



| WELL INFORMATION                 |                  |                  |                   |                   |  |
|----------------------------------|------------------|------------------|-------------------|-------------------|--|
| MWD Run Number                   | 100              | 200              | 300               | 400               |  |
| Date run completed               | 10-Nov-13        | 11-Nov-13        | 15-Nov-13         | 18-Nov-13         |  |
| Rig Bit Number                   | 1                | 3                | 4                 | 5                 |  |
| Bit Size (in)                    | 8.75             | 8.75             | 6.125             | 6.125             |  |
| Tool Nominal OD (in)             | 6.750            | 6.750            | 4.75              | 4.75              |  |
| Log Start Depth (MD, ft)         | 797.00           | 5,981.00         | 7,185.00          | 12,528.00         |  |
| Log End Depth (MD, ft)           | 5,981.00         | 7,185.00         | 12,528.00         | 16,231.00         |  |
| Drill or Wipe                    | Drill            | Drill            | Drill             | Drill             |  |
| Drill/Wipe Start Date and Time   | 10-Nov-13 00:30  | 10-Nov-13 03:30  | 13-Nov-13 01:30   | 15-Nov-13 11:00   |  |
| Drill/Wipe End Date and Time     | 10-Nov-13 16:45  | 11-Nov-13 16:00  | 14-Nov-13 14:30   | 17-Nov-13 15:15   |  |
| Min Inc (deg) @ Depth (MD, ft)   | .09 @ 5,830.00   | 3.88 @ 6,008.00  | 86.55 @ 7,233.00  | 88.74 @ 14,224.00 |  |
| Max Inc (deg) @ Depth (MD, ft)   | 16.42 @ 2,984.00 | 80.29 @ 7,131.00 | 93.21 @ 10,825.00 | 92.87 @ 12,895.00 |  |
| Bit TFA(in2) / Bit Type          | .91 / PDC        | 1.24 / PDC       | .98 / PDC         | .98 / PDC         |  |
| Flow Rate (gpm)                  | 547.97           | 572.22           | 298.59            | 300.00            |  |
| Max AV (fpm) / CV (fpm) @ MWD    | 412.0 / NA       | 412.7 / NA       | 450.0 / NA        | 434.0 / NA        |  |
| Fluid Type                       | Fresh Water Gel  | Fresh Water Gel  | Fresh Water Gel   | Fresh Water Gel   |  |
| Density (ppg) / Viscosity (spqt) | 8.70 / 26.00     | 10.00 / 37.00    | 9.00 / 33.00      | 9.10 / 38.00      |  |
| Filtrate CL (ppm)                | 2,200.00         | 2,000.00         | 2,500.00          | 2,100.00          |  |
| pH / Fluid Loss (mptm)           | 9.00 / NA        | 9.50 / NA        | 8.80 / NA         | 8.60 / NA         |  |
| PV (cP) / YP (Ihf2)              | 1 / 4.00         | 11 / 11.00       | 7 / 6.00          | 10 / 16.00        |  |
| % Solids / % Sand                | 2.20 / 0.20      | 10.5 / 0.20      | 3 / .25           | 5.50 / 0.45       |  |
| % Oil / Oil:Water Ratio          | 0 / 0:95         | 0 / 0:95         | 0 / 0:95          | 0 / 0:95          |  |
| Rm @ Measured Temp (degF)        | NA @ NA          | NA @ NA          | NA @ NA           | NA @ NA           |  |
| Rmf @ Measured Temp (degF)       | NA @ NA          | NA @ NA          | NA @ NA           | NA @ NA           |  |
| Rmc @ Measured Temp (degF)       | NA @ NA          | NA @ NA          | NA @ NA           | NA @ NA           |  |
| Max Tool Temp (deg F) @ S        | 148 / 100M       | 125.50 / 100M    | 222.75 / 100M     | 222.22 / 100M     |  |

|                               |              |              |              |              |  |
|-------------------------------|--------------|--------------|--------------|--------------|--|
| Max Tool Temp (degF) / Source | 146 / PCM    | 165.58 / PCM | 228.74 / PCM | 230.30 / PCM |  |
| Rm @ Max Tool Temp (degF)     | NA @ NA      | NA @ NA      | NA @ NA      | NA @ NA      |  |
| Lead MWD Engineer             | Gary Eifert  | Gary Eifert  | Gary Eifert  | Gary Eifert  |  |
| Customer Representative       | Matt Settles | Matt Settles | Matt Settles | Matt Settles |  |

## SENSOR INFORMATION

### Downhole Processor Information

|                           |                 |                 |                 |                 |  |
|---------------------------|-----------------|-----------------|-----------------|-----------------|--|
| Tool Type                 | PCM             | PCM             | PCM             | PCM             |  |
| Software Version          | 5.84            | 5.84            | 5.84            | 5.84            |  |
| Sub Serial Number         | 11341340        | 11341340        | 11670105        | 11670105        |  |
| Insert Serial Number      | 11400840        | 11400840        | 11227514        | 11400840        |  |
| Date and Time Initialized | 09-Nov-13 13:19 | 01-Jan-70 00:00 | 12-Nov-13 02:03 | 15-Nov-13 03:18 |  |
| Date and Time Read        | 12-Nov-13 00:41 | 12-Nov-13 00:49 | 15-Nov-13 07:42 | 18-Nov-13 09:56 |  |
| ECMB SW Version           | N/A             | N/A             | N/A             | N/A             |  |

### Directional Sensor Information

|                        |          |          |          |          |  |
|------------------------|----------|----------|----------|----------|--|
| Tool Type              | PCDC     | PCDC     | PCDC     | PCDC     |  |
| Distance From Bit (ft) | 56.00    | 54.00    | 67.00    | 66.00    |  |
| Software Version       | 6.21     | 6.21     | 6.21     | 6.21     |  |
| Sub Serial Number      | 11341340 | 11341340 | 11670105 | 11670105 |  |
| Sonde Serial Number    | 11902117 | 11902117 | 12177530 | 11902117 |  |
| Sensor ID Number       | N/A      | N/A      | N/A      | N/A      |  |
| Toolface Offset (deg)  | 250.84   | 21.80    | 255.09   | 234.38   |  |

### Gamma Ray Sensor Information

|                              |          |          |          |          |  |
|------------------------------|----------|----------|----------|----------|--|
| Tool Type                    | PCG      | PCG      | PCG      | PCG      |  |
| Distance From Bit (ft)       | 49.55    | 47.55    | 59.96    | 59.50    |  |
| Recorded Sample Period (sec) | 10       | 10       | 10       | 10       |  |
| Software Version             | 8.15     | 8.15     | 8.15     | 8.15     |  |
| Sub Serial Number            | 11341340 | 11341340 | 11670105 | 11670105 |  |
| Insert/Sonde Serial Number   | 11579845 | 11579845 | 11579776 | 11579845 |  |

## 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 annual 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 7.4.2

# WARRANTY

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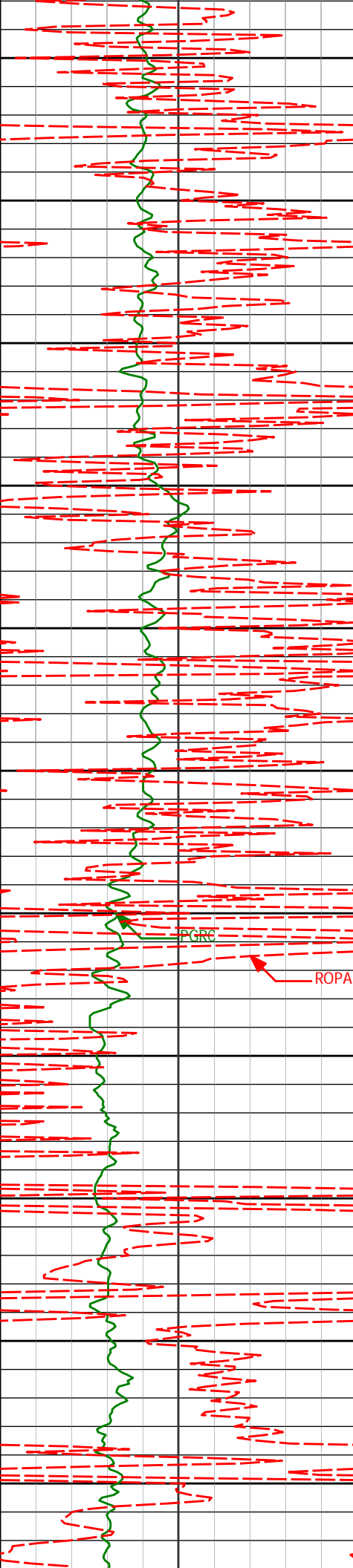
## HALLIBURTON

Sperry Drilling Services

### MD Main Log 1:600

Noble Energy  
NCLP PC AA04-65HN  
H&P 343  
T6N-R63W





3300

3350

3400

3450

3500

3550

3600

3650

3700

3750

3800

3363'

8.54°

1.11°

3328.82'

12.11'

3458'

7.22°

1.52°

3422.92'

13.09'

3553'

6.46°

10.45°

3517.25'

14.81'

3648'

7.29°

7.96°

3611.56'

17.20'

3742'

6.55°

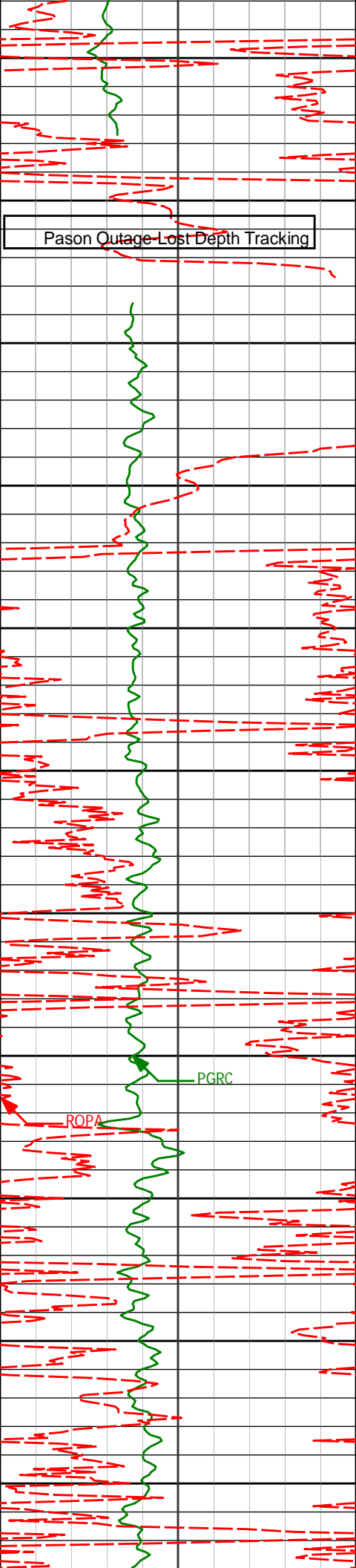
1.55°

3704.88'

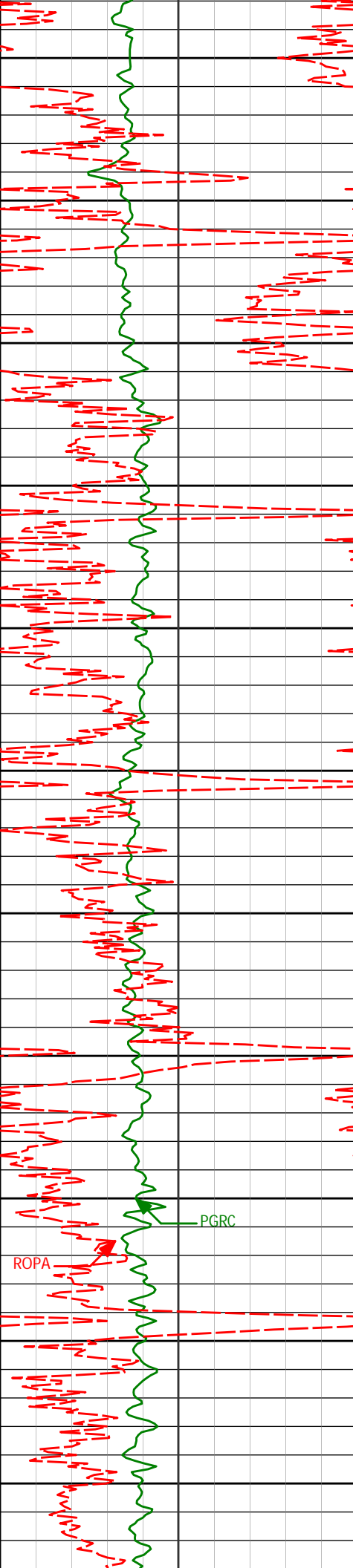
18.77'

FGRC

ROPA

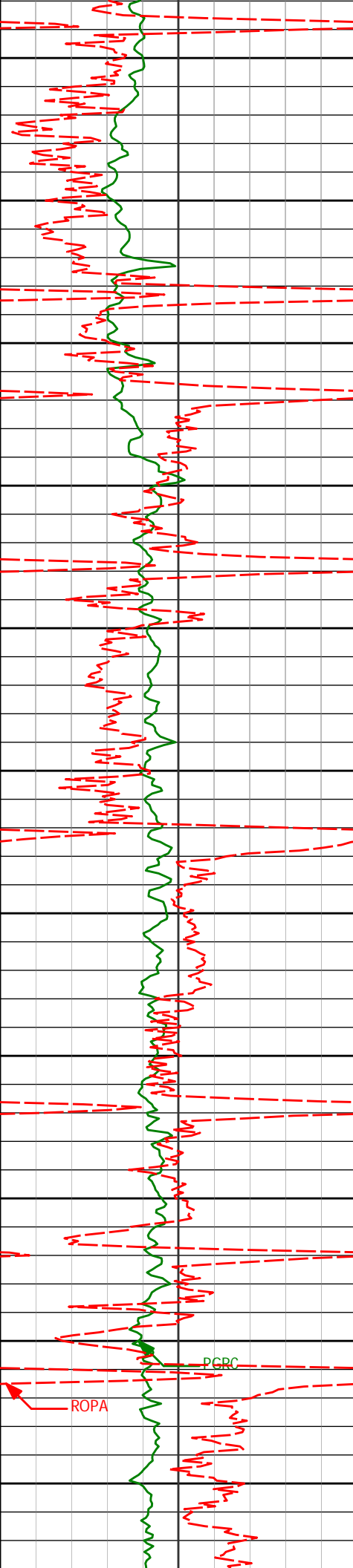


|       |       |         |          |        |
|-------|-------|---------|----------|--------|
| 3837' | 4.78° | 350.88° | 3799.41' | 18.78' |
| 3850  |       |         |          |        |
| 3900  |       |         |          |        |
| 3932' | 3.48° | 331.38° | 3894.17' | 17.11' |
| 3950  |       |         |          |        |
| 4000  |       |         |          |        |
| 4028' | 1.55° | 248.58° | 3990.09' | 14.62' |
| 4050  |       |         |          |        |
| 4100  |       |         |          |        |
| 4123' | 1.25° | 244.02° | 4085.07' | 12.45' |
| 4150  |       |         |          |        |
| 4200  |       |         |          |        |
| 4217' | 1.25° | 228.26° | 4179.04' | 10.71' |
| 4250  |       |         |          |        |
| 4300  |       |         |          |        |
| 4312' | 1.11° | 227.71° | 4274.02' | 9.18'  |
| 4350  |       |         |          |        |



4400  
4450  
4500  
4550  
4600  
4650  
4700  
4750  
4800  
4850  
4900

|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4407' | 0.57° | 195.52° | 4369.01' | 8.32' |
| 4502' | 0.55° | 187.60° | 4464.01' | 8.09' |
| 4597' | 0.59° | 204.48° | 4559.00' | 7.78' |
| 4692' | 0.83° | 206.45° | 4654.00' | 7.21' |
| 4787' | 1.17° | 201.93° | 4748.98' | 6.47' |
| 4881' | 0.71° | 227.06° | 4842.97' | 5.61' |



4950

4976'

0.34°

207.82°

4937.97'

5.02'

5000

5050

5071'

0.34°

220.49°

5032.96'

4.68'

5100

5150

5166'

0.36°

252.62°

5127.96'

4.20'

5200

5250

5261'

1.00°

222.12°

5222.96'

3.32'

5300

5350

5400

5450

5450'

0.72°

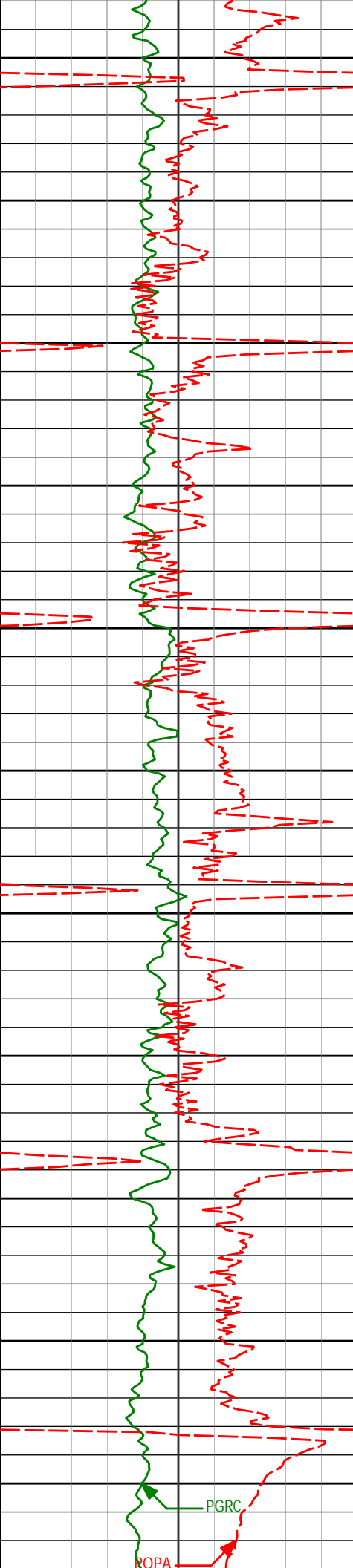
196.83°

5411.94'

1.75'

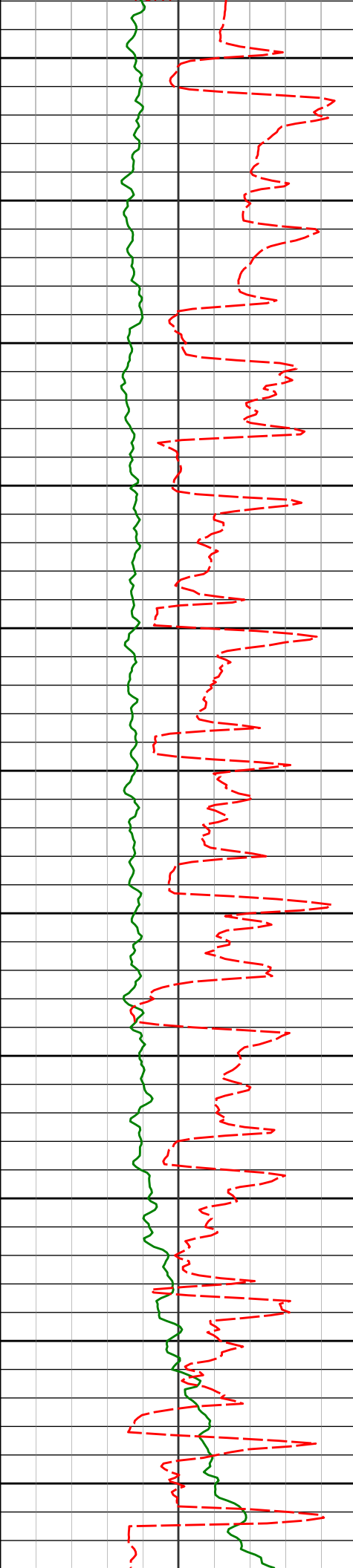
PGRC

ROPA

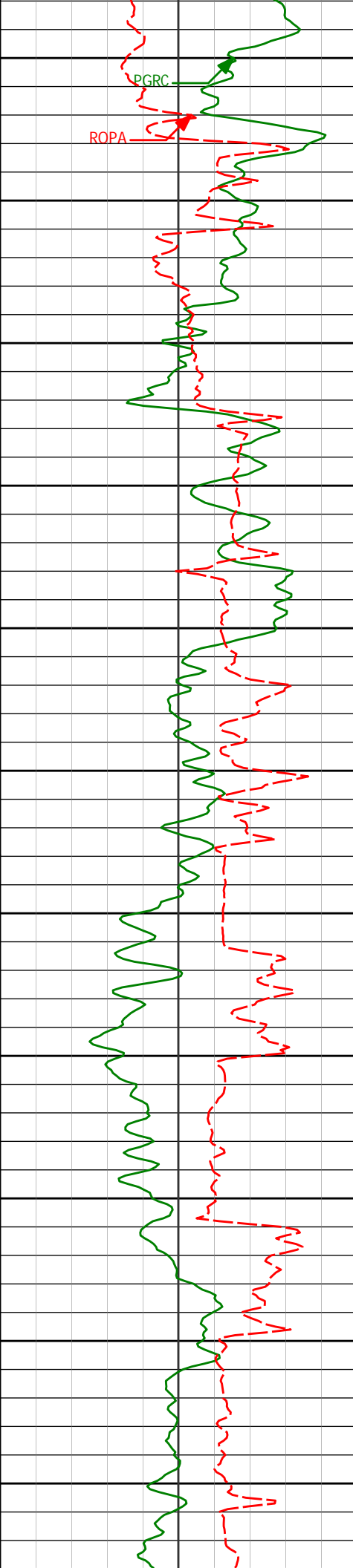


|           |       |         |          |       |
|-----------|-------|---------|----------|-------|
| 5500      |       |         |          |       |
| 5550      |       |         |          |       |
| 5600      |       |         |          |       |
| 5640'     | 0.26° | 137.28° | 5601.93' | 1.62' |
| 5650      |       |         |          |       |
| 5700      |       |         |          |       |
| 5735'     | 0.19° | 243.40° | 5696.93' | 1.61' |
| 5750      |       |         |          |       |
| 5800      |       |         |          |       |
| 5830'     | 0.09° | 317.62° | 5791.93' | 1.42' |
| 5850      |       |         |          |       |
| 5900      |       |         |          |       |
| 5925'     | 0.37° | 330.98° | 5886.93' | 1.24' |
| 5950      |       |         |          |       |
| <Run 200> |       |         |          |       |
| 6000      |       |         |          |       |
| 6008'     | 3.88° | 78.81°  | 5969.86' | 3.90' |





|      |       |        |        |          |         |
|------|-------|--------|--------|----------|---------|
| 6050 | 6056' | 8.58°  | 85.56° | 6017.57' | 9.09'   |
| 6100 | 6103' | 12.05° | 88.05° | 6063.80' | 17.50'  |
| 6150 | 6151' | 15.56° | 88.40° | 6110.41' | 28.95'  |
| 6200 | 6197' | 17.48° | 83.13° | 6154.51' | 42.01'  |
| 6250 | 6245' | 20.14° | 83.09° | 6199.94' | 57.45'  |
| 6300 | 6292' | 22.61° | 88.37° | 6243.71' | 74.56'  |
| 6350 | 6340' | 24.86° | 92.52° | 6287.65' | 93.83'  |
| 6400 | 6387' | 26.23° | 90.54° | 6330.06' | 114.03' |
| 6450 | 6435' | 30.26° | 88.50° | 6372.33' | 136.72' |
| 6500 | 6482' | 36.63° | 85.88° | 6411.53' | 162.61' |
| 6550 | 6576' | 49.61° | 88.10° | 6480.00' | 226.71' |



6600

6650

6700

6750

6800

6850

6900

6950

7000

7050

7100

6671'

57.31°

88.47°

6536.52'

302.96'

6719'

57.62°

87.88°

6562.34'

343.42'

6766'

58.00°

87.50°

6587.38'

383.19'

6861'

65.67°

88.63°

6632.18'

466.86'

6956'

72.70°

87.42°

6665.92'

555.59'

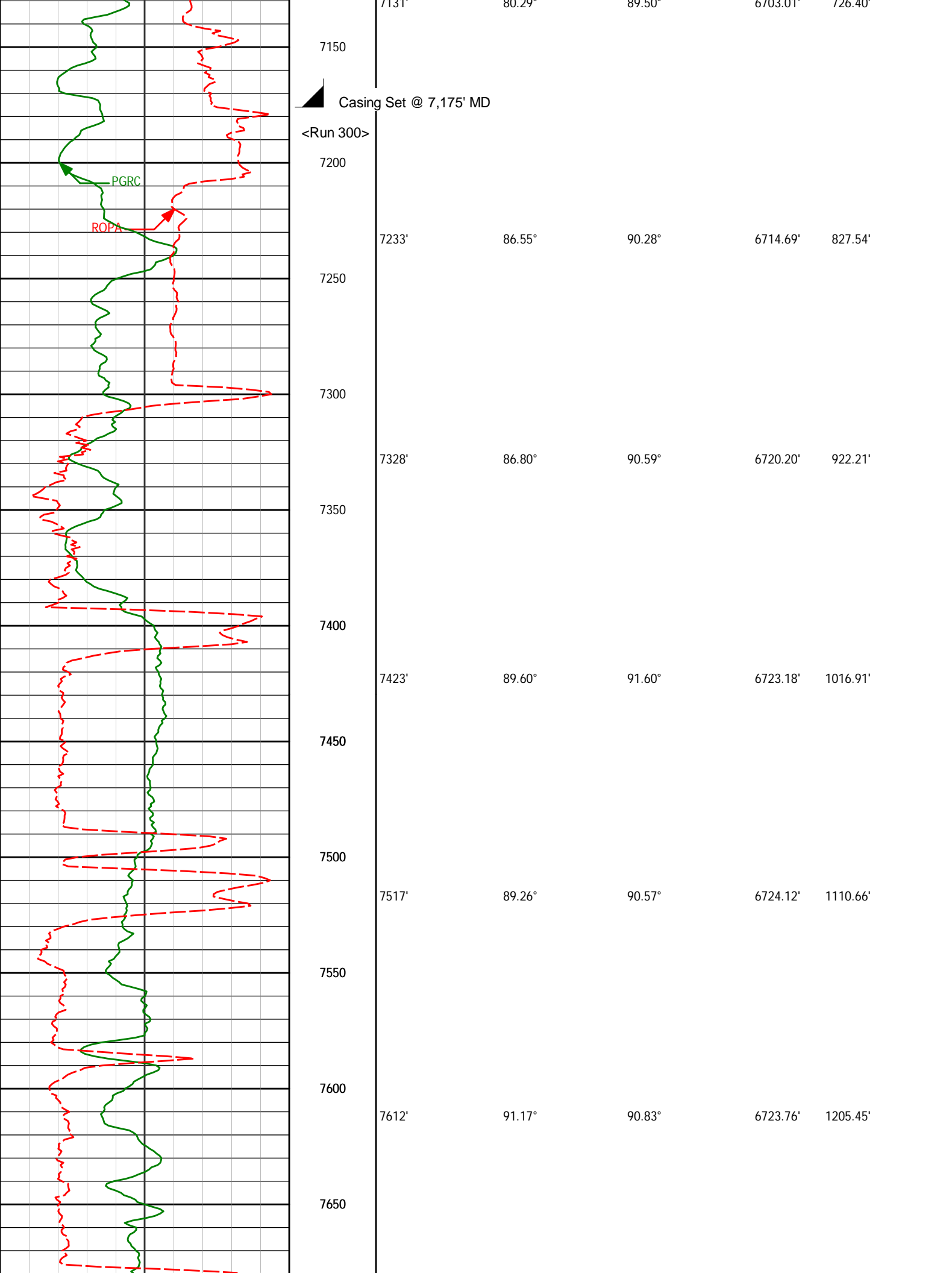
7051'

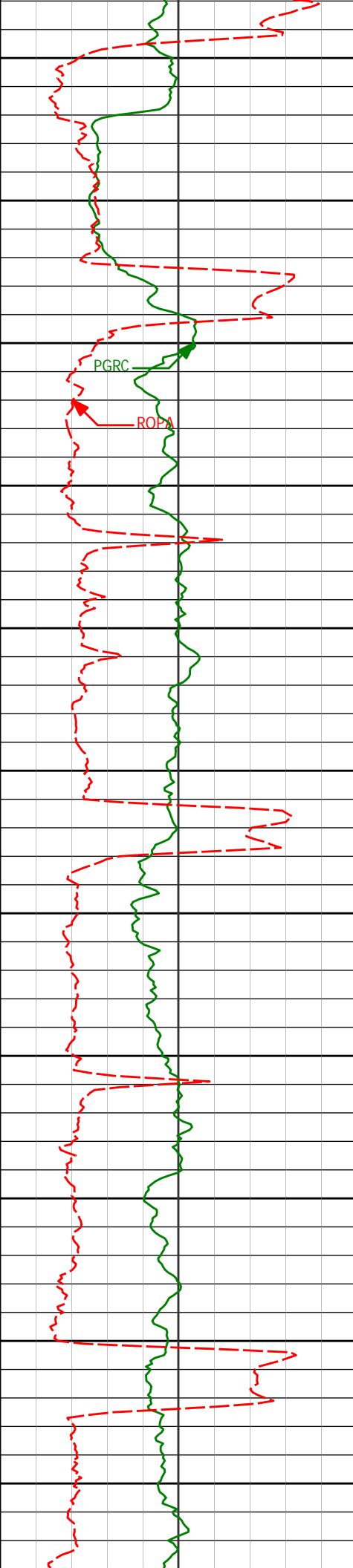
79.34°

88.44°

6688.86'

647.71'





7700

7707'

92.31°

89.47°

6720.88'

1300.26'

7750

7800

7801'

88.80°

86.84°

6719.97'

1394.21'

7850

7900

7896'

89.48°

86.34°

6721.39'

1489.20'

7950

8000

7991'

89.38°

88.67°

6722.34'

1584.18'

8050

8100

8086'

91.64°

88.74°

6721.49'

1679.13'

8150

8200

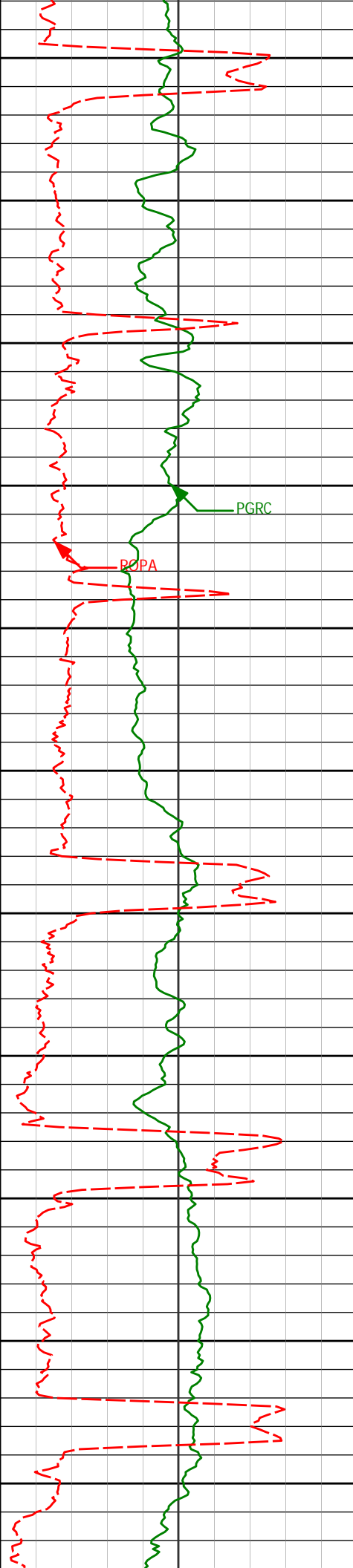
8181'

90.00°

88.38°

6720.13'

1774.08'



8250

8276'

88.58°

88.38°

6721.31'

1869.04'

8300

8350

8371'

88.86°

88.67°

6723.43'

1963.98'

8400

PGRC

BOPA

8450

8465'

91.67°

88.83°

6723.00'

2057.92'

8500

8550

8560'

91.88°

89.25°

6720.05'

2152.82'

8600

8650

8655'

90.71°

89.71°

6717.91'

2247.70'

8700

8750

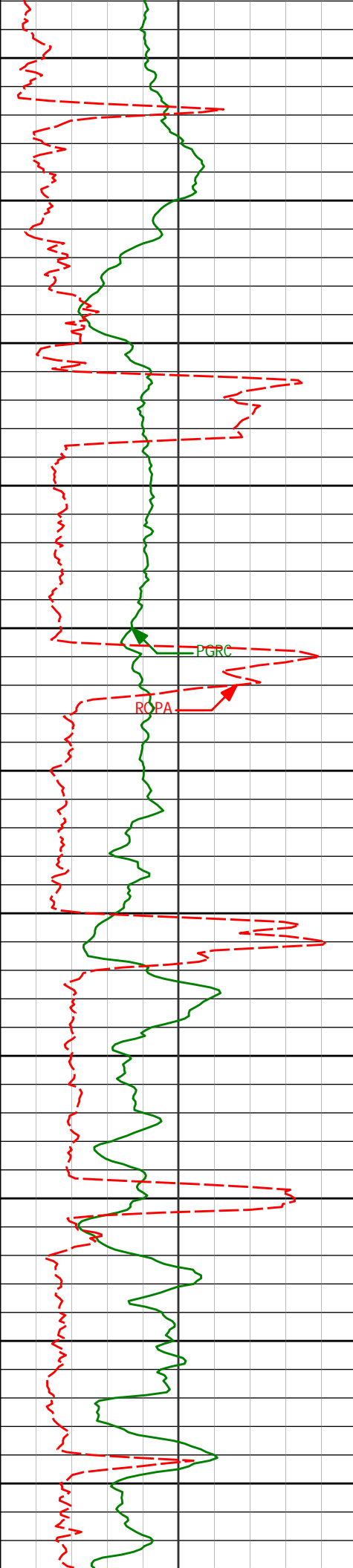
8750'

89.23°

89.95°

6717.96'

2342.58'



8800

8850

8900

8950

9000

9050

9100

9150

9200

9250

9300

8845'      92.50°      90.82°      6716.52'      2437.38'

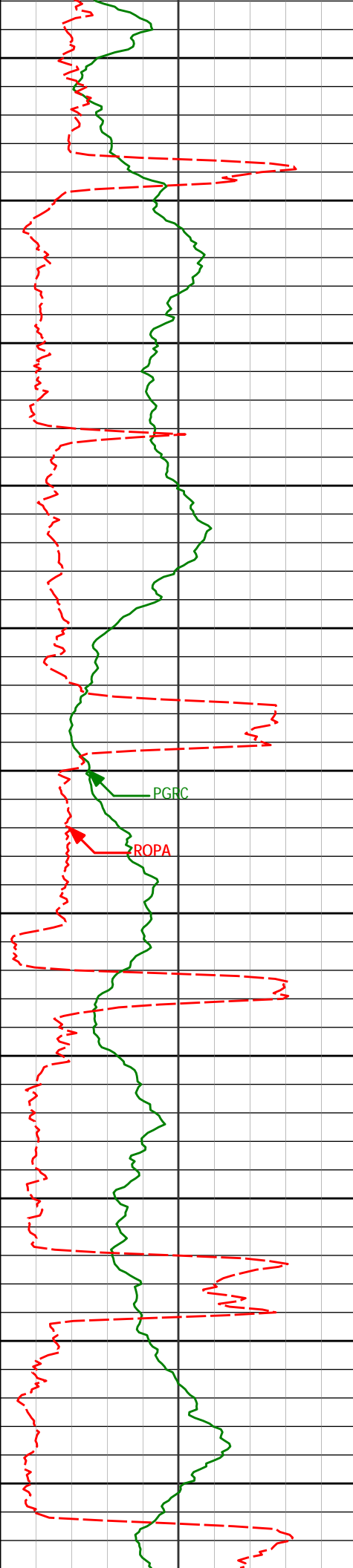
8940'      90.96°      89.25°      6713.66'      2532.20'

9035'      90.25°      89.64°      6712.65'      2627.10'

9130'      89.57°      88.86°      6712.80'      2722.03'

9224'      88.77°      88.94°      6714.16'      2815.96'

9319'      89.23°      88.66°      6715.82'      2910.90'



9350

9400

9450

9500

9550

9600

9650

9700

9750

9800

9850

9414'

89.29°

88.22°

6717.05'

3005.86'

9509'

92.41°

89.62°

6715.64'

3100.78'

9604'

91.33°

89.03°

6712.54'

3195.65'

9703'

92.59°

89.49°

6709.15'

3294.51'

9798'

91.51°

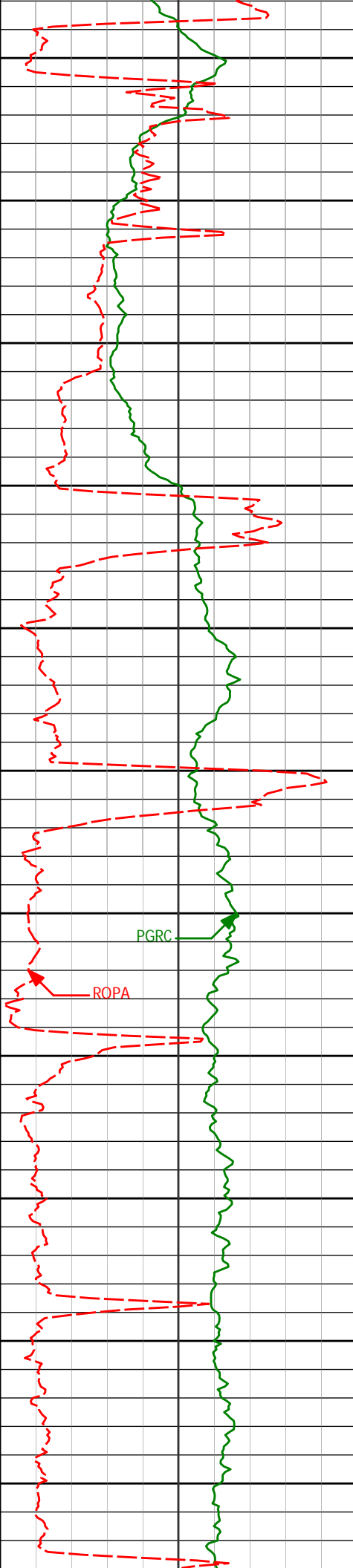
88.73°

6705.75'

3389.38'

PGRC

ROPA



9900

9950

10000

10050

10100

10150

10200

10250

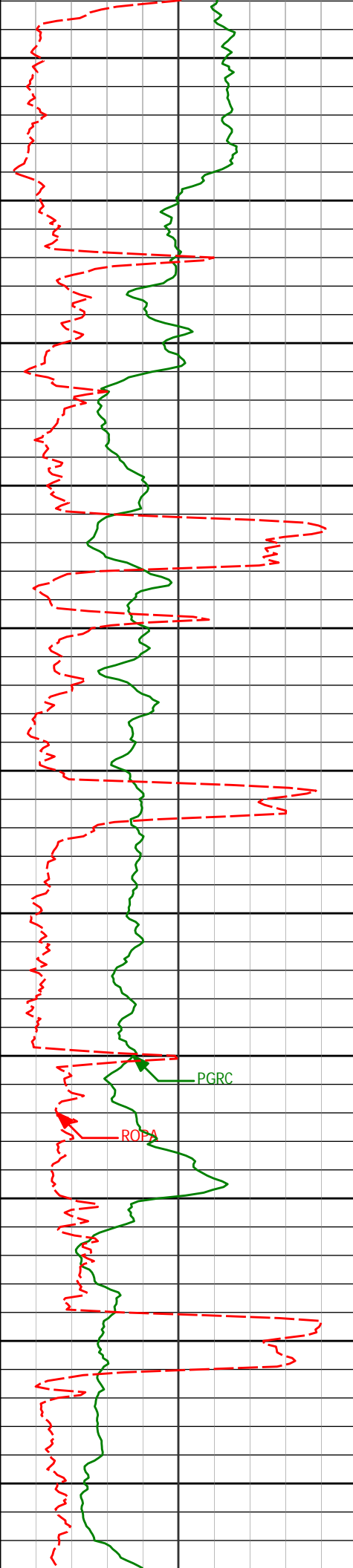
10300

10350

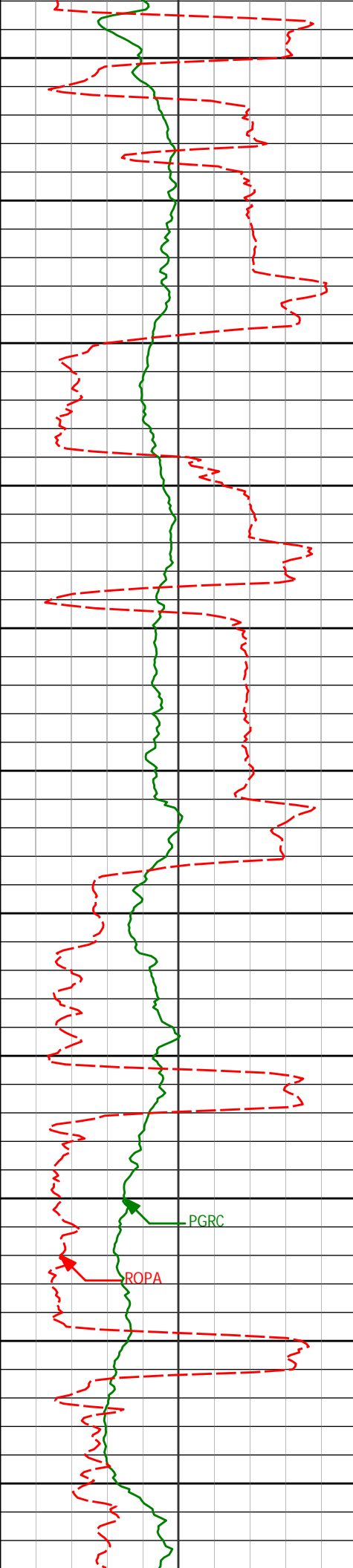
10400

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 9893'  | 88.61° | 89.21° | 6705.66' | 3484.31' |
|        |        |        |          |          |
| 9988'  | 90.52° | 89.83° | 6706.38' | 3579.21' |
|        |        |        |          |          |
| 10083' | 90.92° | 91.37° | 6705.18' | 3674.01' |
|        |        |        |          |          |
| 10176' | 89.97° | 90.69° | 6704.46' | 3766.77' |
|        |        |        |          |          |
| 10268' | 90.03° | 90.38° | 6704.46' | 3858.59' |
|        |        |        |          |          |
| 10361' | 90.09° | 90.23° | 6704.36' | 3951.44' |





|       |        |        |        |          |          |
|-------|--------|--------|--------|----------|----------|
| 10450 | 10453' | 89.82° | 89.46° | 6704.44' | 4043.32' |
| 10500 |        |        |        |          |          |
| 10550 | 10546' | 88.21° | 86.43° | 6706.03' | 4136.28' |
| 10600 |        |        |        |          |          |
| 10650 | 10639' | 91.29° | 88.80° | 6706.44' | 4229.25' |
| 10700 |        |        |        |          |          |
| 10750 | 10732' | 91.60° | 89.13° | 6704.10' | 4322.17' |
| 10800 |        |        |        |          |          |
| 10850 | 10825' | 93.21° | 88.97° | 6700.19' | 4415.02' |
| 10900 |        |        |        |          |          |
| 10950 | 10917' | 92.40° | 88.38° | 6695.69' | 4506.87' |



11000

11010'

91.67°

87.81°

6692.39'

4599.79'

11050

11100

11102'

90.37°

89.10°

6690.75'

4691.74'

11150

11200

11196'

90.80°

91.58°

6689.79'

4785.57'

11250

11300

11289'

87.63°

89.05°

6691.06'

4878.38'

11350

11400

11382'

90.00°

88.93°

6692.99'

4971.30'

11450

11500

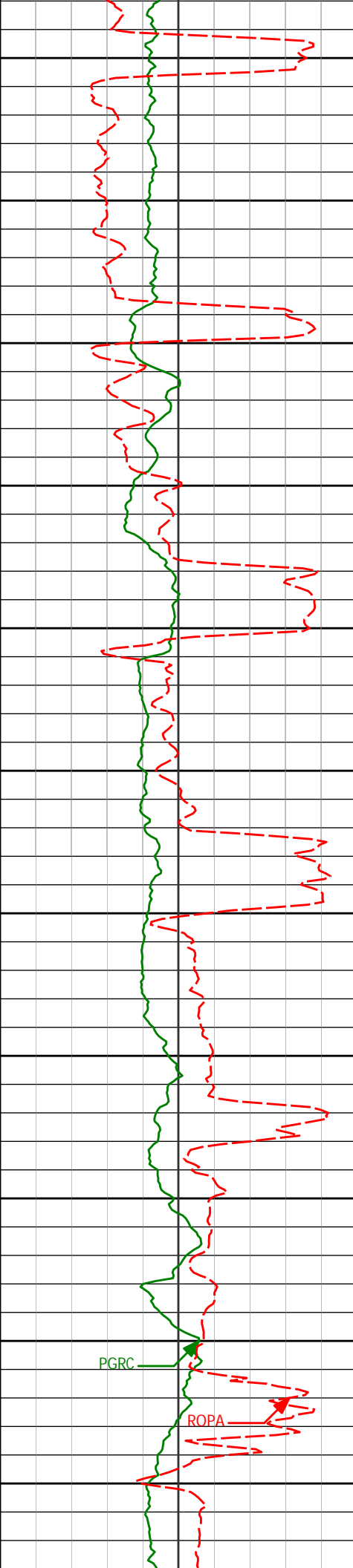
11476'

90.00°

89.09°

6692.99'

5065.24'



11550

11568'

90.03°

90.20°

6692.96'

5157.14'

11600

11650

11661'

92.77°

89.19°

6690.69'

5249.99'

11700

11750

11756'

91.20°

87.07°

6687.40'

5344.91'

11800

11850

11851'

89.45°

89.17°

6686.86'

5439.88'

11900

11950

11945'

92.19°

90.67°

6685.52'

5533.73'

12000

PGRC

12050

12041'

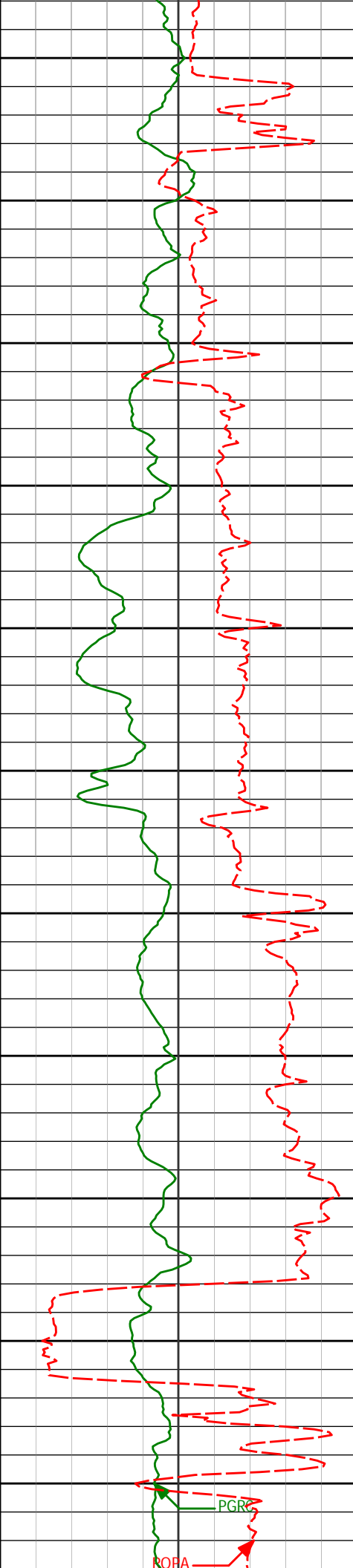
89.14°

88.44°

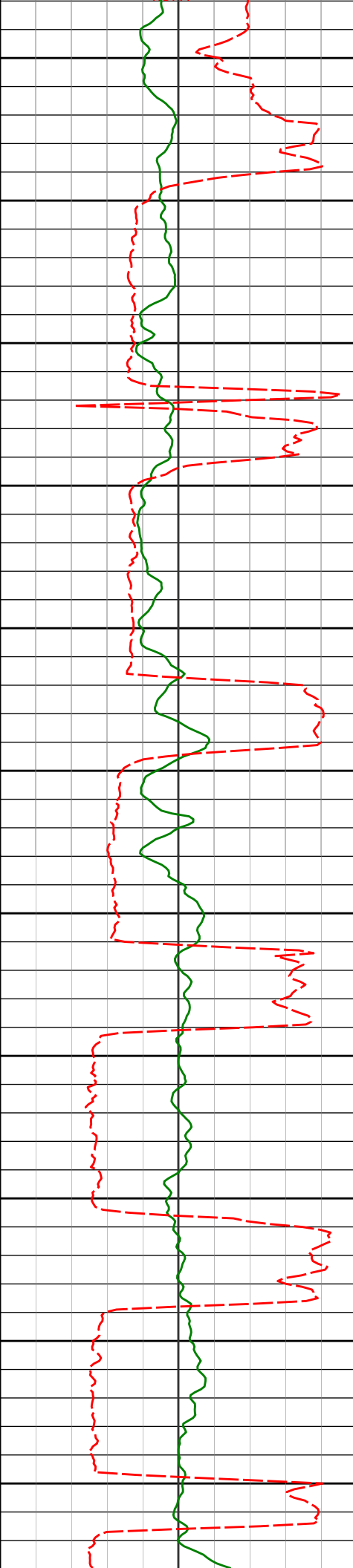
6684.40'

5629.61'

ROPA



|           |        |        |          |          |
|-----------|--------|--------|----------|----------|
| 12100     |        |        |          |          |
| 12136'    | 87.90° | 89.59° | 6686.86' | 5724.52' |
| 12150     |        |        |          |          |
| 12200     |        |        |          |          |
| 12231'    | 87.72° | 88.74° | 6690.49' | 5819.38' |
| 12250     |        |        |          |          |
| 12300     |        |        |          |          |
| 12325'    | 86.70° | 87.62° | 6695.06' | 5913.24' |
| 12350     |        |        |          |          |
| 12400     |        |        |          |          |
| 12419'    | 90.99° | 86.58° | 6696.96' | 6007.20' |
| 12450     |        |        |          |          |
| 12500     |        |        |          |          |
| 12510'    | 90.25° | 88.12° | 6695.97' | 6098.19' |
| <Run 400> |        |        |          |          |
| 12550     |        |        |          |          |
| 12600     |        |        |          |          |
| 12605'    | 91.05° | 87.64° | 6694.89' | 6193.17' |



12650

12700

12750

12800

12850

12900

12950

13000

13050

13100

13150

12700'

12800'

12895'

12990'

13085'

13179'

88.76°

90.59°

92.87°

92.22°

90.37°

91.54°

85.94°

87.82°

90.19°

89.29°

88.82°

89.69°

6695.05'

6695.62'

6692.75'

6688.53'

6686.39'

6684.82'

6288.16'

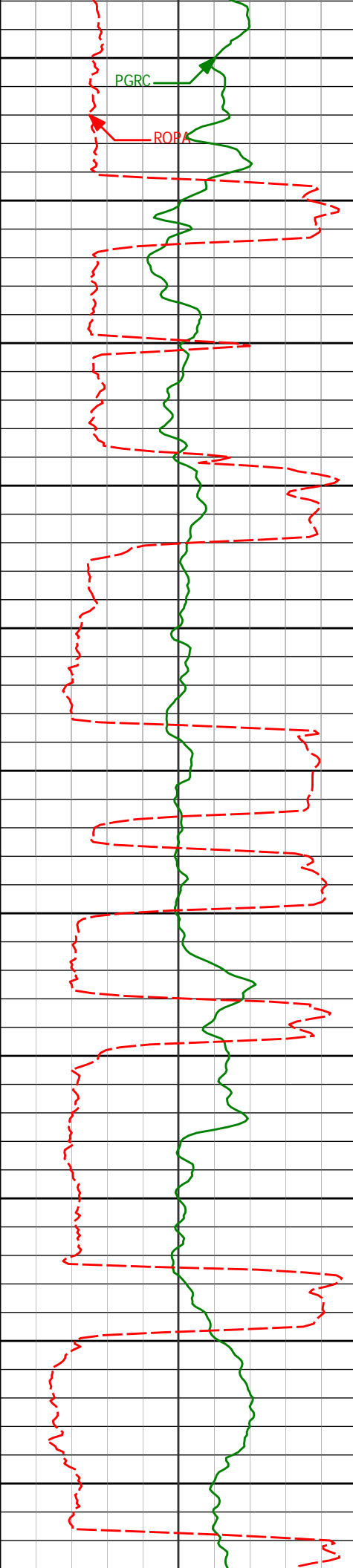
6388.15'

6483.03'

6577.82'

6672.73'

6766.64'



13200

13250

13300

13350

13400

13450

13500

13550

13600

13650

13700

13274'

91.55°

88.44°

6682.26'

6861.54'

13369'

91.69°

88.50°

6679.57'

6956.47'

13464'

90.49°

89.43°

6677.77'

7051.40'

13559'

90.03°

90.46°

6677.33'

7146.26'

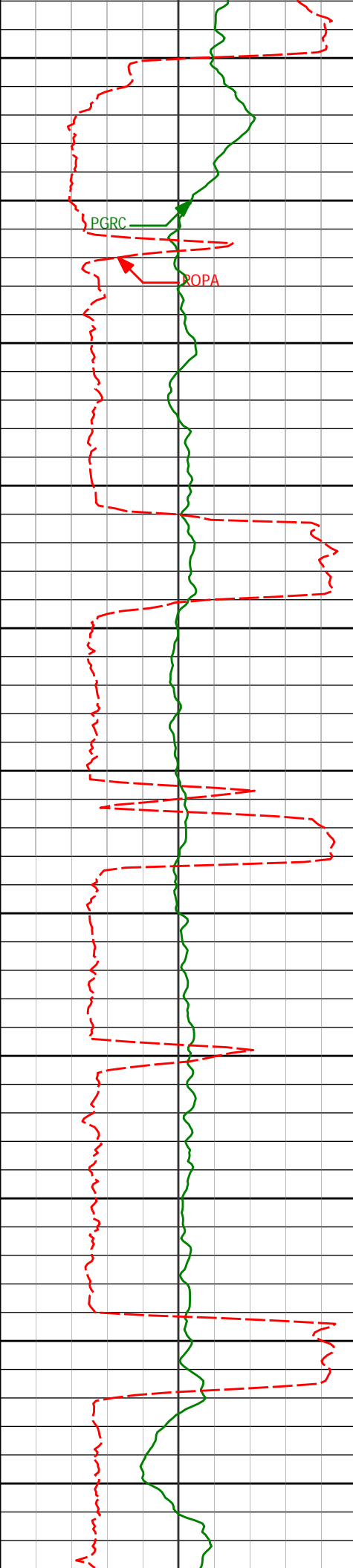
13654'

89.97°

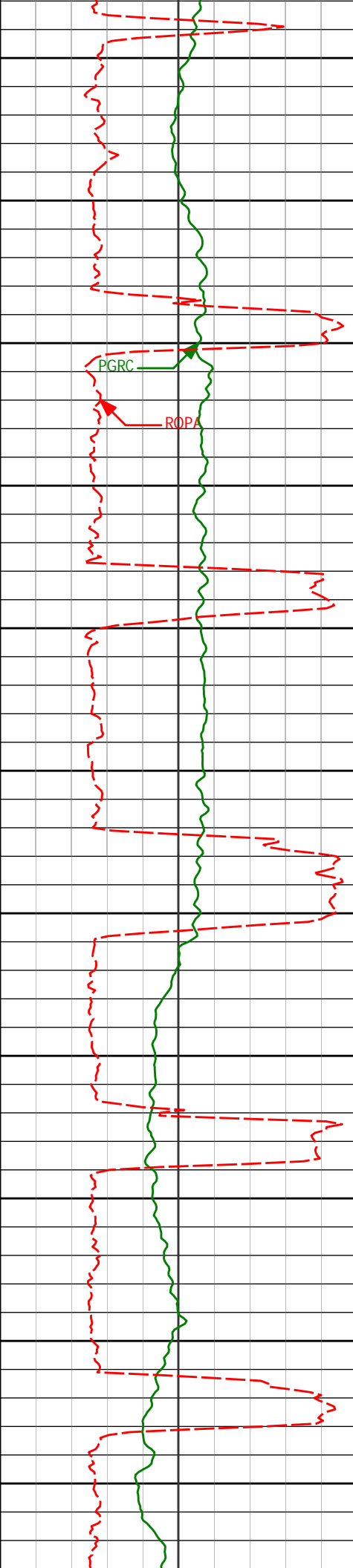
90.59°

6677.33'

7241.08'



|       |        |        |        |          |          |
|-------|--------|--------|--------|----------|----------|
| 13750 | 13749' | 88.92° | 89.28° | 6678.25' | 7335.95' |
| 13800 |        |        |        |          |          |
| 13850 | 13844' | 90.06° | 89.00° | 6679.10' | 7430.87' |
| 13900 |        |        |        |          |          |
| 13950 | 13939' | 89.94° | 91.66° | 6679.10' | 7525.70' |
| 14000 |        |        |        |          |          |
| 14050 | 14034' | 89.51° | 91.38° | 6679.56' | 7620.40' |
| 14100 |        |        |        |          |          |
| 14150 | 14129' | 90.83° | 92.59° | 6679.27' | 7715.03' |
| 14200 |        |        |        |          |          |
| 14250 | 14224' | 88.74° | 89.76° | 6679.63' | 7809.76' |



14300

14318'

90.28°

90.33°

6680.43'

7903.62'

14350

14400

14413'

89.75°

89.49°

6680.41'

7998.49'

14450

14500

14508'

90.43°

92.71°

6680.26'

8093.23'

14550

14600

14603'

89.75°

88.61°

6680.11'

8188.02'

14650

14700

14698'

90.12°

87.02°

6680.22'

8283.00'

14750

14800

14793'

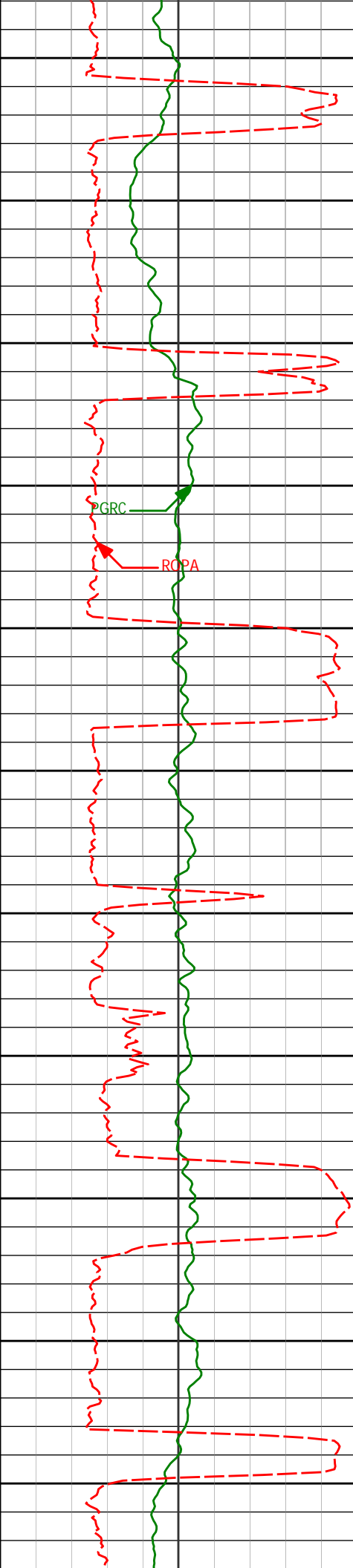
90.00°

87.33°

6680.12'

8378.00'





14850

14887'

90.55°

88.05°

6679.67'

8471.99'

14900

14950

14982'

91.97°

89.10°

6677.58'

8566.93'

15000

15050

15077'

89.91°

88.38°

6676.02'

8661.86'

15100

15150

15172'

90.22°

87.56°

6675.91'

8756.85'

15200

15250

15267'

90.46°

90.32°

6675.35'

8851.78'

15300

15350

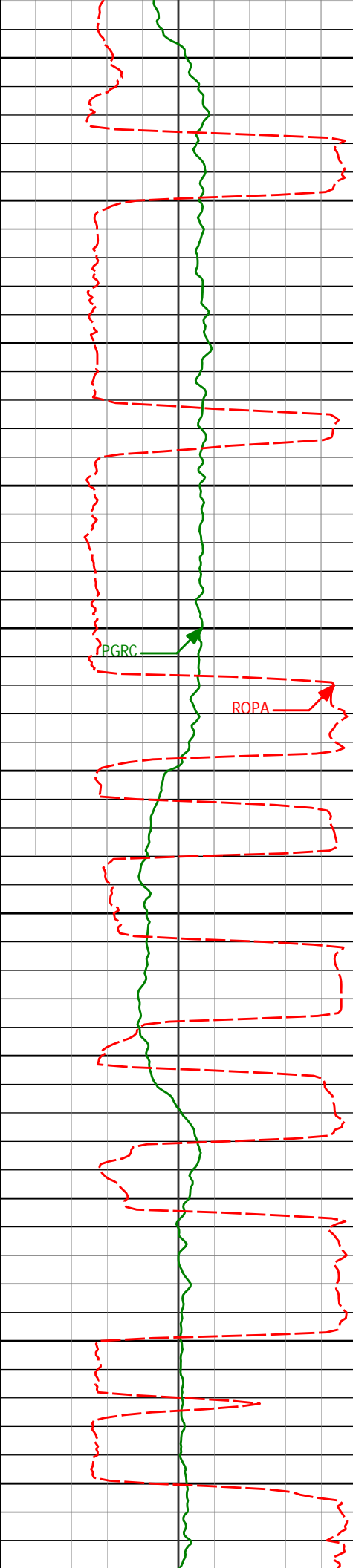
15362'

90.96°

91.76°

6674.17'

8946.53'



15400

15450

15500

15550

15600

15650

15700

15750

15800

15850

15900

15456'

89.63°

90.25°

6673.69'

9040.29'

15551'

90.43°

95.72°

6673.64'

9134.73'

15646'

89.11°

99.51°

6674.02'

9228.08'

15741'

91.42°

96.22°

6673.58'

9321.35'

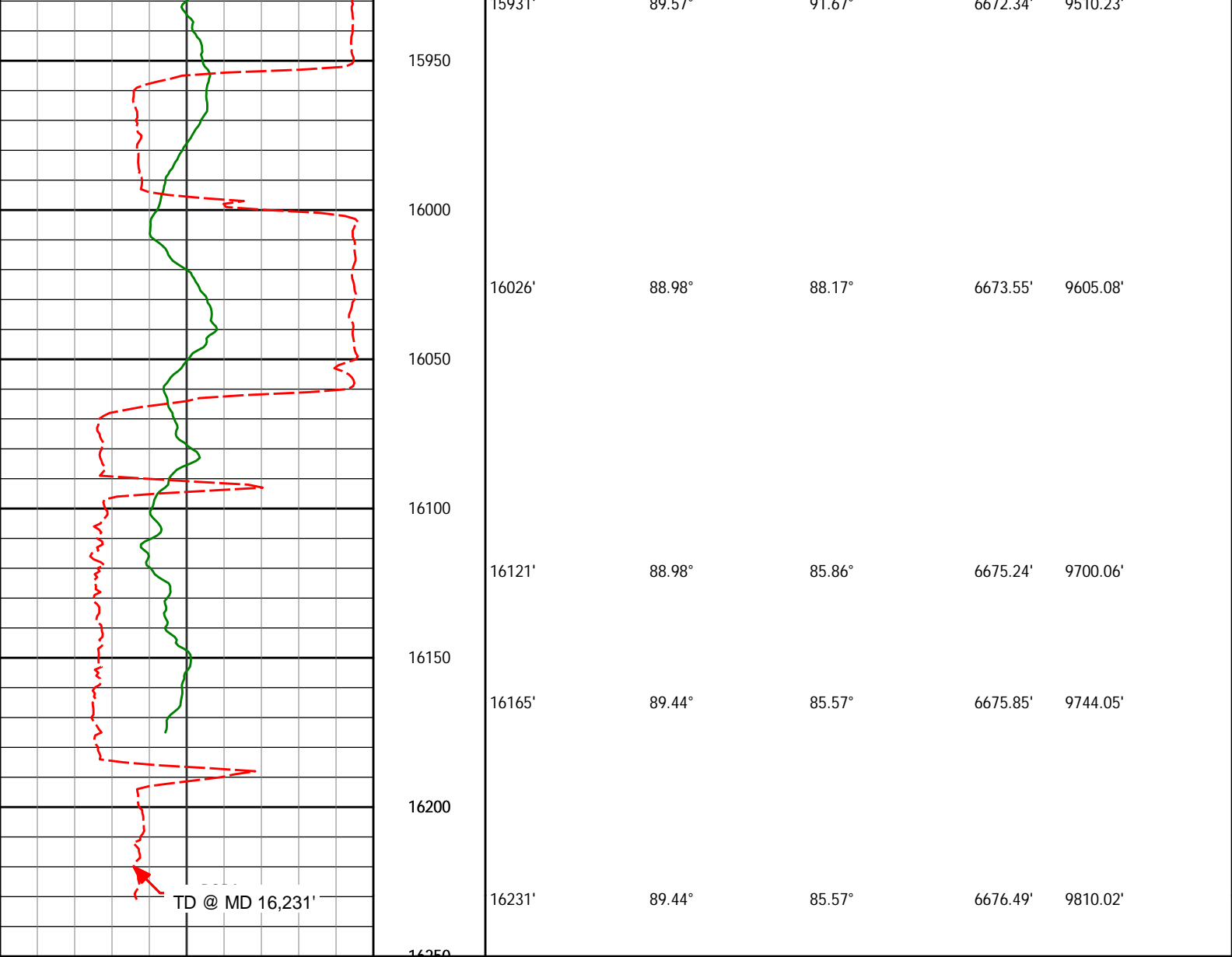
15836'

90.25°

92.00°

6672.20'

9415.58'



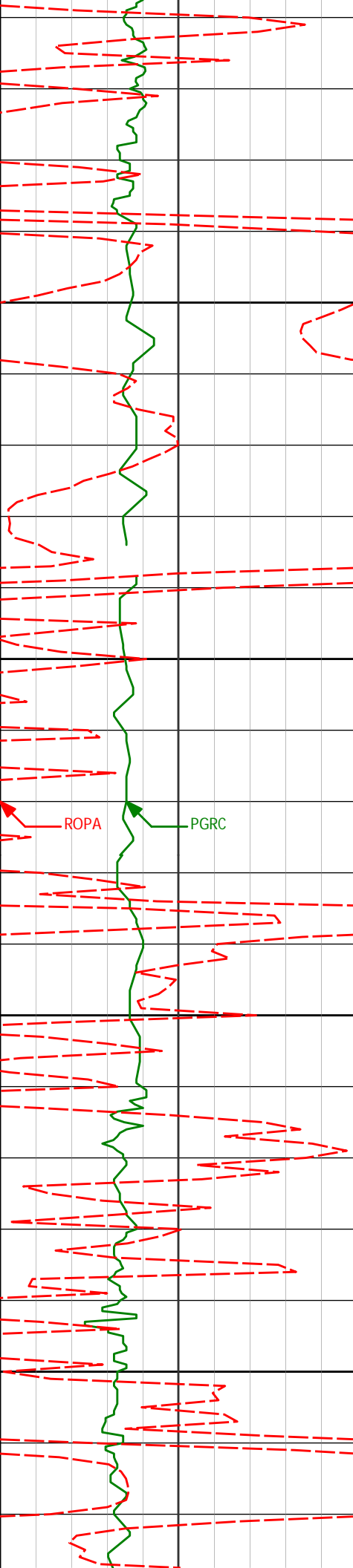
|   |             |              |             |             |            |             |
|---|-------------|--------------|-------------|-------------|------------|-------------|
| <b>Avg Rate of Penetration</b><br>ROPA<br>feet per hr | Depth<br>ft | <b>Depth</b> | <b>Inc.</b> | <b>Azi.</b> | <b>TVD</b> | <b>V.S.</b> |
| 500   | 0           |              |             |             |            |             |
| <b>PCG Gamma Ray</b><br>PGRC<br>api                   |             |              |             |             |            |             |
| 0   | 300         |              |             |             |            |             |

**HALLIBURTON**  
Sperry Drilling Services

MD Detail Log 1:240

Noble Energy  
NCLP PC AA04-65HN  
H&P 343  
T6N-R63W

|   |             |              |             |             |            |             |
|---|-------------|--------------|-------------|-------------|------------|-------------|
| <b>PCG Gamma Ray</b><br>PGRC<br>api                   |             |              |             |             |            |             |
| 0   | 300         |              |             |             |            |             |
| <b>Avg Rate of Penetration</b><br>ROPA<br>feet per hr | Depth<br>ft | <b>Depth</b> | <b>Inc.</b> | <b>Azi.</b> | <b>TVD</b> | <b>V.S.</b> |
| 500   | 0           |              |             |             |            |             |



3050

3100

3150

3200

3079'

13.91°

358.00°

3050.55'

10.96'

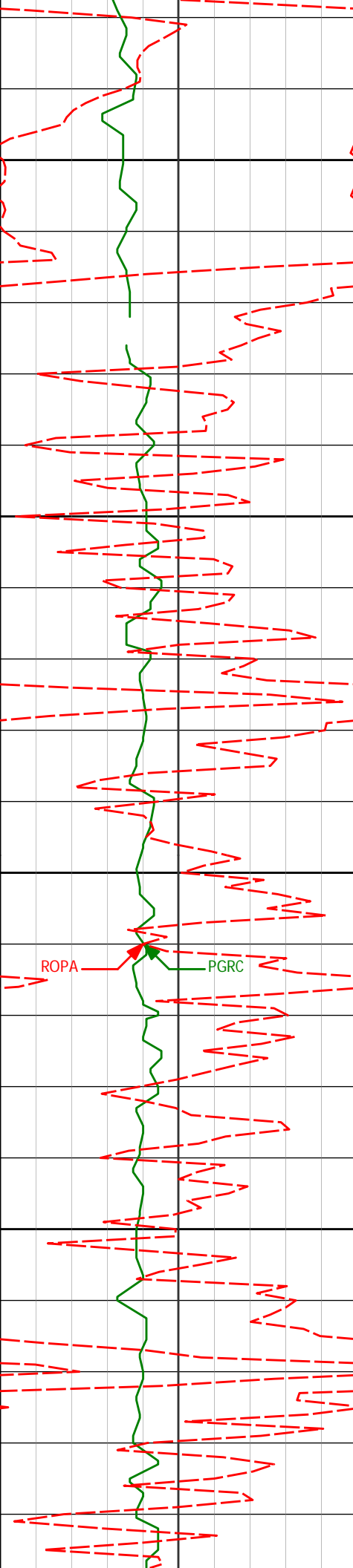
3174'

13.41°

356.96°

3142.86'

11.17'



3250

3268'

9.43°

358.56°

3234.99'

11.38'

3300

3350

ROPA

PGRC

3363'

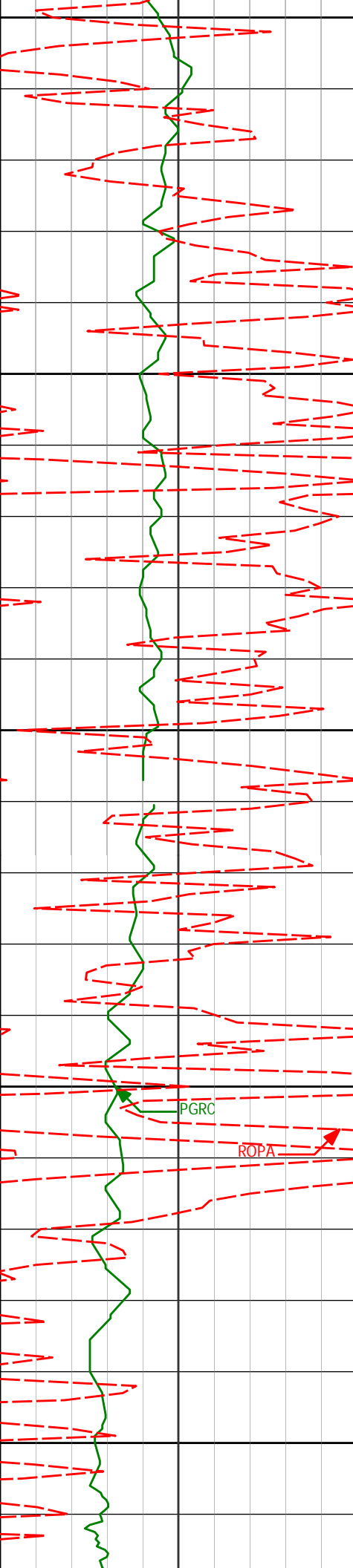
8.54°

1.11°

3328.82'

12.11'

3400



3450

3458'

7.22°

1.52°

3422.92'

13.09'

3500

3550

3553'

6.46°

10.45°

3517.25'

14.81'

3600

PGRC

ROPA

3650

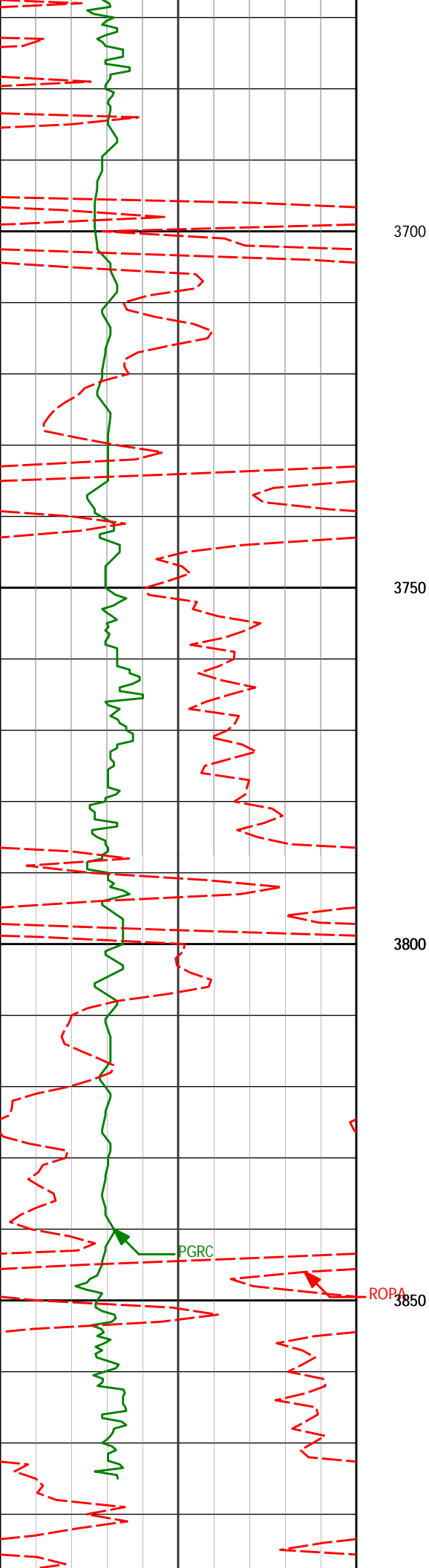
3648'

7.29°

7.96°

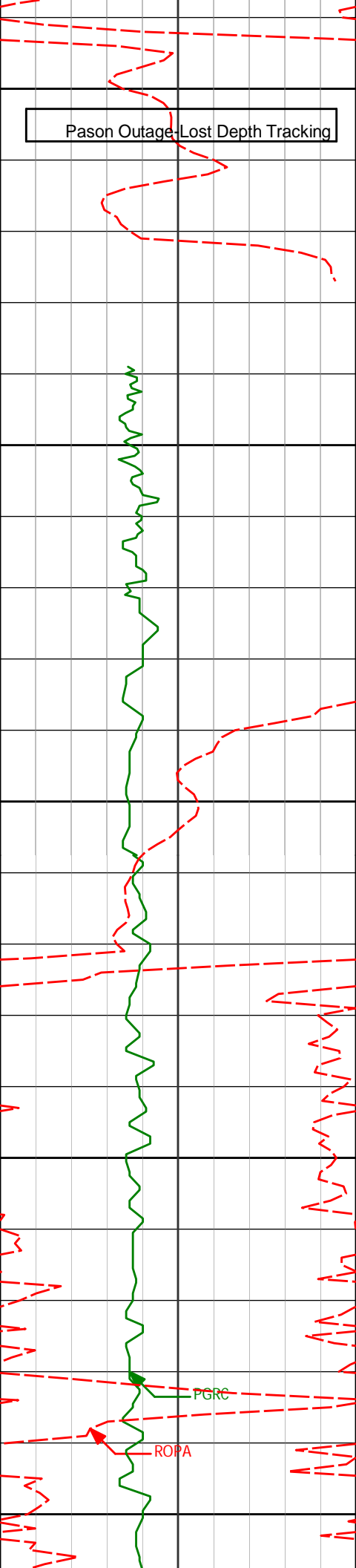
3611.56'

17.20'



3742' 6.55° 1.55° 3704.88' 18.77'

3837' 4.78° 350.88° 3799.41' 18.78'



3900

3950

4000

4050

4100

3932'

3.48°

331.38°

3894.17'

17.11'

4028'

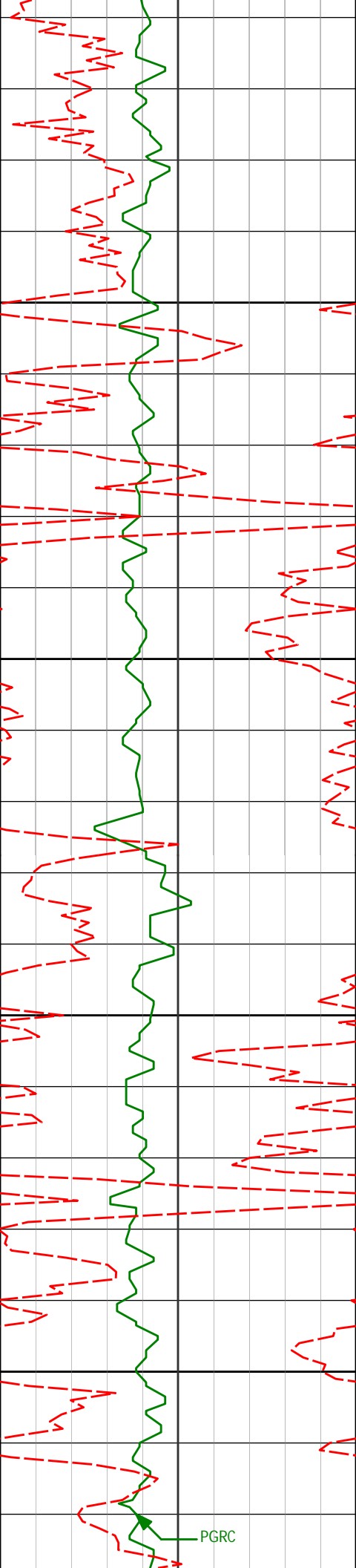
1.55°

248.58°

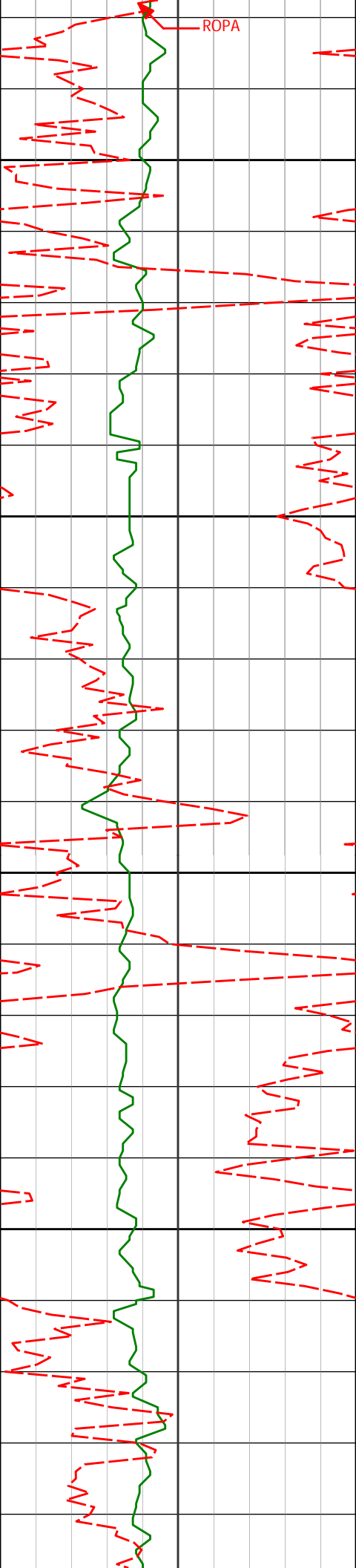
3990.09'

14.62'





|       |       |         |          |        |
|-------|-------|---------|----------|--------|
| 4123' | 1.25° | 244.02° | 4085.07' | 12.45' |
| 4150  |       |         |          |        |
| 4200  |       |         |          |        |
| 4217' | 1.25° | 228.26° | 4179.04' | 10.71' |
| 4250  |       |         |          |        |
| 4300  |       |         |          |        |
| 4312' | 1.11° | 227.71° | 4274.02' | 9.18'  |



4407'

0.57°

195.52°

4369.01'

8.32'

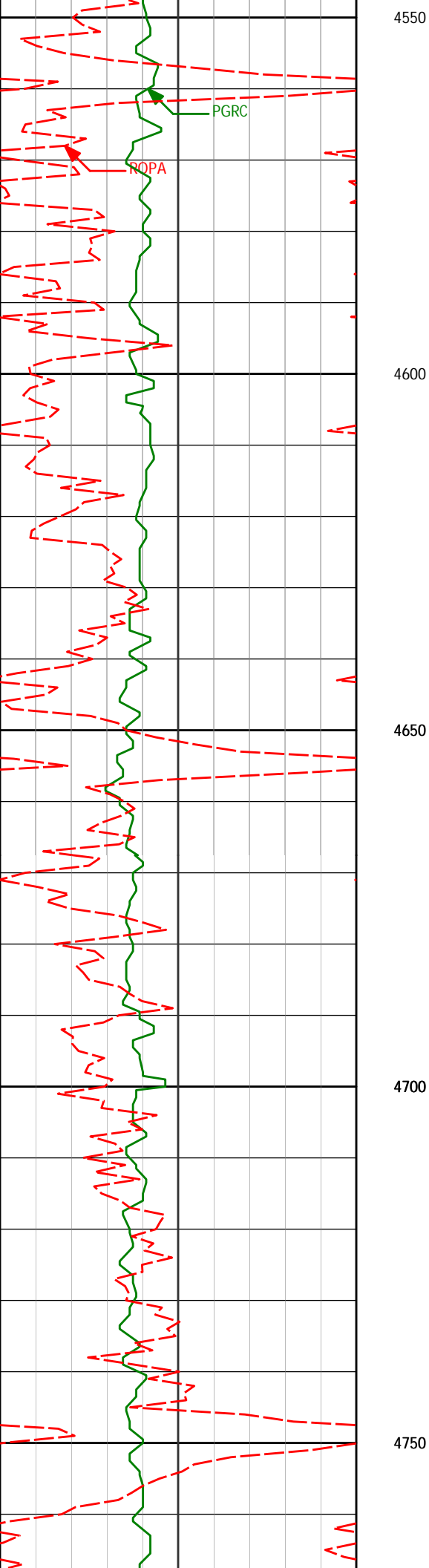
4502'

0.55°

187.60°

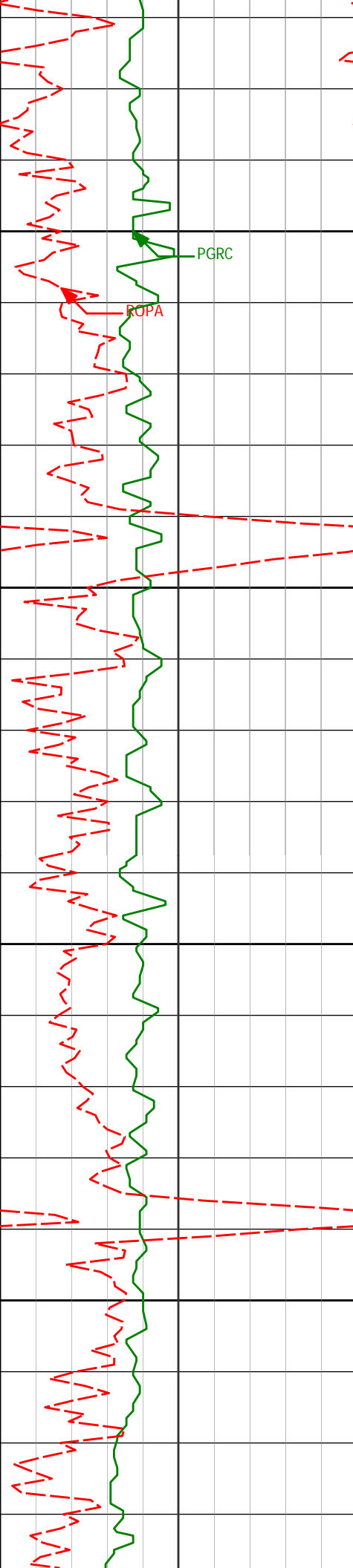
4464.01'

8.09'



|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4597' | 0.59° | 204.48° | 4559.00' | 7.78' |
|-------|-------|---------|----------|-------|

|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4692' | 0.83° | 206.45° | 4654.00' | 7.21' |
|-------|-------|---------|----------|-------|



|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4787' | 1.17° | 201.93° | 4748.98' | 6.47' |
|-------|-------|---------|----------|-------|

4800

PGRC

ROPA

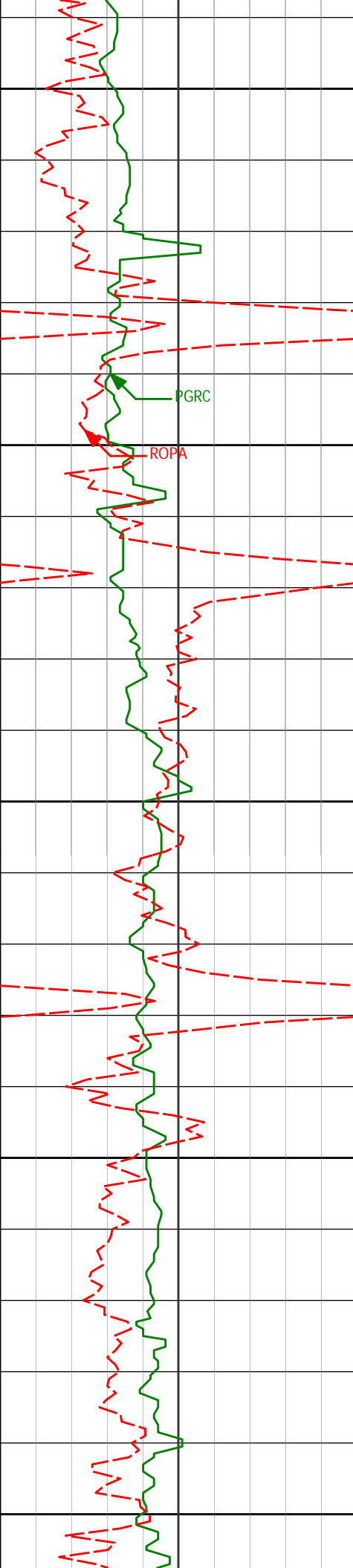
4850

|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4881' | 0.71° | 227.06° | 4842.97' | 5.61' |
|-------|-------|---------|----------|-------|

4900

4950

|       |       |         |          |       |
|-------|-------|---------|----------|-------|
| 4976' | 0.34° | 207.82° | 4937.97' | 5.02' |
|-------|-------|---------|----------|-------|



5000

5050

5100

5150

5200

PGRC

ROPA

5071'

0.34°

220.49°

5032.96'

4.68'

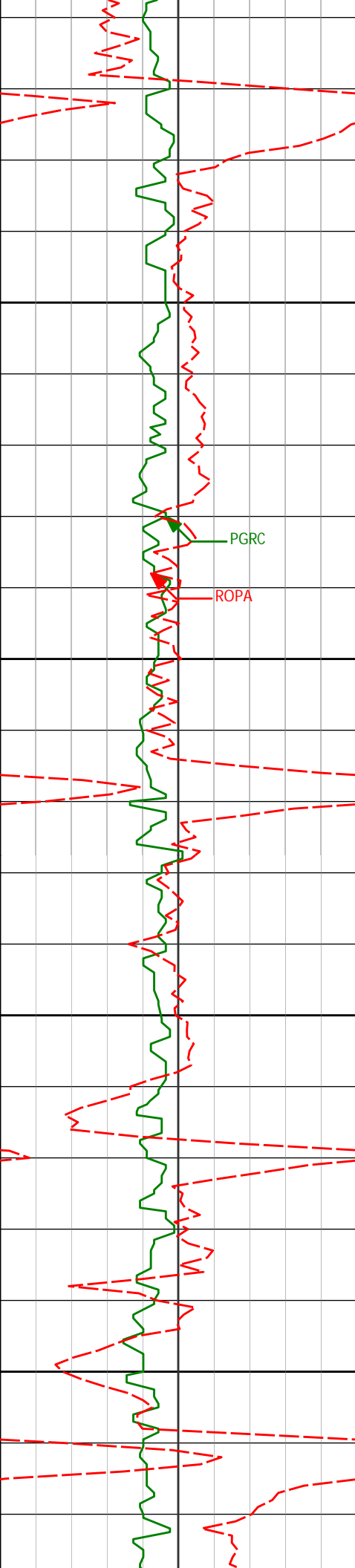
5166'

0.36°

252.62°

5127.96'

4.20'



5250

5261'

1.00°

222.12°

5222.96'

3.32'

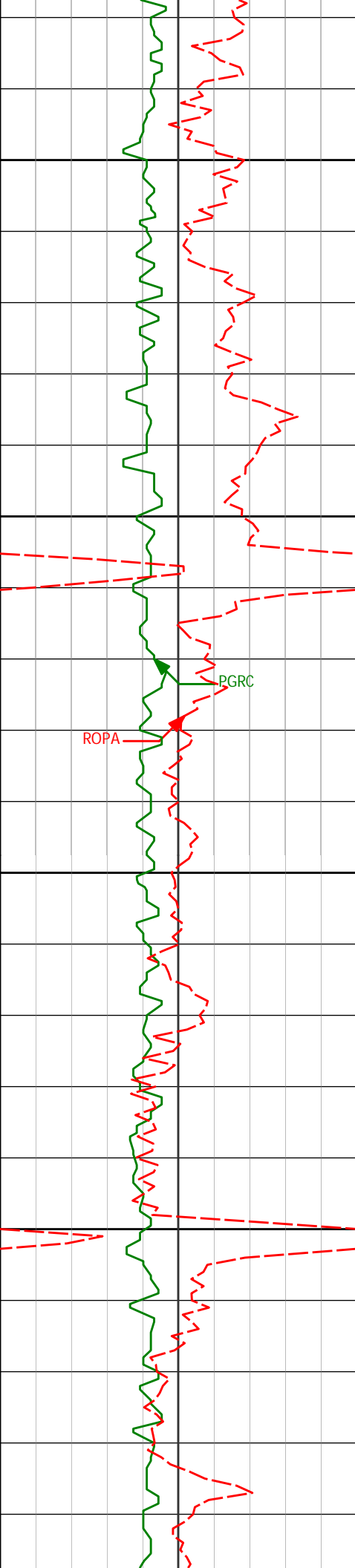
PGRC

ROPA

5300

5350

5400



5450

5450'

0.72°

196.83°

5411.94'

1.75'

5500

5550

5600

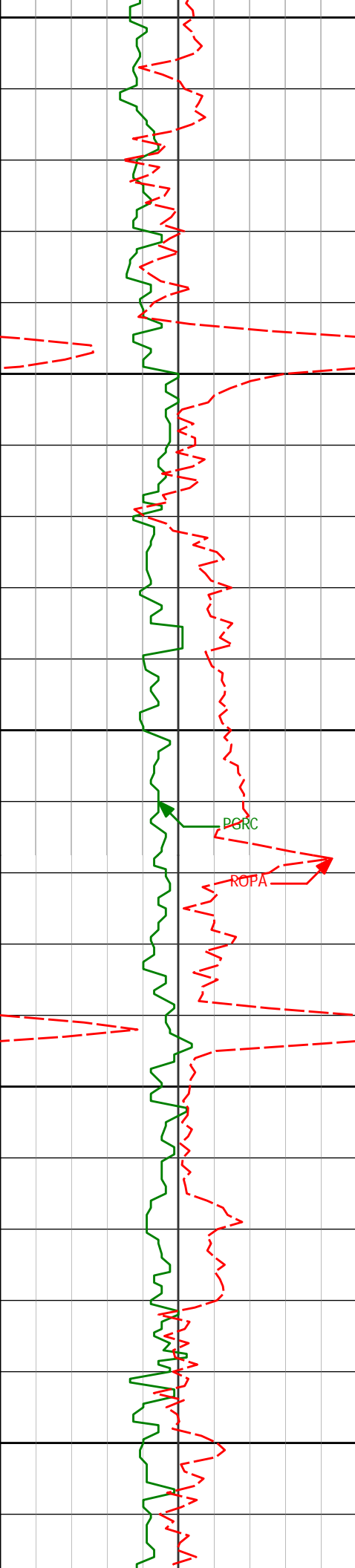
5640'

0.26°

137.28°

5601.93'

1.62'



5650

5700

5750

5800

5850

5735'

0.19°

243.40°

5696.93'

1.61'

DGRC

ROPA

5830'

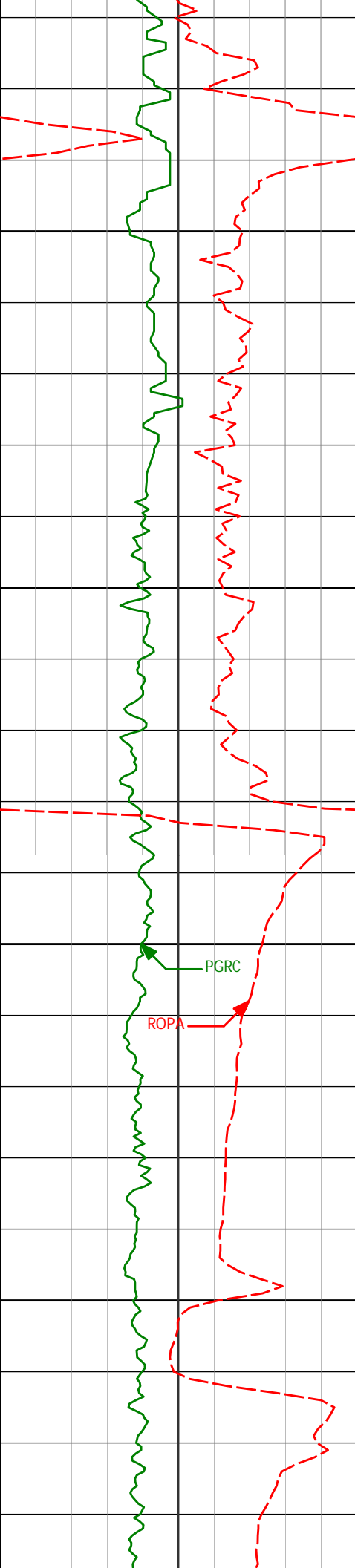
0.09°

317.62°

5791.93'

1.42'





5900

5925'

0.37°

330.98°

5886.93'

1.24'

5950

<Run 200>

6000

6008'

3.88°

78.81°

5969.86'

3.90'

6050

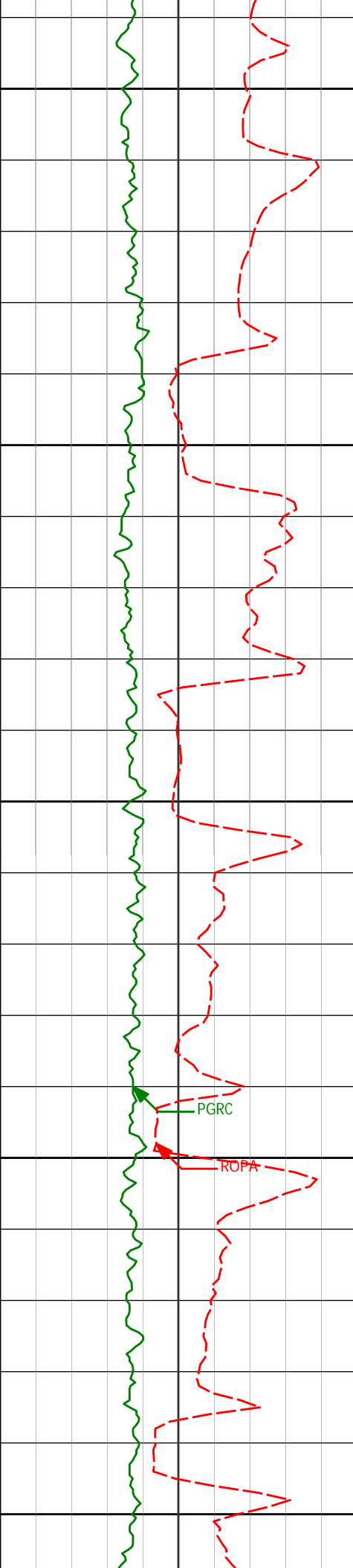
6056'

8.58°

85.56°

6017.57'

9.09'



6100

6103'

12.05°

88.05°

6063.80'

17.50'

6150

6151'

15.56°

88.40°

6110.41'

28.95'

6200

6197'

17.48°

83.13°

6154.51'

42.01'

6250

6245'

20.14°

83.09°

6199.94'

57.45'

6300

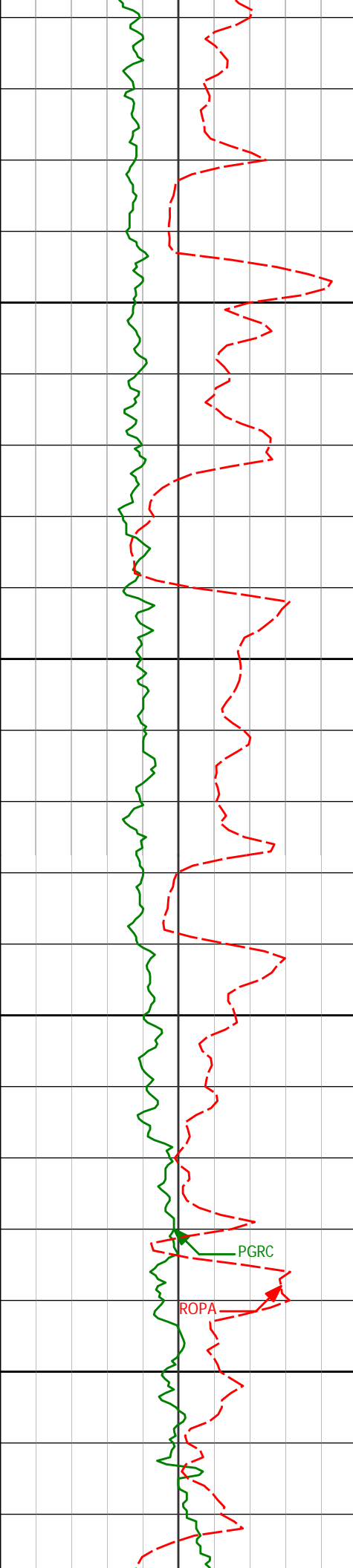
6292'

22.61°

88.37°

6243.71'

74.56'

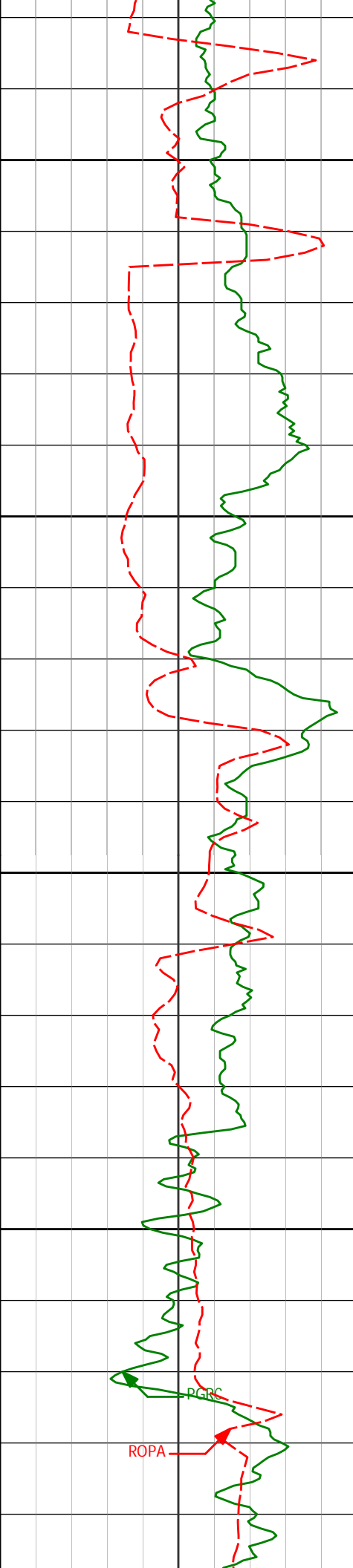


6350

6400

6450

6500



6550

6600

6650

6700

6576'

49.61°

88.10°

6480.00'

226.71'

6671'

57.31°

88.47°

6536.52'

302.96'

6719'

57.62°

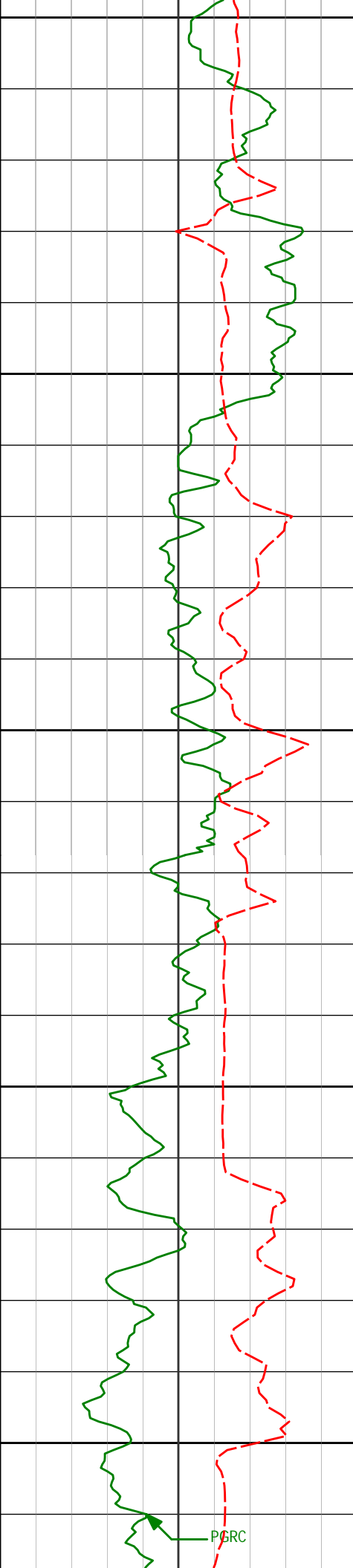
87.88°

6562.34'

343.42'

ROPA

PGRC



6750

6766'

58.00°

87.50°

6587.38'

383.19'

6800

6850

6861'

65.67°

88.63°

6632.18'

466.86'

6900

6950

6956'

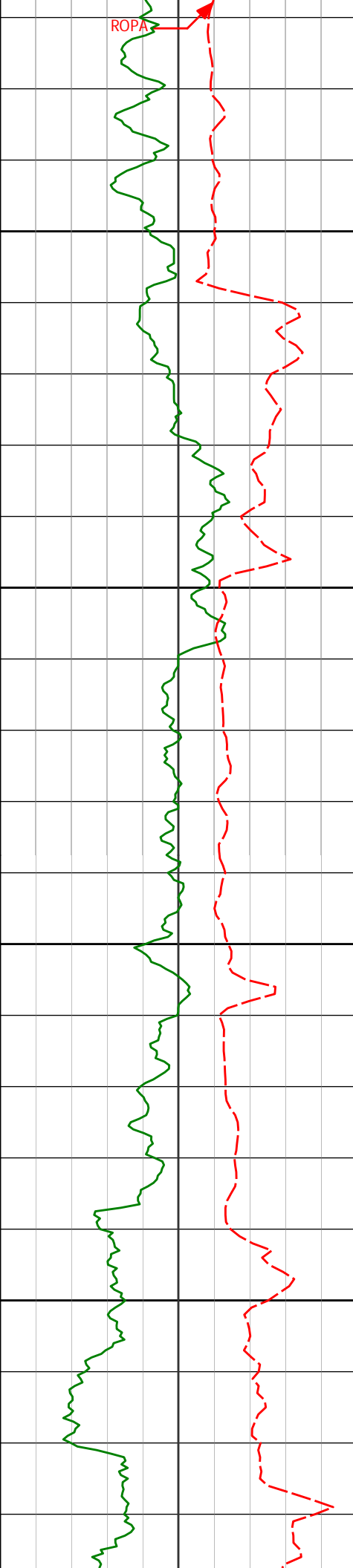
72.70°

87.42°

6665.92'

555.59'

PGRC



7000

7050

7100

7150

7051'

79.34°

88.44°

6688.86'

647.71'

7131'

80.29°

89.50°

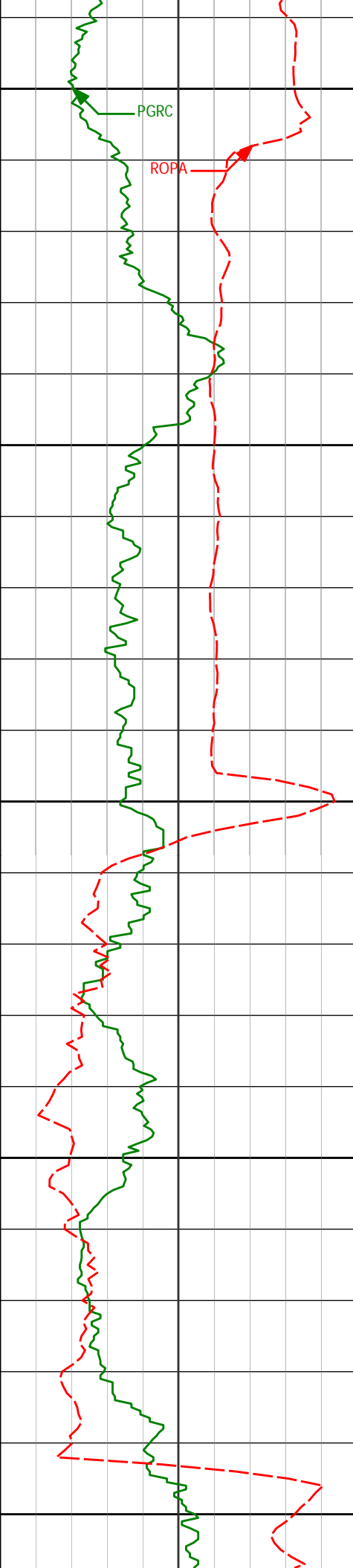
6703.01'

726.40'



Casing Set @ 7,175' MD

<Run 300>



7200

PGRC

ROPA

7233'

86.55°

90.28°

6714.69'

827.54'

7250

7300

7328'

86.80°

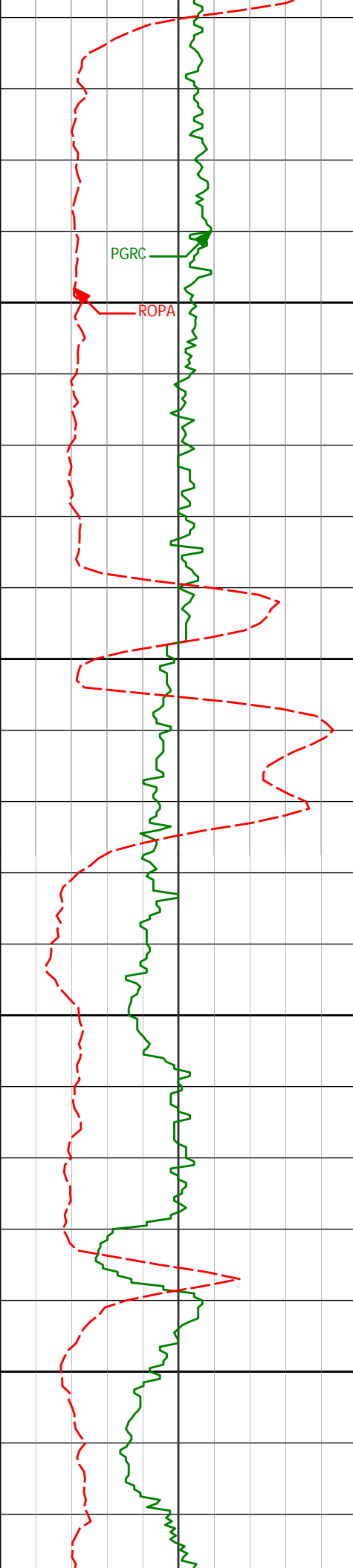
90.59°

6720.20'

922.21'

7350

7400



7450

7500

7550

7600

7423'

89.60°

91.60°

6723.18'

1016.91'

7517'

89.26°

90.57°

6724.12'

1110.66'

7612'

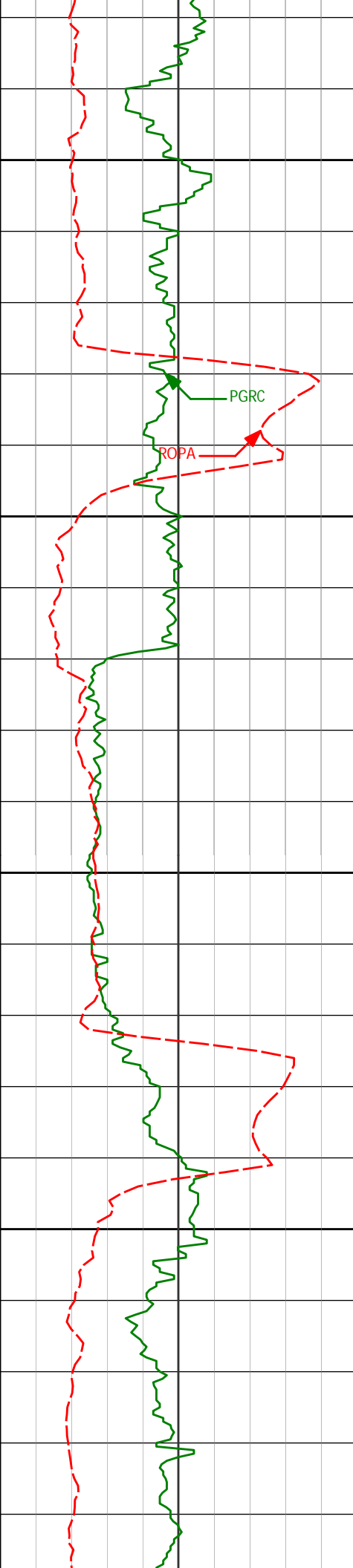
91.17°

90.83°

6723.76'

1205.45'





7650

PGRC

ROPA

7700

7707'

92.31°

89.47°

6720.88'

1300.26'

7750

7800

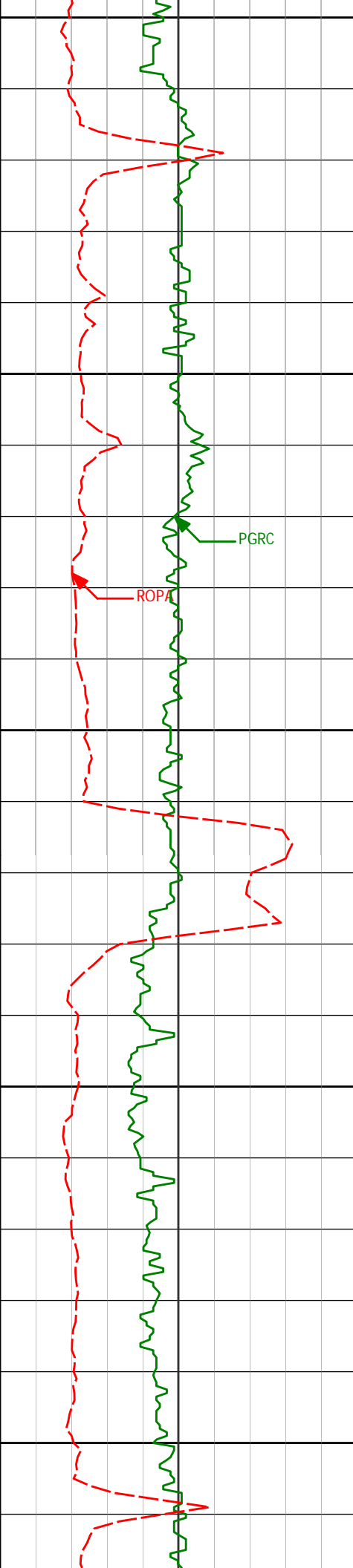
7801'

88.80°

86.84°

6719.97'

1394.21'



7850

7900

7950

8000

8050

7896'

89.48°

86.34°

6721.39'

1489.20'

7991'

89.38°

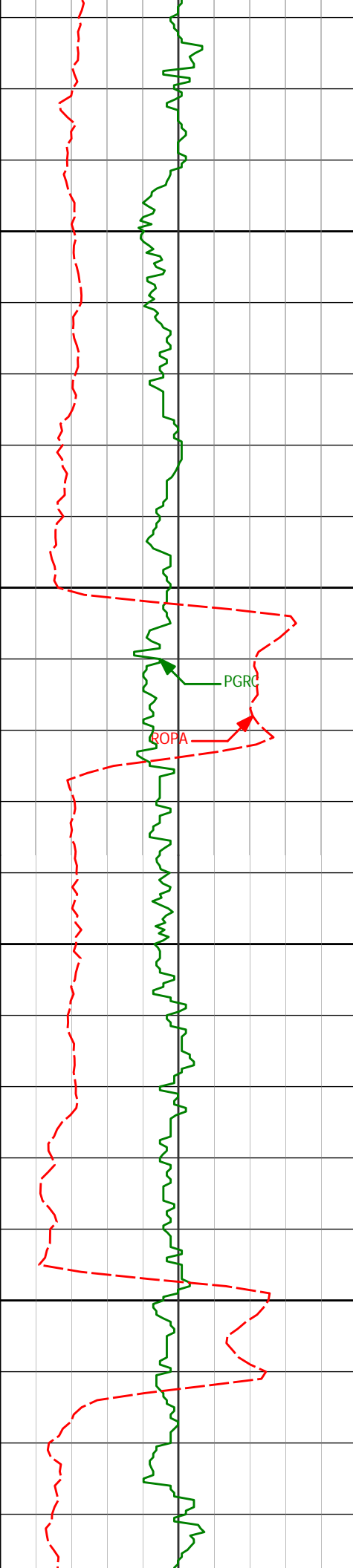
88.67°

6722.34'

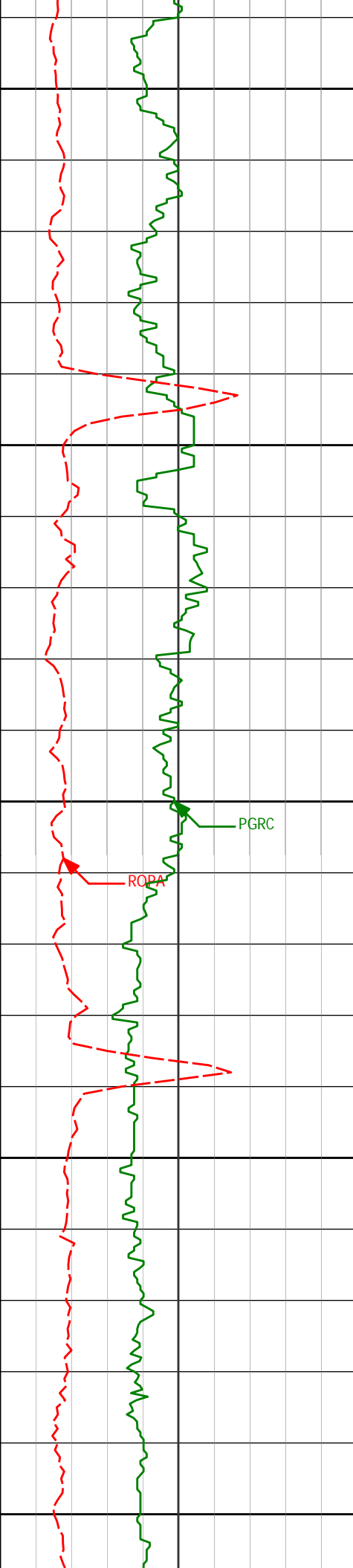
1584.18'

PGRC

ROPA



|      |       |        |        |          |          |
|------|-------|--------|--------|----------|----------|
|      | 8086' | 91.64° | 88.74° | 6721.49' | 1679.13' |
| 8100 |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
| 8150 |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      | 8181' | 90.00° | 88.38° | 6720.13' | 1774.08' |
|      |       |        |        |          |          |
| 8200 |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
| 8250 |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      |       |        |        |          |          |
|      | 8276' | 88.58° | 88.38° | 6721.31' | 1869.04' |



8300

8350

8400

8450

8500

8371'

88.86°

88.67°

6723.43'

1963.98'

ROPA

PGRC

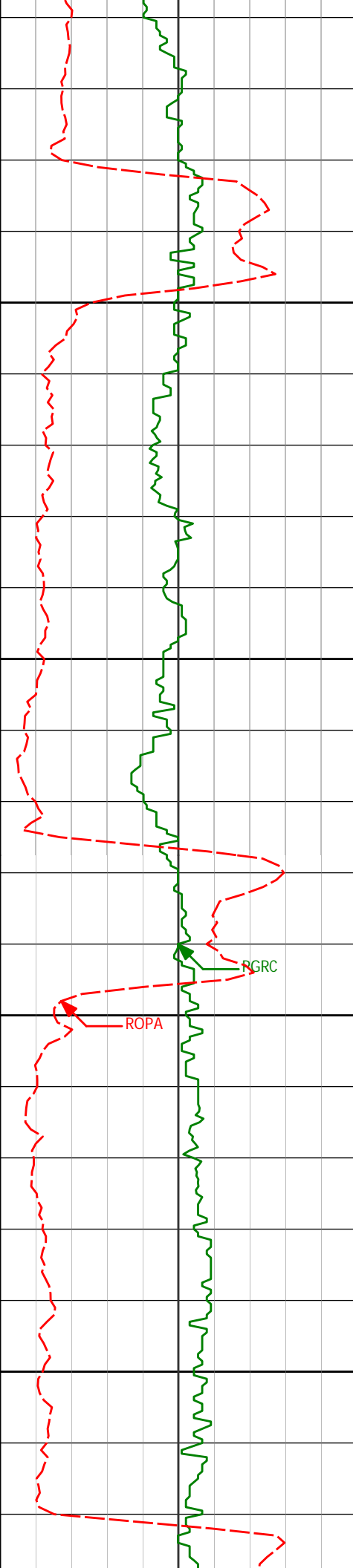
8465'

91.67°

88.83°

6723.00'

2057.92'



8550

8560'

91.88°

89.25°

6720.05'

2152.82'

8600

8650

8655'

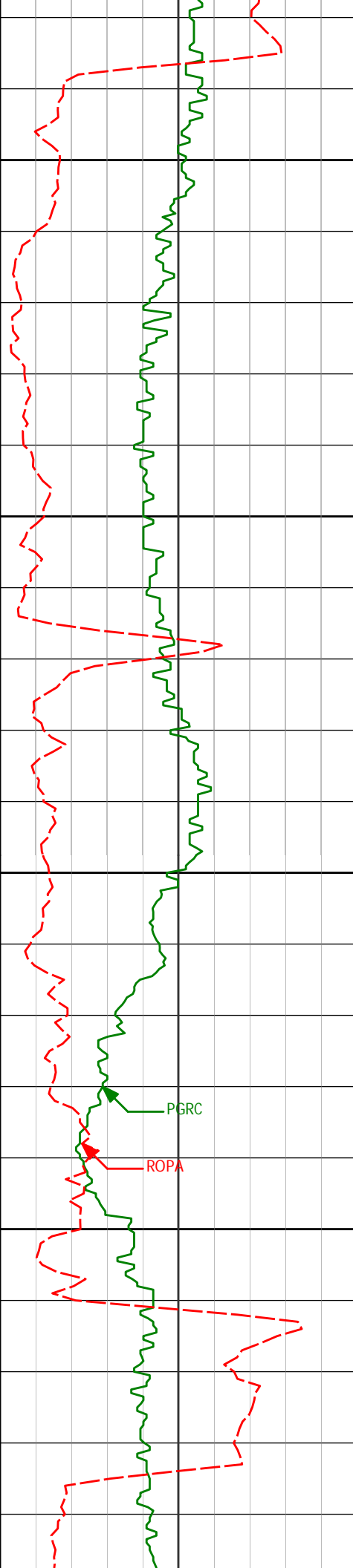
90.71°

89.71°

6717.91'

2247.70'

8700



8750

8750'

89.23°

89.95°

6717.96'

2342.58'

8800

8850

8845'

92.50°

90.82°

6716.52'

2437.38'

8900

8940'

90.96°

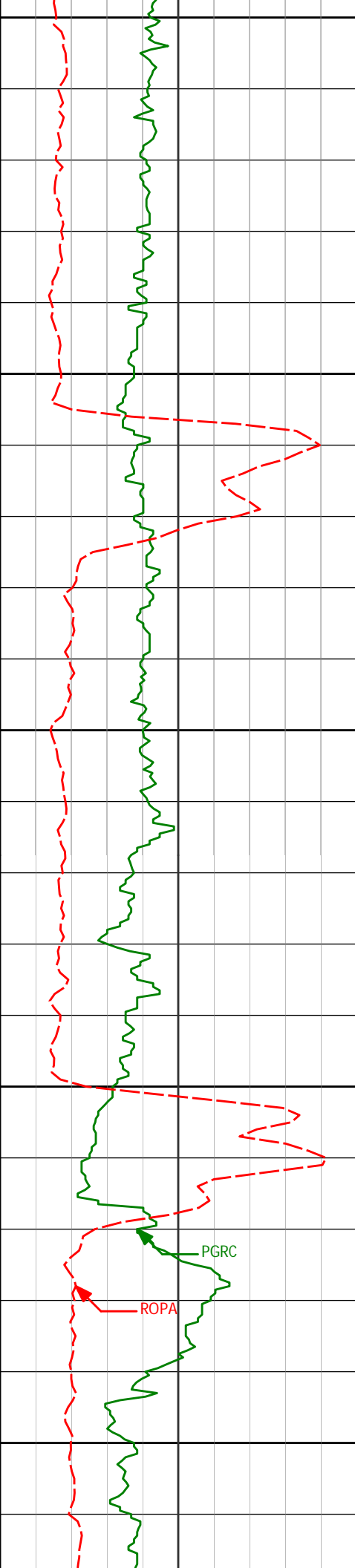
89.25°

6713.66'

2532.20'

PGRC

ROPA



8950

9000

9050

9100

9150

9035'

90.25°

89.64°

6712.65'

2627.10'

9130'

89.57°

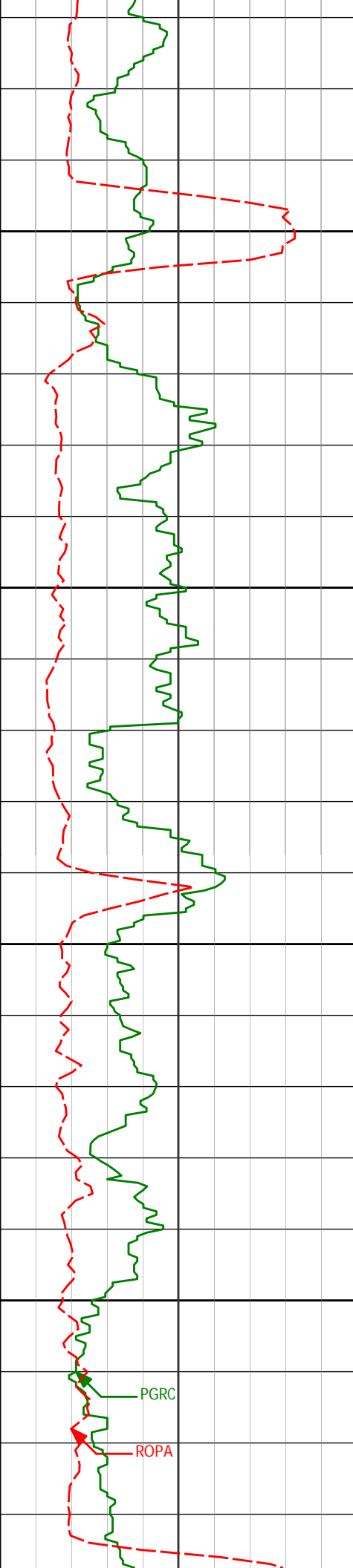
88.86°

6712.80'

2722.03'

PGRC

ROPA



9200

9250

9300

9350

9224'

88.77°

88.94°

6714.16'

2815.96'

9319'

89.23°

88.66°

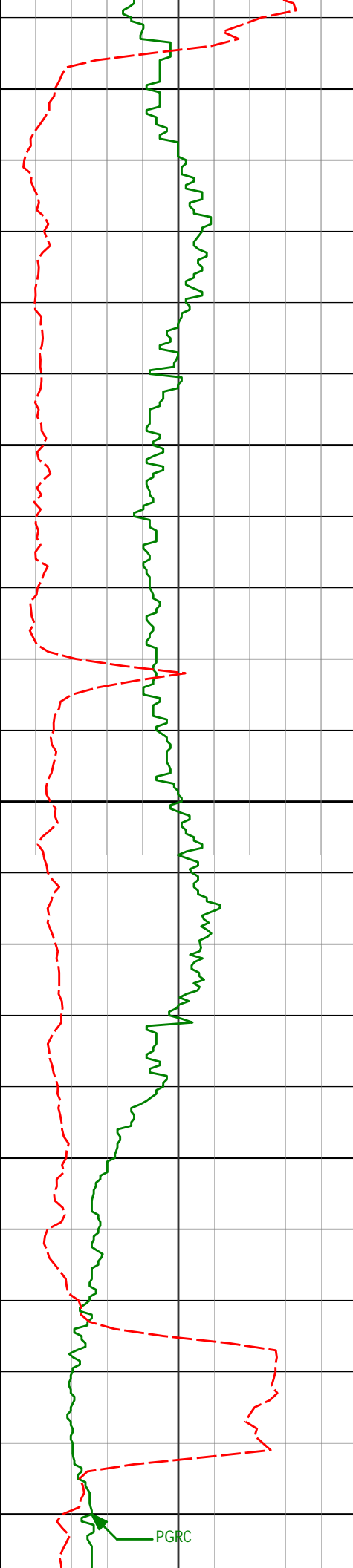
6715.82'

2910.90'

PGRC

ROPA





9400

9414'

89.29°

88.22°

6717.05'

3005.86'

9450

9500

9509'

92.41°

89.62°

6715.64'

3100.78'

9550

9600

9604'

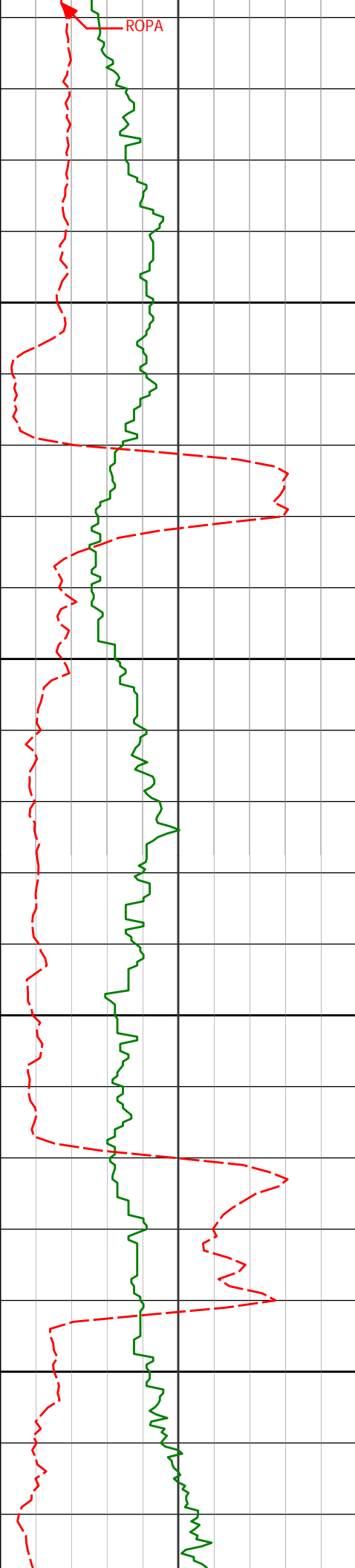
91.33°

89.03°

6712.54'

3195.65'

PGRC



9650

9700

9750

9800

9703'

92.59°

89.49°

6709.15'

3294.51'

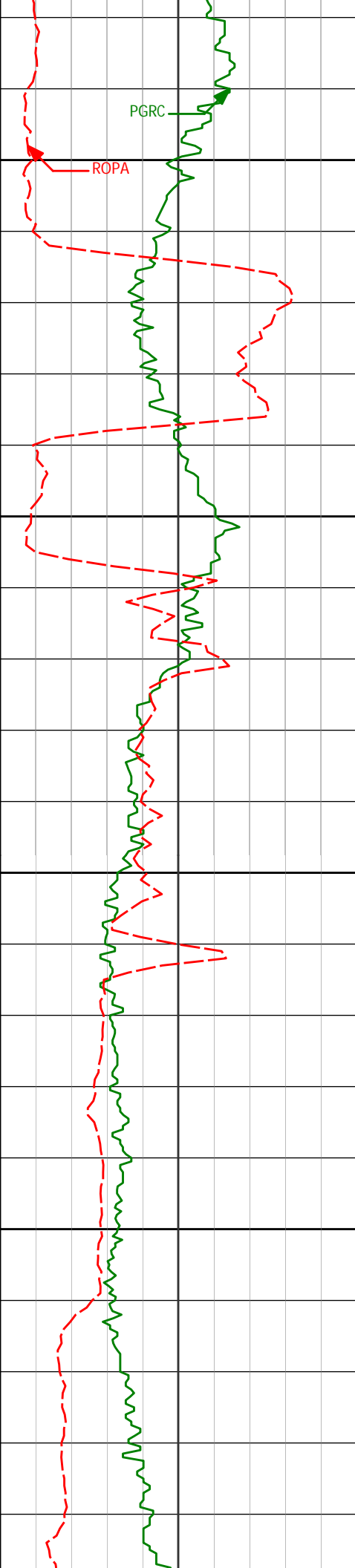
9798'

91.51°

88.73°

6705.75'

3389.38'



9850

9893'

88.61°

89.21°

6705.66'

3484.31'

9900

9950

10000

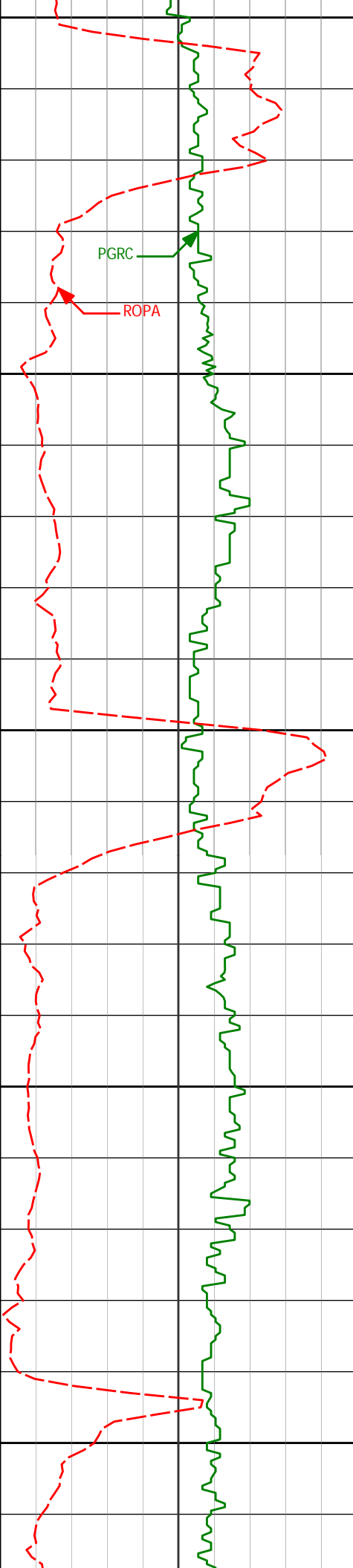
9988'

90.52°

89.83°

6706.38'

3579.21'



10050

10083'

90.92°

91.37°

6705.18'

3674.01'

10100

10150

10176'

89.97°

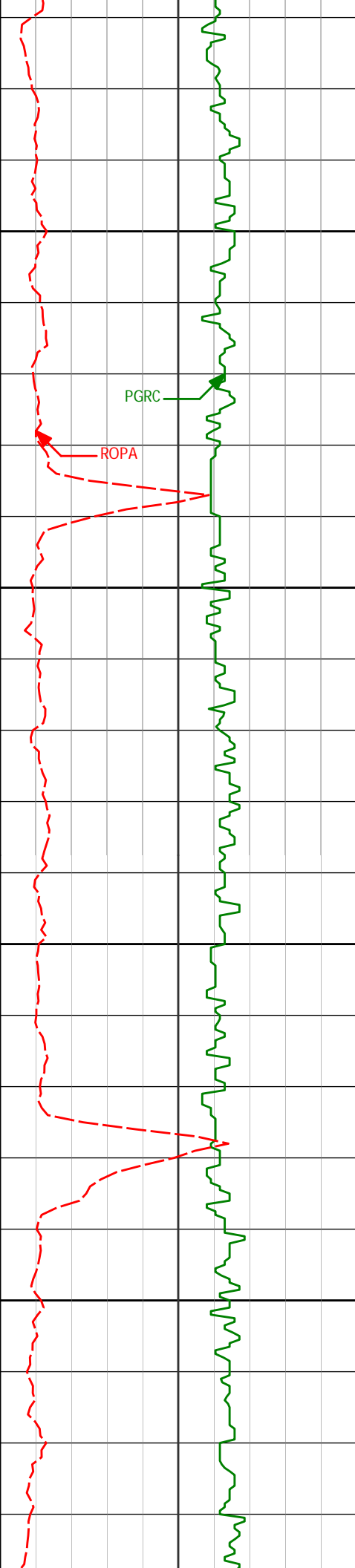
90.69°

6704.46'

3766.77'

10200

10250



10300

PGRC

ROPA

10350

10400

10450

10361'

90.09°

90.23°

6704.36'

3951.44'

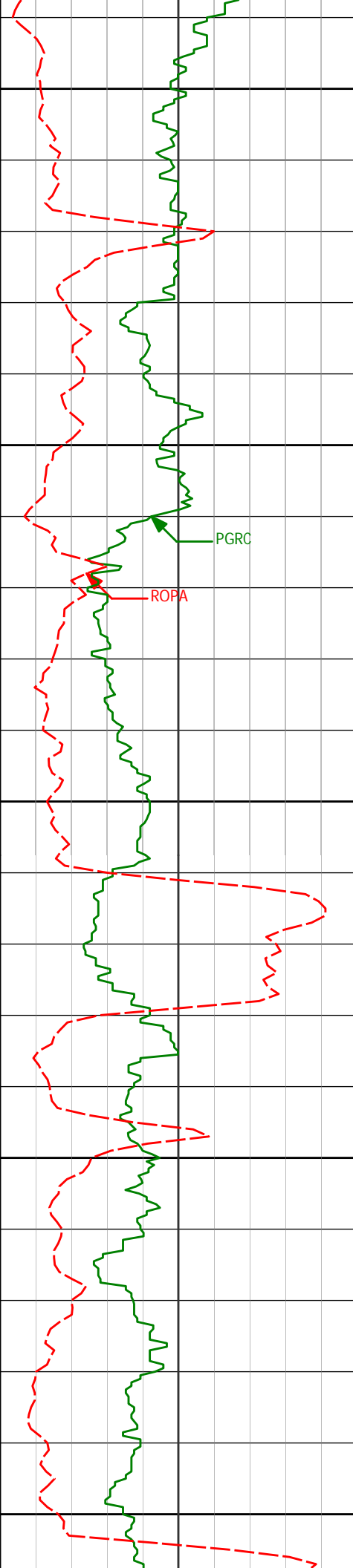
10453'

89.82°

89.46°

6704.44'

4043.32'



10500

10550

10600

10650

10700

10546'

88.21°

86.43°

6706.03'

4136.28'

PGRC

ROPA

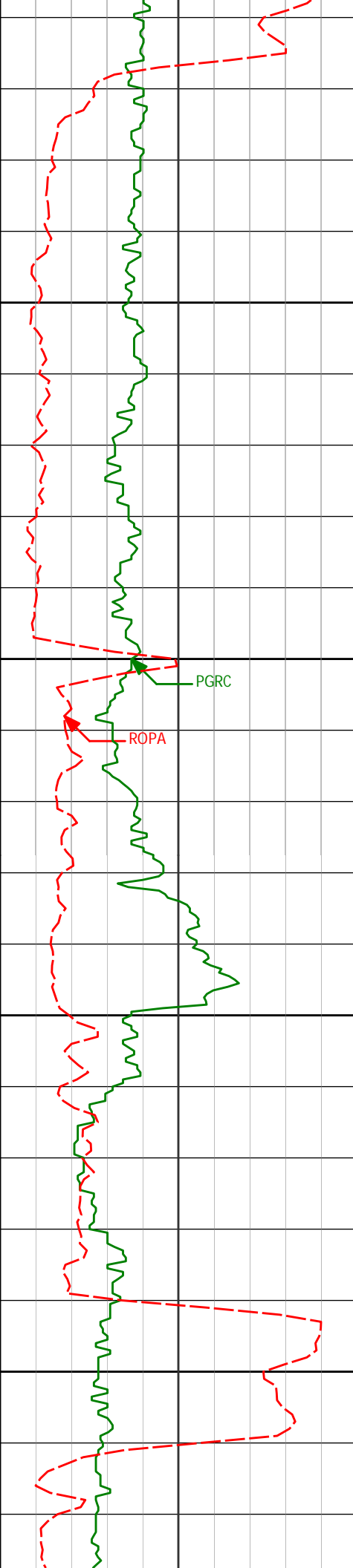
10639'

91.29°

88.80°

6706.44'

4229.25'



|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 10732' | 91.60° | 89.13° | 6704.10' | 4322.17' |
|--------|--------|--------|----------|----------|

10750

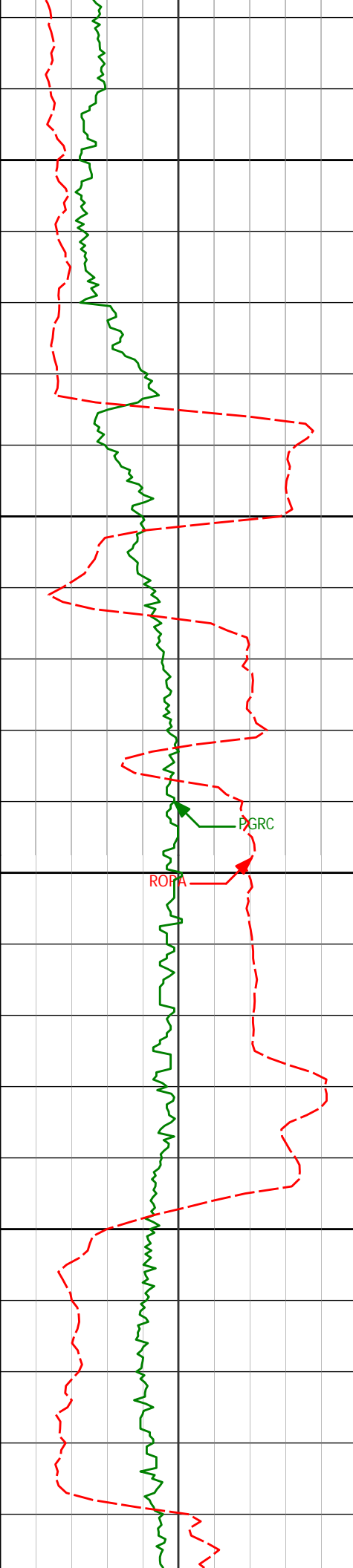
10800

10850

10900

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 10825' | 93.21° | 88.97° | 6700.19' | 4415.02' |
|--------|--------|--------|----------|----------|

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 10917' | 92.40° | 88.38° | 6695.69' | 4506.87' |
|--------|--------|--------|----------|----------|



10950

11000

11050

11100

11010'

91.67°

87.81°

6692.39'

4599.79'

11102'

90.37°

89.10°

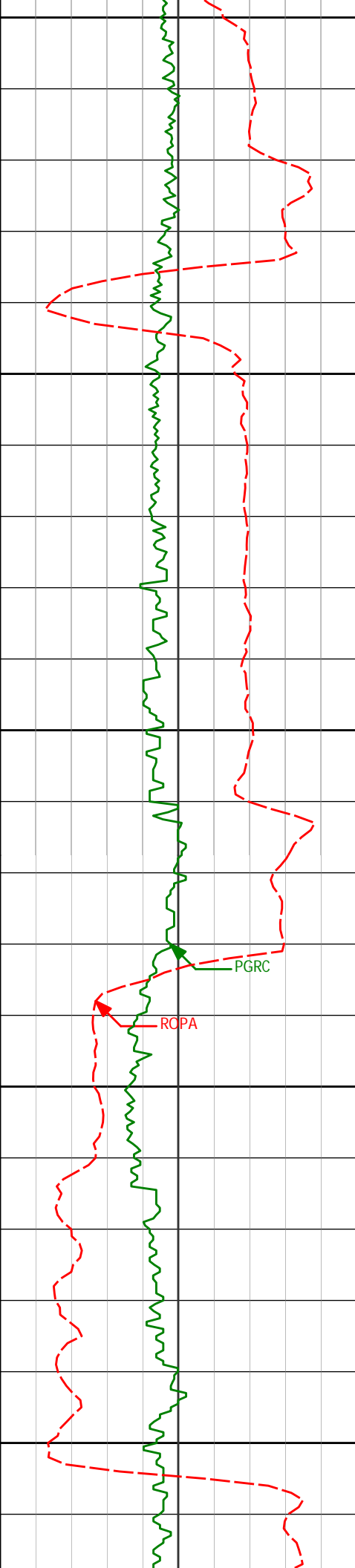
6690.75'

4691.74'

ROPA

PGRC





11150

11200

11250

11300

11350

11196'

90.80°

91.58°

6689.79'

4785.57'

11289'

87.63°

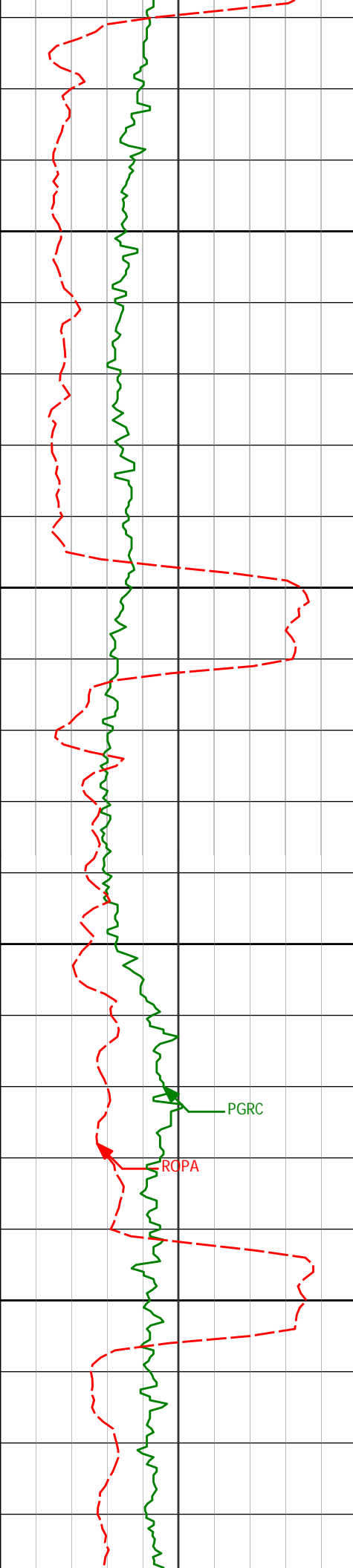
89.05°

6691.06'

4878.38'

PGRC

RCPA



11400

11450

11500

11550

11382'

90.00°

88.93°

6692.99'

4971.30'

11476'

90.00°

89.09°

6692.99'

5065.24'

11568'

90.03°

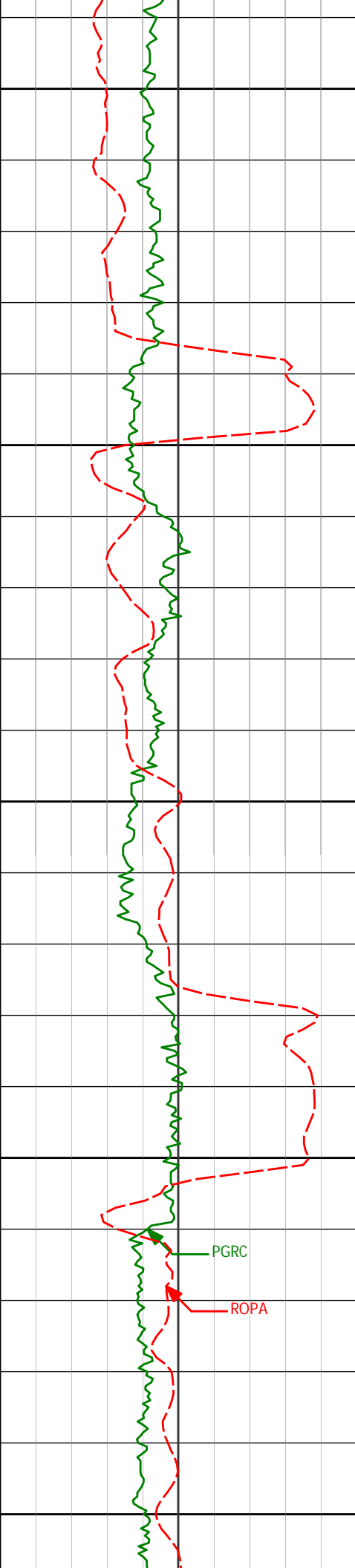
90.20°

6692.96'

5157.14'

PGRC

RCPA



11600

11650

11700

11750

11800

11661'

92.77°

89.19°

6690.69'

5249.99'

11756'

91.20°

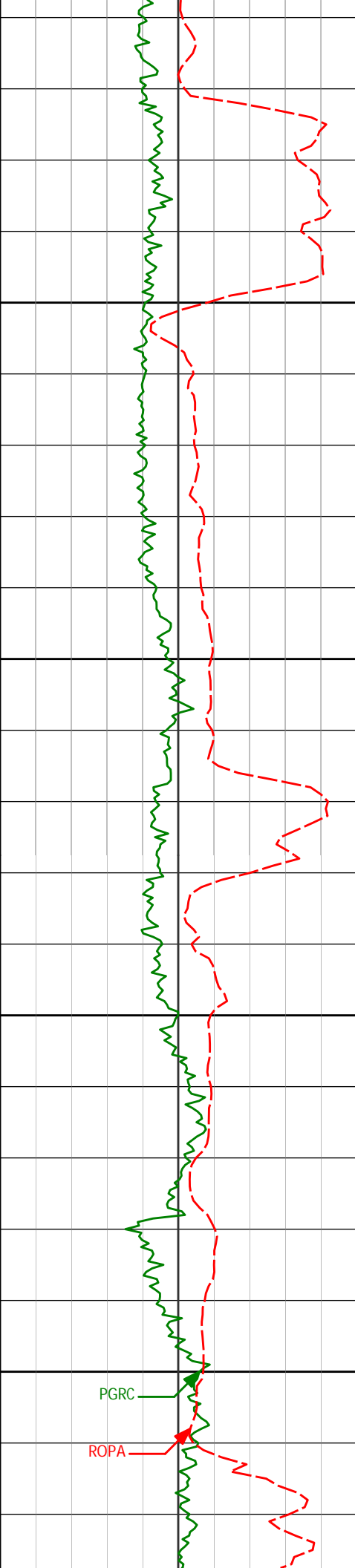
87.07°

6687.40'

5344.91'

PGRC

ROPA



11850

11851'

89.45°

89.17°

6686.86'

5439.88'

11900

11950

11945'

92.19°

90.67°

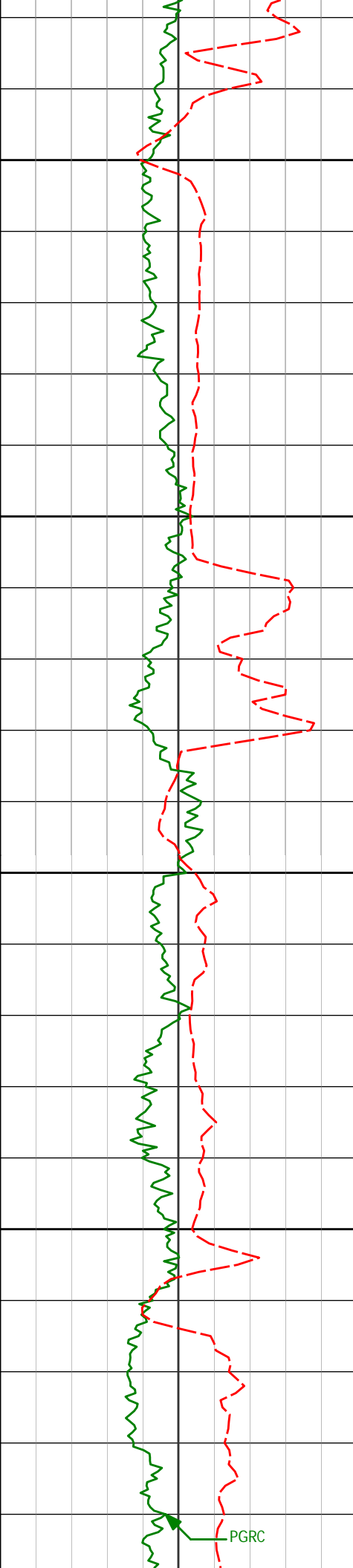
6685.52'

5533.73'

12000

PGRC

ROPA



12050

12100

12150

12200

12041'

89.14°

88.44°

6684.40'

5629.61'

12136'

87.90°

89.59°

6686.86'

5724.52'

12231'

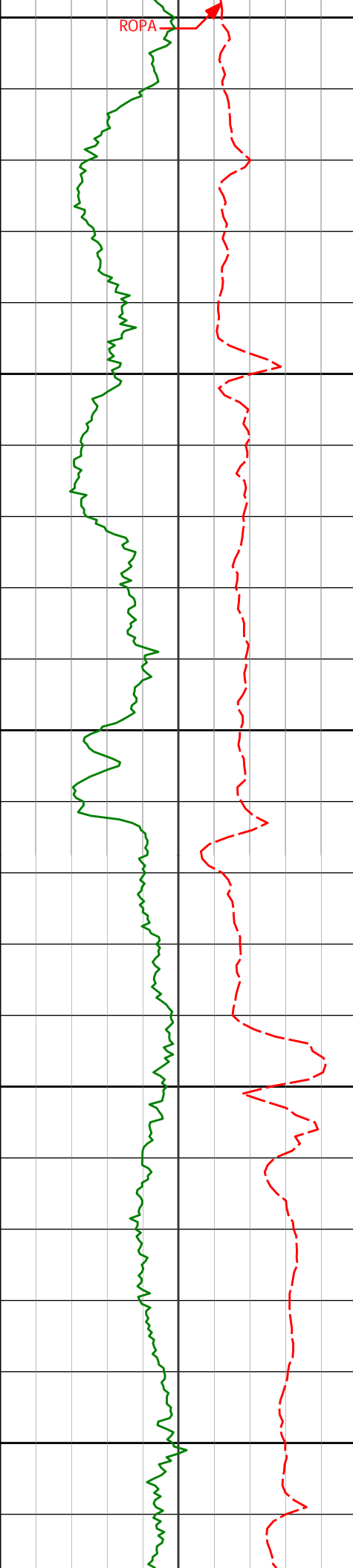
87.72°

88.74°

6690.49'

5819.38'

PGRC



12250

12300

12350

12400

12450

12325'

86.70°

87.62°

6695.06'

5913.24'

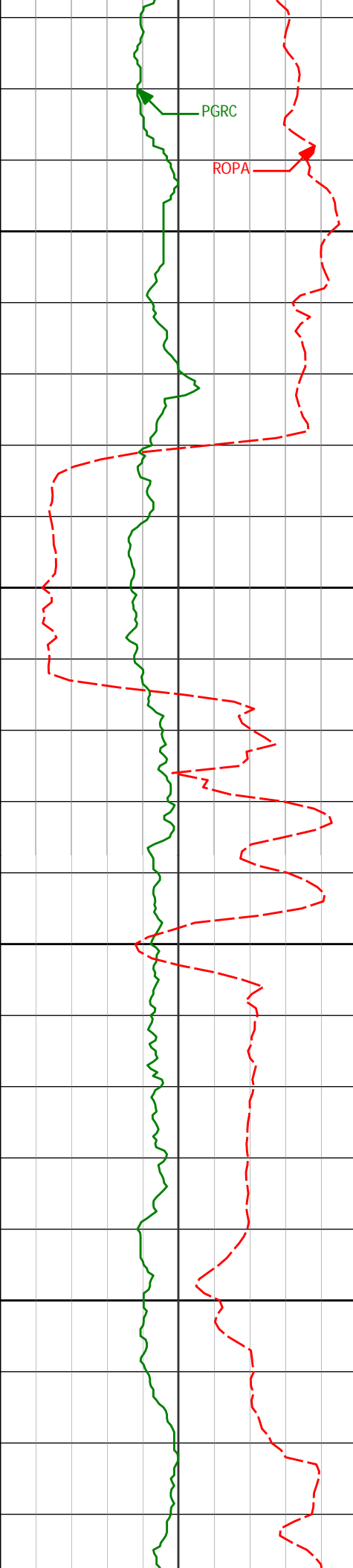
12419'

90.99°

86.58°

6696.96'

6007.20'



12500

<Run 400>

12550

12600

12650

12510'

90.25°

88.12°

6695.97'

6098.19'

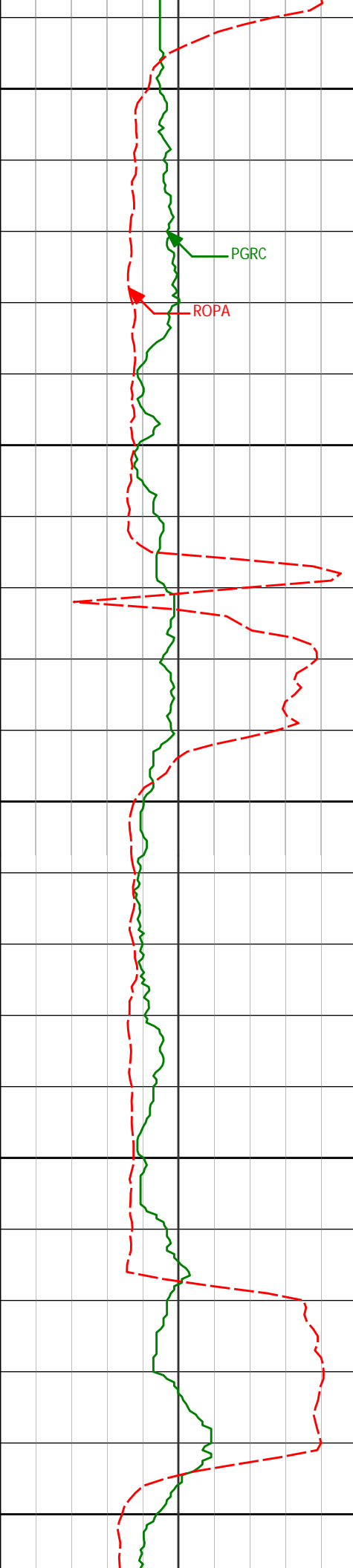
12605'

91.05°

87.64°

6694.89'

6193.17'



12700

12700'

88.76°

85.94°

6695.05'

6288.16'

PGRC

ROPA

12750

12800

12800'

90.59°

87.82°

6695.62'

6388.15'

12850

12900

12895'

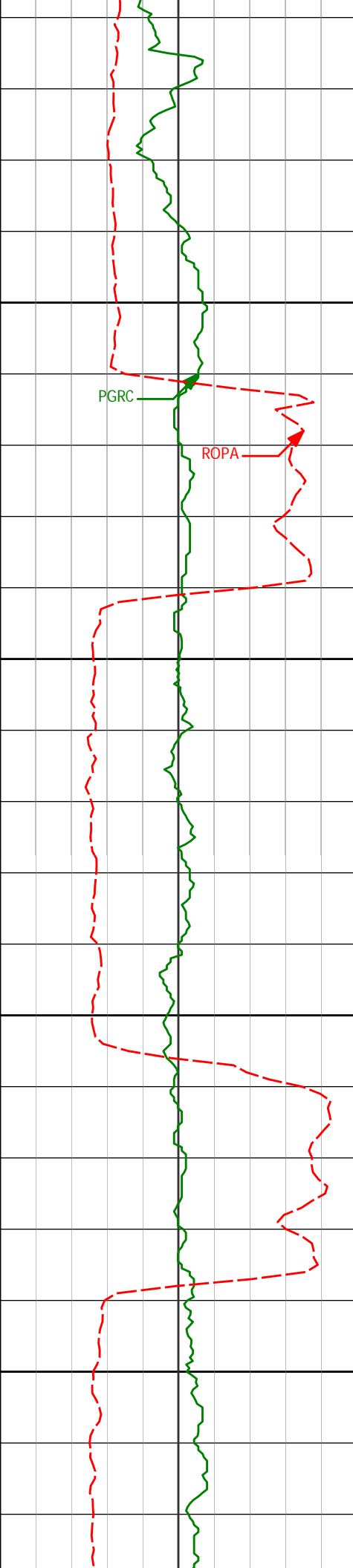
92.87°

90.19°

6692.75'

6483.03'





12950

PGRC

ROPA

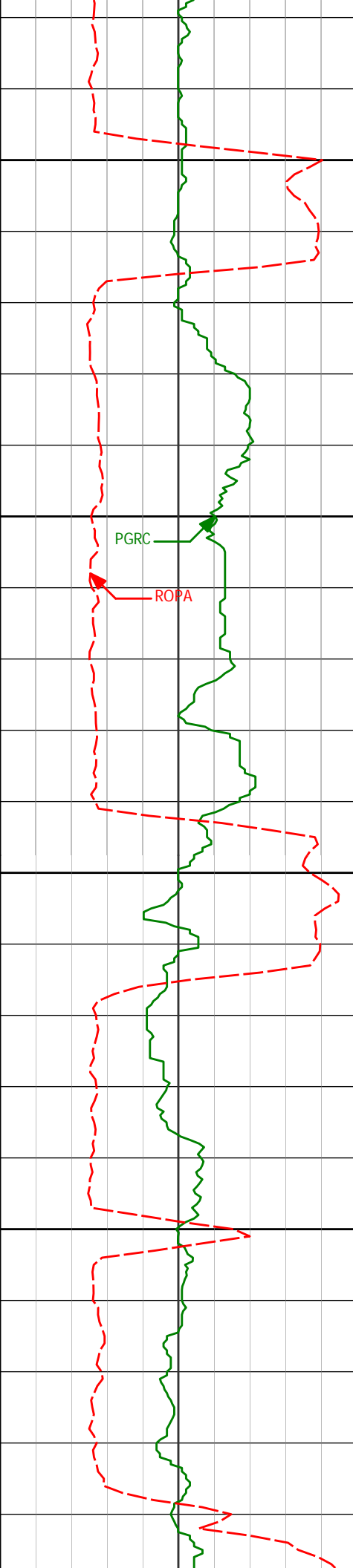
13000

13050

13100

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 12990' | 92.22° | 89.29° | 6688.53' | 6577.82' |
|--------|--------|--------|----------|----------|

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 13085' | 90.37° | 88.82° | 6686.39' | 6672.73' |
|--------|--------|--------|----------|----------|



13150

13179'

91.54°

89.69°

6684.82'

6766.64'

13200

PGRC

ROPA

13250

13274'

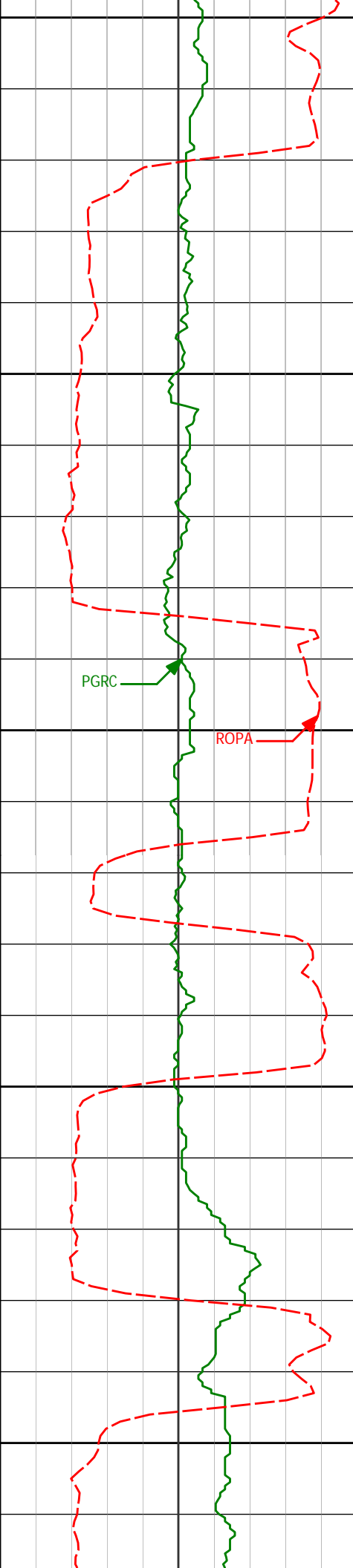
91.55°

88.44°

6682.26'

6861.54'

13300



13350

13369'

91.69°

88.50°

6679.57'

6956.47'

13400

PGRC

ROPA

13450

13464'

90.49°

89.43°

6677.77'

7051.40'

13500

13550

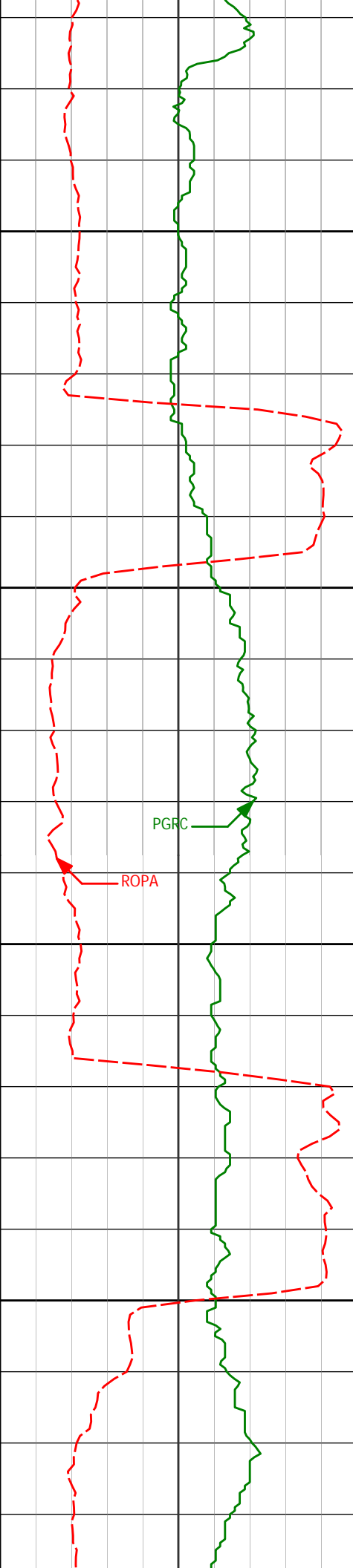
13559'

90.03°

90.46°

6677.33'

7146.26'



13600

13650

13700

13750

13654'

89.97°

90.59°

6677.33'

7241.08'

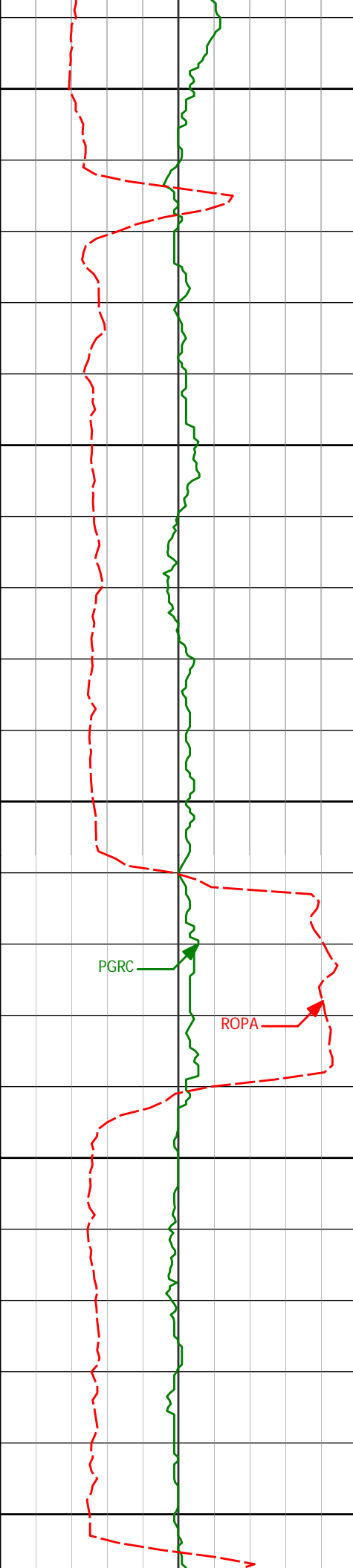
13749'

88.92°

89.28°

6678.25'

7335.95'



13800

13850

13900

13950

14000

13844'

90.06°

89.00°

6679.10'

7430.87'

13939'

89.94°

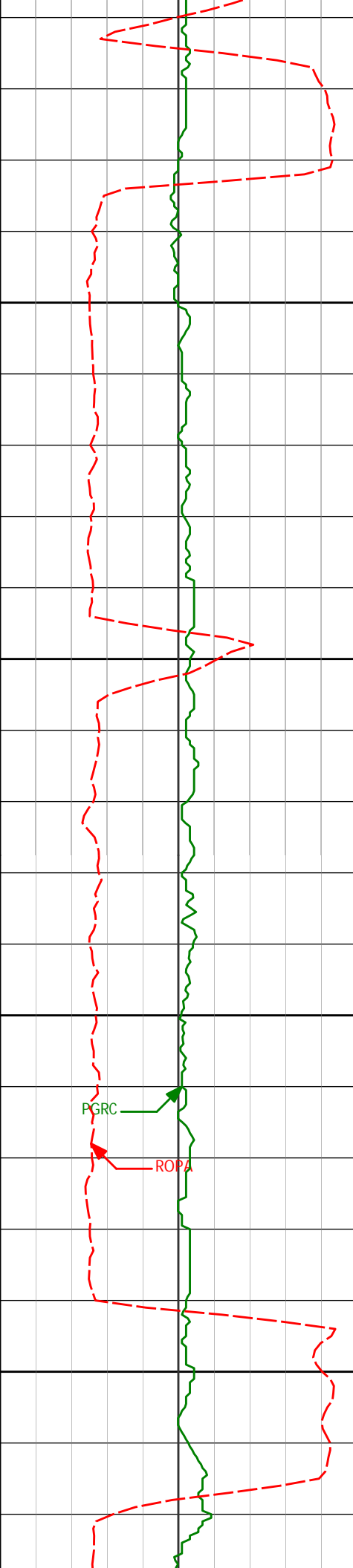
91.66°

6679.10'

7525.70'

PGRC

ROPA



14050

14100

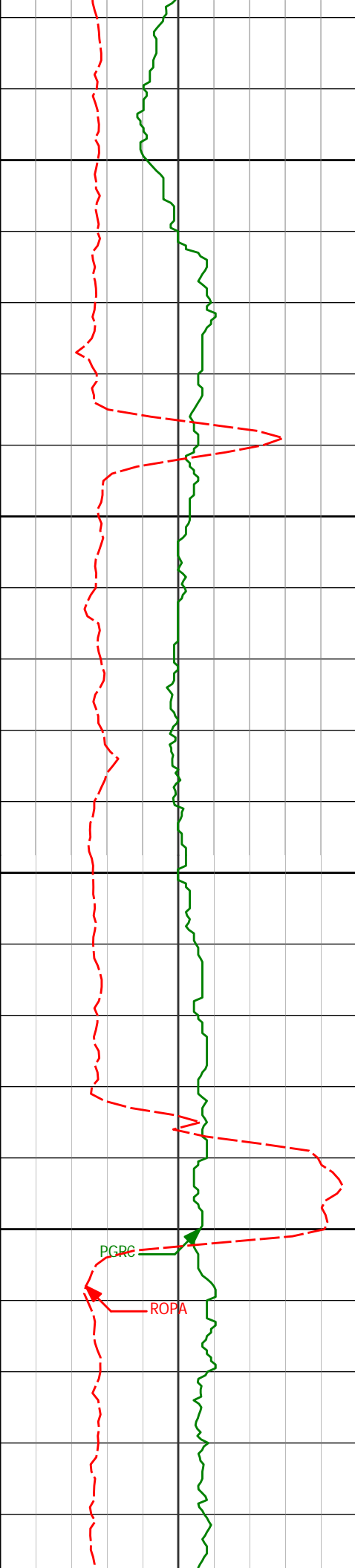
14150

14200

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 14034' | 89.51° | 91.38° | 6679.56' | 7620.40' |
|--------|--------|--------|----------|----------|

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 14129' | 90.83° | 92.59° | 6679.27' | 7715.03' |
|--------|--------|--------|----------|----------|

|        |        |        |          |          |
|--------|--------|--------|----------|----------|
| 14224' | 88.74° | 89.76° | 6679.63' | 7809.76' |
|--------|--------|--------|----------|----------|



14250

14300

14350

14400

14318'

90.28°

90.33°

6680.43'

7903.62'

14413'

89.75°

89.49°

6680.41'

7998.49'



14450

14500

14550

14600

14650

14508'

90.43°

92.71°

6680.26'

8093.23'

14603'

89.75°

88.61°

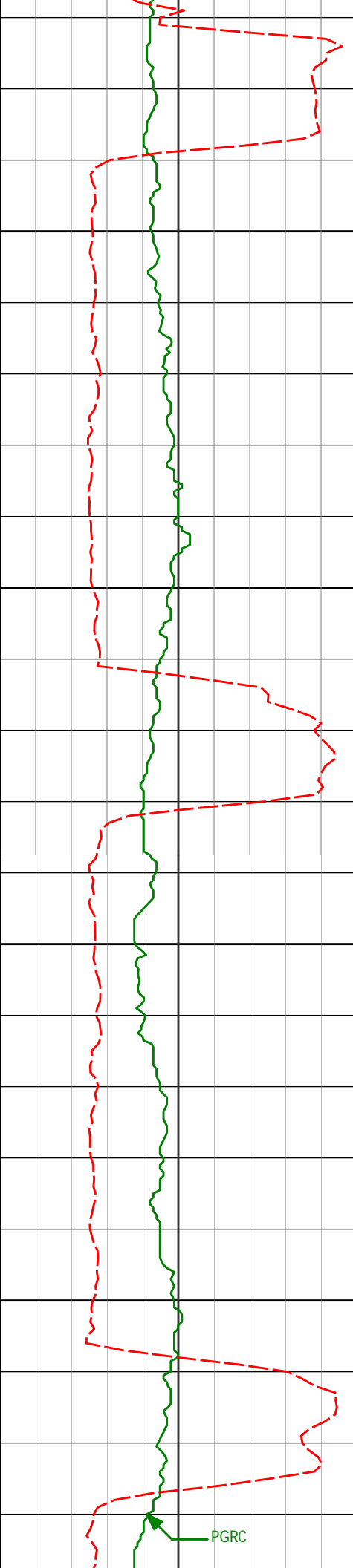
6680.11'

8188.02'

PGRC

ROPA





14700

14750

14800

14850

PGRC

14698'

90.12°

87.02°

6680.22'

8283.00'

14793'

90.00°

87.33°

6680.12'

8378.00'

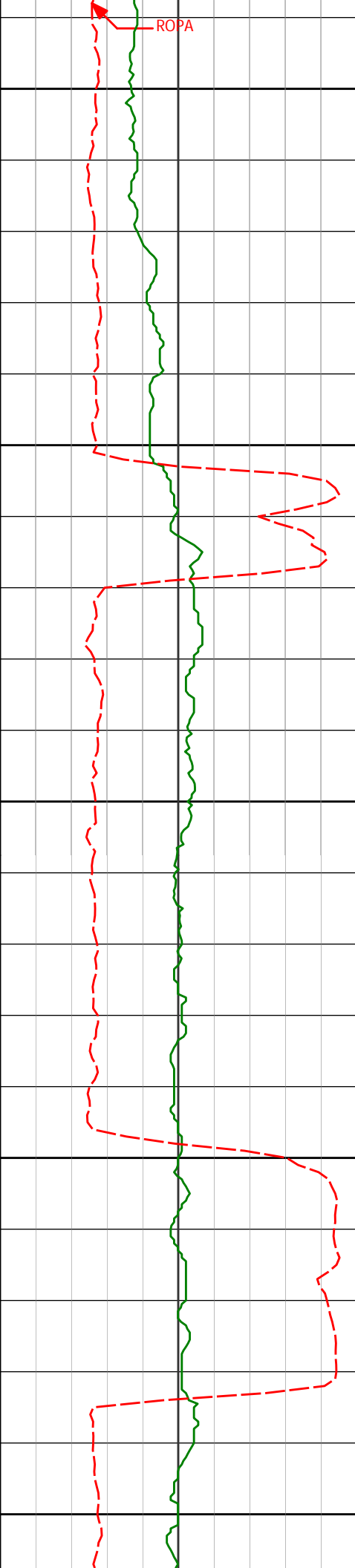
14887'

90.55°

88.05°

6679.67'

8471.99'



14900

14950

15000

15050

15100

14982'

91.97°

89.10°

6677.58'

8566.93'

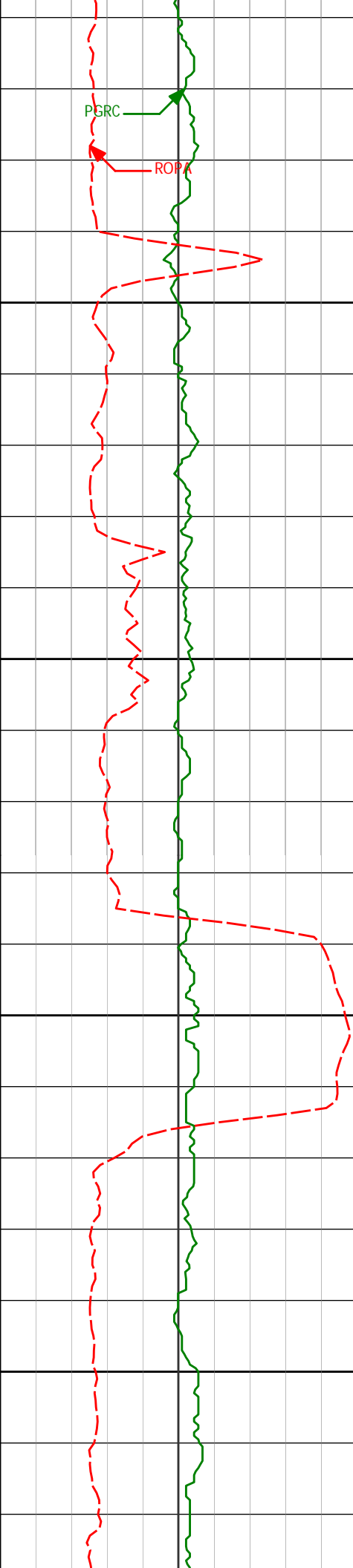
15077'

89.91°

88.38°

6676.02'

8661.86'



15150

15172'

90.22°

87.56°

6675.91'

8756.85'

15200

15250

15267'

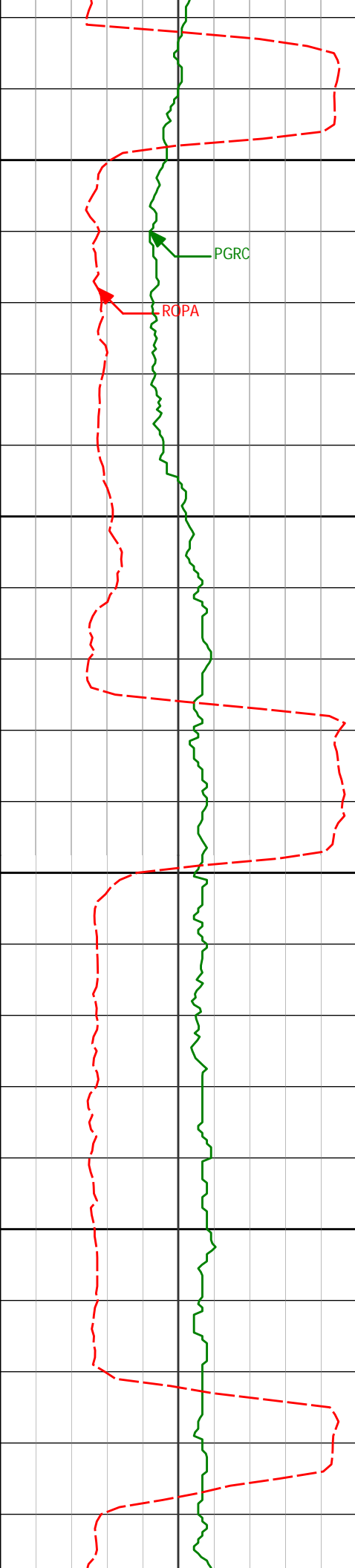
90.46°

90.32°

6675.35'

8851.78'

15300



15350

15362'

90.96°

91.76°

6674.17'

8946.53'

15400

15450

15456'

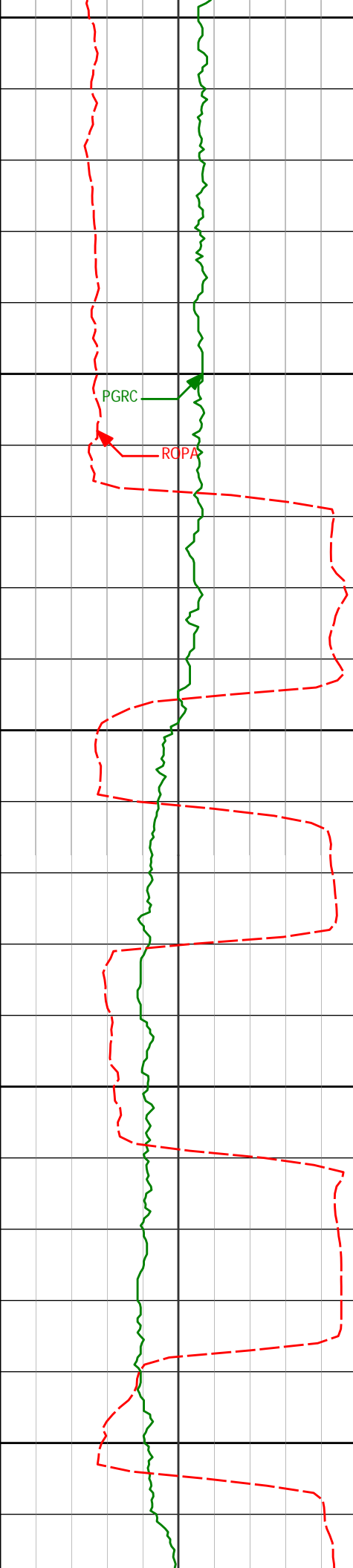
89.63°

90.25°

6673.69'

9040.29'

15500



15550

15551'

90.43°

95.72°

6673.64'

9134.73'

15600

PGRC

RCPA

15650

15646'

89.11°

99.51°

6674.02'

9228.08'

15700

15750

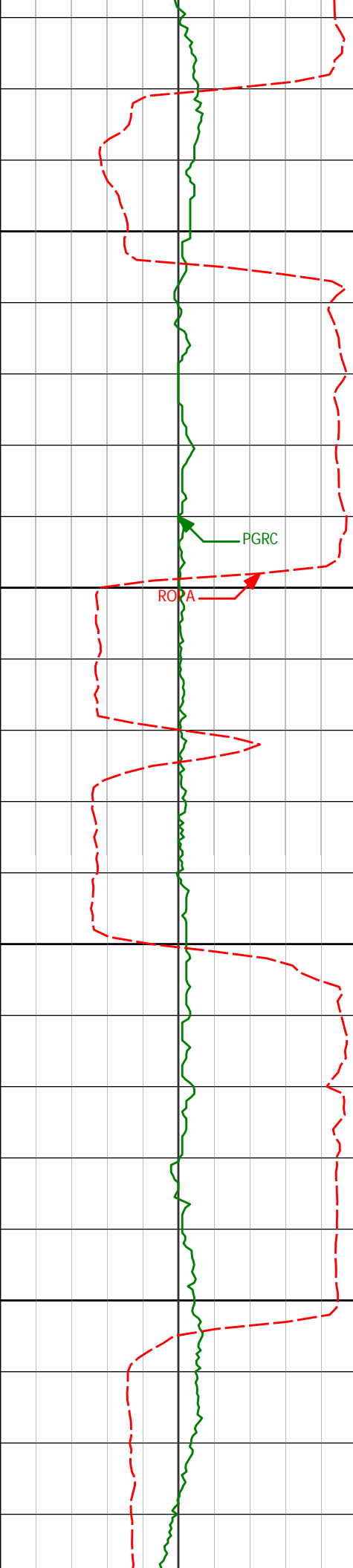
15741'

91.42°

96.22°

6673.58'

9321.35'



15800

15836'

90.25°

92.00°

6672.20'

9415.58'

15850

15900

15931'

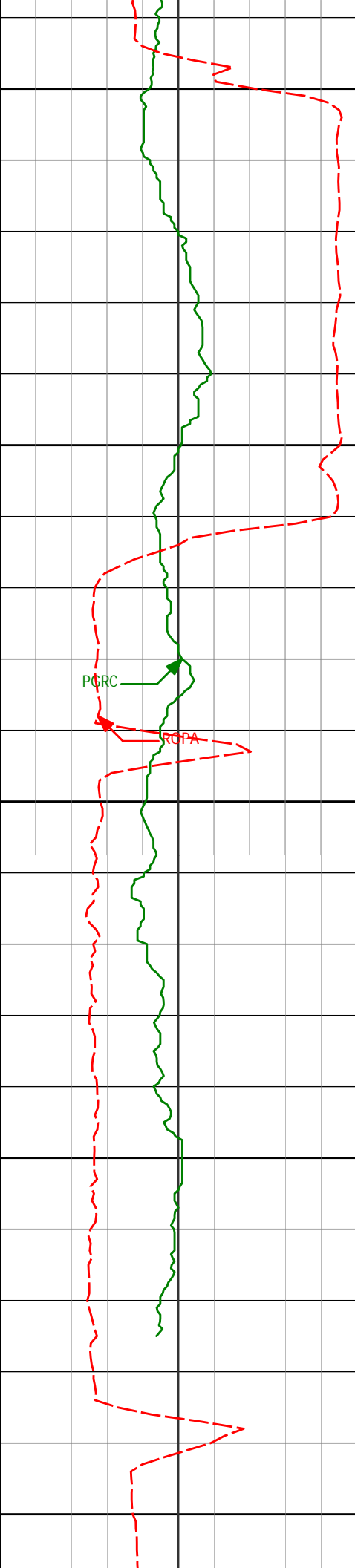
89.57°

91.67°

6672.34'

9510.23'

15950



16000

16026'

88.98°

88.17°

6673.55'

9605.08'

16050

16100

16121'

88.98°

85.86°

6675.24'

9700.06'

16150

16165'

89.44°

85.57°

6675.85'

9744.05'

16200



# DIRECTIONAL SURVEY REPORT

| Measured<br>Depth<br>(feet) | Inclination<br>(degrees) | Direction<br>(degrees) | Vertical<br>Depth<br>(feet) | Latitude<br>(feet) | Departure<br>(feet) | Vertical<br>Section<br>(feet) | Dogleg<br>(deg/100ft) |
|-----------------------------|--------------------------|------------------------|-----------------------------|--------------------|---------------------|-------------------------------|-----------------------|
| 0.00                        | 0.00                     | 0.00                   | 0.00                        | 0.00 N             | 0.00 E              | 0.00                          | TIE-IN                |
| 360.00                      | 0.60                     | 107.43                 | 359.99                      | 0.56 S             | 1.80 E              | 1.77                          | 0.17                  |
| 762.00                      | 1.20                     | 152.83                 | 761.95                      | 4.94 S             | 5.73 E              | 5.46                          | 0.22                  |
| 907.00                      | 2.25                     | 159.47                 | 906.88                      | 8.96 S             | 7.42 E              | 6.94                          | 0.74                  |
| 1001.00                     | 1.87                     | 101.41                 | 1000.83                     | 10.99 S            | 9.57 E              | 8.98                          | 2.16                  |
| 1094.00                     | 2.00                     | 12.78                  | 1093.79                     | 9.71 S             | 11.42 E             | 10.89                         | 2.91                  |
| 1186.00                     | 2.12                     | 351.74                 | 1185.73                     | 6.46 S             | 11.53 E             | 11.17                         | 0.83                  |
| 1279.00                     | 2.08                     | 349.84                 | 1278.67                     | 3.09 S             | 10.98 E             | 10.80                         | 0.09                  |
| 1374.00                     | 2.36                     | 355.03                 | 1373.60                     | 0.55 N             | 10.51 E             | 10.52                         | 0.36                  |
| 1469.00                     | 2.33                     | 351.89                 | 1468.52                     | 4.41 N             | 10.07 E             | 10.29                         | 0.14                  |
| 1564.00                     | 2.72                     | 357.44                 | 1563.43                     | 8.58 N             | 9.70 E              | 10.13                         | 0.48                  |
| 1659.00                     | 2.70                     | 355.61                 | 1658.32                     | 13.06 N            | 9.42 E              | 10.10                         | 0.09                  |
| 1754.00                     | 2.94                     | 355.47                 | 1753.21                     | 17.72 N            | 9.06 E              | 9.98                          | 0.25                  |
| 1848.00                     | 2.62                     | 353.96                 | 1847.10                     | 22.26 N            | 8.64 E              | 9.81                          | 0.35                  |
| 1943.00                     | 2.64                     | 351.55                 | 1942.00                     | 26.58 N            | 8.09 E              | 9.49                          | 0.12                  |
| 2038.00                     | 5.09                     | 355.53                 | 2036.77                     | 32.95 N            | 7.44 E              | 9.17                          | 2.59                  |
| 2133.00                     | 6.51                     | 347.47                 | 2131.29                     | 42.41 N            | 5.95 E              | 8.18                          | 1.72                  |
| 2228.00                     | 8.81                     | 351.22                 | 2225.43                     | 54.86 N            | 3.67 E              | 6.56                          | 2.48                  |
| 2322.00                     | 11.23                    | 357.12                 | 2317.99                     | 71.12 N            | 2.11 E              | 5.86                          | 2.79                  |
| 2417.00                     | 14.07                    | 357.14                 | 2410.68                     | 91.89 N            | 1.07 E              | 5.92                          | 2.99                  |
| 2606.00                     | 13.76                    | 357.06                 | 2594.13                     | 137.28 N           | 1.23 W              | 6.03                          | 0.16                  |
| 2700.00                     | 13.33                    | 355.75                 | 2685.52                     | 159.26 N           | 2.61 W              | 5.81                          | 0.56                  |
| 2794.00                     | 15.86                    | 1.50                   | 2776.48                     | 182.91 N           | 3.08 W              | 6.60                          | 3.10                  |
| 2889.00                     | 16.41                    | 0.36                   | 2867.74                     | 209.30 N           | 2.65 W              | 8.42                          | 0.67                  |
| 2984.00                     | 16.42                    | 0.28                   | 2958.87                     | 236.15 N           | 2.50 W              | 9.98                          | 0.03                  |
| 3079.00                     | 13.91                    | 358.00                 | 3050.55                     | 260.99 N           | 2.83 W              | 10.96                         | 2.72                  |
| 3174.00                     | 13.41                    | 356.96                 | 3142.86                     | 283.41 N           | 3.82 W              | 11.17                         | 0.59                  |
| 3268.00                     | 9.43                     | 358.56                 | 3234.99                     | 302.00 N           | 4.59 W              | 11.38                         | 4.25                  |
| 3363.00                     | 8.54                     | 1.11                   | 3328.82                     | 316.83 N           | 4.65 W              | 12.11                         | 1.03                  |
| 3458.00                     | 7.22                     | 1.52                   | 3422.92                     | 329.85 N           | 4.35 W              | 13.09                         | 1.39                  |
| 3553.00                     | 6.46                     | 10.45                  | 3517.25                     | 341.07 N           | 3.23 W              | 14.81                         | 1.37                  |
| 3648.00                     | 7.29                     | 7.96                   | 3611.56                     | 352.30 N           | 1.42 W              | 17.20                         | 0.93                  |
| 3742.00                     | 6.55                     | 1.55                   | 3704.88                     | 363.56 N           | 0.45 W              | 18.77                         | 1.14                  |
| 3837.00                     | 4.78                     | 350.88                 | 3799.41                     | 372.89 N           | 0.93 W              | 18.78                         | 2.16                  |
| 3932.00                     | 3.48                     | 331.38                 | 3894.17                     | 379.33 N           | 2.94 W              | 17.11                         | 2.00                  |



|          |       |        |         |          |           |         |       |
|----------|-------|--------|---------|----------|-----------|---------|-------|
| 3932.00  | 3.48  | 331.38 | 3894.17 | 379.33 N | 2.94 W    | 17.11   | 2.00  |
| 4028.00  | 1.55  | 248.58 | 3990.09 | 381.41 N | 5.55 W    | 14.62   | 3.78  |
| 4123.00  | 1.25  | 244.02 | 4085.07 | 380.49 N | 7.67 W    | 12.45   | 0.34  |
| 4217.00  | 1.25  | 228.26 | 4179.04 | 379.36 N | 9.36 W    | 10.71   | 0.36  |
| 4312.00  | 1.11  | 227.71 | 4274.02 | 378.05 N | 10.81 W   | 9.18    | 0.15  |
| 4407.00  | 0.57  | 195.52 | 4369.01 | 376.98 N | 11.62 W   | 8.32    | 0.73  |
| 4502.00  | 0.55  | 187.60 | 4464.01 | 376.07 N | 11.81 W   | 8.09    | 0.08  |
| 4597.00  | 0.59  | 204.48 | 4559.00 | 375.17 N | 12.07 W   | 7.78    | 0.18  |
| 4692.00  | 0.83  | 206.45 | 4654.00 | 374.11 N | 12.58 W   | 7.21    | 0.25  |
| 4787.00  | 1.17  | 201.93 | 4748.98 | 372.59 N | 13.25 W   | 6.47    | 0.37  |
| 4881.00  | 0.71  | 227.06 | 4842.97 | 371.31 N | 14.03 W   | 5.61    | 0.65  |
| 4976.00  | 0.34  | 207.82 | 4937.97 | 370.66 N | 14.60 W   | 5.02    | 0.43  |
| 5071.00  | 0.34  | 220.49 | 5032.96 | 370.19 N | 14.91 W   | 4.68    | 0.08  |
| 5166.00  | 0.36  | 252.62 | 5127.96 | 369.89 N | 15.38 W   | 4.20    | 0.20  |
| 5261.00  | 1.00  | 222.12 | 5222.96 | 369.19 N | 16.22 W   | 3.32    | 0.75  |
| 5450.00  | 0.72  | 196.83 | 5411.94 | 366.83 N | 17.67 W   | 1.75    | 0.25  |
| 5640.00  | 0.26  | 137.28 | 5601.93 | 365.37 N | 17.72 W   | 1.62    | 0.33  |
| 5735.00  | 0.19  | 243.40 | 5696.93 | 365.14 N | 17.72 W   | 1.61    | 0.38  |
| 5830.00  | 0.09  | 317.62 | 5791.93 | 365.12 N | 17.91 W   | 1.42    | 0.20  |
| 5925.00  | 0.37  | 330.98 | 5886.93 | 365.44 N | 18.11 W   | 1.24    | 0.30  |
| 6008.00  | 3.88  | 78.81  | 5969.86 | 366.22 N | 15.48 W   | 3.90    | 4.83  |
| 6056.00  | 8.58  | 85.56  | 6017.57 | 366.82 N | 10.32 W   | 9.09    | 9.89  |
| 6103.00  | 12.05 | 88.05  | 6063.80 | 367.26 N | 1.91 W    | 17.50   | 7.44  |
| 6151.00  | 15.56 | 88.40  | 6110.41 | 367.61 N | 9.53 E    | 28.95   | 7.31  |
| 6197.00  | 17.48 | 83.13  | 6154.51 | 368.60 N | 22.56 E   | 42.01   | 5.29  |
| 6245.00  | 20.14 | 83.09  | 6199.94 | 370.46 N | 37.92 E   | 57.45   | 5.54  |
| 6292.00  | 22.61 | 88.37  | 6243.71 | 371.69 N | 54.99 E   | 74.56   | 6.66  |
| 6340.00  | 24.86 | 92.52  | 6287.65 | 371.51 N | 74.30 E   | 93.83   | 5.84  |
| 6387.00  | 26.23 | 90.54  | 6330.06 | 370.98 N | 94.56 E   | 114.03  | 3.43  |
| 6435.00  | 30.26 | 88.50  | 6372.33 | 371.20 N | 117.26 E  | 136.72  | 8.63  |
| 6482.00  | 36.63 | 85.88  | 6411.53 | 372.51 N | 143.11 E  | 162.61  | 13.89 |
| 6576.00  | 49.61 | 88.10  | 6480.00 | 375.73 N | 207.14 E  | 226.71  | 13.90 |
| 6671.00  | 57.31 | 88.47  | 6536.52 | 378.00 N | 283.38 E  | 302.96  | 8.11  |
| 6719.00  | 57.62 | 87.88  | 6562.34 | 379.29 N | 323.82 E  | 343.42  | 1.22  |
| 6766.00  | 58.00 | 87.50  | 6587.38 | 380.89 N | 363.56 E  | 383.19  | 1.06  |
| 6861.00  | 65.67 | 88.63  | 6632.18 | 383.69 N | 447.20 E  | 466.86  | 8.14  |
| 6956.00  | 72.70 | 87.42  | 6665.92 | 386.77 N | 535.89 E  | 555.59  | 7.49  |
| 7051.00  | 79.34 | 88.44  | 6688.86 | 390.09 N | 627.97 E  | 647.71  | 7.07  |
| 7131.00  | 80.29 | 89.50  | 6703.01 | 391.50 N | 706.69 E  | 726.40  | 1.76  |
| 7233.00  | 86.55 | 90.28  | 6714.69 | 391.69 N | 807.97 E  | 827.54  | 6.18  |
| 7328.00  | 86.80 | 90.59  | 6720.20 | 390.97 N | 902.80 E  | 922.21  | 0.42  |
| 7423.00  | 89.60 | 91.60  | 6723.18 | 389.15 N | 997.73 E  | 1016.91 | 3.13  |
| 7517.00  | 89.26 | 90.57  | 6724.12 | 387.37 N | 1091.71 E | 1110.66 | 1.15  |
| 7612.00  | 91.17 | 90.83  | 6723.76 | 386.21 N | 1186.69 E | 1205.45 | 2.03  |
| 7707.00  | 92.31 | 89.47  | 6720.88 | 385.97 N | 1281.65 E | 1300.26 | 1.87  |
| 7801.00  | 88.80 | 86.84  | 6719.97 | 388.99 N | 1375.57 E | 1394.21 | 4.67  |
| 7896.00  | 89.48 | 86.34  | 6721.39 | 394.64 N | 1470.39 E | 1489.20 | 0.89  |
| 7991.00  | 89.38 | 88.67  | 6722.34 | 398.78 N | 1565.29 E | 1584.18 | 2.45  |
| 8086.00  | 91.64 | 88.74  | 6721.49 | 400.92 N | 1660.26 E | 1679.13 | 2.38  |
| 8181.00  | 90.00 | 88.38  | 6720.13 | 403.31 N | 1755.21 E | 1774.08 | 1.77  |
| 8276.00  | 88.58 | 88.38  | 6721.31 | 406.00 N | 1850.16 E | 1869.04 | 1.49  |
| 8371.00  | 88.86 | 88.67  | 6723.43 | 408.44 N | 1945.11 E | 1963.98 | 0.42  |
| 8465.00  | 91.67 | 88.83  | 6723.00 | 410.49 N | 2039.08 E | 2057.92 | 2.99  |
| 8560.00  | 91.88 | 89.25  | 6720.05 | 412.08 N | 2134.02 E | 2152.82 | 0.49  |
| 8655.00  | 90.71 | 89.71  | 6717.91 | 412.94 N | 2228.99 E | 2247.70 | 1.32  |
| 8750.00  | 89.23 | 89.95  | 6717.96 | 413.23 N | 2323.98 E | 2342.58 | 1.58  |
| 8845.00  | 92.50 | 90.82  | 6716.52 | 412.59 N | 2418.96 E | 2437.38 | 3.56  |
| 8940.00  | 90.96 | 89.25  | 6713.66 | 412.53 N | 2513.91 E | 2532.20 | 2.31  |
| 9035.00  | 90.25 | 89.64  | 6712.65 | 413.45 N | 2608.90 E | 2627.10 | 0.85  |
| 9130.00  | 89.57 | 88.86  | 6712.80 | 414.69 N | 2703.89 E | 2722.03 | 1.09  |
| 9224.00  | 88.77 | 88.94  | 6714.16 | 416.50 N | 2797.86 E | 2815.96 | 0.86  |
| 9319.00  | 89.23 | 88.66  | 6715.82 | 418.49 N | 2892.82 E | 2910.90 | 0.57  |
| 9414.00  | 89.29 | 88.22  | 6717.05 | 421.07 N | 2987.78 E | 3005.86 | 0.47  |
| 9509.00  | 92.41 | 89.62  | 6715.64 | 422.86 N | 3082.74 E | 3100.78 | 3.60  |
| 9604.00  | 91.33 | 89.03  | 6712.54 | 423.98 N | 3177.68 E | 3195.65 | 1.30  |
| 9703.00  | 92.59 | 89.49  | 6709.15 | 425.26 N | 3276.61 E | 3294.51 | 1.35  |
| 9798.00  | 91.51 | 88.73  | 6705.75 | 426.74 N | 3371.54 E | 3389.38 | 1.39  |
| 9893.00  | 88.61 | 89.21  | 6705.66 | 428.44 N | 3466.51 E | 3484.31 | 3.09  |
| 9988.00  | 90.52 | 89.83  | 6706.38 | 429.24 N | 3561.50 E | 3579.21 | 2.11  |
| 10083.00 | 90.92 | 91.37  | 6705.18 | 428.25 N | 3656.49 E | 3674.01 | 1.67  |
| 10176.00 | 89.97 | 90.69  | 6704.46 | 426.57 N | 3749.47 E | 3766.77 | 1.26  |
| 10268.00 | 90.03 | 90.38  | 6704.46 | 425.71 N | 3841.46 E | 3858.59 | 0.34  |
| 10361.00 | 90.09 | 90.23  | 6704.36 | 425.22 N | 3934.46 E | 3951.44 | 0.17  |
| 10453.00 | 89.82 | 89.46  | 6704.44 | 425.47 N | 4026.46 E | 4043.32 | 0.89  |
| 10546.00 | 88.21 | 86.43  | 6706.03 | 428.80 N | 4119.37 E | 4136.28 | 3.69  |

|          |       |       |         |          |           |         |      |
|----------|-------|-------|---------|----------|-----------|---------|------|
| 10639.00 | 88.29 | 88.80 | 6706.44 | 432.67 N | 4212.27 E | 4229.25 | 4.18 |
| 10732.00 | 91.60 | 89.13 | 6704.10 | 434.35 N | 4305.23 E | 4322.17 | 0.49 |
| 10825.00 | 93.21 | 88.97 | 6700.19 | 435.89 N | 4398.13 E | 4415.02 | 1.74 |
| 10917.00 | 92.40 | 88.38 | 6695.69 | 438.02 N | 4489.99 E | 4506.87 | 1.09 |
| 11010.00 | 91.67 | 87.81 | 6692.39 | 441.11 N | 4582.88 E | 4599.79 | 1.00 |
| 11102.00 | 90.37 | 89.10 | 6690.75 | 443.59 N | 4674.83 E | 4691.74 | 1.99 |
| 11196.00 | 90.80 | 91.58 | 6689.79 | 443.03 N | 4768.82 E | 4785.57 | 2.68 |
| 11289.00 | 87.63 | 89.05 | 6691.06 | 442.52 N | 4861.79 E | 4878.38 | 4.36 |
| 11382.00 | 90.00 | 88.93 | 6692.99 | 444.15 N | 4954.75 E | 4971.30 | 2.55 |
| 11476.00 | 90.00 | 89.09 | 6692.99 | 445.78 N | 5048.73 E | 5065.24 | 0.17 |
| 11568.00 | 90.03 | 90.20 | 6692.96 | 446.35 N | 5140.73 E | 5157.14 | 1.21 |
| 11661.00 | 92.77 | 89.19 | 6690.69 | 446.84 N | 5233.69 E | 5249.99 | 3.14 |
| 11756.00 | 91.20 | 87.07 | 6687.40 | 449.94 N | 5328.57 E | 5344.91 | 2.78 |
| 11851.00 | 89.45 | 89.17 | 6686.86 | 453.06 N | 5423.51 E | 5439.88 | 2.88 |
| 11945.00 | 92.19 | 90.67 | 6685.52 | 453.19 N | 5517.49 E | 5533.73 | 3.32 |
| 12041.00 | 89.14 | 88.44 | 6684.40 | 453.94 N | 5613.46 E | 5629.61 | 3.94 |
| 12136.00 | 87.90 | 89.59 | 6686.86 | 455.57 N | 5708.41 E | 5724.52 | 1.78 |
| 12231.00 | 87.72 | 88.74 | 6690.49 | 456.95 N | 5803.33 E | 5819.38 | 0.91 |
| 12325.00 | 86.70 | 87.62 | 6695.06 | 459.93 N | 5897.17 E | 5913.24 | 1.61 |
| 12419.00 | 90.99 | 86.58 | 6696.96 | 464.69 N | 5991.01 E | 6007.20 | 4.70 |
| 12510.00 | 90.25 | 88.12 | 6695.97 | 468.89 N | 6081.90 E | 6098.19 | 1.88 |
| 12605.00 | 91.05 | 87.64 | 6694.89 | 472.41 N | 6176.83 E | 6193.17 | 0.98 |
| 12700.00 | 88.76 | 85.94 | 6695.05 | 477.73 N | 6271.67 E | 6288.16 | 3.00 |
| 12800.00 | 90.59 | 87.82 | 6695.62 | 483.17 N | 6371.51 E | 6388.15 | 2.62 |
| 12895.00 | 92.87 | 90.19 | 6692.75 | 484.82 N | 6466.44 E | 6483.03 | 3.46 |
| 12990.00 | 92.22 | 89.29 | 6688.53 | 485.25 N | 6561.35 E | 6577.82 | 1.17 |
| 13085.00 | 90.37 | 88.82 | 6686.39 | 486.82 N | 6656.31 E | 6672.73 | 2.01 |
| 13179.00 | 91.54 | 89.69 | 6684.82 | 488.04 N | 6750.28 E | 6766.64 | 1.55 |
| 13274.00 | 91.55 | 88.44 | 6682.26 | 489.59 N | 6845.23 E | 6861.54 | 1.32 |
| 13369.00 | 91.69 | 88.50 | 6679.57 | 492.12 N | 6940.16 E | 6956.47 | 0.16 |
| 13464.00 | 90.49 | 89.43 | 6677.77 | 493.84 N | 7035.13 E | 7051.40 | 1.60 |
| 13559.00 | 90.03 | 90.46 | 6677.33 | 493.93 N | 7130.12 E | 7146.26 | 1.19 |
| 13654.00 | 89.97 | 90.59 | 6677.33 | 493.06 N | 7225.12 E | 7241.08 | 0.15 |
| 13749.00 | 88.92 | 89.28 | 6678.25 | 493.17 N | 7320.11 E | 7335.95 | 1.77 |
| 13844.00 | 90.06 | 89.00 | 6679.10 | 494.59 N | 7415.10 E | 7430.87 | 1.24 |
| 13939.00 | 89.94 | 91.66 | 6679.10 | 494.05 N | 7510.09 E | 7525.70 | 2.80 |
| 14034.00 | 89.51 | 91.38 | 6679.56 | 491.53 N | 7605.05 E | 7620.40 | 0.54 |
| 14129.00 | 90.83 | 92.59 | 6679.27 | 488.24 N | 7699.99 E | 7715.03 | 1.88 |
| 14224.00 | 88.74 | 89.76 | 6679.63 | 486.29 N | 7794.95 E | 7809.76 | 3.70 |
| 14318.00 | 90.28 | 90.33 | 6680.43 | 486.21 N | 7888.95 E | 7903.62 | 1.75 |
| 14413.00 | 89.75 | 89.49 | 6680.41 | 486.36 N | 7983.95 E | 7998.49 | 1.05 |
| 14508.00 | 90.43 | 92.71 | 6680.26 | 484.54 N | 8078.92 E | 8093.23 | 3.46 |
| 14603.00 | 89.75 | 88.61 | 6680.11 | 483.45 N | 8173.89 E | 8188.02 | 4.37 |
| 14698.00 | 90.12 | 87.02 | 6680.22 | 487.07 N | 8268.82 E | 8283.00 | 1.72 |
| 14793.00 | 90.00 | 87.33 | 6680.12 | 491.75 N | 8363.70 E | 8378.00 | 0.35 |
| 14887.00 | 90.55 | 88.05 | 6679.67 | 495.54 N | 8457.62 E | 8471.99 | 0.96 |
| 14982.00 | 91.97 | 89.10 | 6677.58 | 497.90 N | 8552.57 E | 8566.93 | 1.86 |
| 15077.00 | 89.91 | 88.38 | 6676.02 | 499.99 N | 8647.52 E | 8661.86 | 2.30 |
| 15172.00 | 90.22 | 87.56 | 6675.91 | 503.36 N | 8742.46 E | 8756.85 | 0.92 |
| 15267.00 | 90.46 | 90.32 | 6675.35 | 505.11 N | 8837.44 E | 8851.78 | 2.92 |
| 15362.00 | 90.96 | 91.76 | 6674.17 | 503.39 N | 8932.41 E | 8946.53 | 1.60 |
| 15456.00 | 89.63 | 90.25 | 6673.69 | 501.74 N | 9026.39 E | 9040.29 | 2.14 |
| 15551.00 | 90.43 | 95.72 | 6673.64 | 496.79 N | 9121.22 E | 9134.73 | 5.82 |
| 15646.00 | 89.11 | 99.51 | 6674.02 | 484.21 N | 9215.37 E | 9228.08 | 4.22 |
| 15741.00 | 91.42 | 96.22 | 6673.58 | 471.21 N | 9309.45 E | 9321.35 | 4.23 |
| 15836.00 | 90.25 | 92.00 | 6672.20 | 464.41 N | 9404.17 E | 9415.58 | 4.61 |
| 15931.00 | 89.57 | 91.67 | 6672.34 | 461.36 N | 9499.13 E | 9510.23 | 0.80 |
| 16026.00 | 88.98 | 88.17 | 6673.55 | 461.50 N | 9594.10 E | 9605.08 | 3.74 |
| 16121.00 | 88.98 | 85.86 | 6675.24 | 466.44 N | 9688.95 E | 9700.06 | 2.43 |
| 16165.00 | 89.44 | 85.57 | 6675.85 | 469.73 N | 9732.82 E | 9744.05 | 1.24 |
| 16231.00 | 89.44 | 85.57 | 6676.49 | 474.83 N | 9798.62 E | 9810.02 | 0.00 |

# CALCULATION BASED ON MINIMUM CURVATURE METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT  
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 86.97 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.73 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT (CLOSURE) AT 16231.00 FEET  
12,021.84 FEET ALONG 87.00 DEGREES (GRID)

IS 9810.12 FEET ALONG 87.23 DEGREES (GRID)

Surveys are tied into two non-Haliburton surveys at MD 360' and 762' taken while drilling the surface section. The final survey is a straight-line projection to bit.

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