HALLIBURTON | Sperry Drilling

# PCG Pressure Case Gamma
# PCD Pressure Case Directional

Company : **Noble Energy**
Rig : **H&P 343**
Well : **Bronco State AF10-64-1HN**
Field : **Wattenberg**
Country : **USA**
API Number : **05-123-36580**

Country : **USA**
Field : **Wattenberg**
Location : **Lat: 40° 24' 42.59" North**
**Long: 104° 18' 3.24" West**
Well : **Bronco State AF10-64-1HN**
Company : **Noble Energy**
Rig : **H&P 343**

LOCATION

Latitude : **40° 24' 42.59" North**
Longitude : **104° 18' 3.24" West**
UTM Easting = **3,333,893.31 ft**
UTM Northing = **1,395,127.79 ft**

Other Services
**Directional Drilling**

Elev. KB **NA**
DF **4670.00 ft**
GL **4646.00 ft**
WD **NA**

Permanent Datum : **Ground Level** Elevation : **4646.00 ft**
Log Measured From : **Drill Floor** **24.00 ft** Above Permanent Datum
Drilling Measured From : **Drill Floor**

MD LOG

Depth Logged : **598.00 ft** To **10,705.00 ft**
Date Logged : **20-Mar-13** To **27-Mar-13**
Total Depth MD : **10,705.00 ft** TVD : **6,390.63 ft**
Spud Date : **20-Mar-13**

Unit No. : **11610115**
Plot Type : **Final**
Plot Date : **28-Mar-13**

Job No. :**CA-XX-090020615 9**

Borehole Record (MD)

| Run No. | Size | From | To |
|---|---|---|---|
| 2 | 8.750 in | 598.00 ft | 1,896.00 ft |
| 3 | 8.750 in | 1,896.00 ft | 6,119.00 ft |
| 4 | 8.750 in | 6,119.00 ft | 6,737.00 ft |
| 5 | 6.125 in | 6,737.00 ft | 10,705.00 ft |

Run No.

| Size |
|---|
| 9.625 in |
| 7.000 in |

Borehole Record (MD)

| Size | From | To |
|---|---|---|

Casing Record (MD)

| Weight | From | To |
|---|---|---|
| 36.00 lbpf | SURFACE | 587.00 ft |
| 26.00 lbpf | SURFACE | 6,727.00 ft |

## WELL INFORMATION

| | | | | |
|---|---|---|---|---|
| **MWD Run Number** | 100 | 200 | 300 | 400 |
| **Date run completed** | 22-Mar-13 | 23-Mar-13 | 24-Mar-13 | 28-Mar-13 |
| **Rig Bit Number** | 2 | 3 | 4 | 5 |
| **Bit Size (in)** | 8.750 | 8.750 | 8.750 | 6.125 |
| **Tool Nominal OD (in)** | 6.750 | 6.750 | 6.750 | 4.75 |
| **Log Start Depth (MD, ft)** | 598.00 | 1,897.00 | 6,118.00 | 6,737.00 |
| **Log End Depth (MD, ft)** | 1,897.00 | 6,118.00 | 6,737.00 | 10,705.00 |
| **Drill or Wipe** | Drill | Drill | Drill | Drill |
| **Drill/Wipe Start Date and Time** | 21-Mar-13 17:30 | 22-Mar-13 05:10 | 23-Mar-13 23:00 | 26-Mar-13 07:45 |
| **Drill/Wipe End Date and Time** | 21-Mar-13 21:15 | 23-Mar-13 06:45 | 24-Mar-13 16:00 | 26-Mar-13 16:41 |
| **Min Inc (deg) @ Depth (MD, ft)** | .18 @ 717.00 | .34 @ 5,256.00 | 34.09 @ 6,159.00 | 87.97 @ 8,578.00 |
| **Max Inc (deg) @ Depth (MD, ft)** | 1.05 @ 1,745.00 | 29.86 @ 6,111.00 | 85.57 @ 6,679.00 | 91.91 @ 7,083.00 |
| **Bit TFA(in2) / Bit Type** | .86 / PDC | .86 / PDC | .86 / PDC | .46 / PDC |
| **Flow Rate (gpm)** | 593.75 | 597.10 | 494.00 | 269.37 |
| **Max AV (fpm) / CV (fpm) @ MWD** | 427.6 / NA | 417.4 / NA | 342.6 / NA | 401.4 / NA |
| **Fluid Type** | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel | Fresh Water Gel |
| **Density (ppg) / Viscosity (spqt)** | 8.60 / 28.00 | 8.70 / 27.00 | 10.48 / 35.00 | 9.30 / 32.00 |
| **Filtrate CL (ppm)** | 2,300.00 | 2,300.00 | 2,100.00 | 2,200.00 |
| **pH / Fluid Loss (mptm)** | 11.60 / 48 | 8.30 / 23 | 9.30 / 8 | 9.20 / 8 |
| **PV (cP) / YP (lhf2)** | 3 / 4.00 | 3 / 2.00 | 11 / 14.00 | 7 / 9.00 |
| **% Solids / % Sand** | 1.80 / 0.25 | 2.50 / 0.20 | 10.20 / 0.20 | 4.9 / .25 |
| **% Oil / Oil:Water Ratio** | 0 / 0:95 | 0 / 0:96 | 0 / 0:91.6 | 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 (degF) / Source** | 95.30 / PCM | 145.90 / PCM | 154.30 / PCM | 209.2 / 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** | Johnny Sanchez | Johnny Sanchez | Johnny Sanchez | Johnny Sanchez | |

## SENSOR INFORMATION

### Downhole Processor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCM | PCM | PCM | PCM | |
| **Software Version** | 5.76 | 5.76 | 5.76 | 5.76 | |
| **Sub Serial Number** | 11404284 | 11404284 | 11404284 | 12134697 | |
| **Insert Serial Number** | 11680747 | 11680747 | 11680747 | 11680784 | |
| **Date and Time Initialized** | 20-Mar-13 15:03 | 20-Mar-13 15:03 | 20-Mar-13 15:03 | 24-Mar-13 17:16 | |
| **Date and Time Read** | 25-Mar-13 11:06 | 25-Mar-13 11:17 | 25-Mar-13 11:24 | 28-Mar-13 00:35 | |
| **ECMB SW Version** | N/A | N/A | N/A | N/A | |

### Directional Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCDC | PCDC | PCDC | PCDC | |
| **Distance From Bit (ft)** | 57.00 | 54.00 | 58.00 | 65.00 | |
| **Software Version** | 6.21 | 6.21 | 6.21 | 6.21 | |
| **Sub Serial Number** | 11404284 | 11404284 | 11404284 | 12134697 | |
| **Sonde Serial Number** | 11638501 | 11638501 | 11638501 | 11638570 | |
| **Sensor ID Number** | N/A | N/A | N/A | N/A | |
| **Toolface Offset (deg)** | 186.59 | 327.27 | 15.43 | 134.91 | |

### Gamma Ray Sensor Information

| | | | | | |
|---|---|---|---|---|---|
| **Tool Type** | PCG | PCG | PCG | PCG | |
| **Distance From Bit (ft)** | 50.00 | 47.63 | 50.94 | 57.77 | |
| **Recorded Sample Period (sec)** | 10 | 10 | 10 | 10 | |
| **Software Version** | 8.15 | 8.15 | 8.15 | 8.15 | |
| **Sub Serial Number** | 11404284 | 11404284 | 11404284 | 12134697 | |
| **Insert/Sonde Serial Number** | 11293345 | 11293345 | 11293345 | 11579820 | |

## 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. The depth used for the tie in survey is the shoe depth of the surface casing and assumes an inclination and azimuth of zero.**
**7. INSITE version 7.4.01**

## WARRANTY

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

HALLIBURTON

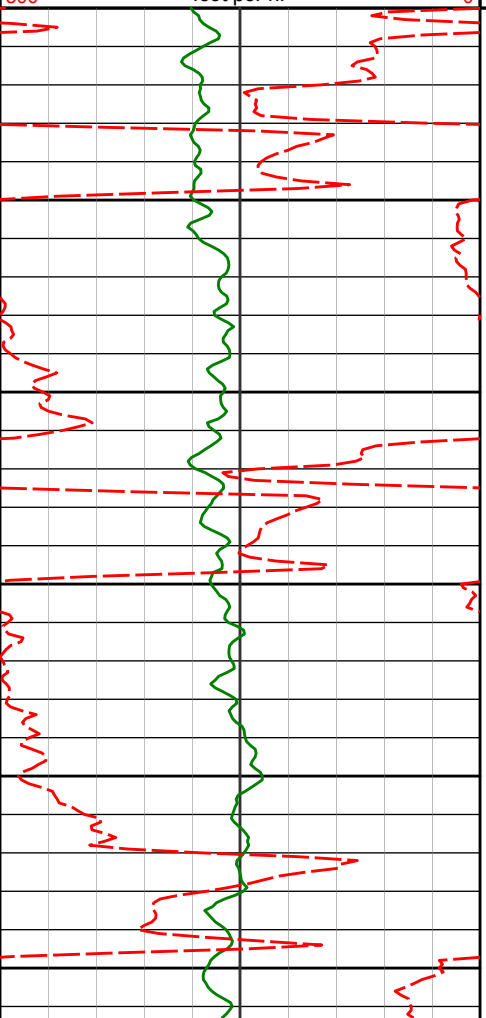
Sperry Drilling Services

# MD Main Log 1:600

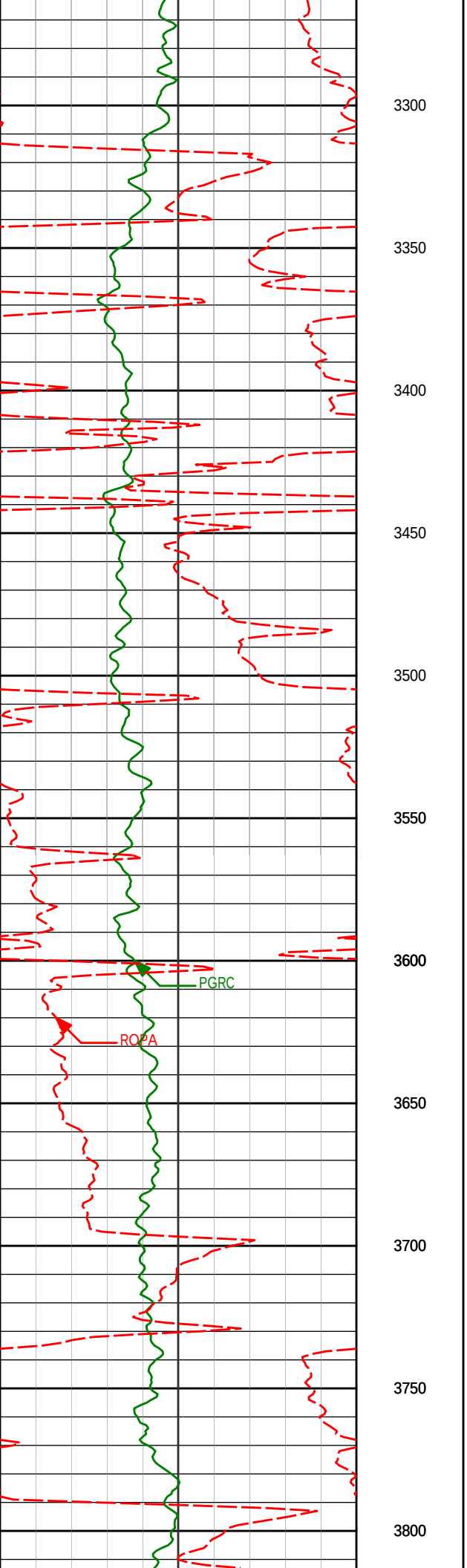
Noble Energy
Bronco State AF10-64-1HN
H&P 343
T5N-R62W

***PCG Gamma Ray***
PGRC
0 api 300

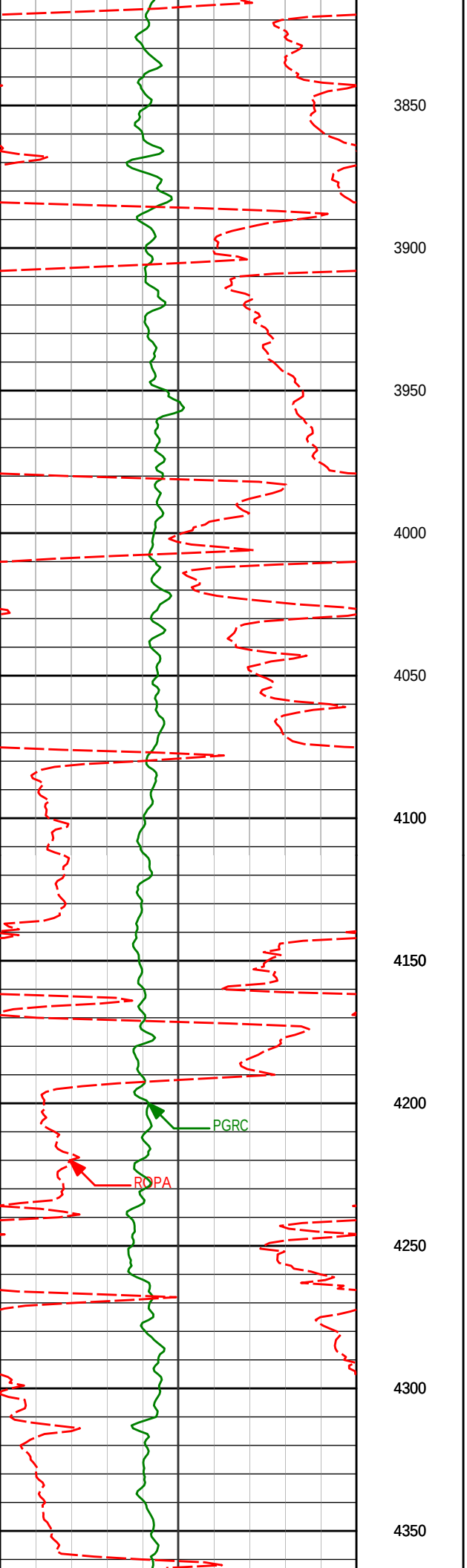
***Avg Rate of Penetration***
ROPA
500 feet per hr 0



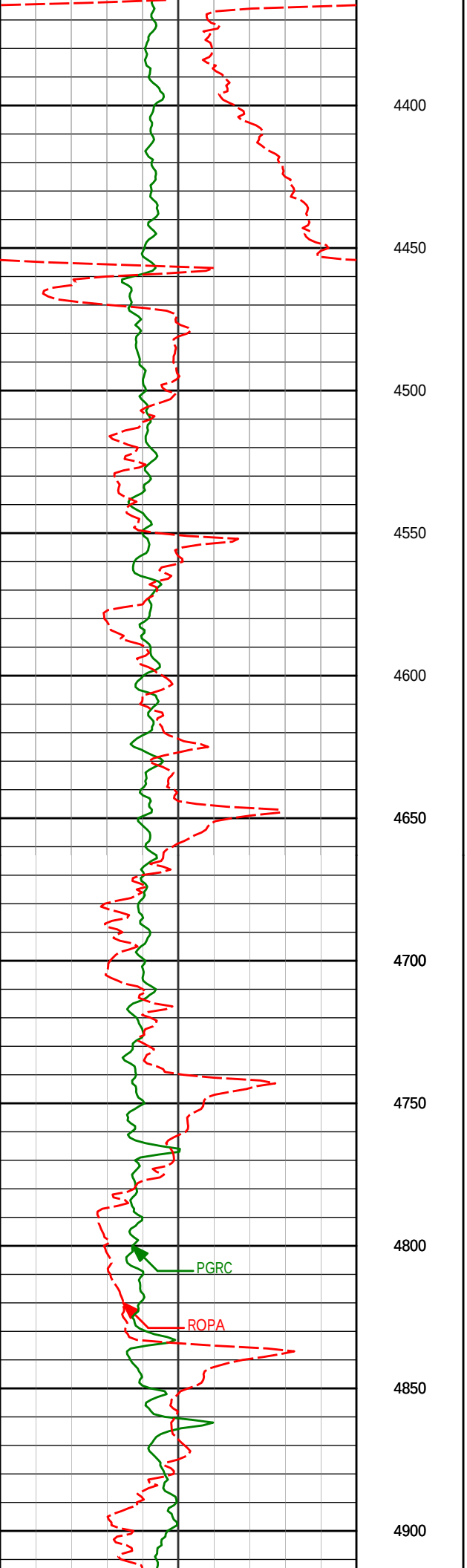
| Depth ft | *Depth* | *Inc.* | *Azi.* | *TVD* | *V.S.* |
|---|---|---|---|---|---|
| 3050 | 3072' | 3.41° | 91.91° | 3071.55' | -13.51' |
| 3100 | | | | | |
| 3150 | 3167' | 5.95° | 98.45° | 3166.22' | -21.19' |
| 3200 | | | | | |
| 3250 | 3262' | 8.33° | 87.64° | 3260.48' | -32.93' |



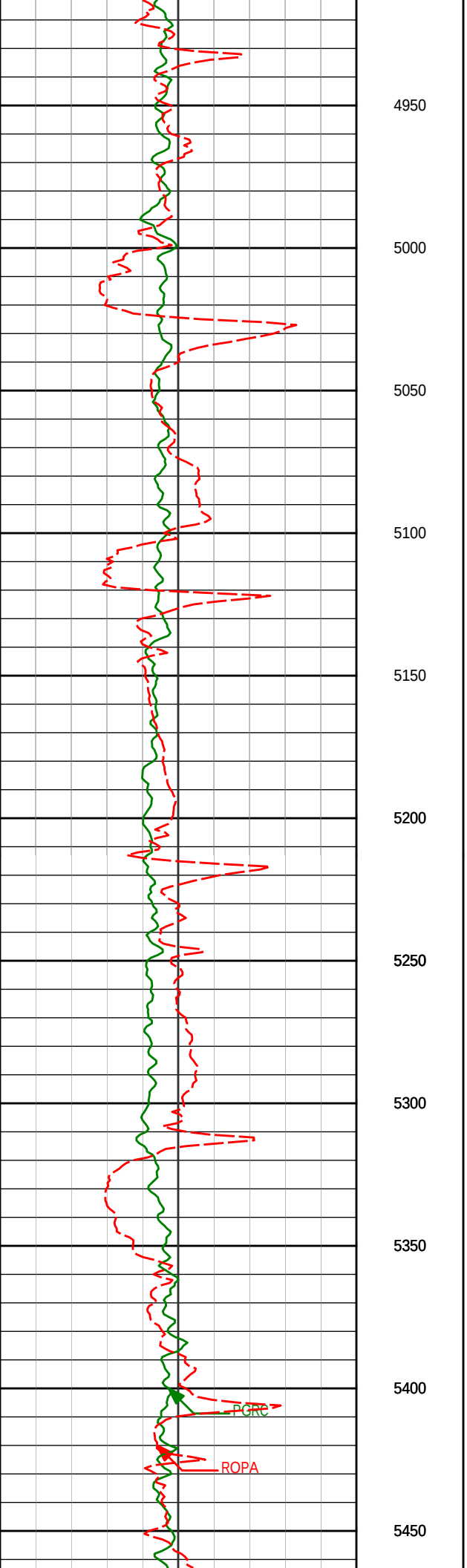

| | | | | |
|---|---|---|---|---|
| 3357' | 10.81° | 88.76° | 3354.15' | -48.72' |
| 3452' | 12.19° | 88.75° | 3447.24' | -67.66' |
| 3547' | 13.58° | 90.94° | 3539.85' | -88.84' |
| 3642' | 14.51° | 90.95° | 3632.01' | -111.88' |
| 3737' | 11.84° | 79.02° | 3724.51' | -133.39' |



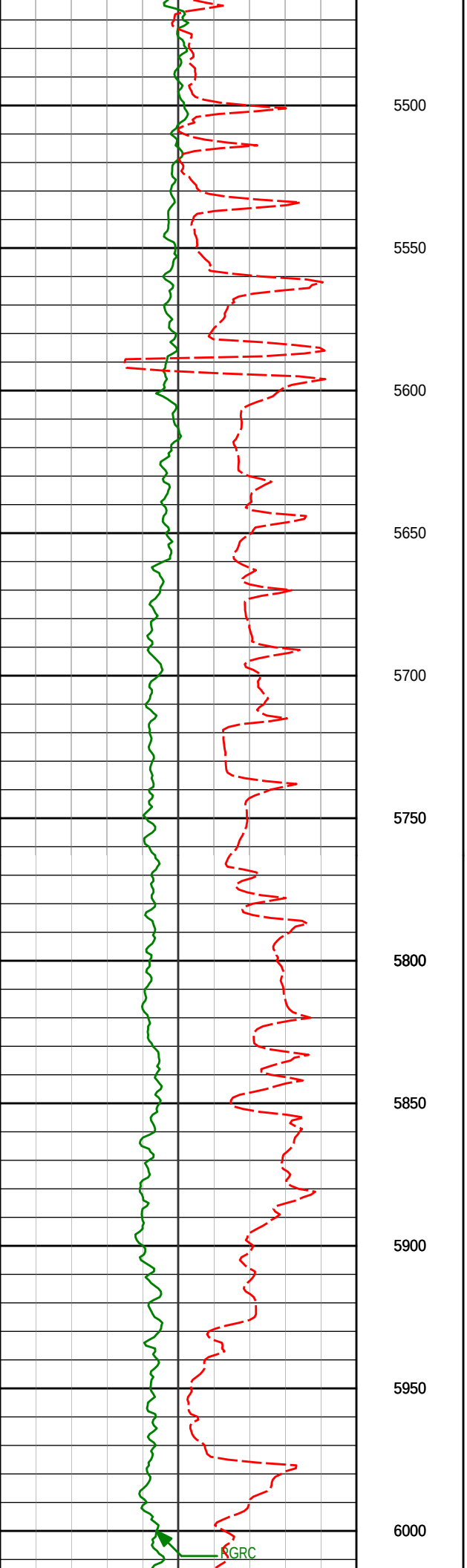

| | | | | |
|---|---|---|---|---|
| 3832' | 8.30° | 74.61° | 3818.04' | -149.65' |
| 3927' | 6.01° | 76.05° | 3912.29' | -161.15' |
| 4022' | 2.66° | 84.05° | 4007.01' | -168.20' |
| 4117' | 2.03° | 83.50° | 4101.93' | -172.06' |
| 4212' | 0.48° | 32.33° | 4196.90' | -173.95' |
| 4307' | 1.06° | 333.50° | 4291.90' | -173.80' |



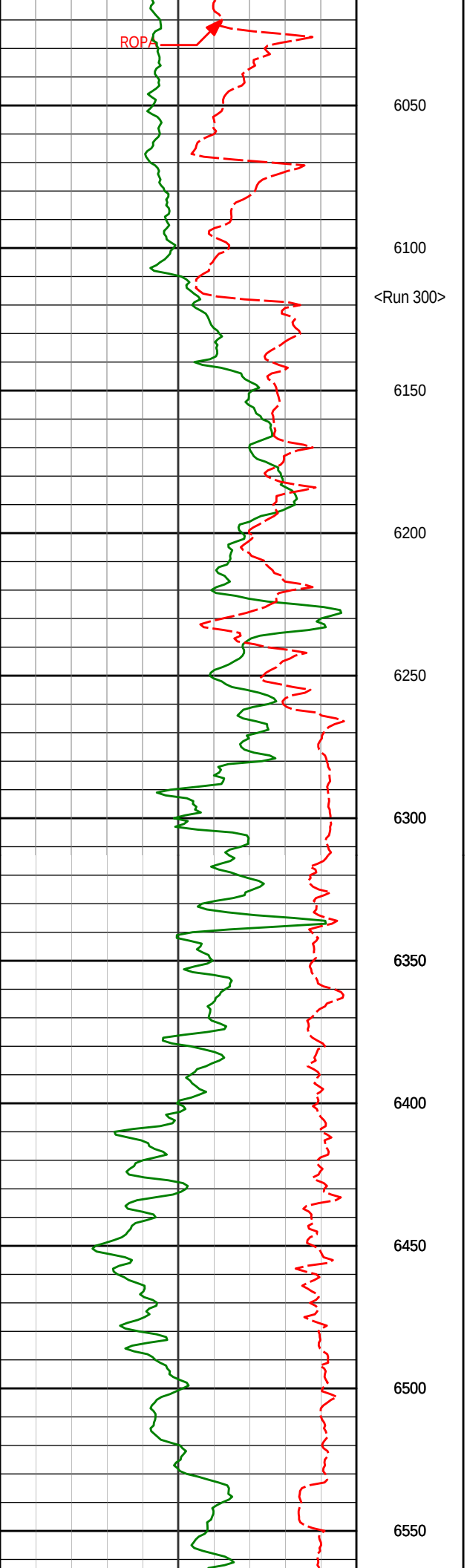

| | | | | |
|---|---|---|---|---|
| 4402' | 1.26° | 332.27° | 4386.88' | -172.96' |
| 4497' | 0.95° | 344.39° | 4481.86' | -172.30' |
| 4592' | 0.98° | 358.95° | 4576.85' | -172.10' |
| 4687' | 0.81° | 342.30° | 4671.83' | -171.91' |
| 4782' | 1.00° | 353.15° | 4766.82' | -171.64' |
| 4877' | 0.77° | 355.56° | 4861.81' | -171.52' |



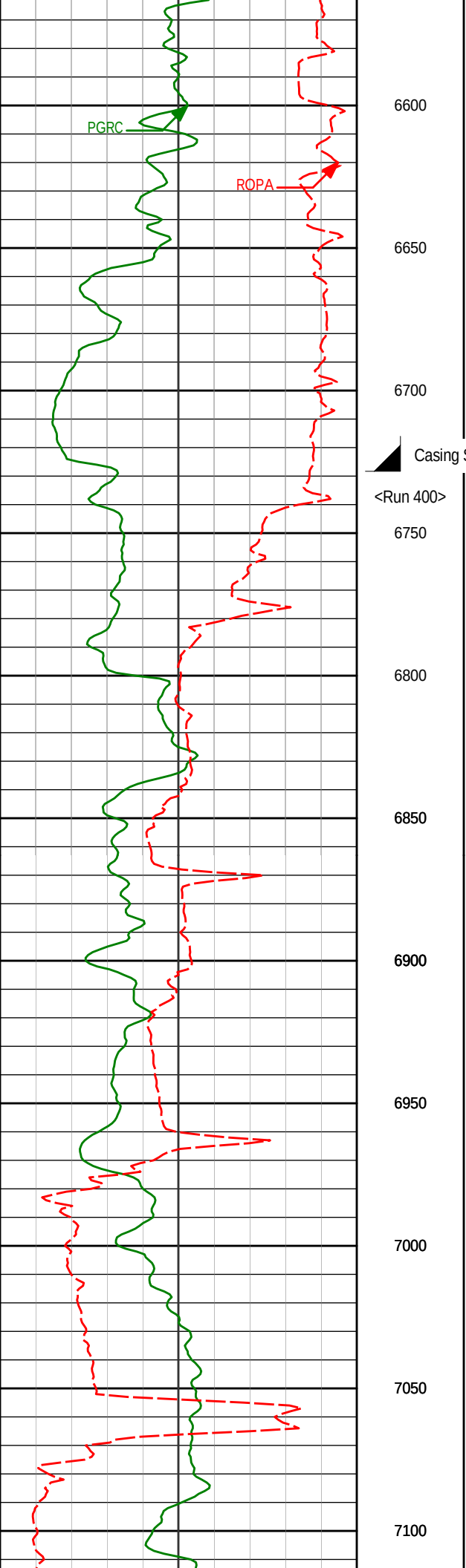

| | | | | |
|---|---|---|---|---|
| 4972' | 0.47° | 16.61° | 4956.81' | -171.61' |
| 5067' | 0.42° | 288.41° | 5051.80' | -171.40' |
| 5162' | 0.51° | 272.48° | 5146.80' | -170.65' |
| 5256' | 0.34° | 194.89° | 5240.80' | -170.16' |
| 5351' | 0.73° | 188.23° | 5335.79' | -169.98' |
| 5446' | 1.16° | 195.13° | 5430.78' | -169.61' |




| | | | | |
|---|---|---|---|---|
| 5541' | 1.43° | 203.68° | 5525.76' | -168.84' |
| 5589' | 3.41° | 248.33° | 5573.71' | -167.25' |
| 5636' | 7.28° | 258.30° | 5620.50' | -163.02' |
| 5684' | 9.49° | 263.45° | 5667.99' | -156.08' |
| 5731' | 11.45° | 266.09° | 5714.20' | -147.56' |
| 5779' | 14.36° | 263.91° | 5760.98' | -136.87' |
| 5826' | 16.56° | 266.95° | 5806.28' | -124.36' |
| 5921' | 20.24° | 272.41° | 5896.41' | -94.42' |
| 5969' | 21.80° | 271.49° | 5941.22' | -77.23' |




| | | | | |
|---|---|---|---|---|
| 6016' | 24.13° | 271.18° | 5984.49' | -58.91' |
| 6064' | 26.70° | 269.95° | 6027.84' | -38.32' |
| 6111' | 29.86° | 269.31° | 6069.23' | -16.06' |
| 6159' | 34.09° | 269.05° | 6109.93' | 9.36' |
| 6206' | 38.82° | 269.00° | 6147.73' | 37.28' |
| 6254' | 40.87° | 271.19° | 6184.58' | 68.02' |
| 6301' | 45.45° | 271.01° | 6218.86' | 100.13' |
| 6349' | 51.86° | 271.25° | 6250.55' | 136.12' |
| 6396' | 57.71° | 270.27° | 6277.64' | 174.48' |
| 6444' | 64.12° | 267.75° | 6300.96' | 216.40' |
| 6491' | 68.80° | 268.01° | 6319.73' | 259.47' |
| 6539' | 73.22° | 268.90° | 6335.35' | 304.84' |

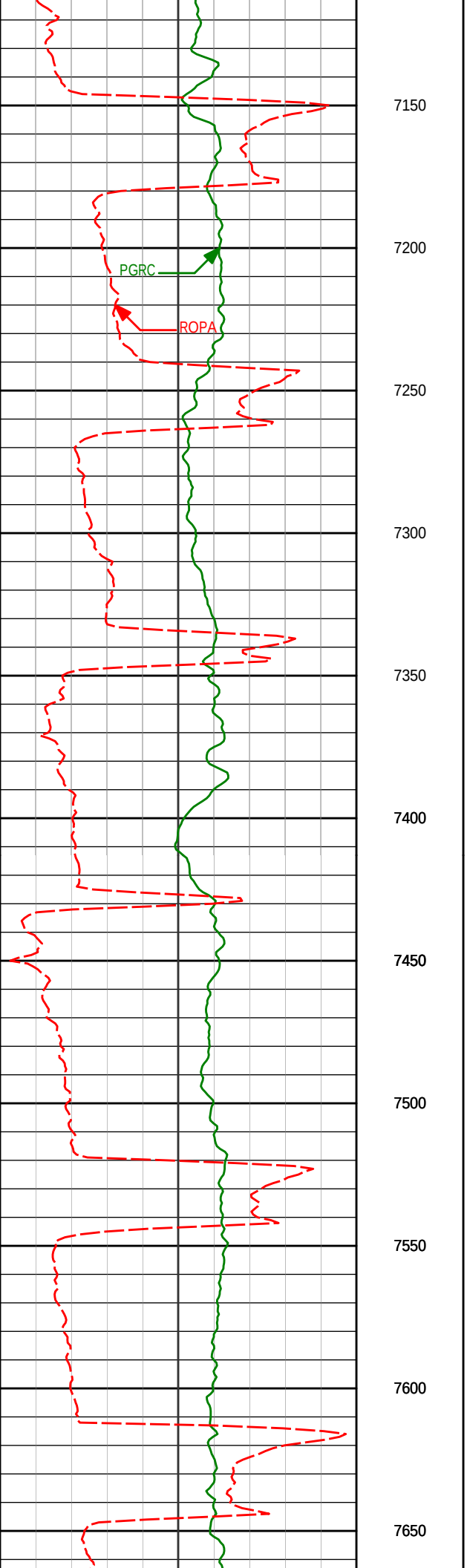



| | | | | |
|---|---|---|---|---|
| 6586' | 76.41° | 269.90° | 6347.66' | 350.19' |
| 6634' | 79.81° | 270.65° | 6357.55' | 397.14' |
| 6679' | 85.57° | 269.94° | 6363.27' | 441.74' |

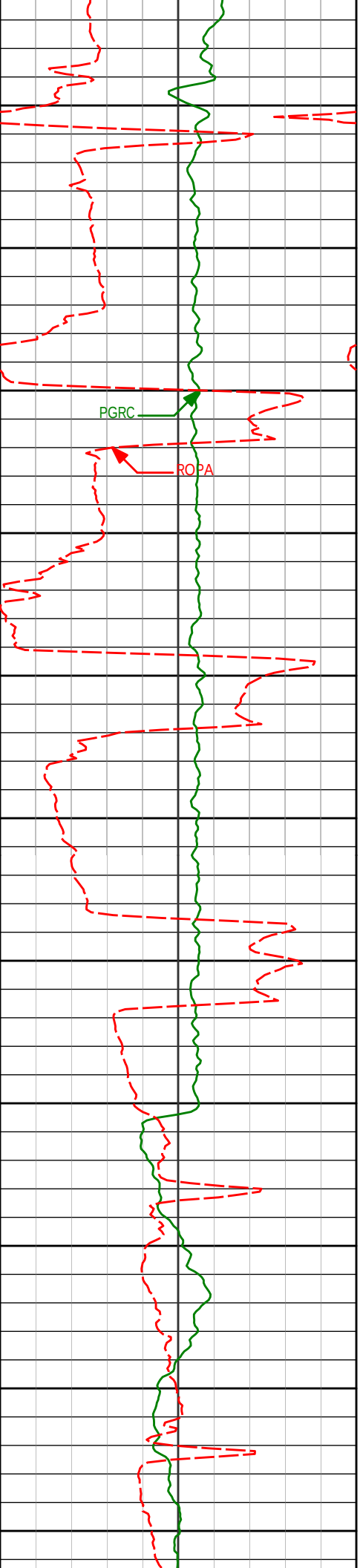
Casing Set @ 6,727'

<Run 400>

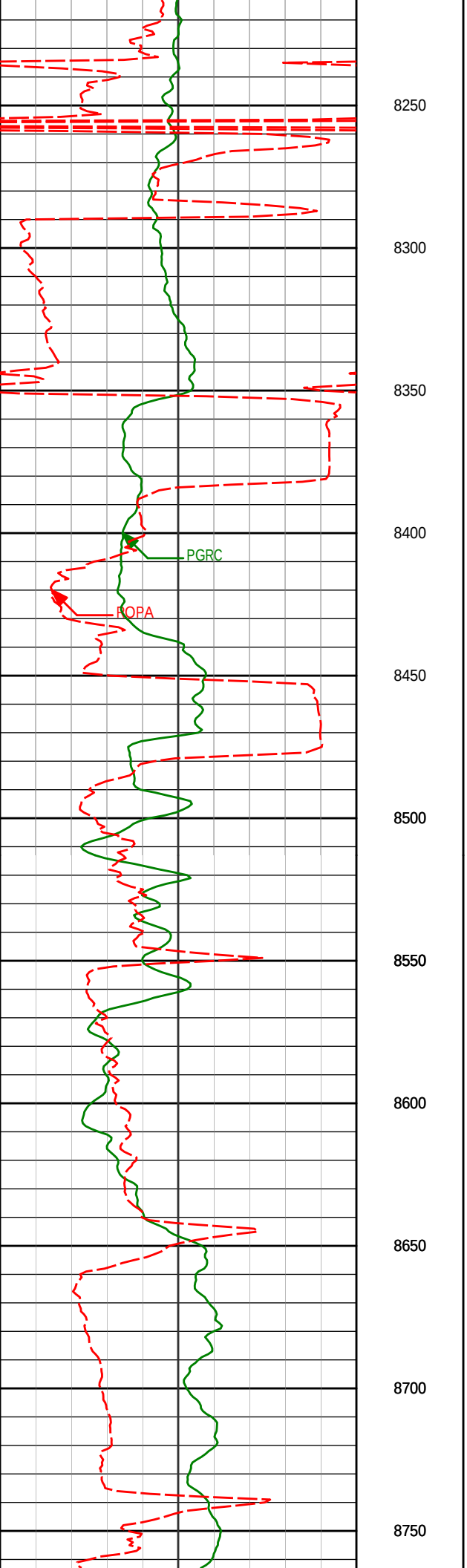
| | | | | |
|---|---|---|---|---|
| 6803' | 89.69° | 268.94° | 6368.39' | 565.60' |
| 6897' | 89.17° | 267.86° | 6369.33' | 659.59' |
| 6990' | 90.96° | 268.56° | 6369.23' | 752.58' |
| 7083' | 91.91° | 268.92° | 6366.90' | 845.55' |



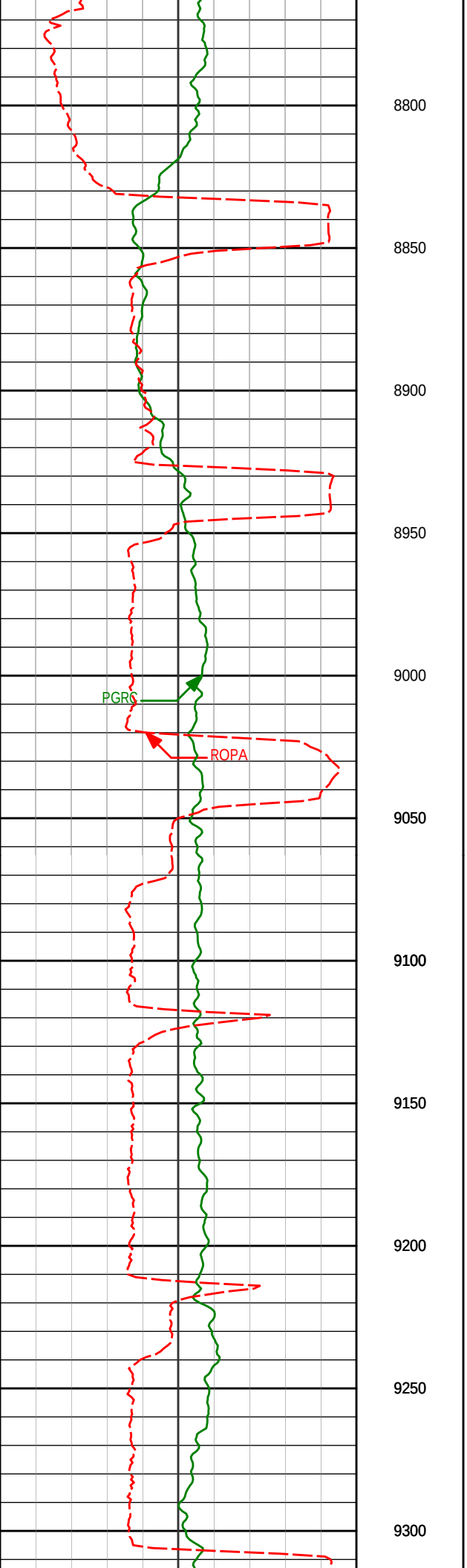

| | | | | |
|---|---|---|---|---|
| 7176' | 90.52° | 268.25° | 6364.93' | 938.53' |
| 7269' | 89.26° | 268.09° | 6365.11' | 1031.52' |
| 7362' | 88.64° | 267.85° | 6366.81' | 1124.49' |
| 7456' | 90.46° | 268.30° | 6367.55' | 1218.48' |
| 7549' | 90.40° | 268.40° | 6366.85' | 1311.47' |
| 7642' | 88.80° | 268.15° | 6367.50' | 1404.46' |



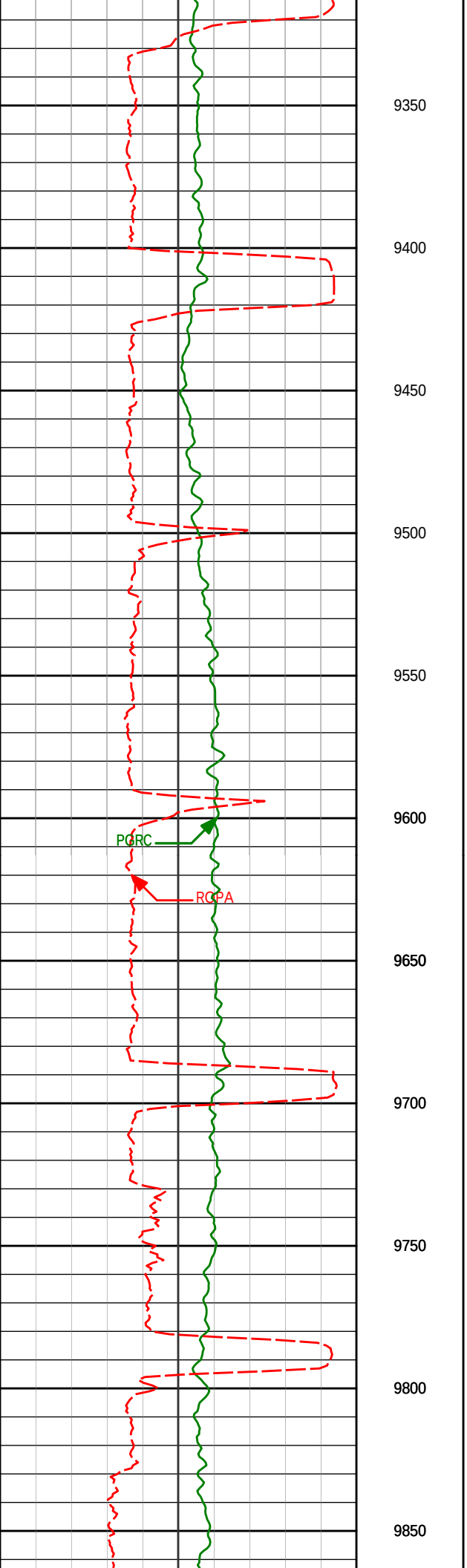

| | | | | |
|---|---|---|---|---|
| 7734' | 89.75° | 268.02° | 6368.66' | 1496.45' |
| 7828' | 89.81° | 267.83° | 6369.02' | 1590.44' |
| 7921' | 89.78° | 270.62° | 6369.34' | 1683.42' |
| 8014' | 88.58° | 268.74° | 6370.67' | 1776.40' |
| 8106' | 88.61° | 267.91° | 6372.92' | 1868.37' |
| 8199' | 89.51° | 267.73° | 6374.45' | 1961.34' |



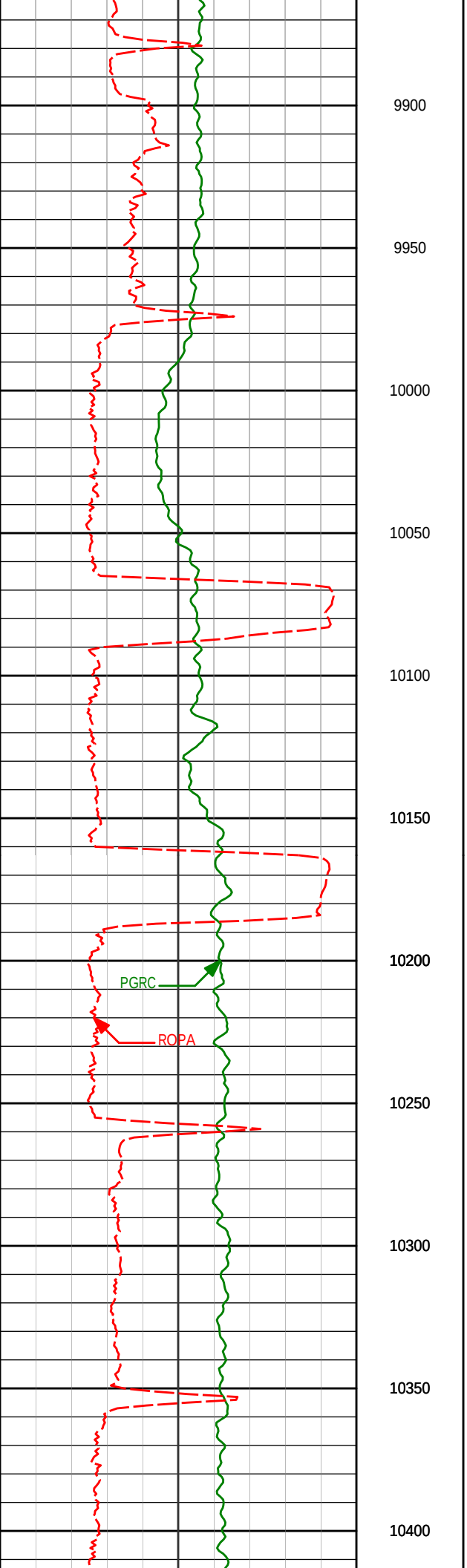

| | | | | |
|---|---|---|---|---|
| 8293' | 90.93° | 267.51° | 6374.09' | 2055.31' |
| 8388' | 90.28° | 268.02° | 6373.10' | 2150.29' |
| 8483' | 88.55° | 268.37° | 6374.07' | 2245.28' |
| 8578' | 87.97° | 268.77° | 6376.96' | 2340.23' |
| 8673' | 88.09° | 269.32° | 6380.23' | 2435.18' |



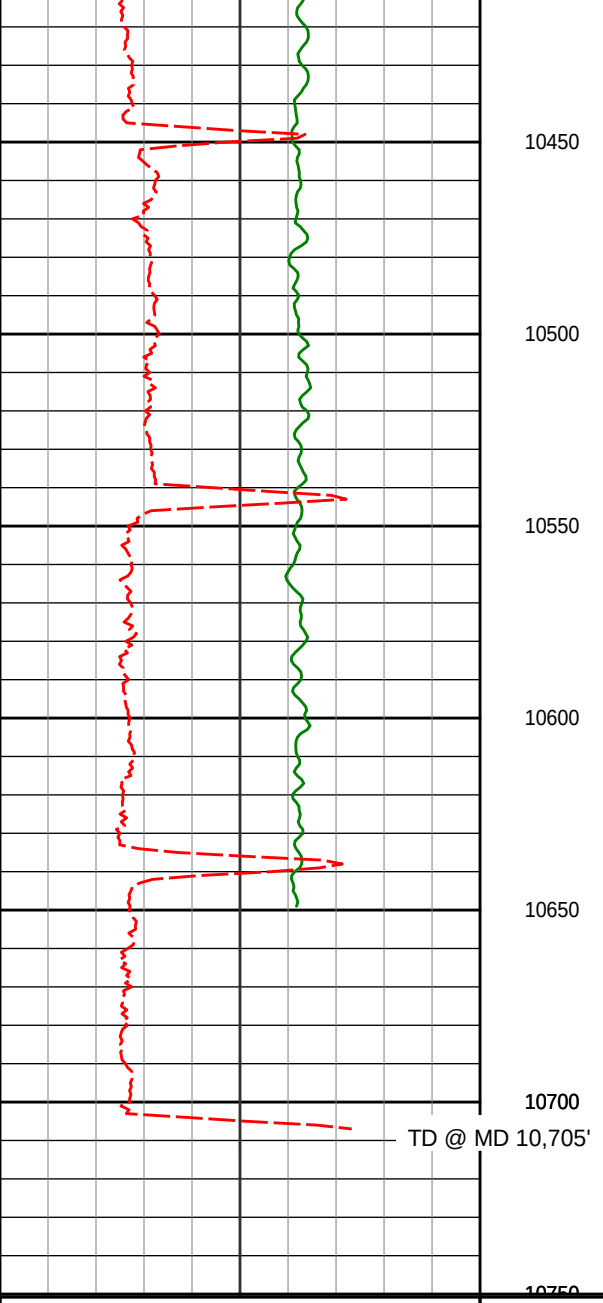

| | | | | |
|---|---|---|---|---|
| 8768' | 88.49° | 269.27° | 6383.07' | 2530.13' |
| 8863' | 91.08° | 269.69° | 6383.43' | 2625.11' |
| 8958' | 90.74° | 270.11° | 6381.92' | 2720.08' |
| 9053' | 89.48° | 269.06° | 6381.74' | 2815.07' |
| 9148' | 89.75° | 268.36° | 6382.38' | 2910.07' |
| 9243' | 90.71° | 267.88° | 6382.00' | 3005.06' |




| | | | | |
|---|---|---|---|---|
| 9338' | 90.12° | 267.18° | 6381.31' | 3100.03' |
| 9433' | 89.01° | 268.52° | 6382.02' | 3195.01' |
| 9528' | 89.51° | 268.12° | 6383.25' | 3290.00' |
| 9623' | 90.06° | 267.50° | 6383.61' | 3384.99' |
| 9718' | 90.15° | 268.12° | 6383.43' | 3479.97' |
| 9812' | 89.38° | 269.06° | 6383.81' | 3573.97' |




| | | | | |
|---|---|---|---|---|
| 9908' | 89.97° | 268.53° | 6384.35' | 3669.97' |
| 10003' | 90.74° | 268.76° | 6383.76' | 3764.96' |
| 10097' | 90.80° | 269.37° | 6382.50' | 3858.95' |
| 10192' | 89.11° | 269.66° | 6382.57' | 3953.94' |
| 10287' | 88.52° | 268.27° | 6384.54' | 4048.92' |
| 10382' | 89.51° | 268.12° | 6386.18' | 4143.90' |




| Depth | Inc. | Azi. | TVD | V.S. |
|---|---|---|---|---|
| 10477' | 89.38° | 266.87° | 6387.10' | 4238.87' |
| 10572' | 88.74° | 265.73° | 6388.65' | 4333.76' |
| 10640' | 89.29° | 265.43° | 6389.82' | 4401.64' |
| 10705' | 89.29° | 265.43° | 6390.63' | 4466.52' |

**Avg Rate of Penetration**
ROPA
500 feet per hr 0

**PCG Gamma Ray**
PGRC
0 api 300

Depth ft

HALLIBURTON

Sperry Drilling Services

# MD Detail Log 1:240

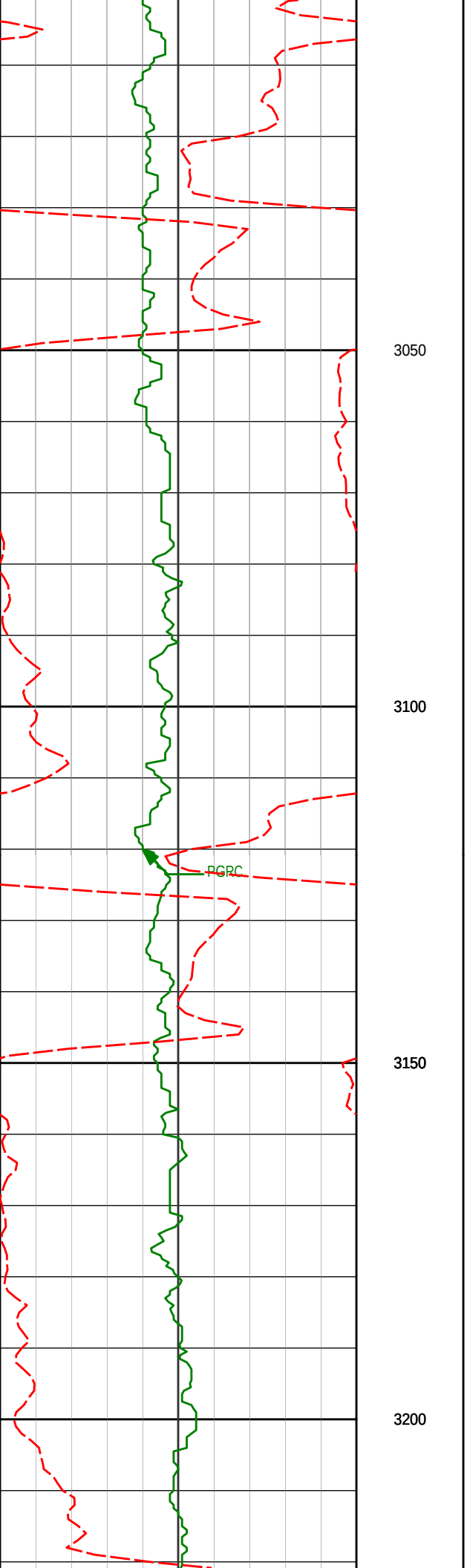
Noble Energy
Bronco State AF10-64-1HN
H&P 343
T5N-R62W

**PCG Gamma Ray**
PGRC
0 api 300

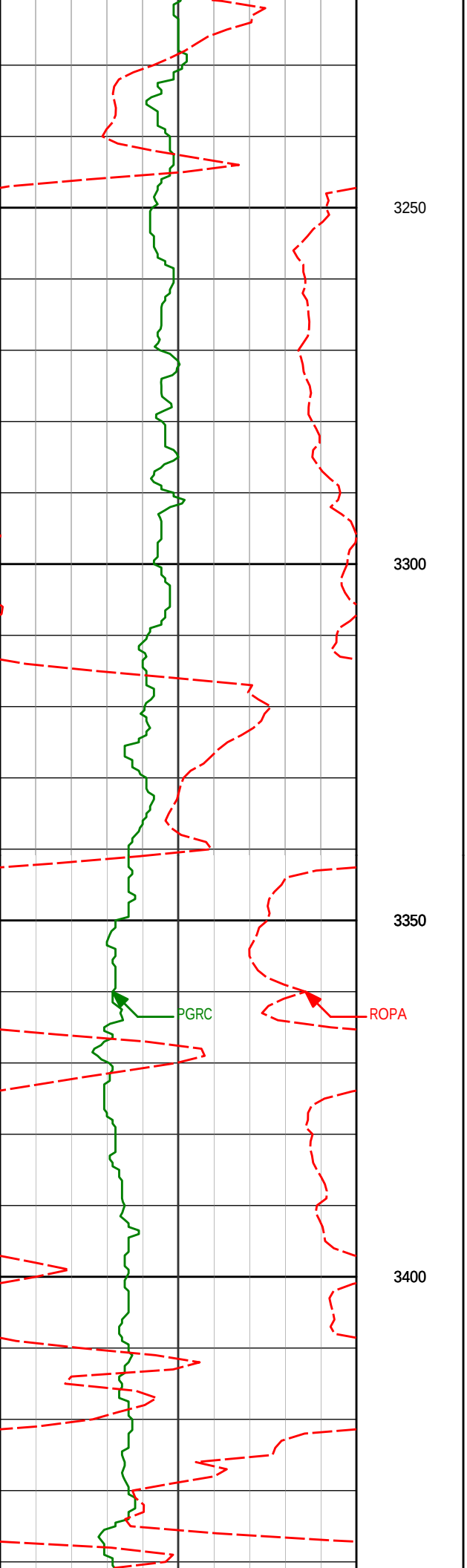
**Avg Rate of Penetration**
ROPA
500 feet per hr 0

Depth ft

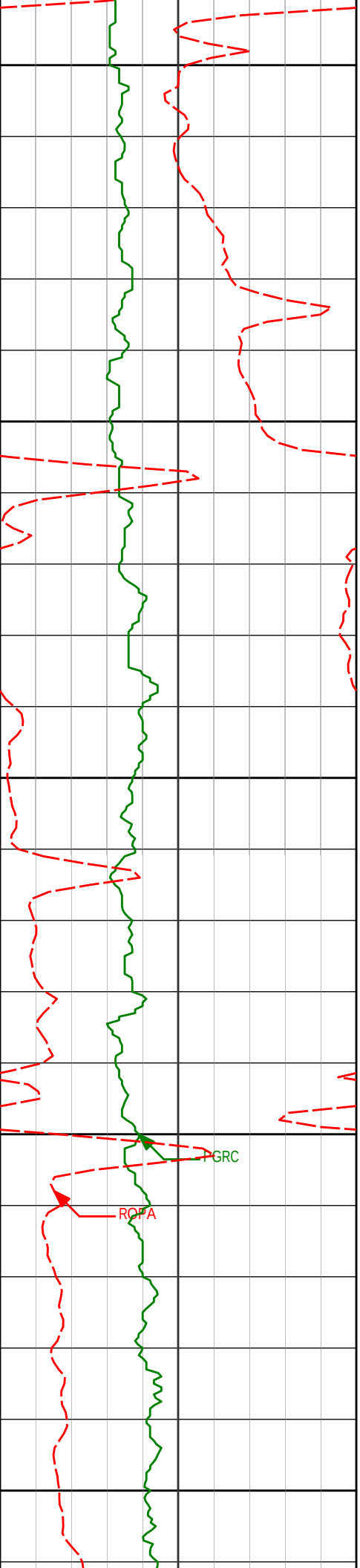
| Depth | Inc. | Azi. | TVD | V.S. |
|---|---|---|---|---|



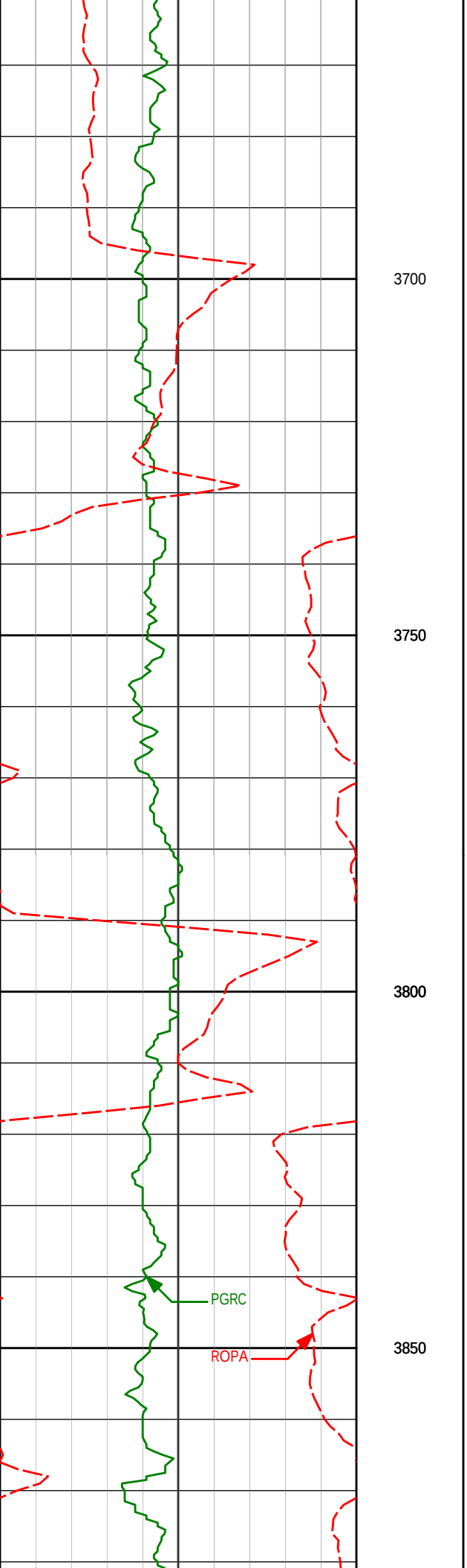

| | | | | |
|---|---|---|---|---|
| 3072' | 3.41° | 91.91° | 3071.55' | -13.51' |
| 3167' | 5.95° | 98.45° | 3166.22' | -21.19' |



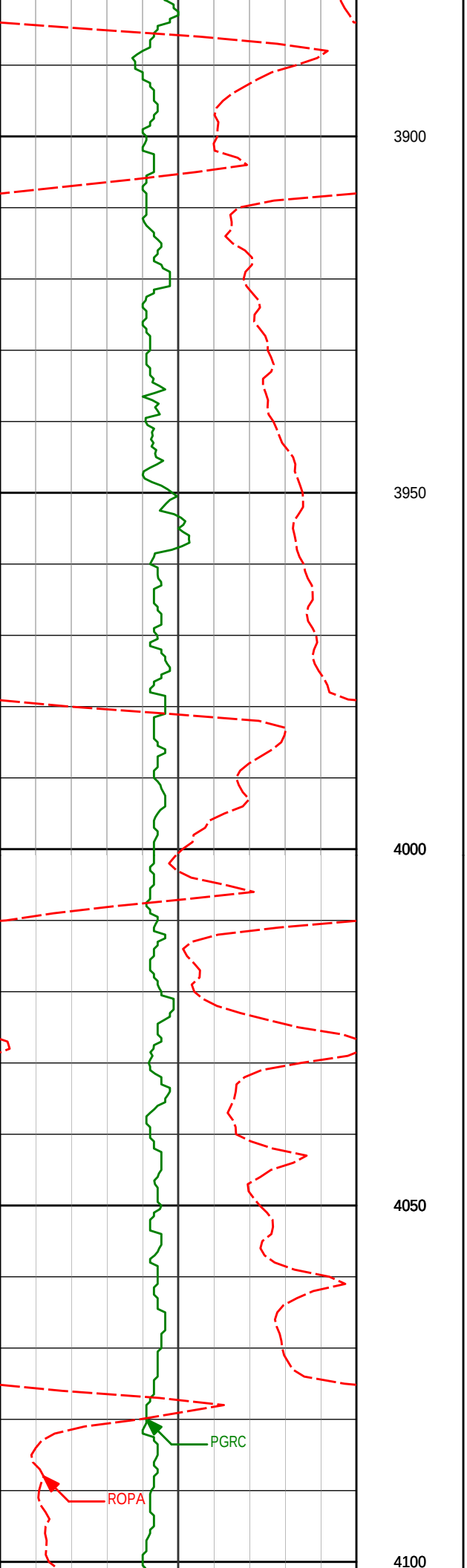

| | | | | |
|---|---|---|---|---|
| 3262' | 8.33° | 87.64° | 3260.48' | -32.93' |
| 3357' | 10.81° | 88.76° | 3354.15' | -48.72' |



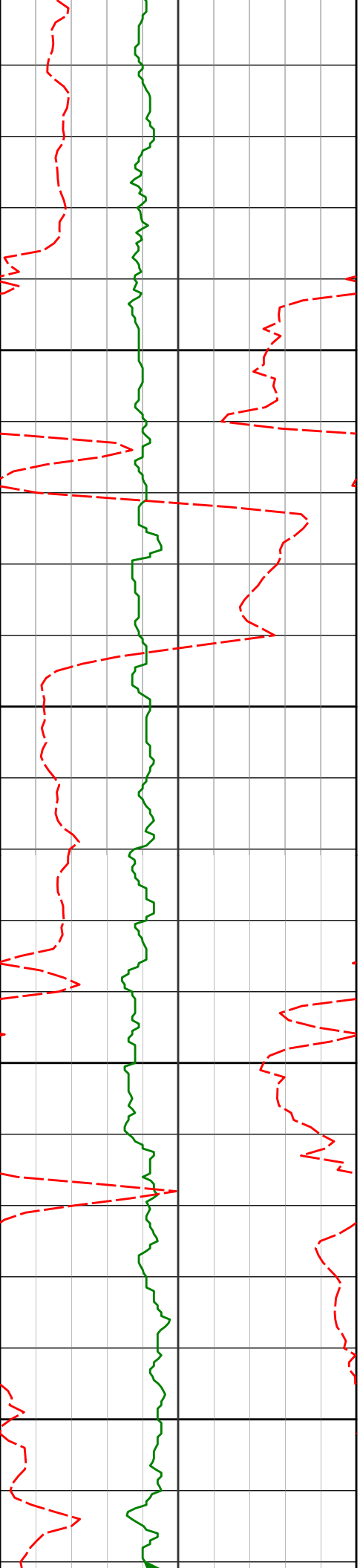

| | | | | |
|---|---|---|---|---|
| 3452' | 12.19° | 88.75° | 3447.24' | -67.66' |
| 3547' | 13.58° | 90.94° | 3539.85' | -88.84' |
| 3642' | 14.51° | 90.95° | 3632.01' | -111.88' |



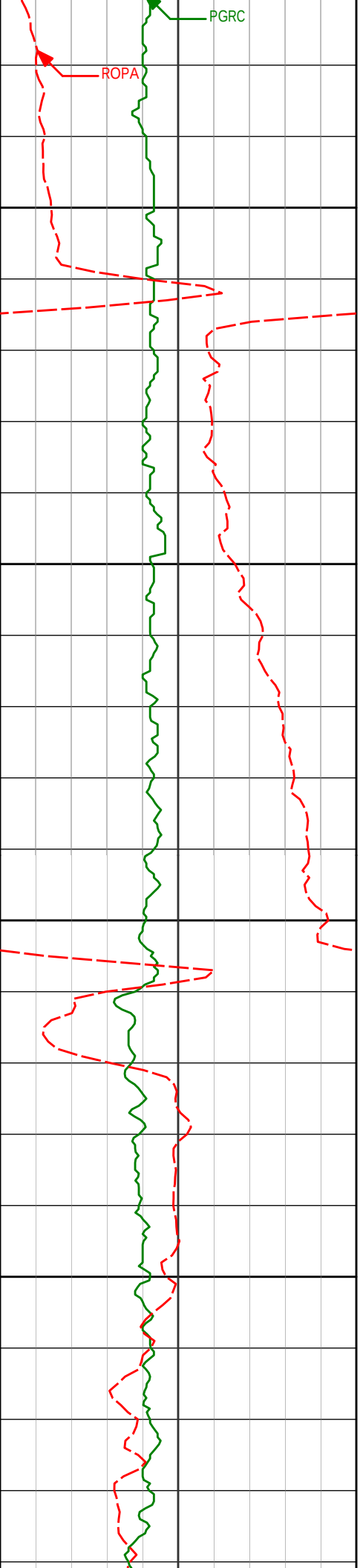

| | | | | |
|---|---|---|---|---|
| 3737' | 11.84° | 79.02° | 3724.51' | -133.39' |
| 3832' | 8.30° | 74.61° | 3818.04' | -149.65' |



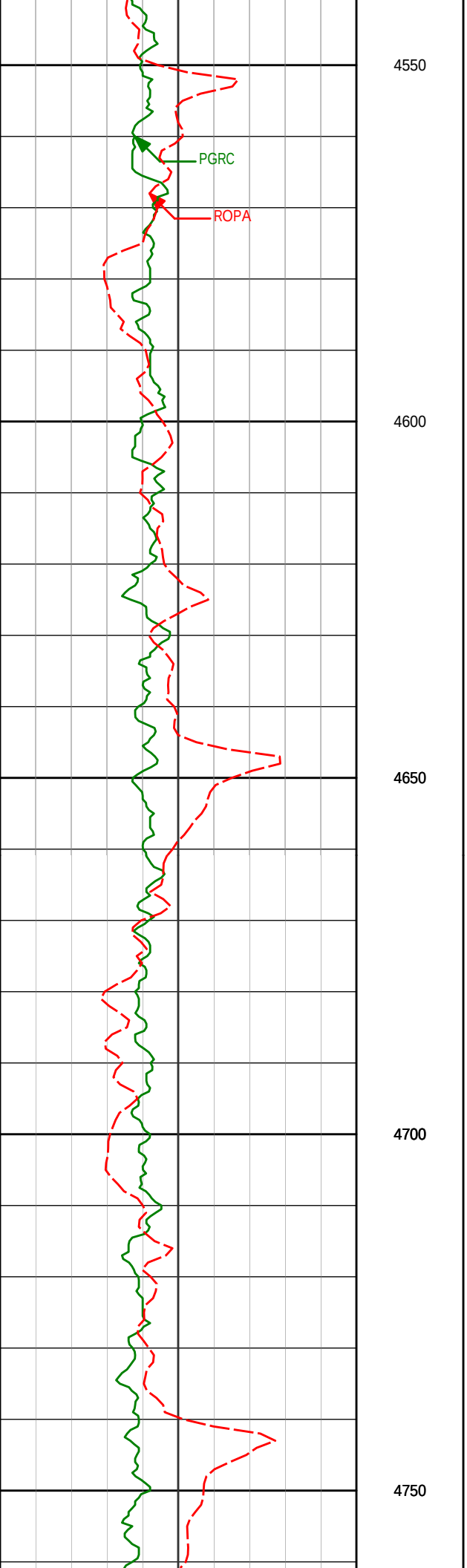

| | | | | |
|---|---|---|---|---|
| 3927' | 6.01° | 76.05° | 3912.29' | -161.15' |
| 4022' | 2.66° | 84.05° | 4007.01' | -168.20' |



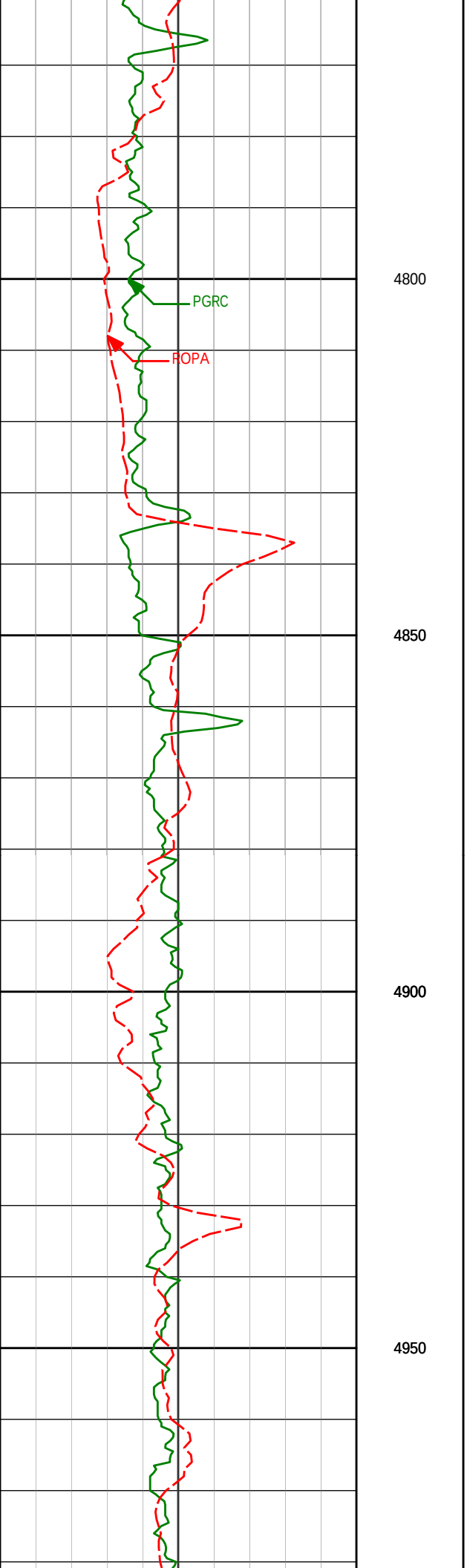

| | | | | |
|---|---|---|---|---|
| 4117' | 2.03° | 83.50° | 4101.93' | -172.06' |
| 4212' | 0.48° | 32.33° | 4196.90' | -173.95' |
| 4307' | 1.06° | 333.50° | 4291.90' | -173.80' |



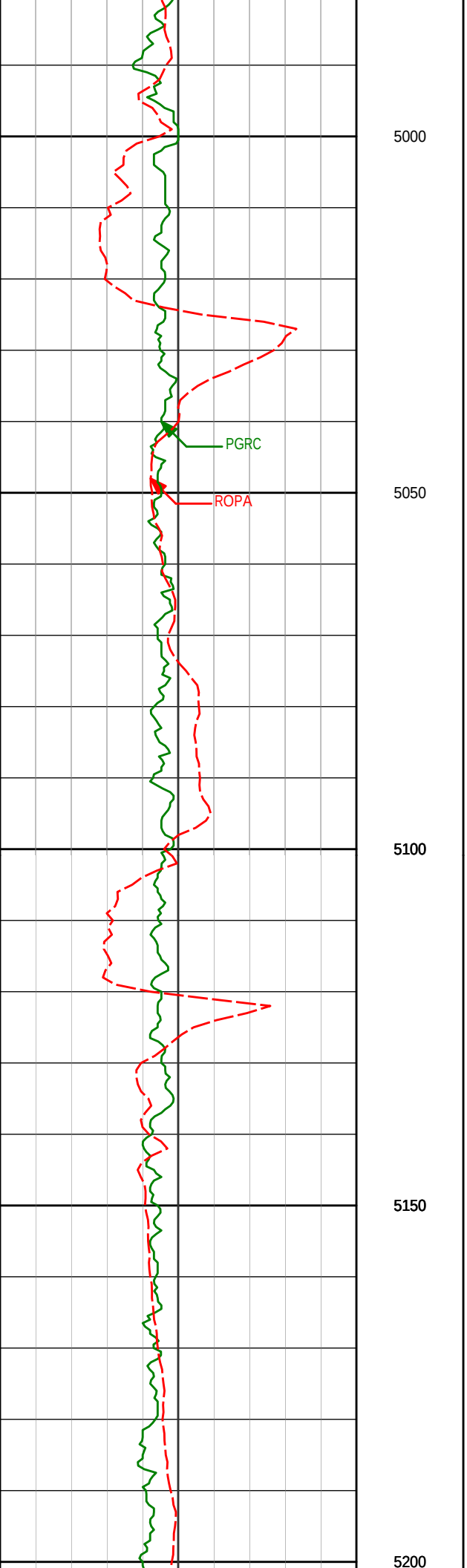

| | | | | |
|---|---|---|---|---|
| 4402' | 1.26° | 332.27° | 4386.88' | -172.96' |
| 4497' | 0.95° | 344.39° | 4481.86' | -172.30' |



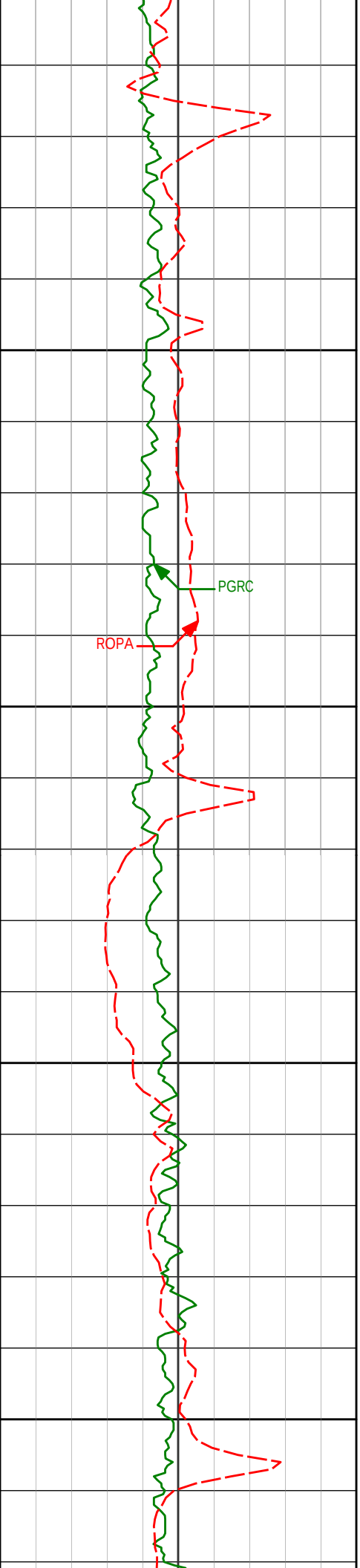

| | | | | |
|---|---|---|---|---|
| 4592' | 0.98° | 358.95° | 4576.85' | -172.10' |
| 4687' | 0.81° | 342.30° | 4671.83' | -171.91' |



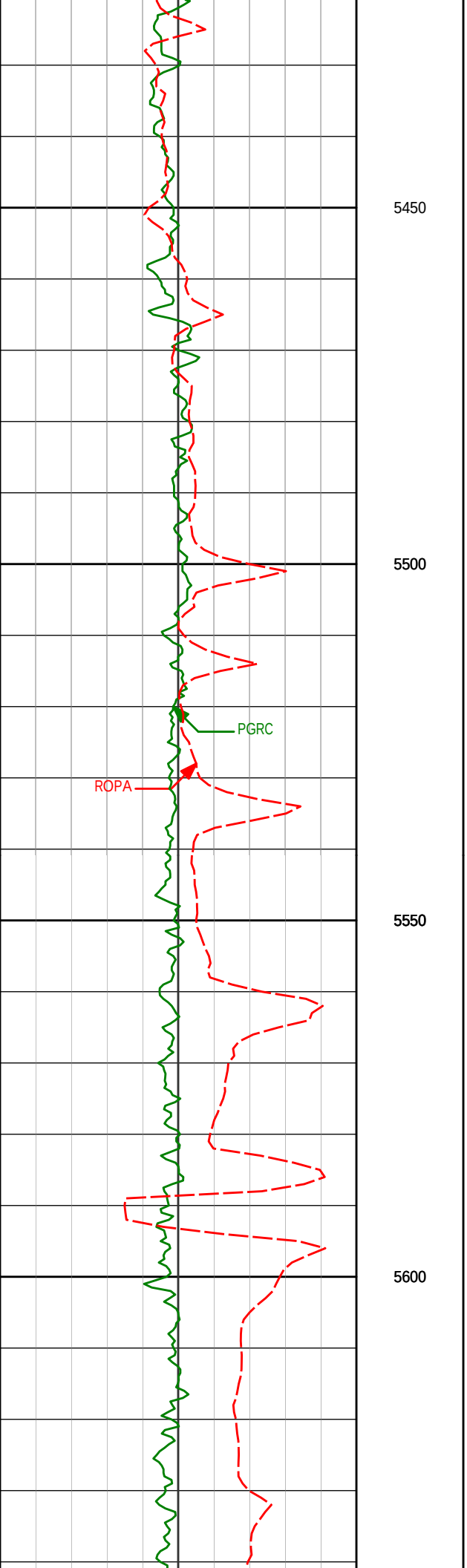

| | | | | |
|---|---|---|---|---|
| 4782' | 1.00° | 353.15° | 4766.82' | -171.64' |
| 4877' | 0.77° | 355.56° | 4861.81' | -171.52' |
| 4972' | 0.47° | 16.61° | 4956.81' | -171.61' |



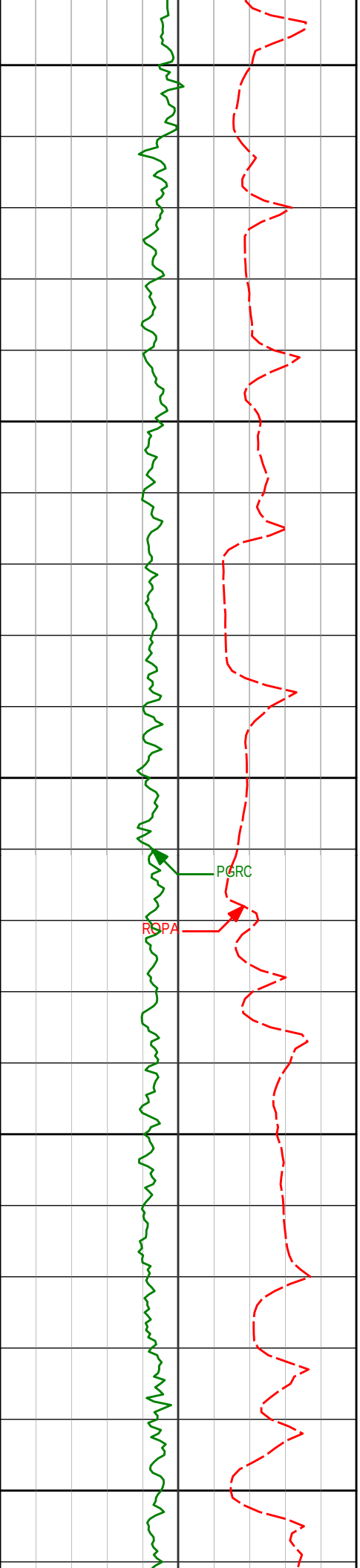

| | | | | |
|---|---|---|---|---|
| 5067' | 0.42° | 288.41° | 5051.80' | -171.40' |
| 5162' | 0.51° | 272.48° | 5146.80' | -170.65' |



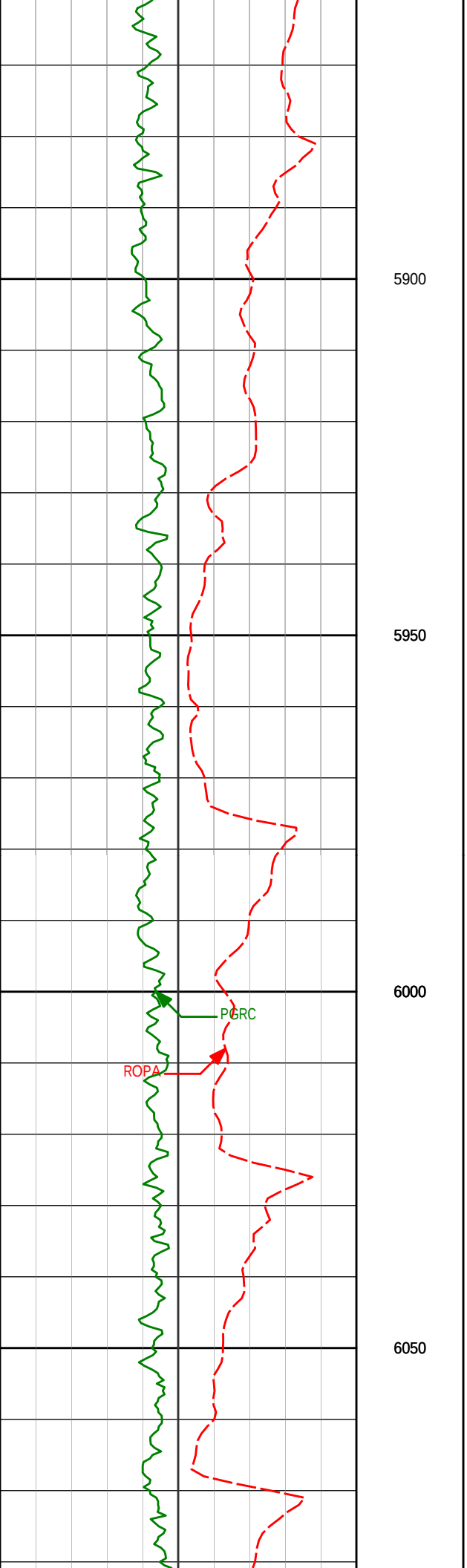

| | | | | | |
|---|---|---|---|---|---|
| 5250 | | | | | |
| | 5256' | 0.34° | 194.89° | 5240.80' | -170.16' |
| 5300 | | | | | |
| 5350 | | | | | |
| | 5351' | 0.73° | 188.23° | 5335.79' | -169.98' |
| 5400 | | | | | |



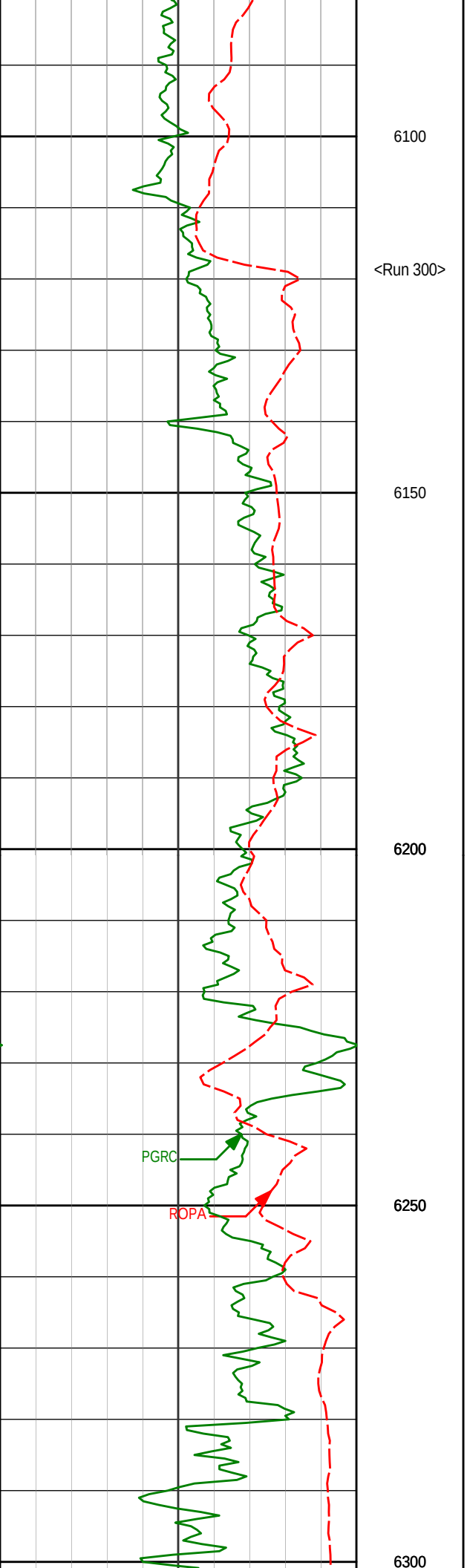

| | | | | |
|---|---|---|---|---|
| 5446' | 1.16° | 195.13° | 5430.78' | -169.61' |
| 5541' | 1.43° | 203.68° | 5525.76' | -168.84' |
| 5589' | 3.41° | 248.33° | 5573.71' | -167.25' |
| 5636' | 7.28° | 258.30° | 5620.50' | -163.02' |



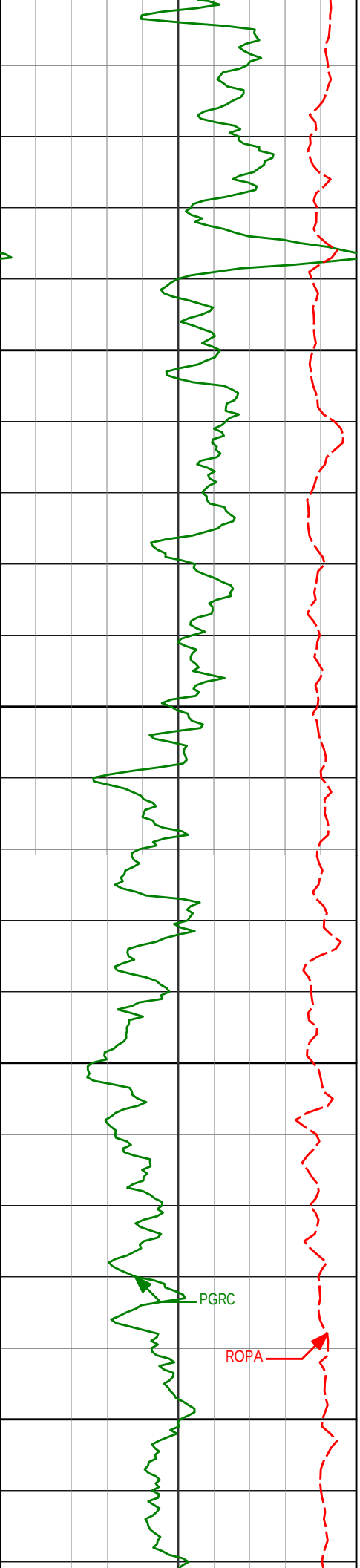

| | | | | |
|---|---|---|---|---|
| 5684' | 9.49° | 263.45° | 5667.99' | -156.08' |
| 5731' | 11.45° | 266.09° | 5714.20' | -147.56' |
| 5779' | 14.36° | 263.91° | 5760.98' | -136.87' |
| 5826' | 16.56° | 266.95° | 5806.28' | -124.36' |



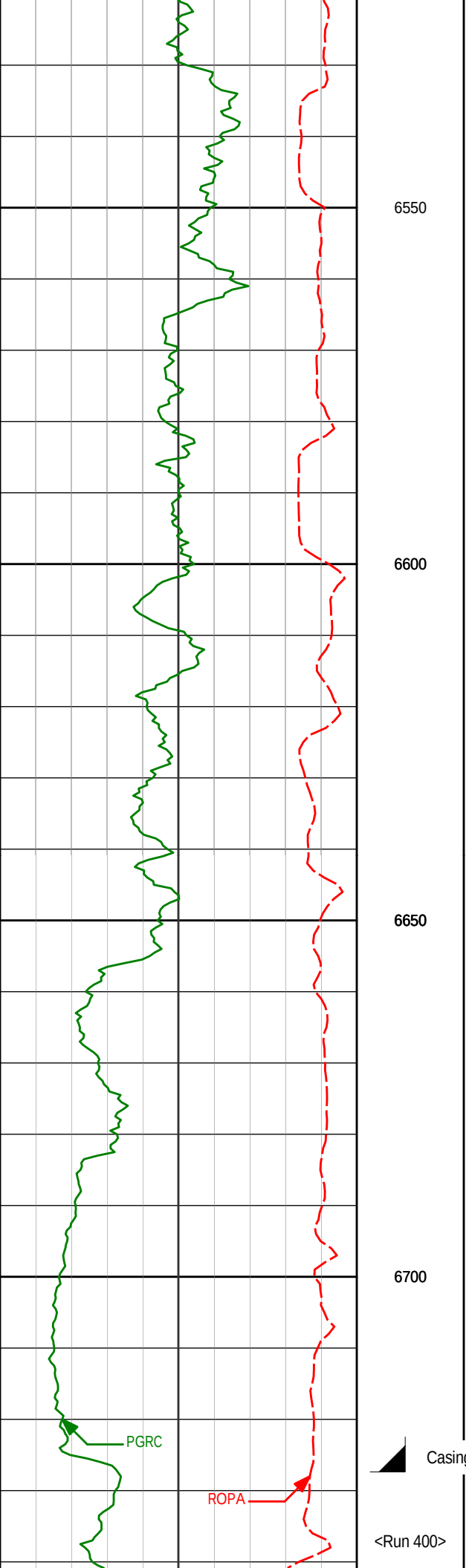

| | | | | |
|---|---|---|---|---|
| 5921' | 20.24° | 272.41° | 5896.41' | -94.42' |
| 5969' | 21.80° | 271.49° | 5941.22' | -77.23' |
| 6016' | 24.13° | 271.18° | 5984.49' | -58.91' |
| 6064' | 26.70° | 269.95° | 6027.84' | -38.32' |




| | | | | |
|---|---|---|---|---|
| 6111' | 29.86° | 269.31° | 6069.23' | -16.06' |
| 6159' | 34.09° | 269.05° | 6109.93' | 9.36' |
| 6206' | 38.82° | 269.00° | 6147.73' | 37.28' |
| 6254' | 40.87° | 271.19° | 6184.58' | 68.02' |



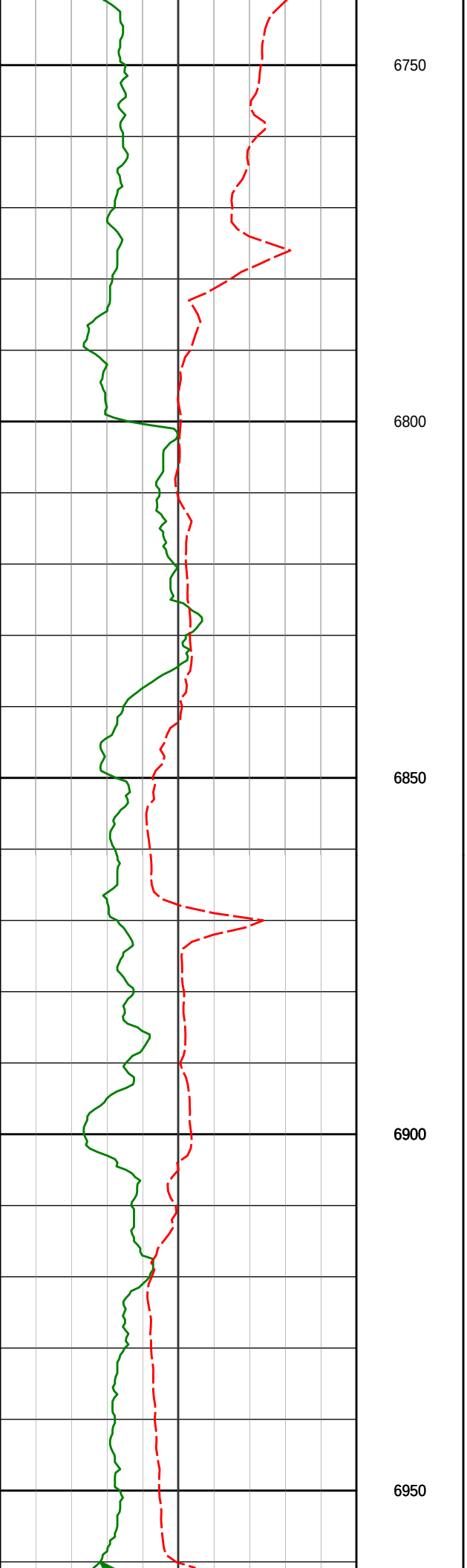

| | | | | |
|---|---|---|---|---|
| 6301 | 45.45 | 271.01 | 6218.86 | 100.13 |
| 6349' | 51.86° | 271.25° | 6250.55' | 136.12' |
| 6396' | 57.71° | 270.27° | 6277.64' | 174.48' |
| 6444' | 64.12° | 267.75° | 6300.96' | 216.40' |
| 6491' | 68.80° | 268.01° | 6319.73' | 259.47' |



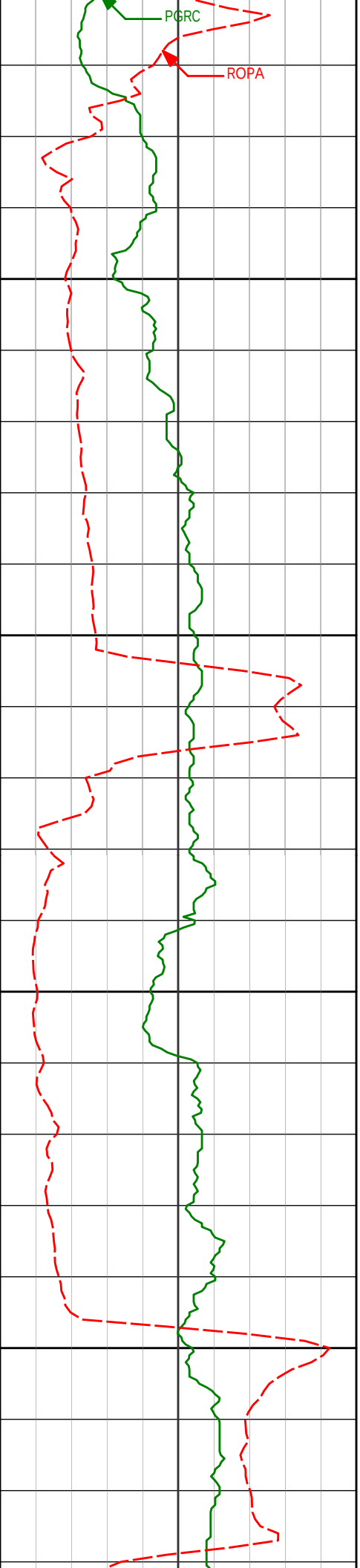

| | | | | |
|---|---|---|---|---|
| 6539' | 73.22° | 268.90° | 6335.35' | 304.84' |
| 6586' | 76.41° | 269.90° | 6347.66' | 350.19' |
| 6634' | 79.81° | 270.65° | 6357.55' | 397.14' |
| 6679' | 85.57° | 269.94° | 6363.27' | 441.74' |

Casing Set @ 6,727'

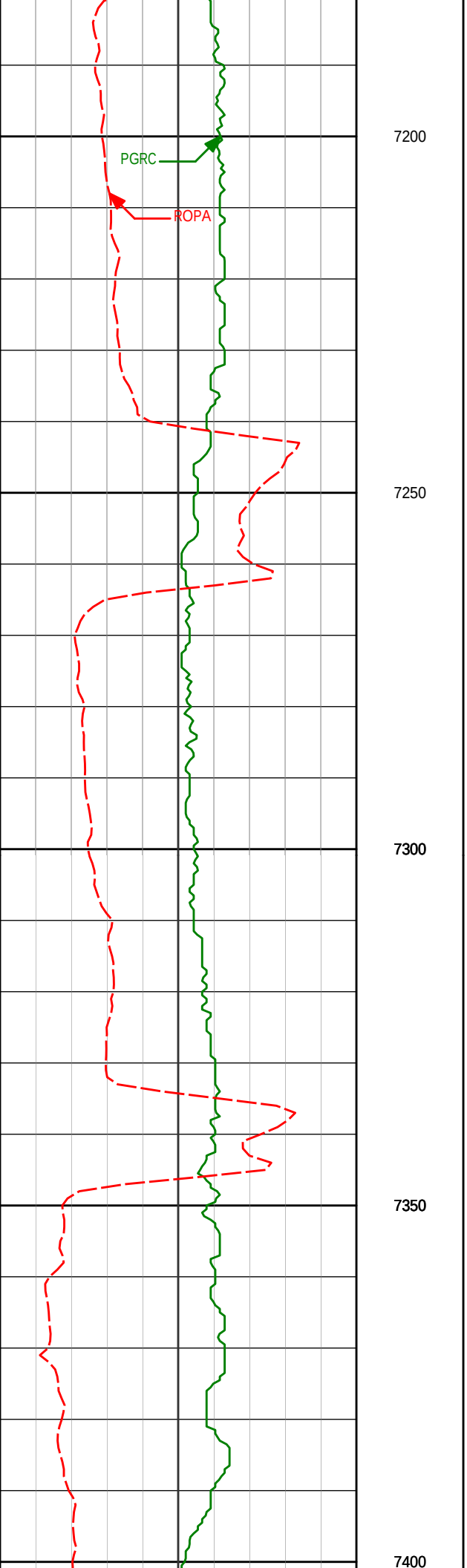
<Run 400>



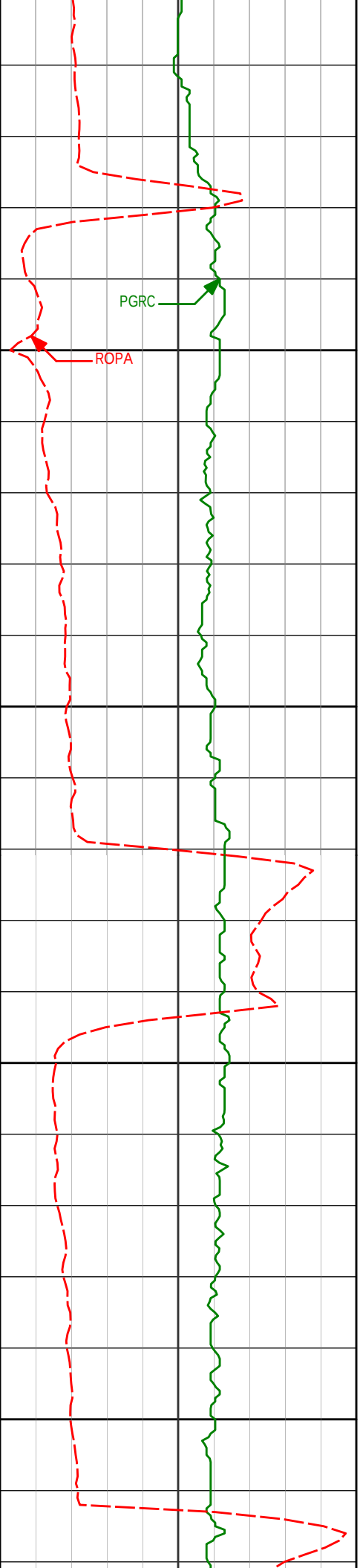

| | | | | |
|---|---|---|---|---|
| 6803' | 89.69° | 268.94° | 6368.39' | 565.60' |
| 6897' | 89.17° | 267.86° | 6369.33' | 659.59' |



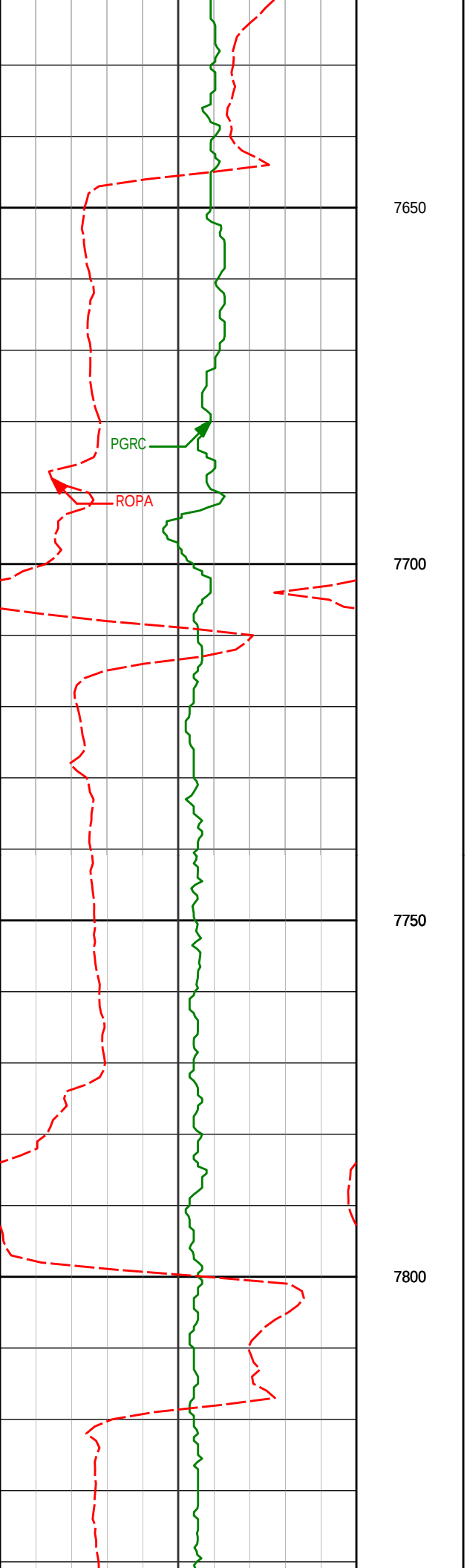

| | | | | |
|---|---|---|---|---|
| 6990' | 90.96° | 268.56° | 6369.23' | 752.58' |
| 7083' | 91.91° | 268.92° | 6366.90' | 845.55' |
| 7176' | 90.52° | 268.25° | 6364.93' | 938.53' |



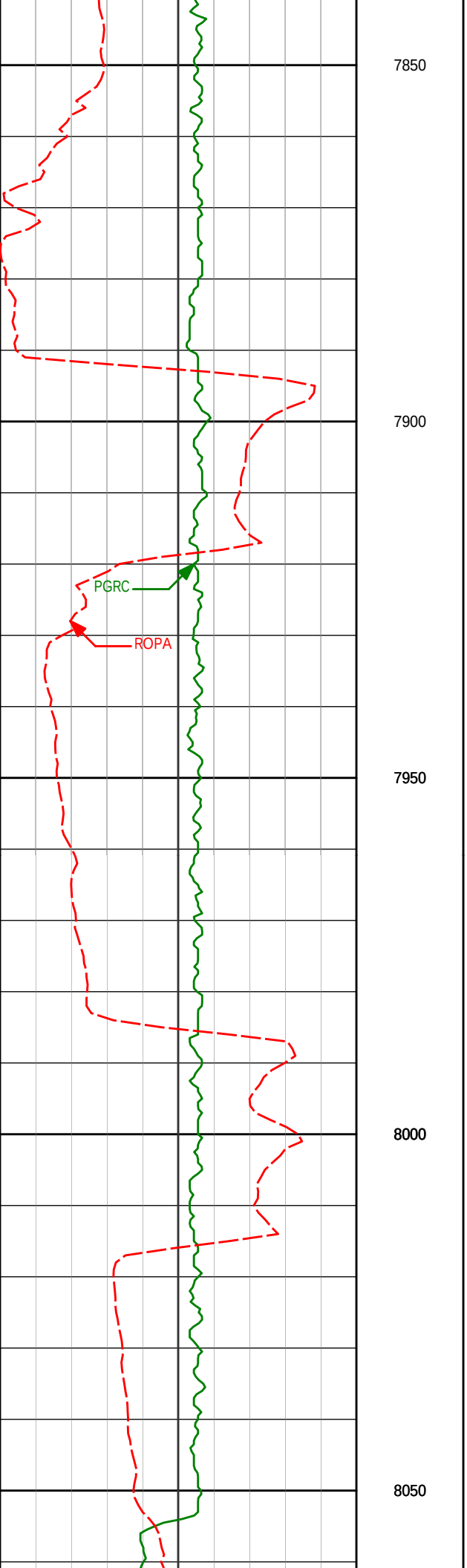

| | | | | |
|---|---|---|---|---|
| 7269' | 89.26° | 268.09° | 6365.11' | 1031.52' |
| 7362' | 88.64° | 267.85° | 6366.81' | 1124.49' |



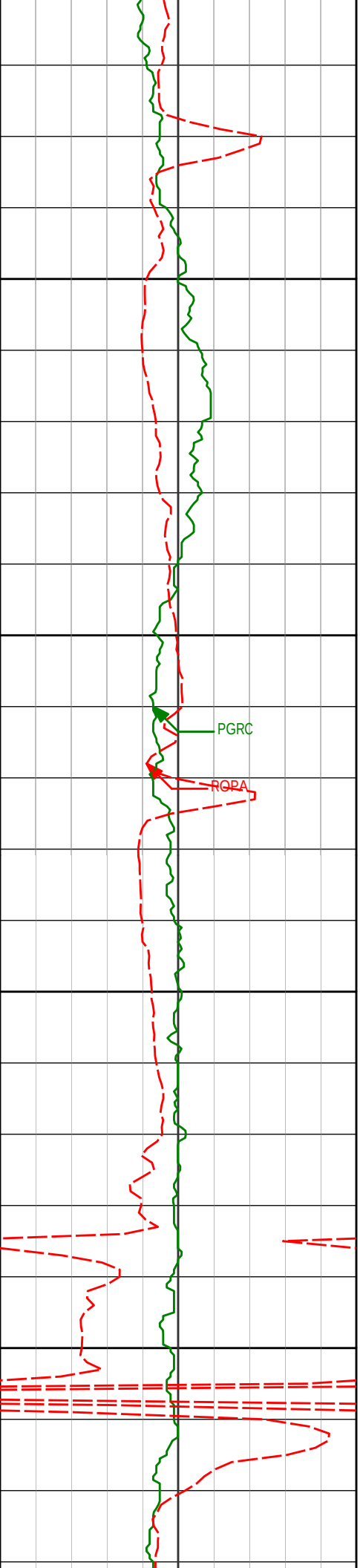

| | | | | |
|---|---|---|---|---|
| 7456' | 90.46° | 268.30° | 6367.55' | 1218.48' |
| 7549' | 90.40° | 268.40° | 6366.85' | 1311.47' |



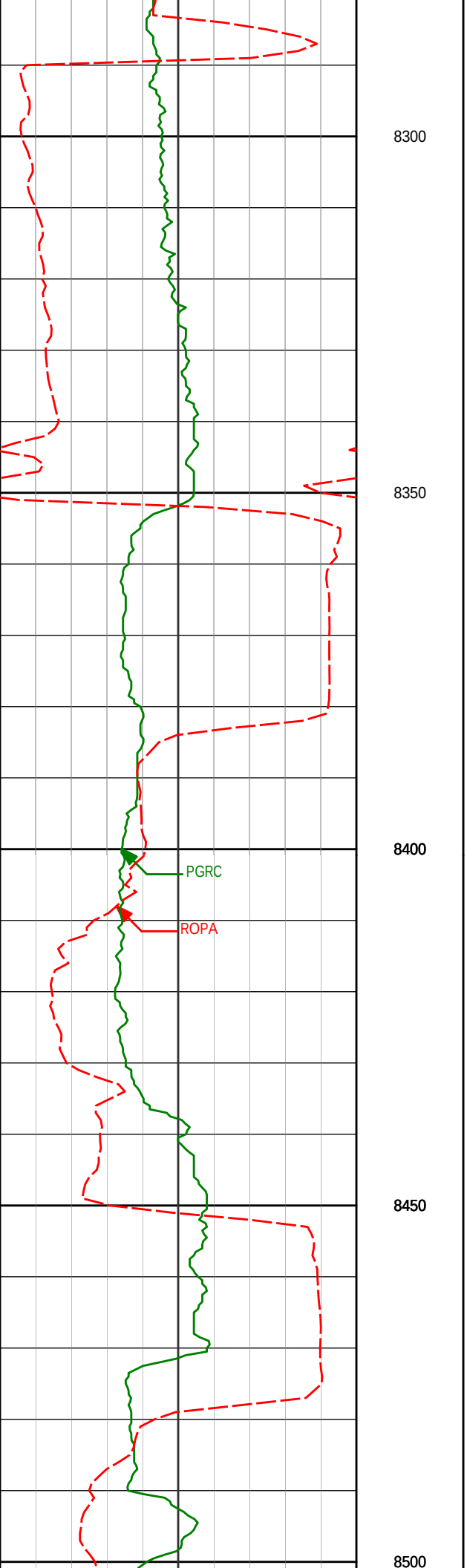

| | | | | |
|---|---|---|---|---|
| 7642' | 88.80° | 268.15° | 6367.50' | 1404.46' |
| 7734' | 89.75° | 268.02° | 6368.66' | 1496.45' |
| 7828' | 89.81° | 267.83° | 6369.02' | 1590.44' |



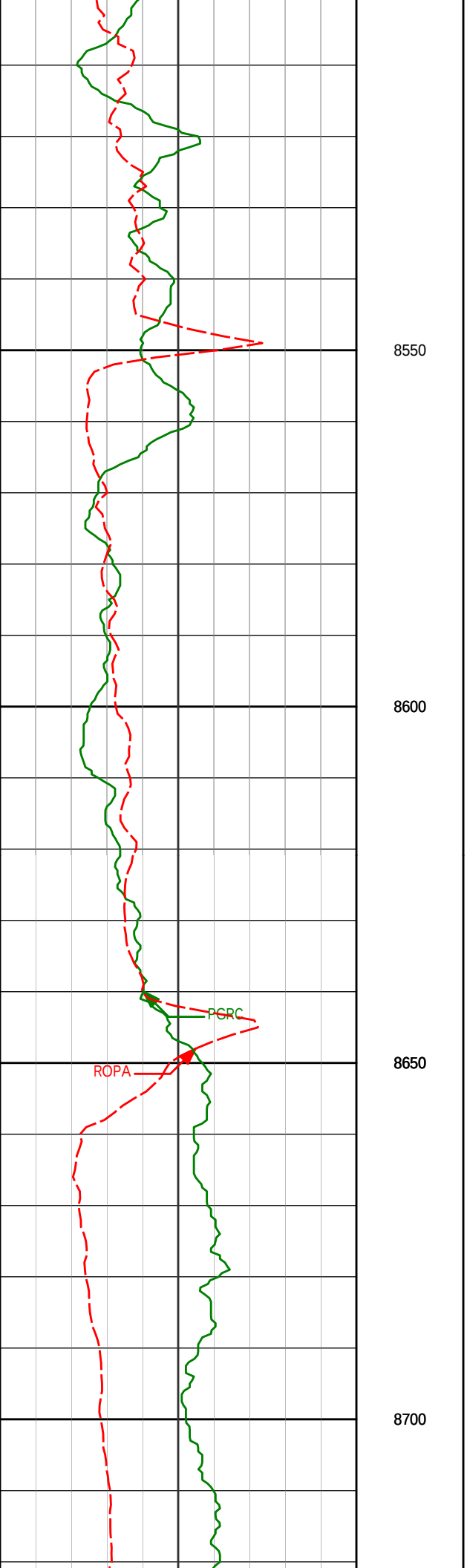

| | | | | |
|---|---|---|---|---|
| 7921' | 89.78° | 270.62° | 6369.34' | 1683.42' |
| 8014' | 88.58° | 268.74° | 6370.67' | 1776.40' |



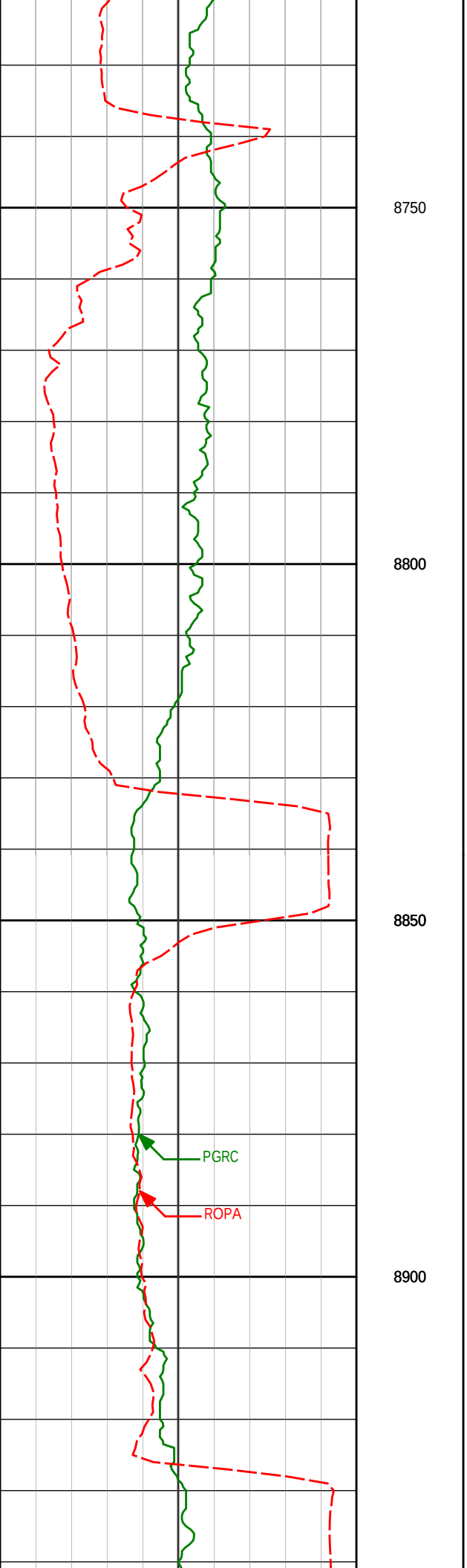

| | | | | | |
|---|---|---|---|---|---|
| 8100 | | | | | |
| | 8106' | 88.61° | 267.91° | 6372.92' | 1868.37' |
| 8150 | | | | | |
| 8200 | 8199' | 89.51° | 267.73° | 6374.45' | 1961.34' |
| 8250 | | | | | |



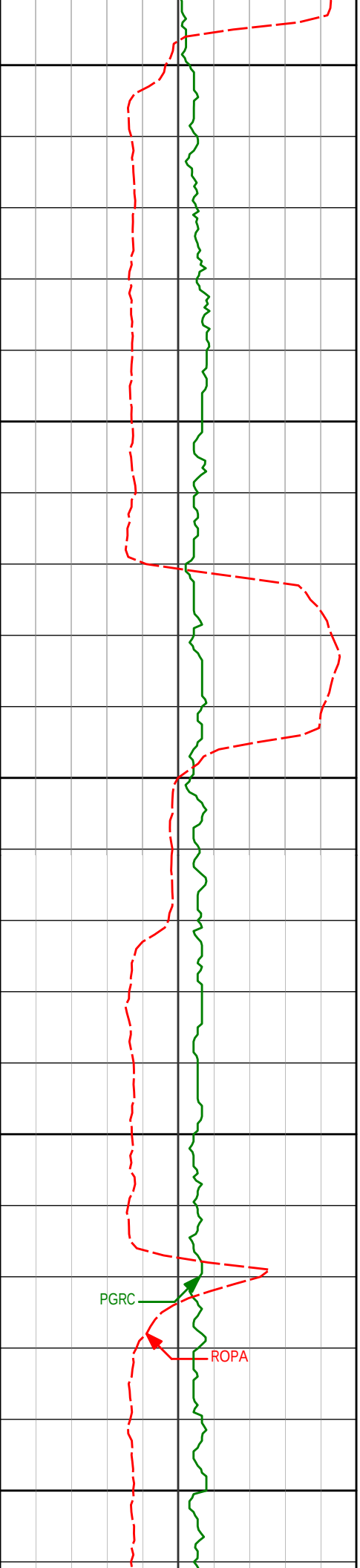

| | | | | |
|---|---|---|---|---|
| 8293' | 90.93° | 267.51° | 6374.09' | 2055.31' |
| 8388' | 90.28° | 268.02° | 6373.10' | 2150.29' |
| 8483' | 88.55° | 268.37° | 6374.07' | 2245.28' |



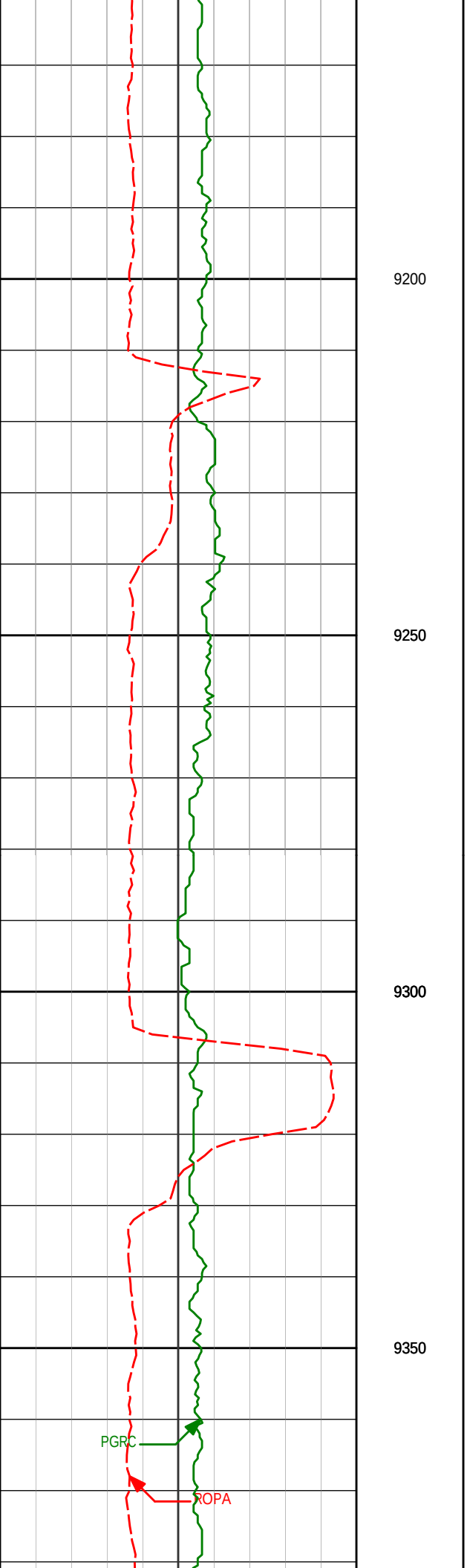

| | | | | |
|---|---|---|---|---|
| 8578' | 87.97° | 268.77° | 6376.96' | 2340.23' |
| 8673' | 88.09° | 269.32° | 6380.23' | 2435.18' |



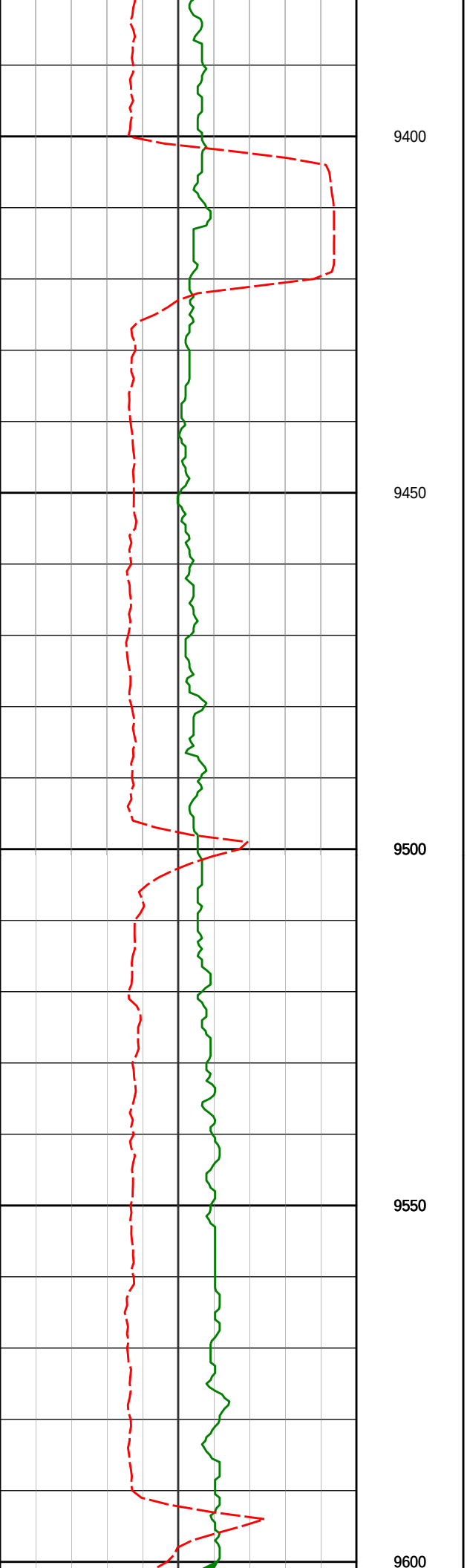

| | | | | |
|---|---|---|---|---|
| 8768' | 88.49° | 269.27° | 6383.07' | 2530.13' |
| 8863' | 91.08° | 269.69° | 6383.43' | 2625.11' |



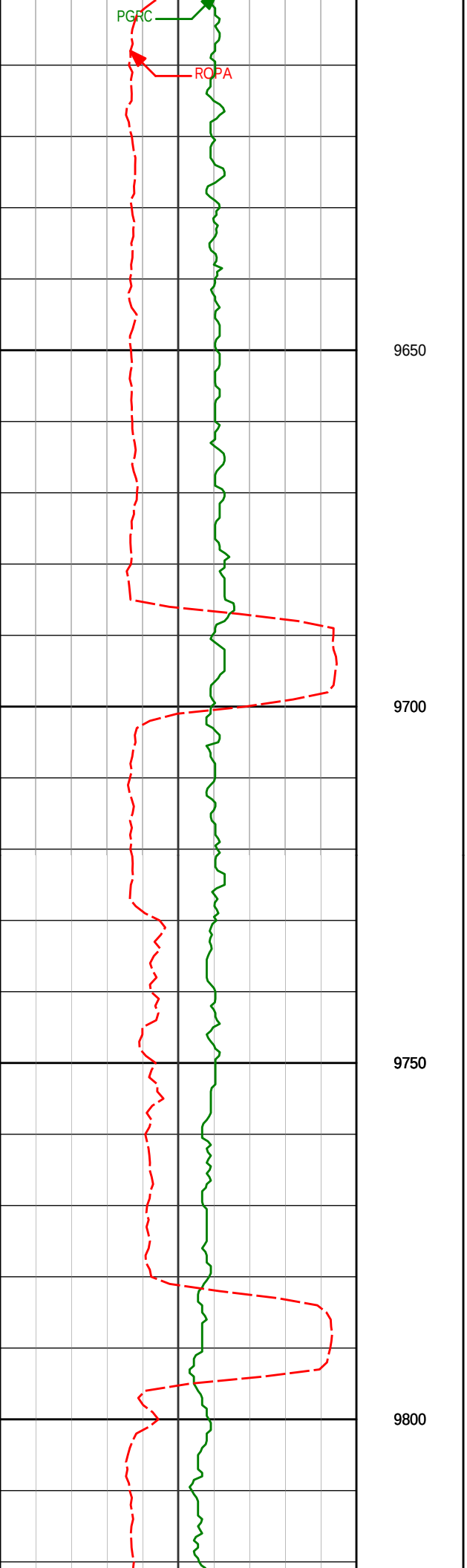

| | | | | |
|---|---|---|---|---|
| 8958' | 90.74° | 270.11° | 6381.92' | 2720.08' |
| 9053' | 89.48° | 269.06° | 6381.74' | 2815.07' |
| 9148' | 89.75° | 268.36° | 6382.38' | 2910.07' |



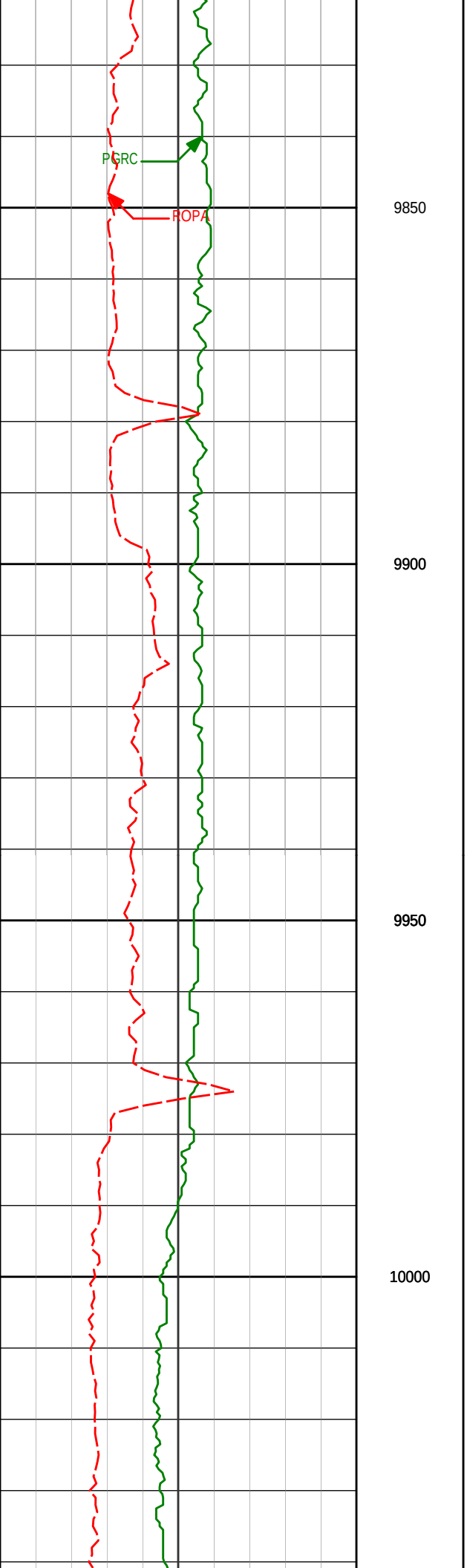

| | | | | |
|---|---|---|---|---|
| 9243' | 90.71° | 267.88° | 6382.00' | 3005.06' |
| 9338' | 90.12° | 267.18° | 6381.31' | 3100.03' |



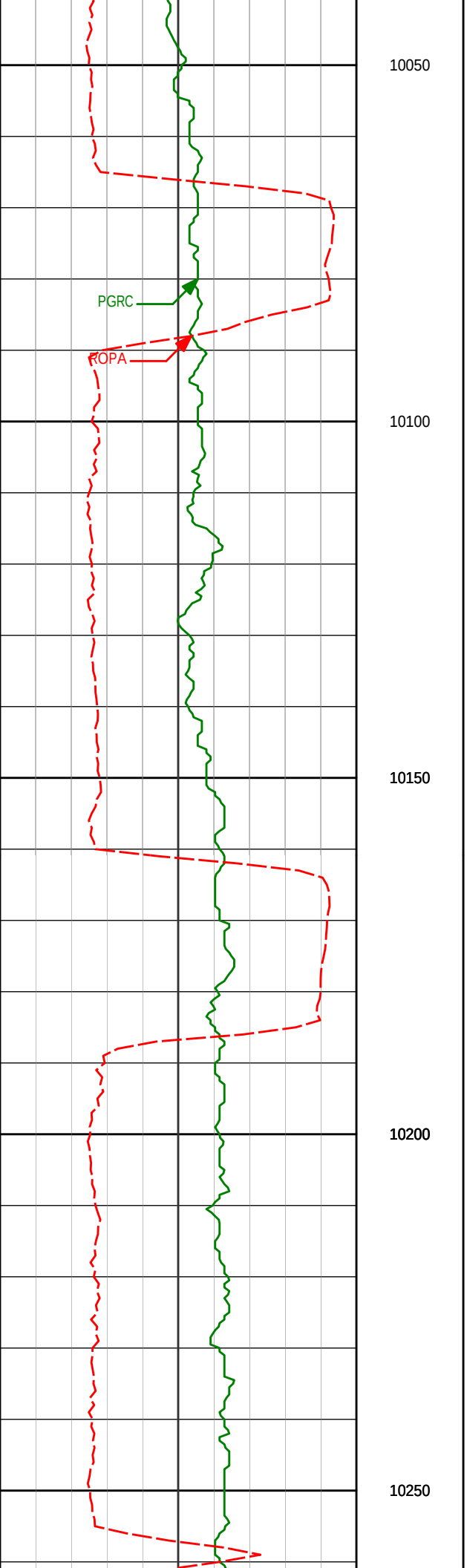

| | | | | |
|---|---|---|---|---|
| 9433' | 89.01° | 268.52° | 6382.02' | 3195.01' |
| 9528' | 89.51° | 268.12° | 6383.25' | 3290.00' |



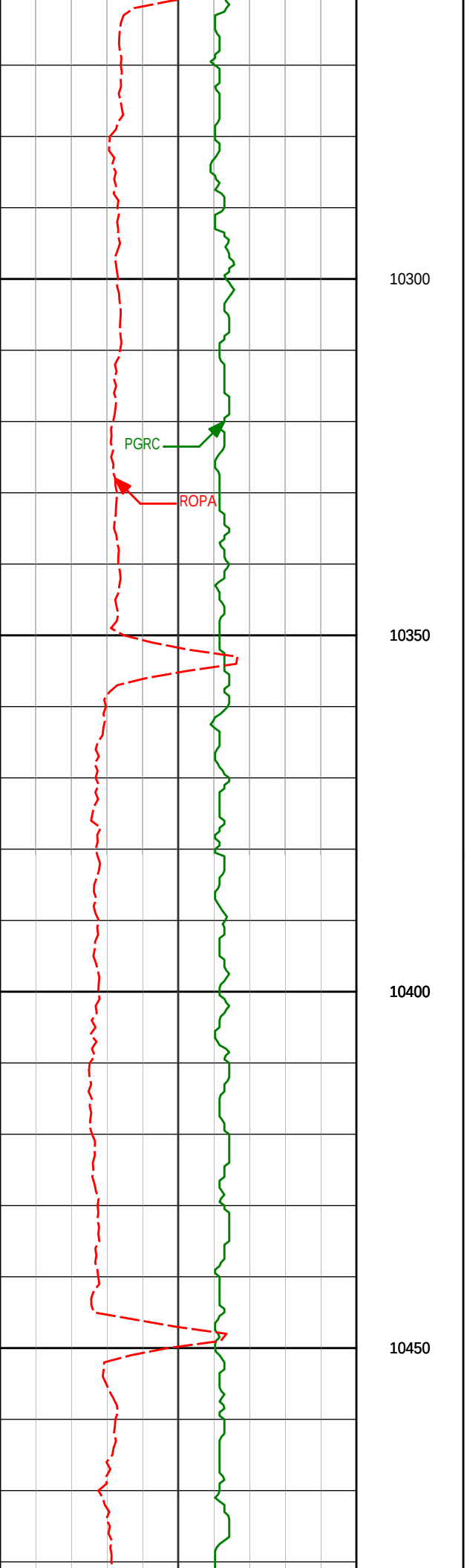

| | | | | |
|---|---|---|---|---|
| 9623' | 90.06° | 267.50° | 6383.61' | 3384.99' |
| 9718' | 90.15° | 268.12° | 6383.43' | 3479.97' |
| 9812' | 89.38° | 269.06° | 6383.81' | 3573.97' |



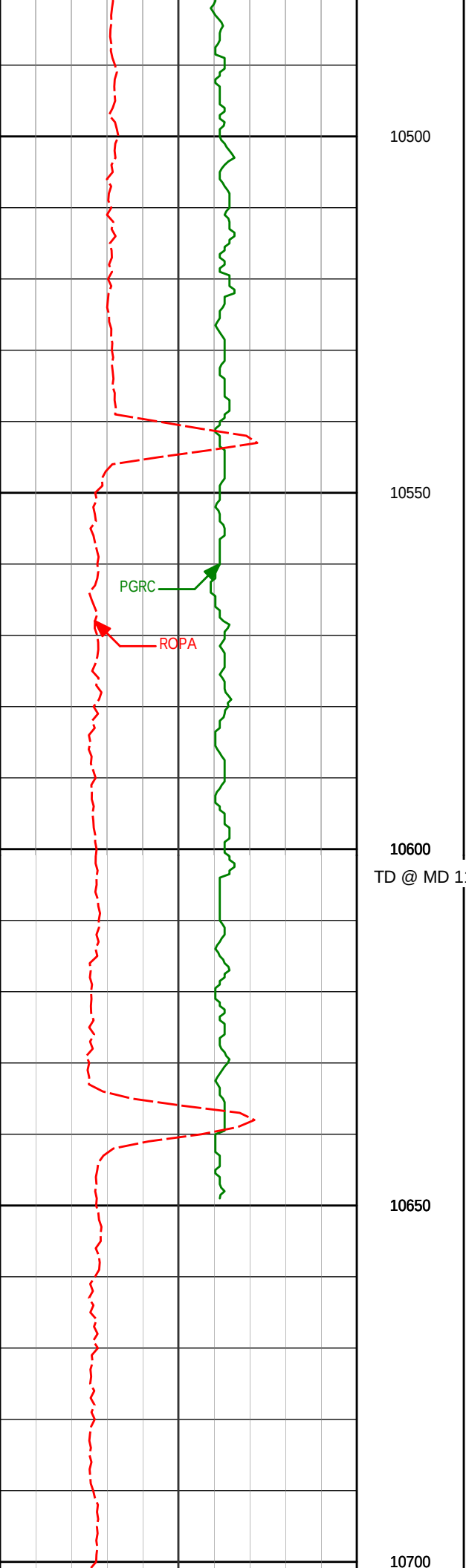

| | | | | |
|---|---|---|---|---|
| 9908' | 89.97° | 268.53° | 6384.35' | 3669.97' |
| 10003' | 90.74° | 268.76° | 6383.76' | 3764.96' |




| | | | | |
|---|---|---|---|---|
| 10097' | 90.80° | 269.37° | 6382.50' | 3858.95' |
| 10192' | 89.11° | 269.66° | 6382.57' | 3953.94' |



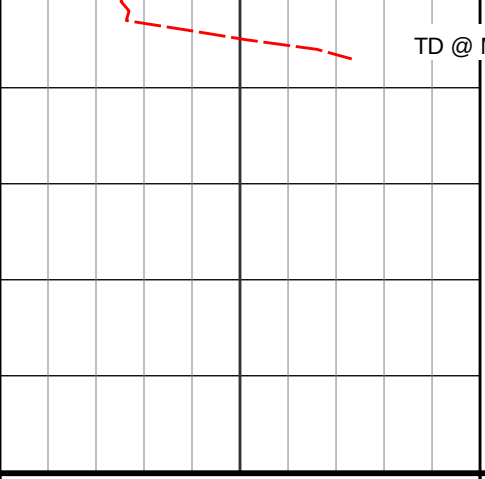

| | | | | |
|---|---|---|---|---|
| 10287' | 88.52° | 268.27° | 6384.54' | 4048.92' |
| 10382' | 89.51° | 268.12° | 6386.18' | 4143.90' |
| 10477' | 89.38° | 266.87° | 6387.10' | 4238.87' |




| | | | | |
|---|---|---|---|---|
| 10572' | 88.74° | 265.73° | 6388.65' | 4333.76' |

TD @ MD 11,156'

| | | | | |
|---|---|---|---|---|
| 10640' | 89.29° | 265.43° | 6389.82' | 4401.64' |




| | | | | | |
|---|---|---|---|---|---|
| 10705' | 89.29° | 265.43° | 6390.63' | 4466.52' | |

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

HALLIBURTON

# DIRECTIONAL SURVEY REPORT

**Noble Energy**
**Bronco State AF10-64-1HN**
**Wattenberg**
**Weld Colorado**
**USA**
**CA-XX-0900206159**

| Measured Depth (feet) | Inclination (degrees) | Direction (degrees) | Vertical Depth (feet) | Latitude (feet) | Departure (feet) | Vertical Section (feet) | Dogleg (deg/100ft) |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 0.00 | 0.00 | 0.00 N | 0.00 E | 0.00 | TIE-IN |
| 587.00 | 0.00 | 0.00 | 587.00 | 0.00 N | 0.00 E | 0.00 | 0.00 |
| 654.00 | 0.32 | 227.41 | 654.00 | 0.13 S | 0.14 W | 0.14 | 0.48 |
| 717.00 | 0.18 | 272.43 | 717.00 | 0.24 S | 0.37 W | 0.38 | 0.37 |
| 810.00 | 0.65 | 202.62 | 810.00 | 0.72 S | 0.72 W | 0.74 | 0.66 |
| 904.00 | 0.86 | 198.42 | 903.99 | 1.88 S | 1.15 W | 1.19 | 0.23 |
| 997.00 | 0.70 | 199.28 | 996.98 | 3.08 S | 1.56 W | 1.62 | 0.17 |
| 1089.00 | 0.70 | 201.33 | 1088.97 | 4.13 S | 1.95 W | 2.03 | 0.03 |
| 1183.00 | 0.50 | 227.62 | 1182.97 | 4.94 S | 2.46 W | 2.56 | 0.35 |
| 1276.00 | 0.60 | 218.77 | 1275.96 | 5.59 S | 3.06 W | 3.18 | 0.14 |
| 1460.00 | 0.61 | 220.60 | 1459.95 | 7.08 S | 4.30 W | 4.45 | 0.01 |
| 1555.00 | 0.50 | 183.16 | 1554.95 | 7.88 S | 4.65 W | 4.82 | 0.39 |
| 1650.00 | 0.37 | 176.32 | 1649.95 | 8.61 S | 4.66 W | 4.84 | 0.15 |
| 1745.00 | 1.05 | 197.47 | 1744.94 | 9.74 S | 4.90 W | 5.10 | 0.75 |
| 1852.00 | 0.62 | 213.73 | 1851.93 | 11.15 S | 5.51 W | 5.74 | 0.46 |
| 1946.00 | 0.64 | 187.67 | 1945.92 | 12.09 S | 5.86 W | 6.11 | 0.30 |
| 2039.00 | 0.85 | 143.74 | 2038.92 | 13.16 S | 5.53 W | 5.80 | 0.63 |
| 2225.00 | 0.82 | 136.57 | 2224.90 | 15.23 S | 3.80 W | 4.11 | 0.06 |
| 2318.00 | 1.37 | 128.60 | 2317.88 | 16.41 S | 2.47 W | 2.81 | 0.61 |
| 2410.00 | 1.74 | 121.22 | 2409.84 | 17.82 S | 0.41 W | 0.78 | 0.46 |
| 2502.00 | 2.03 | 64.00 | 2501.80 | 17.83 S | 2.24 E | -1.87 | 1.98 |
| 2597.00 | 1.54 | 49.47 | 2596.76 | 16.27 S | 4.72 E | -4.38 | 0.70 |
| 2692.00 | 1.11 | 48.55 | 2691.73 | 14.83 S | 6.38 E | -6.07 | 0.45 |
| 2787.00 | 1.39 | 25.52 | 2786.71 | 13.18 S | 7.57 E | -7.30 | 0.60 |
| 2882.00 | 1.64 | 7.88 | 2881.68 | 10.79 S | 8.25 E | -8.03 | 0.55 |
| 2977.00 | 1.71 | 58.58 | 2976.64 | 8.71 S | 9.65 E | -9.47 | 1.51 |
| 3072.00 | 3.41 | 91.91 | 3071.55 | 8.07 S | 13.68 E | -13.51 | 2.31 |
| 3167.00 | 5.95 | 98.45 | 3166.22 | 8.88 S | 21.38 E | -21.19 | 2.73 |
| 3262.00 | 8.33 | 87.64 | 3260.48 | 9.33 S | 33.13 E | -32.93 | 2.87 |
| 3357.00 | 10.81 | 88.76 | 3354.15 | 8.85 S | 48.92 E | -48.72 | 2.61 |
| 3452.00 | 12.19 | 88.75 | 3447.24 | 8.44 S | 67.85 E | -67.66 | 1.45 |
| 3547.00 | 13.58 | 90.94 | 3539.85 | 8.40 S | 89.03 E | -88.84 | 1.55 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3642.00 | 14.51 | 90.95 | 3632.01 | 8.78 S | 112.09 E | -111.88 | 0.98 |
| 3737.00 | 11.84 | 79.02 | 3724.51 | 7.13 S | 133.57 E | -133.39 | 4.00 |
| 3832.00 | 8.30 | 74.61 | 3818.04 | 3.45 S | 149.75 E | -149.65 | 3.81 |
| 3927.00 | 6.01 | 76.05 | 3912.29 | 0.43 S | 161.19 E | -161.15 | 2.41 |
| 4022.00 | 2.66 | 84.05 | 4007.01 | 1.00 N | 168.21 E | -168.20 | 3.58 |
| 4117.00 | 2.03 | 83.50 | 4101.93 | 1.42 N | 172.07 E | -172.06 | 0.67 |
| 4212.00 | 0.48 | 32.33 | 4196.90 | 1.94 N | 173.95 E | -173.95 | 1.86 |
| 4307.00 | 1.06 | 333.50 | 4291.90 | 3.06 N | 173.77 E | -173.80 | 0.96 |
| 4402.00 | 1.26 | 332.27 | 4386.88 | 4.77 N | 172.90 E | -172.96 | 0.21 |
| 4497.00 | 0.95 | 344.39 | 4481.86 | 6.45 N | 172.20 E | -172.30 | 0.40 |
| 4592.00 | 0.98 | 358.95 | 4576.85 | 8.02 N | 171.97 E | -172.10 | 0.26 |
| 4687.00 | 0.81 | 342.30 | 4671.83 | 9.47 N | 171.76 E | -171.91 | 0.33 |
| 4782.00 | 1.00 | 353.15 | 4766.82 | 10.93 N | 171.45 E | -171.64 | 0.27 |
| 4877.00 | 0.77 | 355.56 | 4861.81 | 12.40 N | 171.30 E | -171.52 | 0.24 |
| 4972.00 | 0.47 | 16.61 | 4956.81 | 13.41 N | 171.37 E | -171.61 | 0.40 |
| 5067.00 | 0.42 | 288.41 | 5051.80 | 13.89 N | 171.15 E | -171.40 | 0.65 |
| 5162.00 | 0.51 | 272.48 | 5146.80 | 14.02 N | 170.40 E | -170.65 | 0.16 |
| 5256.00 | 0.34 | 194.89 | 5240.80 | 13.77 N | 169.91 E | -170.16 | 0.58 |
| 5351.00 | 0.73 | 188.23 | 5335.79 | 12.90 N | 169.75 E | -169.98 | 0.42 |
| 5446.00 | 1.16 | 195.13 | 5430.78 | 11.37 N | 169.41 E | -169.61 | 0.46 |
| 5541.00 | 1.43 | 203.68 | 5525.76 | 9.35 N | 168.68 E | -168.84 | 0.35 |
| 5589.00 | 3.41 | 248.33 | 5573.71 | 8.28 N | 167.12 E | -167.25 | 5.40 |
| 5636.00 | 7.28 | 258.30 | 5620.50 | 7.16 N | 162.90 E | -163.02 | 8.45 |
| 5684.00 | 9.49 | 263.45 | 5667.99 | 6.09 N | 155.99 E | -156.08 | 4.86 |
| 5731.00 | 11.45 | 266.09 | 5714.20 | 5.33 N | 147.48 E | -147.56 | 4.30 |
| 5779.00 | 14.36 | 263.91 | 5760.98 | 4.37 N | 136.81 E | -136.87 | 6.14 |
| 5826.00 | 16.56 | 266.95 | 5806.28 | 3.40 N | 124.32 E | -124.36 | 4.98 |
| 5921.00 | 20.24 | 272.41 | 5896.41 | 3.37 N | 94.37 E | -94.42 | 4.27 |
| 5969.00 | 21.80 | 271.49 | 5941.22 | 3.95 N | 77.16 E | -77.23 | 3.33 |
| 6016.00 | 24.13 | 271.18 | 5984.49 | 4.37 N | 58.83 E | -58.91 | 4.95 |
| 6064.00 | 26.70 | 269.95 | 6027.84 | 4.57 N | 38.23 E | -38.32 | 5.48 |
| 6111.00 | 29.86 | 269.31 | 6069.23 | 4.42 N | 15.97 E | -16.06 | 6.76 |
| 6159.00 | 34.09 | 269.05 | 6109.93 | 4.05 N | 9.44 W | 9.36 | 8.82 |
| 6206.00 | 38.82 | 269.00 | 6147.73 | 3.57 N | 37.36 W | 37.28 | 10.06 |
| 6254.00 | 40.87 | 271.19 | 6184.58 | 3.63 N | 68.11 W | 68.02 | 5.17 |
| 6301.00 | 45.45 | 271.01 | 6218.86 | 4.24 N | 100.24 W | 100.13 | 9.75 |
| 6349.00 | 51.86 | 271.25 | 6250.55 | 4.96 N | 136.25 W | 136.12 | 13.36 |
| 6396.00 | 57.71 | 270.27 | 6277.64 | 5.45 N | 174.63 W | 174.48 | 12.57 |
| 6444.00 | 64.12 | 267.75 | 6300.96 | 4.70 N | 216.54 W | 216.40 | 14.11 |
| 6491.00 | 68.80 | 268.01 | 6319.73 | 3.11 N | 259.59 W | 259.47 | 9.97 |
| 6539.00 | 73.22 | 268.90 | 6335.35 | 1.89 N | 304.95 W | 304.84 | 9.38 |
| 6586.00 | 76.41 | 269.90 | 6347.66 | 1.41 N | 350.30 W | 350.19 | 7.09 |
| 6634.00 | 79.81 | 270.65 | 6357.55 | 1.64 N | 397.26 W | 397.14 | 7.25 |
| 6679.00 | 85.57 | 269.94 | 6363.27 | 1.87 N | 441.88 W | 441.74 | 12.90 |
| 6803.00 | 89.69 | 268.94 | 6368.39 | 0.65 N | 565.74 W | 565.60 | 3.42 |
| 6897.00 | 89.17 | 267.86 | 6369.33 | 1.97 S | 659.69 W | 659.59 | 1.27 |
| 6990.00 | 90.96 | 268.56 | 6369.23 | 4.88 S | 752.64 W | 752.58 | 2.07 |
| 7083.00 | 91.91 | 268.92 | 6366.90 | 6.92 S | 845.59 W | 845.55 | 1.10 |
| 7176.00 | 90.52 | 268.25 | 6364.93 | 9.22 S | 938.54 W | 938.53 | 1.66 |
| 7269.00 | 89.26 | 268.09 | 6365.11 | 12.18 S | 1031.49 W | 1031.52 | 1.37 |
| 7362.00 | 88.64 | 267.85 | 6366.81 | 15.47 S | 1124.41 W | 1124.49 | 0.72 |
| 7456.00 | 90.46 | 268.30 | 6367.55 | 18.63 S | 1218.35 W | 1218.48 | 2.00 |
| 7549.00 | 90.40 | 268.40 | 6366.85 | 21.31 S | 1311.31 W | 1311.47 | 0.12 |
| 7642.00 | 88.80 | 268.15 | 6367.50 | 24.11 S | 1404.27 W | 1404.46 | 1.75 |
| 7734.00 | 89.75 | 268.02 | 6368.66 | 27.19 S | 1496.21 W | 1496.45 | 1.05 |
| 7828.00 | 89.81 | 267.83 | 6369.02 | 30.59 S | 1590.14 W | 1590.44 | 0.21 |
| 7921.00 | 89.78 | 270.62 | 6369.34 | 31.85 S | 1683.12 W | 1683.42 | 3.00 |
| 8014.00 | 88.58 | 268.74 | 6370.67 | 32.38 S | 1776.11 W | 1776.40 | 2.40 |
| 8106.00 | 88.61 | 267.91 | 6372.92 | 35.07 S | 1868.04 W | 1868.37 | 0.90 |
| 8199.00 | 89.51 | 267.73 | 6374.45 | 38.61 S | 1960.96 W | 1961.34 | 0.98 |
| 8293.00 | 90.93 | 267.51 | 6374.09 | 42.52 S | 2054.88 W | 2055.31 | 1.53 |
| 8388.00 | 90.28 | 268.02 | 6373.10 | 46.22 S | 2149.80 W | 2150.29 | 0.87 |
| 8483.00 | 88.55 | 268.37 | 6374.07 | 49.21 S | 2244.74 W | 2245.28 | 1.85 |
| 8578.00 | 87.97 | 268.77 | 6376.96 | 51.58 S | 2339.67 W | 2340.23 | 0.74 |
| 8673.00 | 88.09 | 269.32 | 6380.23 | 53.17 S | 2434.60 W | 2435.18 | 0.59 |
| 8768.00 | 88.49 | 269.27 | 6383.07 | 54.35 S | 2529.55 W | 2530.13 | 0.43 |
| 8863.00 | 91.08 | 269.69 | 6383.43 | 55.21 S | 2624.53 W | 2625.11 | 2.76 |
| 8958.00 | 90.74 | 270.11 | 6381.92 | 55.37 S | 2719.52 W | 2720.08 | 0.57 |
| 9053.00 | 89.48 | 269.06 | 6381.74 | 56.06 S | 2814.52 W | 2815.07 | 1.73 |
| 9148.00 | 89.75 | 268.36 | 6382.38 | 58.20 S | 2909.49 W | 2910.07 | 0.79 |
| 9243.00 | 90.71 | 267.88 | 6382.00 | 61.31 S | 3004.44 W | 3005.06 | 1.13 |
| 9338.00 | 90.12 | 267.18 | 6381.31 | 65.41 S | 3099.34 W | 3100.03 | 0.96 |
| 9433.00 | 89.01 | 268.52 | 6382.02 | 68.97 S | 3194.27 W | 3195.01 | 1.83 |
| 9528.00 | 89.51 | 268.12 | 6383.25 | 71.75 S | 3289.22 W | 3290.00 | 0.67 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9623.00 | 90.06 | 267.50 | 6383.61 | 75.37 S | 3384.15 W | 3384.99 | 0.88 |
| 9718.00 | 90.15 | 268.12 | 6383.43 | 78.99 S | 3479.08 W | 3479.97 | 0.66 |
| 9812.00 | 89.38 | 269.06 | 6383.81 | 81.30 S | 3573.05 W | 3573.97 | 1.29 |
| 9908.00 | 89.97 | 268.53 | 6384.35 | 83.32 S | 3669.03 W | 3669.97 | 0.82 |
| 10003.00 | 90.74 | 268.76 | 6383.76 | 85.56 S | 3764.00 W | 3764.96 | 0.85 |
| 10097.00 | 90.80 | 269.37 | 6382.50 | 87.10 S | 3857.98 W | 3858.95 | 0.66 |
| 10192.00 | 89.11 | 269.66 | 6382.57 | 87.90 S | 3952.97 W | 3953.94 | 1.81 |
| 10287.00 | 88.52 | 268.27 | 6384.54 | 89.61 S | 4047.93 W | 4048.92 | 1.59 |
| 10382.00 | 89.51 | 268.12 | 6386.18 | 92.60 S | 4142.87 W | 4143.90 | 1.05 |
| 10477.00 | 89.38 | 266.87 | 6387.10 | 96.76 S | 4237.77 W | 4238.87 | 1.32 |
| 10572.00 | 88.74 | 265.73 | 6388.65 | 102.89 S | 4332.56 W | 4333.76 | 1.38 |
| 10640.00 | 89.29 | 265.43 | 6389.82 | 108.13 S | 4400.35 W | 4401.64 | 0.93 |
| 10705.00 | 89.29 | 265.43 | 6390.63 | 113.30 S | 4465.13 W | 4466.52 | 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 CLOSURE OF 268.55 DEGREES (GRID)**
**A TOTAL CORRECTION OF 7.66 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**
**HORIZONTAL DISPLACEMENT(CLOSURE) AT 10705.00 FEET**
**IS 4466.57 FEET ALONG 268.55 DEGREES (GRID)**

**Date Printed:28 March 2013**