

# Noble Energy

Weld County, CO (NAD 83)

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

Wells Ranch AE32-690

05-123-41733

Plan A

Design: Actual Surveys

## Sperry Drilling Services

### Final Survey Report

02 November, 2015

Surface UWI : 05-123-41733

Well Coordinates: 1,408,452.90 N, 3,318,869.53 E (40° 26' 56.22" N, 104° 21' 15.23" W)

Ground Level: 4,748.00 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 AE32-690

KB = 24' @ 4772.00usft (H&P 343)

N

Grid

Dec-Deg - API - US Survey Feet - Custom

**HALLIBURTON**

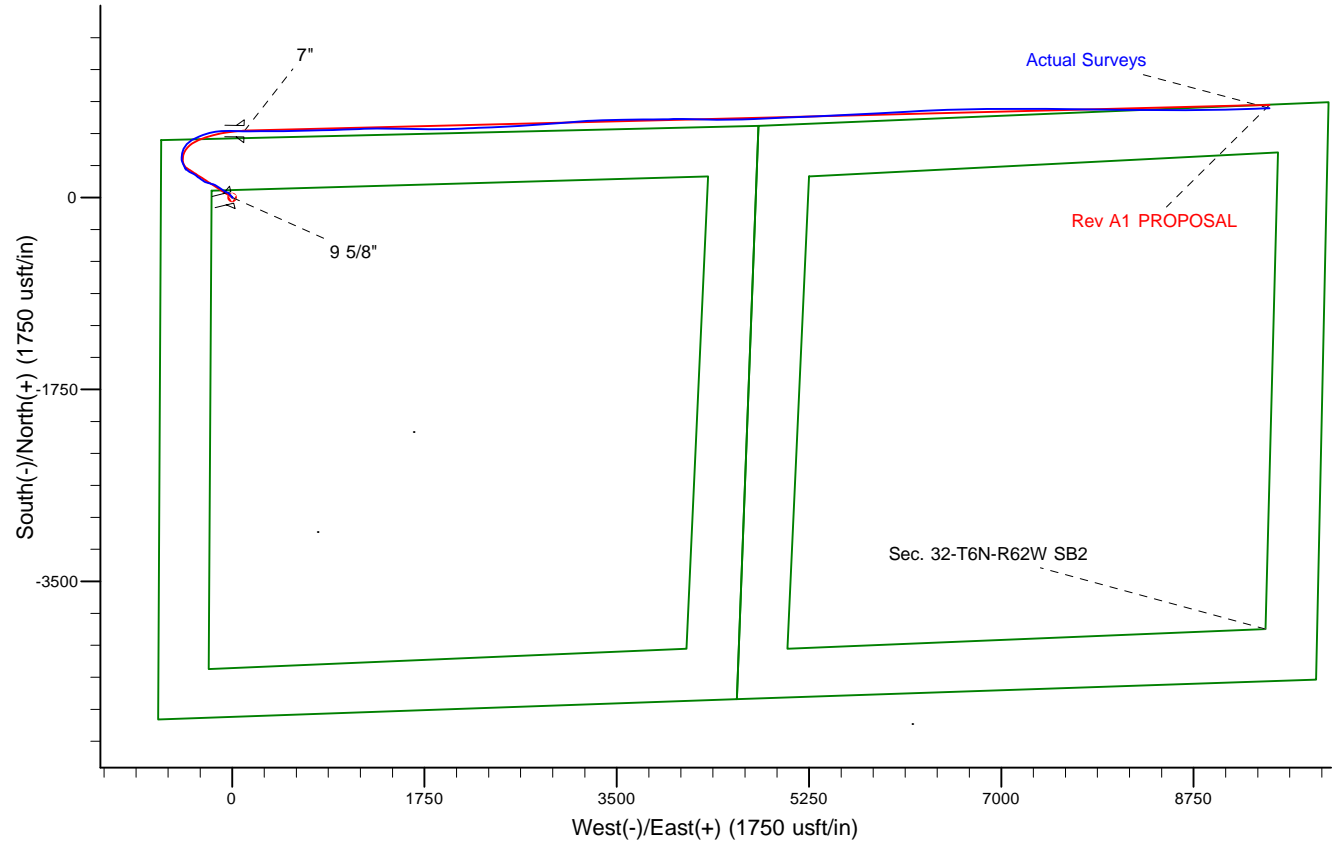
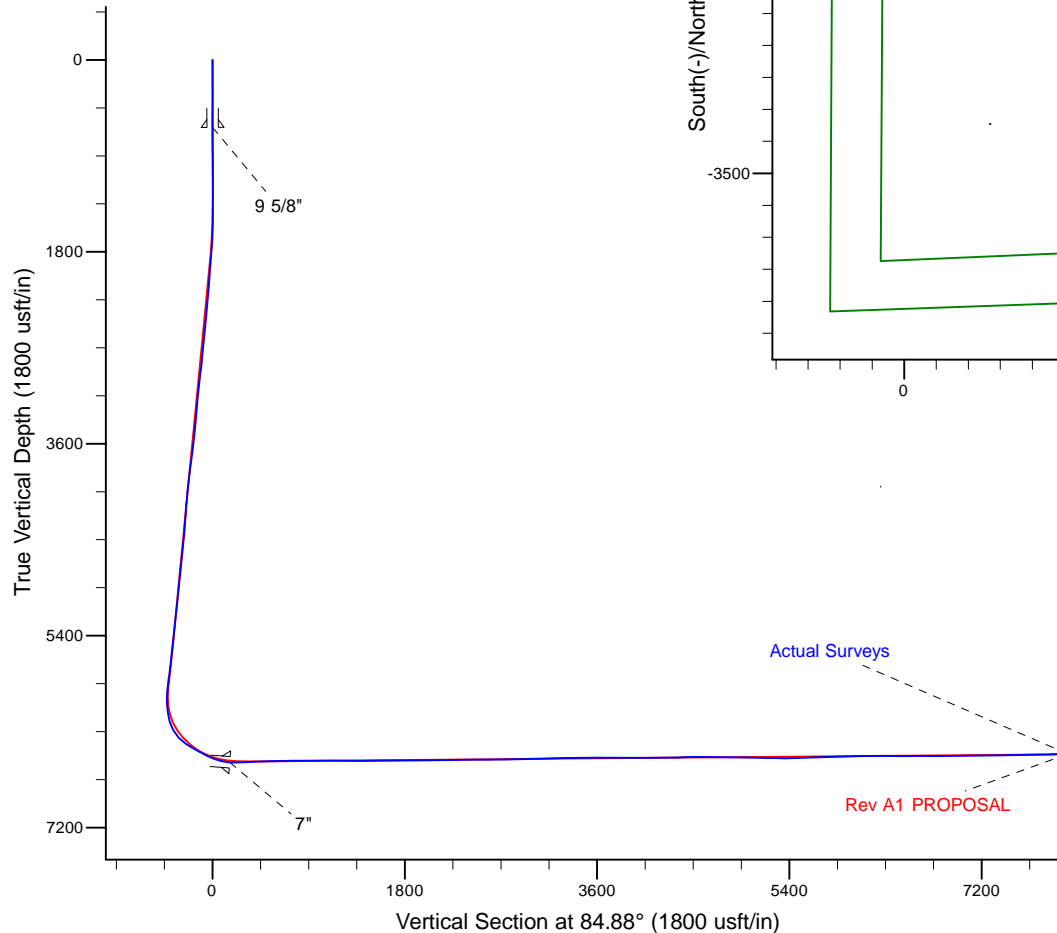
Project: Weld County, CO (NAD 83)  
 Site: Sec. 32-T6N-R62W (Wells Ranch AE32)  
 Well: Wells Ranch AE32-690  
 Wellbore: Plan A  
 Design: Actual Surveys



Platted SHL: 539' FNL, 650' FWL  
 Platted Lat/Long: 40.44895, -104.35423  
 Location: Sec. 32-T6N-R62W

~7" Casing: 57' FSL, 761' FWL  
 Lat/Long: 40.450605 N, -104.353814 W  
 State Planes - CO Northern: 1,409,057.36 N, 3,318,977.47 E  
 Sec. 32-T6N-R62W

Platted BHL: 1' FNL, 535' FEL  
 Platted Lat/Long: 40.450840, -104.320512  
 State Planes - CO Northern: 1,409,264.50 N, 3,328,243.77 E  
 Location: Sec. 33-T6N-R62W



# LEGEND

- Wells Ranch AE32-690, Plan A, Rev A1 PROPOSAL V0
- Actual Surveys

WELL DETAILS: Wells Ranch AE32-690

Ground Level: 4748.00

KB = 24' @ 4772.00usft (H&P 343)

Created By: Tatiana Gomez  
 Created On: 11/3/2015

**Design Report for Wells Ranch AE32-690 - 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
634.00	0.27	76.18	634.00	0.35	1.43	1.46	0.04
<b>9 5/8"</b>							
738.00	0.31	76.18	738.00	0.48	1.94	1.97	0.04
<b>First Sperry MWD Survey at 738.00ft</b>							
833.00	0.31	84.09	833.00	0.56	2.44	2.48	0.05
928.00	0.16	112.88	927.99	0.54	2.82	2.86	0.20
1,116.00	0.29	157.46	1,115.99	0.00	3.25	3.23	0.11
1,207.00	0.22	126.70	1,206.99	-0.32	3.47	3.43	0.17
1,299.00	0.30	154.42	1,298.99	-0.64	3.72	3.65	0.16
1,390.00	0.44	148.97	1,389.99	-1.16	4.00	3.88	0.16
1,483.00	0.84	288.60	1,482.99	-1.24	3.54	3.42	1.30
1,576.00	2.78	312.34	1,575.94	0.49	1.23	1.27	2.19
1,669.00	5.02	325.71	1,668.72	5.37	-2.73	-2.24	2.58
1,762.00	6.64	319.53	1,761.23	12.83	-8.52	-7.34	1.87
1,854.00	7.09	317.91	1,852.57	21.09	-15.77	-13.83	0.53
1,947.00	6.63	313.02	1,944.91	29.01	-23.55	-20.87	0.80
2,040.00	6.36	310.52	2,037.31	36.02	-31.39	-28.05	0.42
2,224.00	6.21	297.56	2,220.22	47.24	-47.96	-43.55	0.77
2,317.00	5.70	291.68	2,312.71	51.28	-56.71	-51.91	0.85
2,409.00	5.02	287.55	2,404.31	54.18	-64.79	-59.70	0.85
2,502.00	7.85	307.30	2,496.73	59.26	-73.73	-68.15	3.82
2,595.00	7.71	305.96	2,588.87	66.77	-83.83	-77.54	0.25
2,688.00	7.30	304.13	2,681.07	73.75	-93.77	-86.82	0.51
2,779.00	6.60	303.88	2,771.40	79.91	-102.90	-95.36	0.77
2,871.00	9.08	302.06	2,862.54	86.71	-113.44	-105.26	2.71
2,966.00	8.44	302.02	2,956.43	94.38	-125.70	-116.79	0.67
3,061.00	7.89	301.22	3,050.47	101.46	-137.19	-127.60	0.59
3,155.00	7.14	305.43	3,143.66	108.19	-147.47	-137.23	0.99
3,250.00	5.16	303.01	3,238.11	113.94	-155.86	-145.08	2.10
3,344.00	6.27	288.93	3,331.64	117.91	-164.26	-153.10	1.89
3,439.00	5.29	279.96	3,426.16	120.35	-173.48	-162.06	1.40
3,533.00	6.22	287.23	3,519.69	122.61	-182.62	-170.96	1.26
3,628.00	7.45	287.75	3,614.01	126.01	-193.40	-181.39	1.30
3,723.00	8.01	286.94	3,708.15	129.82	-205.60	-193.20	0.60
3,817.00	8.22	285.37	3,801.21	133.51	-218.34	-205.57	0.32
3,912.00	7.66	288.63	3,895.30	137.33	-230.89	-217.72	0.76
4,006.00	6.53	285.27	3,988.57	140.74	-241.98	-228.47	1.28
4,101.00	6.44	297.69	4,082.97	144.64	-251.91	-238.01	1.48
4,195.00	5.19	301.44	4,176.49	149.30	-260.21	-245.86	1.39
4,290.00	5.09	309.29	4,271.11	154.21	-267.13	-252.32	0.75
4,385.00	6.68	310.85	4,365.60	160.50	-274.58	-259.17	1.68
4,479.00	6.50	304.99	4,458.98	167.12	-283.07	-267.04	0.74
4,574.00	7.63	302.34	4,553.26	173.58	-292.80	-276.16	1.24
4,668.00	6.84	302.99	4,646.51	179.97	-302.77	-285.52	0.84
4,763.00	8.97	314.21	4,740.61	188.21	-312.83	-294.80	2.76
4,857.00	7.27	304.97	4,833.67	196.73	-322.95	-304.13	2.27
4,952.00	8.14	305.06	4,927.81	204.04	-333.39	-313.86	0.92
5,141.00	7.30	298.72	5,115.10	217.50	-354.87	-334.06	0.63
5,236.00	6.85	289.63	5,209.37	222.30	-365.50	-344.22	1.27

## Design Report for Wells Ranch AE32-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
5,330.00	8.13	300.25	5,302.58	227.53	-376.52	-354.73	2.00
5,425.00	6.22	298.75	5,396.83	233.39	-386.84	-364.49	2.02
5,519.00	8.27	307.04	5,490.07	239.92	-396.70	-373.73	2.44
5,614.00	8.54	306.05	5,584.05	248.18	-407.86	-384.10	0.32
5,709.00	7.47	299.66	5,678.13	255.39	-418.93	-394.48	1.46
5,803.00	20.78	334.55	5,769.21	273.58	-431.48	-405.36	16.21
5,898.00	20.08	334.60	5,858.23	303.53	-445.71	-416.87	0.74
5,993.00	18.92	341.32	5,947.79	332.85	-457.64	-426.14	2.66
6,087.00	22.59	3.48	6,035.81	365.37	-461.43	-427.02	9.15
6,182.00	25.63	12.22	6,122.54	403.69	-455.98	-418.16	4.93
6,276.00	30.07	23.39	6,205.69	445.22	-442.31	-400.85	7.27
6,371.00	35.57	43.36	6,285.73	487.31	-413.78	-368.68	12.71
6,465.00	46.03	59.91	6,357.00	524.36	-365.47	-317.26	15.93
6,560.00	57.61	68.95	6,415.70	556.05	-298.14	-247.37	14.28
6,654.00	60.69	71.92	6,463.90	583.04	-222.11	-169.24	4.25
6,749.00	63.94	82.31	6,508.13	601.65	-140.25	-86.05	10.27
6,844.00	65.83	89.35	6,548.49	607.86	-54.54	-0.12	7.00
6,955.00	80.50	92.39	6,580.56	606.14	51.39	105.23	13.47
7,012.00	86.00	90.98	6,587.26	604.48	107.95	161.42	9.95
7"							
7,065.00	91.11	89.69	6,588.60	604.17	160.91	214.14	9.95
7,160.00	91.82	89.33	6,586.17	604.98	255.87	308.80	0.84
7,254.00	92.90	90.00	6,582.30	605.53	349.79	402.39	1.35
7,349.00	92.10	89.47	6,578.15	605.97	444.70	496.96	1.01
7,444.00	91.14	89.37	6,575.47	606.93	539.65	591.62	1.02
7,538.00	90.56	88.58	6,574.07	608.61	633.63	685.37	1.04
7,632.00	90.49	88.44	6,573.21	611.05	727.59	779.18	0.17
7,727.00	90.18	87.91	6,572.65	614.08	822.54	874.02	0.65
7,821.00	90.25	88.70	6,572.30	616.86	916.50	967.85	0.84
7,916.00	90.12	88.24	6,572.00	619.40	1,011.46	1,062.67	0.50
8,010.00	89.82	87.74	6,572.04	622.69	1,105.41	1,156.53	0.62
8,105.00	88.92	86.59	6,573.09	627.39	1,200.28	1,251.44	1.54
8,199.00	89.82	89.43	6,574.12	630.66	1,294.21	1,345.29	3.17
8,294.00	90.12	90.68	6,574.17	630.56	1,389.21	1,439.90	1.35
8,388.00	90.40	91.33	6,573.75	628.92	1,483.19	1,533.36	0.75
8,483.00	90.59	92.74	6,572.93	625.54	1,578.13	1,627.62	1.50
8,578.00	90.74	89.64	6,571.82	623.57	1,673.09	1,722.02	3.27
8,672.00	91.11	90.60	6,570.30	623.37	1,767.07	1,815.62	1.09
8,767.00	90.34	89.46	6,569.10	623.32	1,862.06	1,910.23	1.45
8,862.00	90.68	88.27	6,568.26	625.20	1,957.04	2,004.99	1.30
8,956.00	90.68	87.47	6,567.14	628.70	2,050.97	2,098.86	0.85
9,051.00	90.49	88.46	6,566.17	632.07	2,145.90	2,193.71	1.06
9,145.00	90.46	86.60	6,565.39	636.12	2,239.81	2,287.60	1.98
9,240.00	90.92	87.83	6,564.25	640.74	2,334.68	2,382.52	1.38
9,334.00	90.83	89.19	6,562.81	643.18	2,428.64	2,476.32	1.45
9,428.00	90.46	86.63	6,561.75	646.61	2,522.56	2,570.17	2.75
9,523.00	90.34	85.93	6,561.09	652.77	2,617.36	2,665.14	0.75
9,618.00	90.18	86.05	6,560.66	659.42	2,712.13	2,760.12	0.21
9,807.00	91.84	85.51	6,557.33	673.32	2,900.58	2,949.06	0.92
9,902.00	91.63	86.14	6,554.45	680.23	2,995.28	3,044.00	0.70
9,996.00	91.57	85.92	6,551.83	686.74	3,089.02	3,137.95	0.24

## Design Report for Wells Ranch AE32-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
10,091.00	91.70	85.17	6,549.12	694.12	3,183.69	3,232.90	0.80
10,184.00	91.11	86.54	6,546.84	700.84	3,276.42	3,325.86	1.60
10,276.00	90.59	88.80	6,545.47	704.57	3,368.33	3,417.73	2.52
10,459.00	89.75	88.31	6,544.93	709.19	3,551.27	3,600.36	0.53
10,645.00	90.46	89.89	6,544.59	712.11	3,737.24	3,785.85	0.93
10,738.00	90.06	89.43	6,544.17	712.66	3,830.23	3,878.52	0.66
10,831.00	89.26	88.77	6,544.72	714.12	3,923.22	3,971.27	1.12
10,923.00	89.66	89.81	6,545.58	715.26	4,015.21	4,062.99	1.21
11,016.00	89.94	90.23	6,545.91	715.23	4,108.20	4,155.61	0.54
11,202.00	91.75	91.03	6,543.17	713.19	4,294.16	4,340.65	1.06
11,293.00	92.68	92.15	6,539.65	710.66	4,385.06	4,430.96	1.60
11,386.00	90.34	89.27	6,537.20	709.51	4,478.00	4,523.43	3.99
11,477.00	89.66	88.56	6,537.20	711.24	4,568.98	4,614.20	1.08
11,571.00	89.01	88.41	6,538.29	713.72	4,662.95	4,708.01	0.71
11,664.00	88.34	87.91	6,540.44	716.71	4,755.87	4,800.83	0.90
11,756.00	89.78	87.37	6,541.95	720.49	4,847.78	4,892.71	1.67
11,848.00	90.09	87.34	6,542.05	724.74	4,939.68	4,984.63	0.34
11,941.00	88.55	87.26	6,543.16	729.12	5,032.57	5,077.53	1.66
12,036.00	87.75	86.95	6,546.22	733.92	5,127.40	5,172.41	0.90
12,131.00	89.48	87.93	6,548.52	738.16	5,222.27	5,267.29	2.09
12,225.00	90.06	88.49	6,548.90	741.09	5,316.22	5,361.13	0.86
12,320.00	92.03	87.37	6,547.16	744.52	5,411.14	5,455.97	2.39
12,414.00	91.79	87.25	6,544.03	748.93	5,504.98	5,549.83	0.29
12,509.00	91.73	86.94	6,541.11	753.75	5,599.81	5,644.72	0.33
12,604.00	91.97	87.24	6,538.05	758.57	5,694.64	5,739.60	0.40
12,698.00	91.73	86.84	6,535.01	763.42	5,788.47	5,833.48	0.50
12,793.00	91.73	86.82	6,532.14	768.67	5,883.28	5,928.38	0.02
12,887.00	91.42	86.75	6,529.56	773.94	5,977.10	6,022.30	0.34
12,982.00	91.23	86.67	6,527.36	779.39	6,071.91	6,117.22	0.22
13,076.00	89.23	86.70	6,526.99	784.82	6,165.75	6,211.17	2.13
13,171.00	88.49	86.84	6,528.88	790.18	6,260.58	6,306.10	0.79
13,266.00	90.43	88.43	6,529.77	794.09	6,355.49	6,400.98	2.64
13,361.00	90.31	87.99	6,529.16	797.06	6,450.44	6,495.82	0.48
13,455.00	90.00	88.38	6,528.90	800.04	6,544.39	6,589.66	0.53
13,550.00	89.78	87.54	6,529.09	803.42	6,639.33	6,684.52	0.91
13,644.00	90.55	89.13	6,528.82	806.15	6,733.29	6,778.35	1.88
13,739.00	90.56	89.19	6,527.90	807.54	6,828.27	6,873.08	0.06
13,834.00	90.43	89.69	6,527.08	808.47	6,923.26	6,967.77	0.54
13,928.00	90.92	89.77	6,525.97	808.92	7,017.26	7,061.43	0.53
14,023.00	90.80	90.34	6,524.54	808.83	7,112.24	7,156.03	0.61
14,118.00	90.28	89.51	6,523.65	808.95	7,207.24	7,250.66	1.03
14,213.00	91.39	91.18	6,522.26	808.38	7,302.22	7,345.22	2.11
14,307.00	90.40	90.12	6,520.79	807.31	7,396.20	7,438.73	1.54
14,401.00	91.75	90.56	6,519.03	806.75	7,490.18	7,532.28	1.51
14,496.00	90.89	89.63	6,516.84	806.60	7,585.15	7,626.86	1.33
14,591.00	90.40	90.48	6,515.77	806.51	7,680.15	7,721.47	1.03
14,686.00	91.94	91.10	6,513.83	805.20	7,775.11	7,815.94	1.75
14,780.00	92.10	90.98	6,510.52	803.49	7,869.04	7,909.34	0.21
14,875.00	92.13	91.12	6,507.01	801.75	7,963.96	8,003.73	0.15
14,969.00	89.88	90.30	6,505.36	800.59	8,057.93	8,097.22	2.55
15,064.00	89.38	90.22	6,505.98	800.16	8,152.93	8,191.80	0.53

## Design Report for Wells Ranch AE32-690 - Actual Surveys

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)
15,159.00	89.82	90.54	6,506.64	799.53	8,247.92	8,286.36	0.57
15,255.00	90.40	90.57	6,506.46	798.60	8,343.92	8,381.89	0.60
15,352.00	89.75	90.22	6,506.33	797.93	8,440.92	8,478.44	0.76
15,449.00	89.57	90.15	6,506.91	797.61	8,537.91	8,575.03	0.20
15,546.00	90.06	90.66	6,507.22	796.93	8,634.91	8,671.57	0.73
15,643.00	89.91	90.86	6,507.24	795.64	8,731.90	8,768.06	0.26
15,740.00	89.91	88.91	6,507.40	795.84	8,828.90	8,864.69	2.01
15,837.00	90.34	88.56	6,507.18	797.98	8,925.87	8,961.47	0.57
15,933.00	91.20	88.38	6,505.89	800.54	9,021.83	9,057.27	0.92
16,031.00	91.20	88.56	6,503.84	803.16	9,119.77	9,155.06	0.18
16,128.00	90.71	87.83	6,502.23	806.21	9,216.71	9,251.88	0.91
16,225.00	91.20	88.20	6,500.61	809.57	9,313.64	9,348.72	0.63
16,286.00	90.99	87.93	6,499.44	811.63	9,374.59	9,409.62	0.56
Final Sperry MWD Survey at 16286.00ft							
16,353.00	90.99	87.93	6,498.29	814.05	9,441.54	9,476.52	0.00
Straight Line Projection to TD at 16353.00ft - Wells Ranch AE32-690_Rev A1_BHL - Wells Ranch AE32-690_Rev A0_BHL							

Design Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	+E/-W (usft)	Comment
738.00	738.00	0.48	1.94	First Sperry MWD Survey at 738.00ft
16,286.00	6,499.44	811.63	9,374.59	Final Sperry MWD Survey at 16286.00ft
16,353.00	6,498.29	814.05	9,441.54	Straight Line Projection to TD at 16353.00ft

Vertical Section Information

Angle Type	Target	Azimuth (°)	Origin Type	Origin +N/_S (usft)	+E/-W (usft)	Start TVD (usft)
Target	Wells Ranch AE32-690_Rev A1_BHL	84.88	Slot	0.00	0.00	0.00

Survey tool program

From (usft)	To (usft)	Survey/Plan	Survey Tool
738.00	6,955.00	Intermediate Sperry MWD Surveys	MWD
7,065.00	16,353.00	Production Sperry MWD Surveys	MWD+IFR1+MS_WY

Casing Details

Measured Depth (usft)	Vertical Depth (usft)	Name	Casing Diameter (")	Hole Diameter (")
634.00	634.00	9 5/8"	9-5/8	13-3/4
7,012.00	6,587.26	7"	7	8-3/4

## Design Report for Wells Ranch AE32-690 - 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 AE32-690 - 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	1,408,452.91	3,318,869.52	40.448950	-104.354230
Wells Ranch AE32-690 - actual wellpath misses target center by 31.18usft at 16353.00usft MD (6498.29 TVD, 814.05 N, 9441.54 E) - Point	0.00	0.00	6,499.00	845.22	9,441.32	1,409,298.09	3,328,310.50	40.450930	-104.320270
Wells Ranch AE32-690 - actual wellpath misses target center by 31.18usft at 16353.00usft MD (6498.29 TVD, 814.05 N, 9441.54 E) - Point	0.00	0.00	6,499.00	845.22	9,441.32	1,409,298.09	3,328,310.50	40.450930	-104.320270

### Directional Difficulty Index

Average Dogleg over Survey:	1.71 °/100usft	Maximum Dogleg over Survey:	16.21 °/100usft at 5,803.00 usft
Net Tortousity applicable to Plans:	0.97 °/100usft	Directional Difficulty Index:	6.870

### Audit Info