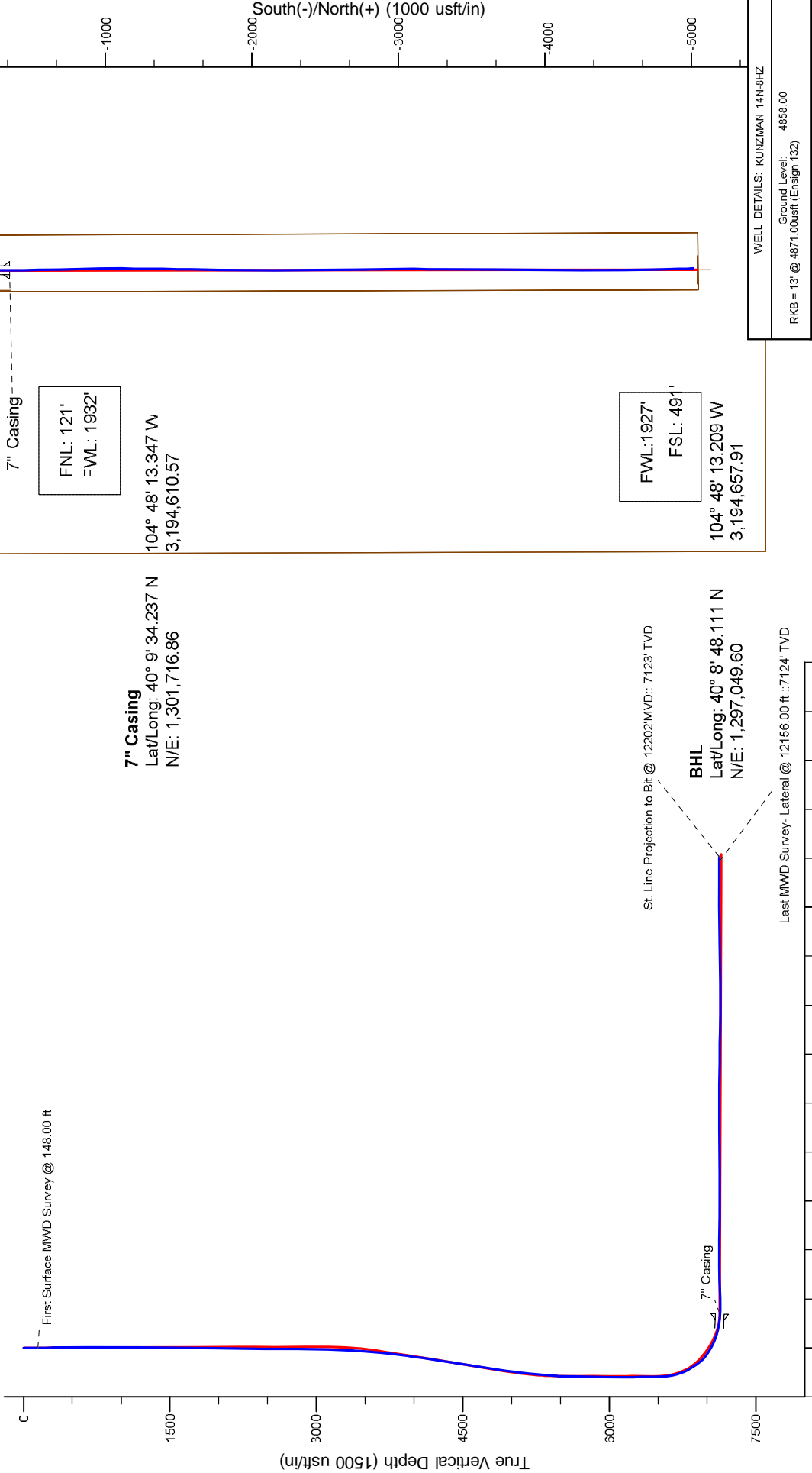


Project: Weld County, CO (NAD 83)
Site: Sec. 5-T2N-R66W
Well: KUNZMAN 14N-8HZ
Wellbore: Plan C
Design: Actual Surveys



LEGEND

- KUNZMAN 14N-8HZ, Plan C, Plan C0 Proposal V0
- Actual Surveys



West(-)/East(+) (1000 usft/in)

South(-)/North(+) (1000 usft/in)

WELL DETAILS: KUNZMAN 14N-8HZ

Ground Level: 4859.00
RKB = 13' @ 4871.00usft (Ensign 132)

Design: Actual Surveys (KUNZMAN 14N-8HZ/Plan C)

Created By: Pari Amanlou Date: 09/26/2013

Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 5-T2N-R66W

KUNZMAN 14N-8HZ

Plan C

Design: Actual Surveys

Sperry Drilling Services

Standard Report

02 October, 2013

Well Coordinates: 1,302,062.96 N, 3,194,489.50 E (40° 09' 37.67" N, 104° 48' 14.87" W)

Ground Level: 4,858.00 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 KUNZMAN 14N-8HZ

RKB = 13' @ 4871.00usft (Ensign 132)

N

True

API - US Survey Feet - Custom

HALLIBURTON

Design Report for KUNZMAN 14N-8HZ - Actual 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
148.00	0.70	248.34	148.00	-0.33	-0.84	0.33	0.47
First Surface MWD Survey @ 148.00 ft							
230.00	0.96	250.82	229.99	-0.74	-1.95	0.74	0.32
326.00	0.90	254.35	325.98	-1.21	-3.44	1.21	0.09
415.00	0.97	261.84	414.96	-1.51	-4.86	1.50	0.16
539.00	0.56	262.43	538.95	-1.74	-6.50	1.73	0.33
633.00	0.40	224.94	632.95	-2.03	-7.19	2.02	0.37
726.00	0.44	218.04	725.95	-2.54	-7.64	2.53	0.07
819.00	0.57	231.12	818.94	-3.11	-8.22	3.10	0.19
874.00	0.39	247.45	873.94	-3.36	-8.60	3.34	0.41
1,068.00	0.44	306.20	1,067.94	-3.17	-9.81	3.16	0.21
1,160.00	0.53	315.57	1,159.93	-2.66	-10.39	2.64	0.13
1,344.00	0.62	321.70	1,343.92	-1.27	-11.61	1.25	0.06
1,435.00	0.68	330.11	1,434.92	-0.41	-12.18	0.40	0.12
1,526.00	0.89	332.68	1,525.91	0.68	-12.78	-0.70	0.23
1,618.00	0.50	42.49	1,617.90	1.61	-12.83	-1.63	0.93
1,710.00	0.43	74.61	1,709.90	2.00	-12.23	-2.02	0.29
1,801.00	0.38	24.71	1,800.90	2.37	-11.77	-2.38	0.38
1,893.00	0.33	29.81	1,892.90	2.87	-11.51	-2.89	0.06
1,988.00	0.58	20.52	1,987.89	3.56	-11.21	-3.58	0.27
2,083.00	0.71	12.36	2,082.89	4.59	-10.91	-4.60	0.17
2,368.00	1.11	350.53	2,367.85	9.03	-10.99	-9.05	0.18
2,463.00	1.08	349.07	2,462.84	10.82	-11.31	-10.84	0.04
2,558.00	0.69	343.86	2,557.82	12.25	-11.64	-12.26	0.42
2,653.00	0.94	333.27	2,652.81	13.50	-12.15	-13.51	0.31
2,749.00	0.68	351.01	2,748.80	14.76	-12.59	-14.78	0.37
2,844.00	0.89	358.94	2,843.80	16.06	-12.69	-16.07	0.25
3,034.00	0.44	14.89	3,033.78	18.24	-12.53	-18.25	0.25
3,129.00	0.96	45.44	3,128.78	19.15	-11.87	-19.16	0.66
3,224.00	2.51	33.48	3,223.73	21.44	-10.16	-21.45	1.67
3,319.00	4.04	28.45	3,318.57	26.12	-7.42	-26.13	1.64
3,414.00	5.06	27.31	3,413.27	32.78	-3.90	-32.79	1.08
3,509.00	5.03	22.19	3,507.90	40.36	-0.41	-40.36	0.47
3,605.00	4.26	20.40	3,603.59	47.60	2.43	-47.60	0.82
3,700.00	5.53	20.73	3,698.24	55.19	5.28	-55.18	1.34
3,795.00	6.87	25.31	3,792.68	64.61	9.33	-64.60	1.50
3,890.00	8.17	27.20	3,886.86	75.75	14.84	-75.73	1.39
3,985.00	9.94	25.74	3,980.67	89.14	21.49	-89.11	1.88
4,080.00	9.43	25.29	4,074.32	103.56	28.37	-103.53	0.54
4,175.00	8.69	24.03	4,168.13	117.15	34.62	-117.11	0.81
4,270.00	8.85	25.36	4,262.02	130.31	40.67	-130.26	0.27
4,366.00	10.08	24.71	4,356.72	144.62	47.35	-144.56	1.29
4,461.00	9.15	20.81	4,450.38	159.23	53.51	-159.16	1.19
4,556.00	10.38	26.04	4,544.00	173.98	59.95	-173.91	1.60
4,651.00	10.38	24.32	4,637.45	189.47	67.23	-189.39	0.33
4,746.00	9.37	23.62	4,731.04	204.35	73.85	-204.26	1.07
4,841.00	10.17	28.88	4,824.66	218.78	81.00	-218.69	1.26
4,936.00	8.96	32.83	4,918.34	232.35	89.06	-232.24	1.45
5,032.00	8.29	32.14	5,013.26	244.49	96.80	-244.37	0.71

Design Report for KUNZMAN 14N-8HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,127.00	7.54	32.31	5,107.35	255.55	103.77	-255.43	0.79
5,222.00	6.36	31.10	5,201.65	265.33	109.82	-265.19	1.25
5,317.00	5.73	28.59	5,296.12	274.00	114.81	-273.86	0.72
5,412.00	5.50	27.57	5,390.67	282.20	119.19	-282.05	0.26
5,507.00	3.08	18.78	5,485.40	288.65	122.12	-288.50	2.63
5,603.00	0.52	12.60	5,581.34	291.52	123.04	-291.37	2.67
5,983.00	1.22	13.25	5,961.29	297.14	124.35	-296.99	0.18
6,078.00	1.42	12.86	6,056.27	299.27	124.84	-299.12	0.21
6,173.00	0.26	152.97	6,151.26	300.23	125.20	-300.07	1.71
6,268.00	0.45	179.03	6,246.26	299.66	125.30	-299.51	0.26
6,364.00	0.24	153.01	6,342.26	299.11	125.40	-298.95	0.27
6,459.00	0.35	156.79	6,437.25	298.66	125.61	-298.51	0.12
6,507.00	0.21	114.23	6,485.25	298.49	125.74	-298.34	0.50
6,554.00	2.27	168.05	6,532.24	297.54	126.02	-297.39	4.58
6,602.00	6.66	177.78	6,580.08	293.83	126.32	-293.68	9.25
6,649.00	10.60	181.96	6,626.54	286.79	126.28	-286.63	8.48
6,697.00	13.74	181.83	6,673.46	276.67	125.95	-276.52	6.54
6,744.00	18.12	180.93	6,718.64	263.78	125.65	-263.63	9.33
6,792.00	22.58	182.22	6,763.64	247.10	125.17	-246.95	9.34
6,839.00	27.10	182.29	6,806.28	227.38	124.39	-227.22	9.62
6,887.00	31.45	181.57	6,848.14	203.92	123.61	-203.77	9.09
6,934.00	36.51	178.96	6,887.10	177.67	123.53	-177.52	11.20
6,982.00	41.82	180.98	6,924.30	147.37	123.52	-147.22	11.38
7,029.00	46.43	182.63	6,958.03	114.67	122.47	-114.52	10.11
7,077.00	51.74	183.05	6,989.46	78.46	120.66	-78.31	11.08
7,124.00	57.57	182.82	7,016.64	40.19	118.70	-40.04	12.41
7,172.00	61.62	182.21	7,040.93	-1.16	116.89	1.30	8.51
7,219.00	65.13	181.35	7,061.99	-43.15	115.59	43.29	7.65
7,267.00	68.47	179.72	7,080.89	-87.26	115.19	87.40	7.63
7,314.00	72.47	179.44	7,096.60	-131.54	115.51	131.69	8.53
7,362.00	75.59	179.58	7,109.81	-177.68	115.91	177.83	6.51
7,409.00	78.65	178.88	7,120.28	-223.49	116.53	223.63	6.67
7,452.00	82.95	178.36	7,127.16	-265.92	117.55	266.06	10.07
7,496.00	86.33	179.84	7,131.27	-309.71	118.24	309.86	8.38
7,533.40	87.52	179.80	7,133.27	-347.06	118.35	347.20	3.18
7" Casing							
7,630.00	90.59	179.69	7,134.87	-443.63	118.78	443.78	3.18
7,726.00	91.42	179.50	7,133.18	-539.61	119.46	539.76	0.89
7,821.00	90.96	178.77	7,131.21	-634.58	120.90	634.73	0.91
8,011.00	91.60	178.57	7,126.97	-824.48	125.31	824.63	0.35
8,106.00	90.71	179.06	7,125.05	-919.44	127.27	919.59	1.07
8,201.00	89.72	178.97	7,124.69	-1,014.42	128.90	1,014.58	1.05
8,296.00	89.17	180.12	7,125.61	-1,109.41	129.66	1,109.57	1.34
8,391.00	88.33	181.18	7,127.69	-1,204.38	128.58	1,204.54	1.42
8,486.00	89.29	180.73	7,129.66	-1,299.35	127.00	1,299.50	1.12
8,581.00	90.00	180.13	7,130.25	-1,394.34	126.28	1,394.50	0.98
8,676.00	90.18	181.54	7,130.10	-1,489.33	124.90	1,489.48	1.50
8,772.00	90.99	180.98	7,129.12	-1,585.30	122.79	1,585.45	1.03
8,867.00	89.60	180.71	7,128.63	-1,680.29	121.39	1,680.43	1.49
8,962.00	91.14	180.70	7,128.02	-1,775.28	120.22	1,775.42	1.62
9,057.00	90.22	180.62	7,126.89	-1,870.26	119.13	1,870.41	0.97

Design Report for KUNZMAN 14N-8HZ - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,152.00	90.74	180.29	7,126.09	-1,965.25	118.37	1,965.40	0.65
9,345.00	90.83	179.95	7,123.45	-2,158.24	117.97	2,158.38	0.18
9,438.00	89.57	179.62	7,123.12	-2,251.23	118.32	2,251.38	1.40
9,533.00	89.88	180.12	7,123.58	-2,346.23	118.53	2,346.37	0.62
9,628.00	89.38	179.44	7,124.19	-2,441.23	118.90	2,441.37	0.89
9,723.00	89.72	179.09	7,124.94	-2,536.22	120.11	2,536.36	0.51
9,818.00	89.20	179.41	7,125.83	-2,631.20	121.36	2,631.35	0.64
9,913.00	89.54	179.29	7,126.88	-2,726.19	122.44	2,726.34	0.38
10,009.00	89.88	178.66	7,127.37	-2,822.17	124.15	2,822.32	0.75
10,104.00	89.72	179.49	7,127.70	-2,917.16	125.69	2,917.31	0.89
10,199.00	89.72	179.79	7,128.16	-3,012.16	126.28	3,012.31	0.32
10,294.00	89.29	180.45	7,128.98	-3,107.15	126.08	3,107.30	0.83
10,389.00	88.15	181.17	7,131.10	-3,202.12	124.74	3,202.27	1.42
10,484.00	88.61	180.63	7,133.79	-3,297.07	123.25	3,297.21	0.75
10,579.00	89.69	179.82	7,135.20	-3,392.05	122.88	3,392.20	1.42
10,674.00	89.54	180.47	7,135.84	-3,487.05	122.64	3,487.20	0.70
10,770.00	90.59	179.93	7,135.73	-3,583.05	122.30	3,583.19	1.23
10,865.00	90.40	180.41	7,134.91	-3,678.04	122.02	3,678.19	0.54
10,960.00	91.26	179.97	7,133.53	-3,773.03	121.71	3,773.18	1.02
11,055.00	90.18	180.59	7,132.34	-3,868.02	121.24	3,868.17	1.31
11,150.00	90.37	180.18	7,131.88	-3,963.02	120.60	3,963.16	0.48
11,245.00	91.17	179.71	7,130.61	-4,058.01	120.69	4,058.15	0.98
11,340.00	90.59	181.11	7,129.15	-4,152.99	120.01	4,153.14	1.59
11,435.00	90.68	181.11	7,128.09	-4,247.97	118.17	4,248.11	0.09
11,530.00	91.57	180.21	7,126.23	-4,342.94	117.08	4,343.08	1.33
11,625.00	90.96	179.70	7,124.13	-4,437.92	117.15	4,438.06	0.84
11,721.00	88.92	179.24	7,124.23	-4,533.91	118.04	4,534.05	2.18
11,816.00	89.26	178.89	7,125.74	-4,628.88	119.59	4,629.03	0.51
11,911.00	89.75	178.67	7,126.56	-4,723.86	121.61	4,724.00	0.57
12,006.00	90.74	178.58	7,126.15	-4,818.83	123.89	4,818.98	1.05
12,101.00	90.68	178.54	7,124.98	-4,913.79	126.28	4,913.94	0.08
12,156.00	90.96	178.37	7,124.19	-4,968.77	127.76	4,968.92	0.60
Last MWD Survey- Lateral @ 12156.00 ft ::7124' TVD							
12,202.00	90.96	178.37	7,123.42	-5,014.74	129.07	5,014.89	0.00
St. Line Projection to Bit @ 12202'MVD:: 7123' TVD							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
148.00	148.00	-0.33	-0.84	First Surface MWD Survey @ 148.00 ft
12,156.00	7,124.19	-4,968.77	127.76	Last MWD Survey- Lateral @ 12156.00 ft ::7124' TVD
12,202.00	7,123.42	-5,014.74	129.07	St. Line Projection to Bit @ 12202'MVD:: 7123' TVD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	179.93	Slot	0.00	0.00	0.00

Design Report for KUNZMAN 14N-8HZ - Actual Surveys**Survey tool program**

From (usft)	To (usft)	Survey/Plan	Survey Tool
148.00	874.00	MWD Surface Surveys	MWD+SC
1,068.00	7,496.00	MWD Vertical/Build	MWD+IFR1+SC
7,630.00	12,156.00	MWD Lateral Surveys	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
7,533.40	7,133.27	7" Casing	7	8-3/4

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
Kunzman 14N-8HZ_ST - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,302,062.97	3,194,489.50	40° 9' 37.667 N	104° 48' 14.872 W
Kunzman 14N-8HZ_LI - actual wellpath misses target center by 256.40usft at 0.68usft MD (0.68 TVD, 0.00 N, 0.00 E) - Polygon	0.00	0.00	0.00	-255.73	-18.45	1,301,807.10	3,194,473.06	40° 9' 35.140 N	104° 48' 15.109 W
Point 1				0.00	30.72	-10.89	1,301,837.74	3,194,461.93	
Point 2				0.00	32.15	377.15	1,301,842.21	3,194,849.93	
Point 3				0.00	-4,789.32	393.22	1,297,021.22	3,194,903.83	
Point 4				0.00	-4,791.80	5.17	1,297,015.69	3,194,515.83	
Point 5				0.00	30.72	-10.89	1,301,837.74	3,194,461.93	
Kunzman 30N-5HZ_SE - actual wellpath misses target center by 256.40usft at 0.68usft MD (0.68 TVD, 0.00 N, 0.00 E) - Polygon	0.00	0.00	0.00	-255.74	-18.45	1,301,807.10	3,194,473.06	40° 9' 35.140 N	104° 48' 15.109 W
Point 1				0.00	5,198.42	-1,789.33	1,306,991.10	3,192,643.07	
Point 2				0.00	5,226.63	861.22	1,307,040.11	3,195,293.20	
Point 3				0.00	5,255.04	3,511.74	1,307,089.31	3,197,943.31	
Point 4				0.00	2,675.78	3,506.24	1,304,510.20	3,197,958.05	
Point 5				0.00	30.50	3,502.70	1,301,865.08	3,197,975.26	
Point 6				0.00	30.42	853.45	1,301,844.21	3,195,326.21	
Point 7				0.00	29.32	-1,796.03	1,301,822.32	3,192,676.93	
Point 8				0.00	30.42	853.45	1,301,844.21	3,195,326.21	
Point 9				0.00	30.50	3,502.70	1,301,865.08	3,197,975.26	
Point 10				0.00	-5,246.74	3,489.01	1,296,588.12	3,198,002.99	
Point 11				0.00	-5,248.96	855.38	1,296,565.23	3,195,369.56	
Point 12				0.00	-5,251.38	-1,778.39	1,296,542.15	3,192,736.01	
Point 13				0.00	-2,610.49	-1,787.24	1,299,182.77	3,192,706.43	
Point 14				0.00	29.32	-1,796.03	1,301,822.32	3,192,676.93	
Point 15				0.00	5,198.42	-1,789.33	1,306,991.10	3,192,643.07	
Kunzman 14N-8HZ_BI - actual wellpath misses target center by 35.78usft at 12202.00usft MD (7123.42 TVD, -5014.74 N, 129.07 E) - Point	0.00	0.00	7,147.00	-5,040.67	121.91	1,297,023.61	3,194,650.96	40° 8' 47.854 N	104° 48' 13.302 W

Directional Difficulty Index

Average Dogleg over Survey:	1.42 °/100usft	Maximum Dogleg over Survey:	12.41 °/100usft at 7,124.00 usft
Net Tortousity applicable to Plans:	0.50 °/100usft	Directional Difficulty Index:	6.225

Design Report for KUNZMAN 14N-8HZ - Actual Surveys

Audit Info

North Reference Sheet for Sec. 5-T2N-R66W - KUNZMAN 14N-8HZ - Plan C

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.
 Vertical Depths are relative to RKB = 13' @ 4871.00usft (Ensign 132). Northing and Easting are relative to KUNZMAN 14N-8HZ
 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: 0.99995808

Grid Coordinates of Well: 1,302,062.96 usft N, 3,194,489.50 usft E
 Geographical Coordinates of Well: 40° 09' 37.67" N, 104° 48' 14.87" W
 Grid Convergence at Surface is: 0.45°

Based upon Minimum Curvature type calculations, at a Measured Depth of 12,202.00usft
 the Bottom Hole Displacement is 5,016.40usft in the Direction of 178.53° (True).
 Magnetic Convergence at surface is: -8.15° (16 August 2013, , BGGM2013)

