

Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AE32-645

05-123-41728

Plan A

Design: Actual Surveys

Sperry Drilling Services

Final Survey Report

07 October, 2015

Surface UWI : 05-123-41728

Well Coordinates: 1,405,804.04 N, 3,318,856.43 E (40° 26' 30.05" N, 104° 21' 15.84" W)

Ground Level: 4,723.00 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 AE32-645

KB = 24' @ 4747.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

HALLIBURTON

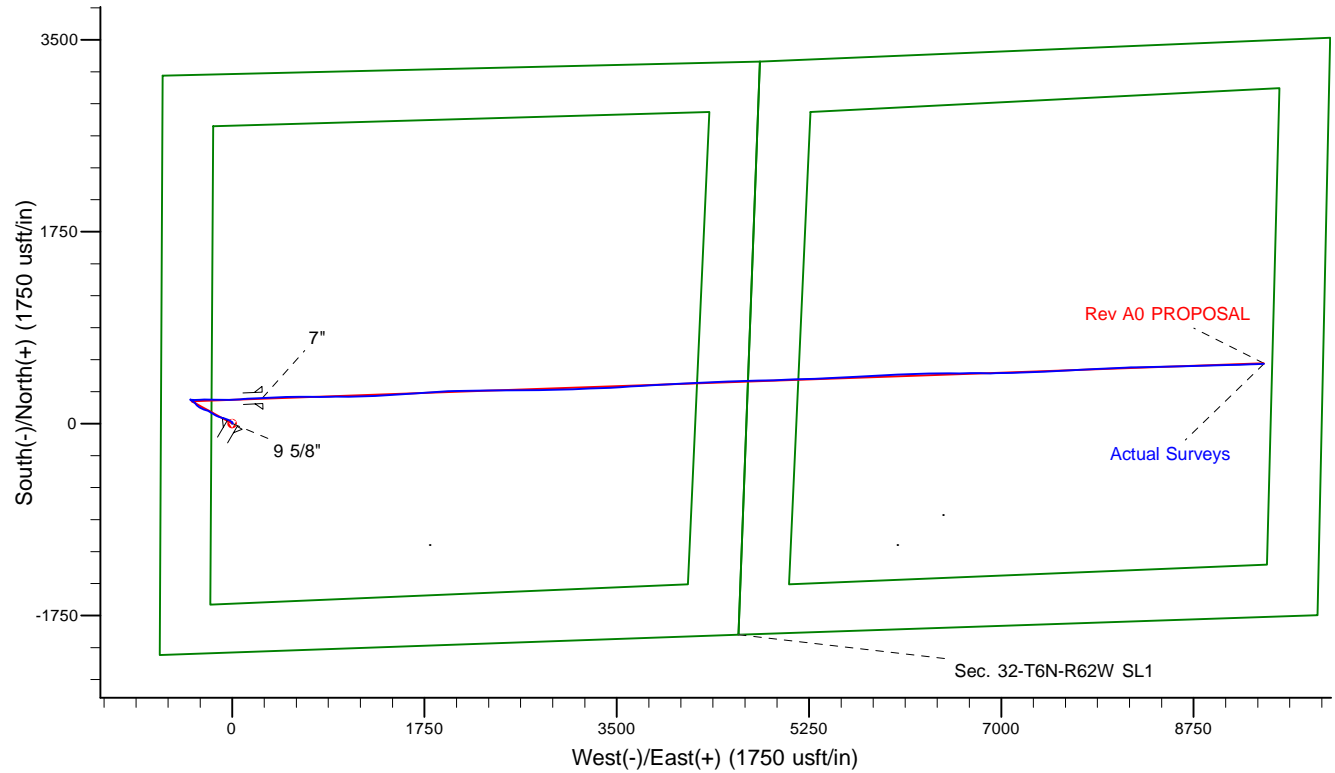
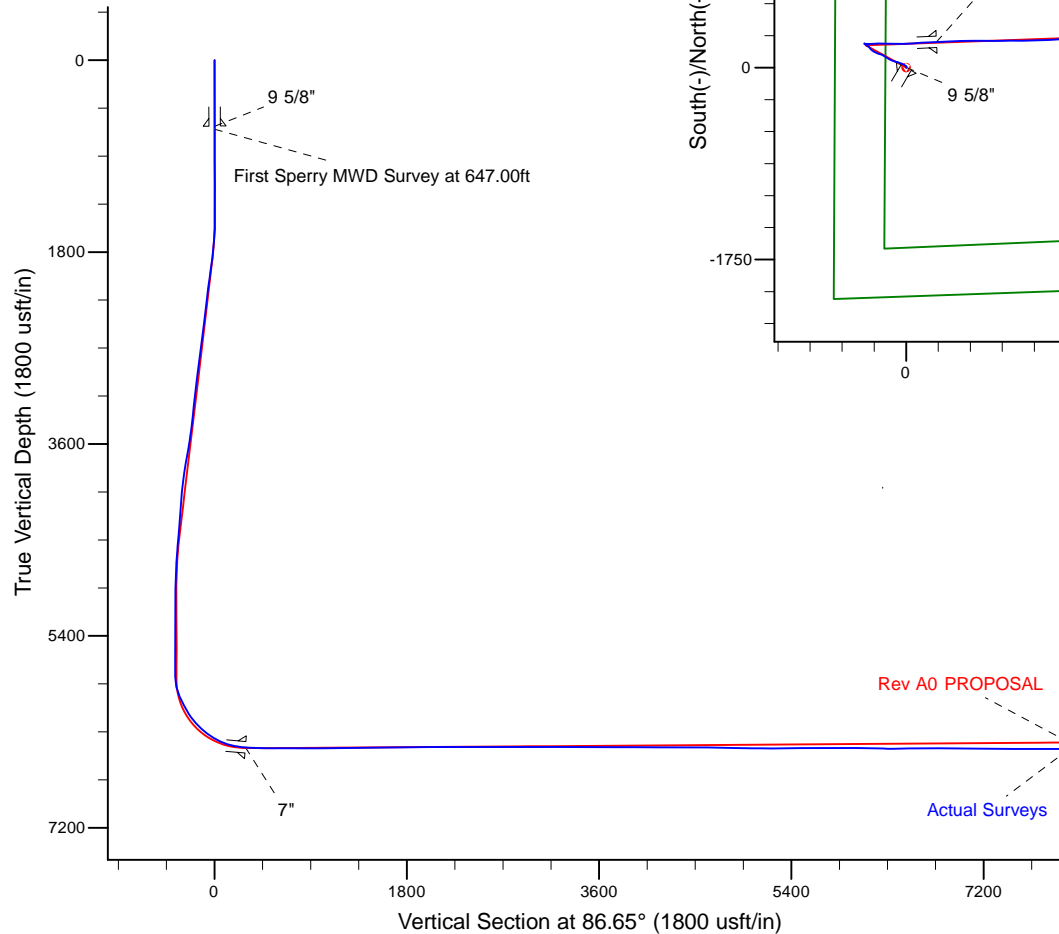
Project: Weld County, CO (NAD 83)
 Site: Sec. 32-T6N-R62W (Wells Ranch AE32)
 Well: Wells Ranch AE32-645
 Wellbore: Plan A
 Design: Actual Surveys



Platted SHL: 2085' FSL, 650' FWL
 Platted Lat/Long: 40.441680, -104.3544
 Location: Sec. 32-T6N-R62W

~7" Casing: 2376' FSL, 919' FWL
 Lat/Long: 40.442312 N, -104.353397 W
 State Planes - CO Northern: 1,406,037.76 N, 3,319,132.78 E
 Sec. 32-T6N-R62W

Platted BHL: 2310' FSL, 535' FEL
 Platted Lat/Long: 40.442835 N, -104.320883 W
 State Planes - CO Northern: 1,406,347.10 N, 3,328,179.11 E
 Location: Sec. 33-T6N-R62W



LEGEND

- ✕ Wells Ranch AE32-645, Plan A, Rev A0 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AE32-645

Ground Level: 4723.00
 KB = 24' @ 4747.00usft (H&P 343)

Created By: Tatiana Gomez
 Created On: 10/7/2015

Design Report for Wells Ranch AE32-645 - 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
619.00	0.33	30.16	619.00	1.52	0.88	0.97	0.05
9 5/8"							
647.00	0.34	30.16	647.00	1.66	0.96	1.06	0.05
First Sperry MWD Survey at 647.00ft							
742.00	0.54	37.43	741.99	2.26	1.38	1.51	0.22
837.00	0.43	34.55	836.99	2.91	1.85	2.02	0.12
931.00	0.44	31.70	930.99	3.51	2.24	2.44	0.03
1,026.00	0.32	33.66	1,025.99	4.04	2.58	2.81	0.13
1,119.00	0.39	6.81	1,118.98	4.57	2.76	3.02	0.19
1,213.00	0.50	18.98	1,212.98	5.27	2.93	3.24	0.15
1,305.00	0.60	11.41	1,304.98	6.12	3.16	3.51	0.13
1,399.00	0.63	16.33	1,398.97	7.10	3.40	3.81	0.06
1,492.00	0.68	13.96	1,491.96	8.13	3.68	4.15	0.06
1,584.00	3.34	317.24	1,583.90	10.63	1.99	2.61	3.28
1,677.00	6.41	305.01	1,676.56	15.60	-4.10	-3.18	3.47
1,769.00	6.46	302.59	1,767.98	21.33	-12.67	-11.40	0.30
1,862.00	9.30	299.61	1,860.09	27.86	-23.61	-21.94	3.08
1,954.00	8.80	293.75	1,950.95	34.37	-36.52	-34.45	1.14
2,141.00	7.50	286.63	2,136.06	43.62	-61.31	-58.65	0.88
2,235.00	6.99	286.25	2,229.31	46.98	-72.67	-69.81	0.54
2,328.00	7.34	287.97	2,321.58	50.40	-83.76	-80.67	0.44
2,420.00	6.80	284.28	2,412.88	53.55	-94.63	-91.34	0.77
2,512.00	8.84	290.15	2,504.03	57.33	-106.54	-103.01	2.38
2,604.00	8.02	288.75	2,595.03	61.83	-119.26	-115.44	0.92
2,695.00	8.51	294.37	2,685.09	66.65	-131.40	-127.28	1.04
2,789.00	7.87	294.45	2,778.13	72.18	-143.60	-139.13	0.68
2,882.00	7.60	294.17	2,870.28	77.34	-155.00	-150.22	0.29
2,976.00	9.60	301.87	2,963.22	84.02	-167.33	-162.14	2.45
3,071.00	7.74	302.70	3,057.13	91.66	-179.44	-173.78	1.96
3,165.00	7.86	302.60	3,150.26	98.54	-190.19	-184.10	0.13
3,260.00	7.18	301.68	3,244.45	105.16	-200.71	-194.23	0.73
3,354.00	6.64	301.66	3,337.76	111.10	-210.33	-203.49	0.57
3,449.00	7.57	291.87	3,432.04	116.31	-220.82	-213.65	1.60
3,543.00	9.30	289.72	3,525.02	121.18	-233.71	-226.24	1.87
3,638.00	10.31	289.13	3,618.63	126.56	-248.97	-241.16	1.07
3,733.00	10.88	290.64	3,712.01	132.50	-265.40	-257.20	0.67
3,827.00	11.01	295.56	3,804.30	139.50	-281.80	-273.17	1.00
3,922.00	9.34	302.36	3,897.81	147.55	-296.49	-287.37	2.16
4,016.00	8.26	308.51	3,990.70	155.83	-308.22	-298.59	1.52
4,111.00	7.53	309.94	4,084.80	164.08	-318.33	-308.21	0.80
4,300.00	6.23	326.14	4,272.45	180.55	-333.54	-322.43	1.23
4,395.00	6.53	308.95	4,366.87	188.22	-340.62	-329.04	2.03
4,490.00	7.04	313.03	4,461.21	195.59	-349.07	-337.05	0.74
4,584.00	7.01	311.92	4,554.50	203.35	-357.55	-345.06	0.15
4,679.00	5.19	301.34	4,648.96	209.46	-365.54	-352.68	2.24
4,773.00	3.77	296.59	4,742.67	213.06	-371.93	-358.85	1.56
4,868.00	1.75	309.17	4,837.56	215.37	-375.85	-362.63	2.21
4,962.00	2.26	313.44	4,931.50	217.55	-378.31	-364.96	0.56
5,057.00	0.49	297.19	5,026.47	219.03	-380.03	-366.59	1.89

Design Report for Wells Ranch AE32-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,152.00	0.78	325.70	5,121.46	219.75	-380.76	-367.27	0.44
5,246.00	0.46	265.18	5,215.46	220.24	-381.49	-367.98	0.73
5,341.00	0.31	242.27	5,310.46	220.09	-382.10	-368.59	0.22
5,436.00	0.52	186.78	5,405.45	219.54	-382.38	-368.90	0.45
5,530.00	0.41	202.24	5,499.45	218.81	-382.56	-369.12	0.18
5,625.00	0.29	173.53	5,594.45	218.26	-382.66	-369.26	0.22
5,719.00	0.19	127.52	5,688.45	217.92	-382.51	-369.13	0.22
5,814.00	0.52	69.10	5,783.45	217.98	-381.98	-368.60	0.47
5,909.00	12.84	95.21	5,877.62	217.17	-371.02	-357.70	13.03
6,003.00	24.41	91.46	5,966.55	215.73	-341.10	-327.92	12.37
6,098.00	27.82	86.63	6,051.85	216.53	-299.33	-286.17	4.23
6,192.00	30.62	85.35	6,133.88	219.76	-253.56	-240.29	3.05
6,287.00	43.53	92.13	6,209.55	220.51	-196.49	-183.28	14.24
6,381.00	47.87	93.25	6,275.19	217.33	-129.31	-116.40	4.69
6,476.00	54.85	90.69	6,334.48	214.86	-55.20	-42.56	7.64
6,571.00	63.77	84.67	6,382.95	218.36	26.28	38.98	10.85
6,665.00	73.31	86.18	6,417.30	225.29	113.38	126.34	10.26
6,760.00	81.38	87.20	6,438.10	230.63	205.84	218.96	8.56
6,776.00	83.48	87.66	6,440.20	231.34	221.68	234.82	13.43
6,831.00	85.27	87.33	6,445.59	233.73	276.36	289.54	3.31
7"							
6,879.00	86.83	87.05	6,448.90	236.07	324.19	337.43	3.31
6,974.00	89.23	88.40	6,452.17	239.84	419.05	432.34	2.90
7,068.00	89.48	87.83	6,453.23	242.93	512.99	526.31	0.66
7,163.00	89.97	89.46	6,453.68	245.18	607.96	621.24	1.79
7,258.00	90.18	91.64	6,453.56	244.27	702.95	716.02	2.31
7,352.00	89.32	89.38	6,453.97	243.43	796.94	809.80	2.57
7,447.00	90.22	88.76	6,454.35	244.97	891.93	904.71	1.15
7,541.00	90.46	89.88	6,453.79	246.09	985.92	998.61	1.22
7,636.00	90.46	89.43	6,453.03	246.66	1,080.91	1,093.47	0.47
7,731.00	90.31	88.26	6,452.39	248.58	1,175.89	1,188.40	1.24
7,826.00	90.65	88.36	6,451.59	251.38	1,270.84	1,283.36	0.37
7,920.00	91.63	86.91	6,449.72	255.26	1,364.74	1,377.32	1.86
8,015.00	90.34	85.72	6,448.09	261.36	1,459.53	1,472.30	1.85
8,109.00	91.67	86.33	6,446.44	267.88	1,553.28	1,566.28	1.56
8,204.00	89.97	86.28	6,445.08	274.00	1,648.07	1,661.26	1.79
8,299.00	90.34	85.53	6,444.82	280.78	1,742.83	1,756.25	0.88
8,393.00	90.34	85.92	6,444.27	287.79	1,836.57	1,850.24	0.41
8,583.00	90.68	88.12	6,442.58	297.66	2,026.29	2,040.22	1.17
8,677.00	90.37	89.47	6,441.71	299.64	2,120.26	2,134.14	1.47
8,771.00	89.51	89.38	6,441.81	300.58	2,214.26	2,228.03	0.92
8,865.00	89.69	89.31	6,442.47	301.66	2,308.25	2,321.93	0.21
8,960.00	90.28	89.07	6,442.49	303.00	2,403.24	2,416.83	0.67
9,054.00	89.91	89.39	6,442.34	304.27	2,497.23	2,510.74	0.52
9,243.00	90.43	90.32	6,441.78	304.74	2,686.23	2,699.44	0.56
9,338.00	89.91	88.84	6,441.50	305.44	2,781.22	2,794.31	1.65
9,433.00	90.34	88.72	6,441.29	307.46	2,876.20	2,889.24	0.47
9,527.00	89.91	88.76	6,441.08	309.53	2,970.17	2,983.18	0.46
9,621.00	89.82	88.61	6,441.30	311.69	3,064.15	3,077.12	0.19
9,716.00	89.78	86.94	6,441.64	315.38	3,159.07	3,172.10	1.76
9,905.00	90.65	88.19	6,440.93	323.40	3,347.90	3,361.07	0.81

Design Report for Wells Ranch AE32-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
9,999.00	89.23	87.20	6,441.03	327.19	3,441.82	3,455.05	1.84
10,094.00	89.32	86.32	6,442.23	332.55	3,536.66	3,550.04	0.93
10,187.00	89.32	86.07	6,443.33	338.72	3,629.44	3,643.03	0.27
10,281.00	89.94	86.58	6,443.94	344.75	3,723.25	3,737.03	0.85
10,373.00	90.56	86.36	6,443.54	350.41	3,815.07	3,829.03	0.72
10,467.00	89.69	87.23	6,443.33	355.67	3,908.92	3,923.02	1.31
10,560.00	90.31	87.65	6,443.33	359.82	4,001.83	4,016.01	0.81
10,653.00	89.57	86.84	6,443.43	364.29	4,094.72	4,109.01	1.18
10,745.00	88.92	87.78	6,444.64	368.61	4,186.61	4,200.99	1.24
10,837.00	89.41	87.31	6,445.98	372.55	4,278.52	4,292.97	0.74
10,930.00	89.48	86.61	6,446.88	377.48	4,371.38	4,385.96	0.76
11,022.00	90.25	86.70	6,447.10	382.85	4,463.22	4,477.96	0.84
11,117.00	90.89	88.85	6,446.15	386.54	4,558.14	4,572.93	2.36
11,210.00	89.14	89.17	6,446.13	388.15	4,651.12	4,665.85	1.91
11,303.00	88.27	88.98	6,448.23	389.65	4,744.08	4,758.74	0.96
11,396.00	89.02	88.20	6,450.43	391.93	4,837.03	4,851.66	1.16
11,489.00	89.04	87.56	6,452.01	395.37	4,929.95	4,944.63	0.69
11,580.00	88.89	86.95	6,453.65	399.73	5,020.83	5,035.61	0.69
11,672.00	89.54	87.59	6,454.91	404.11	5,112.72	5,127.59	0.99
11,764.00	89.66	88.01	6,455.55	407.64	5,204.65	5,219.57	0.47
11,857.00	90.59	87.92	6,455.35	410.95	5,297.59	5,312.55	1.00
11,950.00	90.56	87.55	6,454.42	414.62	5,390.51	5,405.52	0.40
12,139.00	91.82	87.83	6,450.49	422.24	5,579.31	5,594.45	0.68
12,234.00	89.94	87.45	6,449.03	426.15	5,674.22	5,689.42	2.02
12,328.00	89.38	87.57	6,449.59	430.23	5,768.13	5,783.41	0.61
12,423.00	89.26	86.87	6,450.72	434.84	5,863.01	5,878.39	0.75
12,518.00	89.51	86.65	6,451.74	440.21	5,957.85	5,973.39	0.35
12,612.00	89.17	86.25	6,452.82	446.03	6,051.66	6,067.38	0.56
12,707.00	88.80	86.84	6,454.50	451.75	6,146.47	6,162.37	0.73
12,802.00	88.64	88.34	6,456.62	455.75	6,241.36	6,257.33	1.59
12,896.00	89.88	89.31	6,457.84	457.67	6,335.33	6,351.25	1.67
13,086.00	91.26	90.68	6,455.95	457.69	6,525.31	6,540.91	1.02
13,180.00	90.18	89.35	6,454.77	457.67	6,619.30	6,634.73	1.82
13,275.00	89.97	88.63	6,454.64	459.34	6,714.29	6,729.65	0.79
13,369.00	90.68	91.09	6,454.11	459.57	6,808.28	6,823.50	2.72
13,464.00	89.72	89.38	6,453.78	459.18	6,903.27	6,918.31	2.06
13,559.00	89.32	88.30	6,454.57	461.11	6,998.25	7,013.23	1.21
13,653.00	89.05	88.67	6,455.91	463.59	7,092.20	7,107.17	0.49
13,748.00	88.92	88.60	6,457.59	465.85	7,187.16	7,202.10	0.16
13,843.00	89.38	87.49	6,459.00	469.09	7,282.10	7,297.06	1.26
13,937.00	89.63	87.35	6,459.82	473.32	7,376.00	7,391.05	0.30
14,032.00	89.75	87.23	6,460.33	477.82	7,470.89	7,486.04	0.18
14,127.00	90.22	87.35	6,460.35	482.31	7,565.78	7,581.04	0.51
14,316.00	90.18	86.70	6,459.69	492.12	7,754.53	7,770.03	0.34
14,505.00	90.12	87.40	6,459.20	501.84	7,943.27	7,959.02	0.37
14,600.00	89.63	86.16	6,459.41	507.18	8,038.12	8,054.02	1.40
14,694.00	90.93	88.60	6,458.95	511.48	8,132.01	8,148.00	2.94
14,788.00	91.11	89.74	6,457.27	512.84	8,225.99	8,241.90	1.23
14,883.00	89.20	87.07	6,457.02	515.48	8,320.94	8,336.84	3.46
14,977.00	91.11	89.14	6,456.76	518.59	8,414.87	8,430.80	3.00
15,072.00	91.51	89.27	6,454.59	519.91	8,509.84	8,525.68	0.44

Design Report for Wells Ranch AE32-645 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
15,167.00	92.43	89.31	6,451.33	521.08	8,604.78	8,620.52	0.97
15,262.00	91.57	87.66	6,448.01	523.59	8,699.68	8,715.41	1.96
15,356.00	91.42	87.54	6,445.56	527.53	8,793.57	8,809.37	0.20
15,451.00	92.13	88.42	6,442.61	530.88	8,888.46	8,904.29	1.19
15,546.00	92.75	88.73	6,438.57	533.24	8,983.34	8,999.15	0.73
15,641.00	91.29	88.63	6,435.22	535.42	9,078.26	9,094.03	1.54
15,735.00	92.12	88.59	6,432.42	537.70	9,172.19	9,187.93	0.88
15,830.00	91.45	87.72	6,429.47	540.76	9,267.09	9,282.85	1.16
15,886.00	91.17	87.54	6,428.19	543.08	9,323.03	9,338.83	0.59
Final Sperry MWD Survey at 15886.00ft							
15,953.00	91.17	87.54	6,426.82	545.95	9,389.95	9,405.81	0.00
Straight Line Projection to TD at 15953.00ft - Wells Ranch AE32-645_Rev A0_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
647.00	647.00	1.66	0.96	First Sperry MWD Survey at 647.00ft
15,886.00	6,428.19	543.08	9,323.03	Final Sperry MWD Survey at 15886.00ft
15,953.00	6,426.82	545.95	9,389.95	Straight Line Projection to TD at 15953.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AE32-645_Rev A0_BHL	86.65	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
647.00	6,776.00	Intermediate Survey	MWD
6,879.00	15,953.00	Production Survey	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
619.00	619.00	9 5/8"	9-5/8	13-3/4
6,831.00	6,445.59	7"	7	8-3/4

Design Report for Wells Ranch AE32-645 - 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 AE32-645 - actual wellpath misses target center by 0.01usft at 0.00usft MD (0.00 TVD, 0.00 N, 0.00 E) - Point	0.00	0.00	0.00	0.01	0.00	1,405,804.06	3,318,856.43	40.441680	-104.354400
Wells Ranch AE32-645 - actual wellpath misses target center by 36.98usft at 15953.00usft MD (6426.82 TVD, 545.95 N, 9389.95 E) - Point	0.00	0.00	6,390.00	549.41	9,390.61	1,406,353.43	3,328,246.68	40.442850	-104.320640

Directional Difficulty Index

Average Dogleg over Survey:	1.50 °/100usft	Maximum Dogleg over Survey:	14.24 °/100usft at 6,287.00 usft
Net Tortosity applicable to Plans:	0.83 °/100usft	Directional Difficulty Index:	6.783

Audit Info