



**1 : 600 / 1 : 240**

| WELL INFORMATION                 |                  |                   |  |  |  |
|----------------------------------|------------------|-------------------|--|--|--|
| MWD Run Number                   | 100              | 200               |  |  |  |
| Date run completed               | 18-Sep-15        | 21-Sep-15         |  |  |  |
| Rig Bit Number                   | 0100             | 0200              |  |  |  |
| Bit Size (in)                    | 8.750            | 6.125             |  |  |  |
| Tool Nominal OD (in)             | 6.750            | 4.750             |  |  |  |
| Log Start Depth (MD, ft)         | 629.00           | 6,841.00          |  |  |  |
| Log End Depth (MD, ft)           | 6,841.00         | 15,953.00         |  |  |  |
| Drill or Wipe                    | Drill            | Drill             |  |  |  |
| Drill/Wipe Start Date and Time   | 15-Sep-15 14:02  | 18-Sep-15 23:30   |  |  |  |
| Drill/Wipe End Date and Time     | 17-Sep-15 23:30  | 21-Sep-15 01:45   |  |  |  |
| Min Inc (deg) @ Depth (MD, ft)   | 0.19 @ 5,719.00  | 86.83 @ 6,879.00  |  |  |  |
| Max Inc (deg) @ Depth (MD, ft)   | 83.48 @ 6,776.00 | 92.75 @ 15,546.00 |  |  |  |
| Bit TFA(in2) / Bit Type          | 0.98 / PDC       | 0.98 / PDC        |  |  |  |
| Flow Rate (gpm)                  | 593.79           | 316.02            |  |  |  |
| 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 / 35.00    | 10.00 / 34.00     |  |  |  |
| Filtrate CL (ppm)                | 1,100.00         | 2,500.00          |  |  |  |
| pH / Fluid Loss (mptm)           | 9.40 / 8         | 10.30 / 6         |  |  |  |
| PV (cP) / YP (lbf2)              | 11 / 10.00       | 9 / 9.00          |  |  |  |
| % Solids / % Sand                | 11.70 / 0.10     | 7.70 / 0.10       |  |  |  |
| % 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         | 177.04 / PDM     | 217.70 / PDM      |  |  |  |

|                               |              |              |  |  |  |
|-------------------------------|--------------|--------------|--|--|--|
| Max Tool Temp (degF) / Source | 177.64 / PCM | 247.78 / PCM |  |  |  |
| Rm @ Max Tool Temp (degF)     | N/A @ N/A    | N/A @ N/A    |  |  |  |
| Lead MWD Engineer             | Brian Neu    | Brian Neu    |  |  |  |
| Customer Representative       | Derek D      | Derek D      |  |  |  |

## SENSOR INFORMATION

### Downhole Processor Information

|                           |                 |                 |  |  |  |
|---------------------------|-----------------|-----------------|--|--|--|
| Tool Type                 | PCM             | PCM             |  |  |  |
| Software Version          | 5.93            | 5.93            |  |  |  |
| Sub Serial Number         | 11404299        | 12334773        |  |  |  |
| Insert Serial Number      | 11400842        | 11400842        |  |  |  |
| Date and Time Initialized | 15-Sep-15 14:52 | 18-Sep-15 15:28 |  |  |  |
| Date and Time Read        | 18-Sep-15 03:12 | 21-Sep-15 14:14 |  |  |  |
| ECMB SW Version           | N/A             | N/A             |  |  |  |

### Directional Sensor Information

|                        |          |          |  |  |  |
|------------------------|----------|----------|--|--|--|
| Tool Type              | PCDC     | PCDC     |  |  |  |
| Distance From Bit (ft) | 65.00    | 67.00    |  |  |  |
| Software Version       | 6.33     | 6.33     |  |  |  |
| Sub Serial Number      | 11404299 | 12334773 |  |  |  |
| Sonde Serial Number    | 11902092 | 11902092 |  |  |  |
| Sensor ID Number       | N/A      | N/A      |  |  |  |
| Toolface Offset (deg)  | 331.60   | 189.40   |  |  |  |

### Gamma Ray Sensor Information

|                              |          |          |  |  |  |
|------------------------------|----------|----------|--|--|--|
| Tool Type                    | PCG      | PCG      |  |  |  |
| Distance From Bit (ft)       | 58.76    | 60.61    |  |  |  |
| Recorded Sample Period (sec) | 10       | 10       |  |  |  |
| Software Version             | 8.15     | 8.15     |  |  |  |
| Sub Serial Number            | 11404299 | 12334773 |  |  |  |
| Insert/Sonde Serial Number   | 11681061 | 11681061 |  |  |  |

## REMARKS

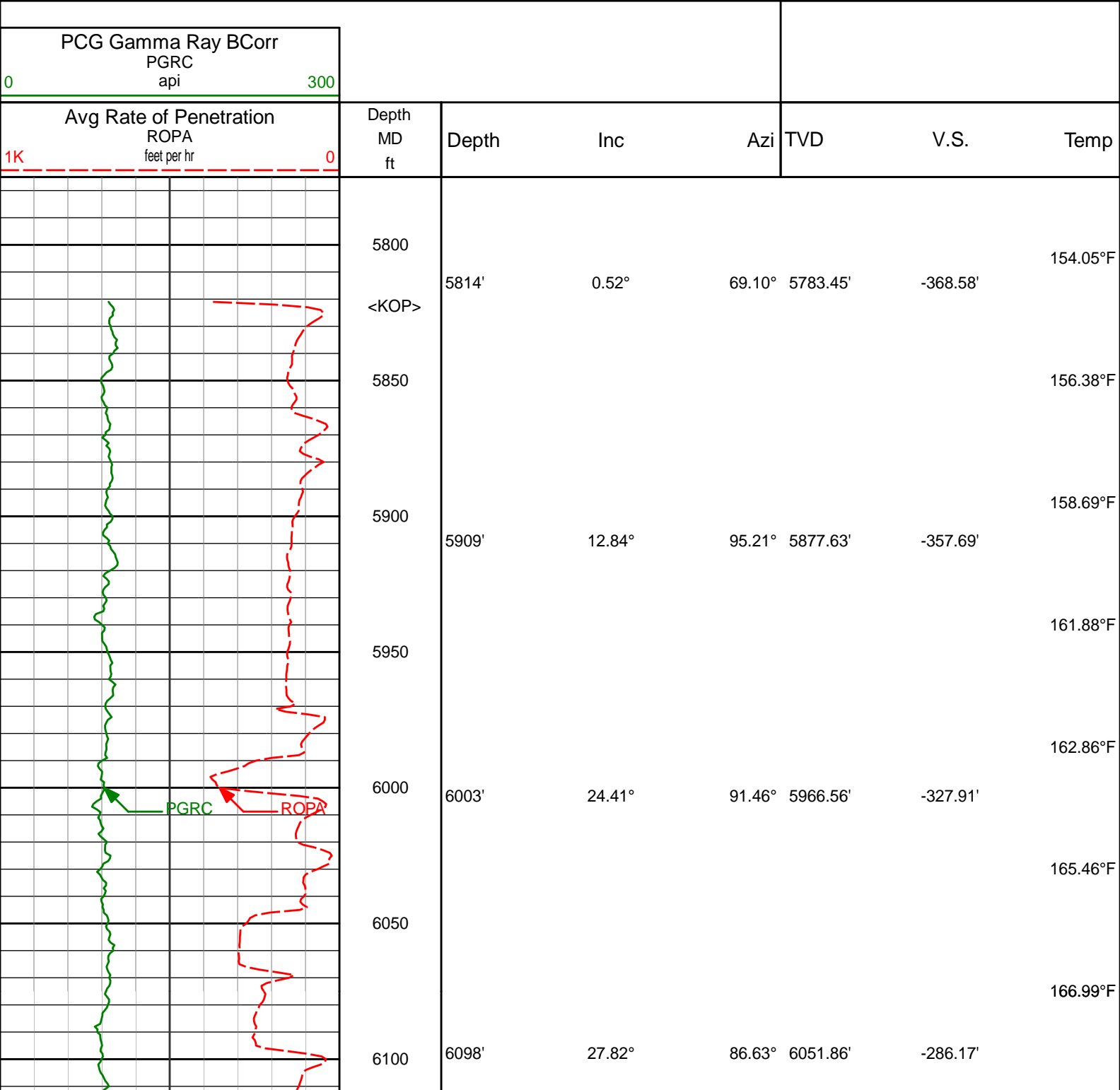
1. All depths are calibrated to driller's pipe tally and are total vertical depth from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. Environmental parameters used in gamma and resistance processing:  
Hole Size: 6.125"  
Mud Density: 9.9-10.3
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)

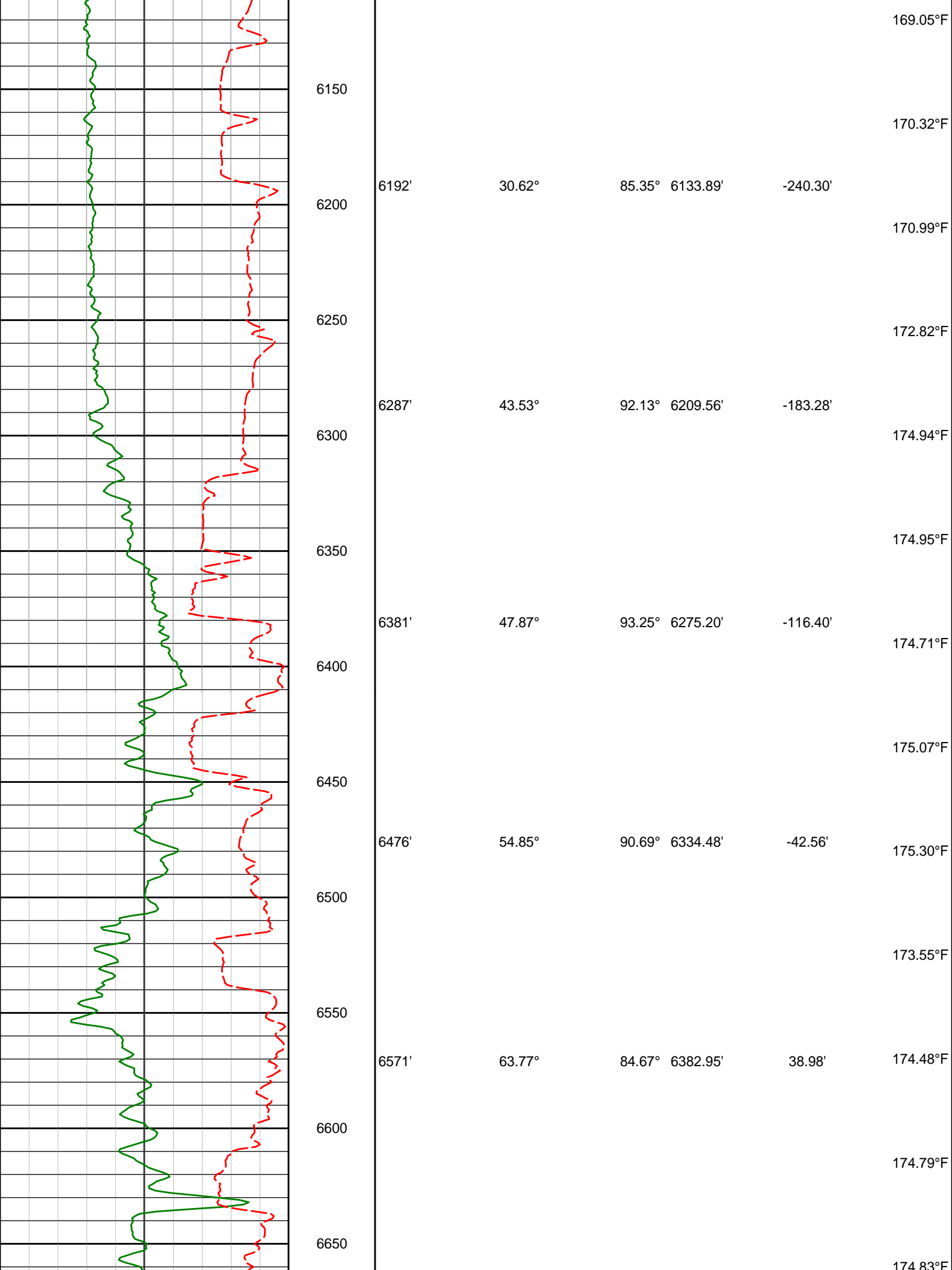
## WARRANTY

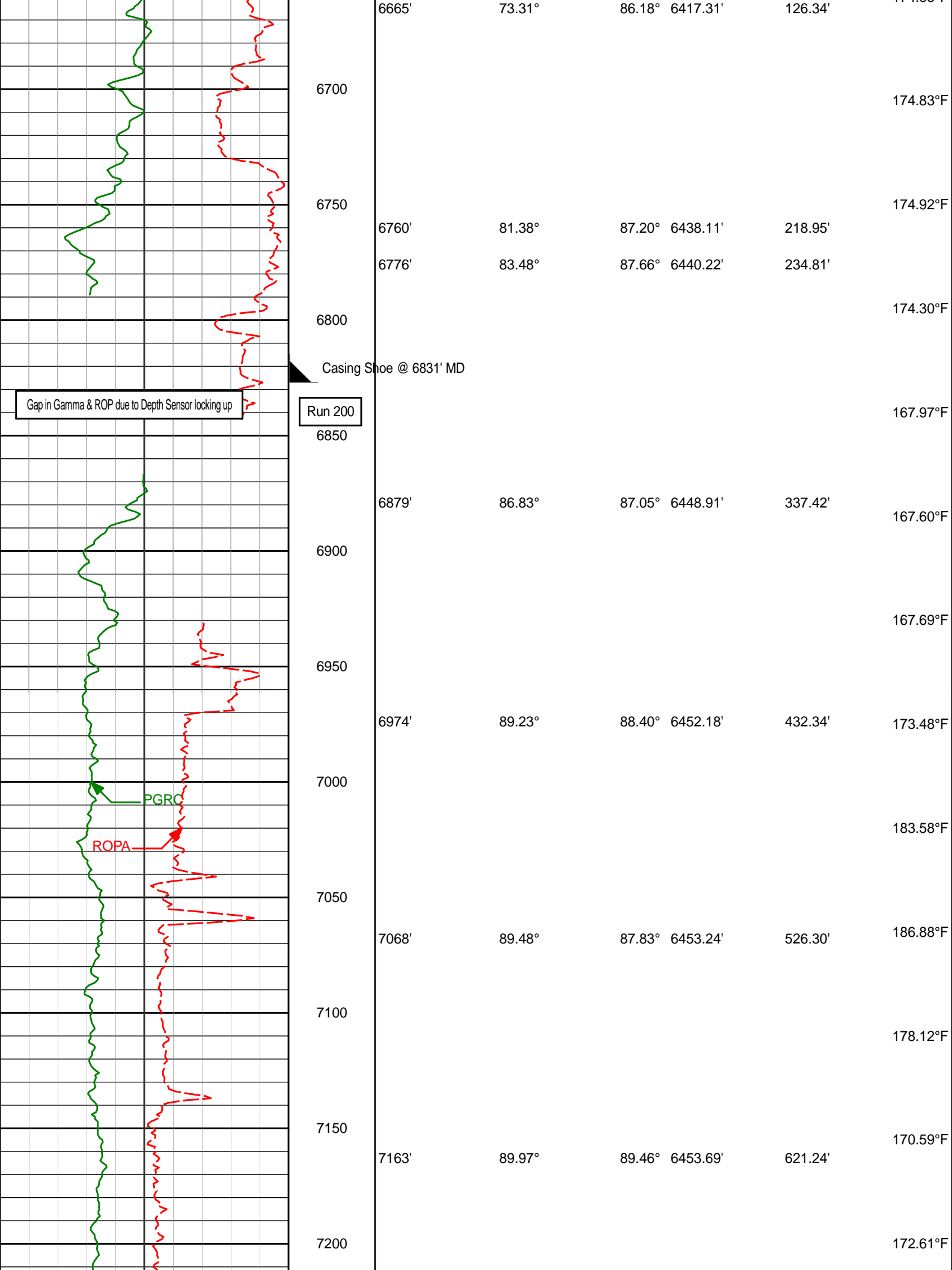
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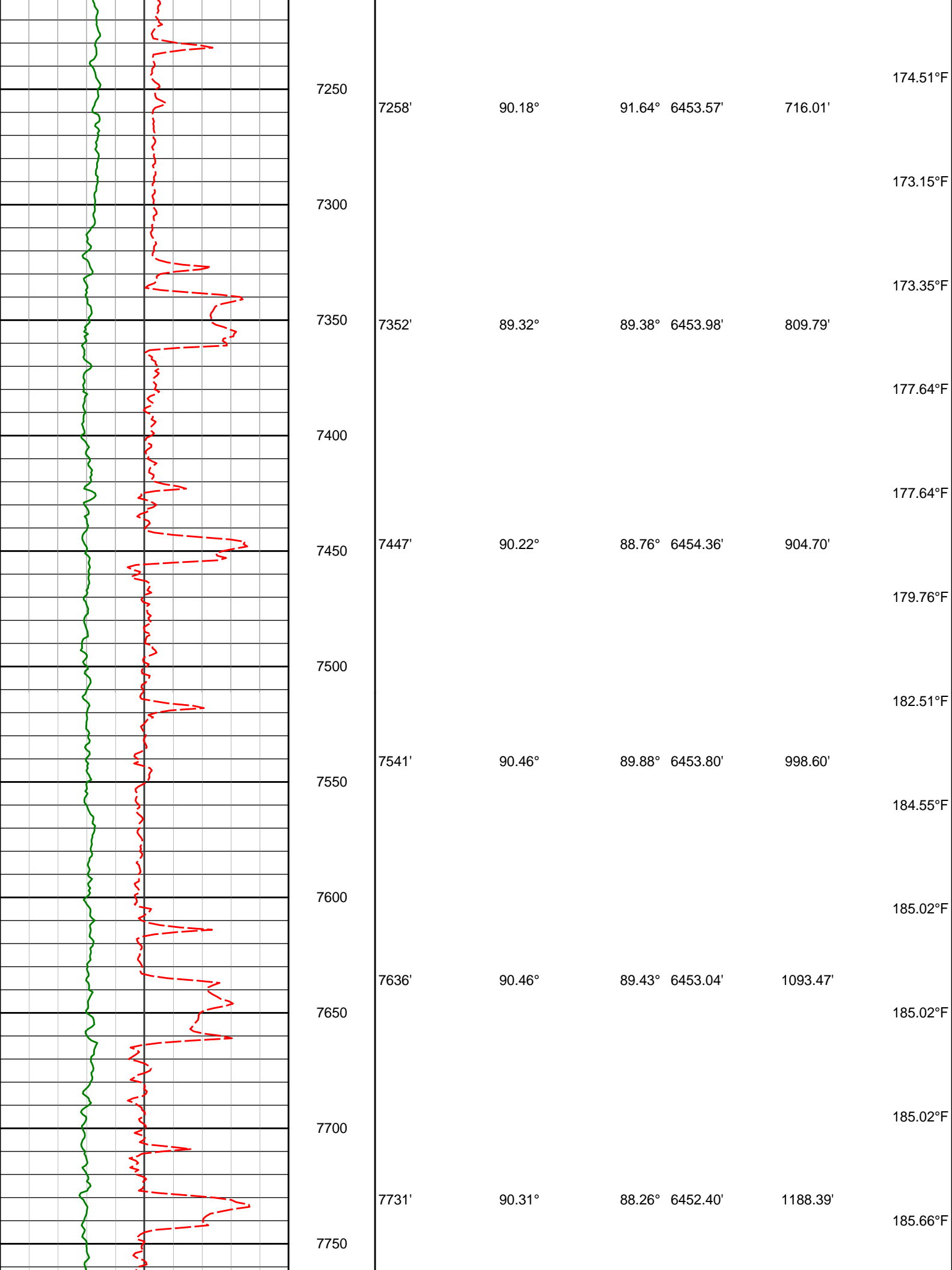
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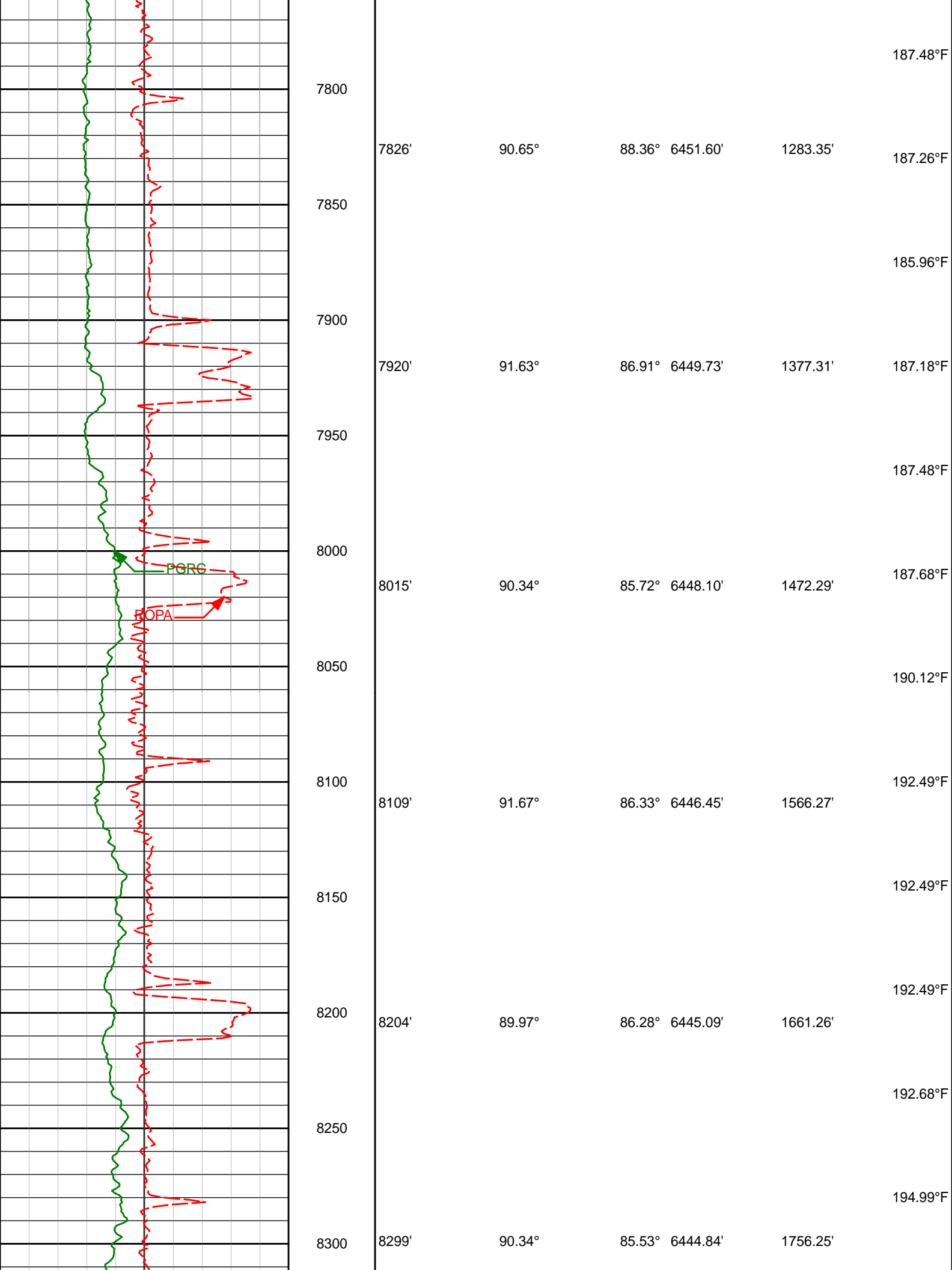
# MD Detail 1:600 Scale

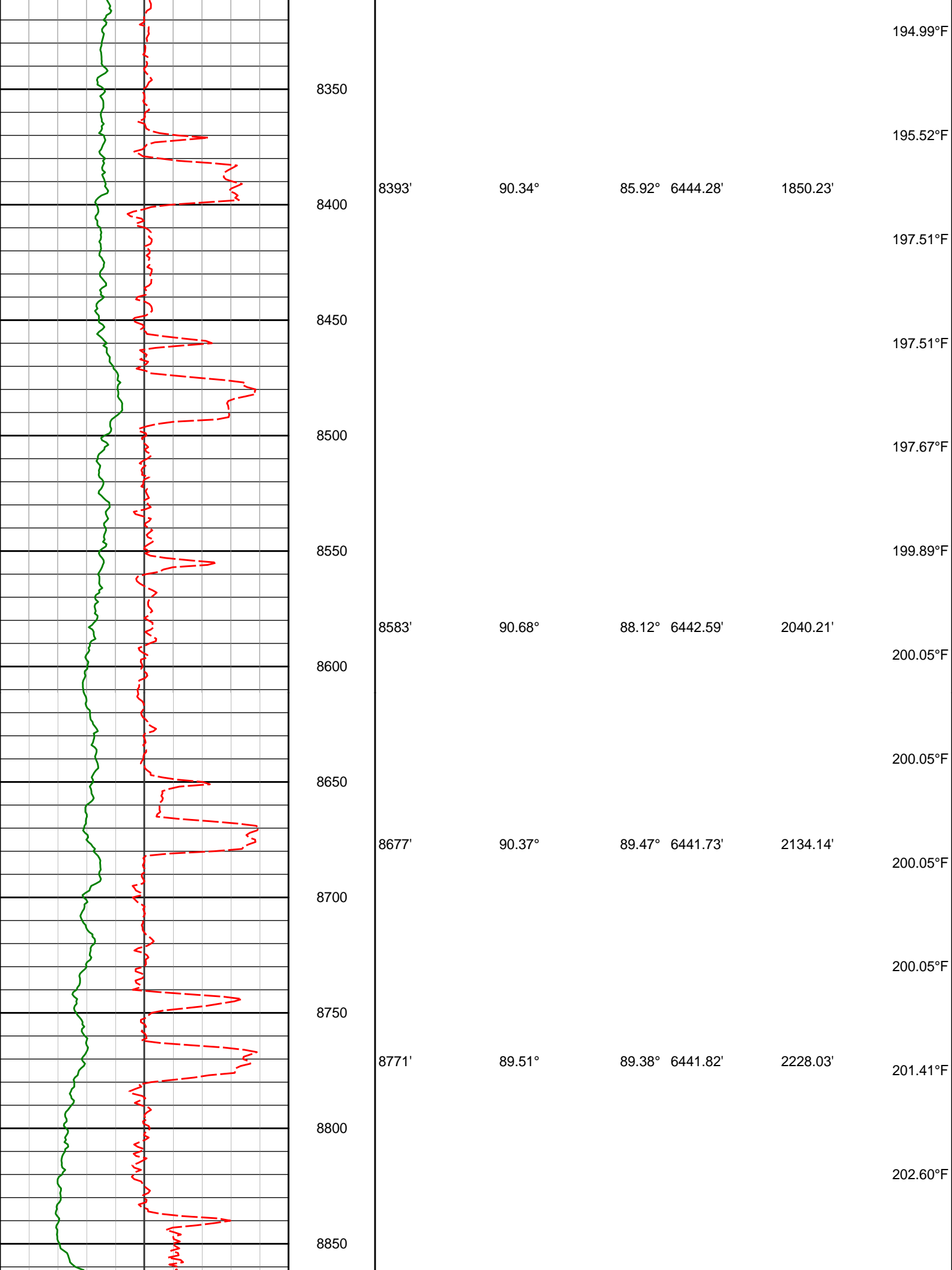




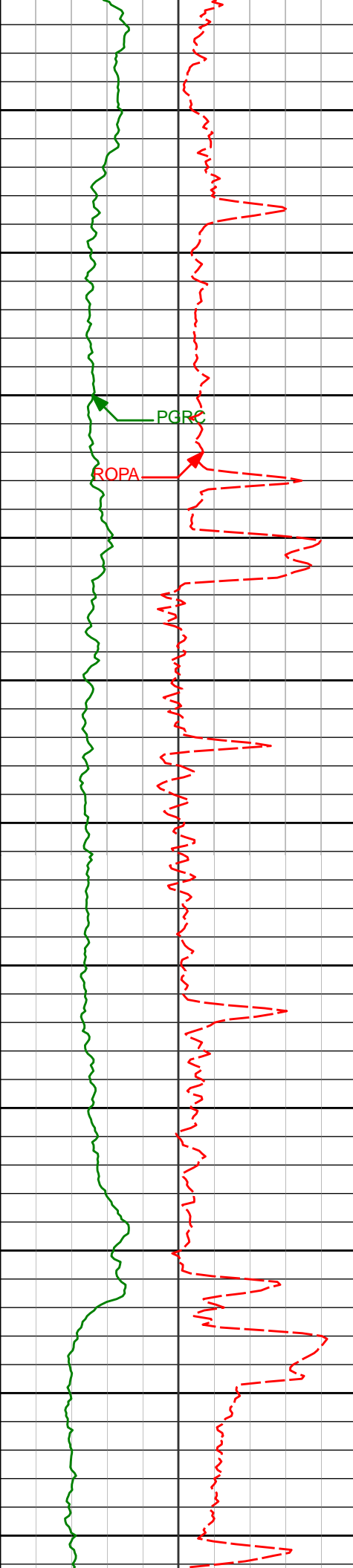




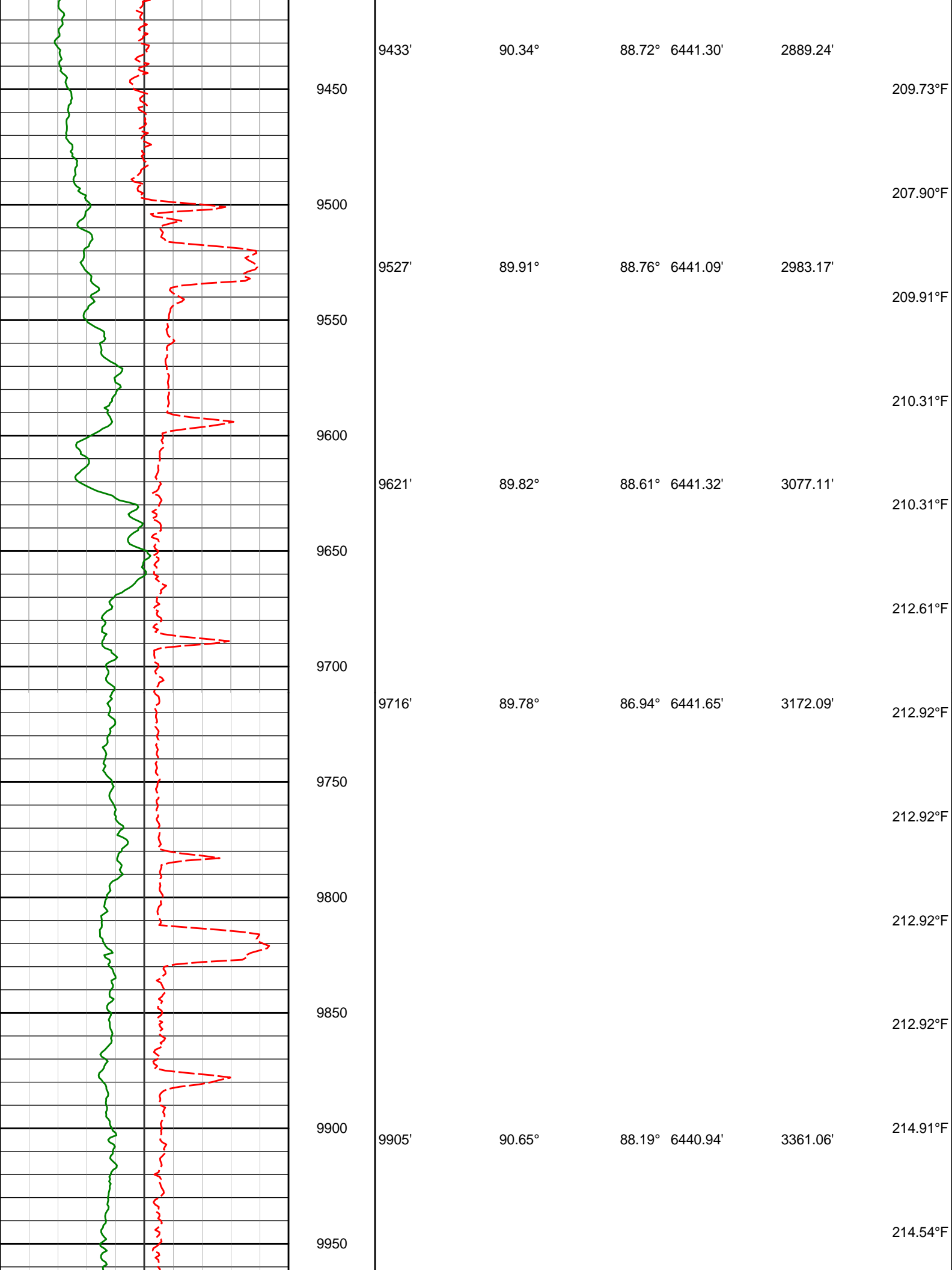


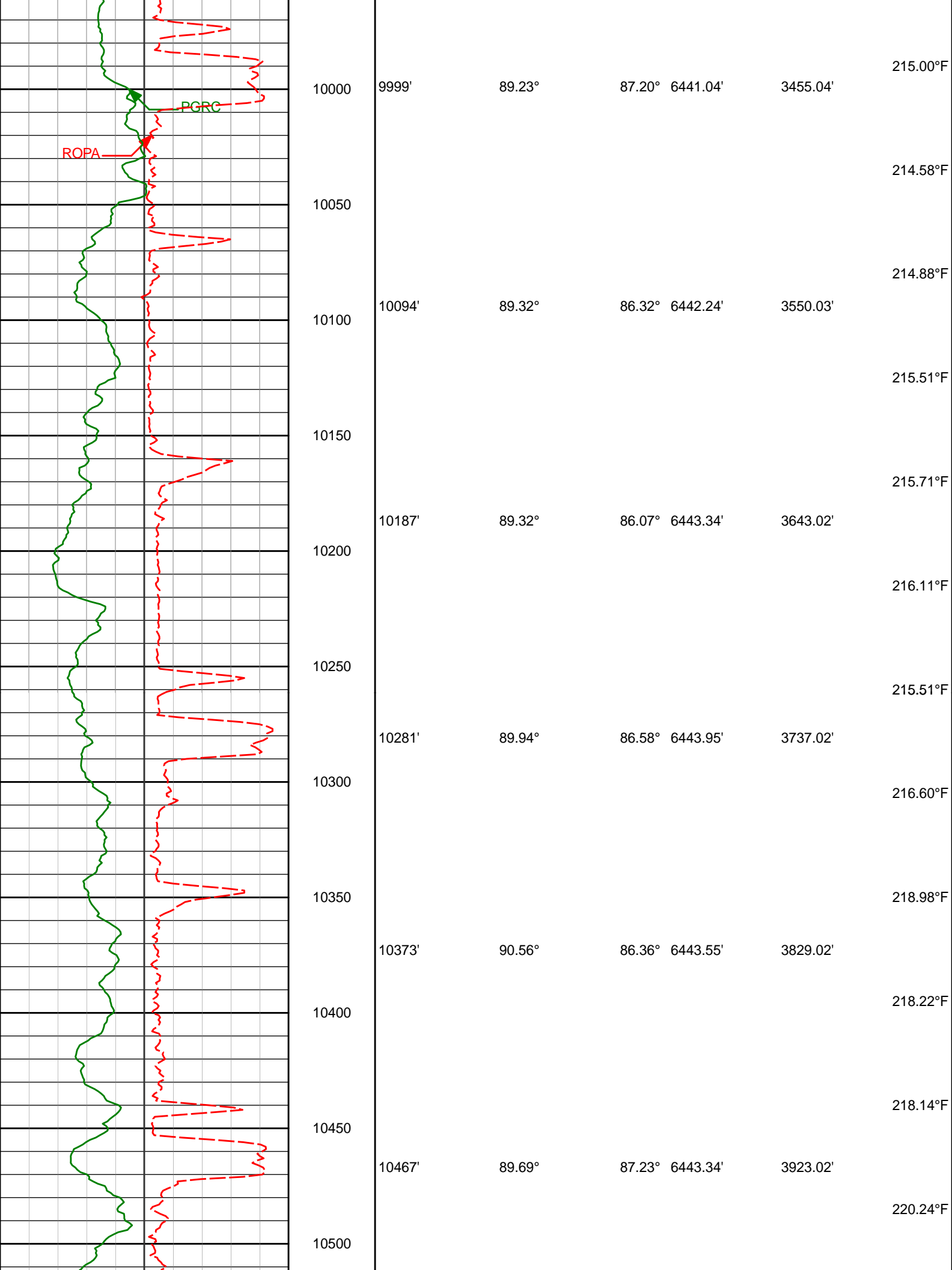


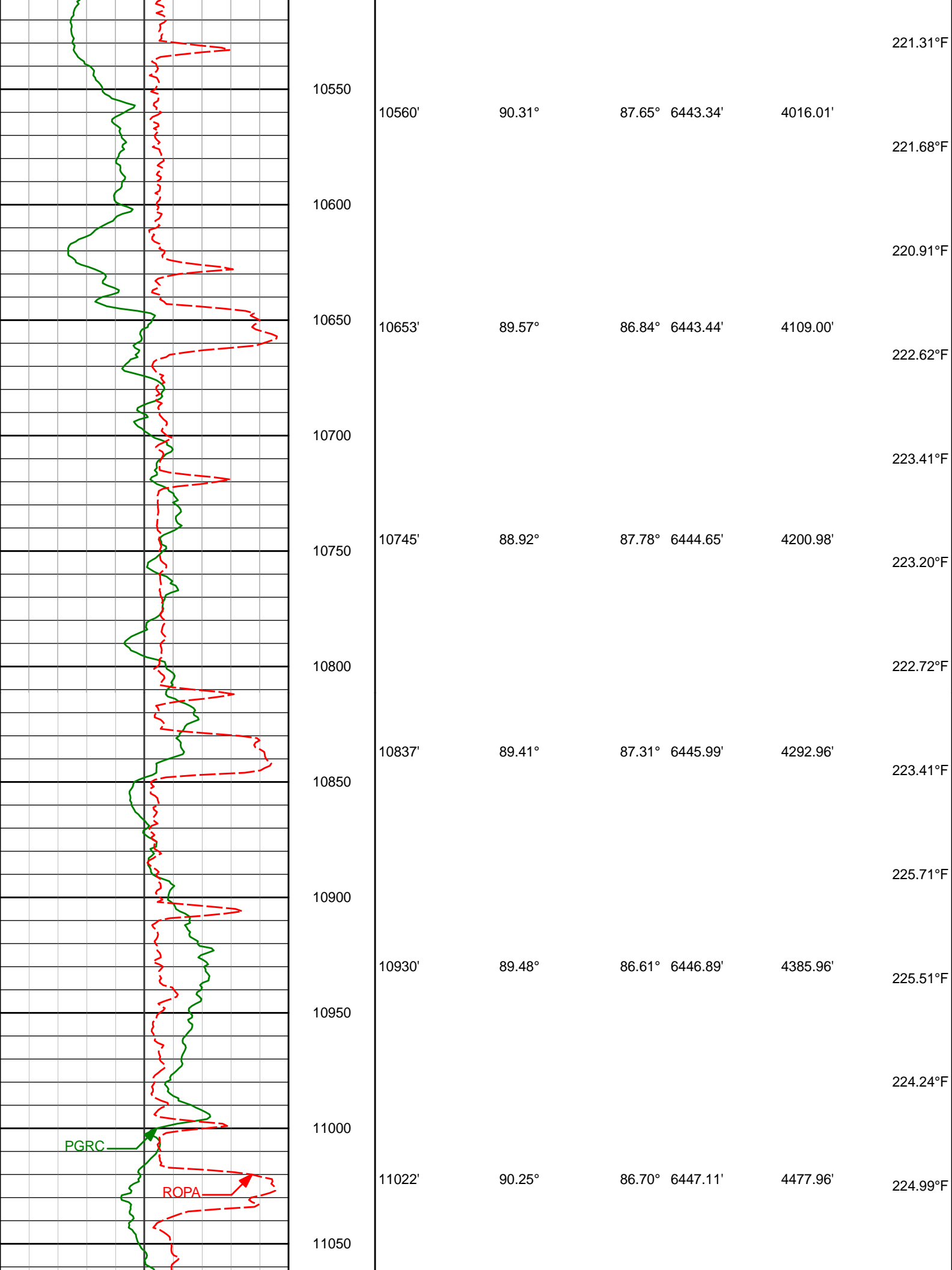


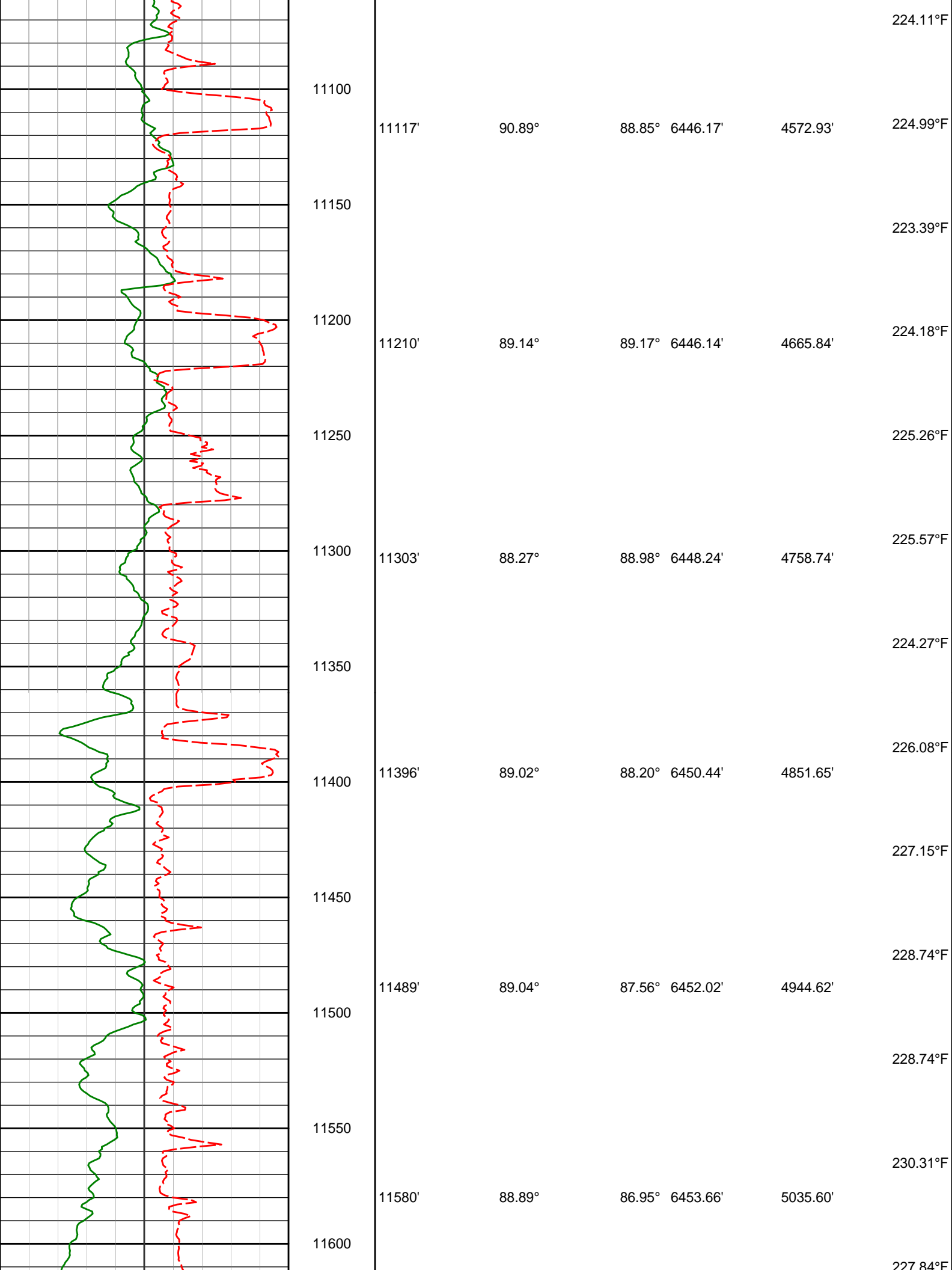


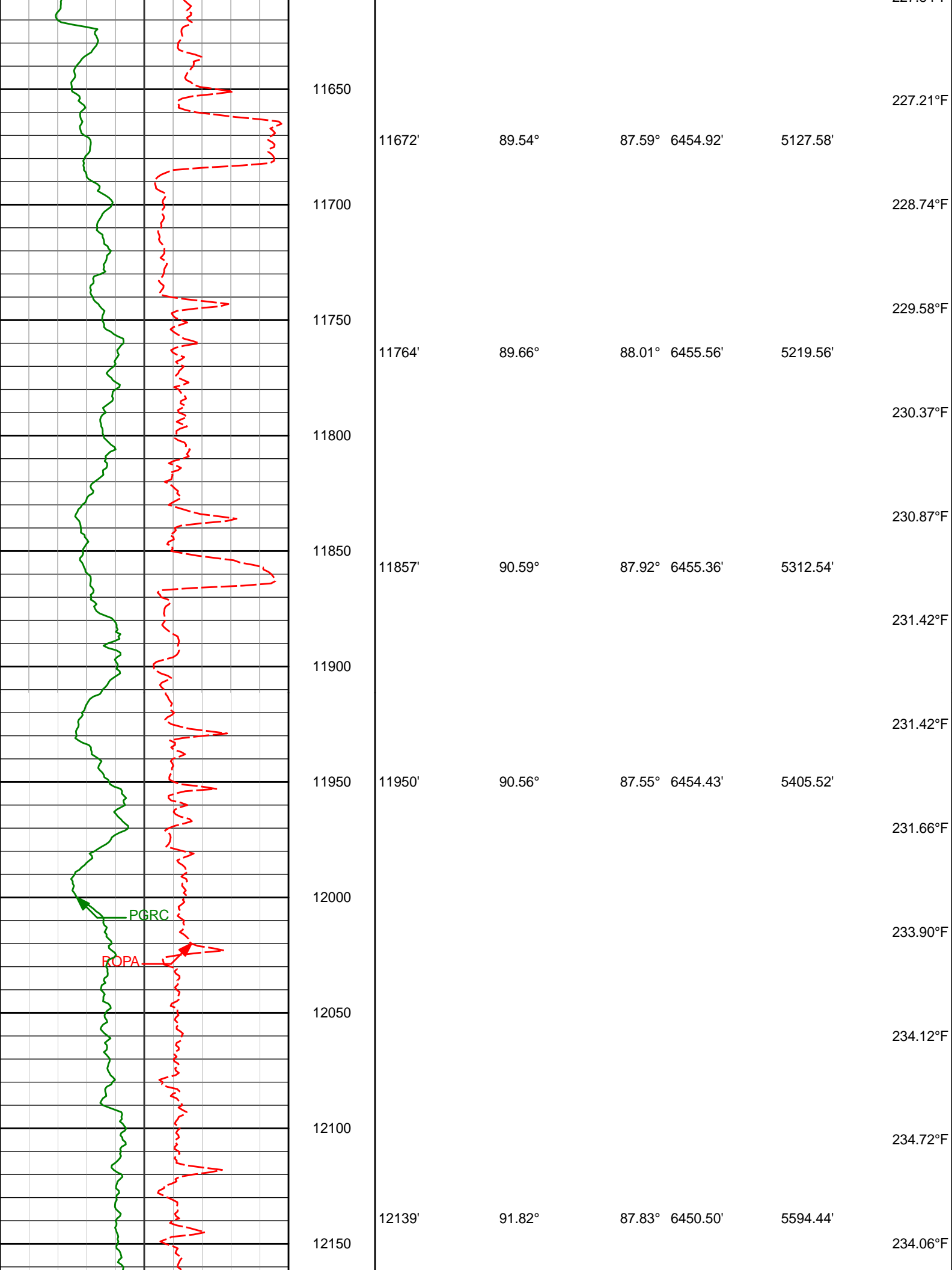
|       |        |        |          |          |          |
|-------|--------|--------|----------|----------|----------|
| 8865' | 89.69° | 89.31° | 6442.48' | 2321.92' | 202.60°F |
| 8900  |        |        |          |          | 202.60°F |
| 8950  |        |        |          |          | 204.83°F |
| 8960' | 90.28° | 89.07° | 6442.50' | 2416.83' | 204.83°F |
| 9000  |        |        |          |          | 203.76°F |
| 9050  |        |        |          |          | 203.23°F |
| 9054' | 89.91° | 89.39° | 6442.35' | 2510.73' | 203.23°F |
| 9100  |        |        |          |          | 205.16°F |
| 9150  |        |        |          |          | 207.05°F |
| 9200  |        |        |          |          | 205.99°F |
| 9243' | 90.43° | 90.32° | 6441.79' | 2699.43' | 207.53°F |
| 9250  |        |        |          |          | 206.65°F |
| 9300  |        |        |          |          | 205.16°F |
| 9338' | 89.91° | 88.84° | 6441.51' | 2794.30' | 207.53°F |
| 9350  |        |        |          |          | 207.53°F |
| 9400  |        |        |          |          | 208.46°F |

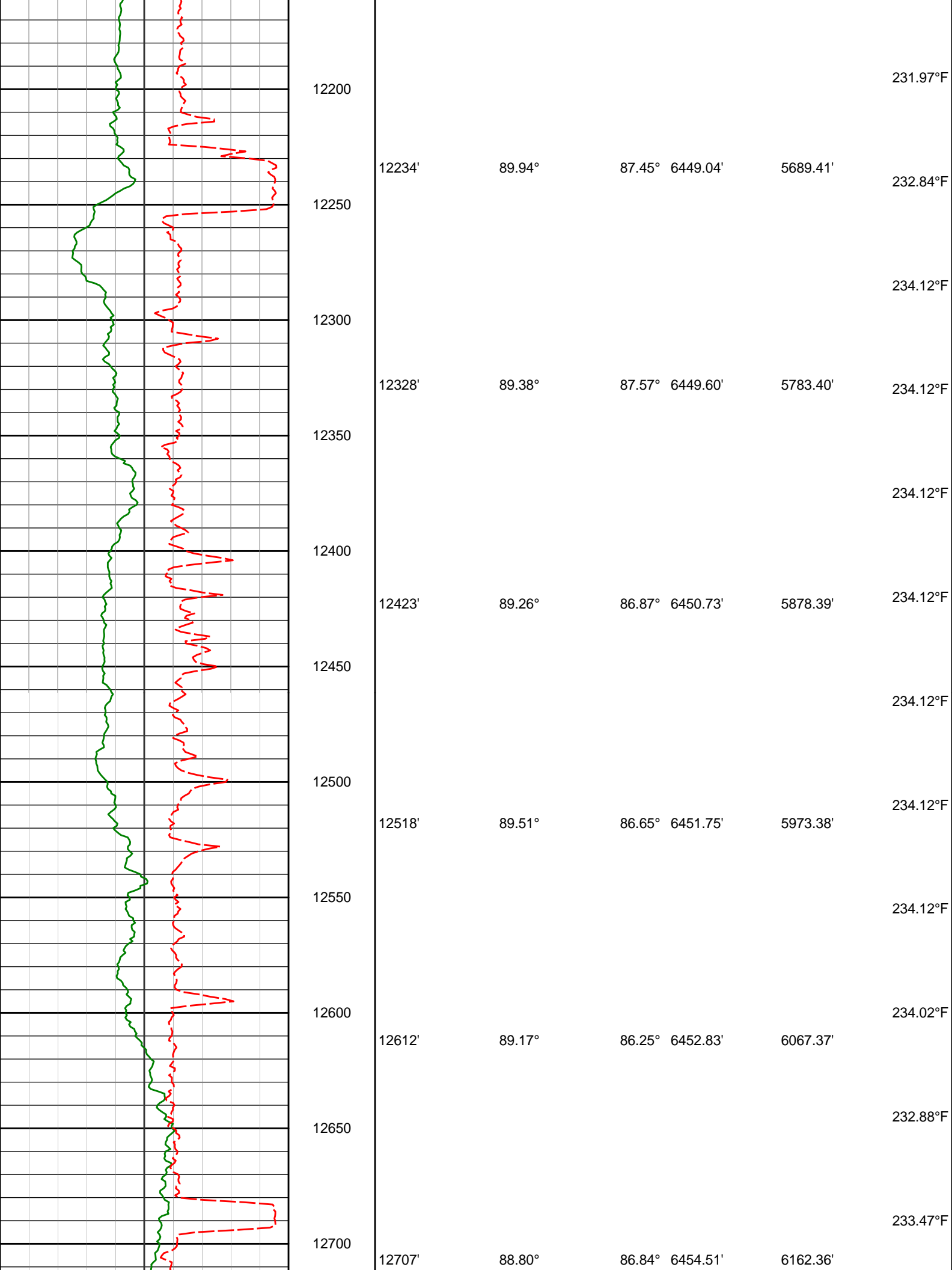


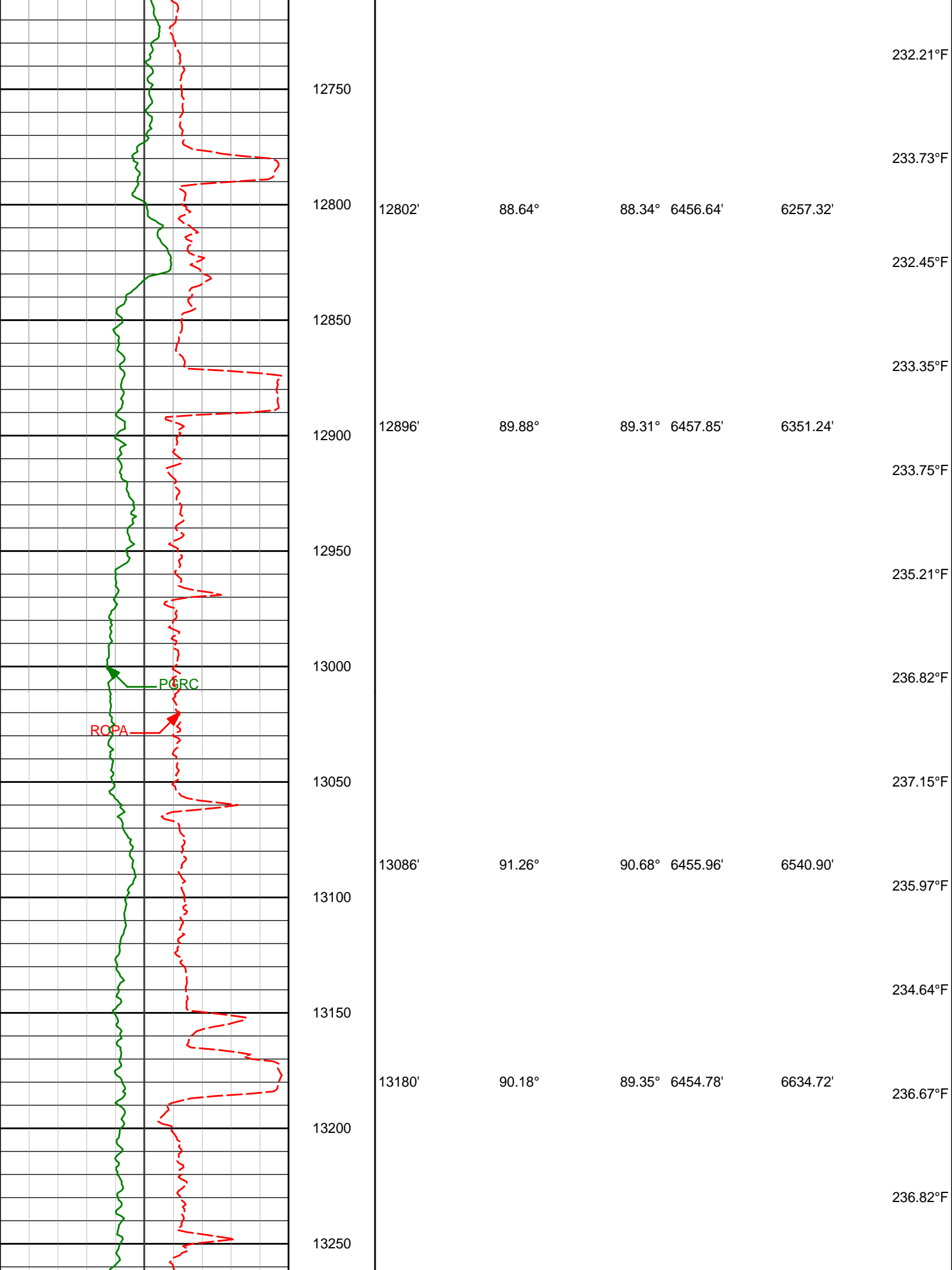




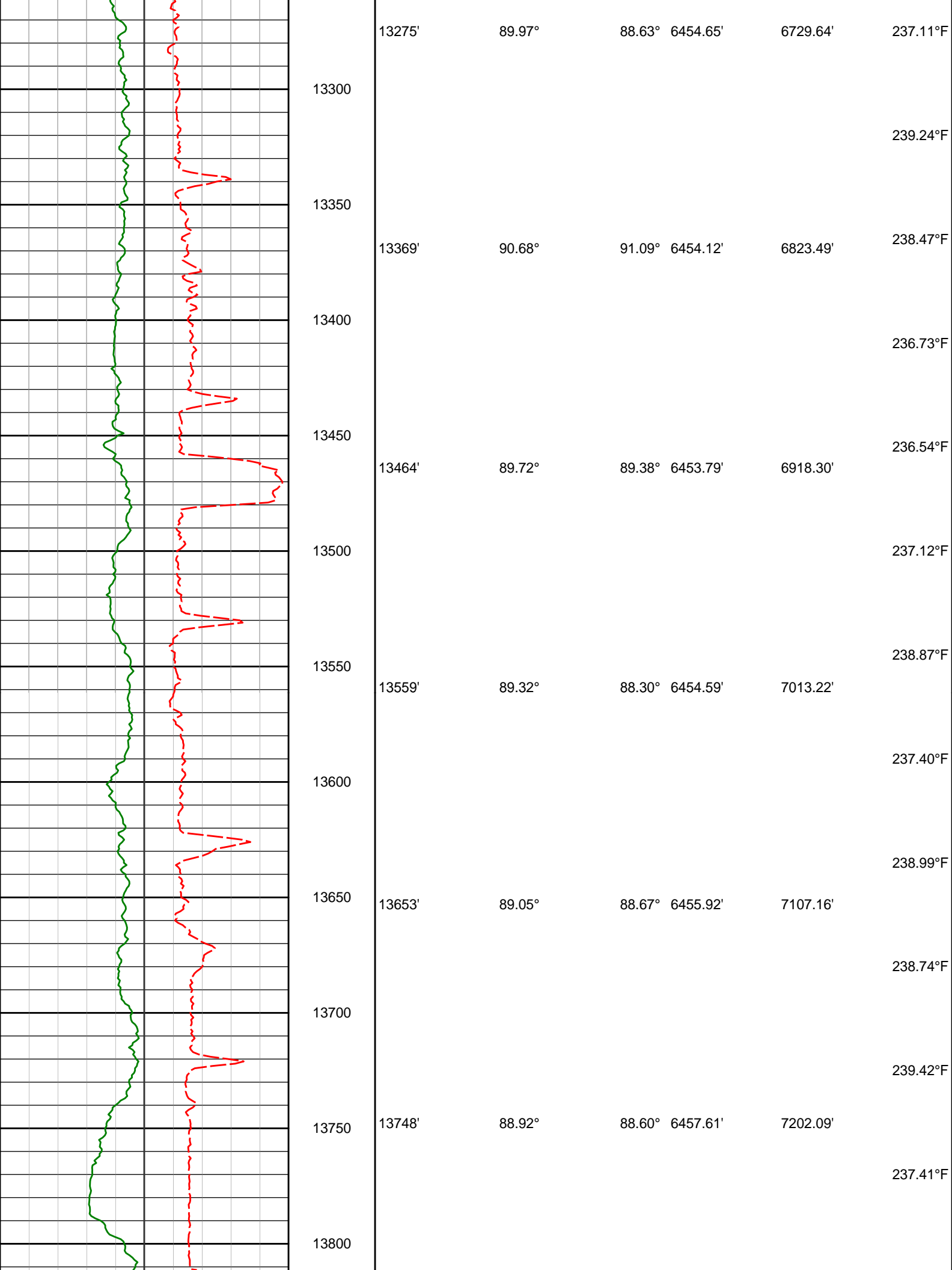


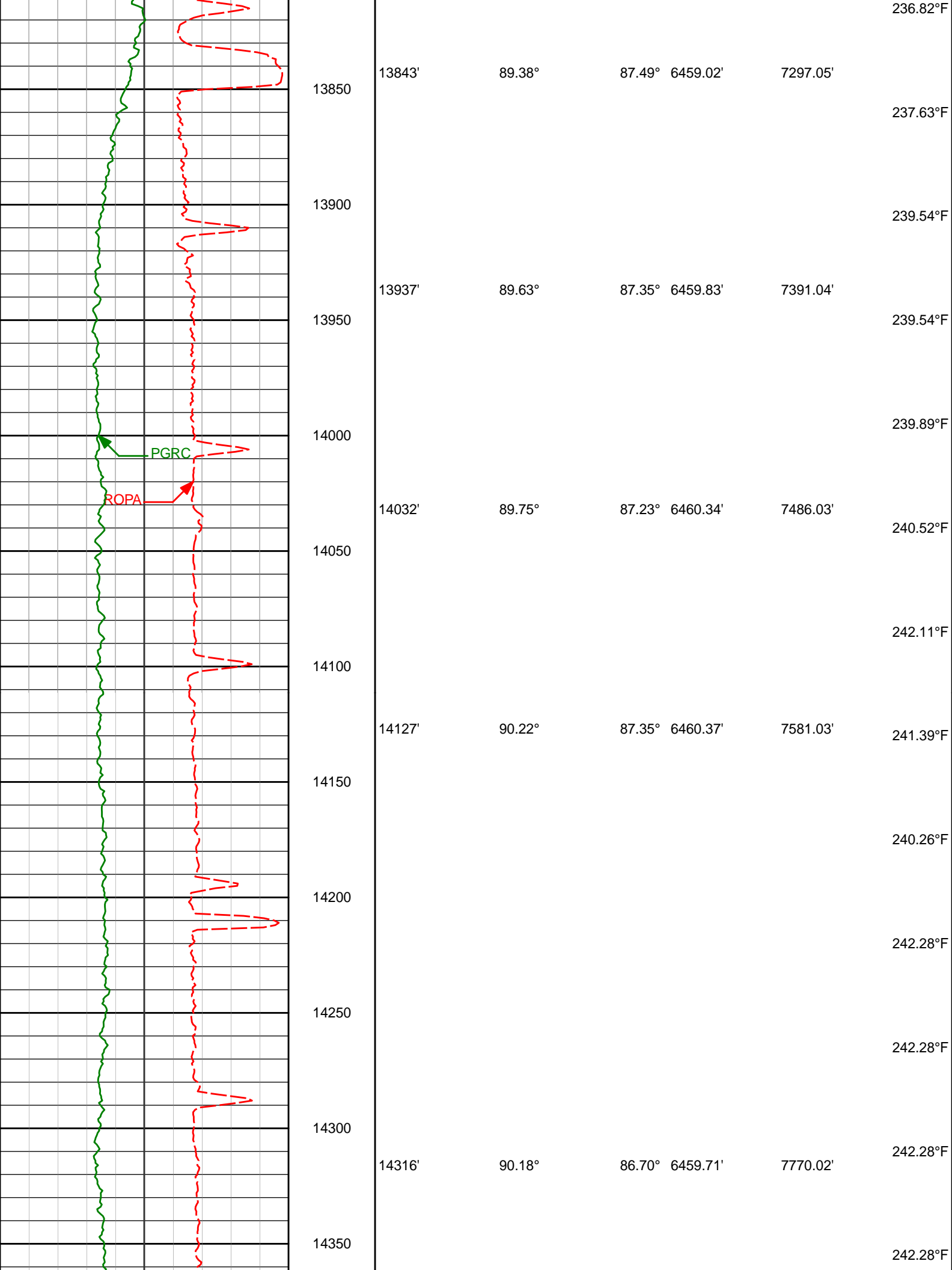


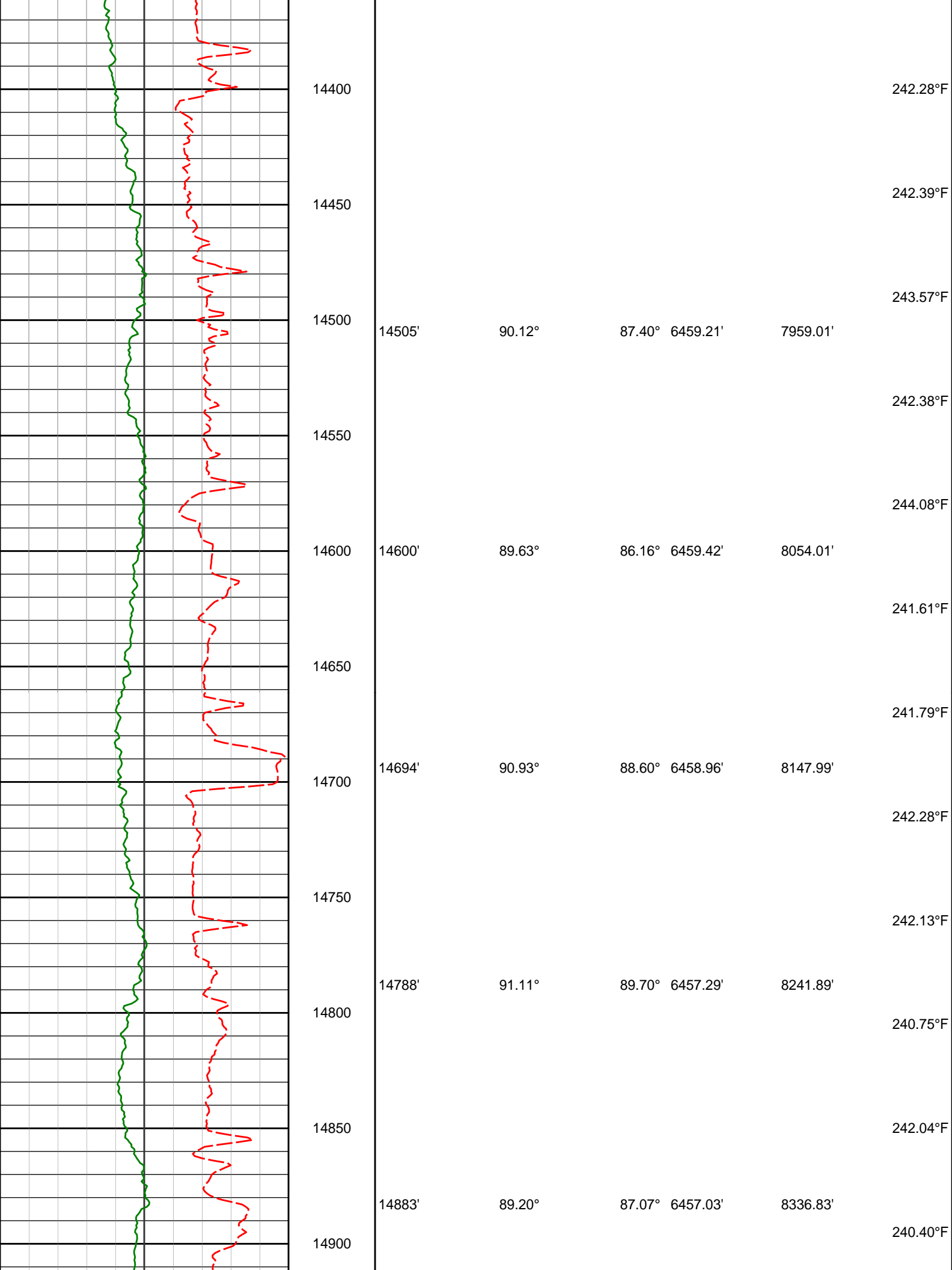


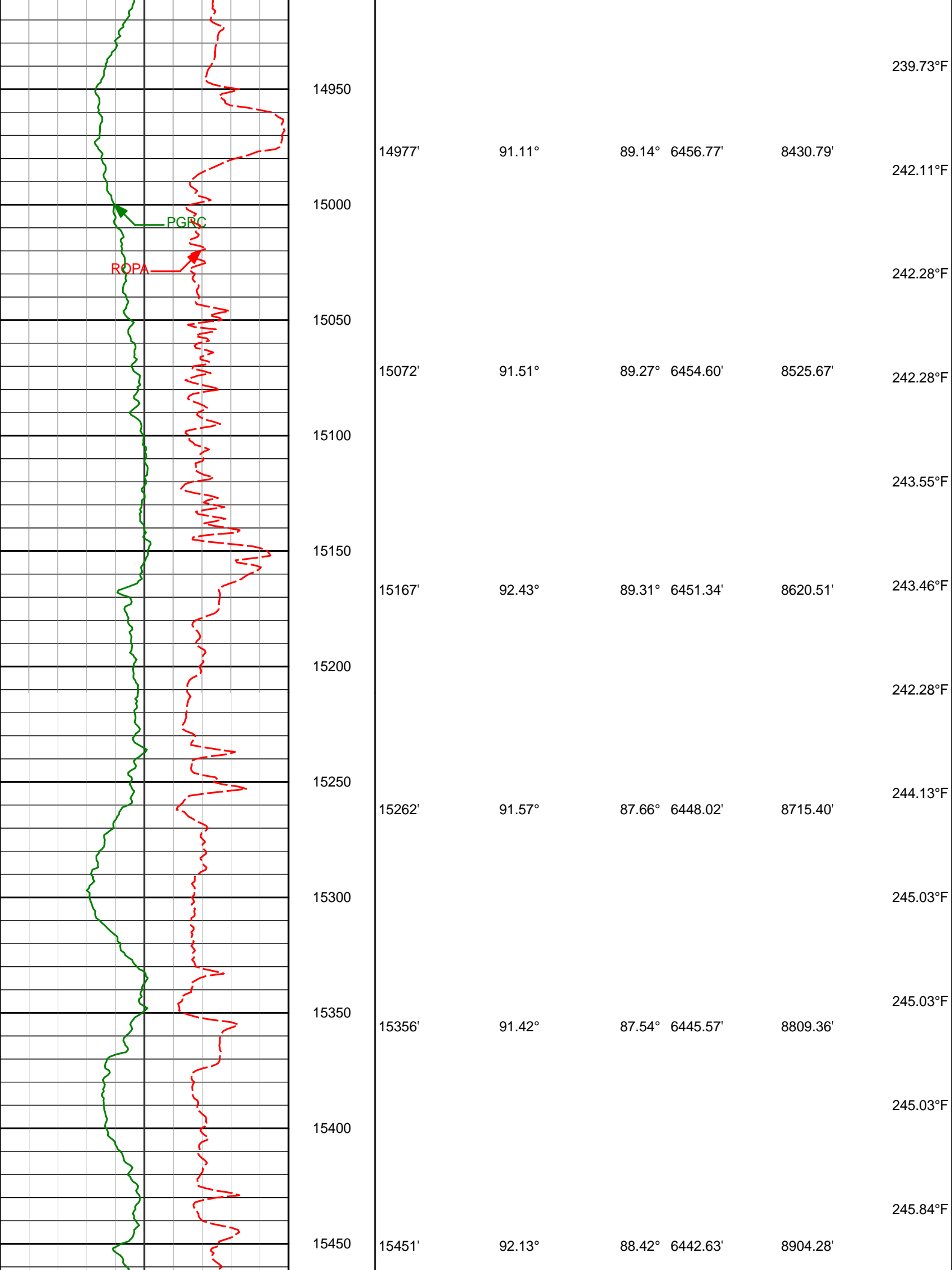


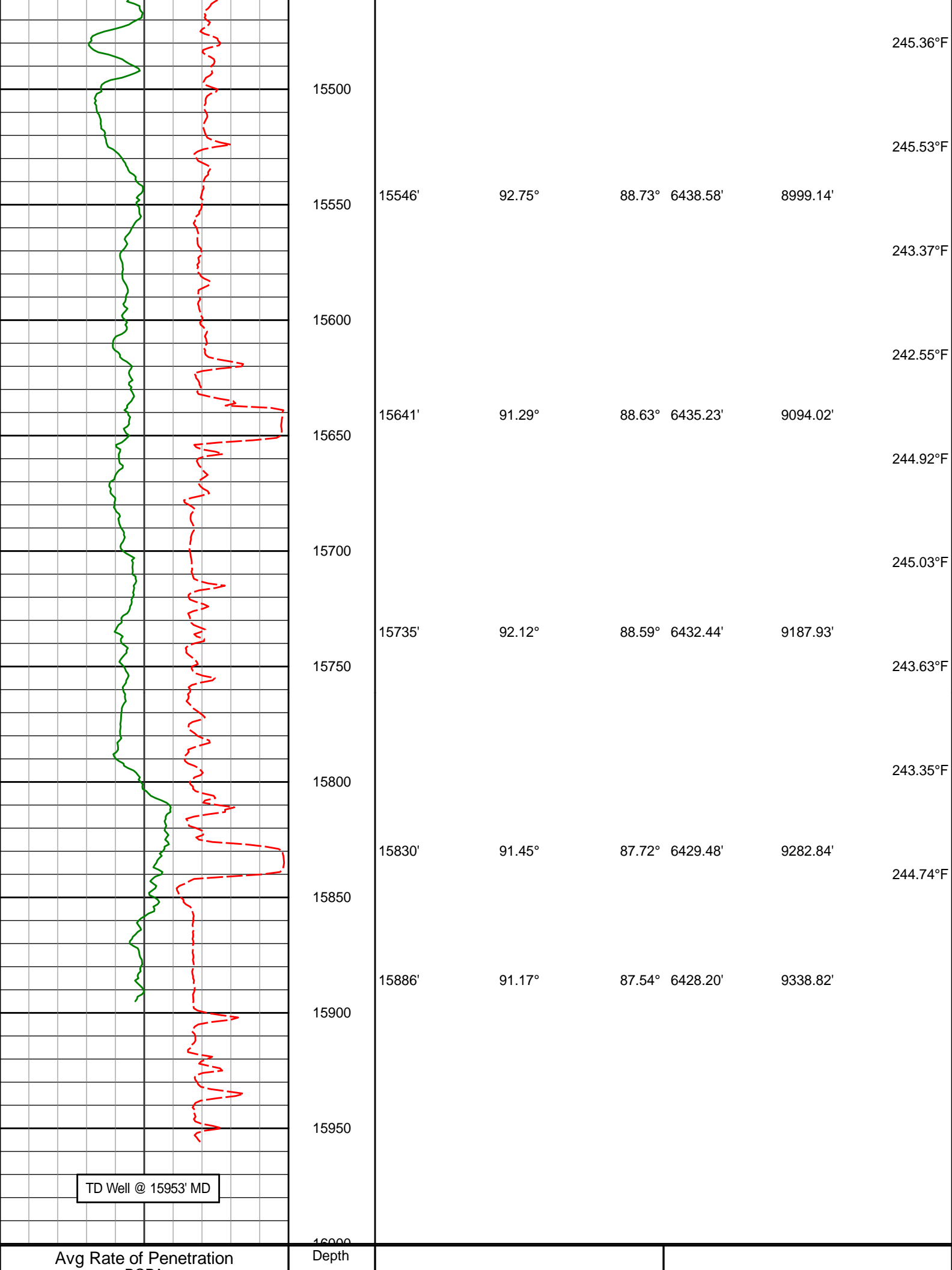










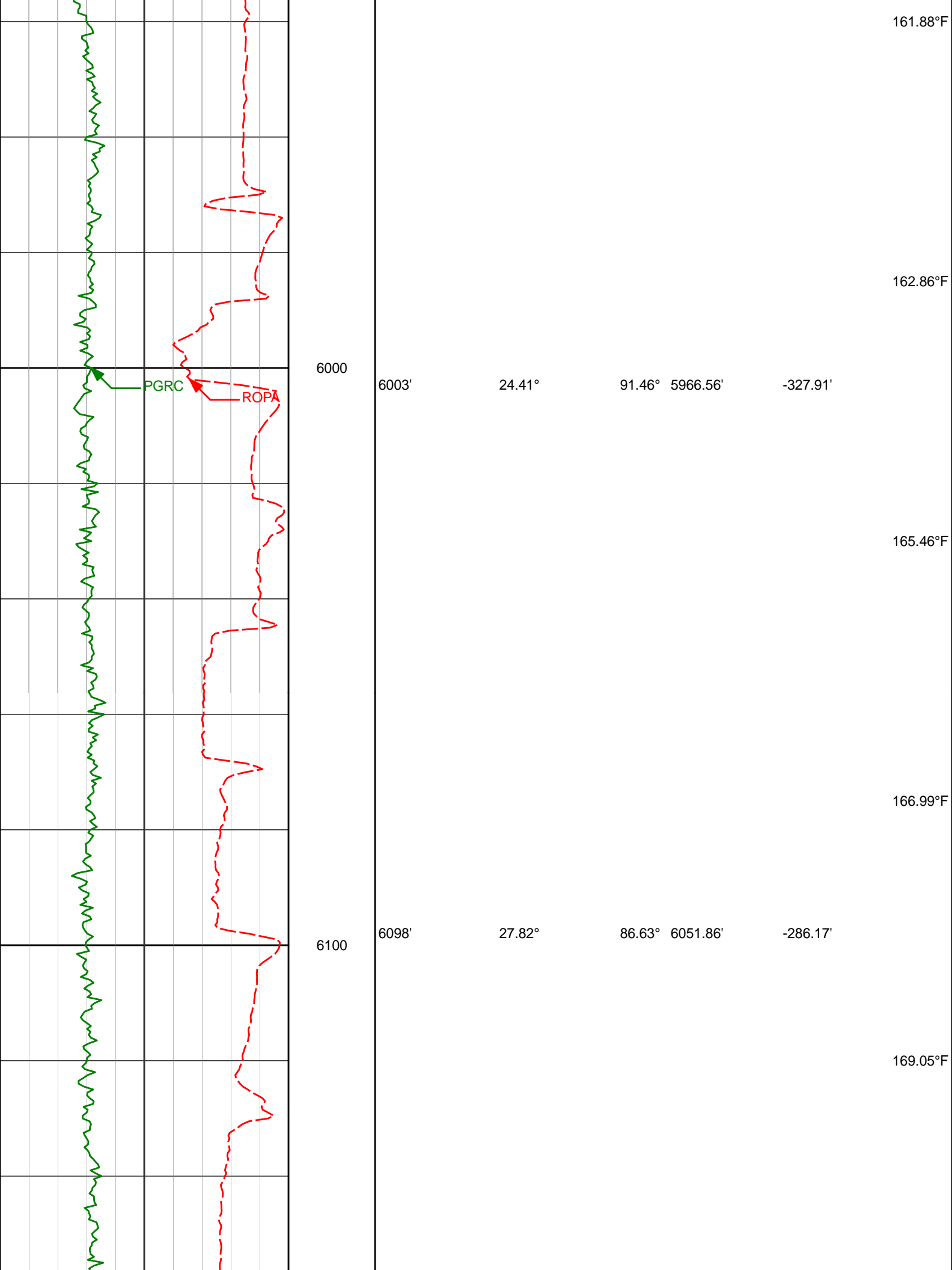


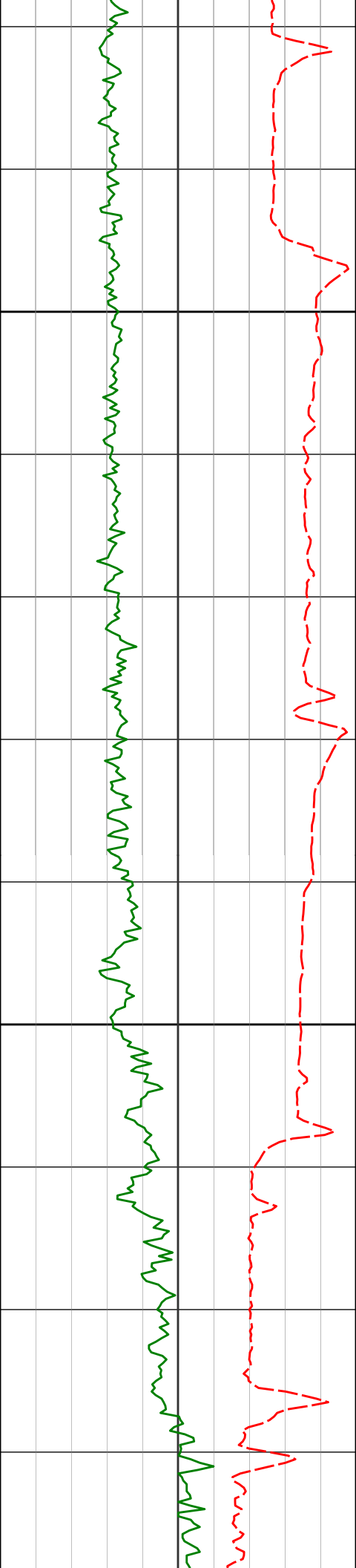
TD Well @ 15953' MD

Avg Rate of Penetration

Depth

|  |  |                   |       |        |        |          |          |          |
|--|--|-------------------|-------|--------|--------|----------|----------|----------|
| ROPA<br>feet per hr                            |  | MD<br>ft          | Depth | Inc    | Azi    | TVD      | V.S.     | Temp     |
| PCG Gamma Ray BCorr<br>PGRC<br>api             |  |                   |       |        |        |          |          |          |
| 1K 0   |  |                   |       |        |        |          |          |          |
| 0 300  |  |                   |       |        |        |          |          |          |
| MD Detail 1:240 Scale                          |  |                   |       |        |        |          |          |          |
| PCG GR XHi-Range RT<br>PGRC<br>api             |  |                   |       |        |        |          |          |          |
| 0 300  |  |                   |       |        |        |          |          |          |
| Avg Rate of Penetration<br>ROPA<br>feet per hr |  | Depth<br>MD<br>ft | Depth | Inc    | Azi    | TVD      | V.S.     | Temp     |
| 1K 0   |  | 5800              |       |        |        |          |          |          |
|  |  | <KOP>             | 5814' | 0.52°  | 69.10° | 5783.45' | -368.58' | 154.05°F |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  | 5900              |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   | 5909' | 12.84° | 95.21° | 5877.63' | -357.69' | 158.69°F |
|  |  |                   |       |        |        |          |          |          |
|  |  |                   |       |        |        |          |          |          |





6200

6300

6192'

30.62°

85.35° 6133.89'

-240.30'

6287'

43.53°

92.13° 6209.56'

-183.28'

170.32°F

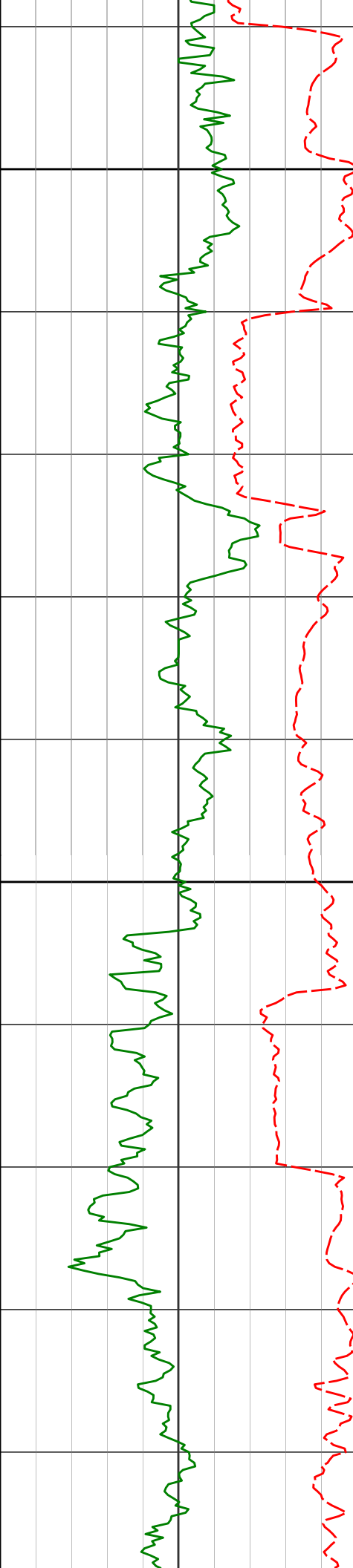
170.99°F

172.82°F

174.94°F

174.95°F





6381'

47.87°

93.25° 6275.20'

-116.40'

174.71°F

6400

175.07°F

6476'

54.85°

90.69° 6334.48'

-42.56'

175.30°F

6500

173.55°F

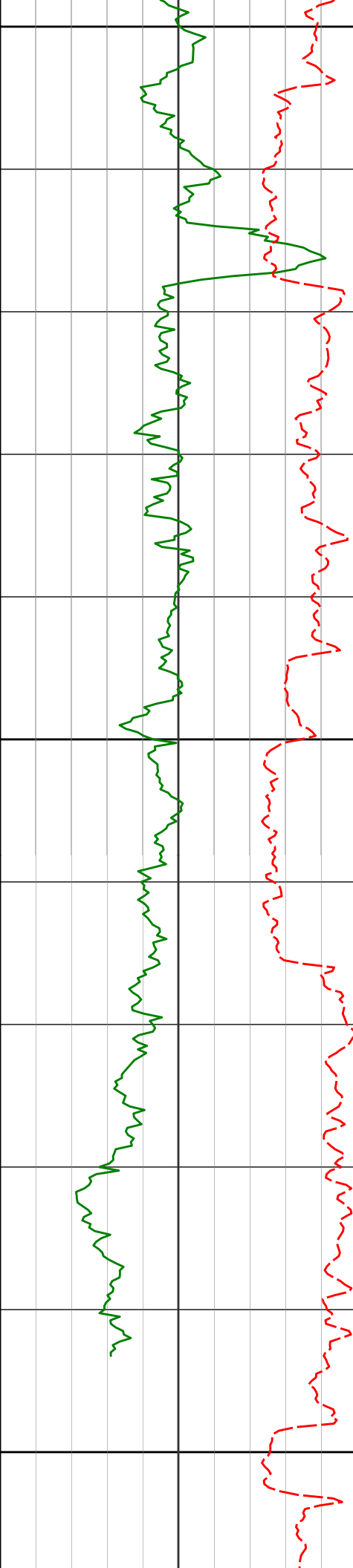
6571'

63.77°

84.67° 6382.95'

38.98'

174.48°F



6600

174.79°F

174.83°F

6665'

73.31°

86.18°

6417.31'

126.34'

6700

174.83°F

174.92°F

6760'

81.38°

87.20°

6438.11'

218.95'

6776'

83.48°

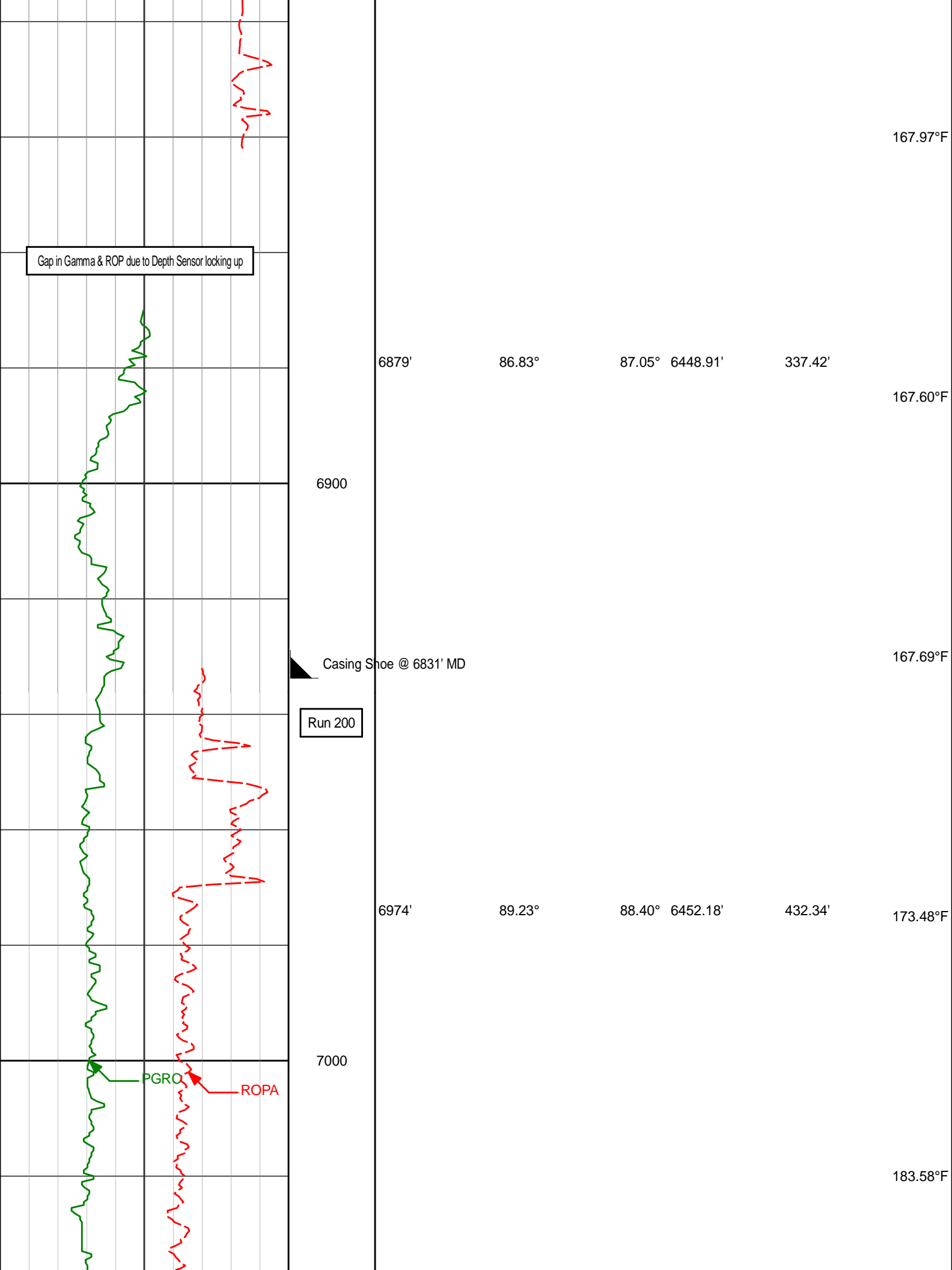
87.66°

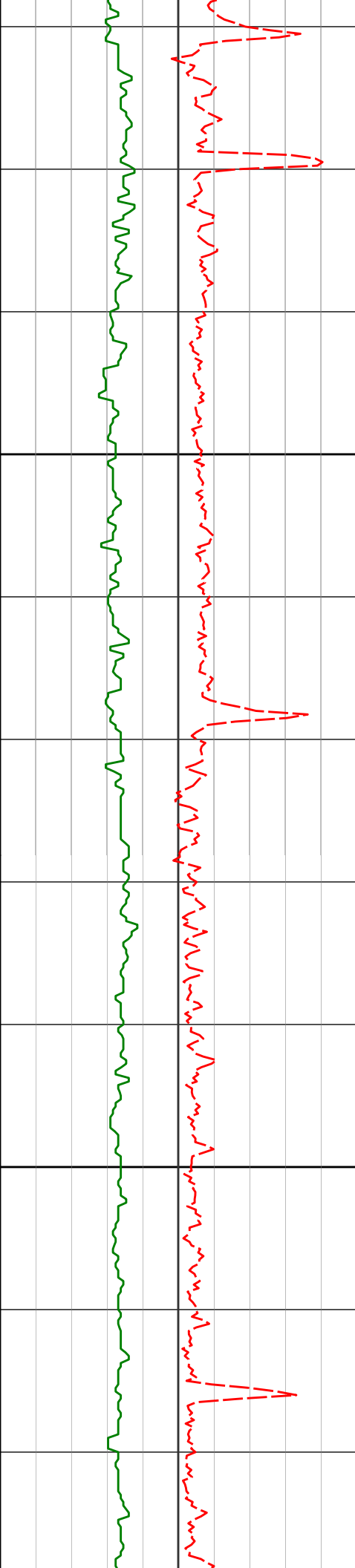
6440.22'

234.81'

6800

174.30°F





7100

7200

7068'

89.48°

87.83° 6453.24'

526.30'

186.88°F

178.12°F

170.59°F

7163'

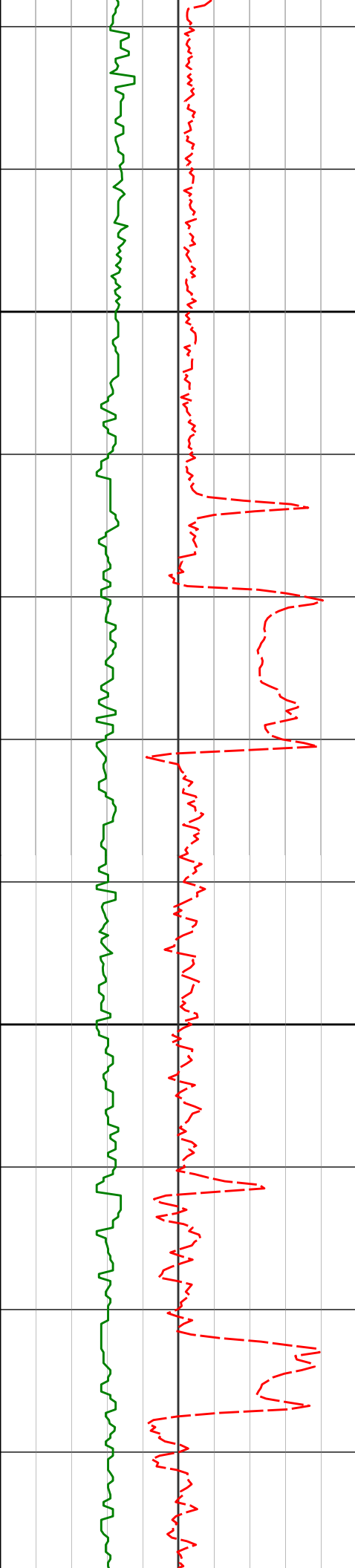
89.97°

89.46° 6453.69'

621.24'

172.61°F

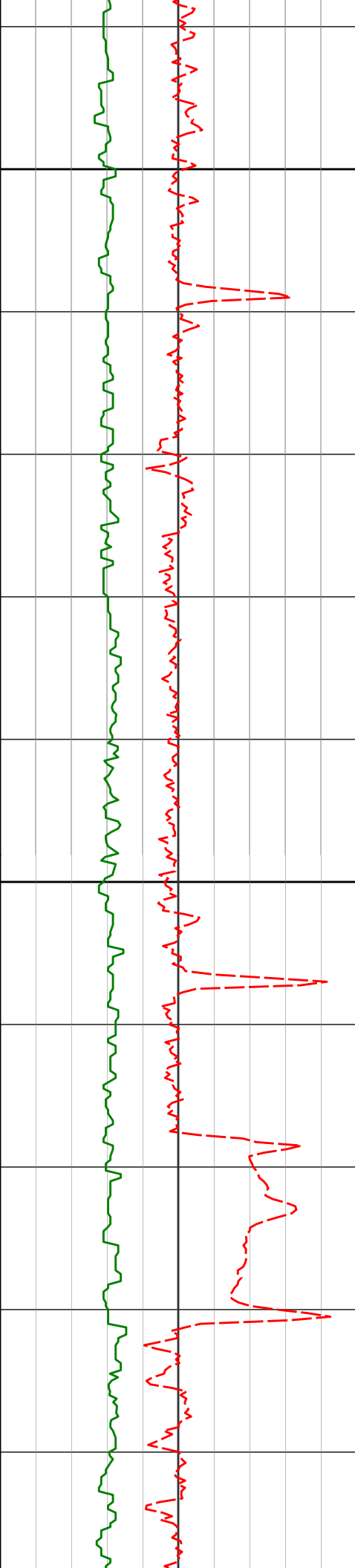
174.51°F



7300

7400

|       |        |        |          |         |          |
|-------|--------|--------|----------|---------|----------|
| 7258' | 90.18° | 91.64° | 6453.57' | 716.01' |          |
|       |        |        |          |         | 173.15°F |
|       |        |        |          |         |          |
|       |        |        |          |         |          |
|       |        |        |          |         | 173.35°F |
|       |        |        |          |         |          |
| 7352' | 89.32° | 89.38° | 6453.98' | 809.79' |          |
|       |        |        |          |         |          |
|       |        |        |          |         | 177.64°F |
|       |        |        |          |         |          |
|       |        |        |          |         | 177.64°F |
|       |        |        |          |         |          |
| 7447' | 90.22° | 88.76° | 6454.36' | 904.70' |          |
|       |        |        |          |         | 179.76°F |



7500

7541'

7600

7636'

90.46°

89.88° 6453.80'

998.60'

90.46°

89.43° 6453.04'

1093.47'

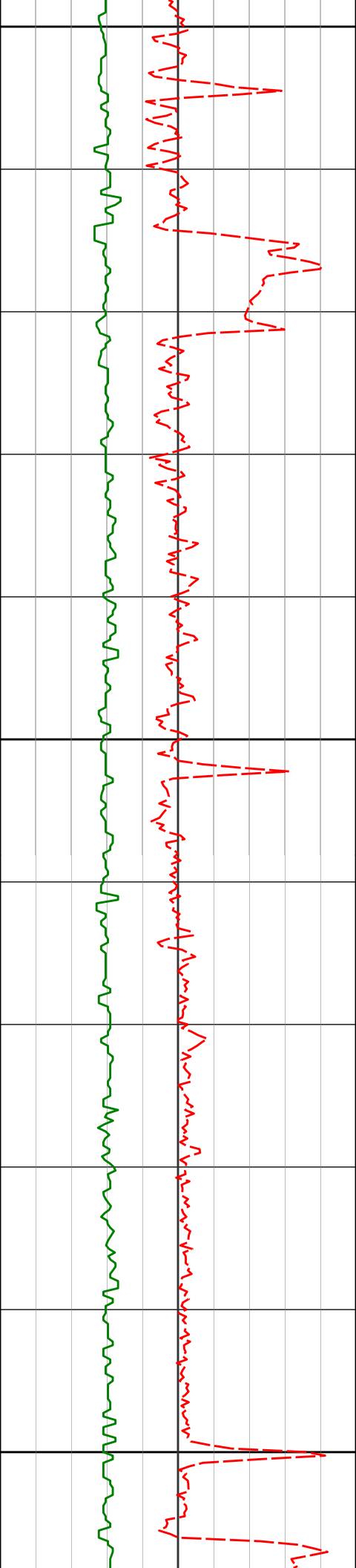
182.51°F

184.55°F

185.02°F

185.02°F

185.02°F



7700

7731'

90.31°

88.26° 6452.40'

1188.39'

185.66°F

187.48°F

7800

7826'

90.65°

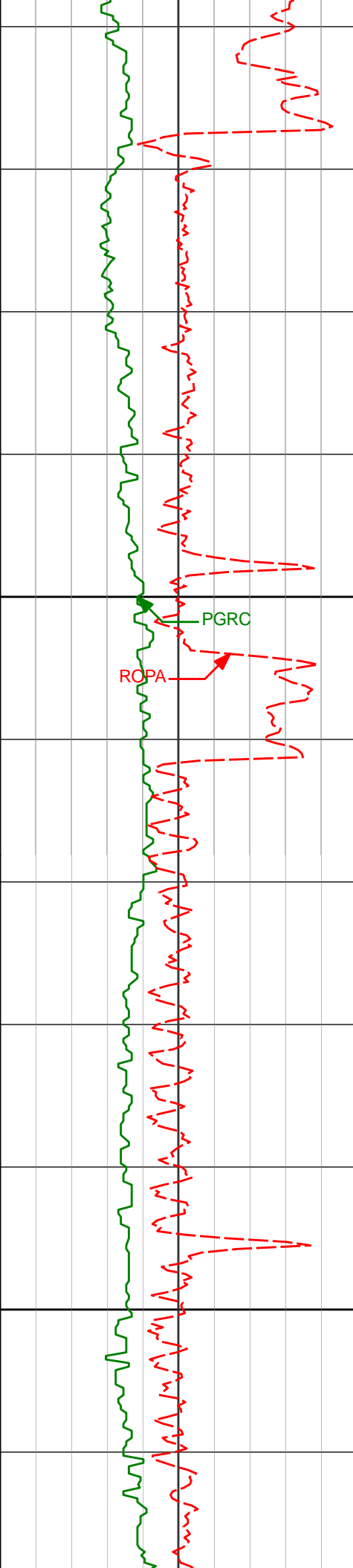
88.36° 6451.60'

1283.35'

187.26°F

185.96°F

7900



8000

8100

7920'

91.63°

86.91° 6449.73'

1377.31'

187.18°F

8015'

90.34°

85.72° 6448.10'

1472.29'

187.68°F

8109'

91.67°

86.33° 6446.45'

1566.27'

192.49°F

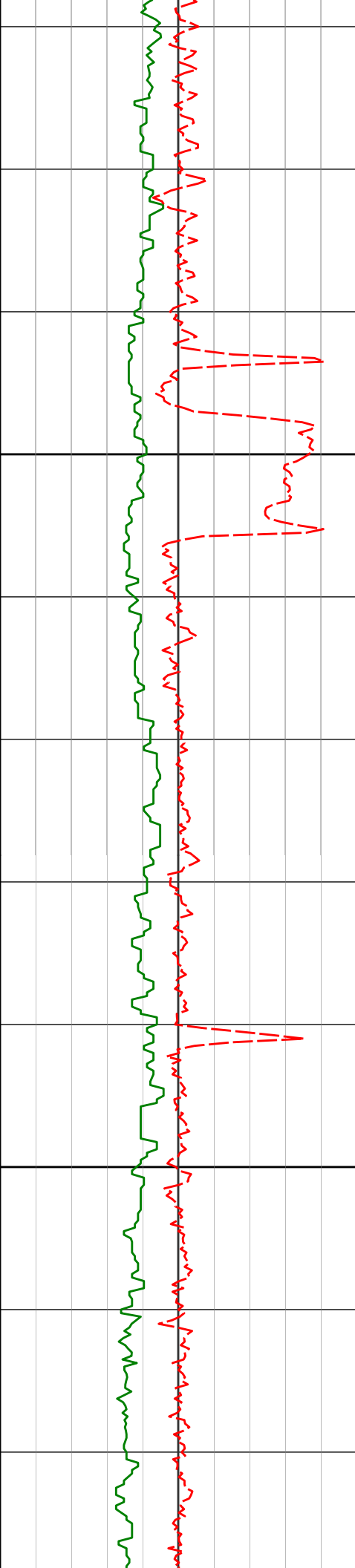
187.48°F

190.12°F

PGRC

ROPA





8200

8300

8204'

8299'

89.97°

90.34°

86.28° 6445.09'

85.53° 6444.84'

1661.26'

1756.25'

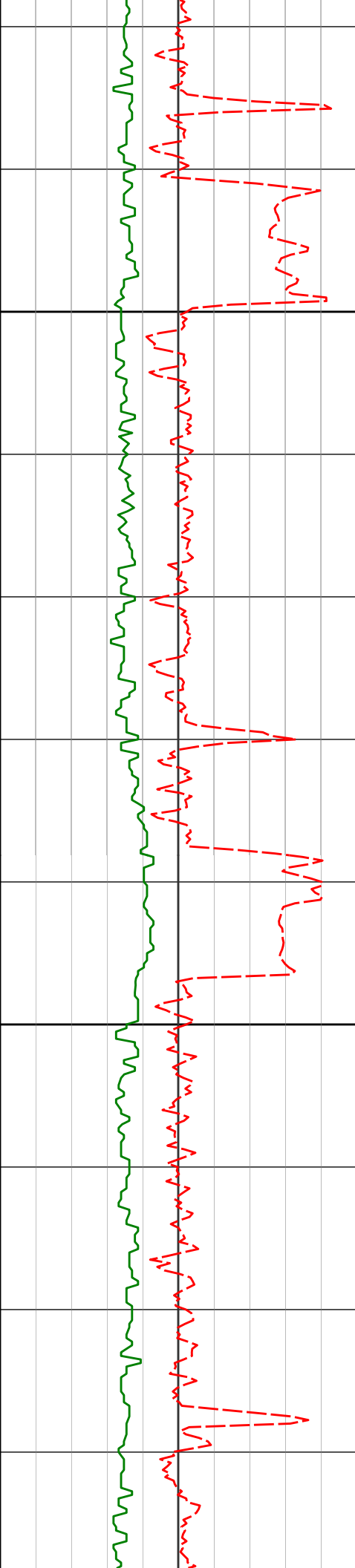
192.49°F

192.49°F

192.68°F

194.99°F

194.99°F



8400

8500

8393'

90.34°

85.92° 6444.28'

1850.23'

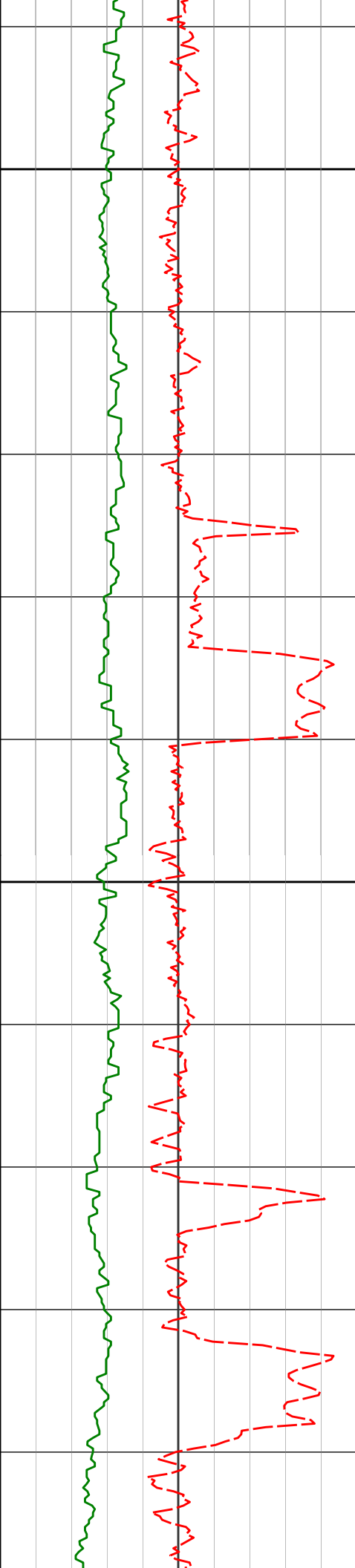
195.52°F

197.51°F

197.51°F

197.67°F

199.89°F



8600

8700

8583'

90.68°

88.12° 6442.59'

2040.21'

200.05°F

200.05°F

8677'

90.37°

89.47° 6441.73'

2134.14'

200.05°F

200.05°F

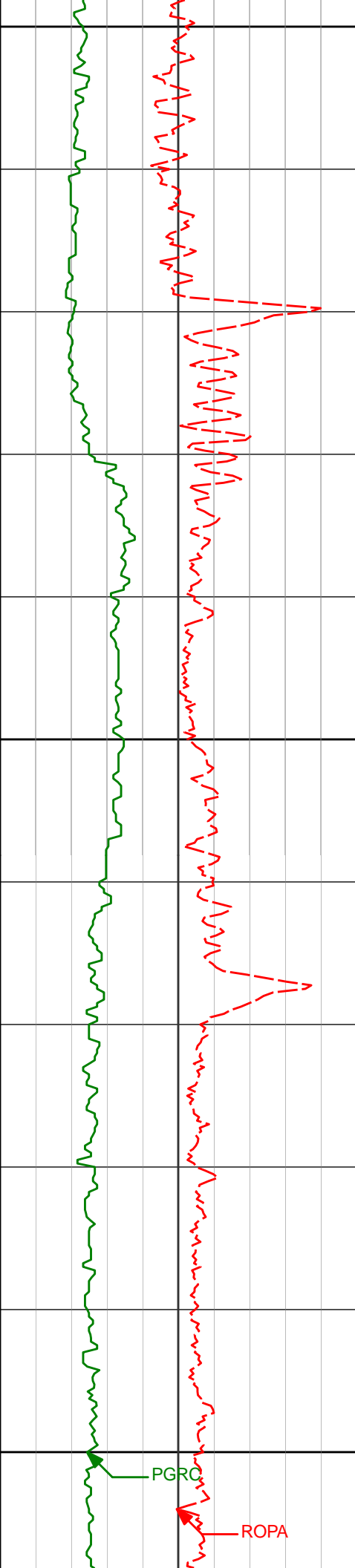
8771'

89.51°

89.38° 6441.82'

2228.03'

201.41°F



8800

202.60°F

8865'

89.69°

89.31° 6442.48'

2321.92'

202.60°F

8900

202.60°F

8960'

90.28°

89.07° 6442.50'

2416.83'

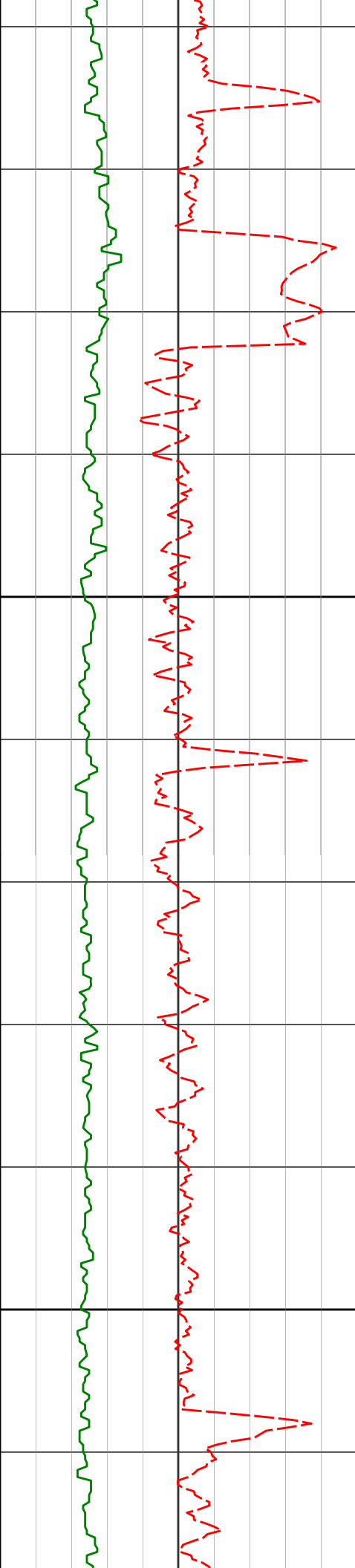
204.83°F

9000

203.76°F

PGRC

ROPA



9100

9200

9054'

89.91°

89.39° 6442.35'

2510.73'

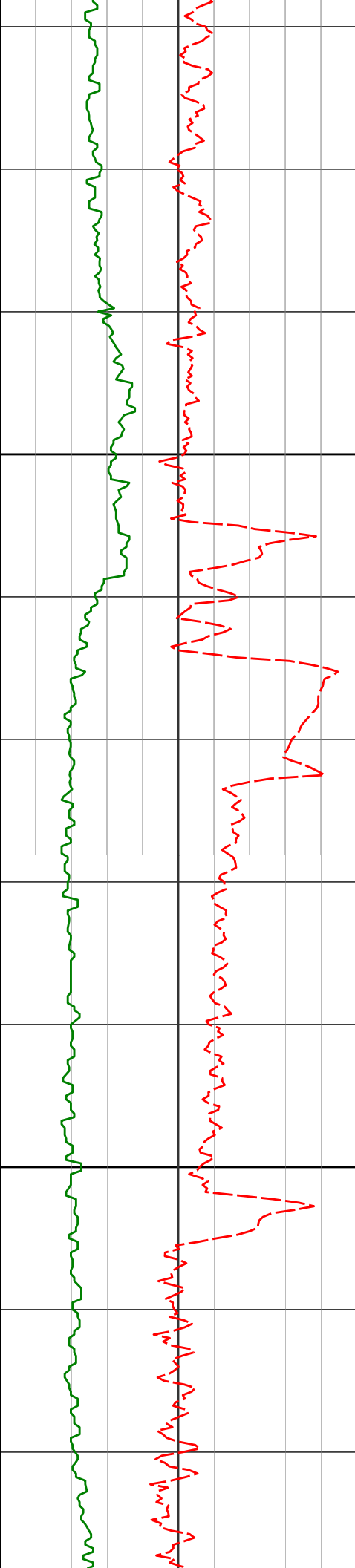
203.23°F

205.16°F

207.05°F

205.99°F

207.53°F



9243'

90.43°

90.32° 6441.79'

2699.43'

206.65°F

9300

205.16°F

9338'

89.91°

88.84° 6441.51'

2794.30'

207.53°F

9400

208.46°F

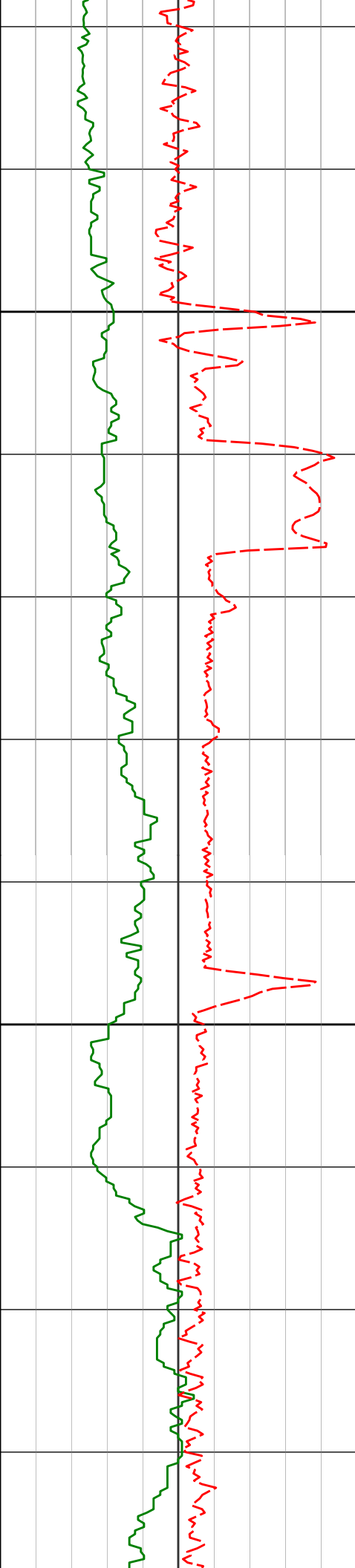
9433'

90.34°

88.72° 6441.30'

2889.24'

209.73°F



9500

9527'

89.91°

88.76° 6441.09'

2983.17'

207.90°F

209.91°F

210.31°F

9600

9621'

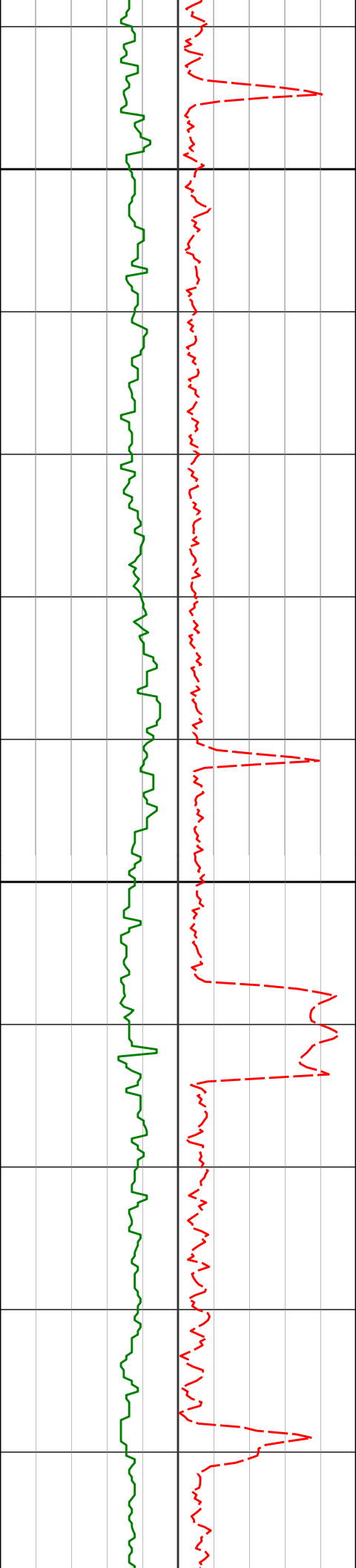
89.82°

88.61° 6441.32'

3077.11'

210.31°F

212.61°F



9700

9716'

89.78°

86.94° 6441.65'

3172.09'

212.92°F

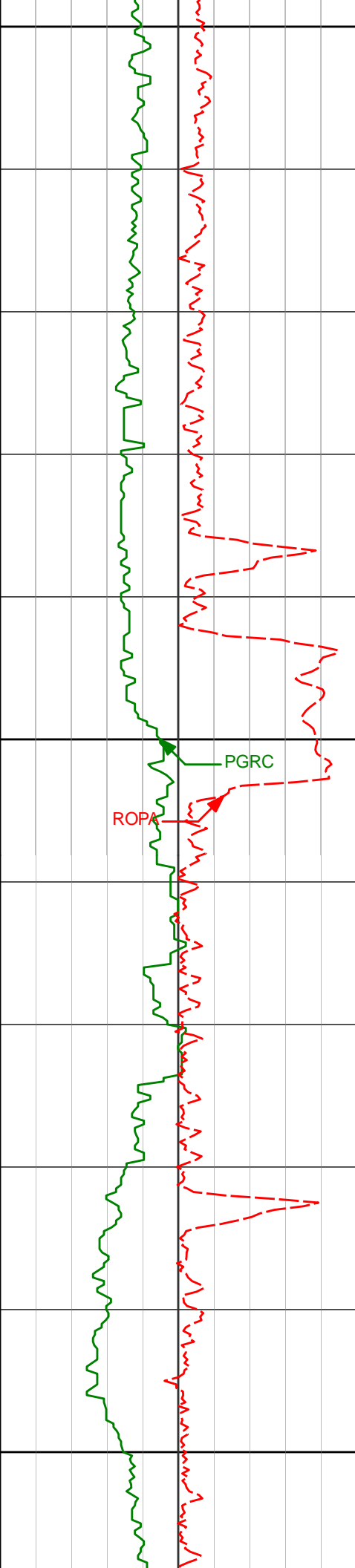
212.92°F

9800

212.92°F

212.92°F





9900

9905'

90.65°

88.19° 6440.94'

3361.06'

214.91°F

214.54°F

215.00°F

10000

9999'

89.23°

87.20° 6441.04'

3455.04'

PGRC

ROPA

214.58°F

214.88°F

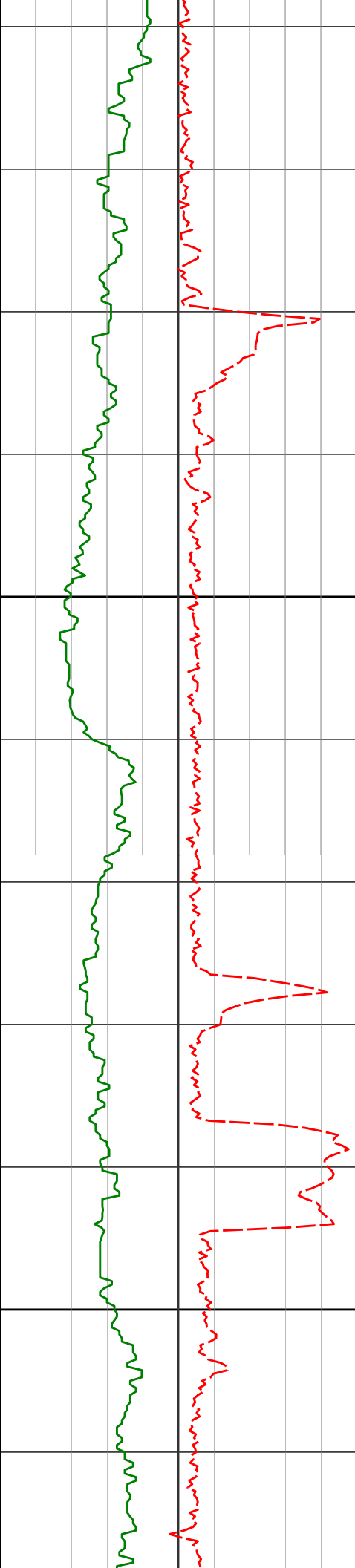
10094'

89.32°

86.32° 6442.24'

3550.03'

10100



10200

10300

10187'

89.32°

86.07° 6443.34'

3643.02'

10281'

89.94°

86.58° 6443.95'

3737.02'

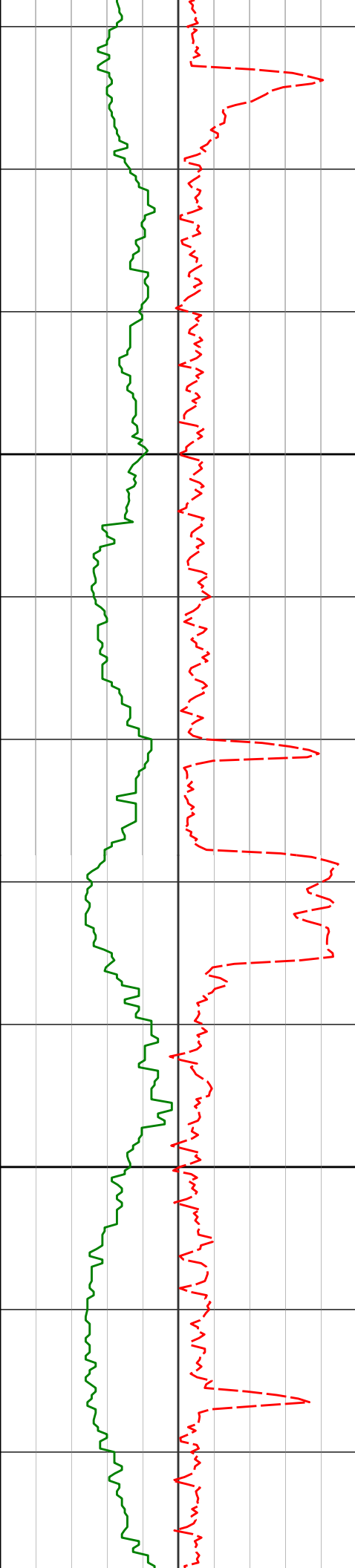
215.51°F

215.71°F

216.11°F

215.51°F

216.60°F



10400

10500

10373'

90.56°

86.36° 6443.55'

3829.02'

10467'

89.69°

87.23° 6443.34'

3923.02'

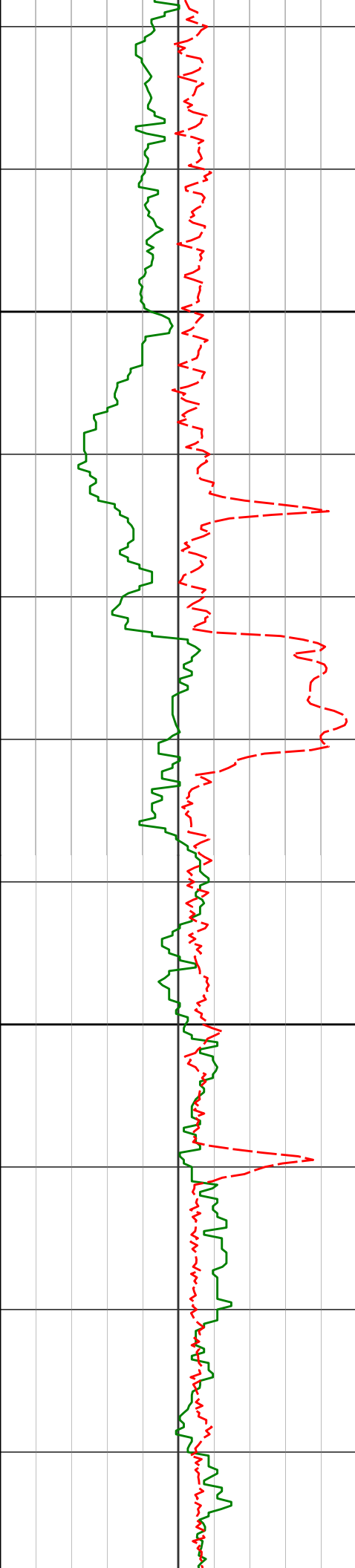
218.98°F

218.22°F

218.14°F

220.24°F

221.31°F



10600

10700

10560'

90.31°

87.65°

6443.34'

4016.01'

221.68°F

220.91°F

10653'

89.57°

86.84°

6443.44'

4109.00'

222.62°F

223.41°F

10745'

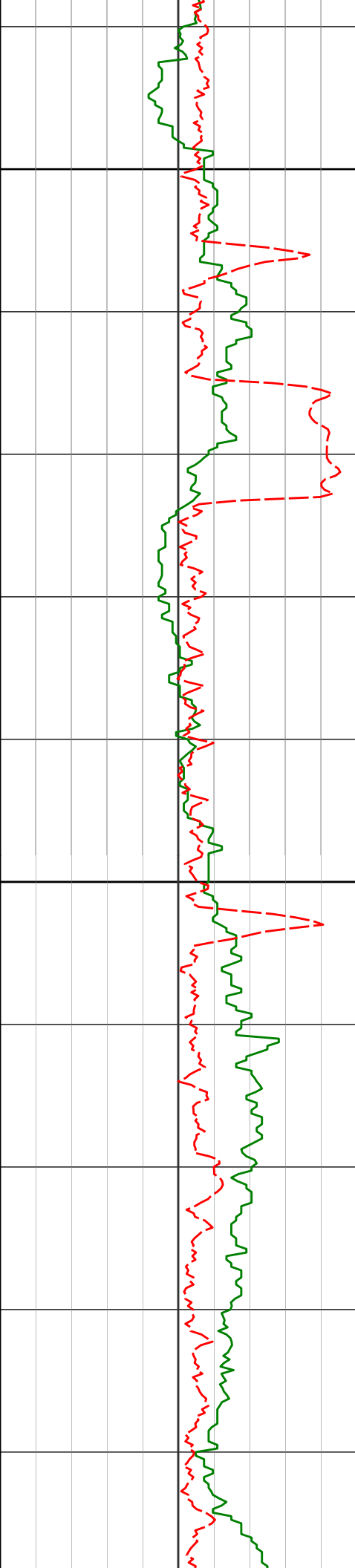
88.92°

87.78°

6444.65'

4200.98'

223.20°F



10800

222.72°F

10837'

89.41°

87.31° 6445.99'

4292.96'

223.41°F

10900

225.71°F

10930'

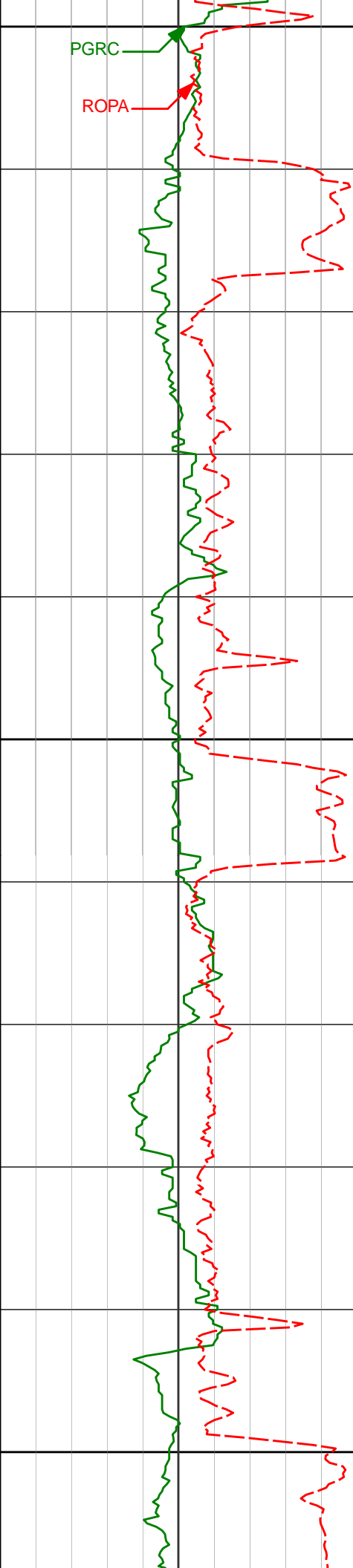
89.48°

86.61° 6446.89'

4385.96'

225.51°F

224.24°F



11000

11022'

90.25°

86.70° 6447.11'

4477.96'

224.99°F

11100

11117'

90.89°

88.85° 6446.17'

4572.93'

224.99°F

11200

11210'

89.14°

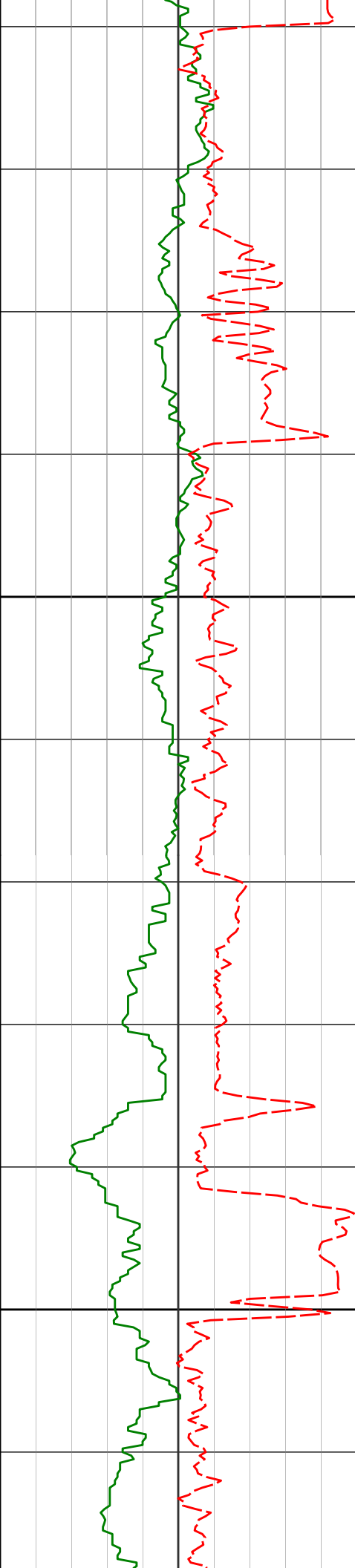
89.17° 6446.14'

4665.84'

224.18°F

224.11°F

223.39°F



11300

11303'

88.27°

88.98° 6448.24'

4758.74'

225.26°F

225.57°F

224.27°F

226.08°F

11400

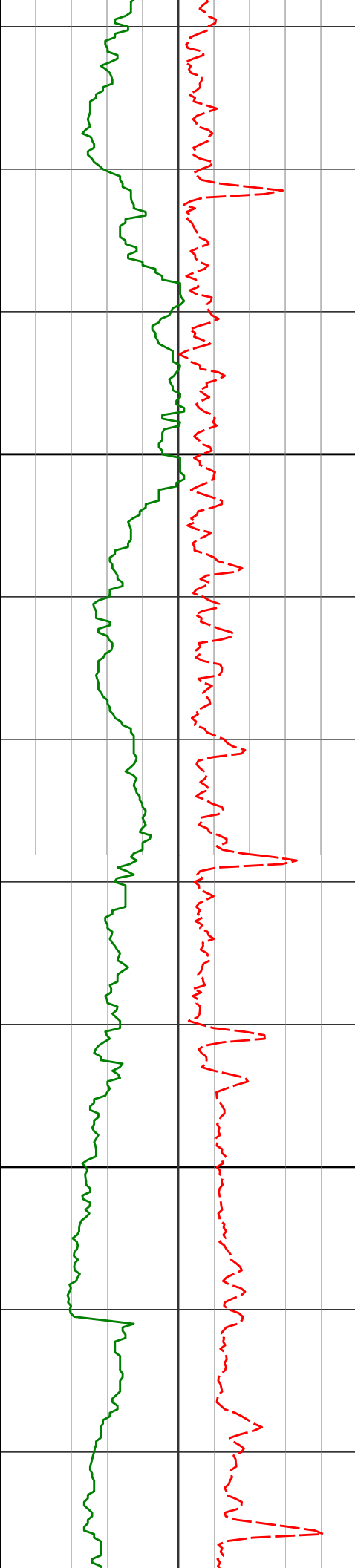
11396'

89.02°

88.20° 6450.44'

4851.65'

227.15°F



11500

11600

11489'

89.04°

87.56° 6452.02'

4944.62'

11580'

88.89°

86.95° 6453.66'

5035.60'

228.74°F

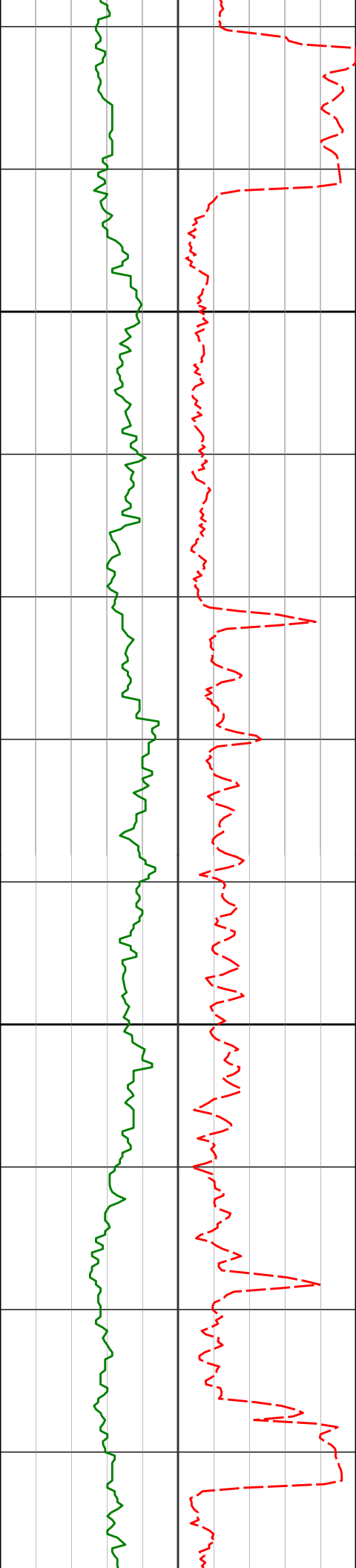
228.74°F

230.31°F

227.84°F

227.21°F





11672'

89.54°

87.59° 6454.92'

5127.58'

11700

228.74°F

229.58°F

11764'

89.66°

88.01° 6455.56'

5219.56'

230.37°F

11800

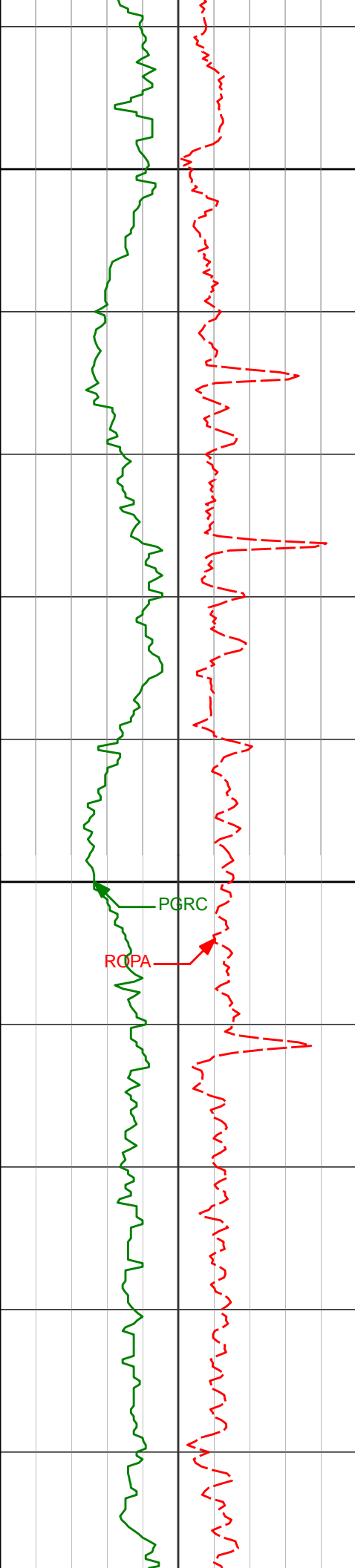
230.87°F

11857'

90.59°

87.92° 6455.36'

5312.54'



11900

11950'

90.56°

87.55° 6454.43'

5405.52'

12000

PGRC

ROPA

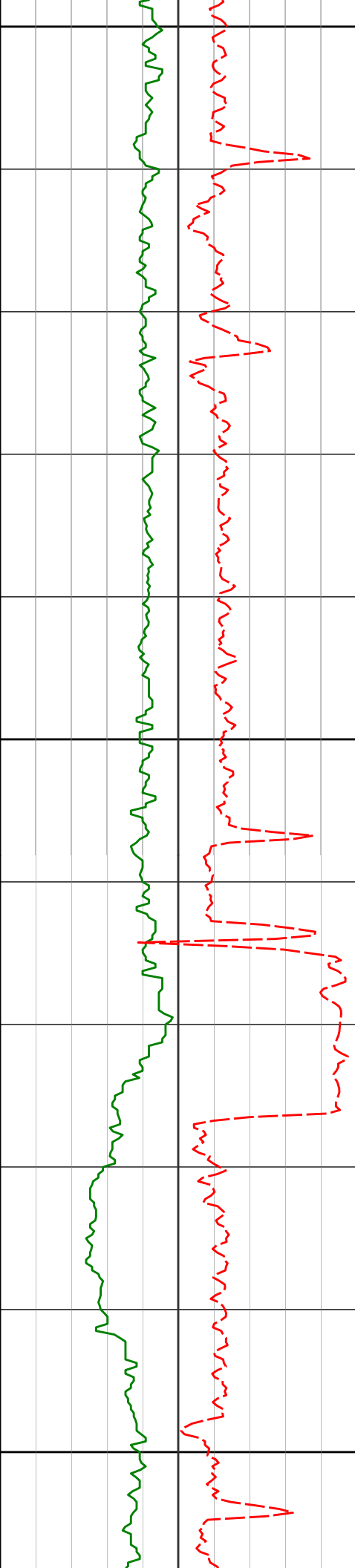
231.42°F

231.42°F

231.66°F

233.90°F

234.12°F



12100

234.72°F

12139'

91.82°

87.83° 6450.50'

5594.44'

234.06°F

12200

231.97°F

12234'

89.94°

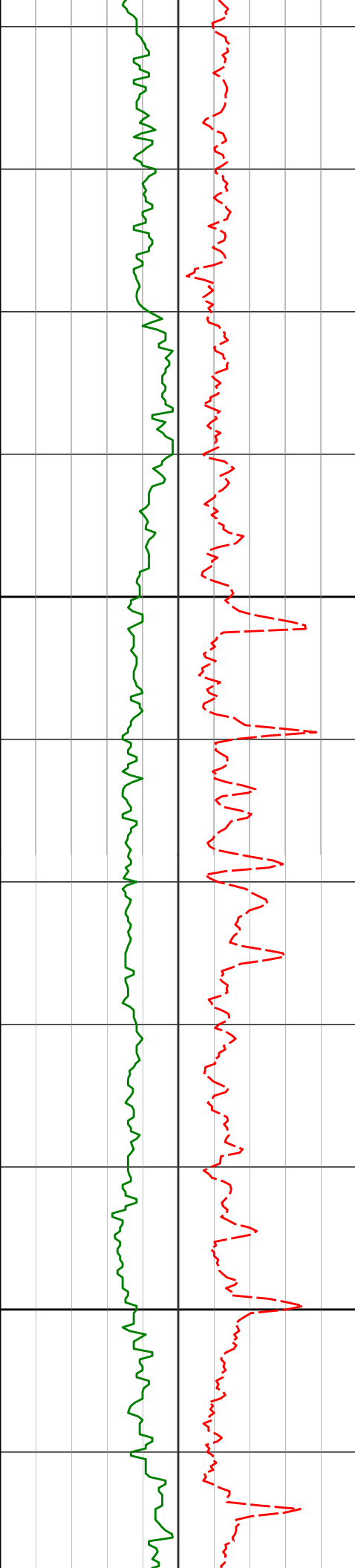
87.45° 6449.04'

5689.41'

232.84°F

12300

234.12°F



12400

12500

12328'

89.38°

87.57° 6449.60'

5783.40'

234.12°F

12423'

89.26°

86.87° 6450.73'

5878.39'

234.12°F

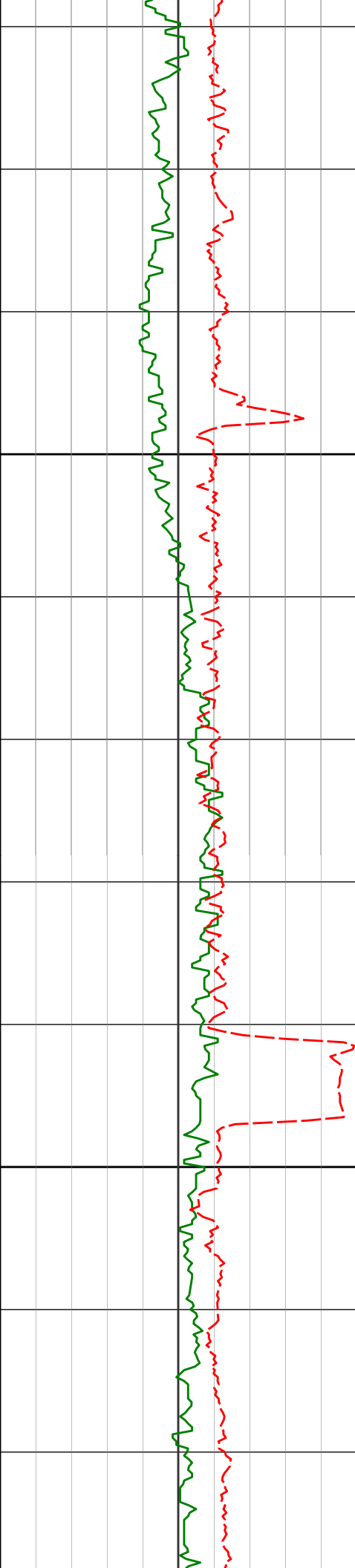
12518'

89.51°

86.65° 6451.75'

5973.38'

234.12°F



12600

12700

12612'

12707'

89.17°

88.80°

86.25° 6452.83'

86.84° 6454.51'

6067.37'

6162.36'

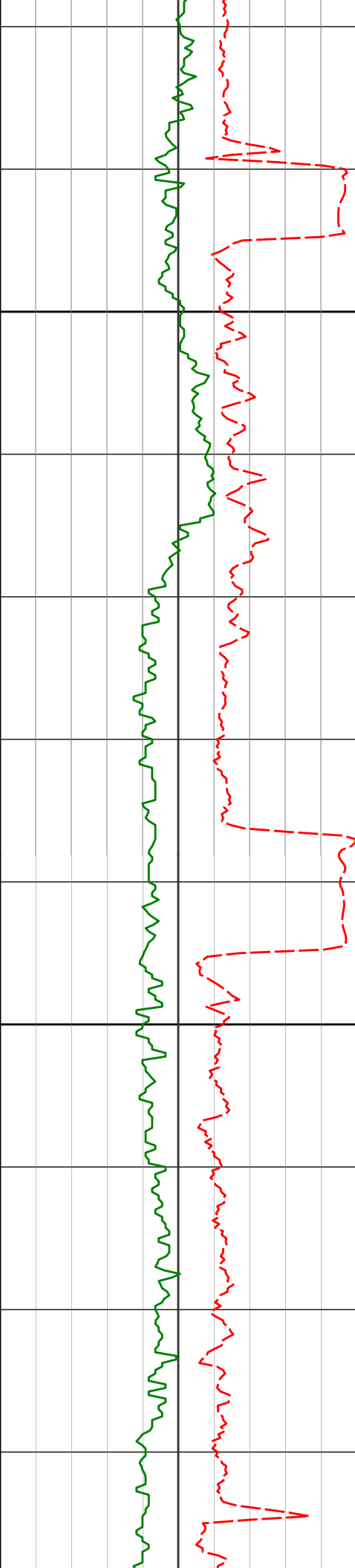
234.12°F

234.02°F

232.88°F

233.47°F

232.21°F



12800

12900

12802'

12896'

88.64°

89.88°

88.34° 6456.64'

89.31° 6457.85'

6257.32'

6351.24'

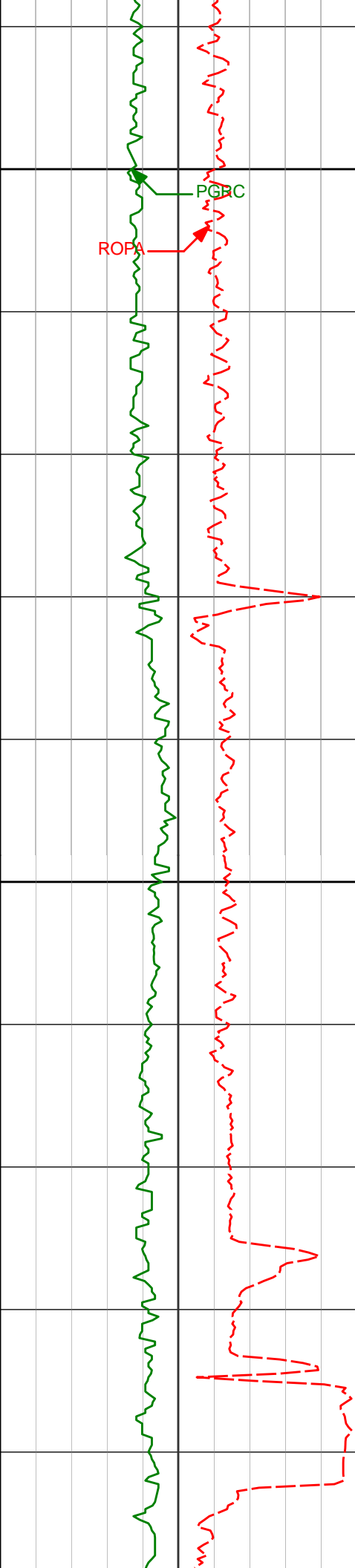
233.73°F

232.45°F

233.35°F

233.75°F

235.21°F



13000

236.82°F

237.15°F

13086'

91.26°

90.68° 6455.96'

6540.90'

235.97°F

13100

234.64°F

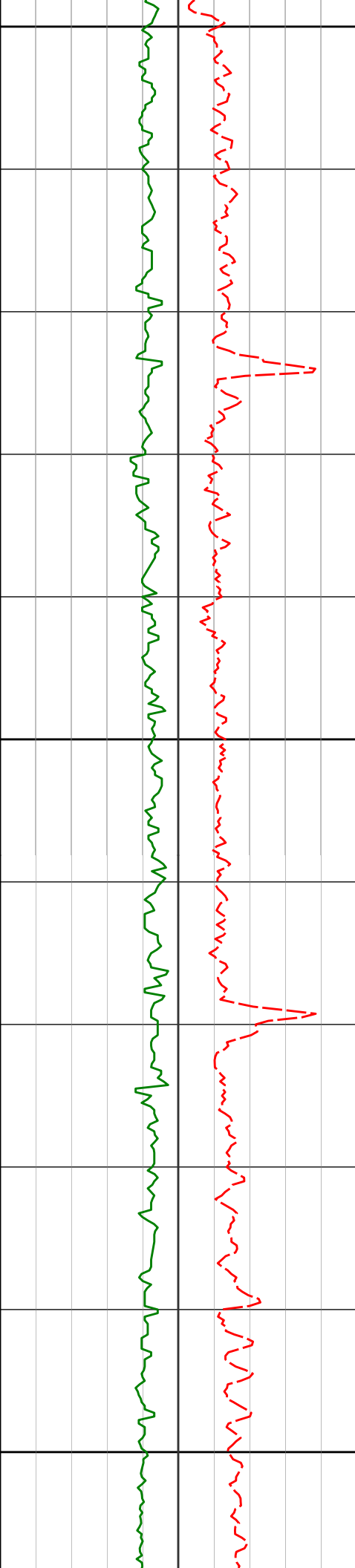
13180'

90.18°

89.35° 6454.78'

6634.72'

236.67°F



13200

236.82°F

13275'

89.97°

88.63° 6454.65'

6729.64'

237.11°F

13300

239.24°F

13369'

90.68°

91.09° 6454.12'

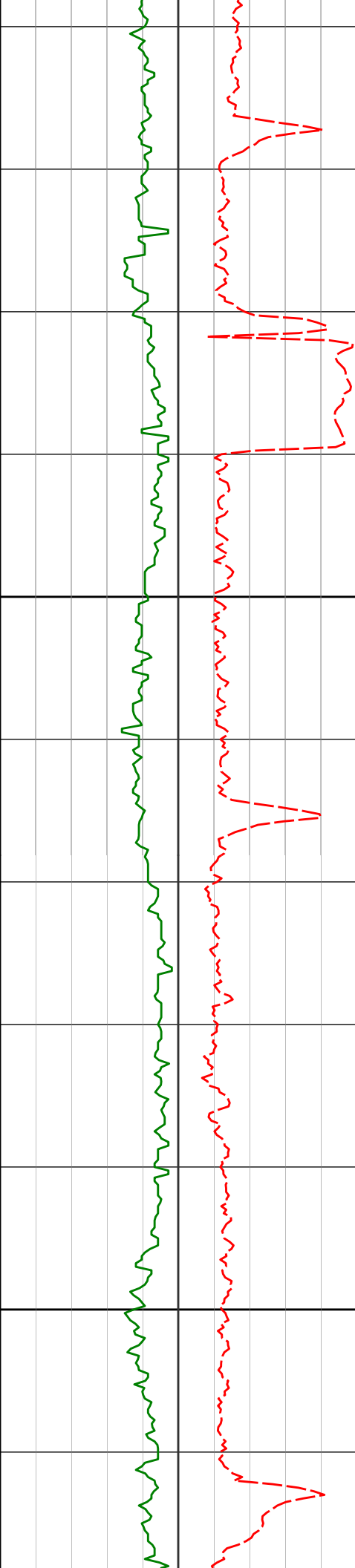
6823.49'

238.47°F

13400

236.73°F





13500

13600

13464'

89.72°

89.38° 6453.79'

6918.30'

13559'

89.32°

88.30° 6454.59'

7013.22'

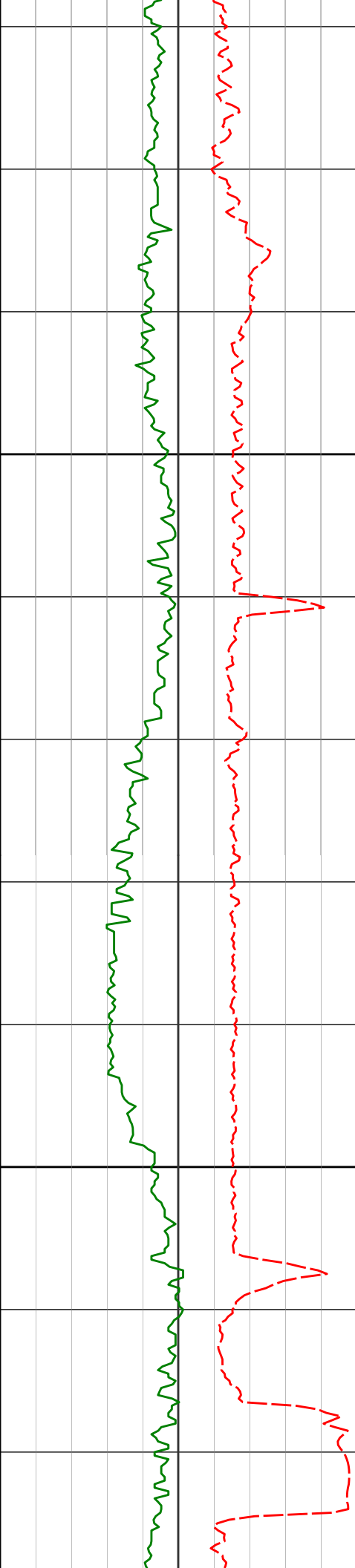
236.54°F

237.12°F

238.87°F

237.40°F

238.99°F



13700

13800

13653'

89.05°

88.67° 6455.92'

7107.16'

13748'

88.92°

88.60° 6457.61'

7202.09'

13843'

89.38°

87.49° 6459.02'

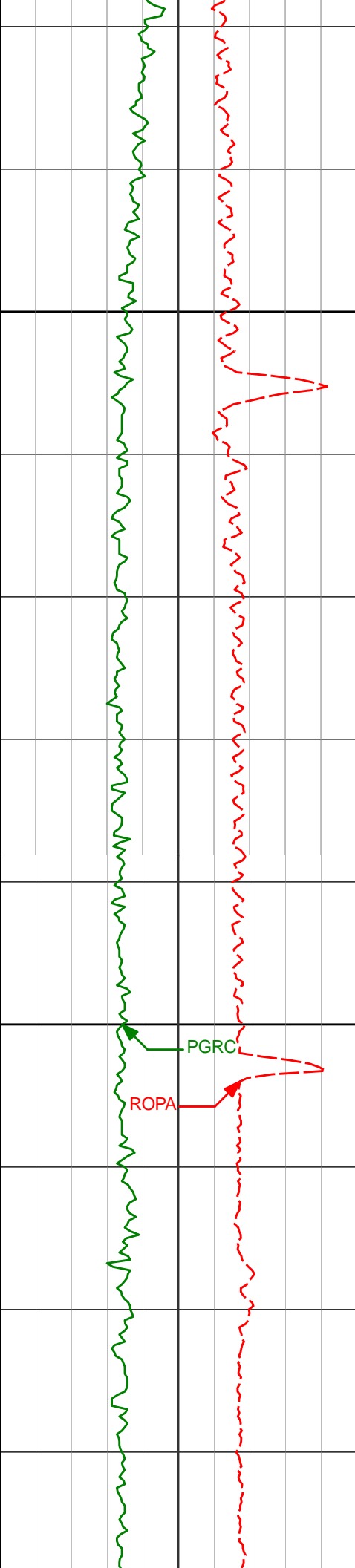
7297.05'

238.74°F

239.42°F

237.41°F

236.82°F



13900

14000

13937'

89.63°

87.35° 6459.83'

7391.04'

14032'

89.75°

87.23° 6460.34'

7486.03'

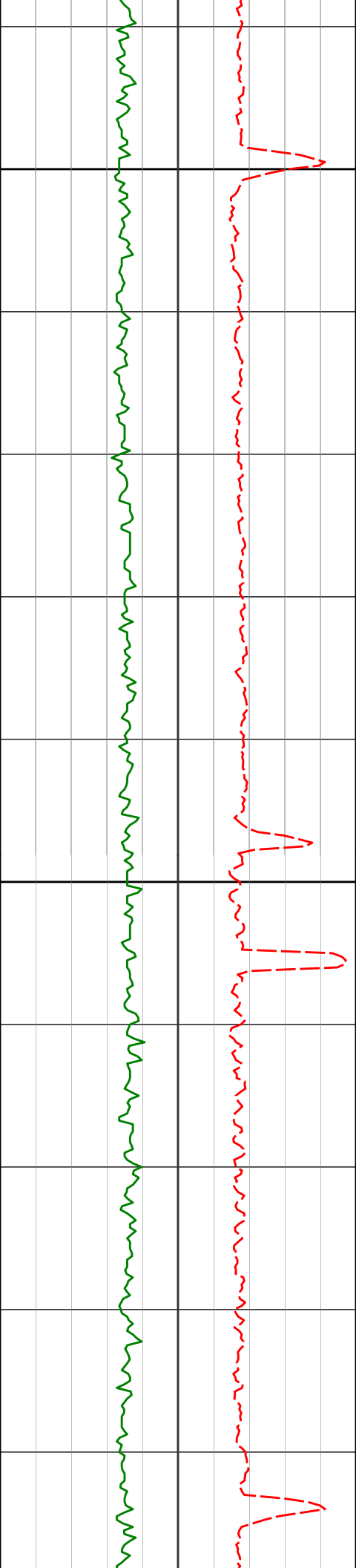
237.63°F

239.54°F

239.54°F

239.89°F

240.52°F



14100

14127'

90.22°

87.35° 6460.37'

7581.03'

14200

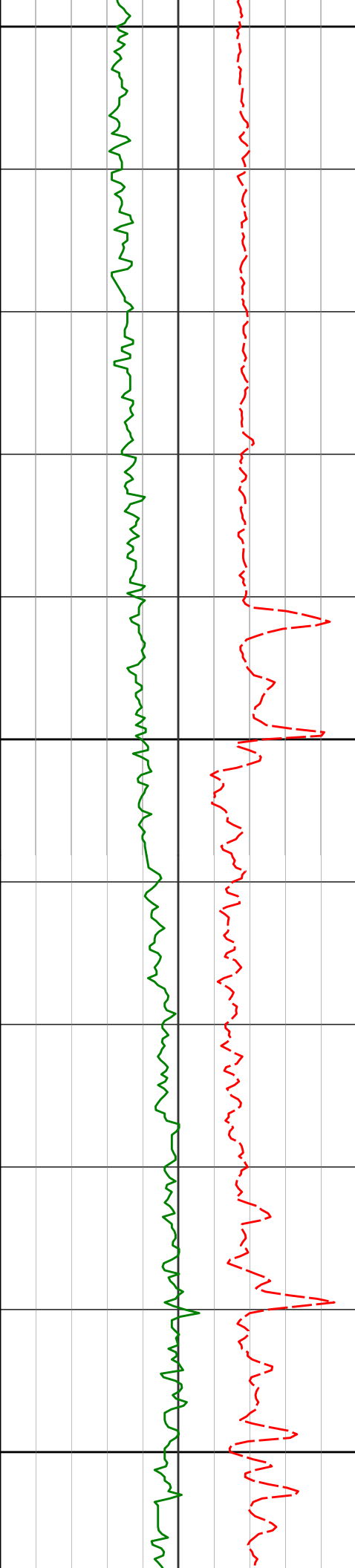
242.11°F

241.39°F

240.26°F

242.28°F

242.28°F



14300

14316'

90.18°

86.70° 6459.71'

7770.02'

242.28°F

242.28°F

14400

242.28°F

242.39°F

243.57°F

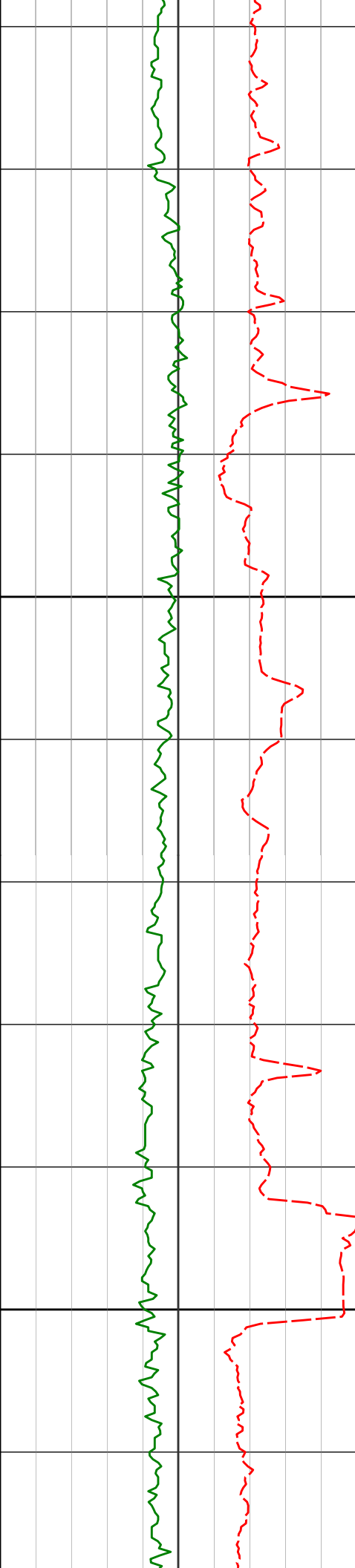
14500

14505'

90.12°

87.40° 6459.21'

7959.01'



14600

14700

14600'

14694'

89.63°

90.93°

86.16° 6459.42'

88.60° 6458.96'

8054.01'

8147.99'

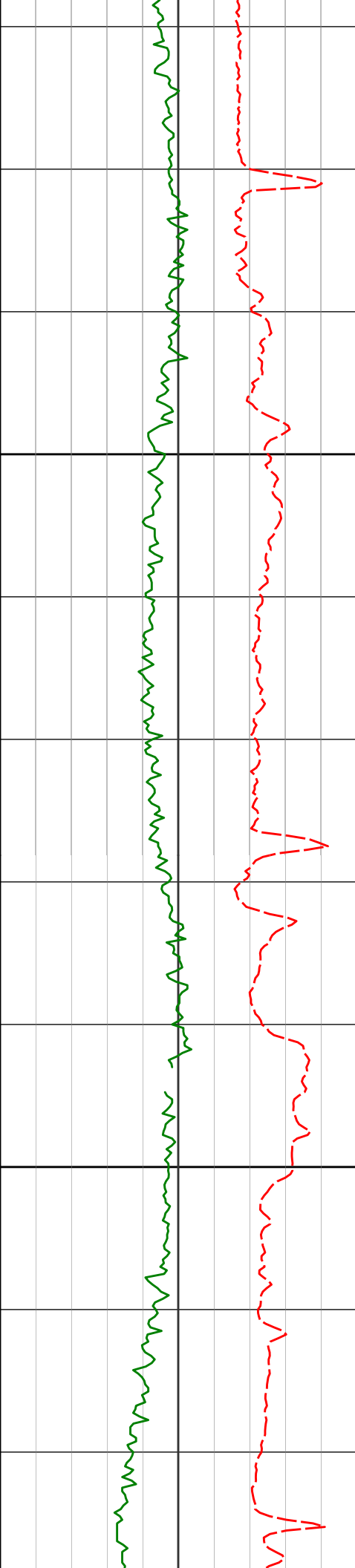
242.38°F

244.08°F

241.61°F

241.79°F

242.28°F



14800

14900

14788'

91.11°

89.70° 6457.29'

8241.89'

242.13°F

240.75°F

242.04°F

14883'

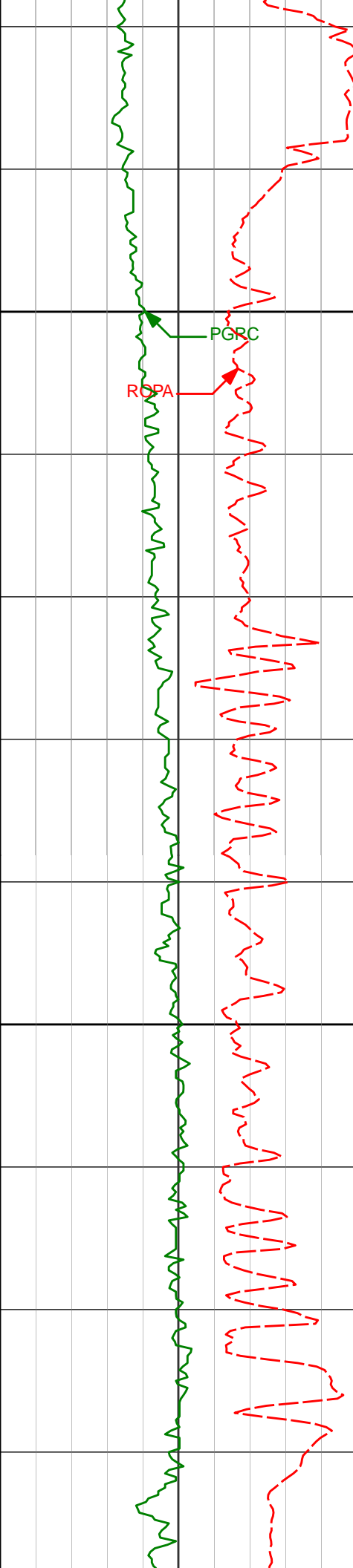
89.20°

87.07° 6457.03'

8336.83'

240.40°F

239.73°F

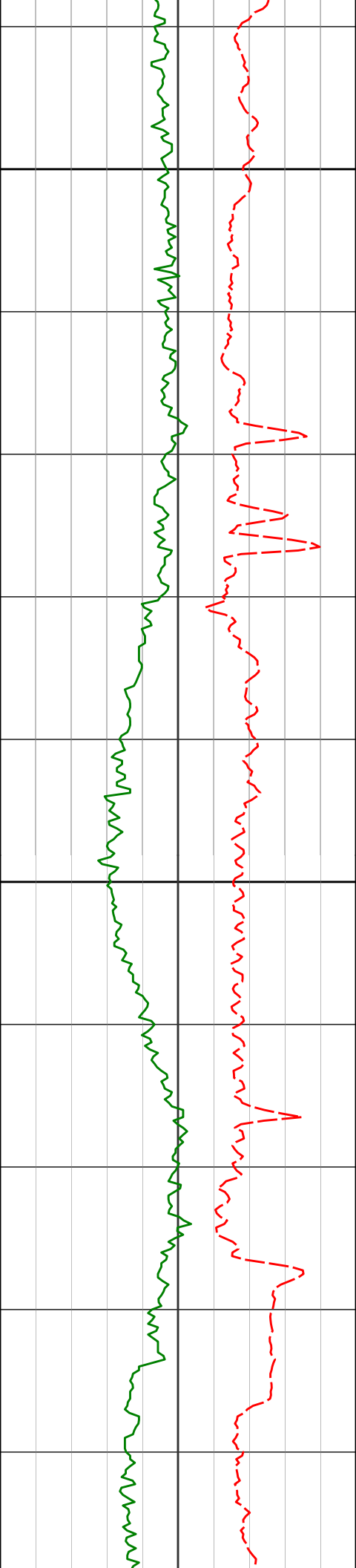


15000

15100

|        |        |        |          |          |          |
|--------|--------|--------|----------|----------|----------|
| 14977' | 91.11° | 89.14° | 6456.77' | 8430.79' | 242.11°F |
| 15072' | 91.51° | 89.27° | 6454.60' | 8525.67' | 242.28°F |
| 15167' | 92.43° | 89.31° | 6451.34' | 8620.51' | 243.46°F |





15200

242.28°F

244.13°F

15262'

91.57°

87.66° 6448.02'

8715.40'

15300

245.03°F

245.03°F

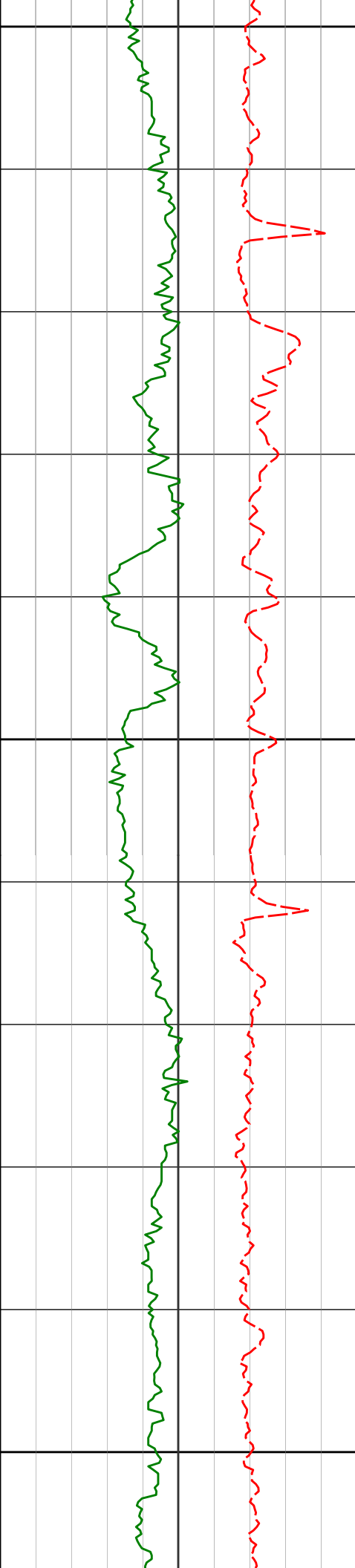
15356'

91.42°

87.54° 6445.57'

8809.36'

245.03°F



15400

245.84°F

15451'

92.13°

88.42° 6442.63'

8904.28'

245.36°F

15500

245.53°F

15546'

92.75°

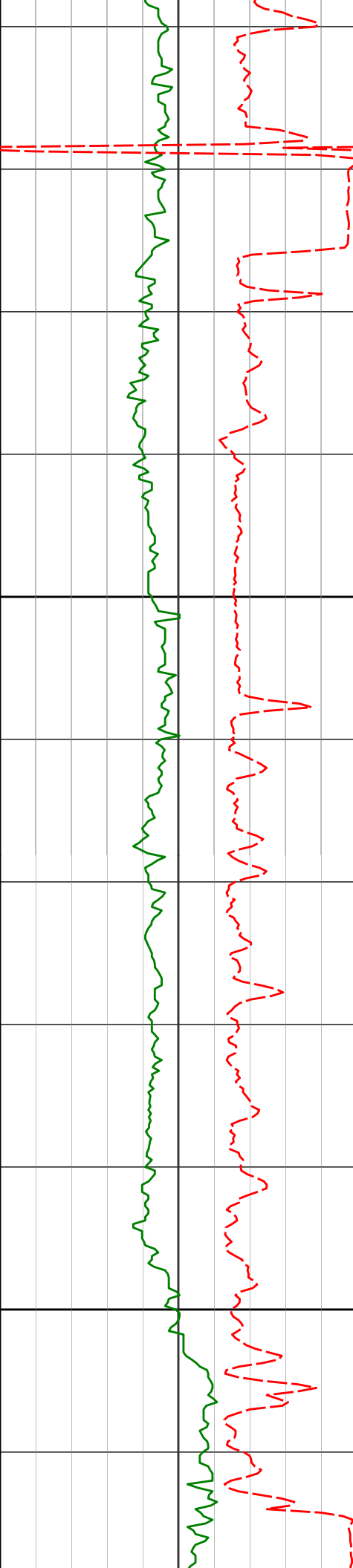
88.73° 6438.58'

8999.14'

243.37°F

15600

242.55°F



15700

15800

15641'

91.29°

88.63° 6435.23'

9094.02'

15735'

92.12°

88.59° 6432.44'

9187.93'

15830'

91.45°

87.72° 6429.48'

9282.84'

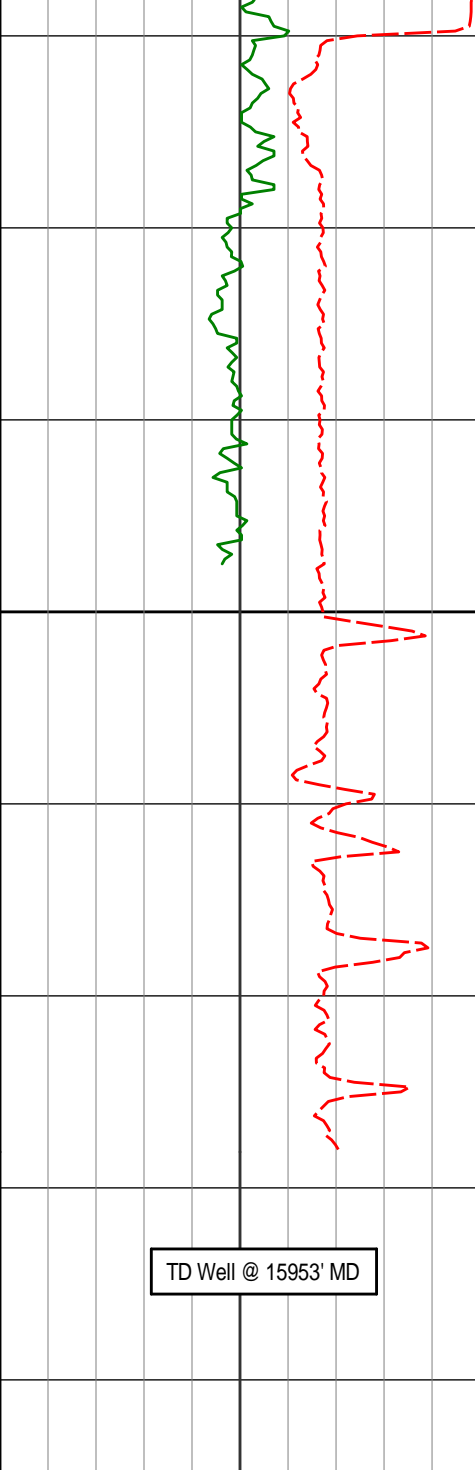
244.92°F

245.03°F

243.63°F

243.35°F

244.74°F



15900

15886'

91.17°

87.54° 6428.20'

9338.82'

TD Well @ 15953' MD

Avg Rate of Penetration  
ROPA  
feet per hr

1K feet per hr 0

Depth  
MD  
ft

## Depth

Inc

Azi

|TVD

V.S.

Temp

PCG GR XHi-Range RT  
PGRC  
api

|   |     |     |
|---|-----|-----|
| 0 | api | 300 |
|---|-----|-----|

# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

**Noble Energy  
Wells Ranch AE32-645  
Wattensburg  
Weld Colorado  
USA**

CA-XX-0902674376

**Surveys in the Lateral Section (Starting at 6879) have had IFR/MSA Corrections applied.**

|  |         |       |        |         |          |          |         |        |
|--|---------|-------|--------|---------|----------|----------|---------|--------|
|  | 0.00    | 0.00  | 0.00   | 0.00    | 0.00 N   | 0.00 E   | 0.00    | TIE-IN |
|  | 647.00  | 0.34  | 30.16  | 647.00  | 1.65 N   | 0.96 E   | 1.06    | 0.05   |
|  | 742.00  | 0.54  | 37.43  | 741.99  | 2.25 N   | 1.38 E   | 1.51    | 0.22   |
|  | 837.00  | 0.43  | 34.55  | 836.99  | 2.91 N   | 1.85 E   | 2.02    | 0.12   |
|  | 931.00  | 0.44  | 31.70  | 930.99  | 3.51 N   | 2.24 E   | 2.44    | 0.02   |
|  | 1026.00 | 0.32  | 33.66  | 1025.99 | 4.03 N   | 2.58 E   | 2.81    | 0.13   |
|  | 1119.00 | 0.39  | 6.81   | 1118.98 | 4.57 N   | 2.76 E   | 3.02    | 0.20   |
|  | 1213.00 | 0.50  | 18.98  | 1212.98 | 5.27 N   | 2.93 E   | 3.24    | 0.15   |
|  | 1305.00 | 0.60  | 11.41  | 1304.98 | 6.12 N   | 3.16 E   | 3.51    | 0.14   |
|  | 1399.00 | 0.63  | 16.33  | 1398.97 | 7.10 N   | 3.40 E   | 3.81    | 0.07   |
|  | 1492.00 | 0.68  | 13.96  | 1491.96 | 8.12 N   | 3.68 E   | 4.14    | 0.06   |
|  | 1584.00 | 3.34  | 317.24 | 1583.91 | 10.61 N  | 1.99 E   | 2.60    | 3.28   |
|  | 1677.00 | 6.41  | 305.01 | 1676.56 | 15.58 N  | 4.10 W   | -3.19   | 3.47   |
|  | 1769.00 | 6.46  | 302.59 | 1767.98 | 21.32 N  | 12.67 W  | -11.40  | 0.30   |
|  | 1862.00 | 9.30  | 299.61 | 1860.09 | 27.85 N  | 23.61 W  | -21.94  | 3.08   |
|  | 1954.00 | 8.80  | 293.75 | 1950.95 | 34.36 N  | 36.52 W  | -34.45  | 1.14   |
|  | 2141.00 | 7.50  | 286.63 | 2136.06 | 43.61 N  | 61.31 W  | -58.66  | 0.88   |
|  | 2235.00 | 6.99  | 286.25 | 2229.31 | 46.97 N  | 72.68 W  | -69.81  | 0.55   |
|  | 2328.00 | 7.34  | 287.97 | 2321.58 | 50.39 N  | 83.77 W  | -80.68  | 0.45   |
|  | 2420.00 | 6.80  | 284.28 | 2412.88 | 53.54 N  | 94.64 W  | -91.35  | 0.77   |
|  | 2512.00 | 8.84  | 290.15 | 2504.02 | 57.32 N  | 106.55 W | -103.02 | 2.38   |
|  | 2604.00 | 8.02  | 288.75 | 2595.03 | 61.82 N  | 119.27 W | -115.45 | 0.92   |
|  | 2695.00 | 8.51  | 294.37 | 2685.09 | 66.64 N  | 131.41 W | -127.30 | 1.04   |
|  | 2789.00 | 7.87  | 294.45 | 2778.13 | 72.17 N  | 143.61 W | -139.15 | 0.68   |
|  | 2882.00 | 7.60  | 294.17 | 2870.28 | 77.33 N  | 155.01 W | -150.23 | 0.30   |
|  | 2976.00 | 9.60  | 301.87 | 2963.22 | 84.01 N  | 167.34 W | -162.14 | 2.45   |
|  | 3071.00 | 7.74  | 302.70 | 3057.13 | 91.65 N  | 179.45 W | -173.78 | 1.96   |
|  | 3165.00 | 7.86  | 302.60 | 3150.26 | 98.53 N  | 190.19 W | -184.11 | 0.13   |
|  | 3260.00 | 7.18  | 301.68 | 3244.45 | 105.15 N | 200.71 W | -194.23 | 0.73   |
|  | 3354.00 | 6.64  | 301.66 | 3337.76 | 111.08 N | 210.34 W | -203.49 | 0.57   |
|  | 3449.00 | 7.57  | 291.87 | 3432.04 | 116.30 N | 220.82 W | -213.65 | 1.61   |
|  | 3543.00 | 9.30  | 289.72 | 3525.02 | 121.17 N | 233.72 W | -226.24 | 1.86   |
|  | 3638.00 | 10.31 | 289.13 | 3618.63 | 126.54 N | 248.98 W | -241.16 | 1.07   |
|  | 3733.00 | 10.88 | 290.64 | 3712.01 | 132.49 N | 265.39 W | -257.20 | 0.66   |
|  | 3827.00 | 11.01 | 295.56 | 3804.30 | 139.48 N | 281.79 W | -273.16 | 1.00   |
|  | 3922.00 | 9.34  | 302.36 | 3897.81 | 147.53 N | 296.48 W | -287.36 | 2.16   |
|  | 4016.00 | 8.26  | 308.51 | 3990.70 | 155.81 N | 308.21 W | -298.58 | 1.52   |
|  | 4111.00 | 7.53  | 309.94 | 4084.80 | 164.06 N | 318.33 W | -308.20 | 0.79   |
|  | 4300.00 | 6.23  | 326.14 | 4272.45 | 180.53 N | 333.54 W | -322.42 | 1.23   |
|  | 4395.00 | 6.53  | 308.95 | 4366.87 | 188.21 N | 340.62 W | -329.04 | 2.03   |
|  | 4490.00 | 7.04  | 313.03 | 4461.21 | 195.58 N | 349.08 W | -337.05 | 0.74   |
|  | 4584.00 | 7.01  | 311.92 | 4554.50 | 203.35 N | 357.56 W | -345.06 | 0.15   |
|  | 4679.00 | 5.19  | 301.34 | 4648.96 | 209.46 N | 365.54 W | -352.68 | 2.24   |
|  | 4773.00 | 3.77  | 296.59 | 4742.67 | 213.05 N | 371.94 W | -358.85 | 1.56   |
|  | 4868.00 | 1.75  | 309.17 | 4837.56 | 215.37 N | 375.86 W | -362.63 | 2.20   |
|  | 4962.00 | 2.26  | 313.44 | 4931.50 | 217.55 N | 378.32 W | -364.96 | 0.56   |
|  | 5057.00 | 0.49  | 297.19 | 5026.47 | 219.02 N | 380.03 W | -366.59 | 1.89   |
|  | 5152.00 | 0.78  | 325.70 | 5121.46 | 219.74 N | 380.76 W | -367.27 | 0.45   |
|  | 5246.00 | 0.46  | 265.18 | 5215.46 | 220.24 N | 381.50 W | -367.97 | 0.73   |
|  | 5341.00 | 0.31  | 242.27 | 5310.46 | 220.09 N | 382.10 W | -368.59 | 0.22   |
|  | 5436.00 | 0.52  | 186.78 | 5405.46 | 219.54 N | 382.38 W | -368.90 | 0.45   |
|  | 5530.00 | 0.41  | 202.24 | 5499.45 | 218.80 N | 382.56 W | -369.12 | 0.18   |
|  | 5625.00 | 0.29  | 173.53 | 5594.45 | 218.25 N | 382.66 W | -369.25 | 0.22   |
|  | 5719.00 | 0.19  | 127.52 | 5688.45 | 217.92 N | 382.51 W | -369.12 | 0.22   |
|  | 5814.00 | 0.52  | 69.10  | 5783.45 | 217.97 N | 381.97 W | -368.58 | 0.48   |
|  | 5909.00 | 12.84 | 95.21  | 5877.63 | 217.17 N | 371.02 W | -357.69 | 13.02  |
|  | 6003.00 | 24.41 | 91.46  | 5966.56 | 215.72 N | 341.10 W | -327.91 | 12.37  |
|  | 6098.00 | 27.82 | 86.63  | 6051.86 | 216.53 N | 299.33 W | -286.17 | 4.23   |
|  | 6192.00 | 30.62 | 85.35  | 6133.89 | 219.76 N | 253.57 W | -240.30 | 3.05   |
|  | 6287.00 | 43.53 | 92.13  | 6209.56 | 220.51 N | 196.50 W | -183.28 | 14.24  |
|  | 6381.00 | 47.87 | 93.25  | 6275.20 | 217.33 N | 129.32 W | -116.40 | 4.70   |
|  | 6476.00 | 54.85 | 90.69  | 6334.48 | 214.86 N | 55.22 W  | -42.56  | 7.64   |
|  | 6571.00 | 63.77 | 84.67  | 6382.95 | 218.36 N | 26.26 E  | 38.98   | 10.84  |
|  | 6665.00 | 73.31 | 86.18  | 6417.31 | 225.29 N | 113.37 E | 126.34  | 10.26  |
|  | 6760.00 | 81.38 | 87.20  | 6438.11 | 230.62 N | 205.83 E | 218.95  | 8.55   |
|  | 6776.00 | 83.48 | 87.66  | 6440.22 | 231.33 N | 221.67 E | 234.81  | 13.46  |
|  | 6879.00 | 86.83 | 87.05  | 6448.91 | 236.07 N | 324.18 E | 337.42  | 3.30   |
|  | 6974.00 | 89.23 | 88.40  | 6452.18 | 239.84 N | 419.04 E | 432.34  | 2.90   |
|  | 7068.00 | 89.48 | 87.83  | 6453.24 | 242.93 N | 512.98 E | 526.30  | 0.66   |
|  | 7163.00 | 89.97 | 89.46  | 6453.69 | 245.18 N | 607.95 E | 621.24  | 1.79   |

|          |       |       |         |          |           |         |      |
|----------|-------|-------|---------|----------|-----------|---------|------|
| 7258.00  | 90.18 | 91.64 | 6453.57 | 244.27 N | 702.94 E  | 716.01  | 2.31 |
| 7352.00  | 89.32 | 89.38 | 6453.98 | 243.43 N | 796.93 E  | 809.79  | 2.57 |
| 7447.00  | 90.22 | 88.76 | 6454.36 | 244.97 N | 891.91 E  | 904.70  | 1.15 |
| 7541.00  | 90.46 | 89.88 | 6453.80 | 246.09 N | 985.90 E  | 998.60  | 1.22 |
| 7636.00  | 90.46 | 89.43 | 6453.04 | 246.66 N | 1080.90 E | 1093.47 | 0.47 |
| 7731.00  | 90.31 | 88.26 | 6452.40 | 248.57 N | 1175.88 E | 1188.39 | 1.24 |
| 7826.00  | 90.65 | 88.36 | 6451.60 | 251.37 N | 1270.83 E | 1283.35 | 0.37 |
| 7920.00  | 91.63 | 86.91 | 6449.73 | 255.25 N | 1364.73 E | 1377.31 | 1.86 |
| 8015.00  | 90.34 | 85.72 | 6448.10 | 261.36 N | 1459.51 E | 1472.29 | 1.85 |
| 8109.00  | 91.67 | 86.33 | 6446.45 | 267.87 N | 1553.27 E | 1566.27 | 1.56 |
| 8204.00  | 89.97 | 86.28 | 6445.09 | 273.99 N | 1648.06 E | 1661.26 | 1.79 |
| 8299.00  | 90.34 | 85.53 | 6444.84 | 280.78 N | 1742.82 E | 1756.25 | 0.88 |
| 8393.00  | 90.34 | 85.92 | 6444.28 | 287.78 N | 1836.55 E | 1850.23 | 0.41 |
| 8583.00  | 90.68 | 88.12 | 6442.59 | 297.66 N | 2026.28 E | 2040.21 | 1.17 |
| 8677.00  | 90.37 | 89.47 | 6441.73 | 299.64 N | 2120.25 E | 2134.14 | 1.47 |
| 8771.00  | 89.51 | 89.38 | 6441.82 | 300.58 N | 2214.24 E | 2228.03 | 0.92 |
| 8865.00  | 89.69 | 89.31 | 6442.48 | 301.66 N | 2308.24 E | 2321.92 | 0.21 |
| 8960.00  | 90.28 | 89.07 | 6442.50 | 303.00 N | 2403.23 E | 2416.83 | 0.67 |
| 9054.00  | 89.91 | 89.39 | 6442.35 | 304.26 N | 2497.22 E | 2510.73 | 0.52 |
| 9243.00  | 90.43 | 90.32 | 6441.79 | 304.74 N | 2686.21 E | 2699.43 | 0.56 |
| 9338.00  | 89.91 | 88.84 | 6441.51 | 305.44 N | 2781.21 E | 2794.30 | 1.65 |
| 9433.00  | 90.34 | 88.72 | 6441.30 | 307.46 N | 2876.19 E | 2889.24 | 0.47 |
| 9527.00  | 89.91 | 88.76 | 6441.09 | 309.53 N | 2970.16 E | 2983.17 | 0.46 |
| 9621.00  | 89.82 | 88.61 | 6441.32 | 311.68 N | 3064.14 E | 3077.11 | 0.19 |
| 9716.00  | 89.78 | 86.94 | 6441.65 | 315.37 N | 3159.06 E | 3172.09 | 1.76 |
| 9905.00  | 90.65 | 88.19 | 6440.94 | 323.40 N | 3347.88 E | 3361.06 | 0.81 |
| 9999.00  | 89.23 | 87.20 | 6441.04 | 327.18 N | 3441.80 E | 3455.04 | 1.84 |
| 10094.00 | 89.32 | 86.32 | 6442.24 | 332.55 N | 3536.64 E | 3550.03 | 0.93 |
| 10187.00 | 89.32 | 86.07 | 6443.34 | 338.72 N | 3629.43 E | 3643.02 | 0.27 |
| 10281.00 | 89.94 | 86.58 | 6443.95 | 344.75 N | 3723.24 E | 3737.02 | 0.85 |
| 10373.00 | 90.56 | 86.36 | 6443.55 | 350.41 N | 3815.06 E | 3829.02 | 0.72 |
| 10467.00 | 89.69 | 87.23 | 6443.34 | 355.67 N | 3908.91 E | 3923.02 | 1.31 |
| 10560.00 | 90.31 | 87.65 | 6443.34 | 359.82 N | 4001.82 E | 4016.01 | 0.81 |
| 10653.00 | 89.57 | 86.84 | 6443.44 | 364.29 N | 4094.71 E | 4109.00 | 1.18 |
| 10745.00 | 88.92 | 87.78 | 6444.65 | 368.61 N | 4186.60 E | 4200.98 | 1.24 |
| 10837.00 | 89.41 | 87.31 | 6445.99 | 372.55 N | 4278.50 E | 4292.96 | 0.74 |
| 10930.00 | 89.48 | 86.61 | 6446.89 | 377.48 N | 4371.37 E | 4385.96 | 0.76 |
| 11022.00 | 90.25 | 86.70 | 6447.11 | 382.85 N | 4463.21 E | 4477.96 | 0.84 |
| 11117.00 | 90.89 | 88.85 | 6446.17 | 386.54 N | 4558.13 E | 4572.93 | 2.36 |
| 11210.00 | 89.14 | 89.17 | 6446.14 | 388.14 N | 4651.11 E | 4665.84 | 1.91 |
| 11303.00 | 88.27 | 88.98 | 6448.24 | 389.64 N | 4744.07 E | 4758.74 | 0.96 |
| 11396.00 | 89.02 | 88.20 | 6450.44 | 391.93 N | 4837.02 E | 4851.65 | 1.16 |
| 11489.00 | 89.04 | 87.56 | 6452.02 | 395.37 N | 4929.94 E | 4944.62 | 0.69 |
| 11580.00 | 88.89 | 86.95 | 6453.66 | 399.73 N | 5020.82 E | 5035.60 | 0.69 |
| 11672.00 | 89.54 | 87.59 | 6454.92 | 404.11 N | 5112.71 E | 5127.58 | 0.99 |
| 11764.00 | 89.66 | 88.01 | 6455.56 | 407.64 N | 5204.64 E | 5219.56 | 0.47 |
| 11857.00 | 90.59 | 87.92 | 6455.36 | 410.94 N | 5297.58 E | 5312.54 | 1.00 |
| 11950.00 | 90.56 | 87.55 | 6454.43 | 414.62 N | 5390.50 E | 5405.52 | 0.40 |
| 12139.00 | 91.82 | 87.83 | 6450.50 | 422.24 N | 5579.30 E | 5594.44 | 0.68 |
| 12234.00 | 89.94 | 87.45 | 6449.04 | 426.15 N | 5674.20 E | 5689.41 | 2.02 |
| 12328.00 | 89.38 | 87.57 | 6449.60 | 430.23 N | 5768.11 E | 5783.40 | 0.61 |
| 12423.00 | 89.26 | 86.87 | 6450.73 | 434.84 N | 5862.99 E | 5878.39 | 0.75 |
| 12518.00 | 89.51 | 86.65 | 6451.75 | 440.21 N | 5957.84 E | 5973.38 | 0.35 |
| 12612.00 | 89.17 | 86.25 | 6452.83 | 446.03 N | 6051.65 E | 6067.37 | 0.56 |
| 12707.00 | 88.80 | 86.84 | 6454.51 | 451.75 N | 6146.46 E | 6162.36 | 0.73 |
| 12802.00 | 88.64 | 88.34 | 6456.64 | 455.75 N | 6241.35 E | 6257.32 | 1.59 |
| 12896.00 | 89.88 | 89.31 | 6457.85 | 457.67 N | 6335.32 E | 6351.24 | 1.67 |
| 13086.00 | 91.26 | 90.68 | 6455.96 | 457.69 N | 6525.30 E | 6540.90 | 1.02 |
| 13180.00 | 90.18 | 89.35 | 6454.78 | 457.67 N | 6619.29 E | 6634.72 | 1.82 |
| 13275.00 | 89.97 | 88.63 | 6454.65 | 459.34 N | 6714.28 E | 6729.64 | 0.79 |
| 13369.00 | 90.68 | 91.09 | 6454.12 | 459.57 N | 6808.27 E | 6823.49 | 2.72 |
| 13464.00 | 89.72 | 89.38 | 6453.79 | 459.18 N | 6903.26 E | 6918.30 | 2.06 |
| 13559.00 | 89.32 | 88.30 | 6454.59 | 461.10 N | 6998.24 E | 7013.22 | 1.21 |
| 13653.00 | 89.05 | 88.67 | 6455.92 | 463.59 N | 7092.19 E | 7107.16 | 0.49 |
| 13748.00 | 88.92 | 88.60 | 6457.61 | 465.85 N | 7187.15 E | 7202.09 | 0.16 |
| 13843.00 | 89.38 | 87.49 | 6459.02 | 469.09 N | 7282.08 E | 7297.05 | 1.26 |
| 13937.00 | 89.63 | 87.35 | 6459.83 | 473.32 N | 7375.98 E | 7391.04 | 0.30 |
| 14032.00 | 89.75 | 87.23 | 6460.34 | 477.81 N | 7470.88 E | 7486.03 | 0.18 |
| 14127.00 | 90.22 | 87.35 | 6460.37 | 482.31 N | 7565.77 E | 7581.03 | 0.51 |
| 14316.00 | 90.18 | 86.70 | 6459.71 | 492.11 N | 7754.51 E | 7770.02 | 0.34 |
| 14505.00 | 90.12 | 87.40 | 6459.21 | 501.84 N | 7943.26 E | 7959.01 | 0.37 |
| 14600.00 | 89.63 | 86.16 | 6459.42 | 507.18 N | 8038.11 E | 8054.01 | 1.40 |
| 14694.00 | 90.93 | 88.60 | 6458.96 | 511.47 N | 8132.00 E | 8147.99 | 2.94 |
| 14788.00 | 91.11 | 89.70 | 6457.29 | 512.87 N | 8225.97 E | 8241.89 | 1.19 |
| 14883.00 | 89.20 | 87.07 | 6457.03 | 515.55 N | 8320.92 E | 8336.83 | 3.42 |

|          |       |       |         |          |           |         |      |
|----------|-------|-------|---------|----------|-----------|---------|------|
| 14977.00 | 91.11 | 89.14 | 6456.77 | 518.65 N | 8414.86 E | 8430.79 | 3.00 |
| 15072.00 | 91.51 | 89.27 | 6454.60 | 519.97 N | 8509.83 E | 8525.67 | 0.44 |
| 15167.00 | 92.43 | 89.31 | 6451.34 | 521.15 N | 8604.76 E | 8620.51 | 0.97 |
| 15262.00 | 91.57 | 87.66 | 6448.02 | 523.66 N | 8699.67 E | 8715.40 | 1.96 |
| 15356.00 | 91.42 | 87.54 | 6445.57 | 527.59 N | 8793.55 E | 8809.36 | 0.20 |
| 15451.00 | 92.13 | 88.42 | 6442.63 | 530.94 N | 8888.45 E | 8904.28 | 1.19 |
| 15546.00 | 92.75 | 88.73 | 6438.58 | 533.30 N | 8983.33 E | 8999.14 | 0.73 |
| 15641.00 | 91.29 | 88.63 | 6435.23 | 535.49 N | 9078.24 E | 9094.02 | 1.54 |
| 15735.00 | 92.12 | 88.59 | 6432.44 | 537.77 N | 9172.17 E | 9187.93 | 0.88 |
| 15830.00 | 91.45 | 87.72 | 6429.48 | 540.82 N | 9267.08 E | 9282.84 | 1.16 |
| 15886.00 | 91.17 | 87.54 | 6428.20 | 543.14 N | 9323.01 E | 9338.82 | 0.59 |
| 15953.00 | 91.17 | 87.54 | 6426.83 | 546.01 N | 9389.94 E | 9405.80 | 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 86.65 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.32 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 15953.00 FEET  
IS 9405.80 FEET ALONG 86.67 DEGREES (GRID)**

**Final survey is a straight line projection to TD.**