

### PCD Pressure Case Gamma Ray

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100				
<b>Date run completed</b>	03-Aug-13				
<b>Rig Bit Number</b>	1				
<b>Bit Size (in)</b>	8.750				
<b>Tool Nominal OD (in)</b>	6.750				
<b>Log Start Depth (MD, ft)</b>	944.00				
<b>Log End Depth (MD, ft)</b>	8,170.00				
<b>Drill or Wipe</b>	Drill				
<b>Drill/Wipe Start Date and Time</b>	31-Jul-13 11:30				
<b>Drill/Wipe End Date and Time</b>	03-Aug-13 04:26				
<b>Min Inc (deg) @ Depth (MD, ft)</b>	.06 @ 957.00				
<b>Max Inc (deg) @ Depth (MD, ft)</b>	88.70 @ 8,122.00				
<b>Bit TFA(in2) / Bit Type</b>	2.23 / PDC				
<b>Flow Rate (gpm)</b>	583.30				
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	N/A / N/A				
<b>Fluid Type</b>	Fresh Water Gel				
<b>Density (ppg) / Viscosity (spqt)</b>	9.13 / 45.00				
<b>Filtrate CL (ppm)</b>	60.00				
<b>pH / Fluid Loss (mptm)</b>	N/A / N/A				
<b>PV (cP) / YP (lhf2)</b>	9 / 12.00				
<b>% Solids / % Sand</b>	3.30 / 0.10				
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A				
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A				
<b>Max Tool Temp (degF) / Source</b>	183.90 / PCM				
<b>Rm @ Max Tool Temp (degF)</b>	N/A @ 183.90				
<b>Lead MWD Engineer</b>	Caleb Jones				
<b>Customer Representative</b>	Hal Curlett				

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM				
Software Version	5.84				
Sub Serial Number	11404277				
Insert Serial Number	11620311				
Date and Time Initialized	30-Jul-13 19:37				
Date and Time Read	05-Aug-13 11:31				
ECMB SW Version	N/A				

### Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	45.33				
Software Version	6.21				
Sub Serial Number	11404277				
Sonde Serial Number	12177532				
Sensor ID Number	N/A				
Toolface Offset (deg)	298.02				

### Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	55.67				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404277				
Insert/Sonde Serial Number	11293433				

## REMARKS

1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the drill floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" model for water based fluids and the "Bingham Plastic" model for synthetic and oil based fluids.
4. All data presented is recorded data unless otherwise specified.  
--ROPA is Realtime Data
5. The following smoothing parameters have been applied to the data:  
ROPA: 0.5 ft interval, 1.2 ft coercion distance, 3 ft gap fill  
PGRC: 0.5 ft interval, 0.6 ft coercion distance, 3 ft gap fill
6. Insite Version 7.4.20

## WARRANTY

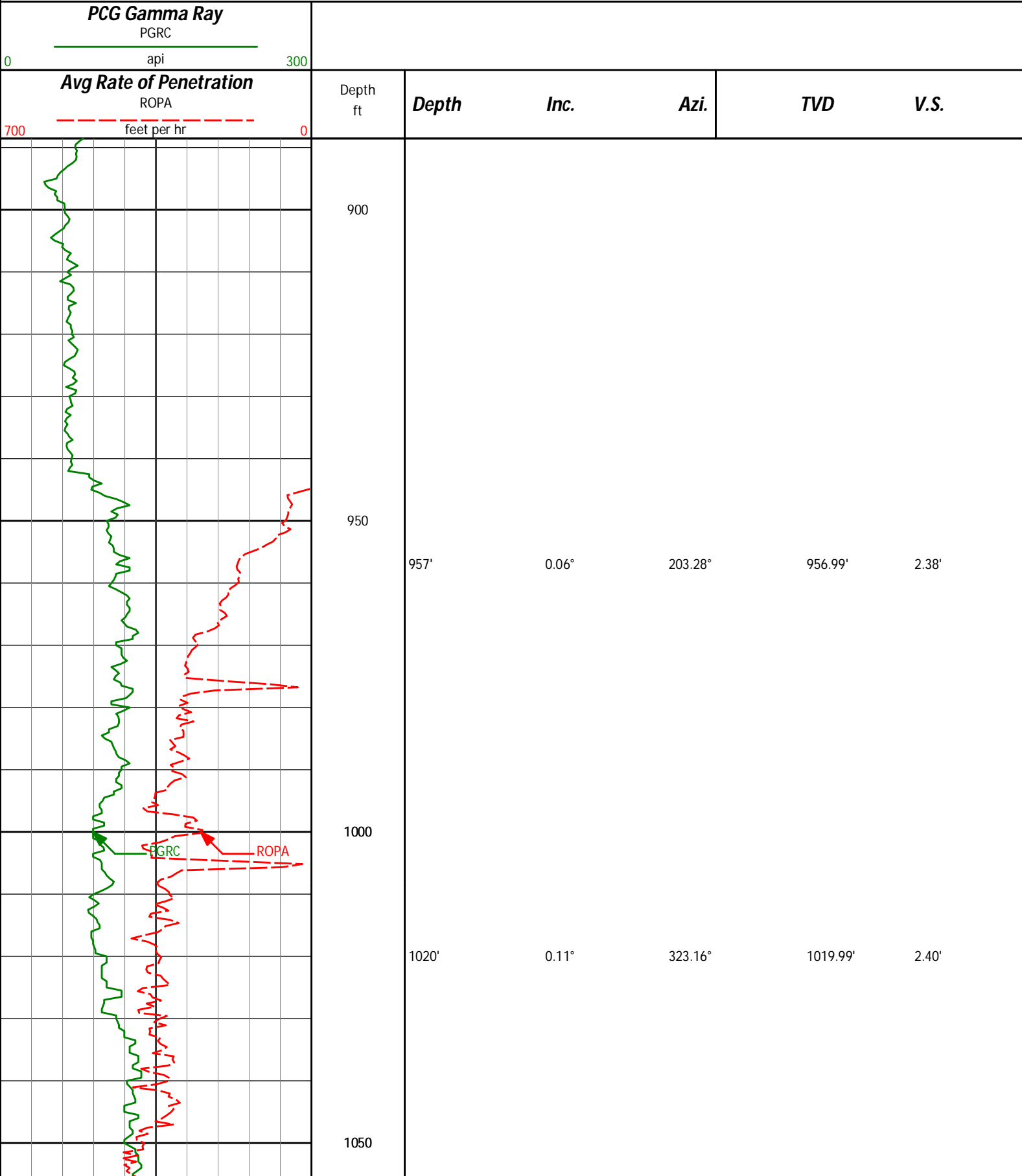
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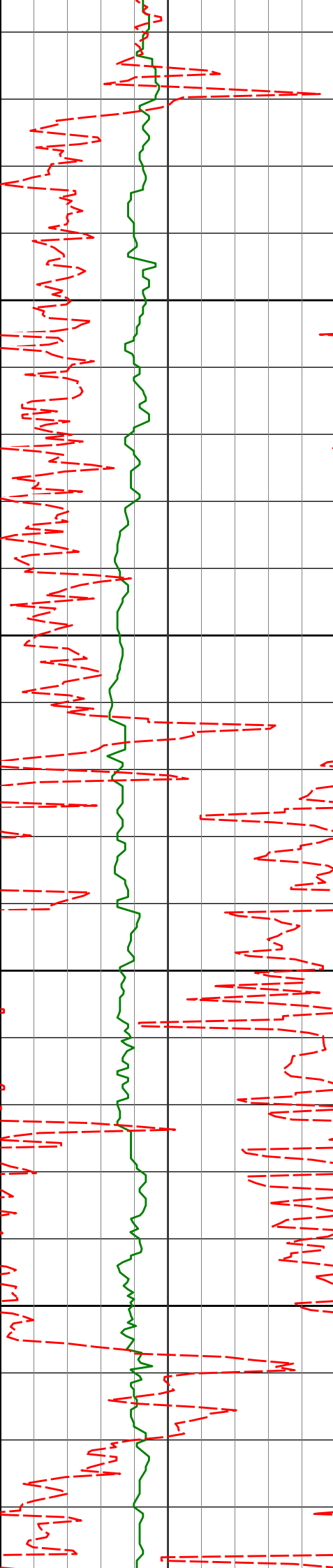
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Sperry Drilling Services

TVD Detail Log 1:240

Anadarko  
Underhill 28N-17HZ  
Xtreme 22  
05123369160000





1100

1150

1200

1250

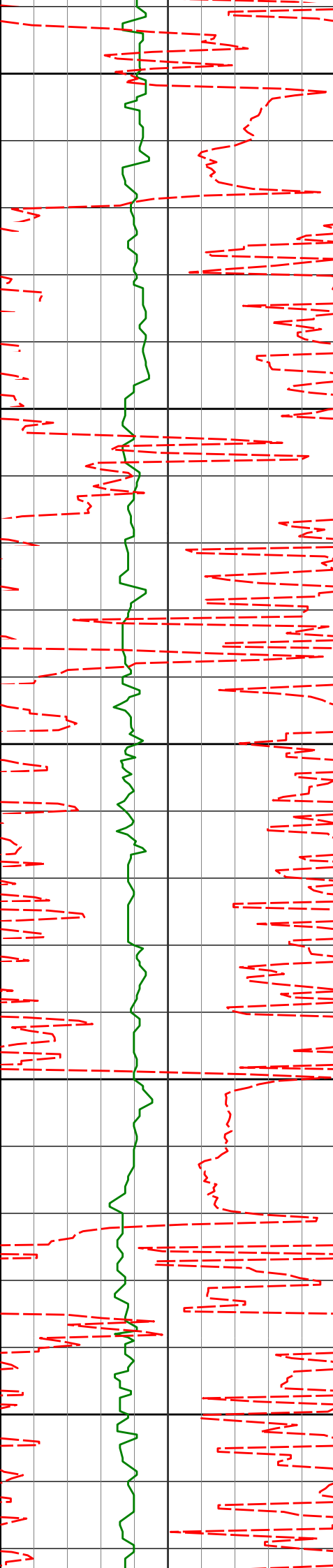
1211'

0.22°

314.93°

1210.99'

2.81'



1300

1305'

1.77°

255.53°

1304.97'

2.58'

1350

1400

1401'

3.02°

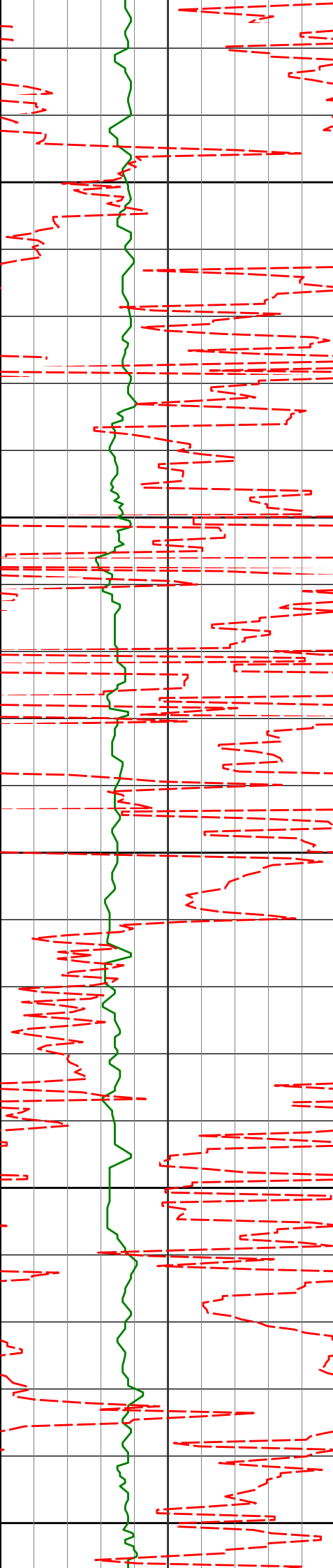
248.37°

1400.89'

1.29'

1450

1500



1550

1600

1650

1700

1750

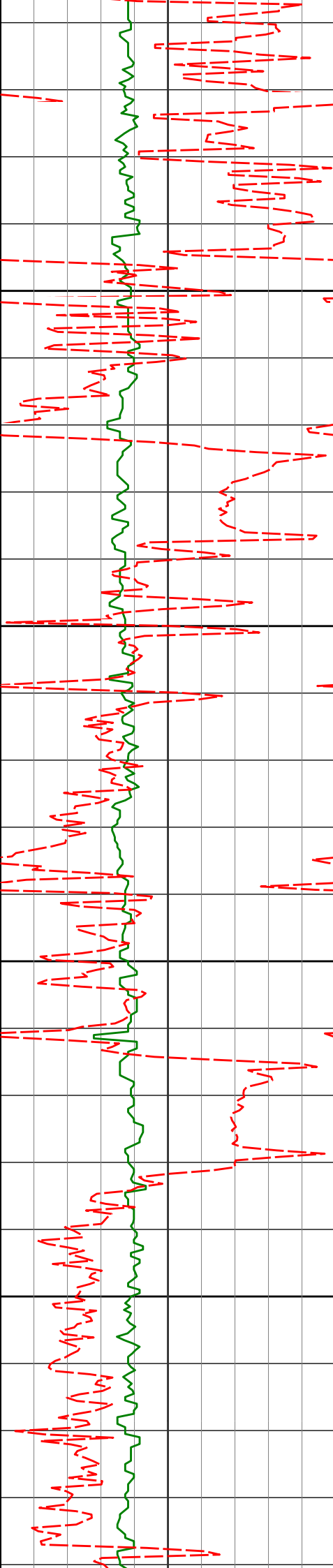
1591'

7.07°

240.64°

1590.11'

-6.25'



1800

1850

1900

1950

1778'

8.48°

237.72°

1775.39'

-19.18'

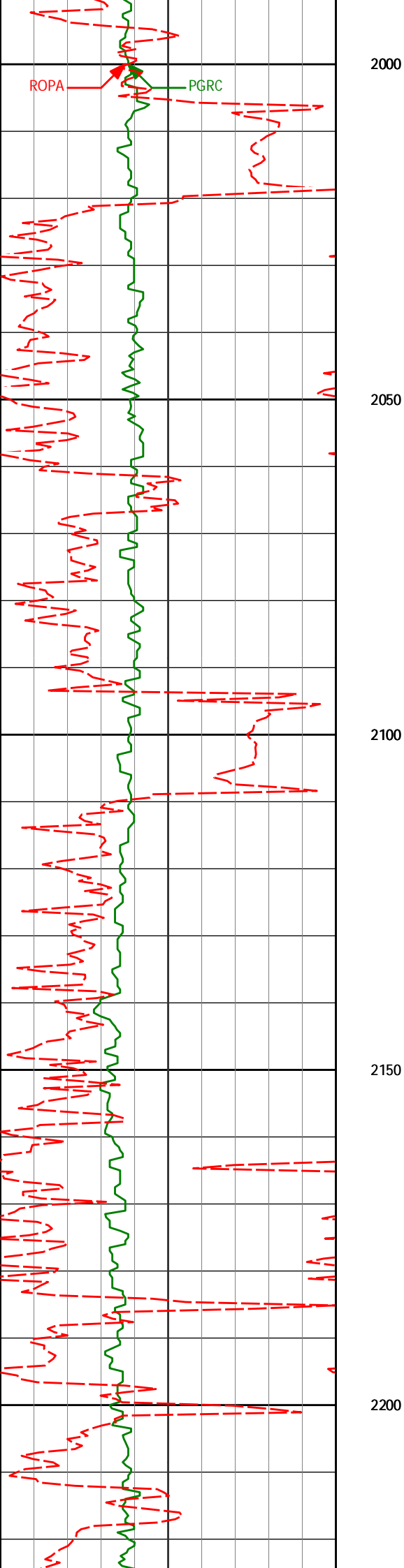
1961'

10.60°

221.03°

1955.88'

-39.02'



2145'

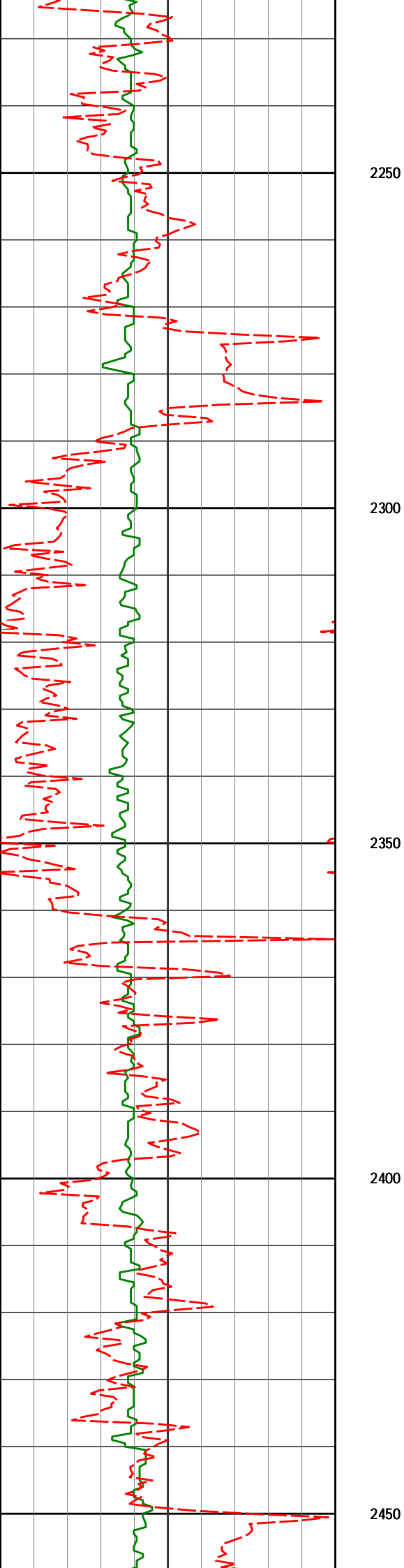
12.89°

224.98°

2136.02'

-66.23'





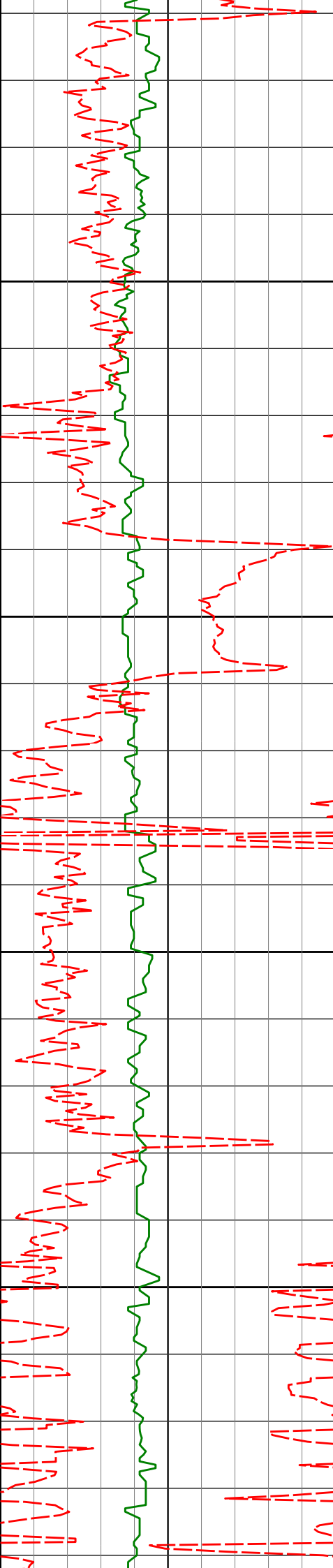
2327'

12.98°

224.00°

2313.40'

-95.20'



2510'	12.15°	223.10°	2492.01'	-123.96'
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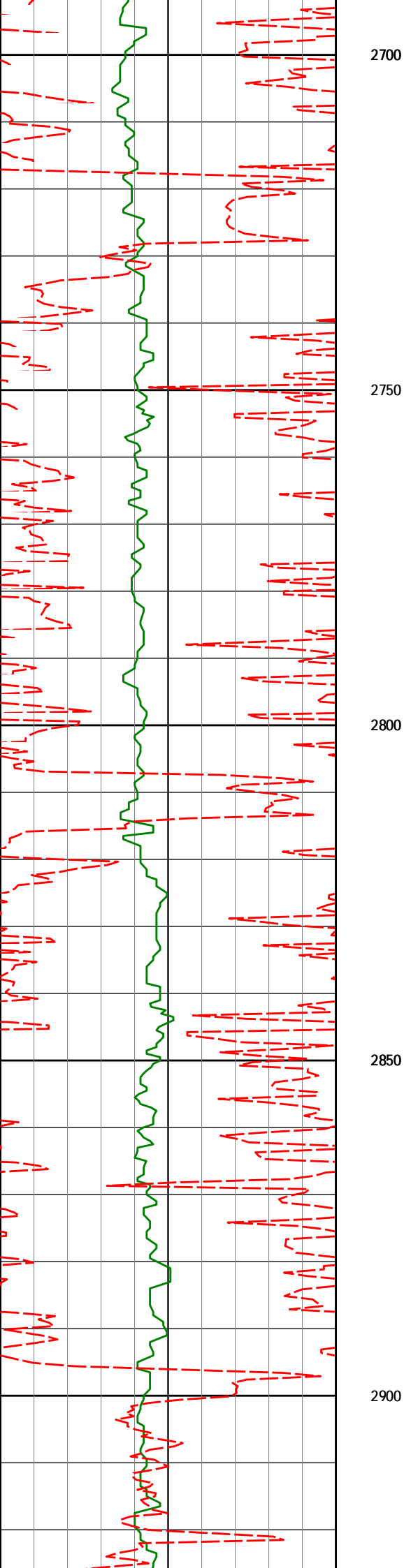
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2550

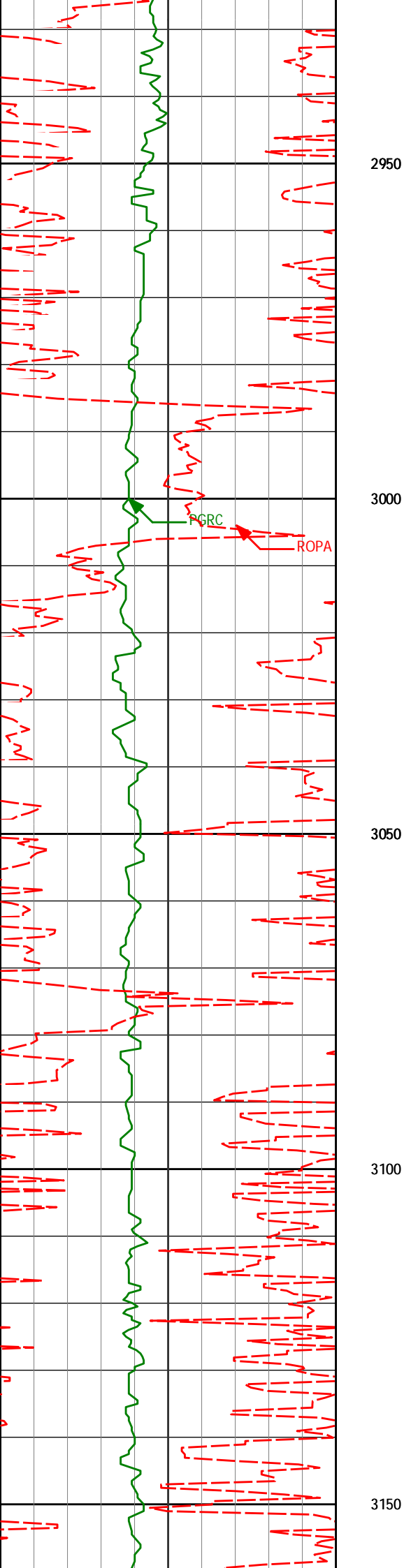
2600

2650

2694'	12.91°	230.42°	2671.64'	-151.10'
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2876'	11.08°	221.29°	2849.67'	-177.11'
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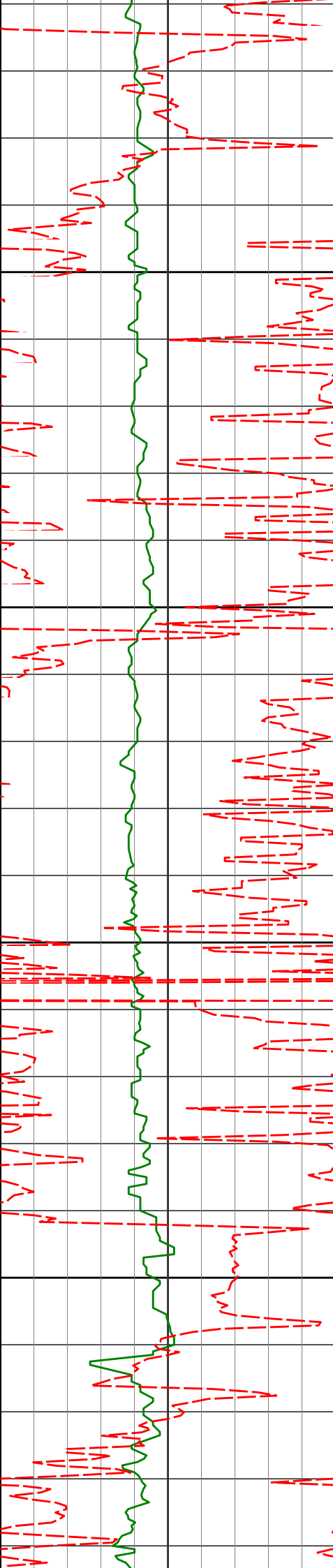
3059'

13.05°

232.16°

3028.65'

-202.90'



3200

3250

3300

3350

3242'

12.71°

232.15°

3207.04'

-227.83'

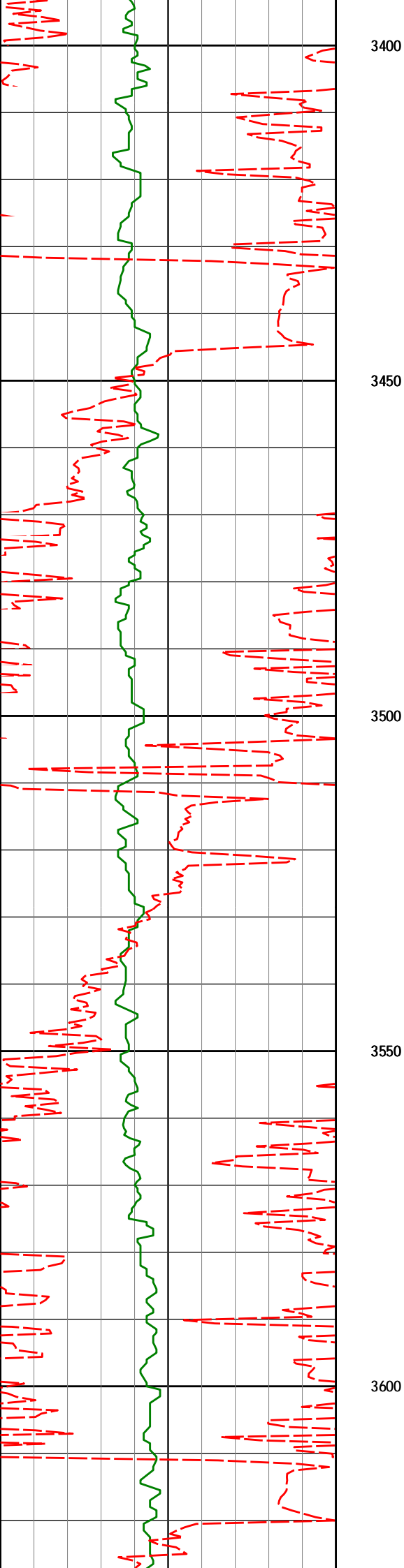
3425'

11.73°

228.15°

3385.90'

-252.49'



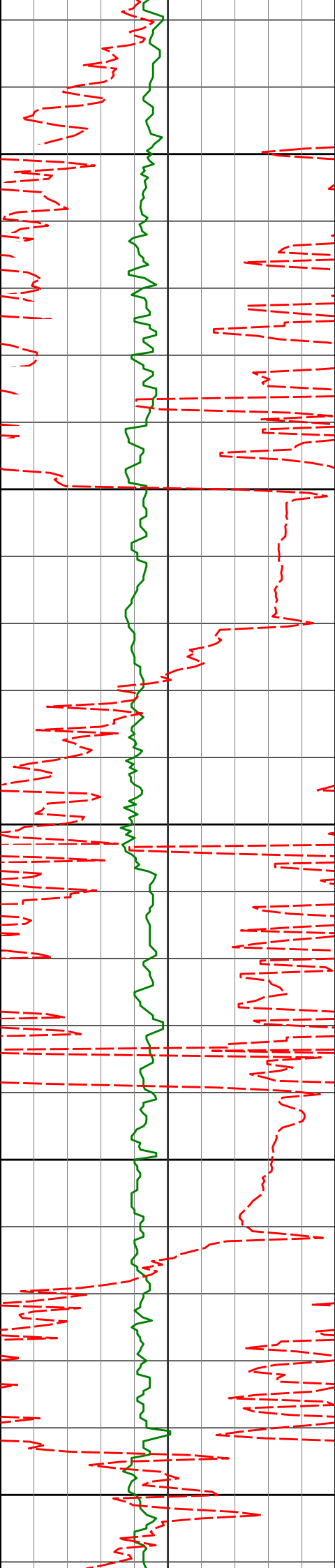
3609'

11.33°

228.83°

3566.18'

-276.77'



3650

3700

3750

3800

3850

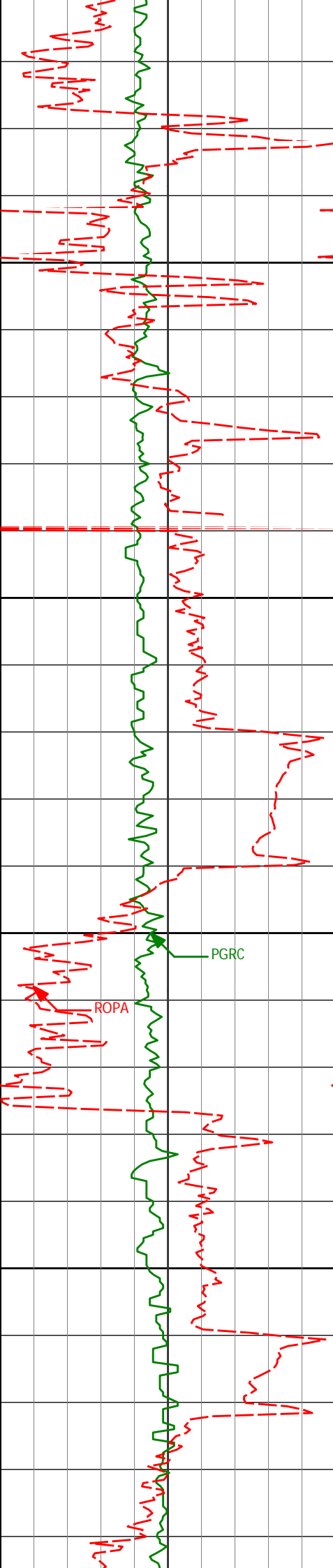
3792'

12.99°

226.20°

3745.07'

-302.75'



3900

3950

4000

4050

3975'

13.27°

221.66°

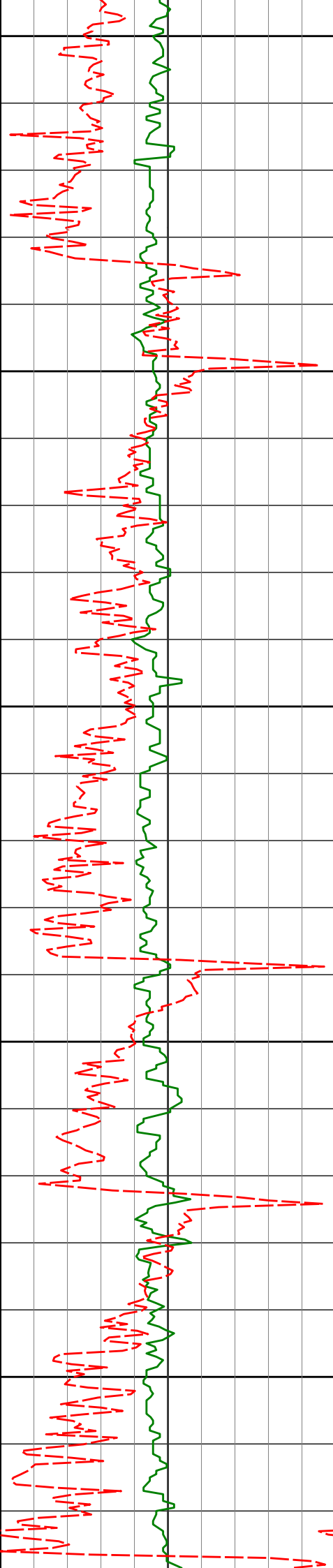
3923.29'

-332.58'

PGRC

ROPA





4100

4150

4200

4250

4300

4158'

14.60°

222.33°

4100.91'

-365.23'

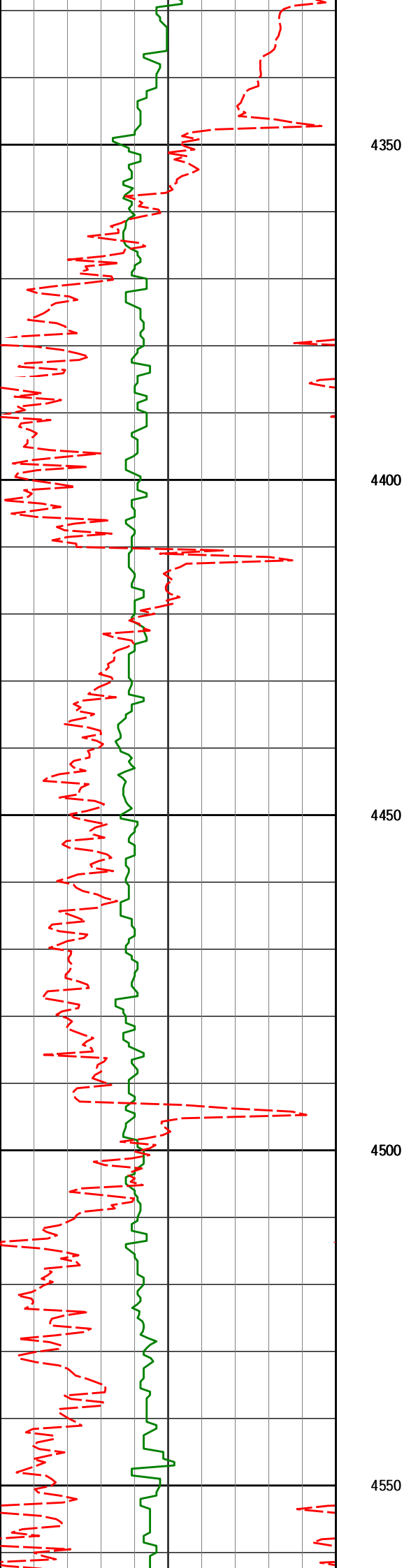
4341'

12.93°

221.36°

4278.65'

-397.54'



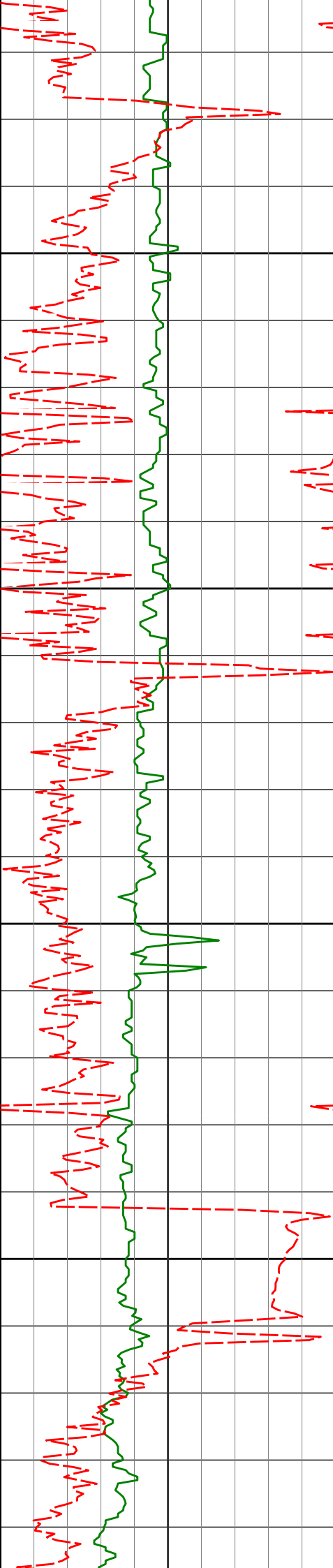
4513'

14.42°

223.73°

4445.77'

-427.37'



4600

4684'

12.94°

222.58°

4611.92'

-456.76'

4650

4700

4750

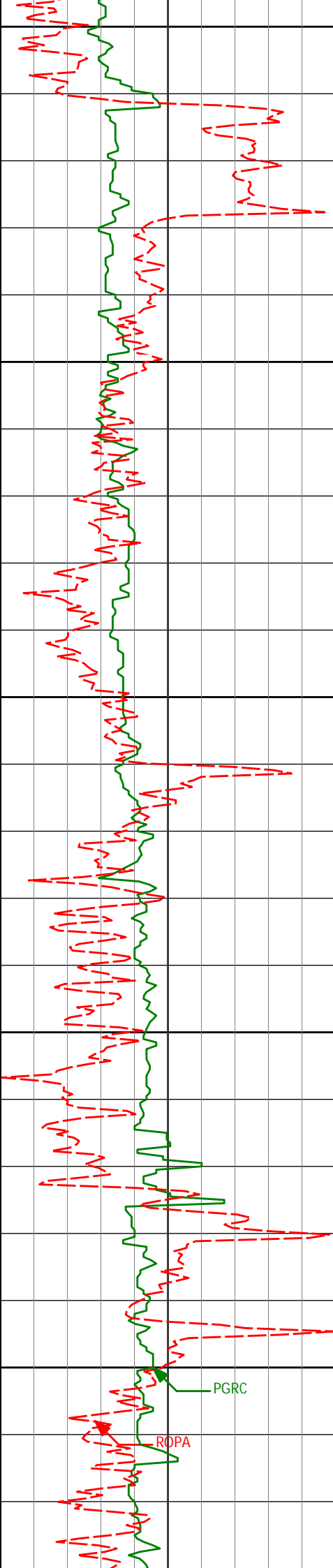
4855'

12.99°

220.02°

4778.56'

-485.49'



4800

4850

4900

4950

5000

5027'

13.17°

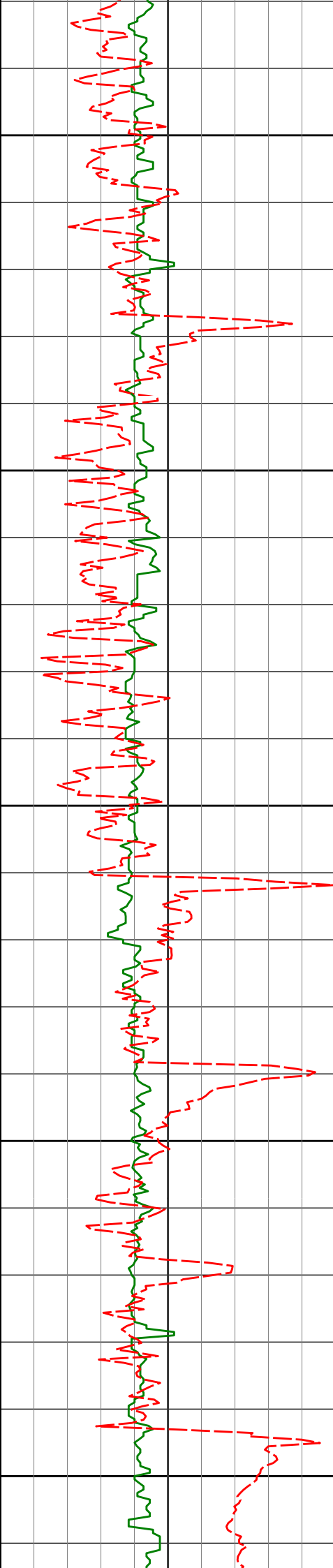
220.37°

4946.10'

-515.13'

PGRC

ROPA



5050

5100

5150

5200

5250

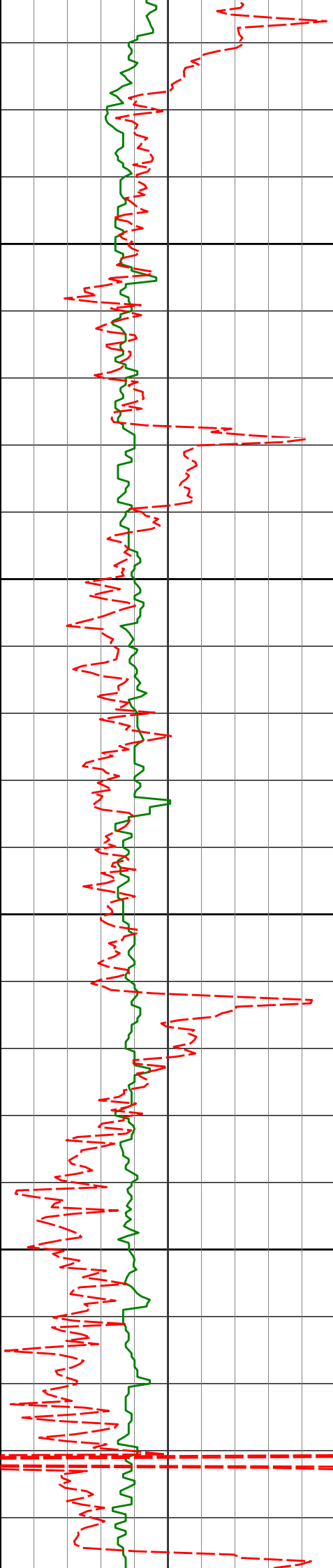
5198'

12.28°

219.19°

5112.90'

-543.98'



5300

5350

5400

5450

5370'

12.30°

221.15°

5280.96'

-571.88'

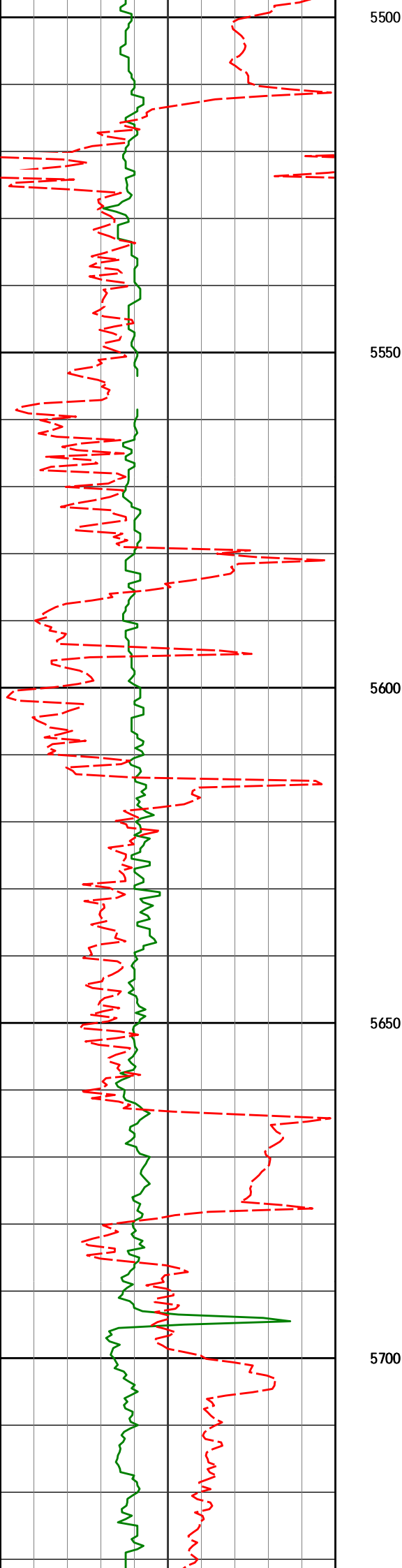
5541'

11.93°

217.80°

5448.15'

-599.47'



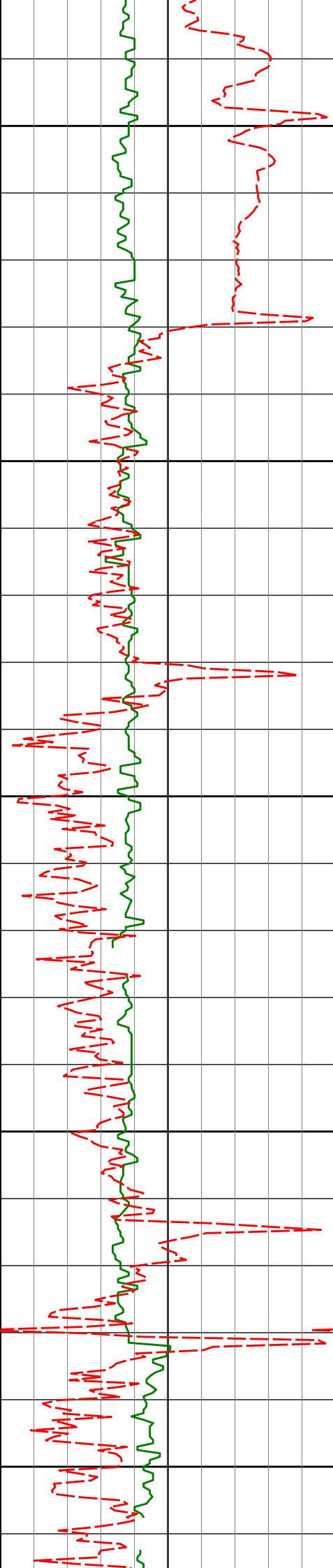
5712'

12.67°

217.38°

5615.23'

-628.26'



5750

5800

5850

5900

5950

5969'

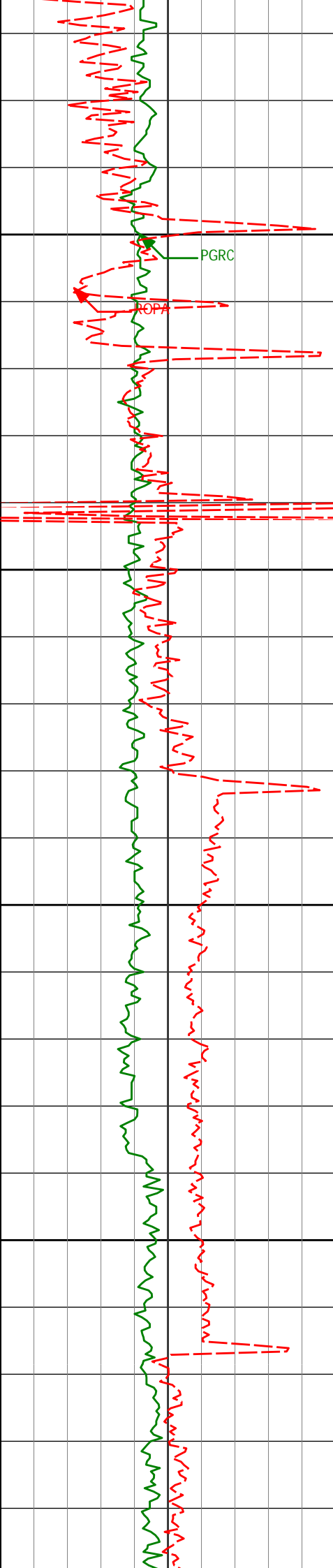
14.30°

232.18°

5865.21'

-669.98'





6000

PGRC

POPA

6050

6100

6150

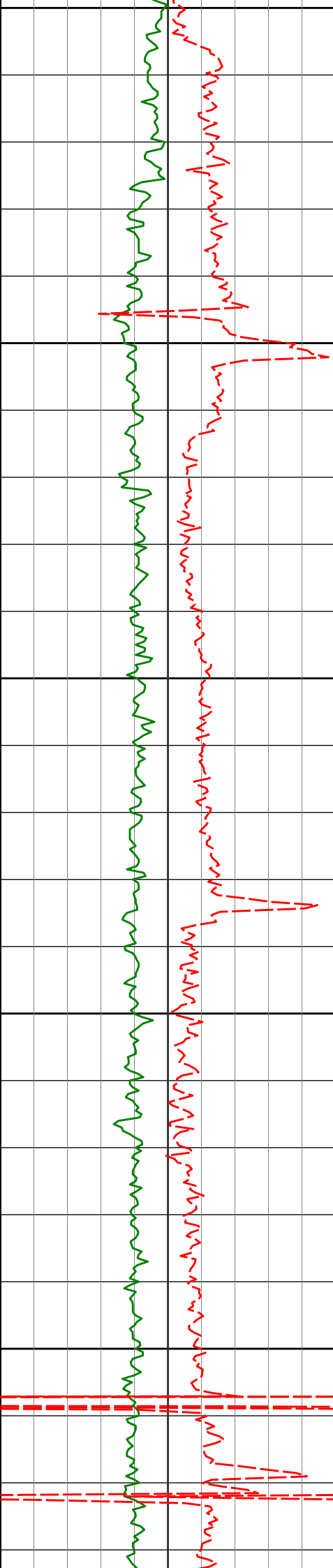
6141'

12.09°

230.12°

6032.66'

-694.45'



6200

6250

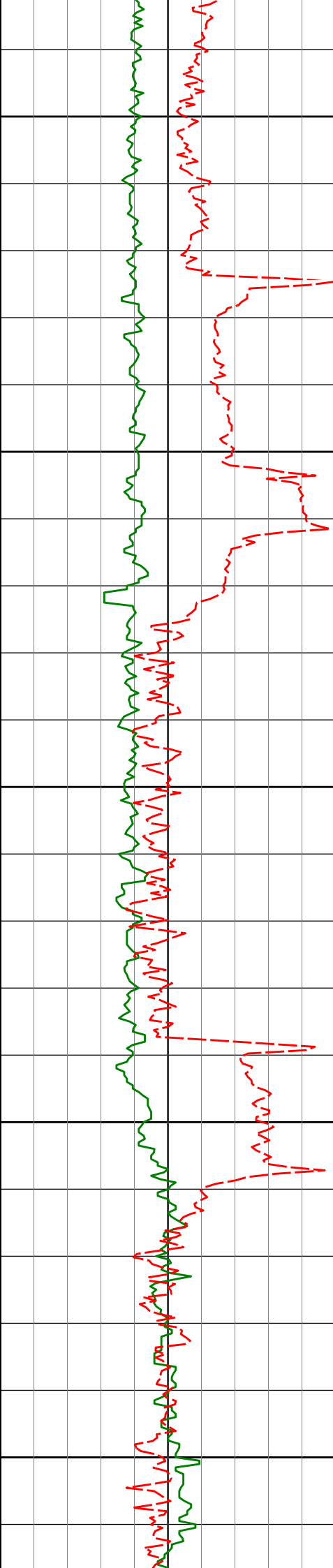
6300

6350

6400

6312' 9.81° 229.14° 6200.54' -715.38'

6483' 8.48° 229.24° 6369.37' -733.07'



6450

6500

6550

6600

6650

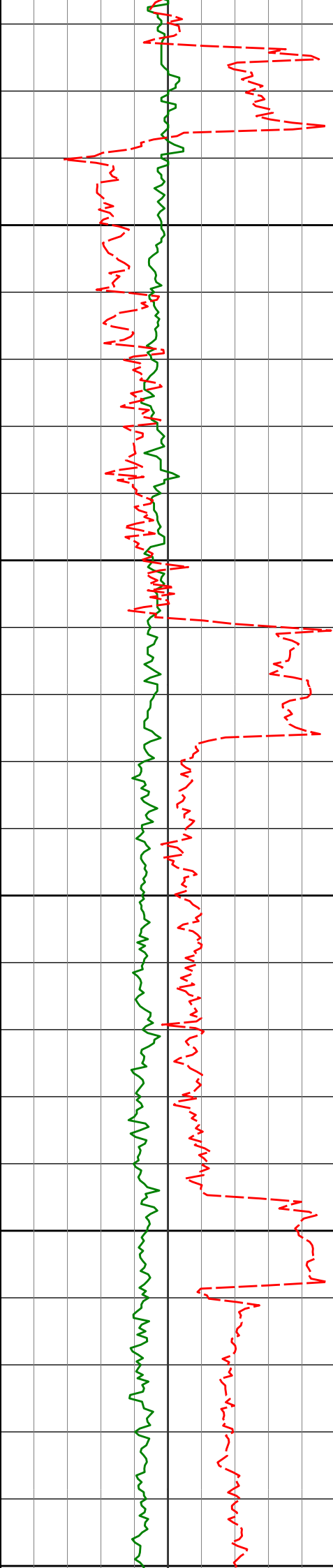
6655'

6.20°

230.65°

6539.94'

-747.19'



6700

6750

6800

6850

6900

6826'

3.69°

209.66°

6710.31'

-757.79'

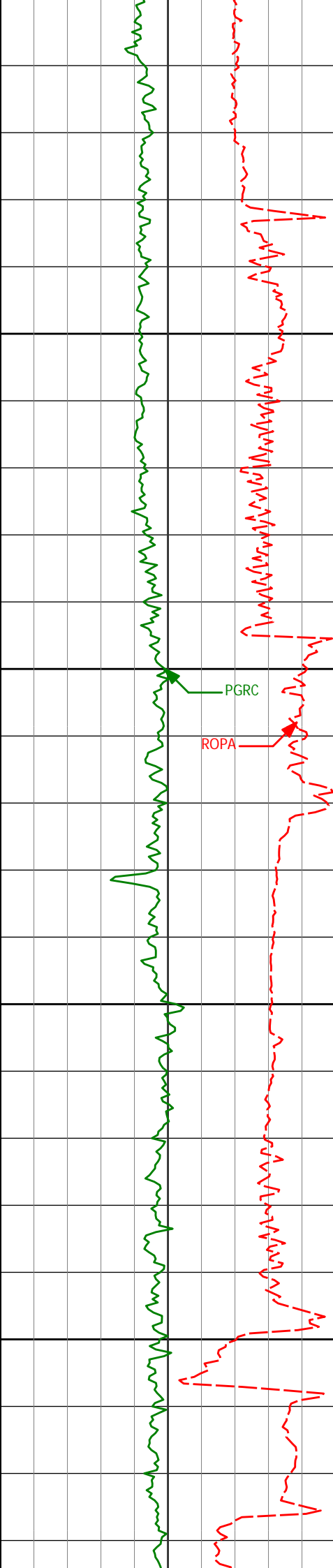
6997'

2.39°

229.96°

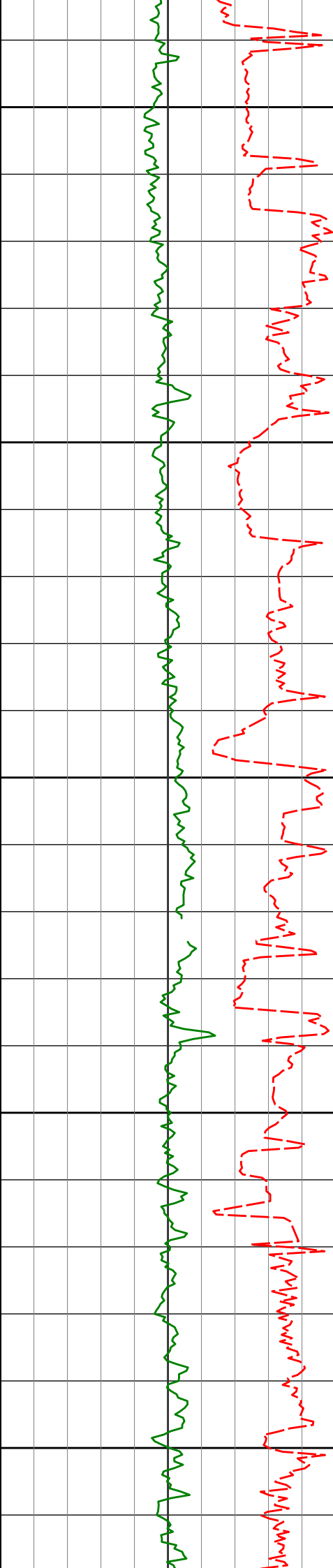
6881.07'

-764.84'



6900  
6950  
7000  
7050  
7100

7040'	3.36°	229.93°	6924.01'	-766.23'
7083'	3.94°	318.93°	6966.95'	-765.92'
7126'	8.41°	335.23°	7009.70'	-761.94'
7169'	16.34°	346.38°	7051.67'	-753.18'
7212'	25.05°	353.06°	7091.86'	-738.23'
7254'	26.00°	355.88°	7129.76'	-720.21'



7150

7297'

26.59°

355.44°

7168.31'

-701.21'

7200

7340'

28.83°

357.45°

7206.38'

-681.25'

7250

7383'

31.56°

2.10°

7243.55'

-659.64'

7300

7426'

35.24°

3.33°

7279.44'

-636.01'

7469'

36.71°

4.96°

7314.23'

-610.82'

7350

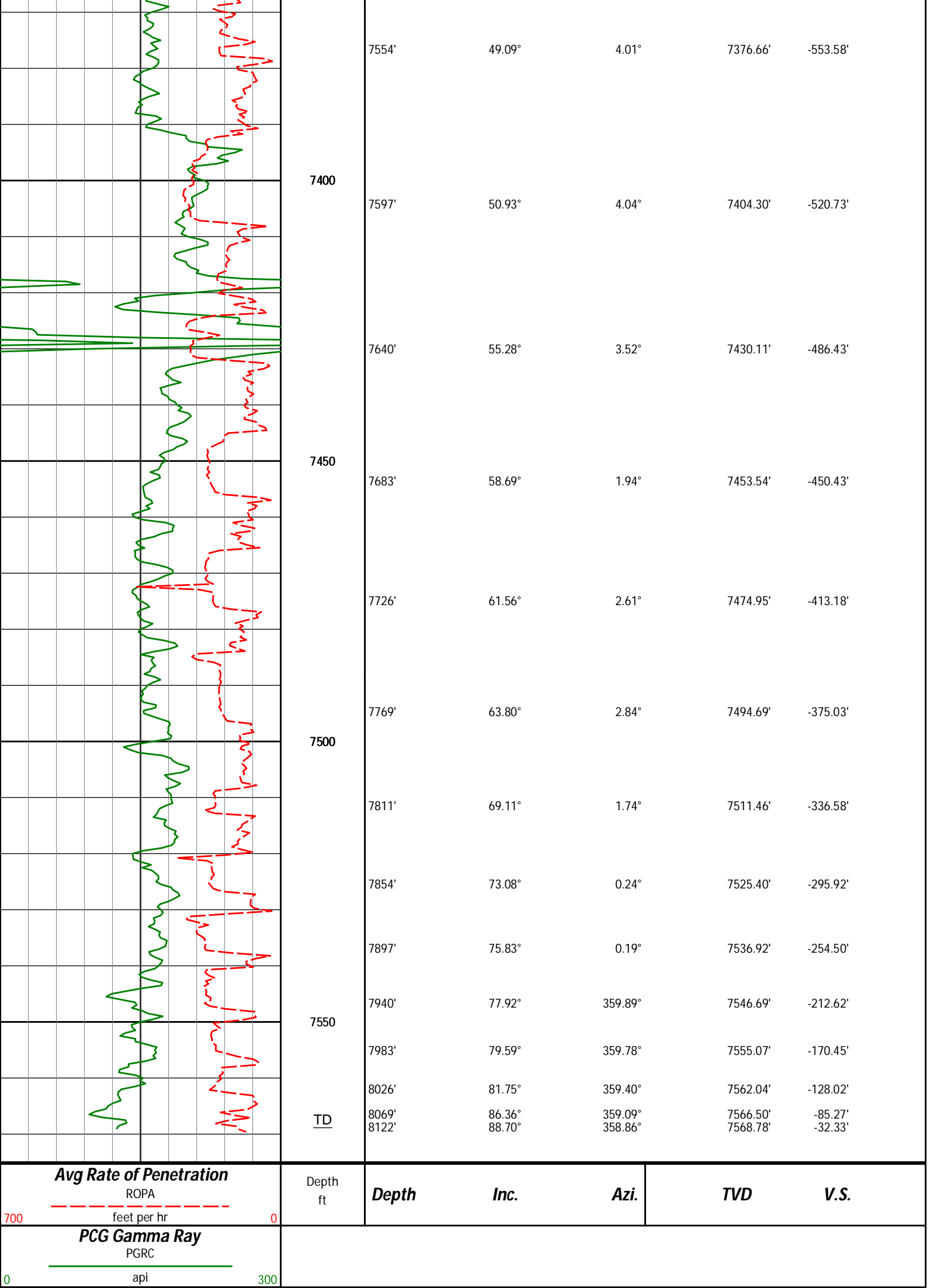
7511'

42.27°

4.85°

7346.63'

-584.22'





# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corporation  
Underhill 28N-17HZ  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900550718

<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
795.00	0.45	307.68	794.99	2.06 N	2.74 W	2.07	TIE-IN
957.00	0.06	203.28	956.99	2.37 N	3.28 W	2.38	0.29
1020.00	0.11	323.16	1019.99	2.39 N	3.33 W	2.40	0.24
1211.00	0.22	314.93	1210.99	2.80 N	3.70 W	2.81	0.06
1305.00	1.77	255.53	1304.97	2.56 N	5.24 W	2.58	1.77
1401.00	3.02	248.37	1400.89	1.26 N	9.03 W	1.29	1.34
1591.00	7.07	240.64	1590.11	6.33 S	23.88 W	-6.25	2.15
1778.00	8.48	237.72	1775.39	19.34 S	45.57 W	-19.18	0.79
1961.00	10.60	221.03	1955.88	39.25 S	68.04 W	-39.02	1.89
2145.00	12.89	224.98	2136.02	66.54 S	93.67 W	-66.23	1.32
2327.00	12.98	224.00	2313.40	95.61 S	122.22 W	-95.20	0.13
2510.00	12.15	223.10	2492.01	124.46 S	149.66 W	-123.96	0.47
2694.00	12.91	230.42	2671.64	151.69 S	178.74 W	-151.10	0.96
2876.00	11.08	221.29	2849.67	177.79 S	205.95 W	-177.11	1.45
3059.00	13.05	232.16	3028.65	203.68 S	233.88 W	-202.90	1.64
3242.00	12.71	232.15	3207.04	228.71 S	266.10 W	-227.83	0.19
3425.00	11.73	228.15	3385.90	253.47 S	295.85 W	-252.49	0.71
3609.00	11.33	228.83	3566.18	277.85 S	323.38 W	-276.77	0.23
3792.00	12.99	226.20	3745.07	303.92 S	351.76 W	-302.75	0.95
3975.00	13.27	221.66	3923.29	333.85 S	380.57 W	-332.58	0.58
4158.00	14.60	222.33	4100.91	366.59 S	410.06 W	-365.23	0.73
4341.00	12.93	221.36	4278.65	399.00 S	439.11 W	-397.54	0.92
4513.00	14.42	223.73	4445.77	428.92 S	466.62 W	-427.37	0.92
4684.00	12.94	222.58	4611.92	458.40 S	494.30 W	-456.76	0.88
4855.00	12.99	220.02	4778.56	487.22 S	519.61 W	-485.49	0.34
5027.00	13.17	220.37	4946.10	516.94 S	544.72 W	-515.13	0.11
5198.00	12.28	219.19	5112.90	545.87 S	568.83 W	-543.98	0.54
5370.00	12.30	221.15	5280.96	573.84 S	592.44 W	-571.88	0.24
5541.00	11.93	217.80	5448.15	601.52 S	615.26 W	-599.47	0.46
5712.00	12.67	217.38	5615.23	630.38 S	637.47 W	-628.26	0.43
5969.00	14.30	232.18	5865.21	672.24 S	679.66 W	-669.98	1.48
6141.00	12.09	230.12	6032.66	696.81 S	710.26 W	-694.45	1.31
6312.00	9.81	229.14	6200.54	717.82 S	735.01 W	-715.38	1.34
6483.00	8.48	229.24	6369.37	735.58 S	755.58 W	-733.07	0.78
6655.00	6.20	230.65	6539.94	749.75 S	772.37 W	-747.19	1.33
6826.00	3.69	209.66	6710.31	760.39 S	782.23 W	-757.79	1.79
6997.00	2.39	229.96	6881.07	767.46 S	787.69 W	-764.84	0.97
7040.00	3.36	229.93	6924.01	768.85 S	789.34 W	-766.23	2.25
7083.00	3.94	318.93	6966.95	768.55 S	791.27 W	-765.92	11.93
7126.00	8.41	335.23	7009.70	764.58 S	793.56 W	-761.94	11.07
7169.00	16.34	346.38	7051.67	755.83 S	796.31 W	-753.18	19.19
7212.00	25.05	353.06	7091.86	740.88 S	798.84 W	-738.23	20.95
7254.00	26.00	355.88	7129.76	722.87 S	800.57 W	-720.21	3.67
7297.00	26.59	355.44	7168.31	703.87 S	802.02 W	-701.21	1.45
7340.00	28.83	357.45	7206.38	683.92 S	803.24 W	-681.25	5.64
7383.00	31.56	2.10	7243.55	662.31 S	803.29 W	-659.64	8.34
7426.00	35.24	3.33	7279.44	638.67 S	802.16 W	-636.01	8.72
7469.00	36.71	4.96	7314.23	613.48 S	800.33 W	-610.82	4.08
7511.00	42.27	4.85	7346.63	586.88 S	798.05 W	-584.22	13.22
7554.00	49.09	4.01	7376.66	556.22 S	795.69 W	-553.58	15.92
7597.00	50.93	4.04	7404.30	523.36 S	793.38 W	-520.73	4.28
7640.00	55.28	3.52	7430.11	489.06 S	791.12 W	-486.43	10.16
7683.00	58.69	1.94	7453.54	453.05 S	789.41 W	-450.43	8.52
7726.00	61.56	2.61	7474.95	415.80 S	787.93 W	-413.18	6.80
7769.00	63.80	2.84	7494.69	377.64 S	786.11 W	-375.03	5.23
7811.00	69.11	1.74	7511.46	339.18 S	784.58 W	-336.58	12.88
7854.00	73.08	0.24	7525.40	298.52 S	783.88 W	-295.92	9.80
7897.00	75.83	0.19	7536.92	257.10 S	783.72 W	-254.50	6.40
7940.00	77.92	359.89	7546.69	215.22 S	783.70 W	-212.62	4.91
7983.00	79.59	359.78	7555.07	173.05 S	783.82 W	-170.45	3.90



8026.00	81.75	359.40	7562.04	130.62 S	784.13 W	-128.02	5.09
8069.00	86.36	359.09	7566.50	87.87 S	784.69 W	-85.27	10.76
8122.00	88.70	358.86	7568.78	34.93 S	785.63 W	-32.33	4.44

**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 359.81 DEGREES (TRUE)  
A TOTAL CORRECTION OF 8.66 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.**

**HORIZONTAL DISPLACEMENT(CLOSURE) AT 8122.00 FEET  
IS 786.41 FEET ALONG 267.45 DEGREES (TRUE)**

**Directional Surveys Tied on to Gyro's @ 795' MD**

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