



Weatherford®

6 3/4 in. WeatherfordMLWD™
Gamma Ray
1 in. & 5 in. TRUE VERTICAL DEPTH
RECORDED DATA
FINAL PRINT

Company: Anadarko Petroleum Corpora
Well: Howard 4N-28HZ
Field: Wattenberg
Rig: Xtreme 23
County: Weld

COMPANY Anadarko Petroleum Corporation
WELL Howard 4N-28HZ
FIELD Wattenberg
RIG Xtreme 23
COUNTY Weld STATE Colorado
API # 05-123-37676

Location	
Latitude: 40.015625° N	x = 3,167,982 ft
Longitude: 104.9002490° W	y = 1,249,106 ft
Mag Decl: 8.65°	
Mag Dip: 66.64°	

Other Services: Directional

Permanent Datum: <u>Mean Sea Level</u>	
Log Measured From: <u>Drill Floor</u>	Elev: <u>5024 ft</u> above perm. datum
Depth Reference: <u>Drillers Tally</u>	Total Depth: <u>12586 ft</u>
Depth Logged: 6982 ft	Runs: 4
Date Logged: 19-Aug-13 to 7-Sep-13	Spud Date: 17-Aug-13

Elevation	
K.B. Top Drive	
G.L. 5008 ft	
D.F. 5024 ft	
W.D. Land	

Borehole Record			Casing Record		
Hole Size	From	To	Size	Weight	From To
12.250 in.	Surface	966 ft	9.625 in.	57.0 lb/ft	Surface 964 ft
8.750 in.	966 ft	8067 ft	7.000 in.	26.0 lb/ft	Surface 8062 ft
6.125 in.	8067 ft	12586 ft			

Borehole Deviation Record			Mud Record		
Hole Size	Min. Inc.	Max. Inc.	Type	Weight	From To
8.750 in.	0.16°	83.56°	WBM	8.45 - 10.20 ppɡ	966 ft 12586 ft
6.125 in.	87.23°	95.43°			

All interpretations of log data are opinions based on inferences from electrical or other measurements. Weatherford International does not guarantee the accuracy or correctness of any interpretation or recommendation and we shall not be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation or recommendation made by any of our employees or agents.

RUN SUMMARY							
M/LWD Run Number	1	2	3	4			
Bit Size in.	8.750	8.750	8.750	6.125			
Bit Type	PDC	PDC	PDC	PDC			
Bit TFA sq.in.	1.240	1.530	1.320	1.530			
Bit Start Depth ft	966	7032	8005	8067			
Bit End Depth ft	7032	8005	8067	12586			
Top Log Interval ft	NA	6982	7956	8027			
Bottom Log Interval ft	NA	8005	8067	12586			
Begin Log Time hrs	NA	3:34	18:06	19:35			
Begin Log Date DD-MMM-YY	NA	19-Aug-13	21-Aug-13	5-Sep-13			
End Log Time hrs	NA	23:26	0:51	7:42			
End Log Date DD-MMM-YY	NA	20-Aug-13	22-Aug-13	7-Sep-13			
Drill or Wipe	NA	Drill	Drill	Drill			
Flow Rate gal/min	578	530	556	305			
Max AV / CV @ MWD ft/min	470 / 100	419 / 347	441 / 356	488 / 319			
Min Inc @ Depth deg @ ft	0.16 @ 1174	0.70 @ 7033	NA	87.23 @ 11879			
Max Inc @ Depth deg @ ft	18.52 @ 2286	83.56 @ 8001	NA	95.43 @ 8083			
MUD DATA							
Depth ft	7032	8005	8067	12586			
Fluid Type	WBM	WBM	WBM	WBM			
Mud Weight ppG	10.00	10.20	10.10	8.90			
Plastic Viscosity cP	12	12	13	8			
Solids / Sand %	8.7 / 0.5	8.7 / 0.5	8.7 / 0.1	3.7 / 0.6			
NaCl Equiv. Chlorides ppm	1980	1980	2145	1650			
pH	8.9	9.6	9.3	9.5			
Oil:Water Ratio % Vol	1.7 : 98.3	1.7 : 98.3	1.5 : 98.5	0.7 : 99.3			
Rm @ Temperature ohm-m @ deg F	NA	NA	NA	NA			
Rmc @ Temperature ohm-m @ deg F	NA	NA	NA	NA			
Rmf @ Temperature ohm-m @ deg F	NA	NA	NA	NA			
KCl % Vol	0	0	0	0			
Client Representative	J. Tettleton	J. Tettleton	J. Tettleton	R. McPeters			
WeatherfordM/LWD Engineer	D. Palmer	D. Palmer	D. Palmer	M. Nguyen			

EQUIPMENT SUMMARY					
M/LWD Run Number	1	2	3	4	
BTR / CDS Serial Number	44708 / 44742	44708 / 44742	44702 / 44736	NA	
Battery Serial Number	403716774	403716774	403715890	NA	
Gamma Ray Serial Number	NA	3138	51262	NA	
HEL Serial Number	NA	NA	NA	NW132070PDBS4.75	
SAGR Serial Number	NA	NA	NA	NW132077JB4.75	
IDS Serial Number	NA	NA	NA	NW132072IB4.75	
Sensor to Bit Offsets / Acquisition Rates					
Directional	ft / sec	63.90 / RT	63.92 / RT	63.90 / RT	55.28 / RT
Spectral Gamma Ray	ft / sec	NA	NA	NA	40.33 / 5
Other Information					
Total BHA Length	ft	119.14	120.23	120.21	7236.93
BHA Assembly Type		Steerable	Steerable	Steerable	Steerable
Stabilizer Location	ft	NA	NA	NA	30.34
Run Circulating Time	hr	24.72	18.39	8.58	36.74
Run Drilling Time	hr	15.92	10.75	4.11	18.00

MUD SUMMARY

Date and Time	Run	Bit Depth	Mud Weight	% K	Rm @ Temp	Rmf @ Temp	Rmc @ Temp	BHCT
19 Aug 13 @ 23:00	01	7032 ft	10.00 ppg	0	NA	NA	NA	168 F
20 Aug 13 @ 23:26	02	8005 ft	10.20 ppg	0	NA	NA	NA	176 F
22 Aug 13 @ 00:51	03	8067 ft	10.10 ppg	0	NA	NA	NA	178 F
07 Sept 13 @ 07:42	04	12586 ft	8.90 ppg	0	NA	NA	NA	220 F

M/LWD RUN REMARKS

Run Number: 1 :: RECORDED DATA LOG

WFT Services Provided:

Directional Services: On demand Inclination and Azimuth.

Run Number: 2 :: RECORDED DATA LOG

WFT Services Provided:

Recorded and Real Time Logging: Gamma Ray and Temperature.

Directional Services: On demand Inclination and Azimuth.

Borehole and Environmental Correction:

Hole Size: 8.750 in.

Gamma Ray: Hole size, mud weight, Collar O.D., Collar I.D. and K1 factor.

Mud Weight: 10.20 ppg

Collar O.D.: 6.860 in.

K1 Factor: 3.25

Collar I.D.: 3.250 in.

Run Number: 3 :: RECORDED DATA LOG

WFT Services Provided:

Recorded and Real Time Logging: Gamma Ray and Temperature.

Directional Services: On demand Inclination and Azimuth.

Borehole and Environmental Correction:

Hole Size: 8.750 in.

Gamma Ray: Hole size, mud weight, Collar O.D., Collar I.D. and K1 factor.

Mud Weight: 10.20 ppg

Collar O.D.: 6.860 in.

K1 Factor: 3.25

Collar I.D.: 3.250 in.

Run Number: 4 :: RECORDED DATA LOG

WFT Services Provided:

Recorded and Real Time Logging: Spectral Gamma Ray and Temperature.

Directional Services: On demand Inclination and Azimuth.

Borehole and Environmental Correction:

Hole Size: 6.125 in.

Gamma Ray: Hole size mud weight, and KCL Concentration.

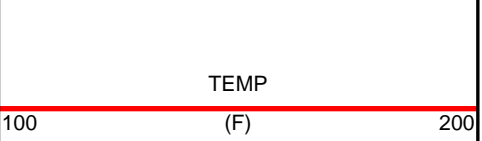
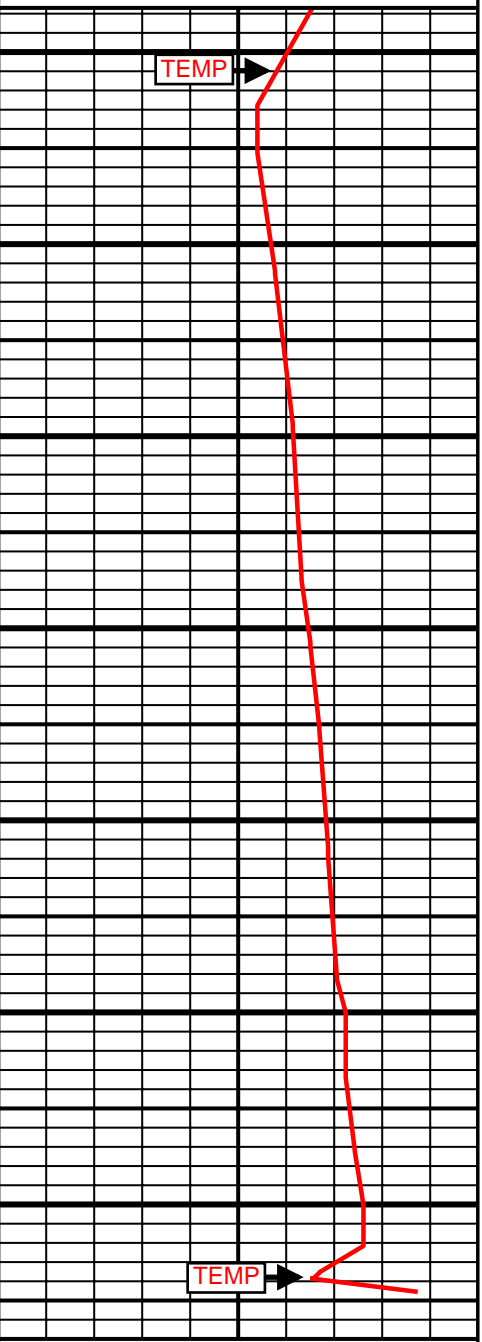
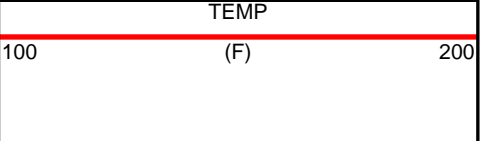
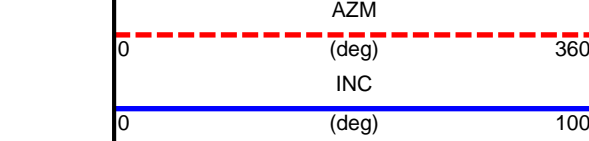
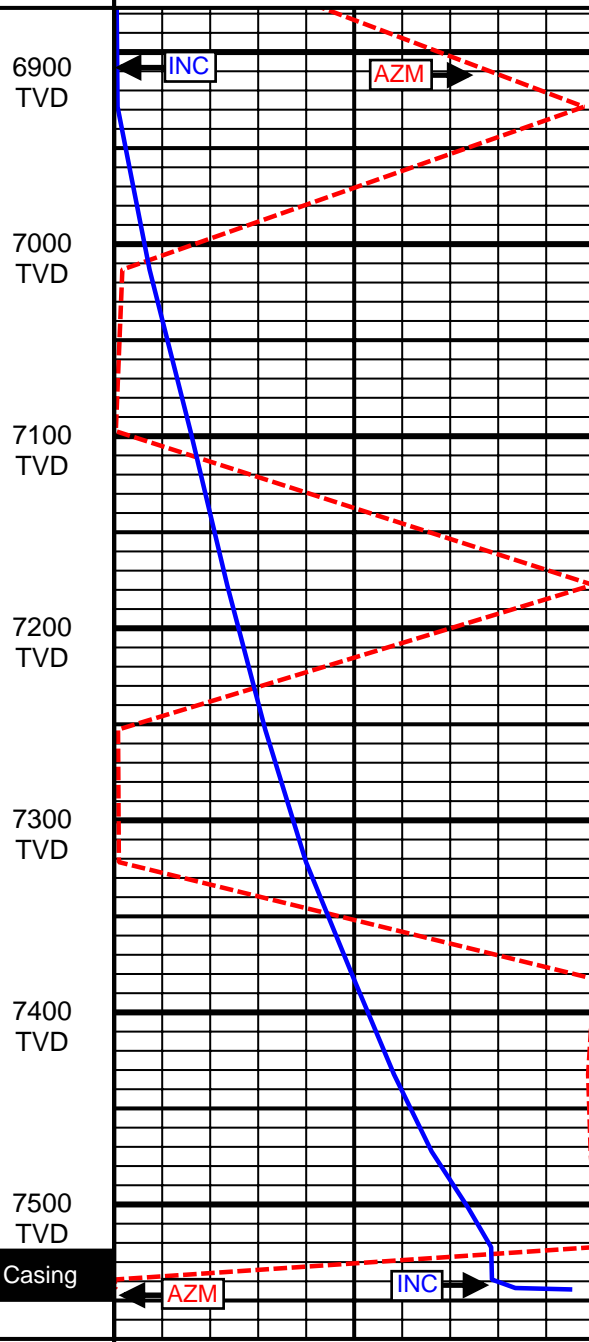
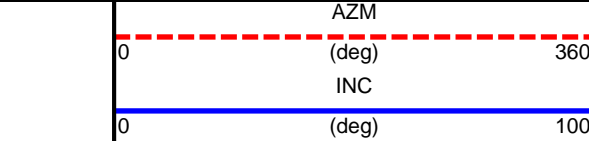
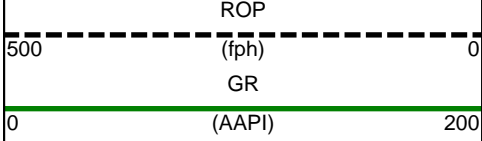
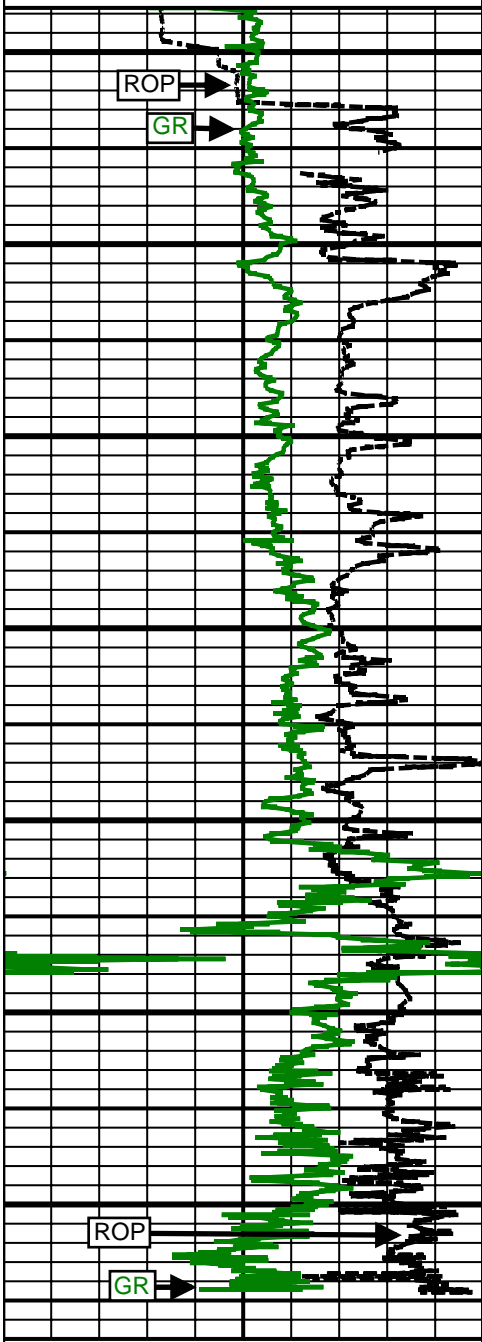
Mud Weight: 9.00 ppg

KCl Concentration: 0%

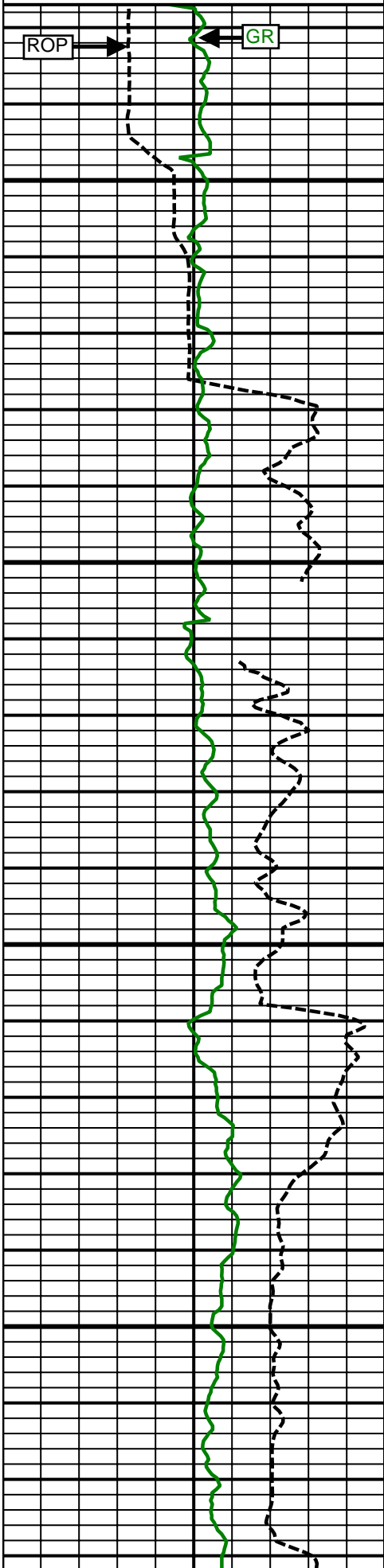
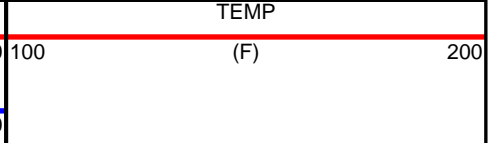
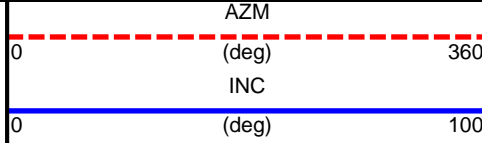
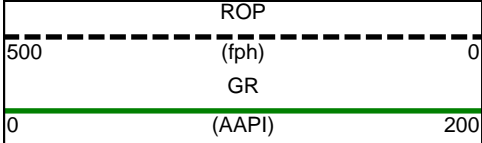
M/LWD LOG COMMENTS	
Comment No. 1-1	<p>RECORDED DATA LOG</p> <p>Start of M/LWD Drilling Run 02</p> <p>Weatherford International provided 6 3/4 in. Directional and Gamma Ray for Run 02.</p> <p>Run 02 started formation drilling August 19, 2013 at 3:34 at 7032 MD / 6928 TVD. Weatherford International logged the 8.750 in. borehole.</p> <p>The WBM at the start of drilling was 8.45 ppg.</p>
Comment No. 1-2	<p>End of M/LWD Drilling Run 02</p> <p>Run 02 ended drilling formation August 20, 2013 at 23:26 at 8005 MD / 7544 TVD.</p> <p>The WBM at the end of drilling was 10.20 ppg.</p>
Comment No. 2-1	<p>RECORDED DATA LOG</p> <p>Start of M/LWD Drilling Run 03</p> <p>Weatherford International provided 6 3/4 in. Directional and Gamma Ray for Run 03.</p> <p>Run 03 started formation drilling August 21, 2013 at 18:06 at 8005 MD / 7544 TVD. Weatherford International logged the 8.750 in. borehole.</p> <p>The WBM at the start of drilling was 10.20 ppg.</p>
Comment No. 2-2	<p>End of M/LWD Drilling Run 03</p> <p>Run 03 ended drilling formation August 22, 2013 at 00:51 at 8067 MD / 7546 TVD.</p> <p>The WBM at the end of drilling was 10.10 ppg.</p>
Comment No. 3-1	<p>RECORDED DATA LOG</p> <p>Start of M/LWD Drilling Run 04</p> <p>Weatherford International provided 4 3/4 in. Directional and Spectral Gamma Ray for Run 04.</p> <p>Run 04 started formation drilling September 5, 2013 at 19:35 at 8067 MD / 7546 TVD. Weatherford International logged the 6.125 in. borehole.</p> <p>The WBM at the start of drilling was 8.70 ppg.</p>
Comment No. 3-2	<p>End of M/LWD Drilling Run 04</p> <p>Run 04 ended drilling formation September 7, 2013 at 7:42 at 12586 MD / 7507 TVD.</p> <p>The WBM at the end of drilling was 8.90 ppg.</p>

CURVE SPECIFICATIONS				
CURVE TYPE	MNEMONIC	UNITS	COMMENTS	CORRECTIONS
Rate of Penetration	ROP	fph	Rate of Penetration 3.0 ft window 0.5 ft Exponential Smoothing	None
Gamma Ray	GR	AAPI	Gamma Ray 3.0 ft window 0.5 ft Exponential Smoothing	See M/LWD Run Remarks
Inclination	INC	deg	Survey Inclination No Smoothing	None
Azimuth	AZM	deg	Survey Azimuth No Smoothing	
Temperature	TEMP	F	Borehole Temperature 3.0 ft window 0.5 ft Exponential Smoothing	

1 Inch - True Vertical Depth

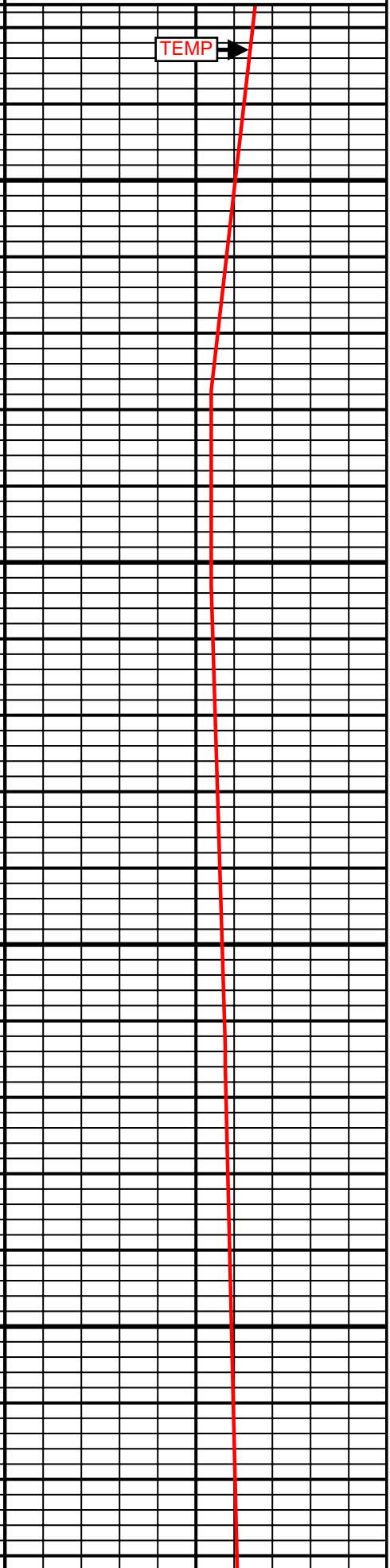
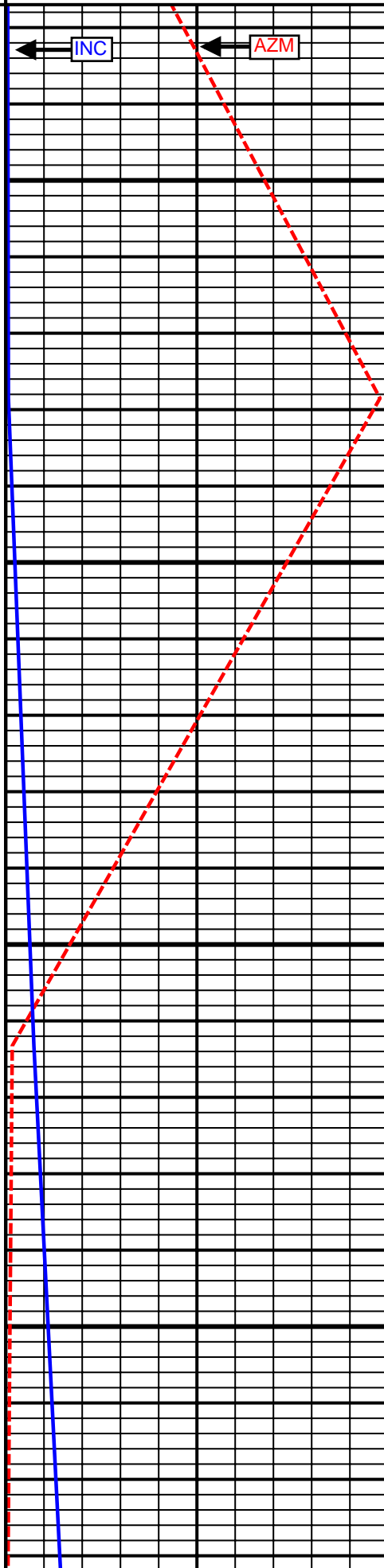


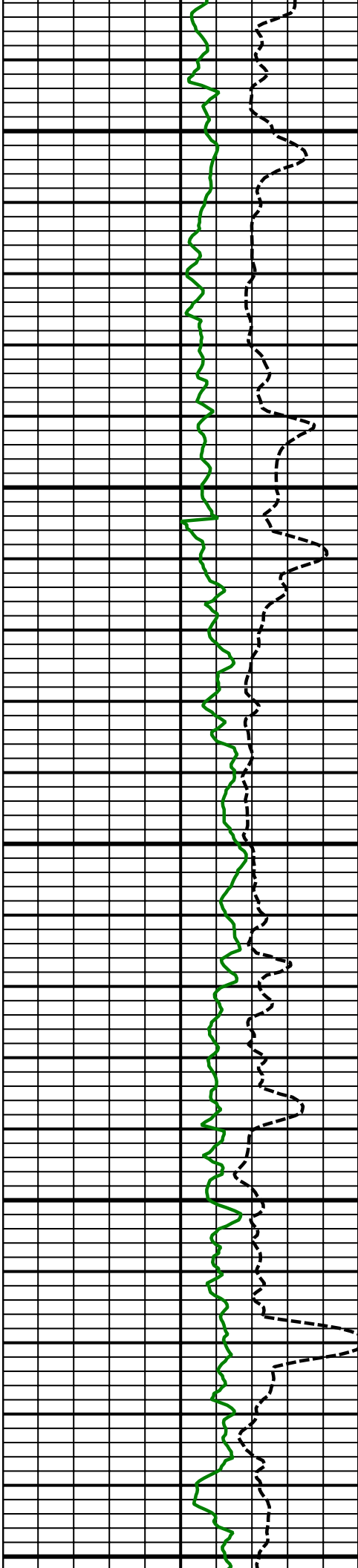
5 Inch - True Vertical Depth



6900
TVD

7000
TVD

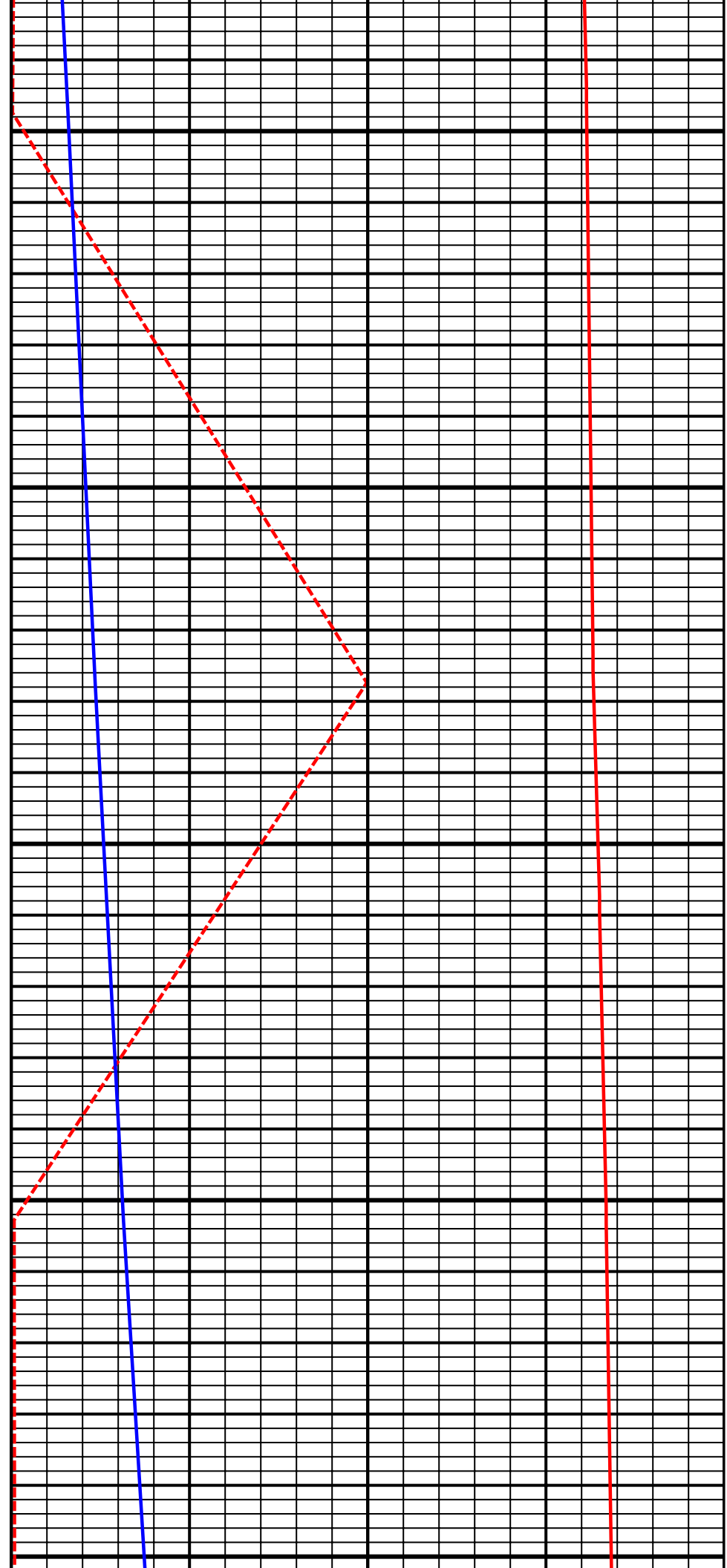


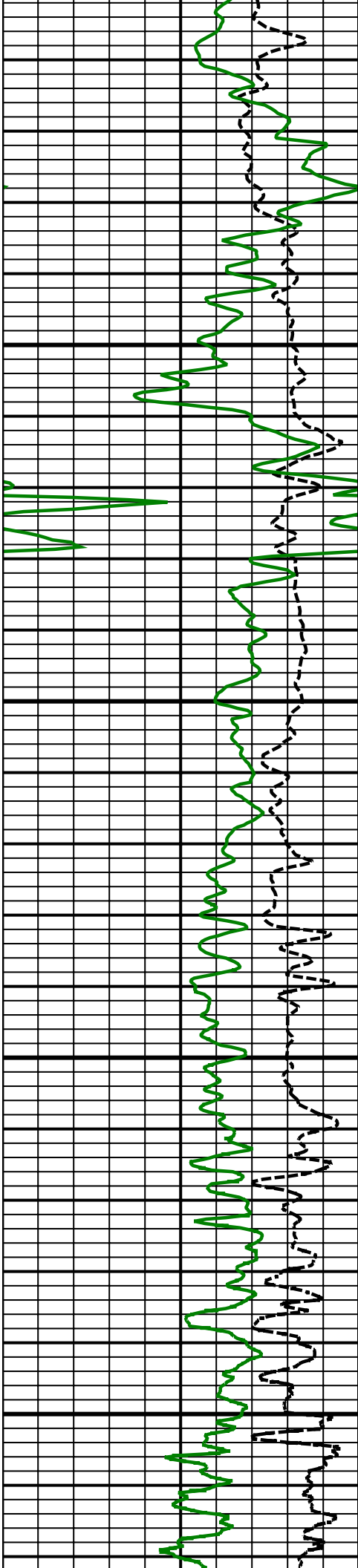


7100
TVD

7200
TVD

7300

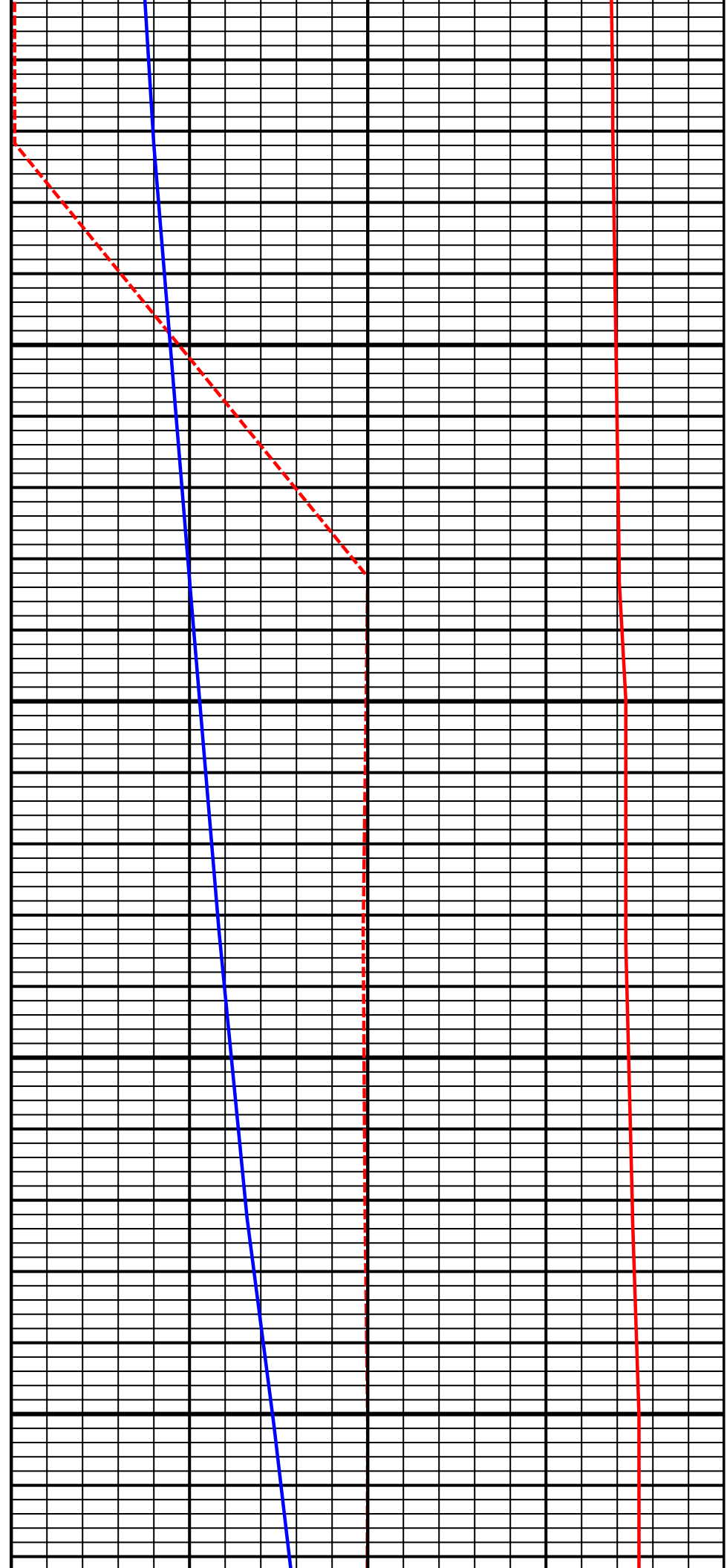


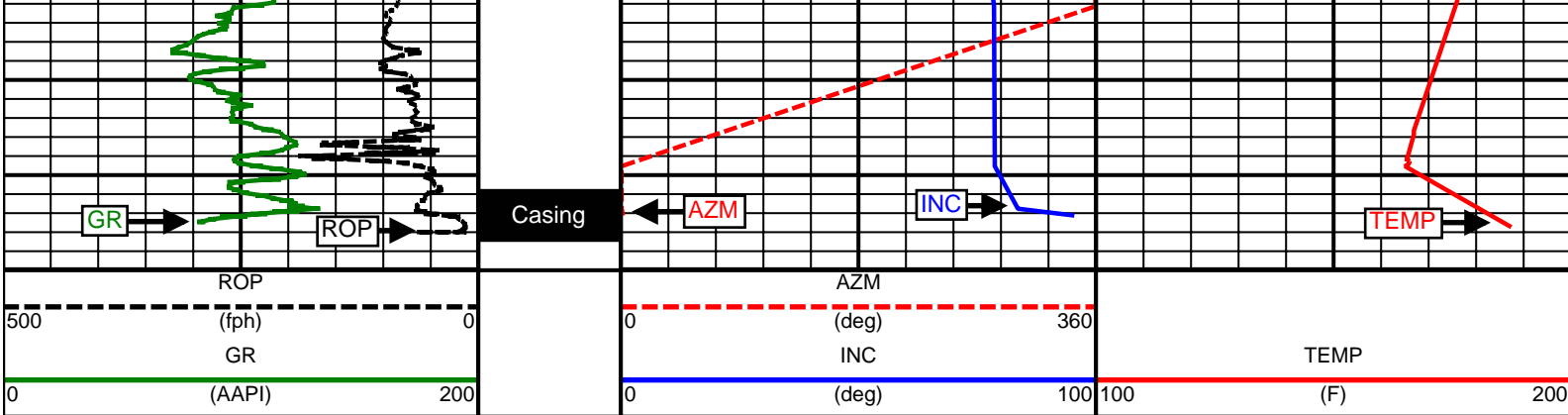


TVD

7400
TVD

7500
TVD





SURVEY						
Survey Calculation Method: Minimum Curvature						
Magnetic Reference	Target Direction	Total Magnetic Field	Magnetic Dip Angle	Magnetic Declination	Grid Convergence	Total Correction
True North	359.65 deg	52617 nT	66.64 deg	8.65 deg	0.00 deg	8.65 deg
Survey Tie-On	Depth	INC	AZ	TVD	NS	EW
	966.00 ft	0.27 deg	292.29 deg	965.99 ft	1.68 ft	1.55 ft

Well Head							
Depth (ft)	Inc (deg)	Azm (deg)	TVD (ft)	NS (ft)	EW (ft)	VSect (ft)	Dogleg (deg/100ft)
1117.00	0.35	94.42	1116.99	1.78	1.68	1.77	0.41
1174.00	0.16	302.96	1173.99	1.81	1.79	1.80	0.87
1265.00	2.59	272.36	1264.96	1.96	-0.37	1.97	2.70
1356.00	3.91	267.89	1355.81	1.93	-5.53	1.97	1.48
1452.00	5.25	260.86	1451.50	1.12	-13.14	1.20	1.51
1545.00	6.09	252.00	1544.05	-1.09	-22.03	-0.95	1.30
1637.00	7.51	252.63	1635.40	-4.39	-32.41	-4.19	1.55
1730.00	10.48	255.66	1727.24	-8.30	-46.41	-8.01	3.23
1823.00	12.35	253.42	1818.40	-13.23	-64.14	-12.84	2.07
1916.00	14.53	251.32	1908.85	-19.81	-84.72	-19.29	2.40
2009.00	16.13	246.61	1998.54	-28.67	-107.63	-28.01	2.18
2193.00	18.44	245.34	2174.22	-50.96	-157.55	-50.00	1.27
2286.00	18.52	249.98	2262.43	-62.16	-184.79	-61.03	1.58
2471.00	15.89	250.22	2439.13	-80.79	-236.24	-79.35	1.42
2563.00	16.87	253.35	2527.40	-88.88	-260.88	-87.28	1.43
2656.00	17.90	255.16	2616.15	-96.41	-287.62	-94.65	1.25
2748.00	16.08	255.36	2704.13	-103.25	-313.62	-101.33	1.98
2842.00	15.47	258.03	2794.59	-109.14	-338.48	-107.07	1.01
2935.00	15.60	258.82	2884.20	-114.13	-362.88	-111.92	0.27
3027.00	15.80	254.96	2972.77	-119.78	-387.11	-117.42	1.16
3119.00	15.11	258.76	3061.44	-125.37	-410.97	-122.86	1.33
3211.00	15.36	253.52	3150.21	-131.17	-434.42	-128.51	1.52
3297.00	15.68	253.22	3233.08	-137.75	-456.47	-134.96	0.38
3382.00	15.95	252.86	3314.86	-144.51	-478.62	-141.58	0.34
3468.00	15.45	251.24	3397.65	-151.68	-500.76	-148.61	0.77
3553.00	15.25	251.42	3479.62	-158.88	-522.08	-155.69	0.24
3638.00	15.14	248.55	3561.65	-166.50	-543.01	-163.18	0.89
3724.00	15.21	250.45	3644.65	-174.38	-564.09	-170.93	0.58
3809.00	14.92	246.78	3726.73	-182.43	-584.65	-178.85	1.17
3895.00	15.29	244.93	3809.76	-191.60	-605.10	-187.90	0.71
3980.00	14.94	245.72	3891.82	-200.85	-625.24	-197.03	0.48
4065.00	14.82	249.35	3973.97	-209.19	-645.40	-205.24	1.11
4151.00	13.55	250.93	4057.35	-216.36	-665.21	-212.29	1.54
4236.00	12.19	253.97	4140.21	-222.09	-683.25	-217.92	1.79
4322.00	11.62	256.30	4224.36	-226.65	-700.39	-222.37	0.87
4407.00	10.33	262.04	4307.81	-229.74	-716.26	-225.36	1.99
4493.00	10.09	260.03	4392.44	-232.11	-731.31	-227.64	0.50
4578.00	9.10	258.33	4476.25	-234.76	-745.23	-230.20	1.21
4663.00	7.74	255.29	4560.34	-237.57	-757.35	-232.94	1.68
4749.00	6.23	256.72	4645.70	-240.11	-767.49	-235.42	1.77
4834.00	4.93	254.66	4730.29	-242.14	-775.51	-237.40	1.55
4920.00	4.33	256.56	4816.01	-243.87	-782.23	-239.09	0.72

5005.00	3.26	253.53	4900.82	-245.30	-787.67	-240.48	1.28
5090.00	2.29	249.94	4985.72	-246.57	-791.58	-241.73	1.16
5175.00	1.02	246.06	5070.68	-247.46	-793.87	-242.60	1.50
5261.00	1.04	266.03	5156.67	-247.82	-795.34	-242.96	0.42
5346.00	0.97	283.24	5241.66	-247.71	-796.81	-242.84	0.36
5432.00	1.24	314.23	5327.64	-246.90	-798.19	-242.02	0.75
5517.00	1.19	3.31	5412.63	-245.37	-798.80	-240.49	1.19
5602.00	0.98	19.04	5497.61	-243.80	-798.51	-238.92	0.43
5773.00	0.80	89.49	5668.59	-242.41	-796.84	-237.54	0.61
5858.00	0.56	191.29	5753.59	-242.81	-796.33	-237.94	1.25
5943.00	0.44	220.90	5838.59	-243.47	-796.62	-238.60	0.33
6114.00	0.25	310.38	6009.59	-243.72	-797.34	-238.85	0.29
6199.00	0.29	315.07	6094.58	-243.45	-797.63	-238.57	0.05
6285.00	0.16	120.27	6180.58	-243.36	-797.68	-238.48	0.52
6370.00	1.22	104.97	6265.58	-243.65	-796.70	-238.78	1.25
6456.00	0.84	80.16	6351.56	-243.78	-795.20	-238.92	0.67
6541.00	0.70	55.46	6436.56	-243.38	-794.15	-238.52	0.42
6626.00	0.80	28.26	6521.55	-242.56	-793.45	-237.71	0.43
6711.00	0.75	40.01	6606.54	-241.61	-792.81	-236.76	0.20
6797.00	0.66	121.88	6692.54	-241.44	-792.02	-236.60	1.08
6882.00	0.64	110.80	6777.53	-241.87	-791.17	-237.03	0.15
6966.00	0.44	96.93	6861.53	-242.07	-790.41	-237.24	0.28
7033.00	0.70	352.21	6928.53	-241.70	-790.21	-236.87	1.37
7118.00	7.34	6.08	7013.27	-235.78	-789.70	-230.95	7.84
7204.00	15.87	1.09	7097.44	-218.53	-788.89	-213.71	9.98
7289.00	23.51	359.04	7177.41	-189.92	-788.96	-185.09	9.02
7374.00	31.44	2.87	7252.77	-150.76	-788.13	-145.94	9.55
7459.00	39.94	3.40	7321.74	-101.29	-785.40	-96.49	10.01
7545.00	49.91	359.97	7382.56	-40.67	-783.77	-35.89	11.93
7630.00	58.28	355.37	7432.38	28.02	-786.71	32.82	10.77
7716.00	66.13	357.27	7472.46	103.88	-791.55	108.71	9.33
7801.00	73.70	359.92	7501.63	183.62	-793.46	188.46	9.37
7887.00	78.52	359.51	7522.27	267.08	-793.88	271.92	5.62
7972.00	78.69	0.46	7539.06	350.40	-793.90	355.24	1.11
8001.00	83.56	0.59	7543.54	379.04	-793.64	383.89	16.80
8083.00	95.43	1.51	7544.26	460.88	-792.14	465.71	14.52
8166.00	93.89	2.32	7537.51	543.56	-789.37	548.37	2.09
8207.00	93.89	2.30	7534.73	584.43	-787.72	589.23	0.05
8293.00	91.60	1.92	7530.61	670.27	-784.56	675.05	2.70
8378.00	89.81	1.44	7529.57	755.22	-782.07	759.98	2.18
8463.00	90.37	359.97	7529.43	840.21	-781.02	844.97	1.85
8549.00	90.56	359.78	7528.74	926.21	-781.21	930.96	0.31
8720.00	90.43	358.96	7527.26	1097.19	-783.09	1101.95	0.49
8805.00	91.05	0.44	7526.16	1182.18	-783.53	1186.94	1.89
8891.00	91.48	0.47	7524.26	1268.15	-782.85	1272.91	0.50
8976.00	90.49	359.51	7522.80	1353.14	-782.87	1357.90	1.62
9061.00	90.19	358.54	7522.30	1438.12	-784.31	1442.89	1.19
9146.00	89.01	358.58	7522.89	1523.09	-786.45	1527.87	1.39
9232.00	88.58	359.62	7524.70	1609.06	-787.80	1613.85	1.31
9317.00	89.01	359.30	7526.49	1694.04	-788.60	1698.83	0.63
9402.00	89.63	0.08	7527.50	1779.03	-789.06	1783.82	1.17
9488.00	89.75	0.03	7527.96	1865.03	-788.98	1869.82	0.15
9573.00	92.53	359.81	7526.27	1950.01	-789.10	1954.79	3.28
9659.00	92.28	0.91	7522.66	2035.93	-788.56	2040.71	1.31
9744.00	91.29	1.60	7520.01	2120.86	-786.70	2125.63	1.42
9829.00	90.71	1.60	7518.53	2205.82	-784.32	2210.57	0.68
9914.00	90.62	1.39	7517.54	2290.78	-782.11	2295.52	0.27
10000.00	90.99	1.70	7516.34	2376.74	-779.79	2381.46	0.56
10085.00	91.23	2.19	7514.69	2461.68	-776.90	2466.38	0.64
10171.00	92.22	2.30	7512.10	2547.57	-773.54	2552.25	1.16
10256.00	90.55	358.30	7510.04	2632.52	-773.09	2637.20	5.10

10341.00	88.58	356.95	7510.69	2717.44	-776.61	2722.14	2.81
10427.00	87.65	357.42	7513.52	2803.29	-780.83	2808.01	1.21
10512.00	89.45	358.25	7515.67	2888.20	-784.04	2892.93	2.33
10597.00	90.43	359.84	7515.76	2973.18	-785.46	2977.93	2.20
10683.00	91.11	0.11	7514.60	3059.18	-785.50	3063.92	0.85
10768.00	90.43	0.57	7513.46	3144.17	-784.99	3148.90	0.97
10854.00	90.62	0.84	7512.67	3230.16	-783.94	3234.88	0.38
10939.00	91.91	0.91	7510.80	3315.12	-782.64	3319.84	1.52
11024.00	91.42	359.31	7508.33	3400.08	-782.48	3404.80	1.97
11110.00	89.88	357.88	7507.35	3486.05	-784.58	3490.78	2.44
11195.00	92.28	358.45	7505.75	3570.98	-787.31	3575.72	2.90
11281.00	92.03	358.77	7502.51	3656.90	-789.39	3661.65	0.47
11366.00	91.98	358.99	7499.54	3741.83	-791.05	3746.59	0.27
11452.00	91.67	359.02	7496.80	3827.77	-792.54	3832.54	0.36
11537.00	91.36	358.50	7494.55	3912.72	-794.38	3917.50	0.71
11622.00	90.55	358.56	7493.14	3997.68	-796.56	4002.47	0.96
11708.00	90.06	358.65	7492.68	4083.65	-798.66	4088.46	0.58
11794.00	88.03	358.27	7494.11	4169.61	-800.97	4174.42	2.40
11879.00	87.23	359.32	7497.63	4254.51	-802.75	4259.34	1.55
11964.00	87.60	359.61	7501.46	4339.42	-803.55	4344.25	0.55
12050.00	87.72	359.90	7504.97	4425.35	-803.91	4430.18	0.36
12135.00	89.38	359.75	7507.12	4510.32	-804.17	4515.15	1.96
12220.00	89.94	359.48	7507.63	4595.31	-804.74	4600.14	0.73
12306.00	90.37	358.93	7507.40	4681.31	-805.94	4686.14	0.81
12391.00	90.49	357.91	7506.76	4766.27	-808.28	4771.12	1.21
12477.00	89.75	357.57	7506.58	4852.20	-811.67	4857.07	0.95
12529.00	88.83	357.36	7507.22	4904.15	-813.97	4909.03	1.81
12586.00	88.83	357.36	7508.39	4961.07	-816.60	4965.97	0.00

Weatherford surveys from 1117 ft MD to 12529 ft MD.

TD well at 12586 ft MD.

The total correction is 8.65 deg relative to True North.



Weatherford®

Final Print

COMPANY	<u>Anadarko Petroleum Corporation</u>		
WELL	<u>Howard 4N-28HZ</u>		
FIELD	<u>Wattenberg</u>		
RIG	<u>Xtreme 23</u>		
LOC.	<u>Colorado</u>	COUNTY	<u>Weld</u>