

PCGC - Pressure Case Gamma



1 : 240 / 1 : 600

Country		: USA		<div>Company : Noble Energy</div> <div>Rig : H&P 273</div> <div>Well : Remora LC34-745</div> <div>Field : Wattenberg</div> <div>Country : USA</div> <div>API Number : 05-123-40599</div>			
Field		: Wattenberg					
Location		: Lat: 40° 42' 43.44" North Long: 103° 57' 35.21" West					
Well		: Remora LC34-745					
Company		: Noble Energy					
Rig		: H&P 273					
Permanent Datum : Ground Level				Elevation : 4816.00 ft		Other Services Directional Drilling	
Log Measured From : Drill Floor		24.00 ft Above Permanent Datum					
Drilling Measured From : Drill Floor				MD LOG		Elev. KB N/A DF 4840.00 ft GL 4816.00 ft WD N/A	
Depth Logged : 618.00 ft		To 10,355.00 ft		Unit No. : 11703727		Job No.: CA-XX-0902986605	
Date Logged : 01-Feb-16		To 06-Feb-16		Plot Type : Final			
Total Depth MD : 10,355.00 ft		TVD : 6,026.27 ft		Plot Date : 06-Feb-16			
Spud Date : 01-Feb-16							
Run No.	Borehole Record (MD)			Run No.	Borehole Record (MD)		
	Size	From	To		Size	From	To
2	8.750 in	618.00 ft	4,928.00 ft				
3	8.750 in	4,928.00 ft	6,454.00 ft				
4	6.125 in	6,454.00 ft	10,355.00 ft				
				Casing Record (MD)			
				Size	Weight	From	To
				9.625 in	36.00 lbpf	SURFACE	618.00 ft
				7.125 in	24.00 lbpf	SURFACE	6,444.00 ft

WELL INFORMATION

MWD Run Number	100	200	300		
Date run completed	02-Feb-16	03-Feb-16	05-Feb-16		
Rig Bit Number	2	3	4		
Bit Size (in)	8.750	8.750	6.125		
Tool Nominal OD (in)	6.560	6.750	4.750		
Log Start Depth (MD, ft)	618.00	4,928.00	6,454.00		
Log End Depth (MD, ft)	4,928.00	6,454.00	10,355.00		
Drill or Wipe	Drill	Drill	Drill		
Drill/Wipe Start Date and Time	01-Feb-16 06:00	02-Feb-16 04:00	04-Feb-16 03:30		
Drill/Wipe End Date and Time	01-Feb-16 21:15	03-Feb-16 03:30	05-Feb-16 13:00		
Min Inc (deg) @ Depth (MD, ft)	0.17 @ 618.00	9.00 @ 4,928.00	88.98 @ 7,455.00		
Max Inc (deg) @ Depth (MD, ft)	11.00 @ 3,604.00	83.45 @ 6,399.00	91.91 @ 8,494.00		
Bit TFA(in2) / Bit Type	0.98 / PDC	0.98 / PDC	0.65 / PDC		
Flow Rate (gpm)	595.63	562.29	318.94		
Max AV (fpm) / CV (fpm) @ MWD	300.0 / 0.0	130.0 / 0.0	345.0 / 0.0		
Fluid Type	Native/Spud Mud	Native/Spud Mud	Native/Spud Mud		
Density (ppg) / Viscosity (spqt)	8.70 / 30.00	10.17 / 45.00	10.25 / 39.00		
Filtrate CL (ppm)	1,600.00	1,700.00	2,000.00		
pH / Fluid Loss (mptm)	9.10 / 38	8.50 / 7	8.80 / 9		
PV (cP) / YP (lhf2)	5 / 4.00	12 / 11.00	9 / 8.00		
% Solids / % Sand	3.00 / 0.25	11.10 / 0.15	8.70 / 0.20		
% 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		

Max Tool Temp (degF) / Source	137.50 / PCM	162.80 / PCM	213.40 / PCM		
Rm @ Max Tool Temp (degF)	N/A @ 137.50	N/A @ 162.80	N/A @ 213.40		
Lead MWD Engineer	Adam Sampson	Brandon McNair	Brandon McNair		
Customer Representative	Justin Fields	Justin Fields	Justin Fields		

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM	PCM		
Software Version	5.93	5.93	5.93		
Sub Serial Number	12686428	12686428	12686428		
Insert Serial Number	11227541	11227541	11680771		
Date and Time Initialized	30-Jan-16 09:55	30-Jan-16 09:53	03-Feb-16 19:08		
Date and Time Read	03-Feb-16 10:28	03-Feb-16 10:28	05-Feb-16 22:45		
ECMB SW Version	N/A	N/A	N/A		

Directional Sensor Information

Tool Type	PCDC	PCDC	PCDC		
Distance From Bit (ft)	63.00	55.00	68.00		
Software Version	6.33	6.33	6.33		
Sub Serial Number	12686428	12686428	12686428		
Sonde Serial Number	11297563	11297563	11062039		
Sensor ID Number	N/A	N/A	N/A		
Toolface Offset (deg)	66.20	252.80	15.70		

Gamma Ray Sensor Information

Tool Type	PCG	PCG	PCG		
Distance From Bit (ft)	51.03	42.60	55.48		
Recorded Sample Period (sec)	10	10	10		
Software Version	8.15	8.15	8.15		
Sub Serial Number	12686428	12686428	12686428		
Insert/Sonde Serial Number	12071507	12071507	12037396		

REMARKS

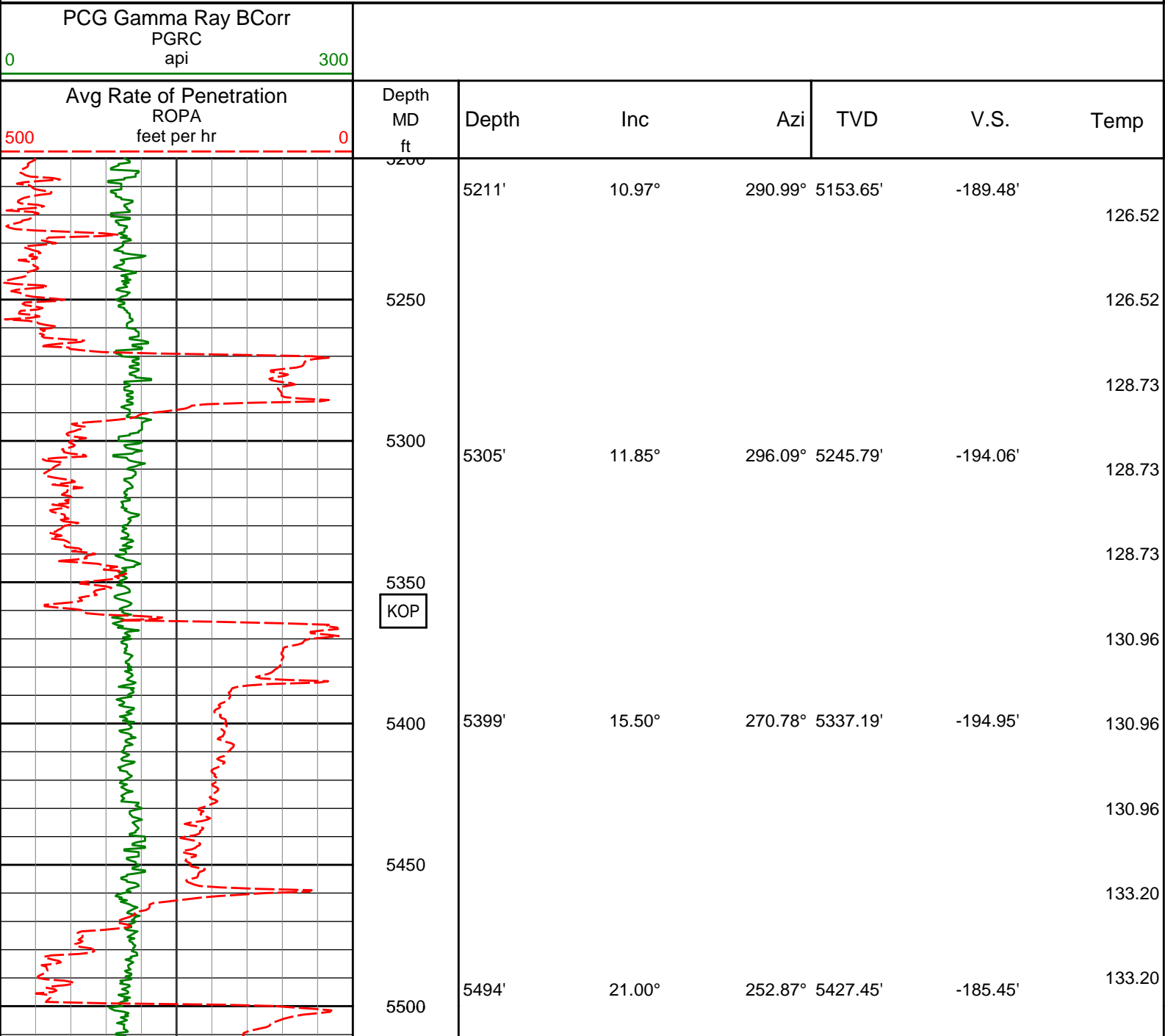
1. All depths are calibrated to the driller's pipe tally and are measured from the Rig drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
 - ROPA: Average Rate of Penetration is real time data.
 - PGRC: Smooth Pressure Case Gamma Ray Borehole corrected is recorded data.
4. The following smoothing parameters have been applied to the data:
 - All ROP in logs - 0.5 ft interval, 1.2 ft coercion distance.
 - Gamma in 2" (1:600) logs - 1 ft interval, 3 ft coercion distance.
 - Gamma in 5" (1:240) logs - 0.5 ft interval, 0.6 ft coercion distance.
5. INSITE version 8.3.0.

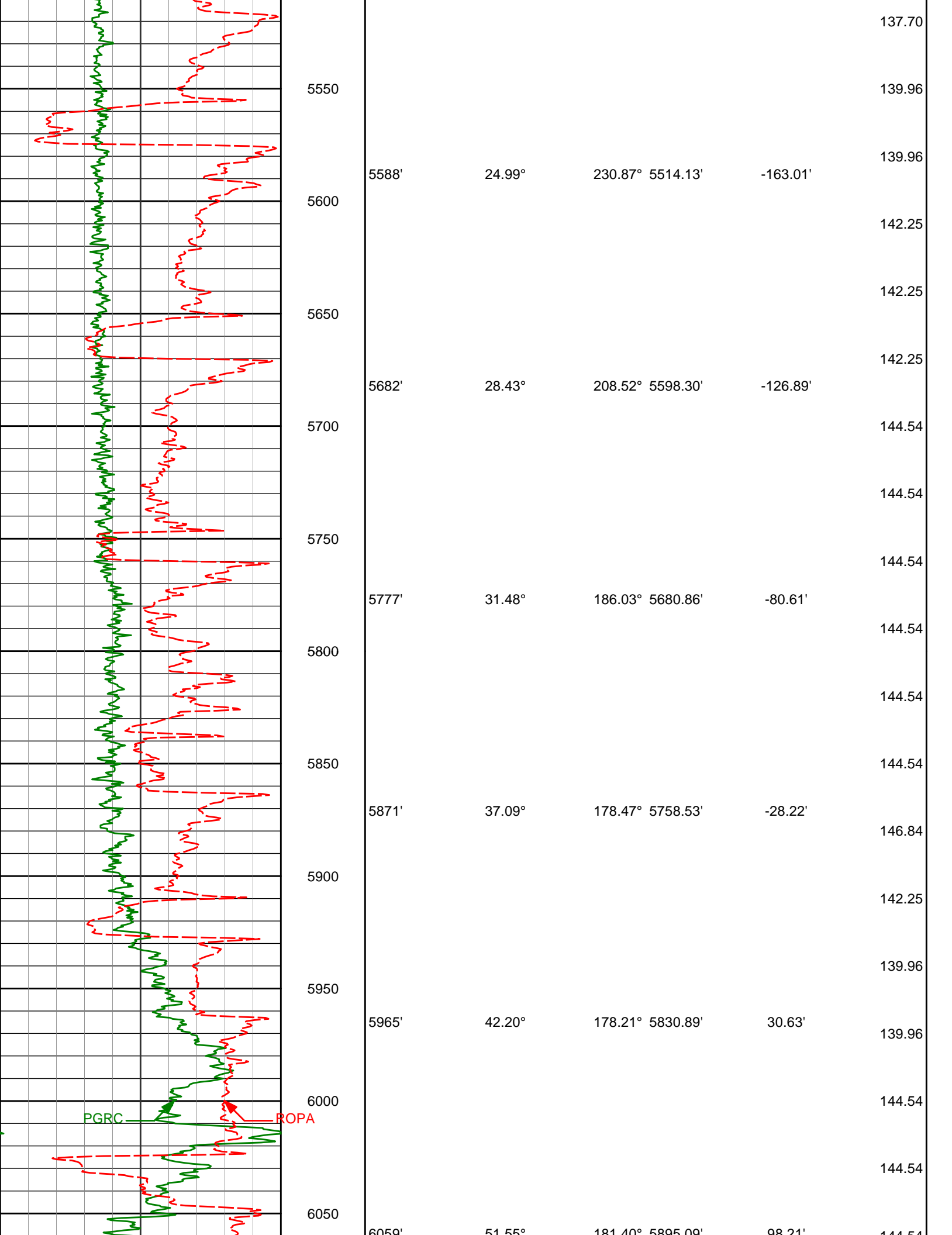
WARRANTY

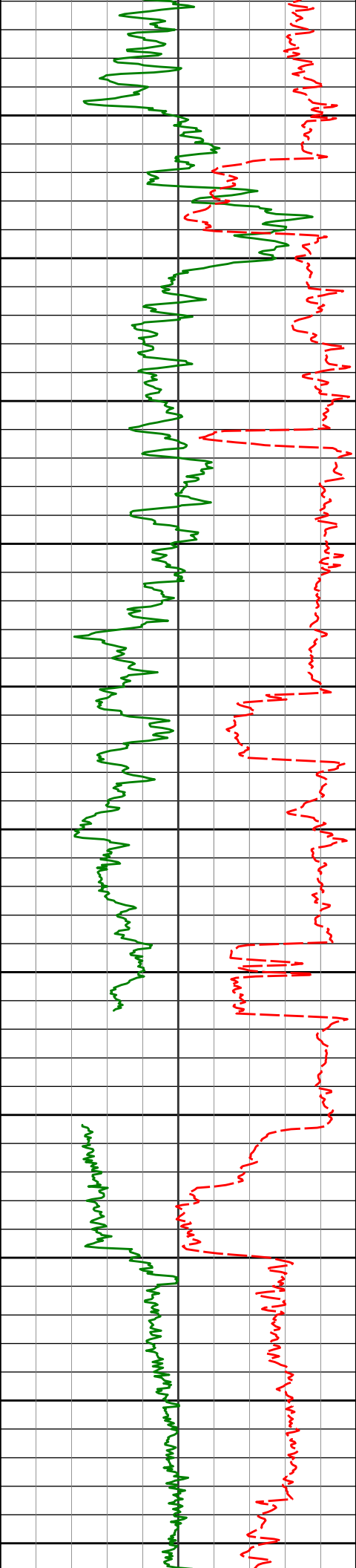
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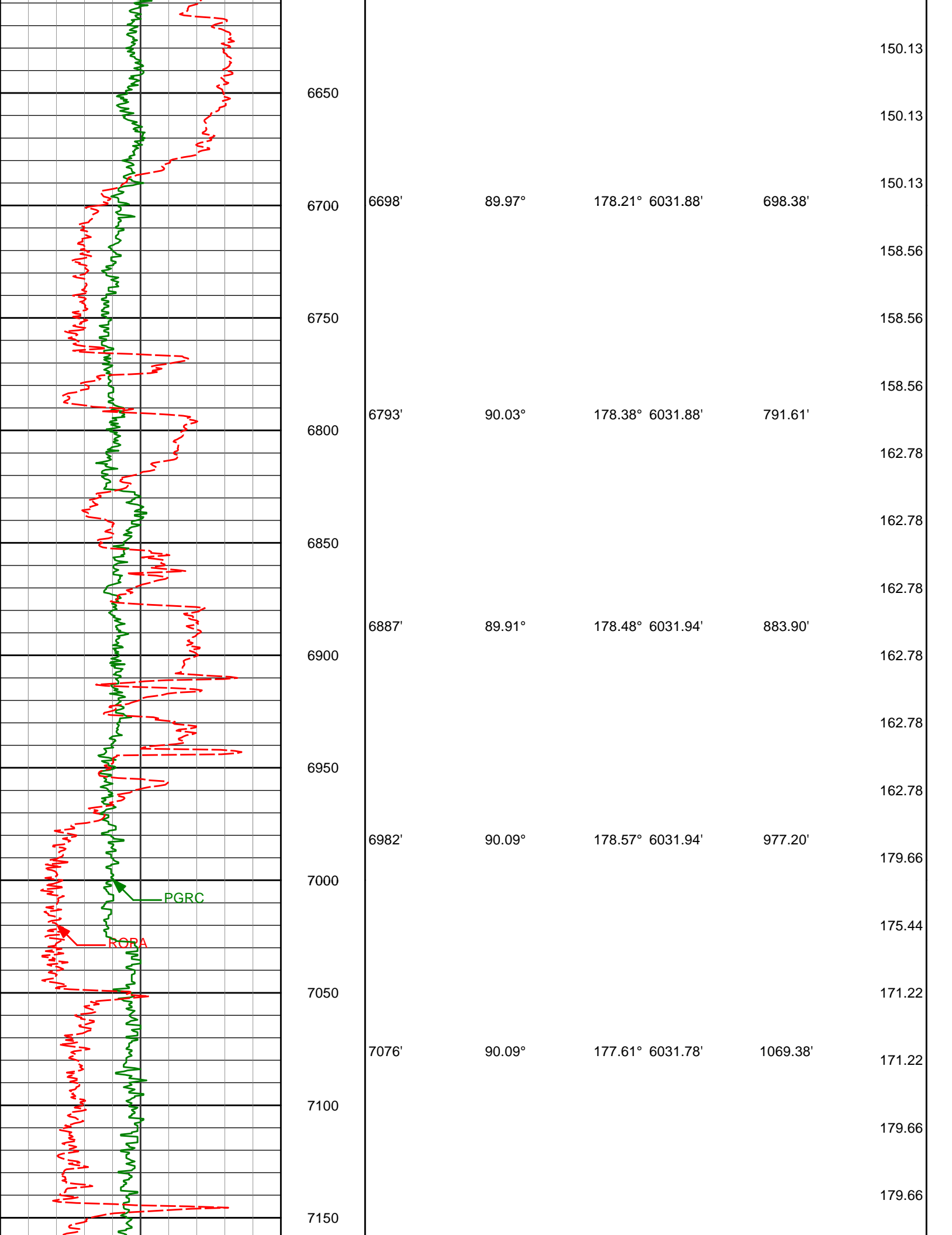
MD Detail 1:600 Scale

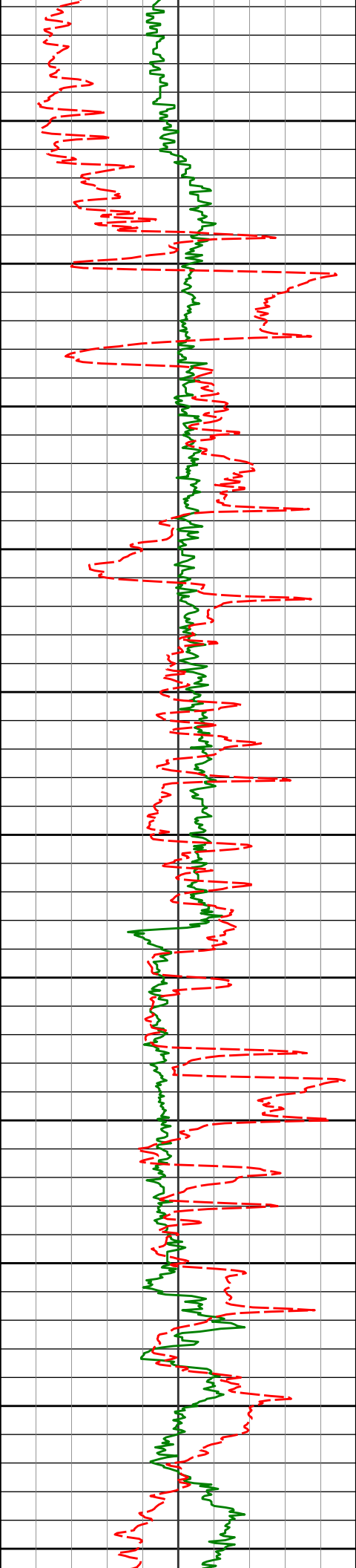




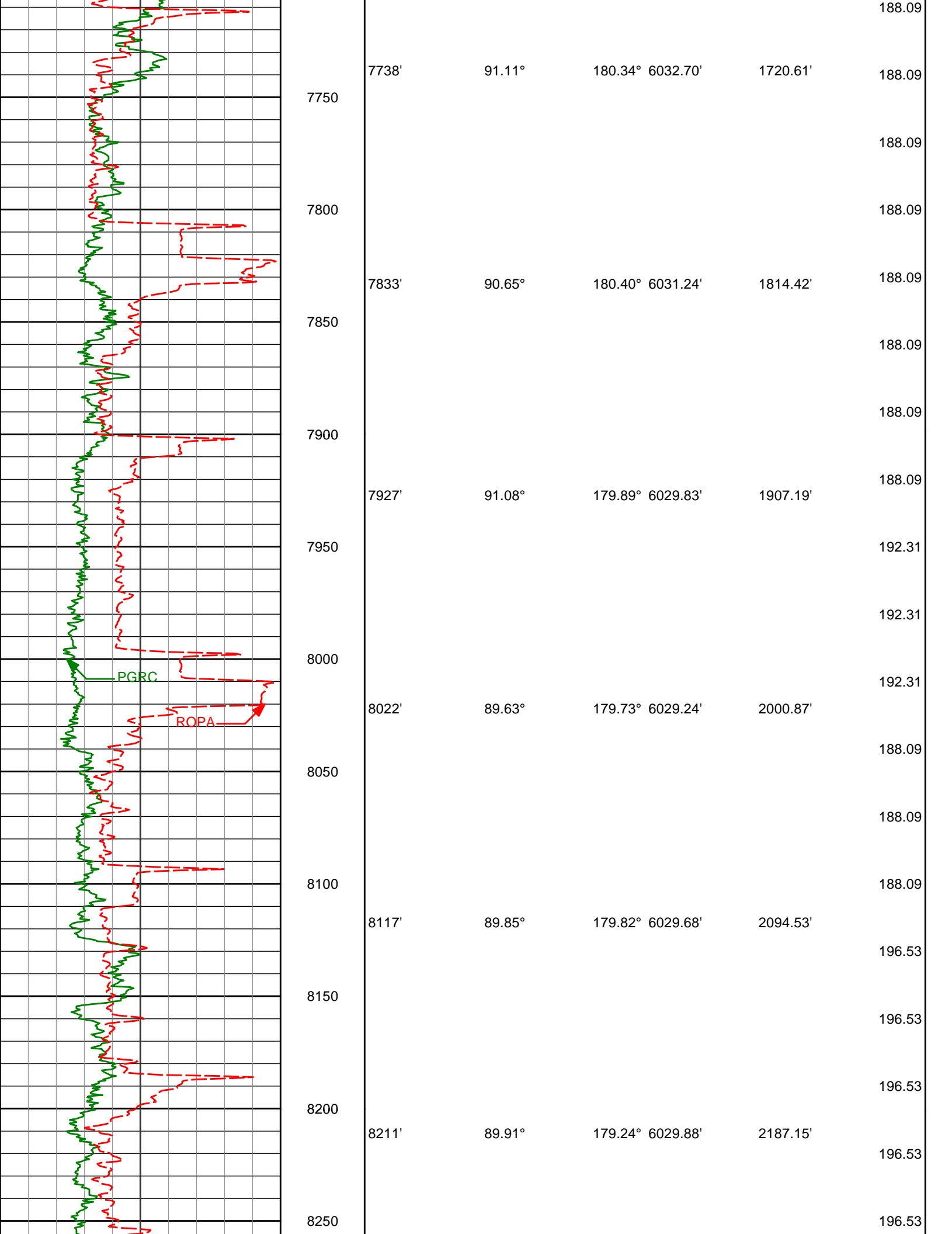


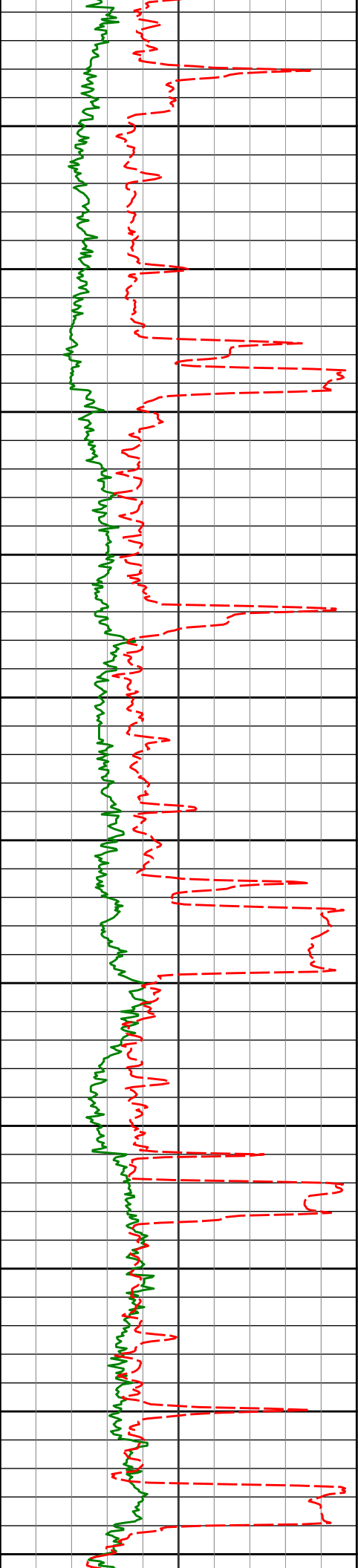
	6059	51.55°	181.40°	5899.09'	96.21'	144.54
						149.14
						149.14
6100						146.84
	6153'	58.93°	183.59°	5948.65'	174.83'	151.47
						156.13
6200						156.13
	6248'	69.27°	184.85°	5990.09'	259.82'	158.47
						156.13
6300						156.13
	6342'	78.20°	181.68°	6016.39'	349.44'	156.13
						160.83
6400	6399'	83.45°	178.78°	6025.48'	404.97'	160.83
						160.83
6450						160.83
	6516'	90.12°	178.65°	6032.03'	519.70'	154.34
						154.34
6550						154.34
						150.13
6600						



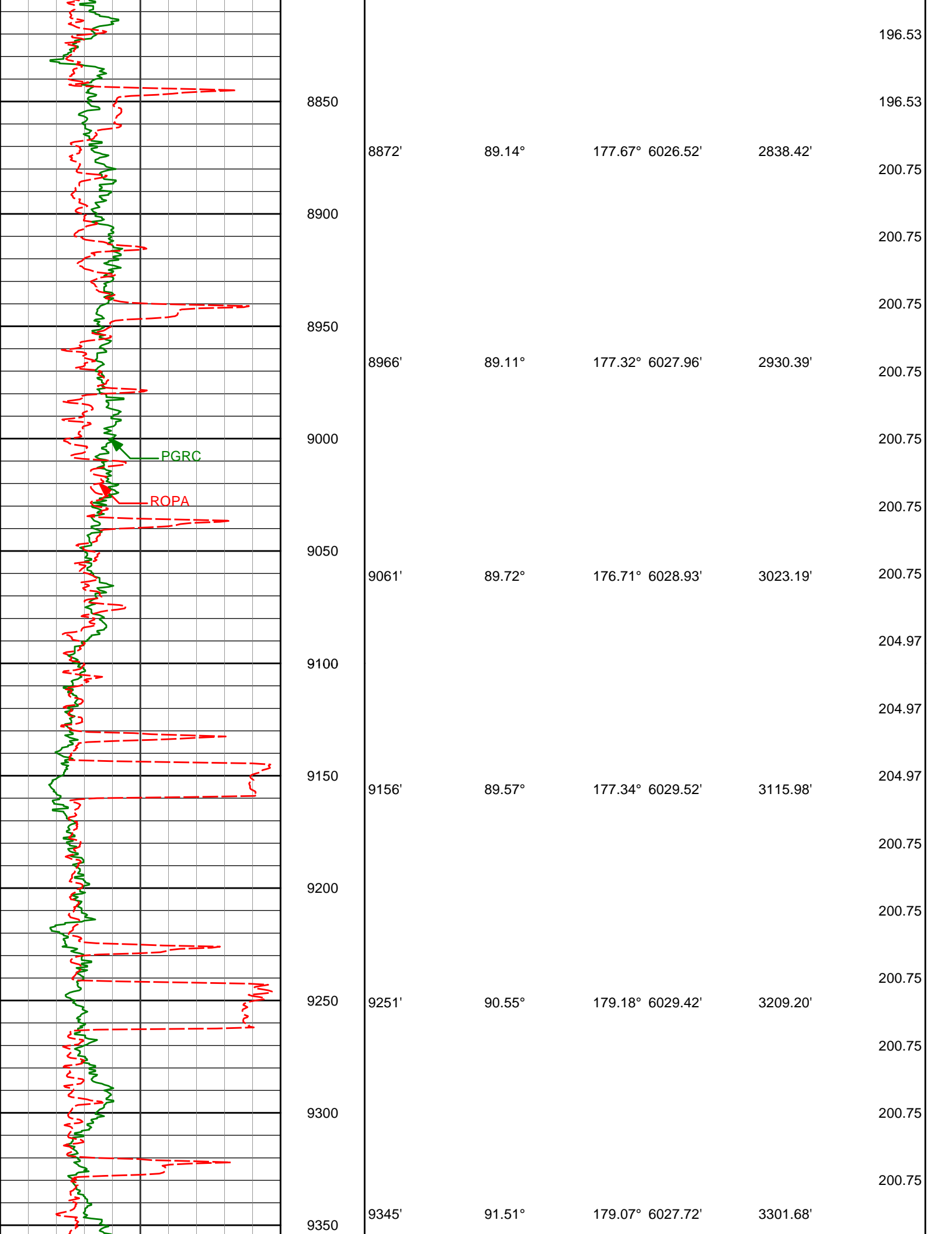


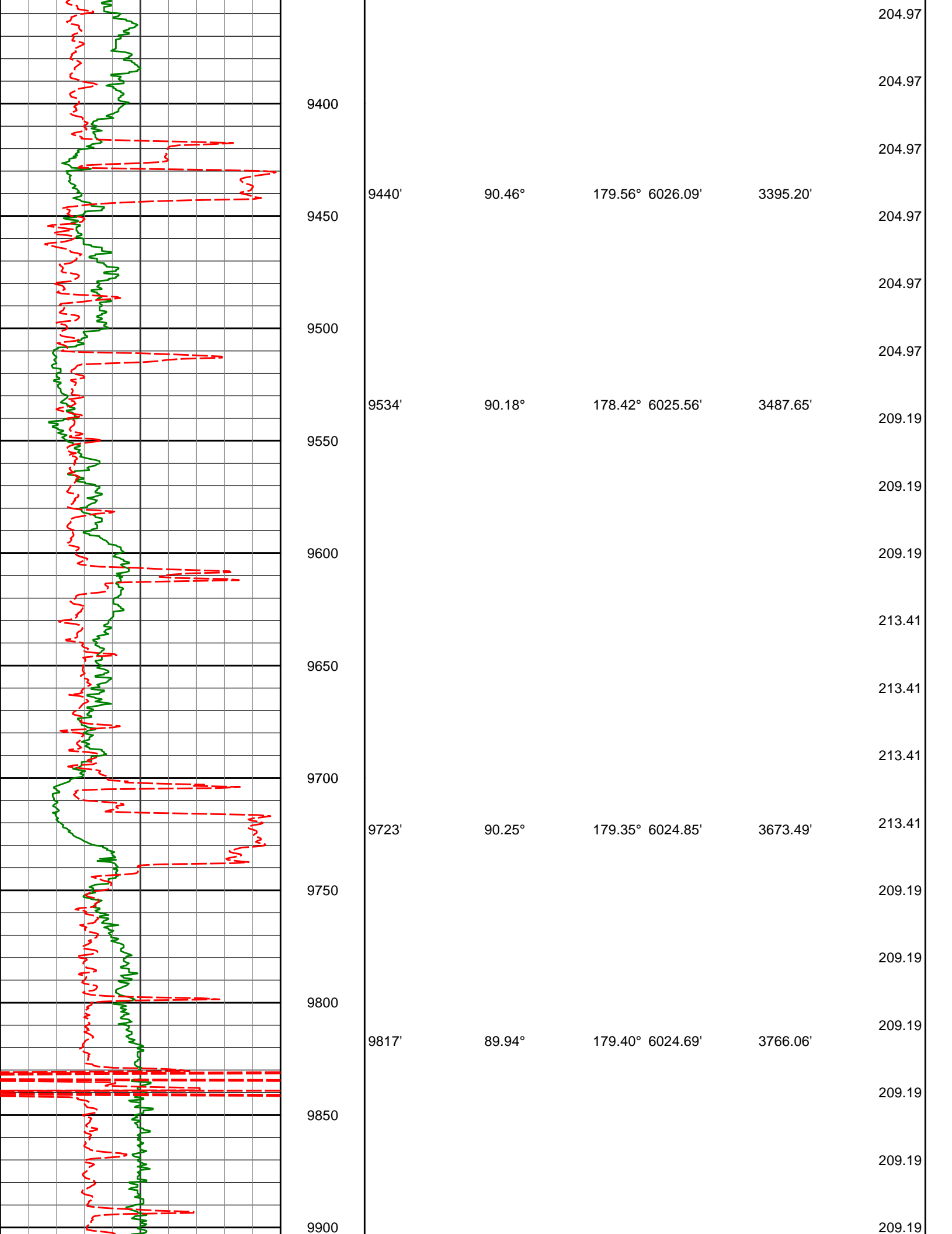
	7171'	89.75°	177.22°	6031.91'	1162.31'	179.66
7200						179.66
						179.66
7250						179.66
						179.66
7300						179.66
						179.66
7350						179.66
	7360'	89.35°	179.50°	6033.38'	1347.81'	183.88
7400						183.88
						183.88
7450	7455'	88.98°	178.98°	6034.76'	1441.31'	183.88
						183.88
7500						183.88
						183.88
7550	7549'	90.31°	180.17°	6035.35'	1533.93'	188.09
						188.09
7600						188.09
						188.09
7650	7643'	90.89°	180.57°	6034.36'	1626.77'	188.09
						188.09
7700						188.09

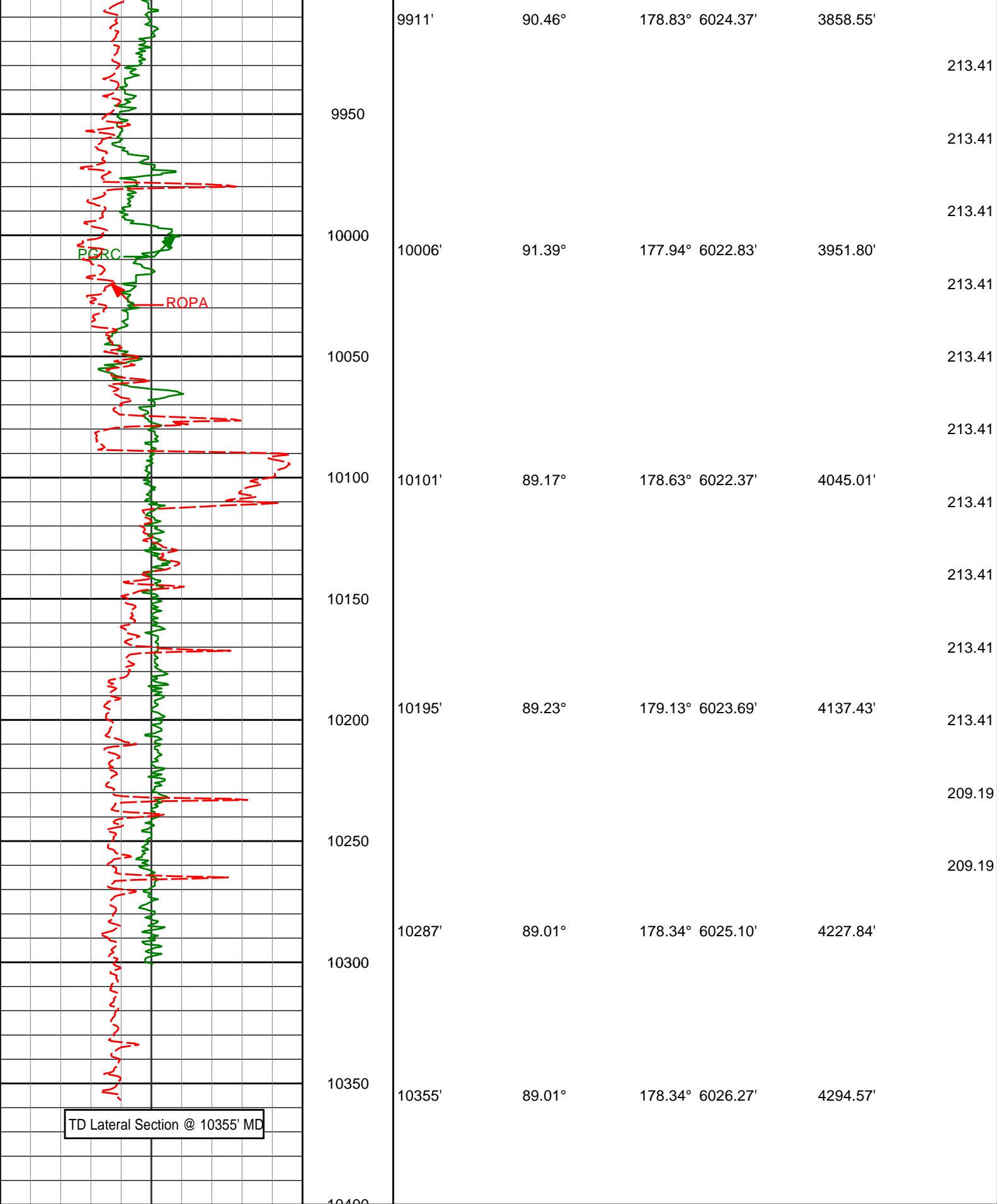




						196.53
8300	8306'	90.52°	178.76°	6029.52'	2280.59'	196.53
						196.53
8350						196.53
						196.53
8400	8400'	90.28°	179.55°	6028.86'	2373.09'	196.53
						196.53
8450						196.53
						196.53
8500	8494'	91.91°	181.88°	6027.07'	2465.99'	196.53
						200.75
8550						200.75
						200.75
8600	8588'	90.25°	180.97°	6025.30'	2559.07'	196.53
						196.53
8650						196.53
						196.53
8700	8683'	90.03°	179.15°	6025.07'	2652.81'	196.53
						196.53
8750						196.53
						196.53
8800	8777'	89.54°	178.66°	6025.42'	2745.24'	196.53

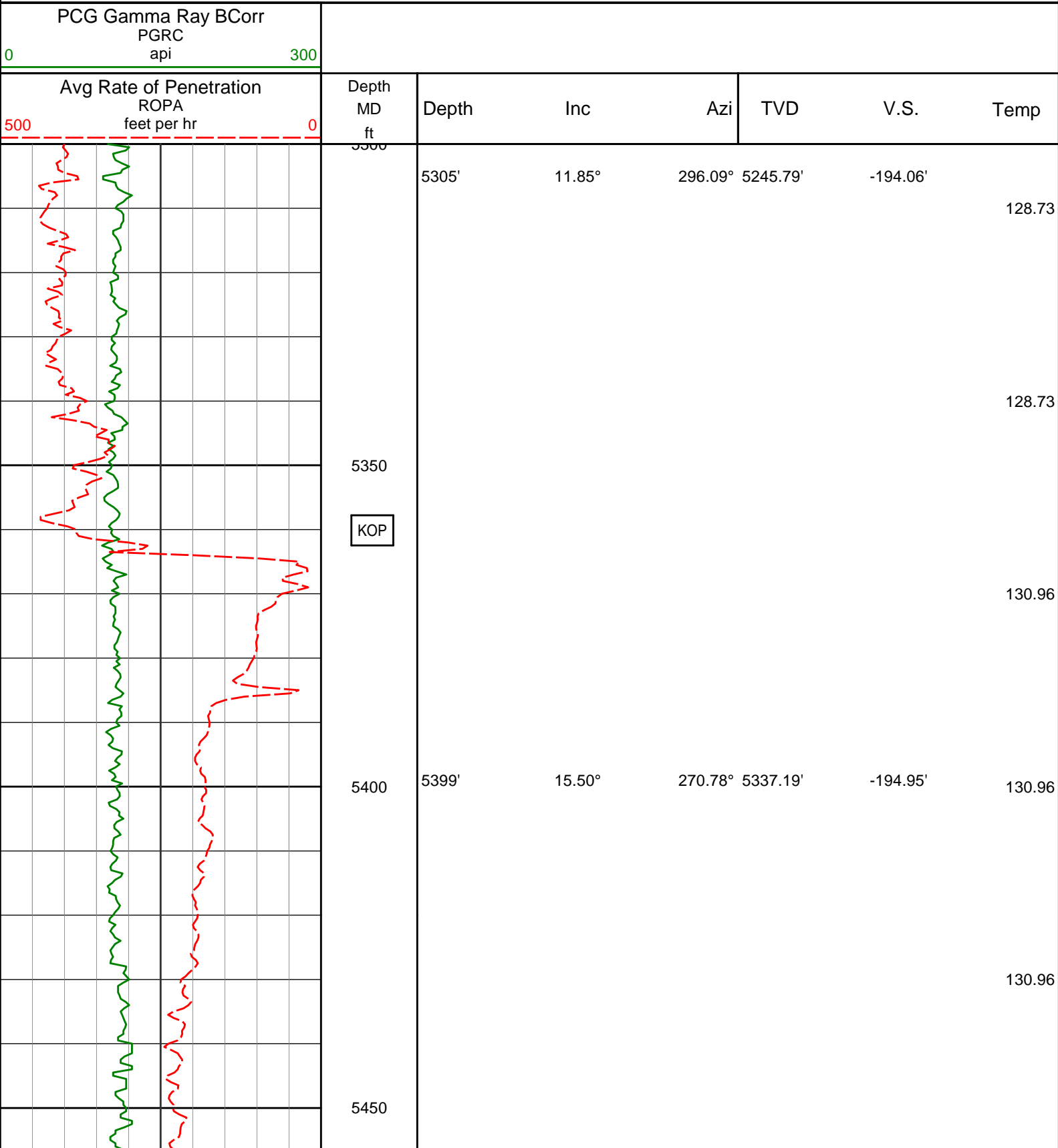


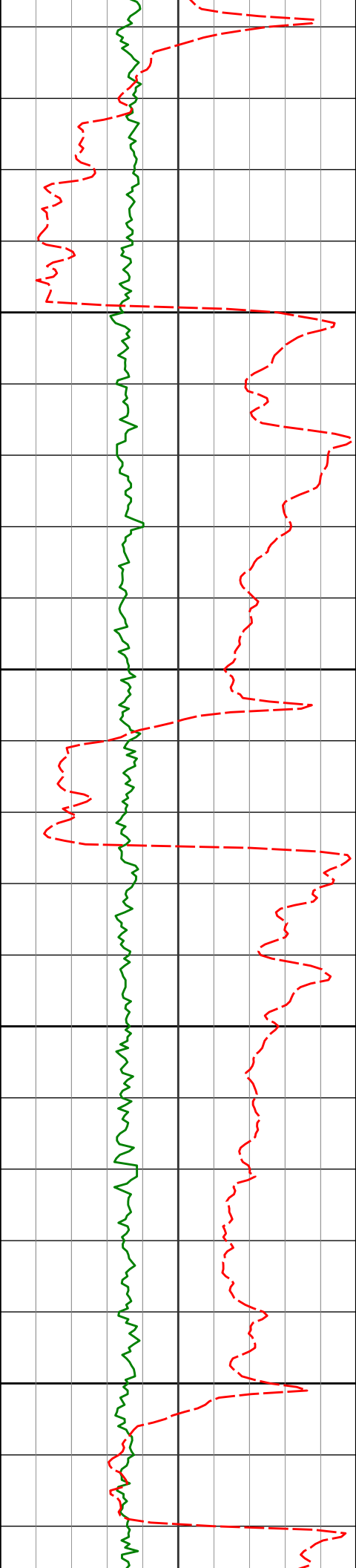




Avg Rate of Penetration ROPA feet per hr		Depth MD ft	Inc	Azi	TVD	V.S.	Temp
500		0					
PCG Gamma Ray BCorr PGRC api							
0		300					

MD Detail 1:240 Scale





5500

5550

5600

5650

5494'

21.00°

252.87° 5427.45'

-185.45'

5588'

24.99°

230.87° 5514.13'

-163.01'

133.20

133.20

137.70

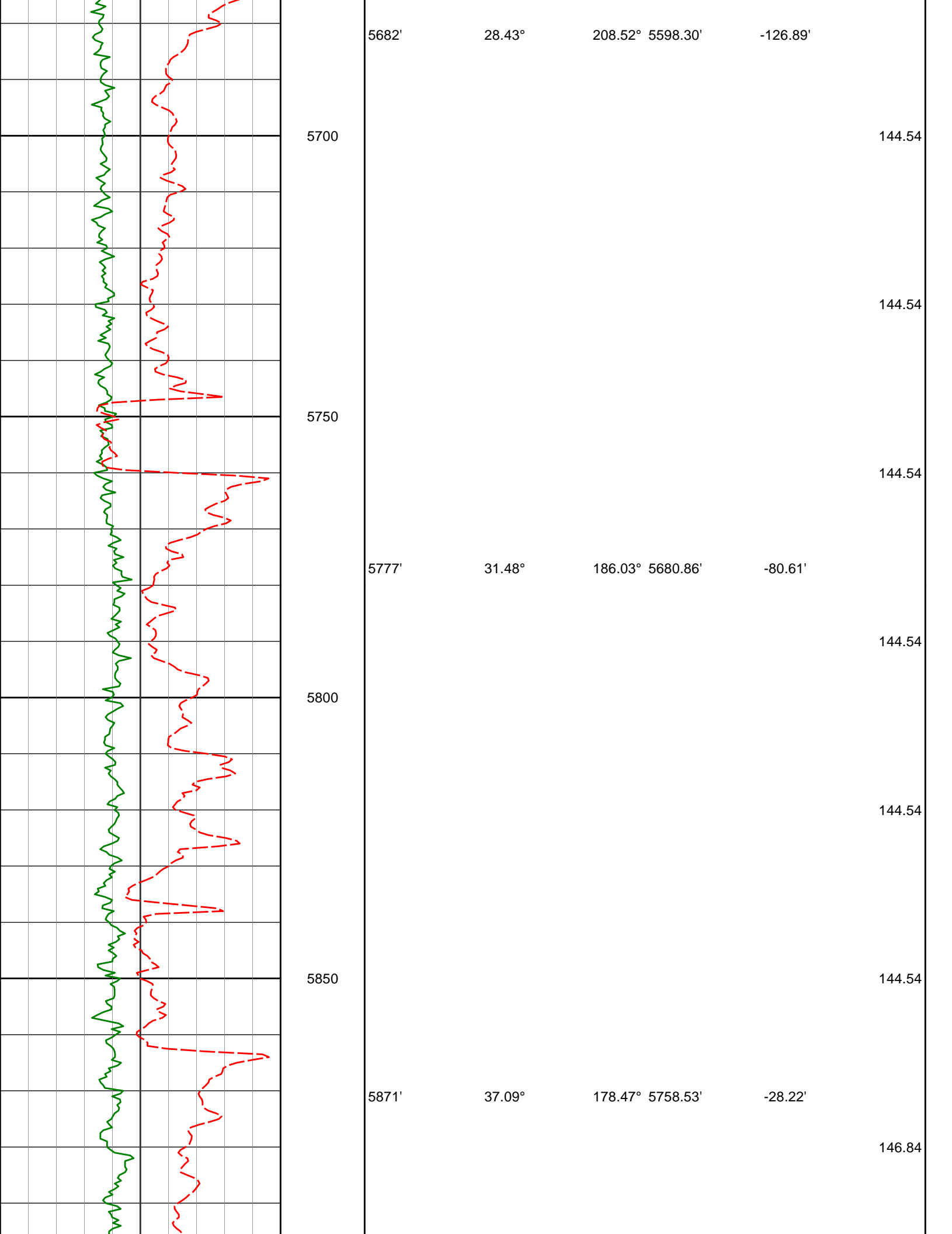
139.96

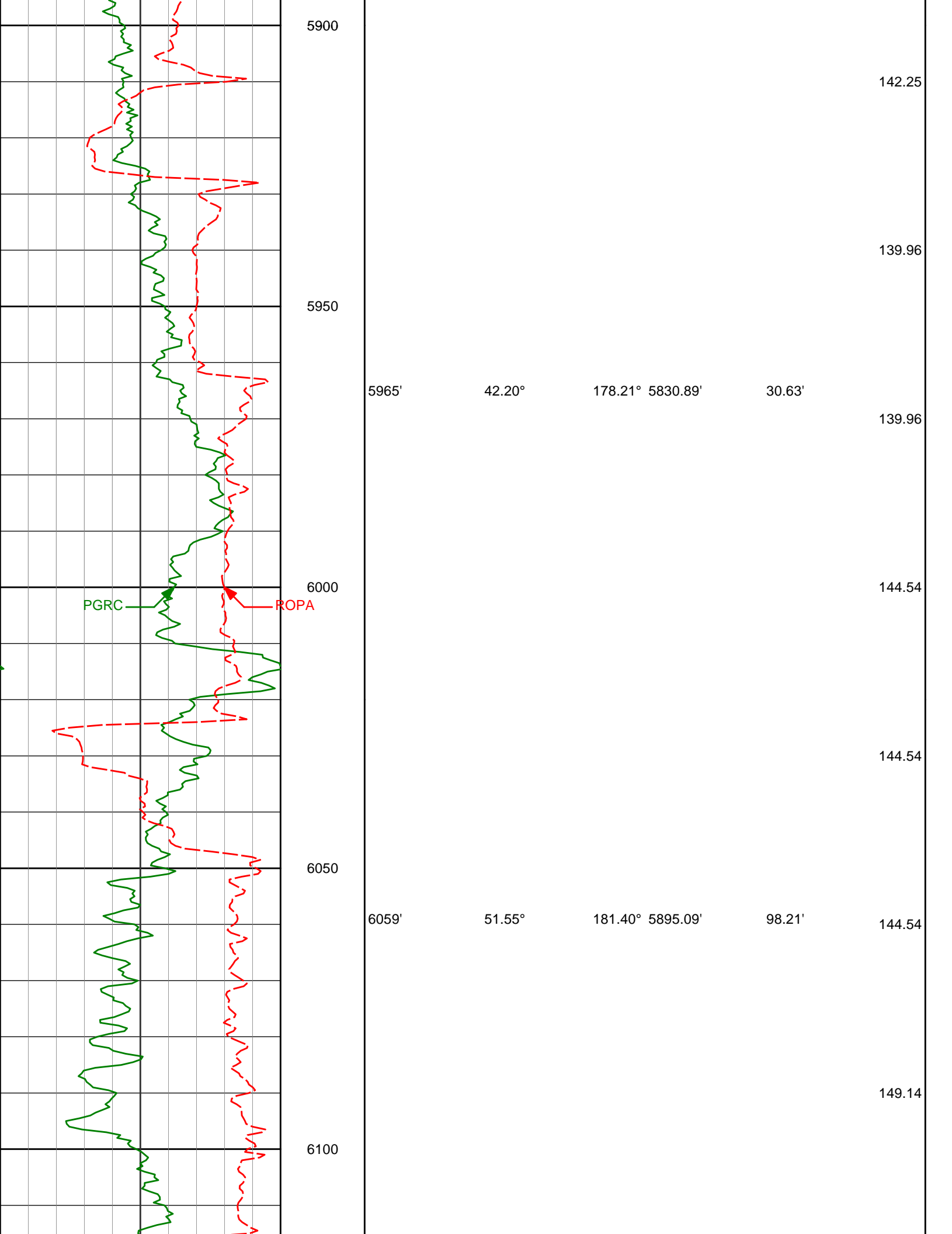
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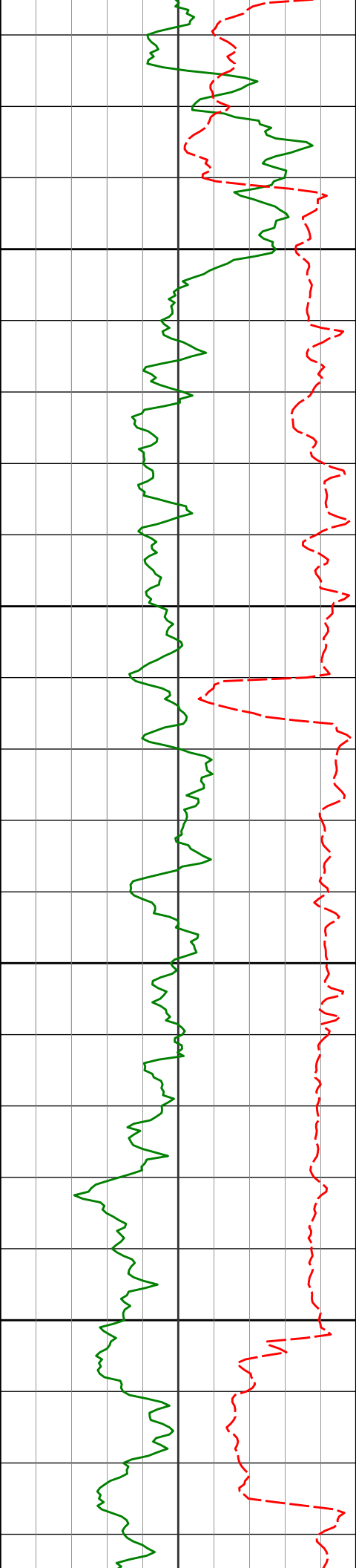
142.25

142.25

142.25







6150

6200

6250

6300

6153'

6248'

58.93°

69.27°

183.59° 5948.65'

184.85° 5990.09'

174.83'

259.82'

149.14

146.84

151.47

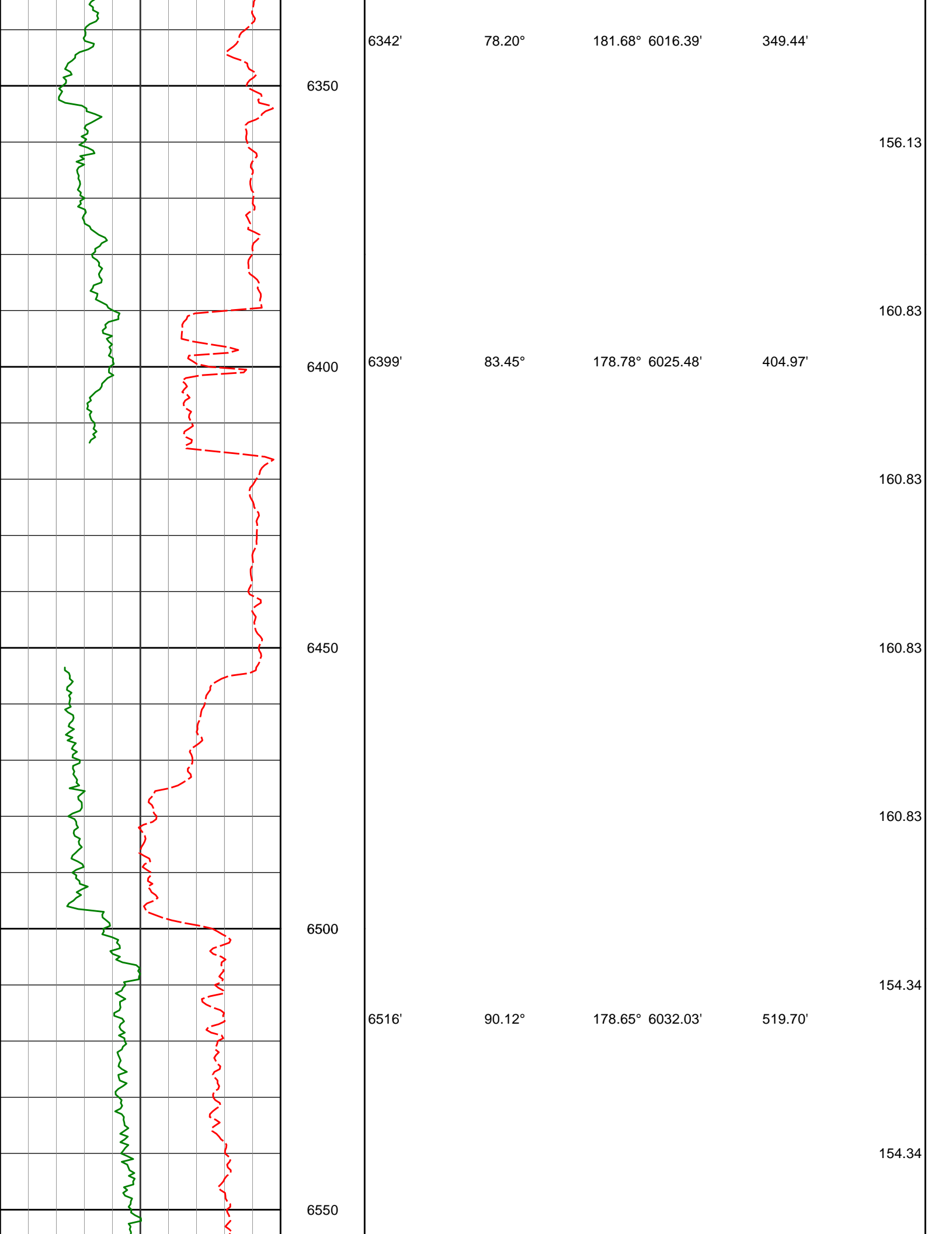
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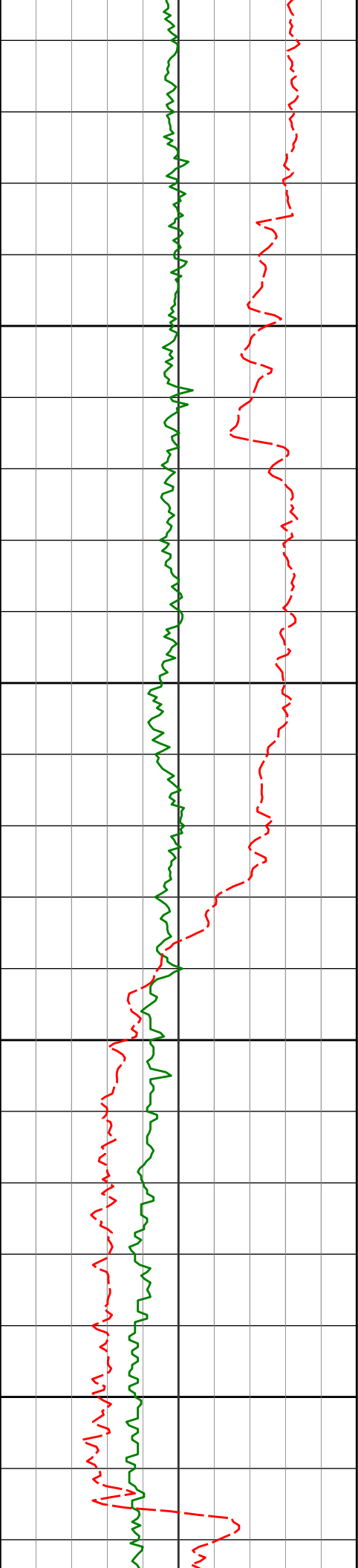
156.13

158.47

156.13

156.13





6600

6650

6700

6750

6698'

89.97°

178.21° 6031.88'

698.38'

154.34

150.13

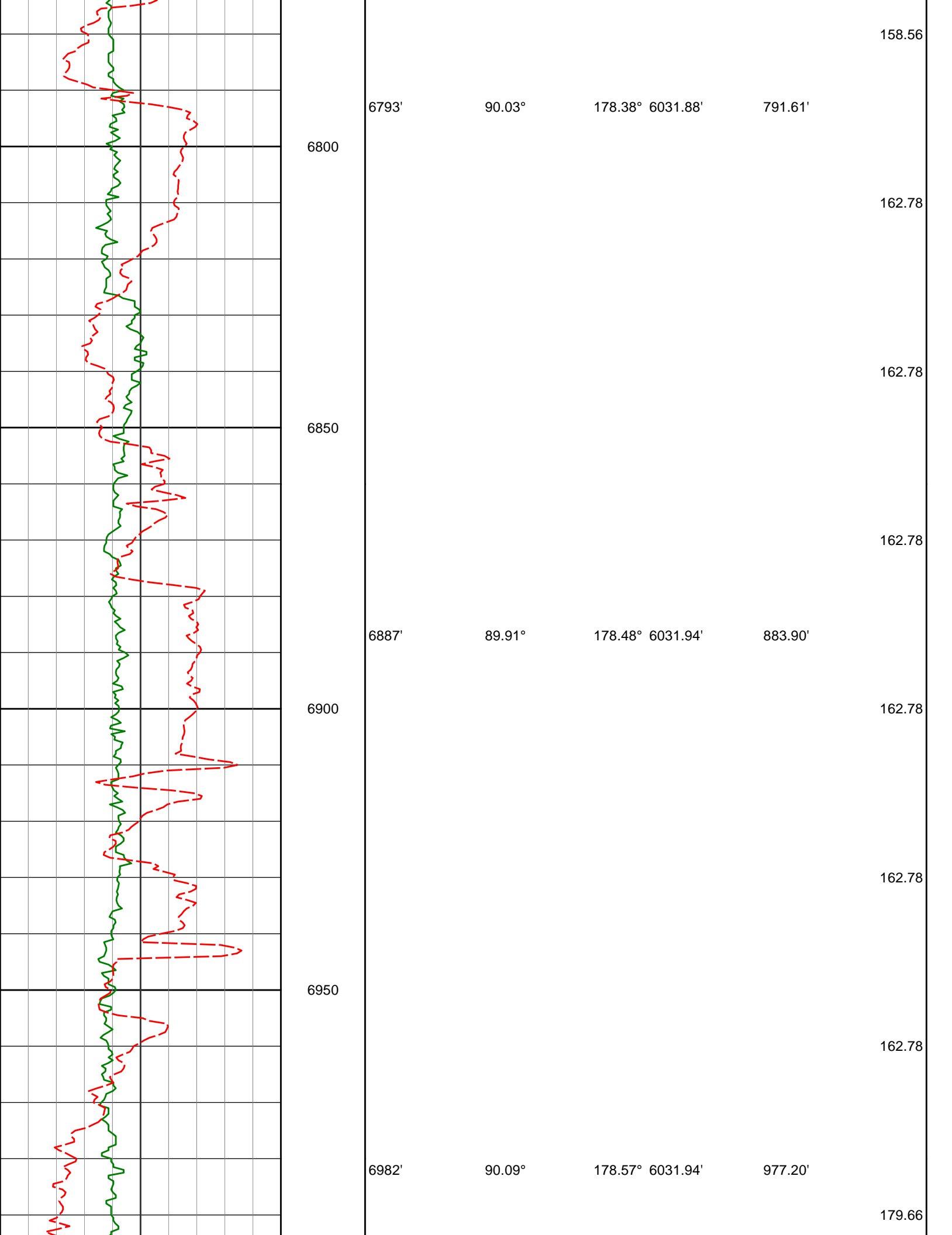
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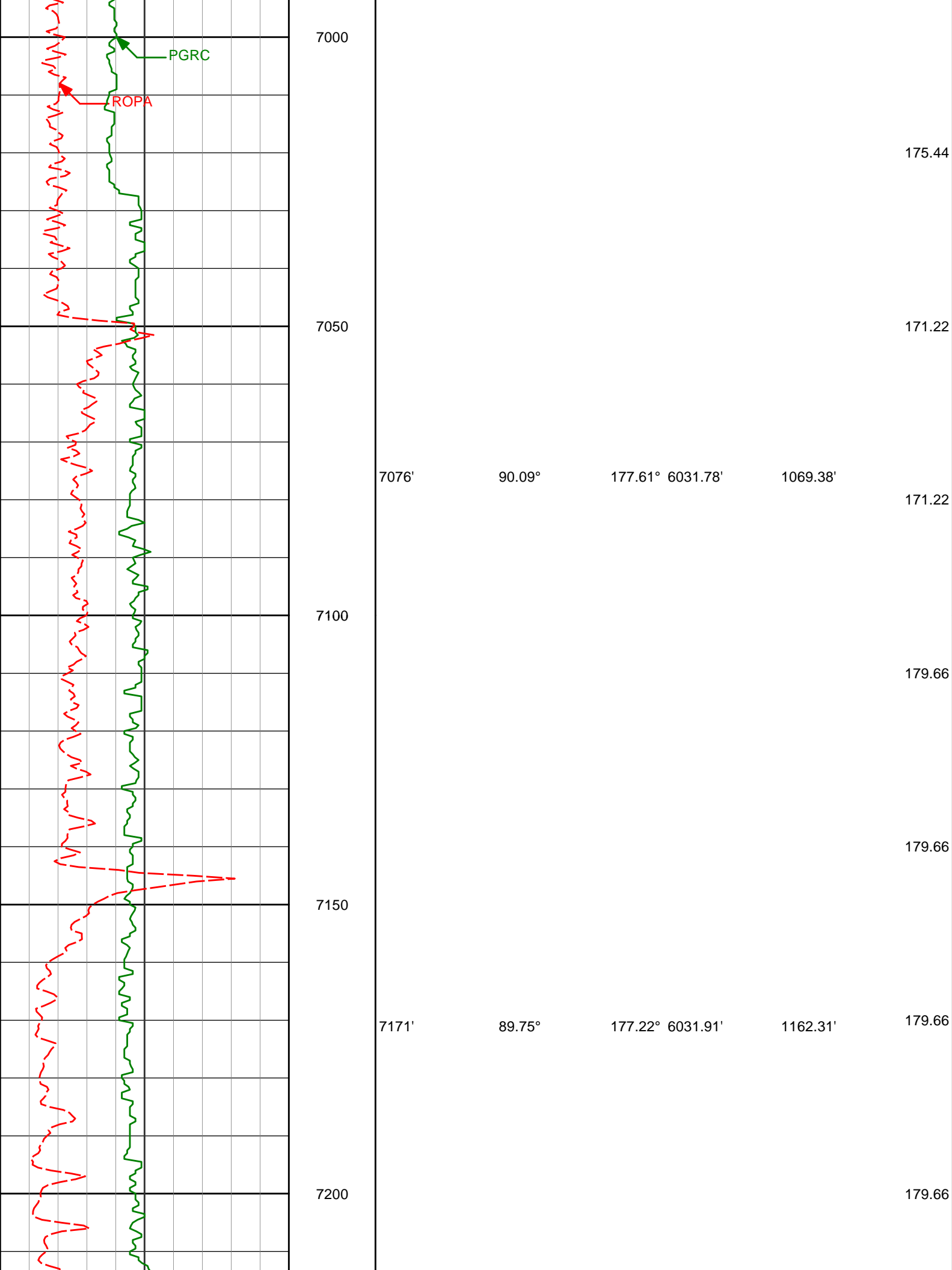
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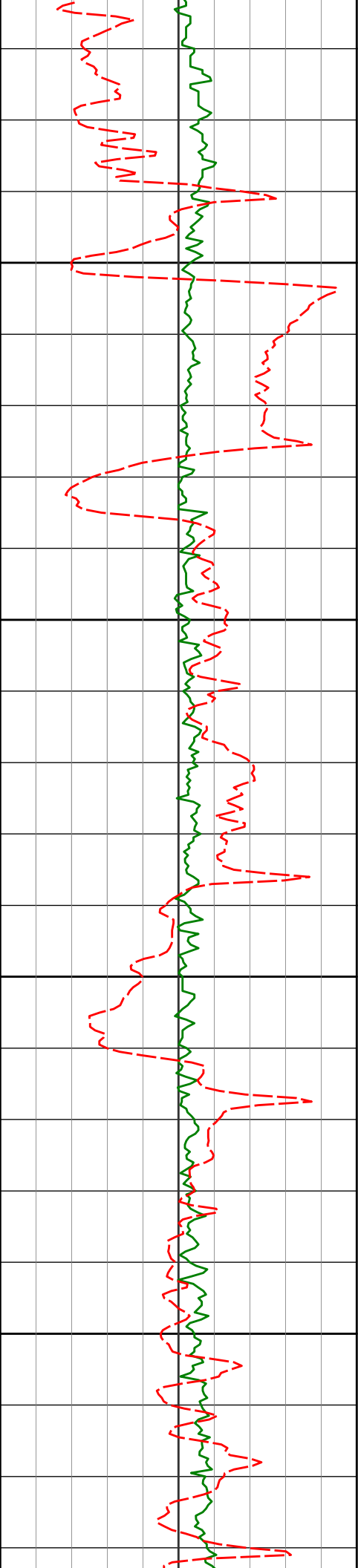
150.13

158.56

158.56







7250

7300

7350

7400

7360'

89.35°

179.50° 6033.38'

1347.81'

179.66

179.66

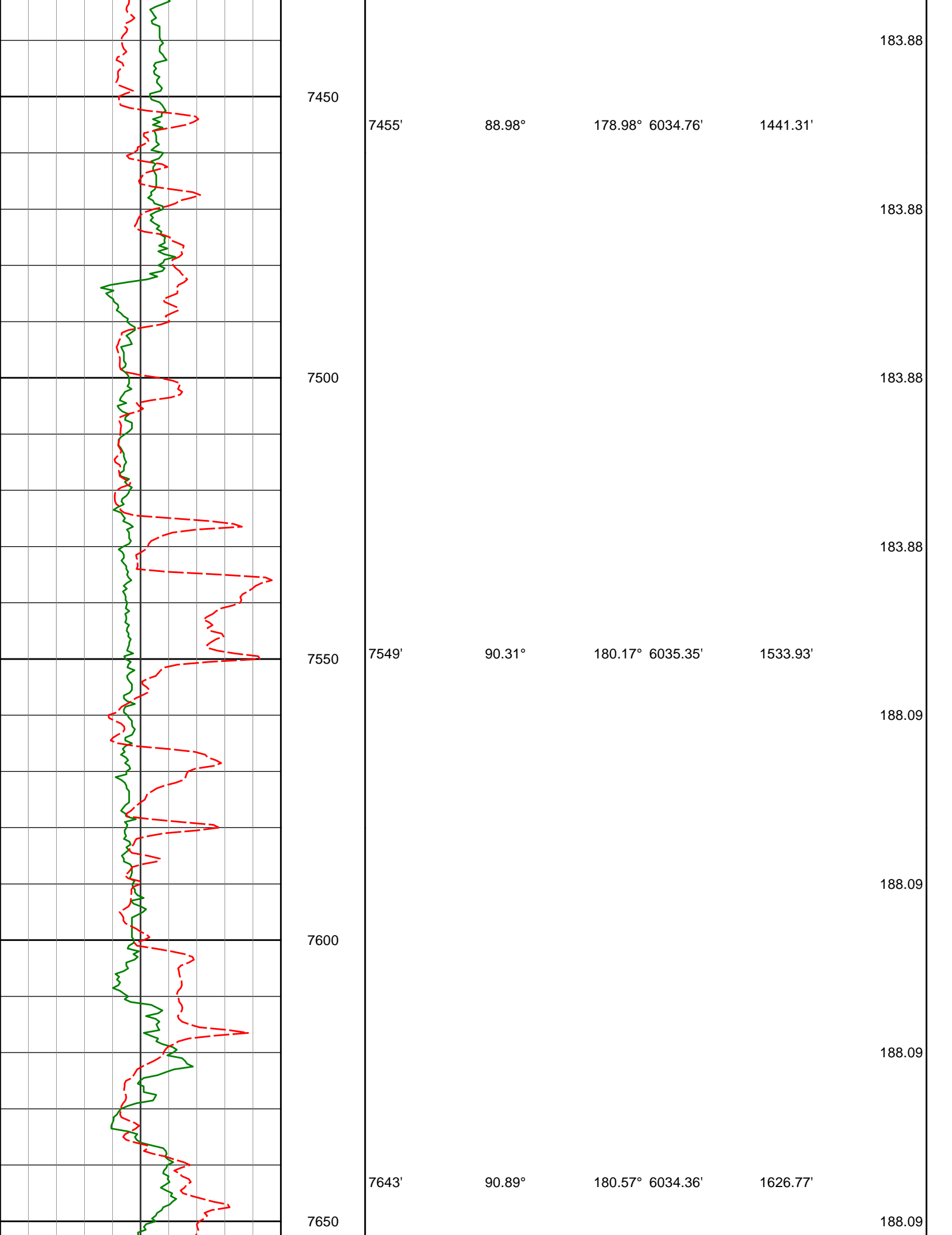
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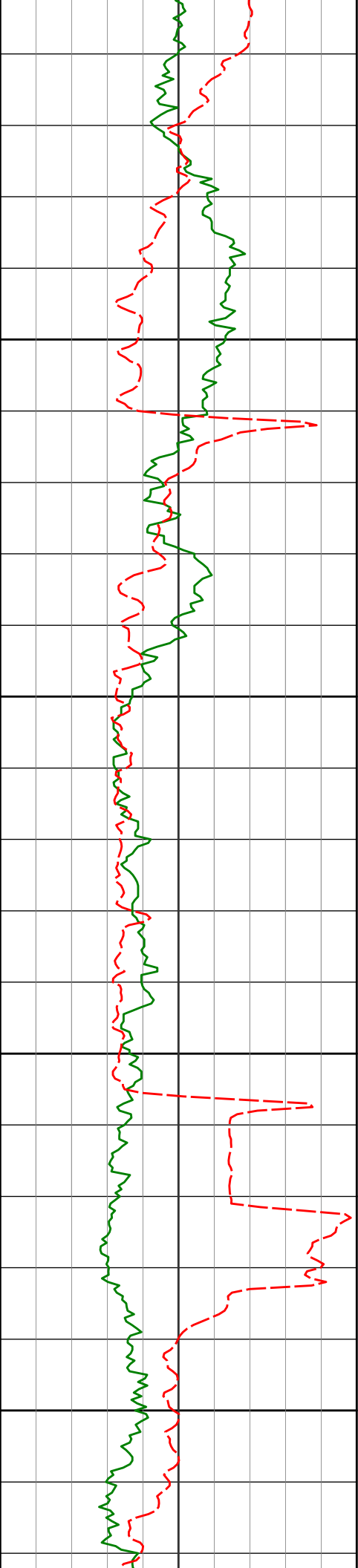
179.66

179.66

183.88

183.88





7700

7750

7800

7850

7738'

91.11°

180.34° 6032.70'

1720.61'

7833'

90.65°

180.40° 6031.24'

1814.42'

188.09

188.09

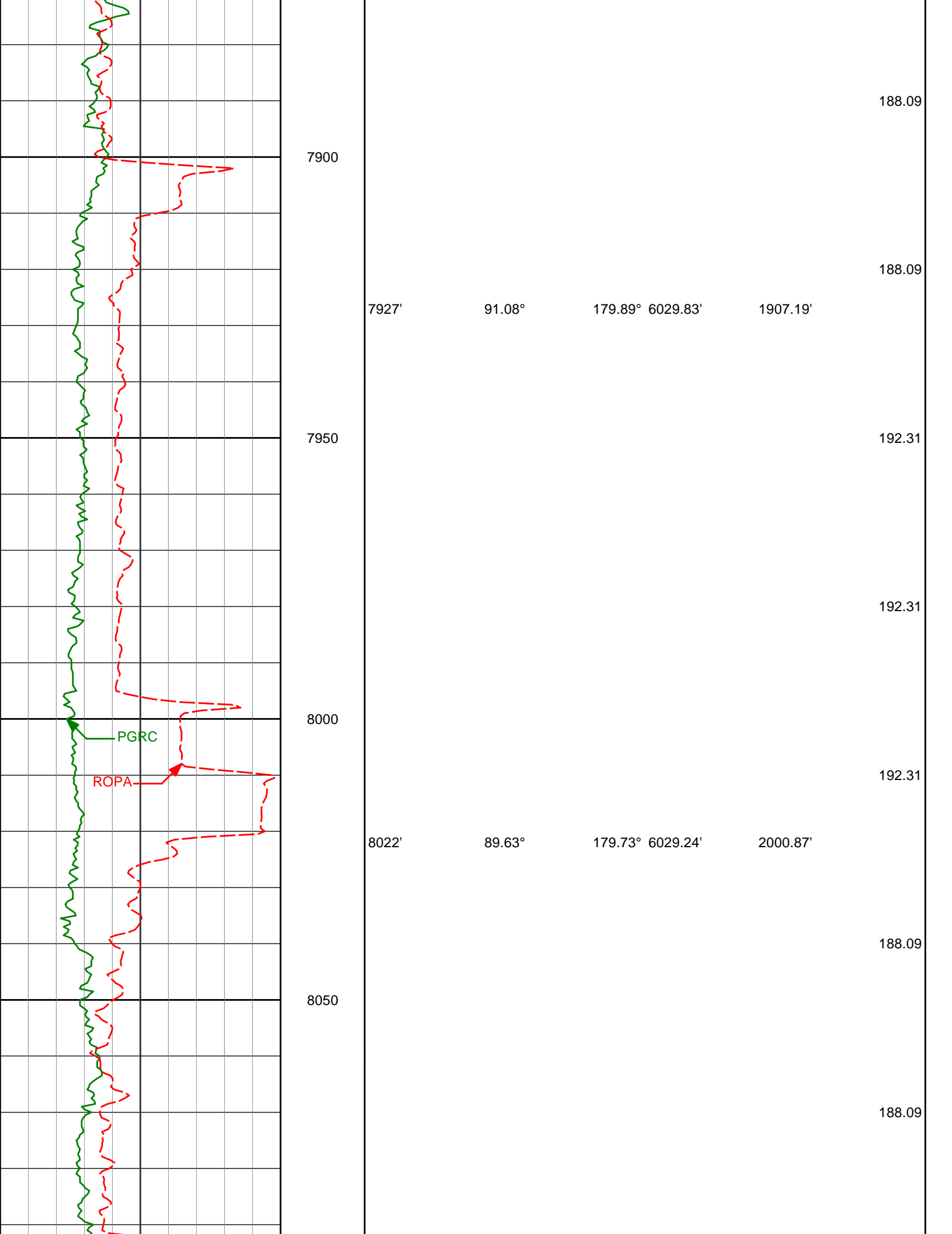
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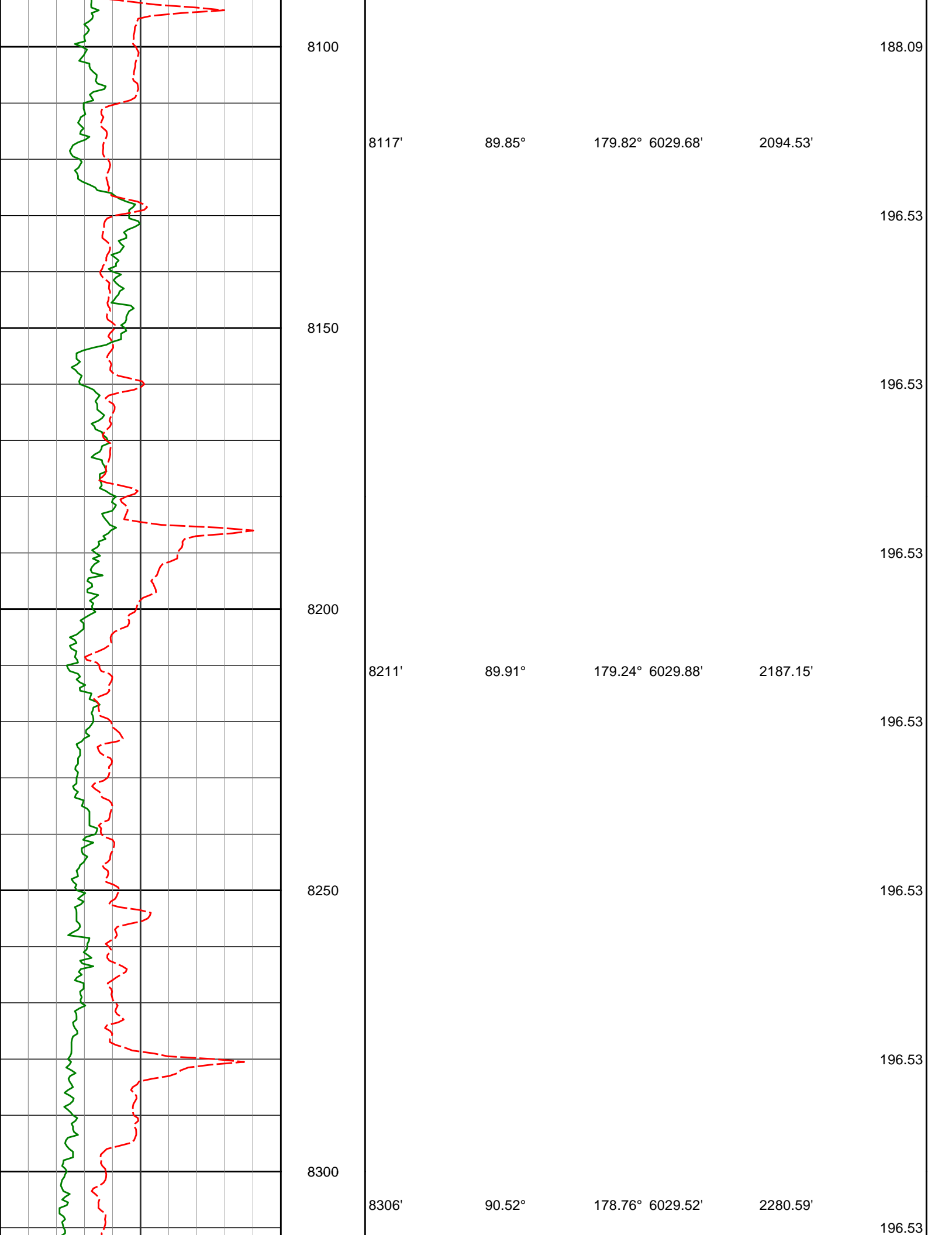
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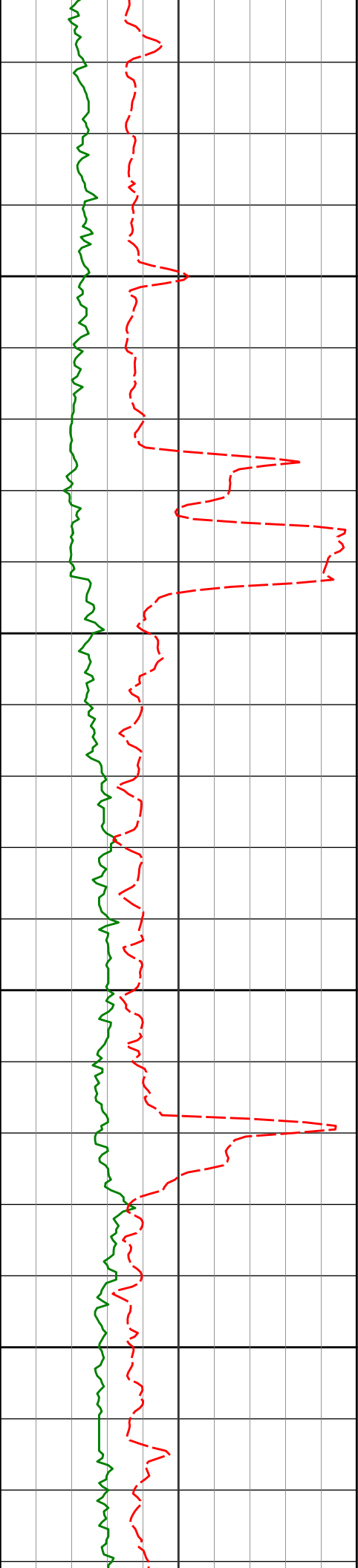
188.09

188.09

188.09







8350

8400

8450

8500

8400'

8494'

90.28°

91.91°

179.55° 6028.86'

181.88° 6027.07'

2373.09'

2465.99'

196.53

196.53

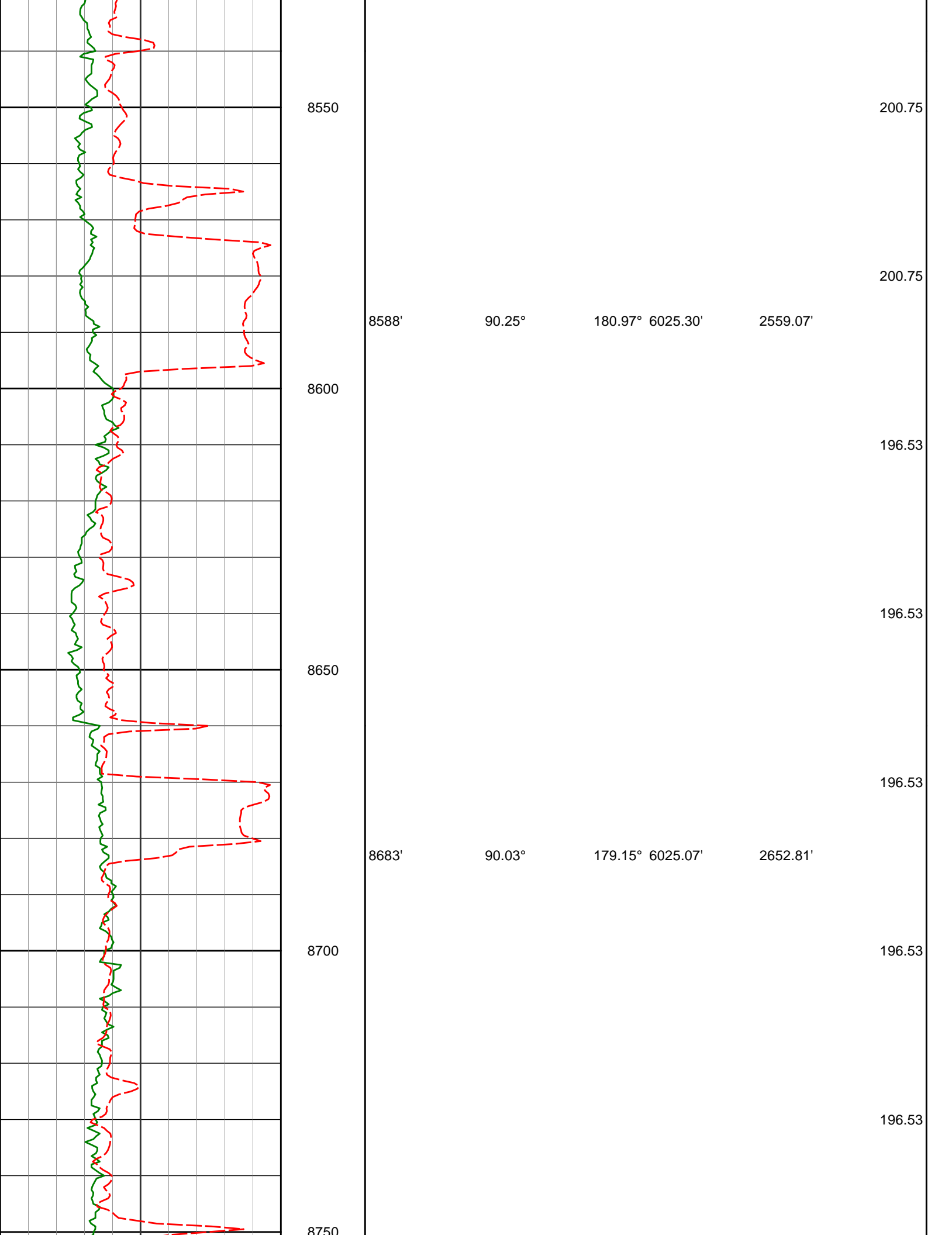
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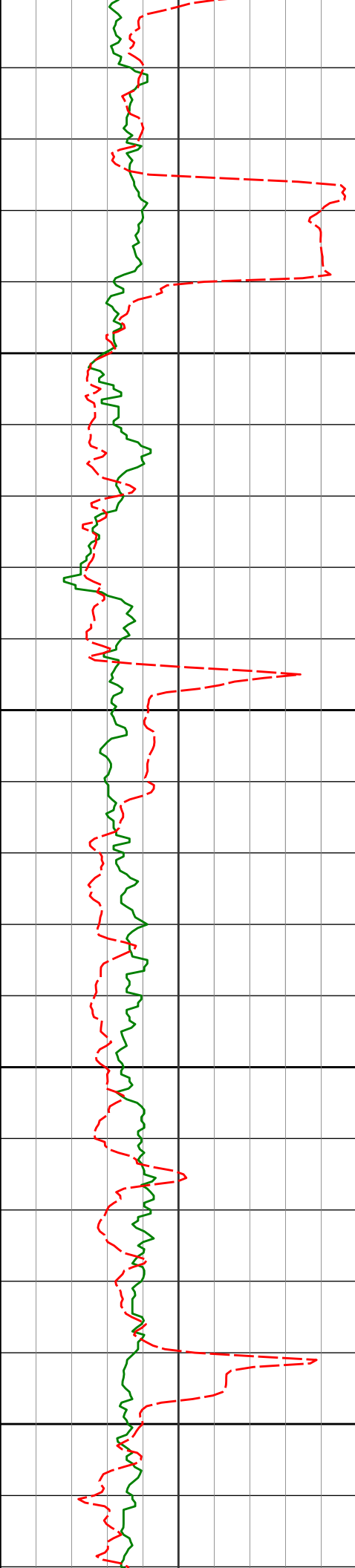
196.53

196.53

196.53

200.75





8750
8800
8850
8900
8950

8777'

89.54°

178.66° 6025.42'

2745.24'

8872'

89.14°

177.67° 6026.52'

2838.42'

8966'

89.11°

177.32° 6027.96'

2930.39'

196.53

196.53

196.53

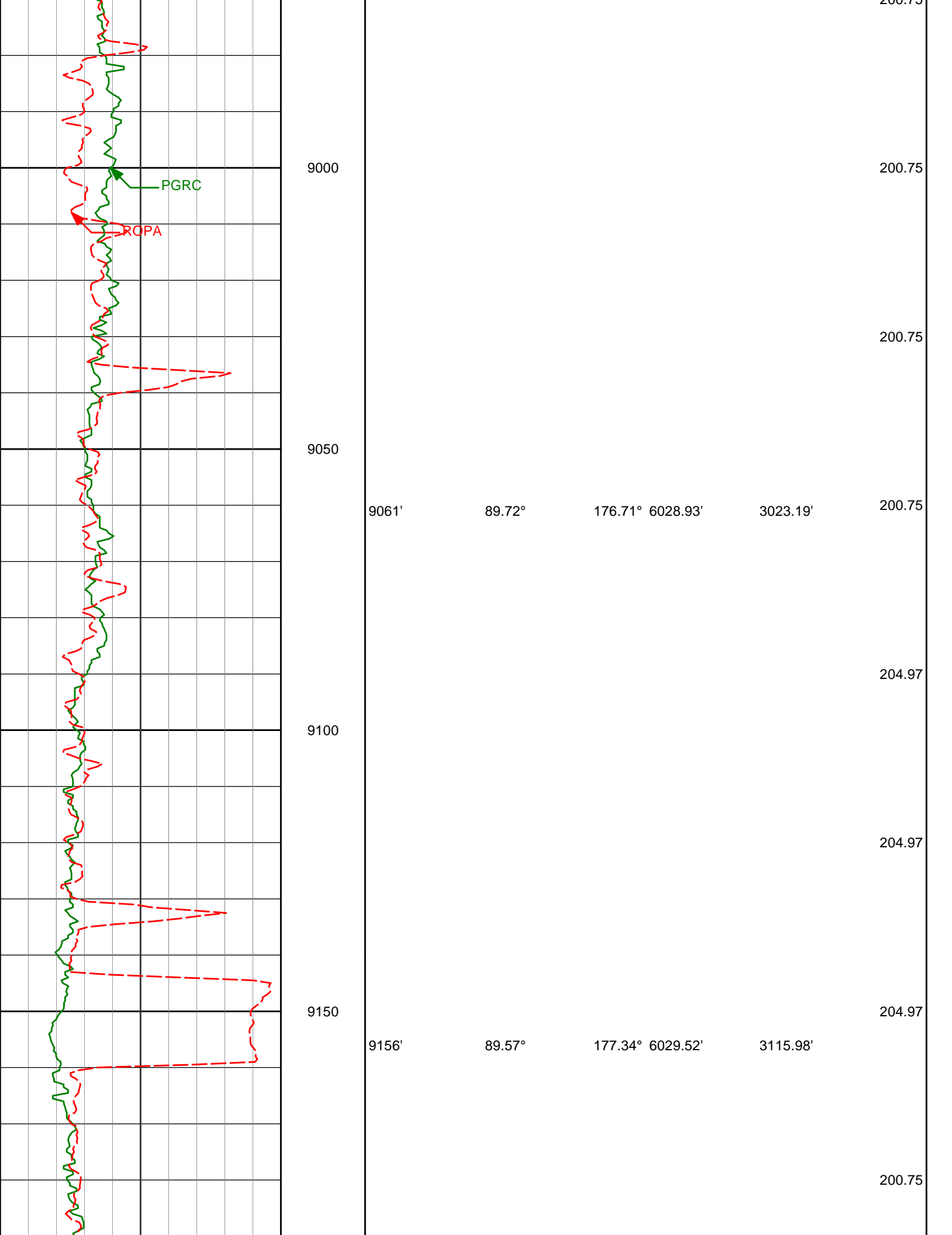
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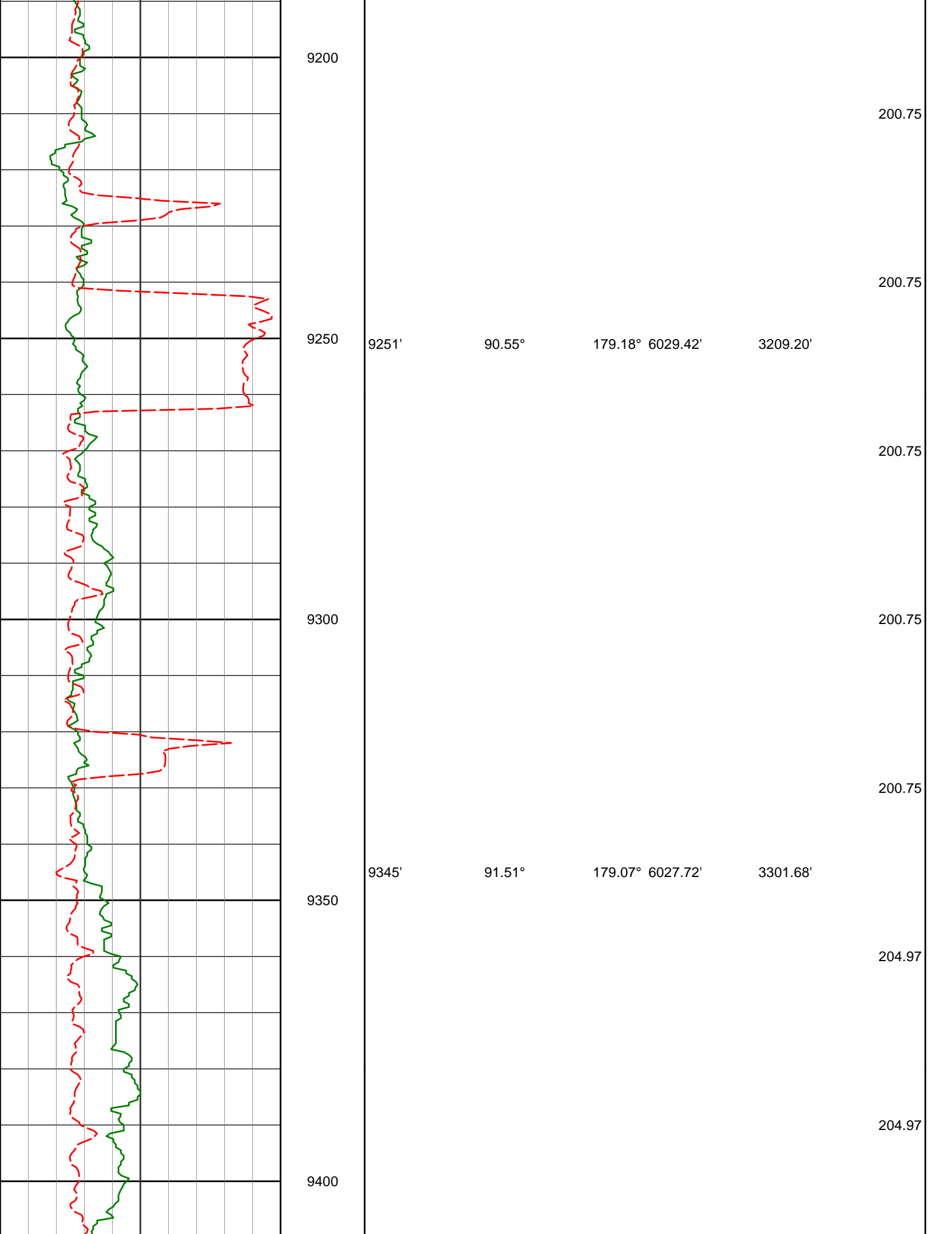
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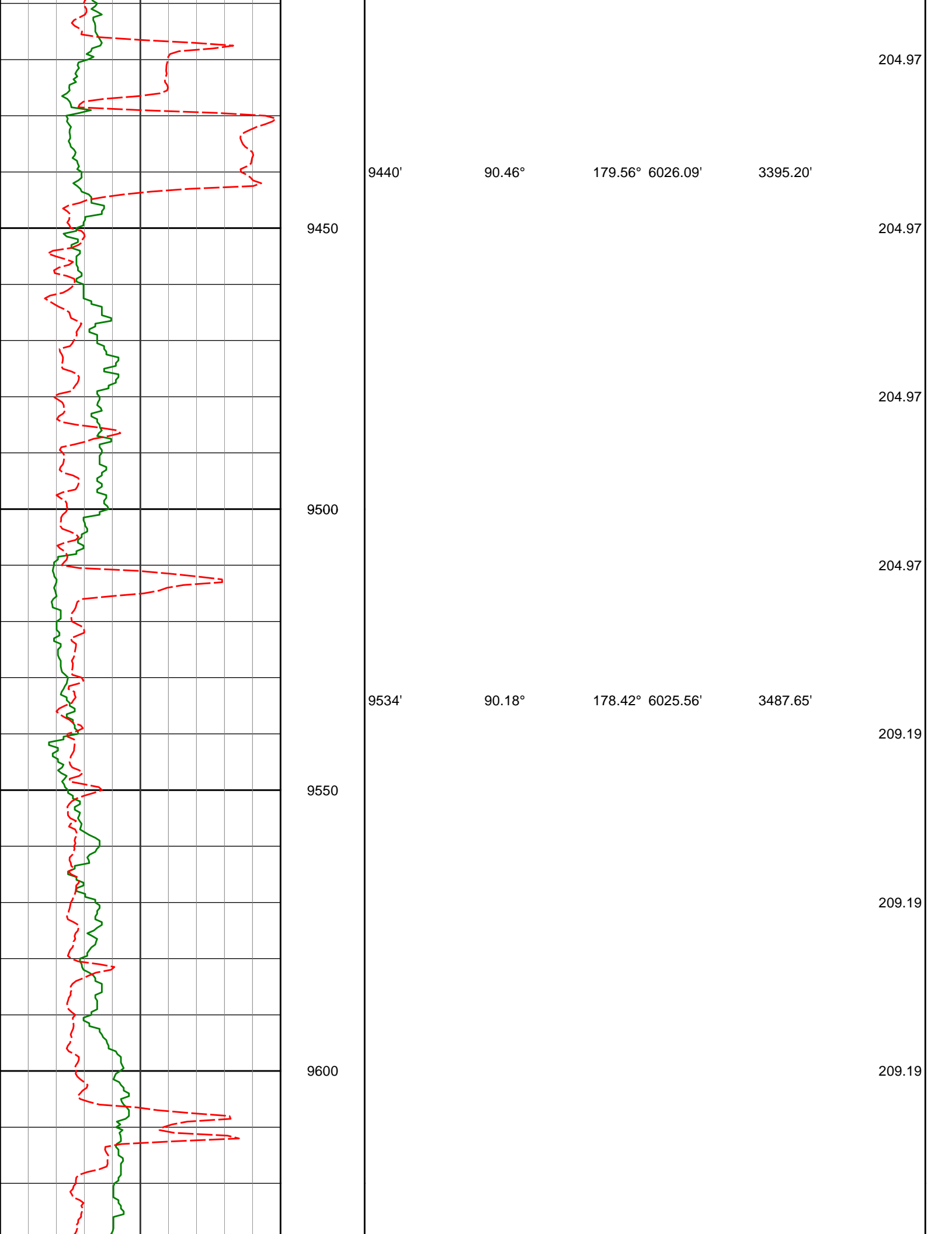
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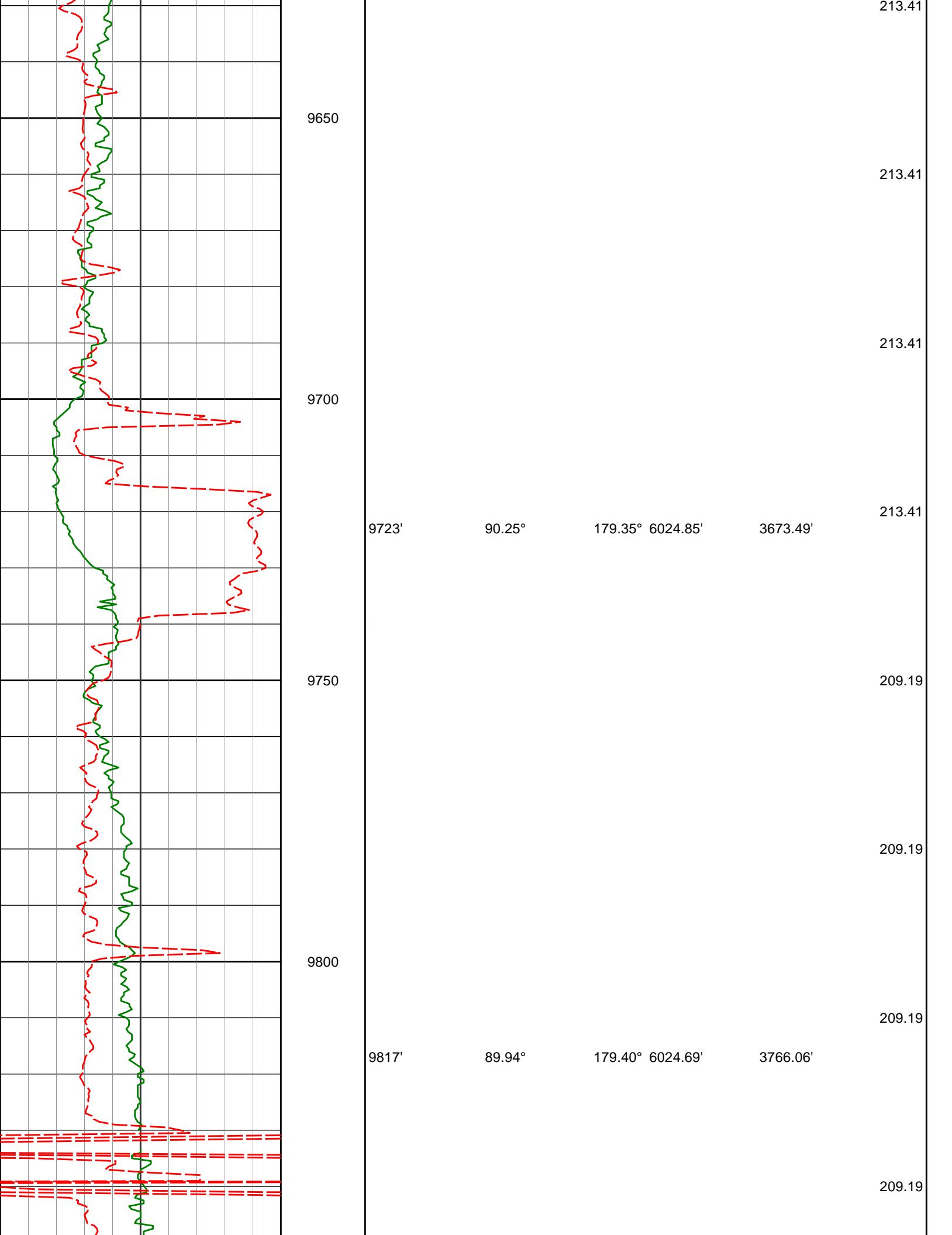
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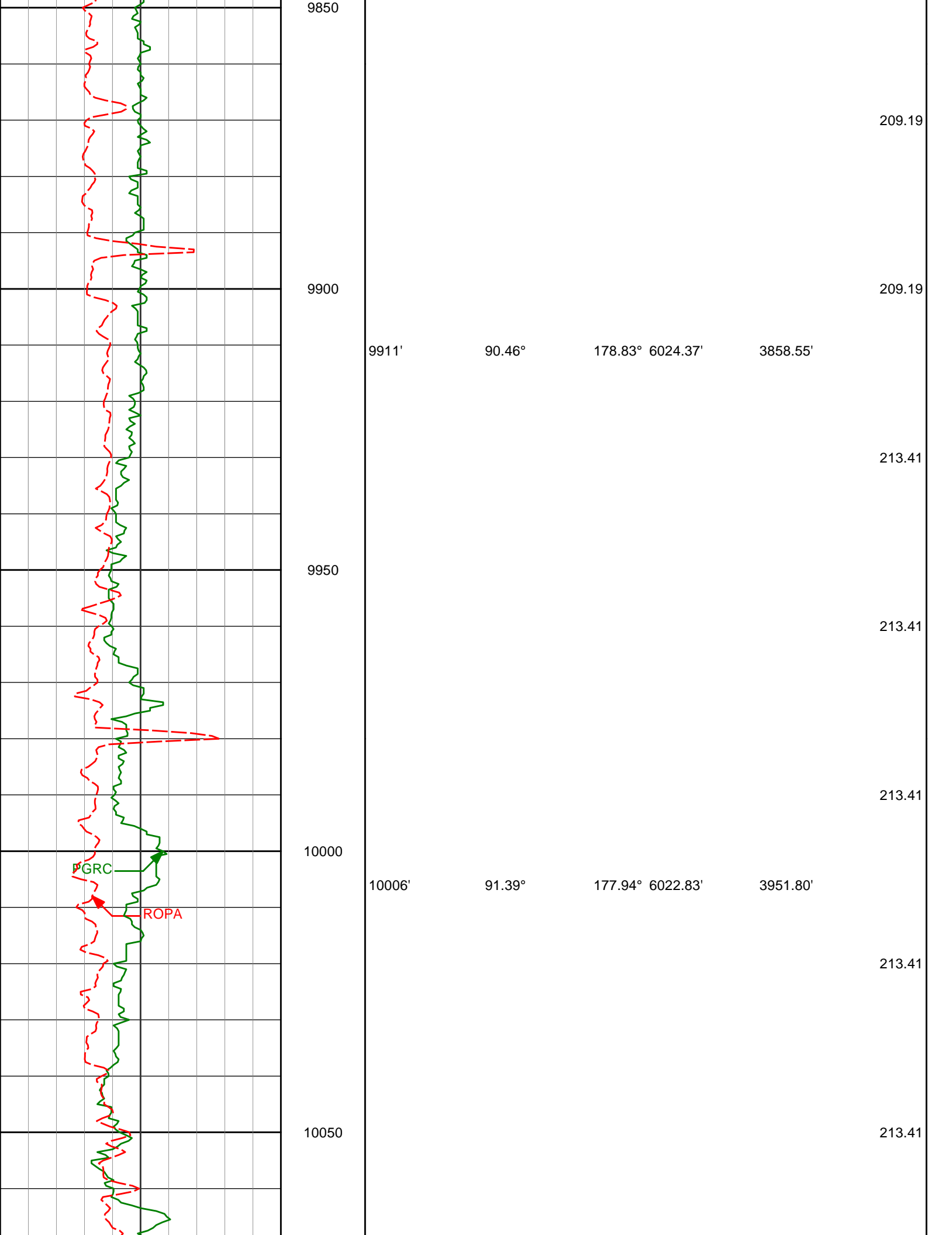
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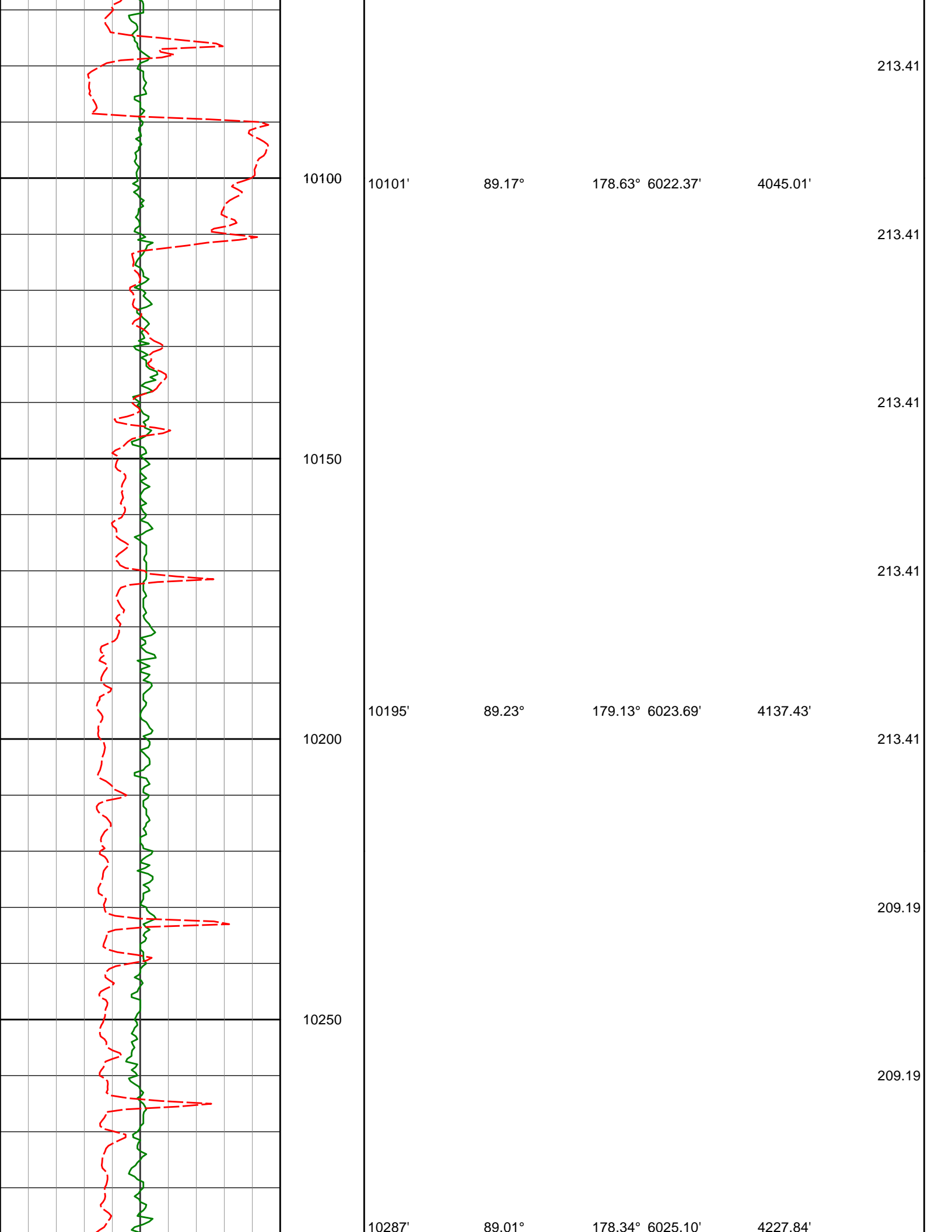


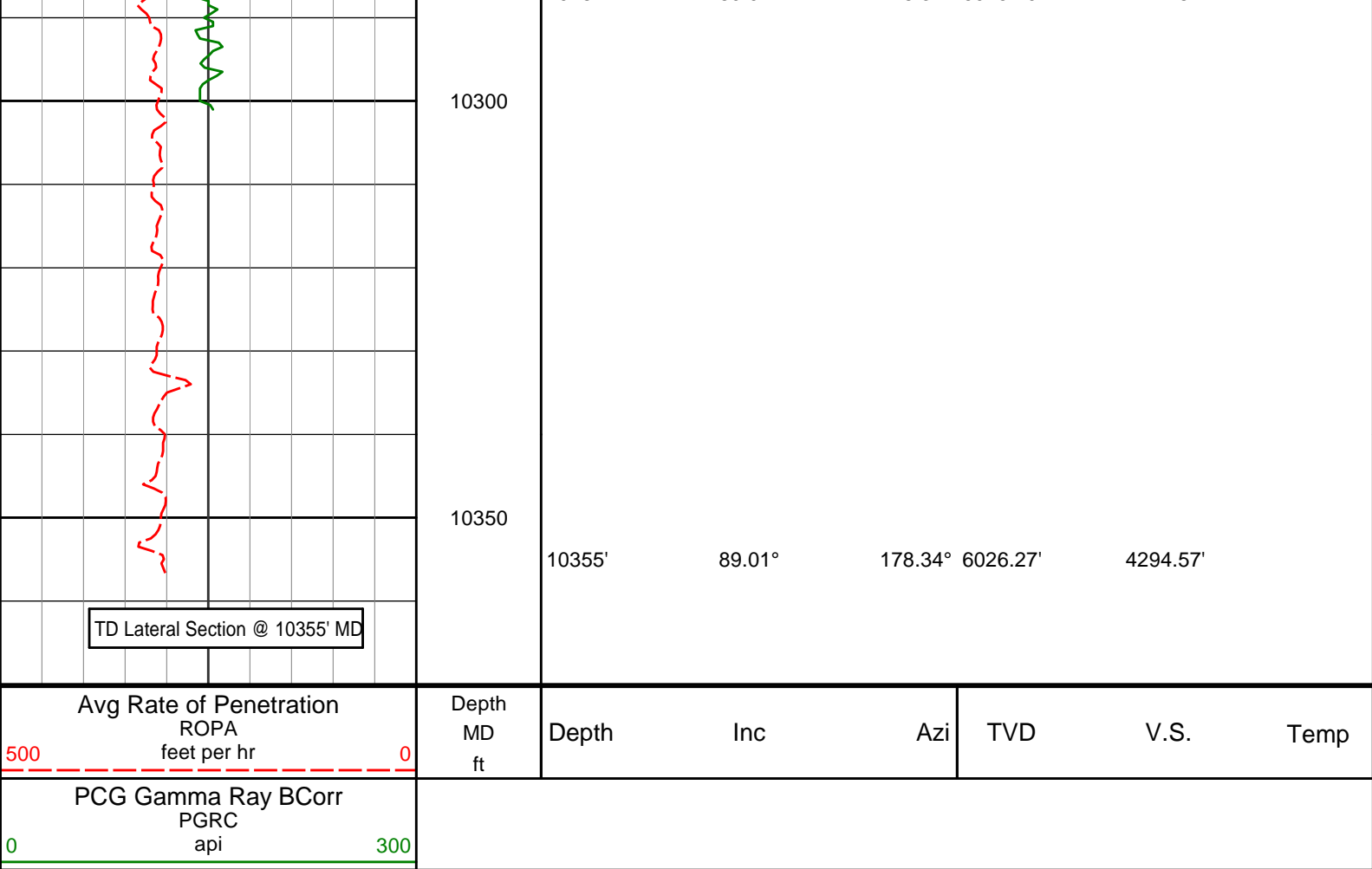












HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Remora LC34-745
Wattenberg
Weld Colorado
USA
CA-XX-0902986605

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
250.00	0.07	159.97	250.00	0.14 S	0.05 E	0.13	0.03
500.00	0.14	159.97	500.00	0.57 S	0.21 E	0.53	0.03
618.00	0.17	159.97	618.00	0.87 S	0.32 E	0.81	0.03
632.00	0.22	159.78	632.00	0.92 S	0.34 E	0.85	0.39
726.00	0.28	158.86	726.00	1.31 S	0.48 E	1.21	0.06
915.00	0.31	155.88	915.00	2.22 S	0.86 E	2.05	0.02
1009.00	2.87	309.91	1008.96	0.94 S	0.84 W	1.07	3.36
1103.00	5.11	307.43	1102.73	3.11 N	5.97 W	-2.10	2.38
1195.00	6.37	311.12	1194.26	8.96 N	13.07 W	-6.71	1.43
1287.00	7.95	309.75	1285.54	16.39 N	21.81 W	-12.61	1.72
1379.00	10.66	302.82	1376.33	25.07 N	33.85 W	-19.21	3.19
1470.00	10.54	304.06	1465.77	34.29 N	47.82 W	-26.04	0.29
1562.00	10.36	301.97	1556.25	43.38 N	61.81 W	-32.73	0.45
1653.00	10.06	302.14	1645.81	51.95 N	75.49 W	-38.95	0.33
1745.00	10.09	291.76	1736.39	59.21 N	89.78 W	-43.79	1.97
1836.00	9.60	290.45	1826.05	64.81 N	104.29 W	-46.95	0.60
1927.00	9.34	290.78	1915.82	70.08 N	118.30 W	-49.87	0.29
2019.00	8.70	290.32	2006.68	75.15 N	131.80 W	-52.66	0.70
2110.00	8.43	290.00	2096.66	79.82 N	144.52 W	-55.20	0.30

2202.00	10.61	297.50	2187.39	86.04 N	158.37 W	-59.08	2.72
2293.00	9.77	297.87	2276.96	93.52 N	172.63 W	-64.13	0.92
2385.00	9.42	298.30	2367.67	100.74 N	186.17 W	-69.05	0.39
2477.00	8.80	298.46	2458.51	107.66 N	198.99 W	-73.79	0.67
2568.00	9.89	295.37	2548.30	114.33 N	212.17 W	-78.22	1.32
2660.00	9.80	295.76	2638.94	121.12 N	226.36 W	-82.61	0.13
2752.00	9.66	296.22	2729.62	127.93 N	240.33 W	-87.05	0.17
2846.00	9.51	296.97	2822.31	134.94 N	254.33 W	-91.68	0.21
2941.00	8.92	296.82	2916.08	141.82 N	267.90 W	-96.26	0.63
3036.00	7.96	295.97	3010.05	148.02 N	280.39 W	-100.35	1.02
3130.00	9.14	289.25	3103.01	153.34 N	293.29 W	-103.49	1.65
3225.00	8.25	289.06	3196.91	158.05 N	306.85 W	-105.93	0.94
3320.00	9.81	295.67	3290.74	163.78 N	320.58 W	-109.34	1.97
3414.00	10.72	296.34	3383.23	171.13 N	335.63 W	-114.14	0.98
3509.00	10.98	295.73	3476.54	178.97 N	351.69 W	-119.26	0.30
3604.00	11.00	296.11	3569.79	186.88 N	367.98 W	-124.41	0.08
3793.00	10.53	296.09	3755.47	202.41 N	399.68 W	-134.57	0.25
3887.00	10.33	296.92	3847.92	210.01 N	414.91 W	-139.58	0.27
3982.00	9.16	297.46	3941.54	217.35 N	429.21 W	-144.49	1.23
4077.00	8.09	298.67	4035.47	224.04 N	441.79 W	-149.05	1.15
4172.00	8.62	294.95	4129.46	230.25 N	454.11 W	-153.16	0.80
4266.00	8.64	296.25	4222.40	236.35 N	466.83 W	-157.10	0.21
4360.00	9.66	293.45	4315.20	242.61 N	480.40 W	-161.07	1.18
4455.00	8.65	289.04	4408.99	248.11 N	494.46 W	-164.21	1.30
4550.00	9.48	281.51	4502.81	252.00 N	508.88 W	-165.70	1.53
4644.00	9.98	285.56	4595.45	255.73 N	524.31 W	-166.86	0.90
4739.00	9.09	286.94	4689.14	260.13 N	539.42 W	-168.73	0.97
4834.00	8.84	291.01	4782.98	264.93 N	553.42 W	-171.19	0.72
4928.00	9.00	295.50	4875.84	270.69 N	566.80 W	-174.69	0.76
5022.00	10.39	298.56	4968.50	277.91 N	580.88 W	-179.52	1.57
5117.00	12.48	294.58	5061.61	286.27 N	597.74 W	-185.02	2.35
5211.00	10.97	290.99	5153.65	293.69 N	615.32 W	-189.48	1.78
5305.00	11.85	296.09	5245.79	301.14 N	632.34 W	-194.06	1.43
5399.00	15.50	270.78	5337.19	305.56 N	653.59 W	-194.95	7.36
5494.00	21.00	252.87	5427.45	300.72 N	682.59 W	-185.45	8.21
5588.00	24.99	230.87	5514.13	283.19 N	714.16 W	-163.01	10.01
5682.00	28.43	208.52	5598.30	250.91 N	740.31 W	-126.89	11.22
5777.00	31.48	186.03	5680.86	206.22 N	753.76 W	-80.61	12.18
5871.00	37.09	178.47	5758.53	153.41 N	755.58 W	-28.22	7.48
5965.00	42.20	178.21	5830.89	93.49 N	753.84 W	30.63	5.44
6059.00	51.55	181.40	5895.09	24.97 N	753.75 W	98.21	10.25
6153.00	58.93	183.59	5948.65	52.12 S	757.17 W	174.83	8.08
6248.00	69.27	184.85	5990.09	137.22 S	763.49 W	259.82	10.95
6342.00	78.20	181.68	6016.39	227.22 S	768.58 W	349.44	10.04
6399.00	83.45	178.78	6025.48	283.46 S	768.79 W	404.97	10.49
6516.00	90.12	178.65	6032.03	400.18 S	766.17 W	519.70	5.70
6698.00	89.97	178.21	6031.88	582.11 S	761.17 W	698.38	0.26
6793.00	90.03	178.38	6031.88	677.07 S	758.34 W	791.61	0.19
6887.00	89.91	178.48	6031.94	771.03 S	755.76 W	883.90	0.17
6982.00	90.09	178.57	6031.94	866.00 S	753.31 W	977.20	0.22
7076.00	90.09	177.61	6031.78	959.95 S	750.17 W	1069.38	1.02
7171.00	89.75	177.22	6031.91	1054.85 S	745.88 W	1162.31	0.55
7360.00	89.35	179.50	6033.38	1243.75 S	740.47 W	1347.81	1.23
7455.00	88.98	178.98	6034.76	1338.74 S	739.21 W	1441.31	0.68
7549.00	90.31	180.17	6035.35	1432.73 S	738.51 W	1533.93	1.90
7643.00	90.89	180.57	6034.36	1526.72 S	739.12 W	1626.77	0.76
7738.00	91.11	180.34	6032.70	1621.70 S	739.88 W	1720.61	0.34
7833.00	90.65	180.40	6031.24	1716.69 S	740.49 W	1814.42	0.49
7927.00	91.08	179.89	6029.83	1810.68 S	740.73 W	1907.19	0.71
8022.00	89.63	179.73	6029.24	1905.67 S	740.42 W	2000.87	1.53
8117.00	89.85	179.82	6029.68	2000.67 S	740.04 W	2094.53	0.25
8211.00	89.91	179.24	6029.88	2094.67 S	739.27 W	2187.15	0.62
8306.00	90.52	178.76	6029.52	2189.65 S	737.61 W	2280.59	0.82
8400.00	90.28	179.55	6028.86	2283.64 S	736.23 W	2373.09	0.88
8494.00	91.91	181.88	6027.07	2377.60 S	737.39 W	2465.99	3.02
8588.00	90.25	180.97	6025.30	2471.55 S	739.72 W	2559.07	2.02
8683.00	90.03	179.15	6025.07	2566.55 S	739.82 W	2652.81	1.93
8777.00	89.54	178.66	6025.42	2660.53 S	738.03 W	2745.24	0.74
8872.00	89.14	177.67	6026.52	2755.47 S	734.98 W	2838.42	1.13
8966.00	89.11	177.32	6027.96	2849.37 S	730.88 W	2930.39	0.36
9061.00	89.73	176.74	6028.93	2944.24 S	725.94 W	3023.49	0.94

9061.00	89.72	176.71	6026.93	2944.24 S	725.94 W	3023.19	0.91
9156.00	89.57	177.34	6029.52	3039.11 S	721.01 W	3115.98	0.68
9251.00	90.55	179.18	6029.42	3134.06 S	718.12 W	3209.20	2.19
9345.00	91.51	179.07	6027.72	3228.03 S	716.68 W	3301.68	1.02
9440.00	90.46	179.56	6026.09	3323.01 S	715.54 W	3395.20	1.22
9534.00	90.18	178.42	6025.56	3416.99 S	713.89 W	3487.65	1.24
9723.00	90.25	179.35	6024.85	3605.95 S	710.21 W	3673.49	0.49
9817.00	89.94	179.40	6024.69	3699.95 S	709.18 W	3766.06	0.33
9911.00	90.46	178.83	6024.37	3793.93 S	707.73 W	3858.55	0.83
10006.00	91.39	177.94	6022.83	3888.88 S	705.05 W	3951.80	1.35
10101.00	89.17	178.63	6022.37	3983.83 S	702.21 W	4045.01	2.45
10195.00	89.23	179.13	6023.69	4077.81 S	700.38 W	4137.43	0.53
10287.00	89.01	178.34	6025.10	4169.77 S	698.35 W	4227.84	0.89
10355.00	89.01	178.34	6026.27	4237.73 S	696.38 W	4294.57	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 DIRECTION OF 189.38 DEGREES (GRID)
A TOTAL CORRECTION OF 7.03 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 10355.00 FEET
IS 4294.57 FEET ALONG 189.33 DEGREES (GRID)**

Final survey is a straight-line projection to TD.

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