



**1 : 600 / 1 : 240**

WELL INFORMATION					
MWD Run Number	100	200			
Date run completed	01-Aug-15	01-Aug-15			
Rig Bit Number	2	3			
Bit Size (in)	8.750	8.750			
Tool Nominal OD (in)	6.750	6.750			
Log Start Depth (TVD, ft)	1,134.97	5,808.76			
Log End Depth (TVD, ft)	5,808.76	5,824.15			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	30-Jul-15 23:00	01-Aug-15 05:00			
Drill/Wipe End Date and Time	31-Jul-15 22:45	01-Aug-15 10:45			
Min Inc (deg) @ Depth (TVD, ft)	0.14 @ 1,222.97	0.14 @ 1,222.97			
Max Inc (deg) @ Depth (TVD, ft)	61.84 @ 5,764.57	84.60 @ 5,821.14			
Bit TFA(in2) / Bit Type	0.98 / PDC	0.98 / PDC			
Flow Rate (gpm)	596.14	560.00			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	10.65 / 40.00	10.60 / 29.00			
Filtrate CL (ppm)	400.00	400.00			
pH / Fluid Loss (mptm)	9.70 / 7	11.00 / 14			
PV (cP) / YP (lbf2)	12 / 12.00	3 / 3.00			
% Solids / % Sand	4.7 / 0.25	4.7 / .1			
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A			
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A			
Max Tool Temp (in F) / S	175.01 / PCM	175.01 / PCM			

Max Tool Temp (degF) / Source	175.21 / PCM	175.21 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Brian Neu	Brian Neu			
Customer Representative	JW Irwin	JW Irwin			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.93	5.93			
Sub Serial Number	11303511	11303511			
Insert Serial Number	11400870	11400870			
Date and Time Initialized	29-Jul-15 21:09	29-Jul-15 21:09			
Date and Time Read	01-Aug-15 15:21	01-Aug-15 15:27			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	65.00	64.00			
Software Version	6.21	6.21			
Sub Serial Number	11303511	11303511			
Sonde Serial Number	11478016	11478016			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	41.80	172.80			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	58.24	57.27			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11303511	11303511			
Insert/Sonde Serial Number	12037418	12037418			

## REMARKS

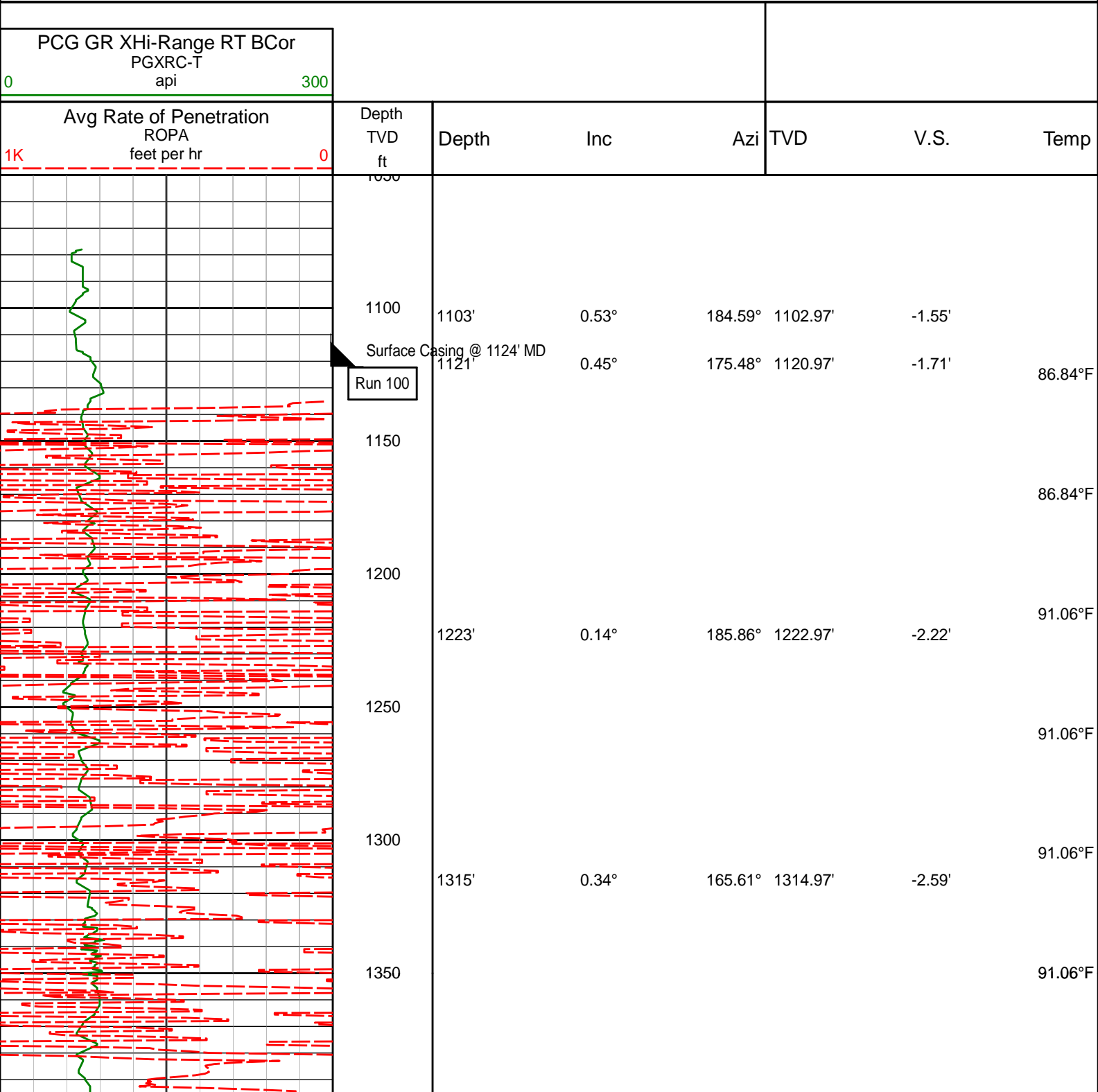
1. All depths are calibrated to driller's pipe tally and are total vertical depth from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. Environmental parameters used in gamma and resistance processing:  
Hole Size: 8.75"  
Mud Density: 9.9-11.0
5. The following smoothing parameters have been applied to the data:  
Interval: 0.5 ft  
Coercion Distance: 1.2 ft (ROPA)  
Interval: 0.5 ft  
Coercion Distance: 0.6 ft (Gamma Ray)

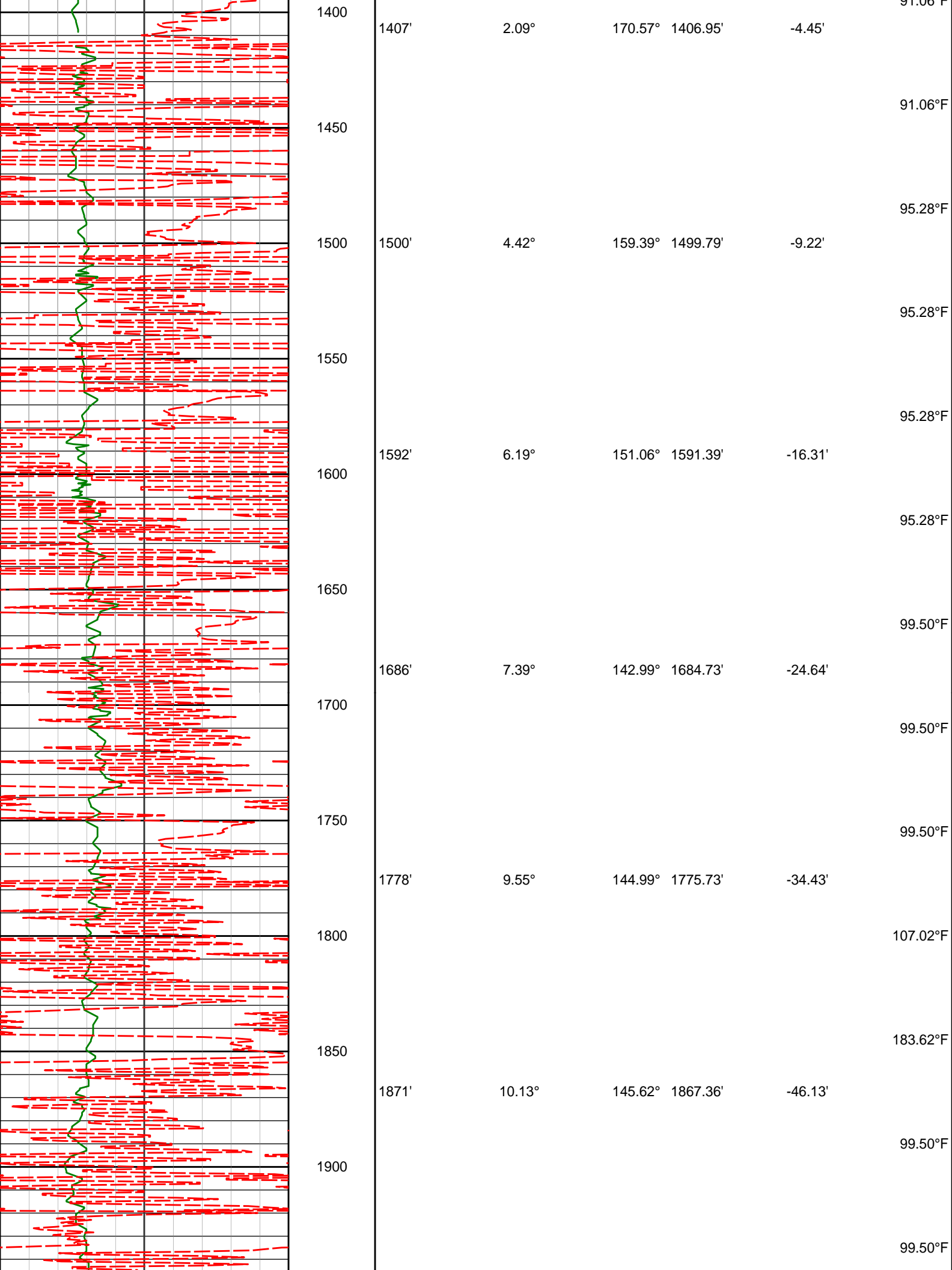
## WARRANTY

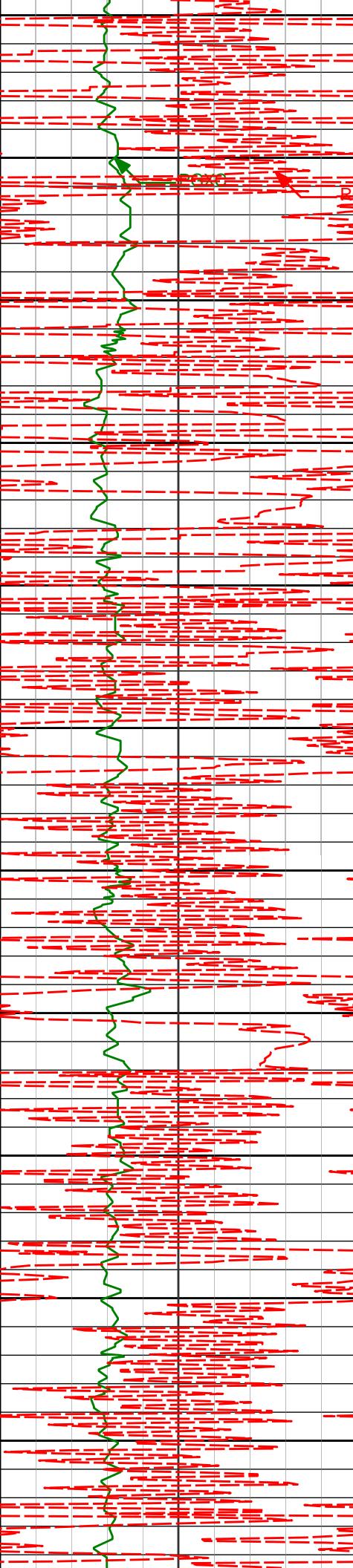
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# TVD Detail 1:600 Scale







1950  
2000  
2050  
2100  
2150  
2200  
2250  
2300  
2350  
2400  
2450

1964'  
2055'  
2147'  
2239'  
2331'  
2424'

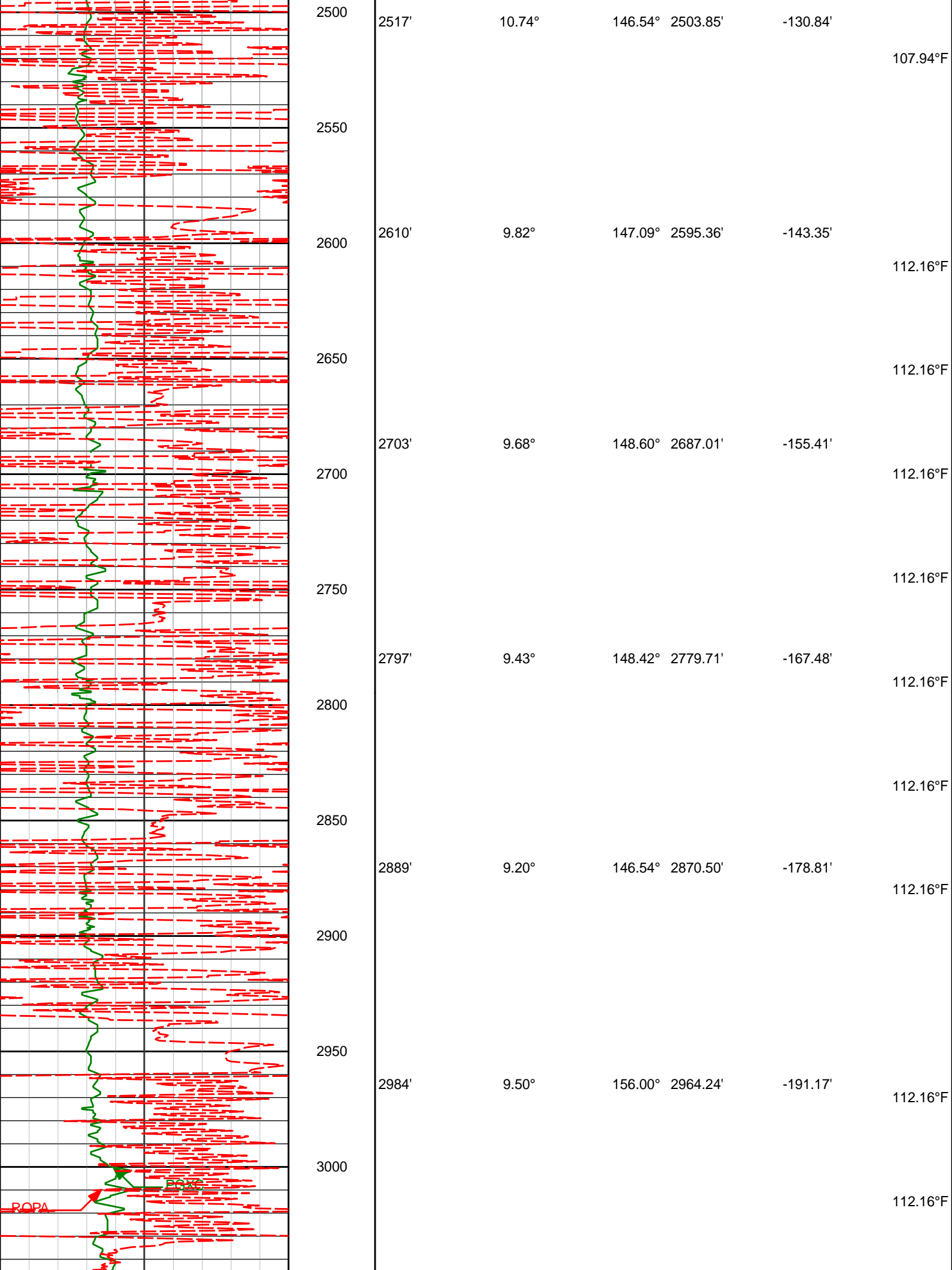
9.86°  
9.05°  
9.62°  
9.13°  
10.26°  
10.45°

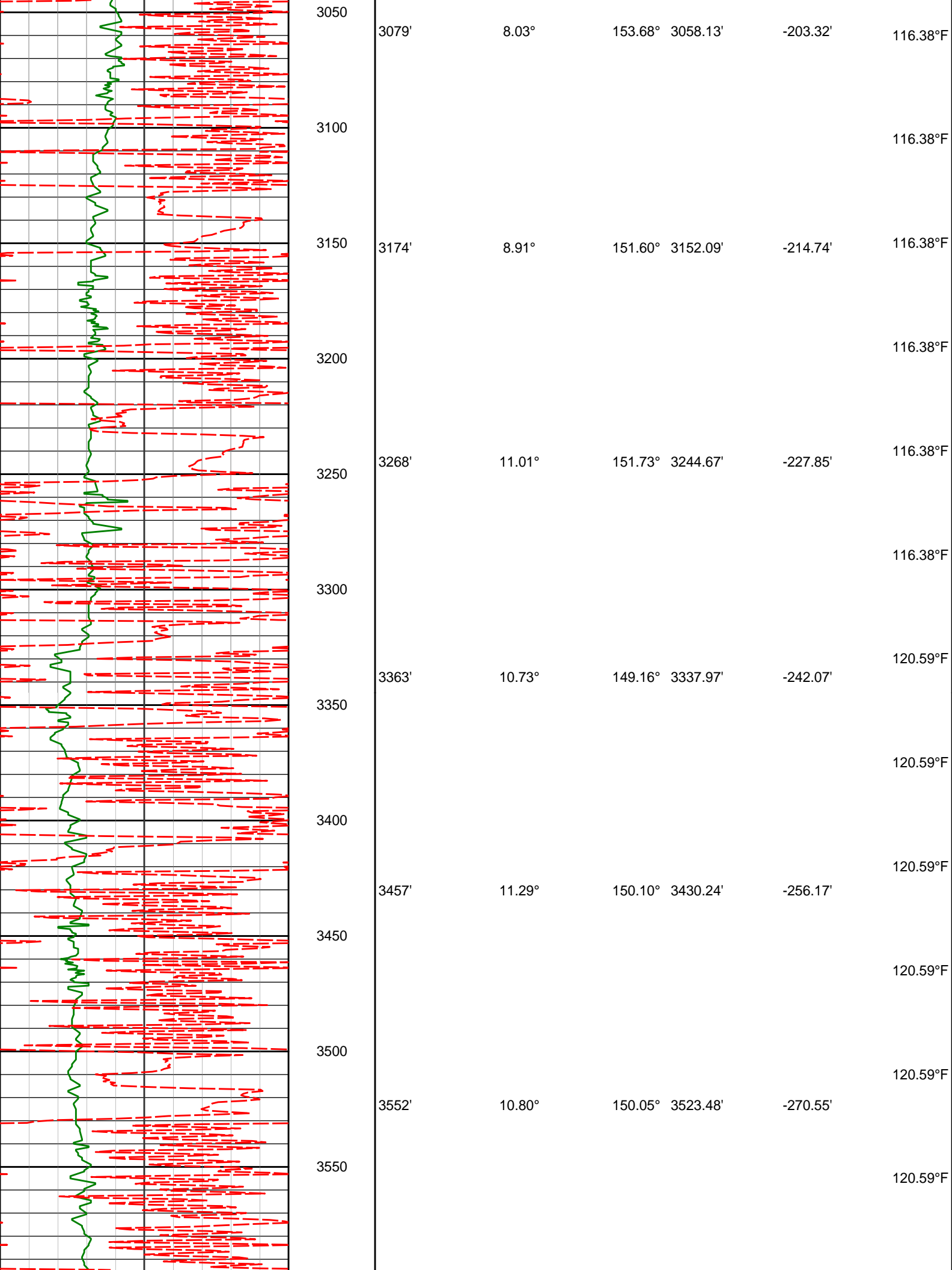
144.95°  
143.99°  
150.85°  
152.52°  
151.21°  
147.51°

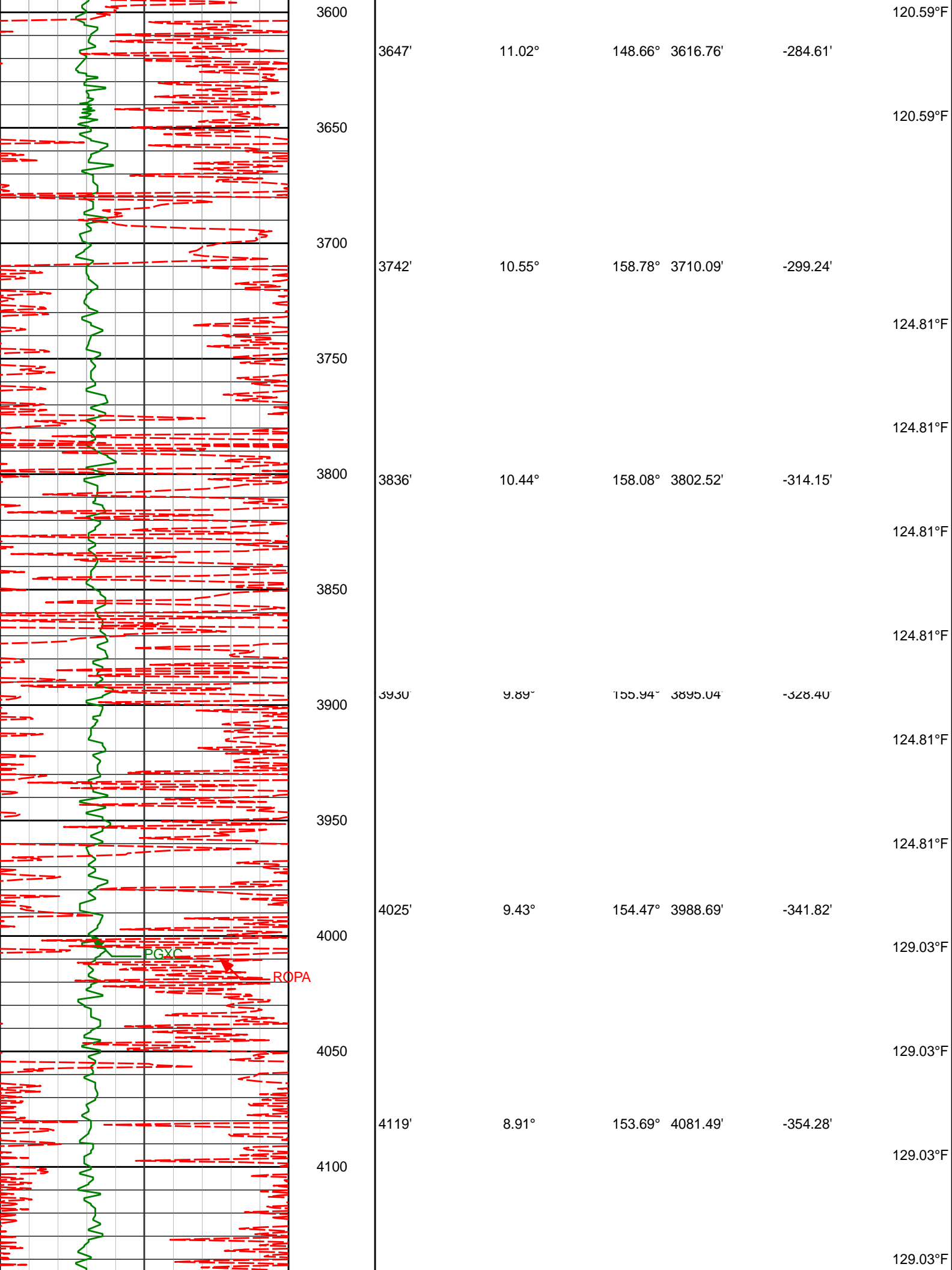
1958.95'  
2048.71'  
2139.50'  
2230.27'  
2320.95'  
2412.44'

-58.01'  
-68.87'  
-80.22'  
-92.32'  
-104.84'  
-117.91'

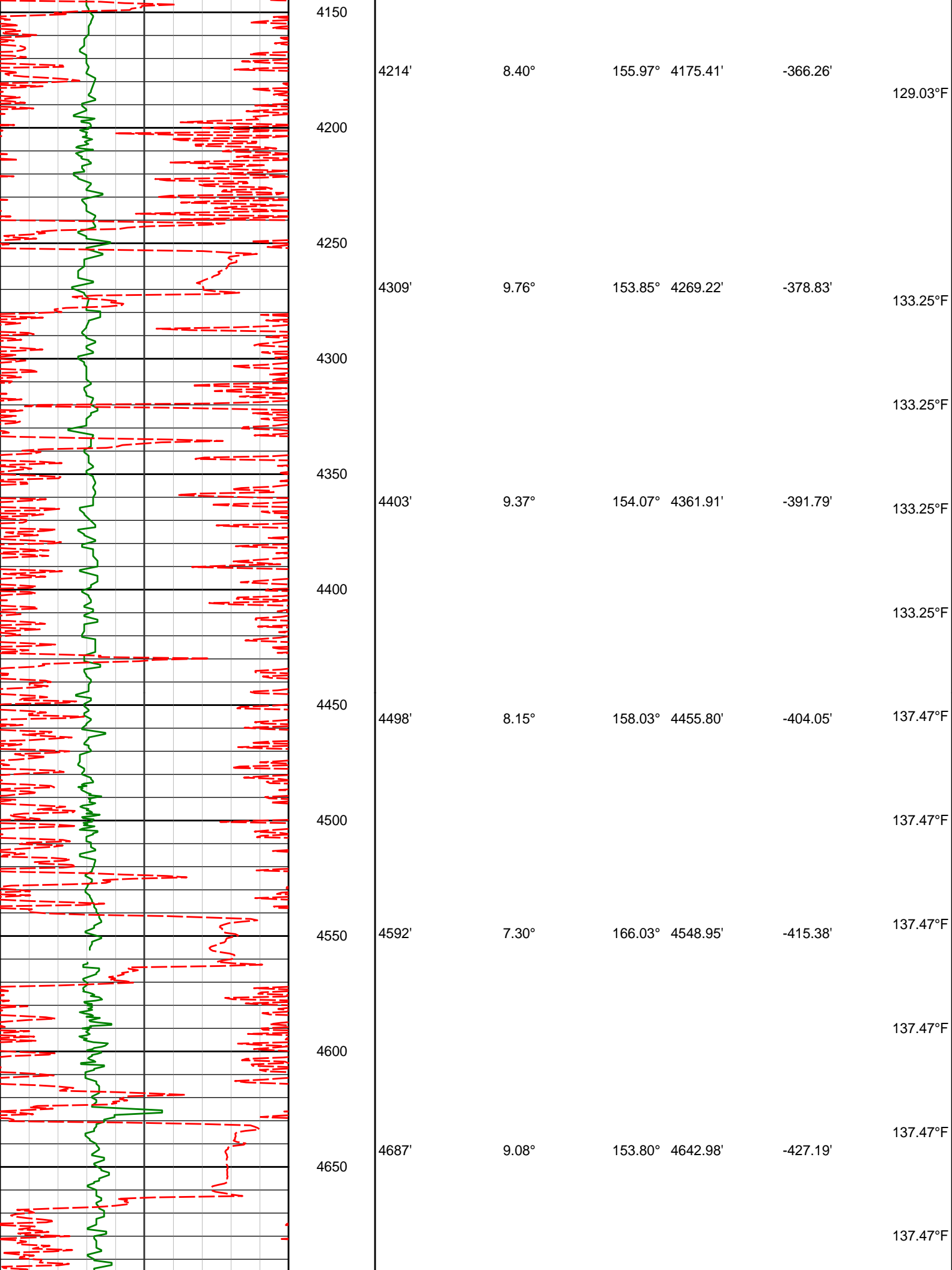
99.50°F  
99.50°F  
99.50°F  
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107.94°F  
107.94°F  
107.94°F

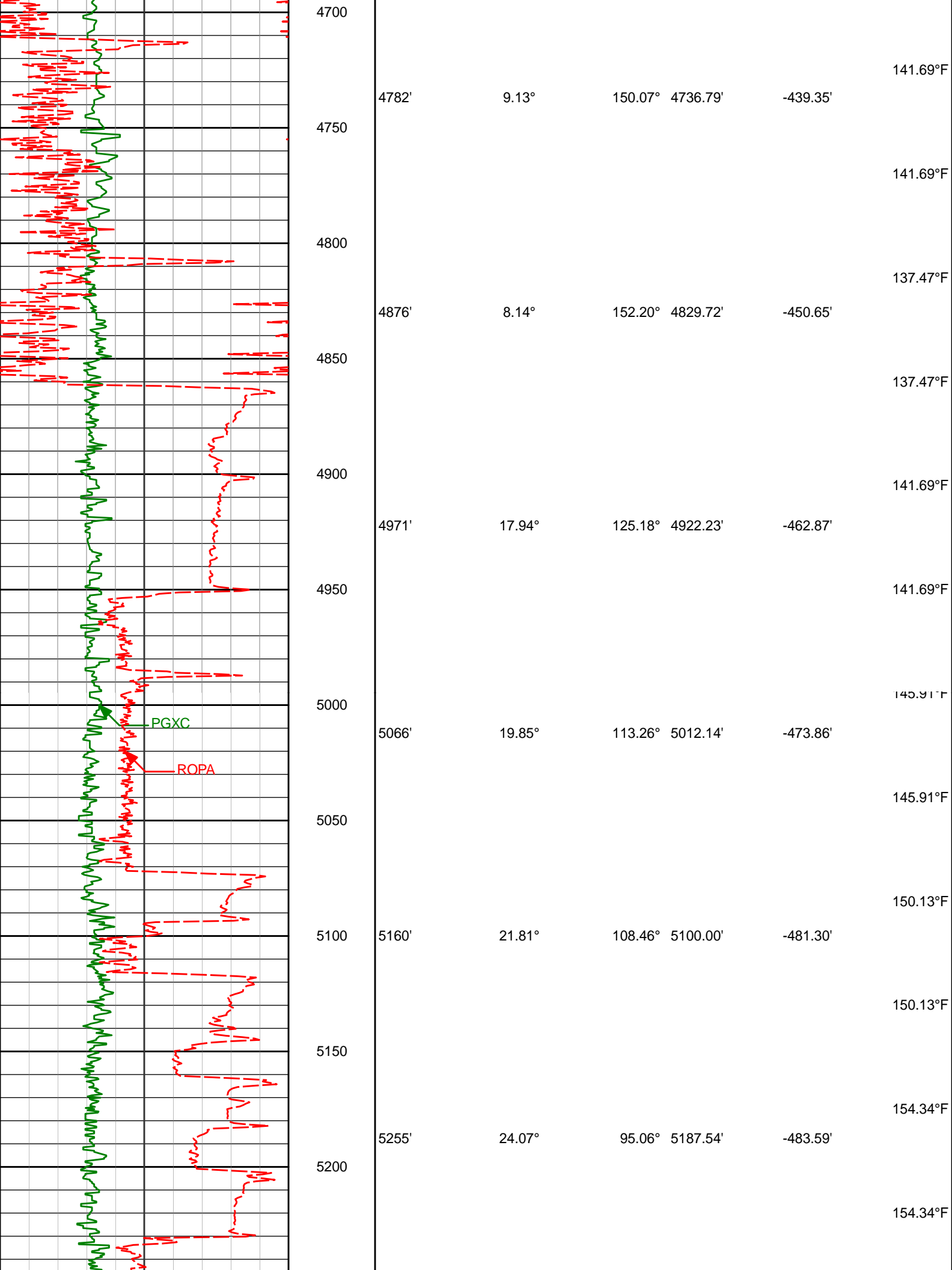


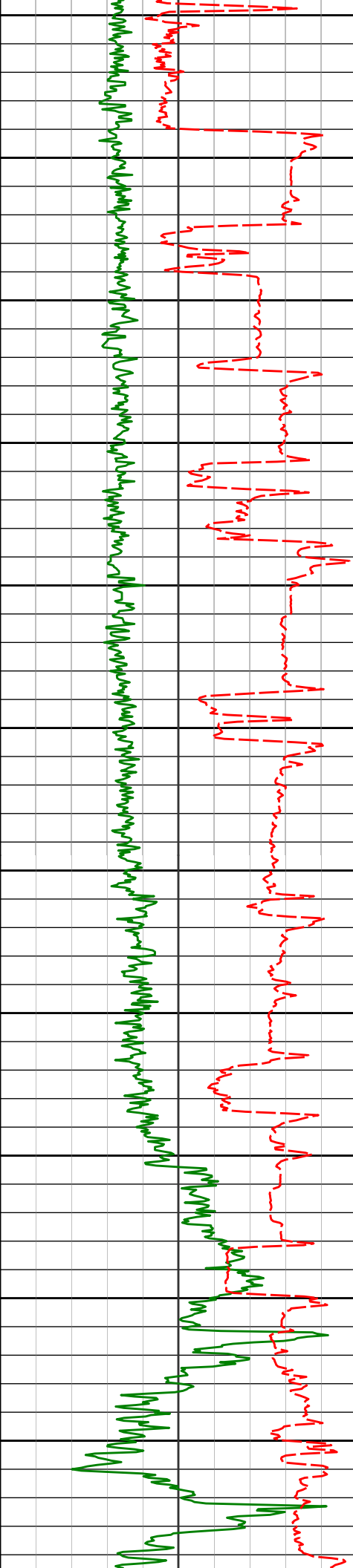












5250

5349'

25.64°

83.77°

5272.88'

-477.68'

154.34°F

5300

154.34°F

5350

5444'

27.93°

73.20°

5357.73'

-463.37'

158.56°F

5400

160.29°F

5450

5539'

31.74°

62.16°

5440.19'

-439.46'

162.78°F

5500

162.78°F

5550

5633'

39.51°

51.04°

5516.62'

-403.11'

162.78°F

5600

5728'

43.77°

32.78°

5587.86'

-351.05'

167.00°F

5650

170.02°F

5823'

46.14°

22.27°

5655.18'

-287.97'

170.46°F

5700

5917'

55.03°

17.57°

5714.83'

-217.02'

167.00°F

5750

6012'

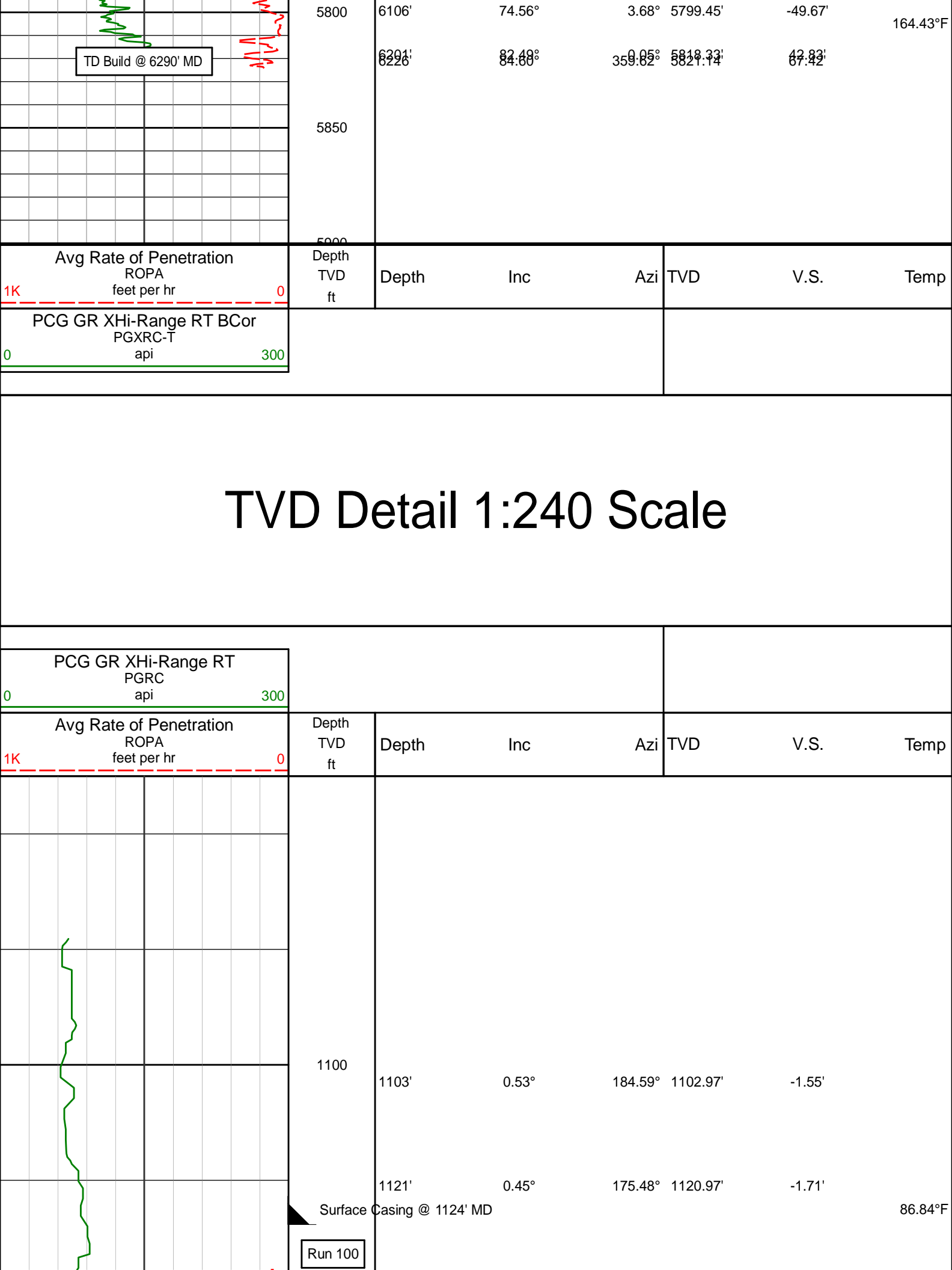
61.84°

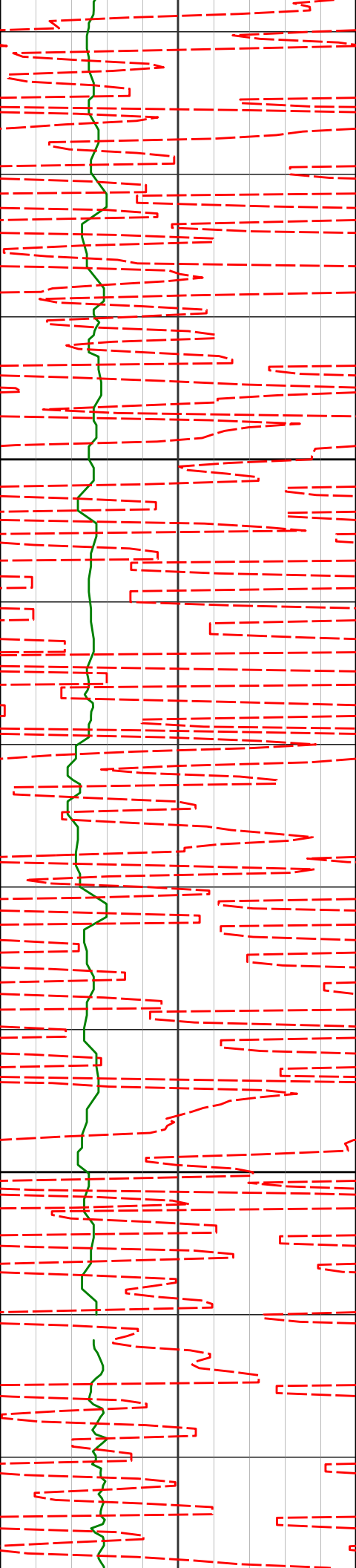
11.04°

5764.57'

-136.68'

171.22°F





1200

1223'

0.14°

185.86°

1222.97'

-2.22'

86.84°F

91.06°F

91.06°F

1300

1315'

0.34°

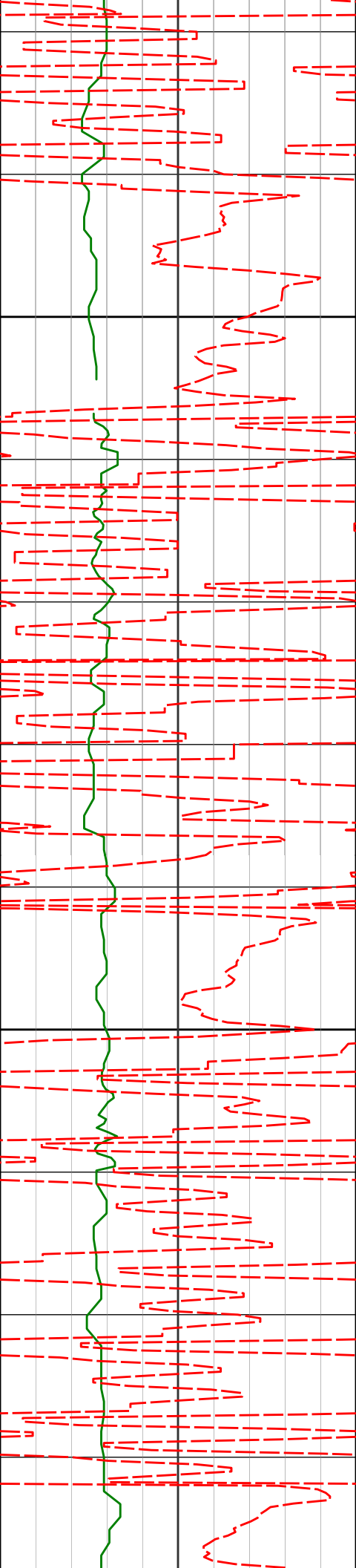
165.61°

1314.97'

-2.59'

91.06°F

91.06°F



1400

1407'

2.09°

170.57°

1406.95'

-4.45'

91.06°F

91.06°F

95.28°F

1500

1500'

4.42°

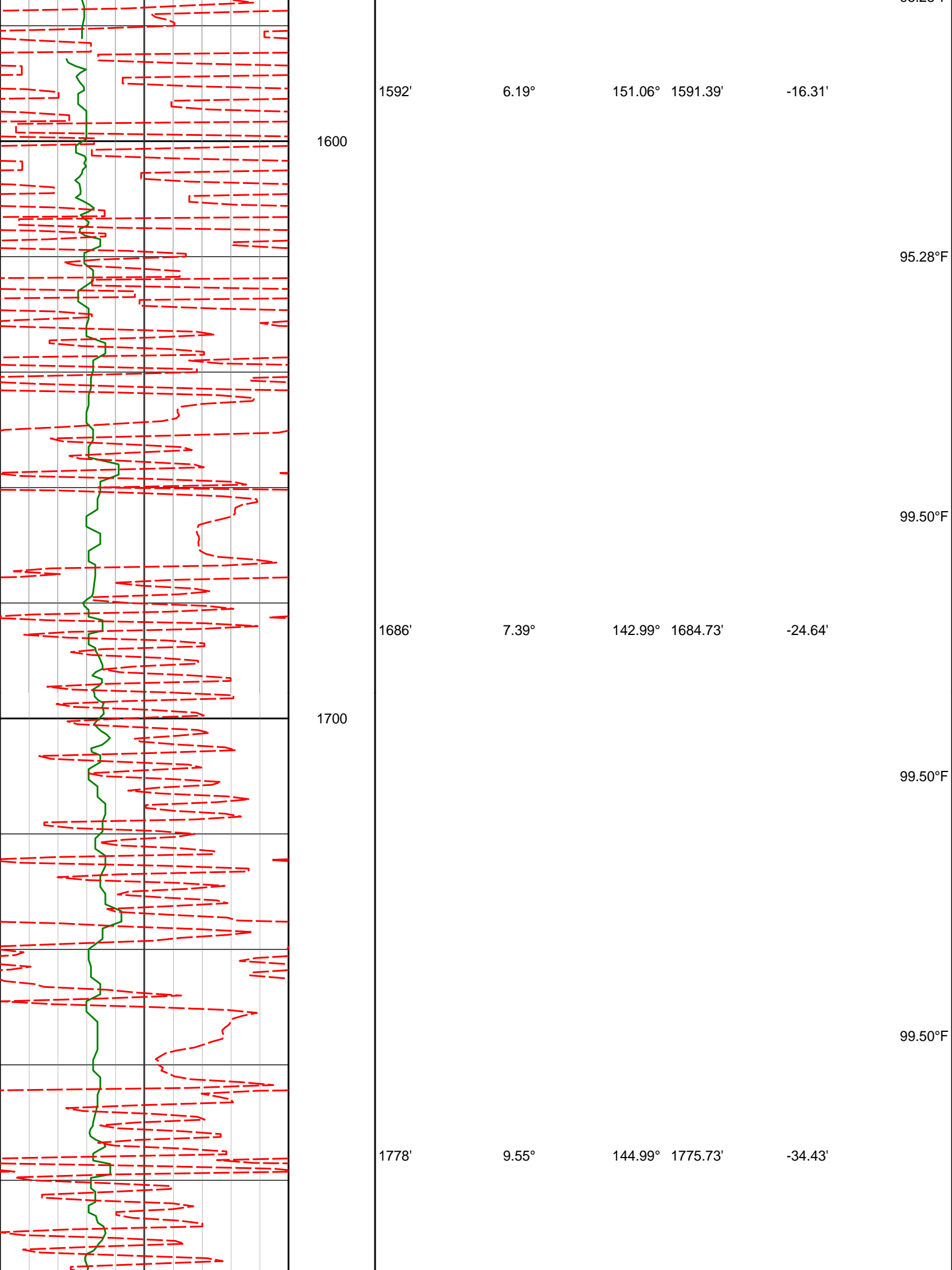
159.39°

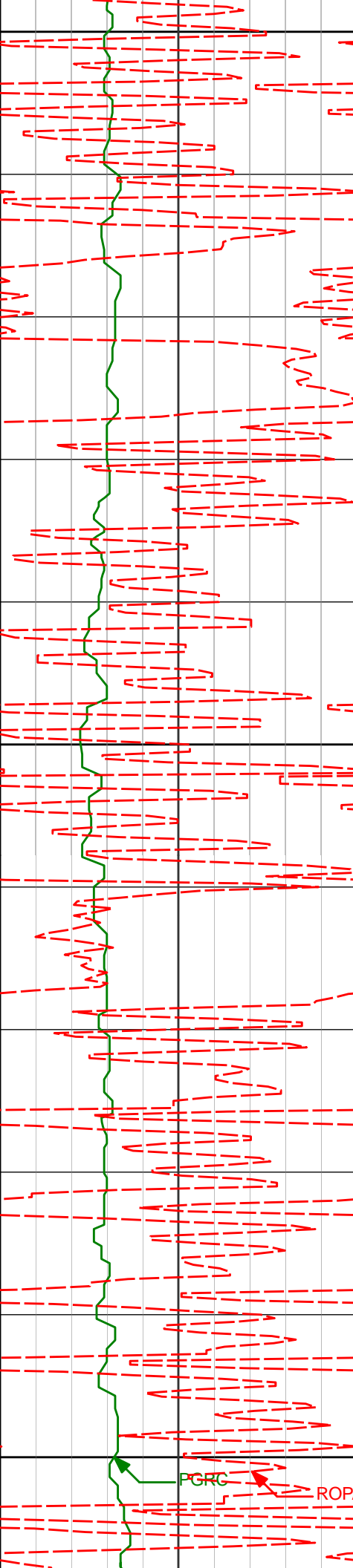
1499.79'

-9.22'

95.28°F

95.28°F





1800

107.02°F

183.62°F

1871'

10.13°

145.62° 1867.36'

-46.13'

99.50°F

1900

99.50°F

1964'

9.86°

144.95° 1958.95'

-58.01'

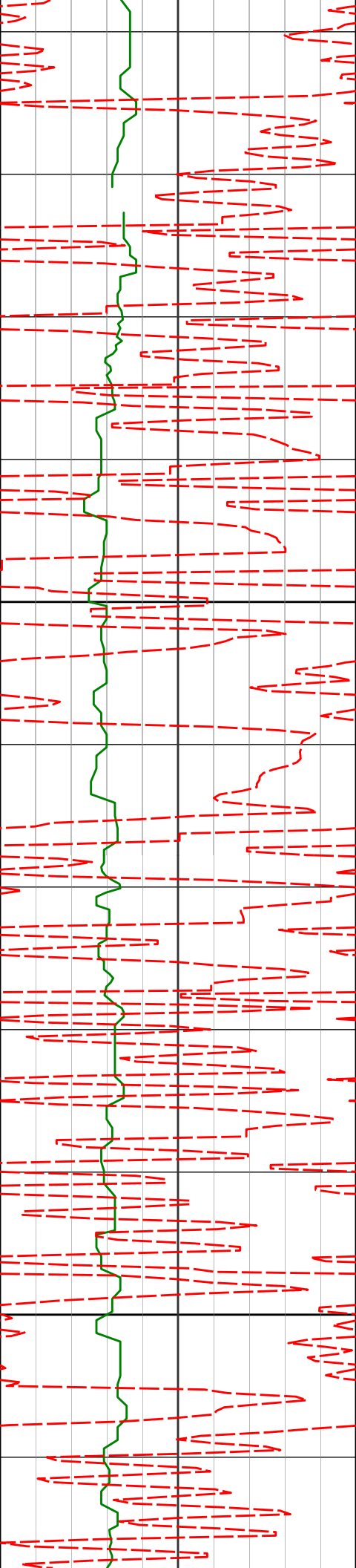
99.50°F

2000

PGRC

ROPA





2100

2200

2055'

2147'

2239'

9.05°

9.62°

9.13°

143.99°

150.85°

152.52°

2048.71'

2139.50'

2230.27'

-68.87'

-80.22'

-92.32'

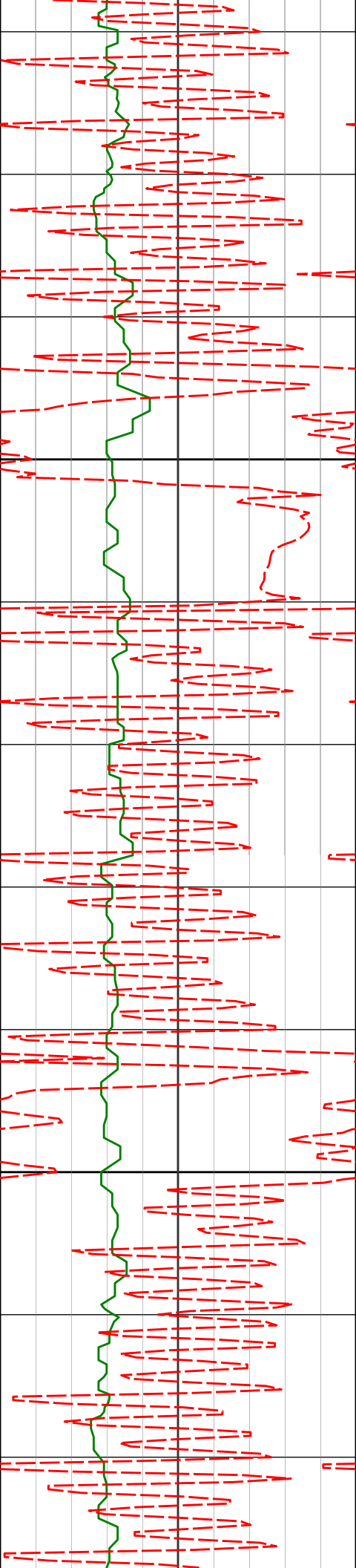
99.50°F

99.50°F

103.72°F

103.72°F

103.72°F



2300

2400

2331'

2424'

10.26°

10.45°

151.21° 2320.95'

147.51° 2412.44'

-104.84'

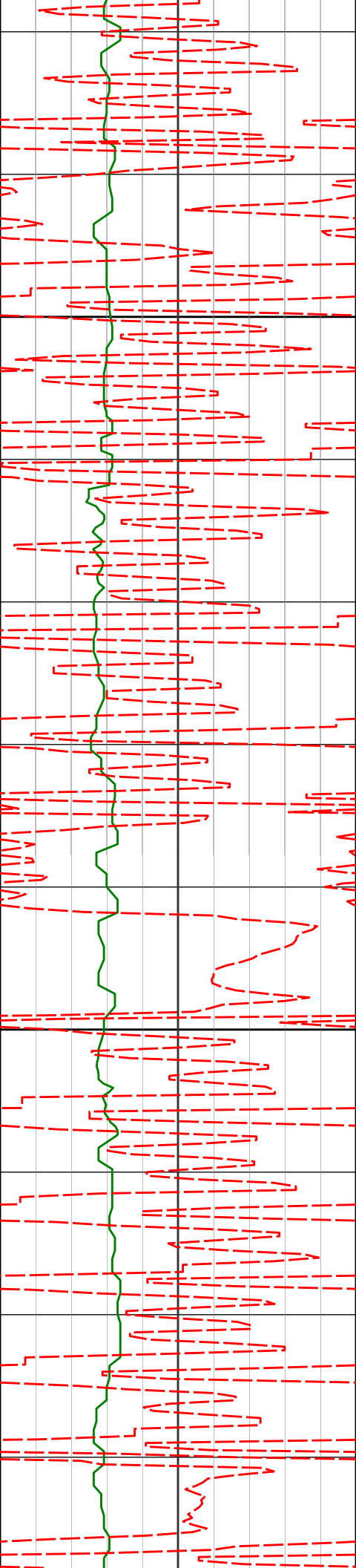
-117.91'

103.72°F

107.94°F

107.94°F

107.94°F



2500

2517'

10.74°

146.54° 2503.85'

-130.84'

107.94°F

107.94°F

2600

2610'

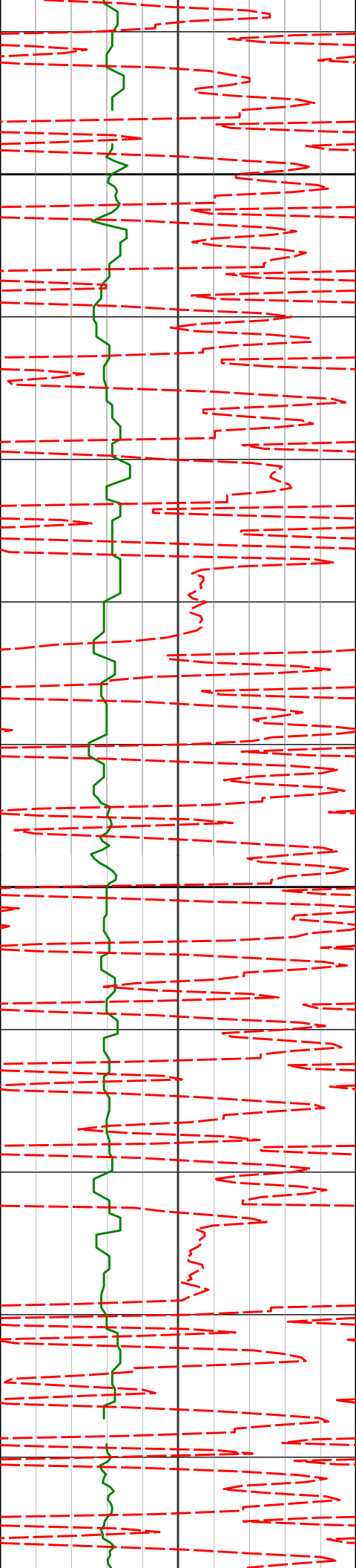
9.82°

147.09° 2595.36'

-143.35'

112.16°F

112.16°F



2703'

9.68°

148.60° 2687.01'

-155.41'

2700

112.16°F

112.16°F

2797'

9.43°

148.42° 2779.71'

-167.48'

2800

112.16°F

112.16°F

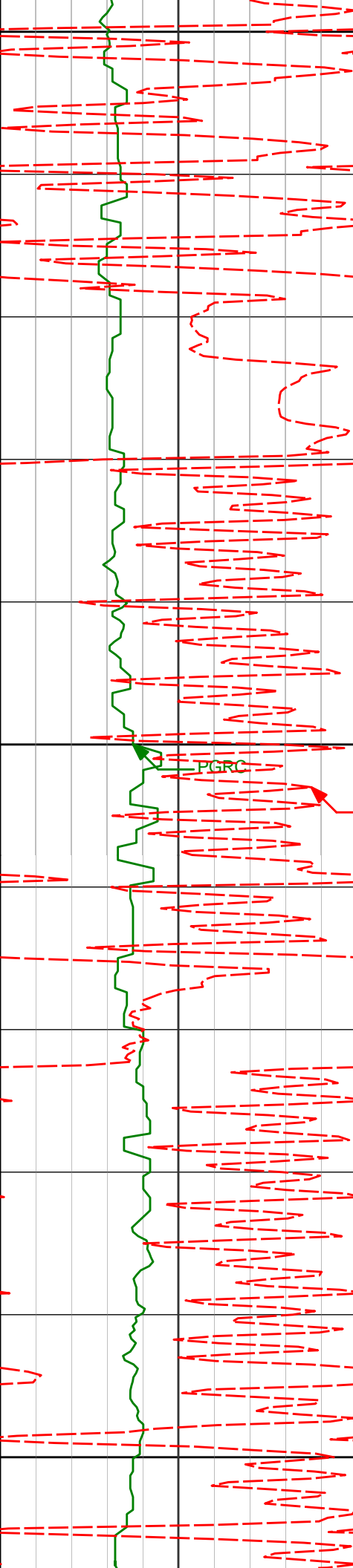
2889'

9.20°

146.54° 2870.50'

-178.81'

112.16°F



2900

2984'

9.50°

156.00°

2964.24'

-191.17'

112.16°F

3000

PGRC

ROPA

112.16°F

3079'

8.03°

153.68°

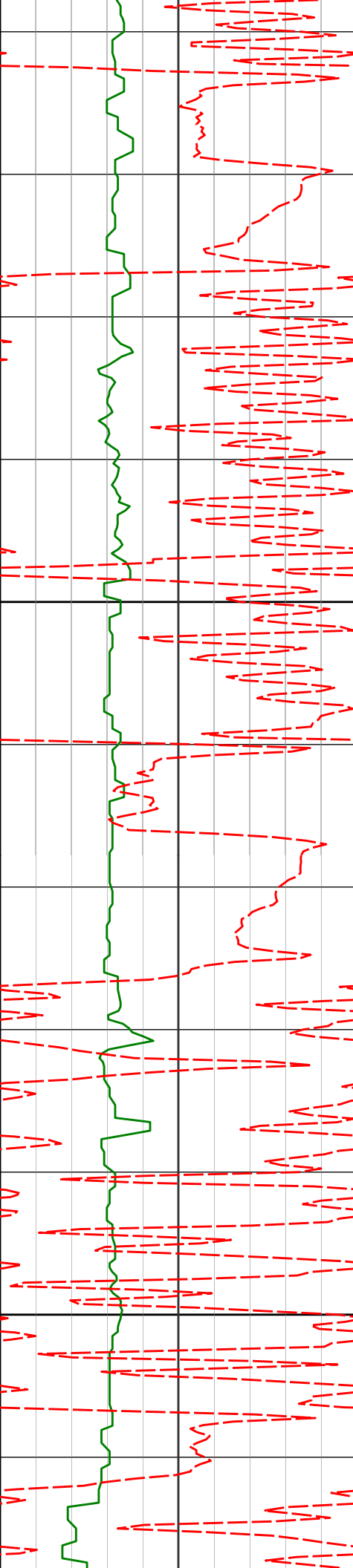
3058.13'

-203.32'

116.38°F

3100

116.38°F



3200

3300

3174'

8.91°

151.60° 3152.09'

-214.74'

116.38°F

116.38°F

116.38°F

3268'

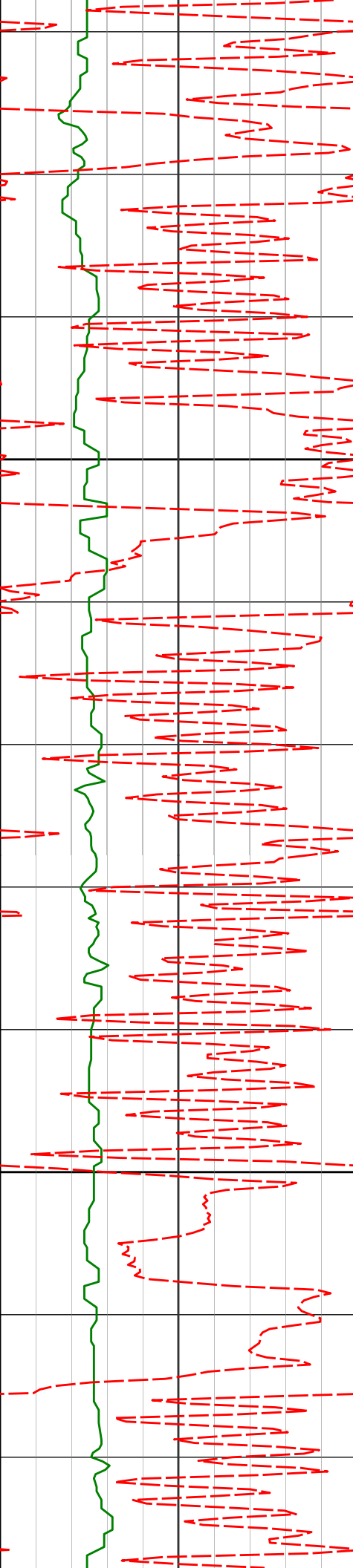
11.01°

151.73° 3244.67'

-227.85'

116.38°F

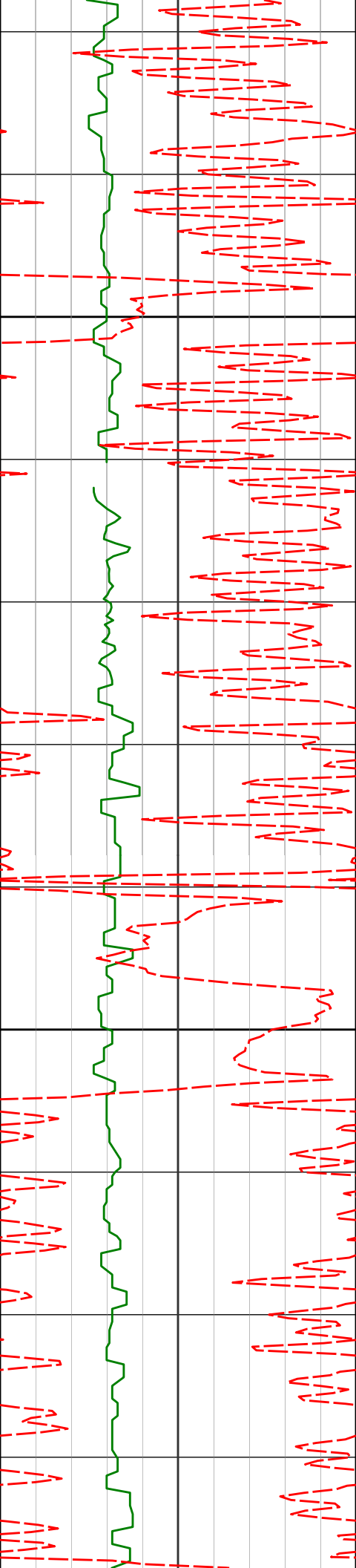
120.59°F



3400

3500

3363'	10.73°	149.16°	3337.97'	-242.07'	
					120.59°F
					120.59°F
3457'	11.29°	150.10°	3430.24'	-256.17'	
					120.59°F
					120.59°F
3552'	10.80°	150.05°	3523.48'	-270.55'	
					120.59°F
					120.59°F



3600

3647'

11.02°

148.66°

3616.76'

-284.61'

120.59°F

3700

3742'

10.55°

158.78°

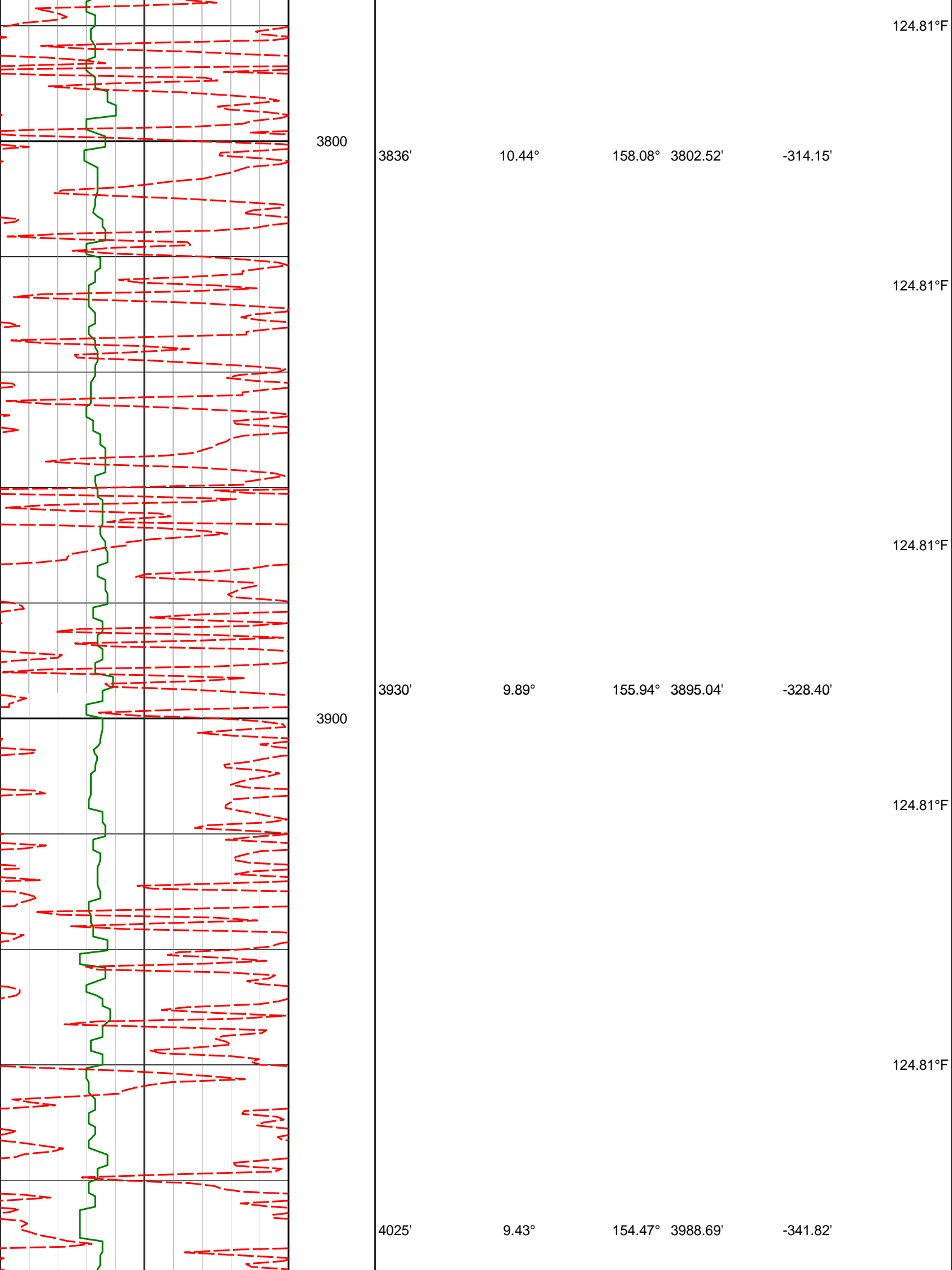
3710.09'

-299.24'

120.59°F

124.81°F





124.81°F

3800

3836'

10.44°

158.08°

3802.52'

-314.15'

124.81°F

124.81°F

3900

3930'

9.89°

155.94°

3895.04'

-328.40'

124.81°F

124.81°F

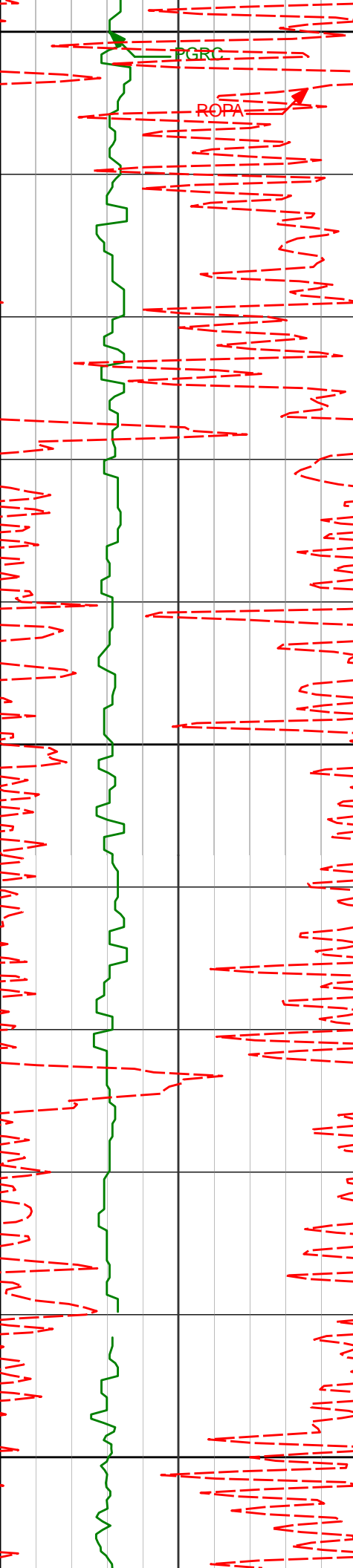
4025'

9.43°

154.47°

3988.69'

-341.82'



4000

PGRC

ROPA

129.03°F

129.03°F

4119'

8.91°

153.69°

4081.49'

-354.28'

129.03°F

4100

129.03°F

4214'

8.40°

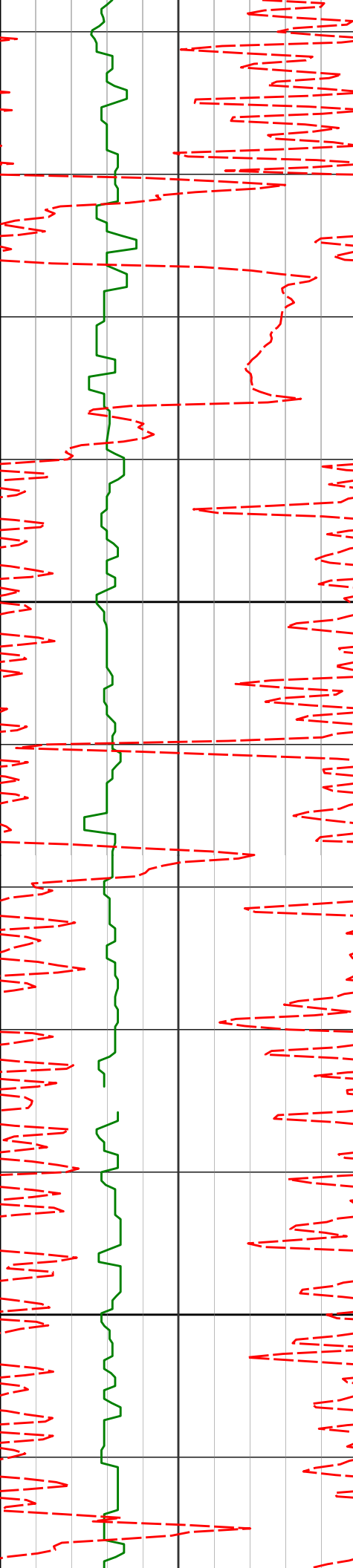
155.97°

4175.41'

-366.26'

129.03°F

4200



4309'

9.76°

153.85° 4269.22'

-378.83'

133.25°F

4300

133.25°F

4403'

9.37°

154.07° 4361.91'

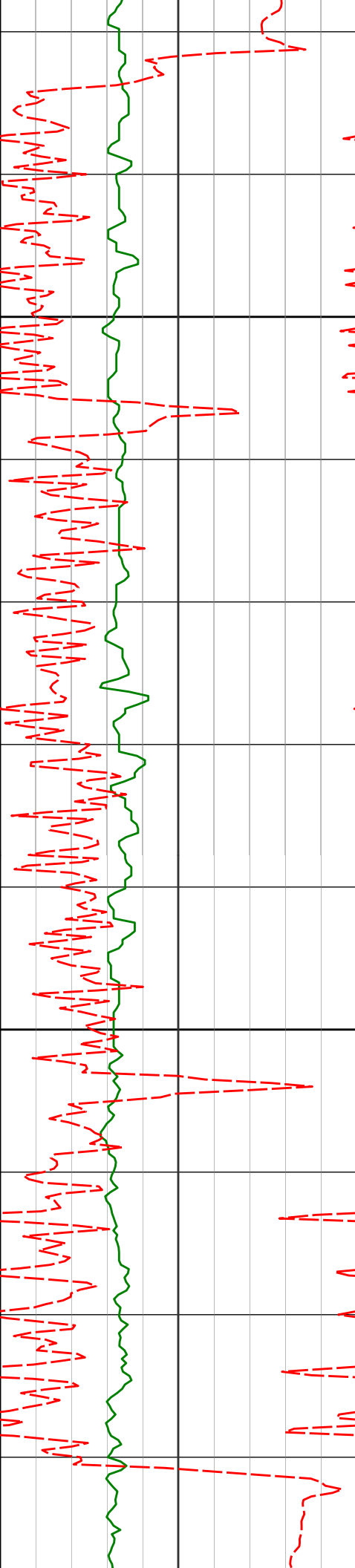
-391.79'

133.25°F

4400

133.25°F





4700

4800

4782'

9.13°

150.07° 4736.79'

-439.35'

4876'

8.14°

152.20° 4829.72'

-450.65'

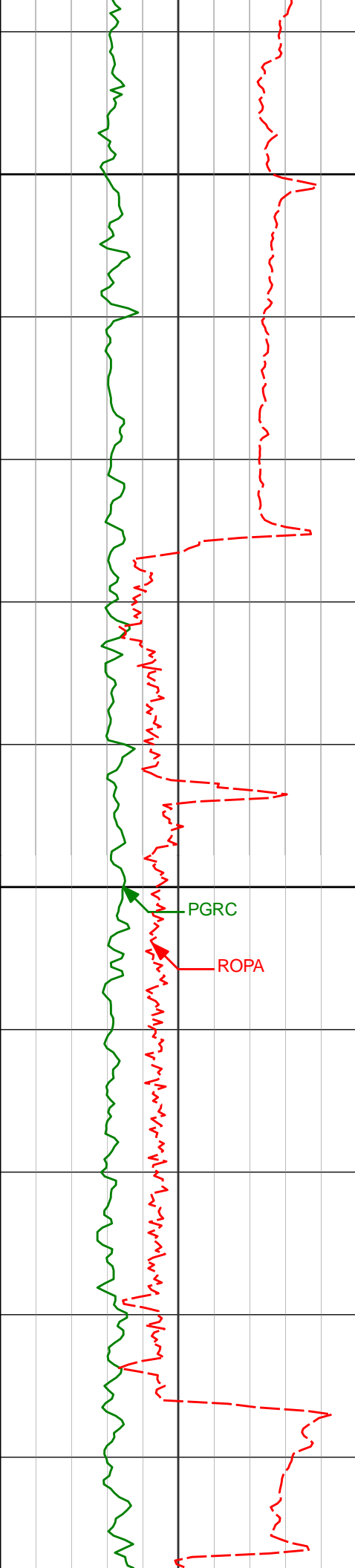
137.47°F

141.69°F

141.69°F

137.47°F

137.47°F



4900

5000

4971'

5066'

17.94°

19.85°

125.18°

113.26°

4922.23'

5012.14'

-462.87'

-473.86'

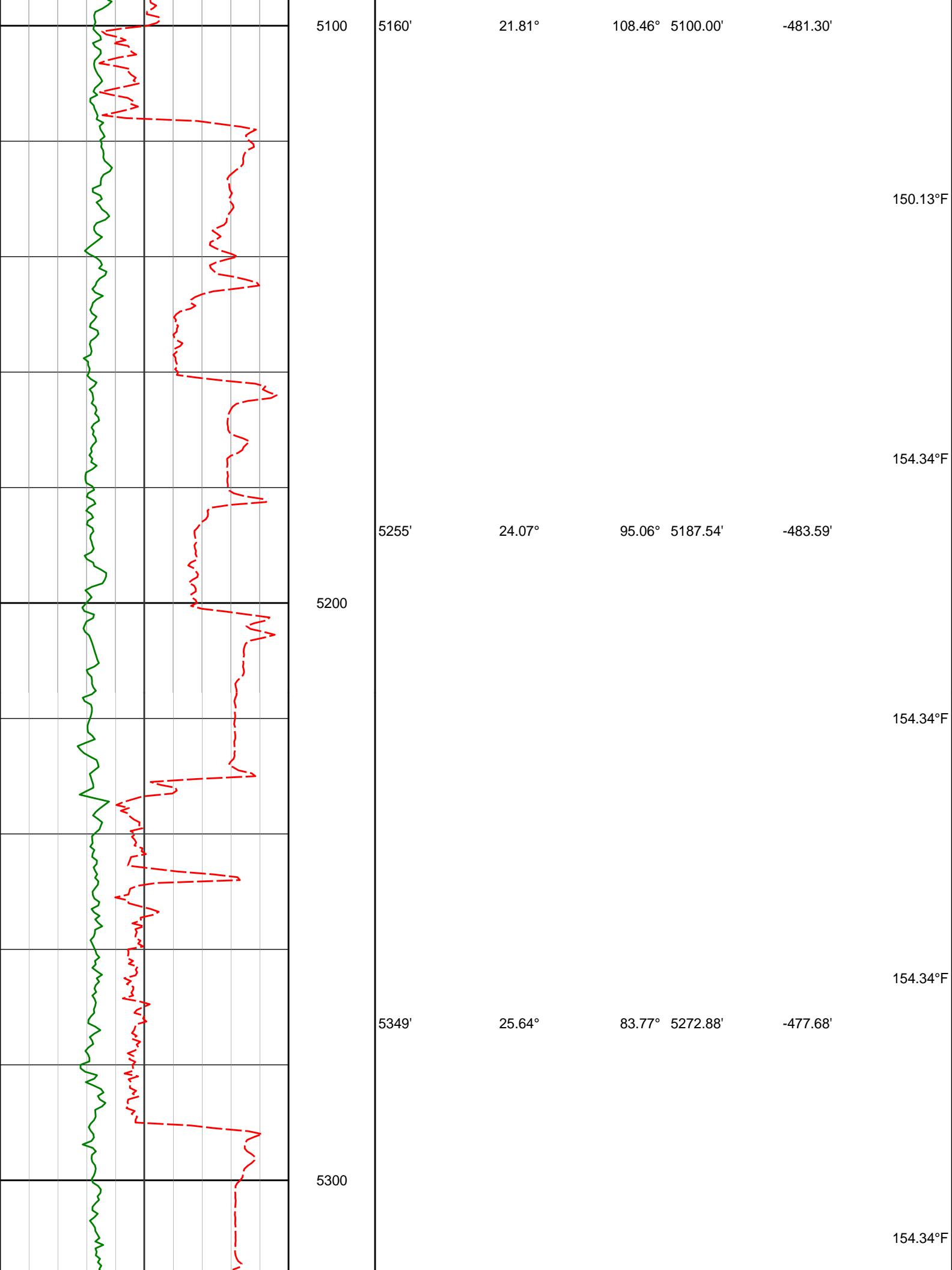
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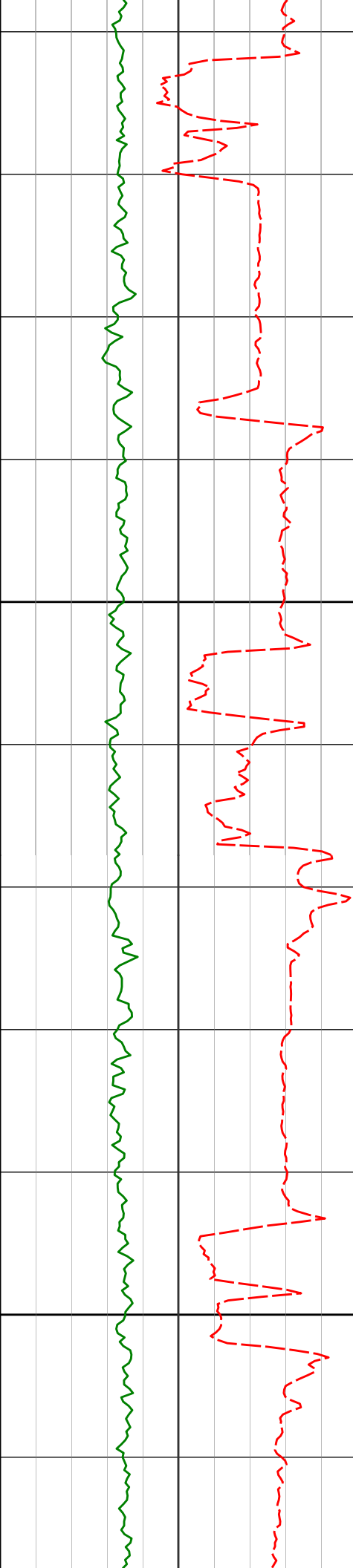
141.69°F

145.91°F

145.91°F

150.13°F





5400

5500

5444'

27.93°

73.20° 5357.73'

-463.37'

158.56°F

5539'

31.74°

62.16° 5440.19'

-439.46'

162.78°F

5633'

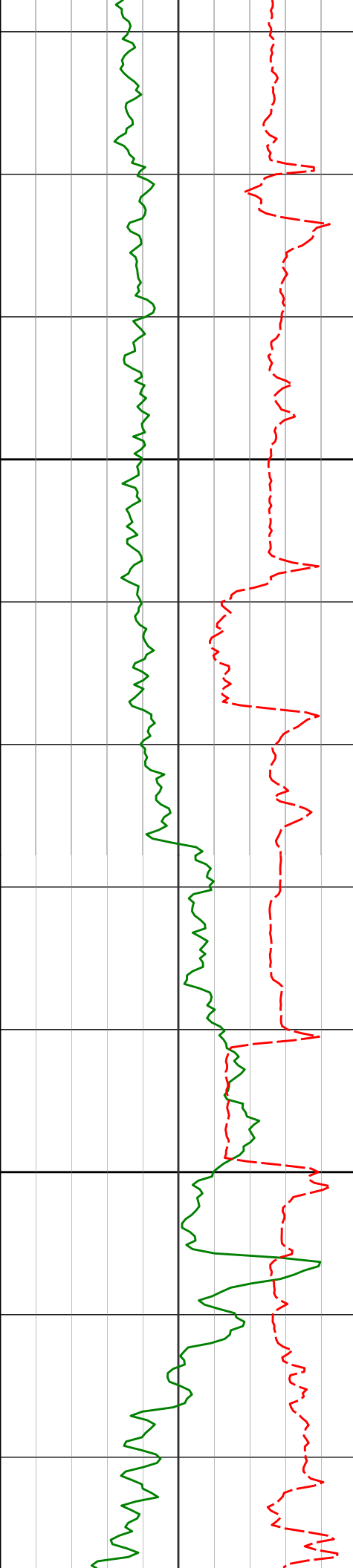
39.51°

51.04° 5516.62'

-403.11'

162.78°F





5600

5700

5728'

43.77°

32.78° 5587.86'

-351.05'

5823'

46.14°

22.27° 5655.18'

-287.97'

5917'

55.03°

17.57° 5714.83'

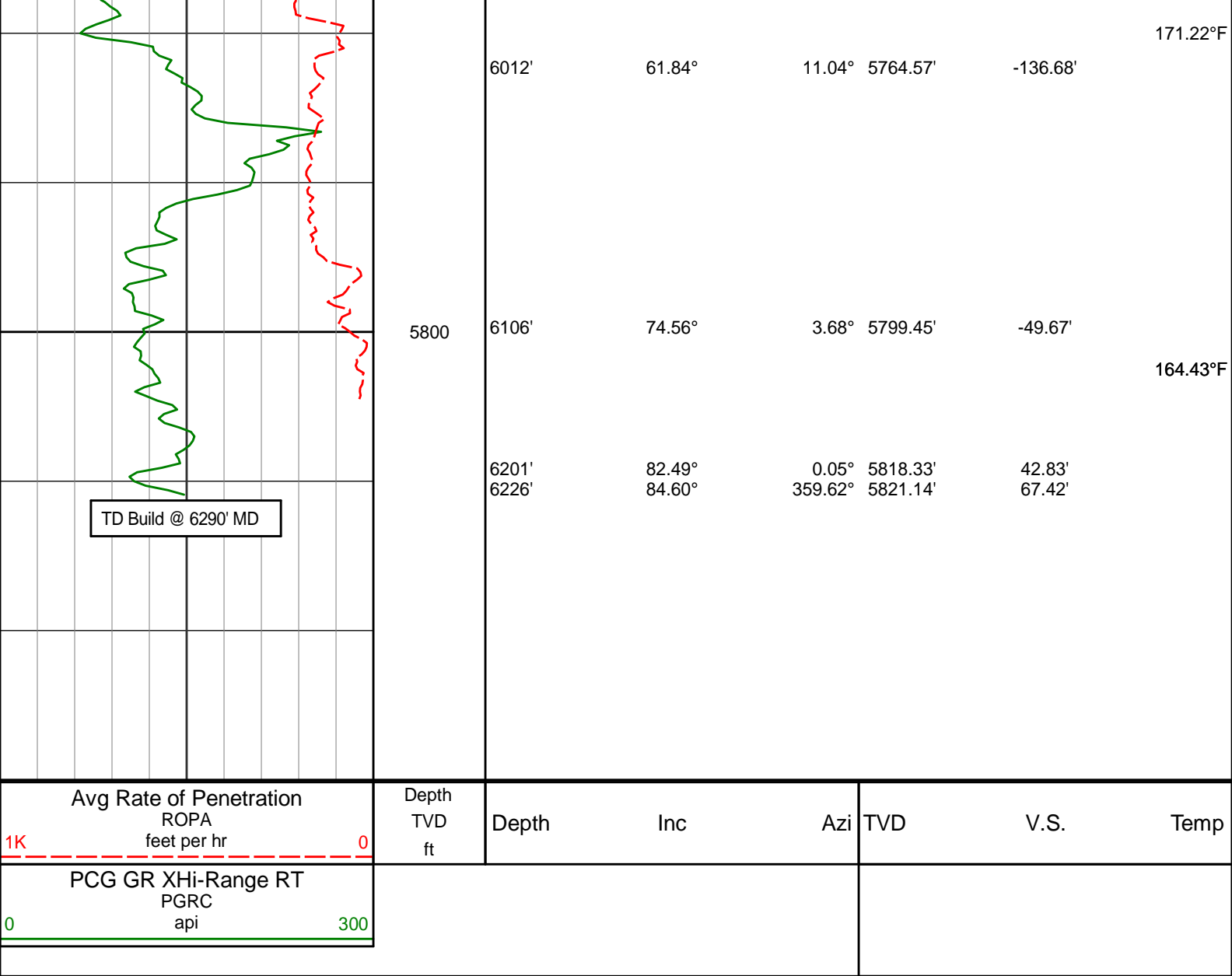
-217.02'

167.00°F

170.02°F

170.46°F

167.00°F



## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Noble Energy Inc.  
Greyson LD28-753  
Wattenburg  
Weld Colorado  
USA  
CA-XX-0902594951

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
39.00	0.20	282.17	39.00	0.01 N	0.07 W	0.01	0.52
102.00	0.29	252.81	102.00	0.01 S	0.33 W	-0.05	0.24
193.00	0.51	331.37	193.00	0.28 N	0.74 W	0.18	0.59
284.00	0.50	327.41	283.99	0.98 N	1.15 W	0.81	0.04
375.00	0.58	348.27	374.99	1.77 N	1.46 W	1.55	0.23
466.00	0.21	313.08	465.99	2.33 N	1.68 W	2.08	0.46
557.00	0.20	243.13	556.99	2.38 N	1.94 W	2.09	0.26
648.00	0.51	209.64	647.99	1.95 N	2.28 W	1.62	0.40
739.00	0.16	209.98	738.98	1.49 N	2.55 W	1.12	0.38
830.00	0.44	171.79	829.98	1.03 N	2.56 W	0.67	0.36
921.00	0.44	181.38	920.98	0.34 N	2.52 W	-0.01	0.08

1012.00	0.51	172.90	1011.98	0.41 S	2.48 W	-0.75	0.11
1103.00	0.53	184.59	1102.97	1.23 S	2.46 W	-1.55	0.12
1121.00	0.45	175.48	1120.97	1.38 S	2.47 W	-1.71	0.60
1223.00	0.14	185.86	1222.97	1.91 S	2.45 W	-2.22	0.31
1315.00	0.34	165.61	1314.97	2.28 S	2.39 W	-2.59	0.24
1407.00	2.09	170.57	1406.95	4.20 S	2.05 W	-4.45	1.90
1500.00	4.42	159.39	1499.79	9.24 S	0.50 W	-9.22	2.59
1592.00	6.19	151.06	1591.39	16.90 S	3.14 E	-16.31	2.08
1686.00	7.39	142.99	1684.73	26.16 S	9.23 E	-24.64	1.63
1778.00	9.55	144.99	1775.73	37.13 S	17.18 E	-34.43	2.36
1871.00	10.13	145.62	1867.36	50.20 S	26.22 E	-46.13	0.63
1964.00	9.86	144.95	1958.95	63.46 S	35.40 E	-58.01	0.32
2055.00	9.05	143.99	2048.71	75.63 S	44.09 E	-68.87	0.90
2147.00	9.62	150.85	2139.50	88.20 S	52.09 E	-80.22	1.36
2239.00	9.13	152.52	2230.27	101.39 S	59.20 E	-92.32	0.61
2331.00	10.26	151.21	2320.95	115.05 S	66.52 E	-104.84	1.25
2424.00	10.45	147.51	2412.44	129.42 S	75.03 E	-117.91	0.75
2517.00	10.74	146.54	2503.85	143.76 S	84.34 E	-130.84	0.37
2610.00	9.82	147.09	2595.36	157.65 S	93.43 E	-143.35	0.99
2703.00	9.68	148.60	2687.01	170.99 S	101.81 E	-155.41	0.31
2797.00	9.43	148.42	2779.71	184.29 S	109.97 E	-167.48	0.28
2889.00	9.20	146.54	2870.50	196.85 S	117.97 E	-178.81	0.42
2984.00	9.50	156.00	2964.24	210.34 S	125.34 E	-191.17	1.65
3079.00	8.03	153.68	3058.13	223.45 S	131.47 E	-203.32	1.58
3174.00	8.91	151.60	3152.09	235.87 S	137.91 E	-214.74	0.97
3268.00	11.01	151.73	3244.67	250.18 S	145.63 E	-227.85	2.23
3363.00	10.73	149.16	3337.97	265.75 S	154.45 E	-242.07	0.59
3457.00	11.29	150.10	3430.24	281.24 S	163.53 E	-256.17	0.63
3552.00	10.80	150.05	3523.48	297.01 S	172.61 E	-270.55	0.51
3647.00	11.02	148.66	3616.76	312.48 S	181.77 E	-284.61	0.36
3742.00	10.55	158.78	3710.09	328.34 S	189.64 E	-299.24	2.05
3836.00	10.44	158.08	3802.52	344.27 S	195.94 E	-314.15	0.18
3930.00	9.89	155.94	3895.04	359.54 S	202.41 E	-328.40	0.71
4025.00	9.43	154.47	3988.69	374.02 S	209.09 E	-341.82	0.55
4119.00	8.91	153.69	4081.49	387.50 S	215.64 E	-354.28	0.57
4214.00	8.40	155.97	4175.41	400.44 S	221.73 E	-366.26	0.64
4309.00	9.76	153.85	4269.22	414.01 S	228.10 E	-378.83	1.47
4403.00	9.37	154.07	4361.91	428.04 S	234.96 E	-391.79	0.42
4498.00	8.15	158.03	4455.80	441.24 S	240.86 E	-404.05	1.43
4592.00	7.30	166.03	4548.95	453.22 S	244.80 E	-415.38	1.45
4687.00	9.08	153.80	4642.98	465.81 S	249.56 E	-427.19	2.61
4782.00	9.13	150.07	4736.79	479.06 S	256.63 E	-439.35	0.62
4876.00	8.14	152.20	4829.72	491.41 S	263.46 E	-450.65	1.10
4971.00	17.94	125.18	4922.23	505.84 S	278.61 E	-462.87	11.89
5066.00	19.85	113.26	5012.14	520.64 S	305.39 E	-473.86	4.52
5160.00	21.81	108.46	5100.00	532.48 S	336.62 E	-481.30	2.77
5255.00	24.07	95.06	5187.54	539.78 S	372.69 E	-483.59	5.98
5349.00	25.64	83.77	5272.88	539.26 S	412.03 E	-477.68	5.31
5444.00	27.93	73.20	5357.73	530.59 S	453.79 E	-463.37	5.55
5539.00	31.74	62.16	5440.19	512.47 S	497.23 E	-439.46	7.03
5633.00	39.51	51.04	5516.62	482.04 S	542.46 E	-403.11	10.73
5728.00	43.77	32.78	5587.86	435.21 S	583.92 E	-351.05	13.49
5823.00	46.14	22.27	5655.18	375.80 S	614.74 E	-287.97	8.19
5917.00	55.03	17.57	5714.83	307.57 S	639.27 E	-217.02	10.21
6012.00	61.84	11.04	5764.57	229.21 S	659.07 E	-136.68	9.25
6106.00	74.56	3.68	5799.45	142.87 S	669.98 E	-49.67	15.35
6201.00	82.49	0.05	5818.33	49.90 S	672.96 E	42.83	9.15
6226.00	84.60	359.62	5821.14	25.06 S	672.89 E	67.42	8.61

# 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 7.88 DEGREES (GRID)  
A TOTAL CORRECTION OF 6.97 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6226.00 FEET  
IS 673.36 FEET ALONG 92.13 DEGREES (GRID)

Surveys from surface to 1121' MD are flexi-shot surveys.  
Final survey is a straight line projection to TD