

Noble Energy

Weld County, CO (NAD 83)

Sec. 32-T6N-R62W (Wells Ranch AE32)

Wells Ranch AE32-640

05-123-41727

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

06 October, 2015

Surface UWI : 05-123-41727

Well Coordinates: 1,405,763.97 N, 3,318,856.95 E (40° 26' 29.65" N, 104° 21' 15.84" W)

Ground Level: 4,722.00 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 AE32-640

KB = 24' @ 4746.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

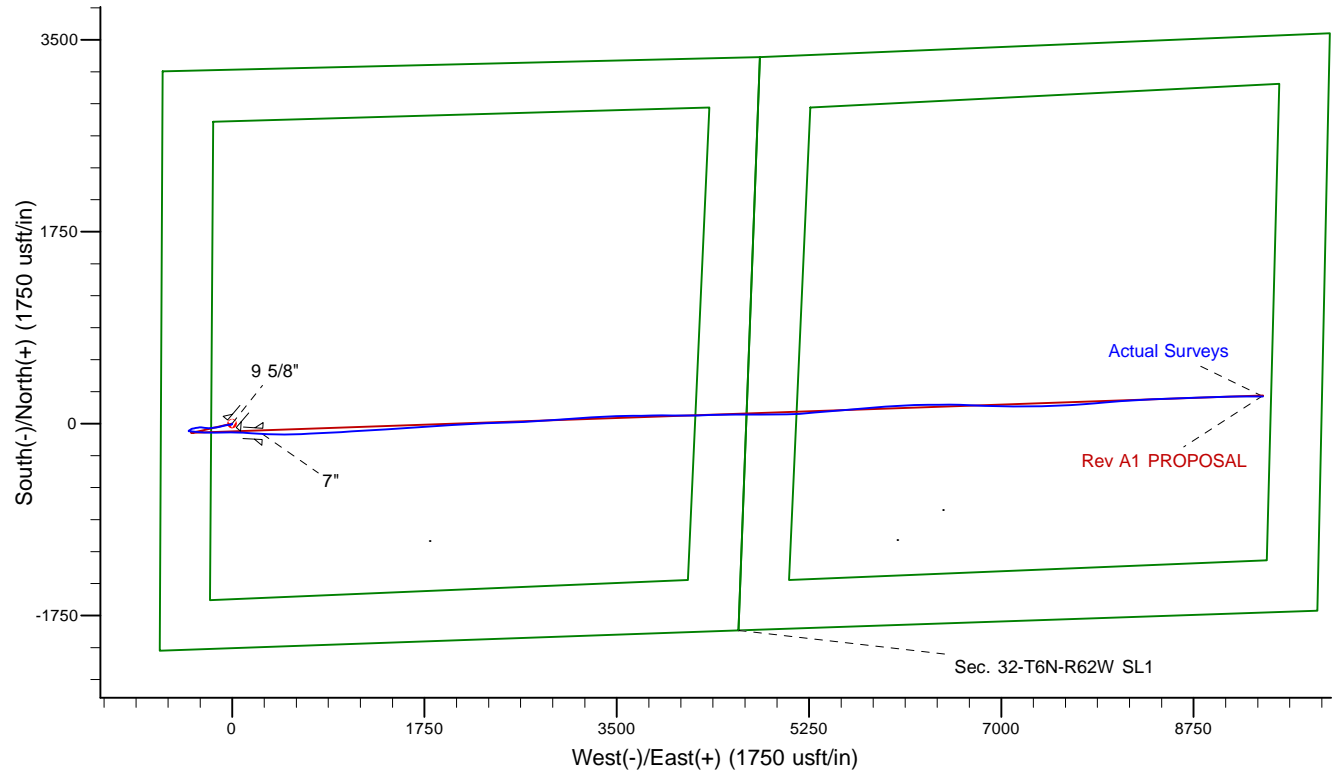
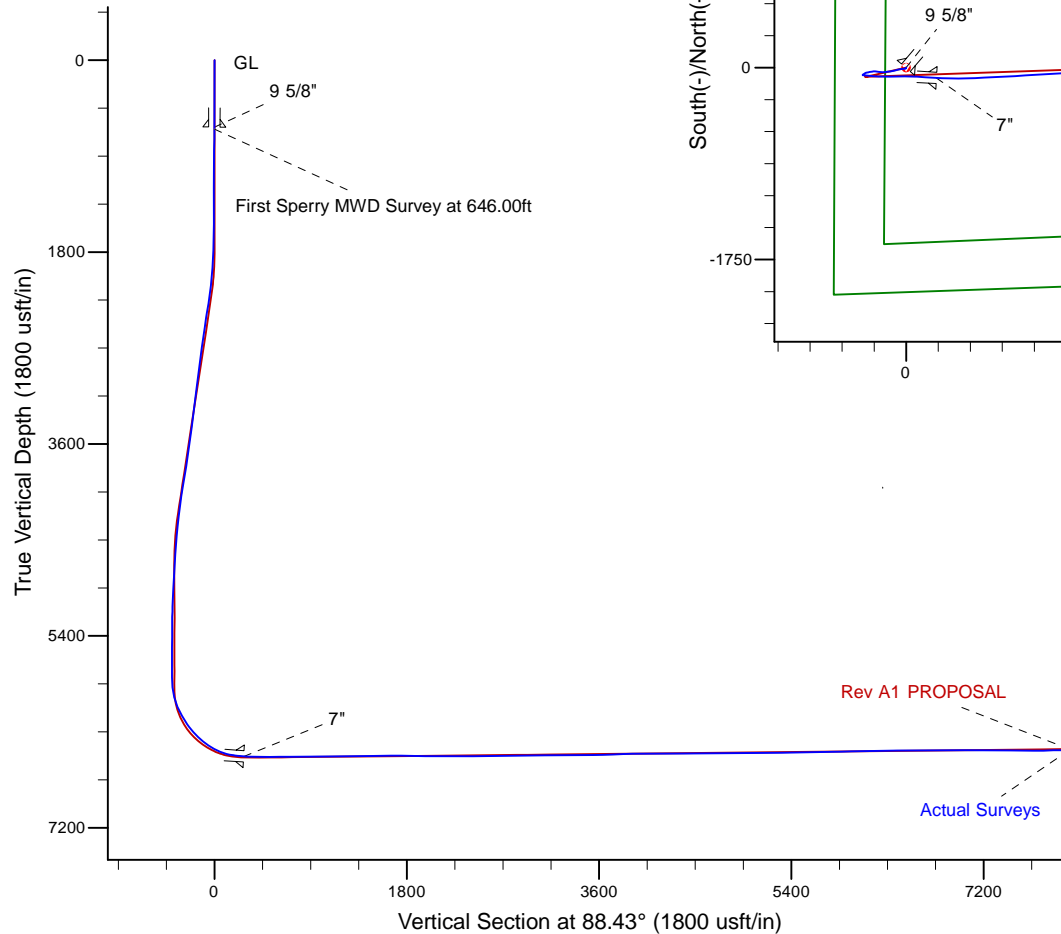
Project: Weld County, CO (NAD 83)
 Site: Sec. 32-T6N-R62W (Wells Ranch AE32)
 Well: Wells Ranch AE32-640
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 2047' FSL, 650' FWL
 Platted Lat/Long: 40.441570, -104.3544
 Location: Sec. 32-T6N-R62W

~7" Casing: 1944' FSL, 928' FWL
 Lat/Long: 40.441303 N, -104.353415 W
 State Planes - CO Northern: 1,405,670.11 N, 3,319,132.53 E
 Sec. 32-T6N-R62W

Platted BHL: 1980' FSL, 535' FEL
 Platted Lat/Long: 40.441917 N, -104.320928 W
 State Planes - CO Northern: 1,406,012.47 N, 3,328,171.14 E
 Location: Sec. 33-T6N-R62W



LEGEND

- Wells Ranch AE32-640, Plan A, Rev A1 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AE32-640

Ground Level: 4722.00

KB = 24' @ 4746.00usft (H&P 343)

Created By: Tatiana Gomez
 Created On: 10/6/2015

Design Report for Wells Ranch AE32-640 - 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
Wells Ranch AE32-640_Rev A0_SHL							
628.00	0.49	220.31	627.99	-2.03	-1.72	-1.78	0.08
9 5/8"							
646.00	0.50	220.31	645.99	-2.15	-1.82	-1.88	0.08
First Sperry MWD Survey at 646.00ft							
741.00	0.56	222.43	740.99	-2.81	-2.40	-2.48	0.07
836.00	0.81	220.60	835.98	-3.66	-3.16	-3.25	0.26
1,025.00	0.65	206.57	1,024.97	-5.63	-4.50	-4.66	0.13
1,212.00	0.40	223.15	1,211.96	-7.06	-5.42	-5.62	0.16
1,491.00	0.70	224.15	1,490.94	-8.99	-7.28	-7.52	0.11
1,583.00	0.81	224.92	1,582.94	-9.86	-8.13	-8.40	0.12
1,768.00	0.48	267.06	1,767.93	-10.82	-9.83	-10.12	0.30
1,861.00	3.55	272.02	1,860.86	-10.74	-13.09	-13.38	3.30
1,953.00	4.40	262.61	1,952.64	-11.09	-19.44	-19.74	1.16
2,047.00	5.35	263.72	2,046.29	-12.04	-27.37	-27.69	1.02
2,140.00	6.66	267.99	2,138.78	-12.70	-37.07	-37.41	1.49
2,234.00	8.67	263.83	2,231.94	-13.65	-49.56	-49.92	2.22
2,327.00	9.85	258.81	2,323.73	-15.95	-64.34	-64.75	1.54
2,419.00	8.70	252.98	2,414.52	-19.51	-78.71	-79.22	1.61
2,511.00	7.84	249.44	2,505.57	-23.75	-91.24	-91.86	1.09
2,603.00	8.44	260.52	2,596.65	-27.07	-103.78	-104.48	1.82
2,694.00	7.93	262.08	2,686.72	-29.04	-116.58	-117.33	0.61
2,788.00	7.43	261.26	2,779.88	-30.85	-129.01	-129.81	0.54
2,881.00	7.27	261.16	2,872.11	-32.67	-140.77	-141.61	0.17
2,975.00	8.69	264.17	2,965.20	-34.31	-153.71	-154.59	1.57
3,070.00	7.01	260.05	3,059.31	-36.04	-166.56	-167.49	1.86
3,164.00	6.02	253.63	3,152.70	-38.42	-176.94	-177.93	1.31
3,260.00	6.70	262.63	3,248.11	-40.55	-187.32	-188.37	1.25
3,353.00	7.40	270.07	3,340.41	-41.24	-198.69	-199.75	1.24
3,448.00	7.04	265.79	3,434.66	-41.66	-210.62	-211.68	0.68
3,543.00	7.47	271.81	3,528.90	-41.89	-222.60	-223.66	0.92
3,637.00	9.10	279.14	3,621.91	-40.52	-236.04	-237.07	2.06
3,732.00	9.33	277.98	3,715.69	-38.26	-251.09	-252.04	0.31
3,827.00	9.74	277.85	3,809.38	-36.09	-266.67	-267.56	0.43
3,921.00	9.51	277.30	3,902.05	-34.02	-282.25	-283.08	0.26
4,016.00	8.58	261.41	3,995.89	-34.08	-297.05	-297.87	2.79
4,110.00	7.96	258.78	4,088.91	-36.39	-310.36	-311.25	0.77
4,299.00	6.55	259.80	4,276.39	-40.85	-333.81	-334.81	0.75
4,394.00	6.17	263.38	4,370.81	-42.40	-344.22	-345.25	0.58
4,489.00	5.19	257.06	4,465.34	-43.95	-353.47	-354.55	1.22
4,583.00	4.75	258.60	4,558.98	-45.67	-361.43	-362.55	0.49
4,678.00	4.16	244.16	4,653.70	-47.95	-368.39	-369.57	1.33
4,772.00	3.93	234.63	4,747.47	-51.30	-374.09	-375.35	0.75
4,867.00	3.48	230.03	4,842.27	-55.04	-378.95	-380.32	0.57
4,961.00	3.56	235.98	4,936.09	-58.50	-383.56	-385.02	0.40
5,056.00	2.95	244.00	5,030.94	-61.22	-388.20	-389.73	0.80
5,151.00	2.16	236.19	5,125.84	-63.29	-391.88	-393.47	0.91
5,245.00	1.15	205.94	5,219.80	-65.13	-393.77	-395.41	1.39
5,340.00	0.49	211.87	5,314.79	-66.33	-394.40	-396.07	0.70

Design Report for Wells Ranch AE32-640 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,435.00	0.28	291.89	5,409.79	-66.59	-394.83	-396.51	0.55
5,529.00	0.81	274.59	5,503.79	-66.45	-395.70	-397.38	0.58
5,624.00	0.56	167.44	5,598.78	-66.85	-396.27	-397.96	1.17
5,718.00	0.53	157.87	5,692.78	-67.70	-396.01	-397.72	0.10
5,813.00	0.28	137.65	5,787.78	-68.28	-395.69	-397.41	0.30
5,908.00	4.32	99.06	5,882.68	-69.01	-391.99	-393.74	4.32
6,002.00	14.30	93.95	5,975.33	-70.37	-376.88	-378.67	10.64
6,097.00	23.64	96.49	6,065.07	-73.34	-346.18	-348.06	9.87
6,191.00	30.34	95.54	6,148.79	-77.77	-303.78	-305.80	7.14
6,286.00	33.23	92.85	6,229.53	-81.38	-253.88	-256.02	3.39
6,380.00	43.75	90.62	6,303.01	-83.02	-195.49	-197.70	11.29
6,475.00	48.48	89.30	6,368.85	-82.94	-127.05	-129.28	5.08
6,570.00	55.21	87.46	6,427.51	-80.77	-52.42	-54.62	7.25
6,664.00	63.99	91.70	6,475.04	-80.31	28.54	26.33	10.12
6,759.00	76.35	93.03	6,507.21	-84.03	117.66	115.30	13.08
6,861.00	84.11	94.01	6,524.51	-90.21	217.91	215.35	7.67
6,919.00	86.36	93.24	6,529.32	-93.86	275.59	272.91	4.10
7"							
6,973.00	88.46	92.52	6,531.76	-96.57	329.46	326.69	4.10
7,069.00	88.80	90.59	6,534.06	-99.18	425.40	422.51	2.04
7,163.00	90.59	88.29	6,534.56	-98.26	519.38	516.49	3.10
7,258.00	90.31	88.16	6,533.81	-95.31	614.33	611.48	0.32
7,352.00	90.37	86.95	6,533.25	-91.30	708.24	705.47	1.29
7,447.00	90.43	87.07	6,532.59	-86.35	803.11	800.44	0.14
7,542.00	91.05	87.52	6,531.36	-81.87	898.00	895.41	0.81
7,636.00	89.97	86.15	6,530.53	-76.68	991.85	989.37	1.86
7,731.00	90.37	86.33	6,530.24	-70.45	1,086.64	1,084.30	0.46
7,826.00	90.52	86.72	6,529.51	-64.69	1,181.46	1,179.24	0.44
7,921.00	90.68	86.91	6,528.51	-59.41	1,276.31	1,274.20	0.26
8,015.00	90.74	86.09	6,527.35	-53.67	1,370.13	1,368.14	0.87
8,109.00	91.02	86.68	6,525.90	-47.75	1,463.93	1,462.06	0.69
8,204.00	90.15	86.01	6,524.93	-41.69	1,558.73	1,557.00	1.16
8,299.00	91.97	86.77	6,523.18	-35.71	1,653.52	1,651.91	2.08
8,394.00	88.61	85.54	6,522.70	-29.34	1,748.29	1,746.82	3.77
8,488.00	88.15	86.92	6,525.35	-23.16	1,842.05	1,840.71	1.55
8,583.00	89.94	86.52	6,526.94	-17.73	1,936.87	1,935.66	1.93
8,677.00	89.54	86.26	6,527.36	-11.81	2,030.69	2,029.59	0.51
8,771.00	89.23	86.20	6,528.37	-5.63	2,124.48	2,123.52	0.34
8,866.00	89.57	87.56	6,529.37	-0.46	2,219.33	2,218.48	1.48
8,960.00	90.62	87.58	6,529.21	3.53	2,313.24	2,312.47	1.12
9,054.00	90.89	87.94	6,527.97	7.20	2,407.16	2,406.45	0.48
9,149.00	90.86	88.00	6,526.52	10.57	2,502.09	2,501.44	0.07
9,244.00	90.43	87.77	6,525.45	14.07	2,597.02	2,596.43	0.51
9,338.00	90.00	87.09	6,525.10	18.29	2,690.92	2,690.41	0.86
9,433.00	90.46	86.69	6,524.72	23.44	2,785.78	2,785.38	0.64
9,527.00	90.62	86.01	6,523.83	29.42	2,879.59	2,879.31	0.74
9,622.00	90.83	86.14	6,522.63	35.93	2,974.36	2,974.22	0.26
9,716.00	91.02	85.99	6,521.11	42.38	3,068.12	3,068.13	0.26
9,810.00	91.66	85.90	6,518.91	49.02	3,161.86	3,162.02	0.69
9,905.00	90.31	86.14	6,517.28	55.61	3,256.62	3,256.91	1.44
10,000.00	89.66	86.46	6,517.31	61.74	3,351.42	3,351.85	0.76

Design Report for Wells Ranch AE32-640 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,188.00	90.09	88.84	6,517.72	69.45	3,539.25	3,539.82	1.29
10,281.00	92.19	89.44	6,515.87	70.85	3,632.21	3,632.79	2.35
10,373.00	91.91	89.02	6,512.57	72.08	3,724.14	3,724.72	0.55
10,467.00	92.87	88.87	6,508.65	73.81	3,818.04	3,818.63	1.03
10,560.00	92.16	90.42	6,504.57	74.39	3,910.95	3,911.52	1.83
10,653.00	89.88	89.94	6,502.92	74.10	4,003.93	4,004.45	2.51
10,745.00	89.48	90.00	6,503.43	74.14	4,095.93	4,096.42	0.44
10,838.00	89.23	90.22	6,504.48	73.97	4,188.92	4,189.37	0.36
10,931.00	89.48	88.46	6,505.53	75.04	4,281.90	4,282.35	1.91
11,117.00	91.29	88.58	6,504.28	79.84	4,467.83	4,468.34	0.98
11,210.00	90.43	89.15	6,502.88	81.68	4,560.80	4,561.32	1.11
11,303.00	91.42	89.75	6,501.38	82.58	4,653.78	4,654.29	1.24
11,396.00	90.83	89.61	6,499.55	83.09	4,746.76	4,747.25	0.65
11,489.00	90.74	90.12	6,498.28	83.31	4,839.75	4,840.22	0.56
11,580.00	91.05	90.55	6,496.86	82.78	4,930.74	4,931.15	0.58
11,673.00	89.32	88.35	6,496.56	83.67	5,023.73	5,024.13	3.01
11,764.00	89.60	87.13	6,497.41	87.26	5,114.65	5,115.12	1.38
11,857.00	90.03	85.32	6,497.72	93.39	5,207.44	5,208.04	2.00
11,950.00	91.26	85.24	6,496.67	101.04	5,300.12	5,300.90	1.33
12,045.00	91.11	85.41	6,494.70	108.78	5,394.78	5,395.74	0.24
12,139.00	90.56	85.36	6,493.33	116.34	5,488.47	5,489.59	0.59
12,234.00	91.73	85.43	6,491.44	123.97	5,583.14	5,584.44	1.23
12,329.00	90.77	84.60	6,489.36	132.22	5,677.76	5,679.25	1.34
12,423.00	91.82	84.81	6,487.24	140.89	5,771.33	5,773.02	1.14
12,518.00	90.77	85.13	6,485.09	149.22	5,865.94	5,867.83	1.16
12,613.00	92.19	85.38	6,482.64	157.07	5,960.58	5,962.65	1.52
12,707.00	92.13	87.46	6,479.09	162.94	6,054.32	6,056.52	2.21
12,802.00	90.34	87.88	6,477.05	166.80	6,149.22	6,151.48	1.94
12,897.00	90.06	89.01	6,476.72	169.38	6,244.18	6,246.48	1.23
12,991.00	90.86	89.15	6,475.96	170.89	6,338.17	6,340.47	0.86
13,086.00	89.81	89.27	6,475.41	172.20	6,433.15	6,435.46	1.11
13,180.00	90.12	89.99	6,475.46	172.80	6,527.15	6,529.44	0.83
13,275.00	90.46	91.69	6,474.98	171.41	6,622.14	6,624.35	1.82
13,370.00	90.52	93.26	6,474.17	167.31	6,717.04	6,719.10	1.65
13,464.00	91.29	92.05	6,472.68	162.96	6,810.93	6,812.83	1.53
13,559.00	90.34	90.97	6,471.33	160.45	6,905.88	6,907.68	1.51
13,654.00	89.85	90.83	6,471.18	158.96	7,000.87	7,002.59	0.54
13,748.00	89.97	90.59	6,471.32	157.80	7,094.86	7,096.52	0.29
13,843.00	89.88	90.65	6,471.45	156.77	7,189.86	7,191.45	0.11
13,938.00	88.95	89.08	6,472.42	156.99	7,284.85	7,286.41	1.92
14,032.00	88.43	88.64	6,474.57	158.86	7,378.80	7,380.38	0.72
14,127.00	89.63	88.00	6,476.18	161.65	7,473.75	7,475.37	1.43
14,221.00	90.25	86.15	6,476.27	166.44	7,567.62	7,569.34	2.08
14,316.00	89.69	86.25	6,476.32	172.74	7,662.41	7,664.26	0.60
14,411.00	91.60	85.93	6,475.25	179.22	7,757.18	7,759.17	2.04
14,505.00	91.05	85.75	6,473.08	186.03	7,850.91	7,853.05	0.62
14,600.00	89.91	85.21	6,472.28	193.52	7,945.61	7,947.92	1.33
14,694.00	92.19	85.46	6,470.56	201.16	8,039.27	8,041.76	2.44
14,788.00	91.30	86.25	6,467.70	207.95	8,132.98	8,135.62	1.27
14,883.00	90.43	86.15	6,466.27	214.25	8,227.76	8,230.54	0.92
14,978.00	90.40	86.47	6,465.58	220.36	8,322.56	8,325.47	0.34

Design Report for Wells Ranch AE32-640 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
15,073.00	91.33	88.61	6,464.14	224.44	8,417.46	8,420.44	2.46
15,167.00	91.26	88.42	6,462.02	226.88	8,511.40	8,514.42	0.22
15,262.00	89.91	87.95	6,461.05	229.88	8,606.35	8,609.41	1.50
15,357.00	92.62	87.75	6,458.95	233.45	8,701.25	8,704.38	2.86
15,451.00	92.65	87.53	6,454.63	237.31	8,795.07	8,798.27	0.24
15,546.00	93.61	87.74	6,449.44	241.23	8,889.84	8,893.12	1.03
15,641.00	91.82	88.44	6,444.94	244.39	8,984.68	8,988.00	2.02
15,735.00	91.91	88.75	6,441.88	246.69	9,078.60	9,081.95	0.34
15,830.00	91.26	89.31	6,439.26	248.30	9,173.55	9,176.91	0.90
15,924.00	89.72	90.01	6,438.45	248.86	9,267.54	9,270.88	1.80
15,971.00	90.68	90.83	6,438.29	248.51	9,314.54	9,317.85	2.69
Final Sperry MWD Survey at 15971.00ft							
16,038.00	90.68	90.83	6,437.49	247.54	9,381.53	9,384.79	0.00
Straight Line Projection to TD at 16038.00ft - Wells Ranch AE32-640_Rev A0_BHL - Wells Ranch AE32-640_Rev A1_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
646.00	645.99	-2.15	-1.82	First Sperry MWD Survey at 646.00ft
15,971.00	6,438.29	248.51	9,314.54	Final Sperry MWD Survey at 15971.00ft
16,038.00	6,437.49	247.54	9,381.53	Straight Line Projection to TD at 16038.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AE32-640_Rev A1_BHL	88.43	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
646.00	6,861.00	Intermediate Surveys	MWD
6,973.00	16,038.00	Production Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
628.00	627.99	9 5/8"	9-5/8	13-3/4
6,919.00	6,529.32	7"	7	8-3/4

Design Report for Wells Ranch AE32-640 - Actual 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
Wells Ranch AE32-640 - actual wellpath misses target center by 0.02usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.02	0.00	1,405,763.99	3,318,856.95	40.441570	-104.354400
Wells Ranch AE32-640 - actual wellpath misses target center by 14.82usft at 16038.00usft MD (6437.49 TVD, 247.54 N, 9381.53 E) - Point	0.00	0.00	6,427.00	257.84	9,383.36	1,406,021.80	3,328,239.96	40.441940	-104.320680
Wells Ranch AE32-640 - actual wellpath misses target center by 14.14usft at 16038.00usft MD (6437.49 TVD, 247.54 N, 9381.53 E) - Point	0.00	0.00	6,447.00	257.84	9,383.36	1,406,021.80	3,328,239.96	40.441940	-104.320680

Directional Difficulty Index

Average Dogleg over Survey:	1.51 °/100usft	Maximum Dogleg over Survey:	13.08 °/100usft at 6,759.00 usft
Net Tortousity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.783

Audit Info