

Noble Energy

Weld County, CO (NAD 83)

Sec. 28-T6N-R65W (Five M 28 PAD)

Five M E21-74-1HN

Design: MWD Survey

Sperry Drilling Services Final Survey Report

12 April, 2013

Well Coordinates: 1,412,956.08 N, 3,232,461.29 E (40° 27' 50.26" N, 104° 39' 52.34" W)

Ground Level: 4,704.00 ft

Local Coordinate Origin: Centered on Well Five M E21-74-1HN - Slot A2

Viewing Datum: KB=24' @ 4728.00ft (H&P 322)

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 Five M E21-74-1HN - 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
792.00	0.00	0.00	792.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 792.00ft							
883.00	1.98	281.02	882.98	0.30	-1.54	0.35	2.18
First MWD Survey							
1,007.00	1.97	288.11	1,006.91	1.37	-5.67	1.56	0.20
1,286.00	2.29	264.03	1,285.72	2.28	-15.77	2.82	0.34
1,565.00	2.50	258.73	1,564.48	0.51	-27.29	1.44	0.11
1,846.00	1.09	244.67	1,845.33	-1.83	-35.71	-0.62	0.52
1,941.00	0.79	208.85	1,940.32	-2.79	-36.84	-1.54	0.68
2,037.00	2.33	324.19	2,036.30	-1.78	-38.31	-0.49	2.88
2,132.00	4.74	341.77	2,131.11	3.51	-40.66	4.88	2.75
2,227.00	5.82	339.92	2,225.71	11.76	-43.55	13.23	1.15
2,322.00	7.54	337.53	2,320.06	22.05	-47.58	23.64	1.83
2,416.00	11.08	338.92	2,412.80	36.18	-53.19	37.96	3.77
2,511.00	10.68	335.54	2,506.10	52.71	-60.12	54.71	0.79
2,606.00	10.83	330.31	2,599.43	68.48	-68.18	70.74	1.04
2,701.00	11.46	331.69	2,692.64	84.54	-77.08	87.10	0.72
2,796.00	12.08	332.38	2,785.64	101.66	-86.16	104.51	0.67
2,891.00	11.11	331.35	2,878.70	118.50	-95.16	121.65	1.04
2,986.00	8.91	339.49	2,972.25	133.42	-102.13	136.80	2.75
3,081.00	6.52	341.48	3,066.39	145.43	-106.42	148.94	2.53
3,176.00	1.71	326.14	3,161.12	151.72	-108.92	155.32	5.15
3,270.00	0.25	208.95	3,255.10	152.71	-109.81	156.34	1.96
3,366.00	1.29	141.07	3,351.10	151.68	-109.23	155.29	1.27
3,461.00	1.81	156.95	3,446.06	149.47	-107.97	153.04	0.71
3,556.00	1.65	149.96	3,541.02	146.91	-106.70	150.43	0.28
3,651.00	1.32	140.44	3,635.99	144.88	-105.31	148.36	0.43
3,745.00	1.52	155.37	3,729.96	142.91	-104.11	146.35	0.45
3,840.00	1.61	133.47	3,824.92	140.85	-102.61	144.24	0.63
3,935.00	2.09	147.04	3,919.87	138.48	-100.70	141.80	0.68
4,030.00	1.24	106.19	4,014.83	136.74	-98.77	140.00	1.48
4,125.00	0.91	88.97	4,109.82	136.46	-97.03	139.67	0.48
4,220.00	0.83	97.30	4,204.81	136.39	-95.59	139.55	0.16
4,314.00	0.72	95.62	4,298.80	136.25	-94.33	139.36	0.12
4,409.00	0.66	68.72	4,393.79	136.39	-93.23	139.46	0.34
4,504.00	0.59	66.19	4,488.79	136.78	-92.27	139.82	0.08
4,599.00	0.48	72.89	4,583.78	137.10	-91.44	140.11	0.13
4,694.00	0.23	62.89	4,678.78	137.30	-90.89	140.30	0.27
4,789.00	0.33	93.31	4,773.78	137.37	-90.45	140.35	0.19
4,884.00	0.72	119.97	4,868.78	137.06	-89.66	140.01	0.47
4,978.00	0.18	224.83	4,962.77	136.66	-89.25	139.60	0.84
5,073.00	0.09	139.25	5,057.77	136.50	-89.31	139.44	0.21
5,168.00	0.28	241.12	5,152.77	136.33	-89.46	139.27	0.33
5,263.00	0.46	201.84	5,247.77	135.86	-89.81	138.82	0.32
5,358.00	0.41	231.82	5,342.77	135.30	-90.22	138.27	0.24
5,644.00	2.13	216.60	5,628.69	130.40	-94.19	133.51	0.61
5,929.00	0.84	112.46	5,913.62	125.35	-95.42	128.50	0.87
6,214.00	0.72	85.11	6,198.59	124.70	-91.70	127.73	0.14
6,300.00	0.81	52.59	6,284.58	125.12	-90.68	128.11	0.51

Design Report for Five M E21-74-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
6,396.00	2.33	356.81	6,380.55	127.48	-90.25	130.46	2.07
6,443.00	5.56	337.59	6,427.43	130.54	-91.17	133.55	7.33
6,491.00	8.32	341.25	6,475.08	135.98	-93.17	139.05	5.82
6,539.00	11.17	343.42	6,522.38	143.72	-95.62	146.87	5.99
6,586.00	13.30	346.79	6,568.31	153.35	-98.15	156.58	4.78
6,633.00	15.44	1.46	6,613.85	164.87	-99.23	168.13	8.95
6,681.00	19.55	10.42	6,659.63	179.17	-97.61	182.37	10.21
6,728.00	23.43	10.64	6,703.36	196.09	-94.46	199.17	8.26
6,776.00	29.53	8.24	6,746.30	217.20	-91.00	220.15	12.90
6,823.00	34.66	7.40	6,786.10	241.93	-87.62	244.76	10.96
6,871.00	40.59	3.24	6,824.11	271.09	-84.98	273.81	13.43
6,918.00	46.04	358.68	6,858.30	303.30	-84.50	305.98	13.36
6,966.00	50.12	358.13	6,890.37	338.99	-85.50	341.69	8.54
7,013.00	52.93	358.02	6,919.60	375.76	-86.74	378.48	5.98
7,061.00	56.74	357.95	6,947.24	414.97	-88.12	417.71	7.94
7,108.00	60.06	358.03	6,971.87	454.97	-89.52	457.74	7.07
7,156.00	63.24	358.51	6,994.66	497.19	-90.79	499.97	6.68
7,203.00	67.31	358.28	7,014.31	539.85	-91.99	542.66	8.67
7,251.00	70.93	358.19	7,031.42	584.67	-93.37	587.50	7.54
7,298.00	73.65	358.28	7,045.71	629.42	-94.75	632.26	5.79
7,346.00	75.59	357.62	7,058.44	675.67	-96.41	678.54	4.25
7,400.00	77.81	358.39	7,070.87	728.19	-98.23	731.09	4.34
7,446.00	80.20	358.81	7,079.64	773.32	-99.34	776.24	5.27
Estimated 7" Casing Point: 506' FSL, 1648' FEL (Not a Survey Point)							
7,512.00	83.63	359.40	7,088.92	838.65	-100.36	841.56	5.27
7,559.00	86.38	358.07	7,093.01	885.45	-101.39	888.38	6.49
7,606.00	89.23	357.20	7,094.81	932.37	-103.33	935.34	6.34
7,653.00	90.86	357.27	7,094.77	979.32	-105.60	982.33	3.47
7,701.00	91.02	358.51	7,093.99	1,027.28	-107.36	1,030.32	2.60
7,796.00	90.92	358.78	7,092.38	1,122.24	-109.61	1,125.30	0.30
7,890.00	89.11	359.30	7,092.35	1,216.22	-111.19	1,219.29	2.00
7,986.00	91.02	359.84	7,092.25	1,312.21	-111.91	1,315.25	2.07
8,080.00	90.31	358.86	7,091.15	1,406.20	-112.97	1,409.22	1.29
8,175.00	89.88	359.55	7,091.00	1,501.19	-114.29	1,504.20	0.86
8,270.00	90.65	359.36	7,090.56	1,596.18	-115.19	1,599.17	0.83
8,365.00	90.68	1.65	7,089.45	1,691.17	-114.36	1,694.07	2.41
8,460.00	89.26	1.55	7,089.50	1,786.13	-111.70	1,788.88	1.50
8,555.00	90.65	2.44	7,089.58	1,881.07	-108.40	1,883.66	1.74
8,650.00	87.99	0.24	7,090.71	1,976.02	-106.18	1,978.48	3.63
8,745.00	88.43	359.73	7,093.67	2,070.97	-106.20	2,073.38	0.71
8,840.00	87.91	359.03	7,096.71	2,165.92	-107.23	2,168.30	0.92
8,935.00	89.69	358.14	7,098.70	2,260.86	-109.57	2,263.28	2.09
9,030.00	91.17	358.42	7,097.98	2,355.81	-112.42	2,358.27	1.59
9,125.00	93.46	359.33	7,094.15	2,450.71	-114.29	2,453.17	2.59
9,220.00	90.59	359.09	7,090.79	2,545.63	-115.60	2,548.09	3.03
9,314.00	90.77	358.79	7,089.68	2,639.61	-117.34	2,642.07	0.37
9,409.00	91.05	358.88	7,088.17	2,734.58	-119.27	2,737.05	0.31
9,504.00	90.18	0.31	7,087.15	2,829.57	-119.94	2,832.00	1.76
9,599.00	85.64	0.57	7,090.61	2,924.48	-119.21	2,926.83	4.79
9,694.00	90.31	359.23	7,093.97	3,019.39	-119.38	3,021.70	5.11
9,789.00	88.95	358.54	7,094.58	3,114.37	-121.23	3,116.68	1.61

Design Report for Five M E21-74-1HN - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
9,884.00	90.55	357.92	7,094.99	3,209.32	-124.16	3,211.68	1.81
9,979.00	88.33	358.28	7,095.92	3,304.25	-127.31	3,306.67	2.37
10,074.00	90.28	358.87	7,097.08	3,399.21	-129.67	3,401.65	2.14
10,121.00	90.49	358.32	7,096.76	3,446.20	-130.82	3,448.65	1.25
10,169.00	90.52	358.45	7,096.34	3,494.18	-132.18	3,496.65	0.28
10,264.00	86.88	357.87	7,098.49	3,589.09	-135.23	3,591.61	3.88
10,359.00	86.97	356.72	7,103.59	3,683.84	-139.70	3,686.46	1.21
10,454.00	88.06	356.88	7,107.71	3,778.60	-145.00	3,781.34	1.16
10,549.00	89.51	356.99	7,109.72	3,873.44	-150.08	3,876.30	1.53
10,644.00	90.74	357.86	7,109.51	3,968.34	-154.35	3,971.29	1.59
10,739.00	91.97	357.37	7,107.27	4,063.23	-158.30	4,066.26	1.39
10,834.00	90.34	357.50	7,105.35	4,158.12	-162.55	4,161.23	1.72
10,929.00	89.60	357.77	7,105.40	4,253.03	-166.47	4,256.23	0.83
11,024.00	90.15	357.63	7,105.61	4,347.96	-170.28	4,351.23	0.60
11,118.00	90.71	358.55	7,104.90	4,441.90	-173.42	4,445.22	1.15
11,213.00	91.66	358.88	7,102.94	4,536.85	-175.55	4,540.20	1.06
11,308.00	89.14	357.68	7,102.28	4,631.80	-178.40	4,635.18	2.94
11,403.00	89.54	357.00	7,103.37	4,726.69	-182.80	4,730.17	0.83
11,512.00	90.15	355.68	7,103.67	4,835.47	-189.76	4,839.12	1.33
Final MWD Survey							
11,574.00	90.15	355.68	7,103.50	4,897.29	-194.43	4,901.06	0.00
Estimated BHL: 537' FNL, 1678' FEL - Survey Projection to TD							

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
792.00	792.00	0.00	0.00	Surface Casing Assumed Vertical at 792.00ft
883.00	882.98	0.30	-1.54	First MWD Survey
7,446.00	7,079.64	773.32	-99.34	Estimated 7" Casing Point: 506' FSL, 1648' FEL (Not a Survey Point)
11,512.00	7,103.67	4,835.47	-189.76	Final MWD Survey
11,574.00	7,103.50	4,897.29	-194.43	Estimated BHL: 537' FNL, 1678' FEL
11,574.00	7,103.50	4,897.29	-194.43	Survey Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (ft)
				+N/-S (ft)	+E/-W (ft)	
Target	Five M E21-74-1HN_PlanB - Rev0_B	358.06	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
792.00	7,446.00	MWD Surveys	MWD
7,446.00	11,574.00	MWD Surveys	MWD

Design Report for Five M E21-74-1HN - MWD Survey

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,446.00	7,079.64	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
Five M	0.00	0.00	0.00	0.36	38.96	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath misses target center by 38.96ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1,083.04	310.36		1,413,266.43	3,231,378.29		
Point 2			1,558.96	189.36		1,413,145.44	3,234,020.19		
Point 3			1,600.96	-2,465.64		1,410,490.53	3,234,062.19		
Point 4			1,645.96	-5,121.64		1,407,834.63	3,234,107.19		
Point 5			-1,013.04	-5,026.64		1,407,929.63	3,231,448.29		
Point 6			-3,672.04	-4,927.64		1,408,028.62	3,228,789.38		
Point 7			-3,728.04	-2,227.64		1,410,728.52	3,228,733.38		
Point 8			-3,744.04	435.36		1,413,391.43	3,228,717.38		
Point 9			-1,083.04	310.36		1,413,266.43	3,231,378.29		
Five M	0.00	0.00	0.00	0.36	38.96	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath misses target center by 38.96ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1,083.04	310.36		1,413,266.43	3,231,378.29		
Point 2			-3,744.04	435.36		1,413,391.43	3,228,717.38		
Point 3			-3,797.04	2,864.36		1,415,820.34	3,228,664.39		
Point 4			-3,847.04	5,290.36		1,418,246.25	3,228,614.39		
Point 5			-1,183.04	5,399.36		1,418,355.25	3,231,278.29		
Point 6			1,472.96	5,489.36		1,418,445.24	3,233,934.20		
Point 7			1,517.96	2,838.36		1,415,794.34	3,233,979.19		
Point 8			1,558.96	189.36		1,413,145.44	3,234,020.19		
Point 9			-1,083.04	310.36		1,413,266.43	3,231,378.29		
Five M	0.00	0.00	0.00	0.36	38.96	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath misses target center by 38.96ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1,083.04	770.36		1,413,726.42	3,231,378.29		
Point 2			-3,284.04	895.36		1,413,851.41	3,229,177.37		
Point 3			-3,337.04	2,864.36		1,415,820.34	3,229,124.37		
Point 4			-3,387.04	4,830.36		1,417,786.27	3,229,074.37		
Point 5			-1,183.04	4,939.36		1,417,895.26	3,231,278.29		
Point 6			1,012.96	5,029.36		1,417,985.26	3,233,474.21		
Point 7			1,057.96	2,838.36		1,415,794.34	3,233,519.21		
Point 8			1,098.96	649.36		1,413,605.42	3,233,560.21		
Point 9			-1,083.04	770.36		1,413,726.42	3,231,378.29		
Five M	0.00	0.00	0.00	0.36	38.96	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath misses target center by 38.96ft at 0.00ft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-1,083.04	-149.64		1,412,806.45	3,231,378.29		
Point 2			1,098.96	-270.64		1,412,685.45	3,233,560.21		
Point 3			1,140.96	-2,465.64		1,410,490.53	3,233,602.21		
Point 4			1,185.96	-4,661.64		1,408,294.61	3,233,647.21		
Point 5			-1,013.04	-4,566.64		1,408,389.61	3,231,448.29		
Point 6			-3,212.04	-4,467.64		1,408,488.61	3,229,249.36		
Point 7			-3,268.04	-2,227.64		1,410,728.52	3,229,193.37		
Point 8			-3,284.04	-24.64		1,412,931.44	3,229,177.37		
Point 9			-1,083.04	-149.64		1,412,806.45	3,231,378.29		
Five M	0.00	0.00	7,103.11	4,898.70	-165.78	1,417,854.61	3,232,295.51	40.47741	-104.66497
- actual wellpath misses target center by 28.68ft at 11573.25ft MD (7103.50 TVD, 4896.54 N, -194.38 E)									
- Point									

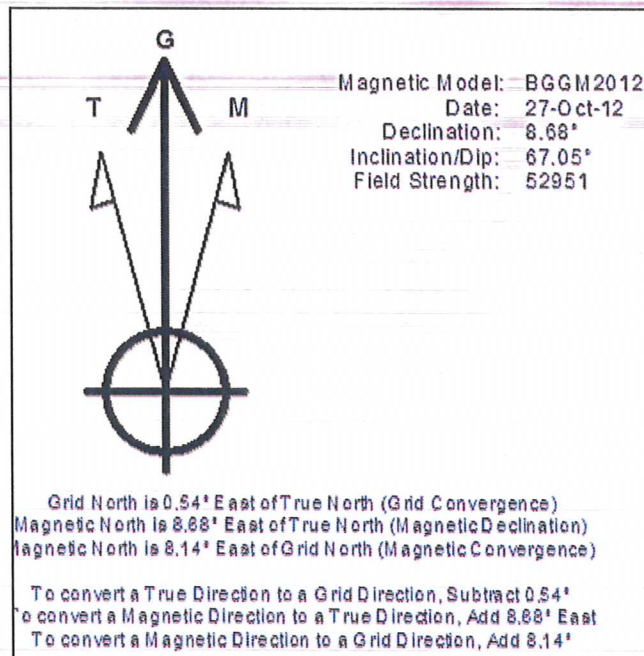
North Reference Sheet for Sec. 28-T6N-R65W (Five M 28 PAD) - Five M E21-74-1HN

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' @ 4728.00ft (H&P 322). Northing and Easting are relative to Five M E21-74-1HN - Slot A2
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 -105.50000°; Longitude Origin:0.00000°, Latitude Origin:40.78333°
False Easting: 3,000,000.00ft, False Northing: 1,000,000.00ft, Scale Reduction: 0.99996375

Grid Coordinates of Well: 1,412,956.08 ft N, 3,232,461.29 ft E
Geographical Coordinates of Well: 40° 27' 50.26" N, 104° 39' 52.34" W
Grid Convergence at Surface is: 0.54°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,574.00ft
the Bottom Hole Displacement is 4,901.15ft in the Direction of 357.73° (Grid).
Magnetic Convergence at surface is: -8.14° (27 October 2012, , BGGM2012)

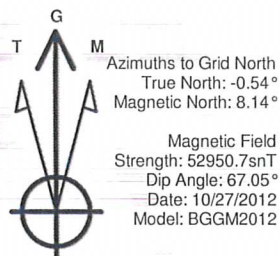


Project: Weld County, CO (NAD 83)
 Site: Sec. 28-T6N-R65W (Five M 28 PAD)
 Well: Five M E21-74-1HN

Noble Energy

HALLIBURTON

Sperry Drilling

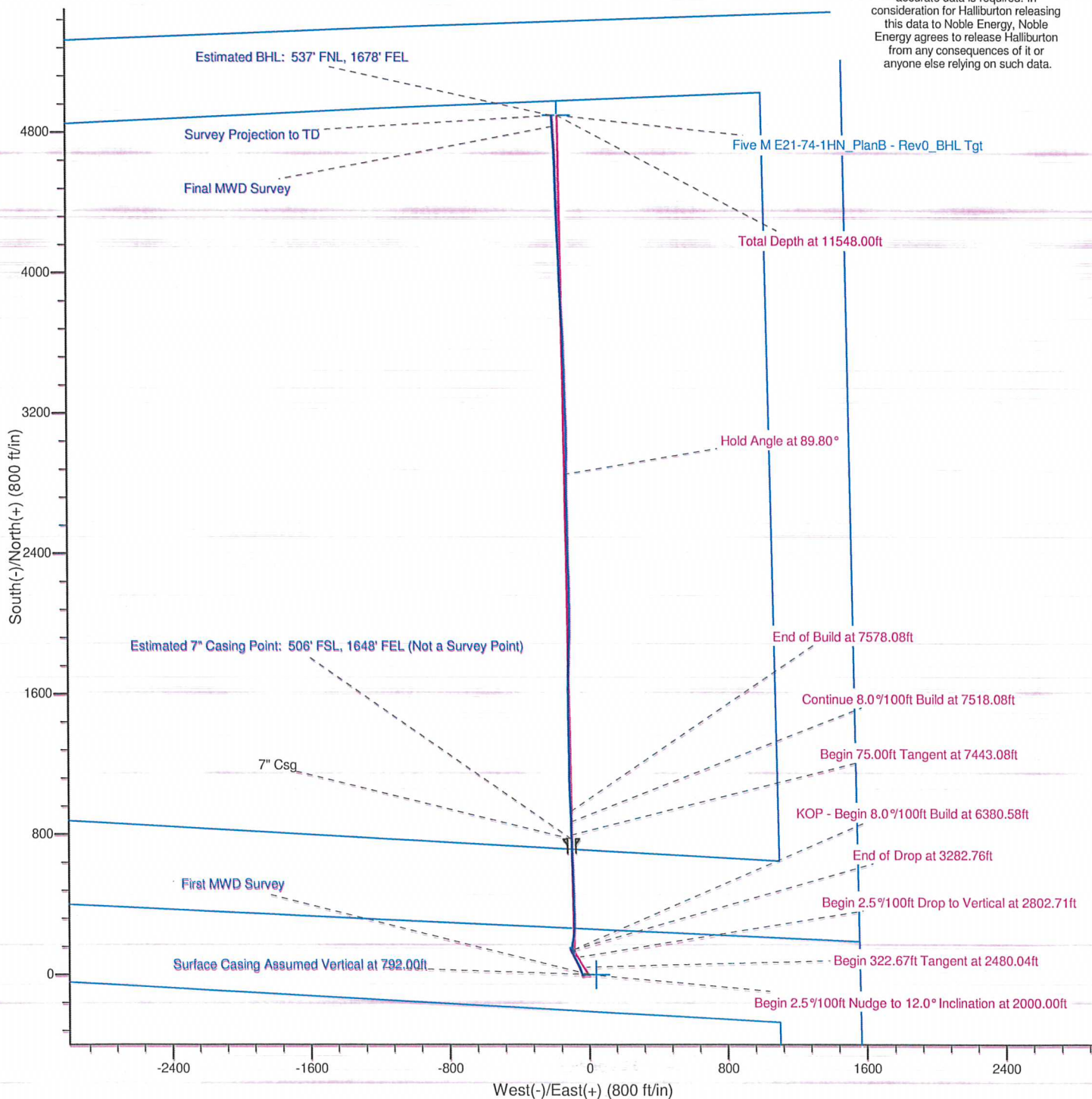


LEGEND

- Five M E21-74-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

Permitted BHL: 535' FNL, 1650' FEL

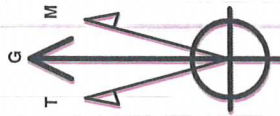
Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Five M E21-74-1HN well located at Weld County, CO. At the conclusion of the job Halliburton performed a final survey on the well. Noble Energy has requested that Halliburton provide them 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. 28-T6N-R65W (Five M 28 PAD)
 Well: Five M E21-74-1HN

Noble Energy

HALLIBURTON
 Sperry Drilling



Azimuths to Grid North
 True North: -0.54°
 Magnetic North: 8.14°
 Magnetic Field
 Strength: 52950.7snT
 Dip Angle: 67.05°
 Date: 10/27/2012
 Model: BGGM2012

LEGEND

- Five M E21-74-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Survey

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