

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENTFORM 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.***SUBMIT IN TRIPLICATE - Other instructions on page 2**

| | | |
|---|---|--|
| 1. Type of Well <input checked="" type="checkbox"/> Oil Well <input type="checkbox"/> Gas Well <input type="checkbox"/> Other | | 5. Lease Serial No. NMNM0392082A |
| 2. Name of Operator CIMAREX ENERGY COMPANY OF CO Contact: ARICKA EASTERLING E-Mail: aeasterling@cimarex.com | | 6. If Indian, Allottee or Tribe Name |
| 3a. Address 202 S CHEYENNE AVE. SUITE 1000 TULSA, OK 74103 | 3b. Phone No. (include area code) Ph: 918.560.7060 | 7. If Unit or CA/Agreement, Name and/or No. |
| 4. Location of Well (Footage, Sec., T., R., M., or Survey Description) Sec 5 T26S R32E SWSW 500FSL 330FWL 32.035857 N Lat, 103.421711 W Lon | | 8. Well Name and No. HALLERTAU 5 FEDERAL 8H |
| | | 9. API Well No. 30-025-42666-00-X1 |
| | | 10. Field and Pool or Exploratory Area JENNINGS |
| | | 11. County or Parish, State LEA COUNTY, NM |

12. CHECK THE APPROPRIATE BOX(ES) TO INDICATE NATURE OF NOTICE, REPORT, OR OTHER DATA

| TYPE OF SUBMISSION | TYPE OF ACTION | | | |
|--|---|---|--|---|
| <input checked="" type="checkbox"/> Notice of Intent | <input type="checkbox"/> Acidize | <input type="checkbox"/> Deepen | <input type="checkbox"/> Production (Start/Resume) | <input type="checkbox"/> Water Shut-Off |
| <input type="checkbox"/> Subsequent Report | <input type="checkbox"/> Alter Casing | <input type="checkbox"/> Hydraulic Fracturing | <input type="checkbox"/> Reclamation | <input type="checkbox"/> Well Integrity |
| <input type="checkbox"/> Final Abandonment Notice | <input type="checkbox"/> Casing Repair | <input type="checkbox"/> New Construction | <input type="checkbox"/> Recomplete | <input checked="" type="checkbox"/> Other |
| | <input type="checkbox"/> Change Plans | <input type="checkbox"/> Plug and Abandon | <input type="checkbox"/> Temporarily Abandon | Change to Original A |
| | <input type="checkbox"/> Convert to Injection | <input type="checkbox"/> Plug Back | <input type="checkbox"/> Water Disposal | PD |

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 recompleat 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 recompleat 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.

Cimarex respectfully request approval to change the drilling plan (casing, cement & mud) for the above referenced well. Please see attached drilling plan. Cimarex also requests approval for a multibowl well head, please see attached diagram and procedure.

**SEE ATTACHED FOR
CONDITIONS OF APPROVAL**

| | |
|--|--------------------------|
| 14. I hereby certify that the foregoing is true and correct. Electronic Submission #386560 verified by the BLM Well Information System For CIMAREX ENERGY COMPANY OF CO, sent to the Hobbs Committed to AFMSS for processing by ZOTA STEVENS on 09/06/2017 (17ZS0023SE) | |
| Name (Printed/Typed) ARICKA EASTERLING | Title REGULATORY ANALYST |
| Signature (Electronic Submission) | Date 08/29/2017 |

THIS SPACE FOR FEDERAL OR STATE OFFICE USE

| | | |
|---|--------------------------|-----------------|
| Approved By ZOTA STEVENS | Title PETROLEUM ENGINEER | Date 09/06/2017 |
| 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 Hobbs | | |

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)

**** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED ** BLM REVISED *****KZ*

1. Geological Formations

TVD of target 11,855
MD at TD 16,139

Pilot Hole TD N/A
Deepest expected fresh water

| Formation | Depth (TVD) from KB | Water/Mineral Bearing/Target Zone | Hazards |
|--------------------|---------------------|-----------------------------------|---------|
| Rustler | 1019 | N/A | |
| Salt | 1345 | N/A | |
| Castille | 2800 | N/A | |
| Base Last Salt | 4159 | N/A | |
| Lamar | 4435 | N/A | |
| Bell Canyon | 4455 | Hydrocarbons | |
| Cherry Canyon | 5411 | Hydrocarbons | |
| Brushy Canyon | 6730 | Hydrocarbons | |
| Top Bone Spring | 8436 | Hydrocarbons | |
| Top Wolfcamp | 11679 | Hydrocarbons | |
| Wolfcamp A-1 Shale | 11856 | Hydrocarbons | |
| Wolfcamp Target | 11865 | Hydrocarbons | |

2. Casing Program

| Hole Size | Casing Depth From | Casing Depth To | Casing Size | Weight (lb/ft) | Grade | Conn. | SF Collapse | SF Burst | SF Tension |
|-----------|-------------------|-----------------|-------------|----------------|-------|-------|-------------|----------|---|
| 14 3/4 | 0 | 1069 | 10-3/4" | 40.50 | J-55 | BT&C | 3.23 | 6.40 | 14.53 |
| 9 7/8 | 0 | 11969 | 7-5/8" | 29.70 | L-80 | LT&C | 2.45 | 1.17 | TVD – 11805' Dry SF = 1.61, Wet SF = 1.87 |
| 6 3/4 | 0 | 11344 | 5-1/2" | 20.00 | L-80 | LT&C | 1.20 | 1.25 | 1.95 |
| 6 3/4 | 11344 | 16139 | 5" | 18.00 | P-110 | BT&C | 1.75 | 1.77 | 63.06 |

BLM Minimum Safety Factor

1.125

1

1.6 Dry
1.8 Wet

All casing strings will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.h

| | Y or N |
|--|--------|
| Is casing new? If used, attach certification as required in Onshore Order #1 | Y |
| Does casing meet API specifications? If no, attach casing specification sheet. | Y |
| Is premium or uncommon casing planned? If yes attach casing specification sheet. | N |
| Does the above casing design meet or exceed BLM's minimum standards? If not provide justification (loading assumptions, casing design criteria). | Y |
| Will the intermediate pipe be kept at a minimum 1/3 fluid filled to avoid approaching the collapse pressure rating of the casing? | Y |
| Is well located within Capitan Reef? | N |
| If yes, does production casing cement tie back a minimum of 50' above the Reef? | N |
| Is well within the designated 4 string boundary. | N |
| Is well located in SOPA but not in R-111-P? | N |
| If yes, are the first 2 strings cemented to surface and 3rd string cement tied back 500' into previous casing? | N |
| Is well located in R-111-P and SOPA? | N |
| If yes, are the first three strings cemented to surface? | N |
| Is 2nd string set 100' to 600' below the base of salt? | N |
| Is well located in high Cave/Karst? | N |
| If yes, are there two strings cemented to surface? | N |
| (For 2 string wells) If yes, is there a contingency casing if lost circulation occurs? | N |
| Is well located in critical Cave/Karst? | N |
| If yes, are there three strings cemented to surface? | N |

3. Cementing Program

| Casing | # Sks | Wt. lb/gal | Yld ft ³ /sack | H ₂ O gal/sk | 500# Comp. Strength (hours) | Slurry Description |
|--------------|-------|---------------|------------------------------|----------------------------|-----------------------------------|--|
| Surface | 415 | 13.50 | 1.72 | 9.15 | 15.5 | Lead: Class C + Bentonite |
| | 111 | 14.80 | 1.34 | 6.32 | 9.5 | Tail: Class C + LCM |
| | | | | | | |
| Intermediate | 557 | 9.20 | 6.18 | 28.80 | | Lead: Class C + Extender + Salt + Strength Enhancement + LCM + Fluid Loss + Retarder |
| | 207 | 14.20 | 1.30 | 5.86 | 14:30 | Tail: 50:50 (Poz:H) + Salt + Bentonite + Fluid Loss + Dispersant + SMS |
| | | | | | | |
| Production | 340 | 14.20 | 1.30 | 5.86 | 14:30 | Tail: 50:50 (Poz:H) + Salt + Bentonite + Fluid Loss + Dispersant + SMS |
| | | | | | | |
| | | | | | | |

| Casing String | TOC | % Excess |
|---------------|-------|----------|
| Surface | 0 | 45 |
| Intermediate | 0 | 48 |
| Production | 11769 | 8 |

4. Pressure Control Equipment

| | |
|--|--|
| | A variance is requested for the use of a diverter on the surface casing. See attached for schematic. |
|--|--|

| BOP installed and tested before drilling which hole? | Size | Min Required WP | Type | | Tested To |
|--|--------|-----------------|------------|---|-------------------------|
| 9 7/8 | 13 5/8 | 5M | Annular | X | 50% of working pressure |
| | | | Blind Ram | | 5M |
| | | | Pipe Ram | X | |
| | | | Double Ram | X | |
| | | | Other | | |
| 6 3/4 | 13 5/8 | 10M | Annular | X | 50% of working pressure |
| | | | Blind Ram | | 10M |
| | | | Pipe Ram | X | |
| | | | Double Ram | X | |
| | | | Other | | |

BOP/BOPE will be tested by an independent service company to 250 psi low and the high pressure indicated above per Onshore Order 2 requirements. The System may be upgraded to a higher pressure but still tested to the working pressure listed in the table above. If the system is upgraded all the components installed will be functional and tested.

Pipe rams will be operationally checked each 24 hour period. Blind rams will be operationally checked on each trip out of the hole. These checks will be noted on the daily tour sheets. Other accessories to the BOP equipment will include a Kelly cock and floor safety valve (inside BOP) and choke lines and choke manifold. See attached schematics.

| | |
|---|---|
| X | Formation integrity test will be performed per Onshore Order #2. On Exploratory wells or on that portion of any well approved for a 5M BOPE system or greater, a pressure integrity test of each casing shoe shall be performed. Will be tested in accordance with Onshore Oil and Gas Order #2 III.B.1.i. |
| X | A variance is requested for the use of a flexible choke line from the BOP to Choke Manifold. See attached for specs and hydrostatic test chart. |
| N | Are anchors required by manufacturer? |

5. Mud Program

| Depth | Type | Weight (ppg) | Viscosity | Water Loss |
|------------------|-----------------------|---------------|-----------|------------|
| 0' to 1069' | FW Spud Mud | 8.30 - 8.80 | 28 | N/C |
| 1069' to 11969' | Brine Diesel Emulsion | 9.00 - 9.50 | 30-32 | N/C |
| 11969' to 16139' | OBM | 12.00 - 12.50 | 30-32 | N/C |

The Brine Diesel Emulsion is completely saturated brine fluid that ties diesel into itself to lower the weight of the fluid. The drilling fluid is completely salt saturated.

Sufficient mud materials to maintain mud properties and meet minimum lost circulation and weight increase requirements will be kept on location at all times.

What will be used to monitor the loss or gain of fluid?

PVT/Pason/Visual Monitoring

6. Logging and Testing Procedures**Logging, Coring and Testing**

| | |
|---|---|
| X | Will run GR/CNL from TD to surface (horizontal well – vertical portion of hole). Stated logs run will be in the Completion Report and submitted to the BLM. |
| | No logs are planned based on well control or offset log information. |
| | Drill stem test? |
| | Coring? |

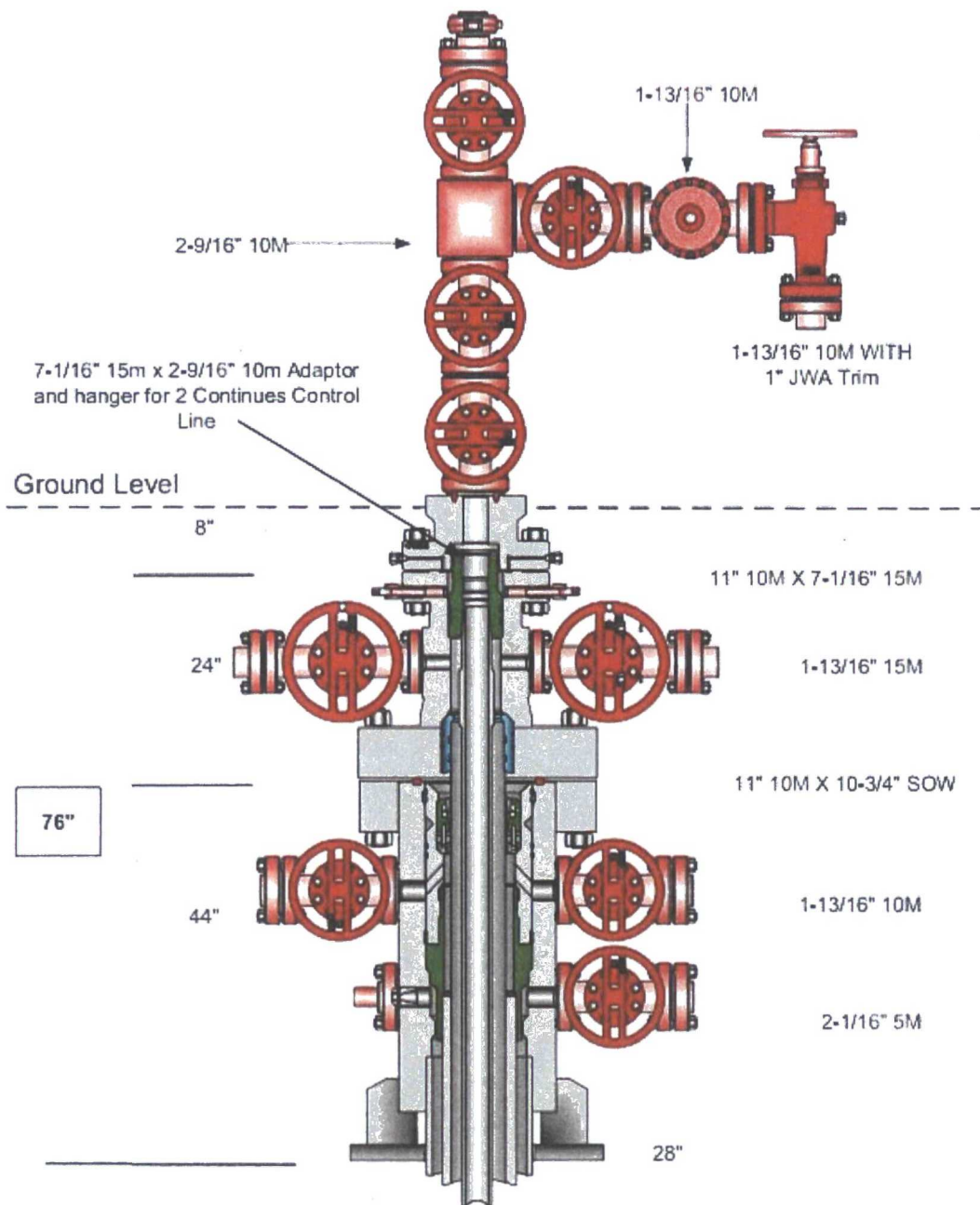
Additional Logs Planned**Interval****7. Drilling Conditions**

| Condition | |
|----------------------------|----------|
| BH Pressure at deepest TVD | 7705 psi |
| Abnormal Temperature | No |

Hydrogen Sulfide (H2S) monitors will be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the operator will comply with the provisions of Onshore Oil and Gas Order #6. If Hydrogen Sulfide is encountered, measured values and formations will be provided to the BLM.

| | |
|---|----------------------|
| X | H2S is present |
| X | H2S plan is attached |

8. Other Facets of Operation



PREPARED ON 8-25-17

Cactus Multi-Bowl Wellhead Steps:

1. Drill 14-3/4" Hole to Surface TD.
2. Trip out of hole.
3. Run and cement 10-3/4" casing.
4. Weld on Cactus Multi-Bowl Wellhead per Manufacturer's procedure.
5. Test weld to 70% of 10-3/4" surface casing collapse.
6. Manufacturer representative will install test plug
7. Test BOPE equipment to 10,000 psi per permitted test pressure for drilling below 7-5/8" intermediate shoe.
8. Install Wear Bushing
9. Drill to 7-5/8" casing shoe with 9-7/8" hole.
10. Trip out of hole.
11. Remove Wear Bushing.
12. Run 7-5/8" casing and land 7-5/8" casing hanger.
13. Cement casing.
14. Washout stack. Run wash tool to clean hanger.
15. Run and Install Packoff.
16. Test Packoff Seals.
17. Run Wear Bushing.
18. TIH to float collar.
19. Test Casing per COA WOC times. (500 psi compressive strength and 8 hours, whichever is greater)
20. Drill to production hole TD.
21. Trip out of hole.
22. Run 5.5" x 5" Production Casing.
23. Cement production Casing.
24. N/D and Set 5.5" Casing Slips.

Note: We will not Test BOP's after welding on the Surface head until the 7" casing is ran and cemented unless we exceed the 30 day limit per Onshore Order #2.

PECOS DISTRICT CONDITIONS OF APPROVAL

| | |
|-----------------------|--------------------------------|
| OPERATOR'S NAME: | CIMAREX ENERGY CO. |
| LEASE NO.: | NM0392082A |
| WELL NAME & NO.: | 8H-HALLERTAU 5 FEDERAL |
| SURFACE HOLE FOOTAGE: | 500' FSL & 330' FWL SWSW |
| BOTTOM HOLE FOOTAGE | 330' FNL & 380' FWL NWNW |
| LOCATION: | Section 5, T.26S., R32E., NMPM |
| COUNTY: | Lea County, New Mexico |

All previous COAs still apply except the following TABLE OF CONTENTS

☒ **Drilling**

H2S Requirements
Cement Requirements
Logging Requirements
Waste Material and Fluids

A. DRILLING OPERATIONS REQUIREMENTS

The BLM is to be notified a minimum of 4 hours in advance for a representative to witness:

- a. Spudding well (minimum of 24 hours)
- b. Setting and/or Cementing of all casing strings (minimum of 4 hours)
- c. BOPE tests (minimum of 4 hours)

☒ **Lea County**

Call the Hobbs Field Station, 414 West Taylor, Hobbs NM 88240,
(575) 393-3612

1. **A Hydrogen Sulfide (H2S) Drilling Plan shall be activated prior to drilling out the surface shoe. As a result, the Hydrogen Sulfide area must meet Onshore Order 6 requirements, which includes equipment and personnel/public protection items. If Hydrogen Sulfide is encountered, provide measured values and formations to the BLM.**
2. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a “Major” violation.**

3. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works is located, this does not include the dog house or stairway area.
4. The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well– vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.

B. CASING

Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size. The Operator can exchange the components of the proposal with that of superior strength (i.e. changing from J-55 to N-80, or from 36# to 40#). Changes to the approved cement program need prior approval if the altered cement plan has less volume or strength or if the changes are substantial (i.e. Multistage tool, ECP, etc.).

Centralizers required on surface casing per Onshore Order 2.III.B.1.f.

Wait on cement (WOC) for Water Basin:

After cementing but before commencing any tests, the casing string shall stand cemented under pressure until both of the following conditions have been met: 1) cement reaches a minimum compressive strength of 500 psi at the shoe, 2) until cement has been in place at least **8 hours**. WOC time will be recorded in the driller's log. See individual casing strings for details regarding lead cement slurry requirements.

No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.

Medium Cave/Karst occurrence.

Possible water and brine flows in the Salado and in the Castile.

Possible lost circulation in the Red Beds, in the Delaware and in the Bone Springs formations.

1. The **10-3/4** inch surface casing shall be set at approximately **1225** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface. **If salt is encountered, set casing at least 25 feet above the salt. Additional cement maybe required. Excess cement calculates only -22%.**
 - a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.
 - b. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry.**
 - c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.
 - d. If cement falls back, remedial cementing will be done prior to drilling out that string.
2. The **7- 5/8** inch intermediate casing shall be set at approximately **11969** feet (into the basal anhydrite of the Castile Formation). The minimum required fill of cement behind the **7-5/8** inch intermediate casing is:

☒ Cement to surface. If cement does not circulate see B.1.a, c-d above.

Intermediate casing shall be kept fluid filled while running into hole to meet BLM minimum collapse requirements.

If 75% or greater lost circulation occurs while drilling the intermediate casing hole, the cement on the production casing must come to surface.

3. The minimum required fill of cement behind the **5-1/2 x 5** inch production casing is:
 - ☒ Cement should tie-back at least 200 feet into previous casing string. Operator shall provide method of verification. **Additional cement maybe required. Excess cement calculates only -59%.**
4. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

C. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API RP 53.
2. Variance approved to use flex line from BOP to choke manifold. Check condition of flexible line from BOP to choke manifold, replace if exterior is damaged or if line fails test. Line to be as straight as possible with no hard bends and is to be anchored according to Manufacturer's requirements. The flexible hose can be exchanged with a hose of equal size and equal or greater pressure rating. **Anchor requirements, specification sheet and hydrostatic pressure test certification matching the hose in service, to be onsite for review.** If the BLM inspector questions the straightness of the hose, a BLM engineer will be contacted and will review in the field or via picture supplied by inspector to determine if changes are required (operator shall expect delays if this occurs).
3. **Operator has proposed a multi-bowl wellhead assembly. This assembly will only be tested when installed on the surface casing. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be 10,000 (10M) psi.**
 - a. Wellhead shall be installed by manufacturer's representatives, submit documentation with subsequent sundry.
 - b. If the welding is performed by a third party, the manufacturer's representative shall monitor the temperature to verify that it does not exceed the maximum temperature of the seal.
 - c. Manufacturer representative shall install the test plug for the initial BOP test.
 - d. If the cement does not circulate and one inch operations would have been possible with a standard wellhead, the well head shall be cut off, cementing operations performed and another wellhead installed.
4. The appropriate BLM office shall be notified a minimum of 4 hours in advance for a representative to witness the tests.
 - a. In a water basin, for all casing strings utilizing slips, these are to be set as soon as the crew and rig are ready and any fallback cement remediation has been done. The casing cut-off and BOP installation can be initiated four hours after installing the slips, which will be approximately six hours after bumping the plug. For those casing strings not using slips, the minimum wait time before cut-off is eight hours after bumping the plug. BOP/BOPE testing can begin after cut-off or once cement reaches 500 psi compressive strength (including lead when specified), whichever is greater. However, if the float does not hold, cut-off cannot be initiated until cement reaches 500 psi compressive strength (including lead when specified).

- b. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**. The operator also has the option of utilizing an independent tester to test without a plug (i.e. against the casing) pursuant to Onshore Order 2 with the pressure not to exceed 70% of the burst rating for the casing. Any test against the casing must meet the WOC time for water basin (18 hours) or potash (24 hours) or 500 pounds compressive strength, whichever is greater, prior to initiating the test (see casing segment as lead cement may be critical item).
- c. The test shall be run on a 5000 psi chart for a 2-3M BOP/BOP, on a 10000 psi chart for a 5M BOP/BOPE and on a 15000 psi chart for a 10M BOP/BOPE. If a linear chart is used, it shall be a one hour chart. A circular chart shall have a maximum 2 hour clock.
- d. The results of the test shall be reported to the appropriate BLM office.
- e. All tests are required to be recorded on a calibrated test chart. **A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.**
- f. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.

D. DRILL STEM TEST

If drill stem tests are performed, Onshore Order 2.III.D shall be followed.

E. WASTE MATERIAL AND FLUIDS

All waste (i.e. drilling fluids, trash, salts, chemicals, sewage, gray water, etc.) created as a result of drilling operations and completion operations shall be safely contained and disposed of properly at a waste disposal facility. No waste material or fluid shall be disposed of on the well location or surrounding area.

Porto-johns and trash containers will be on-location during fracturing operations or any other crew-intensive operations.

ZS 090617

| 10 3/4 Segment | surface csg in a #/ft | Grade | 14 3/4 Coupling | inch hole. Coupling | Body | <u>Design Factors</u> | | <u>SURFACE</u> | |
|--|--------------------------|---------|--------------------|------------------------|----------|-----------------------|--------------|----------------|--------------|
| "A" | | | | | | Collapse | Burst | Length | Weight |
| "A" | 40.50 | J 55 | BUTT | | 12.68 | 2.82 | 0.54 | 1,225 | 49,613 |
| "B" | | | | | | | | 0 | 0 |
| w/8.4#/g mud, 30min Sfc Csg Test psig: 1,500 | | | | | Tail Cmt | does not | circ to sfc. | Totals: | 1,225 49,613 |
| <u>Comparison of Proposed to Minimum Required Cement Volumes</u> | | | | | | | | | |
| Hole | Annular | 1 Stage | 1 Stage | Min | 1 Stage | Drilling | Calc | Req'd | Min Dist |
| Size | Volume | Cmt Sx | CuFt Cmt | Cu Ft | % Excess | Mud Wt | MASP | BOPE | Hole-Cplg |
| 14 3/4 | 0.5563 | 526 | 863 | 707 | 22 | 8.80 | 3229 | 5M | 1.50 |

Burst Frac Gradient(s) for Segment(s) A, B = 2.56, b All > 0.70,

| 7 5/8 Segment | casing inside the #/ft | Grade | 10 3/4 Coupling | <u>A Buoyant</u> Coupling | Joint | <u>Design Factors</u> | | <u>INTERMEDIATE</u> | |
|---|---------------------------|---------|--------------------|------------------------------|----------|-----------------------|---------------------------------|---------------------|----------------|
| "A" | | | | | | Collapse | Burst | Length | Weight |
| "A" | 29.70 | L 80 | LT&C | | 1.84 | 1.28 | 0.9 | 11,344 | 336,917 |
| "B" | 29.70 | L 80 | LT&C | | 78.14 | 0.83 | 0.9 | 625 | 18,563 |
| w/8.4#/g mud, 30min Sfc Csg Test psig: | | | | | | | | Totals: | 11,969 355,479 |
| B s would be: | | | | | 30.49 | 0.82 | if it were a vertical wellbore. | | |
| No Pilot Hole Planned | | | MTD | Max VTD | Csg VD | Curve KOP | Dogleg° | Severity° | MEOC |
| | | | 11969 | 11806 | 11806 | 11344 | 90 | -1 | 0 |
| The cement volume(s) are intended to achieve a top of | | | | | 0 | ft from surface or a | | 1225 | overlap. |
| Hole | Annular | 1 Stage | 1 Stage | Min | 1 Stage | Drilling | Calc | Req'd | Min Dist |
| Size | Volume | Cmt Sx | CuFt Cmt | Cu Ft | % Excess | Mud Wt | MASP | BOPE | Hole-Cplg |
| 9 7/8 | 0.2148 | 764 | 3711 | 2605 | 42 | 9.50 | 5090 | 10M | 0.69 |

Class 'H' tail cmt yld > 1.20

MASP is within 10% of 5000psig, need e:

Burst Frac Gradient(s) for Segment(s): A, B, C, D = 0.61, 0.58, c, d

*Assumed 1/3 fluid filled for Collapse Calculation

| 5 1/2 Segment | casing inside the #/ft | Grade | 7 5/8 Coupling | <u>A Buoyant</u> Coupling | Joint | <u>Design Factors</u> | | <u>PRODUCTION</u> | |
|---|---------------------------|---------|-------------------|------------------------------|----------|-----------------------|---------------------------------|-------------------|----------------|
| "A" | | | | | | Collapse | Burst | Length | Weight |
| "A" | 20.00 | L 80 | LT&C | | 2.32 | 1.2 | 1.19 | 11,344 | 226,880 |
| "B" | 18.00 | P 110 | BUTT | | 8.92 | 1.64 | 1.77 | 4,795 | 86,310 |
| w/8.4#/g mud, 30min Sfc Csg Test psig: 1,483 | | | | | | | | Totals: | 16,139 313,190 |
| B would be: | | | | | 63.08 | 1.75 | if it were a vertical wellbore. | | |
| No Pilot Hole Planned | | | MTD | Max VTD | Csg VD | Curve KOP | Dogleg° | Severity° | MEOC |
| | | | 16139 | 11855 | 11855 | 11344 | 90 | 9 | 12349 |
| The cement volume(s) are intended to achieve a top of | | | | | 4200 | ft from surface or a | | 7769 | overlap. |
| Hole | Annular | 1 Stage | 1 Stage | Min | 1 Stage | Drilling | Calc | Req'd | Min Dist |
| Size | Volume | Cmt Sx | CuFt Cmt | Cu Ft | % Excess | Mud Wt | MASP | BOPE | Hole-Cplg |
| 6 3/4 | 0.0835 | 340 | 442 | 1074 | -59 | 12.50 | | | 0.35 |

Class 'H' tail cmt yld > 1.20