

# SPERRY-SUN DRILLING SERVICES

## CERTIFIED SURVEY WORK SHEET

<b>OPERATOR:</b>	Anadarko Petroleum Corp.
<b>WELL:</b>	NRC 4N-4HZ
<b>FIELD:</b>	DJ Basin
<b>RIG:</b>	H&P 308
<b>LEGALS:</b>	Sec. 9-T1N-R67W
<b>COUNTY:</b>	Weld
<b>STATE:</b>	Colorado
<b>CAL. METHOD:</b>	True N
<b>MAG. DECL. APPLIED:</b>	8.59
<b>VERTICAL SEC. DIR. :</b>	359.950

<b>SSDS Job Number :</b>	901165847
<b>Start Date of Job :</b>	3/21/2014
<b>End Date of Job :</b>	3/31/2014
<b>Lead Directional Driller:</b>	Jesse Kysar
	Brian Saunders
<b>Other SSDS DD's :</b>	
<b>SSDS MWD Engineers :</b>	Patrick Lane
	Mark Spowart
	Patrick



ESS Survey  
First Survey Depth  
Last Survey Depth

KOP Depth/Sidetrack MD

First Survey Depth  
Last Survey Depth  
Bit Extrapolation to TD

Main Hole =====>		1st Side Track =====>		2nd Side Track =====>		3rd Side Track =====>		4th Side Track =====>	
	Tie On		Tie On		Tie On		Tie On		Tie On
25.00	Gyro								
971.00									
6875.00	KOP		KOP-ST1		KOP-ST2		KOP-ST3		KOP-ST4
1105.00	MWD		MWD		MWD		MWD		MWD
17024.00	MWD		MWD		MWD		MWD		MWD
17076.00	T.D.		T.D.		T.D.		T.D.		T.D.

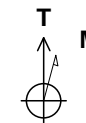
The following Sperry Sun Drilling Services personnel listed below, do certify the above survey information to be accurate :

Print Name : Brian Saunders	Print Name : Mark Spowart	Print Name :
Sign Name : 	Sign Name : 	Sign Name :
Print Name :	Print Name :	Print Name :
Sign Name :	Sign Name :	Sign Name :

Examples of  
Survey Types:

TieOn	Tie On to Surface Casing (Assumed Vertical), Tie On to existing MWD Survey (prior drilled hole)
MWD	Sperry Sun Drilling Services (SSDS) Measurement While Drilling (MWD) Survey's
ESS	Sperry Sun Drilling Services (SSDS) Electronic Survey System (ESS) Survey's
Gyro	Gyro Survey's ; Provided by third party vendor, or by Sperry Sun Drilling Services (SSDS)
SS	Single Shot (SS) Survey's ; Provided by Sperry Sun Drilling Services (SSDS) or third party vendor.

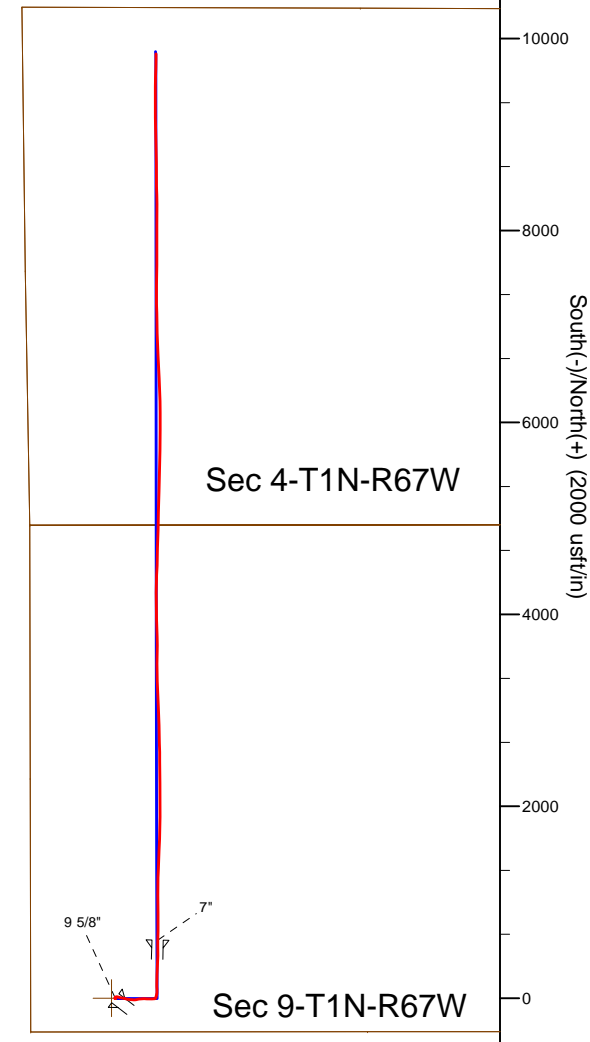
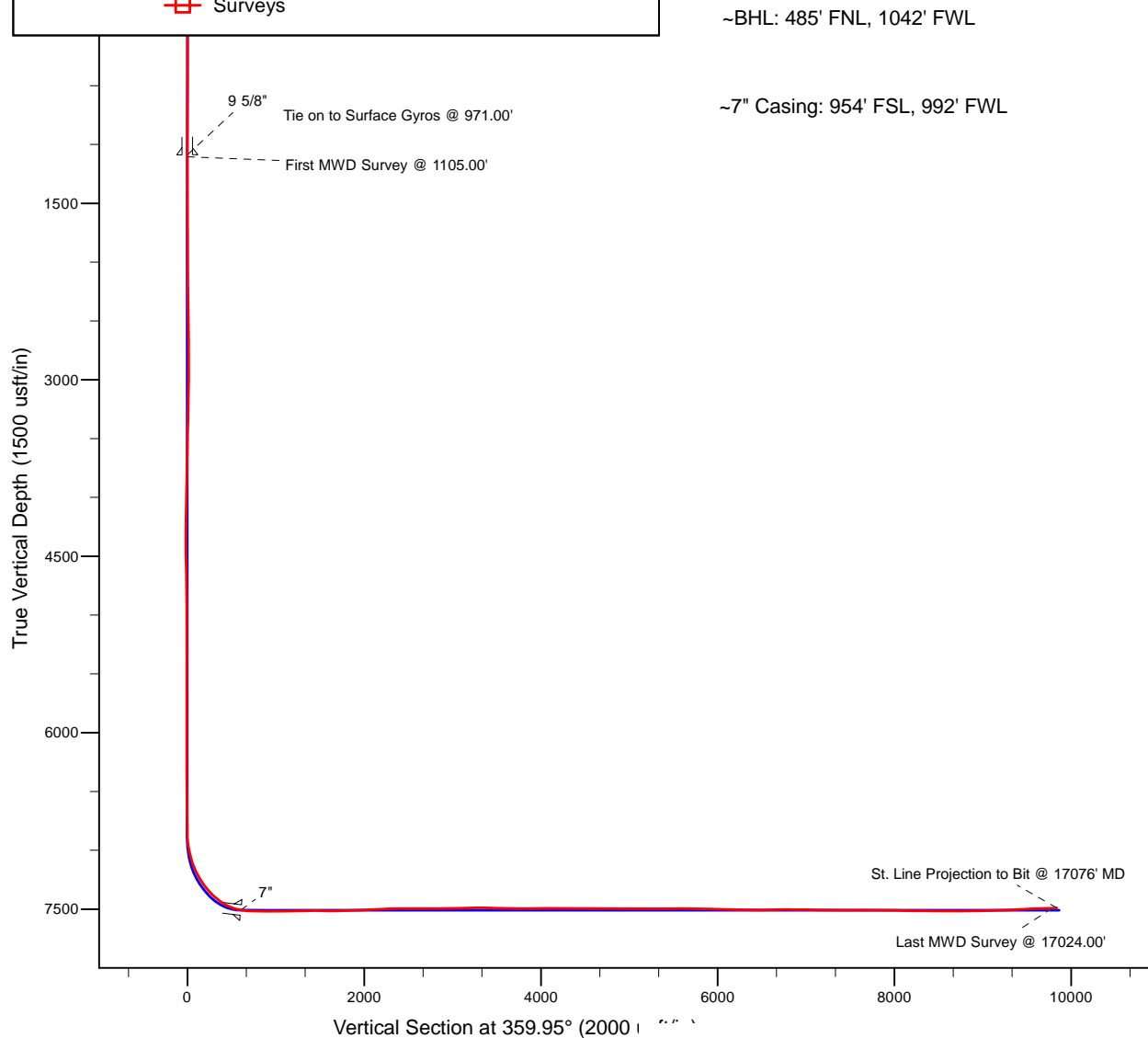
Project: Weld County, CO (NAD 83)  
 Site: Sec. 9-T1N-R67W  
 Well: NRC 4N-4HZ  
 Wellbore: Plan A  
 Design: Surveys



**HALLIBURTON**  
 Sperry Drilling

### LEGEND

- ✕ NRC 4N-4HZ, Plan A, Rev A1 V0
- ▣ Surveys



	Latitude	Longitude	Northing	Easting
7" Casing:	40.060889	-104.901554	1,265,592.51	3,167,505.98
BHL:	40.086239	-104.901600	1,274,826.45	3,167,430.67

WELL DETAILS: NRC 4N-4HZ	
Ground Level:	5064.20
RKB= 25' @ 5089.20usft (H&P 308)	
Design: Surveys (NRC 4N-4HZ/Plan A)	
Created By: Pari Amanlou Date: 4-4-2014	

# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 9-T1N-R67W

NRC 4N-4HZ

Job#901165847::API:05-123-38627

Plan A

Design: Surveys

## Sperry Drilling Services

### Standard Report

22 August, 2014

Surface UWI : Job#901165847::API:05-123-38627

Well Coordinates: 1,264,984.71 N, 3,167,179.07 E (40° 03' 33.22" N, 104° 54' 09.85" W)

Ground Level: 5,064.20 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 NRC 4N-4HZ

RKB= 25' @ 5089.20usft (H&P 308)

N

True

API - US Survey Feet - Custom

**HALLIBURTON**

**Design Report for NRC 4N-4HZ - 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
25.00	0.00	0.00	25.00	0.00	0.00	0.00	0.00
125.00	0.45	68.51	125.00	0.14	0.37	0.14	0.45
225.00	0.49	88.09	225.00	0.30	1.16	0.30	0.16
325.00	0.53	87.17	324.99	0.34	2.05	0.34	0.04
425.00	0.39	42.29	424.99	0.61	2.74	0.61	0.37
525.00	0.42	126.32	524.99	0.65	3.26	0.65	0.54
625.00	0.54	178.40	624.98	-0.04	3.57	-0.04	0.44
725.00	0.19	109.81	724.98	-0.57	3.74	-0.57	0.50
825.00	0.75	221.76	824.98	-1.11	3.46	-1.11	0.84
925.00	0.72	233.12	924.97	-1.98	2.52	-1.98	0.15
971.00	0.32	324.06	970.97	-2.05	2.22	-2.05	1.72
<b>Tie-On to Surface Gyro @ 971.00 FT</b>							
1,089.00	0.75	307.73	1,088.96	-1.31	1.41	-1.31	0.38
<b>9 5/8"</b>							
1,105.00	0.81	306.87	1,104.96	-1.17	1.24	-1.18	0.38
<b>First MWD Survey @ 1105.00'</b>							
1,197.00	0.68	277.60	1,196.96	-0.71	0.18	-0.71	0.43
1,289.00	0.71	284.32	1,288.95	-0.50	-0.92	-0.50	0.09
1,382.00	1.09	294.78	1,381.94	0.01	-2.28	0.02	0.44
1,475.00	1.09	282.65	1,474.92	0.58	-3.94	0.58	0.25
1,568.00	0.40	24.22	1,567.91	1.07	-4.67	1.07	1.33
1,660.00	0.40	355.62	1,659.91	1.68	-4.57	1.69	0.21
1,753.00	1.07	82.15	1,752.91	2.12	-3.73	2.13	1.20
1,845.00	0.82	75.32	1,844.89	2.41	-2.24	2.41	0.30
1,938.00	0.62	63.30	1,937.89	2.80	-1.15	2.80	0.27
2,031.00	0.84	23.85	2,030.88	3.65	-0.43	3.65	0.57
2,124.00	0.63	46.16	2,123.87	4.63	0.22	4.63	0.38
2,217.00	0.96	27.00	2,216.86	5.68	0.94	5.68	0.45
2,309.00	1.45	17.79	2,308.84	7.47	1.65	7.47	0.57
2,402.00	1.74	16.87	2,401.81	9.94	2.42	9.94	0.31
2,493.00	1.94	56.72	2,492.76	12.11	4.10	12.11	1.39
2,586.00	1.85	42.24	2,585.71	14.09	6.43	14.08	0.52
2,679.00	2.36	94.98	2,678.66	15.03	9.35	15.02	2.07
2,772.00	2.05	97.12	2,771.59	14.66	12.91	14.65	0.34
2,867.00	1.68	102.77	2,866.54	14.14	15.95	14.13	0.43
2,961.00	1.03	107.21	2,960.51	13.59	18.10	13.57	0.70
3,056.00	2.68	98.18	3,055.46	13.02	21.11	13.00	1.76
3,150.00	4.26	110.31	3,149.28	11.49	26.56	11.47	1.84
3,244.00	4.01	108.05	3,243.04	9.26	32.96	9.23	0.32
3,339.00	5.45	110.05	3,337.71	6.69	40.36	6.65	1.53
3,433.00	5.09	112.55	3,431.32	3.56	48.40	3.52	0.45
3,527.00	6.32	104.63	3,524.85	0.65	57.26	0.60	1.55
3,621.00	5.10	99.17	3,618.38	-1.32	66.39	-1.38	1.42
3,715.00	6.89	108.33	3,711.87	-3.76	75.87	-3.83	2.15
3,810.00	6.49	108.12	3,806.22	-7.22	86.38	-7.30	0.42
3,904.00	5.38	102.61	3,899.72	-9.84	95.73	-9.92	1.33
3,999.00	6.82	99.44	3,994.18	-11.73	105.64	-11.83	1.56
4,093.00	5.72	97.29	4,087.61	-13.24	115.80	-13.34	1.20
4,187.00	4.86	100.62	4,181.21	-14.57	124.36	-14.68	0.97

**Design Report for NRC 4N-4HZ - Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,282.00	6.66	95.95	4,275.73	-15.88	133.79	-16.00	1.96
4,376.00	5.72	91.41	4,369.18	-16.57	143.90	-16.69	1.13
4,470.00	5.29	89.60	4,462.75	-16.65	152.91	-16.78	0.49
4,565.00	6.26	73.15	4,557.27	-15.12	162.25	-15.26	2.01
4,659.00	5.06	69.35	4,650.81	-12.17	171.03	-12.32	1.34
4,753.00	4.95	77.05	4,744.45	-9.80	178.87	-9.96	0.72
4,848.00	5.56	78.68	4,839.05	-7.98	187.37	-8.14	0.66
4,942.00	7.00	85.40	4,932.49	-6.62	197.55	-6.80	1.72
5,036.00	6.23	86.29	5,025.86	-5.84	208.35	-6.02	0.83
5,131.00	5.61	84.89	5,120.35	-5.09	218.12	-5.28	0.67
5,225.00	6.05	95.82	5,213.87	-5.18	227.62	-5.38	1.27
5,320.00	5.92	93.55	5,308.35	-5.99	237.49	-6.20	0.28
5,414.00	5.30	93.22	5,401.90	-6.54	246.66	-6.75	0.66
5,508.00	4.34	91.15	5,495.57	-6.85	254.56	-7.07	1.04
5,603.00	6.19	93.93	5,590.16	-7.27	263.26	-7.50	1.97
5,697.00	5.17	88.08	5,683.70	-7.48	272.55	-7.72	1.25
5,791.00	4.32	80.05	5,777.38	-6.73	280.27	-6.97	1.15
5,886.00	3.49	95.48	5,872.16	-6.38	286.67	-6.63	1.40
5,980.00	2.64	97.98	5,966.02	-6.96	291.66	-7.21	0.92
6,074.00	2.68	91.31	6,059.92	-7.31	296.00	-7.57	0.33
6,169.00	2.29	95.13	6,154.83	-7.53	300.12	-7.79	0.45
6,263.00	2.13	74.19	6,248.77	-7.22	303.67	-7.49	0.87
6,358.00	1.55	70.62	6,343.72	-6.31	306.58	-6.58	0.62
6,452.00	1.56	50.55	6,437.68	-5.08	308.76	-5.35	0.58
6,547.00	1.32	71.02	6,532.65	-3.90	310.80	-4.17	0.59
6,641.00	0.81	36.11	6,626.64	-3.01	312.21	-3.29	0.85
6,735.00	0.62	58.46	6,720.63	-2.21	313.04	-2.48	0.36
6,830.00	0.68	60.07	6,815.62	-1.66	313.96	-1.93	0.07
6,877.00	1.17	29.86	6,862.62	-1.10	314.45	-1.38	1.44
6,924.00	6.65	9.08	6,909.49	2.00	315.11	1.73	11.85
6,971.00	11.62	12.14	6,955.88	9.32	316.54	9.04	10.62
7,019.00	16.09	15.05	7,002.47	20.48	319.29	20.20	9.42
7,066.00	18.31	8.07	7,047.37	34.08	322.01	33.80	6.44
7,113.00	22.82	5.26	7,091.37	50.47	323.89	50.19	9.82
7,160.00	27.17	0.96	7,133.96	70.29	324.90	70.01	10.02
7,207.00	31.85	356.98	7,174.86	93.42	324.43	93.13	10.79
7,254.00	35.64	359.18	7,213.93	119.50	323.58	119.22	8.47
7,302.00	39.51	0.46	7,251.97	148.77	323.50	148.48	8.22
7,349.00	43.78	1.52	7,287.08	179.99	324.05	179.70	9.21
7,396.00	46.76	0.39	7,320.16	213.37	324.60	213.08	6.57
7,443.00	50.51	1.21	7,351.21	248.63	325.10	248.35	8.09
7,490.00	53.82	2.57	7,380.04	285.72	326.33	285.44	7.40
7,537.00	58.11	2.27	7,406.34	324.63	327.98	324.34	9.14
7,585.00	61.82	2.14	7,430.36	366.14	329.57	365.86	7.73
7,632.00	64.26	1.14	7,451.66	408.02	330.77	407.73	5.53
7,679.00	69.54	359.73	7,470.10	451.23	331.09	450.94	11.57
7,726.00	73.47	358.80	7,485.01	495.79	330.51	495.50	8.57
7,773.00	76.50	0.08	7,497.18	541.18	330.07	540.89	6.96
7,820.00	81.61	1.25	7,506.10	587.30	330.61	587.01	11.14
7,836.00	83.23	1.20	7,508.21	603.16	330.95	602.87	10.13
7,838.46	83.36	1.19	7,508.50	605.60	331.00	605.31	5.34



**Design Report for NRC 4N-4HZ - Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
7"							
7,924.00	87.90	0.67	7,515.02	690.86	332.38	690.57	5.34
8,019.00	88.71	0.43	7,517.83	785.81	333.29	785.52	0.89
8,113.00	89.51	359.49	7,519.29	879.80	333.22	879.51	1.31
8,208.00	90.46	359.11	7,519.31	974.79	332.06	974.50	1.08
8,302.00	91.02	359.80	7,518.10	1,068.78	331.17	1,068.49	0.95
8,397.00	91.14	1.29	7,516.31	1,163.75	332.07	1,163.46	1.57
8,491.00	90.28	1.48	7,515.14	1,257.72	334.35	1,257.42	0.94
8,586.00	90.92	1.20	7,514.15	1,352.68	336.57	1,352.39	0.74
8,680.00	89.88	1.65	7,513.49	1,446.65	338.90	1,446.36	1.21
8,774.00	89.17	1.95	7,514.27	1,540.60	341.86	1,540.30	0.82
8,869.00	89.78	1.56	7,515.14	1,635.55	344.77	1,635.25	0.76
8,963.00	90.56	0.85	7,514.86	1,729.53	346.74	1,729.23	1.12
9,058.00	91.30	0.77	7,513.32	1,824.51	348.09	1,824.20	0.78
9,152.00	92.25	0.23	7,510.41	1,918.46	348.91	1,918.15	1.16
9,243.00	92.47	0.01	7,506.66	2,009.38	349.10	2,009.07	0.34
9,336.00	91.79	359.83	7,503.20	2,102.31	348.97	2,102.01	0.76
9,428.00	91.51	359.69	7,500.55	2,194.28	348.58	2,193.97	0.34
9,520.00	91.05	359.40	7,498.50	2,286.25	347.85	2,285.95	0.59
9,613.00	90.80	359.60	7,497.00	2,379.23	347.04	2,378.93	0.34
9,706.00	89.63	359.57	7,496.65	2,472.23	346.37	2,471.93	1.26
9,799.00	90.28	359.71	7,496.72	2,565.23	345.78	2,564.92	0.71
9,892.00	90.86	359.12	7,495.80	2,658.22	344.83	2,657.91	0.89
9,984.00	89.63	358.77	7,495.40	2,750.20	343.14	2,749.90	1.39
10,076.00	90.12	359.03	7,495.60	2,842.18	341.37	2,841.88	0.60
10,169.00	90.52	358.33	7,495.08	2,935.15	339.23	2,934.86	0.87
10,262.00	91.11	358.07	7,493.76	3,028.10	336.31	3,027.80	0.69
10,355.00	91.76	357.78	7,491.43	3,121.01	332.94	3,120.72	0.77
10,448.00	90.31	357.41	7,489.75	3,213.91	329.04	3,213.62	1.61
10,540.00	90.09	359.93	7,489.43	3,305.87	326.91	3,305.59	2.75
10,633.00	88.98	0.08	7,490.19	3,398.87	326.91	3,398.58	1.20
10,724.00	89.48	359.56	7,491.41	3,489.86	326.63	3,489.57	0.79
10,817.00	88.67	0.83	7,492.91	3,582.85	326.94	3,582.56	1.62
10,910.00	89.23	359.60	7,494.62	3,675.83	327.29	3,675.54	1.45
11,003.00	89.66	358.96	7,495.52	3,768.81	326.12	3,768.53	0.83
11,096.00	90.12	359.04	7,495.69	3,861.80	324.50	3,861.52	0.50
11,189.00	91.11	358.44	7,494.70	3,954.77	322.46	3,954.49	1.24
11,282.00	90.80	359.65	7,493.15	4,047.74	320.91	4,047.46	1.34
11,374.00	90.03	359.34	7,492.48	4,139.74	320.10	4,139.46	0.90
11,467.00	89.66	359.61	7,492.73	4,232.73	319.24	4,232.45	0.49
11,557.00	88.89	1.82	7,493.87	4,322.71	320.37	4,322.43	2.60
11,649.00	89.23	1.70	7,495.38	4,414.66	323.19	4,414.37	0.39
11,741.00	89.72	1.38	7,496.22	4,506.62	325.66	4,506.33	0.64
11,832.00	90.15	1.05	7,496.33	4,597.60	327.59	4,597.31	0.60
11,926.00	89.75	1.16	7,496.41	4,691.58	329.41	4,691.29	0.44
12,021.00	90.37	0.90	7,496.31	4,786.56	331.11	4,786.27	0.71
12,115.00	89.41	1.60	7,496.49	4,880.54	333.16	4,880.25	1.26
12,209.00	89.78	1.14	7,497.15	4,974.51	335.41	4,974.21	0.63
12,304.00	90.00	1.23	7,497.34	5,069.49	337.38	5,069.19	0.25
12,398.00	90.34	0.53	7,497.06	5,163.48	338.82	5,163.18	0.83
12,492.00	89.17	1.32	7,497.46	5,257.46	340.34	5,257.16	1.50

**Design Report for NRC 4N-4HZ - Surveys**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
12,587.00	89.91	1.15	7,498.22	5,352.44	342.39	5,352.13	0.80
12,681.00	90.34	0.89	7,498.02	5,446.42	344.06	5,446.12	0.53
12,776.00	89.69	1.13	7,497.99	5,541.40	345.73	5,541.10	0.73
12,870.00	90.31	0.87	7,497.99	5,635.39	347.37	5,635.08	0.72
12,964.00	90.52	0.19	7,497.31	5,729.38	348.24	5,729.08	0.76
13,059.00	89.69	0.51	7,497.14	5,824.38	348.82	5,824.07	0.94
13,153.00	88.40	0.68	7,498.70	5,918.36	349.80	5,918.05	1.38
13,247.00	88.49	359.88	7,501.25	6,012.32	350.26	6,012.01	0.86
13,342.00	88.77	359.43	7,503.53	6,107.29	349.69	6,106.99	0.56
13,436.00	89.20	359.36	7,505.19	6,201.27	348.69	6,200.97	0.46
13,530.00	89.38	358.88	7,506.36	6,295.25	347.25	6,294.95	0.55
13,625.00	89.72	358.36	7,507.10	6,390.22	344.96	6,389.92	0.65
13,719.00	90.15	357.98	7,507.21	6,484.18	341.96	6,483.87	0.61
13,813.00	90.89	357.15	7,506.36	6,578.09	337.97	6,577.79	1.18
13,908.00	90.74	357.55	7,505.00	6,672.97	333.58	6,672.68	0.45
14,002.00	90.15	358.11	7,504.27	6,766.90	330.02	6,766.61	0.87
14,096.00	89.54	359.10	7,504.53	6,860.87	327.73	6,860.58	1.24
14,191.00	89.94	358.89	7,504.96	6,955.86	326.06	6,955.57	0.48
14,285.00	88.92	359.00	7,505.89	7,049.84	324.33	7,049.55	1.09
14,380.00	89.57	358.90	7,507.15	7,144.81	322.59	7,144.53	0.69
14,474.00	88.98	0.10	7,508.34	7,238.80	321.77	7,238.51	1.42
14,569.00	89.75	0.39	7,509.39	7,333.79	322.18	7,333.51	0.87
14,663.00	90.31	359.97	7,509.34	7,427.79	322.47	7,427.50	0.74
14,757.00	90.19	0.55	7,508.93	7,521.79	322.90	7,521.50	0.63
14,852.00	90.56	359.91	7,508.31	7,616.78	323.28	7,616.50	0.78
14,946.00	89.04	0.33	7,508.64	7,710.78	323.48	7,710.49	1.68
15,041.00	89.29	359.75	7,510.02	7,805.77	323.54	7,805.48	0.66
15,135.00	89.51	359.20	7,511.00	7,899.76	322.68	7,899.47	0.63
15,230.00	89.51	1.01	7,511.82	7,994.75	322.86	7,994.47	1.91
15,324.00	89.29	0.85	7,512.80	8,088.73	324.38	8,088.45	0.29
15,418.00	89.63	359.65	7,513.69	8,182.73	324.79	8,182.44	1.33
15,512.00	90.40	359.47	7,513.66	8,276.72	324.07	8,276.44	0.84
15,607.00	88.98	359.63	7,514.18	8,371.72	323.32	8,371.43	1.50
15,701.00	89.57	359.30	7,515.37	8,465.70	322.45	8,465.42	0.72
15,796.00	90.46	358.85	7,515.34	8,560.69	320.91	8,560.41	1.05
15,890.00	88.89	359.61	7,515.87	8,654.68	319.65	8,654.40	1.86
15,984.00	90.09	0.13	7,516.71	8,748.67	319.44	8,748.39	1.39
16,078.00	90.15	359.06	7,516.51	8,842.67	318.77	8,842.39	1.14
16,173.00	90.86	359.01	7,515.68	8,937.65	317.17	8,937.37	0.75
16,267.00	91.58	358.79	7,513.68	9,031.61	315.37	9,031.33	0.80
16,361.00	92.29	358.31	7,510.50	9,125.53	312.99	9,125.25	0.91
16,456.00	91.02	0.10	7,507.76	9,220.47	311.67	9,220.20	2.31
16,550.00	91.33	0.50	7,505.83	9,314.45	312.17	9,314.17	0.54
16,645.00	91.79	0.08	7,503.24	9,409.41	312.65	9,409.14	0.66
16,739.00	92.28	0.08	7,499.91	9,503.35	312.78	9,503.08	0.52
16,834.00	91.97	0.86	7,496.38	9,598.28	313.56	9,598.01	0.88
16,928.00	90.86	1.33	7,494.06	9,692.24	315.35	9,691.96	1.28
17,024.00	91.42	0.81	7,492.15	9,788.20	317.14	9,787.92	0.80
<b>Last MWD Survey @ 17024.00'</b>							
17,076.00	91.42	0.81	7,490.86	9,840.18	317.88	9,839.90	0.00
<b>St. Line Projection to Bit @ 17076' MD</b>							

## Design Report for NRC 4N-4HZ - Surveys

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

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
971.00	970.97	-2.05	2.22	Tie-On to Surface Gyro @ 971.00 FT
1,105.00	1,104.96	-1.17	1.24	First MWD Survey @ 1105.00'
17,024.00	7,492.15	9,788.20	317.14	Last MWD Survey @ 17024.00'
17,076.00	7,490.86	9,840.18	317.88	St. Line Projection to Bit @ 17076' MD

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
User	No Target (Freehand)	359.95	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
25.00	971.00	Surface Gyros	NS-GYRO-MS
1,105.00	7,836.00	MWD Surveys- Intermediate	MWD+IFR1+SC
7,924.00	17,024.00	MWD Surveys- Lateral	MWD+IFR1+SC

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,089.00		9 5/8"	9-5/8	13-1/2
7,838.46		7"	7	8-3/4



## Design Report for NRC 4N-4HZ - Surveys

**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
NRC 13-9HZ Pad_Sec	0.00	0.00	-0.40	0.05	-29.95	1,264,984.56	3,167,149.12	40° 3' 33.217 N	104° 54' 10.235 W
- actual wellpath misses target center by 29.95usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			-0.40	10,329.15	-698.23	1,275,308.38	3,166,381.37		
Point 2			-0.40	7,581.05	-672.58	1,272,560.62	3,166,425.53		
Point 3			-0.40	4,929.01	-636.91	1,269,908.98	3,166,479.06		
Point 4			-0.40	4,933.30	1,997.48	1,269,931.01	3,169,113.26		
Point 5			-0.40	4,937.55	4,629.98	1,269,952.99	3,171,745.57		
Point 6			-0.40	4,933.30	1,997.48	1,269,931.01	3,169,113.26		
Point 7			-0.40	4,929.01	-636.91	1,269,908.98	3,166,479.06		
Point 8			-0.40	2,289.57	-633.27	1,267,269.72	3,166,500.47		
Point 9			-0.40	-350.08	-629.55	1,264,630.26	3,166,521.97		
Point 10			-0.40	-349.24	1,997.80	1,264,648.79	3,169,149.16		
Point 11			-0.40	-348.39	4,625.17	1,264,667.34	3,171,776.36		
Point 12			-0.40	2,294.58	4,627.58	1,267,310.17	3,171,760.97		
Point 13			-0.40	4,937.55	4,629.98	1,269,952.99	3,171,745.57		
Point 14			-0.40	7,577.90	4,612.90	1,272,593.07	3,171,710.71		
Point 15			-0.40	10,308.11	4,581.57	1,275,322.90	3,171,660.99		
Point 16			-0.40	10,318.54	1,941.91	1,275,315.56	3,169,021.42		
Point 17			-0.40	10,329.15	-698.23	1,275,308.38	3,166,381.37		
NRC 4N-4HZ SHL	0.00	0.00	0.00	0.03	0.00	1,264,984.75	3,167,179.07	40° 3' 33.217 N	104° 54' 9.850 W
- actual wellpath misses target center by 0.03usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
NRC 4N-4HZ LD	0.00	0.00	0.00	0.03	0.00	1,264,984.75	3,167,179.07	40° 3' 33.217 N	104° 54' 9.850 W
- actual wellpath misses target center by 0.03usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Polygon									
Point 1			0.00	110.22	193.82	1,265,096.27	3,167,372.14		
Point 2			0.00	2,290.40	192.22	1,267,276.30	3,167,355.86		
Point 3			0.00	4,930.42	190.30	1,269,916.15	3,167,336.16		
Point 4			0.00	7,580.52	159.62	1,272,565.89	3,167,287.63		
Point 5			0.00	9,865.66	136.49	1,274,850.73	3,167,249.11		
Point 6			0.00	9,861.96	1,056.61	1,274,853.23	3,168,169.20		
Point 7			0.00	7,579.96	1,079.71	1,272,571.52	3,168,207.67		
Point 8			0.00	4,931.91	1,110.36	1,269,923.84	3,168,256.15		
Point 9			0.00	2,291.27	1,112.25	1,267,283.37	3,168,275.83		
Point 10			0.00	110.52	1,113.86	1,265,102.76	3,168,292.12		
Point 11			0.00	110.22	193.82	1,265,096.27	3,167,372.14		
NRC 4N-4HZ BHL_Re	0.00	0.00	7,509.00	9,865.40	315.00	1,274,851.64	3,167,427.61	40° 5' 10.709 N	104° 54' 5.797 W
- actual wellpath misses target center by 31.20usft at 17076.00usft MD (7490.86 TVD, 9840.18 N, 317.88 E)									
- Point									
NRC 4N-4HZ BHL_Re	0.00	0.00	7,509.00	9,865.40	296.15	1,274,851.51	3,167,408.76	40° 5' 10.709 N	104° 54' 6.039 W
- actual wellpath misses target center by 37.91usft at 17076.00usft MD (7490.86 TVD, 9840.18 N, 317.88 E)									
- Point									
NRC 4N-4HZ BHL	0.00	0.00	7,509.00	9,865.40	196.15	1,274,850.84	3,167,308.76	40° 5' 10.709 N	104° 54' 7.326 W
- actual wellpath misses target center by 125.63usft at 17076.00usft MD (7490.86 TVD, 9840.18 N, 317.88 E)									
- Point									

**Directional Difficulty Index**

Average Dogleg over Survey:	1.37 °/100usft	Maximum Dogleg over Survey:	11.85 °/100usft at 6,924.00 usft
Net Tortosity applicable to Plans:	0.74 °/100usft	Directional Difficulty Index:	6.733

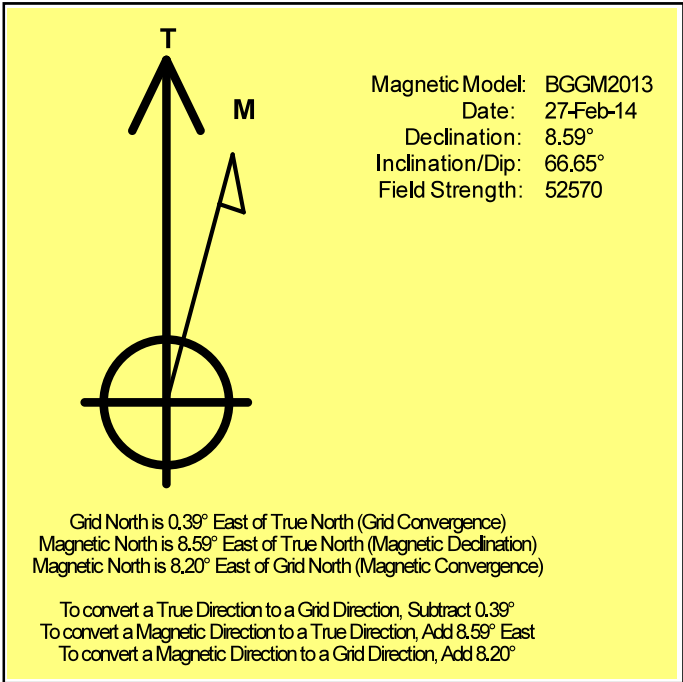
**Audit Info**

**North Reference Sheet for Sec. 9-T1N-R67W - NRC 4N-4HZ - Plan A**

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.  
 Vertical Depths are relative to RKB= 25' @ 5089.20usft (H&P 308). Northing and Easting are relative to NRC 4N-4HZ  
 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: 0.99996240

Grid Coordinates of Well: 1,264,984.71 usft N, 3,167,179.07 usft E  
 Geographical Coordinates of Well: 40° 03' 33.22" N, 104° 54' 09.85" W  
 Grid Convergence at Surface is: 0.39°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,076.00usft  
 the Bottom Hole Displacement is 9,845.31usft in the Direction of 1.85° (True).  
 Magnetic Convergence at surface is: -8.20° (27 February 2014, , BGGM2013)



# Anadarko Petroleum Corp.

Weld County, CO (NAD 83)

Sec. 9-T1N-R67W

NRC 4N-4HZ

Job#901165847::API:05-123-38627

Plan A

Design: Surveys

## Sperry Drilling Services

### Geodetic Report

25 August, 2014

Well Coordinates: 1,264,984.71 N, 3,167,179.07 E (40° 03' 33.22" N, 104° 54' 09.85" W)

Ground Level: 5,064.20 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 NRC 4N-4HZ

RKB= 25' @ 5089.20usft (H&P 308)

N

True

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

## Design Report for NRC 4N-4HZ - Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
0.00	0.00	0.00	0.00	0.00	0.00	40.059227	-104.902736	1,264,984.71	3,167,179.07
25.00	0.00	0.00	25.00	0.00	0.00	40.059227	-104.902736	1,264,984.71	3,167,179.07
125.00	0.45	68.51	125.00	0.14	0.37	40.059227	-104.902735	1,264,984.86	3,167,179.44
225.00	0.49	88.09	225.00	0.30	1.16	40.059228	-104.902732	1,264,985.02	3,167,180.23
325.00	0.53	87.17	324.99	0.34	2.05	40.059228	-104.902729	1,264,985.07	3,167,181.12
425.00	0.39	42.29	424.99	0.61	2.74	40.059229	-104.902726	1,264,985.35	3,167,181.81
525.00	0.42	126.32	524.99	0.65	3.26	40.059229	-104.902725	1,264,985.38	3,167,182.33
625.00	0.54	178.40	624.98	-0.04	3.57	40.059227	-104.902724	1,264,984.70	3,167,182.65
725.00	0.19	109.81	724.98	-0.57	3.74	40.059225	-104.902723	1,264,984.17	3,167,182.82
825.00	0.75	221.76	824.98	-1.11	3.46	40.059224	-104.902724	1,264,983.63	3,167,182.54
925.00	0.72	233.12	924.97	-1.98	2.52	40.059222	-104.902727	1,264,982.75	3,167,181.61
971.00	0.32	324.06	970.97	-2.05	2.22	40.059221	-104.902728	1,264,982.68	3,167,181.30
1,089.00	0.75	307.73	1,088.96	-1.31	1.41	40.059223	-104.902731	1,264,983.42	3,167,180.49
1,105.00	0.81	306.87	1,104.96	-1.17	1.24	40.059224	-104.902732	1,264,983.55	3,167,180.32
1,197.00	0.68	277.60	1,196.96	-0.71	0.18	40.059225	-104.902736	1,264,984.00	3,167,179.26
1,289.00	0.71	284.32	1,288.95	-0.50	-0.92	40.059226	-104.902740	1,264,984.21	3,167,178.16
1,382.00	1.09	294.78	1,381.94	0.01	-2.28	40.059227	-104.902744	1,264,984.71	3,167,176.80
1,475.00	1.09	282.65	1,474.92	0.58	-3.94	40.059229	-104.902750	1,264,985.27	3,167,175.13
1,568.00	0.40	24.22	1,567.91	1.07	-4.67	40.059230	-104.902753	1,264,985.75	3,167,174.39
1,660.00	0.40	355.62	1,659.91	1.68	-4.57	40.059232	-104.902753	1,264,986.36	3,167,174.50
1,753.00	1.07	82.15	1,752.91	2.12	-3.73	40.059233	-104.902750	1,264,986.81	3,167,175.33
1,845.00	0.82	75.32	1,844.89	2.41	-2.24	40.059234	-104.902744	1,264,987.11	3,167,176.81
1,938.00	0.62	63.30	1,937.89	2.80	-1.15	40.059235	-104.902740	1,264,987.51	3,167,177.90
2,031.00	0.84	23.85	2,030.88	3.65	-0.43	40.059237	-104.902738	1,264,988.36	3,167,178.62
2,124.00	0.63	46.16	2,123.87	4.63	0.22	40.059240	-104.902735	1,264,989.34	3,167,179.26
2,217.00	0.96	27.00	2,216.86	5.68	0.94	40.059243	-104.902733	1,264,990.40	3,167,179.98
2,309.00	1.45	17.79	2,308.84	7.47	1.65	40.059247	-104.902730	1,264,992.20	3,167,180.67
2,402.00	1.74	16.87	2,401.81	9.94	2.42	40.059254	-104.902728	1,264,994.67	3,167,181.42
2,493.00	1.94	56.72	2,492.76	12.11	4.10	40.059260	-104.902722	1,264,996.85	3,167,183.10
2,586.00	1.85	42.24	2,585.71	14.09	6.43	40.059266	-104.902713	1,264,998.84	3,167,185.41
2,679.00	2.36	94.98	2,678.66	15.03	9.35	40.059268	-104.902703	1,264,999.81	3,167,188.32
2,772.00	2.05	97.12	2,771.59	14.66	12.91	40.059267	-104.902690	1,264,999.46	3,167,191.88
2,867.00	1.68	102.77	2,866.54	14.14	15.95	40.059266	-104.902679	1,264,998.96	3,167,194.93
2,961.00	1.03	107.21	2,960.51	13.59	18.10	40.059264	-104.902672	1,264,998.42	3,167,197.08
3,056.00	2.68	98.18	3,055.46	13.02	21.11	40.059263	-104.902661	1,264,997.87	3,167,200.10
3,150.00	4.26	110.31	3,149.28	11.49	26.56	40.059259	-104.902641	1,264,996.39	3,167,205.56
3,244.00	4.01	108.05	3,243.04	9.26	32.96	40.059252	-104.902619	1,264,994.20	3,167,211.97
3,339.00	5.45	110.05	3,337.71	6.69	40.36	40.059245	-104.902592	1,264,991.67	3,167,219.39
3,433.00	5.09	112.55	3,431.32	3.56	48.40	40.059237	-104.902563	1,264,988.60	3,167,227.45
3,527.00	6.32	104.63	3,524.85	0.65	57.26	40.059229	-104.902532	1,264,985.75	3,167,236.33
3,621.00	5.10	99.17	3,618.38	-1.32	66.39	40.059223	-104.902499	1,264,983.84	3,167,245.47
3,715.00	6.89	108.33	3,711.87	-3.76	75.87	40.059217	-104.902465	1,264,981.46	3,167,254.97

## Design Report for NRC 4N-4HZ - Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
3,810.00	6.49	108.12	3,806.22	-7.22	86.38	40.059207	-104.902428	1,264,978.07	3,167,265.50
3,904.00	5.38	102.61	3,899.72	-9.84	95.73	40.059200	-104.902394	1,264,975.52	3,167,274.87
3,999.00	6.82	99.44	3,994.18	-11.73	105.64	40.059195	-104.902359	1,264,973.69	3,167,284.79
4,093.00	5.72	97.29	4,087.61	-13.24	115.80	40.059191	-104.902323	1,264,972.25	3,167,294.95
4,187.00	4.86	100.62	4,181.21	-14.57	124.36	40.059187	-104.902292	1,264,970.98	3,167,303.52
4,282.00	6.66	95.95	4,275.73	-15.88	133.79	40.059183	-104.902258	1,264,969.73	3,167,312.97
4,376.00	5.72	91.41	4,369.18	-16.57	143.90	40.059181	-104.902222	1,264,969.12	3,167,323.07
4,470.00	5.29	89.60	4,462.75	-16.65	152.91	40.059181	-104.902190	1,264,969.09	3,167,332.09
4,565.00	6.26	73.15	4,557.27	-15.12	162.25	40.059185	-104.902157	1,264,970.69	3,167,341.42
4,659.00	5.06	69.35	4,650.81	-12.17	171.03	40.059194	-104.902125	1,264,973.70	3,167,350.18
4,753.00	4.95	77.05	4,744.45	-9.80	178.87	40.059200	-104.902097	1,264,976.12	3,167,358.00
4,848.00	5.56	78.68	4,839.05	-7.98	187.37	40.059205	-104.902067	1,264,978.00	3,167,366.49
4,942.00	7.00	85.40	4,932.49	-6.62	197.55	40.059209	-104.902031	1,264,979.42	3,167,376.66
5,036.00	6.23	86.29	5,025.86	-5.84	208.35	40.059211	-104.901992	1,264,980.28	3,167,387.45
5,131.00	5.61	84.89	5,120.35	-5.09	218.12	40.059213	-104.901957	1,264,981.09	3,167,397.21
5,225.00	6.05	95.82	5,213.87	-5.18	227.62	40.059213	-104.901923	1,264,981.07	3,167,406.72
5,320.00	5.92	93.55	5,308.35	-5.99	237.49	40.059211	-104.901888	1,264,980.32	3,167,416.59
5,414.00	5.30	93.22	5,401.90	-6.54	246.66	40.059209	-104.901855	1,264,979.84	3,167,425.77
5,508.00	4.34	91.15	5,495.57	-6.85	254.56	40.059208	-104.901827	1,264,979.58	3,167,433.66
5,603.00	6.19	93.93	5,590.16	-7.27	263.26	40.059207	-104.901796	1,264,979.21	3,167,442.37
5,697.00	5.17	88.08	5,683.70	-7.48	272.55	40.059206	-104.901763	1,264,979.07	3,167,451.66
5,791.00	4.32	80.05	5,777.38	-6.73	280.27	40.059208	-104.901735	1,264,979.88	3,167,459.37
5,886.00	3.49	95.48	5,872.16	-6.38	286.67	40.059209	-104.901712	1,264,980.26	3,167,465.77
5,980.00	2.64	97.98	5,966.02	-6.96	291.66	40.059208	-104.901694	1,264,979.72	3,167,470.77
6,074.00	2.68	91.31	6,059.92	-7.31	296.00	40.059207	-104.901679	1,264,979.40	3,167,475.11
6,169.00	2.29	95.13	6,154.83	-7.53	300.12	40.059206	-104.901664	1,264,979.21	3,167,479.22
6,263.00	2.13	74.19	6,248.77	-7.22	303.67	40.059207	-104.901651	1,264,979.54	3,167,482.77
6,358.00	1.55	70.62	6,343.72	-6.31	306.58	40.059210	-104.901641	1,264,980.46	3,167,485.68
6,452.00	1.56	50.55	6,437.68	-5.08	308.76	40.059213	-104.901633	1,264,981.71	3,167,487.85
6,547.00	1.32	71.02	6,532.65	-3.90	310.80	40.059216	-104.901626	1,264,982.91	3,167,489.88
6,641.00	0.81	36.11	6,626.64	-3.01	312.21	40.059219	-104.901621	1,264,983.80	3,167,491.29
6,735.00	0.62	58.46	6,720.63	-2.21	313.04	40.059221	-104.901618	1,264,984.61	3,167,492.11
6,830.00	0.68	60.07	6,815.62	-1.66	313.96	40.059222	-104.901615	1,264,985.17	3,167,493.03
6,877.00	1.17	29.86	6,862.62	-1.10	314.45	40.059224	-104.901613	1,264,985.73	3,167,493.51
6,924.00	6.65	9.08	6,909.49	2.00	315.11	40.059232	-104.901611	1,264,988.84	3,167,494.16
6,971.00	11.62	12.14	6,955.88	9.32	316.54	40.059253	-104.901605	1,264,996.17	3,167,495.53
7,019.00	16.09	15.05	7,002.47	20.48	319.29	40.059283	-104.901596	1,265,007.34	3,167,498.20
7,066.00	18.31	8.07	7,047.37	34.08	322.01	40.059321	-104.901586	1,265,020.96	3,167,500.84
7,113.00	22.82	5.26	7,091.37	50.47	323.89	40.059366	-104.901579	1,265,037.36	3,167,502.60
7,160.00	27.17	0.96	7,133.96	70.29	324.90	40.059420	-104.901576	1,265,057.19	3,167,503.48
7,207.00	31.85	356.98	7,174.86	93.42	324.43	40.059483	-104.901577	1,265,080.31	3,167,502.85
7,254.00	35.64	359.18	7,213.93	119.50	323.58	40.059555	-104.901580	1,265,106.39	3,167,501.83

## Design Report for NRC 4N-4HZ - Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
7,302.00	39.51	0.46	7,251.97	148.77	323.50	40.059635	-104.901581	1,265,135.65	3,167,501.55
7,349.00	43.78	1.52	7,287.08	179.99	324.05	40.059721	-104.901579	1,265,166.87	3,167,501.90
7,396.00	46.76	0.39	7,320.16	213.37	324.60	40.059813	-104.901577	1,265,200.25	3,167,502.22
7,443.00	50.51	1.21	7,351.21	248.63	325.10	40.059909	-104.901575	1,265,235.52	3,167,502.48
7,490.00	53.82	2.57	7,380.04	285.72	326.33	40.060011	-104.901570	1,265,272.62	3,167,503.46
7,537.00	58.11	2.27	7,406.34	324.63	327.98	40.060118	-104.901565	1,265,311.53	3,167,504.84
7,585.00	61.82	2.14	7,430.36	366.14	329.57	40.060232	-104.901559	1,265,353.06	3,167,506.16
7,632.00	64.26	1.14	7,451.66	408.02	330.77	40.060347	-104.901555	1,265,394.93	3,167,507.08
7,679.00	69.54	359.73	7,470.10	451.23	331.09	40.060466	-104.901553	1,265,438.15	3,167,507.10
7,726.00	73.47	358.80	7,485.01	495.79	330.51	40.060588	-104.901556	1,265,482.70	3,167,506.23
7,773.00	76.50	0.08	7,497.18	541.18	330.07	40.060713	-104.901557	1,265,528.08	3,167,505.48
7,820.00	81.61	1.25	7,506.10	587.30	330.61	40.060839	-104.901555	1,265,574.21	3,167,505.71
7,836.00	83.23	1.20	7,508.21	603.16	330.95	40.060883	-104.901554	1,265,590.06	3,167,505.94
7,838.46	83.36	1.19	7,508.50	605.60	331.00	40.060889	-104.901554	1,265,592.51	3,167,505.98
7,924.00	87.90	0.67	7,515.02	690.86	332.38	40.061123	-104.901549	1,265,677.77	3,167,506.78
8,019.00	88.71	0.43	7,517.83	785.81	333.29	40.061384	-104.901546	1,265,772.72	3,167,507.05
8,113.00	89.51	359.49	7,519.29	879.80	333.22	40.061642	-104.901546	1,265,866.70	3,167,506.35
8,208.00	90.46	359.11	7,519.31	974.79	332.06	40.061903	-104.901550	1,265,961.68	3,167,504.55
8,302.00	91.02	359.80	7,518.10	1,068.78	331.17	40.062161	-104.901553	1,266,055.66	3,167,503.03
8,397.00	91.14	1.29	7,516.31	1,163.75	332.07	40.062422	-104.901550	1,266,150.63	3,167,503.29
8,491.00	90.28	1.48	7,515.14	1,257.72	334.35	40.062679	-104.901542	1,266,244.61	3,167,504.93
8,586.00	90.92	1.20	7,514.15	1,352.68	336.57	40.062940	-104.901534	1,266,339.58	3,167,506.51
8,680.00	89.88	1.65	7,513.49	1,446.65	338.90	40.063198	-104.901525	1,266,433.56	3,167,508.21
8,774.00	89.17	1.95	7,514.27	1,540.60	341.86	40.063456	-104.901515	1,266,527.52	3,167,510.53
8,869.00	89.78	1.56	7,515.14	1,635.55	344.77	40.063717	-104.901505	1,266,622.49	3,167,512.80
8,963.00	90.56	0.85	7,514.86	1,729.53	346.74	40.063975	-104.901497	1,266,716.47	3,167,514.15
9,058.00	91.30	0.77	7,513.32	1,824.51	348.09	40.064235	-104.901493	1,266,811.46	3,167,514.85
9,152.00	92.25	0.23	7,510.41	1,918.46	348.91	40.064493	-104.901490	1,266,905.41	3,167,515.04
9,243.00	92.47	0.01	7,506.66	2,009.38	349.10	40.064743	-104.901489	1,266,996.32	3,167,514.62
9,336.00	91.79	359.83	7,503.20	2,102.31	348.97	40.064998	-104.901489	1,267,089.25	3,167,513.86
9,428.00	91.51	359.69	7,500.55	2,194.28	348.58	40.065250	-104.901491	1,267,181.20	3,167,512.86
9,520.00	91.05	359.40	7,498.50	2,286.25	347.85	40.065503	-104.901493	1,267,273.17	3,167,511.51
9,613.00	90.80	359.60	7,497.00	2,379.23	347.04	40.065758	-104.901496	1,267,366.14	3,167,510.07
9,706.00	89.63	359.57	7,496.65	2,472.23	346.37	40.066013	-104.901499	1,267,459.13	3,167,508.77
9,799.00	90.28	359.71	7,496.72	2,565.23	345.78	40.066269	-104.901501	1,267,552.11	3,167,507.56
9,892.00	90.86	359.12	7,495.80	2,658.22	344.83	40.066524	-104.901504	1,267,645.09	3,167,505.98
9,984.00	89.63	358.77	7,495.40	2,750.20	343.14	40.066776	-104.901510	1,267,737.06	3,167,503.67
10,076.00	90.12	359.03	7,495.60	2,842.18	341.37	40.067029	-104.901517	1,267,829.02	3,167,501.28
10,169.00	90.52	358.33	7,495.08	2,935.15	339.23	40.067284	-104.901524	1,267,921.98	3,167,498.51
10,262.00	91.11	358.07	7,493.76	3,028.10	336.31	40.067539	-104.901535	1,268,014.89	3,167,494.97
10,355.00	91.76	357.78	7,491.43	3,121.01	332.94	40.067794	-104.901547	1,268,107.77	3,167,490.98
10,448.00	90.31	357.41	7,489.75	3,213.91	329.04	40.068049	-104.901561	1,268,200.64	3,167,486.45



## Design Report for NRC 4N-4HZ - Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
10,540.00	90.09	359.93	7,489.43	3,305.87	326.91	40.068302	-104.901568	1,268,292.59	3,167,483.69
10,633.00	88.98	0.08	7,490.19	3,398.87	326.91	40.068557	-104.901568	1,268,385.58	3,167,483.08
10,724.00	89.48	359.56	7,491.41	3,489.86	326.63	40.068807	-104.901569	1,268,476.56	3,167,482.18
10,817.00	88.67	0.83	7,492.91	3,582.85	326.94	40.069062	-104.901568	1,268,569.55	3,167,481.87
10,910.00	89.23	359.60	7,494.62	3,675.83	327.29	40.069317	-104.901567	1,268,662.52	3,167,481.59
11,003.00	89.66	358.96	7,495.52	3,768.81	326.12	40.069573	-104.901571	1,268,755.50	3,167,479.80
11,096.00	90.12	359.04	7,495.69	3,861.80	324.50	40.069828	-104.901577	1,268,848.47	3,167,477.55
11,189.00	91.11	358.44	7,494.70	3,954.77	322.46	40.070083	-104.901584	1,268,941.42	3,167,474.88
11,282.00	90.80	359.65	7,493.15	4,047.74	320.91	40.070338	-104.901590	1,269,034.37	3,167,472.70
11,374.00	90.03	359.34	7,492.48	4,139.74	320.10	40.070591	-104.901593	1,269,126.36	3,167,471.27
11,467.00	89.66	359.61	7,492.73	4,232.73	319.24	40.070846	-104.901596	1,269,219.34	3,167,469.79
11,557.00	88.89	1.82	7,493.87	4,322.71	320.37	40.071093	-104.901592	1,269,309.32	3,167,470.31
11,649.00	89.23	1.70	7,495.38	4,414.66	323.19	40.071345	-104.901581	1,269,401.28	3,167,472.51
11,741.00	89.72	1.38	7,496.22	4,506.62	325.66	40.071598	-104.901573	1,269,493.25	3,167,474.37
11,832.00	90.15	1.05	7,496.33	4,597.60	327.59	40.071848	-104.901566	1,269,584.24	3,167,475.68
11,926.00	89.75	1.16	7,496.41	4,691.58	329.41	40.072106	-104.901559	1,269,678.23	3,167,476.86
12,021.00	90.37	0.90	7,496.31	4,786.56	331.11	40.072366	-104.901553	1,269,773.22	3,167,477.93
12,115.00	89.41	1.60	7,496.49	4,880.54	333.16	40.072624	-104.901546	1,269,867.20	3,167,479.35
12,209.00	89.78	1.14	7,497.15	4,974.51	335.41	40.072882	-104.901538	1,269,961.18	3,167,480.96
12,304.00	90.00	1.23	7,497.34	5,069.49	337.38	40.073143	-104.901531	1,270,056.17	3,167,482.29
12,398.00	90.34	0.53	7,497.06	5,163.48	338.82	40.073401	-104.901526	1,270,150.16	3,167,483.10
12,492.00	89.17	1.32	7,497.46	5,257.46	340.34	40.073659	-104.901520	1,270,244.15	3,167,483.98
12,587.00	89.91	1.15	7,498.22	5,352.44	342.39	40.073920	-104.901513	1,270,339.13	3,167,485.39
12,681.00	90.34	0.89	7,498.02	5,446.42	344.06	40.074178	-104.901507	1,270,433.12	3,167,486.43
12,776.00	89.69	1.13	7,497.99	5,541.40	345.73	40.074438	-104.901501	1,270,528.11	3,167,487.46
12,870.00	90.31	0.87	7,497.99	5,635.39	347.37	40.074696	-104.901495	1,270,622.10	3,167,488.47
12,964.00	90.52	0.19	7,497.31	5,729.38	348.24	40.074954	-104.901492	1,270,716.10	3,167,488.71
13,059.00	89.69	0.51	7,497.14	5,824.38	348.82	40.075215	-104.901490	1,270,811.09	3,167,488.65
13,153.00	88.40	0.68	7,498.70	5,918.36	349.80	40.075473	-104.901486	1,270,905.07	3,167,488.99
13,247.00	88.49	359.88	7,501.25	6,012.32	350.26	40.075731	-104.901485	1,270,999.03	3,167,488.82
13,342.00	88.77	359.43	7,503.53	6,107.29	349.69	40.075992	-104.901487	1,271,093.99	3,167,487.61
13,436.00	89.20	359.36	7,505.19	6,201.27	348.69	40.076250	-104.901490	1,271,187.96	3,167,485.98
13,530.00	89.38	358.88	7,506.36	6,295.25	347.25	40.076508	-104.901495	1,271,281.93	3,167,483.90
13,625.00	89.72	358.36	7,507.10	6,390.22	344.96	40.076769	-104.901504	1,271,376.88	3,167,480.98
13,719.00	90.15	357.98	7,507.21	6,484.18	341.96	40.077026	-104.901514	1,271,470.80	3,167,477.34
13,813.00	90.89	357.15	7,506.36	6,578.09	337.97	40.077284	-104.901529	1,271,564.68	3,167,472.72
13,908.00	90.74	357.55	7,505.00	6,672.97	333.58	40.077545	-104.901544	1,271,659.53	3,167,467.69
14,002.00	90.15	358.11	7,504.27	6,766.90	330.02	40.077803	-104.901557	1,271,753.43	3,167,463.50
14,096.00	89.54	359.10	7,504.53	6,860.87	327.73	40.078060	-104.901565	1,271,847.38	3,167,460.57
14,191.00	89.94	358.89	7,504.96	6,955.86	326.06	40.078321	-104.901571	1,271,942.35	3,167,458.27
14,285.00	88.92	359.00	7,505.89	7,049.84	324.33	40.078579	-104.901577	1,272,036.31	3,167,455.90
14,380.00	89.57	358.90	7,507.15	7,144.81	322.59	40.078840	-104.901583	1,272,131.27	3,167,453.52

## Design Report for NRC 4N-4HZ - Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates		Geographic Coordinates		UTM Coordinates	
				+N/-S (usft)	+E/-W (usft)	Latitude (usft)	Longitude (usft)	Northing (usft)	Easting (usft)
14,474.00	88.98	0.10	7,508.34	7,238.80	321.77	40.079098	-104.901586	1,272,225.24	3,167,452.07
14,569.00	89.75	0.39	7,509.39	7,333.79	322.18	40.079359	-104.901585	1,272,320.23	3,167,451.84
14,663.00	90.31	359.97	7,509.34	7,427.79	322.47	40.079617	-104.901584	1,272,414.23	3,167,451.50
14,757.00	90.19	0.55	7,508.93	7,521.79	322.90	40.079875	-104.901582	1,272,508.22	3,167,451.29
14,852.00	90.56	359.91	7,508.31	7,616.78	323.28	40.080136	-104.901581	1,272,603.21	3,167,451.03
14,946.00	89.04	0.33	7,508.64	7,710.78	323.48	40.080394	-104.901580	1,272,697.21	3,167,450.60
15,041.00	89.29	359.75	7,510.02	7,805.77	323.54	40.080654	-104.901580	1,272,792.19	3,167,450.02
15,135.00	89.51	359.20	7,511.00	7,899.76	322.68	40.080912	-104.901583	1,272,886.17	3,167,448.53
15,230.00	89.51	1.01	7,511.82	7,994.75	322.86	40.081173	-104.901583	1,272,981.16	3,167,448.06
15,324.00	89.29	0.85	7,512.80	8,088.73	324.38	40.081431	-104.901577	1,273,075.14	3,167,448.96
15,418.00	89.63	359.65	7,513.69	8,182.73	324.79	40.081689	-104.901576	1,273,169.14	3,167,448.73
15,512.00	90.40	359.47	7,513.66	8,276.72	324.07	40.081947	-104.901578	1,273,263.12	3,167,447.38
15,607.00	88.98	359.63	7,514.18	8,371.72	323.32	40.082208	-104.901581	1,273,358.10	3,167,445.99
15,701.00	89.57	359.30	7,515.37	8,465.70	322.45	40.082466	-104.901584	1,273,452.08	3,167,444.48
15,796.00	90.46	358.85	7,515.34	8,560.69	320.91	40.082727	-104.901589	1,273,547.05	3,167,442.31
15,890.00	88.89	359.61	7,515.87	8,654.68	319.65	40.082985	-104.901594	1,273,641.02	3,167,440.41
15,984.00	90.09	0.13	7,516.71	8,748.67	319.44	40.083243	-104.901595	1,273,735.01	3,167,439.57
16,078.00	90.15	359.06	7,516.51	8,842.67	318.77	40.083501	-104.901597	1,273,829.00	3,167,438.27
16,173.00	90.86	359.01	7,515.68	8,937.65	317.17	40.083761	-104.901603	1,273,923.96	3,167,436.03
16,267.00	91.58	358.79	7,513.68	9,031.61	315.37	40.084019	-104.901609	1,274,017.90	3,167,433.59
16,361.00	92.29	358.31	7,510.50	9,125.53	312.99	40.084277	-104.901618	1,274,111.80	3,167,430.58
16,456.00	91.02	0.10	7,507.76	9,220.47	311.67	40.084538	-104.901622	1,274,206.73	3,167,428.63
16,550.00	91.33	0.50	7,505.83	9,314.45	312.17	40.084796	-104.901621	1,274,300.70	3,167,428.49
16,645.00	91.79	0.08	7,503.24	9,409.41	312.65	40.085056	-104.901619	1,274,395.67	3,167,428.33
16,739.00	92.28	0.08	7,499.91	9,503.35	312.78	40.085314	-104.901618	1,274,489.60	3,167,427.83
16,834.00	91.97	0.86	7,496.38	9,598.28	313.56	40.085575	-104.901616	1,274,584.53	3,167,427.97
16,928.00	90.86	1.33	7,494.06	9,692.24	315.35	40.085833	-104.901609	1,274,678.49	3,167,429.13
17,024.00	91.42	0.81	7,492.15	9,788.20	317.14	40.086096	-104.901603	1,274,774.46	3,167,430.27
17,076.00	91.42	0.81	7,490.86	9,840.18	317.88	40.086239	-104.901600	1,274,826.44	3,167,430.66

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
971.00	970.97	-2.05	2.22	Tie-On to Surface Gyro @ 971.00 FT
1,105.00	1,104.96	-1.17	1.24	First MWD Survey @ 1105.00'
17,024.00	7,492.15	9,788.20	317.14	Last MWD Survey @ 17024.00'
17,076.00	7,490.86	9,840.18	317.88	St. Line Projection to Bit @ 17076' MD

## Design Report for NRC 4N-4HZ - Surveys

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
User	No Target (Freehand)	359.95	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
25.00	971.00	Surface Gyros	NS-GYRO-MS
1,105.00	7,836.00	MWD Surveys- Intermediate	MWD+IFR1+SC
7,924.00	17,024.00	MWD Surveys- Lateral	MWD+IFR1+SC

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,089.00	1,088.96	9 5/8"	9-5/8	13-1/2
7,838.46	7,508.50	7"	7	8-3/4

### Design Targets

Shape	Target Name	TVD (usft)	Northing (usft)	Easting (usft)	+N/-S usft	+E/-W usft	Created	Updated
Polygon	NRC 13-9HZ Pad_Sec. Lir	-0.40	1,264,984.56	3,167,149.12	0.05	-29.95	3/2/2014	3/2/2014

### Directional Difficulty Index

Average Dogleg over Survey:	1.37 °/100usft	Maximum Dogleg over Survey:	11.85 °/100usft at 6,924.00 usft
Net Tortousity applicable to Plans:	0.74 °/100usft	Directional Difficulty Index:	6.733

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**Design Report for NRC 4N-4HZ - Surveys**

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*Audit Info*

## North Reference Sheet for Sec. 9-T1N-R67W - NRC 4N-4HZ - Plan A

All data is in US Feet unless otherwise stated. Directions and Coordinates are relative to True North Reference.

Vertical Depths are relative to RKB= 25' @ 5089.20usft (H&P 308). Northing and Easting are relative to NRC 4N-4HZ

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: 0.99996240

Grid Coordinates of Well: 1,264,984.71 usft N, 3,167,179.07 usft E

Geographical Coordinates of Well: 40° 03' 33.22" N, 104° 54' 09.85" W

Grid Convergence at Surface is: 0.39°

Based upon Minimum Curvature type calculations, at a Measured Depth of 17,076.00usft

the Bottom Hole Displacement is 9,845.31usft in the Direction of 1.85° (True).

Magnetic Convergence at surface is: -8.20° (27 February 2014, , BGGM2013)

