

State of New Mexico
Energy, Minerals and Natural Resources Department

Susana Martinez
Governor

Ken McQueen
Cabinet Secretary

Matthias Sayer
Deputy Cabinet Secretary

David R. Catanach, 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 1/16/2014 **Sundry Date 7/20/2017**

API WELL #	Well Name	Well #	Operator Name	Type	Stat	County	Surf_Owner	UL	Sec	Twp	N/S	Rng	W/E
30-043-21199-00-00	NORTH ALAMITO UNIT	232H	ENCANA OIL & GAS (USA) INC.	G	N	Sandoval	F	I	28	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

August 30, 2017

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



NMOCD Approved by Signature

8/14/17
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.**

5. Lease Serial No.
NMNM 016586

NMNM 6682

6. If Indian, Allottee or Tribe Name

N/A

SUBMIT IN TRIPLICATE - Other instructions on page 2

1. Type of Well

☒ Oil Well ☐ Gas Well ☐ Other

2. Name of Operator

Encana Oil & Gas (USA) Inc.

3a. Address

370 17th Street, Suite 1700
Denver, CO 80202

3b. Phone No. (include area code)

(720) 876-3533

4. Location of Well (Footage, Sec., T., R., M., or Survey Description)

SHL: 1347' FSL and 43' FEL Section 28, T23N, R7W
BHL: 530' FSL and 1250' FWL Section 21, T23N, R8W

7. If Unit of CA/Agreement, Name and/or No.

NMNM 135229X

8. Well Name and No.

North Alamito Unit 232H (FKA Lybrook P28-2307 01H)

9. API Well No.

30-043-21199

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 - 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 P28-2307 01H well, which was approved by the OCD on October 2, 2014, will now be a part of the North Alamito Unit. Encana is submitting this sundry to change the well name from the Lybrook P28-2307 01H to the North Alamito Unit 232H.

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. Note, the drilling plans were also updated to remove the conductor.

OIL CONS. DIV DIST. 3

AUG 10 2017

RECEIVED

JUL 21 2017

Farmington Field Office
Bureau of Land Management

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

Katie Wegner

Title Senior Regulatory Analyst

Signature

Date

07/20/2017

THE SPACE FOR FEDERAL OR STATE OFFICE USE

Approved by

Dave Mankiewicz

Title

AFM-min

Date

07/31/17

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

BLM-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)

NMOCOD

22

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) 476-3480 Fax: (505) 476-3482

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

Submit one copy to appropriate
District Office

☐ AMENDED REPORT

WELL LOCATION AND ACREAGE DEDICATION PLAT

¹ API Number 30-043-21199		² Pool Code 98174	³ Pool Name ALAMITO MANCOS N (OIL)
⁴ Property Code 317188	⁵ Property Name NORTH ALAMITO UNIT		⁶ Well Number 232H
⁷ OGRID No. 282327	⁸ Operator Name ENCANA OIL & GAS (USA) INC.		⁹ Elevation 6940'

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
1	28	23N	7W		1347'	SOUTH	43'	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
M	21	23N	7W		530'	SOUTH	1250'	WEST	SANDOVAL

13 Dedicated Acres 90 PENETRATED SPACING UNIT: S/2 of SW/4 of Sec 21 (40 acres); NENW, NWNE, S/2 of NE/4 & NESE of Sec 28 (200 acres); NWSW of Sec 27 (40 acres)	13 Joint or Infill	14 Consolidation Code	15 Order No. R-14081-A (14,262.78 acres)
--	----------------------------------	-------------------------------------	---

NO ALLOWABLE WILL BE ASSIGNED TO THIS COMPLETION UNTIL ALL INTERESTS HAVE BEEN CONSOLIDATED
Order = 370 OR A NON-STANDARD UNIT HAS BEEN APPROVED BY THE DIVISION

FND 2 1/2" BC
GLO 1947
FND 2 1/2" BC
GLO 1947
WITNESS CORNER
O SP CALC

NW CORNER SEC 28
LAT. 36.205213° N (NAD83)
LONG. 107.588914° W (NAD83)
LAT. 36.205199° N (NAD27)
LONG. 107.588306° W (NAD27)

N/4 CORNER SEC 28
LAT. 36.205195° N (NAD83)
LONG. 107.580046° W (NAD83)
LAT. 36.205181° N (NAD27)
LONG. 107.579438° W (NAD27)

NE CORNER SEC 28
LAT. 36.2005200° N (NAD83)
LONG. 107.571184° W (NAD83)
LAT. 36.205186° N (NAD27)
LONG. 107.570577° W (NAD27)

E/4 CORNER SEC 28
LAT. 36.197855° N (NAD83)
LONG. 107.571110° W (NAD83)
LAT. 36.197841° N (NAD27)
LONG. 107.570503° W (NAD27)

SE CORNER SEC 28
LAT. 36.190525° N (NAD83)
LONG. 107.571034° W (NAD83)
LAT. 36.190511° N (NAD27)
LONG. 107.570427° W (NAD27)

S/4 CORNER SEC 28
LAT. 36.190555° N (NAD83)
LONG. 107.579931° W (NAD83)
LAT. 36.190541° N (NAD27)
LONG. 107.579323° W (NAD27)

SE CORNER SEC 27
LAT. 36.190230° N (NAD83)
LONG. 107.553342° W (NAD83)
LAT. 36.190216° N (NAD27)
LONG. 107.552735° W (NAD27)

BOTTOM HOLE
LAT. 36.206666° N (NAD83)
LONG. 107.584682° W (NAD83)
LAT. 36.206652° N (NAD27)
LONG. 107.584074° W (NAD27)

ENTRY POINT
LAT. 36.196182° N (NAD83)
LONG. 107.571031° W (NAD83)
LAT. 36.196168° N (NAD27)
LONG. 107.570424° W (NAD27)

WELL FLAG
LAT. 36.194226° N (NAD83)
LONG. 107.571218° W (NAD83)
LAT. 36.194212° N (NAD27)
LONG. 107.570611° W (NAD27)

HORIZONTAL DRILL
N 00°18'14" W 132.00' (R&M)
N 00°18'14" W 2664.06' (M)
N 00°18' W 2668.38' (R)
N 89°59'56" W 2616.19' (M)
N 89°59' W 2614.92' (R)
N 89°53' W 2614.92' (R)
N 00°37'39" W 2673.64' (M)
N 00°37' W 2674.65' (R)
N 00°38'07" W 2668.48' (M)
N 00°27' W 2674.65' (R)
N 89°54'49" W 2625.46' (M)
N 89°54' W 2620.53' (R)
N 88°58'50" W 5221.68' (M)
N 88°56' W 5225.88' (R)

DATE OF SURVEY
FEBRUARY 14, 2017

SIGNATURE AND SEAL OF PROFESSIONAL SURVEYOR:

HENRY P. BROADHURST
NEW MEXICO
PROFESSIONAL SURVEYOR
NO. 11393
05/31/2017

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

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State of New Mexico
Energy, Minerals & Natural Resources Department

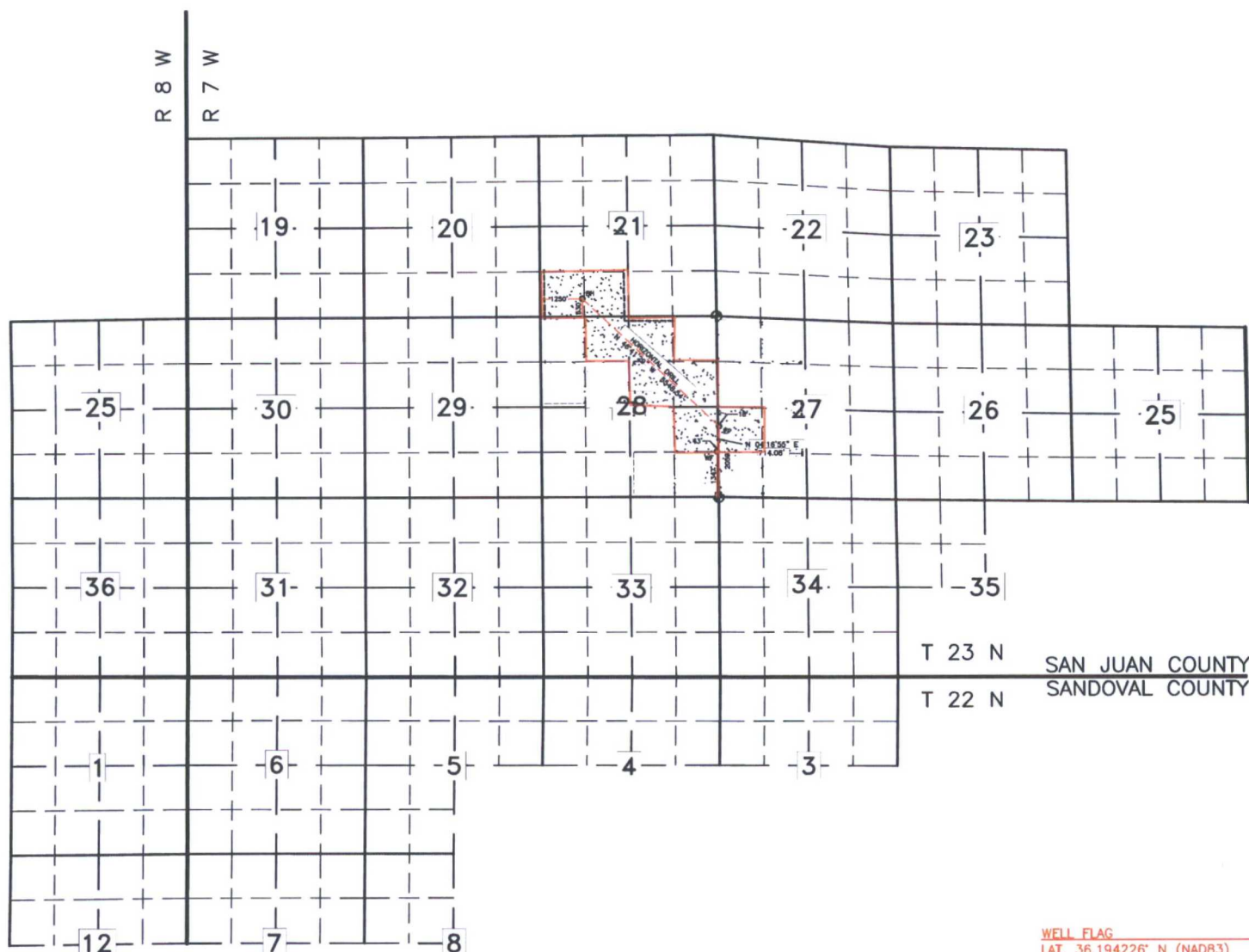
Form C-102
Revised August 1, 2011

Submit one copy to appropriate
District Office

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

☐ AMENDED REPORT

ENCANA OIL & GAS (USA) INC.
NORTH ALAMITO UNIT #232H



WELL FLAG
LAT. 36.194226° N (NAD83)
LONG. 107.571218° W (NAD83)
LAT. 36.194212° N (NAD27)
LONG. 107.570611° W (NAD27)

ENTRY POINT
LAT. 36.196182° N (NAD83)
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LONG. 107.570424° W (NAD27)

BOTTOM HOLE
LAT. 36.206666° N (NAD83)
LONG. 107.584682° W (NAD83)
LAT. 36.206652° N (NAD27)
LONG. 107.584074° W (NAD27)

PENETRATED SPACING UNIT: S/2 of SW/4 of Sec 21 (40 acres);
NENW, NWNE, S/2 of NE/4 & NESE of Sec 28 (200 acres); NWSW of
Sec 27 (40 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

North Alamito Unit 232H
 SHL: 1347' FSL, 43' FEL
 Sec 28, T23N, R7W
 BHL: 530' FSL, 1250' FWL
 Sec 21, T23N, R7W
 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	1,021
Kirtland Shale	1,286
Fruitland Coal	1,483
Pictured Cliffs Ss.	1,638
Lewis Shale	1,760
Cliffhouse Ss.	2,473
Menefee Fn.	3,163
Point Lookout Ss.	4,010
Mancos Shale	4,211
Mancos Silt	4,752
Gallup Fn.	5,013

The referenced surface elevation is 6940', KB 6956'

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

Substance	Formation	Depth (TVD) units = feet
Water/Gas	Fruitland Coal	1,483
Water/Gas	Pictured Cliffs Ss.	1,638
Water/Gas	Cliffhouse Ss.	2,473
Water/Gas	Menefee Fn.	3,163
Water/Gas	Point Lookout Ss.	4,010
Oil/Gas	Mancos Shale	4,211
Oil/Gas	Mancos Silt	4,752
Oil/Gas	Gallup Fn.	5,013

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

3. PRESSURE CONTROL

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

North Alamito Unit 232H
 SHL: 1347' FSL, 43' FEL
 Sec 28, T23N, R7W
 BHL: 530' FSL, 1250' FWL
 Sec 21, T23N, R7W

Sandoval County, NM

- 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'-5500'	8 3/4"	7"	26	J55, LTC New
Production Liner	5300'-11354'	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.

North Alamito Unit 232H
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Sec 21, T23N, R7W
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'-5500'	100% open hole excess Stage 1 Lead: 672 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	5300'-11354'	30% open hole excess Cement Vol: 549 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

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

North Alamito Unit 232H
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 Sec 21, T23N, R7W
 Sandoval County, NM

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 4459'. Directional plans are attached.

Description	Proposed Depth (TVD/MD)	Formation
Horizontal Lateral TD	5307'/11354'	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'-5228'/5500'	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"	5228'/5500'- 5307'/11354'	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

8. ABNORMAL PRESSURES & HYDROGEN SULFIDE

The anticipated bottom hole pressure is +/- 2469 psi based on a 9.0 ppg at 5276' 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.

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9. ANTICIPATED START DATE AND DURATION OF OPERATIONS

Drilling is estimated to commence on January 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.

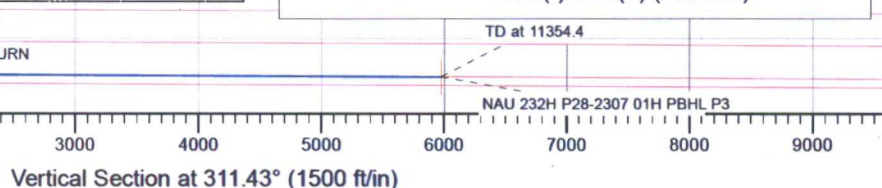
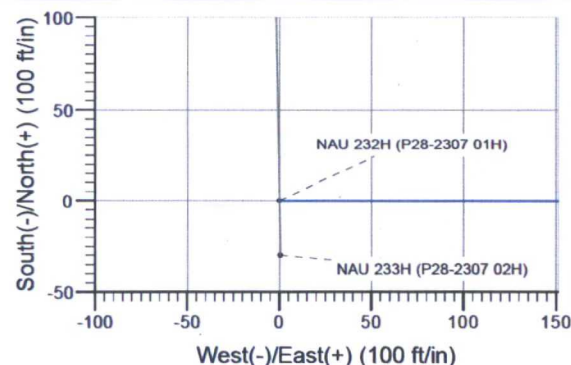
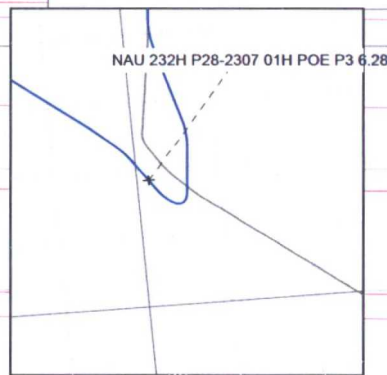
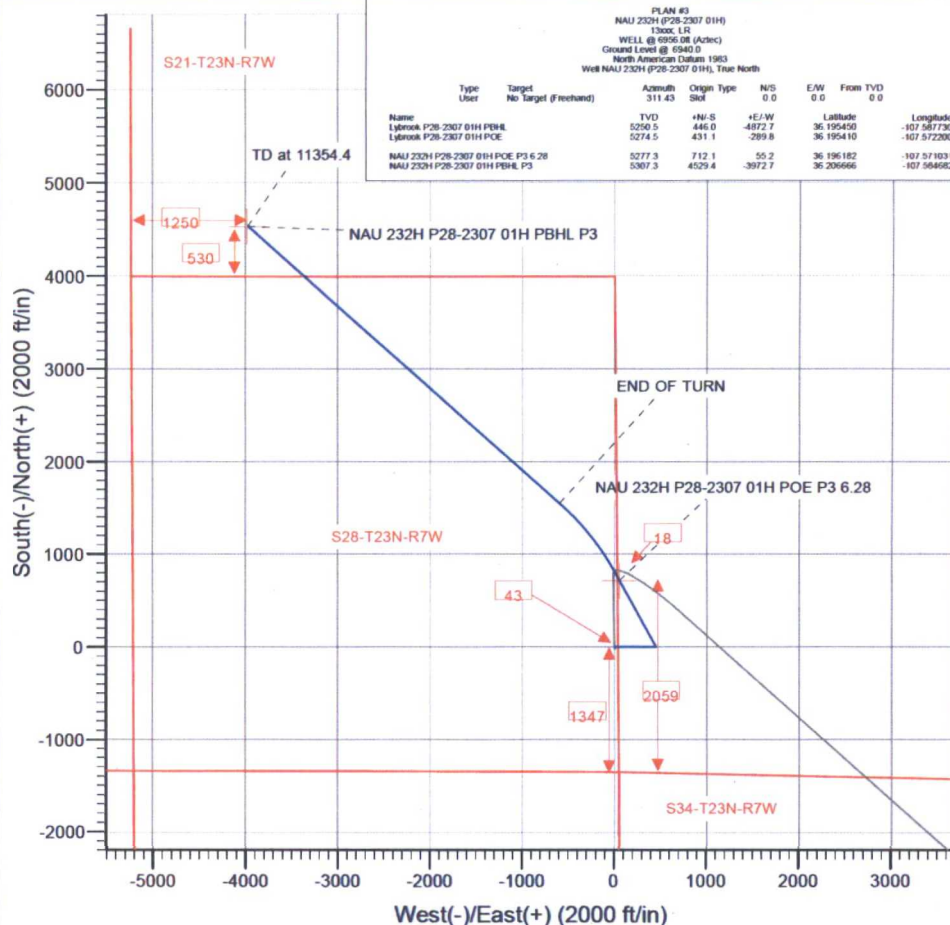
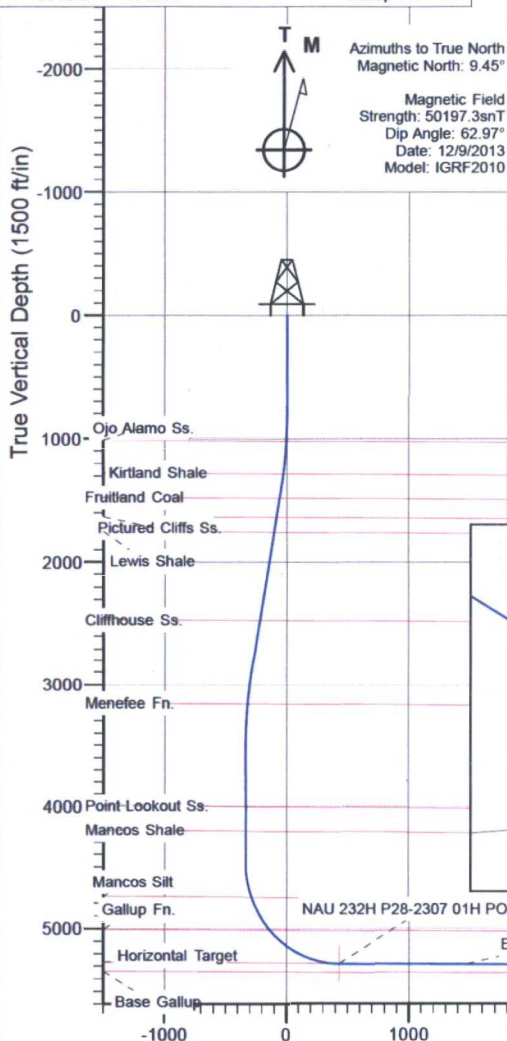
It is anticipated that the drilling of this well will take approximately 10 days.



Project: Sandoval County, NM
Site: S28-T23N-R7W
Well: NAU 232H (P28-2307 01H)
Wellbore: OH
Design: PLAN #3

FORMATION TOP DETAILS

TVDPATH	MDPATH	FORMATION
1021.0	1021.2	Ojo Alamo Ss.
1285.8	1288.2	Kirtland Shale
1482.7	1489.1	Fruitland Coal
1637.5	1647.5	Pictured Cliffs Ss.
1759.4	1772.2	Lewis Shale
2471.8	2500.9	Cliffhouse Ss.
3161.3	3203.8	Menefee Fm.
4008.2	4051.6	Point Lookout Ss.
4209.2	4252.6	Mancos Shale
4750.5	4800.3	Mancos Silt.
5012.3	5109.7	Gallup Fm.



WELL DETAILS: NAU 232H (P28-2307 01H)

			Ground Level:	6940.0		
+N/-S	+E/-W	Northing	Easting	Latitude		Longitude
0.0	0.0	1892622.45	1250576.02	36.194226		-107.571218



Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Site: S28-T23N-R7W
Well: NAU 232H (P28-2307 01H)
Wellbore: OH
Design: PLAN #3

Local Co-ordinate Reference: Well NAU 232H (P28-2307 01H)
TVD Reference: WELL @ 6956.0ft (Aztec)
MD Reference: WELL @ 6956.0ft (Aztec)
North Reference: True
Survey Calculation Method: Minimum Curvature

Project Sandoval County, NM

Map System: US State Plane 1983
Geo Datum: North American Datum 1983
Map Zone: New Mexico Central Zone

System Datum: Mean Sea Level

Site S28-T23N-R7W

Site Position:		Northing:	1,892,622.45 ft	Latitude:	36.194226
From:	Lat/Long	Easting:	1,250,576.02 ft	Longitude:	-107.571218
Position Uncertainty:	0.0 ft	Slot Radius:	13.200 in	Grid Convergence:	-0.78 °

Well NAU 232H (P28-2307 01H)

Well Position	+N/-S	0.0 ft	Northing:	1,892,622.45 ft	Latitude:	36.194226
	+E/-W	0.0 ft	Easting:	1,250,576.02 ft	Longitude:	-107.571218
Position Uncertainty		0.0 ft	Wellhead Elevation:	ft	Ground Level:	6,940.0 ft

Wellbore OH

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	12/9/2013	9.45	62.97	50,197.30232936

Design PLAN #3

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	311.43

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	
800.0	0.00	0.00	800.0	0.0	0.0	0.00	0.00	0.00	0.00	
1,407.5	12.15	90.00	1,402.9	0.0	64.2	2.00	2.00	0.00	90.00	
2,935.8	12.15	90.00	2,897.1	0.0	385.8	0.00	0.00	0.00	0.00	
3,543.3	0.00	0.00	3,500.0	0.0	450.0	2.00	-2.00	0.00	180.00	
4,502.8	0.00	0.00	4,459.5	0.0	450.0	0.00	0.00	0.00	0.00	
5,784.2	89.70	331.00	5,278.0	712.1	55.3	7.00	7.00	0.00	331.00	
5,874.2	89.70	331.00	5,278.5	790.9	11.6	0.00	0.00	0.00	0.00	
6,852.0	89.70	311.44	5,283.6	1,549.4	-597.8	2.00	0.00	-2.00	-90.05	
11,354.4	89.70	311.44	5,307.3	4,529.4	-3,972.7	0.00	0.00	0.00	0.00	NAU 232H P28-2307

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Site: S28-T23N-R7W
Well: NAU 232H (P28-2307 01H)
Wellbore: OH
Design: PLAN #3

Local Co-ordinate Reference: Well NAU 232H (P28-2307 01H)
TVD Reference: WELL @ 6956.0ft (Aztec)
MD Reference: WELL @ 6956.0ft (Aztec)
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	
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	KOP @ 800'
900.0	2.00	90.00	900.0	0.0	1.7	-1.3	2.00	2.00	
1,000.0	4.00	90.00	999.8	0.0	7.0	-5.2	2.00	2.00	
1,021.2	4.42	90.00	1,021.0	0.0	8.5	-6.4	2.00	2.00	Ojo Alamo Ss.
1,100.0	6.00	90.00	1,099.5	0.0	15.7	-11.8	2.00	2.00	
1,200.0	8.00	90.00	1,198.7	0.0	27.9	-20.9	2.00	2.00	
1,288.2	9.76	90.00	1,285.8	0.0	41.5	-31.1	2.00	2.00	Kirtland Shale
1,300.0	10.00	90.00	1,297.5	0.0	43.5	-32.6	2.00	2.00	
1,400.0	12.00	90.00	1,395.6	0.0	62.6	-46.9	2.00	2.00	
1,407.5	12.15	90.00	1,402.9	0.0	64.2	-48.1	2.00	2.00	EOB; INC=12.15°
1,489.1	12.15	90.00	1,482.7	0.0	81.3	-61.0	0.00	0.00	Fruitland Coal
1,500.0	12.15	90.00	1,493.4	0.0	83.6	-62.7	0.00	0.00	
1,600.0	12.15	90.00	1,591.1	0.0	104.7	-78.5	0.00	0.00	
1,647.5	12.15	90.00	1,637.5	0.0	114.7	-86.0	0.00	0.00	Pictured Cliffs Ss.
1,700.0	12.15	90.00	1,688.9	0.0	125.7	-94.3	0.00	0.00	
1,772.2	12.15	90.00	1,759.4	0.0	140.9	-105.7	0.00	0.00	Lewis Shale
1,800.0	12.15	90.00	1,786.7	0.0	146.8	-110.0	0.00	0.00	
1,900.0	12.15	90.00	1,884.4	0.0	167.8	-125.8	0.00	0.00	
2,000.0	12.15	90.00	1,982.2	0.0	188.9	-141.6	0.00	0.00	
2,100.0	12.15	90.00	2,079.9	0.0	209.9	-157.4	0.00	0.00	
2,200.0	12.15	90.00	2,177.7	0.0	231.0	-173.2	0.00	0.00	
2,300.0	12.15	90.00	2,275.5	0.0	252.0	-188.9	0.00	0.00	
2,400.0	12.15	90.00	2,373.2	0.0	273.1	-204.7	0.00	0.00	
2,500.0	12.15	90.00	2,471.0	0.0	294.1	-220.5	0.00	0.00	
2,500.9	12.15	90.00	2,471.8	0.0	294.3	-220.6	0.00	0.00	Cliffhouse Ss.
2,600.0	12.15	90.00	2,568.7	0.0	315.2	-236.3	0.00	0.00	
2,700.0	12.15	90.00	2,666.5	0.0	336.2	-252.1	0.00	0.00	
2,800.0	12.15	90.00	2,764.3	0.0	357.2	-267.8	0.00	0.00	
2,900.0	12.15	90.00	2,862.0	0.0	378.3	-283.6	0.00	0.00	
2,935.8	12.15	90.00	2,897.1	0.0	385.8	-289.3	0.00	0.00	Start Drop -2.00
3,000.0	10.87	90.00	2,959.9	0.0	398.6	-298.9	2.00	-2.00	
3,100.0	8.87	90.00	3,058.4	0.0	415.8	-311.7	2.00	-2.00	
3,200.0	6.87	90.00	3,157.5	0.0	429.5	-322.0	2.00	-2.00	
3,203.8	6.79	90.00	3,161.3	0.0	429.9	-322.3	2.00	-2.00	Menefee Fn.
3,300.0	4.87	90.00	3,257.0	0.0	439.7	-329.7	2.00	-2.00	
3,400.0	2.87	90.00	3,356.7	0.0	446.4	-334.7	2.00	-2.00	
3,500.0	0.87	90.00	3,456.7	0.0	449.7	-337.1	2.00	-2.00	
3,543.3	0.00	0.00	3,500.0	0.0	450.0	-337.4	2.00	-2.00	EOD; INC=0°
3,600.0	0.00	0.00	3,556.7	0.0	450.0	-337.4	0.00	0.00	
3,700.0	0.00	0.00	3,656.7	0.0	450.0	-337.4	0.00	0.00	
3,800.0	0.00	0.00	3,756.7	0.0	450.0	-337.4	0.00	0.00	
3,900.0	0.00	0.00	3,856.7	0.0	450.0	-337.4	0.00	0.00	
4,000.0	0.00	0.00	3,956.7	0.0	450.0	-337.4	0.00	0.00	
4,051.6	0.00	0.00	4,008.2	0.0	450.0	-337.4	0.00	0.00	Point Lookout Ss.

Cathedral Energy Services

Planning Report

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Wellbore: OH
Design: PLAN #3

Local Co-ordinate Reference:
TVD Reference:
MD Reference:
North Reference:
Survey Calculation Method:

Well NAU 232H (P28-2307 01H)
WELL @ 6956.0ft (Aztec)
WELL @ 6956.0ft (Aztec)
True
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
4,100.0	0.00	0.00	4,056.7	0.0	450.0	-337.4	0.00	0.00	
4,200.0	0.00	0.00	4,156.7	0.0	450.0	-337.4	0.00	0.00	
4,252.6	0.00	0.00	4,209.2	0.0	450.0	-337.4	0.00	0.00	Mancos Shale
4,300.0	0.00	0.00	4,256.7	0.0	450.0	-337.4	0.00	0.00	
4,400.0	0.00	0.00	4,356.7	0.0	450.0	-337.4	0.00	0.00	
4,500.0	0.00	0.00	4,456.7	0.0	450.0	-337.4	0.00	0.00	
4,502.8	0.00	0.00	4,459.5	0.0	450.0	-337.4	0.00	0.00	Start Build 7.00
4,600.0	6.80	331.00	4,556.5	5.0	447.2	-332.0	7.00	7.00	
4,700.0	13.80	331.00	4,654.8	20.7	438.5	-315.1	7.00	7.00	
4,800.0	20.80	331.00	4,750.2	46.7	424.1	-287.1	7.00	7.00	
4,800.3	20.83	331.00	4,750.5	46.8	424.1	-287.0	7.00	7.00	Mancos Silt
4,900.0	27.80	331.00	4,841.3	82.6	404.2	-248.4	7.00	7.00	
5,000.0	34.80	331.00	4,926.7	128.1	379.0	-199.4	7.00	7.00	
5,100.0	41.80	331.00	5,005.1	182.2	349.0	-141.1	7.00	7.00	
5,109.7	42.48	331.00	5,012.3	187.9	345.8	-134.9	7.00	7.00	Gallup Fn.
5,200.0	48.80	331.00	5,075.4	244.4	314.5	-74.1	7.00	7.00	
5,300.0	55.80	331.00	5,136.5	313.5	276.2	0.4	7.00	7.00	
5,400.0	62.80	331.00	5,187.5	388.7	234.5	81.3	7.00	7.00	
5,500.0	69.80	331.00	5,227.7	468.7	190.2	167.6	7.00	7.00	
5,600.0	76.80	331.00	5,256.4	552.4	143.8	257.8	7.00	7.00	
5,700.0	83.80	331.00	5,273.2	638.6	96.0	350.6	7.00	7.00	
5,784.2	89.70	331.00	5,278.0	712.1	55.3	429.8	7.00	7.00	LP @ 5278' TVD; 89.7°
5,800.0	89.70	331.00	5,278.1	725.9	47.6	444.6	0.00	0.00	
5,874.2	89.70	331.00	5,278.5	790.9	11.6	514.6	0.00	0.00	START TURN
5,900.0	89.70	330.48	5,278.6	813.3	-1.0	538.9	2.00	0.00	
6,000.0	89.70	328.48	5,279.1	899.5	-51.7	634.0	2.00	0.00	
6,100.0	89.70	326.48	5,279.7	983.8	-105.5	730.1	2.00	0.00	
6,200.0	89.70	324.48	5,280.2	1,066.2	-162.1	827.1	2.00	0.00	
6,300.0	89.70	322.48	5,280.7	1,146.5	-221.6	924.9	2.00	0.00	
6,400.0	89.70	320.48	5,281.3	1,224.8	-283.9	1,023.3	2.00	0.00	
6,500.0	89.70	318.48	5,281.8	1,300.8	-348.9	1,122.3	2.00	0.00	
6,600.0	89.70	316.48	5,282.3	1,374.5	-416.4	1,221.8	2.00	0.00	
6,700.0	89.70	314.48	5,282.8	1,445.8	-486.6	1,321.5	2.00	0.00	
6,800.0	89.70	312.48	5,283.4	1,514.6	-559.1	1,421.4	2.00	0.00	
6,852.0	89.70	311.44	5,283.6	1,549.4	-597.8	1,473.4	2.00	0.00	END OF TURN
6,900.0	89.70	311.44	5,283.9	1,581.2	-633.7	1,521.4	0.00	0.00	
7,000.0	89.70	311.44	5,284.4	1,647.3	-708.7	1,621.4	0.00	0.00	
7,100.0	89.70	311.44	5,284.9	1,713.5	-783.7	1,721.4	0.00	0.00	
7,200.0	89.70	311.44	5,285.5	1,779.7	-858.6	1,821.4	0.00	0.00	
7,300.0	89.70	311.44	5,286.0	1,845.9	-933.6	1,921.4	0.00	0.00	
7,400.0	89.70	311.44	5,286.5	1,912.1	-1,008.5	2,021.4	0.00	0.00	
7,500.0	89.70	311.44	5,287.0	1,978.3	-1,083.5	2,121.4	0.00	0.00	
7,600.0	89.70	311.44	5,287.6	2,044.5	-1,158.5	2,221.4	0.00	0.00	
7,700.0	89.70	311.44	5,288.1	2,110.7	-1,233.4	2,321.4	0.00	0.00	
7,800.0	89.70	311.44	5,288.6	2,176.8	-1,308.4	2,421.4	0.00	0.00	
7,900.0	89.70	311.44	5,289.1	2,243.0	-1,383.3	2,521.4	0.00	0.00	
8,000.0	89.70	311.44	5,289.7	2,309.2	-1,458.3	2,621.4	0.00	0.00	
8,100.0	89.70	311.44	5,290.2	2,375.4	-1,533.3	2,721.4	0.00	0.00	
8,200.0	89.70	311.44	5,290.7	2,441.6	-1,608.2	2,821.4	0.00	0.00	
8,300.0	89.70	311.44	5,291.2	2,507.8	-1,683.2	2,921.4	0.00	0.00	
8,400.0	89.70	311.44	5,291.8	2,574.0	-1,758.1	3,021.4	0.00	0.00	
8,500.0	89.70	311.44	5,292.3	2,640.2	-1,833.1	3,121.4	0.00	0.00	

Cathedral Energy Services

Planning Report

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Well NAU 232H (P28-2307 01H)
WELL @ 6956.0ft (Aztec)
WELL @ 6956.0ft (Aztec)
True
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
8,600.0	89.70	311.44	5,292.8	2,706.4	-1,908.1	3,221.4	0.00	0.00	
8,700.0	89.70	311.44	5,293.3	2,772.5	-1,983.0	3,321.4	0.00	0.00	
8,800.0	89.70	311.44	5,293.9	2,838.7	-2,058.0	3,421.4	0.00	0.00	
8,900.0	89.70	311.44	5,294.4	2,904.9	-2,132.9	3,521.4	0.00	0.00	
9,000.0	89.70	311.44	5,294.9	2,971.1	-2,207.9	3,621.4	0.00	0.00	
9,100.0	89.70	311.44	5,295.4	3,037.3	-2,282.8	3,721.4	0.00	0.00	
9,200.0	89.70	311.44	5,296.0	3,103.5	-2,357.8	3,821.4	0.00	0.00	
9,300.0	89.70	311.44	5,296.5	3,169.7	-2,432.8	3,921.4	0.00	0.00	
9,400.0	89.70	311.44	5,297.0	3,235.9	-2,507.7	4,021.4	0.00	0.00	
9,500.0	89.70	311.44	5,297.5	3,302.0	-2,582.7	4,121.4	0.00	0.00	
9,600.0	89.70	311.44	5,298.1	3,368.2	-2,657.6	4,221.4	0.00	0.00	
9,700.0	89.70	311.44	5,298.6	3,434.4	-2,732.6	4,321.4	0.00	0.00	
9,800.0	89.70	311.44	5,299.1	3,500.6	-2,807.6	4,421.4	0.00	0.00	
9,900.0	89.70	311.44	5,299.6	3,566.8	-2,882.5	4,521.4	0.00	0.00	
10,000.0	89.70	311.44	5,300.2	3,633.0	-2,957.5	4,621.4	0.00	0.00	
10,100.0	89.70	311.44	5,300.7	3,699.2	-3,032.4	4,721.4	0.00	0.00	
10,200.0	89.70	311.44	5,301.2	3,765.4	-3,107.4	4,821.4	0.00	0.00	
10,300.0	89.70	311.44	5,301.7	3,831.6	-3,182.4	4,921.4	0.00	0.00	
10,400.0	89.70	311.44	5,302.3	3,897.7	-3,257.3	5,021.4	0.00	0.00	
10,500.0	89.70	311.44	5,302.8	3,963.9	-3,332.3	5,121.4	0.00	0.00	
10,600.0	89.70	311.44	5,303.3	4,030.1	-3,407.2	5,221.4	0.00	0.00	
10,700.0	89.70	311.44	5,303.8	4,096.3	-3,482.2	5,321.4	0.00	0.00	
10,800.0	89.70	311.44	5,304.4	4,162.5	-3,557.2	5,421.4	0.00	0.00	
10,900.0	89.70	311.44	5,304.9	4,228.7	-3,632.1	5,521.4	0.00	0.00	
11,000.0	89.70	311.44	5,305.4	4,294.9	-3,707.1	5,621.4	0.00	0.00	
11,100.0	89.70	311.44	5,305.9	4,361.1	-3,782.0	5,721.4	0.00	0.00	
11,200.0	89.70	311.44	5,306.5	4,427.2	-3,857.0	5,821.4	0.00	0.00	
11,300.0	89.70	311.44	5,307.0	4,493.4	-3,931.9	5,921.4	0.00	0.00	
11,354.4	89.70	311.44	5,307.3	4,529.4	-3,972.7	5,975.7	0.00	0.00	TD at 11354.4

Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (ft)	+N/-S (ft)	+E/-W (ft)	Northing (ft)	Easting (ft)	Latitude	Longitude
Lybrook P28-2307 01H I - hit/miss target - Shape	0.00	0.00	5,274.5	431.1	-289.8	1,893,057.42	1,250,292.13	36.195410	-107.572200
- plan misses target center by 438.1ft at 5705.6ft MD (5273.8 TVD, 643.5 N, 93.3 E)									
- Point									
NAU 232H P28-2307 01 - plan misses target center by 0.7ft at 5784.3ft MD (5278.0 TVD, 712.2 N, 55.2 E)	0.00	0.00	5,277.3	712.1	55.2	1,893,333.77	1,250,640.90	36.196182	-107.571031
- Point									
NAU 232H P28-2307 01 - plan misses target center by 243.9ft at 5685.2ft MD (5271.5 TVD, 625.7 N, 103.2 E)	0.00	0.00	5,277.3	743.1	316.9	1,893,361.15	1,250,903.05	36.196267	-107.570144
- Point									
Lybrook P28-2307 01H I - plan misses target center by 3656.9ft at 9326.0ft MD (5296.6 TVD, 3186.9 N, -2452.3 E)	0.00	0.00	5,250.5	446.0	-4,872.7	1,893,134.81	1,245,709.80	36.195450	-107.587730
- Point									
NAU 232H P28-2307 01 - plan hits target center - Point	0.00	0.00	5,307.3	4,529.4	-3,972.7	1,897,205.55	1,246,665.38	36.206666	-107.584682

Cathedral Energy Services

Planning Report

Database: USA EDM 5000 Multi Users DB
 Company: EnCana Oil & Gas (USA) Inc
 Project: Sandoval County, NM
 Site: S28-T23N-R7W
 Well: NAU 232H (P28-2307 01H)
 Wellbore: OH
 Design: PLAN #3

Local Co-ordinate Reference:
 TVD Reference:
 MD Reference:
 North Reference:
 Survey Calculation Method:

Well NAU 232H (P28-2307 01H)
 WELL @ 6956.0ft (Aztec)
 WELL @ 6956.0ft (Aztec)
 True
 Minimum Curvature

Formations

Measured Depth (ft)	Vertical Depth (ft)	Name	Lithology	Dip (°)	Dip Direction (°)
1,021.2	1,021.0	Ojo Alamo Ss.		0.30	311.43
1,288.2	1,286.0	Kirtland Shale		0.30	311.43
1,489.1	1,483.0	Fruitland Coal		0.30	311.43
1,647.5	1,638.0	Pictured Cliffs Ss.		0.30	311.43
1,772.2	1,760.0	Lewis Shale		0.30	311.43
2,500.9	2,473.0	Cliffhouse Ss.		0.30	311.43
3,203.8	3,163.0	Menefee Fn.		0.30	311.43
4,051.6	4,010.0	Point Lookout Ss.		0.30	311.43
4,252.6	4,211.0	Mancos Shale		0.30	311.43
4,800.3	4,752.0	Mancos Silt		0.30	311.43
5,109.7	5,013.0	Gallup Fn.		0.30	311.43

Plan Annotations

Measured Depth (ft)	Vertical Depth (ft)	Local Coordinates		Comment
		+N/-S (ft)	+E/-W (ft)	
800.0	800.0	0.0	0.0	KOP @ 800'
1,407.5	1,402.9	0.0	64.2	EOB; INC=12.15°
2,935.8	2,897.1	0.0	385.8	Start Drop -2.00
3,543.3	3,500.0	0.0	450.0	EOD; INC=0°
4,502.8	4,459.5	0.0	450.0	Start Build 7.00
5,784.2	5,278.0	712.1	55.3	LP @ 5278' TVD; 89.7°
5,874.2	5,278.5	790.9	11.6	START TURN
6,852.0	5,283.6	1,549.4	-597.8	END OF TURN
11,354.4	5,307.3	4,529.4	-3,972.7	TD at 11354.4

EnCana Oil & Gas (USA) Inc

Sandoval County, NM

S28-T23N-R7W

NAU 232H (P28-2307 01H)

OH

PLAN #3

Anticollision Report

18 May, 2017

Cathedral Energy Services

Anticollision Report

Company:	EnCana Oil & Gas (USA) Inc	Local Co-ordinate Reference:	Well NAU 232H (P28-2307 01H)
Project:	Sandoval County, NM	TVD Reference:	WELL @ 6956.0ft (Aztec)
Reference Site:	S28-T23N-R7W	MD Reference:	WELL @ 6956.0ft (Aztec)
Site Error:	0.0ft	North Reference:	True
Reference Well:	NAU 232H (P28-2307 01H)	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0ft	Output errors are at	2.00 sigma
Reference Wellbore	OH	Database:	USA EDM 5000 Multi Users DB
Reference Design:	PLAN #3	Offset TVD Reference:	Offset Datum

Reference	PLAN #3
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria
Interpolation Method:	MD Interval 100.0ft
Depth Range:	Unlimited
Results Limited by:	Maximum center-center distance of 1,404.0ft
Warning Levels Evaluated at:	2.00 Sigma
Error Model:	Systematic Ellipse
Scan Method:	Closest Approach 3D
Error Surface:	Elliptical Conic

Survey Tool Program	Date	5/18/2017
From (ft)	To (ft)	Survey (Wellbore)
0.0	11,354.4	PLAN #3 (OH)
		Tool Name
		MWD+HDGM
		Description
		OWSG MWD + HDGM

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						
S28-T23N-R7W						
NAU 233H (P28-2307 02H) - OH - PLAN #3	1,052.8	1,054.3	13.6	6.4	1.893	CC, ES, SF

Cathedral Energy Services

Anticollision Report

Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Reference Site: S28-T23N-R7W
Site Error: 0.0ft
Reference Well: NAU 232H (P28-2307 01H)
Well Error: 0.0ft
Reference Wellbore: OH
Reference Design: PLAN #3

Local Co-ordinate Reference: Well NAU 232H (P28-2307 01H)
TVD Reference: WELL @ 6956.0ft (Aztec)
MD Reference: WELL @ 6956.0ft (Aztec)
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 S28-T23N-R7W - NAU 233H (P28-2307 02H) - OH - PLAN #3														Offset Site Error:	0.0 ft
Survey Program: 0-MWD+HDGM														Offset Well Error:	0.0 ft
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference	Offset	Semi Major Axis (ft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (ft)	+E/-W (ft)	Distance Between Centres (ft)	Between Ellipses (ft)	Total Uncertainty Axis	Separation Factor	Warning	
0.0	0.0	0.0	0.0	0.0	0.0	178.87		-29.9	0.6	29.9					
100.0	100.0	100.0	100.0	0.2	0.2	178.87		-29.9	0.6	29.9	29.6	0.30	99.165		
200.0	200.0	200.0	200.0	0.5	0.5	178.87		-29.9	0.6	29.9	28.8	1.02	29.330		
300.0	300.0	300.0	300.0	0.9	0.9	178.87		-29.9	0.6	29.9	28.1	1.74	17.210		
400.0	400.0	400.0	400.0	1.2	1.2	178.87		-29.9	0.6	29.9	27.4	2.45	12.178		
500.0	500.0	500.0	500.0	1.6	1.6	178.87		-29.9	0.6	29.9	26.7	3.17	9.423		
600.0	600.0	600.0	600.0	1.9	1.9	178.87		-29.9	0.6	29.9	26.0	3.89	7.684		
700.0	700.0	700.0	700.0	2.3	2.3	178.87		-29.9	0.6	29.9	25.3	4.60	6.487		
800.0	800.0	801.0	801.0	2.7	2.7	178.86		-28.1	0.6	28.1	22.8	5.34	5.257		
900.0	900.0	901.7	901.6	3.0	3.0	93.35		-22.8	0.5	22.8	16.7	6.10	3.743		
1,000.0	999.8	1,001.9	1,001.3	3.4	3.4	115.79		-14.0	0.3	15.5	8.7	6.84	2.272		
1,052.8	1,052.5	1,054.3	1,053.4	3.5	3.6	144.01		-8.0	0.2	13.6	6.4	7.17	1.893 CC, ES, SF		
1,100.0	1,099.5	1,101.0	1,099.7	3.7	3.7	173.23		-1.8	0.1	15.7	8.2	7.45	2.106		
1,200.0	1,198.7	1,198.8	1,196.3	4.1	4.1	-153.88		13.4	-0.2	31.2	23.0	8.22	3.797		
1,300.0	1,297.5	1,294.9	1,290.6	4.4	4.5	-143.06		31.7	-0.5	54.6	45.7	8.99	6.079		
1,400.0	1,395.6	1,389.1	1,382.5	4.8	4.9	-138.43		52.6	-0.8	83.5	73.7	9.75	8.564		
1,500.0	1,493.4	1,483.6	1,474.2	5.2	5.3	-136.29		75.5	-1.2	115.2	104.7	10.47	10.996		
1,600.0	1,591.1	1,578.4	1,566.2	5.7	5.7	-135.09		98.4	-1.6	147.0	135.8	11.20	13.118		
1,700.0	1,688.9	1,673.2	1,658.1	6.1	6.1	-134.31		121.3	-2.0	178.8	166.9	11.95	14.969		
1,800.0	1,786.7	1,768.0	1,750.1	6.5	6.5	-133.77		144.2	-2.4	210.7	198.0	12.70	16.593		
1,900.0	1,884.4	1,862.7	1,842.0	7.0	6.9	-133.37		167.1	-2.8	242.6	229.1	13.46	18.024		
2,000.0	1,982.2	1,957.5	1,934.0	7.4	7.4	-133.07		190.0	-3.2	274.5	260.2	14.23	19.293		
2,100.0	2,079.9	2,052.3	2,026.0	7.9	7.8	-132.83		213.0	-3.6	306.4	291.4	15.00	20.424		
2,200.0	2,177.7	2,147.0	2,117.9	8.3	8.2	-132.63		235.9	-4.0	338.3	322.5	15.78	21.436		
2,300.0	2,275.5	2,241.8	2,209.9	8.8	8.7	-132.47		258.8	-4.4	370.2	353.6	16.56	22.347		
2,400.0	2,373.2	2,336.6	2,301.8	9.2	9.1	-132.33		281.7	-4.8	402.1	384.7	17.35	23.170		
2,500.0	2,471.0	2,431.3	2,393.8	9.7	9.5	-132.21		304.6	-5.2	434.0	415.8	18.15	23.917		
2,600.0	2,568.7	2,526.1	2,485.7	10.1	10.0	-132.11		327.5	-5.6	465.9	447.0	18.94	24.598		
2,700.0	2,666.5	2,620.9	2,577.7	10.6	10.4	-132.02		350.5	-6.0	497.8	478.1	19.74	25.220		
2,800.0	2,764.3	2,715.6	2,669.6	11.1	10.9	-131.95		373.4	-6.4	529.7	509.2	20.54	25.791		
2,900.0	2,862.0	2,810.4	2,761.6	11.5	11.3	-131.88		396.3	-6.8	561.6	540.3	21.34	26.316		
3,000.0	2,959.9	2,905.3	2,853.7	12.0	11.8	-132.08		419.3	-7.2	593.1	570.9	22.14	26.784		
3,100.0	3,058.4	3,000.9	2,946.4	12.4	12.2	-132.19		442.4	-7.6	622.5	599.5	22.93	27.142		
3,200.0	3,157.5	3,096.9	3,039.6	12.8	12.7	-132.07		465.6	-8.0	649.6	625.9	23.71	27.397		
3,300.0	3,257.0	3,193.4	3,133.2	13.2	13.1	-131.72		488.9	-8.4	674.6	650.1	24.48	27.561		
3,400.0	3,356.7	3,290.2	3,227.1	13.6	13.6	-131.18		512.3	-8.8	697.5	672.3	25.23	27.647		
3,500.0	3,456.7	3,387.1	3,321.2	13.9	14.0	-130.45		535.8	-9.2	718.3	692.3	25.96	27.667		
3,600.0	3,556.7	3,484.1	3,415.3	14.2	14.5	-39.42		559.2	-9.6	737.5	710.8	26.68	27.644		
3,700.0	3,656.7	3,581.2	3,509.5	14.5	15.0	-38.29		582.7	-10.0	756.8	729.4	27.39	27.627		
3,800.0	3,756.7	3,678.2	3,603.6	14.8	15.4	-37.22		606.2	-10.4	776.4	748.3	28.11	27.622		
3,900.0	3,856.7	3,775.2	3,697.8	15.1	15.9	-36.20		629.6	-10.8	796.3	767.4	28.82	27.627		
4,000.0	3,956.7	3,872.3	3,791.9	15.5	16.4	-35.23		653.1	-11.2	816.3	786.8	29.53	27.641		
4,100.0	4,056.7	3,969.3	3,886.1	15.8	16.8	-34.31		676.5	-11.6	836.6	806.4	30.24	27.662		
4,200.0	4,156.7	4,066.3	3,980.2	16.1	17.3	-33.43		700.0	-12.0	857.1	826.2	30.96	27.689		
4,300.0	4,256.7	4,163.4	4,074.4	16.4	17.8	-32.59		723.5	-12.4	877.8	846.1	31.67	27.721		
4,400.0	4,356.7	4,260.4	4,168.5	16.7	18.2	-31.79		746.9	-12.9	898.6	866.3	32.38	27.757		
4,500.0	4,456.7	4,357.4	4,262.7	17.1	18.7	-31.02		770.4	-13.3	919.7	886.6	33.09	27.797		
4,600.0	4,556.5	4,451.3	4,353.8	17.4	19.6	-30.15		794.2	-13.7	940.3	906.3	33.80	27.837		
4,700.0	4,654.8	4,549.7	4,451.9	17.7	20.3	-29.28		818.0	-14.1	960.9	926.9	34.51	27.877		
4,800.0	4,752.2	4,647.0	4,549.1	17.9	20.8	-28.41		841.8	-14.5	981.5	947.5	35.22	27.917		
4,900.0	4,841.3	4,735.7	4,631.3	18.2	21.4	-27.54		865.6	-14.9	1002.1	968.1	35.93	27.957		
5,000.0	4,926.7	4,820.9	4,716.4	18.4	21.9	-26.67		889.5	-15.3	1022.7	988.7	36.64	27.997		

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: S28-T23N-R7W
Site Error: 0.0ft
Reference Well: NAU 232H (P28-2307 01H)
Well Error: 0.0ft
Reference Wellbore: OH
Reference Design: PLAN #3

Local Co-ordinate Reference: Well NAU 232H (P28-2307 01H)
TVD Reference: WELL @ 6956.0ft (Aztec)
MD Reference: WELL @ 6956.0ft (Aztec)
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 S28-T23N-R7W - NAU 233H (P28-2307 02H) - OH - PLAN #3													Offset Site Error:	0.0 ft
Survey Program: 0-MWD+HDGM													Offset Well Error:	0.0 ft
Reference		Offset		Semi Major Axis		Highside Toolface (°)	Offset Wellbore Centre		Distance		Total Uncertainty Axis	Separation Factor	Warning	
Measured Depth (ft)	Vertical Depth (ft)	Measured Depth (ft)	Vertical Depth (ft)	Reference (ft)	Offset (ft)		+N/-S (ft)	+E/-W (ft)	Between Centres (ft)	Between Ellipses (ft)				
5,100.0	5,005.1	5,633.6	5,245.0	18.7	23.1	90.93	524.2	538.4	458.7	425.4	33.25	13.794		
5,200.0	5,075.4	5,571.5	5,226.5	18.9	22.3	87.76	560.8	491.7	392.9	356.7	36.22	10.849		
5,300.0	5,136.5	5,513.6	5,205.3	19.3	21.7	83.30	593.5	448.9	336.0	297.0	39.06	8.604		
5,400.0	5,187.5	5,458.3	5,181.6	19.9	21.3	77.22	623.1	408.8	292.1	251.0	41.14	7.102		
5,500.0	5,227.7	5,404.8	5,155.6	20.7	21.1	69.44	650.3	370.7	266.0	224.6	41.45	6.419		
5,572.9	5,249.8	5,366.6	5,135.2	21.5	21.0	62.89	668.8	344.2	260.3	220.1	40.22	6.472		
5,600.0	5,256.4	5,350.0	5,125.9	21.8	21.0	59.87	676.5	332.8	261.1	221.7	39.38	6.630		
5,700.0	5,273.2	5,300.0	5,096.3	22.9	20.9	50.45	698.9	299.3	276.2	239.9	36.28	7.613		
5,800.0	5,278.1	5,250.0	5,064.3	24.3	20.9	41.52	719.6	267.0	306.4	272.7	33.70	9.091		
5,900.0	5,278.6	5,200.0	5,030.1	25.7	20.9	34.37	738.6	235.9	351.3	319.4	31.99	10.982		
6,000.0	5,279.1	5,161.0	5,001.9	27.2	20.9	28.29	752.3	212.6	410.3	378.6	31.77	12.918		
6,100.0	5,279.7	5,123.2	4,973.6	28.9	20.8	22.50	764.5	190.9	479.2	447.3	31.95	14.998		
6,200.0	5,280.2	5,089.2	4,947.0	30.7	20.8	17.24	774.6	172.1	554.8	522.4	32.40	17.120		
6,300.0	5,280.7	5,050.0	4,915.5	32.6	20.8	11.81	785.1	151.4	635.0	602.4	32.61	19.474		
6,400.0	5,281.3	5,030.5	4,899.4	34.6	20.7	7.75	789.9	141.5	718.3	684.8	33.47	21.458		
6,500.0	5,281.8	5,000.0	4,873.7	36.6	20.7	3.11	796.9	126.5	804.0	770.2	33.83	23.764		
6,600.0	5,282.3	4,981.9	4,858.3	38.8	20.7	-1.03	800.6	118.0	891.5	857.0	34.45	25.876		
6,700.0	5,282.8	4,950.0	4,830.5	41.0	20.6	-5.43	806.7	103.4	980.4	945.8	34.65	28.295		
6,800.0	5,283.4	4,950.0	4,830.5	43.2	20.6	-9.46	806.7	103.4	1,070.2	1,034.7	35.47	30.174		
6,900.0	5,283.9	4,923.3	4,806.8	45.5	20.6	-11.62	811.1	91.9	1,160.7	1,125.0	35.66	32.546		
7,000.0	5,284.4	4,900.0	4,785.9	47.9	20.5	-11.57	814.5	82.2	1,252.1	1,216.2	35.88	34.897		
7,100.0	5,284.9	4,900.0	4,785.9	50.3	20.5	-11.57	814.5	82.2	1,344.3	1,307.9	36.40	36.928		

Cathedral Energy Services

Anticollision Report

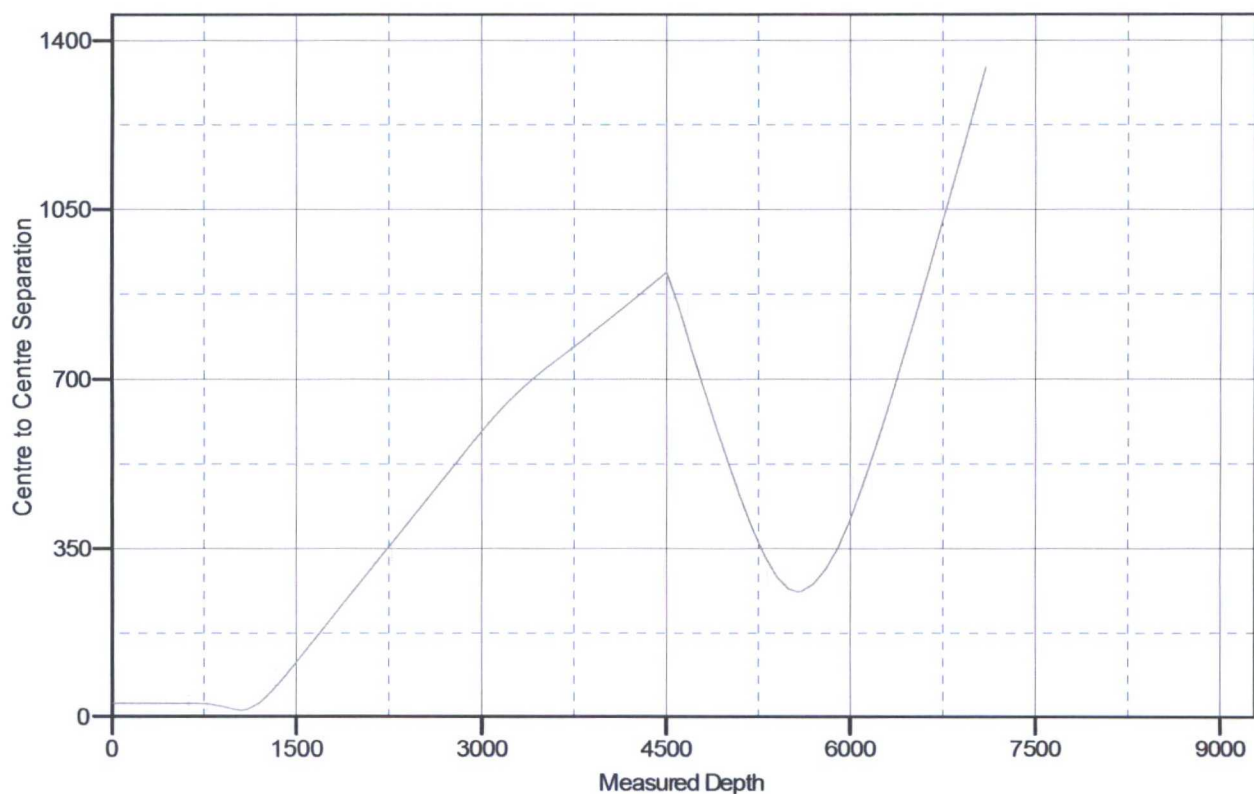
Company: EnCana Oil & Gas (USA) Inc
Project: Sandoval County, NM
Reference Site: S28-T23N-R7W
Site Error: 0.0ft
Reference Well: NAU 232H (P28-2307 01H)
Well Error: 0.0ft
Reference Wellbore: OH
Reference Design: PLAN #3

Local Co-ordinate Reference: Well NAU 232H (P28-2307 01H)
TVD Reference: WELL @ 6956.0ft (Aztec)
MD Reference: WELL @ 6956.0ft (Aztec)
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 WELL @ 6956.0ft (Aztec)
 Offset Depths are relative to Offset Datum
 Central Meridian is -106.250000 °

Coordinates are relative to: NAU 232H (P28-2307 01H)
 Coordinate System is US State Plane 1983, New Mexico Central Zone
 Grid Convergence at Surface is: -0.78°

Ladder Plot



LEGEND

 NAU 233H (P28-2307 02H), OH, PLAN #3 V0

LOC: 1347' FSL, 43' FEL Sec 28 23N 07W County: Sandoval WELL: NAU 232H			Encana Natural Gas WELL SUMMARY			ENG: L. Hubbard RIG: Unassigned GLE: 6940 RKBE: 6956			6/29/17
MWD LWD	OPEN HOLE LOGGING	FORM	DEPTH			HOLE SIZE	CASING SPECS	MW MUD TYPE	DEVIATION INFORMATION
			TVD	MD					
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 8.3-8.2	Vertical <1°
Survey Every 60'-120', updating anticollision report after surveys. Stop operations and contact drilling engineer if separation factor approaches 1.5 Surveys every 30' through the curve	No OH logs MWD GR Mud Log	Ojo Alamo Kirtland Shale Fruitland Coal Pictured Cliffs Ss. Lewys Shale Cliffhouse Ss. Menefee Fn. Point Lookout Ss. Mancos Shale KOP Mancos Silt Gallup Fn. 7" Csg	1,021 1,286 1,483 1,638 1,760 2,473 3,163 4,010 4,211 4,459 4,752 5,013 5,228	4,503 5,500'		8 3/4	7" 26ppf J55 LTC TOC @ surface (100% OH excess) Stage 1 Total: 910sks	Fresh Wtr 8.3-10	Directional 6.2°
Surveys every stand to TD unless directed otherwise by Geologist MWD Gamma Directional	No OH Logs	Horizontal Target TD Base Gallup	5,276 5,307 5,347	11,354		6 1/8	200' overlap at liner top 5854' Drilled Lateral TOC @ Top of Liner (30% open hole excess)	WBM 8.3-10	Horz Inc/TVD 89.7°deg/5276' TD = 11354.4' MD