

PCGC: Pressure Case Gamma
PCDC: Pressure Case Directional



1 : 600 / 1 : 240

[illegible]

WELL INFORMATION

MWD Run Number	100				
Date run completed	31-May-15				
Rig Bit Number	2				
Bit Size (in)	8.750				
Tool Nominal OD (in)	6.750				
Log Start Depth (TVD, ft)	651.96				
Log End Depth (TVD, ft)	6,707.67				
Drill or Wipe	Drill				
Drill/Wipe Start Date and Time	30-May-15 00:50				
Drill/Wipe End Date and Time	31-May-15 05:45				
Min Inc (deg) @ Depth (TVD, ft)	0.14 @ 5,785.47				
Max Inc (deg) @ Depth (TVD, ft)	77.89 @ 6,699.20				
Bit TFA(in2) / Bit Type	0.91 / PDC				
Flow Rate (gpm)	593.37				
Max AV (fpm) / CV (fpm) @ MWD	N/A / N/A				
Fluid Type	Fresh Water Gel				
Density (ppg) / Viscosity (spqt)	10.00 / 37.00				
Filtrate CL (ppm)	1,100.00				
pH / Fluid Loss (mptm)	8.00 / 0				
PV (cP) / YP (lhf2)	11 / 10.00				
% Solids / % Sand	10.2 / .3				
% Oil / Oil:Water Ratio	N/A / N/A				
Rm @ Measured Temp (degF)	N/A @ N/A				
Rmf @ Measured Temp (degF)	N/A @ N/A				
Rmc @ Measured Temp (degF)	N/A @ N/A				

Max Tool Temp (degF) / Source	179.70 / PCM				
Rm @ Max Tool Temp (degF)	N/A @ N/A				
Lead MWD Engineer	Paul Kock				
Customer Representative	Justin Fields				

SENSOR INFORMATION

Downhole Processor Information

Tool Type	PCM				
Software Version	5.93				
Sub Serial Number	11341324				
Insert Serial Number	11400838				
Date and Time Initialized	29-May-15 14:23				
Date and Time Read	31-May-15 12:12				
ECMB SW Version	N/A				

Directional Sensor Information

Tool Type	PCDC				
Distance From Bit (ft)	52.00				
Software Version	6.33				
Sub Serial Number	11341324				
Sonde Serial Number	11638623				
Sensor ID Number	N/A				
Toolface Offset (deg)	95.70				

Gamma Ray Sensor Information

Tool Type	PCG				
Distance From Bit (ft)	40.19				
Recorded Sample Period (sec)	10				
Software Version	8.15				
Sub Serial Number	11341324				
Insert/Sonde Serial Number	12071280				

REMARKS

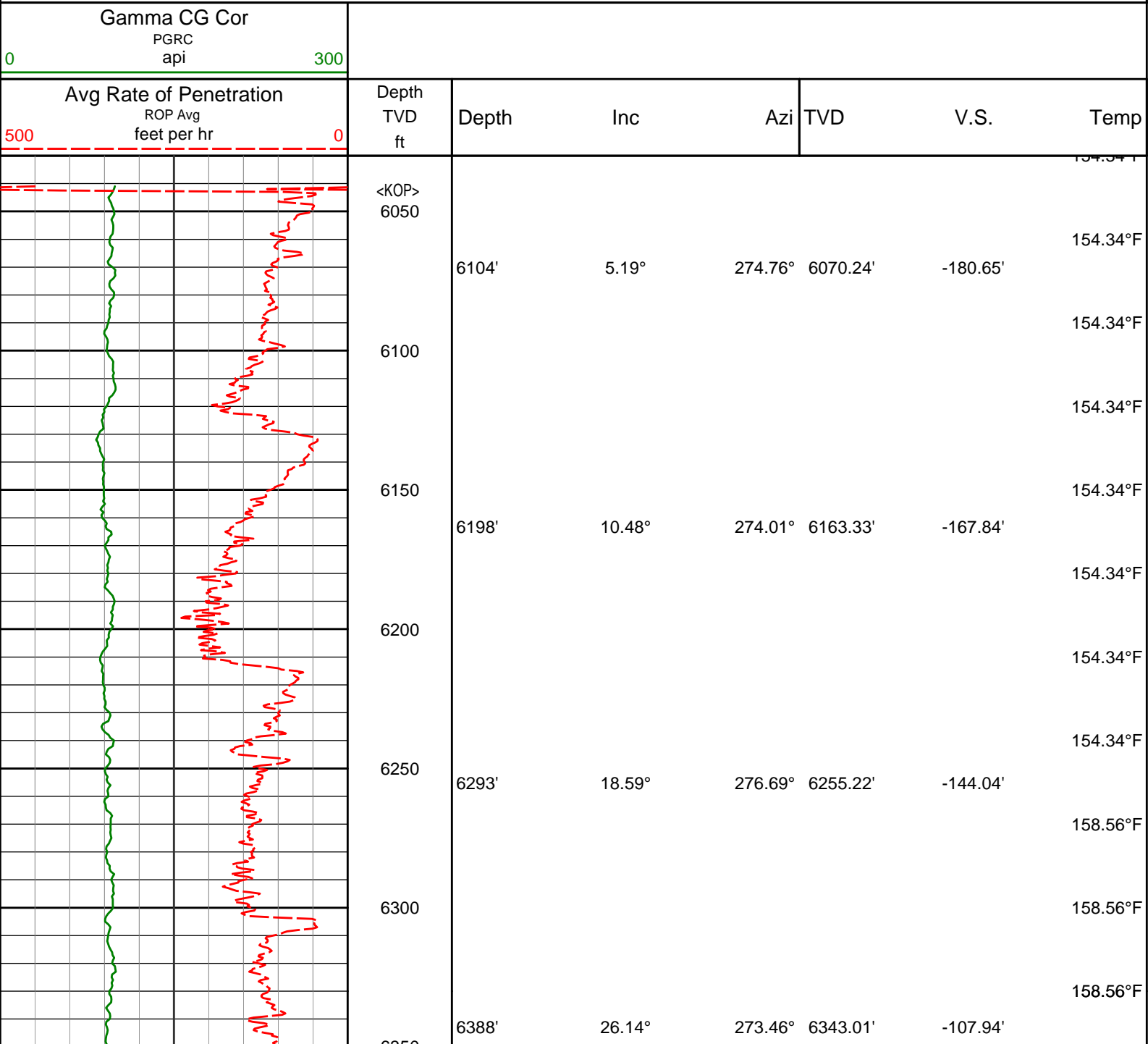
1. All depths are calibrated to the driller's pipe tally and are measured from the Rig drill floor.
2. No depth corrections have been made for pipe stretch or compression.
3. All data presented is recorded (memory data) unless otherwise stated.
 - ROPA: Average Rate of Penetration is real time data.
 - 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 8.1.10.

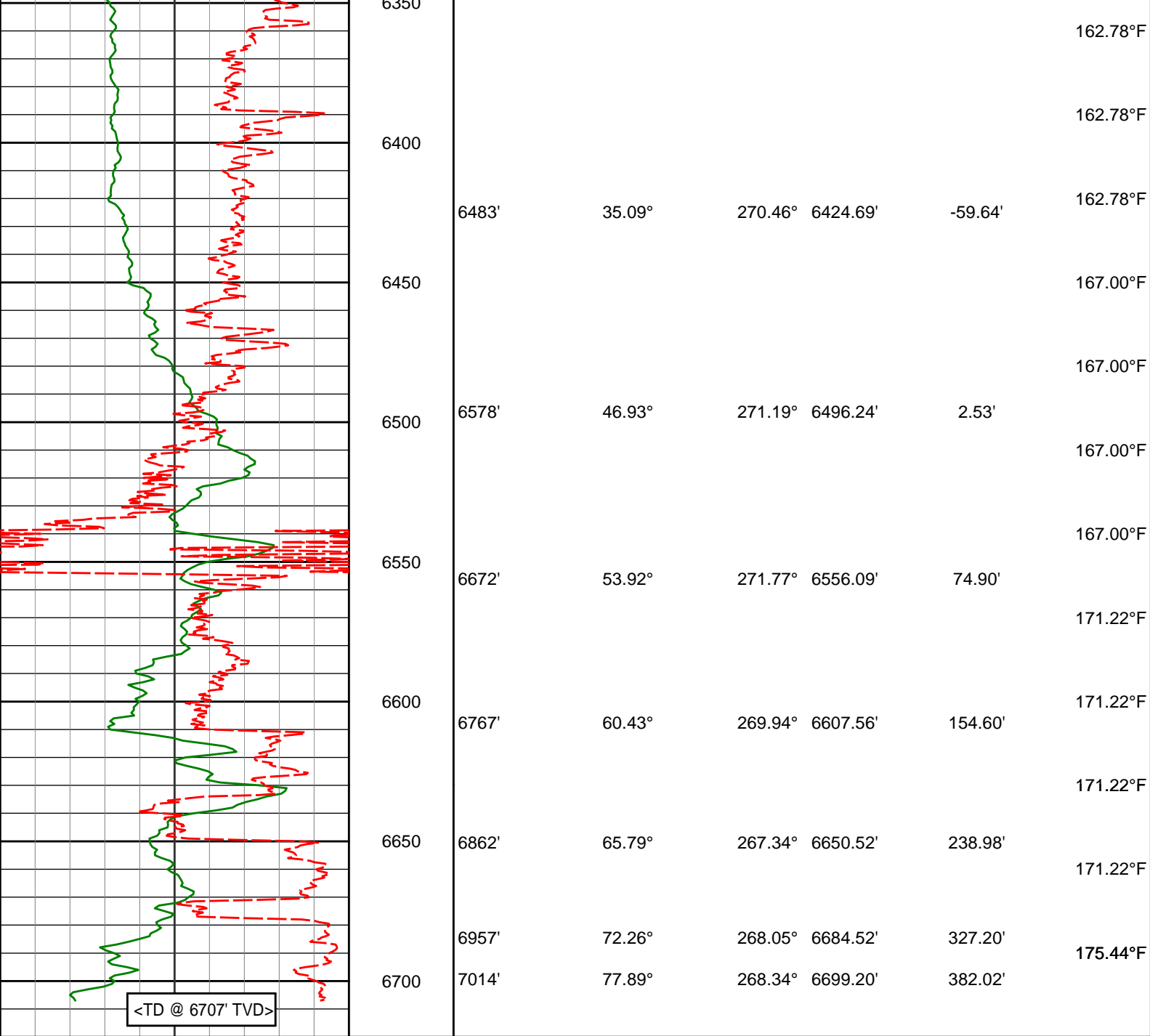
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TVD Detail 1:600 Scale



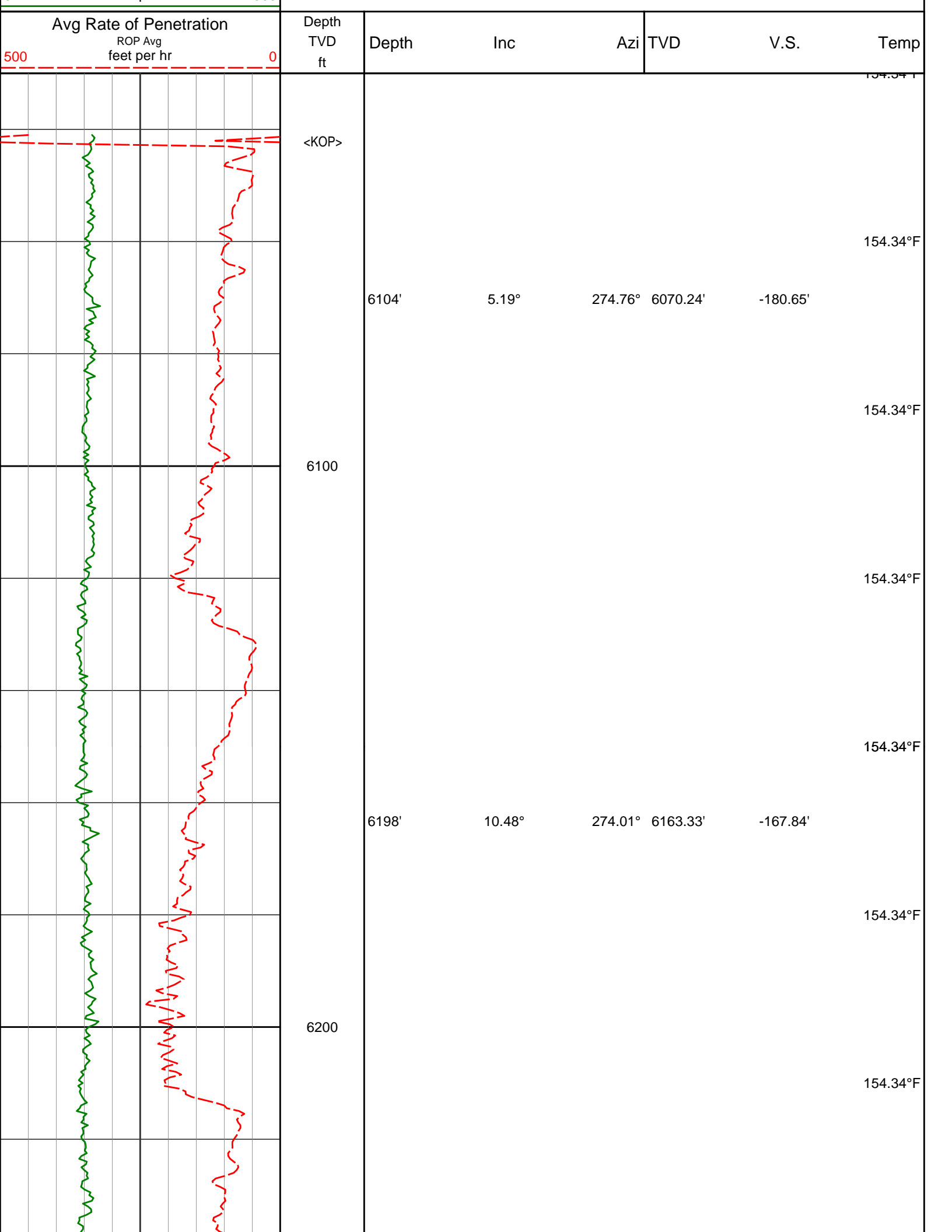


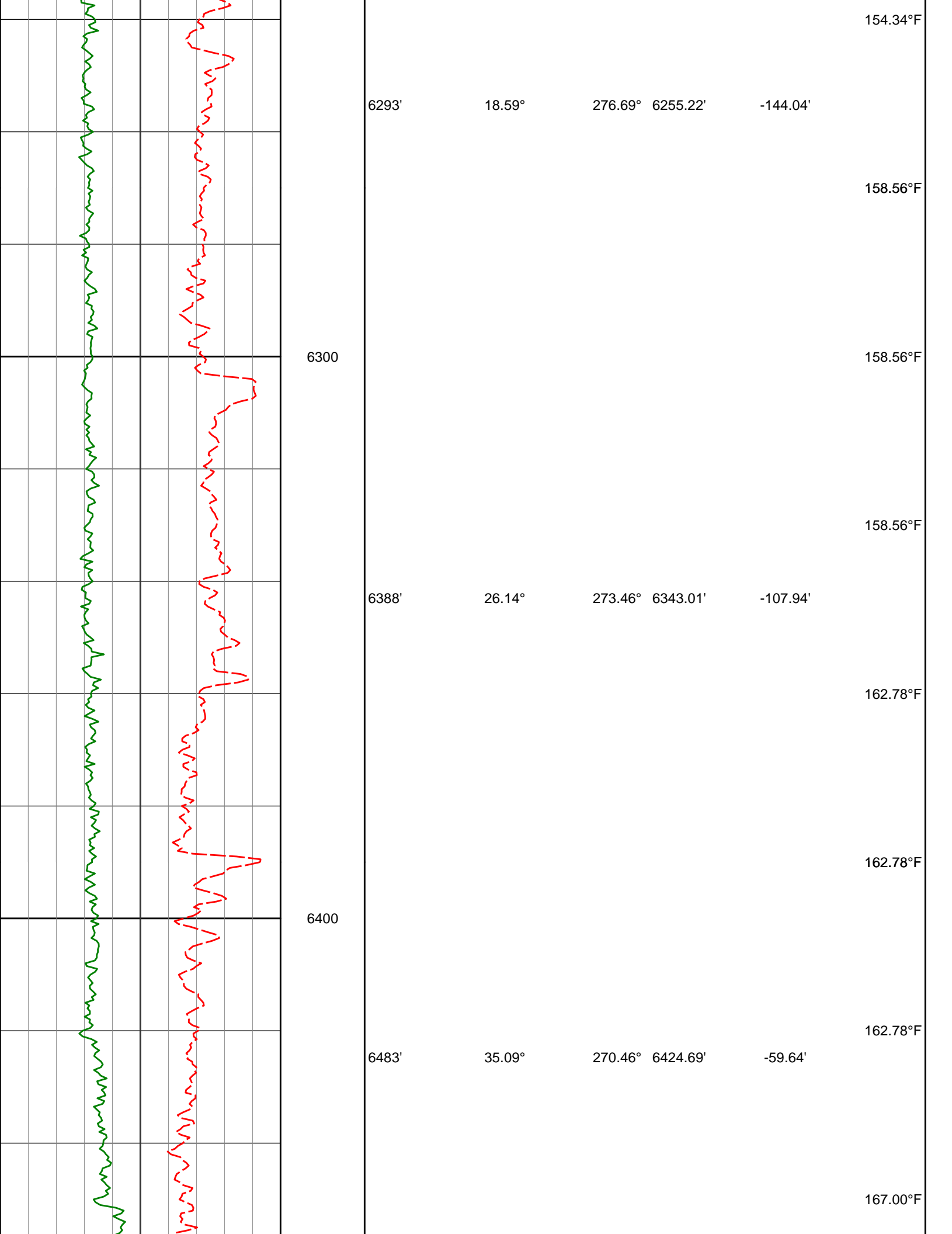
Avg Rate of Penetration ROP Avg feet per hr		Depth TVD ft	Depth	Inc	Azi	TVD	V.S.	Temp
500		0						

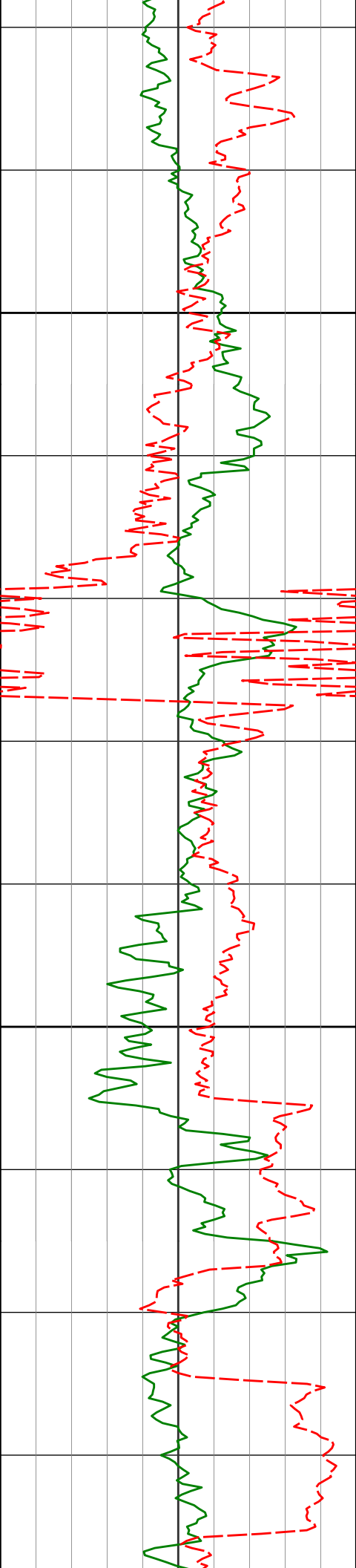
Gamma CG Cor PGRC api		
0		300

TVD Detail 1:240 Scale

Gamma Ray Cor PGRC api		
0		300







6500

6600

6578'

6672'

6767'

6862'

46.93°

53.92°

60.43°

65.79°

271.19°

271.77°

269.94°

267.34°

6496.24'

6556.09'

6607.56'

6650.52'

2.53'

74.90'

154.60'

238.98'

167.00°F

167.00°F

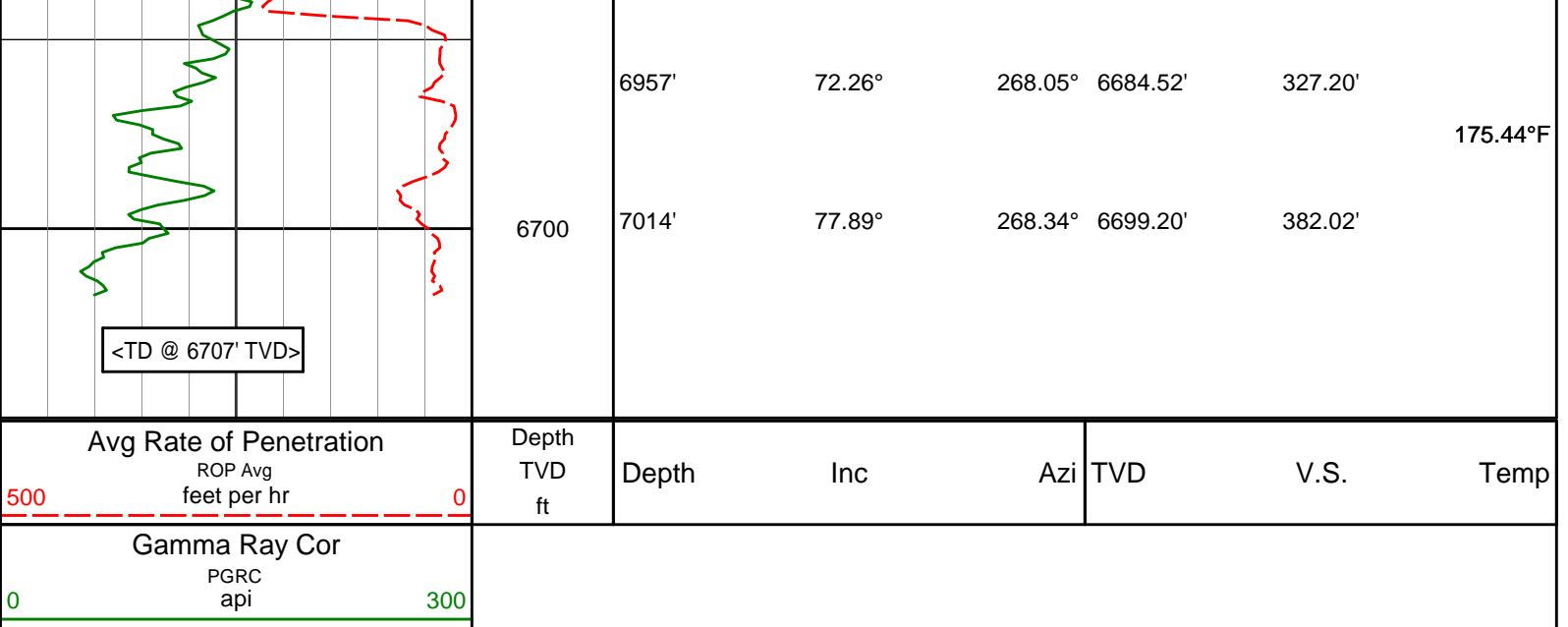
167.00°F

171.22°F

171.22°F

171.22°F

171.22°F



HALLIBURTON

DIRECTIONAL SURVEY REPORT

Noble Energy
Wells Ranch AA11-667
Wattenberg
Weld Colorado
USA
CA-XX-0902306869

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	0.41	312.00	250.00	0.60 N	0.66 W	0.70	0.16
500.00	0.82	312.00	499.98	2.39 N	2.66 W	2.80	0.16
664.00	1.06	312.00	663.96	4.20 N	4.66 W	4.90	0.15
759.00	0.97	315.95	758.95	5.36 N	5.88 W	6.19	0.13
854.00	1.30	312.20	853.93	6.66 N	7.23 W	7.61	0.35
1043.00	1.43	313.23	1042.87	9.72 N	10.54 W	11.10	0.07
1138.00	1.59	310.38	1137.84	11.38 N	12.40 W	13.06	0.18
1229.00	1.42	307.99	1228.81	12.89 N	14.25 W	14.99	0.20
1321.00	1.57	304.37	1320.78	14.31 N	16.19 W	17.02	0.20
1412.00	1.67	311.23	1411.74	15.89 N	18.22 W	19.13	0.24
1595.00	1.87	314.03	1594.65	19.72 N	22.37 W	23.51	0.12
1687.00	1.77	304.99	1686.61	21.58 N	24.62 W	25.86	0.33
1778.00	2.08	341.40	1777.56	23.95 N	26.29 W	27.67	1.36
1870.00	2.22	47.72	1869.51	26.73 N	25.51 W	27.06	2.56
1961.00	3.84	43.56	1960.38	30.12 N	22.11 W	23.86	1.79
2053.00	5.97	45.07	2052.04	35.73 N	16.60 W	18.70	2.32
2144.00	7.23	43.56	2142.43	43.22 N	9.30 W	11.86	1.40
2236.00	8.78	40.53	2233.53	52.75 N	0.75 W	3.89	1.74
2327.00	8.64	36.16	2323.48	63.55 N	7.80 E	-3.99	0.74
2419.00	8.04	33.53	2414.51	74.49 N	15.43 E	-10.95	0.77
2510.00	9.12	35.26	2504.49	85.68 N	23.10 E	-17.95	1.22
2602.00	8.39	28.87	2595.42	97.51 N	30.55 E	-24.68	1.32
2694.00	8.35	26.13	2686.44	109.39 N	36.74 E	-30.15	0.44
2786.00	9.37	34.45	2777.35	121.57 N	43.92 E	-36.59	1.78
2881.00	9.19	26.74	2871.11	134.73 N	51.71 E	-43.58	1.32
2976.00	9.16	23.65	2964.89	148.43 N	58.16 E	-49.20	0.52
3070.00	10.27	28.17	3057.54	162.67 N	65.12 E	-55.30	1.43
3165.00	10.21	26.51	3151.03	177.67 N	72.87 E	-62.14	0.32
3260.00	9.59	23.53	3244.61	192.46 N	79.79 E	-68.17	0.85
3355.00	9.16	20.67	3338.35	206.79 N	85.62 E	-73.13	0.67
3449.00	8.56	36.27	3431.24	219.43 N	92.40 E	-79.14	2.63

3544.00	7.22	37.40	3525.34	229.88 N	100.21 E	-86.32	1.42
3639.00	8.95	39.09	3619.39	240.35 N	108.49 E	-93.96	1.84
3733.00	9.95	38.15	3712.11	252.41 N	118.12 E	-102.85	1.08
3828.00	10.46	38.73	3805.61	265.60 N	128.59 E	-112.51	0.55
3923.00	10.98	37.81	3898.95	279.48 N	139.53 E	-122.61	0.58
4018.00	11.81	32.51	3992.08	294.83 N	150.30 E	-132.45	1.41
4112.00	10.04	32.52	4084.37	309.85 N	159.88 E	-141.11	1.89
4302.00	8.31	29.57	4271.93	335.76 N	175.56 E	-155.21	0.94
4397.00	7.10	28.66	4366.07	346.88 N	181.76 E	-160.74	1.28
4492.00	6.27	29.09	4460.43	356.57 N	187.10 E	-165.50	0.88
4587.00	6.24	27.74	4554.86	365.67 N	192.03 E	-169.87	0.16
4681.00	5.77	27.32	4648.35	374.39 N	196.57 E	-173.89	0.50
4776.00	4.91	25.89	4742.93	382.29 N	200.54 E	-177.37	0.91
4871.00	3.72	21.87	4837.66	388.80 N	203.46 E	-179.90	1.29
4966.00	1.13	18.82	4932.57	392.55 N	204.91 E	-181.13	2.72
5061.00	0.60	358.18	5027.56	393.93 N	205.20 E	-181.33	0.64
5156.00	0.79	37.26	5122.55	394.95 N	205.57 E	-181.65	0.52
5250.00	0.81	71.37	5216.54	395.67 N	206.60 E	-182.62	0.50
5345.00	0.96	53.00	5311.53	396.37 N	207.87 E	-183.86	0.34
5440.00	0.83	66.01	5406.52	397.13 N	209.14 E	-185.08	0.25
5535.00	1.25	61.90	5501.51	397.90 N	210.69 E	-186.58	0.44
5629.00	1.07	57.87	5595.49	398.85 N	212.33 E	-188.16	0.21
5819.00	0.14	11.87	5785.47	400.01 N	213.88 E	-189.63	0.51
5914.00	0.95	289.42	5880.47	400.39 N	213.16 E	-188.89	0.99
6009.00	1.95	265.28	5975.44	400.51 N	210.81 E	-186.54	1.21
6104.00	5.19	274.76	6070.24	400.74 N	204.92 E	-180.65	3.45
6198.00	10.48	274.01	6163.33	401.69 N	192.15 E	-167.84	5.63
6293.00	18.59	276.69	6255.22	404.06 N	168.45 E	-144.04	8.56
6388.00	26.14	273.46	6343.01	407.09 N	132.46 E	-107.94	8.05
6483.00	35.09	270.46	6424.69	408.57 N	84.16 E	-59.64	9.55
6578.00	46.93	271.19	6496.24	409.51 N	21.94 E	2.53	12.47
6672.00	53.92	271.77	6556.09	411.40 N	50.44 W	74.90	7.45
6767.00	60.43	269.94	6607.56	412.54 N	130.22 W	154.60	7.04
6862.00	65.79	267.34	6650.52	410.49 N	214.88 W	238.98	6.15
6957.00	72.26	268.05	6684.52	406.93 N	303.46 W	327.20	6.84
7014.00	77.89	268.34	6699.20	405.20 N	358.49 W	382.02	9.90
7066.00	83.35	269.15	6707.67	404.08 N	409.76 W	433.14	10.62

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 273.42 DEGREES (GRID)
A TOTAL CORRECTION OF 7.65 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.
HORIZONTAL DISPLACEMENT(CLOSURE) AT 7066.00 FEET
IS 575.49 FEET ALONG 314.60 DEGREES (GRID)**

Surveys at 250 ft and 500 ft were interpolated from first survey at 664 ft per Noble Energy.

Last survey is a projection from 7014 ft MD to TD at 7066 ft MD.