

PCGK - Pressure Case Gamma

1 : 240

[illegible]

## WELL INFORMATION

<b>MWD Run Number</b>	100	200			
<b>Date run completed</b>	09-Jan-14	10-Jan-14			
<b>Rig Bit Number</b>	2	3			
<b>Bit Size (in)</b>	8.750	8.750			
<b>Tool Nominal OD (in)</b>	6.750	6.750			
<b>Log Start Depth (TVD, ft)</b>	970.00	5,965.02			
<b>Log End Depth (TVD, ft)</b>	5965.02	6667.72			
<b>Drill or Wipe</b>	Drill	Drill			
<b>Drill/Wipe Start Date and Time</b>	08-Jan-14 03:30	09-Jan-14 12:50			
<b>Drill/Wipe End Date and Time</b>	08-Jan-14 22:00	10-Jan-14 02:20			
<b>Min Inc (deg) @ Depth (TVD, ft)</b>	0.10 @ 736.99	3.41 @ 6,036.93			
<b>Max Inc (deg) @ Depth (TVD, ft)</b>	17.65 @ 3,887.86	78.24 @ 6,655.90			
<b>Bit TFA(in2) / Bit Type</b>	0.75 / PDC	1.50 / PDC			
<b>Flow Rate (gpm)</b>	584.80	546.10			
<b>Max AV (fpm) / CV (fpm) @ MWD</b>	477.1 / 477.1	462.9 / 462.9			
<b>Fluid Type</b>	Fresh Water Gel	Fresh Water Gel			
<b>Density (ppg) / Viscosity (spqt)</b>	8.80 / 28.00	9.45 / 36.00			
<b>Filtrate CL (ppm)</b>	2,100.00	2,900.00			
<b>pH / Fluid Loss (mptm)</b>	8.70 / N/A	10.20 / N/A			
<b>PV (cP) / YP (lbf2)</b>	29 / 2.00	8 / 7.00			
<b>% Solids / % Sand</b>	2.9 / .35	6.10 / 0.45			
<b>% Oil / Oil:Water Ratio</b>	N/A / N/A	N/A / N/A			
<b>Rm @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmf @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Rmc @ Measured Temp (degF)</b>	N/A @ N/A	N/A @ N/A			
<b>Max Tool Temp (deg F) / S</b>	145.00 / 20M	122.00 / 20M			

Max Tool Temp (degF) / Source	145.90 / PCM	162.80 / PCM			
Rm @ Max Tool Temp (degF)	N/A @ N/A	N/A @ N/A			
Lead MWD Engineer	Garry Igunbor	Garry Igunbor			
Customer Representative	Jeremy Stolz	Jeremy Stolz			

## SENSOR INFORMATION

### Downhole Processor Information

Tool Type	PCM	PCM			
Software Version	5.84	5.84			
Sub Serial Number	11303511	11303511			
Insert Serial Number	11145509	11145509			
Date and Time Initialized	07-Jan-14 14:58	07-Jan-14 14:58			
Date and Time Read	10-Jan-14 11:25	10-Jan-14 11:18			
ECMB SW Version	N/A	N/A			

### Directional Sensor Information

Tool Type	PCDC	PCDC			
Distance From Bit (ft)	60.00	58.00			
Software Version	6.21	6.21			
Sub Serial Number	11303511	11303511			
Sonde Serial Number	11297588	11297588			
Sensor ID Number	N/A	N/A			
Toolface Offset (deg)	212.94	118.93			

### Gamma Ray Sensor Information

Tool Type	PCG	PCG			
Distance From Bit (ft)	52.96	50.89			
Recorded Sample Period (sec)	10	10			
Software Version	8.15	8.15			
Sub Serial Number	11303511	11303511			
Insert/Sonde Serial Number	11293266	11293266			

## REMARKS

1. All depths are true vertical 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"

PGXR (Gamma Ray CG):

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

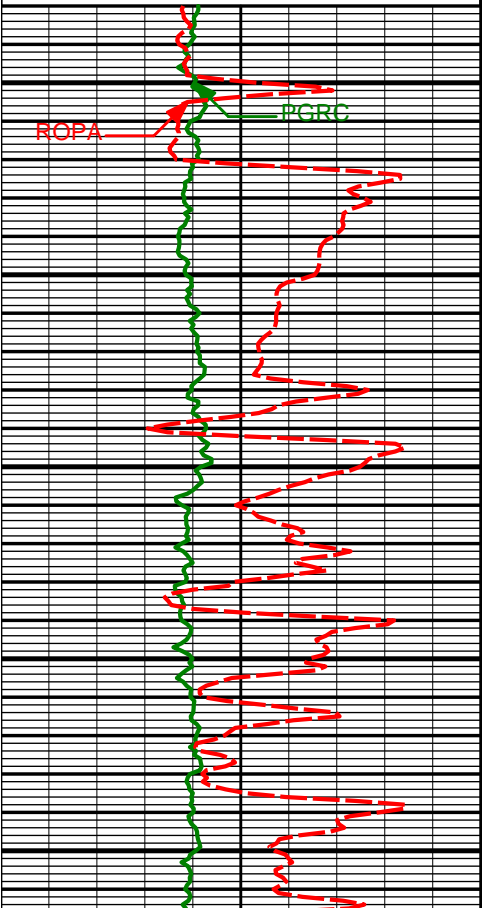
5. Gamma from 5816 ft to 5829 ft TVD and ROP from 5865 ft to 5877 ft TVD is missing due to communication error with Pason.

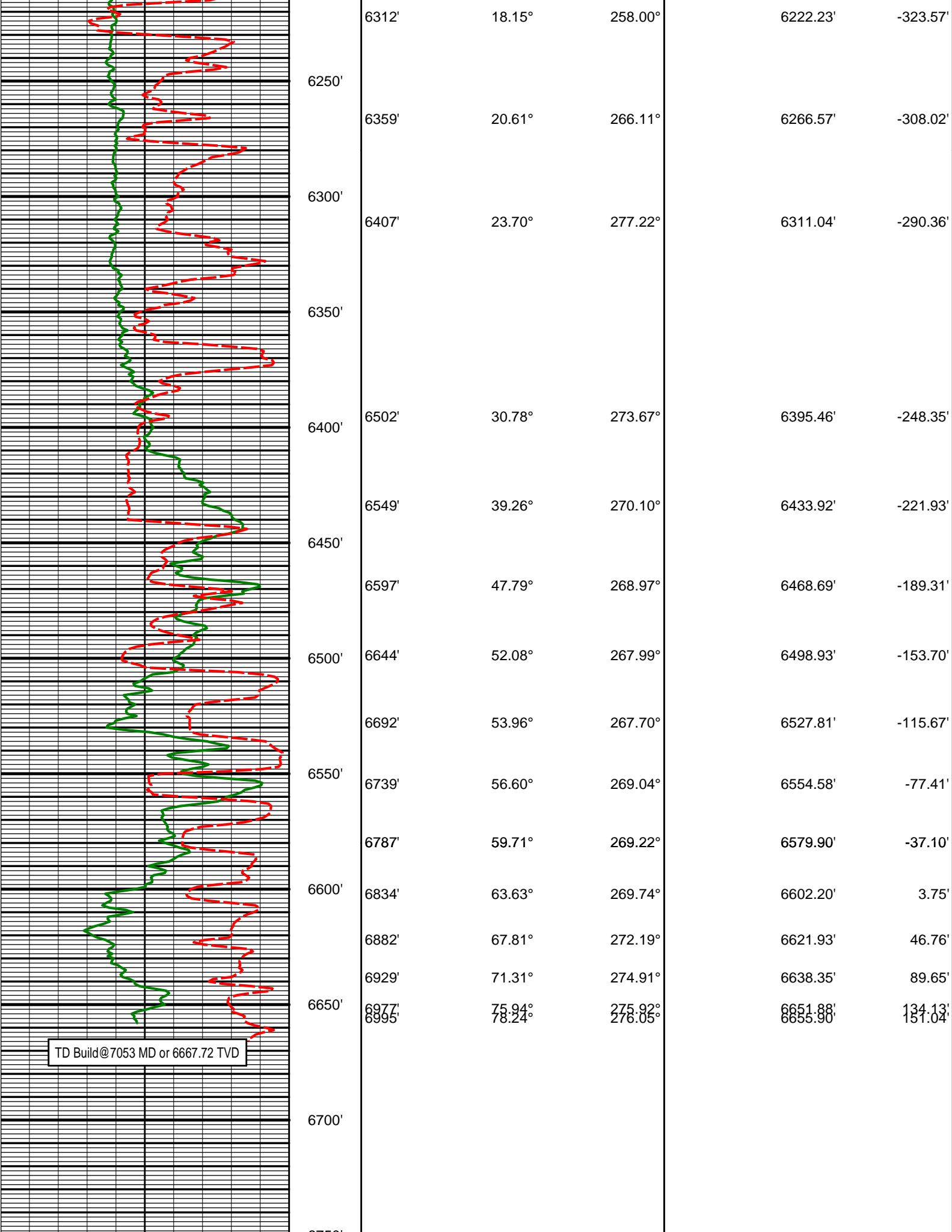
WARRANTY

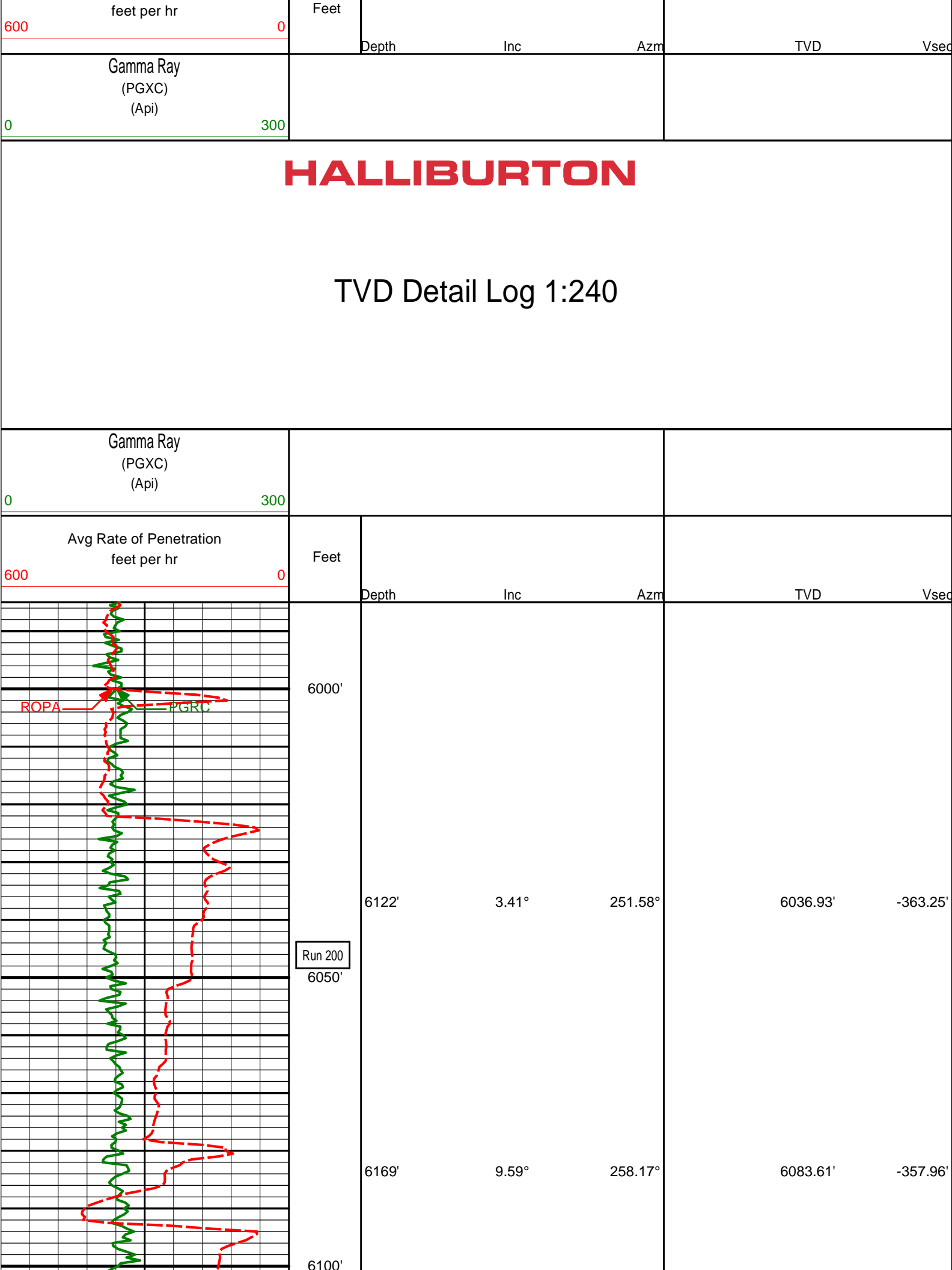
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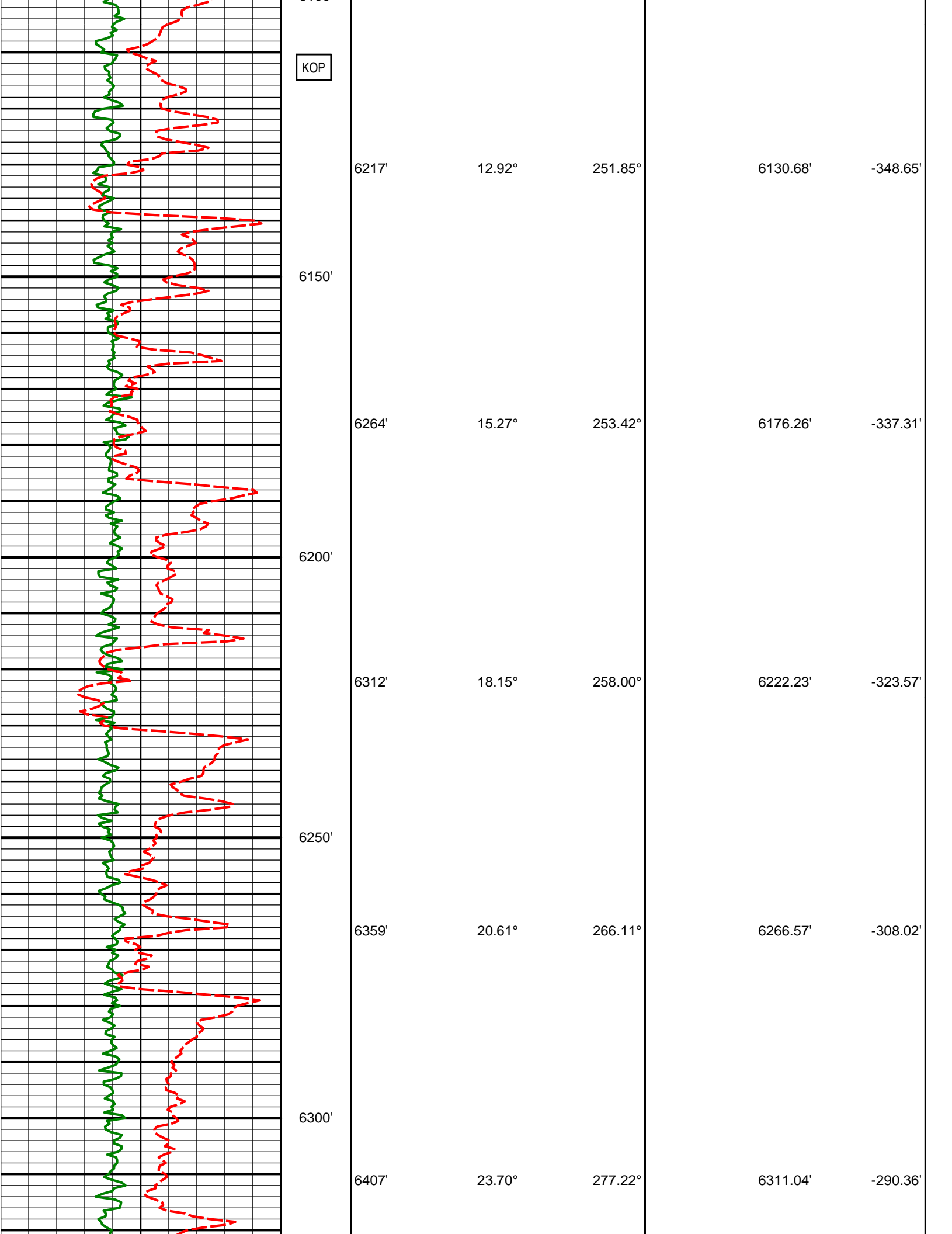
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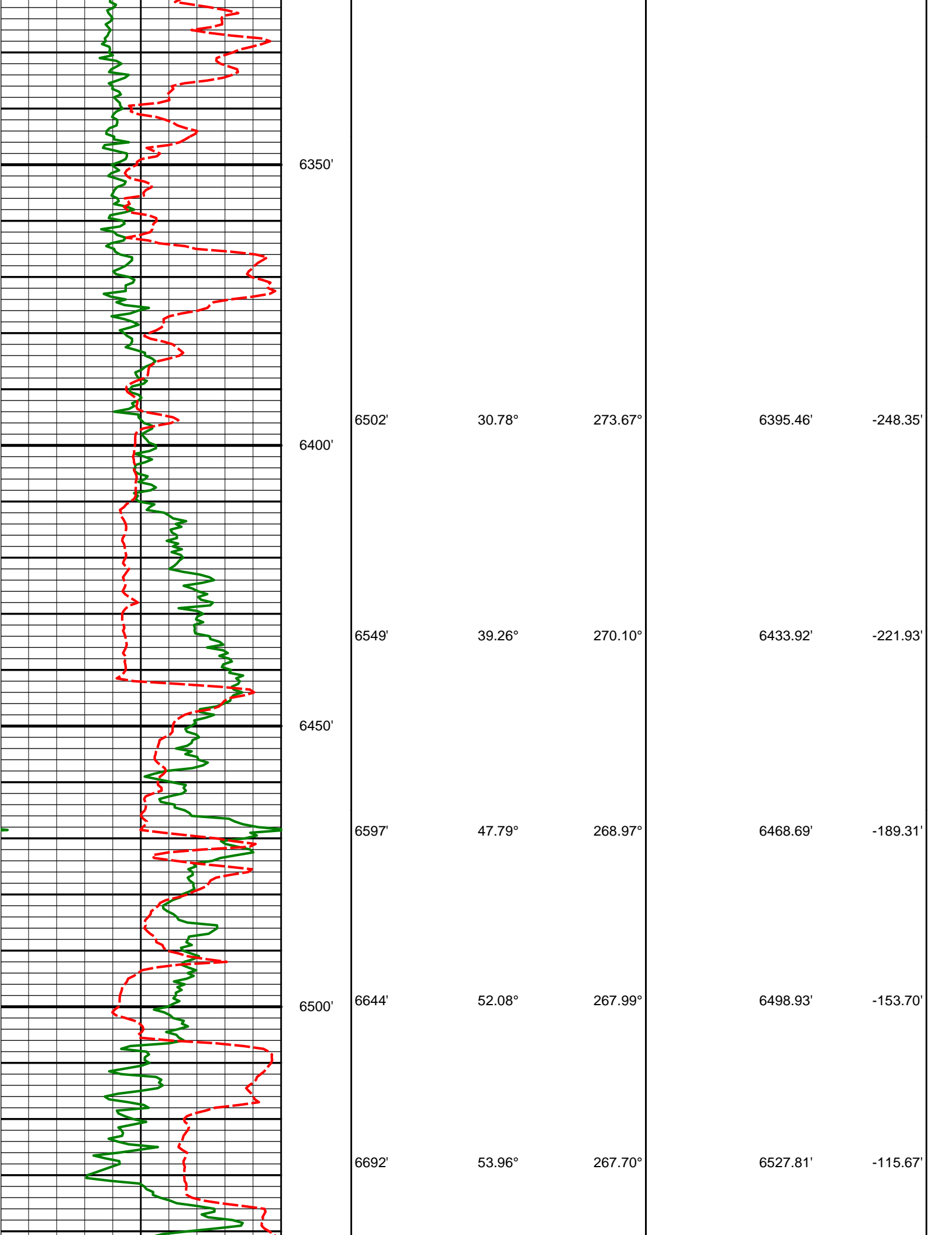
TVD Detail Log 1:600

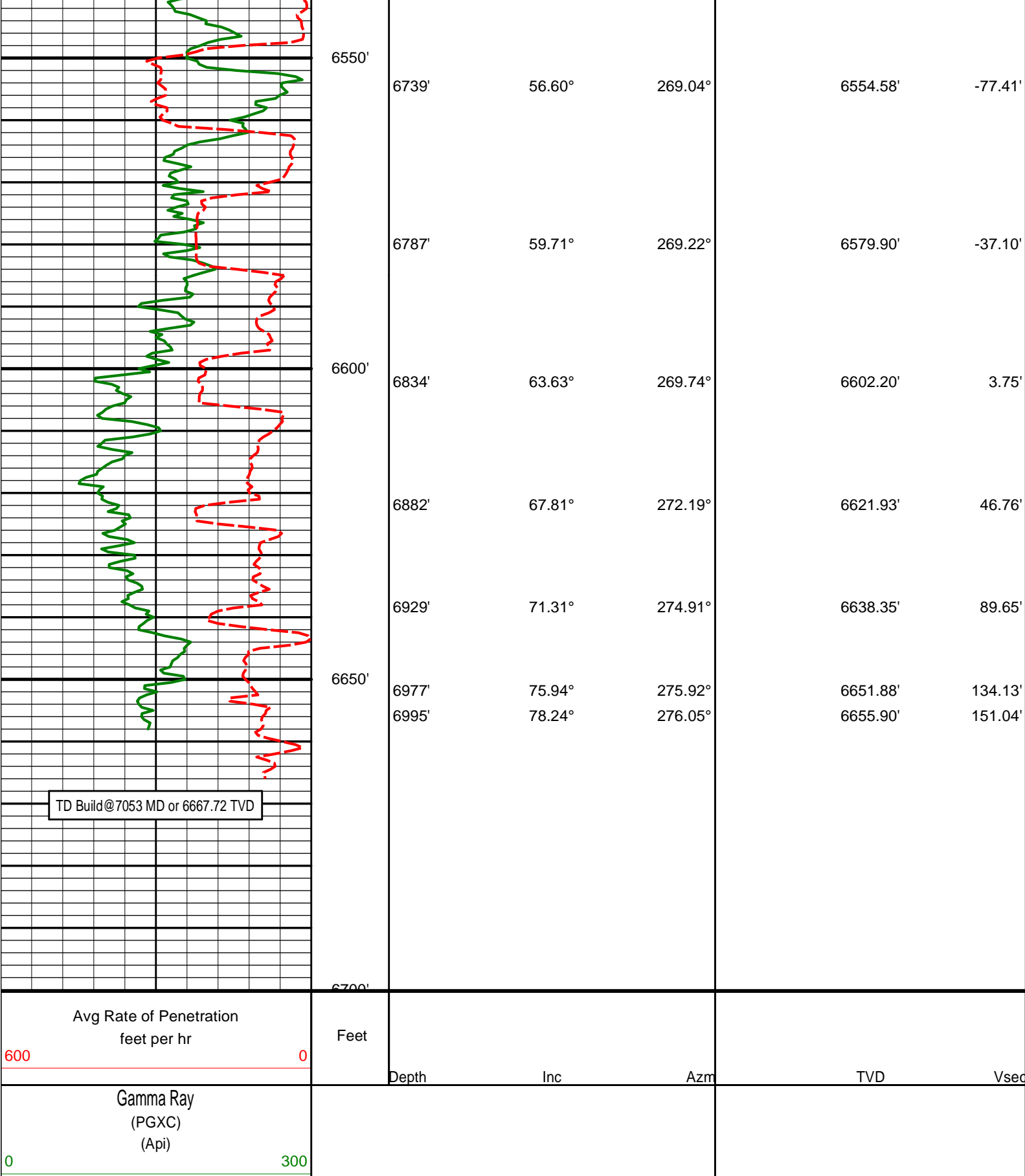
Gamma Ray (PGXC) (Api)					
0300					
Avg Rate of Penetration feet per hr	Feet				
6000					
	Depth	Inc	Azm	TVD	Vsec
	6000'				
	Run 200 6050'	6122'	3.41°	251.58°	6036.93' -363.25'
		6169'	9.59°	258.17°	6083.61' -357.96'
	6100' KOP	6217'	12.92°	251.85°	6130.68' -348.65'
	6150'	6264'	15.27°	253.42°	6176.26' -337.31'
	6200'				











**DIRECTIONAL SURVEY REPORT**

Noble Energy  
Wells Ranch State AA21-62-1HN  
Wattenberg  
Weld Colorado  
USA



<i>Measured Depth (feet)</i>	<i>Inclination (degrees)</i>	<i>Direction (degrees)</i>	<i>Vertical Depth (feet)</i>	<i>Latitude (feet)</i>	<i>Departure (feet)</i>	<i>Vertical Section (feet)</i>	<i>Dogleg (deg/100ft)</i>
0.00	0.00	0.00	0.00	0.00 N	0.00 E	0.00	TIE-IN
234.00	0.30	300.59	234.00	0.31 N	0.53 W	0.47	0.13
483.00	0.50	299.69	482.99	1.18 N	2.03 W	1.81	0.08
737.00	0.10	59.89	736.99	1.84 N	2.80 W	2.46	0.22
912.00	0.10	93.89	911.99	1.91 N	2.52 W	2.17	0.03
1015.00	0.52	36.12	1014.99	2.28 N	2.15 W	1.75	0.46
1107.00	0.59	66.11	1106.98	2.81 N	1.47 W	0.99	0.32
1200.00	0.79	26.93	1199.98	3.57 N	0.75 W	0.15	0.54
1293.00	0.57	339.15	1292.97	4.58 N	0.62 W	-0.14	0.63
1386.00	1.77	128.71	1385.96	4.11 N	0.34 E	-1.01	2.45
1479.00	3.67	154.49	1478.85	0.53 N	2.74 E	-2.79	2.38
1574.00	4.72	150.89	1573.60	5.63 S	5.95 E	-4.94	1.14
1669.00	5.86	160.22	1668.19	13.61 S	9.49 E	-7.11	1.50
1764.00	8.49	148.15	1762.45	24.13 S	14.84 E	-10.64	3.18
1859.00	10.93	137.48	1856.09	36.73 S	24.63 E	-18.22	3.18
1954.00	12.37	137.55	1949.13	50.88 S	37.58 E	-28.66	1.52
2048.00	12.18	133.72	2040.98	65.16 S	51.54 E	-40.07	0.89
2143.00	14.00	140.52	2133.51	80.96 S	66.09 E	-51.81	2.51
2238.00	12.86	135.27	2225.92	97.34 S	80.84 E	-63.65	1.76
2333.00	14.02	138.67	2318.31	113.49 S	95.88 E	-75.81	1.48
2428.00	12.91	134.63	2410.70	129.59 S	111.04 E	-88.10	1.53
2523.00	12.95	141.84	2503.30	145.42 S	125.17 E	-99.42	1.70
2618.00	12.71	151.70	2595.94	162.99 S	136.70 E	-107.89	2.32
2713.00	10.94	148.94	2688.92	179.92 S	146.31 E	-114.57	1.96
2808.00	12.20	150.99	2781.99	196.42 S	155.82 E	-121.23	1.39
2903.00	14.08	152.34	2874.50	215.43 S	166.06 E	-128.18	2.01
2998.00	14.56	154.18	2966.55	236.42 S	176.62 E	-135.14	0.70
3092.00	13.24	152.65	3057.79	256.62 S	186.72 E	-141.75	1.46
3187.00	12.62	151.24	3150.38	275.38 S	196.71 E	-148.51	0.73
3282.00	12.98	147.57	3243.02	293.48 S	207.42 E	-156.08	0.94
3377.00	13.28	147.16	3335.54	311.65 S	219.06 E	-164.56	0.33
3472.00	11.25	148.31	3428.37	328.71 S	229.85 E	-172.38	2.15
3567.00	10.13	139.35	3521.72	342.93 S	240.16 E	-180.20	2.11
3662.00	13.27	134.59	3614.74	356.93 S	253.37 E	-190.92	3.46
3756.00	15.26	134.14	3705.84	373.12 S	269.93 E	-204.57	2.12
3851.00	16.85	132.54	3797.13	391.14 S	289.05 E	-220.45	1.74
3946.00	17.65	135.80	3887.86	410.77 S	309.24 E	-237.12	1.32
4040.00	15.72	139.65	3977.90	430.69 S	327.42 E	-251.76	2.37
4135.00	14.37	141.97	4069.64	449.79 S	343.01 E	-263.99	1.56
4230.00	12.93	140.98	4161.96	467.33 S	356.97 E	-274.85	1.54
4325.00	11.59	142.64	4254.79	483.18 S	369.45 E	-284.54	1.46
4419.00	10.66	145.74	4347.02	497.87 S	380.08 E	-292.59	1.18
4515.00	12.15	146.73	4441.12	513.65 S	390.62 E	-300.38	1.57
4610.00	10.96	149.71	4534.20	529.81 S	400.66 E	-307.62	1.40
4705.00	12.22	143.71	4627.26	545.72 S	411.16 E	-315.35	1.83
4800.00	10.50	140.01	4720.40	560.45 S	422.68 E	-324.27	1.97
4894.00	8.97	137.30	4813.04	572.40 S	433.15 E	-332.63	1.70
4989.00	9.02	134.41	4906.87	583.06 S	443.50 E	-341.07	0.48
5084.00	7.37	138.98	5000.90	592.86 S	452.82 E	-348.64	1.87
5178.00	6.25	138.11	5094.24	601.22 S	460.19 E	-354.53	1.20
5273.00	4.49	142.35	5188.82	608.02 S	465.91 E	-359.05	1.90
5368.00	4.68	139.38	5283.51	613.90 S	470.71 E	-362.81	0.32
5463.00	3.83	130.22	5378.25	618.89 S	475.65 E	-366.86	1.14
5558.00	1.74	123.90	5473.13	621.75 S	479.27 E	-369.96	2.22
5653.00	0.49	170.72	5568.11	622.95 S	480.54 E	-371.01	1.53
5748.00	1.39	203.52	5663.10	624.41 S	480.14 E	-370.38	1.07
5843.00	1.02	183.79	5758.08	626.31 S	479.63 E	-369.56	0.58
5938.00	1.47	194.59	5853.06	628.33 S	479.26 E	-368.86	0.53
5990.00	1.32	213.97	5905.04	629.48 S	478.76 E	-368.18	0.95
6122.00	3.41	251.58	6036.93	631.98 S	474.19 E	-363.25	1.89
6169.00	9.59	258.17	6083.61	633.22 S	469.02 E	-357.96	13.22
6217.00	12.92	251.85	6130.68	635.71 S	460.01 E	-348.65	7.39
6264.00	15.27	253.42	6176.26	639.12 S	449.08 E	-337.31	5.07
6312.00	18.15	258.00	6222.23	642.48 S	435.71 E	-323.57	6.59
6359.00	20.61	266.11	6266.57	644.56 S	420.29 E	-308.02	7.75
6407.00	23.70	277.22	6311.04	643.92 S	402.28 E	-290.36	10.82

6502.00	30.78	273.67	6395.46	639.96 S	359.02 E	-248.35	7.64
6549.00	39.26	270.10	6433.92	639.16 S	332.10 E	-221.93	18.55
6597.00	47.79	268.97	6468.69	639.46 S	299.07 E	-189.31	17.84
6644.00	52.08	267.99	6498.93	640.42 S	263.12 E	-153.70	9.27
6692.00	53.96	267.70	6527.81	641.86 S	224.81 E	-115.67	3.95
6739.00	56.60	269.04	6554.58	642.95 S	186.20 E	-77.41	6.09
6787.00	59.71	269.22	6579.90	643.57 S	145.43 E	-37.10	6.49
6834.00	63.63	269.74	6602.20	643.94 S	104.07 E	3.75	8.40
6882.00	67.81	272.19	6621.93	643.19 S	60.34 E	46.76	9.87
6929.00	71.31	274.91	6638.35	640.45 S	16.39 E	89.65	9.21
6977.00	75.94	275.92	6651.88	636.11 S	29.44 W	134.13	9.85
6995.00	78.24	276.05	6655.90	634.28 S	46.89 W	151.04	12.80

**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 260.49 DEGREES (GRID)  
A TOTAL CORRECTION OF 7.69 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED**

**HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD.  
HORIZONTAL DISPLACEMENT(CLOSURE) AT 6995.00 FEET  
IS 636.01 FEET ALONG 184.23 DEGREES (GRID)**

**Tie-In @ Surface**

**Surveys at 234 ft, 483 ft, 737 ft, and 912 were taken and provided by HP 322 while they were drilling the surface hole and have been covered  
from magnetic north to grid north.**

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