



# Cathedral Energy Services

## Survey Report

<b>Company:</b>	EnCana Oil & Gas (USA) Inc	<b>Local Co-ordinate Reference:</b>	Well 8504E-24 L24 496
<b>Project:</b>	Story Gulch	<b>TVD Reference:</b>	KB @ 8208.0ft (Patterson 330)
<b>Site:</b>	L24 496	<b>MD Reference:</b>	KB @ 8208.0ft (Patterson 330)
<b>Well:</b>	8504E-24 L24 496	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	DD	<b>Database:</b>	USA EDM 5000 Multi Users DB

<b>Project</b>	Story Gulch		
<b>Map System:</b>	US State Plane 1983	<b>System Datum:</b>	Mean Sea Level
<b>Geo Datum:</b>	North American Datum 1983		
<b>Map Zone:</b>	Colorado Central Zone		

<b>Site</b>	L24 496			
<b>Site Position:</b>		<b>Northing:</b>	1,685,024.52 ft	<b>Latitude:</b> 39° 41' 5.72 N
<b>From:</b>	Lat/Long	<b>Easting:</b>	2,261,789.15 ft	<b>Longitude:</b> 108° 7' 23.99 W
<b>Position Uncertainty:</b>	0.0 ft	<b>Slot Radius:</b>	13.200 in	<b>Grid Convergence:</b> -1.65 °

<b>Well</b>	8504E-24 L24 496			
<b>Well Position</b>	<b>+N/-S</b>	0.0 ft	<b>Northing:</b>	1,685,137.54 ft
	<b>+E/-W</b>	0.0 ft	<b>Easting:</b>	2,261,870.63 ft
<b>Position Uncertainty</b>	0.0 ft	<b>Wellhead Elevation:</b>	ft	<b>Ground Level:</b> 8,193.0 ft

<b>Wellbore</b>	DD				
<b>Magnetics</b>	<b>Model Name</b>	<b>Sample Date</b>	<b>Declination (°)</b>	<b>Dip Angle (°)</b>	<b>Field Strength (nT)</b>
	IGRF2010	6/14/2013	10.17	65.82	52,117

<b>Design</b>	DD			
<b>Audit Notes:</b>				
<b>Version:</b>	1.0	<b>Phase:</b>	ACTUAL	<b>Tie On Depth:</b> 0.0
<b>Vertical Section:</b>	<b>Depth From (TVD)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Direction (°)</b>
	0.0	0.0	0.0	353.30

<b>Survey Program</b>	<b>Date</b>	2/21/2014		
<b>From (ft)</b>	<b>To (ft)</b>	<b>Survey (Wellbore)</b>	<b>Tool Name</b>	<b>Description</b>
107.0	3,335.0	Survey #1 (DD)	Geolink MWD	Geolink MWD

<b>Survey</b>									
<b>Measured Depth (ft)</b>	<b>Inclination (°)</b>	<b>Azimuth (°)</b>	<b>Vertical Depth (ft)</b>	<b>+N/-S (ft)</b>	<b>+E/-W (ft)</b>	<b>Vertical Section (ft)</b>	<b>Dogleg Rate (°/100ft)</b>	<b>Build Rate (°/100ft)</b>	<b>Formations / Comments</b>
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
107.0	0.50	334.90	107.0	0.4	-0.2	0.4	0.47	0.47	
137.0	0.50	1.00	137.0	0.7	-0.3	0.7	0.75	0.00	
168.0	1.20	13.50	168.0	1.1	-0.2	1.1	2.32	2.26	
198.0	1.90	9.70	198.0	1.9	0.0	1.9	2.36	2.33	
228.0	2.50	13.40	228.0	3.0	0.2	3.0	2.05	2.00	
259.0	3.20	17.70	258.9	4.5	0.6	4.4	2.36	2.26	
290.0	4.00	15.00	289.9	6.4	1.2	6.2	2.64	2.58	
320.0	4.50	5.20	319.8	8.6	1.6	8.3	2.93	1.67	
350.0	5.50	5.90	349.7	11.2	1.8	10.9	3.34	3.33	
381.0	6.40	7.20	380.5	14.4	2.2	14.0	2.94	2.90	
412.0	7.20	2.60	411.3	18.0	2.5	17.6	3.12	2.58	
442.0	8.10	3.90	441.0	22.0	2.7	21.5	3.05	3.00	

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<b>Site:</b>	L24 496	<b>MD Reference:</b>	KB @ 8208.0ft (Patterson 330)
<b>Well:</b>	8504E-24 L24 496	<b>North Reference:</b>	True
<b>Wellbore:</b>	DD	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Design:</b>	DD	<b>Database:</b>	USA EDM 5000 Multi Users DB

### Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Formations / Comments
472.0	9.00	6.80	470.7	26.5	3.1	25.9	3.33	3.00	
502.0	9.80	357.40	500.3	31.3	3.3	30.7	5.76	2.67	
533.0	10.30	359.50	530.8	36.7	3.2	36.1	2.00	1.61	
564.0	10.60	3.10	561.3	42.4	3.3	41.7	2.32	0.97	
610.0	11.70	2.50	606.4	51.2	3.7	50.5	2.40	2.39	
701.0	13.00	353.80	695.3	70.6	3.0	69.8	2.49	1.43	
793.0	14.60	348.60	784.7	92.3	-0.4	91.7	2.20	1.74	
885.0	17.20	347.80	873.1	117.0	-5.6	116.8	2.84	2.83	
977.0	19.40	353.00	960.5	145.4	-10.3	145.6	2.98	2.39	
1,069.0	21.70	356.10	1,046.6	177.6	-13.3	177.9	2.76	2.50	
1,161.0	21.90	356.80	1,132.0	211.7	-15.4	212.0	0.36	0.22	
1,253.0	20.60	353.00	1,217.8	244.9	-18.4	245.3	2.06	-1.41	
1,345.0	20.10	351.00	1,304.1	276.5	-22.8	277.3	0.93	-0.54	
1,437.0	19.10	349.60	1,390.7	307.0	-28.0	308.1	1.20	-1.09	
1,528.0	18.90	352.30	1,476.8	336.2	-32.7	337.7	0.99	-0.22	
1,620.0	18.90	355.20	1,563.8	365.8	-35.9	367.5	1.02	0.00	
1,712.0	18.30	356.80	1,651.0	395.1	-38.0	396.8	0.86	-0.65	
1,804.0	18.60	357.40	1,738.3	424.2	-39.4	425.9	0.39	0.33	
1,896.0	18.20	357.60	1,825.6	453.2	-40.7	454.8	0.44	-0.43	
1,988.0	16.80	352.60	1,913.3	480.7	-43.0	482.5	2.23	-1.52	
2,080.0	16.70	351.10	2,001.4	507.0	-46.8	509.0	0.48	-0.11	
2,171.0	16.90	353.30	2,088.5	533.0	-50.3	535.3	0.73	0.22	
2,263.0	17.00	354.80	2,176.5	559.7	-53.1	562.1	0.49	0.11	
2,308.0	16.70	353.90	2,219.6	572.7	-54.4	575.1	0.88	-0.67	
2,354.0	17.20	353.70	2,263.6	586.0	-55.8	588.5	1.09	1.09	
2,400.0	17.80	352.50	2,307.5	599.7	-57.5	602.4	1.52	1.30	
2,446.0	18.50	352.50	2,351.2	614.0	-59.4	616.7	1.52	1.52	
2,538.0	18.90	353.20	2,438.3	643.2	-63.0	646.2	0.50	0.43	
2,630.0	19.30	352.90	2,525.3	673.1	-66.7	676.3	0.45	0.43	
2,722.0	19.10	352.30	2,612.1	703.1	-70.6	706.5	0.31	-0.22	
2,814.0	18.50	353.50	2,699.2	732.5	-74.3	736.2	0.78	-0.65	
2,906.0	18.10	356.70	2,786.6	761.3	-76.7	765.0	1.18	-0.43	
2,996.0	18.70	357.20	2,872.0	789.7	-78.2	793.4	0.69	0.67	
3,088.0	18.90	353.70	2,959.1	819.2	-80.6	823.0	1.24	0.22	
3,180.0	18.60	349.40	3,046.2	848.4	-84.9	852.6	1.54	-0.33	
3,260.0	18.20	347.50	3,122.1	873.2	-90.0	877.7	0.90	-0.50	Last Cathedral Survey @ 3260' MD
3,335.0	18.20	347.50	3,193.4	896.0	-95.1	901.0	0.00	0.00	PTB @ 3,335'

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<b>Well:</b>	8504E-24 L24 496	<b>North Reference:</b>	True
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<b>Design:</b>	DD	<b>Database:</b>	USA EDM 5000 Multi Users DB

Targets									
Target Name	Dip Angle	Dip Dir.	TVD	+N/-S	+E/-W	Northing	Easting	Latitude	Longitude
- hit/miss target	(°)	(°)	(ft)	(ft)	(ft)	(ft)	(ft)		
- Shape									
8504E-24 L24 496 PBHI	0.00	0.00	13,159.0	2,474.0	-290.8	1,687,618.89	2,261,651.38	39° 41' 31.31 N	108° 7' 26.71 W
- survey misses target center by 10091.7ft at 3335.0ft MD (3193.4 TVD, 896.0 N, -95.1 E)									
- Rectangle (sides W30.0 H50.0 D0.0)									
8504E-24 L24 496 TGT	0.00	0.00	8,334.0	2,484.0	-273.8	1,687,628.42	2,261,668.65	39° 41' 31.41 N	108° 7' 26.49 W
- survey misses target center by 5383.3ft at 3335.0ft MD (3193.4 TVD, 896.0 N, -95.1 E)									
- Point									

Survey Annotations					
Measured Depth	Vertical Depth	Local Coordinates			
(ft)	(ft)	+N/-S	+E/-W		
(ft)	(ft)	(ft)	(ft)	Comment	
3,260.0	3,122.1	873.2	-90.0	Last Cathedral Survey @ 3260' MD	
3,335.0				PTB @ 3,335'	

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