



Indian Creek # 01-05H
 SHL: SW/SE Section 5-T6N-R78W
 BHL: NE/NE Section 5-T6N-R78W
 Jackson County, Colorado
 COC-65580

DRILLING PLAN

1. ESTIMATED TOPS OF IMPORTANT GEOLOGIC MARKERS & ANTICIPATED WATER, OIL, GAS OR MINERAL FORMATIONS:

Formation	TVD (ft)	MD (ft)	Hydrocarbon/Water Bearing Zones
Tertiary	0	0	
Midcoal	330	330	Gas
Suddeth Coal	1666	1666	Gas
Tertiary Base Unconformity	3032	3032	
Sussex Marker	4064	4064	
Sussex	4280	4280	
Shannon	4862	4862	
KOP (start build curve)	6081	6081	
Niobrara	6218	6220	Gas / Oil
Intermediate CSG (90°INC)	6558	6831	
Lateral TD (@ BHL)	6558	11062	

All shows of fresh water and minerals will be adequately protected and reported.
 Gas detection to be operational prior to drilling the Frontier.

2. PRESSURE CONTROL EQUIPMENT:

All well control equipment shall be in accordance with Onshore Order #2 for 5M systems.
 Well control equipment will be rigged up after setting surface casing.

The minimum specifications for pressure control equipment that will be provided are included on the attached schematic diagram showing size and pressure ratings.

5000# BOP with 4" or 4-1/2" Pipe Rams
 5000# BOP with Blind Rams
 5000# Annular

Auxiliary equipment to be used:

- Upper kelly cock with handle available.
- Stabbing Valve

The choke manifold will include appropriate valves and adjustable chokes. The kill line will have one check valve.

Ram type preventers will be pressure tested to full working pressure (utilizing a tester and test plug) at:

- Initial installation
- Whenever any seal subject to test pressure is broken
- following related repairs
- 30 day intervals

The annular preventer will be pressure tested to 50 percent of the rated working pressure.

All pressure tests shall be maintained at least 10 minutes or until provisions of test are met, whichever is longer.

Annular preventers shall be functionally operated at least weekly.

Pipe and blind rams shall be activated each trip.

A BOPE pit level drill will be conducted weekly for each drilling crew.

All tests and drills will be recorded in the drilling log.

The accumulator will have sufficient capacity to open the HCR valve, close all rams plus the annular preventer, and retain 200 psi above pre-charge pressure without the use of closing unit pumps. The system will have two independent power sources to close the preventers in accordance with 5M system requirements outlined in Onshore Order #2.

Remote controls shall be readily accessible to the driller. Master controls shall be at the accumulator.

3. CASING & CEMENTING PROGRAM:

A. The proposed casing program will be as follows:

Section	Measured Depth (ft)	Hole Size	Size	Grade	Weight	Thread	Condition
Surface	0 – 800	12 ¼	9 5/8	J-55	36.0	STC	New
Intermediate	0 – 6831	8 ¾	7	P110	23.0	LTC	New
Production*	6081 - 11062	6	4 ½	HC-P110	11.6	LTC	New

*4 ½" production string will be a liner, utilizing a liner hanger with pack-off assembly.

Size	Grade	Weight	Thread	Collapse	Burst	Pressure Gradient Collapse	Pressure Gradient Burst
9 5/8	J-55	36.0	STC	2020	3520	0.43	0.50
7	P110	23.0	LTC	5650	8720	0.50	0.50
4 ½	HC-P110	11.6	LTC	8650	10690	0.50	0.50

All casing strings below the conductor shall be pressure tested to 0.22 psi/ft. of casing string length or 1500 psi, whichever is greater, but not to exceed 70% minimum internal yield.

B. The proposed cementing program will be as follows:

Surface String: Top of cement - surface
Estimated volume: gauge hole + 50% excess

270 sx Type III Cement + 1% CaCl₂ + 0.25#/sx Cello flake @ 14.5 ppg, 1.41 ft³/sx.

Top Out (if required): Type III Cement + 2% CaCl₂ @ 14.5 ppg, 1.41 ft³/sx.

Intermediate String: Top of cement - 200' above the Midcoal formation.
Top of Tail cement - 400' above KOP
Estimated volume: gauge hole + 30% excess

Lead: 575 sx 35/65 Poz/G + additives @ 1.89 ft³/sx
Tail: 135 sx 50/50 Poz/G + additives @ 1.71 ft³/sx

Production Liner: Un-cemented with Swell Packers

OR

310 sx Premium Lite High Strength D @ 13.0 ppg, 1.82 ft³/sx.

Cement will be brought up to the top of the liner (within 100' of KOP). Estimated volume (gauge hole + 30% excess in open hole, 0% excess in 7" x 4-1/2" casing annulus).

Actual cement volumes used on the production liner will be calculated and adjusted based upon openhole caliper logs and/or gauge hole +30%.

OR

Open Hole completion without a 4 1/2" liner

After cementing, but before commencing any test, the casing string will stand cemented until cement has reached a compressive strength of 500 psi at the shoe. WOC times will be recorded in the drillers log.

