

Project: Weld County, CO (NAD 83)
 Site: Sec. 1-T9N-R58W (Atwater State 1 PAD)
 Well: Atwater State LD01-76-1AHN
 Wellbore: Original Wellbore
 Design: Noble Flexishot and Sperry MWD Survey



HALLIBURTON

Sperry Drilling

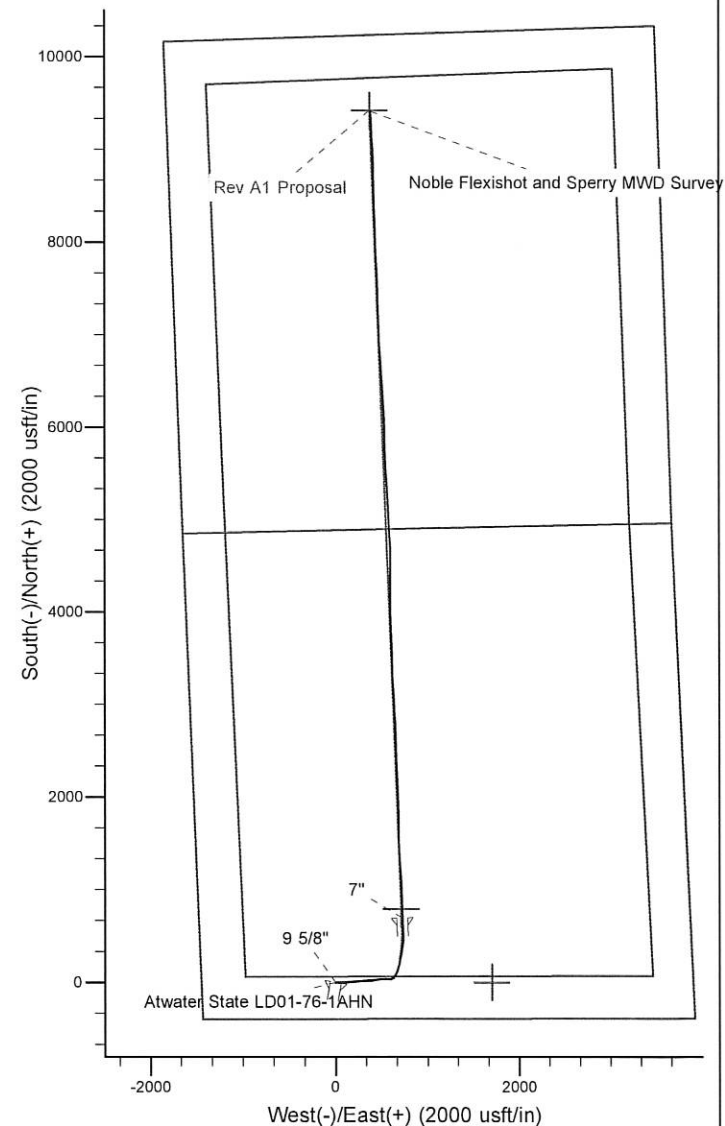
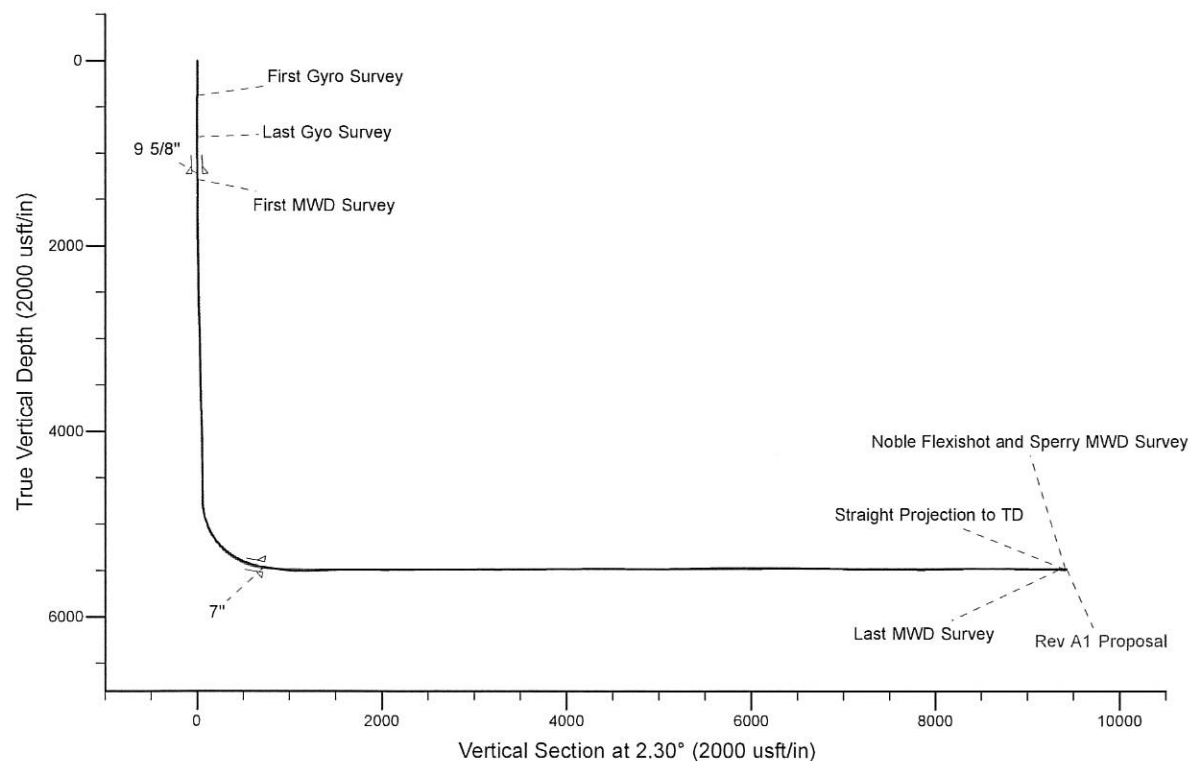
Platted SHL: 400' FSL, 1450' FWL
 Platted Lat/Long: 40.77439 N, 103.81642W
 Location: Sec. 1-T9N-R58W

~7" Casing: 1080' FSL, 2200' FWL
 Lat/Long: 40.776255 N, 103.813761 W
 State Planes - CO Northern: 1530076.02 N, 3467000.29 E
 Location: Sec. 1-9N-R58W

Platted BHL: 810' FNL, 2200' FEL FWL
 Lat/Long: 40.80022 N, 103.81441 W
 State Planes - CO Northern: 1538802.24 N, 3466654.58 E
 Location: Sec. 36-T10N-R58W

LEGEND

- ◇ Atwater State LD01-76-1AHN, Original Wellbore, Rev A1 Proposal V0
- ▣ Noble Flexishot and Sperry MWD Survey



WELL DETAILS: Atwater State LD01-76-1AHN

Ground Level: 4648.00

KB=24' @ 4672.00usf (H&P 273)

Created By: Gordy Roth
 Created On: 11/9/2014

Design Report for Atwater State LD01-76-1AHN - Noble Flexishot and Sperry MWD Survey

Measured Depth (ustf)	Inclination (°)	Azimuth (°)	Vertical Depth (ustf)	+N/-S (ustf)	+E/-W (ustf)	Vertical Section (ustf)	Dogleg Rate (°/100ustf)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
380.00	0.40	179.62	380.00	-1.33	0.01	-1.32	0.11
First Gyro Survey							
830.00	0.40	159.12	829.99	-4.36	0.58	-4.34	0.03
Last Gyro Survey							
1,290.00	1.73	8.90	1,289.93	1.00	2.23	1.08	0.45
First MWD Survey							
1,382.00	2.86	78.33	1,381.87	2.83	4.69	3.02	3.01
1,474.00	5.48	103.54	1,473.62	2.27	11.21	2.72	3.41
1,567.00	9.21	106.69	1,565.84	-0.91	22.66	0.00	4.03
1,659.00	10.90	98.93	1,656.43	-4.38	38.31	-2.84	2.35
1,752.00	10.97	87.60	1,747.75	-5.37	55.84	-3.13	2.31
1,938.00	10.91	84.66	1,930.37	-2.99	91.04	0.66	0.30
2,124.00	10.17	81.40	2,113.24	1.10	124.81	6.10	0.51
2,217.00	10.41	89.14	2,204.74	2.46	141.33	8.12	1.51
2,495.00	10.34	85.04	2,478.20	4.99	191.30	12.65	0.27
2,588.00	10.50	83.87	2,569.67	6.62	208.04	14.95	0.29
2,681.00	10.51	80.17	2,661.11	8.97	224.82	17.97	0.73
2,773.00	10.11	86.23	2,751.63	10.93	241.14	20.59	1.26
2,963.00	9.68	83.42	2,938.80	13.86	273.65	24.81	0.34
3,057.00	9.40	81.02	3,031.50	15.96	289.09	27.54	0.52
3,152.00	10.63	89.23	3,125.06	17.29	305.51	29.52	1.98
3,342.00	11.51	89.37	3,311.52	17.74	341.99	31.43	0.46
3,437.00	12.06	88.90	3,404.52	18.03	361.39	32.50	0.59
3,531.00	12.02	89.04	3,496.45	18.38	381.00	33.64	0.05
3,626.00	10.99	80.92	3,589.55	19.98	399.83	35.98	2.02
3,721.00	10.17	78.25	3,682.93	23.12	416.98	39.81	1.01
3,816.00	9.83	76.97	3,776.49	26.65	433.10	43.99	0.43
3,910.00	9.23	73.69	3,869.19	30.58	448.15	48.51	0.86
4,004.00	9.36	80.33	3,961.96	33.98	462.92	52.50	1.15
4,099.00	9.75	88.18	4,055.65	35.53	478.58	54.68	1.43
4,193.00	9.46	87.50	4,148.33	36.12	494.25	55.90	0.33
4,288.00	9.71	87.42	4,242.00	36.82	510.05	57.23	0.26
4,383.00	9.93	88.53	4,335.61	37.40	526.24	58.45	0.31
4,478.00	8.42	84.49	4,429.39	38.27	541.36	59.93	1.73
4,572.00	9.05	98.29	4,522.31	37.87	555.52	60.10	2.32
4,667.00	10.75	97.03	4,615.89	35.71	571.71	58.59	1.80
4,762.00	8.82	96.02	4,709.51	33.86	587.75	57.38	2.04
4,856.00	11.94	70.75	4,802.00	36.31	604.11	60.49	5.80
4,904.00	15.18	56.66	4,848.67	41.40	614.05	65.97	9.59
4,951.00	18.19	46.72	4,893.70	49.82	624.54	74.80	8.80
4,999.00	20.75	38.79	4,938.96	61.59	635.32	86.99	7.65
5,046.00	23.52	33.41	4,982.49	75.91	645.71	101.72	7.30
5,094.00	25.35	25.53	5,026.20	93.18	655.41	119.37	7.78
5,141.00	28.22	21.90	5,068.16	112.58	663.90	139.09	7.03
5,189.00	31.71	19.09	5,109.74	135.04	672.26	161.86	7.83
5,236.00	35.51	15.85	5,148.88	159.85	680.03	186.97	8.94
5,284.00	39.21	13.86	5,187.03	188.00	687.47	215.40	8.11
5,330.00	42.92	11.73	5,221.70	217.47	694.14	245.10	8.62
5,378.00	46.55	11.76	5,255.80	250.54	701.02	278.42	7.56

Design Report for Atwater State LD01-76-1AHN - 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)
5,425.00	50.40	11.70	5,286.95	284.98	708.17	313.13	8.19
5,473.00	54.11	10.62	5,316.33	322.21	715.51	350.63	7.93
5,520.00	57.93	7.85	5,342.59	360.67	721.74	389.30	9.48
5,568.00	62.04	5.91	5,366.60	401.93	726.70	430.72	9.25
5,614.00	65.55	4.03	5,386.91	443.04	730.27	471.94	8.47
5,662.00	68.76	0.87	5,405.55	487.22	732.14	516.16	9.93
5,709.00	71.11	358.27	5,421.68	531.36	731.80	560.25	7.21
5,757.00	72.46	356.35	5,436.68	576.90	729.66	605.67	4.73
5,804.00	75.96	356.34	5,449.47	622.02	726.78	650.65	7.45
5,829.00	78.22	357.18	5,455.05	646.35	725.40	674.90	9.61
5,916.00	81.80	358.78	5,470.14	731.96	722.39	760.32	4.50
6,010.00	81.87	358.85	5,483.49	824.99	720.46	853.20	0.10
6,105.00	83.29	358.86	5,495.76	919.17	718.58	947.23	1.49
6,200.00	86.64	358.43	5,504.10	1,013.77	716.34	1,041.66	3.56
6,295.00	90.34	356.06	5,506.60	1,108.60	711.78	1,136.23	4.62
6,389.00	92.59	355.93	5,504.20	1,202.33	705.22	1,229.63	2.40
6,484.00	91.82	356.05	5,500.54	1,297.03	698.58	1,323.98	0.82
6,579.00	92.44	355.76	5,497.01	1,391.72	691.80	1,418.32	0.72
6,673.00	90.99	358.87	5,494.20	1,485.56	687.40	1,511.91	3.65
6,768.00	91.30	358.30	5,492.30	1,580.51	685.05	1,606.69	0.66
6,863.00	88.98	359.10	5,492.07	1,675.48	682.90	1,701.50	2.58
6,958.00	90.15	0.36	5,492.79	1,770.48	682.45	1,796.40	1.81
7,053.00	89.32	359.17	5,493.23	1,865.47	682.06	1,891.30	1.53
7,147.00	89.41	357.91	5,494.27	1,959.43	679.67	1,985.09	1.34
7,240.00	90.74	357.50	5,494.15	2,052.36	675.94	2,077.79	1.50
7,333.00	90.99	357.18	5,492.75	2,145.24	671.63	2,170.43	0.44
7,425.00	90.93	356.82	5,491.20	2,237.11	666.81	2,262.03	0.40
7,517.00	90.83	358.89	5,489.79	2,329.03	663.37	2,353.74	2.25
7,611.00	90.37	357.93	5,486.71	2,622.89	655.21	2,647.04	0.36
8,001.00	89.75	357.26	5,486.51	2,812.72	647.24	2,836.40	0.48
8,096.00	89.23	356.64	5,487.36	2,907.58	642.18	2,930.98	0.65
8,190.00	89.35	356.04	5,488.52	3,001.38	636.18	3,024.46	0.65
8,285.00	88.70	355.96	5,490.14	3,096.14	629.56	3,118.88	0.69
8,380.00	89.54	357.54	5,491.60	3,190.97	624.17	3,213.42	1.88
8,474.00	90.34	358.95	5,491.70	3,284.92	621.29	3,307.18	1.72
8,569.00	90.34	359.17	5,491.13	3,379.91	619.74	3,402.03	0.23
8,664.00	91.30	358.50	5,489.78	3,474.88	617.81	3,496.84	1.23
8,759.00	91.36	358.52	5,487.57	3,569.82	615.34	3,591.61	0.07
8,948.00	90.19	357.15	5,485.01	3,756.66	608.20	3,780.01	0.95
9,043.00	90.25	357.56	5,484.65	3,853.56	603.81	3,874.66	0.44
9,138.00	90.18	356.81	5,484.29	3,948.44	599.15	3,969.28	0.79
9,233.00	90.52	359.04	5,483.71	4,043.37	595.71	4,063.99	2.37
9,328.00	90.77	0.58	5,482.64	4,138.36	595.39	4,158.90	1.64
9,423.00	90.77	1.28	5,481.37	4,233.34	596.93	4,253.86	0.74
9,518.00	90.43	0.78	5,480.37	4,328.32	598.64	4,348.83	0.64
9,612.00	89.32	359.53	5,480.58	4,422.32	598.90	4,442.76	1.78
9,707.00	89.32	359.54	5,481.70	4,517.31	598.12	4,537.64	0.01
9,802.00	88.58	359.56	5,483.44	4,612.29	597.38	4,632.52	0.78
9,897.00	89.69	358.15	5,484.88	4,707.25	595.48	4,727.33	1.89
9,992.00	89.94	357.54	5,485.19	4,802.18	591.91	4,822.04	0.69
10,084.00	90.59	357.39	5,484.76	4,894.09	587.84	4,913.72	0.73

Design Report for Atwater State LD01-76-1AHN - Noble Flexishot and Sperry MWD Survey

Measured Depth (ustf)	Inclination (°)	Azimuth (°)	Vertical		+N/-S (ustf)	+E/-W (ustf)	Vertical		Dogleg Rate (%/100ustf)
			Depth (ustf)				Section (ustf)		
10,177.00	90.80	357.20	5,483.63		4,986.98	583.45	5,006.36		0.30
10,269.00	90.49	357.14	5,482.60		5,078.86	578.91	5,097.98		0.34
10,362.00	90.40	356.44	5,481.87		5,171.71	573.70	5,190.55		0.76
10,454.00	90.74	356.08	5,480.96		5,263.51	567.70	5,282.03		0.54
10,546.00	91.26	356.19	5,479.35		5,355.29	561.50	5,373.49		0.58
10,639.00	91.67	356.17	5,476.98		5,448.05	555.31	5,465.93		0.44
10,731.00	90.89	356.83	5,474.92		5,539.86	549.69	5,557.43		1.11
10,824.00	90.40	358.01	5,473.87		5,632.76	545.51	5,650.09		1.37
10,917.00	90.68	357.68	5,473.00		5,725.69	542.01	5,742.80		0.47
11,010.00	90.34	358.82	5,472.17		5,818.64	539.17	5,835.57		1.28
11,103.00	89.63	358.94	5,472.19		5,911.62	537.35	5,928.40		0.77
11,196.00	89.97	358.32	5,472.52		6,004.59	535.13	6,021.21		0.76
11,288.00	90.12	358.62	5,472.45		6,096.56	532.67	6,113.00		0.36
11,381.00	90.25	357.38	5,472.15		6,189.50	529.43	6,205.74		1.34
11,474.00	89.75	355.96	5,472.15		6,282.34	524.02	6,298.29		1.62
11,567.00	89.75	356.12	5,472.55		6,375.12	517.60	6,390.74		0.17
11,659.00	89.14	355.68	5,473.44		6,466.88	511.02	6,482.16		0.82
11,751.00	89.04	355.25	5,474.90		6,556.58	503.75	6,573.49		0.48
11,842.00	89.26	356.13	5,476.25		6,649.31	496.91	6,663.88		1.00
11,937.00	89.20	356.20	5,477.53		6,744.09	490.56	6,758.33		0.10
12,031.00	89.07	355.52	5,478.95		6,837.83	483.77	6,851.72		0.74
12,126.00	88.00	357.92	5,481.38		6,932.63	478.34	6,946.23		2.77
12,221.00	88.24	357.82	5,484.49		7,027.52	474.81	7,040.90		0.27
12,316.00	87.87	357.14	5,487.72		7,122.37	470.64	7,135.51		0.81
12,411.00	90.12	359.13	5,489.39		7,217.29	467.55	7,230.23		3.16
12,505.00	90.22	358.68	5,489.11		7,311.28	465.75	7,324.07		0.49
12,600.00	90.03	358.51	5,488.90		7,406.25	463.42	7,418.87		0.27
12,695.00	89.66	357.93	5,489.16		7,501.20	460.47	7,513.63		0.72
12,790.00	89.48	357.62	5,489.87		7,596.13	456.78	7,608.33		0.38
12,884.00	89.14	357.16	5,491.00		7,690.02	452.50	7,701.98		0.61
12,980.00	88.86	356.16	5,492.68		7,785.84	446.91	7,797.50		1.08
13,074.00	90.34	357.44	5,493.33		7,879.69	441.66	7,891.06		2.08
13,169.00	91.33	358.20	5,491.95		7,974.61	438.05	7,985.76		1.31
13,264.00	91.94	358.00	5,489.24		8,069.52	434.90	8,080.46		0.66
13,358.00	91.45	359.14	5,486.46		8,163.45	432.56	8,174.22		1.32
13,453.00	91.05	357.97	5,484.38		8,258.39	430.16	8,268.99		1.30
13,548.00	91.88	357.78	5,481.96		8,353.29	426.64	8,363.68		0.90
13,643.00	90.55	358.58	5,479.94		8,448.22	423.62	8,458.41		1.63
13,737.00	89.38	359.36	5,480.00		8,542.20	421.93	8,552.25		1.50
13,832.00	89.72	359.18	5,480.75		8,637.19	420.72	8,647.11		0.40
13,927.00	89.63	359.09	5,481.28		8,732.18	419.29	8,741.97		0.13
14,021.00	89.32	358.56	5,482.15		8,826.16	417.36	8,835.79		0.65
14,116.00	89.32	357.69	5,483.27		8,921.10	414.25	8,930.53		0.92
14,211.00	88.98	357.34	5,484.68		9,016.00	410.14	9,025.19		0.51
14,306.00	89.35	357.26	5,486.07		9,110.88	405.66	9,119.82		0.40
14,400.00	89.63	356.77	5,486.90		9,204.75	400.77	9,213.42		0.60
14,494.00	89.32	355.53	5,487.76		9,298.53	394.45	9,306.87		1.36
14,540.00	89.85	355.53	5,488.10		9,344.39	390.87	9,352.55		1.15
Last MWD Survey									
14,605.00	89.85	355.53	5,488.27		9,409.19	385.80	9,417.10		0.00
Straight Projection to TD									

Design Report for Atwater State LD01-76-1AHN - Noble Flexishot and Sperry MWD Survey

Measured Depth (ustf)	Inclination (°)	Azimuth (°)	Vertical Depth (ustf)	+N/-S (ustf)	+E/-W (ustf)	Vertical Section (ustf)	Dogleg Rate (°/100ustf)
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Design Annotations

Measured Depth (ustf)	Vertical Depth (ustf)	Local Coordinates +N/-S (ustf)	+E/-W (ustf)	Comment
380.00	380.00	-1.33	0.01	First Gyro Survey
830.00	829.99	-4.36	0.58	Last Gyro Survey
1,290.00	1,289.93	1.00	2.23	First MWD Survey
14,540.00	5,488.10	9,344.39	390.87	Last MWD Survey
14,605.00	5,488.27	9,409.19	385.80	Straight Projection to TD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/-S (ustf)	+E/-W (ustf)	Start TVD (ustf)
Target	Atwater State LD01-76-1AHN_BHL	2.30	Slot	0.00	0.00	5,478.75

Survey tool program

From (ustf)	To (ustf)	Survey/Plan	Survey Tool
380.00	830.00	Noble Flexishot Surveys	Flexi-Shot
1,290.00	5,829.00	Intermediate	MWD
5,916.00	14,605.00	Production Surveys	MWD

Casing Details

Measured Depth (ustf)	Vertical Depth (ustf)	Name	Casing Diameter (")	Hole Diameter (")
1,225.00	1,224.95	9 5/8"	9-5/8	13-3/4
5,877.00	5,464.04	7"	7	8-3/4

HALLIBURTON

Noble Energy
Weld County, CO (NAD 83)

Design Report for Atwater State LD01-76-1AHN - Noble Flexishot and Sperry MWD Survey

Wellbore Targets

Target Name	Dip	Dip	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	Angle	Dir.	(usft)	(usft)	(usft)	(usft)	(usft)		
- Shape	(°)	(°)							
Elway State LD01-74-° 0.00 0.00 15.00 3.20 1,700.86 1,529,385.76 3,467,977.70 40.774310 -103.810280									
- actual wellpath misses target center by 1700.86usft at 15.03usft MD (15.03 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	69.00	1,761.00	1,529,454.76	3,469,738.70		
Point 2			15.00	58.00	-2,674.00	1,529,443.76	3,465,303.70		
Point 3			15.00	4,841.00	-2,867.00	1,534,226.76	3,465,090.71		
Point 4			15.00	9,698.00	-3,092.00	1,539,083.75	3,464,885.71		
Point 5			15.00	9,865.00	1,326.00	1,539,250.75	3,469,303.70		
Point 6			15.00	4,957.00	1,509.00	1,534,342.76	3,469,486.70		
Point 7			15.00	69.00	1,761.00	1,529,454.76	3,469,738.70		
Elway State LD01-74-° 0.00 0.00 15.00 3.20 1,700.86 1,529,385.76 3,467,977.70 40.774310 -103.810280									
- actual wellpath misses target center by 1700.86usft at 15.03usft MD (15.03 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	-391.00	2,221.00	1,528,994.77	3,470,198.70		
Point 2			15.00	-402.00	-3,134.00	1,528,983.77	3,464,843.71		
Point 3			15.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71		
Point 4			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Point 5			15.00	-391.00	2,221.00	1,528,994.77	3,470,198.70		
Elway State LD01-74-° 0.00 0.00 15.00 3.20 1,700.86 1,529,385.76 3,467,977.70 40.774310 -103.810280									
- actual wellpath misses target center by 1700.86usft at 15.03usft MD (15.03 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Point 2			15.00	4,841.00	-3,347.00	1,534,226.76	3,464,630.71		
Point 3			15.00	10,158.00	-3,552.00	1,539,543.75	3,464,425.71		
Point 4			15.00	10,325.00	1,786.00	1,539,710.75	3,469,763.70		
Point 5			15.00	4,957.00	1,969.00	1,534,342.76	3,469,946.70		
Atwater State LD01-76° 0.00 0.00 5,478.75 9,419.69 377.74 1,538,802.24 3,466,654.58 40.800220 -103.814410									
- actual wellpath misses target center by 16.30usft at 14605.00usft MD (5488.27 TVD, 9409.19 N, 385.80 E)									
- Point									
Atwater State LD01-76° 0.00 0.00 5,486.19 790.30 709.60 1,530,172.86 3,466,986.44 40.776522 -103.813804									
- actual wellpath misses target center by 13.81usft at 5976.27usft MD (5478.72 TVD, 791.61 N, 721.14 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.51 °/100usft	Maximum Dogleg over Survey:	9.61 °/100usft at 5,829.00 usft
Net Tortuosity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.768

Audit Info

North Reference Sheet for Sec. 1-T9N-R58W (Atwater State 1 PAD) - Atwater State LD01-76-1AHN - 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' @ 4672.00usft (H&P 273). Northing and Easting are relative to Sec. 1-T9N-R58W (Atwater State 1 PAD)

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: 0.999998556

Grid Coordinates of Well: 1,529,382.56 usft N, 3,466,276.84 usft E

Geographical Coordinates of Well: 40° 46' 27.80" N, 103° 48' 59.11" W

Grid Convergence at Surface is: 1.09°

Based upon Minimum Curvature type calculations, at a Measured Depth of 14,605.00usft the Bottom Hole Displacement is 9,417.10usft in the Direction of 2.35° (Grid).

Magnetic Convergence at surface is: -6.92° (5 November 2014 , BGM2014)

