

# Noble Energy

Weld County, CO (NAD 83)

Sec. 11-T6N-R63W (Wells Ranch PAD)

Wells Ranch AA11-623

05-123-41248

Original Wellbore

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

30 July, 2015

Surface UWI : 05-123-41248

Well Coordinates: 1,425,338.67 N, 3,307,305.98 E (40° 29' 44.52" N, 104° 23' 42.07" W)

Ground Level: 4,833.00 usft

Local Coordinate Origin:

Centered on Well Wells Ranch AA11-623

Viewing Datum:

KB @ 4857.00usft (HP 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: 73

**HALLIBURTON**

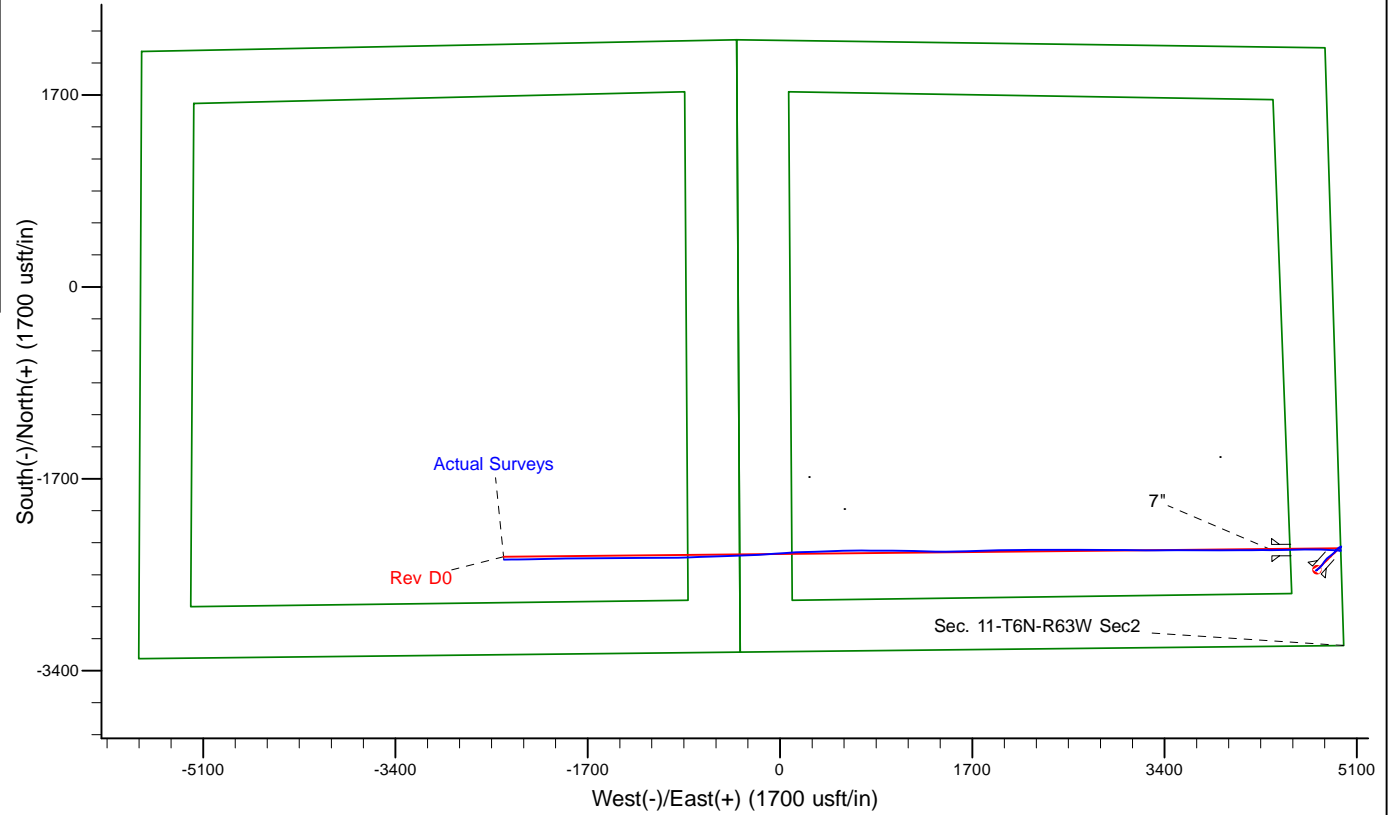
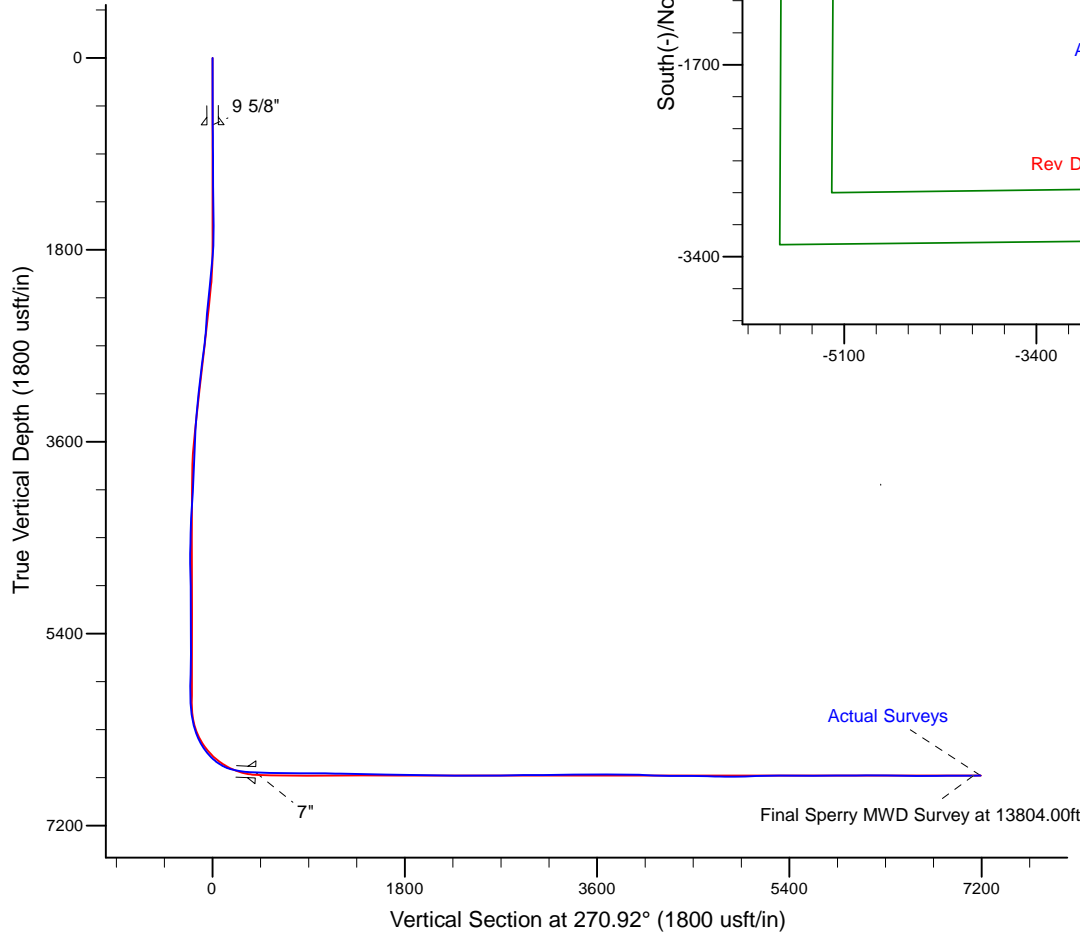
Project: Weld County, CO (NAD 83)  
 Site: Sec. 11-T6N-R63W (Wells Ranch PAD)  
 Well: Wells Ranch AA11-623  
 Wellbore: Original Wellbore  
 Design: Actual Surveys



Platted SHL: 675' FSL, 215' FEL  
 Platted Lat/Long: 40.4957, -104.395020  
 Location: Sec. 11-T6N-R63W

~7" Casing: 603' FEL, 851' FSL  
 Lat/Long: 40.496193 N, -104.396449 W  
 State Planes - CO Northern: 1,425,513.42 N, 3,306,906.42 E  
 Sec. 11-T6N-R63W

Platted BHL: 867' FSL, 2085' FEL  
 Platted Lat/Long: 40.496190 N, 104.420619 W  
 State Planes - CO Northern: 1,425,429.60 N, 3,300,184.84 E  
 Location: Sec. 10-T6N-R63W



LEGEND	
	Wells Ranch AA11-623, Original Wellbore, Rev D0 V0
	Actual Surveys

WELL DETAILS: Wells Ranch AA11-623	
Ground Level:	4833.00
KB @ 4857.00usft (HP 343)	
Created By:	Tatiana Gomez
Created On:	8-3-15

**Design Report for Wells Ranch AA11-623 - 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
627.00	0.57	221.99	626.99	-2.32	-2.09	2.05	0.09
<b>9 5/8"</b>							
638.00	0.58	221.99	637.99	-2.40	-2.16	2.12	0.09
<b>First Sperry MWD Survey at 638.00ft</b>							
733.00	0.75	211.70	732.98	-3.29	-2.81	2.76	0.22
827.00	0.83	228.86	826.97	-4.26	-3.64	3.58	0.26
922.00	0.74	228.74	921.96	-5.12	-4.62	4.54	0.09
1,017.00	0.50	192.97	1,016.96	-5.92	-5.18	5.08	0.47
1,111.00	0.42	183.13	1,110.96	-6.67	-5.29	5.18	0.12
1,204.00	0.78	321.50	1,203.95	-6.51	-5.70	5.60	1.21
1,296.00	0.63	281.61	1,295.95	-5.92	-6.59	6.49	0.54
1,389.00	0.52	274.30	1,388.94	-5.79	-7.51	7.41	0.14
1,483.00	0.40	262.49	1,482.94	-5.80	-8.26	8.17	0.16
1,575.00	0.46	348.03	1,574.94	-5.48	-8.65	8.57	0.64
1,668.00	0.37	22.13	1,667.94	-4.83	-8.62	8.54	0.28
1,760.00	2.92	55.19	1,759.89	-3.22	-6.58	6.53	2.85
1,852.00	4.90	63.70	1,851.67	-0.14	-1.14	1.13	2.24
1,946.00	6.54	50.48	1,945.21	5.04	6.59	-6.51	2.23
2,039.00	7.32	53.97	2,037.53	11.90	15.47	-15.28	0.95
2,131.00	9.20	45.06	2,128.57	20.54	25.42	-25.08	2.47
2,222.00	9.02	40.06	2,218.43	31.14	35.16	-34.65	0.89
2,314.00	9.00	37.08	2,309.29	42.40	44.14	-43.45	0.51
2,407.00	8.57	34.57	2,401.20	53.91	52.46	-51.58	0.62
2,499.00	7.67	29.61	2,492.28	64.89	59.38	-58.33	1.24
2,593.00	8.31	38.17	2,585.37	75.69	66.68	-65.45	1.44
2,685.00	9.60	44.72	2,676.25	86.37	76.18	-74.79	1.79
2,778.00	10.31	43.98	2,767.85	97.87	87.42	-85.84	0.78
2,870.00	9.03	49.52	2,858.54	108.48	98.63	-96.87	1.72
2,965.00	8.46	51.08	2,952.43	117.71	109.74	-107.83	0.65
3,154.00	8.04	52.26	3,139.48	134.53	131.01	-128.83	0.24
3,249.00	7.96	48.77	3,233.55	142.93	141.21	-138.89	0.52
3,343.00	7.29	43.33	3,326.72	151.56	150.19	-147.74	1.05
3,438.00	6.79	38.05	3,421.01	160.37	157.79	-155.20	0.86
3,533.00	3.89	52.44	3,515.59	166.76	163.81	-161.11	3.34
3,627.00	3.24	48.75	3,609.41	170.45	168.33	-165.58	0.73
3,722.00	3.53	42.67	3,704.24	174.37	172.33	-169.51	0.49
3,817.00	3.39	35.51	3,799.07	178.81	175.95	-173.05	0.48
3,911.00	3.80	29.40	3,892.88	183.79	179.09	-176.12	0.60
4,005.00	4.14	51.68	3,986.66	188.60	183.28	-180.23	1.67
4,100.00	4.59	51.18	4,081.39	193.11	188.94	-185.81	0.48
4,195.00	4.20	65.02	4,176.11	196.96	195.05	-191.86	1.19
4,289.00	3.86	64.14	4,269.88	199.80	201.02	-197.78	0.37
4,384.00	2.52	69.32	4,364.73	201.93	205.85	-202.58	1.44
4,478.00	1.86	57.53	4,458.66	203.48	209.07	-205.78	0.85
4,573.00	1.57	45.72	4,553.62	205.22	211.30	-207.98	0.48
4,668.00	0.84	182.02	4,648.61	205.43	212.21	-208.88	2.37
4,762.00	1.56	193.74	4,742.59	203.50	211.88	-208.59	0.81
4,857.00	1.74	212.12	4,837.55	201.02	210.81	-207.55	0.59
4,951.00	1.77	217.00	4,931.50	198.65	209.17	-205.96	0.16

## Design Report for Wells Ranch AA11-623 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,046.00	1.82	205.13	5,026.46	196.11	207.65	-204.48	0.39
5,141.00	1.91	201.03	5,121.41	193.27	206.44	-203.31	0.17
5,235.00	2.10	191.32	5,215.35	190.12	205.54	-202.46	0.41
5,330.00	2.17	177.63	5,310.28	186.62	205.28	-202.25	0.54
5,425.00	2.56	173.98	5,405.20	182.71	205.57	-202.61	0.44
5,519.00	0.99	196.11	5,499.16	179.84	205.57	-202.65	1.79
5,614.00	1.11	180.08	5,594.14	178.13	205.34	-202.45	0.33
5,708.00	1.67	152.86	5,688.11	176.00	205.96	-203.11	0.91
5,803.00	1.66	144.91	5,783.07	173.64	207.38	-204.57	0.24
5,897.00	1.46	151.69	5,877.04	171.48	208.73	-205.95	0.29
5,992.00	1.42	153.78	5,972.01	169.36	209.83	-207.08	0.07
6,087.00	1.22	163.27	6,066.98	167.33	210.64	-207.93	0.31
6,181.00	12.06	276.64	6,160.31	167.51	201.14	-198.42	13.40
6,276.00	15.93	279.30	6,252.48	170.76	178.40	-175.64	4.13
6,371.00	19.11	271.88	6,343.07	173.38	149.98	-147.18	4.08
6,466.00	28.19	270.63	6,430.00	174.14	111.92	-109.11	9.57
6,560.00	38.20	273.51	6,508.56	176.17	60.58	-57.74	10.78
6,655.00	48.26	272.32	6,577.69	179.41	-4.32	7.20	10.62
6,749.00	59.27	268.35	6,633.19	179.67	-80.00	82.87	12.19
6,844.00	75.07	268.94	6,669.93	177.63	-167.26	170.09	16.64
6,938.00	81.19	268.72	6,689.26	175.75	-259.18	261.97	6.51
7,023.00	86.48	270.04	6,698.38	174.84	-343.66	346.42	6.41
7,079.00	87.41	269.79	6,701.36	174.76	-399.58	402.33	1.73
7"							
7,164.00	88.83	269.40	6,704.15	174.15	-484.53	487.26	1.73
7,258.00	89.51	269.75	6,705.51	173.46	-578.51	581.22	0.81
7,353.00	88.37	269.74	6,707.27	173.03	-673.49	676.18	1.20
7,447.00	89.14	269.61	6,709.31	172.50	-767.47	770.14	0.83
7,542.00	90.28	269.14	6,709.79	171.46	-862.46	865.10	1.30
7,636.00	90.12	270.48	6,709.46	171.15	-956.46	959.08	1.44
7,731.00	89.38	271.17	6,709.88	172.52	-1,051.44	1,054.08	1.07
7,825.00	89.29	269.60	6,710.97	173.15	-1,145.43	1,148.07	1.67
7,918.00	87.84	269.45	6,713.30	172.38	-1,238.40	1,241.01	1.57
8,011.00	89.01	269.29	6,715.86	171.36	-1,331.36	1,333.94	1.27
8,104.00	89.88	270.44	6,716.76	171.14	-1,424.35	1,426.91	1.55
8,197.00	88.03	270.70	6,718.45	172.06	-1,517.32	1,519.89	2.01
8,289.00	88.15	270.52	6,721.52	173.04	-1,609.27	1,611.84	0.24
8,382.00	88.64	270.75	6,724.12	174.07	-1,702.23	1,704.80	0.58
8,474.00	90.09	271.06	6,725.14	175.53	-1,794.21	1,796.79	1.61
8,567.00	89.45	270.33	6,725.52	176.65	-1,887.20	1,889.79	1.04
8,660.00	89.08	269.97	6,726.71	176.90	-1,980.19	1,982.77	0.56
8,753.00	89.20	269.96	6,728.10	176.84	-2,073.18	2,075.75	0.13
8,845.00	89.08	270.26	6,729.49	177.02	-2,165.17	2,167.73	0.35
8,936.00	88.65	269.75	6,731.29	177.03	-2,256.15	2,258.70	0.73
9,028.00	89.41	270.24	6,732.85	177.02	-2,348.14	2,350.67	0.98
9,121.00	90.46	269.71	6,732.95	176.98	-2,441.13	2,443.66	1.26
9,214.00	90.86	269.30	6,731.88	176.17	-2,534.12	2,536.63	0.62
9,307.00	91.85	269.14	6,729.68	174.91	-2,627.09	2,629.56	1.08
9,400.00	90.86	269.48	6,727.48	173.79	-2,720.05	2,722.49	1.13
9,492.00	90.99	269.05	6,726.00	172.61	-2,812.03	2,814.44	0.49
9,584.00	89.45	268.34	6,725.64	170.51	-2,904.01	2,906.37	1.84

## Design Report for Wells Ranch AA11-623 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,679.00	89.85	268.40	6,726.22	167.81	-2,998.97	3,001.27	0.43
9,774.00	90.86	268.03	6,725.63	164.85	-3,093.92	3,096.16	1.13
9,868.00	91.20	268.10	6,723.95	161.68	-3,187.85	3,190.03	0.37
9,963.00	90.59	270.39	6,722.46	160.43	-3,282.82	3,284.97	2.49
10,057.00	91.85	270.48	6,720.46	161.14	-3,376.80	3,378.95	1.34
10,152.00	89.91	271.96	6,719.00	163.16	-3,471.76	3,473.93	2.57
10,247.00	89.01	271.54	6,719.90	166.06	-3,566.71	3,568.91	1.05
10,341.00	90.43	271.76	6,720.36	168.77	-3,660.66	3,662.90	1.53
10,436.00	89.41	270.16	6,720.49	170.36	-3,755.65	3,757.90	2.00
10,531.00	90.77	269.71	6,720.34	170.25	-3,850.64	3,852.88	1.51
10,626.00	88.12	270.36	6,721.26	170.31	-3,945.63	3,947.85	2.87
10,720.00	87.04	270.10	6,725.23	170.69	-4,039.54	4,041.76	1.18
10,815.00	87.47	268.13	6,729.78	169.22	-4,134.42	4,136.60	2.12
10,909.00	89.14	268.00	6,732.56	166.05	-4,228.32	4,230.44	1.78
11,004.00	89.48	268.43	6,733.70	163.09	-4,323.27	4,325.33	0.58
11,099.00	90.43	269.20	6,733.78	161.13	-4,418.24	4,420.26	1.29
11,193.00	88.61	267.45	6,734.56	158.38	-4,512.19	4,514.15	2.69
11,288.00	89.01	267.15	6,736.54	153.91	-4,607.07	4,608.94	0.53
11,383.00	88.55	265.79	6,738.56	148.06	-4,701.86	4,703.63	1.51
11,477.00	89.85	266.97	6,739.87	142.12	-4,795.66	4,797.33	1.87
11,572.00	90.34	266.30	6,739.72	136.55	-4,890.50	4,892.06	0.87
11,667.00	90.77	266.58	6,738.80	130.65	-4,985.31	4,986.76	0.54
11,761.00	93.02	268.09	6,735.69	126.28	-5,079.15	5,080.52	2.88
11,856.00	92.06	267.89	6,731.48	122.95	-5,173.99	5,175.30	1.03
11,951.00	89.32	268.62	6,730.33	120.06	-5,268.93	5,270.18	2.98
12,045.00	89.63	267.86	6,731.19	117.17	-5,362.89	5,364.08	0.87
12,140.00	89.75	268.02	6,731.71	113.76	-5,457.82	5,458.95	0.21
12,234.00	90.15	267.89	6,731.79	110.40	-5,551.76	5,552.82	0.45
12,329.00	90.83	267.92	6,730.98	106.93	-5,646.69	5,647.68	0.72
12,424.00	89.63	268.64	6,730.60	104.08	-5,741.65	5,742.58	1.47
12,518.00	90.96	270.12	6,730.11	103.06	-5,835.64	5,836.54	2.12
12,613.00	89.94	271.07	6,729.37	104.05	-5,930.63	5,931.53	1.47
12,708.00	90.09	270.53	6,729.34	105.38	-6,025.62	6,026.53	0.59
12,802.00	90.62	270.17	6,728.76	105.95	-6,119.61	6,120.53	0.68
12,897.00	88.92	269.41	6,729.14	105.60	-6,214.61	6,215.50	1.96
12,991.00	89.57	269.73	6,730.38	104.90	-6,308.60	6,309.47	0.77
13,086.00	90.12	269.24	6,730.64	104.04	-6,403.59	6,404.44	0.78
13,180.00	89.26	267.16	6,731.14	101.09	-6,497.54	6,498.32	2.39
13,275.00	89.04	269.63	6,732.55	98.43	-6,592.48	6,593.21	2.61
13,370.00	89.48	269.71	6,733.78	97.88	-6,687.47	6,688.18	0.47
13,465.00	90.62	269.44	6,733.70	97.18	-6,782.47	6,783.15	1.23
13,559.00	91.32	268.67	6,732.11	95.63	-6,876.44	6,877.09	1.11
13,654.00	89.97	269.17	6,731.04	93.84	-6,971.42	6,972.02	1.52
13,748.00	90.00	268.68	6,731.06	92.07	-7,065.40	7,065.97	0.52
13,804.00	90.34	268.98	6,730.90	90.93	-7,121.39	7,121.93	0.81
<b>Final Sperry MWD Survey at 13804.00ft</b>							
13,872.00	90.34	268.98	6,730.49	89.72	-7,189.37	7,189.89	0.00
<b>Straight Line Projection to TD at 13872.00ft - Wells Ranch AA11-623_BHL</b>							

## Design Report for Wells Ranch AA11-623 - Actual Surveys

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
638.00	637.99	-2.40	-2.16	First Sperry MWD Survey at 638.00ft
13,804.00	6,730.90	90.93	-7,121.39	Final Sperry MWD Survey at 13804.00ft
13,872.00	6,730.49	89.72	-7,189.37	Straight Line Projection to TD at 13872.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AA11-623_BHL	270.92	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
638.00	7,023.00	Intermediate Surveys	MWD
7,164.00	13,872.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
627.00		9 5/8"	9-5/8	13-3/4
7,079.00	6,701.36	7"	7	8-3/4

Wellbore Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
- hit/miss target									
- Shape									
Wells Ranch AA11-623	0.00	0.00	0.00	115.48	-7,191.51	1,425,454.14	3,300,114.72	40.496260	-104.420870
- actual wellpath misses target center by 6730.54usft at 13872.00usft MD (6730.49 TVD, 89.72 N, -7189.37 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.60 °/100usft	Maximum Dogleg over Survey:	16.64 °/100usft at 6,844.00 usft
Net Tortosity applicable to Plans:	0.82 °/100usft	Directional Difficulty Index:	6.549

Audit Info

North Reference Sheet for Sec. 11-T6N-R63W (Wells Ranch PAD) - Wells Ranch  
AA11-623 - 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 @ 4857.00usft (HP 343). Northing and Easting are relative to Wells Ranch AA11-623

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: 0.99996596

Grid Coordinates of Well: 1,425,338.67 usft N, 3,307,305.98 usft E

Geographical Coordinates of Well: 40° 29' 44.52" N, 104° 23' 42.07" W

Grid Convergence at Surface is: 0.71°

Based upon Minimum Curvature type calculations, at a Measured Depth of 13,872.00usft  
the Bottom Hole Displacement is 7,189.93usft in the Direction of 270.71° (Grid).

Magnetic Convergence at surface is: -7.65° (15 May 2015, , BGGM2015)

