

PCGK - Pressure Case Gamma



1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	21-Oct-13				
Rig Bit Number	101				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	1,027.00				
Log End Depth (MD, ft)	7,691.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	18-Oct-13 23:00				
Drill/Wipe End Date and Time	20-Oct-13 20:10				
Min Inc (deg) @ Depth (MD, ft)	0.00 @ 5,788.00				
Max Inc (deg) @ Depth (MD, ft)	87.53 @ 7,643.00				
Bit TFA(in2) / Bit Type	1.04 / PDC				
Flow Rate (gpm)	551.35				
Max AV (fpm) / CV (fpm) @ MWD	232.1 / N/A				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	10.40 / 47.00				
Filtrate CL (ppm)	1,100.00				
pH / Fluid Loss (mptm)	8.80 / 4				
PV (cP) / YP (lbf2)	13 / 15.00				
% Solids / % Sand	9.30 / 0.10				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (deg F) @ Depth (MD, ft)	170.07 / 2034				

Max Tool Temp (degF) / Source	170.37 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 170.37				
Lead MWD Engineer	Clay Wass				
Customer Representative	Scott Hancock				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.76				
Sub Serial Number	11404261				
Insert Serial Number	11400901				
Date and Time Initialized	17-Oct-13 15:19				
Date and Time Read	21-Oct-13 05:39				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	48.00				
Software Version	6.21				
Sub Serial Number	11404261				
Sonde Serial Number	11297555				
Sensor ID Number	N/A				
Toolface Offset (deg)	92.42				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	51.18				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404261				
Insert/Sonde Serial Number	12035849				

REMARKS

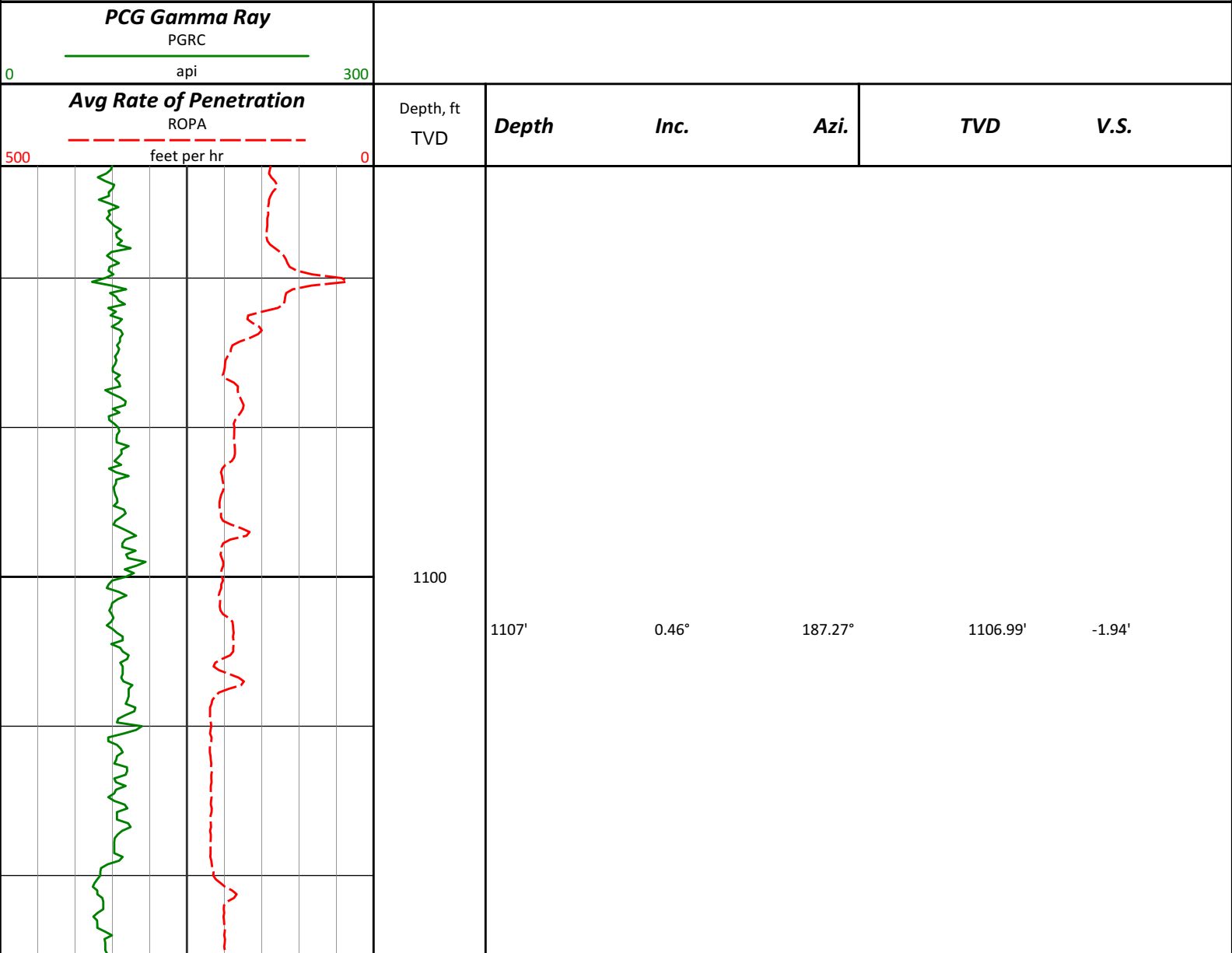
1. All depths are measured depths, referenced to the Driller's pipe tally and are measured from the Kelly Bushing, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for oil and 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: 0.6 ft
 - Gap Fill: 3.0 ft

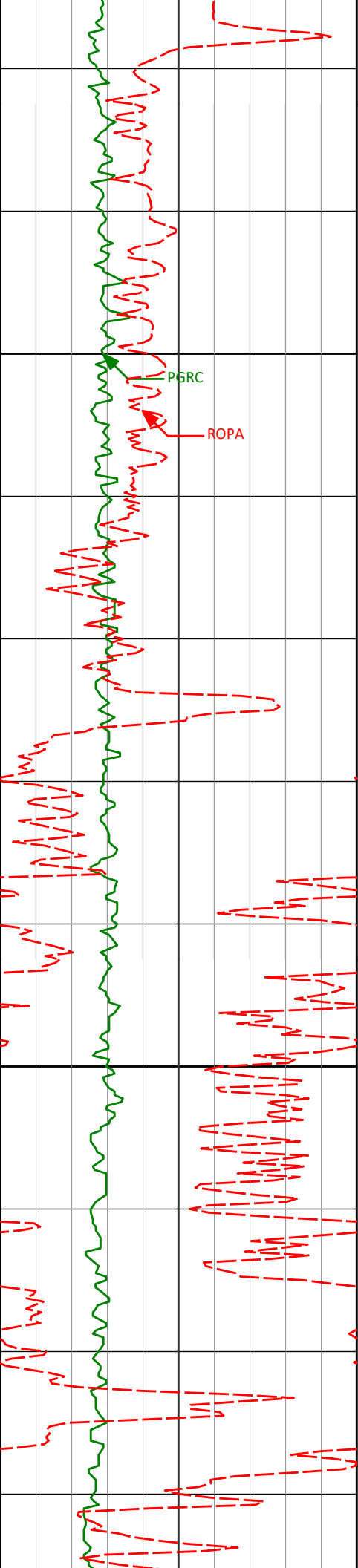
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HALLIBURTON
Sperry Drilling Services
MD Detail Log 1:240

Anadarko Petroleum Company
Butterball 3N-15HZ
Xtreme 22
Weld County, CO





1200

1202'

0.43°

196.53°

1201.99'

-1.22'

1300

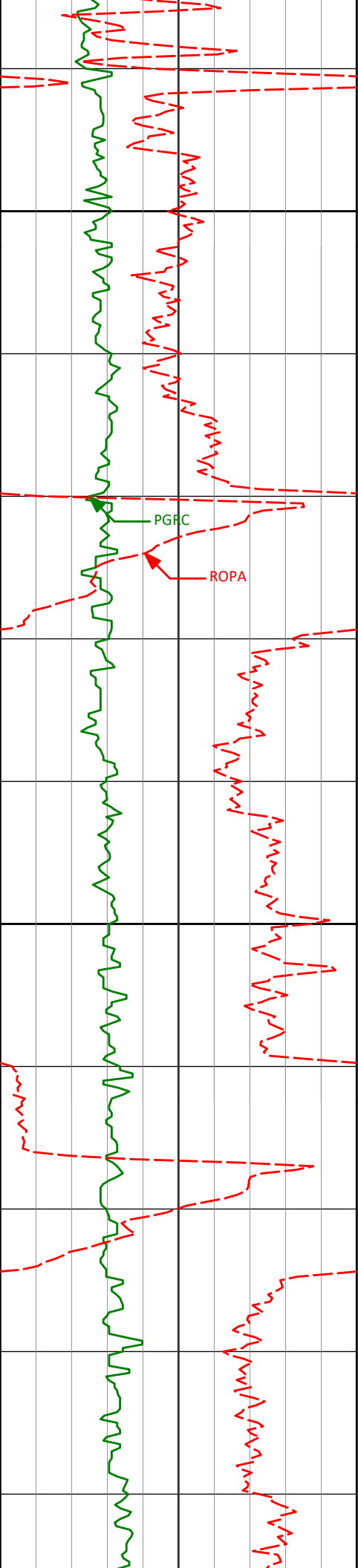
1297'

0.47°

205.81°

1296.98'

-0.53'



1400

1500

1392'

0.57°

204.90°

1391.98'

0.25'

1487'

0.50°

228.52°

1486.97'

0.95'

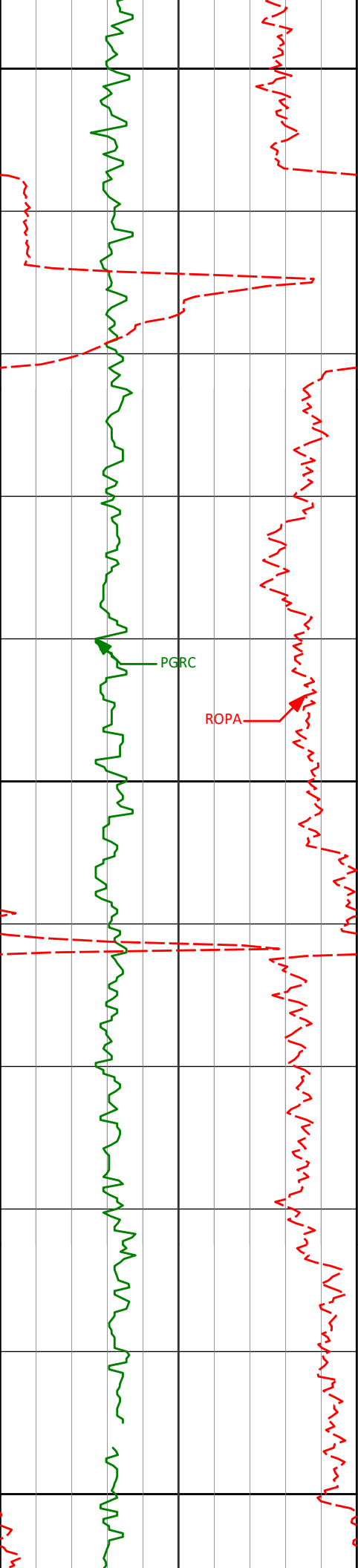
1580'

0.68°

248.38°

1579.97'

1.42'



1600

1676'

0.49°

272.64°

1675.96'

1.60'

1700

1767'

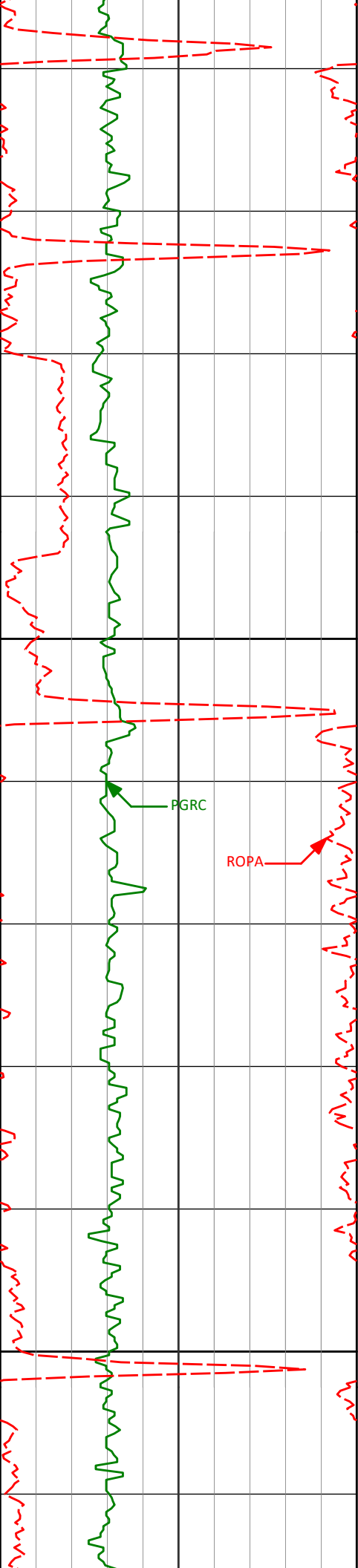
0.55°

275.51°

1766.96'

1.54'

1800



1860'

0.99°

280.88°

1859.95'

1.34'

1900

PGRC

ROPA

1952'

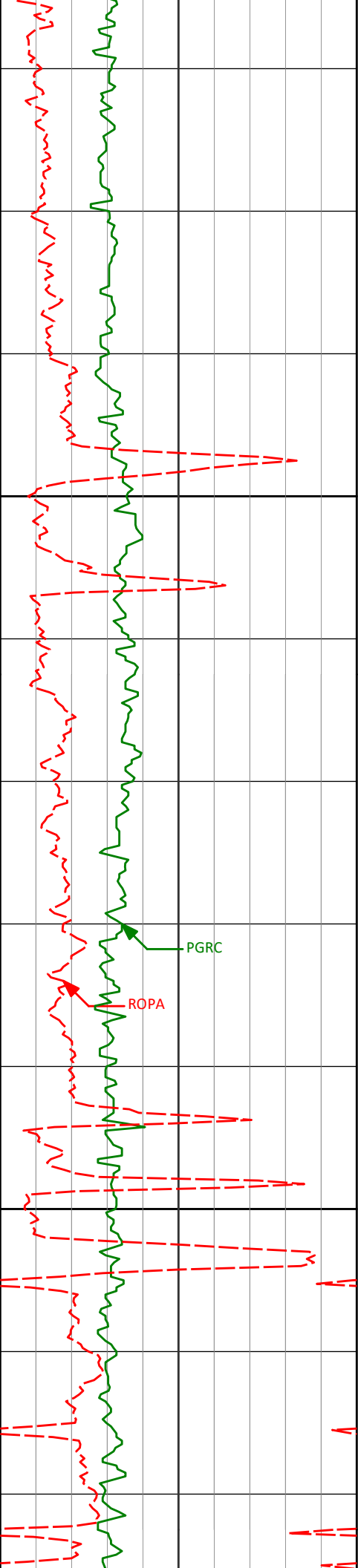
1.00°

306.37°

1951.94'

0.71'

2000



2100

2200

2044'

1.06°

290.28°

2043.92'

-0.07'

2137'

1.15°

301.18°

2136.91'

-0.86'

2228'

0.57°

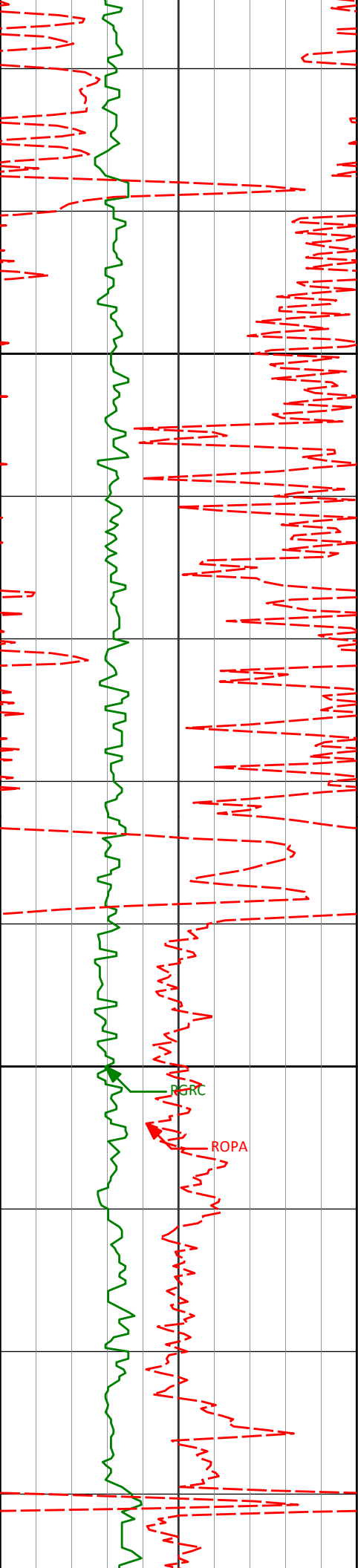
235.89°

2227.90'

-1.08'

ROPA

PGRC



2300

2320'

0.22°

129.60°

2319.90'

-0.71'

2400

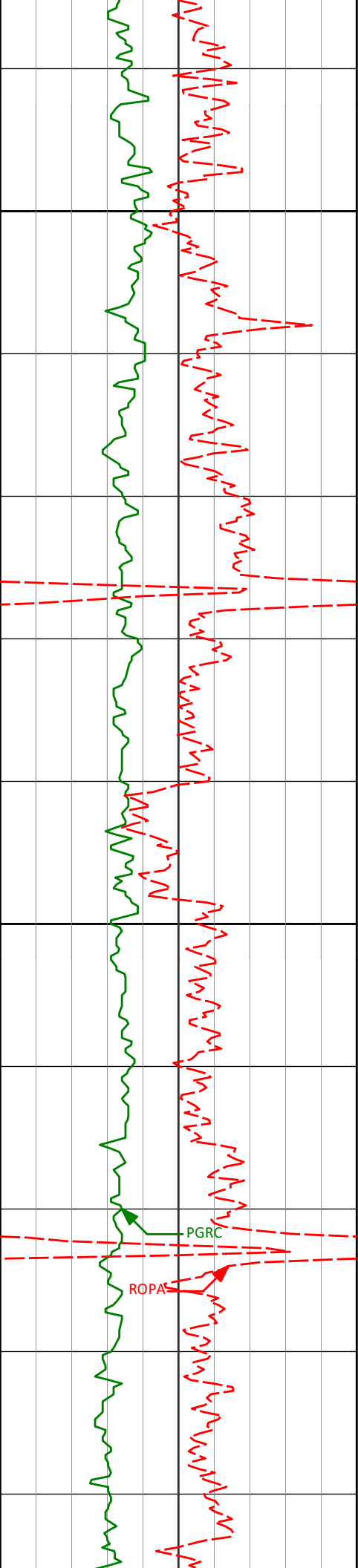
2413'

1.29°

81.12°

2412.89'

-0.76'



2500

2505'

0.96°

76.81°

2504.87'

-1.08'

2600

2597'

0.74°

76.85°

2596.86'

-1.39'

ROPAS

PGRS

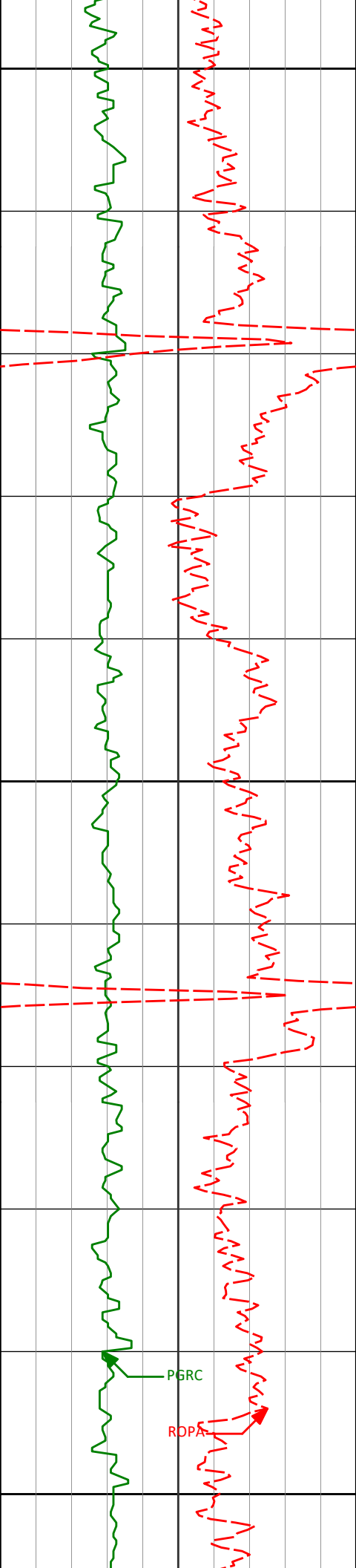
2689'

0.37°

57.12°

2688.86'

-1.68'



2700

2780'

0.28°

0.19°

2779.85'

-2.06'

2800

2872'

0.26°

22.32°

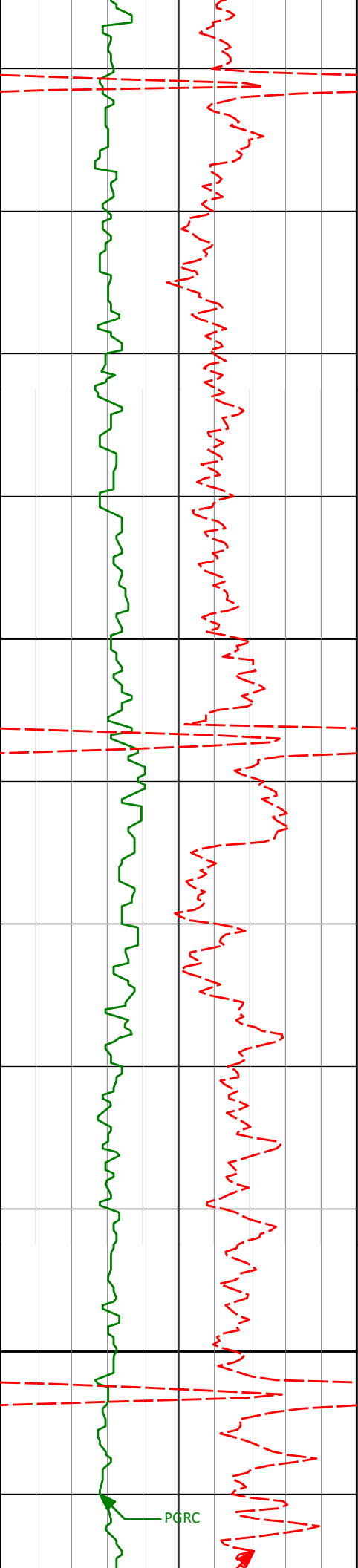
2871.85'

-2.48'

2900

PGRC

RDPA



3000

3100

PGRC

2963'

0.35°

331.90°

2962.85'

-2.92'

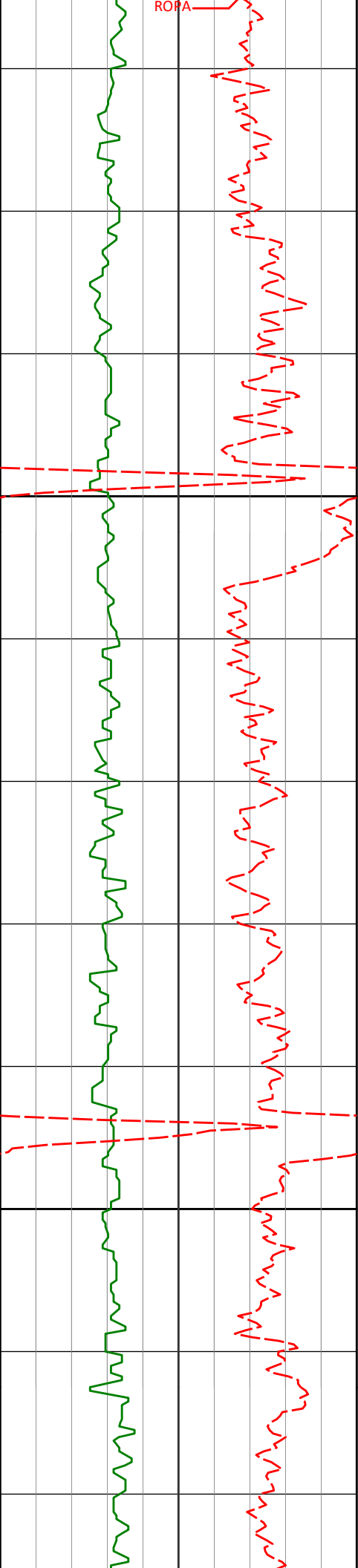
3053'

0.40°

322.12°

3052.85'

-3.41'



3200

3300

3145'

0.48°

291.30°

3144.85'

-3.81'

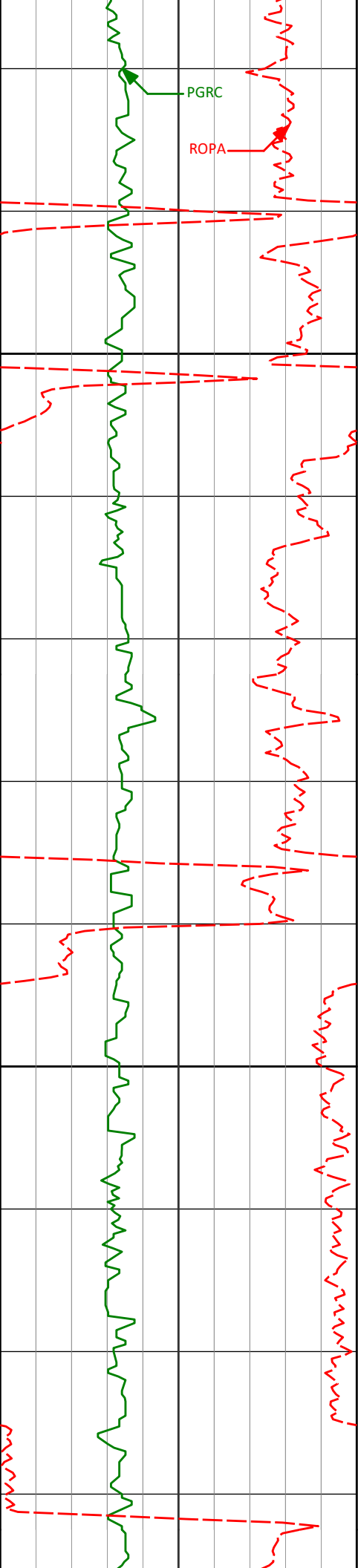
3327'

0.82°

306.46°

3326.84'

-4.86'



3400

3418'

0.92°

316.88°

3417.82'

-5.79'

3500

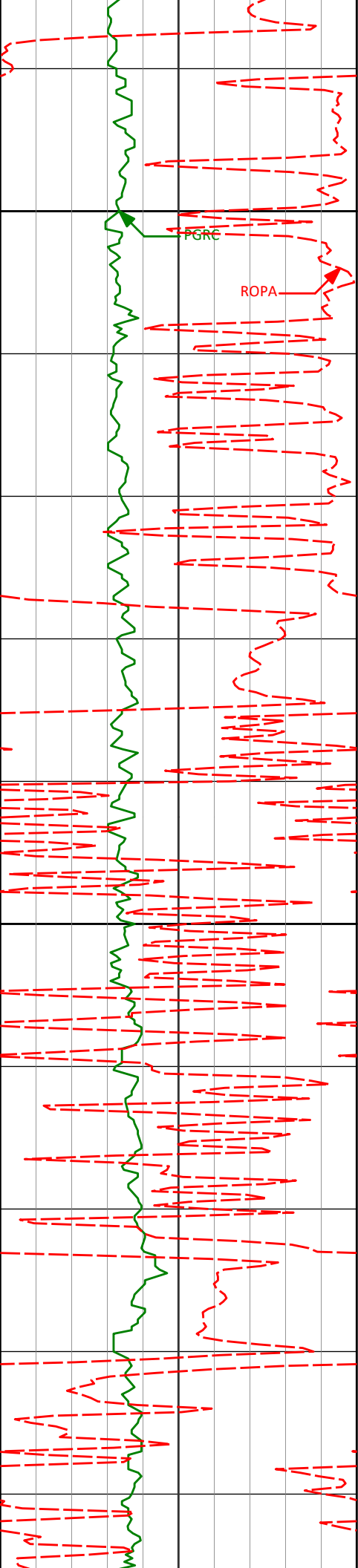
3510'

1.56°

271.04°

3509.80'

-6.36'



3600

3601'

2.60°

263.63°

3600.74'

-6.16'

PGRC

ROPA

3700

3693'

4.26°

276.74°

3692.58'

-6.36'

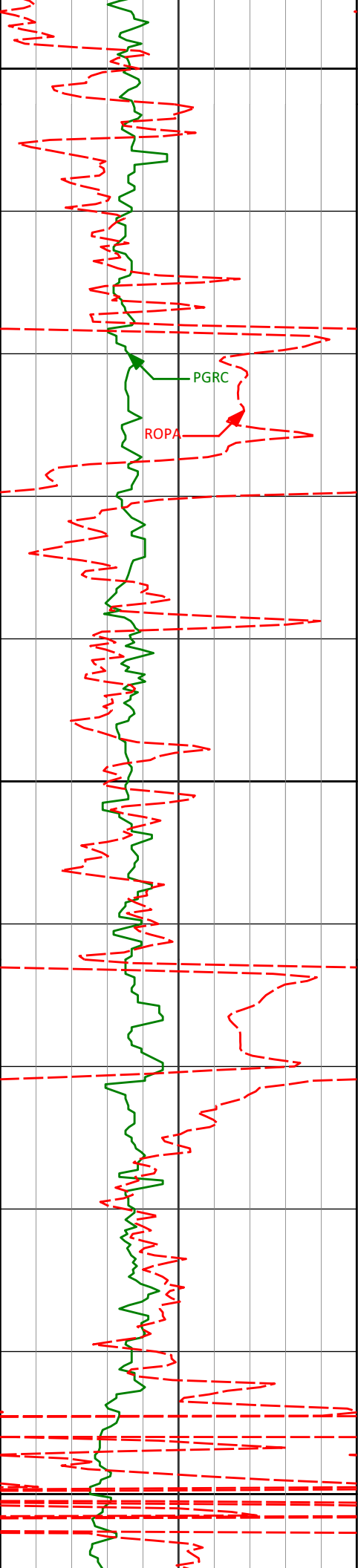
3784'

6.05°

271.24°

3783.21'

-6.89'



3800

PGR

ROPA

3900

3875'

7.40°

277.89°

3873.58'

-7.84'

3966'

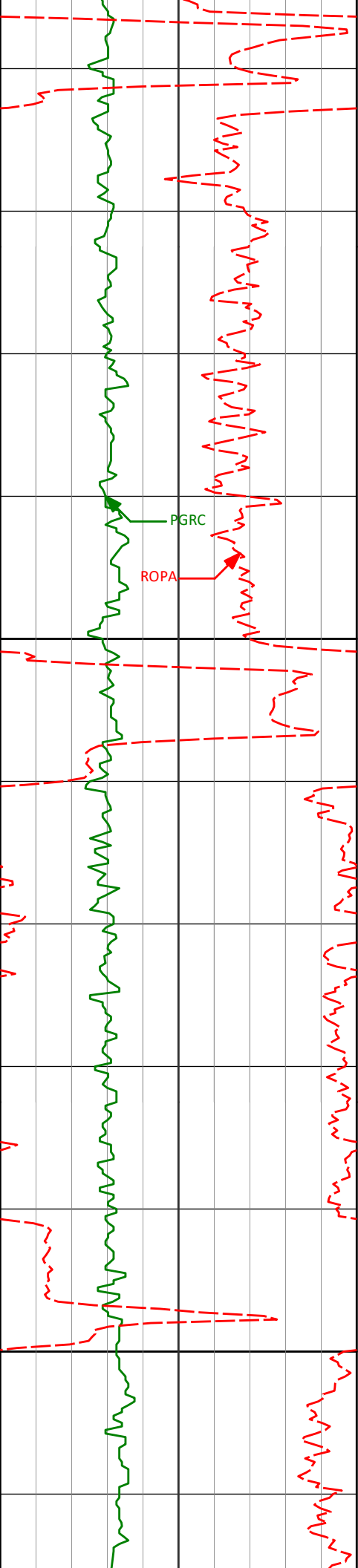
9.30°

281.38°

3963.61'

-10.15'

4000



4057'

9.53°

283.86°

4053.39'

-13.47'

4100

4148'

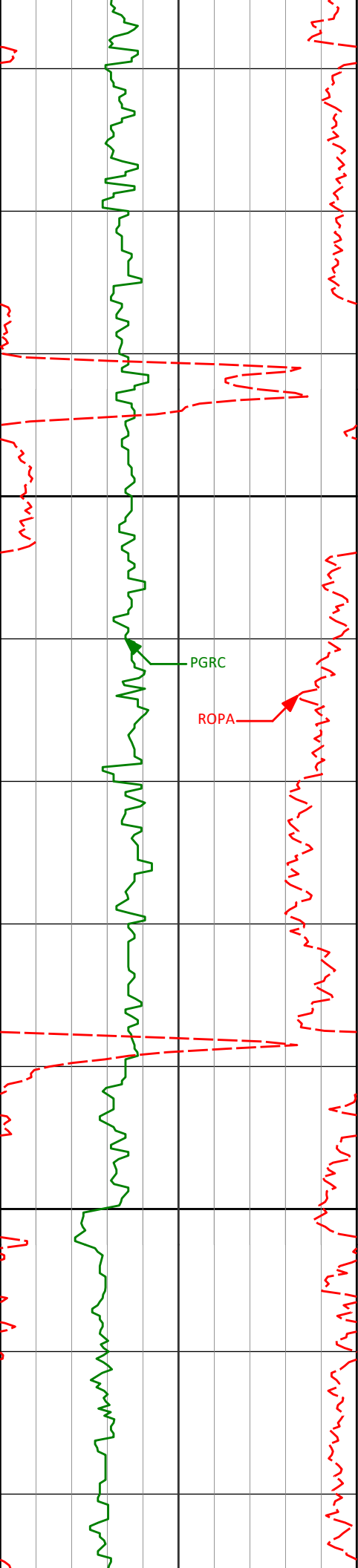
10.19°

279.89°

4143.04'

-16.72'

4200



4300

4400

4240'

4332'

4418'

9.60°

8.97°

8.15°

278.13°

275.93°

278.28°

4233.67'

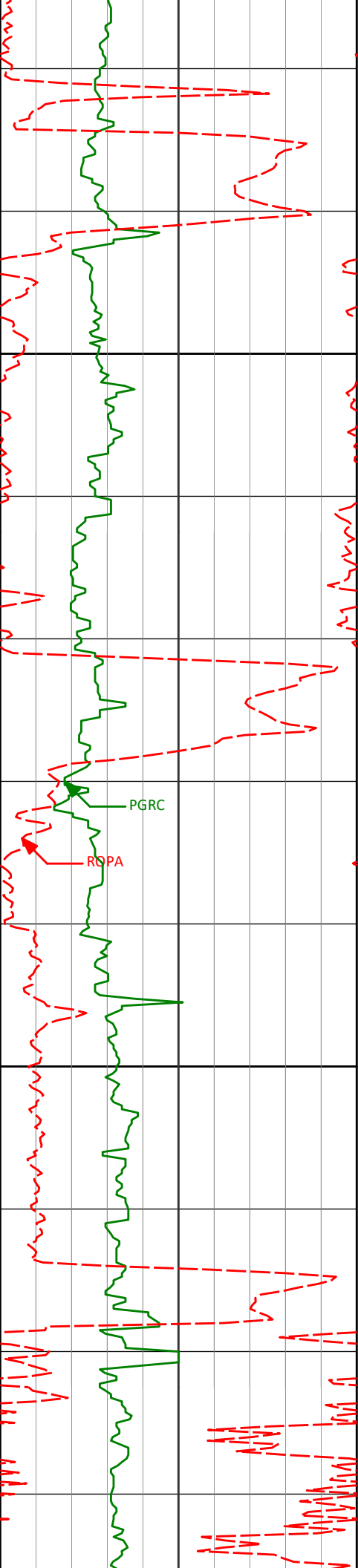
4324.47'

4409.51'

-19.27'

-21.16'

-22.78'



4500

4504'

7.63°

272.46°

4494.70'

-23.95'

PGRC

ROPA

4600

4589'

7.60°

261.15°

4578.95'

-23.38'

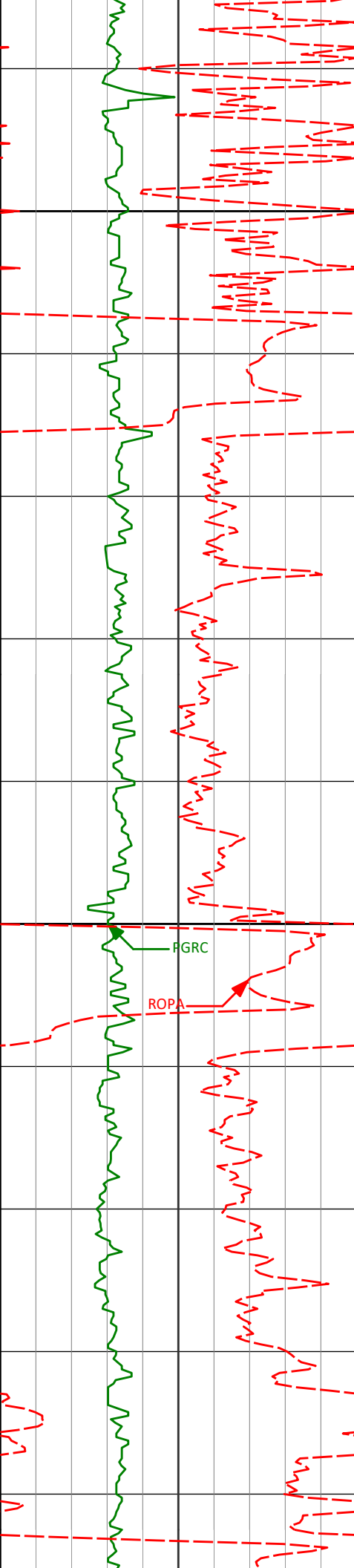
4674'

7.19°

255.61°

4663.25'

-21.24'



4700

4760'

5.21°

257.65°

4748.74'

-19.10'

4800

FGRC

ROPA

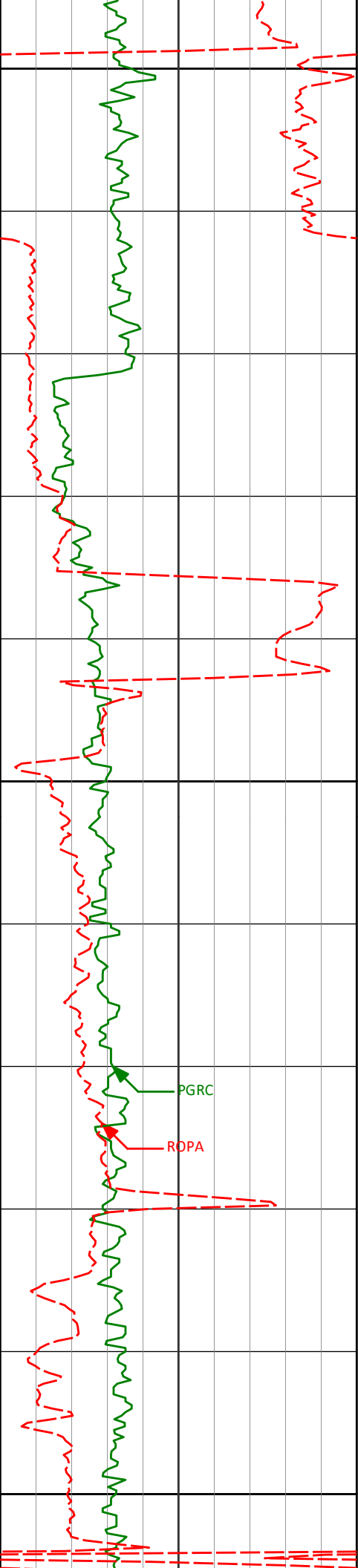
4846'

3.37°

261.55°

4834.49'

-17.92'



4900

4931'

1.94°

288.99°

4919.40'

-18.04'

5000

5017'

0.37°

261.12°

5005.38'

-18.47'

PGRC

ROPA

5102'

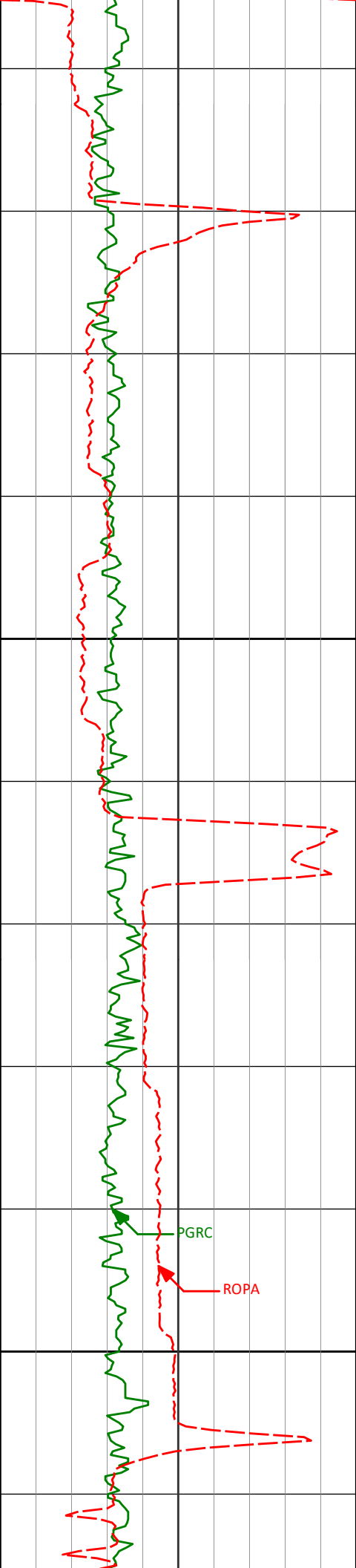
0.46°

269.41°

5090.38'

-18.43'

5100

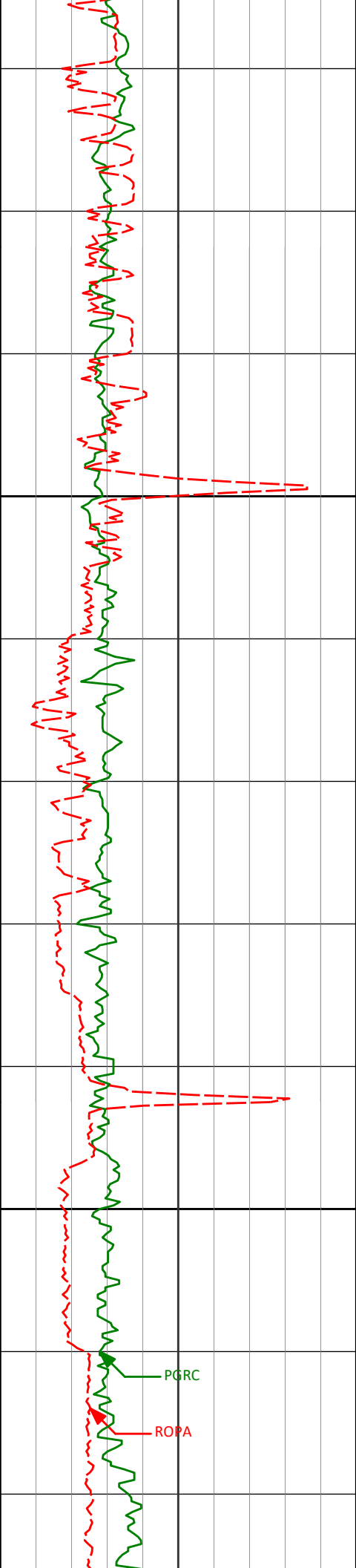


5188' 0.37° 283.51° 5176.38' -18.50'

5200

5274' 0.41° 97.18° 5262.38' -18.52'

5300



5400

5500

5359'

0.55°

83.85°

5347.38'

-18.52'

5445'

0.40°

92.05°

5433.37'

-18.56'

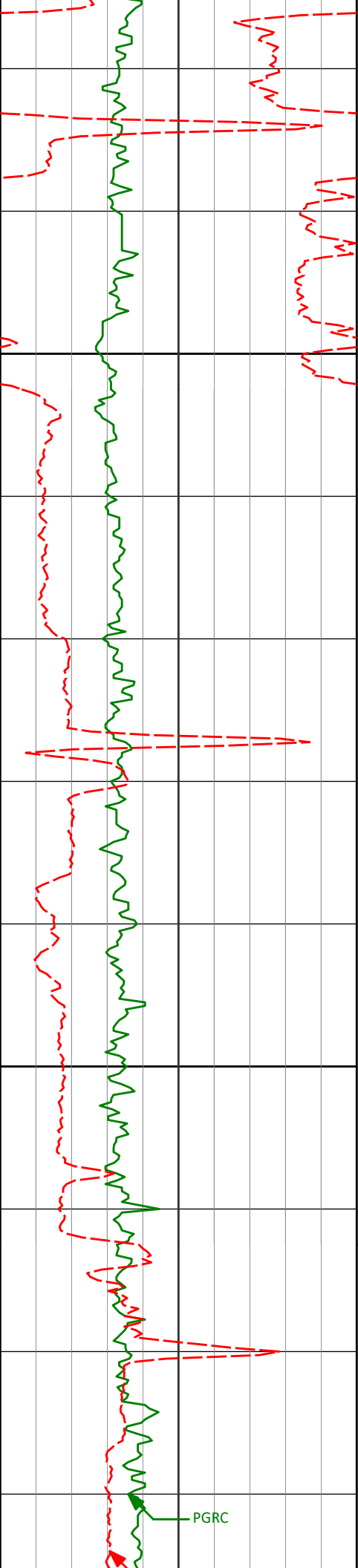
5530'

0.47°

89.12°

5518.37'

-18.55'



5600

5616'

0.38°

71.55°

5604.37'

-18.64'

5700

5702'

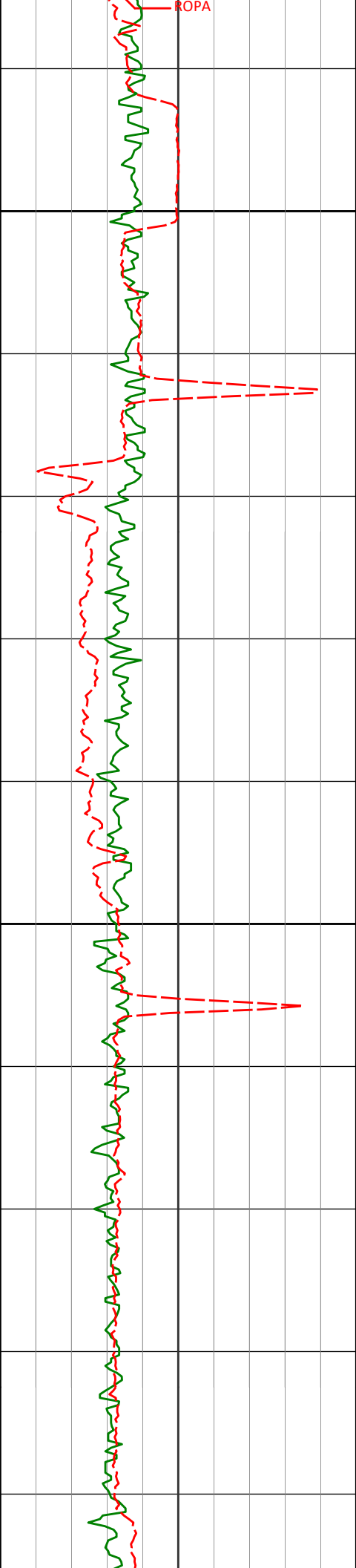
0.20°

34.25°

5690.37'

-18.85'

PGRC



5800

5788'

0.00°

121.73°

5776.37'

-18.98'

5873'

0.37°

195.12°

5861.37'

-18.71'

5900

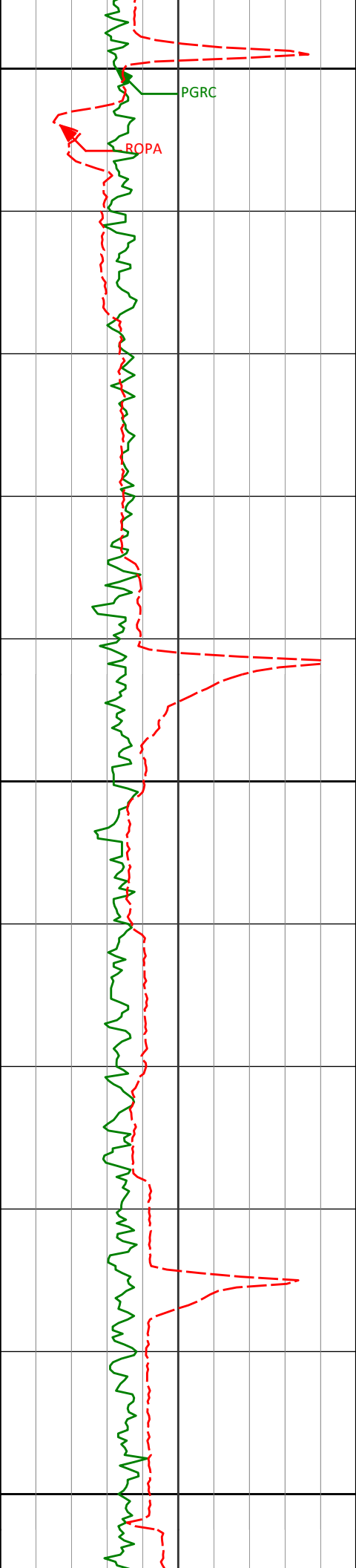
5959'

0.71°

151.25°

5947.36'

-17.98'



6000

6045'

0.68°

137.38°

6033.36'

-17.13'

6100

6130'

0.68°

155.01°

6118.35'

-16.30'

6200

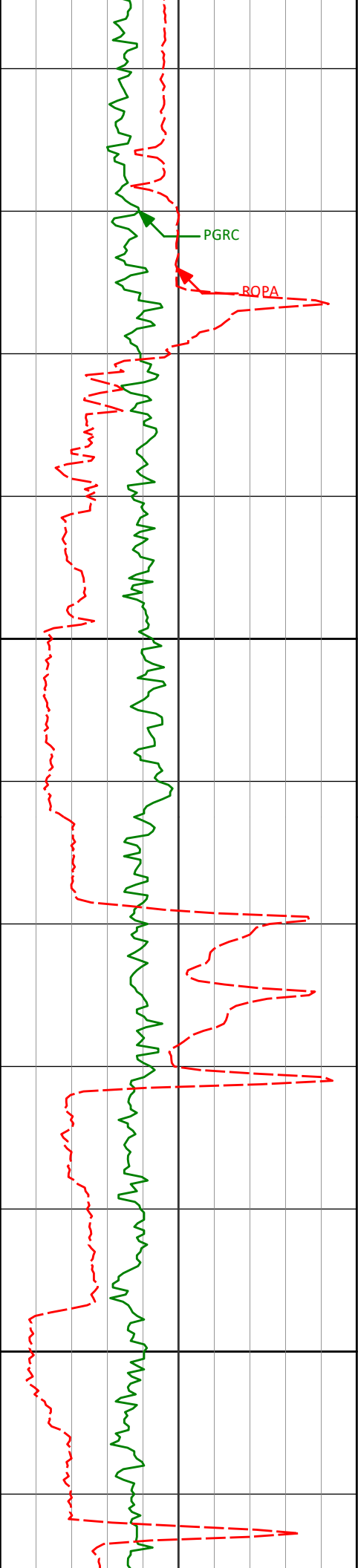
6216'

0.55°

173.70°

6204.35'

-15.43'

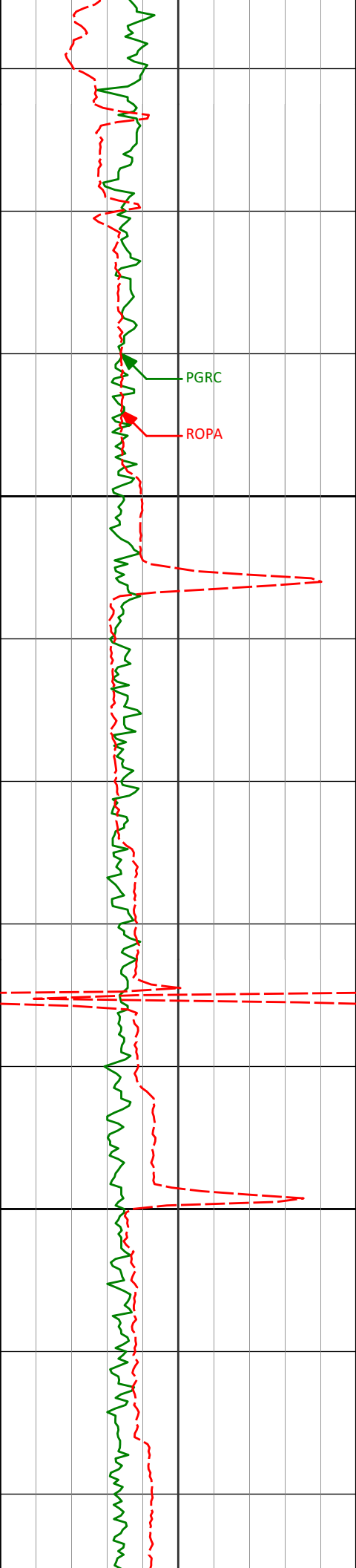


6302'	0.44°	169.23°	6290.34'	-14.69'
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6300

6387'	0.50°	184.83°	6375.34'	-14.00'
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6400



6500

6600

6473'

0.51°

186.53°

6461.34'

-13.25'

6559'

0.56°

197.23°

6547.33'

-12.47'

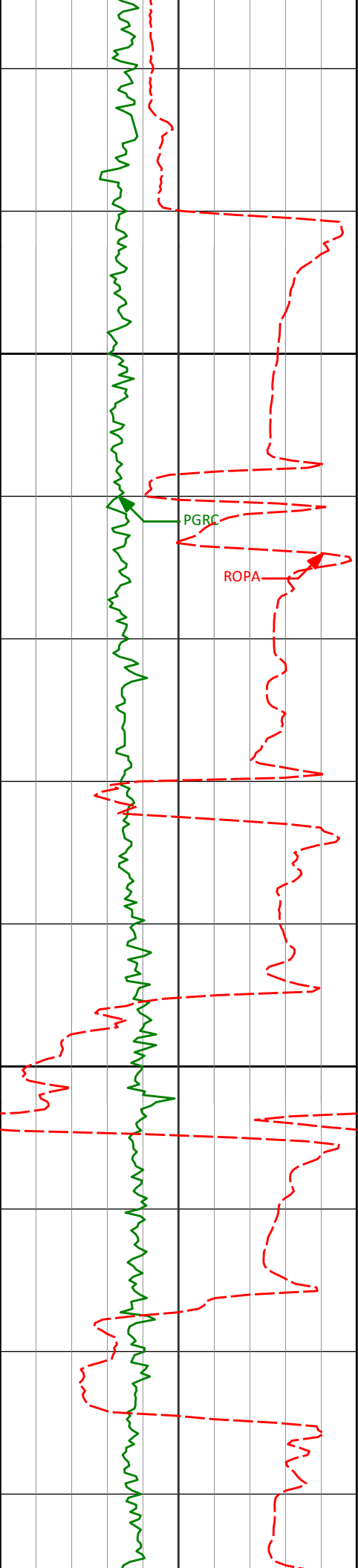
6645'

0.31°

203.24°

6633.33'

-11.85'



6700

6688'

0.65°

188.52°

6676.33'

-11.50'

6730'

5.43°

193.06°

6718.26'

-9.33'

6773'

10.46°

192.38°

6760.83'

-3.54'

6800

6816'

12.58°

191.05°

6802.96'

4.86'

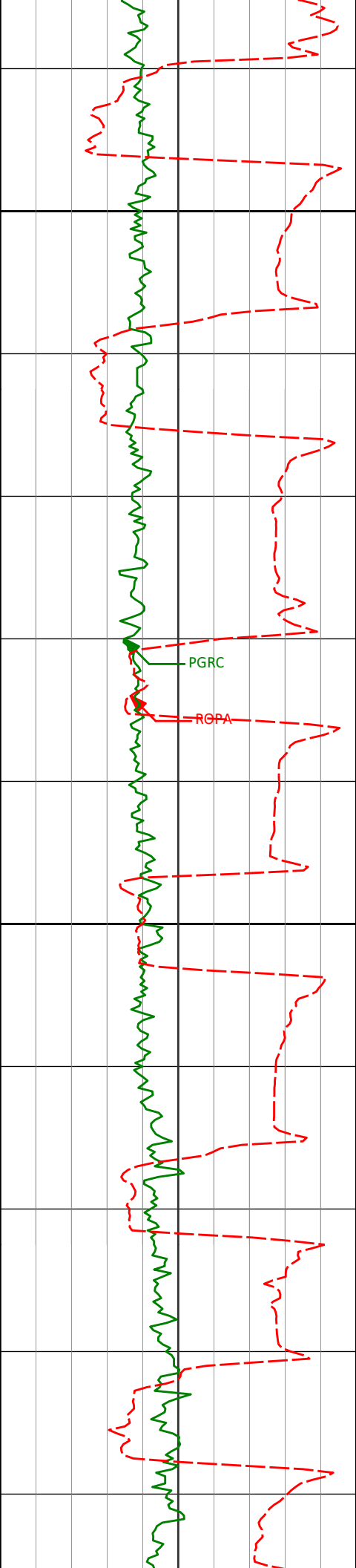
6859'

15.91°

185.38°

6844.64'

15.32'



6900

6902'

19.26°

181.17°

6885.62'

28.28'

6945'

22.78°

181.00°

6925.75'

43.70'

6987'

27.25°

176.35°

6963.81'

61.44'

7000

7030'

31.60°

177.09°

7001.25'

82.53'

7073'

36.46°

177.09°

7036.88'

106.56'

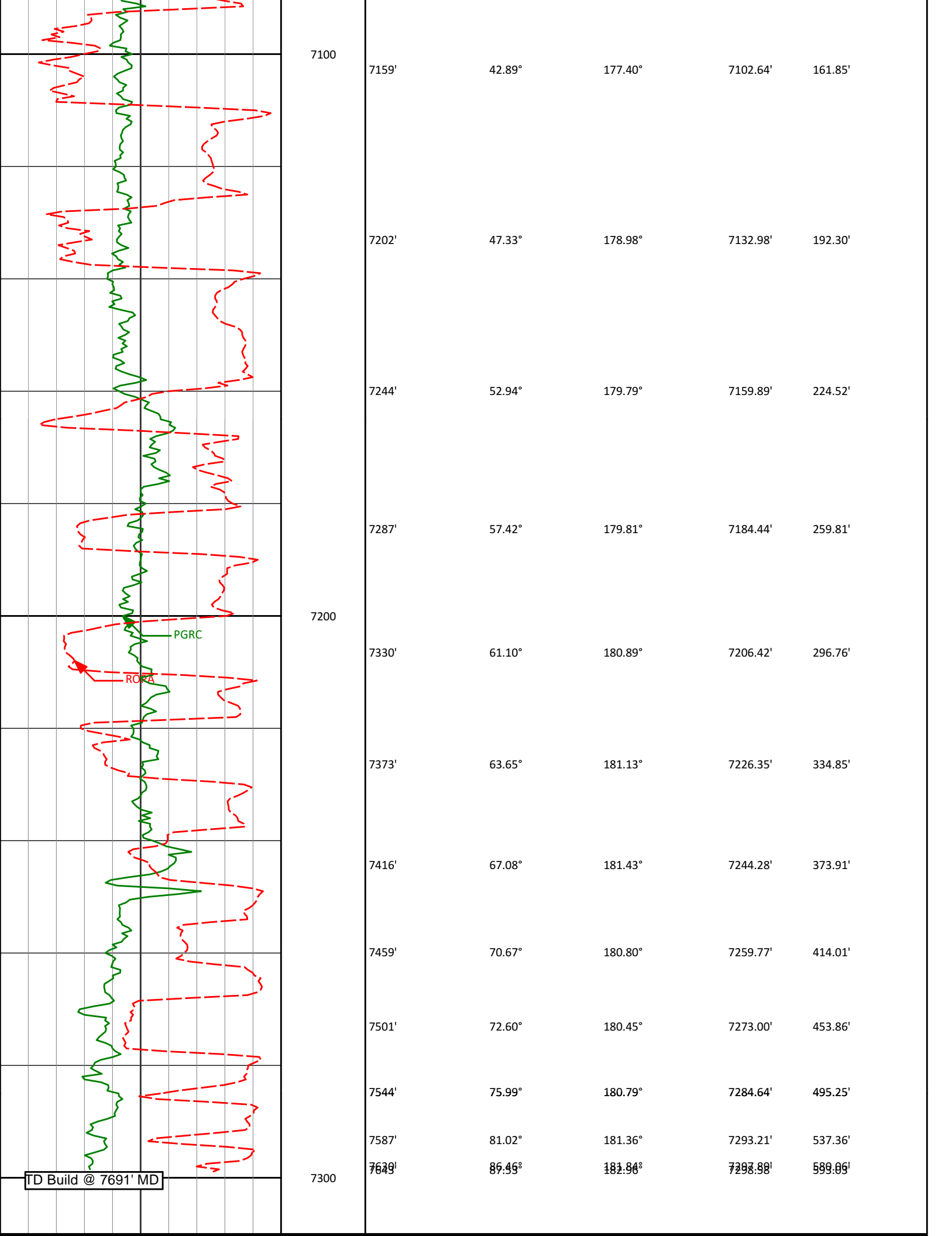
7116'

40.49°

177.45°

7070.54'

133.28'



<div><div>Avg Rate of Penetration</div><div>ROPA</div><div>feet per hr</div></div>		Depth, ft TVD	Depth	Inc.	Azi.	TVD	V.S.
500	0						
<div><div>PCG Gamma Ray</div><div>PGRC</div><div>api</div></div>							
0	300						

HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp.
Batterball 3N-15HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900752899

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
946.00	0.23	308.67	945.99	2.39 N	2.19 E	-2.38	TIE-IN
1107.00	0.46	187.27	1106.99	1.95 N	1.86 E	-1.94	0.38
1202.00	0.43	196.53	1201.99	1.23 N	1.71 E	-1.22	0.08
1297.00	0.47	205.81	1296.98	0.54 N	1.44 E	-0.53	0.09
1392.00	0.57	204.90	1391.98	0.24 S	1.07 E	0.25	0.11
1487.00	0.50	228.52	1486.97	0.94 S	0.56 E	0.95	0.24
1580.00	0.68	248.38	1579.97	1.42 S	0.26 W	1.42	0.29
1676.00	0.49	272.64	1675.96	1.61 S	1.20 W	1.60	0.32
1767.00	0.55	275.51	1766.96	1.55 S	2.02 W	1.54	0.07
1860.00	0.99	280.88	1859.95	1.35 S	3.26 W	1.34	0.48
1952.00	1.00	306.37	1951.94	0.73 S	4.68 W	0.71	0.48
2044.00	1.06	290.28	2043.92	0.04 N	6.13 W	-0.07	0.32
2137.00	1.15	301.18	2136.91	0.83 N	7.73 W	-0.86	0.25
2228.00	0.57	235.89	2227.90	1.04 N	8.89 W	-1.08	1.15
2320.00	0.22	129.60	2319.90	0.68 N	9.13 W	-0.71	0.72
2413.00	1.29	81.12	2412.89	0.72 N	7.96 W	-0.76	1.24
2505.00	0.96	76.81	2504.87	1.06 N	6.19 W	-1.08	0.37
2597.00	0.74	76.85	2596.86	1.37 N	4.86 W	-1.39	0.24
2689.00	0.37	57.12	2688.86	1.67 N	4.03 W	-1.68	0.45
2780.00	0.28	0.19	2779.85	2.05 N	3.78 W	-2.06	0.35
2872.00	0.26	22.32	2871.85	2.47 N	3.70 W	-2.48	0.11
2963.00	0.35	331.90	2962.85	2.90 N	3.75 W	-2.92	0.30
3053.00	0.40	322.12	3052.85	3.39 N	4.08 W	-3.41	0.09
3145.00	0.48	291.30	3144.85	3.79 N	4.63 W	-3.81	0.27
3327.00	0.82	306.46	3326.84	4.84 N	6.39 W	-4.86	0.21
3418.00	0.92	316.88	3417.82	5.76 N	7.41 W	-5.79	0.21
3510.00	1.56	271.04	3509.80	6.32 N	9.17 W	-6.36	1.23
3601.00	2.60	263.63	3600.74	6.11 N	12.46 W	-6.16	1.18
3693.00	4.26	276.74	3692.58	6.28 N	17.93 W	-6.36	1.98
3784.00	6.05	271.24	3783.21	6.78 N	26.08 W	-6.89	2.04
3875.00	7.40	277.89	3873.58	7.69 N	36.68 W	-7.84	1.71
3966.00	9.30	281.38	3963.61	9.95 N	49.69 W	-10.15	2.16
4057.00	9.53	283.86	4053.39	13.20 N	64.22 W	-13.47	0.51
4148.00	10.19	279.89	4143.04	16.39 N	79.46 W	-16.72	1.04
4240.00	9.60	278.13	4233.67	18.87 N	95.07 W	-19.27	0.72
4332.00	8.97	275.93	4324.47	20.70 N	109.80 W	-21.16	0.79
4418.00	8.15	278.28	4409.51	22.27 N	122.50 W	-22.78	1.04
4504.00	7.63	272.46	4494.70	23.39 N	134.24 W	-23.95	1.11
4589.00	7.60	261.15	4578.95	22.77 N	145.43 W	-23.38	1.76
4674.00	7.19	255.61	4663.25	20.58 N	156.14 W	-21.24	0.97
4760.00	5.21	257.65	4748.74	18.41 N	165.17 W	-19.10	2.32
4846.00	3.37	261.55	4834.49	17.20 N	171.48 W	-17.92	2.17
4931.00	1.94	288.99	4919.40	17.30 N	175.31 W	-18.04	2.21
5017.00	0.37	261.12	5005.38	17.73 N	176.96 W	-18.47	1.89
5102.00	0.46	269.41	5090.38	17.69 N	177.58 W	-18.43	0.13
5188.00	0.37	283.51	5176.38	17.75 N	178.19 W	-18.50	0.16
5273.00	0.44	287.42	5262.33	17.73 N	178.18 W	-18.52	0.24

5274.00	0.41	97.18	5262.38	17.78 N	178.16 W	-18.52	0.91
5359.00	0.55	83.85	5347.38	17.78 N	177.45 W	-18.52	0.21
5445.00	0.40	92.05	5433.37	17.81 N	176.74 W	-18.56	0.19
5530.00	0.47	89.12	5518.37	17.81 N	176.09 W	-18.55	0.09
5616.00	0.38	71.55	5604.37	17.91 N	175.47 W	-18.64	0.18
5702.00	0.20	34.25	5690.37	18.12 N	175.11 W	-18.85	0.29
5788.00	0.00	121.73	5776.37	18.24 N	175.03 W	-18.98	0.23
5873.00	0.37	195.12	5861.37	17.98 N	175.10 W	-18.71	0.44
5959.00	0.71	151.25	5947.36	17.24 N	174.92 W	-17.98	0.60
6045.00	0.68	137.38	6033.36	16.40 N	174.32 W	-17.13	0.20
6130.00	0.68	155.01	6118.35	15.57 N	173.76 W	-16.30	0.25
6216.00	0.55	173.70	6204.35	14.70 N	173.50 W	-15.43	0.28
6302.00	0.44	169.23	6290.34	13.96 N	173.39 W	-14.69	0.14
6387.00	0.50	184.83	6375.34	13.27 N	173.36 W	-14.00	0.17
6473.00	0.51	186.53	6461.34	12.52 N	173.44 W	-13.25	0.02
6559.00	0.56	197.23	6547.33	11.74 N	173.61 W	-12.47	0.13
6645.00	0.31	203.24	6633.33	11.12 N	173.82 W	-11.85	0.30
6688.00	0.65	188.52	6676.33	10.78 N	173.91 W	-11.50	0.83
6730.00	5.43	193.06	6718.26	8.60 N	174.39 W	-9.33	11.39
6773.00	10.46	192.38	6760.83	2.80 N	175.69 W	-3.54	11.70
6816.00	12.58	191.05	6802.96	5.60 S	177.42 W	4.86	4.97
6859.00	15.91	185.38	6844.64	16.07 S	178.87 W	15.32	8.39
6902.00	19.26	181.17	6885.62	29.03 S	179.57 W	28.28	8.33
6945.00	22.78	181.00	6925.75	44.45 S	179.86 W	43.70	8.19
6987.00	27.25	176.35	6963.81	62.19 S	179.39 W	61.44	11.62
7030.00	31.60	177.09	7001.25	83.27 S	178.19 W	82.53	10.15
7073.00	36.46	177.09	7036.88	107.30 S	176.97 W	106.56	11.30
7116.00	40.49	177.45	7070.54	134.02 S	175.70 W	133.28	9.39
7159.00	42.89	177.40	7102.64	162.59 S	174.41 W	161.85	5.58
7202.00	47.33	178.98	7132.98	193.03 S	173.47 W	192.30	10.65
7244.00	52.94	179.79	7159.89	225.25 S	173.13 W	224.52	13.44
7287.00	57.42	179.81	7184.44	260.54 S	173.01 W	259.81	10.42
7330.00	61.10	180.89	7206.42	297.49 S	173.24 W	296.76	8.83
7373.00	63.65	181.13	7226.35	335.58 S	173.91 W	334.85	5.95
7416.00	67.08	181.43	7244.28	374.65 S	174.79 W	373.91	8.00
7459.00	70.67	180.80	7259.77	414.75 S	175.57 W	414.01	8.46
7501.00	72.60	180.45	7273.00	454.60 S	176.00 W	453.86	4.66
7544.00	75.99	180.79	7284.64	495.99 S	176.45 W	495.25	7.92
7587.00	81.02	181.36	7293.21	538.11 S	177.24 W	537.36	11.77
7630.00	86.46	181.84	7297.89	580.82 S	178.43 W	580.06	12.70
7643.00	87.53	182.96	7298.58	593.79 S	178.98 W	593.03	11.91

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 179.76 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 7643.00 FEET
IS 620.17 FEET ALONG 196.77 DEGREES (TRUE)**

Direction Surveys Tied onto Gyro's @ 946' MD.