

**Whiting Oil & Gas Corp.**  
**Horsetail\_19N-1924M Drill Plan**  
**Vertical – Precambrian Well**  
**March 28, 2013**

**Summary:**

The Horsetail 19N 1924M well will be a vertical Precambrian well. The well will be drilled to 9,300' TD and 7" casing will be run and cemented. 450' of cores will be drilled through the Niobrara formation (5,413' – 5,863'.) This is a stratigraphic test well of lower targets and will be a monitor well only.

**Surface Location:** 18-T10N-R57W  
660' FSL 2656' FEL  
Weld County, Colorado

**DRILLING PROGRAM**

**1. ESTIMATED TOPS OF GEOLOGICAL MARKERS:**

Ground Level 4,748' Estimated KB 4,766' (17')

FORMATION	TVD	SSTVD
WHITE RIVER	SURFACE	
UPPER PIERRE	1,445	3321
HYGIENE	3,192	1574
P200 MARKER	5,451	-685
P300 MARKER	5,474	-708
P350 MARKER	5,493	-727
SHARON SPRINGS	5,503	-737
NIOBRARA	5,508	-742
FORT HAYS	5,810	-1044
CODELL	5,850	-1084
CARLILE	5,865	-1099
X-BENTONITE	6,179	-1413
D-SAND	6,270	-1504
DAKOTA J-SAND	6,362	-1596
SKULL CREEK SHALE	6,425	-1659
LAKOTA	6,602	-1836
MORRISON	6,714	-1948
ENTRADA	6,966	-2200
LITTLE MEDICINE EVAPORITE	7,134	-2368
FREEZEOUT SHALE	7,154	-2388
ERVAY EVAPORITE	7,212	-2446
OPECHE SHALE	7,299	-2533
BLAINE EVAPORITE	7,340	-2574
UPPER LYONS	7,424	-2658
SATANKA SHALE	7,468	-2702
LOWER LYONS	7,497	-2731
SUMNER	7,599	-2833
WOLFCAMP	7,725	-2959
AMAZON	7,842	-3076
ADMIRE	8,063	-3297
PENNSYLVANIAN	8,185	-3419
BASAL KANSAS CITY	8,498	-3732
DESMOINESIAN	8,522	-3756
CHEROKEE	8,663	-3897
ATOKA	8,787	-4021
MORROW	8,953	-4187
MISSISSIPPIAN	9,151	-4385
GRANITE WASH	9,189	-4423
PRECAMBRIAN	9,200	-4434

## **PRESSURE CONTROL EQUIPMENT**

**A. Type:** Eleven (11) inch double gate hydraulic BOP with eleven (11) inch annular preventer with 5,000 psi Casinghead and 5,000 psi Tubinghead.

**B. Testing Procedure:**

The annular preventer will be pressure tested to 50% of stack rated working pressure for ten (10) minutes or until provisions of test are met, whichever is longer. The BOP, choke manifold, and related equipment will be pressure tested to approved BOP stack working pressure (if isolated from surface casing by a test plug) or to 70% of surface casing internal yield strength (if BOP is not isolated by a test plug). Pressure will be maintained for ten (10) minutes or until the requirements of the test are met, whichever is longer. At a minimum, the Annular and Blow-Out Preventer pressure tests will be performed:

1. When the BOPE is initially installed;
2. Whenever any seal subject to test pressure is broken;
3. Following related repairs; and
4. At thirty (30) day intervals.

Annular will be function tested weekly, and pipe & blind rams activated each trip, but not more than once per day. All BOP drills & tests will be recorded in IADC driller's log.

**C. Choke Manifold Equipment:**

All choke lines will be straight lines whenever possible at turns, tee blocks will be used or will be targeted with running tees, and will be anchored to prevent whip and vibration.

**D. Accumulator:**

Accumulator will have sufficient capacity to open hydraulically-controlled choke line valve (if so equipped), close all rams plus annular preventer, and retain a minimum of 200 psi above precharge on the closing manifold without the use of closing unit pumps. The fluid reservoir capacity will be double accumulator capacity and the fluid level will be maintained at manufacturer's recommendations. Accumulator precharge pressure test will be conducted prior to connecting the closing unit to the BOP stack.

**E. Miscellaneous Information:**

Choke manifold and BOP extension rods with hand wheels will be located outside rig sub-structure. Hydraulic BOP closing unit will be located at least twenty-five (25) feet from the wellhead but readily accessible to the driller. Exact locations and configurations of the hydraulic BOP closing unit will depend upon the particular rig contracted to drill this hole.

A flare line will be installed after the choke manifold with the discharge point of the flare line to a separate pit located at least 125 feet away from the wellbore and any existing production facilities.

A volume monitoring system with alarms will be used to monitor pit gains/losses along with visual backup.

## 2. PROPOSED CASING PROGRAM

### A. Casing Program: All New

Hole Size	Casing Size	Wt./Ft.	Grade	Joint	Coupling OD	Burst (psi)	Collapse (psi)	Tension (Body/Joint) (klbs)	Depth Set (md)
13-1/2"	9-5/8"	36	J-55	LT&C	10.625"	3,520	2,020	564/453	0 – 1,500'
8-3/4"	7"	29	P110	LT&C	7.656"	11,220	8,530	797/929	0 – 9,300'

9-5/8" surface casing will have centralizers as follows:

1. Install a bowspring centralizer at the first and second collars above the guide shoe.
2. Install one bowspring centralizer every third joint above the second collar.
3. Centralizer and basket placed 120' below the surface (or at the bottom of the third joint below the surface).
4. Centralizer and basket placed 80' below the surface (or at the bottom of the second joint below the surface).

7" production casing will have centralizers as follows:

1. Install a bowspring centralizer at the first and second collars above the guide shoe.
2. After that centralize every third joint to surface with single bow spring centralizers.

Casing string(s) will be pressure tested to 0.22 psi/foot of casing string length or 1500 psi, whichever is greater (not to exceed 70% of the internal yield strength of the casing), after cementing and prior to drilling out from under the casing shoe.

### B. Casing Design Parameters:

#### Surface Casing

Interval	Size	Wt	Grade	Burst (psi) <sup>a</sup> /SF	Collapse (psi) <sup>b</sup> /SF	Tension (klb) <sup>c</sup> /SF
0' – 1,500'	9-5/8"	36.0 lb/ft	J-55	3,520/3.33	2,020/2.88	453/9.73

- a. based on frac gradient at shoe of 14.0 ppg
- b. based on full evacuation with 9.0 ppg fluid on backside
- c. based on casing string weight in 9.0 ppg mud  
String Weight in 9.0 ppg mud ≈ 46,580 lbs

#### Production Casing

Interval	Size	Wt	Grade	Burst (psi) <sup>a</sup> /SF	Collapse (psi) <sup>b</sup> /SF	Tension (klb) <sup>c</sup> /SF
0' – 9,300'	7"	29.0 lb/ft	P-110	11,220/1.73	8,530/1.6	797/3.49

- a. based on 6,500 psi frac pressure.
- b. based on full evacuation with 11 ppg pore pressure on backside
- c. based on casing string weight in 10.0 ppg mud  
String Weight in 10.0 ppg mud ≈ 228,524 lbs.

### 3. PROPOSED CEMENTING PROGRAM

#### Surface Casing

CASING	SLURRY	FT. of FILL	CEMENT TYPE	SXS	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
9-5/8"	Lead	1,500'	Type III Cement + 0.08 lbs/sack Static Free + 1% bwoc Calcium Chloride + 0.25 lbs/sack Cello Flake + 60.4% Fresh Water.	693	30	14.5	1.40

A cement top job is required if cement fallback is greater than 10' below ground level.

#### Production Casing

CASING	SLURRY	FT. of FILL	CEMENT TYPE	SXS	XC (%)	WEIGHT (ppg)	YIELD (ft <sup>3</sup> /sx)
7"	Lead	4,500'	(35:65) Poz (Fly Ash):Class G Cement + 0.06 lbs/sack Static Free + 0.1% bwoc R-3 + 46.46% bwoc LW-6 + 1% bwoc FL-25 + 0.5% bwoc Sodium Metasilicate + 5% bwoc CSE-2 + 85% Fresh Water.	526	30	10.5	2.64
7"	Tail	4,800'	315 cu-ft; 101 sacks (35:65) Poz (Fly Ash):Class G Cement + 0.06 lbs/sack Static Free + 54.44% bwoc LW-6 + 1% bwoc FL-25 + 0.5% bwoc Sodium Metasilicate + 20% bwoc Silica Sand, 100 mesh, Sacked + 5% bwoc CSE-2 + 100.6% Fresh Water.	528	35	10.5	3.12

Cement volumes for the 7" Production Casing will be calculated to provide a top of cement to Surface.

All waiting on cement (WOC) times will be adequate to achieve a minimum of 500 psi compressive strength at the casing shoe prior to drilling out.

### 4. MUD PROGRAM

<u>Depth (MD)</u>	<u>Mud System</u>	<u>MW</u>	<u>PV</u>	<u>YP</u>	<u>FL</u>
0 -1,500'	Water, Gel/Lime Sweeps	8.4 – 8.5	0 - 6	0 - 4	NC
1,550' – 9,300'	LSND	8.7 – 10	8 - 20	8 - 14	10 - 12

## **5. EVALUATION PROGRAM**

Cores: 450' of core planned from 5,413' to 5,863'.

DST: None planned

Surveys: Deviation surveys every 500' to TD in both surface and production holes.

Mud Logger:

Samples: 100' samples surface to 500' above Niobrara  
50' samples from Niobrara to TD

Open Hole Logging Program: Quad Combo 9,300' to Surface

## **6. ABNORMAL CONDITIONS**

No abnormal pressures are anticipated. No H<sub>2</sub>S gas is anticipated.

Anticipated bottom hole pressure is 4,027 psi (0.433 psi/ft) at 9,300' TVD in the Precambrian and the maximum anticipated surface pressure equals approximately 1,252 psi (anticipated bottom hole pressure minus the pressure of a partially evacuated hole calculated at 0.22 psi/foot of hole).

## **7. ANTICIPATED STARTING DATES**

### **A. Anticipated Starting Dates:**

Dirt work startup: June 2014

Spud: July 2014

Duration: 25 – 35 days