



Cathedral Energy Services

Survey Report - Geographic

Company:	Apollo Operating, LLC	Local Co-ordinate Reference:	Well Steffes 21-2D
Project:	Weld County, CO	TVD Reference:	KBE @ 5009.0ft (Original Well Elev)
Site:	Sec 2-T3N-R68W (Steffes/Margil Farms)	MD Reference:	KBE @ 5009.0ft (Original Well Elev)
Well:	Steffes 21-2D	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	USA EDM 5000 Multi Users DB

Project	Weld County, CO		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site	Sec 2-T3N-R68W (Steffes/Margil Farms)				
Site Position:		Northing:	1,337,438.45 ft	Latitude:	40.258480
From:	Lat/Long	Easting:	3,145,883.91 ft	Longitude:	-104.977310
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	0.34 °

Well	Steffes 21-2D					
Well Position	+N/-S	0.0 ft	Northing:	1,336,957.93 ft	Latitude:	40.257140
	+E/-W	0.0 ft	Easting:	3,147,173.41 ft	Longitude:	-104.972700
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	4,998.0 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	9/19/2011	8.93	66.89	53,005

Design	OH				
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 (°)	
	0.0	0.0	0.0	359.88	

Survey Program	Date	10/19/2011			
From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description	
101.0	7,677.0	Survey #1 (OH)	MWD	Geolink MWD	

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (ft)	Map Easting (ft)	Latitude	Longitude	
0.0	0.00	0.00	0.0	0.0	0.0	1,336,957.93	3,147,173.41	40.257140	-104.972700	
101.0	1.10	133.60	101.0	-0.7	0.7	1,336,957.26	3,147,174.11	40.257138	-104.972698	
190.0	1.20	149.20	190.0	-2.1	1.8	1,336,955.88	3,147,175.22	40.257134	-104.972694	
278.0	0.80	155.00	278.0	-3.4	2.5	1,336,954.53	3,147,175.96	40.257131	-104.972691	
370.0	0.40	159.90	370.0	-4.3	2.9	1,336,953.65	3,147,176.34	40.257128	-104.972690	
462.0	0.10	69.70	462.0	-4.6	3.1	1,336,953.38	3,147,176.53	40.257128	-104.972689	
554.0	0.50	112.20	554.0	-4.7	3.5	1,336,953.26	3,147,176.98	40.257127	-104.972688	
647.0	0.20	150.10	647.0	-5.0	4.0	1,336,952.97	3,147,177.44	40.257126	-104.972686	
739.0	0.30	45.40	739.0	-5.0	4.3	1,336,953.00	3,147,177.69	40.257126	-104.972685	
831.0	0.30	217.70	831.0	-5.0	4.3	1,336,952.98	3,147,177.71	40.257126	-104.972685	
851.0	0.80	233.00	851.0	-5.1	4.1	1,336,952.85	3,147,177.57	40.257126	-104.972685	
939.0	1.50	214.80	938.9	-6.4	3.0	1,336,951.53	3,147,176.43	40.257122	-104.972690	

Cathedral Energy Services

Survey Report - Geographic

Company:	Apollo Operating, LLC	Local Co-ordinate Reference:	Well Steffes 21-2D
Project:	Weld County, CO	TVD Reference:	KBE @ 5009.0ft (Original Well Elev)
Site:	Sec 2-T3N-R68W (Steffes/Margil Farms)	MD Reference:	KBE @ 5009.0ft (Original Well Elev)
Well:	Steffes 21-2D	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	USA EDM 5000 Multi Users DB

Survey										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (ft)	Map Easting (ft)	Latitude	Longitude	
1,034.0	1.70	266.10	1,033.9	-7.5	0.9	1,336,950.40	3,147,174.32	40.257119	-104.972697	
1,129.0	1.80	325.20	1,128.9	-6.4	-1.4	1,336,951.52	3,147,172.06	40.257122	-104.972705	
1,223.0	1.80	344.40	1,222.8	-3.8	-2.6	1,336,954.14	3,147,170.80	40.257130	-104.972710	
1,314.0	2.80	12.50	1,313.7	-0.2	-2.5	1,336,957.69	3,147,170.88	40.257139	-104.972709	
1,408.0	3.00	5.80	1,407.6	4.5	-1.8	1,336,962.38	3,147,171.60	40.257152	-104.972707	
1,503.0	5.00	2.90	1,502.4	11.1	-1.3	1,336,968.99	3,147,172.02	40.257170	-104.972705	
1,597.0	6.30	353.70	1,595.9	20.3	-1.7	1,336,978.21	3,147,171.60	40.257196	-104.972706	
1,693.0	7.10	357.90	1,691.3	31.5	-2.5	1,336,989.37	3,147,170.74	40.257226	-104.972709	
1,788.0	8.00	356.20	1,785.5	43.9	-3.1	1,337,001.83	3,147,170.01	40.257261	-104.972711	
1,881.0	8.80	357.90	1,877.5	57.5	-3.8	1,337,015.39	3,147,169.24	40.257298	-104.972714	
1,976.0	9.30	357.90	1,971.3	72.4	-4.4	1,337,030.32	3,147,168.61	40.257339	-104.972716	
2,069.0	11.00	354.90	2,062.8	88.8	-5.4	1,337,046.66	3,147,167.45	40.257384	-104.972720	
2,164.0	12.30	357.10	2,155.9	107.9	-6.8	1,337,065.79	3,147,166.01	40.257436	-104.972724	
2,258.0	13.60	1.60	2,247.5	129.0	-6.9	1,337,086.84	3,147,165.69	40.257494	-104.972725	
2,352.0	14.70	0.70	2,338.6	151.9	-6.5	1,337,109.81	3,147,166.01	40.257557	-104.972724	
2,445.0	17.40	358.50	2,428.0	177.6	-6.7	1,337,135.51	3,147,165.64	40.257628	-104.972724	
2,540.0	19.50	356.70	2,518.1	207.7	-8.0	1,337,165.54	3,147,164.17	40.257710	-104.972729	
2,635.0	19.10	358.80	2,607.8	239.0	-9.2	1,337,196.90	3,147,162.75	40.257796	-104.972733	
2,729.0	16.20	358.70	2,697.3	267.5	-9.9	1,337,225.39	3,147,161.96	40.257874	-104.972736	
2,824.0	18.90	0.20	2,787.9	296.2	-10.1	1,337,254.03	3,147,161.54	40.257953	-104.972736	
2,920.0	17.80	359.10	2,879.0	326.4	-10.3	1,337,284.24	3,147,161.19	40.258036	-104.972737	
3,015.0	18.80	4.30	2,969.2	356.2	-9.4	1,337,314.04	3,147,161.93	40.258118	-104.972734	
3,110.0	17.80	1.10	3,059.4	386.0	-7.9	1,337,343.83	3,147,163.18	40.258200	-104.972729	
3,205.0	16.30	2.70	3,150.2	413.8	-7.0	1,337,371.67	3,147,163.92	40.258276	-104.972725	
3,299.0	17.60	4.10	3,240.1	441.1	-5.4	1,337,399.03	3,147,165.39	40.258351	-104.972720	
3,394.0	16.70	6.10	3,330.9	469.0	-2.9	1,337,426.94	3,147,167.71	40.258428	-104.972711	
3,488.0	17.80	4.00	3,420.7	496.8	-0.5	1,337,454.72	3,147,169.98	40.258504	-104.972702	
3,583.0	19.20	3.50	3,510.8	526.9	1.5	1,337,484.81	3,147,171.77	40.258586	-104.972695	
3,678.0	19.50	2.40	3,600.4	558.3	3.1	1,337,516.25	3,147,173.20	40.258673	-104.972689	
3,772.0	21.80	359.00	3,688.4	591.5	3.5	1,337,549.39	3,147,173.35	40.258764	-104.972688	
3,866.0	21.40	359.00	3,775.8	626.1	2.9	1,337,583.98	3,147,172.54	40.258859	-104.972690	
3,960.0	20.60	358.30	3,863.5	659.7	2.1	1,337,617.65	3,147,171.55	40.258951	-104.972693	
4,055.0	16.50	356.90	3,953.6	689.9	0.8	1,337,647.83	3,147,170.15	40.259034	-104.972697	
4,149.0	14.40	359.90	4,044.2	714.9	0.1	1,337,672.85	3,147,169.26	40.259103	-104.972700	
4,244.0	15.00	359.00	4,136.1	739.0	-0.1	1,337,696.95	3,147,168.88	40.259169	-104.972701	
4,339.0	16.60	355.20	4,227.5	764.9	-1.5	1,337,722.76	3,147,167.37	40.259240	-104.972706	
4,434.0	17.50	354.90	4,318.3	792.6	-3.9	1,337,750.50	3,147,164.80	40.259316	-104.972714	
4,530.0	17.70	357.50	4,409.8	821.6	-5.8	1,337,779.44	3,147,162.71	40.259395	-104.972721	
4,625.0	17.10	358.80	4,500.4	850.0	-6.7	1,337,807.83	3,147,161.62	40.259473	-104.972724	
4,720.0	18.90	354.90	4,590.8	879.2	-8.4	1,337,837.11	3,147,159.79	40.259554	-104.972730	
4,814.0	19.50	357.30	4,679.6	910.1	-10.5	1,337,867.93	3,147,157.51	40.259638	-104.972738	
4,909.0	19.00	357.80	4,769.3	941.4	-11.8	1,337,899.21	3,147,155.98	40.259724	-104.972743	
5,004.0	17.10	0.20	4,859.6	970.8	-12.4	1,337,928.63	3,147,155.26	40.259805	-104.972745	
5,098.0	15.50	2.80	4,949.8	997.2	-11.7	1,337,955.00	3,147,155.77	40.259877	-104.972742	
5,192.0	14.70	5.10	5,040.6	1,021.6	-10.0	1,337,979.44	3,147,157.30	40.259944	-104.972736	
5,286.0	14.90	7.30	5,131.4	1,045.5	-7.4	1,338,003.32	3,147,159.75	40.260010	-104.972727	
5,381.0	12.00	5.70	5,223.8	1,067.4	-4.9	1,338,025.28	3,147,162.15	40.260070	-104.972718	
5,476.0	12.60	12.30	5,316.6	1,087.4	-1.7	1,338,045.25	3,147,165.22	40.260125	-104.972706	
5,570.0	11.30	14.40	5,408.6	1,106.3	2.8	1,338,064.22	3,147,169.59	40.260177	-104.972690	
5,665.0	8.60	13.20	5,502.2	1,122.2	6.7	1,338,080.17	3,147,173.43	40.260221	-104.972676	
5,758.0	5.90	18.80	5,594.4	1,133.5	9.8	1,338,091.49	3,147,176.49	40.260252	-104.972665	
5,853.0	5.70	20.90	5,688.9	1,142.6	13.1	1,338,100.54	3,147,179.69	40.260276	-104.972653	
5,947.0	5.20	30.90	5,782.5	1,150.6	16.9	1,338,108.58	3,147,183.50	40.260298	-104.972640	
6,042.0	5.40	39.50	5,877.1	1,157.7	22.0	1,338,115.75	3,147,188.51	40.260318	-104.972621	
6,136.0	3.60	40.40	5,970.8	1,163.4	26.7	1,338,121.44	3,147,193.20	40.260334	-104.972605	

Cathedral Energy Services

Survey Report - Geographic

Company:	Apollo Operating, LLC	Local Co-ordinate Reference:	Well Steffes 21-2D
Project:	Weld County, CO	TVD Reference:	KBE @ 5009.0ft (Original Well Elev)
Site:	Sec 2-T3N-R68W (Steffes/Margil Farms)	MD Reference:	KBE @ 5009.0ft (Original Well Elev)
Well:	Steffes 21-2D	North Reference:	True
Wellbore:	OH	Survey Calculation Method:	Minimum Curvature
Design:	OH	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Map Northing (ft)	Map Easting (ft)	Latitude	Longitude
6,229.0	2.70	35.60	6,063.7	1,167.4	29.9	1,338,125.46	3,147,196.35	40.260345	-104.972593
6,323.0	1.70	45.00	6,157.6	1,170.2	32.2	1,338,128.26	3,147,198.60	40.260352	-104.972585
6,417.0	1.00	43.50	6,251.6	1,171.7	33.7	1,338,129.85	3,147,200.15	40.260357	-104.972579
6,512.0	0.30	47.90	6,346.6	1,172.5	34.5	1,338,130.63	3,147,200.90	40.260359	-104.972577
6,607.0	0.40	352.10	6,441.6	1,173.0	34.6	1,338,131.12	3,147,201.03	40.260360	-104.972576
6,702.0	0.40	322.30	6,536.6	1,173.6	34.4	1,338,131.71	3,147,200.78	40.260362	-104.972577
6,797.0	0.50	312.80	6,631.6	1,174.1	33.8	1,338,132.25	3,147,200.27	40.260363	-104.972579
6,892.0	0.50	307.00	6,726.6	1,174.7	33.2	1,338,132.78	3,147,199.63	40.260365	-104.972581
6,986.0	0.00	251.00	6,820.6	1,174.9	32.9	1,338,133.02	3,147,199.30	40.260365	-104.972582
7,081.0	0.50	241.40	6,915.6	1,174.7	32.5	1,338,132.82	3,147,198.94	40.260365	-104.972584
7,176.0	0.40	253.70	7,010.6	1,174.4	31.8	1,338,132.53	3,147,198.26	40.260364	-104.972586
7,271.0	0.40	287.60	7,105.6	1,174.4	31.2	1,338,132.53	3,147,197.62	40.260364	-104.972588
7,365.0	0.70	24.30	7,199.6	1,175.1	31.1	1,338,133.15	3,147,197.54	40.260366	-104.972589
7,460.0	0.90	0.80	7,294.5	1,176.3	31.4	1,338,134.43	3,147,197.79	40.260369	-104.972588
7,555.0	0.60	284.40	7,389.5	1,177.2	30.9	1,338,135.30	3,147,197.31	40.260372	-104.972590
7,617.0	0.60	48.60	7,451.5	1,177.5	30.8	1,338,135.59	3,147,197.24	40.260372	-104.972590
Last Cathedral Survey @ 7,617' MD									
7,677.0	0.60	48.60	7,511.5	1,177.9	31.3	1,338,136.01	3,147,197.71	40.260374	-104.972588
Projection to Bit @ 7,677'									

Design Targets									
Target Name									
- hit/miss target	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- Shape	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
Steffes 21-2D TGT	0.00	0.00	6,500.0	1,340.6	-2.8	1,338,298.47	3,147,162.65	40.260820	-104.972710
- actual wellpath misses target center by 171.3ft at 6666.6ft MD (6501.1 TVD, 1173.4 N, 34.5 E)									
- Point									
Steffes 21-2D BHL	0.00	0.00	7,568.0	1,340.6	-2.8	1,338,298.47	3,147,162.65	40.260820	-104.972710
- actual wellpath misses target center by 175.5ft at 7677.0ft MD (7511.5 TVD, 1177.9 N, 31.3 E)									
- Rectangle (sides W400.0 H400.0 D0.0)									

Design Annotations									
Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment					
		+N/-S (ft)	+E/-W (ft)						
7,617.0	7,451.5	1,177.5	30.8	Last Cathedral Survey @ 7,617' MD					
7,677.0	7,511.5	1,177.9	31.3	Projection to Bit @ 7,677'					

Checked By: _____ Approved By: _____ Date: _____