



1 : 600 / 1 : 240

Country : USA		
Field : Wattenberg		
Location : Lat: 40° 28' 17.15" North Long: 104° 25' 54.84" West		
Well : Wells Ranch AA22-650		
Company : Noble Energy		
Rig : H&P 343		
LOCATION		
Company : Noble Energy	Latitude : 40° 28' 17.15" North	Other Services Directional Drilling
Rig : H&P 343	Longitude : 104° 25' 54.84" West	
Well : Wells Ranch AA22-650	UTM Easting = 3,297,156,290 usft UTM Northing = 1,416,371,990 usft	
Field : Wattenberg		
Country : USA		
API Number : 05-123-42422		
Permanent Datum : Ground Level	Elevation : 4755.00 ft	Elev. KB N/A
Log Measured From : Drill Floor	24.00 ft Above Permanent Datum	DF 4779.00 ft
Drilling Measured From : Drill Floor		GL 4755.00 ft
TVD LOG		WD N/A
Depth Logged : 1,932.95 ft To 6,626.36 ft	Unit No. : 11610115	Job No. : CA-XX-0903206504
Date Logged : 31-Mar-16 To 04-Apr-16	Plot Type : Final	
Total Depth MD : 11,825.00 ft TVD : 6,626.36 ft	Plot Date : 05-Apr-16	
Spud Date : 31-Mar-16		
Run No.	Borehole Record (TVD)	
	Size	To
100	8.500 in	1,932.95 ft
	Size	To
	9.625 in	6,626.36 ft
	Weight	To
	36.60 lppf	1,922.95 ft
	Casing Record (TVD)	
	From	To
	SURFACE	1,922.95 ft

WELL INFORMATION

MWD Run Number	100		
Date run completed	04-Apr-16		
Rig Bit Number	100		
Bit Size (in)	8.500		
Tool Nominal OD (in)	6.750		
Log Start Depth (TVD, ft)	1,932.95		
Log End Depth (TVD, ft)	6,626.36		
Drill or Wipe	Drill		
Drill/Wipe Start Date and Time	02-Apr-16 12:09		
Drill/Wipe End Date and Time	04-Apr-16 14:20		
Min Inc (deg) @ Depth (TVD, ft)	0.47 @ 1,965.95		
Max Inc (deg) @ Depth (TVD, ft)	91.32 @ 6,624.89		
Bit TFA(in2) / Bit Type	1.53 / PDC		
Flow Rate (gpm)	591.14		
Max AV (fpm) / CV (fpm) @ MWD	507.0 / N/A		
Fluid Type	Diesel Mud Base		
Density (ppg) / Viscosity (spqt)	9.50 / 44.00		
Filtrate CL (ppm)	35,000.00		
pH / Fluid Loss (mptm)	N/A / N/A		
PV (cP) / YP (lhf2)	13 / 10.00		
% Solids / % Sand	10.70 / 0		
% Oil / Oil:Water Ratio	66.00 / 66:24		
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) / Source	226.08 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 226.08				
Lead MWD Engineer	Mason Smith				
Customer Representative	Drew Geerdes				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11382329				
Insert Serial Number	12230081				
Date and Time Initialized	02-Apr-16 06:05				
Date and Time Read	04-Apr-16 22:43				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	63.00				
Software Version	6.33				
Sub Serial Number	11382329				
Sonde Serial Number	10859920				
Sensor ID Number	N/A				
Toolface Offset (deg)	16.40				

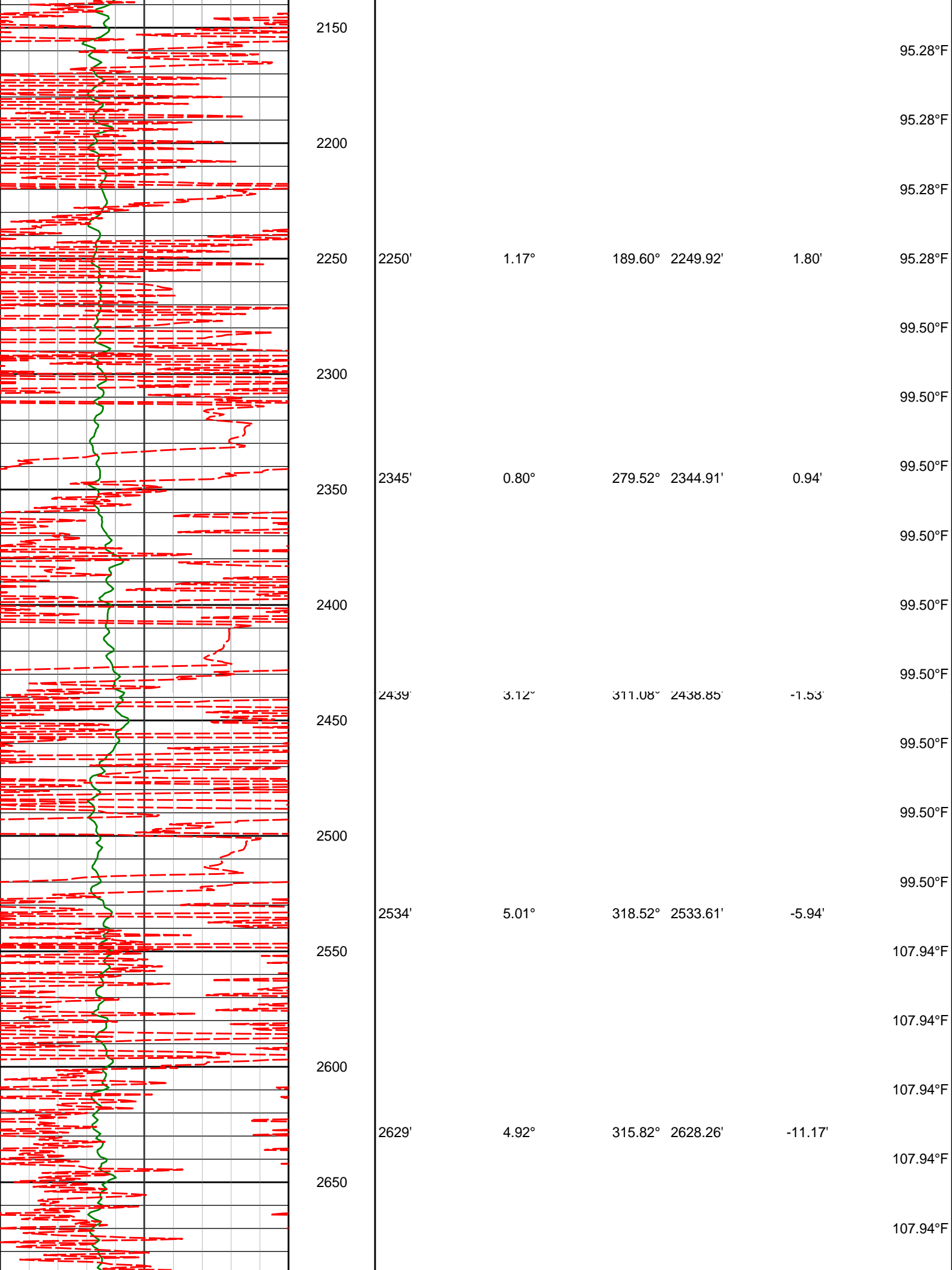
Gamma Ray Sensor Information

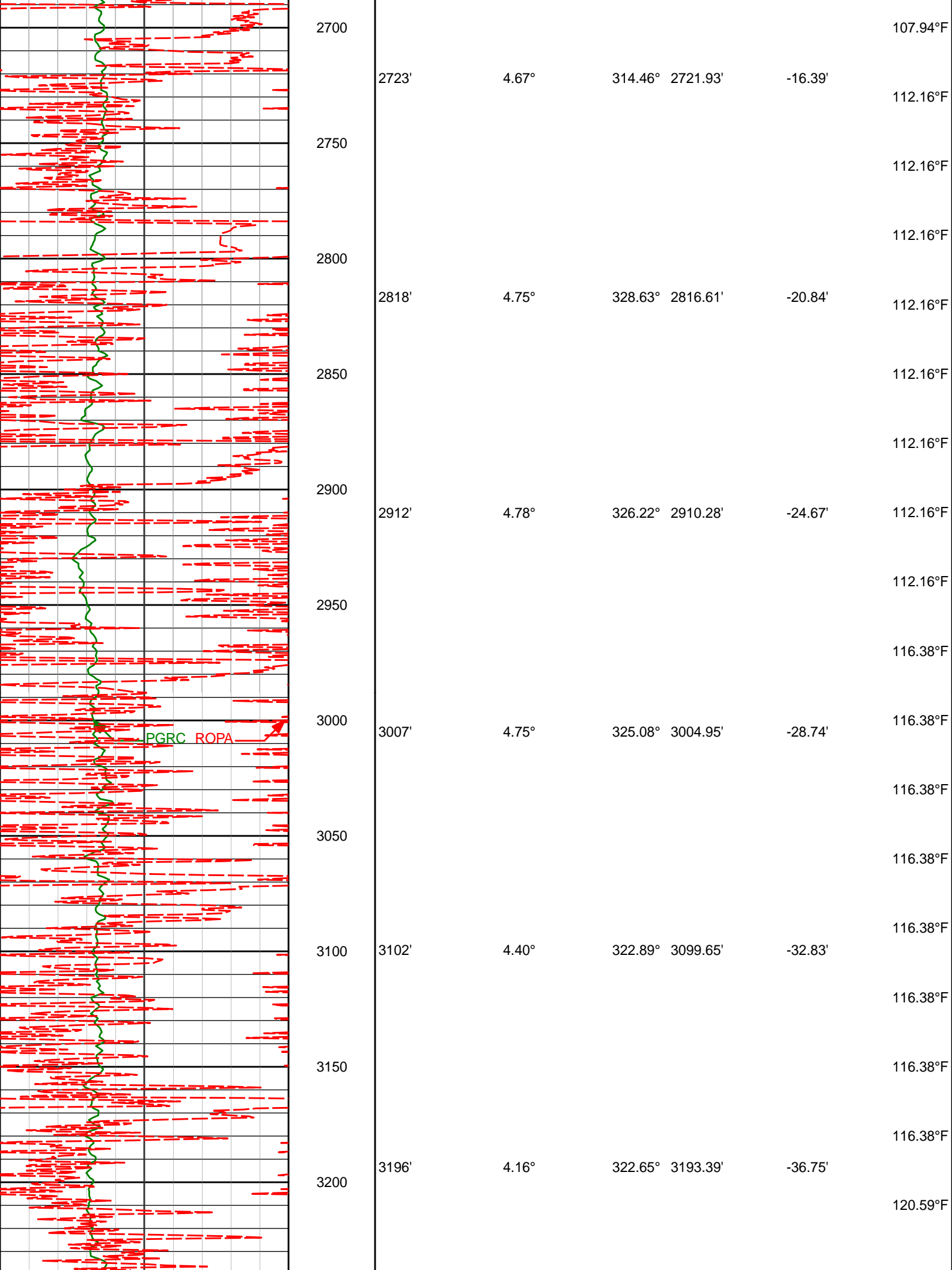
Tool Type	PCG				
Distance From Bit (ft)	56.53				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11382329				
Insert/Sonde Serial Number	11681051				

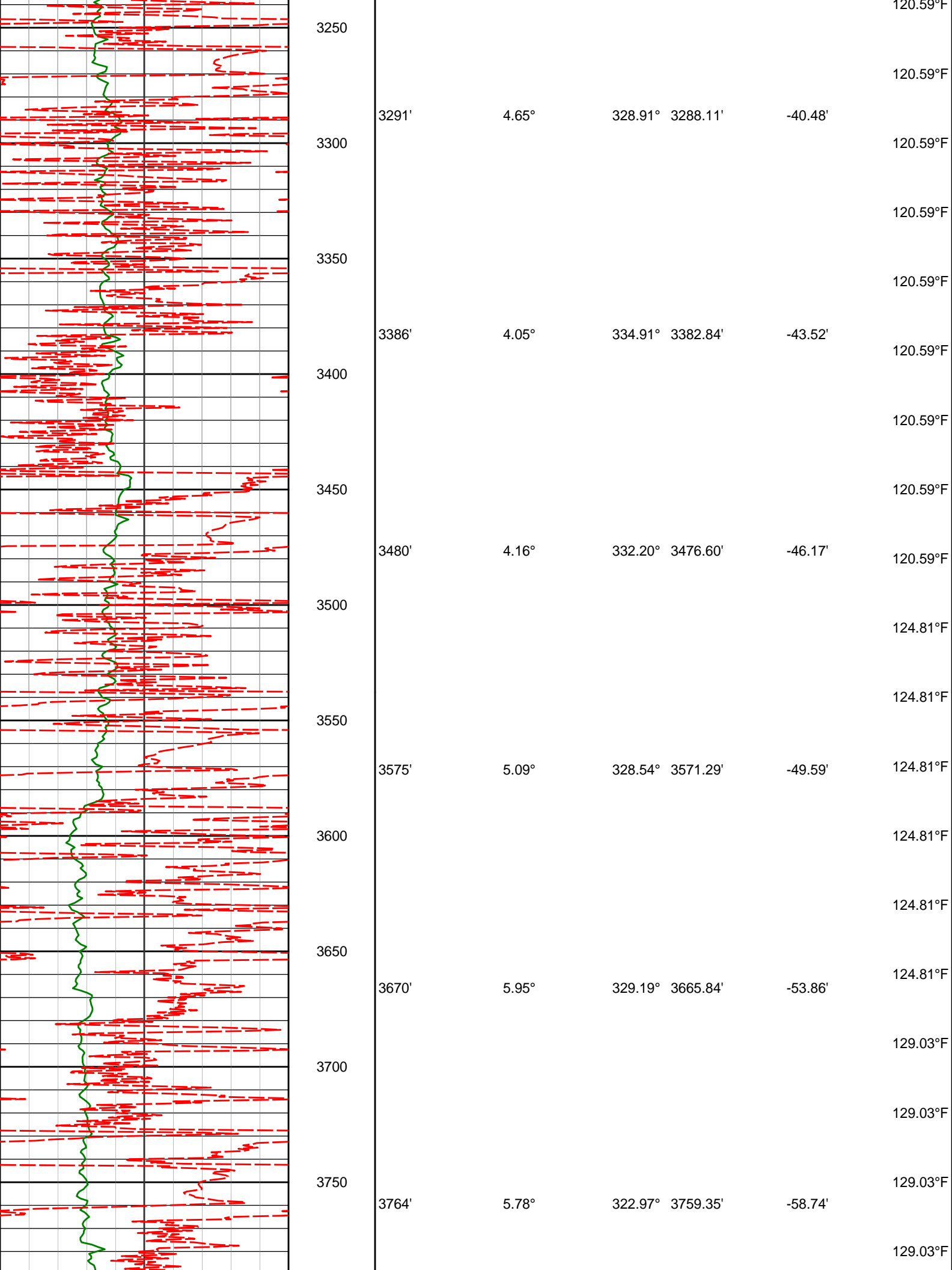
REMARKS

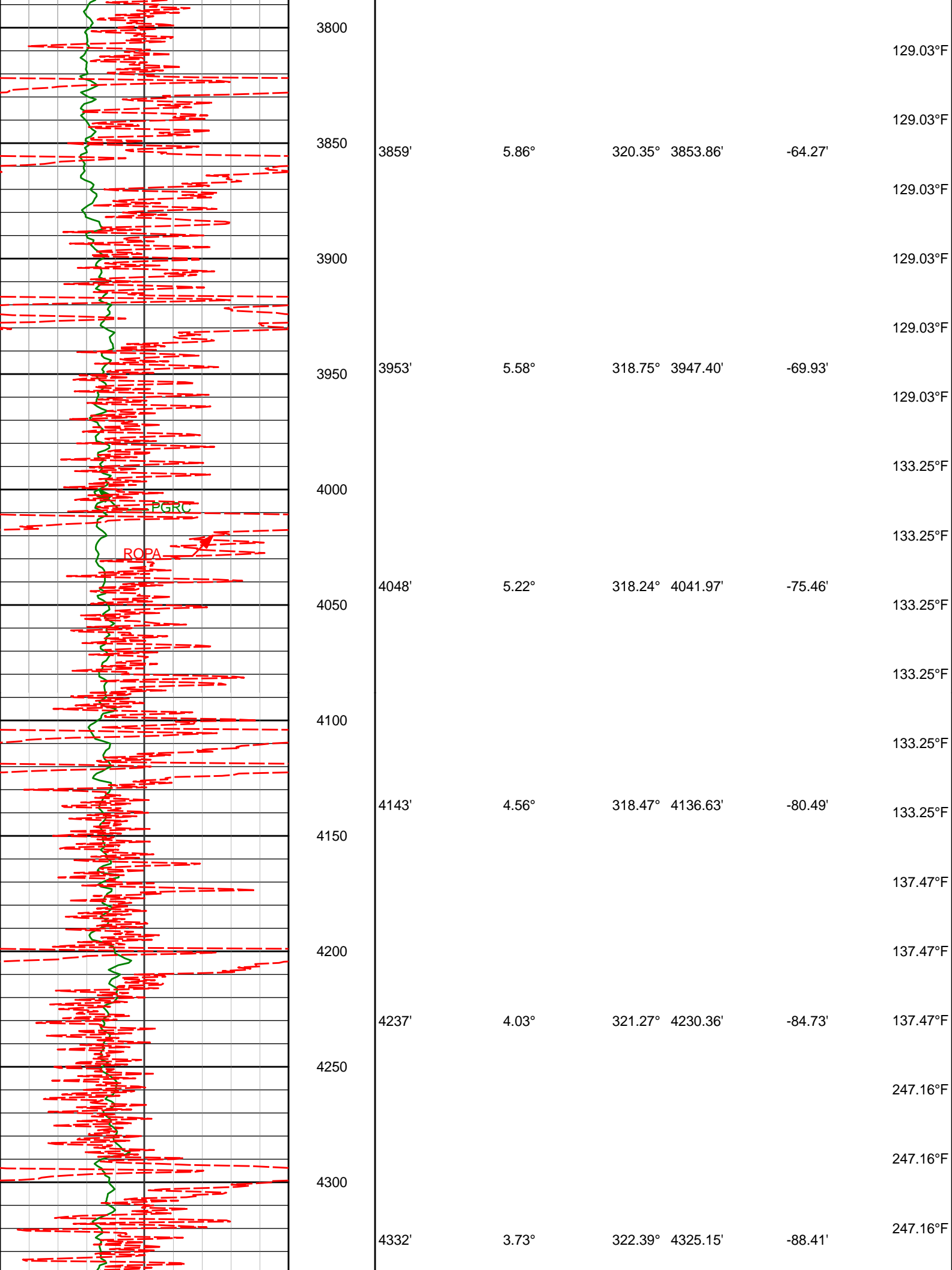
1. All depths are calibrated to driller's pipe tally and are true vertical depths from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The following smoothing parameters have been applied 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)

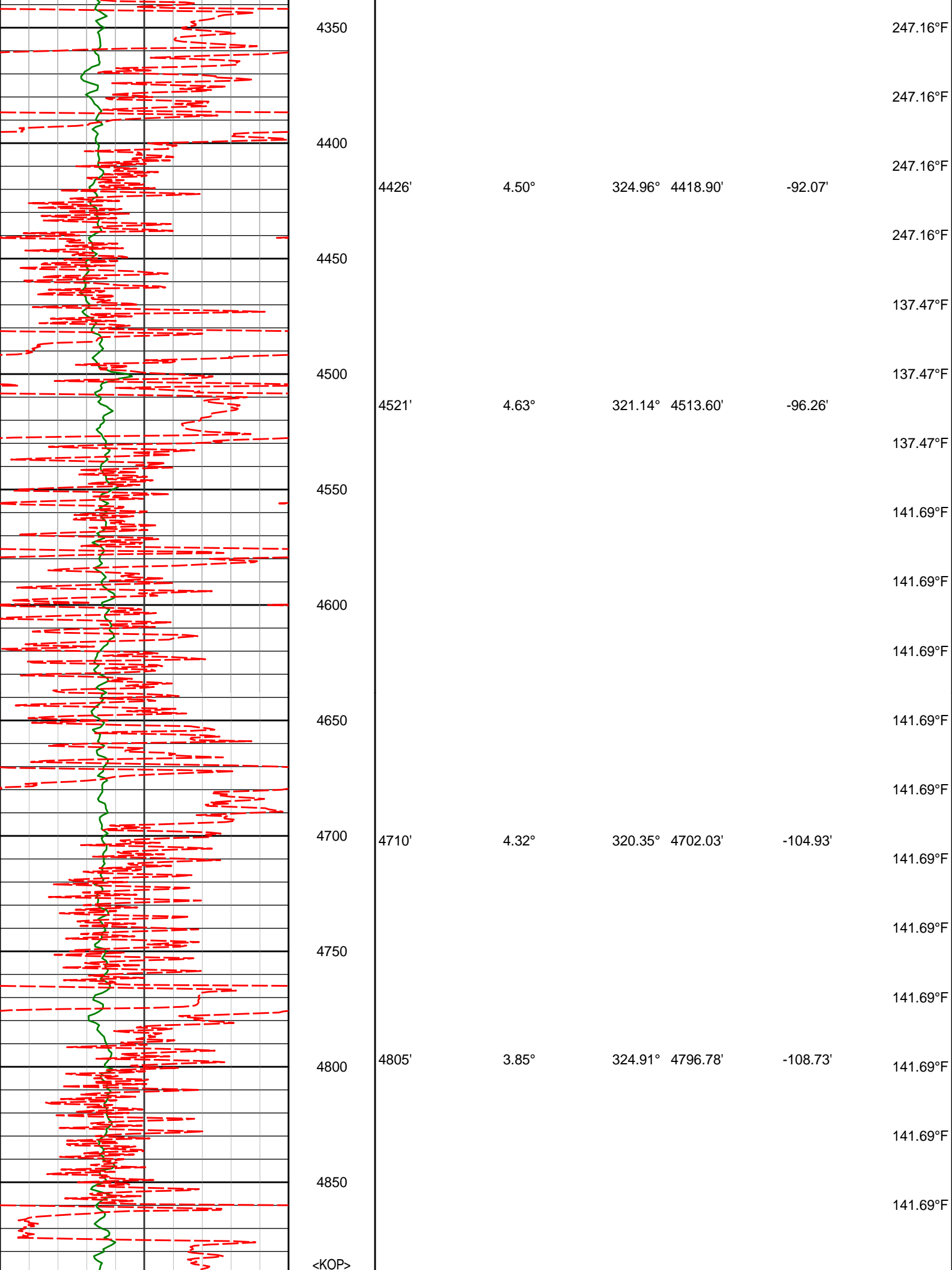
5. Final survey is a projection to the bit

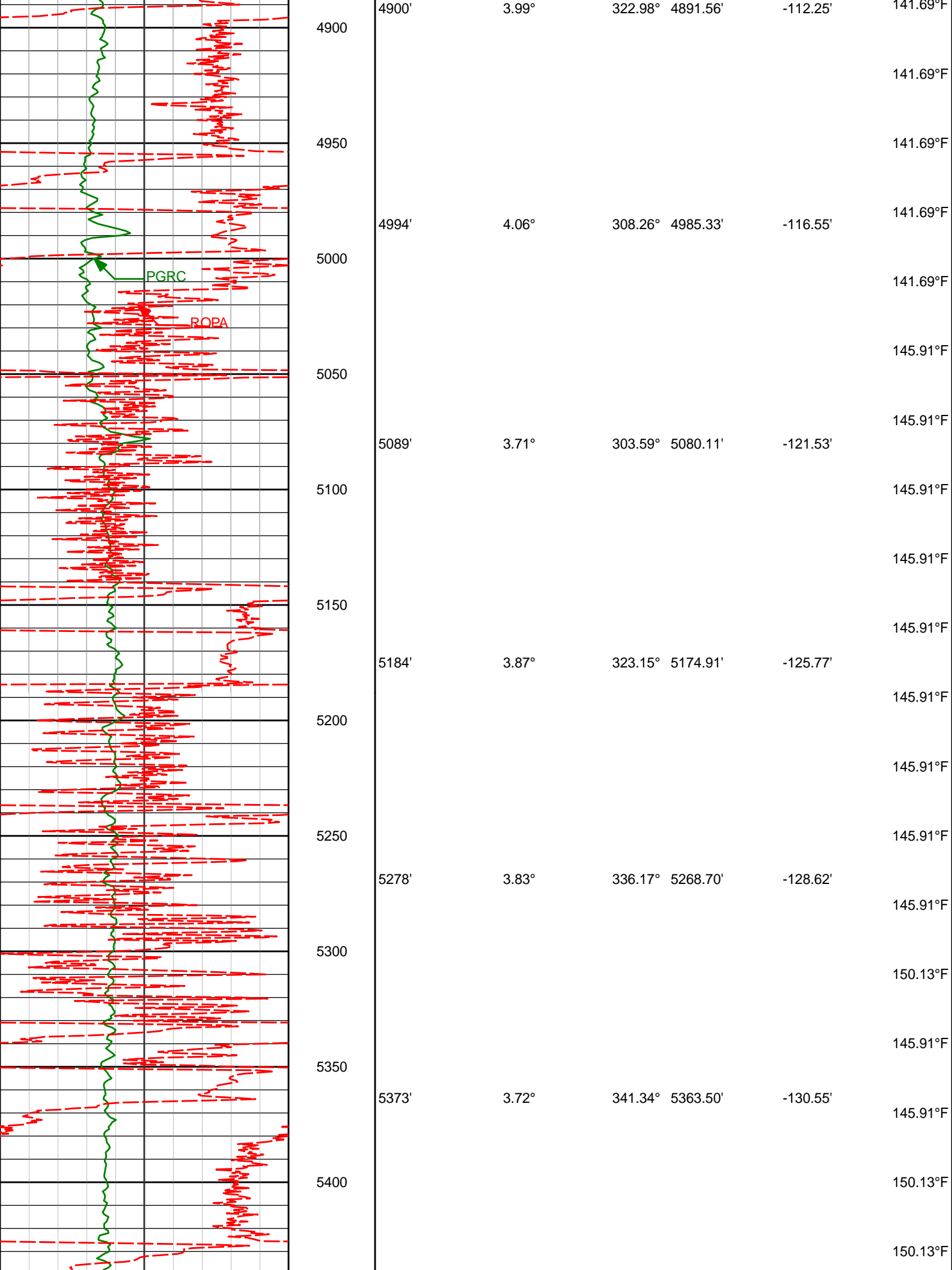


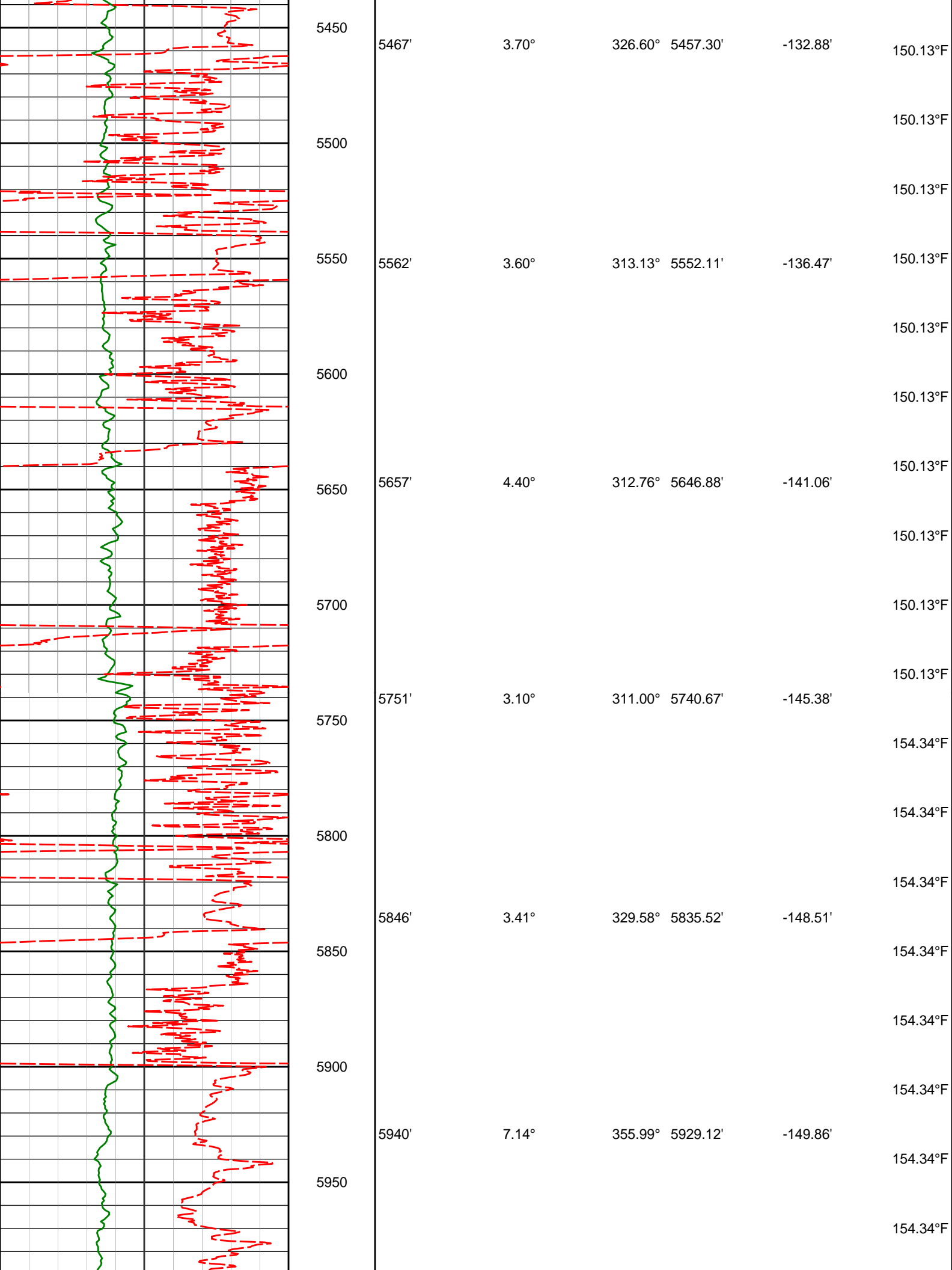


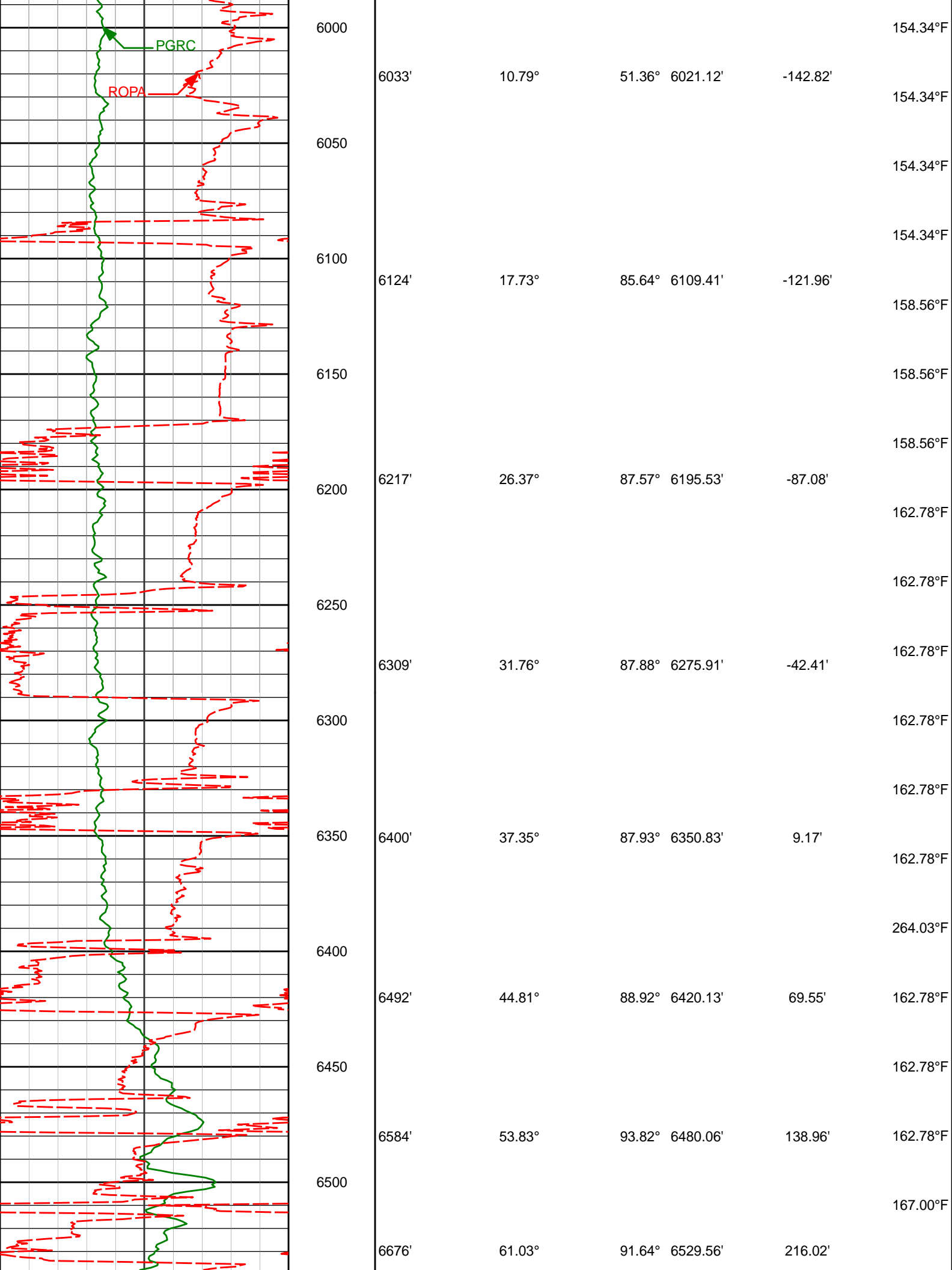


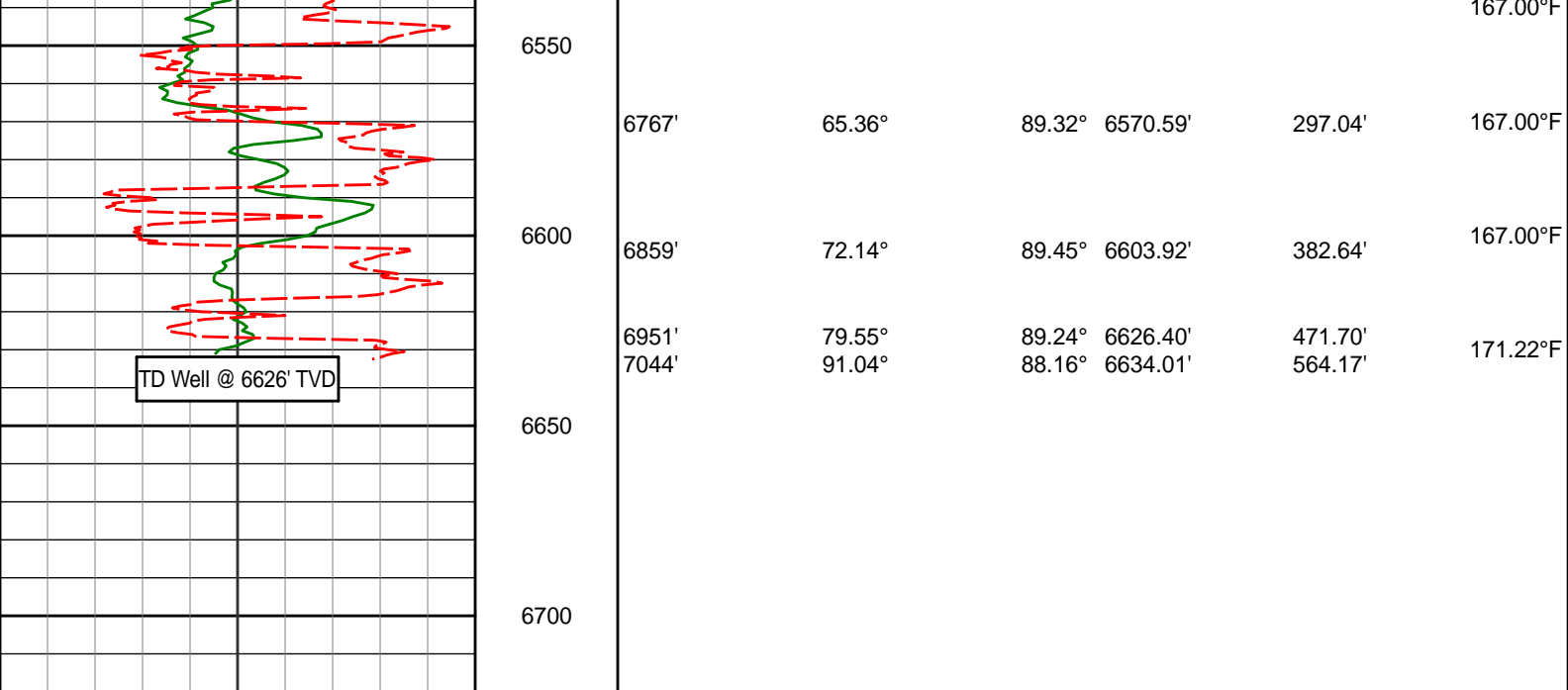








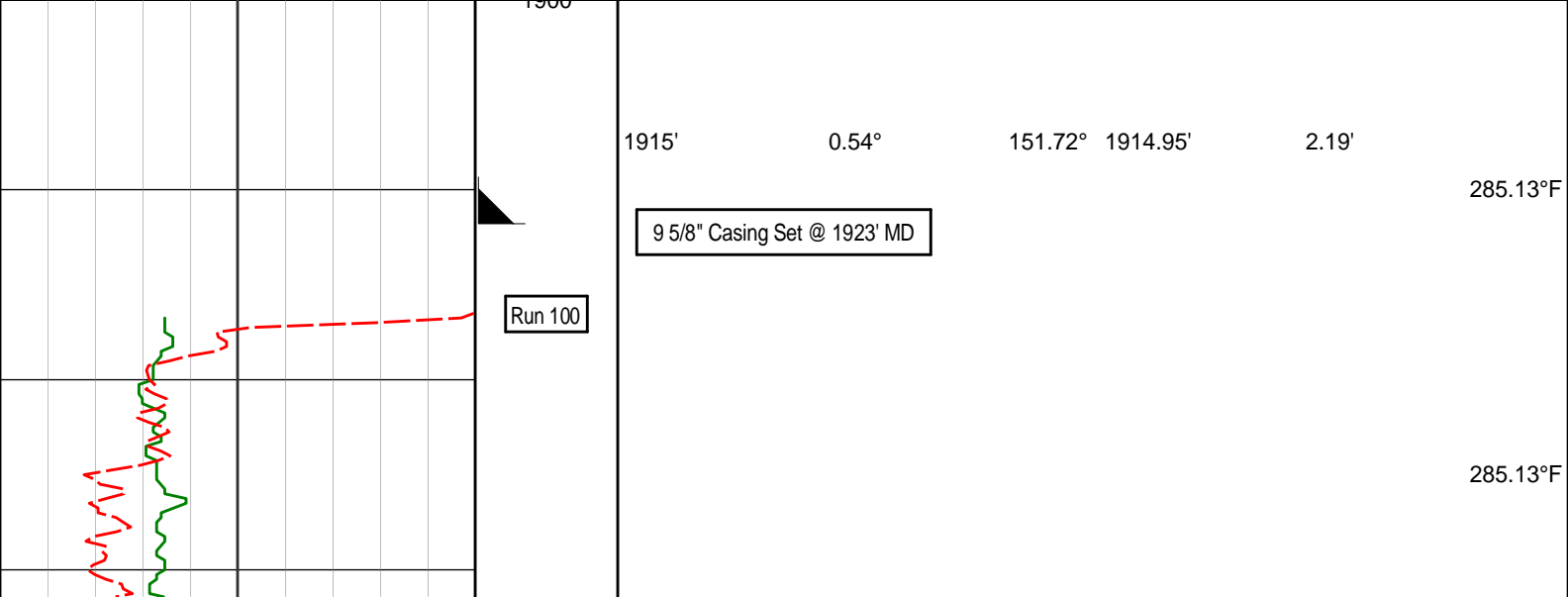


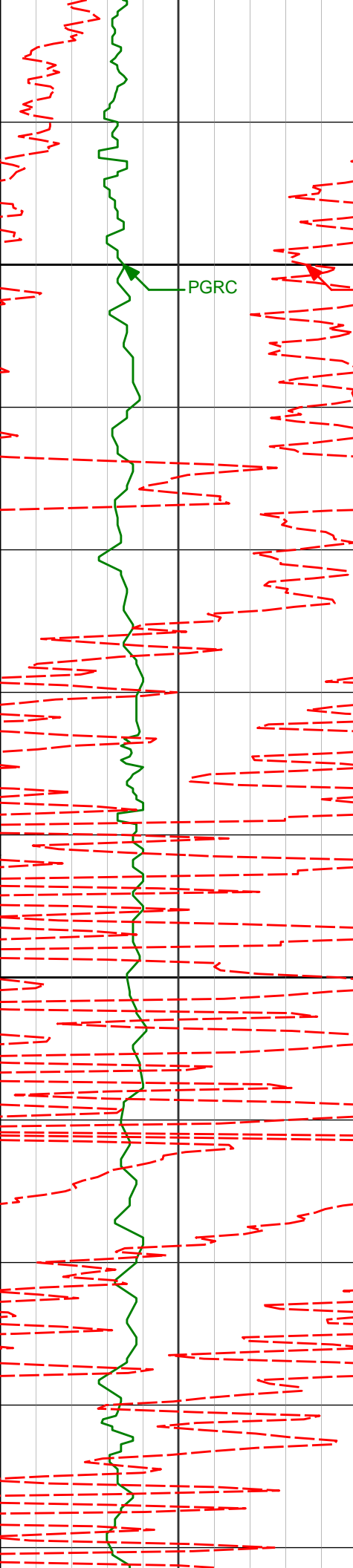


Avg Rate of Penetration ROP Avg feet per hr 500 0	Depth TVD ft	Depth Inc Azi TVD V.S. Temp
Gamma CG Cor PGRC api 0 300		

TVD Detail 1:240 Scale

Gamma Ray Cor PGRC api 0 300	Avg Rate of Penetration ROP Avg feet per hr 500 0	Depth TVD ft	Depth Inc Azi TVD V.S. Temp
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1966'

0.47°

166.79° 1965.95'

2.33'

285.13°F

2000

PGRC

ROPA

91.06°F

91.06°F

2061'

0.65°

182.60° 2060.95'

2.34'

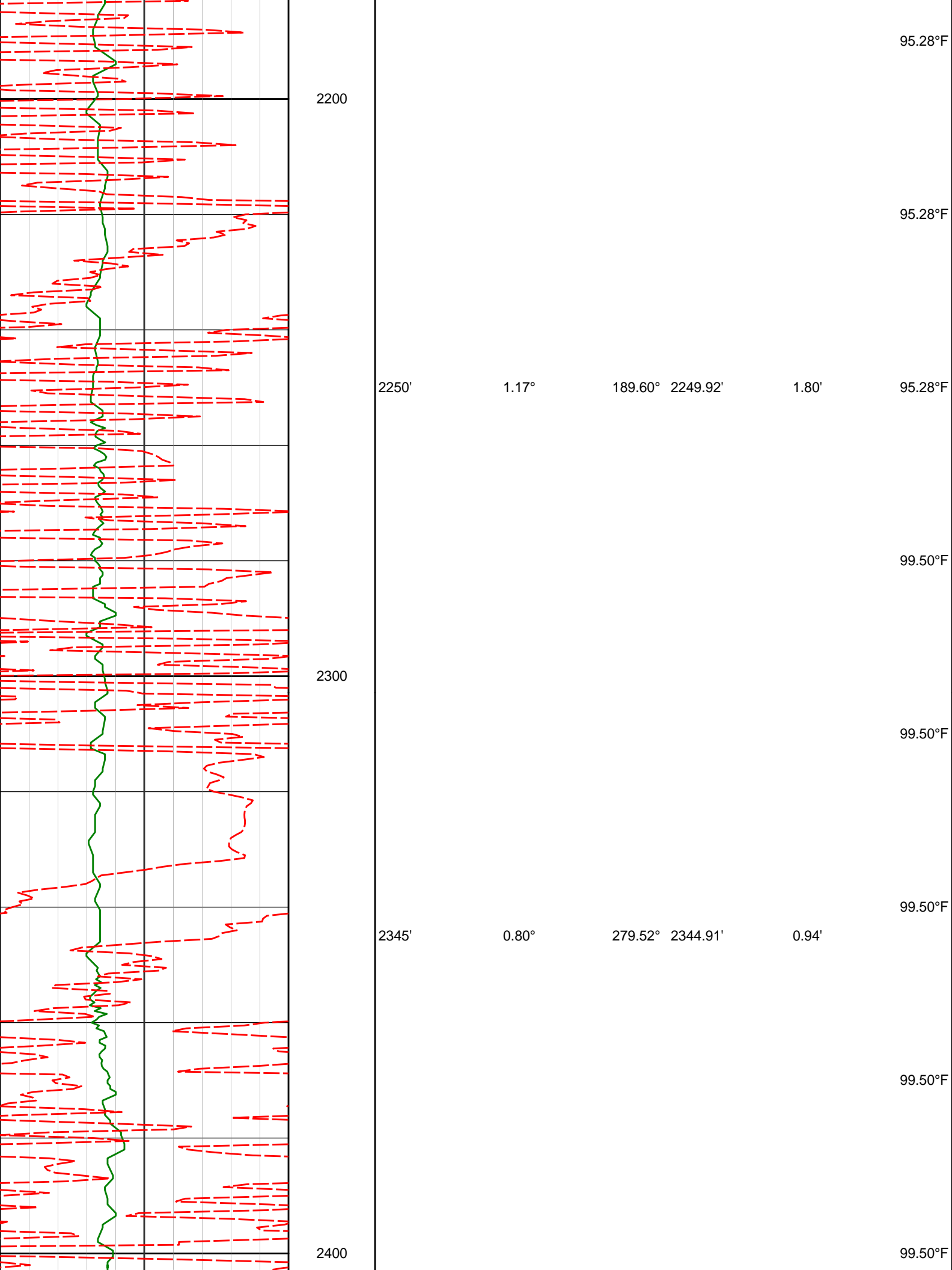
91.06°F

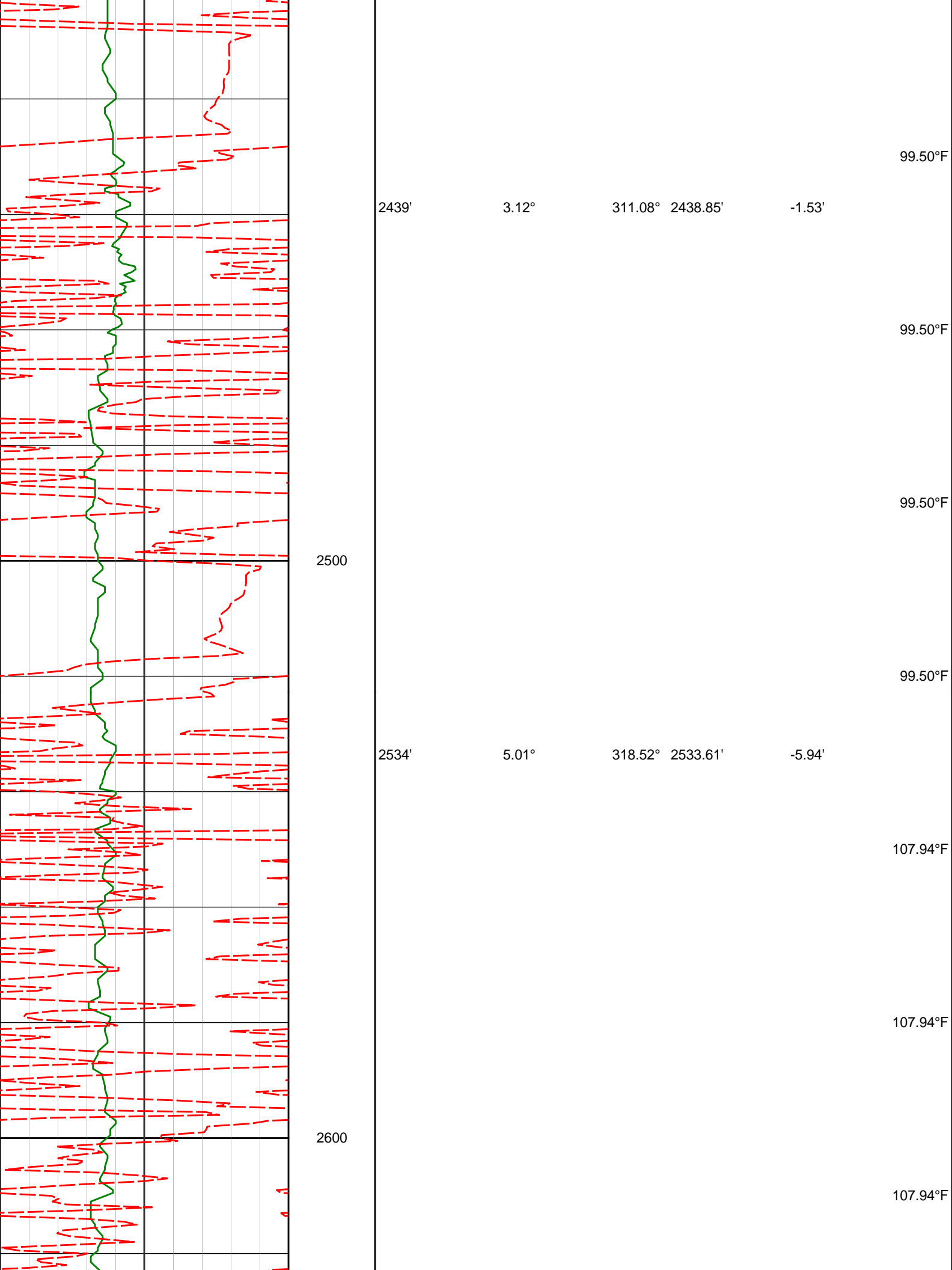
2100

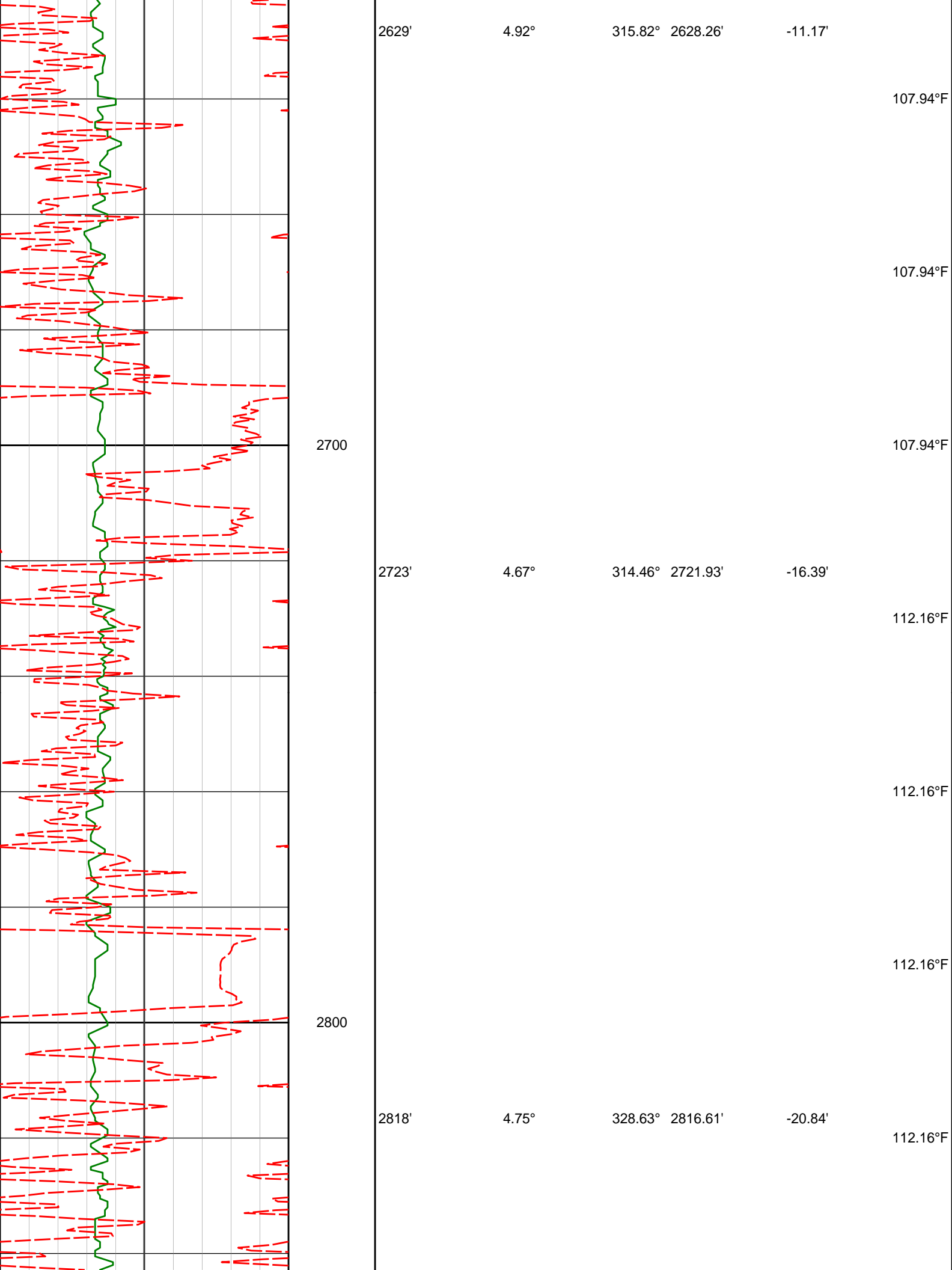
95.28°F

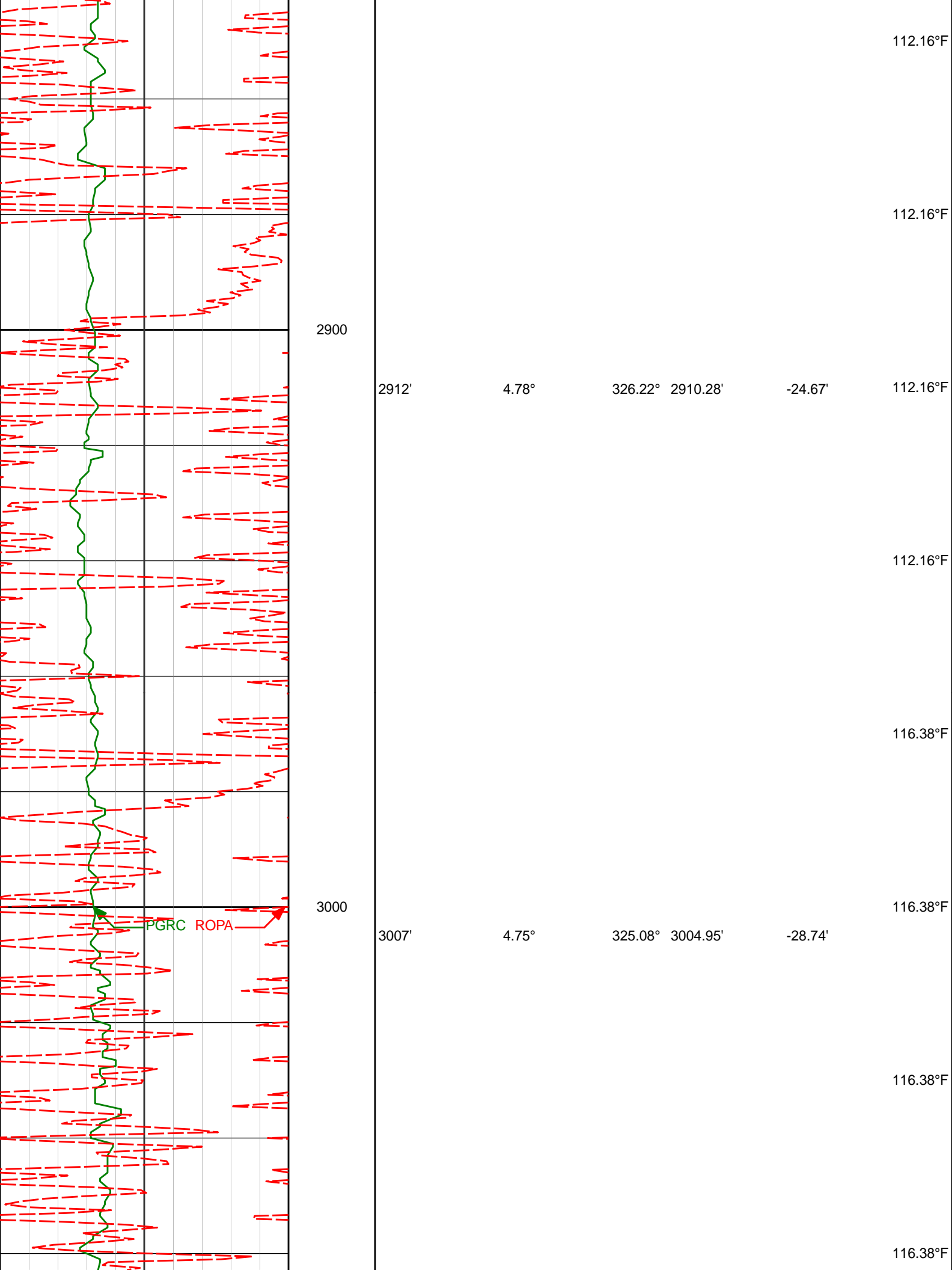
95.28°F

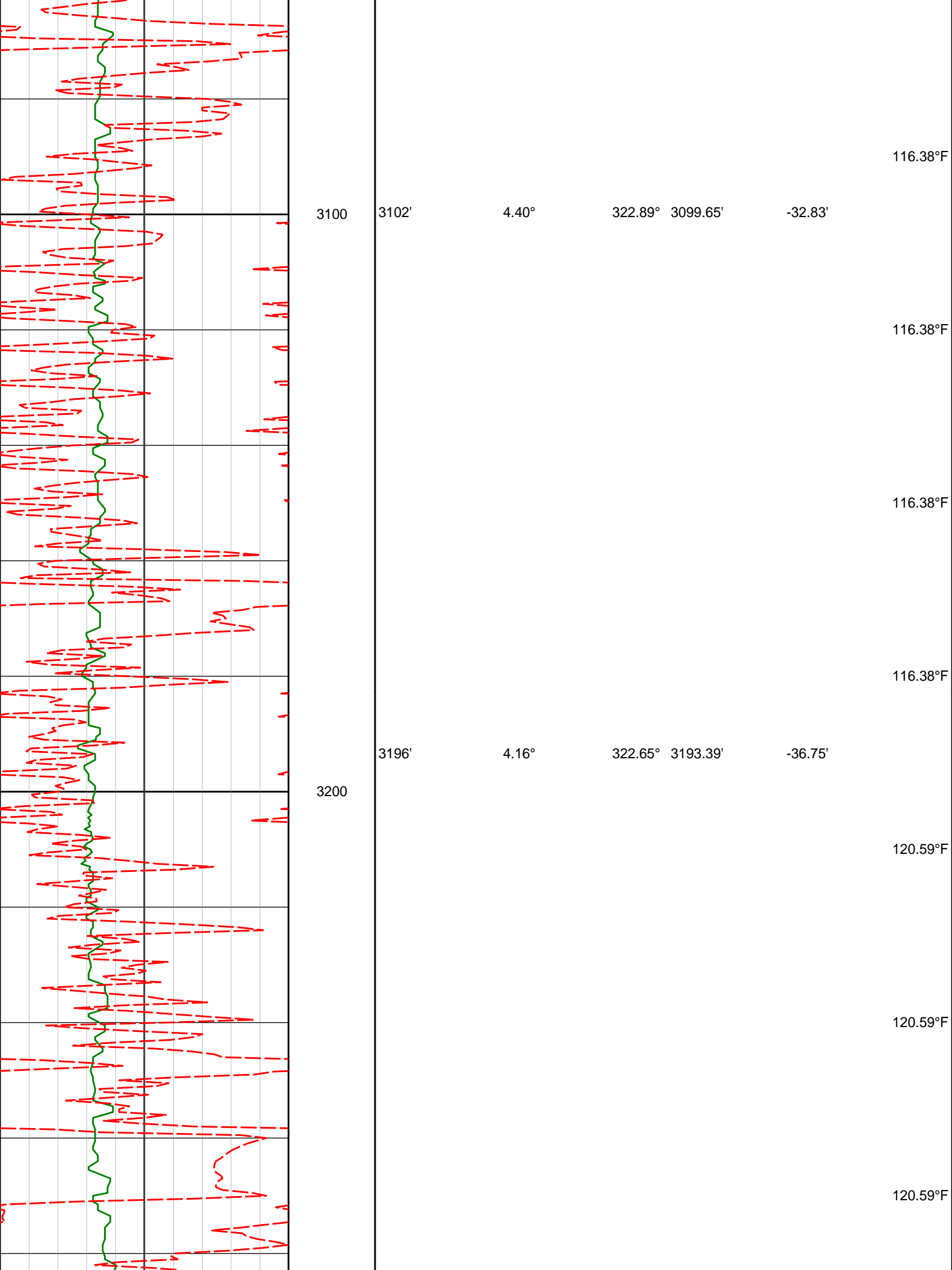
95.28°F

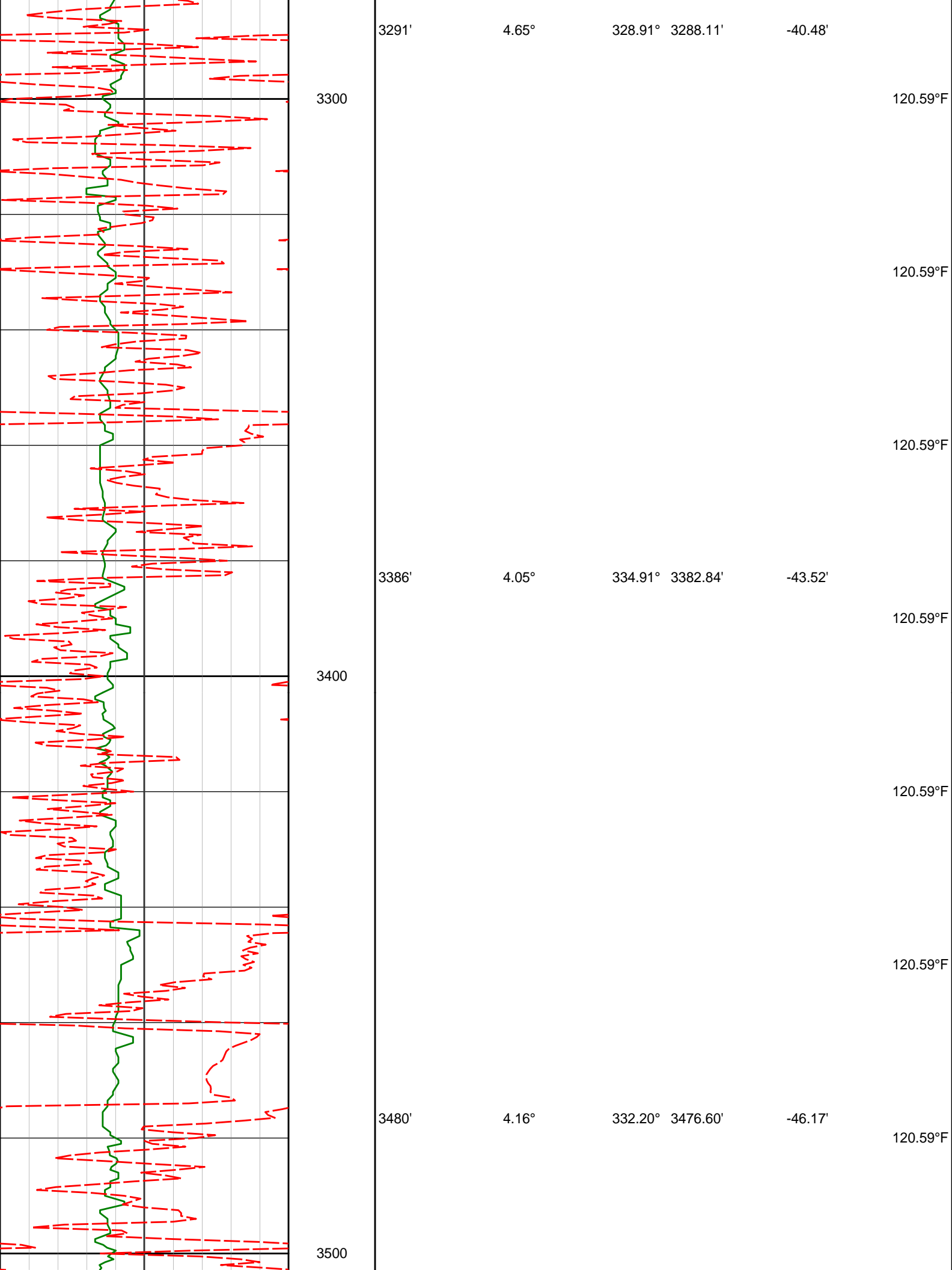


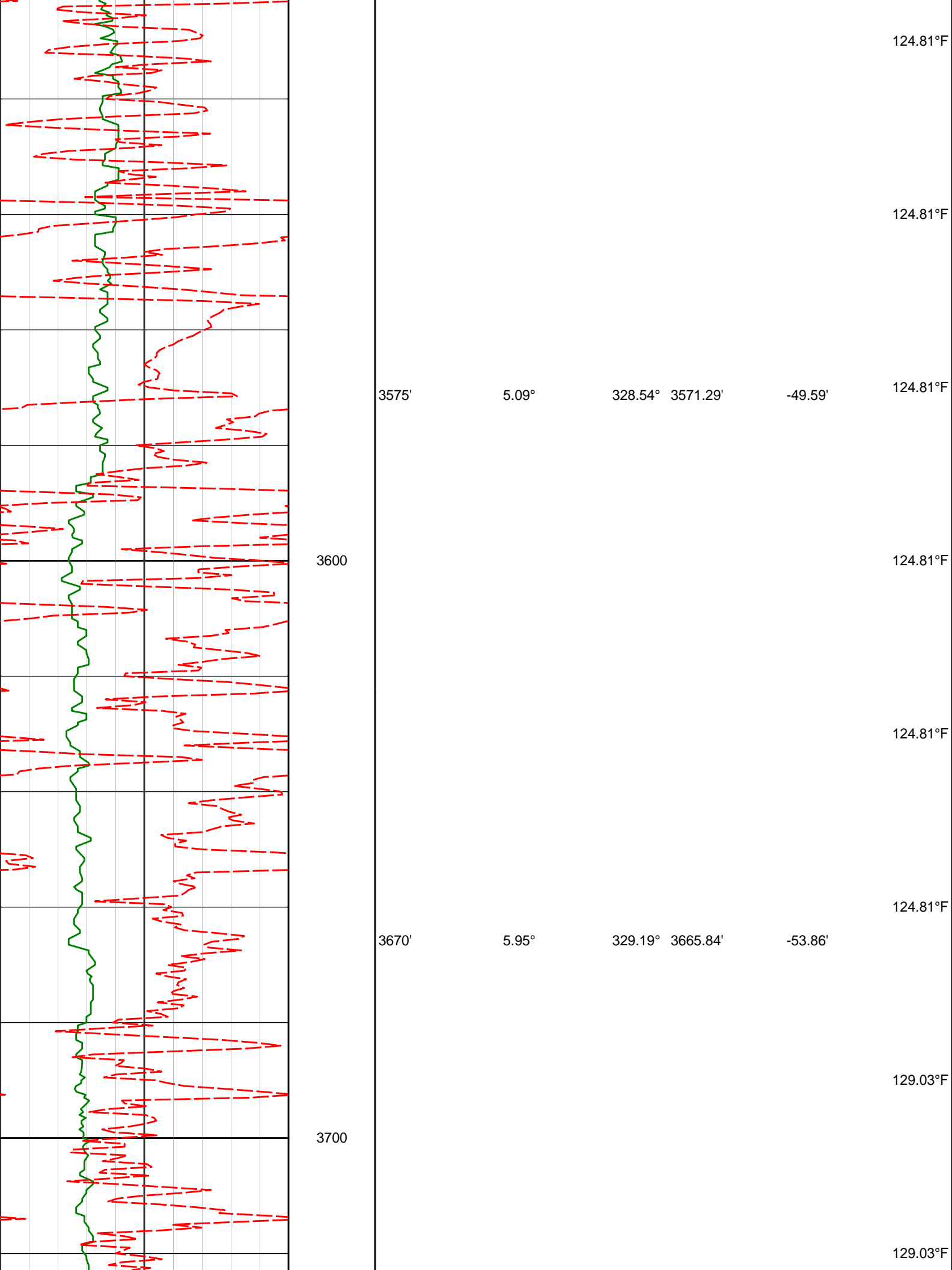


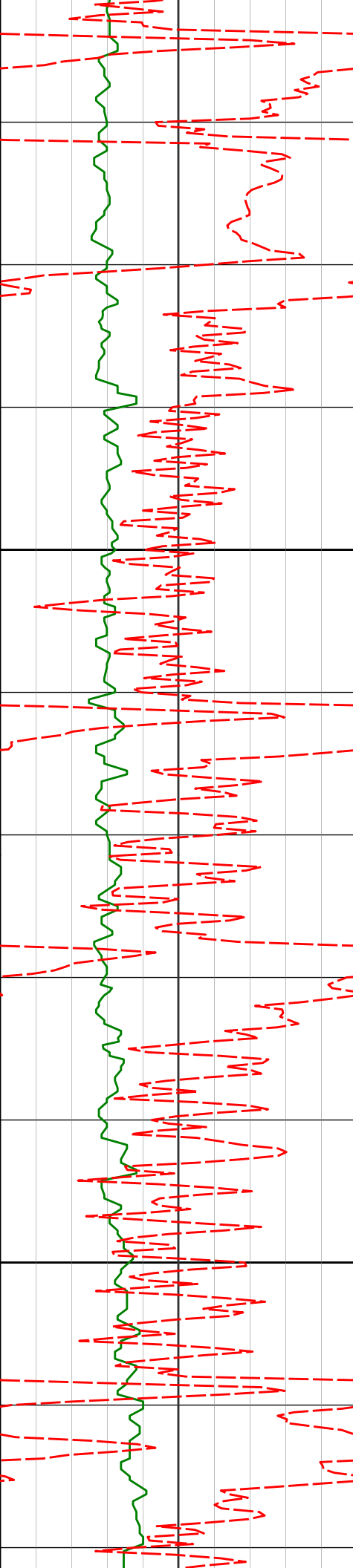












3764'

5.78°

322.97° 3759.35'

-58.74'

3800

3859'

5.86°

320.35° 3853.86'

-64.27'

3900

129.03°F

129.03°F

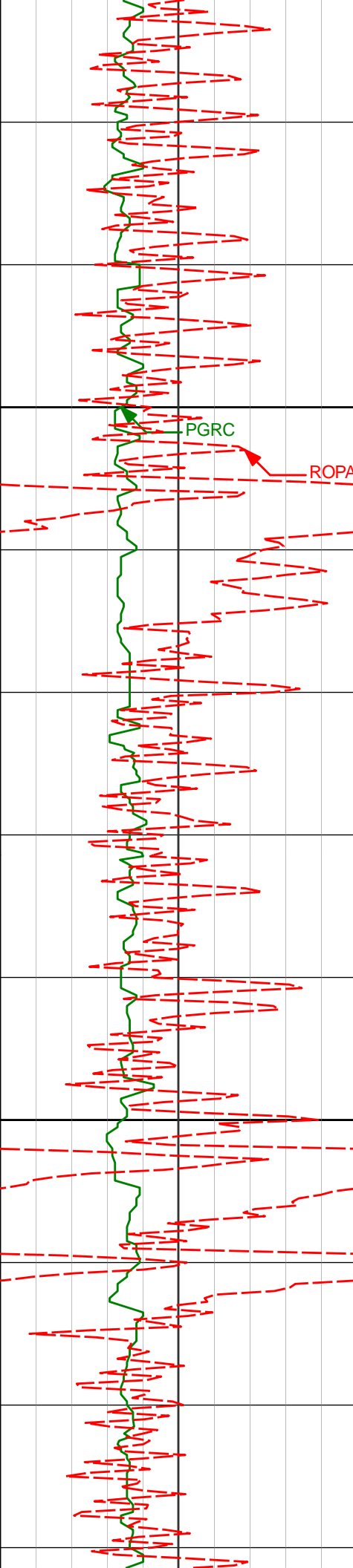
129.03°F

129.03°F

129.03°F

129.03°F

129.03°F



3953'

5.58°

318.75° 3947.40'

-69.93'

129.03°F

133.25°F

4000

PGRC

ROPA

133.25°F

4048'

5.22°

318.24° 4041.97'

-75.46'

133.25°F

133.25°F

4100

133.25°F

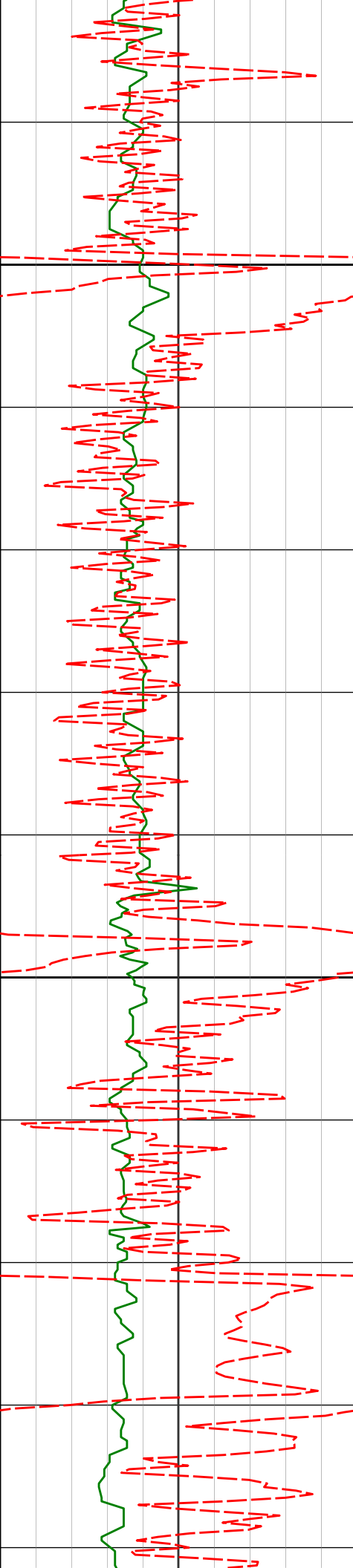
4143'

4.56°

318.47° 4136.63'

-80.49'

133.25°F



4200

4237'

4.03°

321.27° 4230.36'

-84.73'

4300

4332'

3.73°

322.39° 4325.15'

-88.41'

137.47°F

137.47°F

137.47°F

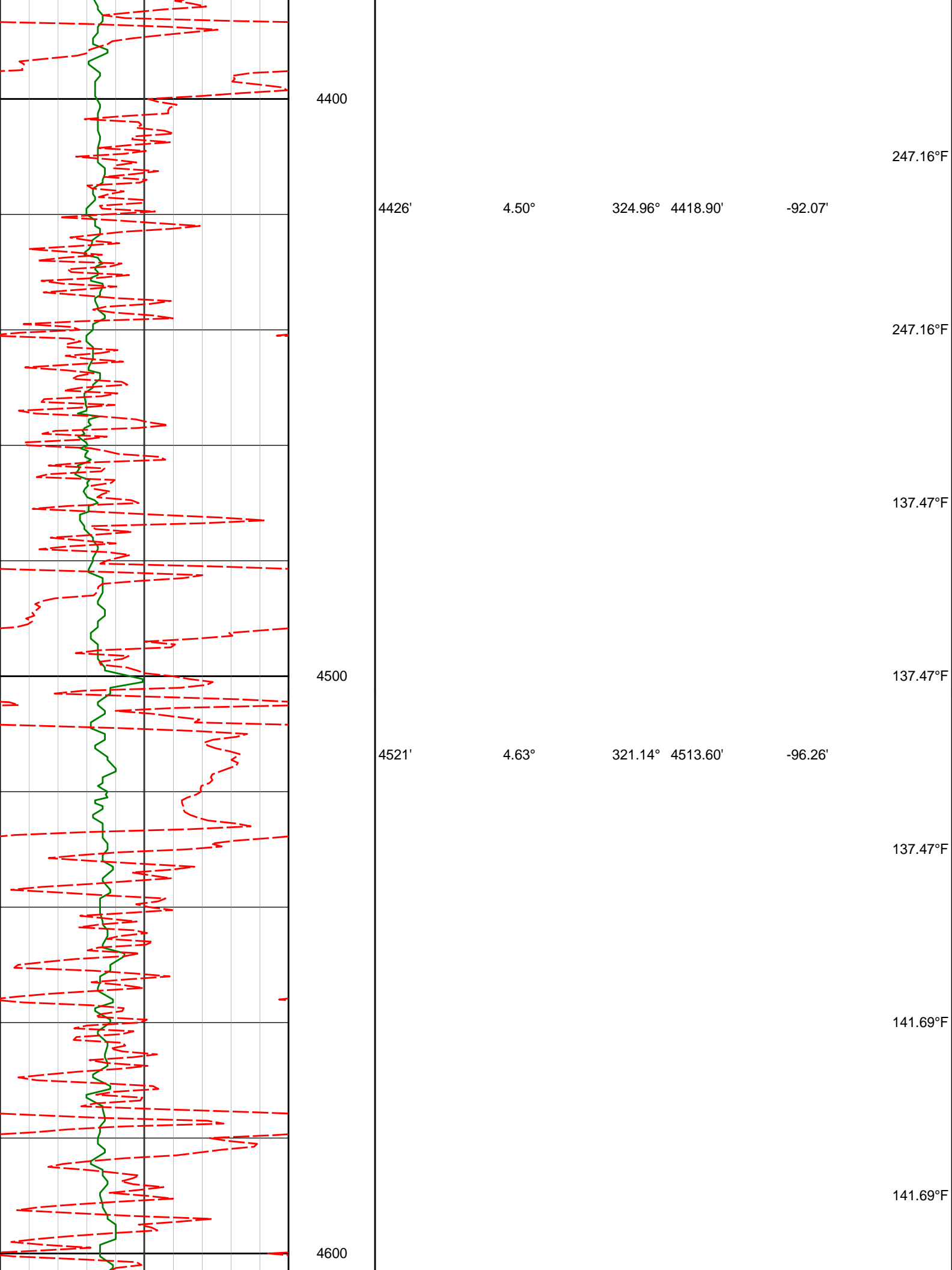
247.16°F

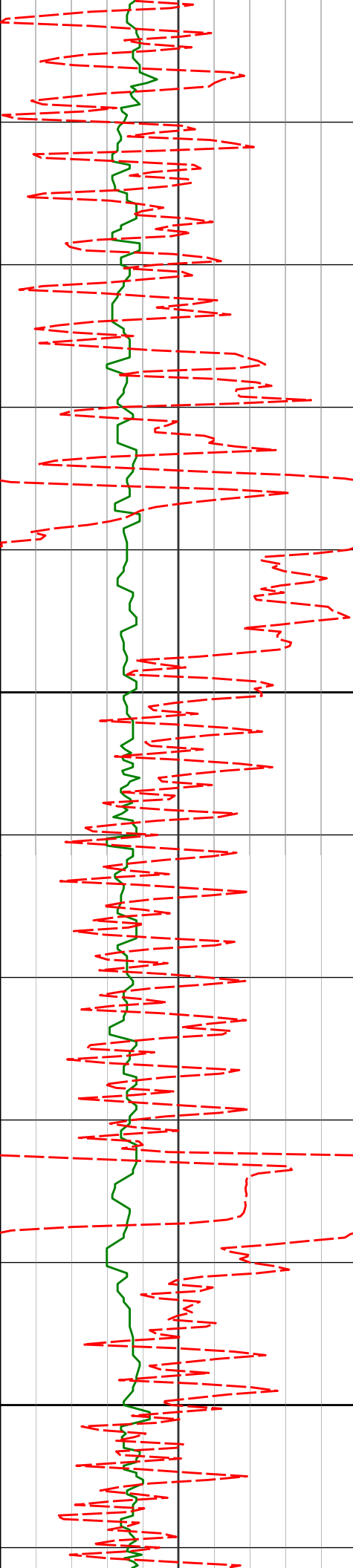
247.16°F

247.16°F

247.16°F

247.16°F





4700

4710'

4.32°

320.35° 4702.03'

-104.93'

141.69°F

141.69°F

141.69°F

141.69°F

141.69°F

141.69°F

4800

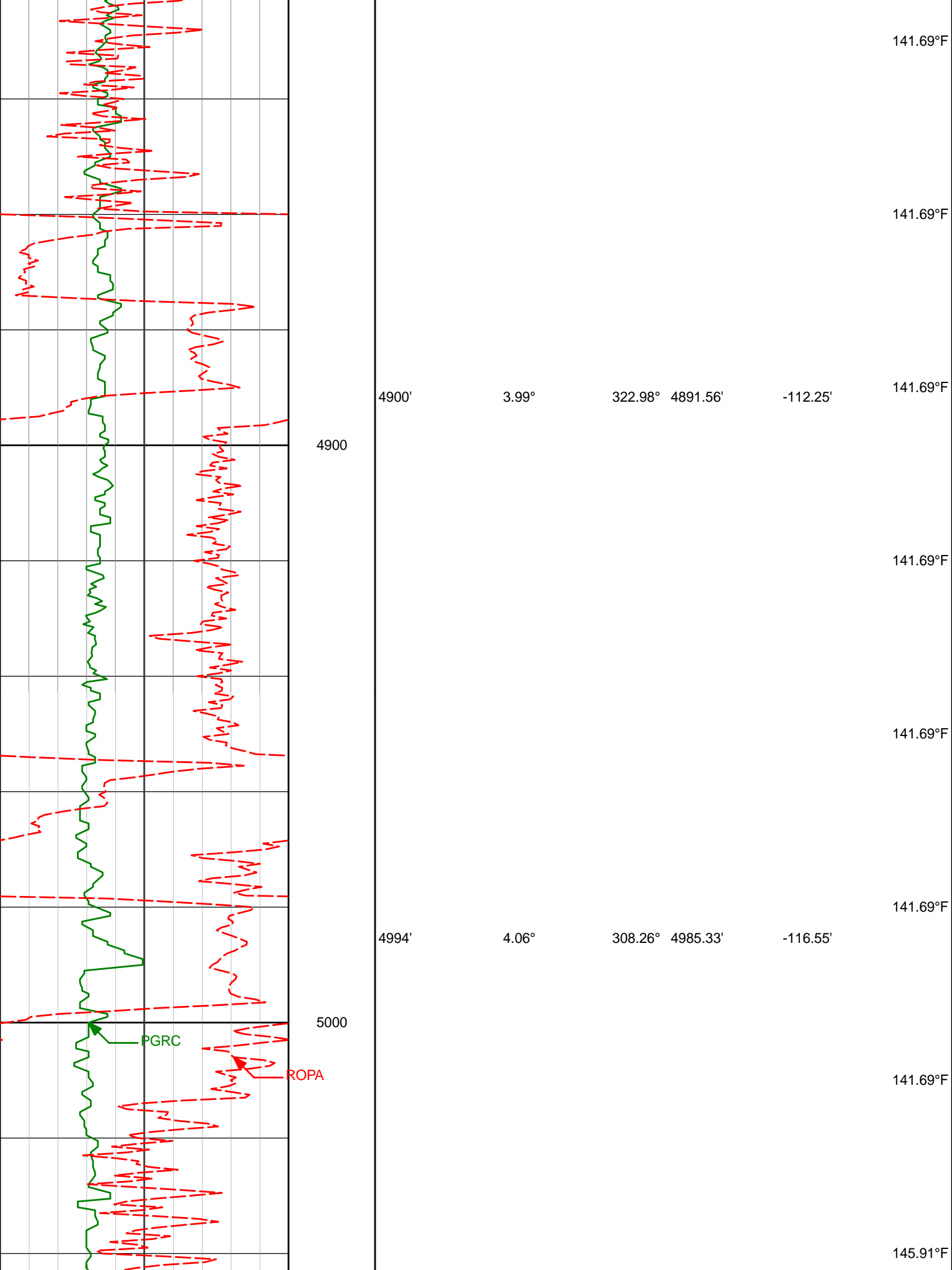
4805'

3.85°

324.91° 4796.78'

-108.73'

141.69°F



141.69°F

141.69°F

141.69°F

141.69°F

141.69°F

141.69°F

141.69°F

145.91°F

4900'

3.99°

322.98° 4891.56'

-112.25'

4900

4994'

4.06°

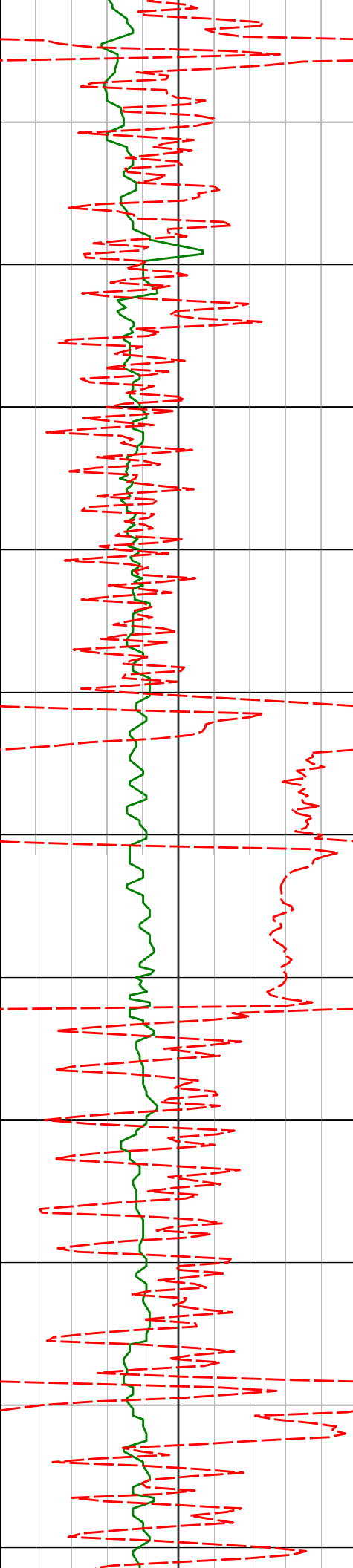
308.26° 4985.33'

-116.55'

5000

PGRC

ROPA



5089'

3.71°

303.59° 5080.11'

-121.53'

5100

5184'

3.87°

323.15° 5174.91'

-125.77'

5200

145.91°F

145.91°F

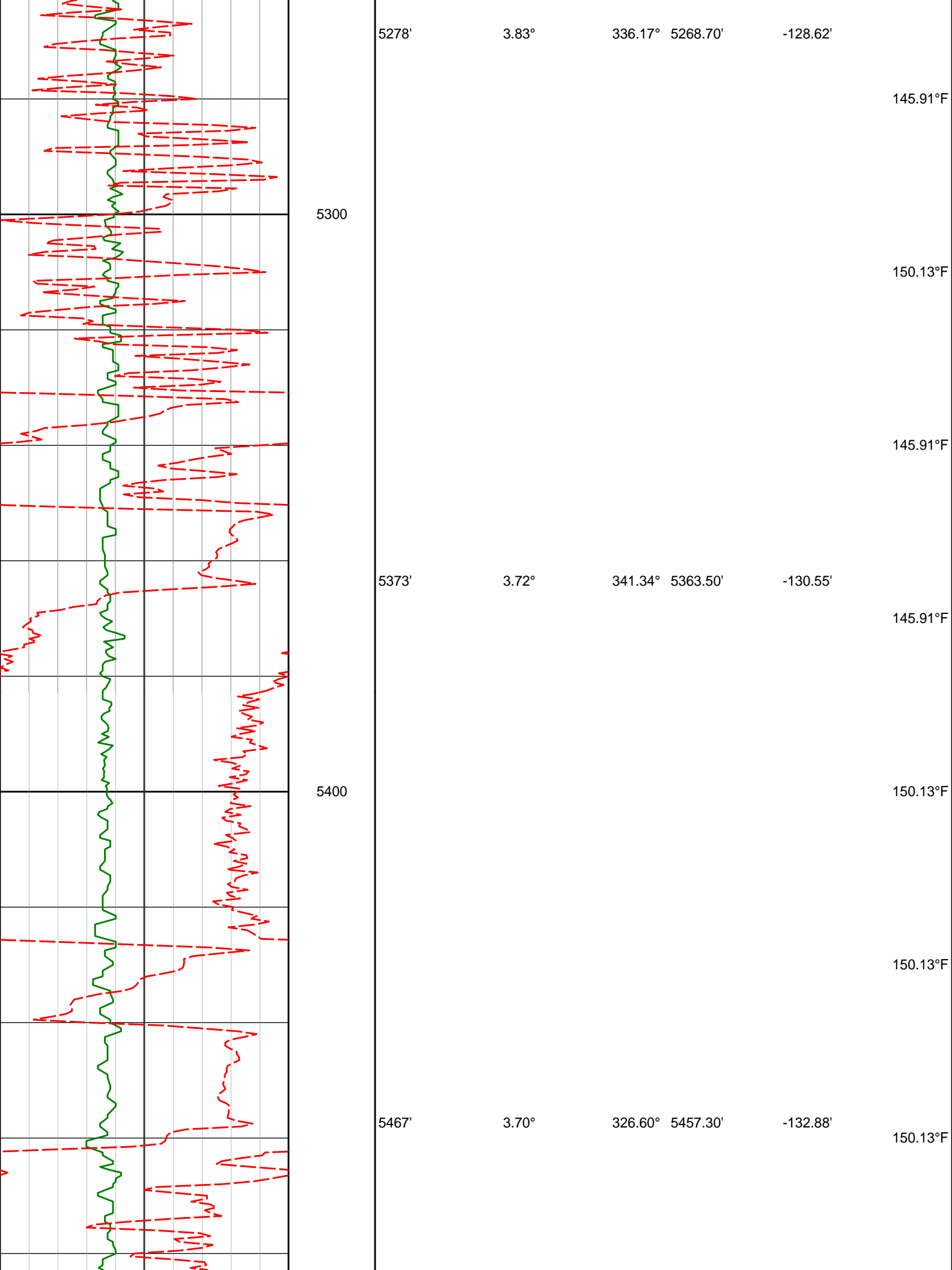
145.91°F

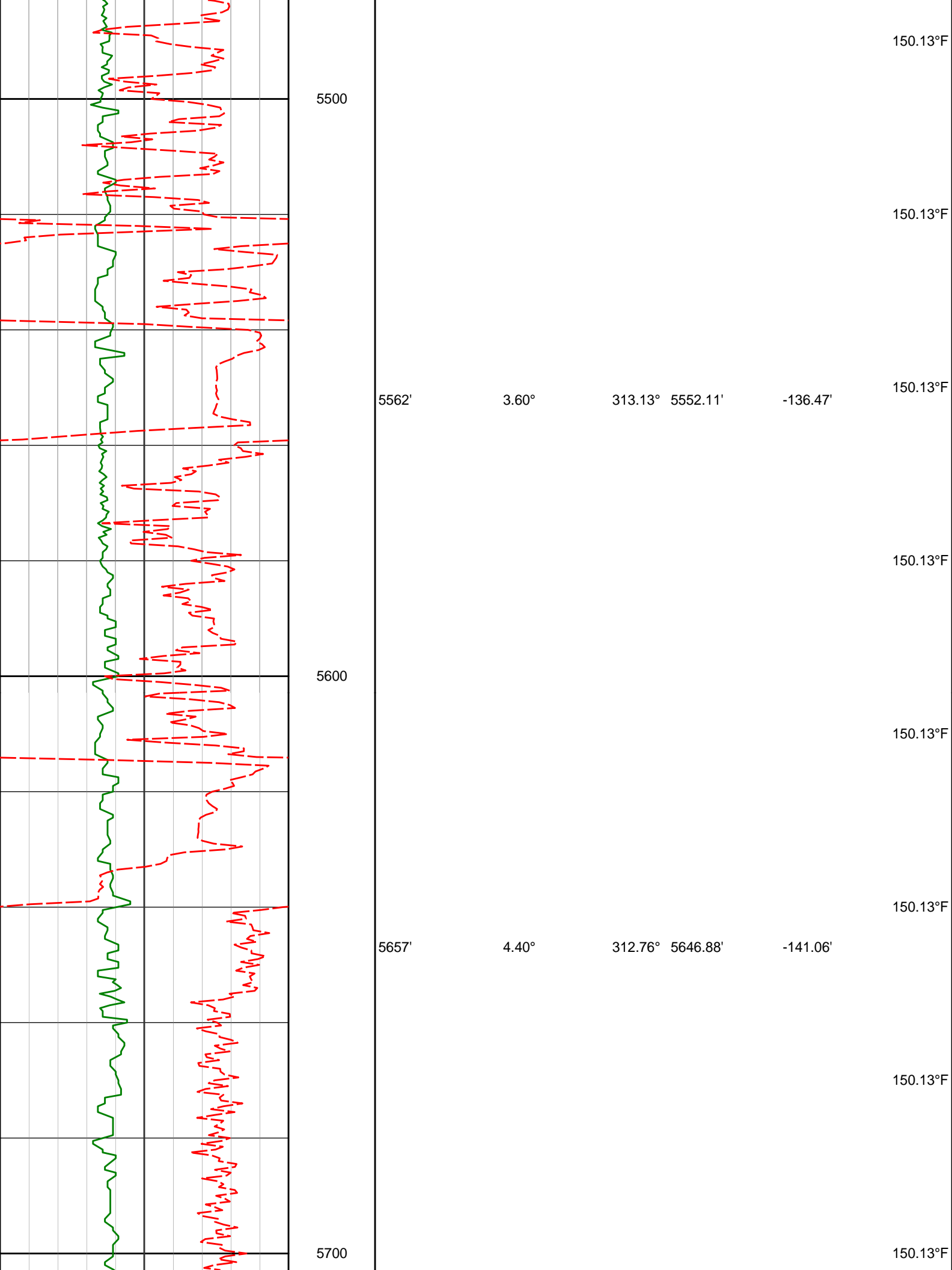
145.91°F

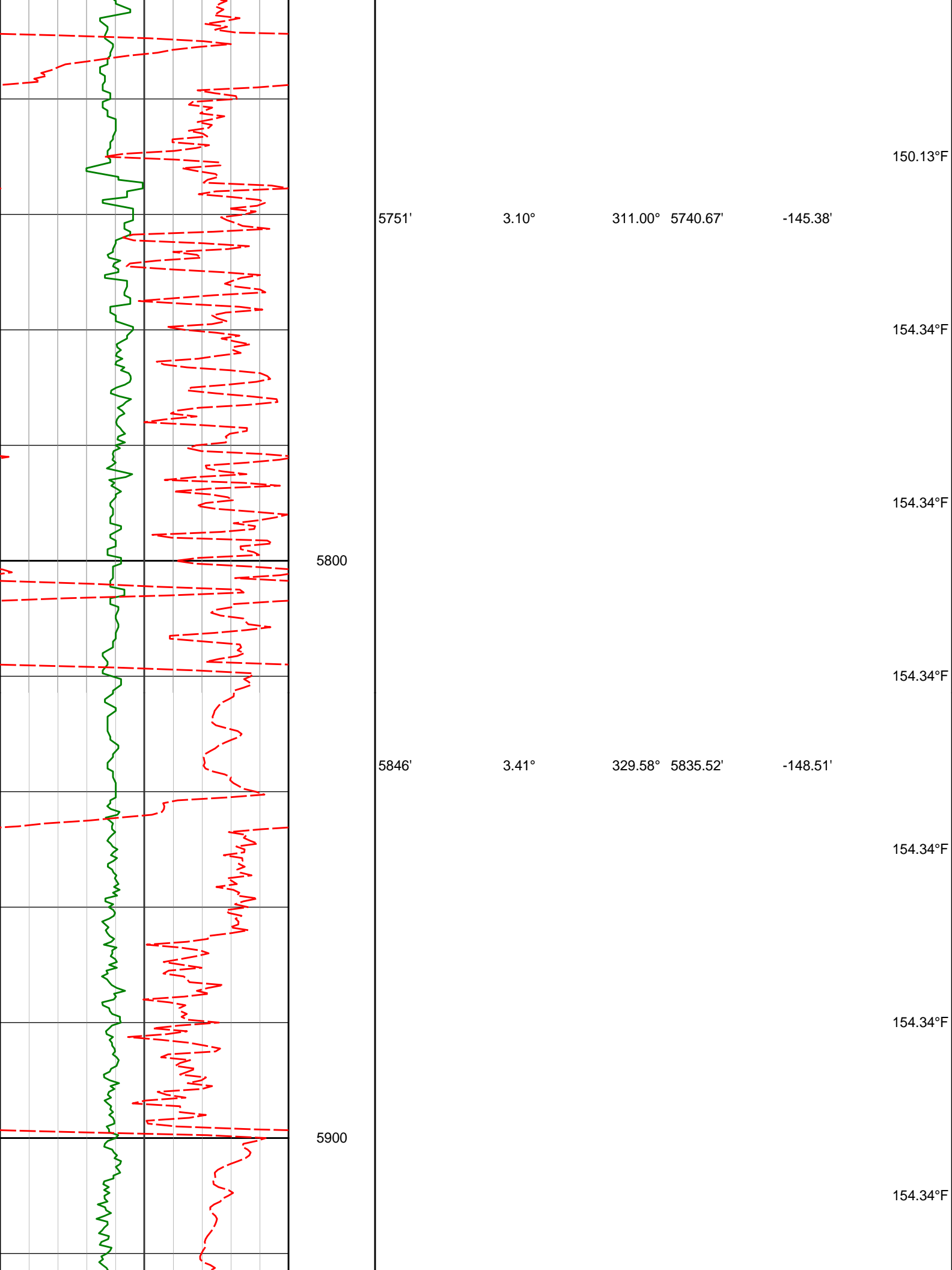
145.91°F

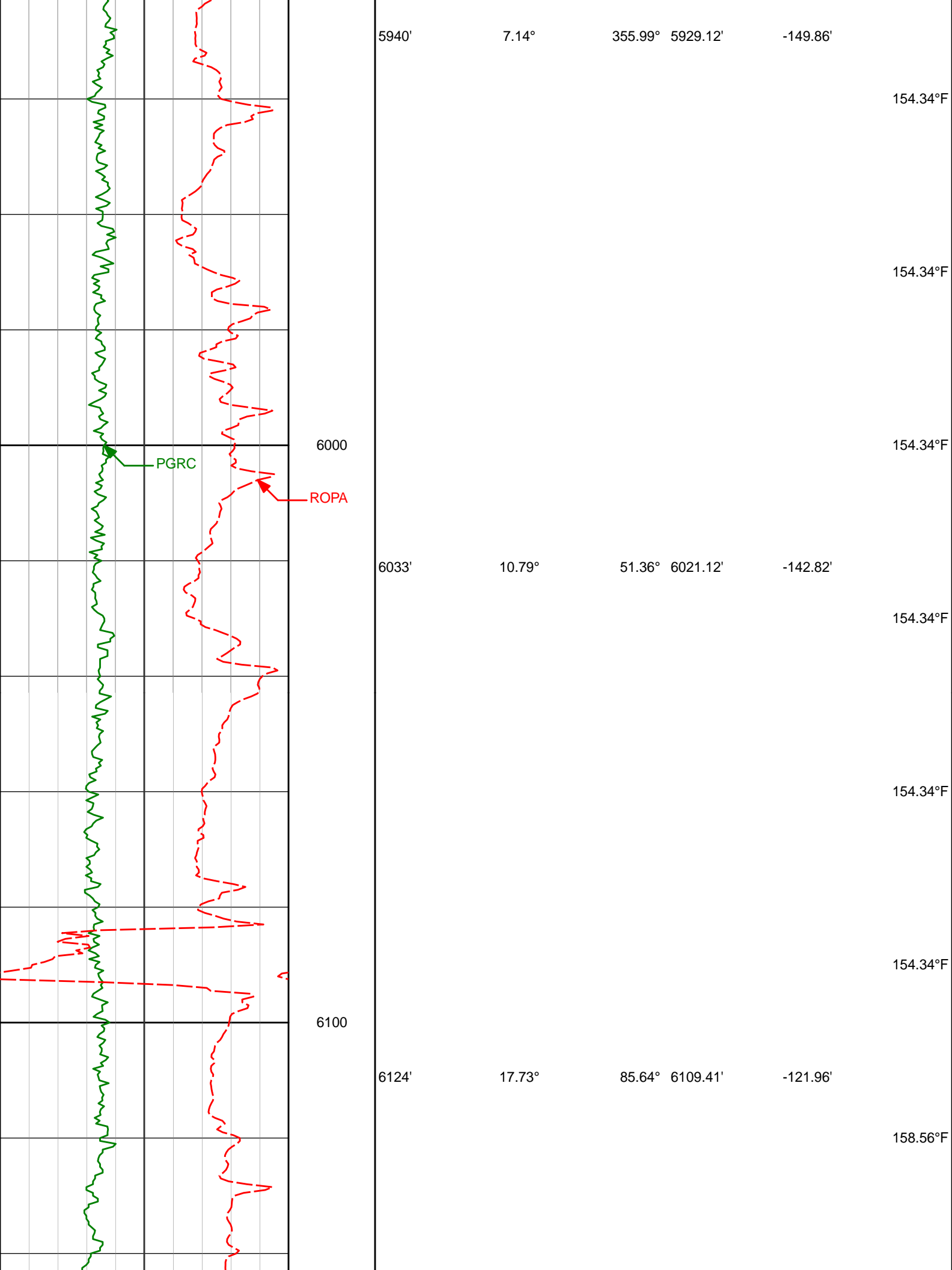
145.91°F

145.91°F









5940'

7.14°

355.99° 5929.12'

-149.86'

154.34°F

154.34°F

154.34°F

6000

PGRC

ROPA

6033'

10.79°

51.36° 6021.12'

-142.82'

154.34°F

154.34°F

154.34°F

6100

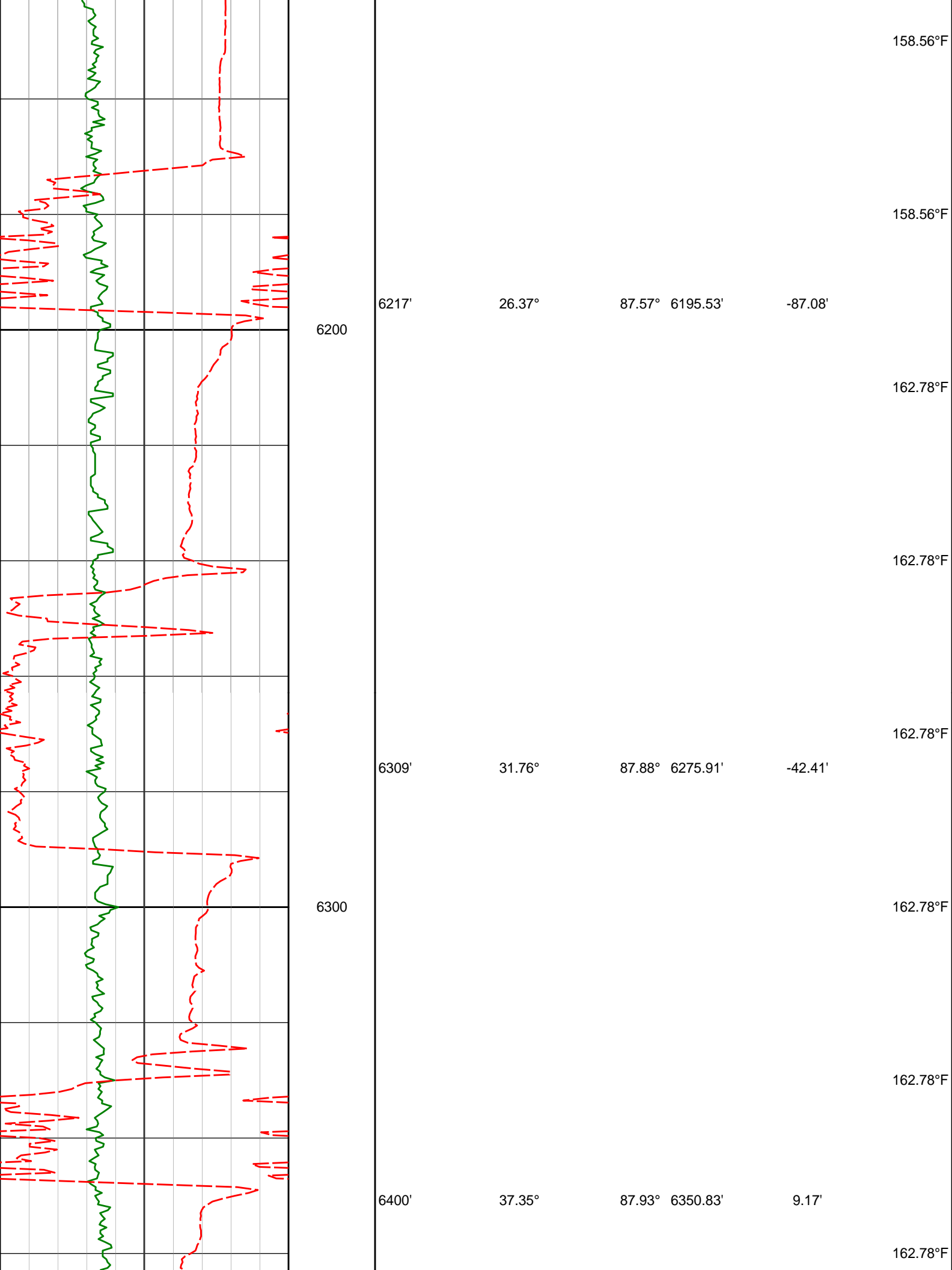
6124'

17.73°

85.64° 6109.41'

-121.96'

158.56°F



158.56°F

158.56°F

162.78°F

162.78°F

162.78°F

162.78°F

162.78°F

162.78°F

6200

6300

6217'

6309'

6400'

26.37°

31.76°

37.35°

87.57°

87.88°

87.93°

6195.53'

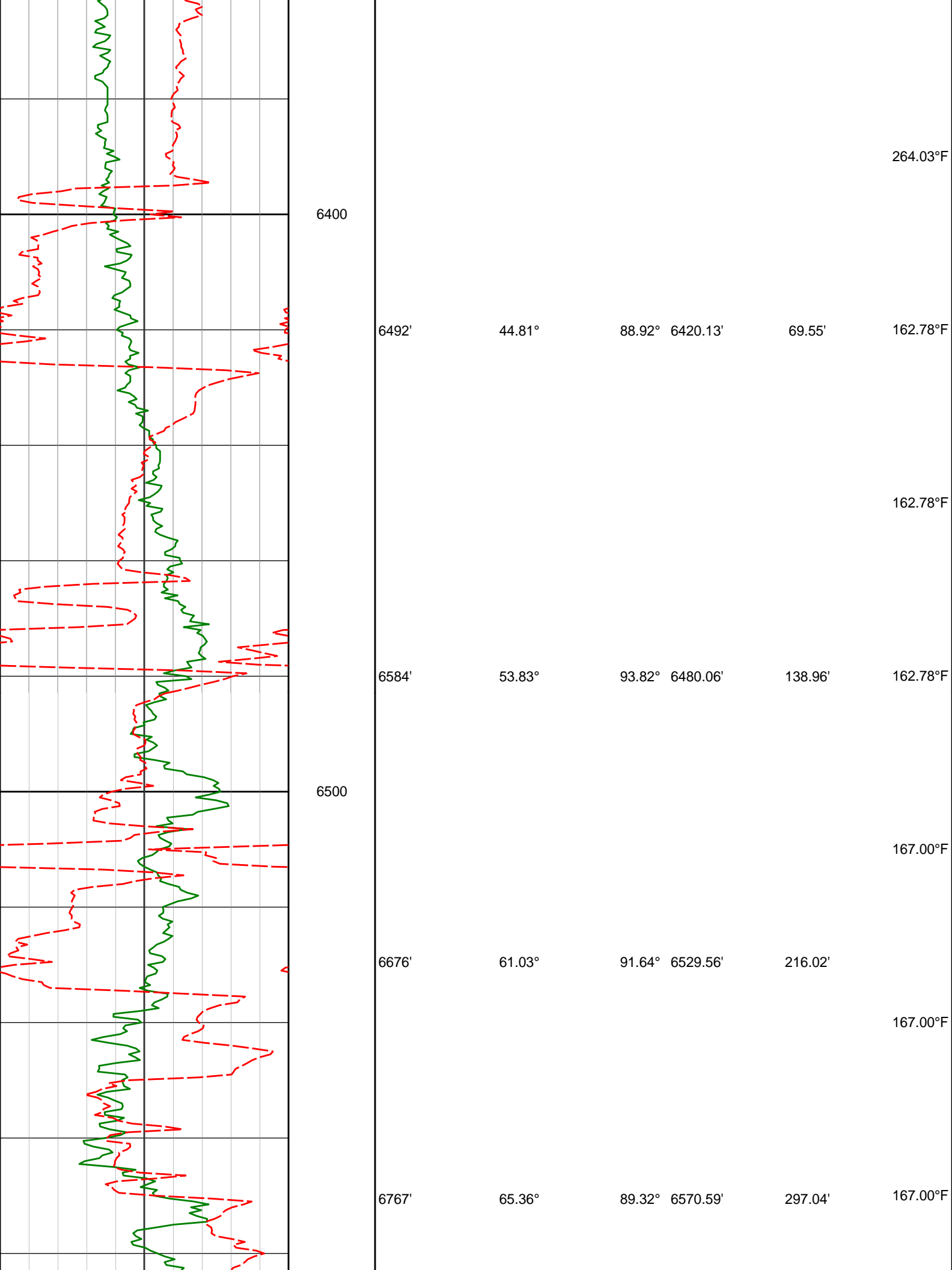
6275.91'

6350.83'

-87.08'

-42.41'

9.17'



6400

264.03°F

6492'

44.81°

88.92°

6420.13'

69.55'

162.78°F

162.78°F

6584'

53.83°

93.82°

6480.06'

138.96'

162.78°F

6500

167.00°F

6676'

61.03°

91.64°

6529.56'

216.02'

167.00°F

6767'

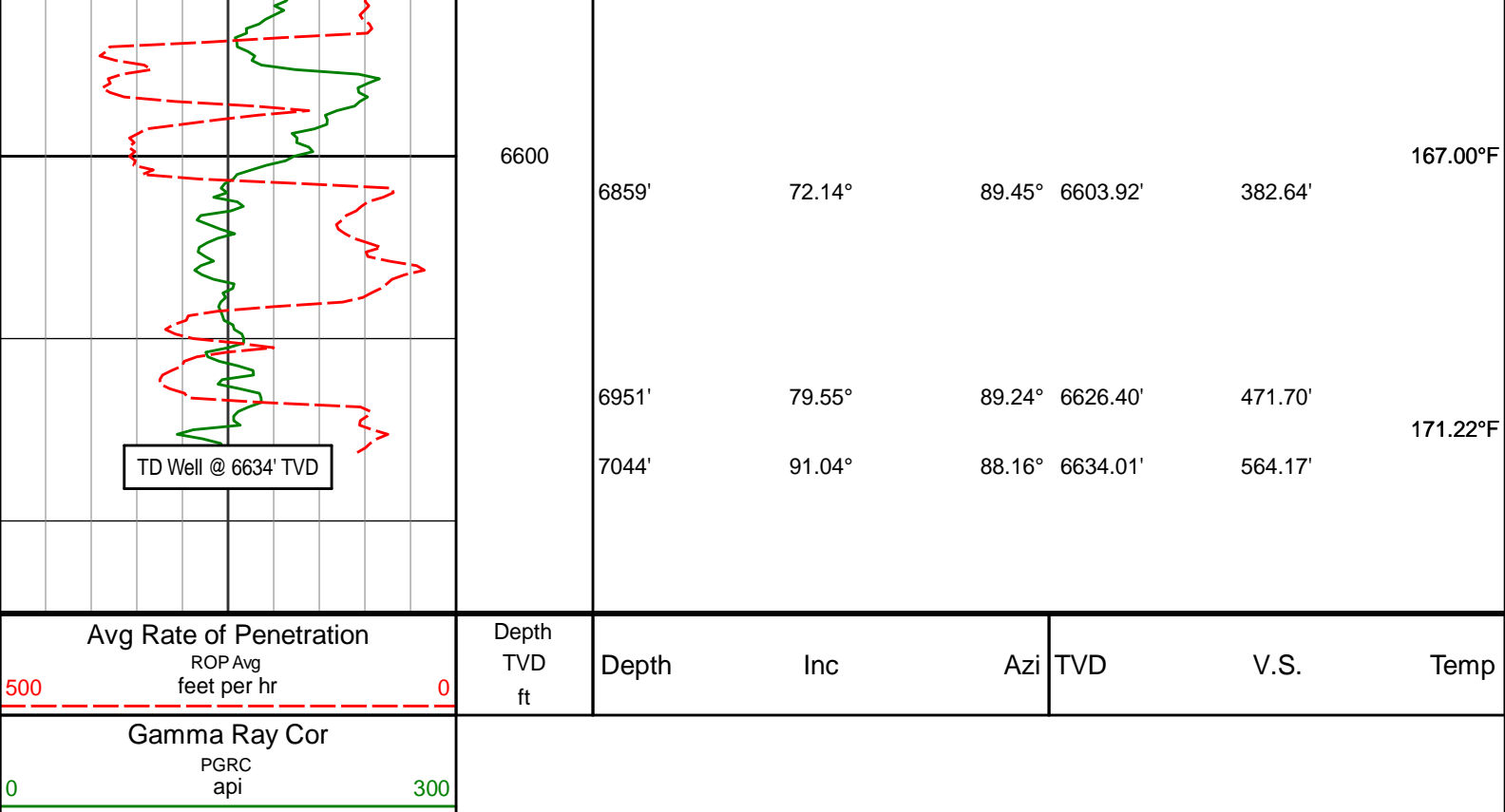
65.36°

89.32°

6570.59'

297.04'

167.00°F



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
 Wells Ranch AA22-650
 Wattenberg
 Weld Colorado
 USA
 CA-XX-0903206504

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
84.00	0.47	182.63	84.00	0.34 S	0.02 W	-0.04	0.56
175.00	0.40	171.27	175.00	1.03 S	0.02 E	-0.04	0.12
270.00	0.38	178.19	269.99	1.67 S	0.08 E	-0.02	0.05
362.00	0.29	187.31	361.99	2.21 S	0.06 E	-0.07	0.11
455.00	0.35	203.47	454.99	2.70 S	0.09 W	-0.24	0.12
549.00	0.33	208.60	548.99	3.20 S	0.33 W	-0.51	0.04
644.00	0.30	207.84	643.99	3.66 S	0.58 W	-0.79	0.03
738.00	0.23	231.61	737.99	4.00 S	0.84 W	-1.07	0.14
833.00	0.09	266.49	832.99	4.12 S	1.07 W	-1.30	0.17
928.00	0.18	286.82	927.99	4.08 S	1.28 W	-1.51	0.11
1022.00	0.21	305.01	1021.99	3.94 S	1.57 W	-1.79	0.07
1117.00	0.12	297.54	1116.99	3.80 S	1.80 W	-2.01	0.10
1211.00	0.16	280.58	1210.99	3.73 S	2.01 W	-2.22	0.06
1306.00	0.19	27.19	1305.99	3.56 S	2.07 W	-2.27	0.30
1401.00	0.45	38.03	1400.98	3.13 S	1.77 W	-1.94	0.28
1495.00	0.58	36.71	1494.98	2.46 S	1.26 W	-1.39	0.14
1590.00	0.82	46.97	1589.97	1.61 S	0.47 W	-0.56	0.28
1684.00	0.73	52.62	1683.96	0.78 S	0.49 E	0.45	0.13
1779.00	0.49	85.62	1778.96	0.39 S	1.38 E	1.36	0.44
1873.00	0.51	141.16	1872.96	0.68 S	2.04 E	2.00	0.50
1915.00	0.54	151.72	1914.95	1.00 S	2.26 E	2.19	0.24
1966.00	0.47	166.79	1965.95	1.42 S	2.42 E	2.33	0.29
2061.00	0.65	182.60	2060.95	2.34 S	2.48 E	2.34	0.25
2250.00	1.17	189.60	2249.92	5.32 S	2.11 E	1.80	0.28
2345.00	0.80	270.52	2344.91	6.17 S	1.20 E	0.94	1.40

2345.00	0.80	279.32	2344.91	0.17 S	1.29 E	0.94	1.49
2439.00	3.12	311.08	2438.85	4.38 S	1.28 W	-1.53	2.63
2534.00	5.01	318.52	2533.61	0.42 N	5.98 W	-5.94	2.06
2629.00	4.92	315.82	2628.26	6.45 N	11.56 W	-11.17	0.26
2723.00	4.67	314.46	2721.93	12.02 N	17.10 W	-16.39	0.29
2818.00	4.75	328.63	2816.61	18.09 N	21.91 W	-20.84	1.23
2912.00	4.78	326.22	2910.28	24.67 N	26.12 W	-24.67	0.22
3007.00	4.75	325.08	3004.95	31.19 N	30.57 W	-28.74	0.11
3102.00	4.40	322.89	3099.65	37.32 N	35.02 W	-32.83	0.41
3196.00	4.16	322.65	3193.39	42.90 N	39.26 W	-36.75	0.26
3291.00	4.65	328.91	3288.11	48.93 N	43.34 W	-40.48	0.72
3386.00	4.05	334.91	3382.84	55.27 N	46.75 W	-43.52	0.79
3480.00	4.16	332.20	3476.60	61.30 N	49.75 W	-46.17	0.23
3575.00	5.09	328.54	3571.29	67.94 N	53.55 W	-49.59	1.02
3670.00	5.95	329.19	3665.84	75.75 N	58.27 W	-53.86	0.91
3764.00	5.78	322.97	3759.35	83.72 N	63.62 W	-58.74	0.70
3859.00	5.86	320.35	3853.86	91.27 N	69.59 W	-64.27	0.29
3953.00	5.58	318.75	3947.40	98.40 N	75.67 W	-69.93	0.34
4048.00	5.22	318.24	4041.97	105.10 N	81.59 W	-75.46	0.39
4143.00	4.56	318.47	4136.63	111.15 N	86.97 W	-80.49	0.69
4237.00	4.03	321.27	4230.36	116.52 N	91.52 W	-84.73	0.61
4332.00	3.73	322.39	4325.15	121.58 N	95.50 W	-88.41	0.32
4426.00	4.50	324.96	4418.90	127.02 N	99.48 W	-92.07	0.84
4521.00	4.63	321.14	4513.60	133.05 N	104.02 W	-96.26	0.35
4710.00	4.32	320.35	4702.03	144.47 N	113.35 W	-104.93	0.16
4805.00	3.85	324.91	4796.78	149.84 N	117.47 W	-108.73	0.61
4900.00	3.99	322.98	4891.56	155.09 N	121.29 W	-112.25	0.20
4994.00	4.06	308.26	4985.33	159.76 N	125.87 W	-116.55	1.10
5089.00	3.71	303.59	5080.11	163.54 N	131.08 W	-121.53	0.49
5184.00	3.87	323.15	5174.91	167.81 N	135.56 W	-125.77	1.36
5278.00	3.83	336.17	5268.70	173.21 N	138.73 W	-128.62	0.93
5373.00	3.72	341.34	5363.50	179.03 N	140.99 W	-130.55	0.38
5467.00	3.70	326.60	5457.30	184.44 N	143.63 W	-132.88	1.01
5562.00	3.60	313.13	5552.11	189.04 N	147.49 W	-136.47	0.91
5657.00	4.40	312.76	5646.88	193.55 N	152.34 W	-141.06	0.85
5751.00	3.10	311.00	5740.67	197.66 N	156.91 W	-145.38	1.39
5846.00	3.41	329.58	5835.52	201.78 N	160.28 W	-148.51	1.15
5940.00	7.14	355.99	5929.12	210.03 N	162.10 W	-149.86	4.64
6033.00	10.79	51.36	6021.12	221.25 N	155.70 W	-142.82	9.58
6124.00	17.73	85.64	6109.41	227.64 N	135.17 W	-121.96	11.71
6217.00	26.37	87.57	6195.53	229.60 N	100.34 W	-87.08	9.32
6309.00	31.76	87.88	6275.91	231.36 N	55.70 W	-42.41	5.85
6400.00	37.35	87.93	6350.83	233.24 N	4.14 W	9.17	6.15
6492.00	44.81	88.92	6420.13	234.86 N	56.25 E	69.55	8.13
6584.00	53.83	93.82	6480.06	233.00 N	125.88 E	138.96	10.60
6676.00	61.03	91.64	6529.56	229.37 N	203.26 E	216.02	8.08
6767.00	65.36	89.32	6570.59	228.72 N	284.46 E	297.04	5.28
6859.00	72.14	89.45	6603.92	229.64 N	370.15 E	382.64	7.37
6951.00	79.55	89.24	6626.40	230.67 N	459.29 E	471.70	8.06
7044.00	91.04	88.16	6634.01	232.77 N	551.79 E	564.17	12.40
7136.00	90.86	88.55	6632.49	235.41 N	643.74 E	656.12	0.46
7227.00	90.95	87.91	6631.05	238.22 N	734.69 E	747.08	0.71
7318.00	90.64	87.61	6629.79	241.78 N	825.61 E	838.06	0.47
7410.00	91.23	90.40	6628.29	243.37 N	917.57 E	929.96	3.10
7599.00	91.16	89.83	6624.35	242.99 N	1106.53 E	1118.59	0.30
7694.00	89.47	90.03	6623.83	243.11 N	1201.53 E	1213.44	1.79
7788.00	89.62	90.22	6624.57	242.90 N	1295.52 E	1307.27	0.26
7883.00	89.65	90.33	6625.18	242.45 N	1390.52 E	1402.08	0.12
7977.00	89.31	90.08	6626.03	242.11 N	1484.51 E	1495.91	0.45
8072.00	89.75	89.91	6626.81	242.12 N	1579.51 E	1590.75	0.50
8167.00	90.61	89.88	6626.51	242.29 N	1674.51 E	1685.60	0.91
8261.00	90.61	89.65	6625.51	242.68 N	1768.50 E	1779.47	0.24
8355.00	89.31	89.81	6625.58	243.12 N	1862.50 E	1873.34	1.39
8450.00	89.35	90.32	6626.69	243.02 N	1957.49 E	1968.17	0.54
8545.00	89.62	89.91	6627.54	242.82 N	2052.49 E	2063.00	0.52
8640.00	89.53	89.51	6628.25	243.31 N	2147.48 E	2157.87	0.43
8734.00	89.62	88.95	6628.94	244.57 N	2241.47 E	2251.77	0.60
8829.00	89.56	89.16	6629.62	246.14 N	2336.46 E	2346.69	0.23
8924.00	89.84	89.41	6630.12	247.32 N	2431.45 E	2441.60	0.40
9018.00	90.05	88.60	6630.21	248.95 N	2525.43 E	2535.52	0.89
9113.00	90.58	88.50	6629.69	251.36 N	2620.40 E	2630.47	0.57
9208.00	91.07	88.86	6628.32	253.55 N	2715.37 E	2725.41	0.64
9302.00	90.09	88.07	6627.37	256.06 N	2809.33 E	2819.36	1.34
9397.00	90.52	88.40	6626.86	258.99 N	2904.28 E	2914.32	0.57
9492.00	89.87	87.00	6626.54	262.80 N	2999.20 E	3009.31	1.62

9586.00	90.40	87.14	6626.32	267.61 N	3093.08 E	3103.30	0.58
9681.00	91.32	87.10	6624.89	272.38 N	3187.94 E	3198.29	0.97
9776.00	89.04	87.58	6624.60	276.79 N	3282.83 E	3293.28	2.45
9870.00	89.35	87.72	6625.92	280.64 N	3376.75 E	3387.26	0.36
9965.00	90.55	88.00	6626.00	284.19 N	3471.68 E	3482.24	1.30
10154.00	89.78	89.34	6625.45	288.58 N	3660.62 E	3671.12	0.82
10249.00	90.30	89.23	6625.39	289.76 N	3755.61 E	3766.03	0.56
10343.00	91.17	89.31	6624.18	290.96 N	3849.60 E	3859.93	0.93
10438.00	88.76	88.77	6624.24	292.55 N	3944.58 E	3954.84	2.60
10532.00	88.52	88.44	6626.47	294.84 N	4038.52 E	4048.76	0.43
10627.00	89.19	88.54	6628.37	297.34 N	4133.47 E	4143.70	0.71
10721.00	89.47	88.07	6629.47	300.12 N	4227.42 E	4237.66	0.58
10816.00	89.90	87.45	6629.99	303.83 N	4322.35 E	4332.64	0.79
10911.00	89.41	89.47	6630.56	306.39 N	4417.31 E	4427.59	2.19
11005.00	89.38	89.20	6631.56	307.48 N	4511.29 E	4521.49	0.29
11100.00	89.69	88.93	6632.33	309.03 N	4606.28 E	4616.40	0.43
11195.00	90.00	89.04	6632.58	310.71 N	4701.26 E	4711.33	0.35
11289.00	90.12	89.31	6632.49	312.07 N	4795.25 E	4805.25	0.31
11384.00	91.32	90.04	6631.29	312.60 N	4890.24 E	4900.11	1.48
11478.00	90.09	90.31	6630.14	312.32 N	4984.23 E	4993.93	1.34
11668.00	90.61	91.00	6628.98	310.15 N	5174.21 E	5183.48	0.45
11762.00	91.10	90.59	6627.57	308.84 N	5268.19 E	5277.23	0.68
11825.00	91.10	90.59	6626.36	308.19 N	5331.18 E	5340.08	0.00

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 86.73 DEGREES (GRID)
A TOTAL CORRECTION OF 7.60 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11825.00 FEET
IS 5340.08 FEET ALONG 86.69 DEGREES (GRID)**

Surveys through 1933' are gyro surveys

Last survey is a projection to the bit at TD.