3.0 ft
6. INSITE version 8.0.2

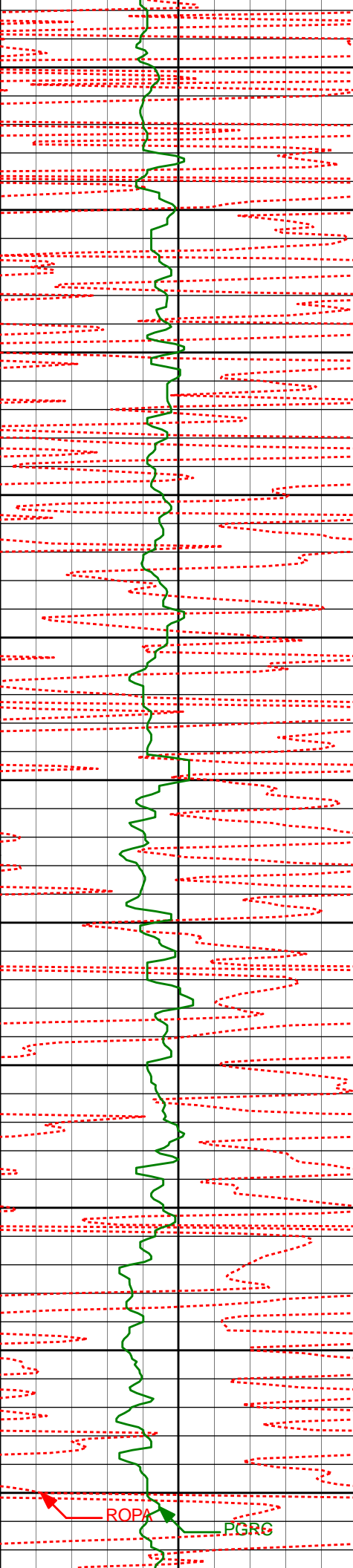
WARRANTY

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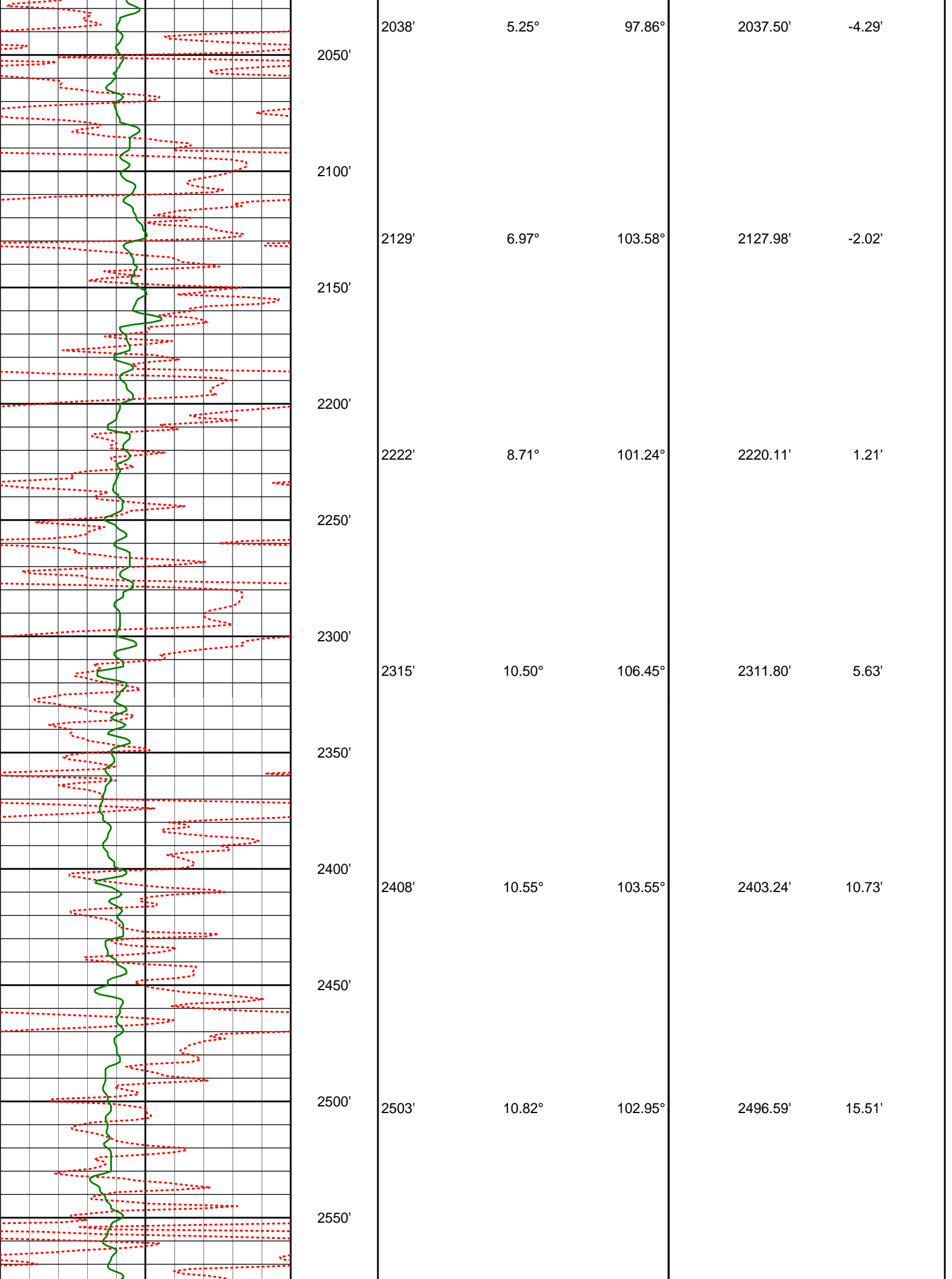
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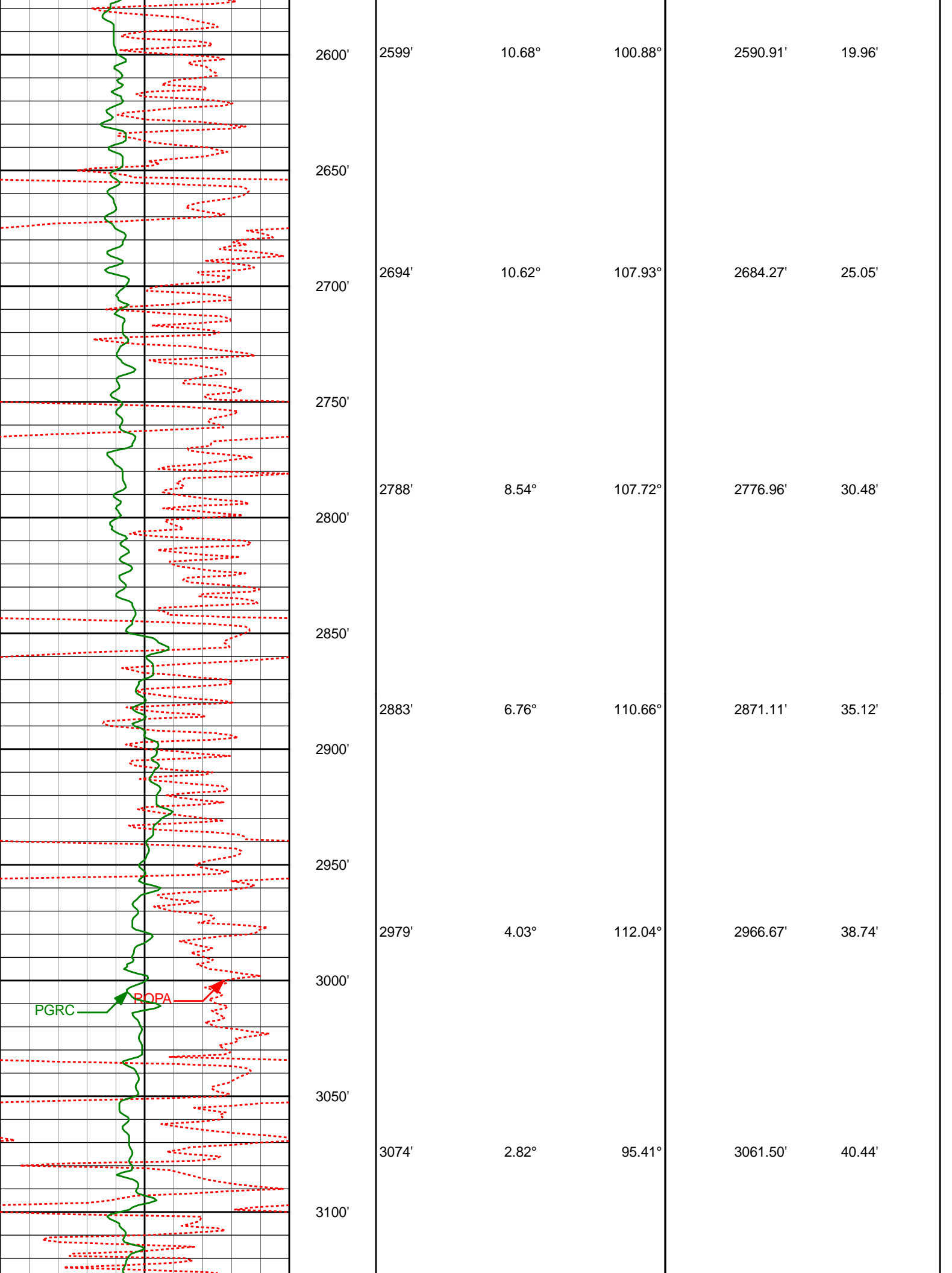
MD Main Log 1:600

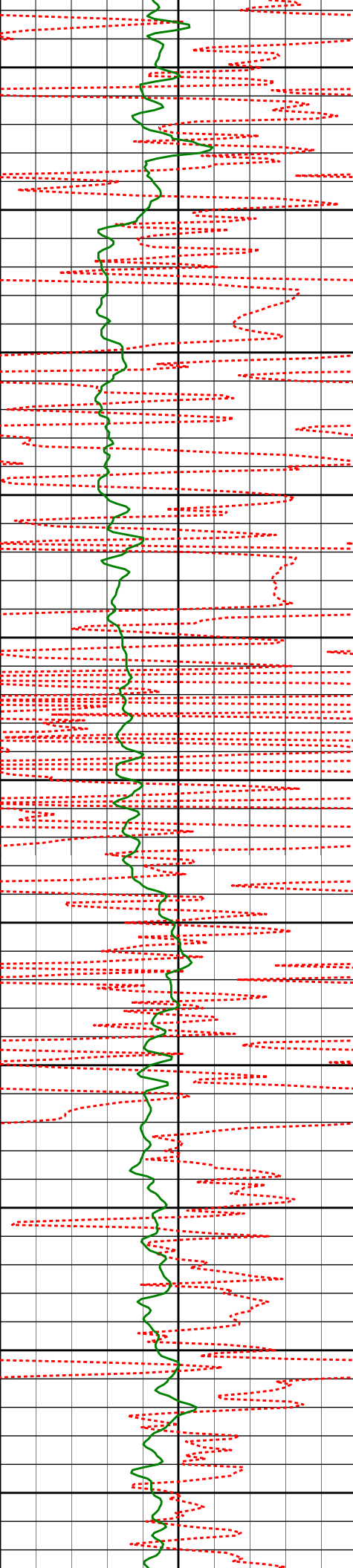




1482'	0.13°	204.08°	1481.92'	-6.72'
1500'				
1550'				
1575'	0.31°	168.54°	1574.92'	-6.37'
1600'				
1650'				
1668'	0.24°	163.92°	1667.92'	-5.93'
1700'				
1750'				
1759'	0.13°	121.47°	1758.92'	-5.69'
1800'				
1850'	1.57°	80.29°	1851.90'	-5.79'
1900'				
1945'	3.82°	95.80°	1944.79'	-5.50'
2000'				







3150'

3169'

2.84°

96.42°

3156.39'

41.13'

3200'

3250'

3264'

1.94°

64.40°

3251.31'

40.86'

3300'

3350'

3359'

1.17°

67.96°

3346.27'

39.91'

3400'

3450'

3454'

0.93°

74.85°

3441.26'

39.41'

3500'

3550'

3549'

0.74°

92.43°

3536.25'

39.30'

3600'

3650'

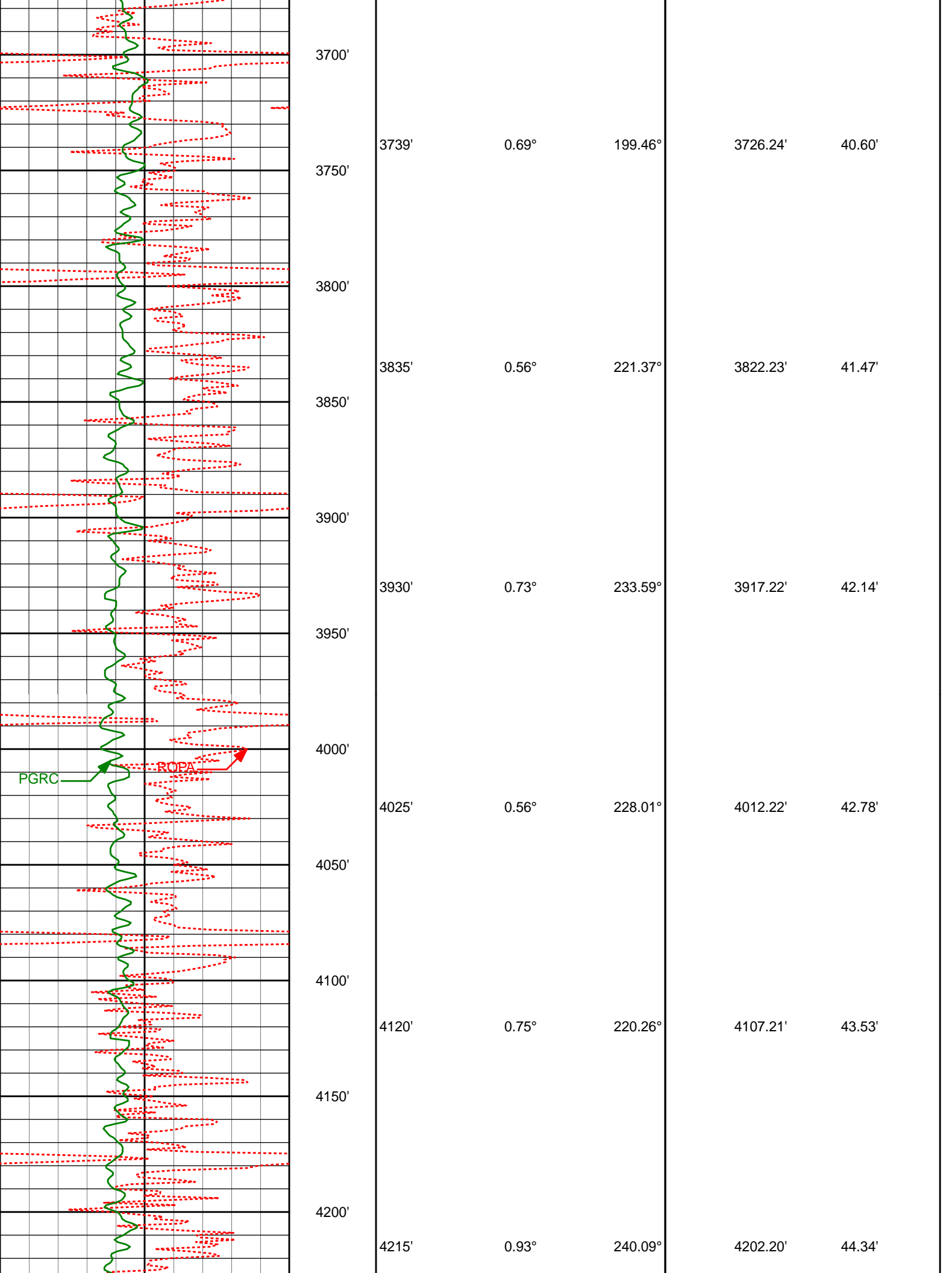
3644'

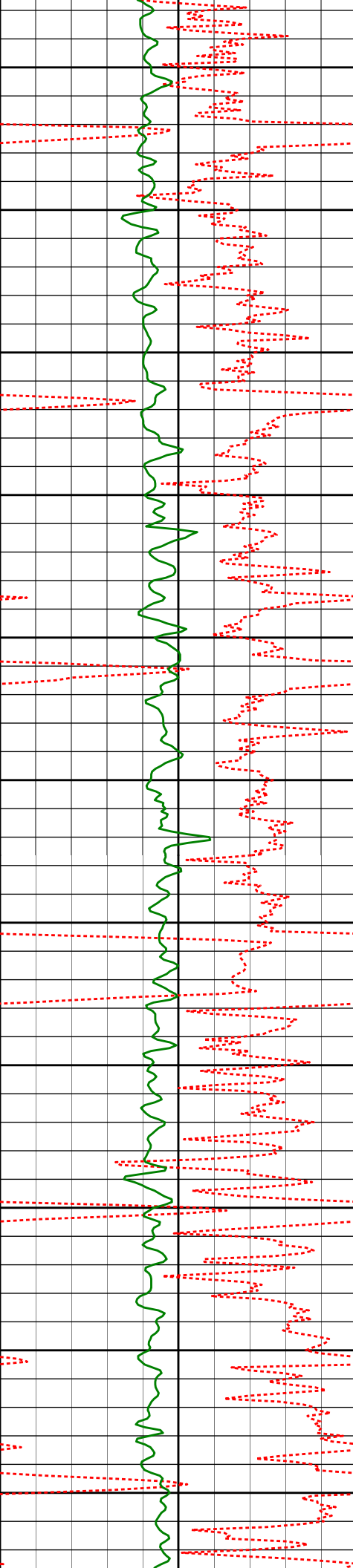
0.52°

144.09°

3631.24'

39.71'





4250'

4300'

4350'

4400'

4450'

4500'

4550'

4600'

4650'

4700'

4750'

4310'

1.62°

178.94°

4297.18'

46.03'

4405'

2.75°

165.40°

4392.11'

49.60'

4500'

2.37°

151.48°

4487.02'

53.60'

4595'

0.22°

15.40°

4581.99'

55.18'

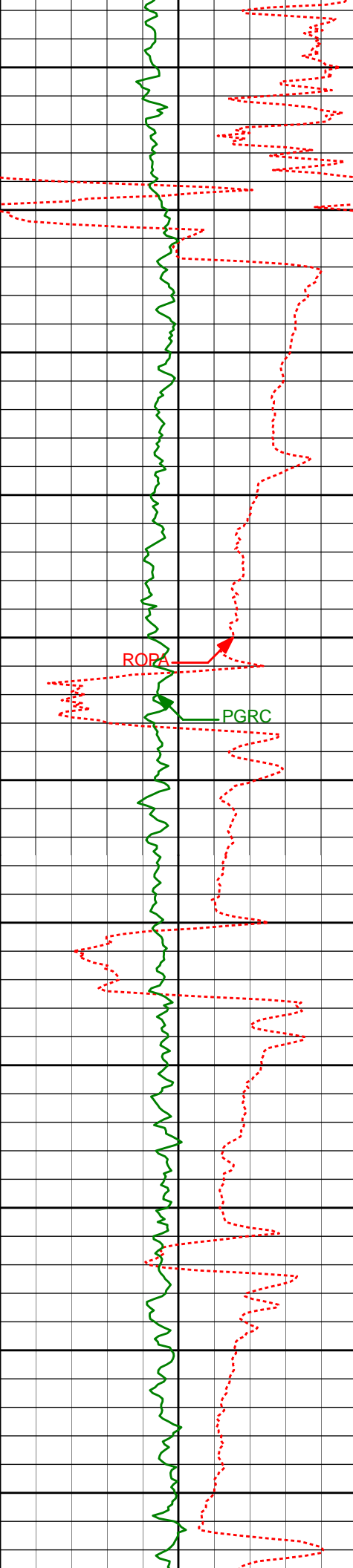
4690'

0.40°

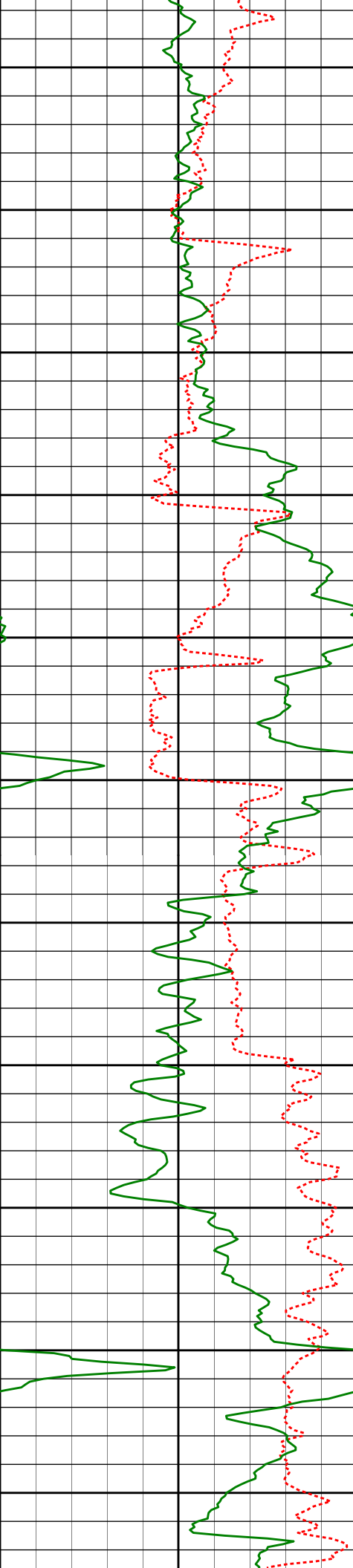
56.33°

4676.99'

54.83'



4786'	0.28°	98.43°	4772.99'	54.70'
4800'				
4850'				
4881'	1.52°	157.10°	4867.98'	55.93'
4900'				
4950'				
4976'	11.68°	181.79°	4962.23'	66.73'
5000'				
5071'	16.73°	183.69°	5054.30'	89.94'
5100'				
5166'	21.25°	180.87°	5144.10'	120.74'
5200'				
5261'	28.84°	176.83°	5230.11'	160.90'
5300'				

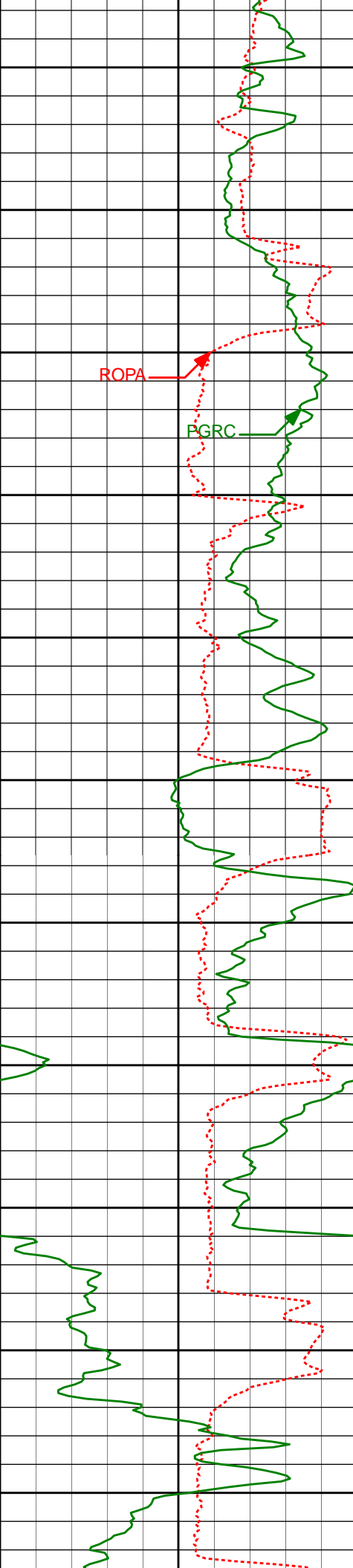


5350'	5356'	38.93°	181.10°	5308.89'	213.74'
5400'					
5450'	5451'	54.15°	182.21°	5374.04'	282.31'
5500'					
5550'	5546'	70.50°	184.12°	5418.02'	365.74'
5600'					
5650'	5641'	73.12°	184.25°	5447.67'	455.37'
5700'					
5750'	5736'	75.52°	182.92°	5473.35'	546.32'
5800'	5811'	81.06°	181.54°	5488.56'	619.48'
5850'					



Casing Shoe @ 5861'

Run200



5900'

5950'

6000'

6050'

6100'

6150'

6200'

6250'

6300'

6350'

6400'

ROPA

PGRC

6004'

89.82°

180.92°

5503.90'

811.27'

6097'

88.00°

180.14°

5505.67'

904.13'

6190'

89.91°

179.67°

5507.38'

997.02'

6281'

89.54°

179.39°

5507.82'

1087.97'

6374'

89.48°

178.80°

5508.62'

1180.93'



6450'

6467'

90.99°

178.41°

5508.24'

1273.91'

6500'

6550'

6560'

92.84°

178.45°

5505.14'

1366.84'

6600'

6650'

6651'

92.47°

178.40°

5500.93'

1457.73'

6700'

6750'

6744'

91.82°

178.10°

5497.45'

1550.66'

6800'

6850'

6837'

91.42°

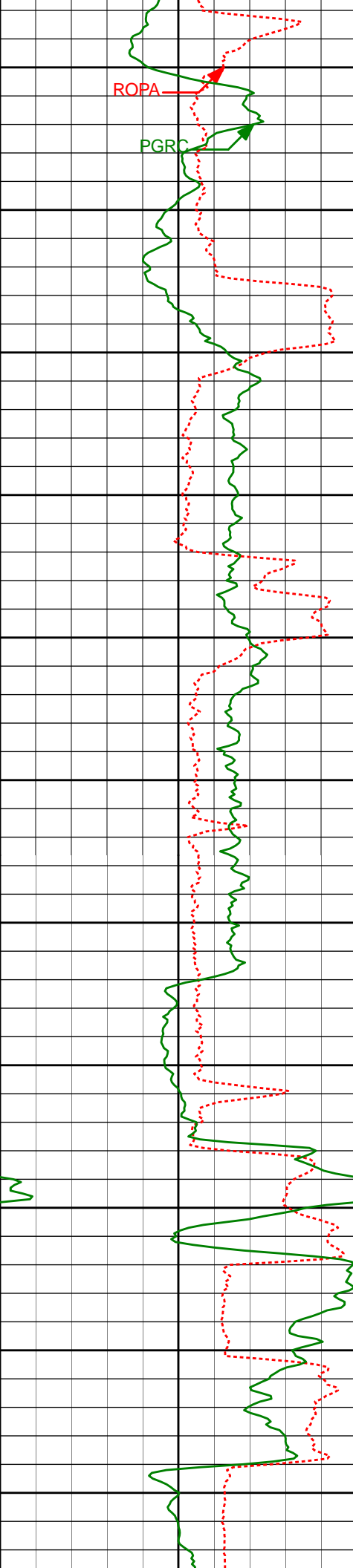
177.72°

5494.82'

1643.62'

6900'

6950'



7000'

7050'

7100'

7150'

7200'

7250'

7300'

7350'

7400'

7450'

7500'

7025'

91.85°

176.67°

5489.47'

1831.54'

7119'

91.51°

179.10°

5486.71'

1925.49'

7214'

89.85°

180.98°

5485.59'

2020.38'

7309'

92.87°

187.20°

5483.34'

2114.67'

7404'

92.25°

185.44°

5479.09'

2208.46'

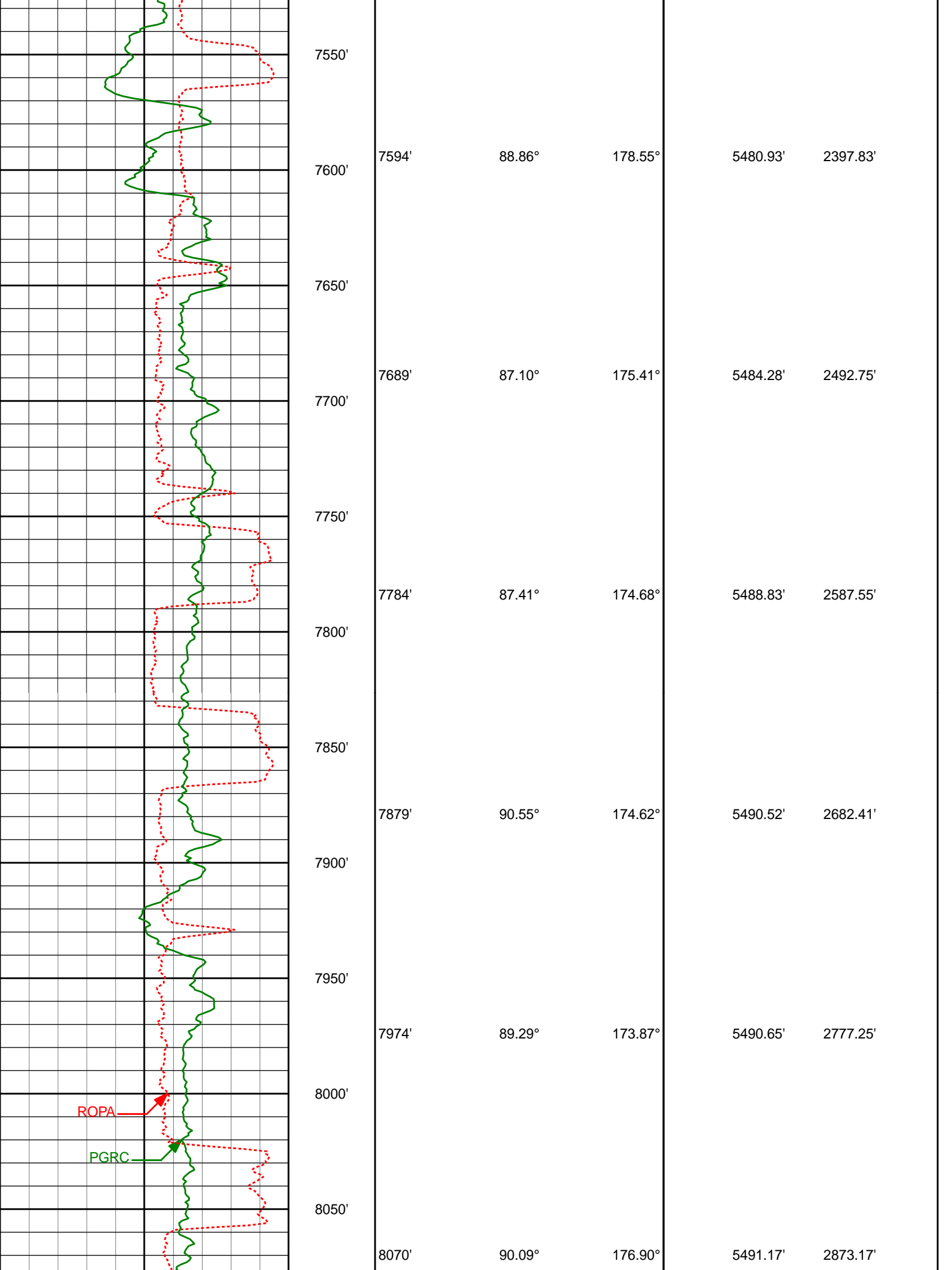
7499'

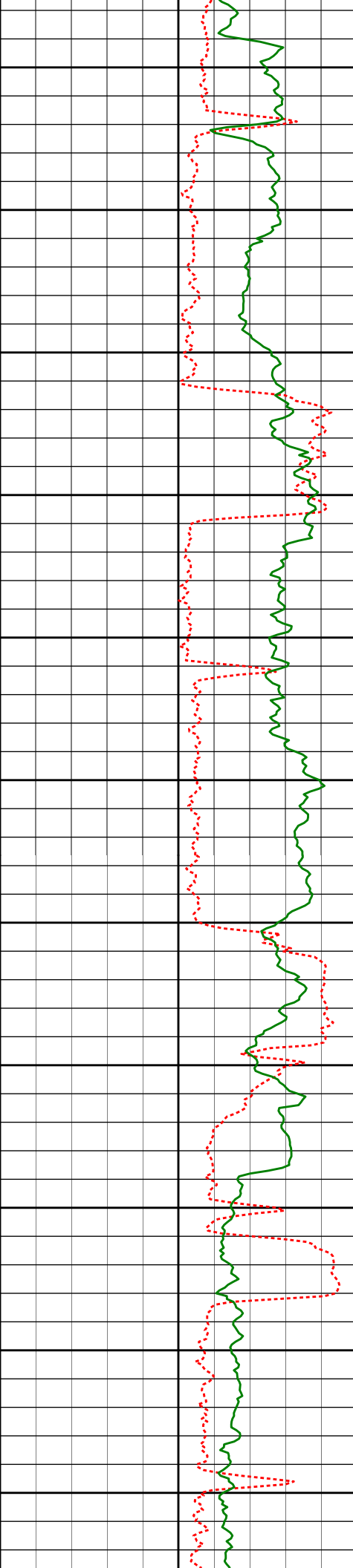
88.33°

181.02°

5478.61'

2302.94'





8100'

8150'

8200'

8250'

8300'

8350'

8400'

8450'

8500'

8550'

8600'

8165'

88.89°

176.51°

5492.01'

2968.15'

8260'

91.51°

181.09°

5491.68'

3063.10'

8355'

89.41°

178.58°

5490.91'

3158.00'

8450'

93.30°

181.16°

5488.66'

3252.87'

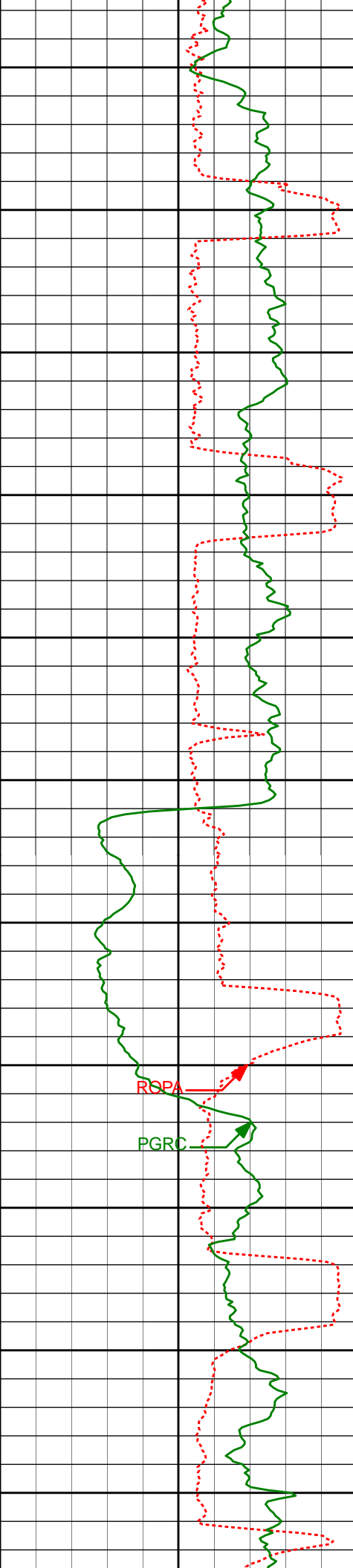
8545'

90.99°

180.65°

5485.11'

3347.63'



8650'

8700'

8750'

8800'

8850'

8900'

8950'

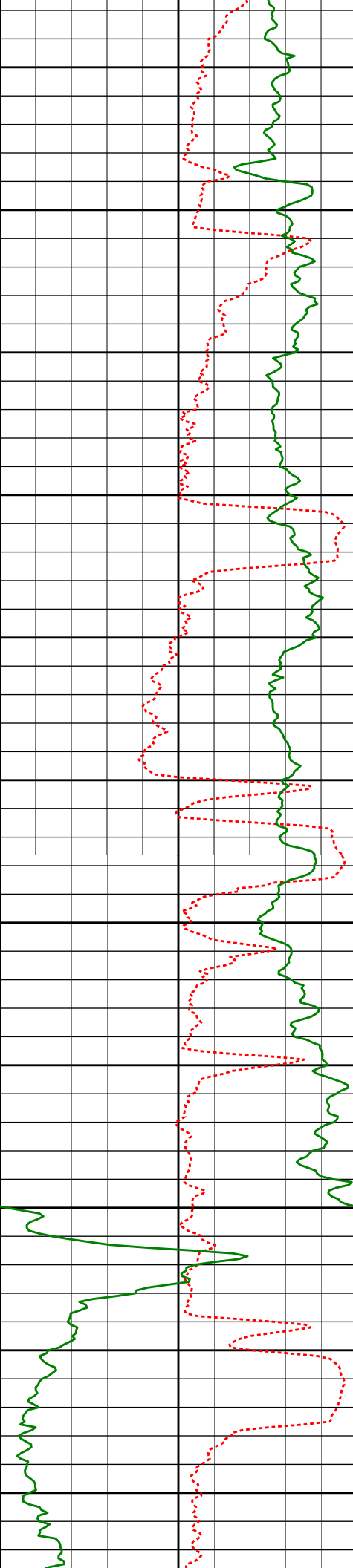
9000'

9050'

9100'

9150'

8640'	89.82°	179.94°	5484.44'	3442.52'
8736'	89.94°	178.61°	5484.65'	3538.47'
8830'	92.34°	179.76°	5482.78'	3632.40'
8925'	90.12°	177.94°	5480.73'	3727.34'
9020'	89.72°	177.50°	5480.86'	3822.34'
9115'	91.70°	179.21°	5479.69'	3917.32'



9200'

9250'

9300'

9350'

9400'

9450'

9500'

9550'

9600'

9650'

9700'

9210'

89.72°

178.04°

5478.51'

4012.29'

9305'

91.54°

179.19°

5477.46'

4107.26'

9400'

91.23°

179.97°

5475.16'

4202.17'

9495'

88.52°

179.25°

5475.37'

4297.09'

9590'

87.16°

178.54°

5478.94'

4392.00'

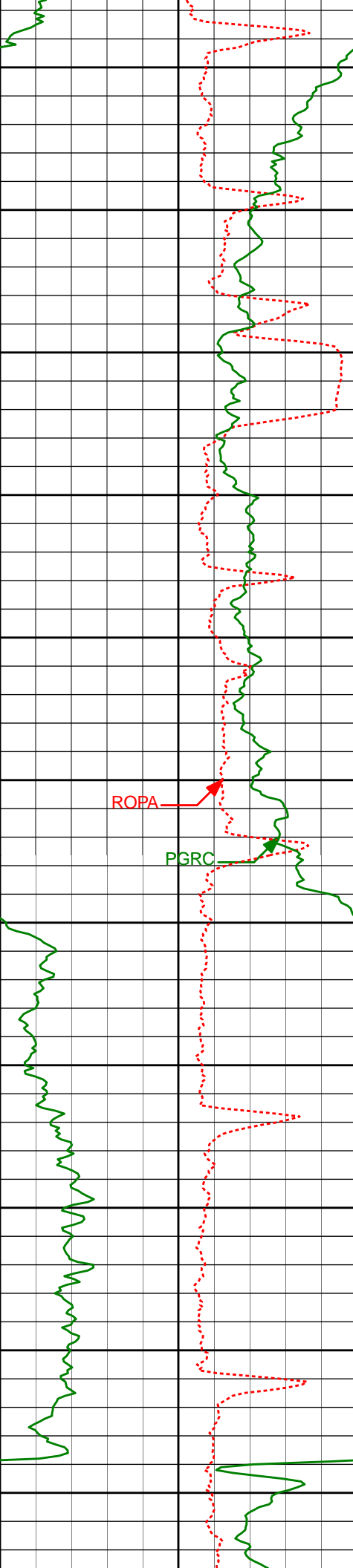
9685'

88.64°

179.64°

5482.42'

4486.89'



9750'

9781'

87.66°

179.12°

5485.52'

4582.79'

9800'

9850'

9875'

90.37°

179.94°

5487.14'

4676.71'

9900'

9950'

9970'

90.77°

179.23°

5486.19'

4771.64'

10000'

ROPA

PGRC

10050'

10065'

90.31°

178.76°

5485.30'

4866.61'

10100'

10150'

10160'

89.60°

178.18°

5485.37'

4961.59'

10200'

10250'

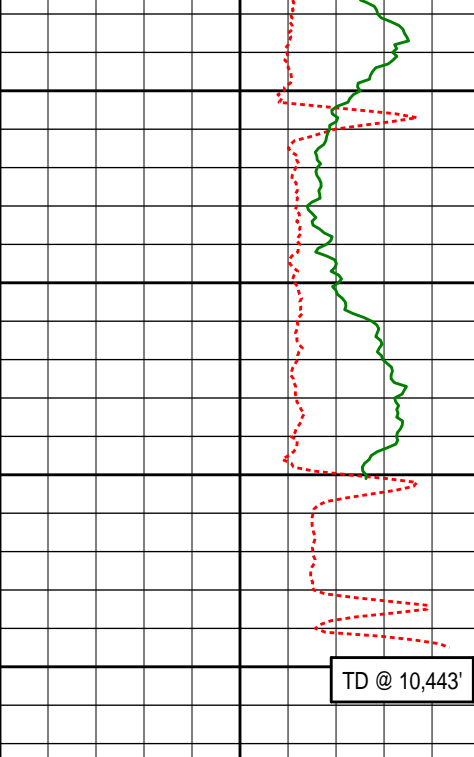
10255'

88.33°

177.14°

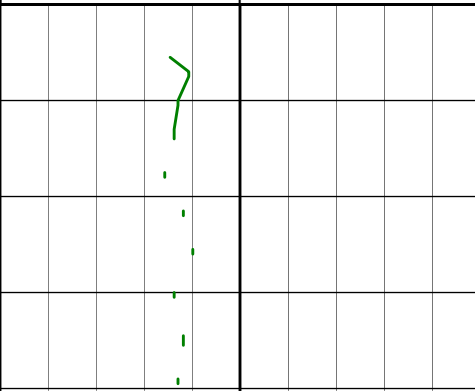
5487.09'

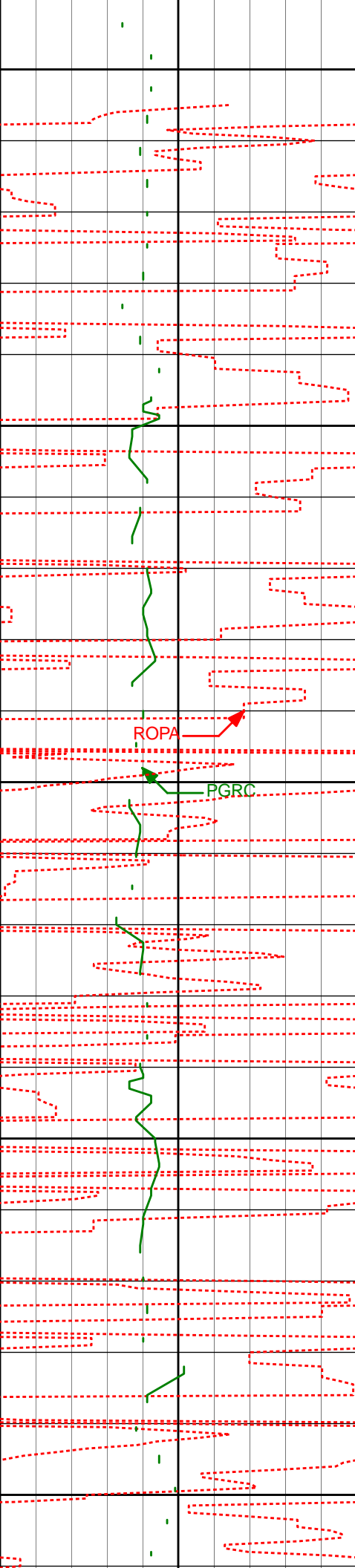
5056.57'

			10300'						
			10350'	10350'	88.98°	177.16°	5489.31'	5151.54'	
			10400'	10392'	88.06°	176.53°	5490.40'	5193.53'	
			10450'	10443'	88.06°	176.53°	5492.12'	5244.49'	
PCG Gamma Ray BCorr PGRC 0 200 api			Measured Depth (ft) 1:600	Depth Inc Azi.		TVD V.S.			
Average Rate of Penetration ROPA 1K 0 feet per hr									

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MD Main Log 1:240

Average Rate of Penetration ROPA 1K 0 feet per hr									
PCG Gamma Ray BCorr PGRC 0 200 api			Measured Depth (ft) 1:240	Depth Inc Azi.		TVD V.S.			
									



1350'

1388'

0.15°

134.64°

1387.92'

-6.91'

1400'

1450'

1482'

0.13°

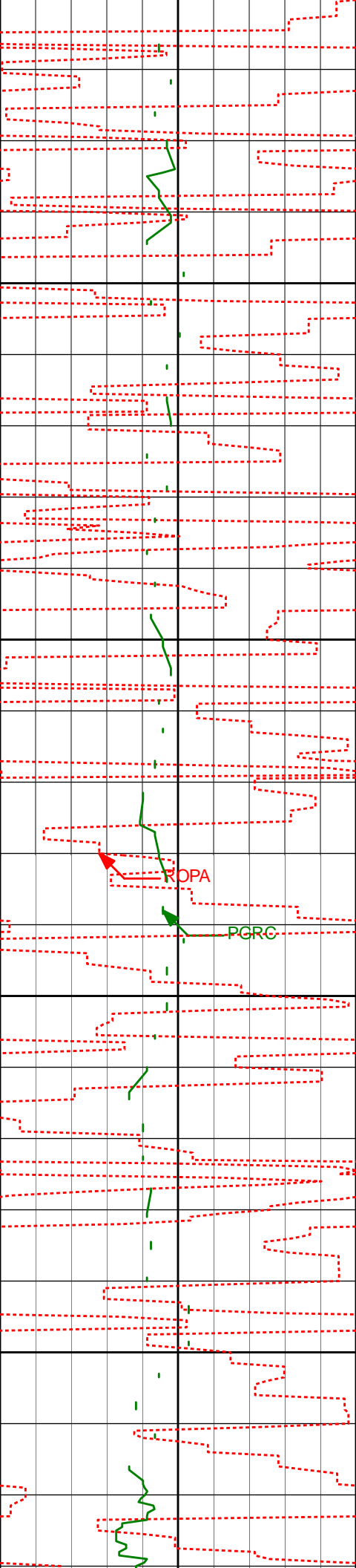
204.08°

1481.92'

-6.72'

1500'

1550'



1600'

1650'

1700'

1750'

1575'

0.31°

168.54°

1574.92'

-6.37'

1668'

0.24°

163.92°

1667.92'

-5.93'

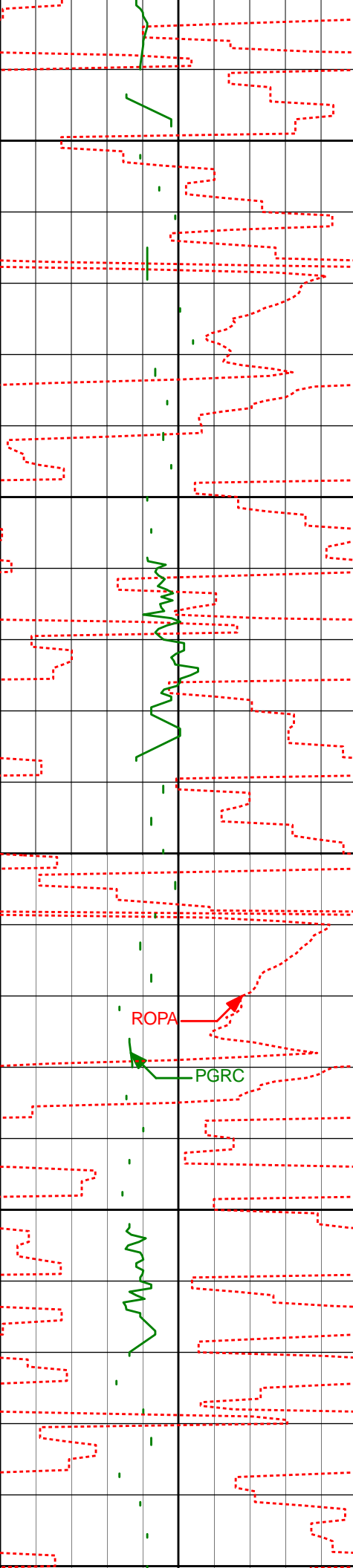
1759'

0.13°

121.47°

1758.92'

-5.69'



1800'

1850'

1900'

1950'

2000'

1852'

1.57°

80.29°

1851.90'

-5.79'

ROP

PGRC

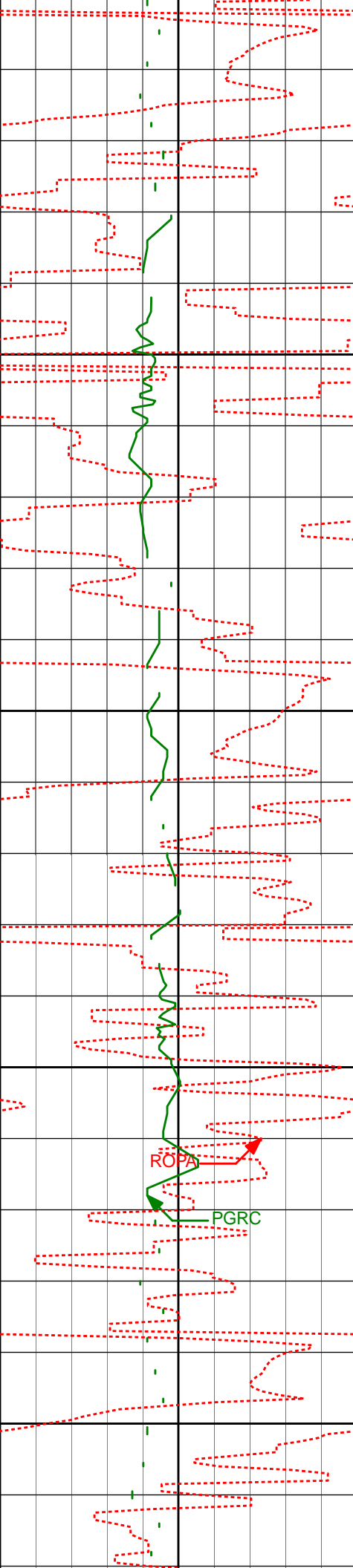
1945'

3.82°

95.80°

1944.79'

-5.50'



2000'

2050'

2100'

2150'

2200'

2038'

5.25°

97.86°

2037.50'

-4.29'

2129'

6.97°

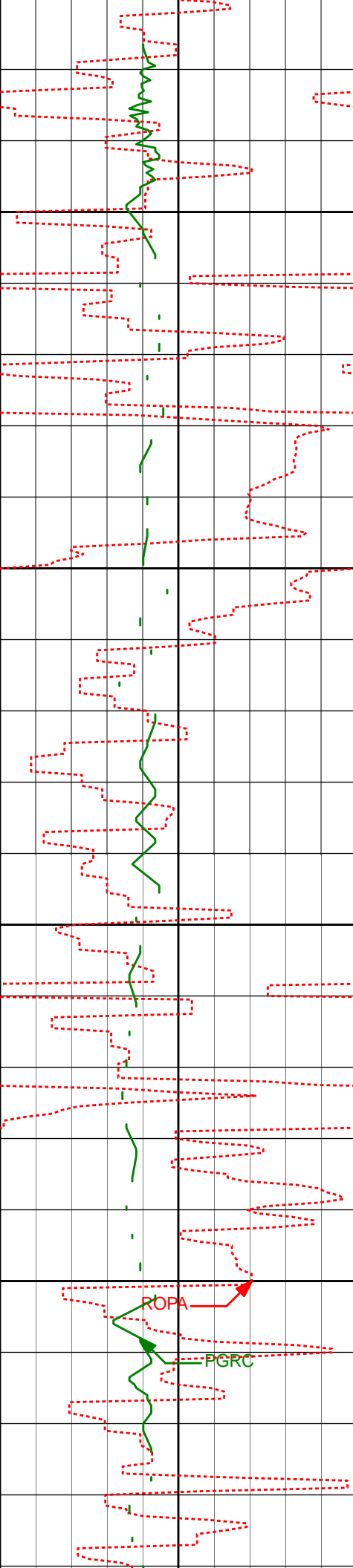
103.58°

2127.98'

-2.02'

ROPA

PGRC



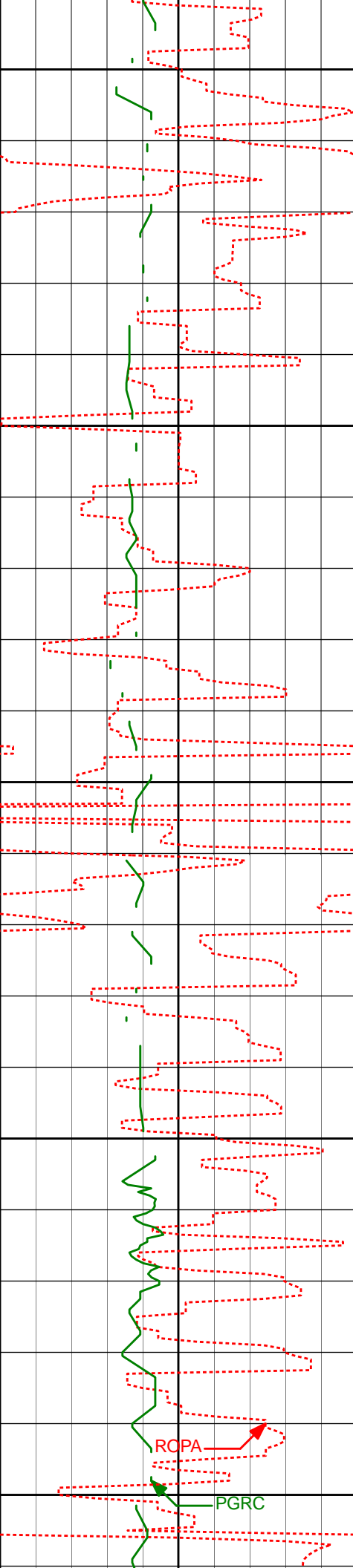
2250'

2300'

2350'

2400'

2222'	8.71°	101.24°	2220.11'	1.21'
2315'	10.50°	106.45°	2311.80'	5.63'
2408'	10.55°	103.55°	2403.24'	10.73'



2450'

2500'

2550'

2600'

2650'

2503'

10.82°

102.95°

2496.59'

15.51'

2599'

10.68°

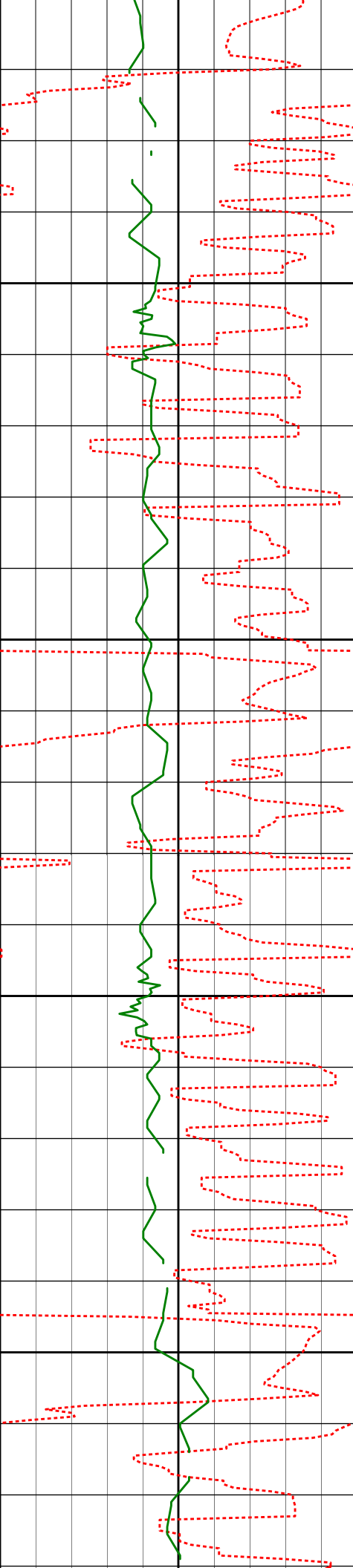
100.88°

2590.91'

19.96'

RCPA

PGRC



2700'

2750'

2800'

2850'

2694'

10.62°

107.93°

2684.27'

25.05'

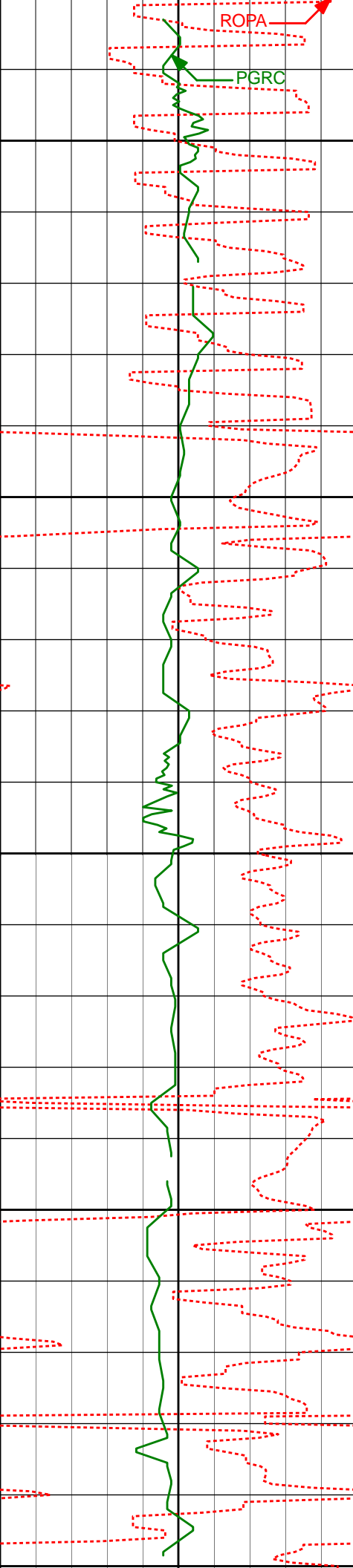
2788'

8.54°

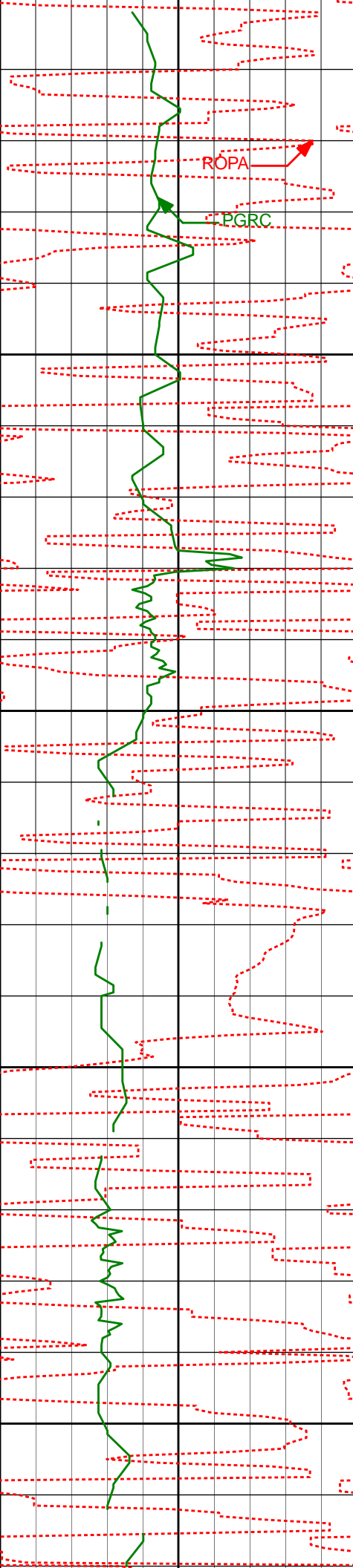
107.72°

2776.96'

30.48'



2883'	6.76°	110.66°	2871.11'	35.12'
2900'				
2950'				
2979'	4.03°	112.04°	2966.67'	38.74'
3000'				
3050'				
3074'	2.82°	95.41°	3061.50'	40.44'
3100'				



3100'

ROPA

PGRC

3150'

3169'

2.84°

96.42°

3156.39'

41.13'

3200'

3250'

3264'

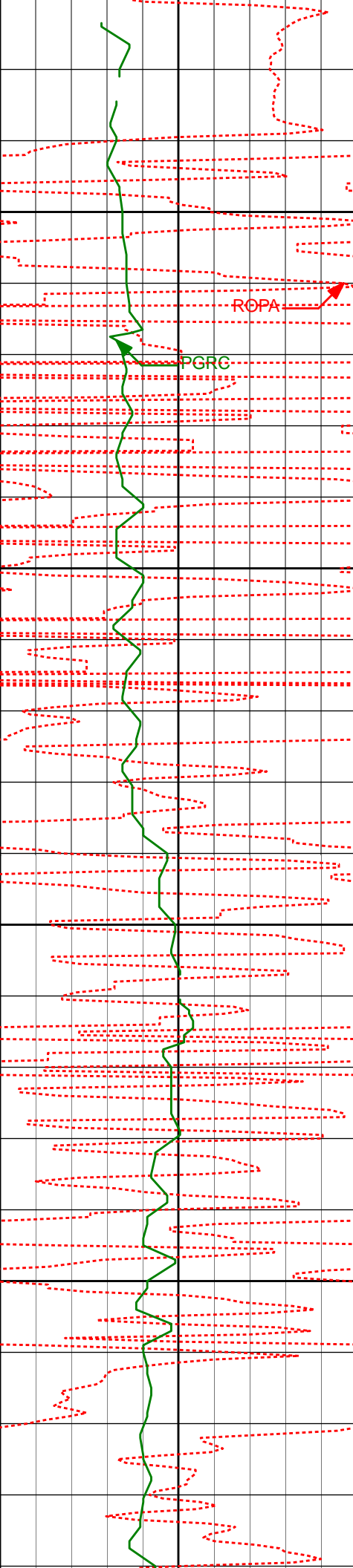
1.94°

64.40°

3251.31'

40.86'

3300'



3350'

3359'

1.17°

67.96°

3346.27'

39.91'

ROPA

PGRC

3400'

3450'

3454'

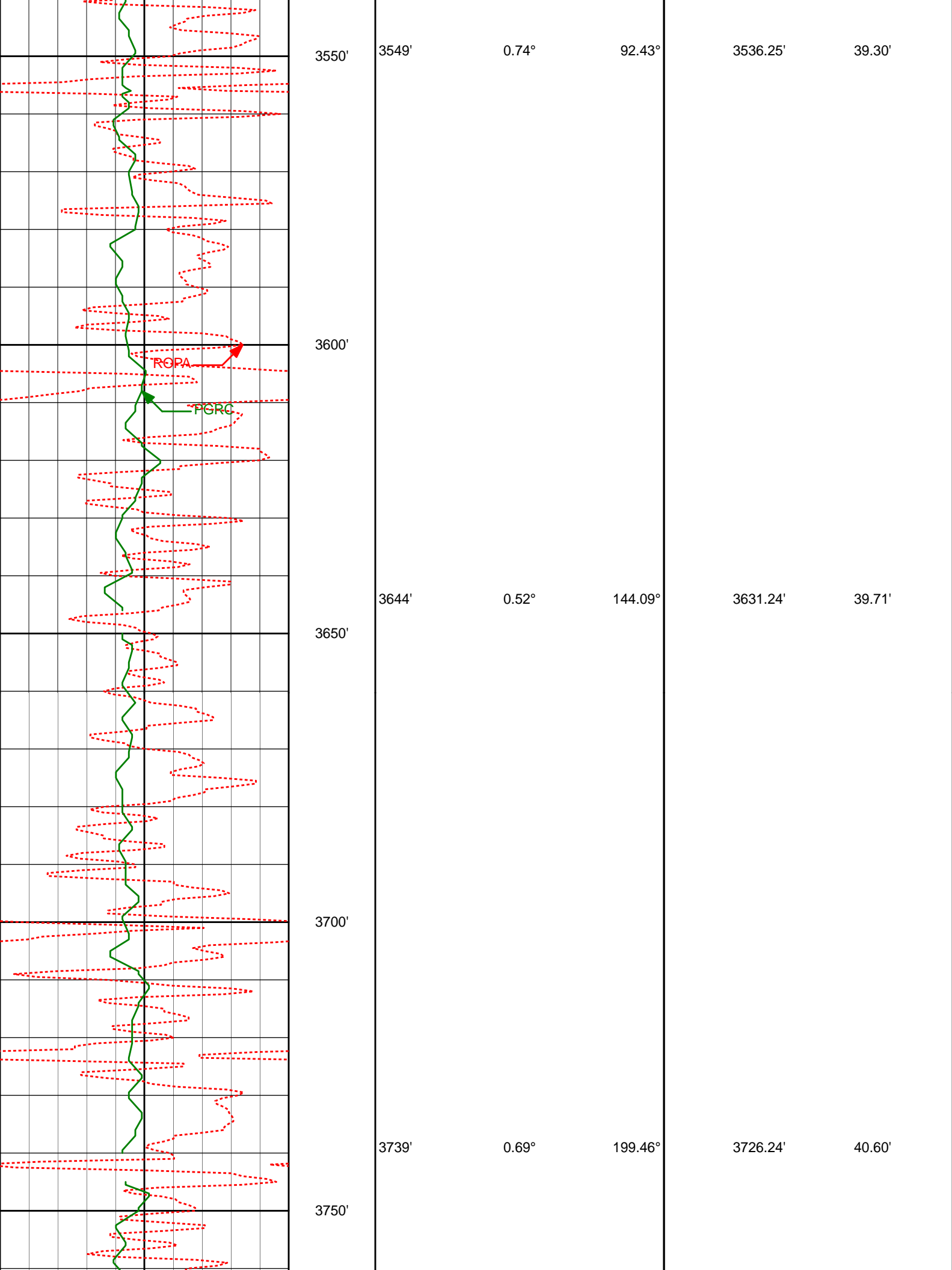
0.93°

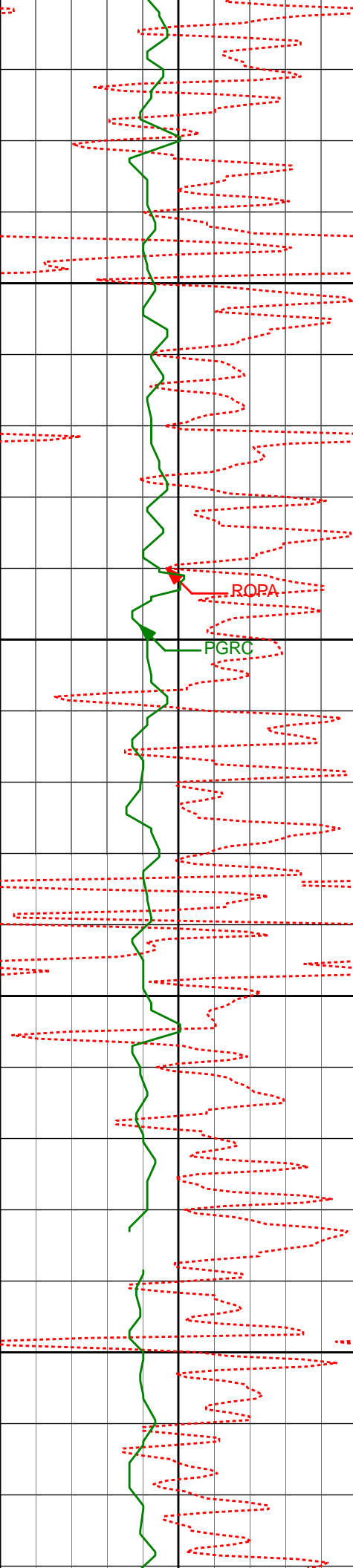
74.85°

3441.26'

39.41'

3500'





3800'

3835'

0.56°

221.37°

3822.23'

41.47'

3850'

ROPA

PGRC

3900'

3930'

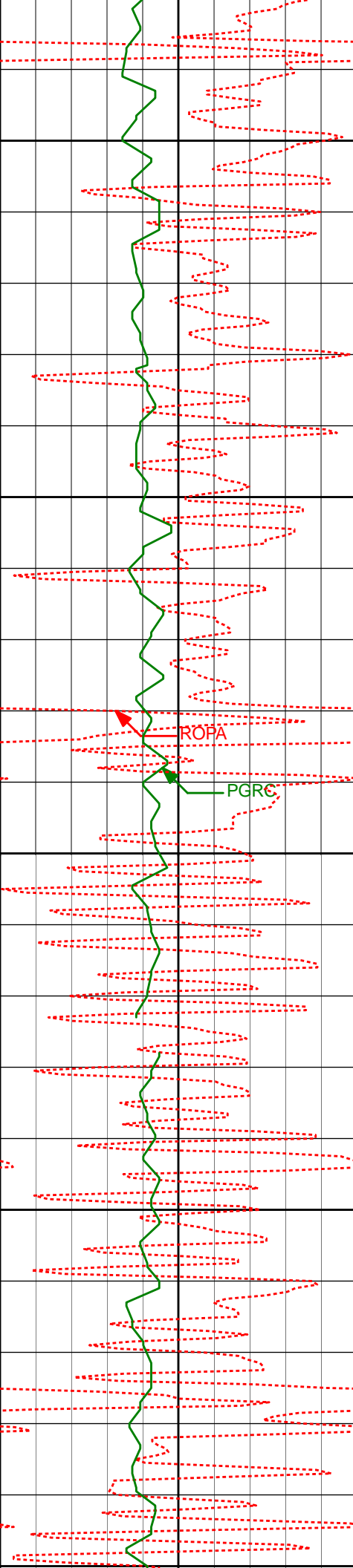
0.73°

233.59°

3917.22'

42.14'

3950'



4000'

4025'

0.56°

228.01°

4012.22'

42.78'

4050'

4100'

4120'

0.75°

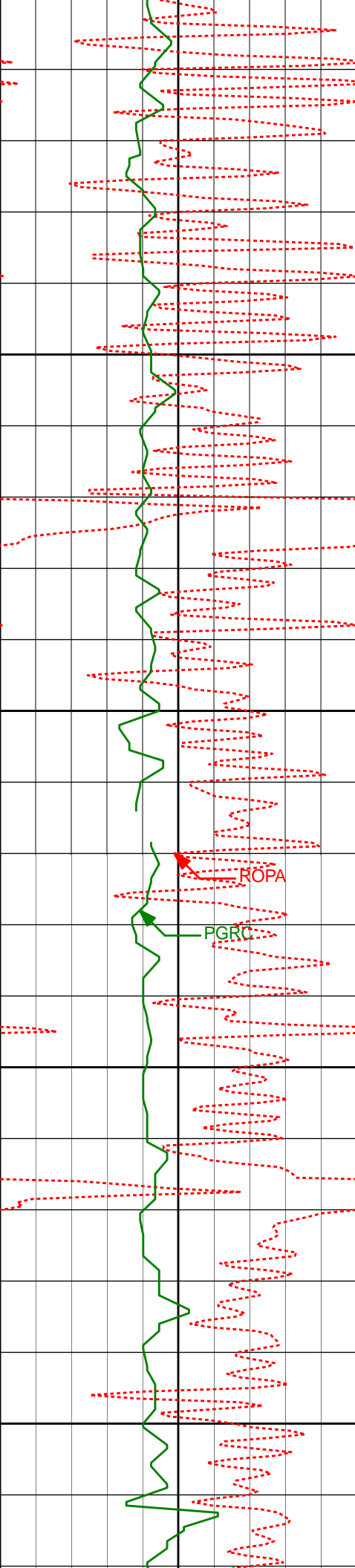
220.26°

4107.21'

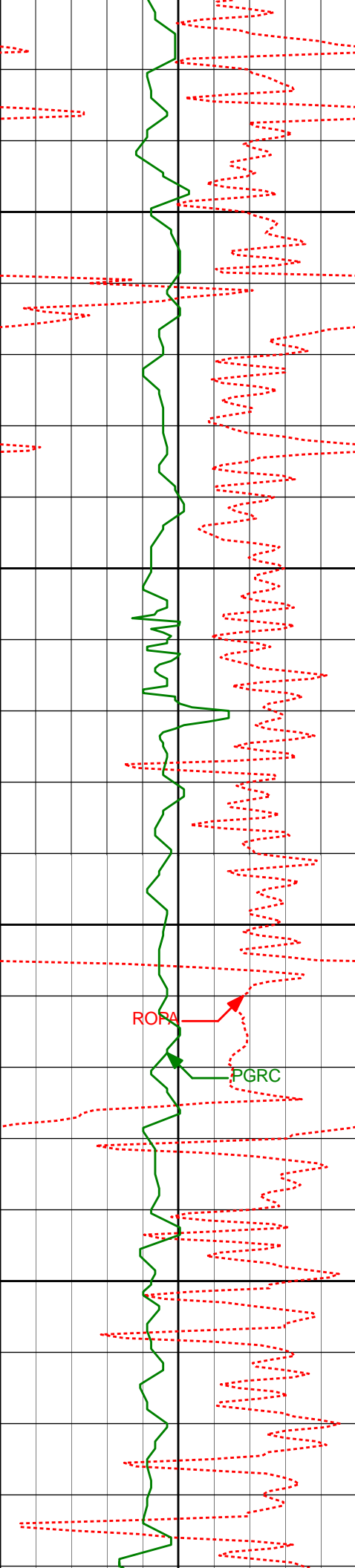
43.53'

4150'

4200'



4215'	0.93°	240.09°	4202.20'	44.34'
4250'				
4300'				
4310'	1.62°	178.94°	4297.18'	46.03'
4350'				
4400'				
4405'	2.75°	165.40°	4392.11'	49.60'



4450'

4500'

4550'

4600'

ROPA

PGRC

4500'

2.37°

151.48°

4487.02'

53.60'

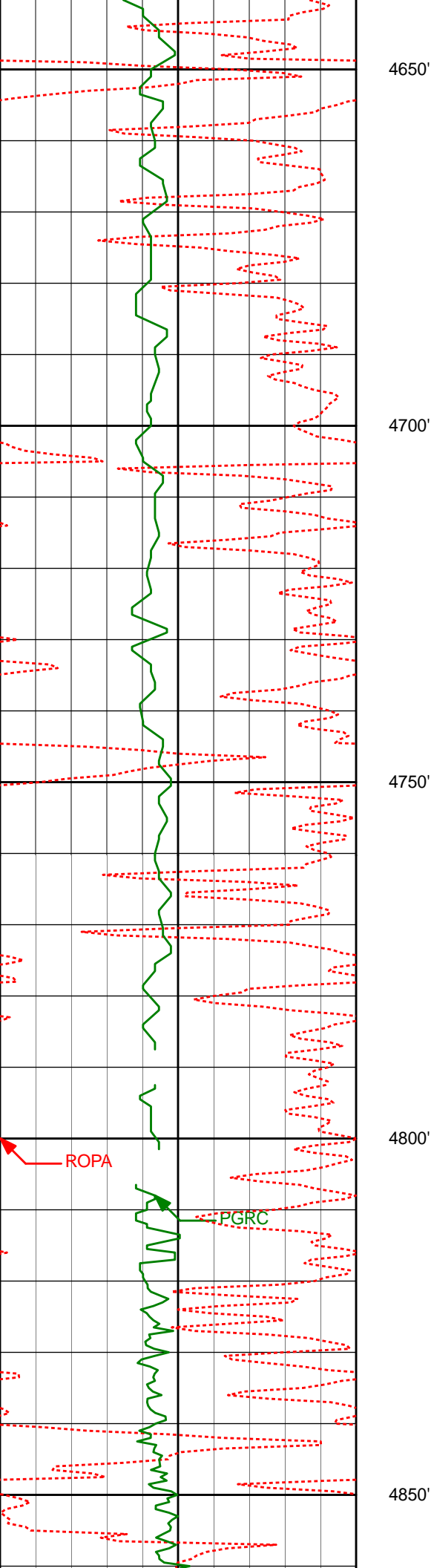
4595'

0.22°

15.40°

4581.99'

55.18'



4650'

4690'

0.40°

56.33°

4676.99'

54.83'

4700'

4750'

4786'

0.28°

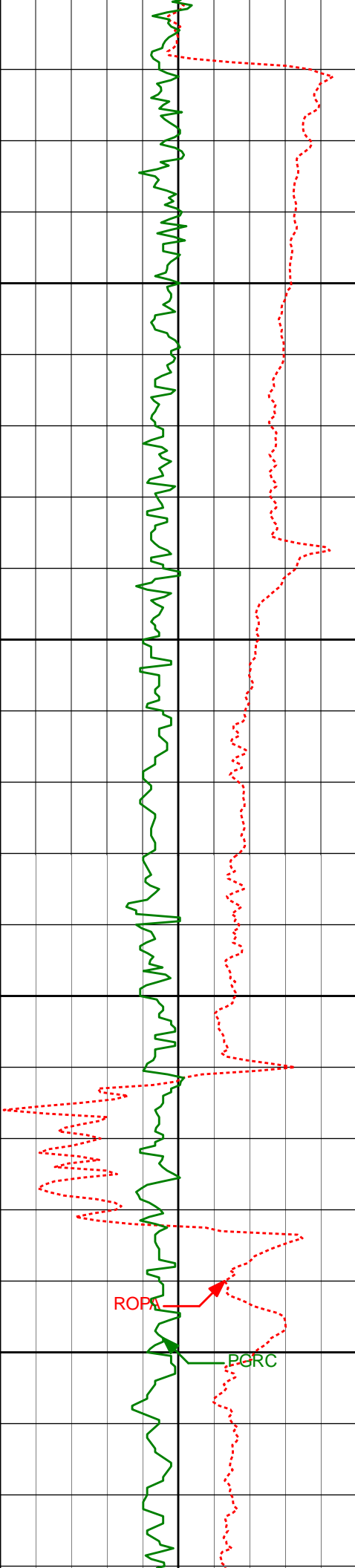
98.43°

4772.99'

54.70'

4800'

4850'



4900'

4950'

5000'

5050'

4881'

1.52°

157.10°

4867.98'

55.93'

4976'

11.68°

181.79°

4962.23'

66.73'

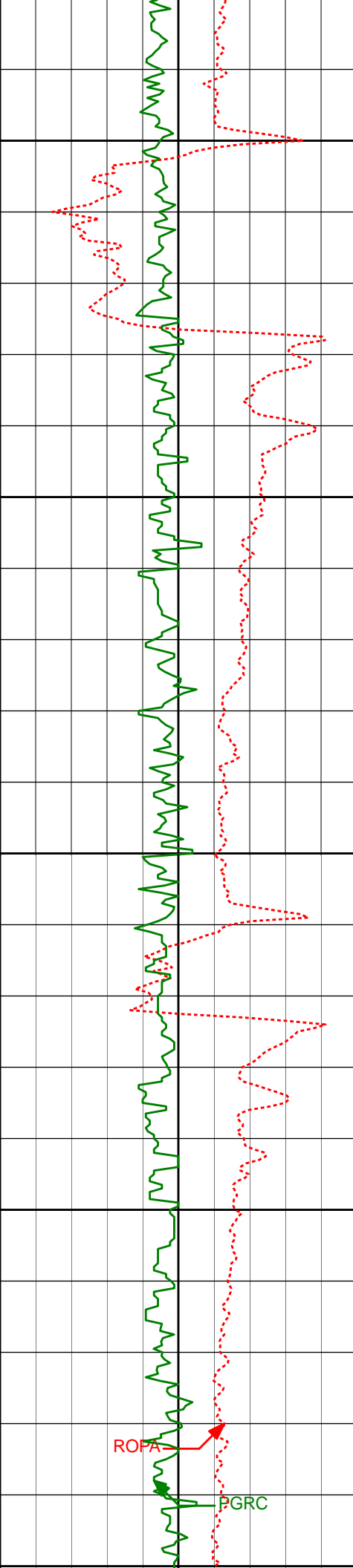
5071'

16.73°

183.69°

5054.30'

89.94'



5100'

5150'

5200'

5250'

5300'

5166'

21.25°

180.87°

5144.10'

120.74'

5261'

28.84°

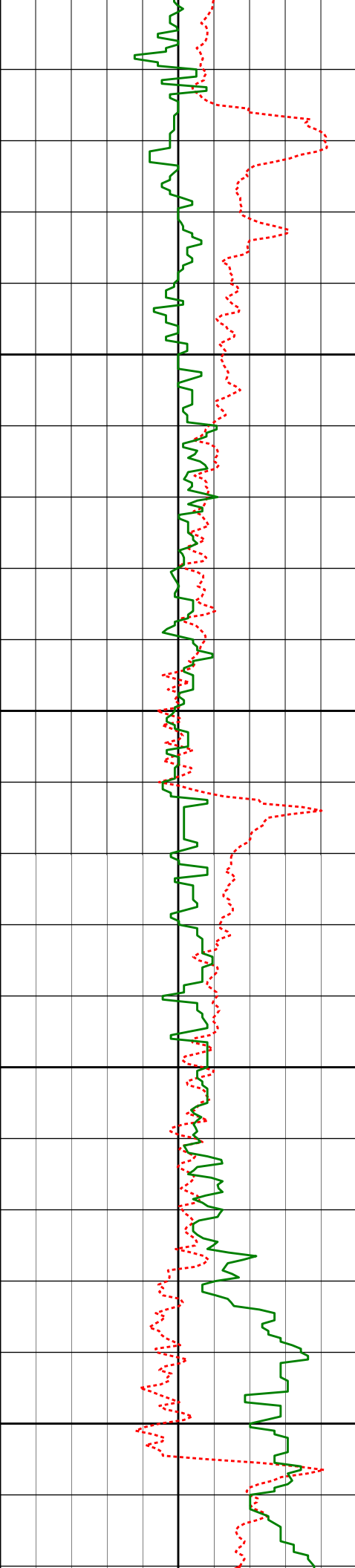
176.83°

5230.11'

160.90'

ROPA

PGRC



5350'

5356'

38.93°

181.10°

5308.89'

213.74'

5400'

5450'

5451'

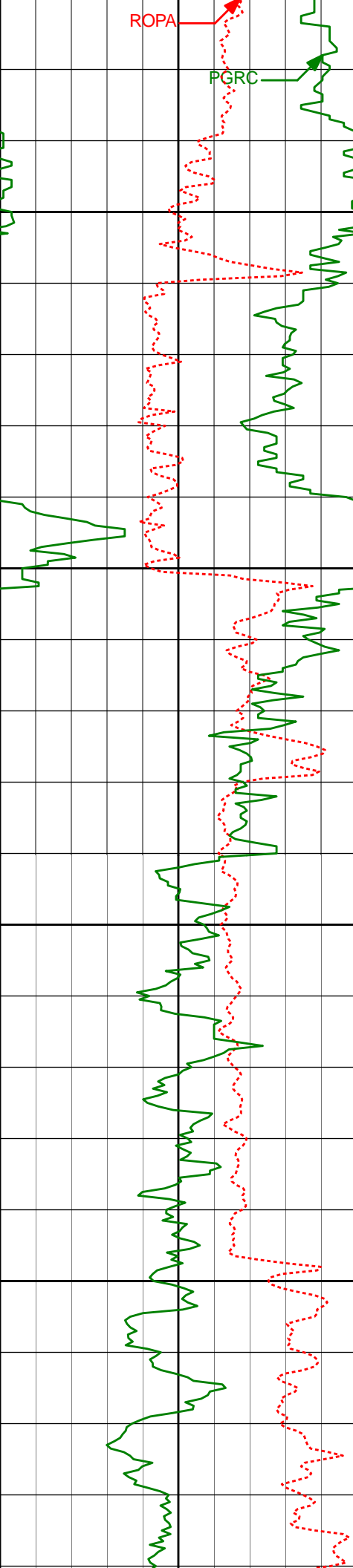
54.15°

182.21°

5374.04'

282.31'

5500'



5550'

5600'

5650'

5700'

5546'

5641'

5736'

70.50°

73.12°

75.52°

184.12°

184.25°

182.92°

5418.02'

5447.67'

5473.35'

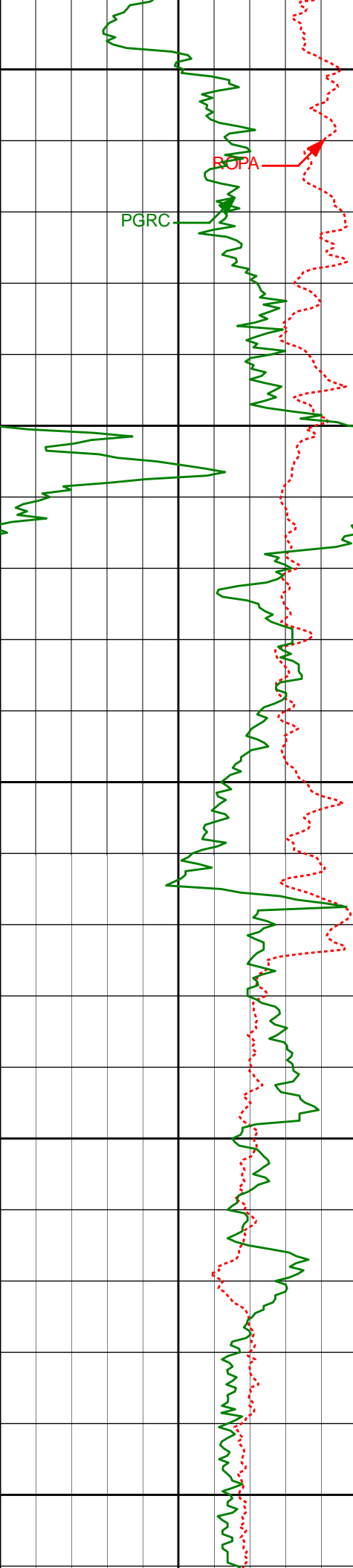
365.74'

455.37'

546.32'

ROPA

PGRC



5750'

ROPA

PGRC

5800'

5811'

81.06°

181.54°

5488.56'

619.48'

5850'

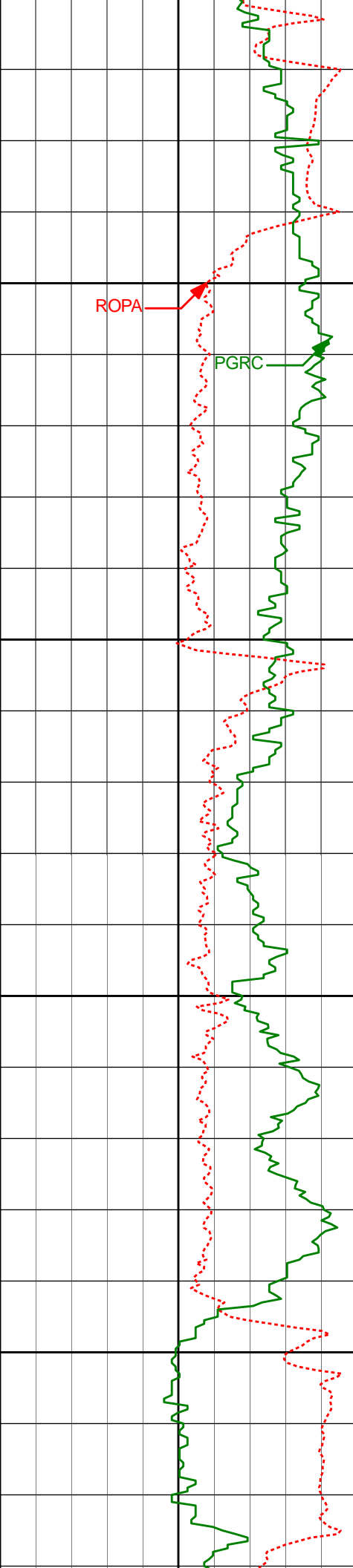


Casing Shoe @ 5861'

Run200

5900'

5950'



6000'

6004'

89.82°

180.92°

5503.90'

811.27'

6050'

6100'

6097'

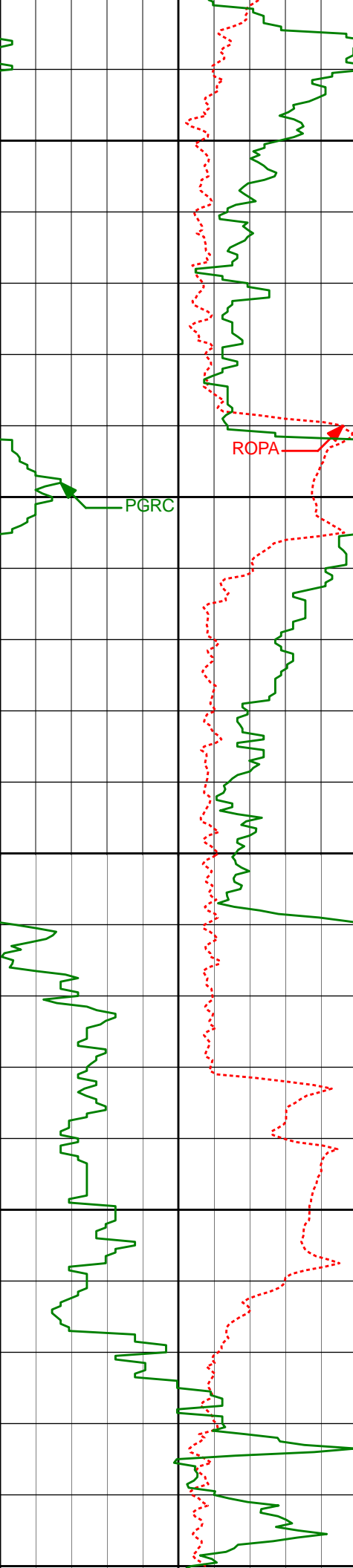
88.00°

180.14°

5505.67'

904.13'

6150'



6200'

6250'

6300'

6350'

6400'

6190'

89.91°

179.67°

5507.38'

997.02'

6281'

89.54°

179.39°

5507.82'

1087.97'

6374'

89.48°

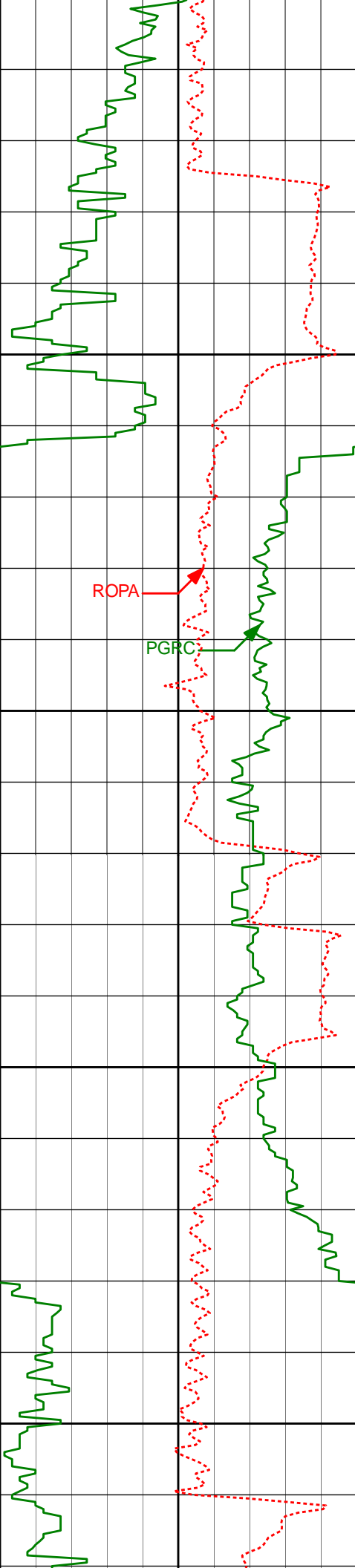
178.80°

5508.62'

1180.93'

ROPA

PGRC



6450'

6467'

90.99°

178.41°

5508.24'

1273.91'

6500'

6550'

6560'

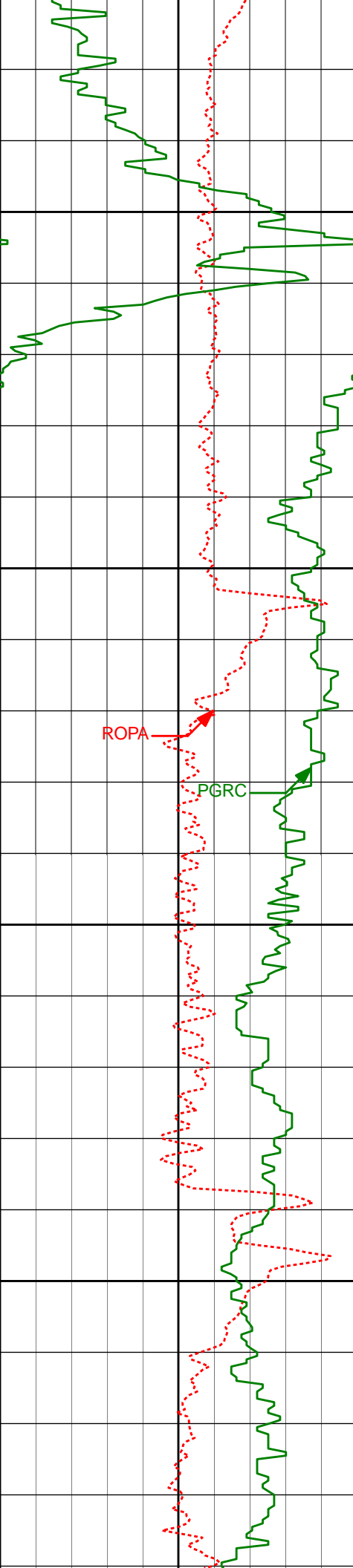
92.84°

178.45°

5505.14'

1366.84'

6600'



6650'

6651'

92.47°

178.40°

5500.93'

1457.73'

6700'

ROPA

PGRC

6750'

6744'

91.82°

178.10°

5497.45'

1550.66'

6800'

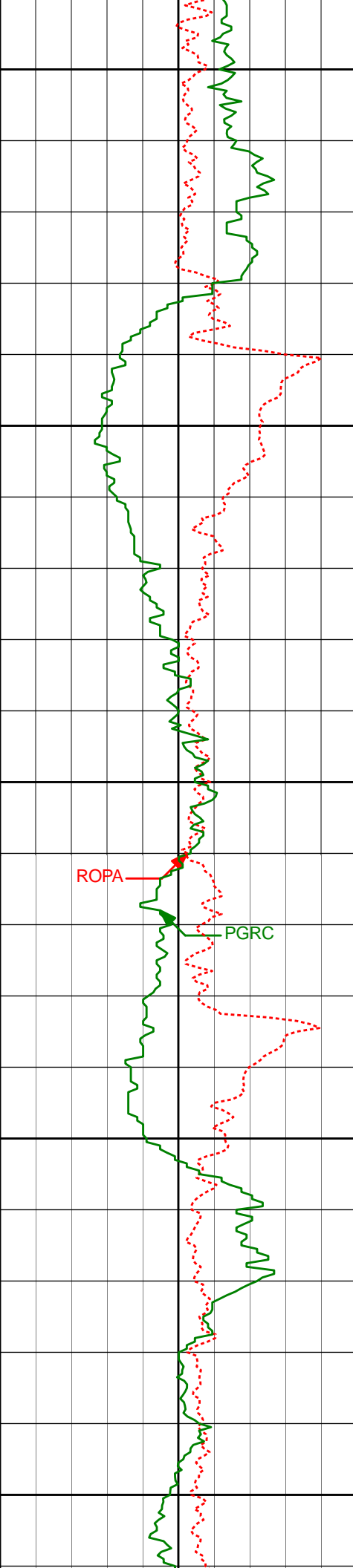
6837'

91.42°

177.72°

5494.82'

1643.62'



6850'

6900'

6950'

7000'

7050'

ROPA

PGRC

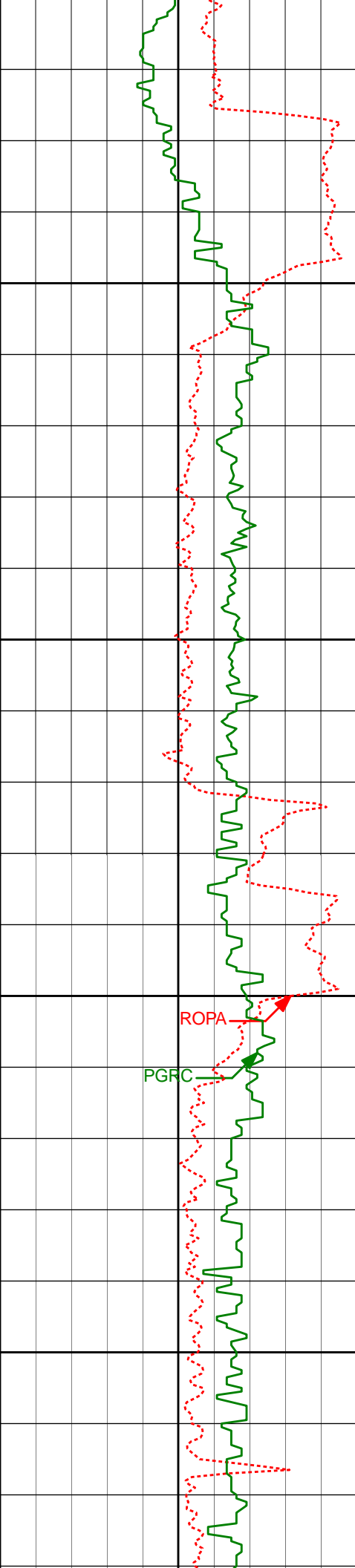
7025'

91.85°

176.67°

5489.47'

1831.54'



7100'

7119'

91.51°

179.10°

5486.71'

1925.49'

7150'

7200'

ROPA

PGRC

7214'

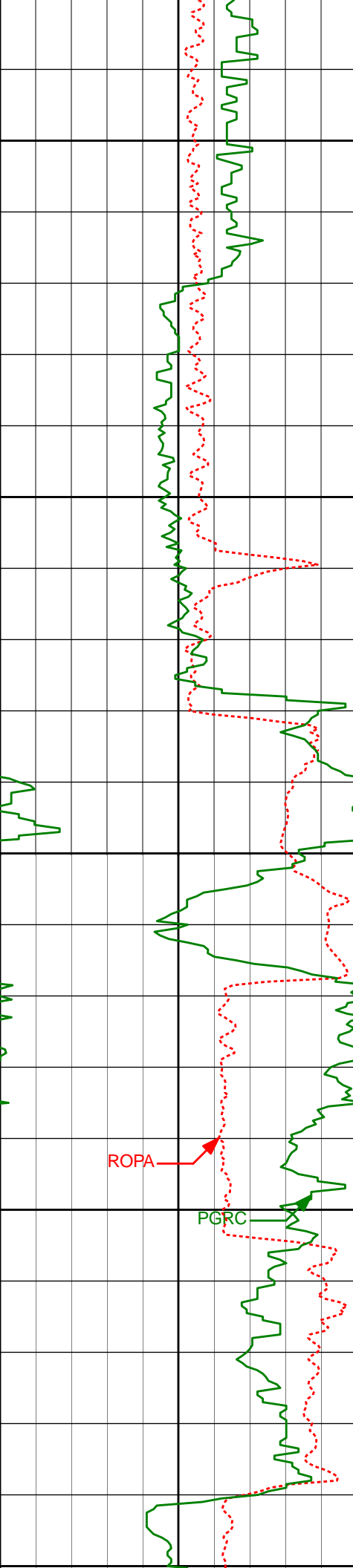
89.85°

180.98°

5485.59'

2020.38'

7250'



7300'

7309'

92.87°

187.20°

5483.34'

2114.67'

7350'

7400'

7404'

92.25°

185.44°

5479.09'

2208.46'

7450'

7500'

7499'

88.33°

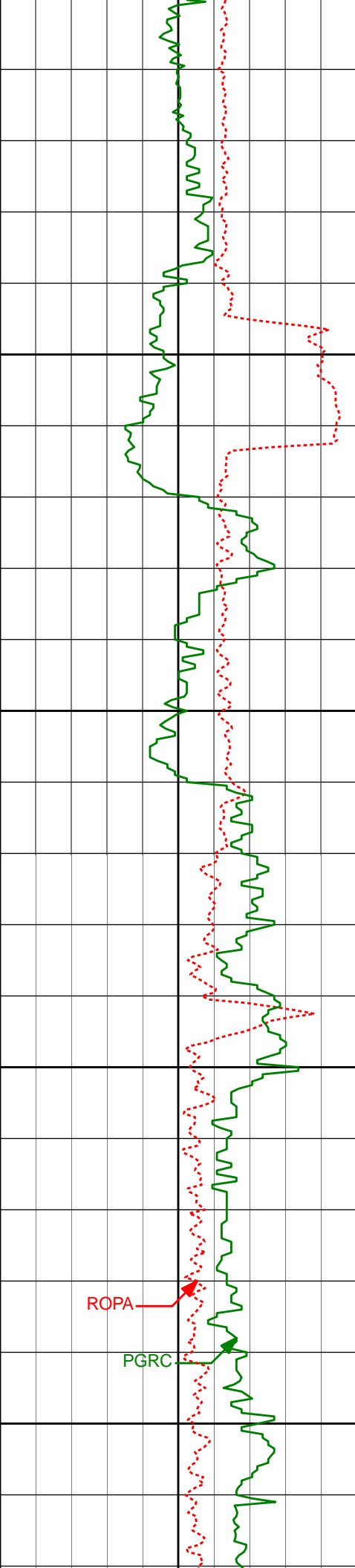
181.02°

5478.61'

2302.94'

ROPA

PGRC



7550'

7600'

7650'

7700'

7594'

88.86°

178.55°

5480.93'

2397.83'

7689'

87.10°

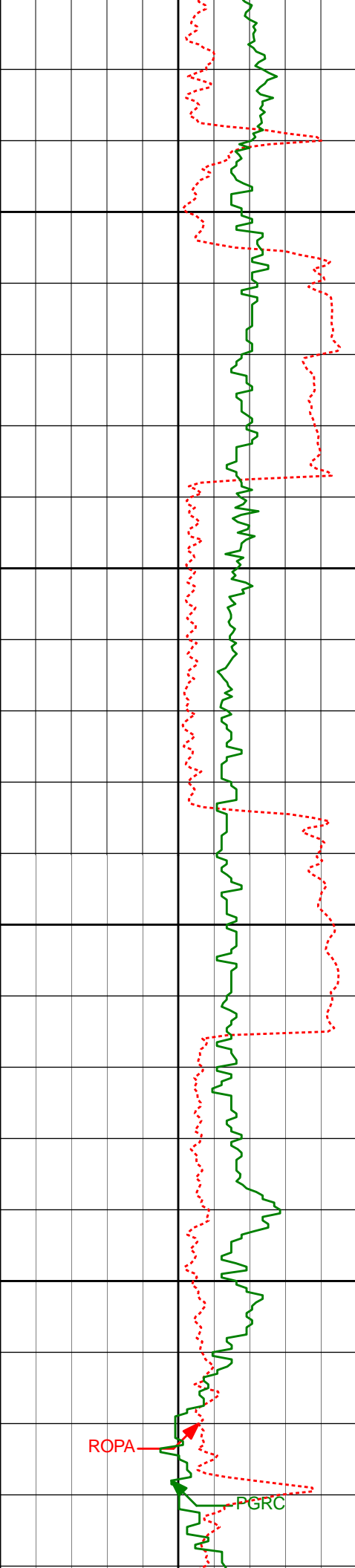
175.41°

5484.28'

2492.75'

ROPA

PGRC



7750'

7784'

87.41°

174.68°

5488.83'

2587.55'

7800'

7850'

7879'

90.55°

174.62°

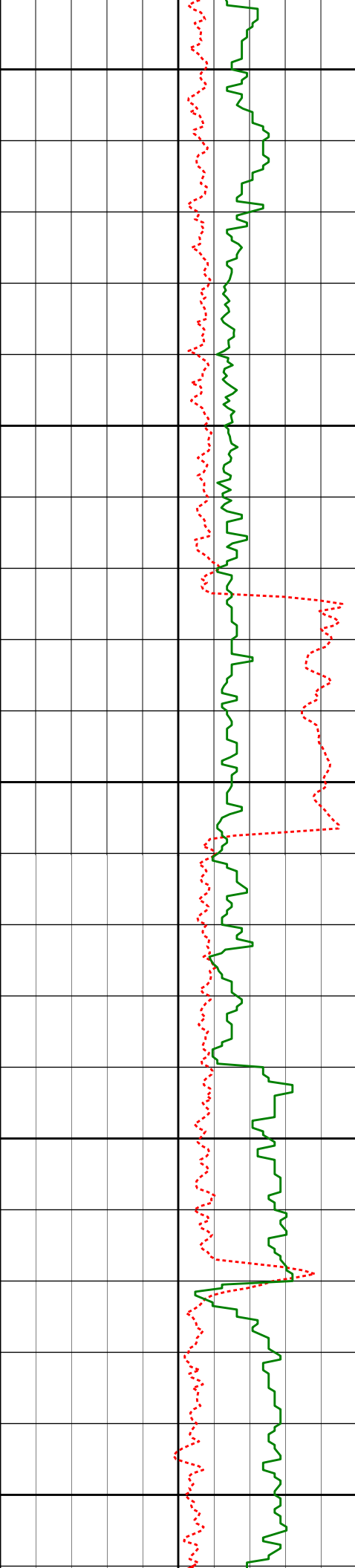
5490.52'

2682.41'

7900'

ROPA

PGRC



7950'

7974'

89.29°

173.87°

5490.65'

2777.25'

8000'

8050'

8070'

90.09°

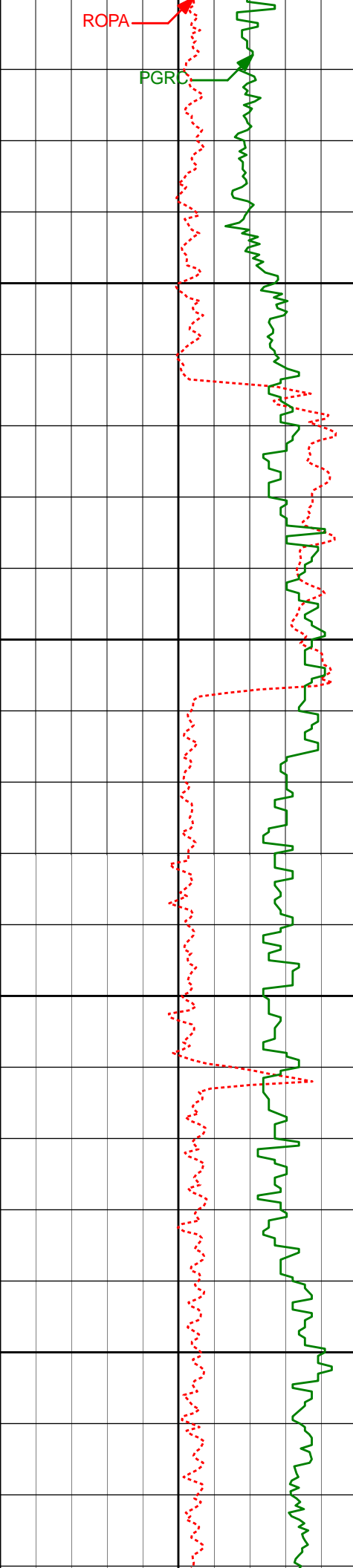
176.90°

5491.17'

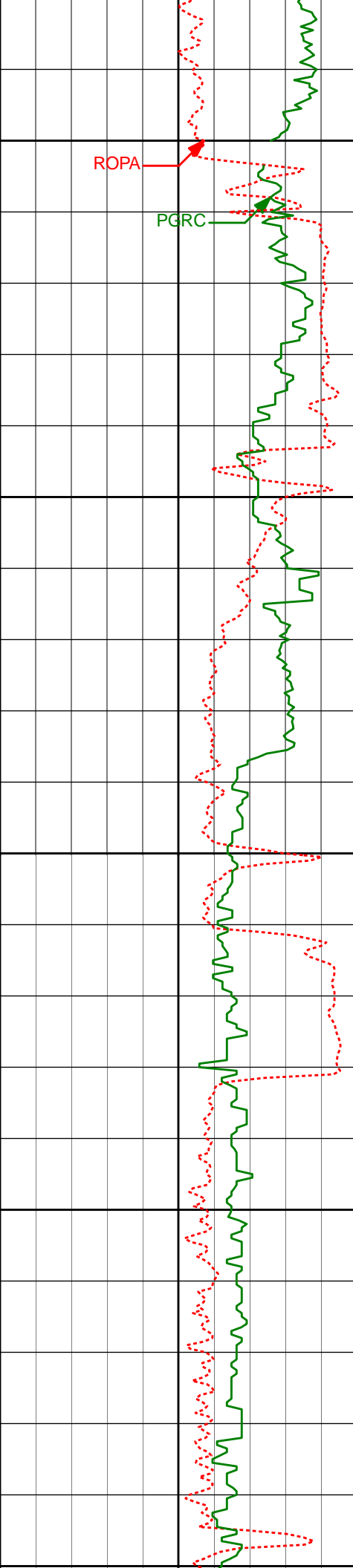
2873.17'

8100'

8150'



8165'	88.89°	176.51°	5492.01'	2968.15'
8260'	91.51°	181.09°	5491.68'	3063.10'
8355'	89.41°	178.58°	5490.91'	3158.00'



8400'

ROPA

PGRC

8450'

8450'

93.30°

181.16°

5488.66'

3252.87'

8500'

8550'

8545'

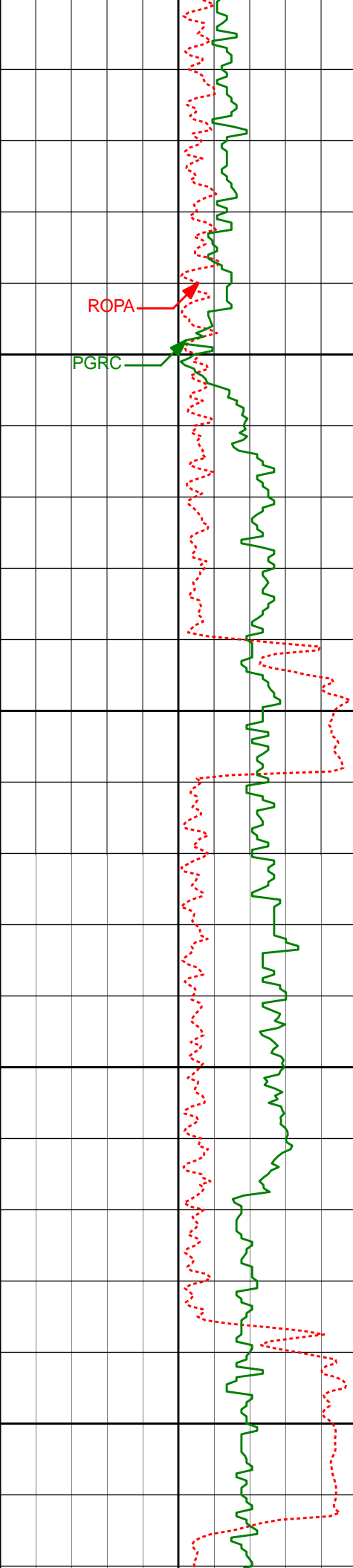
90.99°

180.65°

5485.11'

3347.63'

8600'



8600'

8640'

89.82°

179.94°

5484.44'

3442.52'

8650'

8700'

8736'

89.94°

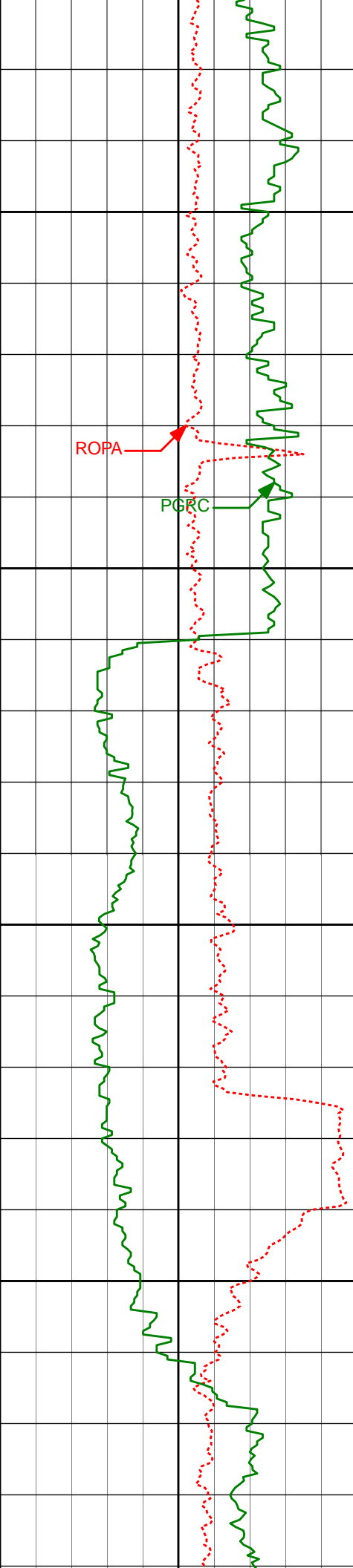
178.61°

5484.65'

3538.47'

8750'

8800'



8850'

8900'

8950'

9000'

8830'

92.34°

179.76°

5482.78'

3632.40'

8925'

90.12°

177.94°

5480.73'

3727.34'

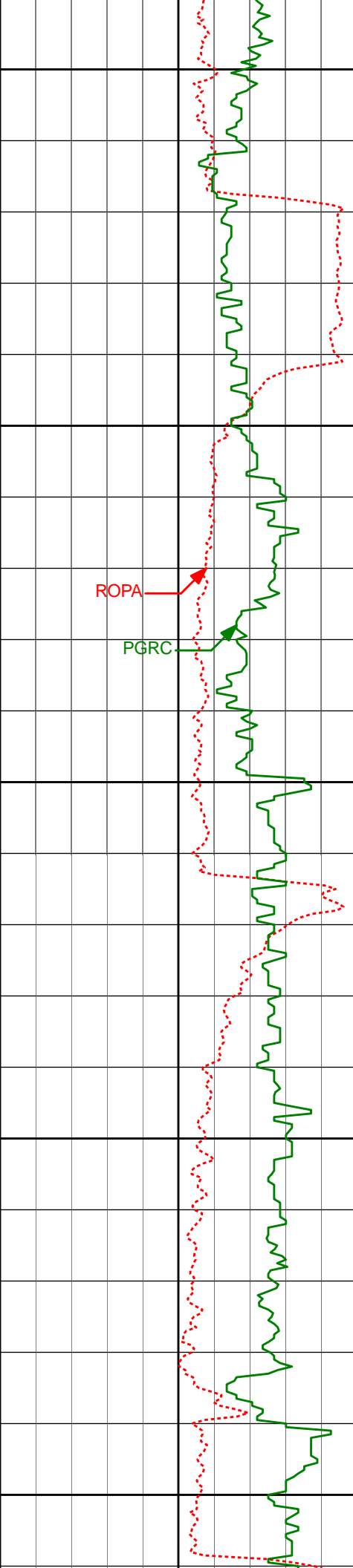
9020'

89.72°

177.50°

5480.86'

3822.34'



9050'

9100'

9150'

9200'

9250'

ROPA

PGRC

9115'

91.70°

179.21°

5479.69'

3917.32'

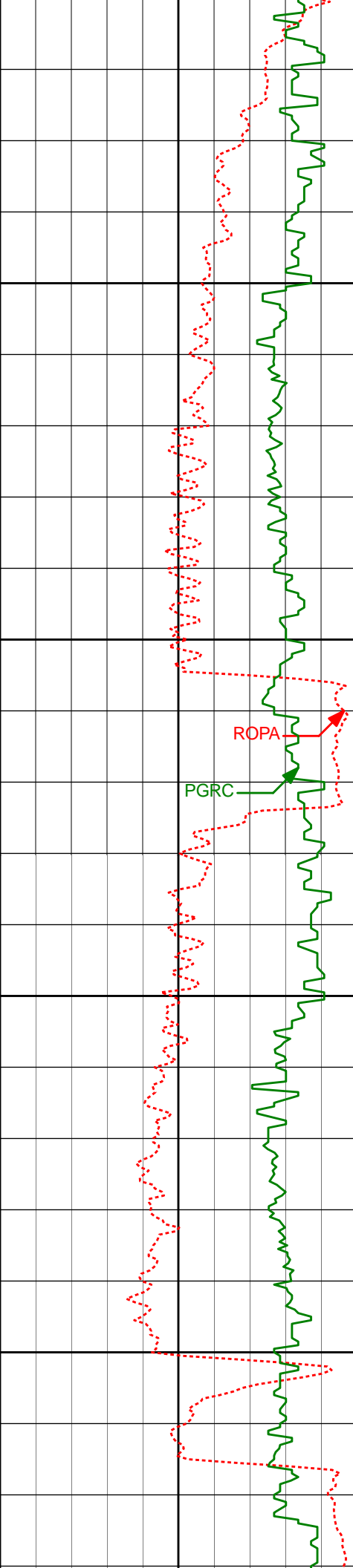
9210'

89.72°

178.04°

5478.51'

4012.29'



9300'

9305'

91.54°

179.19°

5477.46'

4107.26'

9350'

ROPA

PGRC

9400'

9400'

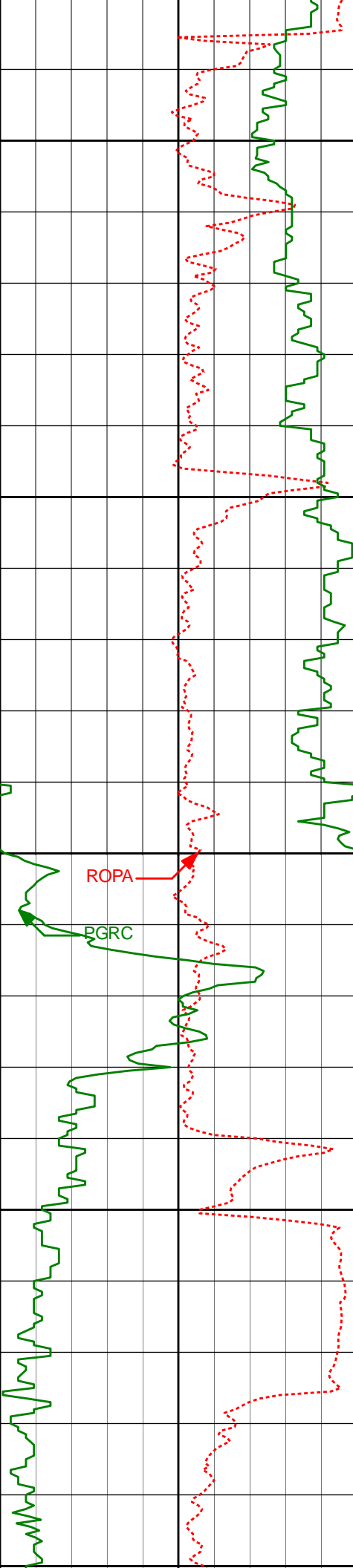
91.23°

179.97°

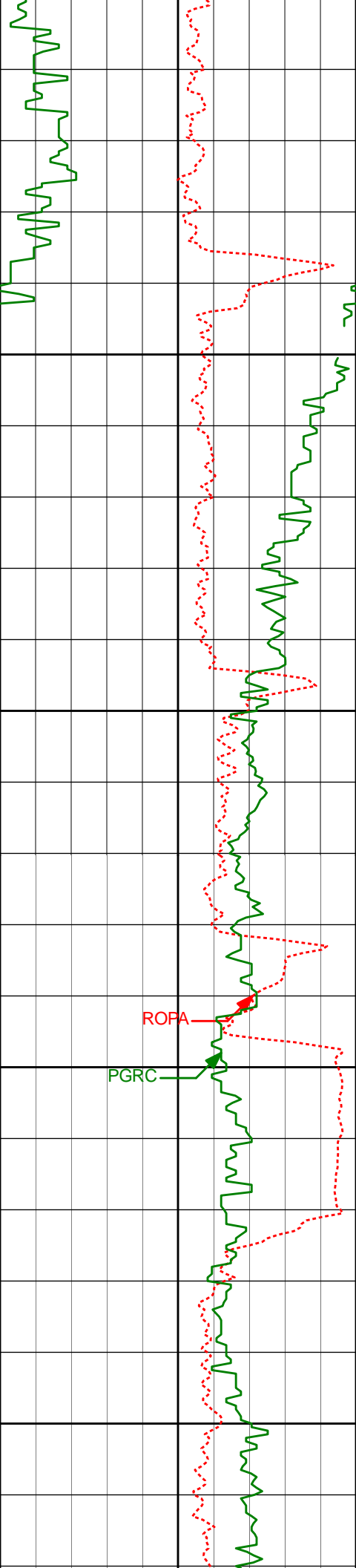
5475.16'

4202.17'

9450'



9495'	88.52°	179.25°	5475.37'	4297.09'
9500'				
9550'				
9590'	87.16°	178.54°	5478.94'	4392.00'
9600'				
9650'				
9685'	88.64°	179.64°	5482.42'	4486.89'
9700'				



9700'

9750'

9800'

9850'

9900'

9781'

87.66°

179.12°

5485.52'

4582.79'

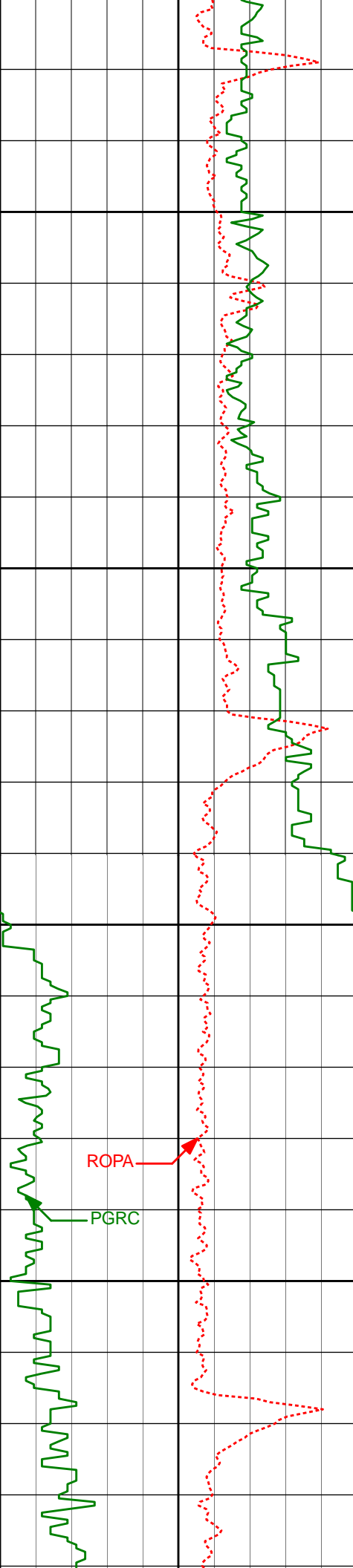
9875'

90.37°

179.94°

5487.14'

4676.71'



9950'

9970'

90.77°

179.23°

5486.19'

4771.64'

10000'

10050'

10065'

90.31°

178.76°

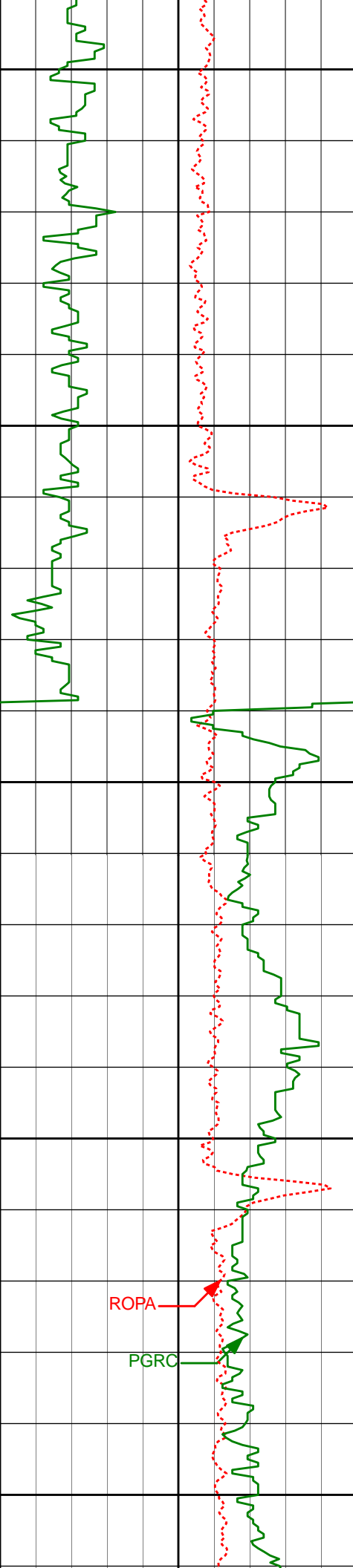
5485.30'

4866.61'

10100'

ROPA

PGRC



10150'

10160'

89.60°

178.18°

5485.37'

4961.59'

10200'

10250'

10255'

88.33°

177.14°

5487.09'

5056.57'

10300'

ROPA

PGRC

10350'

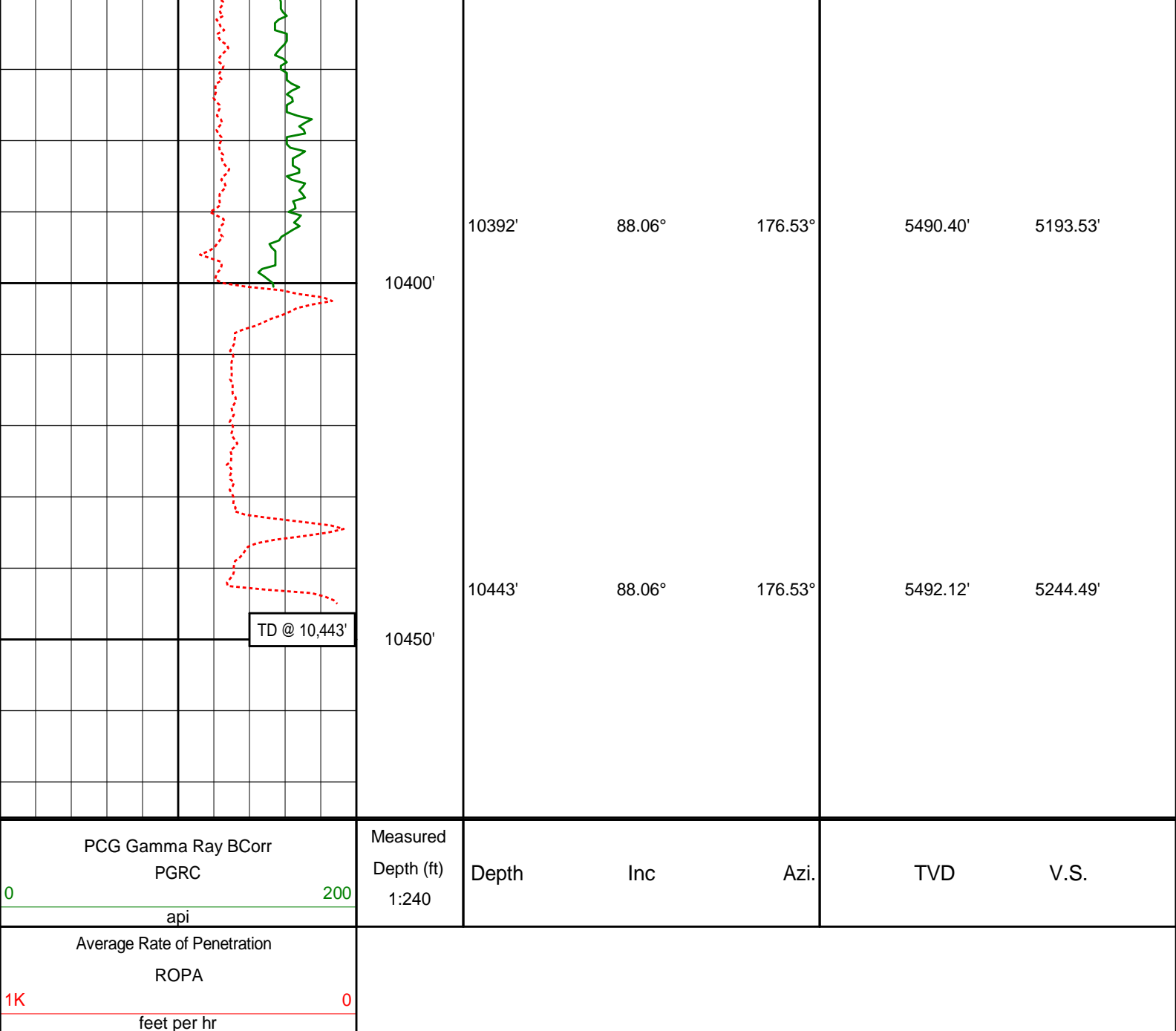
10350'

88.98°

177.16°

5489.31'

5151.54'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Gradishar State LD11-72-1BHN
Wattenberg
Weld Colorado
USA
CA-XX-0901946088

The first three surveys at 460', 742' and 1020' are provided by HP.

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
460.00	0.80	260.71	459.99	0.52 S	3.17 W	0.38	0.17
742.00	0.70	55.11	741.98	0.15 N	3.70 W	-0.31	0.52
1020.00	1.20	16.51	1019.94	3.91 N	1.48 W	-3.97	0.28
1296.00	0.10	17.50	1295.92	6.91 N	0.59 W	-6.93	0.40
1388.00	0.15	134.64	1387.92	6.89 N	0.48 W	-6.91	0.24

1482.00	0.13	204.08	1481.92	6.71 N	0.43 W	-6.72	0.17
1575.00	0.31	168.54	1574.92	6.36 N	0.42 W	-6.37	0.24
1668.00	0.24	163.92	1667.92	5.92 N	0.32 W	-5.93	0.08
1759.00	0.13	121.47	1758.92	5.69 N	0.18 W	-5.69	0.19
1852.00	1.57	80.29	1851.90	5.85 N	1.17 E	-5.79	1.59
1945.00	3.82	95.80	1944.79	5.75 N	5.52 E	-5.50	2.52
2038.00	5.25	97.86	2037.50	4.85 N	12.82 E	-4.29	1.54
2129.00	6.97	103.58	2127.98	2.99 N	22.31 E	-2.02	2.00
2222.00	8.71	101.24	2220.11	0.29 N	34.70 E	1.21	1.90
2315.00	10.50	106.45	2311.80	3.48 S	49.74 E	5.63	2.14
2408.00	10.55	103.55	2403.24	7.88 S	66.15 E	10.73	0.57
2503.00	10.82	102.95	2496.59	11.91 S	83.30 E	15.51	0.31
2599.00	10.68	100.88	2590.91	15.61 S	100.82 E	19.96	0.43
2694.00	10.62	107.93	2684.27	19.97 S	117.79 E	25.05	1.37
2788.00	8.54	107.72	2776.96	24.76 S	132.68 E	30.48	2.20
2883.00	6.76	110.66	2871.11	28.88 S	144.64 E	35.12	1.92
2979.00	4.03	112.04	2966.67	32.14 S	153.06 E	38.74	2.85
3074.00	2.82	95.41	3061.50	33.62 S	158.47 E	40.44	1.63
3169.00	2.84	96.42	3156.39	34.10 S	163.14 E	41.13	0.06
3264.00	1.94	64.40	3251.31	33.67 S	166.93 E	40.86	1.66
3359.00	1.17	67.96	3346.27	32.61 S	169.28 E	39.91	0.82
3454.00	0.93	74.85	3441.26	32.05 S	170.93 E	39.41	0.29
3549.00	0.74	92.43	3536.25	31.87 S	172.29 E	39.30	0.33
3644.00	0.52	144.09	3631.24	32.25 S	173.16 E	39.71	0.62
3739.00	0.69	199.46	3726.24	33.14 S	173.22 E	40.60	0.61
3835.00	0.56	221.37	3822.23	34.03 S	172.72 E	41.47	0.28
3930.00	0.73	233.59	3917.22	34.74 S	171.93 E	42.14	0.23
4025.00	0.56	228.01	4012.22	35.40 S	171.10 E	42.78	0.19
4120.00	0.75	220.26	4107.21	36.19 S	170.35 E	43.53	0.22
4215.00	0.93	240.09	4202.20	37.05 S	169.29 E	44.34	0.35
4310.00	1.62	178.94	4297.18	38.77 S	168.65 E	46.03	1.50
4405.00	2.75	165.40	4392.11	42.32 S	169.25 E	49.60	1.30
4500.00	2.37	151.48	4487.02	46.25 S	170.76 E	53.60	0.77
4595.00	0.22	15.40	4581.99	47.80 S	171.74 E	55.18	2.67
4690.00	0.40	56.33	4676.99	47.43 S	172.07 E	54.83	0.29
4786.00	0.28	98.43	4772.99	47.28 S	172.58 E	54.70	0.28
4881.00	1.52	157.10	4867.98	48.48 S	173.30 E	55.93	1.47
4976.00	11.68	181.79	4962.23	59.28 S	173.49 E	66.73	10.86
5071.00	16.73	183.69	5054.30	82.56 S	172.31 E	89.94	5.34
5166.00	21.25	180.87	5144.10	113.44 S	171.17 E	120.74	4.85
5261.00	28.84	176.83	5230.11	153.59 S	172.18 E	160.90	8.18
5356.00	38.93	181.10	5308.89	206.46 S	172.88 E	213.74	10.91
5451.00	54.15	182.21	5374.04	275.18 S	170.81 E	282.31	16.04
5546.00	70.50	184.12	5418.02	358.89 S	166.07 E	365.74	17.30
5641.00	73.12	184.25	5447.67	448.89 S	159.49 E	455.37	2.77
5736.00	75.52	182.92	5473.35	540.17 S	153.78 E	546.32	2.86
5811.00	81.06	181.54	5488.56	613.52 S	150.93 E	619.48	7.61
6004.00	89.82	180.92	5503.90	805.68 S	146.81 E	811.27	4.55
6097.00	88.00	180.14	5505.67	898.65 S	145.96 E	904.13	2.13
6190.00	89.91	179.67	5507.38	991.63 S	146.12 E	997.02	2.12
6281.00	89.54	179.39	5507.82	1082.63 S	146.86 E	1087.97	0.50
6374.00	89.48	178.80	5508.62	1175.61 S	148.32 E	1180.93	0.64
6467.00	90.99	178.41	5508.24	1268.58 S	150.59 E	1273.91	1.68
6560.00	92.84	178.45	5505.14	1361.49 S	153.14 E	1366.84	1.99
6651.00	92.47	178.40	5500.93	1452.36 S	155.64 E	1457.73	0.41
6744.00	91.82	178.10	5497.45	1545.25 S	158.48 E	1550.66	0.77
6837.00	91.42	177.72	5494.82	1638.15 S	161.87 E	1643.62	0.59
7025.00	91.85	176.67	5489.47	1825.84 S	171.08 E	1831.54	0.61
7119.00	91.51	179.10	5486.71	1919.73 S	174.55 E	1925.49	2.61
7214.00	89.85	180.98	5485.59	2014.72 S	174.48 E	2020.38	2.65
7309.00	92.87	187.20	5483.34	2109.39 S	167.70 E	2114.67	7.28
7404.00	92.25	185.44	5479.09	2203.72 S	157.25 E	2208.46	1.97
7499.00	88.33	181.02	5478.61	2298.52 S	151.90 E	2302.94	6.21
7594.00	88.86	178.55	5480.93	2393.48 S	152.25 E	2397.83	2.66
7689.00	87.10	175.41	5484.28	2488.28 S	157.25 E	2492.75	3.78
7784.00	87.41	174.68	5488.83	2582.81 S	165.44 E	2587.55	0.83
7879.00	90.55	174.62	5490.52	2677.37 S	174.30 E	2682.41	3.31
7974.00	89.29	173.87	5490.65	2771.89 S	183.82 E	2777.25	1.54
8070.00	90.09	176.90	5491.17	2867.57 S	191.54 E	2873.17	3.26
8165.00	88.89	176.51	5492.01	2962.40 S	197.00 E	2968.15	1.33
8260.00	91.51	181.09	5491.68	3057.35 S	198.99 E	3063.10	5.56
8355.00	89.41	178.58	5490.91	3152.33 S	199.26 E	3158.00	3.44
8450.00	93.30	181.16	5488.66	3247.28 S	199.47 E	3252.87	4.90
8545.00	90.99	180.65	5485.11	3342.20 S	197.98 E	3347.63	2.49

8640.00	89.82	179.94	5484.44	3437.19 S	197.48 E	3442.52	1.44
8736.00	89.94	178.61	5484.65	3533.18 S	198.70 E	3538.47	1.40
8830.00	92.34	179.76	5482.78	3627.14 S	200.04 E	3632.40	2.84
8925.00	90.12	177.94	5480.73	3722.09 S	201.94 E	3727.34	3.02
9020.00	89.72	177.50	5480.86	3817.02 S	205.72 E	3822.34	0.63
9115.00	91.70	179.21	5479.69	3911.96 S	208.44 E	3917.32	2.75
9210.00	89.72	178.04	5478.51	4006.92 S	210.72 E	4012.29	2.42
9305.00	91.54	179.19	5477.46	4101.88 S	213.02 E	4107.26	2.27
9400.00	91.23	179.97	5475.16	4196.85 S	213.72 E	4202.17	0.88
9495.00	88.52	179.25	5475.37	4291.84 S	214.36 E	4297.09	2.96
9590.00	87.16	178.54	5478.94	4386.75 S	216.19 E	4392.00	1.61
9685.00	88.64	179.64	5482.42	4481.67 S	217.70 E	4486.89	1.94
9781.00	87.66	179.12	5485.52	4577.61 S	218.74 E	4582.79	1.16
9875.00	90.37	179.94	5487.14	4671.59 S	219.50 E	4676.71	3.02
9970.00	90.77	179.23	5486.19	4766.58 S	220.18 E	4771.64	0.86
10065.00	90.31	178.76	5485.30	4861.56 S	221.85 E	4866.61	0.70
10160.00	89.60	178.18	5485.37	4956.52 S	224.39 E	4961.59	0.96
10255.00	88.33	177.14	5487.09	5051.43 S	228.27 E	5056.57	1.73
10350.00	88.98	177.16	5489.31	5146.28 S	232.99 E	5151.54	0.68
10392.00	88.06	176.53	5490.40	5188.20 S	235.30 E	5193.53	2.67
10443.00	88.06	176.53	5492.12	5239.08 S	238.39 E	5244.49	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 177.52 DEGREES (GRID)
A TOTAL CORRECTION OF 6.91 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10443.00 FEET
IS 5244.50 FEET ALONG 177.39 DEGREES (GRID)**

Final survey is a straight line projection to TD.