



Max Tool Temp (degF) / Source	158.60 / PCM	171.20 / PCM		
Rm @ Max Tool Temp (degF)	NA @ NA	NA @ NA		
Lead MWD Engineer	Ryan Brunkhorst	Ryan Brunkhorst		
Customer Representative	Matt Settles	Matt Settles		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM		
Software Version	5.76	5.76		
Sub Serial Number	11254819	11254819		
Insert Serial Number	11227552	11227552		
Date and Time Initialized	25-Jul-12 10:47	25-Jul-12 10:47		
Date and Time Read	28-Jul-12 20:38	28-Jul-12 20:46		
ECMB SW Version	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC		
Distance From Bit (ft)	56.00	52.00		
Software Version	6.21	6.21		
Sub Serial Number	11254819	11254819		
Sonde Serial Number	11478013	11478013		
Sensor ID Number	N/A	N/A		
Toolface Offset (deg)	91.99	267.66		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG		
Distance From Bit (ft)	48.95	45.10		
Recorded Sample Period (sec)	10	10		
Software Version	8.15	8.15		
Sub Serial Number	11254819	11254819		
Insert/Sonde Serial Number	11681023	11681023		

## REMARKS

1. All depths are true vertical bit depths, referenced to the Driller's pipe tally and are measured from the Drill Floor, unless otherwise specified.
2. No depth corrections have been made for pipe stretch or compression.
3. Critical annular velocities are calculated using the "Power Law" 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 7.3.40

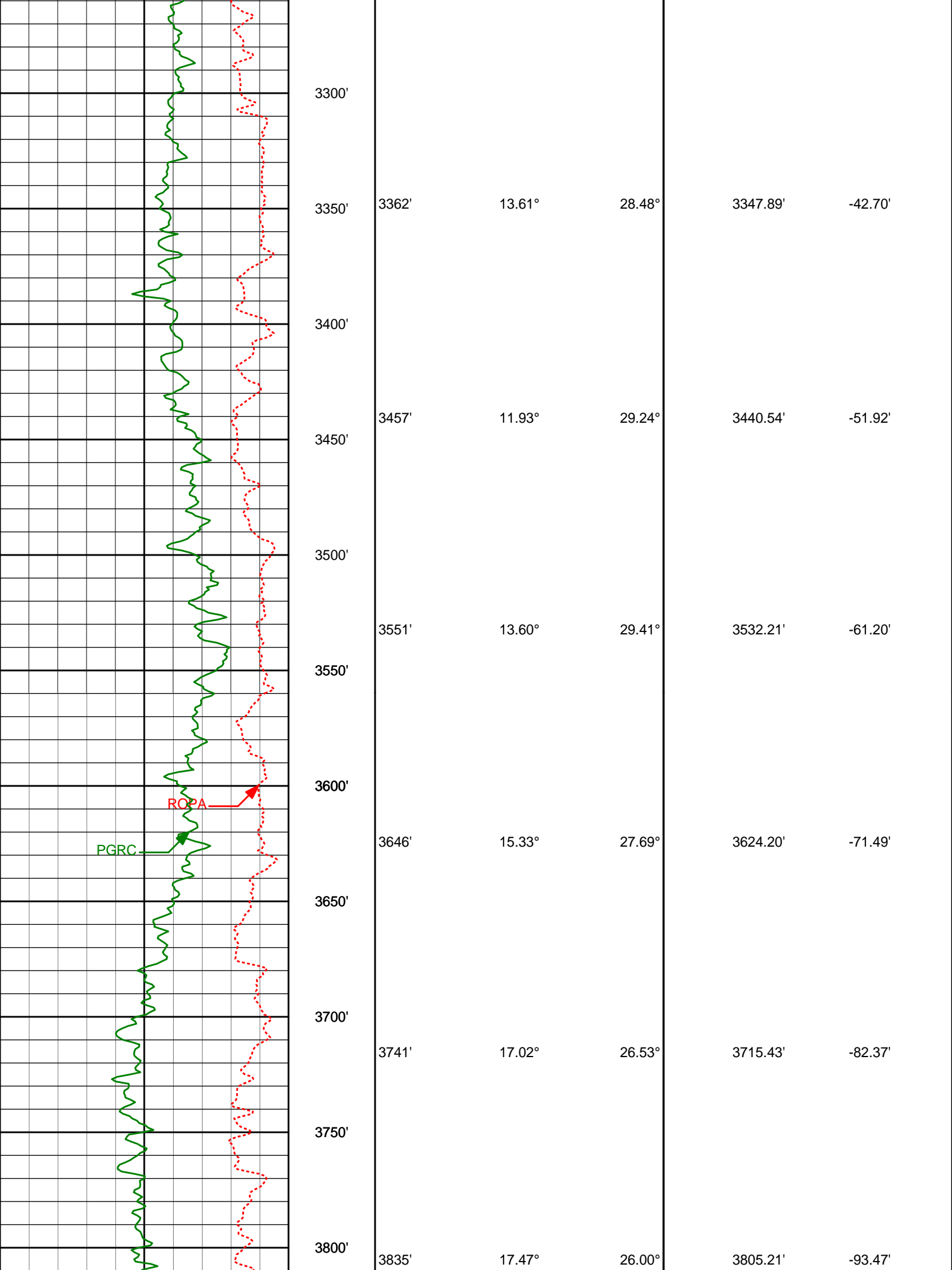
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## HALLIBURTON

### TVD Main Log 1:600

Average Rate of Penetration ROPA						
1K <span style="float: right;">0</span>						
feet per hr						
Gamma Ray PGRC	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
0 <span style="float: right;">200</span>	api					
3000						
3050						
3100		3078'	12.66°	22.45°	3071.89'	-18.93'
3150						
3200		3173'	14.42°	22.79°	3164.25'	-26.47'
3250						
3268'		3268'	13.33°	22.63°	3256.48'	-34.23'



3300'

3350'

3400'

3450'

3500'

3550'

3600'

3650'

3700'

3750'

3800'

3362'

13.61°

28.48°

3347.89'

-42.70'

3457'

11.93°

29.24°

3440.54'

-51.92'

3551'

13.60°

29.41°

3532.21'

-61.20'

3646'

15.33°

27.69°

3624.20'

-71.49'

3741'

17.02°

26.53°

3715.43'

-82.37'

3835'

17.47°

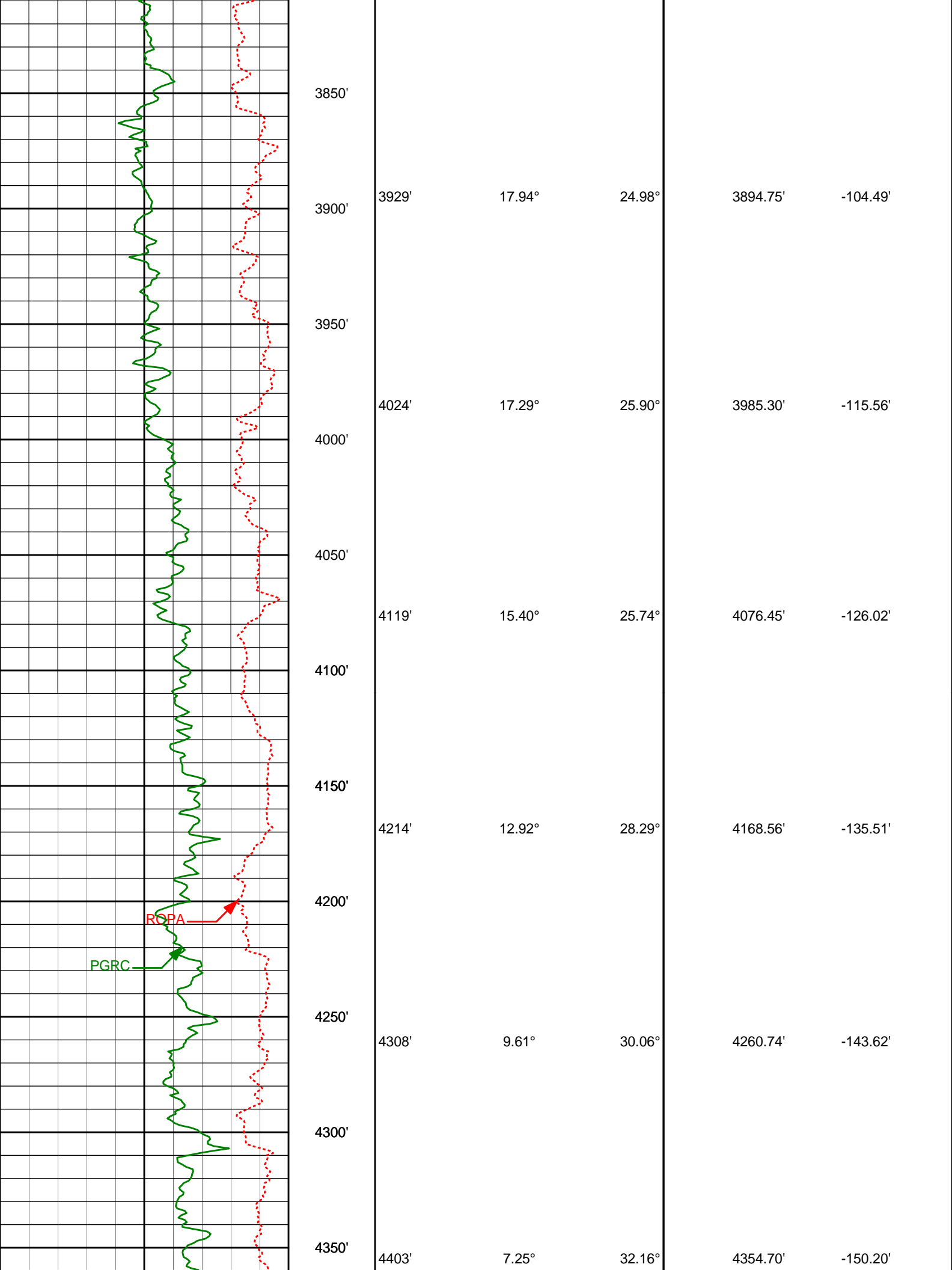
26.00°

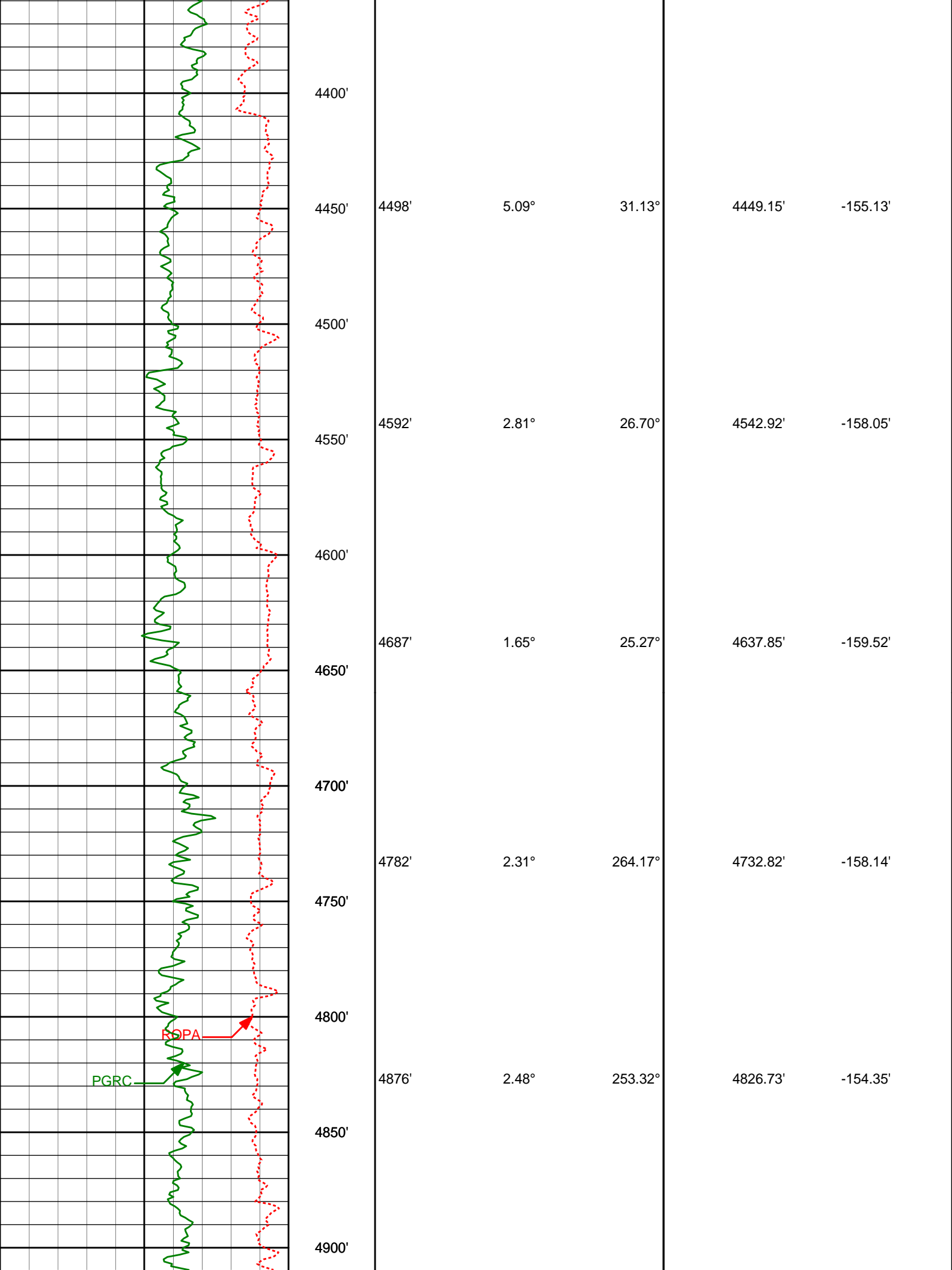
3805.21'

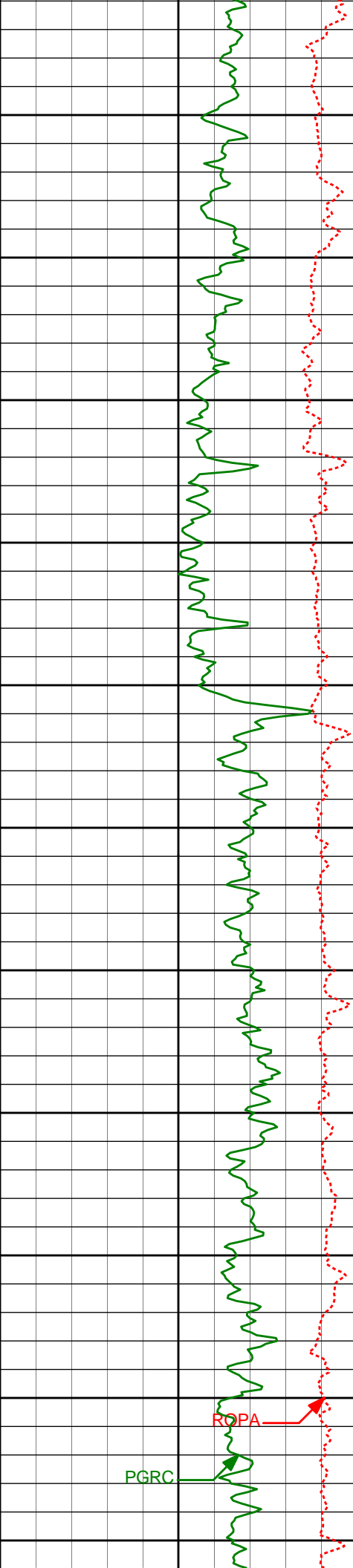
-93.47'

PGRC

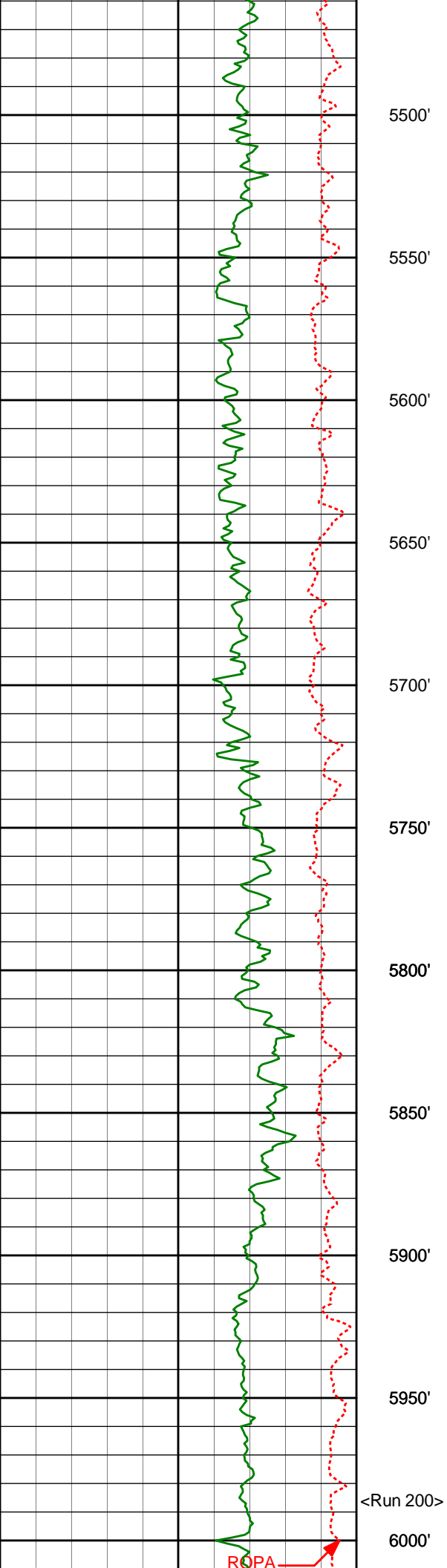
ROPA







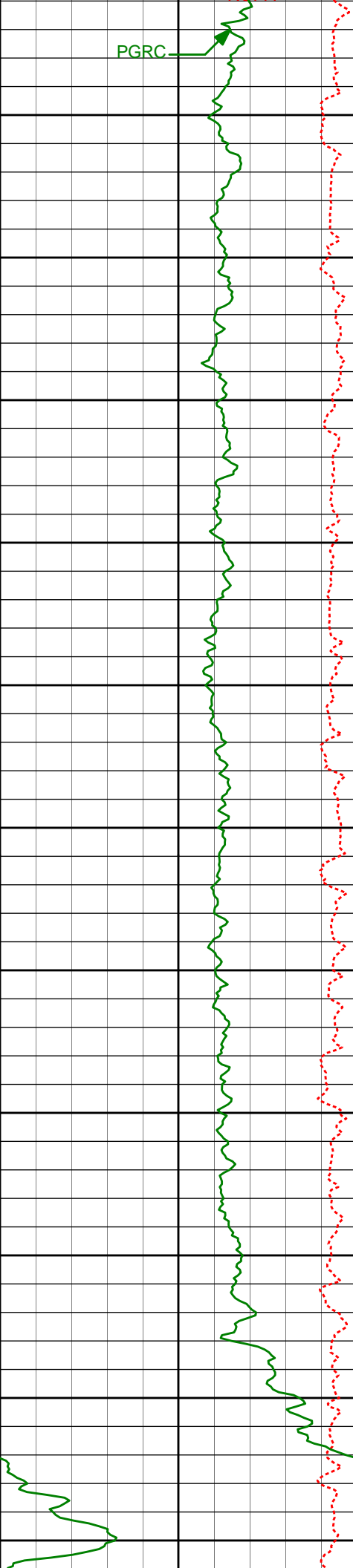
4971'	2.11°	215.99°	4921.66'	-151.46'	
4950'					
5000'					
5066'	2.94°	194.39°	5016.57'	-150.02'	
5050'					
5100'					
5161'	3.12°	196.73°	5111.44'	-148.90'	
5150'					
5200'					
5255'	2.69°	179.05°	5205.32'	-148.43'	
5250'					
5300'					
5350'					
5300'	5350'	3.44°	189.46°	5300.18'	-148.24'
5350'					
5400'	5444'	2.75°	194.59°	5394.05'	-147.46'
5450'					



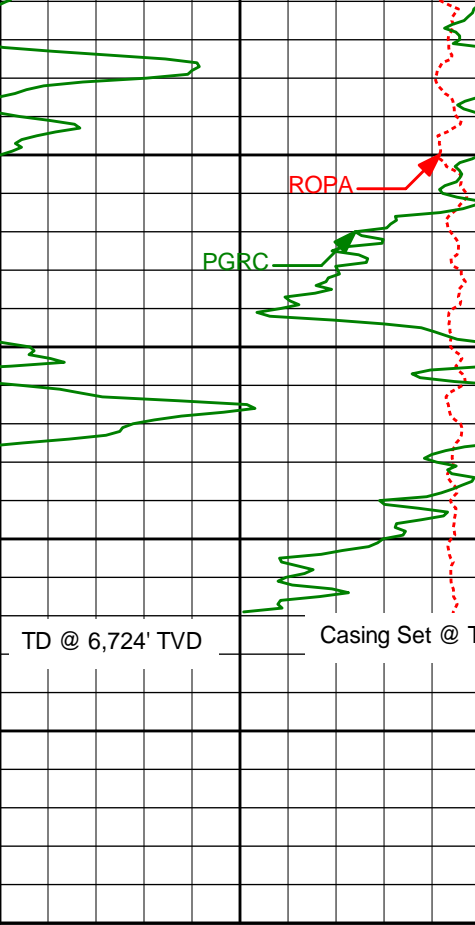
5539'	2.40°	182.53°	5488.95'	-147.00'
5500'				
5550'				
5634'	1.57°	173.35°	5583.89'	-147.22'
5600'				
5650'				
5728'	1.62°	168.11°	5677.86'	-147.77'
5700'				
5750'				
5823'	1.47°	196.57°	5772.82'	-147.82'
5800'				
5850'				
5924'	0.89°	188.80°	5873.80'	-147.43'
5900'				
5950'				
6013'	3.94°	270.24°	5962.73'	-144.30'
<Run 200>				
6000'				

ROPA





6061'	9.48°	274.88°	6010.38'	-138.70'
6050'	12.01°	272.82°	6056.55'	-129.94'
6100'	15.72°	273.30°	6103.14'	-118.44'
6150'	19.12°	272.37°	6147.98'	-104.37'
6200'	22.81°	269.23°	6192.80'	-87.22'
6250'	26.42°	266.78°	6235.52'	-67.72'
6300'	29.26°	267.98°	6277.96'	-45.41'
6350'	32.03°	268.01°	6317.53'	-22.05'
6400'	35.14°	268.37°	6357.52'	4.41'
6450'	37.25°	267.16°	6395.45'	32.06'
6500'	39.60°	268.44°	6433.05'	61.77'
6550'	43.10°	268.23°	6467.57'	92.07'
6600'	47.71°	267.34°	6501.27'	126.10'
6650'	52.08°	266.64°	6531.54'	161.86'



6724'	56.10°	265.44°	6539.66'	200.43'
6770'	59.52°	265.67°	6584.19'	239.07'
6818'	61.32°	265.16°	6607.88'	280.46'
6865'	63.58°	265.80°	6629.62'	321.79'
6650'	64.97°	266.01°	6650.45'	364.72'
6960'	67.62°	267.48°	6669.34'	407.51'
7008'	70.16°	268.33°	6686.63'	452.12'
6700'	73.49°	269.35°	6700.98'	495.71'
7102'	78.24°	268.49°	6712.69'	542.14'
7128'	81.07°	268.43°	6717.36'	567.64'
6750'				
6800'				

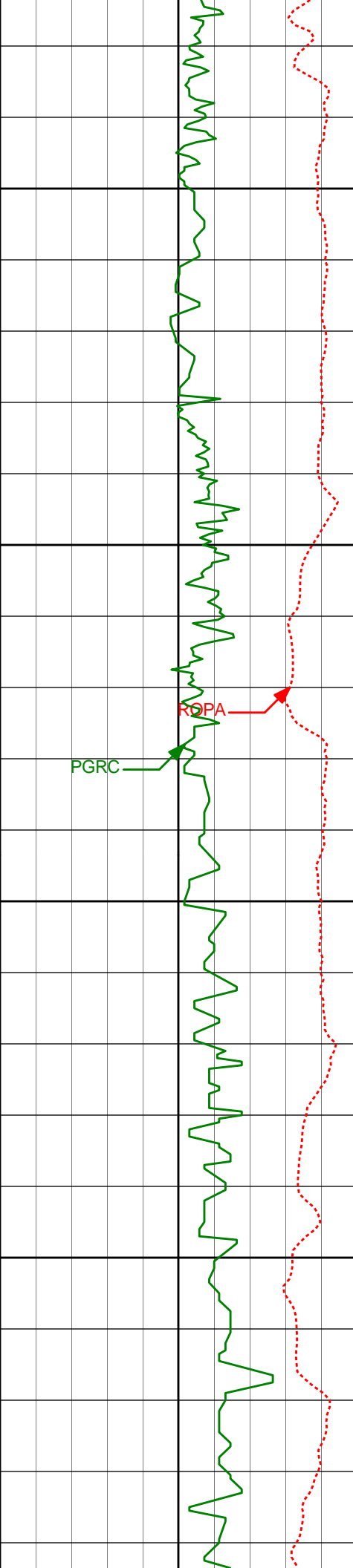
Gamma Ray PGRC api	True Vertical Depth (ft) 1:600	Depth	Inc	Azi.	TVD	V.S.
0 ————— 200						
Average Rate of Penetration ROPA feet per hr						
1K ————— 0						

# HALLIBURTON

## TVD Main Log 1:240

Average Rate of Penetration ROPA feet per hr	True Vertical Depth (ft) 1:240	Depth	Inc	Azi.	TVD	V.S.
1K ————— 0						

Gamma Ray PGRC api	True Vertical Depth (ft) 1:240	Depth	Inc	Azi.	TVD	V.S.
0 ————— 200						



3050'

3078'

12.66°

22.45°

3071.89'

-18.93'

3100'

ROPA

PGRC

3150'

3173'

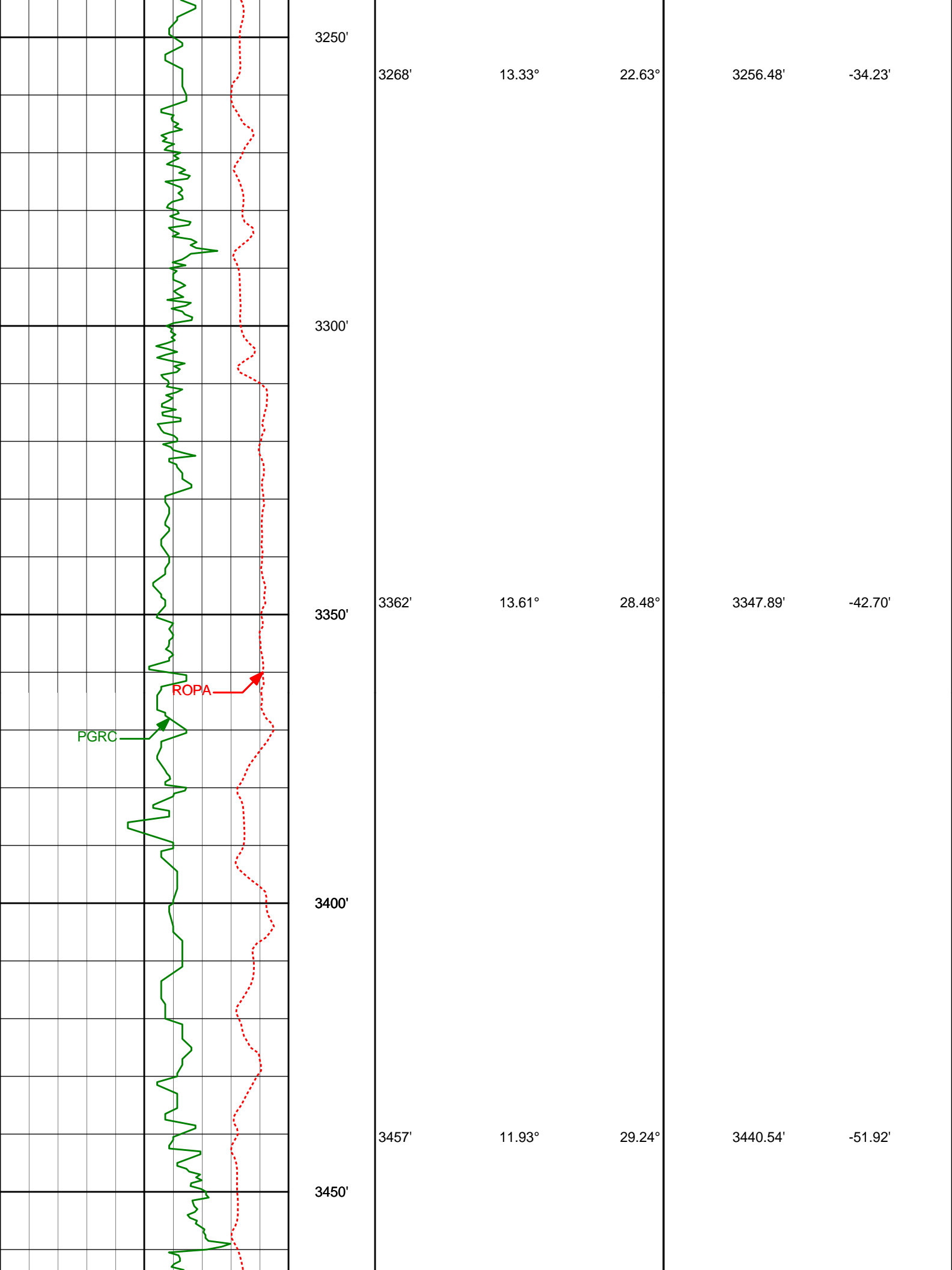
14.42°

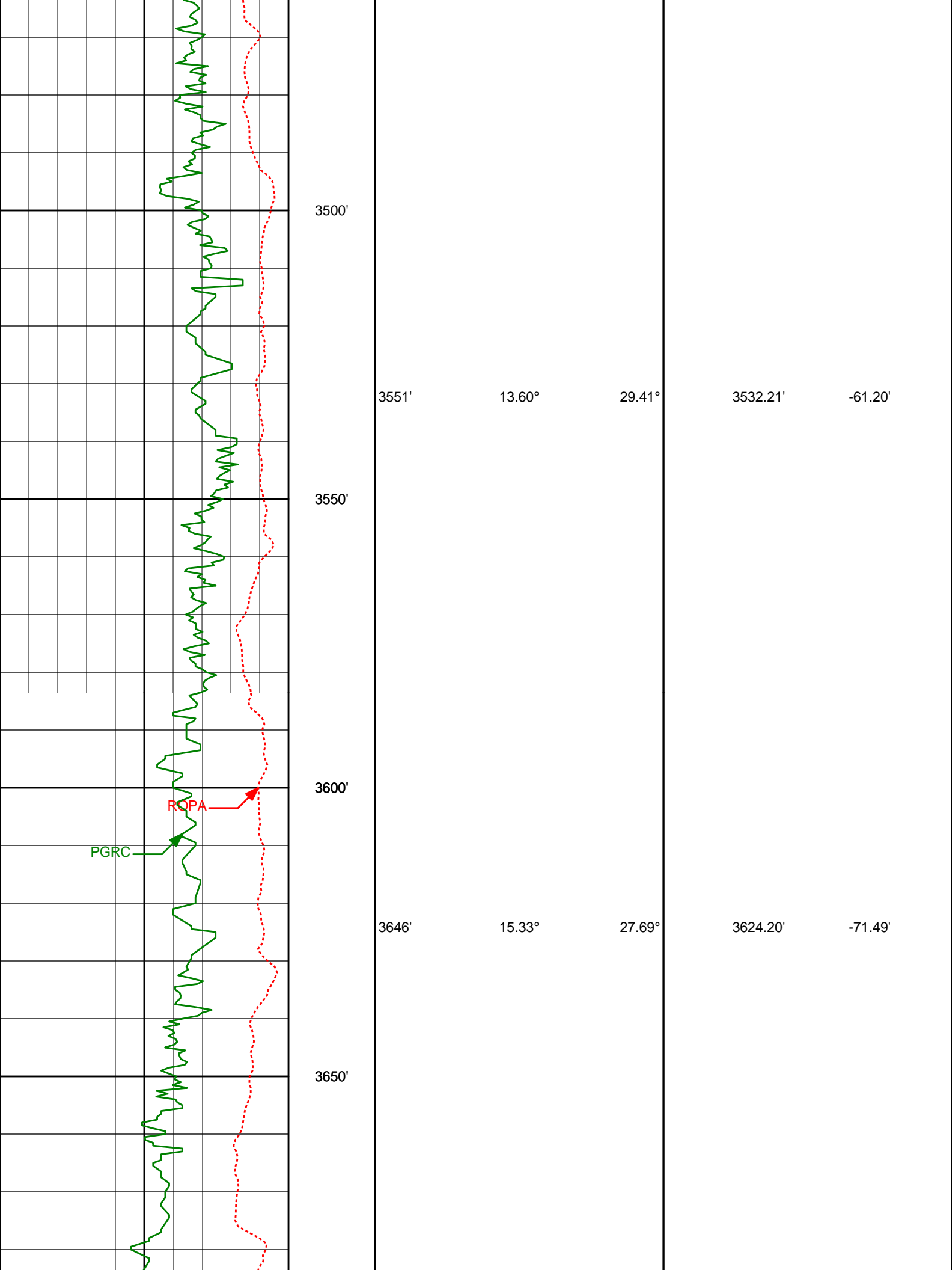
22.79°

3164.25'

-26.47'

3200'





3500'

3551'

13.60°

29.41°

3532.21'

-61.20'

3550'

3600'

RQPA

PGRC

3646'

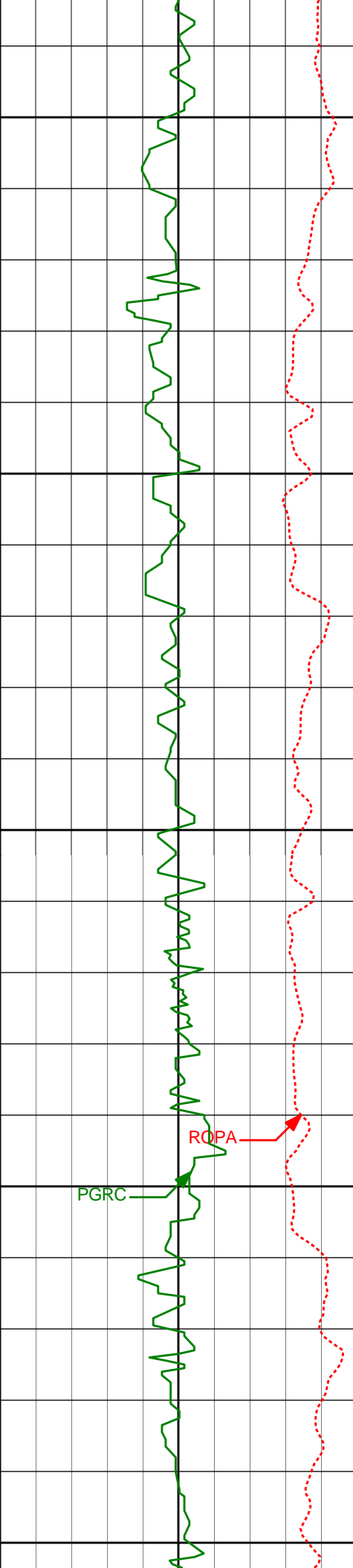
15.33°

27.69°

3624.20'

-71.49'

3650'



3700'

3741'

17.02°

26.53°

3715.43'

-82.37'

3750'

3800'

3835'

17.47°

26.00°

3805.21'

-93.47'

3850'

PGRC

ROPA

3900'

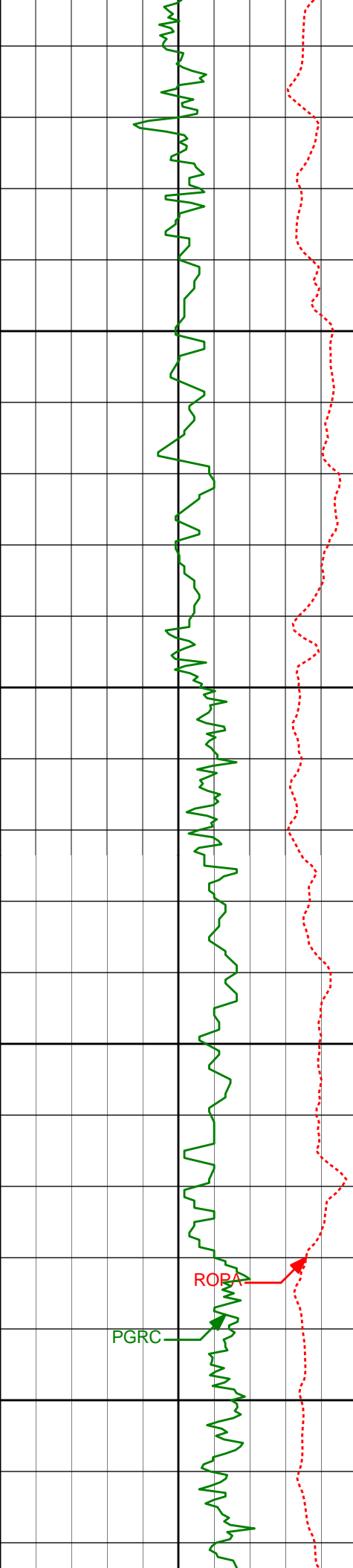
3929'

17.94°

24.98°

3894.75'

-104.49'



3950'

4000'

4050'

4100'

4024'

17.29°

25.90°

3985.30'

-115.56'

4119'

15.40°

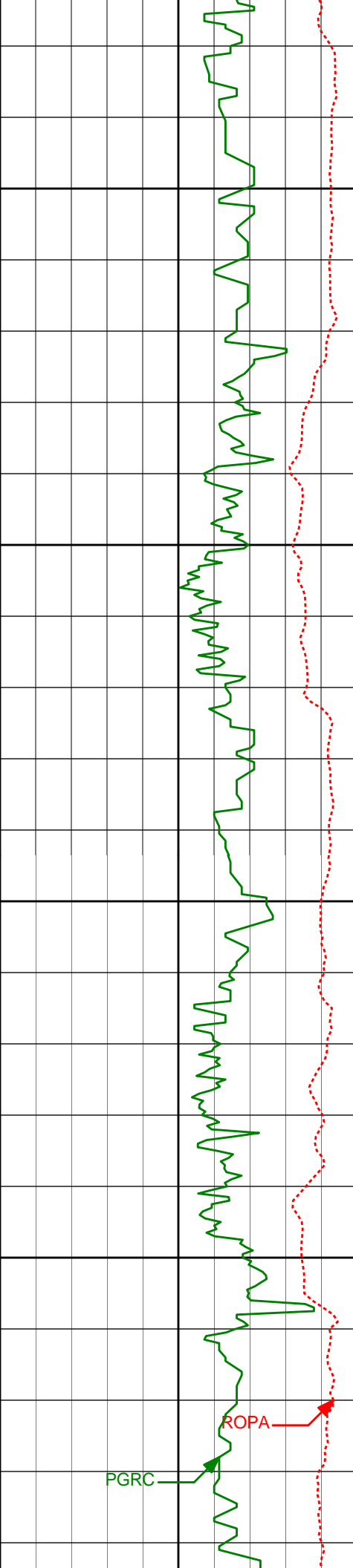
25.74°

4076.45'

-126.02'

ROPA

PGRC



4150'

4214'

12.92°

28.29°

4168.56'

-135.51'

4200'

4250'

4308'

9.61°

30.06°

4260.74'

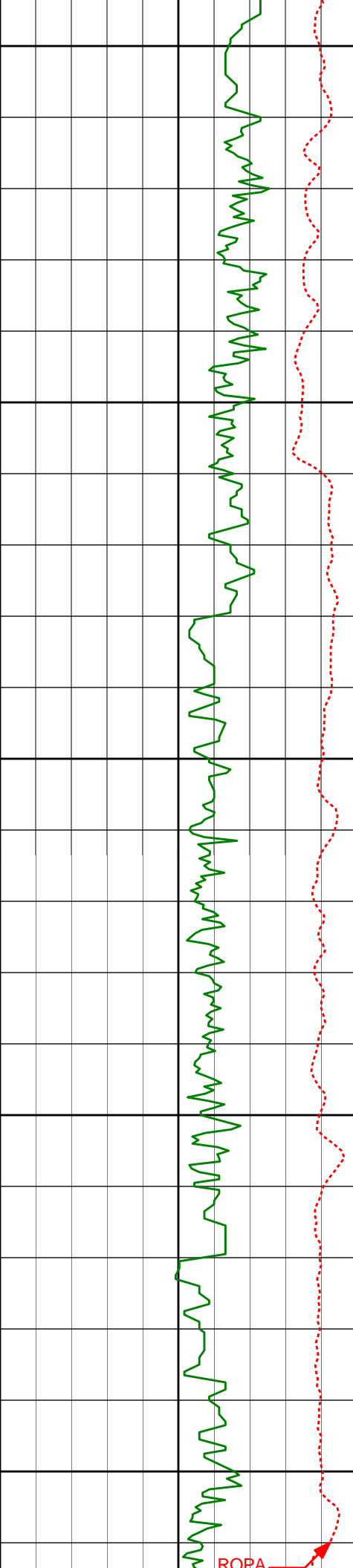
-143.62'

4300'

PGRC

ROPA





4350'

4403'

7.25°

32.16°

4354.70'

-150.20'

4400'

4450'

4498'

5.09°

31.13°

4449.15'

-155.13'

4500'

4592'

2.81°

26.70°

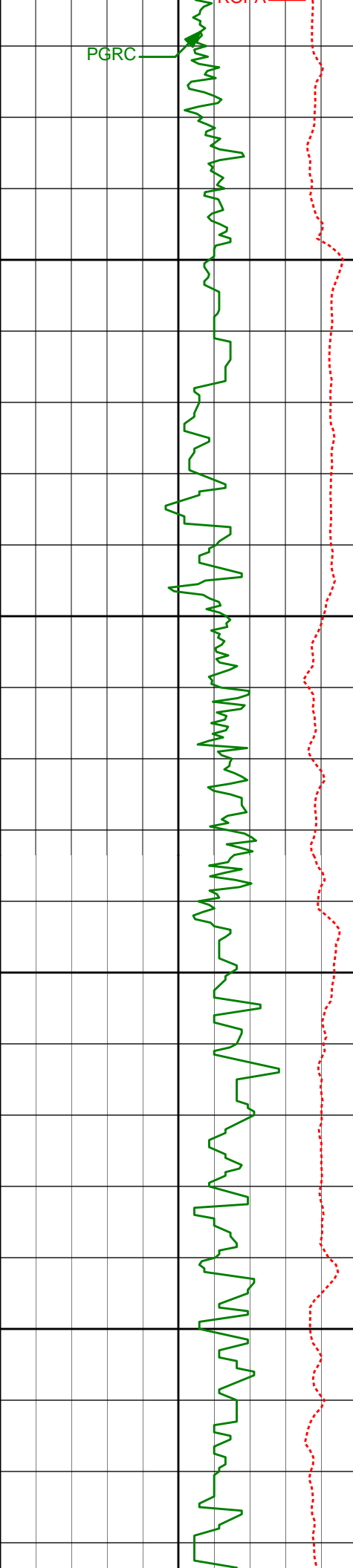
4542.92'

-158.05'

4550'

ROPA





PGRC

4600'

4650'

4700'

4750'

4687'

1.65°

25.27°

4637.85'

-159.52'

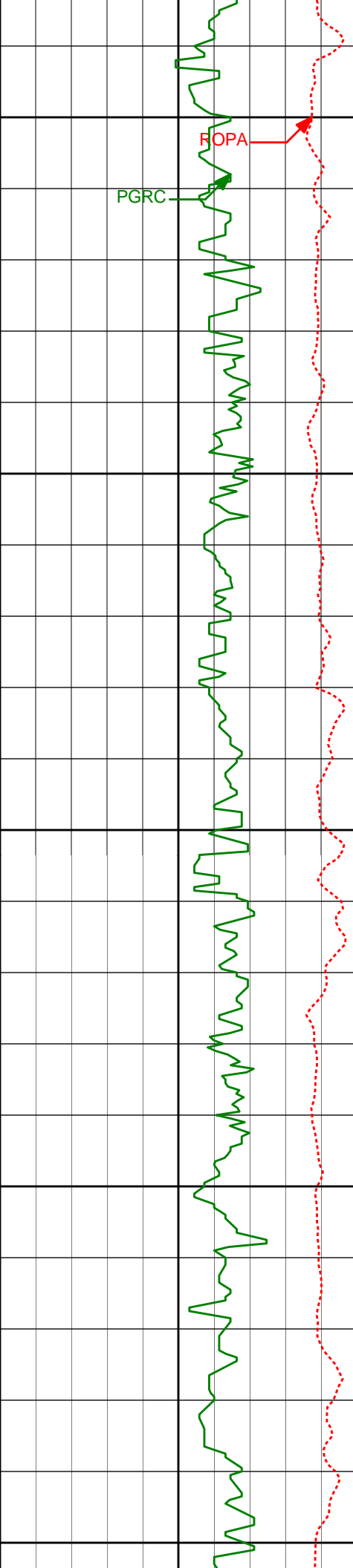
4782'

2.31°

264.17°

4732.82'

-158.14'



4800'

FOPA

PGRC

4876'

2.48°

253.32°

4826.73'

-154.35'

4850'

4900'

4971'

2.11°

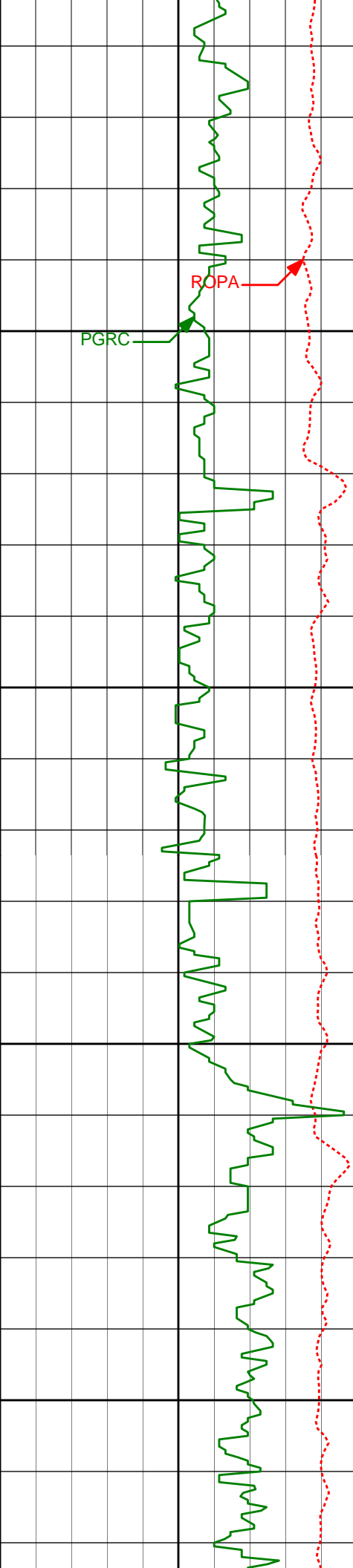
215.99°

4921.66'

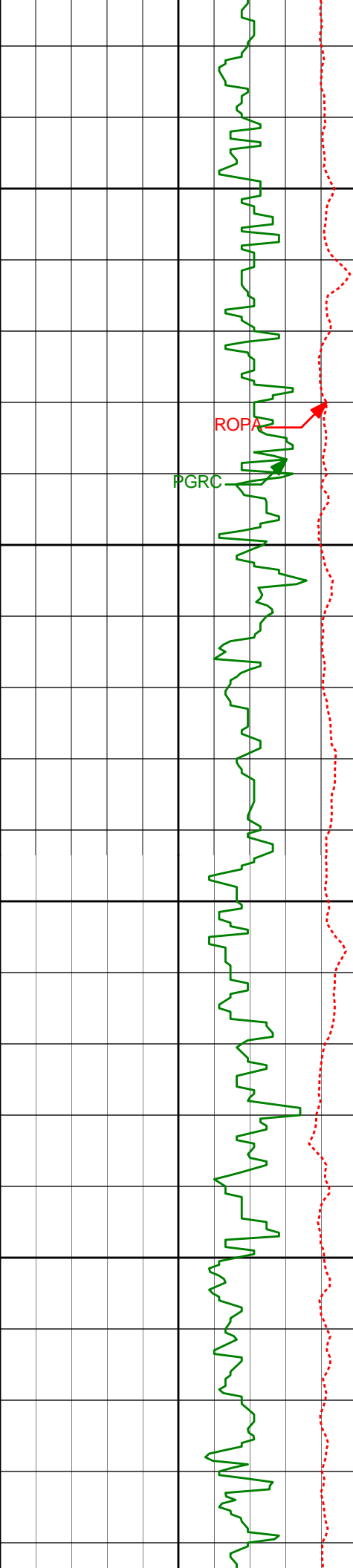
-151.46'

4950'

5000'



5066'	2.94°	194.39°	5016.57'	-150.02'
5050'				
5100'				
5161'	3.12°	196.73°	5111.44'	-148.90'
5150'				
5200'				
5255'	2.69°	179.05°	5205.32'	-148.43'



5250'

ROFA

PGRC

5300'

5350'

3.44°

189.46°

5300.18'

-148.24'

5350'

5400'

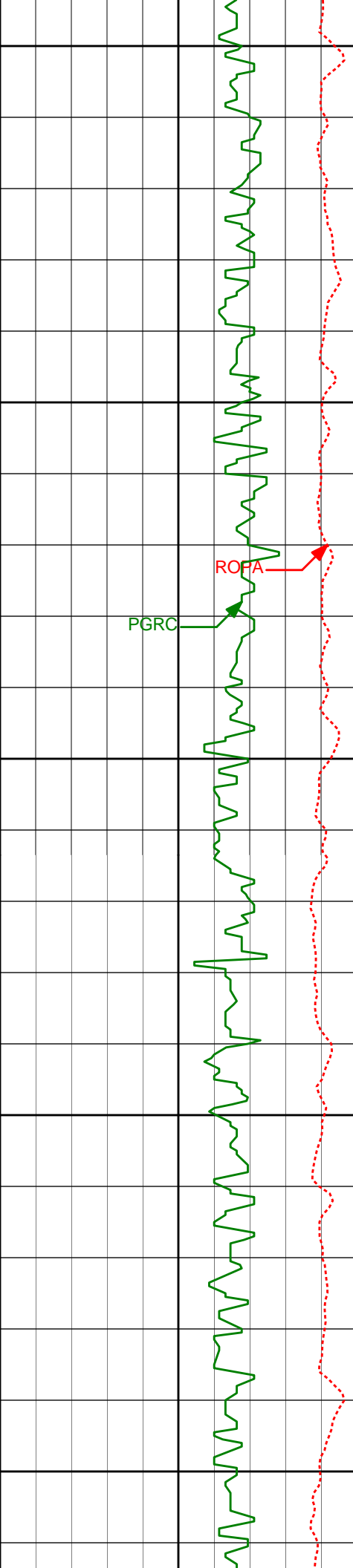
5444'

2.75°

194.59°

5394.05'

-147.46'



5450'

5539'

2.40°

182.53°

5488.95'

-147.00'

5500'

PGRC

ROFA

5550'

5634'

1.57°

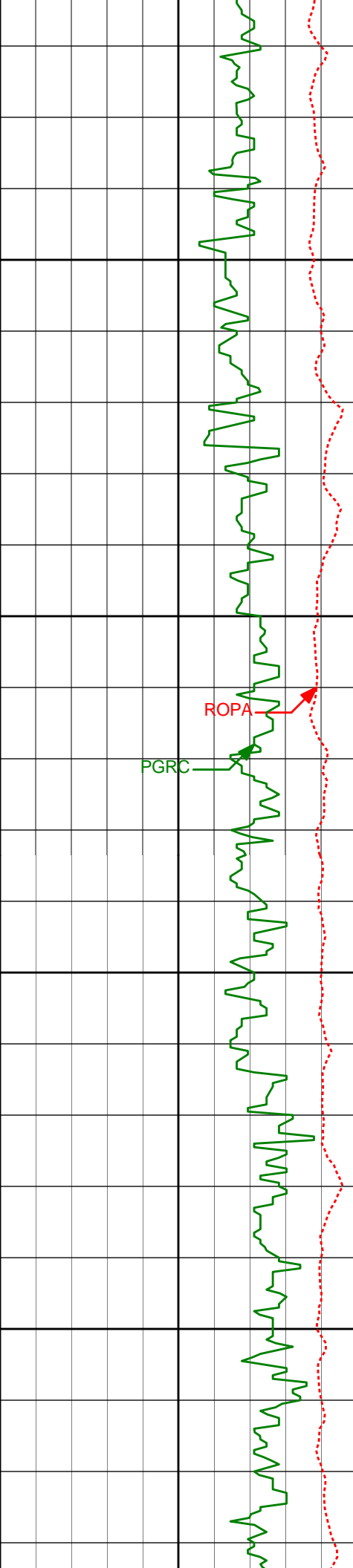
173.35°

5583.89'

-147.22'

5600'

5650'



5728' 1.62° 168.11° 5677.86' -147.77'

5700'

5750'

ROPA

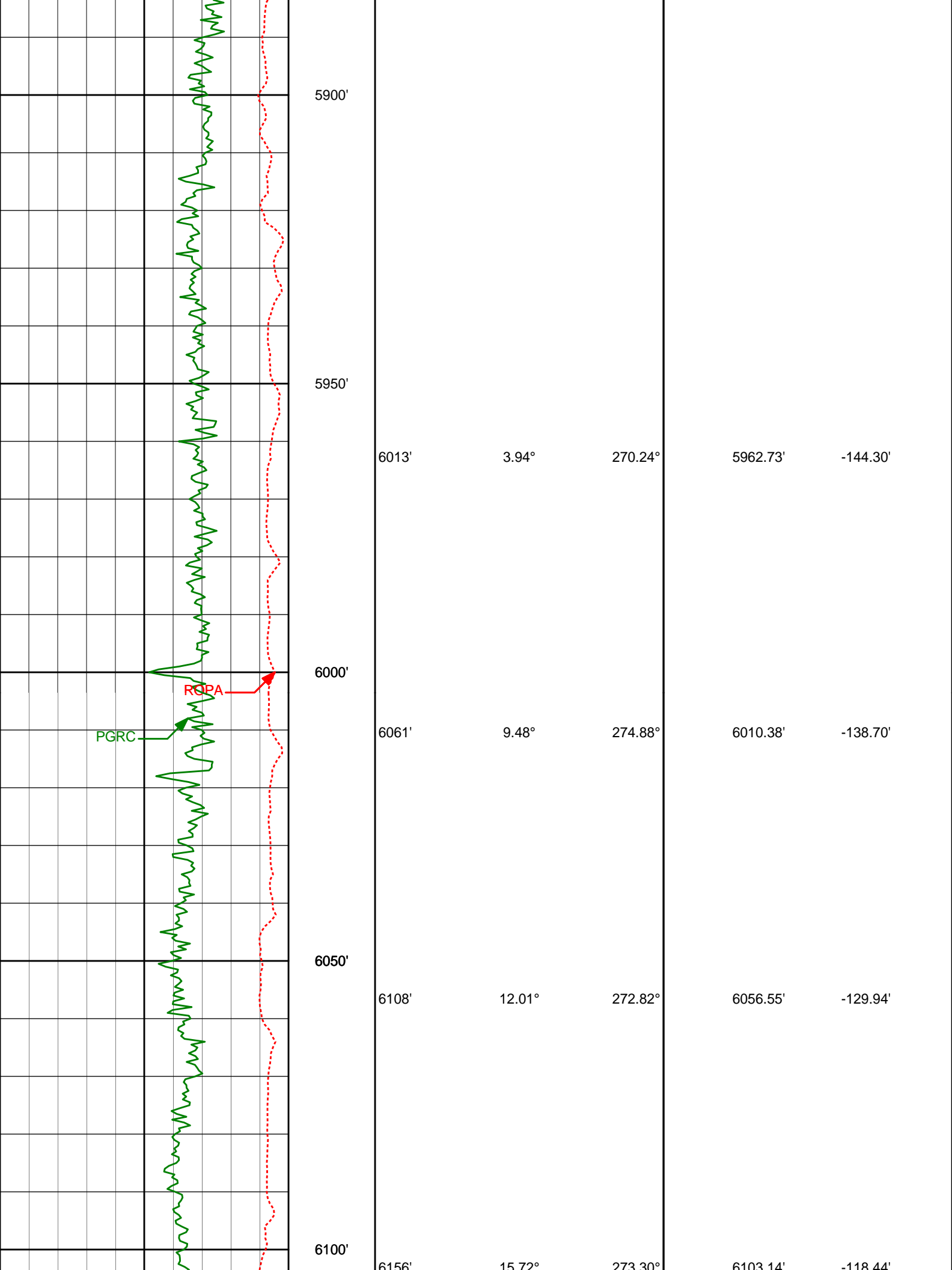
PGRC

5823' 1.47° 196.57° 5772.82' -147.82'

5800'

5850'

5924' 0.89° 188.80° 5873.80' -147.43'



5900'

5950'

6000'

6050'

6100'

6013'

6061'

6108'

6156'

3.94°

9.48°

12.01°

15.72°

270.24°

274.88°

272.82°

273.30°

5962.73'

6010.38'

6056.55'

6103.14'

-144.30'

-138.70'

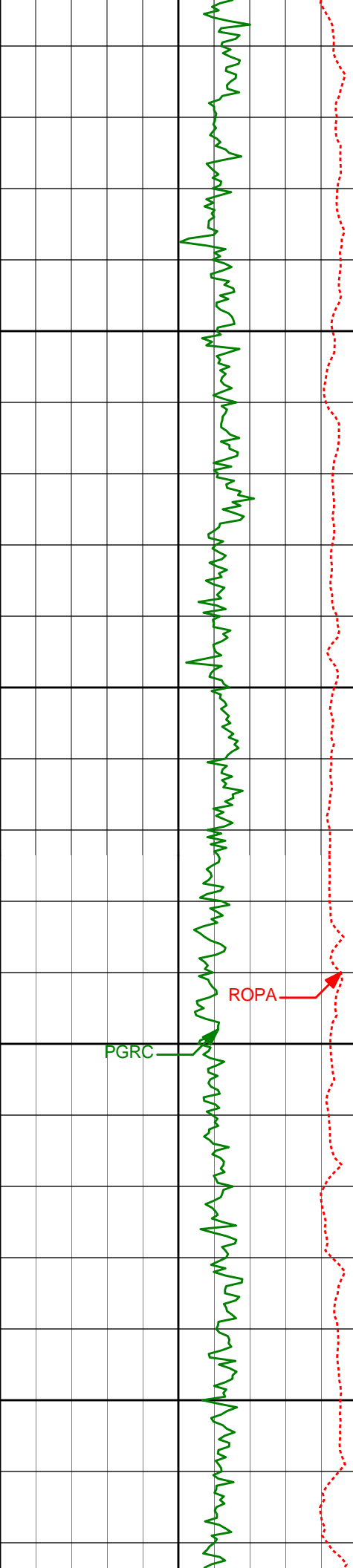
-129.94'

-118.44'

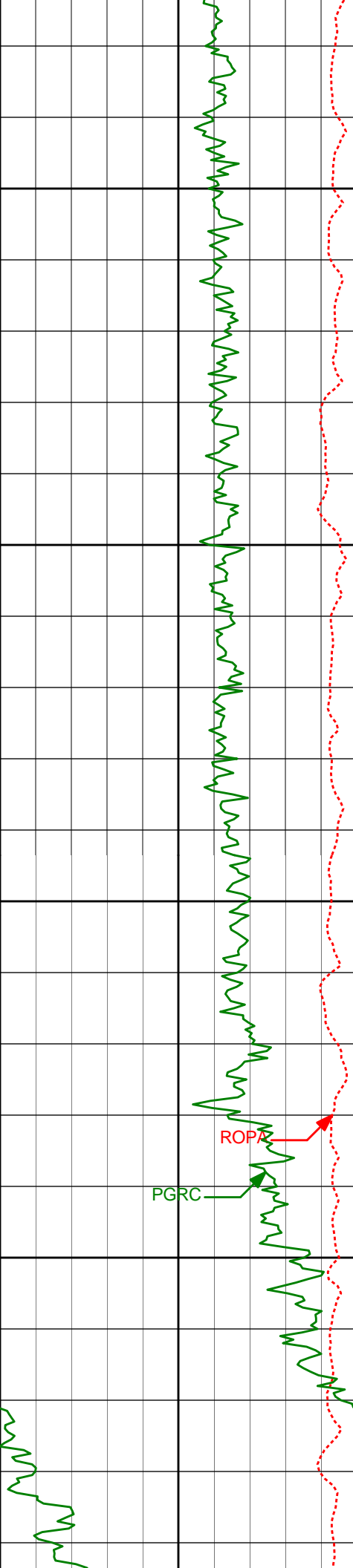
PGRC

ROPA





6150'	6203'	19.12°	272.37°	6147.98'	-104.37'
6200'	6251'	22.81°	269.23°	6192.80'	-87.22'
6250'	6298'	26.42°	266.78°	6235.52'	-67.72'
6300'	6346'	29.26°	267.98°	6277.96'	-45.41'
	6392'	32.03°	268.01°	6317.53'	-22.05'



6350'

6440'

35.14°

268.37°

6357.52'

4.41'

6400'

6487'

37.25°

267.16°

6395.45'

32.06'

6450'

6535'

39.60°

268.44°

6433.05'

61.77'

6500'

6581'

43.10°

268.23°

6467.57'

92.07'

ROPA

PGRC

6629'

47.71°

267.34°

6501.27'

126.10'

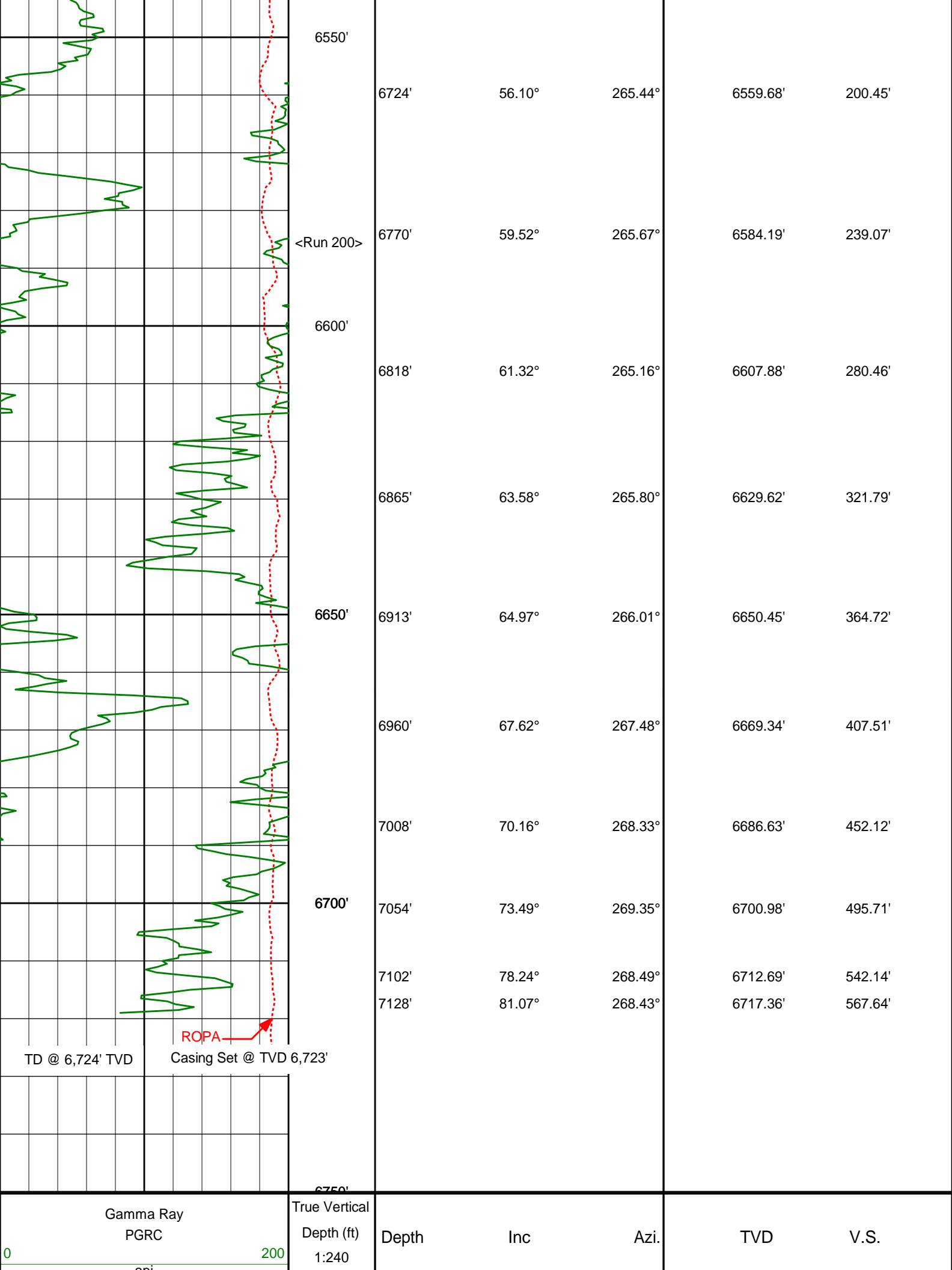
6676'

52.08°

266.64°

6531.54'

161.86'



TD @ 6,724' TVD

Casing Set @ TVD 6,723'

ROPA

Gamma Ray  
PGRC

True Vertical  
Depth (ft)  
1:240

Depth

Inc

Azi.

TVD

V.S.

0 200

Average Rate of Penetration	
ROPA	
1K	0
feet per hr	



# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

Noble Energy  
 Wells Ranch AE06-68-1HN  
 Wattenburg  
 Weld CO  
 U.S.A.  
 CA-XX-0009650356

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
658.00	0.00	0.00	658.00	0.00 N	0.00 E	0.00	0.00
808.00	0.52	163.90	808.00	0.65 S	0.19 E	-0.22	0.34
900.00	0.44	163.91	899.99	1.39 S	0.40 E	-0.47	0.08
992.00	0.57	188.25	991.99	2.18 S	0.43 E	-0.54	0.27
1087.00	0.58	149.95	1086.99	3.06 S	0.61 E	-0.76	0.40
1181.00	0.62	193.58	1180.98	3.98 S	0.73 E	-0.92	0.48
1276.00	0.70	204.18	1275.98	5.01 S	0.37 E	-0.61	0.15
1560.00	0.93	211.57	1559.95	8.55 S	1.55 W	1.13	0.09
1655.00	0.68	282.34	1654.94	9.09 S	2.50 W	2.05	1.00
1749.00	0.83	263.62	1748.93	9.05 S	3.72 W	3.27	0.31
1844.00	0.74	204.92	1843.92	9.68 S	4.67 W	4.19	0.82
1939.00	0.81	288.84	1938.92	10.02 S	5.56 W	5.06	1.09
2032.00	0.80	298.20	2031.91	9.50 S	6.75 W	6.28	0.14
2132.00	1.66	280.05	2131.89	8.91 S	8.80 W	8.35	0.93
2227.00	1.01	316.35	2226.86	8.07 S	10.73 W	10.32	1.09
2322.00	1.20	17.50	2321.85	6.51 S	11.01 W	10.68	1.20
2416.00	2.46	28.42	2415.80	3.79 S	9.75 W	9.55	1.38
2510.00	4.11	30.47	2509.64	0.89 N	7.08 W	7.12	1.75
2605.00	5.12	22.58	2604.33	7.73 N	3.73 W	4.10	1.25
2700.00	6.45	24.09	2698.84	16.51 N	0.07 E	0.73	1.41
2795.00	7.51	24.29	2793.14	27.04 N	4.80 E	-3.48	1.11
2889.00	8.61	20.29	2886.21	39.24 N	9.77 E	-7.84	1.32
2983.00	10.73	20.90	2978.87	54.02 N	15.34 E	-12.68	2.26
3078.00	12.66	22.45	3071.89	71.91 N	22.47 E	-18.93	2.05
3173.00	14.42	22.79	3164.25	92.43 N	31.03 E	-26.47	1.86
3268.00	13.33	22.63	3256.48	113.45 N	39.82 E	-34.23	1.15
3362.00	13.61	28.48	3347.89	133.17 N	49.27 E	-42.70	1.48
3457.00	11.93	29.24	3440.54	151.56 N	59.39 E	-51.92	1.77
3551.00	13.60	29.41	3532.21	169.67 N	69.57 E	-61.20	1.77
3646.00	15.33	27.69	3624.20	190.52 N	80.89 E	-71.49	1.88
3741.00	17.02	26.53	3715.43	214.09 N	92.94 E	-82.37	1.81
3835.00	17.47	26.00	3805.21	239.08 N	105.28 E	-93.47	0.51
3929.00	17.94	24.98	3894.75	264.89 N	117.57 E	-104.49	0.60
4024.00	17.29	25.90	3985.30	290.85 N	129.92 E	-115.56	0.74
4119.00	15.40	25.74	4076.45	314.92 N	141.57 E	-126.02	1.99
4214.00	12.92	28.29	4168.56	335.64 N	152.09 E	-135.51	2.70
4308.00	9.61	30.06	4260.74	351.68 N	161.00 E	-143.62	3.54
4403.00	7.25	32.16	4354.70	363.62 N	168.16 E	-150.20	2.50
4498.00	5.09	31.13	4449.15	372.31 N	173.53 E	-155.13	2.28
4592.00	2.81	26.70	4542.92	377.94 N	176.72 E	-158.05	2.44
4687.00	1.65	25.27	4637.85	381.26 N	178.35 E	-159.52	1.23
4782.00	2.31	264.17	4732.82	382.30 N	177.03 E	-158.14	3.65
4876.00	2.48	253.32	4826.73	381.53 N	173.20 E	-154.35	0.51
4971.00	2.11	215.99	4921.66	379.52 N	170.20 E	-151.46	1.59
5066.00	2.94	194.39	5016.57	375.74 N	168.57 E	-150.02	1.32
5161.00	3.12	196.73	5111.44	370.90 N	167.22 E	-148.90	0.23
5255.00	2.69	179.05	5205.32	366.25 N	166.52 E	-148.43	1.05
5350.00	3.44	189.46	5300.18	361.21 N	166.09 E	-148.24	0.99
5444.00	2.75	194.59	5394.05	356.24 N	165.05 E	-147.46	0.79

5539.00	2.40	182.53	5488.95	352.04 N	164.39 E	-147.00	0.68
5634.00	1.57	173.35	5583.89	348.76 N	164.46 E	-147.22	0.93
5728.00	1.62	168.11	5677.86	346.17 N	164.88 E	-147.77	0.16
5823.00	1.47	196.57	5772.82	343.68 N	164.81 E	-147.82	0.82
5924.00	0.89	188.80	5873.80	341.66 N	164.32 E	-147.43	0.59
6013.00	3.94	270.24	5962.73	340.99 N	161.15 E	-144.30	4.39
6061.00	9.48	274.88	6010.38	341.33 N	155.56 E	-138.70	11.59
6108.00	12.01	272.82	6056.55	341.90 N	146.82 E	-129.94	5.43
6156.00	15.72	273.30	6103.14	342.52 N	135.34 E	-118.44	7.75
6203.00	19.12	272.37	6147.98	343.21 N	121.28 E	-104.37	7.26
6251.00	22.81	269.23	6192.80	343.41 N	104.12 E	-87.22	8.03
6298.00	26.42	266.78	6235.52	342.69 N	84.56 E	-67.72	7.99
6346.00	29.26	267.98	6277.96	341.68 N	62.17 E	-45.41	6.02
6392.00	32.03	268.01	6317.53	340.86 N	38.74 E	-22.05	6.02
6440.00	35.14	268.37	6357.52	340.02 N	12.21 E	4.41	6.49
6487.00	37.25	267.16	6395.45	338.93 N	15.52 W	32.06	4.76
6535.00	39.60	268.44	6433.05	337.80 N	45.33 W	61.77	5.17
6581.00	43.10	268.23	6467.57	336.91 N	75.70 W	92.07	7.60
6629.00	47.71	267.34	6501.27	335.58 N	109.84 W	126.10	9.69
6676.00	52.08	266.64	6531.54	333.69 N	145.73 W	161.86	9.39
6724.00	56.10	265.44	6559.68	330.99 N	184.51 W	200.45	8.60
6770.00	59.52	265.67	6584.19	327.97 N	223.31 W	239.07	7.44
6818.00	61.32	265.16	6607.88	324.63 N	264.92 W	280.46	3.88
6865.00	63.58	265.80	6629.62	321.35 N	306.46 W	321.79	4.94
6913.00	64.97	266.01	6650.45	318.26 N	349.59 W	364.72	2.93
6960.00	67.62	267.48	6669.34	315.82 N	392.55 W	407.51	6.33
7008.00	70.16	268.33	6686.63	314.19 N	437.29 W	452.12	5.54
7054.00	73.49	269.35	6700.98	313.31 N	480.98 W	495.71	7.55
7102.00	78.24	268.49	6712.69	312.43 N	527.51 W	542.14	10.05
7128.00	81.07	268.43	6717.36	311.74 N	553.07 W	567.64	10.89

**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 272.80 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.81 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7128.00 FEET  
IS 634.88 FEET ALONG 299.41 DEGREES (GRID)**