

PCG-K Pressure Case Gamma



1 : 240

[illegible]

WELL INFORMATION

| | | | | | |
|---|------------------|-------------------|-------------------|--|--|
| MWD Run Number | 100 | 200 | 300 | | |
| Date run completed | 08-Jun-13 | 13-Jun-13 | 17-Jun-13 | | |
| Rig Bit Number | 100 | 0200 | 0400 | | |
| Bit Size (in) | 8.750 | 6.125 | 6.125 | | |
| Tool Nominal OD (in) | 6.750 | 4.750 | 4.750 | | |
| Log Start Depth (MD, ft) | 1,040.00 | 7,697.00 | 13,533.00 | | |
| Log End Depth (MD, ft) | 7,697.00 | 13,533.00 | 14,514.00 | | |
| Drill or Wipe | Drill | Drill | Drill | | |
| Drill/Wipe Start Date and Time | 06-Jun-13 06:00 | 10-Jun-13 03:39 | 16-Jun-13 10:31 | | |
| Drill/Wipe End Date and Time | 08-Jun-13 08:57 | 13-Jun-13 06:25 | 17-Jun-13 00:17 | | |
| Min Inc (deg) @ Depth (MD, ft) | .63 @ 6,650.00 | 87.38 @ 10,890.00 | 89.45 @ 13,544.00 | | |
| Max Inc (deg) @ Depth (MD, ft) | 85.93 @ 7,645.00 | 93.88 @ 10,155.00 | 93.70 @ 14,465.00 | | |
| Bit TFA(in2) / Bit Type | .86 / PDC | .61 / PDC | .61 / PDC | | |
| Flow Rate (gpm) | 595.57 | 265.57 | 265.00 | | |
| Max AV (fpm) / CV (fpm) @ MWD | N/A / N/A | 421.0 / 359.0 | N/A / N/A | | |
| Fluid Type | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel | | |
| Density (ppg) / Viscosity (spqt) | 9.80 / 39.00 | 9.60 / 45.00 | 9.60 / 40.00 | | |
| Filtrate CL (ppm) | 14,000.00 | 1,000.00 | 1,000.00 | | |
| pH / Fluid Loss (mptm) | 9.00 / 9.00 | 9.00 / 9.00 | 9.00 / 9.00 | | |
| PV (cP) / YP (lbf2) | 15 / 15.00 | 17 / 14.00 | 17 / 10.00 | | |
| % Solids / % Sand | 6.42 / 0.10 | 7 / .2 | 7 / .7 | | |
| % Oil / Oil:Water Ratio | N/A / N/A | N/A / N/A | N/A / N/A | | |
| Rm @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | N/A @ N/A | | |
| Rmf @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | N/A @ N/A | | |
| Rmc @ Measured Temp (degF) | N/A @ N/A | N/A @ N/A | N/A @ N/A | | |
| Max Fluid Temp (deg F) @ C | 177.80 / 330.00 | 210.00 / 400.00 | 210.00 / 400.00 | | |

| | | | | | |
|-------------------------------|--------------|--------------|--------------|--|--|
| Max Tool Temp (degF) / Source | 177.64 / PCM | 242.28 / PCM | 242.28 / PCM | | |
| Rm @ Max Tool Temp (degF) | N/A @ 177.64 | N/A @ 242.28 | N/A @ 242.28 | | |
| Lead MWD Engineer | Patrick Lane | Ryan White | Ryan White | | |
| Customer Representative | Stan Walters | Stan Walters | Stan Walters | | |

SENSOR INFORMATION

Downhole Processor Information

| | | | | | |
|---------------------------|-----------------|-----------------|-----------------|--|--|
| Tool Type | PCM | PCM | PCM | | |
| Software Version | 5.84 | 5.84 | 5.84 | | |
| Sub Serial Number | 245494 | 12145495 | 12134685 | | |
| Insert Serial Number | 11680788 | 11680736 | 11680788 | | |
| Date and Time Initialized | 03-Jun-13 15:46 | 08-Jun-13 10:37 | 13-Jun-13 15:40 | | |
| Date and Time Read | 08-Jun-13 16:03 | 13-Jun-13 21:35 | 01-Jan-70 00:00 | | |
| ECMB SW Version | N/A | N/A | N/A | | |

Directional Sensor Information

| | | | | | |
|------------------------|----------|----------|----------|--|--|
| Tool Type | PCDC | PCDC | PCDC | | |
| Distance From Bit (ft) | 50.25 | 48.24 | 47.27 | | |
| Software Version | 6.21 | 6.21 | 6.21 | | |
| Sub Serial Number | 245494 | 12145495 | 12134685 | | |
| Sonde Serial Number | 11478107 | 11145703 | 11833213 | | |
| Sensor ID Number | N/A | N/A | N/A | | |
| Toolface Offset (deg) | 166.90 | 95.29 | 179.62 | | |

Gamma Ray Sensor Information

| | | | | | |
|------------------------------|----------|----------|----------|--|--|
| Tool Type | PCG | PCG | PCG | | |
| Distance From Bit (ft) | 55.20 | 53.19 | 52.22 | | |
| Recorded Sample Period (sec) | 10 | 10 | 10 | | |
| Software Version | 8.15 | 8.15 | 8.15 | | |
| Sub Serial Number | 245494 | 12145495 | 12134685 | | |
| Insert/Sonde Serial Number | 11579845 | 11121365 | 11680985 | | |

REMARKS

1. All depths are measured bit depths, referenced to the driller's pipe tally and are measured from the drill floor, unless otherwise specified.

2. No depth corrections have been made for pipe stretch or compression.

3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

4. All data presented is recorded data unless otherwise specified

5. The following smoothing parameters have been applied to the data:

PGRC (Corrected Gamma Ray):

Interval Resolution: 0.5 ft

Interval Distance: 0.6 ft

Gap Fill: 3.0 ft

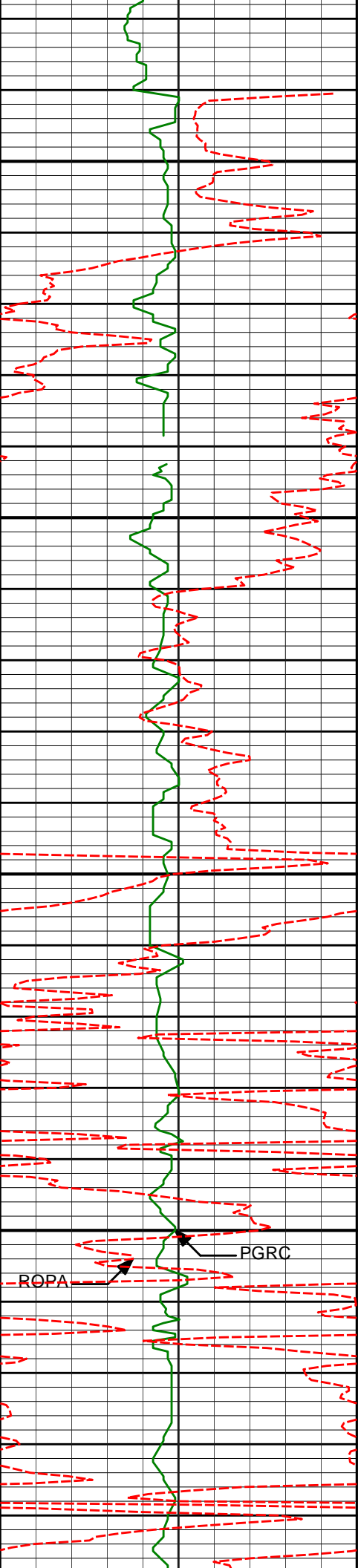
ROPA (Average Rate of Penetration):

Interval Resolution: 0.5 ft

Interval Distance: 1.2 ft

Gap Fill : 3.0 ft

6. INSITE version 7.4.10



1050

1100

1150

1200

1098'

1.09°

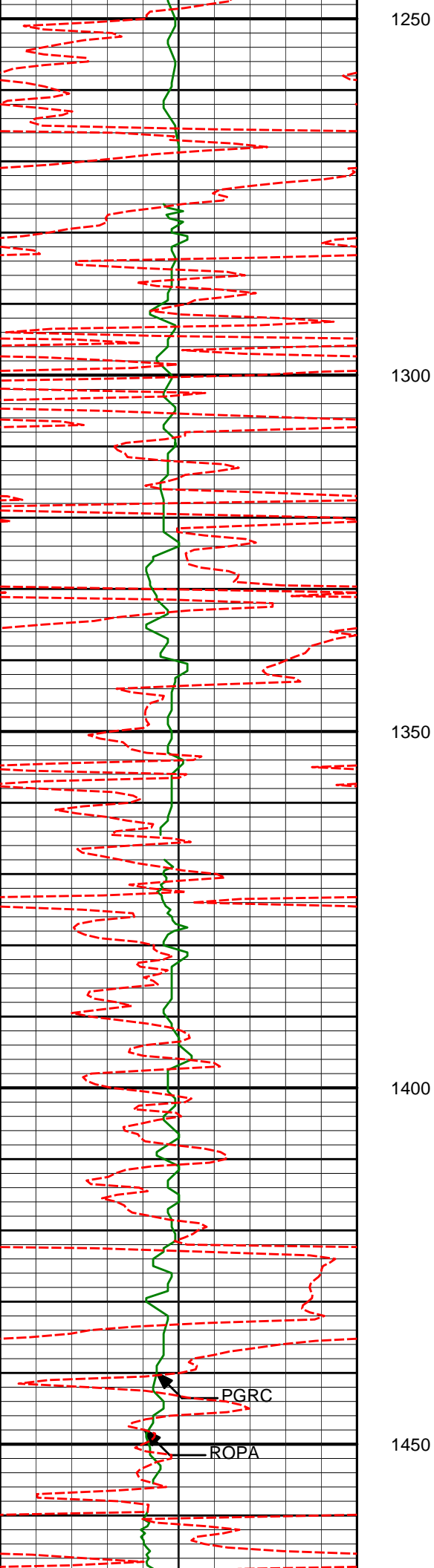
95.72°

1097.86'

-8.99'

ROPA

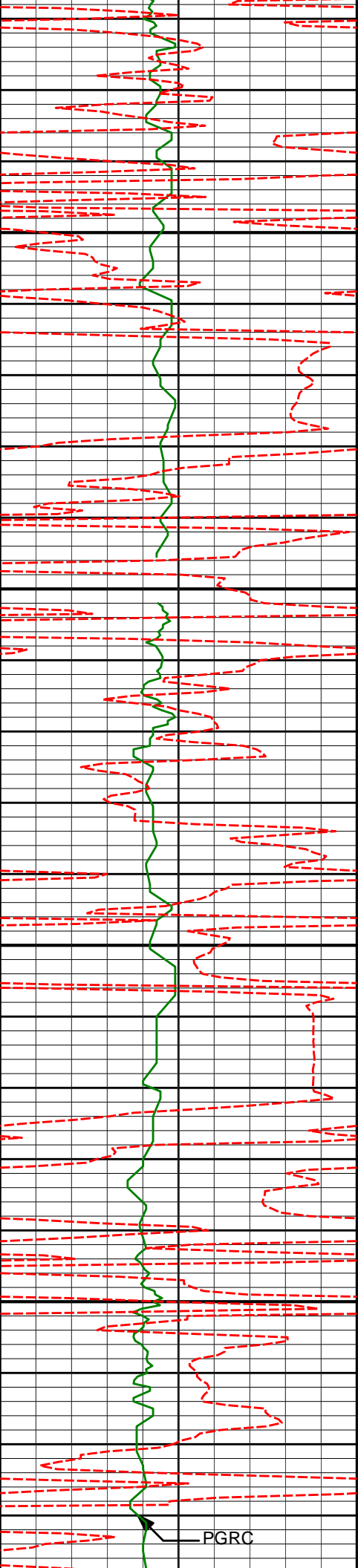
PGRC



1281' 0.94° 103.04° 1280.83' -8.50'

1373' 0.72° 99.27° 1372.82' -8.25'

1465' 1.89° 82.00° 1464.80' -8.38'



1500

1550

1600

1650

1557'

3.28°

71.82°

1556.70'

-9.45'

1648'

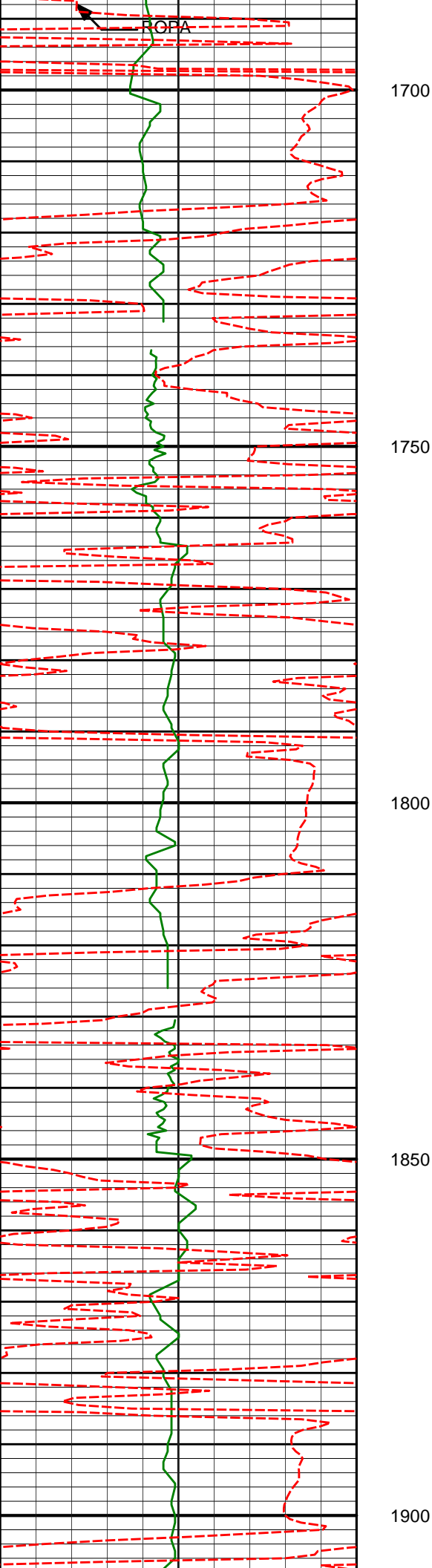
5.20°

61.73°

1647.45'

-12.26'

PGRC



1740'

6.88°

58.41°

1738.94'

-17.19'

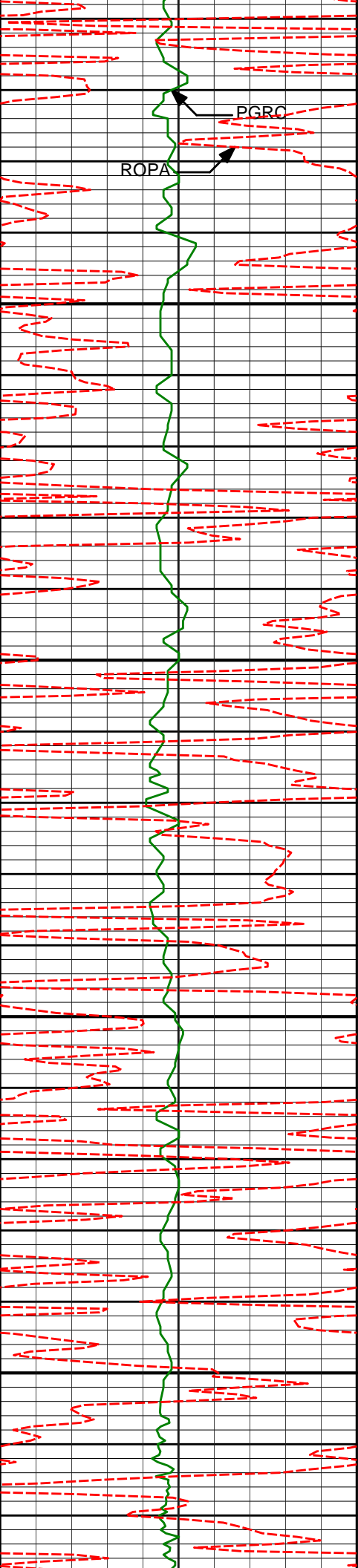
1832'

8.79°

55.15°

1830.07'

-24.18'



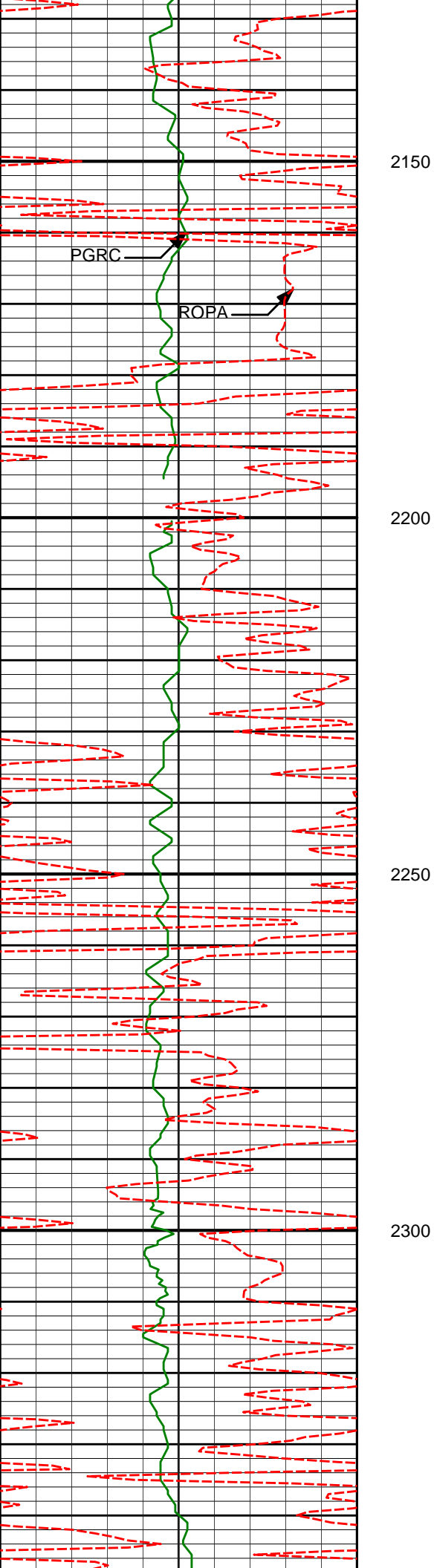
1950

2000

2050

2100

| | | | | |
|-------|--------|--------|----------|---------|
| 1924' | 10.73° | 48.12° | 1920.74' | -34.02' |
| 2016' | 9.90° | 45.53° | 2011.25' | -45.37' |
| 2107' | 9.12° | 42.89° | 2101.00' | -56.22' |



2150

PGRC

ROPA

2200

2202'

10.28°

50.81°

2194.65'

-67.19'

2250

2300

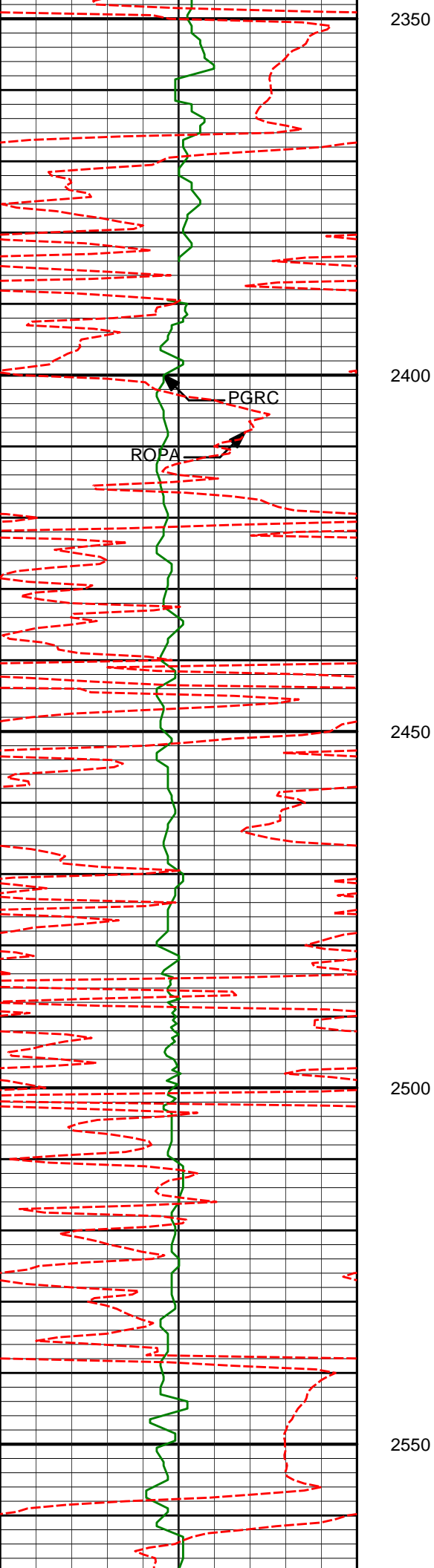
2296'

9.42°

47.84°

2287.26'

-77.76'



2350

2391'

9.96°

54.36°

2380.91'

-87.86'

2400

PGRC

ROPA

2450

2485'

9.06°

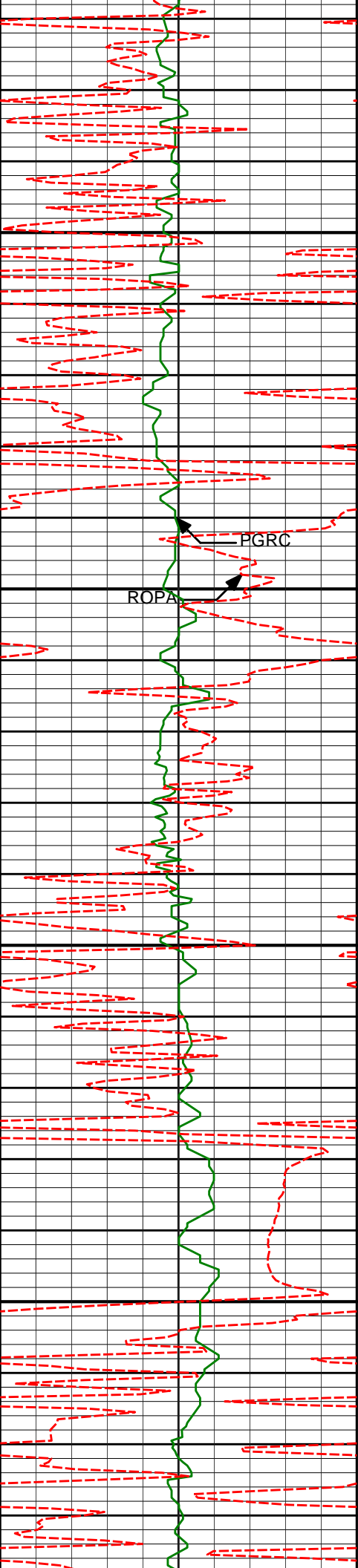
51.20°

2473.62'

-97.34'

2500

2550



| | | | | |
|-------|--------|--------|----------|----------|
| 2580' | 10.20° | 56.66° | 2567.28' | -106.75' |
|-------|--------|--------|----------|----------|

2600

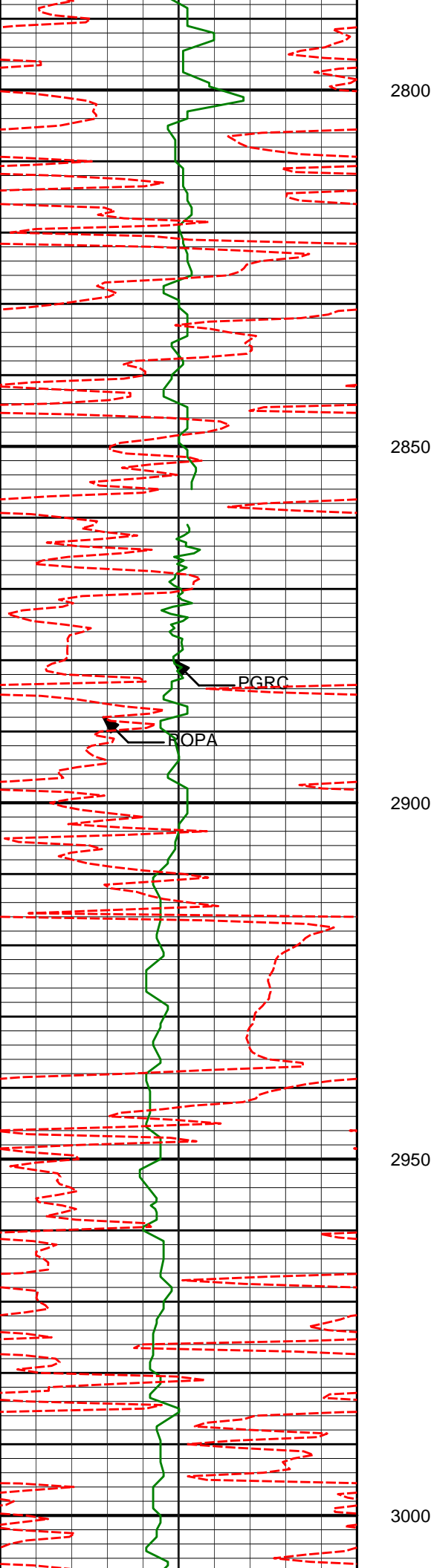
2650

| | | | | |
|-------|-------|--------|----------|----------|
| 2675' | 8.87° | 54.84° | 2660.96' | -115.70' |
|-------|-------|--------|----------|----------|

2700

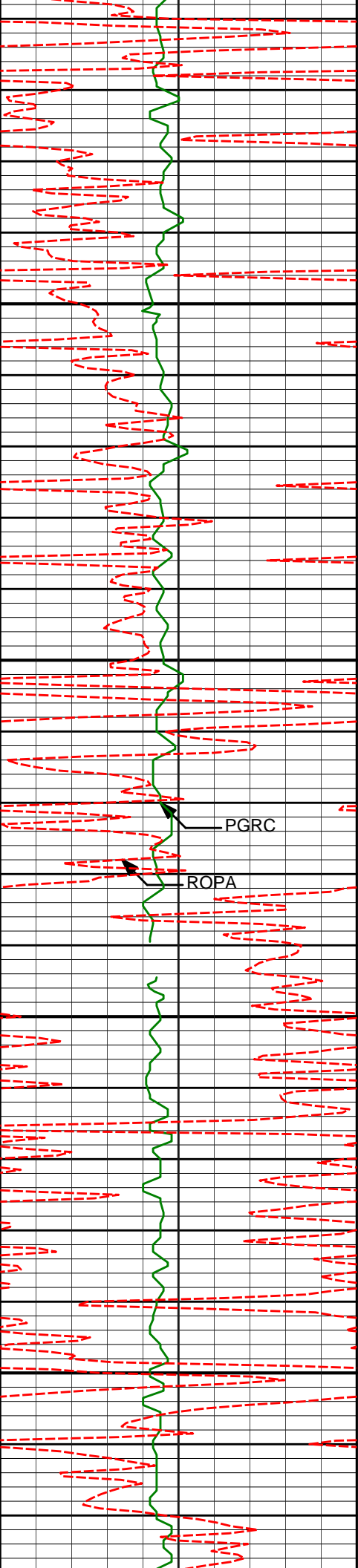
2750

| | | | | |
|-------|--------|--------|----------|----------|
| 2769' | 10.97° | 56.99° | 2753.55' | -124.86' |
|-------|--------|--------|----------|----------|



| | | | | |
|-------|-------|--------|----------|----------|
| 2864' | 9.54° | 51.77° | 2847.04' | -134.77' |
|-------|-------|--------|----------|----------|

| | | | | |
|-------|--------|--------|----------|----------|
| 2958' | 12.13° | 54.69° | 2939.35' | -145.41' |
|-------|--------|--------|----------|----------|



3050

3053'

11.86°

52.88°

3032.28'

-157.21'

3100

PGRC

ROPA

3150

3147'

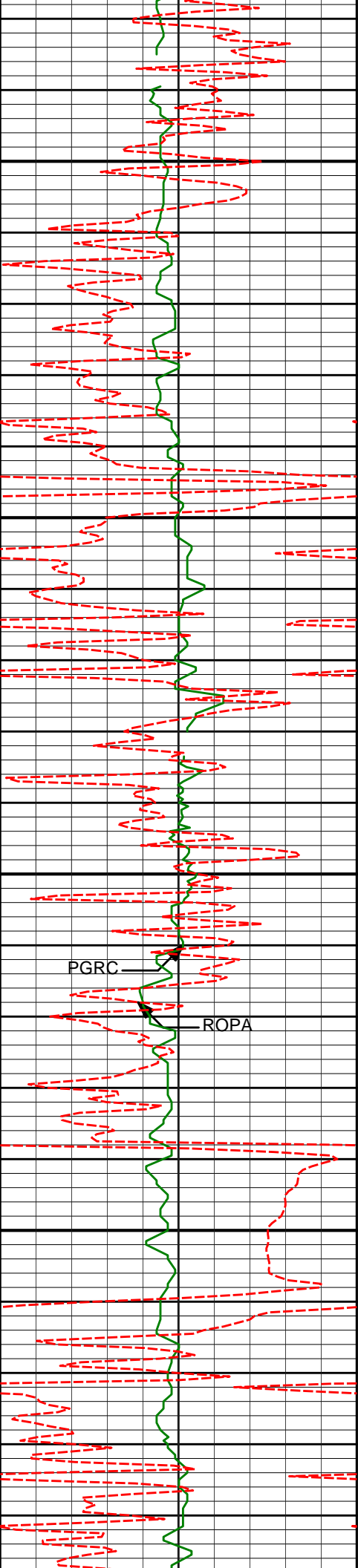
11.37°

51.46°

3124.35'

-168.93'

3200



3250

3300

3350

3400

3242'

10.71°

49.78°

3217.60'

-180.58'

3337'

9.17°

49.42°

3311.17'

-191.31'

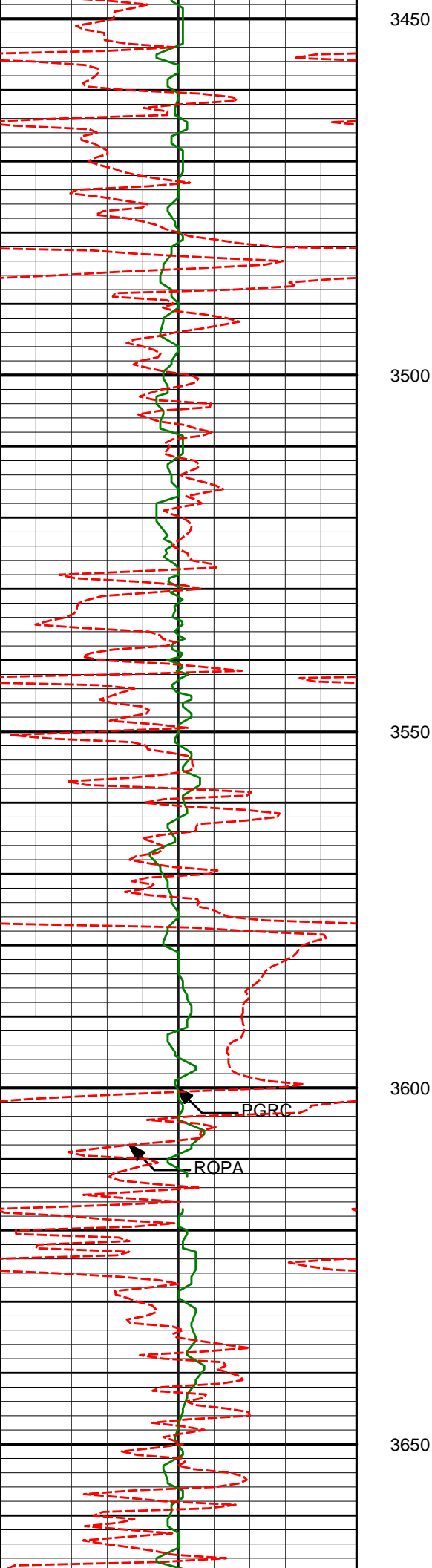
3431'

10.55°

54.07°

3403.78'

-201.33'



3526'

9.28°

50.79°

3497.36'

-211.39'

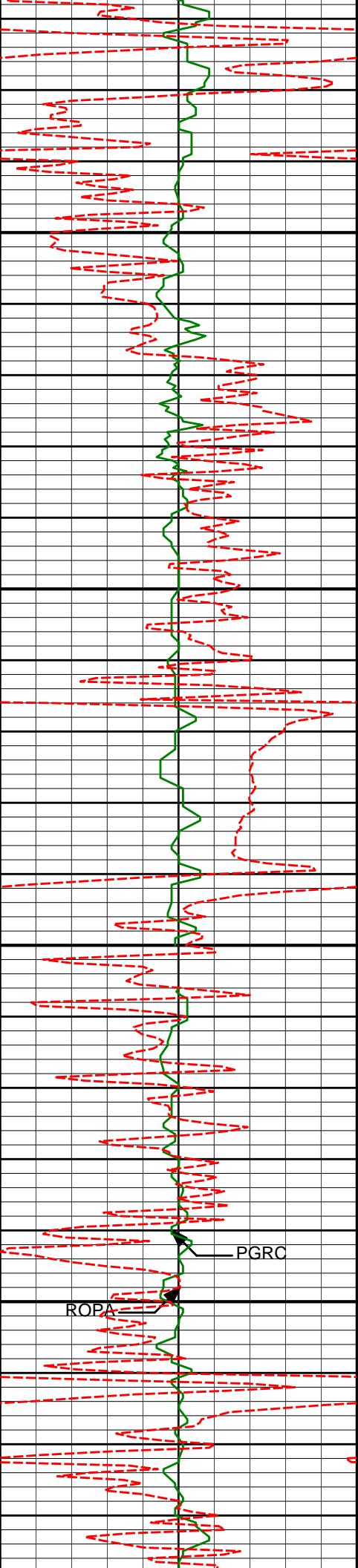
3620'

10.57°

48.77°

3589.95'

-221.96'



3700

3715'

8.76°

47.90°

3683.60'

-232.65'

3750

3800

3809'

10.59°

48.39°

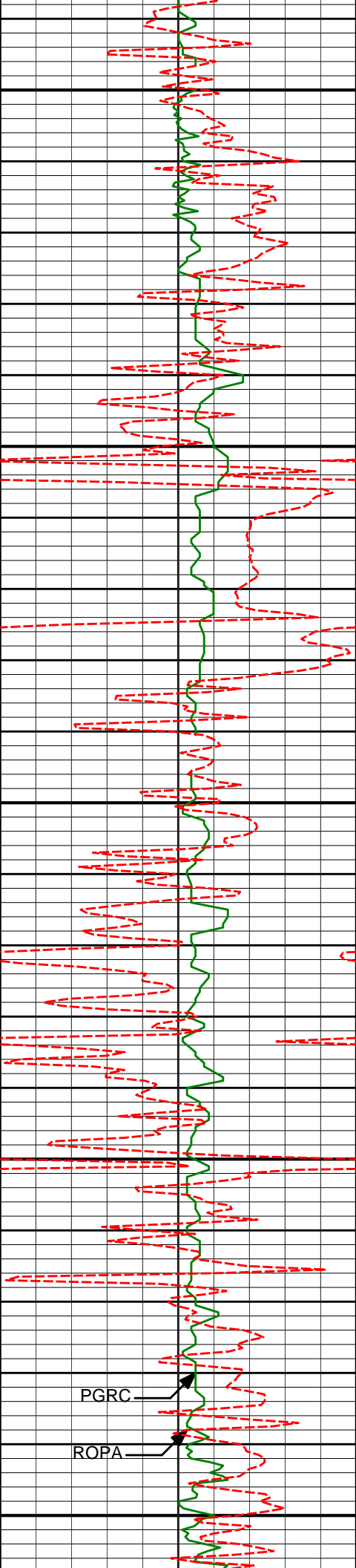
3776.26'

-243.28'

PGRC

ROPA

3850



3900

3904'

8.45°

48.84°

3869.94'

-253.77'

3950

4000

3999'

9.53°

49.58°

3963.77'

-263.56'

4050

PGRC

ROPA

4100

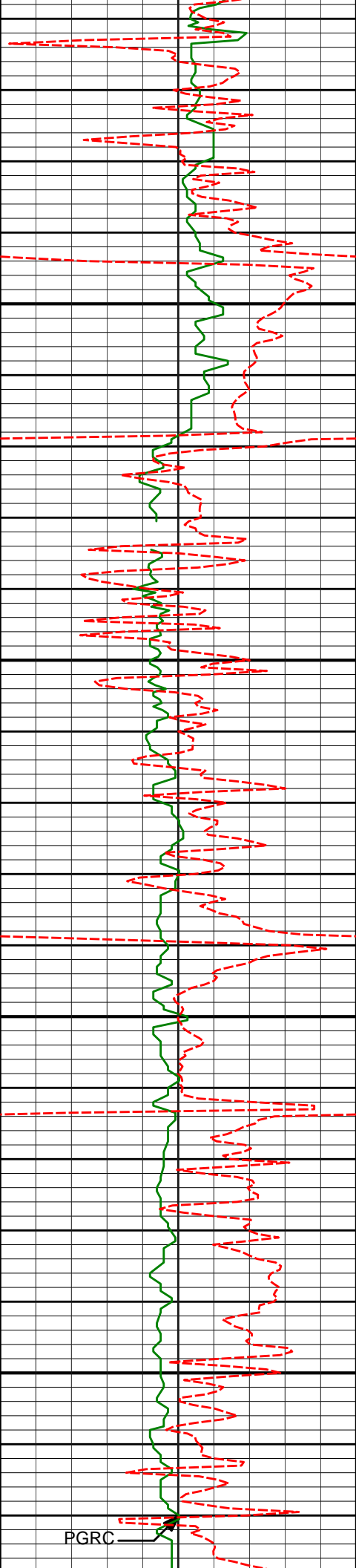
4093'

8.12°

46.72°

4056.66'

-273.24'



4150

4200

4250

4300

4188'

10.14°

41.59°

4150.45'

-284.18'

4282'

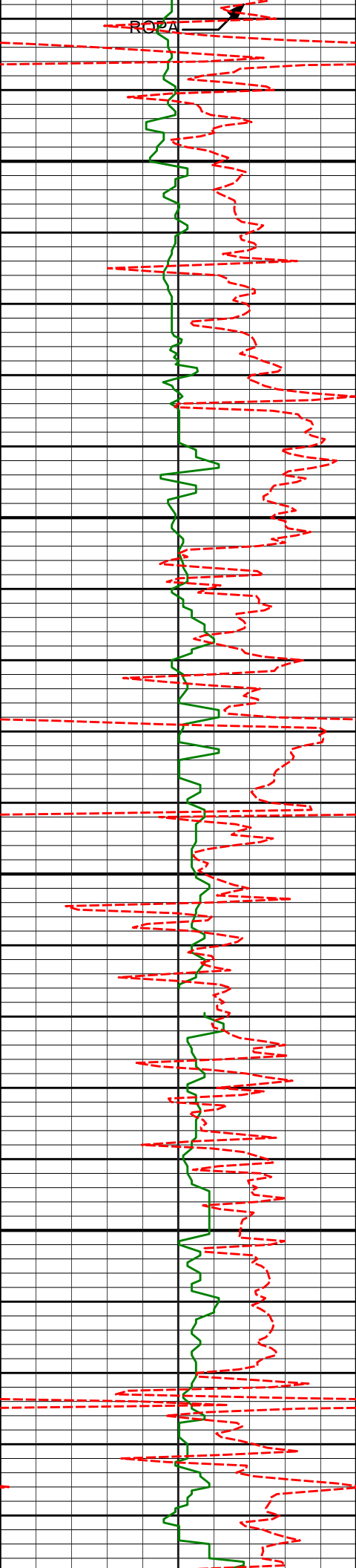
12.54°

36.07°

4242.61'

-298.72'

PGRC



4350

4377'

12.12°

35.35°

4335.42'

-315.28'

4400

4450

4472'

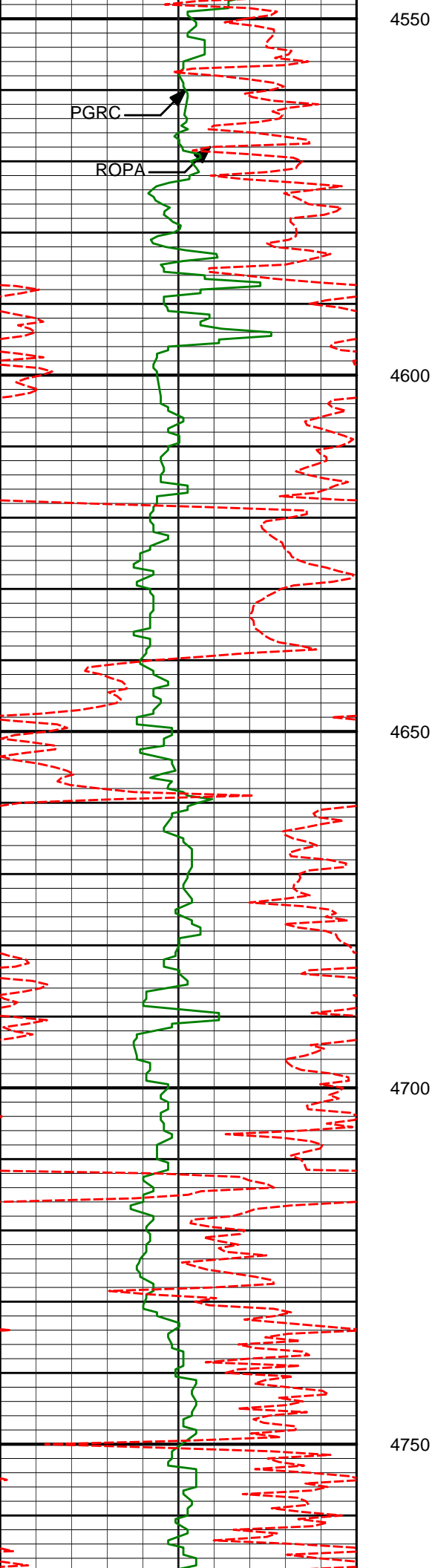
10.54°

43.48°

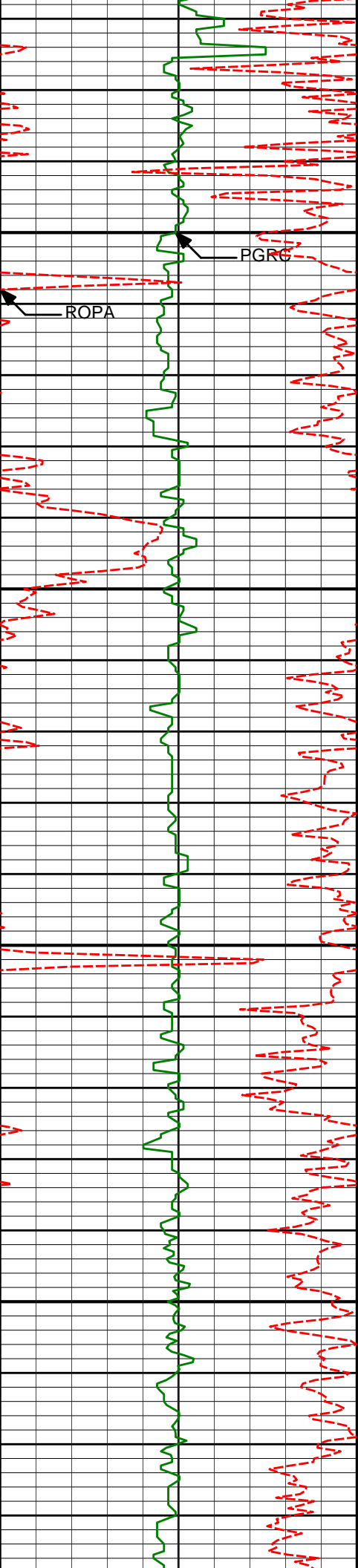
4428.57'

-329.82'

4500



| | | | | |
|-------|-------|--------|----------|----------|
| 4566' | 9.11° | 37.17° | 4521.19' | -342.07' |
| 4661' | 9.48° | 42.56° | 4614.95' | -353.91' |
| 4755' | 8.75° | 42.71° | 4707.76' | -364.95' |



4800

PGRG

ROPA

4850

4850'

7.87°

42.79°

4801.76'

-375.11'

4900

4950

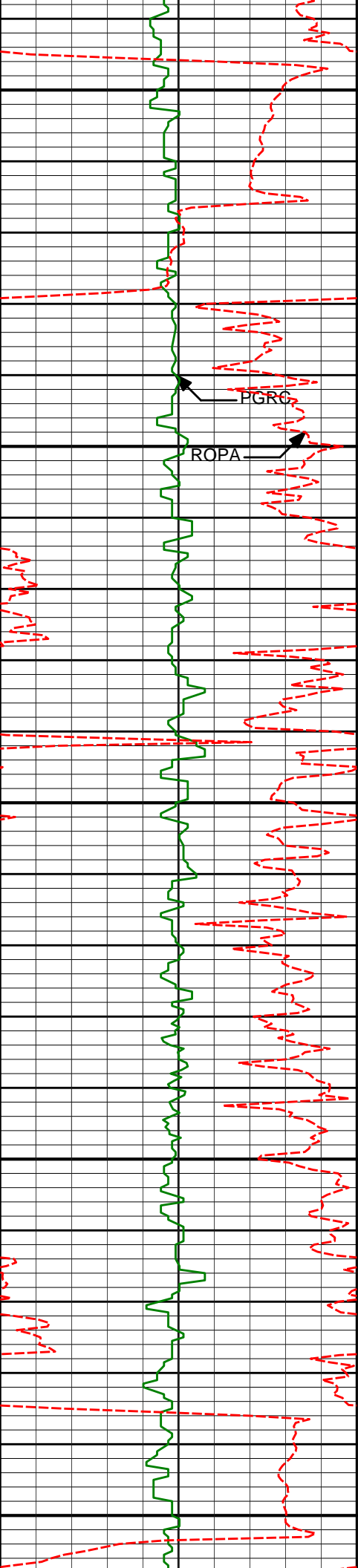
4944'

6.42°

46.43°

4895.03'

-383.52'



5000

5039'

7.98°

55.88°

4989.28'

-390.96'

PGRC

ROPA

5050

5100

5133'

7.21°

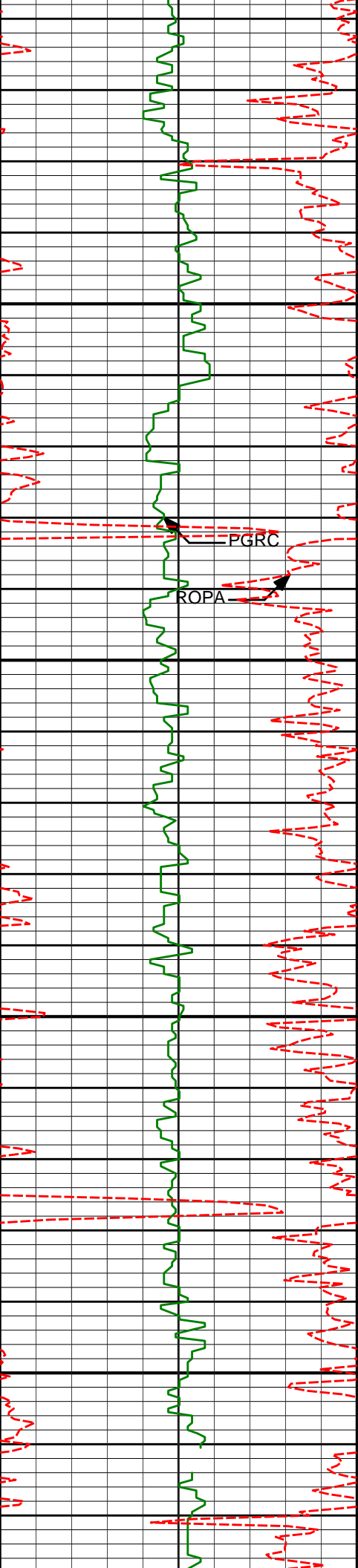
55.74°

5082.46'

-398.02'

5150

5200



5228'

8.41°

51.25°

5176.58'

-405.81'

5250

PGRC

ROPA

5300

5323'

7.13°

49.94°

5270.70'

-414.03'

5350

5400

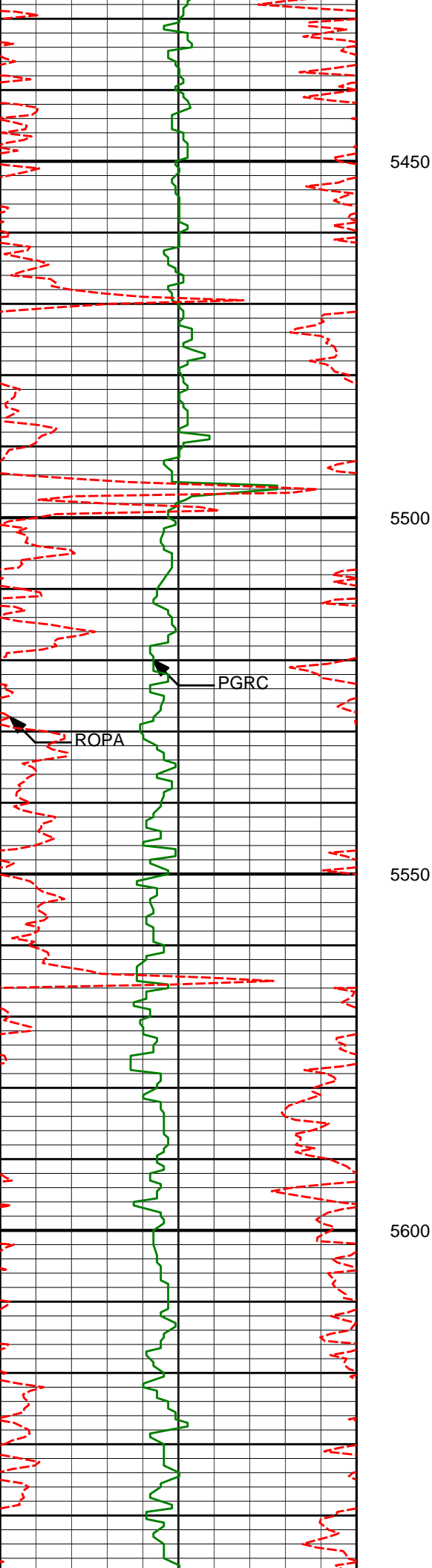
5417'

6.03°

48.36°

5364.08'

-421.14'



5450

5500

5550

5600

5512'

4.67°

51.64°

5458.66'

-426.91'

PGRC

ROPA

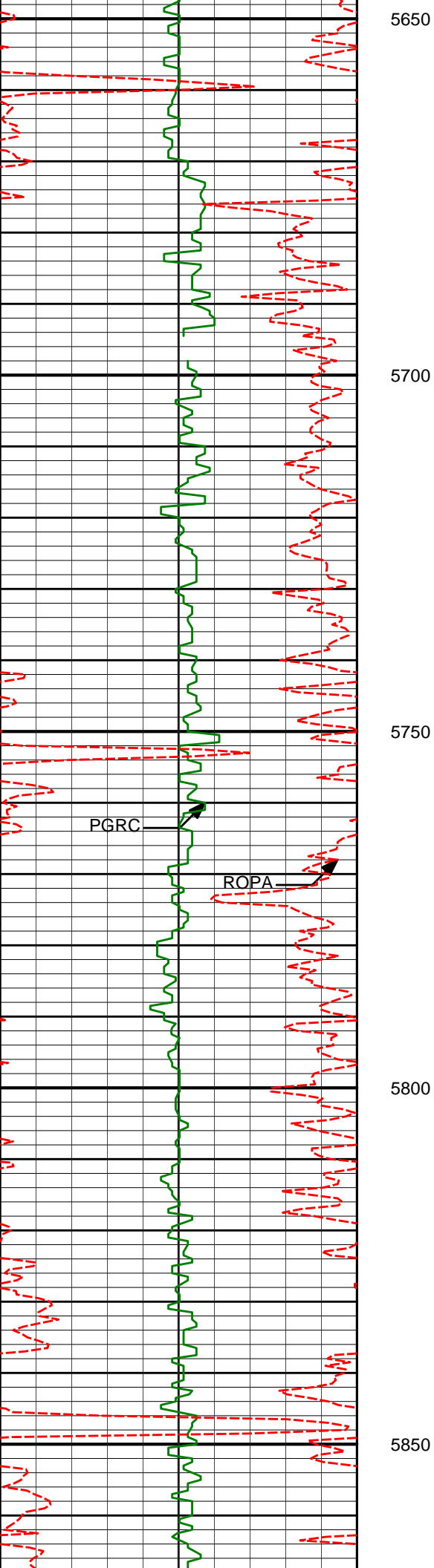
5606'

4.08°

55.74°

5552.39'

-431.21'



5650

5700

5750

5800

5850

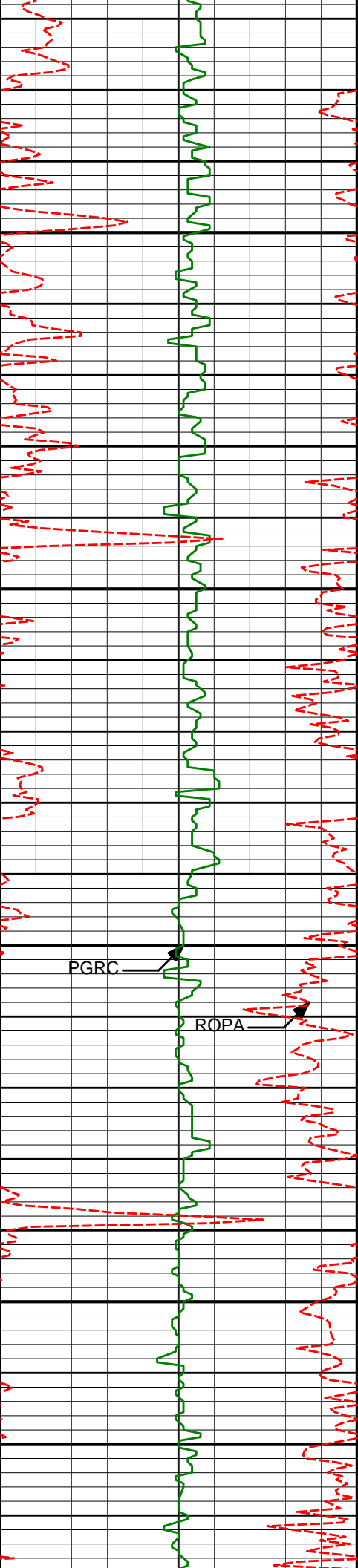
5796'

1.90°

63.25°

5742.12'

-436.50'



5900

5950

6000

6050

PGRC

ROPA

5891'

1.08°

81.15°

5837.09'

-437.37'

5986'

0.74°

114.60°

5932.08'

-437.26'

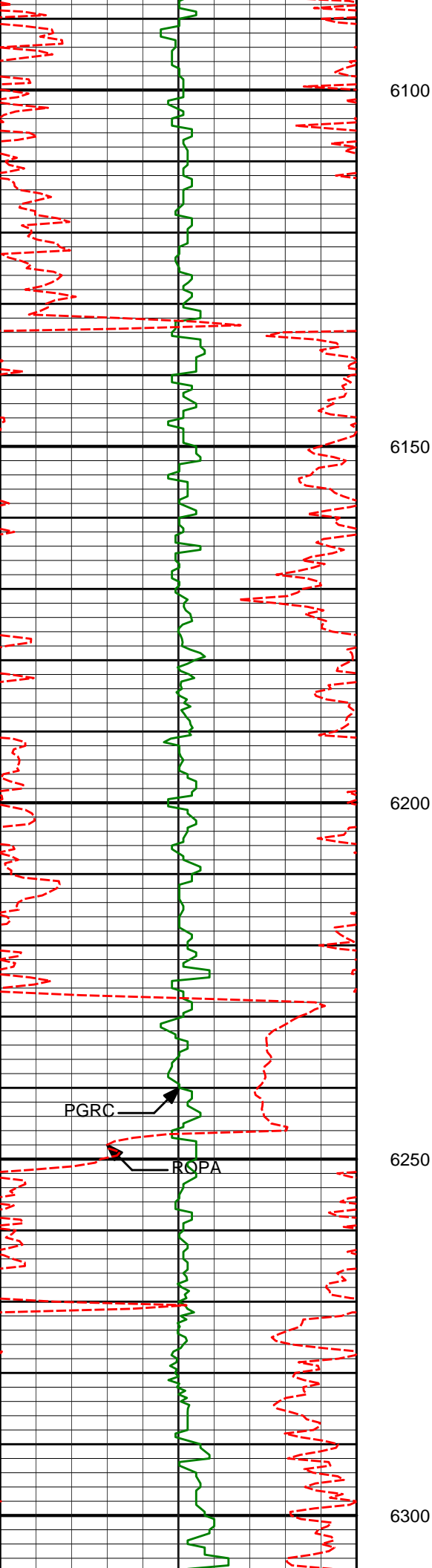
6081'

0.87°

192.27°

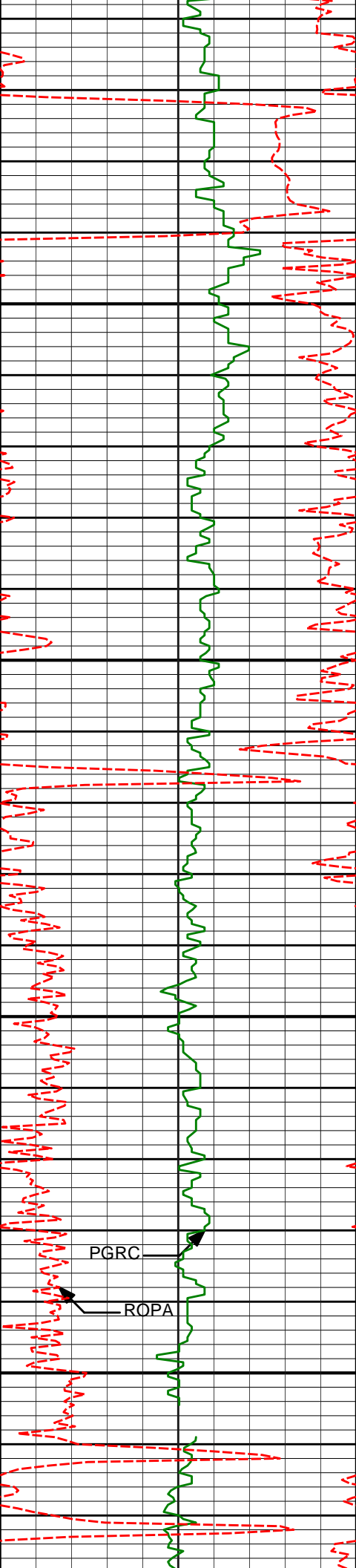
6027.07'

-436.31'



6175' 1.85° 221.62° 6121.04' -434.47'

6270' 1.56° 158.01° 6216.01' -432.12'



6350

6365'

0.99°

48.09°

6311.00'

-431.47'

6400

6450

6460'

0.80°

42.75°

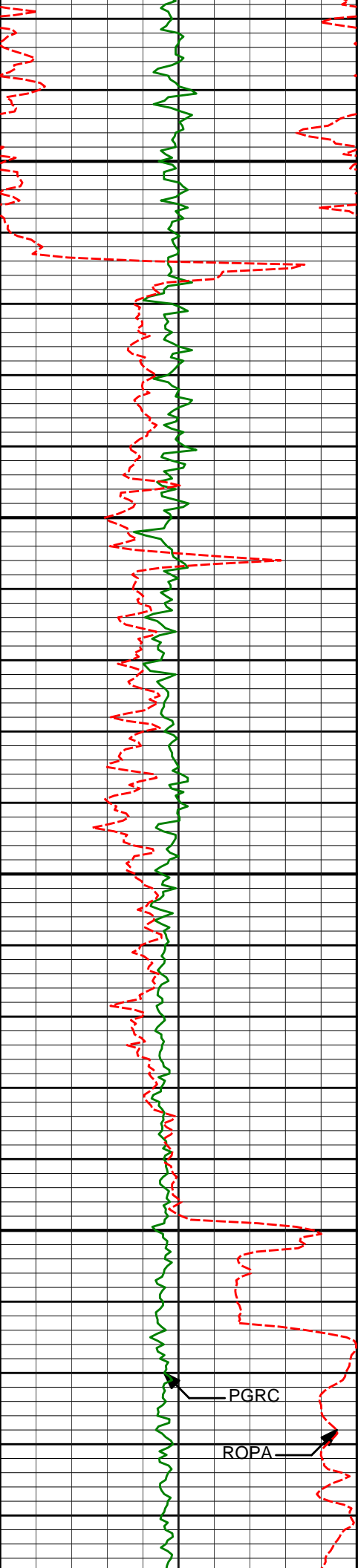
6405.98'

-432.52'

6500

PGRC

ROPA



6550

6555'

0.79°

27.95°

6500.97'

-433.59'

6600

6650

6650'

0.63°

2.84°

6595.97'

-434.69'

6700

PGRC

ROPA

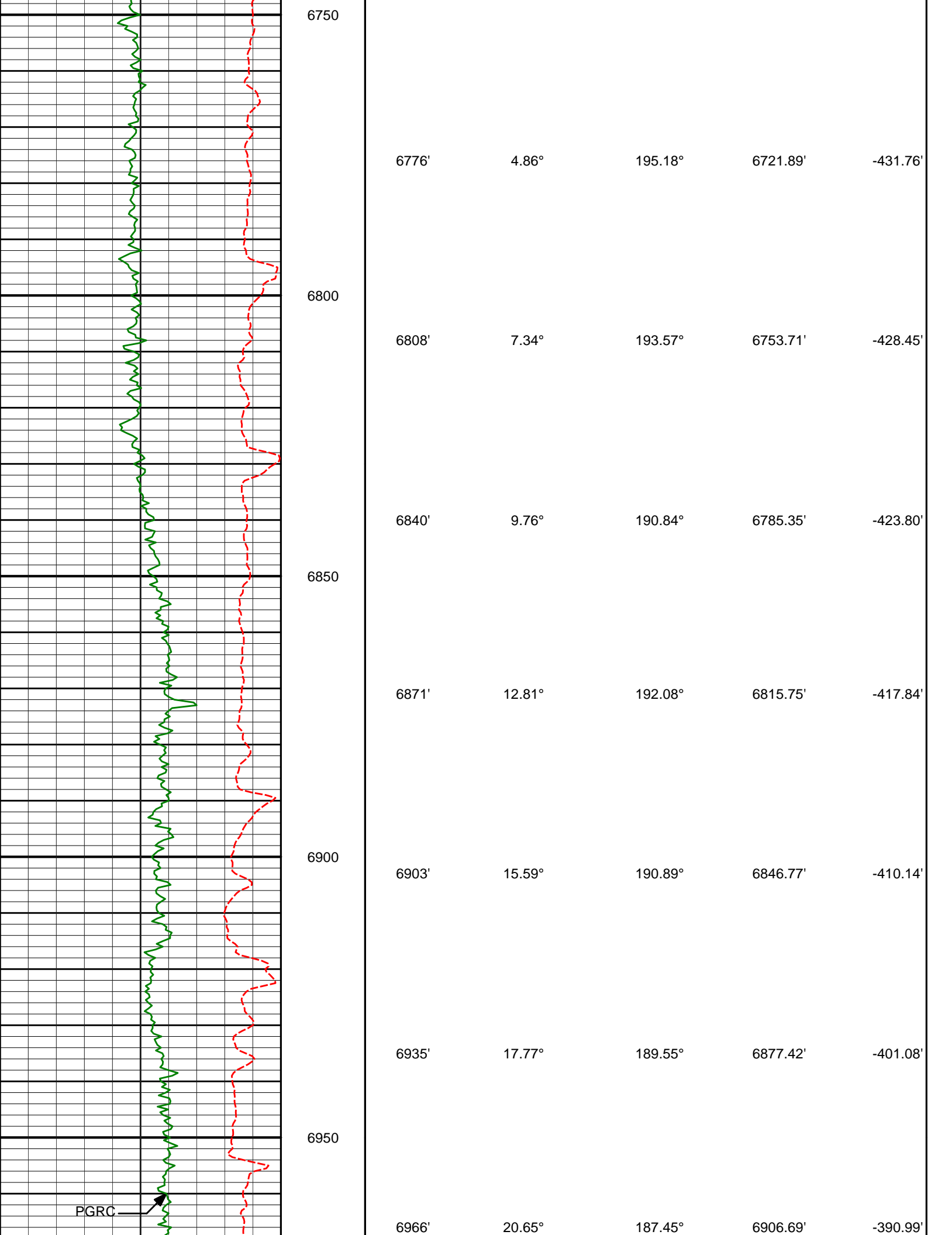
6745'

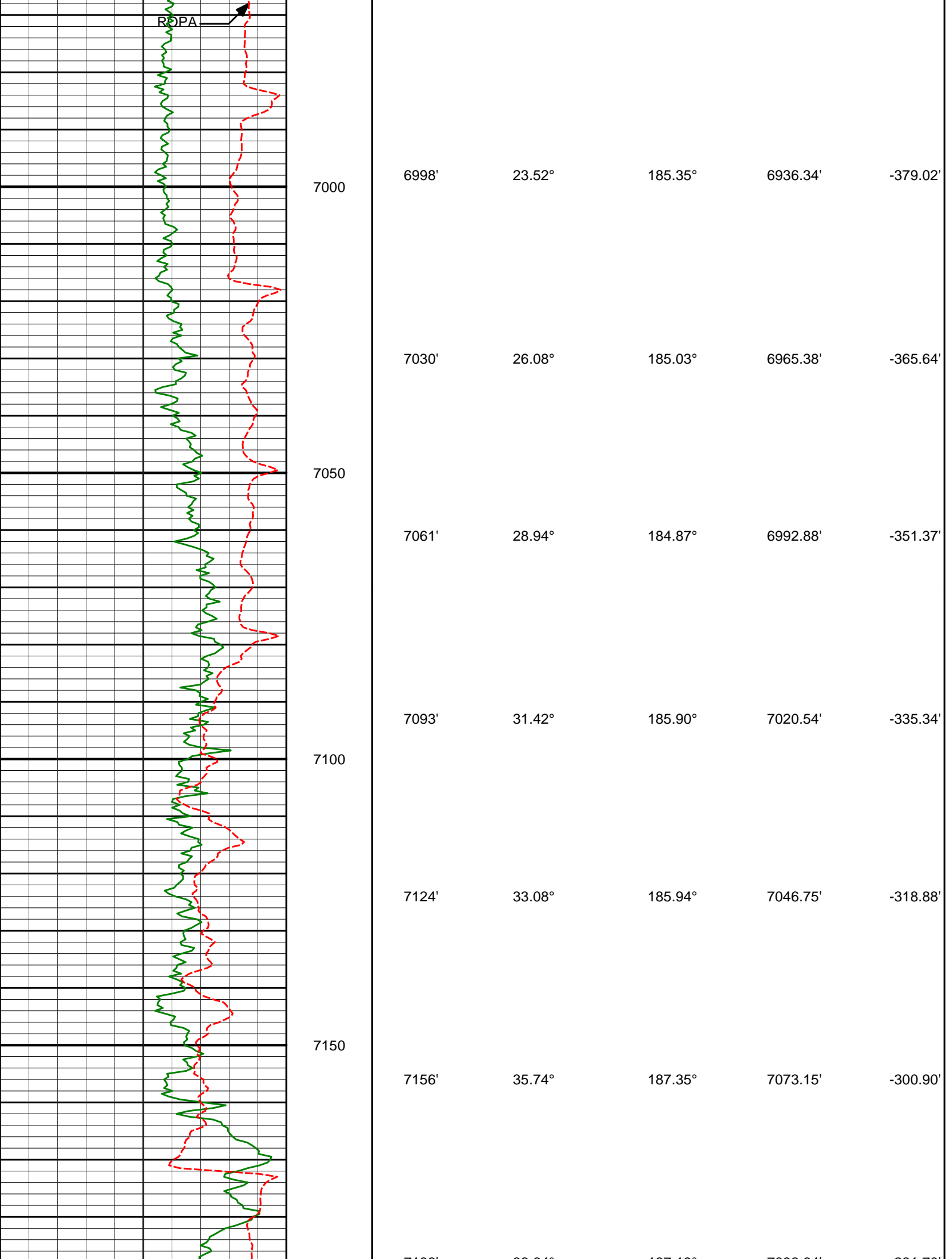
2.09°

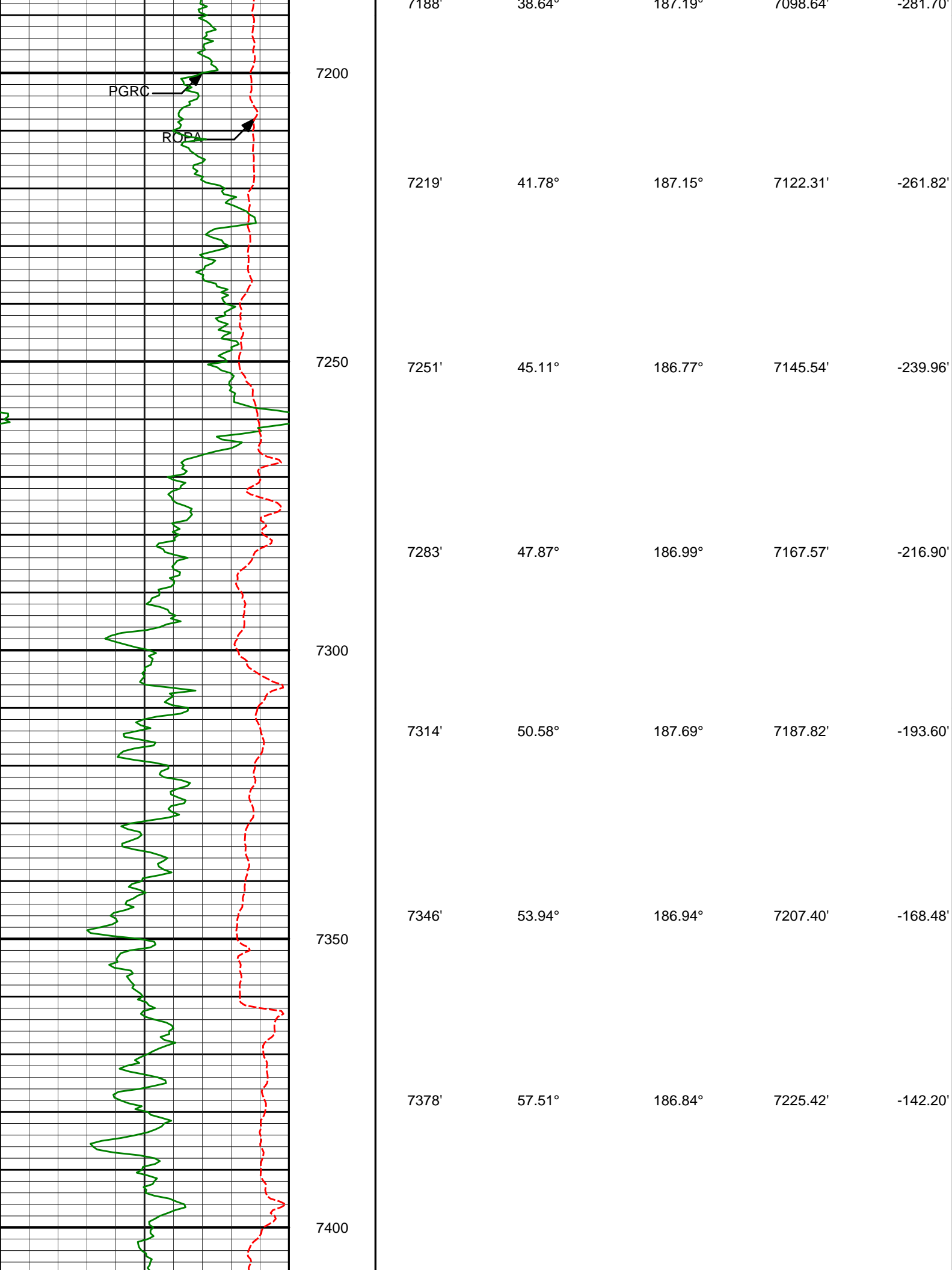
198.39°

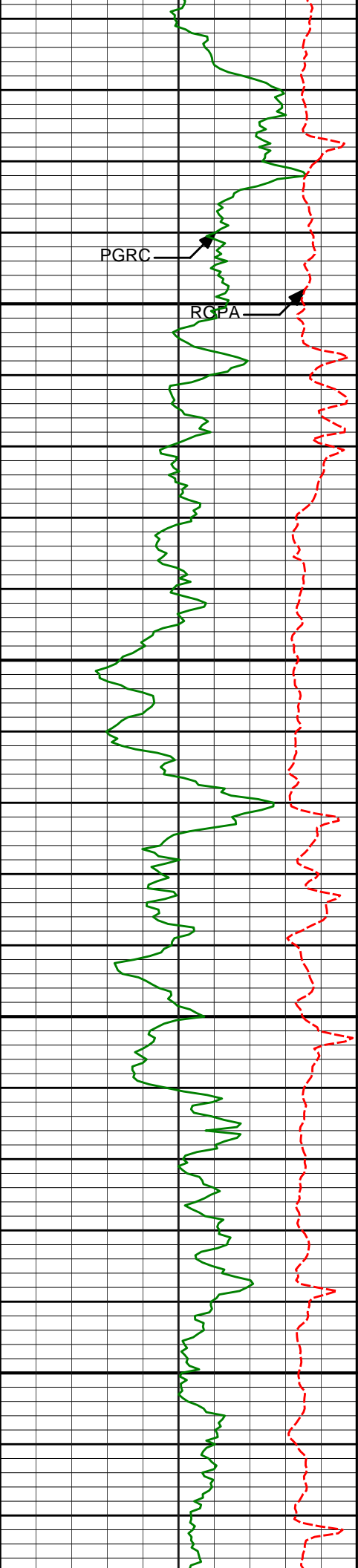
6690.95'

-433.57'









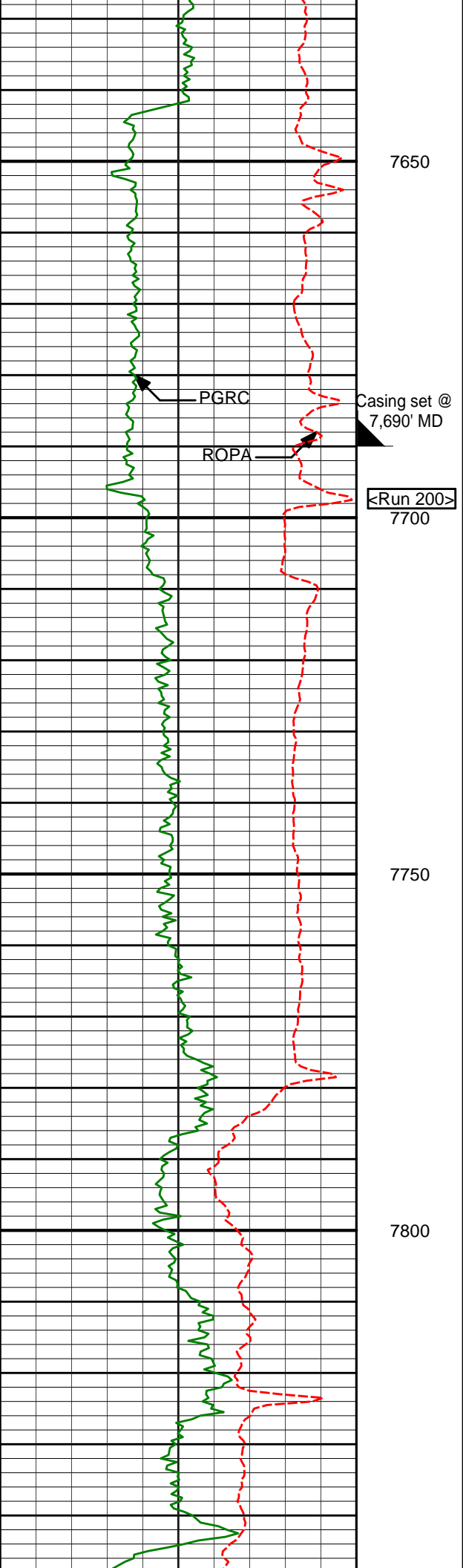
7450

7500

7550

7600

| | | | | |
|-------|--------|---------|----------|----------|
| 7409' | 60.82° | 185.57° | 7241.31' | -115.72' |
| 7441' | 64.36° | 184.95° | 7256.04' | -87.42' |
| 7473' | 66.71° | 183.11° | 7269.29' | -58.35' |
| 7504' | 70.41° | 182.37° | 7280.62' | -29.52' |
| 7536' | 73.95° | 182.99° | 7290.41' | 0.91' |
| 7568' | 77.94° | 181.38° | 7298.18' | 31.93' |
| 7599' | 81.49° | 179.74° | 7303.71' | 62.43' |



7645'

85.93°

176.98°

7308.75'

108.10'

7650

7726'

89.60°

173.37°

7311.91'

188.67'

7750

7800

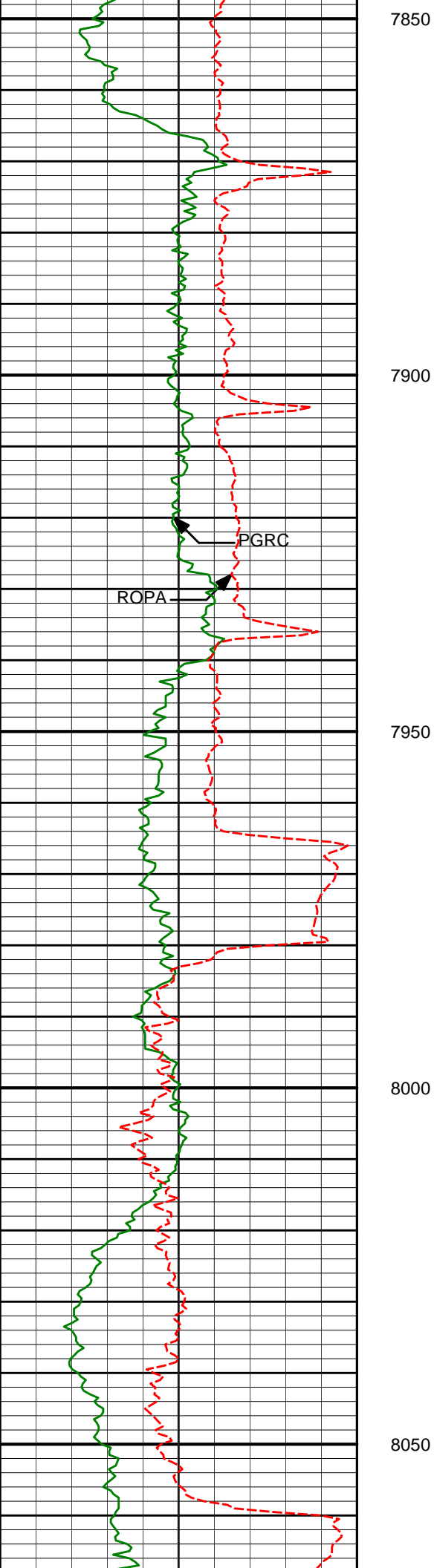
7821'

89.69°

172.52°

7312.50'

282.85'



7916'

90.06°

172.30°

7312.71'

376.91'

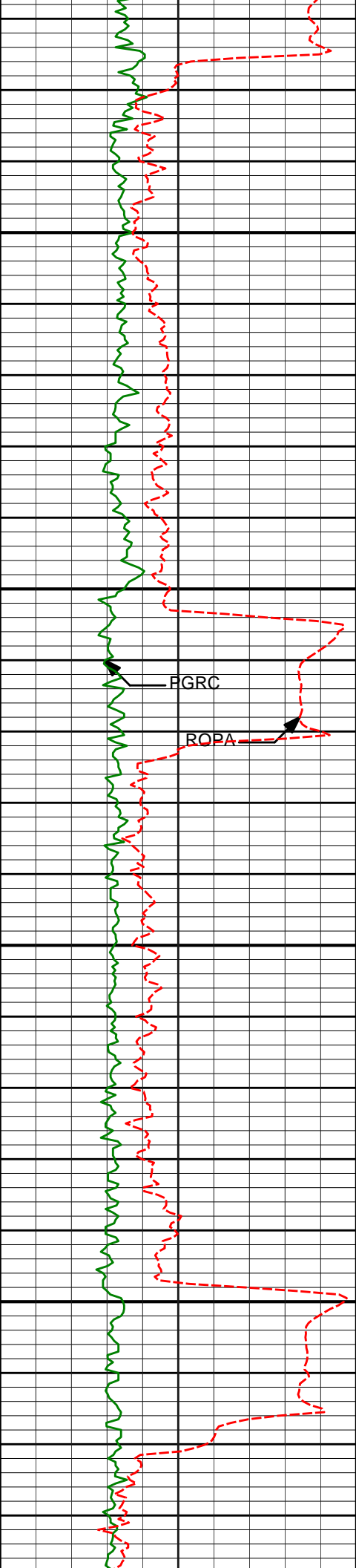
8011'

90.15°

173.10°

7312.53'

471.04'



8100

8106'

90.83°

174.33°

7311.72'

565.37'

8150

PGRC

ROPA

8200

8200'

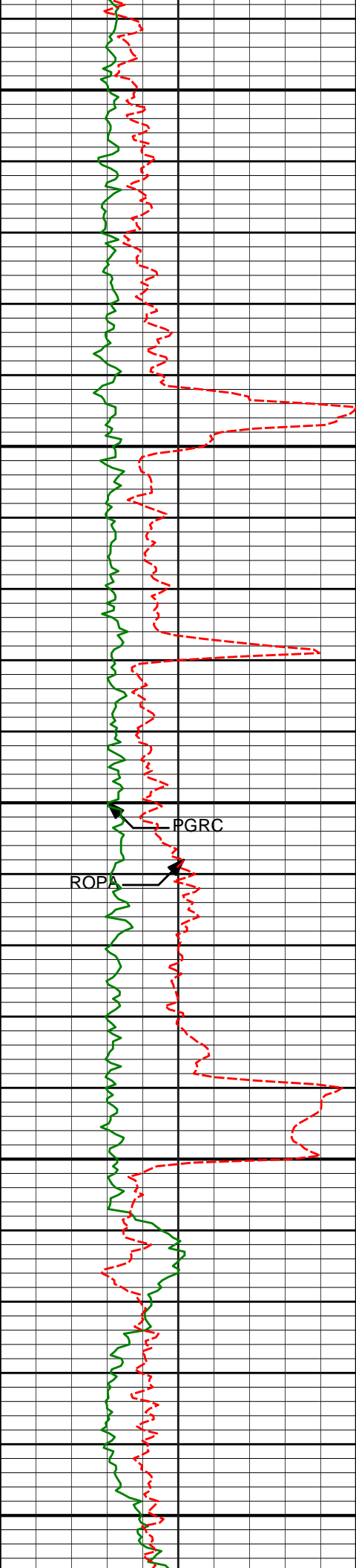
88.40°

174.47°

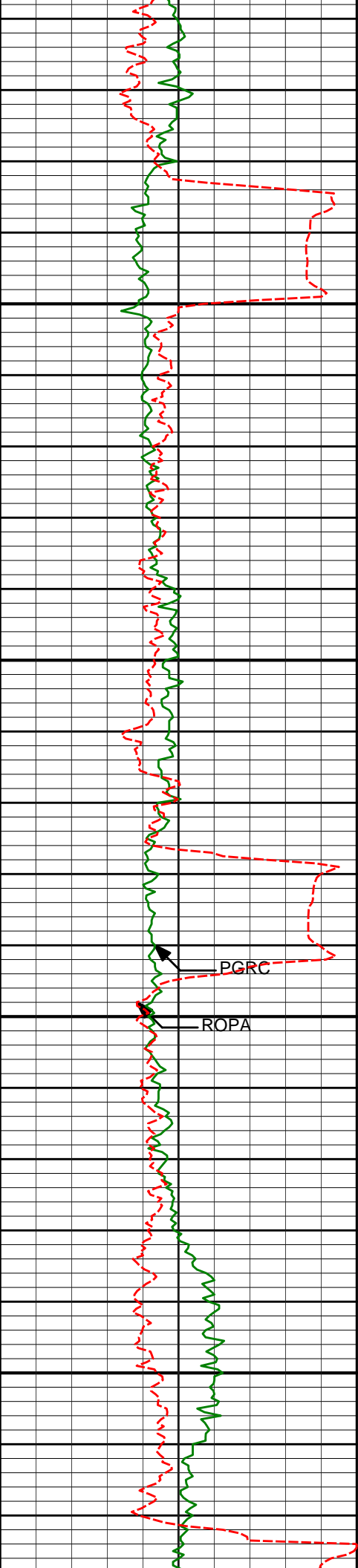
7312.35'

658.84'

8250



| | | | | | |
|------|-------|--------|---------|----------|---------|
| 8300 | 8295' | 90.52° | 178.23° | 7313.25' | 753.56' |
| 8350 | | | | | |
| 8400 | 8390' | 89.23° | 180.43° | 7313.46' | 848.54' |
| 8450 | | | | | |
| 8500 | 8485' | 88.18° | 178.49° | 7315.60' | 943.49' |



8550

8600

8650

8700

8580'

89.48°

178.47°

7317.54'

1038.41'

8675'

89.07°

179.13°

7318.75'

1133.36'

PGRC

ROPA



8750

8770'

89.41°

179.10°

7320.01'

1228.33'

8800

8850

8864'

89.72°

178.63°

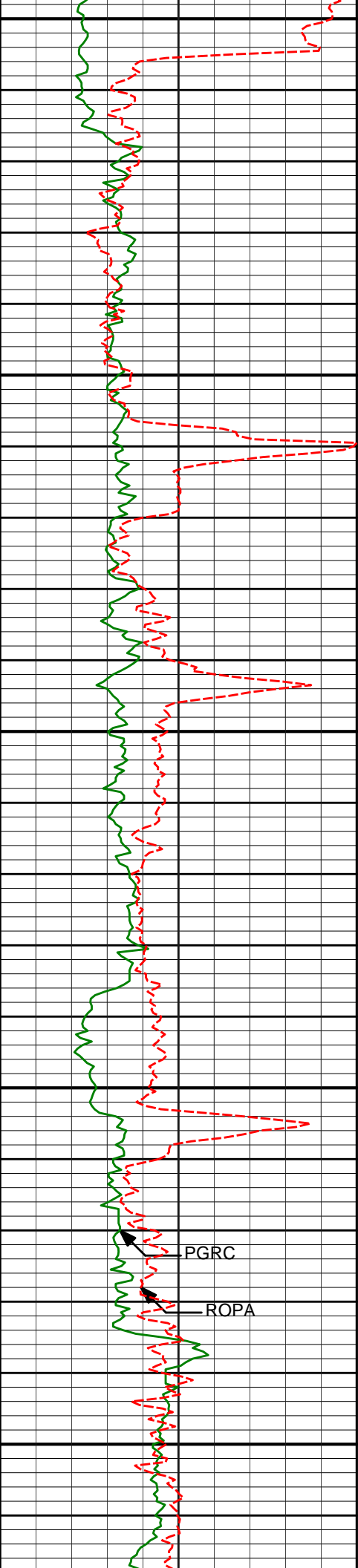
7320.72'

1322.29'

PGRC

ROPA

8900



8950

8959'

90.31°

180.20°

7320.69'

1417.27'

9000

9050

9054'

90.43°

179.88°

7320.08'

1512.27'

9100

PGRC

ROPA

9150

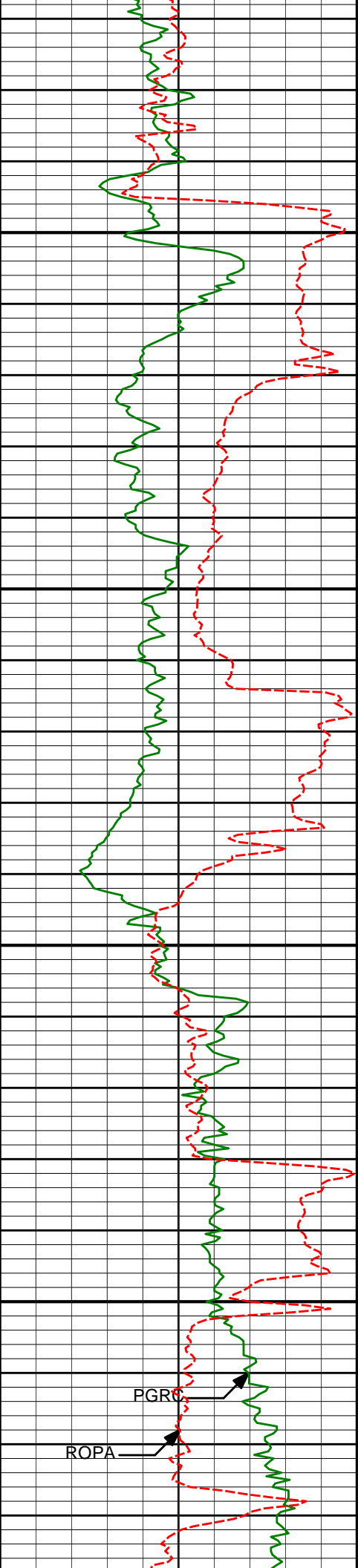
9145'

89.32°

178.08°

7320.28'

1603.23'



9200

9250

9300

9350

PGRC

ROPA

9237'

89.26°

178.48°

7321.42'

1695.15'

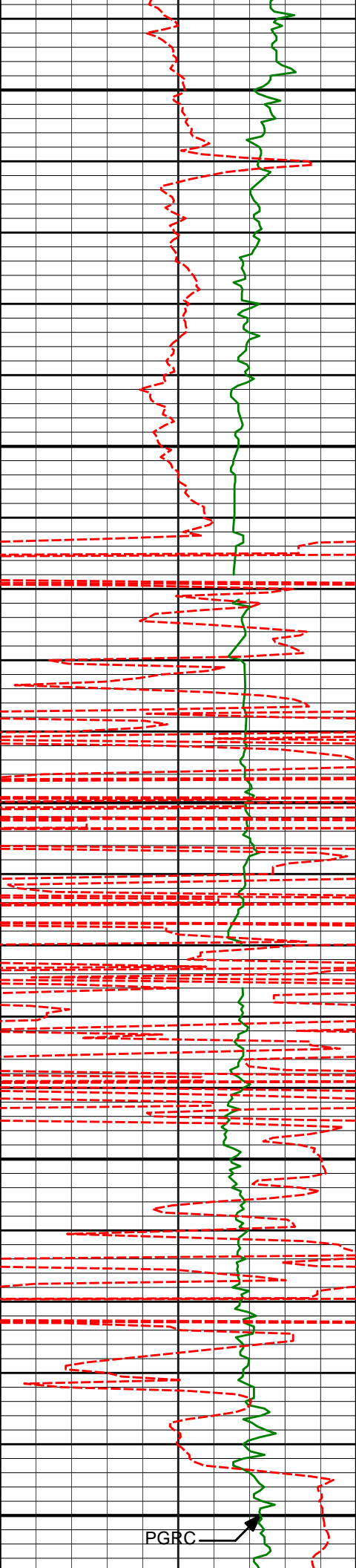
9329'

90.22°

180.09°

7321.84'

1787.13'



9400

9421'

90.22°

179.21°

7321.48'

1879.12'

9450

9500

9513'

89.82°

180.61°

7321.45'

1971.11'

9550

9600

PGRC

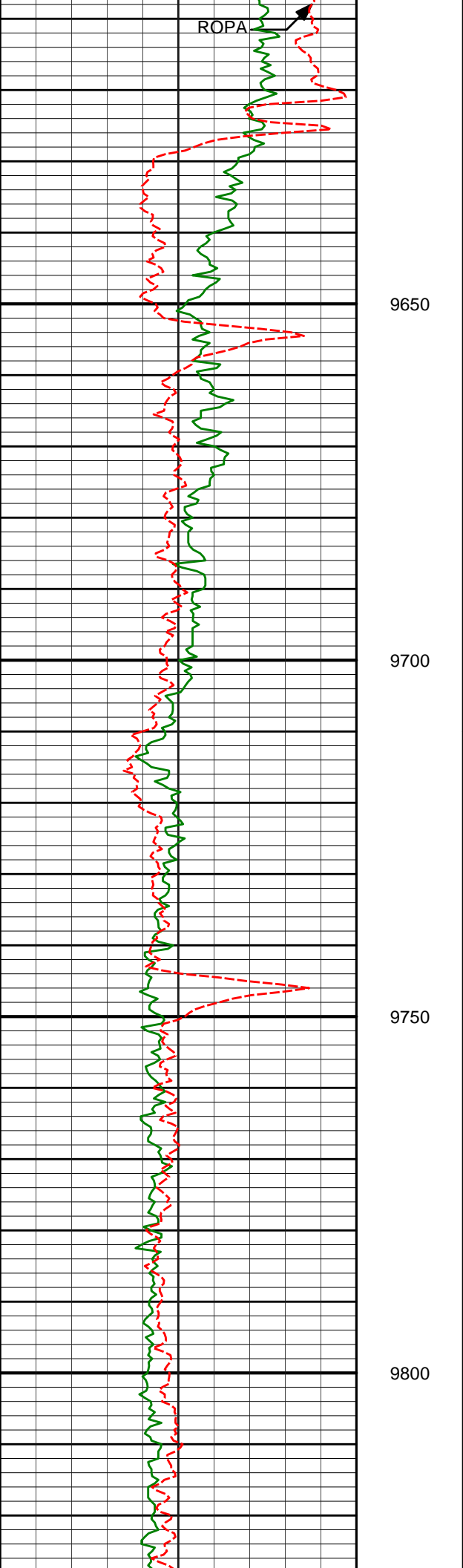
9605'

90.62°

183.88°

7321.10'

2063.05'



9696'

91.11°

184.78°

7319.72'

2153.84'

9700

9750

9788'

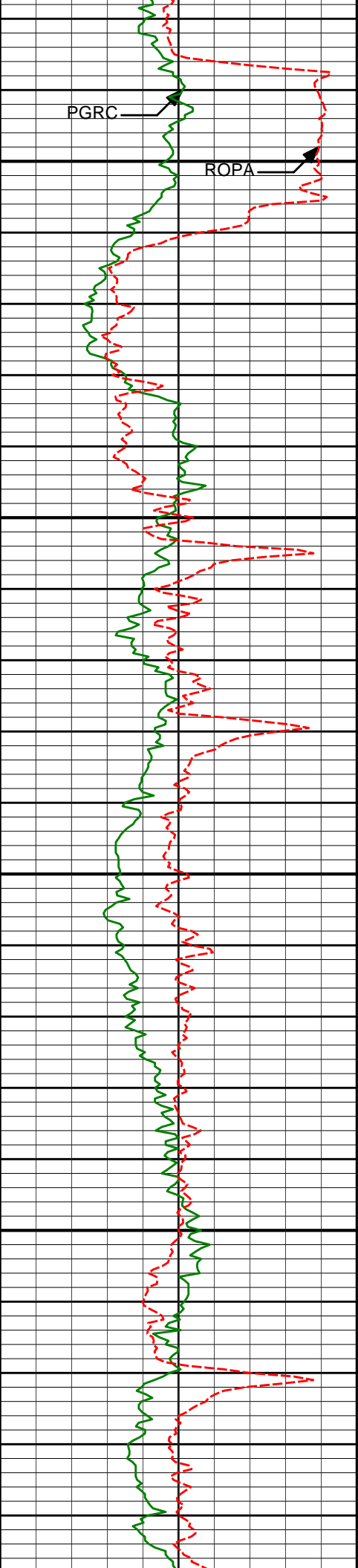
89.35°

181.32°

7319.35'

2245.72'

9800



PGRC

ROPA

9850

9900

9950

10000

9880'

92.46°

183.67°

7317.90'

2337.64'

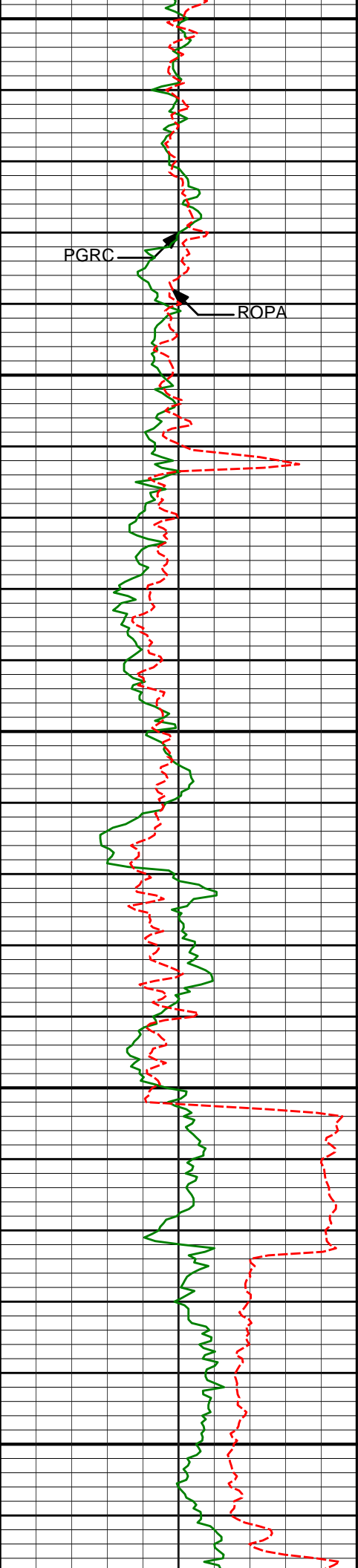
9972'

91.79°

182.24°

7314.49'

2429.49'



10050

10064'

92.41°

181.36°

7311.12'

2521.40'

PGRC

ROPA

10100

10150

10155'

93.88°

180.37°

7306.13'

2612.25'

10200

10250

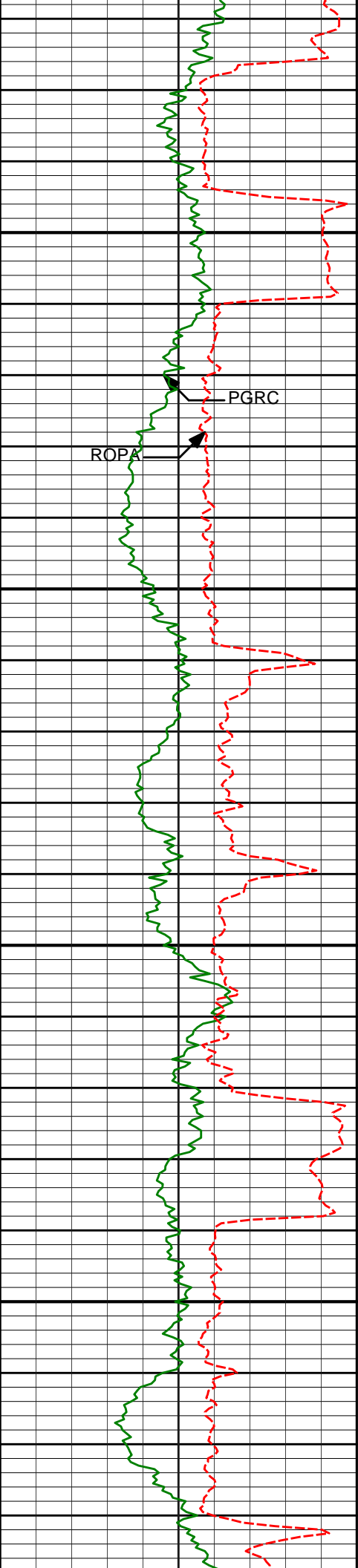
10247'

91.94°

180.38°

7301.46'

2704.13'



10300

10350

10400

10450

PGRC

ROP

10339'

88.98°

180.62°

7300.72'

2796.12'

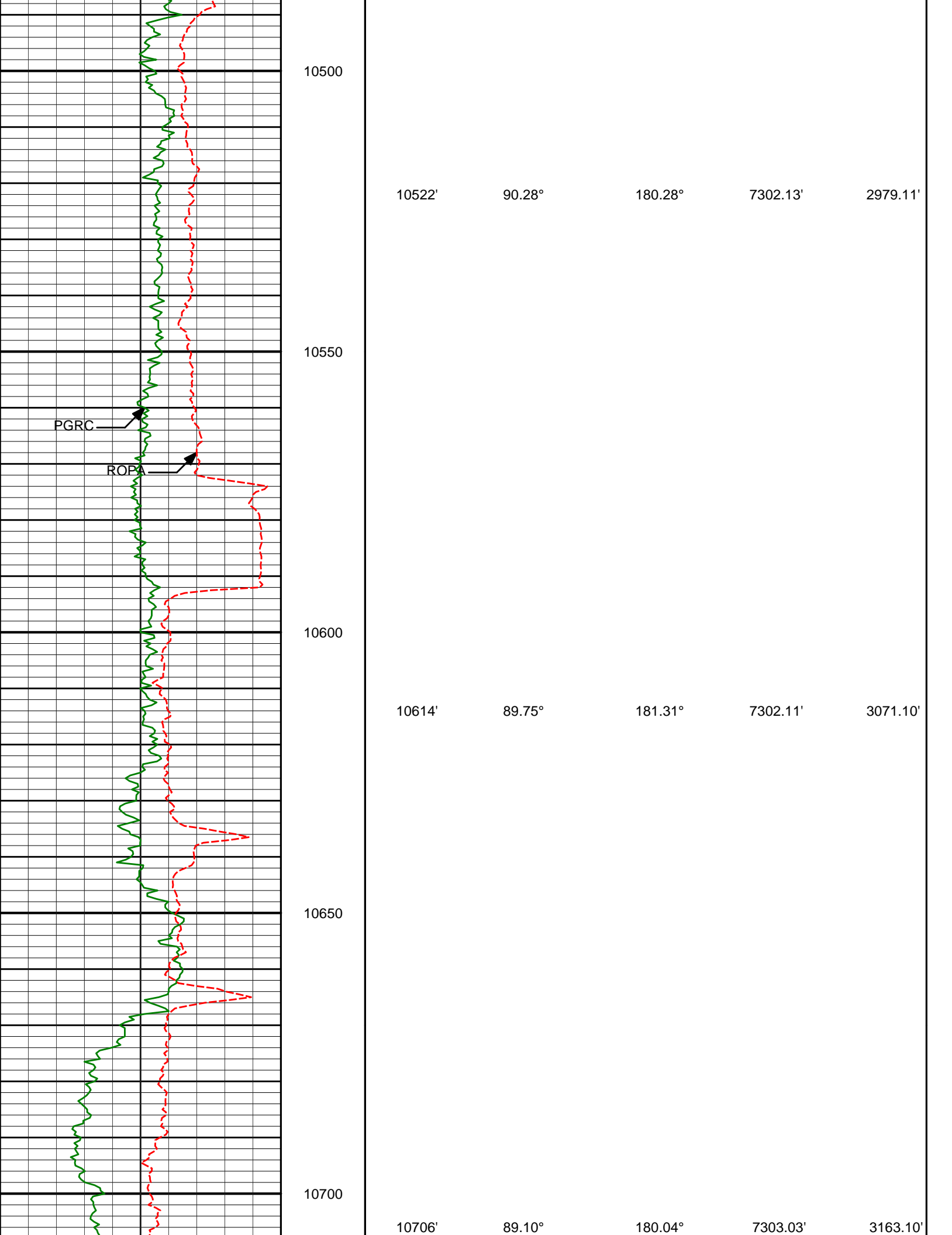
10430'

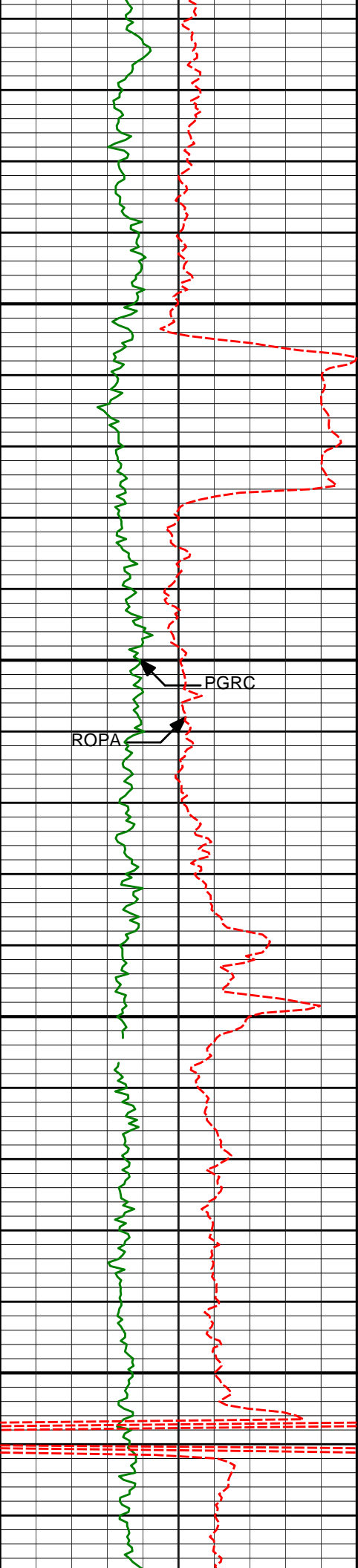
89.48°

180.75°

7301.94'

2887.11'





10750

10800

10850

10900

ROPA

PGRC

10798'

88.62°

181.41°

7304.86'

3255.08'

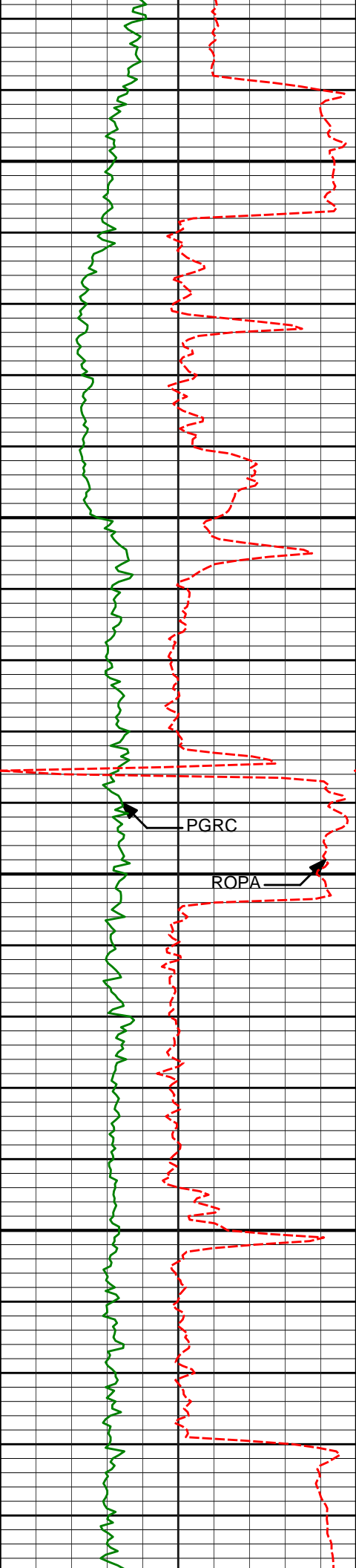
10890'

87.38°

179.92°

7308.07'

3347.01'



10950

10984'

88.24°

181.18°

7311.67'

3440.94'

11000

11050

11079'

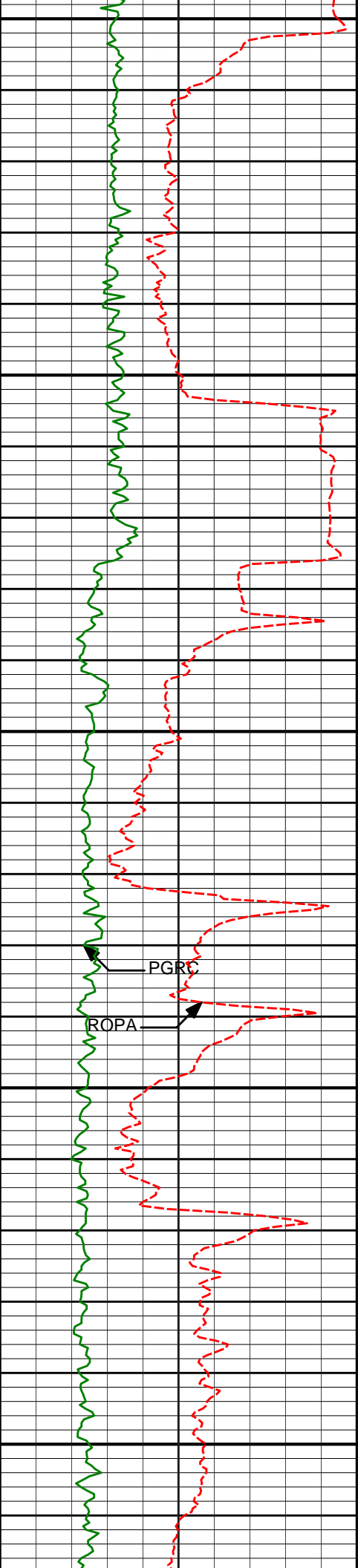
88.18°

181.67°

7314.63'

3535.88'

11100



11150

11174'

88.40°

182.36°

7317.47'

3630.81'

11200

11250

11269'

90.31°

183.76°

7318.54'

3725.70'

PGRC

ROPA

11300

11350

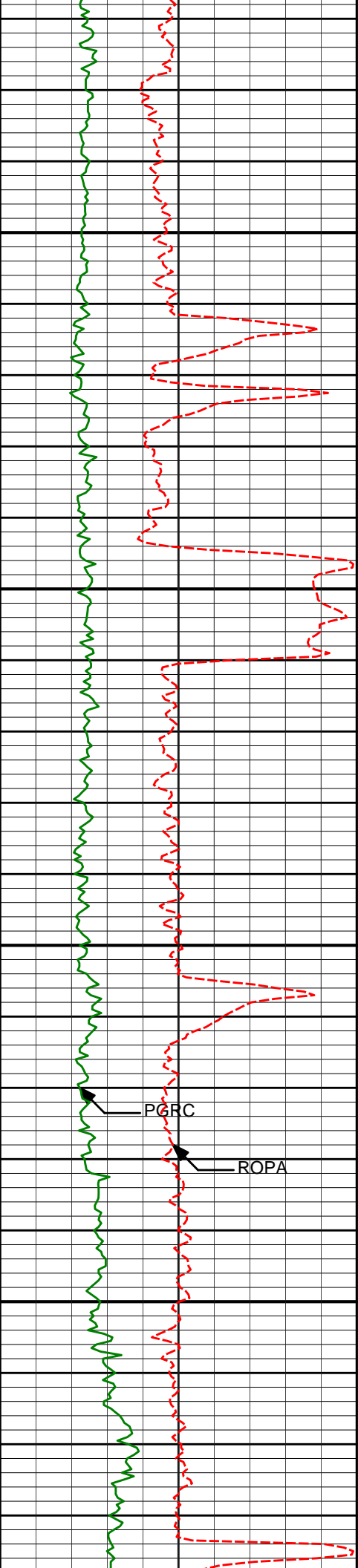
11364'

89.60°

183.28°

7318.61'

3820.56'



11400

11450

11500

11550

PGRC

ROPA

11459'

89.20°

182.50°

7319.61'

3915.47'

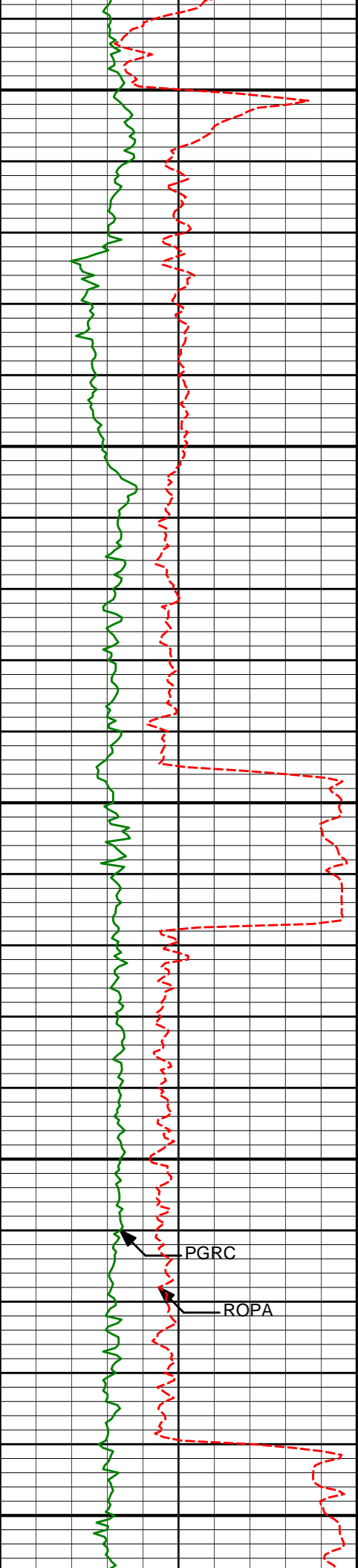
11554'

89.85°

181.94°

7320.40'

4010.42'



11600

11650

11700

11750

11800

11649'

89.54°

180.78°

7320.90'

4105.41'

11743'

88.86°

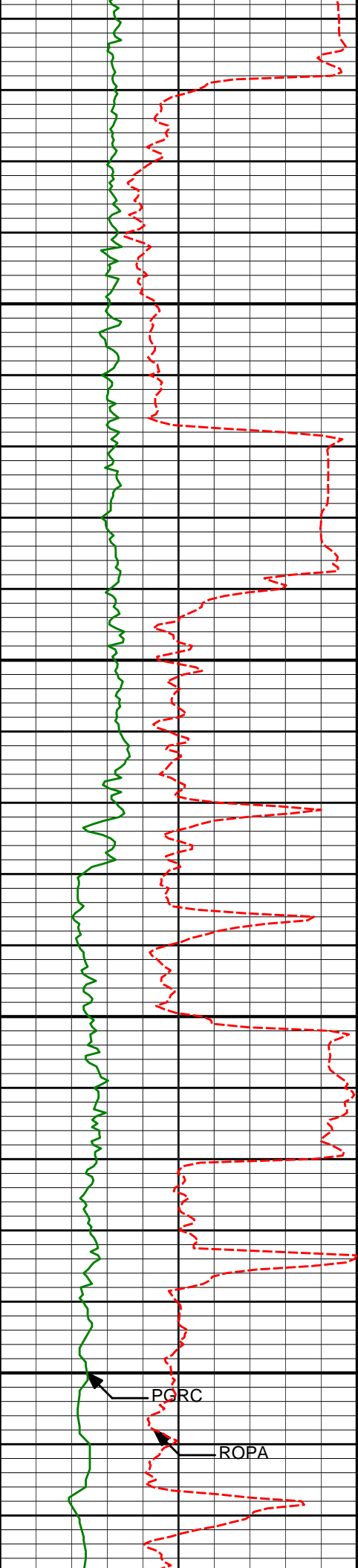
180.65°

7322.21'

4199.40'

PGRC

ROPA



11850

11900

11950

12000

11838'

89.41°

183.43°

7323.65'

4294.34'

11933'

89.94°

184.33°

7324.19'

4389.17'

PGRC

ROPA

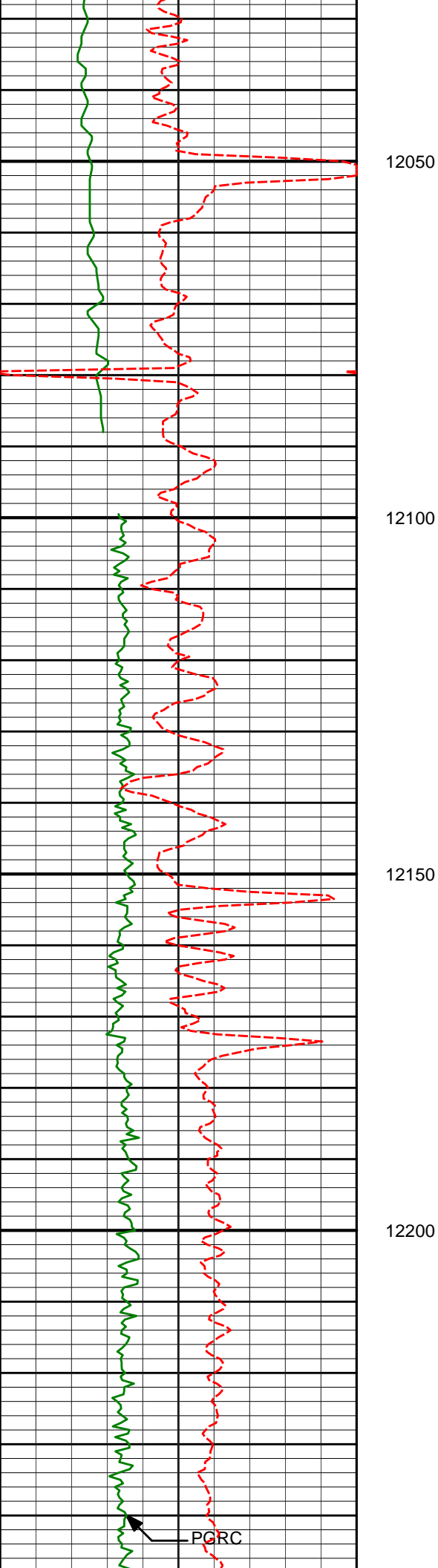
11838'

89.41°

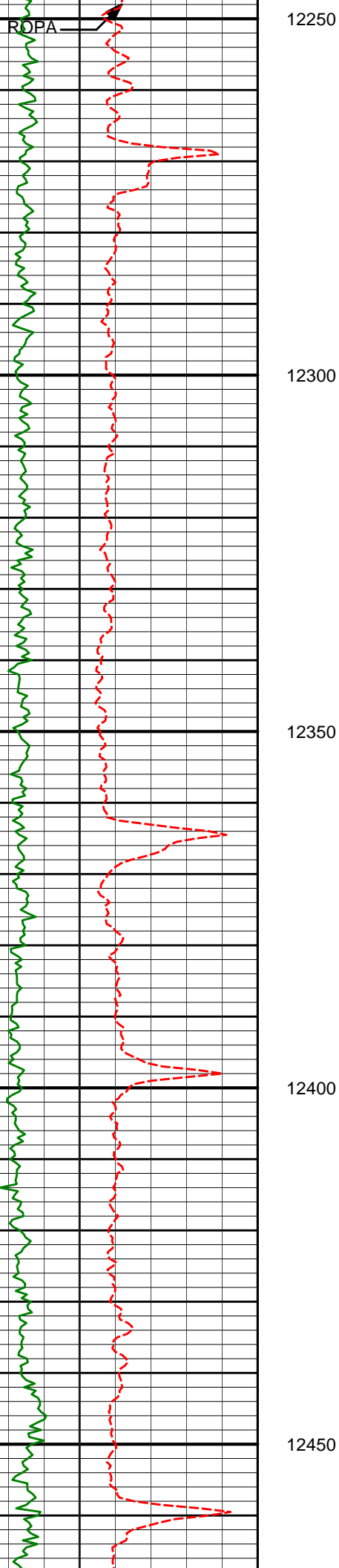
183.43°

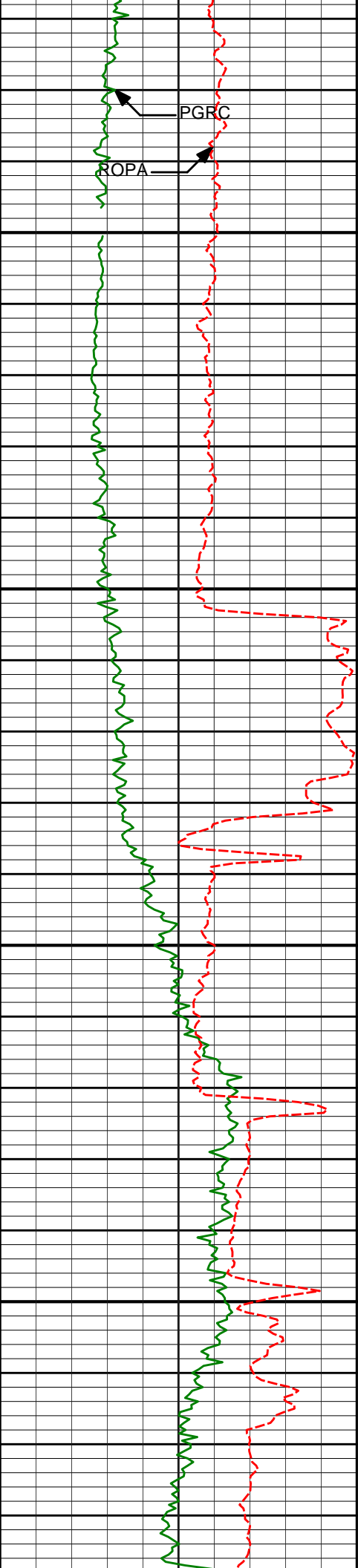
7323.65'

4294.34'



| | | | | |
|--------|--------|---------|----------|----------|
| 12028' | 91.05° | 182.53° | 7323.37' | 4484.03' |
| 12123' | 91.33° | 181.59° | 7321.39' | 4578.97' |
| 12218' | 90.80° | 181.35° | 7319.63' | 4673.94' |





PGRC

ROPA

12500

12550

12600

12650

12502'

90.56°

179.75°

7317.28'

4957.92'

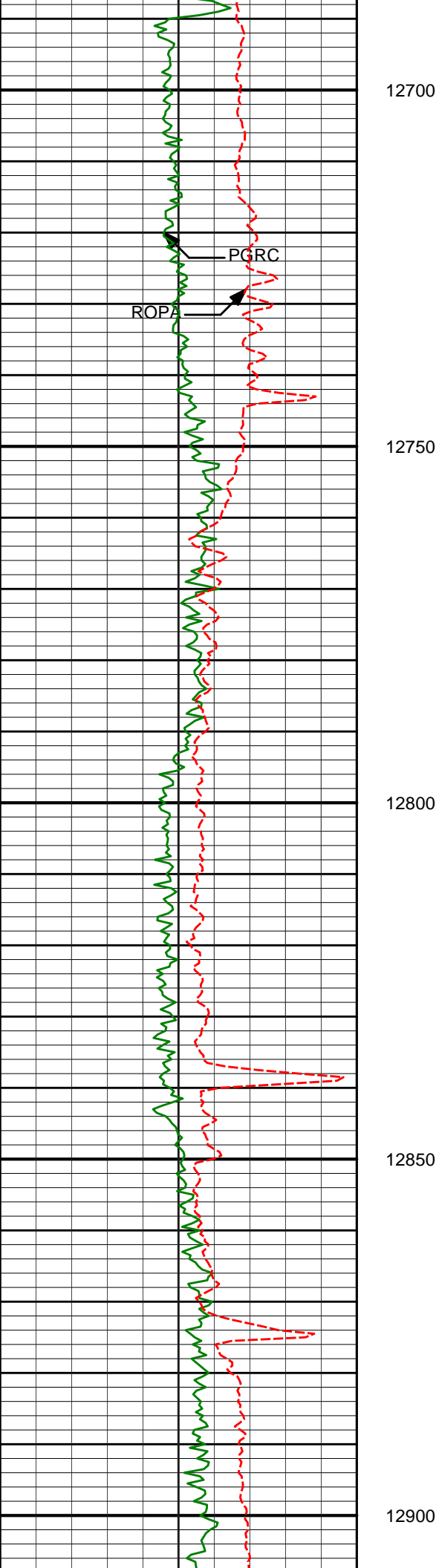
12597'

91.42°

181.74°

7315.64'

5052.90'



12692'

90.86°

180.08°

7313.75'

5147.88'

12787'

91.27°

180.18°

7311.99'

5242.86'

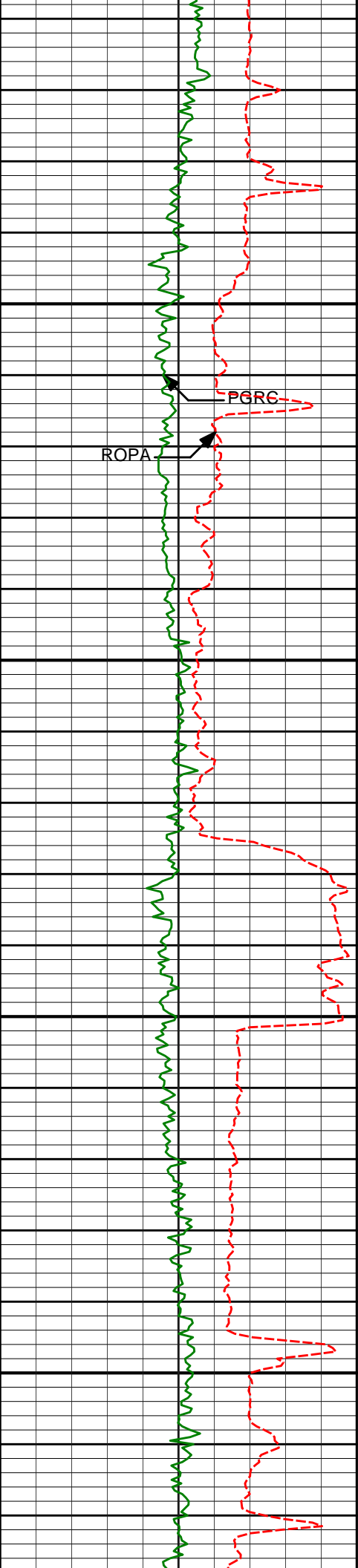
12882'

89.94°

179.21°

7310.98'

5337.84'



12950

13000

13050

13100

ROPAL

PGRG

12976'

89.60°

179.00°

7311.36'

5431.81'

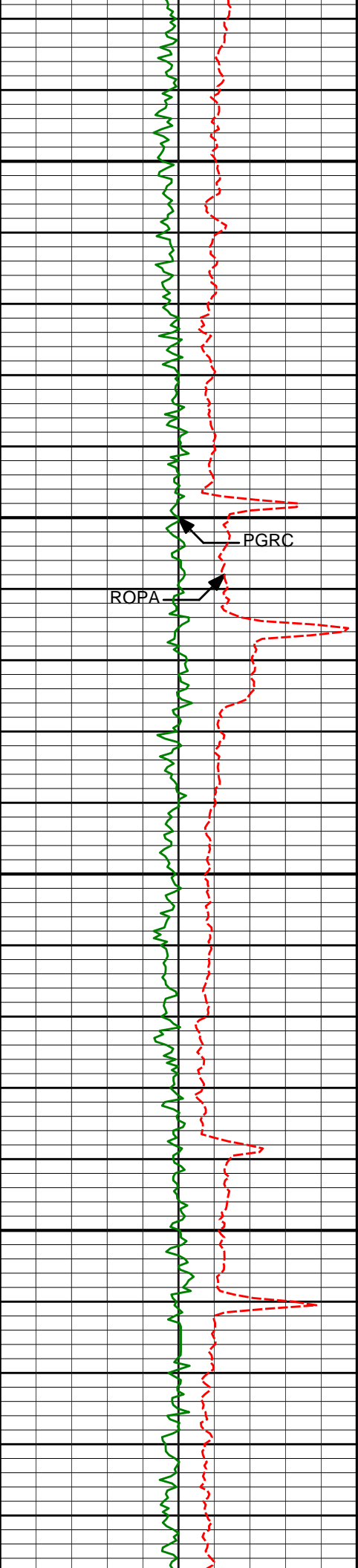
13071'

89.35°

178.33°

7312.23'

5526.76'



13150

13166'

89.60°

178.41°

7313.10'

5621.70'

13200

ROPA

PGRC

13250

13261'

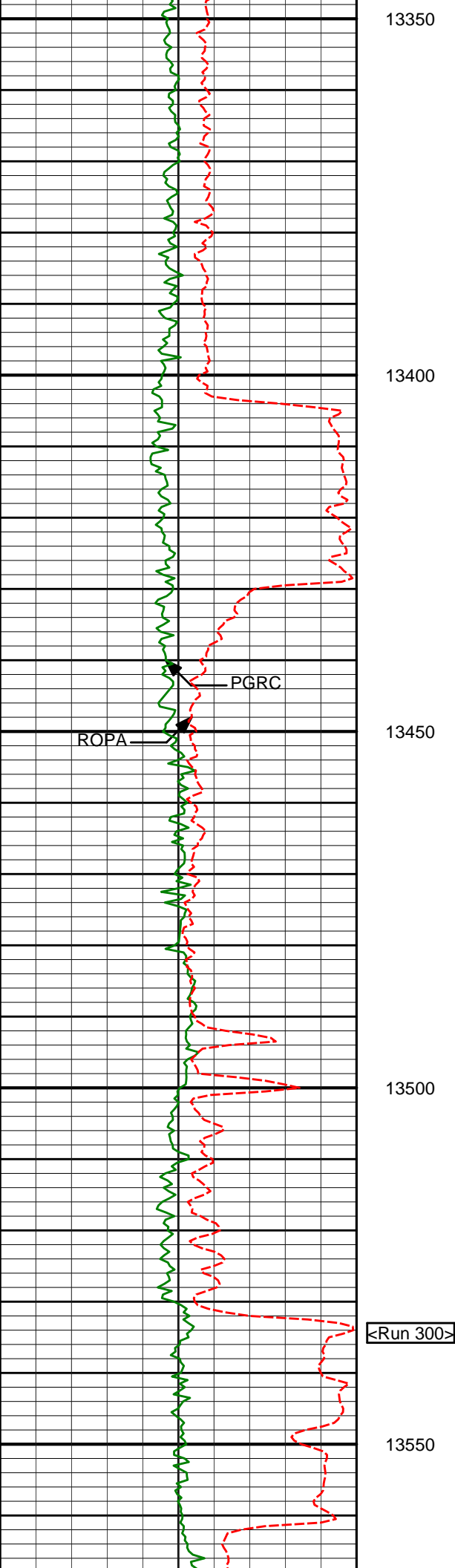
89.75°

178.31°

7313.64'

5716.63'

13300



13350

13355'

89.81°

177.39°

7314.00'

5810.53'

13400

13450

13450'

89.14°

176.10°

7314.87'

5905.32'

13500

<Run 300>

13550

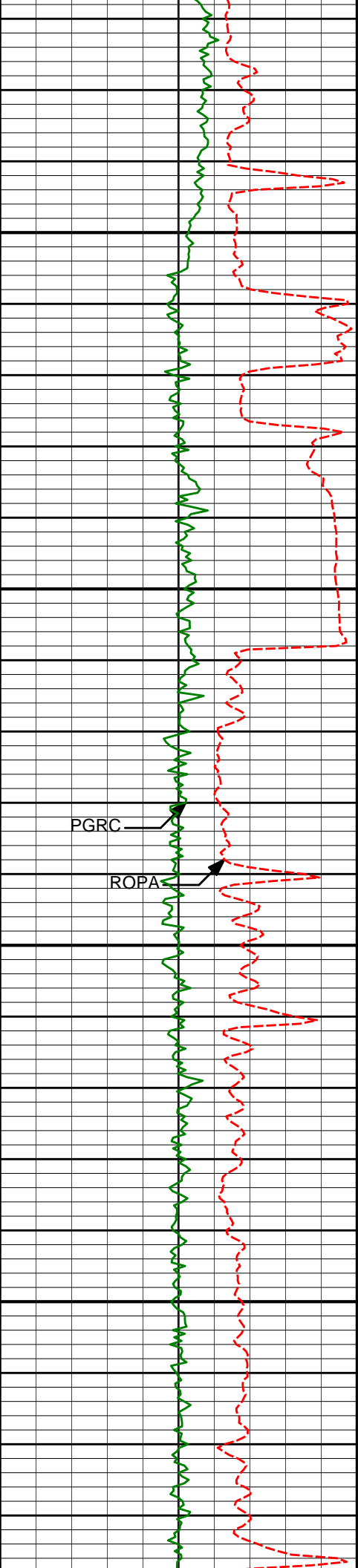
13544'

89.45°

176.54°

7316.03'

5999.07'



13600

13650

13700

13750

PGRC

ROPA

13639'

89.63°

179.70°

7316.79'

6093.97'

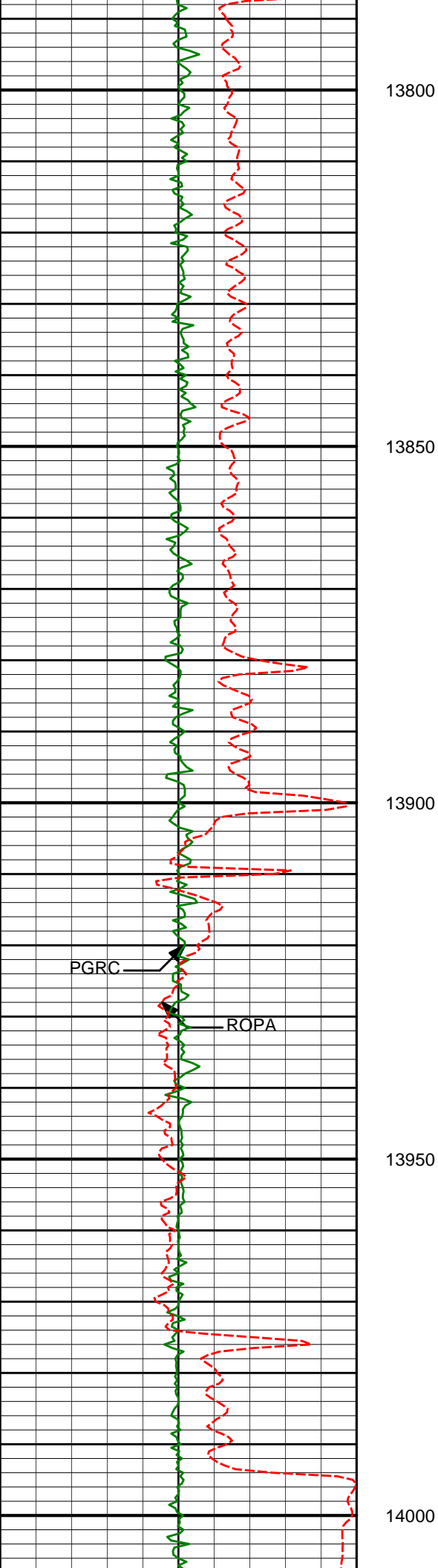
13734'

90.00°

179.18°

7317.10'

6188.96'



13828'

90.12°

175.42°

7317.00'

6282.80'

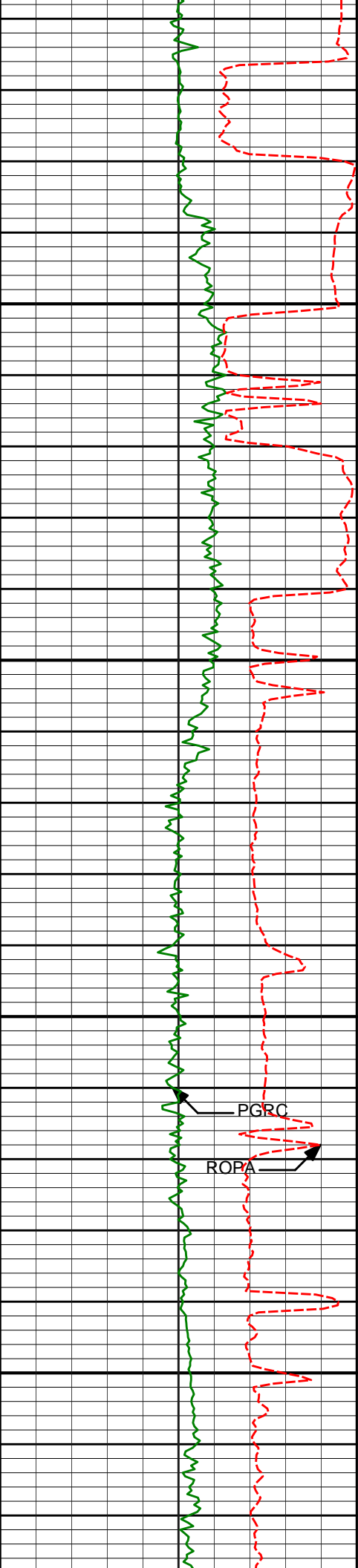
13923'

89.91°

171.94°

7316.97'

6377.12'



14018'

89.72°

171.63°

7317.28'

6471.03'

14050

14100

14113'

91.11°

175.53°

7316.59'

6565.32'

14150

14200

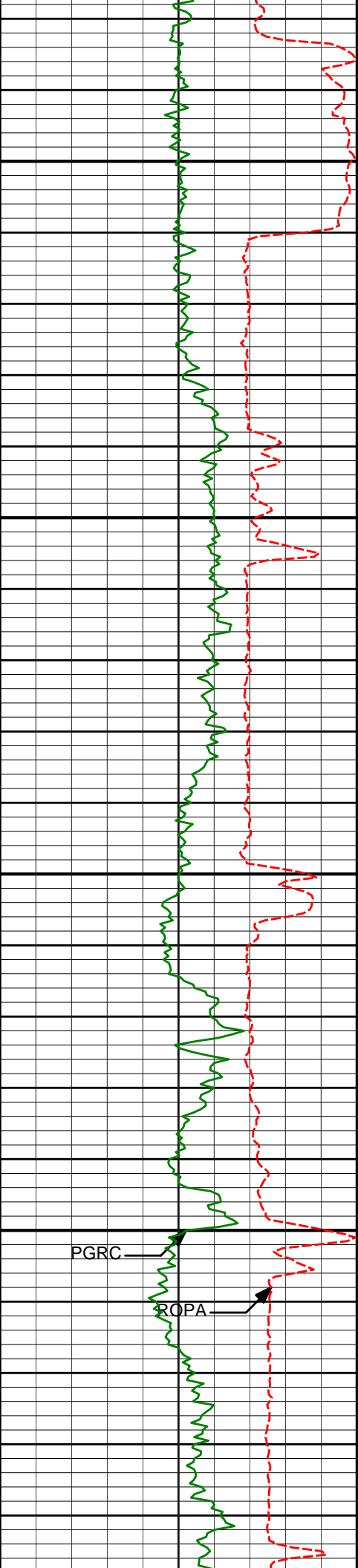
14207'

90.40°

174.79°

7315.35'

6658.90'



14250

14300

14350

14400

14302'

91.23°

175.19°

7314.00'

6753.46'

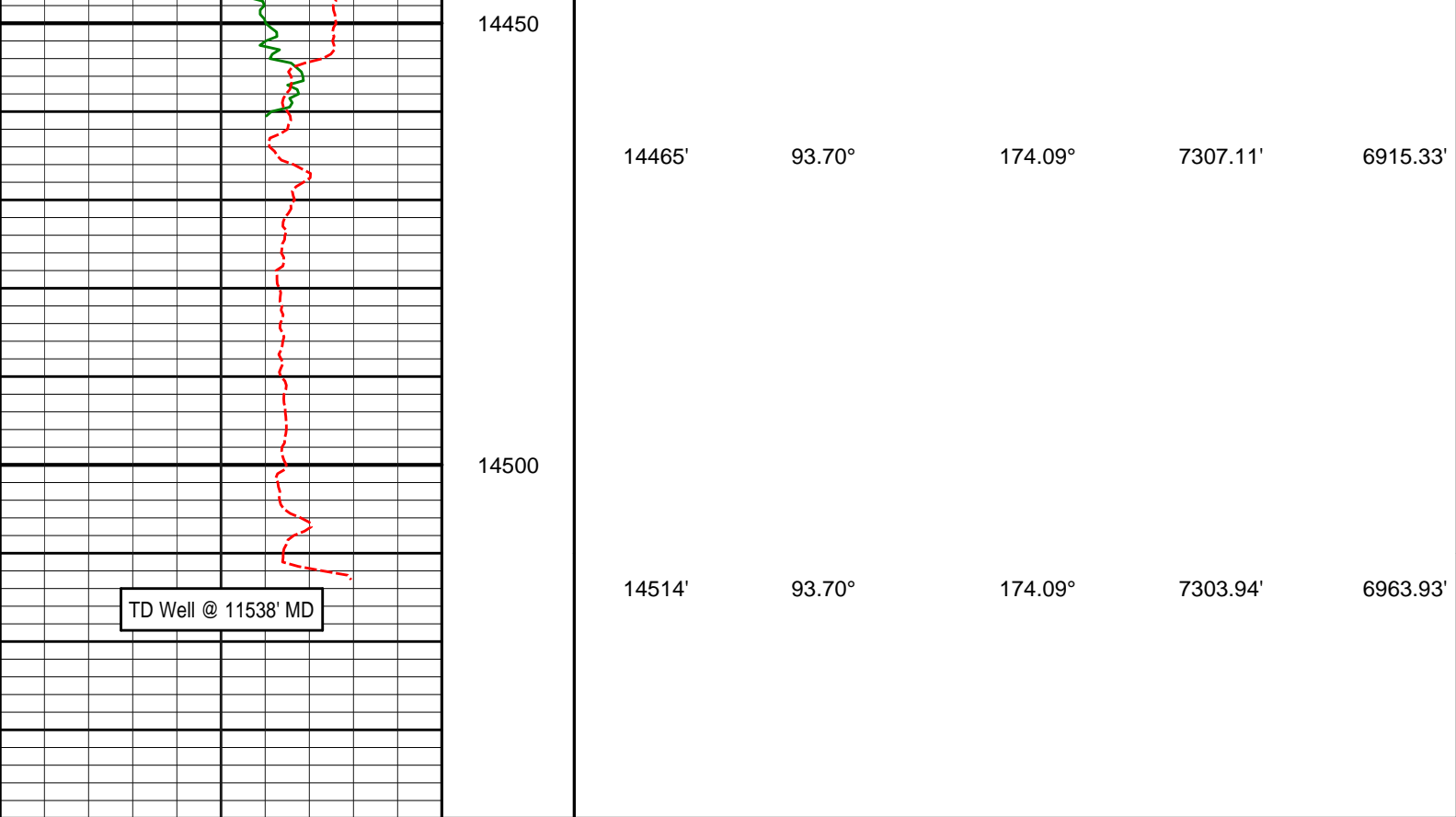
14397'

92.59°

173.75°

7310.84'

6847.88'



| | | | | | | |
|--|------------------------|-------|-----|-----|-----|----|
| Gamma Ray KclBh (PGRC) api | Depth ft 1 : 240 | DEPTH | INC | AZI | TVD | VS |
| 0 250 | | | | | | |
| Avg Rate of Penetration (ROPA) feet per hr | | | | | | |
| 500 0 | | | | | | |

HALLIBURTON

Sperry Drilling

MD 1:240 Detail Log



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko PC

Dove 5N-13HZ

Wattenburg

Weld Colorado

USA

CA-XX-0900302898

Surveys have been IFR Corrected.

| Measured Depth (feet) | Inclination (degrees) | Direction (degrees) | Vertical Depth (feet) | Latitude (feet) | Departure (feet) | Vertical Section (feet) | Dogleg (deg/100ft) |
|-----------------------------|--------------------------|------------------------|-----------------------------|--------------------|---------------------|-------------------------------|-----------------------|
| 946.00 | 1.17 | 71.21 | 945.89 | 8.54 N | 8.16 E | -8.61 | TIE-IN |
| 1098.00 | 1.09 | 95.72 | 1097.86 | 8.90 N | 11.07 E | -8.99 | 0.32 |
| 1281.00 | 0.94 | 103.04 | 1280.83 | 8.38 N | 14.26 E | -8.50 | 0.11 |
| 1373.00 | 0.72 | 99.27 | 1372.82 | 8.12 N | 15.57 E | -8.25 | 0.25 |
| 1465.00 | 1.89 | 82.00 | 1464.80 | 8.24 N | 17.64 E | -8.38 | 1.33 |
| 1557.00 | 3.28 | 71.82 | 1556.70 | 9.27 N | 21.64 E | -9.45 | 1.59 |
| 1648.00 | 5.20 | 61.73 | 1647.45 | 12.04 N | 27.75 E | -12.26 | 2.26 |
| 1740.00 | 6.88 | 58.41 | 1738.94 | 16.90 N | 36.12 E | -17.19 | 1.86 |
| 1832.00 | 8.79 | 55.15 | 1830.07 | 23.80 N | 46.58 E | -24.18 | 2.13 |
| 1924.00 | 10.73 | 48.12 | 1920.74 | 33.54 N | 58.73 E | -34.02 | 2.47 |
| 2016.00 | 9.90 | 45.53 | 2011.25 | 44.80 N | 70.75 E | -45.37 | 1.03 |
| 2107.00 | 9.12 | 42.89 | 2101.00 | 55.56 N | 81.24 E | -56.22 | 0.98 |
| 2202.00 | 10.28 | 50.81 | 2194.65 | 66.43 N | 92.93 E | -67.19 | 1.86 |
| 2296.00 | 9.42 | 47.84 | 2287.26 | 76.90 N | 105.14 E | -77.76 | 1.06 |
| 2391.00 | 9.96 | 54.36 | 2380.91 | 86.90 N | 117.58 E | -87.86 | 1.29 |
| 2485.00 | 9.06 | 51.20 | 2473.62 | 96.28 N | 129.95 E | -97.34 | 1.11 |
| 2580.00 | 10.20 | 56.66 | 2567.28 | 105.59 N | 142.81 E | -106.75 | 1.54 |
| 2675.00 | 8.87 | 54.84 | 2660.96 | 114.43 N | 155.82 E | -115.70 | 1.44 |
| 2769.00 | 10.97 | 56.99 | 2753.55 | 123.47 N | 169.25 E | -124.86 | 2.27 |
| 2864.00 | 9.54 | 51.77 | 2847.04 | 133.27 N | 183.02 E | -134.77 | 1.79 |
| 2958.00 | 12.13 | 54.69 | 2939.35 | 143.80 N | 197.20 E | -145.41 | 2.82 |
| 3053.00 | 11.86 | 52.88 | 3032.28 | 155.46 N | 213.13 E | -157.21 | 0.49 |
| 3147.00 | 11.37 | 51.46 | 3124.35 | 167.07 N | 228.08 E | -168.93 | 0.60 |
| 3242.00 | 10.71 | 49.78 | 3217.60 | 178.60 N | 242.14 E | -180.58 | 0.77 |
| 3337.00 | 9.17 | 49.42 | 3311.17 | 189.23 N | 254.63 E | -191.31 | 1.62 |
| 3431.00 | 10.55 | 54.07 | 3403.78 | 199.15 N | 267.29 E | -201.33 | 1.69 |
| 3526.00 | 9.28 | 50.79 | 3497.36 | 209.09 N | 280.27 E | -211.39 | 1.46 |
| 3620.00 | 10.57 | 48.77 | 3589.95 | 219.57 N | 292.62 E | -221.96 | 1.42 |
| 3715.00 | 8.76 | 47.90 | 3683.60 | 230.16 N | 304.54 E | -232.65 | 1.91 |
| 3809.00 | 10.59 | 48.39 | 3776.26 | 240.70 N | 316.31 E | -243.28 | 1.95 |
| 3904.00 | 8.45 | 48.84 | 3869.94 | 251.09 N | 328.10 E | -253.77 | 2.25 |
| 3999.00 | 9.53 | 49.58 | 3963.77 | 260.78 N | 339.34 E | -263.56 | 1.14 |
| 4093.00 | 8.12 | 46.72 | 4056.66 | 270.38 N | 350.10 E | -273.24 | 1.57 |
| 4188.00 | 10.14 | 41.59 | 4150.45 | 281.23 N | 360.54 E | -284.18 | 2.29 |
| 4282.00 | 12.54 | 36.07 | 4242.61 | 295.67 N | 372.04 E | -298.72 | 2.80 |
| 4377.00 | 12.12 | 35.35 | 4335.42 | 312.15 N | 383.88 E | -315.28 | 0.47 |
| 4472.00 | 10.54 | 43.48 | 4428.57 | 326.59 N | 395.63 E | -329.82 | 2.36 |
| 4566.00 | 9.11 | 37.17 | 4521.19 | 338.76 N | 406.04 E | -342.07 | 1.90 |
| 4661.00 | 9.48 | 42.56 | 4614.95 | 350.51 N | 415.88 E | -353.91 | 1.00 |
| 4755.00 | 8.75 | 42.71 | 4707.76 | 361.47 N | 425.96 E | -364.95 | 0.78 |
| 4850.00 | 7.87 | 42.79 | 4801.76 | 371.55 N | 435.28 E | -375.11 | 0.93 |
| 4944.00 | 6.42 | 46.43 | 4895.03 | 379.89 N | 443.46 E | -383.52 | 1.62 |
| 5039.00 | 7.98 | 55.88 | 4989.28 | 387.25 N | 452.77 E | -390.96 | 2.06 |
| 5133.00 | 7.21 | 55.74 | 5082.46 | 394.24 N | 463.05 E | -398.02 | 0.82 |
| 5228.00 | 8.41 | 51.25 | 5176.58 | 401.94 N | 473.40 E | -405.81 | 1.42 |
| 5323.00 | 7.13 | 49.94 | 5270.70 | 410.08 N | 483.33 E | -414.03 | 1.36 |
| 5417.00 | 6.03 | 48.36 | 5364.08 | 417.12 N | 491.48 E | -421.14 | 1.19 |
| 5512.00 | 4.67 | 51.64 | 5458.66 | 422.83 N | 498.24 E | -426.91 | 1.47 |
| 5606.00 | 4.08 | 55.74 | 5552.39 | 427.09 N | 504.01 E | -431.21 | 0.71 |
| 5796.00 | 1.90 | 63.25 | 5742.12 | 432.32 N | 512.41 E | -436.50 | 1.16 |
| 5891.00 | 1.08 | 81.15 | 5837.09 | 433.16 N | 514.70 E | -437.37 | 0.98 |
| 5986.00 | 0.74 | 114.60 | 5932.08 | 433.04 N | 516.14 E | -437.26 | 0.65 |
| 6081.00 | 0.87 | 192.27 | 6027.07 | 432.08 N | 516.55 E | -436.31 | 1.07 |
| 6175.00 | 1.85 | 221.62 | 6121.04 | 430.25 N | 515.39 E | -434.47 | 1.25 |
| 6270.00 | 1.56 | 158.01 | 6216.01 | 427.91 N | 514.85 E | -432.12 | 1.91 |
| 6365.00 | 0.99 | 48.09 | 6311.00 | 427.26 N | 515.95 E | -431.47 | 2.22 |
| 6460.00 | 0.80 | 42.75 | 6405.98 | 428.29 N | 517.01 E | -432.52 | 0.22 |
| 6555.00 | 0.79 | 27.95 | 6500.97 | 429.36 N | 517.76 E | -433.59 | 0.22 |
| 6650.00 | 0.63 | 2.84 | 6595.97 | 430.46 N | 518.10 E | -434.69 | 0.36 |
| 6745.00 | 2.09 | 198.39 | 6690.95 | 429.33 N | 517.58 E | -433.57 | 2.84 |
| 6776.00 | 4.86 | 195.18 | 6721.89 | 427.53 N | 517.05 E | -431.76 | 8.95 |
| 6808.00 | 7.34 | 193.57 | 6753.71 | 424.23 N | 516.22 E | -428.45 | 7.77 |
| 6840.00 | 9.76 | 190.84 | 6785.35 | 419.58 N | 515.23 E | -423.80 | 7.67 |
| 6871.00 | 12.81 | 192.08 | 6815.75 | 413.64 N | 514.02 E | -417.84 | 9.87 |
| 6903.00 | 15.59 | 190.89 | 6846.77 | 405.95 N | 512.46 E | -410.14 | 8.73 |
| 6935.00 | 17.77 | 189.55 | 6877.42 | 396.91 N | 510.84 E | -401.08 | 6.92 |
| 6966.00 | 20.65 | 187.45 | 6906.69 | 386.82 N | 509.34 E | -390.99 | 9.55 |
| 6998.00 | 23.52 | 185.35 | 6936.34 | 374.87 N | 508.02 E | -379.02 | 9.30 |

| | | | | | | | |
|----------|-------|--------|---------|-----------|----------|---------|-------|
| 7030.00 | 26.08 | 185.03 | 6965.38 | 361.50 N | 506.81 E | -365.64 | 8.01 |
| 7061.00 | 28.94 | 184.87 | 6992.88 | 347.24 N | 505.57 E | -351.37 | 9.23 |
| 7093.00 | 31.42 | 185.90 | 7020.54 | 331.22 N | 504.06 E | -335.34 | 7.92 |
| 7124.00 | 33.08 | 185.94 | 7046.75 | 314.77 N | 502.35 E | -318.88 | 5.36 |
| 7156.00 | 35.74 | 187.35 | 7073.15 | 296.81 N | 500.25 E | -300.90 | 8.68 |
| 7188.00 | 38.64 | 187.19 | 7098.64 | 277.62 N | 497.80 E | -281.70 | 9.07 |
| 7219.00 | 41.78 | 187.15 | 7122.31 | 257.77 N | 495.31 E | -261.82 | 10.13 |
| 7251.00 | 45.11 | 186.77 | 7145.54 | 235.93 N | 492.64 E | -239.96 | 10.44 |
| 7283.00 | 47.87 | 186.99 | 7167.57 | 212.89 N | 489.86 E | -216.90 | 8.64 |
| 7314.00 | 50.58 | 187.69 | 7187.82 | 189.61 N | 486.86 E | -193.60 | 8.91 |
| 7346.00 | 53.94 | 186.94 | 7207.40 | 164.51 N | 483.64 E | -168.48 | 10.66 |
| 7378.00 | 57.51 | 186.84 | 7225.42 | 138.27 N | 480.47 E | -142.20 | 11.16 |
| 7409.00 | 60.82 | 185.57 | 7241.31 | 111.81 N | 477.60 E | -115.72 | 11.24 |
| 7441.00 | 64.36 | 184.95 | 7256.04 | 83.53 N | 475.00 E | -87.42 | 11.20 |
| 7473.00 | 66.71 | 183.11 | 7269.29 | 54.47 N | 472.96 E | -58.35 | 9.02 |
| 7504.00 | 70.41 | 182.37 | 7280.62 | 25.66 N | 471.58 E | -29.52 | 12.14 |
| 7536.00 | 73.95 | 182.99 | 7290.41 | 4.77 S | 470.15 E | 0.91 | 11.22 |
| 7568.00 | 77.94 | 181.38 | 7298.18 | 35.78 S | 468.97 E | 31.93 | 13.39 |
| 7599.00 | 81.49 | 179.74 | 7303.71 | 66.28 S | 468.68 E | 62.43 | 12.58 |
| 7645.00 | 85.93 | 176.98 | 7308.75 | 111.96 S | 469.99 E | 108.10 | 11.35 |
| 7726.00 | 89.60 | 173.37 | 7311.91 | 192.59 S | 476.80 E | 188.67 | 6.35 |
| 7821.00 | 89.69 | 172.52 | 7312.50 | 286.87 S | 488.47 E | 282.85 | 0.90 |
| 7916.00 | 90.06 | 172.30 | 7312.71 | 381.03 S | 501.01 E | 376.91 | 0.45 |
| 8011.00 | 90.15 | 173.10 | 7312.53 | 475.26 S | 513.09 E | 471.04 | 0.85 |
| 8106.00 | 90.83 | 174.33 | 7311.72 | 569.69 S | 523.49 E | 565.37 | 1.48 |
| 8200.00 | 88.40 | 174.47 | 7312.35 | 663.23 S | 532.66 E | 658.84 | 2.59 |
| 8295.00 | 90.52 | 178.23 | 7313.25 | 758.01 S | 538.70 E | 753.56 | 4.54 |
| 8390.00 | 89.23 | 180.43 | 7313.46 | 852.99 S | 539.81 E | 848.54 | 2.68 |
| 8485.00 | 88.18 | 178.49 | 7315.60 | 947.96 S | 540.71 E | 943.49 | 2.32 |
| 8580.00 | 89.48 | 178.47 | 7317.54 | 1042.90 S | 543.23 E | 1038.41 | 1.37 |
| 8675.00 | 89.07 | 179.13 | 7318.75 | 1137.87 S | 545.22 E | 1133.36 | 0.82 |
| 8770.00 | 89.41 | 179.10 | 7320.01 | 1232.86 S | 546.68 E | 1228.33 | 0.36 |
| 8864.00 | 89.72 | 178.63 | 7320.72 | 1326.83 S | 548.55 E | 1322.29 | 0.60 |
| 8959.00 | 90.31 | 180.20 | 7320.69 | 1421.83 S | 549.52 E | 1417.27 | 1.77 |
| 9054.00 | 90.43 | 179.88 | 7320.08 | 1516.82 S | 549.45 E | 1512.27 | 0.36 |
| 9145.00 | 89.32 | 178.08 | 7320.28 | 1607.80 S | 551.07 E | 1603.23 | 2.32 |
| 9237.00 | 89.26 | 178.48 | 7321.42 | 1699.75 S | 553.83 E | 1695.15 | 0.44 |
| 9329.00 | 90.22 | 180.09 | 7321.84 | 1791.74 S | 554.98 E | 1787.13 | 2.04 |
| 9421.00 | 90.22 | 179.21 | 7321.48 | 1883.74 S | 555.54 E | 1879.12 | 0.96 |
| 9513.00 | 89.82 | 180.61 | 7321.45 | 1975.74 S | 555.69 E | 1971.11 | 1.58 |
| 9605.00 | 90.62 | 183.88 | 7321.10 | 2067.65 S | 552.08 E | 2063.05 | 3.66 |
| 9696.00 | 91.11 | 184.78 | 7319.72 | 2158.38 S | 545.21 E | 2153.84 | 1.13 |
| 9788.00 | 89.35 | 181.32 | 7319.35 | 2250.23 S | 540.32 E | 2245.72 | 4.22 |
| 9880.00 | 92.46 | 183.67 | 7317.90 | 2342.12 S | 536.32 E | 2337.64 | 4.24 |
| 9972.00 | 91.79 | 182.24 | 7314.49 | 2433.93 S | 531.58 E | 2429.49 | 1.72 |
| 10064.00 | 92.41 | 181.36 | 7311.12 | 2525.82 S | 528.69 E | 2521.40 | 1.17 |
| 10155.00 | 93.88 | 180.37 | 7306.13 | 2616.67 S | 527.32 E | 2612.25 | 1.95 |
| 10247.00 | 91.94 | 180.38 | 7301.46 | 2708.54 S | 526.72 E | 2704.13 | 2.11 |
| 10339.00 | 88.98 | 180.62 | 7300.72 | 2800.53 S | 525.91 E | 2796.12 | 3.23 |
| 10430.00 | 89.48 | 180.75 | 7301.94 | 2891.51 S | 524.83 E | 2887.11 | 0.57 |
| 10522.00 | 90.28 | 180.28 | 7302.13 | 2983.51 S | 524.00 E | 2979.11 | 1.01 |
| 10614.00 | 89.75 | 181.31 | 7302.11 | 3075.50 S | 522.72 E | 3071.10 | 1.26 |
| 10706.00 | 89.10 | 180.04 | 7303.03 | 3167.48 S | 521.64 E | 3163.10 | 1.55 |
| 10798.00 | 88.62 | 181.41 | 7304.86 | 3259.45 S | 520.47 E | 3255.08 | 1.58 |
| 10890.00 | 87.38 | 179.92 | 7308.07 | 3351.39 S | 519.41 E | 3347.01 | 2.11 |
| 10984.00 | 88.24 | 181.18 | 7311.67 | 3445.31 S | 518.51 E | 3440.94 | 1.62 |
| 11079.00 | 88.18 | 181.67 | 7314.63 | 3540.24 S | 516.14 E | 3535.88 | 0.52 |
| 11174.00 | 88.40 | 182.36 | 7317.47 | 3635.13 S | 512.81 E | 3630.81 | 0.76 |
| 11269.00 | 90.31 | 183.76 | 7318.54 | 3729.99 S | 507.73 E | 3725.70 | 2.49 |
| 11364.00 | 89.60 | 183.28 | 7318.61 | 3824.81 S | 501.90 E | 3820.56 | 0.90 |
| 11459.00 | 89.20 | 182.50 | 7319.61 | 3919.68 S | 497.11 E | 3915.47 | 0.92 |
| 11554.00 | 89.85 | 181.94 | 7320.40 | 4014.60 S | 493.43 E | 4010.42 | 0.90 |
| 11649.00 | 89.54 | 180.78 | 7320.90 | 4109.57 S | 491.18 E | 4105.41 | 1.26 |
| 11743.00 | 88.86 | 180.65 | 7322.21 | 4203.56 S | 490.01 E | 4199.40 | 0.74 |
| 11838.00 | 89.41 | 183.43 | 7323.65 | 4298.48 S | 486.62 E | 4294.34 | 2.98 |
| 11933.00 | 89.94 | 184.33 | 7324.19 | 4393.26 S | 480.20 E | 4389.17 | 1.10 |
| 12028.00 | 91.05 | 182.53 | 7323.37 | 4488.08 S | 474.51 E | 4484.03 | 2.23 |
| 12123.00 | 91.33 | 181.59 | 7321.39 | 4582.99 S | 471.10 E | 4578.97 | 1.03 |
| 12218.00 | 90.80 | 181.35 | 7319.63 | 4677.94 S | 468.66 E | 4673.94 | 0.61 |
| 12313.00 | 90.12 | 180.47 | 7318.86 | 4772.93 S | 467.15 E | 4768.94 | 1.17 |
| 12408.00 | 90.62 | 180.16 | 7318.25 | 4867.92 S | 466.63 E | 4863.93 | 0.62 |

| | | | | | | | |
|----------|-------|--------|---------|-----------|----------|---------|------|
| 12502.00 | 90.56 | 179.75 | 7317.28 | 4961.92 S | 466.71 E | 4957.92 | 0.44 |
| 12597.00 | 91.42 | 181.74 | 7315.64 | 5056.89 S | 465.47 E | 5052.90 | 2.28 |
| 12692.00 | 90.86 | 180.08 | 7313.75 | 5151.86 S | 463.96 E | 5147.88 | 1.84 |
| 12787.00 | 91.27 | 180.18 | 7311.99 | 5246.84 S | 463.75 E | 5242.86 | 0.44 |
| 12882.00 | 89.94 | 179.21 | 7310.98 | 5341.83 S | 464.25 E | 5337.84 | 1.73 |
| 12976.00 | 89.60 | 179.00 | 7311.36 | 5435.82 S | 465.72 E | 5431.81 | 0.43 |
| 13071.00 | 89.35 | 178.33 | 7312.23 | 5530.79 S | 467.93 E | 5526.76 | 0.75 |
| 13166.00 | 89.60 | 178.41 | 7313.10 | 5625.74 S | 470.64 E | 5621.70 | 0.28 |
| 13261.00 | 89.75 | 178.31 | 7313.64 | 5720.70 S | 473.36 E | 5716.63 | 0.19 |
| 13355.00 | 89.81 | 177.39 | 7314.00 | 5814.64 S | 476.88 E | 5810.53 | 0.98 |
| 13450.00 | 89.14 | 176.10 | 7314.87 | 5909.48 S | 482.28 E | 5905.32 | 1.53 |
| 13544.00 | 89.45 | 176.54 | 7316.03 | 6003.28 S | 488.31 E | 5999.07 | 0.57 |
| 13639.00 | 89.63 | 179.70 | 7316.79 | 6098.21 S | 491.42 E | 6093.97 | 3.33 |
| 13734.00 | 90.00 | 179.18 | 7317.10 | 6193.20 S | 492.35 E | 6188.96 | 0.67 |
| 13828.00 | 90.12 | 175.42 | 7317.00 | 6287.08 S | 496.78 E | 6282.80 | 4.00 |
| 13923.00 | 89.91 | 171.94 | 7316.97 | 6381.49 S | 507.24 E | 6377.12 | 3.67 |
| 14018.00 | 89.72 | 171.63 | 7317.28 | 6475.52 S | 520.81 E | 6471.03 | 0.38 |
| 14113.00 | 91.11 | 175.53 | 7316.59 | 6569.90 S | 531.43 E | 6565.32 | 4.36 |
| 14207.00 | 90.40 | 174.79 | 7315.35 | 6663.55 S | 539.36 E | 6658.90 | 1.09 |
| 14302.00 | 91.23 | 175.19 | 7314.00 | 6758.18 S | 547.66 E | 6753.46 | 0.97 |
| 14397.00 | 92.59 | 173.75 | 7310.84 | 6852.68 S | 556.81 E | 6847.88 | 2.08 |
| 14465.00 | 93.70 | 174.09 | 7307.11 | 6920.19 S | 564.00 E | 6915.33 | 1.71 |
| 14514.00 | 93.70 | 174.09 | 7303.94 | 6968.83 S | 569.03 E | 6963.93 | 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 180.47 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.62 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 14514.00 FEET
IS 6992.02 FEET ALONG 175.33 DEGREES (TRUE)**

**Surveys are Tied-On to surface gyros.
Final survey is a straight line projection to bit.**