

**PCGC: Pressure Case Gamma**  
**PCDC: Pressure Case Directional**



**1 : 600 / 1 : 240**

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200	300		
<b>Date run completed</b>	30-Nov-13	02-Dec-13	07-Dec-13		
<b>Rig Bit Number</b>	2	3	4		
<b>Bit Size (in)</b>	8.750	8.750	6.125		
<b>Tool Nominal OD (in)</b>	6.750	6.750	4.750		
<b>Log Start Depth (MD, ft)</b>	632.00	5,878.00	6,920.00		
<b>Log End Depth (MD, ft)</b>	5,878.00	6,920.00	10,754.00		
<b>Drill or Wipe</b>	Drill	Drill	Drill		
<b>Drill/Wipe Start Date and Time</b>	29-Nov-13 20:00	01-Dec-13 09:05	04-Dec-13 02:00		
<b>Drill/Wipe End Date and Time</b>	30-Nov-13 16:30	02-Dec-13 11:00	06-Dec-13 07:20		
<b>Min Inc (deg) @ Depth (MD, ft)</b>	0.15 @ 810.00	0.64 @ 5,889.00	87.53 @ 6,957.00		
<b>Max Inc (deg) @ Depth (MD, ft)</b>	9.29 @ 2,692.00	81.79 @ 6,866.00	92.32 @ 10,548.00		
<b>Bit TFA(in2) / Bit Type</b>	0.75 / PDC	0.86 / PDC	0.65 / PDC		
<b>Flow Rate (gpm)</b>	582.31	561.49	294.13		
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	N/A / N/A	N/A / N/A	N/A / N/A		
<b>Fluid Type</b>	Polymer	Polymer	Polymer		
<b>Density (ppg) / Viscosity (spqt)</b>	8.82 / 28.00	9.65 / 34.00	10.85 / 42.00		
<b>Filtrate CL (ppm)</b>	1,400.00	1,300.00	1,600.00		
<b>pH / Fluid Loss (mptm)</b>	8.80 / 17	8.90 / 11	8.50 / 9		
<b>PV (cP) / YP (lbf2)</b>	4 / 6.00	9 / 11.00	15 / 25.00		
<b>% Solids / % Sand</b>	3.4 / 0.30	10.8 / 0.30	10.2 / 0.50		
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A	N/A / N/A	N/A / N/A		
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A	N/A @ N/A		
<b>Max Tool Temp (in) @ Temp (degF)</b>	170.07 / 326.15	170.07 / 326.15	200.00 / 392.00		

Max Tool Temp (degF) / Source	170.37 / PCM	170.37 / PCM	236.82 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Paul Kock	Henry Schmeidler	Henry Schmeidler		
Customer Representative	Martin Suarez	Martin Suarez	Steve Record		

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.84	5.84	5.84		
Sub Serial Number	11341350	11341350	12310747		
Insert Serial Number	11680770	11680770	12001058		
Date and Time Initialized	29-Nov-13 03:12	29-Nov-13 03:12	03-Dec-13 12:13		
Date and Time Read	02-Dec-13 19:34	02-Dec-13 19:53	07-Dec-13 14:46		
ECMB SW Version	N/A	N/A	N/A		

### Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	54.24	52.43	61.57		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11341350	11341350	12310747		
Sonde Serial Number	11638601	11638601	11638477		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	39.25	324.27	175.14		

### Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	49.24	47.43	56.59		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	11341350	11341350	12310747		
Insert/Sonde Serial Number	11579788	11579788	11120592		

## REMARKS

1. All depths are calibrated to the driller's pipe tally and are measured from the rig 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.
  - ROPA: Average Rate of Penetration is real time data.
  - PGRC: Smooth Pressure Case Gamma Ray Borehole corrected is recorded data.
4. The following smoothing parameters have been applied to the data:
  - All 2" (1:600) logs - 1 ft. interval, 3 ft. coercion distance.
  - All 5" (1:240) logs - .5 ft. interval, .6 ft. coercion distance.
5. INSITE version 8.0.0

## WARRANTY

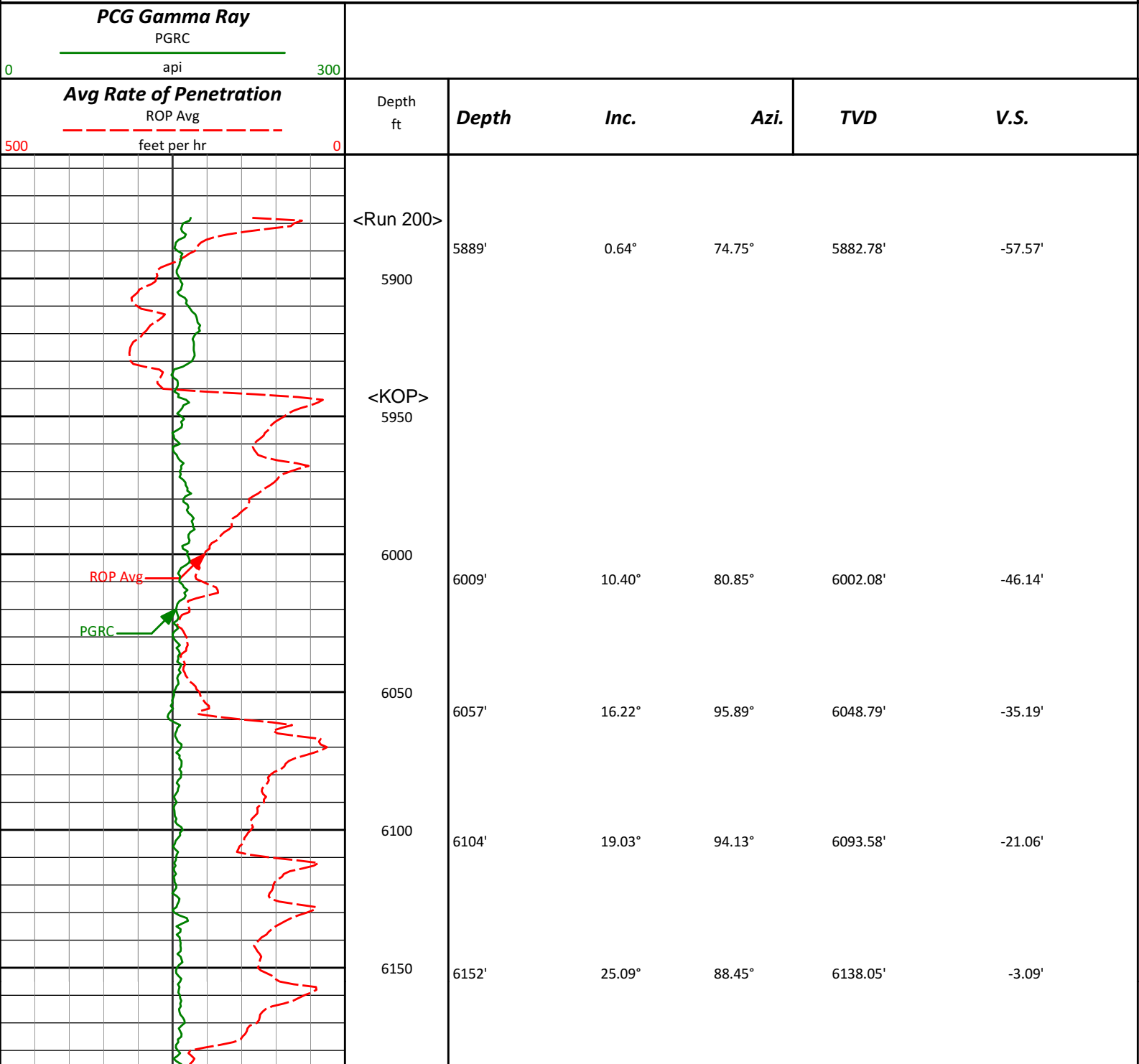
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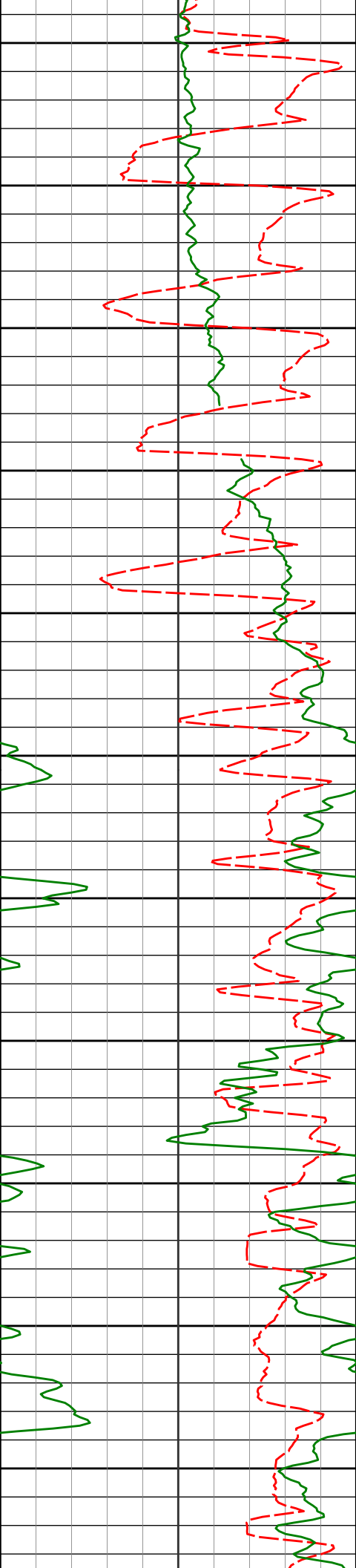
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HALLIBURTON  
Sperry Drilling Services

MD Main Log 1:600

Noble Energy, Inc  
Cockroft B11-62-1HN  
H&P 315  
T5N R64W





6200

6199'

28.27°

92.00°

6180.04'

17.99'

6250

6247'

30.55°

91.72°

6221.85'

41.51'

6300

6293'

33.42°

90.11°

6260.86'

65.84'

6350

6341'

35.93°

89.29°

6300.33'

93.14'

6400

6389'

39.38°

90.33°

6338.33'

122.44'

6450

6437'

43.07°

92.58°

6374.43'

154.00'

6500

6484'

47.95°

91.90°

6407.36'

187.43'

6550

6532'

53.23°

88.88°

6437.83'

224.47'

6600

6578'

54.82°

90.10°

6464.85'

261.68'

6650

6626'

58.18°

90.64°

6491.34'

301.67'

6700

6673'

65.24°

90.81°

6513.60'

342.98'

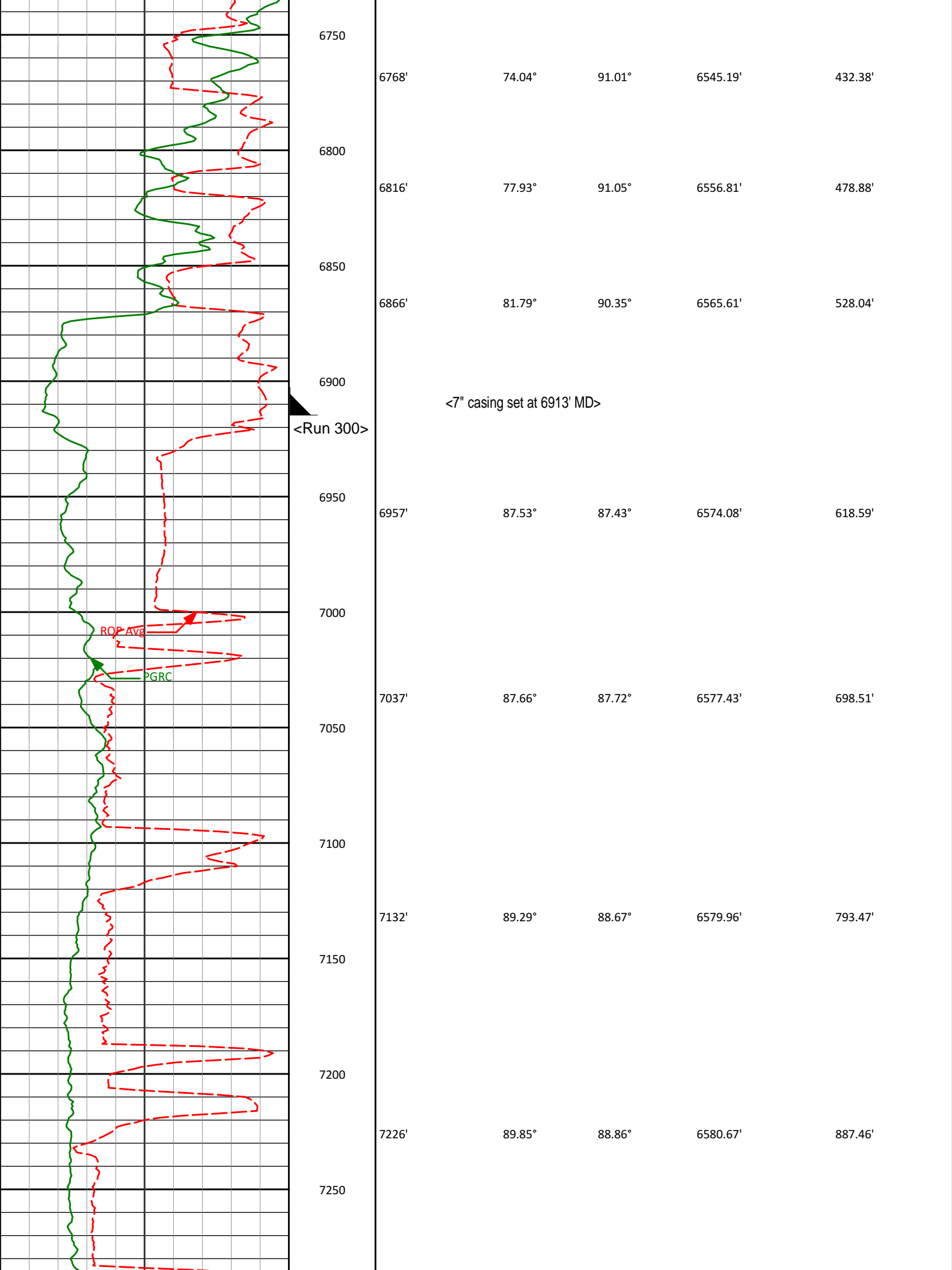
6721'

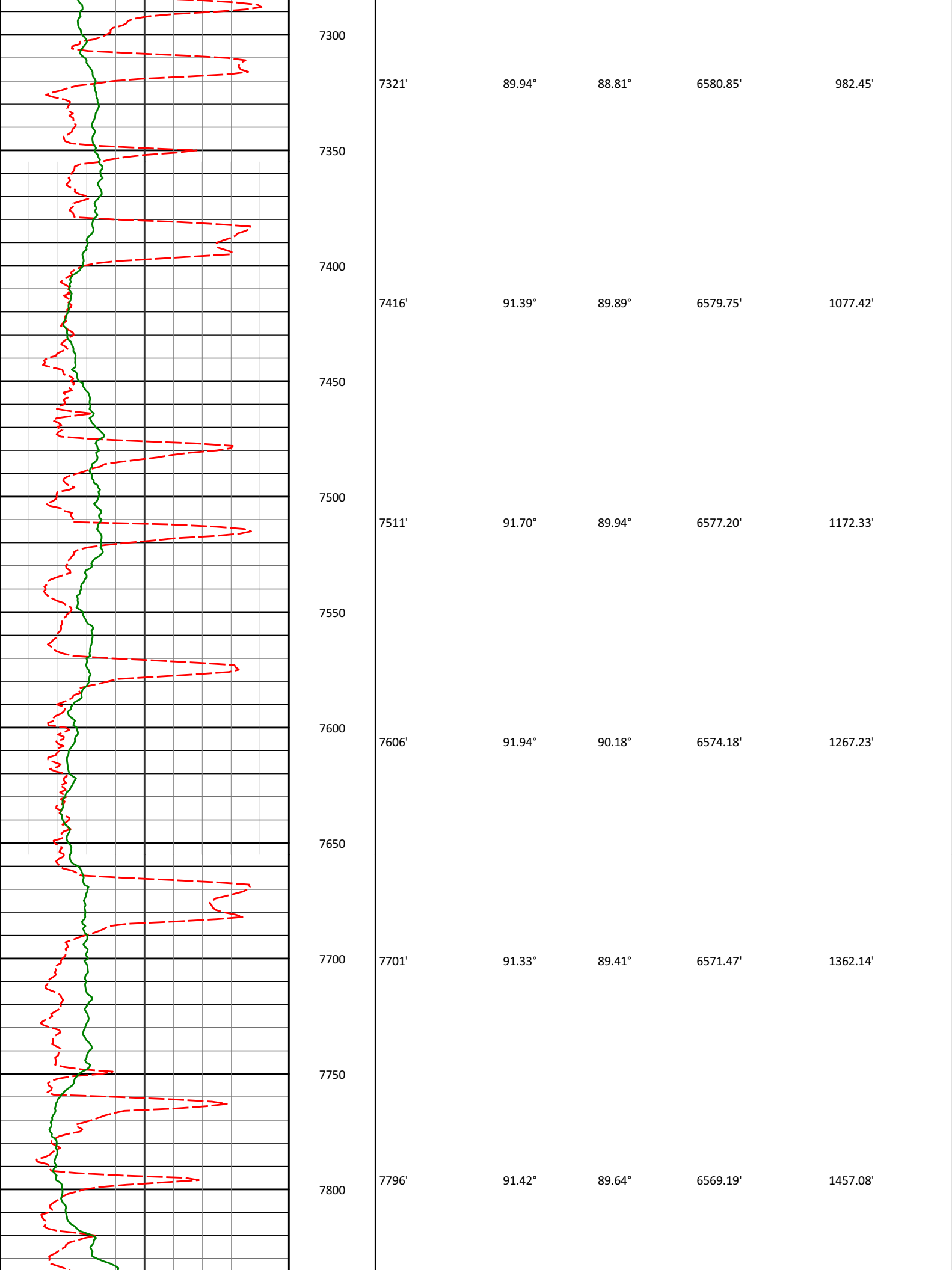
71.52°

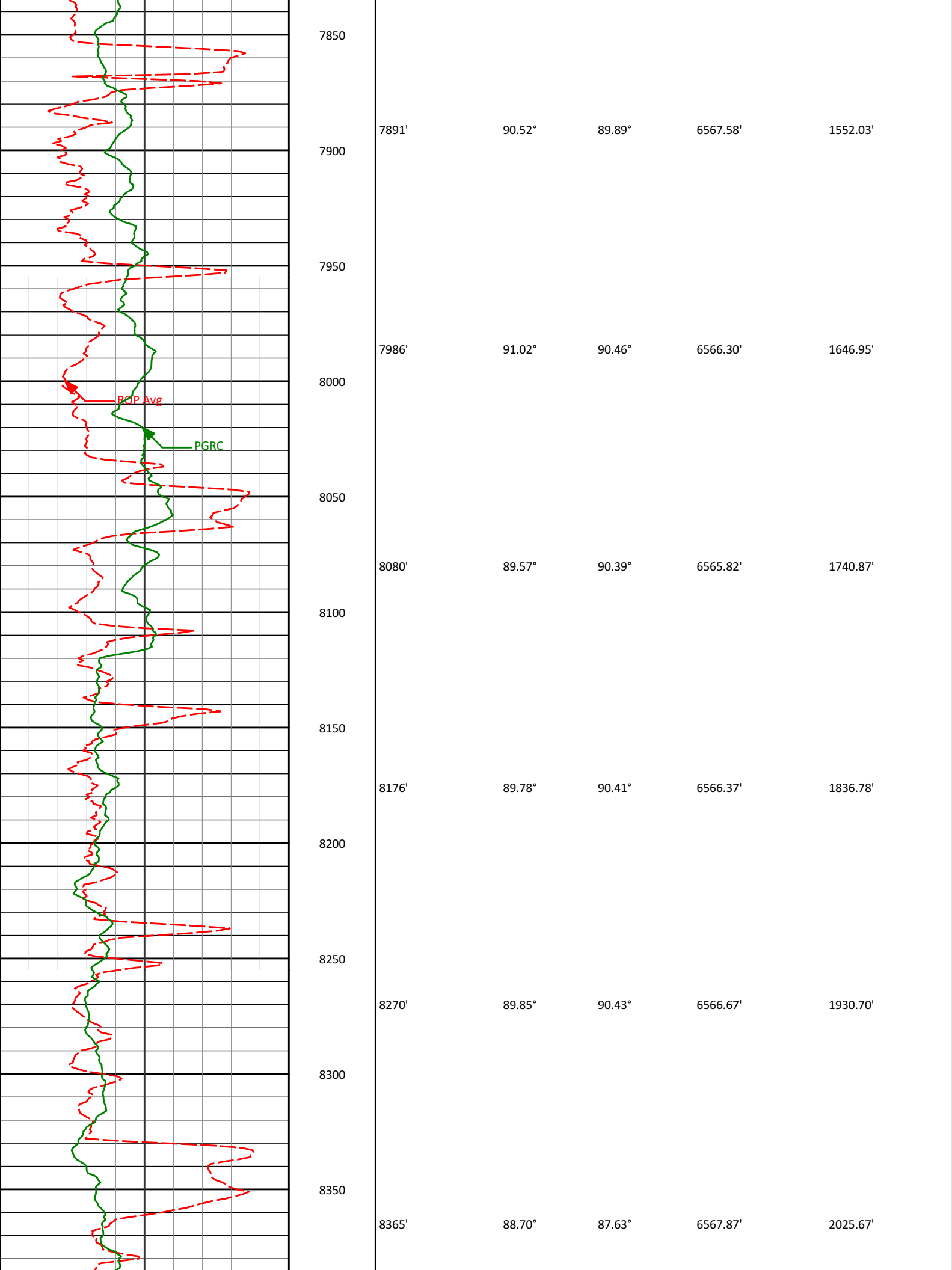
90.24°

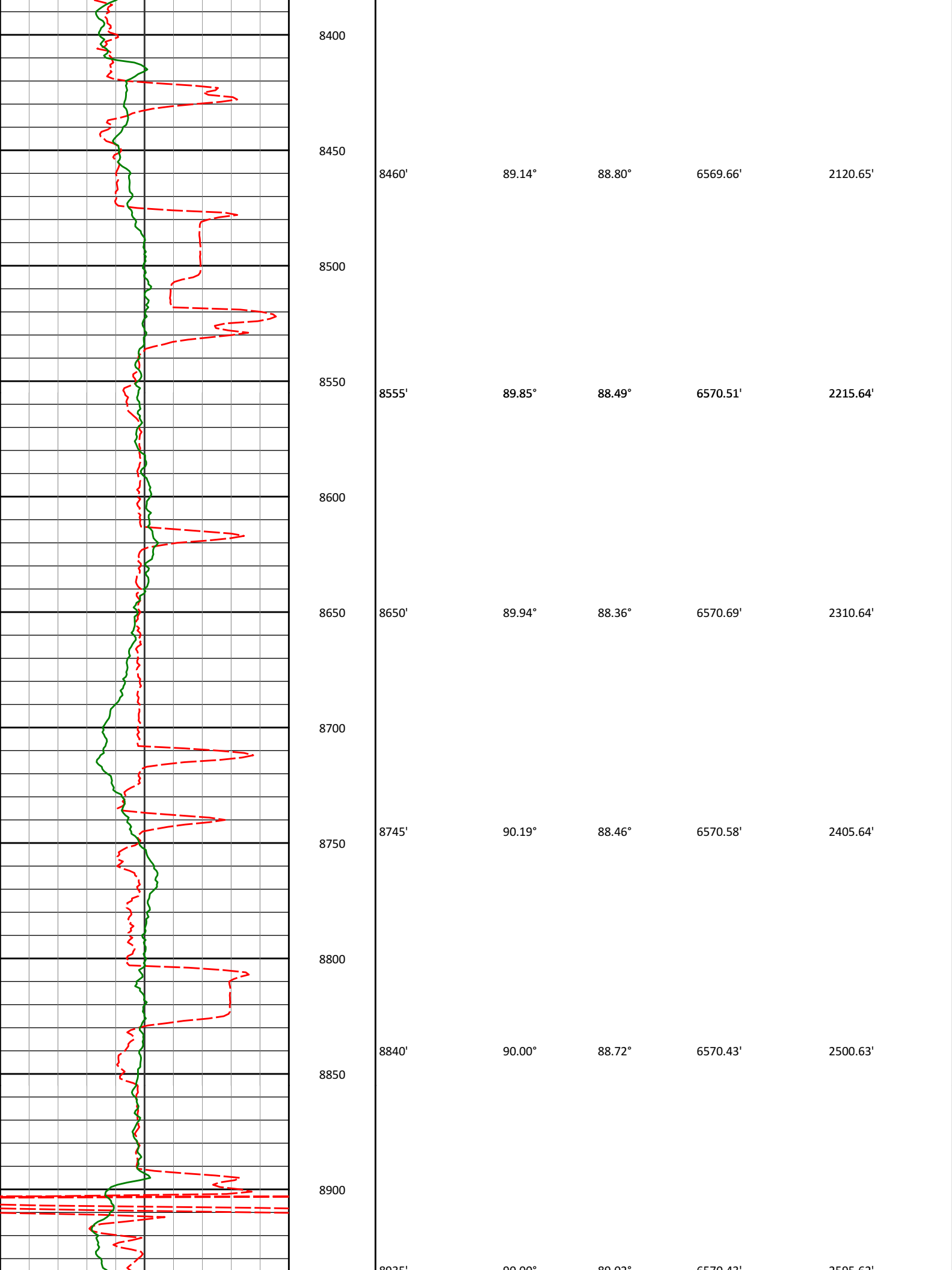
6531.27'

387.54'

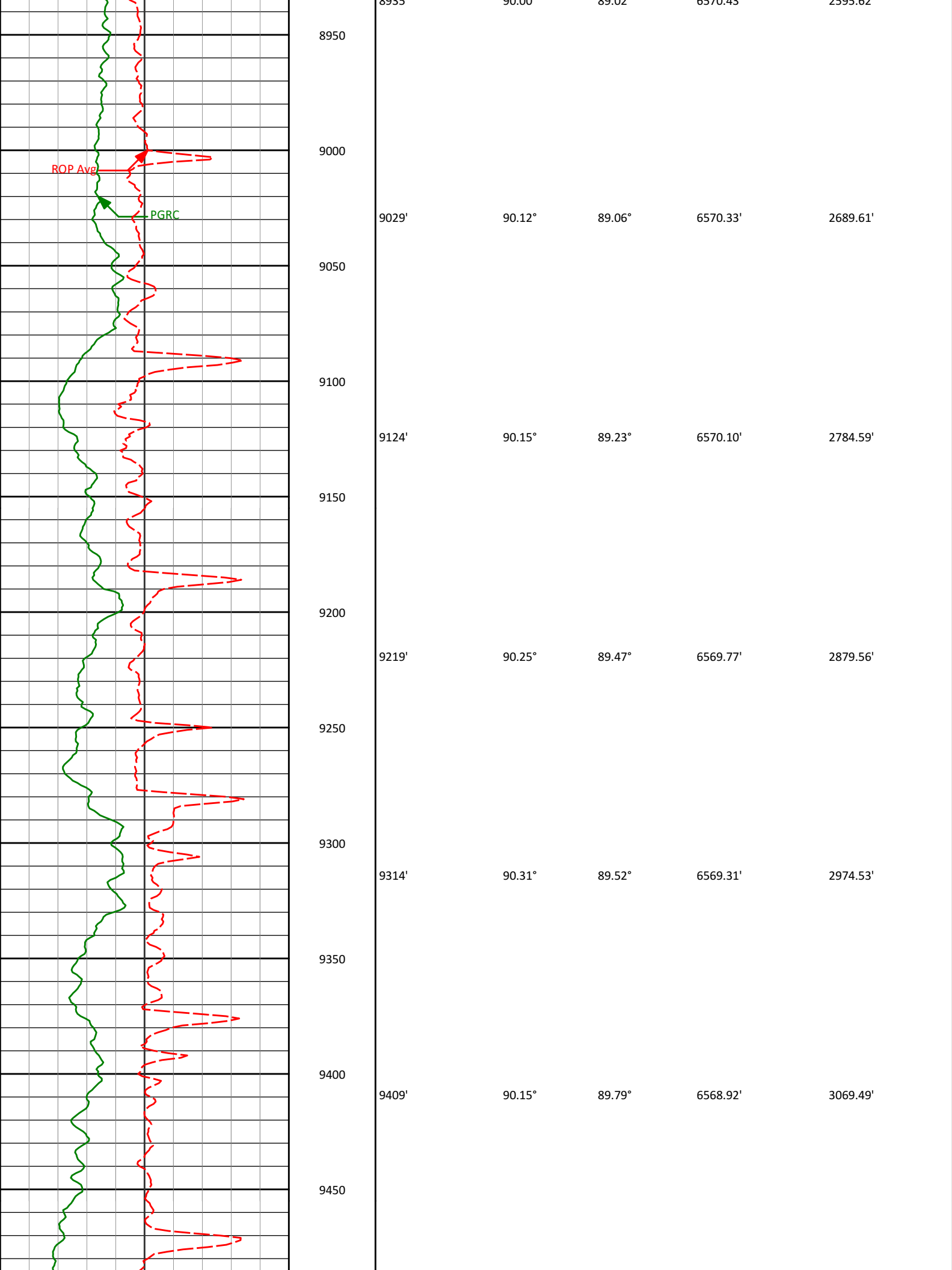


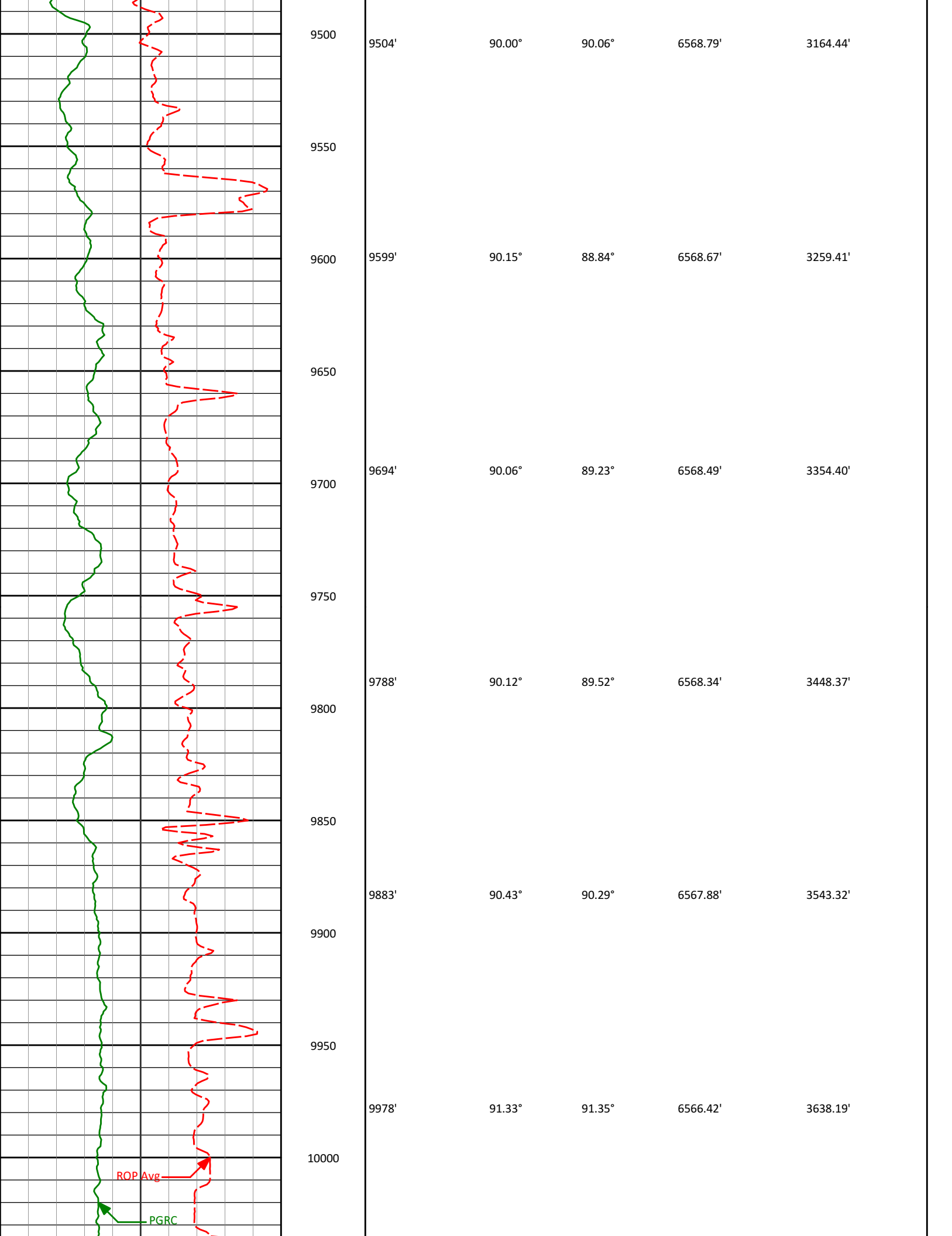


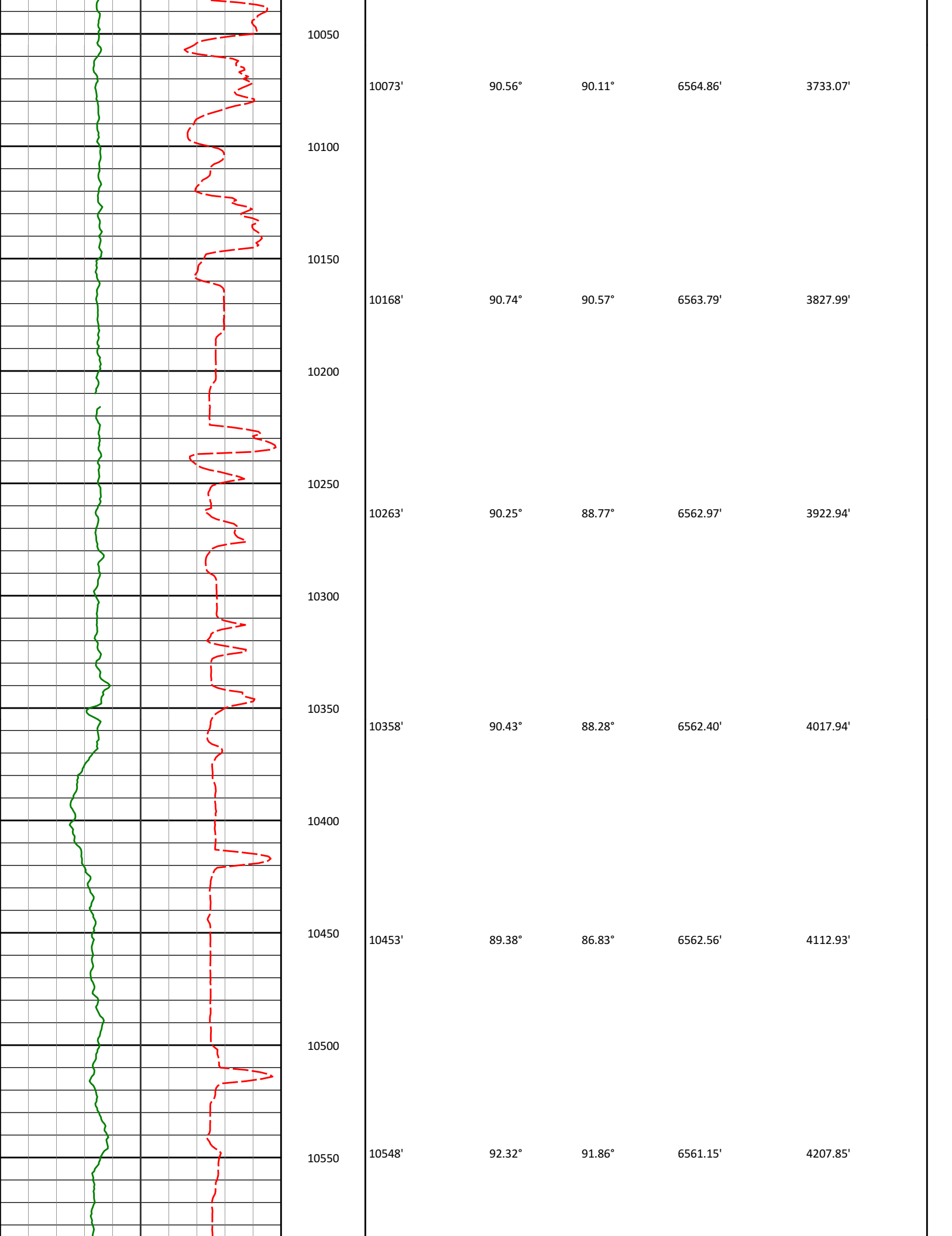


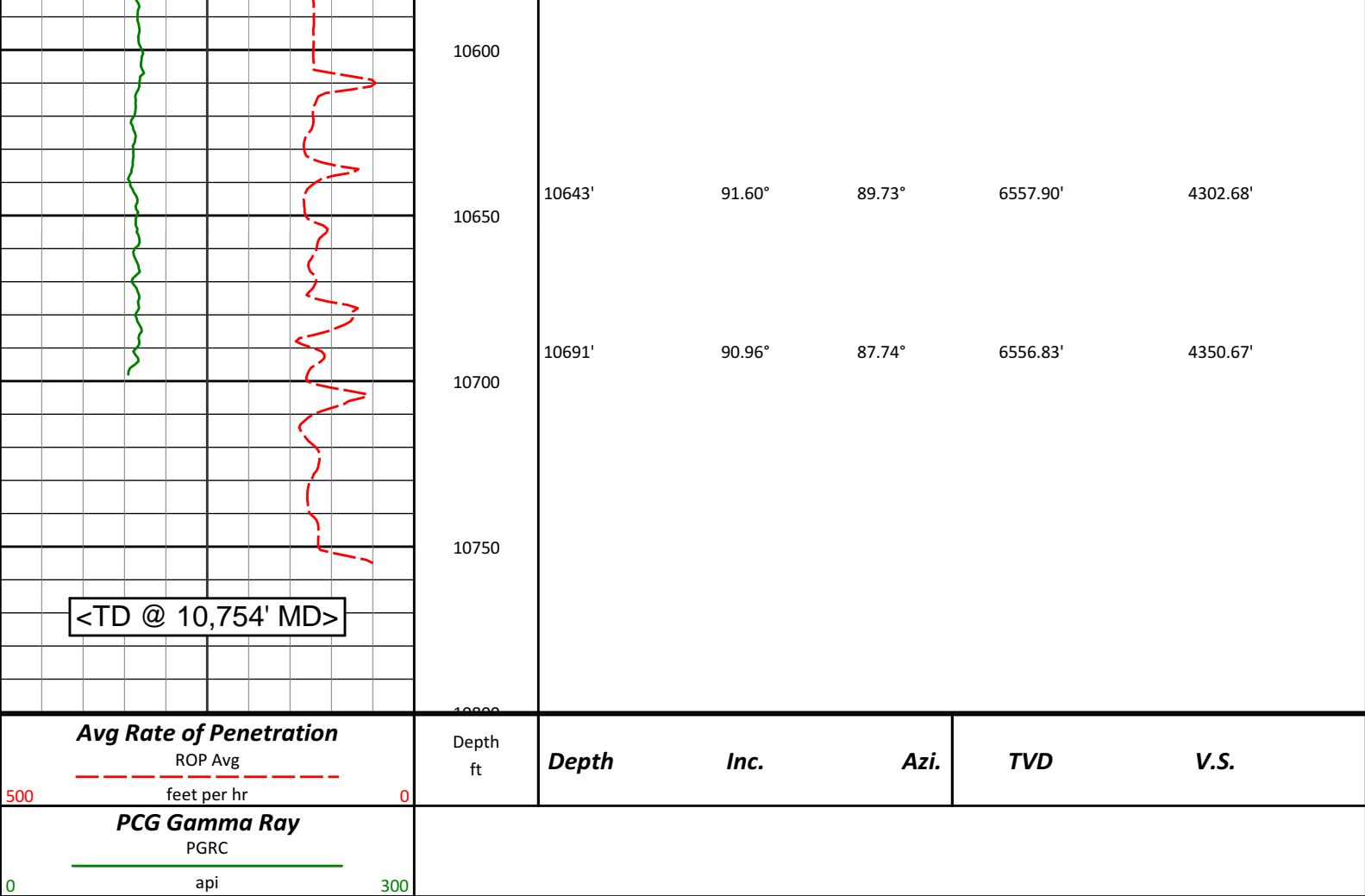










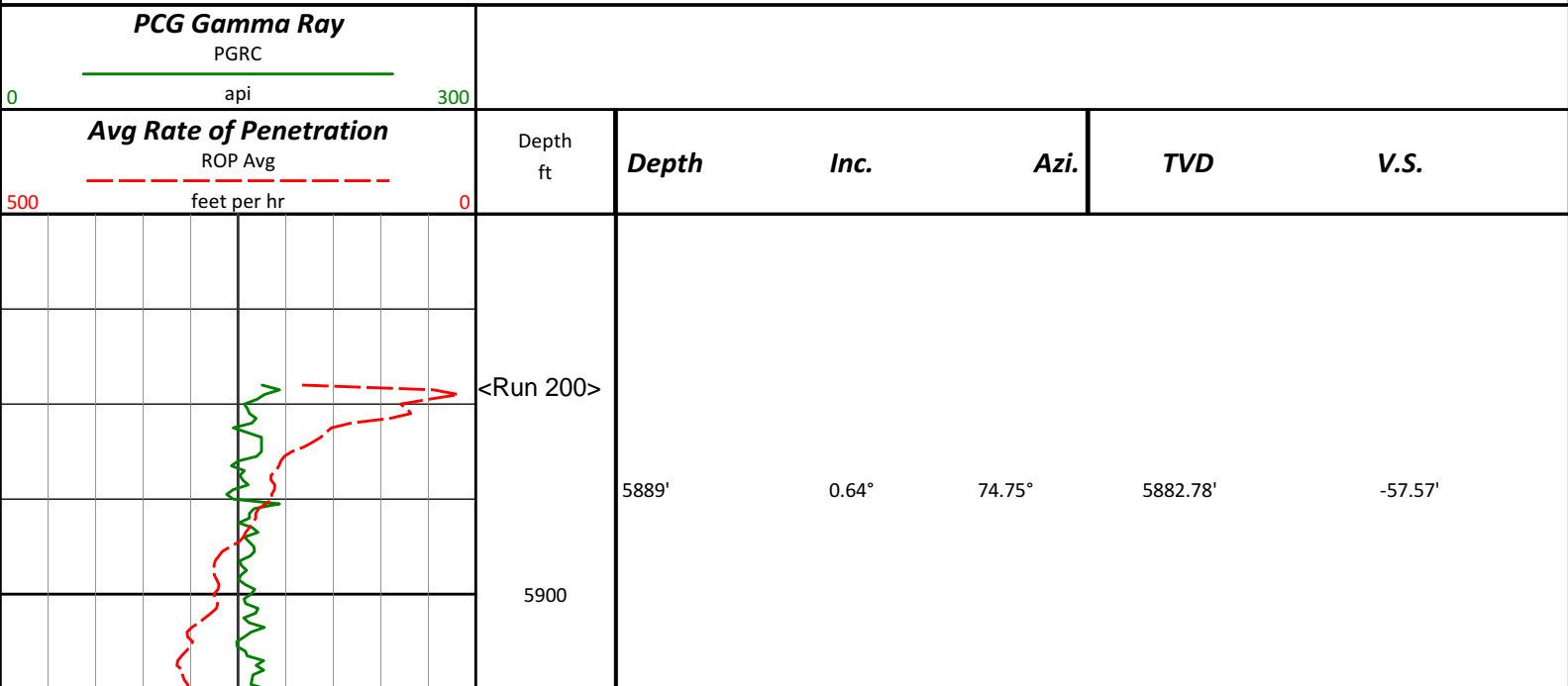


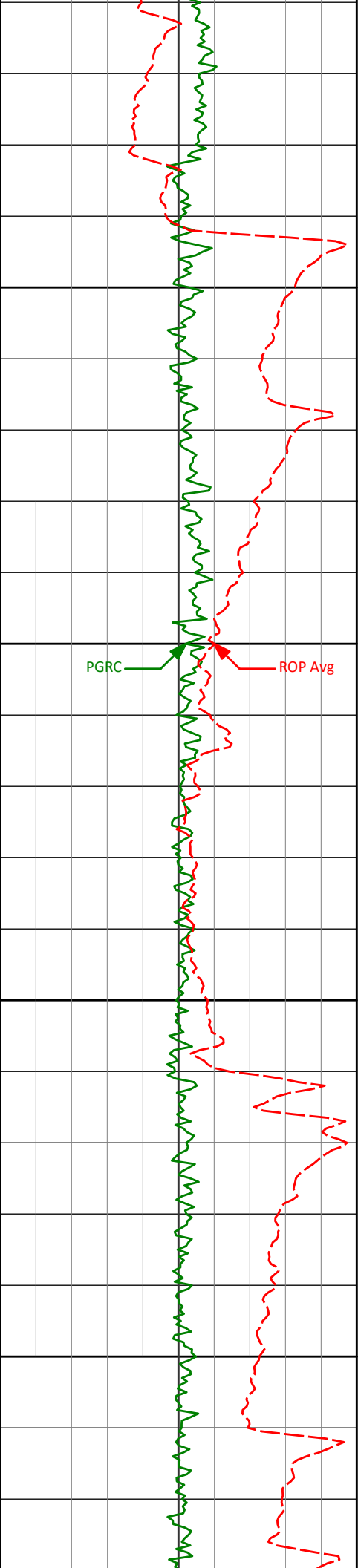
# HALLIBURTON

## Sperry Drilling Services

### MD Detail Log 1:240

Noble Energy, Inc  
Cockroft B11-62-1HN  
H&P 315  
T5N R64W





<KOP>

5950

6000

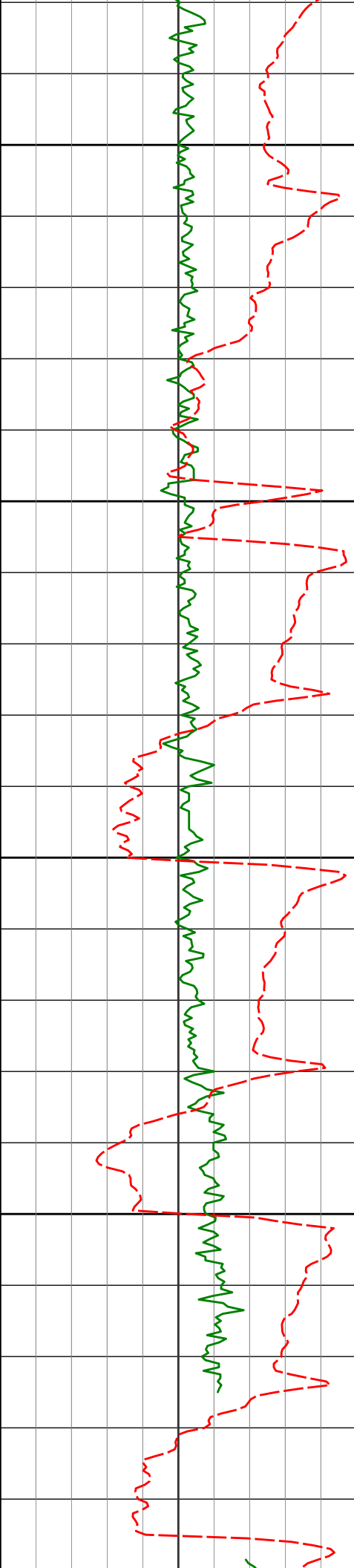
6050

6100

PGRC

ROP Avg

6009'	10.40°	80.85°	6002.08'	-46.14'
6057'	16.22°	95.89°	6048.79'	-35.19'
6104'	19.03°	94.13°	6093.58'	-21.06'



6150

6152'

25.09°

88.45°

6138.05'

-3.09'

6200

6199'

28.27°

92.00°

6180.04'

17.99'

6250

6247'

30.55°

91.72°

6221.85'

41.51'

6300

6293'

33.42°

90.11°

6260.86'

65.84'

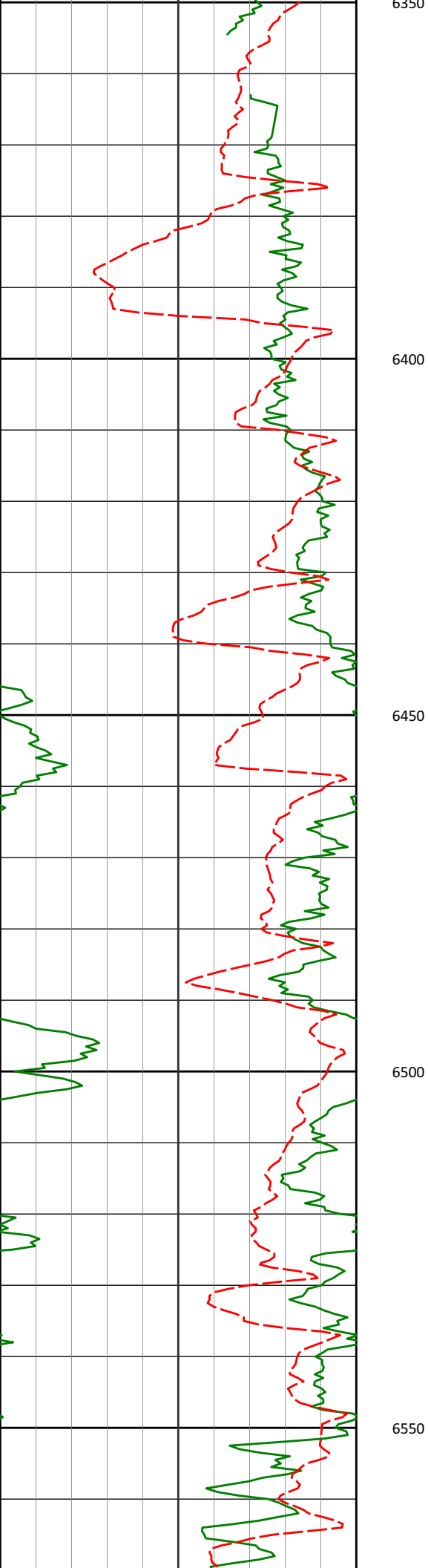
6341'

35.93°

89.29°

6300.33'

93.14'



6389'

39.38°

90.33°

6338.33'

122.44'

6437'

43.07°

92.58°

6374.43'

154.00'

6484'

47.95°

91.90°

6407.36'

187.43'

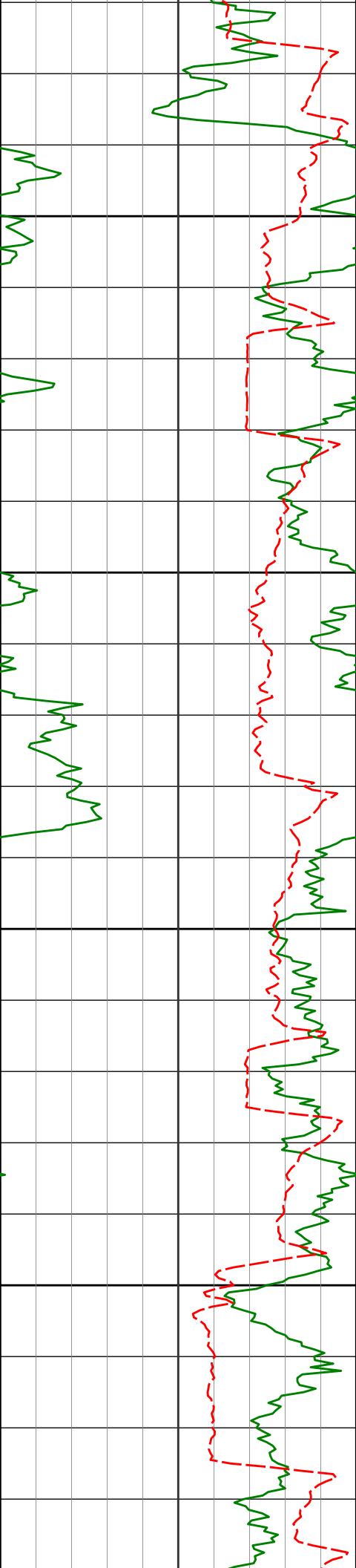
6532'

53.23°

88.88°

6437.83'

224.47'



6578'

54.82°

90.10°

6464.85'

261.68'

6600

6626'

58.18°

90.64°

6491.34'

301.67'

6650

6673'

65.24°

90.81°

6513.60'

342.98'

6700

6721'

71.52°

90.24°

6531.27'

387.54'

6750

6768'

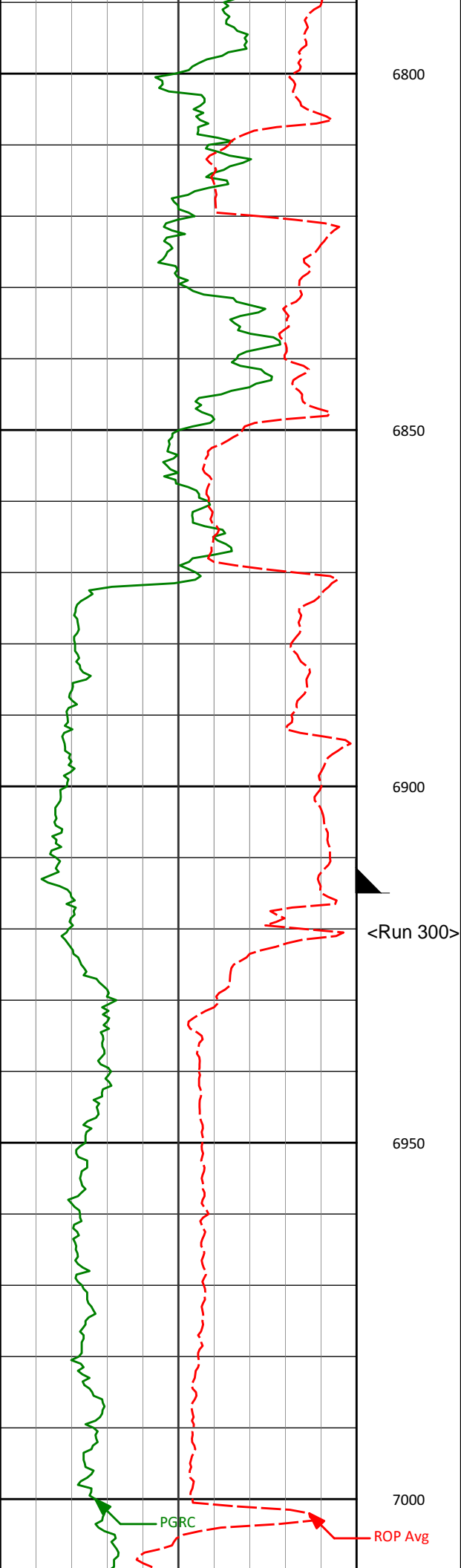
74.04°

91.01°

6545.19'

432.38'





6800

6816'

77.93°

91.05°

6556.81'

478.88'

6850

6866'

81.79°

90.35°

6565.61'

528.04'

6900

<7" casing set at 6913' MD>

<Run 300>

6950

6957'

87.53°

87.43°

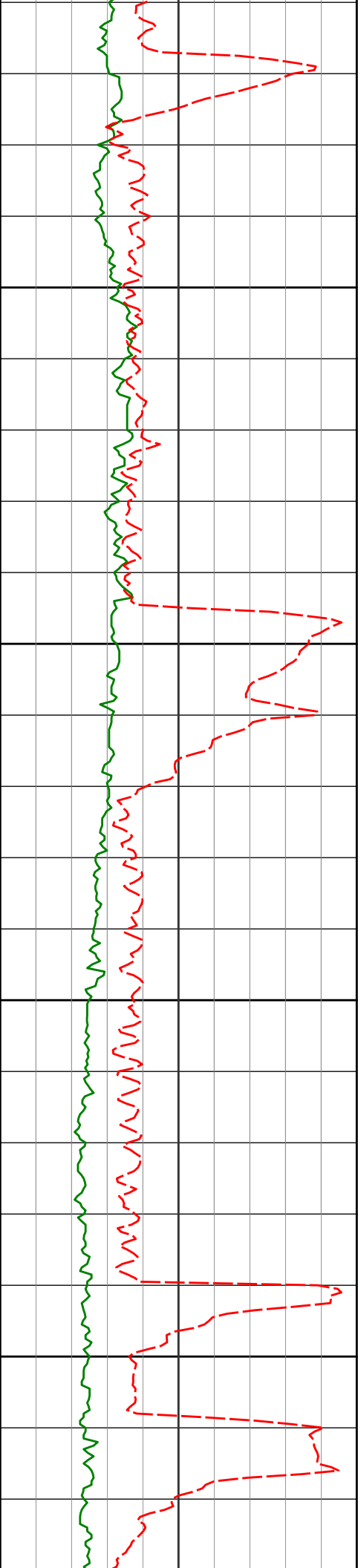
6574.08'

618.59'

7000

PGRC

ROP Avg



7037'

87.66°

87.72°

6577.43'

698.51'

7050

7100

7132'

89.29°

88.67°

6579.96'

793.47'

7150

7200

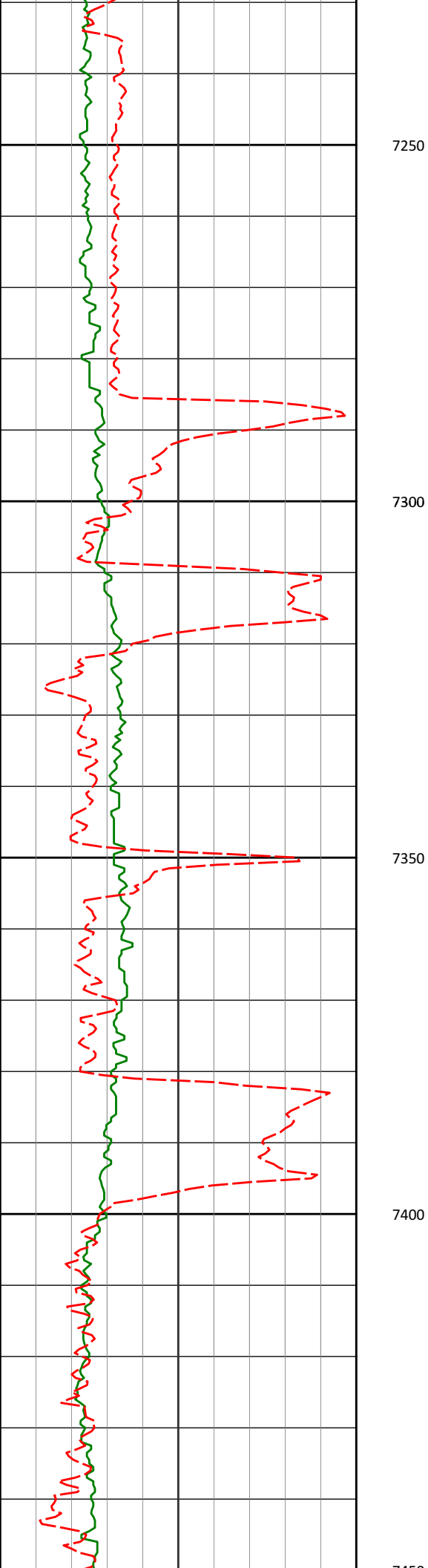
7226'

89.85°

88.86°

6580.67'

887.46'



7321'

89.94°

88.81°

6580.85'

982.45'

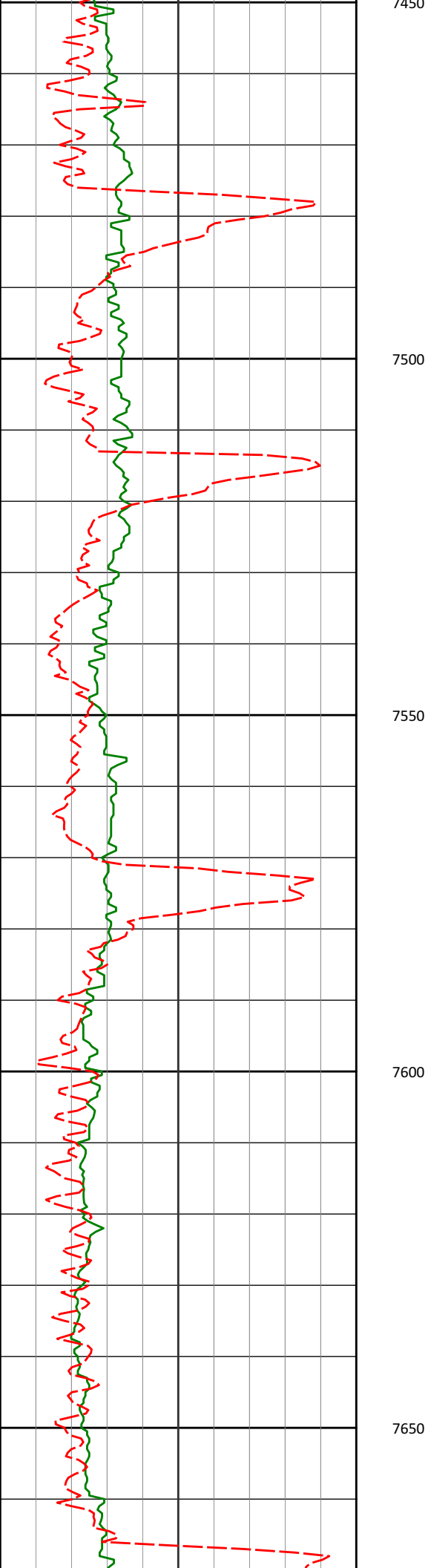
7416'

91.39°

89.89°

6579.75'

1077.42'



7511'

91.70°

89.94°

6577.20'

1172.33'

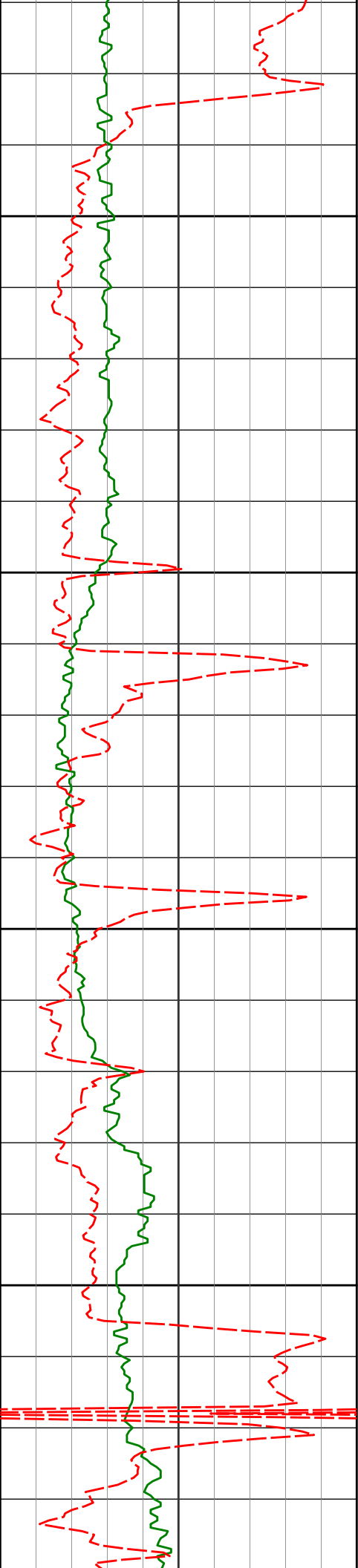
7606'

91.94°

90.18°

6574.18'

1267.23'



7700

7750

7800

7850

7701'

7796'

91.33°

91.42°

89.41°

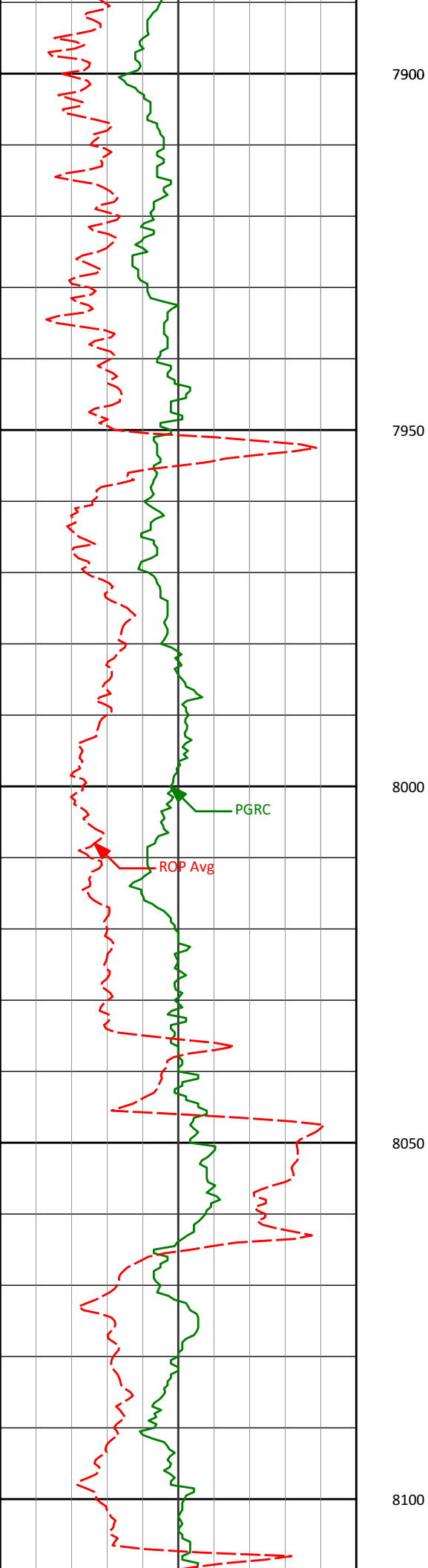
89.64°

6571.47'

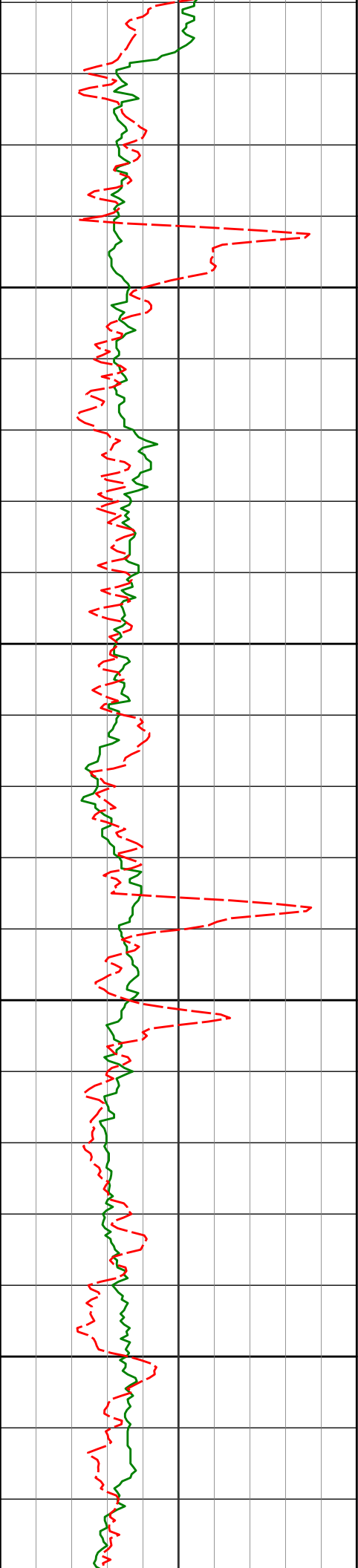
6569.19'

1362.14'

1457.08'



7891'	90.52°	89.89°	6567.58'	1552.03'
7986'	91.02°	90.46°	6566.30'	1646.95'
8080'	89.57°	90.39°	6565.82'	1740.87'



8150

8176'

89.78°

90.41°

6566.37'

1836.78'

8200

8250

8270'

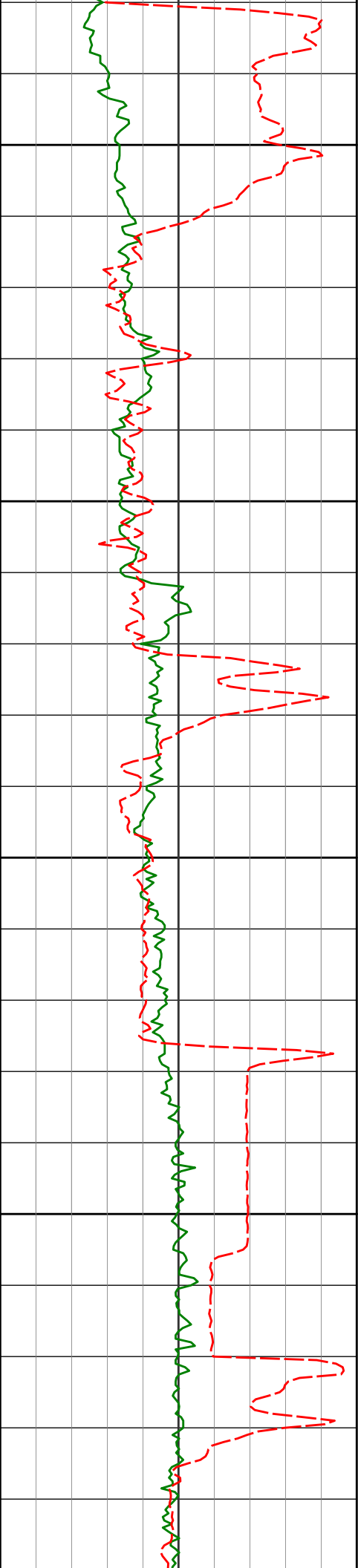
89.85°

90.43°

6566.67'

1930.70'

8300



8350

8365'

88.70°

87.63°

6567.87'

2025.67'

8400

8450

8460'

89.14°

88.80°

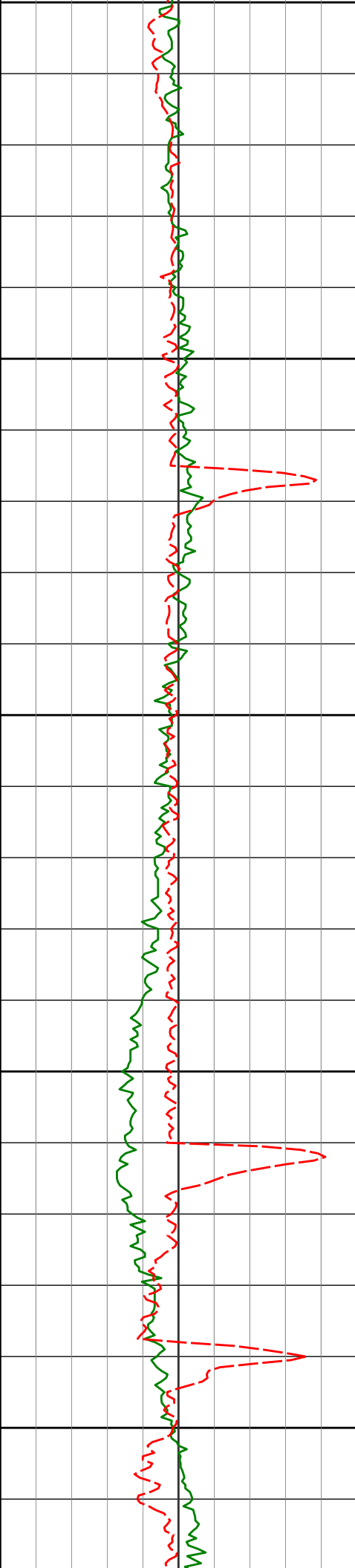
6569.66'

2120.65'

8500

8550'





8550

8555'

89.85°

88.49°

6570.51'

2215.64'

8600

8650

8650'

89.94°

88.36°

6570.69'

2310.64'

8700

8750

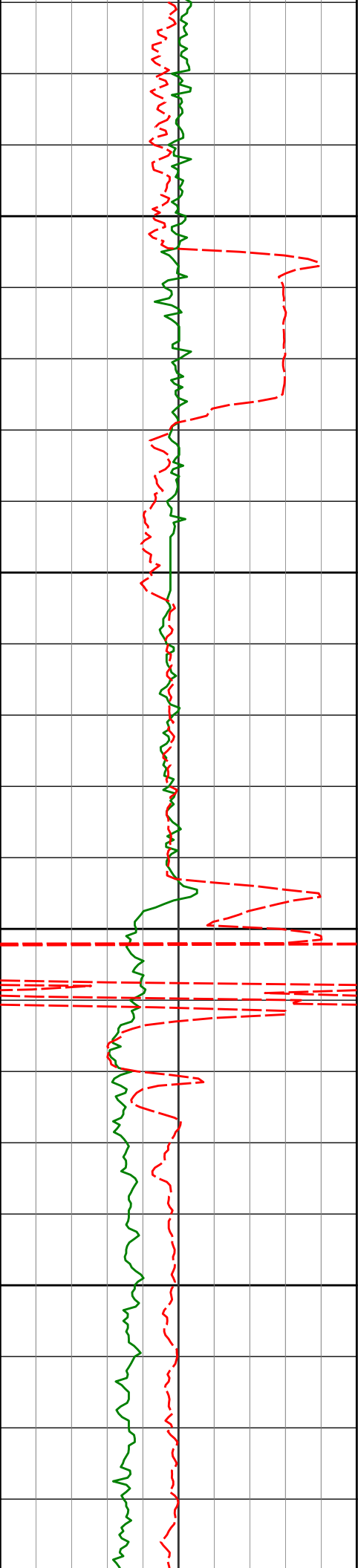
8745'

90.19°

88.46°

6570.58'

2405.64'



8800

8850

8900

8950

8840'

8935'

90.00°

90.00°

88.72°

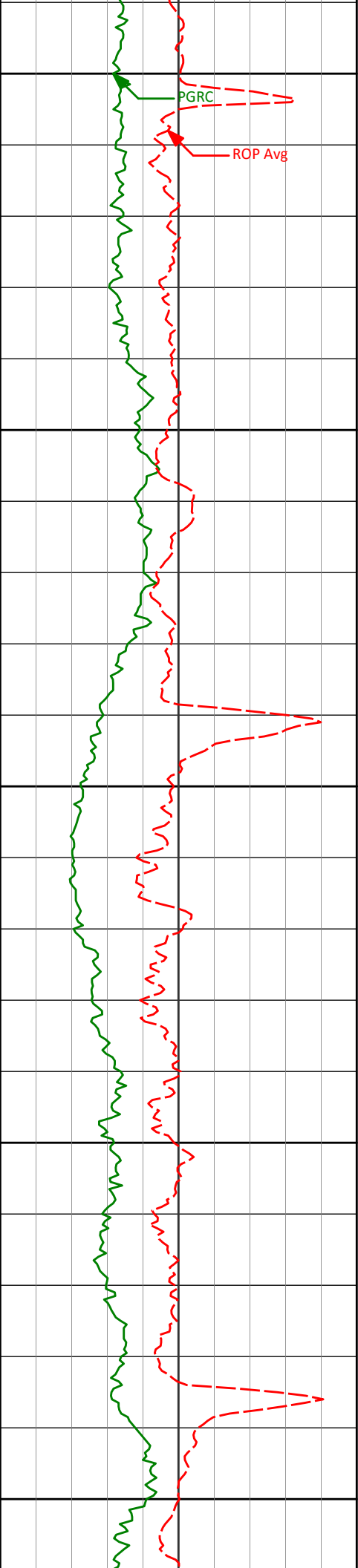
89.02°

6570.43'

6570.43'

2500.63'

2595.62'



9000

9050

9100

9150

9200

PGRC

ROP Avg

9029'

90.12°

89.06°

6570.33'

2689.61'

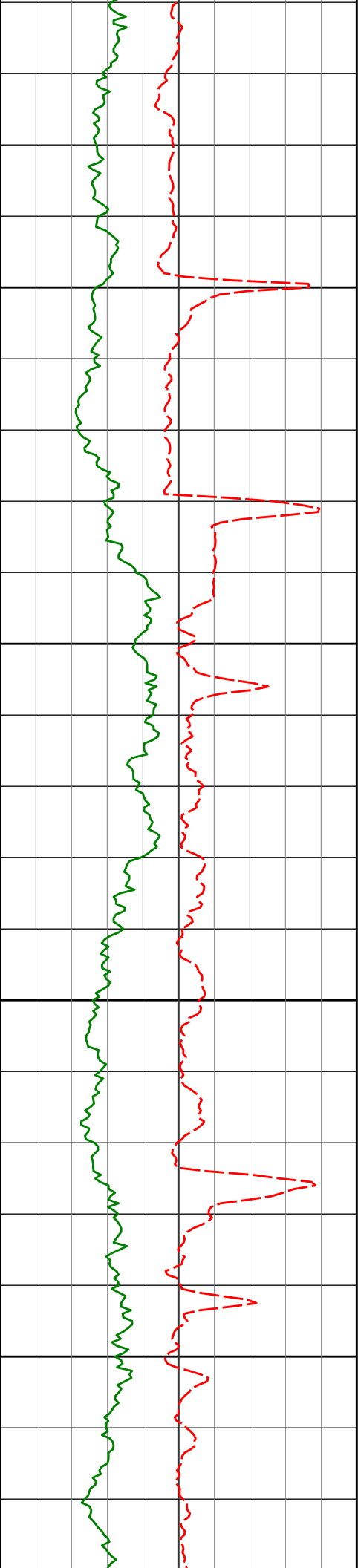
9124'

90.15°

89.23°

6570.10'

2784.59'



9219'

90.25°

89.47°

6569.77'

2879.56'

9250

9300

9314'

90.31°

89.52°

6569.31'

2974.53'

9350

9400

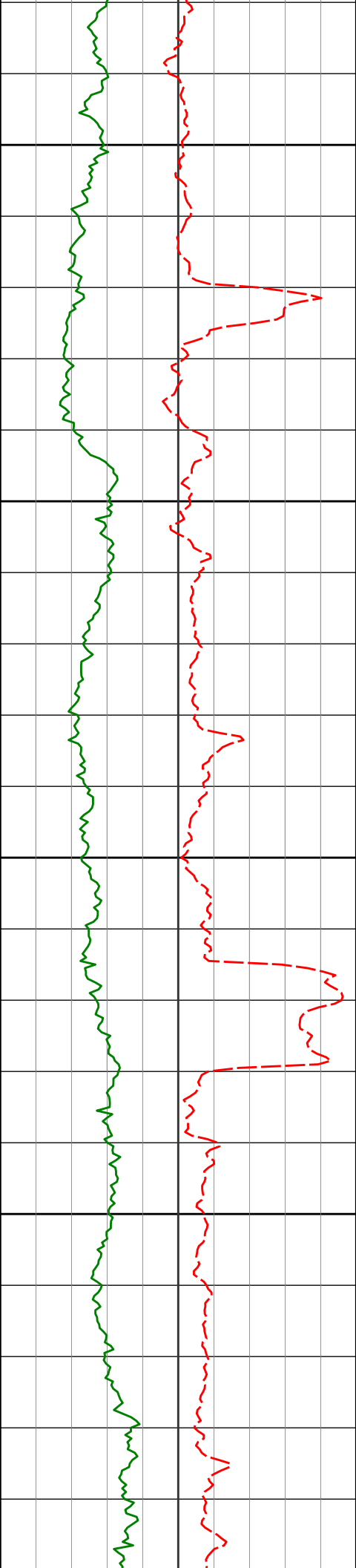
9409'

90.15°

89.79°

6568.92'

3069.49'



9450

9500

9550

9600

9650

9504'

90.00°

90.06°

6568.79'

3164.44'

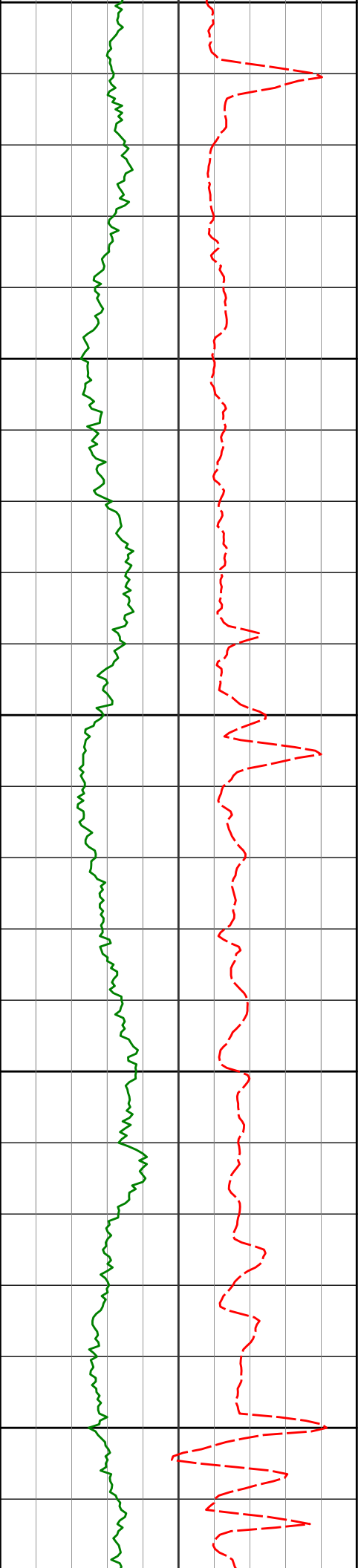
9599'

90.15°

88.84°

6568.67'

3259.41'



9650

9694'

90.06°

89.23°

6568.49'

3354.40'

9700

9750

9788'

90.12°

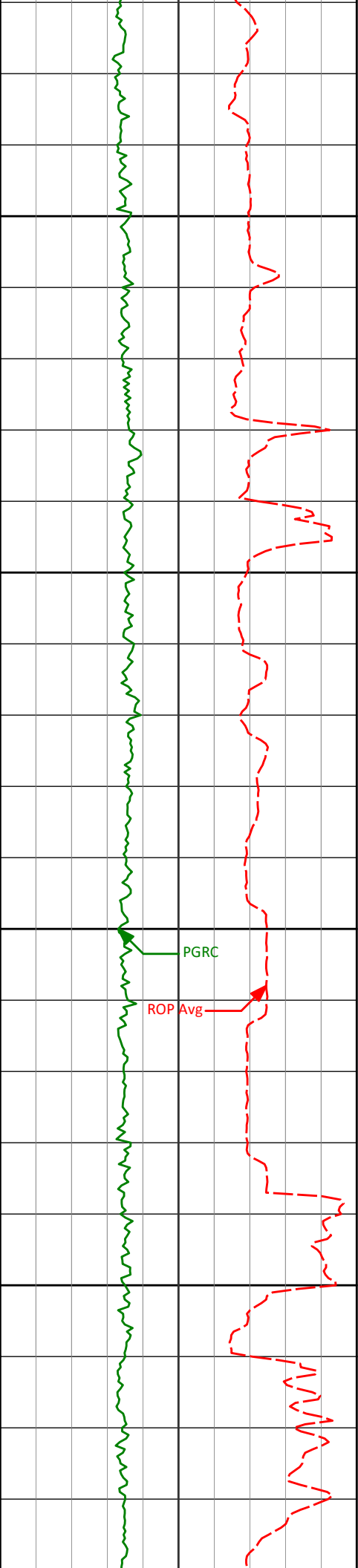
89.52°

6568.34'

3448.37'

9800

9850



9900

9950

10000

10050

9883'

90.43°

90.29°

6567.88'

3543.32'

9978'

91.33°

91.35°

6566.42'

3638.19'

10073'

90.56°

90.11°

6564.86'

3733.07'

PGRC

ROP Avg



10168'

90.74°

90.57°

6563.79'

3827.99'

10263'

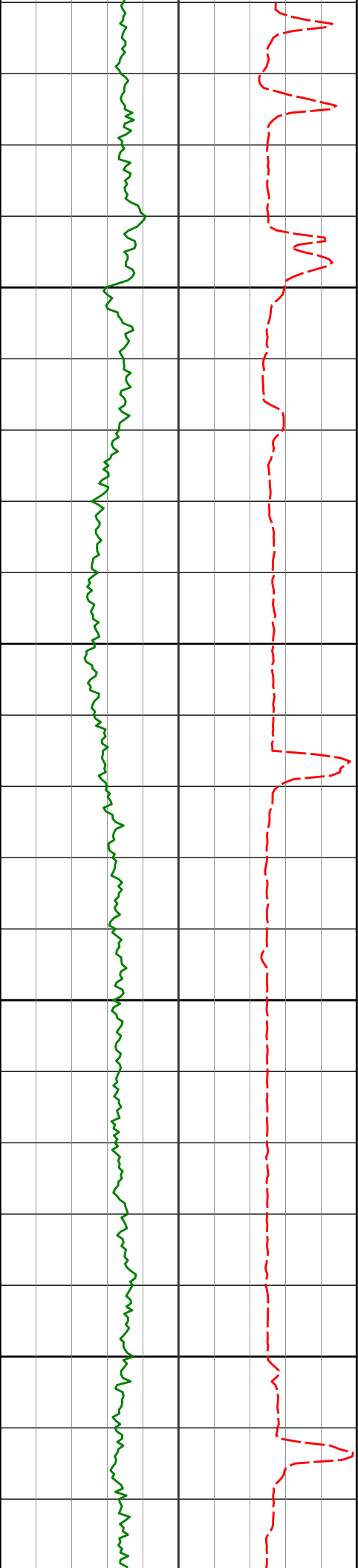
90.25°

88.77°

6562.97'

3922.94'





10350

10358'

90.43°

88.28°

6562.40'

4017.94'

10400

10450

10453'

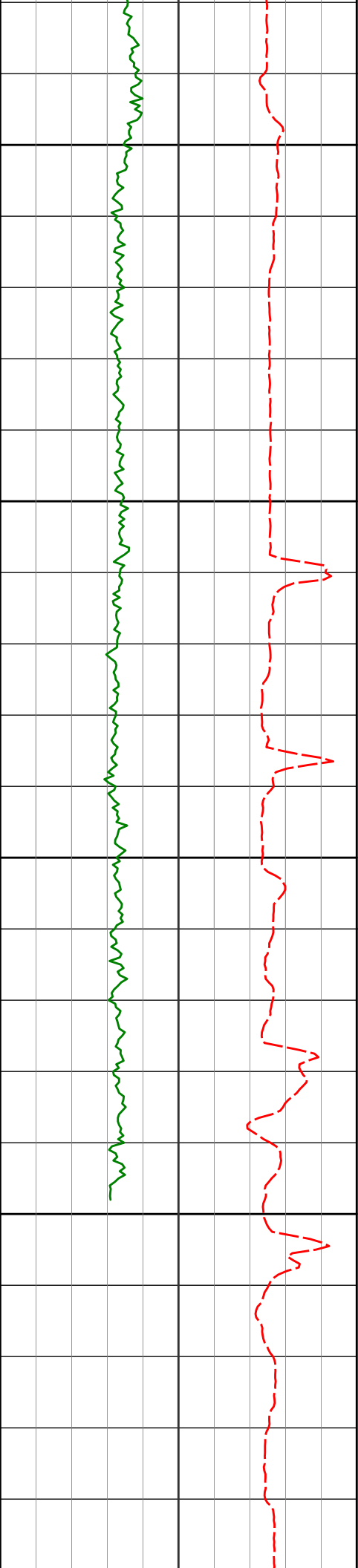
89.38°

86.83°

6562.56'

4112.93'

10500



10550

10600

10650

10700

10548'

10643'

10691'

92.32°

91.60°

90.96°

91.86°

89.73°

87.74°

6561.15'

6557.90'

6556.83'

4207.85'

4302.68'

4350.67'

<TD @ 10,754' MD>
-------------------

10/50

### ***Avg Rate of Penetration***

ROP Avg

feet per hr

**PCG Gamma Ray**

PGRC

api

Depth  
ft

### *Depth*

**Inc.**

**Azi.**

**TVD**

**V.S.**

# HALLIBURTON

## DIRECTIONAL SURVEY REPORT

**Noble Energy  
Cockroft B11-62-1HN  
Wattenberg  
Weld Colorado  
USA  
CA-XX-0900859716**

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
303.00	0.00	0.00	303.00	0.00 N	0.00 E	0.00	0.00
580.00	0.20	0.00	580.00	0.48 N	0.00 E	0.02	0.07
718.00	0.42	348.80	718.00	1.22 N	0.10 W	-0.06	0.16
810.00	0.15	312.75	810.00	1.63 N	0.25 W	-0.20	0.34
902.00	0.36	11.31	902.00	2.00 N	0.29 W	-0.22	0.33
995.00	0.58	325.37	994.99	2.67 N	0.50 W	-0.41	0.45
1087.00	0.37	313.28	1086.99	3.26 N	0.98 W	-0.87	0.24
1180.00	0.49	333.63	1179.99	3.82 N	1.38 W	-1.24	0.20
1273.00	0.90	339.16	1272.98	4.85 N	1.81 W	-1.64	0.45
1366.00	0.77	339.89	1365.97	6.12 N	2.28 W	-2.07	0.14
1459.00	1.00	339.14	1458.96	7.47 N	2.79 W	-2.53	0.25
1553.00	0.73	317.19	1552.95	8.68 N	3.49 W	-3.19	0.45
1648.00	0.98	315.99	1647.94	9.70 N	4.46 W	-4.13	0.26
1743.00	1.02	322.65	1742.92	10.96 N	5.54 W	-5.16	0.13
1838.00	1.42	282.43	1837.90	11.88 N	7.20 W	-6.79	0.97
1933.00	0.83	303.09	1932.88	12.51 N	8.93 W	-8.50	0.75
2027.00	0.61	301.24	2026.88	13.14 N	9.93 W	-9.47	0.24
2122.00	1.92	335.24	2121.85	14.85 N	11.02 W	-10.51	1.54
2217.00	3.99	319.57	2216.72	18.82 N	13.84 W	-13.18	2.32
2312.00	5.18	326.32	2311.42	24.90 N	18.36 W	-17.49	1.37
2407.00	7.05	326.91	2405.87	33.35 N	23.92 W	-22.76	1.97
2502.00	8.72	326.68	2499.97	44.26 N	31.06 W	-29.53	1.76
2597.00	8.99	325.25	2593.84	56.38 N	39.25 W	-37.30	0.36
2692.00	9.29	322.37	2687.63	68.55 N	48.16 W	-45.79	0.57
2787.00	6.99	323.58	2781.67	79.27 N	56.27 W	-53.53	2.43
2881.00	3.88	324.74	2875.23	86.48 N	61.51 W	-58.52	3.31
2976.00	1.97	315.54	2970.11	90.27 N	64.51 W	-61.39	2.07
3071.00	1.05	234.88	3065.08	90.94 N	66.37 W	-63.22	2.19
3166.00	0.56	216.66	3160.07	90.07 N	67.35 W	-64.23	0.58
3451.00	0.40	305.34	3445.07	89.54 N	68.99 W	-65.89	0.24
3736.00	0.91	33.98	3730.05	91.99 N	68.54 W	-65.35	0.35
4020.00	1.09	21.86	4014.01	96.37 N	66.27 W	-62.93	0.10
4305.00	1.61	357.89	4298.93	102.91 N	65.40 W	-61.85	0.27
4590.00	0.54	87.47	4583.89	106.98 N	64.21 W	-60.52	0.60
4874.00	1.09	205.75	4867.87	104.60 N	64.06 W	-60.44	0.50
5159.00	0.85	214.69	5152.82	102.26 N	66.25 W	-62.87	0.29

5159.00	0.85	211.69	5152.83	100.36 N	66.35 W	-62.87	0.09
5444.00	0.89	108.98	5437.81	97.84 N	65.35 W	-61.97	0.48
5729.00	0.34	60.74	5722.79	97.53 N	62.50 W	-59.13	0.25
5822.00	0.69	99.57	5815.79	97.58 N	61.70 W	-58.33	0.51
5889.00	0.64	74.75	5882.78	97.61 N	60.94 W	-57.57	0.43
6009.00	10.40	80.85	6002.08	99.51 N	49.57 W	-46.14	8.13
6057.00	16.22	95.89	6048.79	99.51 N	38.61 W	-35.19	14.02
6104.00	19.03	94.13	6093.58	98.29 N	24.44 W	-21.06	6.08
6152.00	25.09	88.45	6138.05	98.00 N	6.44 W	-3.09	13.37
6199.00	28.27	92.00	6180.04	97.88 N	14.65 E	17.99	7.57
6247.00	30.55	91.72	6221.85	97.11 N	38.21 E	41.51	4.77
6293.00	33.42	90.11	6260.86	96.74 N	62.57 E	65.84	6.51
6341.00	35.93	89.29	6300.33	96.89 N	89.88 E	93.14	5.30
6389.00	39.38	90.33	6338.33	96.97 N	119.19 E	122.44	7.31
6437.00	43.07	92.58	6374.43	96.14 N	150.80 E	154.00	8.29
6484.00	47.95	91.90	6407.36	94.84 N	184.30 E	187.43	10.42
6532.00	53.23	88.88	6437.83	94.63 N	221.36 E	224.47	12.03
6578.00	54.82	90.10	6464.85	94.96 N	258.58 E	261.68	4.07
6626.00	58.18	90.64	6491.34	94.70 N	298.60 E	301.67	7.06
6673.00	65.24	90.81	6513.60	94.17 N	339.96 E	342.98	15.02
6721.00	71.52	90.24	6531.27	93.77 N	384.56 E	387.54	13.13
6768.00	74.04	91.01	6545.19	93.27 N	429.44 E	432.38	5.59
6816.00	77.93	91.05	6556.81	92.44 N	476.00 E	478.88	8.10
6866.00	81.79	90.35	6565.61	91.84 N	525.20 E	528.04	7.84
6957.00	87.53	87.43	6574.08	93.60 N	615.75 E	618.59	7.07
7037.00	87.66	87.72	6577.43	96.98 N	695.60 E	698.51	0.40
7132.00	89.29	88.67	6579.96	99.97 N	790.52 E	793.47	1.99
7226.00	89.85	88.86	6580.67	102.00 N	884.49 E	887.46	0.63
7321.00	89.94	88.81	6580.85	103.93 N	979.47 E	982.45	0.11
7416.00	91.39	89.89	6579.75	105.02 N	1074.46 E	1077.42	1.90
7511.00	91.70	89.94	6577.20	105.16 N	1169.42 E	1172.33	0.33
7606.00	91.94	90.18	6574.18	105.06 N	1264.37 E	1267.23	0.36
7701.00	91.33	89.41	6571.47	105.40 N	1359.33 E	1362.14	1.04
7796.00	91.42	89.64	6569.19	106.19 N	1454.30 E	1457.08	0.27
7891.00	90.52	89.89	6567.58	106.58 N	1549.29 E	1552.03	0.98
7986.00	91.02	90.46	6566.30	106.30 N	1644.28 E	1646.95	0.79
8080.00	89.57	90.39	6565.82	105.60 N	1738.27 E	1740.87	1.54
8176.00	89.78	90.41	6566.37	104.92 N	1834.27 E	1836.78	0.23
8270.00	89.85	90.43	6566.67	104.23 N	1928.26 E	1930.70	0.07
8365.00	88.70	87.63	6567.87	105.85 N	2023.23 E	2025.67	3.19
8460.00	89.14	88.80	6569.66	108.81 N	2118.17 E	2120.65	1.31
8555.00	89.85	88.49	6570.51	111.06 N	2213.14 E	2215.64	0.81
8650.00	89.94	88.36	6570.69	113.66 N	2308.10 E	2310.64	0.17
8745.00	90.19	88.46	6570.58	116.29 N	2403.06 E	2405.64	0.28
8840.00	90.00	88.72	6570.43	118.62 N	2498.03 E	2500.63	0.34
8935.00	90.00	89.02	6570.43	120.50 N	2593.02 E	2595.62	0.31
9029.00	90.12	89.06	6570.33	122.07 N	2687.00 E	2689.61	0.14
9124.00	90.15	89.23	6570.10	123.49 N	2781.99 E	2784.59	0.19
9219.00	90.25	89.47	6569.77	124.56 N	2876.99 E	2879.56	0.26
9314.00	90.31	89.52	6569.31	125.40 N	2971.98 E	2974.53	0.08
9409.00	90.15	89.79	6568.92	125.98 N	3066.98 E	3069.49	0.33
9504.00	90.00	90.06	6568.79	126.11 N	3161.98 E	3164.44	0.33
9599.00	90.15	88.84	6568.67	127.03 N	3256.97 E	3259.41	1.29
9694.00	90.06	89.23	6568.49	128.63 N	3351.96 E	3354.40	0.41
9788.00	90.12	89.52	6568.34	129.66 N	3445.95 E	3448.37	0.32
9883.00	90.43	90.29	6567.88	129.82 N	3540.95 E	3543.32	0.88
9978.00	91.33	91.35	6566.42	128.46 N	3635.93 E	3638.19	1.46
10073.00	90.56	90.11	6564.86	127.25 N	3730.90 E	3733.07	1.54
10168.00	90.74	90.57	6563.79	126.69 N	3825.89 E	3827.99	0.52
10263.00	90.25	88.77	6562.97	127.24 N	3920.89 E	3922.94	1.97
10358.00	90.43	88.28	6562.40	129.69 N	4015.85 E	4017.94	0.55
10453.00	89.38	86.83	6562.56	133.74 N	4110.76 E	4112.93	1.88
10548.00	92.32	91.86	6561.15	134.83 N	4205.70 E	4207.85	6.13
10643.00	91.60	89.73	6557.90	133.51 N	4300.63 E	4302.68	2.36
10691.00	90.96	87.74	6556.83	134.57 N	4348.61 E	4350.67	4.38
10754.00	90.96	87.74	6555.77	137.05 N	4411.55 E	4413.66	0.01

VERTICAL SECTION RELATIVE TO WELL HEAD  
VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 88.04 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 10754.00 FEET  
IS 4413.68 FEET ALONG 88.22 DEGREES (GRID)

Surface surveys at 303 ft and 580 ft had high magnetic totals for azimuth calculation and have been set to zero. They were not taken by Halliburton.

Last survey is a projection from 10691 ft MD to TD at 10754 ft MD.

Date Printed:07 December 2013