

PCG Pressure Case Gamma PCD Pressure Case Directional

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	16-Jan-15				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	1,207.92				
Log End Depth (TVD, ft)	5,496.14				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	15-Jan-15 12:00				
Drill/Wipe End Date and Time	16-Jan-15 04:00				
Min Inc (deg) @ Depth (TVD, ft)	0.10 @ 1,295.92				
Max Inc (deg) @ Depth (TVD, ft)	81.06 @ 5,488.56				
Bit TFA(in2) / Bit Type	1.21 / PDC				
Flow Rate (gpm)	638.17				
Max AV (fpm) / CV (fpm) @ MWD	NA / NA				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	11.10 / 39.00				
Filtrate CL (ppm)	2,200.00				
pH / Fluid Loss (mptm)	9.00 / 6				
PV (cP) / YP (lbf2)	14 / 12.00				
% Solids / % Sand	12.7 / 0.25				
% Oil / Oil:Water Ratio	NA / NA				
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 (degF) @ Depth (ft)	168.00 / 5,496.14				

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

SENSOR INFORMATION

Downhole Processor Information

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

Directional Sensor Information

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

Gamma Ray Sensor Information

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

REMARKS

1. All depths are true vertical 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

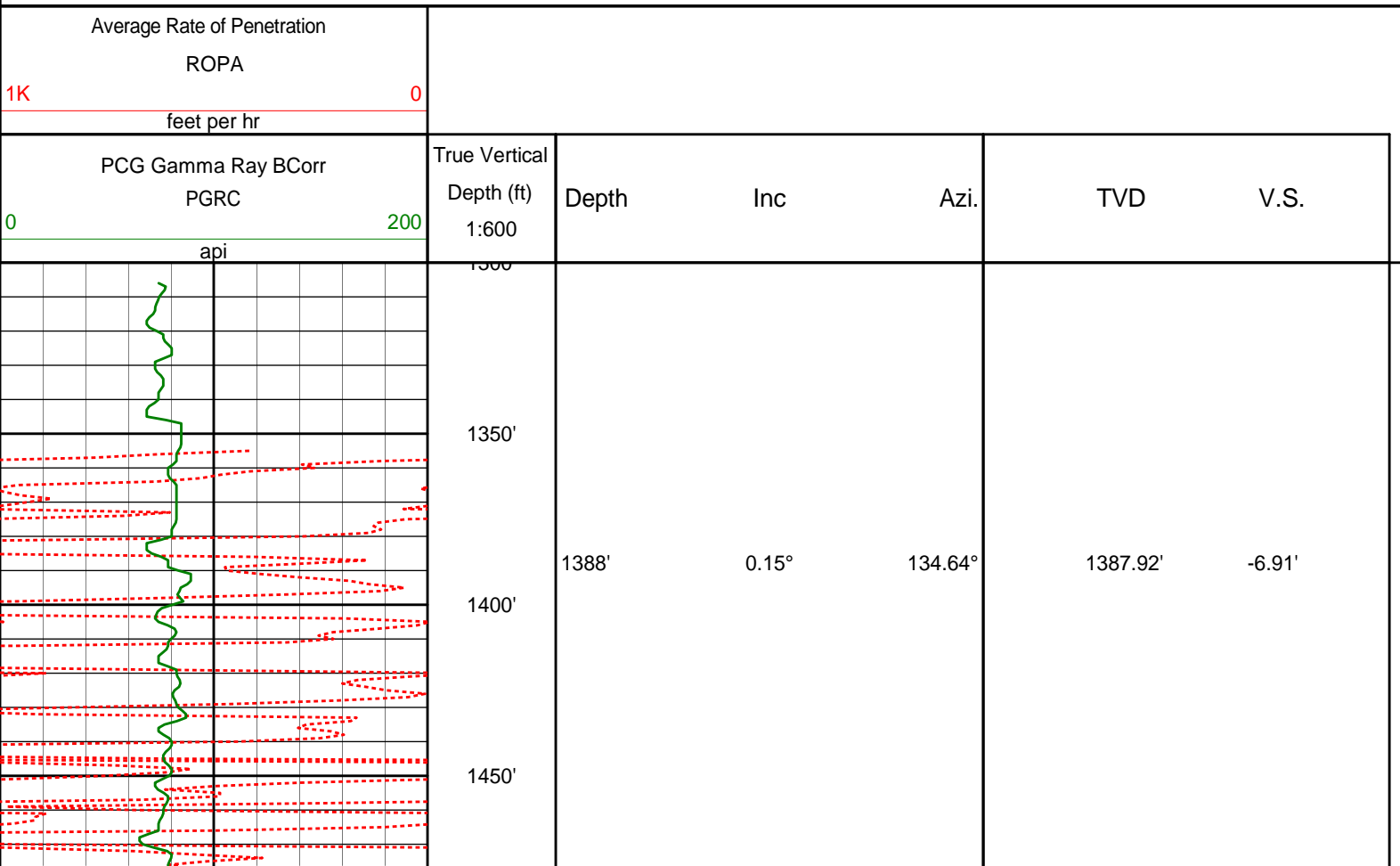
Gap Fill: 3.0 ft
ROPA (Average Rate of Penetration)
Interval Resolution: 0.5 ft
Interval Distance: 1.2 ft
Gap Fill: 3.0 ft
6. INSITE version 8.0.2

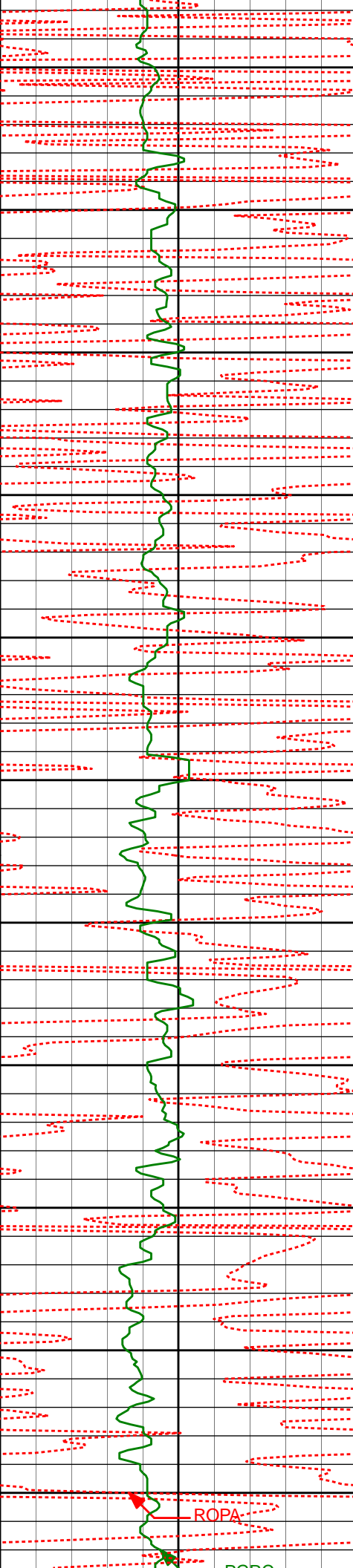
WARRANTY

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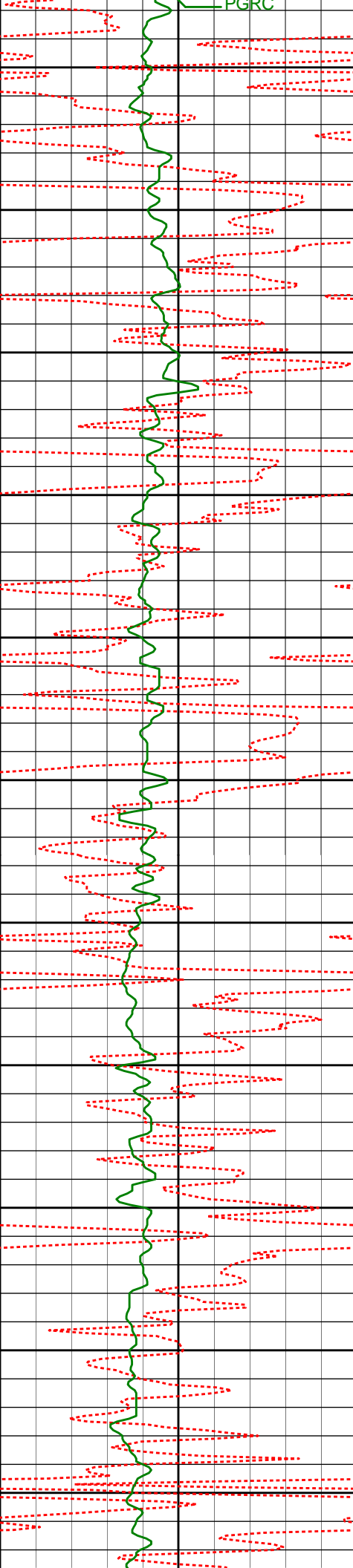
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TVD Main Log 1:600

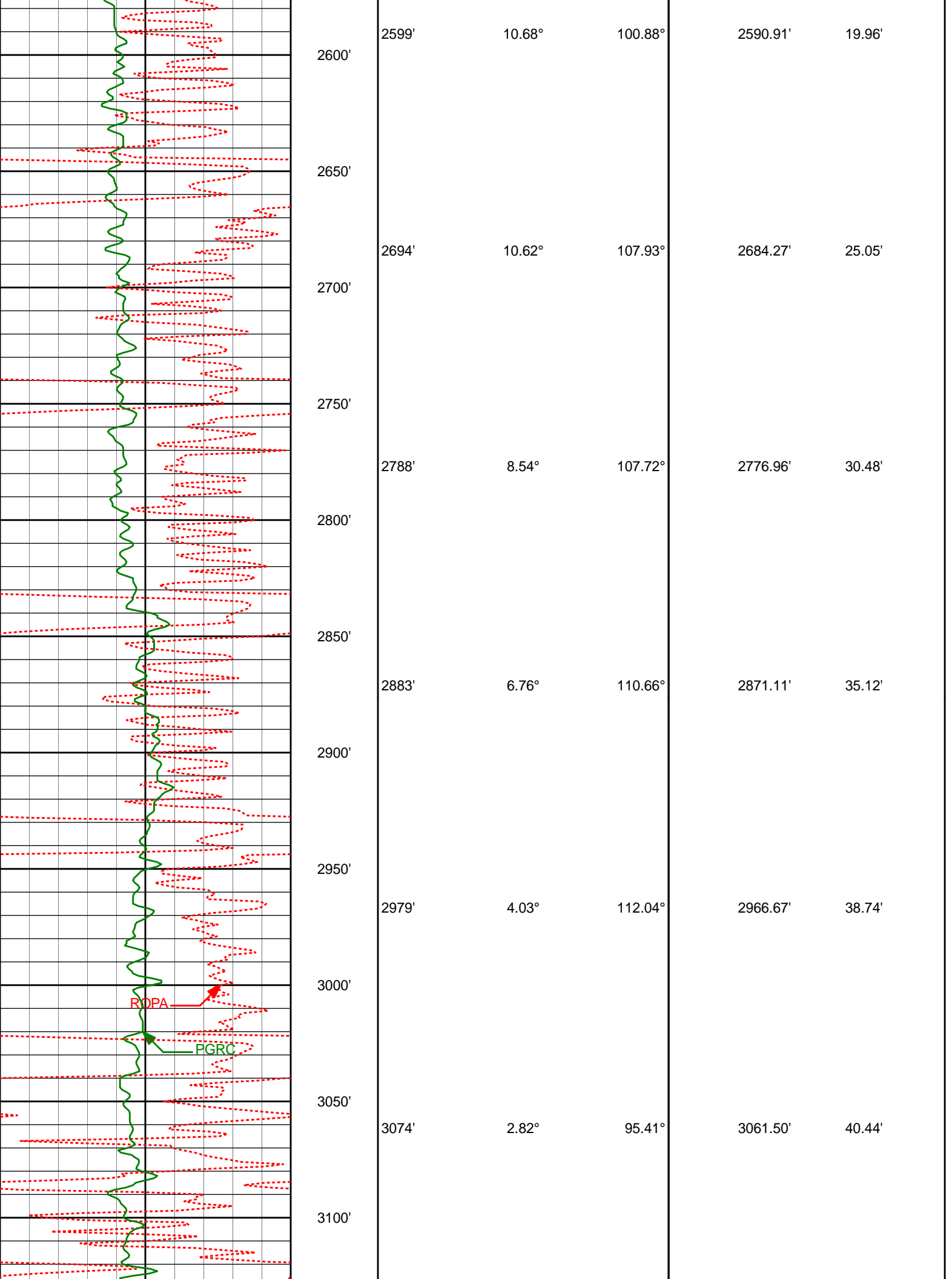


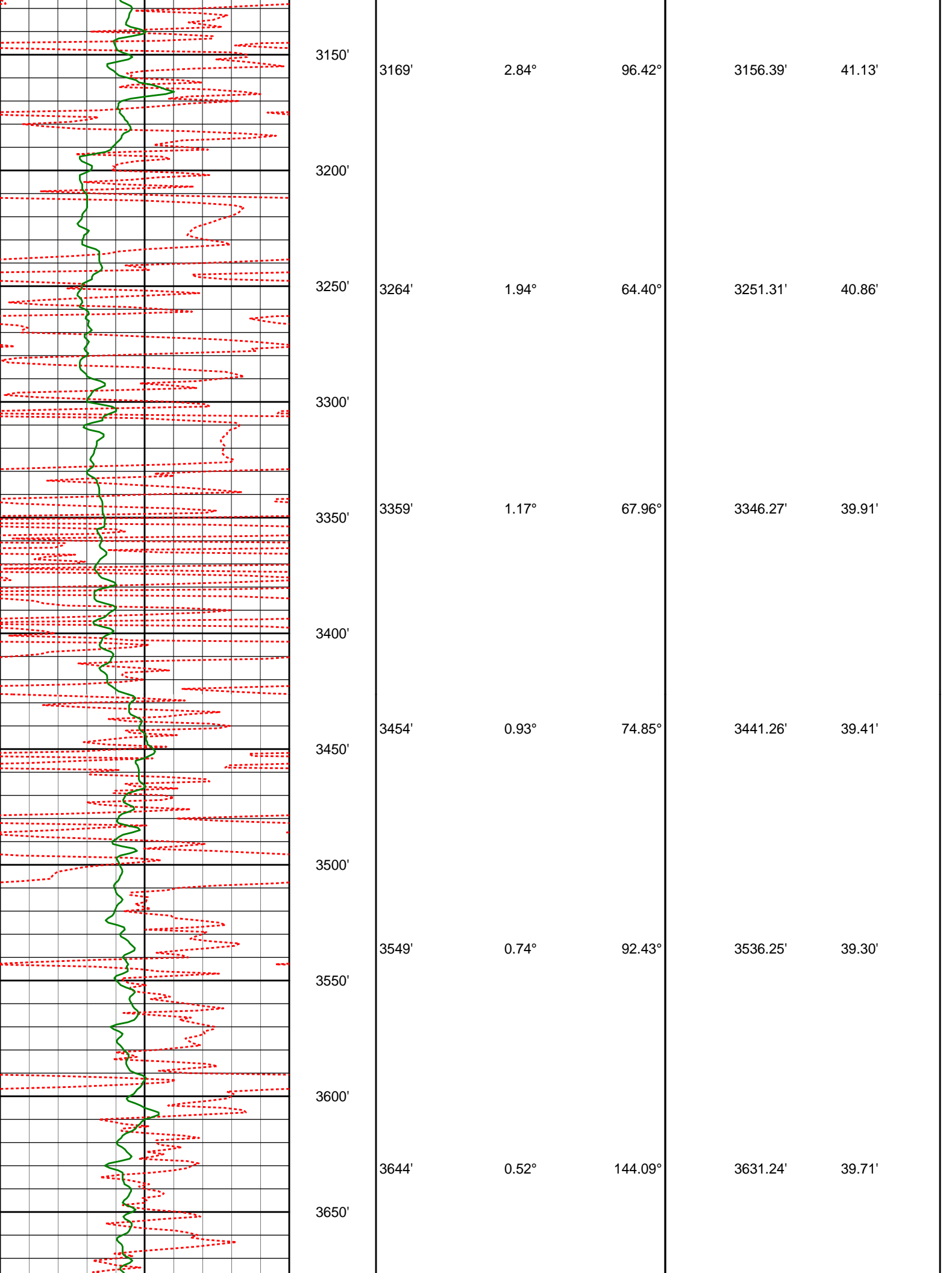


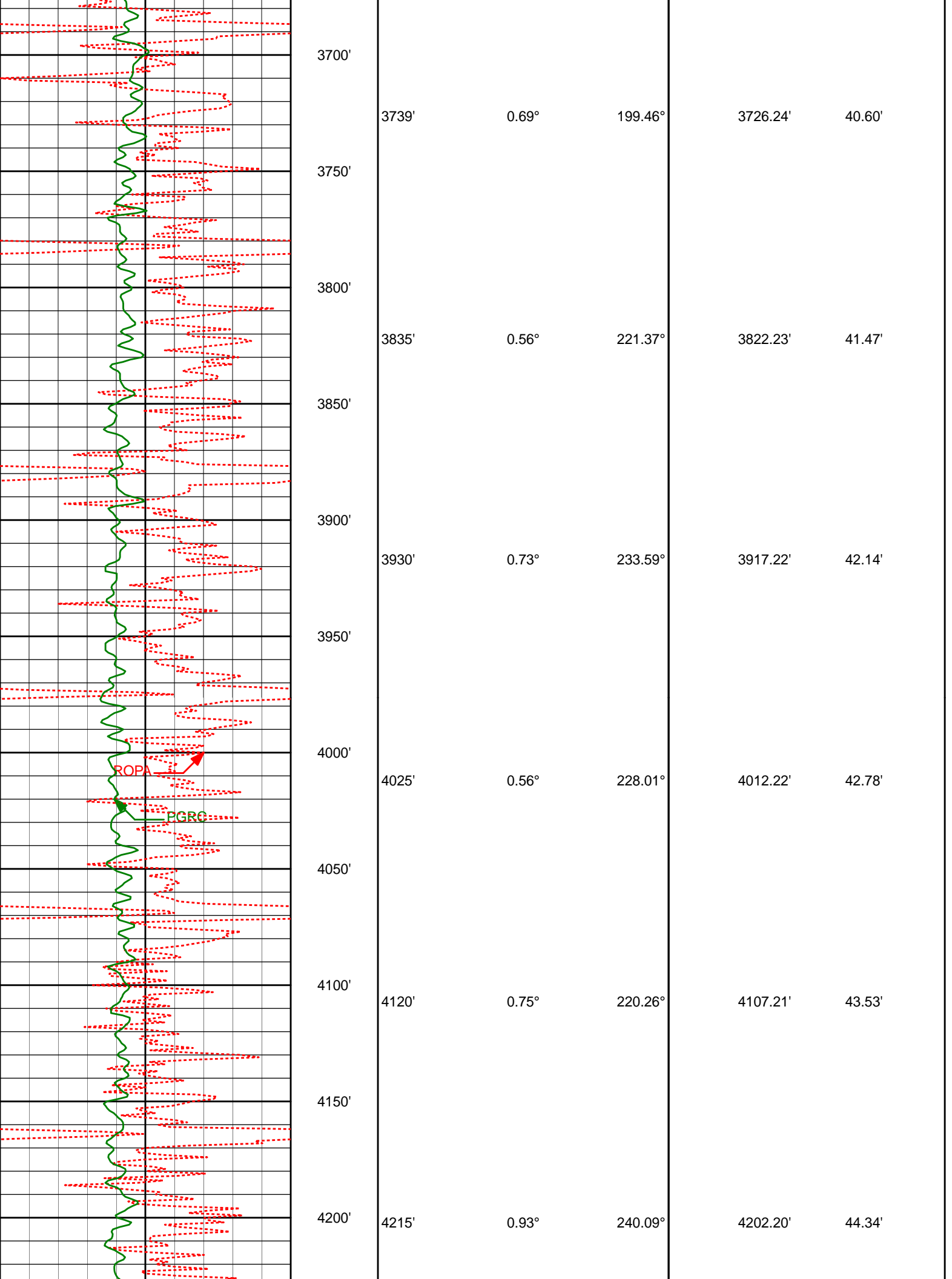
1482'	0.13°	204.08°	1481.92'	-6.72'
1500'				
1550'				
1575'	0.31°	168.54°	1574.92'	-6.37'
1600'				
1650'				
1668'	0.24°	163.92°	1667.92'	-5.93'
1700'				
1750'				
1759'	0.13°	121.47°	1758.92'	-5.69'
1800'				
1850'	1.57°	80.29°	1851.90'	-5.79'
1900'				
1945'	3.82°	95.80°	1944.79'	-5.50'
2000'				

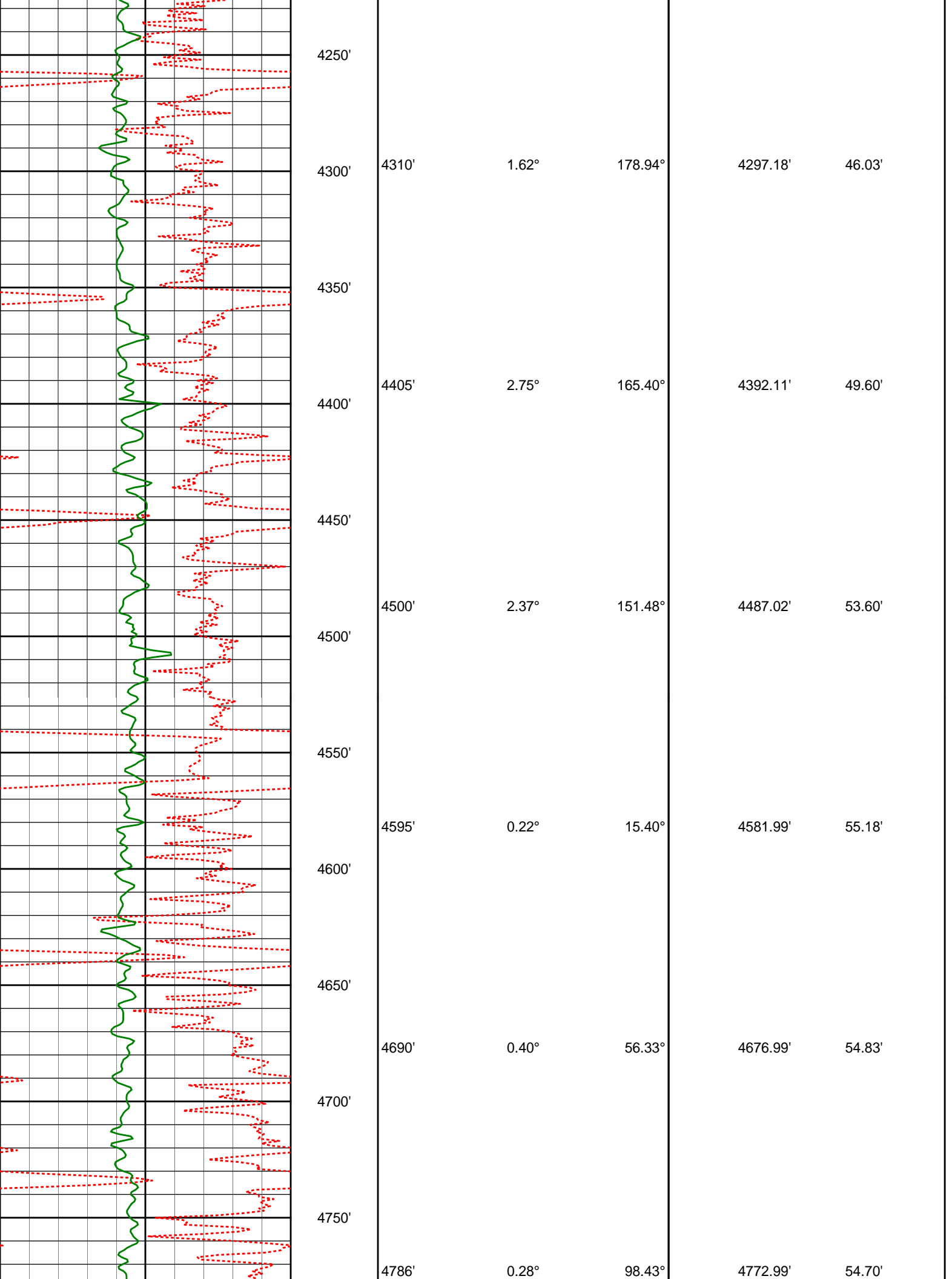


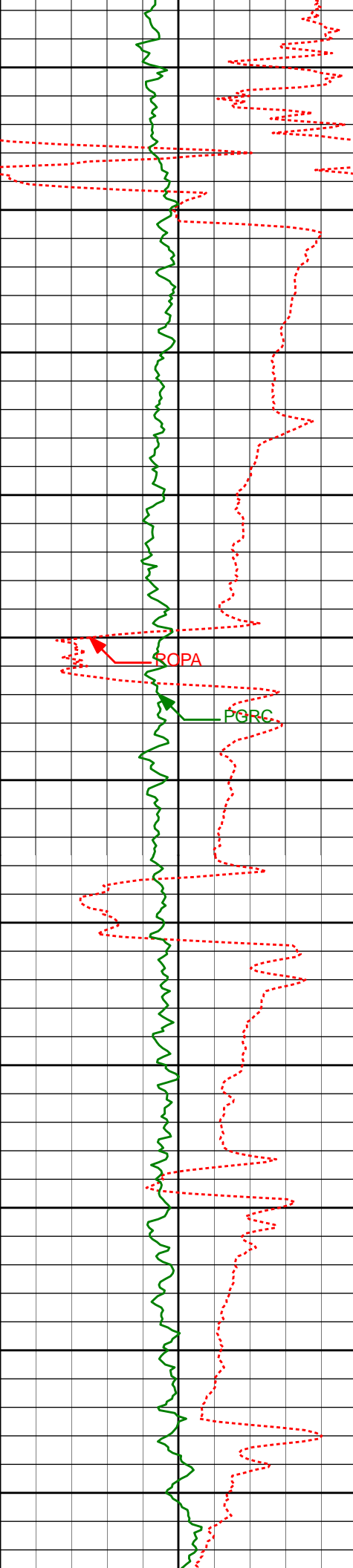
2038'	5.25°	97.86°	2037.50'	-4.29'
2129'	6.97°	103.58°	2127.98'	-2.02'
2222'	8.71°	101.24°	2220.11'	1.21'
2315'	10.50°	106.45°	2311.80'	5.63'
2408'	10.55°	103.55°	2403.24'	10.73'
2503'	10.82°	102.95°	2496.59'	15.51'











4800'

4850'

4900'

4950'

5000'

5050'

5100'

5150'

5200'

5250'

5300'

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'

5166'

21.25°

180.87°

5144.10'

120.74'

5261'

28.84°

176.83°

5230.11'

160.90'

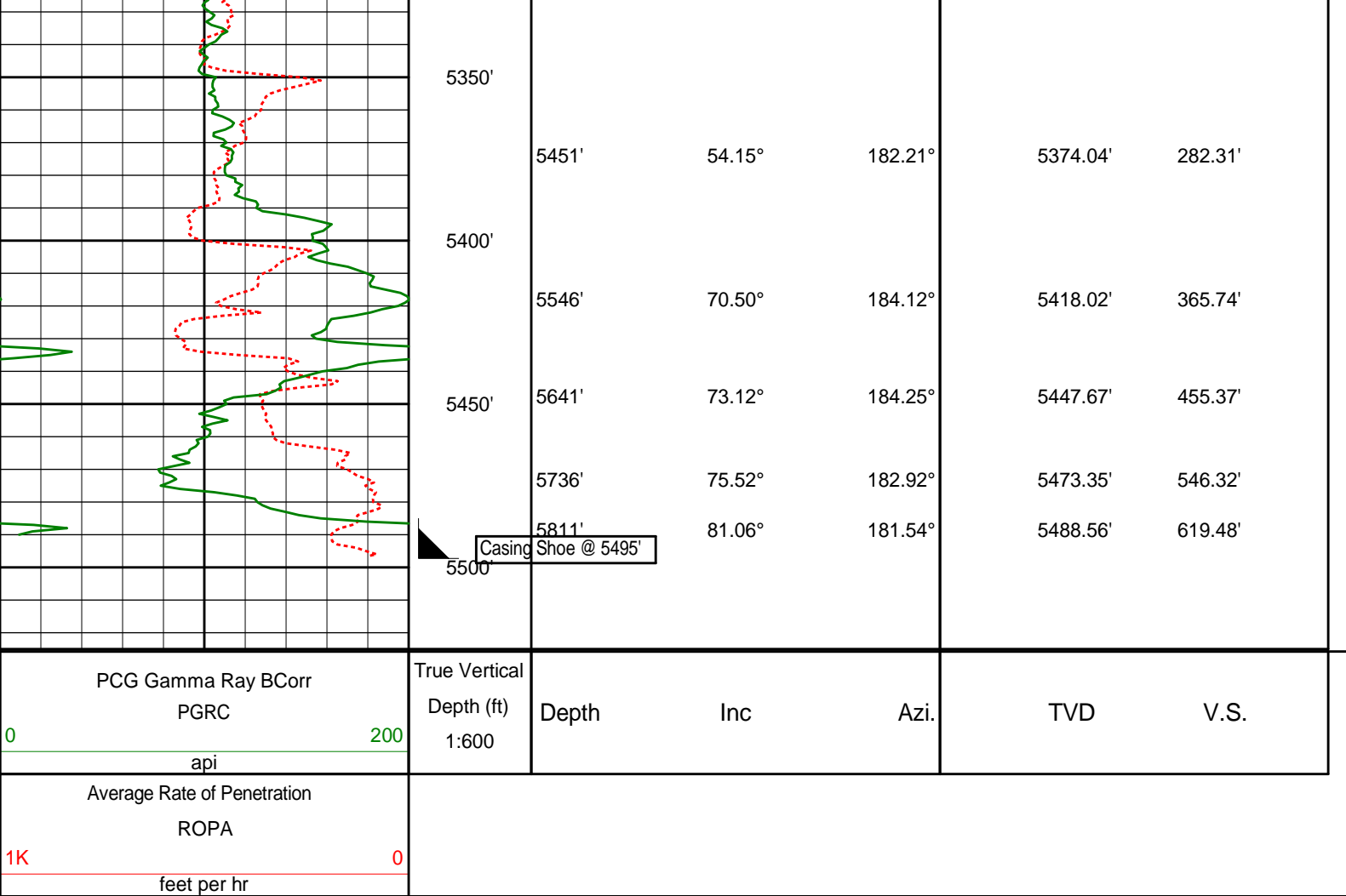
5356'

38.93°

181.10°

5308.89'

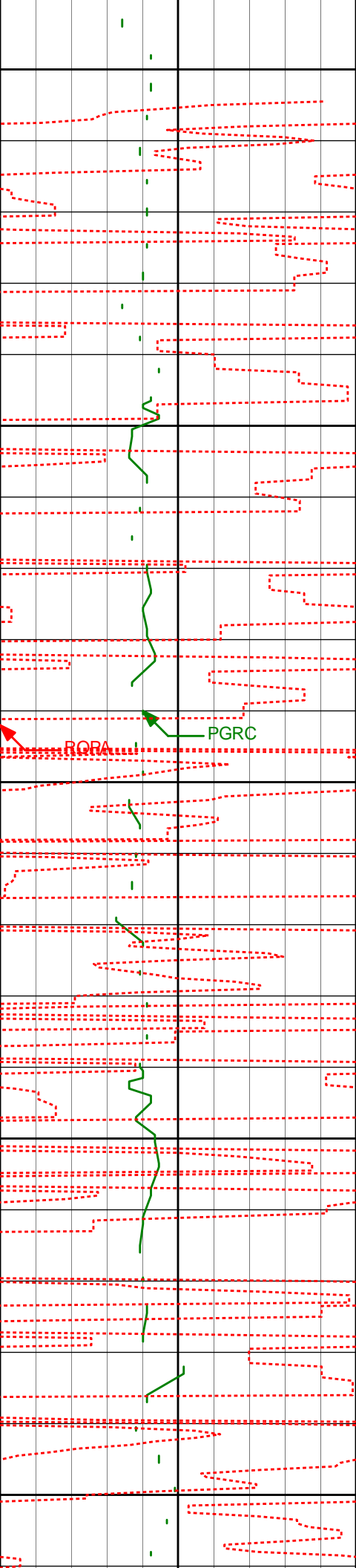
213.74'



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TVD Main Log 1:240





1350'

1388'

0.15°

134.64°

1387.92'

-6.91'

1400'

1450'

1482'

0.13°

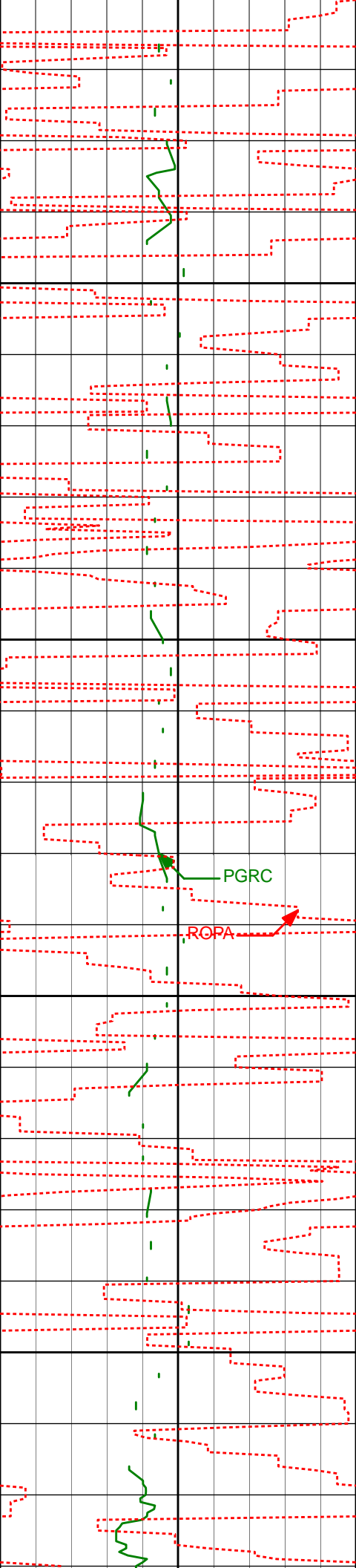
204.08°

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'

PGRC

ROPA

1700'

1750'

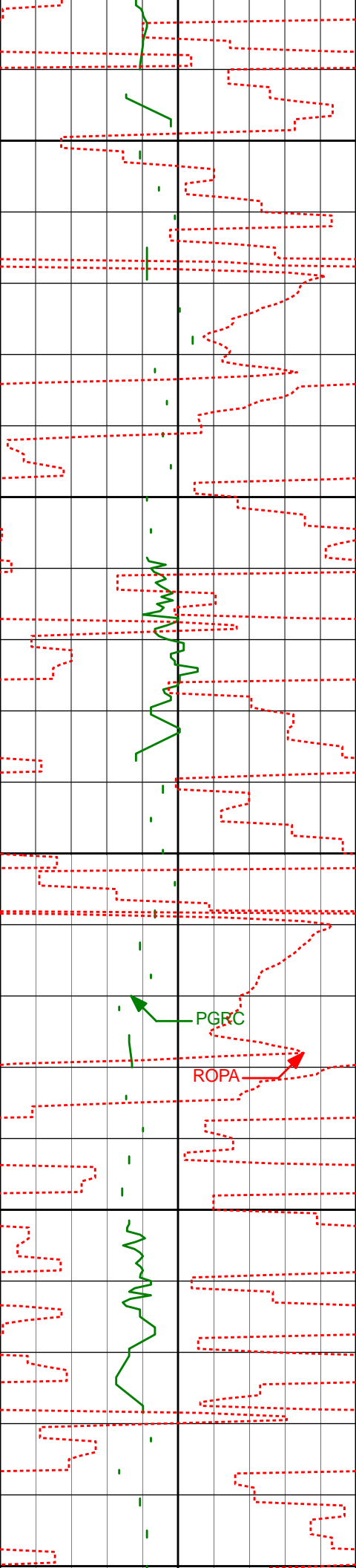
1759'

0.13°

121.47°

1758.92'

-5.69'



1800'

1850'

1900'

1950'

2000'

1852'

1.57°

80.29°

1851.90'

-5.79'

1945'

3.82°

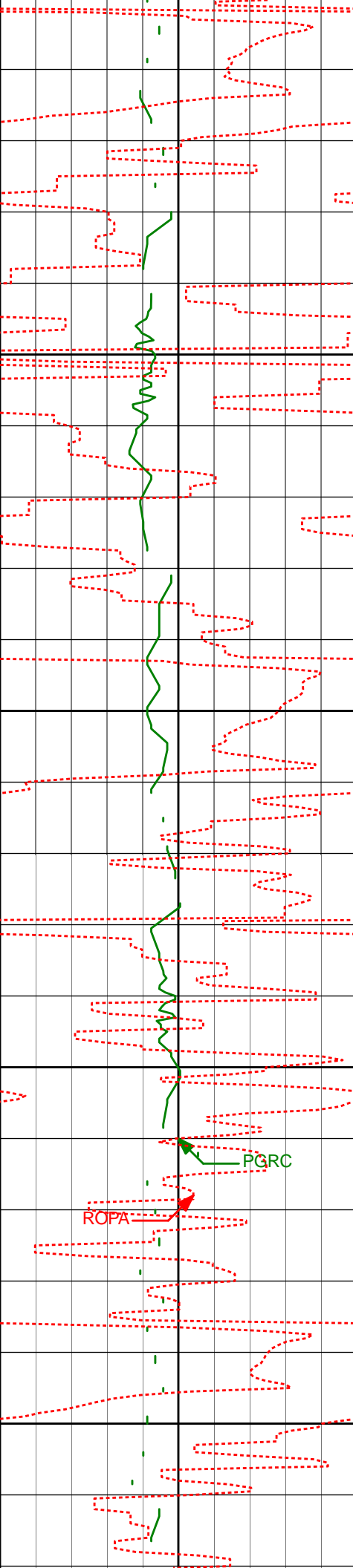
95.80°

1944.79'

-5.50'

PGRC

ROPA



2038'

5.25°

97.86°

2037.50'

-4.29'

2050'

2100'

2129'

6.97°

103.58°

2127.98'

-2.02'

2150'

2200'

2222'

8.71°

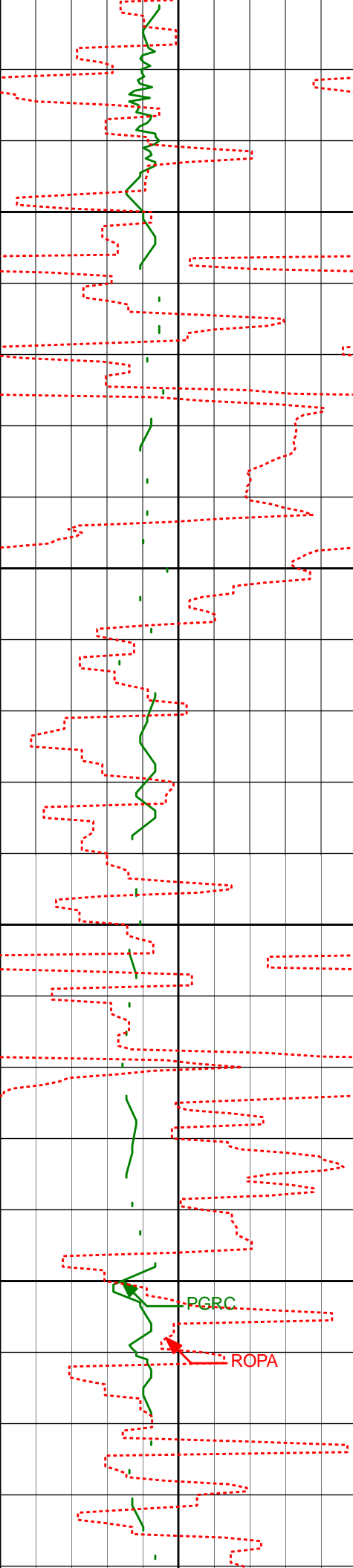
101.24°

2220.11'

1.21'

PGRC

ROPA



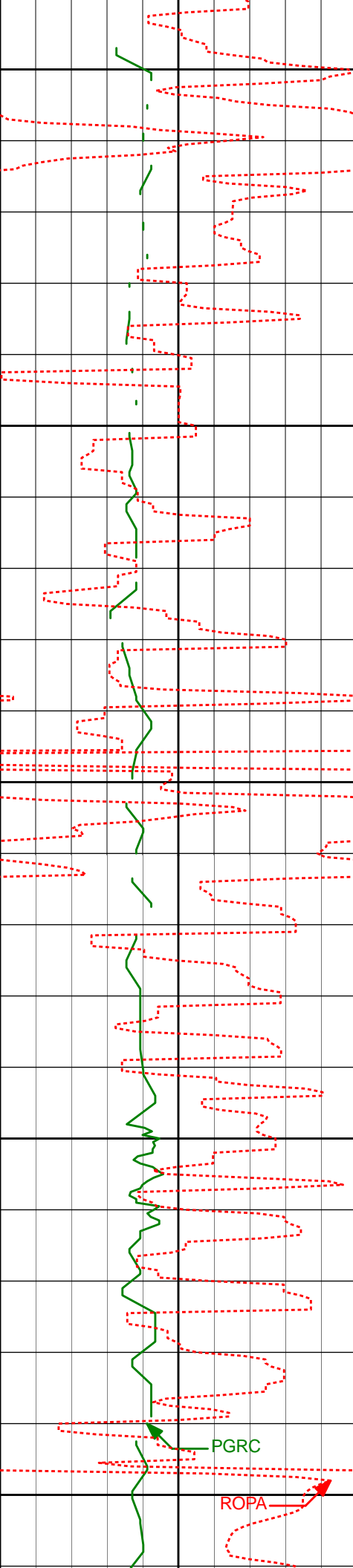
2250'

2300'

2350'

2400'

2222	0.71	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°

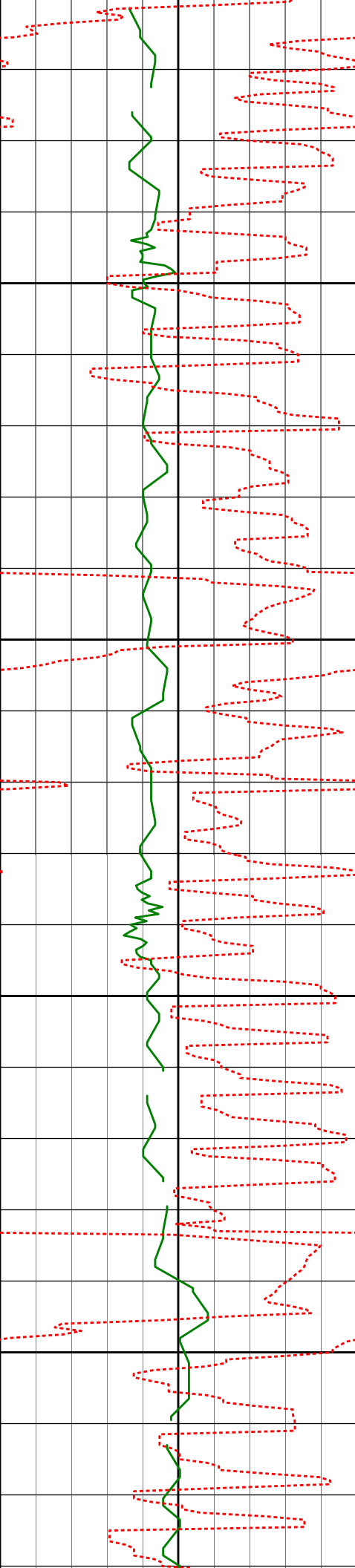
100.88°

2590.91'

19.96'

PGRC

ROPA



2694'

2700'

2750'

2800'

2850'

2694'

10.62°

107.93°

2684.27'

25.05'

2788'

8.54°

107.72°

2776.96'

30.48'

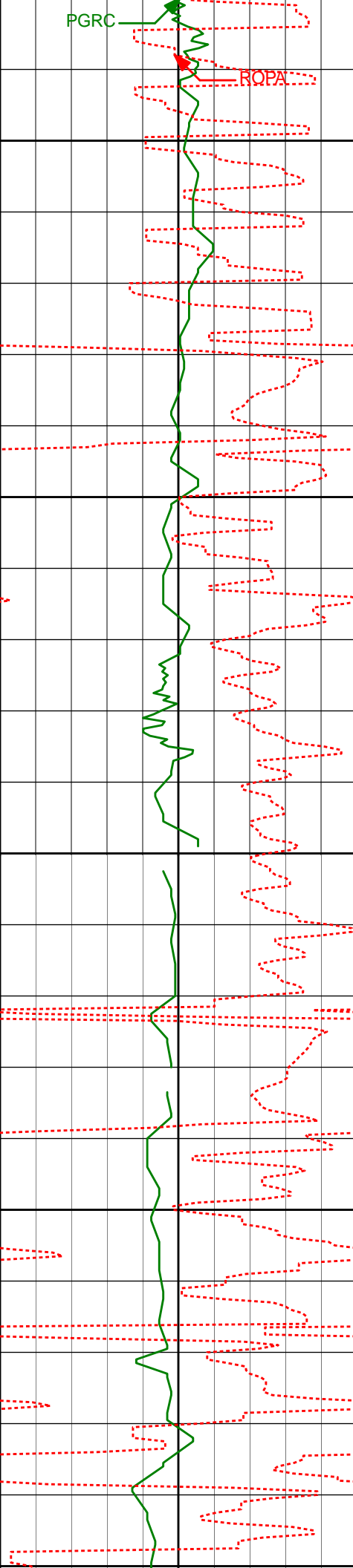
2883'

6.76°

110.66°

2871.11'

35.12'



2900'

2950'

2979'

3000'

3050'

3074'

3100'

4.03°

112.04°

2966.67'

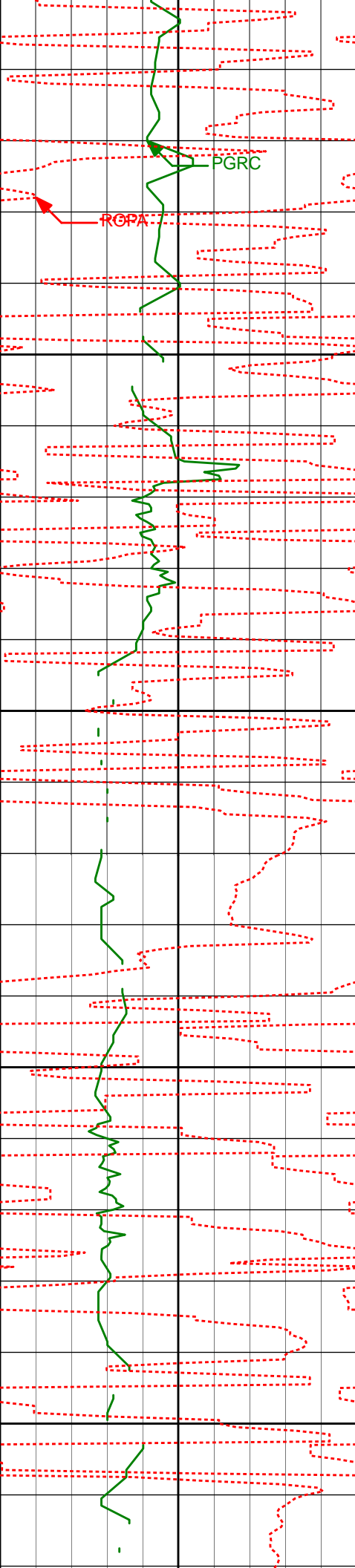
38.74'

2.82°

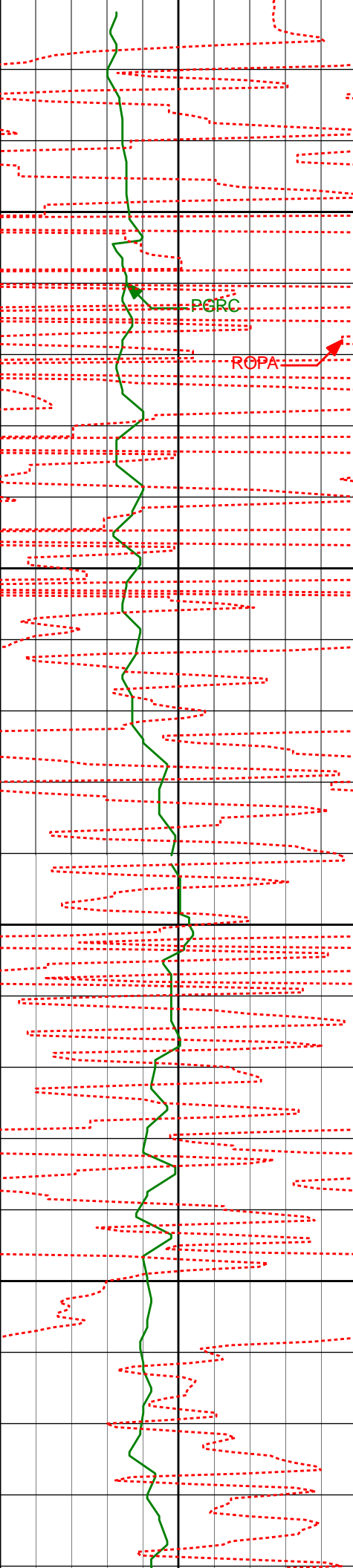
95.41°

3061.50'

40.44'



Station	Distance (ft)	Angle (°)	Distance (ft)	Angle (°)
3150'	3169'	2.84°	96.42°	3156.39'
3200'				41.13'
3250'	3264'	1.94°	64.40°	3251.31'
3300'				40.86'



3350'

3359'

1.17°

67.96°

3346.27'

39.91'

PGRC

ROPA

3400'

3454'

0.93°

74.85°

3441.26'

39.41'

3450'

3500'

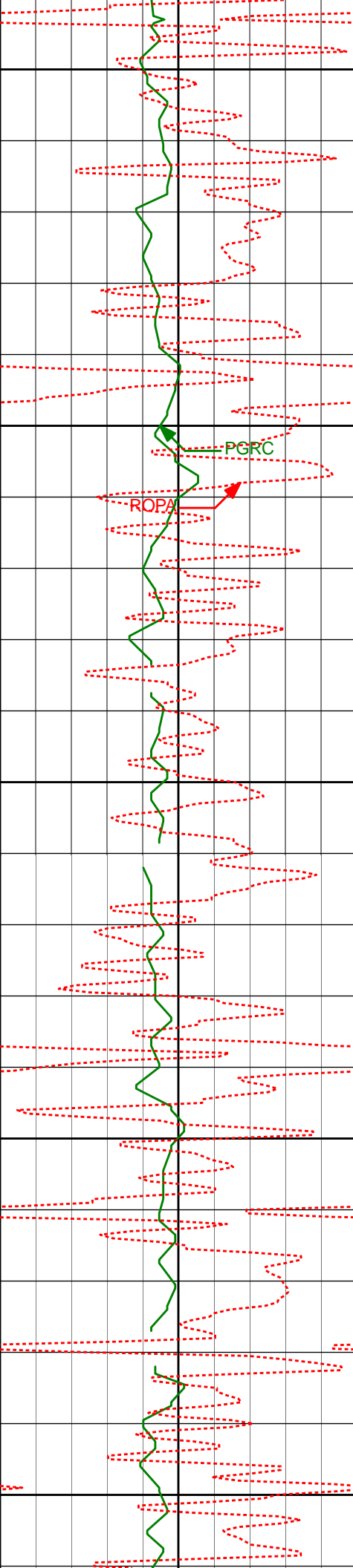
3549'

0.74°

92.43°

3536.25'

39.30'



3550'

3600'

3650'

3700'

3750'

3644'

0.52°

144.09°

3631.24'

39.71'

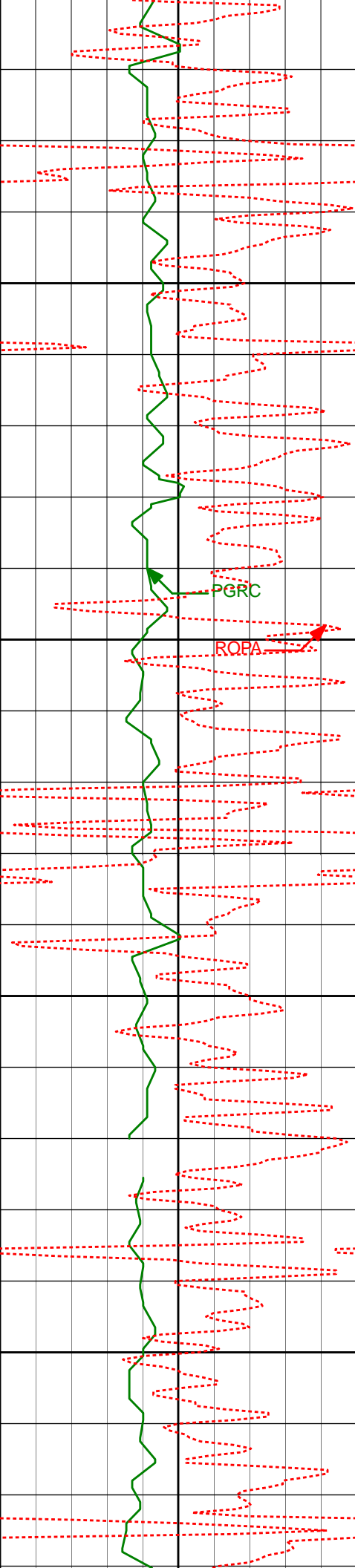
3739'

0.69°

199.46°

3726.24'

40.60'



3800'

3835'

0.56°

221.37°

3822.23'

41.47'

3850'

PGRC

ROPA

3900'

3930'

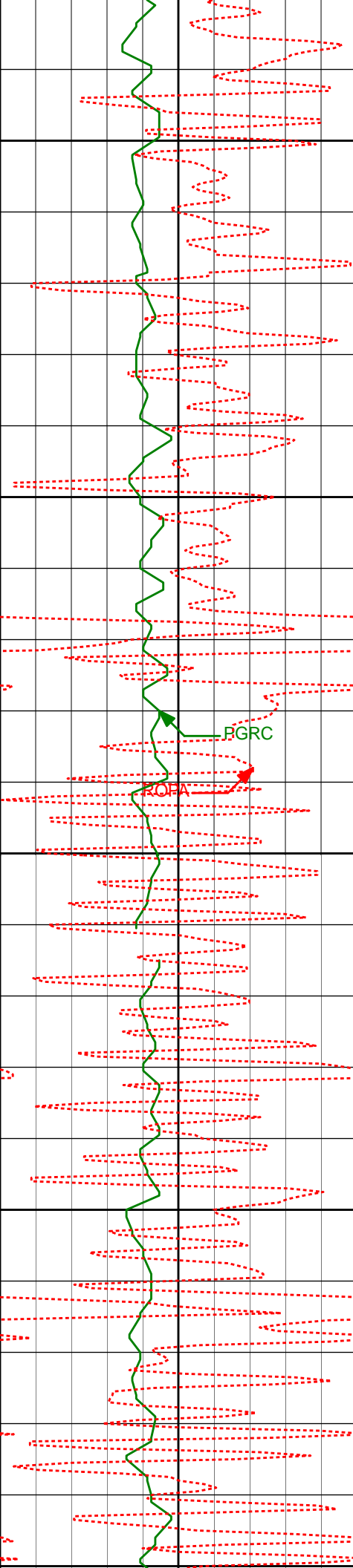
0.73°

233.59°

3917.22'

42.14'

3950'



4000'

4025'

0.56°

228.01°

4012.22'

42.78'

4050'

PGRC

ROPA

4100'

4120'

0.75°

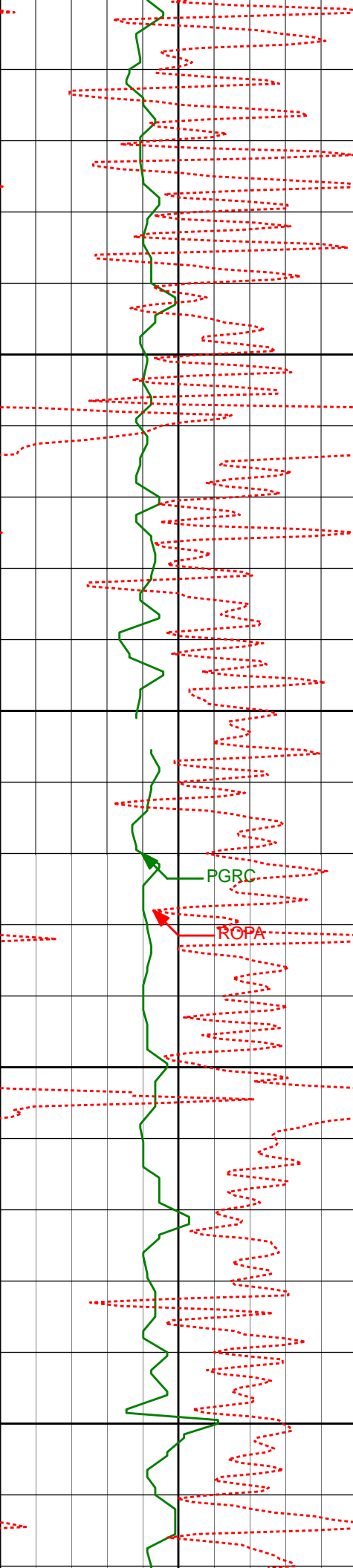
220.26°

4107.21'

43.53'

4150'

4200'



4200'

4250'

4300'

4350'

4400'

4215'

4310'

4405'

4400'

0.93°

1.62°

2.75°

240.09°

178.94°

165.40°

4202.20'

4297.18'

4392.11'

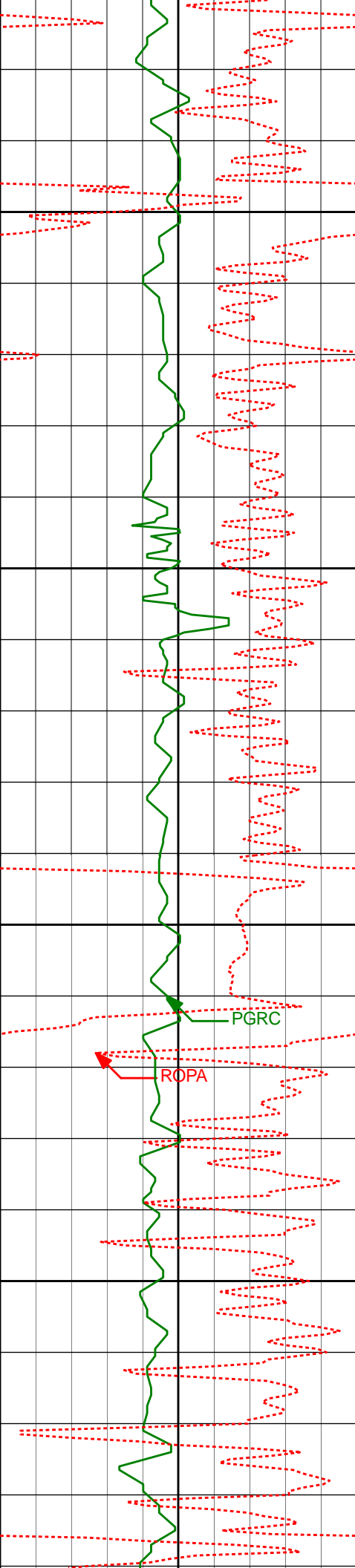
44.34'

46.03'

49.60'

PGRC

ROPA



4450'

4500'

2.37°

151.48°

4487.02'

53.60'

4500'

4550'

PGRC

ROPA

4595'

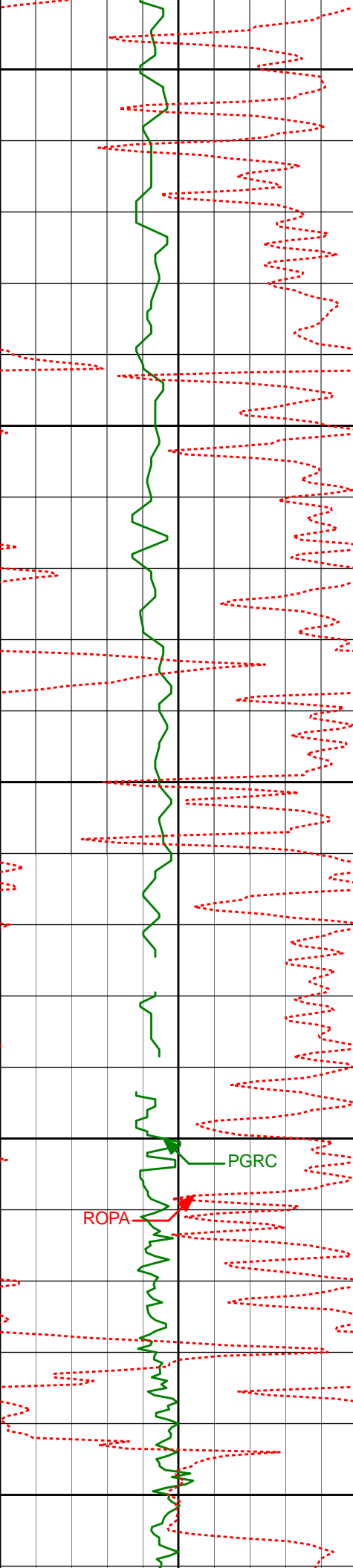
0.22°

15.40°

4581.99'

55.18'

4600'



4650'

4690'

0.40°

56.33°

4676.99'

54.83'

4700'

4750'

4786'

0.28°

98.43°

4772.99'

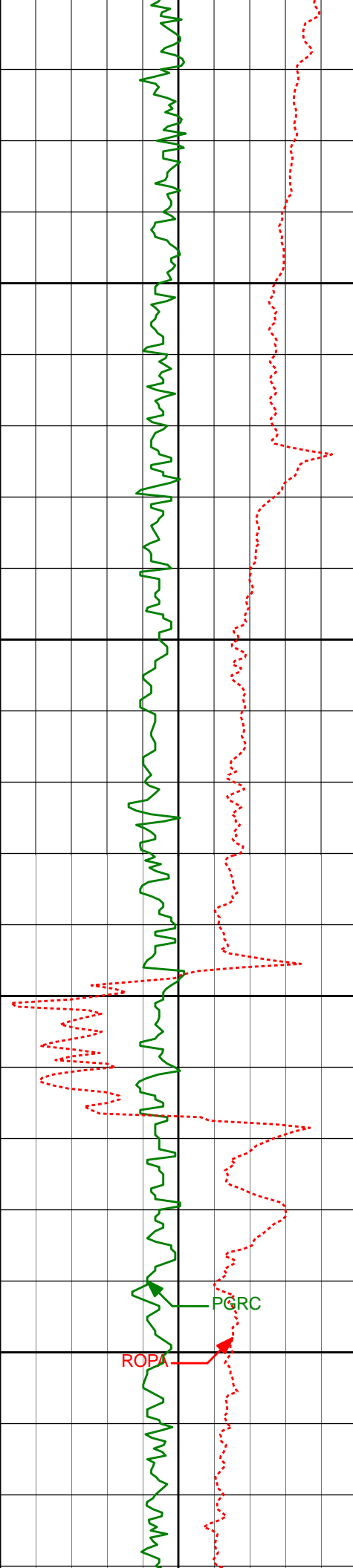
54.70'

4800'

4850'

PGRC

ROPA



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°

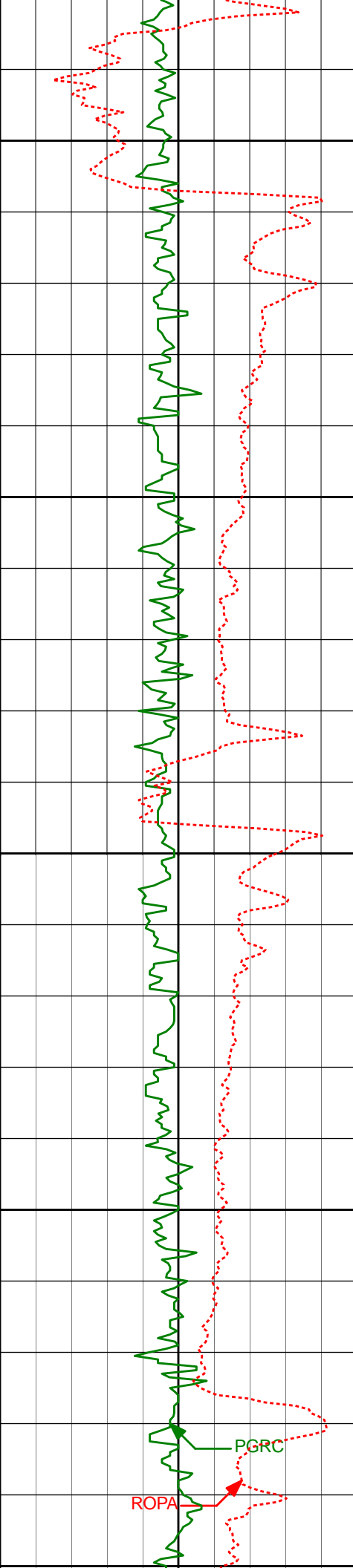
183.69°

5054.30'

89.94'

PGRC

ROPA



5100'

5166'

21.25°

180.87°

5144.10'

120.74'

5150'

5200'

5261'

28.84°

176.83°

5230.11'

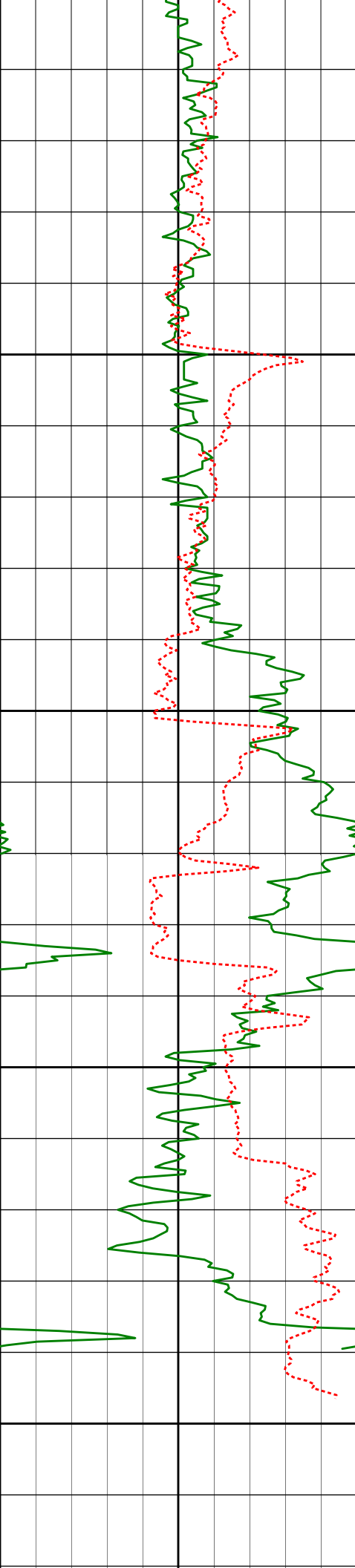
160.90'

5250'

5300'

PGRC

ROPA



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



Casing Shoe @ 5495'

[illegible]

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

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.