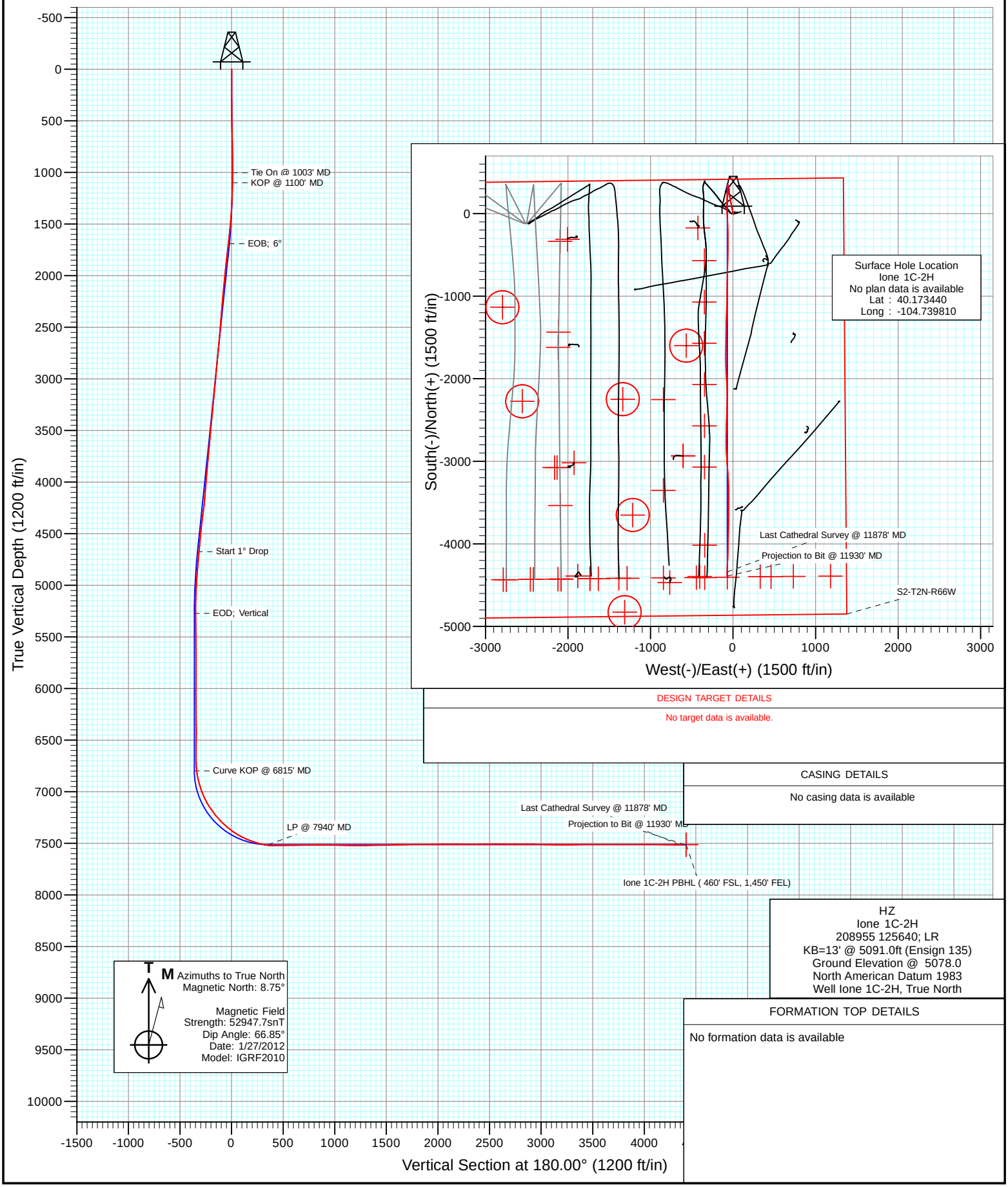
encana natural gas

Project: DJ Wattenberg
Site: NWNE S2-T2N-R66W (Ione)
Well: Ione 1C-2H
Wellbore: HZ
Design: HZ

CATHEDRAL



DESIGN TARGET DETAILS

No target data is available.

CASING DETAILS

No casing data is available

T M Azimuths to True North
Magnetic North: 8.75°

Magnetic Field
Strength: 52947.7snT
Dip Angle: 66.85°
Date: 1/27/2012
Model: IGRF2010

HZ
Ione 1C-2H
208955 125640; LR
KB=13' @ 5091.0ft (Ensign 135)
Ground Elevation @ 5078.0
North American Datum 1983
Well Ione 1C-2H, True North

FORMATION TOP DETAILS

No formation data is available

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	**Local Co-ordinate Reference:**	Well Ione 1C-2H
Project:	DJ Wattenberg	**TVD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Site:	NWNE S2-T2N-R66W (Ione)	**MD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Well:	Ione 1C-2H	**North Reference:**	True
Wellbore:	HZ	**Survey Calculation Method:**	Minimum Curvature
Design:	HZ	**Database:**	USA EDM 5000 Multi Users DB

Project DJ Wattenberg

Map System:	US State Plane 1983	**System Datum:**	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	Colorado Northern Zone		

Site NWNE S2-T2N-R66W (Ione)

Site Position:		**Northing:**	1,306,798.50 ft	**Latitude:**	40.173110
From:	Lat/Long	**Easting:**	3,209,901.52 ft	**Longitude:**	-104.748870
Position Uncertainty:	0.0 ft	**Slot Radius:**	13.200 in	**Grid Convergence:**	0.49 °

Well Ione 1C-2H

Well Position	**+N/-S**	0.0 ft	**Northing:**	1,306,940.25 ft	**Latitude:**	40.173440
	+E/-W	0.0 ft	**Easting:**	3,212,432.15 ft	**Longitude:**	-104.739810
Position Uncertainty		0.0 ft	**Wellhead Elevation:**	ft	**Ground Level:**	5,078.0 ft

Wellbore HZ

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	1/27/2012	8.75	66.85	52,948

Design HZ

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	180.00

Survey Program **Date** 1/24/2013

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
169.0	11,930.0	Survey #1 (HZ)	MWD	Geolink MWD

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
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
169.0	0.40	158.70	169.0	-0.5	0.2	0.5	0.24	0.24	
261.0	0.30	132.60	261.0	-1.0	0.5	1.0	0.20	-0.11	
353.0	0.50	140.90	353.0	-1.5	0.9	1.5	0.23	0.22	
445.0	0.70	159.30	445.0	-2.3	1.4	2.3	0.30	0.22	
537.0	1.00	144.60	537.0	-3.5	2.1	3.5	0.40	0.33	
629.0	1.30	145.20	629.0	-5.0	3.1	5.0	0.33	0.33	
720.0	0.90	154.40	719.9	-6.5	4.0	6.5	0.48	-0.44	
813.0	0.90	159.40	812.9	-7.8	4.6	7.8	0.08	0.00	
905.0	0.20	303.70	904.9	-8.4	4.7	8.4	1.16	-0.76	
1,003.0	0.50	271.40	1,002.9	-8.3	4.1	8.3	0.35	0.31	
1,101.0	0.50	298.50	1,100.9	-8.1	3.3	8.1	0.24	0.00	
1,192.0	1.70	359.80	1,191.9	-6.6	3.0	6.6	1.68	1.32	

Cathedral Energy Services

Survey Report

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Project:	DJ Wattenberg	**TVD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Site:	NWNE S2-T2N-R66W (Ione)	**MD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Well:	Ione 1C-2H	**North Reference:**	True
Wellbore:	HZ	**Survey Calculation Method:**	Minimum Curvature
Design:	HZ	**Database:**	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
1,284.0	2.90	0.00	1,283.8	-2.9	3.0	2.9	1.30	1.30	
1,376.0	3.70	346.80	1,375.7	2.3	2.3	-2.3	1.19	0.87	
1,468.0	4.70	345.50	1,467.4	8.9	0.7	-8.9	1.09	1.09	
1,560.0	6.00	350.60	1,559.0	17.3	-1.1	-17.3	1.50	1.41	
1,652.0	6.30	348.60	1,650.5	27.0	-2.8	-27.0	0.40	0.33	
1,744.0	6.70	348.90	1,741.9	37.2	-4.9	-37.2	0.44	0.43	
1,836.0	6.80	344.20	1,833.3	47.7	-7.4	-47.7	0.61	0.11	
1,928.0	6.30	342.20	1,924.7	57.7	-10.4	-57.7	0.60	-0.54	
2,023.0	5.50	341.70	2,019.2	67.0	-13.4	-67.0	0.84	-0.84	
2,118.0	5.70	350.90	2,113.7	76.0	-15.6	-76.0	0.97	0.21	
2,213.0	5.30	344.80	2,208.3	84.9	-17.5	-84.9	0.75	-0.42	
2,307.0	4.80	352.90	2,301.9	93.0	-19.1	-93.0	0.93	-0.53	
2,402.0	4.70	349.90	2,396.6	100.8	-20.3	-100.8	0.28	-0.11	
2,497.0	5.20	348.10	2,491.2	108.8	-21.9	-108.8	0.55	0.53	
2,592.0	4.80	341.90	2,585.9	116.8	-24.0	-116.8	0.71	-0.42	
2,685.0	5.10	342.50	2,678.5	124.4	-26.4	-124.4	0.33	0.32	
2,779.0	5.80	1.70	2,772.1	133.2	-27.6	-133.2	2.07	0.74	
2,874.0	5.70	355.80	2,866.6	142.7	-27.8	-142.7	0.63	-0.11	
2,969.0	5.90	352.10	2,961.1	152.2	-28.8	-152.2	0.45	0.21	
3,064.0	5.50	352.10	3,055.7	161.6	-30.1	-161.6	0.42	-0.42	
3,159.0	5.80	343.70	3,150.2	170.7	-32.1	-170.7	0.93	0.32	
3,254.0	5.50	345.30	3,244.8	179.7	-34.6	-179.7	0.36	-0.32	
3,348.0	5.70	344.40	3,338.3	188.5	-37.0	-188.5	0.23	0.21	
3,443.0	5.50	344.30	3,432.9	197.5	-39.5	-197.5	0.21	-0.21	
3,538.0	4.90	343.40	3,527.5	205.7	-41.8	-205.7	0.64	-0.63	
3,633.0	5.60	343.70	3,622.1	214.1	-44.3	-214.1	0.74	0.74	
3,728.0	5.20	348.30	3,716.6	222.7	-46.5	-222.7	0.62	-0.42	
3,822.0	5.50	342.80	3,810.2	231.2	-48.7	-231.2	0.63	0.32	
3,917.0	4.70	5.60	3,904.9	239.4	-49.6	-239.4	2.27	-0.84	
4,011.0	4.80	357.10	3,998.5	247.2	-49.5	-247.2	0.76	0.11	
4,106.0	4.40	13.20	4,093.2	254.7	-48.8	-254.7	1.42	-0.42	
4,201.0	6.10	6.60	4,187.8	263.3	-47.4	-263.3	1.90	1.79	
4,296.0	7.80	2.70	4,282.1	274.7	-46.5	-274.7	1.86	1.79	
4,390.0	6.90	356.90	4,375.4	286.7	-46.5	-286.7	1.24	-0.96	
4,485.0	5.40	352.10	4,469.8	296.9	-47.5	-296.9	1.67	-1.58	
4,580.0	6.00	335.90	4,564.4	305.8	-50.1	-305.8	1.80	0.63	
4,674.0	5.80	338.30	4,657.9	314.7	-53.9	-314.7	0.34	-0.21	
4,769.0	4.90	343.20	4,752.4	323.1	-56.8	-323.1	1.06	-0.95	
4,864.0	4.40	348.80	4,847.1	330.5	-58.7	-330.5	0.71	-0.53	
4,958.0	3.90	352.10	4,940.9	337.2	-59.8	-337.2	0.59	-0.53	
5,053.0	3.30	357.90	5,035.7	343.2	-60.4	-343.2	0.74	-0.63	
5,148.0	2.10	336.10	5,130.6	347.5	-61.2	-347.5	1.64	-1.26	
5,242.0	0.70	271.40	5,224.6	349.1	-62.5	-349.1	2.03	-1.49	
5,337.0	1.00	251.20	5,319.6	348.8	-63.8	-348.8	0.44	0.32	
5,432.0	1.10	224.10	5,414.5	347.9	-65.2	-347.9	0.53	0.11	
5,527.0	0.80	185.50	5,509.5	346.6	-65.9	-346.6	0.73	-0.32	
5,622.0	0.50	166.20	5,604.5	345.5	-65.9	-345.5	0.39	-0.32	
5,717.0	0.40	162.60	5,699.5	344.8	-65.7	-344.8	0.11	-0.11	
5,811.0	0.30	124.40	5,793.5	344.3	-65.4	-344.3	0.26	-0.11	
5,906.0	0.50	69.90	5,888.5	344.4	-64.8	-344.4	0.43	0.21	
6,001.0	1.30	38.50	5,983.5	345.3	-63.8	-345.3	0.96	0.84	
6,096.0	0.20	66.00	6,078.5	346.2	-62.9	-346.2	1.19	-1.16	
6,191.0	1.00	201.80	6,173.5	345.5	-63.1	-345.5	1.21	0.84	

Cathedral Energy Services

Survey Report

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Project:	DJ Wattenberg	**TVD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Site:	NWNE S2-T2N-R66W (Ione)	**MD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Well:	Ione 1C-2H	**North Reference:**	True
Wellbore:	HZ	**Survey Calculation Method:**	Minimum Curvature
Design:	HZ	**Database:**	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
6,285.0	1.10	213.10	6,267.5	344.0	-63.9	-344.0	0.24	0.11	
6,380.0	1.30	241.50	6,362.4	342.8	-65.3	-342.8	0.65	0.21	
6,475.0	0.90	295.60	6,457.4	342.6	-67.0	-342.6	1.12	-0.42	
6,570.0	0.70	29.80	6,552.4	343.4	-67.3	-343.4	1.24	-0.21	
6,664.0	0.50	113.40	6,646.4	343.7	-66.7	-343.7	0.87	-0.21	
6,696.0	0.40	95.80	6,678.4	343.7	-66.4	-343.7	0.53	-0.31	
6,759.0	1.80	168.60	6,741.4	342.7	-66.0	-342.7	2.74	2.22	
6,791.0	4.40	179.90	6,773.4	340.9	-65.9	-340.9	8.31	8.12	
6,822.0	7.30	184.50	6,804.2	337.8	-66.1	-337.8	9.47	9.35	
6,854.0	10.00	186.60	6,835.8	333.0	-66.5	-333.0	8.49	8.44	
6,886.0	11.80	184.40	6,867.3	327.0	-67.1	-327.0	5.77	5.62	
6,917.0	13.80	181.50	6,897.5	320.1	-67.5	-320.1	6.77	6.45	
6,949.0	16.20	179.60	6,928.4	311.8	-67.5	-311.8	7.65	7.50	
6,980.0	18.50	179.90	6,958.0	302.6	-67.5	-302.6	7.42	7.42	
7,012.0	19.80	181.90	6,988.2	292.1	-67.7	-292.1	4.55	4.06	
7,044.0	21.40	184.40	7,018.2	280.9	-68.3	-280.9	5.70	5.00	
7,075.0	23.70	185.10	7,046.8	269.0	-69.3	-269.0	7.47	7.42	
7,107.0	26.60	184.20	7,075.8	255.5	-70.4	-255.5	9.14	9.06	
7,138.0	30.00	183.30	7,103.0	240.8	-71.3	-240.8	11.05	10.97	
7,170.0	32.60	182.80	7,130.4	224.2	-72.2	-224.2	8.17	8.12	
7,202.0	33.90	181.60	7,157.1	206.7	-72.9	-206.7	4.55	4.06	
7,233.0	35.00	179.90	7,182.7	189.1	-73.1	-189.1	4.71	3.55	
7,265.0	37.00	179.40	7,208.6	170.3	-73.0	-170.3	6.32	6.25	
7,297.0	39.60	180.50	7,233.7	150.5	-73.0	-150.5	8.40	8.12	
7,328.0	41.90	181.00	7,257.2	130.3	-73.2	-130.3	7.49	7.42	
7,360.0	44.20	180.50	7,280.6	108.4	-73.5	-108.4	7.27	7.19	
7,391.0	46.20	180.00	7,302.4	86.4	-73.6	-86.4	6.55	6.45	
7,423.0	46.80	179.60	7,324.4	63.2	-73.5	-63.2	2.08	1.87	
7,455.0	48.60	179.20	7,346.0	39.6	-73.3	-39.6	5.70	5.62	
7,486.0	52.90	178.40	7,365.6	15.6	-72.8	-15.6	14.01	13.87	
7,518.0	55.30	177.20	7,384.3	-10.3	-71.8	10.3	8.09	7.50	
7,549.0	57.80	176.80	7,401.4	-36.2	-70.4	36.2	8.14	8.06	
7,581.0	59.60	176.50	7,418.1	-63.5	-68.8	63.5	5.68	5.62	
7,612.0	61.40	177.10	7,433.3	-90.4	-67.3	90.4	6.05	5.81	
7,644.0	64.90	177.10	7,447.8	-118.9	-65.9	118.9	10.94	10.94	
7,676.0	67.60	177.60	7,460.7	-148.2	-64.5	148.2	8.56	8.44	
7,707.0	69.90	178.30	7,471.9	-177.0	-63.5	177.0	7.71	7.42	
7,739.0	71.20	178.70	7,482.6	-207.2	-62.7	207.2	4.23	4.06	
7,771.0	72.30	179.40	7,492.6	-237.6	-62.2	237.6	4.02	3.44	
7,802.0	73.80	179.90	7,501.6	-267.2	-62.0	267.2	5.08	4.84	
7,834.0	77.00	180.30	7,509.7	-298.2	-62.1	298.2	10.07	10.00	
7,865.0	81.10	181.00	7,515.6	-328.6	-62.4	328.6	13.41	13.23	
7,883.0	84.30	180.80	7,517.8	-346.5	-62.7	346.5	17.81	17.78	
7,954.0	91.00	180.90	7,520.8	-417.4	-63.8	417.4	9.44	9.44	
8,017.0	90.30	181.00	7,520.0	-480.4	-64.8	480.4	1.12	-1.11	
8,112.0	91.40	180.50	7,518.6	-575.3	-66.0	575.3	1.27	1.16	
8,207.0	90.50	180.80	7,517.1	-670.3	-67.1	670.3	1.00	-0.95	
8,301.0	90.10	181.30	7,516.6	-764.3	-68.8	764.3	0.68	-0.43	
8,396.0	90.60	180.80	7,516.0	-859.3	-70.6	859.3	0.74	0.53	
8,491.0	89.00	180.80	7,516.3	-954.3	-71.9	954.3	1.68	-1.68	
8,586.0	88.70	180.70	7,518.2	-1,049.2	-73.2	1,049.2	0.33	-0.32	
8,680.0	89.10	182.20	7,520.0	-1,143.2	-75.5	1,143.2	1.65	0.43	
8,775.0	89.90	182.40	7,520.9	-1,238.1	-79.3	1,238.1	0.87	0.84	

Cathedral Energy Services

Survey Report

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Well:	Ione 1C-2H	**North Reference:**	True
Wellbore:	HZ	**Survey Calculation Method:**	Minimum Curvature
Design:	HZ	**Database:**	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
8,838.0	91.60	182.40	7,520.0	-1,301.0	-82.0	1,301.0	2.70	2.70	
8,901.0	91.60	180.80	7,518.3	-1,364.0	-83.7	1,364.0	2.54	0.00	
8,964.0	89.80	180.20	7,517.5	-1,427.0	-84.3	1,427.0	3.01	-2.86	
9,027.0	91.30	181.00	7,516.9	-1,490.0	-85.0	1,490.0	2.70	2.38	
9,090.0	91.40	180.40	7,515.4	-1,553.0	-85.7	1,553.0	0.97	0.16	
9,153.0	91.80	180.80	7,513.7	-1,615.9	-86.4	1,615.9	0.90	0.63	
9,248.0	91.50	180.80	7,510.9	-1,710.9	-87.7	1,710.9	0.32	-0.32	
9,343.0	89.50	179.50	7,510.1	-1,805.9	-88.0	1,805.9	2.51	-2.11	
9,438.0	90.50	176.30	7,510.1	-1,900.8	-84.5	1,900.8	3.53	1.05	
9,532.0	90.10	176.90	7,509.6	-1,994.6	-78.9	1,994.6	0.77	-0.43	
9,627.0	90.50	177.90	7,509.1	-2,089.5	-74.6	2,089.5	1.13	0.42	
9,722.0	89.30	179.30	7,509.3	-2,184.5	-72.3	2,184.5	1.94	-1.26	
9,817.0	89.90	180.20	7,509.9	-2,279.5	-71.9	2,279.5	1.14	0.63	
9,911.0	90.50	182.90	7,509.6	-2,373.4	-74.4	2,373.4	2.94	0.64	
10,006.0	90.70	181.40	7,508.6	-2,468.4	-78.0	2,468.4	1.59	0.21	
10,101.0	89.80	180.70	7,508.2	-2,563.3	-79.7	2,563.3	1.20	-0.95	
10,196.0	89.90	182.40	7,508.4	-2,658.3	-82.3	2,658.3	1.79	0.11	
10,290.0	89.50	179.10	7,508.9	-2,752.3	-83.5	2,752.3	3.54	-0.43	
10,384.0	90.40	179.40	7,509.0	-2,846.3	-82.3	2,846.3	1.01	0.96	
10,479.0	88.50	176.40	7,509.9	-2,941.2	-78.8	2,941.2	3.74	-2.00	
10,574.0	89.10	174.90	7,511.9	-3,035.9	-71.6	3,035.9	1.70	0.63	
10,669.0	89.50	175.60	7,513.1	-3,130.6	-63.7	3,130.6	0.85	0.42	
10,763.0	90.30	176.90	7,513.2	-3,224.4	-57.6	3,224.4	1.62	0.85	
10,858.0	90.90	179.40	7,512.2	-3,319.3	-54.5	3,319.3	2.71	0.63	
10,953.0	90.10	179.50	7,511.4	-3,414.3	-53.6	3,414.3	0.85	-0.84	
11,048.0	91.00	180.80	7,510.5	-3,509.3	-53.8	3,509.3	1.66	0.95	
11,143.0	89.50	181.10	7,510.1	-3,604.3	-55.4	3,604.3	1.61	-1.58	
11,238.0	89.20	179.90	7,511.2	-3,699.2	-56.2	3,699.2	1.30	-0.32	
11,332.0	90.50	180.30	7,511.4	-3,793.2	-56.4	3,793.2	1.45	1.38	
11,427.0	90.50	181.50	7,510.6	-3,888.2	-57.9	3,888.2	1.26	0.00	
11,522.0	90.40	181.40	7,509.8	-3,983.2	-60.3	3,983.2	0.15	-0.11	
11,617.0	89.00	181.70	7,510.3	-4,078.2	-62.9	4,078.2	1.51	-1.47	
11,712.0	89.50	181.70	7,511.6	-4,173.1	-65.7	4,173.1	0.53	0.53	
11,807.0	89.90	182.50	7,512.1	-4,268.0	-69.2	4,268.0	0.94	0.42	
11,878.0	89.70	181.00	7,512.3	-4,339.0	-71.3	4,339.0	2.13	-0.28	**Last Cathedral Survey @ 11878' MD**
11,930.0	89.70	181.00	7,512.6	-4,391.0	-72.3	4,391.0	0.00	0.00	**Projection to Bit @ 11930' MD**

Cathedral Energy Services

Survey Report

Company:	EnCana Oil & Gas (USA) Inc	**Local Co-ordinate Reference:**	Well Ione 1C-2H
Project:	DJ Wattenberg	**TVD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Site:	NWNE S2-T2N-R66W (Ione)	**MD Reference:**	KB=13' @ 5091.0ft (Ensign 135)
Well:	Ione 1C-2H	**North Reference:**	True
Wellbore:	HZ	**Survey Calculation Method:**	Minimum Curvature
Design:	HZ	**Database:**	USA EDM 5000 Multi Users DB

Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Ione 1C-2H PBHL (460'	0.00	0.00	7,513.0	-4,404.1	-69.9	1,302,535.67	3,212,400.04	40.161350	-104.740060
- survey misses target center by 13.4ft at 11930.0ft MD (7512.6 TVD, -4391.0 N, -72.3 E)									
- Point									

Survey Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates +N/-S (ft)	Local Coordinates +E/-W (ft)	Comment
11,878.0	7,512.3	-4,339.0	-71.3	Last Cathedral Survey @ 11878' MD
11,930.0	7,512.6	-4,391.0	-72.3	Projection to Bit @ 11930' MD

Checked By: _____ Approved By: _____ Date: _____