

Noble Energy

Weld County, CO

Sec. 16-T5N-R64W (Klein 16 PAD)

Klein B15-13D - A1

Plan B - Rev 0

Design: MWD Survey

Sperry Drilling Services Standard Report

15 March, 2011

Well Coordinates: 1,387,418.24 N, 3,265,080.74 E (40° 23' 34.66" N, 104° 32' 53.88" W)

Ground Level: 4,608.00 ft

Local Coordinate Origin:

Centered on Well Klein B15-13D - Slot A1

Viewing Datum:

KB @ 4632.00ft (Rig KB)

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 Klein B15-13D - 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
870.00	0.29	180.89	870.00	-2.20	-0.03	-0.57	0.03
962.00	1.18	134.50	961.99	-3.10	0.64	-0.14	1.09
1,054.00	3.42	113.17	1,053.91	-4.84	3.84	2.54	2.57
1,180.00	5.65	102.24	1,179.51	-7.64	13.35	11.10	1.89
1,274.00	6.92	89.67	1,272.95	-8.58	23.54	20.74	1.98
1,369.00	8.76	78.41	1,367.06	-7.10	36.35	33.53	2.51
1,464.00	11.21	71.88	1,460.62	-2.77	52.22	49.97	2.84
1,558.00	12.48	71.80	1,552.61	3.24	70.55	69.22	1.35
1,653.00	15.69	73.00	1,644.75	10.21	92.59	92.29	3.39
1,748.00	17.70	73.82	1,735.74	17.99	118.75	119.56	2.13
1,842.00	19.52	74.06	1,824.82	26.28	147.57	149.53	1.94
1,937.00	21.13	73.88	1,913.90	35.40	179.29	182.51	1.70
2,032.00	22.86	74.83	2,001.98	44.98	213.55	218.08	1.86
2,127.00	23.12	75.45	2,089.44	54.49	249.41	255.18	0.37
2,225.00	23.63	74.50	2,179.39	64.58	286.96	294.05	0.65
2,320.00	20.88	75.18	2,267.31	74.00	321.68	330.02	2.91
2,416.00	21.80	77.14	2,356.73	82.34	355.60	364.95	1.21
2,511.00	22.97	75.51	2,444.57	90.90	390.75	401.12	1.39
2,607.00	22.68	74.41	2,533.05	100.57	426.71	438.36	0.54
2,702.00	24.57	74.94	2,620.09	110.62	463.43	476.42	2.00
2,798.00	25.77	74.93	2,706.97	121.23	502.85	517.24	1.25
2,893.00	23.70	74.13	2,793.25	131.82	541.16	556.98	2.21
2,989.00	24.09	74.02	2,881.02	142.49	578.56	595.84	0.41
3,084.00	23.11	73.86	2,968.07	153.01	615.11	633.85	1.03
3,180.00	21.55	77.88	3,056.88	161.95	650.45	670.30	2.27
3,370.00	21.37	76.33	3,233.71	177.46	718.20	739.79	0.31
3,466.00	21.53	77.27	3,323.06	185.48	752.38	774.90	0.39
3,561.00	21.67	76.31	3,411.39	193.47	786.42	809.86	0.40
3,656.00	23.19	77.46	3,499.20	201.68	821.72	846.10	1.67
3,752.00	25.29	75.22	3,586.73	211.02	860.01	885.51	2.39
3,847.00	26.65	75.72	3,672.13	221.45	900.28	927.10	1.45
3,943.00	27.38	74.81	3,757.66	232.55	942.45	970.71	0.87
4,038.00	25.62	74.69	3,842.68	243.69	983.34	1,013.08	1.85
4,134.00	22.15	73.97	3,930.44	254.17	1,020.76	1,051.93	3.63
4,229.00	21.62	76.01	4,018.60	263.35	1,054.96	1,087.33	0.98
4,325.00	20.97	77.28	4,108.04	271.41	1,088.88	1,122.19	0.83
4,420.00	20.27	78.30	4,196.95	278.49	1,121.58	1,155.63	0.83
4,515.00	19.96	76.45	4,286.16	285.63	1,153.45	1,188.29	0.74
4,611.00	21.49	72.74	4,375.95	294.68	1,186.18	1,222.23	2.10
4,706.00	20.54	73.81	4,464.63	304.49	1,218.80	1,256.26	1.08
4,802.00	18.52	77.27	4,555.11	312.55	1,249.85	1,288.34	2.42
4,897.00	18.81	80.53	4,645.11	318.39	1,279.68	1,318.69	1.14
4,993.00	18.23	80.14	4,736.14	323.51	1,309.74	1,349.09	0.62
5,088.00	17.65	74.45	4,826.53	329.92	1,338.25	1,378.31	1.94
5,184.00	15.99	73.91	4,918.42	337.49	1,364.98	1,406.08	1.74
5,279.00	13.45	74.58	5,010.29	344.05	1,388.21	1,430.20	2.68
5,375.00	9.37	74.85	5,104.37	349.06	1,406.52	1,449.18	4.25
5,470.00	7.21	74.89	5,198.38	352.64	1,419.74	1,462.88	2.27
5,566.00	5.54	76.22	5,293.78	355.31	1,430.06	1,473.54	1.75

Design Report for Klein B15-13D - MWD Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)
5,661.00	3.98	82.43	5,388.45	356.84	1,437.78	1,481.40	1.73
5,757.00	3.59	94.51	5,484.24	357.04	1,444.08	1,487.56	0.92
5,852.00	3.11	106.77	5,579.08	356.07	1,449.51	1,492.59	0.90
5,947.00	2.80	113.50	5,673.95	354.40	1,454.11	1,496.64	0.49
6,043.00	2.78	126.93	5,769.84	352.06	1,458.12	1,499.96	0.68
6,138.00	2.96	142.37	5,864.72	348.74	1,461.46	1,502.39	0.83
6,233.00	1.53	142.21	5,959.65	345.79	1,463.74	1,503.88	1.51
6,424.00	2.66	158.09	6,150.52	339.66	1,466.95	1,505.51	0.66
6,520.00	2.60	161.50	6,246.42	335.53	1,468.47	1,505.98	0.17
6,615.00	2.64	160.08	6,341.32	331.43	1,469.90	1,506.37	0.08
6,710.00	2.85	163.78	6,436.21	327.11	1,471.31	1,506.68	0.29
6,806.00	3.02	168.77	6,532.08	322.33	1,472.47	1,506.65	0.32
6,901.00	2.06	169.95	6,626.99	318.20	1,473.25	1,506.40	1.01
6,997.00	1.14	150.98	6,722.95	315.66	1,474.02	1,506.53	1.09
7,154.00	0.59	125.91	6,879.93	313.82	1,475.43	1,507.45	0.42
7,231.00	0.59	125.91	6,956.93	313.36	1,476.07	1,507.96	0.00

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (ft)	Origin +E/-W (ft)	Start TVD (ft)
User	Klein B15-13D_PlanB - Rev0_BHL Tgt	75.92	Slot	0.00	0.00	0.00

Survey tool program

From (ft)	To (ft)	Survey/Plan	Survey Tool
870.00	7,231.00	Sperry MWD Surveys	MWD

Formation Details

Measured Depth (ft)	Vertical Depth (ft)	TVDSS (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
6,743.83	6,470.00	1,838.00	Niobrara		0.00	
7,048.06	6,774.00	2,142.00	Codell		0.00	