



1 : 240

WELL INFORMATION					
MWD Run Number	100	200	300		
Date run completed	23-Dec-12	24-Dec-12	28-Dec-12		
Rig Bit Number	2	3	4		
Bit Size (in)	8.750	8.750	6.125		
Tool Nominal OD (in)	6.750	6.750	4.750		
Log Start Depth (MD, ft)	890.00	5,330.00	6,475.00		
Log End Depth (MD, ft)	5,330.00	6,475.00	10,357.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	22-Dec-12 17:00	23-Dec-12 16:10	25-Dec-12 22:00		
Drill/Wipe End Date and Time	23-Dec-12 06:00	24-Dec-12 16:00	27-Dec-12 17:30		
Min Inc (deg) @ Depth (MD, ft)	.35 @ 1,855.00	3.49 @ 5,409.00	83.23 @ 6,566.00		
Max Inc (deg) @ Depth (MD, ft)	13.64 @ 2,899.00	80.09 @ 6,418.00	92.52 @ 8,371.00		
Bit TFA(in2) / Bit Type	.75 / PDC	.86 / PDC	.46 / PDC		
Flow Rate (gpm)	530.00	560.00	270.00		
Max AV (fpm) / CV (fpm) @ MWD	428.0 / 428.0	441.5 / 428.0	442.9 / 442.9		
Fluid Type	Fresh Water Gel	Fresh Water Gel	Fresh Water Gel		
Density (ppg) / Viscosity (spqt)	8.80 / 30.00	10.10 / 41.00	10.00 / 36.00		
Filtrate CL (ppm)	400.00	400.00	400.00		
pH / Fluid Loss (mptm)	8.60 / N/A	9.80 / N/A	9.50 / N/A		
PV (cP) / YP (Ihf2)	5 / 5.00	9 / 13.00	9 / 8.00		
% Solids / % Sand	4.6 / 0.25	9.7 / 0.25	8.0 / 0.30		
% Oil / Oil:Water Ratio	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		
Rmf @ Measured Temp (degF)	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		
Min Tool Temp (deg F) / S	168.00 / PDM	145.00 / PDM	225.00 / PDM		

Max Tool Temp (degF) / Source	130.96 / PCM	145.90 / PCM	205.00 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A	N/A @ N/A		
Lead MWD Engineer	Robert Ley	Robert Ley	Robert Ley		
Customer Representative	Chales Cullver	Chales Cullver	Chales Cullver		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.76	5.76	5.76		
Sub Serial Number	11341341	11341341	11672158		
Insert Serial Number	11680740	11680789	11680740		
Date and Time Initialized	21-Dec-12 22:46	23-Dec-12 08:27	25-Dec-12 09:10		
Date and Time Read	23-Dec-12 10:05	25-Dec-12 06:00	28-Dec-12 01:19		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	57.00	57.00	70.00		
Software Version	6.21	6.21	6.21		
Sub Serial Number	11341341	11341341	11672158		
Sonde Serial Number	11638497	11062120	11638497		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	353.67	283.39	196.90		

Gamma Ray Sensor Information

Tool Type		PCG	PCG		
Distance From Bit (ft)		50.00	62.49		
Recorded Sample Period (sec)		10	10		
Software Version		8.15	8.15		
Sub Serial Number		11341341	11672158		
Insert/Sonde Serial Number		11680942	11293393		

REMARKS

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

PGRC (Gamma Ray Corrected):

Interval Resolution: 0.5 feet
Coercion Distance: 0.6 feet
Gap Fill: 3.0 feet

ROPA (Rate of Penetration):

Interval Resolution: 0.5 feet
Coercion Distance: 1.2 feet
Gap Fill: 3.0 feet

Insite Version 7.3.40 build 25

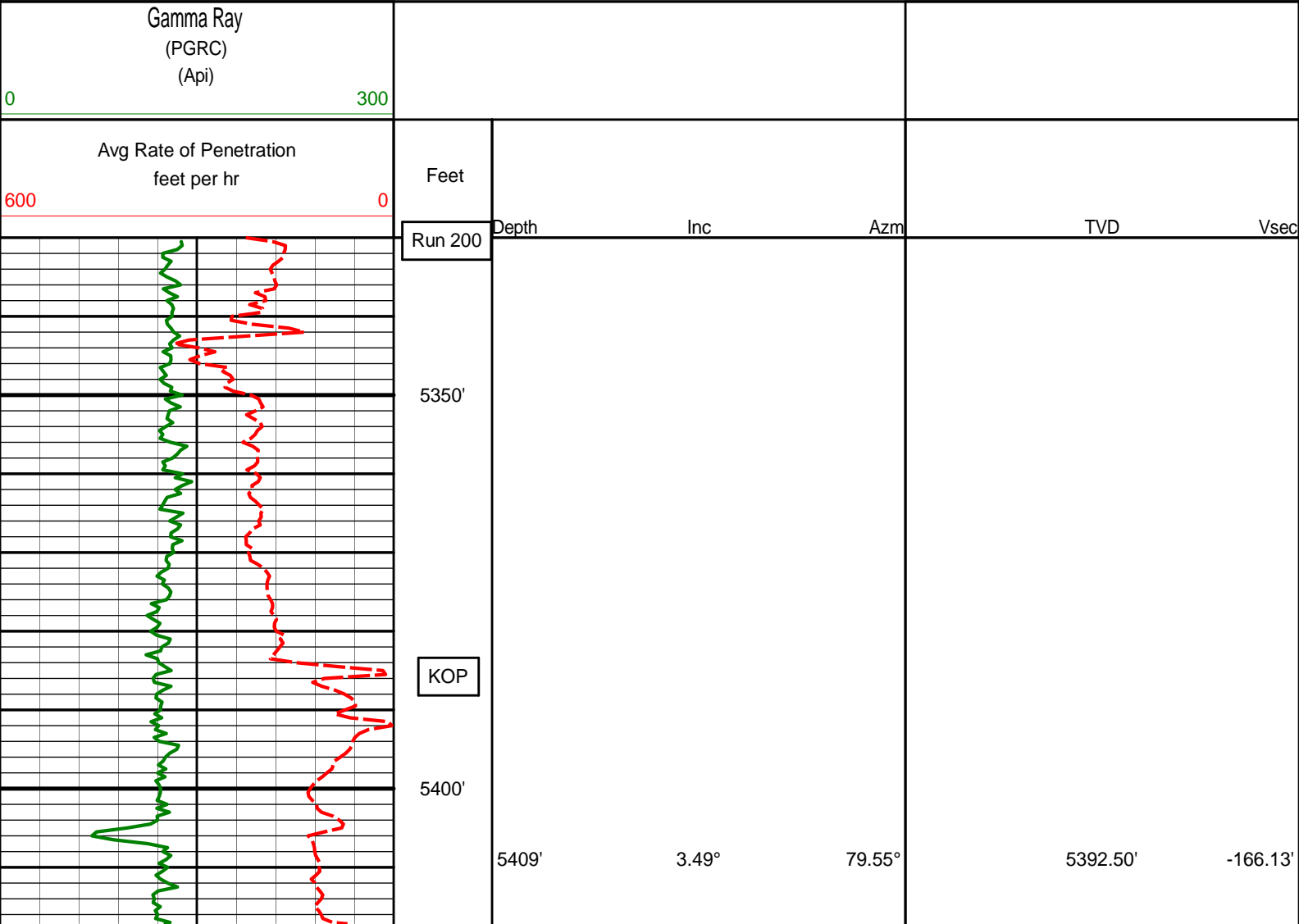
5. Survey at TD is projected to the bit

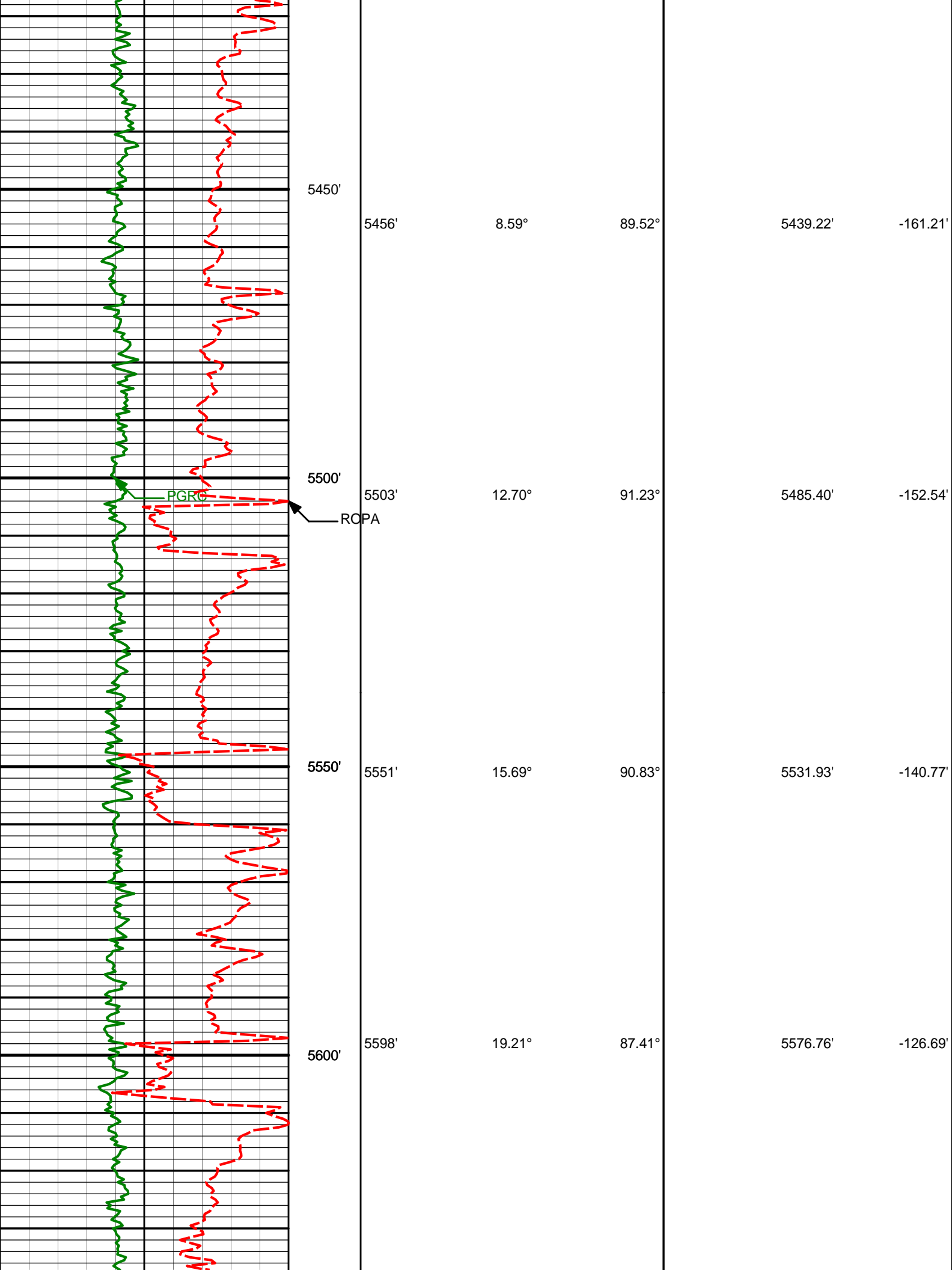
WARRANTY

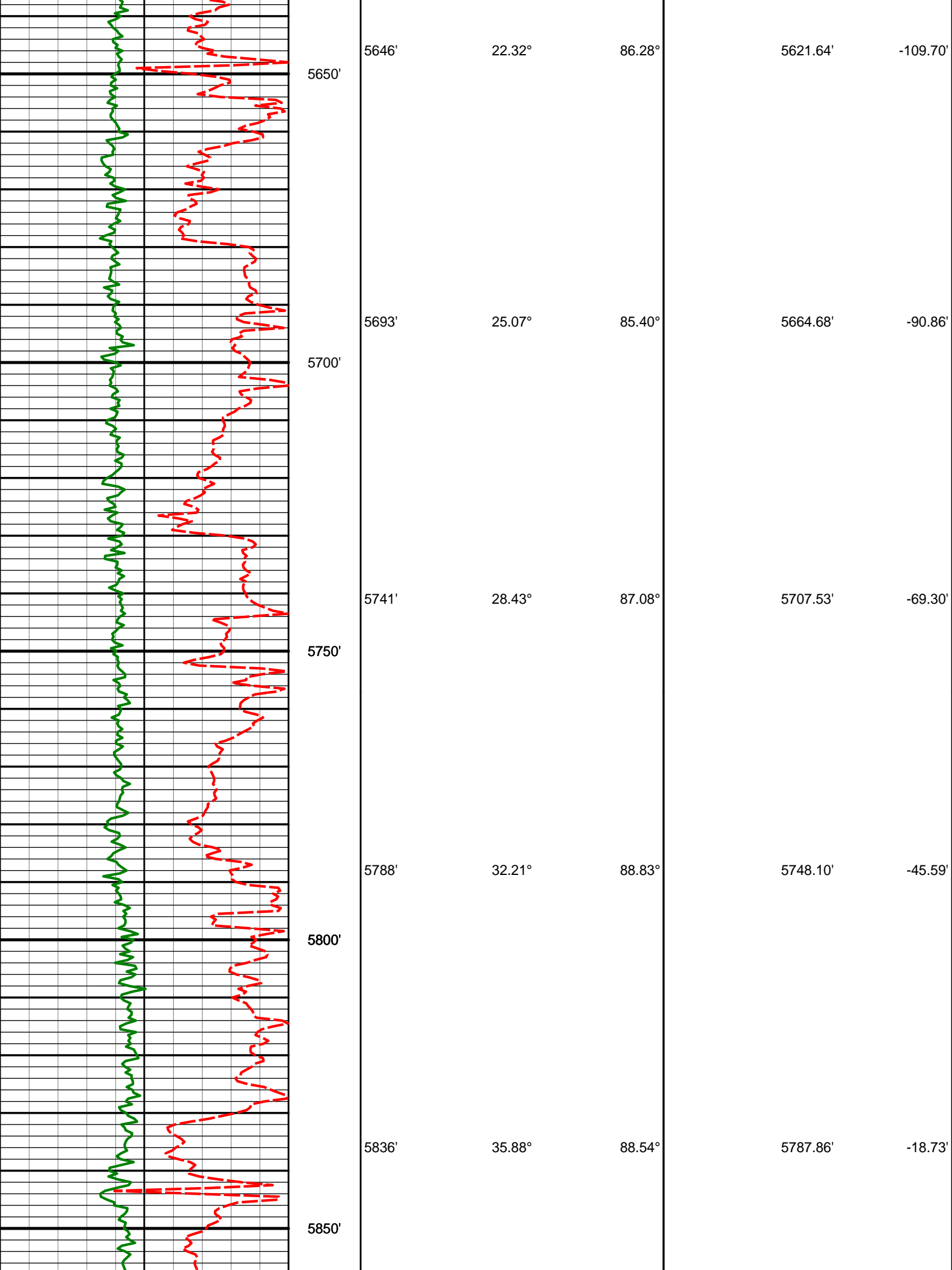
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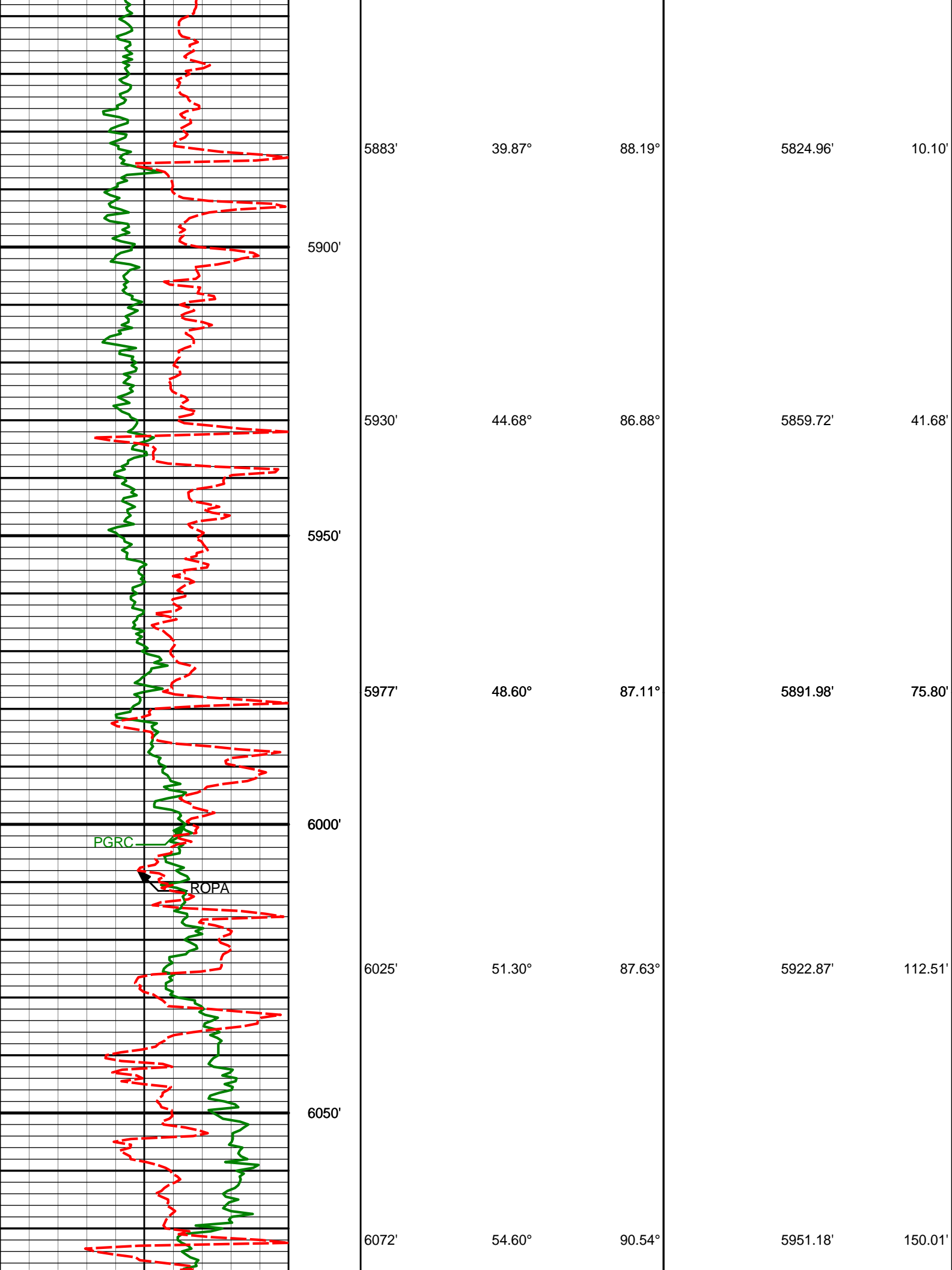
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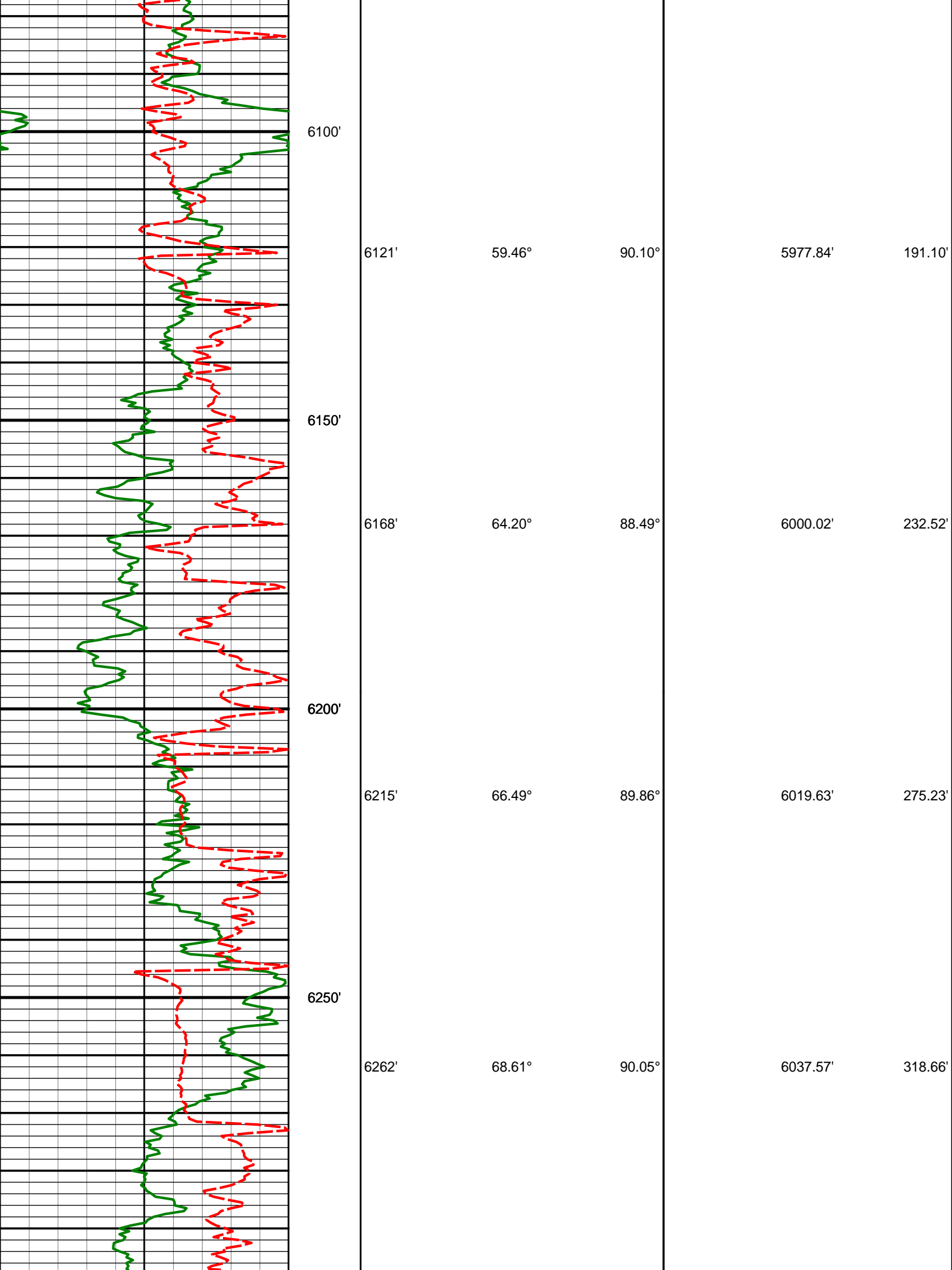
MD Detail Log 1:240

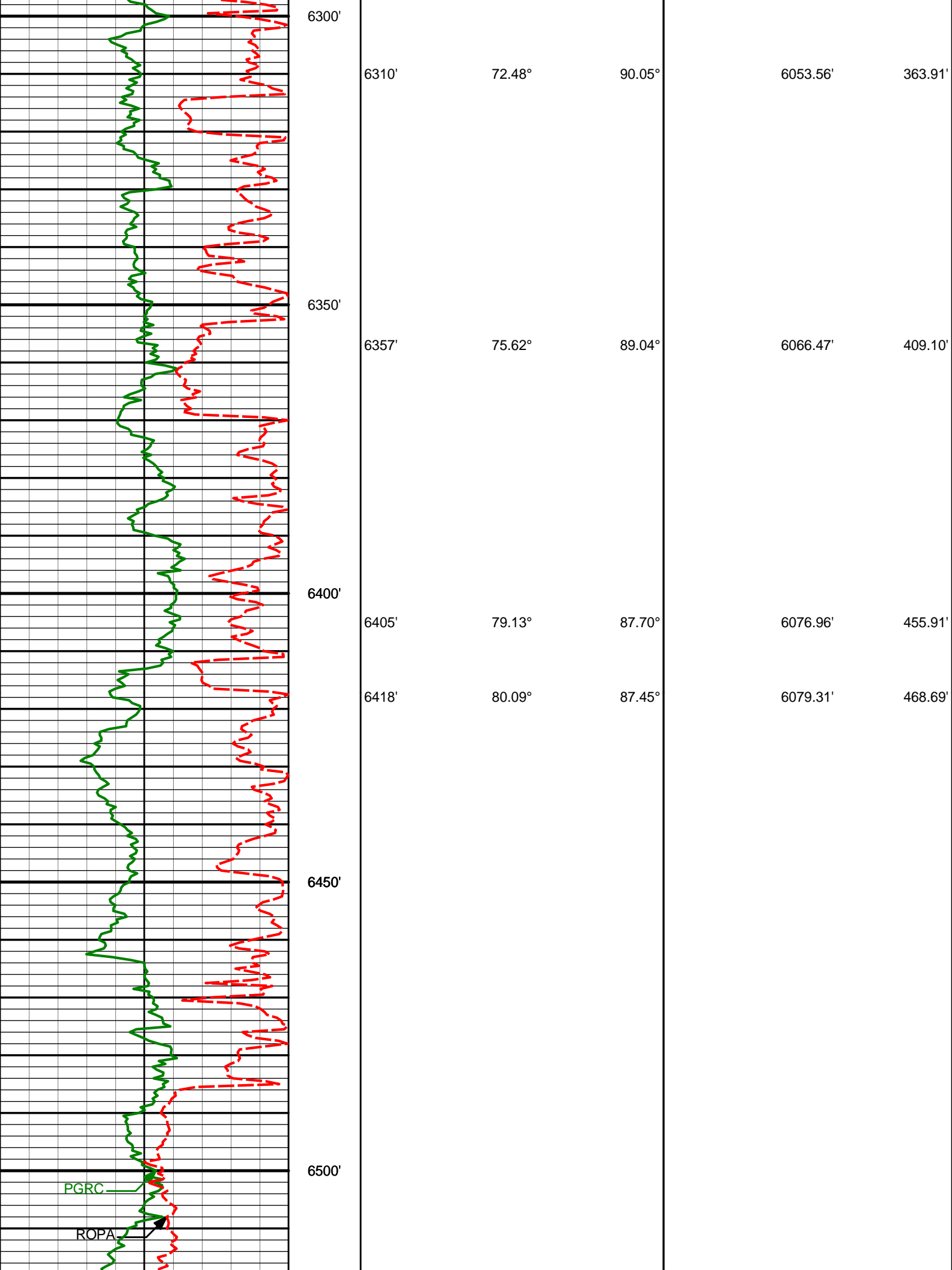


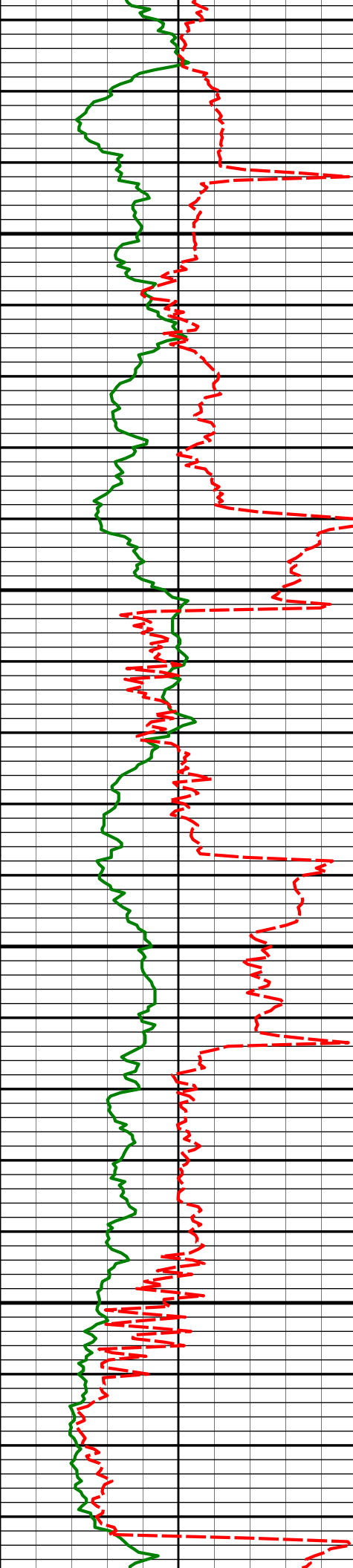












6550'

6600'

6650'

6700'

6519'

6566'

6661'

83.39°

83.23°

86.39°

86.89°

86.27°

87.41°

6093.82'

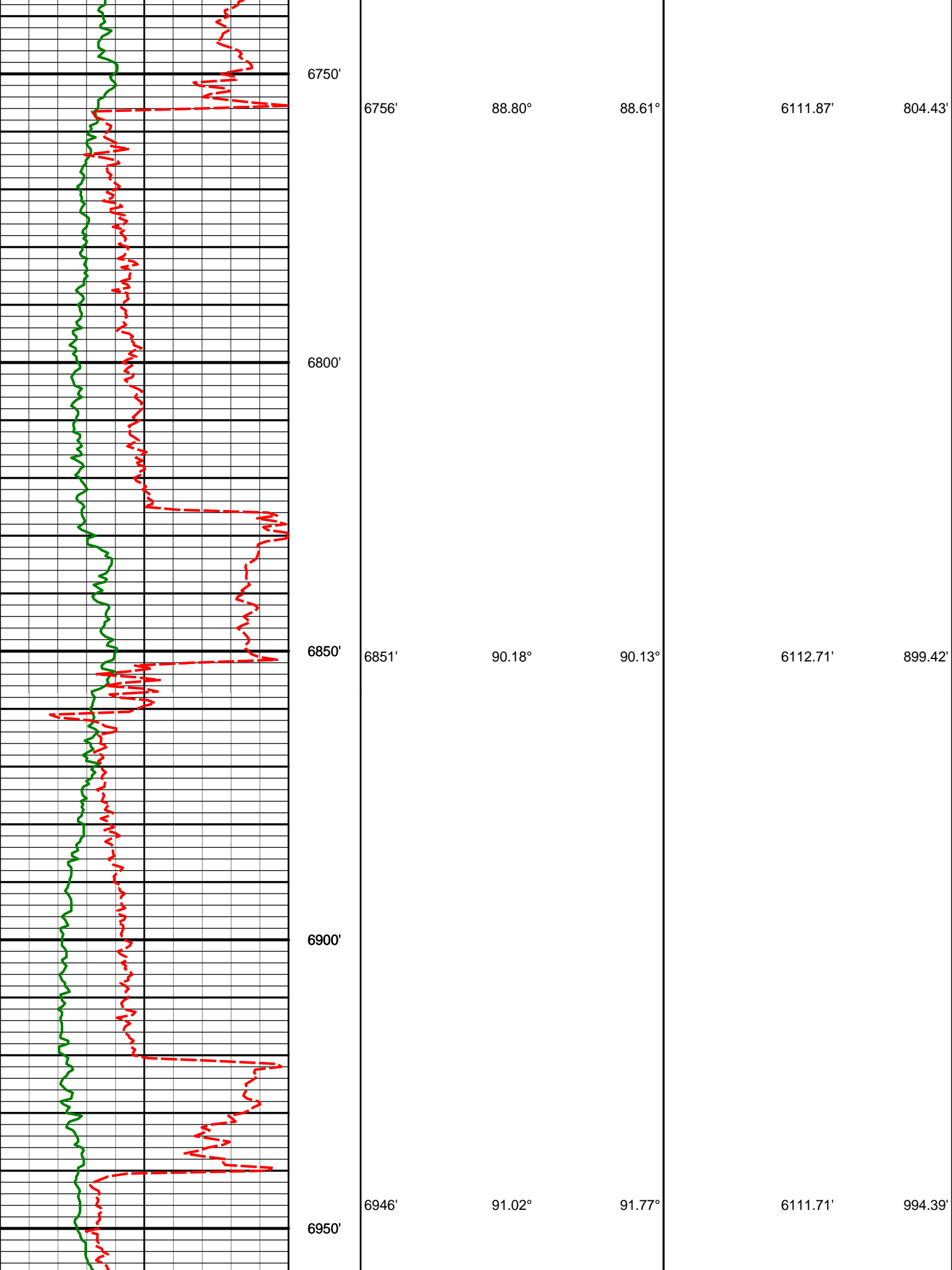
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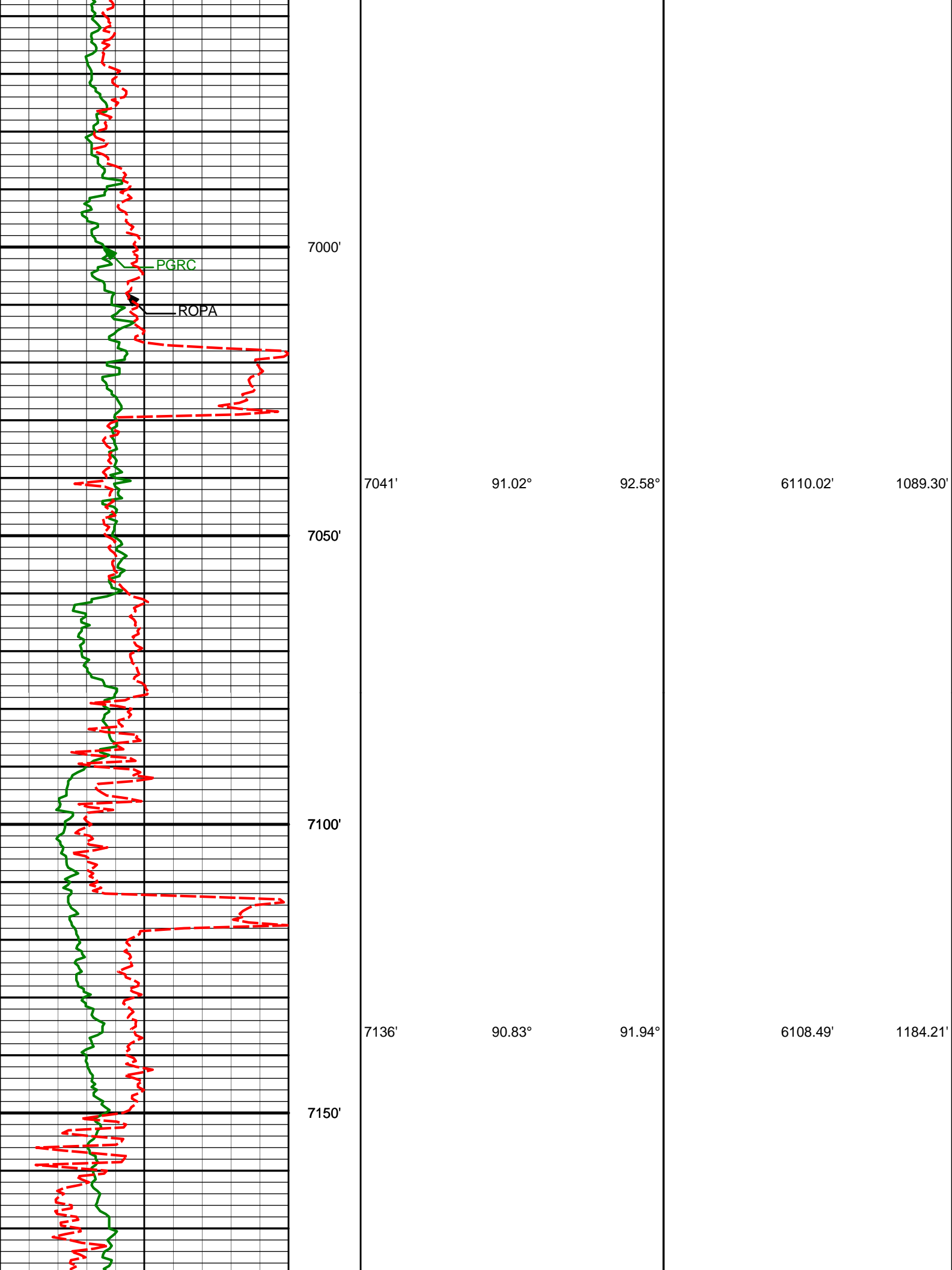
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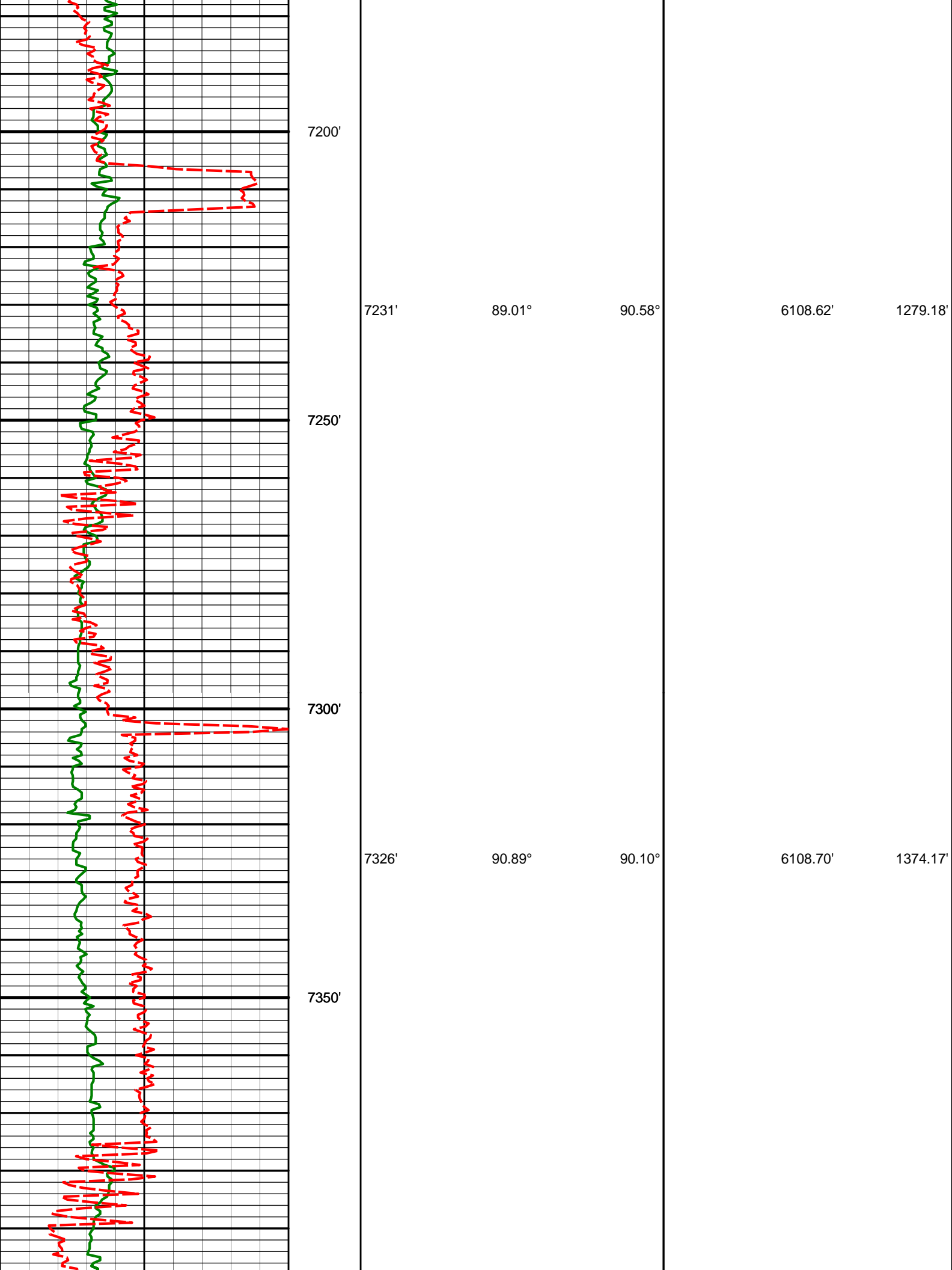
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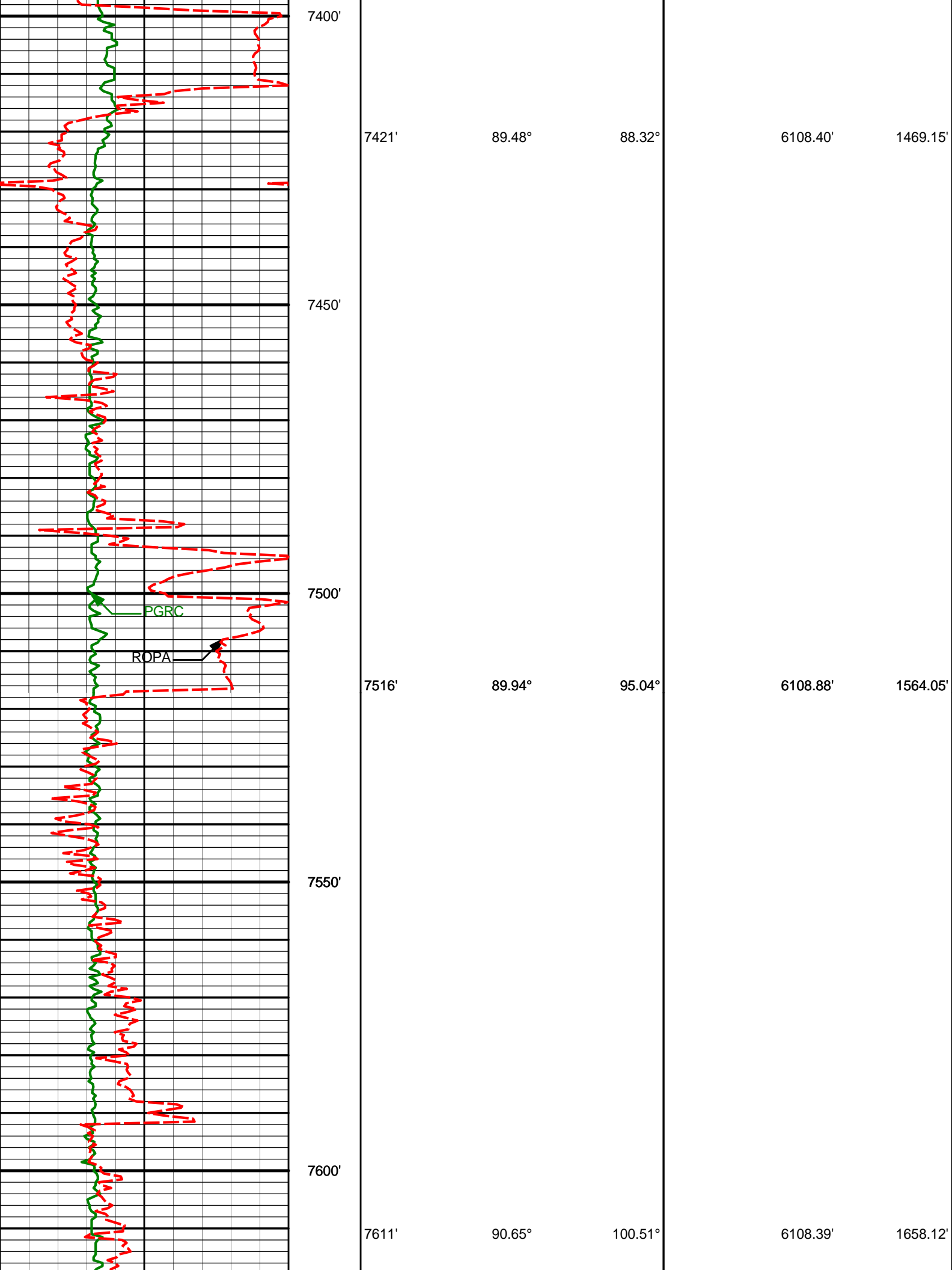
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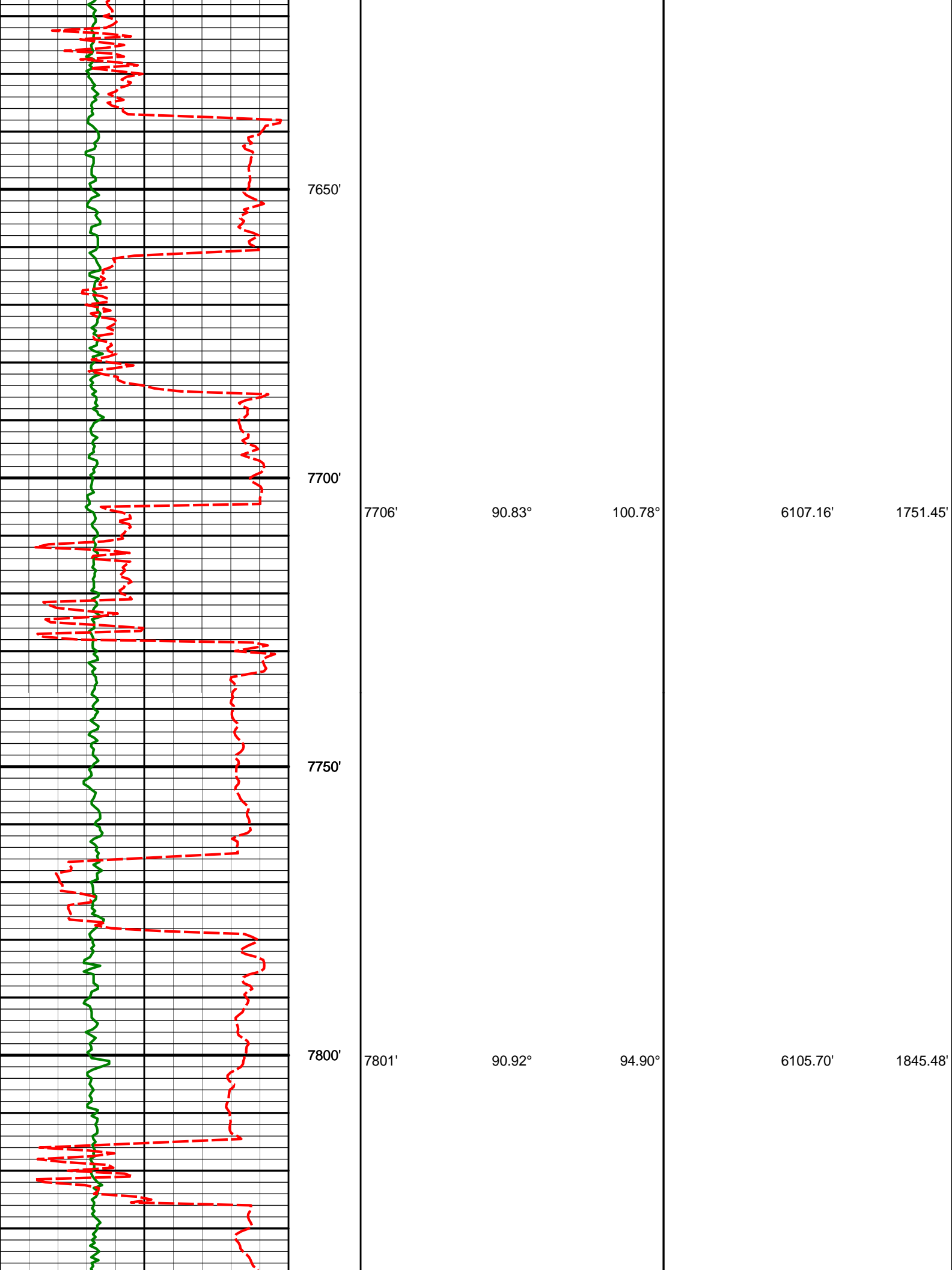
709.57'

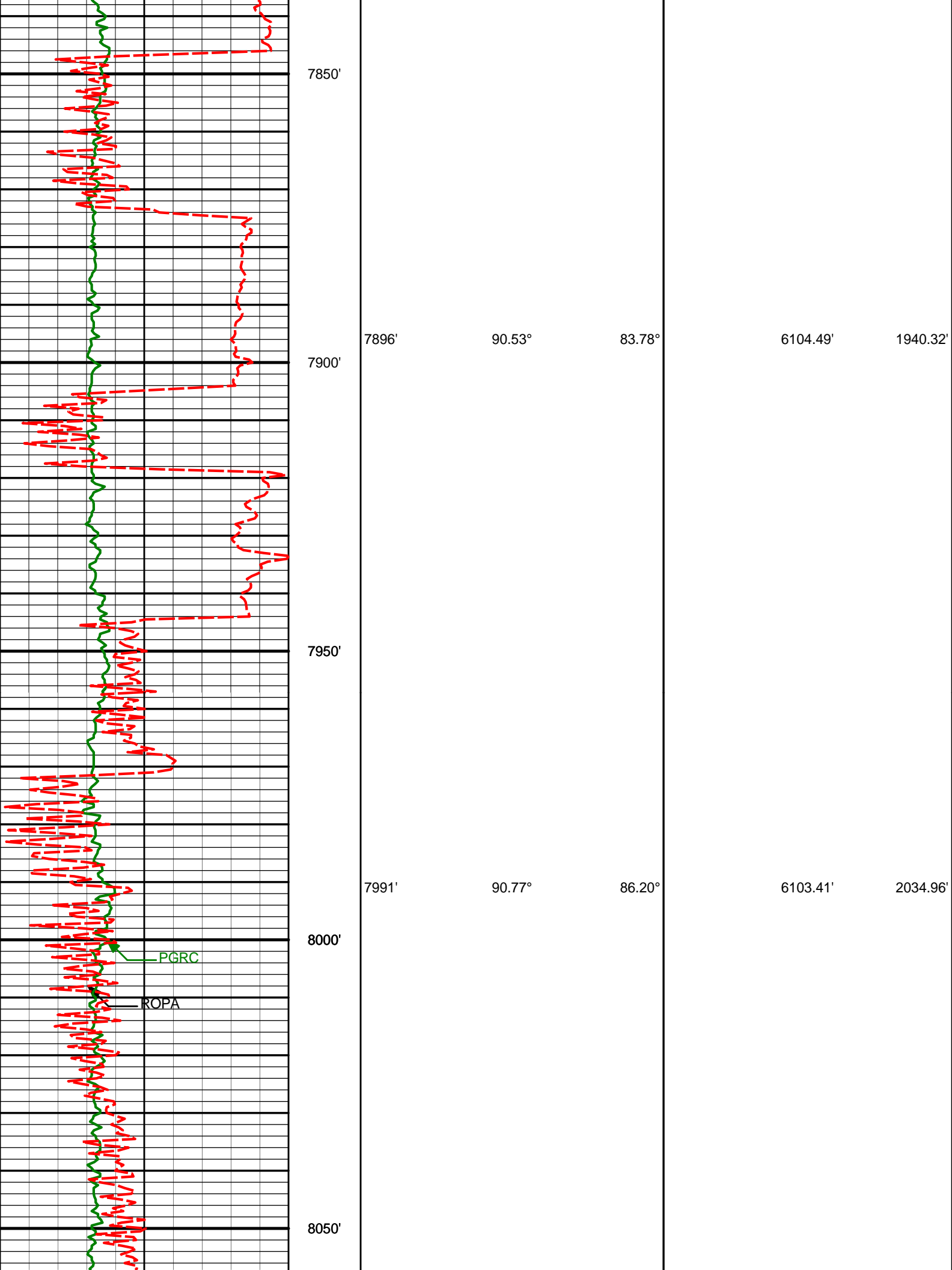


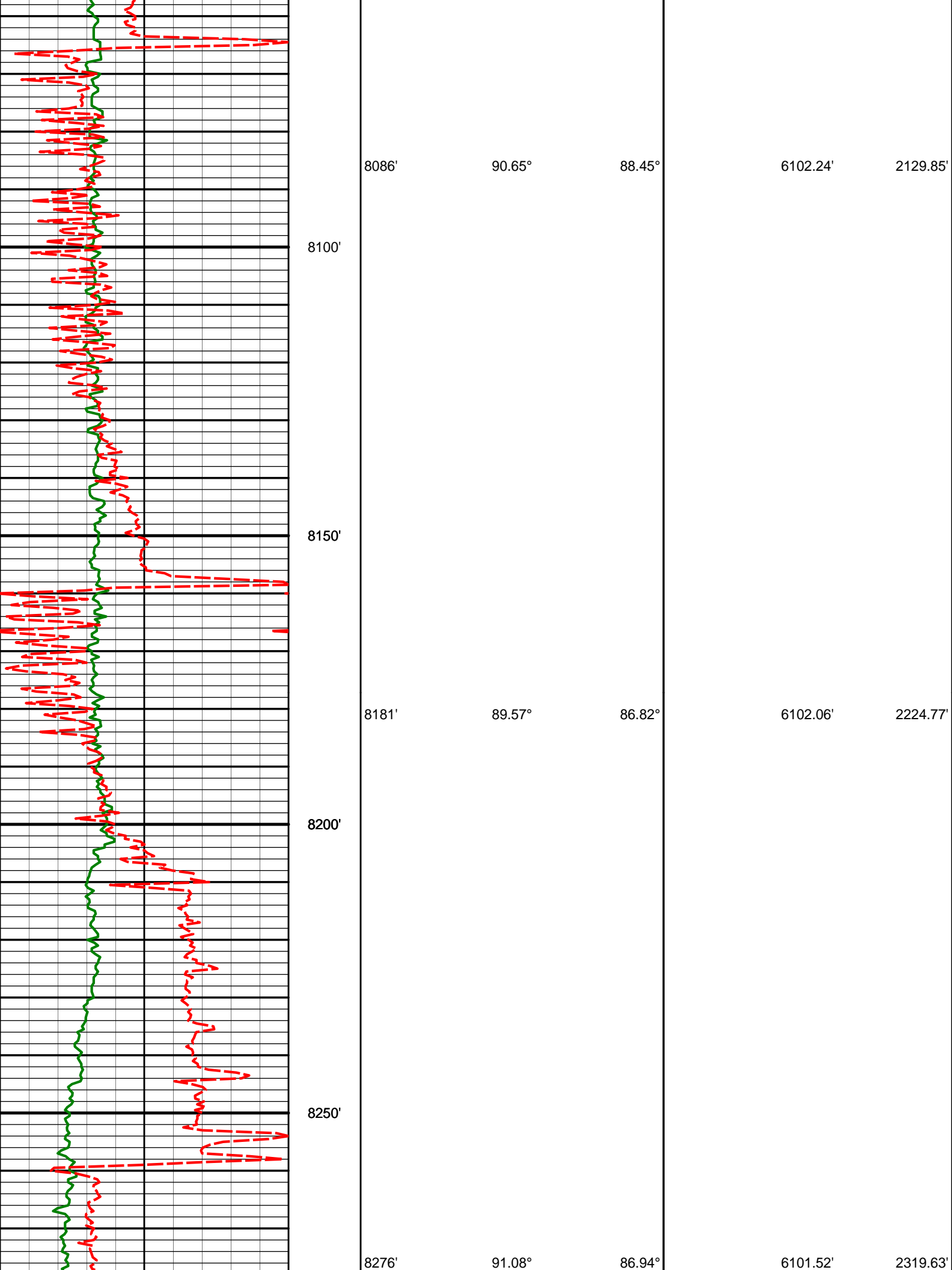


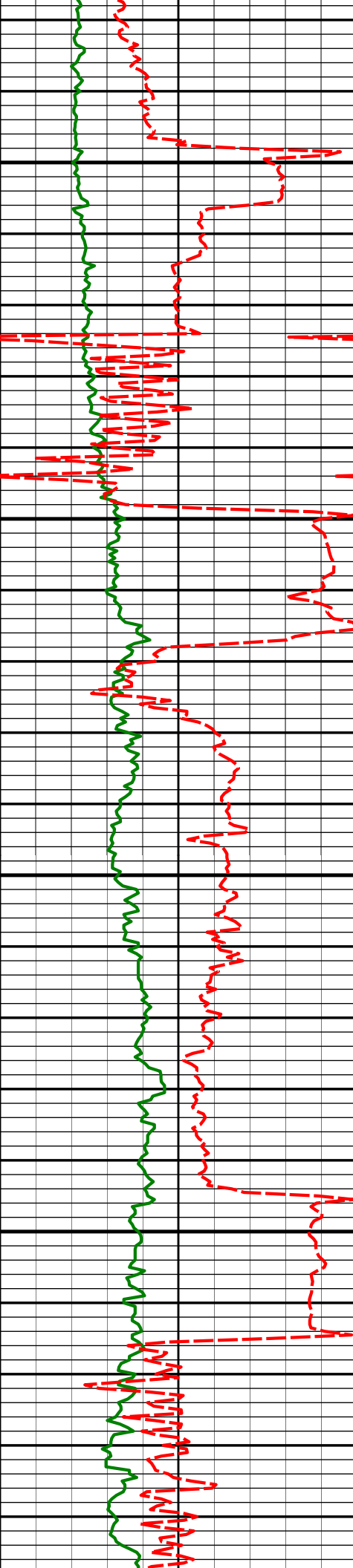












8300'

8350'

8371'

92.52°

87.38°

6098.53'

2414.48'

8400'

8450'

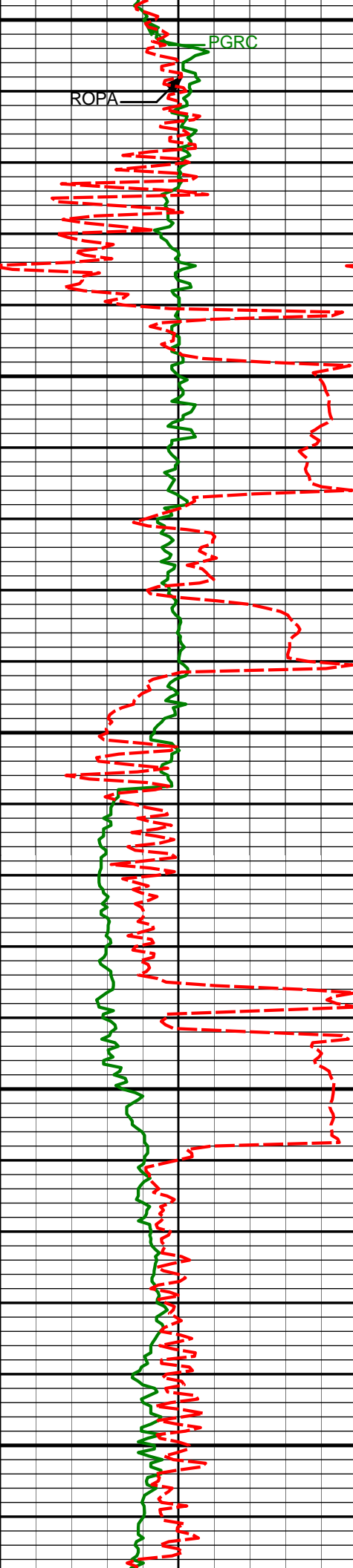
8465'

91.11°

86.28°

6095.55'

2508.29'



ROPA

PGRC

8500'

8550'

8600'

8650'

8700'

8560'

90.59°

86.95°

6094.15'

2603.12'

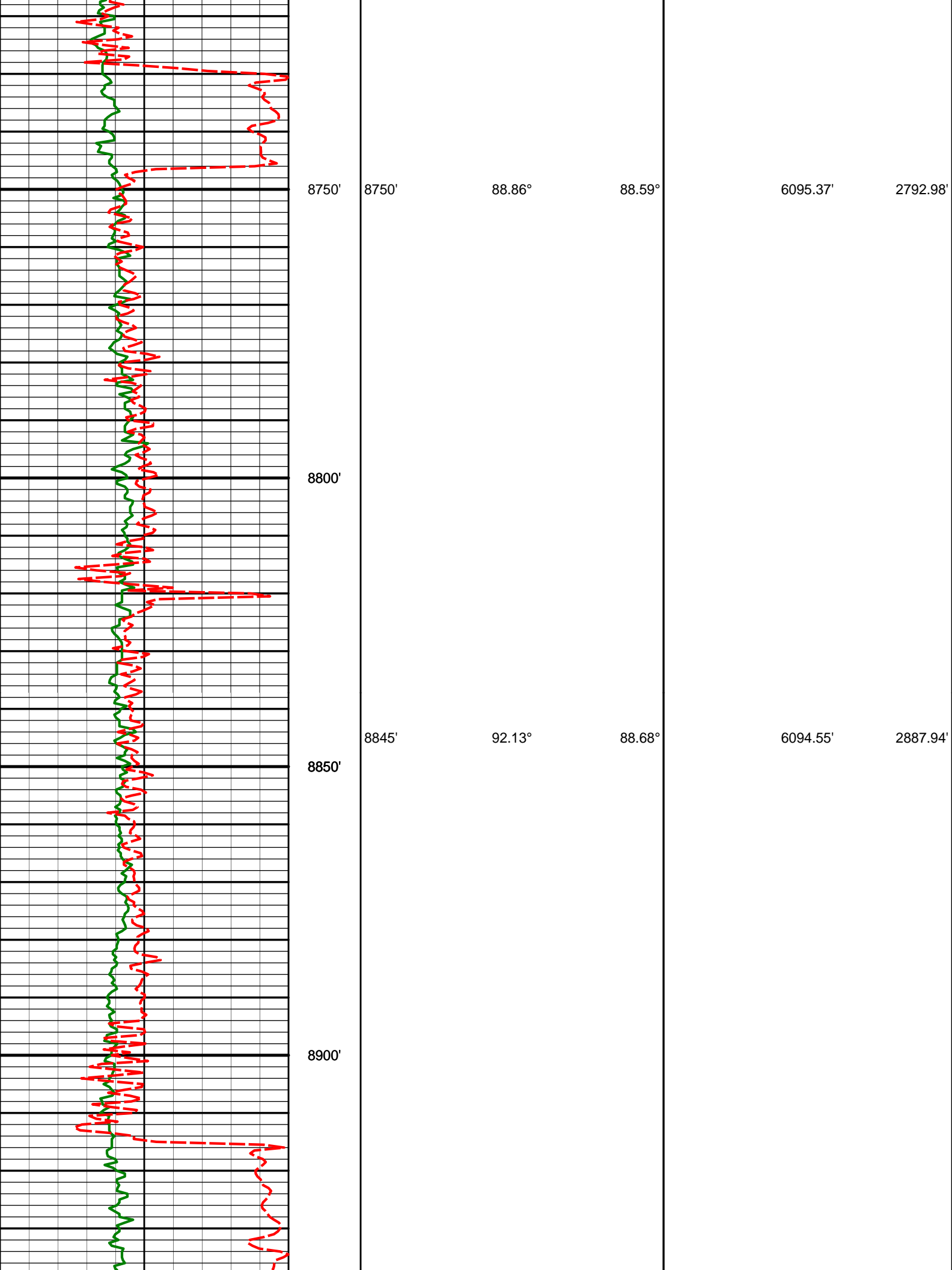
8655'

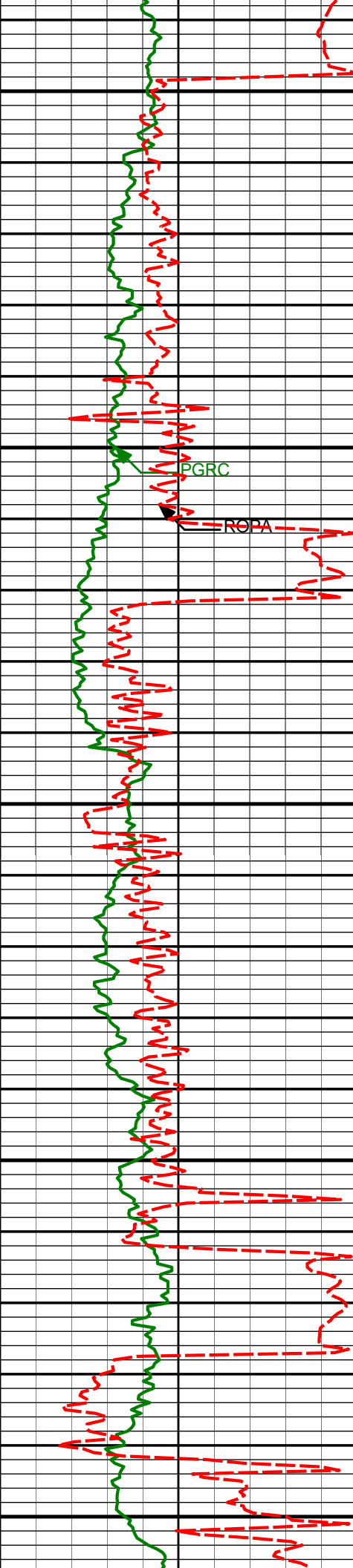
89.54°

87.87°

6094.04'

2698.03'





8940'

88.70°

89.40°

6093.86'

2982.91'

8950'

9000'

PGRC

ROPA

9035'

86.73°

88.66°

6097.65'

3077.82'

9050'

9100'

9129'

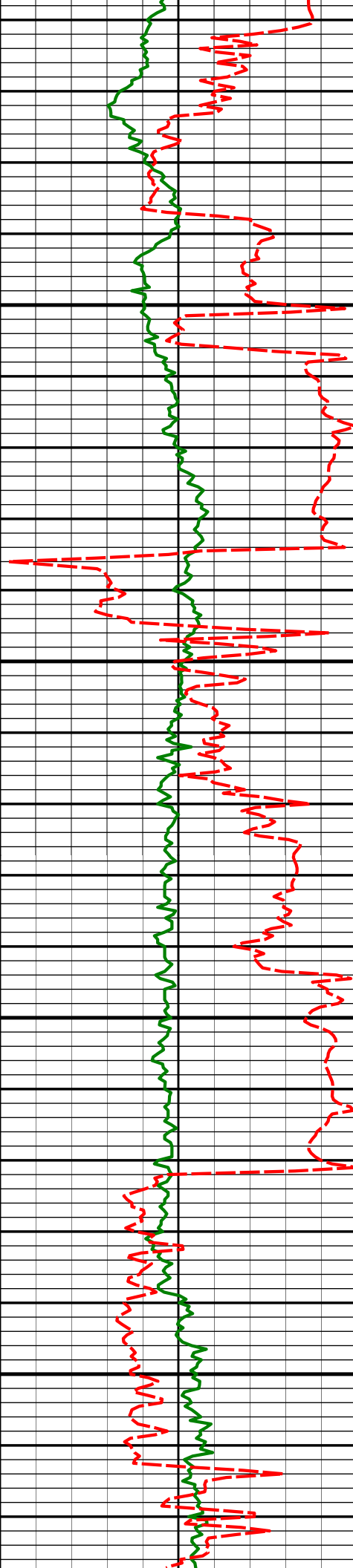
86.73°

88.37°

6103.01'

3171.64'

9150'



9200'

9224'

88.03°

88.33°

6107.36'

3266.50'

9250'

9300'

9319'

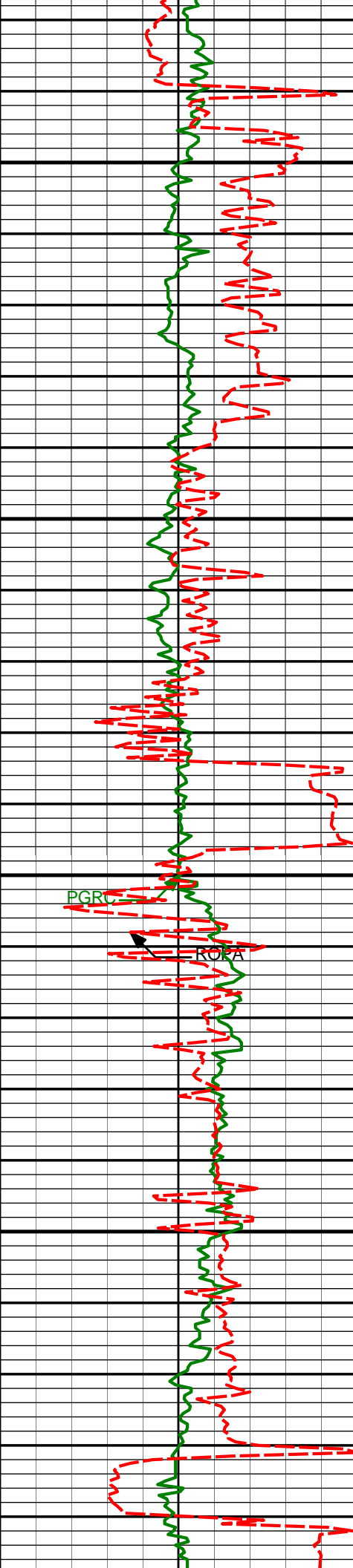
90.15°

89.73°

6108.87'

3361.47'

9350'



9400'

9414'

90.22°

89.04°

6108.56'

3456.47'

9450'

9500'

PGR

9509'

90.52°

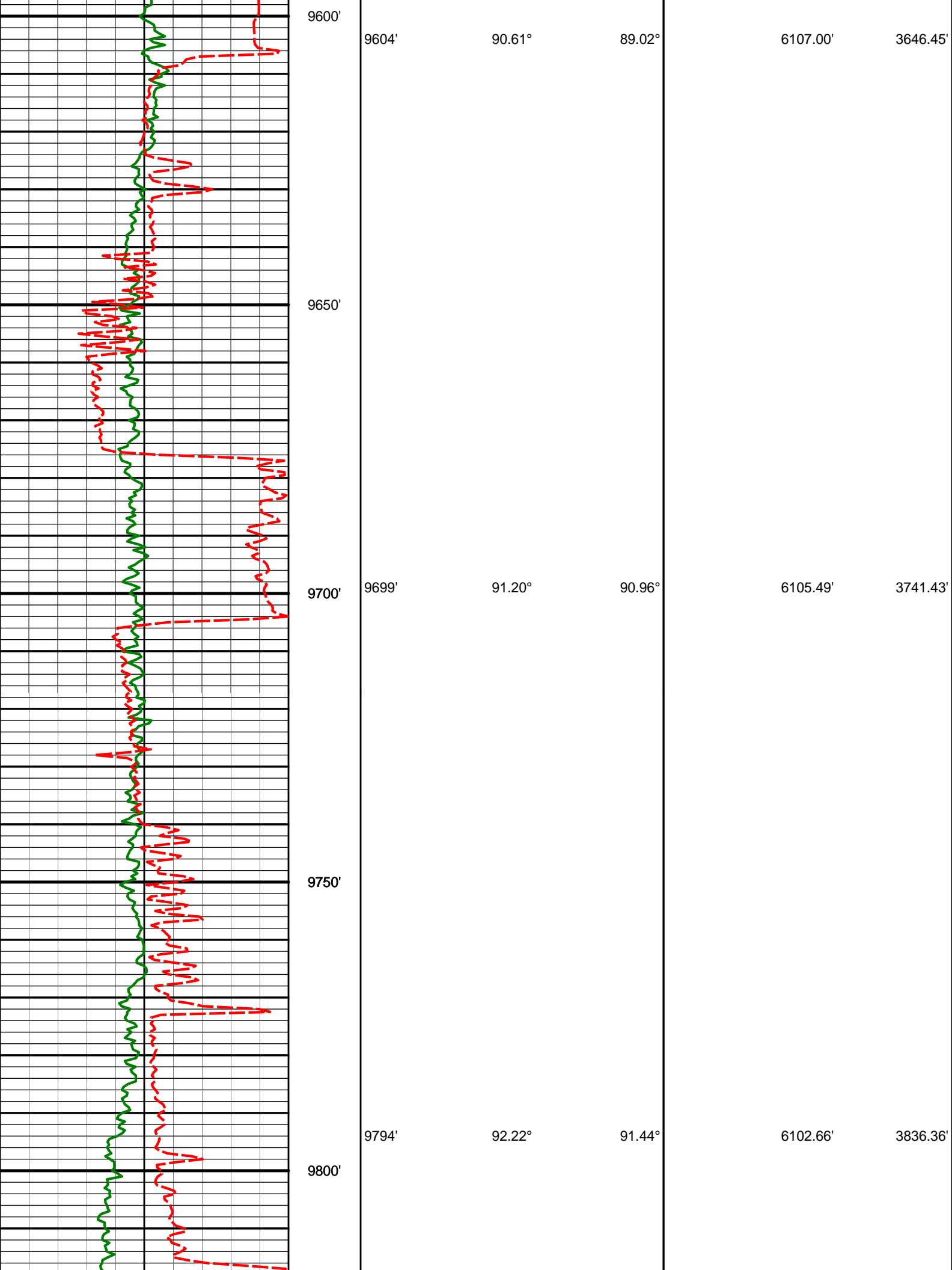
89.33°

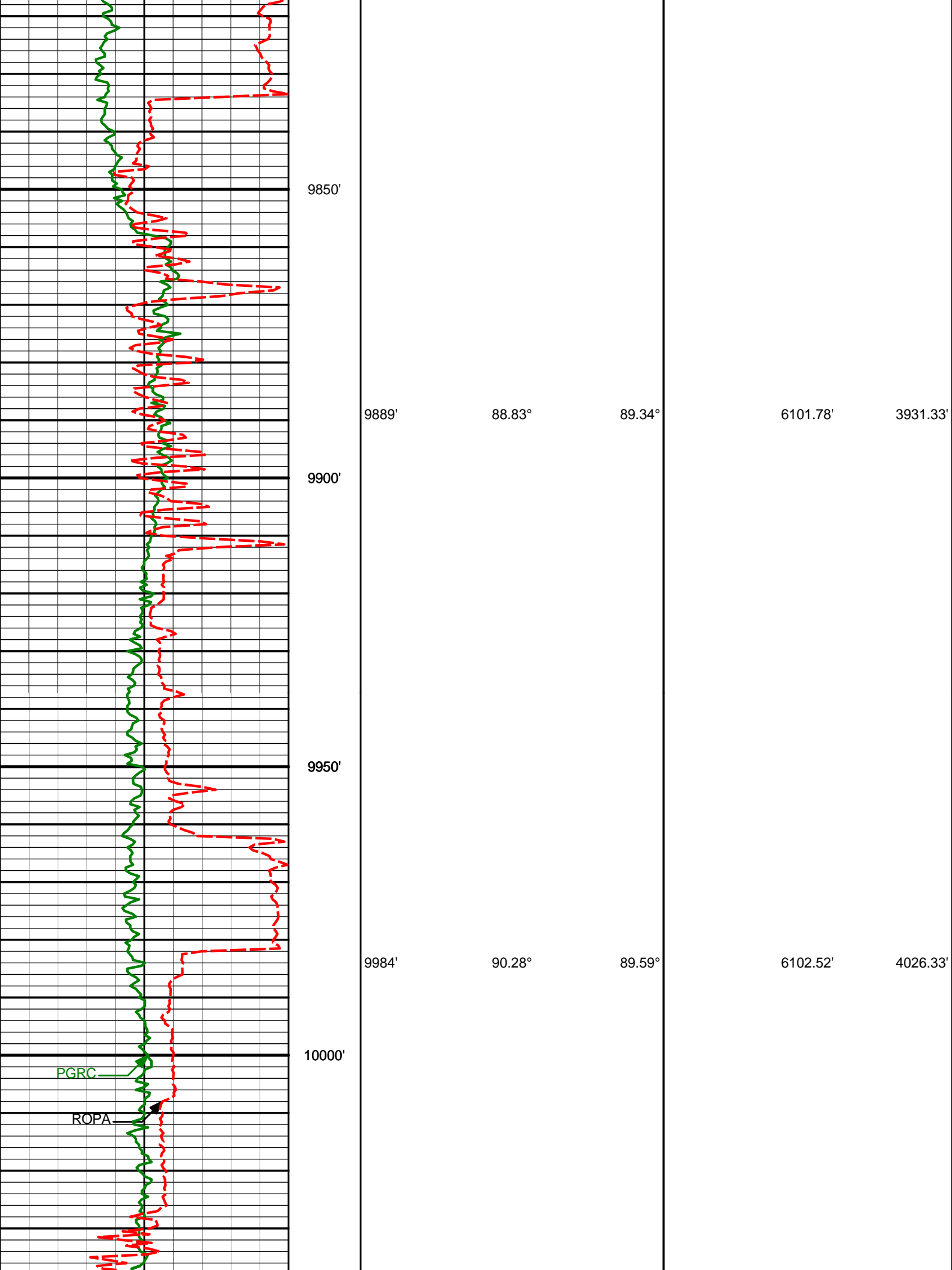
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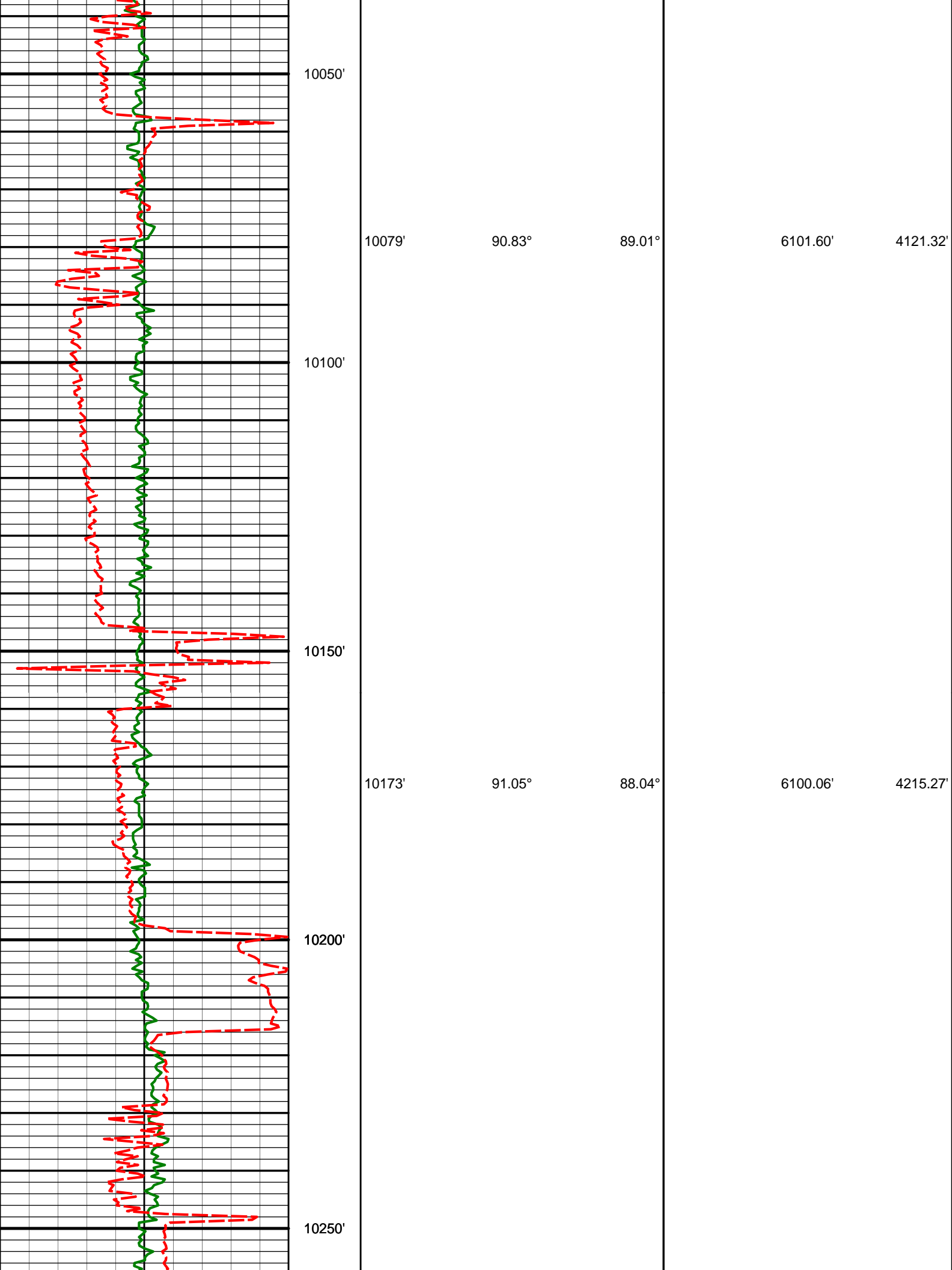
3551.46'

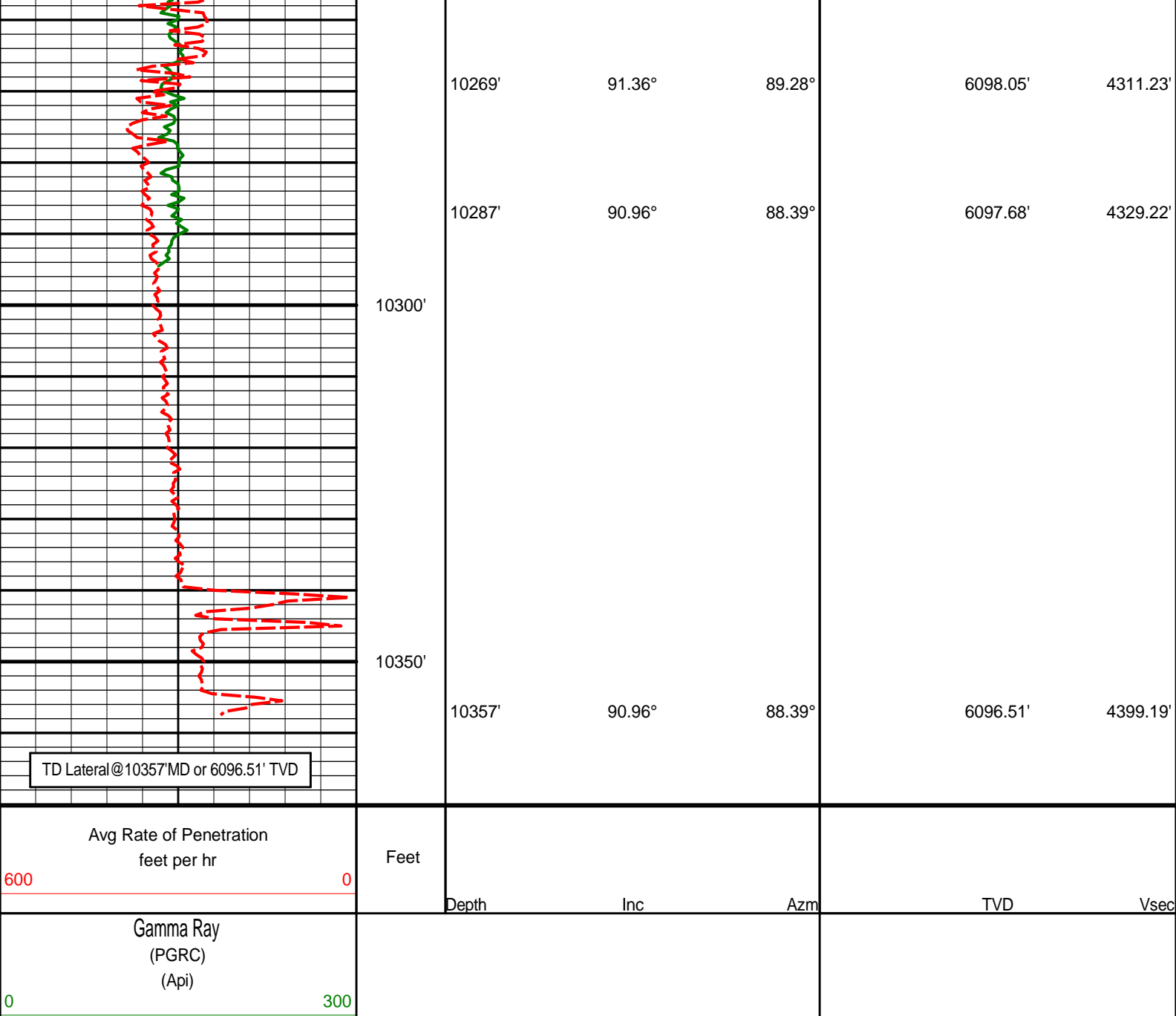
ROPA

9550'









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DIRECTIONAL SURVEY REPORT

Noble Energy
Castor Federal LG17-62HN
Wattenberg
Weld Colorado
USA
CA-XX-0009957680

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
890.00	0.00	0.00	890.00	0.00 N	0.00 E	0.00	TIE-IN
1011.00	0.40	214.01	1011.00	0.35 S	0.24 W	-0.24	0.33
1290.00	0.44	153.96	1289.99	2.13 S	0.31 W	-0.32	0.15
1573.00	0.53	149.27	1572.98	4.24 S	0.84 E	0.83	0.04
1855.00	0.35	158.80	1854.97	6.17 S	1.82 E	1.81	0.07
2140.00	0.43	347.88	2139.97	5.93 S	1.91 E	1.90	0.27
2235.00	2.10	267.08	2234.95	5.67 S	0.09 E	0.08	2.19
2330.00	4.22	268.26	2329.80	5.86 S	5.14 W	-5.15	2.23

2425.00	6.01	277.61	2424.42	5.31 S	13.56 W	-13.57	2.07
2520.00	7.48	269.65	2518.76	4.69 S	24.67 W	-24.68	1.83
2615.00	8.89	269.68	2612.79	4.77 S	38.20 W	-38.21	1.49
2709.00	10.72	271.75	2705.41	4.54 S	54.21 W	-54.21	1.98
2804.00	12.30	270.55	2798.50	4.17 S	73.15 W	-73.16	1.68
2899.00	13.64	271.91	2891.08	3.71 S	94.46 W	-94.47	1.45
2994.00	12.51	270.15	2983.61	3.31 S	115.94 W	-115.95	1.26
3089.00	10.06	270.20	3076.77	3.25 S	134.53 W	-134.53	2.58
3184.00	7.86	267.61	3170.61	3.49 S	149.32 W	-149.32	2.35
3279.00	7.66	269.44	3264.74	3.82 S	162.14 W	-162.14	0.33
3374.00	6.79	268.23	3358.98	4.06 S	174.08 W	-174.09	0.93
3469.00	5.16	277.40	3453.46	3.68 S	183.94 W	-183.94	1.98
3564.00	4.23	271.11	3548.14	3.06 S	191.68 W	-191.69	1.12
3659.00	1.57	270.59	3643.01	2.98 S	196.49 W	-196.50	2.80
3754.00	1.15	87.40	3738.00	2.93 S	196.85 W	-196.85	2.87
3849.00	0.89	90.01	3832.99	2.88 S	195.16 W	-195.16	0.28
4039.00	0.85	62.38	4022.97	2.23 S	192.43 W	-192.43	0.22
4229.00	1.00	171.48	4212.95	3.21 S	190.93 W	-190.94	0.80
4419.00	2.09	149.84	4402.88	7.85 S	188.94 W	-188.95	0.64
4514.00	1.51	112.01	4497.84	9.82 S	186.91 W	-186.92	1.36
4609.00	1.77	130.11	4592.80	11.24 S	184.62 W	-184.64	0.61
4704.00	2.30	119.42	4687.74	13.12 S	181.84 W	-181.86	0.68
4799.00	1.46	74.09	4782.69	13.73 S	179.01 W	-179.04	1.73
4894.00	1.03	96.45	4877.67	13.49 S	177.00 W	-177.02	0.68
4989.00	1.03	72.70	4972.66	13.33 S	175.34 W	-175.36	0.45
5178.00	1.20	49.66	5161.62	11.55 S	172.20 W	-172.22	0.25
5273.00	0.92	42.54	5256.60	10.34 S	170.93 W	-170.95	0.32
5409.00	3.49	79.55	5392.50	8.79 S	166.12 W	-166.13	2.07
5456.00	8.59	89.52	5439.22	8.50 S	161.20 W	-161.21	11.03
5503.00	12.70	91.23	5485.40	8.58 S	152.52 W	-152.54	8.77
5551.00	15.69	90.83	5531.93	8.79 S	140.76 W	-140.77	6.24
5598.00	19.21	87.41	5576.76	8.53 S	126.67 W	-126.69	7.78
5646.00	22.32	86.28	5621.64	7.58 S	109.69 W	-109.70	6.54
5693.00	25.07	85.40	5664.68	6.20 S	90.85 W	-90.86	5.91
5741.00	28.43	87.08	5707.53	4.80 S	69.29 W	-69.30	7.17
5788.00	32.21	88.83	5748.10	3.98 S	45.59 W	-45.59	8.25
5836.00	35.88	88.54	5787.86	3.36 S	18.73 W	-18.73	7.65
5883.00	39.87	88.19	5824.96	2.53 S	10.11 E	10.10	8.51
5930.00	44.68	86.88	5859.72	1.15 S	41.69 E	41.68	10.41
5977.00	48.60	87.11	5891.98	0.64 N	75.80 E	75.80	8.34
6025.00	51.30	87.63	5922.87	2.32 N	112.51 E	112.51	5.70
6072.00	54.60	90.54	5951.18	2.90 N	150.00 E	150.01	8.57
6121.00	59.46	90.10	5977.84	2.67 N	191.10 E	191.10	9.94
6168.00	64.20	88.49	6000.02	3.19 N	232.51 E	232.52	10.54
6215.00	66.49	89.86	6019.63	3.80 N	275.22 E	275.23	5.53
6262.00	68.61	90.05	6037.57	3.83 N	318.66 E	318.66	4.53
6310.00	72.48	90.05	6053.56	3.80 N	363.91 E	363.91	8.06
6357.00	75.62	89.04	6066.47	4.16 N	409.09 E	409.10	6.99
6405.00	79.13	87.70	6076.96	5.49 N	455.90 E	455.91	7.80
6418.00	80.09	87.45	6079.31	6.03 N	468.68 E	468.69	7.62
6519.00	83.39	86.89	6093.82	10.97 N	568.49 E	568.51	3.31
6566.00	83.23	86.27	6099.29	13.75 N	615.09 E	615.11	1.36
6661.00	86.39	87.41	6107.89	18.96 N	709.54 E	709.57	3.54
6756.00	88.80	88.61	6111.87	22.25 N	804.39 E	804.43	2.83
6851.00	90.18	90.13	6112.71	23.30 N	899.38 E	899.42	2.16
6946.00	91.02	91.77	6111.71	21.72 N	994.36 E	994.39	1.94
7041.00	91.02	92.58	6110.02	18.11 N	1089.27 E	1089.30	0.85
7136.00	90.83	91.94	6108.49	14.36 N	1184.18 E	1184.21	0.71
7231.00	89.01	90.58	6108.62	12.27 N	1279.16 E	1279.18	2.39
7326.00	90.89	90.10	6108.70	11.70 N	1374.15 E	1374.17	2.04
7421.00	89.48	88.32	6108.40	13.01 N	1469.13 E	1469.15	2.39
7516.00	89.94	95.04	6108.88	10.22 N	1564.04 E	1564.05	7.09
7611.00	90.65	100.51	6108.39	2.63 S	1658.13 E	1658.12	5.81
7706.00	90.83	100.78	6107.16	20.17 S	1751.48 E	1751.45	0.34
7801.00	90.92	94.90	6105.70	33.13 S	1845.54 E	1845.48	6.18
7896.00	90.53	83.78	6104.49	32.04 S	1940.38 E	1940.32	11.72
7991.00	90.77	86.20	6103.41	23.74 S	2035.00 E	2034.96	2.56
8086.00	90.65	88.45	6102.24	19.30 S	2129.89 E	2129.85	2.38
8181.00	89.57	86.82	6102.06	15.39 S	2224.80 E	2224.77	2.06
8276.00	91.08	86.94	6101.52	10.22 S	2319.66 E	2319.63	1.59
8371.00	92.52	87.38	6098.53	5.52 S	2414.49 E	2414.48	1.59
8465.00	91.11	86.28	6095.55	0.33 S	2508.29 E	2508.29	1.90
8560.00	90.59	86.95	6094.15	5.27 N	2603.12 E	2603.12	0.89
8655.00	89.54	87.87	6094.04	9.57 N	2698.02 E	2698.03	1.46

8750.00	88.86	88.59	6095.37	12.50 N	2792.96 E	2792.98	1.04
8845.00	92.13	88.68	6094.55	14.77 N	2887.92 E	2887.94	3.44
8940.00	88.70	89.40	6093.86	16.36 N	2982.89 E	2982.91	3.69
9035.00	86.73	88.66	6097.65	17.97 N	3077.79 E	3077.82	2.22
9129.00	86.73	88.37	6103.01	20.41 N	3171.61 E	3171.64	0.30
9224.00	88.03	88.33	6107.36	23.13 N	3266.47 E	3266.50	1.36
9319.00	90.15	89.73	6108.87	24.74 N	3361.44 E	3361.47	2.68
9414.00	90.22	89.04	6108.56	25.75 N	3456.43 E	3456.47	0.73
9509.00	90.52	89.33	6107.94	27.10 N	3551.42 E	3551.46	0.44
9604.00	90.61	89.02	6107.00	28.47 N	3646.40 E	3646.45	0.34
9699.00	91.20	90.96	6105.49	28.50 N	3741.39 E	3741.43	2.13
9794.00	92.22	91.44	6102.66	26.51 N	3836.32 E	3836.36	1.19
9889.00	88.83	89.34	6101.78	25.87 N	3931.30 E	3931.33	4.20
9984.00	90.28	89.59	6102.52	26.76 N	4026.29 E	4026.33	1.55
10079.00	90.83	89.01	6101.60	27.92 N	4121.27 E	4121.32	0.84
10173.00	91.05	88.04	6100.06	30.33 N	4215.23 E	4215.27	1.06
10269.00	91.36	89.28	6098.05	32.57 N	4311.18 E	4311.23	1.33
10287.00	90.96	88.39	6097.68	32.94 N	4329.17 E	4329.22	5.42
10357.00	90.96	88.39	6096.51	34.90 N	4399.13 E	4399.19	0.01

CALCULATION BASED ON MINIMUM CURVATURE METHOD

**SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT
TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT**

**VERTICAL SECTION RELATIVE TO WELL HEAD
VERTICAL SECTION IS COMPUTED ALONG A CLOSURE OF 89.55 DEGREES (GRID)
A TOTAL CORRECTION OF 7.36 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10357.00 FEET
IS 4399.27 FEET ALONG 89.55 DEGREES (GRID)**