

PCGK - Pressure Case Gamma

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300	400	
Date run completed	26-Oct-13	01-Nov-13	03-Nov-13	05-Nov-13	
Rig Bit Number	0100	200	0300	0400	
Bit Size (in)	8.750	6.125	6.125	6.125	
Tool Nominal OD (in)	6.750	4.750	4.750	4.750	
Log Start Depth (MD, ft)	1,041.00	7,921.00	15,040.00	15,142.00	
Log End Depth (MD, ft)	7,921.00	15,040.00	15,142.00	16,697.00	
Drill or Wipe	Drill	Drill	Drill	Drill	
Drill/Wipe Start Date and Time	23-Oct-13 00:52	27-Oct-13 18:47	02-Nov-13 07:49	03-Nov-13 10:20	
Drill/Wipe End Date and Time	25-Oct-13 19:40	01-Nov-13 01:22	02-Nov-13 12:02	04-Nov-13 19:30	
Min Inc (deg) @ Depth (MD, ft)	0.17 @ 1,860.00	86.64 @ 10,223.00	88.24 @ 15,068.00	88.46 @ 15,153.00	
Max Inc (deg) @ Depth (MD, ft)	86.52 @ 7,873.00	93.73 @ 9,499.00	88.24 @ 15,068.00	90.68 @ 15,668.00	
Bit TFA(in2) / Bit Type	1.04 / PDC	0.98 / PDC	1.86 / PDC	1.86 / PDC	
Flow Rate (gpm)	571.05	273.83	256.00	260.44	
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	370.0 / 0.0	N/A / N/A	
Fluid Type	Fresh Water Gel	Mineral Oil Bas	Linear Paraffin	Mineral Oil Bas	
Density (ppg) / Viscosity (spqt)	10.10 / 30.00	9.50 / 52.00	9.90 / 105.00	9.70 / 77.00	
Filtrate CL (ppm)	40.00	254,632.00	269,870.00	245,179.00	
pH / Fluid Loss (mptm)	9.30 / 4	N/A / N/A	N/A / N/A	N/A / N/A	
PV (cP) / YP (lbf2)	15 / 16.00	12 / 14.00	23 / 7.00	20 / 15.00	
% Solids / % Sand	4.00 / 0.01	11.00 / 0.00	16.00 / 0.02	15.00 / 0.01	
% Oil / Oil:Water Ratio	2.00 / N/A	60.00 / 38:32	67.00 / 67:33	57.00 / 67:33	
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Max Tool Temp (deg F) @ Depth (MD)	112.00 / 100M	222.51 / 100M	222.51 / 100M	245.00 / 100M	

Max Tool Temp (degF) / Source	412.20 / PCM	239.54 / PCM	239.54 / PCM	245.03 / PCM	
Rm @ Max Tool Temp (degF)	N/A @ 412.20	N/A @ 239.54	N/A @ 239.54	N/A @ 245.03	
Lead MWD Engineer	Caleb Jones	Caleb Jones	Caleb Jones	Caleb Jones	
Customer Representative	David Cornett	David Cornett	David Cornett	David Cornett	

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM	PCM	
Software Version	5.76	5.76	5.76	5.76	
Sub Serial Number	11404261	11670106	11670106	12134679	
Insert Serial Number	11680779	11680779	11400901	11680735	
Date and Time Initialized	22-Oct-13 00:07	26-Oct-13 22:03	01-Nov-13 08:37	02-Nov-13 19:46	
Date and Time Read	26-Oct-13 08:18	01-Nov-13 19:38	03-Nov-13 11:52	05-Nov-13 18:06	
ECMB SW Version	N/A	N/A	N/A	N/A	

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC	PCDC	
Distance From Bit (ft)	46.35	50.02	47.00	42.45	
Software Version	6.21	6.21	6.21	6.21	
Sub Serial Number	11404261	11670106	11670106	12134679	
Sonde Serial Number	11638628	11638628	11297555	11638628	
Sensor ID Number	N/A	N/A	N/A	N/A	
Toolface Offset (deg)	142.18	27.36	181.14	159.49	

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG	PCG	
Distance From Bit (ft)	51.30	54.97	48.90	47.36	
Recorded Sample Period (sec)	10	10	10	10	
Software Version	8.15	8.15	8.15	8.15	
Sub Serial Number	11404261	11670106	11670106	12134679	
Insert/Sonde Serial Number	12037413	12037413	12035849	12037413	

REMARKS

1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the Kelly Bushing, 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" 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:

PGRC (Corrected Gamma Ray):
 Interval Resolution: 0.5 ft
 Interval Distance: 0.6 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

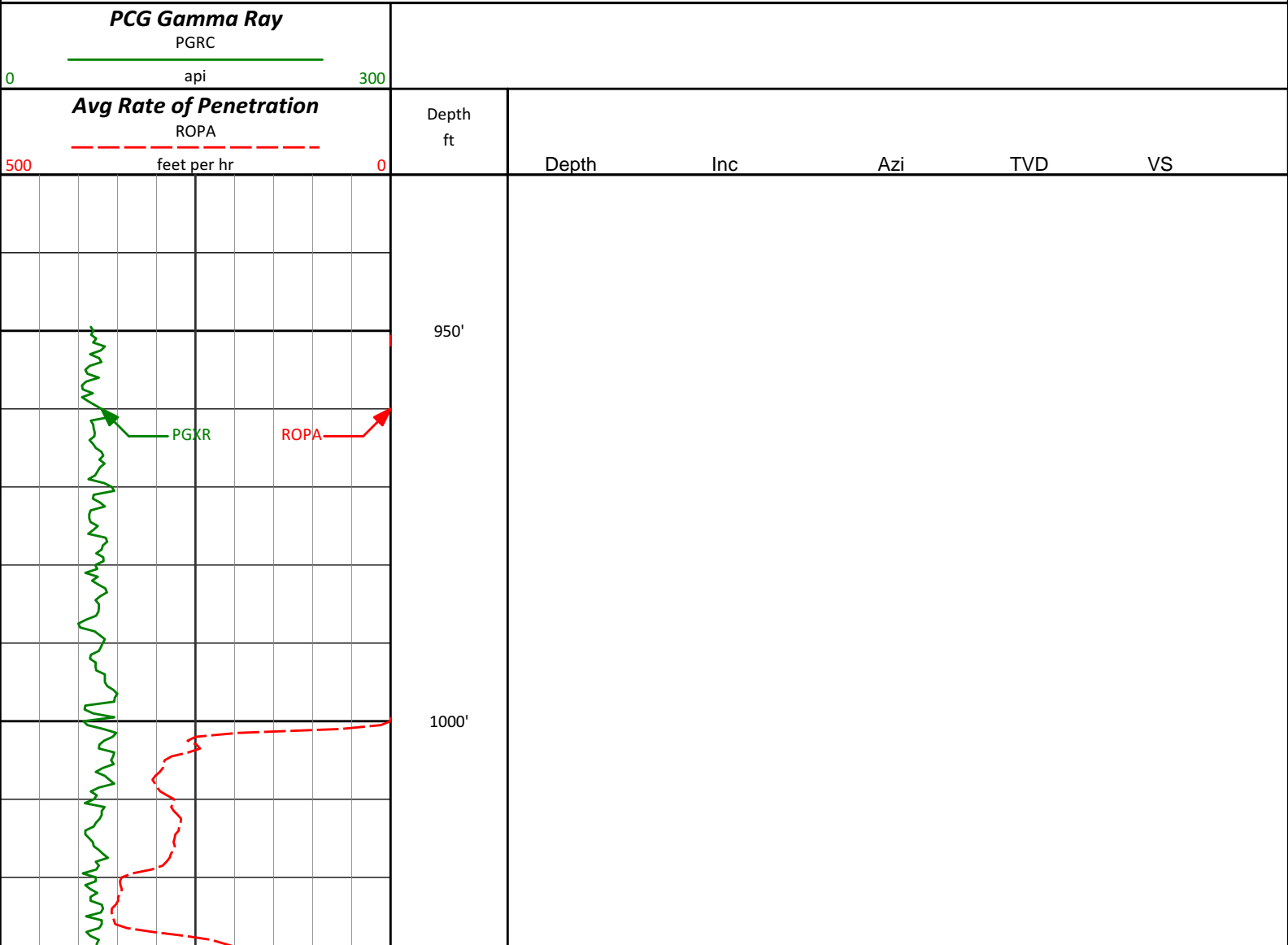
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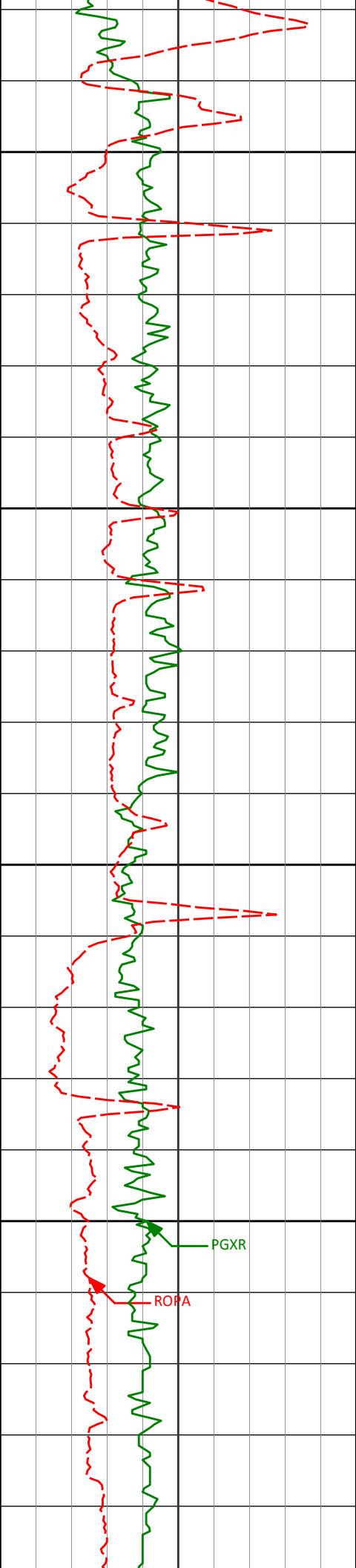
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HALLIBURTON
Sperry Drilling Services
MD Detail Log 1:240

Andarko Petroleum Corp.
Butterball 28C-15HZ
Xtreme 22
Sec 10-T2N-R67W





1050'

1100'

1150'

1200'

PGXR

ROBA

1107'

1.09°

147.57°

1106.98'

1.45'

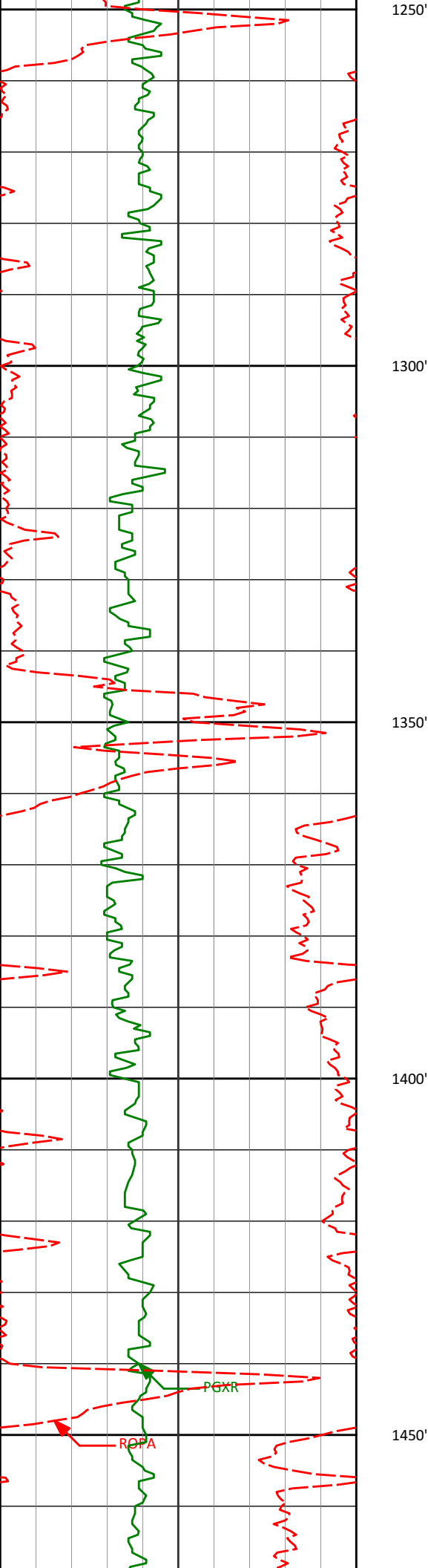
1202'

0.90°

143.98°

1201.96'

2.81'



1297'

0.94°

151.09°

1296.95'

4.10'

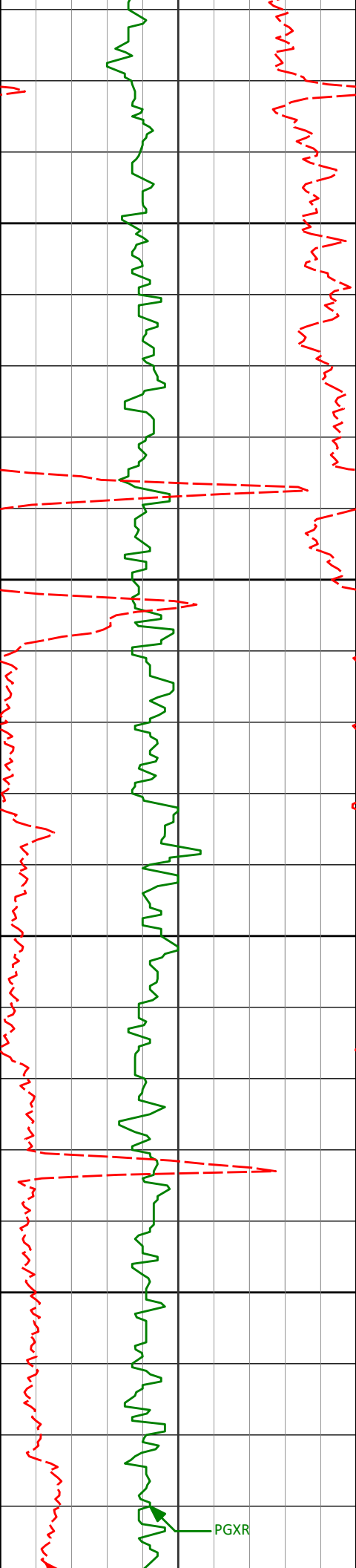
1392'

0.97°

162.26°

1391.94'

5.55'



1487'

0.56°

148.70°

1486.93'

6.71'

1500'

1550'

1580'

0.62°

154.88°

1579.92'

7.56'

1600'

1650'

1676'

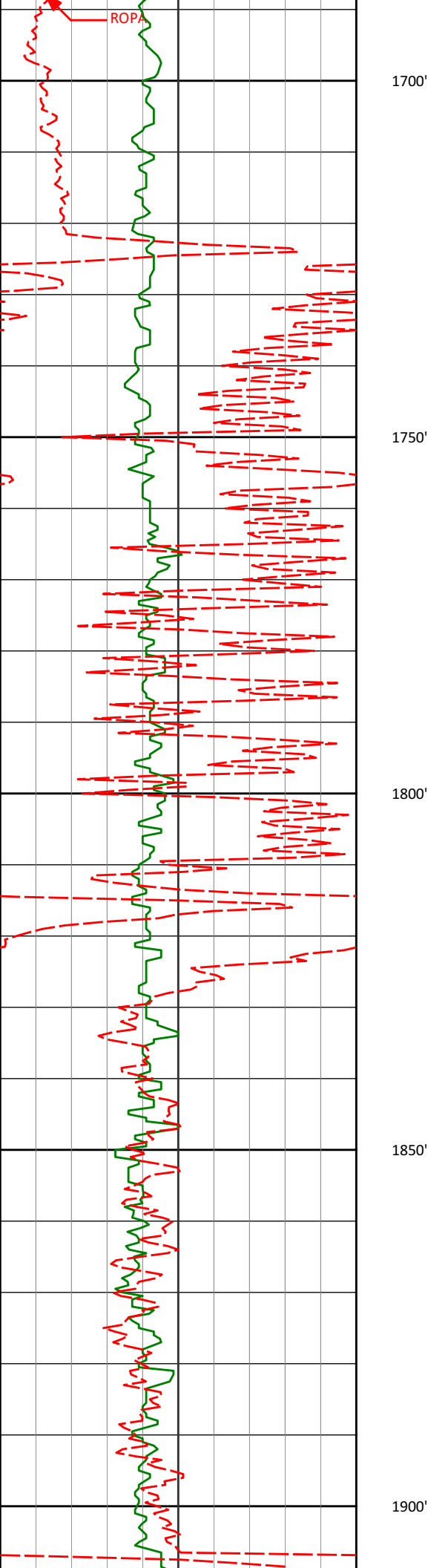
0.46°

138.28°

1675.92'

8.31'

PGXR



1767'

0.31°

152.37°

1766.92'

8.80'

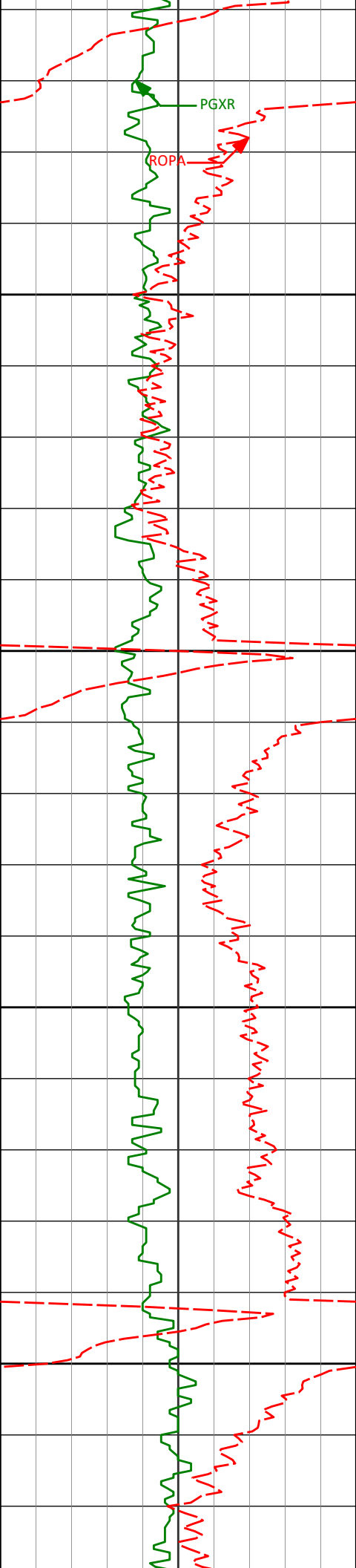
1860'

0.17°

187.00°

1859.92'

9.16'



1950'

1951'

0.28°

151.19°

1950.91'

9.49'

2000'

2050'

2100'

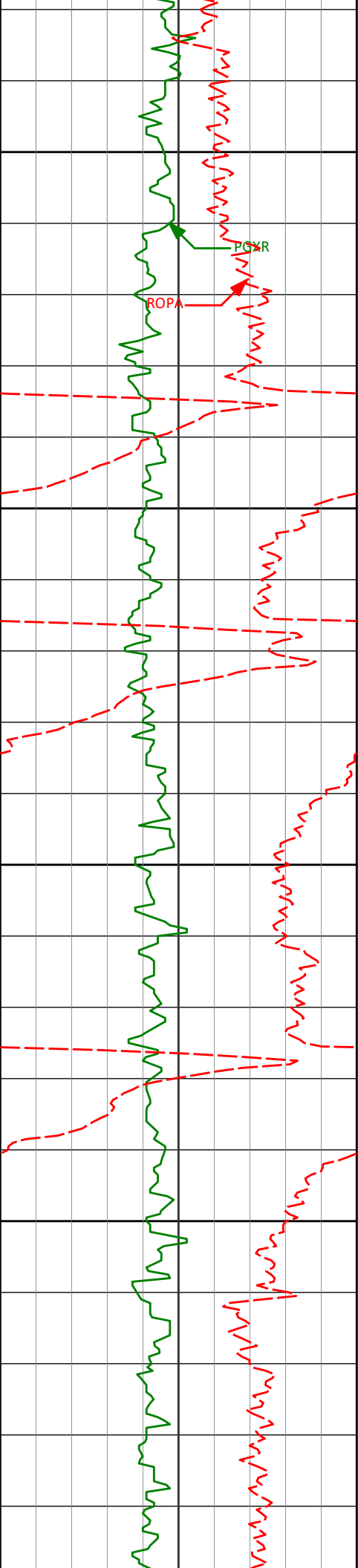
2044'

0.35°

217.28°

2043.91'

9.92'



2150'

2200'

2250'

2300'

2137'

0.75°

216.25°

2136.91'

10.63'

2228'

0.41°

128.40°

2227.91'

11.32'

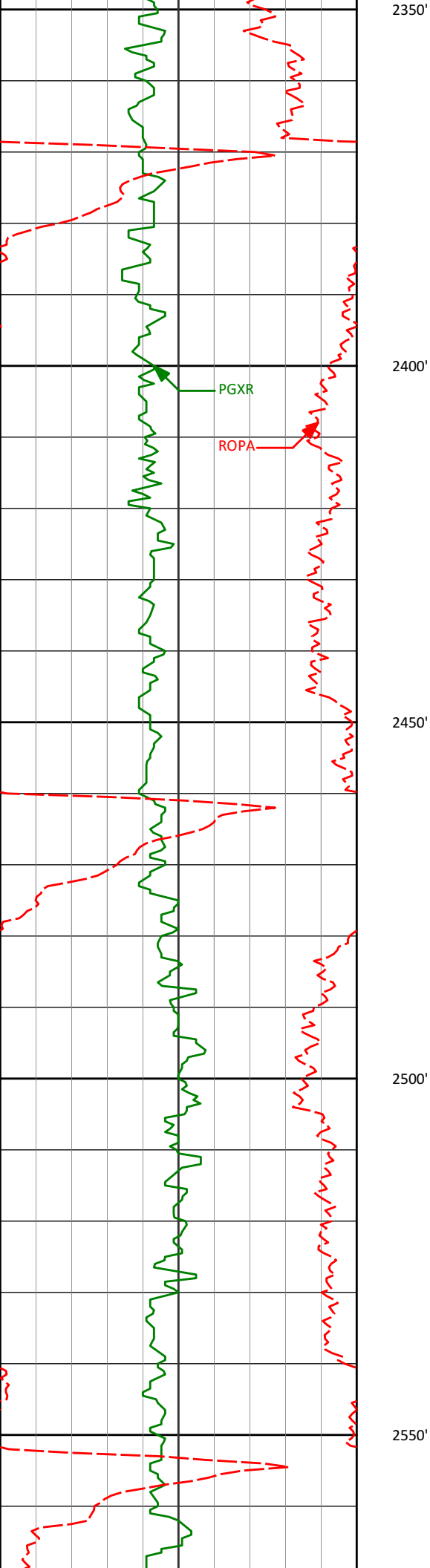
2320'

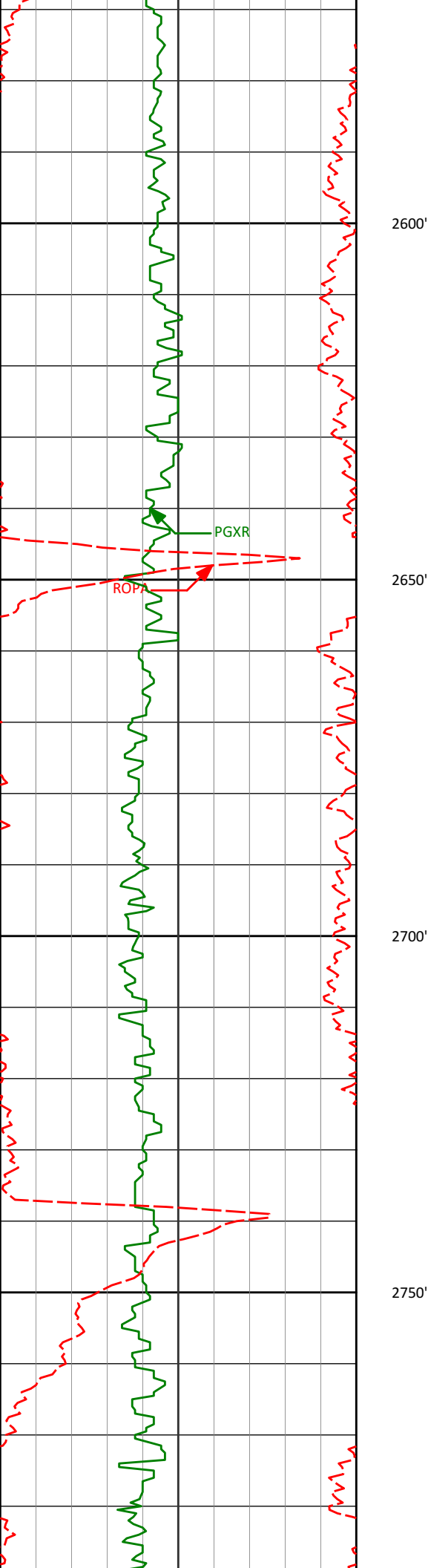
0.39°

99.25°

2319.90'

11.57'





2597'

0.17°

281.28°

2596.90'

11.64'

2600'

PGXR

ROPR

2650'

2700'

2750'

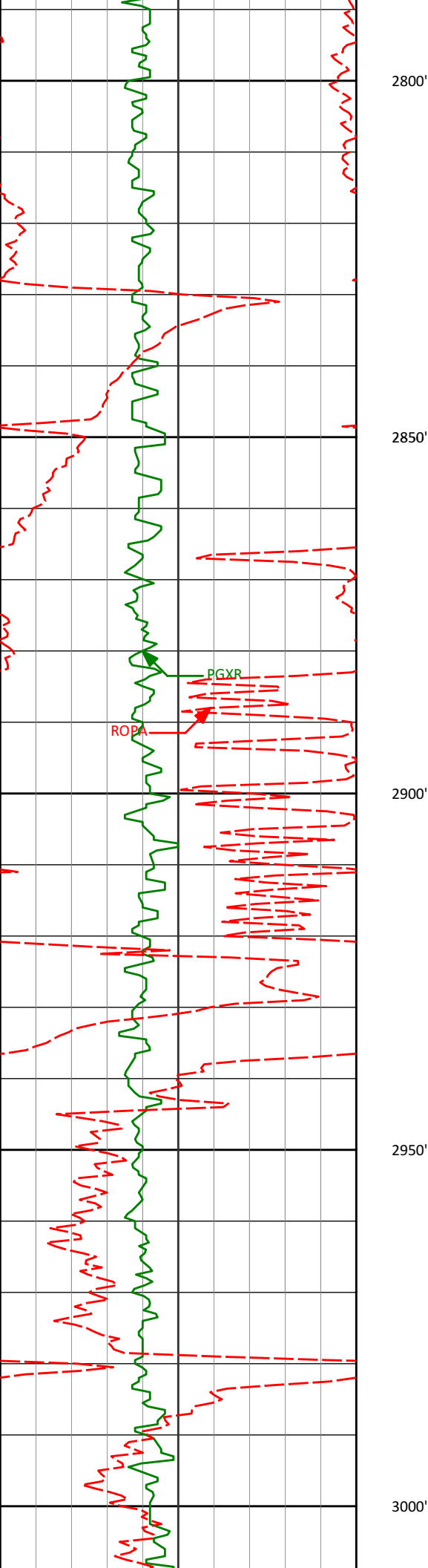
2780'

0.30°

300.89°

2779.90'

11.34'



2871'

0.37°

285.31°

2870.90'

11.14'

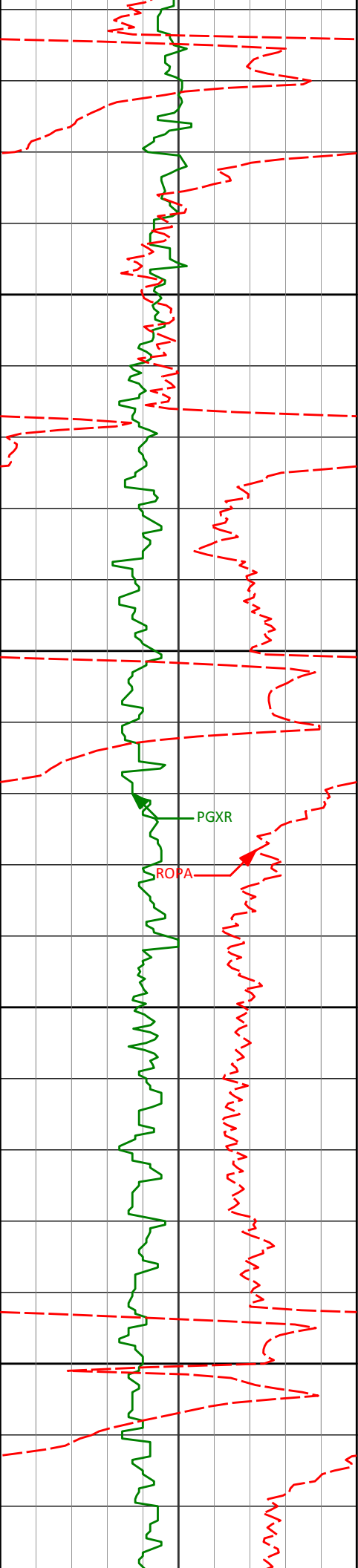
2963'

0.49°

251.91°

2962.90'

11.19'



3050'

3053'

1.18°

173.03°

3052.89'

12.23'

3100'

PGXR

ROPA

3150'

3144'

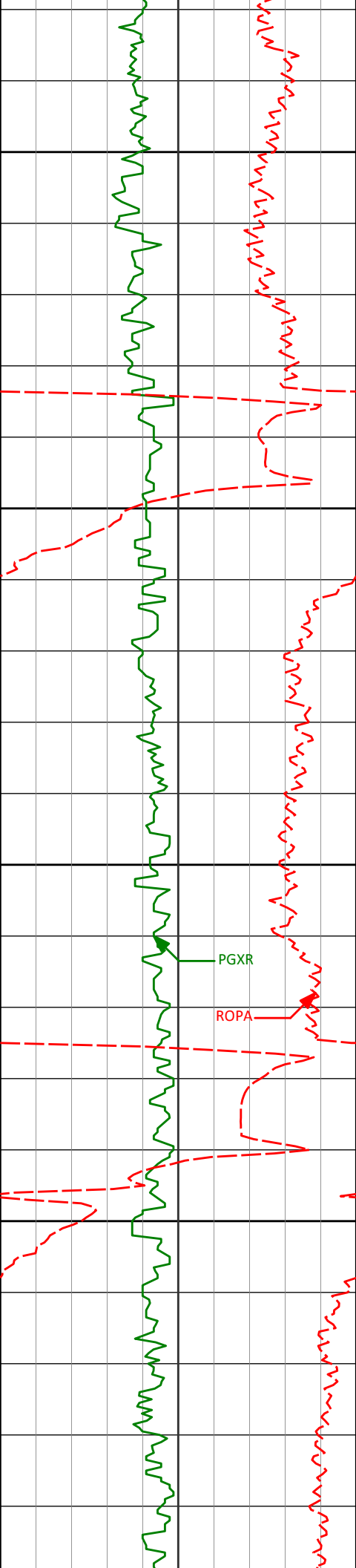
1.67°

151.57°

3143.86'

14.32'

3200'



3236'

2.35°

142.20°

3235.80'

16.99'

3250'

3300'

3327'

2.61°

120.19°

3326.72'

19.51'

3350'

PGXR

ROPA

3400'

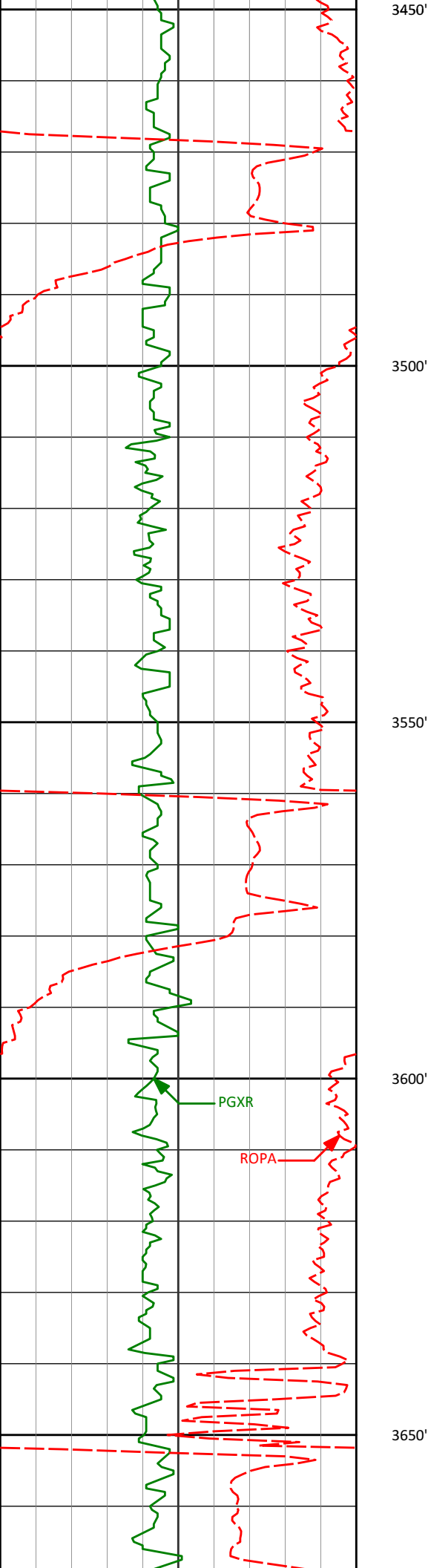
3418'

4.14°

100.86°

3417.56'

21.17'



3509'

4.59°

93.93°

3508.30'

22.04'

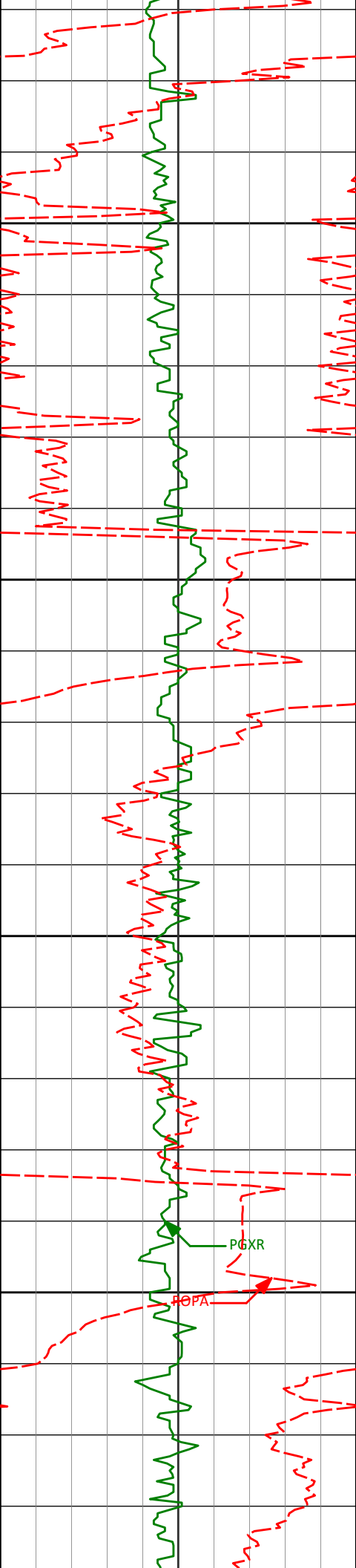
3601'

5.78°

86.79°

3599.92'

22.03'



3700'

3750'

3800'

3850'

3693'

6.71°

94.24°

3691.38'

22.17'

3784'

8.35°

87.58°

3781.59'

22.28'

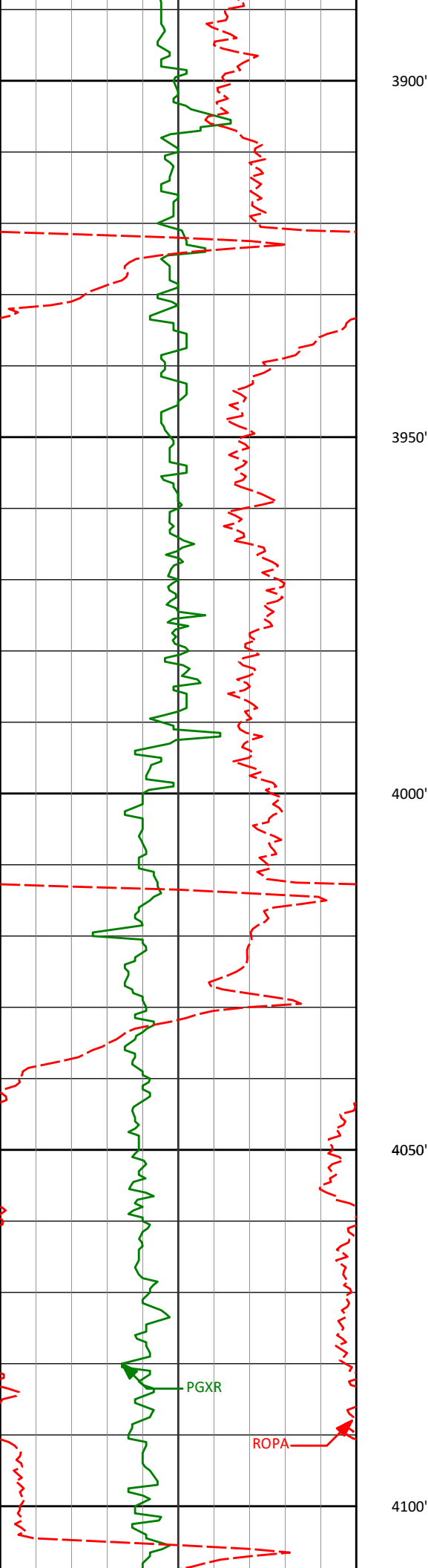
3875'

10.31°

86.88°

3871.38'

21.56'



3900'

3950'

4000'

4050'

4100'

3966'

8.99°

85.90°

3961.09'

20.61'

4057'

11.03°

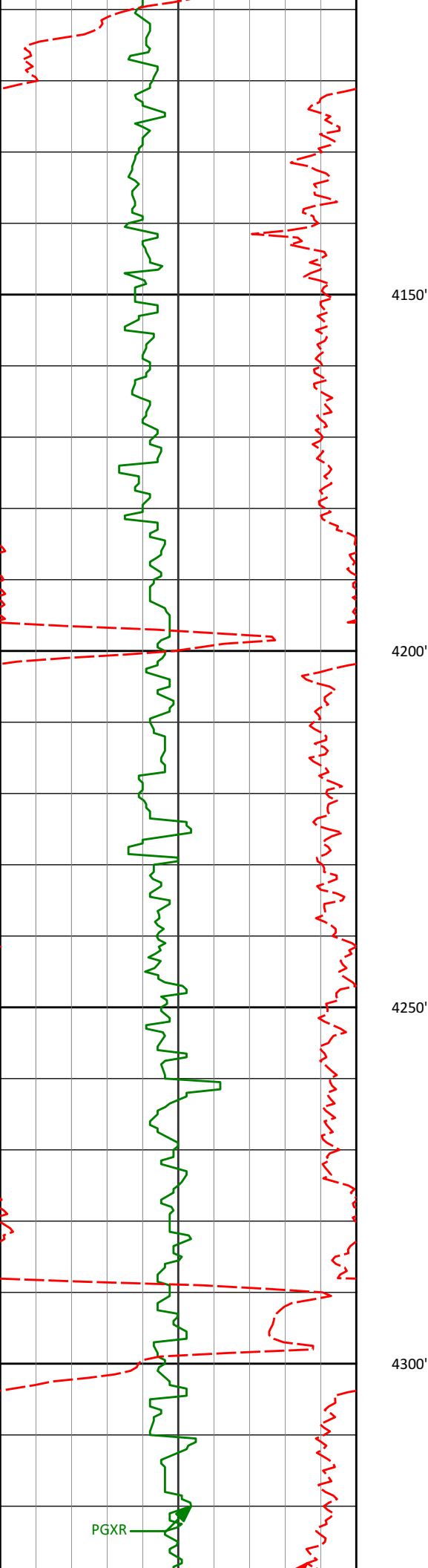
85.33°

4050.70'

19.39'

PGXR

ROPA



4148'

10.79°

85.35°

4140.06'

17.99'

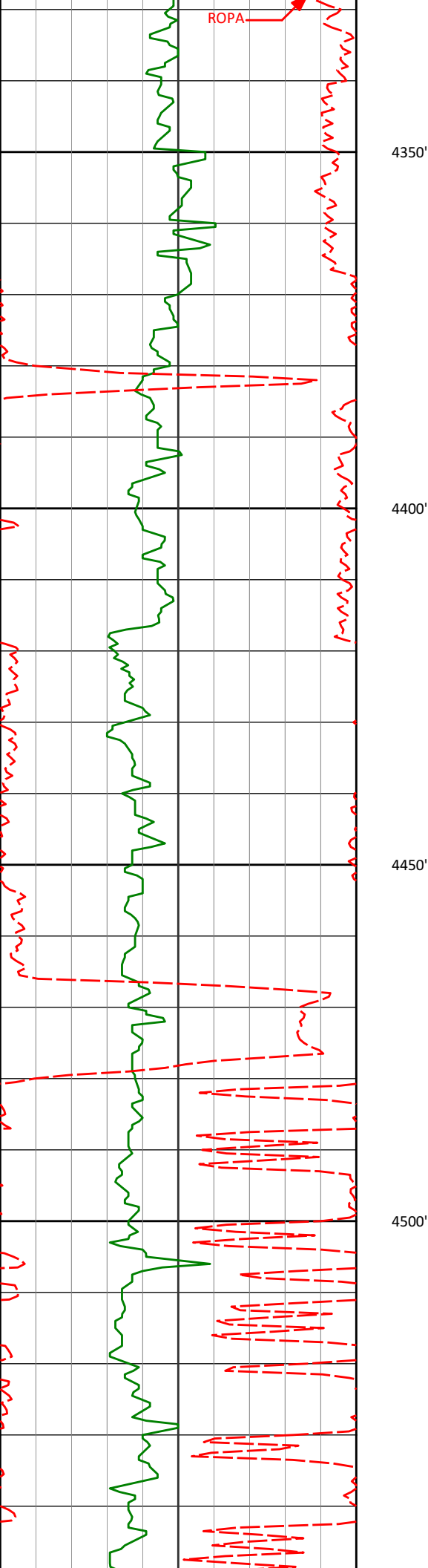
4240'

9.86°

85.21°

4230.57'

16.64'



4332'

10.75°

85.42°

4321.08'

15.29'

4350'

4400'

4418'

9.92°

81.81°

4405.69'

13.60'

4450'

4500'

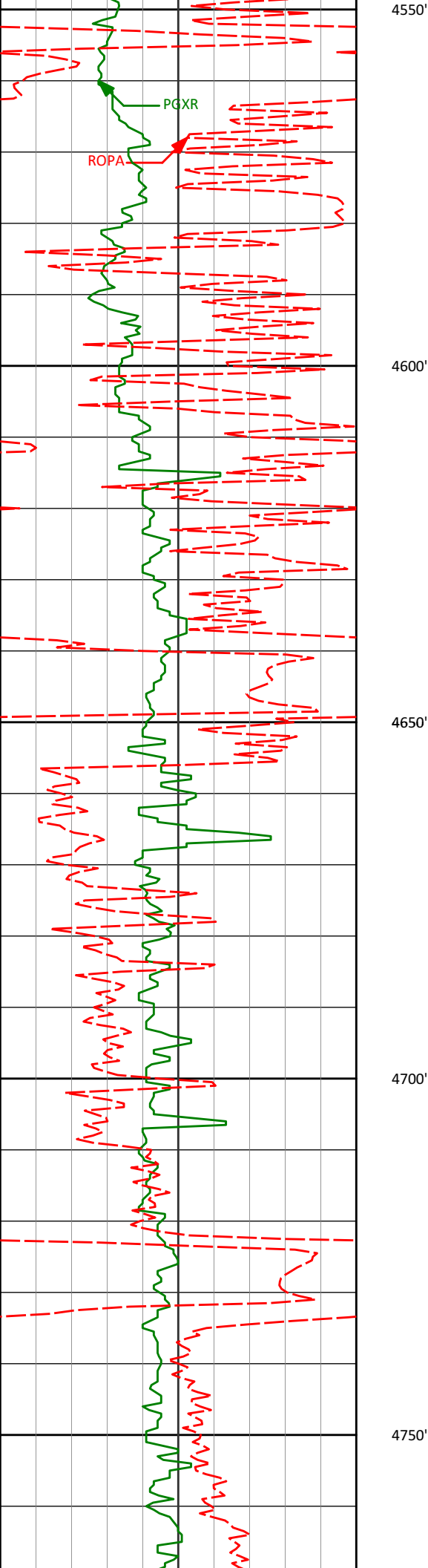
4503'

10.23°

86.67°

4489.38'

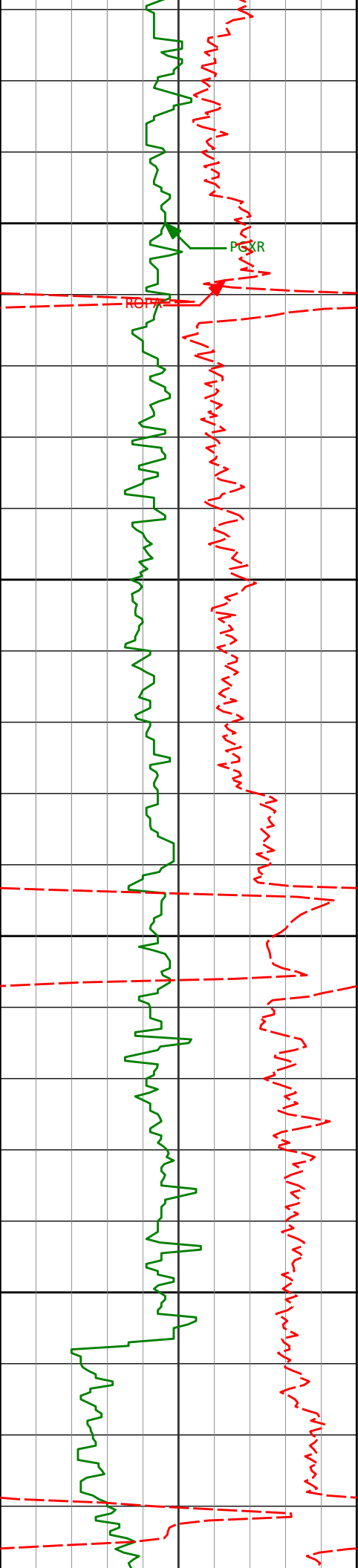
12.12'



4589'	9.74°	86.02°	4574.07'	11.17'
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4674'	10.11°	94.09°	4657.81'	11.20'
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4760'	9.92°	95.54°	4742.50'	12.45'
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4800'

4846'

9.33°

96.23°

4827.29'

13.93'

4850'

4900'

4931'

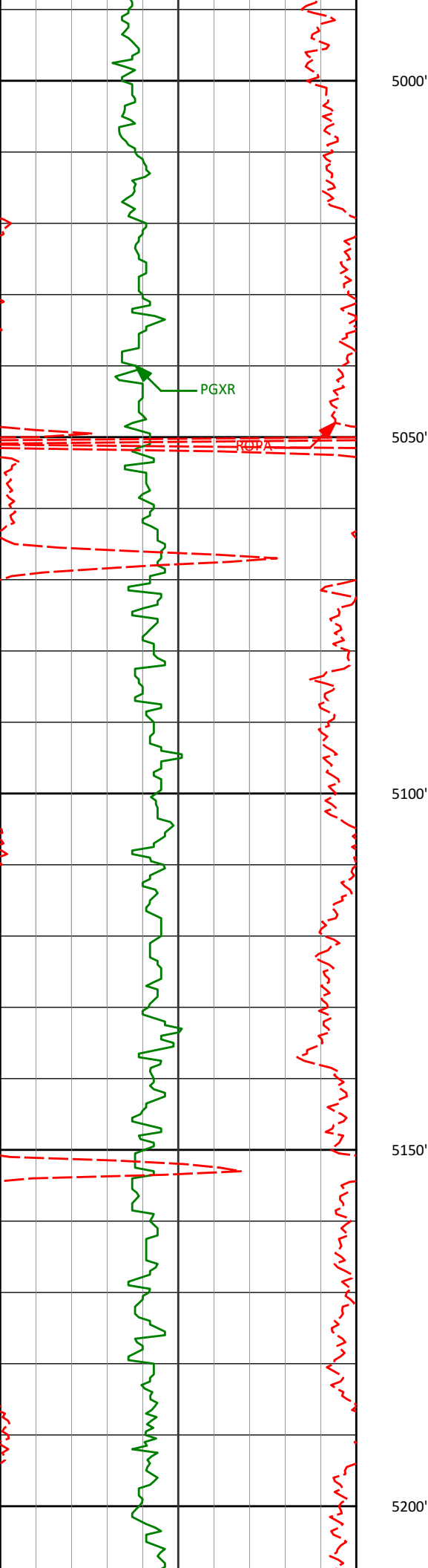
10.99°

87.90°

4910.95'

14.38'

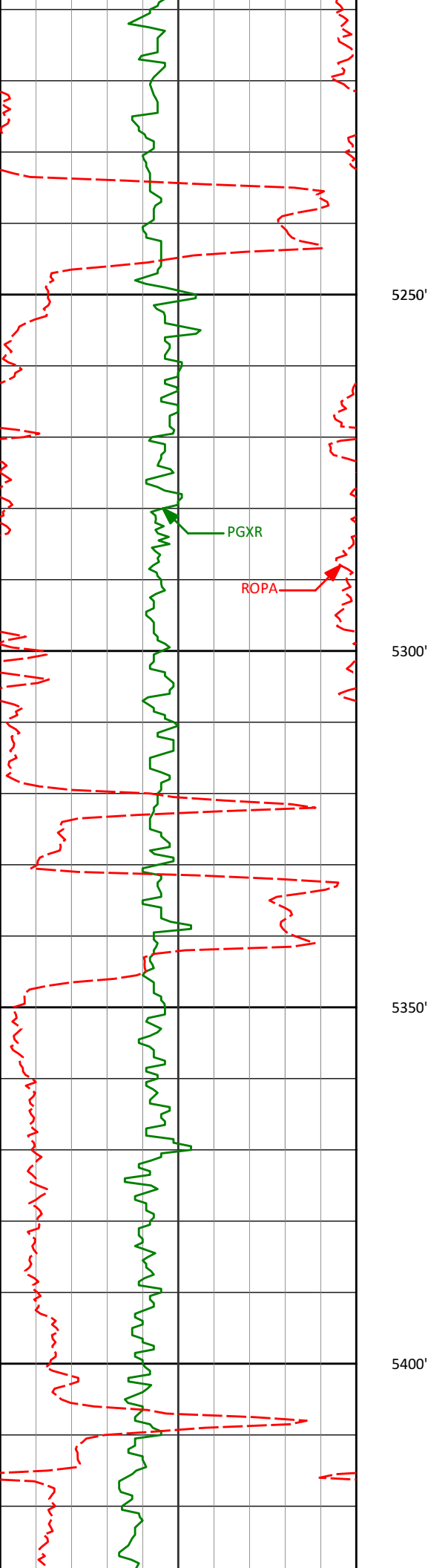
4950'



5017'	11.16°	86.79°	4995.35'	13.61'
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5102'	10.30°	86.48°	5078.87'	12.68'
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5188'	9.31°	85.16°	5163.61'	11.62'
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5274'

8.87°

85.50°

5248.53'

10.52'

5250'

5300'

5350'

5359'

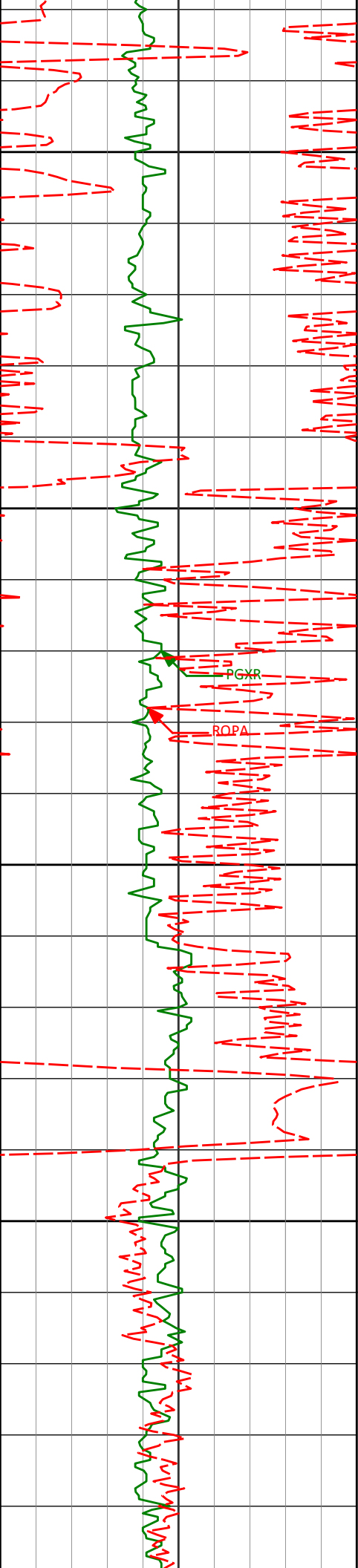
7.98°

91.59°

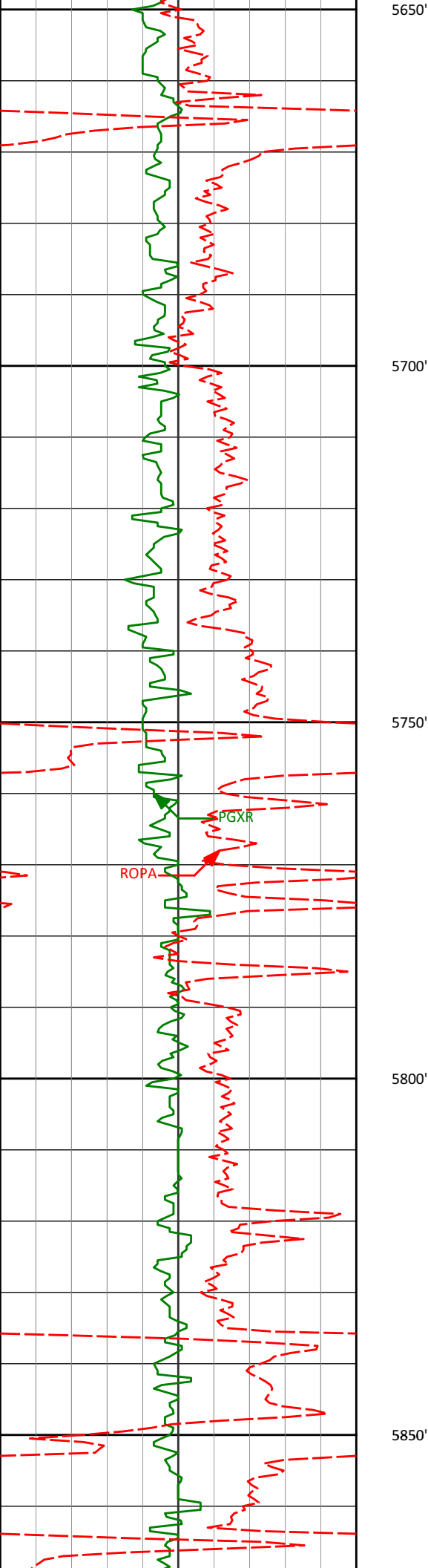
5332.61'

10.17'

5400'



5444'	7.43°	89.91°	5416.84'	10.32'
5450'				
5500'				
5530'	6.66°	87.37°	5502.19'	10.08'
5550'				
5600'				
5616'	7.13°	91.66°	5587.57'	10.01'



5702'

6.08°

88.21°

5673.00'

10.02'

5650'

5700'

5750'

PGXR

ROPA

5787'

5.17°

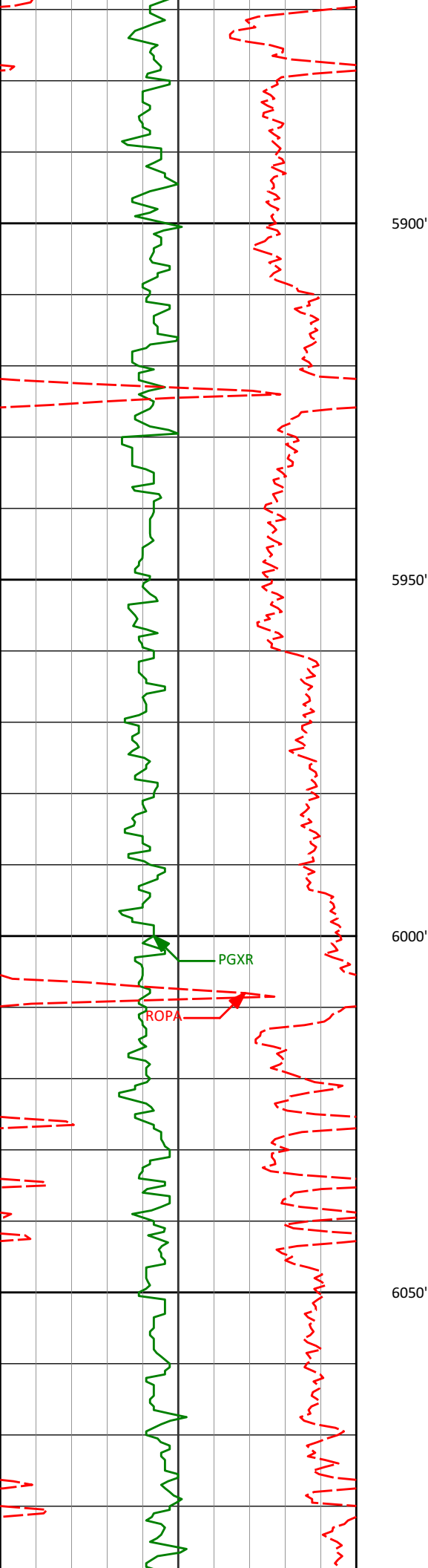
86.38°

5757.59'

9.64'

5800'

5850'



5873'

5.17°

98.51°

5843.24'

9.97'

5900'

5950'

5959'

3.97°

96.17°

5928.97'

10.86'

6000'

6044'

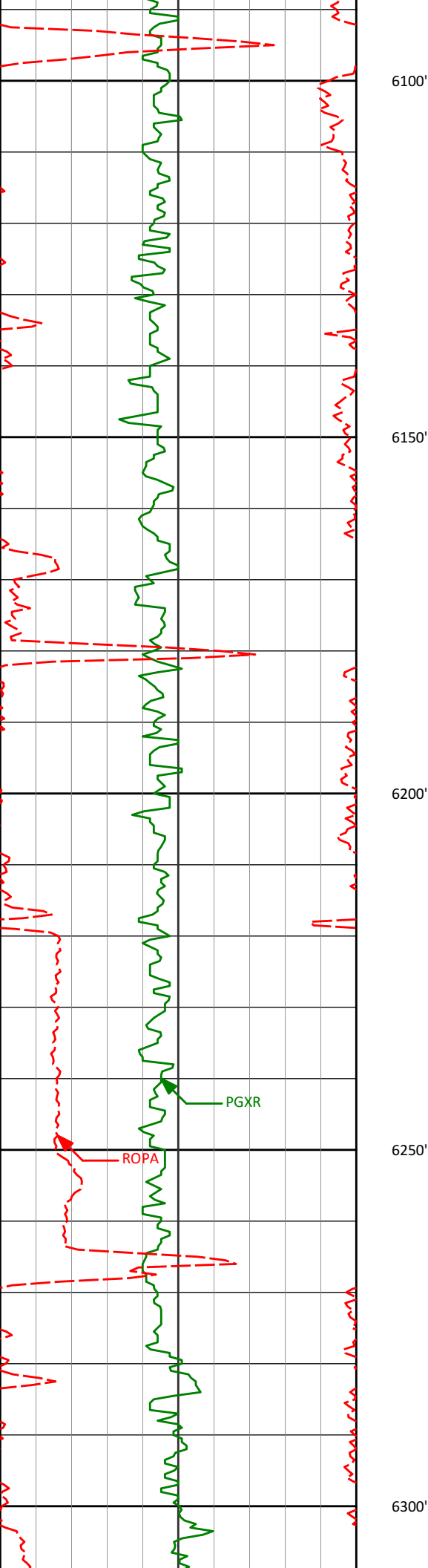
3.12°

88.13°

6013.81'

11.10'

6050'



6130'

2.33°

92.22°

6099.71'

11.09'

6216'

1.53°

90.38°

6185.66'

11.17'

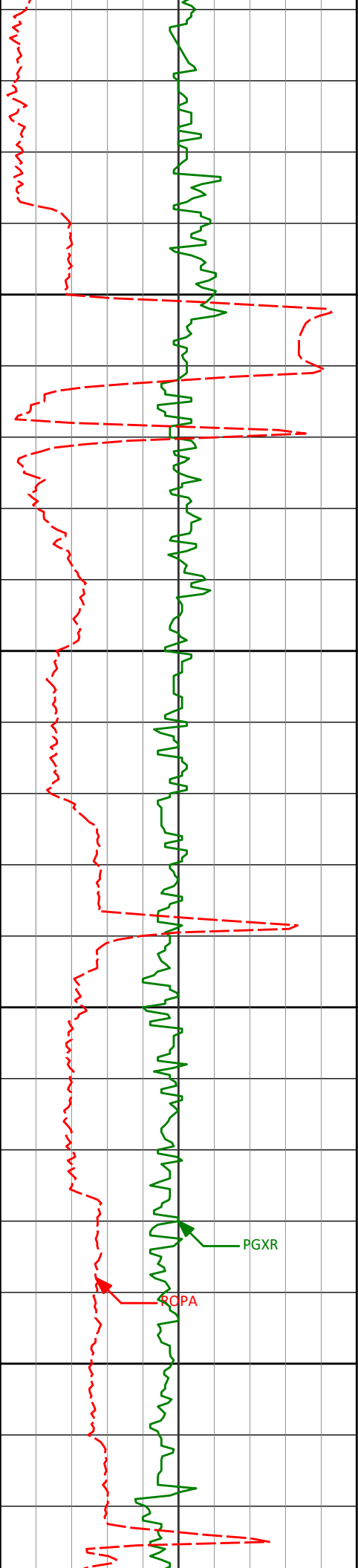
6302'

1.22°

87.51°

6271.63'

11.14'



6350'

6387'

0.99°

337.69°

6356.63'

10.42'

6400'

6450'

6473'

0.65°

349.49°

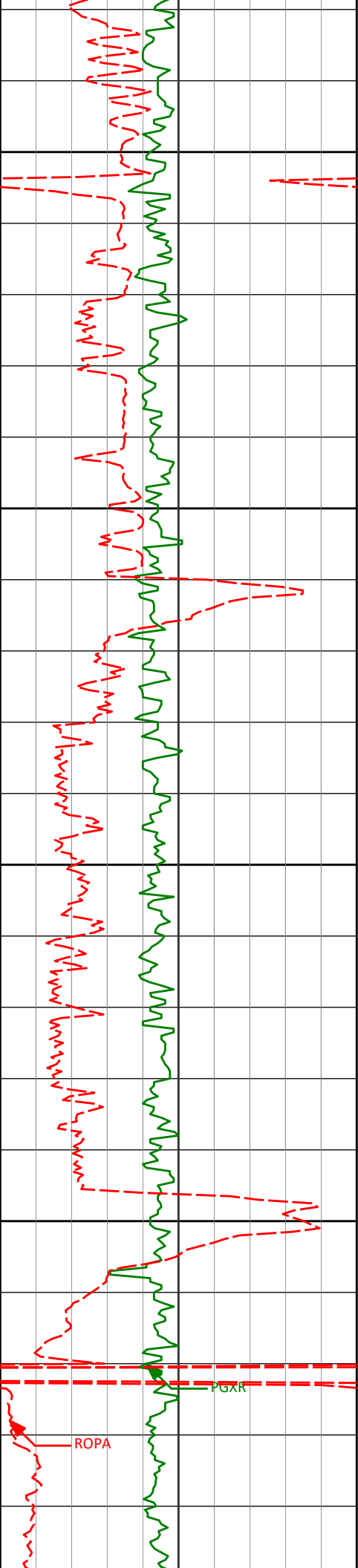
6442.62'

9.25'

6500'

PGXR

ROPA



6550'

6559'

0.48°

346.59°

6528.61'

8.42'

6600'

6645'

0.57°

330.60°

6614.61'

7.70'

6650'

6700'

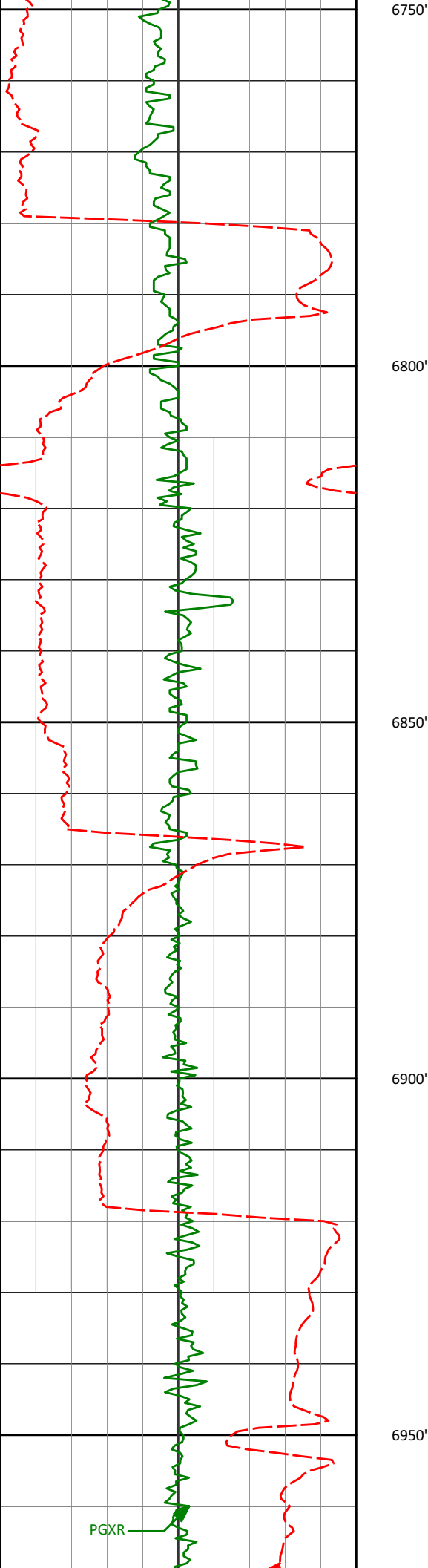
6730'

0.63°

337.51°

6699.60'

6.90'



6816'

0.67°

125.07°

6785.60'

6.75'

6902'

0.57°

107.25°

6871.60'

7.17'

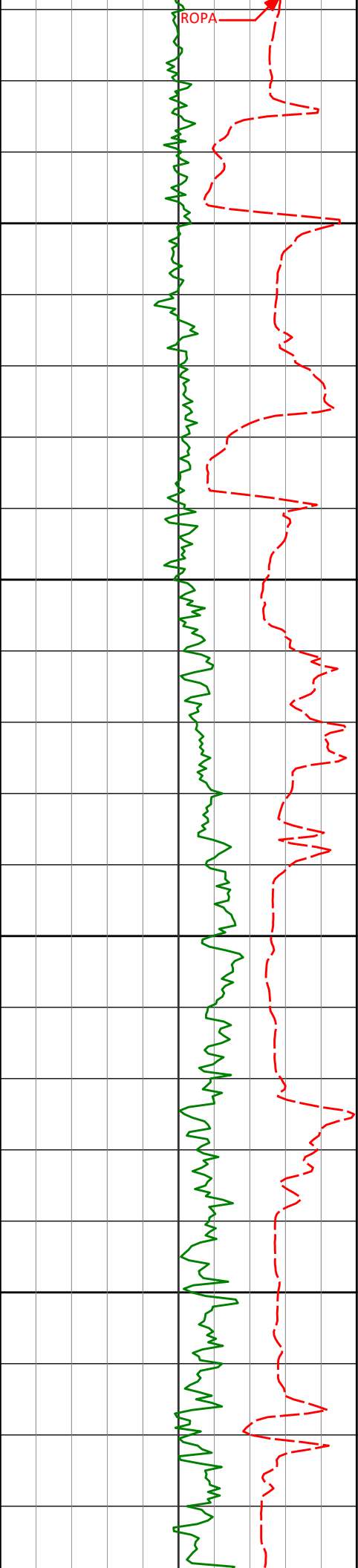
6945'

4.01°

164.03°

6914.56'

8.68'



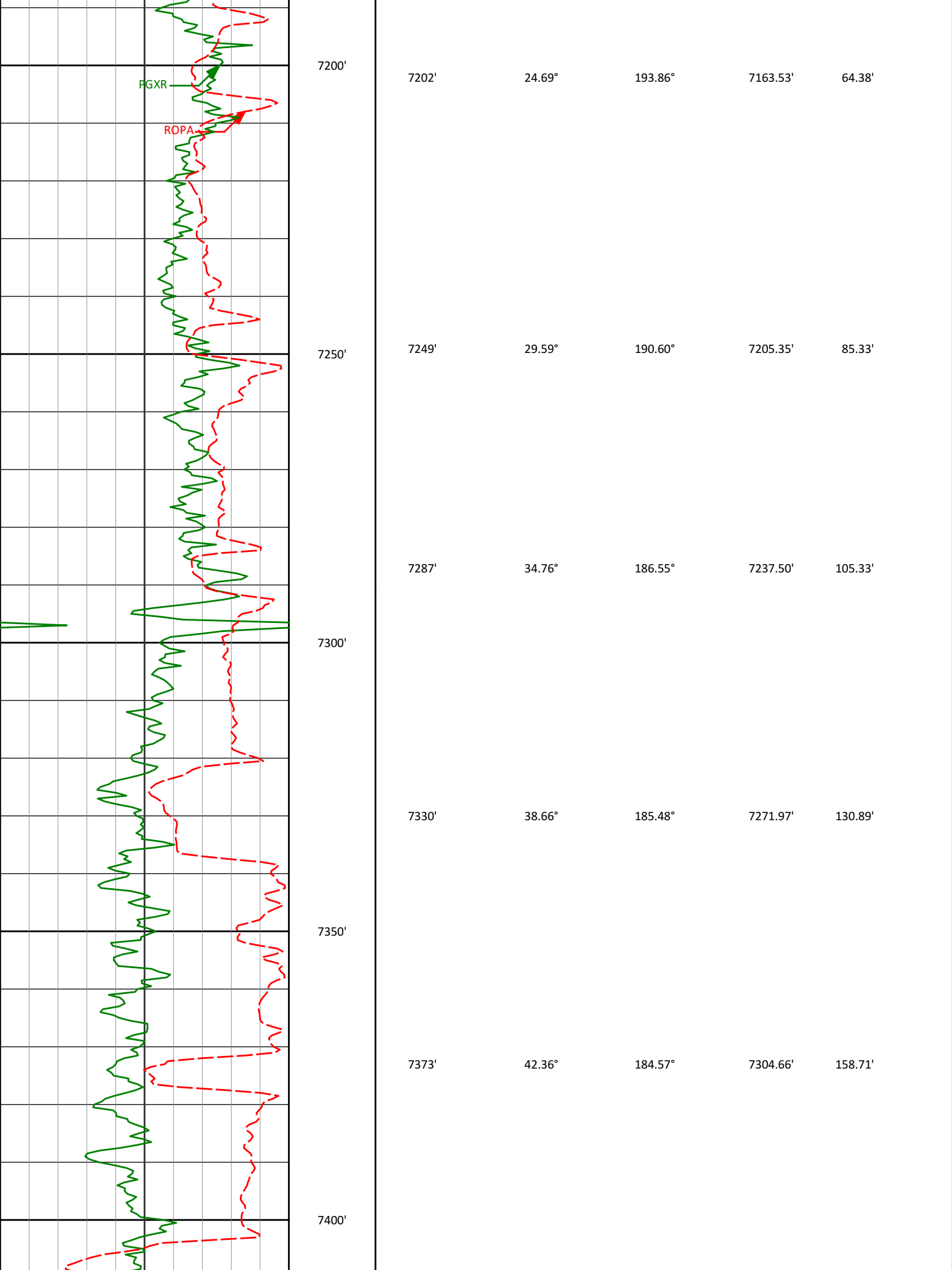
7000'

7050'

7100'

7150'

6987'	7.90°	180.09°	6956.33'	12.98'
7030'	9.72°	189.82°	6998.82'	19.51'
7073'	11.02°	199.76°	7041.12'	26.95'
7116'	14.77°	203.77°	7083.03'	35.84'
7159'	21.09°	197.12°	7123.92'	48.27'





7450'

7500'

7550'

7600'

7416'

46.42°

183.32°

7335.38'

188.71'

7459'

51.50°

181.17°

7363.60'

221.11'

7501'

56.74°

179.88°

7388.21'

255.12'

7544'

60.28°

178.02°

7410.67'

291.78'

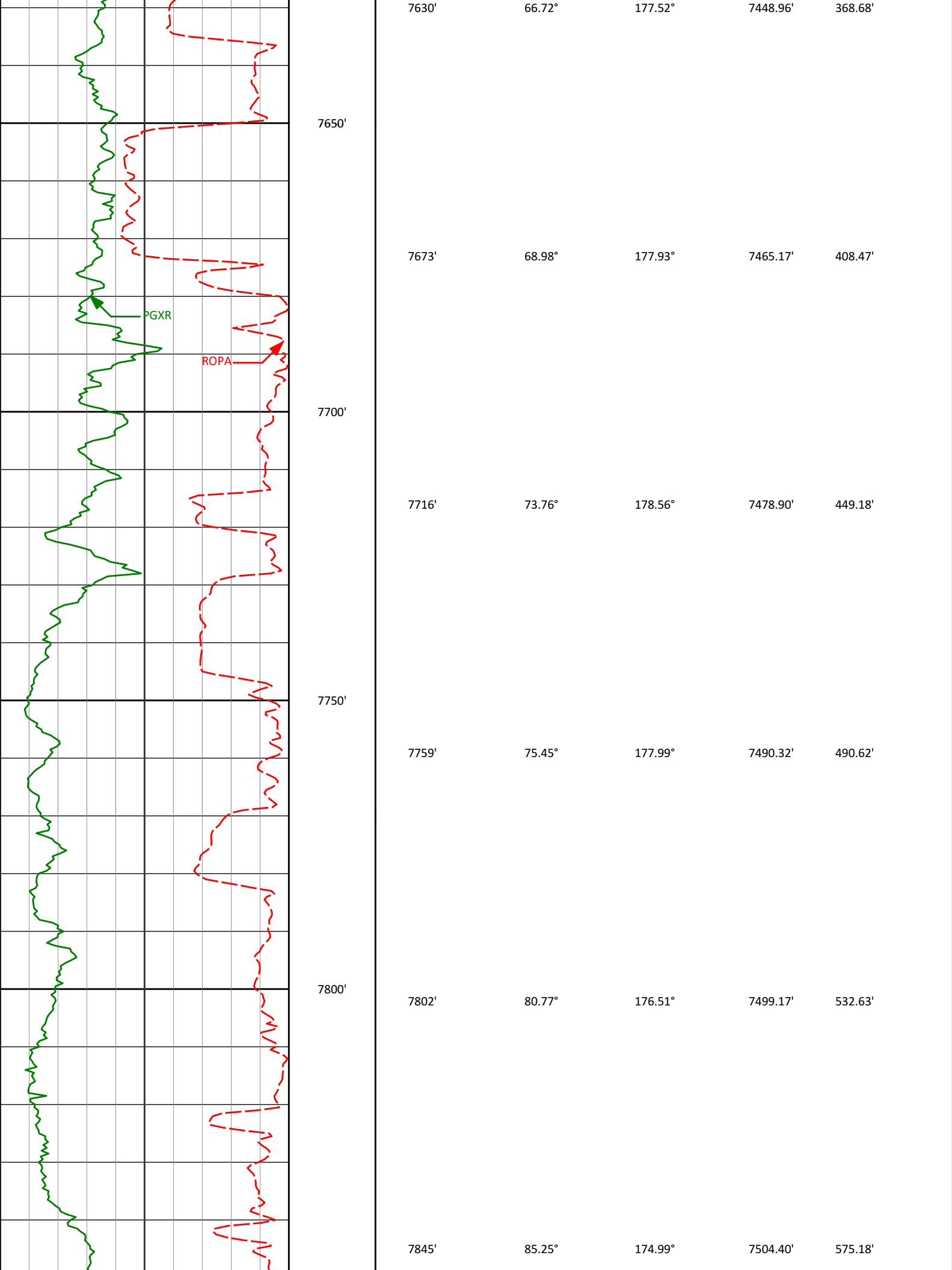
7587'

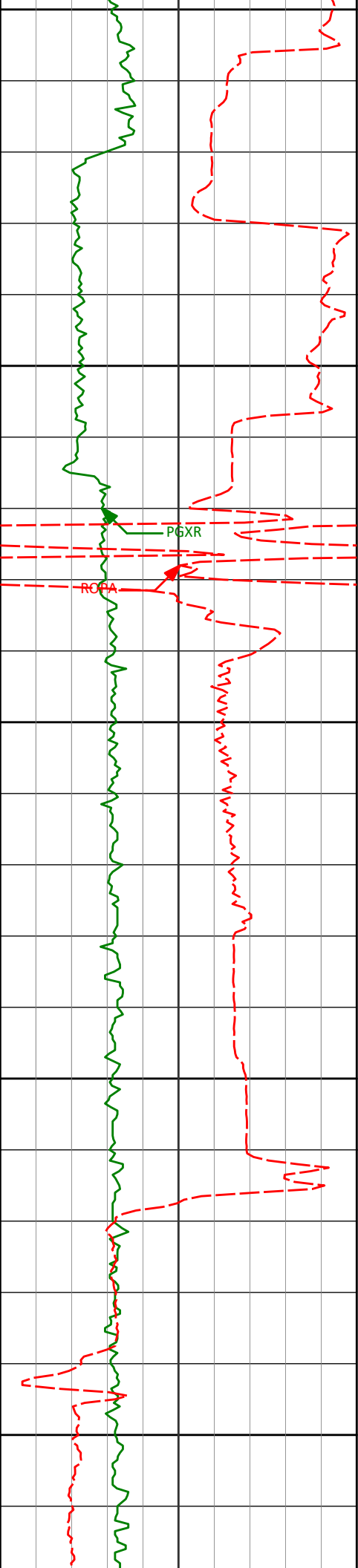
63.60°


177.73°

7430.90'

329.69'





 Casing @ 7911' MD

Run 200

7873'

86.52°

175.25°

7506.41'

603.01'

7900'

7950'

7957'

89.32°

176.92°

7509.46'

686.75'

8000'

8043'

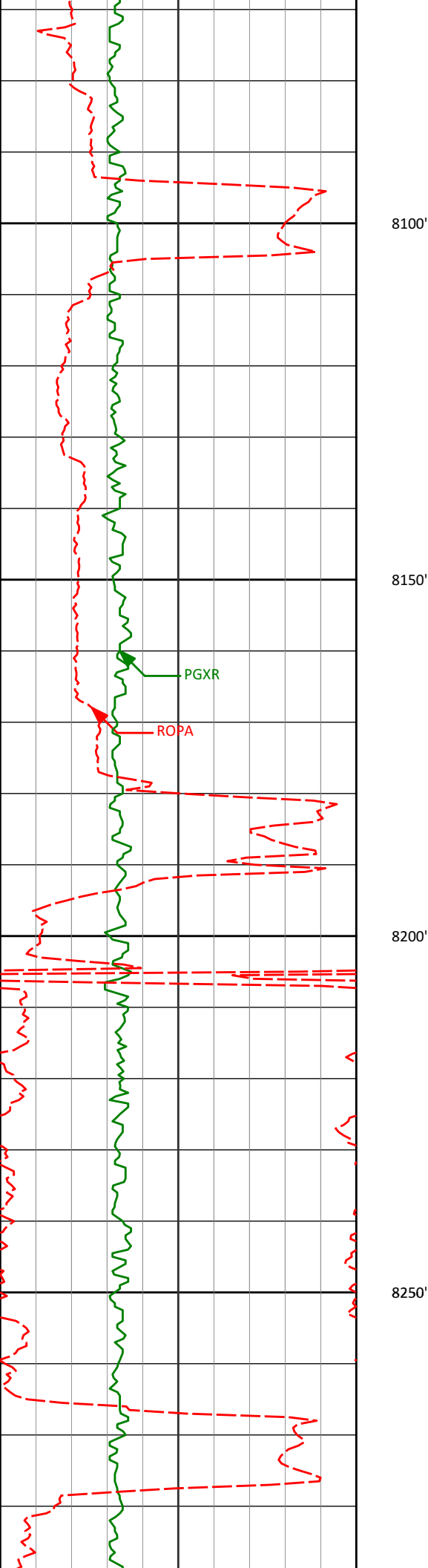
89.20°

177.40°

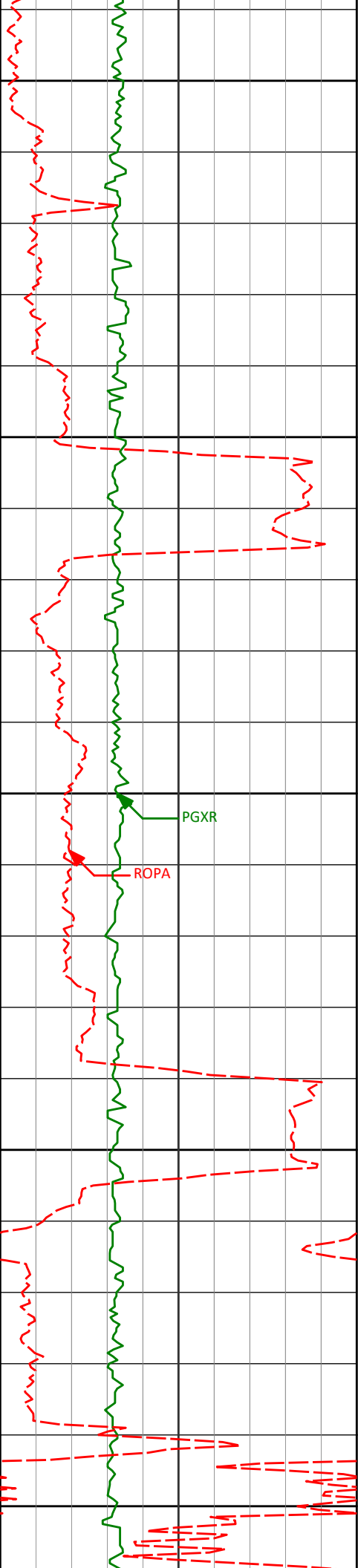
7510.57'

772.63'

8050'



8129'	90.18°	177.01°	7511.04'	858.53'
8215'	89.85°	176.69°	7511.02'	944.40'



8300'

8300'

90.31°

177.51°

7510.90'

1029.29'

8350'

8386'

90.34°

178.23°

7510.41'

1115.23'

8400'

PGXR

ROPA

8450'

8471'

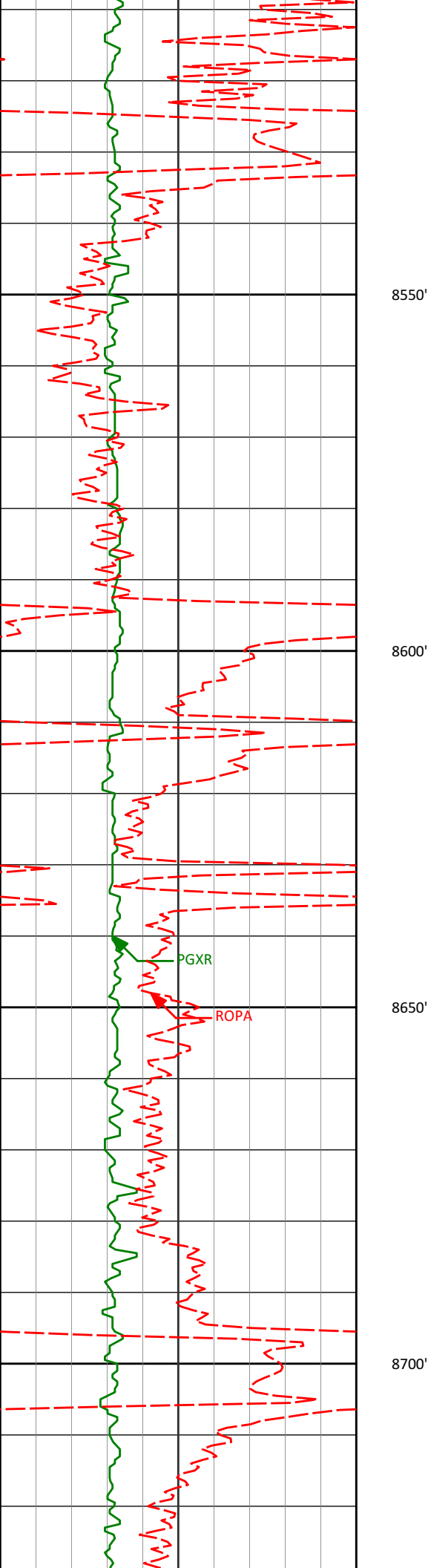
91.02°

180.41°

7509.40'

1200.21'

8500'



8550'

8557'

90.80°

180.89°

7508.03'

1286.19'

8600'

8643'

89.45°

179.49°

7507.85'

1372.19'

8650'

8700'

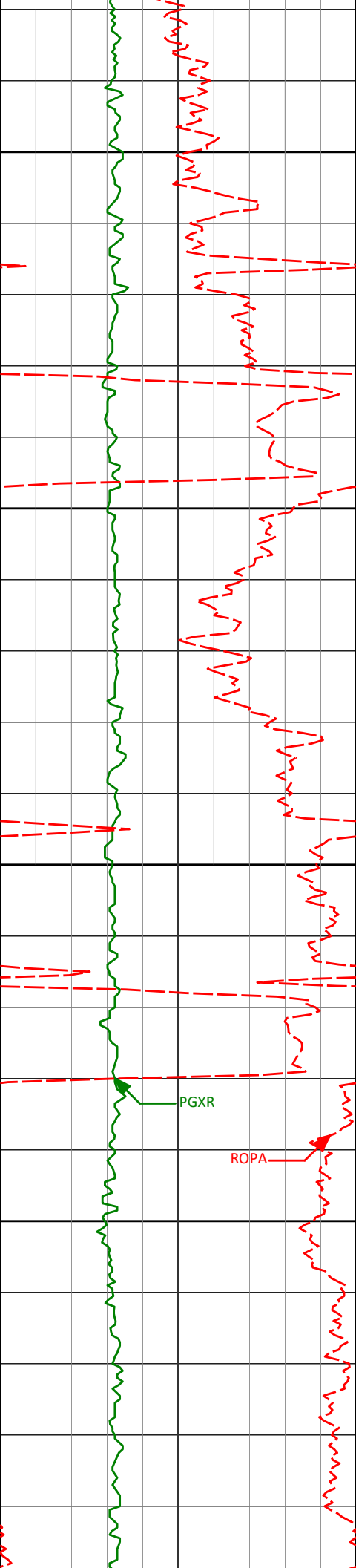
8723'

89.62°

179.44°

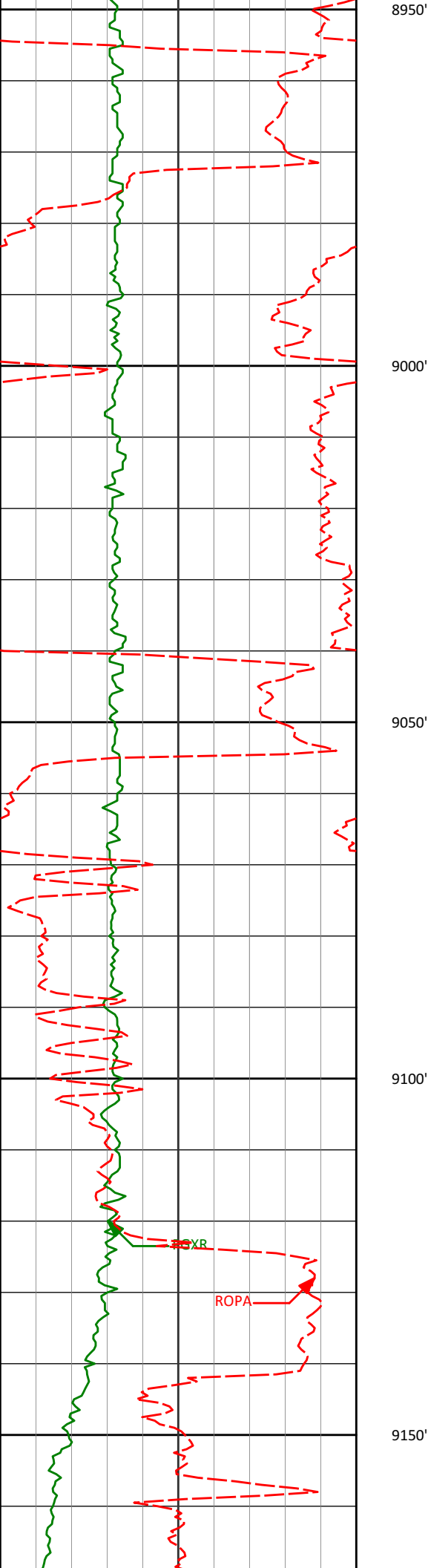
7509.16'

1459.19'



The image displays a 3D visualization of a 5x5 grid of points. The points are colored in a gradient from blue to red. The axes are labeled with values: the vertical axis (y-axis) ranges from 8750' to 8900', the horizontal axis (x-axis) ranges from 8729' to 8900', and the depth axis (z-axis) ranges from 1458.18' to 1629.17'. The points are arranged in a regular grid pattern.

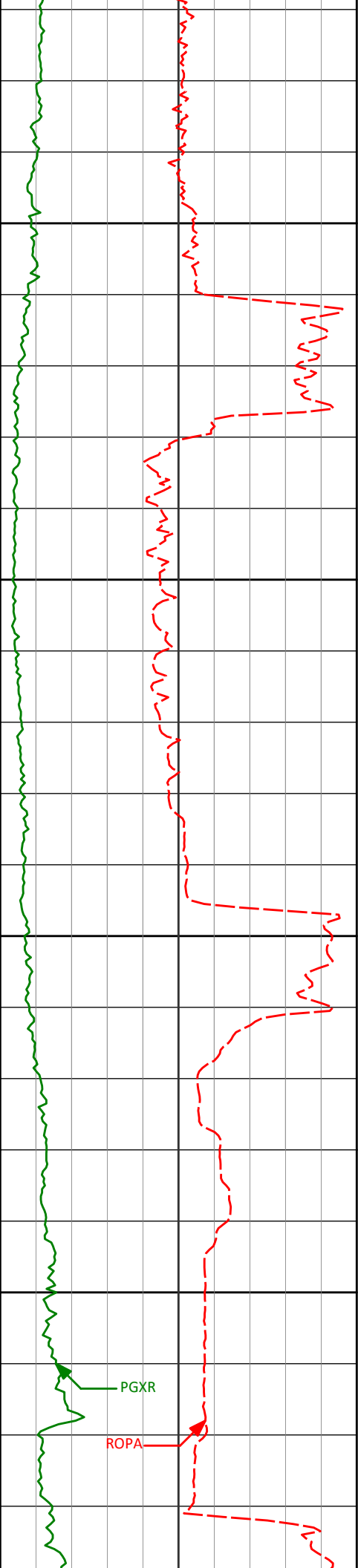
Y-axis (Vertical)	X-axis (Horizontal)	Z-axis (Depth)
8750'	8729'	1458.18'
8750'	8814'	1543.18'
8750'	8899'	1629.17'
8800'	8729'	1458.18'
8800'	8814'	1543.18'
8800'	8899'	1629.17'
8850'	8729'	1458.18'
8850'	8814'	1543.18'
8850'	8899'	1629.17'
8900'	8729'	1458.18'
8900'	8814'	1543.18'
8900'	8899'	1629.17'



8986' 89.45° 180.14° 7510.25' 1715.16'

9071' 90.40° 179.38° 7510.36' 1800.16'

9157' 90.34° 179.82° 7509.80' 1886.16'



9200'

9242'

90.68°

181.14°

7509.05'

1971.15'

9250'

9300'

9328'

90.96°

181.27°

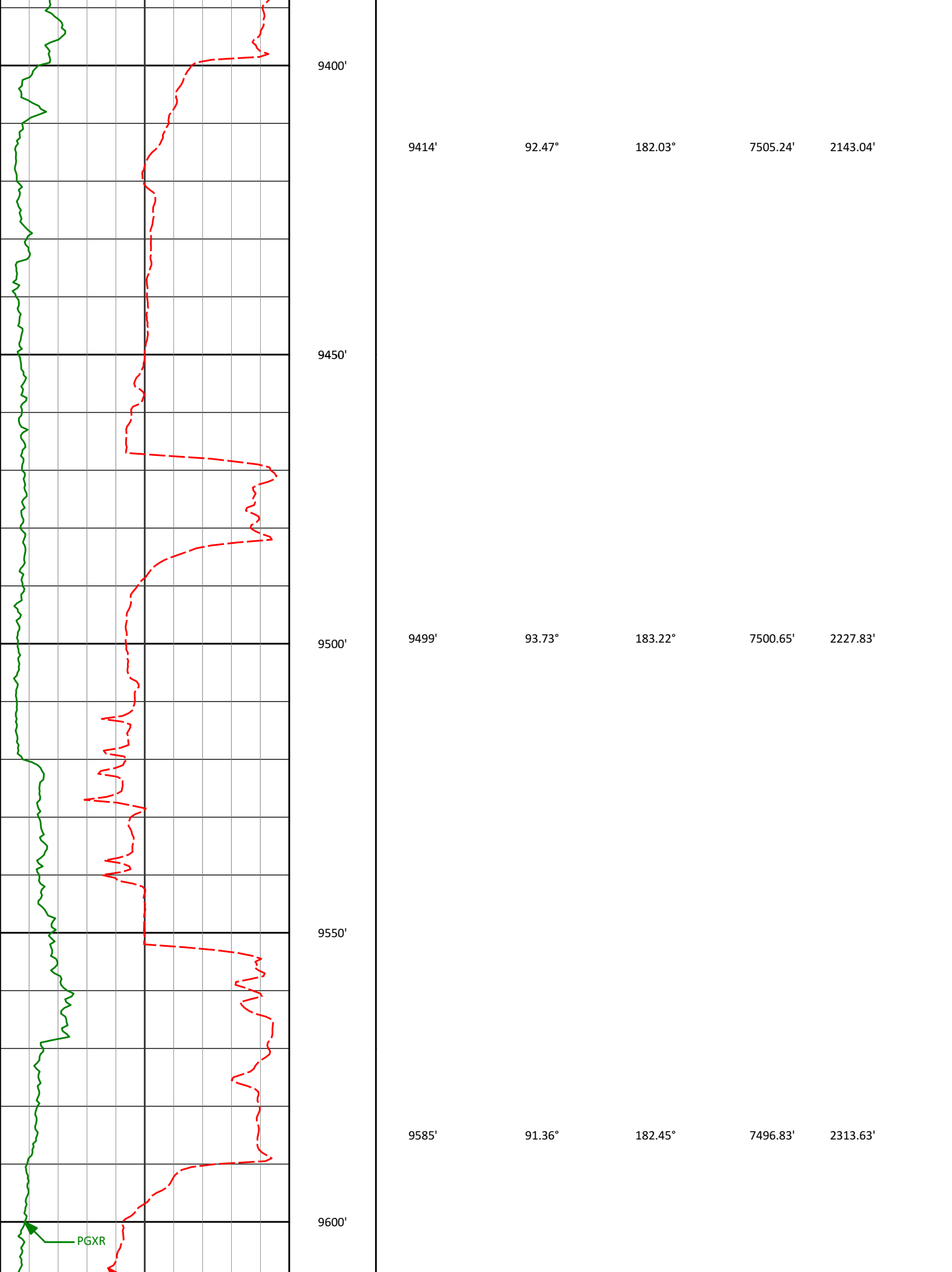
7507.82'

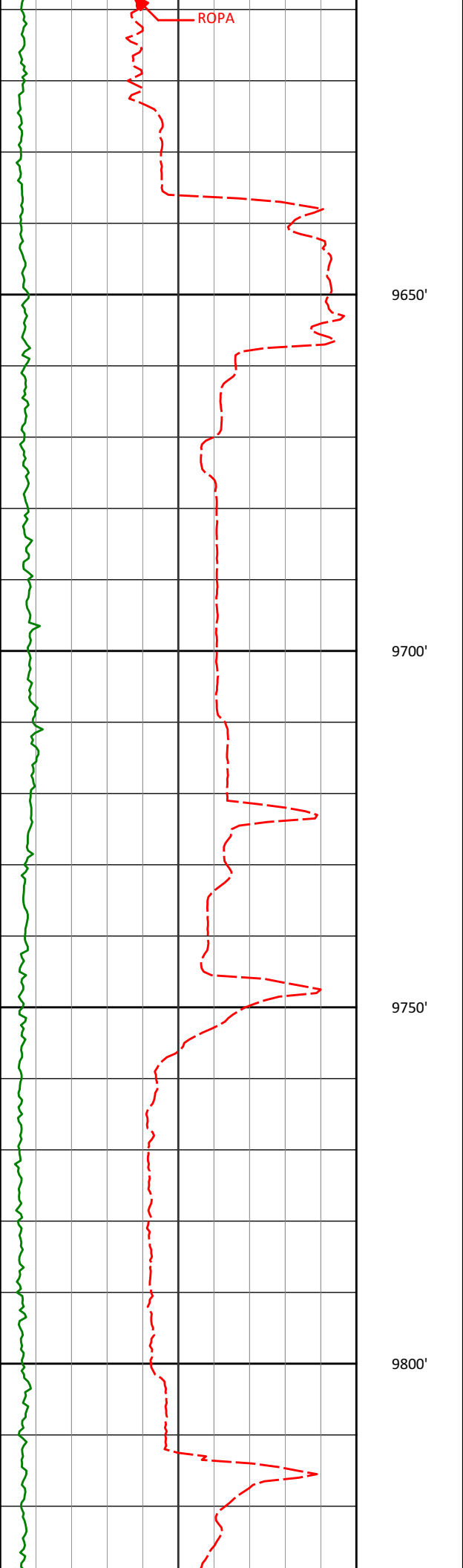
2057.12'

9350'

PGXR

ROPA





9671'

89.72°

182.32°

7496.02'

2399.55'

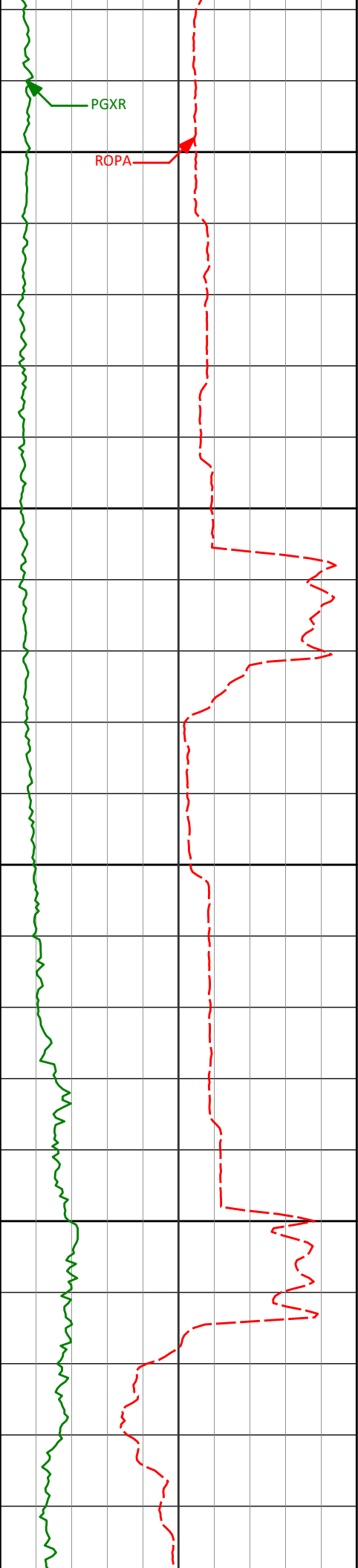
9763'

89.01°

181.79°

7497.04'

2491.48'



9850'

9854'

89.94°

180.60°

7497.87'

2582.46'

9900'

9950'

9946'

89.11°

180.14°

7498.63'

2674.45'

10000'

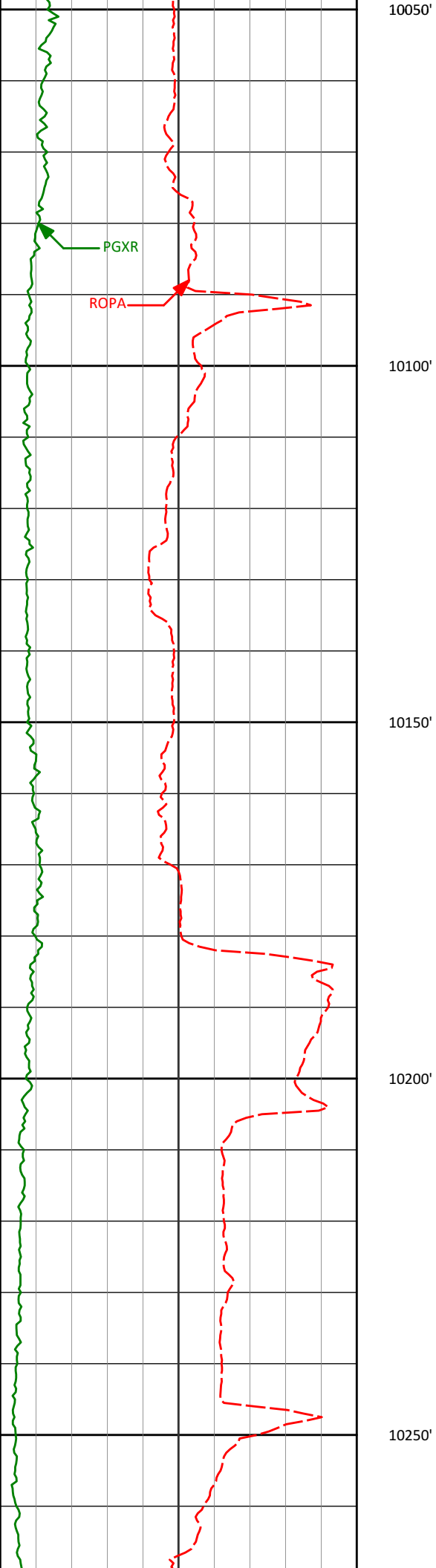
10038'

88.27°

180.67°

7500.74'

2766.42'



10050'

PGXR

ROPA

10100'

10131'

90.15°

181.29°

7502.02'

2859.40'

10150'

10200'

10223'

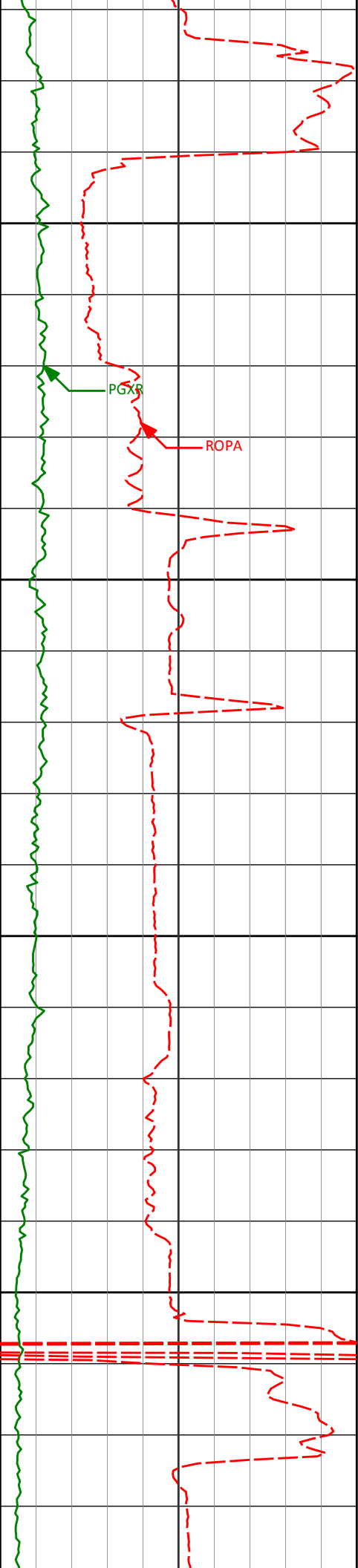
86.64°

178.91°

7504.60'

2951.34'

10250'



10300'

10315'

88.67°

178.60°

7508.36'

3043.24'

PGXR

ROPA

10350'

10400'

10407'

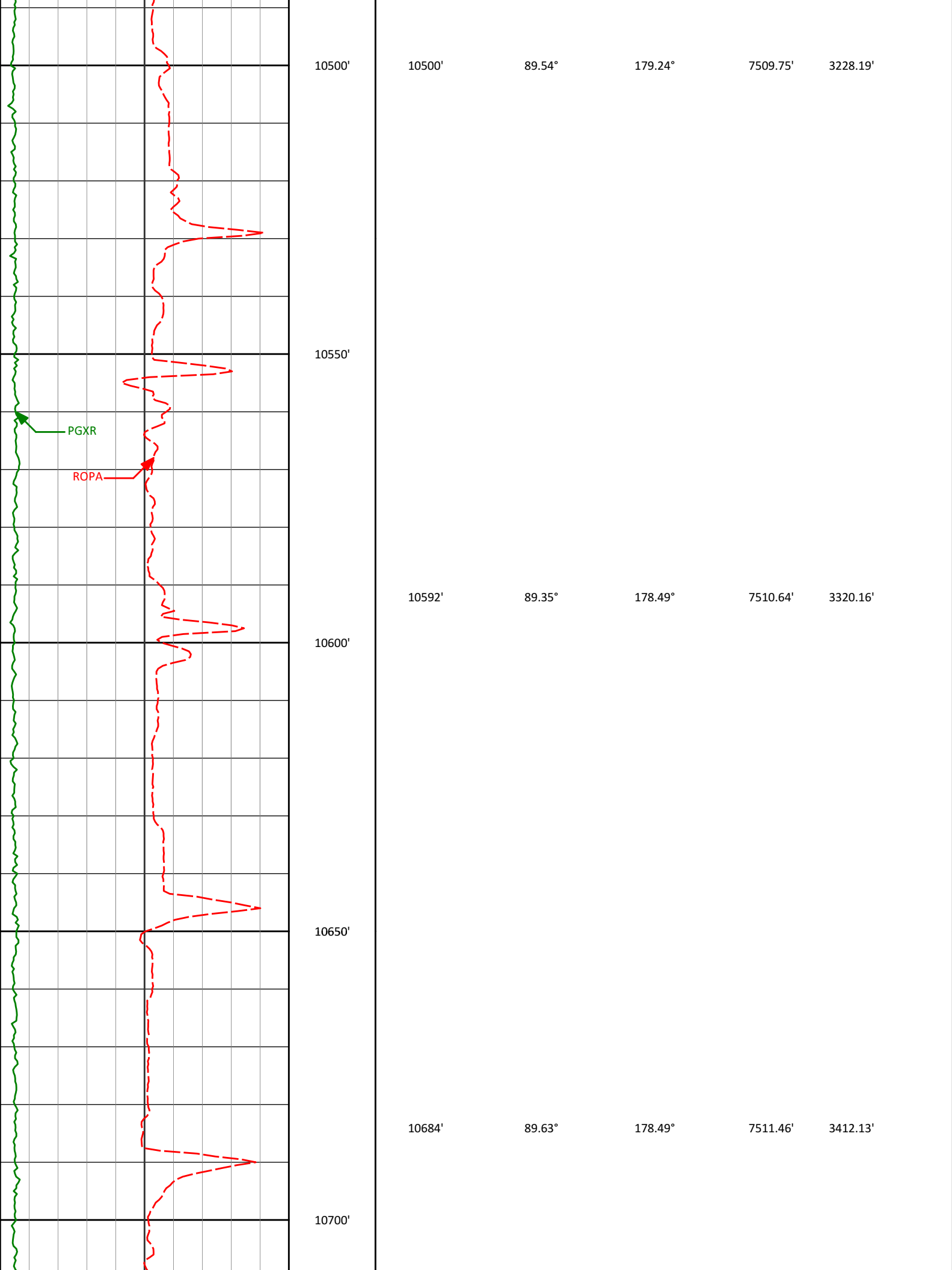
90.03°

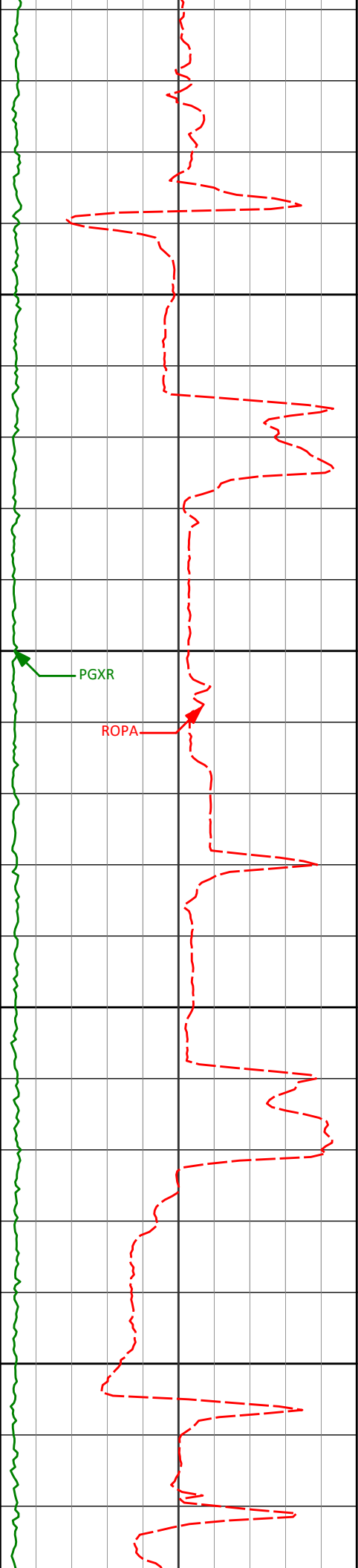
178.69°

7509.40'

3135.20'

10450'





10750'

10776'

90.03°

180.21°

7511.74'

3504.12'

10800'

PGXR

ROPA

10850'

10867'

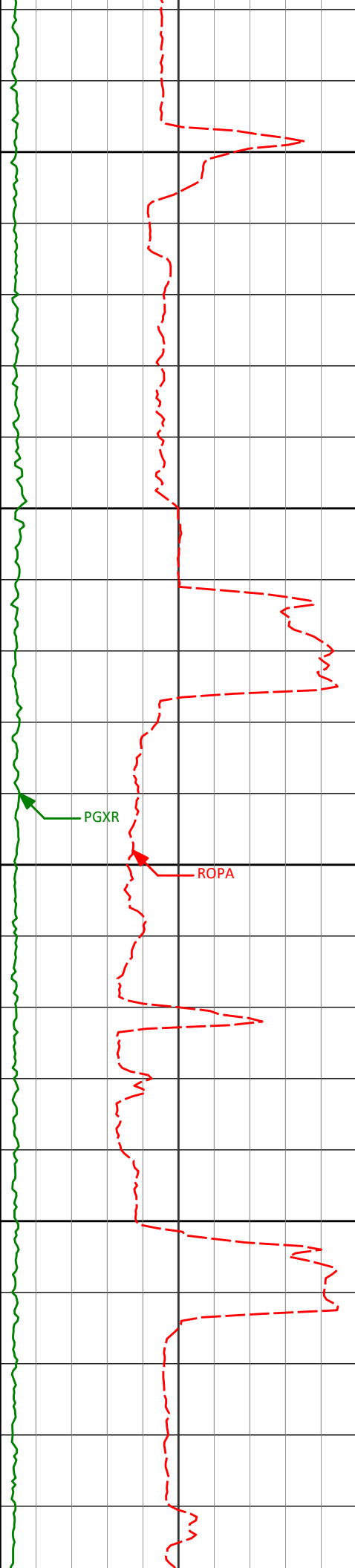
90.19°

179.54°

7511.56'

3595.12'

10900'



10950'

10958'

89.63°

179.26°

7511.70'

3686.11'

11000'

11050'

11050'

90.46°

179.66°

7511.63'

3778.11'

11100'

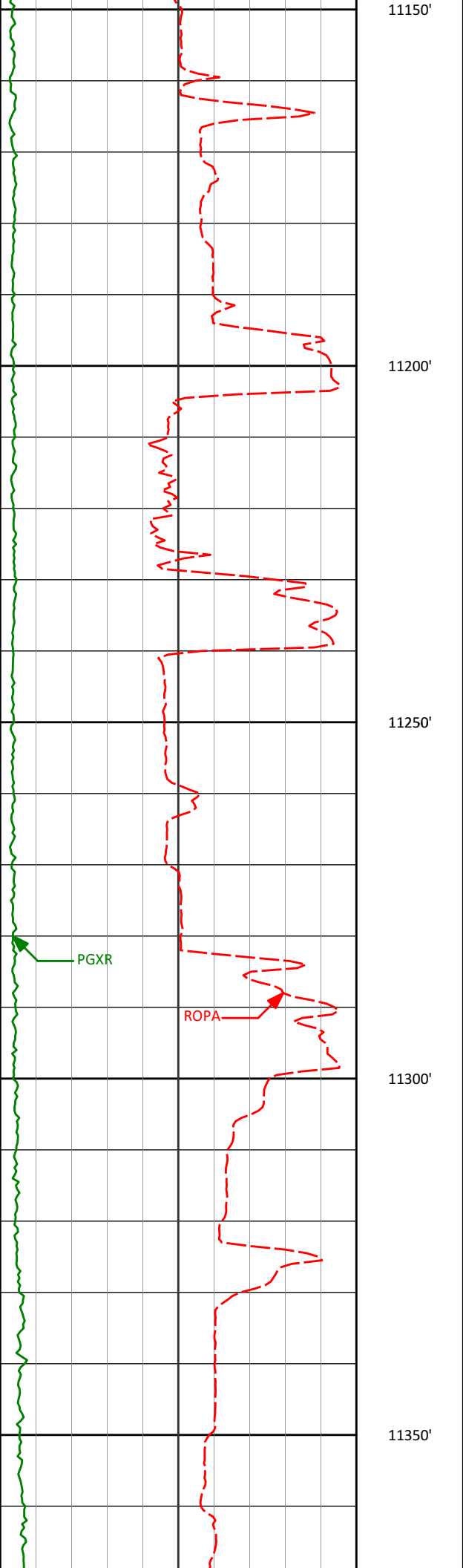
11140'

90.40°

178.72°

7510.96'

3868.09'



11231'

90.59°

179.05°

7510.17'

3959.07'

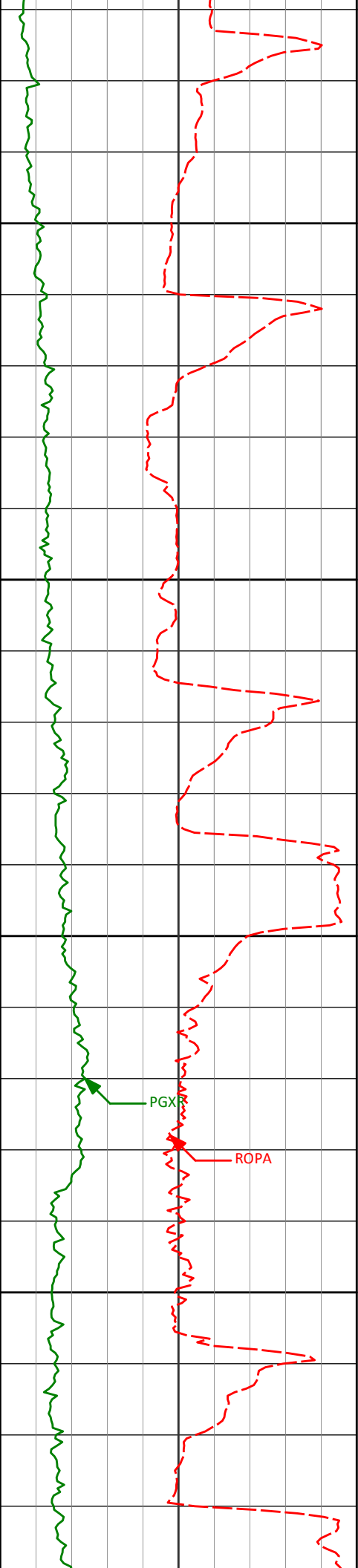
11323'

90.86°

179.51°

7509.01'

4051.06'



11400'

11414'

90.86°

179.24°

7507.64'

4142.04'

11450'

11500'

11505'

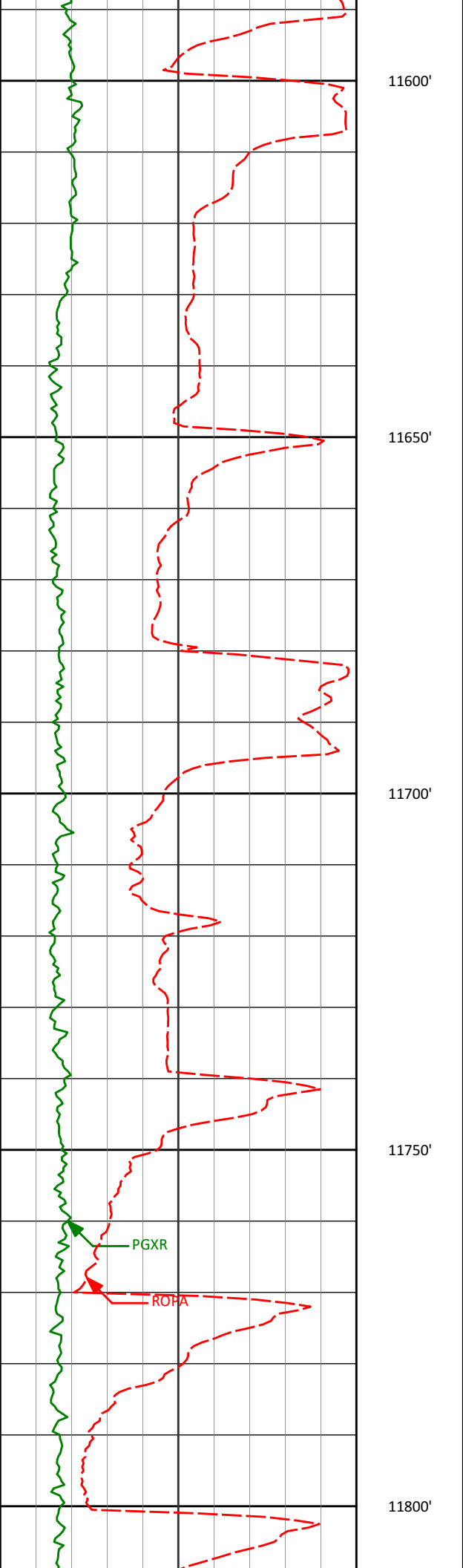
90.55°

180.13°

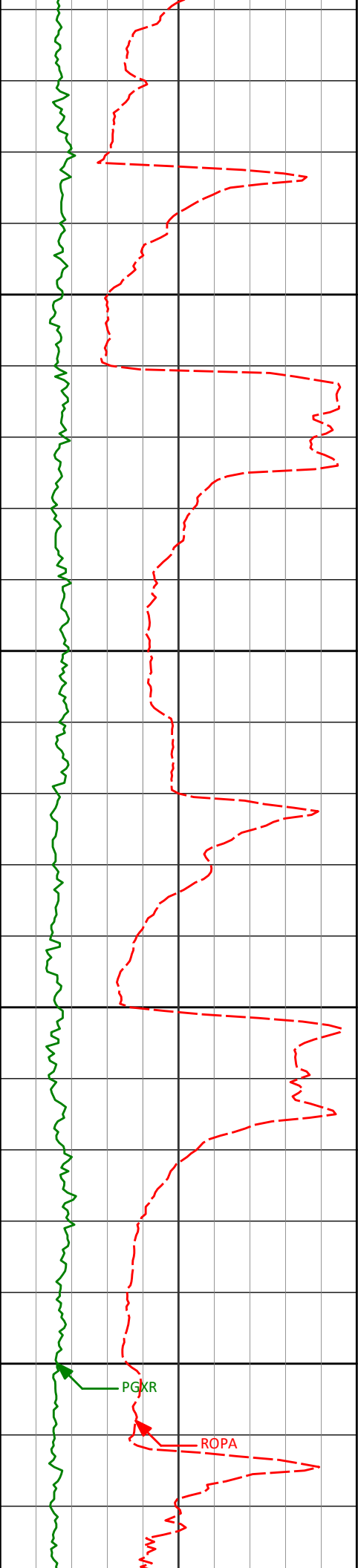
7506.52'

4233.03'

11550'



11596'	88.95°	178.33°	7506.92'	4324.02'
11600'				
11650'				
11688'	90.03°	180.39°	7507.74'	4416.00'
11700'				
11750'				
11779'	90.34°	178.85°	7507.44'	4507.00'
11800'				



11850'

11871'

90.00°

179.12°

7507.17'

4598.98'

11900'

11950'

11962'

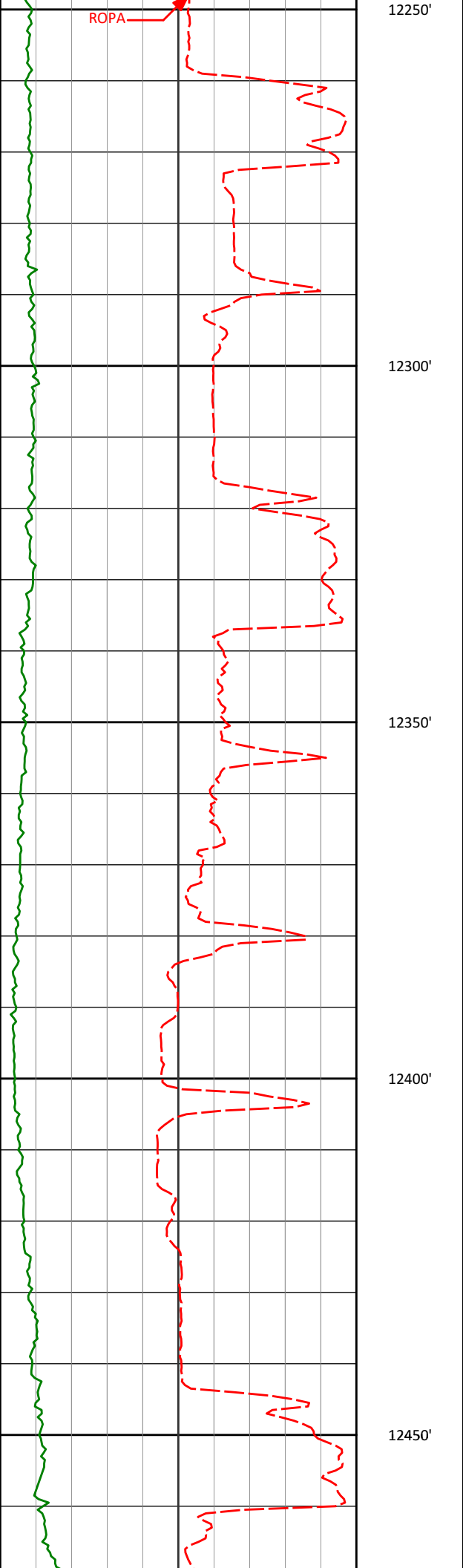
89.11°

179.48°

7507.88'

4689.97'

12000'



12327'

88.24°

182.31°

7516.60'

5054.79'

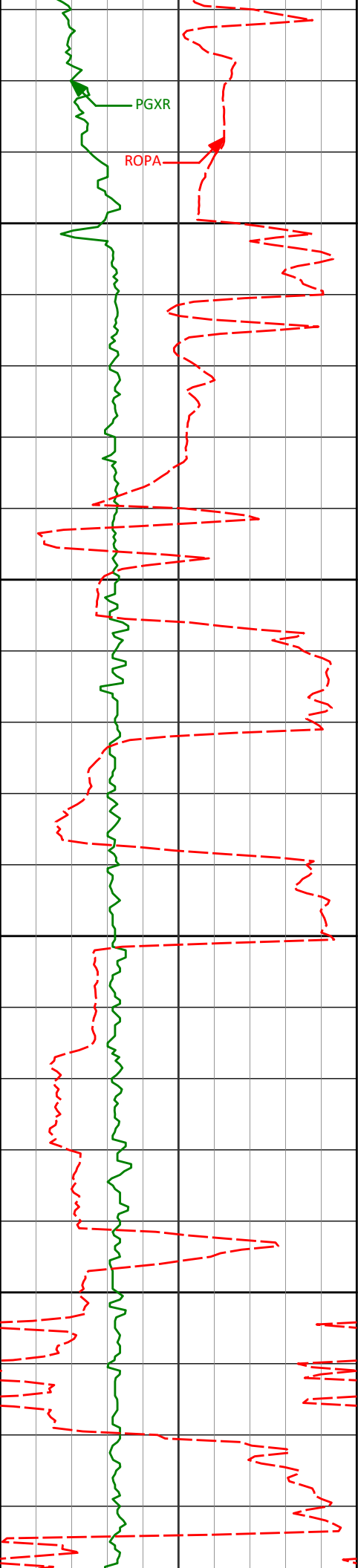
12419'

87.75°

181.59°

7519.82'

5146.68'



12500'

12505'

87.78°

181.59°

7523.17'

5232.58'

12550'

12590'

88.74°

180.96°

7525.75'

5317.52'

12600'

12650'

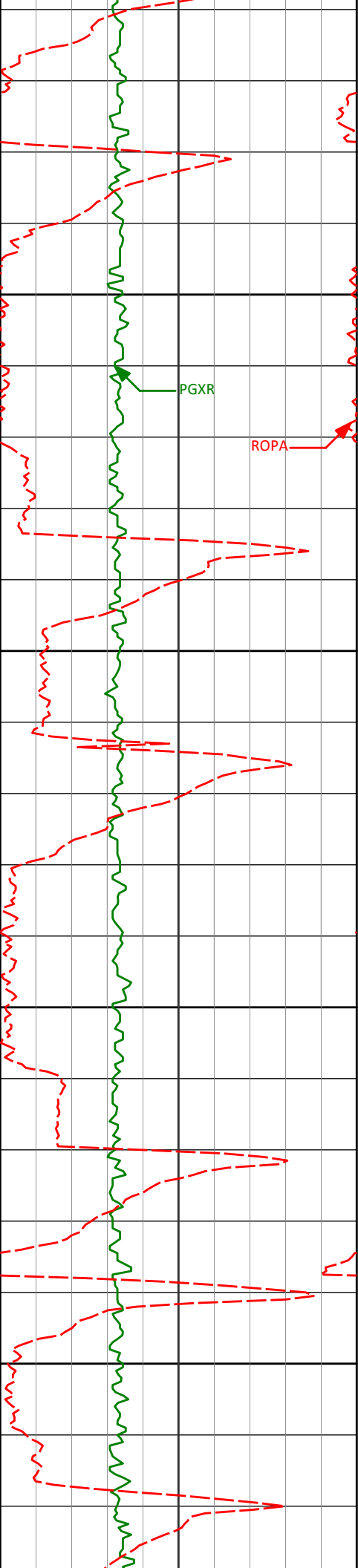
12676'

89.45°

180.68°

7527.11'

5403.50'



12933'

89.45°

179.03°

7527.65'

5660.48'

12950'

PGXR

ROPA

13000'

13019'

90.03°

179.40°

7528.04'

5746.47'

13050'

13100'

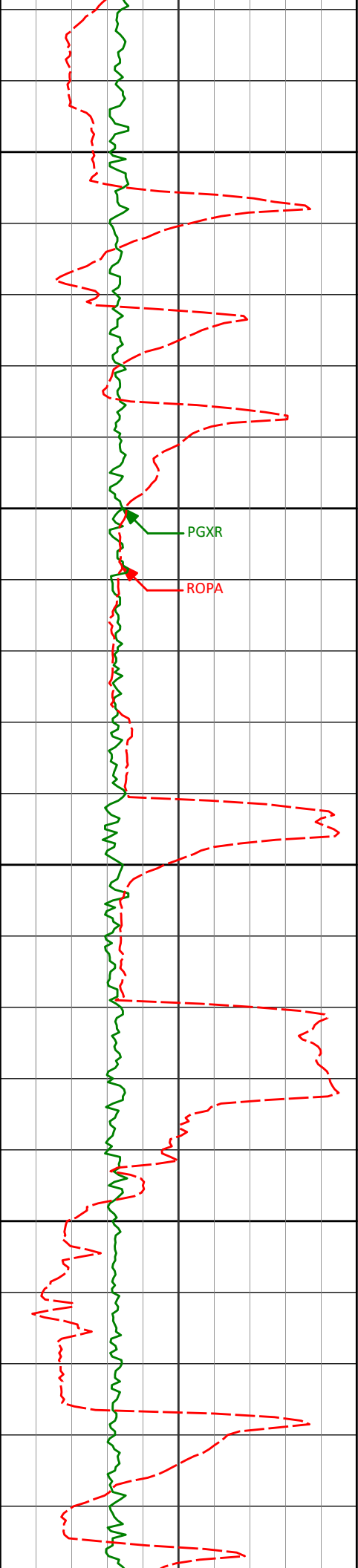
13104'

89.94°

178.23°

7528.06'

5831.45'



13150'

13190'

90.00°

177.49°

7528.11'

5917.39'

13200'

PGXR

ROPA

13250'

13275'

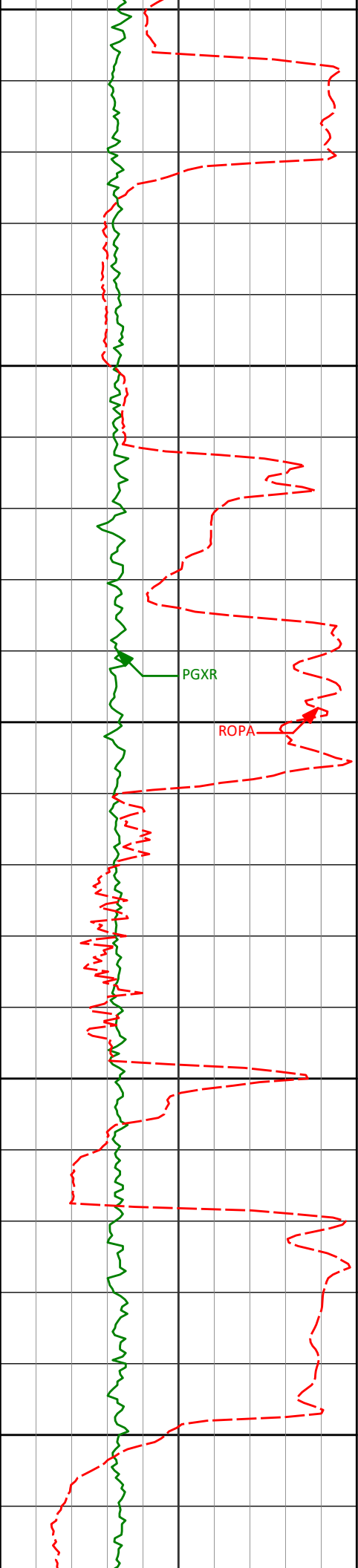
89.88°

177.51°

7528.20'

6002.31'

13300'



13350'

13361'

89.32°

178.74°

7528.80'

6088.26'

13400'

13450'

13447'

89.38°

178.66°

7529.77'

6174.23'

13500'

13532'

88.52°

180.07°

7531.33'

6259.21'

13550'



13600'

13618'

89.29°

181.40°

7532.98'

6345.18'

13650'

13700'

13704'

89.05°

180.78°

7534.22'

6431.16'

13750'

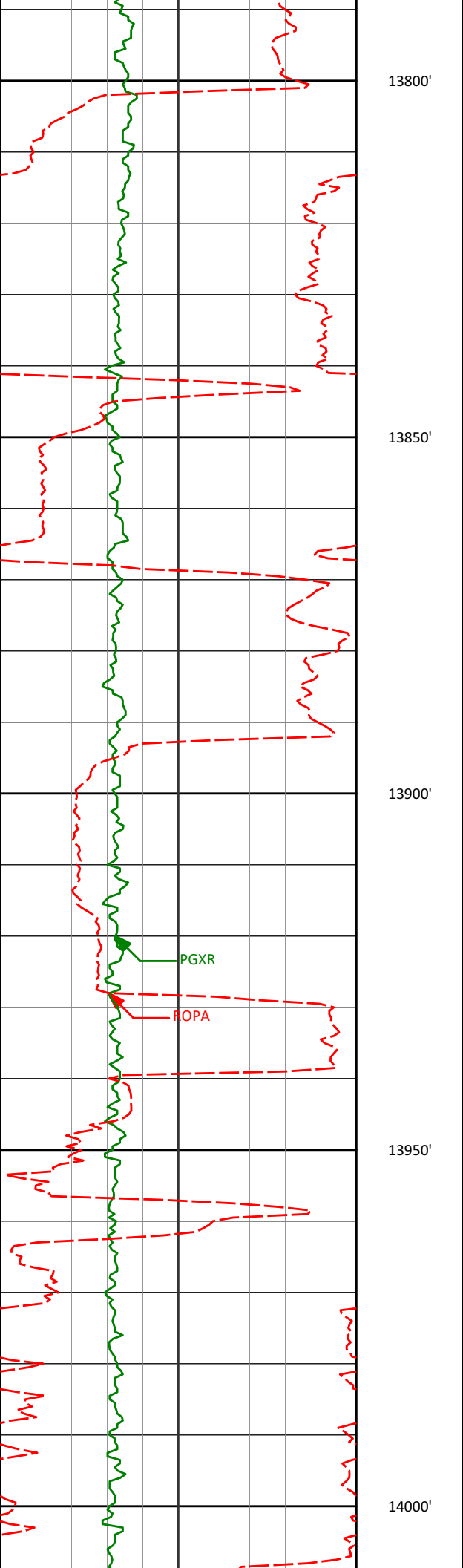
13700'

89.05°

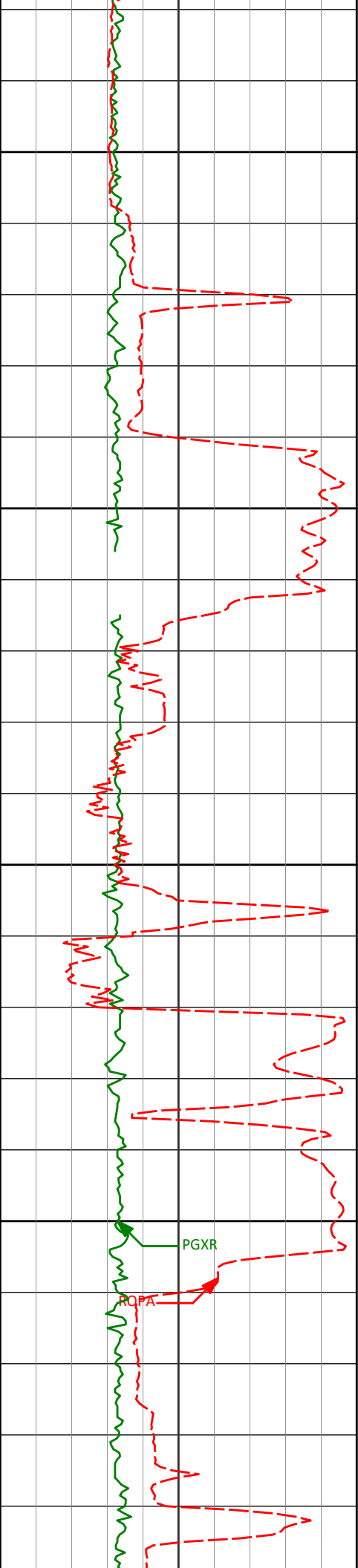
180.78°

7534.22'

6431.16'



13789'	92.22°	180.22°	7533.28'	6516.14'
13875'	90.96°	180.43°	7530.89'	6602.10'
13961'	90.46°	179.99°	7529.83'	6688.10'



14250'

14300'

14350'

14400'

PGXR

POPA

14303'

88.98°

180.02°

7529.66'

7030.04'

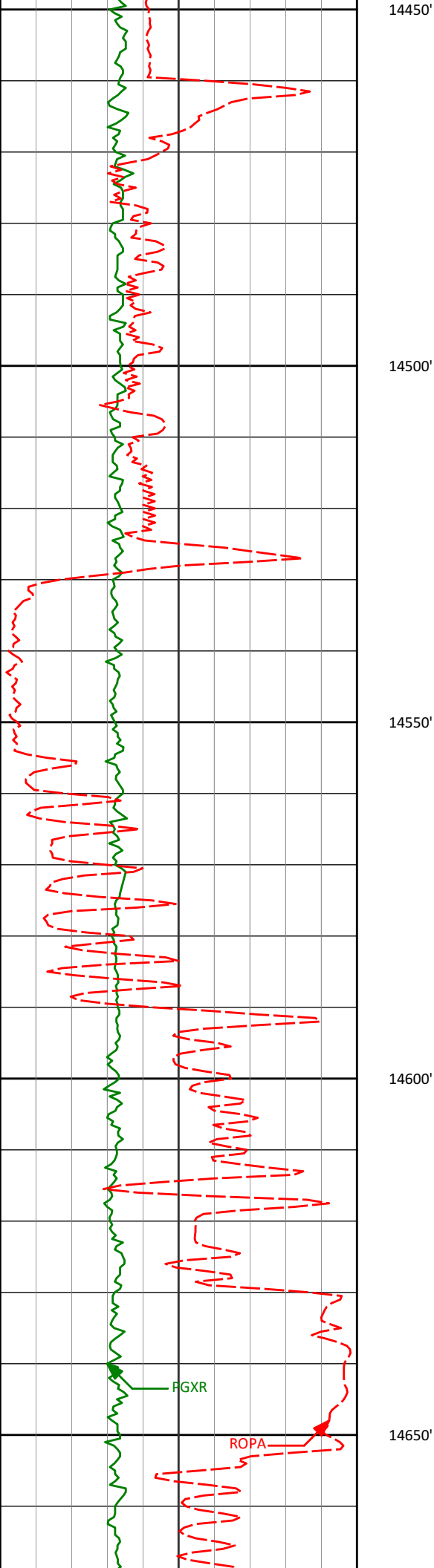
14389'

89.88°

180.41°

7530.51'

7116.03'



14474'

90.65°

180.98°

7530.12'

7201.02'

14560'

90.31°

179.38°

7529.40'

7287.02'

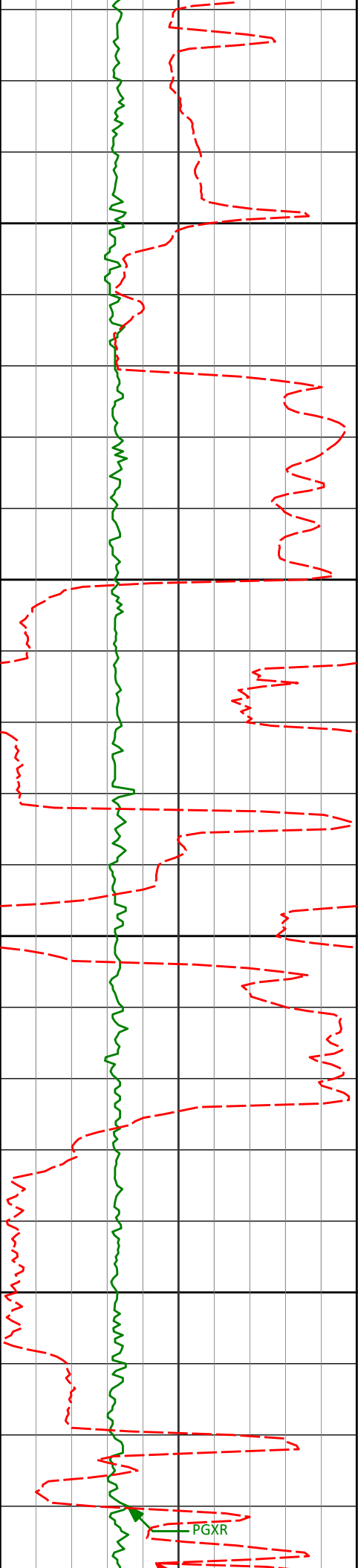
14645'

88.28°

177.42°

7530.44'

7371.97'



14700'

14731'

88.59°

176.41°

7532.79'

7457.81'

14750'

14800'

14850'

14817'

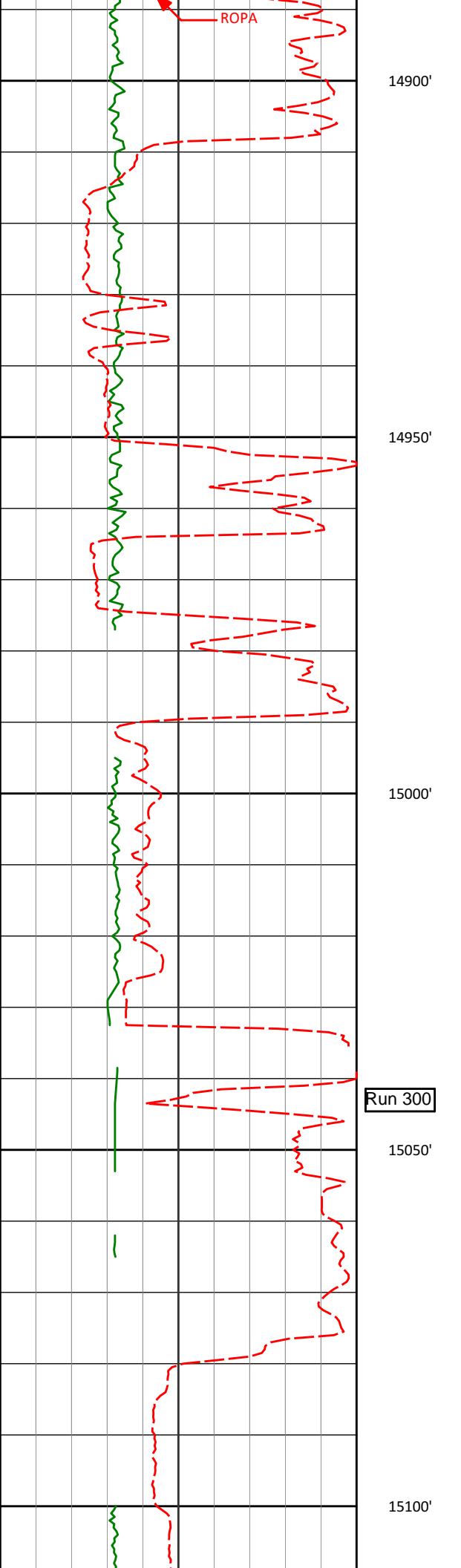
89.94°

176.41°

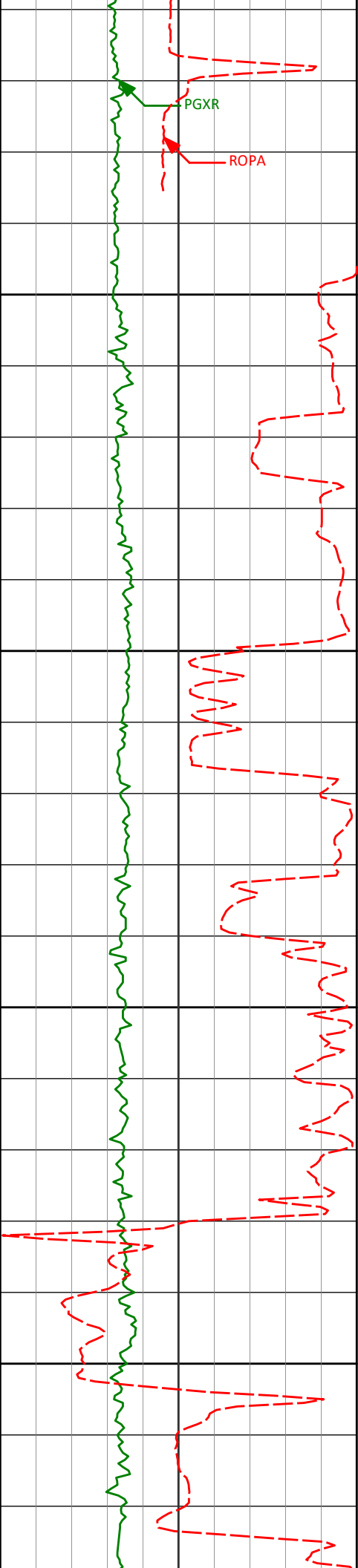
7533.90'

7543.63'

PGXR



14903'	90.74°	177.68°	7533.38'	7629.51'
14988'	89.88°	177.66°	7532.93'	7714.44'
15068'	88.24°	176.95°	7534.24'	7794.34'



Run 400

15150'

15153'

88.46°

177.13°

7536.69'

7879.19'

15200'

15250'

15300'

15239'

89.35°

180.04°

7538.33'

7965.14'

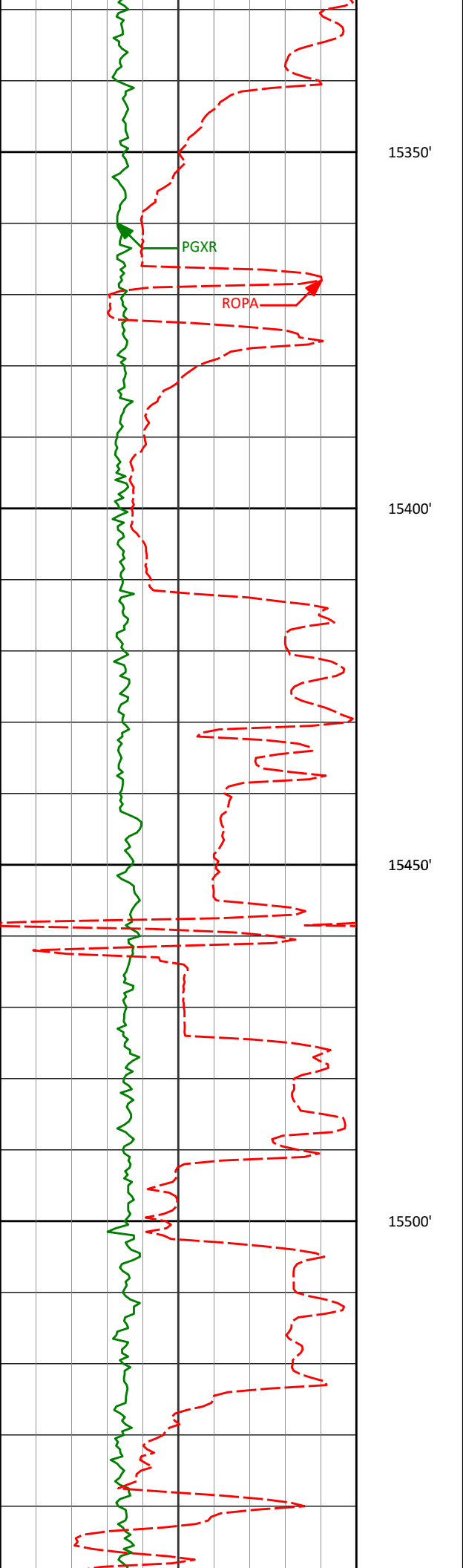
15325'

89.60°

180.10°

7539.12'

8051.13'



15411'

89.72°

178.91°

7539.63'

8137.13'

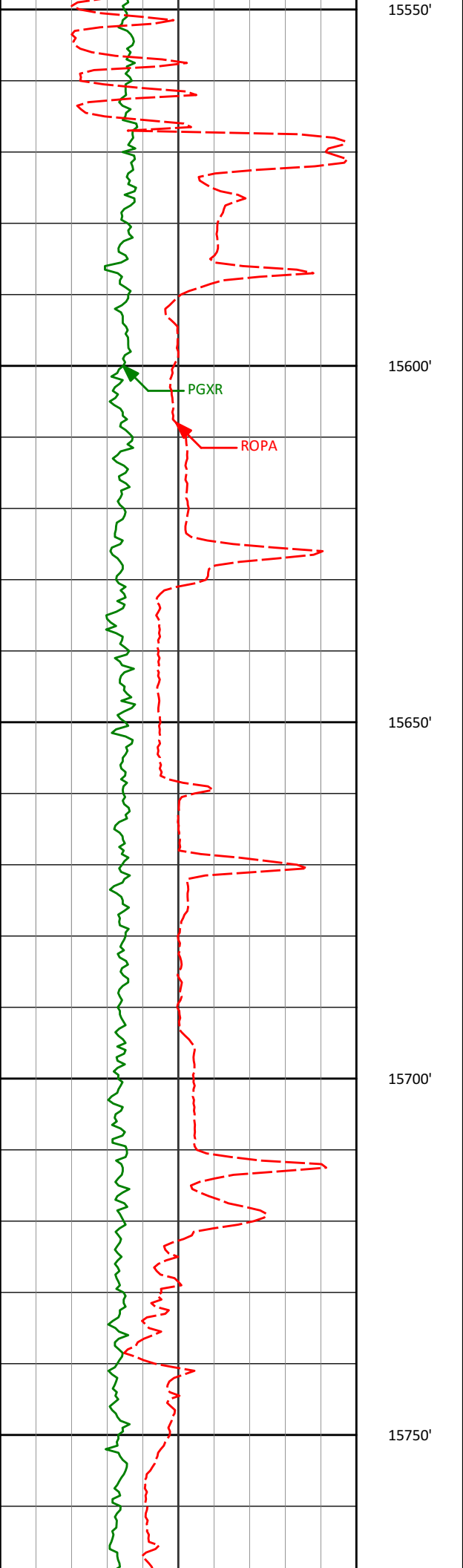
15496'

89.63°

180.35°

7540.11'

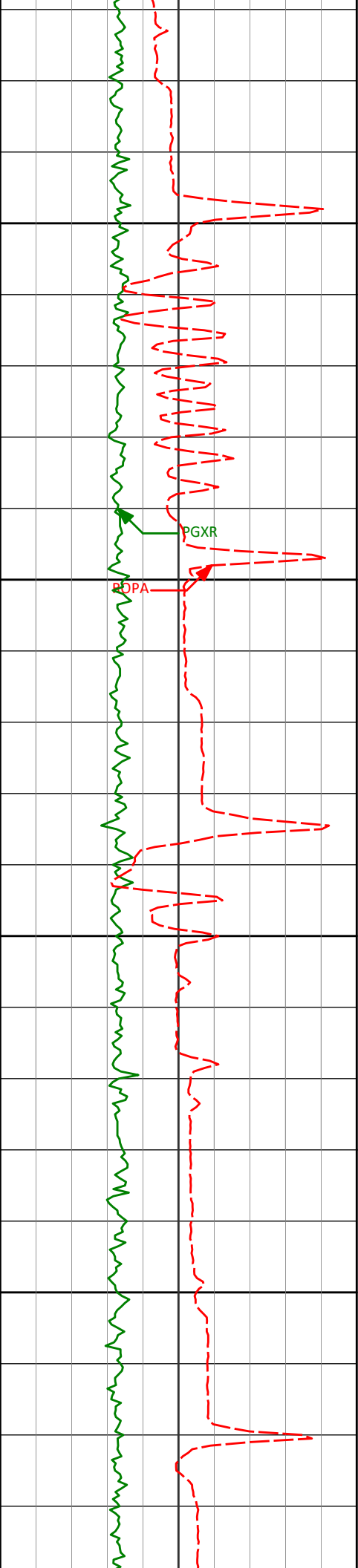
8222.12'



15582' 90.37° 180.71° 7540.11' 8308.12'

15668' 90.68° 181.27° 7539.32' 8394.10'

15753' 90.68° 180.97° 7538.31' 8479.08'



15800'

15839'

90.49°

180.78°

7537.43'

8565.06'

15850'

15900'

15925'

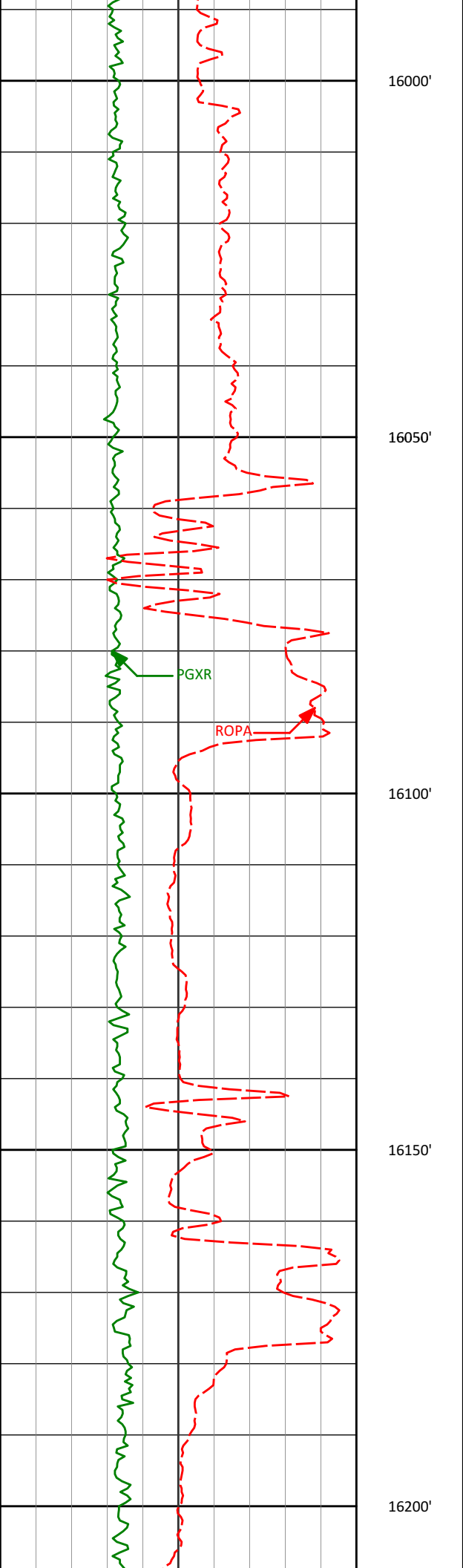
90.43°

180.00°

7536.74'

8651.06'

15950'



16011'

90.56°

179.71°

7536.00'

8737.06'

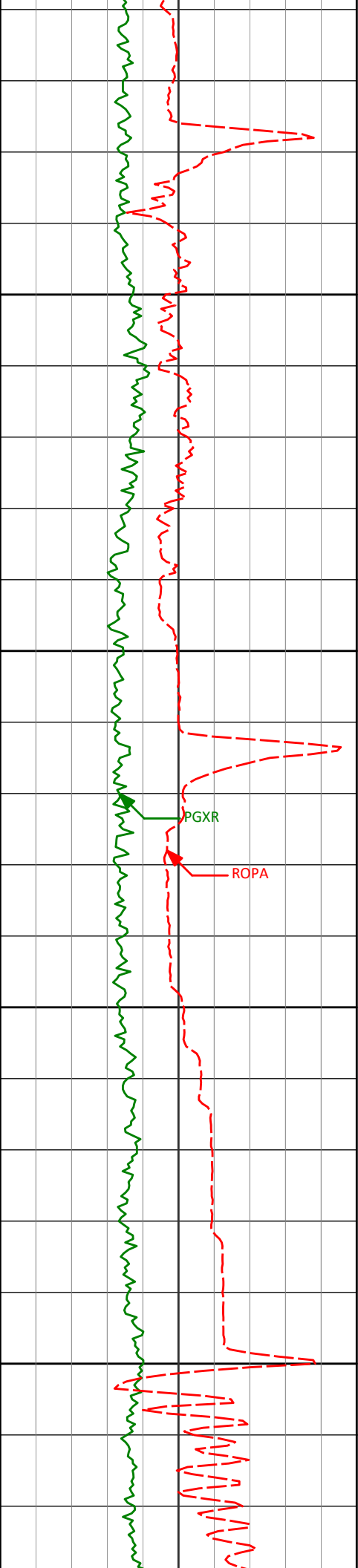
16182'

88.92°

180.54°

7536.78'

8908.05'



16250'

16300'

16350'

16400'

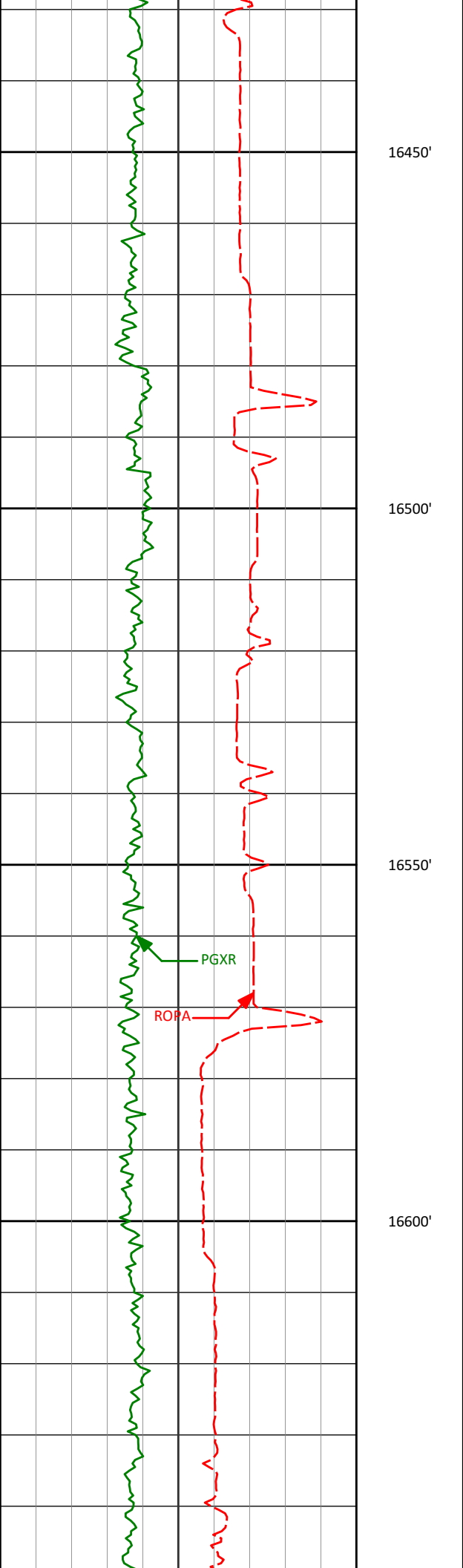
16354'

89.10°

181.74°

7539.75'

9079.98'



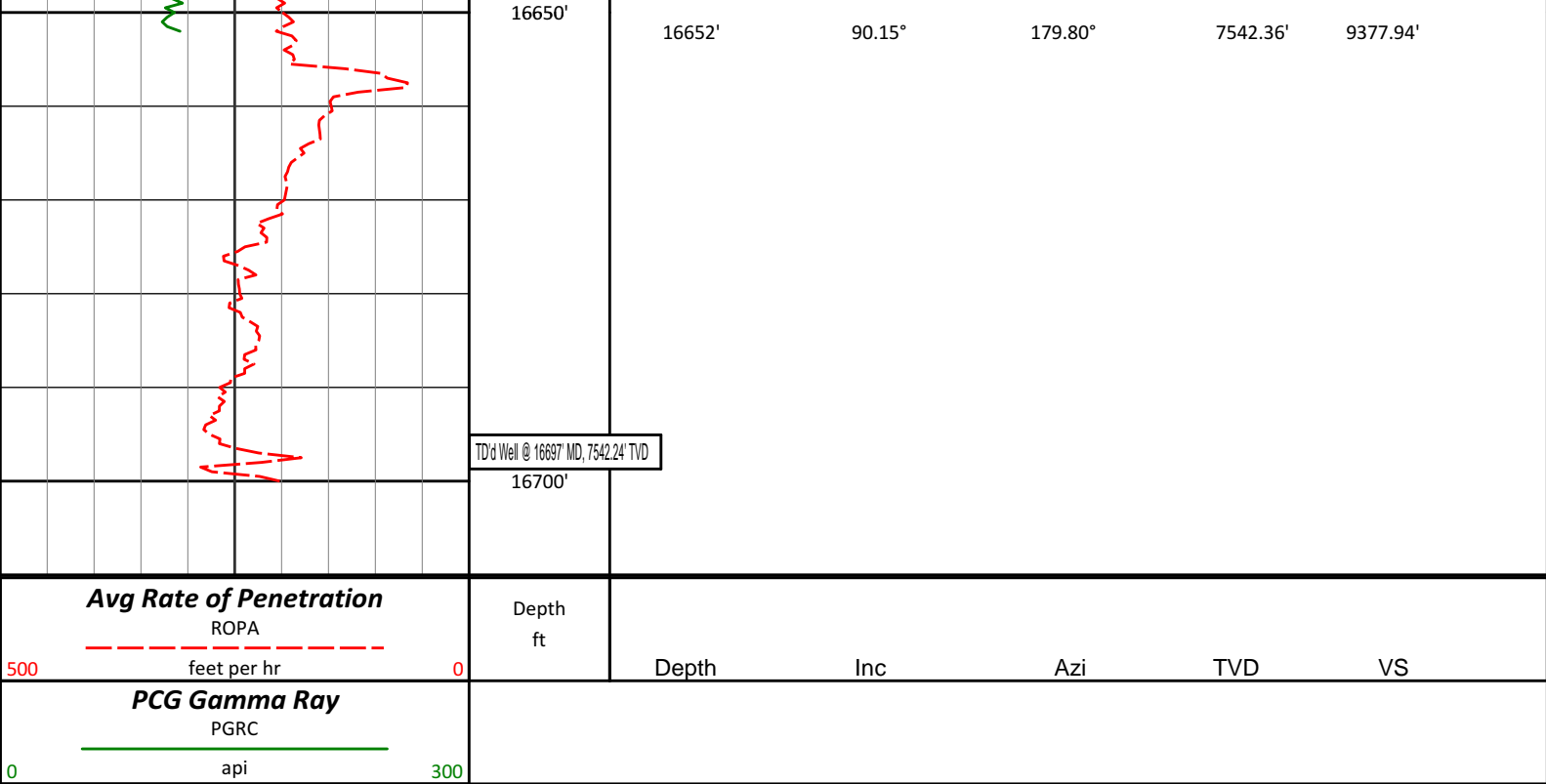
16525'

89.45°

179.40°

7541.91'

9250.95'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko PC
Butterball 28C-15HZ
Wattenburg
Weld Colorado
USA
CA-XX-0900752896

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
946.00	0.39	146.38	945.99	0.30 N	2.63 E	-0.30	TIE-IN
1107.00	1.09	147.57	1106.98	1.45 S	3.75 E	1.45	0.43
1202.00	0.90	143.98	1201.96	2.81 S	4.68 E	2.81	0.21
1297.00	0.94	151.09	1296.95	4.10 S	5.49 E	4.10	0.13
1392.00	0.97	162.26	1391.94	5.55 S	6.12 E	5.55	0.20
1487.00	0.56	148.70	1486.93	6.71 S	6.60 E	6.71	0.47
1580.00	0.62	154.88	1579.92	7.56 S	7.05 E	7.56	0.09
1676.00	0.46	138.28	1675.92	8.31 S	7.53 E	8.31	0.23
1767.00	0.31	152.37	1766.92	8.80 S	7.89 E	8.80	0.19
1860.00	0.17	187.00	1859.92	9.16 S	7.99 E	9.16	0.21
1951.00	0.28	151.19	1950.91	9.49 S	8.08 E	9.49	0.19
2044.00	0.35	217.28	2043.91	9.92 S	8.01 E	9.92	0.37
2137.00	0.75	216.25	2136.91	10.63 S	7.48 E	10.63	0.43
2228.00	0.41	128.40	2227.91	11.32 S	7.38 E	11.32	0.92
2320.00	0.39	99.25	2319.90	11.57 S	7.95 E	11.57	0.22
2597.00	0.17	281.28	2596.90	11.64 S	8.48 E	11.64	0.20
2780.00	0.30	300.89	2779.90	11.34 S	7.80 E	11.34	0.08
2871.00	0.37	285.31	2870.90	11.14 S	7.31 E	11.14	0.13
2963.00	0.49	251.91	2962.90	11.19 S	6.65 E	11.19	0.30
3053.00	1.18	173.03	3052.89	12.23 S	6.40 E	12.23	1.32
3144.00	1.67	151.57	3143.86	14.32 S	7.14 E	14.32	0.79
3236.00	2.35	142.20	3235.80	16.99 S	8.94 E	16.99	0.82
3327.00	2.61	120.19	3326.72	19.51 S	11.87 E	19.51	1.08
3418.00	4.14	100.86	3417.56	21.17 S	16.89 E	21.17	2.07
3509.00	4.59	93.93	3508.30	22.04 S	23.75 E	22.04	0.76
3601.00	5.78	86.79	3599.92	22.03 S	32.05 E	22.03	1.47
3692.00	6.74	84.04	3691.28	22.17 S	42.03 E	22.17	1.24

3693.00	6.71	94.24	3691.38	22.17 S	42.03 E	22.17	1.34
3784.00	8.35	87.58	3781.59	22.28 S	53.94 E	22.28	2.04
3875.00	10.31	86.88	3871.38	21.56 S	68.67 E	21.56	2.16
3966.00	8.99	85.90	3961.09	20.61 S	83.90 E	20.61	1.46
4057.00	11.03	85.33	4050.70	19.39 S	99.67 E	19.39	2.24
4148.00	10.79	85.35	4140.06	17.99 S	116.83 E	17.99	0.26
4240.00	9.86	85.21	4230.57	16.64 S	133.27 E	16.64	1.01
4332.00	10.75	85.42	4321.08	15.29 S	149.67 E	15.29	0.97
4418.00	9.92	81.81	4405.69	13.60 S	165.00 E	13.60	1.22
4503.00	10.23	86.67	4489.38	12.12 S	179.78 E	12.12	1.06
4589.00	9.74	86.02	4574.07	11.17 S	194.66 E	11.17	0.58
4674.00	10.11	94.09	4657.81	11.20 S	209.27 E	11.20	1.69
4760.00	9.92	95.54	4742.50	12.45 S	224.18 E	12.45	0.37
4846.00	9.33	96.23	4827.29	13.93 S	238.48 E	13.93	0.70
4931.00	10.99	87.90	4910.95	14.38 S	253.43 E	14.38	2.60
5017.00	11.16	86.79	4995.35	13.61 S	269.93 E	13.61	0.32
5102.00	10.30	86.48	5078.87	12.68 S	285.73 E	12.68	1.01
5188.00	9.31	85.16	5163.61	11.62 S	300.33 E	11.62	1.18
5274.00	8.87	85.50	5248.53	10.52 S	313.87 E	10.52	0.52
5359.00	7.98	91.59	5332.61	10.17 S	326.31 E	10.17	1.48
5444.00	7.43	89.91	5416.84	10.32 S	337.70 E	10.32	0.70
5530.00	6.66	87.37	5502.19	10.08 S	348.24 E	10.08	0.97
5616.00	7.13	91.66	5587.57	10.01 S	358.56 E	10.01	0.81
5702.00	6.08	88.21	5673.00	10.02 S	368.45 E	10.02	1.30
5787.00	5.17	86.38	5757.59	9.64 S	376.77 E	9.64	1.09
5873.00	5.17	98.51	5843.24	9.97 S	384.47 E	9.97	1.27
5959.00	3.97	96.17	5928.97	10.86 S	391.26 E	10.86	1.41
6044.00	3.12	88.13	6013.81	11.10 S	396.50 E	11.10	1.16
6130.00	2.33	92.22	6099.71	11.09 S	400.58 E	11.09	0.95
6216.00	1.53	90.38	6185.66	11.17 S	403.48 E	11.17	0.93
6302.00	1.22	87.51	6271.63	11.14 S	405.54 E	11.14	0.37
6387.00	0.99	337.69	6356.63	10.42 S	406.17 E	10.42	2.13
6473.00	0.65	349.49	6442.62	9.25 S	405.79 E	9.25	0.44
6559.00	0.48	346.59	6528.61	8.42 S	405.62 E	8.42	0.20
6645.00	0.57	330.60	6614.61	7.70 S	405.33 E	7.70	0.20
6730.00	0.63	337.51	6699.60	6.90 S	404.94 E	6.90	0.11
6816.00	0.67	125.07	6785.60	6.75 S	405.17 E	6.75	1.45
6902.00	0.57	107.25	6871.60	7.17 S	405.99 E	7.17	0.25
6945.00	4.01	164.03	6914.56	8.68 S	406.61 E	8.68	8.67
6987.00	7.90	180.09	6956.33	12.98 S	407.01 E	12.98	9.99
7030.00	9.72	189.82	6998.82	19.51 S	406.39 E	19.51	5.46
7073.00	11.02	199.76	7041.12	26.95 S	404.38 E	26.95	5.13
7116.00	14.77	203.77	7083.03	35.84 S	400.78 E	35.84	8.96
7159.00	21.09	197.12	7123.92	48.27 S	396.29 E	48.27	15.43
7202.00	24.69	193.86	7163.53	64.38 S	391.86 E	64.38	8.87
7249.00	29.59	190.60	7205.35	85.33 S	387.37 E	85.33	10.89
7287.00	34.76	186.55	7237.50	105.33 S	384.40 E	105.33	14.73
7330.00	38.66	185.48	7271.97	130.89 S	381.72 E	130.89	9.19
7373.00	42.36	184.57	7304.66	158.71 S	379.28 E	158.71	8.71
7416.00	46.42	183.32	7335.38	188.71 S	377.23 E	188.71	9.66
7459.00	51.50	181.17	7363.60	221.11 S	375.98 E	221.11	12.40
7501.00	56.74	179.88	7388.21	255.12 S	375.68 E	255.12	12.72
7544.00	60.28	178.02	7410.67	291.78 S	376.36 E	291.78	9.02
7587.00	63.60	177.73	7430.90	329.69 S	377.77 E	329.69	7.74
7630.00	66.72	177.52	7448.96	368.67 S	379.39 E	368.68	7.27
7673.00	68.98	177.93	7465.17	408.47 S	380.97 E	408.47	5.33
7716.00	73.76	178.56	7478.90	449.18 S	382.21 E	449.18	11.20
7759.00	75.45	177.99	7490.32	490.62 S	383.46 E	490.62	4.13
7802.00	80.77	176.51	7499.17	532.63 S	385.49 E	532.63	12.82
7845.00	85.25	174.99	7504.40	575.18 S	388.65 E	575.18	10.99
7873.00	86.52	175.25	7506.41	603.01 S	391.03 E	603.01	4.63
7957.00	89.32	176.92	7509.46	686.75 S	396.76 E	686.75	3.88
8043.00	89.20	177.40	7510.57	772.63 S	401.02 E	772.63	0.58
8129.00	90.18	177.01	7511.04	858.53 S	405.21 E	858.53	1.23
8215.00	89.85	176.69	7511.02	944.40 S	409.94 E	944.40	0.53
8300.00	90.31	177.51	7510.90	1029.29 S	414.24 E	1029.29	1.11
8386.00	90.34	178.23	7510.41	1115.23 S	417.43 E	1115.23	0.84
8471.00	91.02	180.41	7509.40	1200.21 S	418.44 E	1200.21	2.69
8557.00	90.80	180.89	7508.03	1286.19 S	417.47 E	1286.19	0.61
8643.00	89.45	179.49	7507.85	1372.19 S	417.18 E	1372.19	2.26
8729.00	89.69	179.44	7508.49	1458.18 S	417.98 E	1458.18	0.29
8814.00	90.31	180.44	7508.49	1543.18 S	418.07 E	1543.18	1.38

8814.00	88.91	179.27	7509.05	1629.17 S	418.29 E	1629.17	2.09
8900.00	88.95	179.27	7509.05	1629.17 S	418.29 E	1629.17	2.09
8986.00	89.45	180.14	7510.25	1715.16 S	418.73 E	1715.16	1.17
9071.00	90.40	179.38	7510.36	1800.16 S	419.09 E	1800.16	1.43
9157.00	90.34	179.82	7509.80	1886.16 S	419.69 E	1886.16	0.52
9242.00	90.68	181.14	7509.05	1971.15 S	418.98 E	1971.15	1.60
9328.00	90.96	181.27	7507.82	2057.12 S	417.17 E	2057.12	0.36
9414.00	92.47	182.03	7505.24	2143.04 S	414.70 E	2143.04	1.97
9499.00	93.73	183.22	7500.65	2227.83 S	410.81 E	2227.83	2.04
9585.00	91.36	182.45	7496.83	2313.63 S	406.56 E	2313.63	2.90
9671.00	89.72	182.32	7496.02	2399.55 S	402.98 E	2399.55	1.91
9763.00	89.01	181.79	7497.04	2491.48 S	399.68 E	2491.48	0.96
9854.00	89.94	180.60	7497.87	2582.46 S	397.79 E	2582.46	1.66
9946.00	89.11	180.14	7498.63	2674.45 S	397.19 E	2674.45	1.03
10038.00	88.27	180.67	7500.74	2766.42 S	396.54 E	2766.42	1.08
10131.00	90.15	181.29	7502.02	2859.40 S	394.95 E	2859.40	2.13
10223.00	86.64	178.91	7504.60	2951.34 S	394.79 E	2951.34	4.61
10315.00	88.67	178.60	7508.36	3043.24 S	396.79 E	3043.24	2.23
10407.00	90.03	178.69	7509.40	3135.20 S	398.96 E	3135.20	1.48
10500.00	89.54	179.24	7509.75	3228.19 S	400.64 E	3228.19	0.79
10592.00	89.35	178.49	7510.64	3320.16 S	402.46 E	3320.16	0.84
10684.00	89.63	178.49	7511.46	3412.13 S	404.89 E	3412.13	0.30
10776.00	90.03	180.21	7511.74	3504.12 S	405.93 E	3504.12	1.92
10867.00	90.19	179.54	7511.56	3595.12 S	406.13 E	3595.12	0.76
10958.00	89.63	179.26	7511.70	3686.11 S	407.08 E	3686.11	0.69
11050.00	90.46	179.66	7511.63	3778.11 S	407.95 E	3778.11	1.00
11140.00	90.40	178.72	7510.96	3868.09 S	409.22 E	3868.09	1.05
11231.00	90.59	179.05	7510.17	3959.07 S	410.99 E	3959.07	0.42
11323.00	90.86	179.51	7509.01	4051.06 S	412.15 E	4051.06	0.58
11414.00	90.86	179.24	7507.64	4142.04 S	413.14 E	4142.04	0.30
11505.00	90.55	180.13	7506.52	4233.03 S	413.64 E	4233.03	1.04
11596.00	88.95	178.33	7506.92	4324.02 S	414.87 E	4324.02	2.65
11688.00	90.03	180.39	7507.74	4416.00 S	415.89 E	4416.00	2.53
11779.00	90.34	178.85	7507.44	4507.00 S	416.50 E	4507.00	1.73
11871.00	90.00	179.12	7507.17	4598.98 S	418.13 E	4598.98	0.47
11962.00	89.11	179.48	7507.88	4689.97 S	419.24 E	4689.97	1.05
12053.00	87.72	179.06	7510.39	4780.92 S	420.40 E	4780.92	1.60
12143.00	88.92	180.96	7513.03	4870.88 S	420.38 E	4870.88	2.50
12235.00	89.20	180.93	7514.54	4962.86 S	418.86 E	4962.86	0.31
12327.00	88.24	182.31	7516.60	5054.79 S	416.26 E	5054.79	1.83
12419.00	87.75	181.59	7519.82	5146.68 S	413.13 E	5146.68	0.95
12505.00	87.78	181.59	7523.17	5232.58 S	410.75 E	5232.58	0.03
12590.00	88.74	180.96	7525.75	5317.52 S	408.86 E	5317.52	1.35
12676.00	89.45	180.68	7527.11	5403.50 S	407.63 E	5403.50	0.89
12762.00	90.25	180.97	7527.33	5489.49 S	406.39 E	5489.49	0.99
12847.00	89.94	180.39	7527.19	5574.48 S	405.38 E	5574.48	0.77
12933.00	89.45	179.03	7527.65	5660.48 S	405.82 E	5660.48	1.68
13019.00	90.03	179.40	7528.04	5746.47 S	407.00 E	5746.47	0.80
13104.00	89.94	178.23	7528.06	5831.45 S	408.75 E	5831.45	1.38
13190.00	90.00	177.49	7528.11	5917.39 S	411.97 E	5917.39	0.86
13275.00	89.88	177.51	7528.20	6002.31 S	415.67 E	6002.31	0.14
13361.00	89.32	178.74	7528.80	6088.26 S	418.49 E	6088.26	1.57
13447.00	89.38	178.66	7529.77	6174.23 S	420.44 E	6174.23	0.12
13532.00	88.52	180.07	7531.33	6259.21 S	421.38 E	6259.21	1.94
13618.00	89.29	181.40	7532.98	6345.18 S	420.28 E	6345.18	1.79
13704.00	89.05	180.78	7534.22	6431.16 S	418.64 E	6431.16	0.77
13789.00	92.22	180.22	7533.28	6516.14 S	417.90 E	6516.14	3.79
13875.00	90.96	180.43	7530.89	6602.10 S	417.41 E	6602.10	1.49
13961.00	90.46	179.99	7529.83	6688.10 S	417.10 E	6688.10	0.77
14046.00	90.03	178.71	7529.46	6773.09 S	418.06 E	6773.09	1.59
14132.00	90.74	178.54	7528.89	6859.06 S	420.12 E	6859.06	0.85
14217.00	89.63	179.45	7528.61	6944.04 S	421.62 E	6944.04	1.69
14303.00	88.98	180.02	7529.66	7030.04 S	422.01 E	7030.04	1.01
14389.00	89.88	180.41	7530.51	7116.03 S	421.69 E	7116.03	1.14
14474.00	90.65	180.98	7530.12	7201.02 S	420.66 E	7201.02	1.13
14560.00	90.31	179.38	7529.40	7287.02 S	420.39 E	7287.02	1.90
14645.00	88.28	177.42	7530.44	7371.97 S	422.76 E	7371.97	3.32
14731.00	88.59	176.41	7532.79	7457.81 S	427.39 E	7457.81	1.23
14817.00	89.94	176.41	7533.90	7543.63 S	432.77 E	7543.63	1.57
14903.00	90.74	177.68	7533.38	7629.51 S	437.21 E	7629.51	1.75
14988.00	89.88	177.66	7532.93	7714.44 S	440.66 E	7714.44	1.01
15068.00	88.24	176.95	7534.24	7794.34 S	444.42 E	7794.34	2.23

15153.00	88.46	177.13	7536.69	7879.19 S	448.81 E	7879.19	0.33
15239.00	89.35	180.04	7538.33	7965.14 S	450.93 E	7965.14	3.54
15325.00	89.60	180.10	7539.12	8051.13 S	450.83 E	8051.13	0.30
15411.00	89.72	178.91	7539.63	8137.13 S	451.57 E	8137.13	1.39
15496.00	89.63	180.35	7540.11	8222.12 S	452.12 E	8222.12	1.70
15582.00	90.37	180.71	7540.11	8308.12 S	451.32 E	8308.12	0.96
15668.00	90.68	181.27	7539.32	8394.10 S	449.84 E	8394.10	0.74
15753.00	90.68	180.97	7538.31	8479.08 S	448.18 E	8479.08	0.35
15839.00	90.49	180.78	7537.43	8565.06 S	446.86 E	8565.06	0.31
15925.00	90.43	180.00	7536.74	8651.06 S	446.28 E	8651.06	0.91
16011.00	90.56	179.71	7536.00	8737.06 S	446.50 E	8737.06	0.37
16182.00	88.92	180.54	7536.78	8908.05 S	446.12 E	8908.05	1.07
16354.00	89.10	181.74	7539.75	9079.98 S	442.70 E	9079.98	0.71
16525.00	89.45	179.40	7541.91	9250.95 S	441.00 E	9250.95	1.38
16652.00	90.15	179.80	7542.36	9377.94 S	441.89 E	9377.94	0.63

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 180.00 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.62 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 16652.00 FEET
IS 9388.35 FEET ALONG 177.30 DEGREES (TRUE)**

Directional Surveys tied onto Gyro's @ 946' MD. Final Survey is a straight line projection to bit.