

## PCG Pressure Case Gamma

**1:600 / 1:240**

[illegible]

## WELL INFORMATION

MWD Run Number	100				
Date run completed	17-Dec-14				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (MD, ft)	1,211.00				
Log End Depth (MD, ft)	6,036.00				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	15-Dec-14 18:30				
Drill/Wipe End Date and Time	16-Dec-14 21:00				
Min Inc (deg) @ Depth (MD, ft)	0.46 @ 1,289.00				
Max Inc (deg) @ Depth (MD, ft)	85.77 @ 5,978.00				
Bit TFA(in2) / Bit Type	1.21 / PDC				
Flow Rate (gpm)	578.03				
Max AV (fpm) / CV (fpm) @ MWD	424.6 / 400.0				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	9.05 / 41.00				
Filtrate CL (ppm)	2,100.00				
pH / Fluid Loss (mptm)	10.10 / 7				
PV (cP) / YP (lbf2)	12 / 11.00				
% Solids / % Sand	5.7 / 0.25				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				
Max Tool Temp (degF) @ Depth (MD, ft)	450.45 / 6000				

Max Tool Temp (degF) / Source	158.47 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Kyle Wass				
Customer Representative	Seth Mulherin				

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11341350				
Insert Serial Number	11619985				
Date and Time Initialized	15-Dec-14 03:02				
Date and Time Read	17-Dec-14 03:28				
ECMB SW Version	N/A				

### Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	58.00				
Software Version	6.21				
Sub Serial Number	11341350				
Sonde Serial Number	11478016				
Sensor ID Number	N/A				
Toolface Offset (deg)	192.30				

### Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	51.09				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11341350				
Insert/Sonde Serial Number	12037419				

## REMARKS

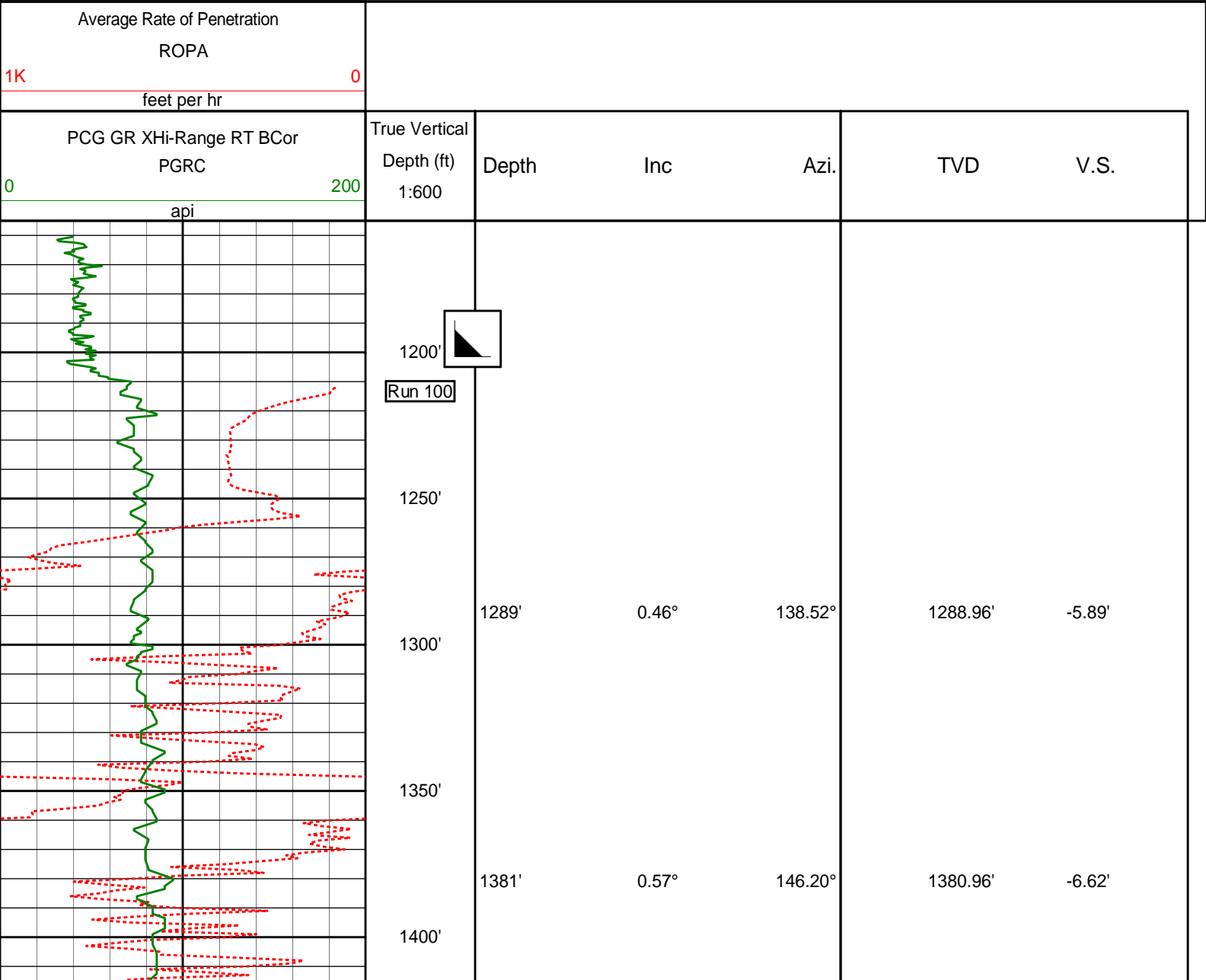
1. All depths are true vertical depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annual velocities are calculated using the "Power Law" model for water 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 8.0.2

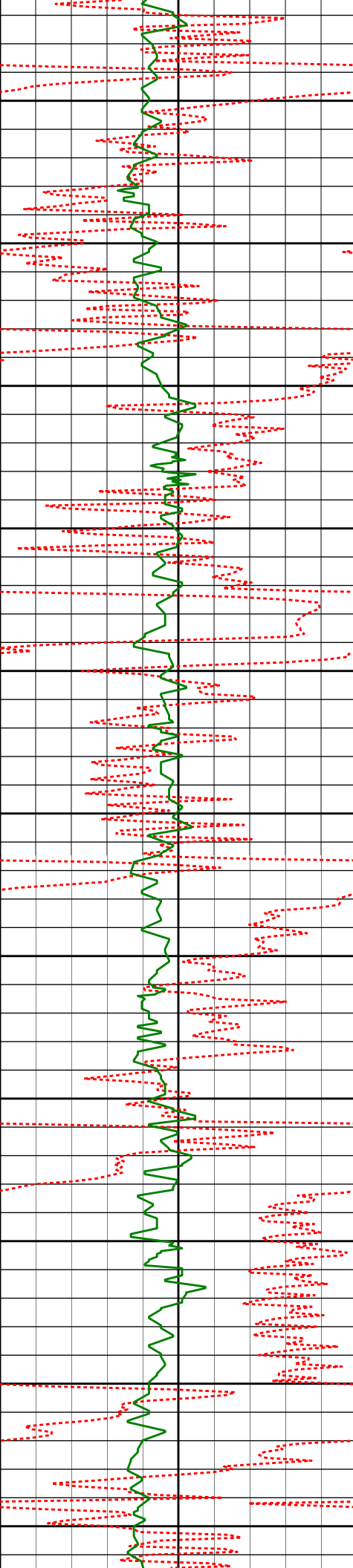
WARRANTY

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TVD Main Log 1:600





1450'

1474'

0.62°

148.70°

1473.96'

-7.50'

1500'

1550'

1567'

0.54°

162.79°

1566.95'

-8.39'

1600'

1650'

1660'

1.26°

244.45°

1659.94'

-9.12'

1700'

1750'

1752'

1.44°

244.42°

1751.92'

-9.77'

1800'

1850'

1844'

1.53°

248.17°

1843.89'

-10.40'

1900'

1950'

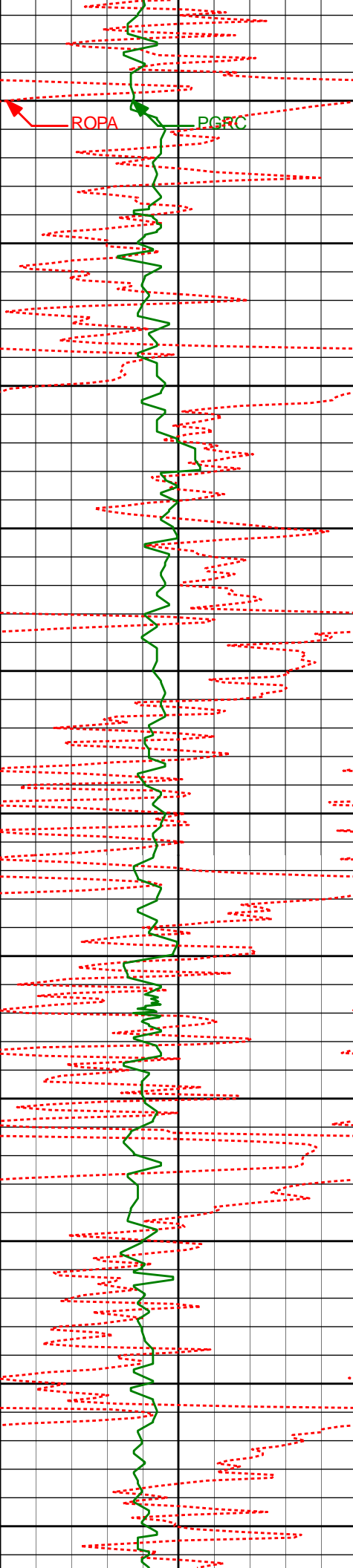
1937'

1.54°

247.05°

1936.85'

-11.00'



2000'

2029'

1.65°

247.36°

2028.82'

-11.64'

2050'

2100'

2122'

1.53°

248.31°

2121.78'

-12.26'

2150'

2200'

2215'

1.53°

249.12°

2214.75'

-12.81'

2250'

2300'

2307'

1.32°

245.36°

2306.72'

-13.38'

2350'

2400'

2402'

0.52°

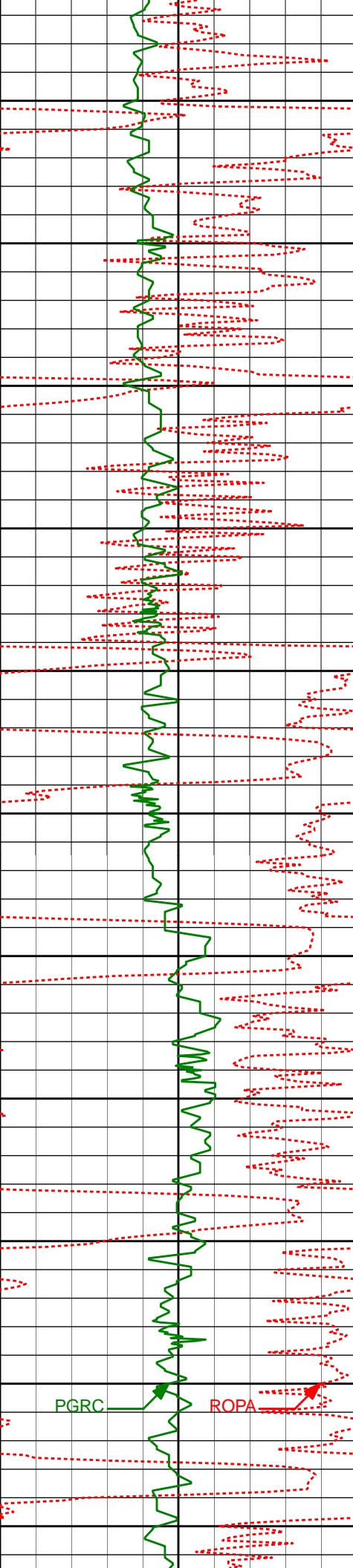
301.98°

2401.71'

-13.40'

2450'

2500'



2550'

2600'

2650'

2700'

2750'

2800'

2850'

2900'

2950'

3000'

3050'

2592'

0.80°

296.35°

2591.69'

-12.08'

2687'

0.90°

293.25°

2686.68'

-11.31'

2782'

1.82°

275.90°

2781.66'

-10.55'

2877'

3.85°

273.37°

2876.53'

-9.53'

2972'

4.63°

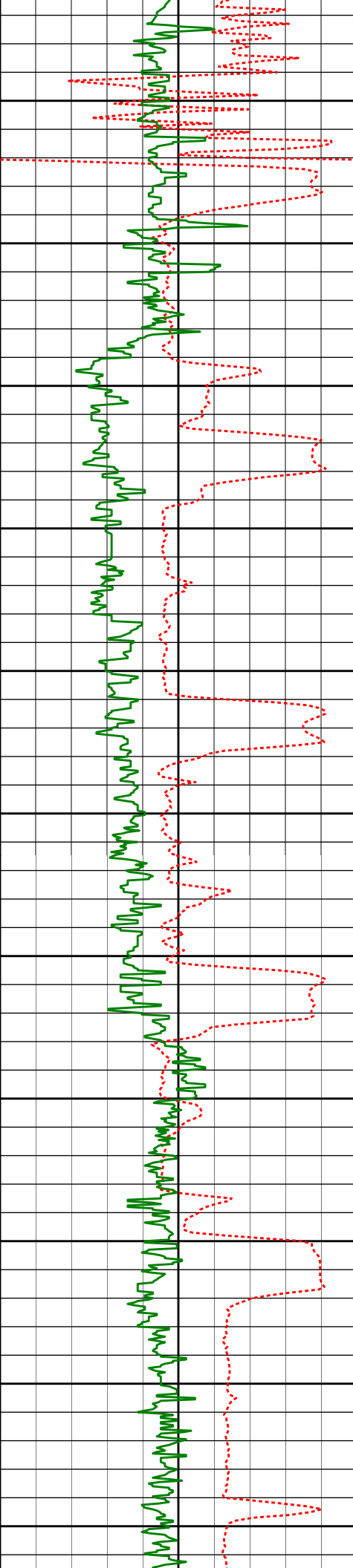
270.46°

2971.27'

-8.29'

PGRC

ROPA



3100'

3150'

3200'

3250'

3300'

3350'

3400'

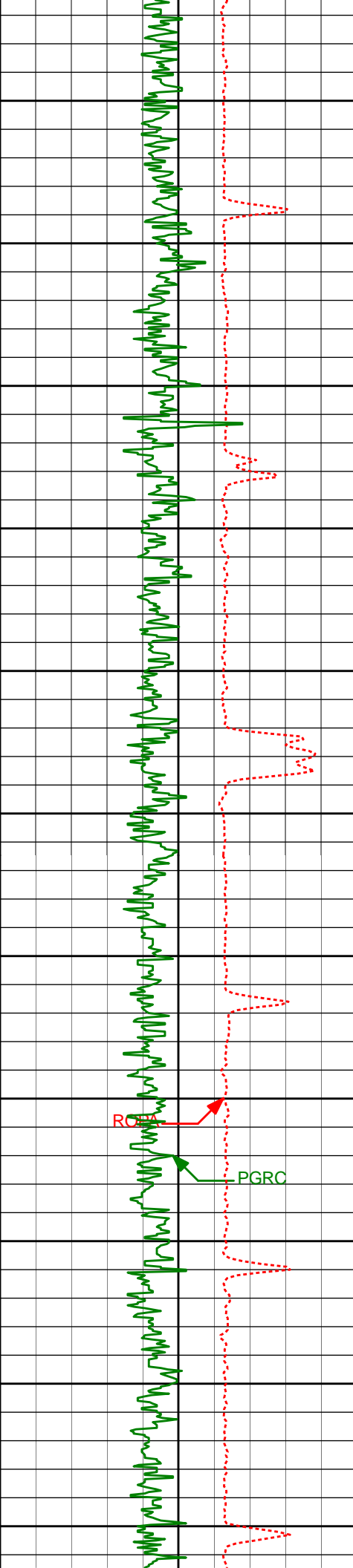
3450'

3500'

3550'

3600'

3067'	5.76°	265.63°	3065.88'	-7.37'
3162'	6.48°	262.63°	3160.34'	-6.95'
3257'	7.35°	258.57°	3254.65'	-7.18'
3353'	9.10°	252.71°	3349.66'	-8.69'
3448'	10.85°	245.24°	3443.22'	-12.38'
3543'	11.75°	246.12°	3536.38'	-17.49'



3650'

3700'

3750'

3800'

3850'

3900'

3950'

4000'

4050'

4100'

4150'

3638'

12.14°

247.61°

3629.32'

-22.50'

3733'

11.95°

247.48°

3722.23'

-27.33'

3828'

12.36°

246.70°

3815.10'

-32.35'

3923'

11.85°

243.24°

3907.99'

-38.05'

4018'

12.08°

242.70°

4000.93'

-44.36'

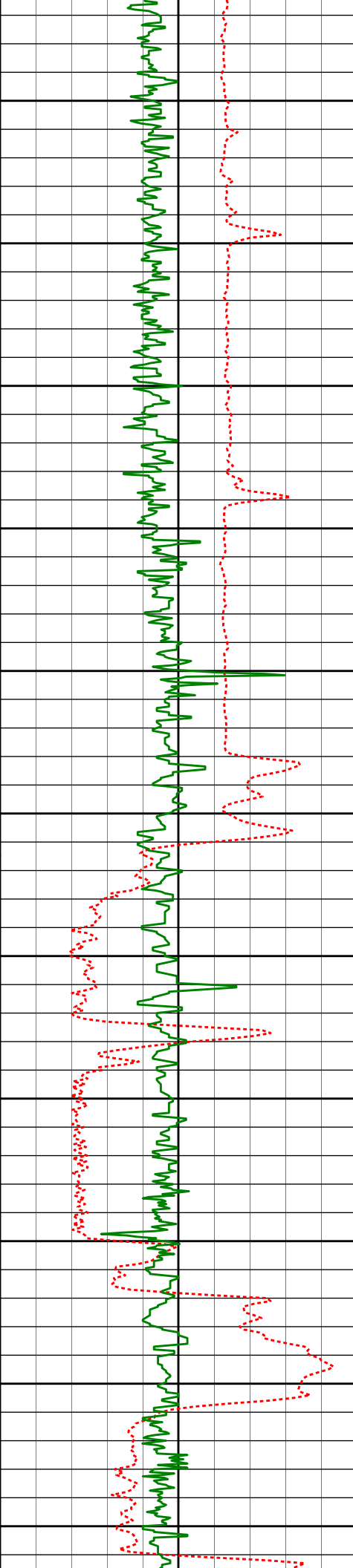
4113'

11.84°

243.19°

4093.87'

-50.67'



4200'

4250'

4300'

4350'

4400'

4450'

4500'

4550'

4600'

4650'

4700'

4208'

11.52°

240.36°

4186.90'

-57.20'

4303'

11.51°

238.15°

4279.99'

-64.42'

4399'

10.81°

237.12°

4374.17'

-71.97'

4494'

12.16°

244.37°

4467.27'

-78.64'

4589'

10.19°

244.16°

4560.47'

-84.14'

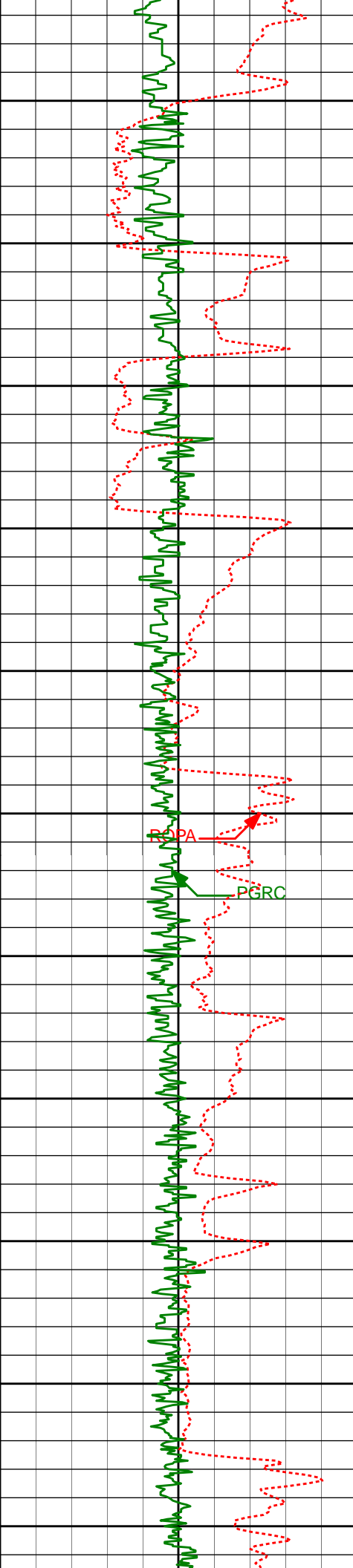
4684'

10.06°

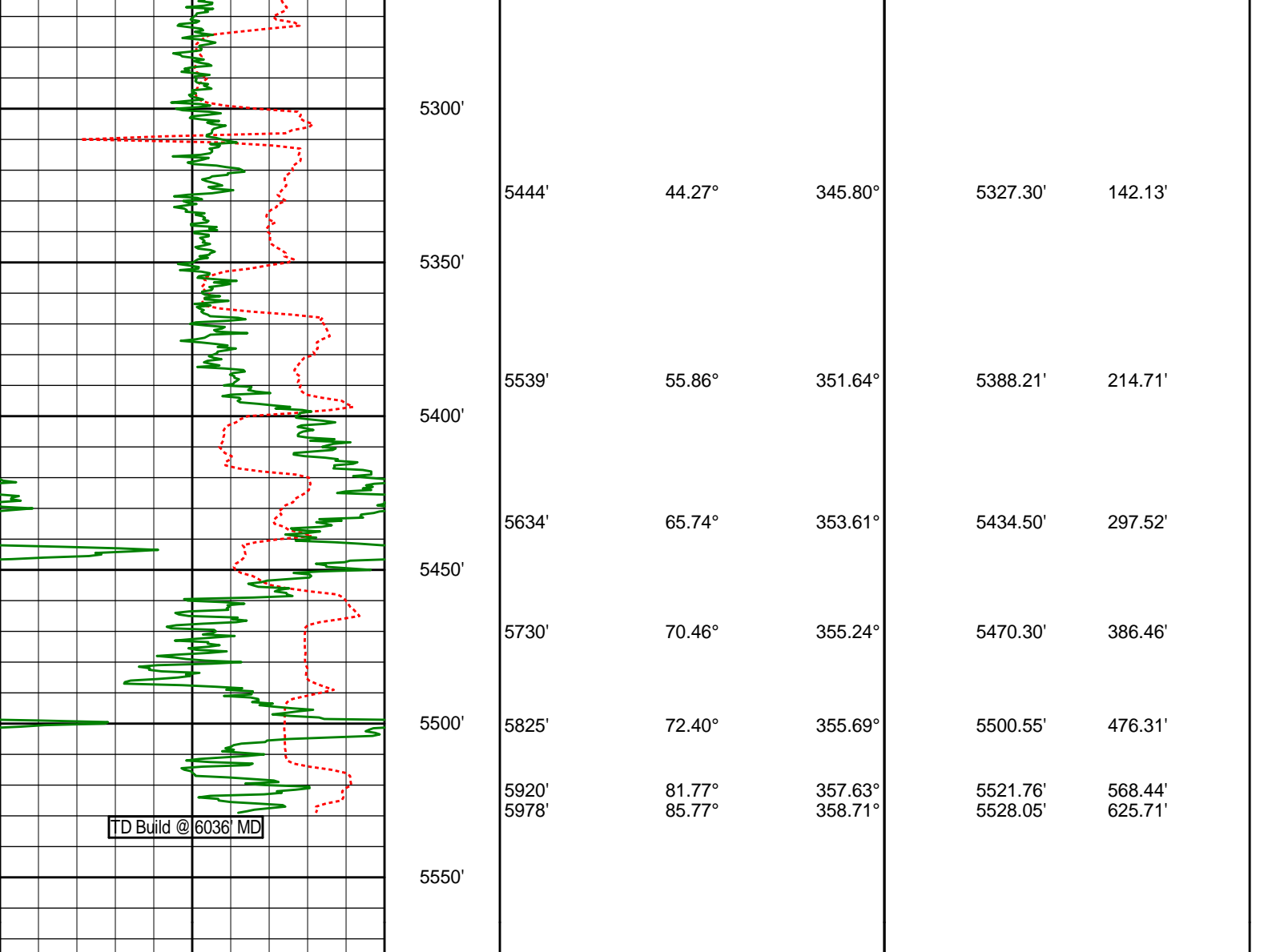
241.95°

4653.99'

-89.46'



4750'	4779'	13.17°	249.70°	4747.04'	-94.49'
4800'					
4850'	4874'	13.81°	260.02°	4839.43'	-97.05'
4900'					
4950'					
5000'	4969'	15.11°	283.70°	4931.50'	-92.72'
5050'	5064'	27.87°	306.06°	5019.85'	-72.41'
5100'	5159'	34.55°	339.37°	5101.65'	-30.18'
5150'					
5200'	5254'	35.80°	347.26°	5179.34'	23.87'
5250'	5349'	37.55°	344.90°	5255.54'	80.33'



PCG GR XHi-Range RT BCor PGRC 0200 api	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
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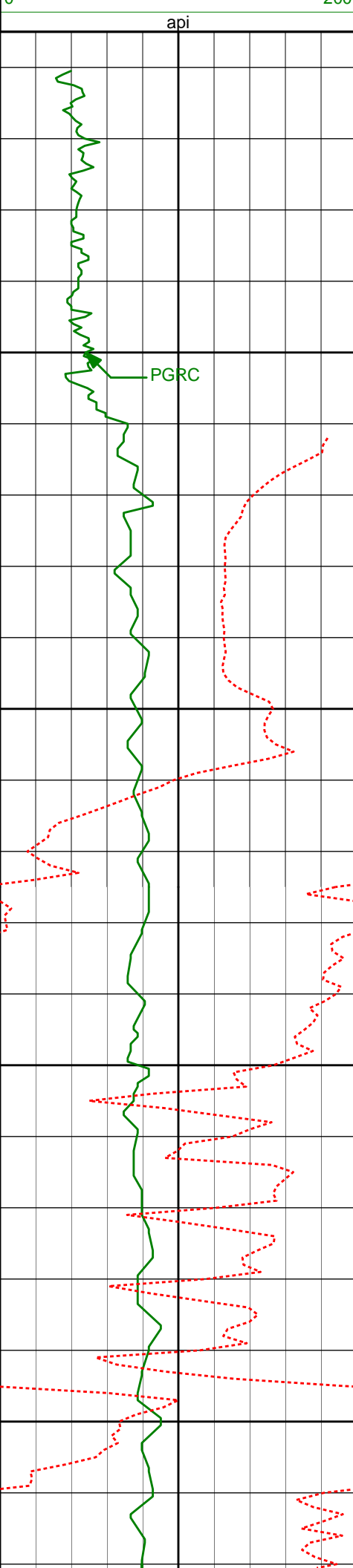
Average Rate of Penetration ROPA 1K0 feet per hr	
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TVD Main Log 1:240

Average Rate of Penetration ROPA 1K0 feet per hr			
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PCG GR XHi-Range RT BCor PGRC 0200	Measured Depth (ft) 1:240	Depth	Inc	Azi.	TVD	V.S.
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1200'



Run 100

1250'

1289'

0.46°

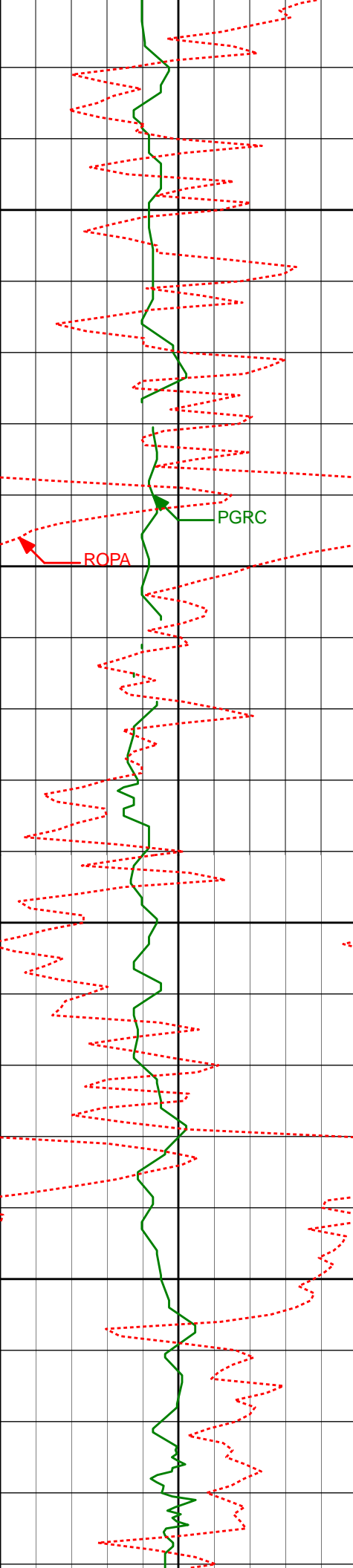
138.52°

1288.96'

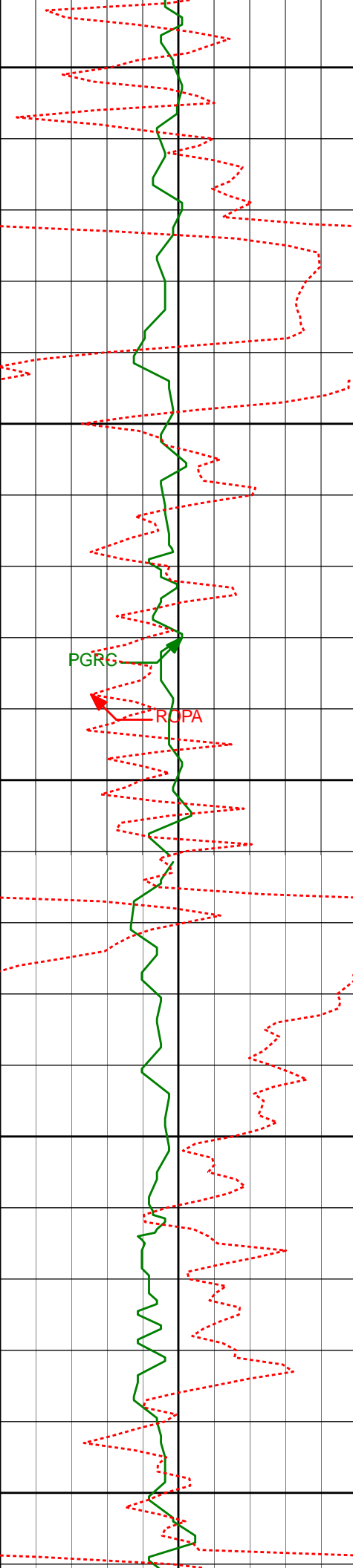
-5.89'

1300'

1350'



1381'	0.57°	146.20°	1380.96'	-6.62'
1400'				
1450'				
1474'	0.62°	148.70°	1473.96'	-7.50'
1500'				
1550'				
1567'	0.54°	162.79°	1566.95'	-8.39'



1600'

1650'

1700'

1750'

1800'

1660'

1.26°

244.45°

1659.94'

-9.12'

PGRG

ROPA

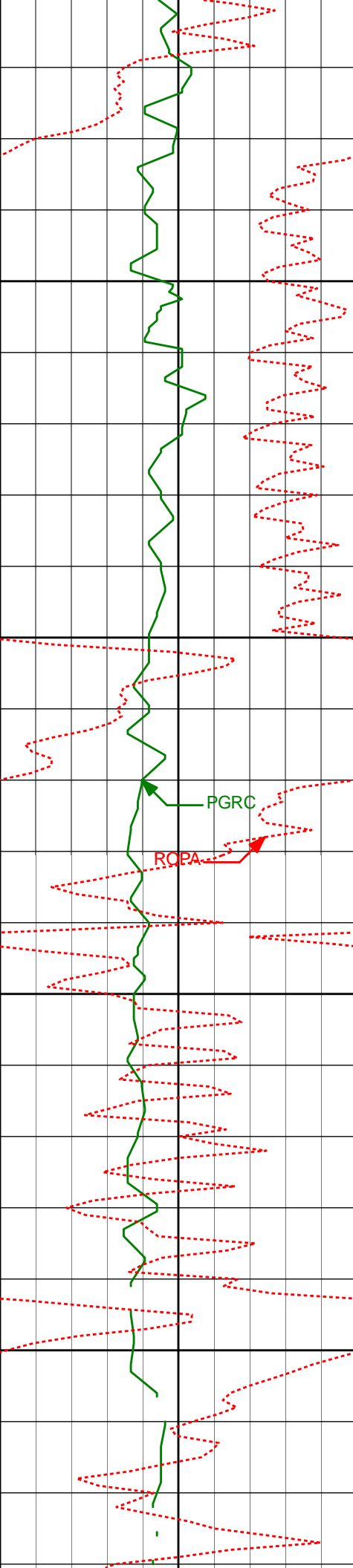
1752'

1.44°

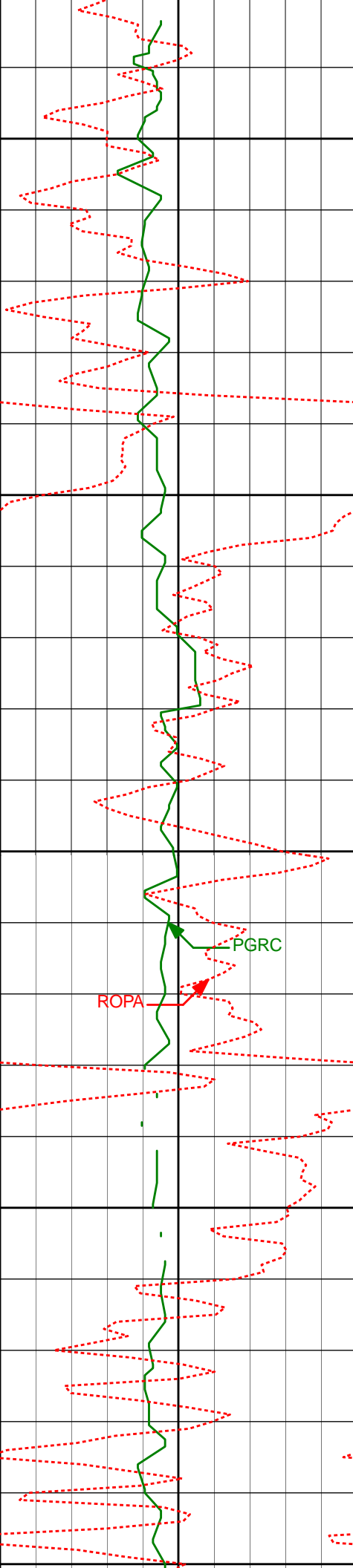
244.42°

1751.92'

-9.77'



1844'	1.53°	248.17°	1843.89'	-10.40'
1850'				
1900'				
1937'	1.54°	247.05°	1936.85'	-11.00'
1950'				
2000'				
2029'	1.65°	247.36°	2028.82'	-11.64'



2050'

2100'

2150'

2200'

2250'

2122'

1.53°

248.31°

2121.78'

-12.26'

PGRC

ROPA

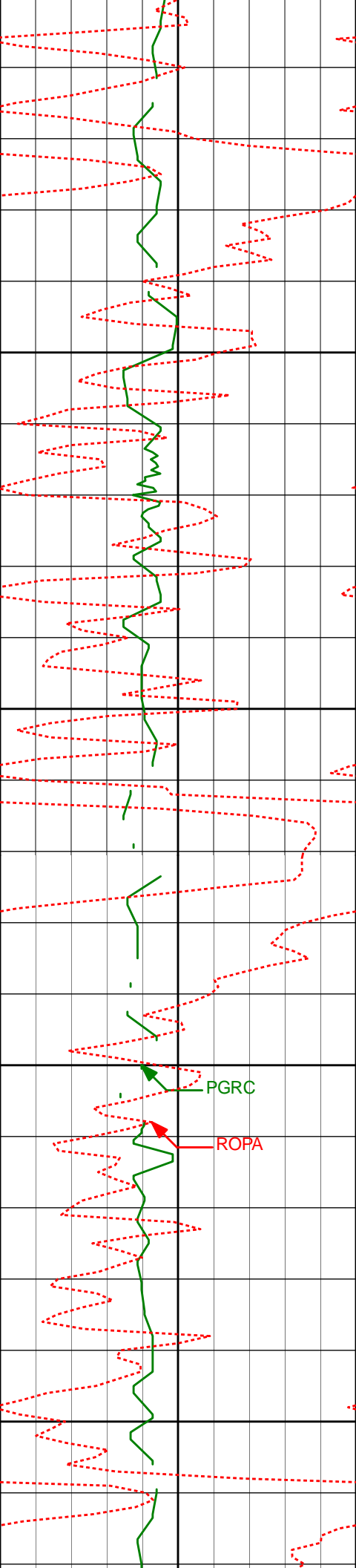
2215'

1.53°

249.12°

2214.75'

-12.81'



2300'

2350'

2400'

2450'

2307'

1.32°

245.36°

2306.72'

-13.38'

2402'

0.52°

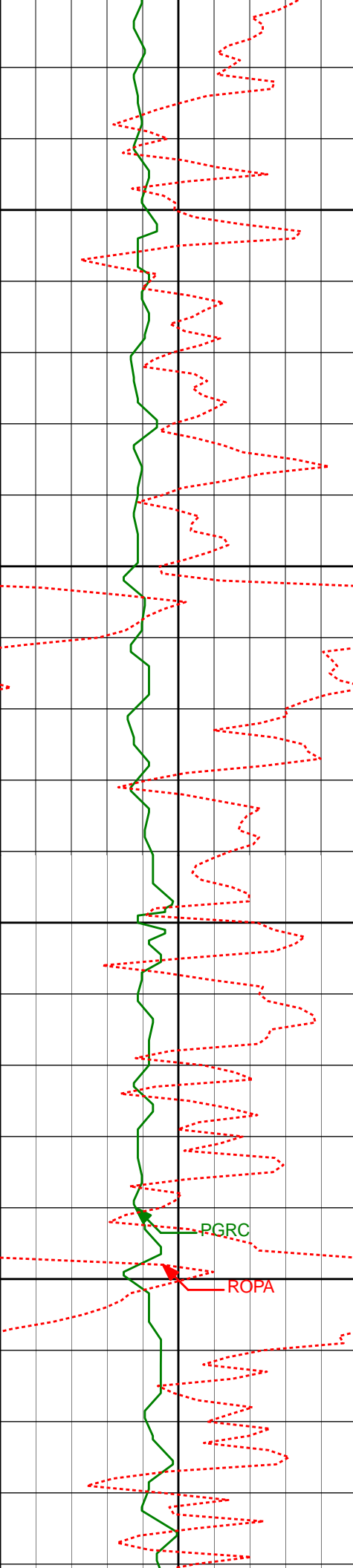
301.98°

2401.71'

-13.40'

PGRC

ROPA



2500'

2550'

2600'

2650'

2592'

0.80°

296.35°

2591.69'

-12.08'

PGRC

ROPA

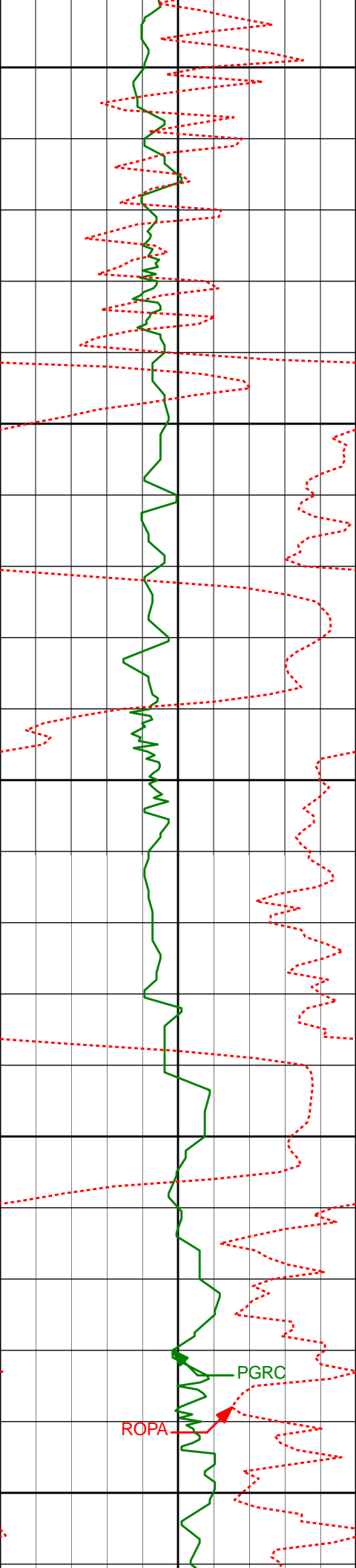
2687'

0.90°

293.25°

2686.68'

-11.31'



2700'

2750'

2800'

2850'

2900'

2782'

1.82°

275.90°

2781.66'

-10.55'

2877'

3.85°

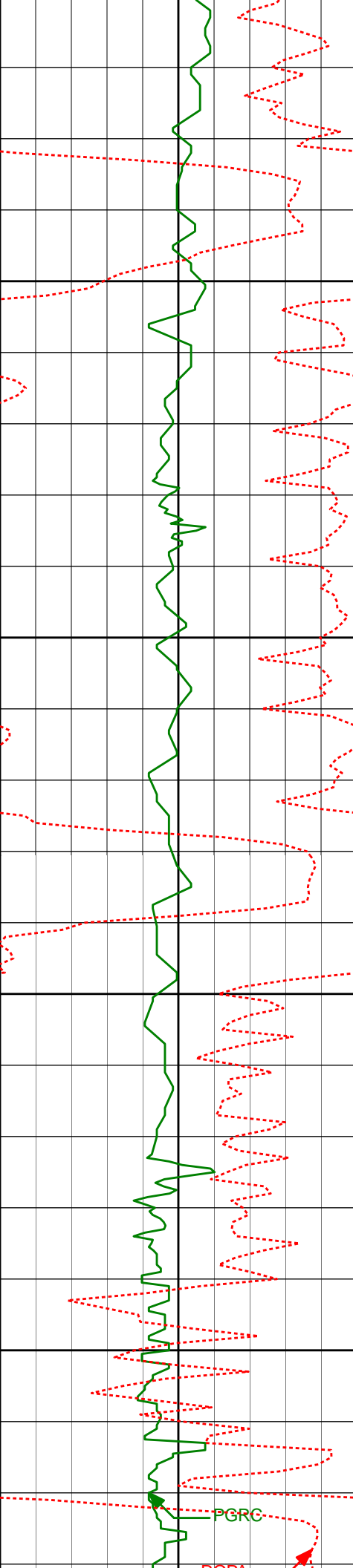
273.37°

2876.53'

-9.53'

PGRC

ROPA



2950'

2972'

4.63°

270.46°

2971.27'

-8.29'

3000'

3050'

3067'

5.76°

265.63°

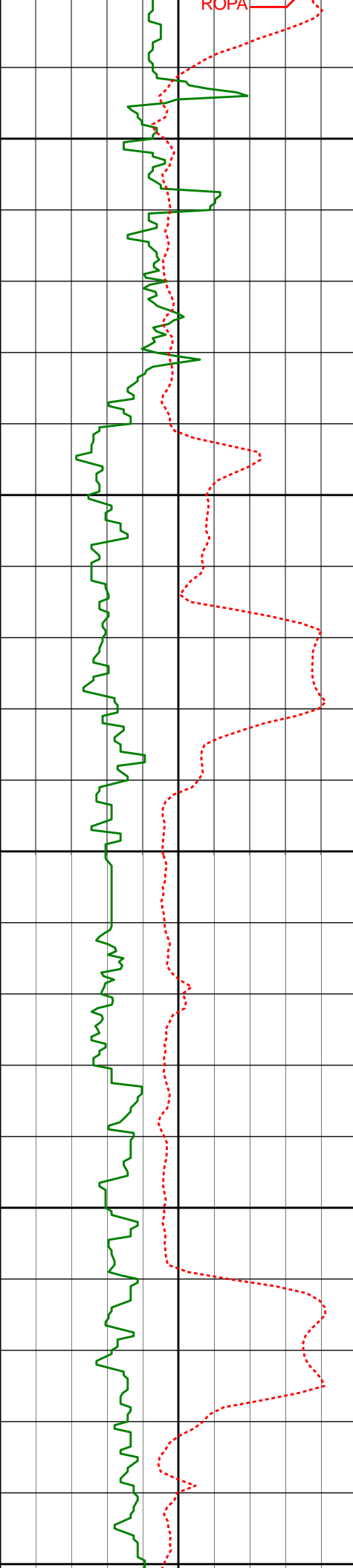
3065.88'

-7.37'

3100'

PGRC

PGRC



3150'

3162'

6.48°

262.63°

3160.34'

-6.95'

3200'

3250'

3257'

7.35°

258.57°

3254.65'

-7.18'

3300'

3350'

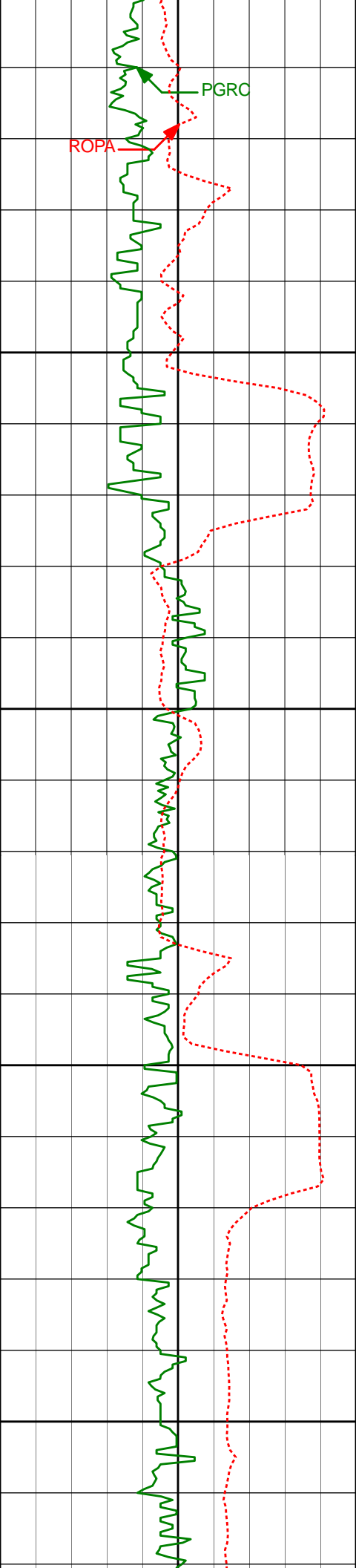
3353'

9.10°

252.71°

3349.66'

-8.69'



3400'

3448'

10.85°

245.24°

3443.22'

-12.38'

3450'

3500'

3543'

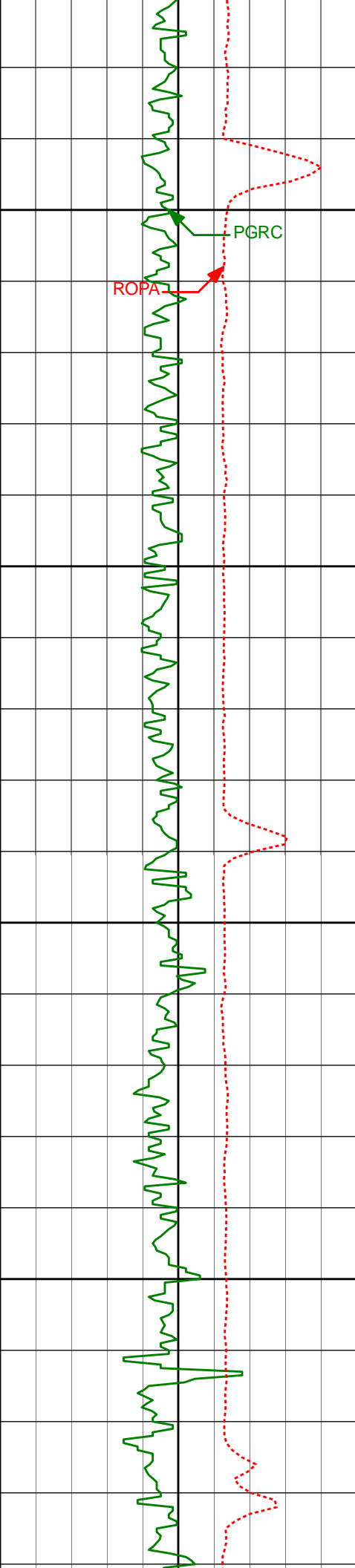
11.75°

246.12°

3536.38'

-17.49'

3550'



3600'

3638'

12.14°

247.61°

3629.32'

-22.50'

3650'

3700'

3733'

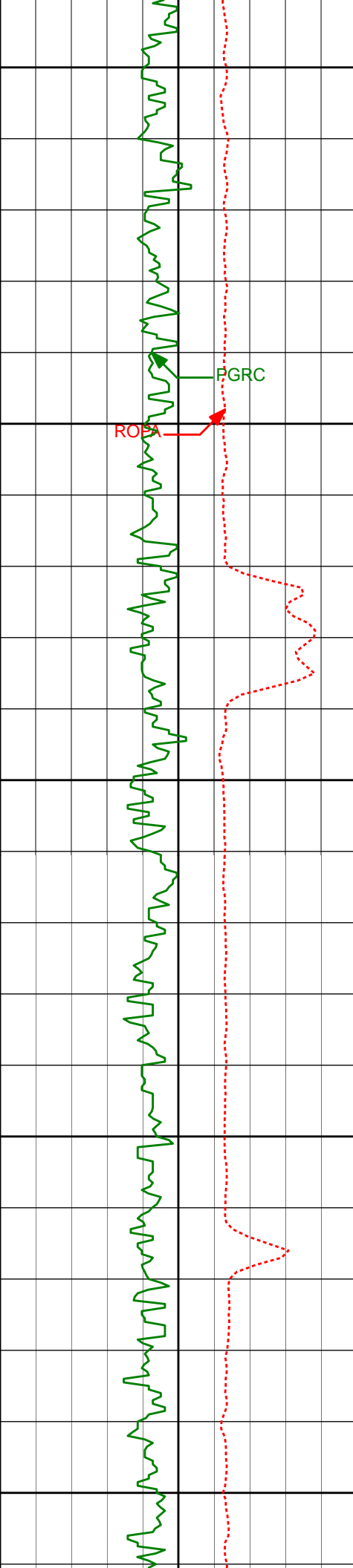
11.95°

247.48°

3722.23'

-27.33'

3750'



3800'

3828'

12.36°

246.70°

3815.10'

-32.35'

3850'

PGRC

ROVA

3900'

3923'

11.85°

243.24°

3907.99'

-38.05'

3950'

4000'

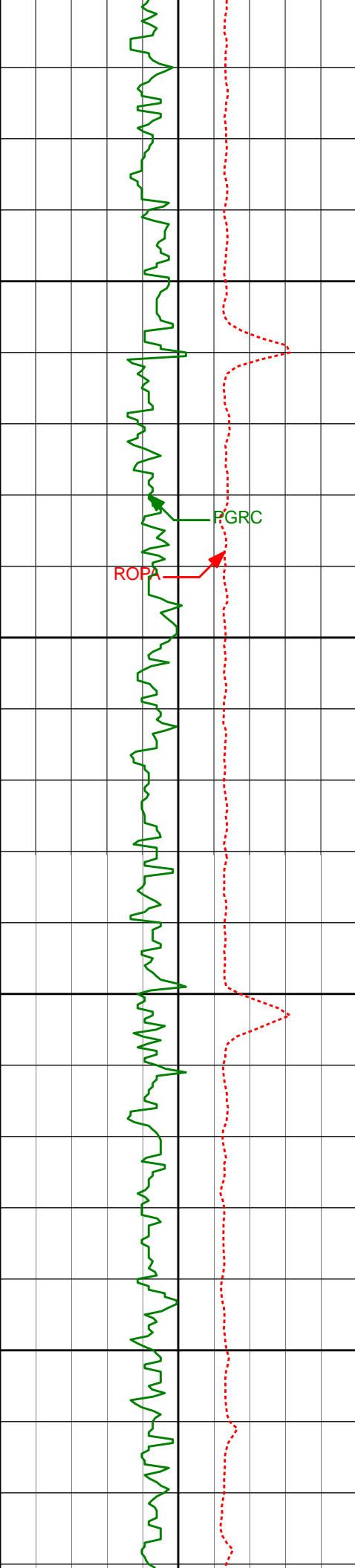
4018'

12.08°

242.70°

4000.93'

-44.36'



4050'

4100'

4150'

4200'

4113'

11.84°

243.19°

4093.87'

-50.67'

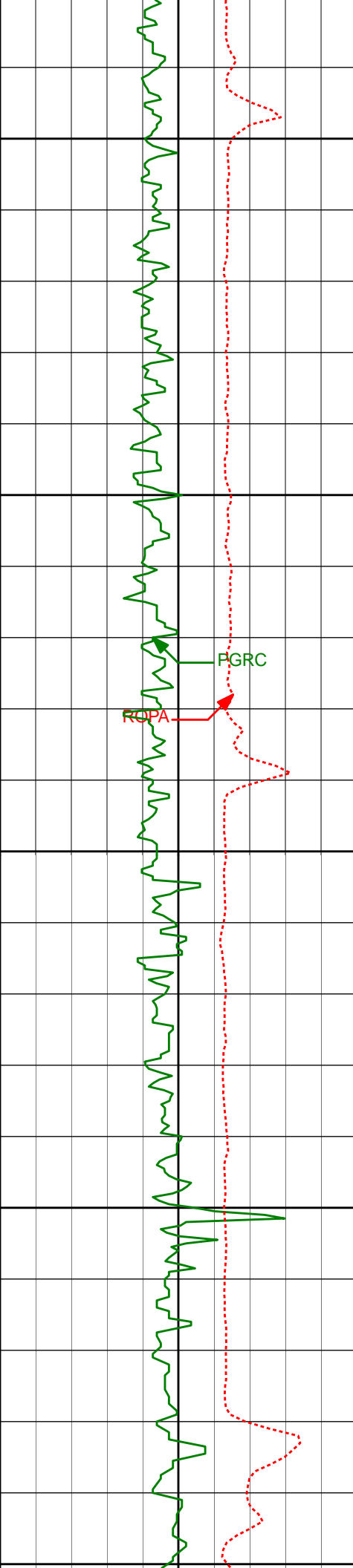
4208'

11.52°

240.36°

4186.90'

-57.20'



4250'

4303'

11.51°

238.15°

4279.99'

-64.42'

4300'

PGRC

ROPA

4350'

4399'

10.81°

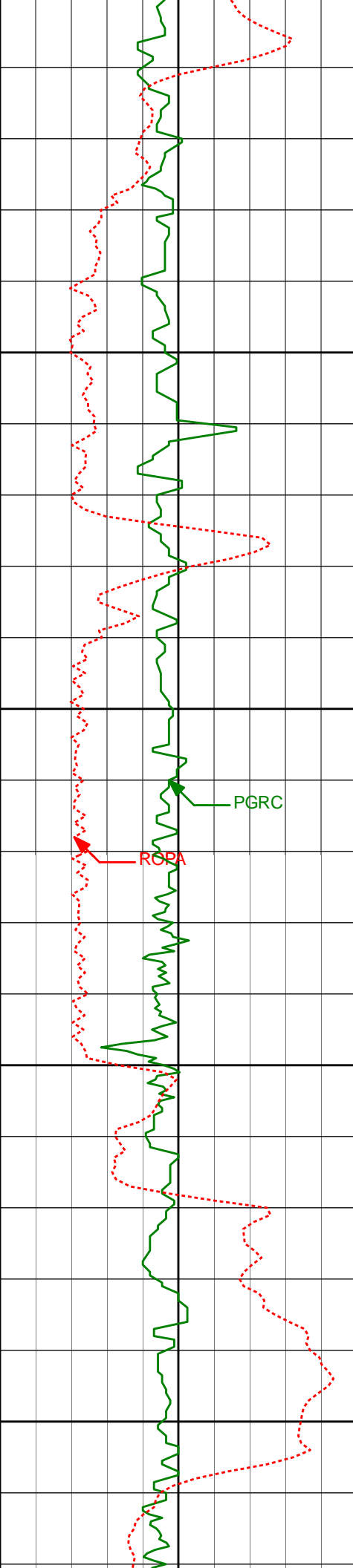
237.12°

4374.17'

-71.97'

4400'

4450'



4494'

4500'

4550'

4589'

4600'

4650'

4494'

12.16°

244.37°

4467.27'

-78.64'

4589'

10.19°

244.16°

4560.47'

-84.14'

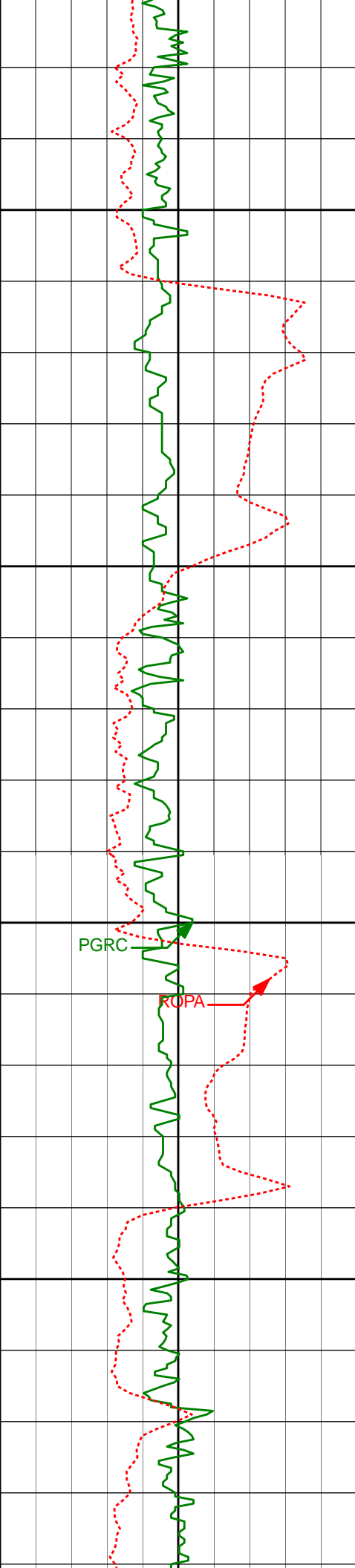
4684'

10.06°

241.95°

4653.99'

-89.46'



4700'

4750'

4800'

4850'

PGRC

ROPA

4779'

13.17°

249.70°

4747.04'

-94.49'

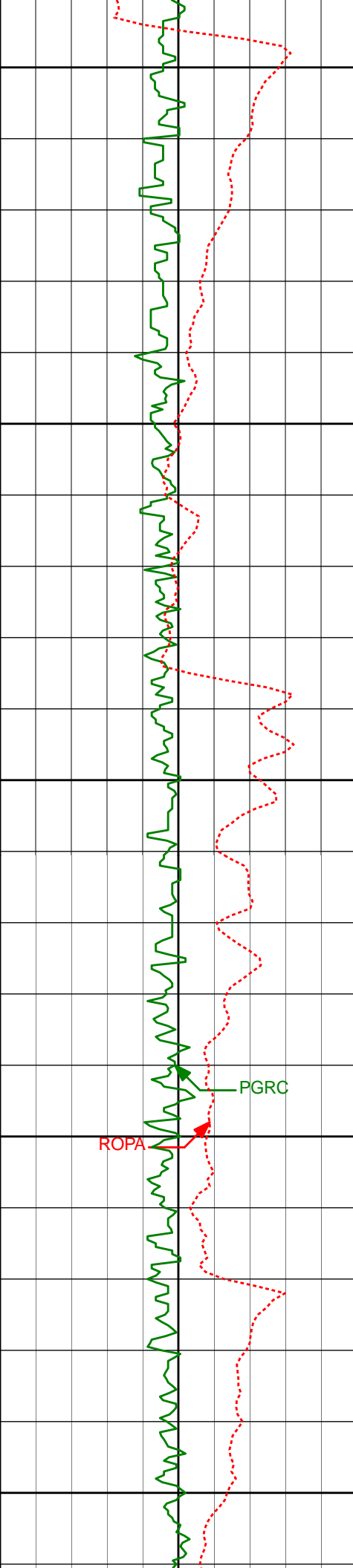
4874'

13.81°

260.02°

4839.43'

-97.05'



4900'

4969'

15.11°

283.70°

4931.50'

-92.72'

4950'

5000'

5064'

27.87°

306.06°

5019.85'

-72.41'

5050'

5100'

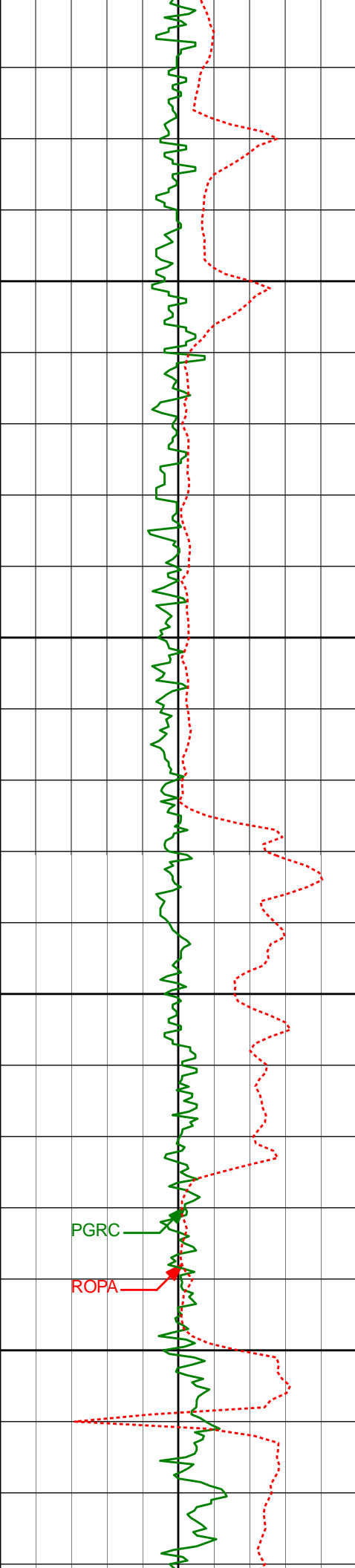
5159'

34.55°

339.37°

5101.65'

-30.18'



5150'

5200'

5250'

5300'

PGRC

ROPA

5254'

35.80°

347.26°

5179.34'

23.87'

5349'

37.55°

344.90°

5255.54'

80.33'

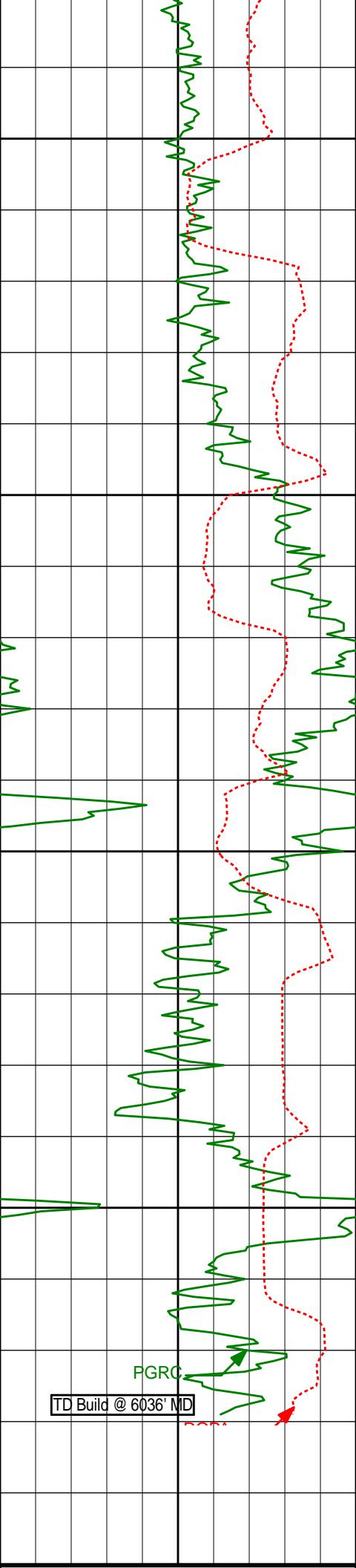
5444'

44.27°

345.80°

5327.30'

142.13'



5350'

5539'

55.86°

351.64°

5388.21'

214.71'

5400'

5634'

65.74°

353.61°

5434.50'

297.52'

5450'

5730'

70.46°

355.24°

5470.30'

386.46'

5500'

5825'

72.40°

355.69°

5500.55'

476.31'

5920'

81.77°

357.63°

5521.76'

568.44'

5978'

85.77°

358.71°

5528.05'

625.71'

FGRC

TD Build @ 6036' MD

5550'

PCG GR XHi-Range RT BCor	Measured	Depth	Inc	Azi.	TVD	V.S.
PGRC	Depth (ft)					
0	1:240					
200						
api						
Average Rate of Penetration						
ROPA						
1K						
0						
feet per hr						

HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy  
Davis State LD02-73-1BHN  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0901828869  
The first three surveys at 355', 635' and 1005' are provided by HP.

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
355.00	0.60	110.92	354.99	0.66 S	1.74 E	-0.91	0.17
635.00	0.20	147.01	634.99	1.60 S	3.37 E	-2.07	0.16
1005.00	0.60	123.51	1004.98	3.21 S	5.34 E	-3.95	0.11
1289.00	0.46	138.52	1288.96	4.88 S	7.33 E	-5.89	0.07
1381.00	0.57	146.20	1380.96	5.54 S	7.83 E	-6.62	0.15
1474.00	0.62	148.70	1473.96	6.35 S	8.35 E	-7.50	0.05
1567.00	0.54	162.79	1566.95	7.20 S	8.74 E	-8.39	0.17
1660.00	1.26	244.45	1659.94	8.06 S	7.94 E	-9.12	1.40
1752.00	1.44	244.42	1751.92	8.99 S	5.98 E	-9.77	0.20
1844.00	1.53	248.17	1843.89	9.95 S	3.80 E	-10.40	0.14
1937.00	1.54	247.05	1936.85	10.90 S	1.49 E	-11.00	0.03
2029.00	1.65	247.36	2028.82	11.89 S	0.87 W	-11.64	0.12
2122.00	1.53	248.31	2121.78	12.87 S	3.26 W	-12.26	0.14
2215.00	1.53	249.12	2214.75	13.77 S	5.58 W	-12.81	0.02
2307.00	1.32	245.36	2306.72	14.65 S	7.69 W	-13.38	0.26
2402.00	0.52	301.98	2401.71	14.87 S	9.05 W	-13.40	1.18
2592.00	0.80	296.35	2591.69	13.82 S	10.97 W	-12.08	0.15
2687.00	0.90	293.25	2686.68	13.23 S	12.26 W	-11.31	0.12
2782.00	1.82	275.90	2781.66	12.78 S	14.45 W	-10.55	1.05
2877.00	3.85	273.37	2876.53	12.44 S	19.14 W	-9.53	2.14
2972.00	4.63	270.46	2971.27	12.22 S	26.15 W	-8.29	0.85
3067.00	5.76	265.63	3065.88	12.55 S	34.74 W	-7.37	1.28
3162.00	6.48	262.63	3160.34	13.61 S	44.81 W	-6.95	0.82
3257.00	7.35	258.57	3254.65	15.50 S	56.09 W	-7.18	1.05
3353.00	9.10	252.71	3349.66	18.97 S	69.36 W	-8.69	2.02
3448.00	10.85	245.24	3443.22	24.95 S	84.65 W	-12.38	2.28
3543.00	11.75	246.12	3536.38	32.61 S	101.62 W	-17.49	0.97
3638.00	12.14	247.61	3629.32	40.33 S	119.70 W	-22.50	0.52
3733.00	11.95	247.48	3722.23	47.91 S	138.03 W	-27.33	0.21
3828.00	12.36	246.70	3815.10	55.69 S	156.45 W	-32.35	0.47
3923.00	11.85	243.24	3907.99	64.11 S	174.49 W	-38.05	0.93
4018.00	12.08	242.70	4000.93	73.05 S	192.03 W	-44.36	0.27
4113.00	11.84	243.19	4093.87	82.01 S	209.56 W	-50.67	0.27
4208.00	11.52	240.36	4186.90	91.10 S	226.51 W	-57.20	0.69
4303.00	11.51	238.15	4279.99	100.79 S	242.80 W	-64.42	0.46
4399.00	10.81	237.12	4374.17	110.73 S	258.50 W	-71.97	0.75
4494.00	12.16	244.37	4467.27	119.90 S	275.00 W	-78.64	2.08
4589.00	10.19	244.16	4560.47	127.89 S	291.59 W	-84.14	2.07
4684.00	10.06	241.95	4653.99	135.46 S	306.48 W	-89.46	0.43
4779.00	13.17	249.70	4747.04	143.11 S	323.96 W	-94.49	3.66
4874.00	13.81	260.02	4839.43	148.83 S	345.27 W	-97.05	2.62
4969.00	15.11	283.70	4931.50	147.86 S	368.49 W	-92.72	6.33
5064.00	27.87	306.06	5019.85	131.77 S	398.64 W	-72.41	15.74
5159.00	34.55	339.37	5101.65	93.16 S	426.32 W	-30.18	19.22

5254.00	35.80	347.26	5179.34	40.82 S	441.95 W	23.87	4.96
5349.00	37.55	344.90	5255.54	14.24 N	455.62 W	80.33	2.37
5444.00	44.27	345.80	5327.30	74.40 N	471.31 W	142.13	7.10
5539.00	55.86	351.64	5388.21	145.72 N	485.21 W	214.71	13.07
5634.00	65.74	353.61	5434.50	227.86 N	495.78 W	297.52	10.56
5730.00	70.46	355.24	5470.30	316.48 N	504.41 W	386.46	5.16
5825.00	72.40	355.69	5500.55	406.25 N	511.52 W	476.31	2.09
5920.00	81.77	357.63	5521.76	498.59 N	516.88 W	568.44	10.06
5978.00	85.77	358.71	5528.05	556.20 N	518.71 W	625.71	7.15

**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 351.64 DEGREES (GRID)  
A TOTAL CORRECTION OF 6.91 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 5978.00 FEET  
IS 760.54 FEET ALONG 317.00 DEGREES (GRID)**

**Final survey is a straight line projection to TD.**