

PCGC: Pressure Case Gamma



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200	300	400	
Date run completed	09-May-14	10-May-14	16-May-14	19-May-14	
Rig Bit Number	2	3	4	5	
Bit Size (in)	8.750	8.750	6.125	6.125	
Tool Nominal OD (in)	6.750	6.750	4.750	4.750	
Log Start Depth (MD, ft)	633.00	5,366.00	6,415.00	13,718.00	
Log End Depth (MD, ft)	5,366.00	6,415.00	13,718.00	15,480.00	
Drill or Wipe	Drill	Drill	Drill	Drill	
Drill/Wipe Start Date and Time	08-May-14 16:10	09-May-14 12:30	11-May-14 10:00	16-May-14 10:00	
Drill/Wipe End Date and Time	09-May-14 03:05	09-May-14 23:30	15-May-14 23:15	19-May-14 01:10	
Min Inc (deg) @ Depth (MD, ft)	0.00 @ 1,366.00	1.27 @ 5,340.00	87.04 @ 8,164.00	86.02 @ 14,577.00	
Max Inc (deg) @ Depth (MD, ft)	13.07 @ 2,307.00	81.31 @ 6,361.00	93.08 @ 13,439.00	91.02 @ 13,723.00	
Bit TFA(in2) / Bit Type	0.74 / PDC	0.98 / PDC	0.86 / PDC	0.86 / PDC	
Flow Rate (gpm)	598.77	556.59	292.72	285.53	
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A	N/A / N/A	N/A / N/A	
Fluid Type	Polymer	Polymer	Polymer	Fresh Water Gel	
Density (ppg) / Viscosity (spqt)	9.30 / 42.00	11.05 / 40.00	9.95 / 37.00	10.15 / 34.00	
Filtrate CL (ppm)	150.00	150.00	200.00	200.00	
pH / Fluid Loss (mptm)	8.00 / 0	8.50 / 0	9.30 / 7	9.80 / 0	
PV (cP) / YP (lbf2)	14 / 9.00	17 / 12.00	8 / 7.00	7 / 7.00	
% Solids / % Sand	5.70 / 0.15	12.80 / 0.25	8.40 / 0.15	8.40 / 0.15	
% Oil / Oil:Water Ratio	N/A / N/A	N/A / N/A	N/A / N/A	N/A / N/A	
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Max Tool Temp (deg F) @ Depth (MD, ft)	127.50 / 100M	151.00 / 100M	200.70 / 100M	200.00 / 100M	

Max Tool Temp (degF) / Source	137.50 / PCM	154.30 / PCM	238.70 / PCM	230.30 / PCM	
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A	N/A @ N/A	
Lead MWD Engineer	Paul Kock	Paul Kock	Paul Kock	Paul Kock	
Customer Representative	Justin Fields	Justin Fields	Justin Fields	Justin Fields	

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM	PCM	
Software Version	5.84	5.84	5.84	5.84	
Sub Serial Number	11404264	11404264	12334779	12334779	
Insert Serial Number	11055839	11055839	11399998	11055839	
Date and Time Initialized	08-May-14 02:56	08-May-14 02:56	10-May-14 09:41	16-May-14 05:12	
Date and Time Read	10-May-14 06:33	10-May-14 06:31	16-May-14 14:34	19-May-14 15:08	
ECMB SW Version	N/A	N/A	N/A	N/A	

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC	PCDC	
Distance From Bit (ft)	53.95	52.38	61.40	62.02	
Software Version	6.21	6.21	6.21	6.21	
Sub Serial Number	11404264	11404264	12334779	12334779	
Sonde Serial Number	10993472	10993472	11297583	10993472	
Sensor ID Number	N/A	N/A	N/A	N/A	
Toolface Offset (deg)	194.82	102.93	12.88	335.51	

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG	PCG	
Distance From Bit (ft)	48.85	47.28	56.30	56.92	
Recorded Sample Period (sec)	10	10	15	15	
Software Version	8.15	8.15	8.15	8.15	
Sub Serial Number	11404264	11404264	12334779	12334779	
Insert/Sonde Serial Number	11293394	11293394	11681029	11293394	

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:
 - 2" (1:600) log - 1 ft. interval, 3 ft. coercion distance, 5 ft. gap fill.
 - 5" (1:240) log for ROP - 0.5 ft. interval, 1.2 ft. coercion distance, 3 ft. gap fill.
 - 5" (1:240) log for Gamma Ray - 0.5 ft. interval, 0.6 ft. coercion distance, 3 ft. gap fill.
5. INSITE version 8.0.20
6. Gamma presented inside casing/cement from 6368 ft. MD to 6415 ft. MD.

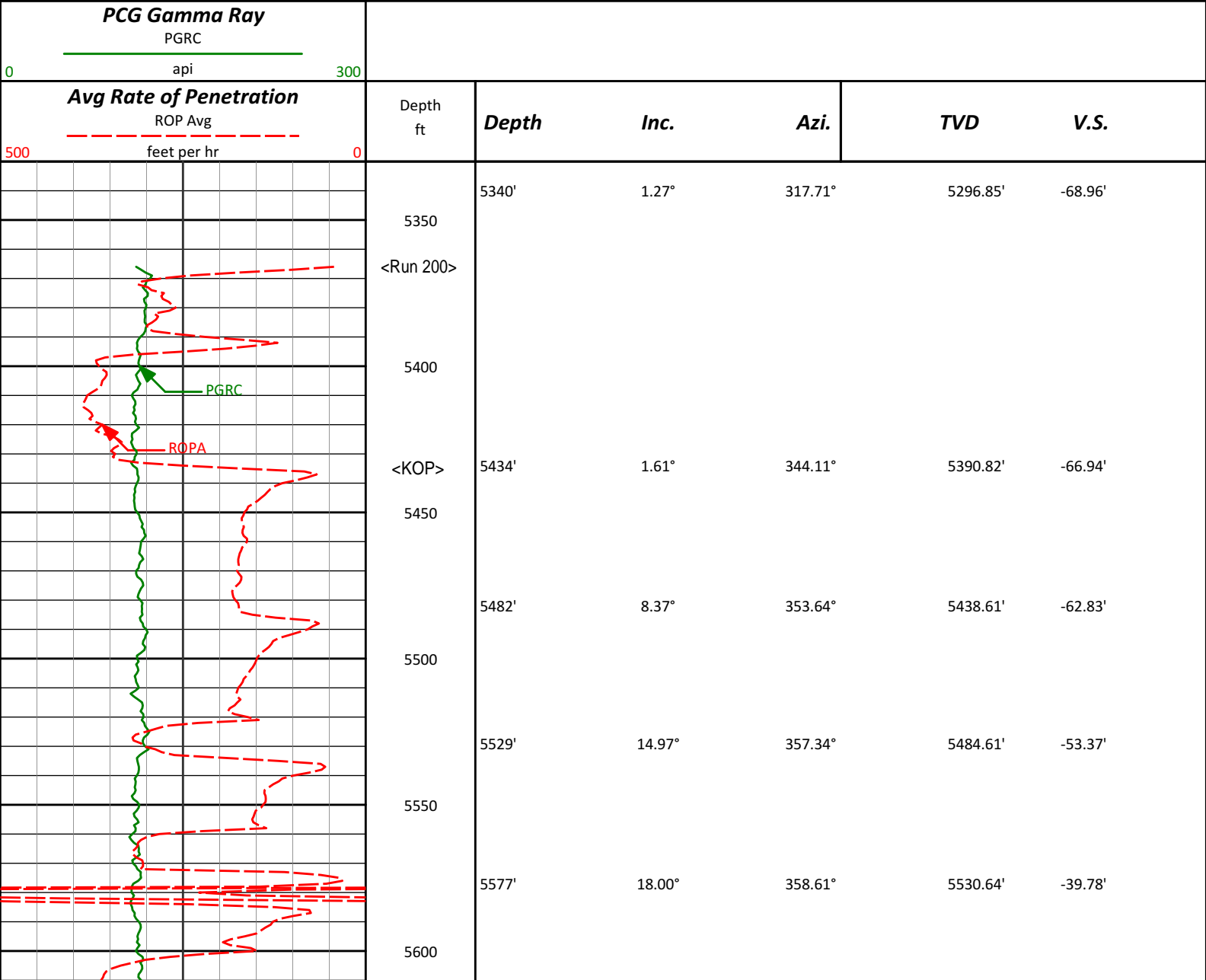
WARRANTY

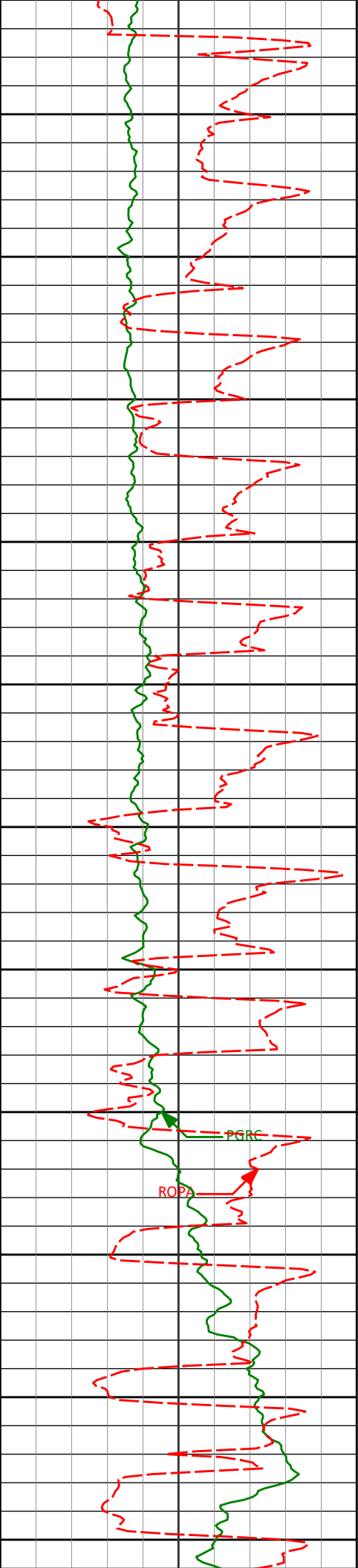
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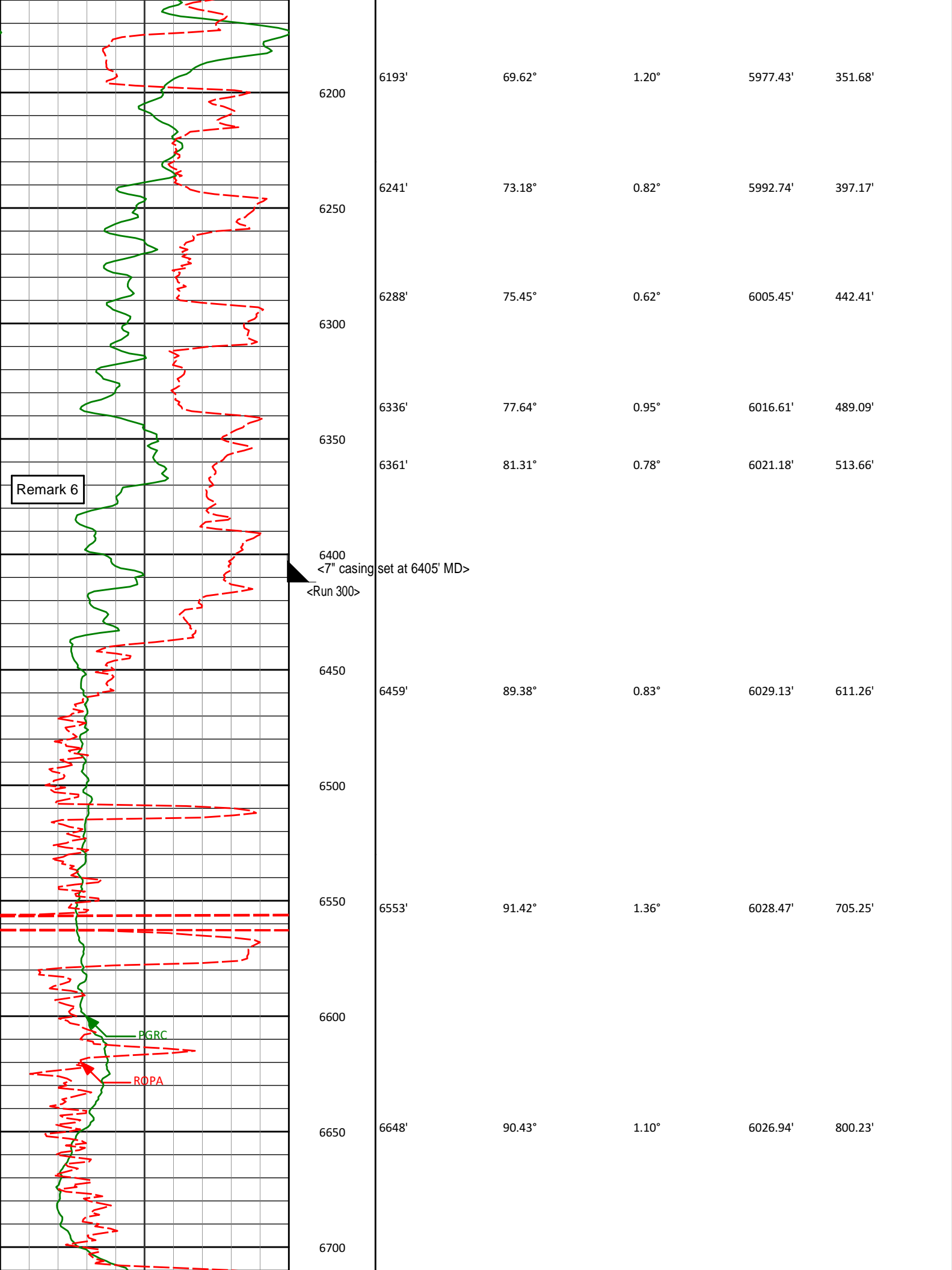
MD Main Log 1:600

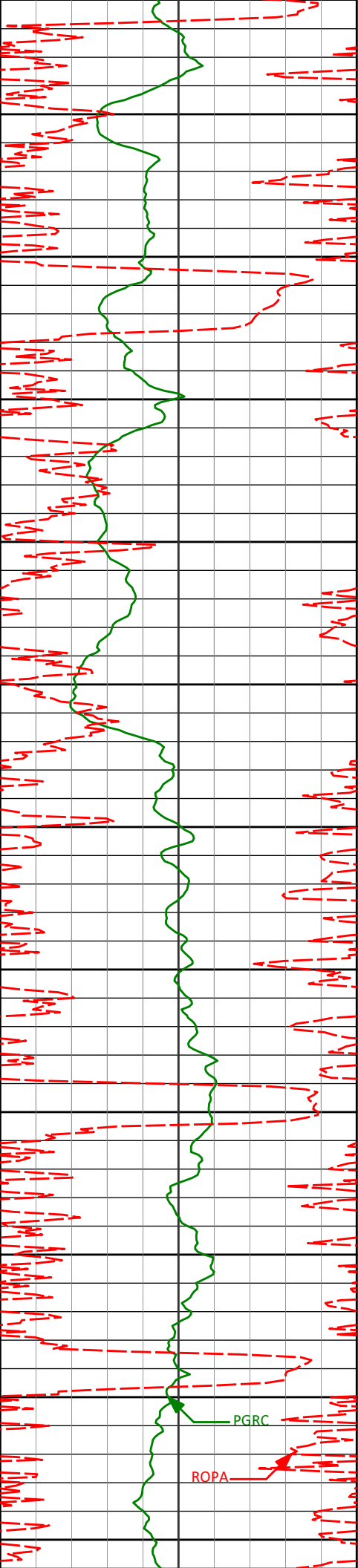
Noble Energy
Rico LC29-74-1HNA
H&P 273
T9N, R59W



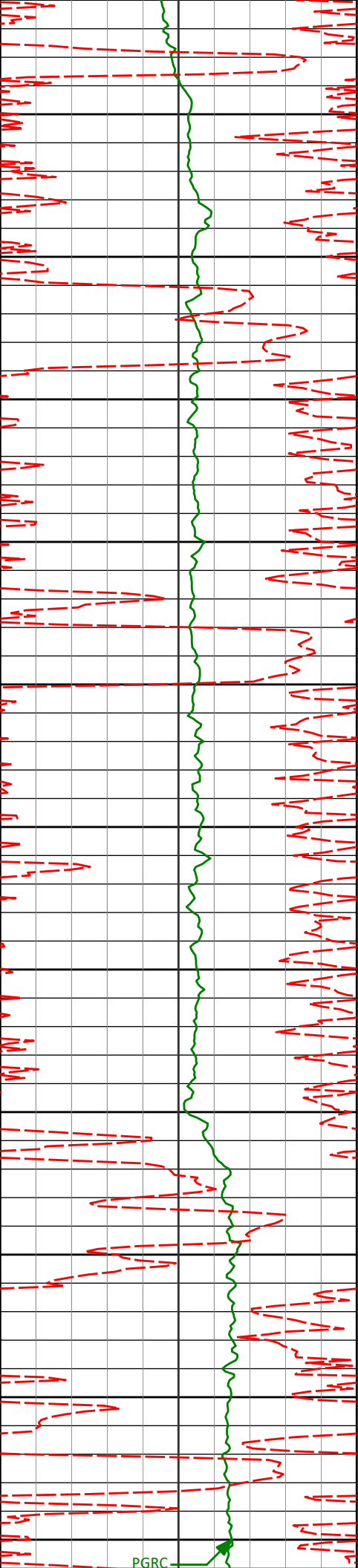


	5624'	19.84°	359.44°	5575.09'	-24.55'
5650					
	5672'	22.86°	0.90°	5619.80'	-7.08'
5700					
	5719'	27.61°	2.95°	5662.30'	12.94'
5750					
	5767'	31.38°	2.90°	5704.07'	36.56'
5800					
	5813'	34.91°	1.51°	5742.58'	61.71'
5850					
	5861'	37.29°	358.59°	5781.36'	89.97'
5900					
	5908'	42.27°	356.32°	5817.47'	119.96'
5950					
	5956'	46.98°	355.59°	5851.63'	153.51'
6000					
	6003'	49.38°	354.25°	5882.96'	188.31'
6050					
	6051'	54.77°	356.49°	5912.46'	225.96'
6100					
	6098'	60.76°	358.51°	5937.52'	265.60'
6150					
	6146'	65.12°	0.85°	5959.35'	308.31'





6750	6743'	91.97°	1.76°	6024.95'	895.21'
6800					
6850	6838'	88.71°	358.62°	6024.38'	990.16'
6900					
6950	6933'	88.37°	358.31°	6026.80'	1085.01'
7000					
7050	7028'	87.60°	357.55°	6030.14'	1179.78'
7100					
7150	7122'	88.00°	357.17°	6033.75'	1273.48'
7200					
7250	7217'	88.86°	355.91°	6036.35'	1368.11'



7300

7311'

89.01°

355.93°

6038.10'

1461.67'

7350

7400

7406'

89.35°

355.62°

6039.46'

1556.21'

7450

7500

7501'

90.52°

0.20°

6039.57'

1651.01'

7550

7600

7596'

90.18°

359.48°

6038.99'

1745.97'

7650

7700

7690'

89.41°

357.96°

6039.33'

1839.87'

7750

7785'

91.32°

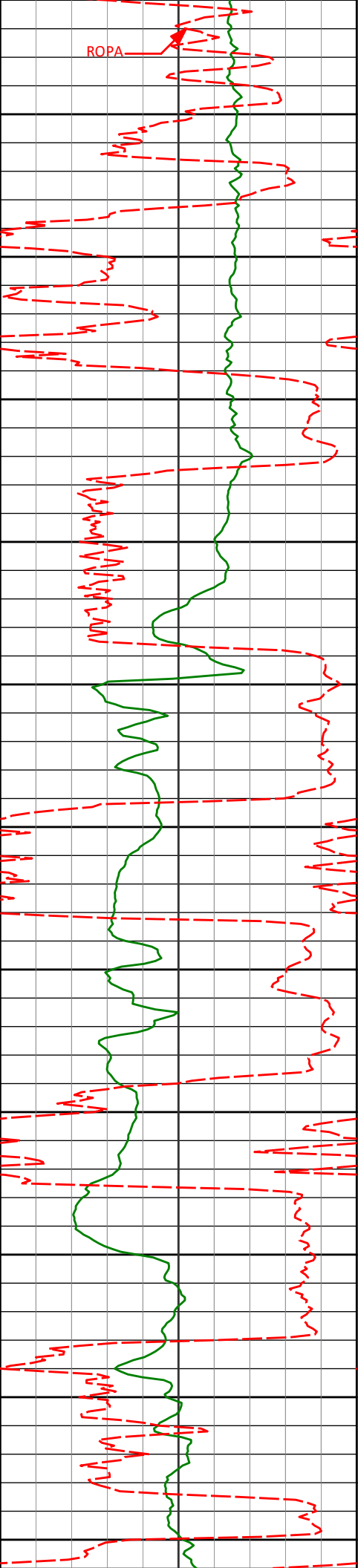
0.91°

6038.72'

1934.80'

7800

PGRC



7850

7880'

92.74°

9.32°

6035.35'

2029.45'

7900

7950

7975'

90.74°

11.64°

6032.46'

2123.19'

8000

8050

8070'

88.68°

8.35°

6032.95'

2217.10'

8100

8150

8164'

87.04°

4.21°

6036.46'

2310.66'

8200

8250

8259'

87.10°

359.40°

6041.32'

2405.50'

8300

8350

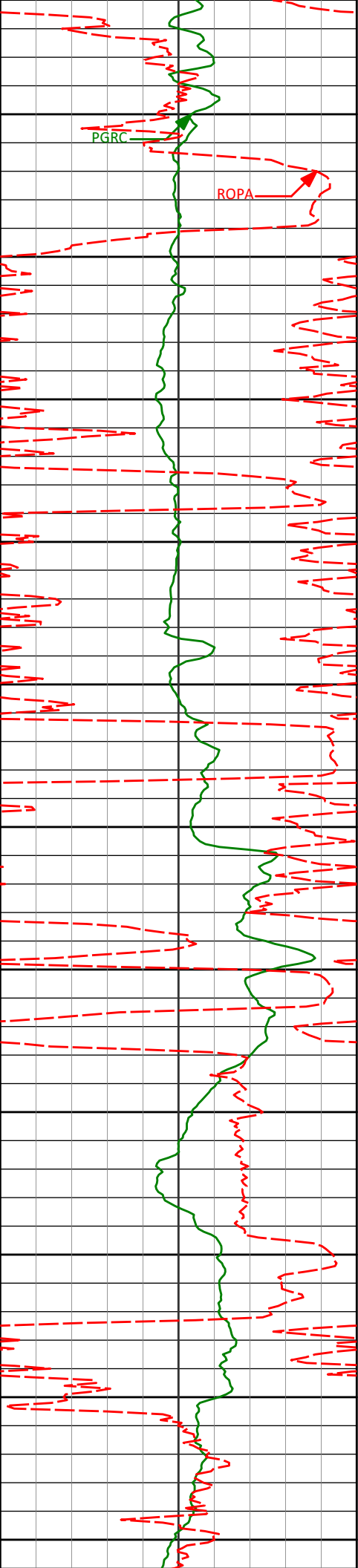
8354'

87.97°

356.28°

6045.40'

2500.23'



8400

8450

8500

8550

8600

8650

8700

8750

8800

8850

8900

8449'

89.32°

355.84°

6047.65'

2594.79'

8544'

89.75°

354.64°

6048.42'

2689.24'

8638'

91.57°

356.15°

6047.34'

2782.72'

8733'

90.12°

355.40°

6045.94'

2877.26'

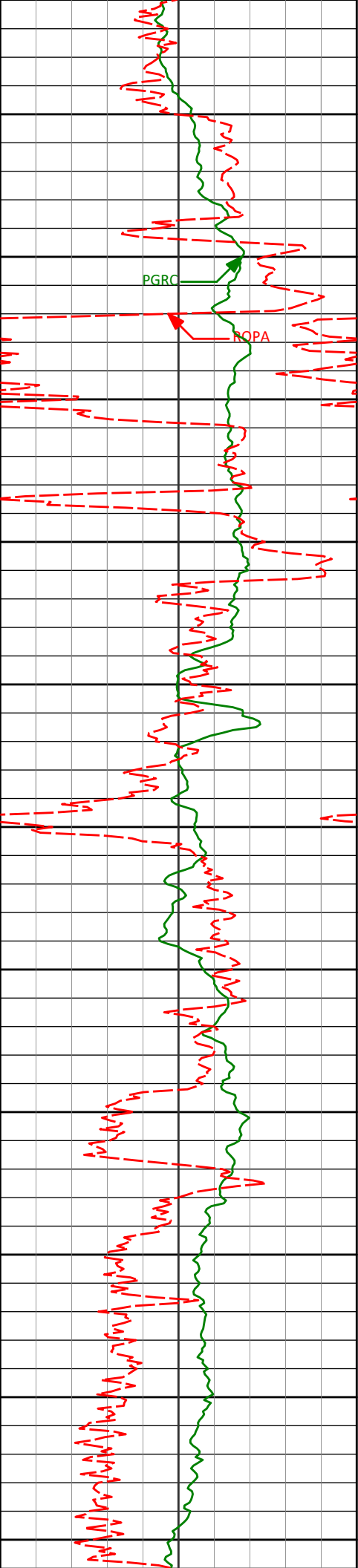
8828'

89.51°

357.24°

6046.24'

2971.89'



8923'	88.80°	356.06°	6047.64'	3066.55'
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8950

9000

9018'	90.80°	356.55°	6047.98'	3161.18'
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9050

9100

9113'	92.50°	356.00°	6045.24'	3255.76'
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9150

9200

9208'	91.42°	355.68°	6041.99'	3350.26'
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9250

9300

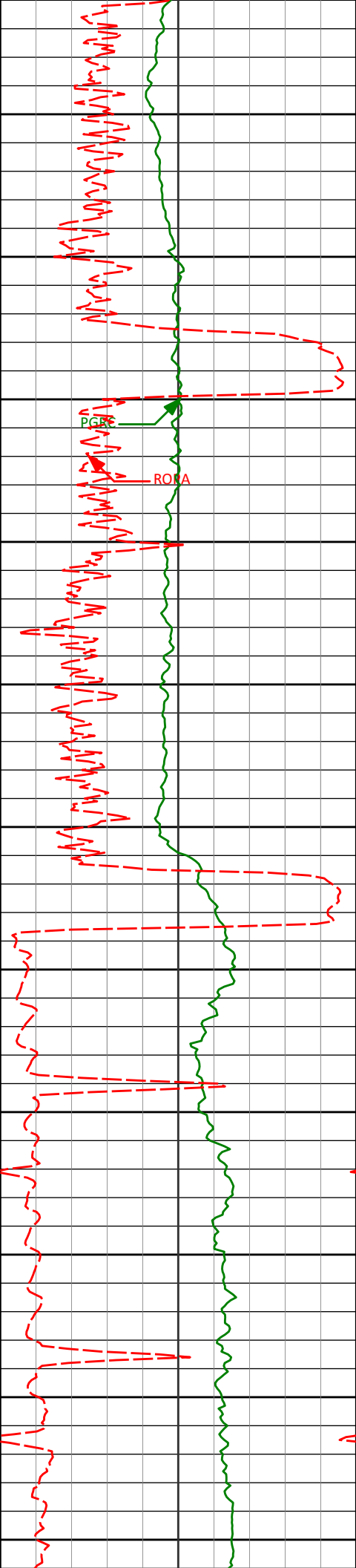
9303'	91.88°	356.25°	6039.26'	3444.80'
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9350

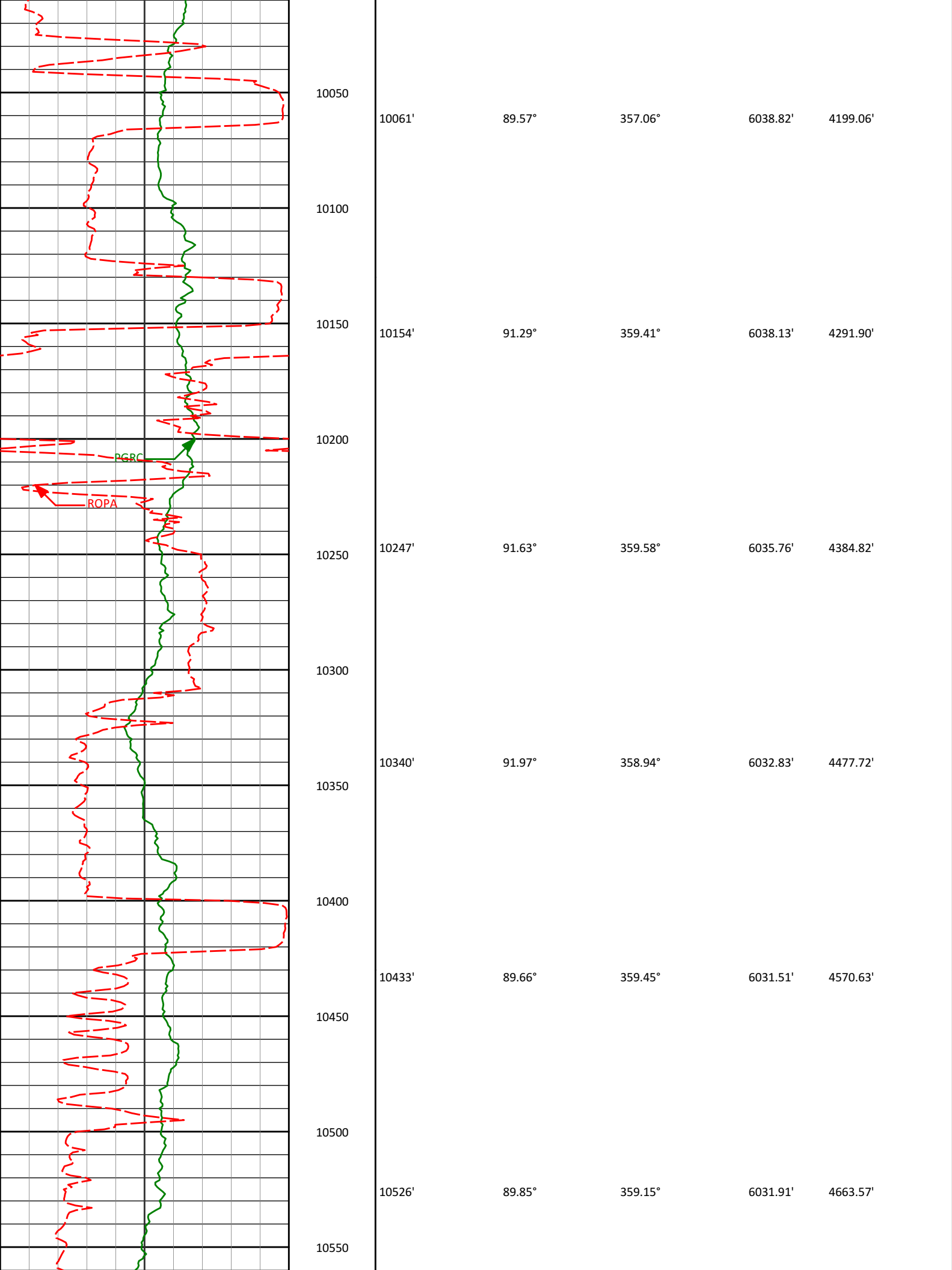
9400

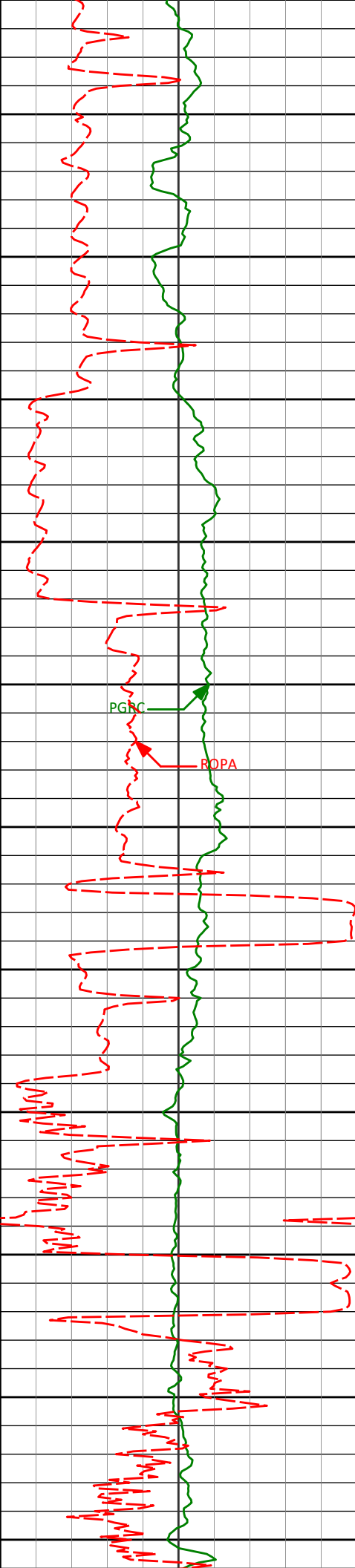
9398'	90.86°	355.45°	6036.98'	3539.33'
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9450



9500	9492'	90.65°	354.58°	6035.75'	3632.75'
9550					
9600	9587'	89.54°	355.29°	6035.59'	3727.15'
9650					
9700	9682'	89.29°	354.87°	6036.56'	3821.57'
9750					
9800	9777'	90.00°	356.33°	6037.15'	3916.09'
9850					
9900	9872'	89.88°	356.82°	6037.25'	4010.76'
9950					
10000	9966'	89.32°	355.96°	6037.90'	4104.40'





10600

10618'

89.78°

358.76°

6032.21'

4755.49'

10650

10700

10711'

90.18°

358.34°

6032.24'

4848.38'

10750

10800

10804'

88.89°

356.44°

6032.99'

4941.15'

10850

10900

10897'

88.77°

357.61°

6034.89'

5033.86'

10950

11000

10989'

89.78°

358.67°

6036.06'

5125.70'

11050

11100

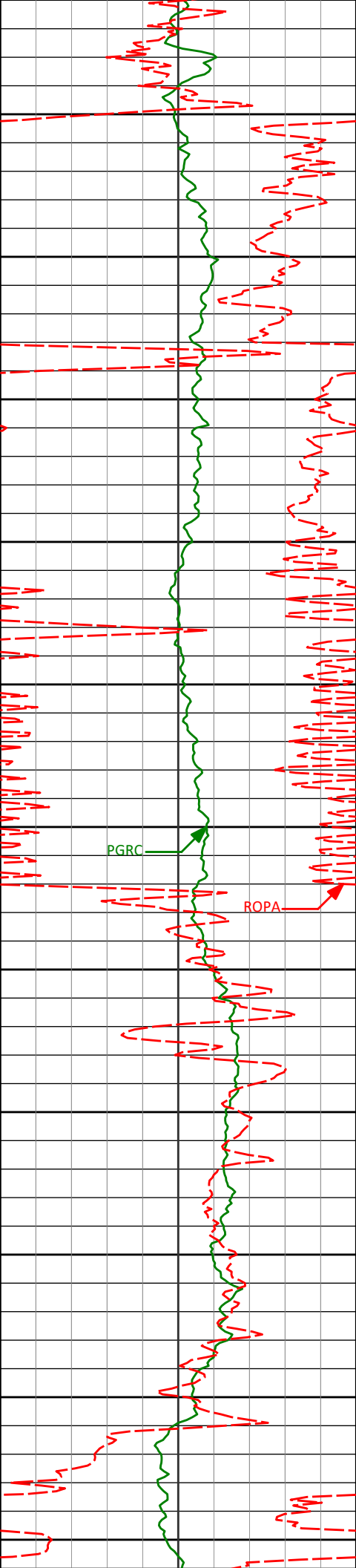
11082'

90.22°

0.50°

6036.06'

5218.65'



11150

11175'

89.85°

0.23°

6036.00'

5311.64'

11200

11250

11267'

90.06°

0.66°

6036.07'

5403.63'

11300

11350

11360'

89.29°

0.49°

6036.60'

5496.62'

11400

11450

11453'

88.55°

359.99°

6038.35'

5589.58'

11500

11550

11546'

88.61°

0.10°

6040.66'

5682.53'

11600

11650

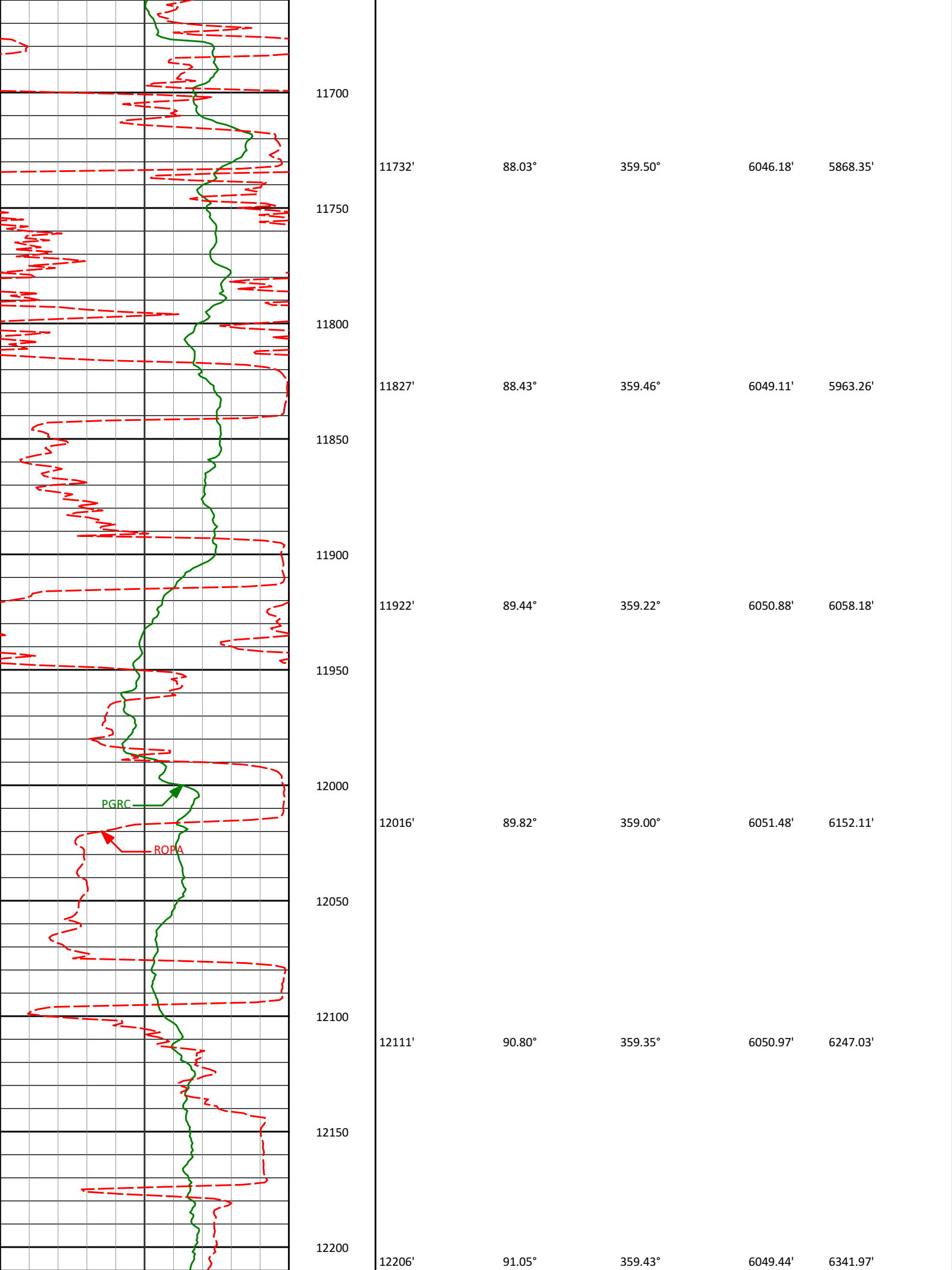
11639'

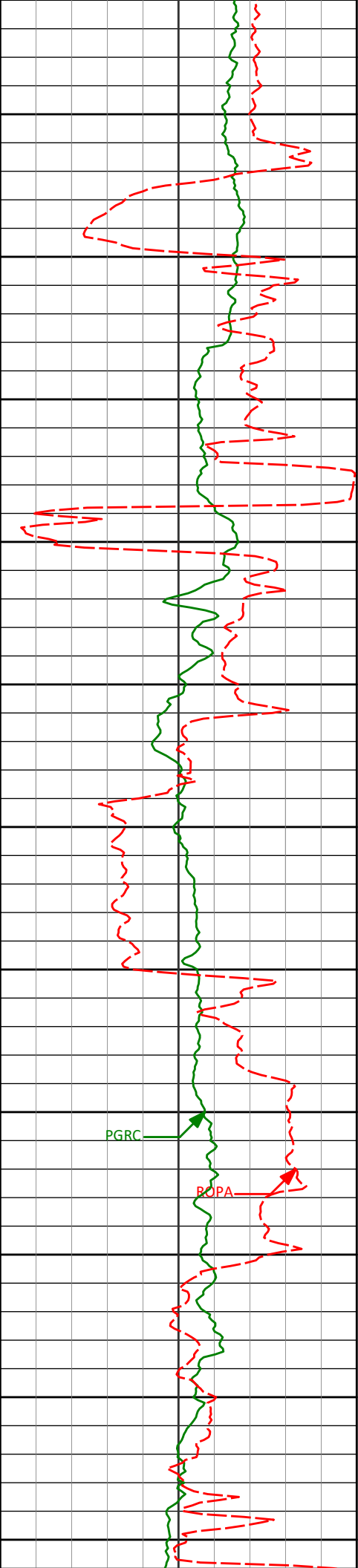
88.28°

359.34°

6043.18'

5775.46'





12250

12300

12350

12400

12450

12500

12550

12600

12650

12700

12750

12301'

92.47°

0.08°

6046.52'

6436.88'

12396'

90.74°

359.45°

6043.86'

6531.80'

12491'

89.94°

359.36°

6043.29'

6626.75'

12585'

89.91°

358.93°

6043.42'

6720.67'

12680'

89.38°

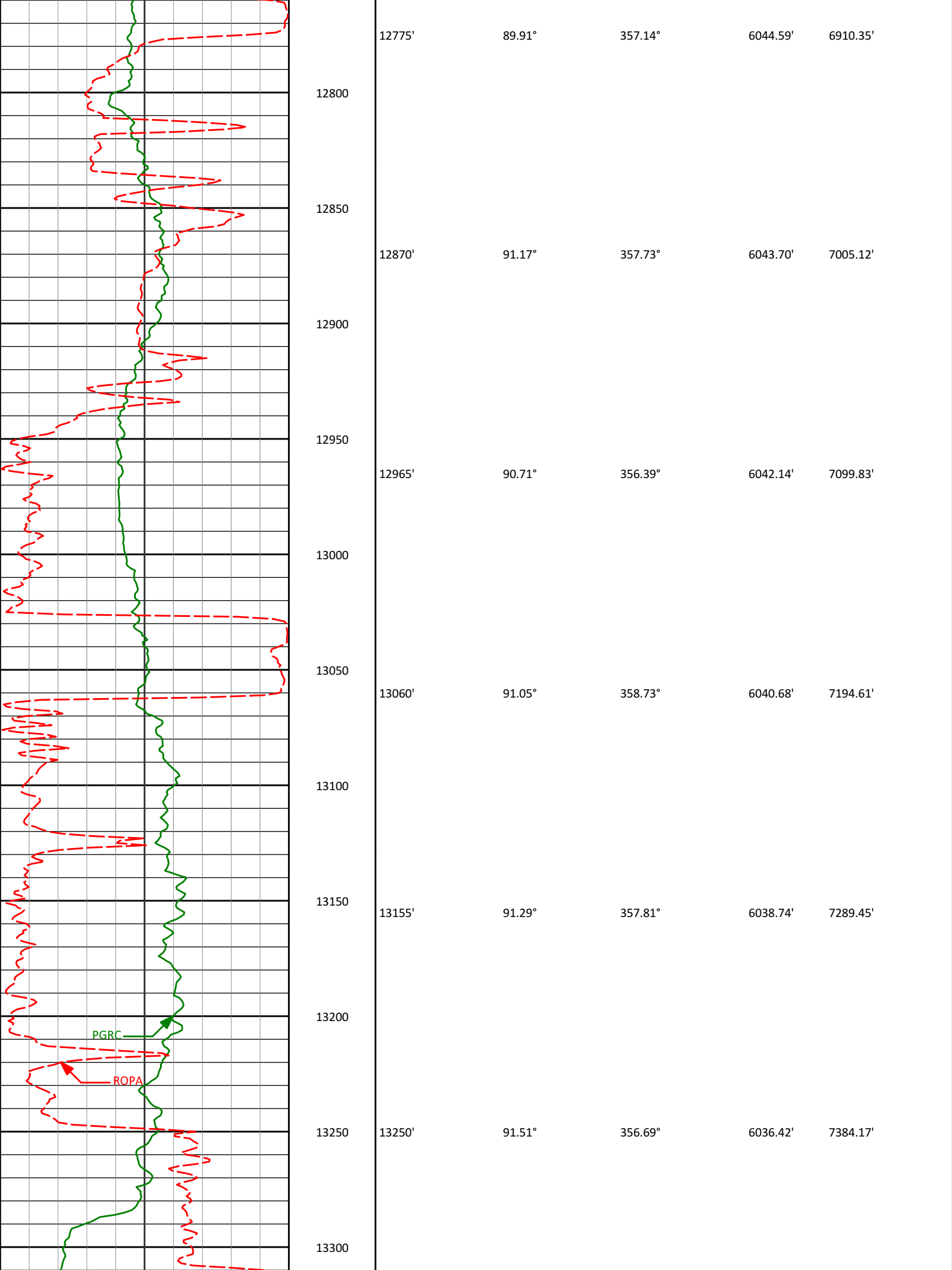
358.07°

6044.00'

6815.55'

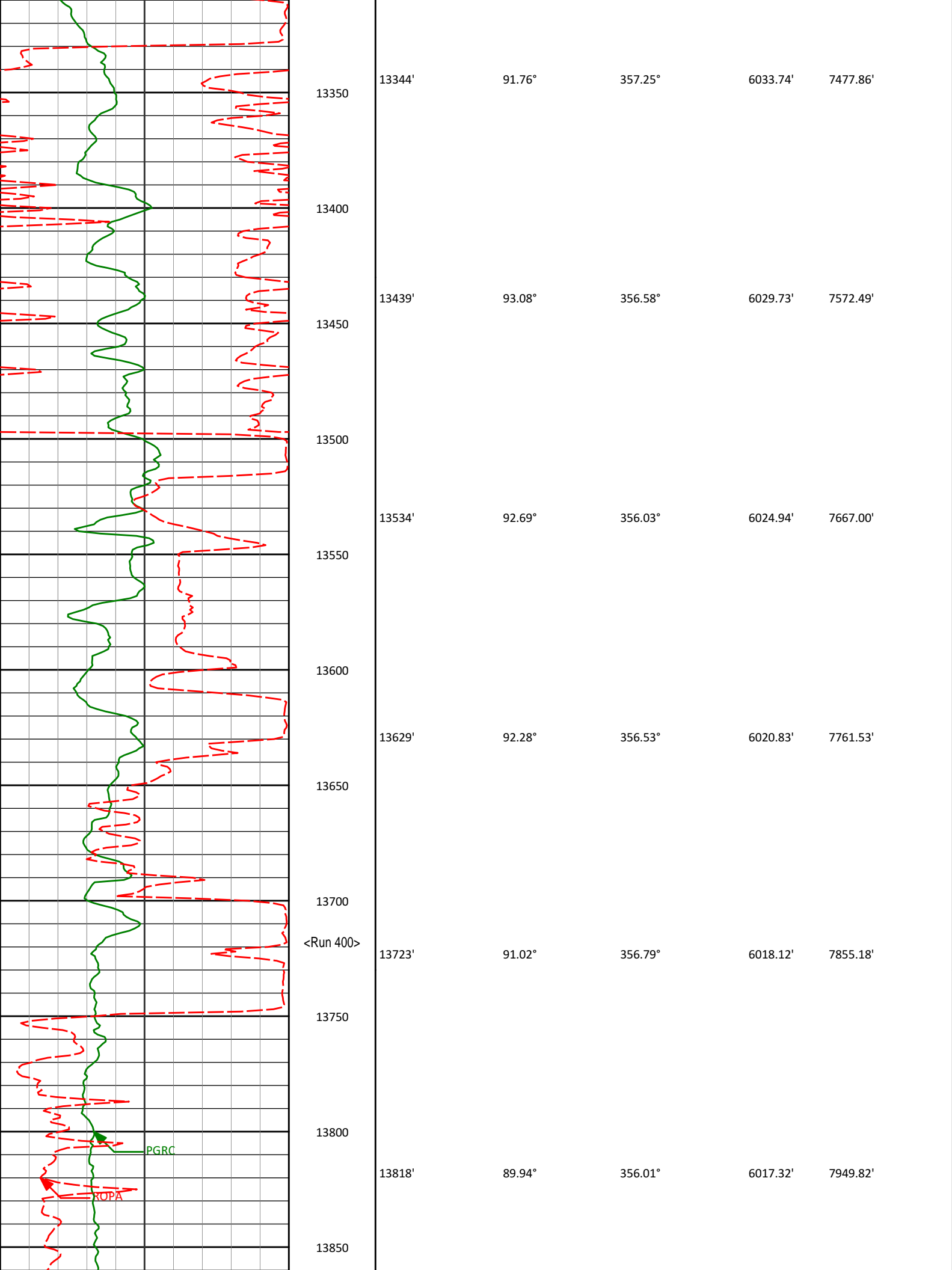
PGRC

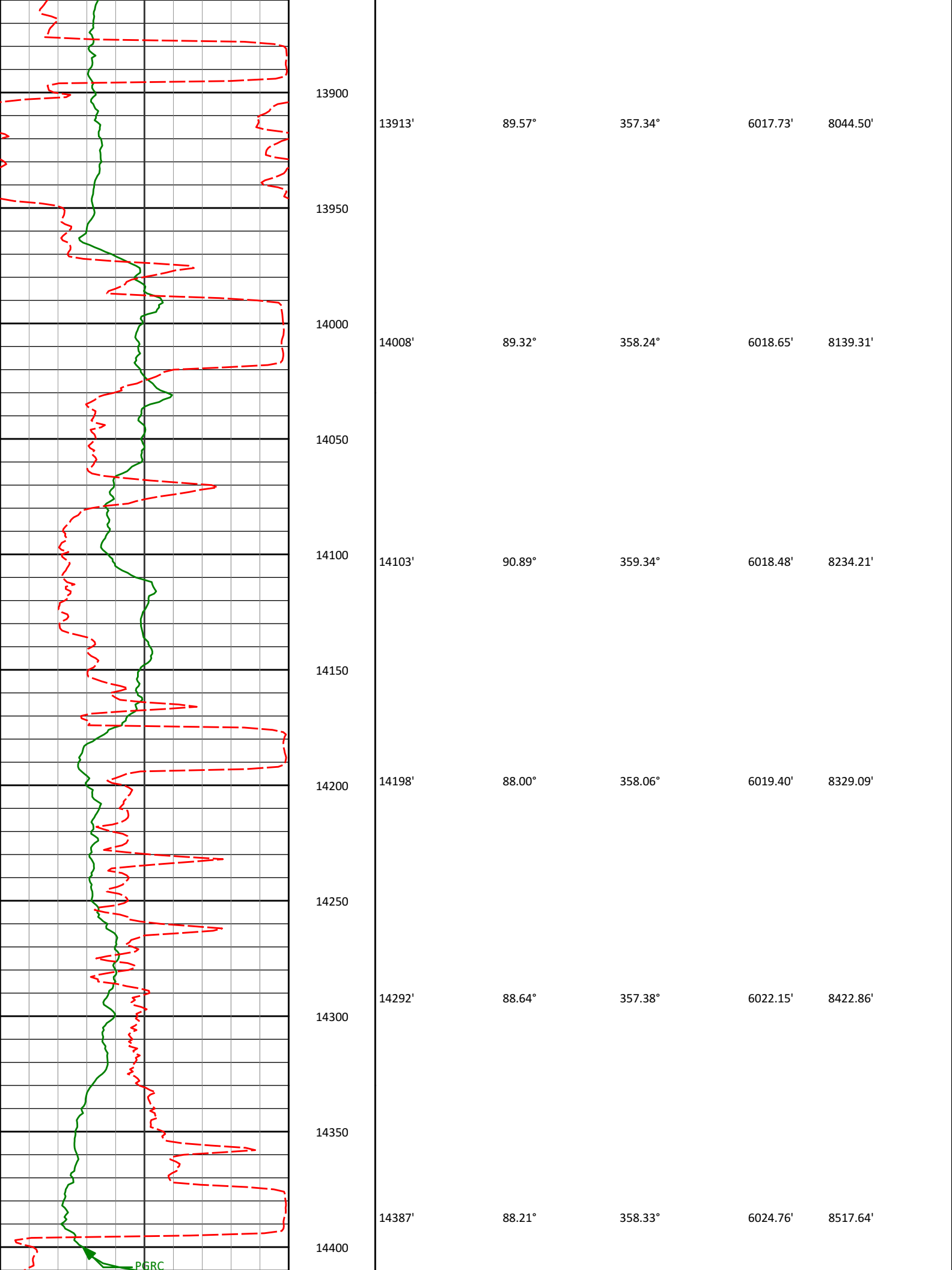
BOPA

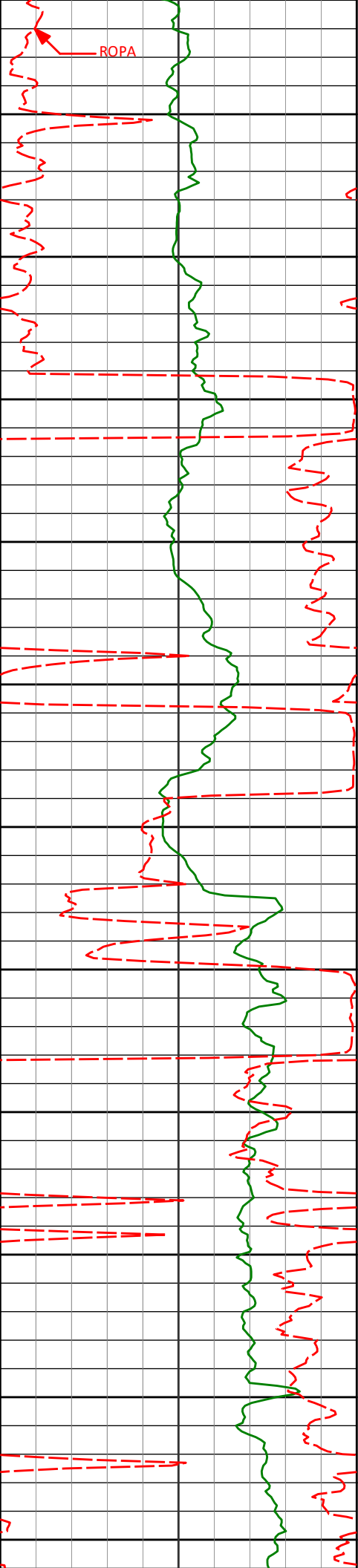


PGRC

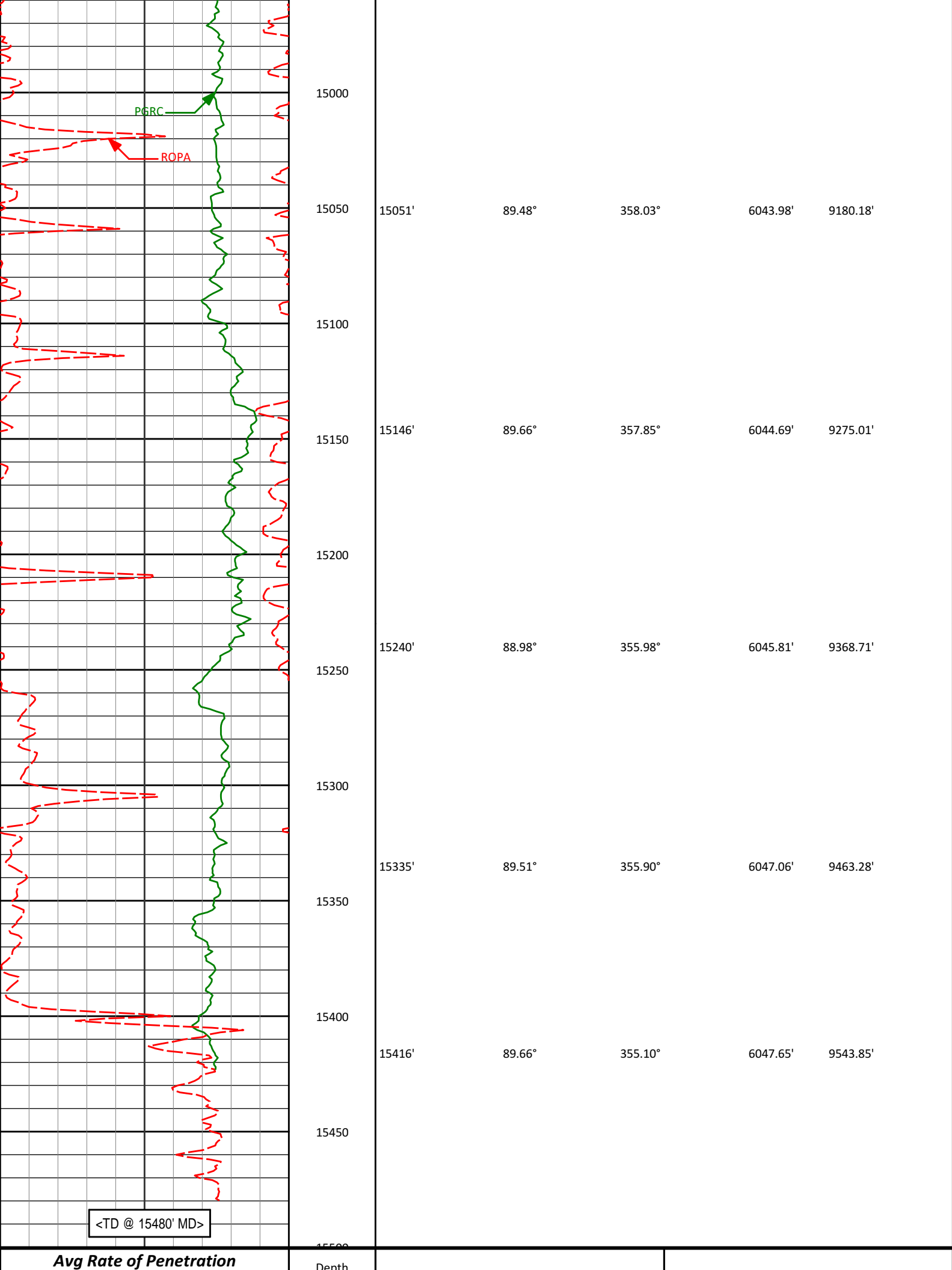
ROPA







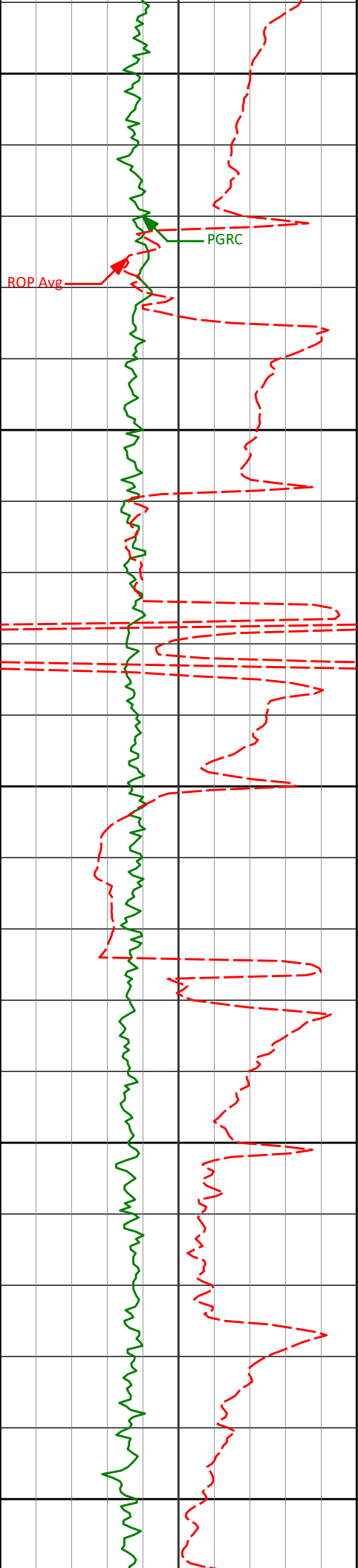
14450				
14482'	87.10°	357.57°	6028.65'	8612.39'
14500				
14550				
14577'	86.02°	358.15°	6034.35'	8707.04'
14600				
14650				
14672'	87.16°	357.92°	6040.00'	8801.71'
14700				
14750				
14766'	89.29°	358.70°	6042.91'	8895.53'
14800				
14850				
14861'	90.52°	358.69°	6043.07'	8990.42'
14900				
14950				
14956'	89.45°	358.63°	6043.10'	9085.32'



Avg Rate of Penetration

Depth

ROP Avg feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
PCG Gamma Ray PGRC							
api							
<div>HALLIBURTON Sperry Drilling Services MD Detail Log 1:240</div> <div>Noble Energy Rico LC29-74-1HNA H&P 273 T9N, R59W</div>							
PCG Gamma Ray PGRC							
api							
Avg Rate of Penetration ROP Avg feet per hr		Depth ft	Depth	Inc.	Azi.	TVD	V.S.
<div><Run 200></div>							
5400							
<KOP>		5434'	1.61°	344.11°	5390.82'	-66.94'	
5450							
		5482'	8.37°	353.64°	5438.61'	-62.83'	



5500

5529'

14.97°

357.34°

5484.61'

-53.37'

5550

5577'

18.00°

358.61°

5530.64'

-39.78'

5600

5624'

19.84°

359.44°

5575.09'

-24.55'

5650

5672'

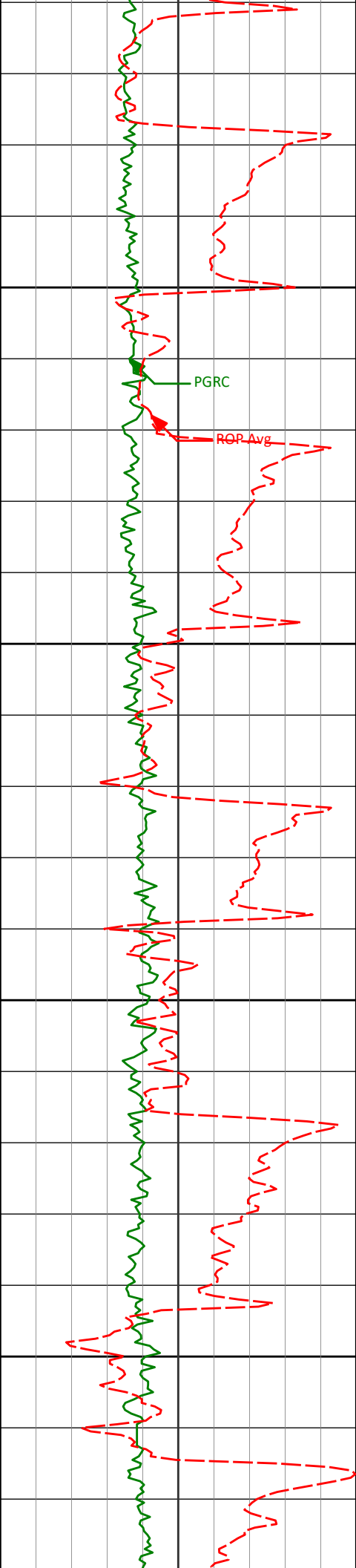
22.86°

0.90°

5619.80'

-7.08'

5700



5719'

27.61°

2.95°

5662.30'

12.94'

5750

5767'

31.38°

2.90°

5704.07'

36.56'

5800

5813'

34.91°

1.51°

5742.58'

61.71'

5850

5861'

37.29°

358.59°

5781.36'

89.97'

5900

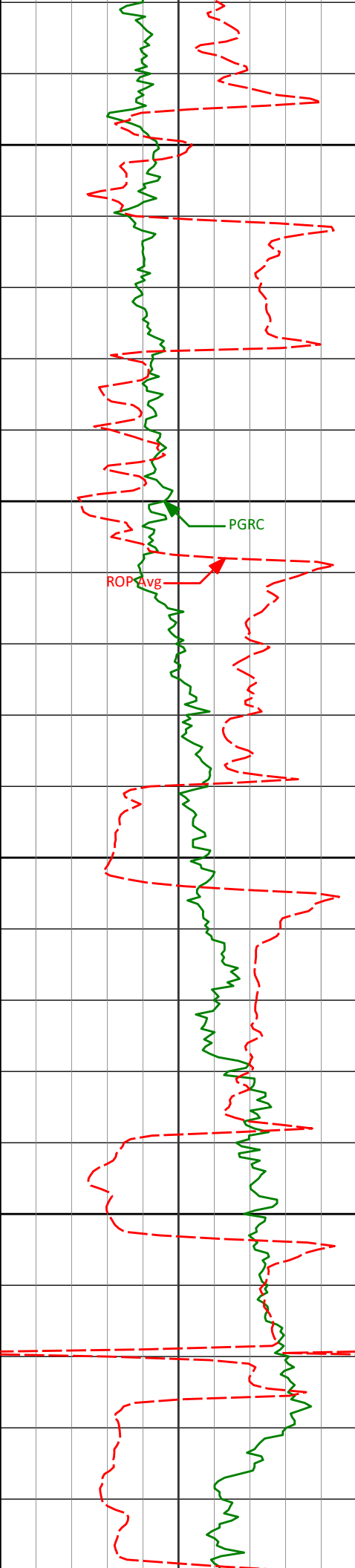
5908'

42.27°

356.32°

5817.47'

119.96'



5950

5956'

46.98°

355.59°

5851.63'

153.51'

6000

6003'

49.38°

354.25°

5882.96'

188.31'

6050

6051'

54.77°

356.49°

5912.46'

225.96'

6100

6098'

60.76°

358.51°

5937.52'

265.60'

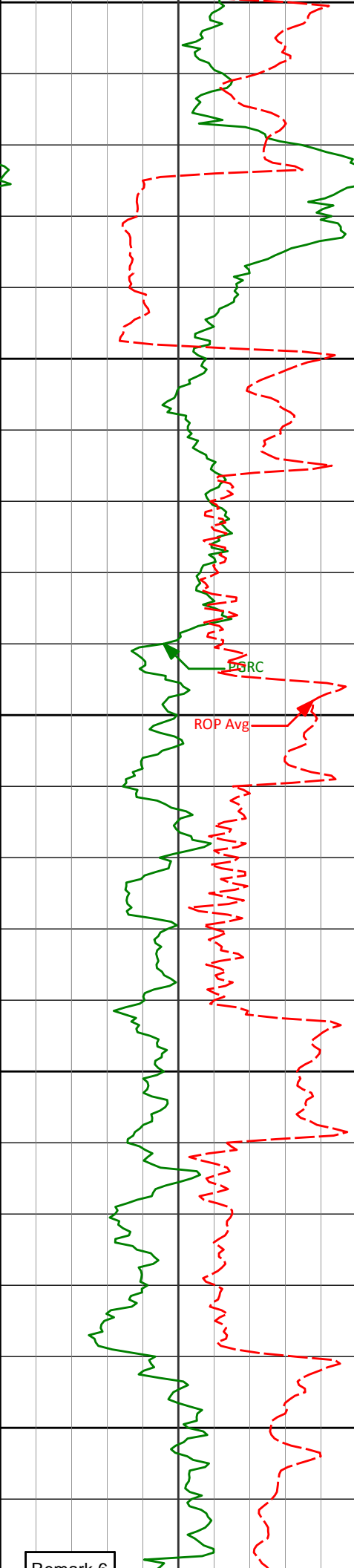
6146'

65.12°

0.85°

5959.35'

308.31'



6150

6200

6250

6300

6350

6193'

69.62°

1.20°

5977.43'

351.68'

6241'

73.18°

0.82°

5992.74'

397.17'

6288'

75.45°

0.62°

6005.45'

442.41'

6336'

77.64°

0.95°

6016.61'

489.09'

6361'

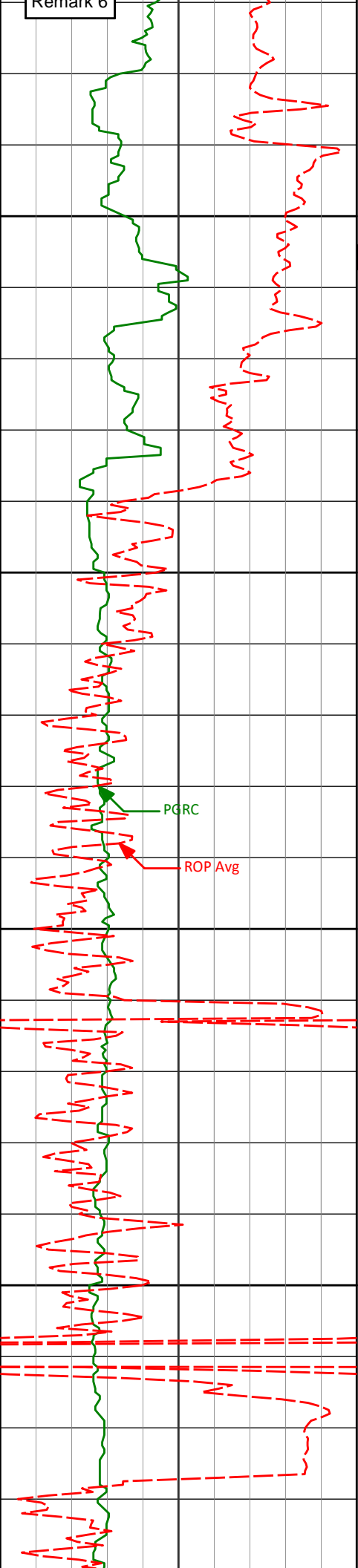
81.31°

0.78°

6021.18'

513.66'

Remark 6



6400

<7" casing set at 6405' MD>

<Run 300>

6450

6459'

89.38°

0.83°

6029.13'

611.26'

PGRC

ROP Avg

6500

6550

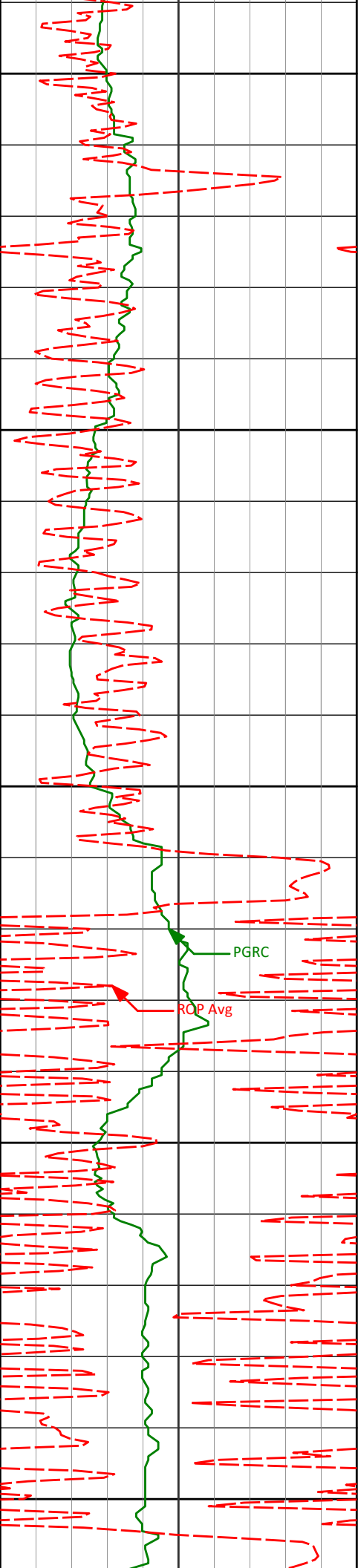
6553'

91.42°

1.36°

6028.47'

705.25'



6600

6650

6700

6750

6800

6648'

90.43°

1.10°

6026.94'

800.23'

PGRC

ROP Avg

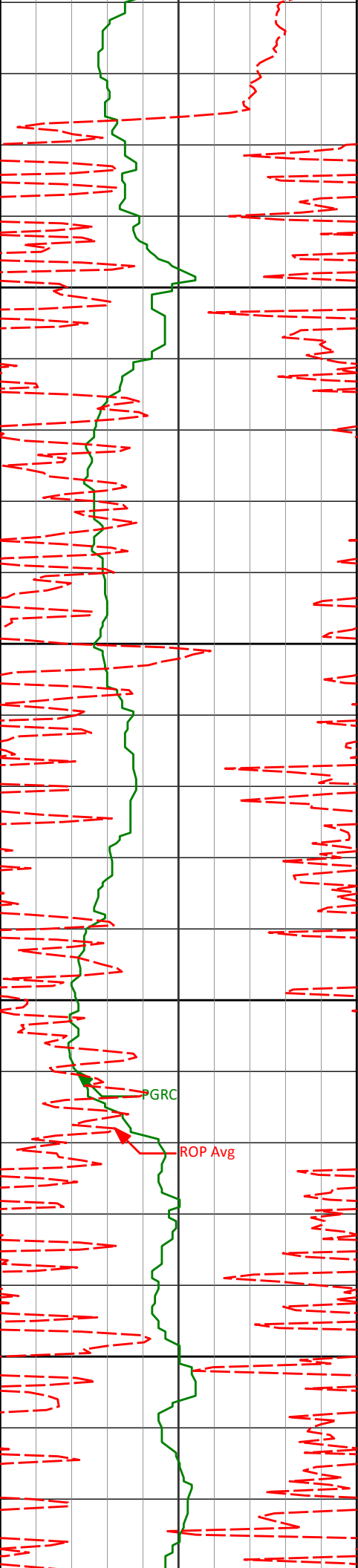
6743'

91.97°

1.76°

6024.95'

895.21'



6838'

88.71°

358.62°

6024.38'

990.16'

6850

6900

6933'

88.37°

358.31°

6026.80'

1085.01'

6950

7000

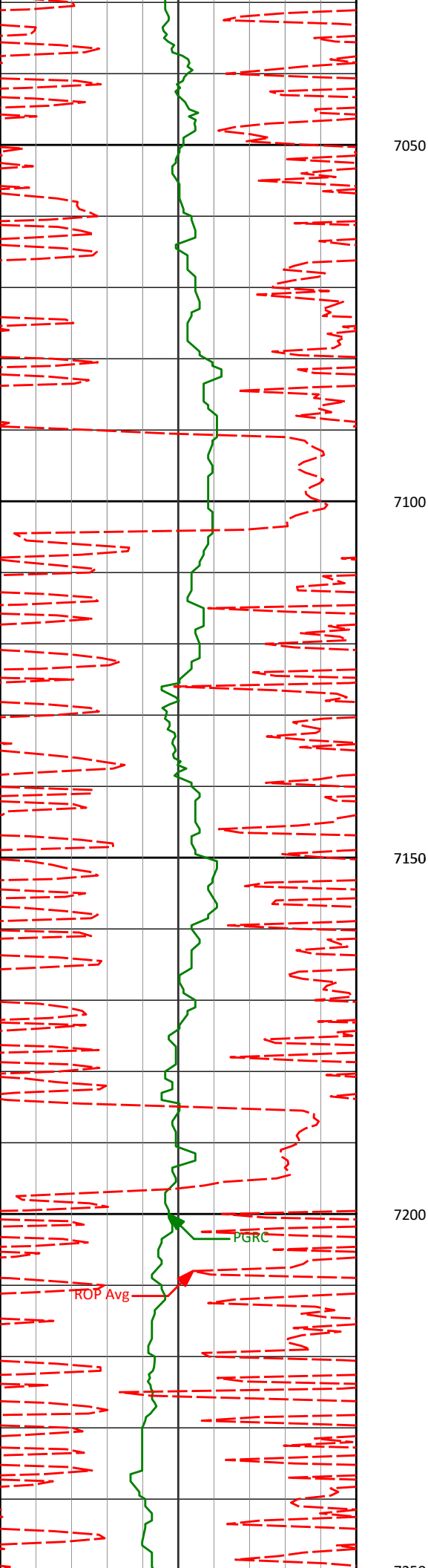
7028'

87.60°

357.55°

6030.14'

1179.78'



7122'

88.00°

357.17°

6033.75'

1273.48'

7150

7200

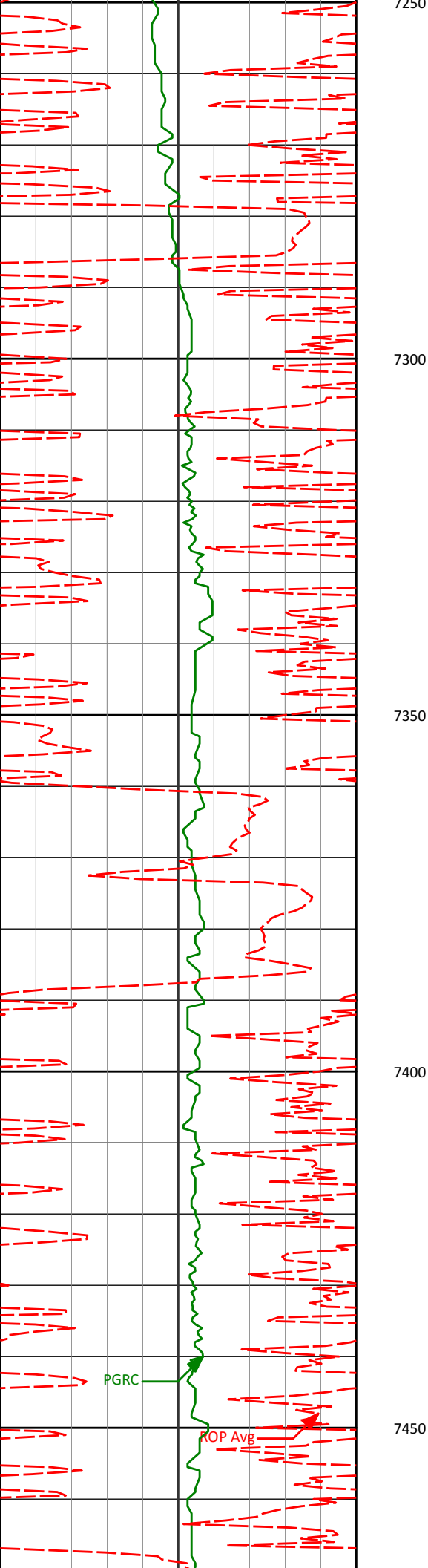
7217'

88.86°

355.91°

6036.35'

1368.11'



7311'

89.01°

355.93°

6038.10'

1461.67'

7300

7350

7400

7406'

89.35°

355.62°

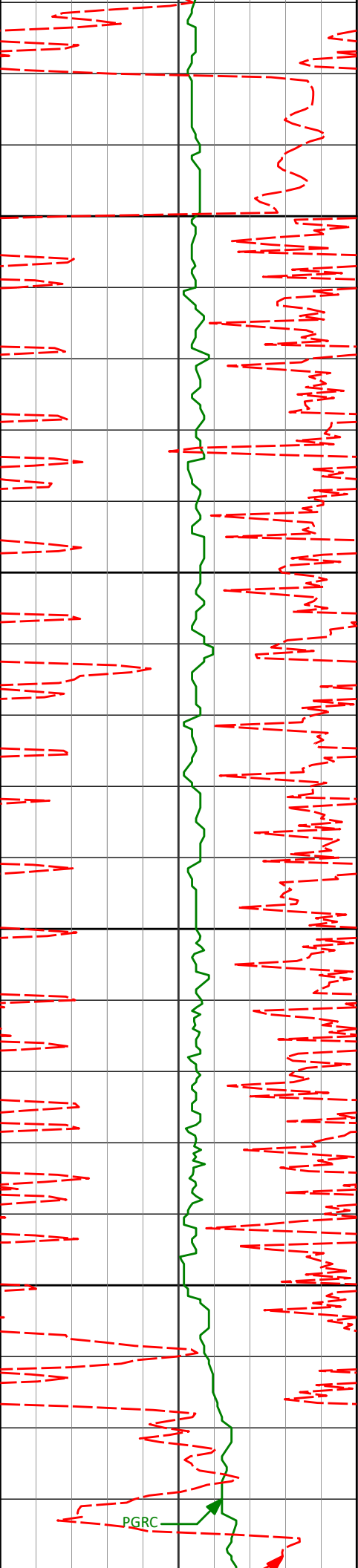
6039.46'

1556.21'

7450

PGRC

ROP Avg



7500

7501'

90.52°

0.20°

6039.57'

1651.01'

7550

7600

7596'

90.18°

359.48°

6038.99'

1745.97'

7650

PGRC

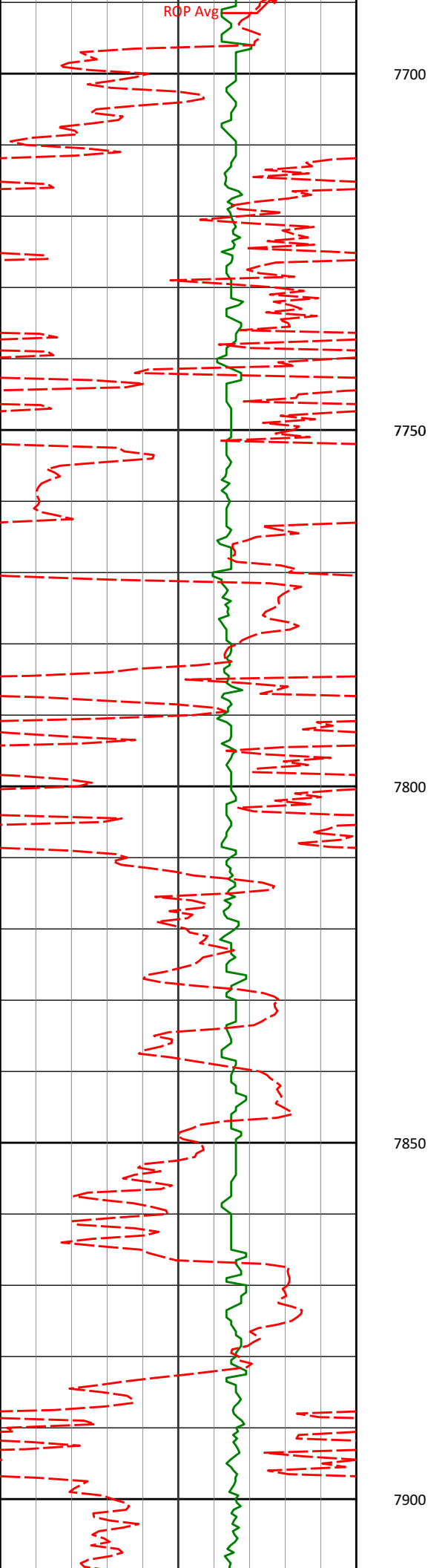
7600'

90.44°

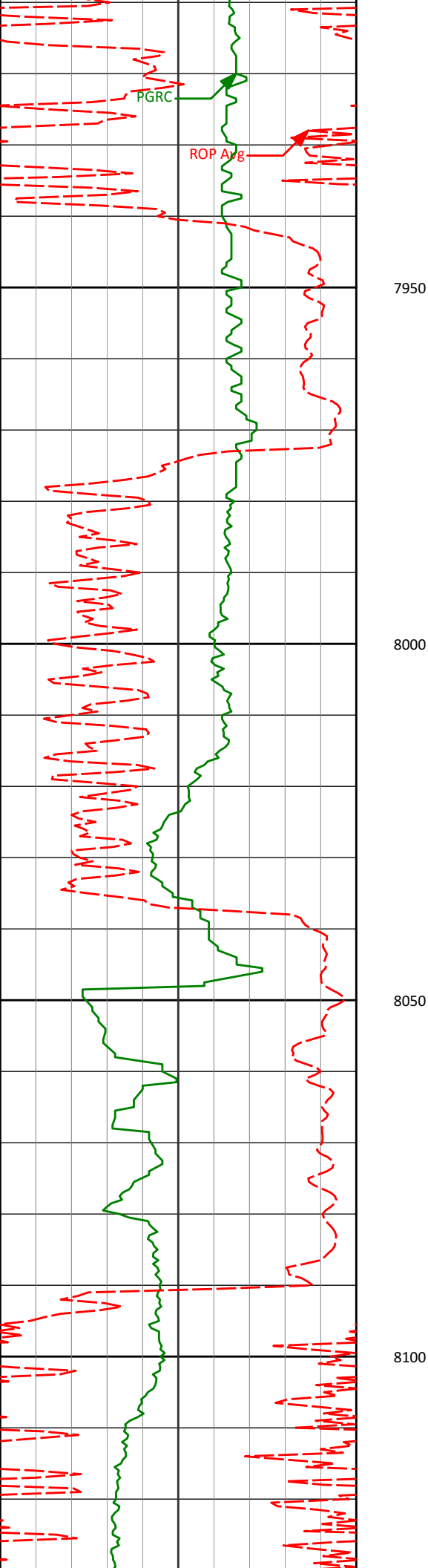
357.06°

6039.33'

1650.67'



7690'	89.41°	357.96°	6039.33'	1839.87'
7785'	91.32°	0.91°	6038.72'	1934.80'
7880'	92.74°	9.32°	6035.35'	2029.45'



7975'

90.74°

11.64°

6032.46'

2123.19'

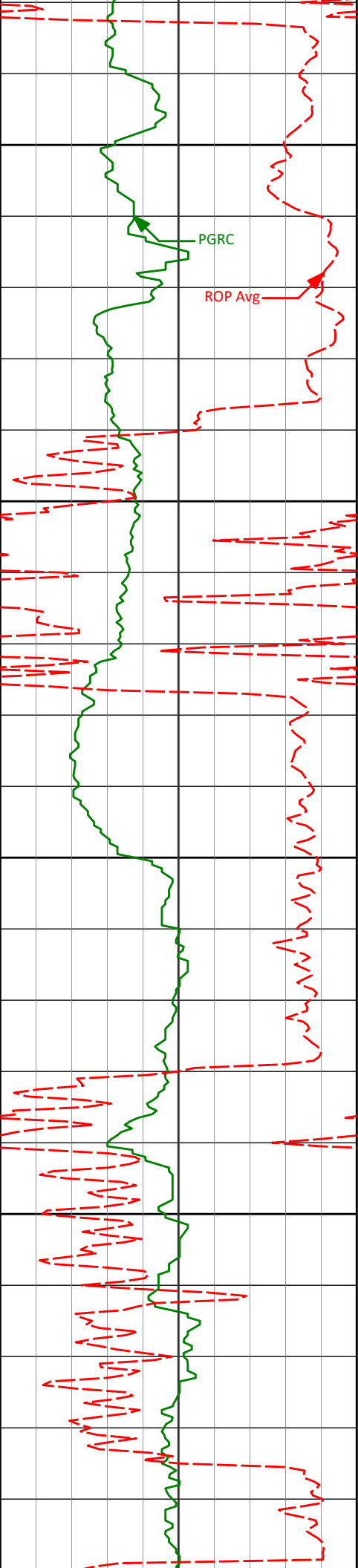
8070'

88.68°

8.35°

6032.95'

2217.10'



8150

8164'

87.04°

4.21°

6036.46'

2310.66'

8200

8250

8259'

87.10°

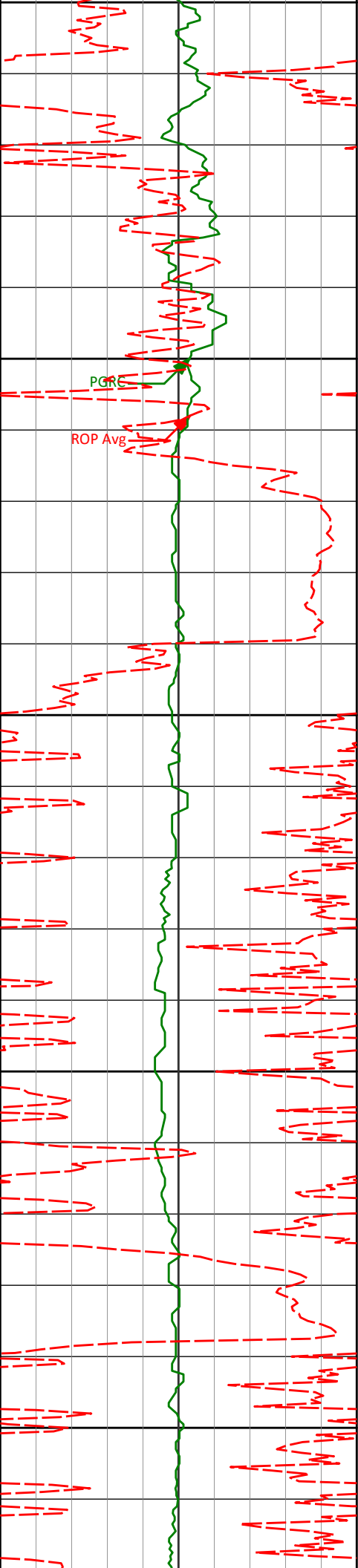
359.40°

6041.32'

2405.50'

8300

8350



8350

8354'

87.97°

356.28°

6045.40'

2500.23'

8400

PGRC

ROP Avg

8450

8449'

89.32°

355.84°

6047.65'

2594.79'

8500

8544'

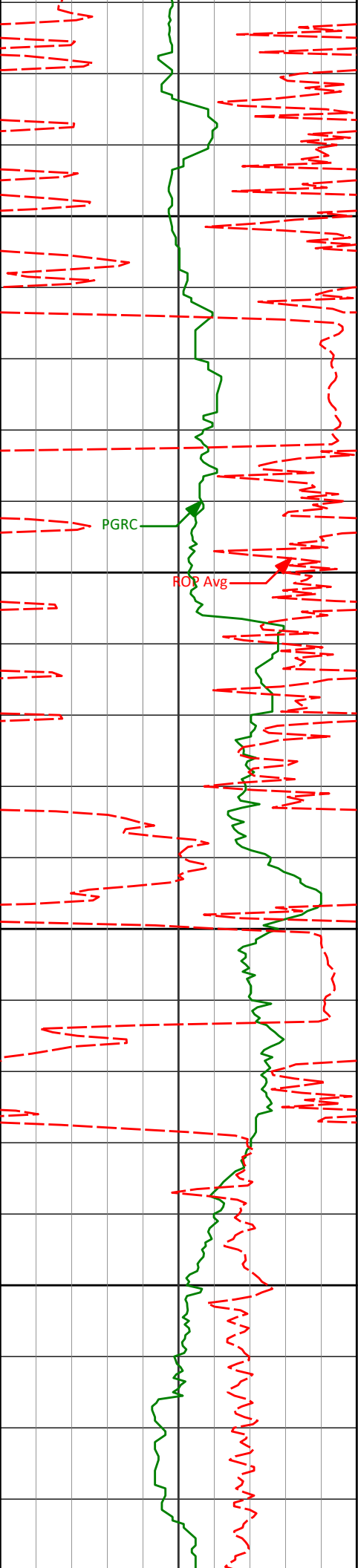
89.75°

354.64°

6048.42'

2689.24'

8550



8600

8638'

91.57°

356.15°

6047.34'

2782.72'

8650

8700

8733'

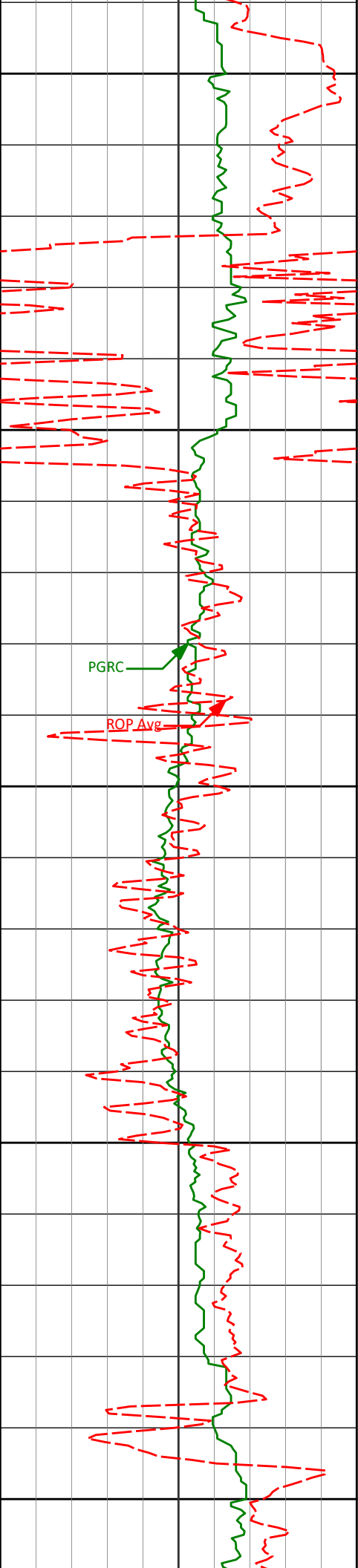
90.12°

355.40°

6045.94'

2877.26'

8750



8800

8828'

89.51°

357.24°

6046.24'

2971.89'

8850

8900

8923'

88.80°

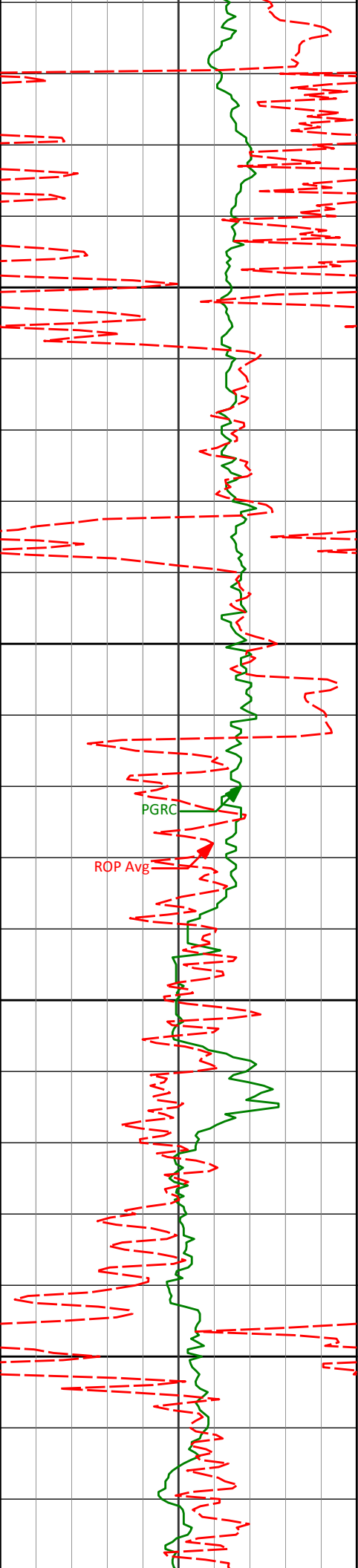
356.06°

6047.64'

3066.55'

8950

9000



9018'

90.80°

356.55°

6047.98'

3161.18'

9050

9100

9113'

92.50°

356.00°

6045.24'

3255.76'

9150

9200

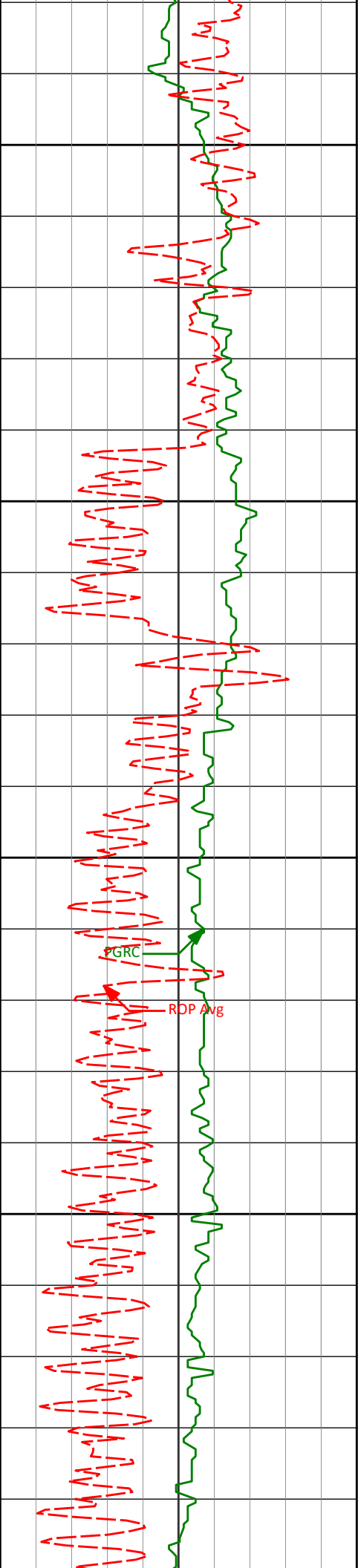
9208'

91.42°

355.68°

6041.99'

3350.26'



9250

9300

9350

9400

9450

9303'

91.88°

356.25°

6039.26'

3444.80'

9398'

90.86°

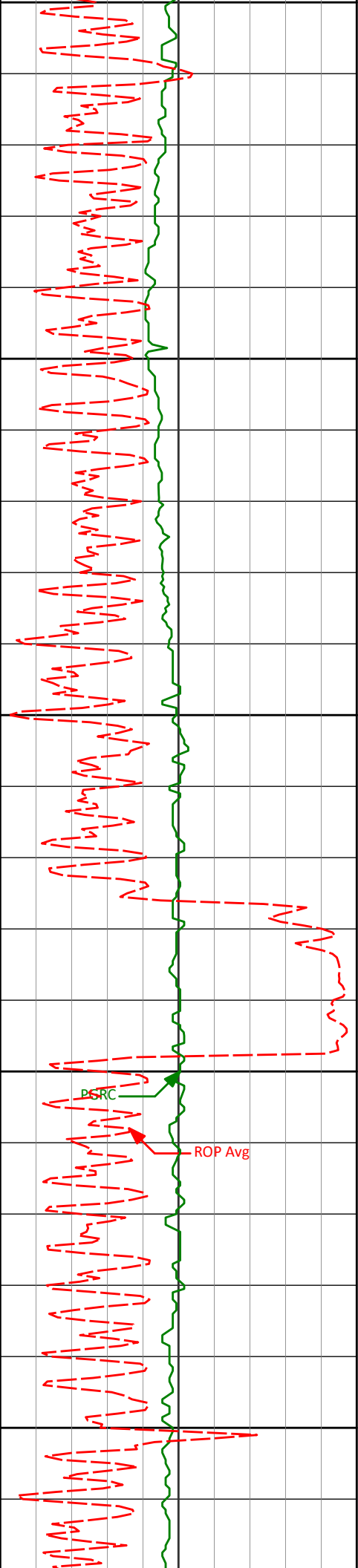
355.45°

6036.98'

3539.33'

GRC

ROP Avg



9450

9492'

90.65°

354.58°

6035.75'

3632.75'

9500

9550

9587'

89.54°

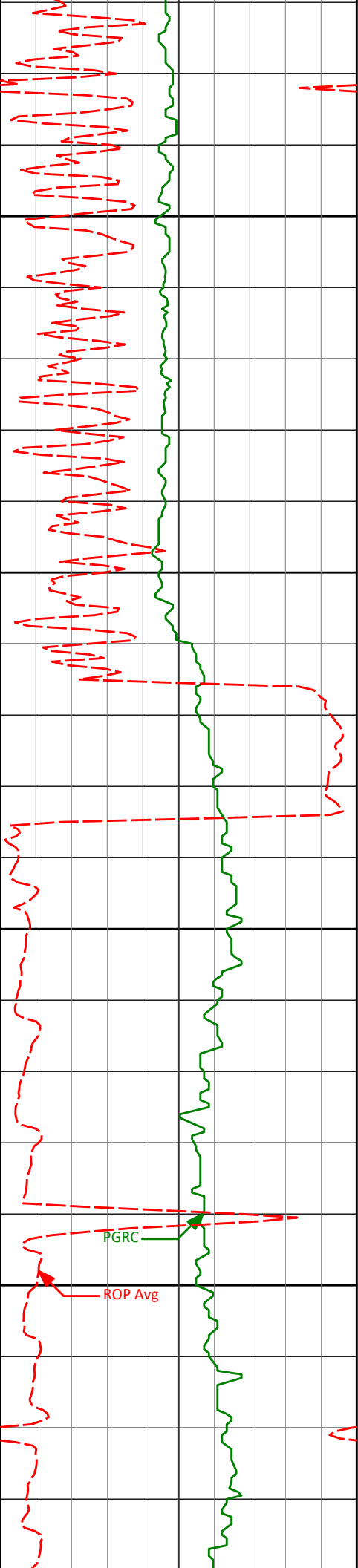
355.29°

6035.59'

3727.15'

9600

9650



9682'

89.29°

354.87°

6036.56'

3821.57'

9700

9750

9777'

90.00°

356.33°

6037.15'

3916.09'

9800

9850

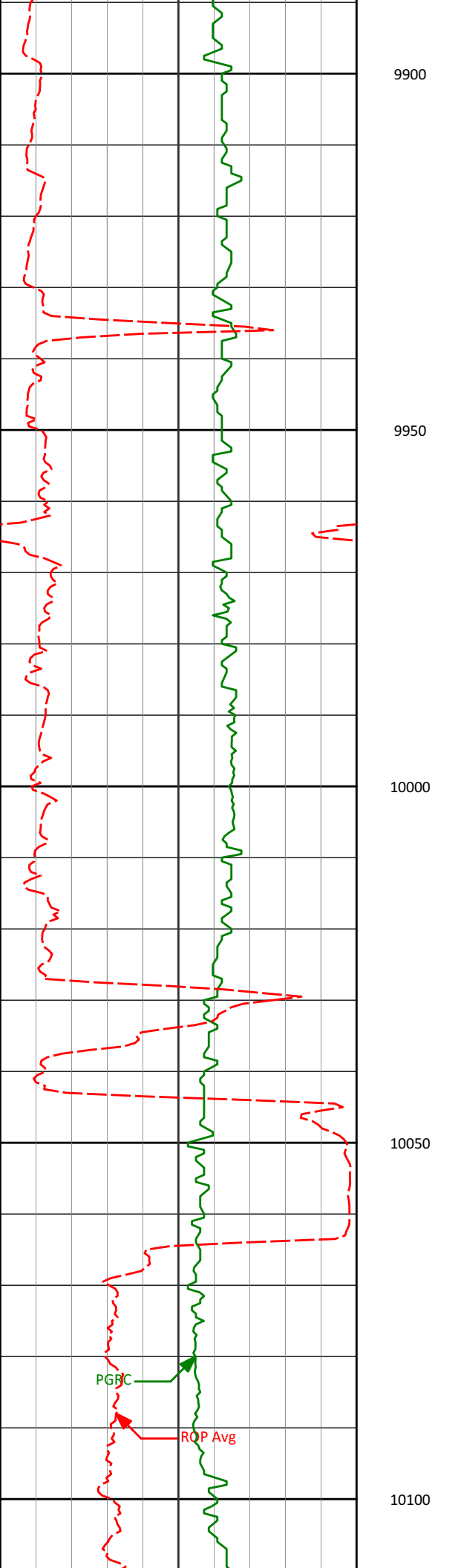
9872'

89.88°

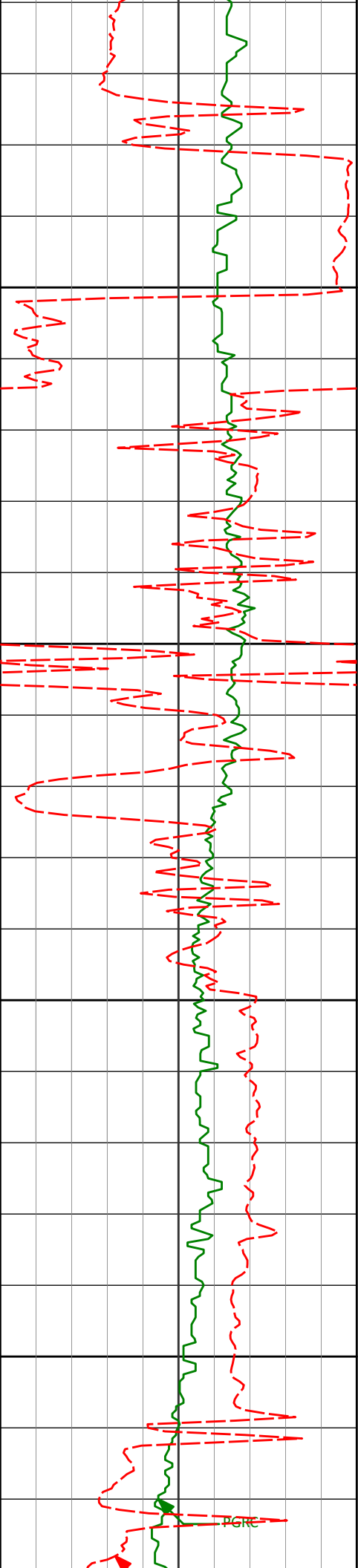
356.82°

6037.25'

4010.76'



9900					
9950					
9966'	89.32°	355.96°	6037.90'	4104.40'	
10000					
10050					
10061'	89.57°	357.06°	6038.82'	4199.06'	
10100					



10150

10154'

91.29°

359.41°

6038.13'

4291.90'

10200

10250

10247'

91.63°

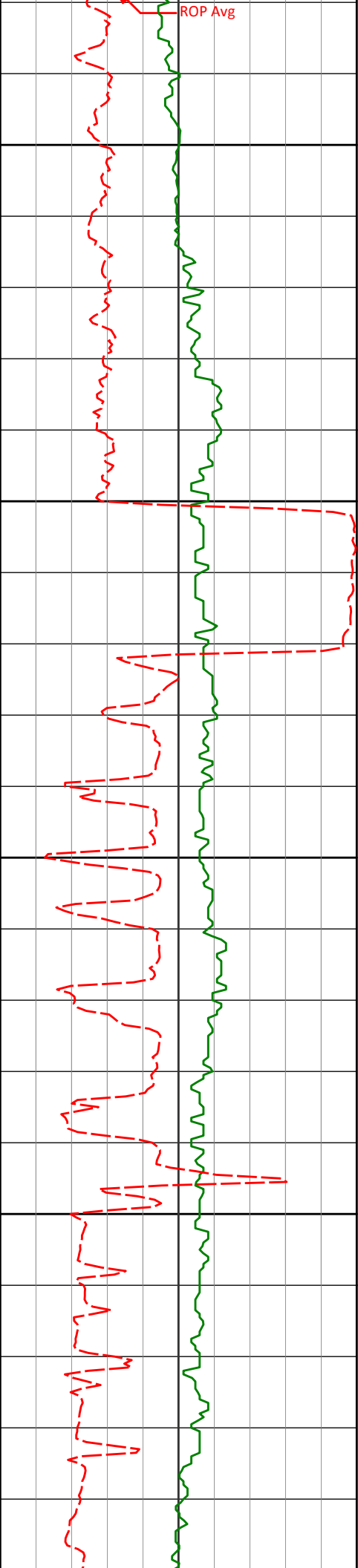
359.58°

6035.76'

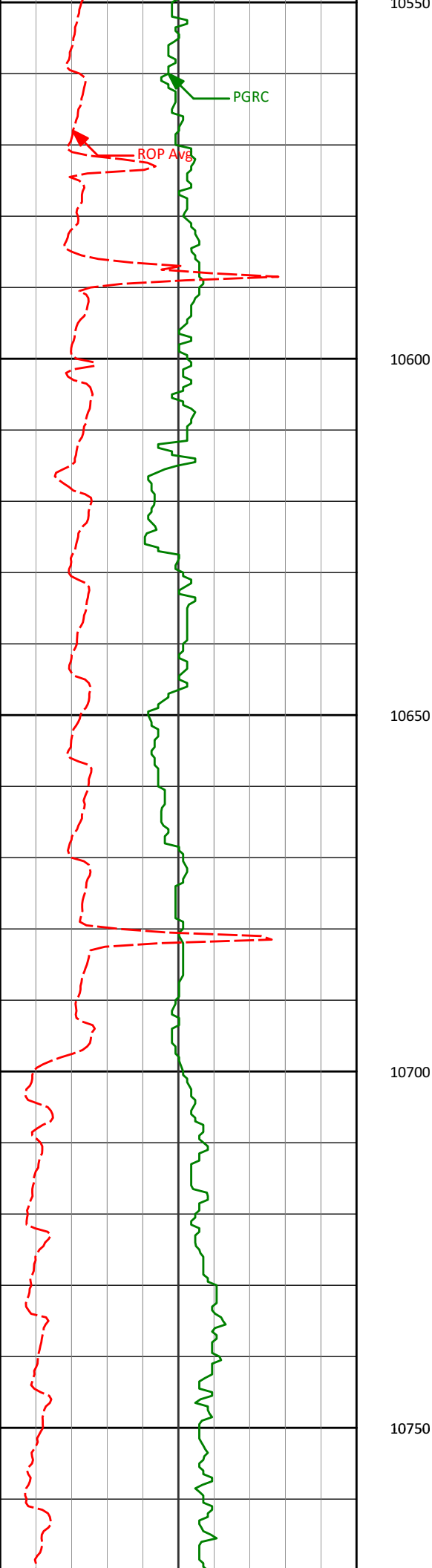
4384.82'

10300

PGRC



10340'	91.97°	358.94°	6032.83'	4477.72'
10350				
10400				
10433'	89.66°	359.45°	6031.51'	4570.63'
10450				
10500				
10526'	89.85°	359.15°	6031.91'	4663.57'
10550				



10618'

89.78°

358.76°

6032.21'

4755.49'

10600

10650

10700

10711'

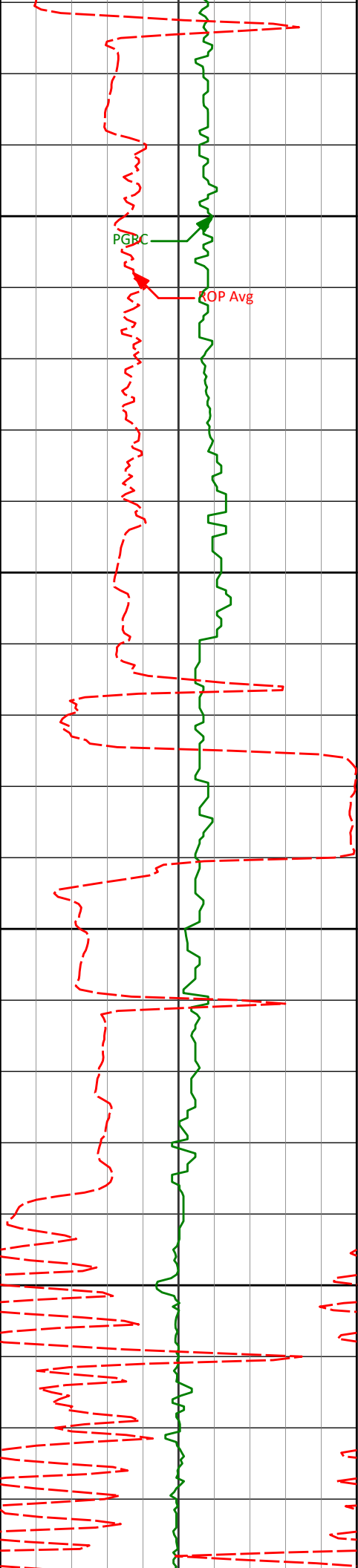
90.18°

358.34°

6032.24'

4848.38'

10750



10800

10850

10900

10950

10804'

88.89°

356.44°

6032.99'

4941.15'

10897'

88.77°

357.61°

6034.89'

5033.86'

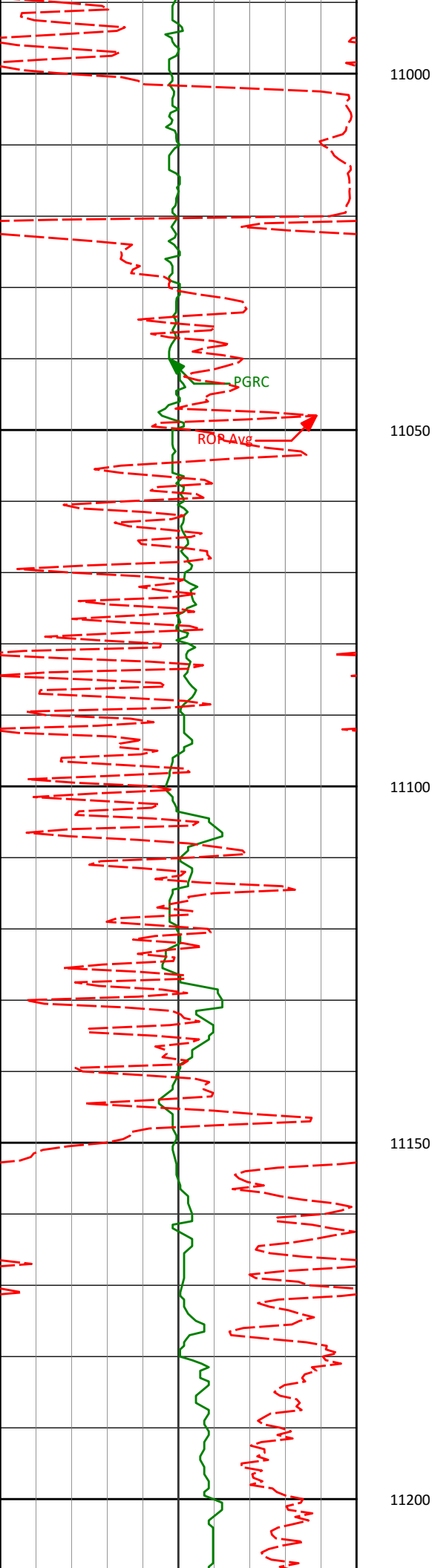
10989'

89.78°

358.67°

6036.06'

5125.70'



11082'

90.22°

0.50°

6036.06'

5218.65'

11100

11150

11175'

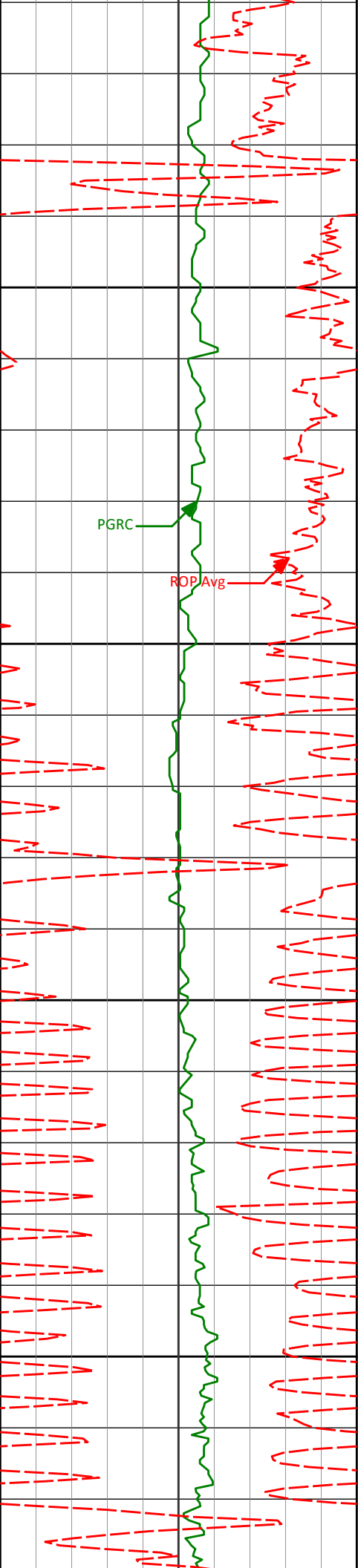
89.85°

0.23°

6036.00'

5311.64'

11200



11250

11267'

90.06°

0.66°

6036.07'

5403.63'

11300

11350

11360'

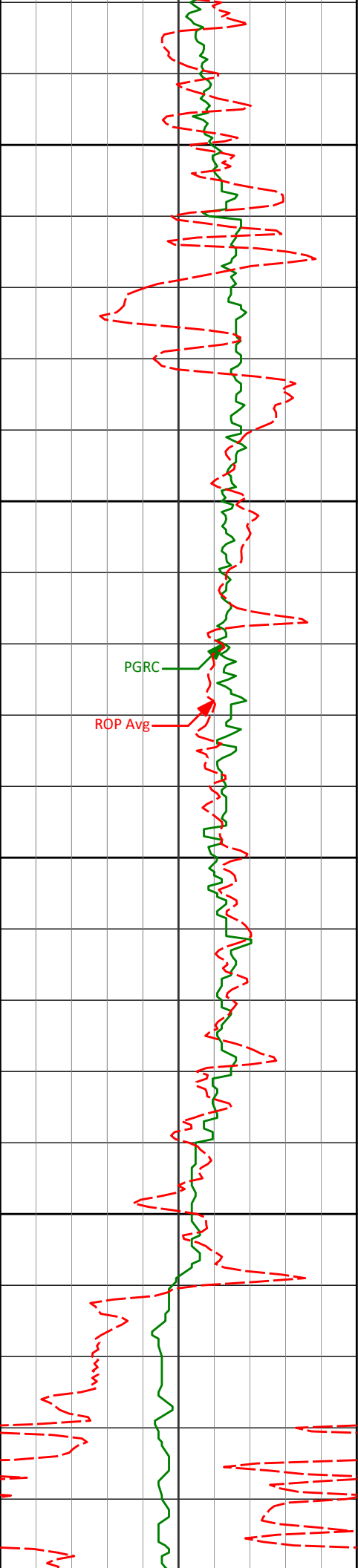
89.29°

0.49°

6036.60'

5496.62'

11400



11450

11453'

88.55°

359.99°

6038.35'

5589.58'

11500

PGRC

ROP Avg

11550

11546'

88.61°

0.10°

6040.66'

5682.53'

11600

11639'

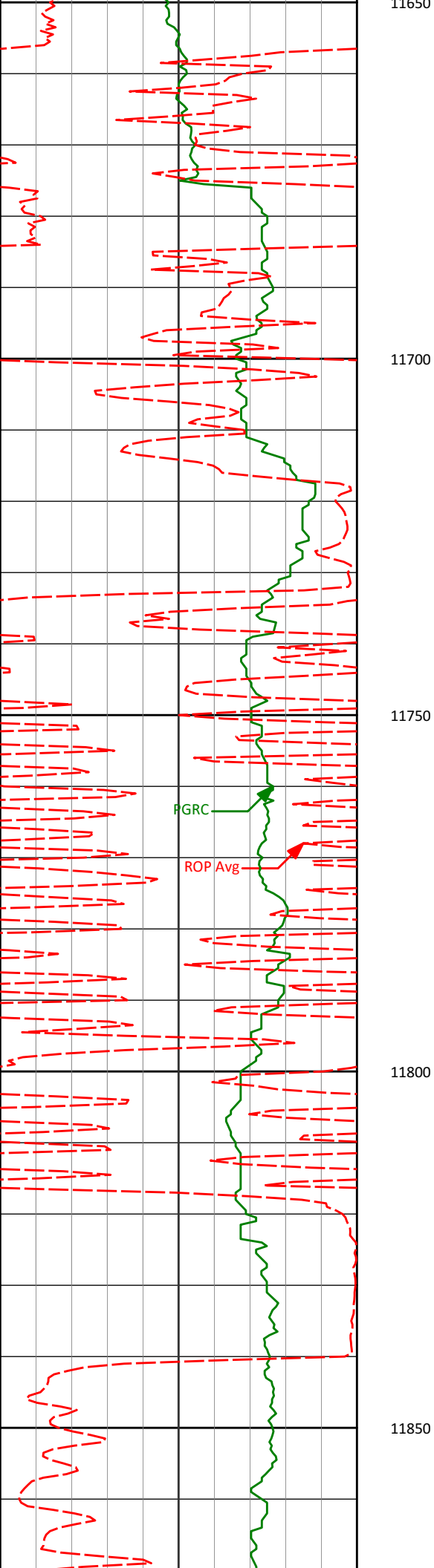
88.28°

359.34°

6043.18'

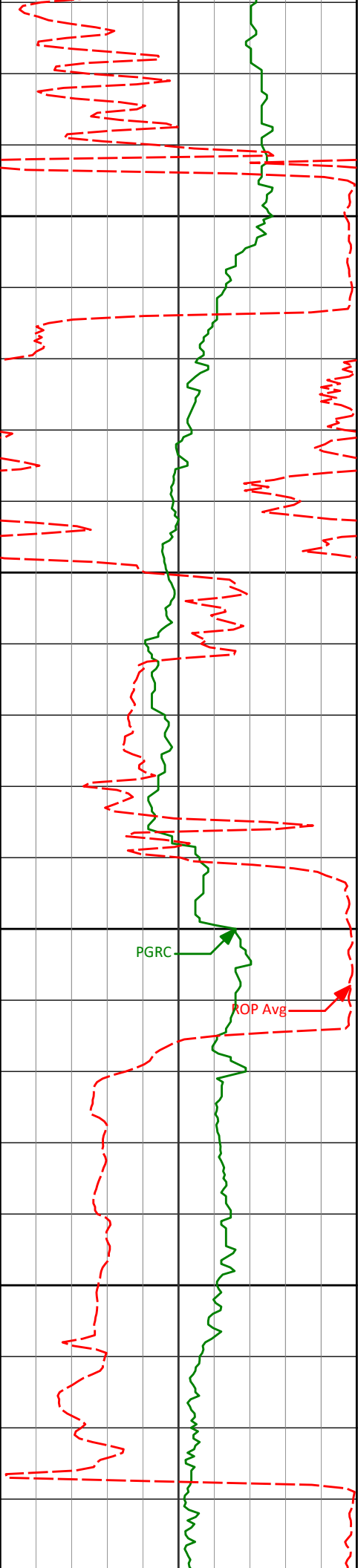
5775.46'

11650



11732'	88.03°	359.50°	6046.18'	5868.35'
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11827'	88.43°	359.46°	6049.11'	5963.26'
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11900

11922'

89.44°

359.22°

6050.88'

6058.18'

11950

12000

PGRC

ROP Avg

12016'

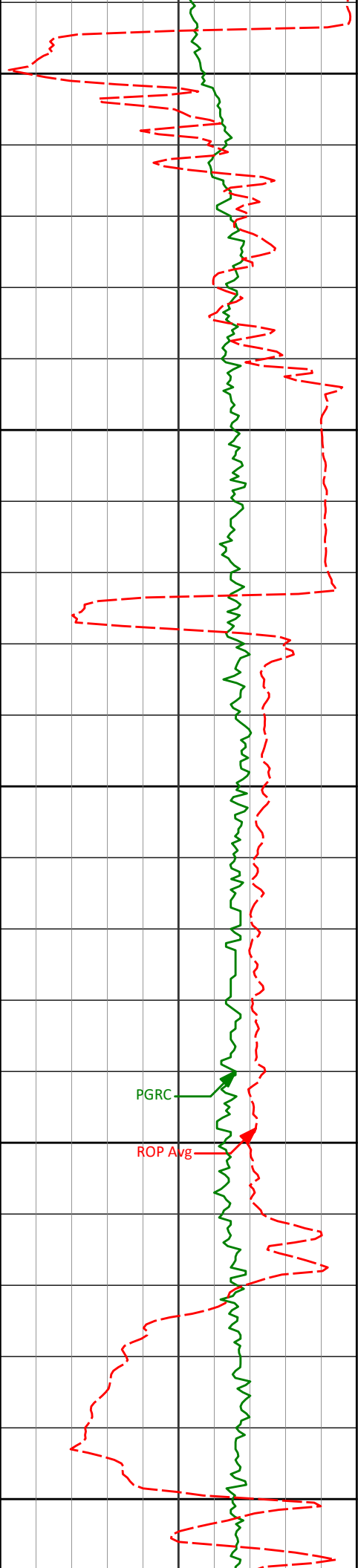
89.82°

359.00°

6051.48'

6152.11'

12050



12100

12111'

90.80°

359.35°

6050.97'

6247.03'

12150

12200

12206'

91.05°

359.43°

6049.44'

6341.97'

12250

12300

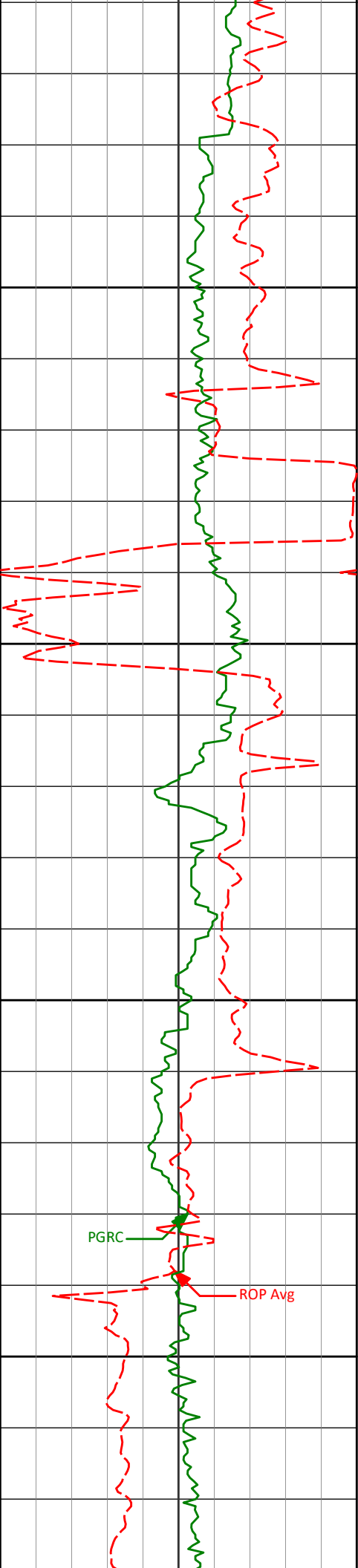
12301'

92.47°

0.08°

6046.52'

6436.88'



12350

12400

12450

12500

12396'

12491'

90.74°

89.94°

359.45°

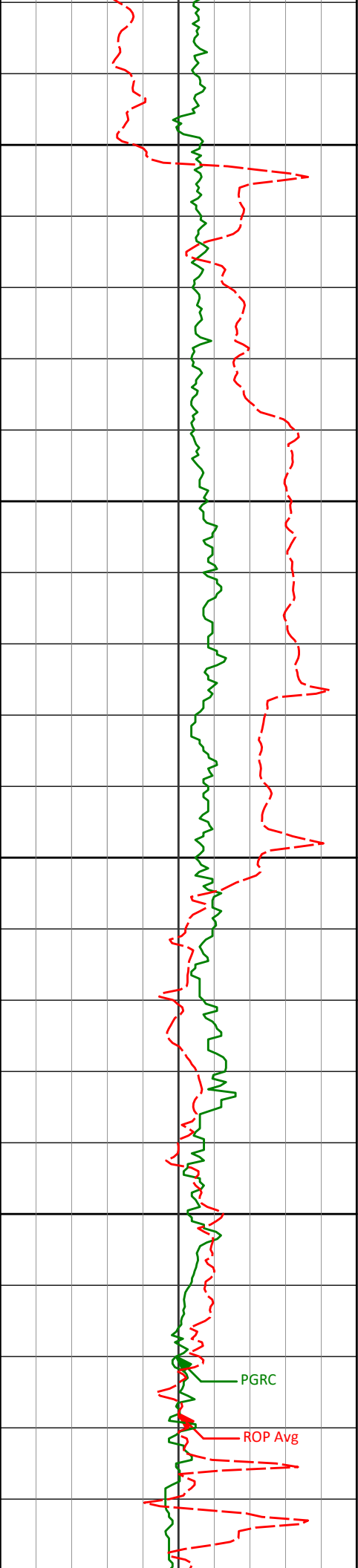
359.36°

6043.86'

6043.29'

6531.80'

6626.75'



12550

12585'

89.91°

358.93°

6043.42'

6720.67'

12600

12650

12680'

89.38°

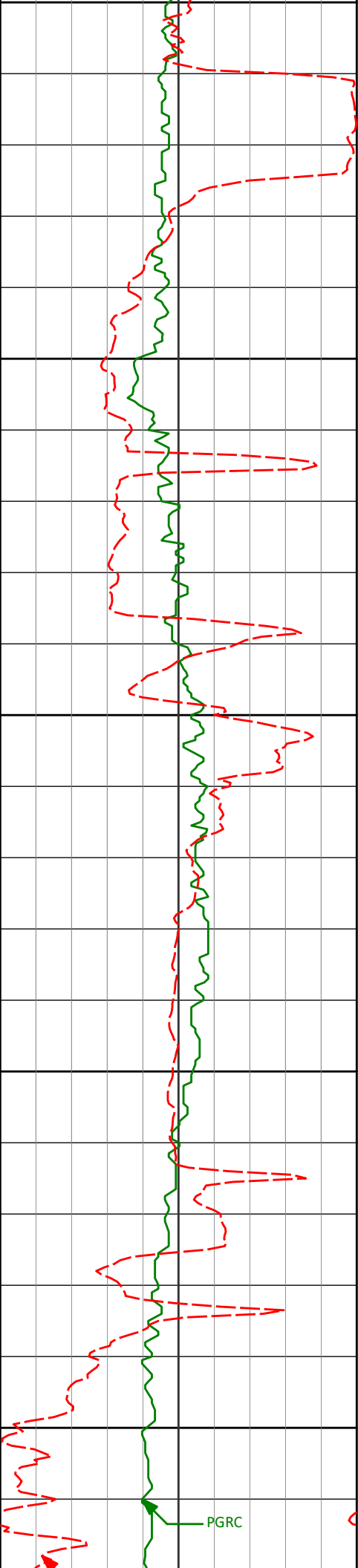
358.07°

6044.00'

6815.55'

12700

12750



12750

12775'

89.91°

357.14°

6044.59'

6910.35'

12800

12850

12870'

91.17°

357.73°

6043.70'

7005.12'

12900

12950

12965'

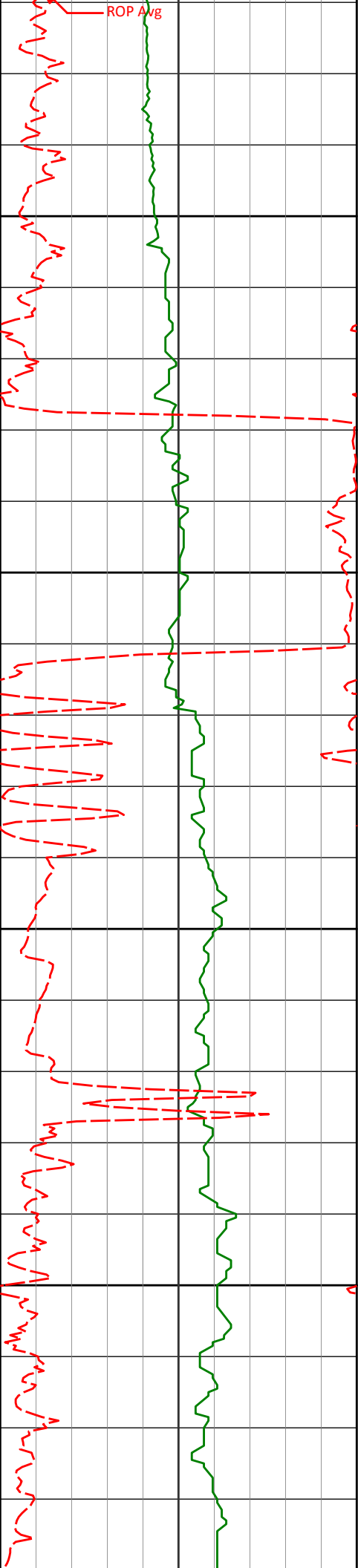
90.71°

356.39°

6042.14'

7099.83'

PGRC



13000

13050

13100

13150

13060'

91.05°

358.73°

6040.68'

7194.61'

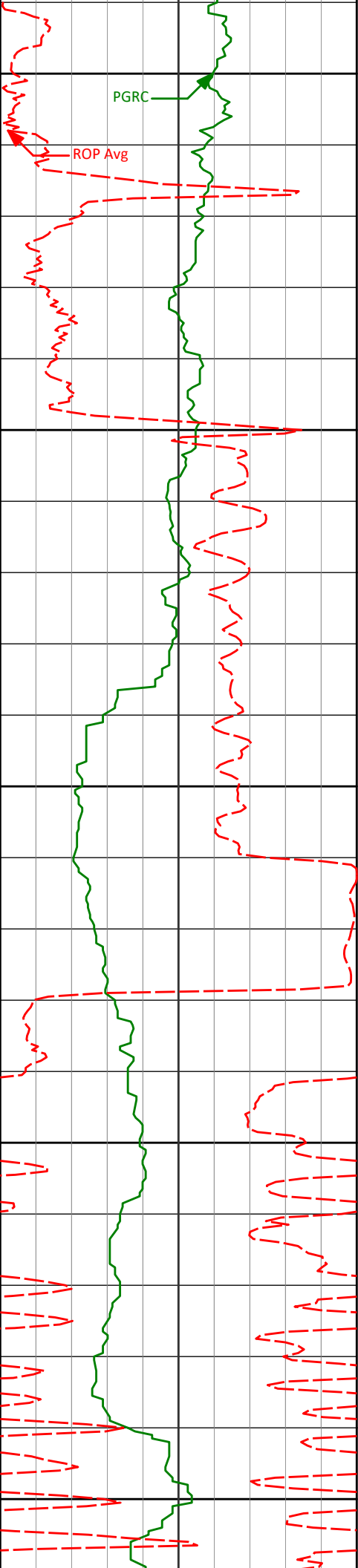
13155'

91.29°

357.81°

6038.74'

7289.45'



13200

13250

13300

13350

13400

13250'

13344'

91.51°

91.76°

356.69°

357.25°

6036.42'

6033.74'

7384.17'

7477.86'



13439'	93.08°	356.58°	6029.73'	7572.49'
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13450

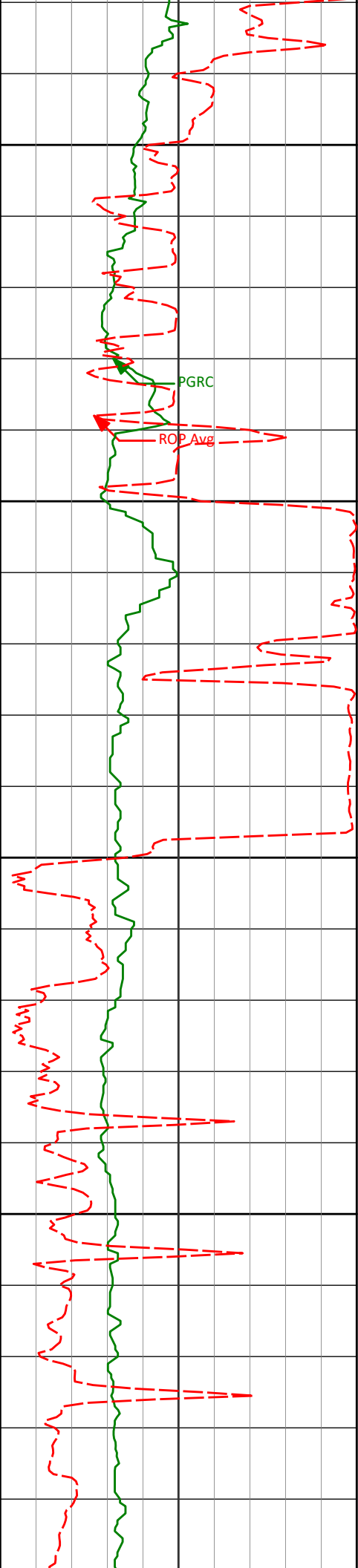
13500

13534'	92.69°	356.03°	6024.94'	7667.00'
--------	--------	---------	----------	----------

13550

13600

13629'	92.28°	356.53°	6020.83'	7761.53'
--------	--------	---------	----------	----------



13650

13700

<Run 400>

13723'

91.02°

356.79°

6018.12'

7855.18'

13750

13800

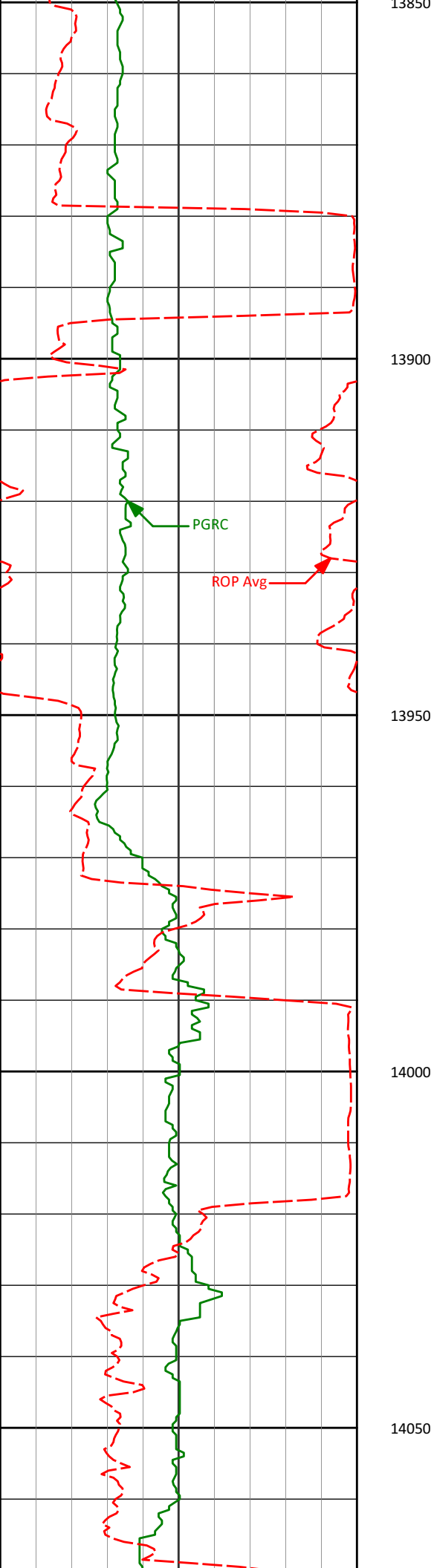
13818'

89.94°

356.01°

6017.32'

7949.82'



13913'

89.57°

357.34°

6017.73'

8044.50'

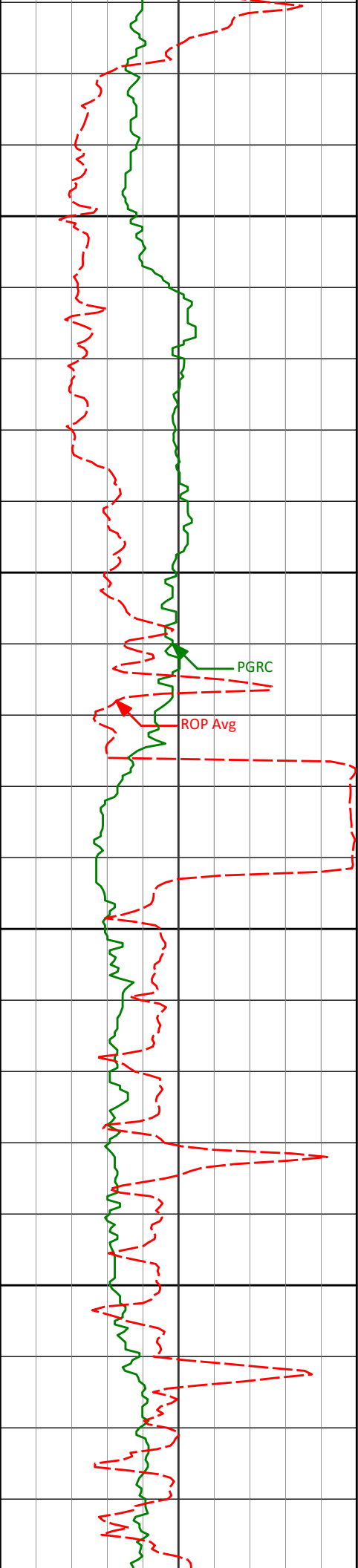
14008'

89.32°

358.24°

6018.65'

8139.31'



14100

14103'

90.89°

359.34°

6018.48'

8234.21'

14150

PGRC

ROP Avg

14200

14198'

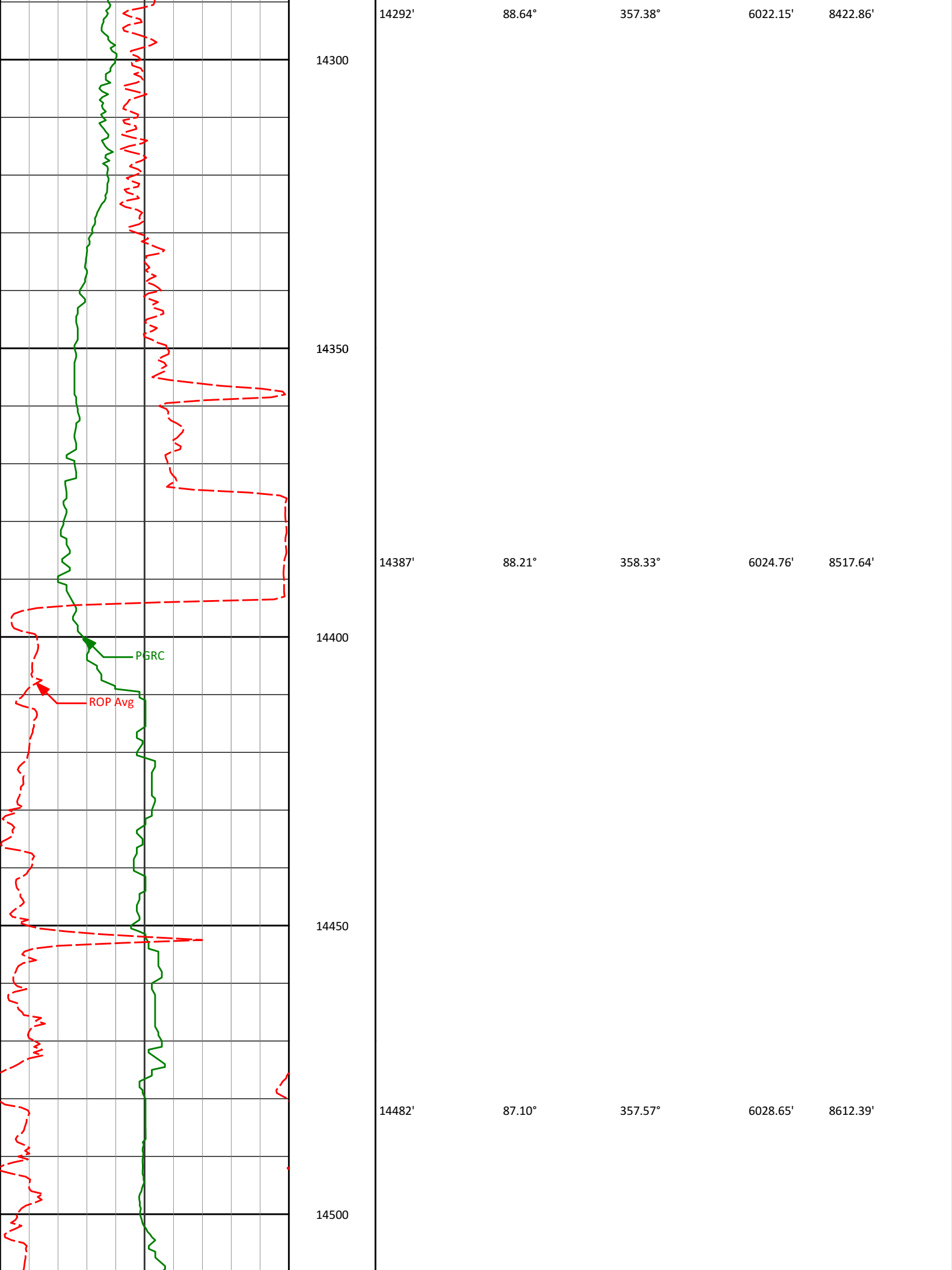
88.00°

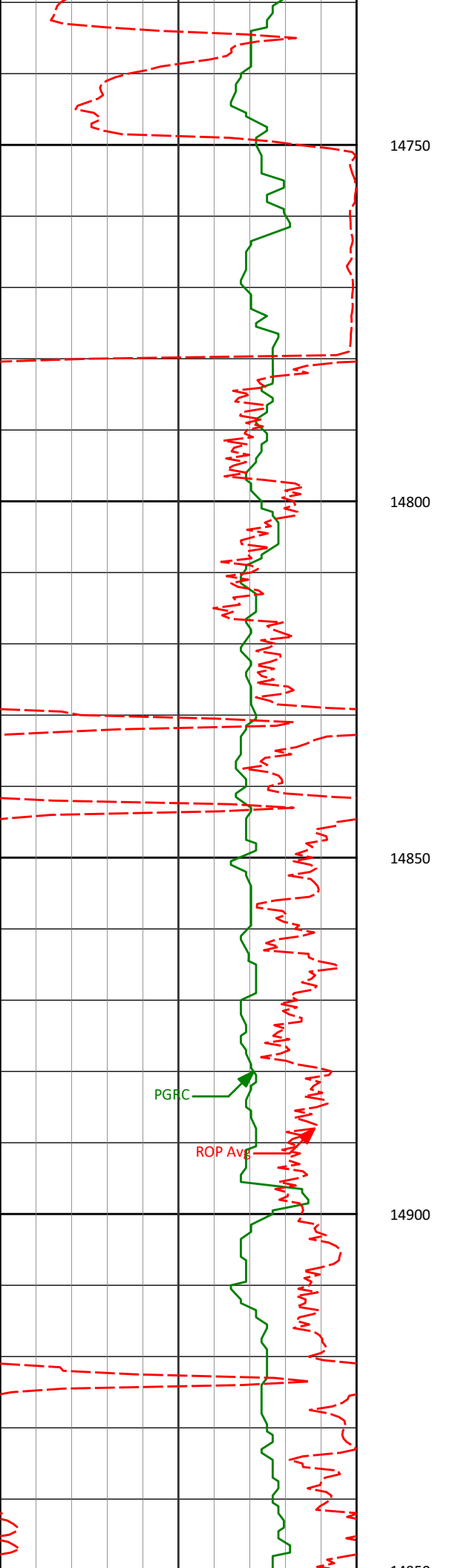
358.06°

6019.40'

8329.09'

14250





14766'

89.29°

358.70°

6042.91'

8895.53'

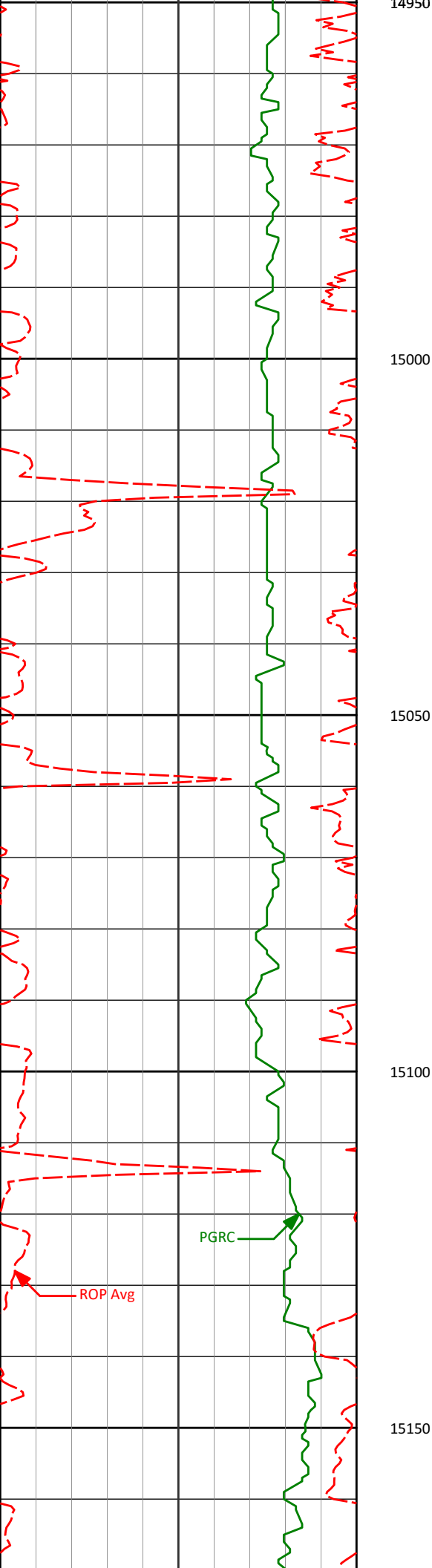
14861'

90.52°

358.69°

6043.07'

8990.42'



14956'

89.45°

358.63°

6043.10'

9085.32'

15000

15050

15051'

89.48°

358.03°

6043.98'

9180.18'

15100

PGRC

ROP Avg

15150

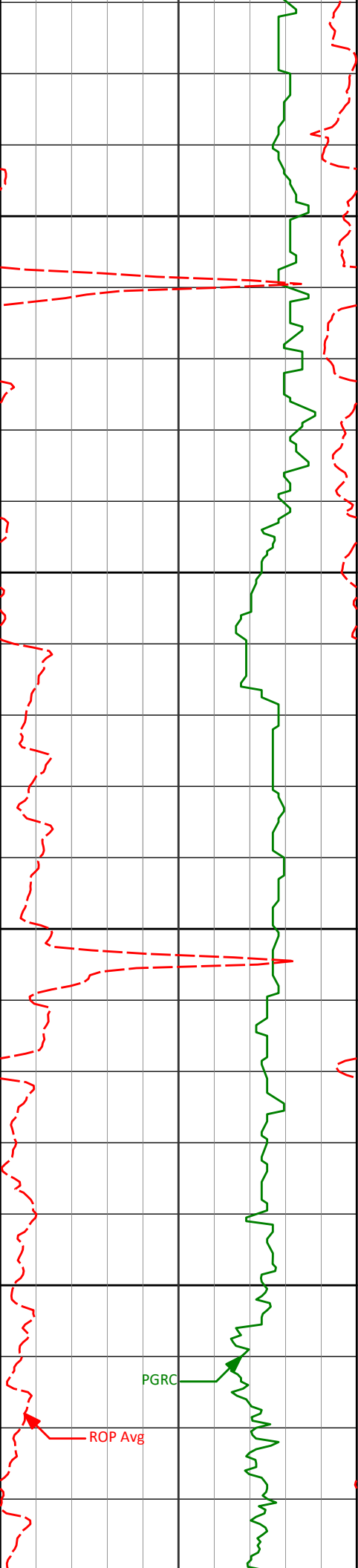
15146'

89.66°

357.85°

6044.69'

9275.01'



15200

15240'

88.98°

355.98°

6045.81'

9368.71'

15250

15300

15335'

89.51°

355.90°

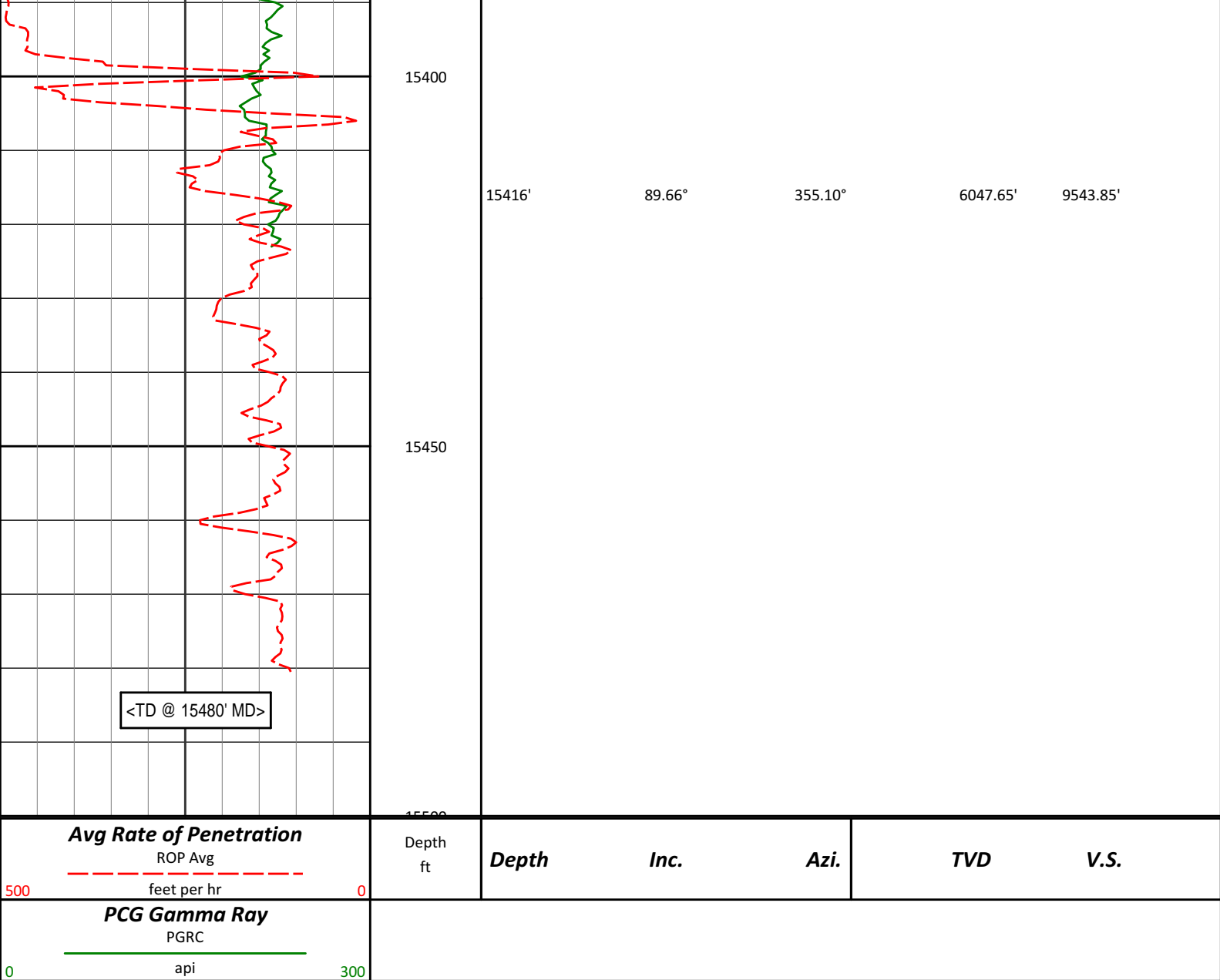
6047.06'

9463.28'

15350

PGRC

ROP Avg



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Rico LC29-74-1HNA
Wattenberg
Weld Colorado
USA

CA-XX-0901286889
Surveys are IFR1 and MSA corrected.

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
370.00	0.50	351.35	370.00	1.60 N	0.24 W	1.59	0.14
620.00	0.60	324.05	619.98	3.73 N	1.18 W	3.71	0.11
809.00	0.32	4.40	808.98	5.06 N	1.72 W	5.02	0.22
994.00	0.47	4.20	993.97	6.33 N	1.62 W	6.29	0.08
1273.00	0.09	155.14	1272.97	7.28 N	1.44 W	7.24	0.20
1366.00	0.00	119.56	1365.97	7.21 N	1.41 W	7.17	0.10
1459.00	0.14	22.97	1458.97	7.31 N	1.37 W	7.28	0.15
1554.00	0.17	62.32	1553.97	7.49 N	1.20 W	7.46	0.11
1645.00	3.16	111.06	1644.92	6.65 N	1.26 E	6.68	3.35

1738.00	5.69	108.57	1737.64	4.26 N	8.02 E	4.45	2.73
1833.00	8.07	108.37	1831.95	0.66 N	18.82 E	1.10	2.51
1927.00	10.54	109.97	1924.70	4.36 S	33.16 E	-3.57	2.64
2022.00	13.01	109.59	2017.70	10.91 S	51.41 E	-9.69	2.60
2117.00	12.98	109.82	2110.26	18.12 S	71.52 E	-16.41	0.06
2212.00	12.94	109.10	2202.84	25.21 S	91.61 E	-23.03	0.18
2307.00	13.07	108.89	2295.41	32.17 S	111.82 E	-29.51	0.15
2402.00	12.44	109.53	2388.06	39.07 S	131.63 E	-35.94	0.68
2497.00	12.21	109.81	2480.87	45.90 S	150.72 E	-42.31	0.25
2591.00	11.83	108.77	2572.81	52.37 S	169.20 E	-48.34	0.47
2687.00	11.82	108.97	2666.77	58.73 S	187.81 E	-54.25	0.04
2781.00	11.81	99.32	2758.79	63.42 S	206.41 E	-58.50	2.10
2876.00	11.85	98.21	2851.77	66.38 S	225.66 E	-61.01	0.24
2971.00	11.85	97.88	2944.75	69.11 S	244.98 E	-63.28	0.07
3066.00	11.46	97.96	3037.79	71.76 S	263.98 E	-65.47	0.41
3161.00	10.96	98.44	3130.98	74.39 S	282.26 E	-67.67	0.54
3256.00	9.65	98.59	3224.44	76.91 S	299.07 E	-69.79	1.38
3351.00	9.52	100.87	3318.12	79.58 S	314.66 E	-72.09	0.42
3446.00	9.74	100.90	3411.78	82.58 S	330.26 E	-74.72	0.23
3540.00	10.11	101.88	3504.37	85.78 S	346.15 E	-77.54	0.43
3635.00	10.50	102.82	3597.84	89.42 S	362.75 E	-80.78	0.45
3730.00	10.83	102.11	3691.20	93.21 S	379.91 E	-84.17	0.37
3825.00	9.65	99.09	3784.68	96.34 S	396.50 E	-86.90	1.36
3920.00	8.46	90.12	3878.50	97.61 S	411.35 E	-87.82	1.94
4014.00	5.99	90.18	3971.75	97.64 S	423.18 E	-87.57	2.63
4109.00	4.25	84.03	4066.37	97.29 S	431.63 E	-87.02	1.92
4204.00	1.84	79.81	4161.23	96.66 S	436.64 E	-86.27	2.55
4299.00	1.72	78.86	4256.18	96.11 S	439.54 E	-85.65	0.13
4394.00	1.93	63.85	4351.13	95.13 S	442.37 E	-84.60	0.55
4488.00	2.09	44.67	4445.08	93.21 S	445.00 E	-82.63	0.73
4583.00	2.25	33.40	4540.01	90.42 S	447.24 E	-79.78	0.48
4678.00	0.37	57.47	4634.98	88.70 S	448.53 E	-78.03	2.02
4773.00	0.65	304.44	4729.98	88.23 S	448.34 E	-77.57	0.91
5057.00	1.39	325.36	5013.93	84.49 S	445.06 E	-73.90	0.29
5152.00	1.51	316.03	5108.90	82.64 S	443.53 E	-72.09	0.28
5247.00	1.40	312.40	5203.87	80.96 S	441.81 E	-70.45	0.15
5310.00	1.20	321.28	5266.85	79.92 S	440.82 E	-69.44	0.45
5340.00	1.27	317.71	5296.85	79.43 S	440.40 E	-68.96	0.35
5434.00	1.61	344.11	5390.82	77.39 S	439.34 E	-66.94	0.78
5482.00	8.37	353.64	5438.61	73.27 S	438.77 E	-62.83	14.14
5529.00	14.97	357.34	5484.61	63.79 S	438.11 E	-53.37	14.13
5577.00	18.00	358.61	5530.64	50.18 S	437.64 E	-39.78	6.36
5624.00	19.84	359.44	5575.09	34.94 S	437.39 E	-24.55	3.96
5672.00	22.86	0.90	5619.80	17.47 S	437.45 E	-7.08	6.39
5719.00	27.61	2.95	5662.30	2.54 N	438.16 E	12.94	10.27
5767.00	31.38	2.90	5704.07	26.14 N	439.36 E	36.56	7.85
5813.00	34.91	1.51	5742.58	51.27 N	440.32 E	61.71	7.85
5861.00	37.29	358.59	5781.36	79.54 N	440.32 E	89.97	6.12
5908.00	42.27	356.32	5817.47	109.57 N	438.95 E	119.96	11.04
5956.00	46.98	355.59	5851.63	143.19 N	436.57 E	153.51	9.87
6003.00	49.38	354.25	5882.96	178.08 N	433.46 E	188.31	5.53
6051.00	54.77	356.49	5912.46	215.80 N	430.43 E	225.96	11.82
6098.00	60.76	358.51	5937.52	255.50 N	428.72 E	265.60	13.25
6146.00	65.12	0.85	5959.35	298.23 N	428.50 E	308.31	10.07
6193.00	69.62	1.20	5977.43	341.59 N	429.28 E	351.68	9.60
6241.00	73.18	0.82	5992.74	387.07 N	430.08 E	397.17	7.45
6288.00	75.45	0.62	6005.45	432.31 N	430.64 E	442.41	4.85
6336.00	77.64	0.95	6016.61	478.99 N	431.28 E	489.09	4.61
6361.00	81.31	0.78	6021.18	503.56 N	431.66 E	513.66	14.70
6459.00	89.38	0.83	6029.13	601.15 N	433.03 E	611.26	8.23
6553.00	91.42	1.36	6028.47	695.12 N	434.82 E	705.25	2.24
6648.00	90.43	1.10	6026.94	790.09 N	436.86 E	800.23	1.08
6743.00	91.97	1.76	6024.95	885.03 N	439.23 E	895.21	1.76
6838.00	88.71	358.62	6024.38	980.01 N	439.55 E	990.16	4.76
6933.00	88.37	358.31	6026.80	1074.94 N	437.00 E	1085.01	0.48
7028.00	87.60	357.55	6030.14	1169.82 N	433.57 E	1179.78	1.14
7122.00	88.00	357.17	6033.75	1263.65 N	429.25 E	1273.48	0.59
7217.00	88.86	355.91	6036.35	1358.44 N	423.52 E	1368.11	1.61
7311.00	89.01	355.93	6038.10	1452.18 N	416.83 E	1461.67	0.16
7406.00	89.35	355.62	6039.46	1546.92 N	409.83 E	1556.21	0.48
7501.00	90.52	0.20	6039.57	1641.83 N	406.37 E	1651.01	4.98

7591.00	90.32	0.20	6039.37	1741.83 N	400.37 E	1831.81	4.38
7596.00	90.18	359.48	6038.99	1736.82 N	406.10 E	1745.97	0.84
7690.00	89.41	357.96	6039.33	1830.80 N	404.00 E	1839.87	1.81
7785.00	91.32	0.91	6038.72	1925.77 N	403.06 E	1934.80	3.70
7880.00	92.74	9.32	6035.35	2020.25 N	411.52 E	2029.45	8.97
7975.00	90.74	11.64	6032.46	2113.61 N	428.79 E	2123.19	3.22
8070.00	88.68	8.35	6032.95	2207.15 N	445.27 E	2217.10	4.09
8164.00	87.04	4.21	6036.46	2300.50 N	455.55 E	2310.66	4.73
8259.00	87.10	359.40	6041.32	2395.30 N	458.54 E	2405.50	5.06
8354.00	87.97	356.28	6045.40	2490.13 N	454.96 E	2500.23	3.41
8449.00	89.32	355.84	6047.65	2584.88 N	448.43 E	2594.79	1.49
8544.00	89.75	354.64	6048.42	2679.54 N	440.55 E	2689.24	1.34
8638.00	91.57	356.15	6047.34	2773.23 N	433.00 E	2782.72	2.52
8733.00	90.12	355.40	6045.94	2867.95 N	426.01 E	2877.26	1.72
8828.00	89.51	357.24	6046.24	2962.75 N	419.91 E	2971.89	2.04
8923.00	88.80	356.06	6047.64	3057.58 N	414.36 E	3066.55	1.45
9018.00	90.80	356.55	6047.98	3152.38 N	408.24 E	3161.18	2.17
9113.00	92.50	356.00	6045.24	3247.13 N	402.07 E	3255.76	1.88
9208.00	91.42	355.68	6041.99	3341.82 N	395.18 E	3350.26	1.19
9303.00	91.88	356.25	6039.26	3436.55 N	388.50 E	3444.80	0.77
9398.00	90.86	355.45	6036.98	3531.27 N	381.62 E	3539.33	1.36
9492.00	90.65	354.58	6035.75	3624.91 N	373.46 E	3632.75	0.95
9587.00	89.54	355.29	6035.59	3719.53 N	365.07 E	3727.15	1.39
9682.00	89.29	354.87	6036.56	3814.18 N	356.92 E	3821.57	0.51
9777.00	90.00	356.33	6037.15	3908.89 N	349.63 E	3916.09	1.71
9872.00	89.88	356.82	6037.25	4003.72 N	343.96 E	4010.76	0.53
9966.00	89.32	355.96	6037.90	4097.53 N	338.04 E	4104.40	1.09
10061.00	89.57	357.06	6038.82	4192.35 N	332.26 E	4199.06	1.19
10154.00	91.29	359.41	6038.13	4285.29 N	329.39 E	4291.90	3.13
10247.00	91.63	359.58	6035.76	4378.26 N	328.57 E	4384.82	0.41
10340.00	91.97	358.94	6032.83	4471.21 N	327.37 E	4477.72	0.78
10433.00	89.66	359.45	6031.51	4564.18 N	326.07 E	4570.63	2.54
10526.00	89.85	359.15	6031.91	4657.17 N	324.93 E	4663.57	0.38
10618.00	89.78	358.76	6032.21	4749.16 N	323.25 E	4755.49	0.43
10711.00	90.18	358.34	6032.24	4842.13 N	320.90 E	4848.38	0.62
10804.00	88.89	356.44	6032.99	4935.02 N	316.66 E	4941.15	2.47
10897.00	88.77	357.61	6034.89	5027.87 N	311.84 E	5033.86	1.26
10989.00	89.78	358.67	6036.06	5119.82 N	308.85 E	5125.70	1.59
11082.00	90.22	0.50	6036.06	5212.81 N	308.18 E	5218.65	2.02
11175.00	89.85	0.23	6036.00	5305.81 N	308.77 E	5311.64	0.49
11267.00	90.06	0.66	6036.07	5397.80 N	309.49 E	5403.63	0.52
11360.00	89.29	0.49	6036.60	5490.80 N	310.42 E	5496.62	0.85
11453.00	88.55	359.99	6038.35	5583.78 N	310.81 E	5589.58	0.96
11546.00	88.61	0.10	6040.66	5676.75 N	310.88 E	5682.53	0.13
11639.00	88.28	359.34	6043.18	5769.71 N	310.43 E	5775.46	0.89
11732.00	88.03	359.50	6046.18	5862.66 N	309.49 E	5868.35	0.32
11827.00	88.43	359.46	6049.11	5957.61 N	308.62 E	5963.26	0.42
11922.00	89.44	359.22	6050.88	6052.59 N	307.53 E	6058.18	1.09
12016.00	89.82	359.00	6051.48	6146.57 N	306.07 E	6152.11	0.47
12111.00	90.80	359.35	6050.97	6241.56 N	304.70 E	6247.03	1.10
12206.00	91.05	359.43	6049.44	6336.54 N	303.69 E	6341.97	0.28
12301.00	92.47	0.08	6046.52	6431.49 N	303.28 E	6436.88	1.64
12396.00	90.74	359.45	6043.86	6526.45 N	302.89 E	6531.80	1.94
12491.00	89.94	359.36	6043.29	6621.44 N	301.91 E	6626.75	0.85
12585.00	89.91	358.93	6043.42	6715.43 N	300.51 E	6720.67	0.46
12680.00	89.38	358.07	6044.00	6810.40 N	298.02 E	6815.55	1.06
12775.00	89.91	357.14	6044.59	6905.31 N	294.05 E	6910.35	1.13
12870.00	91.17	357.73	6043.70	7000.21 N	289.80 E	7005.12	1.46
12965.00	90.71	356.39	6042.14	7095.07 N	284.93 E	7099.83	1.49
13060.00	91.05	358.73	6040.68	7189.97 N	280.88 E	7194.61	2.49
13155.00	91.29	357.81	6038.74	7284.90 N	278.01 E	7289.45	1.00
13250.00	91.51	356.69	6036.42	7379.76 N	273.46 E	7384.17	1.20
13344.00	91.76	357.25	6033.74	7473.59 N	268.49 E	7477.86	0.65
13439.00	93.08	356.58	6029.73	7568.37 N	263.38 E	7572.49	1.56
13534.00	92.69	356.03	6024.94	7663.05 N	257.27 E	7667.00	0.71
13629.00	92.28	356.53	6020.83	7757.76 N	251.11 E	7761.53	0.68
13723.00	91.02	356.79	6018.12	7851.56 N	245.64 E	7855.18	1.37
13818.00	89.94	356.01	6017.32	7946.37 N	239.67 E	7949.82	1.40
13913.00	89.57	357.34	6017.73	8041.20 N	234.16 E	8044.50	1.45
14008.00	89.32	358.24	6018.65	8136.13 N	230.50 E	8139.31	0.98
14103.00	90.89	359.34	6018.48	8231.10 N	228.49 E	8234.21	2.02
14198.00	88.00	358.06	6019.40	8326.06 N	226.34 E	8329.09	3.33

14292.00	88.64	357.38	6022.15	8419.94 N	222.60 E	8422.86	0.99
14387.00	88.21	358.33	6024.76	8514.84 N	219.05 E	8517.64	1.10
14482.00	87.10	357.57	6028.65	8609.70 N	215.65 E	8612.39	1.42
14577.00	86.02	358.15	6034.35	8704.46 N	212.11 E	8707.04	1.29
14672.00	87.16	357.92	6040.00	8799.23 N	208.86 E	8801.71	1.22
14766.00	89.29	358.70	6042.91	8893.14 N	206.09 E	8895.53	2.41
14861.00	90.52	358.69	6043.07	8988.11 N	203.92 E	8990.42	1.29
14956.00	89.45	358.63	6043.10	9083.09 N	201.70 E	9085.32	1.13
15051.00	89.48	358.03	6043.98	9178.04 N	198.93 E	9180.18	0.63
15146.00	89.66	357.85	6044.69	9272.98 N	195.52 E	9275.01	0.27
15240.00	88.98	355.98	6045.81	9366.83 N	190.46 E	9368.71	2.12
15335.00	89.51	355.90	6047.06	9461.58 N	183.73 E	9463.28	0.56
15416.00	89.66	355.10	6047.65	9542.33 N	177.38 E	9543.85	1.00
15480.00	89.66	355.10	6048.03	9606.10 N	171.91 E	9607.47	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 1.36 DEGREES (GRID)
A TOTAL CORRECTION OF 7.16 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 15480.00 FEET
IS 9607.63 FEET ALONG 1.03 DEGREES (GRID)**

Surface surveys at 370 ft and 620 ft have had azimuths corrected to grid north, but were not taken by Halliburton.

Final survey is a projection from 15416' MD to TD at 15480' MD.