





Cathedral Energy Services

Survey Report

Company: Caerus Oil & Gas (NAD 27)	Local Co-ordinate Reference: Well Island Ranch 23B-13
Project: Garfield County, CO	TVD Reference: KB=20' @ 5100.0usft (Patterson #303)
Site: S13-T7S-R96W (Island Ranch)	MD Reference: KB=20' @ 5100.0usft (Patterson #303)
Well: Island Ranch 23B-13	North Reference: True
Wellbore: DD	Survey Calculation Method: Minimum Curvature
Design: FINAL	Database: USA EDM 5000 Multi Users DB

Project Garfield County, CO		
Map System: US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum: NAD 1927 (NADCON CONUS)		
Map Zone: Colorado Central 502		

Site S13-T7S-R96W (Island Ranch)				
Site Position:	Northing:	593,103.71 usft	Latitude:	39.433822
From: Lat/Long	Easting:	1,275,986.01 usft	Longitude:	-108.063611
Position Uncertainty: 0.0 usft	Slot Radius: 13-3/16"		Grid Convergence:	-1.62 °

Well Island Ranch 23B-13				
Well Position	+N/-S	0.0 usft	Northing:	593,159.66 usft
	+E/-W	0.0 usft	Easting:	1,275,978.27 usft
Position Uncertainty		0.0 usft	Wellhead Elevation:	usft
			Latitude:	39.433975
			Longitude:	-108.063644
			Ground Level:	5,080.0 usft

Wellbore DD					
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	5/21/2014	10.00	65.60	51,919

Design FINAL				
Audit Notes:				
Version: 1.0	Phase: ACTUAL	Tie On Depth: 0.0		
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	47.85

Survey Program		Date 5/27/2014
From (usft)	To (usft)	Survey (Wellbore)
145.0	6,135.0	Survey #1 (DD)
		Tool Name ISCWSA MWD
		Description MWD - Standard

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
145.0	0.40	300.60	145.0	0.3	-0.4	-0.2	0.28	0.28	
237.0	1.00	33.00	237.0	1.1	-0.3	0.5	1.19	0.65	
329.0	2.30	44.50	329.0	3.1	1.5	3.1	1.45	1.41	
421.0	5.80	41.70	420.7	7.9	5.8	9.6	3.81	3.80	
512.0	9.50	49.30	510.9	16.2	14.6	21.7	4.21	4.07	
603.0	12.90	51.80	600.1	27.4	28.3	39.3	3.77	3.74	
696.0	15.90	51.00	690.2	41.8	46.3	62.4	3.23	3.23	
787.0	17.40	53.10	777.4	57.8	66.9	88.4	1.78	1.65	
877.0	19.20	52.10	862.8	75.0	89.4	116.6	2.03	2.00	
970.0	20.80	50.10	950.2	95.0	114.1	148.3	1.87	1.72	
1,073.0	22.40	46.80	1,046.0	120.2	142.4	186.2	1.95	1.55	
1,168.0	21.20	45.90	1,134.2	144.5	168.0	221.5	1.31	-1.26	

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Site:	S13-T7S-R96W (Island Ranch)	MVD Reference:	KB=20' @ 5100.0usft (Patterson #303)
Well:	Island Ranch 23B-13	North Reference:	True
Wellbore:	DD	Survey Calculation Method:	Minimum Curvature
Design:	FINAL	Database:	USA EDM 5000 Multi Users DB

Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments
1,263.0	23.30	50.80	1,222.1	168.4	194.9	257.4	2.95	2.21	
1,359.0	23.00	50.40	1,310.4	192.3	224.0	295.1	0.35	-0.31	
1,454.0	25.80	48.90	1,396.9	217.7	253.9	334.4	3.02	2.95	
1,549.0	24.40	48.80	1,482.9	244.2	284.3	374.7	1.47	-1.47	
1,644.0	22.70	47.60	1,570.0	269.5	312.6	412.6	1.86	-1.79	
1,739.0	25.80	50.50	1,656.6	295.1	342.1	451.6	3.49	3.26	
1,834.0	25.70	49.30	1,742.2	321.6	373.6	492.8	0.56	-0.11	
1,929.0	25.60	48.40	1,827.8	348.7	404.6	534.0	0.42	-0.11	
2,024.0	24.40	48.60	1,913.9	375.3	434.7	574.1	1.27	-1.26	
2,119.0	25.30	46.70	2,000.1	402.2	464.1	614.0	1.27	0.95	
2,214.0	25.20	46.80	2,086.1	430.0	493.7	654.5	0.11	-0.11	
2,310.0	24.70	45.30	2,173.1	458.1	522.8	695.0	0.84	-0.52	
2,404.0	24.50	44.80	2,258.6	485.7	550.5	734.1	0.31	-0.21	
2,499.0	24.20	44.50	2,345.1	513.6	578.0	773.2	0.34	-0.32	
2,595.0	23.70	43.50	2,432.9	541.6	605.1	812.1	0.67	-0.52	
2,690.0	23.40	44.70	2,519.9	568.9	631.5	850.0	0.60	-0.32	
2,785.0	23.00	46.50	2,607.3	595.0	658.3	887.3	0.86	-0.42	
2,880.0	23.50	46.70	2,694.5	620.8	685.5	924.8	0.53	0.53	
2,975.0	21.90	45.90	2,782.2	646.1	712.0	961.5	1.72	-1.68	
3,070.0	20.70	45.20	2,870.7	670.3	736.7	996.0	1.29	-1.26	
3,165.0	20.20	45.40	2,959.7	693.6	760.2	1,029.1	0.53	-0.53	
3,260.0	18.50	44.60	3,049.3	715.9	782.5	1,060.6	1.81	-1.79	
3,355.0	16.70	43.10	3,139.9	736.6	802.4	1,089.2	1.95	-1.89	
3,450.0	15.00	42.30	3,231.3	755.7	820.0	1,115.1	1.80	-1.79	
3,545.0	13.70	45.40	3,323.3	772.6	836.3	1,138.5	1.59	-1.37	
3,641.0	11.80	51.00	3,416.9	786.8	852.0	1,159.7	2.36	-1.98	
3,736.0	10.90	50.70	3,510.1	798.6	866.5	1,178.4	0.95	-0.95	
3,831.0	9.70	52.10	3,603.5	809.2	879.8	1,195.3	1.29	-1.26	
3,926.0	7.70	51.90	3,697.4	818.1	891.1	1,209.6	2.11	-2.11	
4,021.0	5.90	52.40	3,791.8	825.0	900.0	1,220.9	1.90	-1.89	
4,116.0	4.70	58.20	3,886.4	830.0	907.2	1,229.6	1.38	-1.26	
4,211.0	4.30	61.70	3,981.1	833.7	913.6	1,236.8	0.51	-0.42	
4,306.0	3.80	57.90	4,075.8	837.1	919.4	1,243.4	0.60	-0.53	
4,401.0	3.20	62.30	4,170.7	840.0	924.4	1,249.1	0.69	-0.63	
4,496.0	2.50	65.50	4,265.5	842.1	928.7	1,253.6	0.76	-0.74	
4,591.0	2.10	63.50	4,360.5	843.7	932.1	1,257.3	0.43	-0.42	
4,686.0	1.40	67.90	4,455.4	844.9	934.7	1,260.0	0.75	-0.74	
4,781.0	1.00	72.20	4,550.4	845.6	936.6	1,261.9	0.43	-0.42	
4,876.0	0.80	77.40	4,645.4	846.0	938.0	1,263.2	0.23	-0.21	
4,971.0	0.30	100.00	4,740.4	846.1	938.9	1,263.9	0.56	-0.53	
5,066.0	0.40	109.70	4,835.4	846.0	939.5	1,264.2	0.12	0.11	
5,161.0	0.40	188.00	4,930.4	845.5	939.8	1,264.1	0.53	0.00	
5,256.0	0.80	196.40	5,025.4	844.6	939.5	1,263.3	0.43	0.42	
5,351.0	0.90	185.10	5,120.4	843.2	939.3	1,262.2	0.20	0.11	
5,446.0	1.10	178.30	5,215.3	841.5	939.2	1,261.1	0.24	0.21	
5,541.0	1.50	183.20	5,310.3	839.4	939.2	1,259.6	0.44	0.42	
5,636.0	0.70	173.40	5,405.3	837.6	939.2	1,258.4	0.86	-0.84	
5,731.0	2.10	191.10	5,500.3	835.3	938.9	1,256.6	1.53	1.47	
5,826.0	1.20	244.50	5,595.2	833.1	937.7	1,254.3	1.78	-0.95	
5,921.0	1.30	203.50	5,690.2	831.7	936.4	1,252.4	0.93	0.11	
6,016.0	1.50	209.60	5,785.2	829.7	935.3	1,250.2	0.26	0.21	
6,085.0	1.70	210.80	5,854.2	828.0	934.3	1,248.4	0.29	0.29	Last CES Survey @ 6,085' MD
6,135.0	1.70	210.80	5,904.1	826.7	933.6	1,246.9	0.00	0.00	Projection to Bit @ 6,135'

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Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usf)	Build Rate (°/100u)	Formations / Comments

Targets									
Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
Island Ranch 23B-13 TC - hit/miss target - Shape	0.00	0.00	3,960.0	833.7	921.1	593,967.09	1,276,922.49	39.436264	-108.060383
- actual wellpath misses target center by 8.9usft at 4190.5usft MD (3960.6 TVD, 833.0 N, 912.3 E)									
- Circle (radius 50.0)									
Island Ranch 23B-13 PE - hit/miss target - Shape	0.00	0.00	5,835.0	833.7	921.1	593,967.09	1,276,922.49	39.436264	-108.060383
- actual wellpath misses target center by 14.6usft at 6065.9usft MD (5835.1 TVD, 828.5 N, 934.6 E)									
- Circle (radius 50.0)									

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
6,085.0	5,854.2	828.0	934.3	Last CES Survey @ 6,085' MD	
6,135.0	5,904.1	826.7	933.6	Projection to Bit @ 6,135'	

Checked By: _____	Approved By: _____	Date: _____
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