

# Noble Energy

Weld County, CO (NAD 83)

Sec. 22-T6N-R63W (Wells Ranch AA22 PAD)

Wells Ranch AA22-650

05-123-42422

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

18 April, 2016

Surface UWI : 05-123-42422

Well Coordinates: 1,416,371.99 N, 3,297,156.29 E (40° 28' 17.15" N, 104° 25' 54.84" W)

Ground Level: 4,755.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Wells Ranch AA22-650

RKB = 24' @ 4779.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

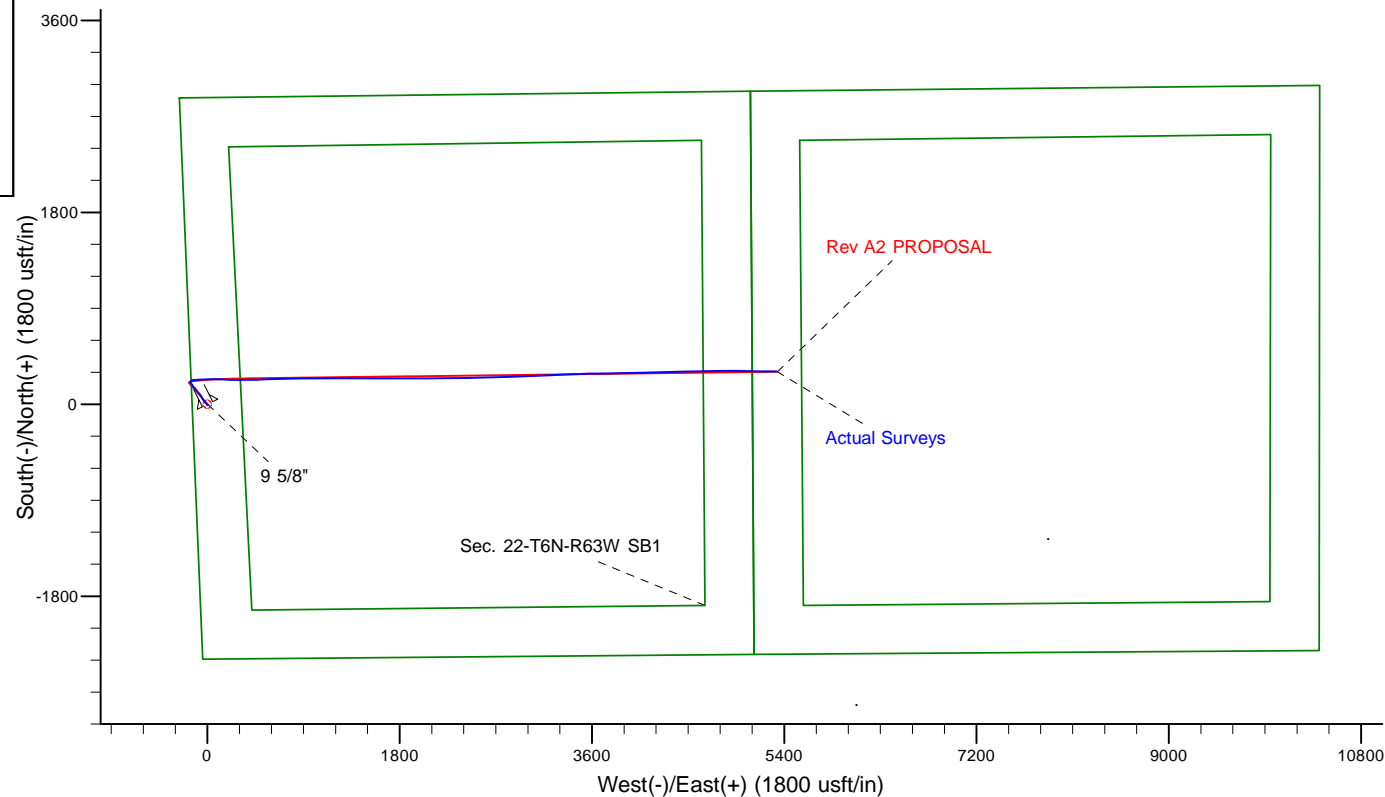
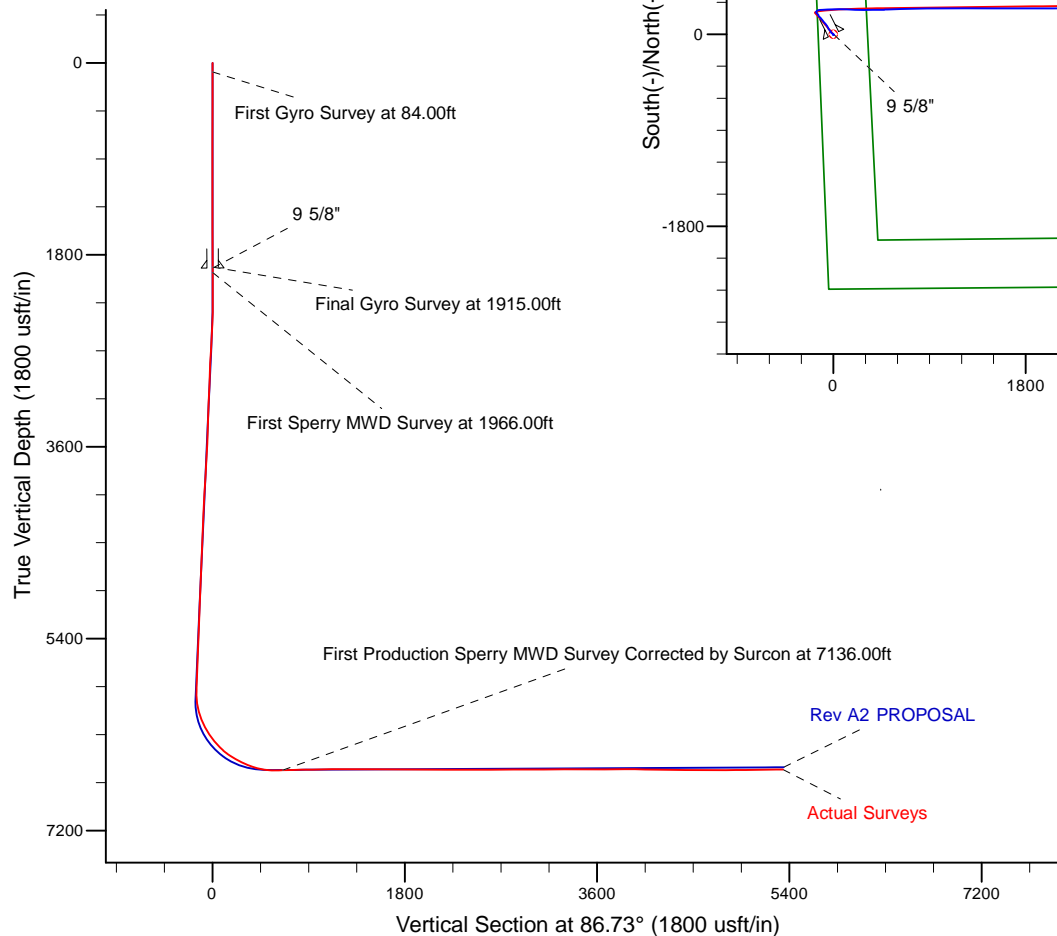
**HALLIBURTON**

Project: Weld County, CO (NAD 83)  
Site: Sec. 22-T6N-R63W (Wells Ranch AA22 PAD)  
Well: Wells Ranch AA22-650  
Wellbore: Plan A  
Design: Actual Surveys



Platted SHL: 2390' FSL, 127' FWL  
Platted Lat/Long: 40.47143, -104.4319  
Location: Sec. 22-T6N-R63W

Platted BHL: 2634' FNL, 235' FWL  
Platted Lat/Long: 40.472102 N, -104.412953 W  
State Planes - CO Northern: 1,416,680.87 N, 3,302,424.27 E  
Sec. 23-T6N-R63W



#### LEGEND

- Wells Ranch AA22-650, Plan A, Rev A2 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AA22-650

Ground Level: 4755.00

RKB = 24' @ 4779.00usft (H&P 343)

Created By: Tatiana Gomez  
Created On: 4/18/16

**Design Report for Wells Ranch AA22-650 - 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
84.00	0.47	182.63	84.00	-0.34	-0.02	-0.04	0.56
<b>First Gyro Survey at 84.00ft</b>							
175.00	0.40	171.27	175.00	-1.03	0.02	-0.04	0.12
270.00	0.38	178.19	269.99	-1.67	0.08	-0.02	0.05
362.00	0.29	187.31	361.99	-2.21	0.06	-0.07	0.11
455.00	0.35	203.47	454.99	-2.70	-0.09	-0.24	0.12
549.00	0.33	208.60	548.99	-3.20	-0.33	-0.51	0.04
644.00	0.30	207.84	643.99	-3.66	-0.58	-0.79	0.03
738.00	0.23	231.61	737.99	-4.00	-0.84	-1.07	0.14
833.00	0.09	266.49	832.99	-4.12	-1.07	-1.30	0.17
928.00	0.18	286.82	927.99	-4.08	-1.28	-1.51	0.11
1,022.00	0.21	305.01	1,021.99	-3.94	-1.57	-1.79	0.07
1,117.00	0.12	297.54	1,116.99	-3.80	-1.80	-2.01	0.10
1,211.00	0.16	280.58	1,210.99	-3.73	-2.01	-2.22	0.06
1,306.00	0.19	27.19	1,305.99	-3.56	-2.07	-2.27	0.30
1,401.00	0.45	38.03	1,400.98	-3.13	-1.77	-1.94	0.28
1,495.00	0.58	36.71	1,494.98	-2.46	-1.26	-1.40	0.14
1,590.00	0.82	46.97	1,589.97	-1.61	-0.47	-0.56	0.28
1,684.00	0.73	52.62	1,683.96	-0.78	0.49	0.45	0.13
1,779.00	0.49	85.62	1,778.96	-0.39	1.38	1.36	0.44
1,873.00	0.51	141.16	1,872.96	-0.68	2.04	2.00	0.50
1,915.00	0.54	151.72	1,914.95	-1.00	2.26	2.19	0.24
<b>Final Gyro Survey at 1915.00ft - Tie on to Gyro Survey at 1915.00ft</b>							
1,923.00	0.53	153.81	1,922.95	-1.07	2.29	2.22	0.29
<b>9 5/8"</b>							
1,966.00	0.47	166.79	1,965.95	-1.42	2.42	2.33	0.29
<b>First Sperry MWD Survey at 1966.00ft</b>							
2,061.00	0.65	182.60	2,060.95	-2.33	2.48	2.34	0.25
2,250.00	1.17	189.60	2,249.92	-5.31	2.11	1.80	0.28
2,345.00	0.80	279.52	2,344.91	-6.15	1.29	0.94	1.49
2,439.00	3.12	311.08	2,438.85	-4.36	-1.28	-1.53	2.63
2,534.00	5.01	318.52	2,533.61	0.44	-5.98	-5.94	2.06
2,629.00	4.92	315.82	2,628.25	6.47	-11.56	-11.18	0.26
2,723.00	4.67	314.46	2,721.93	12.04	-17.10	-16.39	0.29
2,818.00	4.75	328.63	2,816.61	18.11	-21.91	-20.84	1.22
2,912.00	4.78	326.22	2,910.28	24.69	-26.12	-24.66	0.22
3,007.00	4.75	325.08	3,004.95	31.20	-30.57	-28.74	0.10
3,102.00	4.40	322.89	3,099.65	37.34	-35.02	-32.83	0.41
3,196.00	4.16	322.65	3,193.39	42.92	-39.26	-36.75	0.26
3,291.00	4.65	328.91	3,288.11	48.96	-43.34	-40.47	0.72
3,386.00	4.05	334.91	3,382.84	55.29	-46.75	-43.52	0.79
3,480.00	4.16	332.20	3,476.59	61.32	-49.75	-46.17	0.24
3,575.00	5.09	328.54	3,571.28	67.96	-53.56	-49.59	1.03
3,670.00	5.95	329.19	3,665.84	75.78	-58.28	-53.85	0.91
3,764.00	5.78	322.97	3,759.35	83.75	-63.62	-58.74	0.70
3,859.00	5.86	320.35	3,853.86	91.30	-69.60	-64.27	0.29
3,953.00	5.58	318.75	3,947.39	98.43	-75.68	-69.93	0.34
4,048.00	5.22	318.24	4,041.97	105.13	-81.60	-75.46	0.38
4,143.00	4.56	318.47	4,136.63	111.18	-86.98	-80.49	0.70

## Design Report for Wells Ranch AA22-650 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,237.00	4.03	321.27	4,230.36	116.55	-91.53	-84.72	0.61
4,332.00	3.73	322.39	4,325.14	121.60	-95.50	-88.40	0.33
4,426.00	4.50	324.96	4,418.90	127.04	-99.48	-92.06	0.84
4,521.00	4.63	321.14	4,513.60	133.08	-104.03	-96.26	0.35
4,710.00	4.32	320.35	4,702.02	144.50	-113.36	-104.92	0.17
4,805.00	3.85	324.91	4,796.78	149.87	-117.47	-108.72	0.60
4,900.00	3.99	322.98	4,891.56	155.12	-121.30	-112.24	0.20
4,994.00	4.06	308.26	4,985.33	159.79	-125.88	-116.55	1.10
5,089.00	3.71	303.59	5,080.11	163.57	-131.08	-121.52	0.50
5,184.00	3.87	323.15	5,174.91	167.84	-135.56	-125.75	1.36
5,278.00	3.83	336.17	5,268.70	173.25	-138.73	-128.61	0.93
5,373.00	3.72	341.34	5,363.49	179.07	-141.00	-130.54	0.38
5,467.00	3.70	326.60	5,457.30	184.49	-143.65	-132.87	1.01
5,562.00	3.60	313.13	5,552.11	189.09	-147.51	-136.47	0.91
5,657.00	4.40	312.76	5,646.87	193.60	-152.36	-141.05	0.84
5,751.00	3.10	311.00	5,740.67	197.72	-156.93	-145.38	1.39
5,846.00	3.41	329.58	5,835.52	201.84	-160.30	-148.51	1.15
5,940.00	7.14	355.99	5,929.12	210.08	-162.12	-149.86	4.64
6,033.00	10.79	51.36	6,021.12	221.31	-155.72	-142.82	9.58
6,124.00	17.73	85.64	6,109.41	227.70	-135.19	-121.96	11.70
6,217.00	26.37	87.57	6,195.53	229.65	-100.37	-87.08	9.32
6,309.00	31.76	87.88	6,275.91	231.42	-55.72	-42.41	5.86
6,400.00	37.35	87.93	6,350.83	233.30	-4.16	9.17	6.14
6,492.00	44.81	88.92	6,420.13	234.92	56.23	69.55	8.14
6,584.00	53.83	93.82	6,480.06	233.05	125.86	138.97	10.60
6,676.00	61.03	91.64	6,529.55	229.42	203.25	216.02	8.08
6,767.00	65.36	89.32	6,570.59	228.77	284.44	297.04	5.27
6,859.00	72.14	89.45	6,603.91	229.69	370.13	382.65	7.37
6,951.00	79.55	89.24	6,626.39	230.71	459.27	471.70	8.06
7,044.00	91.04	88.16	6,634.01	232.82	551.77	564.17	12.41
7,136.00	90.86	88.55	6,632.48	235.46	643.72	656.12	0.47
<b>First Production Sperry MWD Survey Corrected by Surcon at 7136.00ft</b>							
7,227.00	90.95	87.91	6,631.05	238.27	734.67	747.08	0.71
7,318.00	90.64	87.61	6,629.78	241.83	825.59	838.05	0.47
7,410.00	91.23	90.40	6,628.28	243.42	917.55	929.96	3.10
7,599.00	91.16	89.83	6,624.34	243.05	1,106.51	1,118.59	0.30
7,694.00	89.47	90.03	6,623.82	243.16	1,201.51	1,213.43	1.79
7,788.00	89.62	90.22	6,624.57	242.96	1,295.50	1,307.27	0.26
7,883.00	89.65	90.33	6,625.17	242.50	1,390.50	1,402.08	0.12
7,977.00	89.31	90.08	6,626.02	242.16	1,484.49	1,495.90	0.45
8,072.00	89.75	89.91	6,626.80	242.17	1,579.49	1,590.75	0.50
8,167.00	90.61	89.88	6,626.50	242.35	1,674.49	1,685.60	0.91
8,261.00	90.61	89.65	6,625.50	242.73	1,768.48	1,779.46	0.24
8,355.00	89.31	89.81	6,625.57	243.18	1,862.48	1,873.33	1.39
8,450.00	89.35	90.32	6,626.68	243.07	1,957.47	1,968.16	0.54
8,545.00	89.62	89.91	6,627.53	242.88	2,052.47	2,062.99	0.52
8,640.00	89.53	89.51	6,628.24	243.36	2,147.46	2,157.86	0.43
8,734.00	89.62	88.95	6,628.94	244.62	2,241.45	2,251.77	0.60
8,829.00	89.56	89.16	6,629.62	246.19	2,336.44	2,346.69	0.23
8,924.00	89.84	89.41	6,630.11	247.37	2,431.43	2,441.59	0.40
9,018.00	90.05	88.60	6,630.20	249.01	2,525.41	2,535.51	0.89

## Design Report for Wells Ranch AA22-650 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,113.00	90.58	88.50	6,629.68	251.41	2,620.38	2,630.46	0.57
9,208.00	91.07	88.86	6,628.31	253.60	2,715.35	2,725.40	0.64
9,302.00	90.09	88.07	6,627.36	256.12	2,809.31	2,819.35	1.34
9,397.00	90.52	88.40	6,626.86	259.04	2,904.26	2,914.31	0.57
9,492.00	89.87	87.00	6,626.53	262.85	2,999.18	3,009.30	1.62
9,586.00	90.40	87.14	6,626.31	267.66	3,093.06	3,103.29	0.58
9,681.00	91.32	87.10	6,624.89	272.43	3,187.92	3,198.28	0.97
9,776.00	89.04	87.58	6,624.59	276.84	3,282.81	3,293.27	2.45
9,870.00	89.35	87.72	6,625.91	280.69	3,376.73	3,387.25	0.36
9,965.00	90.55	88.00	6,625.99	284.24	3,471.66	3,482.23	1.30
10,154.00	89.78	89.34	6,625.45	288.63	3,660.60	3,671.11	0.82
10,249.00	90.30	89.23	6,625.38	289.81	3,755.59	3,766.02	0.56
10,343.00	91.17	89.31	6,624.17	291.01	3,849.58	3,859.91	0.93
10,438.00	88.76	88.77	6,624.23	292.60	3,944.56	3,954.83	2.60
10,532.00	88.52	88.44	6,626.46	294.89	4,038.50	4,048.75	0.43
10,627.00	89.19	88.54	6,628.36	297.39	4,133.45	4,143.69	0.71
10,721.00	89.47	88.07	6,629.46	300.17	4,227.40	4,237.65	0.58
10,816.00	89.90	87.45	6,629.98	303.89	4,322.33	4,332.63	0.79
10,911.00	89.41	89.47	6,630.55	306.44	4,417.28	4,427.58	2.19
11,005.00	89.38	89.20	6,631.55	307.53	4,511.27	4,521.47	0.29
11,100.00	89.69	88.93	6,632.32	309.08	4,606.26	4,616.39	0.43
11,195.00	90.00	89.04	6,632.58	310.76	4,701.24	4,711.32	0.35
11,289.00	90.12	89.31	6,632.48	312.12	4,795.23	4,805.23	0.31
11,384.00	91.32	90.04	6,631.28	312.66	4,890.22	4,900.10	1.48
11,478.00	90.09	90.31	6,630.13	312.37	4,984.21	4,993.92	1.34
11,668.00	90.61	91.00	6,628.97	310.20	5,174.19	5,183.46	0.45
11,762.00	91.10	90.59	6,627.56	308.89	5,268.17	5,277.22	0.68
<b>Final Production Sperry MWD Survey Corrected by Surcon at 11762.00ft</b>							
11,825.00	91.10	90.59	6,626.35	308.24	5,331.16	5,340.06	0.00
<b>Straight Line Projection to TD at 11825.00ft</b>							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	-0.34	-0.02	First Gyro Survey at 84.00ft
1,915.00	1,914.95	-1.00	2.26	Final Gyro Survey at 1915.00ft
1,915.00	1,914.95	-1.00	2.26	Tie on to Gyro Survey at 1915.00ft
1,966.00	1,965.95	-1.42	2.42	First Sperry MWD Survey at 1966.00ft
7,136.00	6,632.48	235.46	643.72	First Production Sperry MWD Survey Corrected by Surcon at 7136.00ft
11,762.00	6,627.56	308.89	5,268.17	Final Production Sperry MWD Survey Corrected by Surcon at 11762.00ft
11,825.00	6,626.35	308.24	5,331.16	Straight Line Projection to TD at 11825.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Wells Ranch AA22-650_Rev A2_BHL1	86.73	Slot	0.00	0.00	0.00

## Design Report for Wells Ranch AA22-650 - Actual Surveys

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,915.00	Gyro Data Surveys	NS-GYRO-MS
1,966.00	6,951.00	Intermediate Sperry MWD Surveys	MWD
7,044.00	11,825.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,923.00	9 5/8"		9-5/8	13-3/4

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
Wells Ranch AA22-650 - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,416,371.99	3,297,156.29	40.471430	-104.431900
Wells Ranch AA22-650 - actual wellpath misses target center by 21.09usft at 11825.00usft MD (6626.35 TVD, 308.24 N, 5331.16 E) - Point	0.00	0.00	6,606.00	305.32	5,335.83	1,416,677.30	3,302,491.93	40.472090	-104.412710
Wells Ranch AA22-650 - actual wellpath misses target center by 21.09usft at 11825.00usft MD (6626.35 TVD, 308.24 N, 5331.16 E) - Point	0.00	0.00	6,606.00	305.32	5,335.83	1,416,677.30	3,302,491.93	40.472090	-104.412710
Wells Ranch AA22-650 - actual wellpath misses target center by 21.09usft at 11825.00usft MD (6626.35 TVD, 308.24 N, 5331.16 E) - Point	0.00	0.00	6,606.00	305.32	5,335.83	1,416,677.30	3,302,491.93	40.472090	-104.412710
Wells Ranch AA22-650 - actual wellpath misses target center by 21.09usft at 11825.00usft MD (6626.35 TVD, 308.24 N, 5331.16 E) - Point	0.00	0.00	6,606.00	305.32	5,335.83	1,416,677.30	3,302,491.93	40.472090	-104.412710
Wells Ranch AA22-650 - actual wellpath misses target center by 17.33usft at 6901.23usft MD (6615.66 TVD, 230.12 N, 410.68 E) - Point	0.00	0.00	6,625.68	244.00	408.00	1,416,615.98	3,297,564.27	40.472086	-104.430423
Wells Ranch AA22-650 - actual wellpath misses target center by 17.33usft at 6901.23usft MD (6615.66 TVD, 230.12 N, 410.68 E) - Point	0.00	0.00	6,625.68	244.00	408.00	1,416,615.98	3,297,564.27	40.472086	-104.430423

Directional Difficulty Index

Average Dogleg over Survey:	1.43 °/100usft	Maximum Dogleg over Survey:	12.41 °/100usft at 7,044.00 usft
Net Tortousity applicable to Plans:	0.60 °/100usft	Directional Difficulty Index:	6.241

Audit Info

North Reference Sheet for Sec. 22-T6N-R63W (Wells Ranch AA22 PAD) - Wells Ranch AA22-650 - Plan A

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

Vertical Depths are relative to RKB = 24' @ 4779.00usft (H&P 343). Northing and Easting are relative to Wells Ranch AA22-650

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: 0.99996424

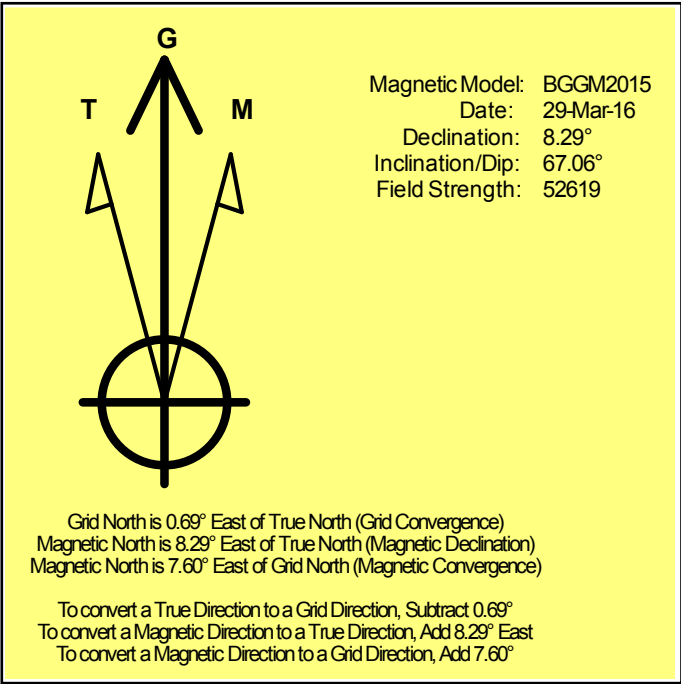
Grid Coordinates of Well: 1,416,371.99 usft N, 3,297,156.29 usft E

Geographical Coordinates of Well: 40° 28' 17.15" N, 104° 25' 54.84" W

Grid Convergence at Surface is: 0.69°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,825.00usft the Bottom Hole Displacement is 5,340.06usft in the Direction of 86.69° (Grid).

Magnetic Convergence at surface is: -7.60° (29 March 2016, , BGGM2015)



# Noble Energy

Weld County, CO (NAD 83)

Sec. 22-T6N-R63W (Wells Ranch AA22 PAD)

Wells Ranch AA22-650

05-123-42422

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Geodetic Report

18 April, 2016

Well Coordinates: 1,416,371.99 N, 3,297,156.29 E (40° 28' 17.15" N, 104° 25' 54.84" W)

Ground Level: 4,755.00 usft

Local Coordinate Origin:

Viewing Datum:

TVDs to System:

North Reference:

Unit System:

Geodetic Scale Factor Applied

Version: 5000.1 Build: 73

Centered on Well Wells Ranch AA22-650

RKB = 24' @ 4779.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**



## Design Report for Wells Ranch AA22-650 - Actual 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	40.471430	-104.431900	1,416,371.99	3,297,156.29
84.00	0.47	182.63	84.00	-0.34	-0.02	40.471429	-104.431900	1,416,371.64	3,297,156.27
175.00	0.40	171.27	175.00	-1.03	0.02	40.471427	-104.431900	1,416,370.96	3,297,156.30
270.00	0.38	178.19	269.99	-1.67	0.08	40.471425	-104.431900	1,416,370.32	3,297,156.36
362.00	0.29	187.31	361.99	-2.21	0.06	40.471424	-104.431900	1,416,369.78	3,297,156.34
455.00	0.35	203.47	454.99	-2.70	-0.09	40.471423	-104.431901	1,416,369.29	3,297,156.20
549.00	0.33	208.60	548.99	-3.20	-0.33	40.471421	-104.431902	1,416,368.78	3,297,155.96
644.00	0.30	207.84	643.99	-3.66	-0.58	40.471420	-104.431903	1,416,368.32	3,297,155.71
738.00	0.23	231.61	737.99	-4.00	-0.84	40.471419	-104.431903	1,416,367.99	3,297,155.45
833.00	0.09	266.49	832.99	-4.12	-1.07	40.471419	-104.431904	1,416,367.87	3,297,155.22
928.00	0.18	286.82	927.99	-4.08	-1.28	40.471419	-104.431905	1,416,367.91	3,297,155.01
1,022.00	0.21	305.01	1,021.99	-3.94	-1.57	40.471419	-104.431906	1,416,368.05	3,297,154.72
1,117.00	0.12	297.54	1,116.99	-3.80	-1.80	40.471420	-104.431907	1,416,368.19	3,297,154.49
1,211.00	0.16	280.58	1,210.99	-3.73	-2.01	40.471420	-104.431908	1,416,368.26	3,297,154.28
1,306.00	0.19	27.19	1,305.99	-3.56	-2.07	40.471420	-104.431908	1,416,368.43	3,297,154.22
1,401.00	0.45	38.03	1,400.98	-3.13	-1.77	40.471422	-104.431907	1,416,368.86	3,297,154.52
1,495.00	0.58	36.71	1,494.98	-2.46	-1.26	40.471423	-104.431905	1,416,369.53	3,297,155.03
1,590.00	0.82	46.97	1,589.97	-1.61	-0.47	40.471426	-104.431902	1,416,370.38	3,297,155.82
1,684.00	0.73	52.62	1,683.96	-0.78	0.49	40.471428	-104.431899	1,416,371.20	3,297,156.78
1,779.00	0.49	85.62	1,778.96	-0.39	1.38	40.471429	-104.431895	1,416,371.60	3,297,157.67
1,873.00	0.51	141.16	1,872.96	-0.68	2.04	40.471428	-104.431893	1,416,371.31	3,297,158.33
1,915.00	0.54	151.72	1,914.95	-1.00	2.26	40.471427	-104.431892	1,416,370.99	3,297,158.54
1,923.00	0.53	153.81	1,922.95	-1.07	2.29	40.471427	-104.431892	1,416,370.92	3,297,158.58
1,966.00	0.47	166.79	1,965.95	-1.42	2.42	40.471426	-104.431892	1,416,370.57	3,297,158.71
2,061.00	0.65	182.60	2,060.95	-2.33	2.48	40.471424	-104.431891	1,416,369.66	3,297,158.77
2,250.00	1.17	189.60	2,249.92	-5.31	2.11	40.471415	-104.431893	1,416,366.68	3,297,158.40
2,345.00	0.80	279.52	2,344.91	-6.15	1.29	40.471413	-104.431896	1,416,365.84	3,297,157.58
2,439.00	3.12	311.08	2,438.85	-4.36	-1.28	40.471418	-104.431905	1,416,367.62	3,297,155.01
2,534.00	5.01	318.52	2,533.61	0.44	-5.98	40.471431	-104.431922	1,416,372.43	3,297,150.31
2,629.00	4.92	315.82	2,628.25	6.47	-11.56	40.471448	-104.431942	1,416,378.46	3,297,144.72
2,723.00	4.67	314.46	2,721.93	12.04	-17.10	40.471464	-104.431961	1,416,384.03	3,297,139.18
2,818.00	4.75	328.63	2,816.61	18.11	-21.91	40.471481	-104.431978	1,416,390.10	3,297,134.38
2,912.00	4.78	326.22	2,910.28	24.69	-26.12	40.471499	-104.431993	1,416,396.68	3,297,130.17
3,007.00	4.75	325.08	3,004.95	31.20	-30.57	40.471517	-104.432009	1,416,403.19	3,297,125.72
3,102.00	4.40	322.89	3,099.65	37.34	-35.02	40.471534	-104.432025	1,416,409.32	3,297,121.27
3,196.00	4.16	322.65	3,193.39	42.92	-39.26	40.471549	-104.432040	1,416,414.91	3,297,117.03
3,291.00	4.65	328.91	3,288.11	48.96	-43.34	40.471566	-104.432054	1,416,420.95	3,297,112.95
3,386.00	4.05	334.91	3,382.84	55.29	-46.75	40.471583	-104.432066	1,416,427.28	3,297,109.54
3,480.00	4.16	332.20	3,476.59	61.32	-49.75	40.471600	-104.432076	1,416,433.30	3,297,106.54
3,575.00	5.09	328.54	3,571.28	67.96	-53.56	40.471618	-104.432090	1,416,439.95	3,297,102.73
3,670.00	5.95	329.19	3,665.84	75.78	-58.28	40.471640	-104.432106	1,416,447.77	3,297,098.01
3,764.00	5.78	322.97	3,759.35	83.75	-63.62	40.471662	-104.432125	1,416,455.73	3,297,092.67

## Design Report for Wells Ranch AA22-650 - Actual 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)
3,859.00	5.86	320.35	3,853.86	91.30	-69.60	40.471683	-104.432146	1,416,463.29	3,297,086.69
3,953.00	5.58	318.75	3,947.39	98.43	-75.68	40.471703	-104.432168	1,416,470.42	3,297,080.62
4,048.00	5.22	318.24	4,041.97	105.13	-81.60	40.471721	-104.432189	1,416,477.11	3,297,074.69
4,143.00	4.56	318.47	4,136.63	111.18	-86.98	40.471738	-104.432208	1,416,483.16	3,297,069.31
4,237.00	4.03	321.27	4,230.36	116.55	-91.53	40.471753	-104.432224	1,416,488.54	3,297,064.77
4,332.00	3.73	322.39	4,325.14	121.60	-95.50	40.471767	-104.432238	1,416,493.59	3,297,060.79
4,426.00	4.50	324.96	4,418.90	127.04	-99.48	40.471782	-104.432252	1,416,499.03	3,297,056.81
4,521.00	4.63	321.14	4,513.60	133.08	-104.03	40.471799	-104.432268	1,416,505.07	3,297,052.26
4,710.00	4.32	320.35	4,702.02	144.50	-113.36	40.471830	-104.432301	1,416,516.49	3,297,042.94
4,805.00	3.85	324.91	4,796.78	149.87	-117.47	40.471845	-104.432316	1,416,521.85	3,297,038.82
4,900.00	3.99	322.98	4,891.56	155.12	-121.30	40.471860	-104.432329	1,416,527.10	3,297,035.00
4,994.00	4.06	308.26	4,985.33	159.79	-125.88	40.471873	-104.432346	1,416,531.77	3,297,030.41
5,089.00	3.71	303.59	5,080.11	163.57	-131.08	40.471883	-104.432364	1,416,535.55	3,297,025.21
5,184.00	3.87	323.15	5,174.91	167.84	-135.56	40.471895	-104.432380	1,416,539.82	3,297,020.73
5,278.00	3.83	336.17	5,268.70	173.25	-138.73	40.471910	-104.432391	1,416,545.23	3,297,017.56
5,373.00	3.72	341.34	5,363.49	179.07	-141.00	40.471926	-104.432399	1,416,551.05	3,297,015.29
5,467.00	3.70	326.60	5,457.30	184.49	-143.65	40.471941	-104.432409	1,416,556.47	3,297,012.65
5,562.00	3.60	313.13	5,552.11	189.09	-147.51	40.471954	-104.432422	1,416,561.07	3,297,008.78
5,657.00	4.40	312.76	5,646.87	193.60	-152.36	40.471966	-104.432439	1,416,565.58	3,297,003.93
5,751.00	3.10	311.00	5,740.67	197.72	-156.93	40.471978	-104.432456	1,416,569.70	3,296,999.36
5,846.00	3.41	329.58	5,835.52	201.84	-160.30	40.471989	-104.432468	1,416,573.82	3,296,996.00
5,940.00	7.14	355.99	5,929.12	210.08	-162.12	40.472012	-104.432474	1,416,582.06	3,296,994.17
6,033.00	10.79	51.36	6,021.12	221.31	-155.72	40.472043	-104.432450	1,416,593.29	3,297,000.58
6,124.00	17.73	85.64	6,109.41	227.70	-135.19	40.472059	-104.432376	1,416,599.68	3,297,021.11
6,217.00	26.37	87.57	6,195.53	229.65	-100.37	40.472064	-104.432251	1,416,601.63	3,297,055.93
6,309.00	31.76	87.88	6,275.91	231.42	-55.72	40.472067	-104.432091	1,416,603.40	3,297,100.57
6,400.00	37.35	87.93	6,350.83	233.30	-4.16	40.472071	-104.431905	1,416,605.28	3,297,152.13
6,492.00	44.81	88.92	6,420.13	234.92	56.23	40.472073	-104.431688	1,416,606.90	3,297,212.51
6,584.00	53.83	93.82	6,480.06	233.05	125.86	40.472066	-104.431438	1,416,605.03	3,297,282.14
6,676.00	61.03	91.64	6,529.55	229.42	203.25	40.472053	-104.431160	1,416,601.40	3,297,359.53
6,767.00	65.36	89.32	6,570.59	228.77	284.44	40.472049	-104.430868	1,416,600.75	3,297,440.72
6,859.00	72.14	89.45	6,603.91	229.69	370.13	40.472048	-104.430560	1,416,601.67	3,297,526.40
6,951.00	79.55	89.24	6,626.39	230.71	459.27	40.472048	-104.430240	1,416,602.69	3,297,615.54
7,044.00	91.04	88.16	6,634.01	232.82	551.77	40.472051	-104.429907	1,416,604.80	3,297,708.04
7,136.00	90.86	88.55	6,632.48	235.46	643.72	40.472055	-104.429577	1,416,607.44	3,297,799.99
7,227.00	90.95	87.91	6,631.05	238.27	734.67	40.472060	-104.429250	1,416,610.25	3,297,890.93
7,318.00	90.64	87.61	6,629.78	241.83	825.59	40.472066	-104.428923	1,416,613.81	3,297,981.85
7,410.00	91.23	90.40	6,628.28	243.42	917.55	40.472068	-104.428592	1,416,615.41	3,298,073.81
7,599.00	91.16	89.83	6,624.34	243.05	1,106.51	40.472061	-104.427913	1,416,615.03	3,298,262.76
7,694.00	89.47	90.03	6,623.82	243.16	1,201.51	40.472058	-104.427572	1,416,615.14	3,298,357.75
7,788.00	89.62	90.22	6,624.57	242.96	1,295.50	40.472054	-104.427234	1,416,614.94	3,298,451.74
7,883.00	89.65	90.33	6,625.17	242.50	1,390.50	40.472050	-104.426892	1,416,614.48	3,298,546.74

## Design Report for Wells Ranch AA22-650 - Actual 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)
7,977.00	89.31	90.08	6,626.02	242.16	1,484.49	40.472046	-104.426555	1,416,614.14	3,298,640.73
8,072.00	89.75	89.91	6,626.80	242.17	1,579.49	40.472042	-104.426213	1,416,614.15	3,298,735.72
8,167.00	90.61	89.88	6,626.50	242.35	1,674.49	40.472040	-104.425872	1,416,614.33	3,298,830.72
8,261.00	90.61	89.65	6,625.50	242.73	1,768.48	40.472038	-104.425534	1,416,614.71	3,298,924.71
8,355.00	89.31	89.81	6,625.57	243.18	1,862.48	40.472036	-104.425196	1,416,615.16	3,299,018.70
8,450.00	89.35	90.32	6,626.68	243.07	1,957.47	40.472032	-104.424855	1,416,615.05	3,299,113.69
8,545.00	89.62	89.91	6,627.53	242.88	2,052.47	40.472029	-104.424513	1,416,614.86	3,299,208.68
8,640.00	89.53	89.51	6,628.24	243.36	2,147.46	40.472027	-104.424172	1,416,615.34	3,299,303.68
8,734.00	89.62	88.95	6,628.94	244.62	2,241.45	40.472027	-104.423834	1,416,616.60	3,299,397.66
8,829.00	89.56	89.16	6,629.62	246.19	2,336.44	40.472028	-104.423493	1,416,618.17	3,299,492.64
8,924.00	89.84	89.41	6,630.11	247.37	2,431.43	40.472028	-104.423151	1,416,619.35	3,299,587.63
9,018.00	90.05	88.60	6,630.20	249.01	2,525.41	40.472030	-104.422813	1,416,620.99	3,299,681.61
9,113.00	90.58	88.50	6,629.68	251.41	2,620.38	40.472033	-104.422472	1,416,623.39	3,299,776.58
9,208.00	91.07	88.86	6,628.31	253.60	2,715.35	40.472036	-104.422130	1,416,625.58	3,299,871.54
9,302.00	90.09	88.07	6,627.36	256.12	2,809.31	40.472040	-104.421793	1,416,628.10	3,299,965.49
9,397.00	90.52	88.40	6,626.86	259.04	2,904.26	40.472045	-104.421451	1,416,631.02	3,300,060.44
9,492.00	89.87	87.00	6,626.53	262.85	2,999.18	40.472052	-104.421110	1,416,634.83	3,300,155.36
9,586.00	90.40	87.14	6,626.31	267.66	3,093.06	40.472062	-104.420772	1,416,639.64	3,300,249.23
9,681.00	91.32	87.10	6,624.89	272.43	3,187.92	40.472072	-104.420431	1,416,644.41	3,300,344.10
9,776.00	89.04	87.58	6,624.59	276.84	3,282.81	40.472081	-104.420090	1,416,648.82	3,300,438.99
9,870.00	89.35	87.72	6,625.91	280.69	3,376.73	40.472088	-104.419752	1,416,652.67	3,300,532.89
9,965.00	90.55	88.00	6,625.99	284.24	3,471.66	40.472095	-104.419411	1,416,656.22	3,300,627.82
10,154.00	89.78	89.34	6,625.45	288.63	3,660.60	40.472100	-104.418732	1,416,660.61	3,300,816.76
10,249.00	90.30	89.23	6,625.38	289.81	3,755.59	40.472101	-104.418390	1,416,661.79	3,300,911.75
10,343.00	91.17	89.31	6,624.17	291.01	3,849.58	40.472101	-104.418052	1,416,662.99	3,301,005.73
10,438.00	88.76	88.77	6,624.23	292.60	3,944.56	40.472102	-104.417711	1,416,664.58	3,301,100.70
10,532.00	88.52	88.44	6,626.46	294.89	4,038.50	40.472105	-104.417373	1,416,666.87	3,301,194.65
10,627.00	89.19	88.54	6,628.36	297.39	4,133.45	40.472109	-104.417032	1,416,669.37	3,301,289.59
10,721.00	89.47	88.07	6,629.46	300.17	4,227.40	40.472113	-104.416694	1,416,672.15	3,301,383.54
10,816.00	89.90	87.45	6,629.98	303.89	4,322.33	40.472120	-104.416353	1,416,675.86	3,301,478.46
10,911.00	89.41	89.47	6,630.55	306.44	4,417.28	40.472124	-104.416011	1,416,678.42	3,301,573.42
11,005.00	89.38	89.20	6,631.55	307.53	4,511.27	40.472124	-104.415674	1,416,679.51	3,301,667.40
11,100.00	89.69	88.93	6,632.32	309.08	4,606.26	40.472125	-104.415332	1,416,681.06	3,301,762.38
11,195.00	90.00	89.04	6,632.58	310.76	4,701.24	40.472126	-104.414991	1,416,682.74	3,301,857.36
11,289.00	90.12	89.31	6,632.48	312.12	4,795.23	40.472127	-104.414653	1,416,684.09	3,301,951.35
11,384.00	91.32	90.04	6,631.28	312.66	4,890.22	40.472125	-104.414311	1,416,684.63	3,302,046.33
11,478.00	90.09	90.31	6,630.13	312.37	4,984.21	40.472121	-104.413974	1,416,684.35	3,302,140.32
11,668.00	90.61	91.00	6,628.97	310.20	5,174.19	40.472109	-104.413291	1,416,682.17	3,302,330.30
11,762.00	91.10	90.59	6,627.56	308.89	5,268.17	40.472102	-104.412953	1,416,680.87	3,302,424.27
11,825.00	91.10	90.59	6,626.35	308.24	5,331.16	40.472098	-104.412727	1,416,680.22	3,302,487.26

## Design Report for Wells Ranch AA22-650 - Actual Surveys

### Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	-0.34	-0.02	First Gyro Survey at 84.00ft
1,915.00	1,914.95	-1.00	2.26	Final Gyro Survey at 1915.00ft
1,915.00	1,914.95	-1.00	2.26	Tie on to Gyro Survey at 1915.00ft
1,966.00	1,965.95	-1.42	2.42	First Sperry MWD Survey at 1966.00ft
7,136.00	6,632.48	235.46	643.72	First Production Sperry MWD Survey Corrected by Surcon at 7136.00ft
11,762.00	6,627.56	308.89	5,268.17	Final Production Sperry MWD Survey Corrected by Surcon at 11762.00ft
11,825.00	6,626.35	308.24	5,331.16	Straight Line Projection to TD at 11825.00ft

### Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/_S (usft)	+E/-W (usft)	
Target	Wells Ranch AA22-650_Rev A2_BHL1	86.73	Slot	0.00	0.00	0.00

### Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,915.00	Gyro Data Surveys	NS-GYRO-MS
1,966.00	6,951.00	Intermediate Sperry MWD Surveys	MWD
7,044.00	11,825.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

### Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,923.00	1,922.95	9 5/8"	9-5/8	13-3/4

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Design Report for Wells Ranch AA22-650 - Actual Surveys

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***Design Targets***

Shape	Target Name	TVD ( )	Northing ( )	Easting ( )	+N/-S	+E/-W	Created	Updated
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**Directional Difficulty Index**

Average Dogleg over Survey:	1.43 °/100usft	Maximum Dogleg over Survey:	12.41 °/100usft at 7,044.00 usft
Net Tortosity applicable to Plans:	0.60 °/100usft	Directional Difficulty Index:	6.241

**Audit Info**

**North Reference Sheet for Sec. 22-T6N-R63W (Wells Ranch AA22 PAD) - Wells Ranch AA22-650 - Plan A**

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

Vertical Depths are relative to RKB = 24' @ 4779.00usft (H&P 343). Northing and Easting are relative to Wells Ranch AA22-650

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: 0.99996424

Grid Coordinates of Well: 1,416,371.99 usft N, 3,297,156.29 usft E

Geographical Coordinates of Well: 40° 28' 17.15" N, 104° 25' 54.84" W

Grid Convergence at Surface is: 0.69°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,825.00usft

the Bottom Hole Displacement is 5,340.06usft in the Direction of 86.69° (Grid).

Magnetic Convergence at surface is: -7.60° (29 March 2016, , BGGM2015)

