



1 : 600 / 1 : 240

WELL INFORMATION					
MWD Run Number	100				
Date run completed	22-Mar-16				
Rig Bit Number	100				
Bit Size (in)	8.500				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	1,957.97				
Log End Depth (TVD, ft)	6456.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	21-Mar-16 14:00				
Drill/Wipe End Date and Time	22-Mar-16 18:30				
Min Inc (deg) @ Depth (TVD, ft)	0.02 @ 937.99				
Max Inc (deg) @ Depth (TVD, ft)	85.00 @ 6,446.25				
Bit TFA(in2) / Bit Type	0.98 / PDC				
Flow Rate (gpm)	595.65				
Max AV (fpm) / CV (fpm) @ MWD	350.0 / 450.0				
Fluid Type	Diesel Mud Base				
Density (ppg) / Viscosity (spqt)	9.40 / 54.00				
Filtrate CL (ppm)	15,000.00				
pH / Fluid Loss (mptm)	N/A / N/A				
PV (cP) / YP (lhf2)	13 / 10.00				
% Solids / % Sand	9.40 / 0.1				
% Oil / Oil:Water Ratio	73.00 / 3:1				
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	127.40 / 6011				

Max Tool Temp (degF) / Source	187.48 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Adam Sampson				
Customer Representative	Charles Colville				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11342298				
Insert Serial Number	11145577				
Date and Time Initialized	20-Mar-16 16:36				
Date and Time Read	23-Mar-16 01:50				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	56.00				
Software Version	6.33				
Sub Serial Number	11342298				
Sonde Serial Number	10859934				
Sensor ID Number	N/A				
Toolface Offset (deg)	328.90				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	49.75				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11342298				
Insert/Sonde Serial Number	11681020				

REMARKS

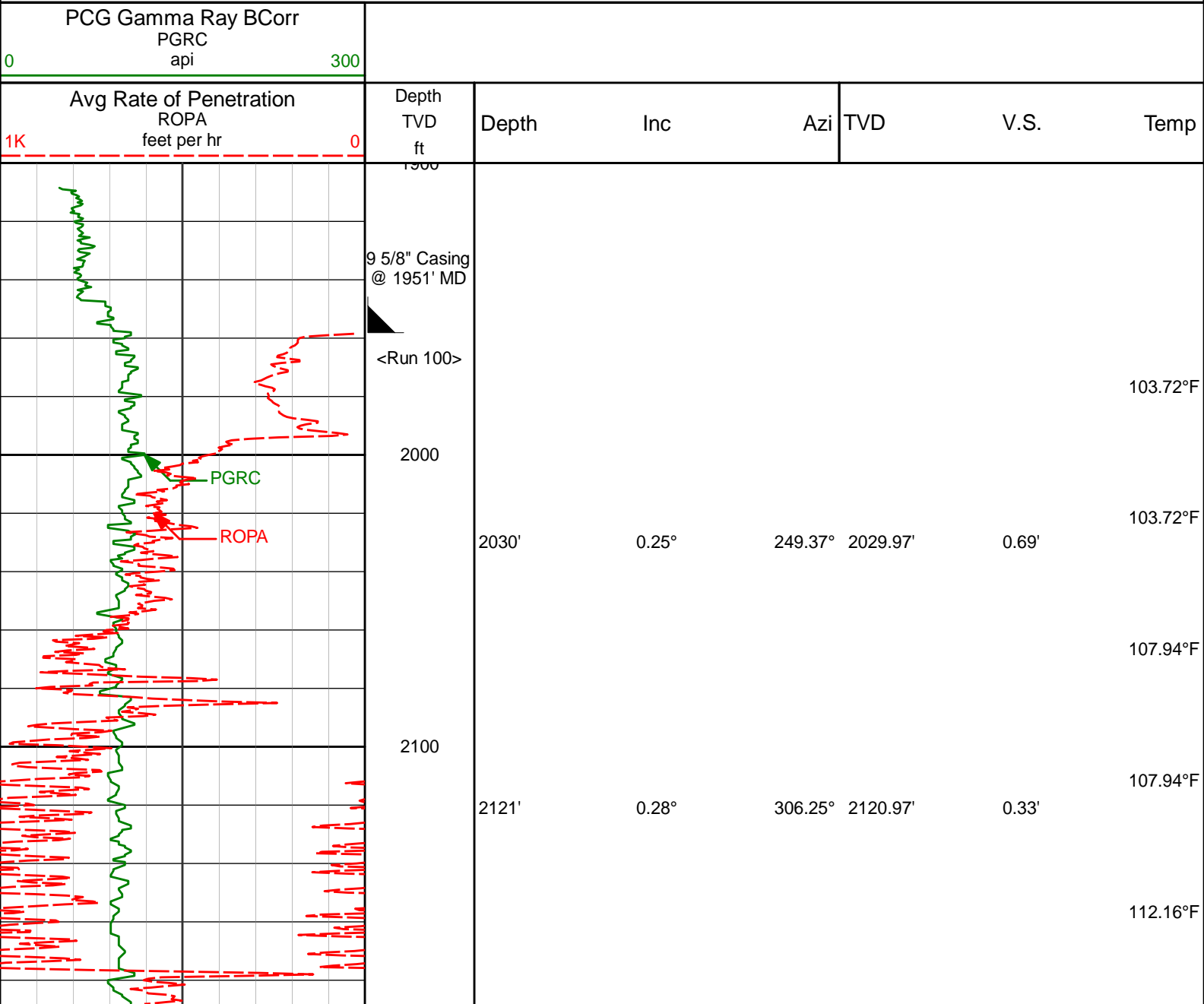
1. All depths are calibrated to driller's pipe tally and are measured depths from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The following smoothing parameters have been applied to the data:
 - 1:600 (2"):
 - Interval: 1.0 ft
 - Coercion Distance: 3.0 ft (ROPA)
 - Interval: 1.0 ft
 - Coercion Distance: 3.0 ft (Gamma Ray)
 - 1:240 (5"):
 - Interval: 0.5 ft
 - Coercion Distance: 1.2 ft (ROPA)
 - Interval: 0.5 ft
 - Coercion Distance: 0.6 ft (Gamma Ray)

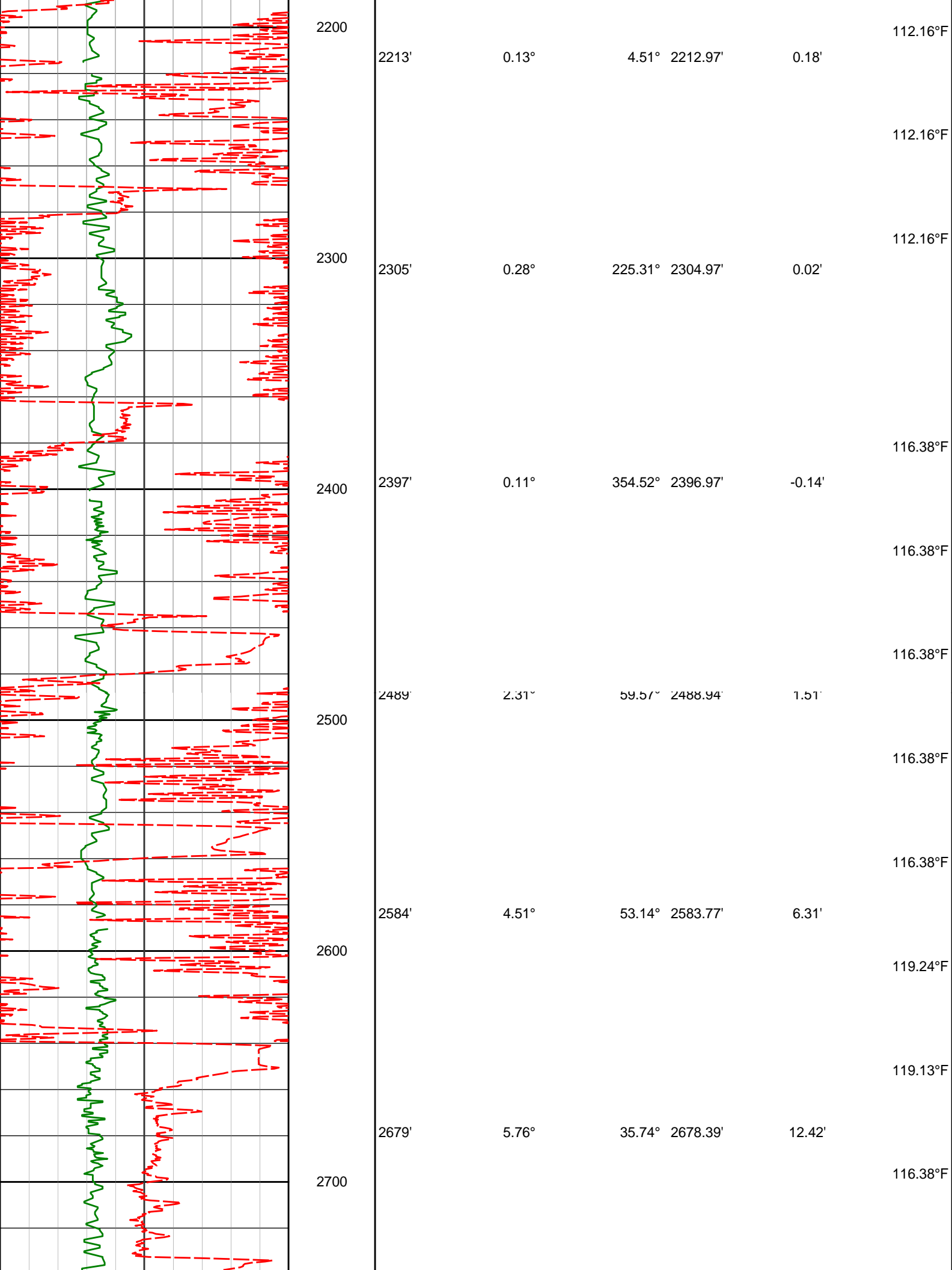
WARRANTY

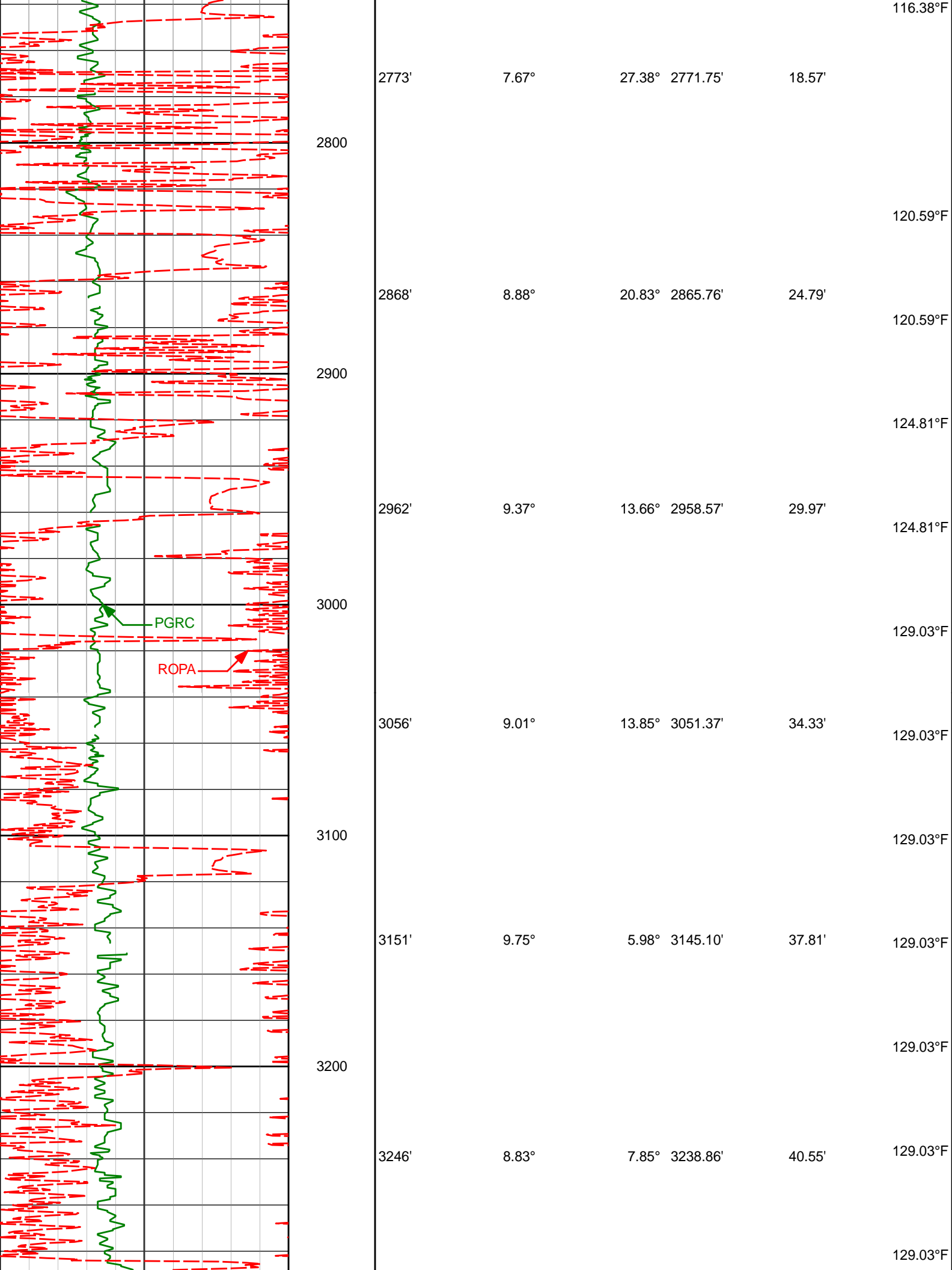
WARRANTY

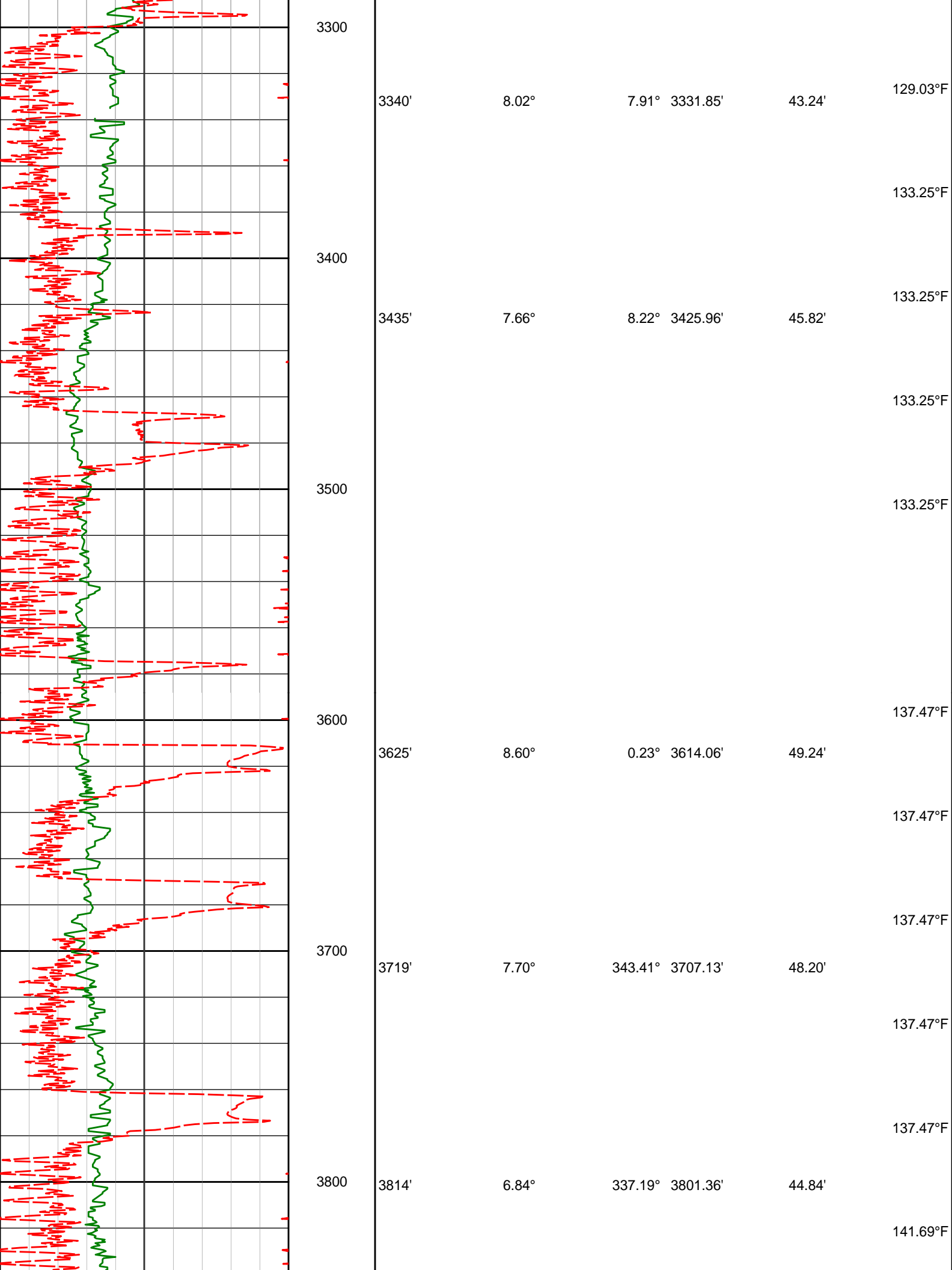
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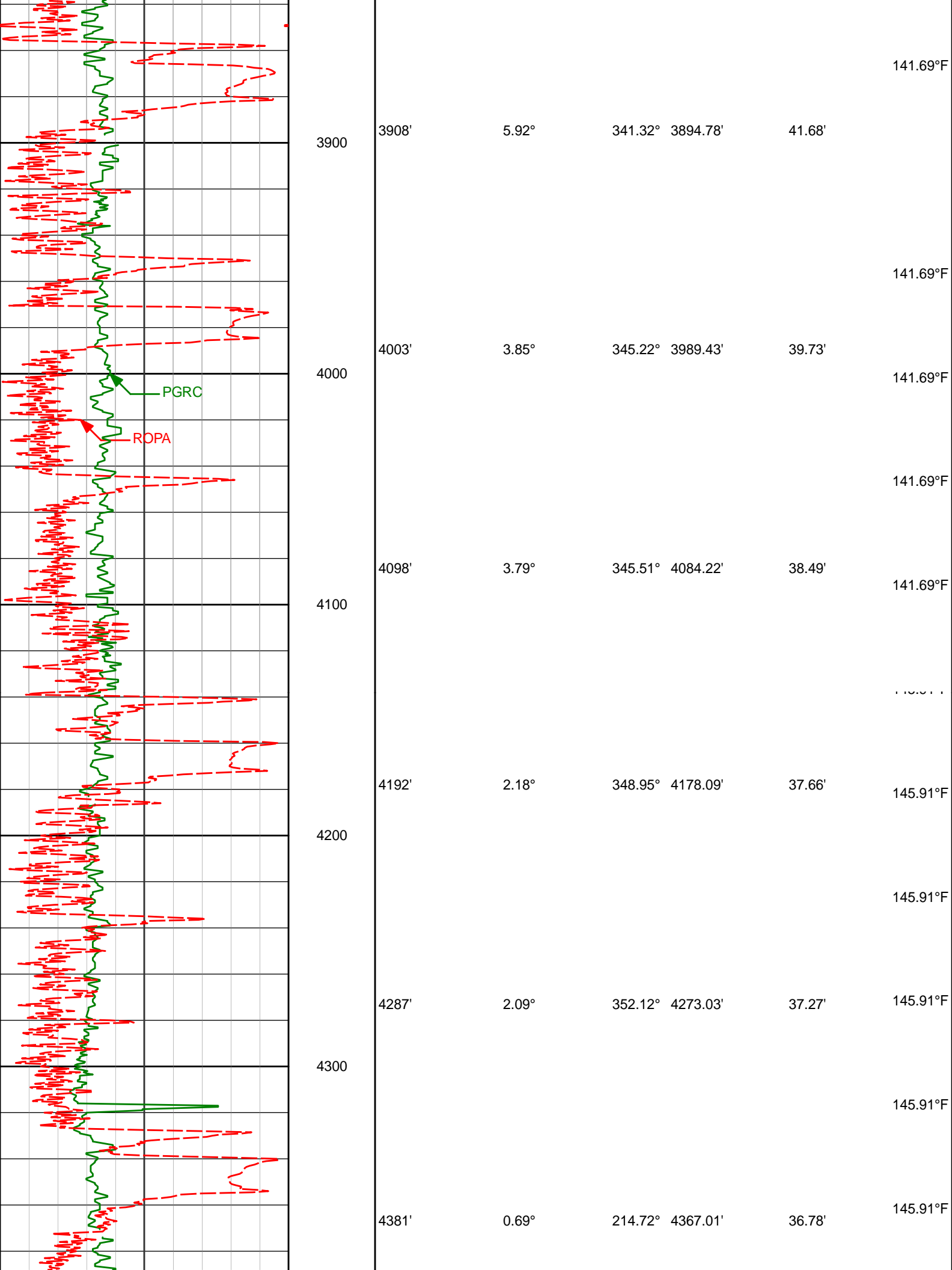
TVD Detail 1:600 Scale

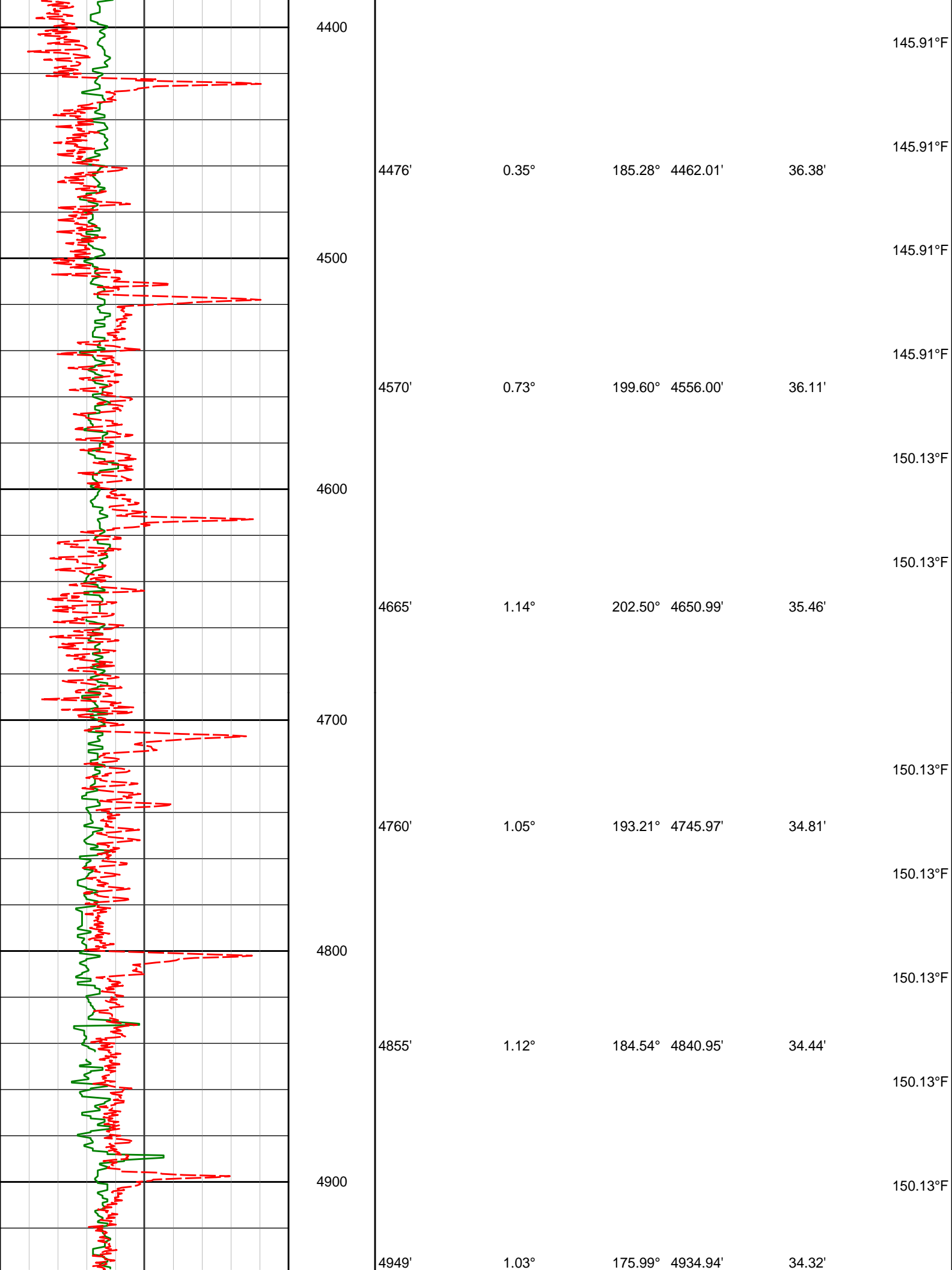


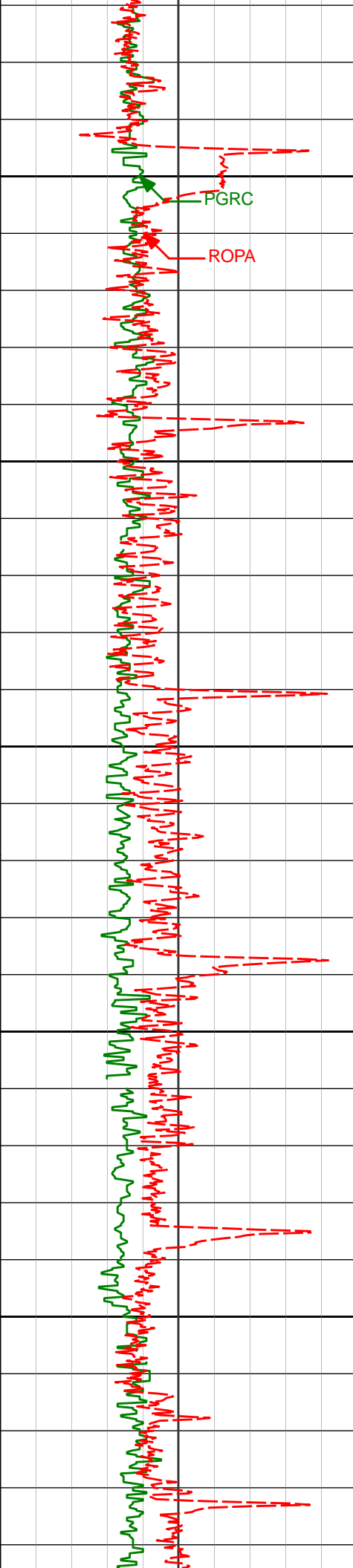












5000

5100

5200

5300

5400

5044'

0.88°

166.95°

5029.92'

34.45'

5138'

0.96°

151.90°

5123.91'

34.90'

5233'

1.05°

147.78°

5218.90'

35.66'

5328'

1.23°

138.90°

5313.88'

36.71'

5423'

1.34°

136.10°

5408.85'

38.05'

150.13°F

150.13°F

150.13°F

154.34°F

154.34°F

154.34°F

154.34°F

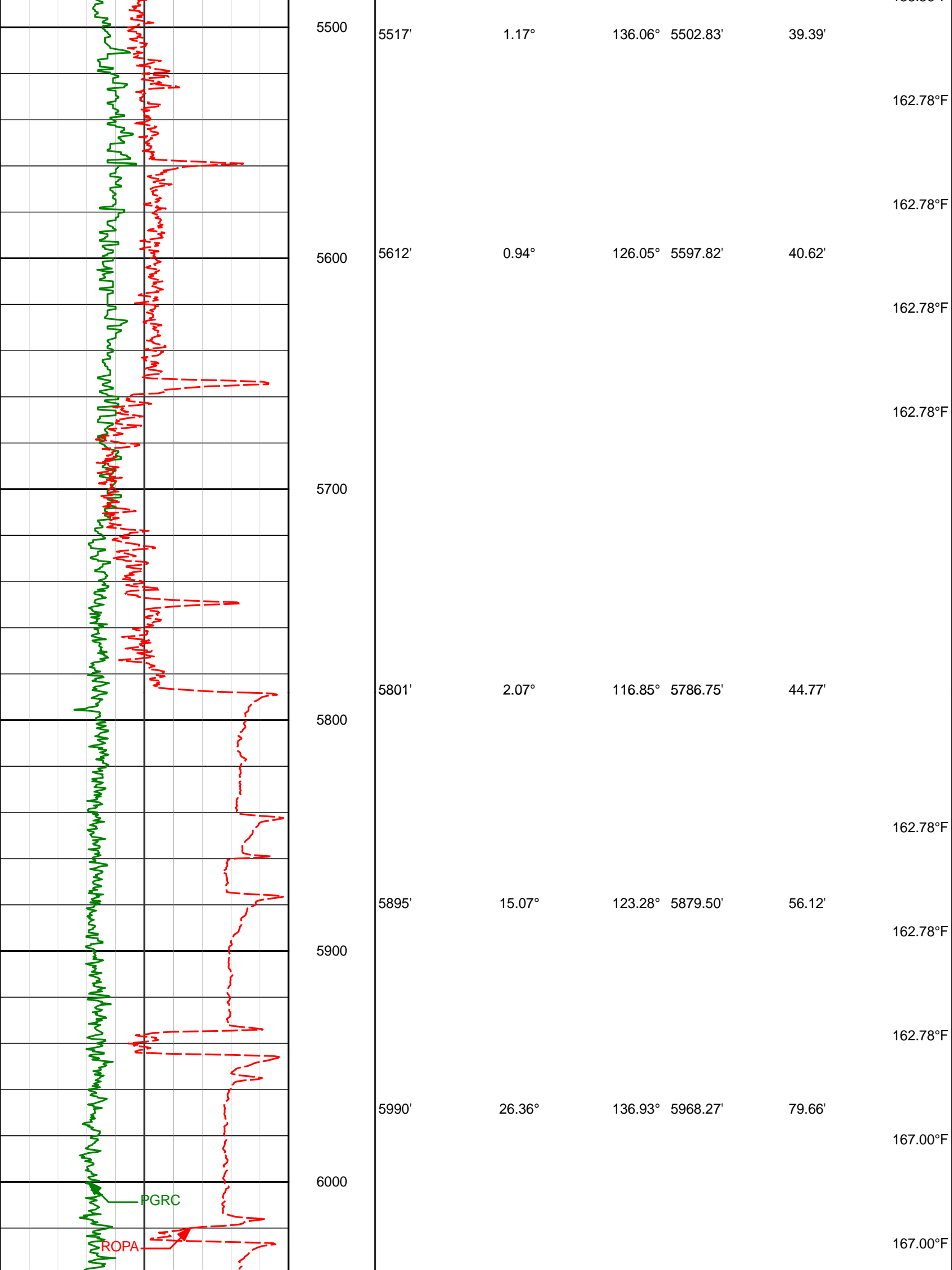
154.34°F

154.34°F

154.34°F

154.34°F

158.56°F



5500

5517'

1.17°

136.06°

5502.83'

39.39'

162.78°F

5600

5612'

0.94°

126.05°

5597.82'

40.62'

162.78°F

162.78°F

162.78°F

5700

5801'

2.07°

116.85°

5786.75'

44.77'

5800

162.78°F

5895'

15.07°

123.28°

5879.50'

56.12'

162.78°F

5900

162.78°F

5990'

26.36°

136.93°

5968.27'

79.66'

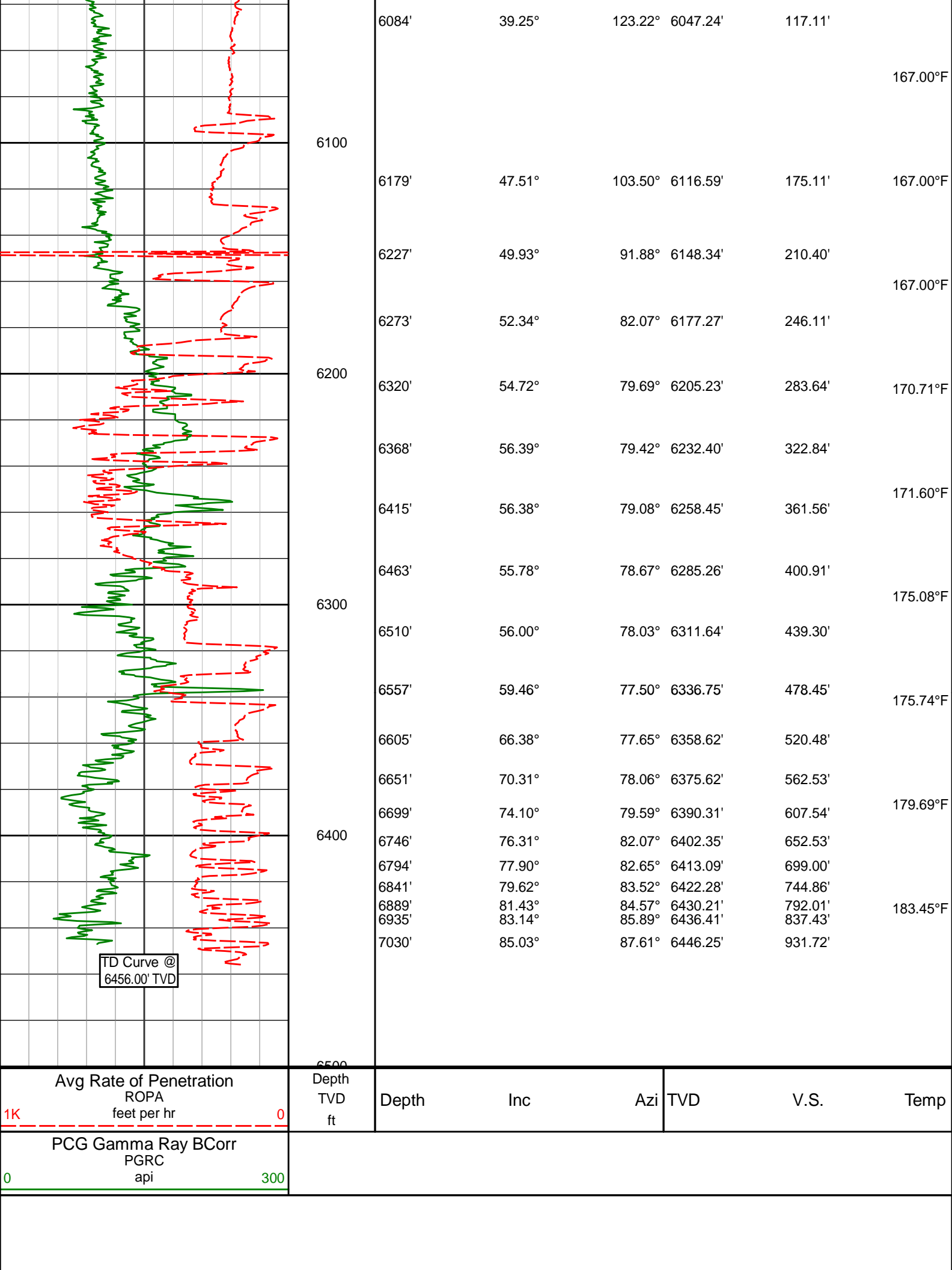
167.00°F

6000

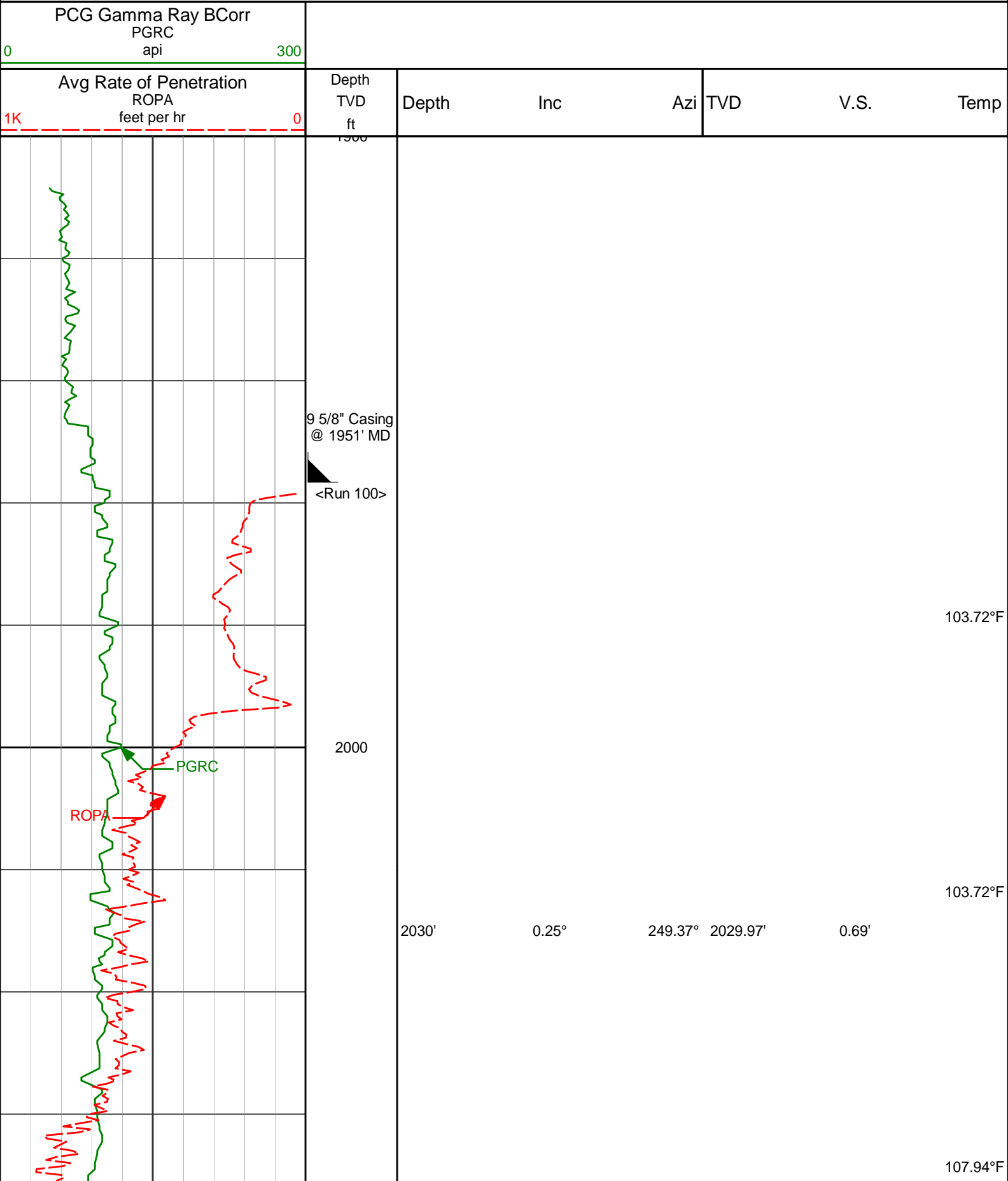
PGRC

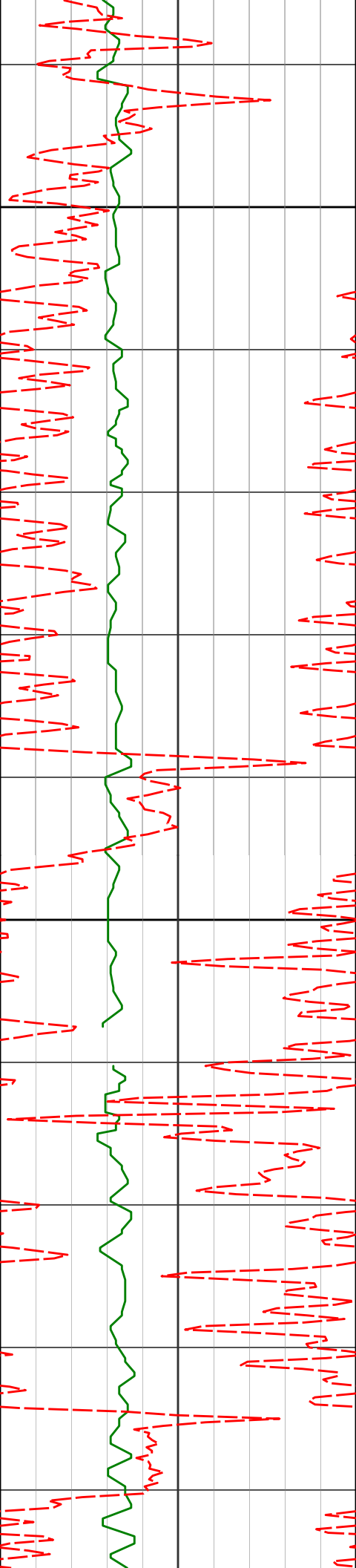
ROPA

167.00°F



TVD Detail 1:240 Scale





2100

107.94°F

2121'

0.28°

306.25° 2120.97'

0.33'

112.16°F

2200

112.16°F

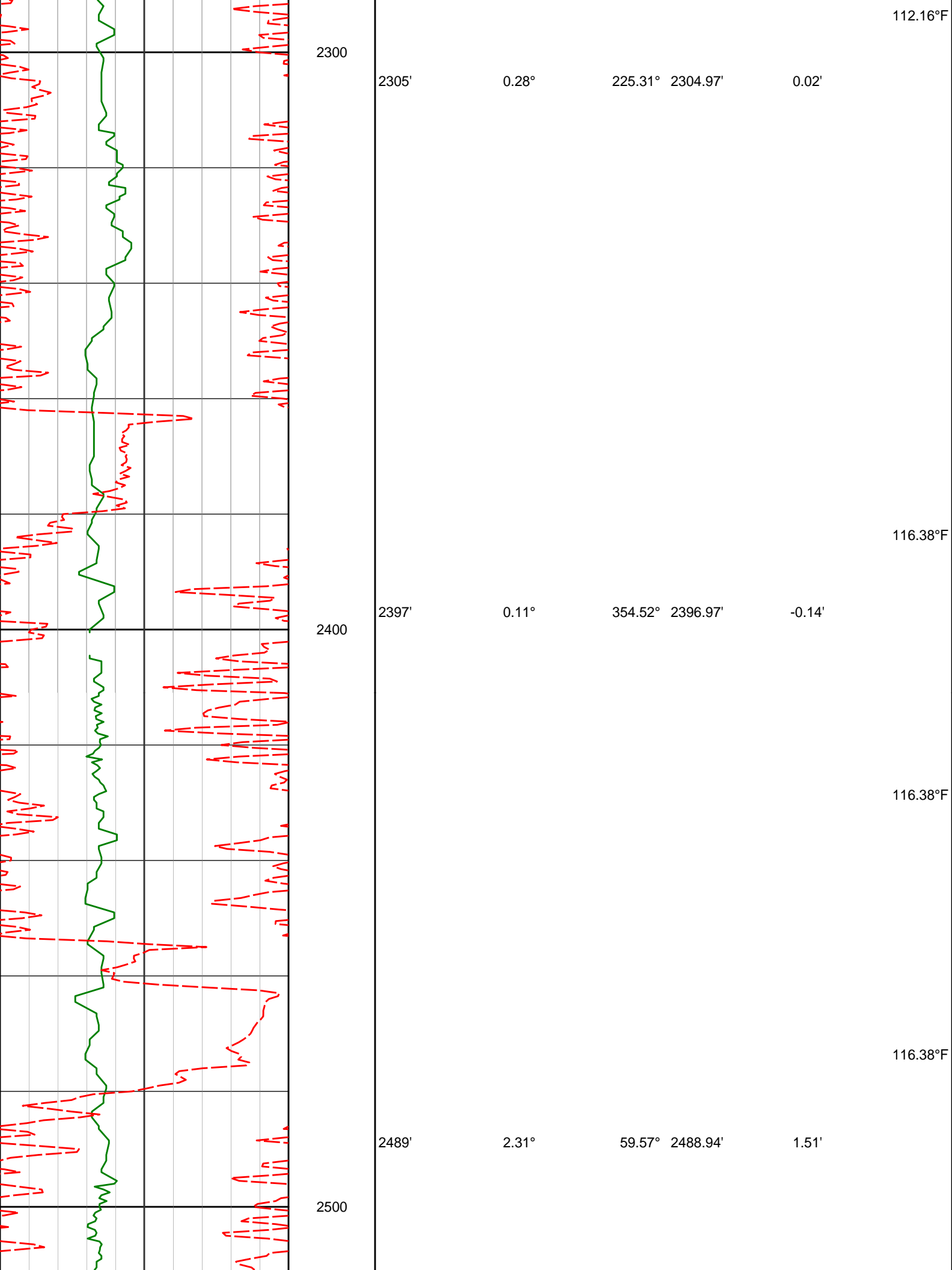
2213'

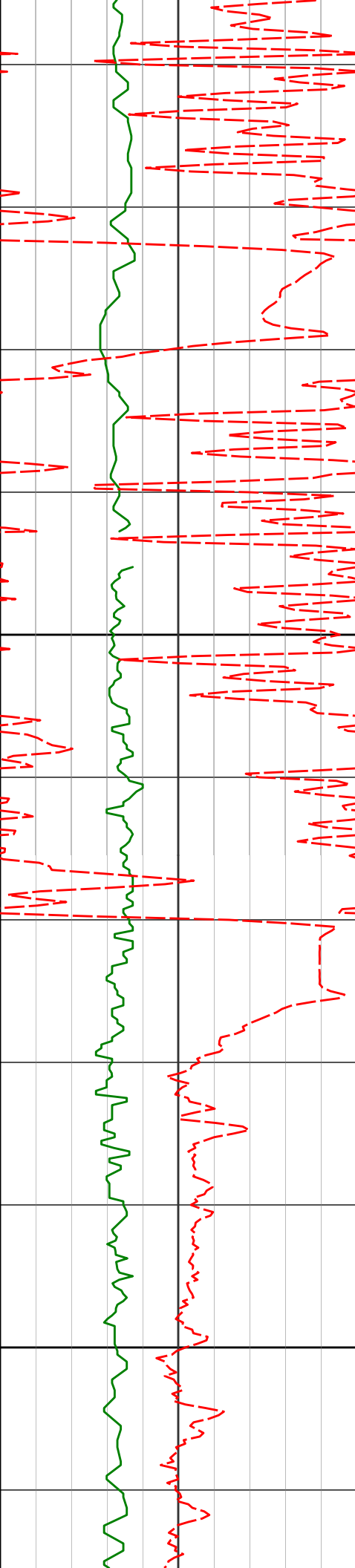
0.13°

4.51° 2212.97'

0.18'

112.16°F





2600

2700

2584'

4.51°

53.14° 2583.77'

6.31'

2679'

5.76°

35.74° 2678.39'

12.42'

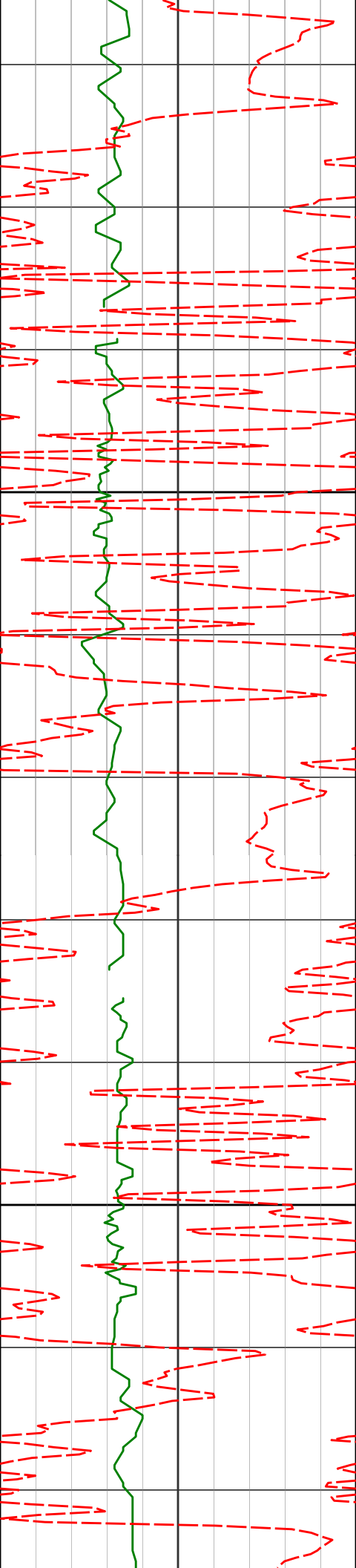
116.38°F

116.38°F

119.24°F

119.13°F

116.38°F



2800

2900

2773'

7.67°

27.38° 2771.75'

18.57'

2868'

8.88°

20.83° 2865.76'

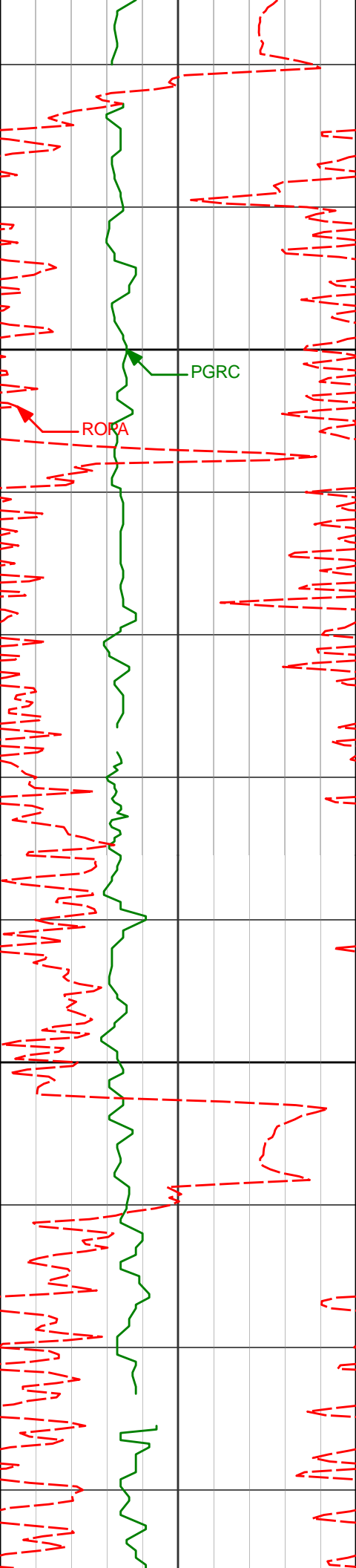
24.79'

116.38°F

120.59°F

120.59°F

124.81°F



2962'

9.37°

13.66° 2958.57'

29.97'

124.81°F

3000

129.03°F

3056'

9.01°

13.85° 3051.37'

34.33'

129.03°F

3100

129.03°F

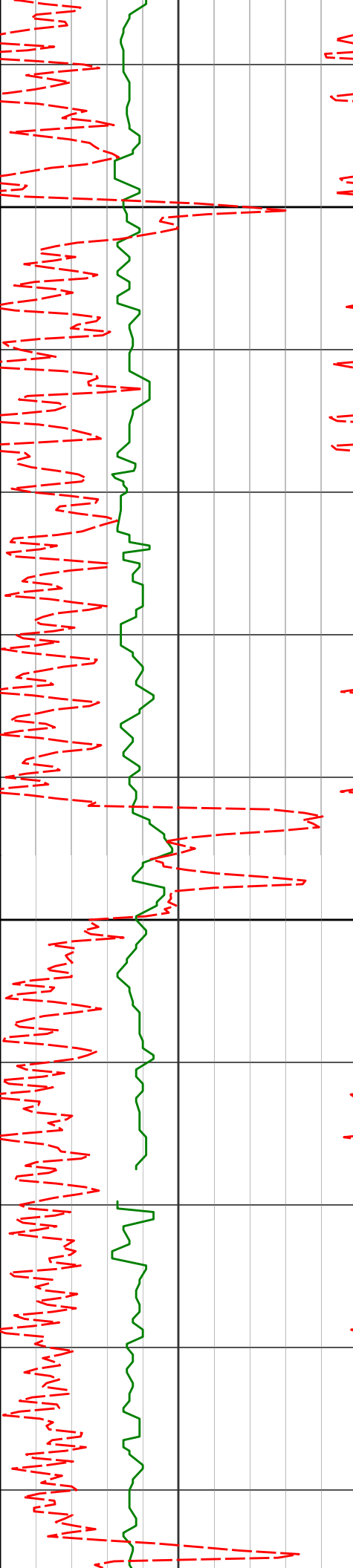
3151'

9.75°

5.98° 3145.10'

37.81'

129.03°F



3200

3246'

8.83°

7.85°

3238.86'

40.55'

129.03°F

129.03°F

3300

3340'

8.02°

7.91°

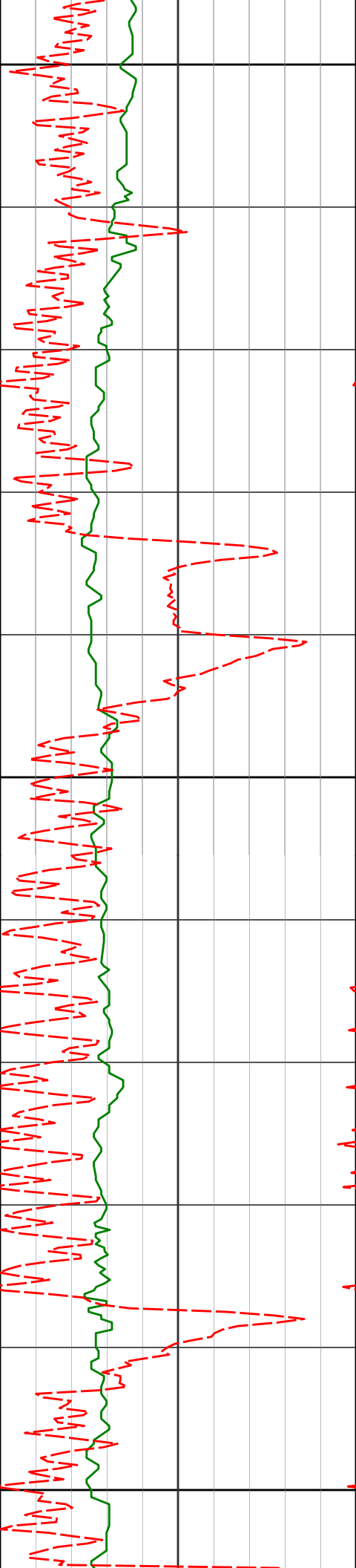
3331.85'

43.24'

129.03°F

129.03°F

133.25°F



3400

3435'

7.66°

8.22°

3425.96'

45.82'

133.25°F

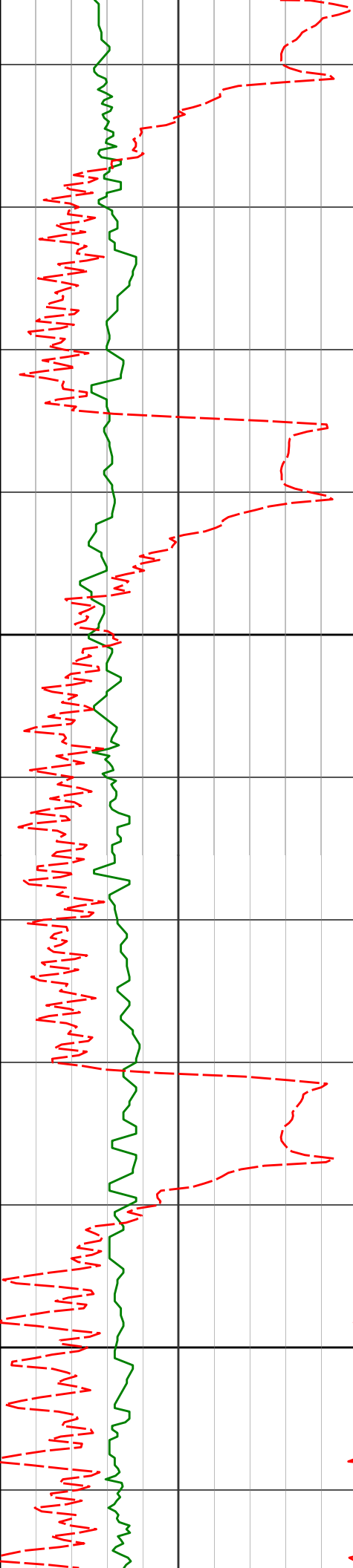
133.25°F

3500

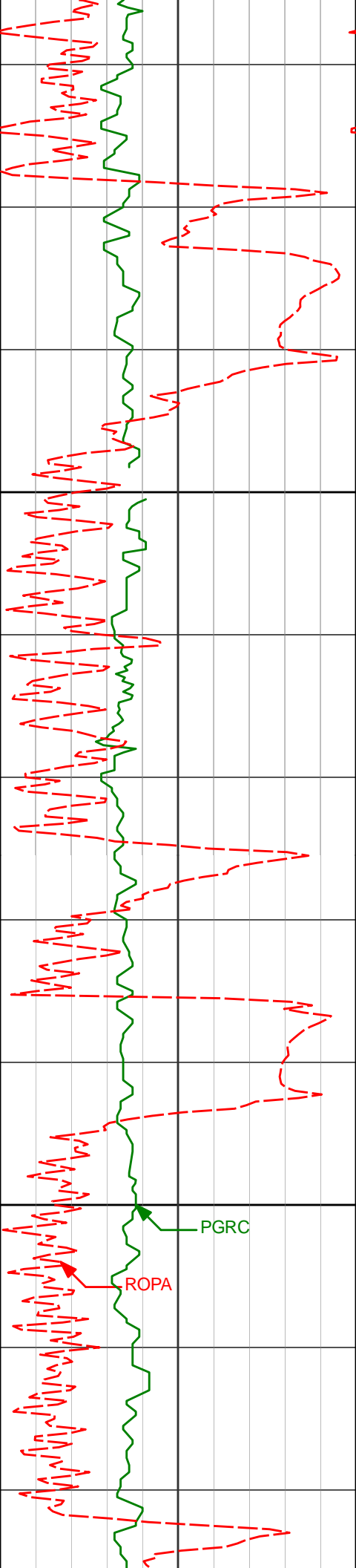
133.25°F

3600

137.47°F



3625'	8.60°	0.23°	3614.06'	49.24'	
					137.47°F
					137.47°F
3700					
3719'	7.70°	343.41°	3707.13'	48.20'	
					137.47°F
					137.47°F
3800					
3814'	6.84°	337.19°	3801.36'	44.84'	
					141.69°F



3900

4000

3908'

4003'

5.92°

3.85°

341.32° 3894.78'

345.22° 3989.43'

41.68'

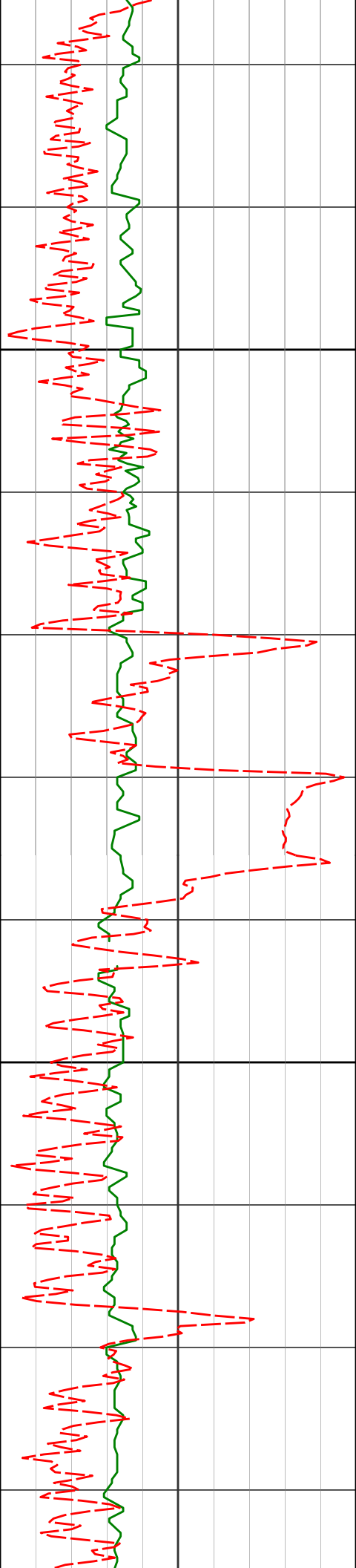
39.73'

141.69°F

141.69°F

141.69°F

141.69°F



4100

4200

4098'

3.79°

345.51° 4084.22'

38.49'

141.69°F

145.91°F

4192'

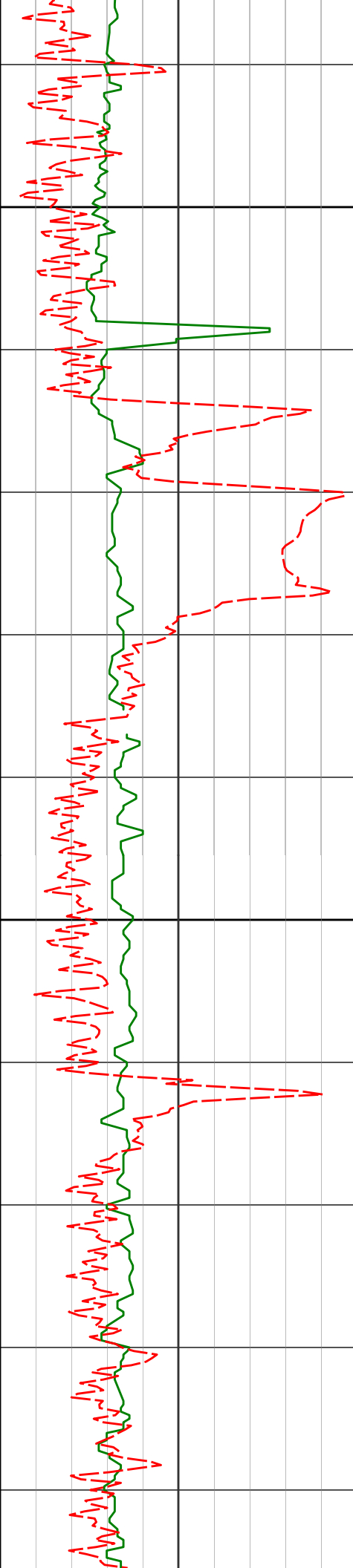
2.18°

348.95° 4178.09'

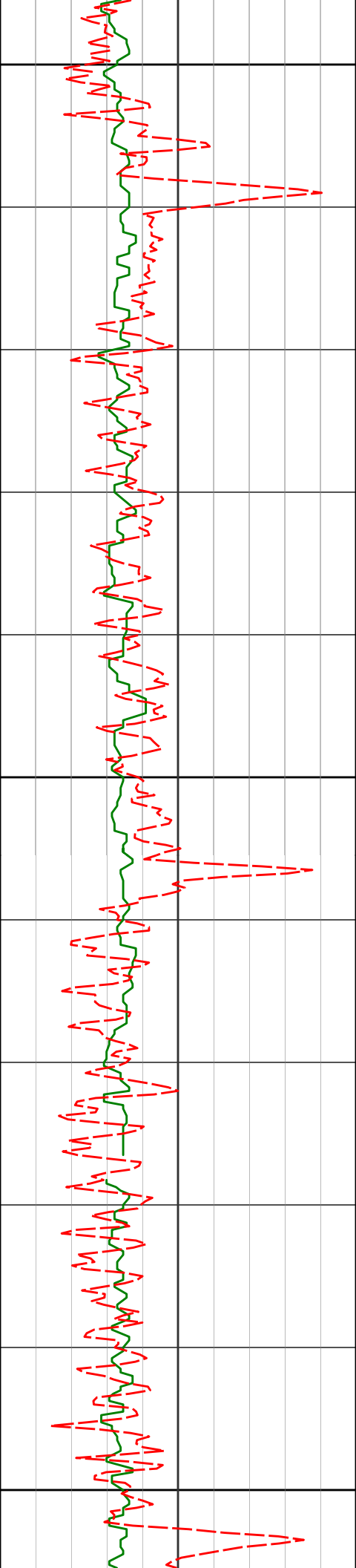
37.66'

145.91°F

145.91°F



Depth (m)	Temperature (°C)	Salinity (PSU)	Specific Gravity	Sound Velocity (m/s)	Temperature (°F)
4287'	2.09°	352.12°	4273.03'	37.27'	145.91°F
4381'	0.69°	214.72°	4367.01'	36.78'	145.91°F
4476'	0.35°	185.28°	4462.01'	36.38'	145.91°F



4500

145.91°F

4570'

0.73°

199.60° 4556.00'

36.11'

145.91°F

4600

150.13°F

4665'

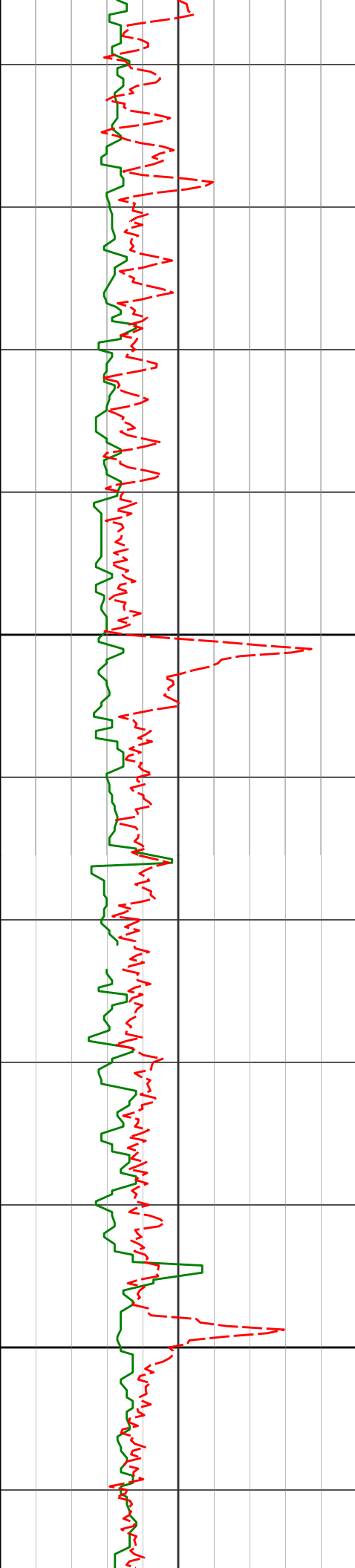
1.14°

202.50° 4650.99'

35.46'

150.13°F

4700



4800

4900

4760'

1.05°

193.21° 4745.97'

34.81'

4855'

1.12°

184.54° 4840.95'

34.44'

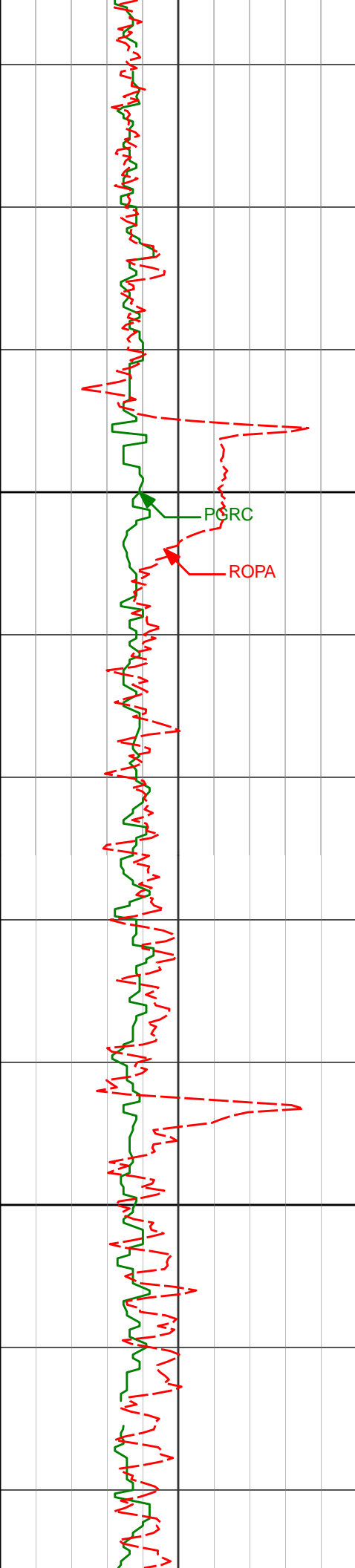
150.13°F

150.13°F

150.13°F

150.13°F

150.13°F



5000

5100

4949'

1.03°

175.99° 4934.94'

34.32'

150.13°F

150.13°F

5044'

0.88°

166.95° 5029.92'

34.45'

150.13°F

154.34°F

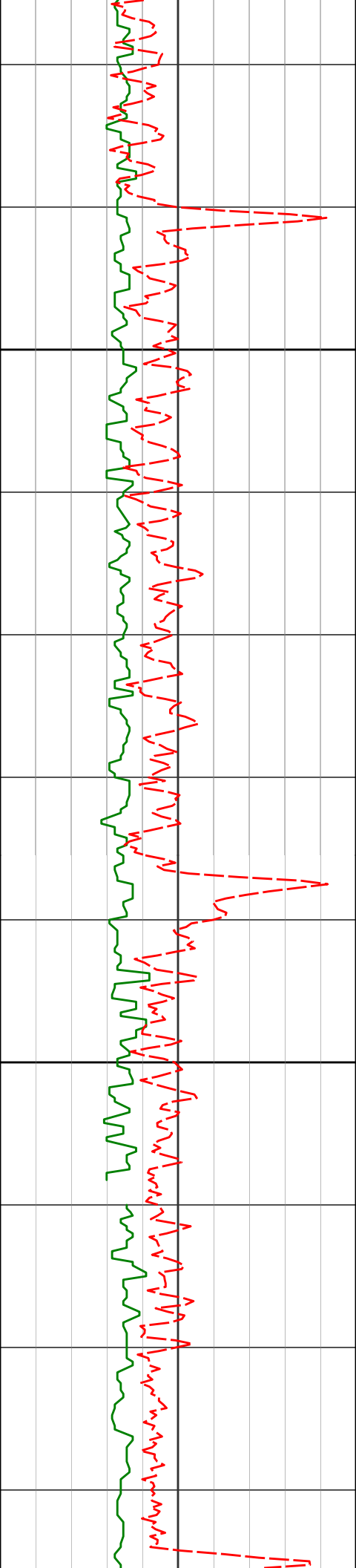
5138'

0.96°

151.90° 5123.91'

34.90'

154.34°F



5200

5300

5233'

1.05°

147.78° 5218.90'

35.66'

154.34°F

154.34°F

154.34°F

154.34°F

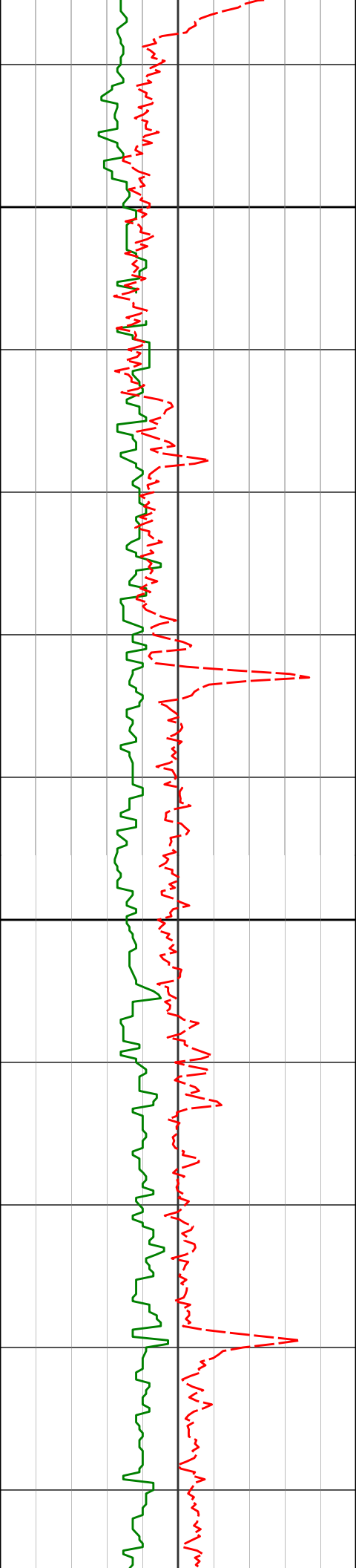
5328'

1.23°

138.90° 5313.88'

36.71'

154.34°F



5400

5423'

1.34°

136.10° 5408.85'

38.05'

154.34°F

158.56°F

158.56°F

5500

5517'

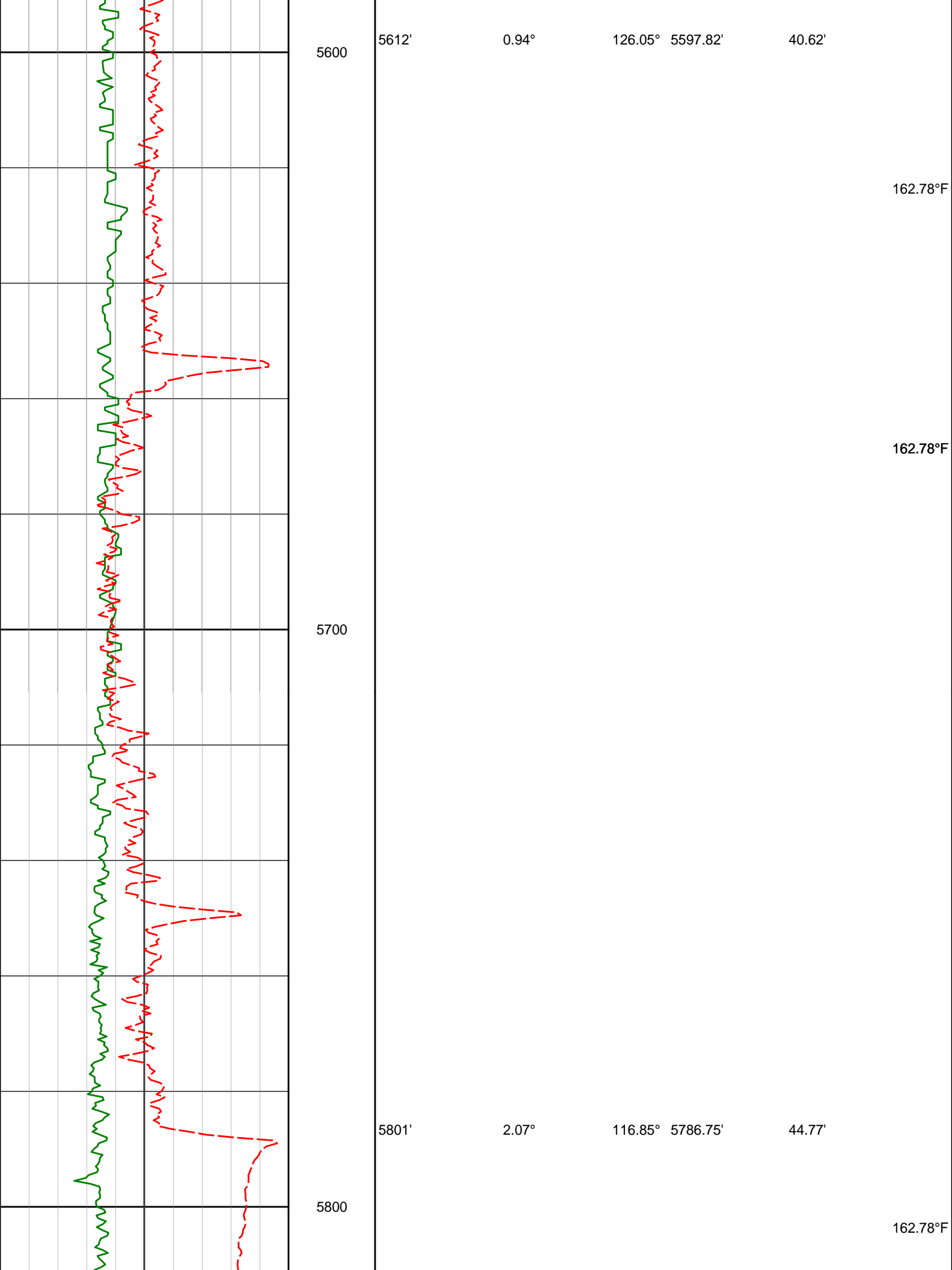
1.17°

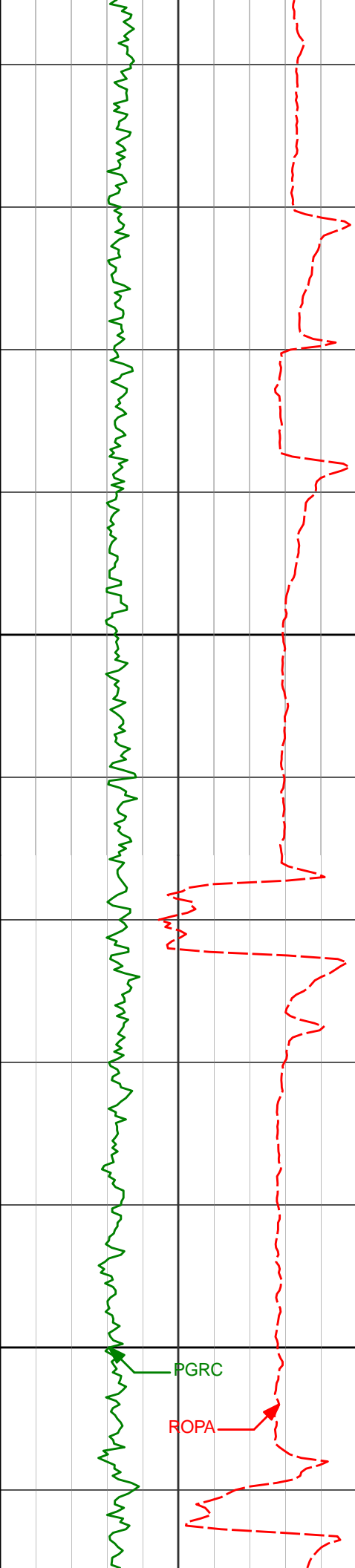
136.06° 5502.83'

39.39'

162.78°F

162.78°F





5900

6000

5895'

15.07°

123.28° 5879.50'

56.12'

162.78°F

162.78°F

162.78°F

5990'

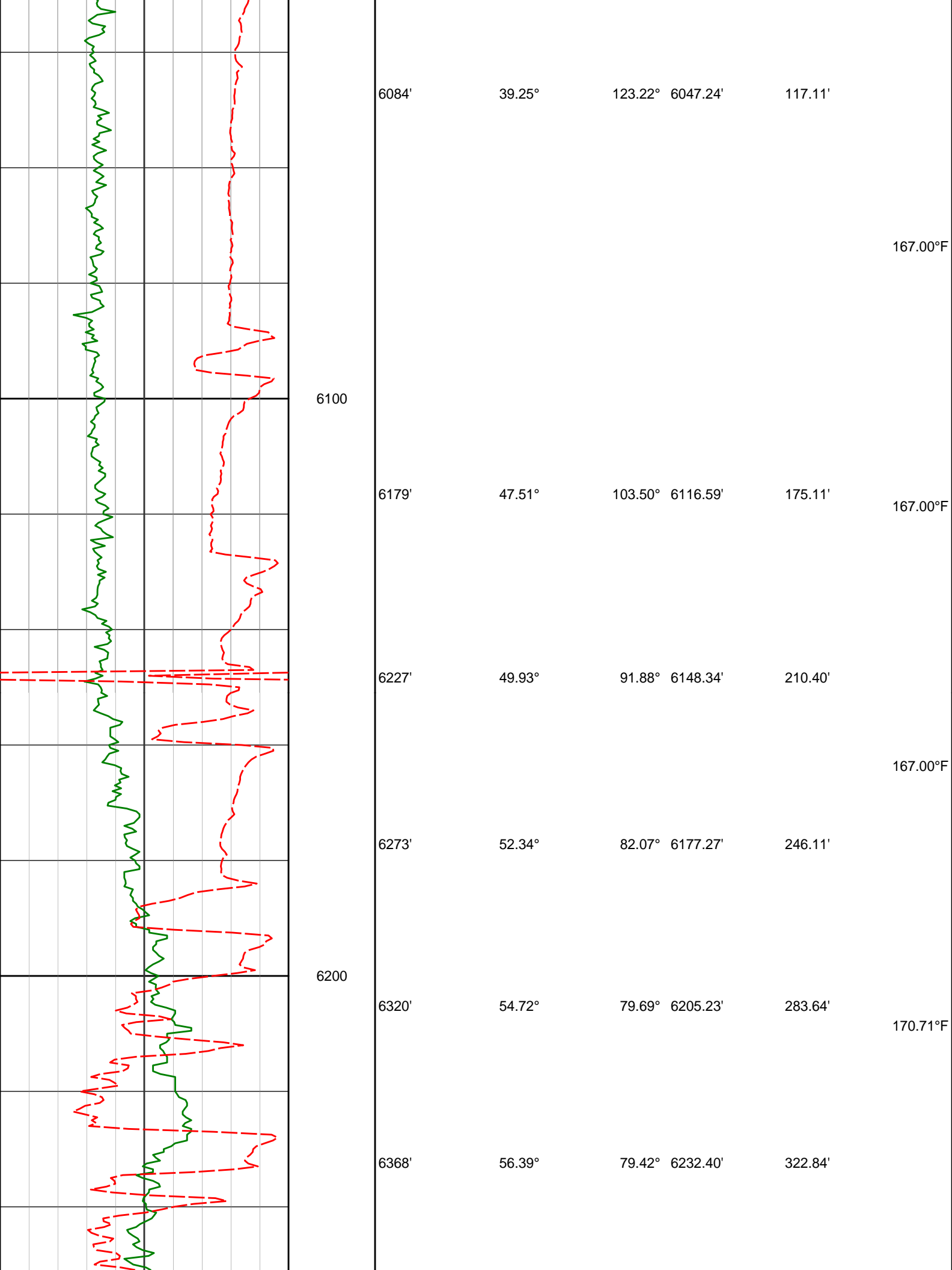
26.36°

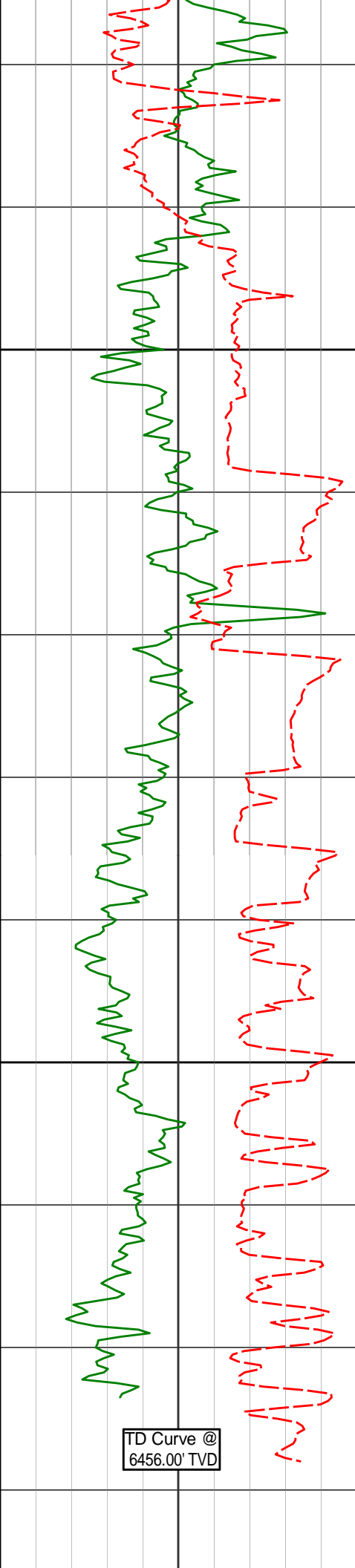
136.93° 5968.27'

79.66'

167.00°F

167.00°F





6300	6415'	56.38°	79.08°	6258.45'	361.56'	171.60°F
	6463'	55.78°	78.67°	6285.26'	400.91'	175.08°F
	6510'	56.00°	78.03°	6311.64'	439.30'	
	6557'	59.46°	77.50°	6336.75'	478.45'	
	6605'	66.38°	77.65°	6358.62'	520.48'	175.74°F
	6651'	70.31°	78.06°	6375.62'	562.53'	
	6699'	74.10°	79.59°	6390.31'	607.54'	
	6746'	76.31°	82.07°	6402.35'	652.53'	179.69°F
	6794'	77.90°	82.65°	6413.09'	699.00'	
	6841'	79.62°	83.52°	6422.28'	744.86'	
6400	6889'	81.43°	84.57°	6430.21'	792.01'	183.45°F
	6935'	83.14°	85.89°	6436.41'	837.43'	
	7030'	85.03°	87.61°	6446.25'	931.72'	

[illegible]

HALLIBURTON

DIRECTIONAL SURVEY REPORT

**Noble Energy
Wells Ranch AF05-625
Wattenberg
Weld Colorado
USA
CA-XX-0903168174**

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
89.00	0.13	350.71	89.00	0.10 N	0.02 W	-0.01	0.15
178.00	0.44	46.11	178.00	0.44 N	0.21 E	0.24	0.43
216.00	0.33	5.21	216.00	0.65 N	0.33 E	0.36	0.76
370.00	0.62	349.57	369.99	1.91 N	0.22 E	0.32	0.20
465.00	0.46	0.43	464.99	2.79 N	0.13 E	0.28	0.20
559.00	0.28	281.63	558.99	3.22 N	0.09 W	0.08	0.52
654.00	0.13	30.05	653.99	3.36 N	0.27 W	-0.09	0.36
741.00	0.30	31.50	740.99	3.64 N	0.10 W	0.10	0.20
843.00	0.13	115.21	842.99	3.82 N	0.15 E	0.35	0.31
938.00	0.02	229.87	937.99	3.76 N	0.23 E	0.43	0.15
1032.00	0.21	1.01	1031.98	3.92 N	0.22 E	0.43	0.24
1127.00	0.19	316.48	1126.98	4.21 N	0.12 E	0.34	0.16
1221.00	0.22	9.47	1220.98	4.50 N	0.04 E	0.28	0.20
1316.00	0.11	20.85	1315.98	4.77 N	0.10 E	0.35	0.12
1411.00	0.28	156.76	1410.98	4.64 N	0.22 E	0.47	0.39
1505.00	0.44	141.05	1504.98	4.15 N	0.54 E	0.76	0.20
1600.00	0.34	69.00	1599.98	3.96 N	1.03 E	1.24	0.49
1694.00	0.29	64.77	1693.98	4.16 N	1.51 E	1.73	0.06
1789.00	0.26	354.98	1788.98	4.48 N	1.71 E	1.94	0.33
1883.00	0.48	307.53	1882.98	4.93 N	1.38 E	1.64	0.38
1946.00	0.46	280.10	1945.97	5.14 N	0.92 E	1.19	0.36
2030.00	0.25	249.23	2029.97	5.13 N	0.42 E	0.69	0.33
2121.00	0.28	306.65	2120.97	5.20 N	0.06 E	0.33	0.28
2213.00	0.12	4.83	2212.97	5.43 N	0.11 W	0.18	0.26
2305.00	0.28	224.84	2304.97	5.37 N	0.26 W	0.02	0.41
2397.00	0.11	355.56	2396.97	5.30 N	0.43 W	-0.14	0.39
2489.00	2.31	59.81	2488.94	6.32 N	1.17 E	1.51	2.46
2584.00	4.51	53.14	2583.77	9.52 N	5.81 E	6.31	2.35
2679.00	5.75	36.02	2678.39	15.61 N	11.60 E	12.42	2.06
2773.00	7.67	27.43	2771.75	24.99 N	17.26 E	18.57	2.30
2868.00	8.88	21.14	2865.76	37.46 N	22.82 E	24.79	1.59
2962.00	9.36	13.70	2958.57	51.65 N	27.25 E	29.97	1.35
3056.00	9.00	13.99	3051.37	66.22 N	30.84 E	34.33	0.39
3151.00	9.74	6.29	3145.10	81.42 N	33.52 E	37.81	1.53
3246.00	8.82	8.23	3238.86	96.62 N	35.44 E	40.55	1.02
3340.00	8.02	8.23	3331.85	110.24 N	37.41 E	43.24	0.86
3435.00	7.65	8.62	3425.96	123.05 N	39.31 E	45.82	0.39
3625.00	8.58	0.40	3614.06	149.74 N	41.30 E	49.24	0.78

3719.00	7.69	343.50	3707.13	162.78 N	39.57 E	48.20	2.70
3814.00	6.83	337.43	3801.36	174.10 N	35.59 E	44.84	1.21
3908.00	5.91	341.51	3894.78	183.85 N	31.91 E	41.68	1.09
4003.00	3.85	345.26	3989.43	191.57 N	29.55 E	39.73	2.20
4098.00	3.79	345.91	4084.22	197.70 N	27.97 E	38.49	0.07
4192.00	2.18	349.29	4178.09	202.46 N	26.89 E	37.66	1.72
4287.00	2.09	352.19	4273.03	205.95 N	26.32 E	37.27	0.15
4381.00	0.69	215.12	4367.01	207.19 N	25.76 E	36.78	2.81
4476.00	0.35	185.82	4462.01	206.43 N	25.40 E	36.38	0.44
4570.00	0.73	199.49	4556.00	205.58 N	25.17 E	36.11	0.42
4665.00	1.14	202.59	4650.99	204.13 N	24.60 E	35.46	0.43
4760.00	1.05	193.30	4745.97	202.41 N	24.04 E	34.81	0.21
4855.00	1.12	184.74	4840.95	200.64 N	23.76 E	34.44	0.18
4949.00	1.03	176.53	4934.94	198.89 N	23.74 E	34.32	0.19
5044.00	0.88	167.25	5029.92	197.32 N	23.95 E	34.45	0.23
5138.00	0.96	151.84	5123.91	195.92 N	24.48 E	34.90	0.27
5233.00	1.05	148.03	5218.90	194.48 N	25.32 E	35.66	0.12
5328.00	1.23	139.20	5313.88	192.97 N	26.44 E	36.71	0.26
5423.00	1.33	136.14	5408.85	191.41 N	27.87 E	38.05	0.13
5517.00	1.17	136.46	5502.83	189.92 N	29.29 E	39.39	0.17
5612.00	0.94	126.41	5597.82	188.76 N	30.59 E	40.62	0.31
5801.00	2.07	116.89	5786.75	186.30 N	34.87 E	44.77	0.61
5895.00	15.06	123.32	5879.50	178.79 N	46.64 E	56.12	13.84
5990.00	26.34	137.06	5968.27	156.49 N	71.41 E	79.66	12.85
6084.00	39.22	123.49	6047.24	124.65 N	110.61 E	117.11	15.70
6179.00	47.48	103.76	6116.59	99.59 N	170.04 E	175.11	16.62
6227.00	49.89	91.98	6148.34	94.74 N	205.64 E	210.40	19.09
6273.00	52.31	81.67	6177.27	96.78 N	241.29 E	246.11	18.19
6320.00	54.69	79.15	6205.23	103.08 N	278.53 E	283.64	6.66
6368.00	56.36	79.03	6232.40	110.57 N	317.39 E	322.84	3.48
6415.00	56.34	78.41	6258.45	118.22 N	355.75 E	361.56	1.10
6463.00	55.75	77.96	6285.26	126.37 N	394.72 E	400.91	1.45
6510.00	55.97	77.39	6311.64	134.67 N	432.73 E	439.30	1.10
6557.00	59.42	77.06	6336.75	143.46 N	471.46 E	478.45	7.36
6605.00	66.34	76.63	6358.62	153.18 N	513.04 E	520.48	14.45
6651.00	70.27	76.65	6375.62	163.06 N	554.62 E	562.53	8.54
6699.00	74.06	77.57	6390.31	173.24 N	599.15 E	607.54	8.10
6746.00	76.27	80.27	6402.35	181.97 N	643.73 E	652.53	7.28
6794.00	77.86	80.43	6413.09	189.81 N	689.85 E	699.00	3.33
6841.00	79.59	81.90	6422.28	196.88 N	735.39 E	744.86	4.77
6889.00	81.40	81.75	6430.21	203.62 N	782.25 E	792.01	3.80
6935.00	83.11	82.74	6436.41	209.77 N	827.41 E	837.43	4.27
7030.00	85.00	83.75	6446.25	220.89 N	921.24 E	931.72	2.26

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 86.94 DEGREES (GRID)
A TOTAL CORRECTION OF 7.51 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7030.00 FEET
IS 947.35 FEET ALONG 76.52 DEGREES (GRID)**