

## Pressure Cased Gamma (PCGK)

**1 : 240**

[illegible]

## WELL INFORMATION

MWD Run Number	100				
Date run completed	03-Dec-14				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	1,183.99				
Log End Depth (TVD, ft)	6,877.42				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	01-Dec-14 14:55				
Drill/Wipe End Date and Time	03-Dec-14 00:30				
Min Inc (deg) @ Depth (TVD, ft)	0.13 @ 6,062.24				
Max Inc (deg) @ Depth (TVD, ft)	85.50 @ 6,877.42				
Bit TFA(in2) / Bit Type	0.91 / PDC				
Flow Rate (gpm)	578.98				
Max AV (fpm) / CV (fpm) @ MWD	N/A				
Fluid Type	Native/Spud Mud				
Density (ppg) / Viscosity (spqt)	9.25 / 44.00				
Filtrate CL (ppm)	2,400.00				
pH / API Filtrate (mpm)	9.00 / 9				
PV (cP) / YP (lbf2)	12 / 13.00				
% Solids / % Sand	9.90 / 0.50				
% Oil / Oil:Water Ratio	0.00 / 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 ERT (in) / ERT	1.00 / 0.50				

Max Tool Temp (degF) / Source	170.37 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ 170.37				
Lead MWD Engineer	Paul Sheets				
Customer Representative	Martin Suarez				

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11404298				
Insert Serial Number	11680745				
Date and Time Initialized	01-Dec-14 07:47				
Date and Time Read	03-Dec-14 07:06				
ECMB SW Version	N/A				

### Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	56.27				
Software Version	6.21				
Sub Serial Number	11404298				
Sonde Serial Number	11638623				
Sensor ID Number	N/A				
Toolface Offset (deg)	42.86				

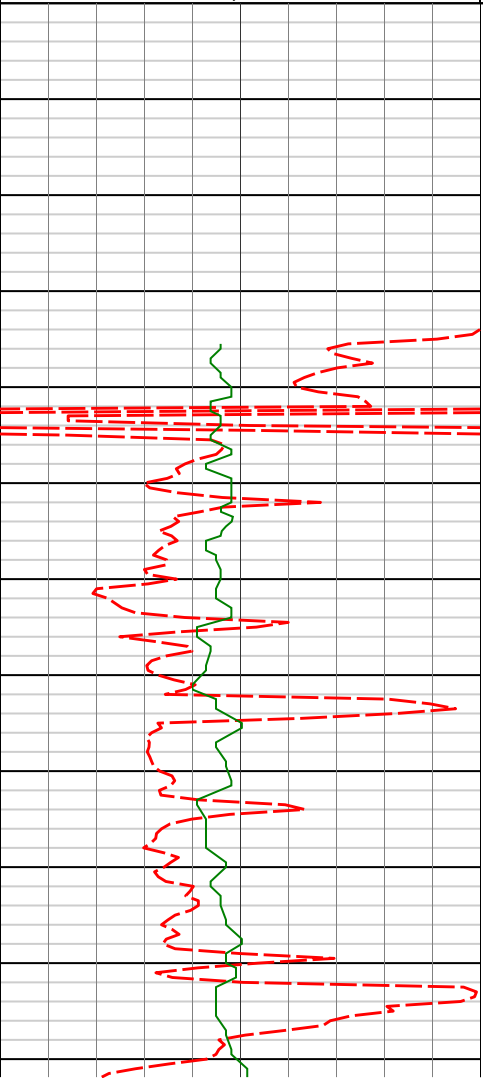
### Gamma Ray Sensor Information

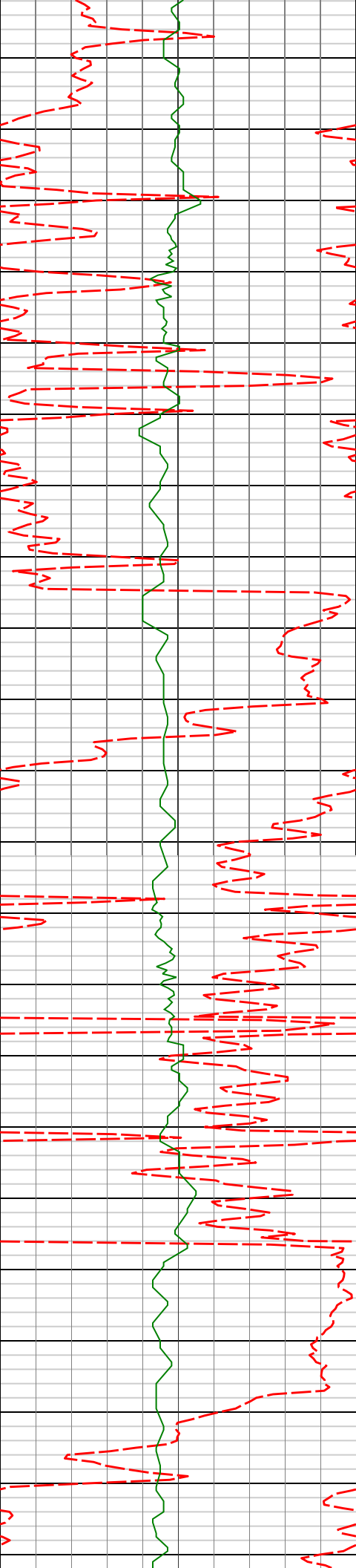
Tool Type	PCG				
Distance From Bit (ft)	51.17				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11404298				
Insert/Sonde Serial Number	12037422				

## 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. All data presented is recorded data unless otherwise specified
4. 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
5. INSITE version 8.4.10-MLWD

## WARRANTY

Gamma Ray BCorr (PGRC)		Depth TVD ft.	Depth	Inc.	Azi.	TVD	V.S.
0	200						
Avg Rate of Penetration (ROPA)							
1K	0						
							



1293'

0.55°

72.68°

1292.99'

-2.14'

1300'

1350'

1386'

1.73°

62.34°

1385.97'

-1.31'

1400'

1450'

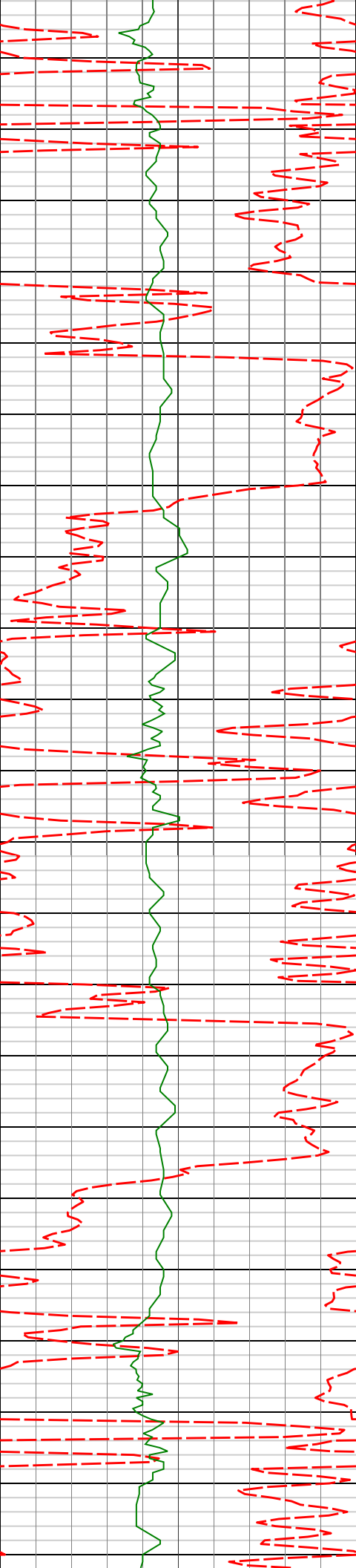
1478'

2.96°

56.60°

1477.89'

0.71'



1500'

1550'

1570'

4.32°

61.77°

1569.70'

3.77'

1600'

1650'

1663'

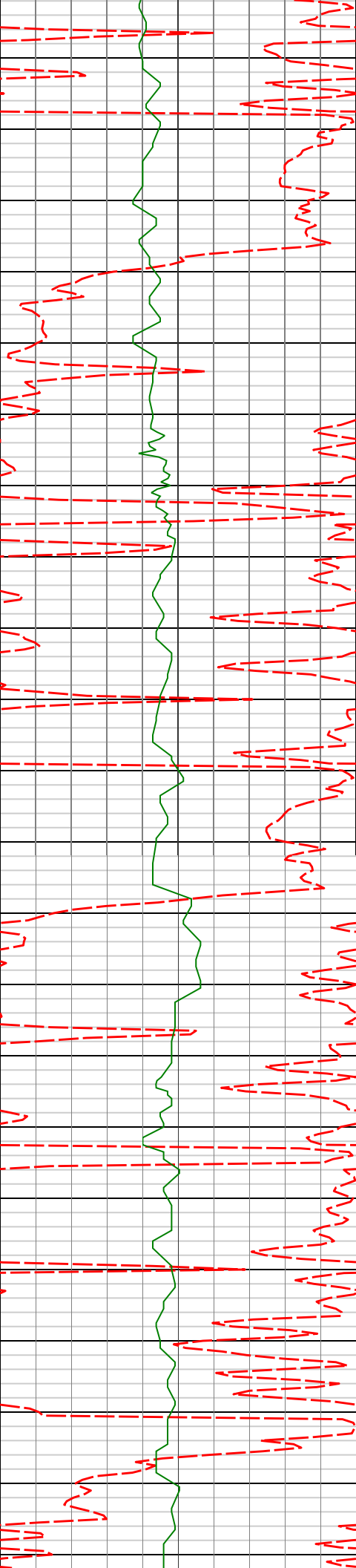
5.74°

53.35°

1662.35'

8.36'

1700'



1750'

1755'

7.23°

49.09°

1753.76'

15.08'

1800'

1847'

8.64°

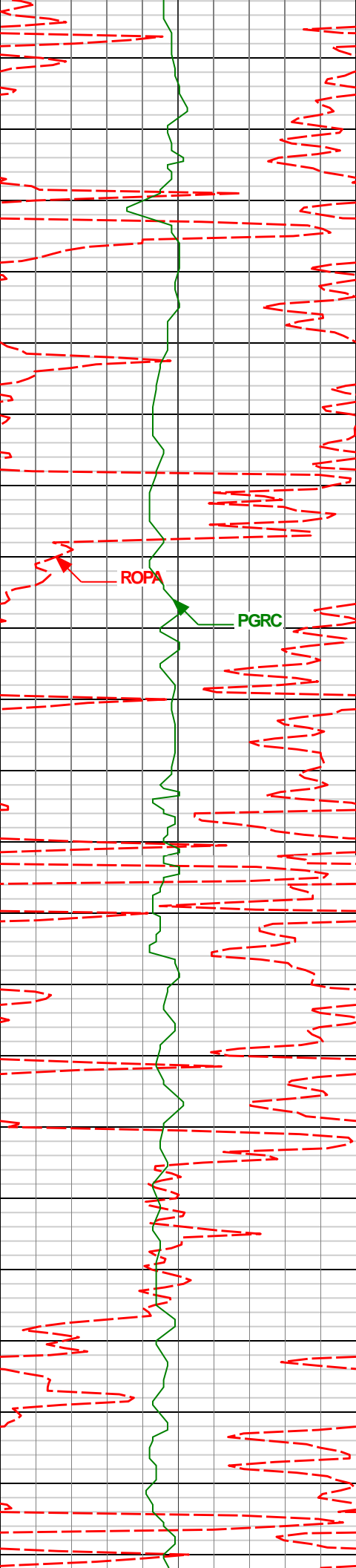
43.14°

1844.87'

24.12'

1850'

1900'



1938'	8.33°	38.54°	1934.88'	34.46'
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1950'

2000'

ROPA

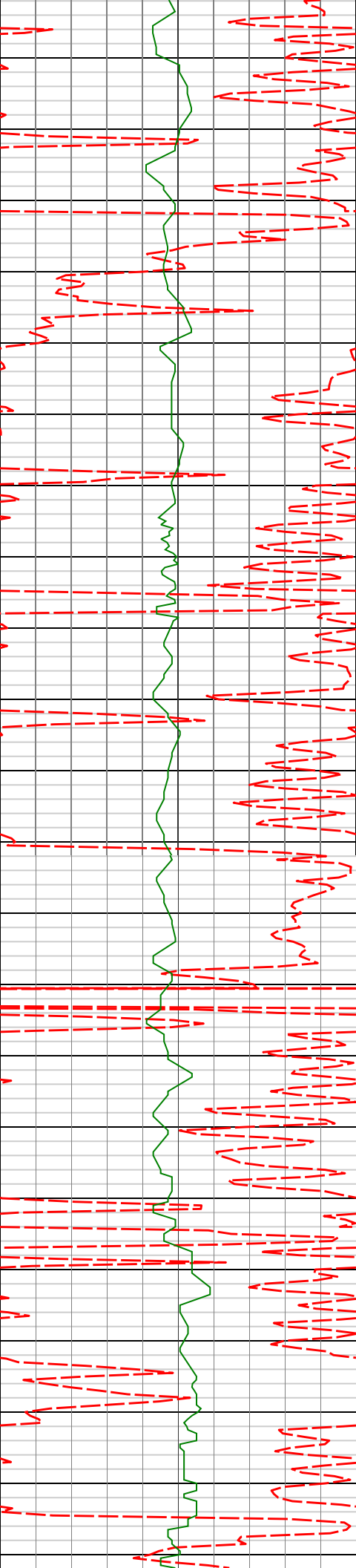
PGRC

2031'	8.27°	36.09°	2026.90'	45.31'
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2050'

2100'

2123'	7.93°	32.85°	2117.99'	56.15'
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2150'

2200'

2250'

2300'

2350'

2216'

7.33°

28.52°

2210.16'

66.90'

2309'

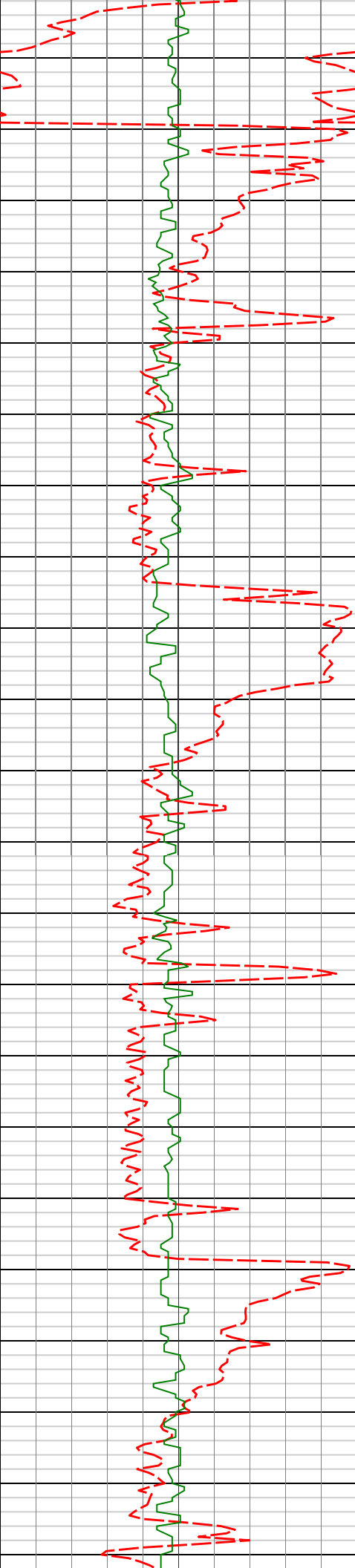
8.02°

38.67°

2302.33'

77.33'





2402'

7.83°

35.39°

2394.45'

87.73'

2400'

2450'

2495'

8.44°

36.24°

2486.51'

98.57'

2500'

2550'

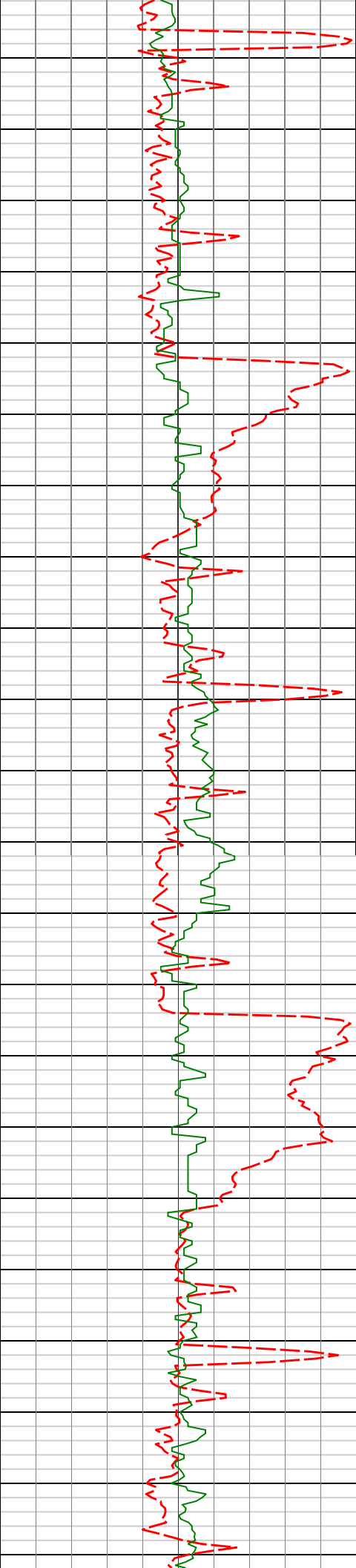
2589'

7.87°

36.40°

2579.56'

109.49'



2600'

2650'

2700'

2750'

2800'

2681'

6.85°

34.43°

2670.80'

119.24'

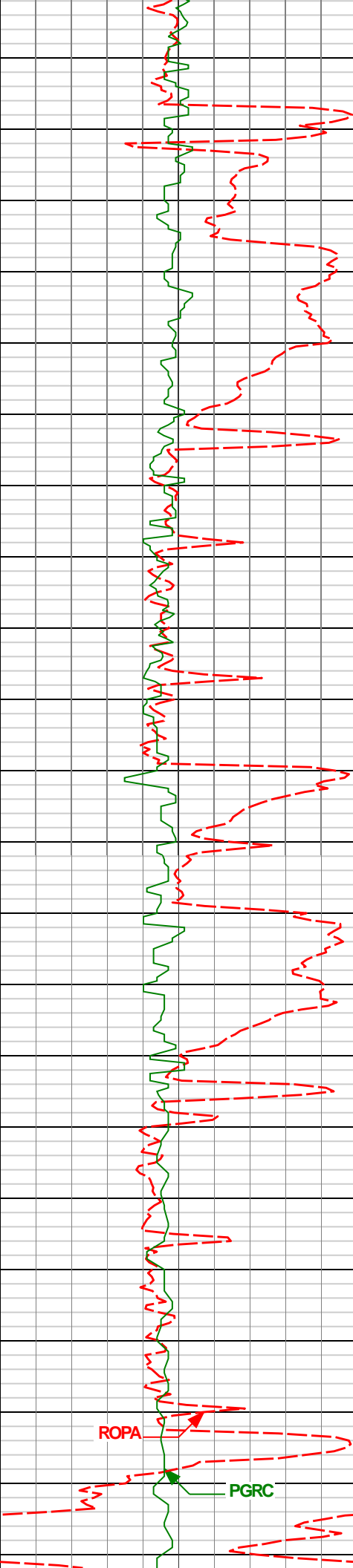
2773'

7.49°

41.87°

2762.08'

128.39'



2850'

2900'

2950'

3000'

2865'

7.87°

44.75°

2853.26'

137.52'

2960'

8.93°

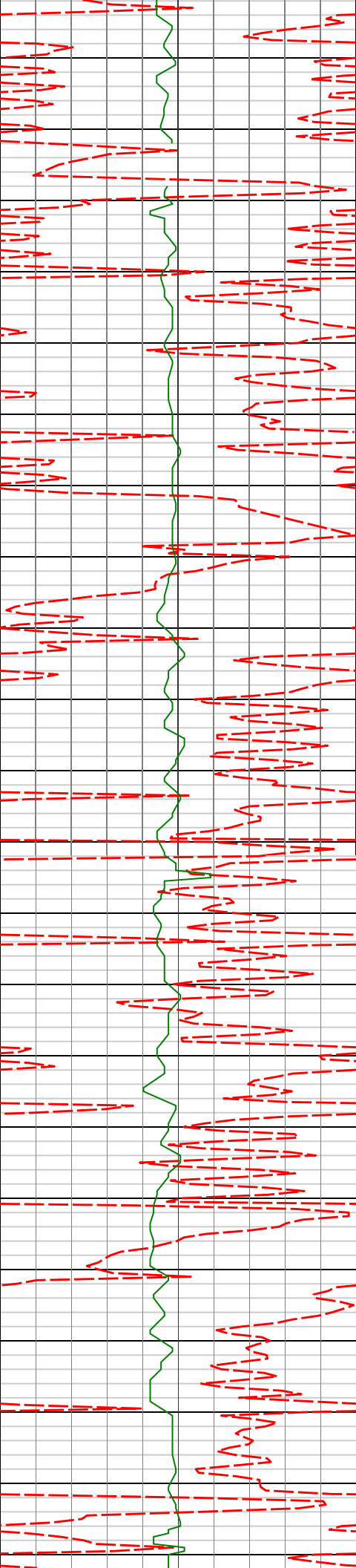
48.04°

2947.24'

147.29'

ROPA

PGRC



3055'	8.76°	48.71°	3041.11'	157.24'
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3050'

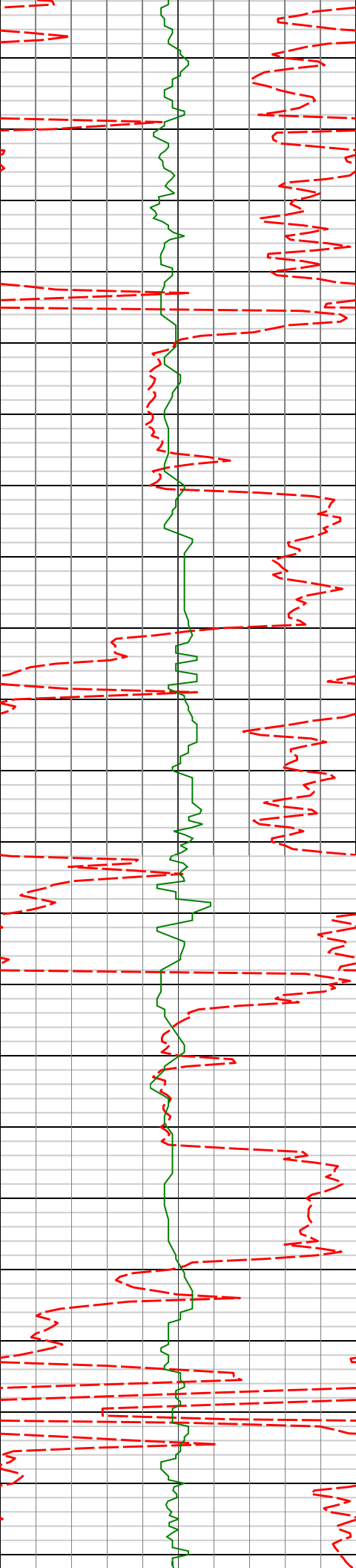
3100'

3150'	8.33°	47.61°	3135.05'	166.89'
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3150'

3200'

3245'	7.61°	46.32°	3229.14'	176.09'
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3250'

3300'

3340'

8.91°

47.96°

3323.15'

185.59'

3350'

3400'

3435'

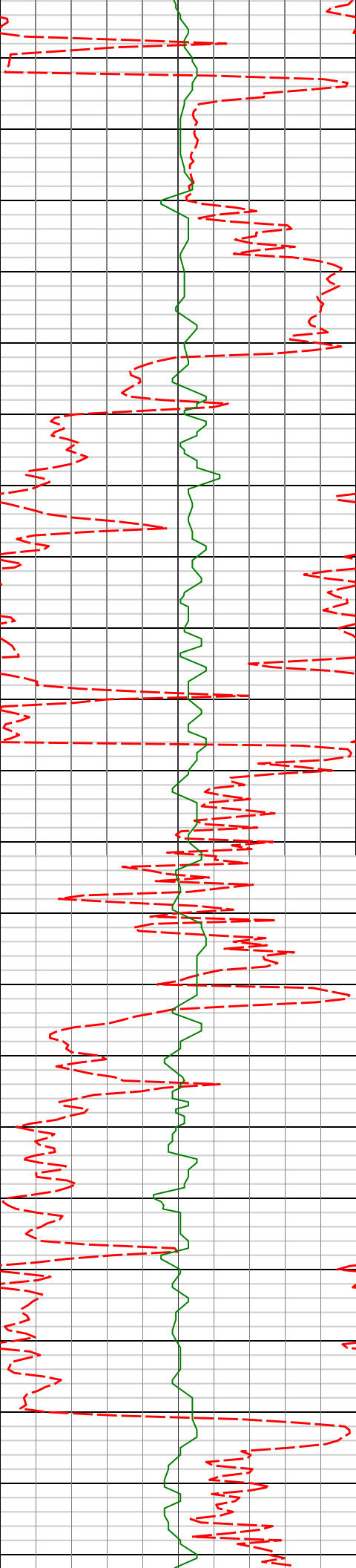
9.52°

42.24°

3416.92'

196.57'

3450'



3500'

3550'

3600'

3650'

3530'

8.53°

33.94°

3510.75'

208.44'

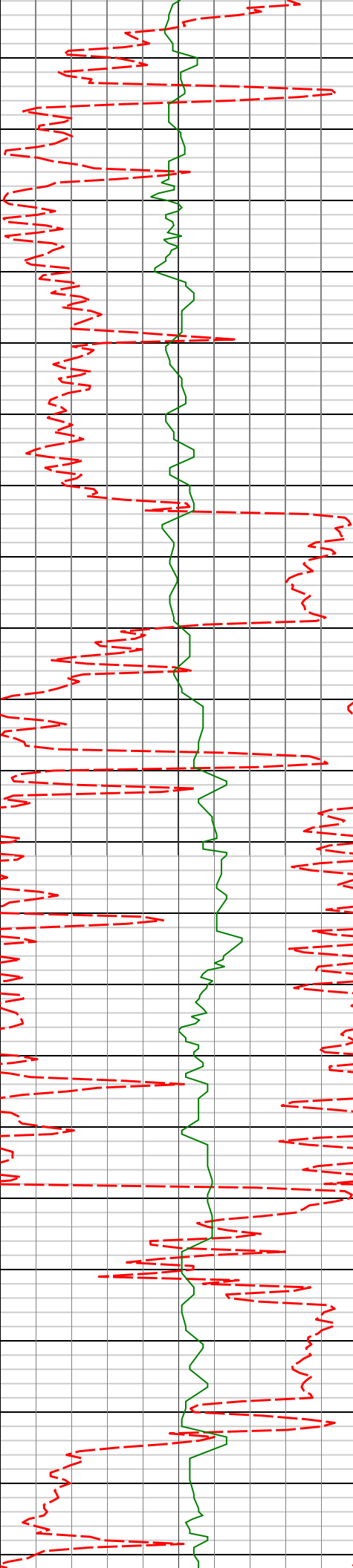
3624'

7.62°

29.41°

3603.82'

219.81'



3700'

3750'

3800'

3850'

3900'

3719'

6.83°

28.18°

3698.06'

230.40'

3814'

7.11°

37.99°

3792.36'

240.16'

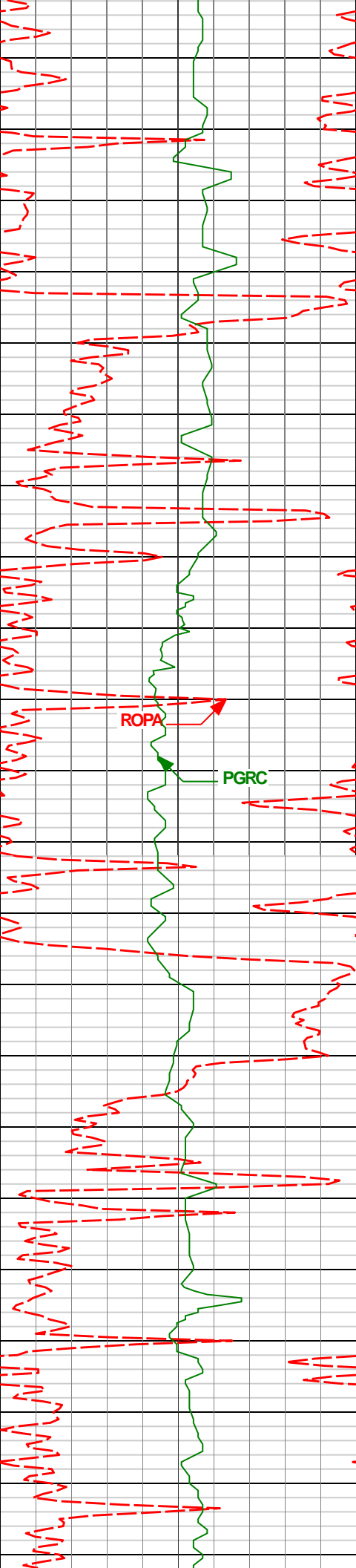
3909'

8.26°

31.81°

3886.51'

250.75'



3950'

4004'

4000'

4050'

4099'

4100'

7.51°

32.16°

3980.61'

261.96'

9.13°

33.55°

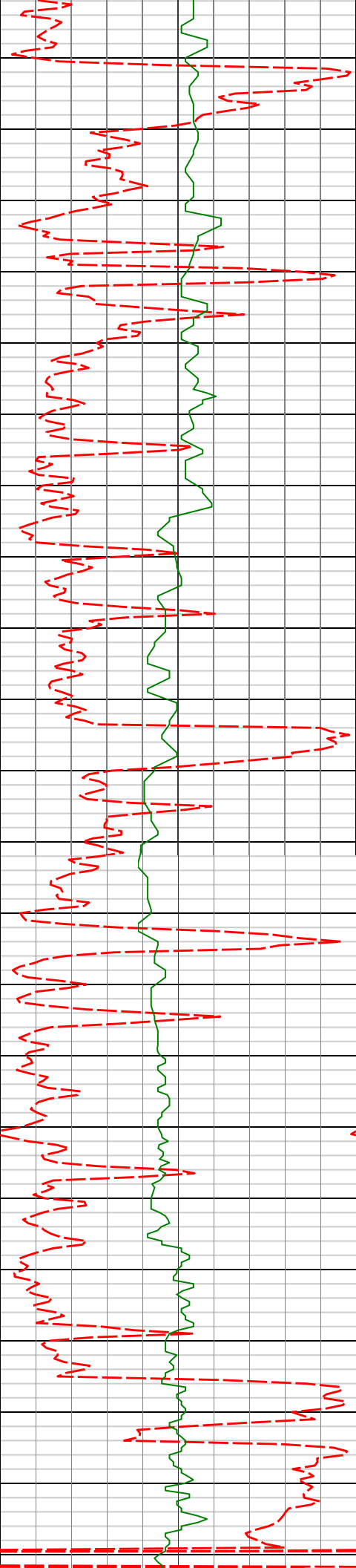
4074.61'

273.66'

ROPA

PGR





4194'

8.15°

33.64°

4168.53'

285.73'

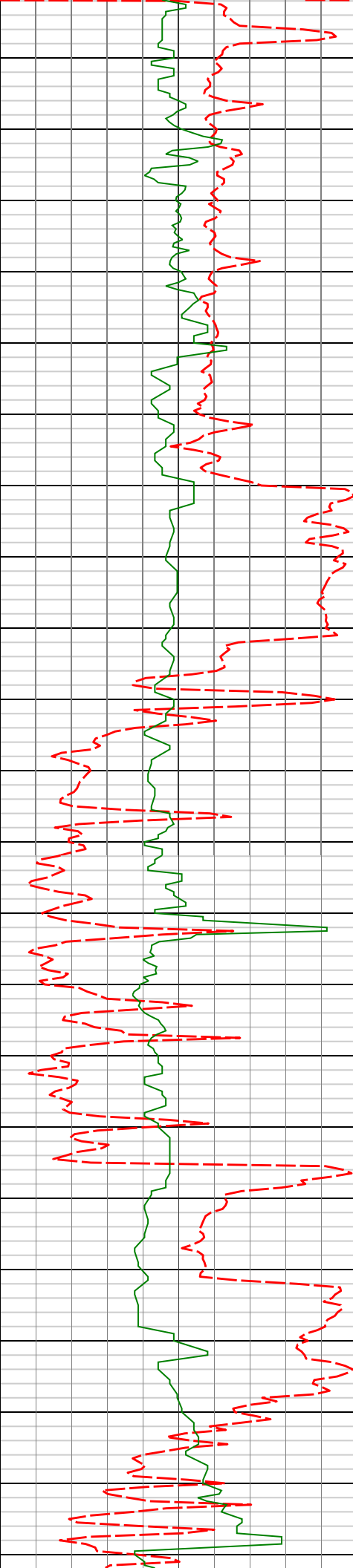
4288'

8.06°

32.95°

4261.59'

296.97'



4350'

4383'

7.87°

30.04°

4355.67'

308.34'

4400'

4450'

4478'

6.33°

24.71°

4449.94'

318.85'

4500'

4550'

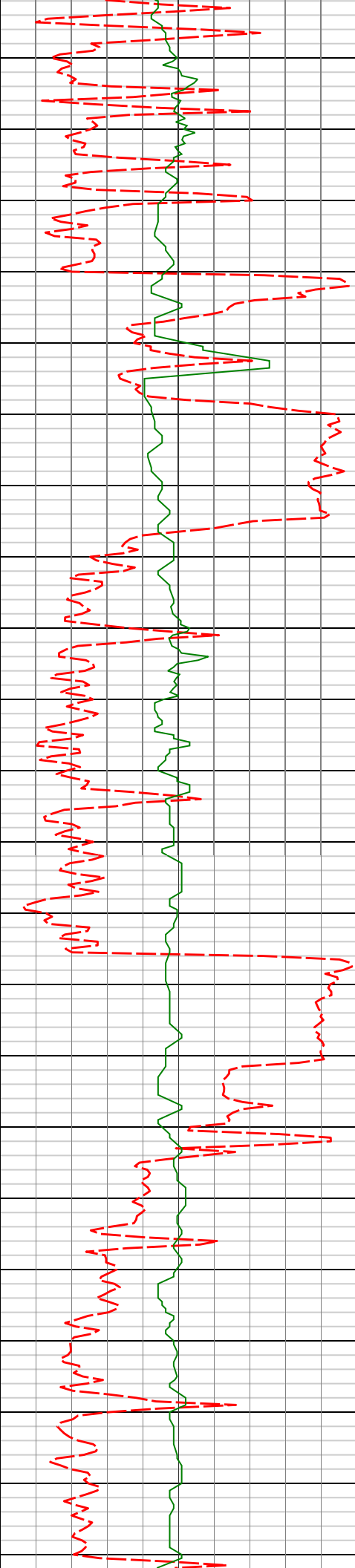
4573'

4.73°

29.71°

4544.50'

327.10'



4600'

4650'

4700'

4750'

4668'

2.64°

26.11°

4639.30'

332.53'

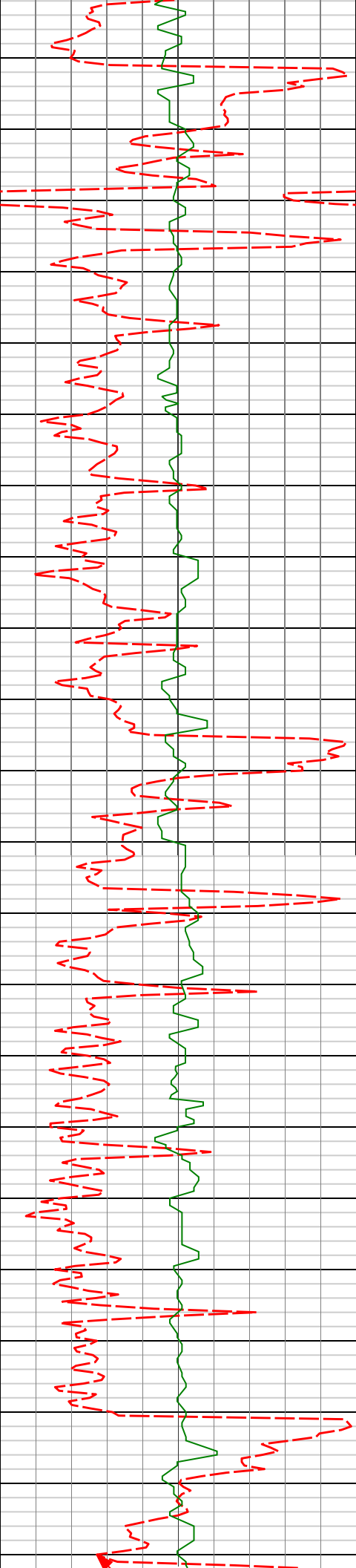
4763'

0.53°

81.39°

4734.26'

334.59'



4800'

4858'

0.22°

89.81°

4829.26'

334.67'

4850'

4900'

4953'

0.28°

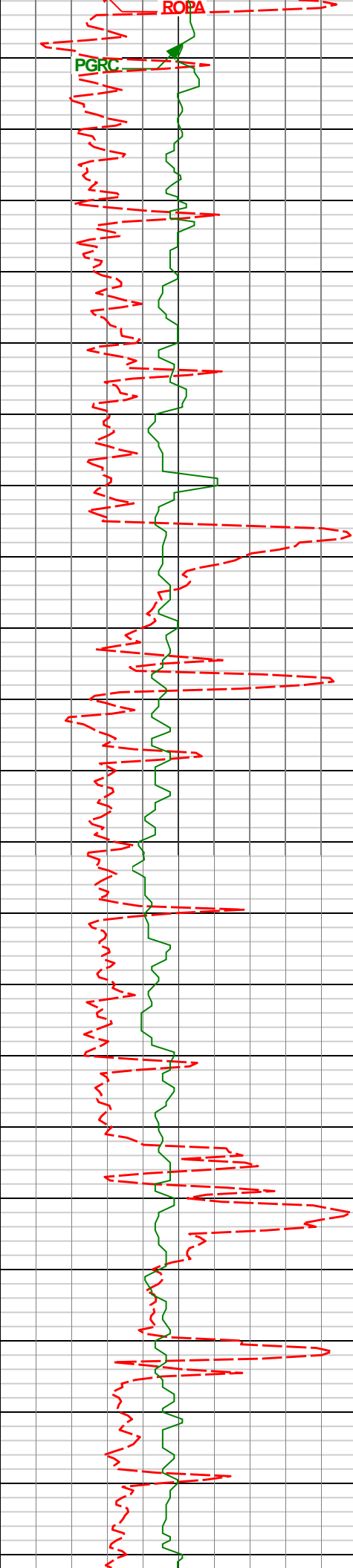
157.66°

4924.26'

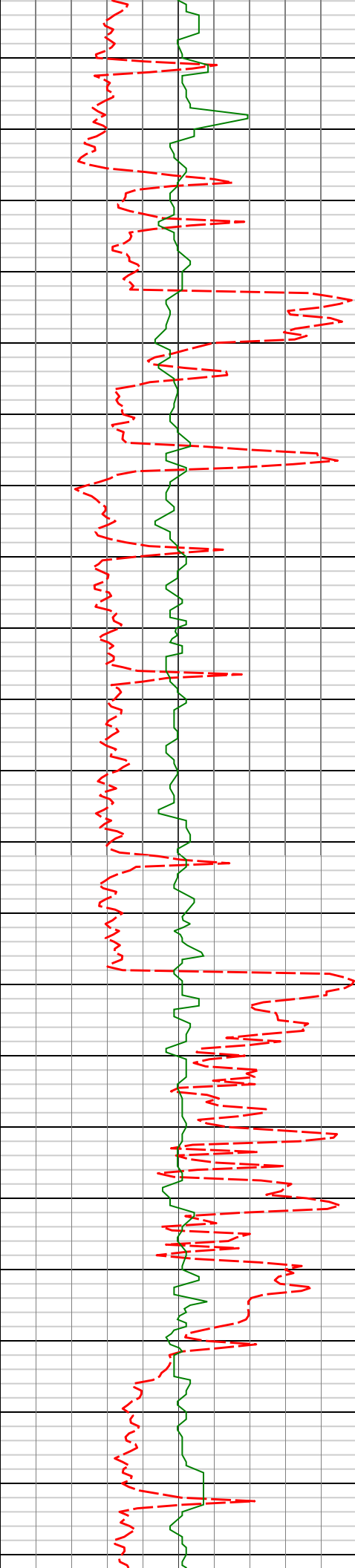
334.47'

4950'

5000'



5048'	0.52°	181.49°	5019.25'	333.82'
5050'				
5100'				
5143'	0.43°	189.34°	5114.25'	333.04'
5150'				
5200'				
5238'	0.34°	191.97°	5209.25'	332.41'



5250'

5300'

5350'

5400'

5333'

0.15°

235.06°

5304.25'

332.06'

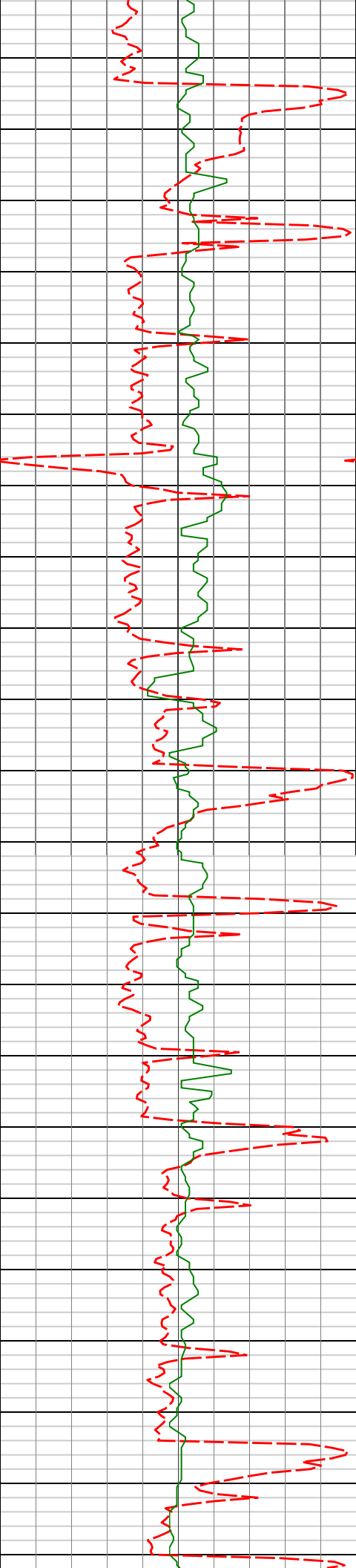
5427'

0.15°

241.99°

5398.25'

331.92'



5450'

5522'

0.23°

293.42°

5493.25'

331.94'

5500'

5550'

5617'

0.16°

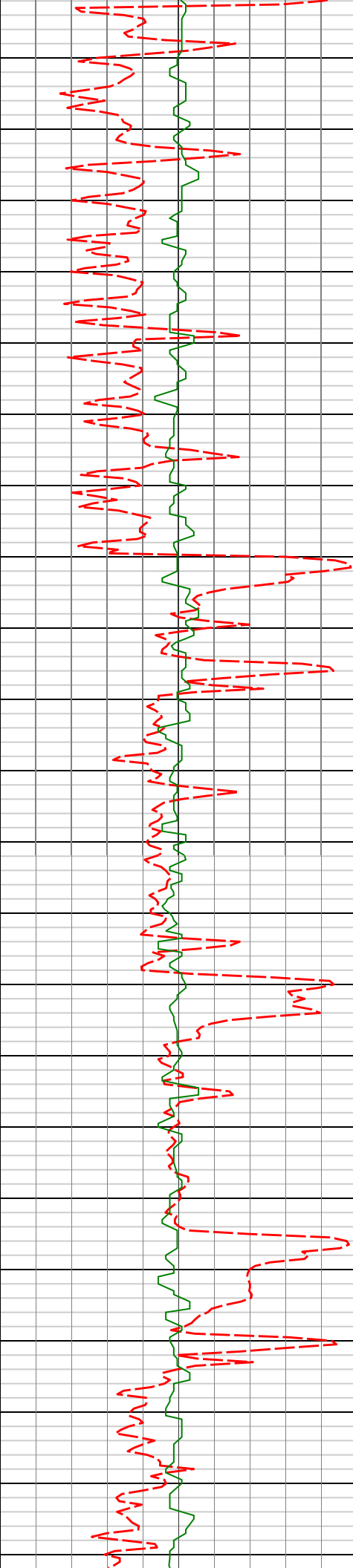
238.86°

5588.25'

331.94'

5600'

5650'



5712'	0.46°	148.21°	5683.25'	331.55'
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5700'

5750'

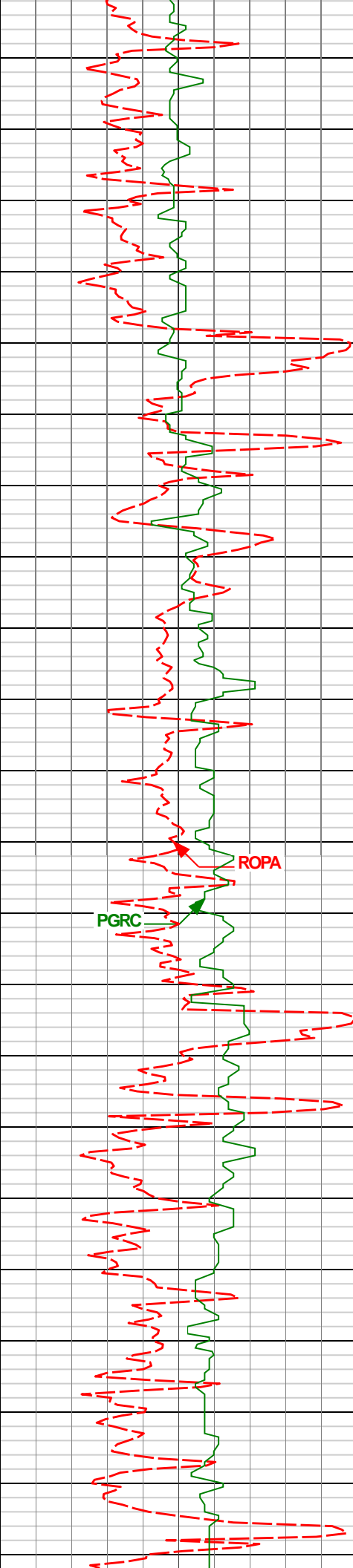
5807'	0.43°	178.56°	5778.24'	330.87'
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5800'

5850'

5902'	0.43°	186.00°	5873.24'	330.16'
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5900'

5950'

6000'

6050'

6100'

5996'

0.33°

170.42°

5967.24'

329.54'

PGRC

ROP A

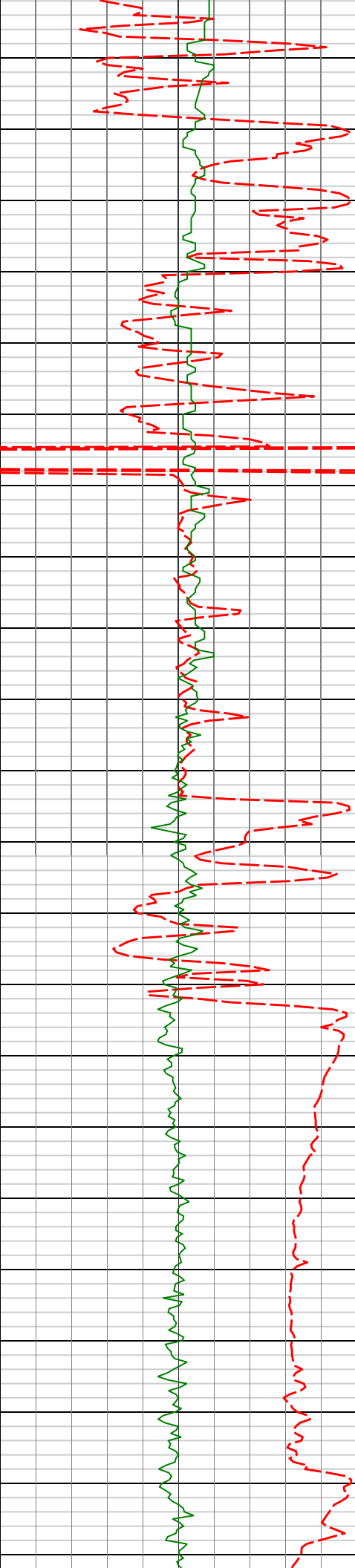
6091'

0.13°

250.14°

6062.24'

329.23'



6150'

6200'

6250'

6300'

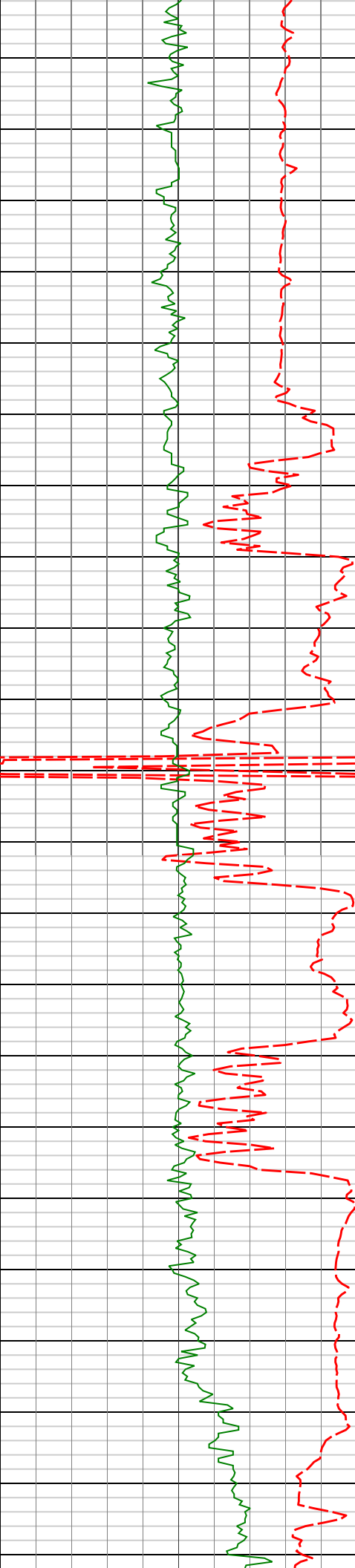
6186'

0.25°

290.72°

6157.24'

329.26'



6350'

6376'

15.43°

3.00°

6344.94'

354.82'

6400'

6424'

20.43°

8.84°

6390.59'

369.52'

6450'

6471'

21.78°

10.08°

6434.44'

386.27'

6500'

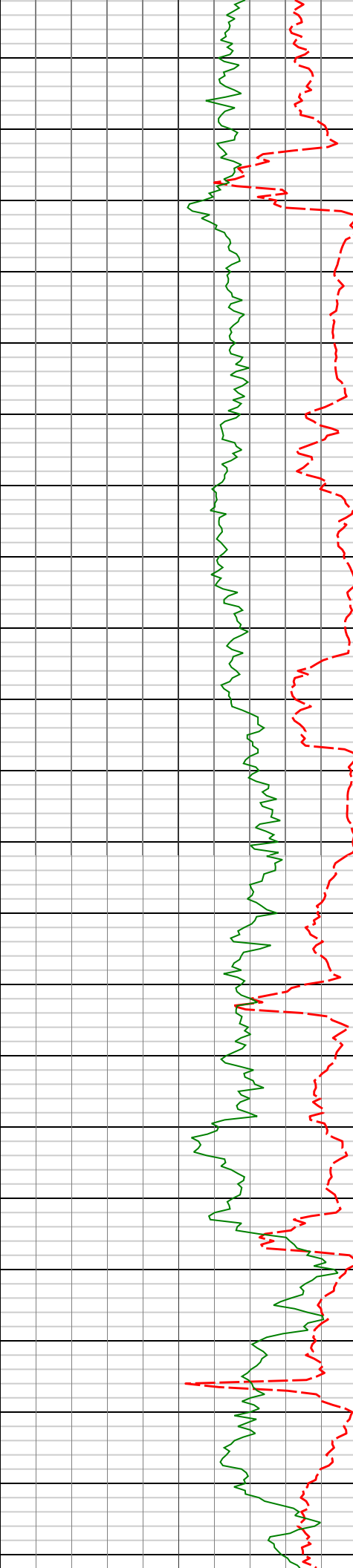
6566'

26.27°

2.77°

6521.21'

424.73'



6550'

6614'

31.70°

357.56°

6563.19'

447.95'

6600'

6661'

34.68°

356.67°

6602.52'

473.61'

6650'

6709'

36.73°

358.87°

6641.49'

501.57'

6700'

6756'

40.86°

359.52°

6678.12'

530.99'

6750'

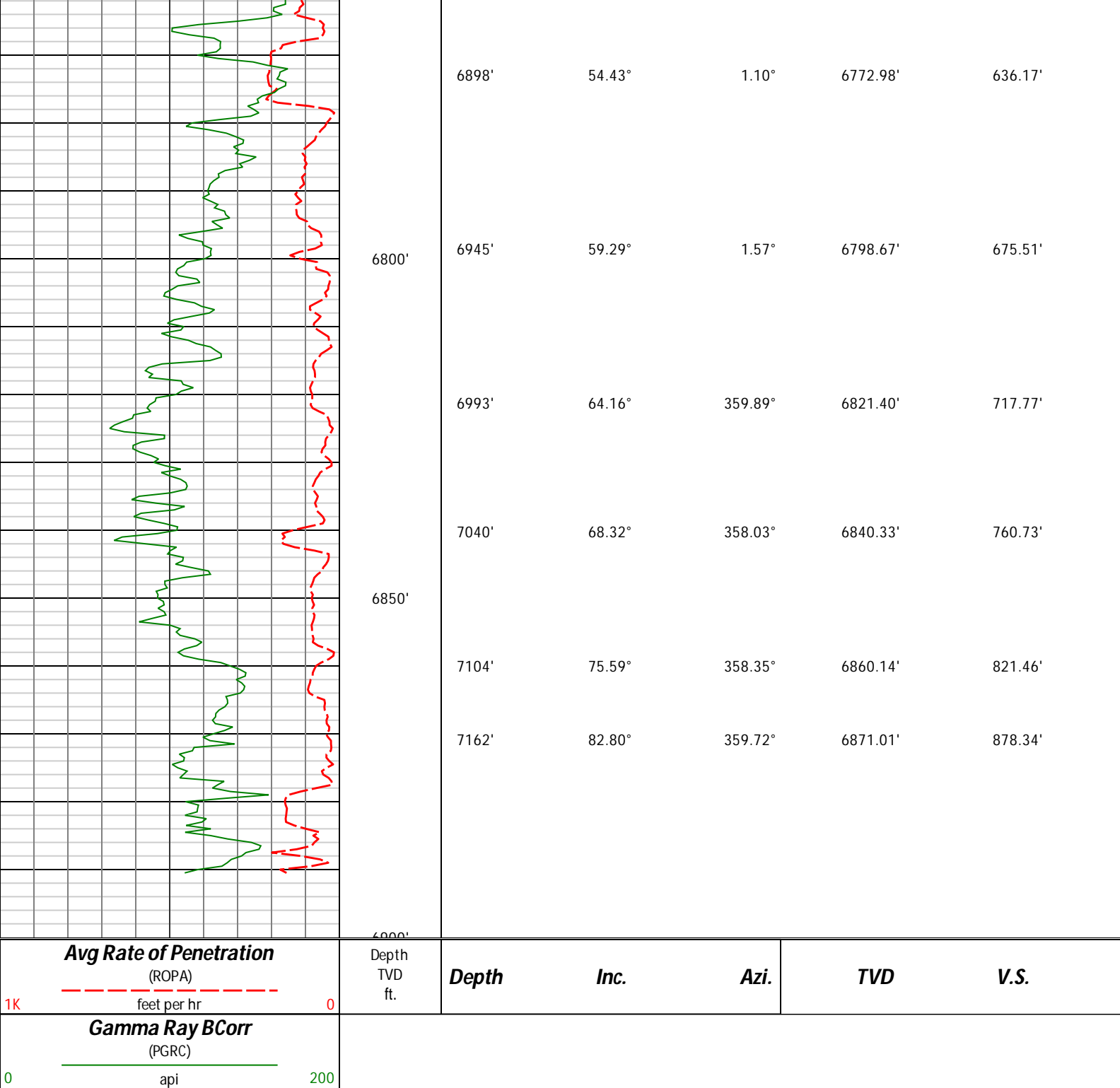
6850'

50.47°

0.21°

6743.73'

598.12'



## HALLIBURTON

### DIRECTIONAL SURVEY REPORT

Noble Energy  
Oscar Y10-74-1HN  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0901673943

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
520.00	0.10	248.80	520.00	0.85 S	0.72 W	-0.86	0.05

742.00	0.30	224.20	742.00	1.34 S	1.30 W	-1.36	0.10
1020.00	0.20	228.30	1019.99	2.18 S	2.17 W	-2.23	0.04
1293.00	0.55	72.68	1292.99	2.11 S	1.28 W	-2.14	0.27
1386.00	1.73	62.34	1385.97	1.32 S	0.39 E	-1.31	1.28
1478.00	2.96	56.60	1477.89	0.63 N	3.61 E	0.71	1.36
1570.00	4.32	61.77	1569.70	3.58 N	8.64 E	3.77	1.52
1663.00	5.74	53.35	1662.35	8.01 N	15.46 E	8.36	1.72
1755.00	7.23	49.09	1753.76	14.55 N	23.53 E	15.08	1.70
1847.00	8.64	43.14	1844.87	23.38 N	32.63 E	24.12	1.77
1938.00	8.33	38.54	1934.88	33.53 N	41.41 E	34.46	0.82
2031.00	8.27	36.09	2026.90	44.20 N	49.55 E	45.31	0.39
2123.00	7.93	32.85	2117.99	54.88 N	56.89 E	56.15	0.62
2216.00	7.33	28.52	2210.16	65.48 N	63.20 E	66.90	0.89
2309.00	8.02	38.67	2302.33	75.76 N	70.09 E	77.33	1.63
2402.00	7.83	35.39	2394.45	85.99 N	77.81 E	87.73	0.53
2495.00	8.44	36.24	2486.51	96.66 N	85.51 E	98.57	0.67
2589.00	7.87	36.40	2579.56	107.40 N	93.41 E	109.49	0.61
2681.00	6.85	34.43	2670.80	117.00 N	100.25 E	119.24	1.14
2773.00	7.49	41.87	2762.08	125.99 N	107.35 E	128.39	1.22
2865.00	7.87	44.75	2853.26	134.93 N	115.79 E	137.52	0.59
2960.00	8.93	48.04	2947.24	144.48 N	125.85 E	147.29	1.22
3055.00	8.76	48.71	3041.11	154.18 N	136.77 E	157.24	0.21
3150.00	8.33	47.61	3135.05	163.59 N	147.29 E	166.89	0.48
3245.00	7.61	46.32	3229.14	172.58 N	156.92 E	176.09	0.78
3340.00	8.91	47.96	3323.15	181.85 N	166.93 E	185.59	1.39
3435.00	9.52	42.24	3416.92	192.59 N	177.68 E	196.57	1.16
3530.00	8.53	33.94	3510.75	204.25 N	186.89 E	208.44	1.72
3624.00	7.62	29.41	3603.82	215.47 N	193.85 E	219.81	1.18
3719.00	6.83	28.18	3698.06	225.93 N	199.61 E	230.40	0.85
3814.00	7.11	37.99	3792.36	235.54 N	205.89 E	240.16	1.29
3909.00	8.26	31.81	3886.51	245.98 N	213.11 E	250.75	1.49
4004.00	7.51	32.16	3980.61	257.03 N	220.01 E	261.96	0.79
4099.00	9.13	33.55	4074.61	268.57 N	227.48 E	273.66	1.72
4194.00	8.15	33.64	4168.53	280.46 N	235.38 E	285.73	1.03
4288.00	8.06	32.95	4261.59	291.54 N	242.65 E	296.97	0.14
4383.00	7.87	30.04	4355.67	302.75 N	249.53 E	308.34	0.47
4478.00	6.33	24.71	4449.94	313.14 N	254.98 E	318.85	1.76
4573.00	4.73	29.71	4544.50	321.30 N	259.11 E	327.10	1.76
4668.00	2.64	26.11	4639.30	326.67 N	262.01 E	332.53	2.21
4763.00	0.53	81.39	4734.26	328.70 N	263.41 E	334.59	2.50
4858.00	0.22	89.81	4829.26	328.77 N	264.03 E	334.67	0.33
4953.00	0.28	157.66	4924.26	328.55 N	264.30 E	334.47	0.30
5048.00	0.52	181.49	5019.25	327.91 N	264.38 E	333.82	0.30
5143.00	0.43	189.34	5114.25	327.13 N	264.31 E	333.04	0.12
5238.00	0.34	191.97	5209.25	326.50 N	264.19 E	332.41	0.10
5333.00	0.15	235.06	5304.25	326.15 N	264.03 E	332.06	0.27
5427.00	0.15	241.99	5398.25	326.02 N	263.82 E	331.92	0.02
5522.00	0.23	293.42	5493.25	326.04 N	263.54 E	331.94	0.19
5617.00	0.16	238.86	5588.25	326.05 N	263.25 E	331.94	0.20
5712.00	0.46	148.21	5683.25	325.65 N	263.33 E	331.55	0.51
5807.00	0.43	178.56	5778.24	324.97 N	263.54 E	330.87	0.25
5902.00	0.43	186.00	5873.24	324.26 N	263.52 E	330.16	0.06
5996.00	0.33	170.42	5967.24	323.65 N	263.52 E	329.54	0.15
6091.00	0.13	250.14	6062.24	323.34 N	263.47 E	329.23	0.35
6186.00	0.25	290.72	6157.24	323.38 N	263.17 E	329.26	0.18
6376.00	15.43	3.00	6344.94	348.92 N	264.11 E	354.82	8.08
6424.00	20.43	8.84	6390.59	363.58 N	265.74 E	369.52	11.06
6471.00	21.78	10.08	6434.44	380.27 N	268.52 E	386.27	3.03
6566.00	26.27	2.77	6521.21	418.65 N	272.63 E	424.73	5.66
6614.00	31.70	357.56	6563.19	441.88 N	272.60 E	447.95	12.47
6661.00	34.68	356.67	6602.52	467.58 N	271.30 E	473.61	6.42
6709.00	36.73	358.87	6641.49	495.56 N	270.22 E	501.57	5.04
6756.00	40.86	359.52	6678.12	525.00 N	269.82 E	530.99	8.83
6850.00	50.47	0.21	6743.73	592.16 N	269.69 E	598.12	10.24
6898.00	54.43	1.10	6772.98	630.20 N	270.14 E	636.17	8.38
6945.00	59.29	1.57	6798.67	669.53 N	271.06 E	675.51	10.37
6993.00	64.16	359.89	6821.40	711.79 N	271.58 E	717.77	10.60
7040.00	68.32	358.03	6840.33	754.78 N	270.79 E	760.73	9.56
7104.00	75.59	358.35	6860.14	815.57 N	268.87 E	821.46	11.37
7162.00	82.80	359.72	6871.01	872.49 N	267.92 E	878.34	12.65
7258.00	85.63	0.26	6880.69	967.99 N	267.91 E	973.82	3.00
7353.00	87.10	358.44	6886.71	1062.79 N	266.83 E	1068.57	2.46

7448.00	89.14	358.21	6889.83	1157.69 N	264.05 E	1163.38	2.16
7543.00	88.92	358.83	6891.43	1252.64 N	261.60 E	1258.26	0.69
7635.00	90.68	357.58	6891.76	1344.59 N	258.72 E	1350.12	2.35
7730.00	91.14	358.92	6890.25	1439.54 N	255.82 E	1444.97	1.49
7823.00	90.99	0.43	6888.52	1532.51 N	255.29 E	1537.91	1.63
7916.00	91.26	359.79	6886.69	1625.50 N	255.47 E	1630.87	0.75
8008.00	91.26	359.18	6884.67	1717.47 N	254.64 E	1722.80	0.66
8100.00	91.35	358.63	6882.57	1809.43 N	252.88 E	1814.70	0.61
8193.00	91.63	0.34	6880.16	1902.39 N	252.05 E	1907.62	1.86
8285.00	91.42	1.27	6877.71	1994.35 N	253.34 E	1999.58	1.04
8377.00	89.60	0.76	6876.89	2086.32 N	254.97 E	2091.57	2.05
8468.00	89.41	0.68	6877.67	2177.31 N	256.11 E	2182.56	0.23
8561.00	89.57	0.01	6878.50	2270.31 N	256.67 E	2275.55	0.74
8654.00	89.75	359.25	6879.05	2363.30 N	256.07 E	2368.51	0.84
8746.00	89.97	359.23	6879.28	2455.30 N	254.85 E	2460.45	0.24
8840.00	90.22	0.66	6879.12	2549.29 N	254.76 E	2554.42	1.54
8932.00	88.40	359.59	6880.23	2641.28 N	254.96 E	2646.39	2.29
9025.00	88.80	358.66	6882.50	2734.24 N	253.54 E	2739.29	1.09
9119.00	90.06	359.27	6883.44	2828.22 N	251.85 E	2833.20	1.49
9211.00	91.02	359.24	6882.57	2920.21 N	250.65 E	2925.14	1.04
9304.00	90.92	359.64	6881.00	3013.19 N	249.74 E	3018.08	0.44
9396.00	90.80	359.64	6879.62	3105.18 N	249.16 E	3110.03	0.13
9491.00	91.17	359.44	6877.98	3200.16 N	248.40 E	3204.97	0.44
9585.00	91.48	358.79	6875.81	3294.12 N	246.95 E	3298.88	0.77
9680.00	90.71	0.18	6873.99	3389.10 N	246.09 E	3393.81	1.67
9775.00	90.58	0.11	6872.92	3484.09 N	246.33 E	3488.78	0.16
9870.00	90.49	0.09	6872.04	3579.09 N	246.50 E	3583.76	0.10
9965.00	90.06	0.38	6871.58	3674.08 N	246.89 E	3678.74	0.55
10060.00	90.00	0.81	6871.53	3769.08 N	247.88 E	3773.73	0.46
10154.00	89.97	2.46	6871.56	3863.04 N	250.56 E	3867.73	1.76
10249.00	89.97	2.87	6871.61	3957.93 N	254.98 E	3962.70	0.43
10344.00	89.45	1.71	6872.09	4052.86 N	258.77 E	4057.68	1.34
10439.00	89.32	359.78	6873.11	4147.84 N	260.01 E	4152.67	2.04
10534.00	90.00	358.90	6873.67	4242.83 N	258.91 E	4247.61	1.17
10629.00	89.63	358.24	6873.98	4337.80 N	256.54 E	4342.50	0.80
10724.00	90.43	359.40	6873.93	4432.77 N	254.58 E	4437.41	1.48
10818.00	90.22	358.65	6873.40	4526.76 N	252.99 E	4531.33	0.83
10913.00	90.99	358.96	6872.39	4621.73 N	251.00 E	4626.24	0.87
11008.00	90.80	358.37	6870.91	4716.69 N	248.79 E	4721.12	0.65
11103.00	90.96	358.14	6869.45	4811.64 N	245.90 E	4815.98	0.29
11198.00	90.49	359.13	6868.25	4906.60 N	243.64 E	4910.87	1.15
11293.00	89.14	358.74	6868.55	5001.58 N	241.87 E	5005.78	1.48
11389.00	88.77	358.19	6870.30	5097.53 N	239.30 E	5101.65	0.69
11483.00	88.49	358.29	6872.55	5191.46 N	236.41 E	5195.49	0.32
11577.00	87.90	358.17	6875.51	5285.37 N	233.51 E	5289.31	0.64
11672.00	89.14	358.09	6877.97	5380.29 N	230.41 E	5384.13	1.31
11767.00	88.86	357.28	6879.62	5475.19 N	226.57 E	5478.92	0.90
11862.00	89.57	357.40	6880.93	5570.08 N	222.17 E	5573.69	0.76
11957.00	90.31	357.99	6881.03	5665.00 N	218.35 E	5668.50	1.00
12052.00	90.28	358.75	6880.54	5759.96 N	215.64 E	5763.37	0.80
12147.00	90.83	358.61	6879.62	5854.93 N	213.45 E	5858.27	0.60
12242.00	90.68	358.32	6878.36	5949.89 N	210.91 E	5953.14	0.34
12337.00	91.29	0.06	6876.73	6044.86 N	209.57 E	6048.06	1.94
12432.00	90.06	0.50	6875.61	6139.85 N	210.03 E	6143.04	1.38
12527.00	89.97	359.68	6875.59	6234.85 N	210.18 E	6238.01	0.87
12621.00	90.52	359.62	6875.19	6328.85 N	209.61 E	6331.97	0.59
12716.00	91.23	358.81	6873.73	6423.83 N	208.30 E	6426.90	1.13
12811.00	90.09	359.45	6872.64	6518.81 N	206.86 E	6521.82	1.38
12906.00	89.14	359.18	6873.28	6613.80 N	205.73 E	6616.76	1.04
13001.00	89.29	359.25	6874.58	6708.78 N	204.42 E	6711.69	0.17
13096.00	89.57	358.34	6875.53	6803.75 N	202.43 E	6806.59	1.00
13190.00	89.32	358.23	6876.44	6897.71 N	199.61 E	6900.46	0.29
13285.00	89.57	357.94	6877.36	6992.65 N	196.44 E	6995.31	0.40
13380.00	90.15	358.36	6877.59	7087.60 N	193.37 E	7090.16	0.75
13474.00	90.71	359.66	6876.88	7181.58 N	191.75 E	7184.08	1.51
13569.00	90.89	358.90	6875.56	7276.56 N	190.55 E	7279.01	0.82
13664.00	90.18	358.19	6874.67	7371.53 N	188.14 E	7373.90	1.06
13759.00	90.15	359.95	6874.40	7466.51 N	186.60 E	7468.82	1.85
13854.00	90.03	358.12	6874.25	7561.49 N	185.00 E	7563.74	1.93
13949.00	89.82	358.44	6874.37	7656.45 N	182.15 E	7658.61	0.40
14044.00	89.97	358.17	6874.54	7751.41 N	179.34 E	7753.48	0.33

14139.00	89.41	358.72	6875.06	7846.37 N	176.76 E	7848.36	0.83
14234.00	89.69	359.30	6875.81	7941.35 N	175.12 E	7943.28	0.68
14317.00	89.72	358.68	6876.23	8024.34 N	173.66 E	8026.21	0.75
14377.00	89.72	358.68	6876.53	8084.32 N	172.27 E	8086.15	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 DIRECTION OF 1.30 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.71 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 14377.00 FEET  
IS 8086.16 FEET ALONG 1.22 DEGREES (GRID)**

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