



Bighorn 0780 1-17

NENW Section 17-T7N-R80W (Surface Hole Location)

NENW Section 17-T7N-R80W (Bottom Hole Location)

Jackson County, Colorado

Drilling Plan

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

Vertical

Formation	MD/TVD (ft)	Hydrocarbon/Water Bearing Zones
Tertiary	0	
Midcoal	2160	Gas
Sussex	4,990	
Shannon	5,480	
Niobrara	6,970	Oil / Gas
Carlisle	7,420	
Frontier	7,610	
Entrada	8,720	
TD	9,000	

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

2. PRESSURE CONTROL EQUIPMENT:

All well control equipment shall be in accordance with Onshore Order #2 for 5M systems.

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

5,000# BOP with 5" Pipe Rams
5,000# BOP with Blind Rams
5,000# Annular
Rotating Head

Auxiliary equipment to be used

- Upper kelly cock with the 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 a 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 test 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-charged 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 (in)	Size (in)	Grade	Weight (#/ft)	Thread	Condition
Surface	0-2,400	12-1/4	9-5/8	J-55	36.0	STC	New
Production	0-9,000	8-3/4	7	P-110	29	LTC	New

All casing strings below the conductor shall be pressure tested to 0.22 psi/ft. of casing string length or 1,500 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 + 100% excess

Lead: 287 sx Class G + additives @ 2.11 ft³/sx
Tail: 106 sx Class G + additives @ 1.48 ft³/sx

Top Out (if needed)
100 sx Class G + additives @ 1.48 ft³/sx

Production String: Top of cement – Surface
Estimated volume gauge hole + 25% excess

Lead: 950 sx Class G + additives @ 2.3 ft³/sx
Tail: 400 sx Neat (G) + additives @ 1.65 ft³/sx

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 driller's log.

4. DRILLING FLUIDS PROGRAM:

Interval (ft)	Type	Weight (ppg)	Viscosity	Ph	Water Loss (cc)	Remarks
Surface	Spud	8.4-9.0	40-60	8-10	NC	WBM – gel & lime
Production	OBM	10.5	40-50	8-9	<6	OBM

NC = no control

Sufficient quantities of mud material will be maintained on site or be readily accessible for the purpose of assuring well control SPR will be recorded on daily drilling report after mudding up Electronic/mechanical mud monitoring equipment will be utilized and will include a pit volume totalizer (PVT), stroke counter, and flow sensor as a minimum.

5. EVALUATION PROGRAM:

Logs MWD-GR
(while drilling)

OH Logs: Quad Combo – TD to Surface Casing

Cores: None anticipated

DST's None anticipated

6. ABNORMAL CONDITIONS:

No anticipated abnormal pressures or temperatures expected to be encountered No hydrogen sulfide expected.

Anticipated bottom-hole pressure is approximately 4,118 psi.

7. OTHER INFORMATION:

The anticipated starting date and duration of the drilling and completion operations will be as follows

Start Date: Upon Approval
Duration: 60 days

The well will be drilled from surface location to bottom hole location per attached directional plan. The proposed well path should not pose any collision or interference concerns with any existing wells along its proposed path.

A completion rig will be used for completion operations. All conditions of this approved plan will be applicable during all operations conducted with the completion rig.