

Noble Energy

Weld County, CO (NAD 83)

Sec. 5-T5N-R62W (Wells Ranch BB01)

Wells Ranch AF05-625

05-123-42136

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

07 April, 2016

Surface UWI : 05-123-42136

Well Coordinates: 1,399,158.61 N, 3,318,853.19 E (40° 25' 24.38" N, 104° 21' 16.99" W)

Ground Level: 4,667.00 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 AF05-625

KB = 24' @ 4691.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

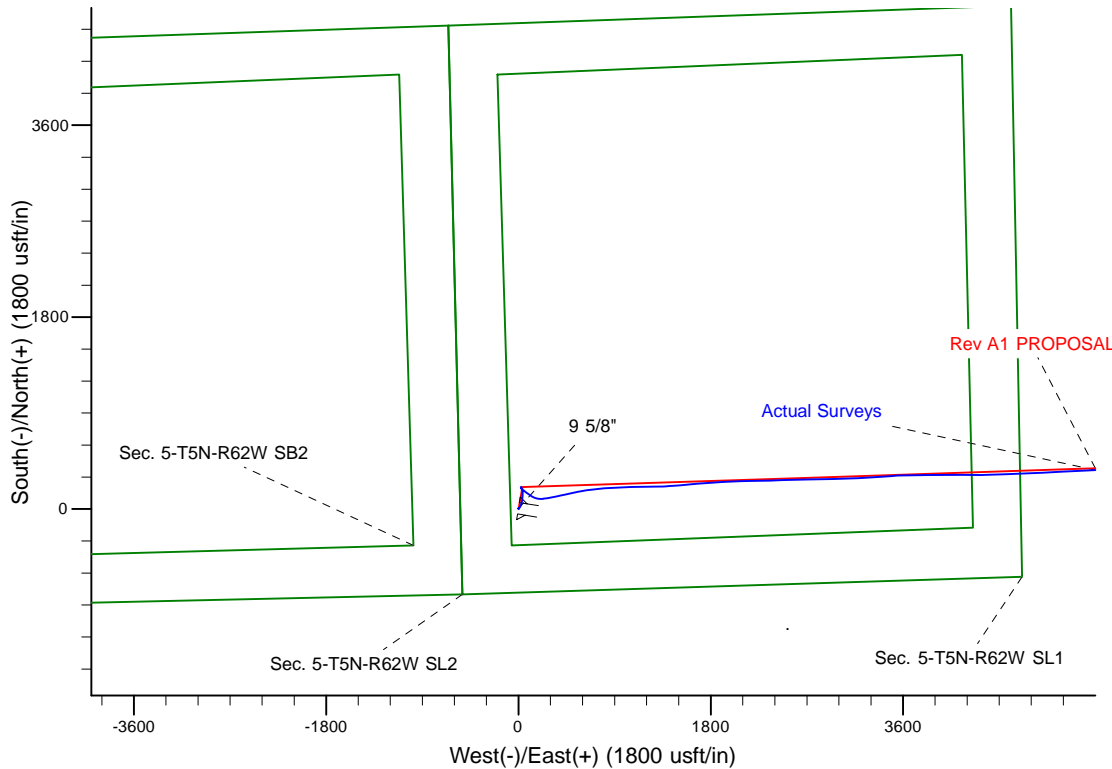
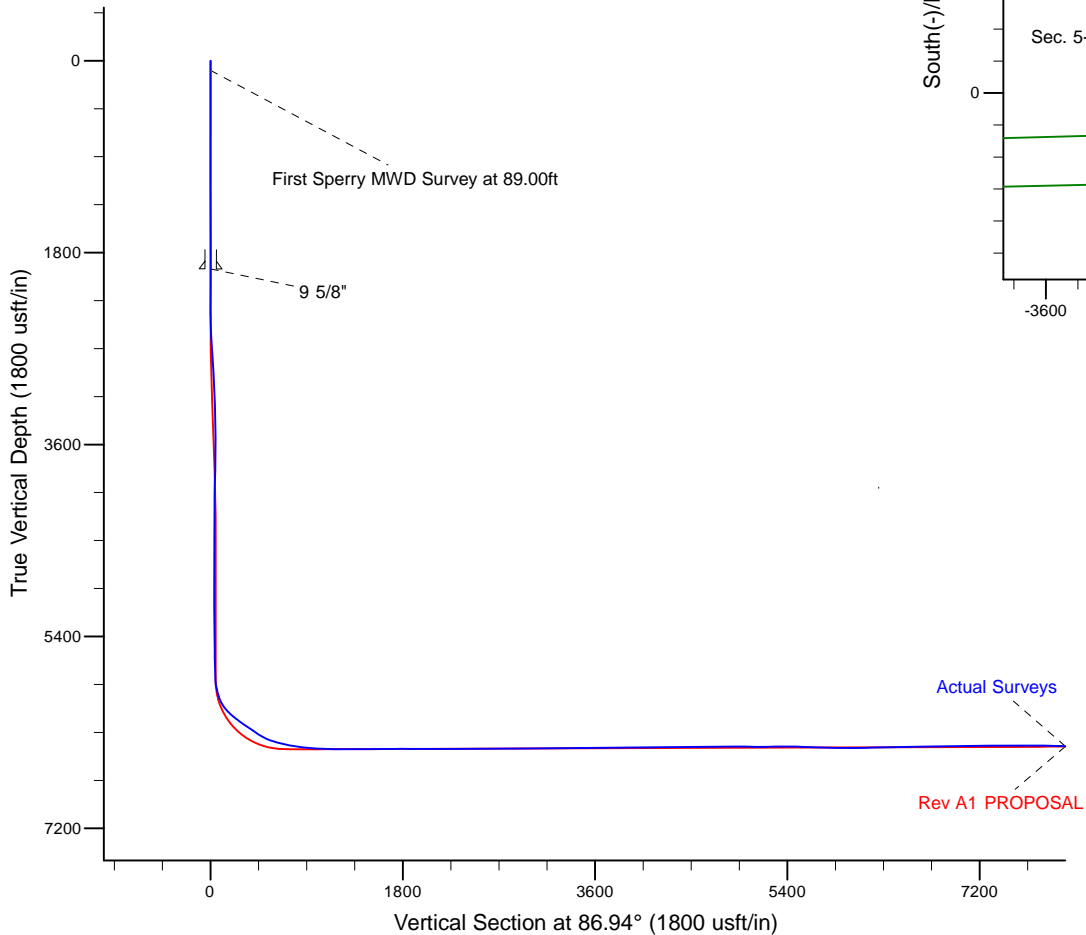
HALLIBURTON

Project: Weld County, CO (NAD 83)
Site: Sec. 5-T5N-R62W (Wells Ranch BB01)
Well: Wells Ranch AF05-625
Wellbore: Plan A
Design: Actual Surveys



Platted SHL: 784' FSL, 545' FWL
Platted Lat/Long: 40.423440, -104.354720
Location: Sec. 5-T5N-R62W

Platted BHL: 990' FSL, 1' FEL
Platted Lat/Long: 40.424532 N, -104.319276 W
State Planes - CO Northern: 1,399,685.66 N, 3,328,715.12 E
Sec. 4-T5N-R62W



LEGEND

- Wells Ranch AF05-625, Plan A, Rev A1 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AF05-625

Ground Level: 4667.00
KB = 24' @ 4691.00usft (H&P 343)

Created By: Tatiana Gomez
Created On: 4/7/16

Design Report for Wells Ranch AF05-625 - 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
89.00	0.13	350.71	89.00	0.10	-0.02	-0.01	0.15
First Sperry MWD Survey at 89.00ft							
178.00	0.44	46.11	178.00	0.44	0.21	0.24	0.43
216.00	0.33	5.21	216.00	0.65	0.33	0.36	0.76
370.00	0.62	349.57	369.99	1.91	0.22	0.32	0.20
465.00	0.46	0.43	464.99	2.79	0.13	0.28	0.20
559.00	0.28	281.63	558.99	3.22	-0.09	0.08	0.52
654.00	0.13	30.05	653.99	3.36	-0.27	-0.09	0.36
741.00	0.30	31.50	740.99	3.64	-0.10	0.09	0.20
843.00	0.13	115.21	842.99	3.82	0.15	0.35	0.31
938.00	0.02	229.87	937.99	3.76	0.23	0.43	0.15
1,032.00	0.21	1.01	1,031.99	3.92	0.22	0.43	0.24
1,127.00	0.19	316.48	1,126.98	4.21	0.12	0.34	0.16
1,221.00	0.22	9.47	1,220.98	4.50	0.04	0.28	0.20
1,316.00	0.11	20.85	1,315.98	4.77	0.10	0.35	0.12
1,411.00	0.28	156.76	1,410.98	4.64	0.22	0.47	0.39
1,505.00	0.44	141.05	1,504.98	4.15	0.54	0.76	0.20
1,600.00	0.34	69.00	1,599.98	3.96	1.03	1.24	0.49
1,694.00	0.29	64.77	1,693.98	4.16	1.51	1.73	0.06
1,789.00	0.26	354.98	1,788.98	4.48	1.71	1.94	0.33
1,883.00	0.48	307.53	1,882.98	4.93	1.38	1.64	0.38
1,946.00	0.46	280.10	1,945.97	5.14	0.92	1.19	0.36
1,952.00	0.44	278.93	1,951.97	5.15	0.87	1.15	0.33
9 5/8"							
2,030.00	0.25	249.37	2,029.97	5.13	0.42	0.69	0.33
2,121.00	0.28	306.25	2,120.97	5.19	0.06	0.33	0.27
2,213.00	0.13	4.51	2,212.97	5.43	-0.11	0.18	0.26
2,305.00	0.28	225.31	2,304.97	5.37	-0.26	0.02	0.41
2,397.00	0.11	354.52	2,396.97	5.30	-0.43	-0.15	0.39
2,489.00	2.31	59.57	2,488.94	6.33	1.16	1.50	2.46
2,584.00	4.51	53.14	2,583.77	9.54	5.80	6.30	2.34
2,679.00	5.76	35.74	2,678.39	15.65	11.58	12.39	2.09
2,773.00	7.67	27.37	2,771.75	25.05	17.22	18.53	2.28
2,868.00	8.88	20.84	2,865.76	37.54	22.74	24.71	1.61
2,962.00	9.37	13.66	2,958.57	51.76	27.13	29.85	1.32
3,056.00	9.01	13.85	3,051.36	66.34	30.70	34.19	0.39
3,151.00	9.75	5.98	3,145.10	81.56	33.32	37.62	1.56
3,246.00	8.83	7.85	3,238.85	96.79	35.15	40.26	1.02
3,340.00	8.02	7.91	3,331.83	110.43	37.04	42.87	0.86
3,435.00	7.66	8.22	3,425.95	123.26	38.86	45.37	0.38
3,625.00	8.60	0.23	3,614.04	150.00	40.72	48.66	0.77
3,719.00	7.70	343.41	3,707.10	163.06	38.95	47.59	2.70
3,814.00	6.83	337.19	3,801.34	174.38	34.94	44.19	1.23
3,908.00	5.92	341.32	3,894.76	184.12	31.22	40.99	1.09
4,003.00	3.85	345.22	3,989.41	191.85	28.84	39.02	2.21
4,098.00	3.79	345.51	4,084.20	197.97	27.24	37.75	0.06
4,192.00	2.18	348.95	4,178.07	202.73	26.12	36.89	1.73
4,287.00	2.09	352.12	4,273.00	206.22	25.54	36.49	0.16
4,381.00	0.69	214.72	4,366.98	207.45	24.98	36.00	2.81

Design Report for Wells Ranch AF05-625 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
4,476.00	0.35	185.28	4,461.98	206.69	24.62	35.61	0.45
4,570.00	0.73	199.60	4,555.98	205.83	24.40	35.33	0.43
4,665.00	1.14	202.50	4,650.96	204.39	23.83	34.69	0.43
4,760.00	1.05	193.21	4,745.95	202.67	23.27	34.04	0.21
4,855.00	1.12	184.54	4,840.93	200.89	23.00	33.67	0.19
4,949.00	1.03	175.99	4,934.91	199.13	22.98	33.56	0.19
5,044.00	0.88	166.94	5,029.90	197.56	23.21	33.71	0.22
5,138.00	0.96	151.90	5,123.89	196.16	23.74	34.16	0.27
5,233.00	1.05	147.78	5,218.87	194.73	24.58	34.92	0.12
5,328.00	1.23	138.90	5,313.85	193.22	25.71	35.98	0.26
5,423.00	1.34	136.10	5,408.83	191.66	27.15	37.33	0.13
5,517.00	1.17	136.06	5,502.81	190.18	28.58	38.67	0.18
5,612.00	0.94	126.05	5,597.79	189.02	29.88	39.91	0.31
5,801.00	2.07	116.84	5,786.72	186.56	34.18	44.08	0.61
5,895.00	15.07	123.28	5,879.47	179.06	45.97	55.45	13.85
5,990.00	26.36	136.93	5,968.24	156.79	70.79	79.05	12.85
6,084.00	39.25	123.22	6,047.18	125.07	110.14	116.65	15.75
6,179.00	47.51	103.50	6,116.49	100.28	169.72	174.82	16.62
6,227.00	49.93	91.88	6,148.22	95.53	205.36	210.16	18.86
6,273.00	52.34	82.06	6,177.13	97.47	241.04	245.89	17.41
6,320.00	54.72	79.69	6,205.06	103.48	278.35	283.47	6.49
6,368.00	56.40	79.42	6,232.21	110.65	317.28	322.72	3.51
6,415.00	56.38	79.08	6,258.23	117.95	355.73	361.51	0.61
6,463.00	55.78	78.67	6,285.01	125.64	394.81	400.95	1.42
6,510.00	56.00	78.03	6,311.37	133.50	432.93	439.43	1.23
6,557.00	59.46	77.50	6,336.46	141.92	471.76	478.65	7.41
6,605.00	66.37	77.65	6,358.30	151.11	513.47	520.79	14.42
6,651.00	70.31	78.06	6,375.28	160.10	555.25	563.00	8.59
6,699.00	74.10	79.59	6,389.94	168.95	600.08	608.23	8.46
6,746.00	76.31	82.06	6,401.95	176.19	644.94	653.41	6.93
6,794.00	77.90	82.65	6,412.66	182.41	691.31	700.05	3.53
6,841.00	79.62	83.52	6,421.82	187.96	737.07	746.04	4.09
6,889.00	81.44	84.57	6,429.72	192.87	784.16	793.32	4.35
6,935.00	83.14	85.89	6,435.89	196.66	829.58	838.88	4.67
7,030.00	85.03	87.61	6,445.68	202.01	923.92	933.37	2.69
7,137.00	86.58	89.12	6,453.50	205.05	1,030.58	1,040.04	2.02
7,231.00	89.02	88.95	6,457.11	206.63	1,124.49	1,133.91	2.60
7,326.00	90.34	88.83	6,457.64	208.47	1,219.47	1,228.85	1.40
7,421.00	90.84	88.78	6,456.66	210.45	1,314.44	1,323.79	0.53
7,515.00	90.19	85.92	6,455.82	214.80	1,408.33	1,417.78	3.12
7,610.00	90.52	85.45	6,455.23	221.94	1,503.06	1,512.75	0.60
7,704.00	90.61	85.15	6,454.30	229.65	1,596.74	1,606.71	0.33
7,799.00	90.46	84.30	6,453.42	238.38	1,691.33	1,701.63	0.91
7,893.00	89.81	86.41	6,453.20	245.99	1,785.01	1,795.59	2.35
7,988.00	89.62	86.45	6,453.67	251.91	1,879.83	1,890.58	0.20
8,177.00	89.81	88.59	6,454.61	260.08	2,068.64	2,079.56	1.14
8,272.00	89.78	88.48	6,454.95	262.51	2,163.61	2,174.52	0.12
8,367.00	89.96	88.36	6,455.16	265.13	2,258.57	2,269.49	0.23
8,461.00	90.24	88.48	6,455.00	267.72	2,352.53	2,363.46	0.32
8,556.00	90.30	88.27	6,454.55	270.42	2,447.49	2,458.43	0.23
8,650.00	90.49	88.46	6,453.90	273.10	2,541.45	2,552.40	0.29

Design Report for Wells Ranch AF05-625 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
8,745.00	90.52	88.32	6,453.07	275.77	2,636.41	2,647.36	0.15
8,840.00	90.76	88.67	6,452.01	278.26	2,731.37	2,742.32	0.45
8,934.00	91.23	89.36	6,450.37	279.88	2,825.35	2,836.25	0.89
9,029.00	90.00	88.71	6,449.35	281.48	2,920.32	2,931.18	1.46
9,124.00	90.15	88.90	6,449.23	283.46	3,015.30	3,026.13	0.25
9,218.00	89.87	87.56	6,449.21	286.36	3,109.26	3,120.10	1.46
9,313.00	90.52	86.85	6,448.89	291.00	3,204.14	3,215.10	1.01
9,407.00	90.64	86.44	6,447.94	296.50	3,297.98	3,309.09	0.45
9,502.00	90.61	86.30	6,446.90	302.51	3,392.78	3,404.08	0.15
9,596.00	90.49	85.73	6,446.00	309.04	3,486.55	3,498.06	0.62
9,691.00	90.61	88.00	6,445.09	314.24	3,581.39	3,593.05	2.39
9,786.00	90.89	89.40	6,443.84	316.39	3,676.36	3,688.00	1.50
9,880.00	90.86	89.64	6,442.41	317.18	3,770.34	3,781.89	0.26
9,975.00	90.36	88.59	6,441.40	318.65	3,865.33	3,876.82	1.22
10,069.00	90.49	88.63	6,440.70	320.93	3,959.30	3,970.77	0.14
10,164.00	90.49	90.36	6,439.89	321.77	4,054.29	4,065.67	1.82
10,259.00	90.33	90.95	6,439.21	320.68	4,149.28	4,160.47	0.64
10,443.00	90.02	89.66	6,438.65	319.70	4,333.27	4,344.15	0.72
10,537.00	90.83	87.67	6,437.95	321.89	4,427.24	4,438.10	2.29
10,631.00	91.01	87.69	6,436.44	325.70	4,521.15	4,532.08	0.19
10,725.00	90.27	88.56	6,435.39	328.77	4,615.09	4,626.05	1.22
10,819.00	90.85	88.72	6,434.47	331.00	4,709.06	4,720.01	0.64
10,913.00	90.92	86.67	6,433.02	334.78	4,802.96	4,813.98	2.18
11,008.00	90.42	86.75	6,431.91	340.23	4,897.80	4,908.97	0.53
11,102.00	88.85	86.94	6,432.51	345.41	4,991.65	5,002.97	1.68
11,196.00	89.37	87.18	6,433.97	350.23	5,085.52	5,096.96	0.61
11,293.00	90.30	87.18	6,434.25	355.00	5,182.40	5,193.95	0.96
11,388.00	91.28	87.36	6,432.94	359.52	5,277.28	5,288.94	1.05
11,482.00	89.84	86.64	6,432.02	364.44	5,371.15	5,382.94	1.71
11,577.00	88.39	86.74	6,433.48	369.93	5,465.97	5,477.92	1.53
11,672.00	87.87	86.57	6,436.58	375.47	5,560.76	5,572.87	0.58
11,766.00	88.42	87.44	6,439.63	380.38	5,654.58	5,666.82	1.09
11,861.00	88.39	88.85	6,442.27	383.45	5,749.49	5,761.76	1.48
11,953.00	89.53	89.62	6,443.94	384.68	5,841.47	5,853.67	1.50
12,045.00	89.13	88.58	6,445.02	386.12	5,933.45	5,945.59	1.21
12,137.00	90.98	89.08	6,444.93	388.00	6,025.42	6,037.54	2.08
12,229.00	90.94	88.34	6,443.39	390.07	6,117.39	6,129.48	0.81
12,321.00	91.26	88.76	6,441.62	392.40	6,209.34	6,221.43	0.57
12,413.00	91.07	88.30	6,439.75	394.76	6,301.29	6,313.37	0.54
12,504.00	91.19	88.35	6,437.96	397.42	6,392.23	6,404.33	0.14
12,596.00	91.10	88.17	6,436.12	400.21	6,484.17	6,496.29	0.22
12,687.00	91.04	87.78	6,434.42	403.43	6,575.10	6,587.26	0.43
12,779.00	91.28	87.76	6,432.56	407.01	6,667.01	6,679.23	0.26
12,871.00	91.35	87.77	6,430.44	410.59	6,758.92	6,771.19	0.08
12,962.00	91.72	87.87	6,428.01	414.05	6,849.82	6,862.15	0.42
13,054.00	89.90	87.85	6,426.71	417.49	6,941.74	6,954.13	1.98
13,146.00	90.21	88.16	6,426.62	420.69	7,033.69	7,046.11	0.48
13,241.00	90.51	88.39	6,426.02	423.55	7,128.64	7,141.08	0.40
13,335.00	90.64	88.35	6,425.08	426.22	7,222.60	7,235.05	0.14
13,430.00	89.99	87.22	6,424.56	429.90	7,317.52	7,330.04	1.37
13,524.00	90.39	87.06	6,424.24	434.59	7,411.41	7,424.03	0.46

Design Report for Wells Ranch AF05-625 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
13,619.00	90.02	87.15	6,423.90	439.38	7,506.28	7,519.03	0.40
13,714.00	89.99	87.24	6,423.90	444.03	7,601.17	7,614.03	0.10
13,808.00	90.30	87.15	6,423.66	448.63	7,695.06	7,708.03	0.34
13,998.00	88.42	86.66	6,425.78	458.89	7,884.76	7,898.01	1.02
14,092.00	88.88	87.42	6,427.99	463.74	7,978.61	7,991.98	0.94
14,187.00	89.37	87.76	6,429.45	467.74	8,073.51	8,086.97	0.63
14,282.00	89.71	87.83	6,430.21	471.39	8,168.44	8,181.95	0.37
14,376.00	90.27	87.77	6,430.22	475.00	8,262.37	8,275.94	0.60
14,471.00	90.42	87.78	6,429.65	478.69	8,357.29	8,370.93	0.16
14,565.00	89.99	87.51	6,429.32	482.55	8,451.21	8,464.92	0.54
14,754.00	90.36	87.28	6,428.74	491.14	8,640.02	8,653.91	0.23
14,849.00	90.30	86.49	6,428.19	496.30	8,734.87	8,748.91	0.83
14,944.00	90.76	88.51	6,427.31	500.45	8,829.78	8,843.90	2.18
15,038.00	90.58	88.55	6,426.21	502.86	8,923.74	8,937.86	0.20
15,133.00	90.67	88.14	6,425.18	505.60	9,018.69	9,032.82	0.44
15,228.00	90.76	88.04	6,423.99	508.77	9,113.63	9,127.79	0.14
15,322.00	91.22	88.16	6,422.37	511.88	9,207.57	9,221.76	0.51
15,417.00	89.43	88.89	6,421.83	514.33	9,302.53	9,316.72	2.03
15,512.00	89.40	88.87	6,422.80	516.19	9,397.51	9,411.66	0.04
15,606.00	89.56	88.71	6,423.65	518.17	9,491.48	9,505.61	0.24
15,701.00	90.02	88.57	6,424.00	520.42	9,586.45	9,600.56	0.51
15,795.00	91.07	88.57	6,423.11	522.77	9,680.42	9,694.52	1.12
15,890.00	91.50	88.82	6,420.98	524.93	9,775.37	9,789.45	0.52
15,977.00	91.62	88.36	6,418.61	527.07	9,862.31	9,876.38	0.55
Final Sperry MWD Survey at 15977.00ft							
16,040.00	91.62	88.36	6,416.83	528.88	9,925.26	9,939.34	0.00
Straight Line Projection to TD at 16040.00ft							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
89.00	89.00	0.10	-0.02	First Sperry MWD Survey at 89.00ft
15,977.00	6,418.61	527.07	9,862.31	Final Sperry MWD Survey at 15977.00ft
16,040.00	6,416.83	528.88	9,925.26	Straight Line Projection to TD at 16040.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin		Start TVD (usft)
				+N/-S (usft)	+E/-W (usft)	
Target	Wells Ranch AF05-625_Rev A1_BHL	86.94	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
89.00	7,030.00	Intermediate Sperry MWD Surveys	MWD
7,137.00	16,040.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Design Report for Wells Ranch AF05-625 - Actual Surveys

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
1,952.00	1,951.97	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 AF05-625	0.00	0.00	0.00	0.02	0.00	1,399,158.64	3,318,853.19	40.423440	-104.354720
- actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E)									
- Point									
Wells Ranch AF05-625	0.00	0.00	6,410.00	531.40	9,955.85	1,399,689.99	3,328,808.65	40.424540	-104.318940
- actual wellpath misses target center by 31.44usft at 16040.00usft MD (6416.83 TVD, 528.88 N, 9925.26 E)									
- Point									
Wells Ranch AF05-625	0.00	0.00	6,426.00	531.40	9,955.85	1,399,689.99	3,328,808.65	40.424540	-104.318940
- actual wellpath misses target center by 32.03usft at 16040.00usft MD (6416.83 TVD, 528.88 N, 9925.26 E)									
- Point									

Directional Difficulty Index

Average Dogleg over Survey:	1.41 °/100usft	Maximum Dogleg over Survey:	18.86 °/100usft at 6,227.00 usft
Net Tortosity applicable to Plans:	0.75 °/100usft	Directional Difficulty Index:	6.759

Audit Info

North Reference Sheet for Sec. 5-T5N-R62W (Wells Ranch BB01) - Wells Ranch
AF05-625 - 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 KB = 24' @ 4691.00usft (H&P 343). Northing and Easting are relative to Wells Ranch AF05-625

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: 0.99996138

Grid Coordinates of Well: 1,399,158.61 usft N, 3,318,853.19 usft E

Geographical Coordinates of Well: 40° 25' 24.38" N, 104° 21' 16.99" W

Grid Convergence at Surface is: 0.74°

Based upon Minimum Curvature type calculations, at a Measured Depth of 16,040.00usft
the Bottom Hole Displacement is 9,939.34usft in the Direction of 86.95° (Grid).

Magnetic Convergence at surface is: -7.51° (17 March 2016, , BGGM2015)

