

## PCGK - Pressure Case Gamma

[illegible]

## WELL INFORMATION

|   |                  |                  |                   |  |  |
|---|------------------|------------------|-------------------|--|--|
| <b>MWD Run Number</b>                   | 100              | 200              | 300               |  |  |
| <b>Date run completed</b>               | 10-Sep-13        | 21-Sep-13        | 24-Sep-13         |  |  |
| <b>Rig Bit Number</b>                   | 02               | 03               | 04                |  |  |
| <b>Bit Size (in)</b>                    | 8.750            | 6.125            | 6.125             |  |  |
| <b>Tool Nominal OD (in)</b>             | 6.750            | 4.750            | 4.750             |  |  |
| <b>Log Start Depth (MD, ft)</b>         | 644.00           | 7,581.00         | 11,223.00         |  |  |
| <b>Log End Depth (MD, ft)</b>           | 7,581.00         | 11,223.00        | 11,700.00         |  |  |
| <b>Drill or Wipe</b>                    | Drill            | Drill            | Drill             |  |  |
| <b>Drill/Wipe Start Date and Time</b>   | 06-Sep-13 21:00  | 11-Sep-13 22:50  | 23-Sep-13 03:30   |  |  |
| <b>Drill/Wipe End Date and Time</b>     | 09-Sep-13 20:00  | 13-Sep-13 13:20  | 23-Sep-13 11:15   |  |  |
| <b>Min Inc (deg) @ Depth (MD, ft)</b>   | 0.38 @ 966.00    | 82.02 @ 7,617.00 | 88.55 @ 11,515.00 |  |  |
| <b>Max Inc (deg) @ Depth (MD, ft)</b>   | 79.39 @ 7,531.00 | 93.58 @ 8,200.00 | 89.75 @ 11,246.00 |  |  |
| <b>Bit TFA(in2) / Bit Type</b>          | 0.84 / PDC       | 0.75 / PDC       | 0.75 / PDC        |  |  |
| <b>Flow Rate (gpm)</b>                  | 578.86           | 300.00           | 275.00            |  |  |
| <b>Max AV (fpm) / CV (fpm) @ MWD</b>    | 321.2 / 250.5    | 285.8 / 271.7    | /                 |  |  |
| <b>Fluid Type</b>                       | Native/Spud Mud  | Fresh Water Gel  | Fresh Water Gel   |  |  |
| <b>Density (ppg) / Viscosity (spqt)</b> | 9.17 / 39.00     | 9.37 / 33.00     | 9.63 / 35.00      |  |  |
| <b>Filtrate CL (ppm)</b>                | 700.00           | NA               | NA                |  |  |
| <b>pH / Fluid Loss (mptm)</b>           | 9.50 / 7         | 8.50 / 9         | 9.50 /            |  |  |
| <b>PV (cP) / YP (lbf2)</b>              | 13 / 10.00       | 6 / 3.00         | 8 / 3.00          |  |  |
| <b>% Solids / % Sand</b>                | 8.50 / 0.25      | 6.40 / 0.20      | 6.50 / 0.20       |  |  |
| <b>% Oil / Oil:Water Ratio</b>          | Na / Na          | Na / Na          | NA / NA           |  |  |
| <b>Rm @ Measured Temp (degF)</b>        | Na @ Na          | Na @ Na          | NA @ NA           |  |  |
| <b>Rmf @ Measured Temp (degF)</b>       | Na @ Na          | Na @ Na          | NA @ NA           |  |  |
| <b>Rmc @ Measured Temp (degF)</b>       | Na @ Na          | Na @ Na          | NA @ NA           |  |  |
| <b>Max Tool Temp (in F) / C</b>         | 478.75 / 248.20  | 349.33 / 176.85  | 345.00 / 174.44   |  |  |

|                               |                |              |                |  |  |
|-------------------------------|----------------|--------------|----------------|--|--|
| Max Tool Temp (degF) / Source | 172.78 / PCM   | 242.28 / PCM | 245.03 / PCM   |  |  |
| Rm @ Max Tool Temp (degF)     | Na @ 172.78    | Na @ 242.28  | NA @ 245.03    |  |  |
| Lead MWD Engineer             | James Ramsay   | Tyrell Foran | Tyrell Foran   |  |  |
| Customer Representative       | Kevin Campbell | JW Irwin     | Kevin Campbell |  |  |

## SENSOR INFORMATION

### Downhole Processor Information

|                           |                 |                 |                 |  |  |
|---------------------------|-----------------|-----------------|-----------------|--|--|
| Tool Type                 | PCM             | PCM             | PCM             |  |  |
| Software Version          | 5.84            | 5.84            | 5.84            |  |  |
| Sub Serial Number         | 11404283        | 11670106        | 11670106        |  |  |
| Insert Serial Number      | 11227547        | 11619990        | 11227547        |  |  |
| Date and Time Initialized | 06-Sep-13 05:37 | 11-Sep-13 04:15 | 21-Sep-13 08:19 |  |  |
| Date and Time Read        | 10-Sep-13 07:27 | 21-Sep-13 20:02 | 24-Sep-13 21:47 |  |  |
| ECMB SW Version           | N/A             | N/A             | N/A             |  |  |

### Directional Sensor Information

|                        |          |          |          |  |  |
|------------------------|----------|----------|----------|--|--|
| Tool Type              | PCDC     | PCDC     | PCDC     |  |  |
| Distance From Bit (ft) | 50.00    | 66.00    | 66.00    |  |  |
| Software Version       | 6.21     | 6.21     | 6.21     |  |  |
| Sub Serial Number      | 11404283 | 11670106 | 11670106 |  |  |
| Sonde Serial Number    | 12174339 | 11297574 | 12174339 |  |  |
| Sensor ID Number       | N/A      | N/A      | N/A      |  |  |
| Toolface Offset (deg)  | 195.97   | 213.70   | 343.33   |  |  |

### Gamma Ray Sensor Information

|                              |          |          |          |  |  |
|------------------------------|----------|----------|----------|--|--|
| Tool Type                    | PCG      | PCG      | PCG      |  |  |
| Distance From Bit (ft)       | 55.81    | 68.71    | 68.73    |  |  |
| Recorded Sample Period (sec) | 10       | 10       | 10       |  |  |
| Software Version             | 8.15     | 8.15     | 8.15     |  |  |
| Sub Serial Number            | 11404283 | 11670106 | 11670106 |  |  |
| Insert/Sonde Serial Number   | 11579811 | 11579779 | 11579811 |  |  |

## REMARKS

1. All depths are true 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" for water based fluids and the "Bingham Plastic" model for oil and synthetic based fluids.

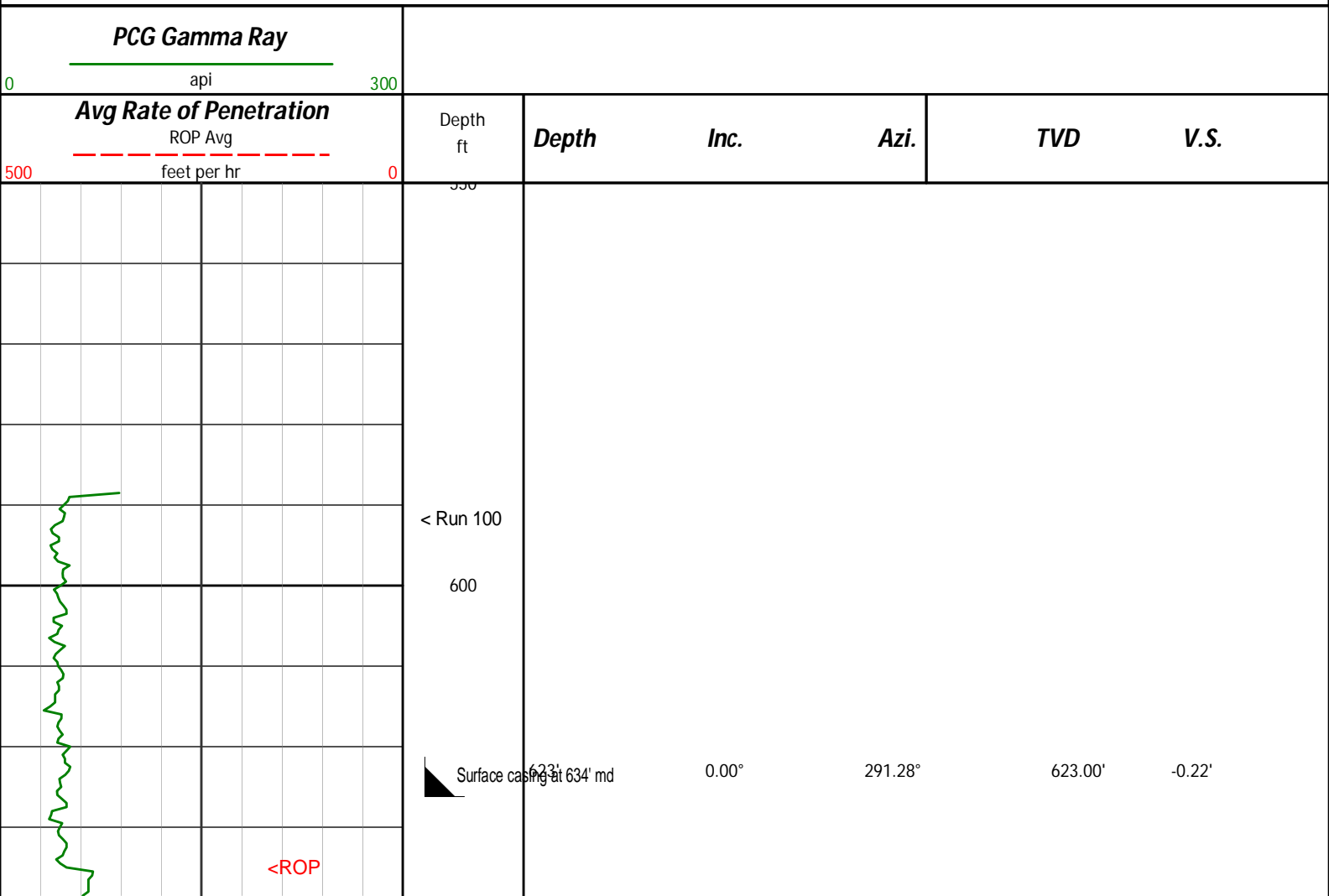
4. All data is stored data unless otherwise specified.

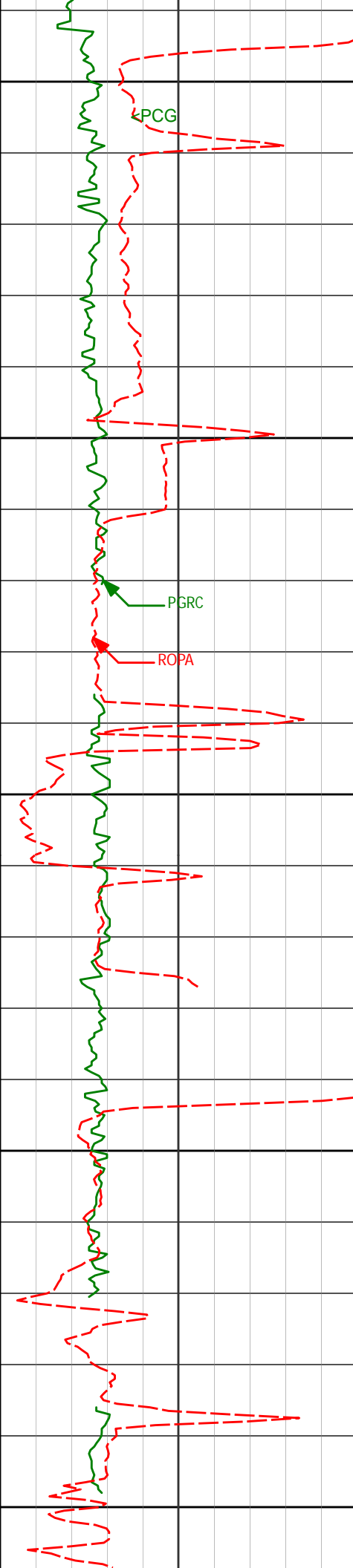
5. The following smoothing parameters have been applied to the data:

PCG GR XHI -Range (Gamma Ray Cor)  
Interval Resolution: 0.5  
Interval Distance: 0.6  
Gap Fill: 3

ROPA (Average Rate of Penetration)  
Interval Resolution: 0.5  
Interval Distance: 1.2  
Gap Fill: 3

6. INSITE Version 8.0.0





650

PCG

700

PGRC

ROPA

750

800

850

698'

0.51°

214.20°

698.00'

-0.48'

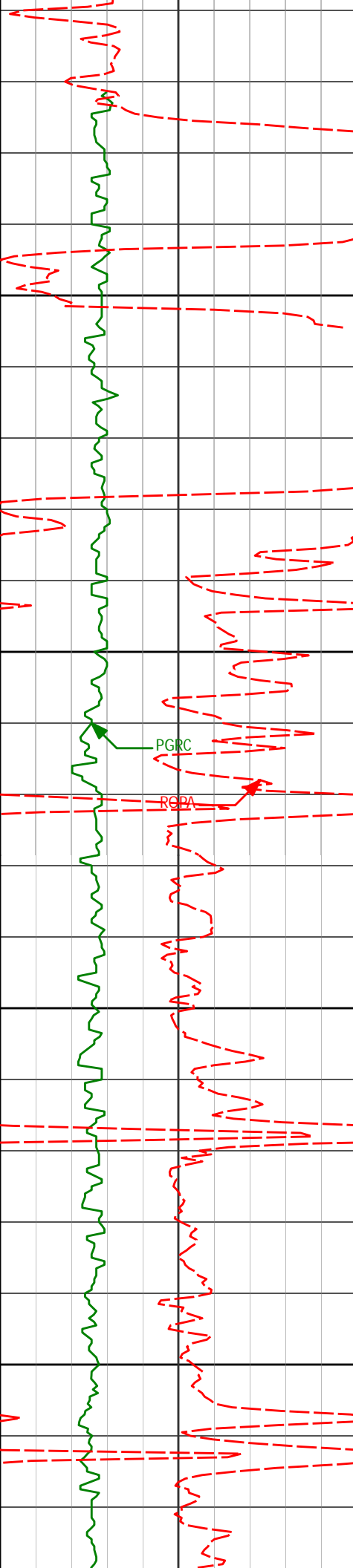
787'

0.80°

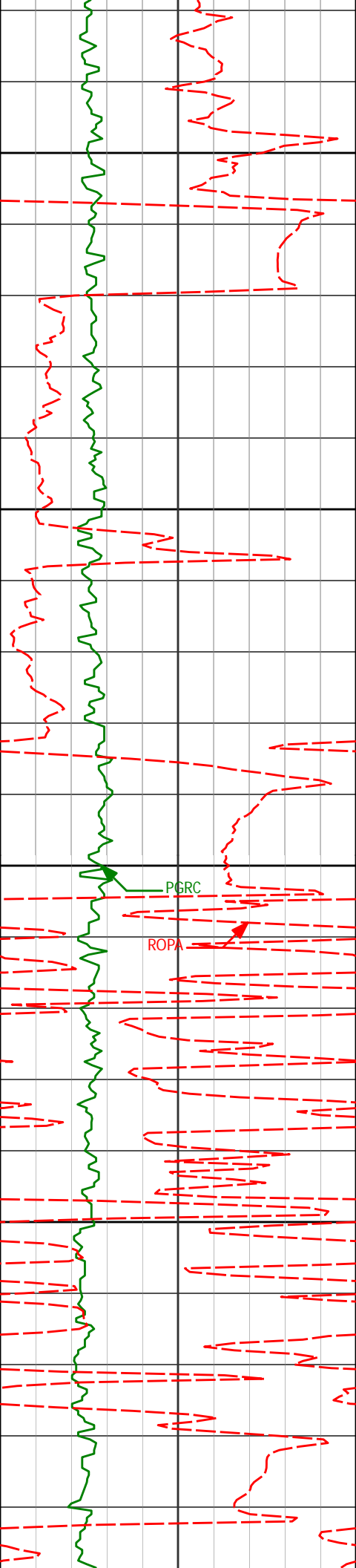
167.40°

786.99'

-0.82'



|       |       |         |          |        |
|-------|-------|---------|----------|--------|
| 877'  | 0.63° | 265.66° | 876.99'  | -1.35' |
| 900   |       |         |          |        |
| 950   |       |         |          |        |
| 966'  | 0.38° | 219.55° | 965.98'  | -2.07' |
| 1000  |       |         |          |        |
| 1050  |       |         |          |        |
| 1056' | 0.77° | 301.77° | 1055.98' | -2.73' |



1100

1135'

0.99°

307.48°

1134.97'

-3.48'

1150

1200

PGRC

ROPA

1229'

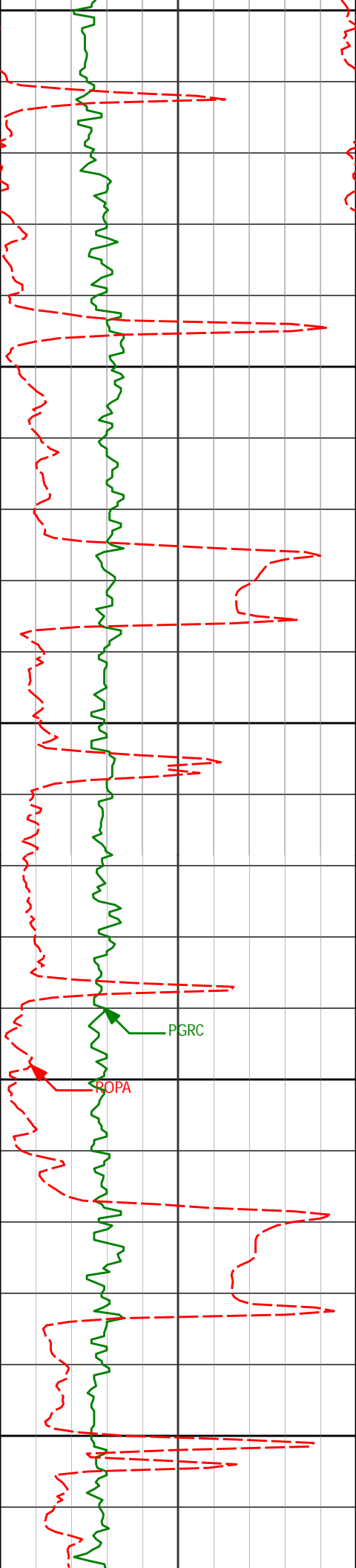
3.78°

347.51°

1228.89'

-3.73'

1250



1300

1323'

5.15°

354.87°

1322.60'

-2.67'

1350

1400

1418'

7.45°

356.32°

1417.02'

-0.44'

1450

PGRC

BOPA

1500

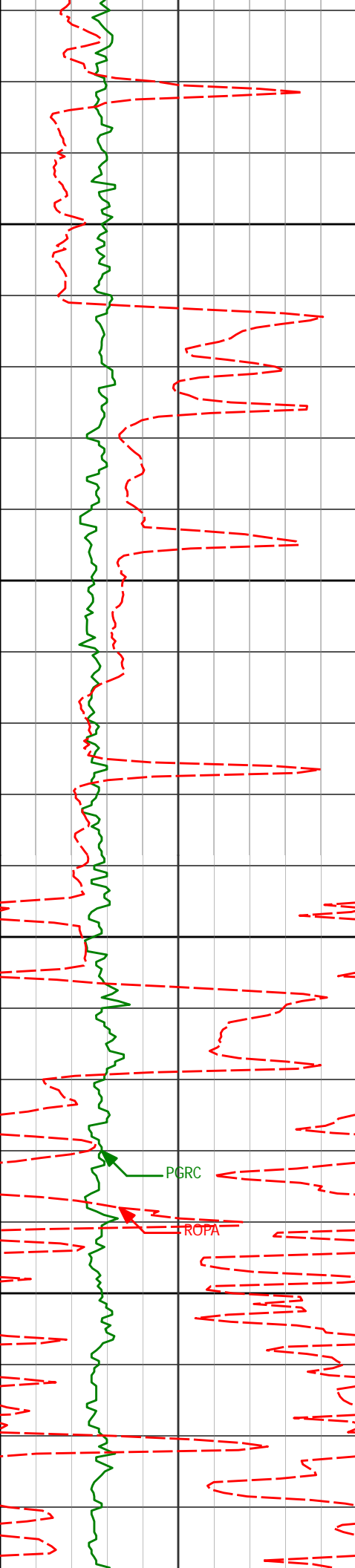
1512'

9.52°

357.45°

1509.99'

2.81'



1550

1600

1650

1700

1606'

10.34°

351.94°

1602.58'

5.96'

1700'

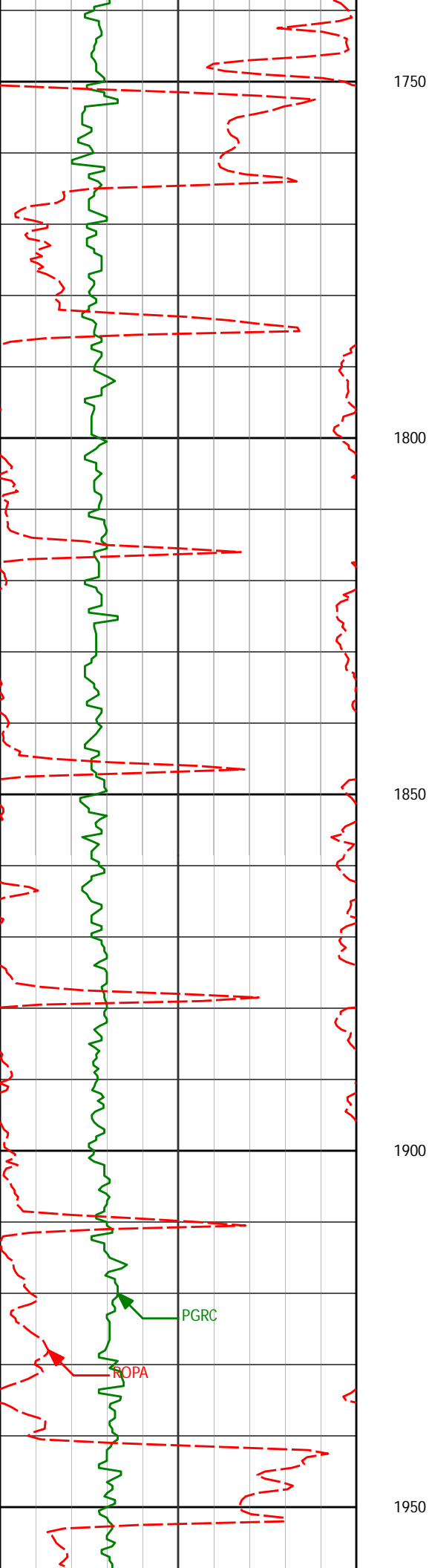
10.83°

350.17°

1694.98'

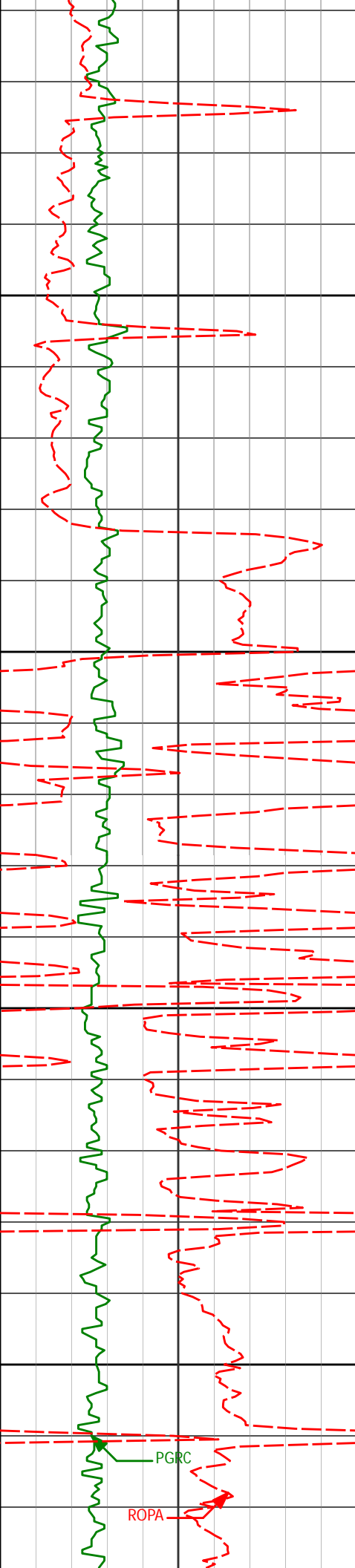
8.26'





|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 1794' | 12.20° | 351.80° | 1787.09' | 10.76' |
|-------|--------|---------|----------|--------|

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 1889' | 11.14° | 348.85° | 1880.13' | 13.10' |
|-------|--------|---------|----------|--------|



|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 1983' | 12.73° | 348.76° | 1972.09' | 14.94' |
|-------|--------|---------|----------|--------|

2000

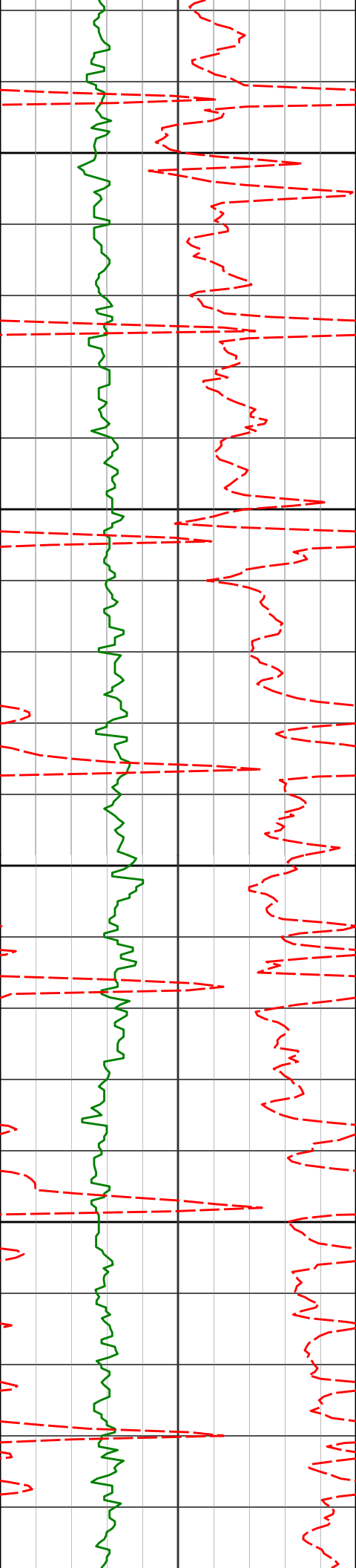
2050

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 2077' | 13.28° | 356.75° | 2063.69' | 18.41' |
|-------|--------|---------|----------|--------|

2100

2150

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 2171' | 12.79° | 355.93° | 2155.26' | 23.16' |
|-------|--------|---------|----------|--------|



2200

2250

2300

2350

2265'

12.20°

354.27°

2247.04'

27.30'

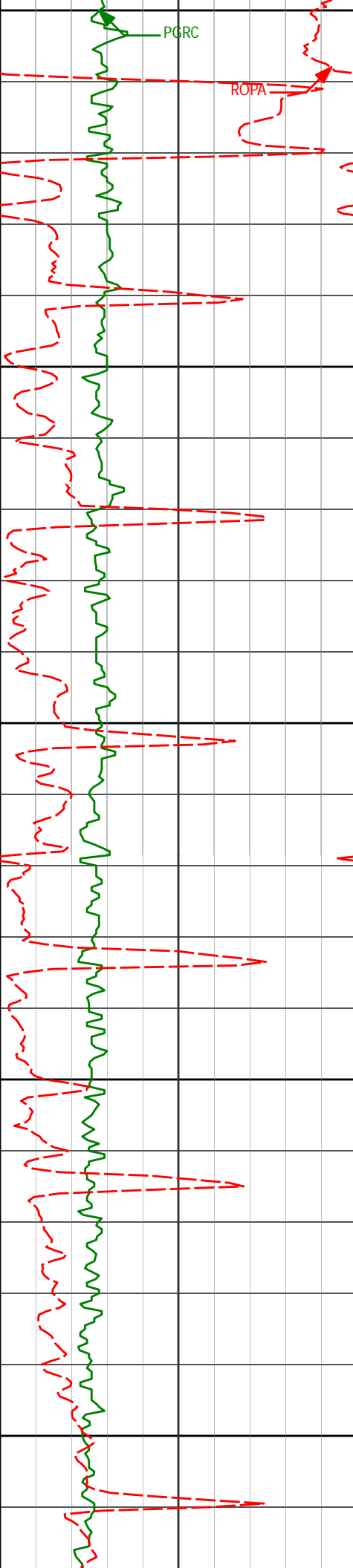
2359'

10.60°

350.23°

2339.18'

30.21'



2400

2450

2500

2550

2600

2451'

12.68°

354.87°

2429.29'

33.23'

2513'

12.44°

354.38°

2489.80'

35.86'

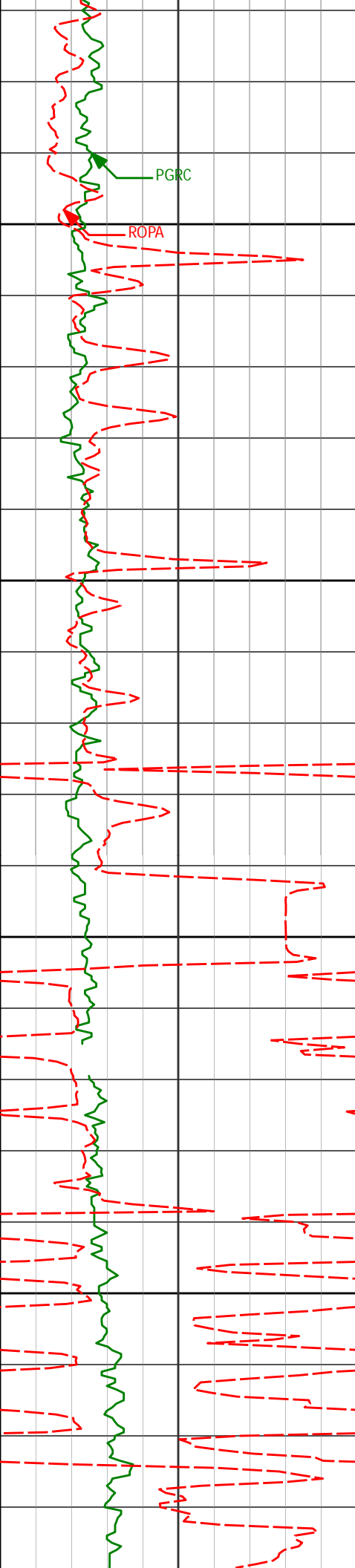
2602'

12.47°

355.22°

2576.71'

39.66'



PGRC

ROPA

2650

2700

2750

2800

2692'

13.95°

355.66°

2664.32'

43.96'

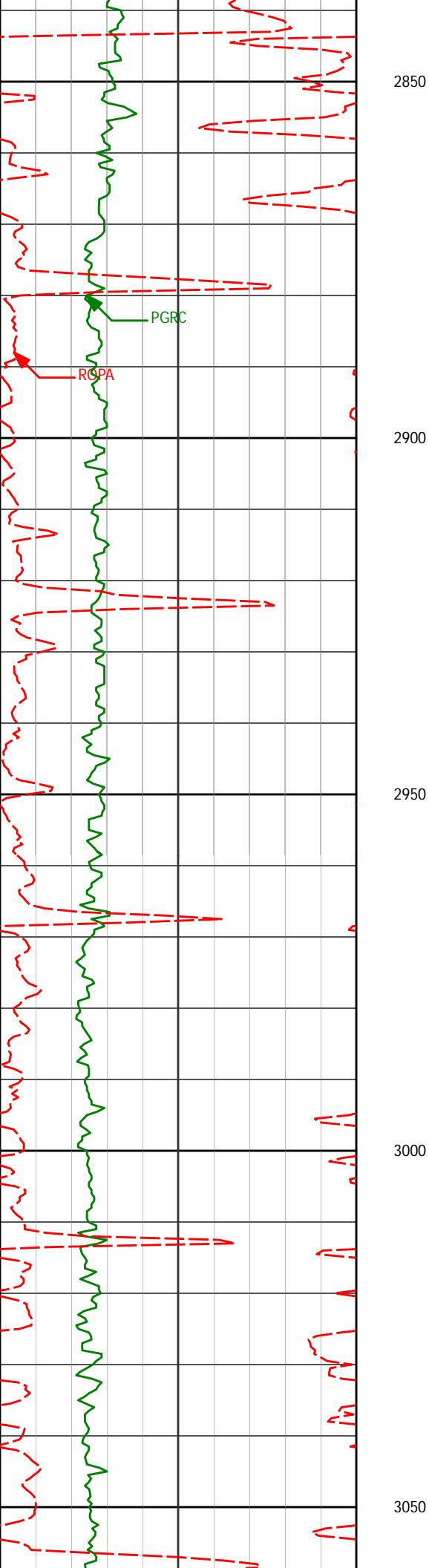
2781'

12.38°

351.43°

2750.99'

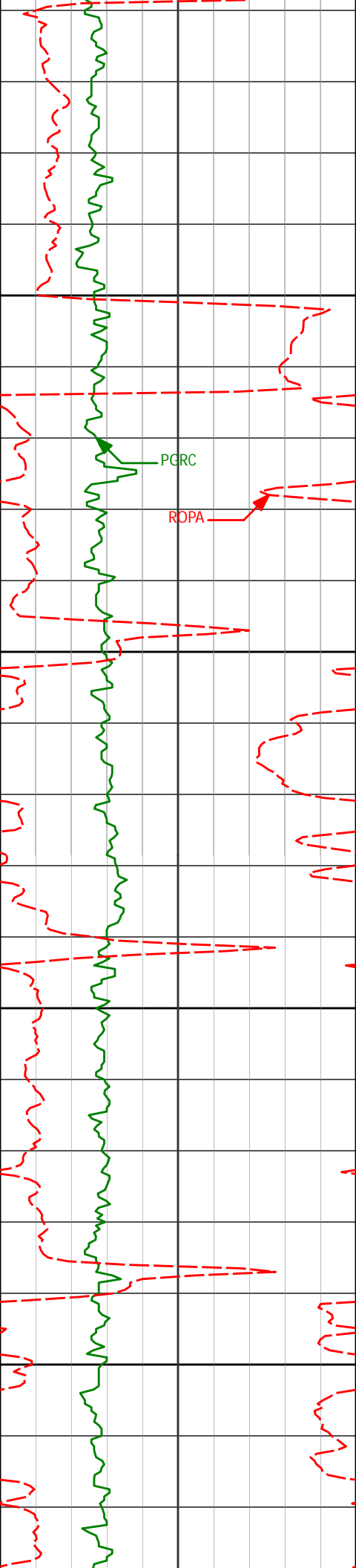
47.58'



2871' 10.48° 348.83° 2839.20' 49.71'

2961' 10.11° 348.19° 2927.75' 51.15'

3050' 9.57° 345.83° 3015.44' 52.12'



3100

3150

3200

3250

3140'

11.49°

345.02°

3103.92'

52.70'

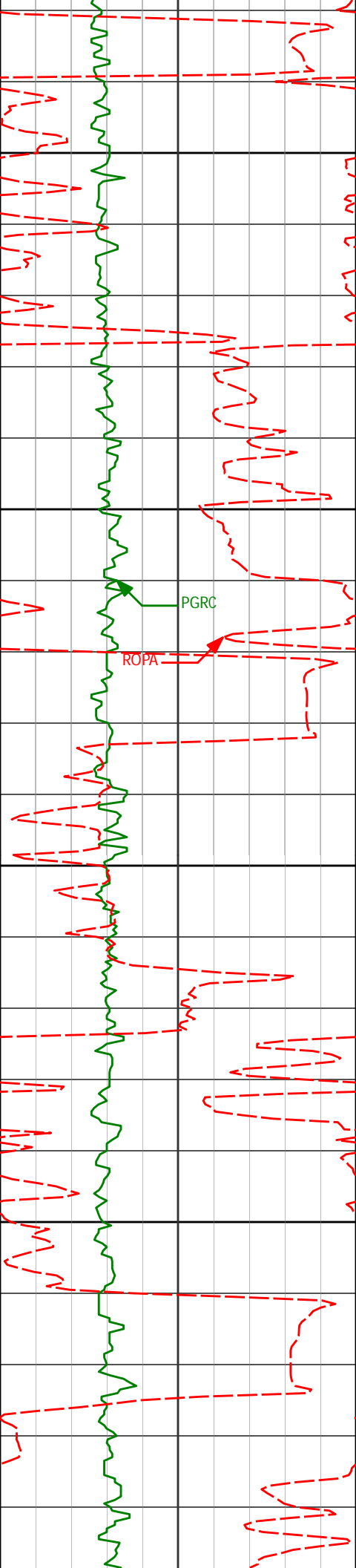
3230'

10.64°

338.45°

3192.25'

52.24'



3300

3350

3400

3450

3319'

9.50°

345.70°

3279.88'

51.83'

PGRC

ROPA

3409'

9.92°

346.26°

3368.59'

52.52'

3498'

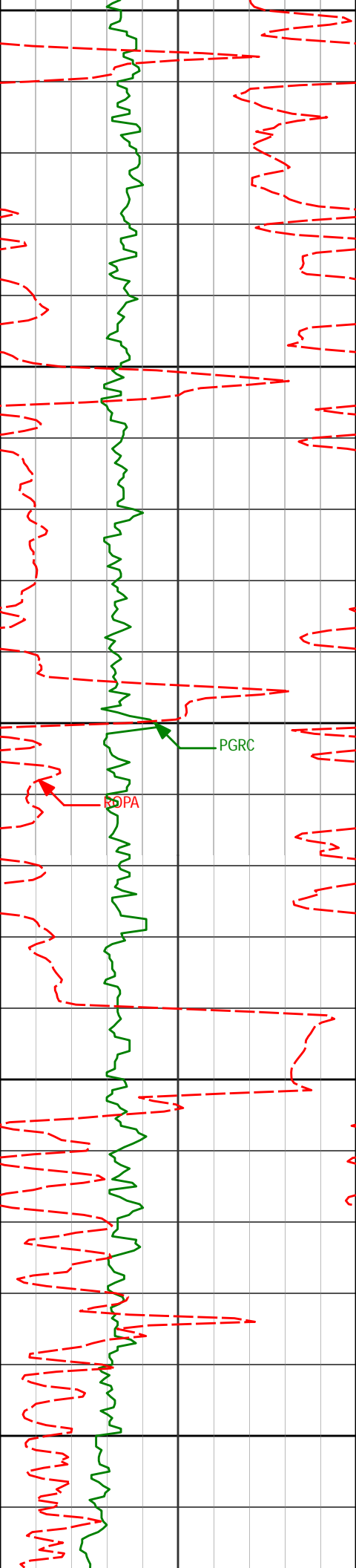
11.37°

348.41°

3456.06'

53.68'





3500

3550

3600

3650

3700

3588'

9.26°

343.12°

3544.60'

54.42'

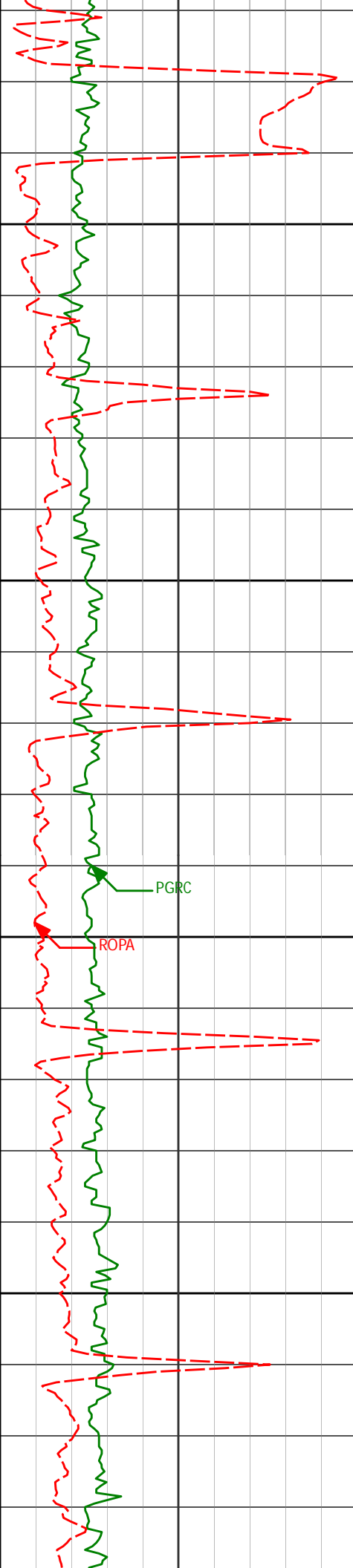
3678'

10.77°

343.55°

3633.22'

54.41'



3750

3767'

11.93°

352.11°

3720.49'

55.83'

3800

3850

3857'

12.90°

352.21°

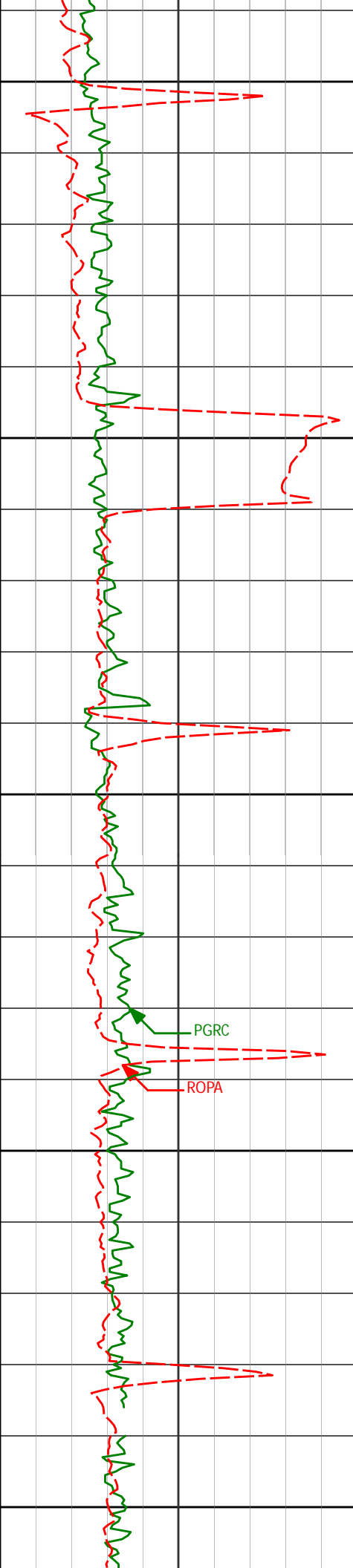
3808.38'

58.79'

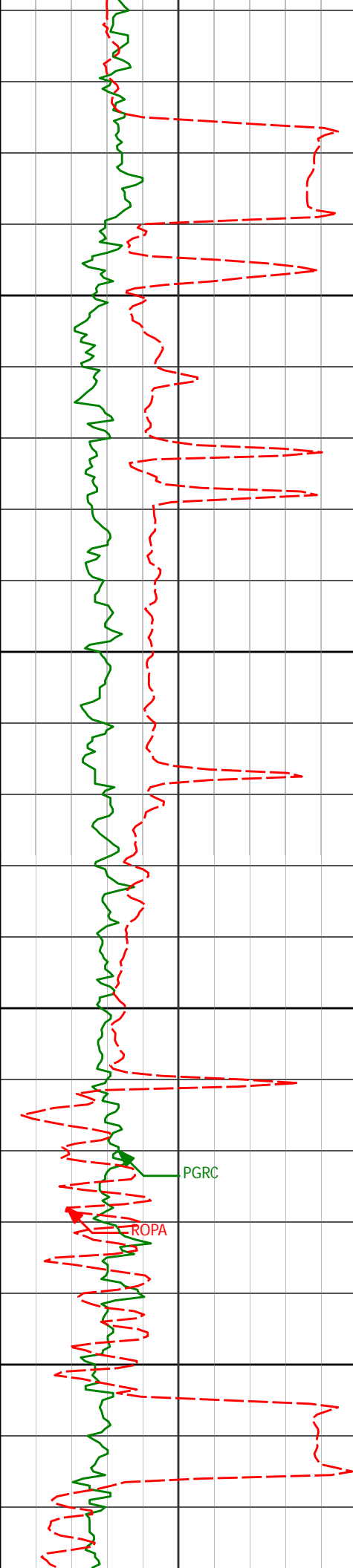
3900

PGRC

ROPA



|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 3946' | 13.14° | 351.61° | 3895.09' | 61.76' |
| 3950  |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
| 4000  |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
| 4036' | 10.83° | 353.94° | 3983.13' | 64.78' |
| 4050  |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
| 4100  |        |         |          |        |
|       |        |         |          |        |
|       |        |         |          |        |
| 4126' | 9.72°  | 350.01° | 4071.68' | 67.20' |
|       |        |         |          |        |
| 4150  |        |         |          |        |



4200

4250

4300

4350

4215'

11.51°

349.73°

4159.15'

69.05'

4305'

10.82°

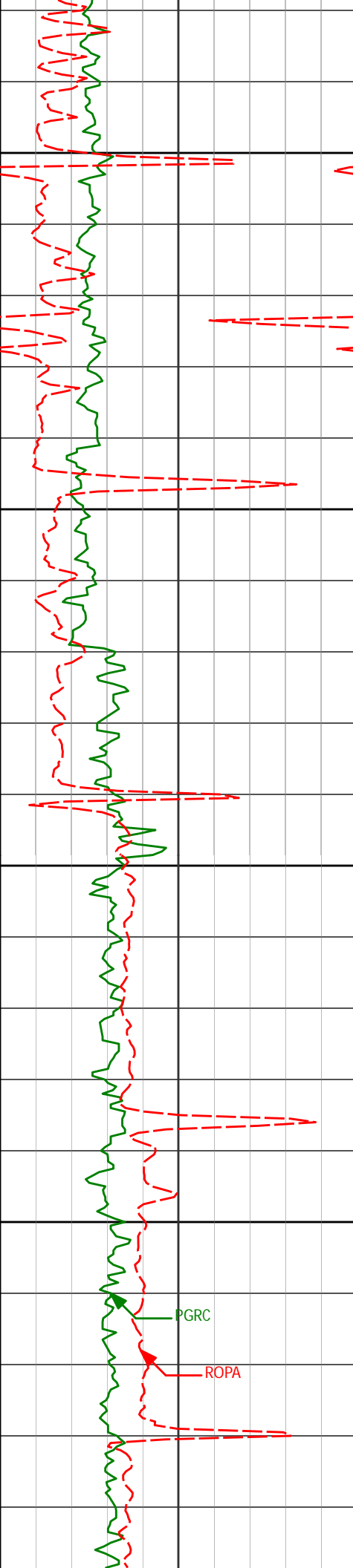
347.97°

4247.45'

70.72'

PGRC

ROPA



|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 4394' | 11.80° | 350.76° | 4334.72' | 72.56' |
|-------|--------|---------|----------|--------|

4400

4450

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 4484' | 10.94° | 349.21° | 4422.96' | 74.61' |
|-------|--------|---------|----------|--------|

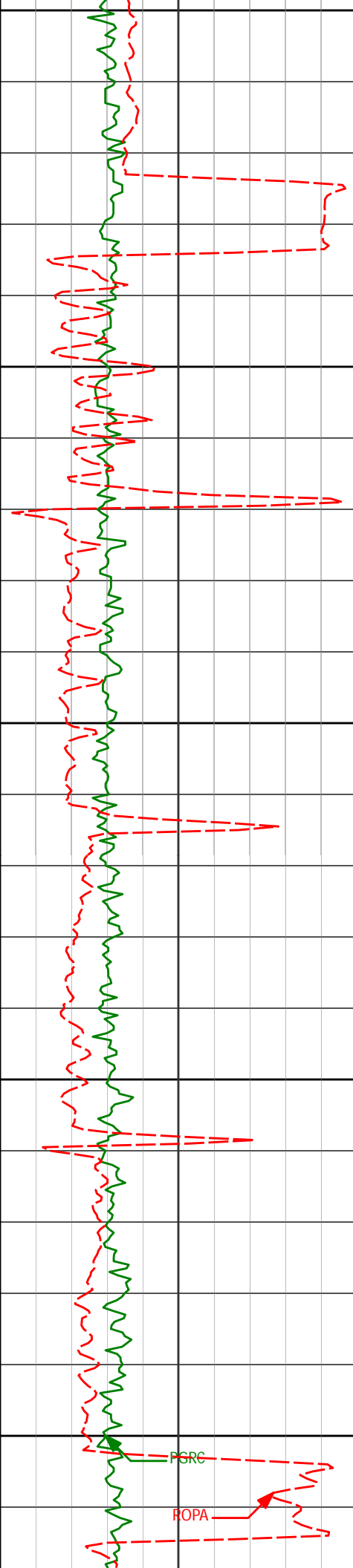
4500

4550

PGRC

ROPA

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 4573' | 10.75° | 347.84° | 4510.37' | 76.11' |
|-------|--------|---------|----------|--------|



4600

4650

4700

4750

4800

4663'

10.71°

353.85°

4598.80'

78.29'

4753'

9.42°

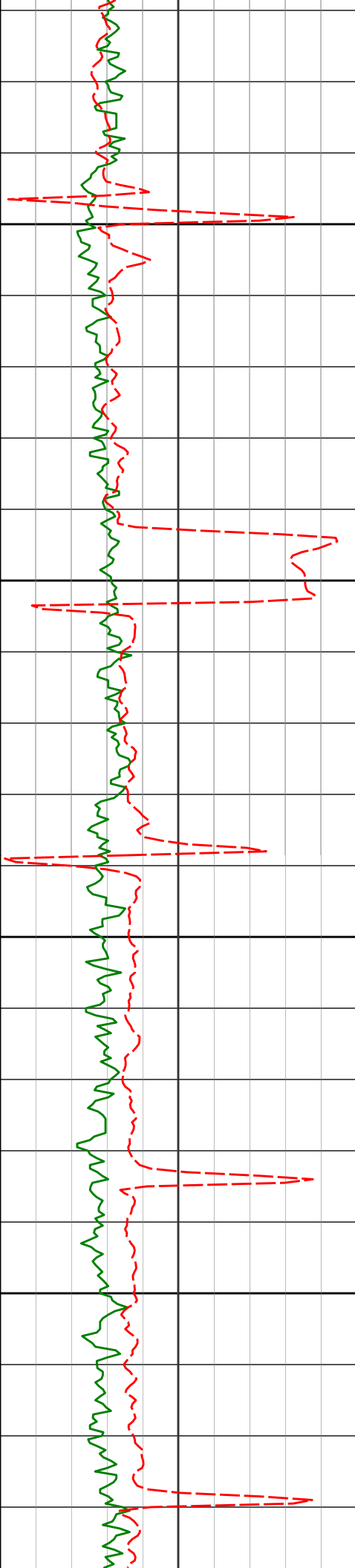
355.14°

4687.41'

81.31'

PGRC

POPA



4850

4900

4950

5000

4842'

9.93°

350.06°

4775.15'

83.68'

4932'

11.62°

350.36°

4863.56'

85.69'

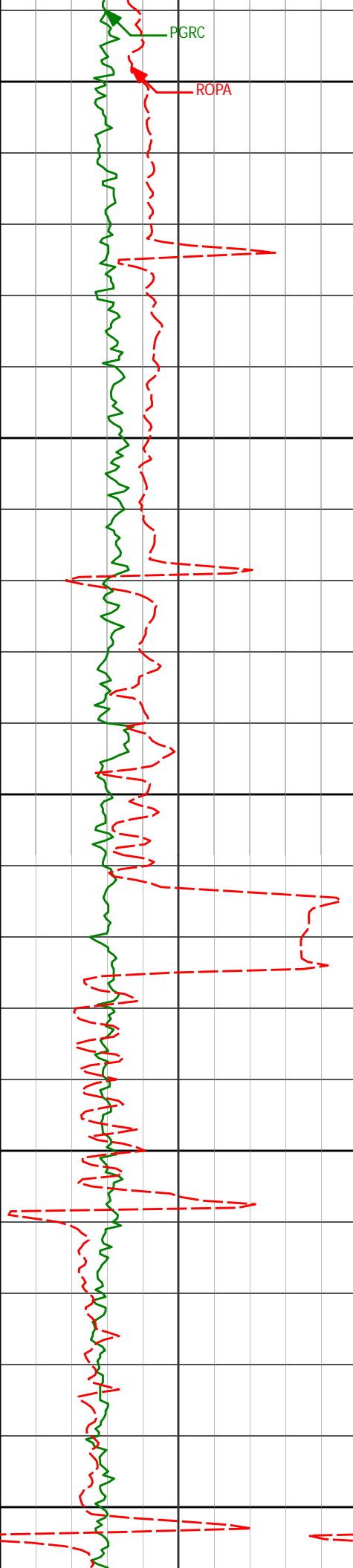
5022'

11.53°

350.60°

4951.73'

87.92'



PGRC

ROPA

5050

5100

5150

5200

5250

5111'

10.16°

349.29°

5039.13'

89.84'

5201'

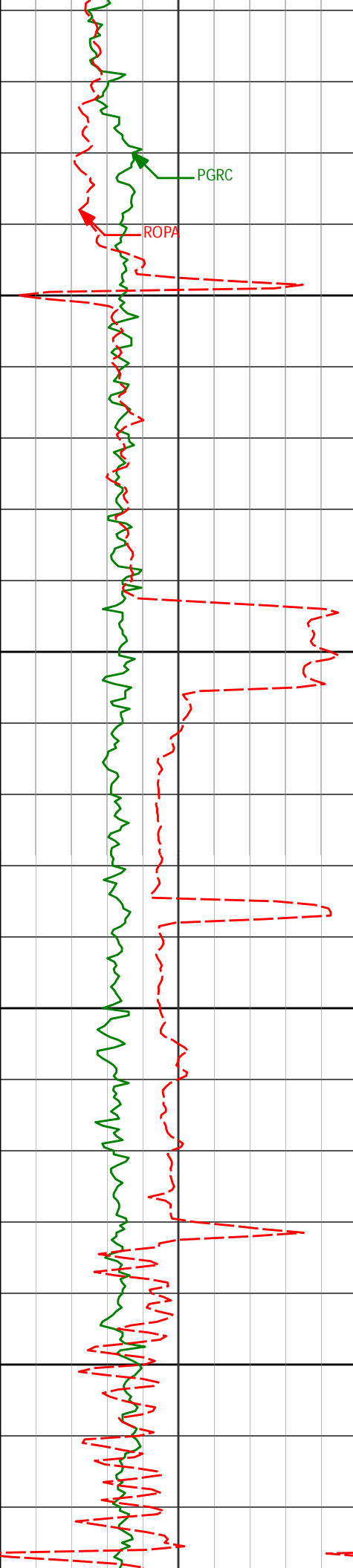
11.03°

350.38°

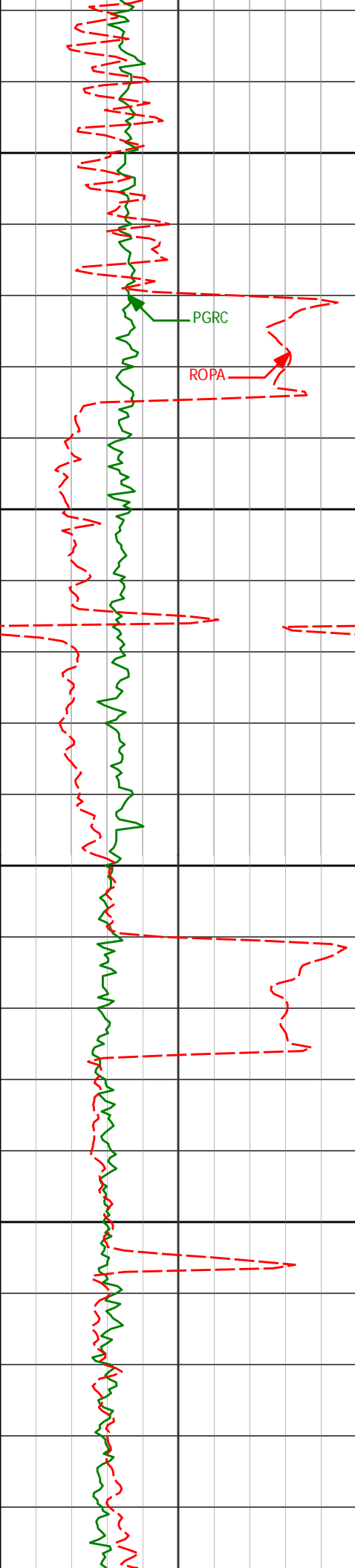
5127.60'

91.71'





|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 5291' | 9.65°  | 348.23° | 5216.14' | 93.40' |
| 5300  |        |         |          |        |
| 5350  |        |         |          |        |
| 5380' | 10.54° | 354.53° | 5303.76' | 95.60' |
| 5400  |        |         |          |        |
| 5450  |        |         |          |        |
| 5470' | 9.17°  | 353.60° | 5392.43' | 98.46' |



5500

PGR

ROPA

5550

5560'

10.22°

348.31°

5481.15'

100.42'

5600

5650

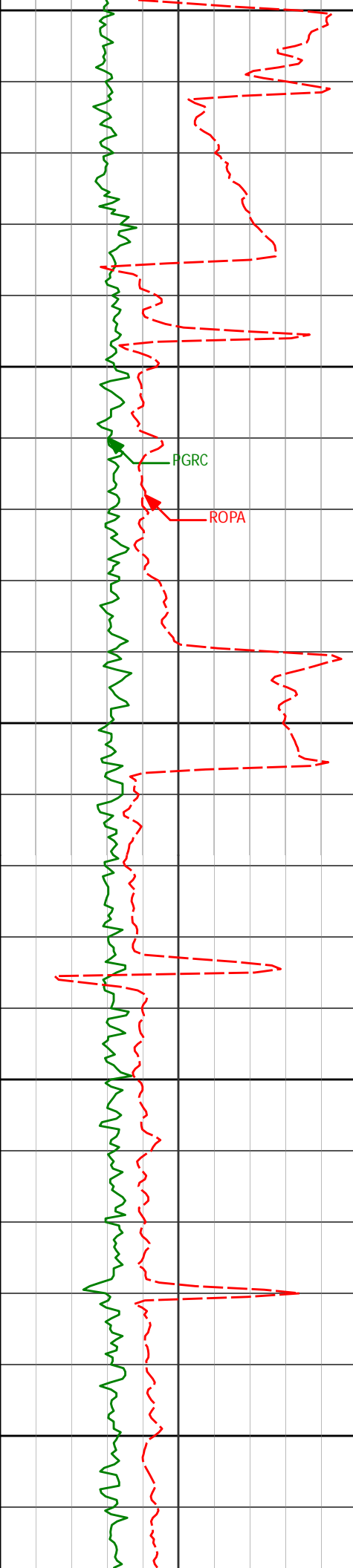
5649'

11.13°

344.05°

5568.61'

101.20'



5700

5739'

11.57°

345.91°

5656.85'

101.70'

5750

FGRC

ROPA

5800

5829'

11.29°

355.55°

5745.07'

103.96'

5850

5900

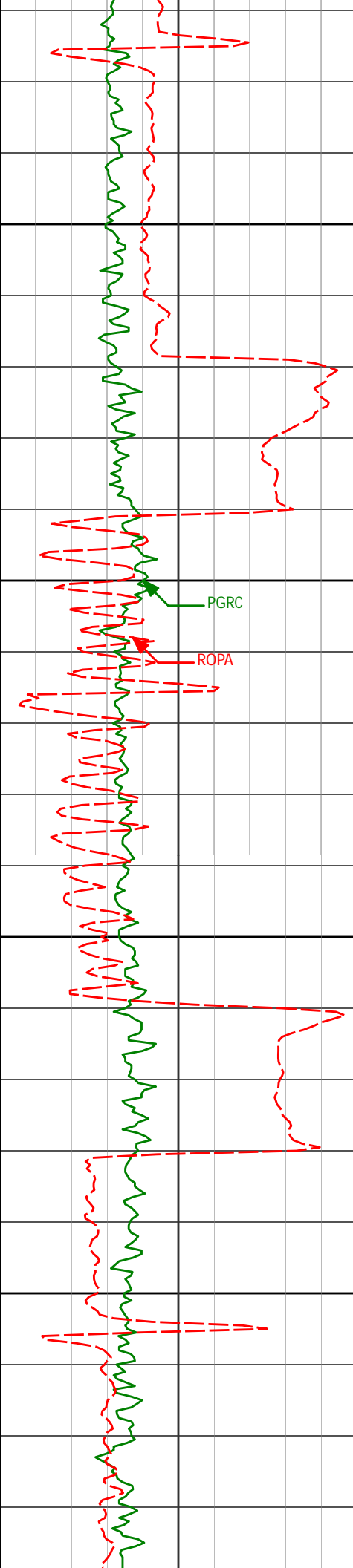
5918'

9.37°

350.81°

5832.63'

106.73'



5950

6000

6050

6100

6008'

10.84°

348.88°

5921.23'

108.49'

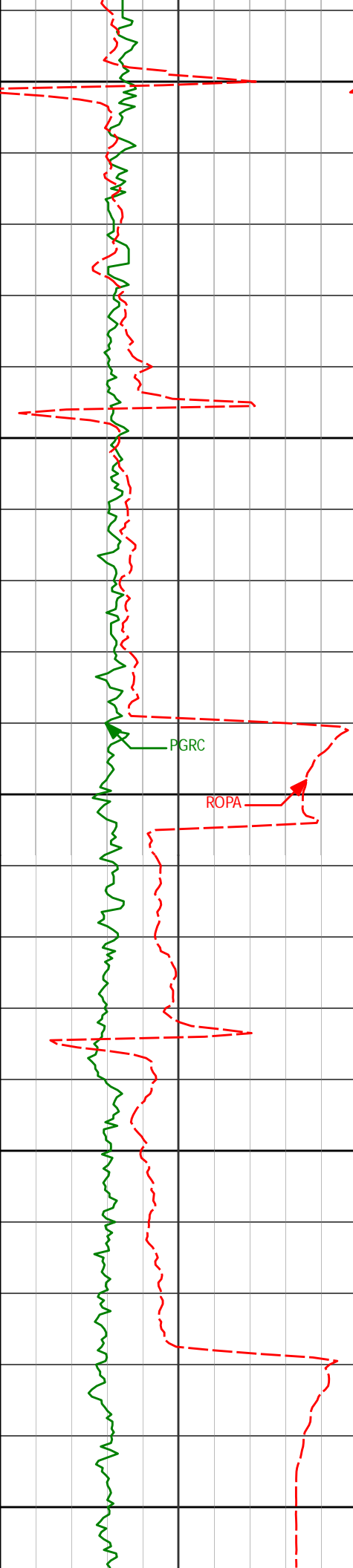
6097'

11.61°

358.92°

6008.54'

111.69'



6150

6187'

9.46°

353.91°

6097.02'

115.47'

6200

PGRC

ROPA

6250

6277'

9.98°

357.15°

6185.72'

118.68'

6300

6322'

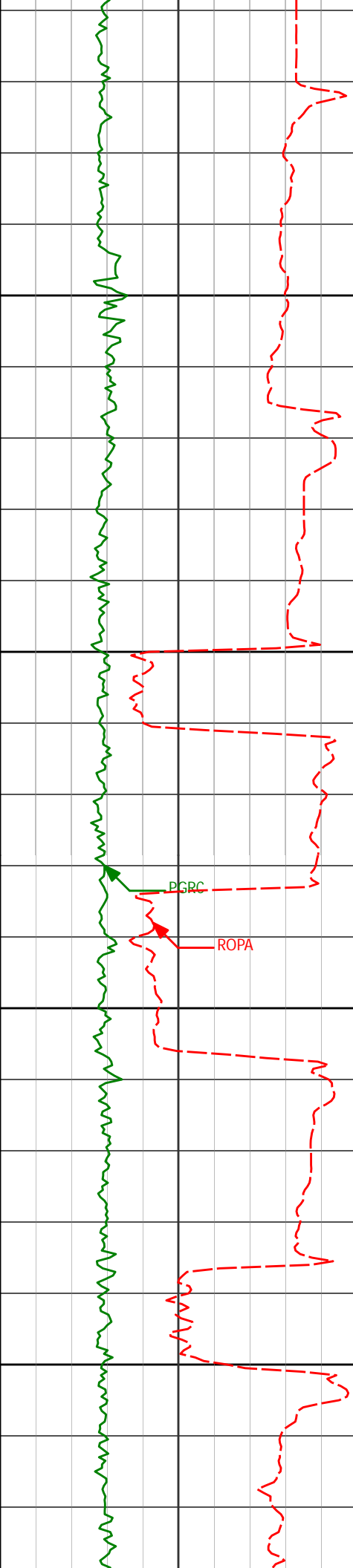
10.30°

357.89°

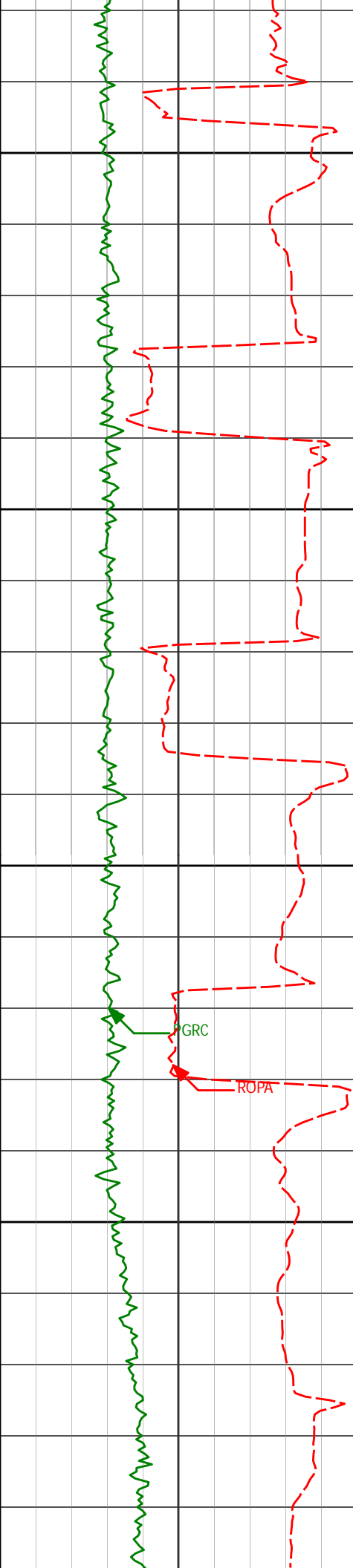
6230.02'

120.61'

6350



|      |       |        |         |          |         |
|------|-------|--------|---------|----------|---------|
|      | 6366' | 14.31° | 1.50°   | 6273.00' | 123.29' |
| 6400 |       |        |         |          |         |
|      | 6411' | 19.89° | 2.40°   | 6316.00' | 127.52' |
|      |       |        |         |          |         |
| 6450 |       |        |         |          |         |
|      | 6456' | 23.62° | 1.06°   | 6357.78' | 132.75' |
|      |       |        |         |          |         |
|      |       |        |         |          |         |
| 6500 |       |        |         |          |         |
|      | 6501' | 25.23° | 358.75° | 6398.75' | 138.03' |
|      |       |        |         |          |         |
|      |       |        |         |          |         |
|      |       |        |         |          |         |
| 6550 |       |        |         |          |         |
|      | 6545' | 28.37° | 355.17° | 6438.03' | 142.66' |
|      |       |        |         |          |         |
|      |       |        |         |          |         |
|      |       |        |         |          |         |



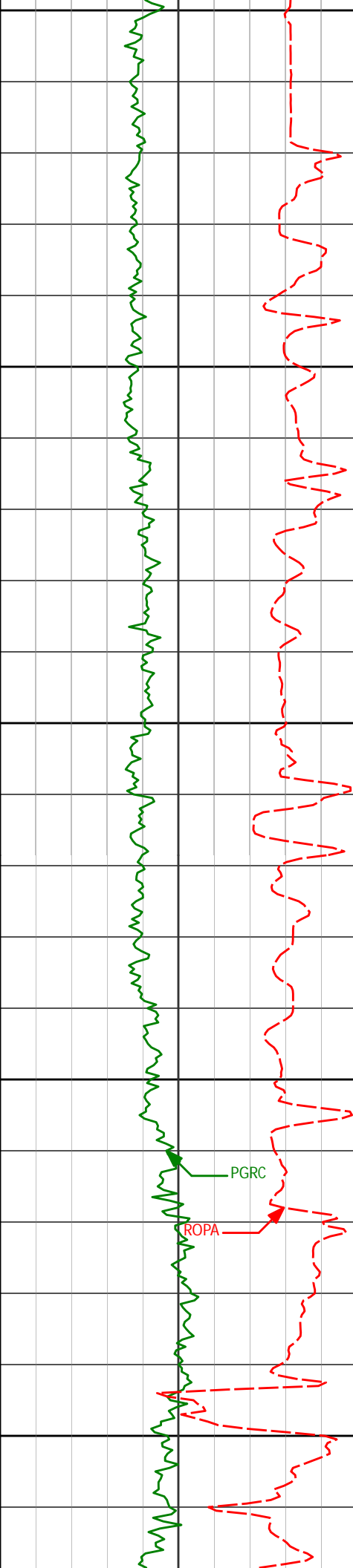
6600

6650

6700

6750

|       |        |         |          |         |
|-------|--------|---------|----------|---------|
| 6590' | 32.70° | 356.68° | 6476.78' | 147.64' |
| 6635' | 36.33° | 358.67° | 6513.85' | 153.95' |
| 6680' | 37.97° | 5.06°   | 6549.73' | 162.59' |
| 6725' | 38.05° | 11.27°  | 6585.20' | 174.19' |
| 6769' | 40.45° | 21.53°  | 6619.31' | 189.37' |



6800

6814'

43.47°

29.32°

6652.79'

209.53'

6850

6859'

43.82°

37.72°

6685.38'

233.33'

6900

6904'

45.46°

47.66°

6717.44'

260.47'

6950

6948'

47.31°

56.90°

6747.83'

290.14'

7000

6993'

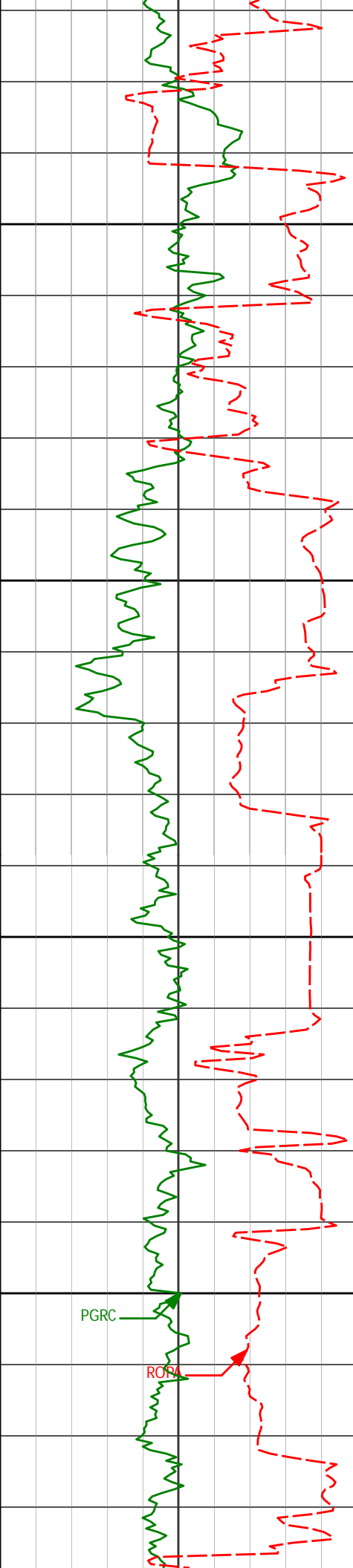
48.56°

64.71°

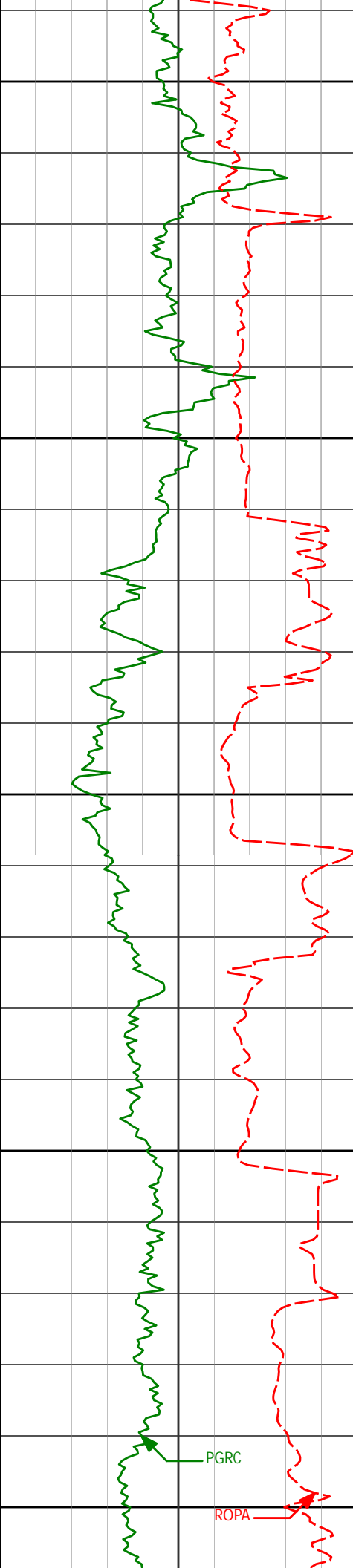
6778.00'

322.70'





|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7038' | 51.86° | 67.72° | 6806.80' | 357.00' |
| 7050  |        |        |          |         |
| 7083' | 53.94° | 70.00° | 6833.94' | 392.78' |
| 7100  |        |        |          |         |
| 7128' | 56.07° | 74.46° | 6859.75' | 429.62' |
| 7150  |        |        |          |         |
| 7173' | 57.50° | 80.59° | 6884.42' | 467.14' |
| 7200  |        |        |          |         |
| 7217' | 59.36° | 82.15° | 6907.46' | 504.26' |



7250

7262'

61.01°

83.43°

6929.83'

542.77'

7300

7307'

62.57°

83.89°

6951.10'

581.79'

7350

7352'

66.64°

84.83°

6970.40'

621.69'

7400

7397'

69.60°

85.05°

6987.16'

662.59'

7450

7442'

72.86°

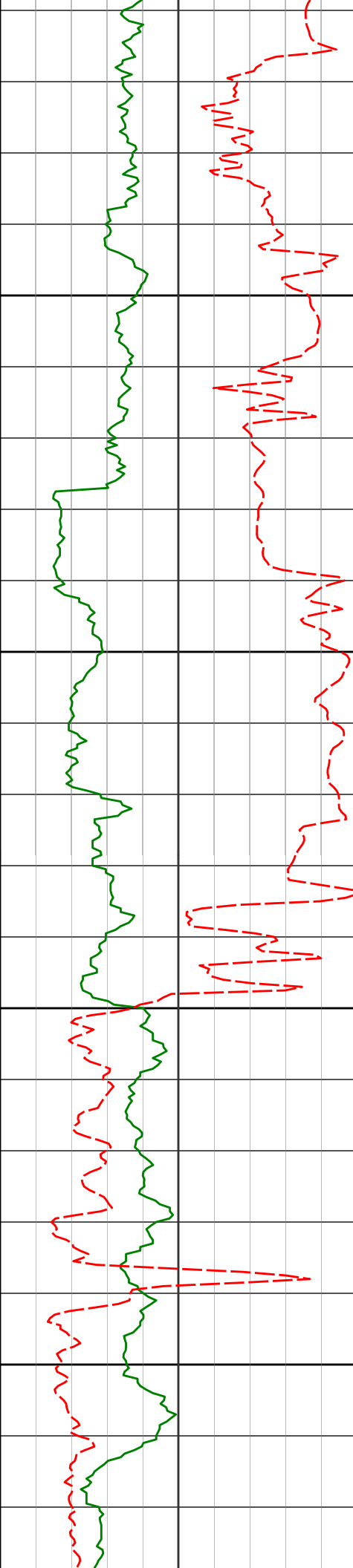
86.27°

7001.64'

704.22'

PGRC

ROPA



Casing at 7571' md

<Run 200

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7487' | 75.95° | 87.51° | 7013.74' | 746.36' |
|-------|--------|--------|----------|---------|

7500

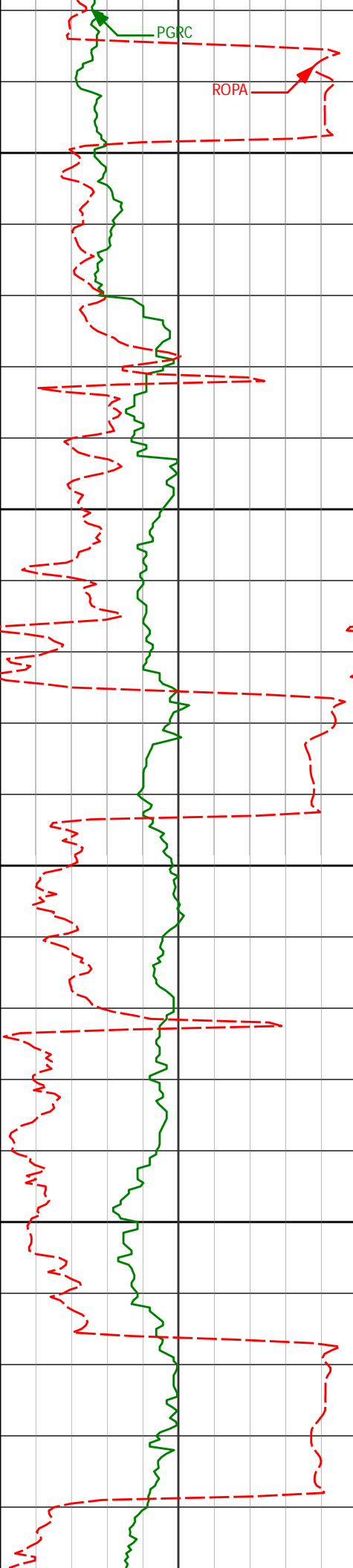
|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7531' | 79.39° | 88.59° | 7023.13' | 787.93' |
|-------|--------|--------|----------|---------|

7550

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7617' | 82.02° | 88.49° | 7037.02' | 869.84' |
|-------|--------|--------|----------|---------|

7600

7650



7700

7707'

82.24°

88.28°

7049.35'

955.95'

7750

7800

7796'

83.82°

88.02°

7060.15'

1041.37'

7850

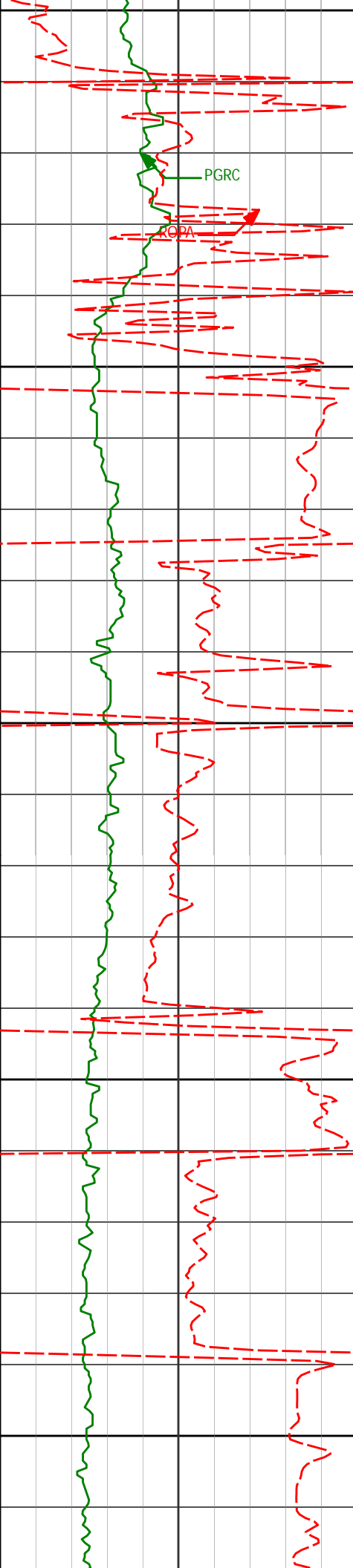
7886'

85.58°

89.74°

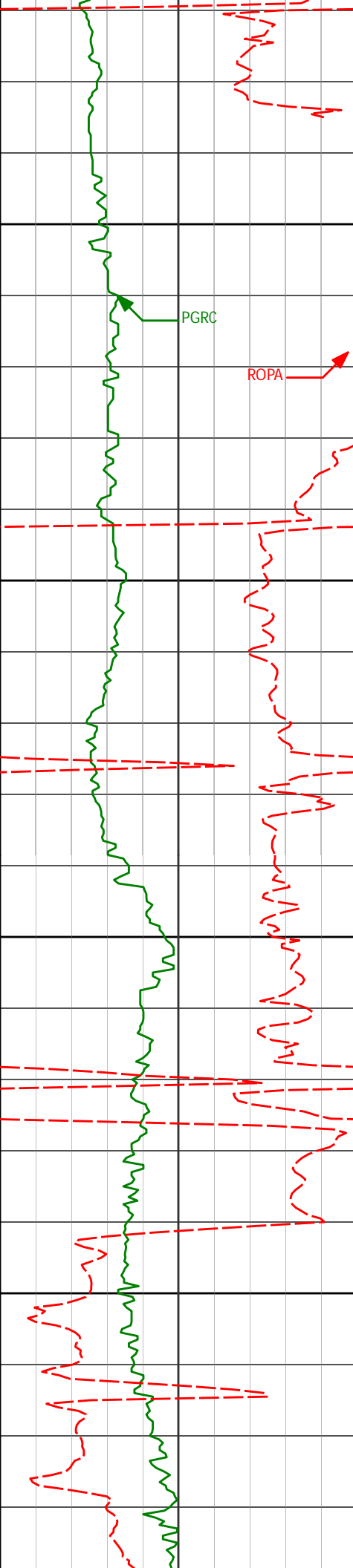
7068.46'

1127.72'



|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 7976' | 87.60° | 91.00° | 7073.81' | 1213.64' |
|-------|--------|--------|----------|----------|

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 8110' | 90.89° | 90.67° | 7075.57' | 1341.44' |
|-------|--------|--------|----------|----------|



8150

PGRC

ROPA

8200

8200'

93.58°

89.87°

7072.06'

1427.48'

8250

8289'

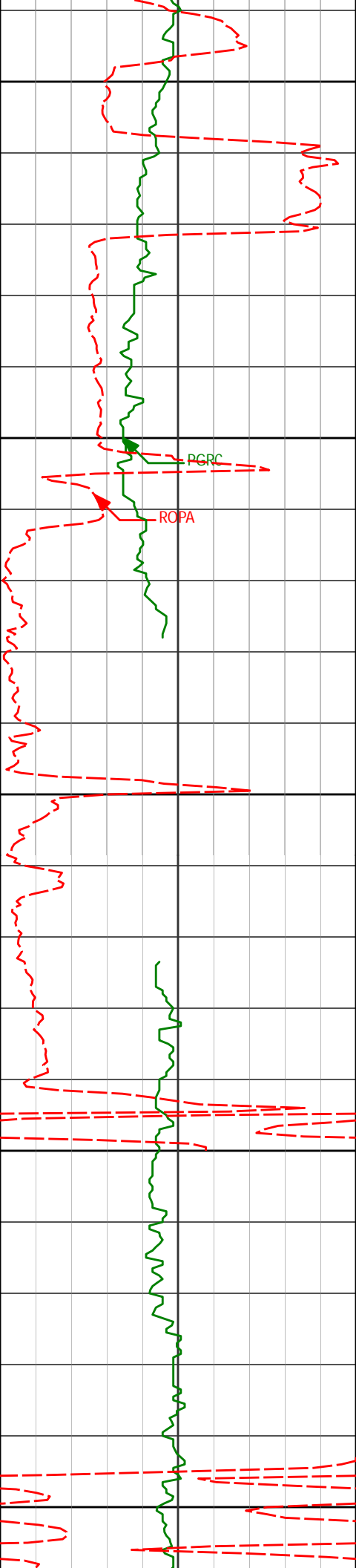
92.96°

90.55°

7066.99'

1512.53'

8300



8350

8379'

92.00°

89.97°

7063.09'

1598.57'

8400

PGRC

ROPA

8450

8469'

92.34°

89.69°

7059.68'

1684.82'

8500

8550

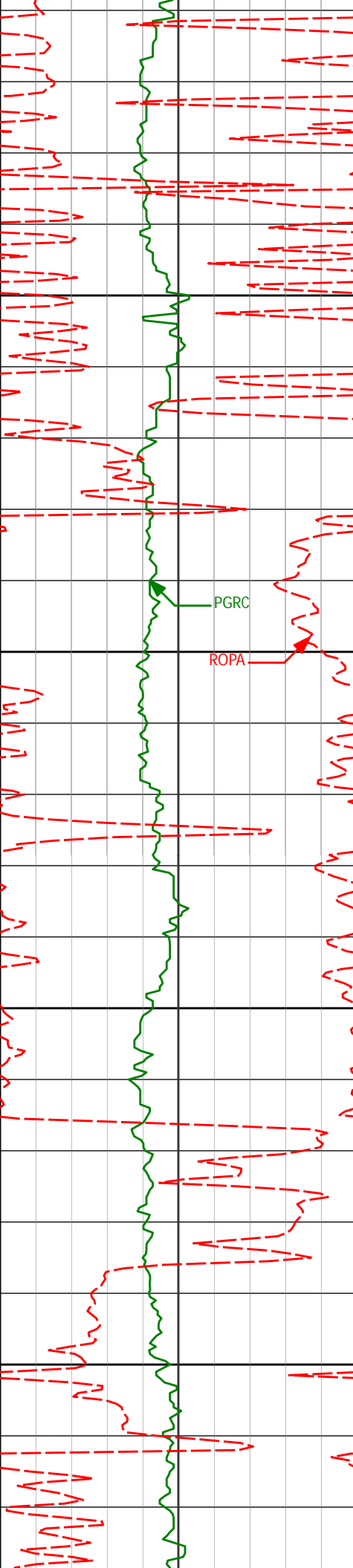
8558'

92.56°

89.18°

7055.88'

1770.28'



8600

8650

8700

8750

PGRC

ROPA

8648'

93.24°

87.67°

7051.32'

1857.08'

8737'

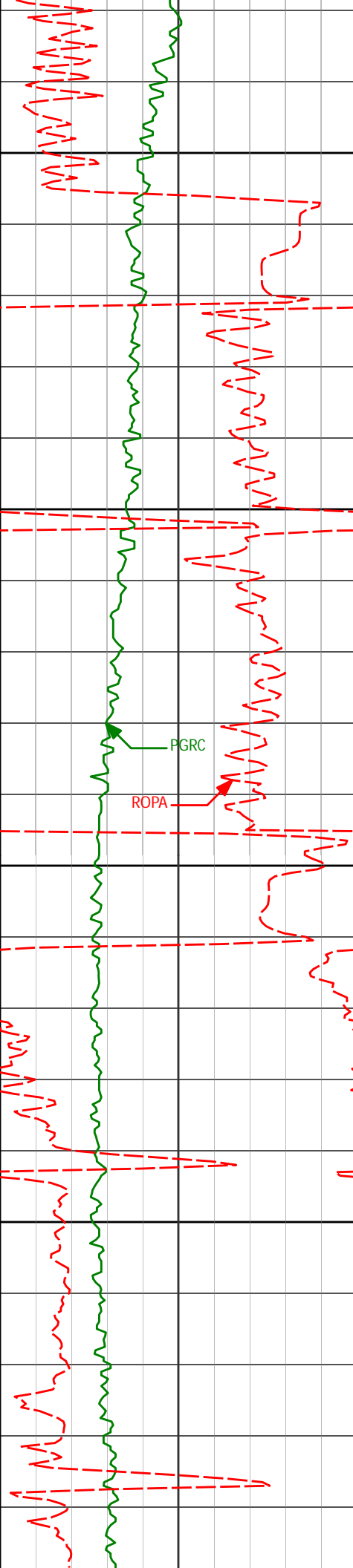
91.63°

88.53°

7047.54'

1943.07'





8800

8827'

90.62°

88.85°

7045.77'

2029.86'

8850

PGRC

ROPA

8900

8917'

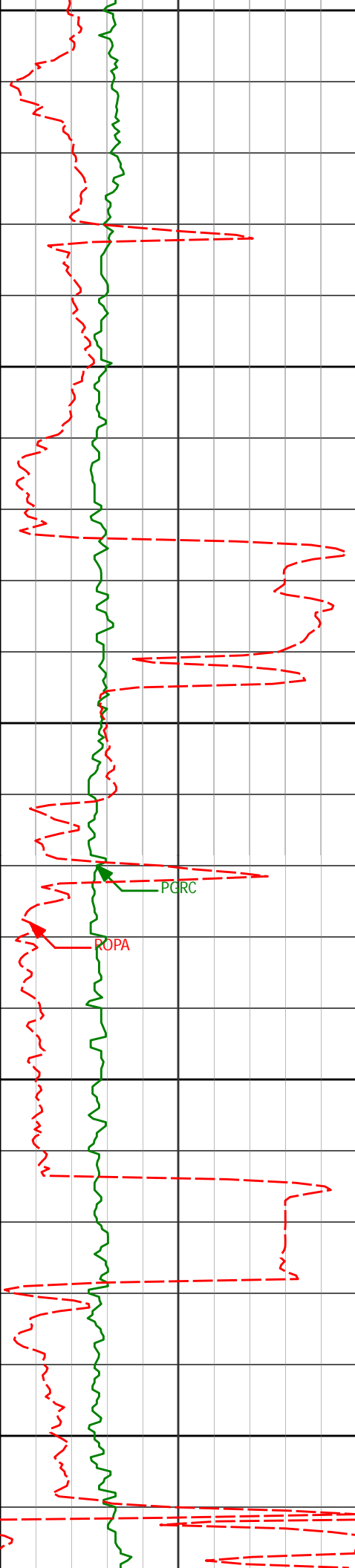
90.83°

91.34°

7044.63'

2116.04'

8950



9000

9006'

91.73°

90.32°

7042.65'

2200.92'

9050

9100

9096'

90.80°

89.90°

7040.66'

2287.09'

9150

9200

9186'

88.64°

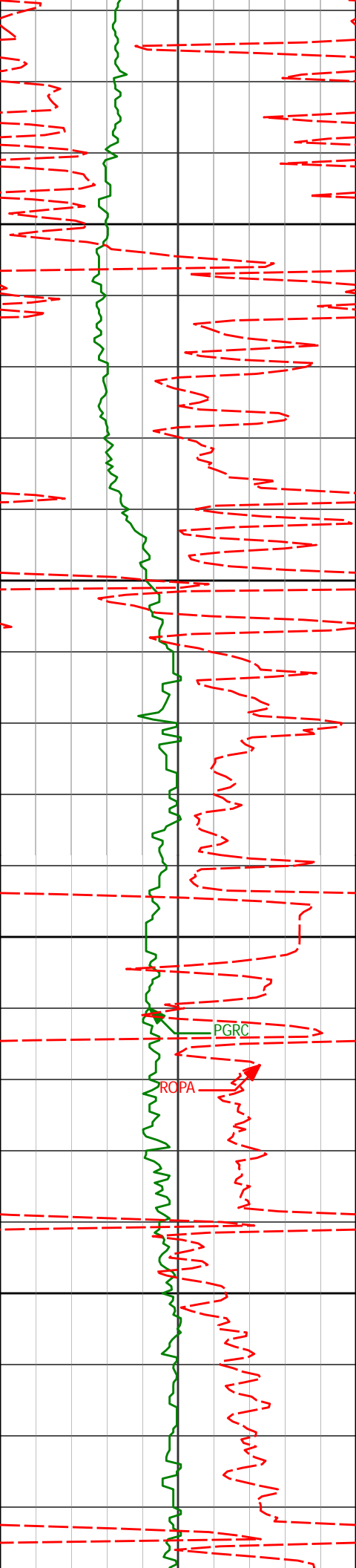
89.86°

7041.10'

2373.38'

PGRC

ROPA



9250

9275'

88.49°

89.51°

7043.32'

2458.77'

9300

9350

9365'

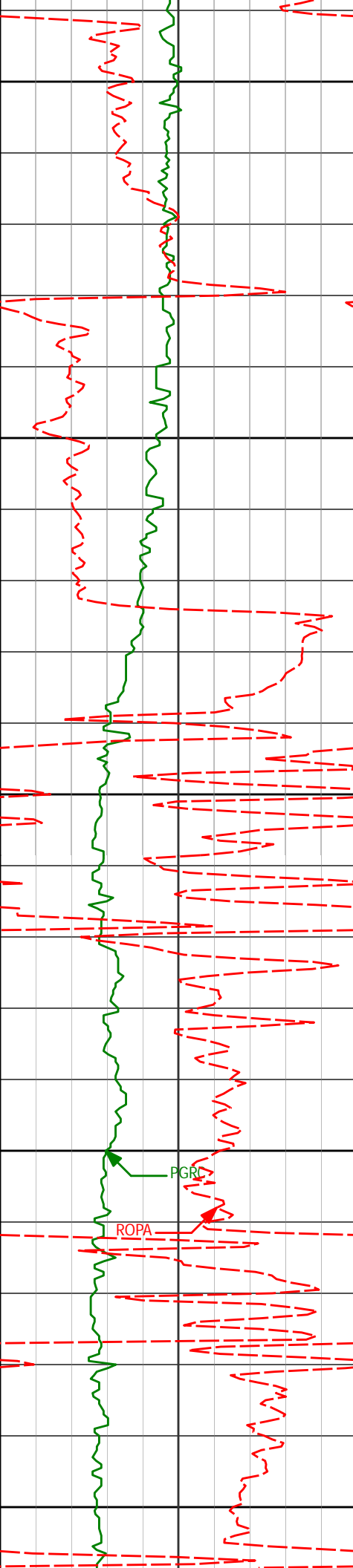
90.15°

89.44°

7044.39'

2545.23'

9400



9450

9454'

90.15°

88.86°

7044.15'

2630.88'

9500

9544'

91.57°

89.82°

7042.79'

2717.40'

9550

9600

PGR

ROPA

9634'

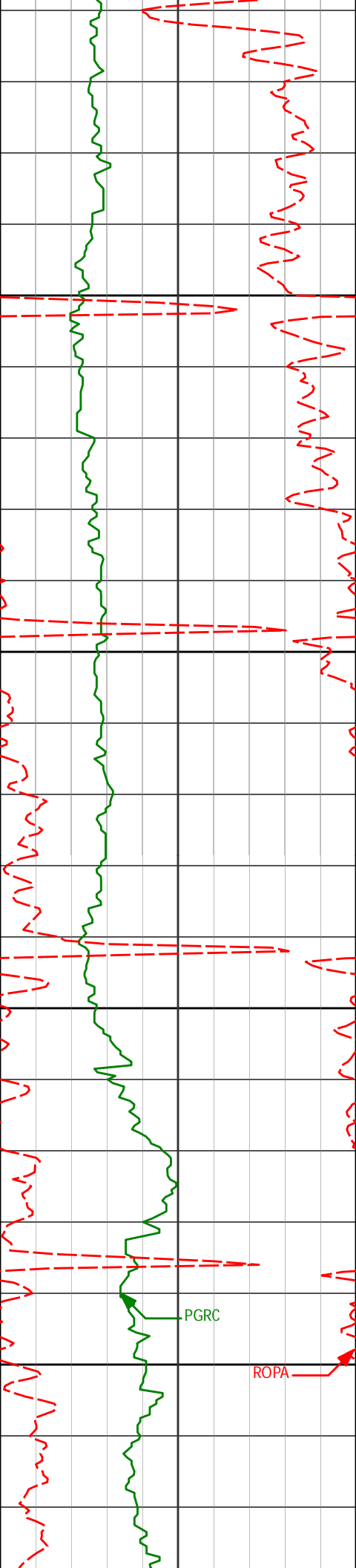
90.89°

91.03°

7040.86'

2803.43'

9650



9700

9723'

91.57°

90.82°

7038.94'

2888.27'

9750

9800

9813'

92.99°

89.21°

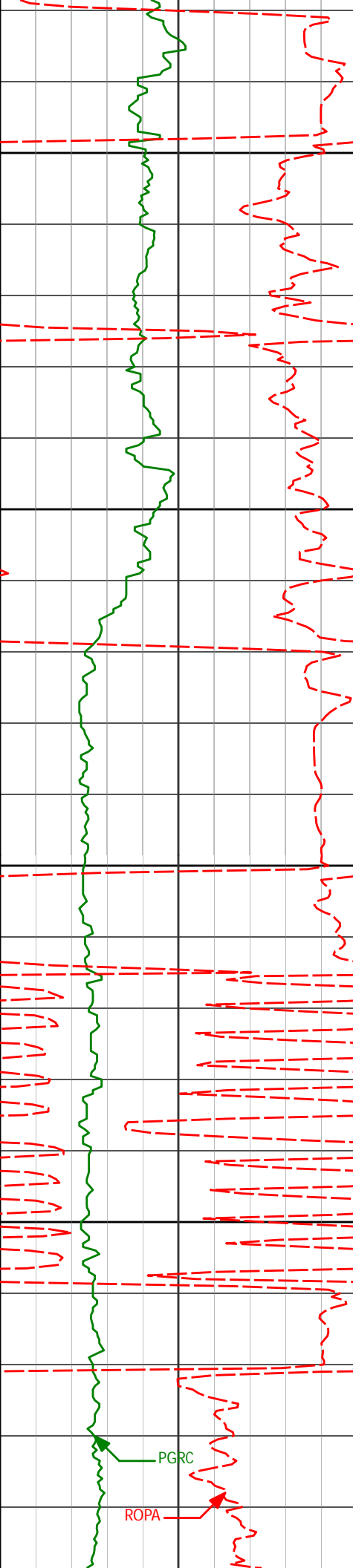
7035.36'

2974.43'

9850

PGRC

ROPA



9900

9902'

92.84°

89.53°

7030.84'

3059.87'

9950

9992'

90.56°

90.01°

7028.17'

3146.17'

10000

10050

10082'

90.77°

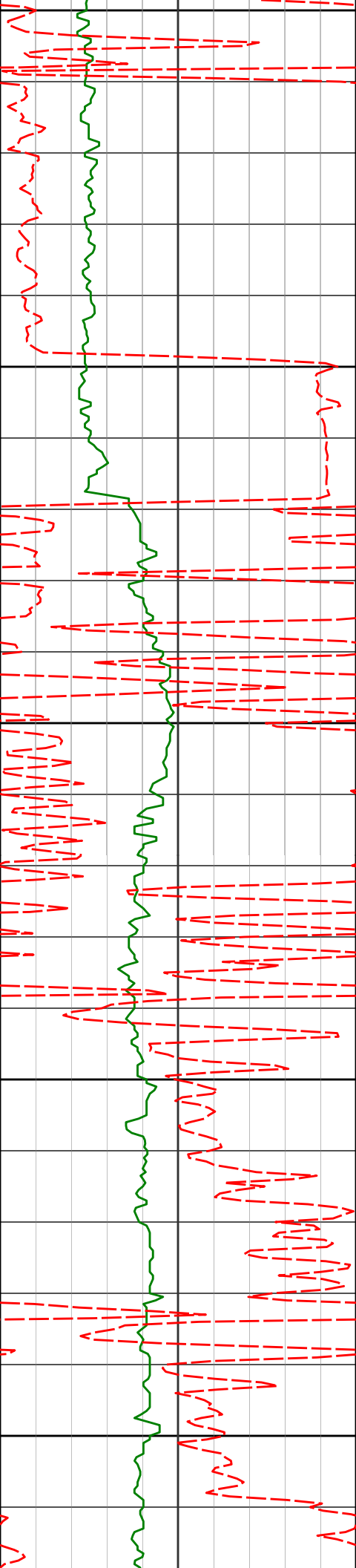
90.79°

7027.13'

3232.22'

PGRC

ROPA



10100

10150

10200

10250

10300

10171'

88.95°

92.20°

7027.34'

3316.81'

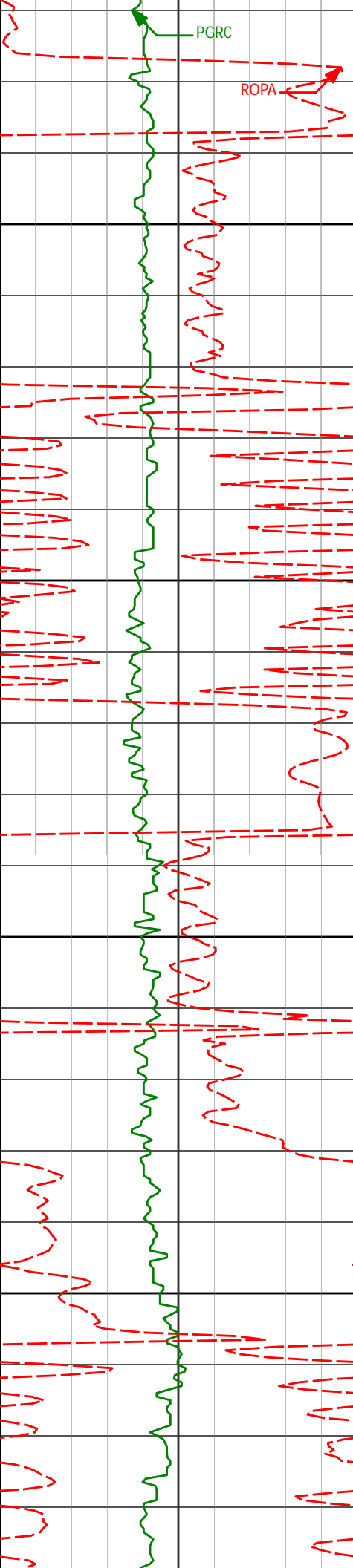
10261'

88.95°

92.20°

7028.99'

3401.98'



10350

10350'

91.11°

92.51°

7028.94'

3486.14'

10400

10440'

89.72°

88.54°

7028.29'

3572.12'

10450

10500

10530'

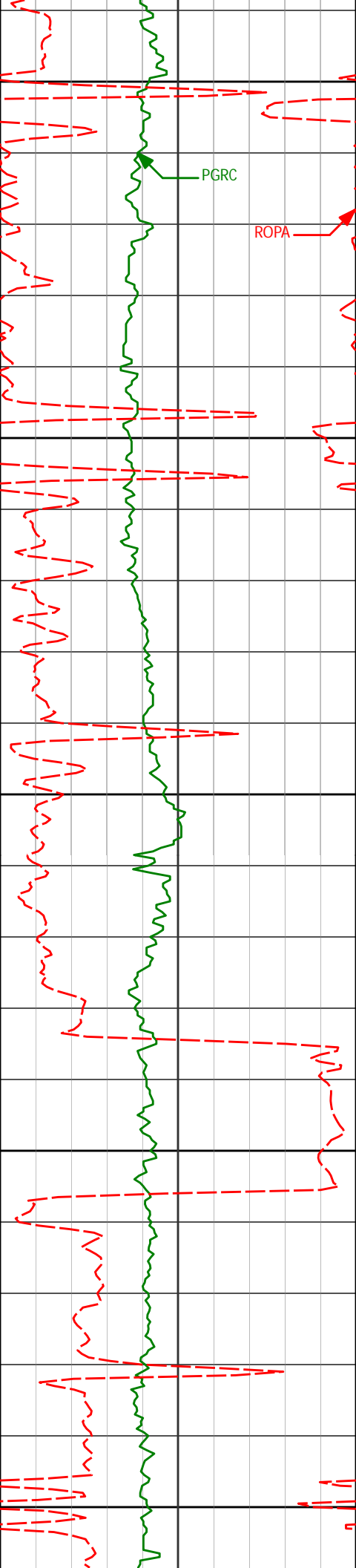
89.38°

87.93°

7028.99'

3659.10'





10550

10600

10650

10700

10750

10619'

91.05°

86.94°

7028.66'

3745.44'

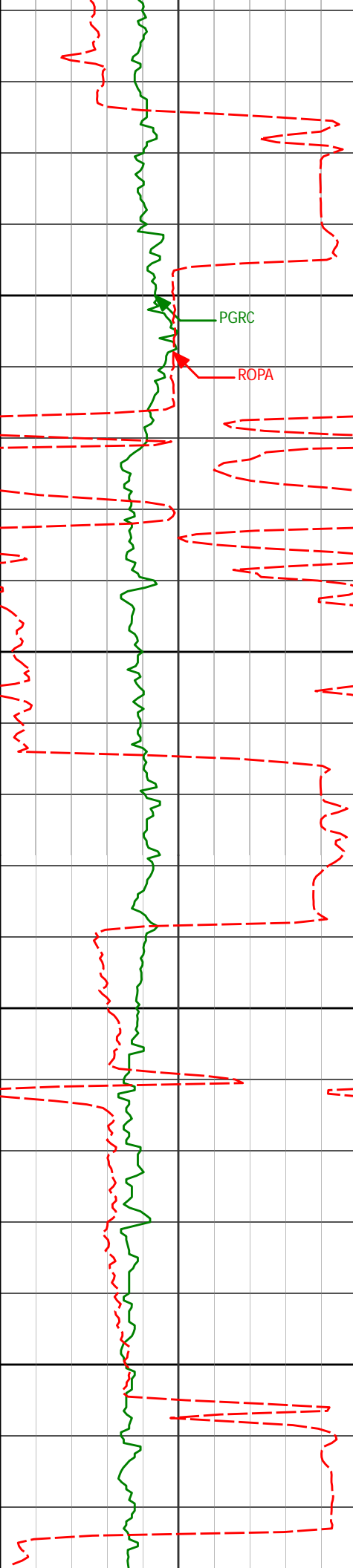
10709'

90.55°

88.68°

7027.40'

3832.58'



10800

10798'

88.70°

86.70°

7027.97'

3918.81'

PGRC

ROPA

10850

10888'

89.11°

88.00°

7029.69'

4006.13'

10900

10950

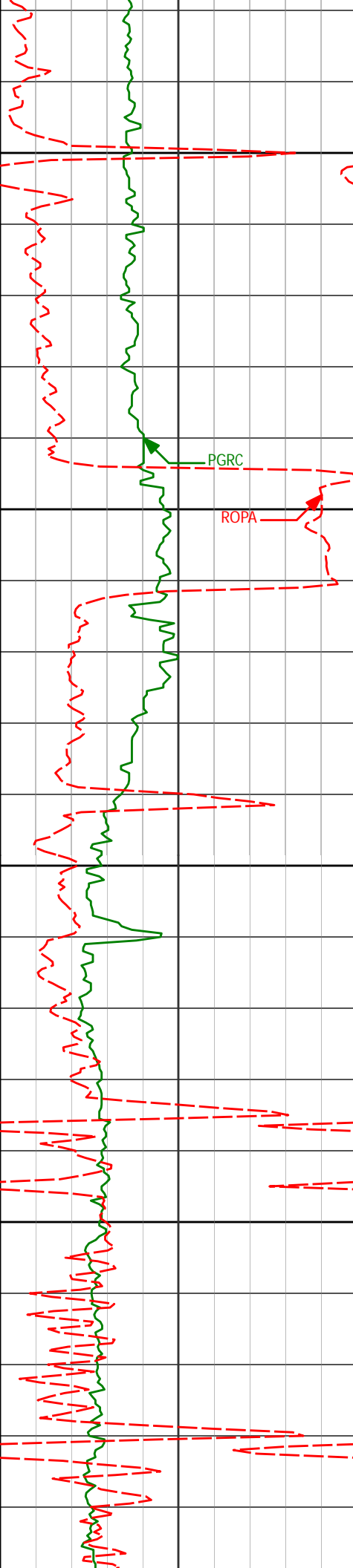
10978'

89.57°

89.48°

7030.73'

4092.91'



11000

11050

11100

11150

11067'

88.43°

89.28°

7032.29'

4178.44'

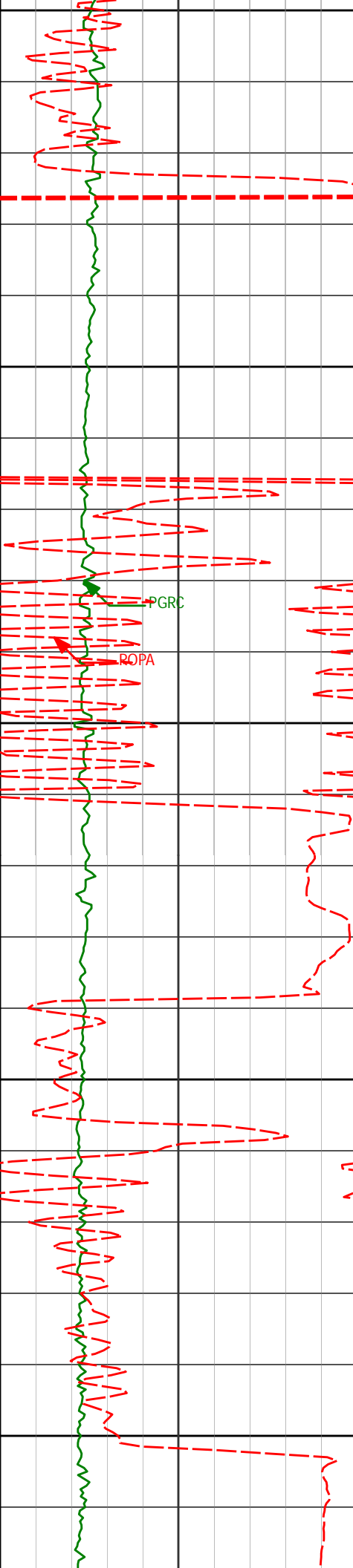
11157'

88.83°

88.72°

7034.44'

4265.09'



11200

<Run 300

11246'

89.75°

87.80°

7035.54'

4351.10'

11250

11300

11335'

89.72°

87.13°

7035.95'

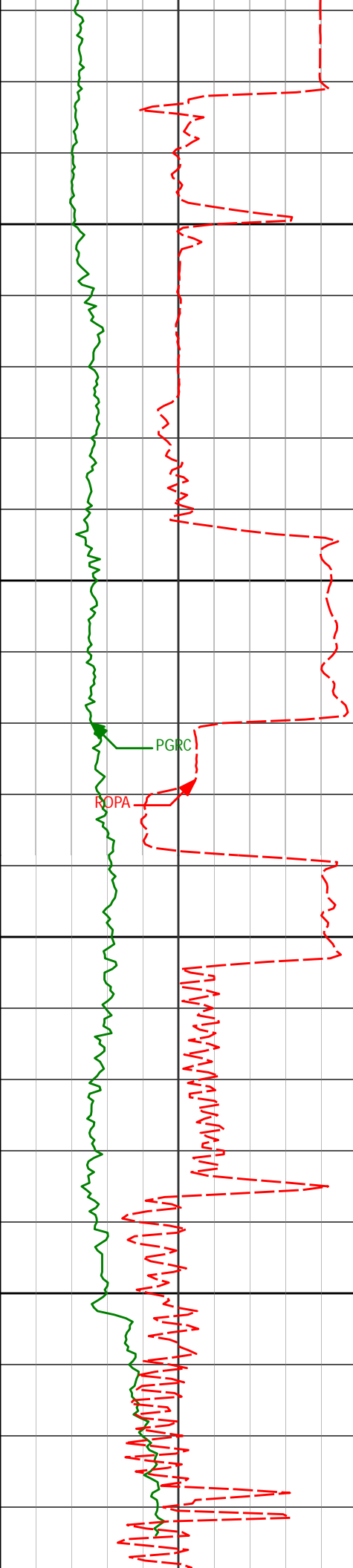
4437.42'

11350

11400

PGRC

ROPA



11425'

89.51°

86.75°

7036.56'

4524.91'

11450

11500

11515'

88.55°

89.43°

7038.08'

4611.94'

11550

11600

11604'

88.86°

90.93°

7040.09'

4697.12'

11634'

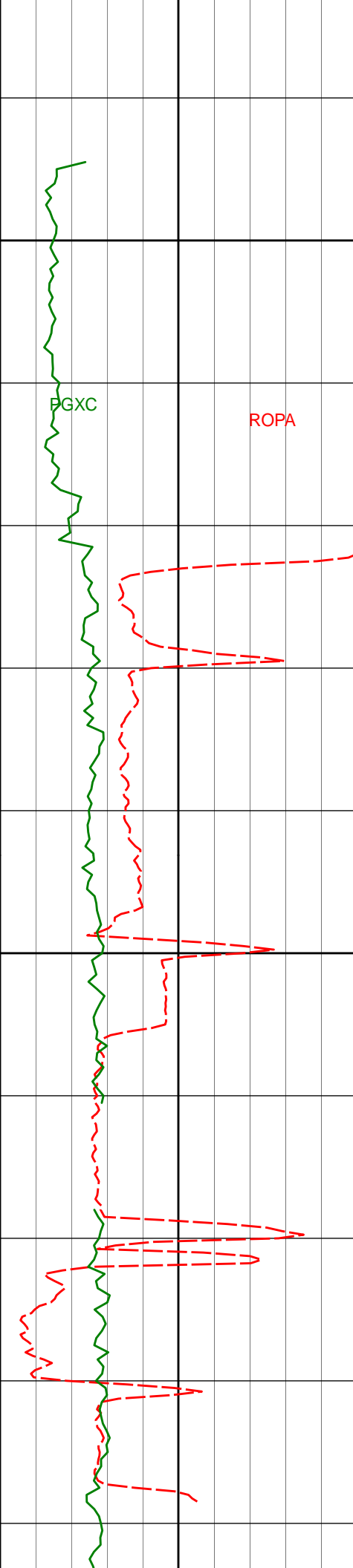
89.17°

90.47°

7040.61'

4725.75'

|   |  |  |  |
|---|--|--|--|
| <div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></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|---|--|--|--|



Run 100

600

623'

0.00°

291.28°

623.00'

-0.22'

700

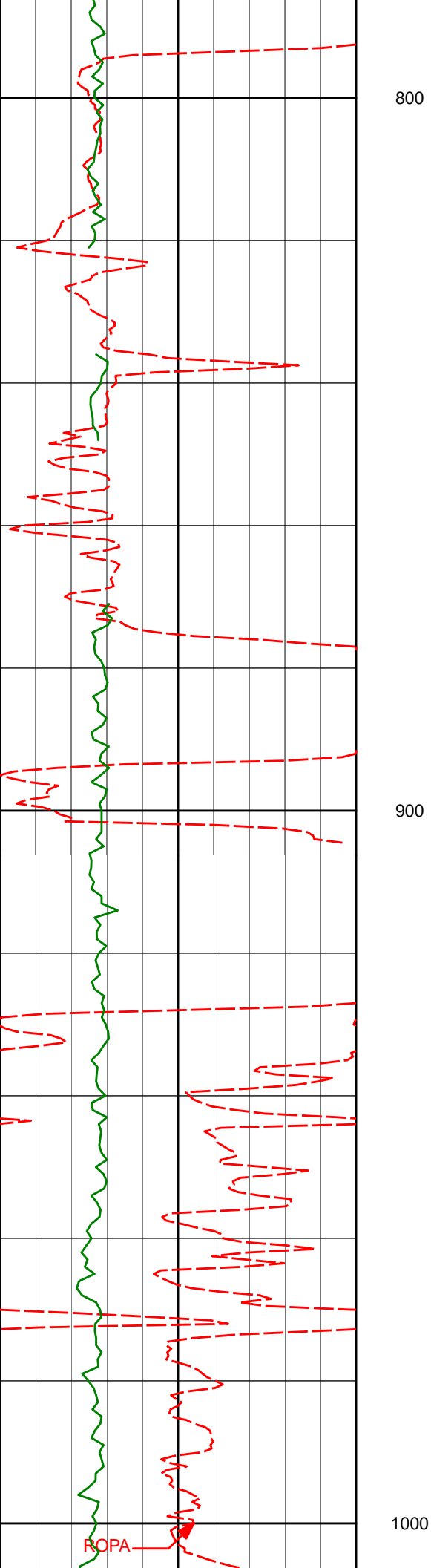
698'

0.51°

214.20°

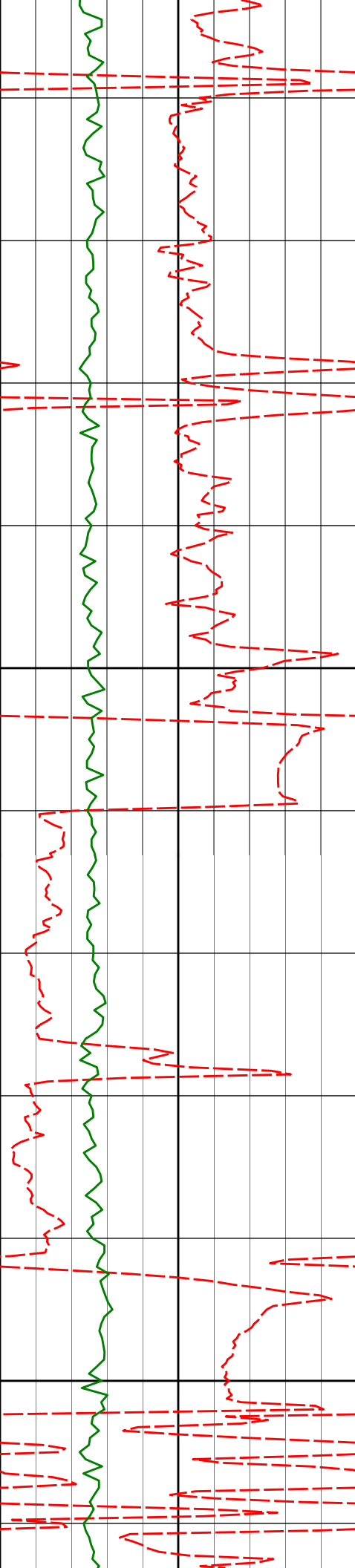
698.00'

-0.48'



|      |       |         |         |        |
|------|-------|---------|---------|--------|
| 787' | 0.80° | 167.40° | 786.99' | -0.82' |
| 877' | 0.63° | 265.66° | 876.99' | -1.35' |
| 966' | 0.38° | 219.55° | 965.98' | -2.07' |





1100

1200

1056'

0.77°

301.77°

1055.98'

-2.73'

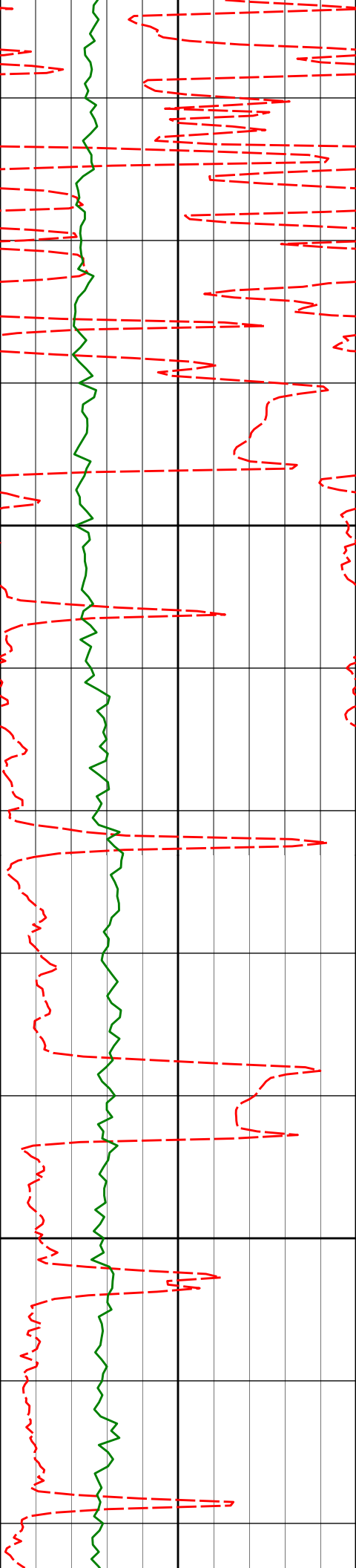
1135'

0.99°

307.48°

1134.97'

-3.48'



1300

1323'

 $5.15^\circ$ 

354.87°

1322.60'

-2.67'

1400

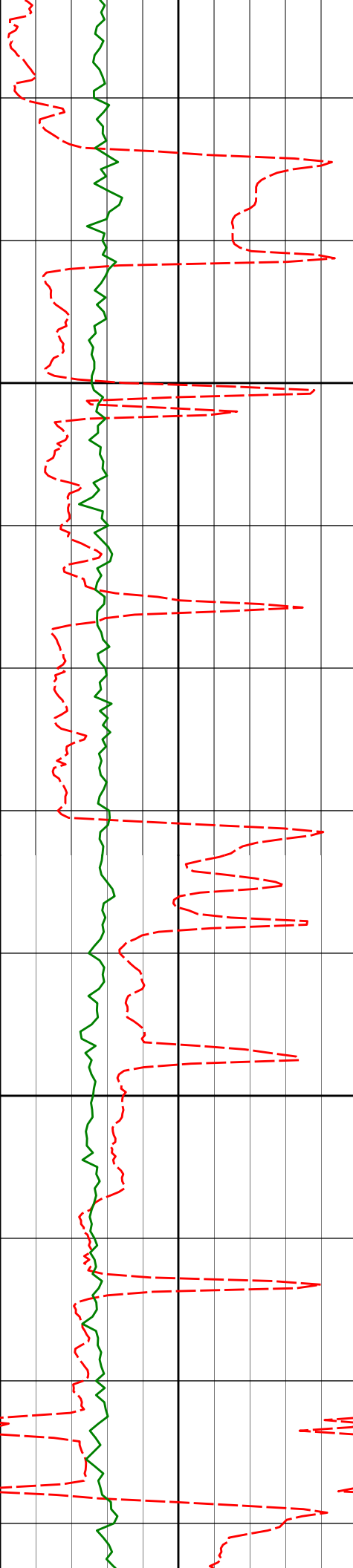
1418'

 $7.45^\circ$ 

356.32°

1417.02'

-0.44'



1500

1512'

 $9.52^\circ$ 

357.45°

1509.99'

2.81'

1600

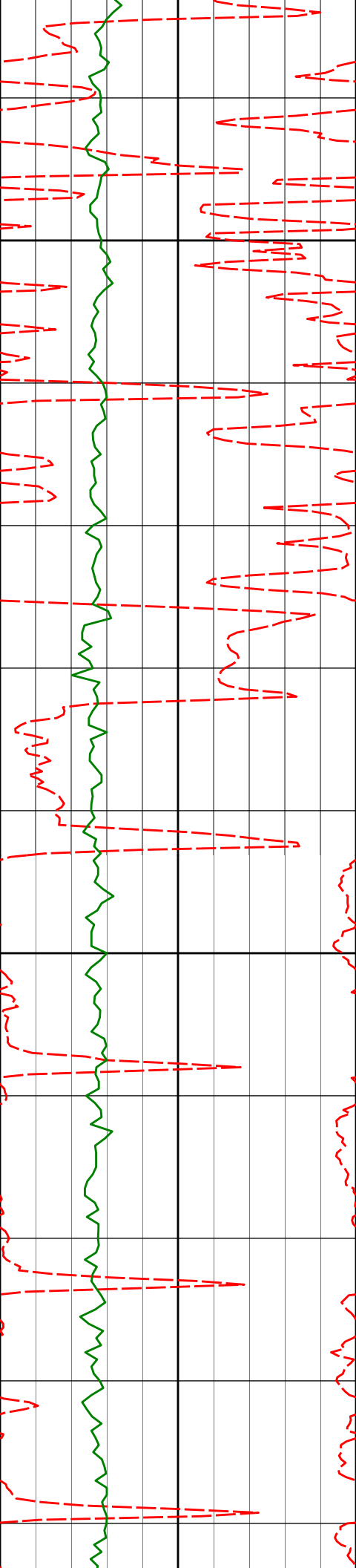
1606'

10.34°

351.94°

1602.58'

5.96'



1700

1800

1700'

1794'

10.83°

12.20°

350.17°

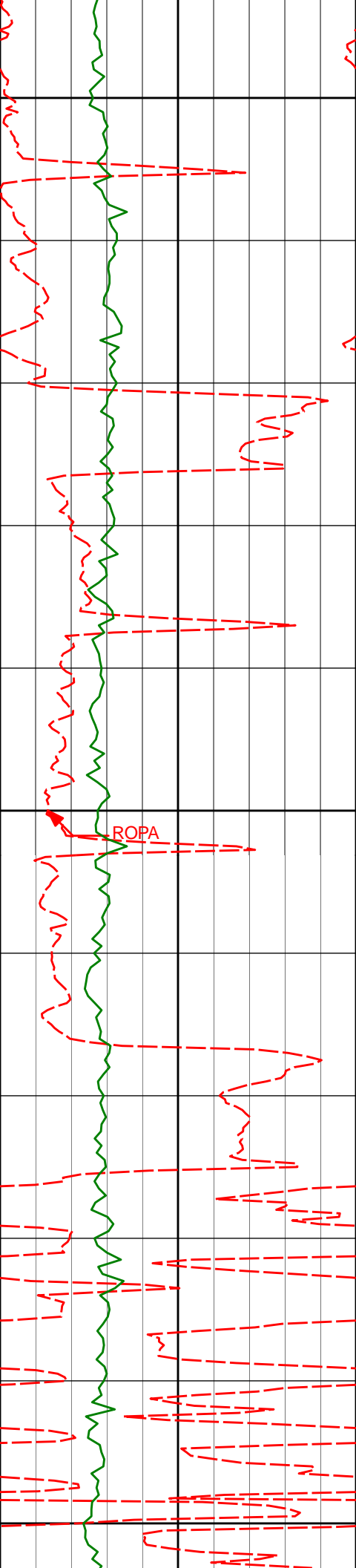
351.80°

1694.98'

1787.09'

8.26'

10.76'



1900

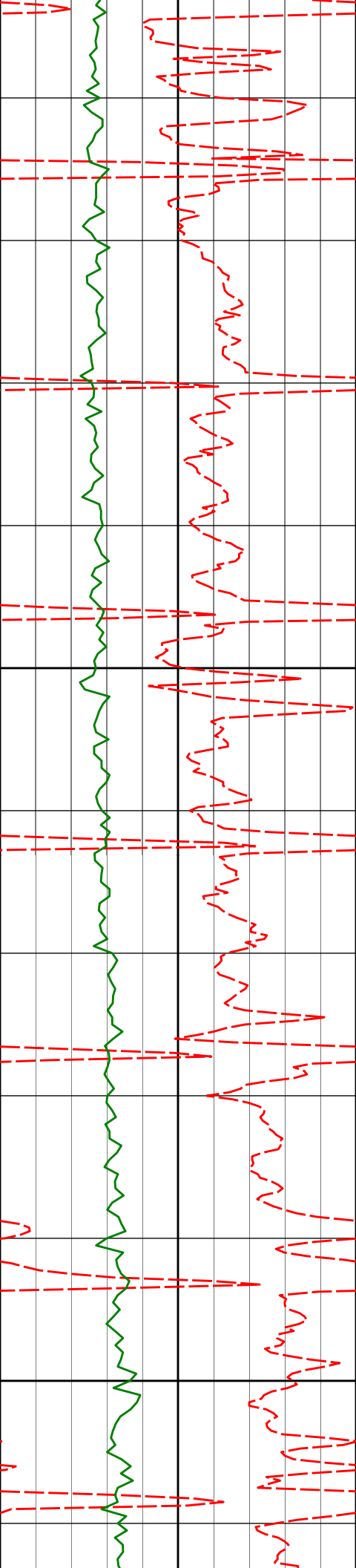
2000

2100

1889' 11.14° 348.85° 1880.13' 13.10'

1983' 12.73° 348.76° 1972.09' 14.94'

2077' 13.28° 356.75° 2063.69' 18.41'



2171'

12.79°

355.93°

2155.26'

23.16'

2200

2265'

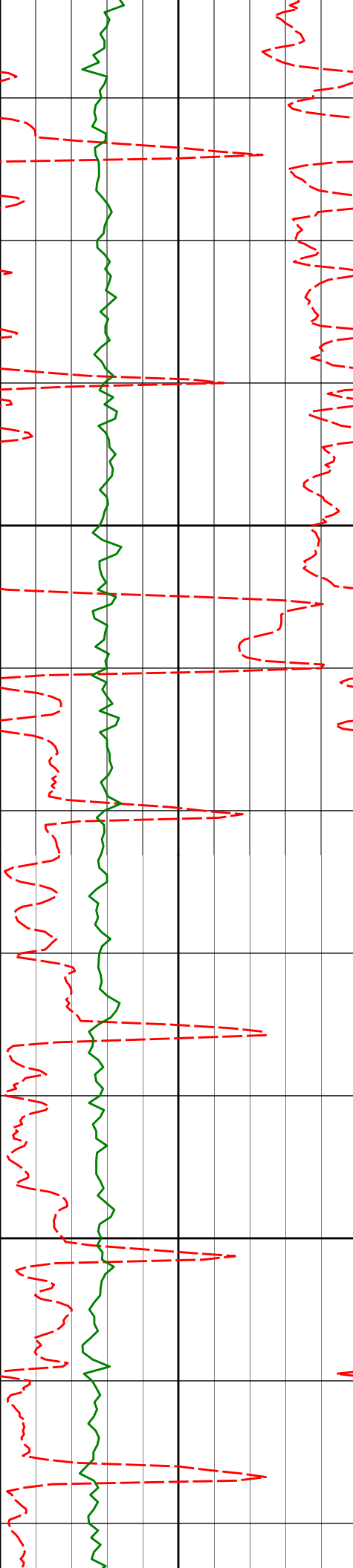
12.20°

354.27°

2247.04'

27.30'

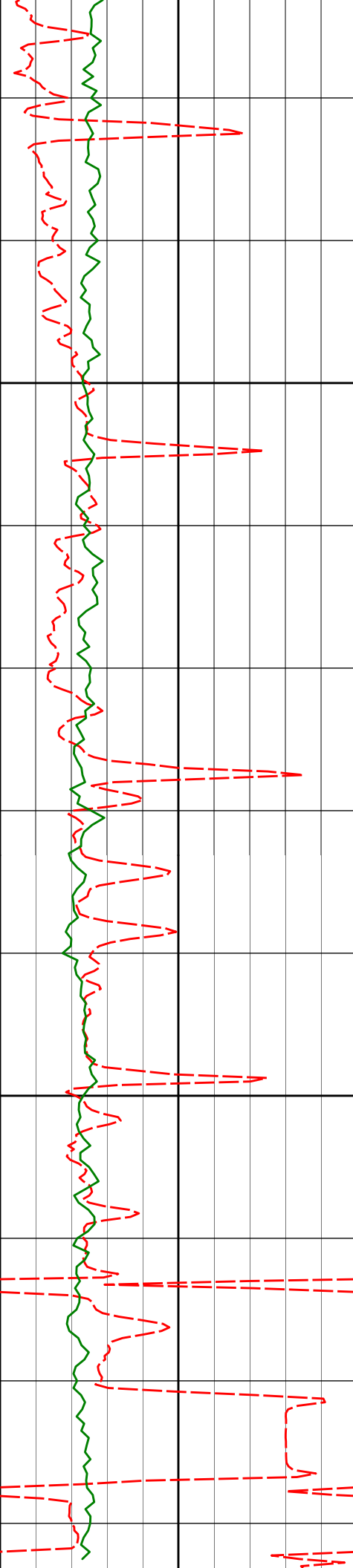
2300



2400

2500

|       |        |         |          |        |
|-------|--------|---------|----------|--------|
| 2359' | 10.60° | 350.23° | 2339.18' | 30.21' |
| 2451' | 12.68° | 354.87° | 2429.29' | 33.23' |
| 2513' | 12.44° | 354.38° | 2489.80' | 35.86' |



2600

2602'

12.47°

355.22°

2576.71'

39.66'

2700

2692'

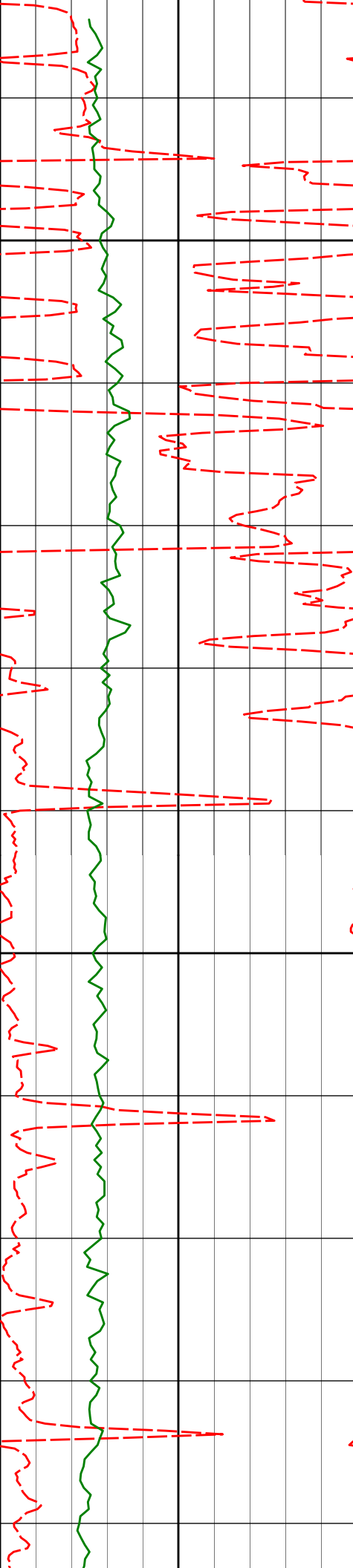
13.95°

355.66°

2664.32'

43.96'





2800

2900

2781'

12.38°

351.43°

2750.99'

47.58'

2871'

10.48°

348.83°

2839.20'

49.71'

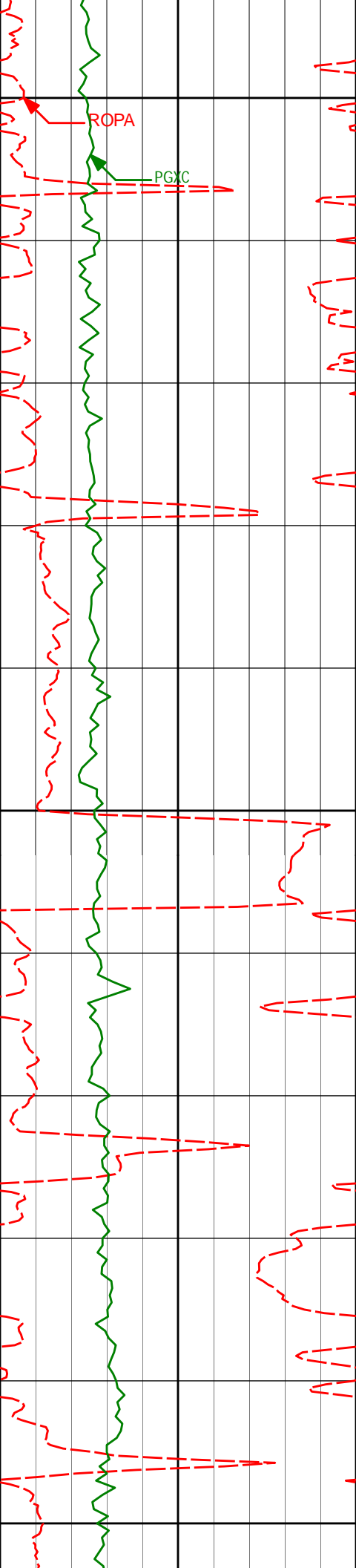
2961'

10.11°

348.19°

2927.75'

51.15'



3000

3050'

9.57°

345.83°

3015.44'

52.12'

3100

3140'

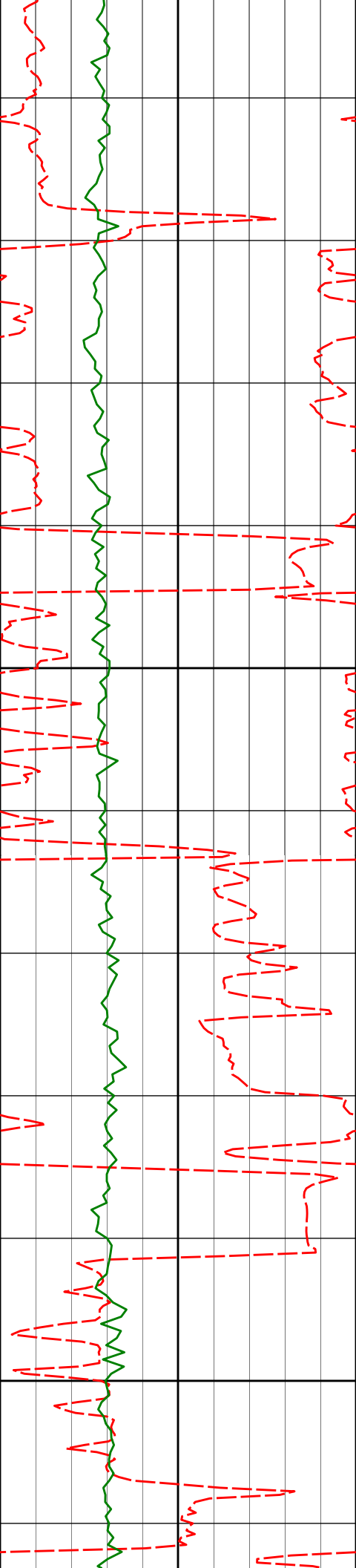
11.49°

345.02°

3103.92'

52.70'

3200



3230'

10.64°

338.45°

3192.25'

52.24'

3300

3319'

9.50°

345.70°

3279.88'

51.83'

3400

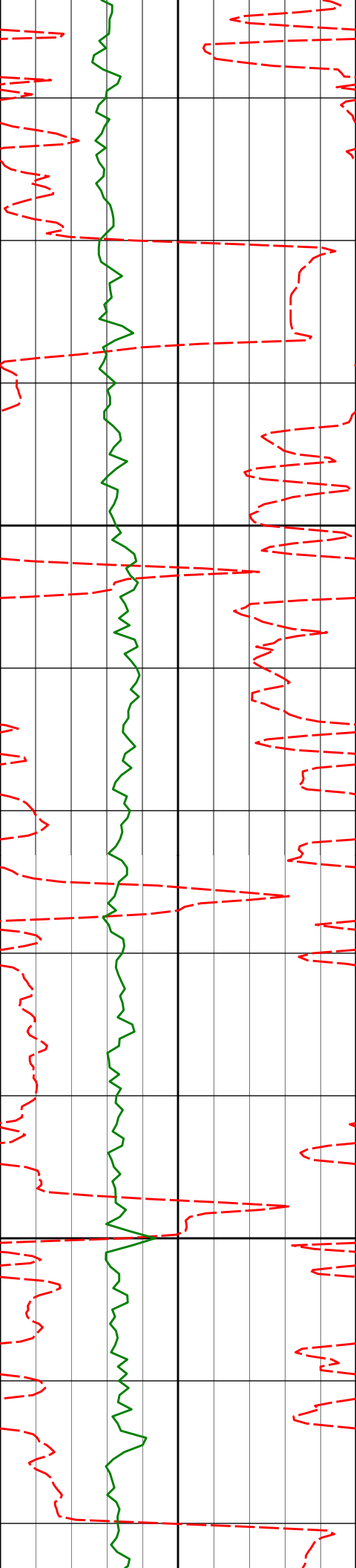
3409'

9.92°

346.26°

3368.59'

52.52'



3500

3498'

11.37°

348.41°

3456.06'

53.68'

3600

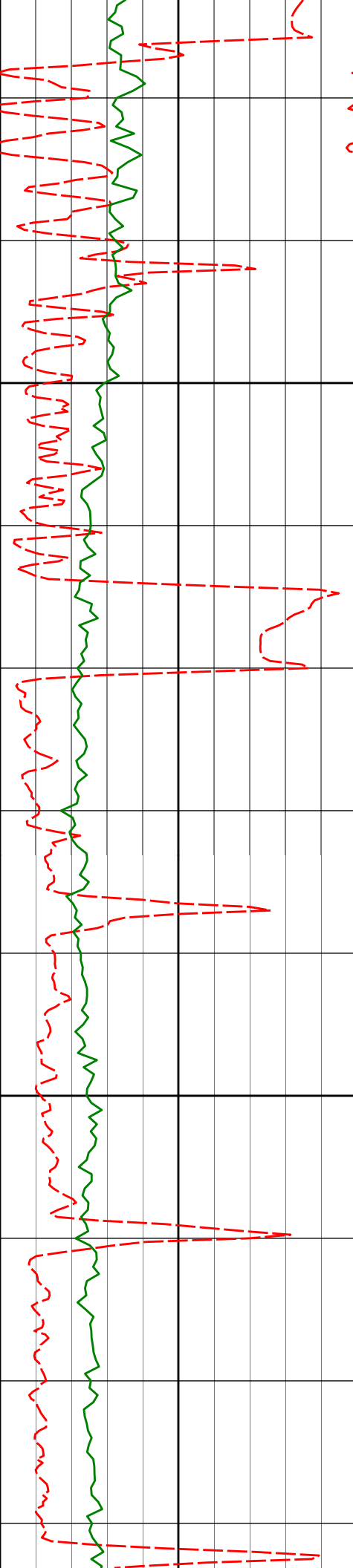
3588'

9.26°

343.12°

3544.60'

54.42'



3700

3800

3678'

10.77°

343.55°

3633.22'

54.41'

3767'

11.93°

352.11°

3720.49'

55.83'

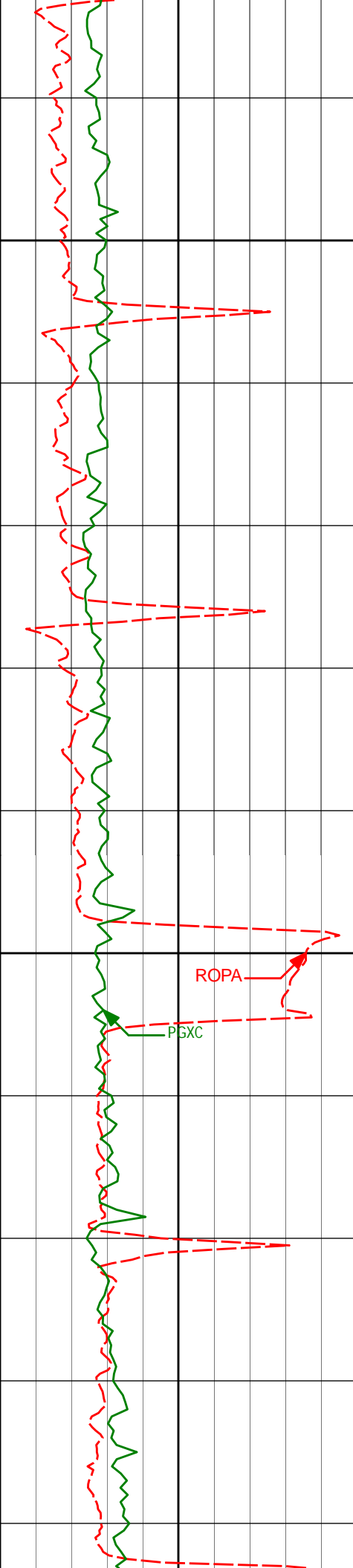
3857'

12.90°

352.21°

3808.38'

58.79'



3900

3946'

13.14°

351.61°

3895.09'

61.76'

4000

ROPA

PGXC

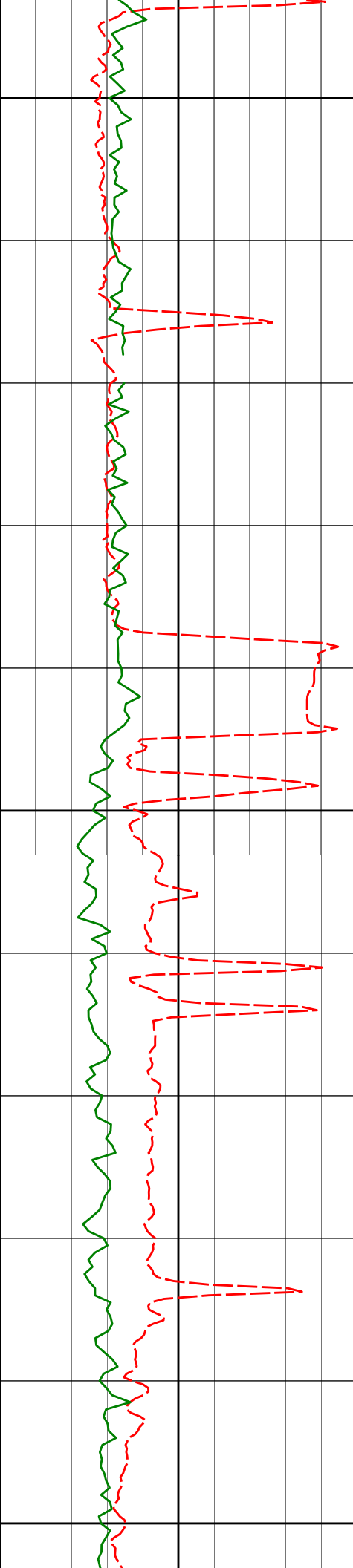
4036'

10.83°

353.94°

3983.13'

64.78'



4100

4126'

9.72°

350.01°

4071.68'

67.20'

4200

4215'

11.51°

349.73°

4159.15'

69.05'

4300

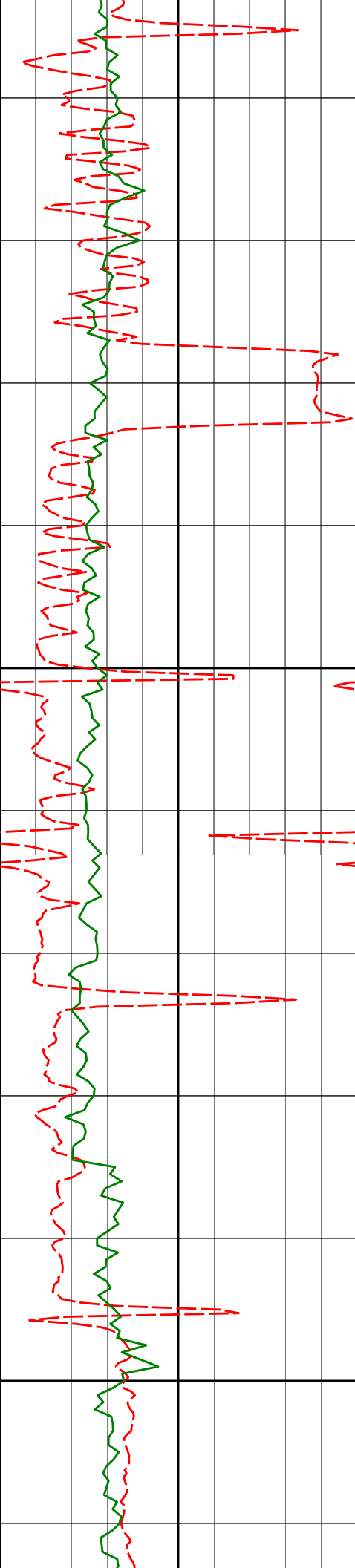
4305'

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347.97°

4247.45'

70.72'



4400

4500

4394'

11.80°

350.76°

4334.72'

72.56'

4484'

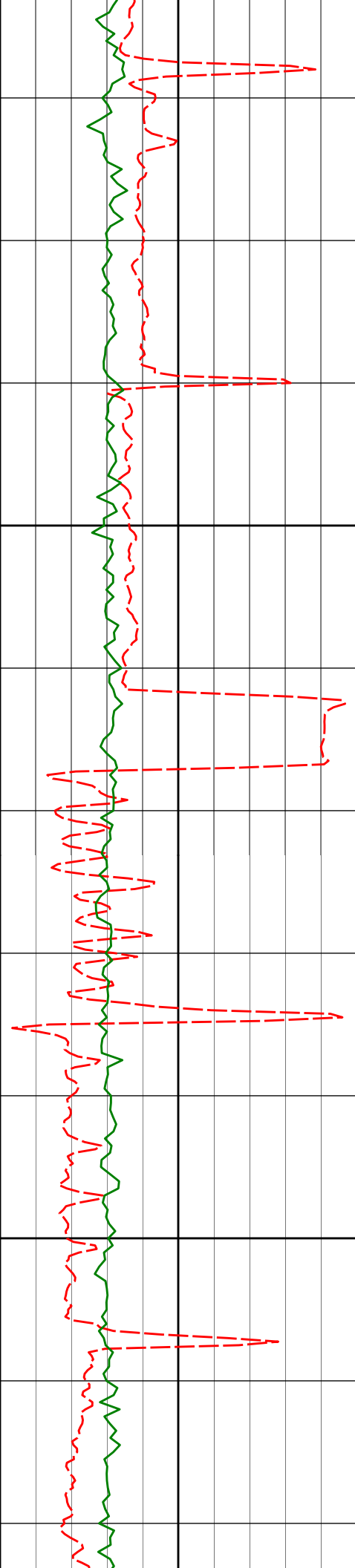
10.94°

349.21°

4422.96'

74.61'





4600

4700

4573'

10.75°

347.84°

4510.37'

76.11'

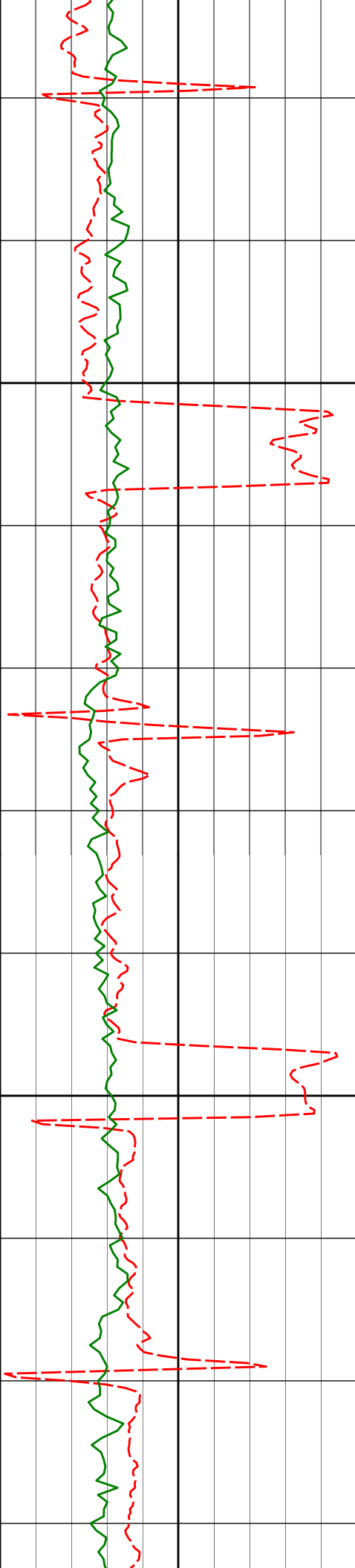
4663'

10.71°

353.85°

4598.80'

78.29'



4800

4900

4753'

9.42°

355.14°

4687.41'

81.31'

4842'

9.93°

350.06°

4775.15'

83.68'

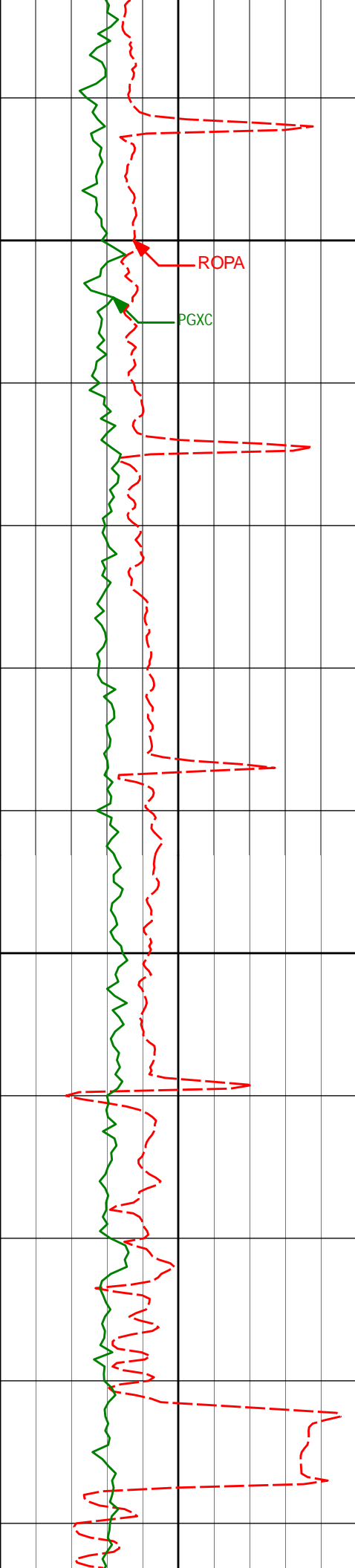
4932'

11.62°

350.36°

4863.56'

85.69'



5000

5022'

11.53°

350.60°

4951.73'

87.92'

5100

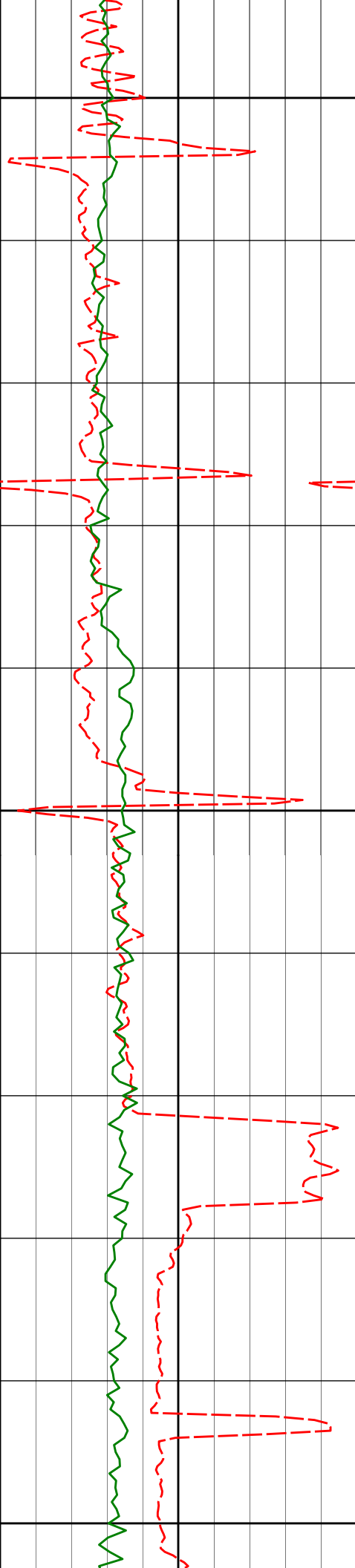
5111'

10.16°

349.29°

5039.13'

89.84'



5200

5201'

11.03°

350.38°

5127.60'

91.71'

5291'

9.65°

348.23°

5216.14'

93.40'

5300

5380'

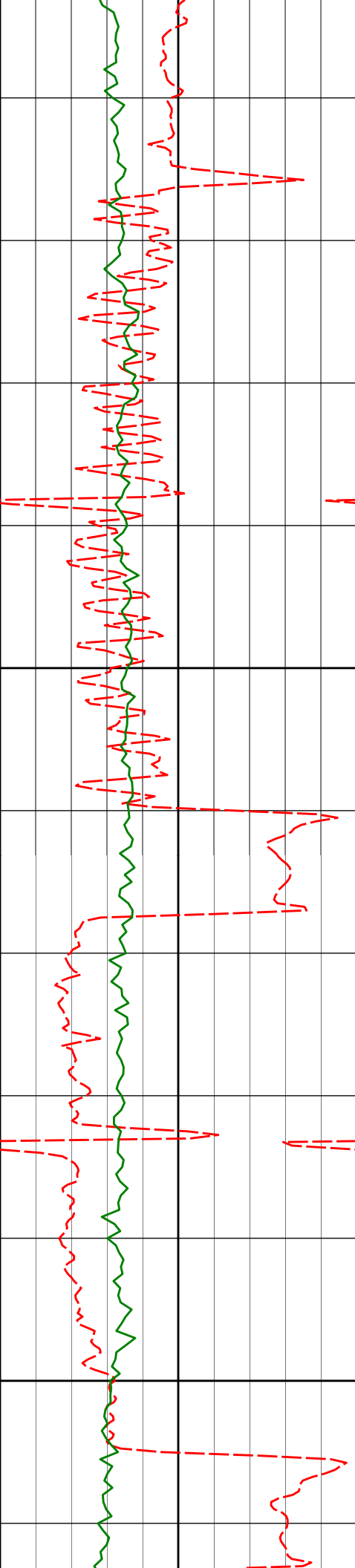
10.54°

354.53°

5303.76'

95.60'

5400



5470'

9.17°

353.60°

5392.43'

98.46'

5500

5560'

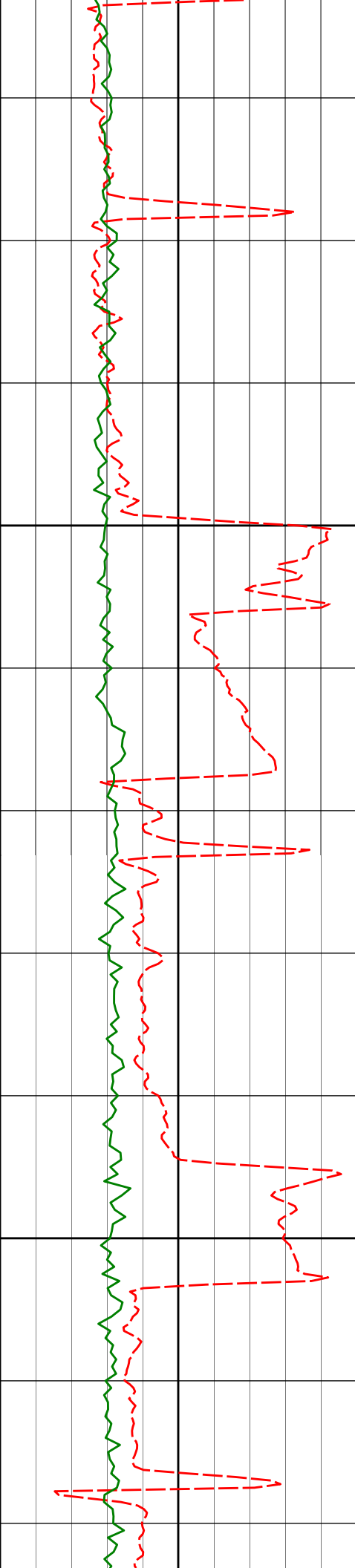
10.22°

348.31°

5481.15'

100.42'

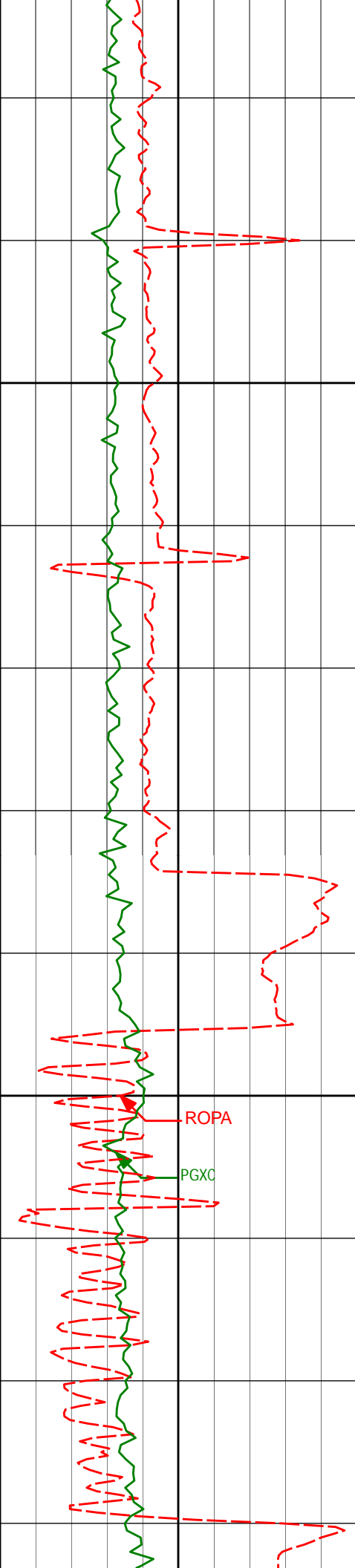
5600



5700

5800

|       |        |         |          |         |
|-------|--------|---------|----------|---------|
| 5649' | 11.13° | 344.05° | 5568.61' | 101.20' |
| 5739' | 11.57° | 345.91° | 5656.85' | 101.70' |
| 5829' | 11.29° | 355.55° | 5745.07' | 103.96' |



5900

5918'

9.37°

350.81°

5832.63'

106.73'

6000

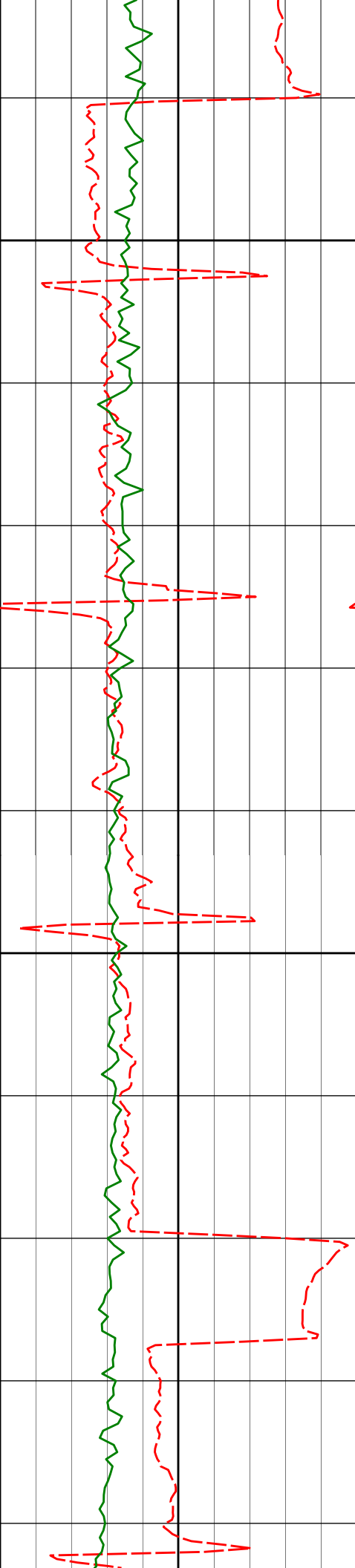
6008'

10.84°

348.88°

5921.23'

108.49'



6100

6097'

11.61°

358.92°

6008.54'

111.69'

6200

6187'

9.46°

353.91°

6097.02'

115.47'

6277'

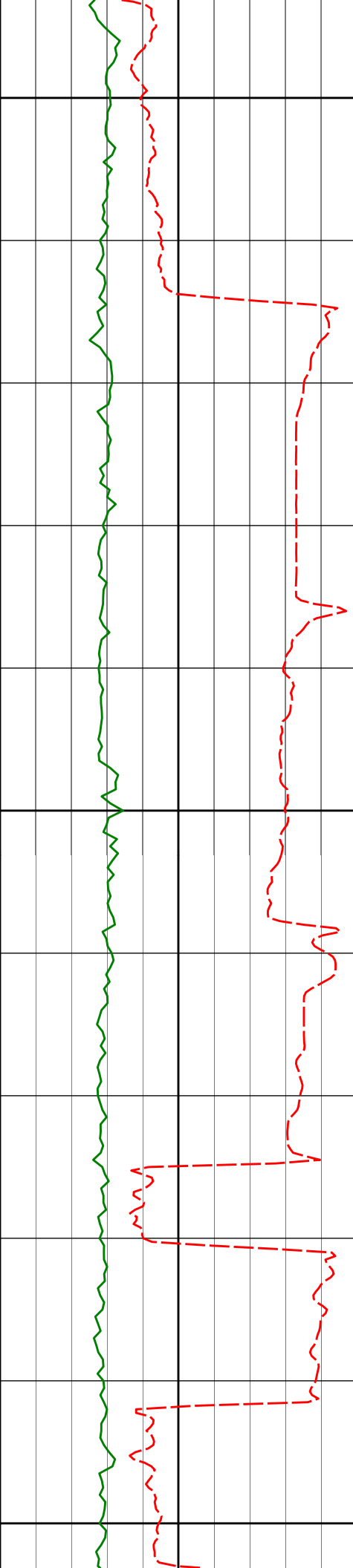
9.98°

357.15°

6185.72'

118.68'





6300

6322'

10.30°

357.89°

6230.02'

120.61'

6366'

14.31°

1.50°

6273.00'

123.29'

6400

6411'

19.89°

2.40°

6316.00'

127.52'

6456'

23.62°

1.06°

6357.78'

132.75'

6500

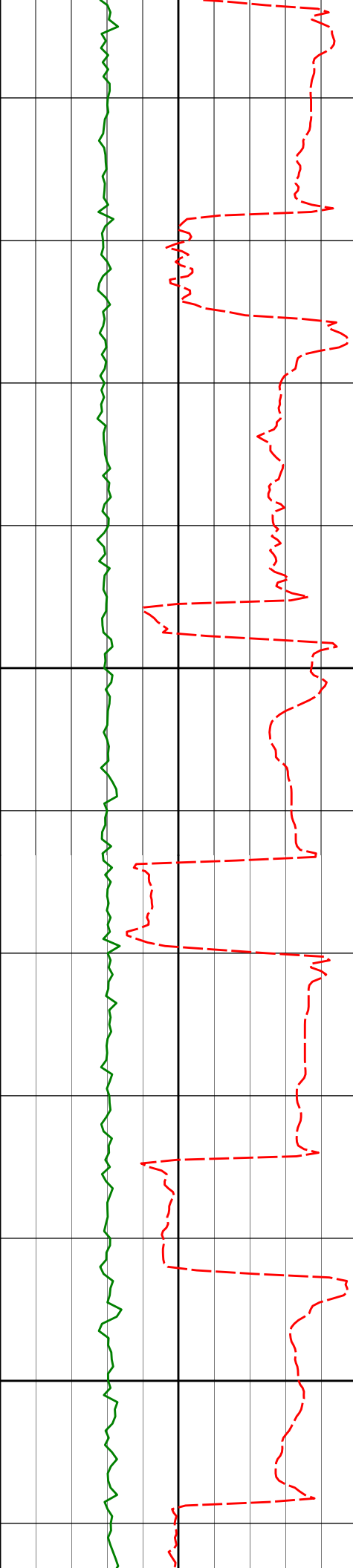
6501'

25.23°

358.75°

6398.75'

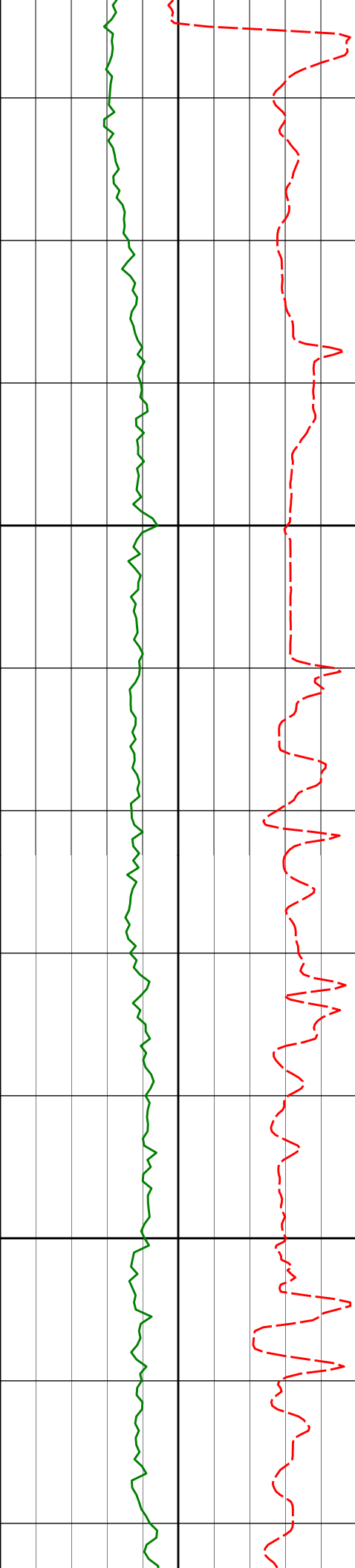
138.03'



6600

6700

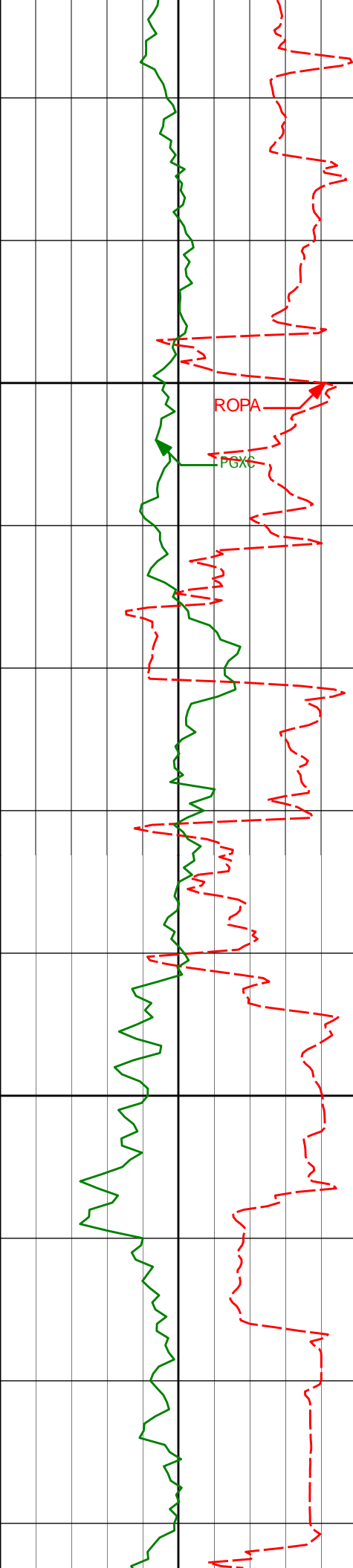
|       |        |         |          |         |
|-------|--------|---------|----------|---------|
| 6545' | 28.37° | 355.17° | 6438.03' | 142.66' |
| 6590' | 32.70° | 356.68° | 6476.78' | 147.64' |
| 6635' | 36.33° | 358.67° | 6513.85' | 153.95' |
| 6680' | 37.97° | 5.06°   | 6549.73' | 162.59' |
| 6725' | 38.05° | 11.27°  | 6585.20' | 174.19' |



6800

6900

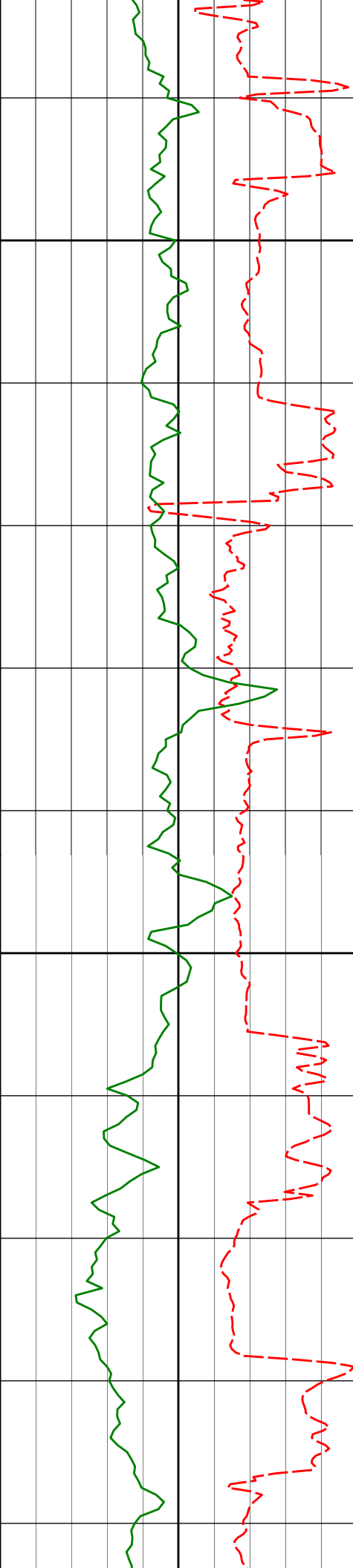
|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 6769' | 40.45° | 21.53° | 6619.31' | 189.37' |
| 6814' | 43.47° | 29.32° | 6652.79' | 209.53' |
| 6859' | 43.82° | 37.72° | 6685.38' | 233.33' |
| 6904' | 45.46° | 47.66° | 6717.44' | 260.47' |



7000

7100

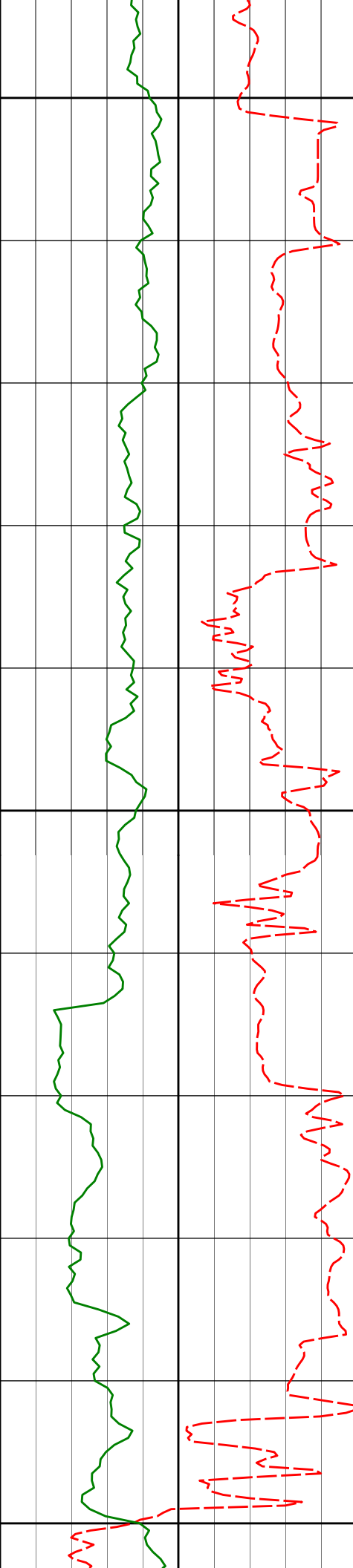
|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 6948' | 47.31° | 56.90° | 6747.83' | 290.14' |
| 6993' | 48.56° | 64.71° | 6778.00' | 322.70' |
| 7038' | 51.86° | 67.72° | 6806.80' | 357.00' |
| 7083' | 53.94° | 70.00° | 6833.94' | 392.78' |
| 7128' | 56.07° | 74.46° | 6859.75' | 429.62' |



7200

7300

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7173' | 57.50° | 80.59° | 6884.42' | 467.14' |
| 7217' | 59.36° | 82.15° | 6907.46' | 504.26' |
| 7262' | 61.01° | 83.43° | 6929.83' | 542.77' |
| 7307' | 62.57° | 83.89° | 6951.10' | 581.79' |
| 7352' | 66.64° | 84.83° | 6970.40' | 621.69' |



7400

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7397' | 69.60° | 85.05° | 6987.16' | 662.59' |
|-------|--------|--------|----------|---------|

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7442' | 72.86° | 86.27° | 7001.64' | 704.22' |
|-------|--------|--------|----------|---------|

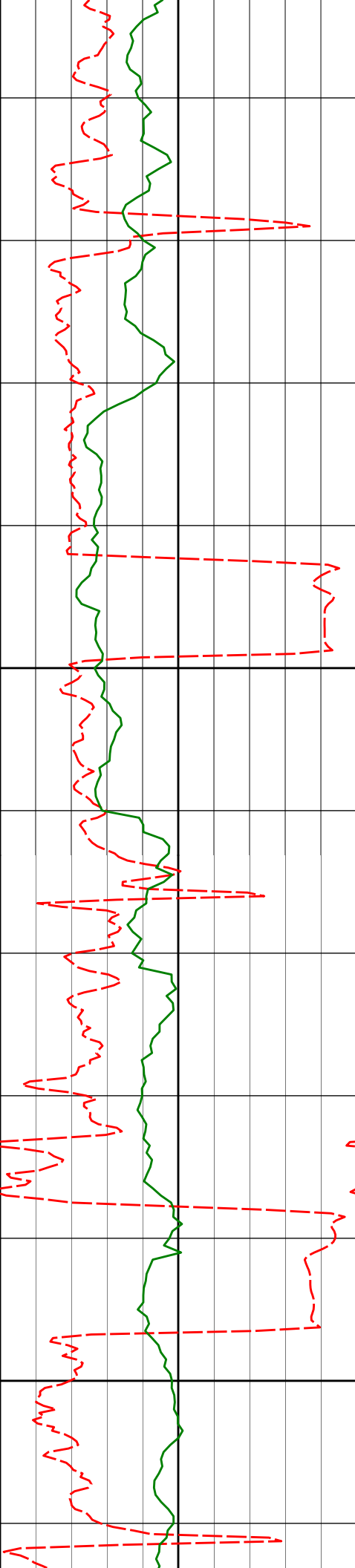
7500

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7487' | 75.95° | 87.51° | 7013.74' | 746.36' |
|-------|--------|--------|----------|---------|

|       |        |        |          |         |
|-------|--------|--------|----------|---------|
| 7531' | 79.39° | 88.59° | 7023.13' | 787.93' |
|-------|--------|--------|----------|---------|

7" casing shoe at 7571ft MD

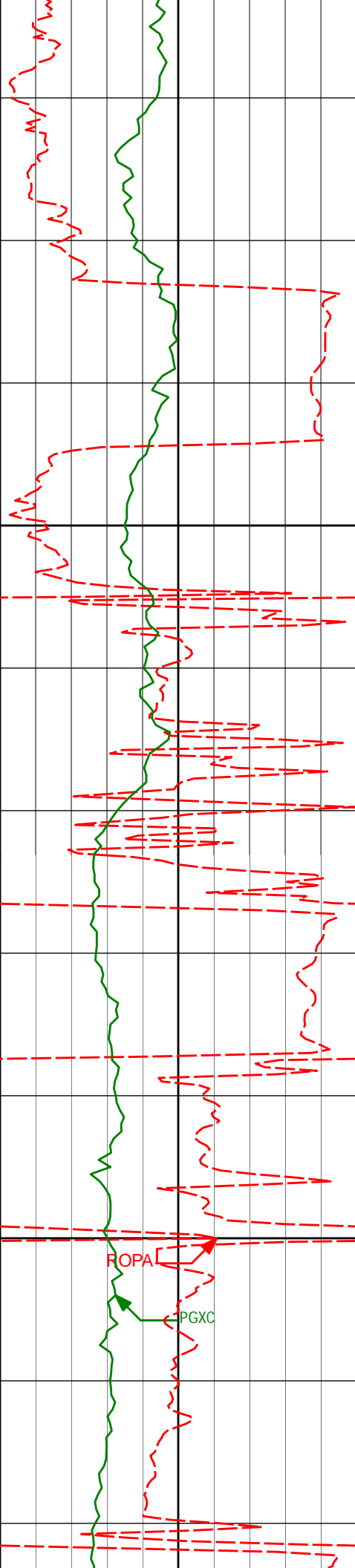
Run 200  
7600



7700

7800

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 7617' | 82.02° | 88.49° | 7037.02' | 869.84'  |
| 7707' | 82.24° | 88.28° | 7049.35' | 955.95'  |
| 7796' | 83.82° | 88.02° | 7060.15' | 1041.37' |



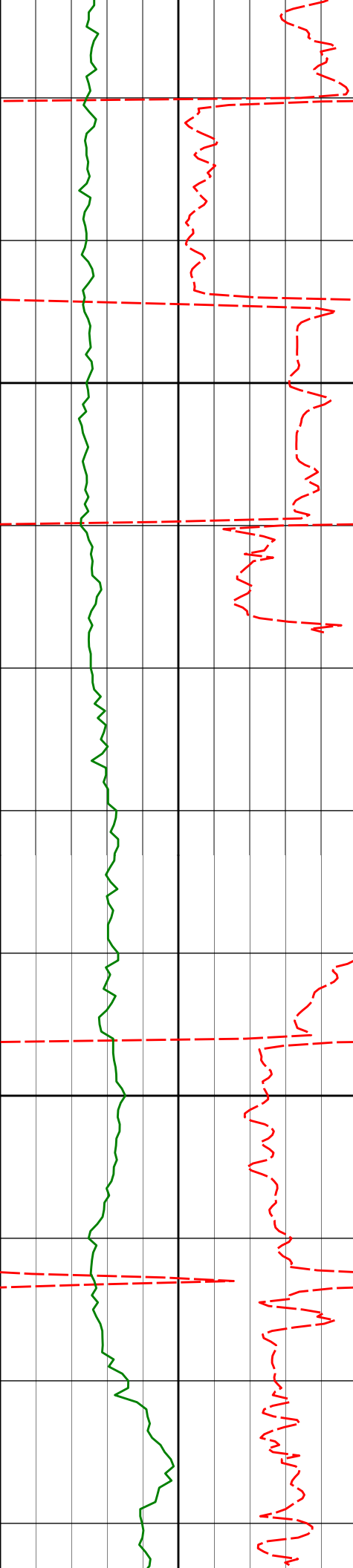
7900

8000

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 7886' | 85.58° | 89.74° | 7068.46' | 1127.72' |
|-------|--------|--------|----------|----------|

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 7976' | 87.60° | 91.00° | 7073.81' | 1213.64' |
|-------|--------|--------|----------|----------|





8100

8110'

90.89°

90.67°

7075.57'

1341.44'

8200

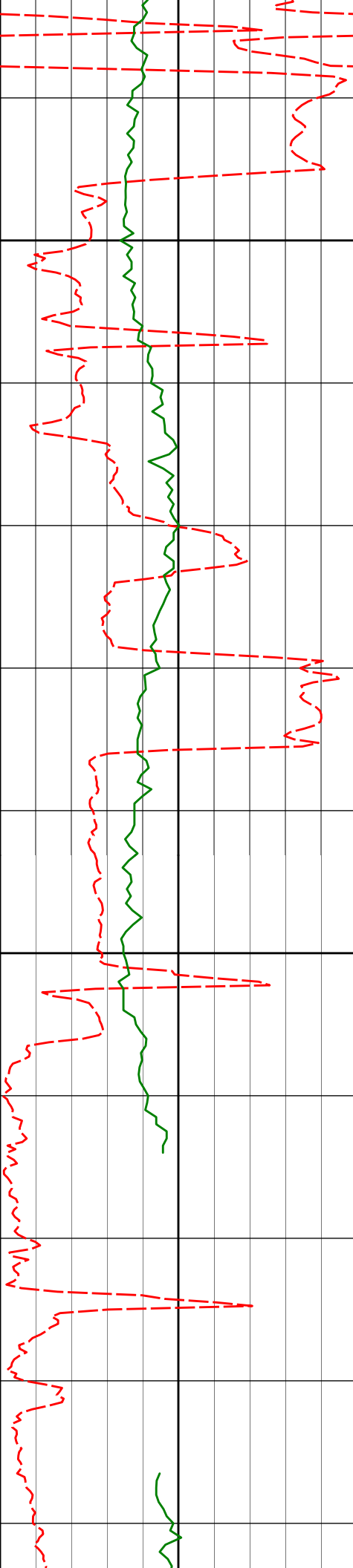
8200'

93.58°

89.87°

7072.06'

1427.48'



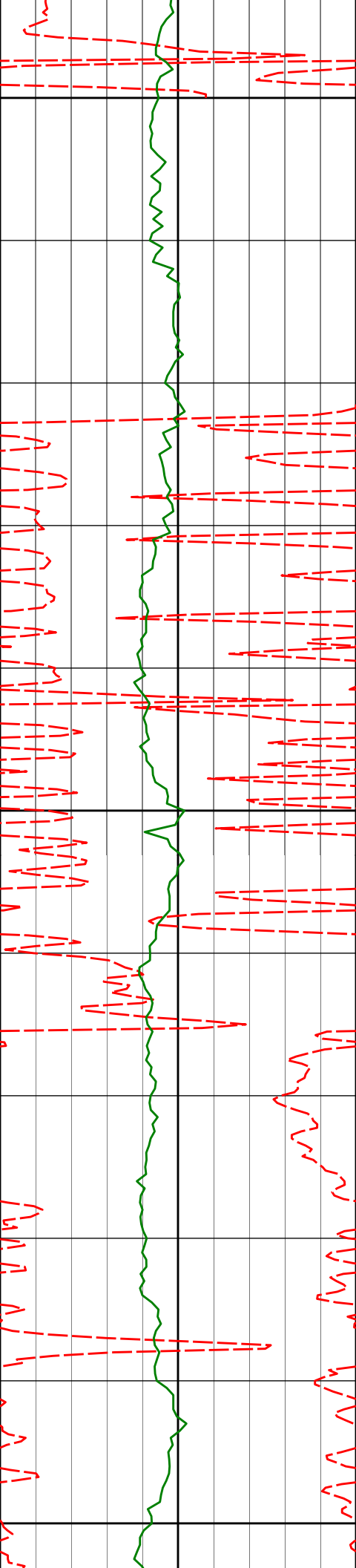
8300

8400

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 8289' | 92.96° | 90.55° | 7066.99' | 1512.53' |
|-------|--------|--------|----------|----------|

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 8379' | 92.00° | 89.97° | 7063.09' | 1598.57' |
|-------|--------|--------|----------|----------|

|       |        |        |          |          |
|-------|--------|--------|----------|----------|
| 8469' | 92.34° | 89.69° | 7059.68' | 1684.82' |
|-------|--------|--------|----------|----------|



8500

8558'

92.56°

89.18°

7055.88'

1770.28'

8600

8648'

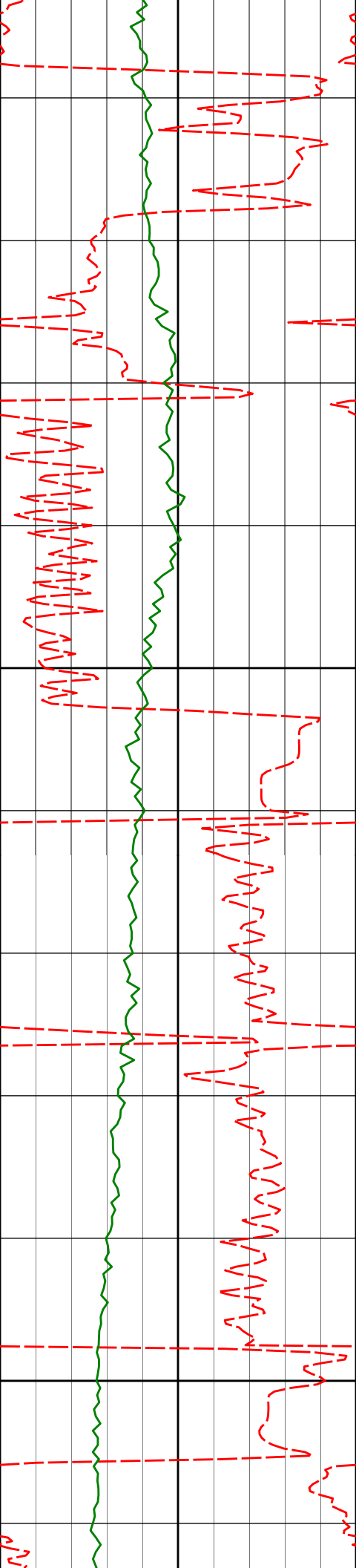
93.24°

87.67°

7051.32'

1857.08'

8700



8737'

91.63°

88.53°

7047.54'

1943.07'

8800

8827'

90.62°

88.85°

7045.77'

2029.86'

8900

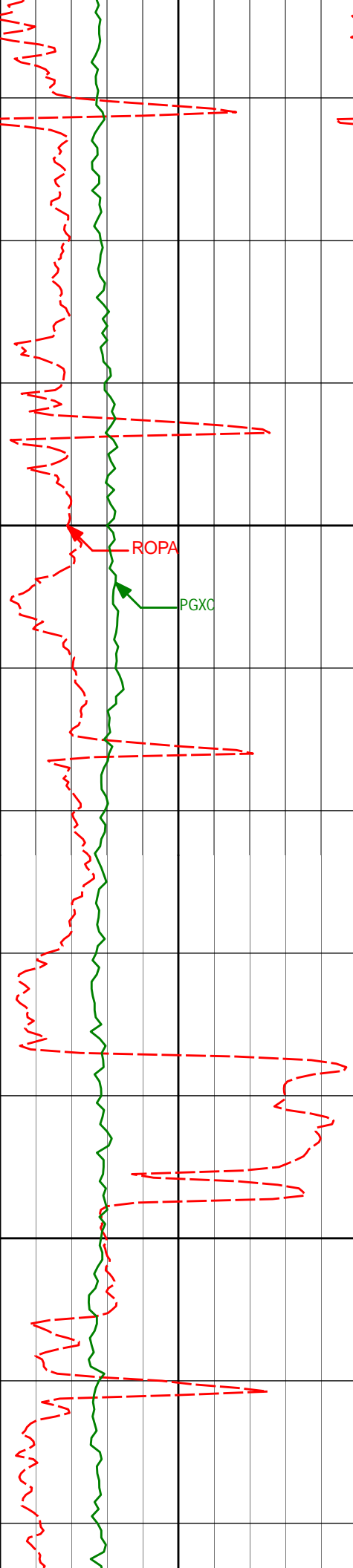
8917'

90.83°

91.34°

7044.63'

2116.04'



9000

9006'

91.73°

90.32°

7042.65'

2200.92'

9100

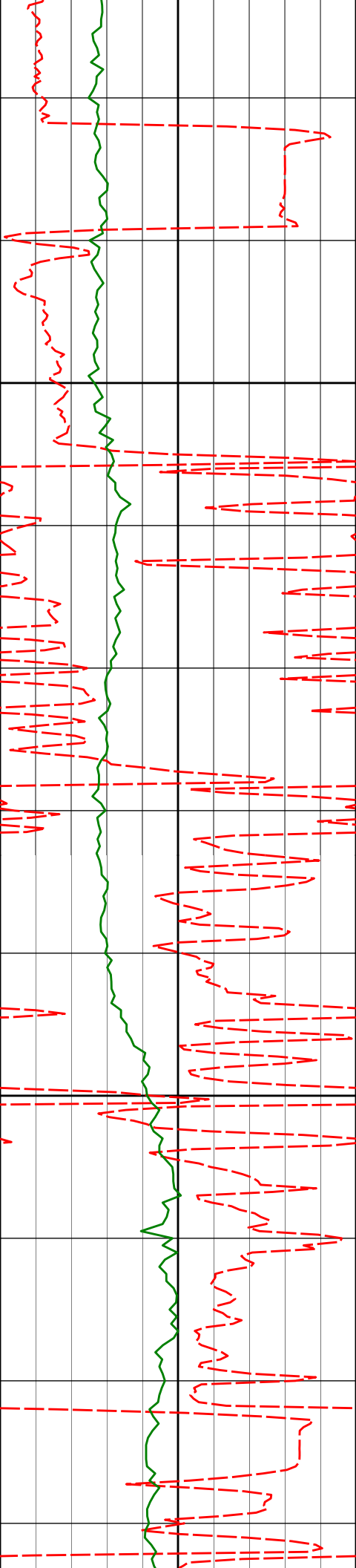
9096'

90.80°

89.90°

7040.66'

2287.09'



9186'

88.64°

89.86°

7041.10'

2373.38'

9200

9275'

88.49°

89.51°

7043.32'

2458.77'

9300

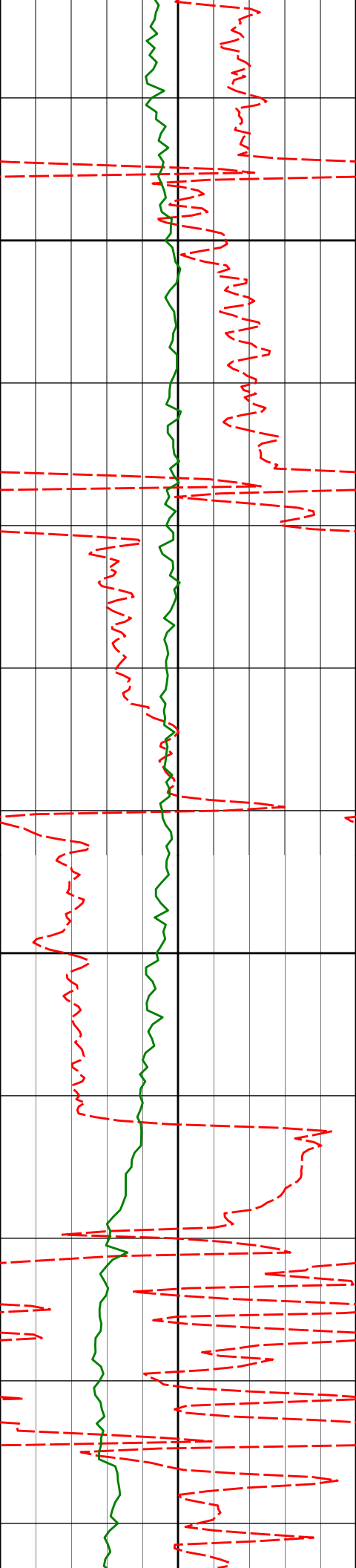
9365'

90.15°

89.44°

7044.39'

2545.23'



9400

9500

9454'

90.15°

88.86°

7044.15'

2630.88'

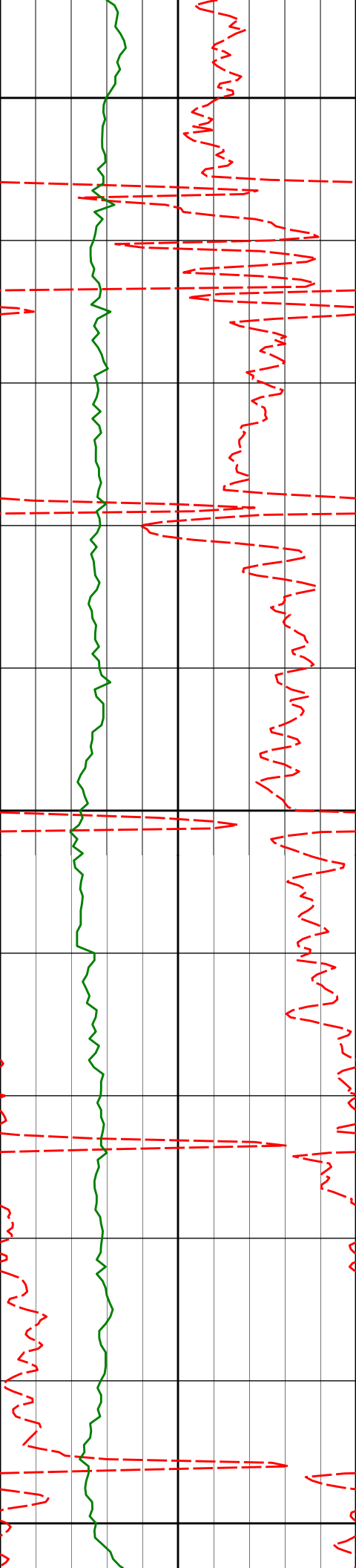
9544'

91.57°

89.82°

7042.79'

2717.40'



9600

9634'

90.89°

91.03°

7040.86'

2803.43'

9700

9723'

91.57°

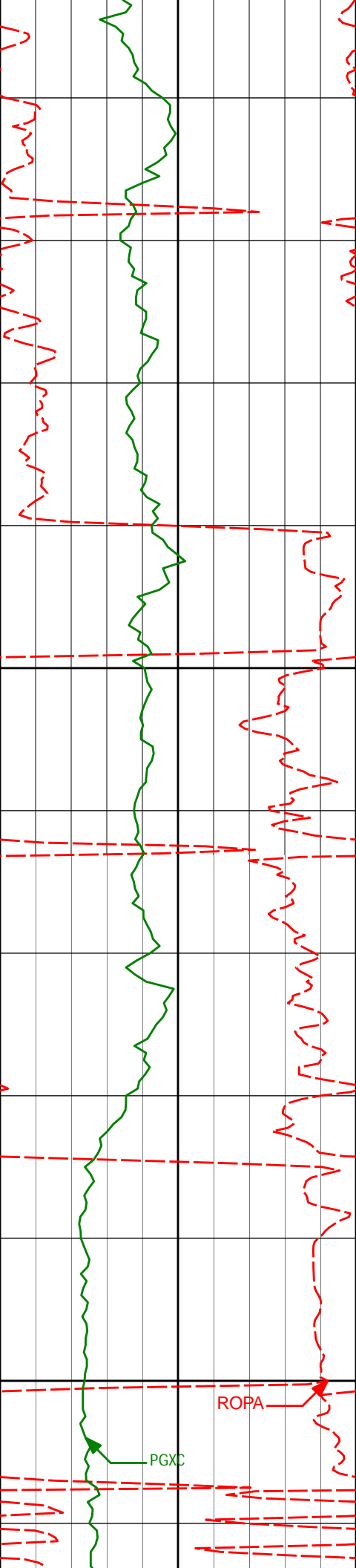
90.82°

7038.94'

2888.27'

9800





9900

10000

9813'

92.99°

89.21°

7035.36'

2974.43'

9902'

92.84°

89.53°

7030.84'

3059.87'

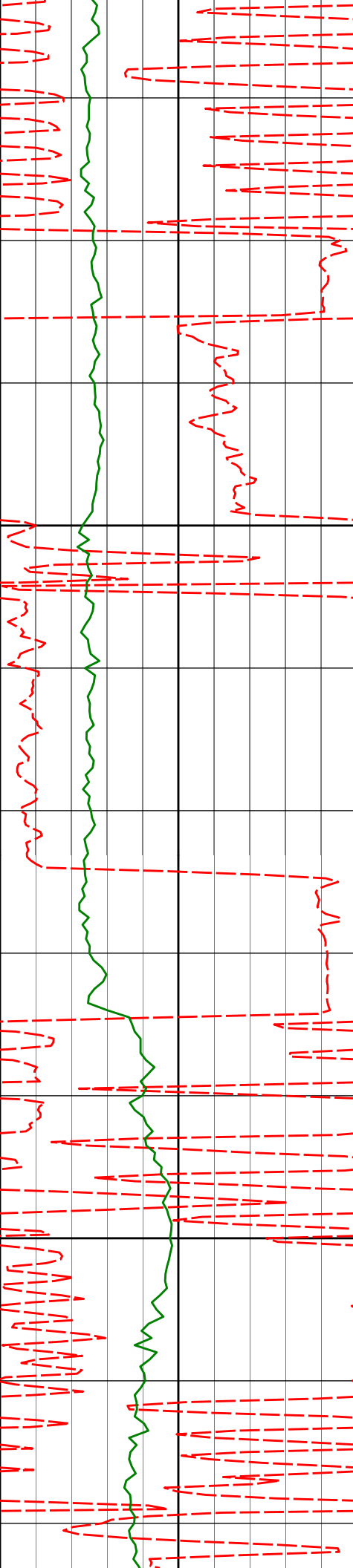
9992'

90.56°

90.01°

7028.17'

3146.17'



Run 300

10082'

90.77°

90.79°

7027.13'

3232.22'

10100

10171'

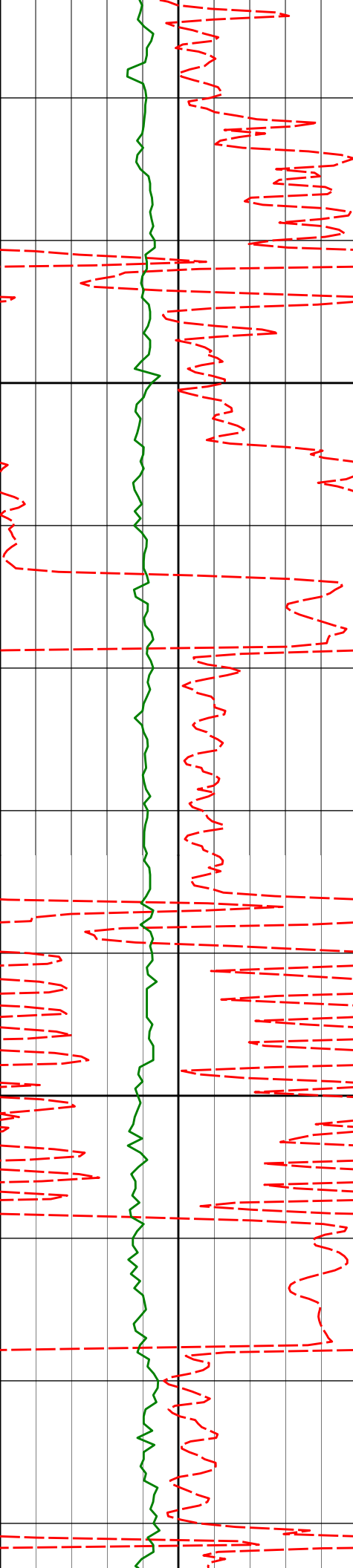
88.95°

92.20°

7027.34'

3316.81'

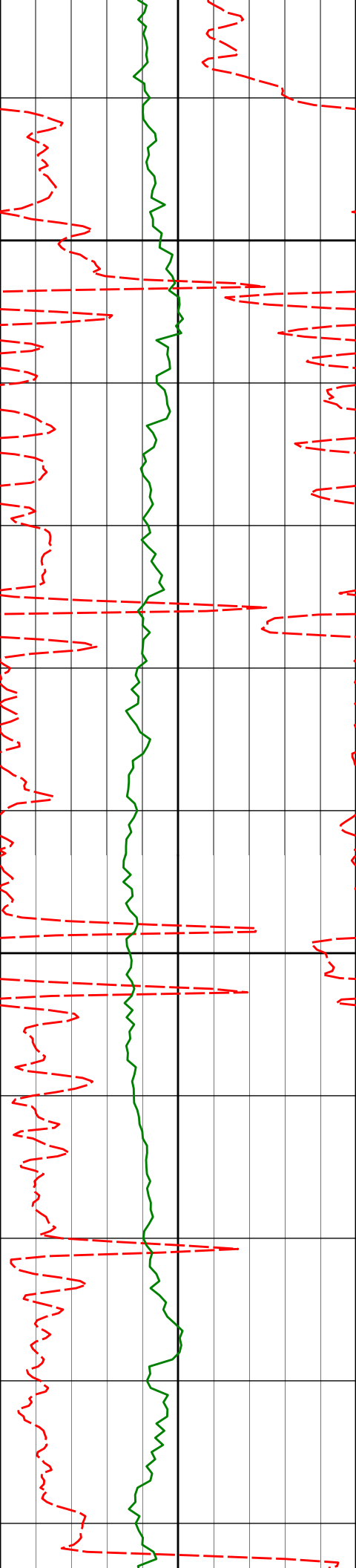
10200



10300

10400

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 10261' | 88.95° | 92.20° | 7028.99' | 3401.98' |
| 10350' | 91.11° | 92.51° | 7028.94' | 3486.14' |
| 10440' | 89.72° | 88.54° | 7028.29' | 3572.12' |



10500

10530'

89.38°

87.93°

7028.99'

3659.10'

10600

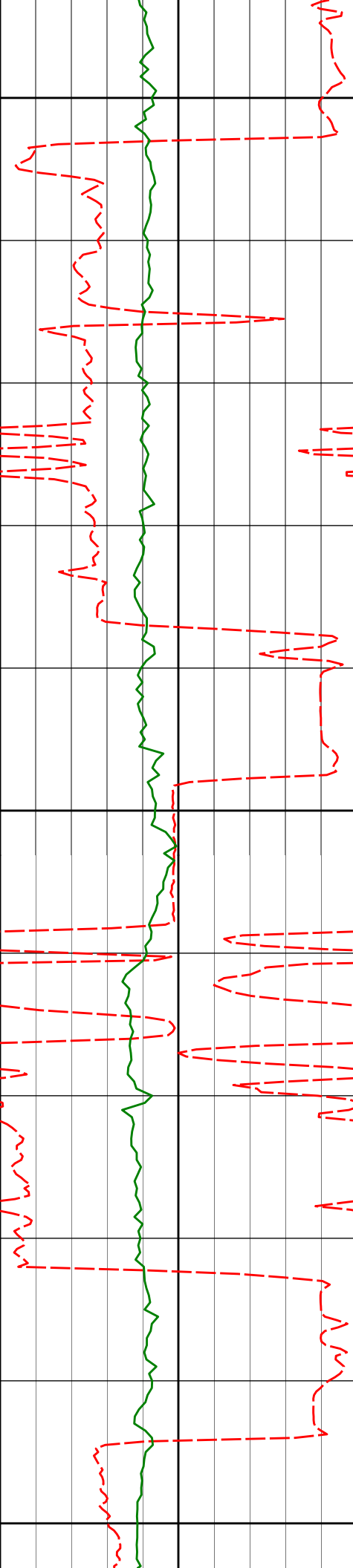
10619'

91.05°

86.94°

7028.66'

3745.44'



10700

10709'

90.55°

88.68°

7027.40'

3832.58'

10800

10798'

88.70°

86.70°

7027.97'

3918.81'

10900

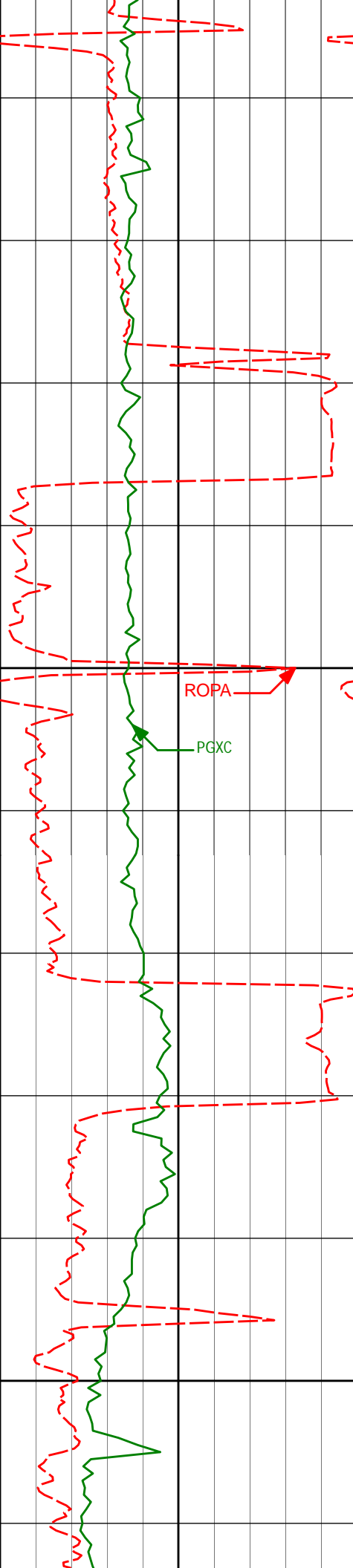
10888'

89.11°

88.00°

7029.69'

4006.13'



10978'

89.57°

89.48°

7030.73'

4092.91'

11000

ROPA

PGXC

11067'

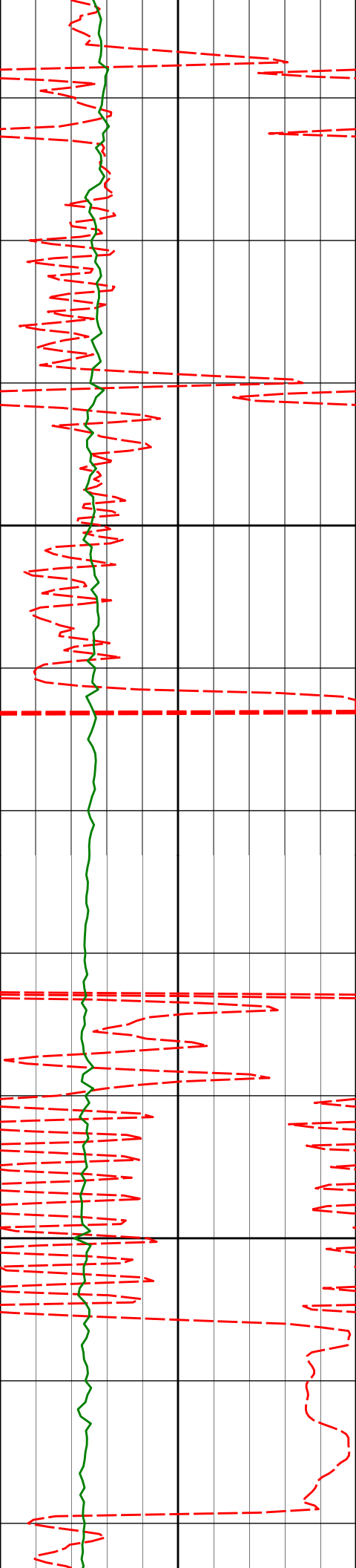
88.43°

89.28°

7032.29'

4178.44'

11100



11200

11300

11157'

88.83°

88.72°

7034.44'

4265.09'

11246'

89.75°

87.80°

7035.54'

4351.10'

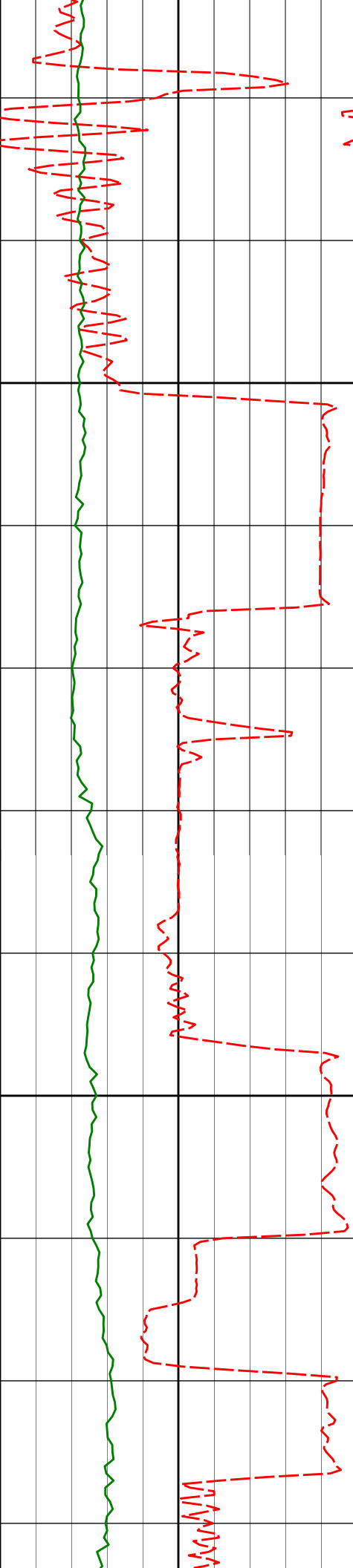
11335'

89.72°

87.13°

7035.95'

4437.42'



11400

11425'

89.51°

86.75°

7036.56'

4524.91'

11500

11515'

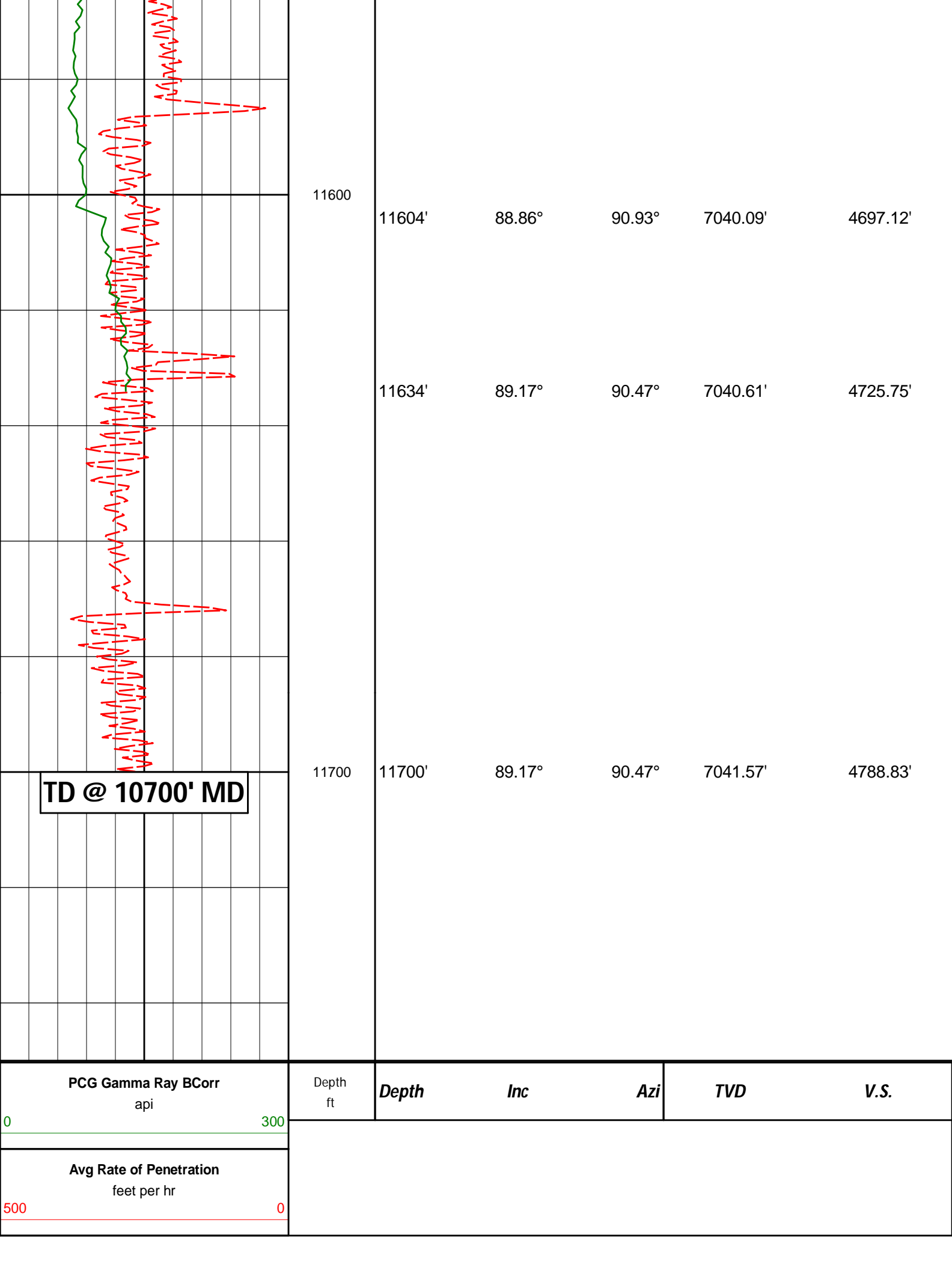
88.55°

89.43°

7038.08'

4611.94'





TD @ 10700' MD

PCG Gamma Ray BCorr  
api

Depth  
ft

Depth

Inc

Azi

TVD

V.S.

Avg Rate of Penetration  
feet per hr

500 0

# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Noble Energy  
Loeffler K1-69-1HN-A1

Wattenburg  
Weld Colorado

USA

CA-XX-0900671432

Tie in to shoe at 623' md First two surveys are imported wire line surveys corrected to gird North.  
Final survey is a projection to bit

| <i>Measured<br/>Depth<br/>(feet)</i> | <i>Inclination<br/>(degrees)</i> | <i>Direction<br/>(degrees)</i> | <i>Vertical<br/>Depth<br/>(feet)</i> | <i>Latitude<br/>(feet)</i> | <i>Departure<br/>(feet)</i> | <i>Vertical<br/>Section<br/>(feet)</i> | <i>Dogleg<br/>(deg/100ft)</i> |
|--------------------------------------|----------------------------------|--------------------------------|--------------------------------------|----------------------------|-----------------------------|--|-------------------------------|
| 0.00                                 | 0.00                             | 0.00                           | 0.00                                 | 0.00 N                     | 0.00 E                      | 0.00                                   | TIE-IN                        |
| 306.00                               | 0.20                             | 331.68                         | 306.00                               | 0.47 N                     | 0.25 W                      | -0.11                                  | 0.07                          |
| 623.00                               | 0.00                             | 291.28                         | 623.00                               | 0.96 N                     | 0.52 W                      | -0.22                                  | 0.06                          |
| 698.00                               | 0.51                             | 214.20                         | 698.00                               | 0.68 N                     | 0.70 W                      | -0.48                                  | 0.67                          |
| 787.00                               | 0.80                             | 167.40                         | 786.99                               | 0.25 S                     | 0.79 W                      | -0.82                                  | 0.66                          |
| 877.00                               | 0.63                             | 265.66                         | 876.99                               | 0.90 S                     | 1.14 W                      | -1.35                                  | 1.21                          |
| 966.00                               | 0.38                             | 219.55                         | 965.98                               | 1.17 S                     | 1.82 W                      | -2.07                                  | 0.51                          |
| 1056.00                              | 0.77                             | 301.77                         | 1055.98                              | 1.08 S                     | 2.52 W                      | -2.73                                  | 0.90                          |
| 1135.00                              | 0.99                             | 307.48                         | 1134.97                              | 0.38 S                     | 3.51 W                      | -3.48                                  | 0.29                          |
| 1229.00                              | 3.78                             | 347.51                         | 1228.89                              | 3.13 N                     | 4.83 W                      | -3.73                                  | 3.28                          |
| 1323.00                              | 5.15                             | 354.87                         | 1322.60                              | 10.36 N                    | 5.87 W                      | -2.67                                  | 1.58                          |
| 1418.00                              | 7.45                             | 356.32                         | 1417.02                              | 20.75 N                    | 6.65 W                      | -0.44                                  | 2.43                          |
| 1512.00                              | 9.52                             | 357.45                         | 1509.99                              | 34.59 N                    | 7.39 W                      | 2.81                                   | 2.21                          |
| 1606.00                              | 10.34                            | 351.94                         | 1602.58                              | 50.71 N                    | 8.92 W                      | 5.96                                   | 1.33                          |
| 1700.00                              | 10.83                            | 350.17                         | 1694.98                              | 67.76 N                    | 11.61 W                     | 8.26                                   | 0.63                          |
| 1794.00                              | 12.20                            | 351.80                         | 1787.09                              | 86.28 N                    | 14.53 W                     | 10.76                                  | 1.50                          |
| 1889.00                              | 11.14                            | 348.85                         | 1880.13                              | 105.22 N                   | 17.73 W                     | 13.10                                  | 1.28                          |
| 1983.00                              | 12.73                            | 348.76                         | 1972.09                              | 124.29 N                   | 21.51 W                     | 14.94                                  | 1.70                          |
| 2077.00                              | 13.28                            | 356.75                         | 2063.69                              | 145.23 N                   | 24.14 W                     | 18.41                                  | 2.00                          |
| 2171.00                              | 12.79                            | 355.93                         | 2155.26                              | 166.39 N                   | 25.49 W                     | 23.16                                  | 0.56                          |
| 2265.00                              | 12.20                            | 354.27                         | 2247.04                              | 186.65 N                   | 27.22 W                     | 27.30                                  | 0.74                          |
| 2359.00                              | 10.60                            | 350.23                         | 2339.18                              | 205.06 N                   | 29.68 W                     | 30.21                                  | 1.90                          |
| 2451.00                              | 12.68                            | 354.87                         | 2429.29                              | 223.45 N                   | 32.02 W                     | 33.23                                  | 2.48                          |
| 2513.00                              | 12.44                            | 354.38                         | 2489.80                              | 236.87 N                   | 33.28 W                     | 35.86                                  | 0.43                          |
| 2602.00                              | 12.47                            | 355.22                         | 2576.71                              | 255.99 N                   | 35.02 W                     | 39.66                                  | 0.21                          |
| 2692.00                              | 13.95                            | 355.66                         | 2664.32                              | 276.49 N                   | 36.65 W                     | 43.96                                  | 1.65                          |
| 2781.00                              | 12.38                            | 351.43                         | 2750.99                              | 296.62 N                   | 38.88 W                     | 47.58                                  | 2.07                          |
| 2871.00                              | 10.48                            | 348.83                         | 2839.20                              | 314.19 N                   | 41.91 W                     | 49.71                                  | 2.18                          |
| 2961.00                              | 10.11                            | 348.19                         | 2927.75                              | 329.96 N                   | 45.11 W                     | 51.15                                  | 0.44                          |
| 3050.00                              | 9.57                             | 345.83                         | 3015.44                              | 344.78 N                   | 48.52 W                     | 52.12                                  | 0.75                          |
| 3140.00                              | 11.49                            | 345.02                         | 3103.92                              | 360.69 N                   | 52.67 W                     | 52.70                                  | 2.14                          |
| 3230.00                              | 10.64                            | 338.45                         | 3192.25                              | 377.08 N                   | 58.04 W                     | 52.24                                  | 1.69                          |
| 3319.00                              | 9.50                             | 345.70                         | 3279.88                              | 391.85 N                   | 62.87 W                     | 51.83                                  | 1.91                          |
| 3409.00                              | 9.92                             | 346.26                         | 3368.59                              | 406.57 N                   | 66.55 W                     | 52.52                                  | 0.47                          |
| 3498.00                              | 11.37                            | 348.41                         | 3456.06                              | 422.61 N                   | 70.13 W                     | 53.68                                  | 1.69                          |
| 3588.00                              | 9.26                             | 343.12                         | 3544.60                              | 438.23 N                   | 74.02 W                     | 54.42                                  | 2.56                          |
| 3678.00                              | 10.77                            | 343.55                         | 3633.22                              | 453.23 N                   | 78.50 W                     | 54.41                                  | 1.68                          |
| 3767.00                              | 11.93                            | 352.11                         | 3720.49                              | 470.32 N                   | 82.12 W                     | 55.83                                  | 2.30                          |
| 3857.00                              | 12.90                            | 352.21                         | 3808.38                              | 489.49 N                   | 84.76 W                     | 58.79                                  | 1.07                          |
| 3946.00                              | 13.14                            | 351.61                         | 3895.09                              | 509.34 N                   | 87.58 W                     | 61.76                                  | 0.32                          |
| 4036.00                              | 10.83                            | 353.94                         | 3983.13                              | 527.87 N                   | 89.97 W                     | 64.78                                  | 2.62                          |
| 4126.00                              | 9.72                             | 350.01                         | 4071.68                              | 543.77 N                   | 92.18 W                     | 67.20                                  | 1.46                          |
| 4215.00                              | 11.51                            | 349.73                         | 4159.15                              | 559.91 N                   | 95.06 W                     | 69.05                                  | 2.01                          |
| 4305.00                              | 10.82                            | 347.97                         | 4247.45                              | 577.01 N                   | 98.43 W                     | 70.72                                  | 0.85                          |
| 4394.00                              | 11.80                            | 350.76                         | 4334.72                              | 594.16 N                   | 101.63 W                    | 72.56                                  | 1.25                          |
| 4484.00                              | 10.94                            | 349.21                         | 4422.96                              | 611.63 N                   | 104.71 W                    | 74.61                                  | 1.01                          |
| 4573.00                              | 10.75                            | 347.84                         | 4510.37                              | 628.04 N                   | 108.03 W                    | 76.11                                  | 0.36                          |
| 4663.00                              | 10.71                            | 353.85                         | 4598.80                              | 644.56 N                   | 110.70 W                    | 78.29                                  | 1.24                          |
| 4753.00                              | 9.42                             | 355.14                         | 4687.41                              | 660.21 N                   | 112.22 W                    | 81.31                                  | 1.46                          |
| 4842.00                              | 9.93                             | 350.06                         | 4775.15                              | 675.02 N                   | 114.16 W                    | 83.68                                  | 1.11                          |
| 4932.00                              | 11.62                            | 350.36                         | 4863.56                              | 691.60 N                   | 117.02 W                    | 85.69                                  | 1.88                          |
| 5022.00                              | 11.53                            | 350.60                         | 4951.73                              | 709.41 N                   | 120.00 W                    | 87.92                                  | 0.11                          |
| 5111.00                              | 10.16                            | 349.29                         | 5039.13                              | 725.90 N                   | 122.91 W                    | 89.84                                  | 1.56                          |
| 5201.00                              | 11.03                            | 350.38                         | 5127.60                              | 742.18 N                   | 125.83 W                    | 91.71                                  | 0.99                          |

|          |       |        |         |           |           |         |       |
|----------|-------|--------|---------|-----------|-----------|---------|-------|
| 5291.00  | 9.65  | 348.23 | 5216.14 | 758.06 N  | 128.81 W  | 93.40   | 1.59  |
| 5380.00  | 10.54 | 354.53 | 5303.76 | 773.46 N  | 131.10 W  | 95.60   | 1.59  |
| 5470.00  | 9.17  | 353.60 | 5392.43 | 788.78 N  | 132.69 W  | 98.46   | 1.52  |
| 5560.00  | 10.22 | 348.31 | 5481.15 | 803.72 N  | 135.11 W  | 100.42  | 1.52  |
| 5649.00  | 11.13 | 344.05 | 5568.61 | 819.71 N  | 139.07 W  | 101.20  | 1.35  |
| 5739.00  | 11.57 | 345.91 | 5656.85 | 836.81 N  | 143.65 W  | 101.70  | 0.64  |
| 5829.00  | 11.29 | 355.55 | 5745.07 | 854.35 N  | 146.53 W  | 103.96  | 2.14  |
| 5918.00  | 9.37  | 350.81 | 5832.63 | 870.18 N  | 148.36 W  | 106.73  | 2.36  |
| 6008.00  | 10.84 | 348.88 | 5921.23 | 885.72 N  | 151.16 W  | 108.49  | 1.68  |
| 6097.00  | 11.61 | 358.92 | 6008.54 | 902.89 N  | 152.95 W  | 111.69  | 2.36  |
| 6187.00  | 9.46  | 353.91 | 6097.02 | 919.30 N  | 153.90 W  | 115.47  | 2.60  |
| 6277.00  | 9.98  | 357.15 | 6185.72 | 934.44 N  | 155.07 W  | 118.68  | 0.84  |
| 6322.00  | 10.30 | 357.89 | 6230.02 | 942.36 N  | 155.42 W  | 120.61  | 0.77  |
| 6366.00  | 14.31 | 1.50   | 6273.00 | 951.73 N  | 155.42 W  | 123.29  | 9.26  |
| 6411.00  | 19.89 | 2.40   | 6316.00 | 964.95 N  | 154.95 W  | 127.52  | 12.42 |
| 6456.00  | 23.62 | 1.06   | 6357.78 | 981.61 N  | 154.46 W  | 132.75  | 8.37  |
| 6501.00  | 25.23 | 358.75 | 6398.75 | 1000.22 N | 154.51 W  | 138.03  | 4.16  |
| 6545.00  | 28.37 | 355.17 | 6438.03 | 1020.02 N | 155.59 W  | 142.66  | 8.01  |
| 6590.00  | 32.70 | 356.68 | 6476.78 | 1042.81 N | 157.20 W  | 147.64  | 9.79  |
| 6635.00  | 36.33 | 358.67 | 6513.85 | 1068.29 N | 158.21 W  | 153.95  | 8.44  |
| 6680.00  | 37.97 | 5.06   | 6549.73 | 1095.41 N | 157.30 W  | 162.59  | 9.31  |
| 6725.00  | 38.05 | 11.27  | 6585.20 | 1122.81 N | 153.36 W  | 174.19  | 8.49  |
| 6769.00  | 40.45 | 21.53  | 6619.31 | 1149.42 N | 145.47 W  | 189.37  | 15.72 |
| 6814.00  | 43.47 | 29.32  | 6652.79 | 1176.52 N | 132.52 W  | 209.53  | 13.37 |
| 6859.00  | 43.82 | 37.72  | 6685.38 | 1202.36 N | 115.39 W  | 233.33  | 12.89 |
| 6904.00  | 45.46 | 47.66  | 6717.44 | 1225.52 N | 93.98 W   | 260.47  | 15.93 |
| 6948.00  | 47.31 | 56.90  | 6747.83 | 1244.93 N | 68.81 W   | 290.14  | 15.77 |
| 6993.00  | 48.56 | 64.71  | 6778.00 | 1261.18 N | 39.68 W   | 322.70  | 13.18 |
| 7038.00  | 51.86 | 67.72  | 6806.80 | 1275.10 N | 8.04 W    | 357.00  | 8.95  |
| 7083.00  | 53.94 | 70.00  | 6833.94 | 1288.04 N | 25.43 E   | 392.78  | 6.13  |
| 7128.00  | 56.07 | 74.46  | 6859.75 | 1299.27 N | 60.53 E   | 429.62  | 9.40  |
| 7173.00  | 57.50 | 80.59  | 6884.42 | 1307.38 N | 97.26 E   | 467.14  | 11.83 |
| 7217.00  | 59.36 | 82.15  | 6907.46 | 1312.99 N | 134.32 E  | 504.26  | 5.20  |
| 7262.00  | 61.01 | 83.43  | 6929.83 | 1317.89 N | 173.06 E  | 542.77  | 4.42  |
| 7307.00  | 62.57 | 83.89  | 6951.10 | 1322.27 N | 212.47 E  | 581.79  | 3.58  |
| 7352.00  | 66.64 | 84.83  | 6970.40 | 1326.26 N | 252.91 E  | 621.69  | 9.24  |
| 7397.00  | 69.60 | 85.05  | 6987.16 | 1329.94 N | 294.50 E  | 662.59  | 6.59  |
| 7442.00  | 72.86 | 86.27  | 7001.64 | 1333.16 N | 336.98 E  | 704.22  | 7.69  |
| 7487.00  | 75.95 | 87.51  | 7013.74 | 1335.51 N | 380.26 E  | 746.36  | 7.36  |
| 7531.00  | 79.39 | 88.59  | 7023.13 | 1336.97 N | 423.21 E  | 787.93  | 8.18  |
| 7617.00  | 82.02 | 88.49  | 7037.02 | 1339.13 N | 508.05 E  | 869.84  | 3.06  |
| 7707.00  | 82.24 | 88.28  | 7049.35 | 1341.64 N | 597.16 E  | 955.95  | 0.33  |
| 7796.00  | 83.82 | 88.02  | 7060.15 | 1344.49 N | 685.45 E  | 1041.37 | 1.80  |
| 7886.00  | 85.58 | 89.74  | 7068.46 | 1346.24 N | 775.05 E  | 1127.72 | 2.73  |
| 7976.00  | 87.60 | 91.00  | 7073.81 | 1345.66 N | 864.88 E  | 1213.64 | 2.64  |
| 8110.00  | 90.89 | 90.67  | 7075.57 | 1343.71 N | 998.83 E  | 1341.44 | 2.47  |
| 8200.00  | 93.58 | 89.87  | 7072.06 | 1343.28 N | 1088.76 E | 1427.48 | 3.11  |
| 8289.00  | 92.96 | 90.55  | 7066.99 | 1342.96 N | 1177.61 E | 1512.53 | 1.03  |
| 8379.00  | 92.00 | 89.97  | 7063.09 | 1342.55 N | 1267.52 E | 1598.57 | 1.24  |
| 8469.00  | 92.34 | 89.69  | 7059.68 | 1342.82 N | 1357.46 E | 1684.82 | 0.49  |
| 8558.00  | 92.56 | 89.18  | 7055.88 | 1343.71 N | 1446.37 E | 1770.28 | 0.62  |
| 8648.00  | 93.24 | 87.67  | 7051.32 | 1346.18 N | 1536.22 E | 1857.08 | 1.83  |
| 8737.00  | 91.63 | 88.53  | 7047.54 | 1349.12 N | 1625.09 E | 1943.07 | 2.05  |
| 8827.00  | 90.62 | 88.85  | 7045.77 | 1351.17 N | 1715.04 E | 2029.86 | 1.19  |
| 8917.00  | 90.83 | 91.34  | 7044.63 | 1351.02 N | 1805.03 E | 2116.04 | 2.77  |
| 9006.00  | 91.73 | 90.32  | 7042.65 | 1349.73 N | 1894.00 E | 2200.92 | 1.52  |
| 9096.00  | 90.80 | 89.90  | 7040.66 | 1349.56 N | 1983.97 E | 2287.09 | 1.13  |
| 9186.00  | 88.64 | 89.86  | 7041.10 | 1349.74 N | 2073.97 E | 2373.38 | 2.40  |
| 9275.00  | 88.49 | 89.51  | 7043.32 | 1350.23 N | 2162.94 E | 2458.77 | 0.43  |
| 9365.00  | 90.15 | 89.44  | 7044.39 | 1351.05 N | 2252.92 E | 2545.23 | 1.85  |
| 9454.00  | 90.15 | 88.86  | 7044.15 | 1352.37 N | 2341.91 E | 2630.88 | 0.65  |
| 9544.00  | 91.57 | 89.82  | 7042.79 | 1353.40 N | 2431.89 E | 2717.40 | 1.90  |
| 9634.00  | 90.89 | 91.03  | 7040.86 | 1352.74 N | 2521.87 E | 2803.43 | 1.54  |
| 9723.00  | 91.57 | 90.82  | 7038.94 | 1351.31 N | 2610.83 E | 2888.27 | 0.80  |
| 9813.00  | 92.99 | 89.21  | 7035.36 | 1351.28 N | 2700.76 E | 2974.43 | 2.38  |
| 9902.00  | 92.84 | 89.53  | 7030.84 | 1352.26 N | 2789.64 E | 3059.87 | 0.39  |
| 9992.00  | 90.56 | 90.01  | 7028.17 | 1352.63 N | 2879.59 E | 3146.17 | 2.59  |
| 10082.00 | 90.77 | 90.79  | 7027.13 | 1351.99 N | 2969.58 E | 3232.22 | 0.90  |
| 10171.00 | 88.95 | 92.20  | 7027.34 | 1349.67 N | 3058.55 E | 3316.81 | 2.59  |
| 10261.00 | 88.95 | 92.20  | 7028.99 | 1346.21 N | 3148.46 E | 3401.98 | 0.00  |
| 10350.00 | 91.11 | 92.51  | 7028.94 | 1342.55 N | 3237.38 E | 3486.14 | 2.45  |
| 10440.00 | 89.72 | 88.54  | 7028.29 | 1341.73 N | 3327.36 E | 3572.12 | 4.67  |
| 10530.00 | 89.38 | 87.93  | 7028.99 | 1344.50 N | 3417.31 E | 3659.10 | 0.78  |
| 10619.00 | 91.05 | 86.94  | 7028.66 | 1348.49 N | 3506.22 E | 3745.44 | 2.18  |

|          |       |       |         |           |           |         |      |
|----------|-------|-------|---------|-----------|-----------|---------|------|
| 10709.00 | 90.55 | 88.68 | 7027.40 | 1351.92 N | 3596.14 E | 3832.58 | 2.00 |
| 10798.00 | 88.70 | 86.70 | 7027.97 | 1355.51 N | 3685.06 E | 3918.81 | 3.04 |
| 10888.00 | 89.11 | 88.00 | 7029.69 | 1359.67 N | 3774.94 E | 4006.13 | 1.51 |
| 10978.00 | 89.57 | 89.48 | 7030.73 | 1361.65 N | 3864.91 E | 4092.91 | 1.73 |
| 11067.00 | 88.43 | 89.28 | 7032.29 | 1362.61 N | 3953.89 E | 4178.44 | 1.30 |
| 11157.00 | 88.83 | 88.72 | 7034.44 | 1364.17 N | 4043.85 E | 4265.09 | 0.77 |
| 11246.00 | 89.75 | 87.80 | 7035.54 | 1366.87 N | 4132.80 E | 4351.10 | 1.47 |
| 11335.00 | 89.72 | 87.13 | 7035.95 | 1370.81 N | 4221.71 E | 4437.42 | 0.76 |
| 11425.00 | 89.51 | 86.75 | 7036.56 | 1375.61 N | 4311.58 E | 4524.91 | 0.48 |
| 11515.00 | 88.55 | 89.43 | 7038.08 | 1378.61 N | 4401.51 E | 4611.94 | 3.16 |
| 11604.00 | 88.86 | 90.93 | 7040.09 | 1378.33 N | 4490.48 E | 4697.12 | 1.71 |
| 11634.00 | 89.17 | 90.47 | 7040.61 | 1377.97 N | 4520.48 E | 4725.75 | 1.83 |
| 11700.00 | 89.17 | 90.47 | 7041.57 | 1377.43 N | 4586.47 E | 4788.83 | 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 73.38 DEGREES (GRID)  
A TOTAL CORRECTION OF 8.08 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 11700.00 FEET  
IS 4788.84 FEET ALONG 73.28 DEGREES (GRID)**

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