



1 : 600 / 1 : 240

| WELL INFORMATION | | | | | |
|-----------------------------------|------------------|--|--|--|--|
| MWD Run Number | 100 | | | | |
| Date run completed | 17-May-16 | | | | |
| Rig Bit Number | 2 | | | | |
| Bit Size (in) | 8.500 | | | | |
| Tool Nominal OD (in) | 6.750 | | | | |
| Log Start Depth (TVD, ft) | 1,930.98 | | | | |
| Log End Depth (TVD, ft) | 6659.76 | | | | |
| Drill or Wipe | Drill | | | | |
| Drill/Wipe Start Date and Time | 14-May-16 05:30 | | | | |
| Drill/Wipe End Date and Time | 17-May-16 09:45 | | | | |
| Min Inc (deg) @ Depth (TVD, ft) | 0.34 @ 3,230.87 | | | | |
| Max Inc (deg) @ Depth (TVD, ft) | 91.99 @ 6,657.24 | | | | |
| Bit TFA(in2) / Bit Type | 2.01 / PDC | | | | |
| Flow Rate (gpm) | 574.21 | | | | |
| Max AV (fpm) / CV (fpm) @ MWD | N/A / N/A | | | | |
| Fluid Type | Diesel Mud Base | | | | |
| Density (ppg) / Viscosity (spqt) | 9.57 / 48.00 | | | | |
| Filtrate CL (ppm) | 30,000.00 | | | | |
| pH / Fluid Loss (mptm) | N/A / 18 | | | | |
| PV (cP) / YP (lhf2) | 15 / 8.00 | | | | |
| % Solids / % Sand | 9.70 / 0.1 | | | | |
| % Oil / Oil:Water Ratio | 65.00 / 73:27 | | | | |
| 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) | 245.76 / 6659.76 | | | | |

| | | | | | |
|-------------------------------|----------------|--|--|--|--|
| Max Tool Temp (degF) / Source | 247.78 / PCM | | | | |
| Rm @ Max Tool Temp (degF) | N/A @ N/A | | | | |
| Lead MWD Engineer | Brian Neu | | | | |
| Customer Representative | Charles Culver | | | | |

SENSOR INFORMATION

Downhole Processor Information

| | | | | | |
|---------------------------|-----------------|--|--|--|--|
| Tool Type | PCM | | | | |
| Software Version | 5.93 | | | | |
| Sub Serial Number | 11341332 | | | | |
| Insert Serial Number | 11680783 | | | | |
| Date and Time Initialized | 13-May-16 19:54 | | | | |
| Date and Time Read | 17-May-16 18:46 | | | | |
| ECMB SW Version | N/A | | | | |

Directional Sensor Information

| | | | | | |
|------------------------|----------|--|--|--|--|
| Tool Type | PCDC | | | | |
| Distance From Bit (ft) | 61.00 | | | | |
| Software Version | 6.33 | | | | |
| Sub Serial Number | 11341332 | | | | |
| Sonde Serial Number | 11181577 | | | | |
| Sensor ID Number | N/A | | | | |
| Toolface Offset (deg) | 96.40 | | | | |

Gamma Ray Sensor Information

| | | | | | |
|------------------------------|----------|--|--|--|--|
| Tool Type | PCG | | | | |
| Distance From Bit (ft) | 48.95 | | | | |
| Recorded Sample Period (sec) | 10 | | | | |
| Software Version | 8.15 | | | | |
| Sub Serial Number | 11341332 | | | | |
| Insert/Sonde Serial Number | 12037413 | | | | |

DDSr-Sonde Sensor Information

| | | | | | |
|------------------------------|------------|--|--|--|--|
| Tool Type | DDSr-Sonde | | | | |
| Distance From Bit (ft) | 0.00 | | | | |
| Recorded Sample Period (sec) | 80 | | | | |
| Software Version | 80.88 | | | | |
| Sub Serial Number | | | | | |
| Insert Serial Number | 12664614 | | | | |
| Sensor ID Number | 12483 | | | | |

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:

Main Log 1:600 (2"):

(ROPA - Avg Rate of Penetration)

Interval: 1.0 ft, Coercion Distance: 3.0 ft, Gap fill: 5.0 ft

(PGRC - Gamma Ray Cor)

Interval: 1.0 ft, Coercion Distance: 3.0 ft, Gap fill: 5.0 ft

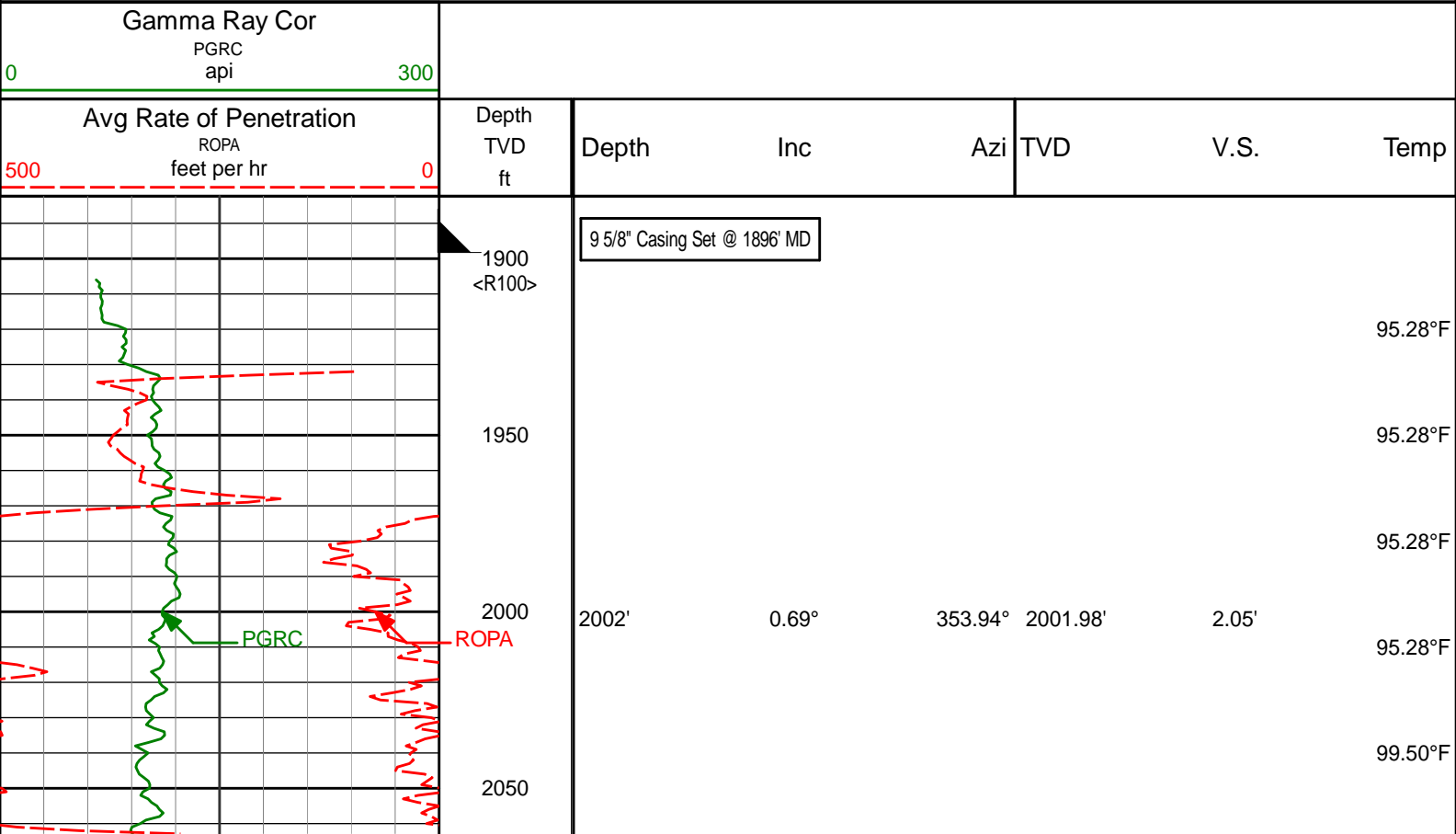
Interval: 1.0 ft, Coercion Distance: 0.0 ft, Gap fill: 0.0 ft
Detail Log 1:240 (5"):
(ROPA - Avg Rate of Penetration)
Interval: 0.5 ft, Coercion Distance: 1.2 ft, Gap fill: 3.0 ft
(PGRC - Gamma Ray Cor)
Interval: 0.5 ft, Coercion Distance: 0.6 ft, Gap fill: 3.0 ft

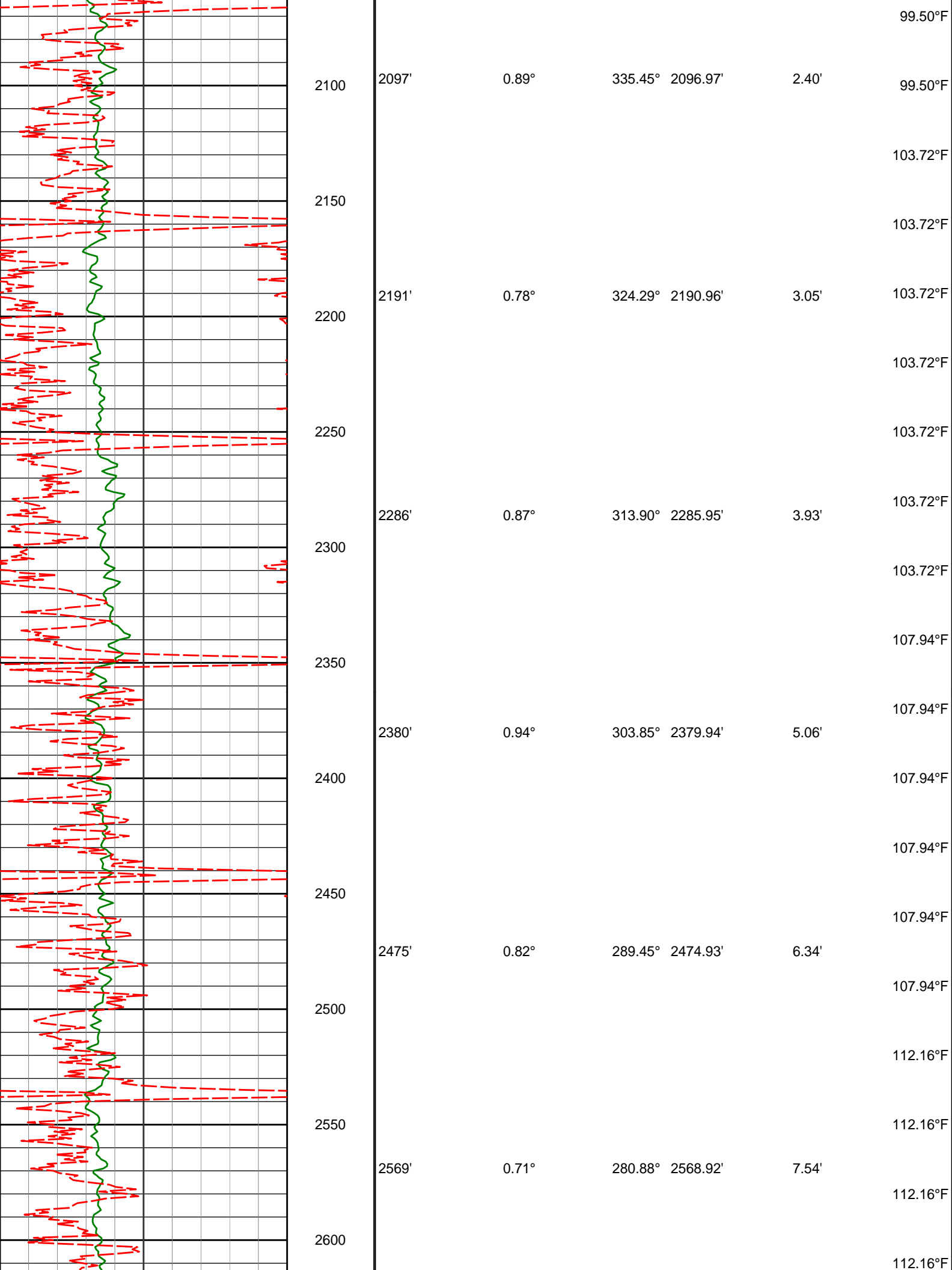
5. Surveys corrected by Surcon starting at 1907 ft.

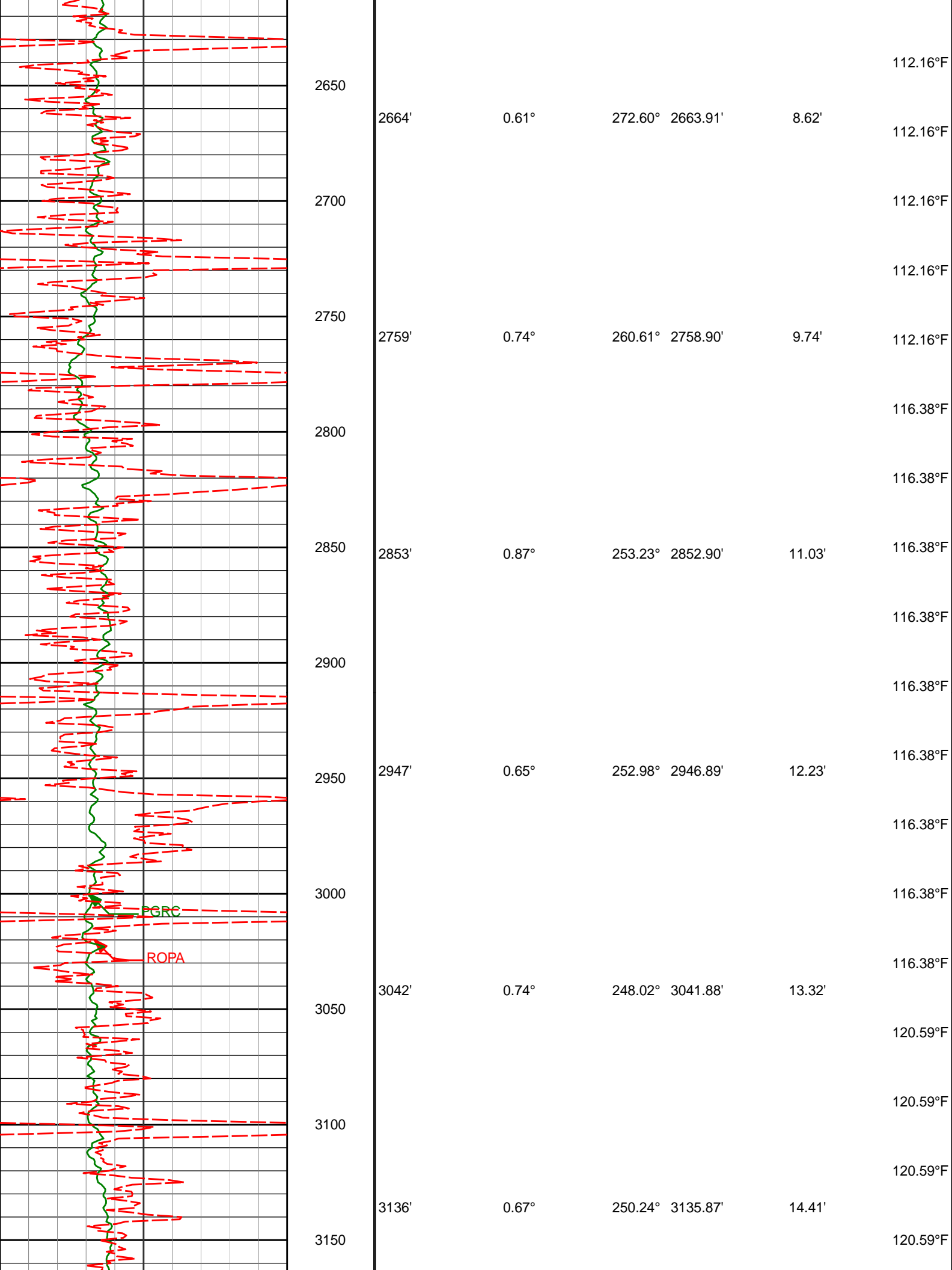
WARRANTY

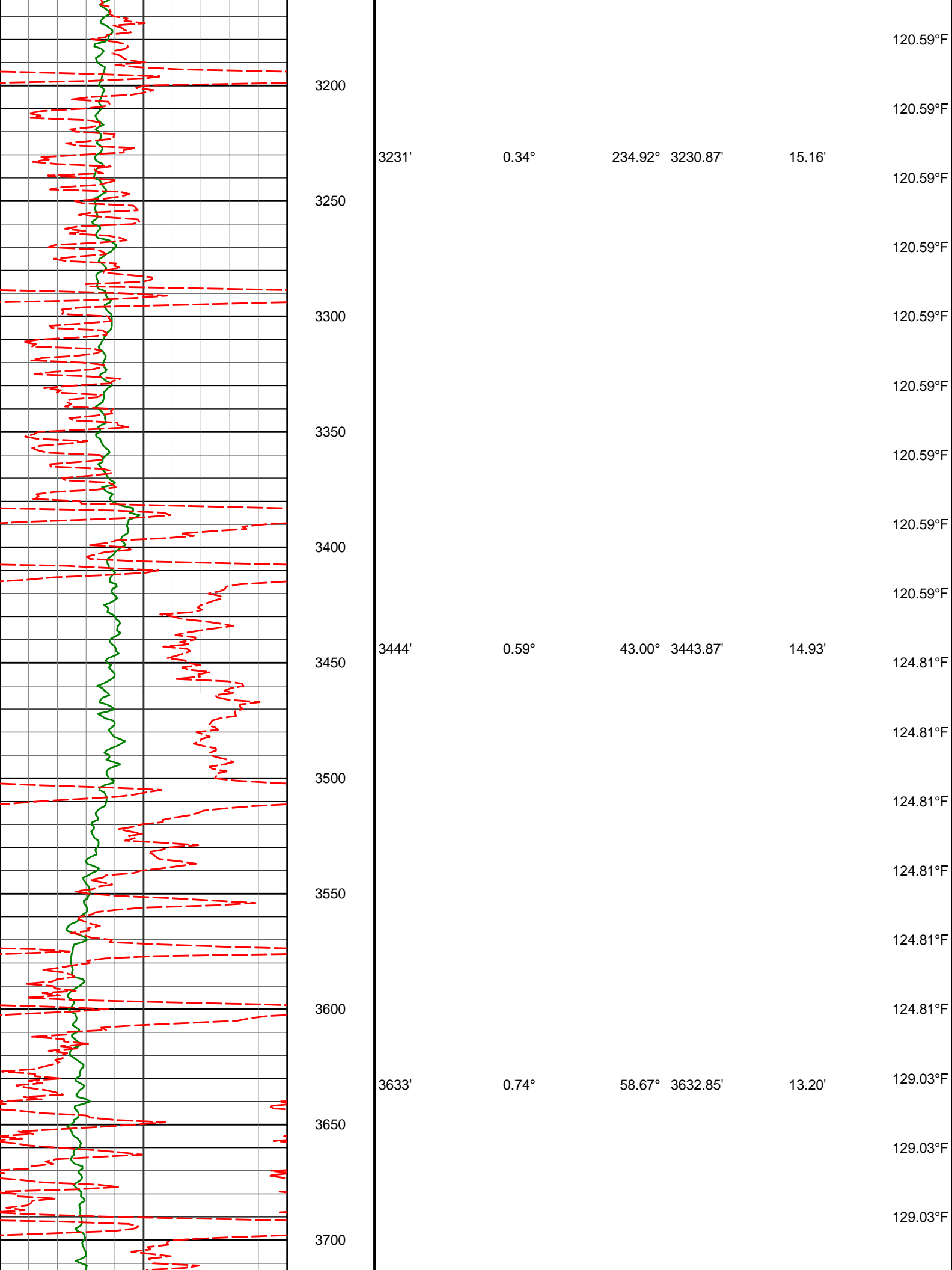
HALLIBURTON WILL USE ITS BEST EFFORTS TO FURNISH CUSTOMERS WITH ACCURATE INFORMATION AND INTERPRETATIONS THAT ARE PART OF, AND INCIDENT TO, THE SERVICES PROVIDED. HOWEVER, HALLIBURTON CANNOT AND DOES NOT WARRANT THE ACCURACY OR CORRECTNESS OF SUCH INFORMATION AND INTERPRETATIONS. UNDER NO CIRCUMSTANCES SHOULD ANY SUCH INFORMATION OR INTERPRETATION BE RELIED UPON AS THE SOLE BASIS FOR ANY DRILLING, COMPLETION, PRODUCTION, OR FINANCIAL DECISION OR ANY PROCEDURE INVOLVING ANY RISK TO THE SAFETY OF ANY DRILLING VENTURE, DRILLING RIG OR ITS CREW OR ANY OTHER THIRD PARTY. THE CUSTOMER HAS FULL RESPONSIBILITY FOR ALL DRILLING, COMPLETION AND PRODUCTION OPERATION. HALLIBURTON MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WITH RESPECT TO THE SERVICES RENDERED. IN NO EVENT WILL HALLIBURTON BE LIABLE FOR FAILURE TO OBTAIN ANY PARTICULAR RESULTS OR FOR ANY DAMAGES, INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES, RESULTING FROM THE USE OF ANY INFORMATION OR INTERPRETATION PROVIDED BY HALLIBURTON.

TVD Main Log 1:600 Scale

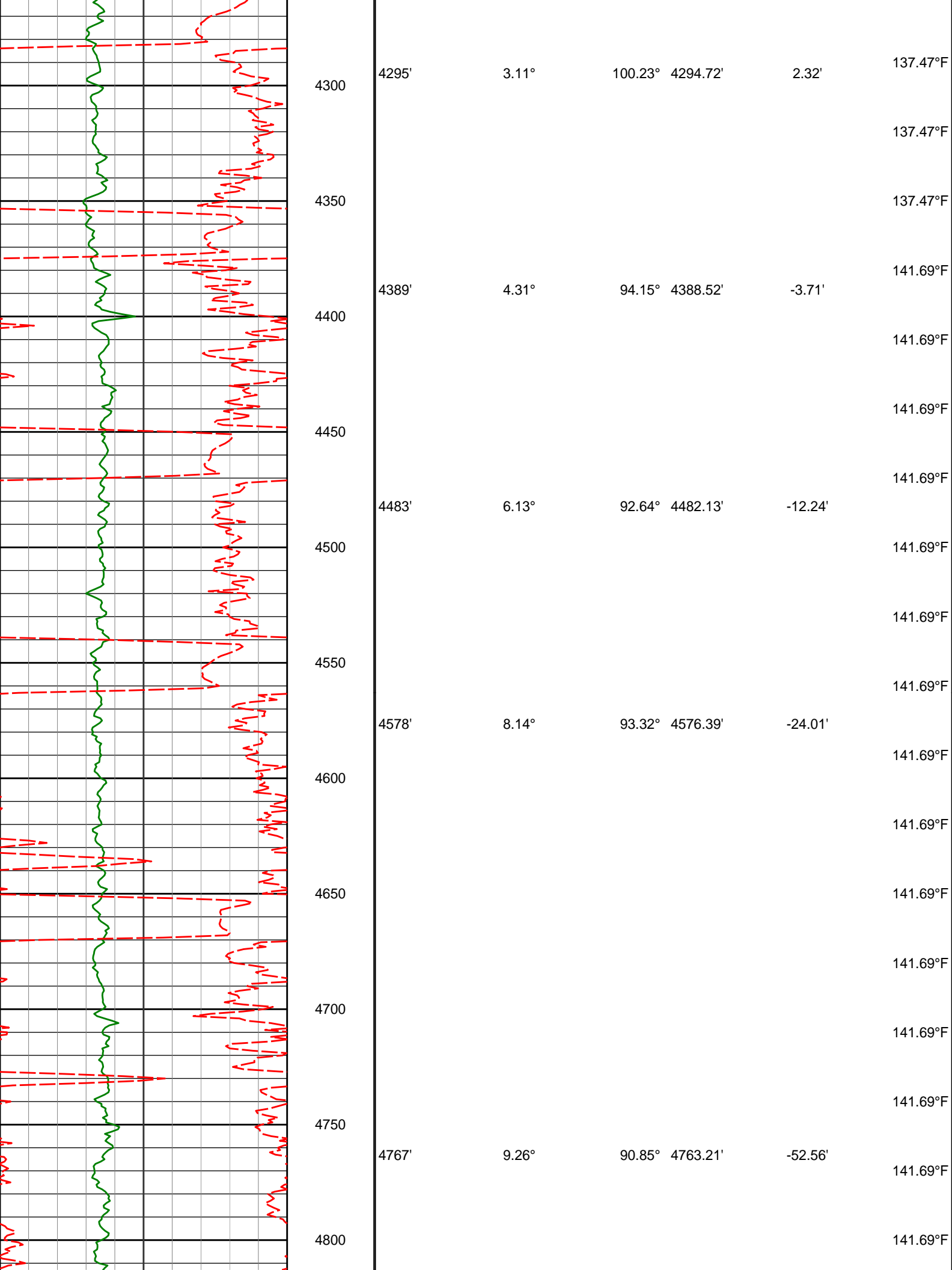


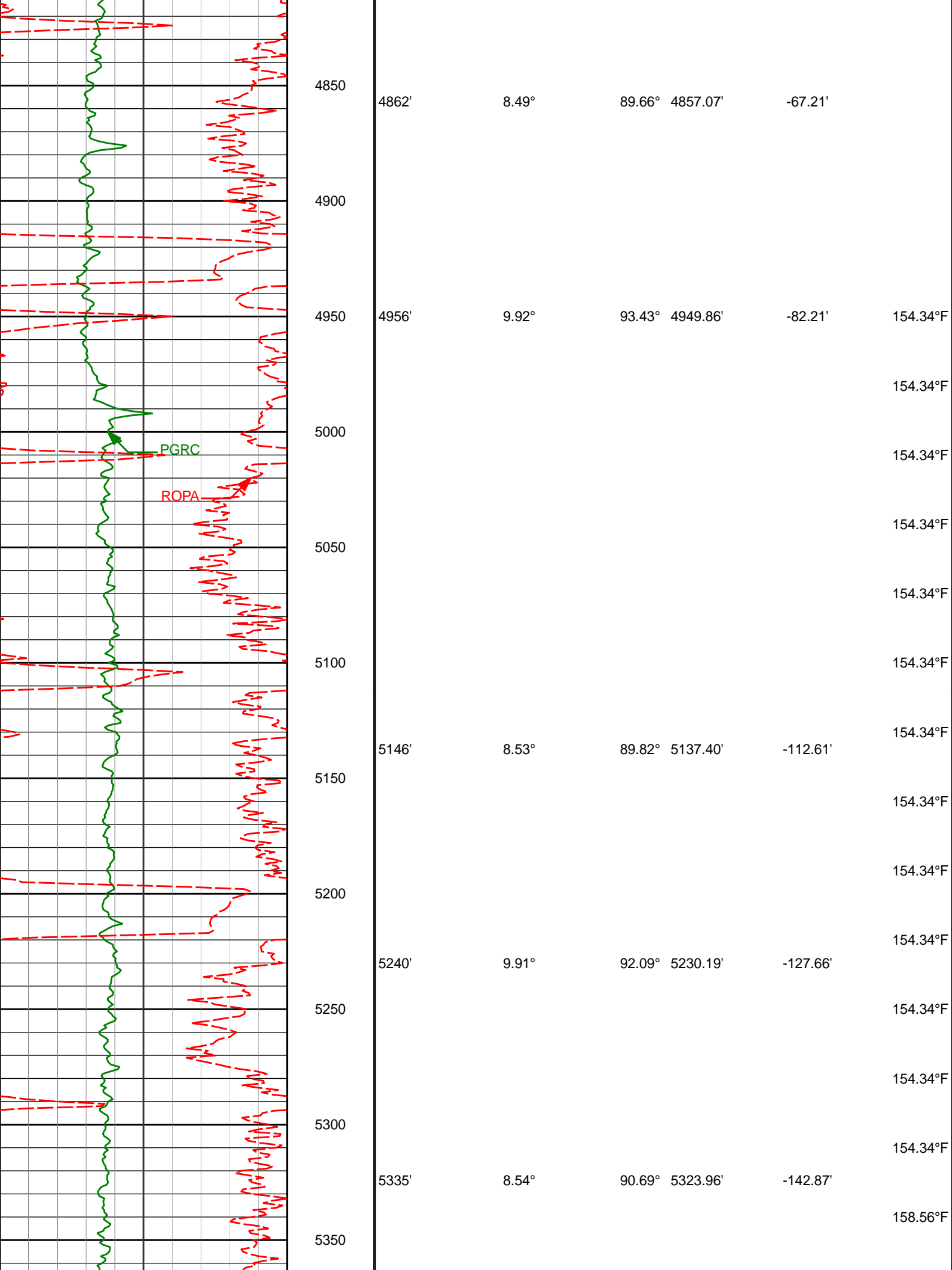


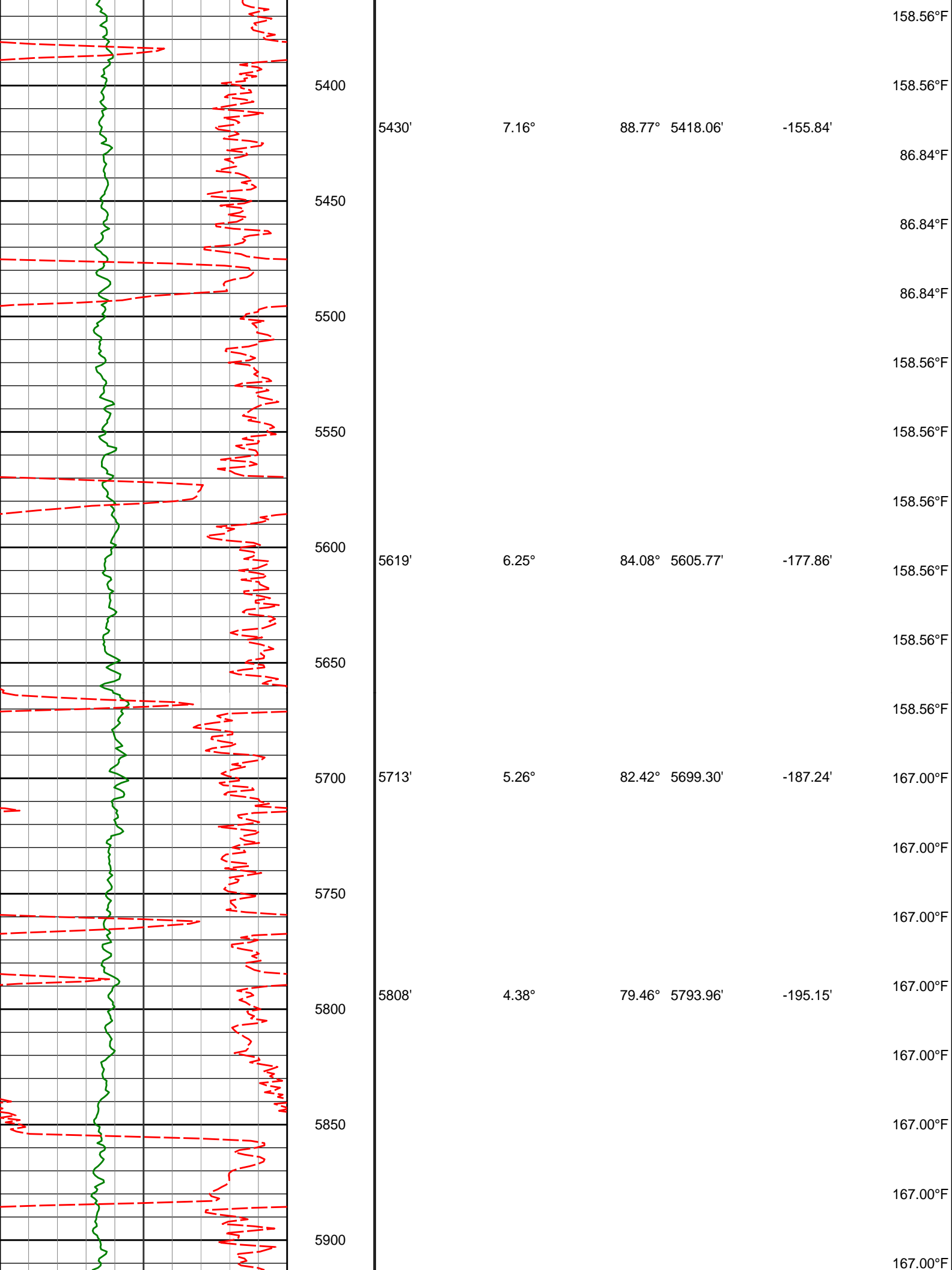


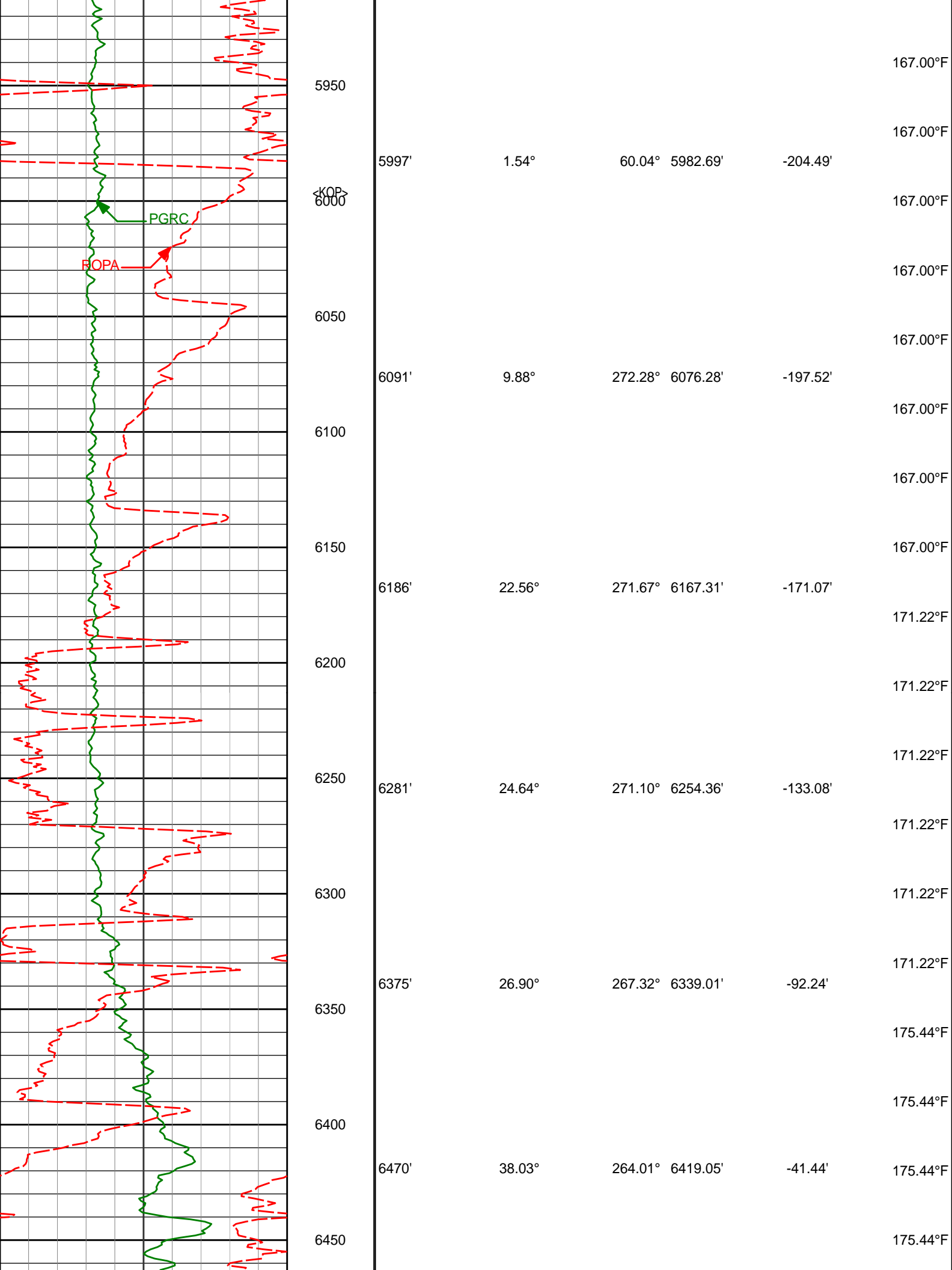


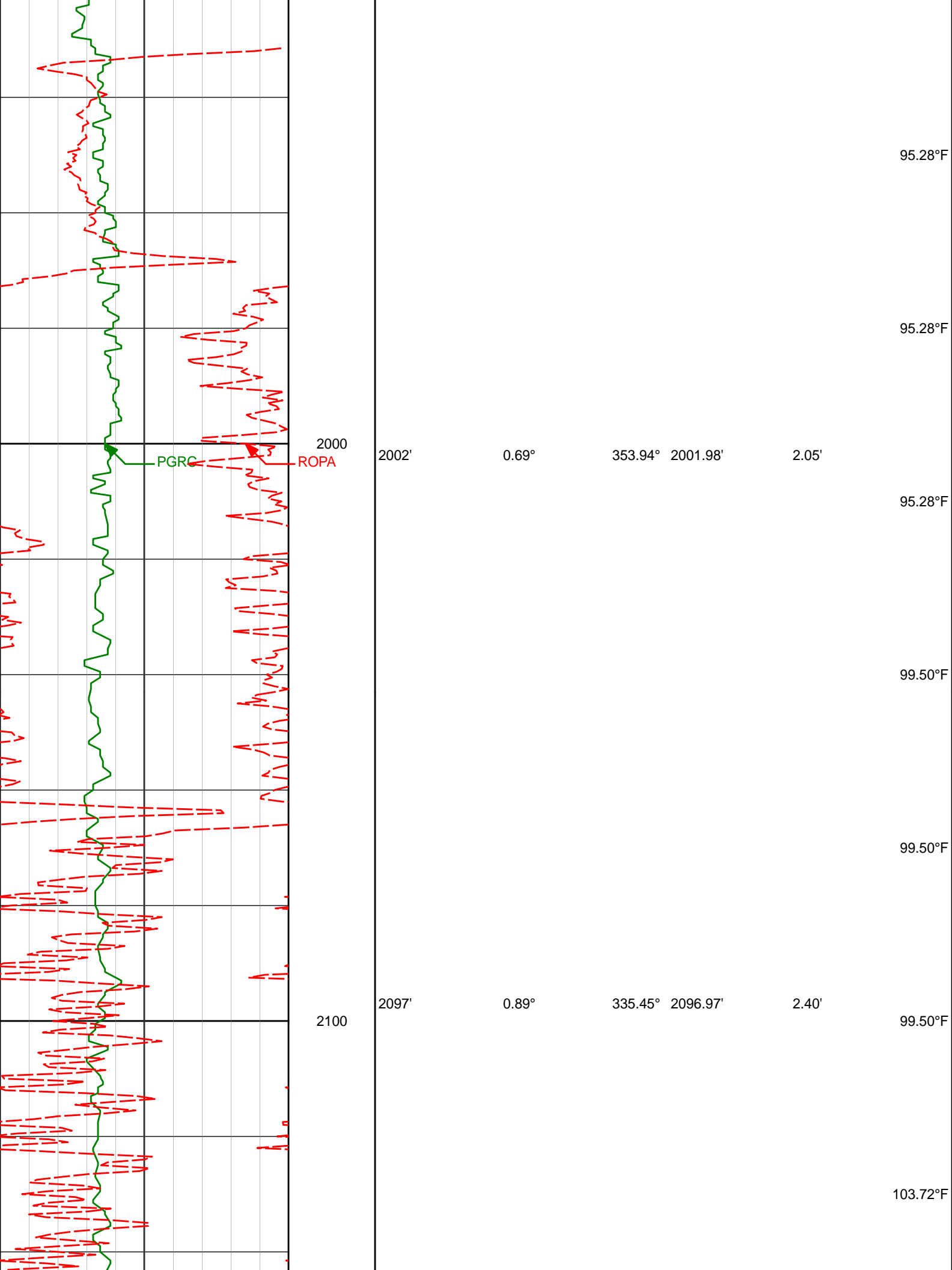


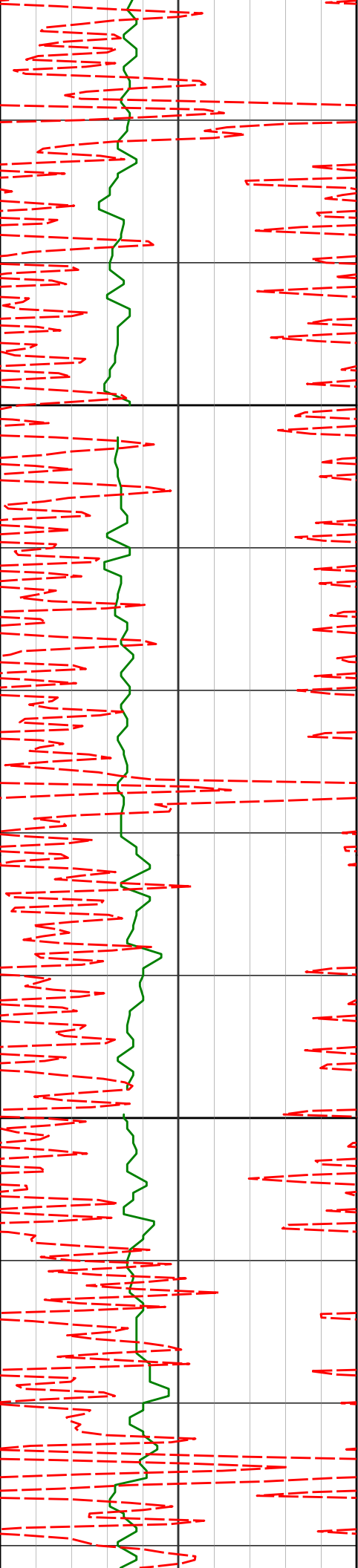












2200

2300

2191'

0.78°

324.29°

2190.96'

3.05'

103.72°F

103.72°F

103.72°F

103.72°F

103.72°F

2286'

0.87°

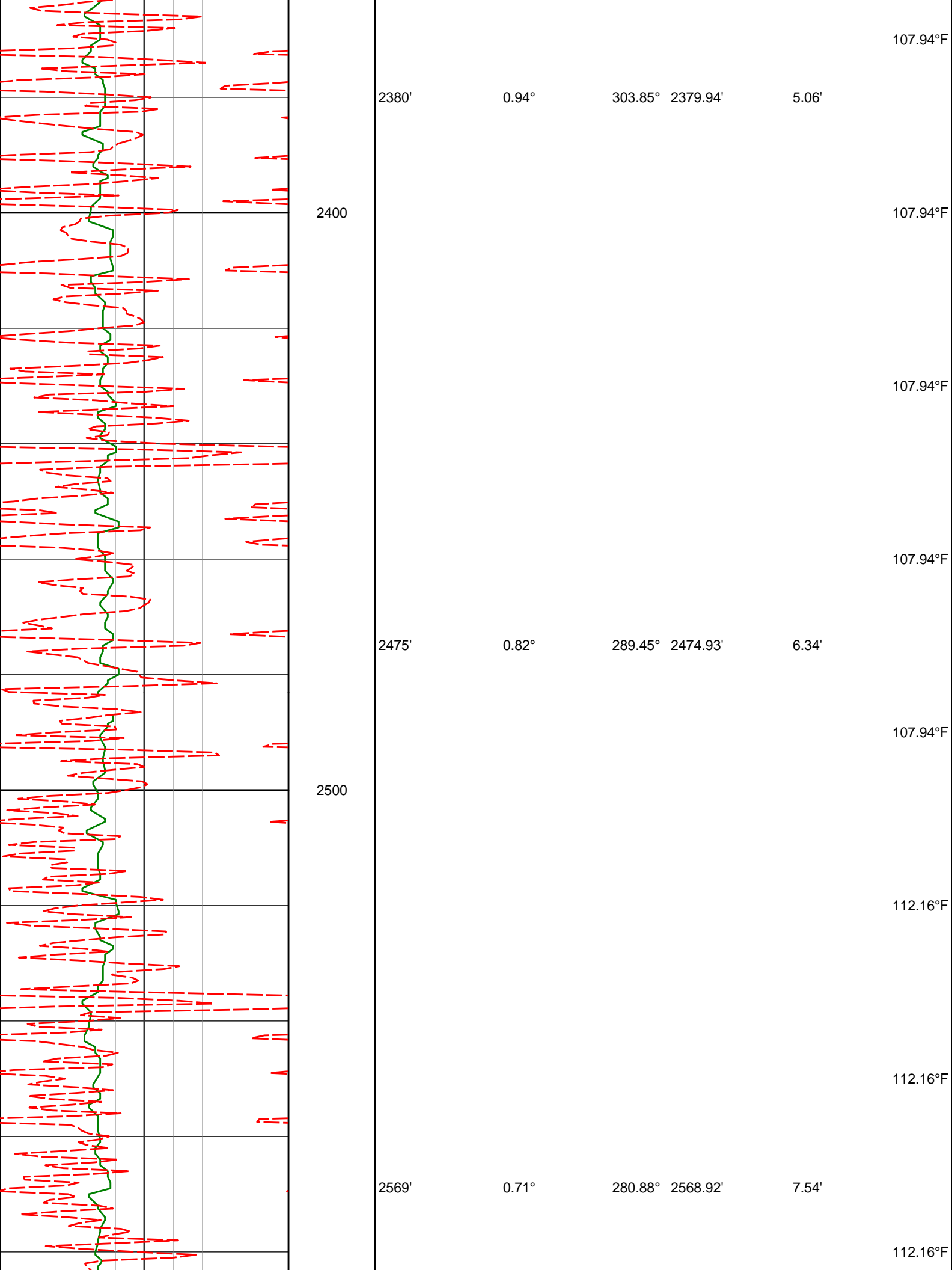
313.90°

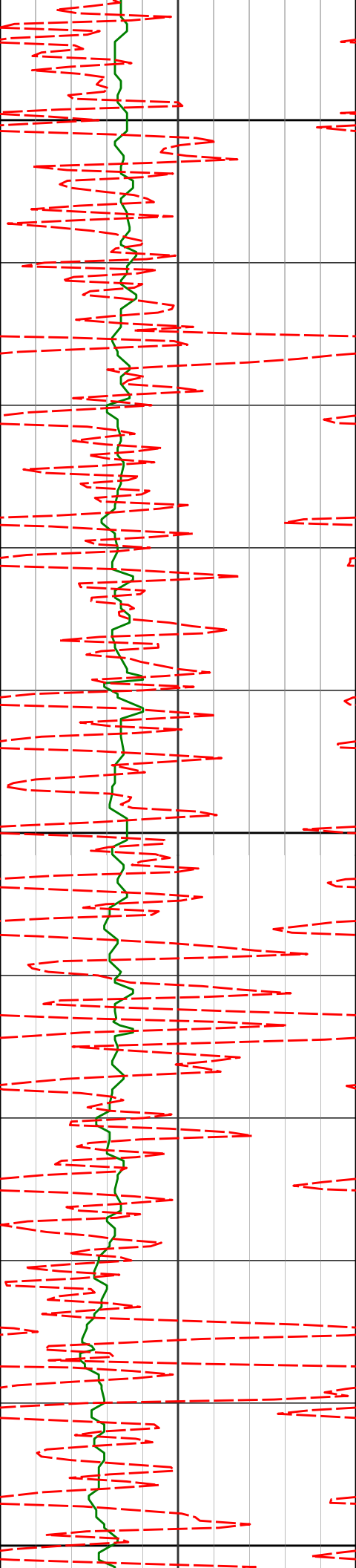
2285.95'

3.93'

103.72°F

107.94°F





2600

112.16°F

112.16°F

2664'

0.61°

272.60°

2663.91'

8.62'

112.16°F

2700

112.16°F

112.16°F

2759'

0.74°

260.61°

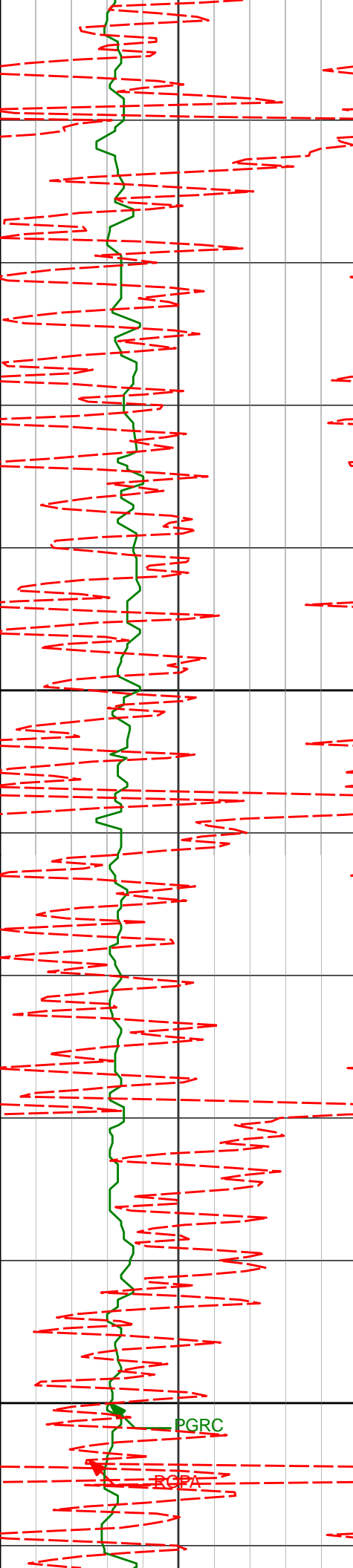
2758.90'

9.74'

112.16°F

116.38°F

2800



2900

3000

2853'

0.87°

253.23° 2852.90'

11.03'

2947'

0.65°

252.98° 2946.89'

12.23'

PGRC

RCPA

116.38°F

116.38°F

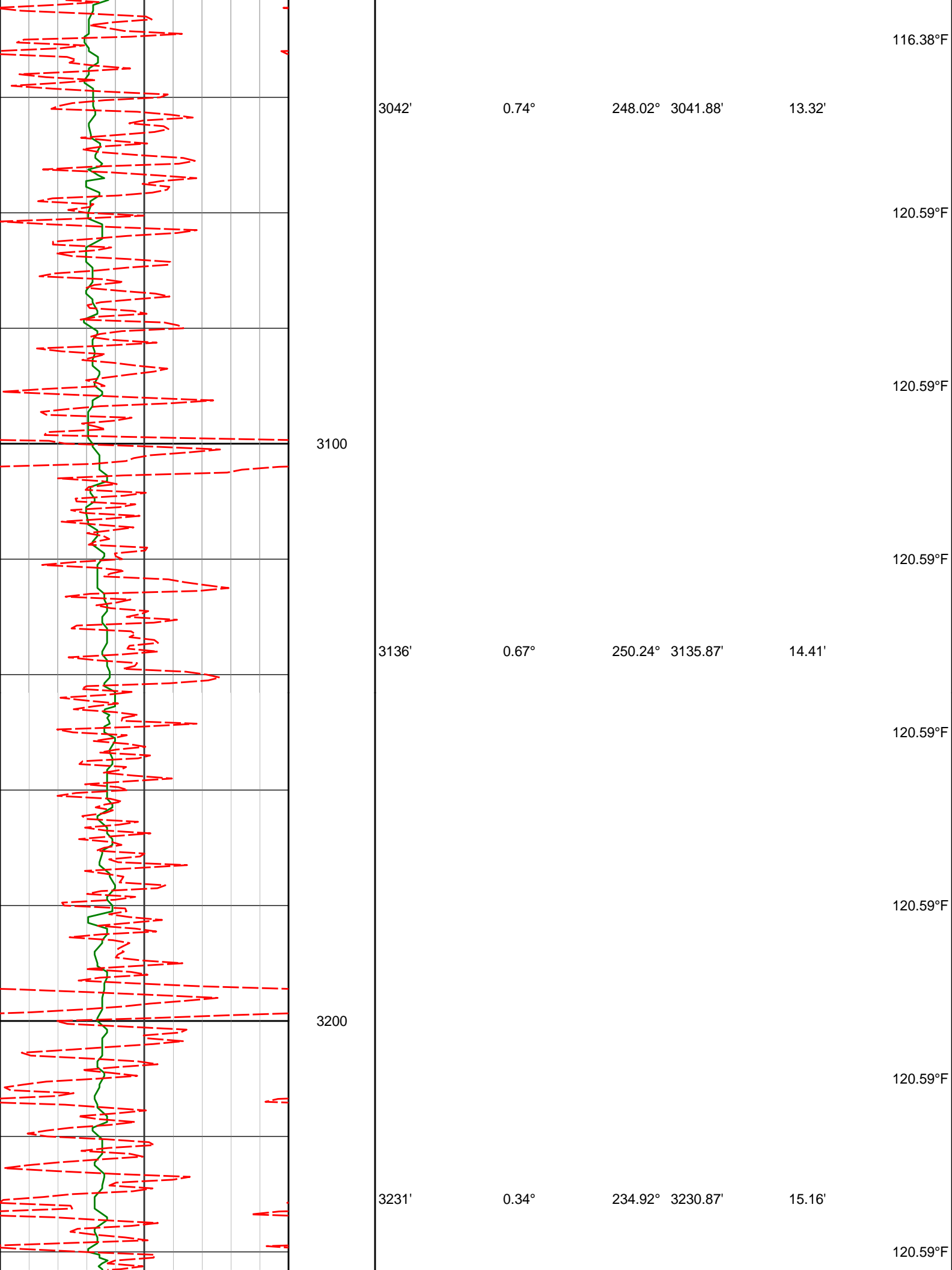
116.38°F

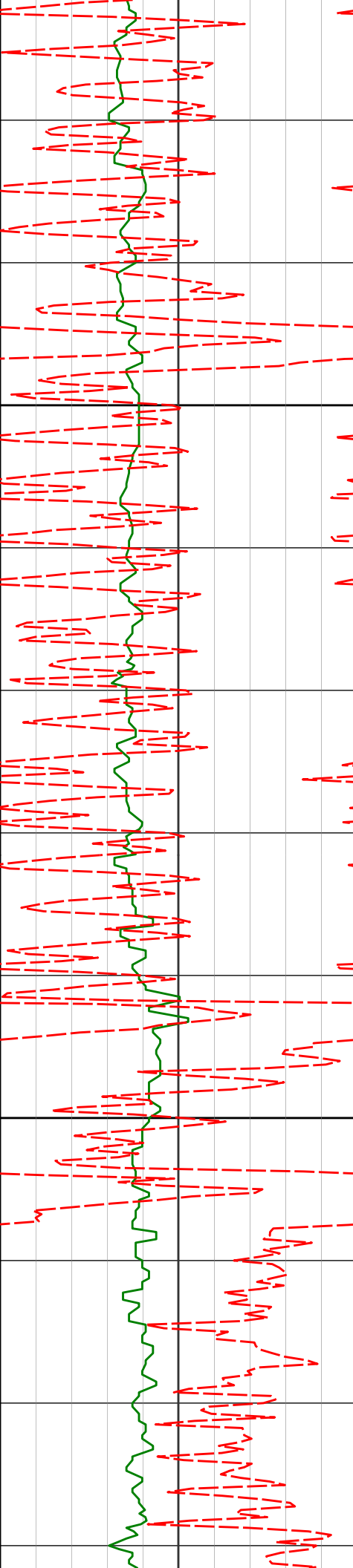
116.38°F

116.38°F

116.38°F

116.38°F





3300

3400

3444'

0.59°

43.00° 3443.87'

14.93'

120.59°F

120.59°F

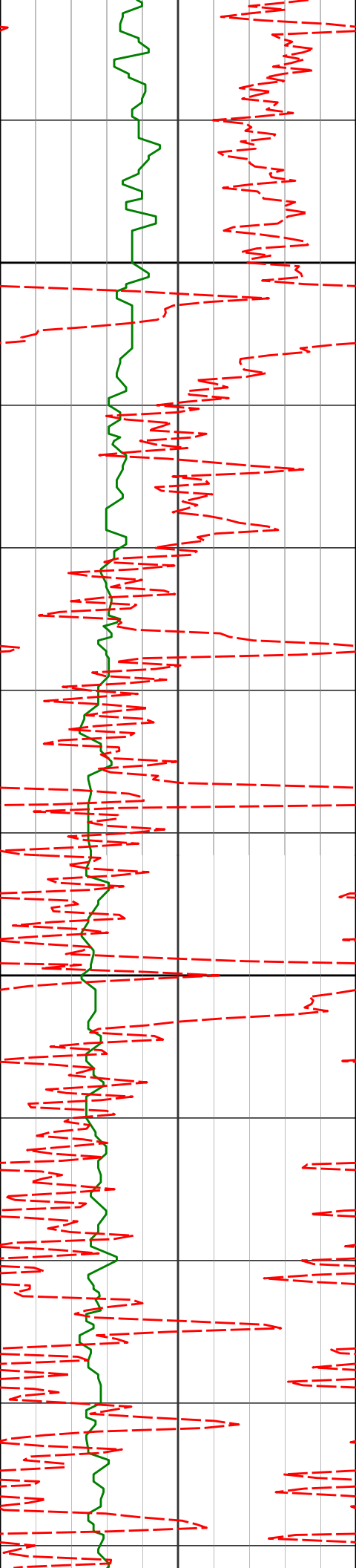
120.59°F

120.59°F

120.59°F

120.59°F

124.81°F



3500

3600

3633'

0.74°

58.67°

3632.85'

13.20'

124.81°F

124.81°F

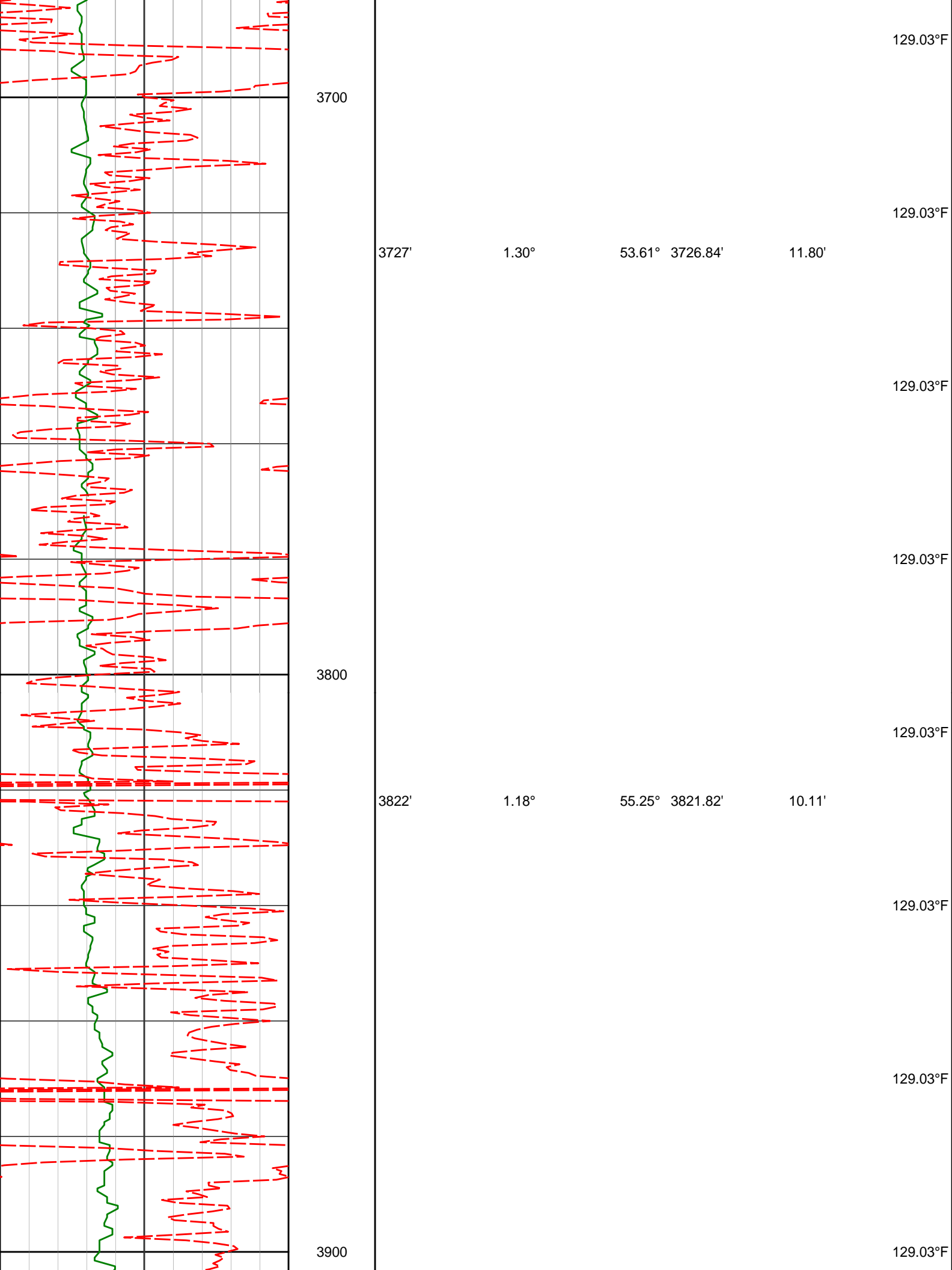
124.81°F

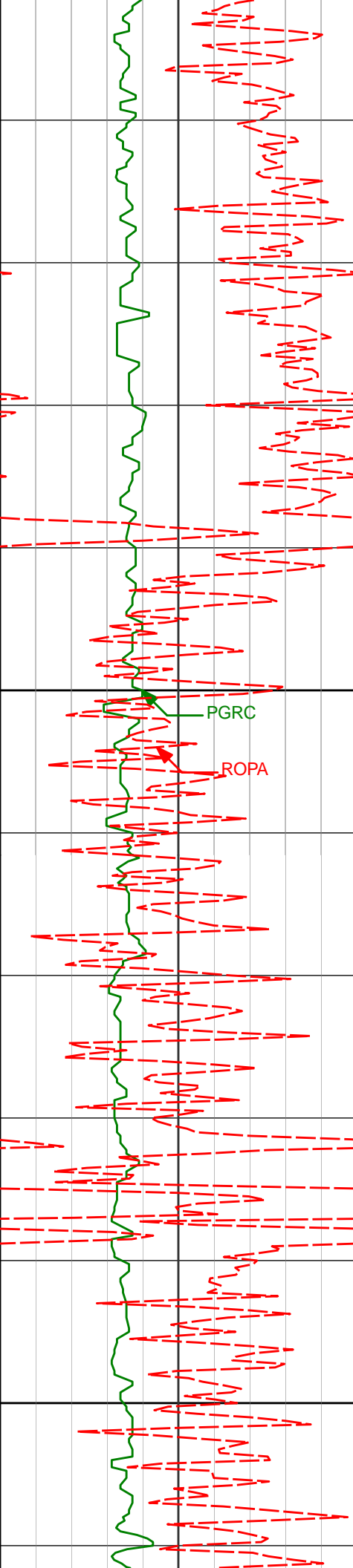
124.81°F

124.81°F

129.03°F

129.03°F





4000

4100

4011'

4106'

0.75°

0.63°

74.13°

73.79°

4010.79'

4105.78'

7.29'

6.18'

129.03°F

129.03°F

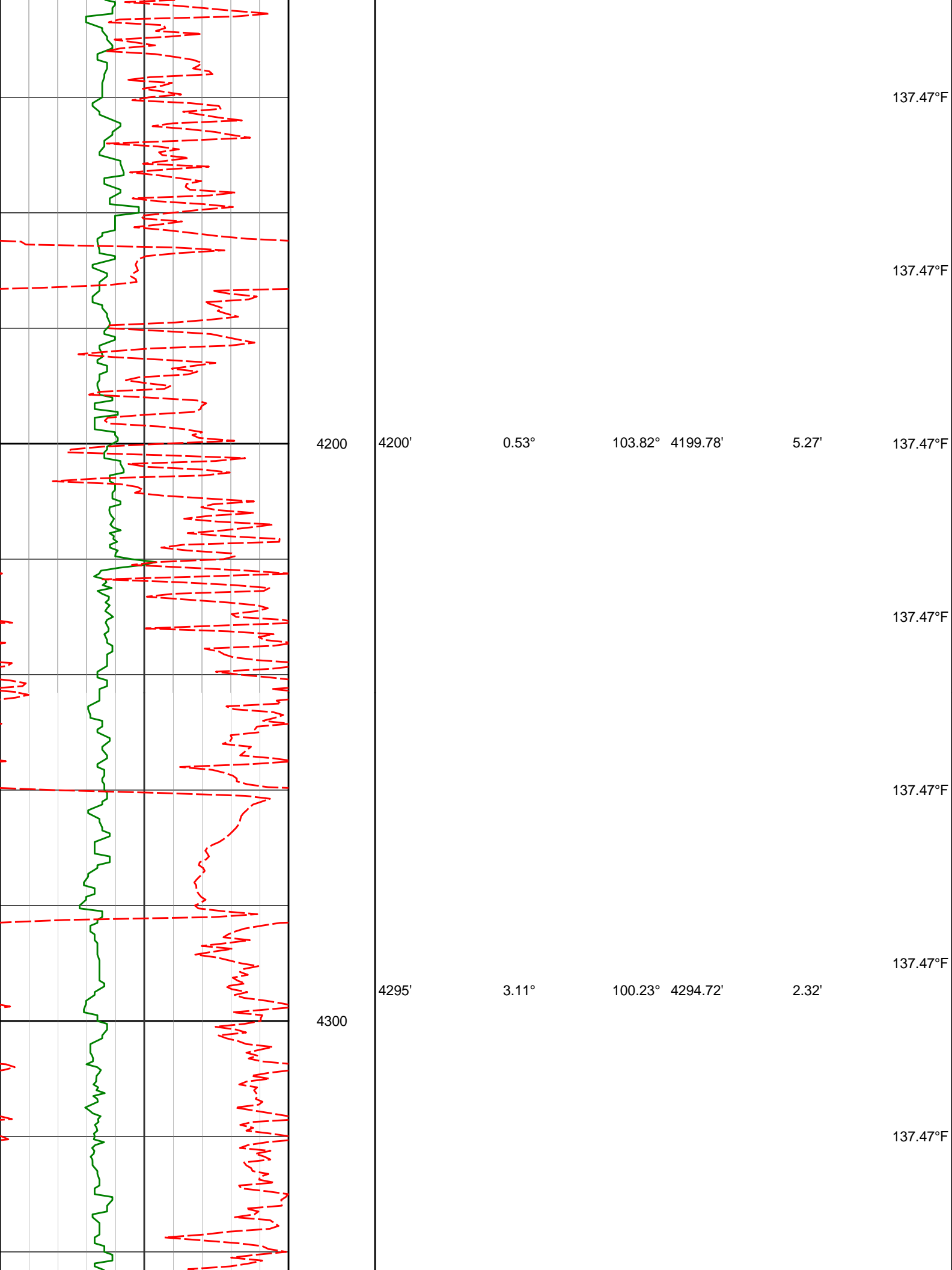
129.03°F

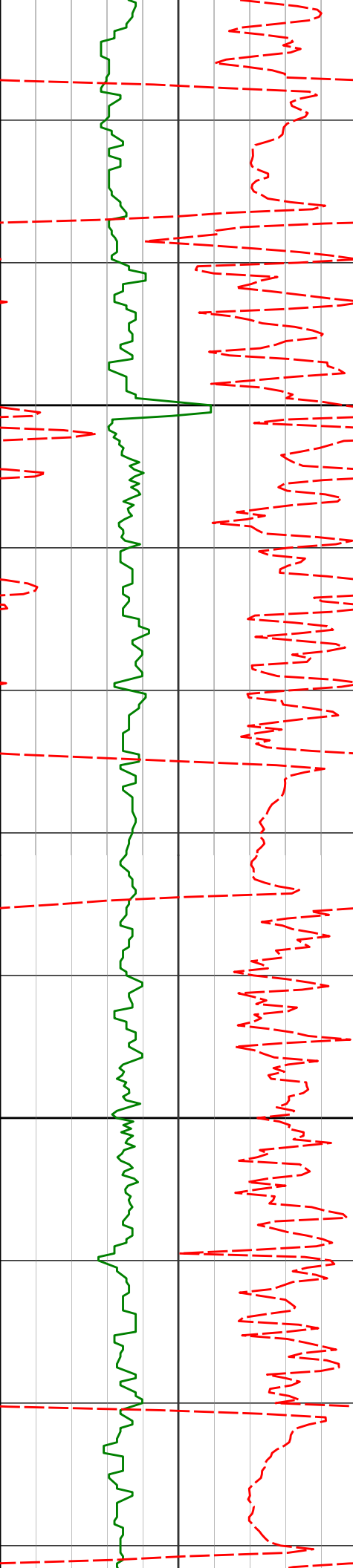
137.47°F

137.47°F

137.47°F

137.47°F





4400

4500

4389'

4.31°

94.15°

4388.52'

-3.71'

4483'

6.13°

92.64°

4482.13'

-12.24'

137.47°F

141.69°F

141.69°F

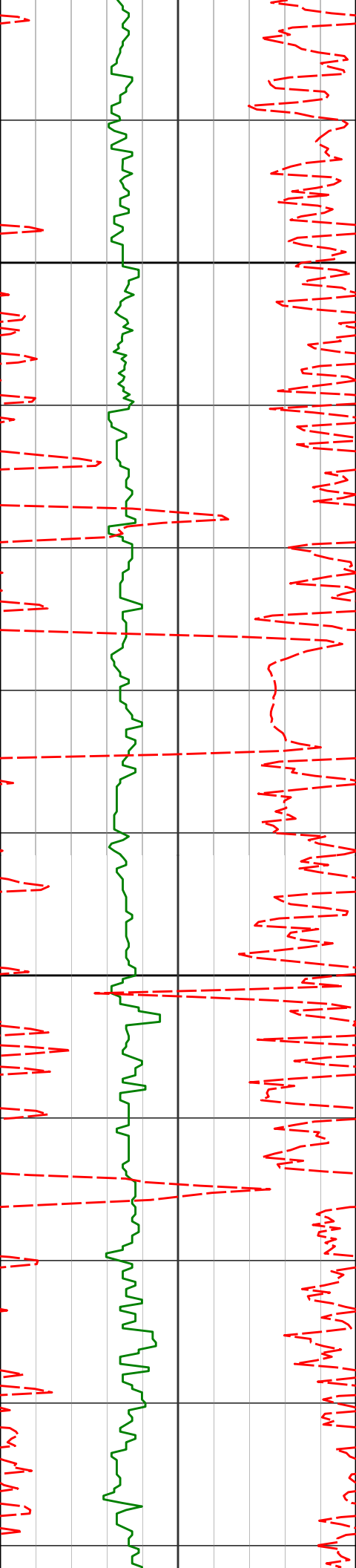
141.69°F

141.69°F

141.69°F

141.69°F

141.69°F



4578'

8.14°

93.32° 4576.39'

-24.01'

4600

141.69°F

141.69°F

141.69°F

141.69°F

4700

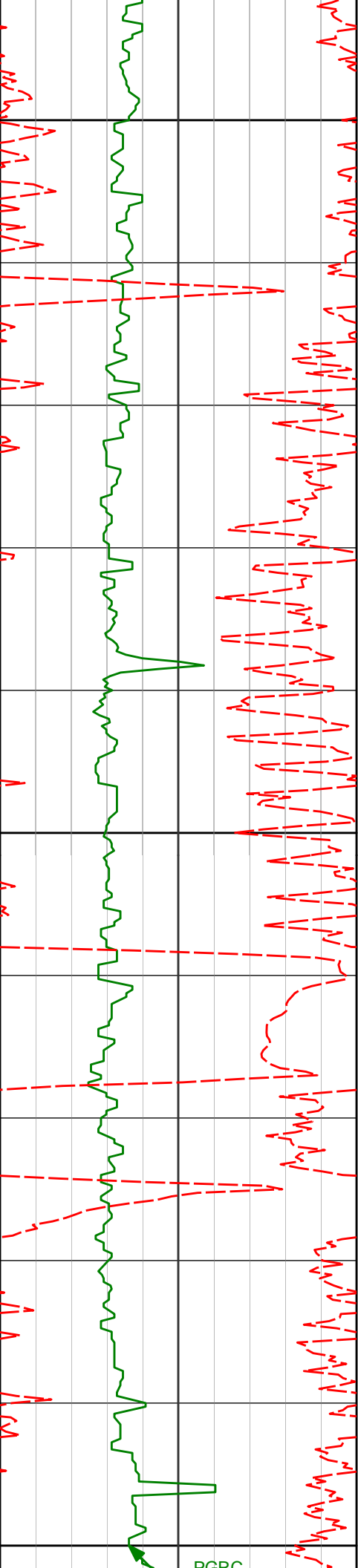
141.69°F

4767'

9.26°

90.85° 4763.21'

-52.56'



4800

4862'

8.49°

89.66°

4857.07'

-67.21'

4900

4956'

9.92°

93.43°

4949.86'

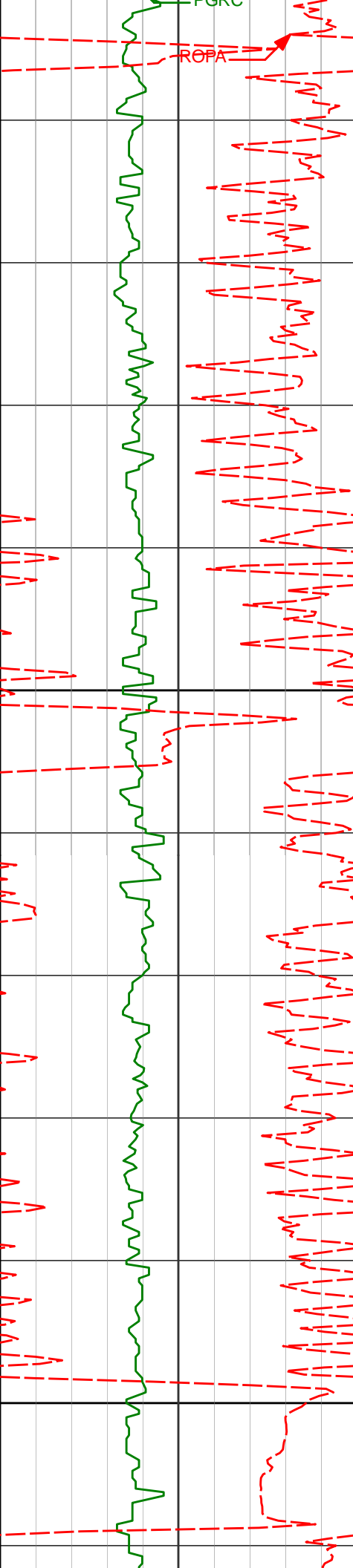
-82.21'

154.34°F

154.34°F

5000

PCPC



ROPA

FGRU

5100

5200

5146'

8.53°

89.82°

5137.40'

-112.61'

154.34°F

154.34°F

154.34°F

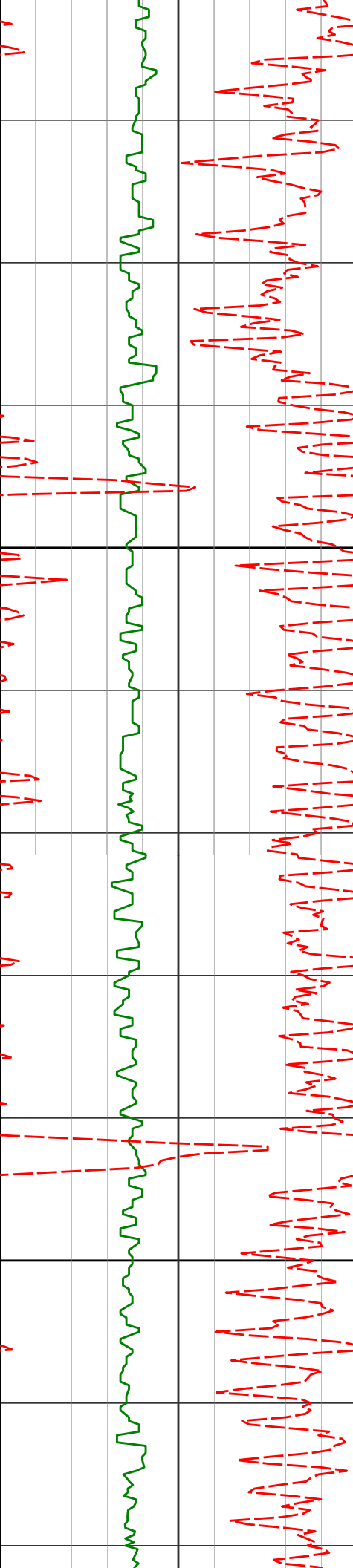
154.34°F

154.34°F

154.34°F

154.34°F

154.34°F



5300

5400

5240'

9.91°

92.09° 5230.19'

-127.66'

154.34°F

154.34°F

154.34°F

5335'

8.54°

90.69° 5323.96'

-142.87'

158.56°F

158.56°F

158.56°F

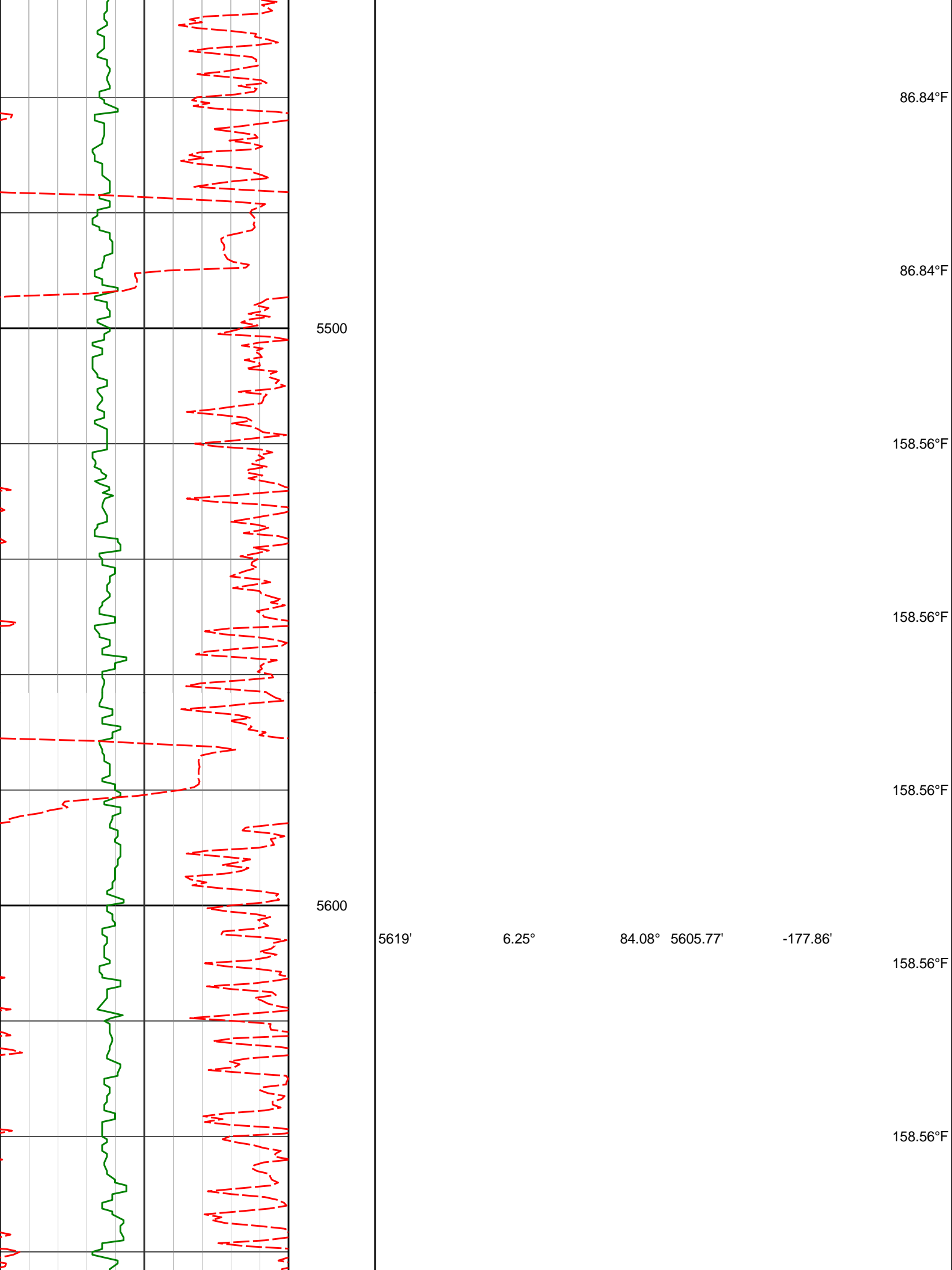
5430'

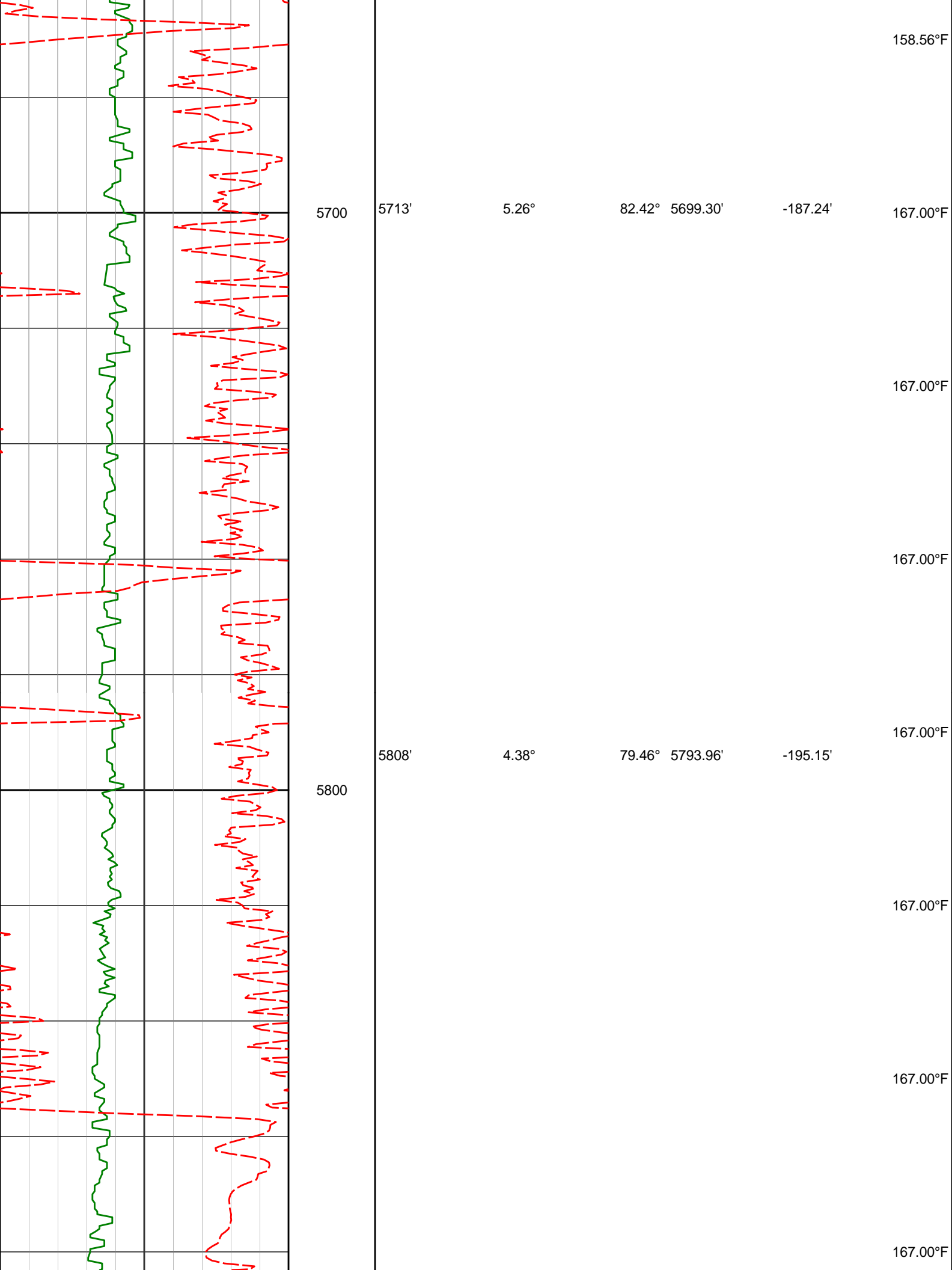
7.16°

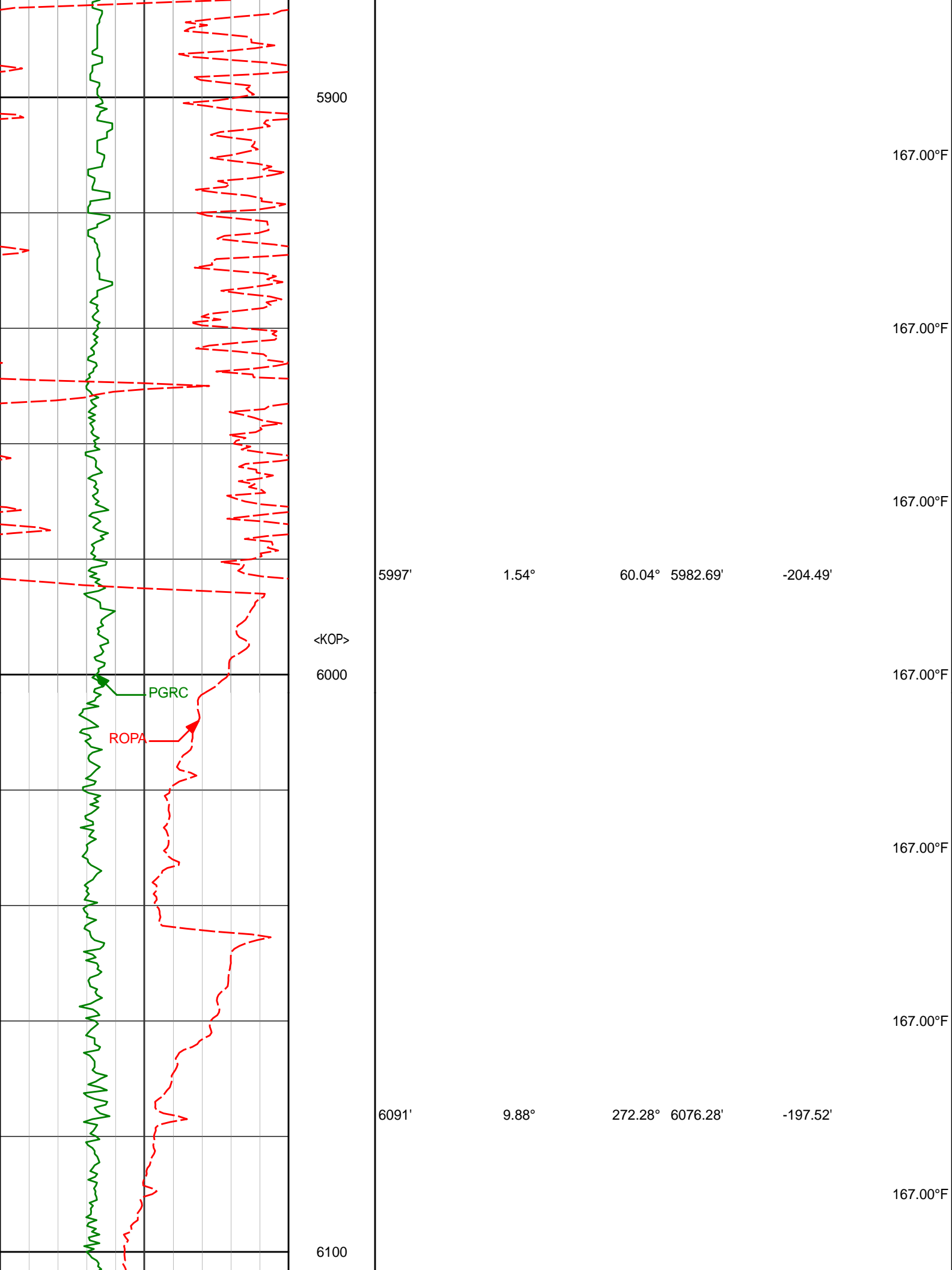
88.77° 5418.06'

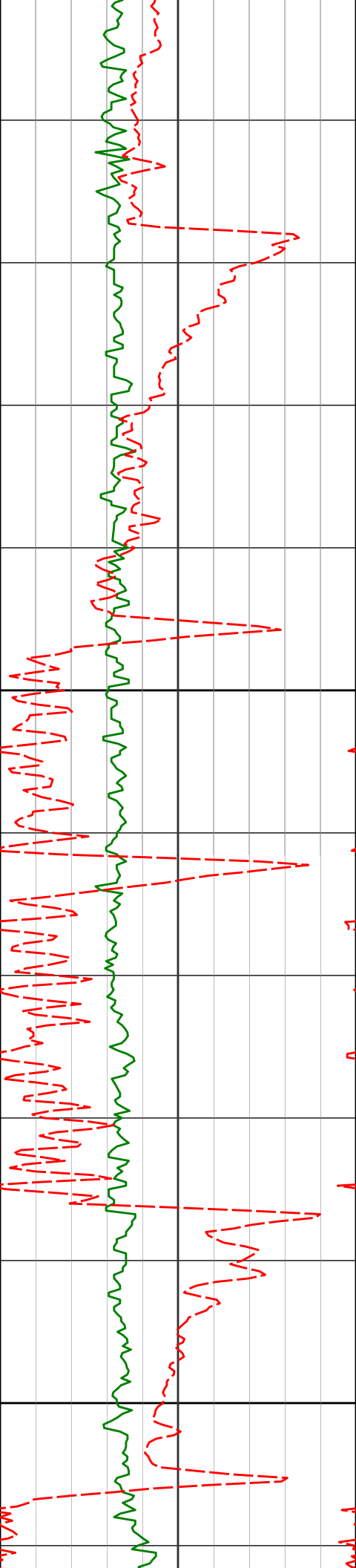
-155.84'

86.84°F









6200

6300

6186'

22.56°

271.67°

6167.31'

-171.07'

6281'

24.64°

271.10°

6254.36'

-133.08'

167.00°F

167.00°F

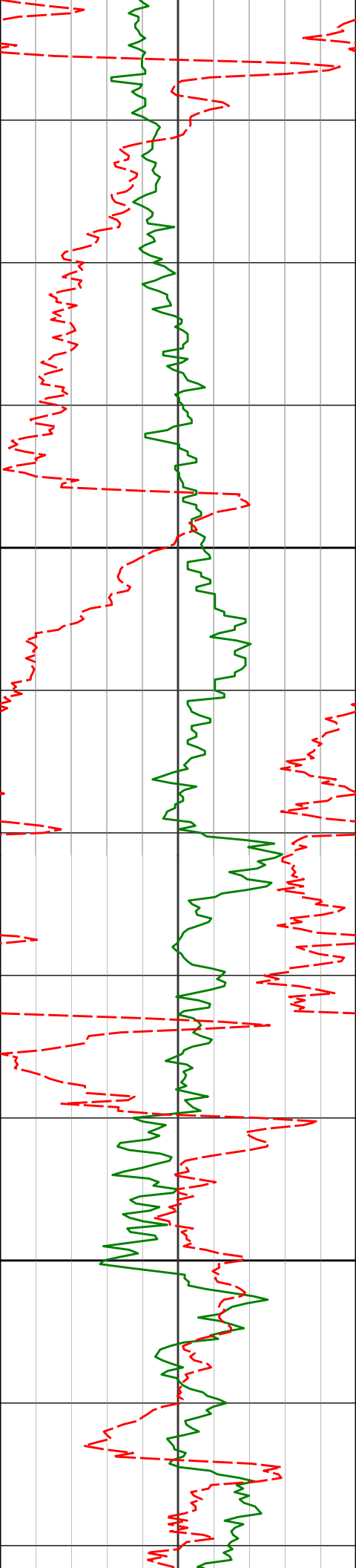
171.22°F

171.22°F

171.22°F

171.22°F

171.22°F



6400

6500

6375'

26.90°

267.32° 6339.01'

-92.24'

171.22°F

175.44°F

175.44°F

6470'

38.03°

264.01° 6419.05'

-41.44'

175.44°F

175.44°F

175.44°F

6564'

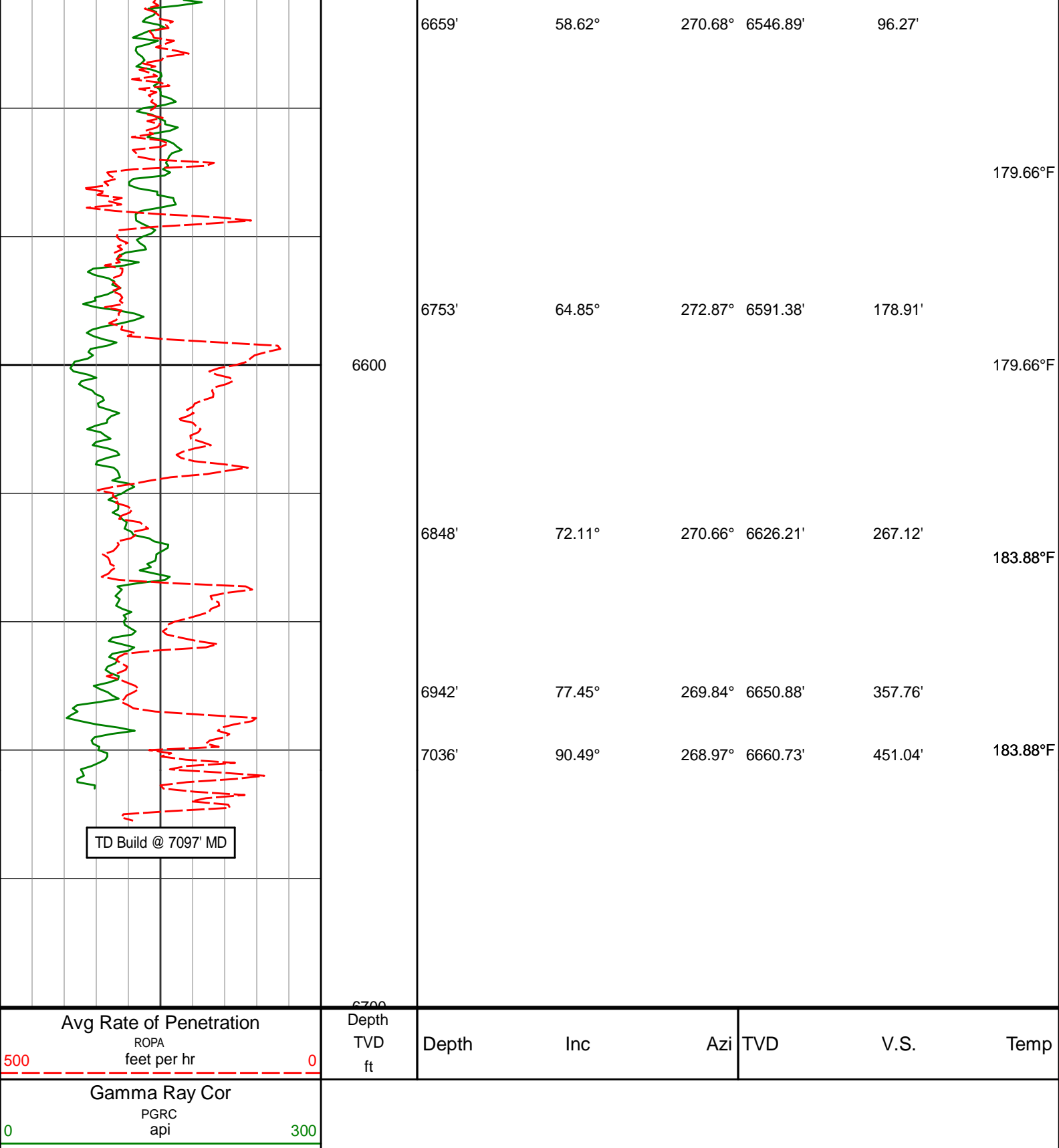
45.94°

268.21° 6488.88'

21.29'

179.66°F

179.66°F



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Shadow State A26-618
Wattenburg
Weld Colorado
USA

CA-XX-0903288403

| | | | | | | | |
|---------|-------|--------|---------|---------|----------|---------|--------|
| | | | | | | | |
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 N | 0.00 E | 0.00 | TIE-IN |
| 84.00 | 0.33 | 230.24 | 84.00 | 0.15 S | 0.19 W | 0.19 | 0.39 |
| 179.00 | 0.11 | 181.14 | 179.00 | 0.42 S | 0.40 W | 0.41 | 0.29 |
| 273.00 | 0.32 | 198.96 | 273.00 | 0.76 S | 0.49 W | 0.50 | 0.23 |
| 368.00 | 0.35 | 203.53 | 368.00 | 1.28 S | 0.69 W | 0.71 | 0.04 |
| 462.00 | 0.17 | 207.69 | 462.00 | 1.66 S | 0.87 W | 0.90 | 0.19 |
| 557.00 | 0.18 | 136.88 | 557.00 | 1.90 S | 0.83 W | 0.86 | 0.21 |
| 651.00 | 0.11 | 333.02 | 651.00 | 1.92 S | 0.77 W | 0.81 | 0.31 |
| 746.00 | 0.20 | 331.96 | 745.99 | 1.70 S | 0.89 W | 0.92 | 0.09 |
| 840.00 | 0.48 | 344.31 | 839.99 | 1.17 S | 1.07 W | 1.09 | 0.31 |
| 935.00 | 0.35 | 298.43 | 934.99 | 0.65 S | 1.44 W | 1.45 | 0.36 |
| 1029.00 | 0.21 | 319.00 | 1028.99 | 0.38 S | 1.80 W | 1.81 | 0.18 |
| 1124.00 | 0.09 | 75.37 | 1123.99 | 0.23 S | 1.84 W | 1.85 | 0.28 |
| 1218.00 | 0.05 | 26.73 | 1217.99 | 0.18 S | 1.75 W | 1.76 | 0.07 |
| 1313.00 | 0.17 | 113.72 | 1312.99 | 0.20 S | 1.61 W | 1.61 | 0.18 |
| 1407.00 | 0.11 | 120.67 | 1406.99 | 0.30 S | 1.40 W | 1.41 | 0.07 |
| 1502.00 | 0.17 | 38.38 | 1501.99 | 0.24 S | 1.23 W | 1.24 | 0.20 |
| 1596.00 | 0.11 | 231.29 | 1595.99 | 0.18 S | 1.22 W | 1.22 | 0.30 |
| 1691.00 | 0.46 | 179.60 | 1690.99 | 0.62 S | 1.29 W | 1.30 | 0.42 |
| 1785.00 | 0.56 | 176.86 | 1784.98 | 1.46 S | 1.26 W | 1.29 | 0.11 |
| 1880.00 | 0.33 | 244.25 | 1879.98 | 2.04 S | 1.48 W | 1.52 | 0.56 |
| 1907.00 | 0.40 | 283.52 | 1906.98 | 2.05 S | 1.64 W | 1.68 | 0.94 |
| 2002.00 | 0.69 | 353.94 | 2001.98 | 1.40 S | 2.02 W | 2.05 | 0.71 |
| 2097.00 | 0.89 | 335.45 | 2096.97 | 0.16 S | 2.39 W | 2.40 | 0.34 |
| 2191.00 | 0.78 | 324.29 | 2190.96 | 1.03 N | 3.07 W | 3.05 | 0.21 |
| 2286.00 | 0.87 | 313.90 | 2285.95 | 2.05 N | 3.96 W | 3.93 | 0.18 |
| 2380.00 | 0.94 | 303.85 | 2379.94 | 2.97 N | 5.12 W | 5.06 | 0.19 |
| 2475.00 | 0.82 | 289.45 | 2474.93 | 3.63 N | 6.41 W | 6.34 | 0.27 |
| 2569.00 | 0.71 | 280.88 | 2568.92 | 3.97 N | 7.62 W | 7.54 | 0.17 |
| 2664.00 | 0.61 | 272.60 | 2663.91 | 4.10 N | 8.70 W | 8.62 | 0.14 |
| 2759.00 | 0.74 | 260.61 | 2758.90 | 4.03 N | 9.82 W | 9.74 | 0.20 |
| 2853.00 | 0.87 | 253.23 | 2852.90 | 3.72 N | 11.10 W | 11.03 | 0.17 |
| 2947.00 | 0.65 | 252.98 | 2946.89 | 3.36 N | 12.29 W | 12.23 | 0.24 |
| 3042.00 | 0.74 | 248.02 | 3041.88 | 2.97 N | 13.38 W | 13.32 | 0.12 |
| 3136.00 | 0.67 | 250.24 | 3135.87 | 2.56 N | 14.46 W | 14.41 | 0.09 |
| 3231.00 | 0.34 | 234.92 | 3230.87 | 2.21 N | 15.21 W | 15.16 | 0.37 |
| 3444.00 | 0.59 | 43.00 | 3443.87 | 2.64 N | 14.98 W | 14.93 | 0.43 |
| 3633.00 | 0.74 | 58.67 | 3632.85 | 3.99 N | 13.27 W | 13.20 | 0.13 |
| 3727.00 | 1.30 | 53.61 | 3726.84 | 4.94 N | 11.89 W | 11.80 | 0.60 |
| 3822.00 | 1.18 | 55.25 | 3821.82 | 6.14 N | 10.22 W | 10.11 | 0.13 |
| 4011.00 | 0.75 | 74.13 | 4010.79 | 7.59 N | 7.43 W | 7.29 | 0.28 |
| 4106.00 | 0.63 | 73.79 | 4105.78 | 7.90 N | 6.33 W | 6.18 | 0.13 |
| 4200.00 | 0.53 | 103.82 | 4199.78 | 7.94 N | 5.42 W | 5.27 | 0.33 |
| 4295.00 | 3.11 | 100.23 | 4294.72 | 7.38 N | 2.45 W | 2.32 | 2.73 |
| 4389.00 | 4.31 | 94.15 | 4388.52 | 6.67 N | 3.58 E | -3.71 | 1.34 |
| 4483.00 | 6.13 | 92.64 | 4482.13 | 6.18 N | 12.13 E | -12.24 | 1.94 |
| 4578.00 | 8.14 | 93.32 | 4576.39 | 5.56 N | 23.92 E | -24.01 | 2.12 |
| 4767.00 | 9.26 | 90.85 | 4763.21 | 4.56 N | 52.48 E | -52.56 | 0.62 |
| 4862.00 | 8.49 | 89.66 | 4857.07 | 4.48 N | 67.13 E | -67.21 | 0.83 |
| 4956.00 | 9.92 | 93.43 | 4949.86 | 4.04 N | 82.15 E | -82.21 | 1.65 |
| 5146.00 | 8.53 | 89.82 | 5137.40 | 3.11 N | 112.58 E | -112.61 | 0.79 |
| 5240.00 | 9.91 | 92.09 | 5230.19 | 2.83 N | 127.63 E | -127.66 | 1.52 |
| 5335.00 | 8.54 | 90.69 | 5323.96 | 2.45 N | 142.85 E | -142.87 | 1.46 |
| 5430.00 | 7.16 | 88.77 | 5418.06 | 2.49 N | 155.82 E | -155.84 | 1.48 |
| 5619.00 | 6.25 | 84.08 | 5605.77 | 3.81 N | 177.82 E | -177.86 | 0.56 |
| 5713.00 | 5.26 | 82.42 | 5699.30 | 4.90 N | 187.18 E | -187.24 | 1.07 |
| 5808.00 | 4.38 | 79.46 | 5793.96 | 6.14 N | 195.07 E | -195.15 | 0.96 |
| 5997.00 | 1.54 | 60.04 | 5982.69 | 8.73 N | 204.37 E | -204.49 | 1.57 |
| 6091.00 | 9.88 | 272.28 | 6076.28 | 9.69 N | 197.38 E | -197.52 | 11.93 |
| 6186.00 | 22.56 | 271.67 | 6167.31 | 10.54 N | 170.91 E | -171.07 | 13.35 |
| 6281.00 | 24.64 | 271.10 | 6254.36 | 11.46 N | 132.89 E | -133.08 | 2.20 |
| 6375.00 | 26.90 | 267.32 | 6339.01 | 10.84 N | 92.06 E | -92.24 | 2.97 |
| 6470.00 | 38.03 | 264.01 | 6419.05 | 6.76 N | 41.33 E | -41.44 | 11.86 |
| 6564.00 | 45.94 | 268.21 | 6488.88 | 2.68 N | 21.34 W | 21.29 | 8.93 |
| 6659.00 | 58.62 | 270.68 | 6546.89 | 2.10 N | 96.32 W | 96.27 | 13.50 |
| 6753.00 | 64.85 | 272.87 | 6591.38 | 4.71 N | 179.03 W | 178.91 | 6.94 |
| 6848.00 | 72.11 | 270.66 | 6626.21 | 7.39 N | 267.30 W | 267.12 | 7.94 |
| 6942.00 | 77.45 | 269.84 | 6650.88 | 7.78 N | 357.97 W | 357.76 | 5.74 |
| 7036.00 | 90.49 | 268.97 | 6660.73 | 6.80 N | 451.24 W | 451.04 | 13.90 |
| 7131.00 | 91.81 | 267.53 | 6658.83 | 3.90 N | 546.17 W | 546.01 | 2.06 |

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 268.95 DEGREES (GRID)
A TOTAL CORRECTION OF 7.65 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7131.00 FEET
IS 546.18 FEET ALONG 270.41 DEGREES (GRID)**

Surveys corrected by Surcon starting at 1907 ft.

Final survey is a projection to TD.