

Noble Energy Inc.- Weld County, CO (Grid North)

Well Name: **Loeffler K1-66-1HN**

Surface Location: Loeffler K1-66-1HN Pad Sec.1-T4N-R66W
North American Datum 1983, US State Plane 1983, Colorado Northern Zone

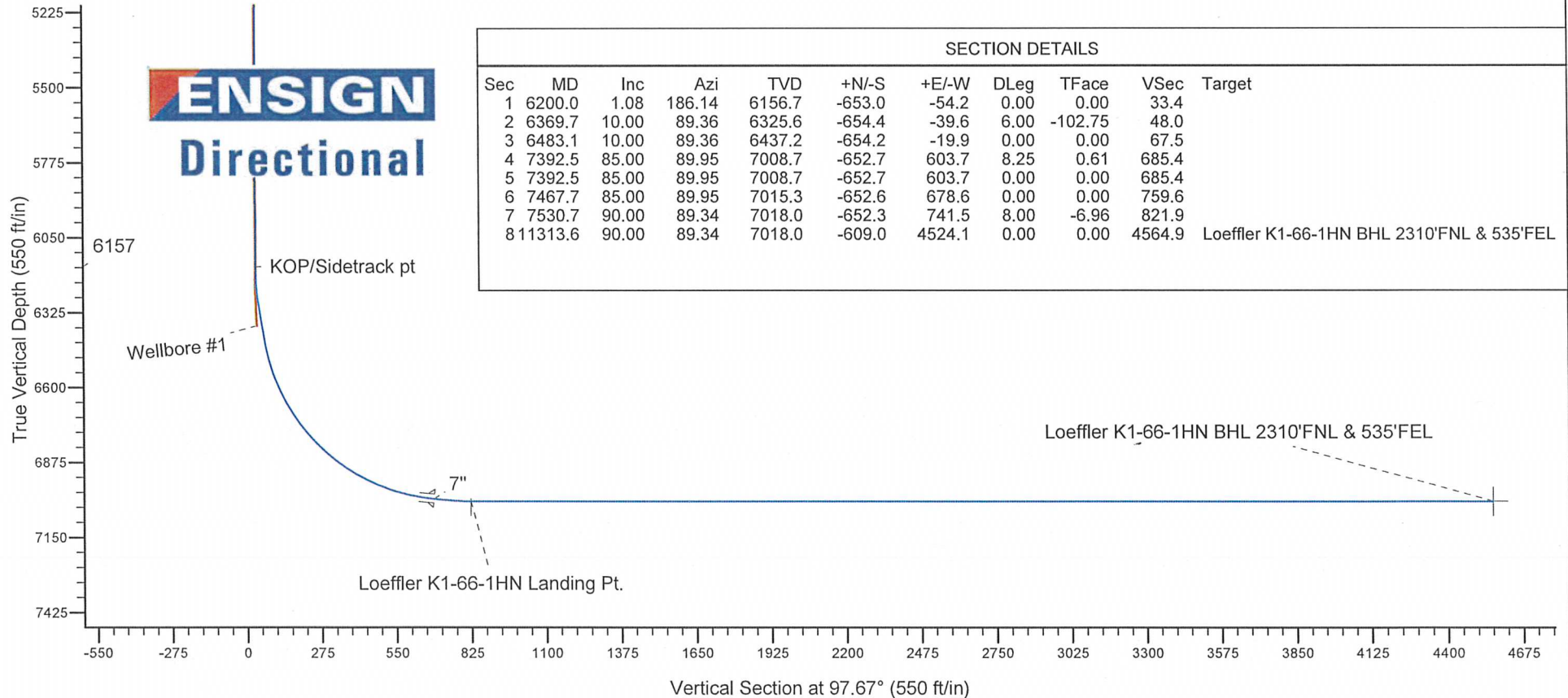
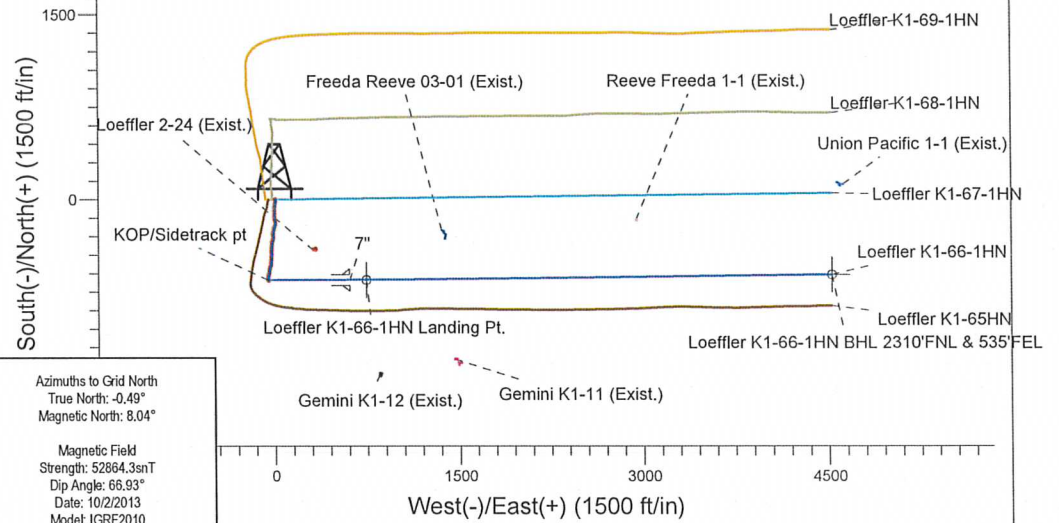
Ground Elevation: 4666.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1369046.34	3213593.65	40.343900	-104.733710	
Precision 829 RKB - 16' WELL @ 4682.0ft (Precision 829 RKB - 16')						

WELLBORE TARGET DETAILS (LAT/LONG)

Name	TVD	+N/-S	+E/-W	Latitude	Longitude
Loeffler K1-66-1HN BHL 2310'FNL & 535'FEL	7018.0	-609.0	4524.1	40.342120	-104.717500
Loeffler K1-66-1HN Landing Pt.	7018.0	-651.2	740.9	40.342095	-104.731072

Loeffler K1-66-1HN Pad Sec.1-T4N-R66W
Loeffler K1-66-1HN
Plan b Sidetrack (10-23-13)
21:55, October 23 2013





Directional

Noble Energy Inc.- Weld County, CO (Grid North)

Sec.1-T4N-R66W

Loeffler K1-66-1HN Pad Sec.1-T4N-R66W

Loeffler K1-66-1HN

Wellbore #1

Plan: Plan b Sidetrack (10-23-13)

Standard Planning Report

23 October, 2013

Database:	Landmark	Local Co-ordinate Reference:	Well Loeffler K1-66-1HN
Company:	Noble Energy Inc.- Weld County, CO (Grid North)	TVD Reference:	WELL @ 4682.0ft (Precision 829 RKB - 16')
Project:	Sec.1-T4N-R66W	MD Reference:	WELL @ 4682.0ft (Precision 829 RKB - 16')
Site:	Loeffler K1-66-1HN Pad Sec.1-T4N-R66W	North Reference:	Grid
Well:	Loeffler K1-66-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan b Sidetrack (10-23-13)		

Project	Sec.1-T4N-R66W, Weld County, CO
Map System:	US State Plane 1983
Geo Datum:	North American Datum 1983
Map Zone:	Colorado Northern Zone
System Datum:	Mean Sea Level Using Well Reference Point Using geodetic scale factor

Well	Loeffler K1-66-1HN
Well Position	+N/-S 0.0 ft Northing: 1,369,046.34 ft Latitude: 40.343900
	+E/-W 0.0 ft Easting: 3,213,593.65 ft Longitude: -104.733710
Position Uncertainty	0.0 ft Wellhead Elevation: ft Ground Level: 4,666.0 ft

Wellbore	Wellbore #1
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	10/2/2013	8.53	66.93	52,864

Design	Plan b Sidetrack (10-23-13)
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Audit Notes:					
Version:	Phase:	PROTOTYPE		Tie On Depth:	6,200.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	0.0	0.0	0.0	97.67	

Plan Sections	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
	6,200.0	1.08	186.14	6,156.7	-653.0	-54.2	0.00	0.00	0.00	0.00	
	6,369.7	10.00	89.36	6,325.6	-654.4	-39.6	6.00	5.26	-57.03	-102.75	
	6,483.1	10.00	89.36	6,437.2	-654.2	-19.9	0.00	0.00	0.00	0.00	
	7,392.5	85.00	89.95	7,008.7	-652.7	603.7	8.25	8.25	0.07	0.61	
	7,392.5	85.00	89.95	7,008.7	-652.7	603.7	0.00	0.00	0.00	0.00	
	7,467.7	85.00	89.95	7,015.3	-652.6	678.6	0.00	0.00	0.00	0.00	
	7,530.7	90.00	89.34	7,018.0	-652.3	741.5	8.00	7.94	-0.97	-6.96	
	11,313.6	90.00	89.34	7,018.0	-609.0	4,524.1	0.00	0.00	0.00	0.00	Loeffler K1-66-1HN

Database:
Company:

Landmark
Noble Energy Inc.- Weld County, CO (Grid North)
Sec.1-T4N-R66W
Loeffler K1-66-1HN Pad Sec.1-T4N-R66W
Loeffler K1-66-1HN
Wellbore #1
Plan b Sidetrack (10-23-13)

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:

Well Loeffler K1-66-1HN
WELL @ 4682.0ft (Precision 829 RKB - 16')
WELL @ 4682.0ft (Precision 829 RKB - 16')
Grid
Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
KOP									
6,200.0	1.08	186.14	6,156.7	-653.0	-54.2	33.4	0.00	0.00	0.00
6,250.0	2.96	104.19	6,206.7	-653.7	-53.0	34.7	6.00	3.76	-163.91
6,300.0	5.86	93.69	6,256.5	-654.2	-49.2	38.5	6.00	5.80	-21.01
6,350.0	8.82	90.17	6,306.1	-654.4	-42.9	44.8	6.00	5.94	-7.02
6,369.7	10.00	89.36	6,325.6	-654.4	-39.6	48.0	6.00	5.96	-4.13
6,400.0	10.00	89.36	6,355.4	-654.3	-34.4	53.2	0.00	0.00	0.00
6,450.0	10.00	89.36	6,404.6	-654.2	-25.7	61.8	0.00	0.00	0.00
6,483.1	10.00	89.36	6,437.2	-654.2	-19.9	67.5	0.00	0.00	0.00
6,500.0	11.39	89.44	6,453.8	-654.1	-16.8	70.6	8.25	8.25	0.45
6,550.0	15.52	89.58	6,502.4	-654.0	-5.2	82.1	8.25	8.25	0.29
6,600.0	19.64	89.67	6,550.1	-653.9	9.9	97.1	8.25	8.25	0.17
6,650.0	23.76	89.72	6,596.5	-653.8	28.4	115.4	8.25	8.25	0.11
6,700.0	27.89	89.76	6,641.5	-653.7	50.2	136.9	8.25	8.25	0.08
6,750.0	32.01	89.79	6,684.9	-653.6	75.1	161.7	8.25	8.25	0.06
6,800.0	36.13	89.82	6,726.3	-653.5	103.1	189.4	8.25	8.25	0.05
6,850.0	40.26	89.84	6,765.6	-653.5	134.1	220.0	8.25	8.25	0.04
6,900.0	44.38	89.85	6,802.5	-653.4	167.7	253.4	8.25	8.25	0.03
6,950.0	48.50	89.87	6,837.0	-653.3	203.9	289.3	8.25	8.25	0.03
7,000.0	52.63	89.88	6,868.7	-653.2	242.5	327.5	8.25	8.25	0.03
7,050.0	56.75	89.89	6,897.6	-653.1	283.3	367.9	8.25	8.25	0.02
7,100.0	60.87	89.90	6,923.5	-653.0	326.1	410.3	8.25	8.25	0.02
7,150.0	65.00	89.91	6,946.2	-653.0	370.6	454.4	8.25	8.25	0.02
7,200.0	69.12	89.92	6,965.7	-652.9	416.7	500.0	8.25	8.25	0.02
7,250.0	73.24	89.93	6,981.8	-652.8	464.0	546.9	8.25	8.25	0.02
7,300.0	77.37	89.94	6,994.5	-652.8	512.3	594.8	8.25	8.25	0.02
7,350.0	81.49	89.95	7,003.7	-652.7	561.5	643.5	8.25	8.25	0.02
7,392.5	85.00	89.95	7,008.7	-652.7	603.7	685.4	8.25	8.25	0.02
7,394.0	85.00	89.95	7,008.8	-652.7	605.2	686.8	0.00	0.00	0.00
7"									
7,400.0	85.00	89.95	7,009.4	-652.7	611.1	692.7	0.00	0.00	0.00
7,450.0	85.00	89.95	7,013.7	-652.7	660.9	742.1	0.00	0.00	0.00
7,467.7	85.00	89.95	7,015.3	-652.6	678.6	759.6	0.00	0.00	0.00
7,500.0	87.56	89.64	7,017.3	-652.5	710.8	791.5	8.00	7.94	-0.97
7,530.1	89.95	89.35	7,018.0	-652.3	740.9	821.3	8.00	7.94	-0.97
Loeffler K1-66-1HN Landing Pt.									
7,530.7	90.00	89.34	7,018.0	-652.3	741.5	821.9	8.00	7.94	-0.97
7,550.0	90.00	89.34	7,018.0	-652.0	760.8	841.0	0.00	0.00	0.00
7,600.0	90.00	89.34	7,018.0	-651.5	810.8	890.4	0.00	0.00	0.00
7,650.0	90.00	89.34	7,018.0	-650.9	860.8	939.9	0.00	0.00	0.00
7,700.0	90.00	89.34	7,018.0	-650.3	910.8	989.4	0.00	0.00	0.00
7,750.0	90.00	89.34	7,018.0	-649.7	960.8	1,038.9	0.00	0.00	0.00
7,800.0	90.00	89.34	7,018.0	-649.2	1,010.8	1,088.3	0.00	0.00	0.00
7,850.0	90.00	89.34	7,018.0	-648.6	1,060.8	1,137.8	0.00	0.00	0.00
7,900.0	90.00	89.34	7,018.0	-648.0	1,110.8	1,187.3	0.00	0.00	0.00
7,950.0	90.00	89.34	7,018.0	-647.5	1,160.8	1,236.8	0.00	0.00	0.00
8,000.0	90.00	89.34	7,018.0	-646.9	1,210.8	1,286.2	0.00	0.00	0.00
8,050.0	90.00	89.34	7,018.0	-646.3	1,260.8	1,335.7	0.00	0.00	0.00
8,100.0	90.00	89.34	7,018.0	-645.7	1,310.8	1,385.2	0.00	0.00	0.00
8,150.0	90.00	89.34	7,018.0	-645.2	1,360.8	1,434.7	0.00	0.00	0.00
8,200.0	90.00	89.34	7,018.0	-644.6	1,410.7	1,484.1	0.00	0.00	0.00
8,250.0	90.00	89.34	7,018.0	-644.0	1,460.7	1,533.6	0.00	0.00	0.00
8,300.0	90.00	89.34	7,018.0	-643.5	1,510.7	1,583.1	0.00	0.00	0.00

Database:
Company:

Landmark
Noble Energy Inc.- Weld County, CO (Grid North)
Sec.1-T4N-R66W
Loeffler K1-66-1HN Pad Sec.1-T4N-R66W
Loeffler K1-66-1HN
Wellbore #1
Plan b Sidetrack (10-23-13)

Local Co-ordinate Reference:
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Well Loeffler K1-66-1HN
WELL @ 4682.0ft (Precision 829 RKB - 16')
WELL @ 4682.0ft (Precision 829 RKB - 16')
Grid
Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
8,350.0	90.00	89.34	7,018.0	-642.9	1,560.7	1,632.6	0.00	0.00	0.00
8,400.0	90.00	89.34	7,018.0	-642.3	1,610.7	1,682.0	0.00	0.00	0.00
8,450.0	90.00	89.34	7,018.0	-641.7	1,660.7	1,731.5	0.00	0.00	0.00
8,500.0	90.00	89.34	7,018.0	-641.2	1,710.7	1,781.0	0.00	0.00	0.00
8,550.0	90.00	89.34	7,018.0	-640.6	1,760.7	1,830.4	0.00	0.00	0.00
8,600.0	90.00	89.34	7,018.0	-640.0	1,810.7	1,879.9	0.00	0.00	0.00
8,650.0	90.00	89.34	7,018.0	-639.4	1,860.7	1,929.4	0.00	0.00	0.00
8,700.0	90.00	89.34	7,018.0	-638.9	1,910.7	1,978.9	0.00	0.00	0.00
8,750.0	90.00	89.34	7,018.0	-638.3	1,960.7	2,028.3	0.00	0.00	0.00
8,800.0	90.00	89.34	7,018.0	-637.7	2,010.7	2,077.8	0.00	0.00	0.00
8,850.0	90.00	89.34	7,018.0	-637.2	2,060.7	2,127.3	0.00	0.00	0.00
8,900.0	90.00	89.34	7,018.0	-636.6	2,110.7	2,176.8	0.00	0.00	0.00
8,950.0	90.00	89.34	7,018.0	-636.0	2,160.7	2,226.2	0.00	0.00	0.00
9,000.0	90.00	89.34	7,018.0	-635.4	2,210.7	2,275.7	0.00	0.00	0.00
9,050.0	90.00	89.34	7,018.0	-634.9	2,260.7	2,325.2	0.00	0.00	0.00
9,100.0	90.00	89.34	7,018.0	-634.3	2,310.7	2,374.7	0.00	0.00	0.00
9,150.0	90.00	89.34	7,018.0	-633.7	2,360.7	2,424.1	0.00	0.00	0.00
9,200.0	90.00	89.34	7,018.0	-633.2	2,410.7	2,473.6	0.00	0.00	0.00
9,250.0	90.00	89.34	7,018.0	-632.6	2,460.7	2,523.1	0.00	0.00	0.00
9,300.0	90.00	89.34	7,018.0	-632.0	2,510.7	2,572.5	0.00	0.00	0.00
9,350.0	90.00	89.34	7,018.0	-631.4	2,560.7	2,622.0	0.00	0.00	0.00
9,400.0	90.00	89.34	7,018.0	-630.9	2,610.7	2,671.5	0.00	0.00	0.00
9,450.0	90.00	89.34	7,018.0	-630.3	2,660.7	2,721.0	0.00	0.00	0.00
9,500.0	90.00	89.34	7,018.0	-629.7	2,710.7	2,770.4	0.00	0.00	0.00
9,550.0	90.00	89.34	7,018.0	-629.2	2,760.7	2,819.9	0.00	0.00	0.00
9,600.0	90.00	89.34	7,018.0	-628.6	2,810.7	2,869.4	0.00	0.00	0.00
9,650.0	90.00	89.34	7,018.0	-628.0	2,860.7	2,918.9	0.00	0.00	0.00
9,700.0	90.00	89.34	7,018.0	-627.4	2,910.7	2,968.3	0.00	0.00	0.00
9,750.0	90.00	89.34	7,018.0	-626.9	2,960.6	3,017.8	0.00	0.00	0.00
9,800.0	90.00	89.34	7,018.0	-626.3	3,010.6	3,067.3	0.00	0.00	0.00
9,850.0	90.00	89.34	7,018.0	-625.7	3,060.6	3,116.8	0.00	0.00	0.00
9,900.0	90.00	89.34	7,018.0	-625.1	3,110.6	3,166.2	0.00	0.00	0.00
9,950.0	90.00	89.34	7,018.0	-624.6	3,160.6	3,215.7	0.00	0.00	0.00
10,000.0	90.00	89.34	7,018.0	-624.0	3,210.6	3,265.2	0.00	0.00	0.00
10,050.0	90.00	89.34	7,018.0	-623.4	3,260.6	3,314.7	0.00	0.00	0.00
10,100.0	90.00	89.34	7,018.0	-622.9	3,310.6	3,364.1	0.00	0.00	0.00
10,150.0	90.00	89.34	7,018.0	-622.3	3,360.6	3,413.6	0.00	0.00	0.00
10,200.0	90.00	89.34	7,018.0	-621.7	3,410.6	3,463.1	0.00	0.00	0.00
10,250.0	90.00	89.34	7,018.0	-621.1	3,460.6	3,512.5	0.00	0.00	0.00
10,300.0	90.00	89.34	7,018.0	-620.6	3,510.6	3,562.0	0.00	0.00	0.00
10,350.0	90.00	89.34	7,018.0	-620.0	3,560.6	3,611.5	0.00	0.00	0.00
10,400.0	90.00	89.34	7,018.0	-619.4	3,610.6	3,661.0	0.00	0.00	0.00
10,450.0	90.00	89.34	7,018.0	-618.9	3,660.6	3,710.4	0.00	0.00	0.00
10,500.0	90.00	89.34	7,018.0	-618.3	3,710.6	3,759.9	0.00	0.00	0.00
10,550.0	90.00	89.34	7,018.0	-617.7	3,760.6	3,809.4	0.00	0.00	0.00
10,600.0	90.00	89.34	7,018.0	-617.1	3,810.6	3,858.9	0.00	0.00	0.00
10,650.0	90.00	89.34	7,018.0	-616.6	3,860.6	3,908.3	0.00	0.00	0.00
10,700.0	90.00	89.34	7,018.0	-616.0	3,910.6	3,957.8	0.00	0.00	0.00
10,750.0	90.00	89.34	7,018.0	-615.4	3,960.6	4,007.3	0.00	0.00	0.00
10,800.0	90.00	89.34	7,018.0	-614.8	4,010.6	4,056.8	0.00	0.00	0.00
10,850.0	90.00	89.34	7,018.0	-614.3	4,060.6	4,106.2	0.00	0.00	0.00
10,900.0	90.00	89.34	7,018.0	-613.7	4,110.6	4,155.7	0.00	0.00	0.00
10,950.0	90.00	89.34	7,018.0	-613.1	4,160.6	4,205.2	0.00	0.00	0.00

Database:	Landmark	Local Co-ordinate Reference:	Well Loeffler K1-66-1HN
Company:	Noble Energy Inc.- Weld County, CO (Grid North)	TVD Reference:	WELL @ 4682.0ft (Precision 829 RKB - 16')
Project:	Sec.1-T4N-R66W	MD Reference:	WELL @ 4682.0ft (Precision 829 RKB - 16')
Site:	Loeffler K1-66-1HN Pad Sec.1-T4N-R66W	North Reference:	Grid
Well:	Loeffler K1-66-1HN	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Plan b Sidetrack (10-23-13)		

Planned Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
11,000.0	90.00	89.34	7,018.0	-612.6	4,210.6	4,254.6	0.00	0.00	0.00
11,050.0	90.00	89.34	7,018.0	-612.0	4,260.6	4,304.1	0.00	0.00	0.00
11,100.0	90.00	89.34	7,018.0	-611.4	4,310.6	4,353.6	0.00	0.00	0.00
11,150.0	90.00	89.34	7,018.0	-610.8	4,360.6	4,403.1	0.00	0.00	0.00
11,200.0	90.00	89.34	7,018.0	-610.3	4,410.6	4,452.5	0.00	0.00	0.00
11,250.0	90.00	89.34	7,018.0	-609.7	4,460.5	4,502.0	0.00	0.00	0.00
11,300.0	90.00	89.34	7,018.0	-609.1	4,510.5	4,551.5	0.00	0.00	0.00
11,313.6	90.00	89.34	7,018.0	-609.0	4,524.1	4,564.9	0.00	0.00	0.00
Loeffler K1-66-1HN BHL 2310'FNL & 535'FEL									

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
- hit/miss target									
- Shape									
Loeffler K1-66-1HN L:	0.00	0.00	7,018.0	-651.2	740.9	1,368,395.17	3,214,334.52	40.342095	-104.731072
- plan misses target center by 1.1ft at 7530.1ft MD (7018.0 TVD, -652.3 N, 740.9 E)									
- Circle (radius 35.0)									
Loeffler K1-66-1HN B	0.00	0.00	7,018.0	-609.0	4,524.1	1,368,437.40	3,218,117.59	40.342120	-104.717500
- plan hits target center									
- Circle (radius 35.0)									
7,394.0	7,008.8	7"						7	8-3/4

Plan Annotations				
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	+E/-W (ft)	Comment
6,200.0	6,156.7	-653.0	-54.2	KOP