

**ATTACHMENT TO FORM 3160-3  
10 POINT DRILLING PLAN  
Nichols 31-11 (PL31SW)**

**1. OPERATOR:** EnCana Oil & Gas (USA).  
**WELL NAME:** Nichols 31-11 (PL31SW)

**LOCATION (SHL):** NE SW 31-9S-95W  
2141 FSL 1786 FWL  
Mesa County, CO

**LOCATION (BHL):** SAME

**2. ESTIMATED TOPS OF GEOLOGICAL MARKERS (MD/TVD)**

Formation	TVD
OHIO CREEK (Top Kmv)	1362
WILLIAMS FORK FM	1677
TOP GAS	3192
Coal Ridge (Paludal)	3806
ROLLINS SS (Iles Fm)	4085
COZZETTE	4371
CORCORAN	4552
MANCOS A	5264
MANCOS B	6059
NIOBRARA	7382
FT HAYES	8492
FRONTIER SS	8596
DAKOTA	8798
CEDAR MTN	8932
MORRISON	9049

**3. ESTIMATED TOPS OF POSSIBLE WATER, OIL, GAS OR MINERALS**

The estimated depths at which possible water, oil, gas or minerals will be encountered are as follows:

<u>Substance</u>	<u>Formation</u>	<u>Depth (TVD)</u>
Water	Wasatch	80'
Gas	Williams Fork	3,192

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 surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing.

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4. OPERATOR'S SPECIFICATIONS FOR PRESSURE CONTROL EQUIPMENT

- a. Minimum working pressure on rams and BOPE will be a 5,000 psi.
- b. Function test and visual inspection of the BOP will be conducted daily and noted in the IADC Daily Drilling Report.
- c. Both high and low pressure tests of the BOPE will be conducted.
- d. The Annular BOP will be pressure tested to a minimum of 50% of its rated working pressure.
- e. Blind and Pipe Rams/BOP will be tested to a minimum of 100% of rated working pressure (against a test plug).
- f. Surface casing will be tested from surface to TD (float collar) at 1,500 psi surface pressure (prior to drilling out the float collar).
- g. All other casing will be pressure tested to 0.22 psi/ft or 1,500 psi, whichever is greater, but not to exceed 70% of the internal yield.
- 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 preventors.
- j. The kill line shall be 2" minimum and contain two kill line valves, one of which shall be a check valve.
- k. The choke line shall be 3" minimum and contain two choke line valves (3" minimum).
- l. The choke and manifold shall contain two adjustable chokes.
- m. Hand wheels shall be installed on all ram preventors,
- n. Safety valves and wrenches (with subs for all drill string connections) shall be available on the rig floor at all times.
- o. Inside BOP or float sub shall also be available on the rig floor at all times.
- p. Upper kelly cock valve (with handle) shall be available at all times.

Proposed BOP and Choke Manifold arrangements are attached.

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5. **PROPOSED CASING AND CEMENTING PROGRAM (Measured Depths)**

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 surface casing shall be cemented back to surface either during the primary cement job or by remedial cementing.

Casing	Depth (MD)	Hole Size (in)	Size (in)	Weight (lb/ft)	Grade	Cement Volume
Conductor	0-40'	+/- 24"	20"	0.25" Wall	X42	+/- 4 yds ready mix (to surface)
Surface	0' – 1,500'	12 1/4"	9 5/8"	40#	J/K55, LTC New	Lead: 327 sxs G Extended 12.5 ppg / 2.11 ft <sup>3</sup> /sx (based on 80% excess entire hole volume)  Tail: 135sxs G Neat 15.8 ppg / 1.16 ft <sup>3</sup> /sx
Production	0' – 9300'	8 1/2"	5 1/2"	17#	P110, LTC New	Lead: 315 sxs TXI 12.0 ppg / 1.79 ft <sup>3</sup> /sx (based on 30% excess)  Tail: 1,272 sxs TXI 13.0 ppg / 1.43 ft <sup>3</sup> /sx (based on 30% excess)

Casing String				Casing Strength Properties			Minimum Design Factors		
Size (in)	Weight (lb/ft)	Grade	Connection	Collapse (psi)	Burst (psi)	Tensile (1000 lb)	Collapse	Burst	Tension
9-5/8"	40	J/K-55	LTC	2,570	3,950	520	1.00	1.10	1.50*
5-1/2"	17	P110	LTC	7,460	10,640	445	1.00	1.10	1.50*

\*Tension design based on 1.5 OR Max Overpull of 100,000 lbs, whichever provides for higher safety.

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Casing Design Considerations/Safety Factors:

A. Surface casing @ 1,500' MD / 1,500' TVD; 9-5/8" 40# J/K55 LTC

Purpose: Protect shallow fresh water and contain MASP to TD

Maximum anticipated mud weight at surface casing depth: = 9.0 ppg

Expected pore press gradient at surface casing depth: = 0.46

Maximum anticipated mud weight at TD: = 12.0 ppg

Maximum anticipated equivalent formation pressure at TD: = 11.5 ppg

Expected pore press gradient at TD: = 0.6

Collapse Design: Evacuated casing with 9.0 ppg drilling fluid density:

Load =  $9.0 \times 0.052 \times 1,500'$  = 702 psig

Rating: = 2,570

S.F. = 3.7

Burst Design: Assume kick with partially evacuated hole and an influx gradient of 0.22 psi/ft.  
(Calculation assumes shoe will not break down.)

MASP (Load) =  $9,300' \times (0.6 - 0.22) \text{psi/ft}$  = 3,534 psig

Rating: = 3,950 psig

S.F. = 1.1

Tensile Design: Designed on Air Weight \* Buoyancy

Load =  $1,500' \times 40\# \times 0.862$  = 51,720 lbs

Rating: = 520,000 lbs

S.F. = 10.1

Overpull = 520,000 lbs - 51,720 lbs = 468,280 lbs

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**B. Production Casing @ 9,300' MD/ 9,300' TVD; 5-1/2", 17#, P110, LTC**

Maximum Anticipated Mud Weight at Total Depth	= 12.0 ppg
Maximum Anticipated Equivalent Formation Pressure at Total Depth	= 11.5 ppg
Maximum Surface Treating Pressure for Fracturing Operations	= 7,000 psig
Assumed Gas Gradient for Production Operations	= 0.115 psi/ft

Collapse Design: Designed on evacuated casing properties with 12.0 ppg drilling fluid density with no internal back-up.

Load = $12.0 * 0.052 * 9,300'$	= 5,803 psig
Rating	= 7,460 psig
S.F.	= 1.3

Burst Design: Assume maximum surface shut-in pressure during production, and maximum surface treating pressure during fracture stimulation operations.

Design Consideration #1: Maximum Surface Shut-In Pressure

MASSIP (Load) = $9,300' * (0.6 - 0.115) \text{psi/ft}$	= 4,511 psig
Rating	= 10,640 psig
S.F.	= 2.4

Design Consideration #2: Maximum Surface Treating Pressure During Frac Operations

MATP:	= 7,000 psig
Rating:	= 10,640 psig
S.F.	= 1.5

Tensile Design: Designed on Air Weight \* Buoyancy

Load = $(9,300' * 17 \text{ lb/ft} * 0.817)$	= 129,168 lbs
Rating	= 445,000 lbs
S.F.	= 3.4

Overpull = 445,000lbs - 129,168 lbs = 315,832 lbs

**\*Cementing Volume Design Clarification:**

Surface Casing:

\*Slurry designed for full coverage with 80% excess.

Production Casing

\*Slurry designed 200' overlap with surface casing. Volume assumes 8-1/2" hole plus 30%.

\*If open hole logs are run, cement volumes will be determined from the caliper plus 10% excess.

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6. **DIRECTIONAL DRILLING PROGRAM**  
 N/A. This is a planned vertical well.

7. **PROPOSED DRILLING FLUIDS PROGRAM**

DEPTH (MD)	MUD TYPE	DENSITY lbs/gal	VISCOSITY (sec/qt)	FLUID LOSS (cc)
0' – 1,500'	Fresh Water Gel	8.8 - 9.0	28 – 35	NC
1,500' – TD	LSND	9.0 – 12.0	35 – 45	5 - 15 cc

Mud flow and volume will be monitored both visually and with electronic pit volume totalizers.

8. **TESTING, CORING AND LOGGING**

- a. Drill Stem Testing – None anticipated
- b. Coring – None.
- c. Mud Logging – Optional
- d. Logging – See Below:

<u>Open Hole</u>	<u>Logging Interval</u>
PEX (AIT-GR-Neutron/Litho Density) (Optional at operator's discretion)	from TD to surface casing
FMI Pipe Conveyed in Lateral (Optional at operator's discretion)	from TD to 4400'
<u>Cased Hole</u>	
CBL/GR/CCL	PBTD to 200' above TOC
RST (in lieu of PEX)	PBTD to surface casing

9. **ABNORMAL PRESSURES OR TEMPERATURES; POTENTIAL HAZARDS**

Barite and a selection of 'sized' lost circulation materials will be kept on location during drilling operations.

The anticipated bottom hole pressure is  $9,300' \times 0.6 \text{ psi/ft} = 5,580 \text{ psi}$   
 The maximum anticipated surface pressure is  $9,300' \times (0.6 - 0.22) \text{ psi/ft} = 3,534 \text{ psi}$

10. **ANTICIPATED STARTING DATE AND DURATION OF OPERATIONS**

The desired target spud date is contingent upon the regulatory approval date. However, the spud date could possibly be delayed or accelerated as required to fit rig schedules.

The drilling operation is anticipated to require  $\pm 25$  days on this well. Completion operations are anticipated to begin within 10 days of the drilling rig vacating the pad.  
 Completion operations require approximately 90 days.

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