

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

1 : 240

Country		: USA			
Field		: Wattenberg			
Location		: Lat: 40° 2' 41.60" North Long: 104° 42' 44.43" West			
Well		: Pettinger 4C-18HZ			
Company		: Anadarko Petroleum Corp.			
Rig		: Ensign 123			
LOCATION		Latitude : 40° 2' 41.60" North Longitude : 104° 42' 44.43" West		Other Services Directional Drilling	
		UTM Easting = 3,220,517.350 ft UTM Northing = 1,260,178.490 ft			
Permanent Datum		: Ground Level		Elev. : 5007.00 ft	
Log Measured From		: Drill Floor		13.00 ft Above Permanent Datum	
Drilling Measured From		: Drill Floor		MD LOG	
Depth Logged		: 1,213.00 ft To 12,467.00 ft		Unit No. : 11703726	
Date Logged		: 15-Feb-14 To 18-Feb-14		Job No. : CA-XX-0900984320	
Total Depth MD		: 12,467.00 ft TVD: 7,389.65 ft		Plot Type : Final	
Spud Date		: 15-Feb-14		Plot Date : 22-Feb-14	
Run No.		Borehole Record (MD)		Borehole Record (MD)	
		Size	From	To	Run No.
2		8.750 in	1,213.00 ft	7,858.00 ft	Size
3		6.125 in	7,858.00 ft	12,467.00 ft	From
					To
		Casing Record (MD)			
		Size	Weight	From	To
		9.625 in	36.00 lbpf	SURFACE	1,196.00 ft
		7.000 in	26.00 lbpf	SURFACE	7,844.00 ft

WELL INFORMATION

MWD Run Number	100	200		
Date run completed	18-Feb-14	22-Feb-14		
Rig Bit Number	2	3		
Bit Size (in)	8.750	6.125		
Tool Nominal OD (in)	6.750	4.750		
Log Start Depth (MD, ft)	1,213.00	7,858.00		
Log End Depth (MD, ft)	7,858.00	12,467.00		
Drill or Wipe	Drill	Drill		
Drill/Wipe Start Date and Time	15-Feb-14 17:19	20-Feb-14 03:22		
Drill/Wipe End Date and Time	18-Feb-14 07:58	21-Feb-14 22:43		
Min Inc (deg) @ Depth (MD, ft)	0.30 @ 6,065.00	87.60 @ 7,993.00		
Max Inc (deg) @ Depth (MD, ft)	88.86 @ 7,858.00	92.28 @ 11,324.00		
Bit TFA(in2) / Bit Type	1.18 / PDC	0.98 / PDC		
Flow Rate (gpm)	579.11	293.17		
Max AV (fpm) / CV (fpm) @ MWD	497.4 / N/A	N/A / N/A		
Fluid Type	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	9.80 / 39.00	9.55 / 42.00		
Filtrate CL (ppm)	2,500.00	2,700.00		
pH / Fluid Loss (mptm)	8.90 / 5	11.40 / 4		
PV (cP) / YP (lbf2)	11 / 22.00	12 / 11.00		
% Solids / % Sand	8.50 / 1.0	6.70 / 0.75		
% Oil / Oil:Water Ratio	0.50 / N/A	N/A / N/A		
Rm @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A		
Rmf @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A		
Rmc @ Measured Temp (degF)	N/A @ N/A	N/A @ N/A		

Max Tool Temp (degF) / Source	167.00 / PCM	217.60 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	James Tilley	James Tilley			
Customer Representative	Mike Cooney	Mike Cooney			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.76	5.84			
Sub Serial Number	11331931	12310750			
Insert Serial Number	11145557	11400958			
Date and Time Initialized	15-Feb-14 00:49	17-Feb-14 20:10			
Date and Time Read	18-Feb-14 19:50	22-Feb-14 14:49			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	47.00	42.27			
Software Version	6.21	6.21			
Sub Serial Number	11331931	12310750			
Sonde Serial Number	11062120	11297493			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	284.65	290.27			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	50.27	47.22			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11331931	12310750			
Insert/Sonde Serial Number	11680997	11293354			

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

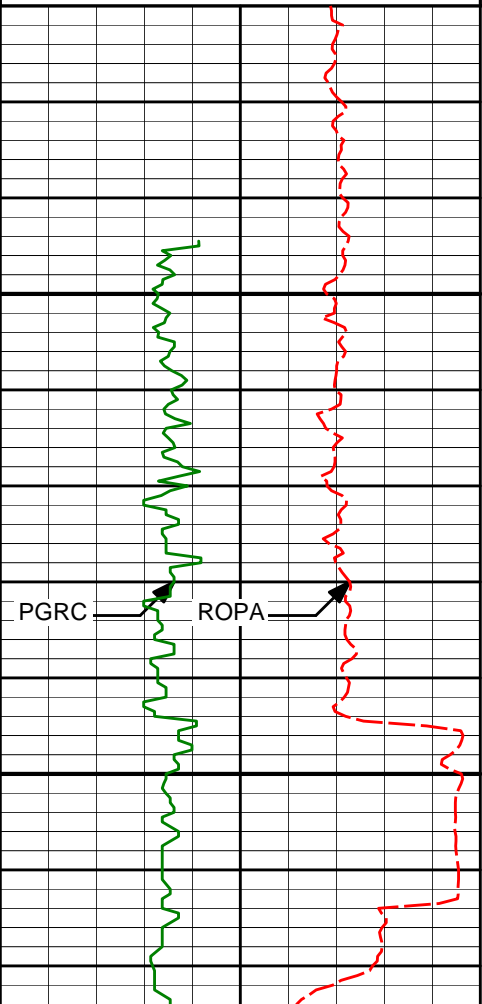
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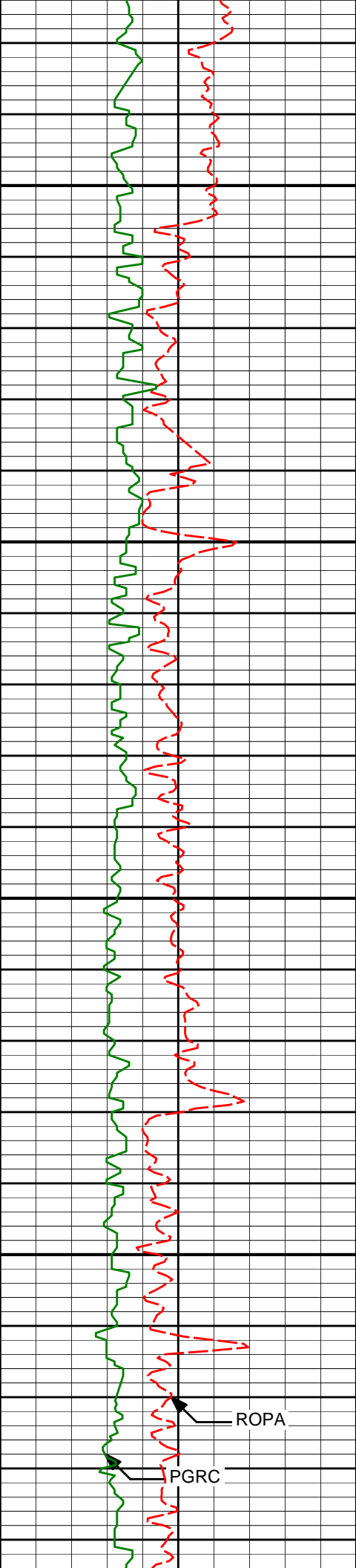
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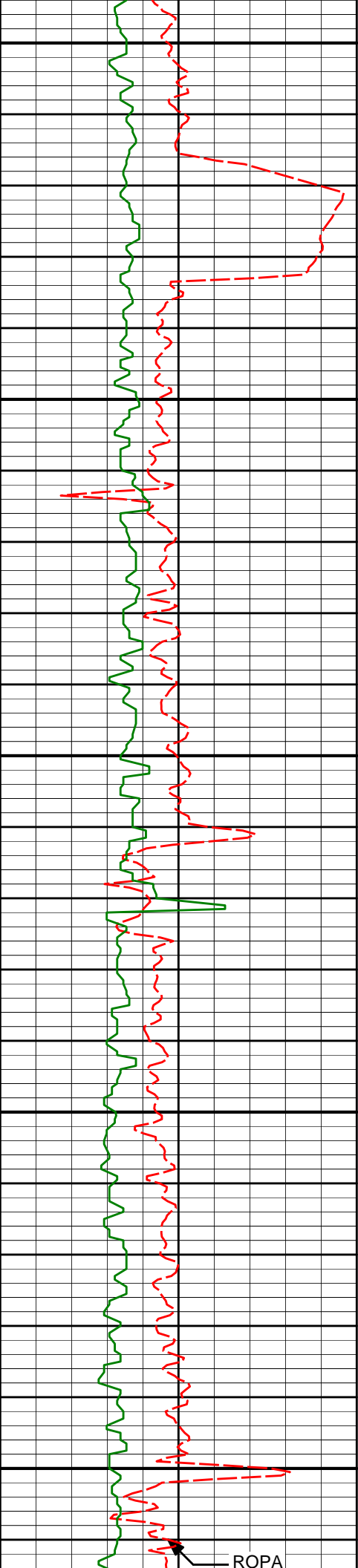
HALLIBURTON

MD Main Log 1:240

Avg Rate of Penetration feet per hr						
1K0						
PCG Gamma Ray BCorr api		Depth				
0300			Survey Depth	Inclination	Azimuth	TVD V/S
		5250	5254.00	1.42	17.77	5165.97 -239.20
		5300				



5350	5344.00	1.00	224.87	5255.97	-238.69
5400					
5450	5434.00	1.27	256.05	5345.95	-239.48
5500					
	5524.00	1.54	254.88	5435.92	-240.02



5550

5600

5650

5700

5750

5614.00

1.04

3.77

5525.91

-239.52

5704.00

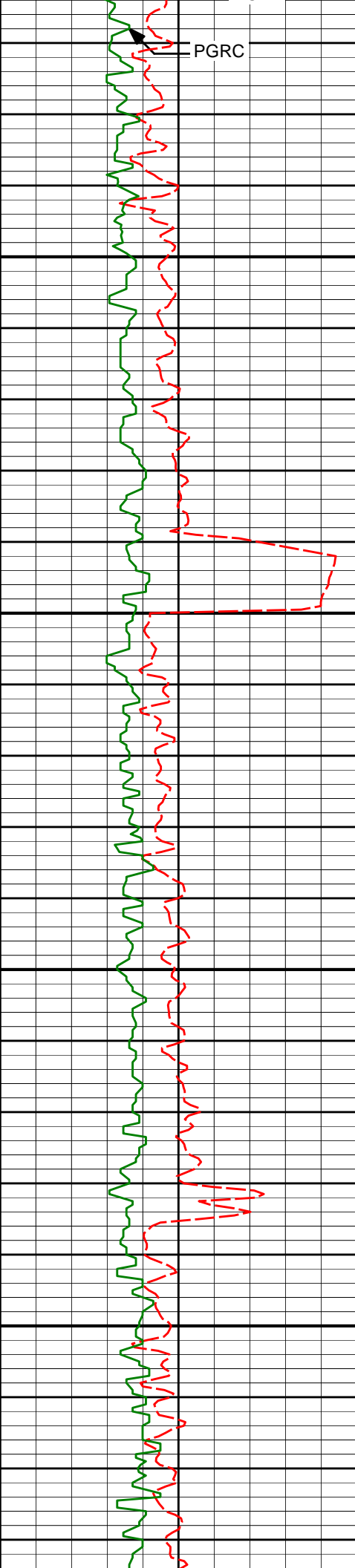
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6.81

5615.90

-238.13

ROPA



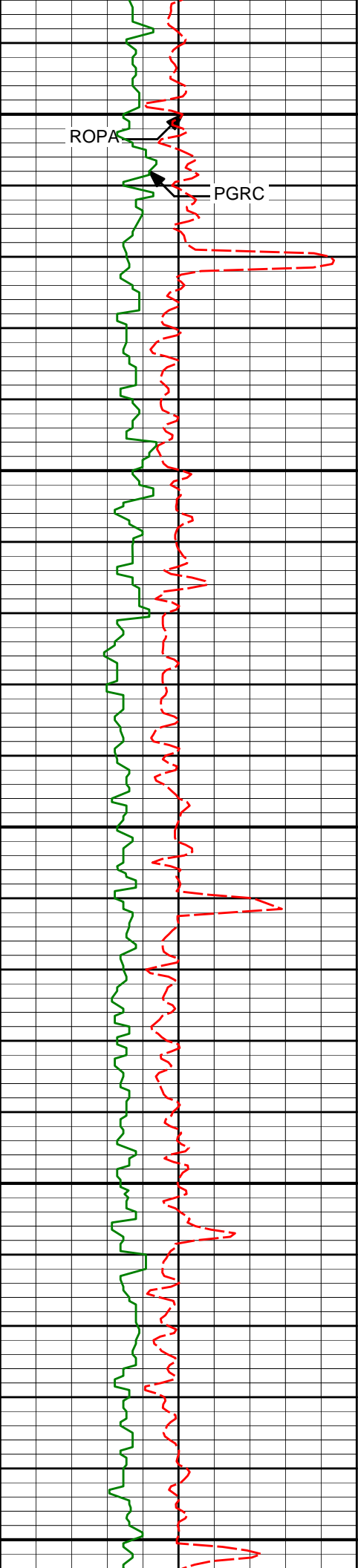
5795.00	0.65	5.71	5706.89	-237.03
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5885.00	1.05	222.11	5796.89	-237.13
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5975.00	0.58	221.99	5886.88	-238.08
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6000

ROPA

PGRC

6050

6065.00

0.30

263.69

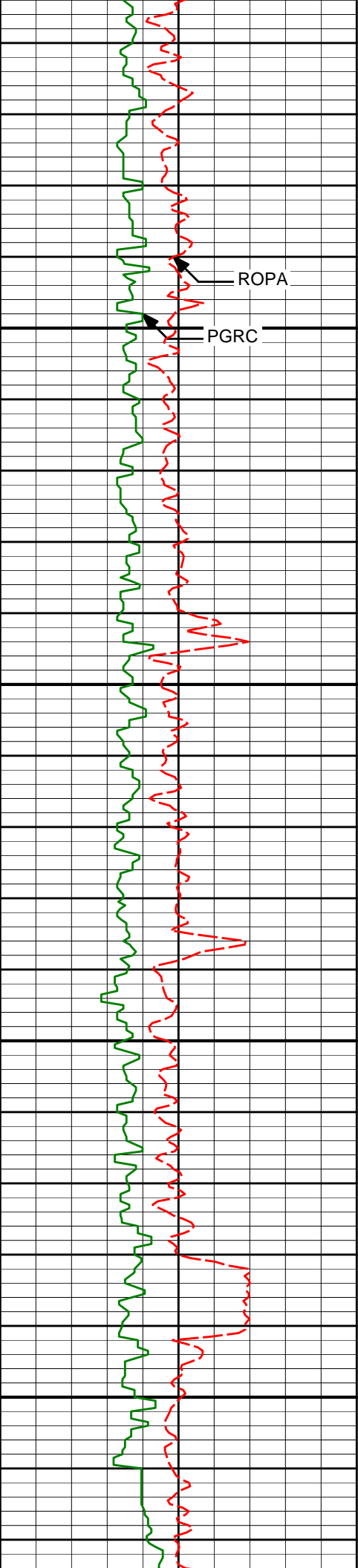
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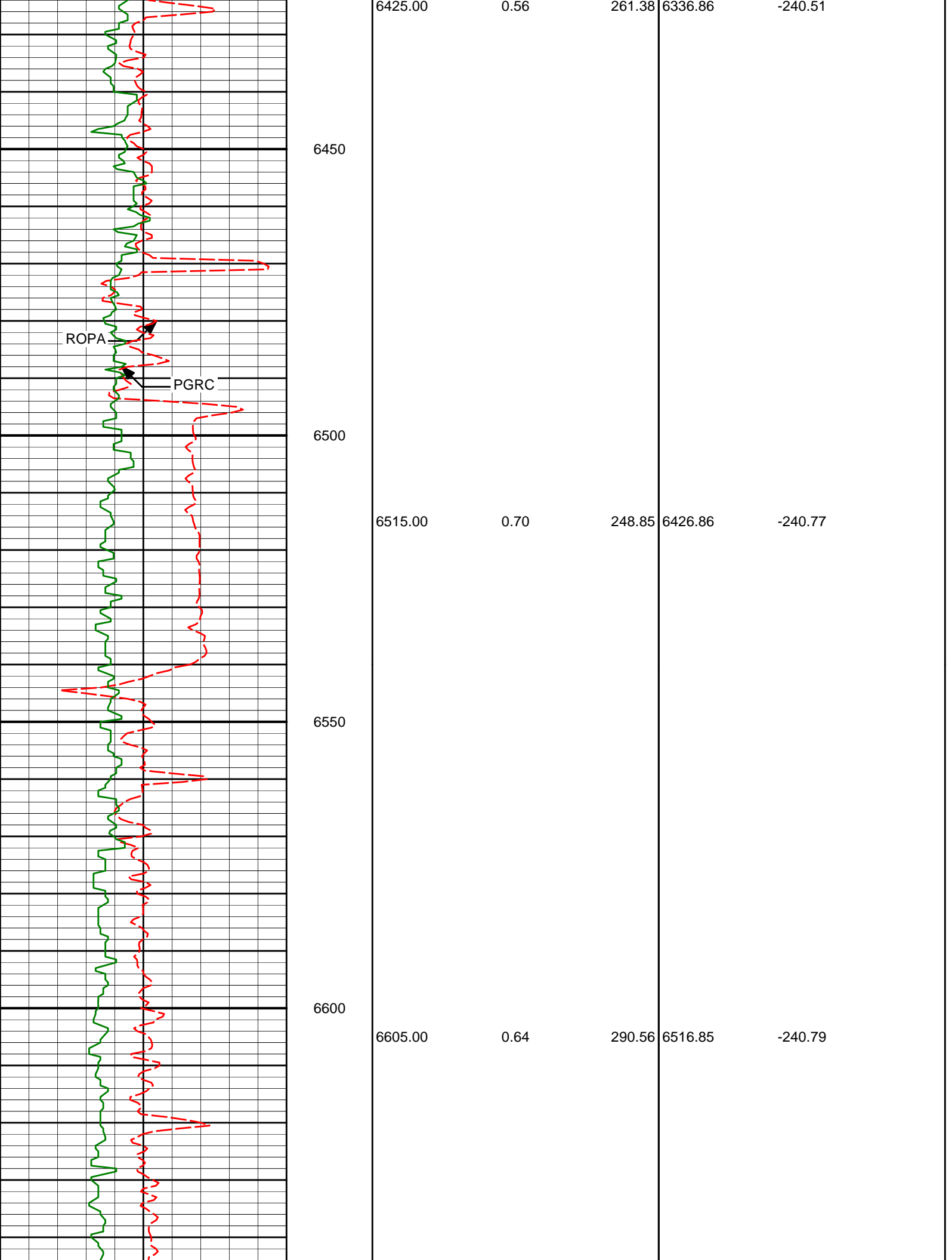
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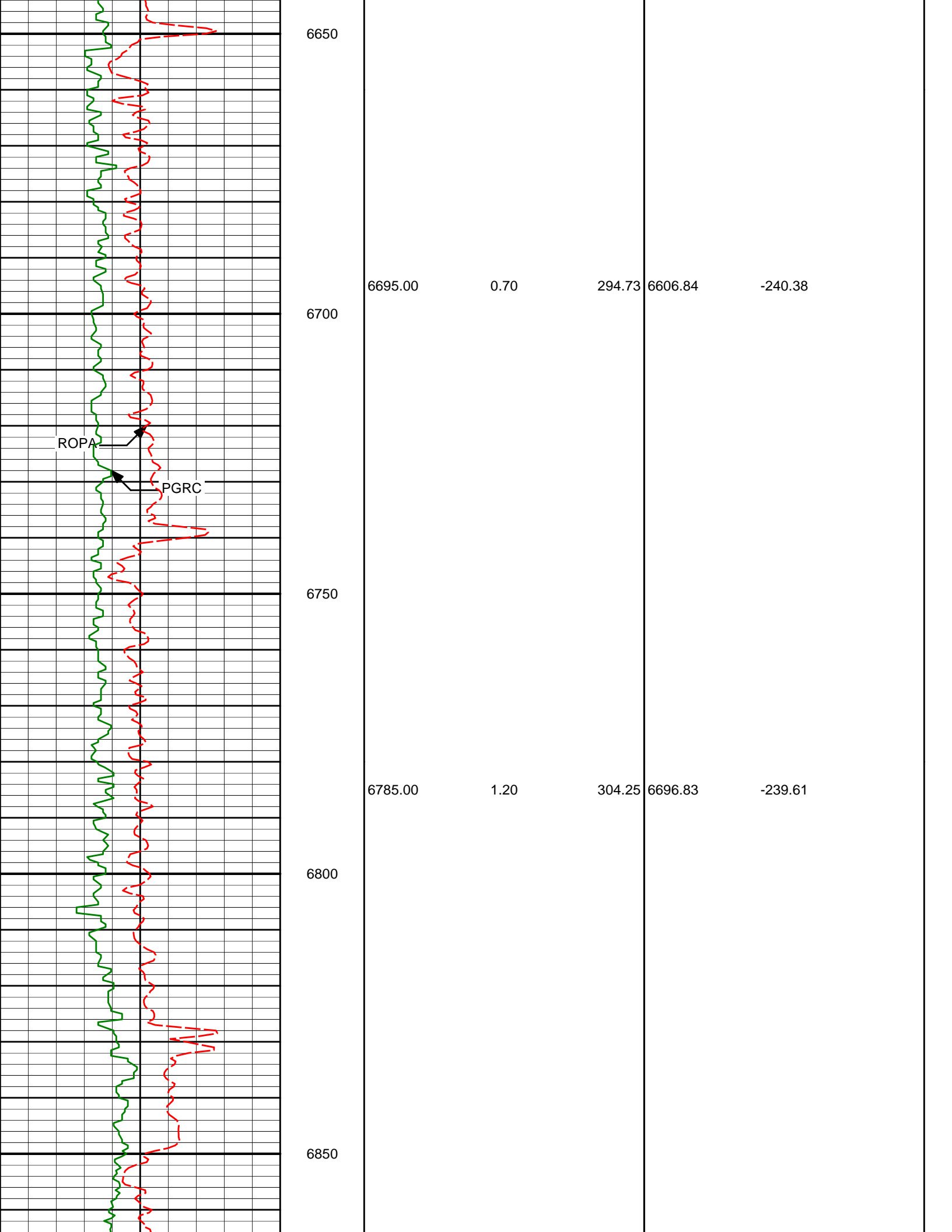
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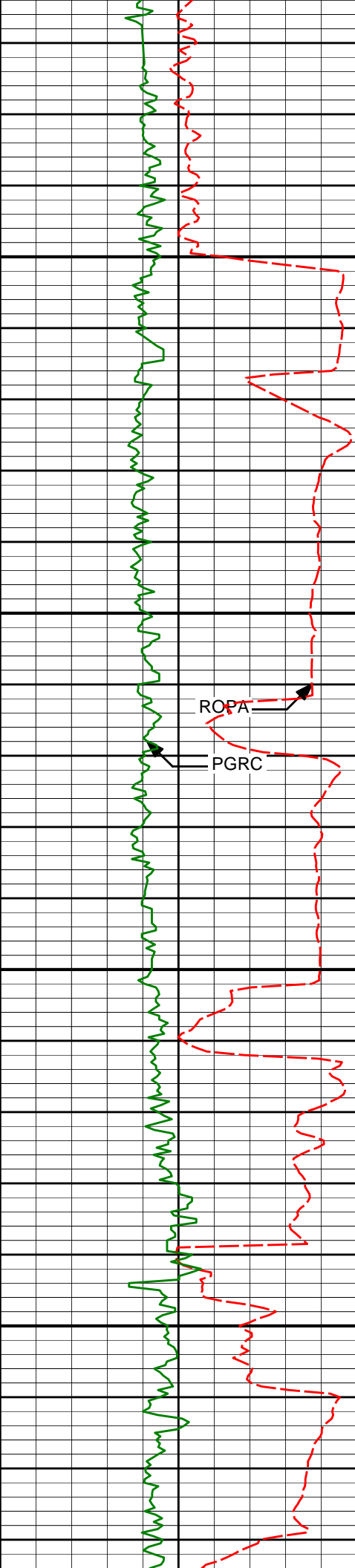
6200



6245.00	0.63	205.20	6156.87	-239.38
6250				
6300				
6335.00	0.52	220.43	6246.87	-240.14
6350				
6400				







6900

6950

7000

7050

6875.00

1.31

301.69

6786.81

-238.54

6920.00

3.07

342.80

6831.78

-237.11

6965.00

9.83

358.79

6876.47

-232.11

7010.00

15.20

353.21

6920.39

-222.40

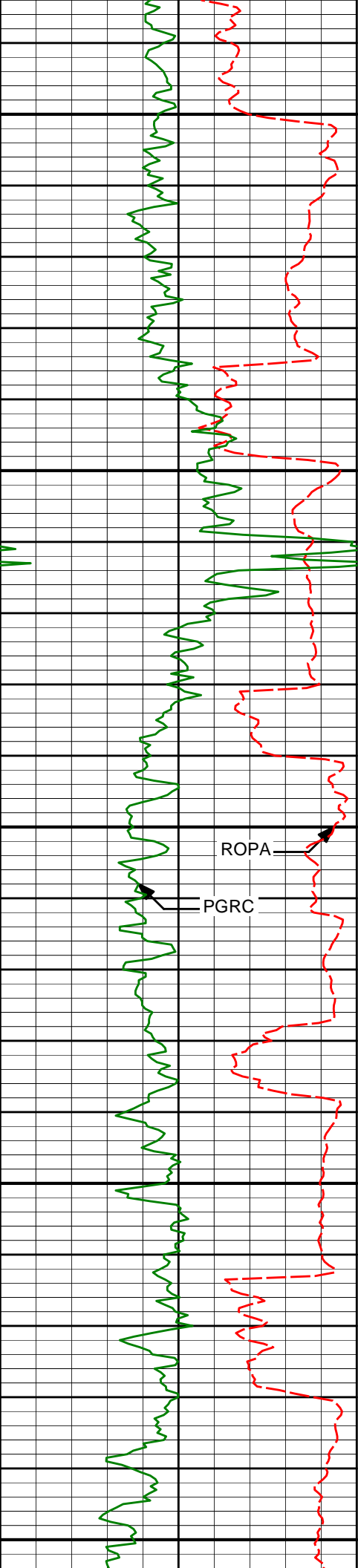
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16.79

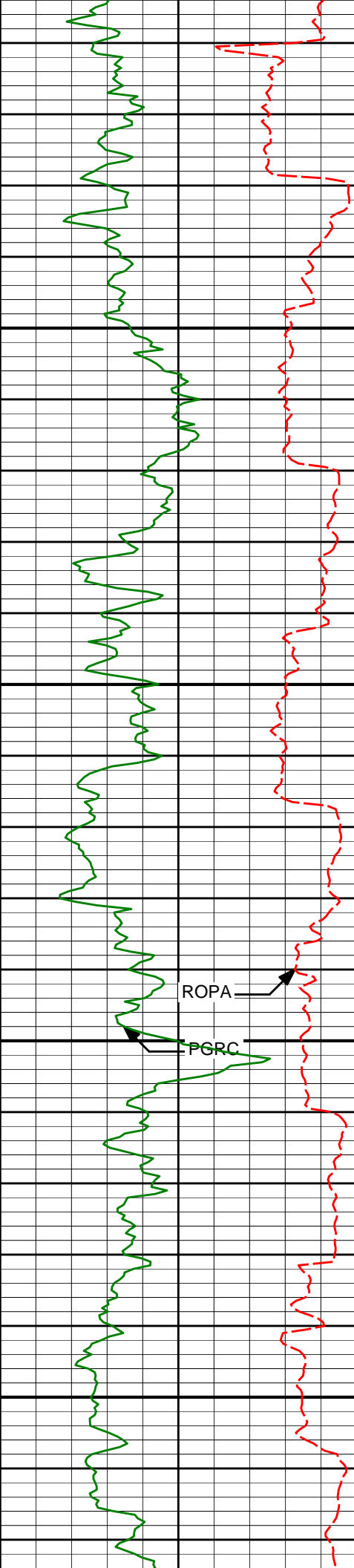
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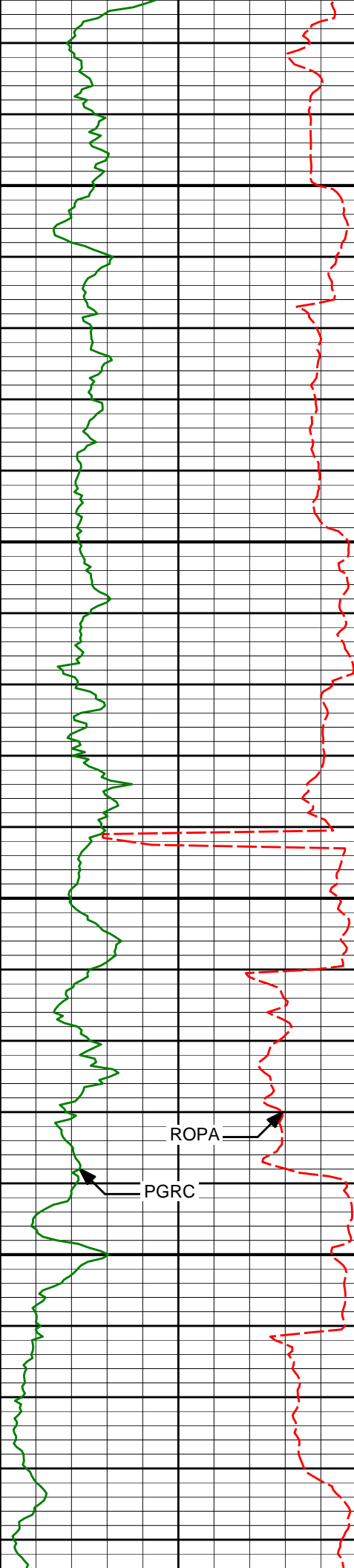
-210.12



7100	7100.00	19.59	351.52	7006.39	-196.24
7150	7145.00	24.76	351.85	7048.05	-179.42
7200	7190.00	30.20	352.10	7087.96	-158.86
7250	7235.00	34.55	355.81	7125.96	-134.89
7300	7280.00	39.20	1.25	7161.95	-107.92



7325.00	44.24	0.64	7195.53	-77.99
7350				
7370.00	48.12	1.13	7226.68	-45.54
7400				
7415.00	52.19	1.82	7255.51	-11.01
7450				
7460.00	56.05	1.66	7281.88	25.42
7500				
7505.00	60.32	0.57	7305.60	63.64



7550	7550.00	64.67	359.49	7326.37	103.54
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	7595.00	67.62	358.48	7344.57	144.69
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7600

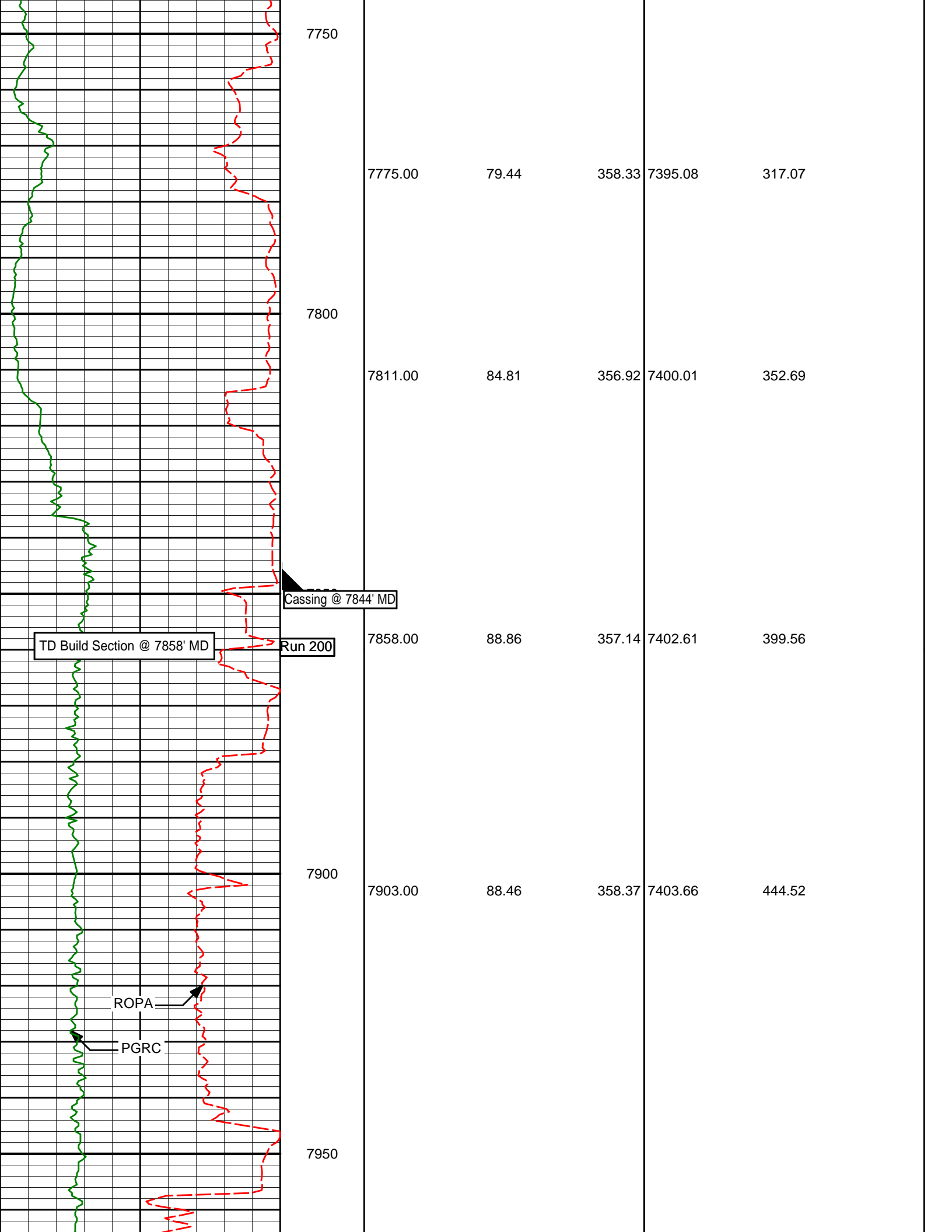
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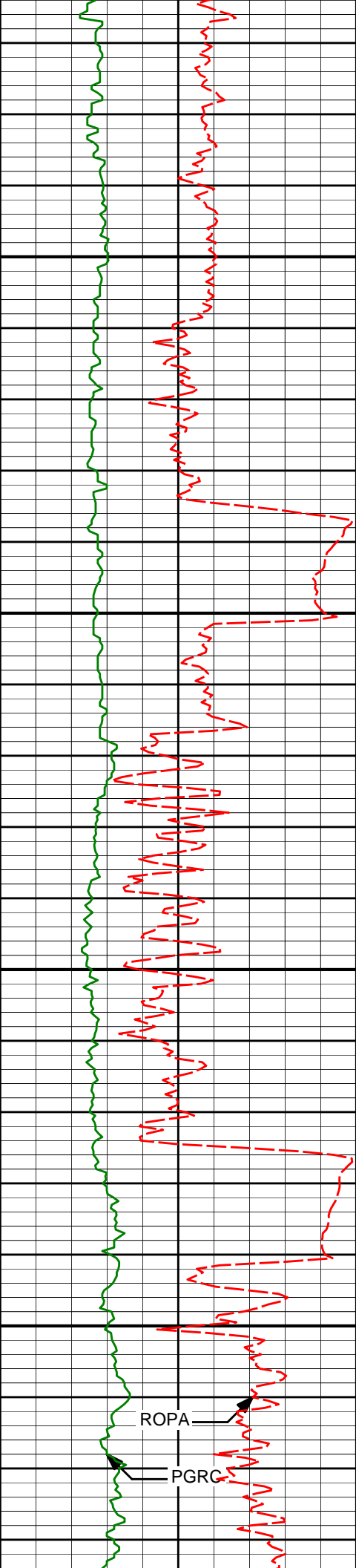
7650

	7685.00	74.23	357.77	7373.97	229.66
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7700

	7730.00	76.02	357.62	7385.52	273.13
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8000

8050

8100

8150

ROPA

PGRG

7993.00

87.60

359.46

7406.76

534.46

8083.00

89.05

359.01

7409.39

624.41

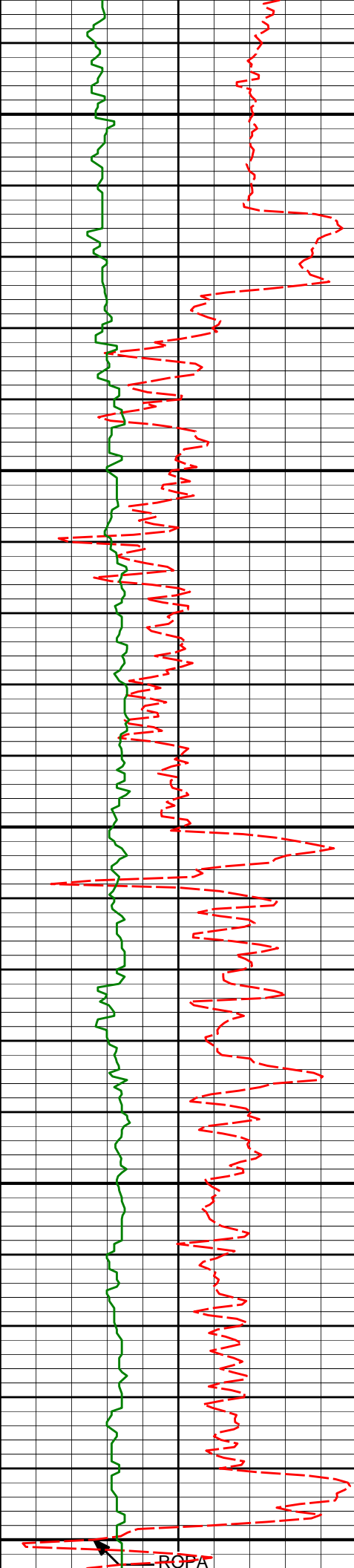
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714.40



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8250

8300

8350

8400

8353.00

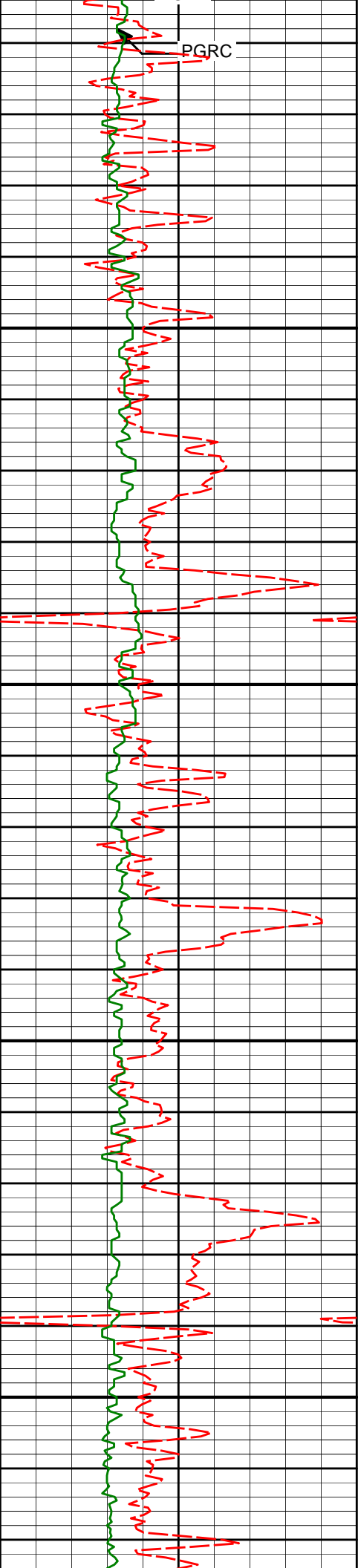
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1.76

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Z-ROPA



8443.00

90.52

1.11

7405.51

984.28

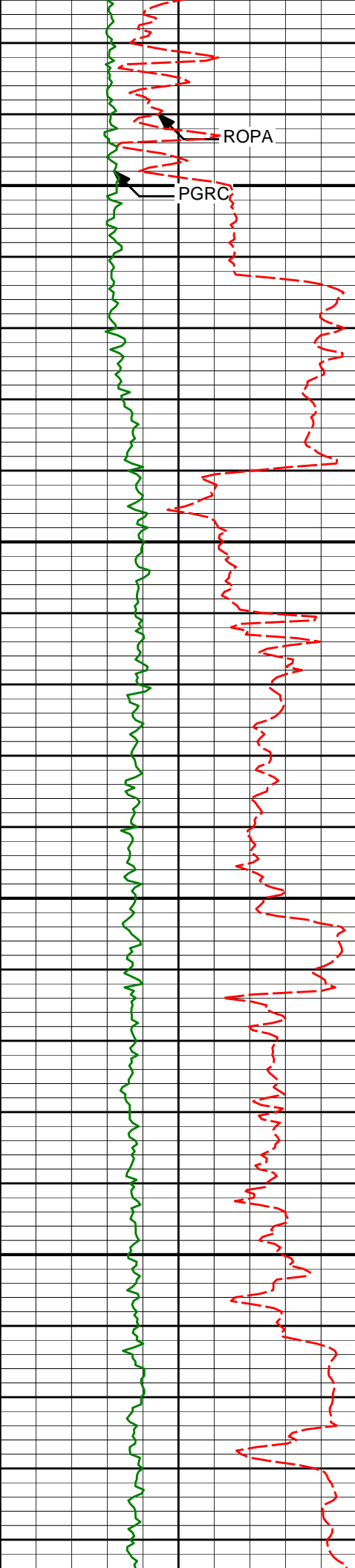
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359.90

7405.41

1164.26



8650

8700

8750

8800

8713.00

88.95

0.53

7406.60

1254.25

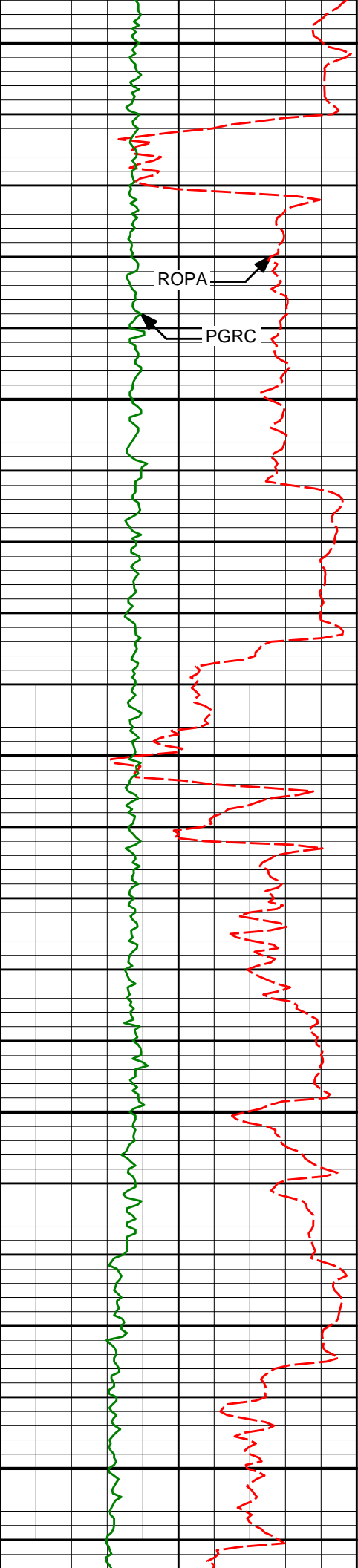
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1.21

7407.81

1344.22



8850

ROPA

PGRC

8900

8950

9000

9050

8893.00

90.83

2.60

7407.54

1434.15

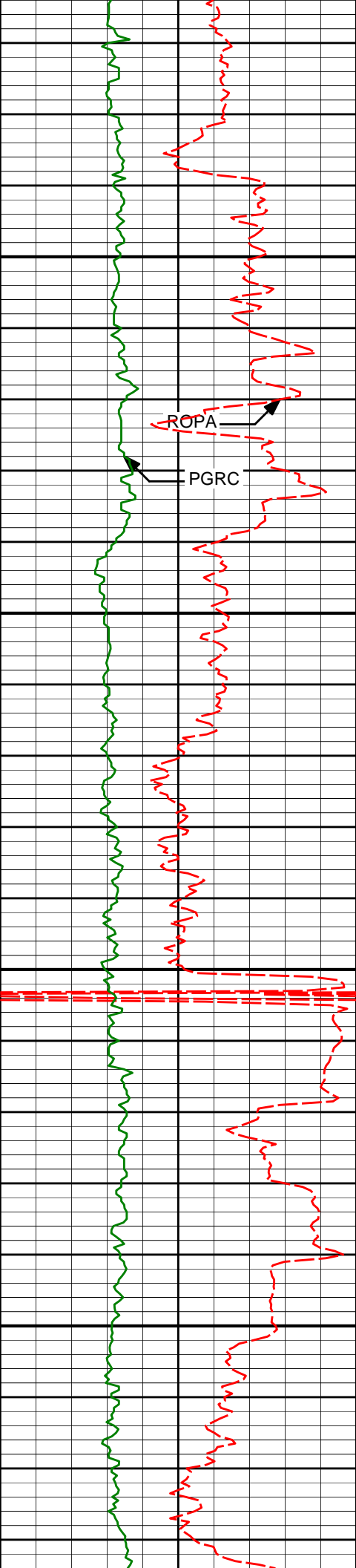
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9150

9200

9250

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1613.99

9163.00

91.85

0.78

7402.11

1703.92

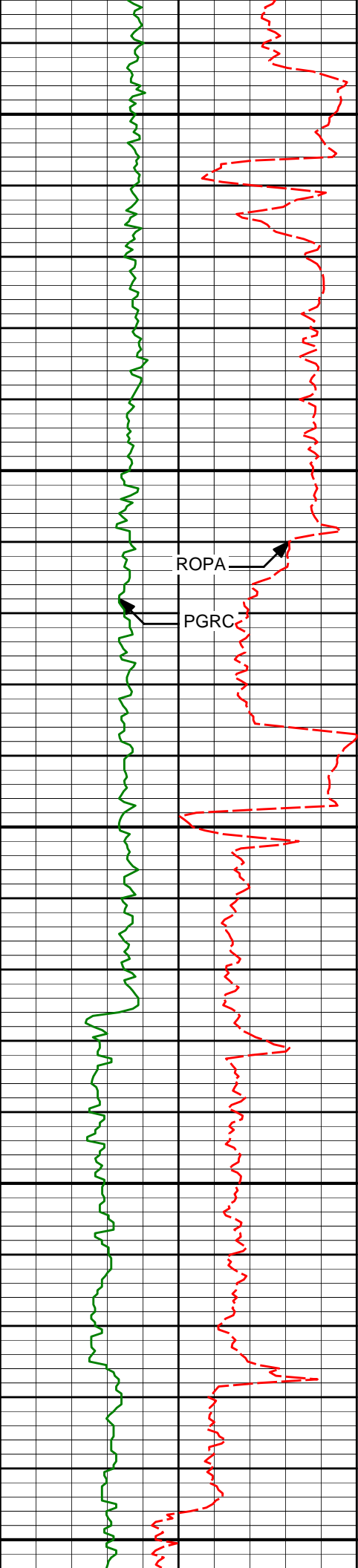
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1.29

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1793.87



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9350

9400

9450

9500

ROPA

PGRC

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89.26

0.77

7400.07

1883.85

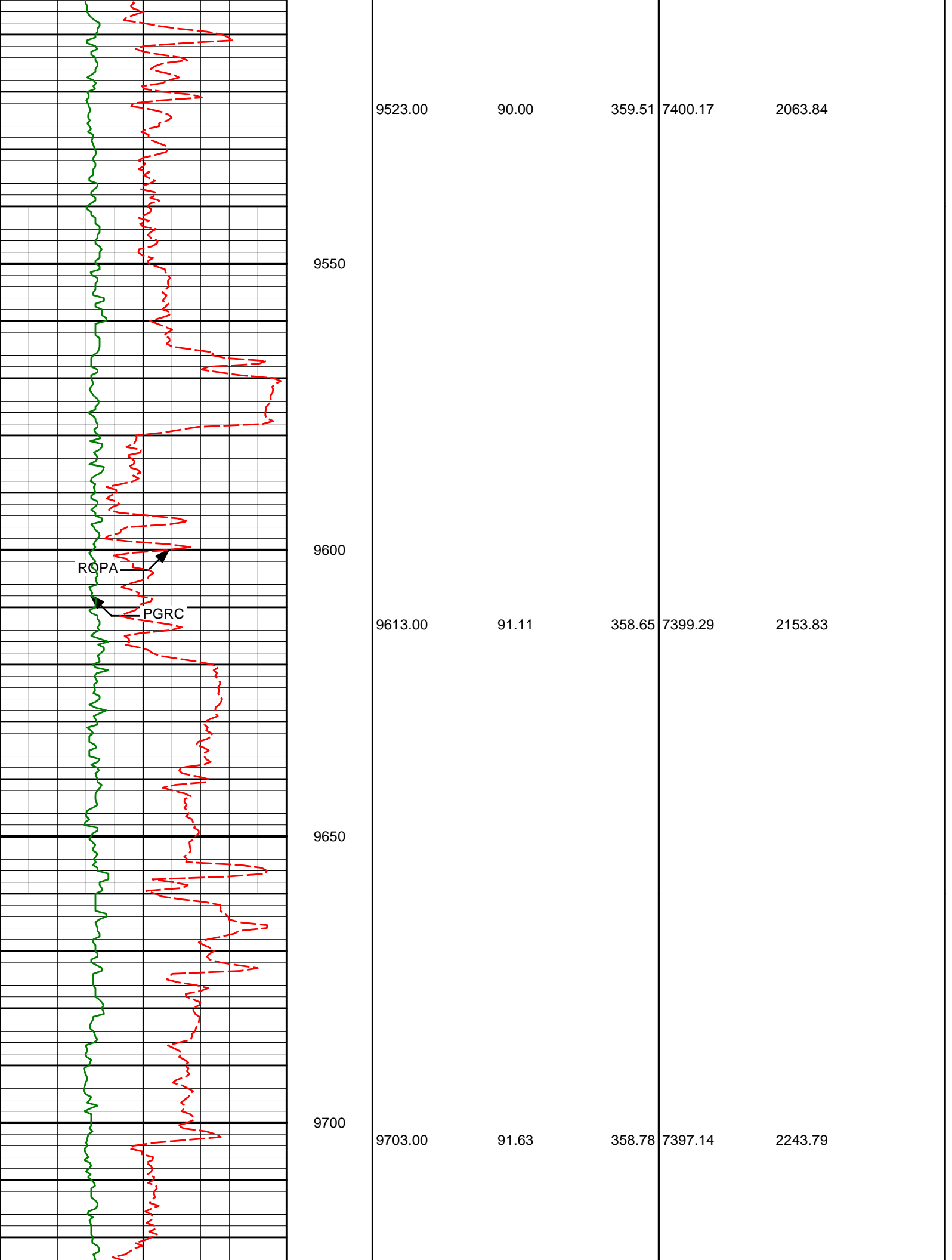
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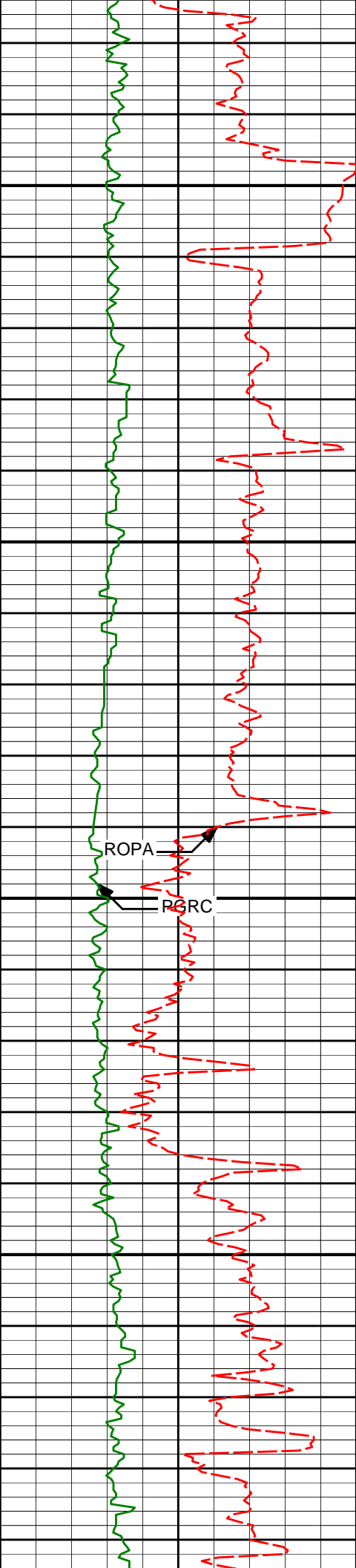
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90.15

358.97

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9800

9850

9884.00

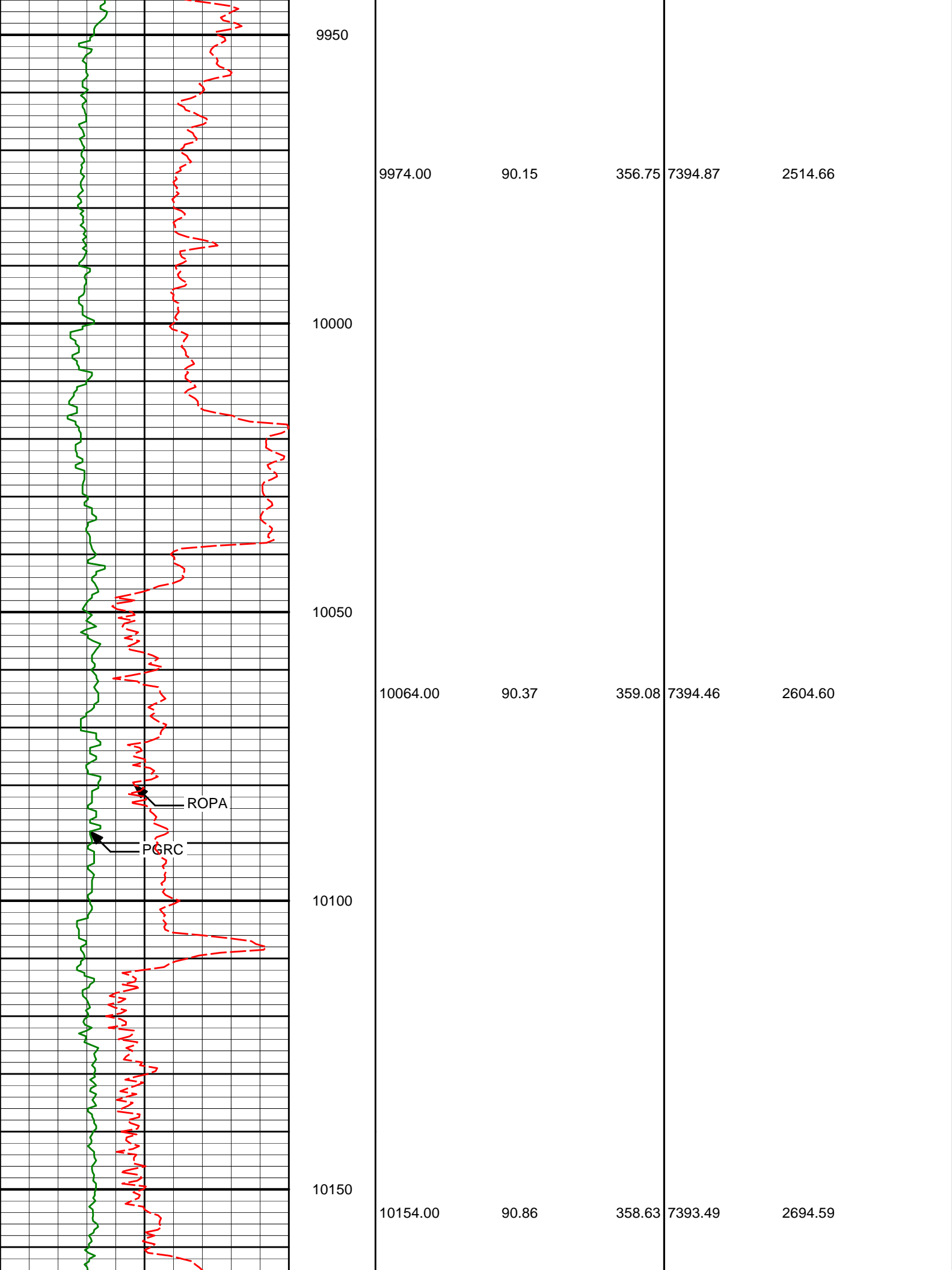
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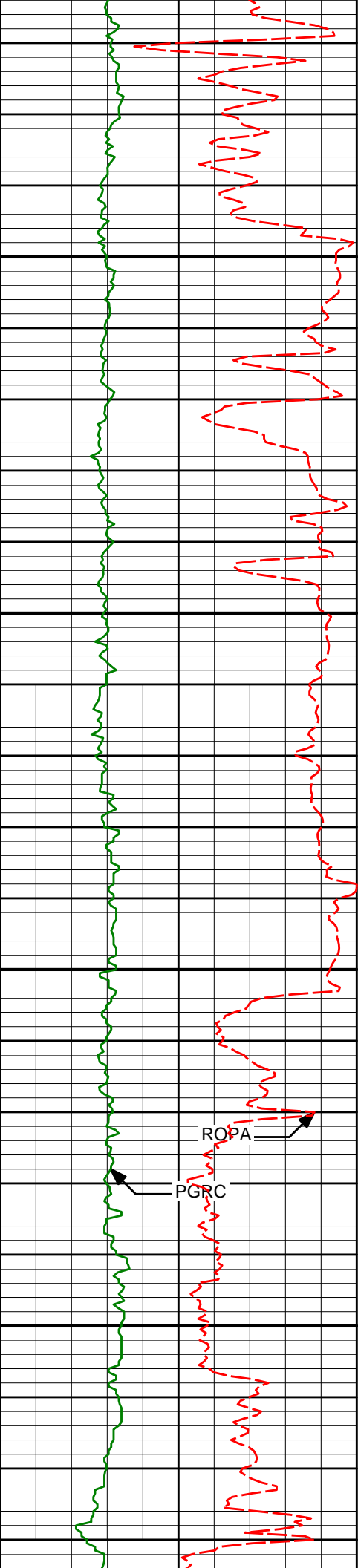
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7395.30

2424.74

9900





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10300

10350

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10334.00

89.51

89.57

359.38

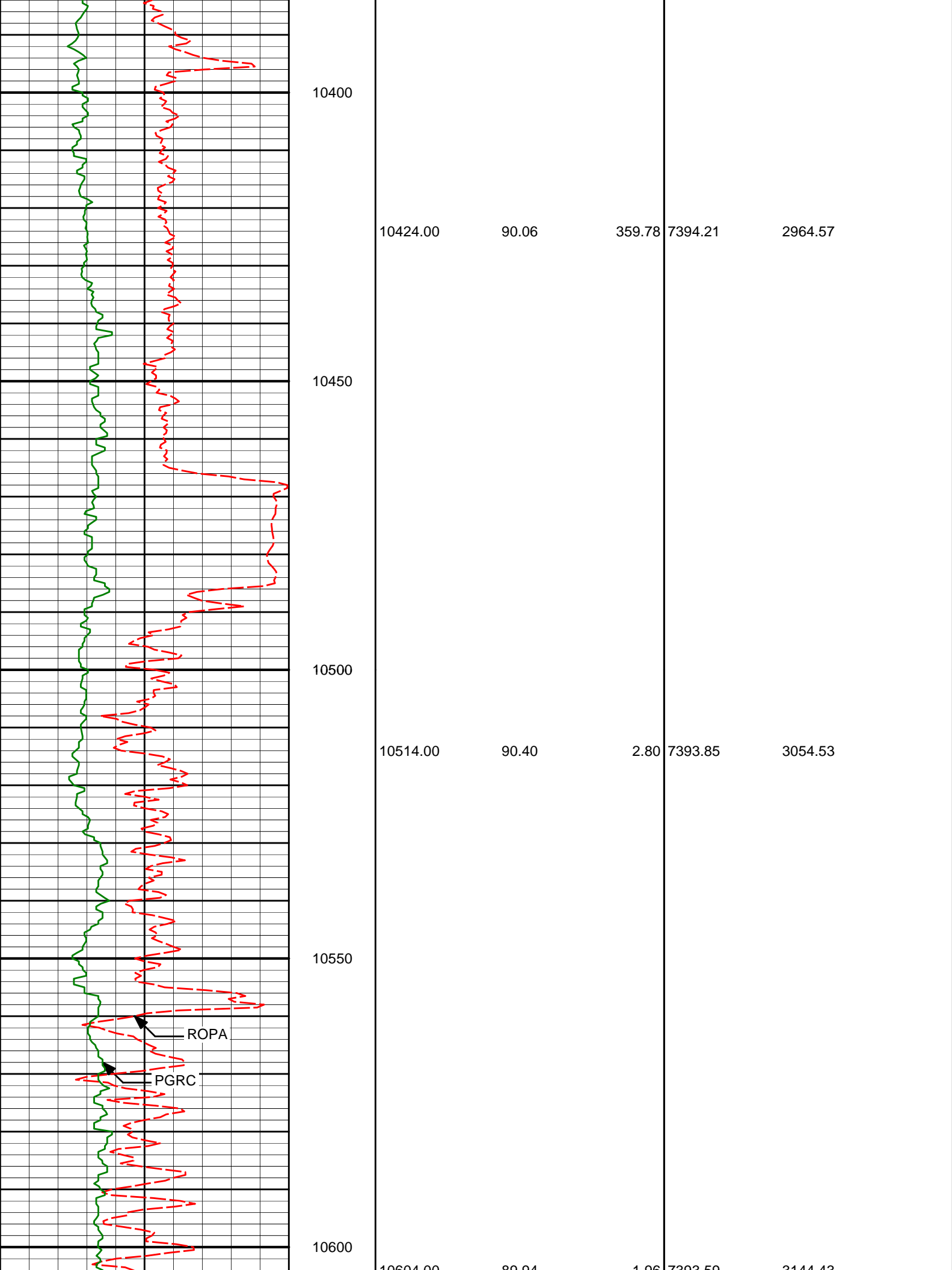
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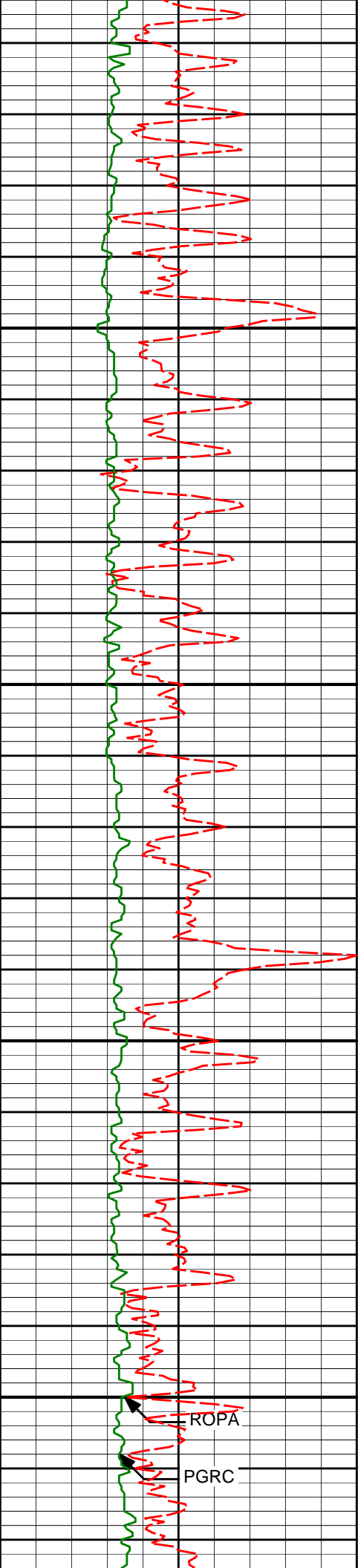
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2784.58

2874.57





10650

10700

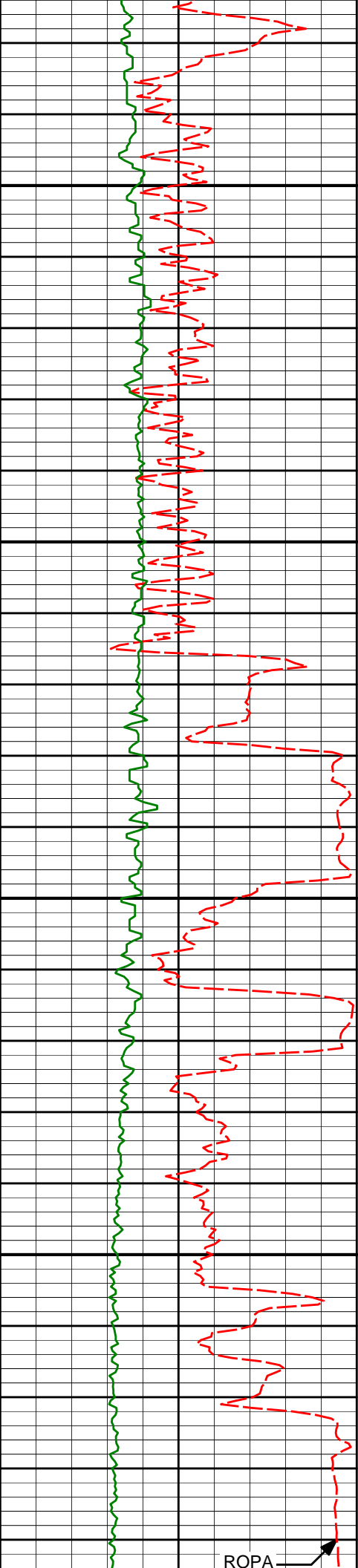
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10800

ROPA

PGRC

10604.00	89.94	1.96	7393.39	3144.43
10694.00	89.60	0.97	7393.95	3234.38
10784.00	90.03	359.86	7394.24	3324.38



10850

10874.00

89.60

358.57

7394.53

3414.37

10900

10950

10964.00

90.22

2.02

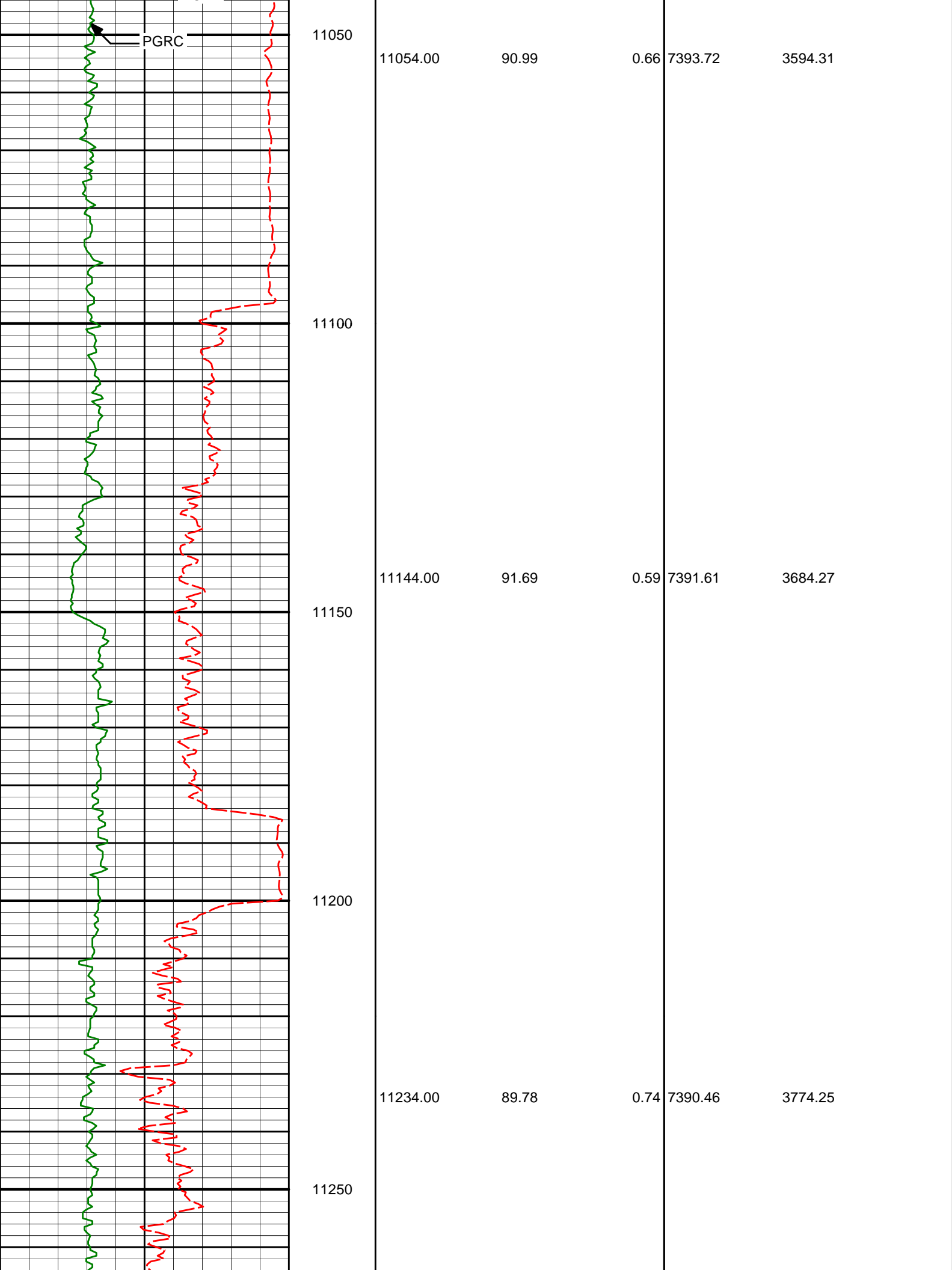
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11000

ROPA





PGRC

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90.99

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3594.31

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7391.61

3684.27

11200

11250

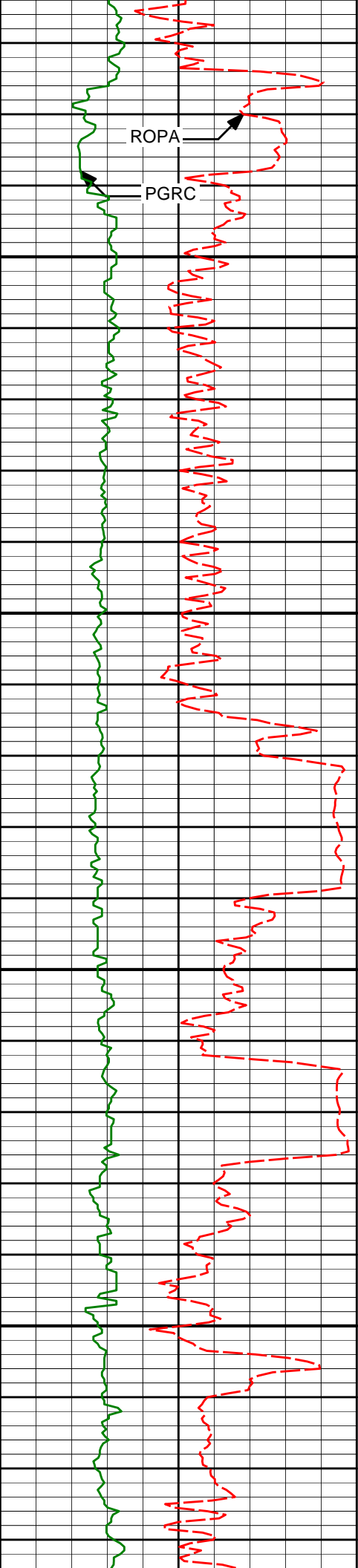
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ROPA

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2.27

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3864.18

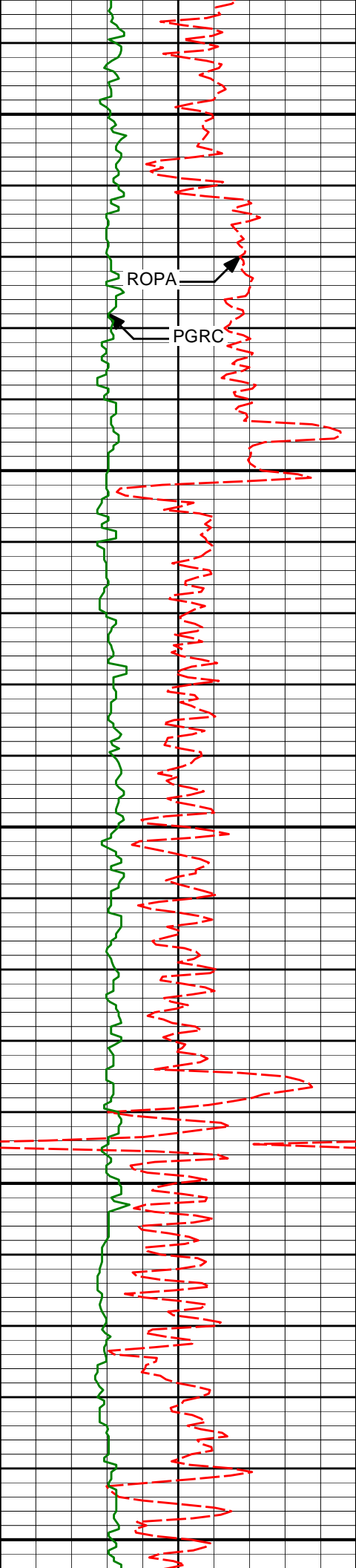
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4134.06

11600

11650

11684.00

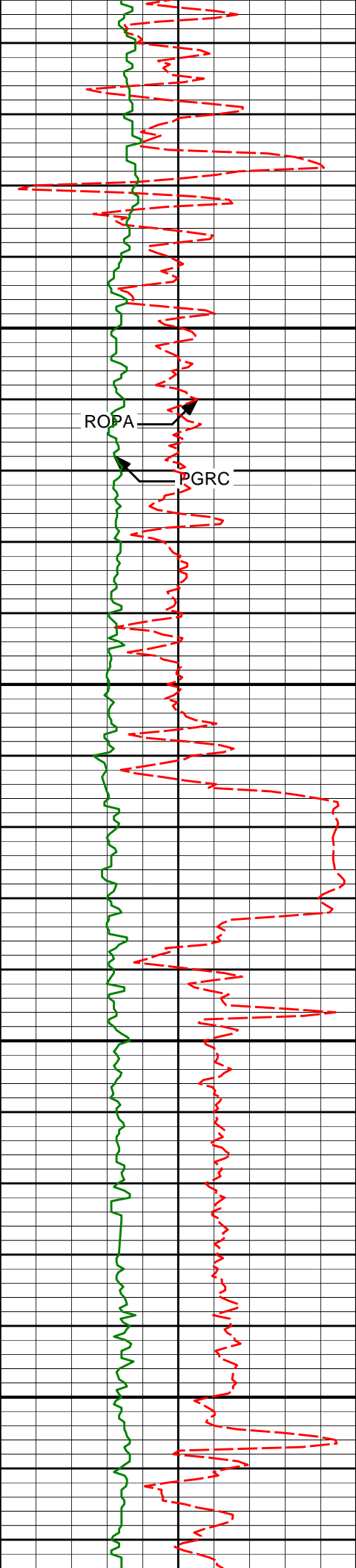
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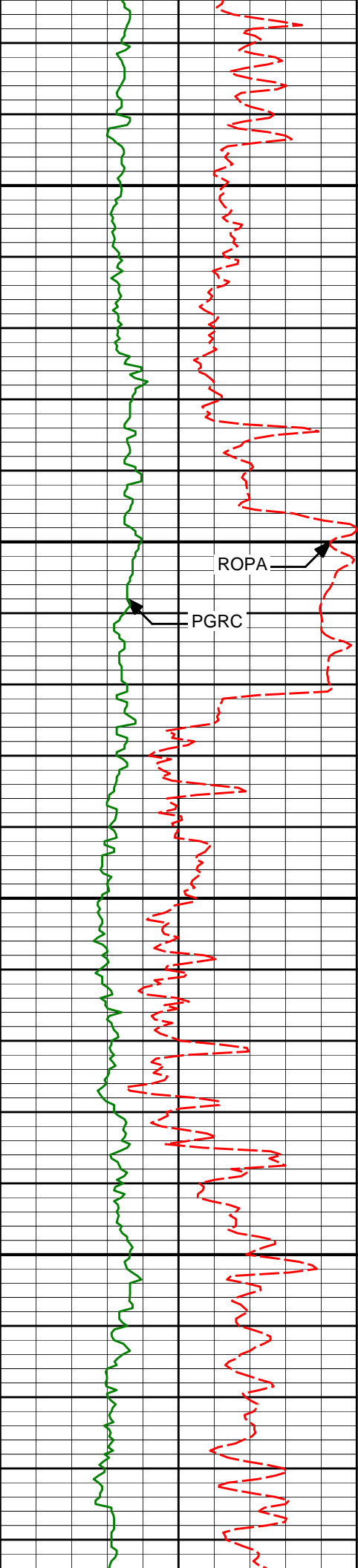
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ROPA

PGRC

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91.39

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4584.97

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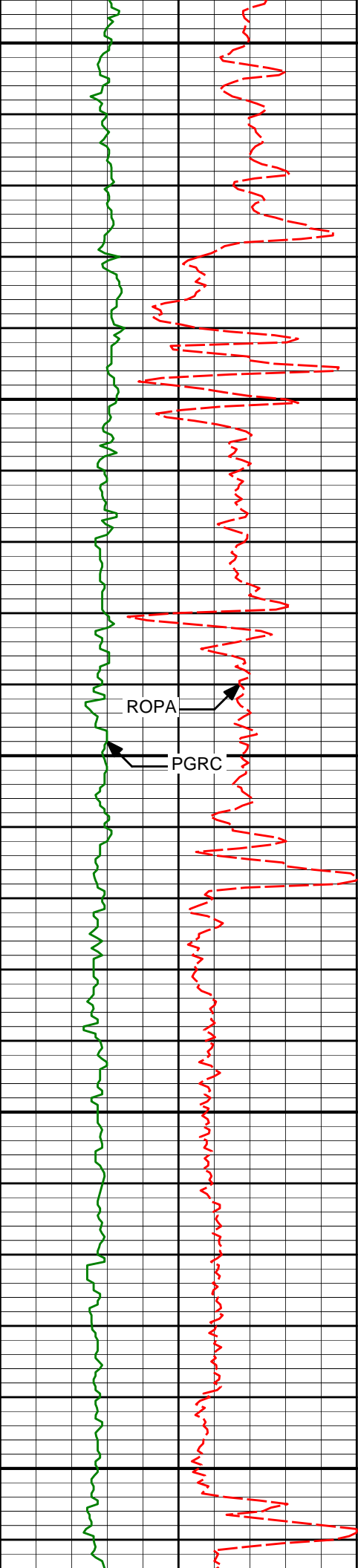
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12300

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357.11

7390.96

4764.79

12315.00

90.12

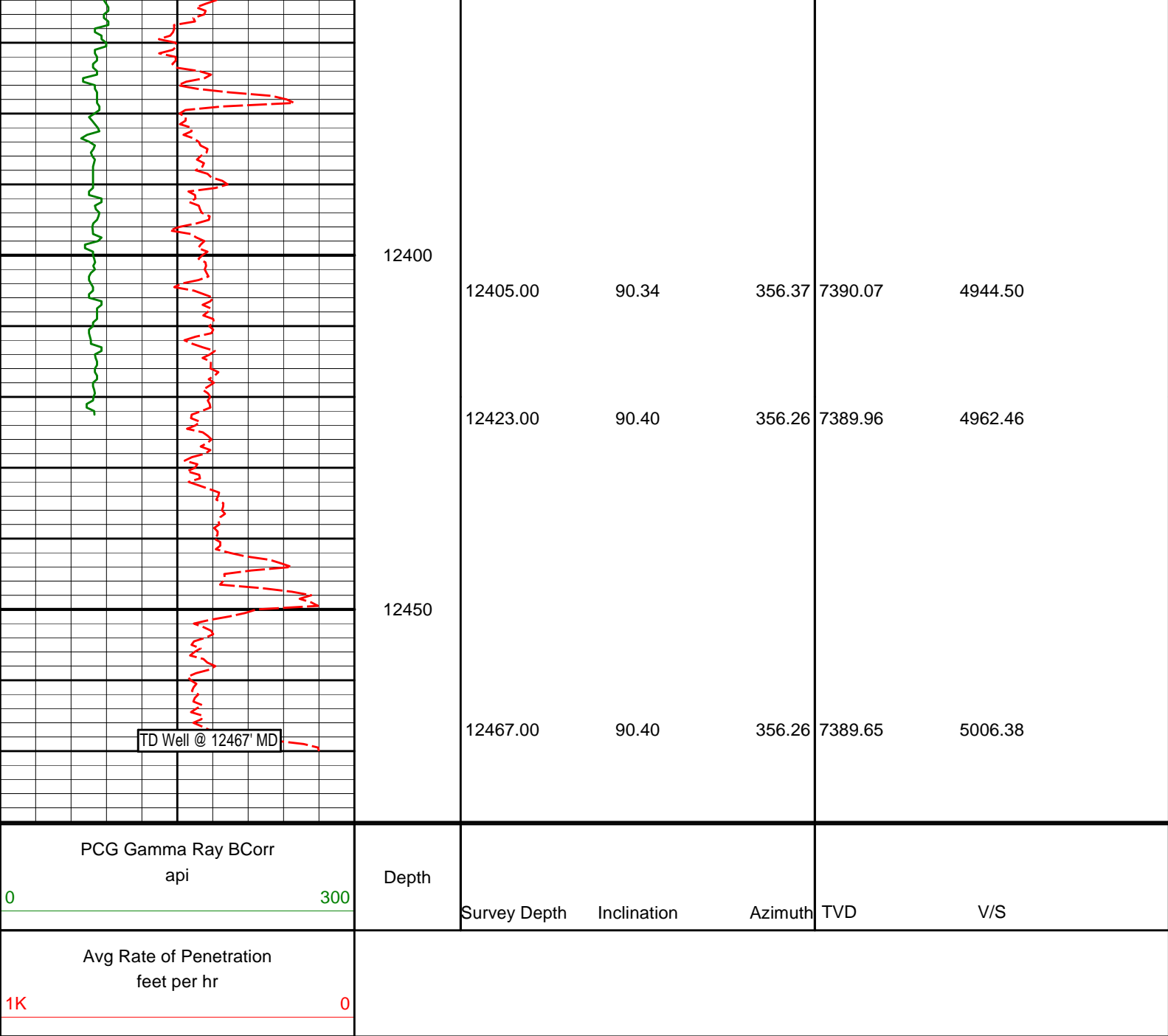
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7390.43

4854.66

ROPA

PGRC



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corp.
Pettinger 4C-18HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900984320
Surveys are IFR corrected

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
1024.00	0.53	184.37	1023.96	4.84 S	4.17 W	-4.82	TIE-IN
1305.00	1.70	126.23	1304.91	8.60 S	0.91 W	-8.60	0.53
1400.00	4.76	121.54	1399.75	11.49 S	3.59 E	-11.51	3.23
1495.00	7.83	119.09	1494.16	16.70 S	12.61 E	-16.76	3.24
1591.00	8.13	132.40	1589.24	24.46 S	23.33 E	-24.57	1.95

1684.00	8.15	161.36	1681.34	35.15 S	30.30 E	-35.29	4.36
1777.00	11.95	157.68	1772.90	50.31 S	36.07 E	-50.47	4.14
1871.00	15.77	153.24	1864.15	70.72 S	45.52 E	-70.94	4.22
1964.00	15.33	152.74	1953.74	92.93 S	56.84 E	-93.20	0.49
2058.00	15.55	141.42	2044.37	113.83 S	70.39 E	-114.16	3.21
2151.00	15.29	134.84	2134.03	132.23 S	86.86 E	-132.63	1.90
2245.00	15.58	120.21	2224.68	147.32 S	106.57 E	-147.82	4.14
2338.00	15.75	105.91	2314.25	157.07 S	129.51 E	-157.68	4.15
2432.00	14.94	97.74	2404.91	162.20 S	153.78 E	-162.92	2.45
2526.00	13.01	95.65	2496.13	164.88 S	176.32 E	-165.70	2.12
2619.00	14.26	96.06	2586.50	167.12 S	198.13 E	-168.05	1.35
2713.00	15.94	101.62	2677.26	170.94 S	222.29 E	-171.98	2.36
2806.00	13.60	100.20	2767.18	175.45 S	245.56 E	-176.60	2.55
2900.00	14.42	94.60	2858.39	178.34 S	268.11 E	-179.60	1.68
2993.00	14.94	94.34	2948.35	180.18 S	291.60 E	-181.55	0.56
3087.00	13.04	92.99	3039.56	181.65 S	314.28 E	-183.13	2.05
3180.00	15.34	86.96	3129.72	181.54 S	337.04 E	-183.13	2.94
3274.00	13.56	84.64	3220.75	179.85 S	360.43 E	-181.55	1.99
3364.00	14.76	83.59	3308.01	177.59 S	382.33 E	-179.39	1.36
3454.00	15.71	86.50	3394.85	175.57 S	405.89 E	-177.48	1.35
3544.00	13.79	90.11	3481.88	174.84 S	428.78 E	-176.86	2.36
3634.00	13.63	97.37	3569.32	176.22 S	450.02 E	-178.34	1.92
3724.00	13.64	102.52	3656.79	179.88 S	470.90 E	-182.10	1.35
3814.00	13.55	106.51	3744.27	185.18 S	491.37 E	-187.49	1.05
3904.00	14.58	106.68	3831.57	191.43 S	512.33 E	-193.84	1.15
3994.00	15.22	110.17	3918.54	198.75 S	534.27 E	-201.27	1.22
4084.00	14.40	112.13	4005.55	207.04 S	555.73 E	-209.66	1.07
4174.00	12.79	111.79	4093.03	214.96 S	575.34 E	-217.67	1.79
4264.00	11.14	111.21	4181.07	221.80 S	592.70 E	-224.59	1.84
4354.00	10.43	111.75	4269.48	227.97 S	608.37 E	-230.83	0.80
4444.00	8.91	113.60	4358.20	233.78 S	622.33 E	-236.71	1.72
4534.00	7.81	110.77	4447.24	238.74 S	634.43 E	-241.72	1.30
4624.00	6.27	97.10	4536.57	241.51 S	645.03 E	-244.55	2.52
4714.00	4.24	93.58	4626.19	242.33 S	653.23 E	-245.40	2.28
4804.00	1.12	89.84	4716.08	242.53 S	657.43 E	-245.63	3.47
4894.00	1.35	56.08	4806.06	241.94 S	659.19 E	-245.04	0.83
4984.00	1.12	46.42	4896.03	240.74 S	660.70 E	-243.85	0.34
5074.00	1.12	42.66	4986.02	239.49 S	661.94 E	-242.60	0.08
5254.00	1.42	17.77	5165.97	236.07 S	663.81 E	-239.20	0.34
5344.00	1.00	224.87	5255.97	235.56 S	663.60 E	-238.69	2.62
5434.00	1.27	256.05	5345.95	236.36 S	662.07 E	-239.48	0.74
5524.00	1.54	254.88	5435.92	236.92 S	659.94 E	-240.02	0.30
5614.00	1.04	3.77	5525.91	236.42 S	658.83 E	-239.52	2.35
5704.00	0.74	6.81	5615.90	235.03 S	658.95 E	-238.13	0.34
5795.00	0.65	5.71	5706.89	233.93 S	659.07 E	-237.03	0.10
5885.00	1.05	222.11	5796.89	234.03 S	658.57 E	-237.13	1.80
5975.00	0.58	221.99	5886.88	234.98 S	657.71 E	-238.08	0.52
6065.00	0.30	263.69	5976.88	235.35 S	657.17 E	-238.44	0.45
6245.00	0.63	205.20	6156.87	236.29 S	656.28 E	-239.38	0.30
6335.00	0.52	220.43	6246.87	237.05 S	655.81 E	-240.14	0.21
6425.00	0.56	261.38	6336.86	237.43 S	655.11 E	-240.51	0.42
6515.00	0.70	248.85	6426.86	237.69 S	654.16 E	-240.77	0.22
6605.00	0.64	290.56	6516.85	237.72 S	653.17 E	-240.79	0.53
6695.00	0.70	294.73	6606.84	237.31 S	652.20 E	-240.38	0.09
6785.00	1.20	304.25	6696.83	236.55 S	650.93 E	-239.61	0.58
6875.00	1.31	301.69	6786.81	235.48 S	649.27 E	-238.54	0.14
6920.00	3.07	342.80	6831.78	234.06 S	648.48 E	-237.11	5.01
6965.00	9.83	358.79	6876.47	229.06 S	648.04 E	-232.11	15.40
7010.00	15.20	353.21	6920.39	219.35 S	647.26 E	-222.40	12.22
7055.00	16.79	350.59	6963.64	207.08 S	645.50 E	-210.12	3.88
7100.00	19.59	351.52	7006.39	193.21 S	643.32 E	-196.24	6.26
7145.00	24.76	351.85	7048.05	176.40 S	640.87 E	-179.42	11.49
7190.00	30.20	352.10	7087.96	155.85 S	637.98 E	-158.86	12.09
7235.00	34.55	355.81	7125.96	131.90 S	635.49 E	-134.89	10.62
7280.00	39.20	1.25	7161.95	104.93 S	634.87 E	-107.92	12.62
7325.00	44.24	0.64	7195.53	75.00 S	635.35 E	-77.99	11.24
7370.00	48.12	1.13	7226.68	42.54 S	635.86 E	-45.54	8.66
7415.00	52.19	1.82	7255.51	8.01 S	636.76 E	-11.01	9.12
7460.00	56.05	1.66	7281.88	28.43 N	637.86 E	25.42	8.58
7505.00	60.32	0.57	7305.60	66.65 N	638.60 E	63.64	9.71
7550.00	64.67	359.49	7326.37	106.55 N	638.61 E	103.54	9.90

7595.00	67.62	358.48	7344.57	147.69 N	637.88 E	144.69	6.87
7640.00	70.92	358.21	7360.50	189.76 N	636.66 E	186.76	7.35
7685.00	74.23	357.77	7373.97	232.66 N	635.15 E	229.66	7.41
7730.00	76.02	357.62	7385.52	276.12 N	633.40 E	273.13	3.99
7775.00	79.44	358.33	7395.08	320.05 N	631.85 E	317.07	7.75
7811.00	84.81	356.92	7400.01	355.67 N	630.37 E	352.69	15.41
7858.00	88.86	357.14	7402.61	402.52 N	627.94 E	399.56	8.63
7903.00	88.46	358.37	7403.66	447.48 N	626.18 E	444.52	2.87
7993.00	87.60	359.46	7406.76	537.41 N	624.48 E	534.46	1.54
8083.00	89.05	359.01	7409.39	627.36 N	623.27 E	624.41	1.69
8173.00	91.08	0.46	7409.28	717.35 N	622.86 E	714.40	2.77
8353.00	90.71	1.76	7406.47	897.29 N	626.34 E	894.33	0.75
8443.00	90.52	1.11	7405.51	987.25 N	628.60 E	984.28	0.75
8623.00	89.54	359.90	7405.41	1167.24 N	630.18 E	1164.26	0.87
8713.00	88.95	0.53	7406.60	1257.23 N	630.52 E	1254.25	0.96
8803.00	89.51	1.21	7407.81	1347.21 N	631.89 E	1344.22	0.98
8893.00	90.83	2.60	7407.54	1437.16 N	634.88 E	1434.15	2.13
8983.00	90.46	1.80	7406.53	1527.09 N	638.34 E	1524.06	0.98
9073.00	91.66	1.54	7404.86	1617.03 N	640.96 E	1613.99	1.36
9163.00	91.85	0.78	7402.11	1706.97 N	642.78 E	1703.92	0.87
9253.00	90.74	1.29	7400.07	1796.93 N	644.40 E	1793.87	1.36
9343.00	89.26	0.77	7400.07	1886.91 N	646.02 E	1883.85	1.74
9433.00	90.31	359.94	7400.41	1976.91 N	646.58 E	1973.84	1.49
9523.00	90.00	359.51	7400.17	2066.91 N	646.15 E	2063.84	0.59
9613.00	91.11	358.65	7399.29	2156.89 N	644.70 E	2153.83	1.56
9703.00	91.63	358.78	7397.14	2246.84 N	642.68 E	2243.79	0.60
9794.00	90.15	358.97	7395.73	2337.81 N	640.90 E	2334.76	1.64
9884.00	90.40	357.92	7395.30	2427.77 N	638.46 E	2424.74	1.20
9974.00	90.15	356.75	7394.87	2517.67 N	634.27 E	2514.66	1.33
10064.00	90.37	359.08	7394.46	2607.61 N	631.00 E	2604.60	2.60
10154.00	90.86	358.63	7393.49	2697.58 N	629.20 E	2694.59	0.74
10244.00	89.51	359.38	7393.20	2787.57 N	627.64 E	2784.58	1.72
10334.00	89.57	0.34	7393.92	2877.56 N	627.42 E	2874.57	1.07
10424.00	90.06	359.78	7394.21	2967.56 N	627.51 E	2964.57	0.83
10514.00	90.40	2.80	7393.85	3057.53 N	629.54 E	3054.53	3.38
10604.00	89.94	1.96	7393.59	3147.45 N	633.27 E	3144.43	1.06
10694.00	89.60	0.97	7393.95	3237.42 N	635.57 E	3234.38	1.16
10784.00	90.03	359.86	7394.24	3327.41 N	636.23 E	3324.38	1.32
10874.00	89.60	358.57	7394.53	3417.40 N	634.99 E	3414.37	1.51
10964.00	90.22	2.02	7394.67	3507.38 N	635.46 E	3504.35	3.89
11054.00	90.99	0.66	7393.72	3597.35 N	637.56 E	3594.31	1.74
11144.00	91.69	0.59	7391.61	3687.32 N	638.54 E	3684.27	0.78
11234.00	89.78	0.74	7390.46	3777.30 N	639.59 E	3774.25	2.13
11324.00	92.28	2.27	7388.84	3867.25 N	641.95 E	3864.18	3.26
11414.00	89.11	0.84	7387.75	3957.20 N	644.39 E	3954.11	3.86
11594.00	88.55	0.13	7391.43	4137.15 N	645.91 E	4134.06	0.50
11684.00	89.17	359.88	7393.22	4227.13 N	645.92 E	4224.04	0.74
11774.00	88.95	359.42	7394.69	4317.12 N	645.37 E	4314.03	0.57
11864.00	90.31	358.52	7395.27	4407.10 N	643.75 E	4404.01	1.81
11954.00	89.97	358.56	7395.05	4497.07 N	641.46 E	4493.99	0.38
12045.00	91.39	358.48	7393.98	4588.03 N	639.11 E	4584.97	1.56
12135.00	90.95	357.09	7392.14	4677.94 N	635.63 E	4674.89	1.62
12225.00	90.55	357.11	7390.96	4767.82 N	631.08 E	4764.79	0.44
12315.00	90.12	356.23	7390.43	4857.66 N	625.85 E	4854.66	1.09
12405.00	90.34	356.37	7390.07	4947.47 N	620.04 E	4944.50	0.29
12423.00	90.40	356.26	7389.96	4965.44 N	618.89 E	4962.46	0.70
12467.00	90.40	356.26	7389.65	5009.34 N	616.02 E	5006.38	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 359.73 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.49 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED

HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 12467.00 FEET
IS 5047.08 FEET ALONG 7.01 DEGREES (TRUE)

ALL DIRECTIONAL SURVEYS TIED ON TO THE LAST CYRUS SURVEY @ 1224.11 MD

