

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Ken McQueen
Cabinet Secretary

Matthias Sayer
Deputy Cabinet Secretary

Heather Riley, Division Director
Oil Conservation Division



New Mexico Oil Conservation Division approval and conditions listed below are made in accordance with OCD Rule 19.15.7.11 and are in addition to the actions approved by BLM on the following 3160-5 form.

Operator Signature Date: Original APD 3/18/2014 **Sundry Date 2/7/2018**

API WELL #	Well Name	Well #	Operator Name	Type	Stat	County	Surf_Owner	UL	Sec	Twp	N/S	Rng	W/E
30-043-21215-00-00	LYBROOK J31-2307	002H	ENCANA OIL & GAS (USA) INC.	O	P	Sandoval	F	J	31	23	N	7	W

Conditions of Approval:

(See the below checked and handwritten conditions)

- ✓ Notify Aztec OCD 24hrs prior to casing & cement. **Run CBL if cement does not circulate**
- ✓ Hold C-104 for directional survey & "As Drilled" Plat
- ✓ Hold C-104 for NSL, NSP, DHC,
- ☐ Spacing rule violation. Operator must follow up with change of status notification on other well to be shut in or abandoned
- ✓ Regarding the use of a pit, closed loop system or below grade tank, the operator must comply with the following as applicable:
 - ✓ A pit requires a complete C-144 be submitted and approved prior to the construction or use of the pit, pursuant to 19.15.17.8.A
 - ✓ A closed loop system requires notification prior to use, pursuant to 19.15.17.9.A
 - ✓ A below grade tank requires a registration be filed prior to the construction or use of the below grade tank, pursuant to 19.15.17.8.C
- ✓ Once the well is spud, to prevent ground water contamination through whole or partial conduits from the surface, the operator shall drill without interruption through the fresh water zone or zones and shall immediately set in cement the water protection string
- ✓ Submit Gas Capture Plan form prior to spudding or initiating recompletions operations.
- ✓ Regarding Hydraulic Fracturing, review EPA Underground Injection Control Guidance 84

March 1, 2018

Page 2

- ✓ Oil base muds are not to be used until fresh water zones are cased and cemented providing isolation from the oil or diesel. This includes synthetic oils. Oil based mud, drilling fluids and solids must be contained in a steel closed loop system.
- ✓ Well-bore communication is regulated under 19.15.29 NMAC. This requires well-bore Communication to be reported in accordance with 19.15.29.8.
- ✓ Comply with current regulations at time of spud
Prior to production operator needs to be in compliance with RULE 19.15.5.9

****Name change and E-permitting not updated with new changes due to the well being in plugged status. Once the well is spud the name change and well information will be updated at that time.**



NMOCD Approved by Signature

2/26/18
Date

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

SUNDRY NOTICES AND REPORTS ON WELLS
**Do not use this form for proposals to drill or to re-enter an
abandoned well. Use Form 3160-3 (APD) for such proposals.**

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well ☒ Oil Well ☐ Gas Well ☐ Other		5. Lease Serial No. NM LG-9090
2. Name of Operator Encana Oil & Gas (USA) Inc.		6. If Indian, Allottee or Tribe Name N/A
3a. Address 370 17th Street, Suite 1700 Denver, CO 80202	3b. Phone No. (include area code) (720) 876-3533	7. If Unit of CA/Agreement, Name and/or No. NMNM 135229X
4. Location of Well (Footage, Sec., T., R., M., or Survey Description) SHL: 2193' FSL and 2550' FEL Section 31, T23N, R7W BHL: 2230' FNL and 330' FWL Section 25, T23N, R8W		8. Well Name and No. North Alamito Unit 332H (FKA Lybrook J31-2307 02H)
		9. API Well No. 30-043-21215
		10. Field and Pool or Exploratory Area Alamito Mancos N (OIL)
		11. Country or Parish, State Sandoval County, NM

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT OR OTHER DATA

TYPE OF SUBMISSION	TYPE OF ACTION			
☒ Notice of Intent	☐ Acidize	☐ Deepen	☐ Production (Start/Resume)	☐ Water Shut-Off
☐ Subsequent Report	☐ Alter Casing	☐ Hydraulic Fracturing	☐ Reclamation	☐ Well Integrity
☐ Final Abandonment Notice	☐ Casing Repair	☐ New Construction	☐ Recomplete	☒ Other - Revised name change & BHL change
	☐ Change Plans	☐ Plug and Abandon	☐ Temporarily Abandon	
	☐ Convert to Injection	☐ Plug Back	☐ Water Disposal	

13. Describe Proposed or Completed Operation: Clearly state all pertinent details, including estimated starting date of any proposed work and approximate duration thereof. If the proposal is to deepen directionally or recomplete horizontally, give subsurface locations and measured and true vertical depths of all pertinent markers and zones. Attach the Bond under which the work will be performed or provide the Bond No. on file with BLM/BIA. Required subsequent reports must be filed within 30 days following completion of the involved operations. If the operation results in a multiple completion or recompletion in a new interval, a Form 3160-4 must be filed once testing has been completed. Final Abandonment Notices must be filed only after all requirements, including reclamation, have been completed and the operator has determined that the site is ready for final inspection.)

Encana Oil & Gas (USA) Inc. (Encana) recently finalized the formation of a 14,262.78 acre Federal exploratory unit named the North Alamito Unit, which became effective December 1, 2012.

The proposed Lybrook J31-2307 02H well, which was approved by the OCD on July 29, 2014, will now be a part of the North Alamito Unit. Encana is submitting this sundry to change the well name from the Lybrook J31-2307 02H to the North Alamito Unit 332H.

In addition to the name change, the BHL was modified to change the wellbore's orientation from oblique to transverse.

Please find attached an updated C-102, directional drilling plan, 10-Point drilling plan, and wellbore diagram that reflect these changes.

RECEIVED

NMOCD

FEB 26 2018

FEB 09 2018

14. I hereby certify that the foregoing is true and correct. Name (Printed/Typed)

Jevin Croteau

DISTRICT III

Title Senior Regulatory Analyst

Farmington Field Office
Bureau of Land Management

Signature

Date

02/07/2018

THE SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

Title

PE

Date

2/22/18

Conditions of approval, if any, are attached. Approval of this notice does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.

Office

FFO

Title 18 U.S.C Section 1001 and Title 43 U.S.C Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

(Instructions on page 2)

NMOCD

DISTRICT I
1625 N. French Dr., Hobbs, N.M. 88240
Phone: (575) 393-6161 Fax: (575) 393-0720

DISTRICT II
811 S. First St., Artesia, N.M. 88210
Phone: (575) 748-1283 Fax: (575) 748-9720

DISTRICT III
1000 Rio Brazos Rd., Aztec, N.M. 87410
Phone: (505) 334-6178 Fax: (505) 334-6170

DISTRICT IV
1220 S. St. Francis Dr., Santa Fe, NM 87505
Phone: (505) 478-3480 Fax: (505) 478-3482

State of New Mexico
Energy, Minerals & Natural Resources Department

Form C-102
Revised August 1, 2011

Submit one copy to appropriate
District Office

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

¹ API Number 30-043-21215	² Pool Code 98174	³ Pool Name ALAMITO MANCOS N (OIL)
⁴ Property Code	⁵ Property Name NORTH ALAMITO UNIT	⁶ Well Number 332H
⁷ GRID No. 282327	⁸ Operator Name ENCANA OIL & GAS (USA) INC.	⁹ Elevation 6979'

¹⁰ Surface Location

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
J	31	23N	7W		2193'	SOUTH	2550'	EAST	SANDOVAL

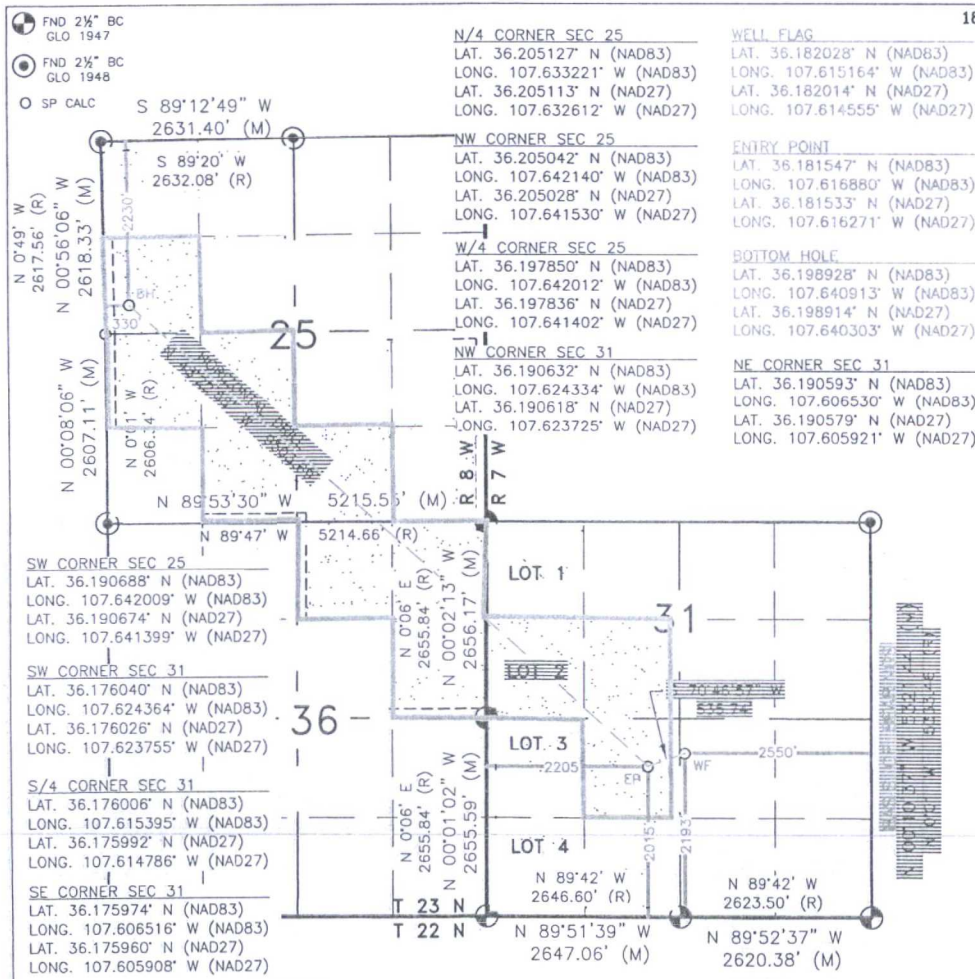
¹¹ Bottom Hole Location If Different From Surface

UL or lot no.	Section	Township	Range	Lot Idn	Feet from the	North/South line	Feet from the	East/West line	County
E	25	23N	8W		2230'	NORTH	330'	WEST	SAN JUAN

¹² Dedicated Acres PENETRATED SPACING UNIT: SWNW, N/2 of SW/4, SESW & SWSE of Sec 25 (200 acres); N/2 of NE/4 & SENE of Sec 36 (120 acres); S/2 of NW/4 & NESW of Sec 31 (120.63 acres)	¹³ Joint or Infill	¹⁴ Consolidation Code	¹⁵ Order No. R-14081-A (14,262.78 acres)
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NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED
OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

16



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17 OPERATOR CERTIFICATION

I hereby certify that the information contained herein is true and complete to the best of my knowledge and belief, and that this organization either owns a working interest or unleased mineral interest in the land including the proposed bottom hole location or has a right to drill this well at this location pursuant to a contract with an owner of such a mineral or working interest, or to a voluntary pooling agreement or a compulsory pooling order heretofore entered by the division.

Signature _____ Date 2/7/18

Jevin Croteau

Printed Name

jevin.croteau@encana.com

E-mail Address

SURVEYOR CERTIFICATION

I hereby certify that the well location shown on this plat was plotted from field notes of actual surveys made by me or under my supervision, and that the same is true and correct to the best of my belief.

FEBRUARY 9, 2017

Date of Survey

Signature and Seal of Professional Surveyor:

HENRY P. BROADHURST, JR.
NEW MEXICO
PROFESSIONAL SURVEYOR
02/21/2017

Certificate Number 11393

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State of New Mexico
Energy, Minerals & Natural Resources Department

OIL CONSERVATION DIVISION

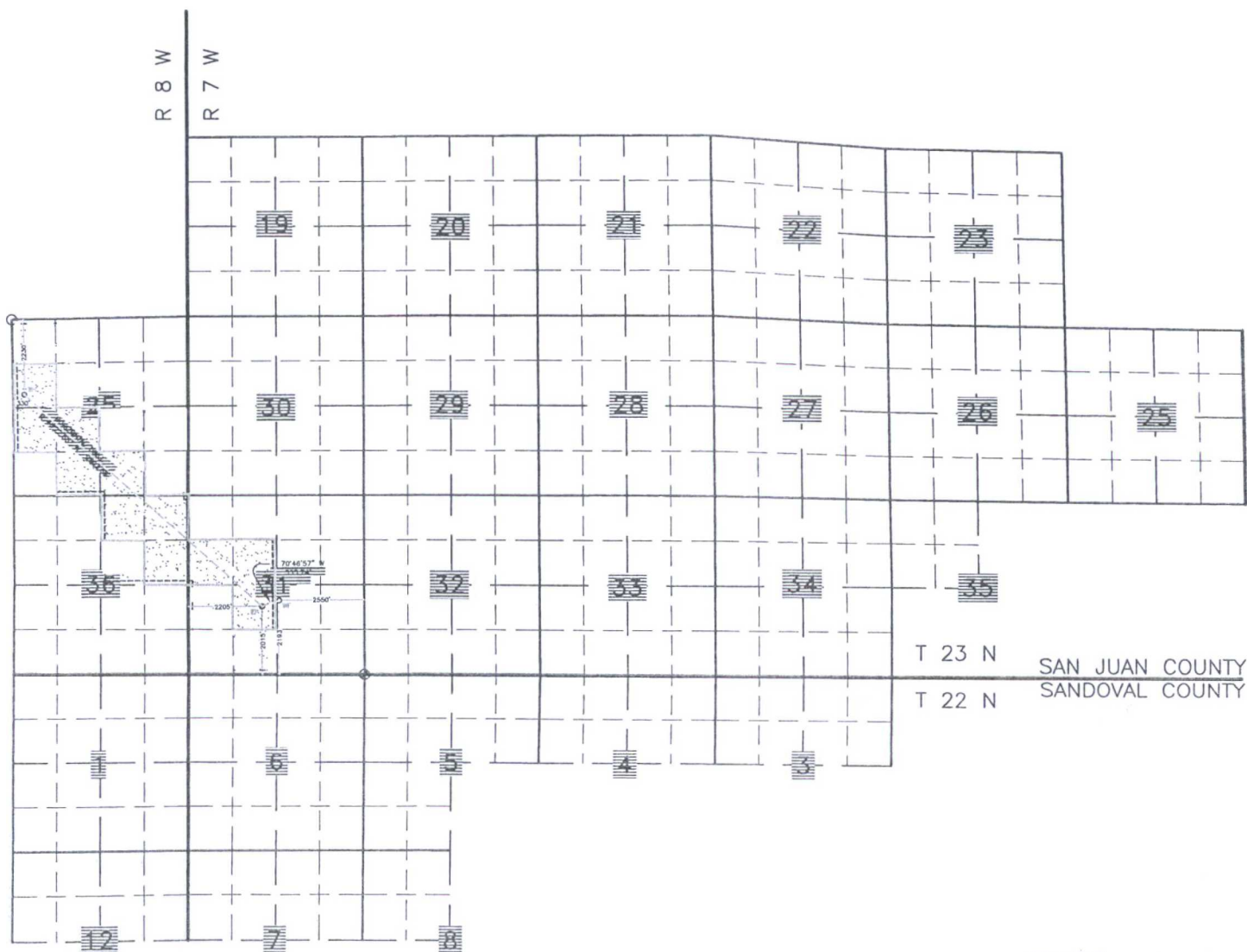
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Revised August 1, 2011

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☐ AMENDED REPORT

ENCANA OIL & GAS (USA) INC.
NORTH ALAMITO UNIT #332H



PENETRATED SPACING UNIT: SWNW, N/2 of SW/4, SESW & SWSE of Sec 25 (200 acres); N/2 of NE/4 & SENE of Sec 36 (120 acres); S/2 of NW/4 & NESW of Sec 31 (120.63 acres)

TOTAL 14,262.78 ACRES: T23N R7W SEC. 19-23, 25, 26-34 (ALL); 35 (NW/4); T22N R7W SEC. 3 & 4 (N/2); 5 (N/2, SW/4); 6 (ALL); 7 (N/2); 8 (NW/4); T23N R8W SEC. 25, 36 (ALL); T22N R8W SEC. 1 (ALL); SEC. 12 (N/2) - UNDIVIDED UNIT

WELL FLAG

LAT. 36.182028° N (NAD83)
LONG. 107.615164° W (NAD83)
LAT. 36.182014° N (NAD27)
LONG. 107.614555° W (NAD27)

ENTRY POINT

LAT. 36.181547° N (NAD83)
LONG. 107.616880° W (NAD83)
LAT. 36.181533° N (NAD27)
LONG. 107.616271° W (NAD27)

BOTTOM HOLE

LAT. 36.198928° N (NAD83)
LONG. 107.640913° W (NAD83)
LAT. 36.198914° N (NAD27)
LONG. 107.640303° W (NAD27)

North Alamito Unit 332H
SHL: 2193' FSL, 2550' FEL
Sec 31, T23N, R7W
BHL: 2230' FNL, 330' FWL
Sec 25, T23N, R8W
Sandoval County, NM

Encana Oil & Gas (USA) Inc. Drilling Plan

1. ESTIMATED TOPS OF GEOLOGICAL MARKERS (TVD)

The estimated tops of important geologic markers are as follows:

Formation	Depth (TVD) units = feet
Ojo Alamo	907
Kirtland Shale	1,075
Fruitland Coal	1,337
Pictured Cliffs Ss.	1,470
Lewis Shale	1,583
Cliffhouse Ss.	2,226
Menefee Fn.	3,106
Point Lookout Ss.	3,857
Mancos Shale	4,030
Mancos Silt	4,542
Gallup Fn.	4,802

The referenced surface elevation is 6979', KB 6995'

2. ESTIMATED DEPTH OF POTENTIAL WATER, OIL, GAS, & OTHER MINERAL BEARING FORMATIONS

Substance	Formation	Depth (TVD) units = feet
Water/Gas	Fruitland Coal	1,337
Water/Gas	Pictured Cliffs Ss.	1,470
Water/Gas	Cliffhouse Ss.	2,226
Water/Gas	Menefee Fn.	3,106
Water/Gas	Point Lookout Ss.	3,857
Oil/Gas	Mancos Shale	4,030
Oil/Gas	Mancos Silt	4,542
Oil/Gas	Gallup Fn.	4,802

All shows of fresh water and minerals will be reported and protected.

3. PRESSURE CONTROL

- Pressure control equipment and configuration will be designed to meet 2M standards.
- Working pressure on rams and BOPE will be 3,000 psi.
- Function test and visual inspection of the BOP will be conducted daily and noted in the IADC Daily Drilling Report.
- The Annular BOP will be pressure tested to a minimum of 50 percent of its rated working pressure.
- Blind and Pipe Rams/BOP will be tested against a test plug to 100 percent of rated working pressure.
- Pressure tests are required before drilling out from under all casing strings set and cemented in place.
- BOP controls must be installed prior to drilling the surface casing plug and will remain in use until the well is completed or abandoned.

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- h) BOP testing procedures and testing frequency will conform to Onshore Order No. 2.
- i) BOP remote controls shall be located on the rig floor at a location readily accessible to the driller. Master controls shall be on the ground at the accumulator and shall have the capability to function all preventers.
- j) The kill line shall be 2-inch minimum and contain two kill line valves, one of which shall be a check valve.
- k) The choke line shall be a 2-inch minimum and contain two choke line valves (2-inch minimum).
- l) The choke and manifold shall contain two adjustable chokes.
- m) Hand wheels shall be installed on all ram preventers.
- n) Safety valves and wrenches (with subs for drill string connections) shall be available on the rig floor at all
- o) Inside BOP or float sub shall also be available on the rig floor at all times.

Proposed BOP and choke manifold arrangements are attached.

4. CASING & CEMENTING PROGRAM

The proposed casing and cementing program has been designed to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use. The casing setting depth shall be calculated to position the casing seat opposite a competent formation which will contain the maximum pressure to which it will be exposed during normal drilling operations. All indications of useable water shall be reported. A higher grade of casing may be run at the Operator's discretion, but a lower grade will not be substituted without prior approval of the BLM.

- a) The proposed casing design is as follows:

Casing	Depth (MD)	Hole Size	Csg Size	Weight	Grade
Surface	0'-320'	12 1/4"	9 5/8"	32.3	H40, STC New
Intermediate	0'-5350'	8 3/4"	7"	26	J55, LTC New
Production Liner	5150'-15128'	6 1/8"	4 1/2"	11.6	B80*, BTC New

Casing String				Casing Strength Properties			Minimum Design Factors		
Size	Weight (ppf)	Grade	Connection	Collapse (psi)	Burst (psi)	Tensile (1000lbs)	Collapse	Burst	Tension
9 5/8"	32.3	H40	STC	1370	2270	365	1.0	1.1	1.5
7"	26	J55	LTC	4330	4980	367	1.0	1.1	1.5
4.5"	11.6	B80	BTC	6350	7780	267	1.0	1.1	1.5

*B80 pipe specifications are attached

Casing design is subject to revision based on geologic conditions encountered

All casing strings below the conductor shall be pressure tested to 0.22 psi per foot of casing string length or 1,500 psi, whichever is greater, but not to exceed 70 percent of the minimum internal yield. If pressure declines more than 10 percent in 30 minutes, corrective action shall be taken.

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 Sec 25, T23N, R8W
 Sandoval County, NM

b) The proposed cementing program is as follows

Casing	Depth (MD)	Cement Volume (sacks)	Cement Type & Yield	Designed TOC	Centralizers
Surface	0'-320'	132 sks	Class V cement w/ 2% CaCl Weight 15.6ppg Yield: 1.21 ft ³ /sk	Surface	1 per joint on bottom 3 joints
Intermediate	0'-5350'	100% open hole excess Stage 1 Lead: 649 sks Stage 1 Tail: 237 sks	Lead: Extended Class G w/ 6% BWOC bentonite + 2.5 lb/sk Kol-Seal + 0.125 lb/sk Poly-flake Weight: 12.3ppg Yield: 1.952 ft ³ /sk Tail: Extended Class G w/ 1% BWOC bentonite + 0.3% BWOC Halad-567 + 0.2% BWOC Versaset + 0.05% SA-1015 Weight: 13.5ppg Yield: 1.305 ft ³ /sk	Surface	1 every 3 joints through water bearing zones
Production Liner	5150'- 15128'	30% open hole excess Cement Vol: 902 sks	Extended Class G w/ 2.5 lb/sk Kol-seal + 0.7% BWOC Halad-567 + 0.20% BWOC Halad-9 + 0.05% SA-1015 Weight: 13.3ppg Yield: 1.36 ft ³ /sk	Top of Liner	N/A

North Alamito Unit 332H
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Sandoval County, NM

Actual volumes will be calculated and determined by conditions onsite. All cement slurries will meet or exceed minimum BLM and New Mexico Oil Conservation Division requirements. Slurries used will be the slurries listed above or equivalent slurries depending on service provider selected. Cement yields may change depending on slurries selected

All waiting on cement times shall be a minimum of 8 hours or adequate to achieve minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

5. WELL PLAN & DIRECTIONAL DRILLING PROGRAM

The proposed horizontal well will have a kick off point of 4255'. Directional plans are attached.

Description	Proposed Depth (TVD/MD)	Formation
Horizontal Lateral TD	5107'/15128'	Gallup

6. DRILLING FLUIDS PROGRAM

a) Surface through Intermediate Casing Point:

Hole Size (in)	Depth (TVD/MD)	Mud Type	Density (ppg)	Viscosity (sec/qt)	Fluid Loss (cc)
12 1/4"	0'-320'/320'	Fresh Water	0	60-70	NC
8 3/4"	320'/320'-5028'/5350'	Fresh Water LSND	8.3-10	40-50	8-10

b) Intermediate Casing Point to TD:

Hole Size (in)	Depth (TVD/MD)	Mud Type	Density (ppg)	Viscosity (sec/qt)	Fluid Loss (cc)
6 1/8"	5028'/5350'- 5107'/15128'	Fresh Water LSND	8.3-10	15-25	<15

- c) There will be sufficient mud on location to control a blowout should one occur. Mud flow and volume will be monitored both visually and with electronic pit volume totalizers. Mud tests shall be performed every 24 hours after mudding up to determine, as applicable: density, viscosity, gel strength, filtration, and pH.
- d) A closed-loop system will be used to recover drilling fluid and dry cuttings in both phases of the well and on all hole intervals. Above-ground tanks will be utilized to hold cuttings and fluids for rig operations. A frac tank will be on location to store fresh water. Waste will be disposed of properly at an EPA-approved hazardous waste facility. Fresh water cuttings will be disposed of at Basin Disposal, Inc. and/or Industrial Ecosystems, Inc. The location will be lined in accordance with the Surface Use Plan of Operations.

7. TESTING, CORING, & LOGGING

- a) Drill Stem Testing - None anticipated.
- b) Coring - None anticipated.
- c) Mud Logging - Mancos Top to TD
- d) Logging - See below
- Cased Hole:
CBL/CCL/GR/VDL will be run as needed for perforating control

North Alamito Unit 332H
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Sandoval County, NM

8. ABNORMAL PRESSURES & HYDROGEN SULFIDE

The anticipated bottom hole pressure is +/- 2374 psi based on a 9.0 ppg at 5073' TVD of the horizontal lateral target. No abnormal pressure or temperatures are anticipated.

No hydrogen sulfide gas is anticipated, however, if H₂S is encountered, the guidelines in Onshore Order No. 6 will be followed.

9. ANTICIPATED START DATE AND DURATION OF OPERATIONS

Drilling is estimated to commence on June 1st, 2018. It is anticipated that completion operations will begin within 30 days after the well has been drilled depending on fracture treatment schedules with various pumping service companies.

It is anticipated that the drilling of this well will take approximately 10 days.

LOC: 2193' FSL, 2550' FEL Sec 31 23N 01			Encana Natural Gas						ENG: L. Hubbard RIG: Unassigned GLE: 6979 RKBE: 6995		6/6/17
County: Sandoval WELL: NAU 332H			WELL SUMMARY								
MWD LWD	OPEN HOLE LOGGING	FORM	DEPTH TVD MD			HOLE SIZE	CASING SPECS	MW MUD TYPE	DEVIATION INFORMATION		
Run survey tool at TD and update anticollision scan	None	Nacimiento 9 5/8" Csg	0 320	320		12 1/4	9 5/8" 32.3ppf H40 STC TOC to Surface 15.6ppg type V cement w/ 2% CaCl	Fresh wtr 8.3-9.2	Vertical <1°		
Survey Every 60'-120', updating anticollision report after surveys. Stop operations and contact drilling engineer if separation factor approaches 1.5	No OH logs	Ojo Alamo Kirtland Shale Fruitland Coal Pictured Cliffs Ss. Lewis Shale Cliffhouse Ss. Menefee Fn. Point Lookout Ss. Mancos Shale	907 1,075 1,337 1,470 1,583 2,226 3,106 3,857 4,030			8 3/4	7" 26ppf J55 LTC TOC @ surface (100% OH excess) Stage 1 Total: 887sks	Fresh Wtr 8.3-10	Directional 6.2°		
Surveys every 30' through the curve	MWD GR Mud Log	KOP Mancos Silt Gallup Fn. 7" Csg	4,255 4,542 4,802 5,028	4,340 5,350'							
Surveys every stand to TD unless directed otherwise by Geologist	No OH Logs	Horizontal Target TD Base Gallup	5,073 5,107 5,142	15,128		6 1/8	200' overlap at liner top 9778' Drilled Lateral TOC @ Top of Liner (30% open hole excess)		Horz Inc/TVD 89.8deg/5073' TD = 15128.4' MD		
MWD Gamma Directional								WBM 8.3-10			

ENCANA™

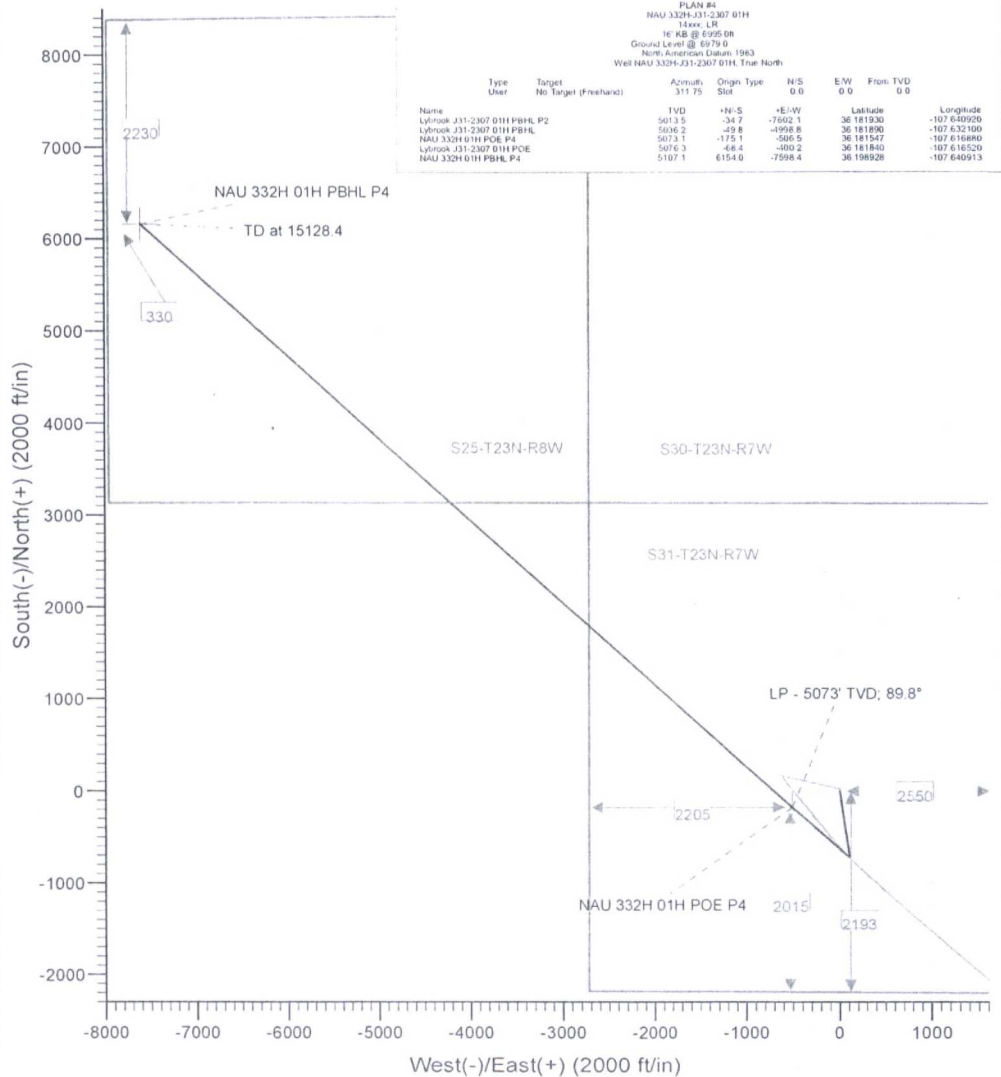
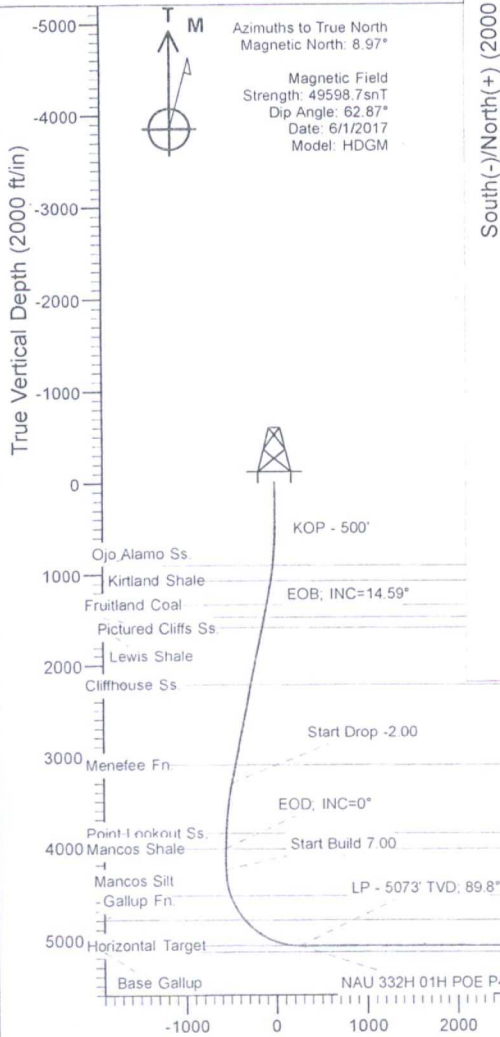
SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	Vsect	Target
1	0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.0	
2	500.0	0.00	0.00	500.0	0.0	0.0	0.00	0.00	0.0	
3	1229.4	14.59	171.91	1221.5	-91.4	13.0	2.00	171.91	-70.6	
4	3375.5	14.59	171.91	3298.5	-626.6	89.0	0.00	0.00	-483.6	
5	4104.9	0.00	0.00	4020.0	-718.0	102.0	2.00	180.00	-554.2	
6	4340.3	0.00	0.00	4255.4	-718.0	102.0	0.00	0.00	-554.2	
7	5623.1	89.80	311.75	5073.9	-174.9	-506.6	7.00	311.75	261.5	
8	15128.4	89.80	311.75	5107.1	6154.0	-7598.4	0.00	0.00	9766.7	NAU 332H 01H PBHL P4

Project: Sandoval County, NM
 Site: S31-T23N-R7W
 Well: NAU 332H-J31-2307 01H
 Wellbore: OH
 Design: PLAN #4

FORMATION TOP DETAILS

TVDPath	MDPath	Formation
906.9	908.3	Ojo Alamo Ss.
1074.8	1078.8	Kirtland Shale
1336.7	1348.4	Fruitland Coal
1469.6	1485.7	Pictured Cliffs Ss.
1582.5	1602.4	Lewis Shale
2225.1	2266.3	Cliffhouse Ss.
3104.4	3175.0	Menefee Fn.
3855.1	3939.9	Point Lookout Ss.
4028.1	4113.0	Mancos Shale
4540.2	4631.2	Mancos Silt
4800.8	4937.2	Gallup Fn.



WELL DETAILS: NAU 332H-J31-2307 01H

+N/-S	+E/-W	Northing	Ground Level:	Easting	Latitude	Longitude
0.0	0.0	1888361.38	6979.0	1237545.92	36.182028	-107.615164

CATHEDRAL

CATHEDRAL

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Site: S31-T23N-R7W
Well: NAU 332H-J31-2307 01H
Wellbore: OH
Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
TVD Reference: 16' KB @ 6995.0ft
MD Reference: 16' KB @ 6995.0ft
North Reference: True
Survey Calculation Method: Minimum Curvature

Project	Sandoval County, NM		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	New Mexico Central Zone		

Site	S31-T23N-R7W				
Site Position:		Northing:	1,890,125.34 ft	Latitude:	36.186880
From:	Lat/Long	Easting:	1,237,740.16 ft	Longitude:	-107.614590
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-0.81 °

Well	NAU 332H-J31-2307 01H					
Well Position	+N/-S	0.0 ft	Northing:	1,888,361.38 ft	Latitude:	36.182028
	+E/-W	0.0 ft	Easting:	1,237,545.92 ft	Longitude:	-107.615164
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	6,979.0 ft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	6/1/2017	8.97	62.87	49,598.70000000

Design	PLAN #4			
Audit Notes:				
Version:	Phase:	PLAN	Tie On Depth:	0.0
Vertical Section:	Depth From (TVD) (ft)	+N/-S (ft)	+E/-W (ft)	Direction (°)
	0.0	0.0	0.0	311.75

Plan Sections										
Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Turn Rate (°/100ft)	TFO (°)	Target
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,229.4	14.59	171.91	1,221.5	-91.4	13.0	2.00	2.00	0.00	171.91	
3,375.5	14.59	171.91	3,298.5	-626.6	89.0	0.00	0.00	0.00	0.00	
4,104.9	0.00	0.00	4,020.0	-718.0	102.0	2.00	-2.00	0.00	180.00	
4,340.3	0.00	0.00	4,255.4	-718.0	102.0	0.00	0.00	0.00	0.00	
5,623.1	89.80	311.75	5,073.9	-174.9	-506.6	7.00	7.00	0.00	311.75	
15,128.4	89.80	311.75	5,107.1	6,154.0	-7,598.4	0.00	0.00	0.00	0.00	NAU 332H 01H PBHL

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 Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
 TVD Reference: 16' KB @ 6995.0ft
 MD Reference: 16' KB @ 6995.0ft
 North Reference: True
 Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	KOP - 500' - 9 5/8"
600.0	2.00	171.91	600.0	-1.7	0.2	-1.3	2.00	2.00	
700.0	4.00	171.91	699.8	-6.9	1.0	-5.3	2.00	2.00	
800.0	6.00	171.91	799.5	-15.5	2.2	-12.0	2.00	2.00	
900.0	8.00	171.91	898.7	-27.6	3.9	-21.3	2.00	2.00	
908.3	8.17	171.91	906.9	-28.8	4.1	-22.2	2.00	2.00	Ojo Alamo Ss.
1,000.0	10.00	171.91	997.5	-43.1	6.1	-33.3	2.00	2.00	
1,078.8	11.58	171.91	1,074.8	-57.7	8.2	-44.5	2.00	2.00	Kirtland Shale
1,100.0	12.00	171.91	1,095.6	-62.0	8.8	-47.8	2.00	2.00	
1,200.0	14.00	171.91	1,193.1	-84.3	12.0	-65.0	2.00	2.00	
1,229.4	14.59	171.91	1,221.5	-91.4	13.0	-70.6	2.00	2.00	EOB; INC=14.59°
1,300.0	14.59	171.91	1,289.9	-109.0	15.5	-84.2	0.00	0.00	
1,348.4	14.59	171.91	1,336.7	-121.1	17.2	-93.5	0.00	0.00	Fruitland Coal
1,400.0	14.59	171.91	1,386.6	-134.0	19.0	-103.4	0.00	0.00	
1,485.7	14.59	171.91	1,469.6	-155.3	22.1	-119.9	0.00	0.00	Pictured Cliffs Ss.
1,500.0	14.59	171.91	1,483.4	-158.9	22.6	-122.7	0.00	0.00	
1,600.0	14.59	171.91	1,580.2	-183.8	26.1	-141.9	0.00	0.00	
1,602.4	14.59	171.91	1,582.5	-184.4	26.2	-142.4	0.00	0.00	Lewis Shale
1,700.0	14.59	171.91	1,677.0	-208.8	29.7	-161.2	0.00	0.00	
1,800.0	14.59	171.91	1,773.8	-233.7	33.2	-180.4	0.00	0.00	
1,900.0	14.59	171.91	1,870.5	-258.7	36.7	-199.6	0.00	0.00	
2,000.0	14.59	171.91	1,967.3	-283.6	40.3	-218.9	0.00	0.00	
2,100.0	14.59	171.91	2,064.1	-308.5	43.8	-238.1	0.00	0.00	
2,200.0	14.59	171.91	2,160.9	-333.5	47.4	-257.4	0.00	0.00	
2,266.3	14.59	171.91	2,225.1	-350.0	49.7	-270.2	0.00	0.00	Cliffhouse Ss.
2,300.0	14.59	171.91	2,257.6	-358.4	50.9	-276.6	0.00	0.00	
2,400.0	14.59	171.91	2,354.4	-383.3	54.5	-295.9	0.00	0.00	
2,500.0	14.59	171.91	2,451.2	-408.3	58.0	-315.1	0.00	0.00	
2,600.0	14.59	171.91	2,548.0	-433.2	61.5	-334.4	0.00	0.00	
2,700.0	14.59	171.91	2,644.7	-458.1	65.1	-353.6	0.00	0.00	
2,800.0	14.59	171.91	2,741.5	-483.1	68.6	-372.9	0.00	0.00	
2,900.0	14.59	171.91	2,838.3	-508.0	72.2	-392.1	0.00	0.00	
3,000.0	14.59	171.91	2,935.1	-532.9	75.7	-411.4	0.00	0.00	
3,100.0	14.59	171.91	3,031.9	-557.9	79.3	-430.6	0.00	0.00	
3,175.0	14.59	171.91	3,104.4	-576.6	81.9	-445.0	0.00	0.00	Menefee Fn.
3,200.0	14.59	171.91	3,128.6	-582.8	82.8	-449.8	0.00	0.00	
3,300.0	14.59	171.91	3,225.4	-607.7	86.3	-469.1	0.00	0.00	
3,375.5	14.59	171.91	3,298.5	-626.6	89.0	-483.6	0.00	0.00	Start Drop -2.00
3,400.0	14.10	171.91	3,322.2	-632.6	89.9	-488.3	2.00	-2.00	
3,500.0	12.10	171.91	3,419.6	-655.0	93.1	-505.6	2.00	-2.00	
3,600.0	10.10	171.91	3,517.7	-674.1	95.8	-520.3	2.00	-2.00	
3,700.0	8.10	171.91	3,616.5	-689.7	98.0	-532.4	2.00	-2.00	
3,800.0	6.10	171.91	3,715.7	-702.0	99.7	-541.8	2.00	-2.00	
3,900.0	4.10	171.91	3,815.3	-710.7	101.0	-548.6	2.00	-2.00	
3,939.9	3.30	171.91	3,855.1	-713.3	101.3	-550.6	2.00	-2.00	Point Lookout Ss.
4,000.0	2.10	171.91	3,915.1	-716.1	101.7	-552.7	2.00	-2.00	
4,100.0	0.10	171.91	4,015.1	-718.0	102.0	-554.2	2.00	-2.00	

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
4,104.9	0.00	0.00	4,020.0	-718.0	102.0	-554.2	2.00	-2.00	EOD; INC=0°
4,113.0	0.00	0.00	4,028.1	-718.0	102.0	-554.2	0.00	0.00	Mancos Shale
4,200.0	0.00	0.00	4,115.1	-718.0	102.0	-554.2	0.00	0.00	
4,300.0	0.00	0.00	4,215.1	-718.0	102.0	-554.2	0.00	0.00	
4,340.3	0.00	0.00	4,255.4	-718.0	102.0	-554.2	0.00	0.00	Start Build 7.00
4,400.0	4.18	311.75	4,315.1	-716.6	100.4	-552.0	7.00	7.00	
4,500.0	11.18	311.75	4,414.1	-707.7	90.4	-538.7	7.00	7.00	
4,600.0	18.18	311.75	4,510.8	-690.8	71.5	-513.3	7.00	7.00	
4,631.2	20.36	311.75	4,540.2	-683.9	63.8	-503.0	7.00	7.00	Mancos Silt
4,700.0	25.18	311.75	4,603.7	-666.2	44.0	-476.4	7.00	7.00	
4,800.0	32.18	311.75	4,691.3	-634.3	8.2	-428.5	7.00	7.00	
4,900.0	39.18	311.75	4,772.5	-595.5	-35.3	-370.2	7.00	7.00	
4,937.2	41.78	311.75	4,800.8	-579.4	-53.3	-346.0	7.00	7.00	Gallup Fn
5,000.0	46.18	311.75	4,846.0	-550.4	-85.9	-302.4	7.00	7.00	
5,043.4	49.22	311.75	4,875.2	-529.0	-109.8	-270.3	7.00	7.00	ICP @ 55°
5,100.0	53.18	311.75	4,910.6	-499.6	-142.7	-226.2	7.00	7.00	
5,200.0	60.18	311.75	4,965.5	-444.0	-205.0	-142.7	7.00	7.00	
5,300.0	67.18	311.75	5,009.9	-384.4	-271.8	-53.1	7.00	7.00	
5,400.0	74.18	311.75	5,042.9	-321.6	-342.2	41.2	7.00	7.00	
5,500.0	81.18	311.75	5,064.2	-256.6	-415.1	138.8	7.00	7.00	
5,600.0	88.18	311.75	5,073.5	-190.3	-489.3	238.3	7.00	7.00	
5,623.1	89.80	311.75	5,073.9	-174.9	-506.6	261.5	7.00	7.00	LP - 5073' TVD; 89.8°
5,700.0	89.80	311.75	5,074.2	-123.7	-563.9	338.3	0.00	0.00	
5,800.0	89.80	311.75	5,074.5	-57.1	-638.5	438.3	0.00	0.00	
5,900.0	89.80	311.75	5,074.9	9.4	-713.1	538.3	0.00	0.00	
6,000.0	89.80	311.75	5,075.2	76.0	-787.7	638.3	0.00	0.00	
6,100.0	89.80	311.75	5,075.6	142.6	-862.3	738.3	0.00	0.00	
6,200.0	89.80	311.75	5,075.9	209.2	-936.9	838.3	0.00	0.00	
6,300.0	89.80	311.75	5,076.3	275.8	-1,011.6	938.3	0.00	0.00	
6,400.0	89.80	311.75	5,076.6	342.4	-1,086.2	1,038.3	0.00	0.00	
6,500.0	89.80	311.75	5,077.0	408.9	-1,160.8	1,138.3	0.00	0.00	
6,600.0	89.80	311.75	5,077.3	475.5	-1,235.4	1,238.3	0.00	0.00	
6,700.0	89.80	311.75	5,077.7	542.1	-1,310.0	1,338.3	0.00	0.00	
6,800.0	89.80	311.75	5,078.0	608.7	-1,384.6	1,438.3	0.00	0.00	
6,900.0	89.80	311.75	5,078.4	675.3	-1,459.2	1,538.3	0.00	0.00	
7,000.0	89.80	311.75	5,078.7	741.9	-1,533.8	1,638.3	0.00	0.00	
7,100.0	89.80	311.75	5,079.1	808.4	-1,608.4	1,738.3	0.00	0.00	
7,200.0	89.80	311.75	5,079.4	875.0	-1,683.0	1,838.3	0.00	0.00	
7,300.0	89.80	311.75	5,079.8	941.6	-1,757.7	1,938.3	0.00	0.00	
7,400.0	89.80	311.75	5,080.1	1,008.2	-1,832.3	2,038.3	0.00	0.00	
7,500.0	89.80	311.75	5,080.5	1,074.8	-1,906.9	2,138.3	0.00	0.00	
7,600.0	89.80	311.75	5,080.8	1,141.4	-1,981.5	2,238.3	0.00	0.00	
7,700.0	89.80	311.75	5,081.2	1,207.9	-2,056.1	2,338.3	0.00	0.00	
7,800.0	89.80	311.75	5,081.5	1,274.5	-2,130.7	2,438.3	0.00	0.00	
7,900.0	89.80	311.75	5,081.9	1,341.1	-2,205.3	2,538.3	0.00	0.00	
8,000.0	89.80	311.75	5,082.2	1,407.7	-2,279.9	2,638.3	0.00	0.00	
8,100.0	89.80	311.75	5,082.6	1,474.3	-2,354.5	2,738.3	0.00	0.00	
8,200.0	89.80	311.75	5,082.9	1,540.9	-2,429.1	2,838.3	0.00	0.00	
8,300.0	89.80	311.75	5,083.3	1,607.4	-2,503.7	2,938.3	0.00	0.00	
8,400.0	89.80	311.75	5,083.6	1,674.0	-2,578.4	3,038.3	0.00	0.00	
8,500.0	89.80	311.75	5,084.0	1,740.6	-2,653.0	3,138.3	0.00	0.00	
8,600.0	89.80	311.75	5,084.3	1,807.2	-2,727.6	3,238.3	0.00	0.00	

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Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
8,700.0	89.80	311.75	5,084.7	1,873.8	-2,802.2	3,338.3	0.00	0.00	
8,800.0	89.80	311.75	5,085.0	1,940.4	-2,876.8	3,438.3	0.00	0.00	
8,900.0	89.80	311.75	5,085.3	2,006.9	-2,951.4	3,538.3	0.00	0.00	
9,000.0	89.80	311.75	5,085.7	2,073.5	-3,026.0	3,638.3	0.00	0.00	
9,100.0	89.80	311.75	5,086.0	2,140.1	-3,100.6	3,738.3	0.00	0.00	
9,200.0	89.80	311.75	5,086.4	2,206.7	-3,175.2	3,838.3	0.00	0.00	
9,300.0	89.80	311.75	5,086.7	2,273.3	-3,249.8	3,938.3	0.00	0.00	
9,400.0	89.80	311.75	5,087.1	2,339.9	-3,324.5	4,038.3	0.00	0.00	
9,500.0	89.80	311.75	5,087.4	2,406.4	-3,399.1	4,138.3	0.00	0.00	
9,600.0	89.80	311.75	5,087.8	2,473.0	-3,473.7	4,238.3	0.00	0.00	
9,700.0	89.80	311.75	5,088.1	2,539.6	-3,548.3	4,338.3	0.00	0.00	
9,800.0	89.80	311.75	5,088.5	2,606.2	-3,622.9	4,438.3	0.00	0.00	
9,900.0	89.80	311.75	5,088.8	2,672.8	-3,697.5	4,538.3	0.00	0.00	
10,000.0	89.80	311.75	5,089.2	2,739.4	-3,772.1	4,638.3	0.00	0.00	
10,100.0	89.80	311.75	5,089.5	2,805.9	-3,846.7	4,738.3	0.00	0.00	
10,200.0	89.80	311.75	5,089.9	2,872.5	-3,921.3	4,838.3	0.00	0.00	
10,300.0	89.80	311.75	5,090.2	2,939.1	-3,995.9	4,938.3	0.00	0.00	
10,400.0	89.80	311.75	5,090.6	3,005.7	-4,070.5	5,038.3	0.00	0.00	
10,500.0	89.80	311.75	5,090.9	3,072.3	-4,145.2	5,138.3	0.00	0.00	
10,600.0	89.80	311.75	5,091.3	3,138.9	-4,219.8	5,238.3	0.00	0.00	
10,700.0	89.80	311.75	5,091.6	3,205.4	-4,294.4	5,338.3	0.00	0.00	
10,800.0	89.80	311.75	5,092.0	3,272.0	-4,369.0	5,438.3	0.00	0.00	
10,900.0	89.80	311.75	5,092.3	3,338.6	-4,443.6	5,538.3	0.00	0.00	
11,000.0	89.80	311.75	5,092.7	3,405.2	-4,518.2	5,638.3	0.00	0.00	
11,100.0	89.80	311.75	5,093.0	3,471.8	-4,592.8	5,738.3	0.00	0.00	
11,200.0	89.80	311.75	5,093.4	3,538.4	-4,667.4	5,838.3	0.00	0.00	
11,300.0	89.80	311.75	5,093.7	3,604.9	-4,742.0	5,938.3	0.00	0.00	
11,400.0	89.80	311.75	5,094.1	3,671.5	-4,816.6	6,038.3	0.00	0.00	
11,500.0	89.80	311.75	5,094.4	3,738.1	-4,891.2	6,138.3	0.00	0.00	
11,600.0	89.80	311.75	5,094.8	3,804.7	-4,965.9	6,238.3	0.00	0.00	
11,700.0	89.80	311.75	5,095.1	3,871.3	-5,040.5	6,338.3	0.00	0.00	
11,800.0	89.80	311.75	5,095.5	3,937.9	-5,115.1	6,438.3	0.00	0.00	
11,900.0	89.80	311.75	5,095.8	4,004.4	-5,189.7	6,538.3	0.00	0.00	
12,000.0	89.80	311.75	5,096.2	4,071.0	-5,264.3	6,638.3	0.00	0.00	
12,100.0	89.80	311.75	5,096.5	4,137.6	-5,338.9	6,738.3	0.00	0.00	
12,200.0	89.80	311.75	5,096.9	4,204.2	-5,413.5	6,838.3	0.00	0.00	
12,300.0	89.80	311.75	5,097.2	4,270.8	-5,488.1	6,938.3	0.00	0.00	
12,400.0	89.80	311.75	5,097.6	4,337.4	-5,562.7	7,038.3	0.00	0.00	
12,500.0	89.80	311.75	5,097.9	4,403.9	-5,637.3	7,138.3	0.00	0.00	
12,600.0	89.80	311.75	5,098.3	4,470.5	-5,712.0	7,238.3	0.00	0.00	
12,700.0	89.80	311.75	5,098.6	4,537.1	-5,786.6	7,338.3	0.00	0.00	
12,800.0	89.80	311.75	5,099.0	4,603.7	-5,861.2	7,438.3	0.00	0.00	
12,900.0	89.80	311.75	5,099.3	4,670.3	-5,935.8	7,538.3	0.00	0.00	
13,000.0	89.80	311.75	5,099.7	4,736.9	-6,010.4	7,638.3	0.00	0.00	
13,100.0	89.80	311.75	5,100.0	4,803.4	-6,085.0	7,738.3	0.00	0.00	
13,200.0	89.80	311.75	5,100.4	4,870.0	-6,159.6	7,838.3	0.00	0.00	
13,300.0	89.80	311.75	5,100.7	4,936.6	-6,234.2	7,938.3	0.00	0.00	
13,400.0	89.80	311.75	5,101.1	5,003.2	-6,308.8	8,038.3	0.00	0.00	
13,500.0	89.80	311.75	5,101.4	5,069.8	-6,383.4	8,138.3	0.00	0.00	
13,600.0	89.80	311.75	5,101.8	5,136.4	-6,458.0	8,238.3	0.00	0.00	
13,700.0	89.80	311.75	5,102.1	5,202.9	-6,532.7	8,338.3	0.00	0.00	
13,800.0	89.80	311.75	5,102.5	5,269.5	-6,607.3	8,438.3	0.00	0.00	

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
 Company: EnCana Oil & Gas (USA) Inc
 Project: Sandoval County, NM
 Site: S31-T23N-R7W
 Well: NAU 332H-J31-2307 01H
 Wellbore: OH
 Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
 TVD Reference: 16' KB @ 6995.0ft
 MD Reference: 16' KB @ 6995.0ft
 North Reference: True
 Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (ft)	Inclination (°)	Azimuth (°)	Vertical Depth (ft)	+N/-S (ft)	+E/-W (ft)	Vertical Section (ft)	Dogleg Rate (°/100ft)	Build Rate (°/100ft)	Comments / Formations
13,900.0	89.80	311.75	5,102.8	5,336.1	-6,681.9	8,538.3	0.00	0.00	
14,000.0	89.80	311.75	5,103.2	5,402.7	-6,756.5	8,638.3	0.00	0.00	
14,100.0	89.80	311.75	5,103.5	5,469.3	-6,831.1	8,738.3	0.00	0.00	
14,200.0	89.80	311.75	5,103.8	5,535.9	-6,905.7	8,838.3	0.00	0.00	
14,300.0	89.80	311.75	5,104.2	5,602.4	-6,980.3	8,938.3	0.00	0.00	
14,400.0	89.80	311.75	5,104.5	5,669.0	-7,054.9	9,038.3	0.00	0.00	
14,500.0	89.80	311.75	5,104.9	5,735.6	-7,129.5	9,138.3	0.00	0.00	
14,600.0	89.80	311.75	5,105.2	5,802.2	-7,204.1	9,238.3	0.00	0.00	
14,700.0	89.80	311.75	5,105.6	5,868.8	-7,278.7	9,338.3	0.00	0.00	
14,800.0	89.80	311.75	5,105.9	5,935.4	-7,353.4	9,438.3	0.00	0.00	
14,900.0	89.80	311.75	5,106.3	6,001.9	-7,428.0	9,538.3	0.00	0.00	
15,000.0	89.80	311.75	5,106.6	6,068.5	-7,502.6	9,638.3	0.00	0.00	
15,100.0	89.80	311.75	5,107.0	6,135.1	-7,577.2	9,738.3	0.00	0.00	
15,128.4	89.80	311.75	5,107.1	6,154.0	-7,598.4	9,766.7	0.00	0.00	TD at 15128.4

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
Lybrook J31-2307 01H F - plan misses target center by 2898.2ft at 9057.9ft MD (5085.9 TVD, 2112.1 N, -3069.2 E) - Point	0.00	0.00	5,036.2	-49.8	-4,998.8	1,888,381.89	1,232,546.92	36.181890	-107.632100
NAU 332H 01H PBHL P - plan hits target center - Point	0.00	0.00	5,107.1	6,154.0	-7,598.4	1,894,621.69	1,230,034.88	36.198928	-107.640913
Lybrook J31-2307 01H F - plan misses target center by 150.2ft at 5614.8ft MD (5073.8 TVD, -180.5 N, -500.3 E) - Point	0.00	0.00	5,076.3	-68.4	-400.2	1,888,298.57	1,237,144.76	36.181840	-107.616520
NAU 332H 01H POE P4 - plan misses target center by 0.8ft at 5622.9ft MD (5073.9 TVD, -175.0 N, -506.4 E) - Point	0.00	0.00	5,073.1	-175.1	-506.5	1,888,193.40	1,237,037.01	36.181547	-107.616880
Lybrook J31-2307 01H F - plan misses target center by 4620.5ft at 11010.2ft MD (5092.7 TVD, 3412.0 N, -4525.8 E) - Point	0.00	0.00	5,013.5	-34.7	-7,602.1	1,888,433.65	1,229,944.09	36.181930	-107.640920
	5,043.4	4,875.2	ICP @ 55°					0.000	0.000
	500.0	500.0	9 5/8"					0.000	0.000

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
 Company: EnCana Oil & Gas (USA) Inc
 Project: Sandoval County, NM
 Site: S31-T23N-R7W
 Well: NAU 332H-J31-2307 01H
 Wellbore: OH
 Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
 TVD Reference: 16' KB @ 6995.0ft
 MD Reference: 16' KB @ 6995.0ft
 North Reference: True
 Survey Calculation Method: Minimum Curvature

Formations

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
908.3	907.0	Ojo Alamo Ss.		0.20	311.75
1,078.8	1,075.0	Kirtland Shale		0.20	311.75
1,348.4	1,337.0	Fruitland Coal		0.20	311.75
1,485.7	1,470.0	Pictured Cliffs Ss.		0.20	311.75
1,602.4	1,583.0	Lewis Shale		0.20	311.75
2,266.3	2,226.0	Cliffhouse Ss.		0.20	311.75
3,175.0	3,106.0	Menefee Fn.		0.20	311.75
3,939.9	3,857.0	Point Lookout Ss.		0.20	311.75
4,113.0	4,030.0	Mancos Shale		0.20	311.75
4,631.2	4,542.0	Mancos Silt		0.20	311.75
4,937.2	4,802.0	Gallup Fn.		0.20	311.75

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
500.0	500.0	0.0	0.0	KOP - 500'
1,229.4	1,221.5	-91.4	13.0	EOB; INC=14.59°
3,375.5	3,298.5	-626.6	89.0	Start Drop -2.00
4,104.9	4,020.0	-718.0	102.0	EOD; INC=0°
4,340.3	4,255.4	-718.0	102.0	Start Build 7.00
5,623.1	5,073.9	-174.9	-506.6	LP - 5073' TVD; 89.8°
15,128.4	5,107.1	6,154.0	-7,598.4	TD at 15128.4



EnCana Oil & Gas (USA) Inc

Sandoval County, NM

S31-T23N-R7W

NAU 332H-J31-2307 01H

OH

PLAN #4

Anticollision Report

05 June, 2017

Cathedral Energy Services

Anticollision Report

Company: EnCana Oil & Gas (USA) Inc
 Project: Sandoval County, NM
 Reference Site: S31-T23N-R7W
 Site Error: 0.0ft
 Reference Well: NAU 332H-J31-2307 01H
 Well Error: 0.0ft
 Reference Wellbore: OH
 Reference Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
 TVD Reference: 16' KB @ 6995.0ft
 MD Reference: 16' KB @ 6995.0ft
 North Reference: True
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA EDM 5000 Multi Users DB
 Offset TVD Reference: Offset Datum

Reference	PLAN #4		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	MD Interval 100.0ft	Error Model:	Systematic Ellipse
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 1,195.9ft	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program Date 6/5/2017

From (ft)	To (ft)	Survey (Wellbore)	Tool Name	Description
0.0	15,097.7	PLAN #4 (OH)	Geolink MWD	Geolink MWD

Summary						
Site Name	Reference Measured Depth (ft)	Offset Measured Depth (ft)	Distance Between Centres (ft)	Distance Between Ellipses (ft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
S31-T23N-R7W						
NAU 333H-J31-2307 02H - OH - PLAN #5	500.0	500.0	29.7	28.0	17.601	CC, ES
NAU 333H-J31-2307 02H - OH - PLAN #5	5,361.5	5,352.6	86.5	66.2	4.272	SF

Cathedral Energy Services

Anticollision Report

Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Reference Site: S31-T23N-R7W
Site Error: 0.0ft
Reference Well: NAU 332H-J31-2307 01H
Well Error: 0.0ft
Reference Wellbore: OH
Reference Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
TVD Reference: 16' KB @ 6995.0ft
MD Reference: 16' KB @ 6995.0ft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Offset Design S31-T23N-R7W - NAU 333H-J31-2307 02H - OH - PLAN #5													Offset Site Error: 0.0 ft
Survey Program: 0-Geolink MWD													Offset Well Error: 0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)	Total Uncertainty Axis	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	41.68	22.2	19.8	29.7				
100.0	100.0	100.0	100.0	0.1	0.1	41.68	22.2	19.8	29.7	29.4	0.29	101.418	
200.0	200.0	200.0	200.0	0.3	0.3	41.68	22.2	19.8	29.7	29.1	0.64	46.299	
300.0	300.0	300.0	300.0	0.5	0.5	41.68	22.2	19.8	29.7	28.7	0.99	29.997	
400.0	400.0	400.0	400.0	0.7	0.7	41.68	22.2	19.8	29.7	28.4	1.34	22.185	
500.0	500.0	500.0	500.0	0.8	0.8	41.68	22.2	19.8	29.7	28.0	1.69	17.601 CC, ES	
600.0	600.0	600.4	600.4	1.0	1.0	-135.71	22.6	18.1	30.2	28.1	2.04	14.773	
700.0	699.8	700.3	700.2	1.2	1.2	-150.57	23.8	13.0	32.9	30.5	2.41	13.697	
800.0	799.5	799.3	798.7	1.4	1.4	-168.57	25.7	4.6	41.3	38.5	2.78	14.850	
900.0	898.7	896.7	895.5	1.7	1.7	177.04	28.4	-6.9	57.1	53.9	3.17	18.007	
1,000.0	997.5	992.3	989.9	1.9	1.9	167.53	31.7	-21.3	80.0	76.5	3.58	22.378	
1,100.0	1,095.6	1,085.6	1,081.5	2.3	2.2	161.43	35.6	-38.3	109.3	105.3	4.00	27.295	
1,200.0	1,193.1	1,177.3	1,171.0	2.7	2.6	157.38	40.1	-57.7	144.2	139.8	4.46	32.359	
1,300.0	1,289.9	1,269.6	1,261.0	3.1	2.9	155.14	44.7	-77.9	182.2	177.3	4.94	36.875	
1,400.0	1,386.6	1,361.9	1,351.0	3.5	3.3	153.75	49.4	-98.0	220.4	215.0	5.44	40.538	
1,500.0	1,483.4	1,454.2	1,440.9	4.0	3.7	152.77	54.0	-118.1	258.7	252.8	5.94	43.525	
1,600.0	1,580.2	1,546.5	1,530.9	4.4	4.1	152.04	58.7	-138.3	297.1	290.6	6.46	45.994	
1,700.0	1,677.0	1,638.8	1,620.8	4.9	4.5	151.48	63.3	-158.4	335.5	328.5	6.98	48.061	
1,800.0	1,773.8	1,731.1	1,710.8	5.3	4.8	151.03	68.0	-178.5	373.9	366.4	7.51	49.812	
1,900.0	1,870.5	1,823.4	1,800.7	5.8	5.2	150.67	72.6	-198.6	412.3	404.3	8.04	51.311	
2,000.0	1,967.3	1,915.7	1,890.7	6.3	5.6	150.37	77.3	-218.8	450.8	442.2	8.57	52.608	
2,100.0	2,064.1	2,008.0	1,980.6	6.7	6.0	150.12	81.9	-238.9	489.2	480.1	9.10	53.740	
2,200.0	2,160.9	2,100.3	2,070.6	7.2	6.4	149.90	86.5	-259.0	527.7	518.0	9.64	54.733	
2,300.0	2,257.6	2,207.4	2,160.5	7.7	6.9	149.71	91.2	-279.2	566.1	555.9	10.23	55.367	
2,400.0	2,354.4	2,284.9	2,250.5	8.1	7.2	149.55	95.8	-299.3	604.6	593.9	10.72	56.397	
2,500.0	2,451.2	2,377.2	2,340.5	8.6	7.6	149.40	100.5	-319.4	643.1	631.8	11.26	57.100	
2,600.0	2,548.0	2,469.4	2,430.4	9.1	8.0	149.28	105.1	-339.6	681.5	669.7	11.81	57.733	
2,700.0	2,644.7	2,561.7	2,520.4	9.5	8.4	149.16	109.8	-359.7	720.0	707.7	12.35	58.306	
2,800.0	2,741.5	2,654.0	2,610.3	10.0	8.8	149.06	114.4	-379.8	758.5	745.6	12.89	58.827	
2,900.0	2,838.3	2,746.3	2,700.3	10.5	9.2	148.97	119.1	-399.9	797.0	783.5	13.44	59.303	
3,000.0	2,935.1	2,838.6	2,790.2	10.9	9.6	148.88	123.7	-420.1	835.4	821.5	13.98	59.739	
3,100.0	3,031.8	2,930.9	2,880.2	11.4	10.0	148.81	128.4	-440.2	873.9	859.4	14.53	60.141	
3,200.0	3,128.6	3,023.2	2,970.1	11.9	10.4	148.74	133.0	-460.3	912.4	897.3	15.08	60.511	
3,300.0	3,225.4	3,115.5	3,060.1	12.3	10.8	148.67	137.6	-480.5	950.9	935.3	15.63	60.853	
3,400.0	3,322.2	3,207.8	3,150.0	12.8	11.2	148.71	142.3	-500.6	989.3	973.1	16.17	61.170	
3,500.0	3,419.6	3,300.9	3,240.8	13.2	11.6	148.98	147.0	-520.9	1,025.7	1,009.0	16.70	61.418	
3,600.0	3,517.7	3,395.0	3,332.5	13.6	12.0	149.12	151.7	-541.4	1,059.4	1,042.1	17.21	61.542	
3,700.0	3,616.5	3,495.3	3,430.3	13.9	12.4	149.12	156.8	-563.3	1,090.2	1,072.4	17.74	61.454	
3,800.0	3,715.7	3,633.7	3,566.0	14.1	12.9	148.96	162.8	-589.4	1,115.8	1,097.5	18.39	60.690	
3,900.0	3,815.3	3,775.8	3,706.6	14.3	13.3	148.84	167.5	-609.6	1,134.9	1,116.0	18.95	59.894	
4,000.0	3,915.1	3,820.6	3,850.7	14.4	13.6	148.74	170.6	-623.2	1,147.1	1,127.7	19.42	59.068	
4,100.0	4,015.1	3,946.2	3,971.9	14.5	13.1	-65.58	-719.9	102.7	1,056.8	1,045.1	11.70	90.296	
4,200.0	4,115.1	3,946.0	3,971.9	14.6	13.1	162.54	-719.8	102.6	956.8	945.0	11.80	81.063	
4,300.0	4,215.1	3,945.9	3,971.9	14.7	13.1	165.17	-719.7	102.4	856.8	844.9	11.90	71.984	
4,400.0	4,314.9	3,940.7	3,971.9	14.7	13.0	-179.61	-716.0	98.8	757.0	745.0	11.99	63.134	
4,500.0	4,413.4	3,923.5	3,972.0	14.6	12.7	179.74	-703.6	86.9	658.6	646.5	12.05	54.642	
4,600.0	4,509.1	3,894.6	3,972.0	14.3	12.2	179.10	-682.6	67.0	563.0	550.9	12.09	46.548	
4,700.0	4,600.5	3,854.3	3,972.1	14.0	11.6	178.18	-653.0	39.6	471.7	459.5	12.13	38.899	
4,800.0	4,686.3	3,803.4	3,972.2	13.6	10.8	176.73	-615.2	5.6	386.1	373.9	12.17	31.730	
4,900.0	4,765.2	3,742.8	3,972.3	13.2	9.9	174.32	-569.3	-33.9	307.7	295.5	12.27	25.088	
5,000.0	4,836.1	3,673.7	3,972.4	12.8	8.9	170.26	-516.0	-77.9	238.4	225.8	12.54	19.003	
5,100.0	4,897.9	3,592.1	3,972.3	12.5	7.8	163.02	-452.3	-129.0	180.0	166.9	13.18	13.663	

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Cathedral Energy Services

Anticollision Report

Company: EnCana Oil & Gas (USA) Inc
 Project: Sandoval County, NM
 Reference Site: S31-T23N-R7W
 Site Error: 0.0ft
 Reference Well: NAU 332H-J31-2307 01H
 Well Error: 0.0ft
 Reference Wellbore: OH
 Reference Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
 TVD Reference: 16' KB @ 6995.0ft
 MD Reference: 16' KB @ 6995.0ft
 North Reference: True
 Survey Calculation Method: Minimum Curvature
 Output errors are at: 2.00 sigma
 Database: USA EDM 5000 Multi Users DB
 Offset TVD Reference: Offset Datum

Offset Design S31-T23N-R7W - NAU 333H-J31-2307 02H - OH - PLAN #5														Offset Site Error:	0.0 ft
Survey Program: 0-Geolink MWD														Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Distance		Total Uncertainty Axis	Separation Factor	Warning				
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)							
5,200.0	4,949.6	5,494.9	5,064.5	12.3	12.9	148.55	-376.8	-189.6	129.9	115.2	14.69	8.845			
5,300.0	4,990.5	5,405.0	5,047.0	12.3	12.3	124.81	-308.1	-244.8	93.9	75.7	18.15	5.173			
5,361.5	5,010.1	5,352.6	5,032.4	12.5	12.0	105.64	-268.8	-276.3	86.5	66.2	20.24	4.272 SF			
5,400.0	5,020.0	5,320.7	5,022.0	12.7	11.9	93.38	-245.3	-295.1	89.4	68.8	20.60	4.339			
5,500.0	5,037.7	5,240.8	4,990.7	13.6	11.7	67.29	-188.0	-341.2	117.8	98.4	19.42	6.066			
5,600.0	5,043.2	5,164.2	4,954.2	15.0	11.7	51.46	-135.5	-383.2	160.4	142.1	18.30	8.769			
5,700.0	5,043.6	5,093.6	4,915.1	16.5	11.9	43.41	-89.7	-420.0	211.0	193.2	17.77	11.872			
5,800.0	5,043.9	5,031.0	4,876.2	18.2	12.0	37.73	-51.4	-450.7	269.7	252.0	17.62	15.308			
5,900.0	5,044.3	4,975.6	4,838.9	20.0	12.2	33.62	-19.6	-476.3	334.8	317.1	17.69	18.923			
6,000.0	5,044.6	4,926.8	4,803.7	21.8	12.4	30.55	6.8	-497.5	405.1	387.2	17.90	22.635			
6,100.0	5,045.0	4,883.6	4,771.0	23.7	12.6	28.20	28.8	-515.1	479.7	461.5	18.16	26.411			
6,200.0	5,045.3	4,850.0	4,744.5	25.7	12.8	26.57	44.9	-528.1	557.7	539.2	18.57	30.037			
6,300.0	5,045.7	4,811.6	4,713.2	27.7	12.9	24.88	62.3	-542.0	638.6	619.7	18.82	33.939			
6,400.0	5,046.0	4,781.4	4,687.9	29.7	13.1	23.67	75.1	-552.3	721.8	702.7	19.12	37.745			
6,500.0	5,046.4	4,750.0	4,660.9	31.7	13.2	22.51	87.7	-562.4	807.0	787.6	19.36	41.682			
6,600.0	5,046.7	4,730.3	4,643.7	33.8	13.3	21.83	95.2	-568.4	893.8	874.1	19.71	45.352			
6,700.0	5,047.1	4,700.0	4,616.8	35.8	13.4	20.84	106.1	-577.1	982.2	962.3	19.89	49.377			
6,800.0	5,047.4	4,700.0	4,616.8	37.9	13.4	20.84	106.1	-577.1	1,071.7	1,051.3	20.35	52.673			
6,900.0	5,047.8	4,670.9	4,590.5	40.0	13.5	19.96	115.8	-584.9	1,162.0	1,141.6	20.49	56.705			

Cathedral Energy Services

Anticollision Report

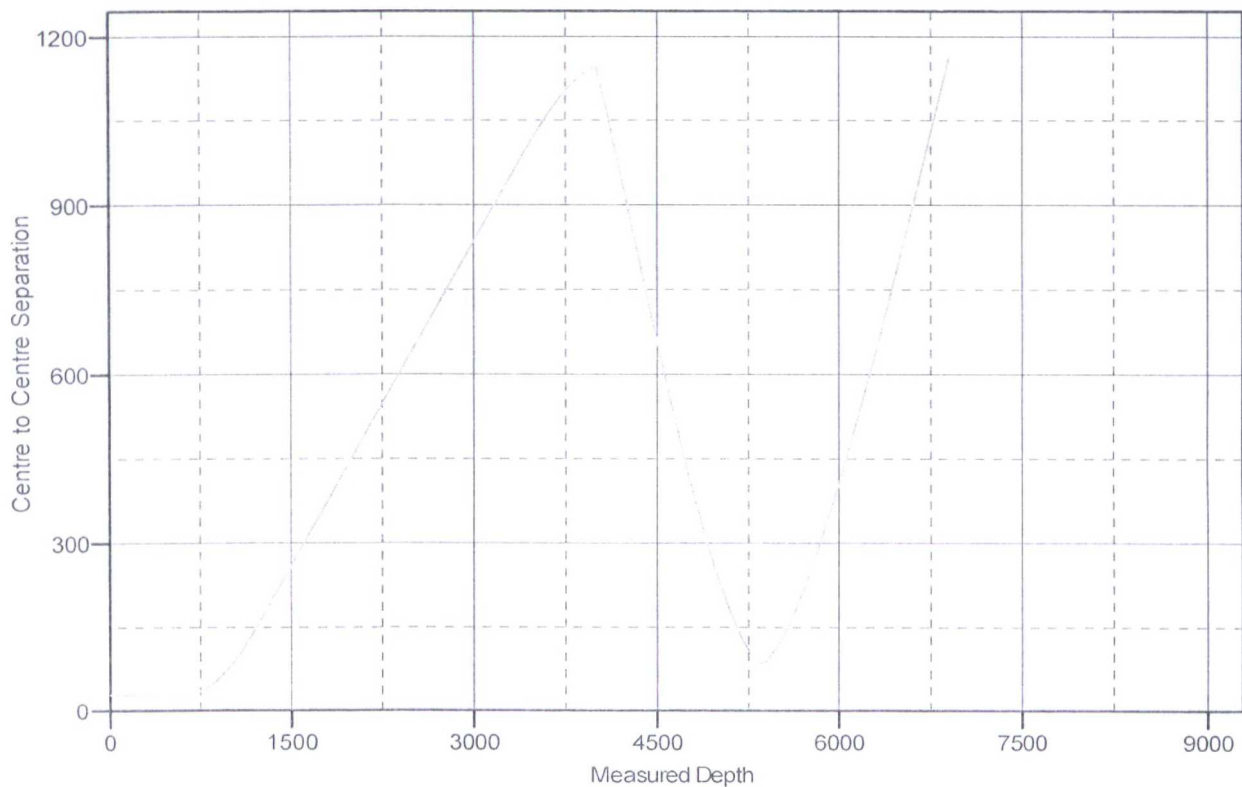
Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Reference Site: S31-T23N-R7W
Site Error: 0.0ft
Reference Well: NAU 332H-J31-2307 01H
Well Error: 0.0ft
Reference Wellbore: OH
Reference Design: PLAN #4

Local Co-ordinate Reference: Well NAU 332H-J31-2307 01H
TVD Reference: 16' KB @ 6995.0ft
MD Reference: 16' KB @ 6995.0ft
North Reference: True
Survey Calculation Method: Minimum Curvature
Output errors are at: 2.00 sigma
Database: USA EDM 5000 Multi Users DB
Offset TVD Reference: Offset Datum

Reference Depths are relative to 16' KB @ 6995.0ft
Offset Depths are relative to Offset Datum
Central Meridian is -106.250000 °

Coordinates are relative to: NAU 332H-J31-2307 01H
Coordinate System is US State Plane 1983, New Mexico Central Zone
Grid Convergence at Surface is: -0.81°

Ladder Plot



LEGEND

NAU 333H-J31-2307 02H, OH, PLAN#5 V0