

Noble Energy

Larimer County, CO (NAD 83)
Sec. 1-T9N-R58W (McCaffrey State Pad)
Elway State LD01-75-1BHN

Original Wellbore

Design: Noble Flexishot and Sperry MWD Survey

Sperry Drilling Services Final Survey Report

27 October, 2014

Well Coordinates: 1,529,385.08 N, 3,467,941.70 E (40° 46' 27.52" N, 103° 48' 37.48" W)
Ground Level: 4,633.00 usft

Local Coordinate Origin:

Centered on Well Elway State LD01-75-1BHN

Viewing Datum:

KB=24' @ 4657.00usft (H&P 343)

TVDs to System:

N

North Reference:

Grid

Unit System:

Dec-Deg - API - US Survey Feet - Custom

Geodetic Scale Factor Applied

Version: 5000.1 Build: 70

HALLIBURTON

Project: Larimer County, CO (NAD 83)
 Site: Sec. 1-T9N-R58W (McCaffrey State Pad)
 Well: Elway State LD01-75-1BHN
 Wellbore: Original Wellbore
 Design: Noble Flexishot and Sperry MWD Survey

Noble Energy

HALLIBURTON
 Sperry Drilling

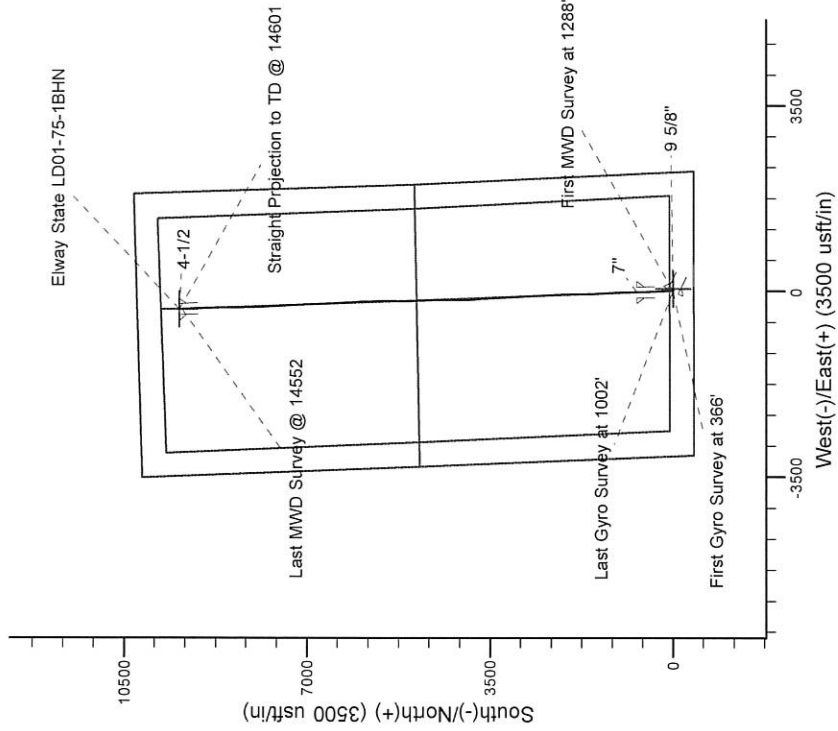
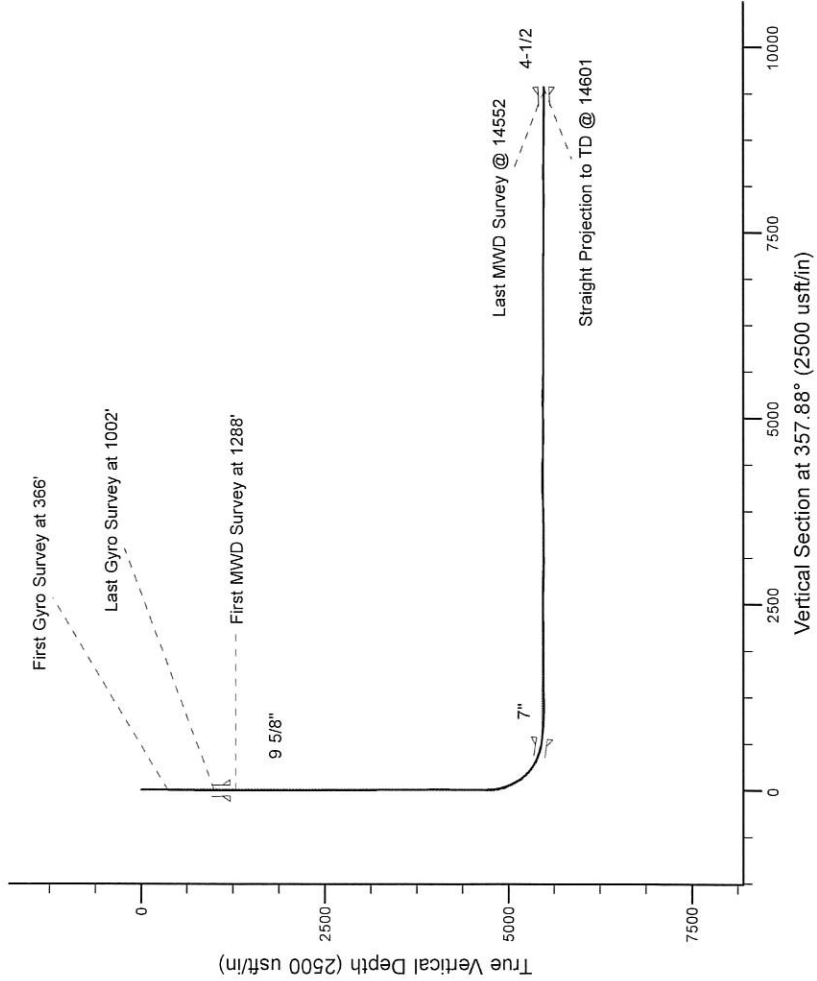
Platted SHL: 400' FSL, 2238' FEL
 Platted Lat/Long: 40.77431 N, 103.81041 W
 Location: Sec. 1-T9N-R58W

~7" Casing: 1068 FSL, 2195 FEL
 Lat/Long: 40.776222 N, 103.810454 W
 State Planes - CO Northern: 1530081.16 N, 3467916.25 E
 Location: Sec. 1-T9N-R58W

Platted BHL: 810' FNL, 2200' FEL
 Lat/Long: 40.80026 N, 103.81102 W
 State Planes - CO Northern: 1538634.67 N, 3467592.71 E
 Location: Sec. 36-T10N-R58W

LEGEND

- △ Elway State LD01-75-1BHN, Original Wellbore, Rev A0 Proposal V0
- ± Noble Flexishot and Sperry MWD Survey



WELL DETAILS: Elway State LD01-75-1BHN
Ground Level: 4633.00
KB-24 @ 4657.00usft (H&P 343)
Created By: Amanda Marchand
Created On: 10/27/2014

Design Report for Elway State LD01-75-1BHN - Noble Flexishot and Sperry MWD Survey

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
366.00	0.20	84.94	366.00	0.06	0.64	0.03	0.05
First Gyro Survey at 366'							
730.00	0.80	175.84	729.99	-2.42	1.45	-2.47	0.23
1,002.00	0.90	251.74	1,001.96	-4.99	-0.44	-4.97	0.39
Last Gyro Survey at 1002'							
1,288.00	0.22	12.72	1,287.95	-5.15	-2.45	-5.06	0.36
First MWD Survey at 1288'							
1,381.00	0.15	91.41	1,380.95	-4.98	-2.29	-4.89	0.26
1,474.00	0.40	98.16	1,473.95	-5.03	-1.85	-4.96	0.27
1,566.00	0.54	88.03	1,565.95	-5.06	-1.09	-5.02	0.18
1,659.00	0.70	51.08	1,658.94	-4.69	-0.21	-4.68	0.45
1,752.00	0.62	56.20	1,751.94	-4.05	0.65	-4.07	0.11
1,845.00	0.56	54.95	1,844.93	-3.51	1.44	-3.56	0.07
1,937.00	0.42	62.36	1,936.93	-3.10	2.10	-3.17	0.17
2,030.00	0.47	61.42	2,029.93	-2.76	2.74	-2.86	0.05
2,123.00	0.79	78.91	2,122.92	-2.45	3.70	-2.59	0.40
2,215.00	0.82	90.91	2,214.91	-2.34	4.98	-2.52	0.19
2,309.00	1.01	93.87	2,308.90	-2.41	6.48	-2.64	0.21
2,493.00	0.89	87.11	2,492.87	-2.44	9.53	-2.79	0.09
2,585.00	1.18	92.00	2,584.86	-2.44	11.19	-2.85	0.33
2,677.00	0.86	99.35	2,676.84	-2.59	12.82	-3.06	0.38
2,769.00	0.32	273.88	2,768.84	-2.68	13.24	-3.17	1.28
2,862.00	0.46	300.83	2,861.84	-2.47	12.66	-2.94	0.24
2,957.00	0.48	309.42	2,956.84	-2.02	12.03	-2.47	0.08
3,052.00	0.57	294.39	3,051.83	-1.58	11.29	-1.99	0.17
3,147.00	0.53	295.53	3,146.83	-1.19	10.46	-1.58	0.04
3,242.00	0.68	289.96	3,241.82	-0.81	9.54	-1.16	0.17
3,337.00	0.68	279.58	3,336.82	-0.52	8.45	-0.84	0.13
3,432.00	0.37	301.65	3,431.81	-0.27	7.63	-0.55	0.38
3,527.00	0.35	307.56	3,526.81	0.07	7.14	-0.19	0.04
3,622.00	1.06	16.53	3,621.80	1.09	7.16	0.82	1.04
3,716.00	1.71	28.23	3,715.78	3.16	8.07	2.86	0.75
3,811.00	1.03	3.97	3,810.75	5.26	8.80	4.93	0.93
3,906.00	0.37	208.86	3,905.74	5.84	8.71	5.52	1.45
4,000.00	0.39	180.99	3,999.74	5.26	8.56	4.94	0.20
4,095.00	0.38	154.58	4,094.74	4.65	8.69	4.32	0.19
4,191.00	0.37	272.38	4,190.74	4.37	8.52	4.06	0.67
4,286.00	0.84	291.89	4,285.73	4.65	7.57	4.36	0.53
4,381.00	0.88	290.45	4,380.72	5.16	6.24	4.93	0.05
4,476.00	0.75	296.02	4,475.71	5.69	4.99	5.50	0.16
4,571.00	0.22	278.20	4,570.71	5.99	4.25	5.83	0.57
4,666.00	0.34	213.01	4,665.71	5.78	3.92	5.63	0.33
4,762.00	2.66	1.18	4,761.68	7.77	3.81	7.62	3.08
4,857.00	12.63	1.52	4,855.71	20.38	4.13	20.22	10.49
4,952.00	18.21	358.08	4,947.26	45.62	3.91	45.45	5.95
5,047.00	24.00	359.57	5,035.85	79.81	3.27	79.63	6.12
5,142.00	30.07	356.79	5,120.43	122.93	1.79	122.78	6.52
5,237.00	37.66	355.79	5,199.26	175.71	-1.68	175.66	8.01
5,332.00	46.71	355.78	5,269.58	239.27	-6.36	239.34	9.53

Design Report for Elway State LD01-75-1BHN - Noble Flexishot and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,427.00	55.92	356.09	5,328.90	313.16	-11.60	313.38	9.70
5,522.00	63.95	357.48	5,376.45	395.18	-16.17	395.51	8.55
5,617.00	72.03	357.38	5,412.03	483.10	-20.12	483.51	8.51
5,712.00	76.39	358.14	5,437.87	574.42	-23.68	574.90	4.65
5,783.00	79.38	359.43	5,452.77	643.81	-25.15	644.30	4.57
5,887.00	83.82	0.36	5,467.96	746.67	-25.33	747.10	4.36
5,982.00	84.94	359.65	5,477.26	841.21	-25.33	841.57	1.39
6,077.00	87.16	359.00	5,483.81	935.97	-26.44	936.31	2.43
6,171.00	89.26	358.55	5,486.74	1,029.90	-28.45	1,030.25	2.28
6,266.00	90.71	355.22	5,486.77	1,124.74	-33.61	1,125.22	3.82
6,362.00	91.29	354.40	5,485.09	1,220.33	-42.30	1,221.06	1.05
6,457.00	92.65	356.77	5,481.83	1,314.99	-49.60	1,315.92	2.87
6,552.00	91.08	357.49	5,478.73	1,409.81	-54.36	1,410.86	1.82
6,647.00	90.28	358.70	5,477.61	1,504.75	-57.52	1,505.85	1.53
6,741.00	87.87	355.89	5,479.12	1,598.62	-61.95	1,599.82	3.94
6,836.00	91.02	0.76	5,480.05	1,693.53	-64.72	1,694.77	6.10
6,931.00	90.09	0.72	5,479.12	1,788.52	-63.50	1,789.65	0.98
7,026.00	90.06	359.03	5,479.00	1,883.52	-63.71	1,884.59	1.78
7,121.00	90.68	358.87	5,478.39	1,978.50	-65.45	1,979.57	0.67
7,216.00	90.31	357.55	5,477.57	2,073.45	-68.41	2,074.56	1.44
7,311.00	91.20	357.15	5,476.31	2,168.34	-72.81	2,169.55	1.03
7,407.00	89.63	357.22	5,475.62	2,264.21	-77.52	2,265.53	1.64
7,502.00	89.41	355.78	5,476.42	2,359.03	-83.32	2,360.50	1.53
7,597.00	90.52	357.24	5,476.47	2,453.85	-89.10	2,455.47	1.93
7,692.00	91.05	358.31	5,475.17	2,548.77	-92.79	2,550.46	1.26
7,788.00	88.27	356.50	5,475.74	2,644.66	-97.14	2,646.44	3.46
7,883.00	87.78	358.32	5,479.02	2,739.50	-101.43	2,741.37	1.98
7,977.00	88.06	357.86	5,482.43	2,833.38	-104.56	2,835.31	0.57
8,073.00	89.41	357.53	5,484.55	2,929.28	-108.42	2,931.29	1.45
8,168.00	89.14	357.43	5,485.75	3,024.18	-112.59	3,026.28	0.30
8,263.00	90.18	355.55	5,486.31	3,118.99	-118.41	3,121.24	2.26
8,358.00	91.36	356.62	5,485.04	3,213.76	-124.89	3,216.18	1.68
8,453.00	90.59	357.54	5,483.42	3,308.62	-129.73	3,311.16	1.26
8,548.00	89.17	355.26	5,483.62	3,403.43	-135.70	3,406.12	2.83
8,644.00	90.80	355.78	5,483.64	3,499.13	-143.20	3,502.03	1.78
8,738.00	91.54	357.45	5,481.72	3,592.94	-148.74	3,595.98	1.94
8,834.00	89.20	354.45	5,481.10	3,688.68	-155.52	3,691.91	3.96
8,929.00	91.97	356.73	5,480.13	3,783.38	-162.83	3,786.81	3.78
9,024.00	92.71	356.66	5,476.25	3,878.14	-168.30	3,881.71	0.78
9,119.00	92.90	0.02	5,471.60	3,972.98	-171.05	3,976.58	3.54
9,214.00	92.84	0.03	5,466.85	4,067.86	-171.01	4,071.40	0.06
9,309.00	91.11	0.29	5,463.57	4,162.80	-170.74	4,166.26	1.84
9,404.00	88.55	359.78	5,463.86	4,257.79	-170.68	4,261.19	2.75
9,500.00	88.18	359.67	5,466.59	4,353.75	-171.14	4,357.10	0.40
9,595.00	87.56	359.34	5,470.13	4,448.68	-171.96	4,451.99	0.74
9,690.00	86.91	358.97	5,474.71	4,543.56	-173.36	4,546.86	0.79
9,785.00	87.35	357.77	5,479.47	4,638.40	-176.06	4,641.73	1.34
9,877.00	89.63	356.67	5,481.89	4,730.25	-180.52	4,733.69	2.75
9,970.00	89.69	356.40	5,482.44	4,823.08	-186.14	4,826.66	0.30
10,063.00	92.22	358.21	5,480.89	4,915.95	-190.52	4,919.63	3.34
10,156.00	92.59	357.45	5,476.99	5,008.80	-194.03	5,012.55	0.91

Design Report for Elway State LD01-75-1BHN - Noble Flexishot and Sperry MWD Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,249.00	92.28	358.14	5,473.04	5,101.65	-197.61	5,105.46	0.81
10,342.00	90.74	2.35	5,470.59	5,194.59	-197.21	5,198.33	4.82
10,434.00	90.06	2.14	5,469.94	5,286.52	-193.61	5,290.06	0.77
10,527.00	88.49	1.48	5,471.12	5,379.46	-190.67	5,382.83	1.83
10,619.00	87.65	0.76	5,474.22	5,471.39	-188.87	5,474.63	1.20
10,712.00	88.12	359.24	5,477.65	5,564.32	-188.87	5,567.50	1.71
10,806.00	89.51	357.83	5,479.60	5,658.27	-191.28	5,661.47	2.11
10,898.00	89.48	357.17	5,480.41	5,750.17	-195.29	5,753.46	0.72
10,991.00	89.41	356.87	5,481.31	5,843.04	-200.12	5,846.45	0.33
11,083.00	89.66	357.52	5,482.05	5,934.93	-204.62	5,938.44	0.76
11,175.00	89.57	357.82	5,482.67	6,026.85	-208.37	6,030.44	0.34
11,267.00	90.65	356.48	5,482.50	6,118.73	-212.94	6,122.42	1.87
11,359.00	91.94	355.40	5,480.42	6,210.48	-219.45	6,214.34	1.83
11,452.00	90.65	356.64	5,478.31	6,303.23	-225.90	6,307.27	1.92
11,544.00	89.29	357.88	5,478.36	6,395.12	-230.30	6,399.26	2.00
11,640.00	89.66	358.08	5,479.24	6,491.05	-233.69	6,495.25	0.44
11,735.00	90.00	357.73	5,479.52	6,585.99	-237.16	6,590.25	0.51
11,830.00	90.59	357.02	5,479.03	6,680.89	-241.51	6,685.25	0.97
11,925.00	89.85	357.80	5,478.67	6,775.79	-245.80	6,780.24	1.13
12,020.00	89.94	357.50	5,478.84	6,870.71	-249.70	6,875.24	0.33
12,115.00	89.32	356.34	5,479.46	6,965.57	-254.80	6,970.22	1.38
12,210.00	88.49	357.35	5,481.27	7,060.40	-260.03	7,065.19	1.38
12,305.00	89.08	357.96	5,483.29	7,155.30	-263.91	7,160.17	0.89
12,400.00	88.00	356.54	5,485.71	7,250.16	-268.47	7,255.13	1.88
12,495.00	90.28	357.72	5,487.13	7,345.02	-273.23	7,350.10	2.70
12,591.00	90.71	356.86	5,486.30	7,440.91	-277.76	7,446.09	1.00
12,686.00	90.89	356.17	5,484.98	7,535.72	-283.54	7,541.05	0.75
12,781.00	90.19	357.10	5,484.08	7,630.55	-289.11	7,636.02	1.23
12,876.00	90.68	356.50	5,483.36	7,725.40	-294.42	7,731.00	0.82
12,971.00	89.85	358.21	5,482.92	7,820.29	-298.80	7,825.99	2.00
13,067.00	90.31	358.75	5,482.79	7,916.26	-301.35	7,921.99	0.74
13,162.00	89.97	357.77	5,482.56	8,011.21	-304.23	8,016.98	1.09
13,257.00	90.37	357.38	5,482.27	8,106.13	-308.25	8,111.98	0.59
13,352.00	90.09	356.00	5,481.89	8,200.97	-313.74	8,206.96	1.48
13,447.00	90.71	359.84	5,481.23	8,295.88	-317.18	8,301.94	4.09
13,542.00	90.80	0.82	5,479.98	8,390.87	-316.64	8,396.84	1.04
13,637.00	88.98	359.43	5,480.16	8,485.86	-316.43	8,491.76	2.41
13,732.00	88.12	358.92	5,482.56	8,580.82	-317.80	8,586.71	1.05
13,827.00	87.90	358.72	5,485.86	8,675.75	-319.75	8,681.64	0.31
13,922.00	89.14	359.01	5,488.32	8,770.69	-321.63	8,776.59	1.34
14,018.00	88.55	358.25	5,490.25	8,866.65	-323.93	8,872.56	1.00
14,113.00	89.26	358.57	5,492.07	8,961.59	-326.56	8,967.54	0.82
14,207.00	90.52	357.49	5,492.25	9,055.53	-329.79	9,061.53	1.77
14,303.00	90.00	357.30	5,491.81	9,151.43	-334.16	9,157.53	0.58
14,398.00	89.75	357.17	5,492.02	9,246.32	-338.74	9,252.52	0.30
14,493.00	90.80	356.88	5,491.56	9,341.19	-343.67	9,347.51	1.15
14,552.00	91.76	357.07	5,490.24	9,400.09	-346.78	9,406.49	1.66
Last MWD Survey @ 14552							
14,601.00	91.76	357.07	5,488.74	9,449.00	-349.29	9,455.46	0.00
Straight Projection to TD @ 14601							

Design Report for Elway State LD01-75-1BHN - Noble Flexishot and Sperry MWD Survey

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
366.00	366.00	0.06	0.64	First Gyro Survey at 366'
1,002.00	1,001.96	-4.99	-0.44	Last Gyro Survey at 1002'
1,288.00	1,287.95	-5.15	-2.45	First MWD Survey at 1288'
14,552.00	5,490.24	9,400.09	-346.78	Last MWD Survey @ 14552
14,601.00	5,488.74	9,449.00	-349.29	Straight Projection to TD @ 14601

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Elway State LD01-75-1BHN_Rev AO_BHL Tgt	357.88	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
366.00	1,002.00	Noble Flexishot Surveys	Flexi-Shot
1,288.00	5,783.00	Intermediate Section	MWD+IFR1+MS_WY
5,887.00	14,601.00	Production Surveys	MWD+IFR1+MS_WY

Design Report for Elway State LD01-75-1BHN - Noble Flexishot and Sperry MWD Survey

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
Elway State LD01-74-'	0.00	0.00	0.00	0.68	36.00	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 36.01usft at 0.06usft MD (0.06 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70	
Point 2				0.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71	
Point 3				0.00	10,158.00	-3,552.00	1,539,543.75	3,464,425.71	
Point 4				0.00	10,325.00	1,786.00	1,539,710.75	3,469,763.70	
Point 5				0.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70	
Elway State LD01-74-'	0.00	0.00	0.00	0.68	36.00	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 36.01usft at 0.06usft MD (0.06 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	-391.00	2,221.00	1,528,994.77	3,470,198.70	
Point 2				0.00	-402.00	-3,134.00	1,528,983.77	3,464,843.71	
Point 3				0.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71	
Point 4				0.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70	
Point 5				0.00	-391.00	2,221.00	1,528,994.77	3,470,198.70	
Elway State LD01-74-'	0.00	0.00	0.00	0.68	36.00	1,529,385.76	3,467,977.70	40.774310	-103.810280
- actual wellpath misses target center by 36.01usft at 0.06usft MD (0.06 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1				0.00	69.00	1,761.00	1,529,454.76	3,469,738.70	
Point 2				0.00	58.00	-2,674.00	1,529,443.76	3,465,303.70	
Point 3				0.00	4,841.00	-2,887.00	1,534,226.76	3,465,090.71	
Point 4				0.00	9,698.00	-3,092.00	1,539,083.75	3,464,885.71	
Point 5				0.00	9,865.00	1,326.00	1,539,250.75	3,469,303.70	
Point 6				0.00	4,957.00	1,509.00	1,534,342.76	3,469,486.70	
Point 7				0.00	69.00	1,761.00	1,529,454.76	3,469,738.70	
Elway State LD01-75-'	0.00	0.00	5,484.50	9,449.60	-348.99	1,538,834.67	3,467,592.71	40.800260	-103.811020
- actual wellpath misses target center by 4.29usft at 14601.00usft MD (5488.74 TVD, 9449.00 N, -349.29 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.64 °/100usft	Maximum Dogleg over Survey:	10.49 °/100usft at 4,857.00 usft
Net Tortosity applicable to Plans:	1.02 °/100usft	Directional Difficulty Index:	6.782

Audit Info

HALLIBURTON**North Reference Sheet for Sec. 1-T9N-R58W (McCaffrey State Pad) - Elway State
LD01-75-1BHN - Original Wellbore**

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' @ 4657.00usft (H&P 343). Northing and Easting are relative to Elway State LD01-75-1BHN

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 -105.500000°, Longitude Origin:0.000000°, Latitude Origin:40.783333°

False Easting: 3,000,000.00usft, False Northing: 1,000,000.00usft, Scale Reduction: 0.99999855

Grid Coordinates of Well: 1,529,385.08 usft N, 3,467,941.70 usft E

Geographical Coordinates of Well: 40° 46' 27.52" N, 103° 48' 37.48" W

Grid Convergence at Surface is: 1.09°

Based upon Minimum Curvature type calculations, at a Measured Depth of 14,601.00usft
the Bottom Hole Displacement is 9,455.46usft in the Direction of 357.88° (Grid).

Magnetic Convergence at surface is: -6.92° (8 October 2014, , BGGM2014)

