

Project: Weld County, CO (NAD 83)  
Site: Sec. 1-T4N-R66W (Loeffler 1 PAD)  
Well: Loeffler K1-69-1HN  
Wellbore: Plan A  
Design: Final Surveys

# Noble Energy

**HALLIBURTON**  
Sperry Drilling

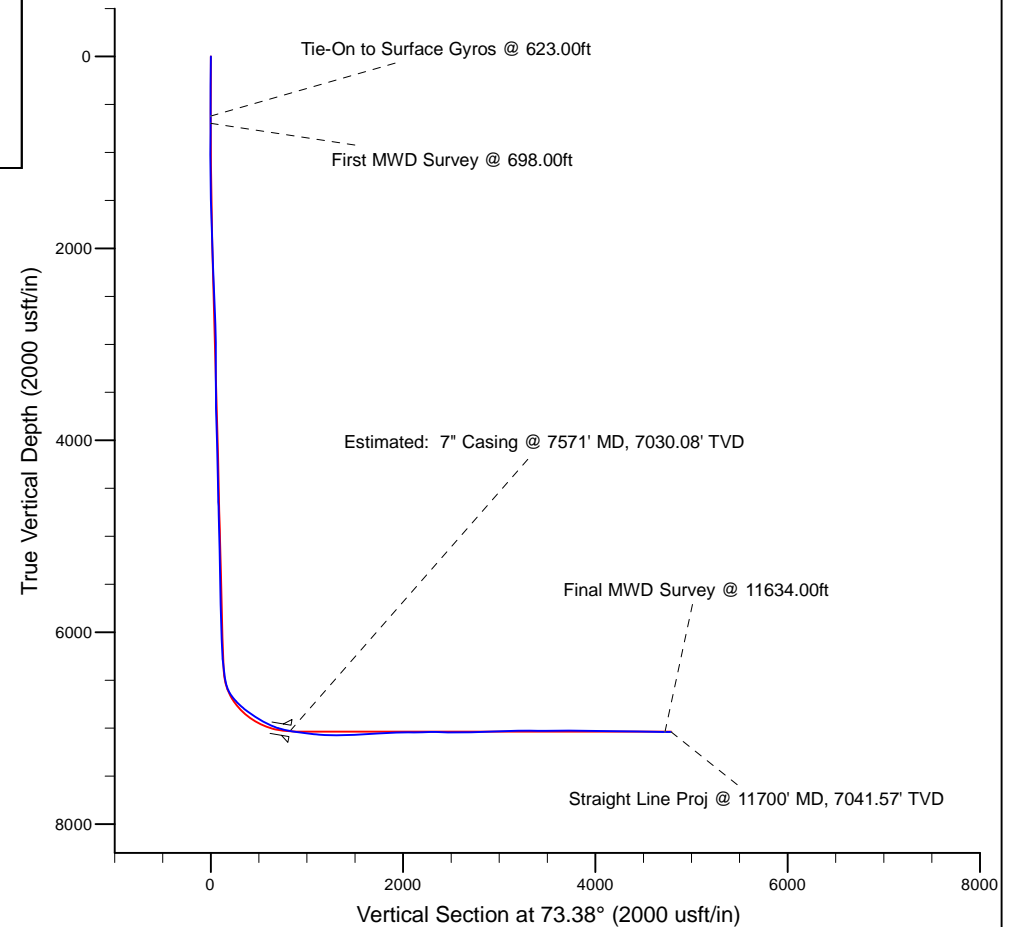
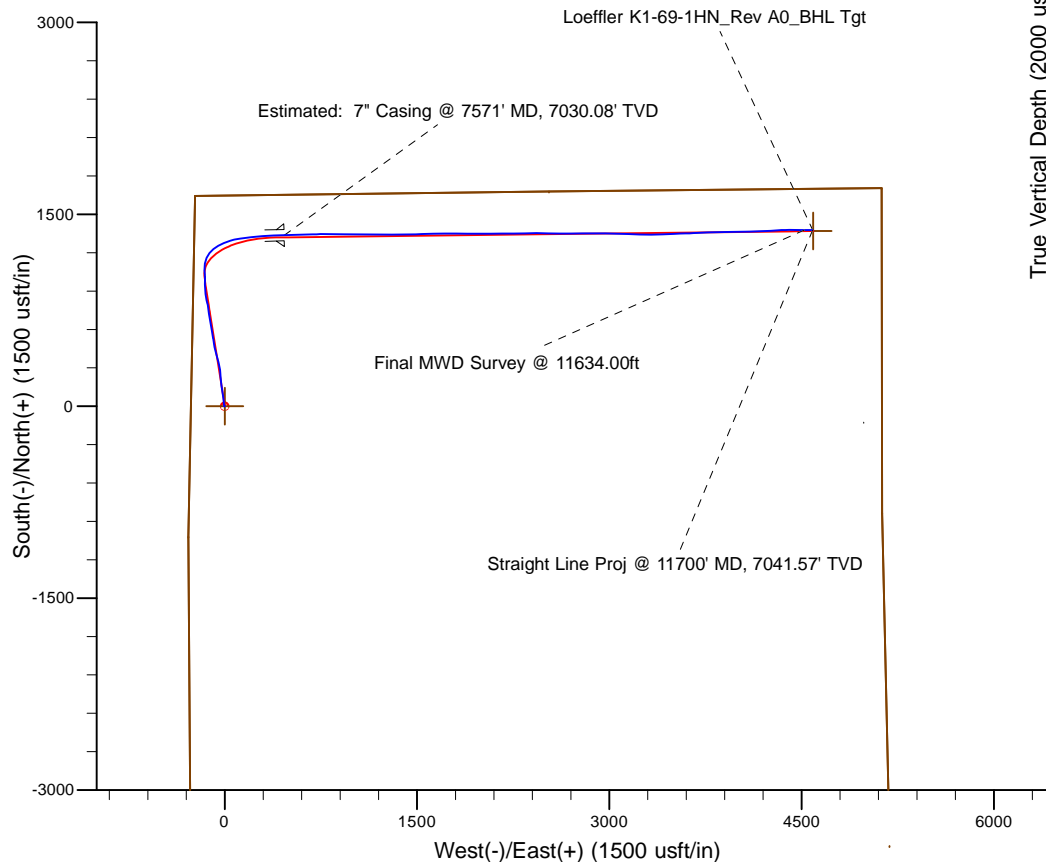
Platted SHL: 1650' FNL, 265' FWL  
Platted Lat/Long: 40.34390° N, 104.73396° W  
Location: Sec. 1-T4N-R66W

7" Casing: ~315.82' FNL, ~700.42' FWL  
Lat/Long: 40° 20' 51.221 N, 104° 43' 56.132 W  
State Planes - CO Northern: 1,370,383.65' N, 3,213,986.54' E  
Location: Sec. 1-T4N-R66W

BHL: ~323.17' FNL, ~537.16' FEL  
Lat/Long: 40° 20' 51.255 N, 104° 43' 2.869 W  
State Planes - CO Northern: 1,370,423.12' N, 3,218,110.24' E  
Location: Sec. 1-T4N-R66W

## LEGEND

- Loeffler K1-69-1HN, Plan A, Rev A0 Proposal V0
- Final Surveys



WELL DETAILS: Loeffler K1-69-1HN

Ground Level: 4666.00  
KB=16" @ 4682.00usft (Precision 829)

Created By: Fred Hartmann  
Created On: 10/30/2013

# Noble Energy

Weld County, CO (NAD 83)

Sec. 1-T4N-R66W (Loeffler 1 PAD)

Loeffler K1-69-1HN - A1

Design: Final Surveys

## Sperry Drilling Services

### Final Survey Report

30 October, 2013

Well Coordinates: 1,369,045.75 N, 3,213,523.97 E (40° 20' 38.04" N, 104° 44' 02.26" W)

Ground Level: 4,666.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Loeffler K1-69-1HN - Slot A1

KB=16' @ 4682.00usft (Precision 829)

N

Grid

API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
306.00	0.20	331.68	306.00	0.47	-0.25	-0.11	0.07
623.00	0.00	291.28	623.00	0.96	-0.52	-0.22	0.06
<b>Tie-On to Surface Gyros @ 623.00ft</b>							
698.00	0.51	214.20	698.00	0.68	-0.70	-0.48	0.67
<b>First MWD Survey @ 698.00ft</b>							
787.00	0.80	167.40	786.99	-0.25	-0.79	-0.82	0.66
877.00	0.63	265.66	876.99	-0.90	-1.14	-1.35	1.21
966.00	0.38	219.55	965.98	-1.17	-1.82	-2.07	0.51
1,056.00	0.77	301.77	1,055.98	-1.08	-2.52	-2.73	0.90
1,135.00	0.99	307.48	1,134.97	-0.38	-3.51	-3.48	0.29
1,229.00	3.78	347.50	1,228.89	3.13	-4.83	-3.73	3.28
1,323.00	5.15	354.87	1,322.60	10.36	-5.87	-2.67	1.58
1,418.00	7.45	356.32	1,417.02	20.75	-6.65	-0.44	2.43
1,512.00	9.52	357.45	1,509.99	34.60	-7.39	2.81	2.21
1,606.00	10.34	351.94	1,602.58	50.71	-8.92	5.96	1.33
1,700.00	10.83	350.17	1,694.98	67.76	-11.61	8.25	0.63
1,794.00	12.20	351.80	1,787.09	86.28	-14.53	10.75	1.50
1,889.00	11.14	348.85	1,880.13	105.22	-17.73	13.10	1.28
1,983.00	12.73	348.76	1,972.09	124.29	-21.51	14.93	1.70
2,077.00	13.28	356.75	2,063.69	145.23	-24.14	18.40	2.00
2,171.00	12.79	355.93	2,155.26	166.39	-25.49	23.15	0.56
2,265.00	12.20	354.27	2,247.04	186.65	-27.22	27.29	0.74
2,359.00	10.60	350.23	2,339.18	205.06	-29.68	30.20	1.90
2,451.00	12.68	354.87	2,429.29	223.45	-32.02	33.22	2.48
2,513.00	12.44	354.38	2,489.80	236.87	-33.28	35.85	0.43
2,602.00	12.47	355.22	2,576.71	255.99	-35.02	39.65	0.21
2,692.00	13.95	355.66	2,664.32	276.49	-36.65	43.95	1.65
2,781.00	12.38	351.43	2,750.99	296.62	-38.88	47.56	2.07
2,871.00	10.48	348.83	2,839.20	314.19	-41.91	49.69	2.18
2,961.00	10.11	348.19	2,927.75	329.96	-45.11	51.13	0.44
3,050.00	9.57	345.83	3,015.44	344.78	-48.52	52.10	0.75
3,140.00	11.49	345.02	3,103.92	360.69	-52.67	52.67	2.14
3,230.00	10.64	338.45	3,192.25	377.08	-58.04	52.22	1.69
3,319.00	9.50	345.70	3,279.88	391.85	-62.87	51.81	1.91
3,409.00	9.92	346.26	3,368.59	406.57	-66.55	52.50	0.47
3,498.00	11.37	348.41	3,456.06	422.61	-70.13	53.65	1.69
3,588.00	9.26	343.12	3,544.60	438.23	-74.02	54.39	2.56
3,678.00	10.77	343.55	3,633.22	453.23	-78.50	54.38	1.68
3,767.00	11.93	352.11	3,720.49	470.32	-82.12	55.80	2.30
3,857.00	12.90	352.21	3,808.38	489.49	-84.76	58.76	1.07
3,946.00	13.14	351.61	3,895.09	509.34	-87.58	61.73	0.32
4,036.00	10.83	353.94	3,983.13	527.87	-89.96	64.74	2.62
4,126.00	9.72	350.01	4,071.68	543.77	-92.18	67.17	1.46
4,215.00	11.51	349.73	4,159.15	559.91	-95.06	69.02	2.01
4,305.00	10.82	347.97	4,247.45	577.01	-98.43	70.69	0.85
4,394.00	11.80	350.76	4,334.72	594.16	-101.63	72.52	1.25
4,484.00	10.94	349.21	4,422.96	611.63	-104.71	74.57	1.01
4,573.00	10.75	347.84	4,510.37	628.04	-108.03	76.07	0.36
4,663.00	10.71	353.85	4,598.80	644.56	-110.70	78.24	1.24

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,753.00	9.42	355.14	4,687.41	660.21	-112.22	81.26	1.46
4,842.00	9.93	350.06	4,775.15	675.02	-114.16	83.64	1.11
4,932.00	11.62	350.36	4,863.56	691.60	-117.02	85.64	1.88
5,022.00	11.53	350.60	4,951.73	709.41	-120.00	87.87	0.11
5,111.00	10.16	349.29	5,039.13	725.90	-122.91	89.80	1.56
5,201.00	11.03	350.38	5,127.60	742.18	-125.83	91.66	0.99
5,291.00	9.65	348.23	5,216.14	758.06	-128.80	93.35	1.59
5,380.00	10.54	354.53	5,303.76	773.46	-131.10	95.55	1.59
5,470.00	9.17	353.60	5,392.43	788.78	-132.69	98.41	1.52
5,560.00	10.22	348.31	5,481.15	803.72	-135.11	100.37	1.52
5,649.00	11.13	344.05	5,568.61	819.71	-139.07	101.15	1.35
5,739.00	11.57	345.91	5,656.85	836.81	-143.65	101.65	0.64
5,829.00	11.29	355.55	5,745.07	854.35	-146.53	103.90	2.14
5,918.00	9.37	350.81	5,832.63	870.18	-148.36	106.67	2.36
6,008.00	10.84	348.88	5,921.23	885.72	-151.16	108.43	1.68
6,097.00	11.61	358.92	6,008.54	902.89	-152.95	111.63	2.36
6,187.00	9.46	353.91	6,097.02	919.30	-153.90	115.41	2.60
6,277.00	9.98	357.15	6,185.72	934.44	-155.07	118.62	0.84
6,322.00	10.30	357.89	6,230.02	942.36	-155.42	120.55	0.77
6,366.00	14.31	1.50	6,273.00	951.73	-155.42	123.23	9.26
6,411.00	19.89	2.40	6,316.00	964.95	-154.95	127.46	12.42
6,456.00	23.62	1.06	6,357.78	981.61	-154.46	132.69	8.37
6,501.00	25.23	358.75	6,398.75	1,000.22	-154.51	137.97	4.16
6,545.00	28.37	355.17	6,438.03	1,020.02	-155.59	142.59	8.01
6,590.00	32.70	356.68	6,476.78	1,042.81	-157.20	147.57	9.79
6,635.00	36.33	358.67	6,513.85	1,068.29	-158.21	153.89	8.44
6,680.00	37.97	5.06	6,549.73	1,095.41	-157.30	162.52	9.31
6,725.00	38.05	11.27	6,585.20	1,122.81	-153.36	174.12	8.49
6,769.00	40.45	21.53	6,619.31	1,149.42	-145.47	189.30	15.72
6,814.00	43.47	29.32	6,652.79	1,176.52	-132.52	209.46	13.37
6,859.00	43.82	37.72	6,685.38	1,202.36	-115.39	233.26	12.89
6,904.00	45.46	47.66	6,717.44	1,225.52	-93.98	260.40	15.93
6,948.00	47.31	56.90	6,747.83	1,244.93	-68.81	290.07	15.77
6,993.00	48.56	64.71	6,778.00	1,261.18	-39.68	322.63	13.18
7,038.00	51.86	67.72	6,806.80	1,275.10	-8.04	356.93	8.95
7,083.00	53.94	70.00	6,833.94	1,288.04	25.43	392.70	6.13
7,128.00	56.07	74.46	6,859.75	1,299.27	60.53	429.54	9.40
7,173.00	57.50	80.59	6,884.42	1,307.38	97.26	467.06	11.83
7,217.00	59.36	82.15	6,907.46	1,313.00	134.32	504.18	5.20
7,262.00	61.01	83.43	6,929.83	1,317.89	173.06	542.70	4.42
7,307.00	62.57	83.89	6,951.10	1,322.27	212.47	581.71	3.58
7,352.00	66.64	84.83	6,970.40	1,326.26	252.91	621.61	9.24
7,397.00	69.60	85.05	6,987.16	1,329.94	294.51	662.52	6.59
7,442.00	72.86	86.27	7,001.64	1,333.16	336.98	704.15	7.69
7,487.00	75.95	87.51	7,013.74	1,335.51	380.26	746.28	7.36
7,531.00	79.39	88.59	7,023.13	1,336.97	423.21	787.86	8.18
7,571.00	80.61	88.54	7,030.08	1,337.95	462.59	825.88	3.06
Estimated: 7" Casing @ 7571' MD, 7030.08' TVD							
7,617.00	82.02	88.49	7,037.02	1,339.13	508.05	869.77	3.06
7,707.00	82.24	88.28	7,049.35	1,341.64	597.16	955.88	0.33
7,796.00	83.82	88.02	7,060.15	1,344.49	685.46	1,041.31	1.80

**Design Report for Loeffler K1-69-1HN - Final Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7,886.00	85.58	89.74	7,068.46	1,346.24	775.05	1,127.66	2.73
7,976.00	87.60	91.00	7,073.81	1,345.66	864.88	1,213.57	2.64
8,110.00	90.89	90.67	7,075.57	1,343.71	998.83	1,341.37	2.47
8,200.00	93.58	89.87	7,072.06	1,343.28	1,088.76	1,427.42	3.11
8,289.00	92.96	90.55	7,066.99	1,342.96	1,177.61	1,512.47	1.03
8,379.00	92.00	89.97	7,063.09	1,342.55	1,267.52	1,598.51	1.24
8,469.00	92.34	89.69	7,059.68	1,342.82	1,357.46	1,684.77	0.49
8,558.00	92.56	89.18	7,055.87	1,343.71	1,446.37	1,770.22	0.62
8,648.00	93.24	87.67	7,051.32	1,346.18	1,536.22	1,857.02	1.83
8,737.00	91.63	88.53	7,047.53	1,349.12	1,625.09	1,943.02	2.05
8,827.00	90.62	88.85	7,045.77	1,351.17	1,715.04	2,029.81	1.19
8,917.00	90.83	91.34	7,044.63	1,351.02	1,805.03	2,116.00	2.77
9,006.00	91.73	90.32	7,042.65	1,349.73	1,894.00	2,200.88	1.52
9,096.00	90.80	89.90	7,040.66	1,349.56	1,983.97	2,287.05	1.13
9,186.00	88.64	89.86	7,041.10	1,349.74	2,073.97	2,373.34	2.40
9,275.00	88.49	89.51	7,043.32	1,350.23	2,162.94	2,458.73	0.43
9,365.00	90.15	89.44	7,044.39	1,351.05	2,252.92	2,545.19	1.85
9,454.00	90.15	88.86	7,044.15	1,352.37	2,341.91	2,630.84	0.65
9,544.00	91.57	89.82	7,042.79	1,353.40	2,431.89	2,717.36	1.90
9,634.00	90.89	91.03	7,040.86	1,352.74	2,521.87	2,803.39	1.54
9,723.00	91.57	90.82	7,038.94	1,351.30	2,610.84	2,888.23	0.80
9,813.00	92.99	89.21	7,035.36	1,351.28	2,700.76	2,974.39	2.38
9,902.00	92.84	89.53	7,030.84	1,352.26	2,789.64	3,059.84	0.39
9,992.00	90.56	90.01	7,028.17	1,352.62	2,879.59	3,146.14	2.59
10,082.00	90.77	90.79	7,027.13	1,351.99	2,969.58	3,232.20	0.90
10,171.00	88.95	92.20	7,027.34	1,349.67	3,058.55	3,316.78	2.59
10,261.00	88.95	92.20	7,028.99	1,346.21	3,148.47	3,401.95	0.00
10,350.00	91.11	92.51	7,028.94	1,342.55	3,237.38	3,486.11	2.45
10,440.00	89.72	88.54	7,028.29	1,341.73	3,327.36	3,572.10	4.67
10,530.00	89.38	87.93	7,028.99	1,344.50	3,417.31	3,659.09	0.78
10,619.00	91.05	86.94	7,028.66	1,348.48	3,506.22	3,745.42	2.18
10,709.00	90.55	88.68	7,027.40	1,351.92	3,596.14	3,832.57	2.00
10,798.00	88.70	86.70	7,027.97	1,355.51	3,685.06	3,918.80	3.04
10,888.00	89.11	88.00	7,029.69	1,359.67	3,774.94	4,006.12	1.51
10,978.00	89.57	89.48	7,030.73	1,361.65	3,864.91	4,092.90	1.73
11,067.00	88.43	89.28	7,032.29	1,362.60	3,953.89	4,178.43	1.30
11,157.00	88.83	88.72	7,034.44	1,364.17	4,043.85	4,265.09	0.77
11,246.00	89.75	87.80	7,035.54	1,366.87	4,132.80	4,351.09	1.47
11,335.00	89.72	87.13	7,035.95	1,370.80	4,221.71	4,437.42	0.76
11,425.00	89.51	86.75	7,036.56	1,375.61	4,311.58	4,524.91	0.48
11,515.00	88.55	89.43	7,038.08	1,378.61	4,401.51	4,611.94	3.16
11,604.00	88.86	90.93	7,040.09	1,378.33	4,490.49	4,697.12	1.71
11,634.00	89.17	90.47	7,040.61	1,377.97	4,520.48	4,725.75	1.83
<b>Final MWD Survey @ 11634.00ft</b>							
11,700.00	89.17	90.47	7,041.57	1,377.42	4,586.47	4,788.83	0.00
<b>Straight Line Proj @ 11700' MD, 7041.57' TVD</b>							

## Design Report for Loeffler K1-69-1HN - Final Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
623.00	623.00	0.96	-0.52	Tie-On to Surface Gyros @ 623.00ft
698.00	698.00	0.68	-0.70	First MWD Survey @ 698.00ft
11,634.00	7,040.61	1,377.97	4,520.48	Final MWD Survey @ 11634.00ft
11,700.00	7,041.57	1,377.42	4,586.47	Straight Line Proj @ 11700' MD, 7041.57' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Loeffler K1-69-1HN_Rev A0_BHL Tgt	73.38	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
306.00	623.00	Surface Gyros	Flexi-Shot
698.00	7,531.00	MWD Surveys - Vert/Build	MWD
7,617.00	11,634.00	MWD Surveys - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,571.00	7,030.08	Estimated: 7" Casing @ 7571' MD, 7030.08' TVD	7	8-3/4

## Design Report for Loeffler K1-69-1HN - Final Surveys

**Wellbore Targets**

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Loeffler K1-69-1HN_Si	0.00	0.00	0.00	0.00	0.00	1,369,045.75	3,213,523.97	40° 20' 38.040 N	104° 44' 2.256 W
- actual wellpath hits target center									
- Polygon									
Point 1				0.00	1,185.00	228.00	1,370,230.70	3,213,751.96	
Point 2				0.00	1,220.00	2,528.00	1,370,265.70	3,216,051.86	
Point 3				0.00	1,246.00	4,663.00	1,370,291.70	3,218,186.77	
Point 4				0.00	-833.00	4,668.00	1,368,212.79	3,218,191.77	
Point 5				0.00	-2,978.00	4,725.00	1,366,067.88	3,218,248.77	
Point 6				0.00	-3,122.00	2,459.00	1,365,923.89	3,215,982.86	
Point 7				0.00	-3,262.00	194.00	1,365,783.89	3,213,717.96	
Point 8				0.00	-1,019.00	176.00	1,368,026.80	3,213,699.96	
Point 9				0.00	1,185.00	228.00	1,370,230.70	3,213,751.96	
Loeffler K1-69-1HN_Si	0.00	0.00	0.00	0.00	0.00	1,369,045.75	3,213,523.97	40° 20' 38.040 N	104° 44' 2.256 W
- actual wellpath hits target center									
- Polygon									
Point 1				0.00	1,645.00	-232.00	1,370,690.69	3,213,291.98	
Point 2				0.00	1,680.00	2,528.00	1,370,725.68	3,216,051.86	
Point 3				0.00	1,706.00	5,123.00	1,370,751.68	3,218,646.75	
Point 4				0.00	-833.00	5,128.00	1,368,212.79	3,218,651.75	
Point 5				0.00	-3,438.00	5,185.00	1,365,607.90	3,218,708.75	
Point 6				0.00	-3,582.00	2,459.00	1,365,463.90	3,215,982.86	
Point 7				0.00	-3,722.00	-266.00	1,365,323.91	3,213,257.98	
Point 8				0.00	-1,019.00	-284.00	1,368,026.80	3,213,239.98	
Point 9				0.00	1,645.00	-232.00	1,370,690.69	3,213,291.98	
Loeffler K1-69-1HN_Ri	0.00	0.00	7,027.19	1,320.00	400.00	1,370,365.70	3,213,923.95	40° 20' 51.049 N	104° 43' 56.943 W
- actual wellpath misses target center by 18.45usft at 7508.64usft MD (7018.68 TVD, 1336.32 N, 401.31 E)									
- Point									
Loeffler K1-69-1HN_Ri	0.00	0.00	7,037.00	1,369.86	4,590.29	1,370,415.55	3,218,114.07	40° 20' 51.180 N	104° 43' 2.820 W
- actual wellpath misses target center by 9.63usft at 11700.00usft MD (7041.57 TVD, 1377.42 N, 4586.47 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	2.27 °/100usft	Maximum Dogleg over Survey:	15.93 °/100usft at 6,904.00 usft
Net Tortousity applicable to Plans:	1.23 °/100usft	Directional Difficulty Index:	6.418

**Audit Info**

**North Reference Sheet for Sec. 1-T4N-R66W (Loeffler 1 PAD) - Loeffler K1-69-1HN**

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

Vertical Depths are relative to KB=16' @ 4682.00usft (Precision 829). Northing and Easting are relative to Loeffler K1-69-1HN - 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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99995816

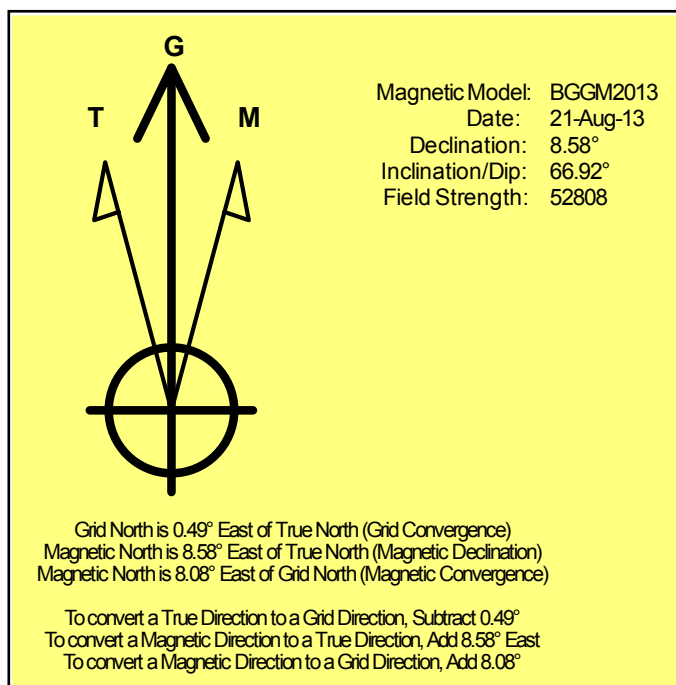
Grid Coordinates of Well: 1,369,045.75 usft N, 3,213,523.97 usft E

Geographical Coordinates of Well: 40° 20' 38.04" N, 104° 44' 02.26" W

Grid Convergence at Surface is: 0.49°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,700.00usft  
the Bottom Hole Displacement is 4,788.84usft in the Direction of 73.28° (Grid).

Magnetic Convergence at surface is: -8.08° (21 August 2013, , BGGM2013)





# Noble Energy

Weld County, CO (NAD 83)

Sec. 1-T4N-R66W (Loeffler 1 PAD)

Loeffler K1-69-1HN - A1

Design: Final Surveys

## Sperry Drilling Services

### Geodetic Report

30 October, 2013

Well Coordinates: 1,369,045.75 N, 3,213,523.97 E (40° 20' 38.04" N, 104° 44' 02.26" W)

Ground Level: 4,666.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

Centered on Well Loeffler K1-69-1HN - Slot A1

KB=16' @ 4682.00usft (Precision 829)

N

Grid

API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40° 20' 38.040 N	104° 44' 2.256 W	1,369,045.75	3,213,523.97
306.00	0.20	331.68	306.00	0.47	-0.25	40° 20' 38.045 N	104° 44' 2.259 W	1,369,046.22	3,213,523.71
623.00	0.00	291.28	623.00	0.96	-0.52	40° 20' 38.049 N	104° 44' 2.263 W	1,369,046.71	3,213,523.45
698.00	0.51	214.20	698.00	0.68	-0.70	40° 20' 38.047 N	104° 44' 2.265 W	1,369,046.44	3,213,523.27
787.00	0.80	167.40	786.99	-0.25	-0.79	40° 20' 38.038 N	104° 44' 2.266 W	1,369,045.50	3,213,523.18
877.00	0.63	265.66	876.99	-0.90	-1.14	40° 20' 38.031 N	104° 44' 2.271 W	1,369,044.85	3,213,522.83
966.00	0.38	219.55	965.98	-1.17	-1.82	40° 20' 38.029 N	104° 44' 2.280 W	1,369,044.59	3,213,522.15
1,056.00	0.77	301.77	1,055.98	-1.08	-2.52	40° 20' 38.030 N	104° 44' 2.289 W	1,369,044.68	3,213,521.45
1,135.00	0.99	307.48	1,134.97	-0.38	-3.51	40° 20' 38.036 N	104° 44' 2.301 W	1,369,045.37	3,213,520.45
1,229.00	3.78	347.50	1,228.89	3.13	-4.83	40° 20' 38.071 N	104° 44' 2.318 W	1,369,048.89	3,213,519.14
1,323.00	5.15	354.87	1,322.60	10.36	-5.87	40° 20' 38.143 N	104° 44' 2.331 W	1,369,056.11	3,213,518.09
1,418.00	7.45	356.32	1,417.02	20.75	-6.65	40° 20' 38.246 N	104° 44' 2.340 W	1,369,066.50	3,213,517.32
1,512.00	9.52	357.45	1,509.99	34.60	-7.39	40° 20' 38.382 N	104° 44' 2.348 W	1,369,080.35	3,213,516.58
1,606.00	10.34	351.94	1,602.58	50.71	-8.92	40° 20' 38.542 N	104° 44' 2.366 W	1,369,096.46	3,213,515.05
1,700.00	10.83	350.17	1,694.98	67.76	-11.61	40° 20' 38.710 N	104° 44' 2.398 W	1,369,113.51	3,213,512.36
1,794.00	12.20	351.80	1,787.09	86.28	-14.53	40° 20' 38.894 N	104° 44' 2.434 W	1,369,132.04	3,213,509.44
1,889.00	11.14	348.85	1,880.13	105.22	-17.73	40° 20' 39.081 N	104° 44' 2.473 W	1,369,150.97	3,213,506.23
1,983.00	12.73	348.76	1,972.09	124.29	-21.51	40° 20' 39.270 N	104° 44' 2.520 W	1,369,170.03	3,213,502.46
2,077.00	13.28	356.75	2,063.69	145.23	-24.14	40° 20' 39.477 N	104° 44' 2.552 W	1,369,190.98	3,213,499.83
2,171.00	12.79	355.93	2,155.26	166.39	-25.49	40° 20' 39.686 N	104° 44' 2.567 W	1,369,212.14	3,213,498.48
2,265.00	12.20	354.27	2,247.04	186.65	-27.22	40° 20' 39.887 N	104° 44' 2.587 W	1,369,232.40	3,213,496.75
2,359.00	10.60	350.23	2,339.18	205.06	-29.68	40° 20' 40.069 N	104° 44' 2.616 W	1,369,250.80	3,213,494.29
2,451.00	12.68	354.87	2,429.29	223.45	-32.02	40° 20' 40.251 N	104° 44' 2.645 W	1,369,269.20	3,213,491.95
2,513.00	12.44	354.38	2,489.80	236.87	-33.28	40° 20' 40.383 N	104° 44' 2.659 W	1,369,282.62	3,213,490.69
2,602.00	12.47	355.22	2,576.71	255.99	-35.02	40° 20' 40.572 N	104° 44' 2.680 W	1,369,301.73	3,213,488.95
2,692.00	13.95	355.66	2,664.32	276.49	-36.65	40° 20' 40.775 N	104° 44' 2.698 W	1,369,322.23	3,213,487.32
2,781.00	12.38	351.43	2,750.99	296.62	-38.88	40° 20' 40.974 N	104° 44' 2.725 W	1,369,342.36	3,213,485.09
2,871.00	10.48	348.83	2,839.20	314.19	-41.91	40° 20' 41.148 N	104° 44' 2.762 W	1,369,359.94	3,213,482.06
2,961.00	10.11	348.19	2,927.75	329.96	-45.11	40° 20' 41.304 N	104° 44' 2.802 W	1,369,375.70	3,213,478.86
3,050.00	9.57	345.83	3,015.44	344.78	-48.52	40° 20' 41.451 N	104° 44' 2.844 W	1,369,390.52	3,213,475.45
3,140.00	11.49	345.02	3,103.92	360.69	-52.67	40° 20' 41.609 N	104° 44' 2.896 W	1,369,406.43	3,213,471.30
3,230.00	10.64	338.45	3,192.25	377.08	-58.04	40° 20' 41.771 N	104° 44' 2.963 W	1,369,422.82	3,213,465.93
3,319.00	9.50	345.70	3,279.88	391.85	-62.87	40° 20' 41.917 N	104° 44' 3.024 W	1,369,437.58	3,213,461.10
3,409.00	9.92	346.26	3,368.59	406.57	-66.55	40° 20' 42.063 N	104° 44' 3.070 W	1,369,452.31	3,213,457.42
3,498.00	11.37	348.41	3,456.06	422.61	-70.13	40° 20' 42.222 N	104° 44' 3.115 W	1,369,468.35	3,213,453.84
3,588.00	9.26	343.12	3,544.60	438.23	-74.02	40° 20' 42.377 N	104° 44' 3.163 W	1,369,483.97	3,213,449.95
3,678.00	10.77	343.55	3,633.22	453.23	-78.50	40° 20' 42.525 N	104° 44' 3.219 W	1,369,498.96	3,213,445.47
3,767.00	11.93	352.11	3,720.49	470.32	-82.12	40° 20' 42.694 N	104° 44' 3.264 W	1,369,516.05	3,213,441.85
3,857.00	12.90	352.21	3,808.38	489.49	-84.76	40° 20' 42.884 N	104° 44' 3.296 W	1,369,535.22	3,213,439.21
3,946.00	13.14	351.61	3,895.09	509.34	-87.58	40° 20' 43.080 N	104° 44' 3.330 W	1,369,555.07	3,213,436.39
4,036.00	10.83	353.94	3,983.13	527.87	-89.96	40° 20' 43.264 N	104° 44' 3.359 W	1,369,573.60	3,213,434.01
4,126.00	9.72	350.01	4,071.68	543.77	-92.18	40° 20' 43.421 N	104° 44' 3.386 W	1,369,589.50	3,213,431.80

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
4,215.00	11.51	349.73	4,159.15	559.91	-95.06	40° 20' 43.581 N	104° 44' 3.421 W	1,369,605.64	3,213,428.91
4,305.00	10.82	347.97	4,247.45	577.01	-98.43	40° 20' 43.750 N	104° 44' 3.463 W	1,369,622.74	3,213,425.55
4,394.00	11.80	350.76	4,334.72	594.16	-101.63	40° 20' 43.920 N	104° 44' 3.502 W	1,369,639.89	3,213,422.34
4,484.00	10.94	349.21	4,422.96	611.63	-104.71	40° 20' 44.093 N	104° 44' 3.540 W	1,369,657.36	3,213,419.27
4,573.00	10.75	347.84	4,510.37	628.04	-108.03	40° 20' 44.255 N	104° 44' 3.581 W	1,369,673.77	3,213,415.94
4,663.00	10.71	353.85	4,598.80	644.56	-110.70	40° 20' 44.419 N	104° 44' 3.614 W	1,369,690.28	3,213,413.28
4,753.00	9.42	355.14	4,687.41	660.21	-112.22	40° 20' 44.573 N	104° 44' 3.632 W	1,369,705.94	3,213,411.76
4,842.00	9.93	350.06	4,775.15	675.02	-114.16	40° 20' 44.720 N	104° 44' 3.655 W	1,369,720.75	3,213,409.81
4,932.00	11.62	350.36	4,863.56	691.60	-117.02	40° 20' 44.884 N	104° 44' 3.690 W	1,369,737.33	3,213,406.96
5,022.00	11.53	350.60	4,951.73	709.41	-120.00	40° 20' 45.060 N	104° 44' 3.727 W	1,369,755.14	3,213,403.97
5,111.00	10.16	349.29	5,039.13	725.90	-122.91	40° 20' 45.223 N	104° 44' 3.762 W	1,369,771.62	3,213,401.06
5,201.00	11.03	350.38	5,127.60	742.18	-125.83	40° 20' 45.384 N	104° 44' 3.798 W	1,369,787.91	3,213,398.15
5,291.00	9.65	348.23	5,216.14	758.06	-128.80	40° 20' 45.542 N	104° 44' 3.835 W	1,369,803.78	3,213,395.17
5,380.00	10.54	354.53	5,303.76	773.46	-131.10	40° 20' 45.694 N	104° 44' 3.863 W	1,369,819.18	3,213,392.87
5,470.00	9.17	353.60	5,392.43	788.78	-132.69	40° 20' 45.845 N	104° 44' 3.882 W	1,369,834.50	3,213,391.29
5,560.00	10.22	348.31	5,481.15	803.72	-135.11	40° 20' 45.993 N	104° 44' 3.911 W	1,369,849.45	3,213,388.87
5,649.00	11.13	344.05	5,568.61	819.71	-139.07	40° 20' 46.152 N	104° 44' 3.961 W	1,369,865.43	3,213,384.91
5,739.00	11.57	345.91	5,656.85	836.81	-143.65	40° 20' 46.321 N	104° 44' 4.018 W	1,369,882.53	3,213,380.33
5,829.00	11.29	355.55	5,745.07	854.35	-146.53	40° 20' 46.495 N	104° 44' 4.053 W	1,369,900.06	3,213,377.45
5,918.00	9.37	350.81	5,832.63	870.18	-148.36	40° 20' 46.651 N	104° 44' 4.075 W	1,369,915.90	3,213,375.61
6,008.00	10.84	348.88	5,921.23	885.72	-151.16	40° 20' 46.805 N	104° 44' 4.109 W	1,369,931.44	3,213,372.81
6,097.00	11.61	358.92	6,008.54	902.89	-152.95	40° 20' 46.975 N	104° 44' 4.131 W	1,369,948.60	3,213,371.03
6,187.00	9.46	353.91	6,097.02	919.30	-153.90	40° 20' 47.137 N	104° 44' 4.141 W	1,369,965.01	3,213,370.07
6,277.00	9.98	357.15	6,185.72	934.44	-155.07	40° 20' 47.287 N	104° 44' 4.154 W	1,369,980.16	3,213,368.90
6,322.00	10.30	357.89	6,230.02	942.36	-155.42	40° 20' 47.365 N	104° 44' 4.158 W	1,369,988.07	3,213,368.56
6,366.00	14.31	1.50	6,273.00	951.73	-155.42	40° 20' 47.458 N	104° 44' 4.157 W	1,369,997.44	3,213,368.56
6,411.00	19.89	2.40	6,316.00	964.95	-154.95	40° 20' 47.588 N	104° 44' 4.149 W	1,370,010.66	3,213,369.02
6,456.00	23.62	1.06	6,357.78	981.61	-154.46	40° 20' 47.753 N	104° 44' 4.141 W	1,370,027.33	3,213,369.51
6,501.00	25.23	358.75	6,398.75	1,000.22	-154.51	40° 20' 47.937 N	104° 44' 4.140 W	1,370,045.93	3,213,369.47
6,545.00	28.37	355.17	6,438.03	1,020.02	-155.59	40° 20' 48.132 N	104° 44' 4.152 W	1,370,065.73	3,213,368.38
6,590.00	32.70	356.68	6,476.78	1,042.81	-157.20	40° 20' 48.358 N	104° 44' 4.170 W	1,370,088.53	3,213,366.78
6,635.00	36.33	358.67	6,513.85	1,068.29	-158.21	40° 20' 48.610 N	104° 44' 4.180 W	1,370,114.00	3,213,365.77
6,680.00	37.97	5.06	6,549.73	1,095.41	-157.30	40° 20' 48.878 N	104° 44' 4.165 W	1,370,141.12	3,213,366.68
6,725.00	38.05	11.27	6,585.20	1,122.81	-153.36	40° 20' 49.148 N	104° 44' 4.111 W	1,370,168.52	3,213,370.61
6,769.00	40.45	21.53	6,619.31	1,149.42	-145.47	40° 20' 49.410 N	104° 44' 4.006 W	1,370,195.13	3,213,378.51
6,814.00	43.47	29.32	6,652.79	1,176.52	-132.52	40° 20' 49.677 N	104° 44' 3.836 W	1,370,222.23	3,213,391.46
6,859.00	43.82	37.72	6,685.38	1,202.36	-115.39	40° 20' 49.931 N	104° 44' 3.612 W	1,370,248.07	3,213,408.58
6,904.00	45.46	47.66	6,717.44	1,225.52	-93.98	40° 20' 50.158 N	104° 44' 3.333 W	1,370,271.22	3,213,429.99
6,948.00	47.31	56.90	6,747.83	1,244.93	-68.81	40° 20' 50.347 N	104° 44' 3.006 W	1,370,290.63	3,213,455.16
6,993.00	48.56	64.71	6,778.00	1,261.18	-39.68	40° 20' 50.506 N	104° 44' 2.628 W	1,370,306.88	3,213,484.29
7,038.00	51.86	67.72	6,806.80	1,275.10	-8.04	40° 20' 50.640 N	104° 44' 2.218 W	1,370,320.80	3,213,515.93
7,083.00	53.94	70.00	6,833.94	1,288.04	25.43	40° 20' 50.765 N	104° 44' 1.784 W	1,370,333.74	3,213,549.40

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,128.00	56.07	74.46	6,859.75	1,299.27	60.53	40° 20' 50.873 N	104° 44' 1.329 W	1,370,344.97	3,213,584.49
7,173.00	57.50	80.59	6,884.42	1,307.38	97.26	40° 20' 50.950 N	104° 44' 0.854 W	1,370,353.08	3,213,621.23
7,217.00	59.36	82.15	6,907.46	1,313.00	134.32	40° 20' 51.003 N	104° 44' 0.375 W	1,370,358.69	3,213,658.29
7,262.00	61.01	83.43	6,929.83	1,317.89	173.06	40° 20' 51.048 N	104° 43' 59.874 W	1,370,363.59	3,213,697.02
7,307.00	62.57	83.89	6,951.10	1,322.27	212.47	40° 20' 51.088 N	104° 43' 59.364 W	1,370,367.97	3,213,736.43
7,352.00	66.64	84.83	6,970.40	1,326.26	252.91	40° 20' 51.124 N	104° 43' 58.842 W	1,370,371.96	3,213,776.87
7,397.00	69.60	85.05	6,987.16	1,329.94	294.51	40° 20' 51.156 N	104° 43' 58.304 W	1,370,375.64	3,213,818.46
7,442.00	72.86	86.27	7,001.64	1,333.16	336.98	40° 20' 51.185 N	104° 43' 57.755 W	1,370,378.86	3,213,860.94
7,487.00	75.95	87.51	7,013.74	1,335.51	380.26	40° 20' 51.204 N	104° 43' 57.196 W	1,370,381.21	3,213,904.21
7,531.00	79.39	88.59	7,023.13	1,336.97	423.21	40° 20' 51.215 N	104° 43' 56.641 W	1,370,382.66	3,213,947.16
7,571.00	80.61	88.54	7,030.08	1,337.95	462.59	40° 20' 51.221 N	104° 43' 56.132 W	1,370,383.65	3,213,986.54
7,617.00	82.02	88.49	7,037.02	1,339.13	508.05	40° 20' 51.229 N	104° 43' 55.545 W	1,370,384.83	3,214,031.99
7,707.00	82.24	88.28	7,049.35	1,341.64	597.16	40° 20' 51.246 N	104° 43' 54.394 W	1,370,387.34	3,214,121.11
7,796.00	83.82	88.02	7,060.15	1,344.49	685.46	40° 20' 51.267 N	104° 43' 53.253 W	1,370,390.19	3,214,209.39
7,886.00	85.58	89.74	7,068.46	1,346.24	775.05	40° 20' 51.276 N	104° 43' 52.096 W	1,370,391.94	3,214,298.98
7,976.00	87.60	91.00	7,073.81	1,345.66	864.88	40° 20' 51.263 N	104° 43' 50.936 W	1,370,391.36	3,214,388.81
8,110.00	90.89	90.67	7,075.57	1,343.71	998.83	40° 20' 51.232 N	104° 43' 49.206 W	1,370,389.41	3,214,522.76
8,200.00	93.58	89.87	7,072.06	1,343.28	1,088.76	40° 20' 51.220 N	104° 43' 48.045 W	1,370,388.98	3,214,612.68
8,289.00	92.96	90.55	7,066.99	1,342.96	1,177.61	40° 20' 51.209 N	104° 43' 46.897 W	1,370,388.66	3,214,701.53
8,379.00	92.00	89.97	7,063.09	1,342.55	1,267.52	40° 20' 51.198 N	104° 43' 45.736 W	1,370,388.25	3,214,791.44
8,469.00	92.34	89.69	7,059.68	1,342.82	1,357.46	40° 20' 51.193 N	104° 43' 44.575 W	1,370,388.52	3,214,881.37
8,558.00	92.56	89.18	7,055.87	1,343.71	1,446.37	40° 20' 51.194 N	104° 43' 43.426 W	1,370,389.40	3,214,970.28
8,648.00	93.24	87.67	7,051.32	1,346.18	1,536.22	40° 20' 51.210 N	104° 43' 42.266 W	1,370,391.87	3,215,060.12
8,737.00	91.63	88.53	7,047.53	1,349.12	1,625.09	40° 20' 51.232 N	104° 43' 41.118 W	1,370,394.82	3,215,148.99
8,827.00	90.62	88.85	7,045.77	1,351.17	1,715.04	40° 20' 51.244 N	104° 43' 39.956 W	1,370,396.87	3,215,238.94
8,917.00	90.83	91.34	7,044.63	1,351.02	1,805.03	40° 20' 51.235 N	104° 43' 38.793 W	1,370,396.72	3,215,328.92
9,006.00	91.73	90.32	7,042.65	1,349.73	1,894.00	40° 20' 51.215 N	104° 43' 37.645 W	1,370,395.43	3,215,417.88
9,096.00	90.80	89.90	7,040.66	1,349.56	1,983.97	40° 20' 51.205 N	104° 43' 36.483 W	1,370,395.26	3,215,507.86
9,186.00	88.64	89.86	7,041.10	1,349.74	2,073.97	40° 20' 51.199 N	104° 43' 35.320 W	1,370,395.44	3,215,597.85
9,275.00	88.49	89.51	7,043.32	1,350.23	2,162.94	40° 20' 51.197 N	104° 43' 34.171 W	1,370,395.93	3,215,686.81
9,365.00	90.15	89.44	7,044.39	1,351.05	2,252.92	40° 20' 51.197 N	104° 43' 33.009 W	1,370,396.75	3,215,776.80
9,454.00	90.15	88.86	7,044.15	1,352.37	2,341.91	40° 20' 51.202 N	104° 43' 31.860 W	1,370,398.06	3,215,865.78
9,544.00	91.57	89.82	7,042.79	1,353.40	2,431.89	40° 20' 51.205 N	104° 43' 30.697 W	1,370,399.10	3,215,955.76
9,634.00	90.89	91.03	7,040.86	1,352.74	2,521.87	40° 20' 51.190 N	104° 43' 29.535 W	1,370,398.44	3,216,045.73
9,723.00	91.57	90.82	7,038.94	1,351.30	2,610.84	40° 20' 51.168 N	104° 43' 28.387 W	1,370,397.00	3,216,134.69
9,813.00	92.99	89.21	7,035.36	1,351.28	2,700.76	40° 20' 51.160 N	104° 43' 27.225 W	1,370,396.98	3,216,224.61
9,902.00	92.84	89.53	7,030.84	1,352.26	2,789.64	40° 20' 51.162 N	104° 43' 26.077 W	1,370,397.96	3,216,313.49
9,992.00	90.56	90.01	7,028.17	1,352.62	2,879.59	40° 20' 51.158 N	104° 43' 24.915 W	1,370,398.32	3,216,403.44
10,082.00	90.77	90.79	7,027.13	1,351.99	2,969.58	40° 20' 51.144 N	104° 43' 23.753 W	1,370,397.69	3,216,493.43
10,171.00	88.95	92.20	7,027.34	1,349.67	3,058.55	40° 20' 51.114 N	104° 43' 22.605 W	1,370,395.37	3,216,582.39
10,261.00	88.95	92.20	7,028.99	1,346.21	3,148.47	40° 20' 51.072 N	104° 43' 21.444 W	1,370,391.91	3,216,672.30
10,350.00	91.11	92.51	7,028.94	1,342.55	3,237.38	40° 20' 51.028 N	104° 43' 20.296 W	1,370,388.25	3,216,761.22

## Design Report for Loeffler K1-69-1HN - Final Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
10,440.00	89.72	88.54	7,028.29	1,341.73	3,327.36	40° 20' 51.012 N	104° 43' 19.134 W	1,370,387.43	3,216,851.19
10,530.00	89.38	87.93	7,028.99	1,344.50	3,417.31	40° 20' 51.031 N	104° 43' 17.972 W	1,370,390.20	3,216,941.14
10,619.00	91.05	86.94	7,028.66	1,348.48	3,506.22	40° 20' 51.063 N	104° 43' 16.823 W	1,370,394.18	3,217,030.04
10,709.00	90.55	88.68	7,027.40	1,351.92	3,596.14	40° 20' 51.089 N	104° 43' 15.661 W	1,370,397.62	3,217,119.96
10,798.00	88.70	86.70	7,027.97	1,355.51	3,685.06	40° 20' 51.117 N	104° 43' 14.513 W	1,370,401.21	3,217,208.87
10,888.00	89.11	88.00	7,029.69	1,359.67	3,774.94	40° 20' 51.150 N	104° 43' 13.351 W	1,370,405.37	3,217,298.75
10,978.00	89.57	89.48	7,030.73	1,361.65	3,864.91	40° 20' 51.162 N	104° 43' 12.189 W	1,370,407.34	3,217,388.72
11,067.00	88.43	89.28	7,032.29	1,362.60	3,953.89	40° 20' 51.164 N	104° 43' 11.040 W	1,370,408.30	3,217,477.69
11,157.00	88.83	88.72	7,034.44	1,364.17	4,043.85	40° 20' 51.171 N	104° 43' 9.878 W	1,370,409.87	3,217,567.65
11,246.00	89.75	87.80	7,035.54	1,366.87	4,132.80	40° 20' 51.190 N	104° 43' 8.729 W	1,370,412.57	3,217,656.60
11,335.00	89.72	87.13	7,035.95	1,370.80	4,221.71	40° 20' 51.221 N	104° 43' 7.580 W	1,370,416.50	3,217,745.50
11,425.00	89.51	86.75	7,036.56	1,375.61	4,311.58	40° 20' 51.261 N	104° 43' 6.419 W	1,370,421.31	3,217,835.37
11,515.00	88.55	89.43	7,038.08	1,378.61	4,401.51	40° 20' 51.283 N	104° 43' 5.257 W	1,370,424.31	3,217,925.29
11,604.00	88.86	90.93	7,040.09	1,378.33	4,490.49	40° 20' 51.272 N	104° 43' 4.108 W	1,370,424.03	3,218,014.27
11,634.00	89.17	90.47	7,040.61	1,377.97	4,520.48	40° 20' 51.266 N	104° 43' 3.721 W	1,370,423.66	3,218,044.26
11,700.00	89.17	90.47	7,041.57	1,377.42	4,586.47	40° 20' 51.255 N	104° 43' 2.869 W	1,370,423.12	3,218,110.24

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
623.00	623.00	0.96	-0.52	Tie-On to Surface Gyros @ 623.00ft
698.00	698.00	0.68	-0.70	First MWD Survey @ 698.00ft
11,634.00	7,040.61	1,377.97	4,520.48	Final MWD Survey @ 11634.00ft
11,700.00	7,041.57	1,377.42	4,586.47	Straight Line Proj @ 11700' MD, 7041.57' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Loeffler K1-69-1HN_Rev A0_BHL Tgt	73.38	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
306.00	623.00	Surface Gyros	Flexi-Shot
698.00	7,531.00	MWD Surveys - Vert/Build	MWD

## Design Report for Loeffler K1-69-1HN - Final Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
7,617.00	11,634.00	MWD Surveys - Lateral	MWD

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,571.00	7,030.08	Estimated: 7" Casing @ 7571' MD, 7030.08' TVD	7	8-3/4

Design Targets

Shape	Target Name	TVD (')	Northing (')	Easting (')	+N/-S	+E/-W	Created	Updated
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Directional Difficulty Index

Average Dogleg over Survey:	2.27 °/100usft	Maximum Dogleg over Survey:	15.93 °/100usft at 6,904.00 usft
Net Tortosity applicable to Plans:	1.23 °/100usft	Directional Difficulty Index:	6.418

Audit Info

**North Reference Sheet for Sec. 1-T4N-R66W (Loeffler 1 PAD) - Loeffler K1-69-1HN**

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

Vertical Depths are relative to KB=16' @ 4682.00usft (Precision 829). Northing and Easting are relative to Loeffler K1-69-1HN - 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° 30' 0.000 W°, Longitude Origin:0° 0' 0.000 E°, Latitude Origin:40° 47' 0.000 N°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99995816

Grid Coordinates of Well: 1,369,045.75 usft N, 3,213,523.97 usft E

Geographical Coordinates of Well: 40° 20' 38.04" N, 104° 44' 02.26" W

Grid Convergence at Surface is: 0.49°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,700.00usft

the Bottom Hole Displacement is 4,788.84usft in the Direction of 73.28° (Grid).

Magnetic Convergence at surface is: -8.08° (21 August 2013, , BGGM2013)

