

Noble Energy

Weld County, CO (NAD 83)
Sec. 28-T6N-R65W (Five M 28 PAD)
Five M E21-73-1HN

Design: MWD Surveys

Sperry Drilling Services

Final Survey Report

14 April, 2013

Well Coordinates: 1,412,956.44 N, 3,232,500.25 E (40° 27' 50.26" N, 104° 39' 51.84" W)
Ground Level: 4,704.00 ft

Local Coordinate Origin:	Centered on Well Five M E21-73-1HN - Slot A1
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: 43I	

HALLIBURTON

Design Report for Five M E21-73-1HN - MWD Surveys

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
789.00	0.00	0.00	789.00	0.00	0.00	0.00	0.00
Surface Casing Assumed Vertical at 789.00 ft. MD							
818.00	0.64	135.70	818.00	-0.12	0.11	-0.11	2.21
First Sperry MWD Survey @ 818.00 ft. MD							
1,100.00	0.50	164.71	1,099.99	-2.43	1.54	-2.30	0.11
1,379.00	0.72	172.37	1,378.97	-5.34	2.09	-5.16	0.08
1,472.00	2.50	103.33	1,471.94	-6.39	4.14	-6.04	2.52
1,566.00	5.21	84.33	1,565.72	-6.44	10.39	-5.59	3.15
1,659.00	6.67	74.58	1,658.22	-4.59	19.80	-2.98	1.90
1,752.00	9.03	68.64	1,750.34	-0.49	31.80	2.06	2.68
1,846.00	11.47	75.76	1,842.84	4.50	47.73	8.31	2.92
1,942.00	12.93	75.53	1,936.67	9.53	67.39	14.90	1.52
2,036.00	15.54	77.07	2,027.77	14.97	89.85	22.14	2.81
2,131.00	14.21	74.32	2,119.59	20.97	113.48	30.01	1.58
2,226.00	14.95	71.19	2,211.53	28.08	136.30	38.92	1.14
2,321.00	13.89	68.03	2,303.54	36.29	158.48	48.89	1.39
2,417.00	14.01	76.37	2,396.72	43.34	180.46	57.69	2.10
2,511.00	15.53	78.94	2,487.61	48.44	203.87	64.64	1.76
2,606.00	14.88	76.68	2,579.28	53.69	228.22	71.83	0.93
2,701.00	13.67	74.78	2,671.35	59.45	250.92	79.39	1.37
2,796.00	15.37	74.44	2,763.31	65.77	273.88	87.54	1.79
2,891.00	15.45	73.91	2,854.90	72.66	298.17	96.35	0.17
2,985.00	14.34	73.32	2,945.74	79.47	321.35	105.00	1.19
3,080.00	16.11	75.62	3,037.40	86.12	345.39	113.56	1.97
3,175.00	14.64	74.96	3,129.00	92.51	369.76	121.88	1.56
3,270.00	14.39	72.95	3,220.96	99.08	392.64	130.27	0.59
3,365.00	12.90	72.66	3,313.28	105.71	414.05	138.59	1.57
3,460.00	10.97	70.30	3,406.22	111.91	432.68	146.28	2.10
3,555.00	9.04	68.53	3,499.77	117.69	448.14	153.28	2.06
3,650.00	7.04	72.65	3,593.84	122.16	460.64	158.73	2.19
3,745.00	6.20	78.93	3,688.20	124.88	471.23	162.30	1.17
3,839.00	4.67	77.55	3,781.78	126.68	479.95	164.79	1.63
3,934.00	2.39	85.07	3,876.59	127.69	485.70	166.25	2.44
4,029.00	1.24	37.65	3,971.55	128.67	488.30	167.44	1.89
4,124.00	0.61	21.58	4,066.53	129.95	489.12	168.79	0.71
4,219.00	0.65	25.57	4,161.53	130.91	489.54	169.78	0.06
4,314.00	0.76	23.35	4,256.52	131.98	490.02	170.88	0.12
4,409.00	0.61	4.11	4,351.51	133.06	490.30	171.98	0.29
4,505.00	0.80	11.52	4,447.51	134.22	490.47	173.15	0.22
4,600.00	0.46	336.71	4,542.50	135.22	490.46	174.15	0.52
4,695.00	0.61	343.91	4,637.50	136.06	490.16	174.96	0.17
4,790.00	0.15	338.75	4,732.50	136.66	489.98	175.54	0.49
4,885.00	0.56	278.90	4,827.49	136.85	489.48	175.69	0.53
4,980.00	0.59	282.58	4,922.49	137.03	488.54	175.79	0.05
5,075.00	0.31	307.86	5,017.49	137.29	487.86	176.00	0.35
5,170.00	0.44	272.39	5,112.48	137.47	487.29	176.13	0.27
5,265.00	0.81	258.88	5,207.48	137.35	486.27	175.93	0.42
5,360.00	0.60	247.77	5,302.47	137.03	485.15	175.53	0.26
5,455.00	1.37	245.43	5,397.46	136.37	483.66	174.75	0.81

Design Report for Five M E21-73-1HN - MWD Surveys

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,550.00	1.13	237.06	5,492.43	135.39	481.84	173.62	0.32
5,645.00	1.26	241.98	5,587.41	134.39	480.13	172.49	0.17
5,740.00	0.88	238.07	5,682.40	133.52	478.59	171.49	0.41
5,834.00	0.55	252.42	5,776.39	133.00	477.54	170.89	0.40
5,929.00	1.39	239.12	5,871.37	132.27	476.12	170.05	0.91
6,024.00	1.41	243.40	5,966.35	131.15	474.09	168.78	0.11
6,144.00	1.11	282.80	6,086.32	130.75	471.63	168.18	0.75
6,206.00	1.11	286.06	6,148.31	131.05	470.47	168.38	0.10
6,254.00	1.48	324.80	6,196.30	131.68	469.67	168.95	1.93
6,302.00	4.82	354.38	6,244.22	134.20	469.11	171.41	7.52
6,350.00	9.40	4.65	6,291.84	140.12	469.23	177.32	9.86
6,396.00	10.30	7.92	6,337.16	147.93	470.10	185.18	2.30
6,444.00	11.58	15.55	6,384.29	156.83	471.99	194.20	4.02
6,491.00	13.84	12.44	6,430.14	166.86	474.46	204.40	5.02
6,539.00	20.39	8.13	6,475.99	180.76	476.88	218.45	13.89
6,586.00	26.50	4.69	6,519.09	199.34	478.90	237.13	13.32
6,634.00	33.59	2.98	6,560.61	223.30	480.47	261.14	14.88
6,681.00	33.90	0.50	6,599.70	249.39	481.26	287.21	3.00
6,729.00	37.77	354.34	6,638.62	277.42	479.93	315.04	11.01
6,776.00	44.17	352.90	6,674.09	308.03	476.48	345.27	13.76
6,824.00	52.28	355.82	6,706.04	343.62	473.02	380.47	17.49
6,871.00	60.66	357.91	6,731.98	382.71	470.92	419.26	18.21
6,919.00	63.67	358.85	6,754.39	425.13	469.72	461.45	6.51
6,966.00	64.70	359.70	6,774.86	467.43	469.19	503.58	2.73
6,997.00	65.46	359.73	6,787.92	495.55	469.05	531.59	2.45
7,029.00	66.33	0.05	6,800.99	524.76	468.99	560.70	2.87
7,061.00	67.50	0.20	6,813.54	554.19	469.06	590.05	3.68
7,092.00	68.51	0.42	6,825.15	582.94	469.21	618.71	3.32
7,124.00	69.67	0.74	6,836.57	612.83	469.51	648.53	3.74
7,156.00	70.25	359.71	6,847.53	642.89	469.63	678.50	3.53
7,187.00	71.13	359.37	6,857.78	672.14	469.40	707.65	3.02
7,219.00	72.36	359.61	6,867.81	702.53	469.13	737.91	3.91
7,251.00	74.25	359.13	6,877.00	733.18	468.79	768.44	6.08
7,282.00	75.48	359.37	6,885.09	763.10	468.40	798.23	4.04
7,314.00	76.49	359.64	6,892.84	794.15	468.13	829.15	3.26
7,346.00	77.41	359.91	6,900.07	825.32	468.01	860.22	2.99
7,390.00	80.35	359.81	6,908.55	868.49	467.90	903.24	6.69
7,436.00	84.05	359.52	6,914.80	914.05	467.63	948.63	8.06
Estimated 7" Casing Point: 676' FSL, 1040' FEL (Not a Survey Point)							
7,492.00	88.55	359.17	6,918.41	969.92	466.99	1,004.27	8.06
7,512.00	89.14	359.03	6,918.81	989.91	466.68	1,024.17	3.03
7,560.00	88.36	358.80	6,919.86	1,037.89	465.77	1,071.92	1.69
7,606.00	88.33	359.08	6,921.19	1,083.86	464.92	1,117.68	0.61
7,701.00	88.27	358.90	6,924.01	1,178.81	463.25	1,212.18	0.20
7,796.00	90.59	358.52	6,924.95	1,273.77	461.11	1,306.67	2.47
7,890.00	90.83	357.71	6,923.79	1,367.71	458.02	1,400.06	0.90
7,985.00	88.37	357.09	6,924.45	1,462.61	453.71	1,494.30	2.67
8,080.00	88.77	357.55	6,926.82	1,557.47	449.27	1,588.50	0.64
8,175.00	90.31	357.27	6,927.58	1,652.37	444.97	1,682.75	1.65
8,270.00	89.85	358.12	6,927.45	1,747.29	441.15	1,777.06	1.02
8,365.00	88.98	357.66	6,928.42	1,842.22	437.66	1,871.40	1.04

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
8,460.00	89.54	358.46	6,929.65	1,937.16	434.44	1,965.77	1.03
8,555.00	88.73	359.48	6,931.08	2,032.13	432.73	2,060.30	1.37
8,650.00	90.46	359.56	6,931.75	2,127.12	431.94	2,154.92	1.82
8,745.00	88.80	358.86	6,932.37	2,222.10	430.63	2,249.50	1.90
8,840.00	89.41	359.65	6,933.85	2,317.08	429.39	2,344.07	1.05
8,935.00	89.69	0.17	6,934.60	2,412.08	429.24	2,438.75	0.62
9,030.00	88.80	356.45	6,935.85	2,507.01	426.44	2,533.15	4.03
9,125.00	88.21	352.59	6,938.33	2,601.53	417.38	2,626.63	4.11
9,220.00	88.24	351.82	6,941.27	2,695.60	404.50	2,719.37	0.81
9,314.00	89.81	354.52	6,942.87	2,788.91	393.32	2,811.48	3.32
9,409.00	90.86	354.41	6,942.32	2,883.47	384.16	2,905.00	1.11
9,504.00	90.28	357.96	6,941.37	2,978.24	377.84	2,998.95	3.79
9,599.00	90.28	1.25	6,940.91	3,073.22	377.19	3,093.58	3.46
9,694.00	90.12	356.65	6,940.57	3,168.18	375.44	3,188.09	4.85
9,789.00	89.85	355.44	6,940.60	3,262.95	368.89	3,282.03	1.31
9,884.00	90.40	2.38	6,940.39	3,357.87	367.09	3,376.50	7.33
9,979.00	90.43	5.73	6,939.70	3,452.62	373.80	3,471.48	3.53
10,074.00	90.65	6.47	6,938.81	3,547.08	383.90	3,566.44	0.81
10,169.00	90.09	2.22	6,938.19	3,641.78	391.09	3,661.42	4.51
10,264.00	90.86	5.42	6,937.41	3,736.55	397.42	3,756.39	3.46
10,359.00	90.98	6.61	6,935.88	3,831.02	407.37	3,851.35	1.26
10,454.00	89.20	3.54	6,935.73	3,925.63	415.78	3,946.33	3.74
10,549.00	87.10	1.96	6,938.80	4,020.46	420.33	4,041.23	2.77
10,644.00	87.75	0.48	6,943.07	4,115.34	422.35	4,135.96	1.70
10,739.00	88.22	2.86	6,946.41	4,210.23	425.12	4,230.77	2.55
10,834.00	89.38	1.16	6,948.40	4,305.15	428.45	4,325.65	2.17
10,929.00	90.12	359.08	6,948.81	4,400.14	428.65	4,420.35	2.32
11,024.00	90.55	359.12	6,948.26	4,495.13	427.16	4,514.91	0.45
11,118.00	90.77	358.12	6,947.17	4,589.09	424.89	4,608.39	1.09
11,213.00	91.70	358.03	6,945.13	4,684.02	421.70	4,702.75	0.98
11,308.00	92.31	358.02	6,941.80	4,778.90	418.43	4,797.07	0.64
11,391.00	92.44	357.90	6,938.36	4,861.78	415.48	4,879.44	0.21

Final Sperry MWD Survey @ 11391.00 ft. MD

11,448.00 92.44 357.90 6,935.94 4,918.69 413.39 4,936.00 0.00

Estimated BHL: 535' FNL, 1030' FEL :: Straight Line Projection to TD @ 11448.00 ft. MD

Design Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
789.00	789.00	0.00	0.00	Surface Casing Assumed Vertical at 789.00 ft. MD
818.00	818.00	-0.12	0.11	First Sperry MWD Survey @ 818.00 ft. MD
7,436.00	6,914.80	914.05	467.63	Estimated 7" Casing Point: 676' FSL, 1040' FEL (Not a Survey Point)
11,391.00	6,938.36	4,861.78	415.48	Final Sperry MWD Survey @ 11391.00 ft. MD
11,448.00	6,935.94	4,918.69	413.39	Estimated BHL: 535' FNL, 1030' FEL :: Straight Line Projection to TD @ 11448.00 ft. MD

Design Report for Five M E21-73-1HN - MWD Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (ft)	Origin +E/-W (ft)	Start TVD (ft)
Target	Five M E21-73-1HN_PlanB - Rev0_B	4.60	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
789.00	7,436.00	Sperry MWD Surveys	MWD
7,436.00	11,448.00	Sperry MWD Surveys	MWD

Casing Details

Measured Depth (ft)	Vertical Depth (ft)	Name	Casing Diameter (")	Hole Diameter (")
7,436.00	6,914.80	7" Casing PT	7	8-3/4

Design Report for Five M E21-73-1HN - MWD Surveys

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	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath hits target center									
- Polygon									
Point 1			-1,122.00	310.00		1,413,266.43	3,231,378.29		
Point 2			1,520.00	189.00		1,413,145.44	3,234,020.19		
Point 3			1,562.00	-2,466.00		1,410,490.53	3,234,062.19		
Point 4			1,607.00	-5,122.00		1,407,834.63	3,234,107.19		
Point 5			-1,052.00	-5,027.00		1,407,929.63	3,231,448.29		
Point 6			-3,711.00	-4,928.00		1,408,028.62	3,228,789.38		
Point 7			-3,767.00	-2,228.00		1,410,728.52	3,228,733.38		
Point 8			-3,783.00	435.00		1,413,391.43	3,228,717.38		
Point 9			-1,122.00	310.00		1,413,266.43	3,231,378.29		
Five M	0.00	0.00	6,936.11	4,918.58	396.01	1,417,874.84	3,232,896.24	40.47745	-104.66281
- actual wellpath misses target center by 17.38ft at 11448.00ft MD (6935.94 TVD, 4918.69 N, 413.39 E)									
- Point									
Five M	0.00	0.00	0.00	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath hits target center									
- Polygon									
Point 1			1,980.00	-271.00		1,412,685.45	3,234,480.18		
Point 2			4,164.00	-297.00		1,412,659.45	3,236,664.10		
Point 3			4,206.00	-2,488.00		1,410,468.53	3,236,706.09		
Point 4			4,248.00	-4,673.00		1,408,283.61	3,236,748.09		
Point 5			2,067.00	-4,662.00		1,408,294.61	3,234,567.17		
Point 6			2,022.00	-2,466.00		1,410,490.53	3,234,522.17		
Point 7			1,980.00	-271.00		1,412,685.45	3,234,480.18		
Five M	0.00	0.00	0.00	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath hits target center									
- Polygon									
Point 1			-1,122.00	310.00		1,413,266.43	3,231,378.29		
Point 2			-3,783.00	435.00		1,413,391.43	3,228,717.38		
Point 3			-3,836.00	2,864.00		1,415,820.34	3,228,664.39		
Point 4			-3,886.00	5,290.00		1,418,246.25	3,228,614.39		
Point 5			-1,222.00	5,399.00		1,418,355.25	3,231,278.29		
Point 6			1,434.00	5,489.00		1,418,445.24	3,233,934.20		
Point 7			1,479.00	2,838.00		1,415,794.34	3,233,979.19		
Point 8			1,520.00	189.00		1,413,145.44	3,234,020.19		
Point 9			-1,122.00	310.00		1,413,266.43	3,231,378.29		
Five M	0.00	0.00	0.00	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath hits target center									
- Polygon									
Point 1			-1,122.00	770.00		1,413,726.42	3,231,378.29		
Point 2			-3,323.00	895.00		1,413,851.41	3,229,177.37		
Point 3			-3,376.00	2,864.00		1,415,820.34	3,229,124.37		
Point 4			-3,426.00	4,830.00		1,417,786.27	3,229,074.37		
Point 5			-1,222.00	4,939.00		1,417,895.26	3,231,278.29		
Point 6			974.00	5,029.00		1,417,985.26	3,233,474.21		
Point 7			1,019.00	2,838.00		1,415,794.34	3,233,519.21		
Point 8			1,060.00	649.00		1,413,605.42	3,233,560.21		
Point 9			-1,122.00	770.00		1,413,726.42	3,231,378.29		
Five M	0.00	0.00	0.00	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440
- actual wellpath hits target center									
- Polygon									
Point 1			-1,122.00	-150.00		1,412,806.45	3,231,378.29		
Point 2			1,060.00	-271.00		1,412,685.45	3,233,560.21		
Point 3			1,102.00	-2,466.00		1,410,490.53	3,233,602.21		
Point 4			1,147.00	-4,662.00		1,408,294.61	3,233,647.21		
Point 5			-1,052.00	-4,567.00		1,408,389.61	3,231,448.29		
Point 6			-3,251.00	-4,468.00		1,408,488.61	3,229,249.36		
Point 7			-3,307.00	-2,228.00		1,410,728.52	3,229,193.37		
Point 8			-3,323.00	-25.00		1,412,931.44	3,229,177.37		
Point 9			-1,122.00	-150.00		1,412,806.45	3,231,378.29		
Five M	0.00	0.00	0.00	0.00	0.00	1,412,956.44	3,232,500.25	40.46396	-104.66440

Design Report for Five M E21-73-1HN - MWD Surveys

- actual wellpath hits target center

- Polygon

Point 1	1,520.00	189.00	1,413,145.44	3,234,020.19
Point 2	4,164.00	163.00	1,413,119.44	3,236,664.10
Point 3	4,206.00	-2,488.00	1,410,468.53	3,236,706.09
Point 4	4,248.00	-5,133.00	1,407,823.63	3,236,748.09
Point 5	1,607.00	-5,122.00	1,407,834.63	3,234,107.19
Point 6	1,563.00	-2,466.00	1,410,490.53	3,234,063.19
Point 7	1,520.00	189.00	1,413,145.44	3,234,020.19

North Reference Sheet for Sec. 28-T6N-R65W (Five M 28 PAD) - Five M E21-73-1HN

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 E21-73-1HN - Slot A1

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

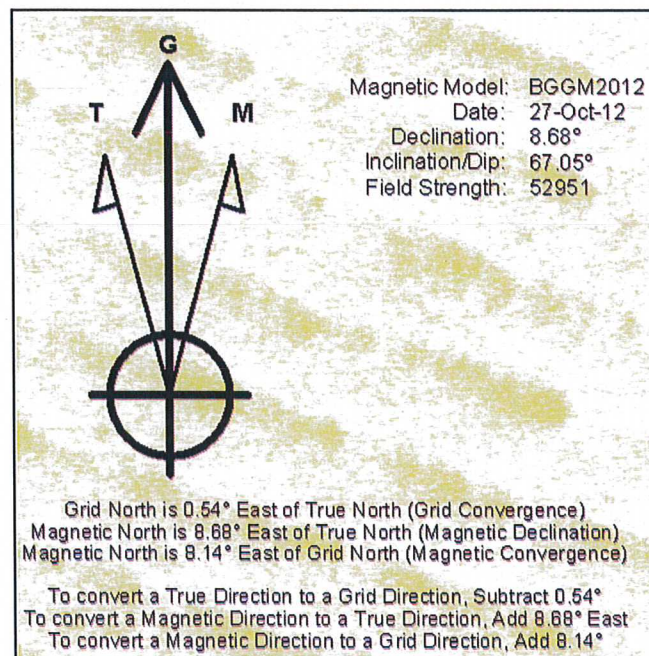
Grid Coordinates of Well: 1,412,956.44 ft N, 3,232,500.25 ft E

Geographical Coordinates of Well: 40° 27' 50.26" N, 104° 39' 51.84" W

Grid Convergence at Surface is: 0.54°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,448.00ft
the Bottom Hole Displacement is 4,936.03ft in the Direction of 4.80° (Grid).

Magnetic Convergence at surface is: -8.14° (27 October 2012, , BGGM2012)

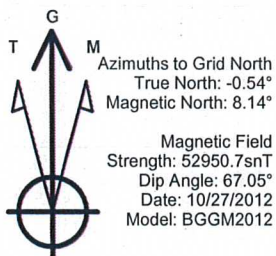


Project: Weld County, CO (NAD 83)
 Site: Sec. 28-T6N-R65W (Five M 28 PAD)
 Well: Five M E21-73-1HN

Noble Energy

HALLIBURTON

Sperry Drilling

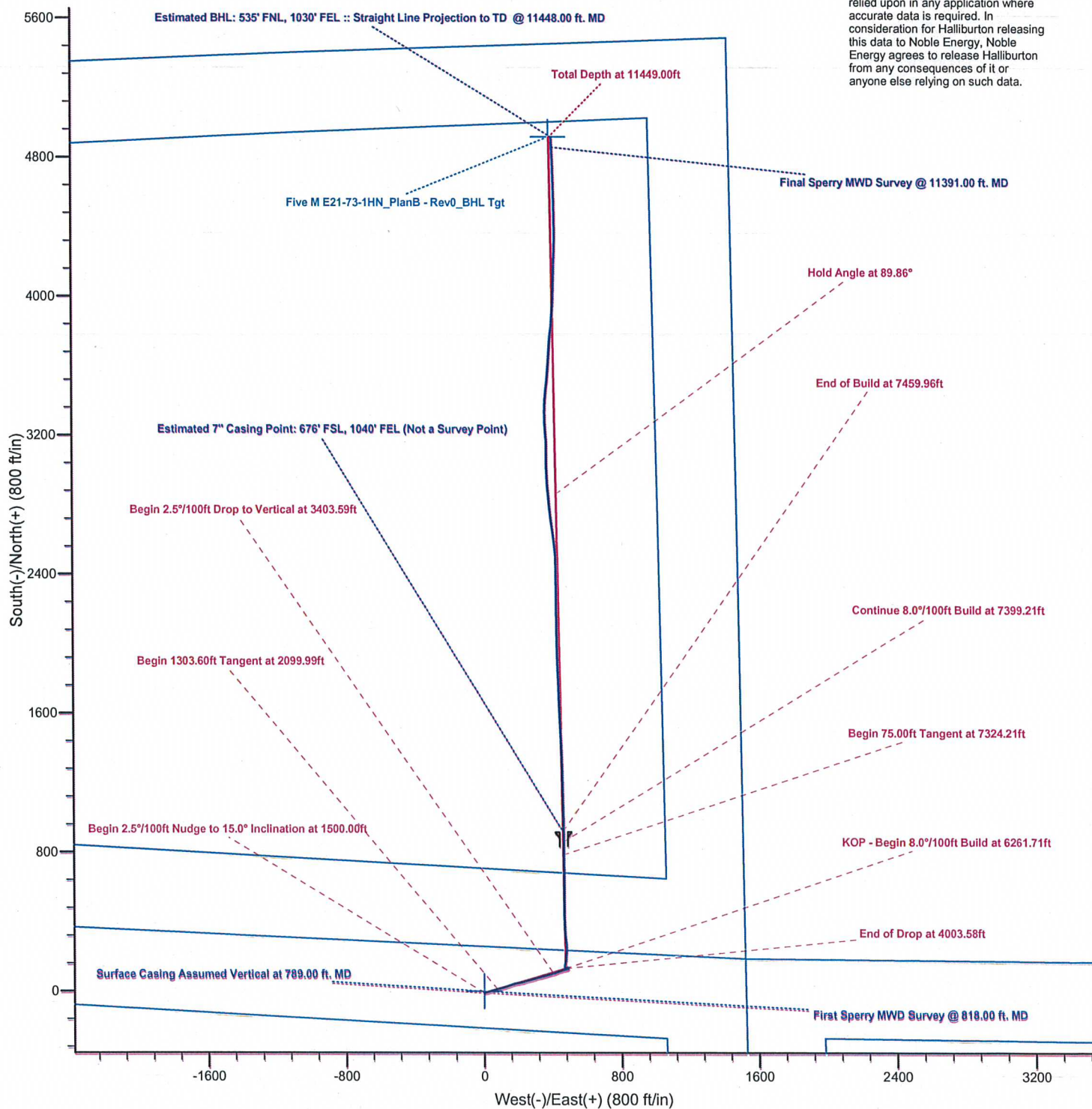


LEGEND

- Five M E21-73-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Surveys

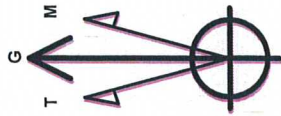
Permitted BHL: 535' FNL, 1050' FEL

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Five M E21-73-1HN 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 E21-73-1HN

Noble Energy



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 E21-73-1HN, Plan B, Plan B - Rev 0 Proposal V0
- MWD Surveys

Halliburton Energy Services, Inc. ("Halliburton") recently completed directional drilling and MWD operations at the Five M E21-73-1HN 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.

