

Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AA22-645

05-123-42421

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

19 April, 2016

Surface UWI : 05-123-42421

Well Coordinates: 1,416,335.56 N, 3,297,156.73 E (40° 28' 16.79" N, 104° 25' 54.84" W)

Ground Level: 4,756.00 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 AA22-645

RKB = 24' @ 4780.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

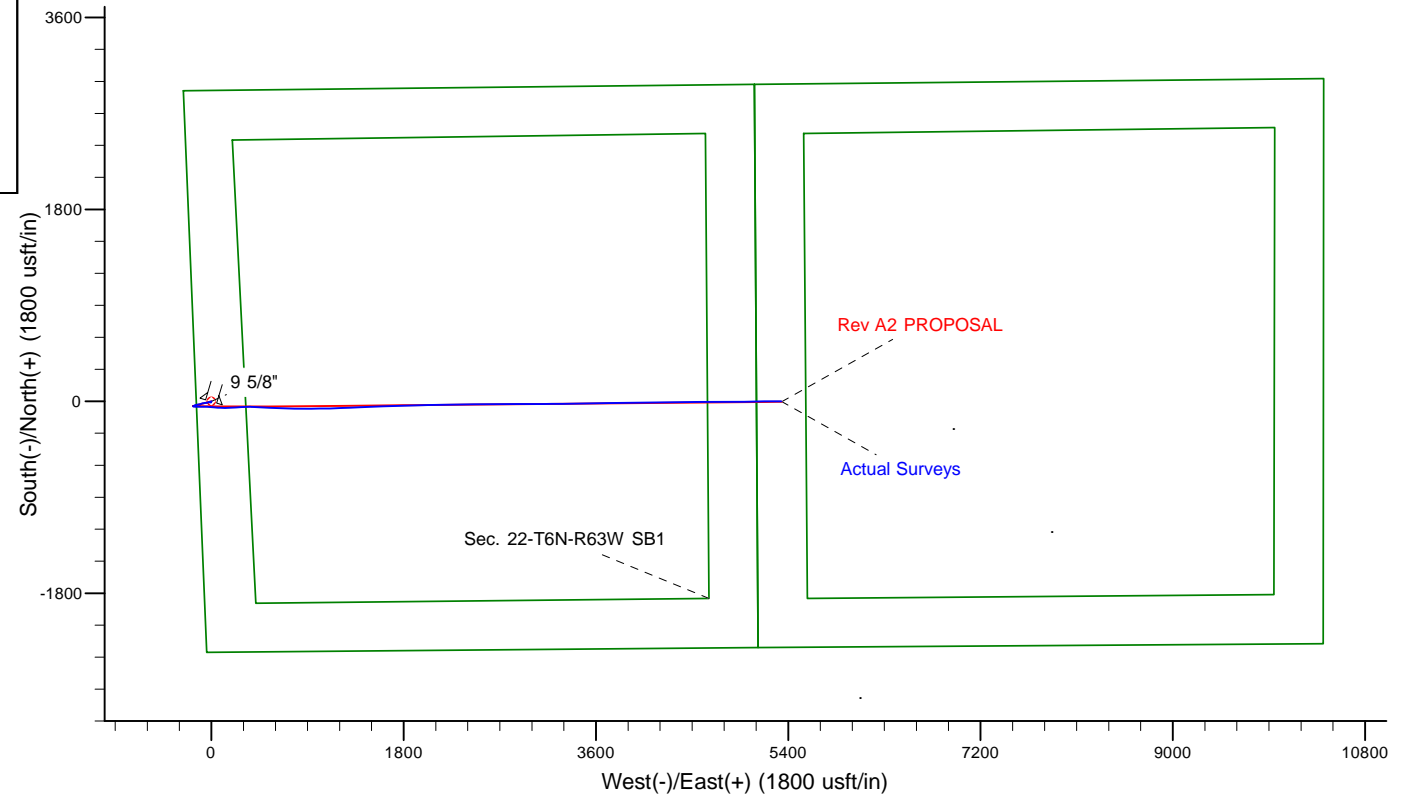
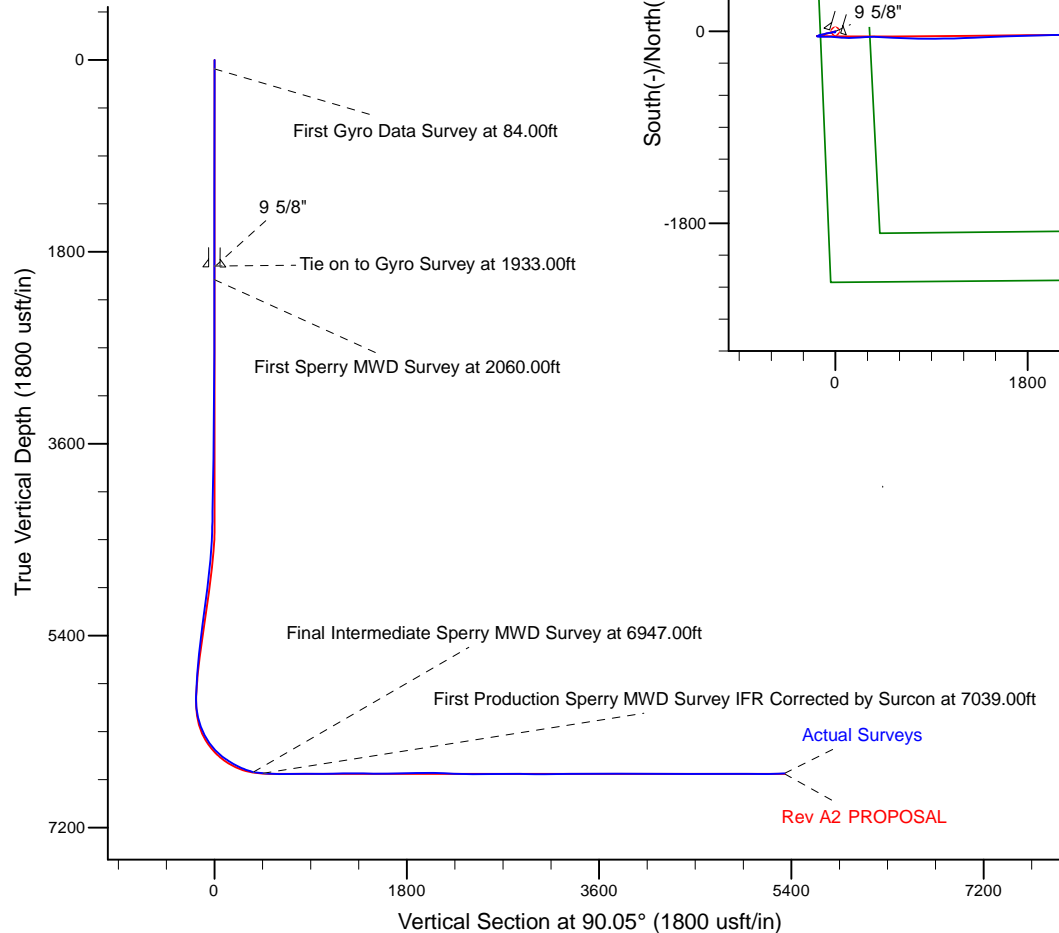
HALLIBURTON

Project: Weld County, CO (NAD 83)
 Site: Sec. 22-T6N-R63W (Wells Ranch AA22 PAD)
 Well: Wells Ranch AA22-645
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 2353' FSL, 126' FWL
 Platted Lat/Long: 40.47133, -104.4319
 Location: Sec. 22-T6N-R63W

Platted BHL: 2304' FSL, 235' FWL
 Platted Lat/Long: 40.471154 N, -104.412939 W
 State Planes - CO Northern: 1,416,335.50 N, 3,302,432.54 E
 Sec. 23-T6N-R63W



LEGEND

- Wells Ranch AA22-645, Plan A, Rev A2 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AA22-645

Ground Level: 4756.00

RKB = 24' @ 4780.00usft (H&P 343)

Created By: Tatiana Gomez

Created On: 4/19/16

Design Report for Wells Ranch AA22-645 - 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	0.26	178.91	84.00	-0.19	0.00	0.00	0.31
First Gyro Data Survey at 84.00ft							
178.00	0.29	169.38	178.00	-0.64	0.05	0.05	0.06
270.00	0.45	136.99	270.00	-1.13	0.34	0.34	0.28
362.00	0.19	188.52	362.00	-1.55	0.56	0.57	0.40
455.00	0.19	210.80	454.99	-1.83	0.46	0.46	0.08
549.00	0.15	200.16	548.99	-2.08	0.34	0.34	0.05
644.00	0.26	256.65	643.99	-2.25	0.09	0.09	0.23
738.00	0.44	239.86	737.99	-2.48	-0.43	-0.43	0.22
833.00	0.19	232.70	832.99	-2.76	-0.87	-0.87	0.27
928.00	0.19	260.37	927.99	-2.88	-1.15	-1.15	0.10
1,022.00	0.20	267.27	1,021.99	-2.91	-1.47	-1.47	0.03
1,117.00	0.11	268.40	1,116.99	-2.92	-1.73	-1.72	0.09
1,211.00	0.24	307.98	1,210.99	-2.80	-1.97	-1.97	0.18
1,306.00	0.24	327.99	1,305.99	-2.51	-2.23	-2.23	0.09
1,400.00	0.09	42.76	1,399.99	-2.29	-2.29	-2.29	0.25
1,495.00	0.08	56.76	1,494.99	-2.20	-2.18	-2.18	0.02
1,589.00	0.36	42.21	1,588.99	-1.94	-1.93	-1.93	0.30
1,684.00	0.15	193.91	1,683.99	-1.84	-1.76	-1.76	0.52
1,779.00	0.15	165.33	1,778.99	-2.09	-1.76	-1.76	0.08
1,873.00	0.38	197.80	1,872.98	-2.50	-1.82	-1.82	0.28
1,933.00	0.47	196.52	1,932.98	-2.93	-1.95	-1.95	0.15
Final Gyro Data Survey at 1933.00ft - Tie on to Gyro Survey at 1933.00ft							
1,941.00	0.45	196.54	1,940.98	-2.99	-1.97	-1.97	0.20
9 5/8"							
2,060.00	0.21	197.33	2,059.98	-3.65	-2.17	-2.17	0.20
First Sperry MWD Survey at 2060.00ft							
2,154.00	0.22	219.03	2,153.98	-3.95	-2.33	-2.33	0.09
2,249.00	0.28	178.60	2,248.98	-4.33	-2.44	-2.44	0.19
2,343.00	0.48	186.04	2,342.98	-4.95	-2.48	-2.48	0.22
2,438.00	0.68	186.48	2,437.97	-5.90	-2.59	-2.58	0.21
2,533.00	0.58	172.08	2,532.97	-6.94	-2.58	-2.58	0.20
2,627.00	0.50	201.67	2,626.96	-7.79	-2.67	-2.66	0.30
2,722.00	0.45	218.26	2,721.96	-8.47	-3.05	-3.05	0.15
2,817.00	0.34	194.09	2,816.96	-9.04	-3.35	-3.34	0.21
2,911.00	0.34	153.55	2,910.96	-9.56	-3.30	-3.29	0.25
3,006.00	0.20	160.21	3,005.95	-9.97	-3.11	-3.11	0.15
3,100.00	0.31	191.66	3,099.95	-10.37	-3.11	-3.10	0.19
3,195.00	0.18	241.72	3,194.95	-10.69	-3.29	-3.28	0.25
3,290.00	0.87	232.99	3,289.95	-11.20	-4.00	-3.99	0.73
3,384.00	0.71	259.13	3,383.94	-11.74	-5.14	-5.13	0.41
3,479.00	0.55	290.19	3,478.93	-11.69	-6.15	-6.14	0.39
3,574.00	0.13	335.53	3,573.93	-11.43	-6.62	-6.61	0.49
3,668.00	0.62	279.49	3,667.93	-11.25	-7.17	-7.16	0.59
3,763.00	0.90	282.62	3,762.92	-11.01	-8.40	-8.39	0.30
3,857.00	1.25	293.90	3,856.91	-10.43	-10.06	-10.05	0.43
3,952.00	1.56	270.04	3,951.88	-10.01	-12.30	-12.29	0.69
4,047.00	1.71	286.55	4,046.84	-9.60	-14.95	-14.94	0.52
4,141.00	1.30	289.08	4,140.81	-8.86	-17.30	-17.30	0.44

Design Report for Wells Ranch AA22-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,236.00	0.91	274.72	4,235.79	-8.44	-19.07	-19.07	0.50
4,331.00	0.79	305.47	4,330.78	-8.00	-20.36	-20.35	0.49
4,425.00	2.00	274.78	4,424.75	-7.49	-22.52	-22.52	1.47
4,520.00	2.65	256.70	4,519.67	-7.85	-26.31	-26.31	1.02
4,614.00	4.16	249.10	4,613.50	-9.57	-31.61	-31.60	1.67
4,709.00	5.55	253.95	4,708.16	-12.07	-39.25	-39.24	1.52
4,804.00	6.43	264.91	4,802.65	-13.81	-48.96	-48.95	1.52
4,898.00	8.26	262.55	4,895.87	-15.15	-60.90	-60.89	1.97
4,993.00	8.34	257.77	4,989.88	-17.50	-74.40	-74.38	0.73
5,088.00	7.46	254.16	5,083.97	-20.64	-87.07	-87.05	1.06
5,182.00	6.35	253.19	5,177.29	-23.81	-97.91	-97.89	1.19
5,277.00	6.76	256.31	5,271.67	-26.65	-108.37	-108.35	0.57
5,371.00	7.54	260.10	5,364.94	-29.02	-119.83	-119.80	0.97
5,466.00	7.08	259.35	5,459.17	-31.18	-131.72	-131.69	0.49
5,561.00	6.66	253.16	5,553.49	-33.85	-142.75	-142.72	0.90
5,655.00	5.66	253.40	5,646.94	-36.76	-152.41	-152.38	1.06
5,750.00	4.75	242.01	5,741.55	-39.94	-160.37	-160.34	1.44
5,844.00	3.80	240.65	5,835.29	-43.30	-166.52	-166.48	1.02
5,936.00	3.11	240.56	5,927.12	-46.02	-171.35	-171.31	0.75
6,028.00	0.75	144.78	6,019.07	-47.73	-173.18	-173.14	3.56
6,121.00	9.66	96.26	6,111.61	-49.09	-165.05	-165.01	9.87
6,213.00	16.12	92.76	6,201.24	-50.54	-144.60	-144.56	7.07
6,304.00	22.58	90.55	6,287.06	-51.32	-114.48	-114.44	7.14
6,396.00	30.98	89.54	6,369.12	-51.30	-73.07	-73.02	9.14
6,488.00	39.62	93.34	6,444.14	-52.82	-20.00	-19.96	9.69
6,579.00	49.17	95.74	6,509.09	-57.97	43.37	43.42	10.65
6,671.00	56.09	90.57	6,564.92	-61.84	116.30	116.35	8.74
6,763.00	61.85	85.91	6,612.35	-59.32	195.03	195.08	7.62
6,855.00	67.90	86.05	6,651.39	-53.49	278.08	278.12	6.58
6,947.00	78.04	91.14	6,678.32	-51.44	365.87	365.91	12.22
Final Sperry MWD Survey at 6947.00ft							
7,039.00	86.88	94.26	6,690.38	-55.76	456.87	456.92	10.18
First Production Sperry MWD Survey IFR Corrected by Surcon at 7039.00ft							
7,131.00	87.77	93.13	6,694.67	-61.68	548.58	548.63	1.56
7,222.00	89.56	91.39	6,696.80	-65.26	639.48	639.53	2.74
7,314.00	90.45	91.40	6,696.79	-67.50	731.45	731.50	0.97
7,408.00	90.54	90.09	6,695.98	-68.73	825.43	825.49	1.40
7,503.00	90.39	89.09	6,695.20	-68.05	920.43	920.48	1.06
7,598.00	90.15	89.40	6,694.76	-66.79	1,015.42	1,015.47	0.41
7,692.00	91.28	89.67	6,693.58	-66.03	1,109.41	1,109.46	1.24
7,787.00	90.39	88.09	6,692.20	-64.17	1,204.37	1,204.43	1.91
7,881.00	89.77	87.31	6,692.07	-60.40	1,298.30	1,298.35	1.06
7,976.00	89.96	86.72	6,692.29	-55.46	1,393.17	1,393.21	0.65
8,070.00	89.37	88.38	6,692.84	-51.44	1,487.08	1,487.12	1.87
8,165.00	90.17	88.80	6,693.22	-49.10	1,582.05	1,582.09	0.95
8,260.00	90.66	88.23	6,692.53	-46.64	1,677.01	1,677.05	0.79
8,354.00	90.82	88.08	6,691.32	-43.61	1,770.95	1,770.99	0.23
8,449.00	91.77	87.76	6,689.17	-40.16	1,865.87	1,865.90	1.06
8,544.00	91.00	87.83	6,686.88	-36.51	1,960.77	1,960.80	0.81
8,638.00	88.47	88.74	6,687.31	-33.70	2,054.72	2,054.74	2.86
8,733.00	87.61	88.61	6,690.56	-31.50	2,149.63	2,149.66	0.92

Design Report for Wells Ranch AA22-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,828.00	87.95	88.71	6,694.24	-29.28	2,244.54	2,244.56	0.37
8,922.00	88.29	89.60	6,697.32	-27.90	2,338.47	2,338.50	1.01
9,017.00	89.28	90.04	6,699.34	-27.60	2,433.45	2,433.47	1.14
9,112.00	90.33	90.50	6,699.66	-28.05	2,528.45	2,528.47	1.21
9,206.00	91.71	90.68	6,697.99	-29.01	2,622.43	2,622.45	1.48
9,301.00	90.60	89.23	6,696.07	-28.94	2,717.40	2,717.42	1.92
9,396.00	89.71	89.26	6,695.82	-27.69	2,812.39	2,812.41	0.94
9,490.00	88.69	89.53	6,697.13	-26.69	2,906.38	2,906.40	1.12
9,585.00	89.25	89.36	6,698.84	-25.77	3,001.36	3,001.38	0.62
9,680.00	89.80	89.53	6,699.62	-24.85	3,096.35	3,096.37	0.61
9,774.00	90.48	89.39	6,699.40	-23.97	3,190.34	3,190.36	0.74
9,869.00	90.78	89.33	6,698.35	-22.91	3,285.33	3,285.35	0.32
9,963.00	91.96	89.37	6,696.10	-21.84	3,379.30	3,379.31	1.26
10,058.00	89.99	89.33	6,694.49	-20.76	3,474.27	3,474.29	2.07
10,152.00	90.85	89.35	6,693.80	-19.68	3,568.26	3,568.28	0.92
10,247.00	89.83	88.88	6,693.23	-18.21	3,663.25	3,663.26	1.18
10,342.00	90.04	88.77	6,693.34	-16.27	3,758.23	3,758.24	0.25
10,436.00	90.42	89.29	6,692.96	-14.67	3,852.21	3,852.22	0.69
10,531.00	89.28	89.11	6,693.21	-13.35	3,947.20	3,947.21	1.21
10,625.00	89.22	89.10	6,694.44	-11.88	4,041.18	4,041.19	0.06
10,720.00	89.43	88.89	6,695.56	-10.21	4,136.16	4,136.17	0.31
10,815.00	89.95	89.00	6,696.08	-8.46	4,231.14	4,231.15	0.56
10,909.00	91.28	89.39	6,695.07	-7.14	4,325.13	4,325.13	1.47
11,004.00	89.15	89.99	6,694.71	-6.63	4,420.12	4,420.12	2.33
11,098.00	89.34	89.89	6,695.95	-6.53	4,514.11	4,514.11	0.23
11,193.00	89.22	89.89	6,697.14	-6.35	4,609.10	4,609.11	0.13
11,288.00	90.20	89.85	6,697.62	-6.13	4,704.10	4,704.10	1.03
11,382.00	90.26	89.63	6,697.25	-5.71	4,798.10	4,798.10	0.24
11,477.00	91.41	89.55	6,695.86	-5.03	4,893.08	4,893.09	1.21
11,572.00	88.76	88.88	6,695.72	-3.73	4,988.07	4,988.07	2.88
11,761.00	90.60	89.40	6,696.78	-0.89	5,177.03	5,177.03	1.01
11,860.00	91.96	89.64	6,694.57	-0.06	5,276.00	5,276.00	1.39
Final Production Sperry MWD Survey IFR Corrected by Surcon at 11860.00ft							
11,920.00	91.96	89.64	6,692.51	0.32	5,335.97	5,335.96	0.00
Straight Line Projection to TD at 11920.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
84.00	84.00	-0.19	0.00	First Gyro Data Survey at 84.00ft
1,933.00	1,932.98	-2.93	-1.95	Final Gyro Data Survey at 1933.00ft
1,933.00	1,932.98	-2.93	-1.95	Tie on to Gyro Survey at 1933.00ft
2,060.00	2,059.98	-3.65	-2.17	First Sperry MWD Survey at 2060.00ft
6,947.00	6,678.32	-51.44	365.87	Final Sperry MWD Survey at 6947.00ft
7,039.00	6,690.38	-55.76	456.87	First Production Sperry MWD Survey IFR Corrected by Surcon at 7039.00ft
11,860.00	6,694.57	-0.06	5,276.00	Final Production Sperry MWD Survey IFR Corrected by Surcon at 11860.00ft
11,920.00	6,692.51	0.32	5,335.97	Straight Line Projection to TD at 11920.00ft

Design Report for Wells Ranch AA22-645 - Actual Surveys

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	Origin +E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AA22-645_Rev A2_BHL	90.05	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,933.00	Gyro Data Surveys	NS-GYRO-MS
2,060.00	6,947.00	Intermediate Sperry MWD Surveys	MWD
7,039.00	11,920.00	Production Sperry MWD Surveys - Correct by Surcon	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,941.00	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 AA22-645 - actual wellpath hits target center - Point	0.00	0.00	0.00	0.00	0.00	1,416,335.57	3,297,156.73	40.471330	-104.431900
Wells Ranch AA22-645 - actual wellpath misses target center by 5.32usft at 6991.11usft MD (6685.86 TVD, -52.88 N, 409.29 E) - Point	0.00	0.00	6,689.48	-49.00	409.00	1,416,286.56	3,297,565.71	40.471182	-104.430432
Wells Ranch AA22-645 - actual wellpath misses target center by 4.79usft at 11920.00usft MD (6692.51 TVD, 0.32 N, 5335.97 E) - Point	0.00	0.00	6,692.00	-4.36	5,336.85	1,416,331.20	3,302,493.39	40.471140	-104.412720
Wells Ranch AA22-645 - actual wellpath misses target center by 4.79usft at 11920.00usft MD (6692.51 TVD, 0.32 N, 5335.97 E) - Point	0.00	0.00	6,692.00	-4.36	5,336.85	1,416,331.20	3,302,493.39	40.471140	-104.412720
Wells Ranch AA22-645 - actual wellpath misses target center by 5.37usft at 11920.00usft MD (6692.51 TVD, 0.32 N, 5335.97 E) - Point	0.00	0.00	6,695.00	-4.36	5,336.85	1,416,331.20	3,302,493.39	40.471140	-104.412720

Directional Difficulty Index

Average Dogleg over Survey:	1.48 °/100usft	Maximum Dogleg over Survey:	12.22 °/100usft at 6,947.00 usft
Net Tortousity applicable to Plans:	0.59 °/100usft	Directional Difficulty Index:	6.254

Audit Info

North Reference Sheet for Sec. 22-T6N-R63W (Wells Ranch AA22 PAD) - Wells Ranch AA22-645 - 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' @ 4780.00usft (H&P 343). Northing and Easting are relative to Wells Ranch AA22-645

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

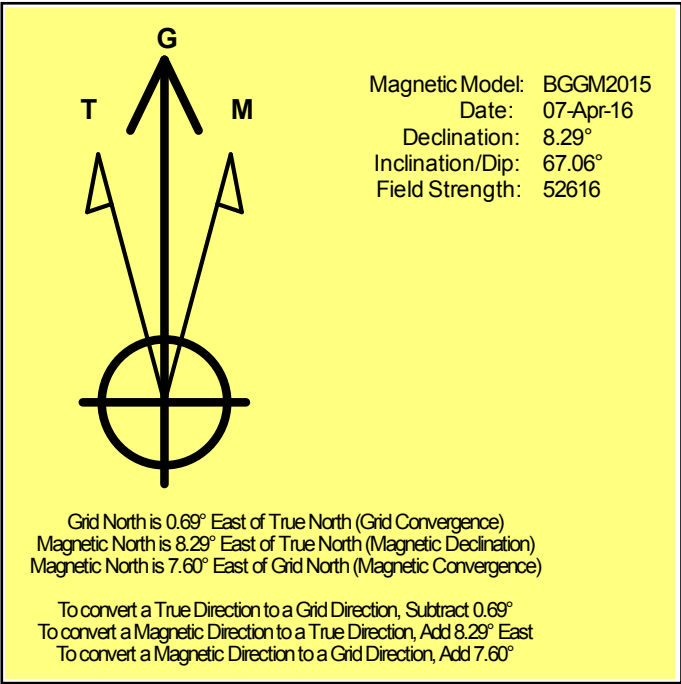
Grid Coordinates of Well: 1,416,335.56 usft N, 3,297,156.73 usft E

Geographical Coordinates of Well: 40° 28' 16.79" N, 104° 25' 54.84" W

Grid Convergence at Surface is: 0.69°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,920.00usft the Bottom Hole Displacement is 5,335.97usft in the Direction of 90.00° (Grid).

Magnetic Convergence at surface is: -7.60° (7 April 2016, , BGGM2015)



Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AA22-645

05-123-42421

Plan A

Design: Actual Surveys

Sperry Drilling Services

Geodetic Report

19 April, 2016

Well Coordinates: 1,416,335.56 N, 3,297,156.73 E (40° 28' 16.79" N, 104° 25' 54.84" W)

Ground Level: 4,756.00 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 AA22-645

RKB = 24' @ 4780.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

Design Report for Wells Ranch AA22-645 - Actual Surveys

Measured			Vertical	Local Coordinates		Geographic Coordinates		UTM Coordinates	
Depth (usft)	Inclination (°)	Azimuth (°)	Depth (usft)	+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	40.471330	-104.431900	1,416,335.56	3,297,156.73
84.00	0.26	178.91	84.00	-0.19	0.00	40.471330	-104.431900	1,416,335.37	3,297,156.73
178.00	0.29	169.38	178.00	-0.64	0.05	40.471328	-104.431900	1,416,334.92	3,297,156.78
270.00	0.45	136.99	270.00	-1.13	0.34	40.471327	-104.431899	1,416,334.43	3,297,157.07
362.00	0.19	188.52	362.00	-1.55	0.56	40.471326	-104.431898	1,416,334.02	3,297,157.29
455.00	0.19	210.80	454.99	-1.83	0.46	40.471325	-104.431899	1,416,333.73	3,297,157.19
549.00	0.15	200.16	548.99	-2.08	0.34	40.471324	-104.431899	1,416,333.48	3,297,157.07
644.00	0.26	256.65	643.99	-2.25	0.09	40.471324	-104.431900	1,416,333.31	3,297,156.82
738.00	0.44	239.86	737.99	-2.48	-0.43	40.471323	-104.431902	1,416,333.08	3,297,156.30
833.00	0.19	232.70	832.99	-2.76	-0.87	40.471323	-104.431904	1,416,332.81	3,297,155.86
928.00	0.19	260.37	927.99	-2.88	-1.15	40.471322	-104.431905	1,416,332.68	3,297,155.57
1,022.00	0.20	267.27	1,021.99	-2.91	-1.47	40.471322	-104.431906	1,416,332.65	3,297,155.26
1,117.00	0.11	268.40	1,116.99	-2.92	-1.73	40.471322	-104.431907	1,416,332.64	3,297,155.00
1,211.00	0.24	307.98	1,210.99	-2.80	-1.97	40.471322	-104.431907	1,416,332.76	3,297,154.75
1,306.00	0.24	327.99	1,305.99	-2.51	-2.23	40.471323	-104.431908	1,416,333.05	3,297,154.49
1,400.00	0.09	42.76	1,399.99	-2.29	-2.29	40.471324	-104.431909	1,416,333.27	3,297,154.44
1,495.00	0.08	56.76	1,494.99	-2.20	-2.18	40.471324	-104.431908	1,416,333.36	3,297,154.54
1,589.00	0.36	42.21	1,588.99	-1.94	-1.93	40.471325	-104.431907	1,416,333.62	3,297,154.80
1,684.00	0.15	193.91	1,683.99	-1.84	-1.76	40.471325	-104.431907	1,416,333.72	3,297,154.97
1,779.00	0.15	165.33	1,778.99	-2.09	-1.76	40.471324	-104.431907	1,416,333.48	3,297,154.97
1,873.00	0.38	197.80	1,872.98	-2.50	-1.82	40.471323	-104.431907	1,416,333.06	3,297,154.91
1,933.00	0.47	196.52	1,932.98	-2.93	-1.95	40.471322	-104.431907	1,416,332.63	3,297,154.78
1,941.00	0.45	196.54	1,940.98	-2.99	-1.97	40.471322	-104.431907	1,416,332.57	3,297,154.76
2,060.00	0.21	197.33	2,059.98	-3.65	-2.17	40.471320	-104.431908	1,416,331.91	3,297,154.56
2,154.00	0.22	219.03	2,153.98	-3.95	-2.33	40.471319	-104.431909	1,416,331.61	3,297,154.39
2,249.00	0.28	178.60	2,248.98	-4.33	-2.44	40.471318	-104.431909	1,416,331.23	3,297,154.28
2,343.00	0.48	186.04	2,342.98	-4.95	-2.48	40.471317	-104.431909	1,416,330.61	3,297,154.25
2,438.00	0.68	186.48	2,437.97	-5.90	-2.59	40.471314	-104.431910	1,416,329.66	3,297,154.14
2,533.00	0.58	172.08	2,532.97	-6.94	-2.58	40.471311	-104.431910	1,416,328.62	3,297,154.14
2,627.00	0.50	201.67	2,626.96	-7.79	-2.67	40.471309	-104.431910	1,416,327.77	3,297,154.06
2,722.00	0.45	218.26	2,721.96	-8.47	-3.05	40.471307	-104.431912	1,416,327.09	3,297,153.67
2,817.00	0.34	194.09	2,816.96	-9.04	-3.35	40.471305	-104.431913	1,416,326.52	3,297,153.38
2,911.00	0.34	153.55	2,910.96	-9.56	-3.30	40.471304	-104.431913	1,416,326.00	3,297,153.43
3,006.00	0.20	160.21	3,005.95	-9.97	-3.11	40.471303	-104.431912	1,416,325.60	3,297,153.61
3,100.00	0.31	191.66	3,099.95	-10.37	-3.11	40.471302	-104.431912	1,416,325.19	3,297,153.62
3,195.00	0.18	241.72	3,194.95	-10.69	-3.29	40.471301	-104.431913	1,416,324.87	3,297,153.43
3,290.00	0.87	232.99	3,289.95	-11.20	-4.00	40.471299	-104.431915	1,416,324.37	3,297,152.73
3,384.00	0.71	259.13	3,383.94	-11.74	-5.14	40.471298	-104.431919	1,416,323.83	3,297,151.58
3,479.00	0.55	290.19	3,478.93	-11.69	-6.15	40.471298	-104.431923	1,416,323.87	3,297,150.58
3,574.00	0.13	335.53	3,573.93	-11.43	-6.62	40.471299	-104.431925	1,416,324.13	3,297,150.11
3,668.00	0.62	279.49	3,667.93	-11.25	-7.17	40.471299	-104.431927	1,416,324.31	3,297,149.56
3,763.00	0.90	282.62	3,762.92	-11.01	-8.40	40.471300	-104.431931	1,416,324.56	3,297,148.33

Design Report for Wells Ranch AA22-645 - 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)
3,857.00	1.25	293.90	3,856.91	-10.43	-10.06	40.471302	-104.431937	1,416,325.13	3,297,146.67
3,952.00	1.56	270.04	3,951.88	-10.01	-12.30	40.471303	-104.431945	1,416,325.55	3,297,144.43
4,047.00	1.71	286.55	4,046.84	-9.60	-14.95	40.471304	-104.431954	1,416,325.96	3,297,141.78
4,141.00	1.30	289.08	4,140.81	-8.86	-17.30	40.471306	-104.431963	1,416,326.71	3,297,139.42
4,236.00	0.91	274.72	4,235.79	-8.44	-19.07	40.471308	-104.431969	1,416,327.12	3,297,137.65
4,331.00	0.79	305.47	4,330.78	-8.00	-20.36	40.471309	-104.431974	1,416,327.56	3,297,136.37
4,425.00	2.00	274.78	4,424.75	-7.49	-22.52	40.471310	-104.431982	1,416,328.08	3,297,134.21
4,520.00	2.65	256.70	4,519.67	-7.85	-26.31	40.471309	-104.431995	1,416,327.71	3,297,130.42
4,614.00	4.16	249.10	4,613.50	-9.57	-31.61	40.471305	-104.432014	1,416,325.99	3,297,125.12
4,709.00	5.55	253.95	4,708.16	-12.07	-39.25	40.471298	-104.432042	1,416,323.49	3,297,117.48
4,804.00	6.43	264.91	4,802.65	-13.81	-48.96	40.471294	-104.432077	1,416,321.75	3,297,107.77
4,898.00	8.26	262.55	4,895.87	-15.15	-60.90	40.471291	-104.432120	1,416,320.41	3,297,095.83
4,993.00	8.34	257.77	4,989.88	-17.50	-74.40	40.471285	-104.432168	1,416,318.06	3,297,082.33
5,088.00	7.46	254.16	5,083.97	-20.64	-87.07	40.471276	-104.432214	1,416,314.92	3,297,069.66
5,182.00	6.35	253.19	5,177.29	-23.81	-97.91	40.471268	-104.432253	1,416,311.75	3,297,058.82
5,277.00	6.76	256.31	5,271.67	-26.65	-108.37	40.471261	-104.432291	1,416,308.91	3,297,048.36
5,371.00	7.54	260.10	5,364.94	-29.02	-119.83	40.471254	-104.432332	1,416,306.54	3,297,036.91
5,466.00	7.08	259.35	5,459.17	-31.18	-131.72	40.471249	-104.432375	1,416,304.39	3,297,025.01
5,561.00	6.66	253.16	5,553.49	-33.85	-142.75	40.471242	-104.432415	1,416,301.71	3,297,013.99
5,655.00	5.66	253.40	5,646.94	-36.76	-152.41	40.471234	-104.432450	1,416,298.81	3,297,004.33
5,750.00	4.75	242.01	5,741.55	-39.94	-160.37	40.471226	-104.432478	1,416,295.62	3,296,996.36
5,844.00	3.80	240.65	5,835.29	-43.30	-166.52	40.471217	-104.432501	1,416,292.27	3,296,990.21
5,936.00	3.11	240.56	5,927.12	-46.02	-171.35	40.471209	-104.432518	1,416,289.55	3,296,985.38
6,028.00	0.75	144.78	6,019.07	-47.73	-173.18	40.471205	-104.432525	1,416,287.83	3,296,983.56
6,121.00	9.66	96.26	6,111.61	-49.09	-165.05	40.471201	-104.432496	1,416,286.48	3,296,991.68
6,213.00	16.12	92.76	6,201.24	-50.54	-144.60	40.471196	-104.432422	1,416,285.02	3,297,012.13
6,304.00	22.58	90.55	6,287.06	-51.32	-114.48	40.471193	-104.432314	1,416,284.24	3,297,042.25
6,396.00	30.98	89.54	6,369.12	-51.30	-73.07	40.471192	-104.432165	1,416,284.26	3,297,083.66
6,488.00	39.62	93.34	6,444.14	-52.82	-20.00	40.471186	-104.431974	1,416,282.74	3,297,136.73
6,579.00	49.17	95.74	6,509.09	-57.97	43.37	40.471170	-104.431747	1,416,277.59	3,297,200.10
6,671.00	56.09	90.57	6,564.92	-61.84	116.30	40.471157	-104.431485	1,416,273.73	3,297,273.02
6,763.00	61.85	85.91	6,612.35	-59.32	195.03	40.471161	-104.431202	1,416,276.24	3,297,351.75
6,855.00	67.90	86.05	6,651.39	-53.49	278.08	40.471174	-104.430903	1,416,282.08	3,297,434.80
6,947.00	78.04	91.14	6,678.32	-51.44	365.87	40.471177	-104.430588	1,416,284.13	3,297,522.59
7,039.00	86.88	94.26	6,690.38	-55.76	456.87	40.471162	-104.430261	1,416,279.81	3,297,613.58
7,131.00	87.77	93.13	6,694.67	-61.68	548.58	40.471143	-104.429931	1,416,273.89	3,297,705.29
7,222.00	89.56	91.39	6,696.80	-65.26	639.48	40.471130	-104.429605	1,416,270.30	3,297,796.18
7,314.00	90.45	91.40	6,696.79	-67.50	731.45	40.471121	-104.429274	1,416,268.06	3,297,888.15
7,408.00	90.54	90.09	6,695.98	-68.73	825.43	40.471114	-104.428937	1,416,266.84	3,297,982.13
7,503.00	90.39	89.09	6,695.20	-68.05	920.43	40.471113	-104.428595	1,416,267.52	3,298,077.12
7,598.00	90.15	89.40	6,694.76	-66.79	1,015.42	40.471113	-104.428254	1,416,268.77	3,298,172.11
7,692.00	91.28	89.67	6,693.58	-66.03	1,109.41	40.471112	-104.427916	1,416,269.53	3,298,266.09

Design Report for Wells Ranch AA22-645 - 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)
7,787.00	90.39	88.09	6,692.20	-64.17	1,204.37	40.471114	-104.427575	1,416,271.39	3,298,361.06
7,881.00	89.77	87.31	6,692.07	-60.40	1,298.30	40.471121	-104.427237	1,416,275.16	3,298,454.98
7,976.00	89.96	86.72	6,692.29	-55.46	1,393.17	40.471132	-104.426896	1,416,280.11	3,298,549.84
8,070.00	89.37	88.38	6,692.84	-51.44	1,487.08	40.471140	-104.426558	1,416,284.13	3,298,643.75
8,165.00	90.17	88.80	6,693.22	-49.10	1,582.05	40.471143	-104.426217	1,416,286.46	3,298,738.72
8,260.00	90.66	88.23	6,692.53	-46.64	1,677.01	40.471146	-104.425875	1,416,288.93	3,298,833.68
8,354.00	90.82	88.08	6,691.32	-43.61	1,770.95	40.471152	-104.425537	1,416,291.95	3,298,927.62
8,449.00	91.77	87.76	6,689.17	-40.16	1,865.87	40.471158	-104.425196	1,416,295.40	3,299,022.53
8,544.00	91.00	87.83	6,686.88	-36.51	1,960.77	40.471165	-104.424855	1,416,299.05	3,299,117.42
8,638.00	88.47	88.74	6,687.31	-33.70	2,054.72	40.471169	-104.424517	1,416,301.87	3,299,211.37
8,733.00	87.61	88.61	6,690.56	-31.50	2,149.63	40.471172	-104.424176	1,416,304.06	3,299,306.28
8,828.00	87.95	88.71	6,694.24	-29.28	2,244.54	40.471175	-104.423835	1,416,306.28	3,299,401.18
8,922.00	88.29	89.60	6,697.32	-27.90	2,338.47	40.471176	-104.423497	1,416,307.67	3,299,495.12
9,017.00	89.28	90.04	6,699.34	-27.60	2,433.45	40.471174	-104.423156	1,416,307.96	3,299,590.09
9,112.00	90.33	90.50	6,699.66	-28.05	2,528.45	40.471169	-104.422814	1,416,307.52	3,299,685.08
9,206.00	91.71	90.68	6,697.99	-29.01	2,622.43	40.471163	-104.422477	1,416,306.55	3,299,779.06
9,301.00	90.60	89.23	6,696.07	-28.94	2,717.40	40.471160	-104.422135	1,416,306.62	3,299,874.03
9,396.00	89.71	89.26	6,695.82	-27.69	2,812.39	40.471161	-104.421794	1,416,307.88	3,299,969.02
9,490.00	88.69	89.53	6,697.13	-26.69	2,906.38	40.471160	-104.421456	1,416,308.87	3,300,063.00
9,585.00	89.25	89.36	6,698.84	-25.77	3,001.36	40.471160	-104.421115	1,416,309.79	3,300,157.98
9,680.00	89.80	89.53	6,699.62	-24.85	3,096.35	40.471159	-104.420773	1,416,310.71	3,300,252.97
9,774.00	90.48	89.39	6,699.40	-23.97	3,190.34	40.471158	-104.420435	1,416,311.59	3,300,346.96
9,869.00	90.78	89.33	6,698.35	-22.91	3,285.33	40.471158	-104.420094	1,416,312.65	3,300,441.94
9,963.00	91.96	89.37	6,696.10	-21.84	3,379.30	40.471158	-104.419756	1,416,313.72	3,300,535.90
10,058.00	89.99	89.33	6,694.49	-20.76	3,474.27	40.471158	-104.419415	1,416,314.80	3,300,630.88
10,152.00	90.85	89.35	6,693.80	-19.68	3,568.26	40.471157	-104.419077	1,416,315.88	3,300,724.86
10,247.00	89.83	88.88	6,693.23	-18.21	3,663.25	40.471158	-104.418736	1,416,317.35	3,300,819.84
10,342.00	90.04	88.77	6,693.34	-16.27	3,758.23	40.471160	-104.418394	1,416,319.30	3,300,914.82
10,436.00	90.42	89.29	6,692.96	-14.67	3,852.21	40.471162	-104.418056	1,416,320.89	3,301,008.80
10,531.00	89.28	89.11	6,693.21	-13.35	3,947.20	40.471162	-104.417715	1,416,322.21	3,301,103.79
10,625.00	89.22	89.10	6,694.44	-11.88	4,041.18	40.471163	-104.417377	1,416,323.68	3,301,197.77
10,720.00	89.43	88.89	6,695.56	-10.21	4,136.16	40.471164	-104.417036	1,416,325.35	3,301,292.74
10,815.00	89.95	89.00	6,696.08	-8.46	4,231.14	40.471166	-104.416694	1,416,327.10	3,301,387.72
10,909.00	91.28	89.39	6,695.07	-7.14	4,325.13	40.471166	-104.416356	1,416,328.42	3,301,481.70
11,004.00	89.15	89.99	6,694.71	-6.63	4,420.12	40.471165	-104.416015	1,416,328.93	3,301,576.69
11,098.00	89.34	89.89	6,695.95	-6.53	4,514.11	40.471162	-104.415677	1,416,329.03	3,301,670.68
11,193.00	89.22	89.89	6,697.14	-6.35	4,609.10	40.471159	-104.415336	1,416,329.21	3,301,765.67
11,288.00	90.20	89.85	6,697.62	-6.13	4,704.10	40.471156	-104.414994	1,416,329.43	3,301,860.66
11,382.00	90.26	89.63	6,697.25	-5.71	4,798.10	40.471155	-104.414657	1,416,329.85	3,301,954.65
11,477.00	91.41	89.55	6,695.86	-5.03	4,893.08	40.471153	-104.414315	1,416,330.53	3,302,049.64
11,572.00	88.76	88.88	6,695.72	-3.73	4,988.07	40.471154	-104.413974	1,416,331.84	3,302,144.62
11,761.00	90.60	89.40	6,696.78	-0.89	5,177.03	40.471155	-104.413294	1,416,334.67	3,302,333.58

Design Report for Wells Ranch AA22-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Geographic Coordinates Latitude (usft)	Longitude (usft)	UTM Coordinates Northing (usft)	Easting (usft)
11,860.00	91.96	89.64	6,694.57	-0.06	5,276.00	40.471154	-104.412939	1,416,335.50	3,302,432.54
11,920.00	91.96	89.64	6,692.51	0.32	5,335.97	40.471153	-104.412723	1,416,335.88	3,302,492.50

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
84.00	84.00	-0.19	0.00	First Gyro Data Survey at 84.00ft
1,933.00	1,932.98	-2.93	-1.95	Final Gyro Data Survey at 1933.00ft
1,933.00	1,932.98	-2.93	-1.95	Tie on to Gyro Survey at 1933.00ft
2,060.00	2,059.98	-3.65	-2.17	First Sperry MWD Survey at 2060.00ft
6,947.00	6,678.32	-51.44	365.87	Final Sperry MWD Survey at 6947.00ft
7,039.00	6,690.38	-55.76	456.87	First Production Sperry MWD Survey IFR Corrected by Surcon at 7039.00ft
11,860.00	6,694.57	-0.06	5,276.00	Final Production Sperry MWD Survey IFR Corrected by Surcon at 11860.00ft
11,920.00	6,692.51	0.32	5,335.97	Straight Line Projection to TD at 11920.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AA22-645_Rev A2_BHL	90.05	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
84.00	1,933.00	Gyro Data Surveys	NS-GYRO-MS
2,060.00	6,947.00	Intermediate Sperry MWD Surveys	MWD
7,039.00	11,920.00	Production Sperry MWD Surveys - Correct by Surcon	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,941.00	1,940.98	9 5/8"	9-5/8	13-3/4

Design Report for Wells Ranch AA22-645 - Actual Surveys

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:	1.48 °/100usft	Maximum Dogleg over Survey:	12.22 °/100usft at 6,947.00 usft
Net Tortosity applicable to Plans:	0.59 °/100usft	Directional Difficulty Index:	6.254

Audit Info

North Reference Sheet for Sec. 22-T6N-R63W (Wells Ranch AA22 PAD) - Wells Ranch AA22-645 - 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' @ 4780.00usft (H&P 343). Northing and Easting are relative to Wells Ranch AA22-645

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: 1,416,335.56 usft N, 3,297,156.73 usft E

Geographical Coordinates of Well: 40° 28' 16.79" N, 104° 25' 54.84" W

Grid Convergence at Surface is: 0.69°

Based upon Minimum Curvature type calculations, at a Measured Depth of 11,920.00usft

the Bottom Hole Displacement is 5,335.97usft in the Direction of 90.00° (Grid).

Magnetic Convergence at surface is: -7.60° (7 April 2016, , BGGM2015)

