

DGR Dual Gamma Ray

1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100	200			
Date run completed	25-Nov-13	28-Nov-13			
Rig Bit Number	1	2			
Bit Size (in)	8.750	6.125			
Tool Nominal OD (in)	6.750	4.750			
Log Start Depth (MD, ft)	1,252.00	8,048.00			
Log End Depth (MD, ft)	8,048.00	12,663.00			
Drill or Wipe	Drill	Drill			
Drill/Wipe Start Date and Time	22-Nov-13 14:30	26-Nov-13 14:00			
Drill/Wipe End Date and Time	25-Nov-13 00:00	28-Nov-13 02:45			
Min Inc (deg) @ Depth (MD, ft)	0.04 @ 1,287.00	87.41 @ 11,910.00			
Max Inc (deg) @ Depth (MD, ft)	88.13 @ 8,048.00	91.42 @ 8,129.00			
Bit TFA(in2) / Bit Type	0.97 / PDC	0.98 / PDC			
Flow Rate (gpm)	571.28	287.50			
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A	N/A / N/A			
Fluid Type	Native/Spud Mud	Native/Spud Mud			
Density (ppg) / Viscosity (spqt)	8.97 / 41.00	9.65 / 39.00			
Filtrate CL (ppm)	1,300.00	1,100.00			
pH / Fluid Loss (mptm)	9.00 / 4	9.00 / 8			
PV (cP) / YP (lbf2)	13 / 12.00	10 / 9.00			
% Solids / % Sand	8.50 / 1.25	6.70 / 1.25			
% Oil / Oil:Water Ratio	N/A / 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 (in F) / S	175.00 / PDM	110.00 / PDM			

Max Tool Temp (degF) / Source	175.21 / PCM	412.20 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ 175.21	N/A @ 412.20			
Lead MWD Engineer	Matt Busche	Matt Busche			
Customer Representative	Sam Taylor	Sam Taylor			

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.76			
Sub Serial Number	11404283	12187590			
Insert Serial Number	11400908	11227549			
Date and Time Initialized	22-Nov-13 09:48	26-Nov-13 01:02			
Date and Time Read	25-Nov-13 09:16	28-Nov-13 16:59			
ECMB SW Version	N/A	N/A			

Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	44.94	43.50			
Software Version	6.21	6.21			
Sub Serial Number	11404283	12187590			
Sonde Serial Number	11477984	11833053			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	332.82	233.47			

Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	49.89	48.45			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11404283	12187590			
Insert/Sonde Serial Number	11579809	11681022			

REMARKS

1. All depths are measured depth, referenced to the Driller's pipe tally and are measured from the Kelly Bushing, 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 final survey is projection to bit.
5. 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

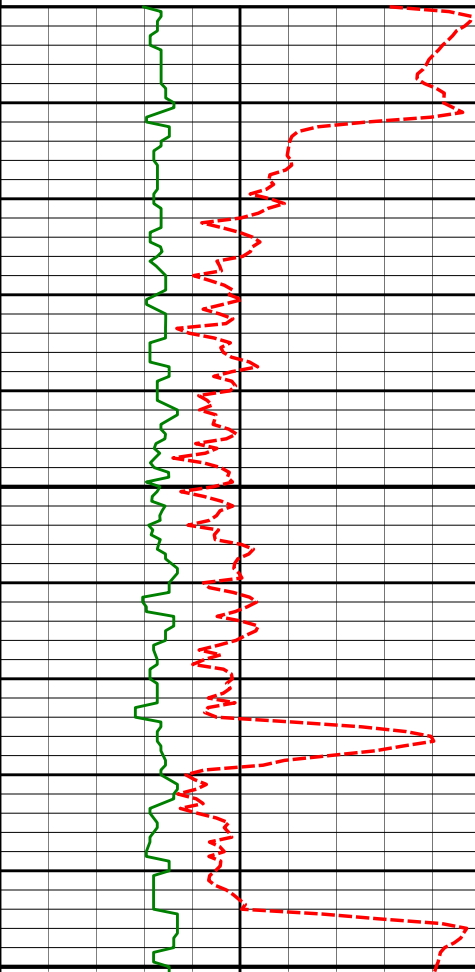
Insite version: 8.0

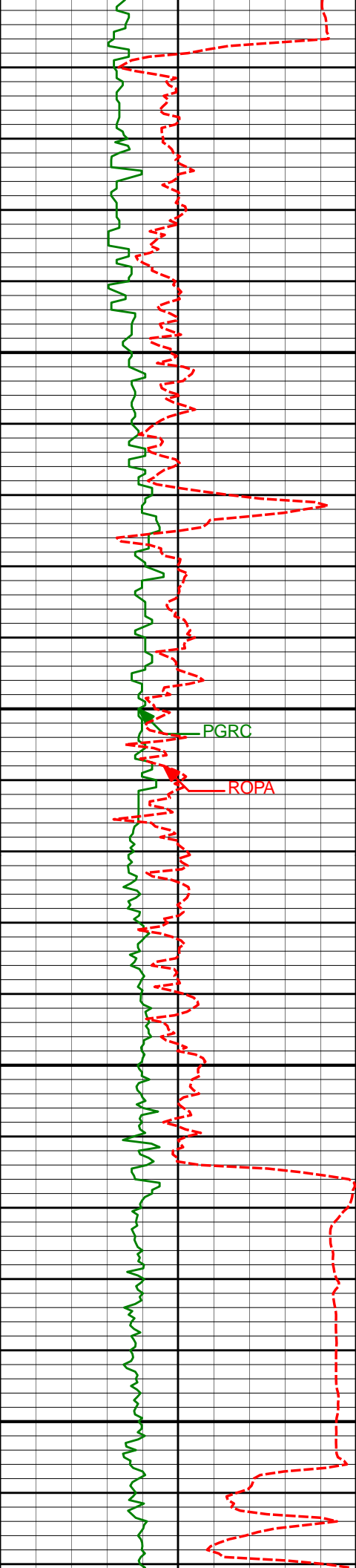
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HALLIBURTON

MD Main Log 1:240

PCG GR XHi-Range RT BCor (PGRC) api0300					
Average Rate of Penetration (ROPA) feet per hr1K0		Depth			
		Depth	Inc	Azi	TVDV/S
		6828'	1.63°	65.33°	6707.22'-720.73'
		6850			
		6900			



6950

6950

7000

7000

7050

7050

7100

7100

6923'

0.33°

30.32°

6802.20'

-721.53'

7018'

0.40°

8.48°

6897.20'

-722.09'

7066'

0.57°

174.79°

6945.20'

-722.02'

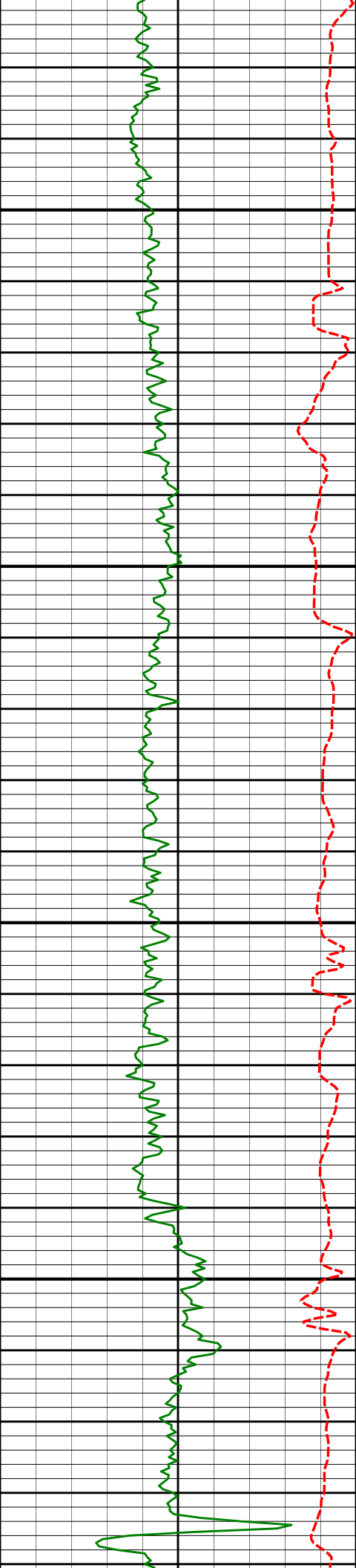
7113'

4.60°

182.30°

6992.14'

-719.90'



7150

7161'

8.94°

181.00°

7039.80'

-714.25'

7200

7209'

13.90°

180.64°

7086.83'

-704.75'

7250

7257'

18.83°

177.08°

7132.87'

-691.24'

7300

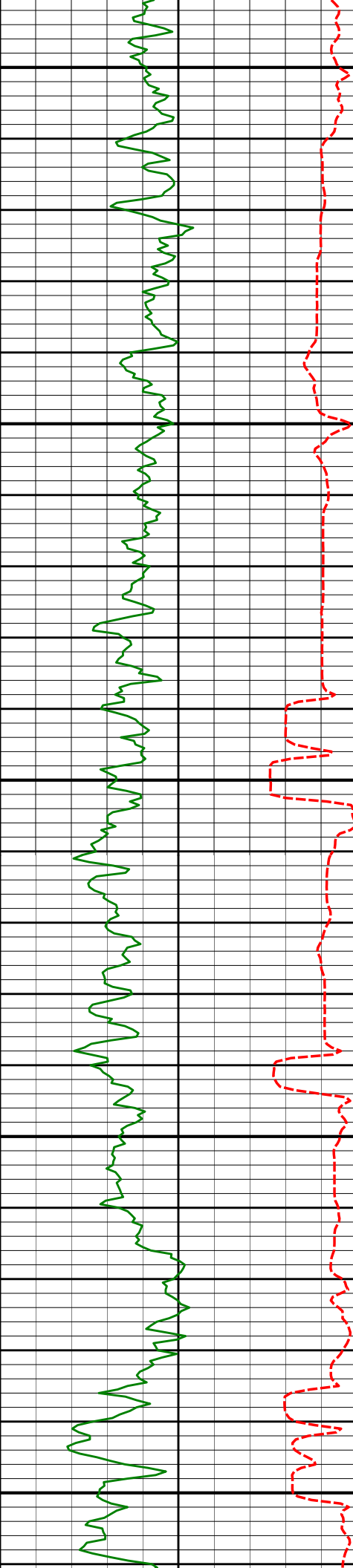
7304'

22.73°

175.48°

7176.81'

-674.60'



7350

7352'

27.45°

174.85°

7220.27'

-654.32'

7400

7399'

33.35°

175.88°

7260.79'

-630.62'

7450

7447'

37.77°

176.90°

7299.83'

-602.77'

7500

7494'

43.01°

176.02°

7335.61'

-572.38'

7550

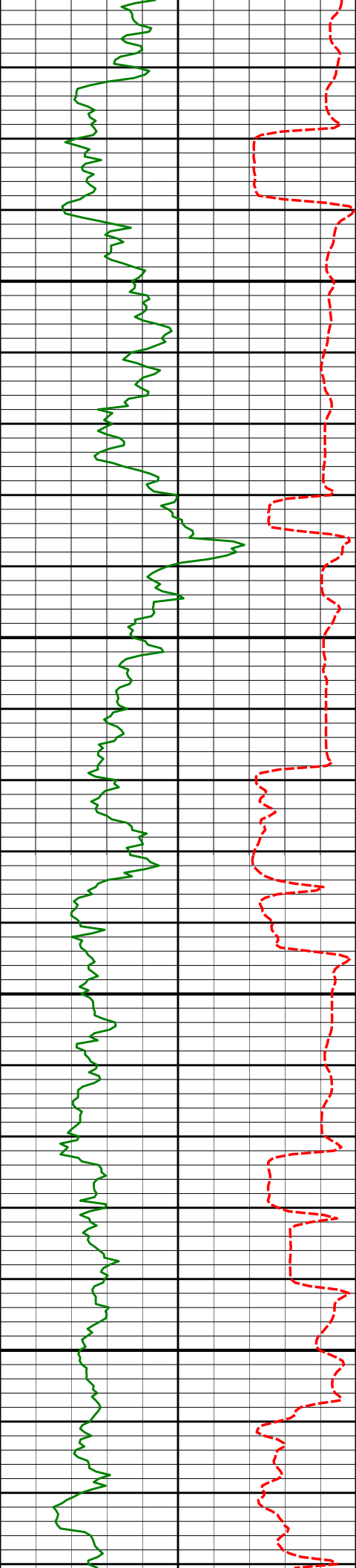
7542'

47.21°

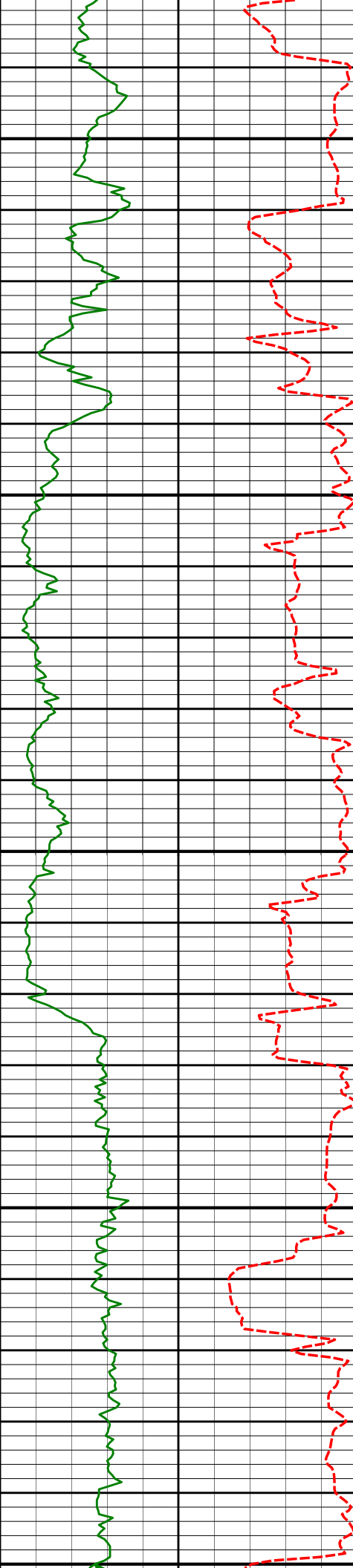
176.10°

7369.48'

-538.45'



7600	7589'	51.35°	177.62°	7400.14'	-502.89'	
	Gamma sensor in casing from 7619' to 7655' MD				7427.96'	-463.82'
	Run 400					
	7684'	61.86°	180.16°	7451.59'	-423.21'	
	7700					
7750	7732'	65.98°	180.99°	7472.69'	-380.11'	
	7779'	68.58°	180.75°	7490.84'	-336.77'	



7800

7827'

72.04°

181.47°

7507.01'

-291.59'

7850

7874'

75.39°

180.88°

7520.19'

-246.50'

7900

7922'

78.30°

180.79°

7531.11'

-199.77'

7950

7969'

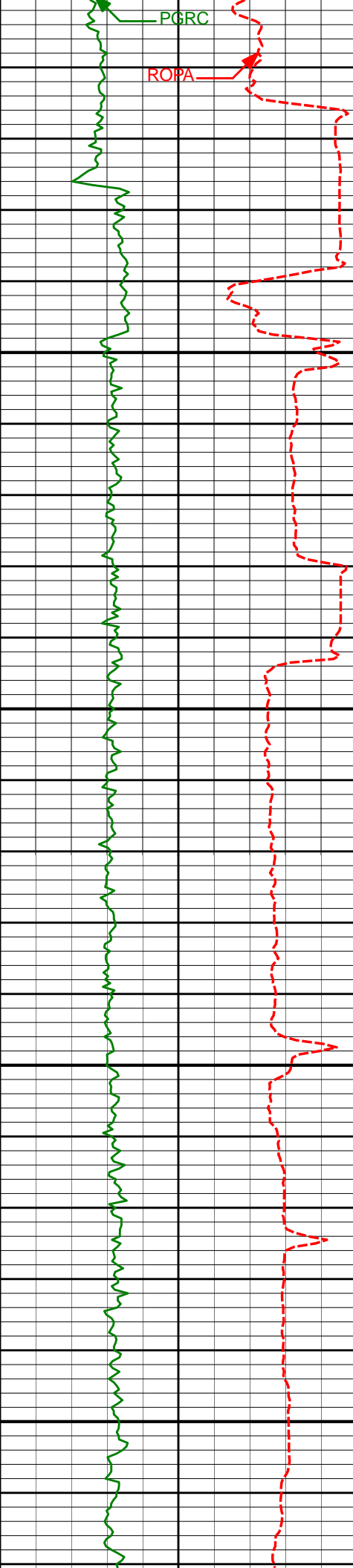
81.90°

180.77°

7539.19'

-153.48'

8000



Gamma sensor in casing from 7998' to 8048' MD

7" Casing Shoe @ 8038' MD / 7545.40' TVD

Run 200

8100

8129'

91.42°

180.18°

7545.68'

6.18'

8150

8200

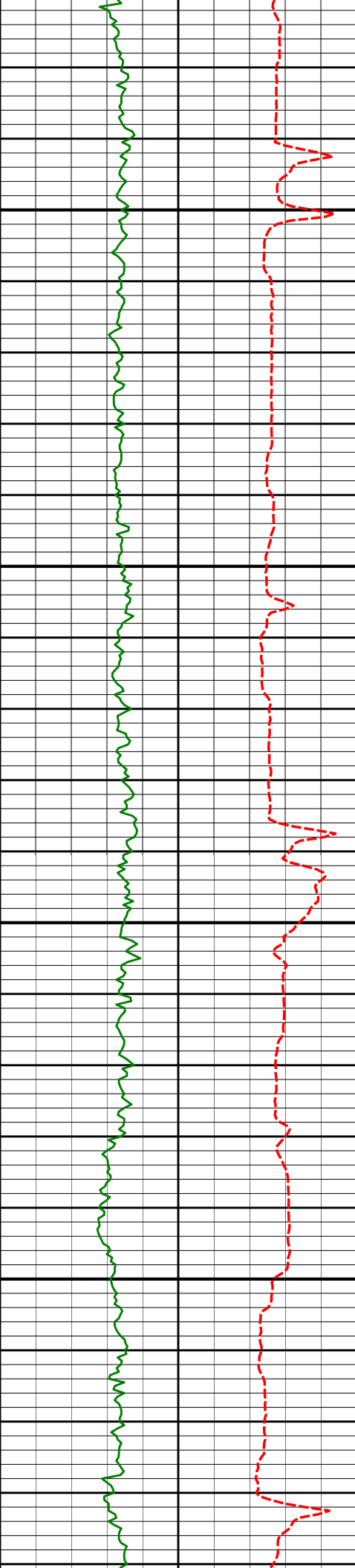
8199'

91.29°

179.59°

7544.03'

76.16'



8250

8295'

91.02°

178.82°

7542.09'

172.13'

8300

8350

8390'

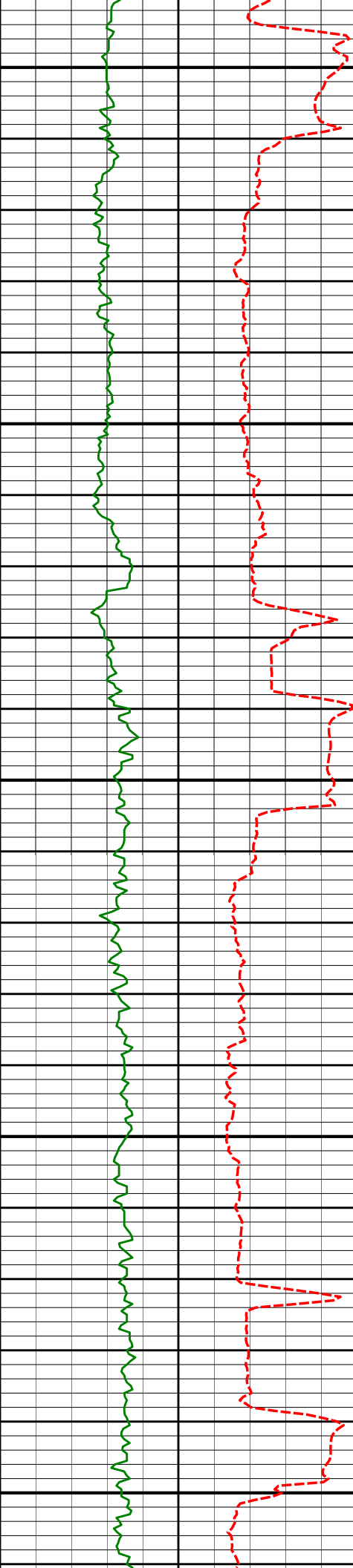
90.96°

178.04°

7540.45'

267.09'

8400



8450

8500

8550

8600

8650

8484'

90.96°

180.02°

7538.88'

361.06'

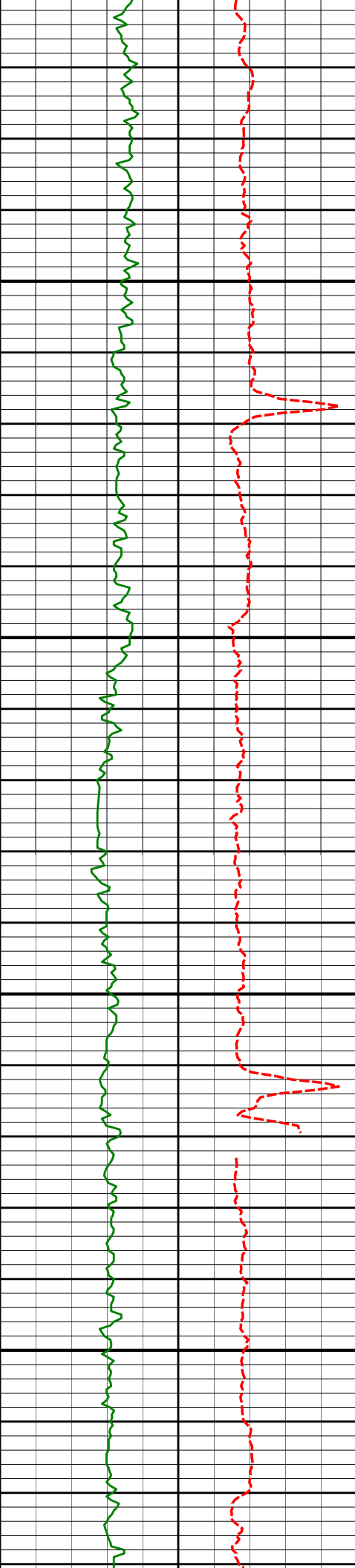
8579'

88.61°

179.69°

7539.23'

456.05'



8700

8750

8800

8850

8675'

89.63°

180.55°

7540.71'

552.04'

8770'

89.44°

180.09°

7541.48'

647.03'

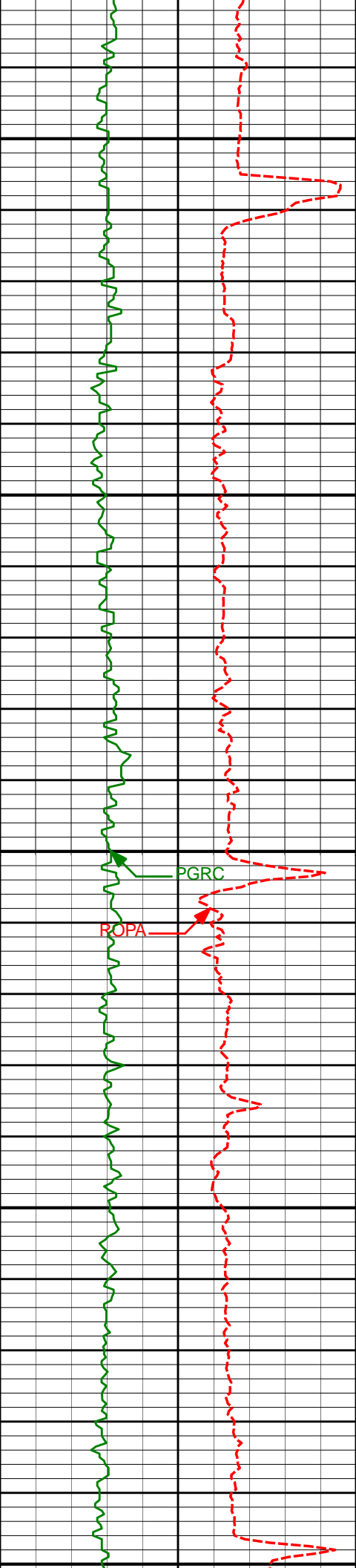
8865'

89.88°

179.99°

7542.04'

742.03'



8900

8950

9000

9050

9100

8960'

90.25°

179.07°

7541.94'

837.03'

9055'

90.37°

177.30°

7541.42'

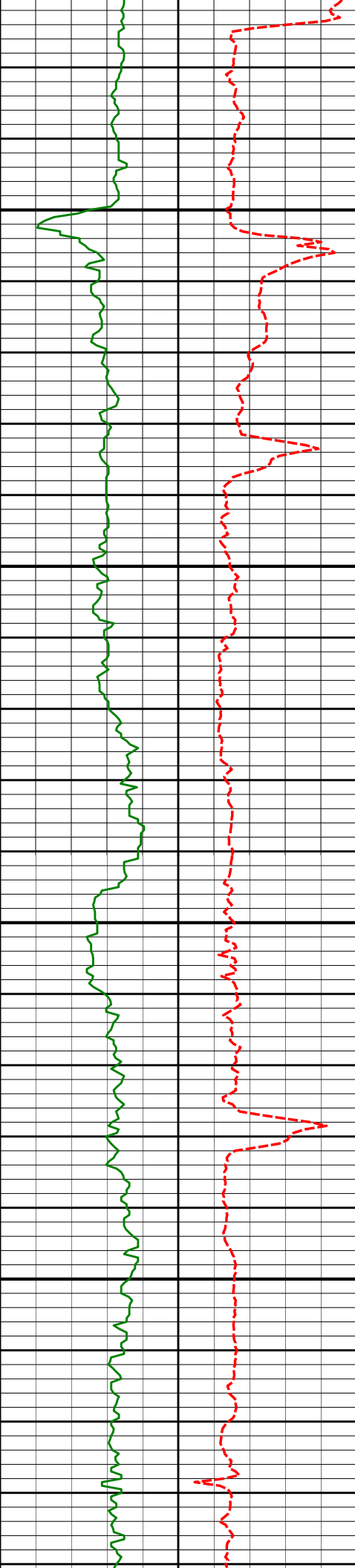
931.98'

PGRC

ROPA



9150	9150'	89.81°	178.02°	7541.27'	1026.91'
9200					
9250	9246'	89.66°	180.06°	7541.72'	1122.89'
9300					



9350

9400

9450

9500

9341'

89.78°

182.13°

7542.18'

1217.87'

9436'

89.72°

181.06°

7542.60'

1312.82'

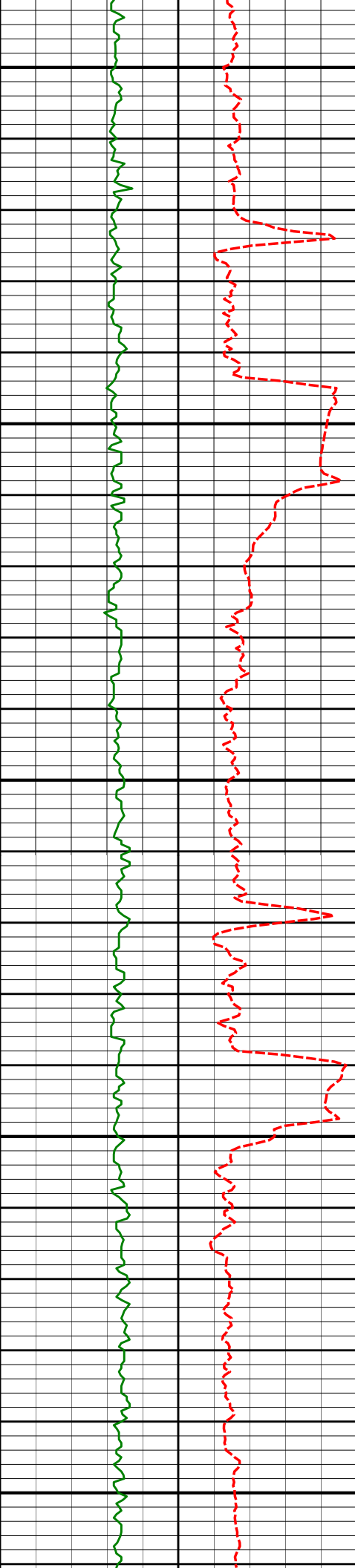
9531'

89.63°

179.55°

7543.13'

1407.81'



9550

9600

9650

9700

9750

9627'

90.15°

180.46°

7543.32'

1503.81'

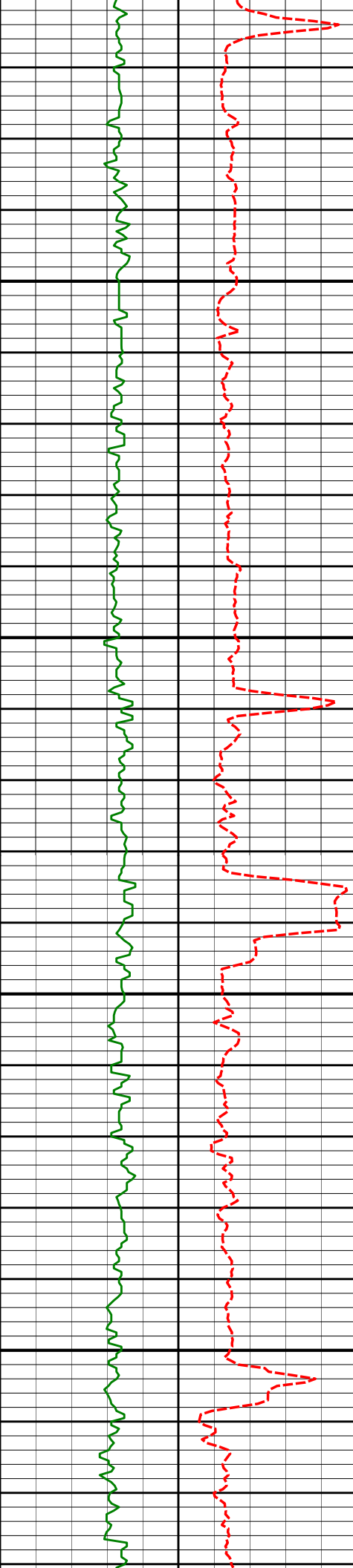
9722'

91.14°

181.32°

7542.25'

1598.79'



9800

9817'

91.36°

180.50°

7540.18'

1693.75'

9850

9900

9912'

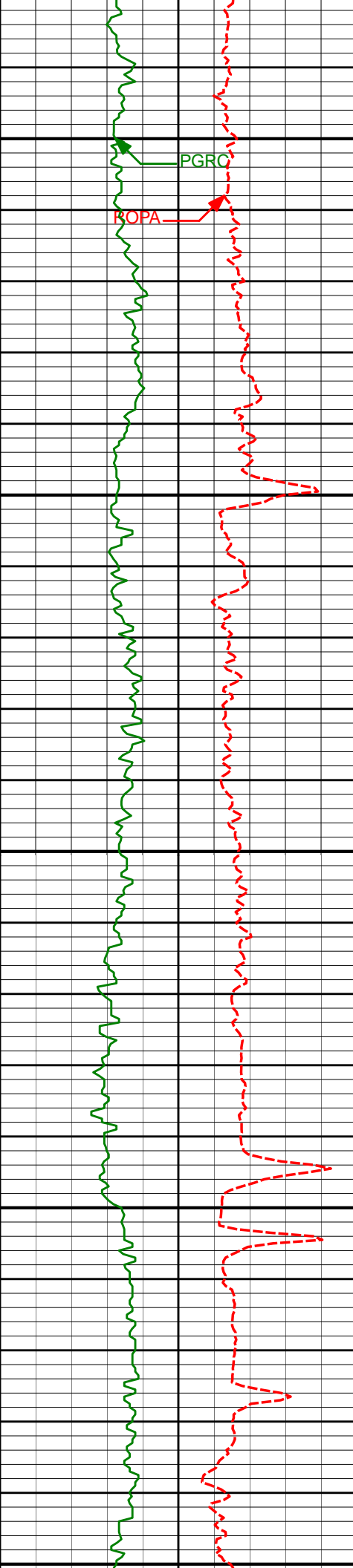
90.52°

181.26°

7538.62'

1788.72'

9950



10000

10007'

90.40°

180.98°

7537.86'

1883.69'

10050

10100

10102'

90.06°

180.47°

7537.47'

1978.68'

10150

10200

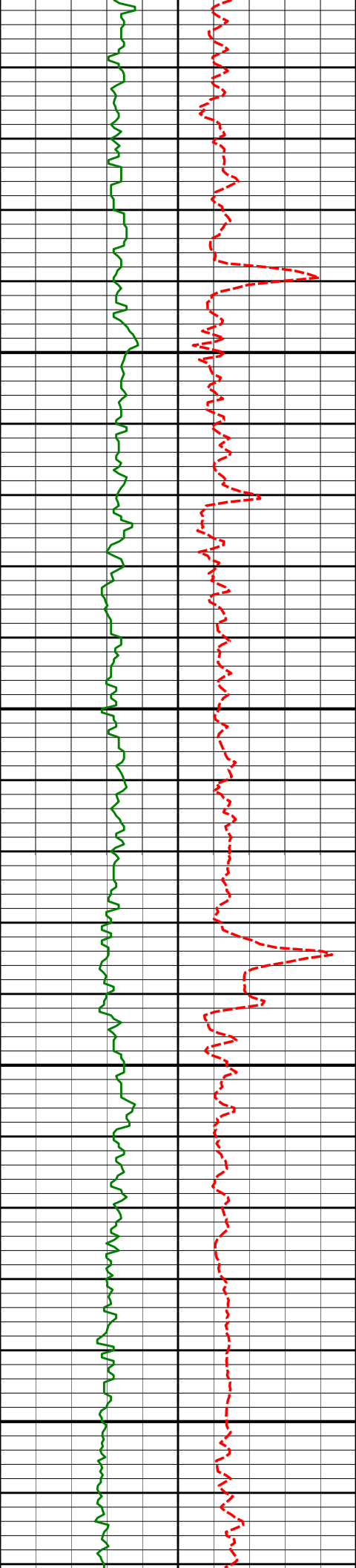
10197'

89.82°

179.91°

7537.57'

2073.68'



10250

10300

10350

10400

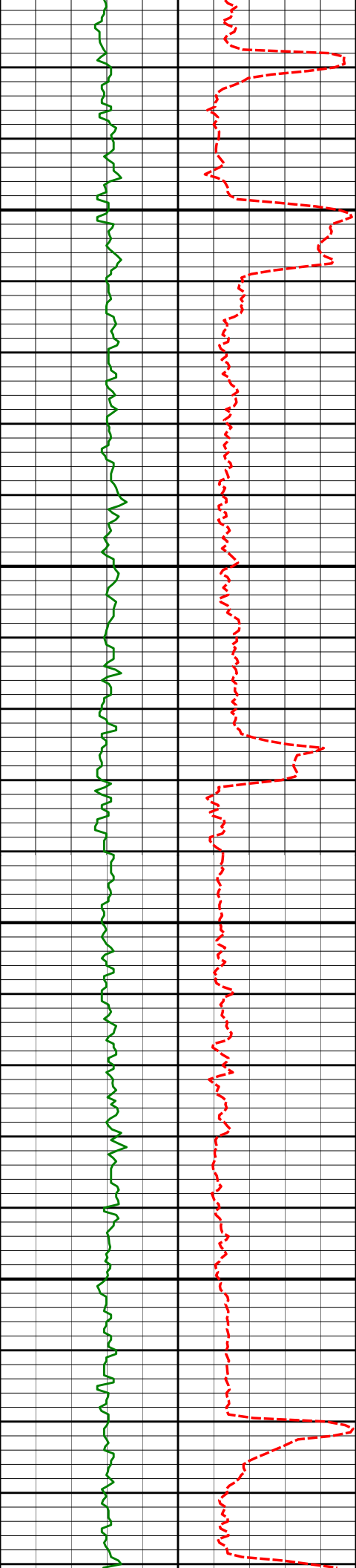
10388'

90.31°

178.68°

7537.36'

2264.67'



10450

10500

10550

10600

10483'

89.85°

179.19°

7537.22'

2359.65'

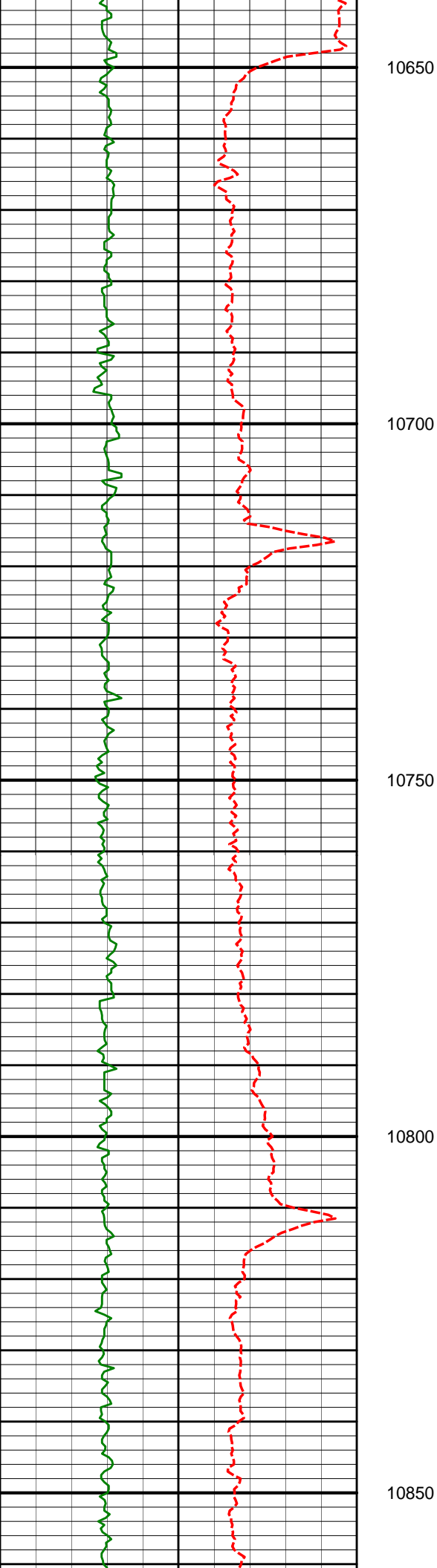
10578'

89.97°

178.37°

7537.37'

2454.63'



10673'

89.72°

179.13°

7537.63'

2549.62'

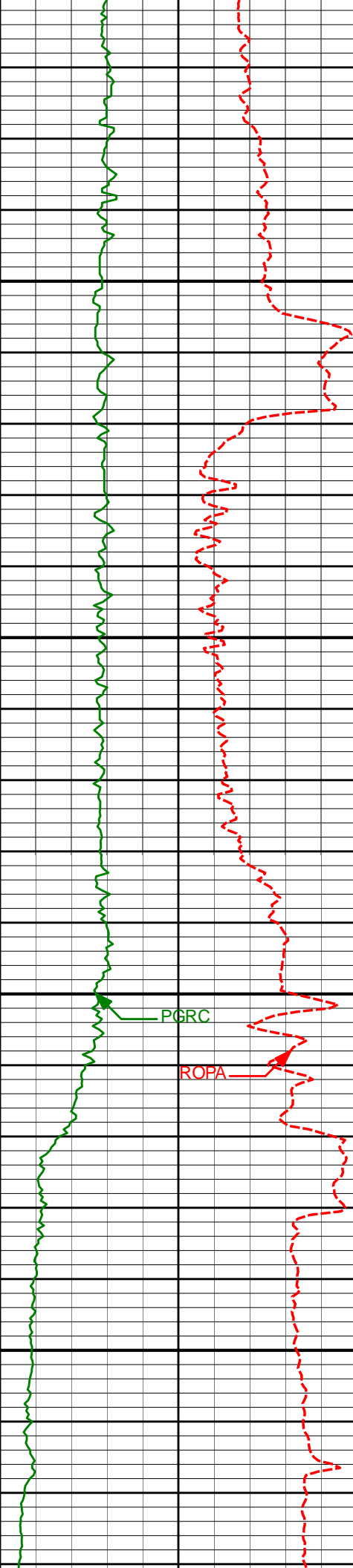
10768'

90.12°

179.04°

7537.76'

2644.61'



10900

10950

11000

11050

10863'	90.18°	178.18°	7537.51'	2739.58'
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10959'	90.86°	178.98°	7536.64'	2835.55'
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11054'	89.91°	178.86°	7536.00'	2930.54'
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11100

11150

11200

11250

11300

11149'

88.83°

179.20°

7537.05'

3025.52'

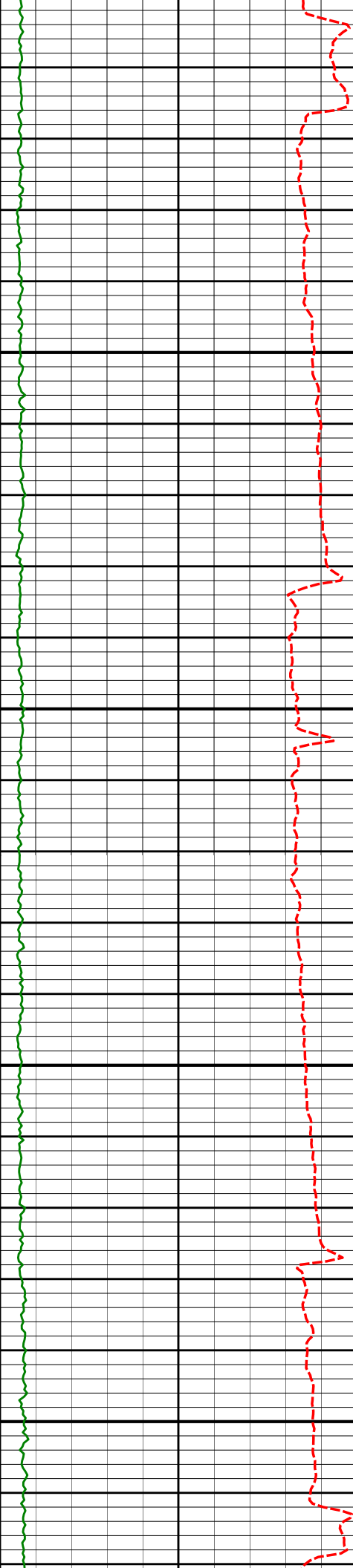
11244'

88.98°

180.29°

7538.86'

3120.50'



11350

11400

11450

11500

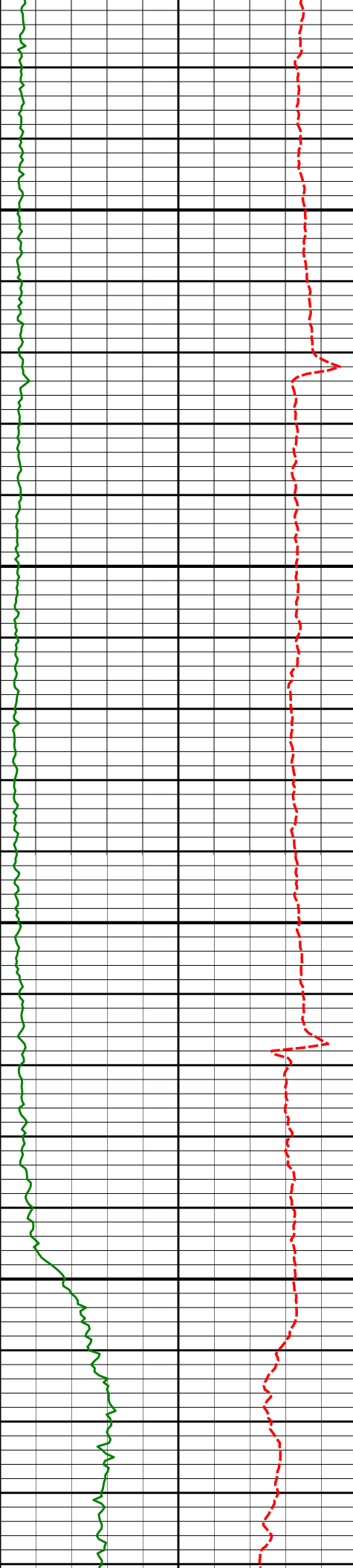
11434'

88.98°

180.31°

7542.25'

3310.47'



11550

11600

11650

11700

11529'

88.09°

180.24°

7544.68'

3405.43'

11624'

88.33°

179.96°

7547.64'

3500.38'

11720'

87.47°

179.29°

7551.16'

3596.32'



11750

11800

11850

11900

11950

11815'

87.72°

179.29°

7555.15'

3691.23'

11910'

87.41°

179.76°

7559.18'

3786.14'



12000

12050

12100

12150

12005'

89.23°

179.58°

7561.97'

3881.10'

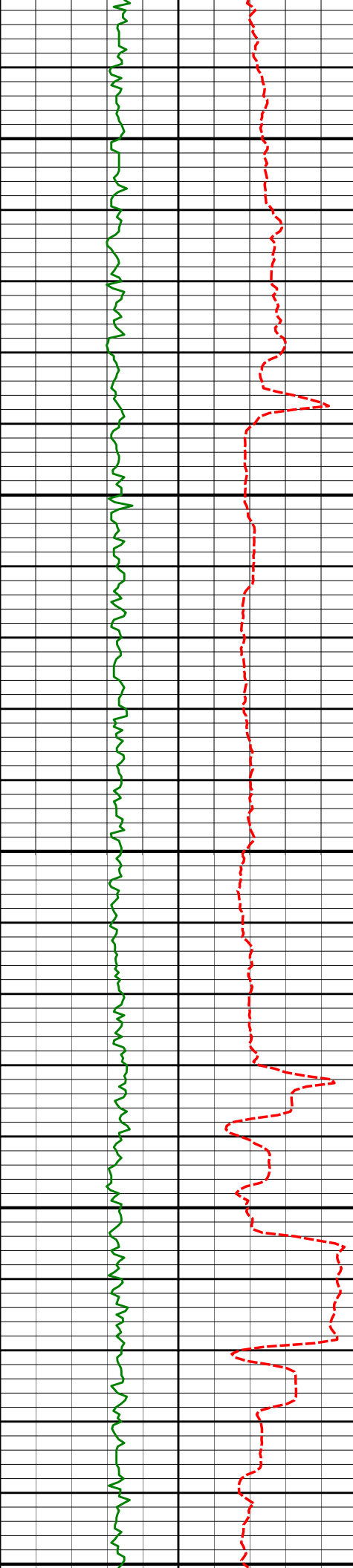
12100'

90.52°

180.48°

7562.18'

3976.09'



12200

12250

12300

12350

12400

12195'

90.52°

179.61°

7561.31'

4071.09'

12290'

90.65°

178.94°

7560.34'

4166.08'

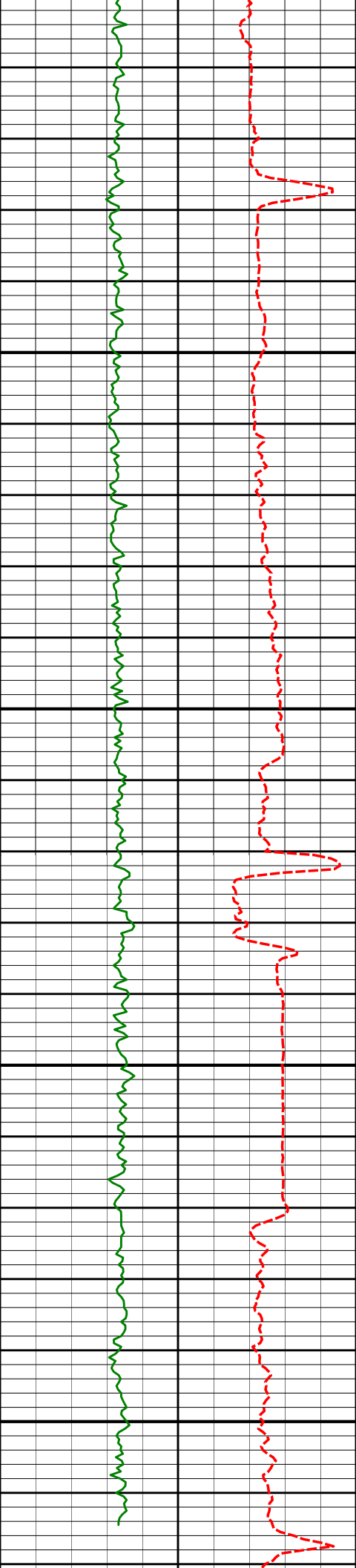
12385'

90.71°

179.89°

7559.22'

4261.07'



12480
12450
12500
12550
12600

12480'

90.89°

179.16°

7557.89'

4356.05'

12575'

90.92°

178.49°

7556.39'

4451.03'

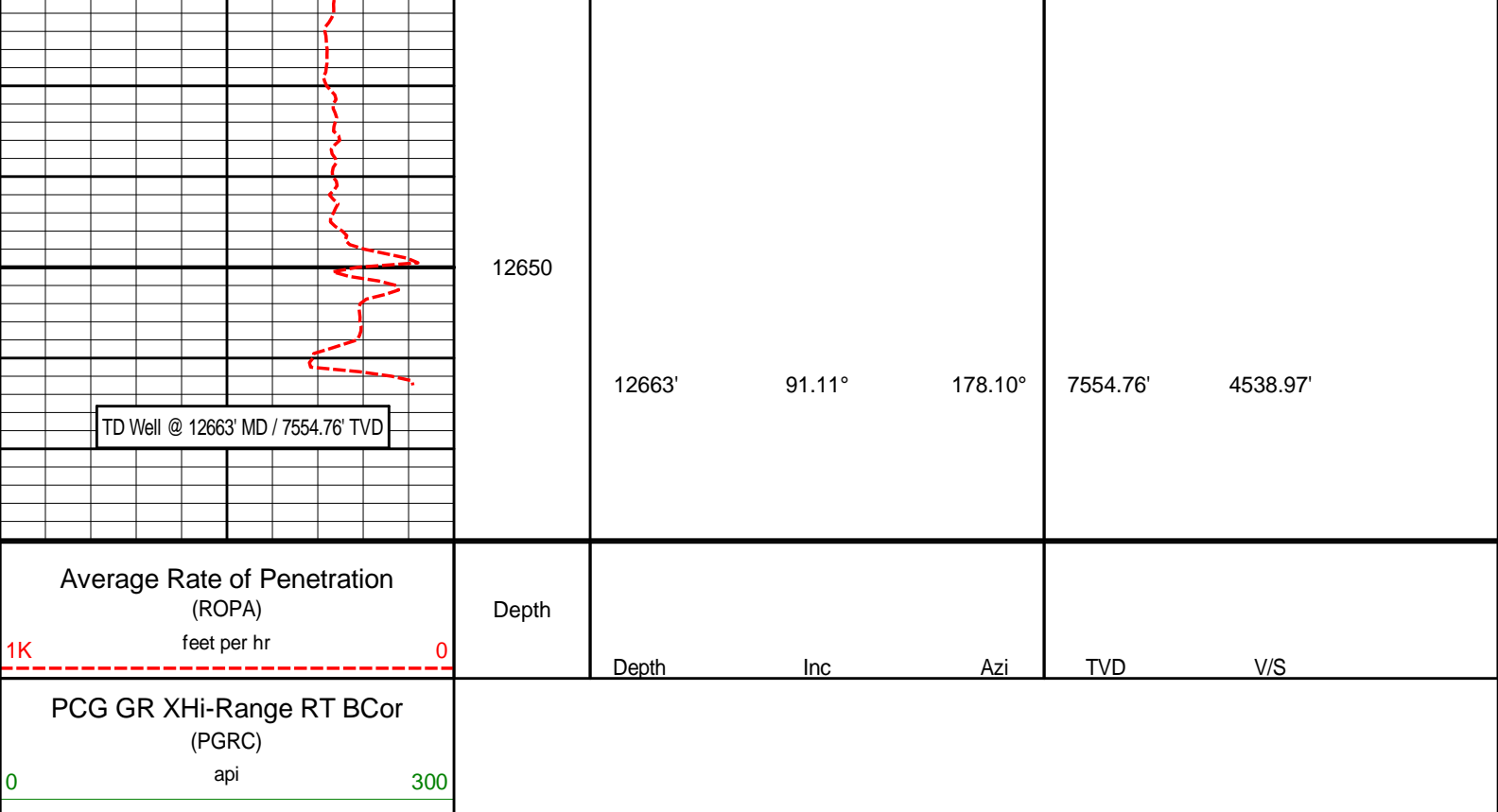
12618'

91.11°

178.10°

7555.63'

4494.00'



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Anadarko Petroleum Corporation
Highway 160 16C-2HZ
Wattenberg
Weld Colorado
USA
CA-XX-0900582949

Measured Depth (feet)	Inclination (degrees)	Direction (degrees)	Vertical Depth (feet)	Latitude (feet)	Departure (feet)	Vertical Section (feet)	Dogleg (deg/100ft)
1133.00	0.28	27.19	1132.98	5.36 N	1.64 W	-5.36	TIE-IN
1287.00	0.04	175.53	1286.98	5.64 N	1.46 W	-5.64	0.20
1660.00	0.30	275.63	1659.98	5.61 N	2.43 W	-5.61	0.08
1843.00	0.93	45.61	1842.97	6.69 N	1.84 W	-6.70	0.63
1934.00	3.77	46.59	1933.88	9.27 N	0.86 E	-9.26	3.12
2026.00	5.42	47.99	2025.59	14.25 N	6.29 E	-14.24	1.80
2118.00	7.14	48.84	2117.03	20.92 N	13.82 E	-20.89	1.87
2210.00	8.42	43.03	2208.18	29.61 N	22.72 E	-29.56	1.63
2302.00	10.06	44.39	2298.99	40.28 N	32.94 E	-40.20	1.80
2393.00	11.51	46.96	2388.38	52.15 N	45.14 E	-52.04	1.68
2484.00	12.69	46.63	2477.35	65.22 N	59.04 E	-65.07	1.30
2576.00	13.69	46.49	2566.93	79.65 N	74.28 E	-79.47	1.09
2668.00	11.98	46.24	2656.62	93.75 N	89.07 E	-93.53	1.86
2759.00	13.80	50.56	2745.33	107.18 N	104.28 E	-106.92	2.26
2851.00	12.22	48.33	2834.96	120.62 N	120.03 E	-120.33	1.80
2943.00	12.85	51.27	2924.77	133.50 N	135.28 E	-133.17	0.97
3035.00	14.26	51.18	3014.21	147.00 N	152.09 E	-146.63	1.53
3126.00	12.48	50.67	3102.74	160.26 N	168.43 E	-159.85	1.96
3218.00	14.10	49.93	3192.27	173.78 N	184.69 E	-173.32	1.77
3310.00	14.83	49.53	3281.35	188.63 N	202.23 E	-188.14	0.80
3405.00	13.52	47.78	3373.46	203.99 N	219.70 E	-203.45	1.45
3500.00	14.80	48.60	3465.57	219.47 N	237.03 E	-218.89	1.36
3595.00	12.74	45.19	3557.84	234.88 N	253.56 E	-234.26	2.33
3691.00	14.14	51.49	3651.21	249.64 N	270.25 E	-248.98	2.11
3786.00	13.48	48.12	3743.47	264.26 N	287.57 E	-263.56	1.10
3881.00	12.22	44.42	3835.24	272.82 N	282.24 E	-272.52	1.24

3881.00	13.00	44.49	3835.94	279.28 N	303.31 E	-278.53	1.01
3976.00	14.39	48.83	3928.24	294.67 N	319.68 E	-293.89	1.82
4071.00	14.60	48.13	4020.22	310.43 N	337.48 E	-309.61	0.29
4166.00	15.34	47.74	4111.99	326.88 N	355.70 E	-326.01	0.79
4261.00	13.08	43.92	4204.08	343.07 N	372.46 E	-342.16	2.57
4356.00	14.86	43.15	4296.27	359.70 N	388.25 E	-358.75	1.88
4451.00	15.66	44.67	4387.92	377.71 N	405.59 E	-376.72	0.94
4545.00	14.12	43.88	4478.76	395.00 N	422.46 E	-393.96	1.65
4640.00	13.82	44.27	4570.95	411.47 N	438.41 E	-410.40	0.33
4736.00	15.26	46.99	4663.87	428.30 N	455.66 E	-427.19	1.66
4831.00	13.54	43.46	4755.89	444.91 N	472.45 E	-443.75	2.03
4926.00	14.40	44.72	4848.08	461.37 N	488.41 E	-460.18	0.96
5021.00	15.13	43.37	4939.94	478.78 N	505.24 E	-477.54	0.85
5116.00	13.85	42.15	5031.92	496.22 N	521.38 E	-494.95	1.39
5211.00	13.75	43.32	5124.17	512.86 N	536.76 E	-511.55	0.31
5306.00	14.57	47.00	5216.29	529.23 N	553.24 E	-527.88	1.28
5401.00	13.08	47.04	5308.53	544.70 N	569.85 E	-543.31	1.57
5496.00	14.22	46.16	5400.85	560.11 N	586.13 E	-558.68	1.22
5592.00	15.33	47.74	5493.67	576.81 N	604.03 E	-575.34	1.23
5687.00	12.20	46.85	5585.93	592.13 N	620.65 E	-590.61	3.30
5782.00	14.01	51.99	5678.46	606.08 N	637.04 E	-604.52	2.26
5877.00	15.75	50.30	5770.27	621.40 N	656.02 E	-619.79	1.89
5972.00	12.97	46.54	5862.30	636.97 N	673.68 E	-635.32	3.09
6067.00	13.23	47.84	5954.82	651.60 N	689.48 E	-649.91	0.41
6162.00	13.20	48.11	6047.31	666.14 N	705.61 E	-664.41	0.07
6257.00	10.10	42.50	6140.34	679.52 N	719.32 E	-677.76	3.47
6353.00	8.79	40.59	6235.04	691.30 N	729.78 E	-689.52	1.40
6448.00	8.15	41.28	6329.00	701.87 N	738.94 E	-700.07	0.68
6543.00	7.13	43.47	6423.16	711.21 N	747.44 E	-709.38	1.12
6638.00	5.21	55.96	6517.61	717.91 N	755.07 E	-716.06	2.45
6733.00	3.67	73.57	6612.32	721.18 N	761.57 E	-719.32	2.15
6828.00	1.63	65.33	6707.22	722.61 N	765.71 E	-720.73	2.18
6923.00	0.33	30.32	6802.20	723.41 N	767.08 E	-721.53	1.45
7018.00	0.40	8.48	6897.20	723.97 N	767.26 E	-722.09	0.16
7066.00	0.57	174.79	6945.20	723.90 N	767.31 E	-722.02	2.01
7113.00	4.60	182.30	6992.14	721.78 N	767.26 E	-719.90	8.59
7161.00	8.94	181.00	7039.80	716.13 N	767.11 E	-714.25	9.05
7209.00	13.90	180.64	7086.83	706.63 N	766.98 E	-704.75	10.33
7257.00	18.83	177.08	7132.87	693.12 N	767.31 E	-691.24	10.48
7304.00	22.73	175.48	7176.81	676.48 N	768.42 E	-674.60	8.38
7352.00	27.45	174.85	7220.27	656.21 N	770.14 E	-654.32	9.85
7399.00	33.35	175.88	7260.79	632.51 N	772.04 E	-630.62	12.60
7447.00	37.77	176.90	7299.83	604.66 N	773.79 E	-602.77	9.29
7494.00	43.01	176.02	7335.61	574.27 N	775.68 E	-572.38	11.21
7542.00	47.21	176.10	7369.48	540.36 N	778.01 E	-538.45	8.75
7589.00	51.35	177.62	7400.14	504.80 N	779.95 E	-502.89	9.14
7637.00	57.76	178.50	7427.96	465.74 N	781.26 E	-463.82	13.44
7684.00	61.86	180.16	7451.59	425.12 N	781.72 E	-423.21	9.24
7732.00	65.98	180.99	7472.69	382.02 N	781.29 E	-380.11	8.72
7779.00	68.58	180.75	7490.84	338.68 N	780.63 E	-336.77	5.55
7827.00	72.04	181.47	7507.01	293.50 N	779.75 E	-291.59	7.35
7874.00	75.39	180.88	7520.19	248.40 N	778.83 E	-246.50	7.23
7922.00	78.30	180.79	7531.11	201.67 N	778.15 E	-199.77	6.07
7969.00	81.90	180.77	7539.19	155.38 N	777.52 E	-153.48	7.66
8001.00	84.60	180.61	7542.95	123.61 N	777.13 E	-121.71	8.45
8047.00	88.58	180.70	7545.68	77.71 N	776.61 E	-75.81	8.65
8129.00	91.42	180.18	7545.68	4.28 S	775.98 E	6.18	3.52
8199.00	91.29	179.59	7544.03	74.26 S	776.12 E	76.16	0.86
8295.00	91.02	178.82	7542.09	170.23 S	777.45 E	172.13	0.85
8390.00	90.96	178.04	7540.45	265.18 S	780.05 E	267.09	0.82
8484.00	90.96	180.02	7538.88	359.15 S	781.65 E	361.06	2.11
8579.00	88.61	179.69	7539.23	454.14 S	781.89 E	456.05	2.50
8675.00	89.63	180.55	7540.71	550.13 S	781.69 E	552.04	1.39
8770.00	89.44	180.09	7541.48	645.13 S	781.15 E	647.03	0.52
8865.00	89.88	179.99	7542.04	740.12 S	781.09 E	742.03	0.47
8960.00	90.25	179.07	7541.94	835.12 S	781.87 E	837.03	1.04
9055.00	90.37	177.30	7541.42	930.07 S	784.88 E	931.98	1.87
9150.00	89.81	178.02	7541.27	1024.99 S	788.76 E	1026.91	0.96
9246.00	89.66	180.06	7541.72	1120.97 S	790.36 E	1122.89	2.13
9341.00	89.78	182.13	7542.18	1215.94 S	788.55 E	1217.87	2.18
9436.00	89.72	181.06	7542.60	1310.90 S	785.90 E	1312.82	1.13
9531.00	89.63	179.55	7543.13	1405.90 S	785.40 E	1407.81	1.59
9627.00	90.15	180.46	7543.32	1501.90 S	785.39 E	1503.81	1.09
9722.00	91.14	181.32	7542.25	1596.88 S	783.91 E	1598.79	1.38
9817.00	91.36	180.50	7540.18	1691.84 S	782.41 E	1693.75	0.89

9912.00	90.52	181.26	7538.62	1786.82 S	780.95 E	1788.72	1.19
10007.00	90.40	180.98	7537.86	1881.79 S	779.09 E	1883.69	0.32
10102.00	90.06	180.47	7537.47	1976.79 S	777.89 E	1978.68	0.65
10197.00	89.82	179.91	7537.57	2071.78 S	777.57 E	2073.68	0.64
10388.00	90.31	178.68	7537.36	2262.77 S	779.92 E	2264.67	0.69
10483.00	89.85	179.19	7537.22	2357.75 S	781.69 E	2359.65	0.72
10578.00	89.97	178.37	7537.37	2452.73 S	783.71 E	2454.63	0.87
10673.00	89.72	179.13	7537.63	2547.70 S	785.78 E	2549.62	0.84
10768.00	90.12	179.04	7537.76	2642.69 S	787.30 E	2644.61	0.43
10863.00	90.18	178.18	7537.51	2737.66 S	789.61 E	2739.58	0.91
10959.00	90.86	178.98	7536.64	2833.63 S	791.99 E	2835.55	1.09
11054.00	89.91	178.86	7536.00	2928.61 S	793.78 E	2930.54	1.01
11149.00	88.83	179.20	7537.05	3023.59 S	795.38 E	3025.52	1.19
11244.00	88.98	180.29	7538.86	3118.57 S	795.81 E	3120.50	1.16
11434.00	88.98	180.31	7542.25	3308.53 S	794.81 E	3310.47	0.01
11529.00	88.09	180.24	7544.68	3403.50 S	794.36 E	3405.43	0.94
11624.00	88.33	179.96	7547.64	3498.45 S	794.19 E	3500.38	0.39
11720.00	87.47	179.29	7551.16	3594.39 S	794.82 E	3596.32	1.14
11815.00	87.72	179.29	7555.15	3689.29 S	795.99 E	3691.23	0.26
11910.00	87.41	179.76	7559.18	3784.20 S	796.78 E	3786.14	0.59
12005.00	89.23	179.58	7561.97	3879.16 S	797.33 E	3881.10	1.93
12100.00	90.52	180.48	7562.18	3974.16 S	797.28 E	3976.09	1.66
12195.00	90.52	179.61	7561.31	4069.15 S	797.20 E	4071.09	0.92
12290.00	90.65	178.94	7560.34	4164.14 S	798.41 E	4166.08	0.72
12385.00	90.71	179.89	7559.22	4259.12 S	799.38 E	4261.07	1.00
12480.00	90.89	179.16	7557.89	4354.11 S	800.16 E	4356.05	0.79
12575.00	90.92	178.49	7556.39	4449.08 S	802.11 E	4451.03	0.71
12618.00	91.11	178.10	7555.63	4492.05 S	803.39 E	4494.00	1.01
12663.00	91.11	178.10	7554.76	4537.02 S	804.88 E	4538.97	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 179.86 DEGREES (TRUE)
A TOTAL CORRECTION OF 8.53 DEG FROM MAGNETIC NORTH TO TRUE NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 12663.00 FEET
IS 4607.86 FEET ALONG 169.94 DEGREES (TRUE)**

All directional surveys tied on to the last gyro survey at 1133' MD. Final survey is a straight-line projection to the bit.