

Noble Energy

Weld County, CO (NAD 83)

Sec. 18-T6N-R62W (Wells Ranch 18 South PAD)

Wells Ranch AE18-62-1HN

Design: MWD Survey

Sperry Drilling Services

Final Survey Report

14 March, 2013

Well Coordinates: 1,420,692.60 N, 3,313,033.44 E (40° 28' 57.90" N, 104° 22' 28.70" W)

Ground Level: 4,831.00 ft

Local Coordinate Origin: Centered on Well Wells Ranch AE18-62-1HN - Slot A

Viewing Datum: KB=24' @ 4855.00ft (H&P 315)

TVDs to System: N

North Reference: Grid

Unit System: API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 2003.16 Build: 431

HALLIBURTON

Design Report for Wells Ranch AE18-62-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
633.00	0.00	0.00	633.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 633.00ft							
713.00	0.44	219.10	713.00	-0.24	-0.19	-0.15	0.55
First MWD Survey							
806.00	0.16	132.41	806.00	-0.60	-0.32	-0.22	0.49
899.00	0.62	222.93	899.00	-1.06	-0.57	-0.38	0.69
991.00	0.83	301.89	990.99	-1.07	-1.47	-1.27	1.02
1,083.00	0.68	278.61	1,082.98	-0.64	-2.58	-2.44	0.37
1,176.00	0.25	201.74	1,175.98	-0.74	-3.20	-3.03	0.72
1,269.00	0.34	264.47	1,268.98	-0.96	-3.55	-3.34	0.34
1,361.00	0.04	320.81	1,360.98	-0.96	-3.84	-3.63	0.35
1,456.00	0.56	324.49	1,455.98	-0.56	-4.13	-3.98	0.55
1,551.00	0.14	357.93	1,550.98	-0.06	-4.41	-4.33	0.47
1,645.00	0.38	344.50	1,644.97	0.35	-4.49	-4.49	0.26
1,740.00	0.17	233.86	1,739.97	0.57	-4.69	-4.72	0.49
1,835.00	0.36	288.12	1,834.97	0.58	-5.09	-5.12	0.31
1,930.00	0.63	278.38	1,929.97	0.75	-5.89	-5.93	0.30
2,025.00	0.37	53.86	2,024.97	1.01	-6.16	-6.24	0.98
2,120.00	0.40	12.20	2,119.97	1.51	-5.84	-6.01	0.29
2,215.00	0.74	229.99	2,214.96	1.44	-6.24	-6.40	1.14
2,309.00	0.35	274.11	2,308.96	1.07	-6.99	-7.07	0.58
2,404.00	2.83	183.11	2,403.92	-1.25	-7.41	-7.09	3.01
2,499.00	0.97	115.05	2,498.87	-3.93	-6.81	-6.05	2.76
2,593.00	1.05	133.73	2,592.86	-4.86	-5.47	-4.57	0.36
2,688.00	0.99	150.82	2,687.84	-6.18	-4.44	-3.33	0.33
2,783.00	1.25	165.74	2,782.82	-7.90	-3.78	-2.40	0.41
2,877.00	0.51	156.23	2,876.81	-9.28	-3.36	-1.75	0.80
2,972.00	0.63	171.41	2,971.81	-10.18	-3.11	-1.35	0.20
3,066.00	3.50	190.12	3,065.74	-13.52	-3.54	-1.21	3.10
3,161.00	5.26	193.14	3,160.46	-20.61	-5.04	-1.50	1.87
3,256.00	7.26	179.06	3,254.89	-30.86	-5.93	-0.66	2.64
3,351.00	7.25	182.76	3,349.13	-42.85	-6.12	1.17	0.49
3,446.00	8.55	183.44	3,443.23	-55.88	-6.83	2.66	1.37
3,541.00	10.66	188.68	3,536.89	-71.62	-8.58	3.58	2.40
3,635.00	12.77	185.38	3,628.93	-90.56	-10.87	4.51	2.35
3,730.00	14.77	188.55	3,721.20	-112.99	-13.65	5.54	2.25
3,825.00	13.77	185.50	3,813.26	-136.22	-16.54	6.60	1.32
3,920.00	12.84	184.20	3,905.71	-158.00	-18.39	8.43	1.03
4,015.00	13.31	181.62	3,998.25	-179.46	-19.48	10.98	0.79
4,110.00	11.71	185.16	4,090.99	-200.00	-20.65	13.27	1.87
4,205.00	11.30	182.08	4,184.09	-218.90	-21.86	15.26	0.78
4,299.00	11.67	174.88	4,276.21	-237.57	-21.34	18.91	1.57
4,394.00	12.17	184.45	4,369.17	-257.13	-21.26	22.27	2.14
4,489.00	11.14	181.68	4,462.21	-276.29	-22.31	24.46	1.23
4,584.00	11.74	183.63	4,555.32	-295.11	-23.19	26.76	0.75
4,679.00	12.38	188.54	4,648.23	-314.82	-25.31	27.98	1.27
4,773.00	10.55	190.49	4,740.35	-333.25	-28.38	28.06	1.99
4,868.00	11.27	185.06	4,833.63	-351.05	-30.78	28.68	1.32
4,963.00	12.20	181.26	4,926.65	-370.33	-31.82	30.90	1.27

Design Report for Wells Ranch AE18-62-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,058.00	11.87	182.14	5,019.56	-390.13	-32.41	33.65	0.40
5,153.00	11.70	185.10	5,112.56	-409.49	-33.63	35.70	0.66
5,248.00	12.55	191.31	5,205.44	-429.21	-36.51	36.18	1.64
5,343.00	11.15	191.05	5,298.42	-448.34	-40.29	35.66	1.47
5,438.00	12.77	196.02	5,391.35	-467.45	-44.95	34.29	2.02
5,533.00	11.98	192.61	5,484.15	-487.17	-50.00	32.62	1.13
5,628.00	12.98	189.89	5,576.90	-507.30	-53.99	32.08	1.22
5,723.00	13.23	190.18	5,669.43	-528.51	-57.74	31.94	0.27
5,817.00	14.76	190.77	5,760.63	-550.86	-61.88	31.62	1.63
5,862.00	13.65	186.54	5,804.26	-561.77	-63.55	31.80	3.38
5,909.00	14.88	178.84	5,849.81	-573.31	-64.06	33.24	4.81
5,957.00	16.22	168.73	5,896.06	-586.05	-62.63	36.80	6.29
6,004.00	18.33	161.66	5,940.95	-599.51	-59.02	42.62	6.33
6,052.00	21.51	157.13	5,986.07	-614.79	-53.22	50.90	7.36
6,099.00	24.07	155.33	6,029.40	-631.44	-45.87	60.95	5.64
6,147.00	25.25	152.00	6,073.02	-649.37	-36.98	72.73	3.80
6,194.00	26.28	148.94	6,115.35	-667.14	-26.90	85.65	3.58
6,242.00	28.62	143.67	6,157.95	-685.51	-14.61	100.86	7.02
6,289.00	29.50	141.32	6,199.03	-703.61	-0.71	117.61	3.07
6,337.00	32.22	138.94	6,240.24	-722.49	15.09	136.35	6.21
6,384.00	36.61	136.93	6,279.00	-742.19	32.90	157.22	9.65
6,432.00	40.64	134.76	6,316.50	-763.66	53.78	181.41	8.86
6,479.00	44.61	132.52	6,351.07	-785.60	76.82	207.82	9.04
6,527.00	46.68	129.70	6,384.63	-808.15	102.69	237.10	6.02
6,574.00	48.78	125.33	6,416.25	-829.30	130.27	267.85	8.20
6,622.00	50.60	119.87	6,447.32	-848.99	161.10	301.55	9.46
6,669.00	51.55	116.52	6,476.85	-866.25	193.32	336.21	5.90
6,717.00	54.89	112.18	6,505.60	-882.06	228.34	373.39	10.04
6,764.00	58.82	110.57	6,531.29	-896.39	264.98	411.92	8.84
6,812.00	65.11	109.45	6,553.84	-910.87	304.77	453.58	13.26
6,858.00	69.28	104.47	6,571.67	-923.20	345.31	495.62	13.48
6,906.00	74.59	101.12	6,586.56	-933.29	389.80	541.17	12.90
6,953.00	76.38	96.05	6,598.34	-940.07	434.77	586.64	11.12
7,001.00	79.80	92.56	6,608.25	-943.58	481.59	633.38	10.07
7,052.00	83.51	89.35	6,615.65	-944.42	532.03	683.24	9.58
7,105.00	85.61	87.81	6,620.68	-943.11	584.77	735.01	4.92
Estimated 7" Casing Point: 308' FSL, 793' FWL (Not a Survey Point)							
7,158.00	87.72	86.27	6,623.76	-940.37	637.60	786.64	4.92
7,221.00	88.46	85.87	6,625.86	-936.06	700.42	847.83	1.34
7,316.00	88.43	85.52	6,628.44	-928.93	795.12	939.98	0.37
7,411.00	93.45	85.07	6,626.88	-921.14	889.75	1,031.96	5.31
7,506.00	94.35	84.68	6,620.42	-912.67	984.15	1,123.59	1.03
7,601.00	93.36	86.00	6,614.03	-904.97	1,078.62	1,215.42	1.73
7,696.00	91.94	86.26	6,609.64	-898.57	1,173.30	1,307.68	1.52
7,791.00	89.88	86.47	6,608.13	-892.55	1,268.09	1,400.11	2.18
7,886.00	88.73	86.30	6,609.28	-886.56	1,362.89	1,492.55	1.22
7,981.00	88.12	87.38	6,611.89	-881.32	1,457.71	1,585.14	1.31
8,076.00	88.83	88.67	6,614.42	-878.05	1,552.62	1,678.15	1.55
8,170.00	88.31	88.67	6,616.77	-875.87	1,646.56	1,770.39	0.55
8,265.00	88.12	88.66	6,619.73	-873.66	1,741.49	1,863.59	0.20
8,360.00	88.31	88.47	6,622.68	-871.28	1,836.42	1,956.77	0.28

Design Report for Wells Ranch AE18-62-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,455.00	90.09	87.99	6,624.01	-868.34	1,931.36	2,049.86	1.94
8,550.00	90.46	86.94	6,623.55	-864.14	2,026.26	2,142.71	1.17
8,645.00	90.40	88.06	6,622.84	-860.00	2,121.17	2,235.57	1.18
8,740.00	90.19	85.73	6,622.35	-854.85	2,216.02	2,328.20	2.46
8,835.00	91.42	86.98	6,621.02	-848.81	2,310.82	2,420.63	1.85
8,930.00	90.31	87.36	6,619.58	-844.12	2,405.69	2,513.37	1.23
9,025.00	90.89	89.17	6,618.59	-841.25	2,500.63	2,606.48	2.00
9,120.00	90.25	89.16	6,617.64	-839.86	2,595.62	2,699.88	0.67
9,215.00	88.83	89.80	6,618.41	-839.00	2,690.61	2,793.37	1.64
9,310.00	89.02	89.77	6,620.19	-838.65	2,785.59	2,886.94	0.20
9,405.00	89.78	90.01	6,621.18	-838.46	2,880.58	2,980.55	0.84
9,500.00	91.05	89.52	6,620.50	-838.07	2,975.58	3,074.13	1.43
9,595.00	91.51	89.58	6,618.37	-837.33	3,070.55	3,167.62	0.49
9,689.00	90.68	90.44	6,616.58	-837.34	3,164.53	3,260.27	1.27
9,784.00	90.18	90.15	6,615.86	-837.83	3,259.53	3,354.00	0.61
9,879.00	90.31	89.63	6,615.46	-837.65	3,354.53	3,447.61	0.56
9,974.00	89.66	88.66	6,615.48	-836.23	3,449.52	3,541.01	1.23
10,069.00	90.15	88.03	6,615.64	-833.49	3,544.48	3,634.16	0.84
10,164.00	90.71	87.75	6,614.93	-829.99	3,639.41	3,727.15	0.66
10,259.00	89.17	87.67	6,615.03	-826.20	3,734.33	3,820.08	1.62
10,354.00	89.02	88.31	6,616.53	-822.86	3,829.26	3,913.10	0.69
10,449.00	92.16	88.91	6,615.55	-820.56	3,924.21	4,006.31	3.37
10,544.00	92.95	88.95	6,611.31	-818.79	4,019.10	4,099.55	0.83
10,639.00	91.20	88.90	6,607.87	-817.01	4,114.02	4,192.82	1.84
10,734.00	90.59	89.30	6,606.39	-815.52	4,208.99	4,286.19	0.77
10,829.00	89.69	87.85	6,606.16	-813.15	4,303.96	4,379.41	1.80
10,924.00	88.43	88.45	6,607.72	-810.09	4,398.90	4,472.48	1.47
11,018.00	88.68	88.15	6,610.09	-807.30	4,492.83	4,564.60	0.42
11,148.00	88.92	87.45	6,612.81	-802.31	4,622.70	4,691.79	0.57
Final MWD Survey							
11,212.00	88.92	87.45	6,614.02	-799.46	4,686.63	4,754.32	0.00
Survey Projection to TD - Estimated BHL: 331' FSL, 538' FEL							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
633.00	633.00	0.00	0.00	Surface Casing Assumed Vertical at 633.00ft
713.00	713.00	-0.24	-0.19	First MWD Survey
7,105.00	6,620.68	-943.11	584.77	Estimated 7" Casing Point: 308' FSL, 793' FWL (Not a Survey Point)
11,148.00	6,612.81	-802.31	4,622.70	Final MWD Survey
11,212.00	6,614.02	-799.46	4,686.63	Survey Projection to TD
11,212.00	6,614.02	-799.46	4,686.63	Estimated BHL: 331' FSL, 538' FEL

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Wells Ranch AE18-62-1HN_PlanA - Rev0_B HL Tgt	99.68	Slot	0.00	0.00	0.00

Design Report for Wells Ranch AE18-62-1HN - MWD Survey

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
633.00	11,212.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,105.00	6,620.68	7" Csg	7	8-3/4

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Wells Ranch	0.00	0.00	6,612.97	-799.89	4,689.68	1,419,892.74	3,317,722.95	40° 28' 49.404 N	104° 21' 28.152 W
- actual wellpath misses target center by 3.25ft at 11212.00ft MD (6614.02 TVD, -799.46 N, 4686.63 E)									
- Point									
Wells Ranch	0.00	0.00	5,990.00	-612.11	-58.94	1,420,080.51	3,312,974.50	40° 28' 51.859 N	104° 22' 29.567 W
- actual wellpath misses target center by 7.18ft at 6053.78ft MD (5987.73 TVD, -615.39 N, -52.97 E)									
- Circle (radius 35.00)									
Wells Ranch	0.00	0.00	-16.00	2,983.80	-15.62	1,423,676.29	3,313,017.82	40° 29' 27.384 N	104° 22' 28.416 W
- actual wellpath misses target center by 2983.88ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				222.38	3,573.80	1,424,266.27	3,313,255.81		
Point 2				4,694.38	3,693.80	1,424,386.27	3,317,727.66		
Point 3				4,768.38	-653.20	1,420,039.42	3,317,801.65		
Point 4				253.38	-814.20	1,419,878.43	3,313,286.81		
Point 5				222.38	3,573.80	1,424,266.27	3,313,255.81		
Wells Ranch	0.00	0.00	-16.00	2,983.80	-15.62	1,423,676.29	3,313,017.82	40° 29' 27.384 N	104° 22' 28.416 W
- actual wellpath misses target center by 2983.88ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				-237.62	4,033.80	1,424,726.26	3,312,795.83		
Point 2				5,154.38	4,153.80	1,424,846.25	3,318,187.64		
Point 3				5,228.38	-1,113.20	1,419,579.44	3,318,261.64		
Point 4				-206.62	-1,274.20	1,419,418.44	3,312,826.83		
Point 5				-237.62	4,033.80	1,424,726.26	3,312,795.83		
Wells Ranch	0.00	0.00	6,616.51	-919.00	540.00	1,419,773.63	3,313,573.42	40° 28' 48.752 N	104° 22' 21.867 W
- actual wellpath misses target center by 25.31ft at 7060.65ft MD (6616.61 TVD, -944.30 N, 540.62 E)									
- Point									
Wells Ranch		88.36	6,620.00	-915.34	667.39	1,419,777.29	3,313,700.81	40° 28' 48.772 N	104° 22' 20.218 W
- actual wellpath misses target center by 23.50ft at 7189.29ft MD (6624.90 TVD, -938.28 N, 668.80 E)									
- Rectangle (sides W70.00 H16.00 D4,023.95)									

North Reference Sheet for Sec. 18-T6N-R62W (Wells Ranch 18 South PAD) - Wells Ranch AE18-62-1HN

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to Grid North Reference.

Vertical Depths are relative to KB=24' @ 4855.00ft (H&P 315). Northing and Easting are relative to Wells Ranch AE18-62-1HN - Slot A4

Coordinate System is US State Plane 1983, Colorado Northern Zone using datum North American Datum 1983, ellipsoid GRS 1980

Projection method is Lambert Conformal Conic (2 parallel)

Central Meridian is 105° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996502

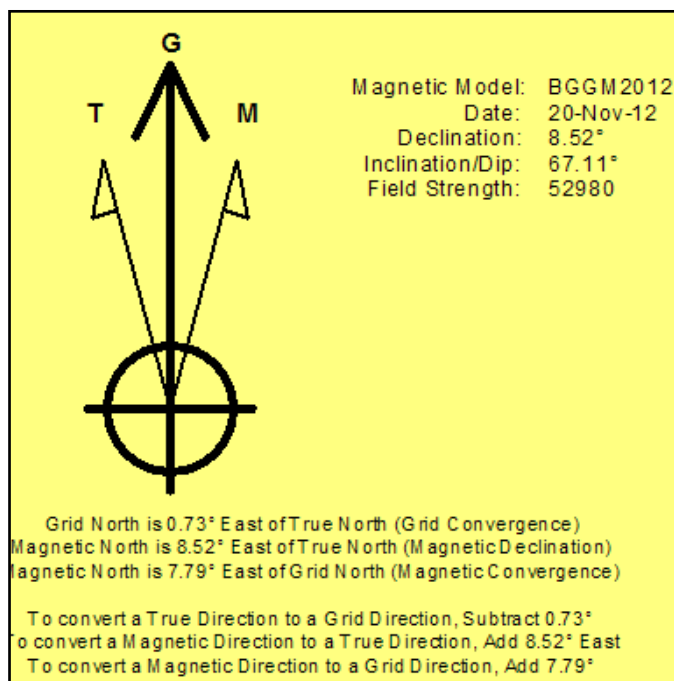
Grid Coordinates of Well: 1,420,692.60 ft N, 3,313,033.44 ft E

Geographical Coordinates of Well: 40° 28' 57.90" N, 104° 22' 28.70" W

Grid Convergence at Surface is: 0.73°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,212.00ft the Bottom Hole Displacement is 4,754.32ft in the Direction of 99.68° (Grid).

Magnetic Convergence at surface is: -7.79° (20 November 2012, , BGGM2012)

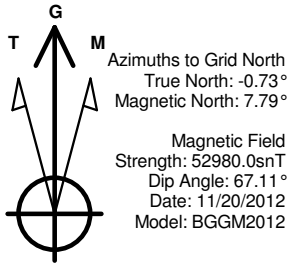


Project: Weld County, CO (NAD 83)
Site: Sec. 18-T6N-R62W (Wells Ranch 18 South PAD)
Well: Wells Ranch AE18-62-1HN

Noble Energy

HALLIBURTON

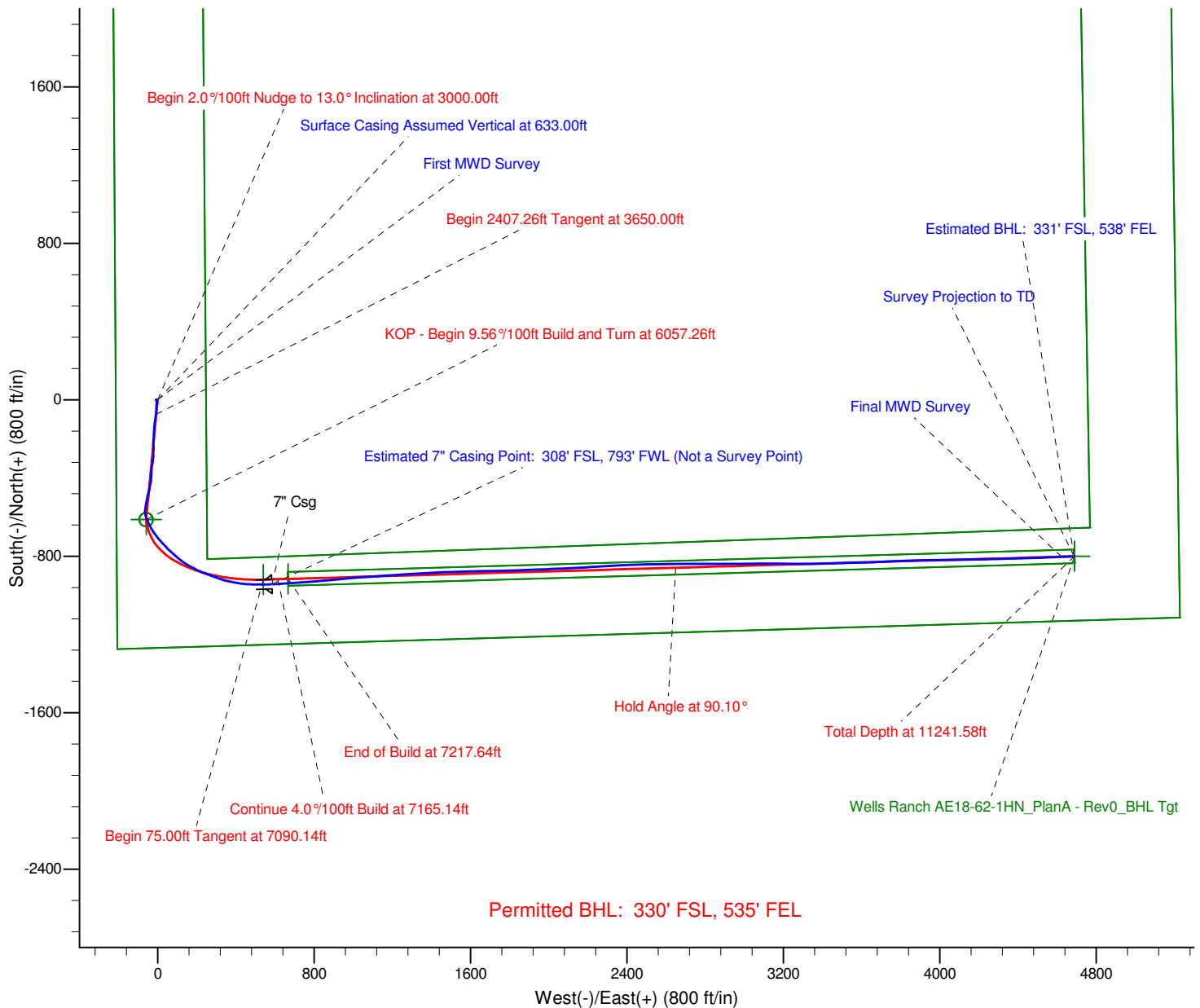
Sperry Drilling



LEGEND

- Wells Ranch AE18-62-1HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Wells Ranch AE18-62-1HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them the distances from BHL to section lines from that final survey to allow Noble Energy to meet its requirements under Colorado law. These distances are generated by a mathematical algorithm based on rough data collected after the well is drilled. Halliburton considers it to be a rough estimate only and it is not to be relied upon in any application where accurate data is required. In consideration for Halliburton releasing this data to Noble Energy, Noble Energy agrees to release Halliburton from any consequences of it or anyone else relying on such data.

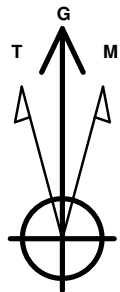


Project: Weld County, CO (NAD 83)
Site: Sec. 18-T6N-R62W (Wells Ranch 18 South PAD)
Well: Wells Ranch AE18-62-1HN

Noble Energy

HALLIBURTON

Sperry Drilling



Azimuths to Grid North
True North: -0.73°
Magnetic North: 7.79°

Magnetic Field
Strength: 52980.0snT
Dip Angle: 67.11°
Date: 11/20/2012
Model: BGGM2012

LEGEND

- Wells Ranch AE18-62-1HN, Plan A, Plan A - Rev 0 Proposal V0
- MWD Survey

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