

Well Name: **JWHS 31-2D**

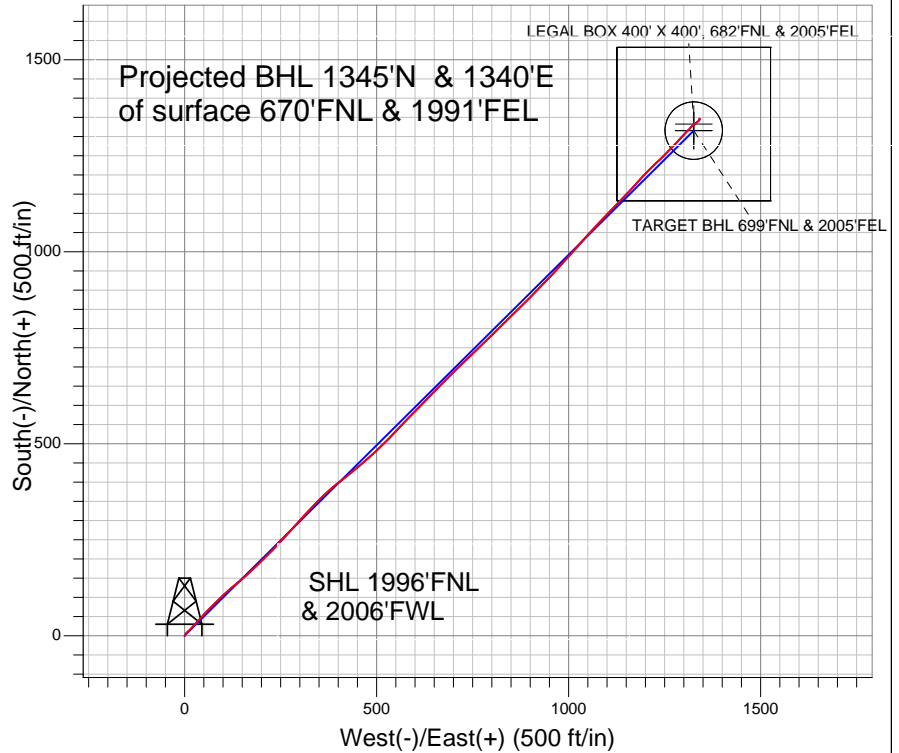
Surface Location: JWHS 31-2D Pad Sec.2-T3N-R68W  
North American Datum 1983 , US State Plane 1983 , Colorado Northern Zone

Ground Elevation: 4999.0

+N/-S	+E/-W	Northing	Easting	Latitude	Longitude	Slot
0.0	0.0	1336995.37	3147175.25	40.257250	-104.972670	

Original Well Elev WELL @ 5012.0ft (Original Well Elev)

## Apollo Operating, LLC.



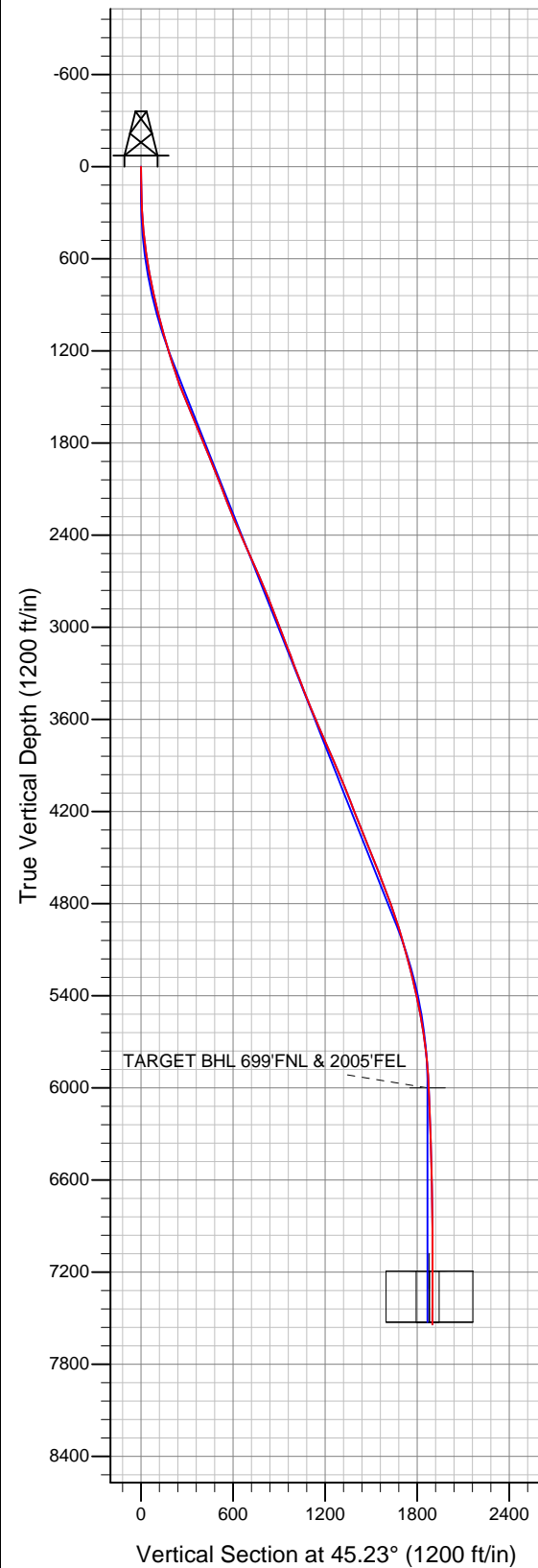
### LEGEND

- △ JWHS 31-2D, Wellbore #1, Plan #2 (5-08-13)R V0
- Wellbore #1
- Survey #1

## Final Survey Plot

Projected Final Survey -  
7871'MD & 7541'TVD @  
1898' VS 0.40 deg Inc  
191.90 deg AZ

Project: SEC.2-T3N-R68W  
Site: JWHS 31-2D Pad Sec.2-T3N-R68W  
Well: JWHS 31-2D  
Plan: Wellbore #1





## **Directional**

### **Apollo Operating, LLC.**

**SEC.2-T3N-R68W**

**JWHS 31-2D Pad Sec.2-T3N-R68W**

**JWHS 31-2D**

**Wellbore #1**

**Survey: Survey #1**

### **Standard Survey Report**

**13 May, 2013**

<b>Company:</b>	Apollo Operating, LLC.	<b>Local Co-ordinate Reference:</b>	Well JWHS 31-2D
<b>Project:</b>	SEC.2-T3N-R68W	<b>TVD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Site:</b>	JWHS 31-2D Pad Sec.2-T3N-R68W	<b>MD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Well:</b>	JWHS 31-2D	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

<b>Project</b>	SEC.2-T3N-R68W, Weld County, CO		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		Using Well Reference Point
<b>Map Zone:</b>	Colorado Northern Zone		Using geodetic scale factor

Site		JWHS 31-2D Pad Sec.2-T3N-R68W			
Site Position:		Northing:		1,336,995.38 ft	
From:	Lat/Long	Easting:		Longitude:	
		3,147,175.25 ft		-104.972670	
Position Uncertainty:		Slot Radius:		Grid Convergence:	
0.0 ft		"		0.34 °	

Well	JWHS 31-2D					
Well Position	+N-S	0.0 ft	Northing:	1,336,995.37 ft	Latitude:	40.257250
	+E-W	0.0 ft	Easting:	3,147,175.25 ft	Longitude:	-104.972670
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,999.0 ft

Wellbore	Wellbore #1				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	5/8/2013	8.71	66.84	52,833

Design	Wellbore #1				
Audit Notes:					
Version:	1.0	Phase:	ACTUAL	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)	
	6,000.0	0.0	0.0	45.23	

Survey Program		Date	5/13/2013		
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
78.0	7,871.0	Survey #1 (Wellbore #1)	MWD	MWD - Standard	

Survey	Survey Data									
	Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
	0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00
	78.0	0.90	28.60	78.0	0.5	0.3	0.6	1.15	1.15	0.00
	167.0	1.10	33.70	167.0	1.9	1.1	2.1	0.25	0.22	5.73
	256.0	2.40	34.50	255.9	4.1	2.6	4.8	1.46	1.46	0.90
	372.0	4.90	45.10	371.7	9.6	7.5	12.1	2.22	2.16	9.14
	498.0	6.90	45.60	497.0	18.7	16.7	25.1	1.59	1.59	0.40
	625.0	8.90	41.80	622.8	31.4	28.7	42.5	1.63	1.57	-2.99
	753.0	11.20	42.30	748.8	47.9	43.7	64.8	1.80	1.80	0.39
	880.0	13.30	44.70	872.9	67.5	62.3	91.7	1.70	1.65	1.89
	921.0	13.90	44.90	912.8	74.3	69.1	101.4	1.47	1.46	0.49
	985.0	14.50	43.90	974.8	85.5	80.1	117.1	1.01	0.94	-1.56
	1,113.0	15.40	48.10	1,098.5	108.4	103.8	150.1	1.10	0.70	3.28
	1,241.0	17.00	50.70	1,221.4	131.6	131.0	185.7	1.37	1.25	2.03

<b>Company:</b>	Apollo Operating, LLC.	<b>Local Co-ordinate Reference:</b>	Well JWHS 31-2D
<b>Project:</b>	SEC.2-T3N-R68W	<b>TVD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Site:</b>	JWHS 31-2D Pad Sec.2-T3N-R68W	<b>MD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Well:</b>	JWHS 31-2D	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

#### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)
1,370.0	18.60	47.20	1,344.2	157.5	160.6	225.0	1.49	1.24	-2.71
1,498.0	21.50	46.50	1,464.5	187.6	192.6	268.9	2.27	2.27	-0.55
1,626.0	22.90	44.60	1,583.0	221.4	227.1	317.2	1.23	1.09	-1.48
1,754.0	23.00	41.90	1,700.9	257.8	261.3	367.1	0.83	0.08	-2.11
1,883.0	21.90	42.30	1,820.1	294.3	294.4	416.3	0.86	-0.85	0.31
2,011.0	22.20	43.50	1,938.7	329.5	327.1	464.3	0.42	0.23	0.94
2,139.0	21.50	45.30	2,057.5	363.6	360.4	511.9	0.76	-0.55	1.41
2,267.0	21.20	52.50	2,176.8	394.2	395.4	558.3	2.06	-0.23	5.63
2,395.0	22.40	50.90	2,295.6	423.6	432.7	605.6	1.05	0.94	-1.25
2,524.0	24.50	49.00	2,413.9	456.7	472.0	656.7	1.73	1.63	-1.47
2,652.0	24.50	44.90	2,530.4	492.9	510.8	709.7	1.33	0.00	-3.20
2,780.0	23.40	43.90	2,647.4	530.0	547.1	761.7	0.92	-0.86	-0.78
2,909.0	21.90	44.60	2,766.5	565.6	581.8	811.4	1.18	-1.16	0.54
3,037.0	21.40	43.90	2,885.4	599.4	614.7	858.6	0.44	-0.39	-0.55
3,164.0	20.60	44.60	3,004.0	632.0	646.5	904.1	0.66	-0.63	0.55
3,293.0	21.50	44.90	3,124.4	664.9	679.1	950.4	0.70	0.70	0.23
3,421.0	20.50	45.30	3,243.9	697.3	711.6	996.3	0.79	-0.78	0.31
3,550.0	22.10	46.20	3,364.1	730.0	745.2	1,043.1	1.27	1.24	0.70
3,678.0	21.60	45.80	3,482.9	763.1	779.4	1,090.8	0.41	-0.39	-0.31
3,806.0	22.40	46.30	3,601.5	796.4	814.0	1,138.7	0.64	0.63	0.39
3,935.0	23.70	46.30	3,720.2	831.3	850.5	1,189.2	1.01	1.01	0.00
4,063.0	23.90	44.00	3,837.4	867.7	887.1	1,240.9	0.74	0.16	-1.80
4,191.0	23.00	43.50	3,954.8	904.5	922.3	1,291.8	0.72	-0.70	-0.39
4,319.0	21.30	43.70	4,073.3	939.4	955.6	1,340.0	1.33	-1.33	0.16
4,448.0	21.90	42.10	4,193.3	974.2	987.9	1,387.5	0.65	0.47	-1.24
4,576.0	22.00	41.90	4,312.0	1,009.8	1,019.9	1,435.2	0.10	0.08	-0.16
4,705.0	21.90	41.40	4,431.6	1,045.8	1,052.0	1,483.4	0.16	-0.08	-0.39
4,833.0	21.40	44.40	4,550.6	1,080.4	1,084.1	1,530.5	0.95	-0.39	2.34
4,962.0	21.10	44.00	4,670.8	1,113.9	1,116.7	1,577.3	0.26	-0.23	-0.31
5,090.0	20.50	42.60	4,790.5	1,147.0	1,147.9	1,622.7	0.61	-0.47	-1.09
5,218.0	17.90	42.60	4,911.4	1,178.0	1,176.3	1,664.7	2.03	-2.03	0.00
5,347.0	15.70	44.00	5,034.9	1,205.1	1,201.9	1,702.0	1.73	-1.71	1.09
5,475.0	15.30	46.70	5,158.2	1,229.2	1,226.2	1,736.2	0.64	-0.31	2.11
5,603.0	13.70	45.40	5,282.1	1,251.4	1,249.3	1,768.2	1.28	-1.25	-1.02
5,731.0	12.10	43.20	5,406.9	1,271.8	1,269.3	1,796.8	1.31	-1.25	-1.72
5,860.0	10.40	43.60	5,533.4	1,290.1	1,286.6	1,822.0	1.32	-1.32	0.31
5,988.0	8.50	42.30	5,659.7	1,305.5	1,300.9	1,843.0	1.49	-1.48	-1.02
6,117.0	6.20	44.70	5,787.6	1,317.5	1,312.2	1,859.4	1.80	-1.78	1.86
6,245.0	3.60	39.10	5,915.1	1,325.5	1,319.6	1,870.4	2.06	-2.03	-4.38
6,329.6	2.77	49.23	5,999.6	1,328.9	1,322.8	1,875.0	1.18	-0.98	11.97
<b>TARGET BHL 699'FNL &amp; 2005'FEL</b>									
6,373.0	2.40	57.00	6,042.9	1,330.1	1,324.4	1,877.0	1.18	-0.86	17.91
6,501.0	2.10	52.30	6,170.8	1,333.0	1,328.5	1,881.9	0.27	-0.23	-3.67
6,629.0	1.80	54.80	6,298.8	1,335.6	1,332.0	1,886.2	0.24	-0.23	1.95
6,757.0	1.50	48.10	6,426.7	1,337.9	1,334.9	1,889.9	0.28	-0.23	-5.23
6,886.0	1.50	59.50	6,555.7	1,339.8	1,337.6	1,893.2	0.23	0.00	8.84
7,015.0	1.10	34.00	6,684.6	1,341.7	1,339.7	1,896.1	0.54	-0.31	-19.77
7,143.0	0.90	25.60	6,812.6	1,343.7	1,340.9	1,898.2	0.19	-0.16	-6.56
7,271.0	0.40	6.20	6,940.6	1,345.0	1,341.4	1,899.5	0.42	-0.39	-15.16
7,399.0	0.40	332.50	7,068.6	1,345.8	1,341.2	1,900.0	0.18	0.00	-26.33
7,523.4	0.19	213.53	7,193.0	1,346.1	1,340.9	1,899.9	0.41	-0.17	-95.65
<b>TARGET CIRCLE 699'FNL &amp; 2005'FEL</b>									
7,523.5	0.19	213.53	7,193.1	1,346.1	1,340.9	1,899.9	0.00	0.00	0.00
<b>LEGAL BOX 400' X 400', 682'FNL &amp; 2005'FEL</b>									

<b>Company:</b>	Apollo Operating, LLC.	<b>Local Co-ordinate Reference:</b>	Well JWHS 31-2D
<b>Project:</b>	SEC.2-T3N-R68W	<b>TVD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Site:</b>	JWHS 31-2D Pad Sec.2-T3N-R68W	<b>MD Reference:</b>	WELL @ 5012.0ft (Original Well Elev)
<b>Well:</b>	JWHS 31-2D	<b>North Reference:</b>	True
<b>Wellbore:</b>	Wellbore #1	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	Wellbore #1	<b>Database:</b>	Landmark

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	
7,528.0	0.20	209.80	7,197.6	1,346.0	1,340.9	1,899.9	0.42	0.32	-82.04	
7,656.0	0.20	227.20	7,325.6	1,345.7	1,340.6	1,899.5	0.05	0.00	13.59	
7,827.0	0.40	191.90	7,496.6	1,344.9	1,340.3	1,898.7	0.15	0.12	-20.64	
7,871.0	0.40	191.90	7,540.6	1,344.6	1,340.2	1,898.4	0.00	0.00	0.00	

Design Targets										
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude		Longitude
- hit/miss target										
- Shape										
TARGET BHL 699'FN	0.00	0.00	6,000.0	1,315.2	1,325.7	1,338,318.35	3,148,493.04	40.260860		-104.967920
- survey misses target center by 14.0ft at 6329.7ft MD (5999.7 TVD, 1328.9 N, 1322.8 E)										
- Point										
TARGET CIRCLE 699'	0.00	0.00	7,193.0	1,315.2	1,325.7	1,338,318.35	3,148,493.04	40.260860		-104.967920
- survey misses target center by 34.4ft at 7523.5ft MD (7193.1 TVD, 1346.1 N, 1340.9 E)										
- Circle (radius 75.0)										
LEGAL BOX 400' X 400'	0.00	0.00	7,193.0	1,332.2	1,325.7	1,338,335.37	3,148,492.94	40.260907		-104.967920
- survey misses target center by 20.6ft at 7523.5ft MD (7193.1 TVD, 1346.1 N, 1340.9 E)										
- Rectangle (sides W400.0 H400.0 D332.0)										

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_