

**PCDC - Pressure Case Directional**  
**PCGK - Pressure Case Gamma**

**1 : 240**

Country		: USA		<div>Company : Noble Energy</div> <div>Rig : H&amp;P 322</div> <div>Well : Krier GV26-62HN</div> <div>Field : Wattenberg</div> <div>Country : USA</div> <div>API Number : 05-123-36667</div>			
Field		: Wattenberg					
Location		: Lat: 40° 42' 48.64" North Long: 104° 9' 51.46" West					
Well		: Krier GV26-62HN					
Company		: Noble Energy					
Rig		: H&P 322					
Permanent Datum : Ground Level				Elevation : 4974.00 ft		Other Services Directional Drilling	
Log Measured From : Drill Floor				24.00 ft Above Permanent Datum			
Drilling Measured From : Drill Floor				MD LOG			
Depth Logged : 851.00 ft To 10,808.00 ft				Unit No. : 11210425		Job No. :CA-XX-0900166418	
Date Logged : 01-Mar-13 To 07-Mar-13							
Total Depth MD : 10,808.00 ft TVD : 6,470.29 ft				Plot Type : Final			
Spud Date : 28-Feb-13				Plot Date : 07-Mar-13			
Run No.		Borehole Record (MD)		Run No.		Borehole Record (MD)	
	Size	From	To		Size	From	To
100	8.750 in	851.00 ft	5740.00 ft				
200	8.750 in	5740.00 ft	6918.00 ft				
300	6.125 in	6918.00 ft	10808.00 ft				
				Casing Record (MD)			
	Size	Weight	From	To			

**WELL INFORMATION**

MWD Run Number	100	200	300		
Date run completed	02-Mar-13	03-Mar-13	07-Mar-13		
Rig Bit Number	2	3	4		
Bit Size (in)	8.750	8.750	6.125		
Tool Nominal OD (in)	6.750	6.750	8.000		
Log Start Depth (MD, ft)	851.00	5,740.00	6,918.00		
Log End Depth (MD, ft)	5,740.00	6,918.00	10,808.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	01-Mar-13 17:16	02-Mar-13 21:42	05-Mar-13 05:05		
Drill/Wipe End Date and Time	02-Mar-13 11:02	03-Mar-13 14:17	06-Mar-13 21:36		
Min Inc (deg) @ Depth (MD, ft)	.16 @ 4,702.00	4.57 @ 5,833.00	85.00 @ 6,936.00		
Max Inc (deg) @ Depth (MD, ft)	16.82 @ 3,753.00	78.15 @ 6,863.00	93.12 @ 9,214.00		
Bit TFA(in2) / Bit Type	.75 / PDC	.86 / PDC	.46 / PDC		
Flow Rate (gpm)	553.00	580.00	270.00		
Max AV (fpm) / CV (fpm) @ MWD	477.1 / 477.1	477.1 / 477.1	442.9 / 442.9		
Fluid Type	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.90 / 27.00	10.30 / 37.00	10.10 / 35.00		
Filtrate CL (ppm)	700.00	800.00	800.00		
pH / Fluid Loss (mptm)	8.40 / N/A	9.60 / N/A	8.80 / NA		
PV (cP) / YP (lbf2)	1 / 4.00	12 / 10.00	11 / 9.00		
% Solids / % Sand	3.50 / 0.30	8.8 / 10.1	9.3 / 0.80		
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	NA / NA		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	NA @ NA		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	NA @ NA		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	NA @ NA		

Max Tool Temp (degF) / Source	141.70 / PCM	162.80 / PCM	213.40 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	NA @ NA		
Lead MWD Engineer	Osahon Igunbor	Osahon Igunbor	Osahon Igunbor		
Customer Representative	Jeremy Stolz	Jeremy Stolz	Jeremy Stolz		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.76	5.76	5.76		
Sub Serial Number	246473	246473	11744843		
Insert Serial Number	11227512	11227512	11227512		
Date and Time Initialized	28-Feb-13 15:50	15-Feb-13 15:50	04-Mar-13 09:18		
Date and Time Read	03-Mar-13 21:54	03-Mar-13 21:47	07-Mar-13 08:59		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	56.00	55.00	67.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	246473	246473	11744843		
Sonde Serial Number	11833053	11833053	11833053		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	280.82	272.68	24.93		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	48.94	48.25	60.07		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	246473	246473	11744843		
Insert/Sonde Serial Number	11293406	11293406	11681003		

## REMARKS

1. All depths are measured bit depths and are calibrated to the driller' pipe tally and are measured from the drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
4. The Following smoothing parameters have been applied to the data"

PGXR-T (Gamma Ray CG):  
Interval Resolution: 0.5 feet  
Coercion Distance: 0.6 feet  
Gap Fill: 3.0 feet

ROPA (Rate of Penetration):  
Interval Resolution: 0.5 feet  
Coercion Distance: 1.2 feet

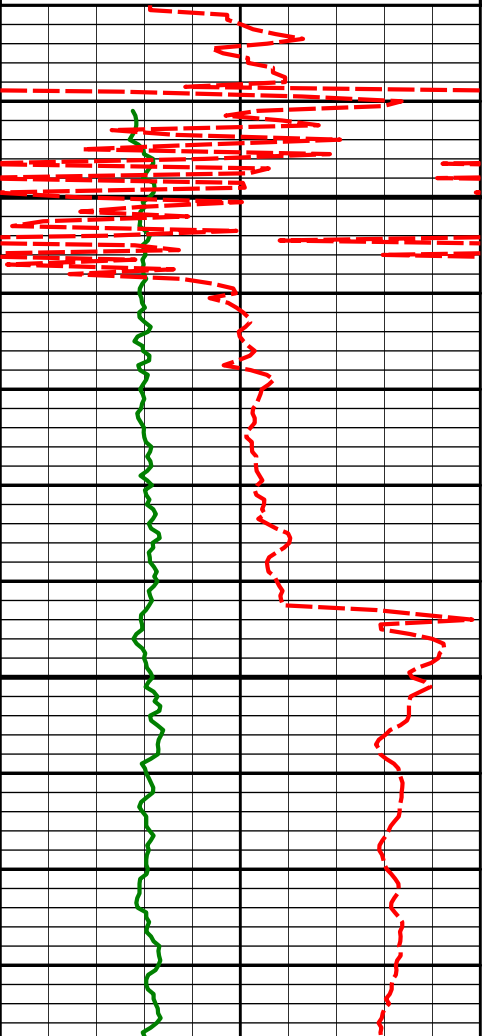
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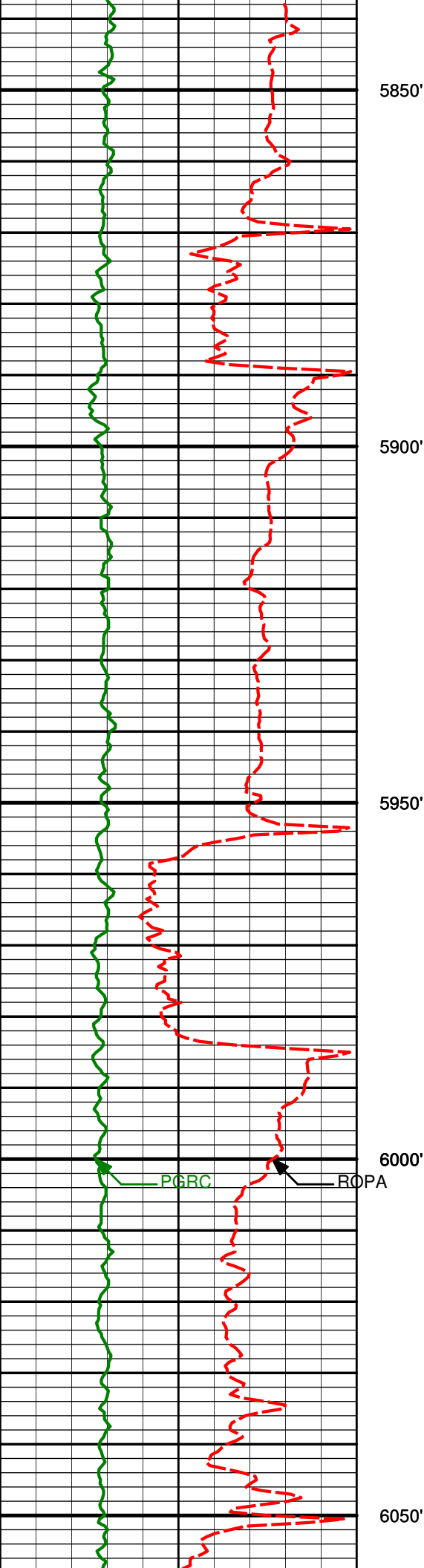
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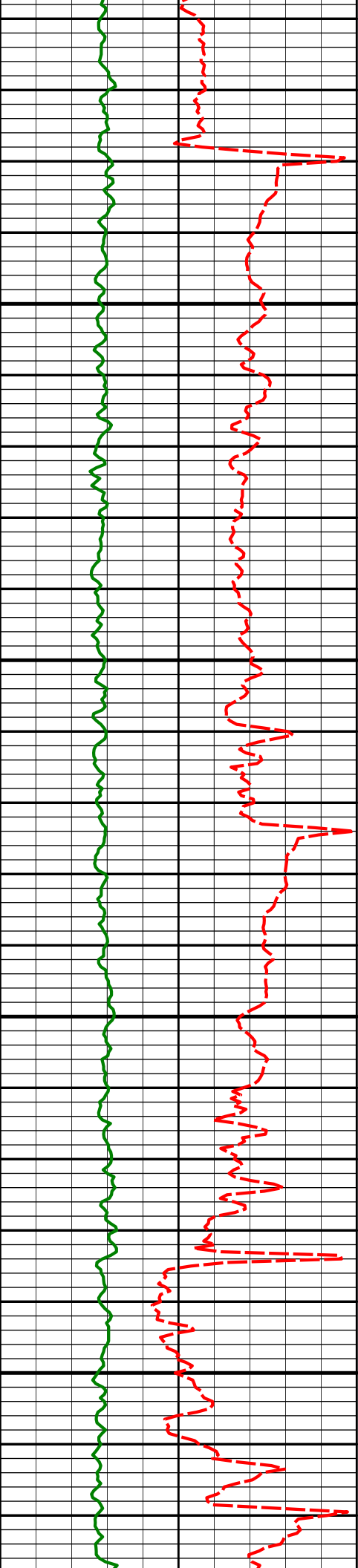
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MD Detail Log 1:240

Gamma Ray CG (PGXR-T) (Api)					
0400					
Avg Rate of Penetration feet per hr	Feet				
6000					
	Run200	Depth	Inc	Azm	TVD
	KOP				Vsec
	5750'				
	5800'				
		5833'	4.57°	262.69°	5765.09'
					-321.28'



5928'	13.28°	264.57°	5858.85'	-306.79'
6023'	19.58°	269.93°	5949.93'	-280.14'



6100'

6118'

27.19°

266.04°

6037.07'

-242.72'

6150'

6200'

6213'

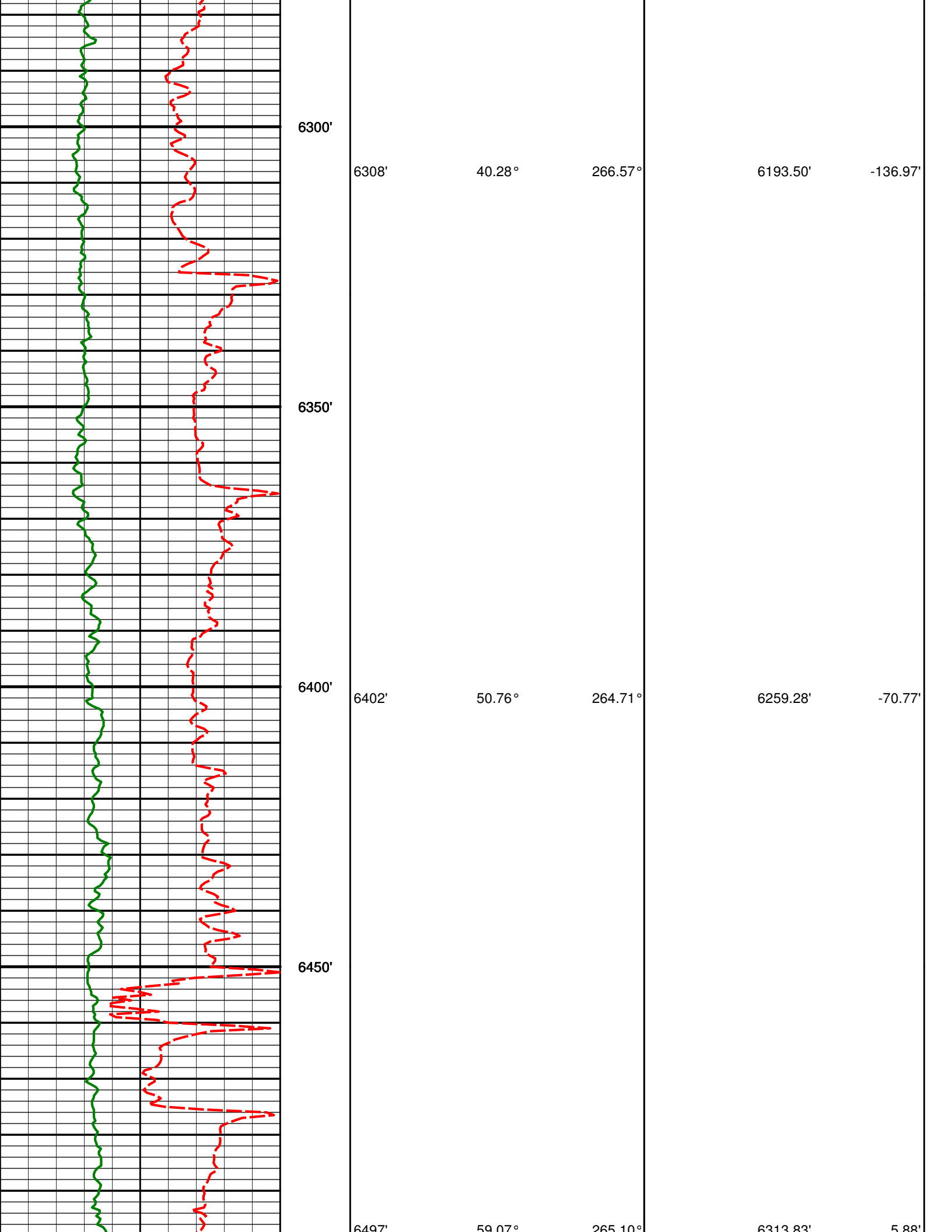
35.07°

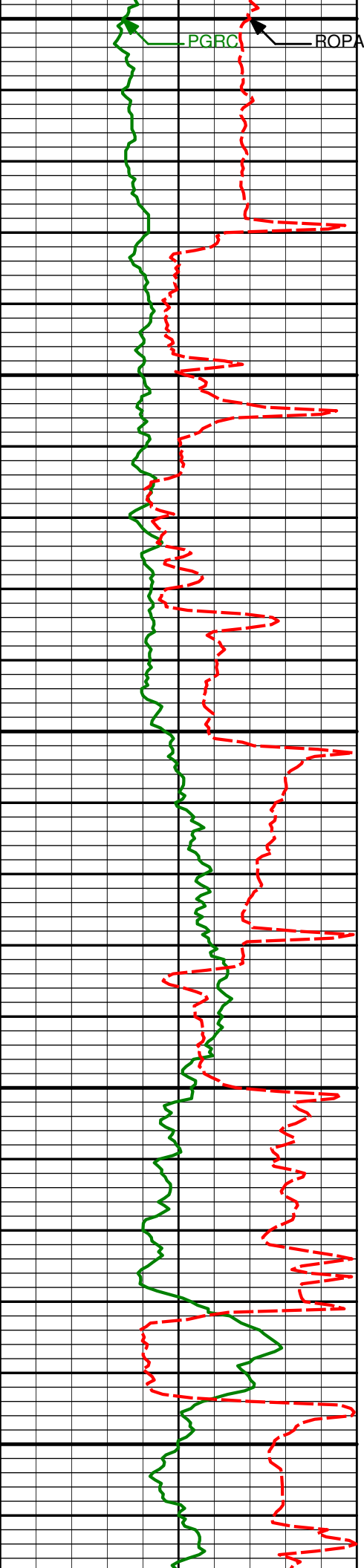
264.00°

6118.33'

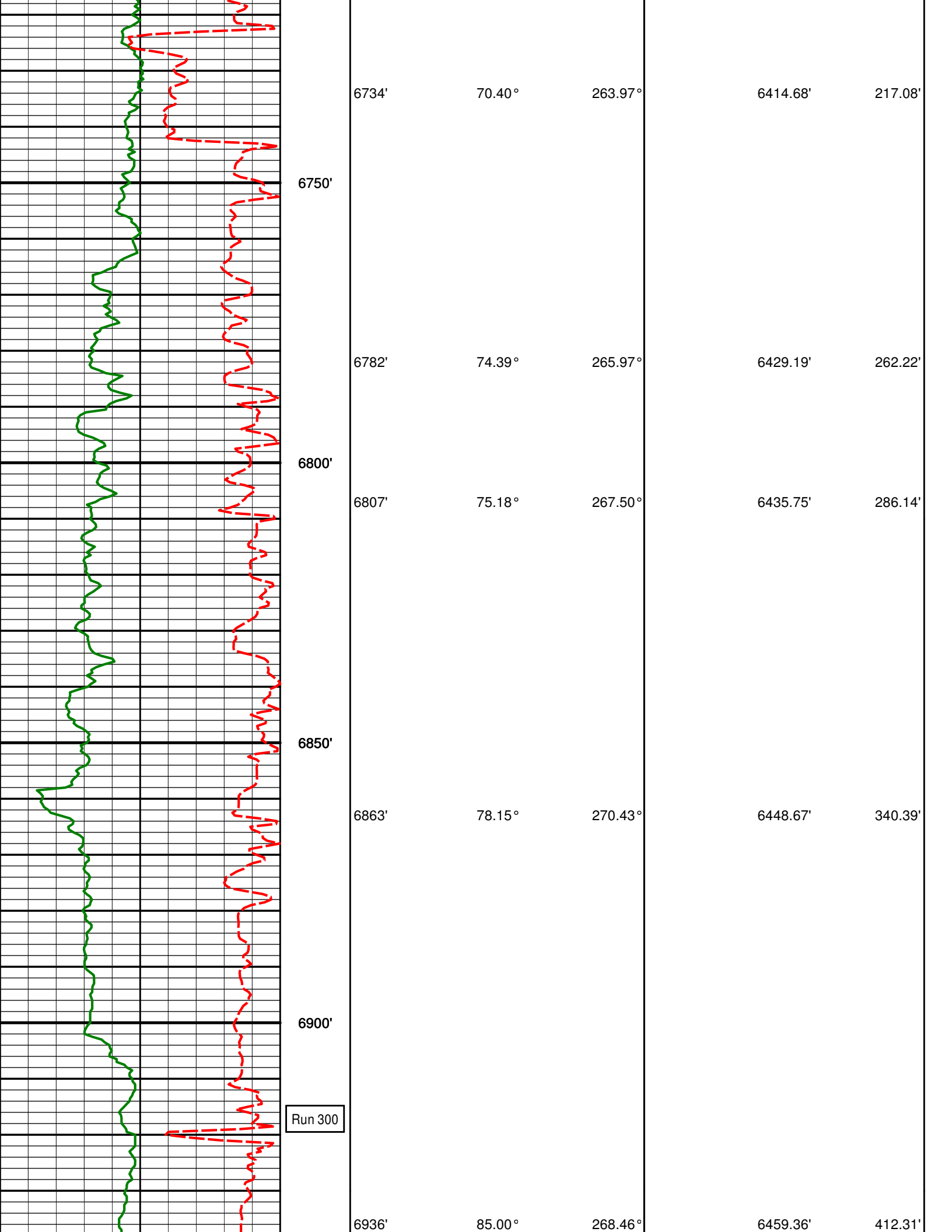
-194.30'

6250'

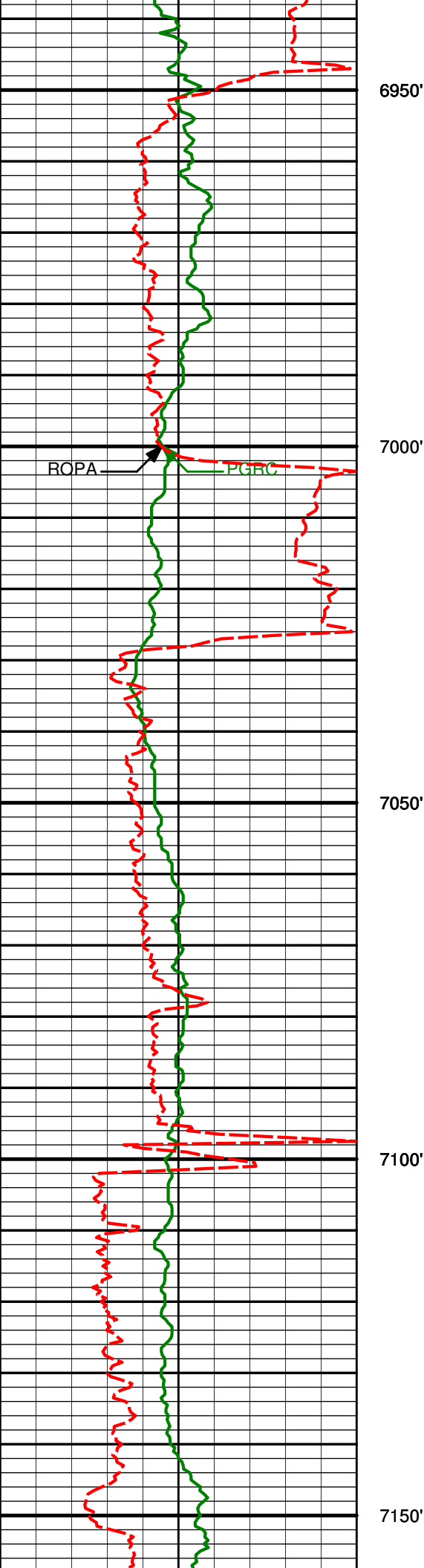




6497'	62.07°	265.10°	6318.55'	5.00'
6544'	62.21°	265.35°	6336.87'	46.34'
6592'	62.61°	265.32°	6359.10'	88.37'
6639'	66.07°	264.45°	6379.45'	130.17'
6687'	68.25°	264.60°	6398.08'	173.77'

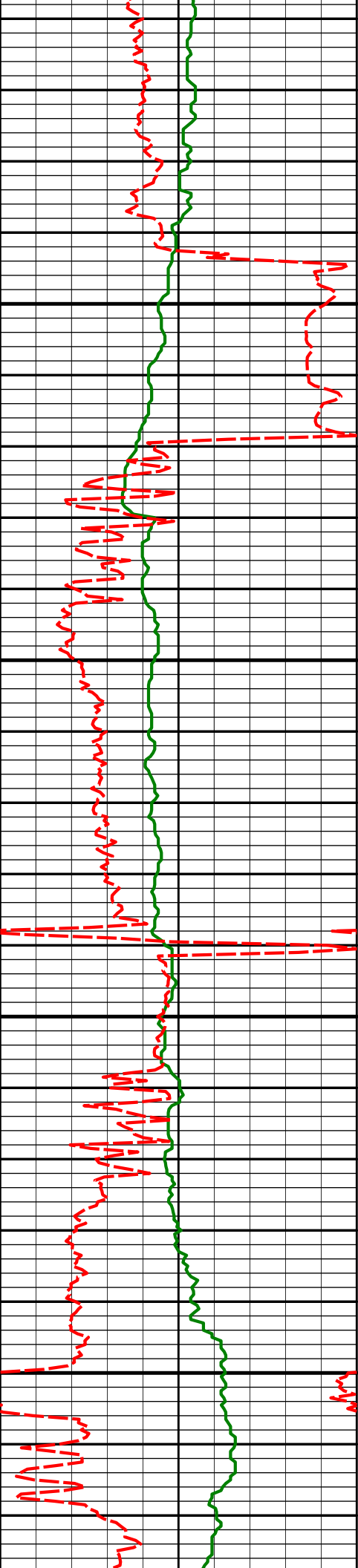






7031'	88.40°	269.43°	6464.83'	506.73'
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7126'	87.81°	269.04°	6467.98'	601.32'
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7200'

7221'

89.41°

269.69°

6470.28'

695.95'

7250'

7300'

7315'

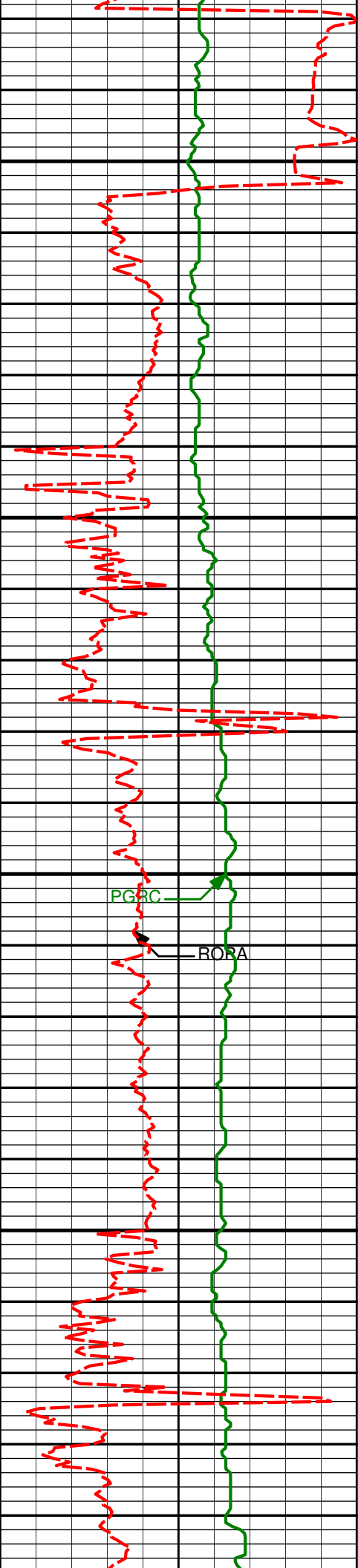
88.67°

269.43°

6471.85'

789.62'

7350'



7410'

90.22°

269.57°

6472.77'

884.30'

7450'

7505'

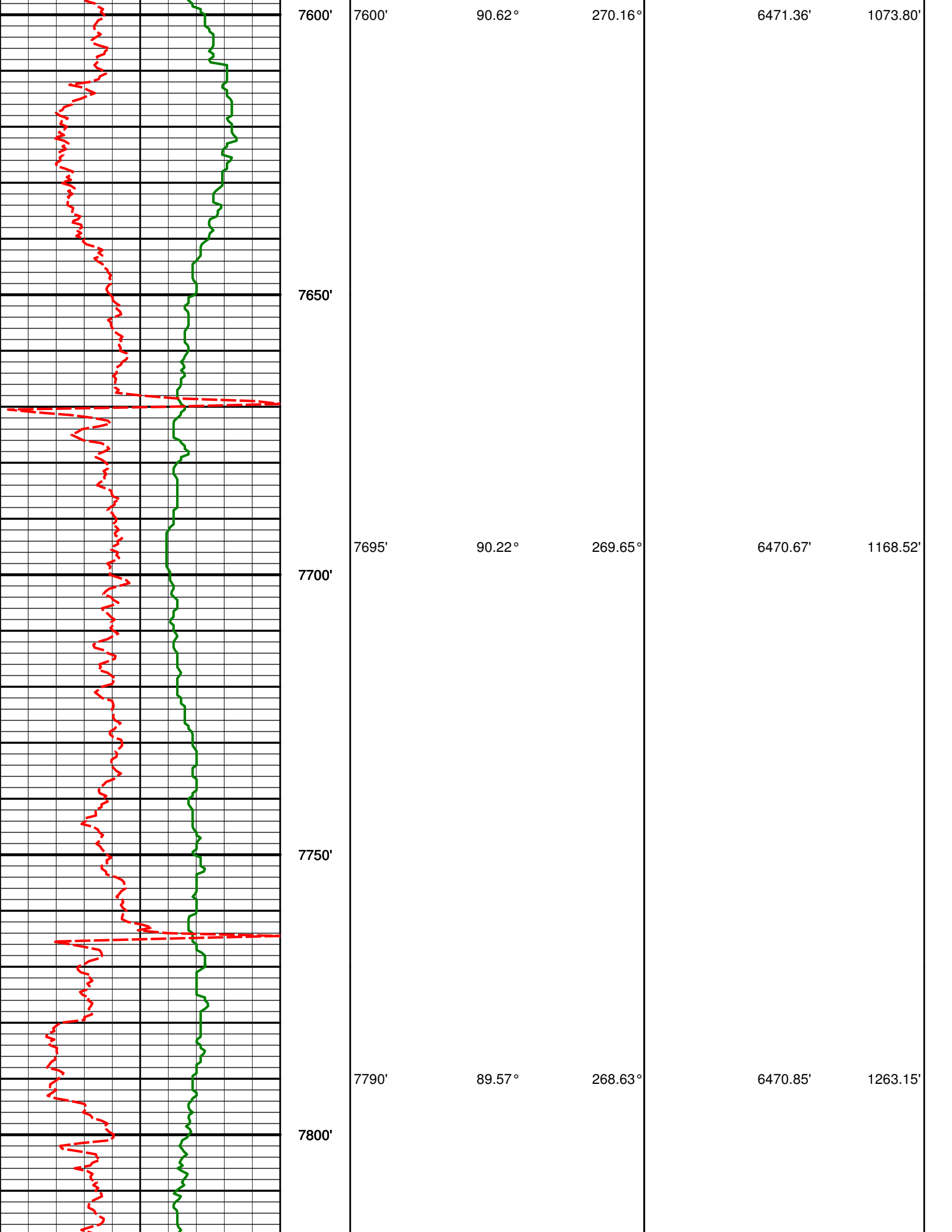
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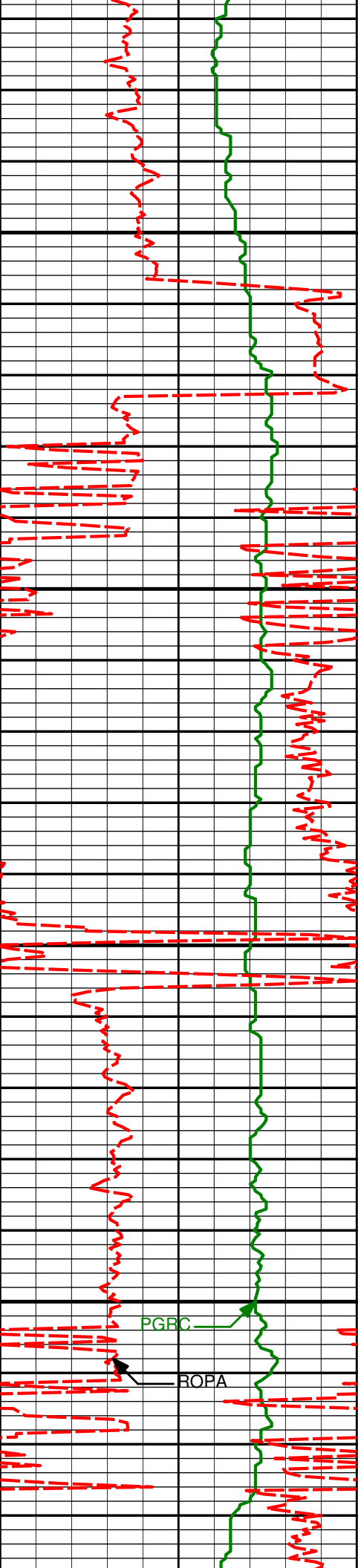
270.32°

6472.23'

979.03'

7550'





7850'

7885'

89.97°

269.50°

6471.23'

1357.76'

7900'

7950'

7979'

89.57°

268.54°

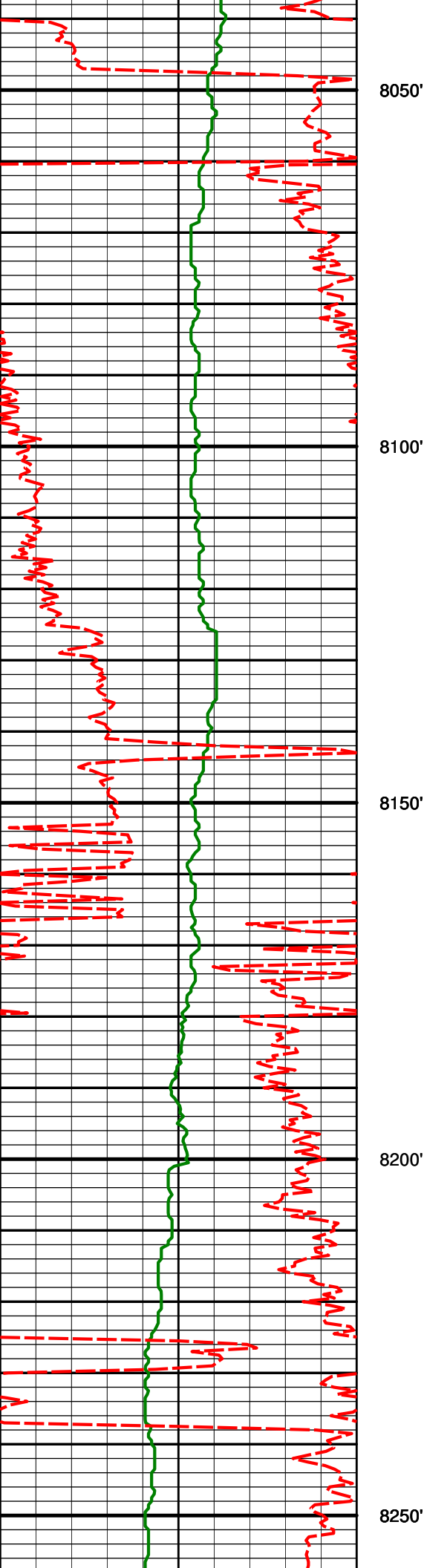
6471.61'

1451.37'

8000'

PGRC

ROPA



8075'

90.37°

267.33°

6471.66'

1546.79'

8100'

8150'

8169'

90.18°

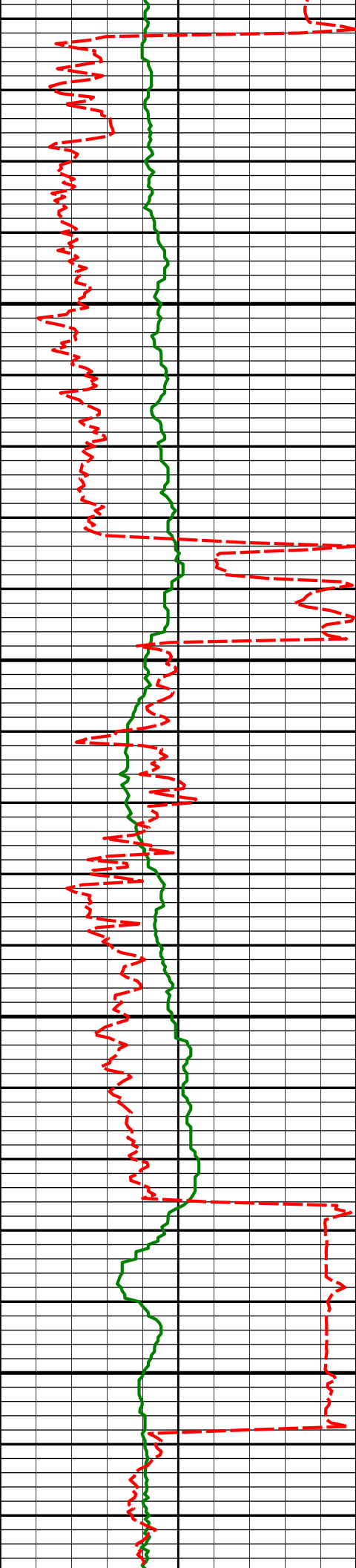
266.77°

6471.21'

1640.06'

8200'

8250'



8264'

89.82°

267.54°

6471.21'

1734.33'

8300'

8350'

8359'

87.96°

267.57°

6473.05'

1828.67'

8400'

8450'

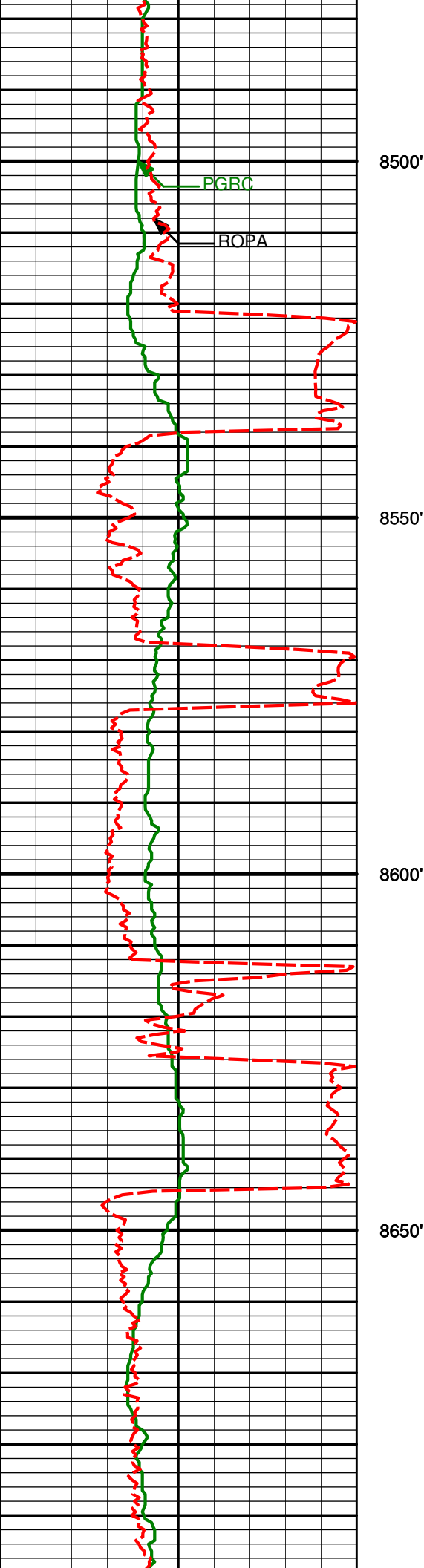
8454'

90.96°

266.54°

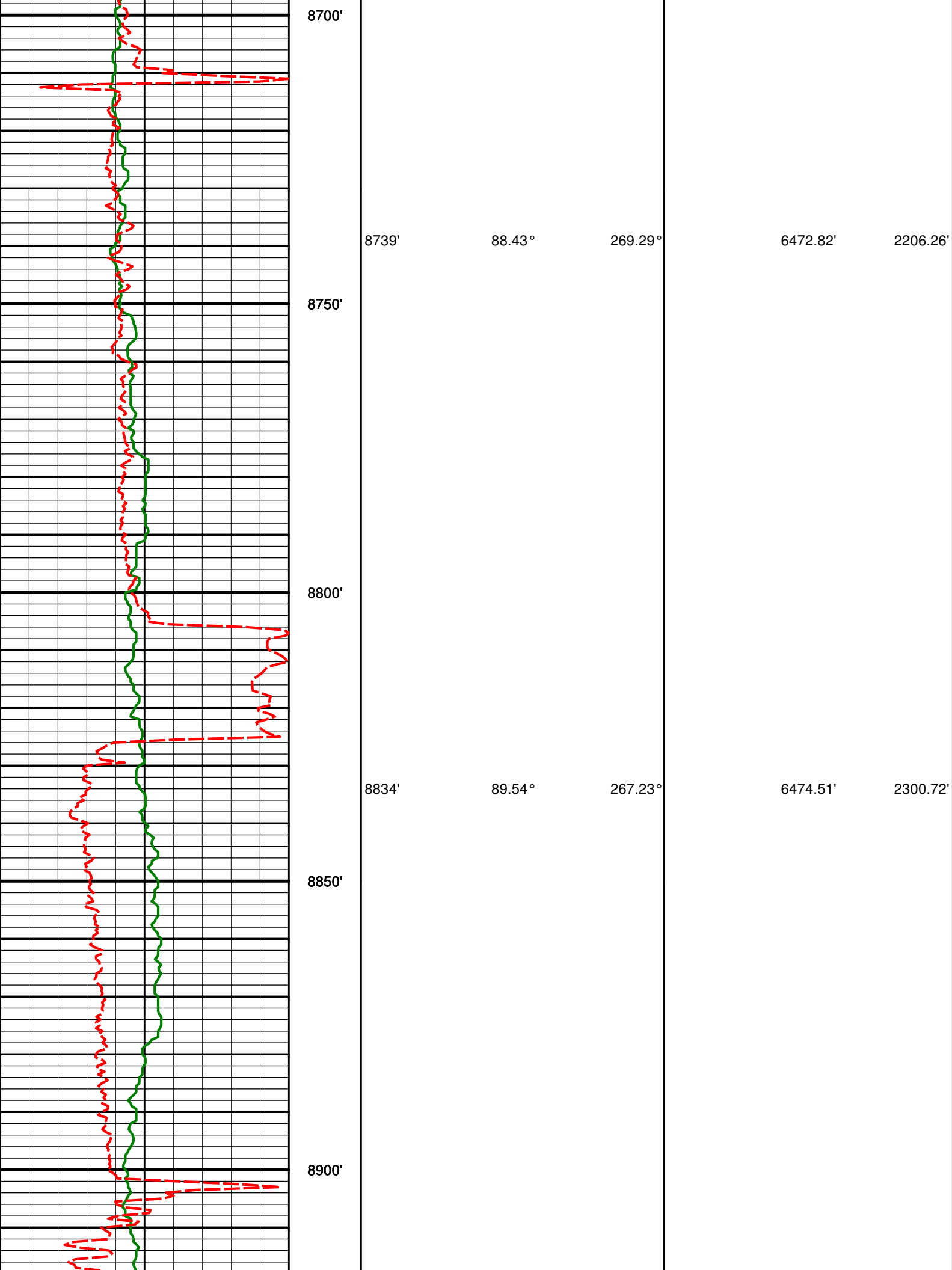
6473.95'

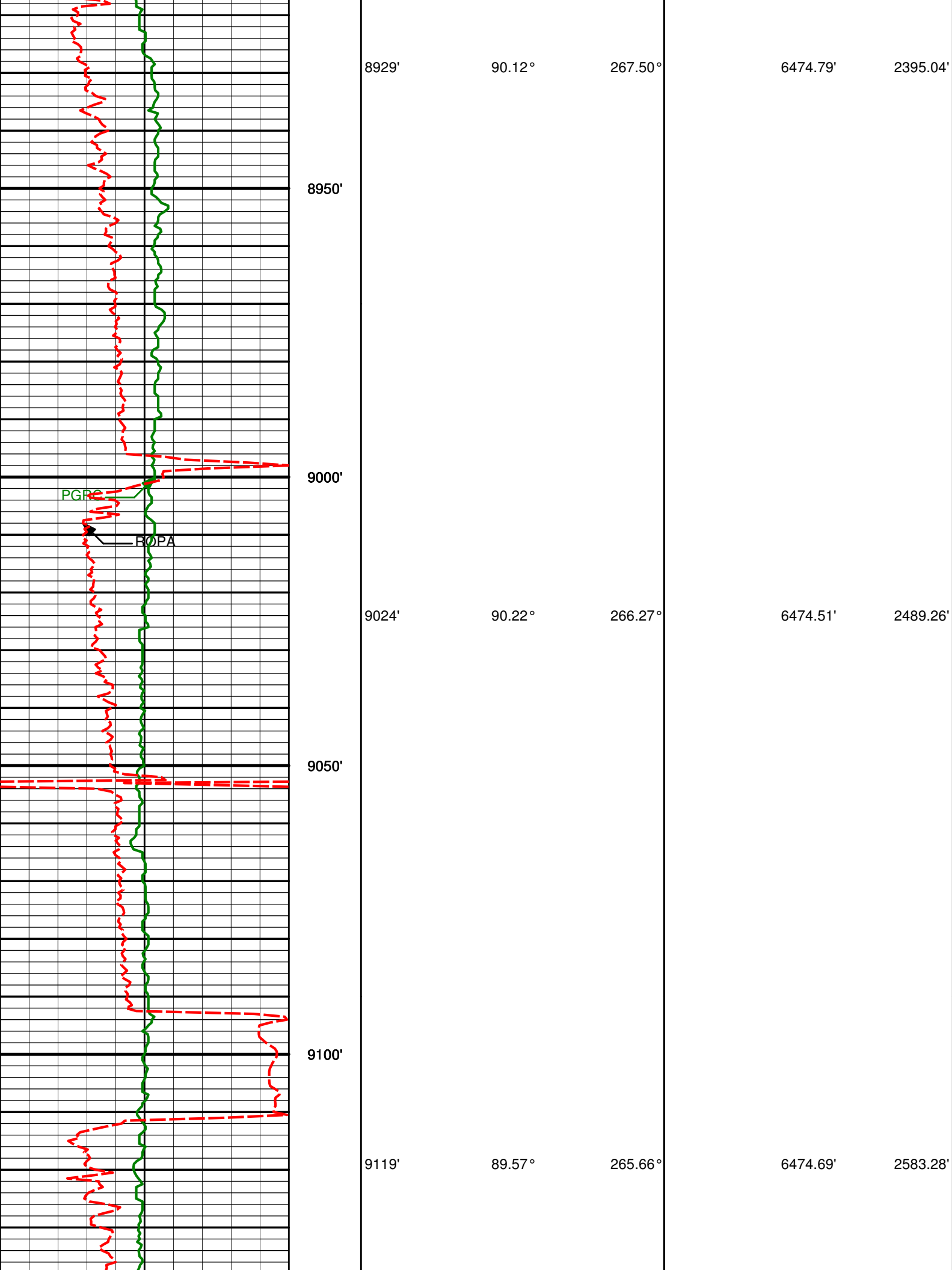
1922.91'

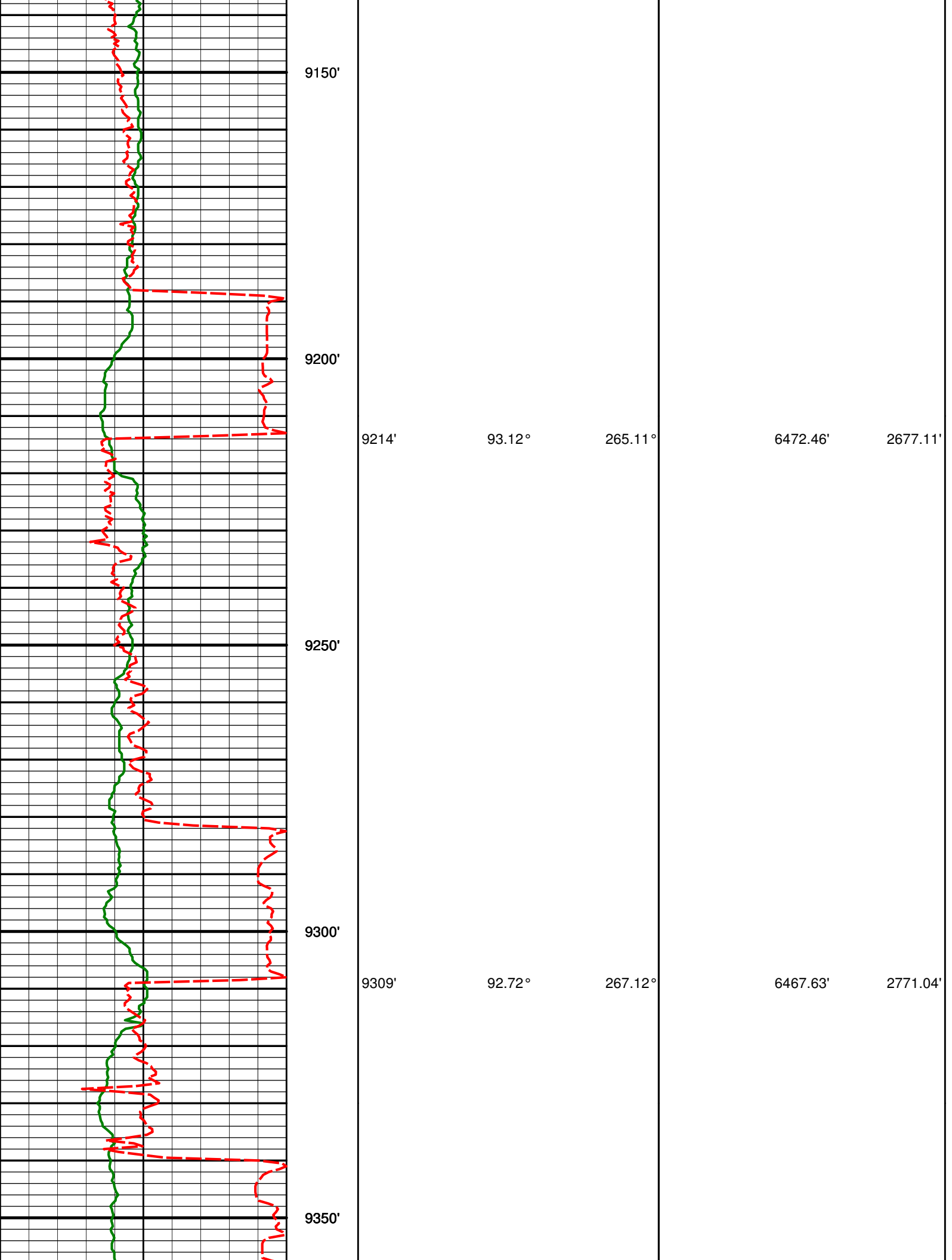


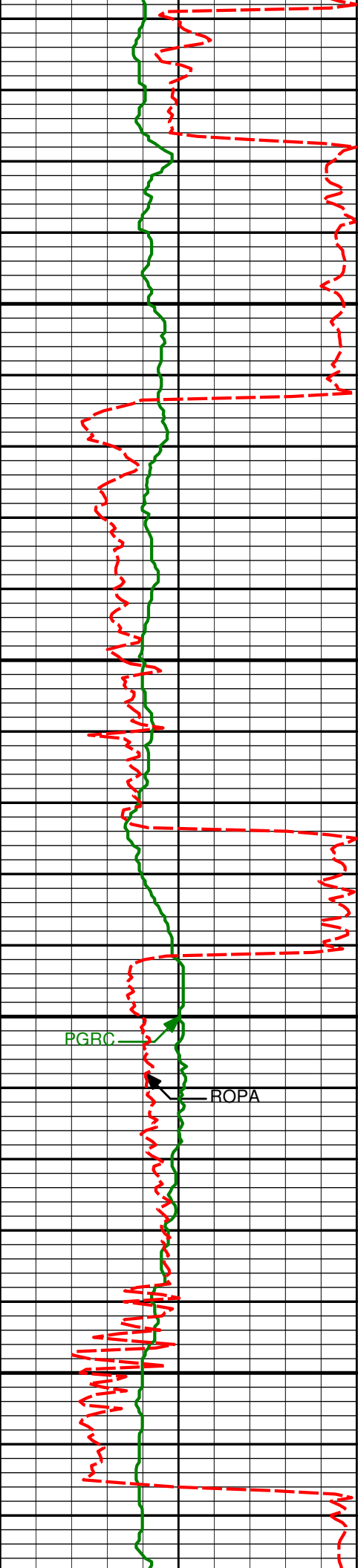
8500'					
8550'	8549'	91.67°	267.48°	6471.77'	2017.14'
8600'					
8650'	8644'	89.32°	269.29°	6470.95'	2111.63'











9400'

9404'

91.51 °

272.44 °

6464.12'

2865.65'

9450'

9500'

9499'

89.91 °

272.68 °

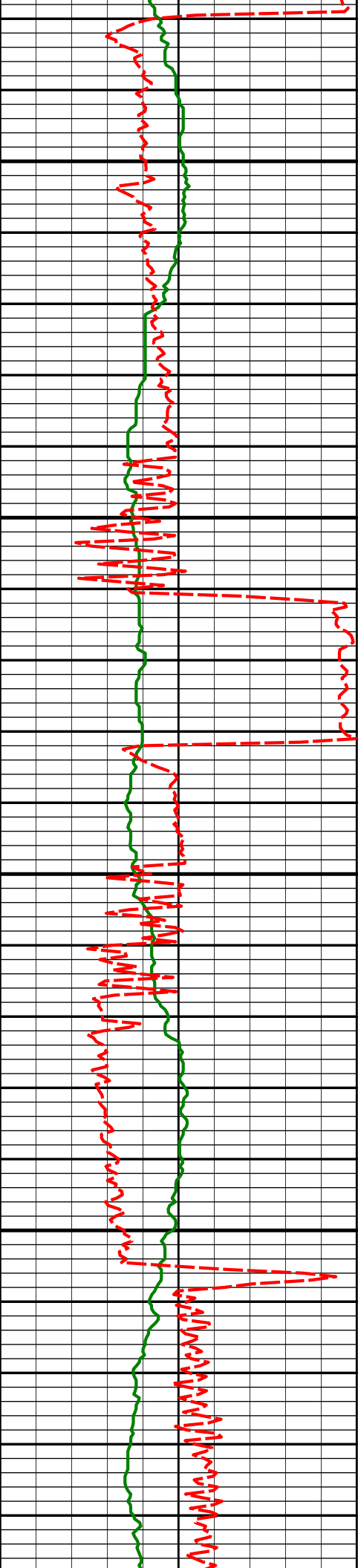
6462.94'

2960.60'

9550'

PGRC

ROPA



9594'

87.59°

271.67°

6465.02'

3055.51'

9600'

9650'

9689'

90.59°

272.35°

6466.53'

3150.42'

9700'

9750'

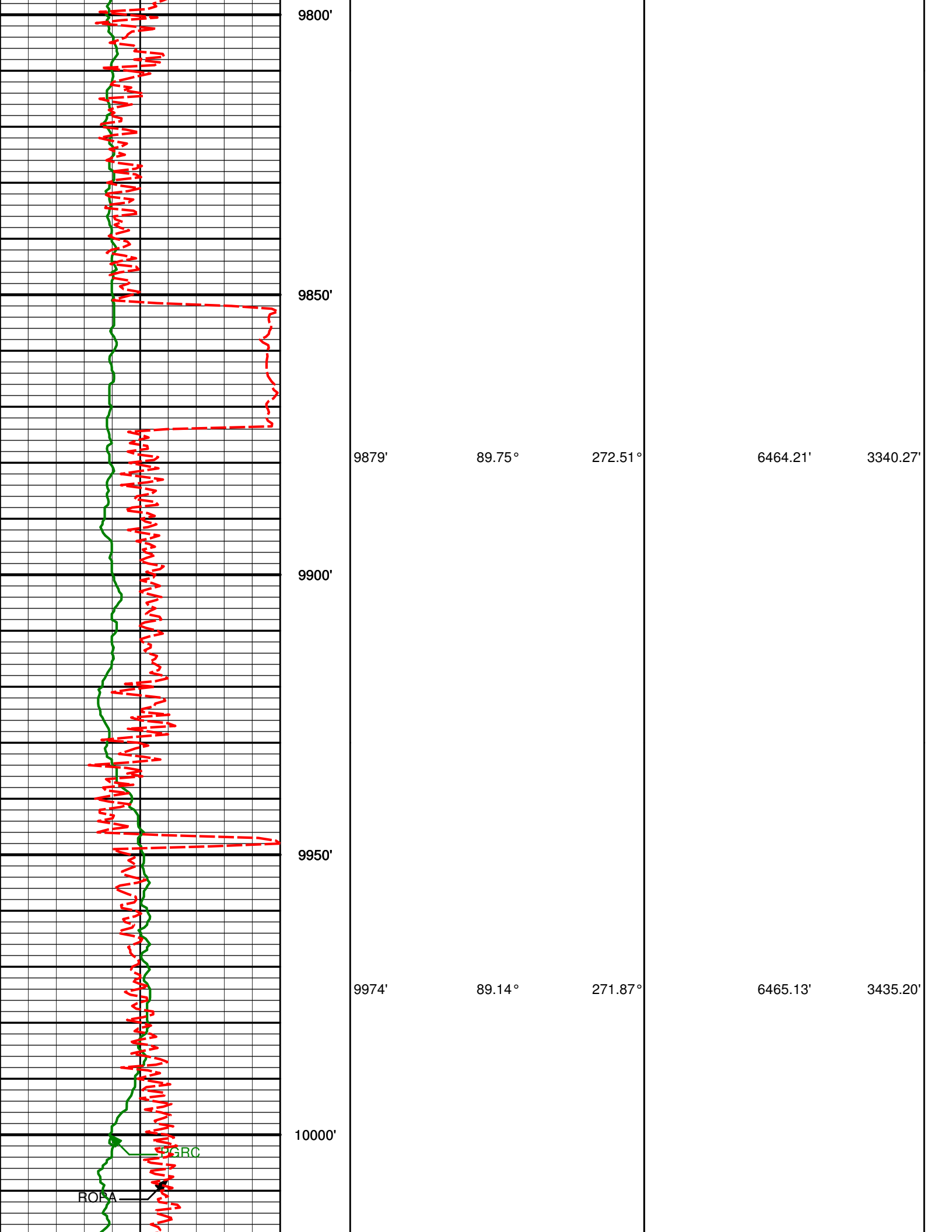
9784'

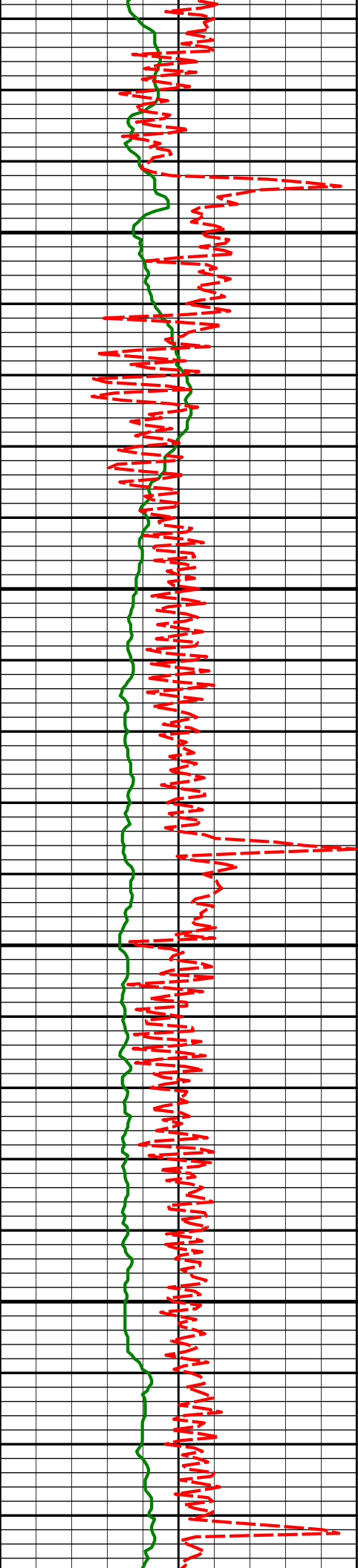
91.23°

271.79°

6465.02'

3245.34'





10050'

10069'

89.04°

270.71°

6466.64'

3530.06'

10100'

10150'

10164'

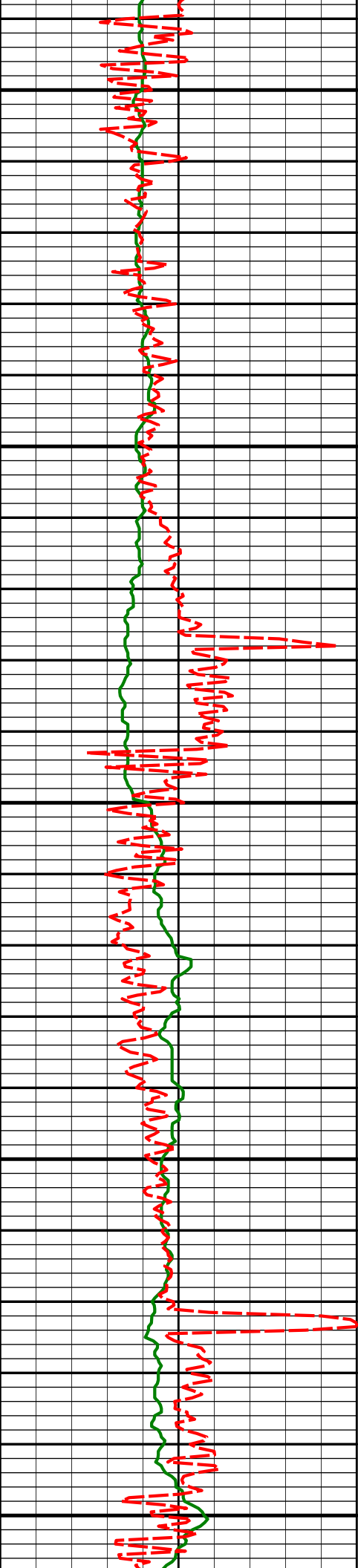
89.38°

270.31°

6467.94'

3624.86'

10200'



10250'

10259'

89.57°

269.99°

6468.81'

3719.61'

10300'

10350'

10354'

89.78°

270.22°

6469.35'

3814.36'

10400'

10450'

10449'

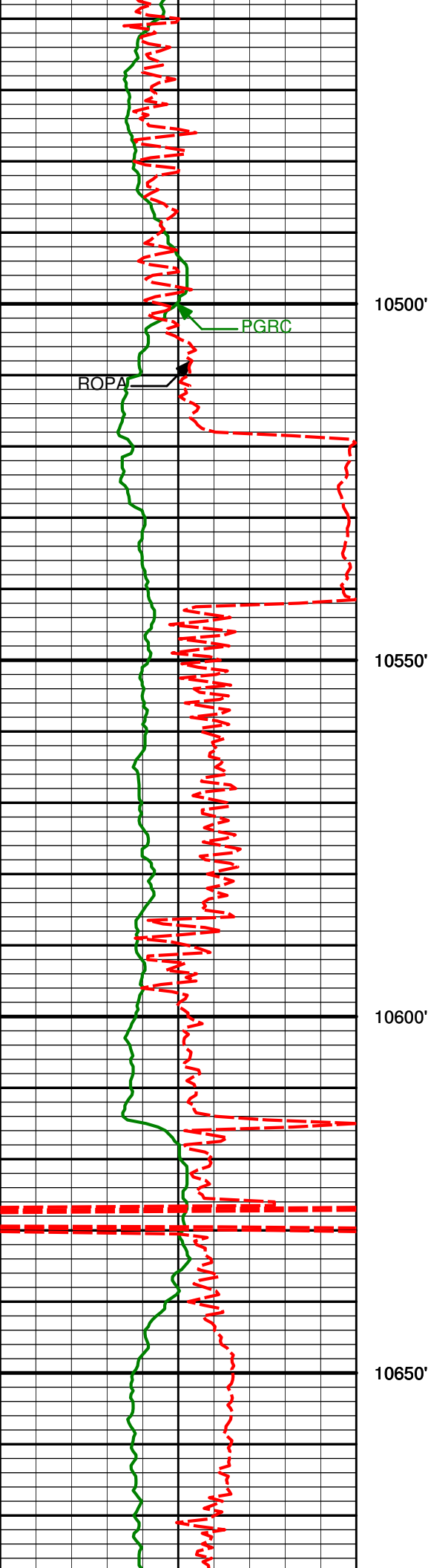
88.61°

270.02°

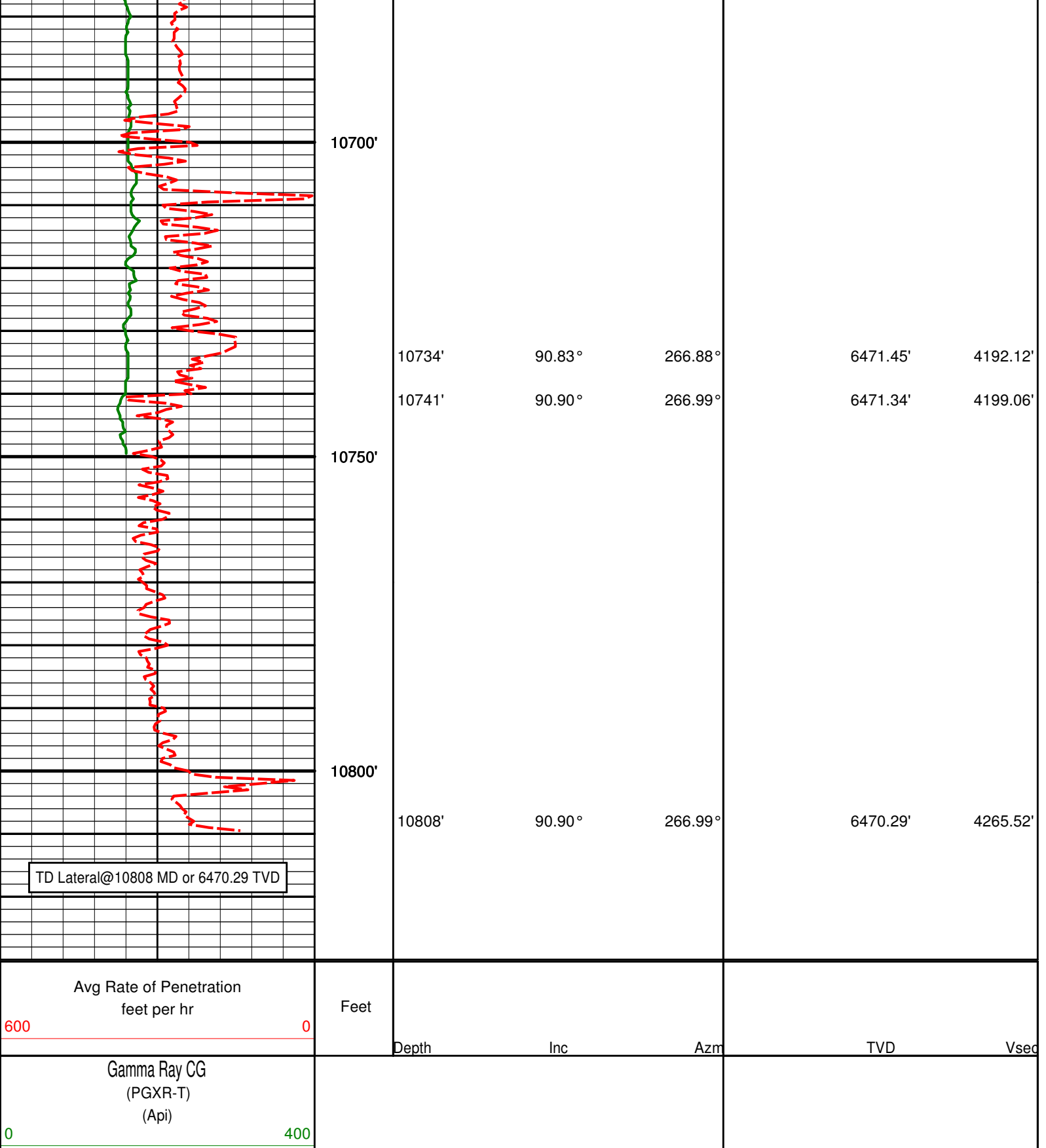
6470.68'

3909.11'





10544'	89.57°	267.16°	6472.19'	4003.63'
10550'				
10600'				
10639'	90.25°	266.99°	6472.34'	4097.89'
10650'				



**HALLIBURTON**

# **DIRECTIONAL SURVEY REPORT**

*Noble Energy  
Krier GV26-62HN  
Wattenberg  
Weld Colorado  
USA*

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
851.00	0.00	0.00	851.00	0.00 N	0.00 E	0.00	TIE-IN
1011.00	0.75	320.81	1011.00	0.81 N	0.66 W	0.72	0.47
1290.00	1.24	326.55	1289.95	4.75 N	3.48 W	3.82	0.18
1571.00	0.89	324.94	1570.90	9.08 N	6.42 W	7.07	0.13
1666.00	1.14	299.55	1665.89	10.15 N	7.66 W	8.39	0.54
1761.00	2.58	23.04	1760.85	12.58 N	7.65 W	8.55	2.84
1856.00	5.07	32.51	1855.63	18.09 N	4.55 W	5.87	2.70
1951.00	5.81	39.79	1950.20	25.33 N	0.78 E	1.09	1.06
2045.00	8.53	38.79	2043.46	34.42 N	8.19 E	-5.64	2.90
2140.00	10.81	43.74	2137.11	46.35 N	18.77 E	-15.30	2.55
2235.00	11.90	39.84	2230.25	60.31 N	31.20 E	-26.68	1.41
2330.00	13.27	42.81	2322.96	75.83 N	44.89 E	-39.19	1.59
2425.00	15.38	39.26	2415.00	93.59 N	60.28 E	-53.23	2.40
2520.00	15.07	39.20	2506.67	112.91 N	76.06 E	-67.54	0.32
2615.00	16.61	40.37	2598.06	132.83 N	92.66 E	-82.64	1.65
2709.00	14.44	39.74	2688.62	152.08 N	108.86 E	-97.37	2.32
2804.00	16.22	38.88	2780.24	171.51 N	124.76 E	-111.80	1.89
2899.00	16.45	39.36	2871.41	192.24 N	141.61 E	-127.08	0.28
2993.00	16.24	36.40	2961.61	213.11 N	157.85 E	-141.74	0.92
3089.00	15.25	39.77	3054.01	233.61 N	173.90 E	-156.24	1.40
3183.00	15.25	41.51	3144.70	252.37 N	190.00 E	-170.91	0.49
3278.00	14.75	39.51	3236.46	271.06 N	205.97 E	-185.47	0.75
3373.00	15.41	41.47	3328.19	289.85 N	222.02 E	-200.09	0.88
3468.00	13.24	39.38	3420.23	307.72 N	237.29 E	-214.00	2.35
3563.00	13.62	35.99	3512.64	325.18 N	250.76 E	-226.15	0.92
3658.00	14.80	38.94	3604.73	343.66 N	264.96 E	-238.95	1.45
3753.00	16.82	39.79	3696.13	363.66 N	281.38 E	-253.86	2.14
3848.00	14.69	43.81	3787.56	382.92 N	298.52 E	-269.53	2.52
3943.00	13.44	48.06	3879.71	398.99 N	315.07 E	-284.86	1.71
4038.00	11.26	39.74	3972.52	413.51 N	329.22 E	-297.90	2.96
4133.00	7.18	47.62	4066.27	424.65 N	339.54 E	-307.37	4.48
4227.00	5.05	39.25	4159.73	431.81 N	346.50 E	-313.79	2.45
4322.00	2.99	31.62	4254.50	437.16 N	350.45 E	-317.33	2.24
4417.00	0.33	25.80	4349.45	439.52 N	351.87 E	-318.57	2.80
4702.00	0.16	290.37	4634.45	440.40 N	351.86 E	-318.50	0.13
4986.00	0.88	343.93	4918.43	442.64 N	350.89 E	-317.37	0.28
5081.00	1.77	57.48	5013.41	444.13 N	351.92 E	-318.29	1.83
5365.00	1.76	32.47	5297.28	450.17 N	357.96 E	-323.86	0.27
5460.00	0.93	43.17	5392.25	451.97 N	359.27 E	-325.04	0.91
5684.00	0.50	38.31	5616.24	454.07 N	361.13 E	-326.73	0.20
5833.00	4.57	262.69	5765.09	453.82 N	355.64 E	-321.28	3.31
5928.00	13.28	264.57	5858.85	452.30 N	341.00 E	-306.79	9.17
6023.00	19.58	269.93	5949.93	451.25 N	314.20 E	-280.14	6.81
6118.00	27.19	266.04	6037.07	449.73 N	276.57 E	-242.72	8.18
6213.00	35.07	264.00	6118.33	445.37 N	227.69 E	-194.30	8.36
6308.00	40.28	266.57	6193.50	440.68 N	169.86 E	-136.97	5.73
6402.00	50.76	264.71	6259.28	435.50 N	103.09 E	-70.77	11.24
6497.00	59.07	265.10	6313.83	428.62 N	25.73 E	5.88	8.76
6544.00	62.21	265.35	6336.87	425.21 N	15.09 W	46.34	6.69
6592.00	62.61	265.32	6359.10	421.75 N	57.49 W	88.37	0.84
6639.00	66.07	264.45	6379.45	417.97 N	99.68 W	130.17	7.55
6687.00	68.25	264.60	6398.08	413.75 N	143.71 W	173.77	4.55
6734.00	70.40	263.97	6414.68	409.37 N	187.46 W	217.08	4.74
6782.00	74.39	265.97	6429.19	405.36 N	233.03 W	262.22	9.21
6807.00	75.18	267.50	6435.75	403.99 N	257.11 W	286.14	6.70
6863.00	78.15	270.43	6448.67	403.02 N	311.58 W	340.39	7.35
6936.00	85.00	268.46	6459.36	402.31 N	383.74 W	412.31	9.75
7031.00	88.40	269.43	6464.83	400.57 N	478.55 W	506.73	3.72
7126.00	87.81	269.04	6467.98	399.31 N	573.49 W	601.32	0.74
7221.00	89.41	269.69	6470.28	398.26 N	668.45 W	695.95	1.82
7315.00	88.67	269.43	6471.85	397.54 N	762.44 W	789.62	0.83
7410.00	90.22	269.57	6472.77	396.71 N	857.43 W	884.30	1.63
7505.00	90.43	270.32	6472.23	396.62 N	952.43 W	979.03	0.81
7600.00	90.62	270.16	6471.36	397.02 N	1047.42 W	1073.80	0.26
7695.00	90.22	269.65	6470.67	396.86 N	1142.42 W	1168.52	0.68

7790.00	89.57	268.63	6470.85	395.43 N	1237.40 W	1263.15	1.27
7885.00	89.97	269.50	6471.23	393.89 N	1332.39 W	1357.76	1.01
7979.00	89.57	268.54	6471.61	392.28 N	1426.37 W	1451.37	1.11
8075.00	90.37	267.33	6471.66	388.82 N	1522.31 W	1546.79	1.51
8169.00	90.18	266.77	6471.21	383.98 N	1616.18 W	1640.06	0.63
8264.00	89.82	267.54	6471.21	379.26 N	1711.06 W	1734.33	0.90
8359.00	87.96	267.57	6473.05	375.21 N	1805.96 W	1828.67	1.95
8454.00	90.96	266.54	6473.95	370.34 N	1900.82 W	1922.91	3.33
8549.00	91.67	267.48	6471.77	365.39 N	1995.66 W	2017.14	1.24
8644.00	89.32	269.29	6470.95	362.71 N	2090.61 W	2111.63	3.12
8739.00	88.43	269.29	6472.82	361.54 N	2185.58 W	2206.26	0.94
8834.00	89.54	267.23	6474.51	358.65 N	2280.52 W	2300.72	2.47
8929.00	90.12	267.50	6474.79	354.28 N	2375.41 W	2395.04	0.68
9024.00	90.22	266.27	6474.51	349.11 N	2470.27 W	2489.26	1.29
9119.00	89.57	265.66	6474.69	342.43 N	2565.04 W	2583.28	0.93
9214.00	93.12	265.11	6472.46	334.80 N	2659.69 W	2677.11	3.78
9309.00	92.72	267.12	6467.63	328.38 N	2754.34 W	2771.04	2.15
9404.00	91.51	272.44	6464.12	328.01 N	2849.24 W	2865.65	5.74
9499.00	89.91	272.68	6462.94	332.25 N	2944.13 W	2960.60	1.71
9594.00	87.59	271.67	6465.02	335.85 N	3039.04 W	3055.51	2.66
9689.00	90.59	272.35	6466.53	339.17 N	3133.95 W	3150.42	3.23
9784.00	91.23	271.79	6465.02	342.60 N	3228.88 W	3245.34	0.90
9879.00	89.75	272.51	6464.21	346.16 N	3323.81 W	3340.27	1.73
9974.00	89.14	271.87	6465.13	349.78 N	3418.73 W	3435.20	0.93
10069.00	89.04	270.71	6466.64	351.92 N	3513.69 W	3530.06	1.23
10164.00	89.38	270.31	6467.94	352.77 N	3608.68 W	3624.86	0.55
10259.00	89.57	269.99	6468.81	353.01 N	3703.68 W	3719.61	0.40
10354.00	89.78	270.22	6469.35	353.18 N	3798.67 W	3814.36	0.33
10449.00	88.61	270.02	6470.68	353.38 N	3893.66 W	3909.11	1.25
10544.00	89.57	267.16	6472.19	351.05 N	3988.61 W	4003.63	3.17
10639.00	90.25	266.99	6472.34	346.21 N	4083.49 W	4097.89	0.74
10734.00	90.83	266.88	6471.45	341.13 N	4178.35 W	4192.12	0.63
10741.00	90.90	266.99	6471.34	340.75 N	4185.34 W	4199.06	1.78
10808.00	90.90	266.99	6470.29	337.24 N	4252.23 W	4265.52	0.01

# 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 274.22 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.53 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10808.00 FEET  
IS 4265.59 FEET ALONG 274.53 DEGREES (GRID)

9.625 inch casing is tied on to 851ft from surface.  
7.000 inch casing is tied on to 6908 ft from surface.