

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
BUREAU OF LAND MANAGEMENT

## APPLICATION FOR PERMIT TO DRILL OR REENTER

1a. Type of work: <input checked="" type="checkbox"/> DRILL <input type="checkbox"/> REENTER		5. Lease Serial No. NMNM043562
1b. Type of Well: <input checked="" type="checkbox"/> Oil Well <input type="checkbox"/> Gas Well <input type="checkbox"/> Other		6. If Indian, Allottee or Tribe Name
1c. Type of Completion: <input type="checkbox"/> Hydraulic Fracturing <input checked="" type="checkbox"/> Single Zone <input type="checkbox"/> Multiple Zone		7. If Unit or CA Agreement, Name and No.
2. Name of Operator CIMAREX ENERGY COMPANY (215099)		8. Lease Name and Well No. CASCADE 29 FEDERAL 17H (39981)
3a. Address 600 N. Marienfeld St., Suite 600 Midland TX 79701	3b. Phone No. (include area code) (432)620-1936	9. API Well No. 30-025-46306 (78180)
4. Location of Well (Report location clearly and in accordance with any State requirements. *) At surface SWSW / 390 FSL / 410 FWL / LAT 32.095392 / LONG -103.601531 At proposed prod. zone NWNW / 100 FNL / 1170 FWL / LAT 32.108558 / LONG -103.59907		10. Field and Pool, or Exploratory BRUSHY CANYON / WC-025 G-09 S253
11. Sec., T. R. M. or Blk. and Survey or Area SEC 29 / T25S / R33E / NMP		
14. Distance in miles and direction from nearest town or post office* 23.1 miles		12. County or Parish LEA
13. State NM		
15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any) 390 feet	16. No of acres in lease 640	17. Spacing Unit dedicated to this well 320
18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft. 20 feet	19. Proposed Depth 12430 feet / 17094 feet	20. BLM/BIA Bond No. in file FED: NMB001188
21. Elevations (Show whether DF, KDB, RT, GL, etc.) 3402 feet	22. Approximate date work will start* 11/08/2019	23. Estimated duration 30 days
24. Attachments		

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No. 1, and the Hydraulic Fracturing rule per 43 CFR 3162.3-3 (as applicable)

- |  |   |
|--|---|
| 1. Well plat certified by a registered surveyor.   | 4. Bond to cover the operations unless covered by an existing bond on file (see Item 20 above). |
| 2. A Drilling Plan.  | 5. Operator certification.  |
| 3. A Surface Use Plan (if the location is on National Forest System Lands, the SUPO must be filed with the appropriate Forest Service Office). | 6. Such other site specific information and/or plans as may be requested by the BLM.            |

25. Signature (Electronic Submission)	Name (Printed/Typed) Sharon LaValley / Ph: (918)295-1673	Date 11/14/2018
Title Regulatory Supervisor		
Approved by (Signature) (Electronic Submission)	Name (Printed/Typed) Cody Layton / Ph: (575)234-5959	Date 07/31/2019
Title Assistant Field Manager Lands & Minerals		
Office CARLSBAD		

Application approval 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.

Conditions of approval, if any, are attached.

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.

BCP Rec 08/23/19

**APPROVED WITH CONDITIONS**

KZ  
08/26/19

## INSTRUCTIONS

**GENERAL:** This form is designed for submitting proposals to perform certain well operations, as indicated on Federal and Indian lands and leases for action by appropriate Federal agencies, pursuant to applicable Federal laws and regulations. Any necessary special instructions concerning the use of this form and the number of copies to be submitted, particularly with regard to local, area, or regional procedures and practices, either are shown below or will be issued by, or may be obtained from local Federal offices.

**ITEM I:** If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

**ITEM 4:** Locations on Federal or Indian land should be described in accordance with Federal requirements. Consult local Federal offices for specific instructions.

**ITEM 14:** Needed only when location of well cannot readily be found by road from the land or lease description. A plat, or plats, separate or on the reverse side, showing the roads to, and the surveyed location of, the well, and any other required information, should be furnished when required by Federal agency offices.

**ITEMS 15 AND 18:** If well is to be, or has been directionally drilled, give distances for subsurface location of hole in any present or objective productive zone.

**ITEM 22:** Consult applicable Federal regulations, or appropriate officials, concerning approval of the proposal before operations are started.

**ITEM 24:** If the proposal will involve hydraulic fracturing operations, you must comply with 43 CFR 3162.3-3, including providing information about the protection of usable water. Operators should provide the best available information about all formations containing water and their depths. This information could include data and interpretation of resistivity logs run on nearby wells. Information may also be obtained from state or tribal regulatory agencies and from local BLM offices.

## NOTICES

The Privacy Act of 1974 and regulation in 43 CFR 2.48(d) provide that you be furnished the following information in connection with information required by this application.

**AUTHORITY:** 30 U.S.C. 181 et seq., 25 U.S.C. 396; 43 CFR 3160

**PRINCIPAL PURPOSES:** The information will be used to: (1) process and evaluate your application for a permit to drill a new oil, gas, or service well or to reenter a plugged and abandoned well; and (2) document, for administrative use, information for the management, disposal and use of National Resource Lands and resources including (a) analyzing your proposal to discover and extract the Federal or Indian resources encountered; (b) reviewing procedures and equipment and the projected impact on the land involved; and (c) evaluating the effects of the proposed operation on the surface and subsurface water and other environmental impacts.

**ROUTINE USE:** Information from the record and/or the record will be transferred to appropriate Federal, State, and local or foreign agencies, when relevant to civil, criminal or regulatory investigations or prosecution, in connection with congressional inquiries and for regulatory responsibilities.

**EFFECT OF NOT PROVIDING INFORMATION:** Filing of this application and disclosure of the information is mandatory only if you elect to initiate a drilling or reentry operation on an oil and gas lease.

The Paperwork Reduction Act of 1995 requires us to inform you that:

The BLM connects this information to an evaluation of the technical, safety, and environmental factors involved with drilling for oil and/or gas on Federal and Indian oil and gas leases. This information will be used to analyze and approve applications. Response to this request is mandatory only if the operator elects to initiate drilling or reentry operations on an oil and gas lease. The BLM would like you to know that you do not have to respond to this or any other Federal agency-sponsored information collection unless it displays a currently valid OMB control number.

**BURDEN HOURS STATEMENT:** Public reporting burden for this form is estimated to average 8 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form to U.S. Department of the Interior, Bureau of Land Management (1004-0137), Bureau Information Connection Clearance Officer (WO-630), 1849 C Street, N.W., Mail Stop 401 LS, Washington, D.C. 20240.

## Additional Operator Remarks

### Location of Well

1. SHL: SWSW / 390 FSL / 410 FWL / TWSP: 25S / RANGE: 33E / SECTION: 29 / LAT: 32.095392 / LONG: -103.601531 ( TVD: 0 feet, MD: 0 feet )  
PPP: SWSW / 437 FSL / 1093 FWL / TWSP: 25S / RANGE: 33E / SECTION: 29 / LAT: 32.0955056 / LONG: -103.599325 ( TVD: 12189 feet, MD: 12266 feet )  
BHL: NWNW / 100 FNL / 1170 FWL / TWSP: 25S / RANGE: 33E / SECTION: 29 / LAT: 32.108558 / LONG: -103.599007 ( TVD: 12430 feet, MD: 17094 feet )

### BLM Point of Contact

Name: Priscilla Perez  
Title: Legal Instruments Examiner  
Phone: 5752345934  
Email: pperez@blm.gov

CONFIDENTIAL

### **Review and Appeal Rights**

A person contesting a decision shall request a State Director review. This request must be filed within 20 working days of receipt of the Notice with the appropriate State Director (see 43 CFR 3165.3). The State Director review decision may be appealed to the Interior Board of Land Appeals, 801 North Quincy Street, Suite 300, Arlington, VA 22203 (see 43 CFR 3165.4). Contact the above listed Bureau of Land Management office for further information.

**CONFIDENTIAL**



## Application for Permit to Drill

U.S. Department of the Interior  
Bureau of Land Management

### APD Package Report

Date Printed: 08/06/2019 03:06 PM

APD ID: 10400036215

Well Status: AAPD

APD Received Date: 11/14/2018 12:47 PM

Well Name: CASCADE 29 FEDERAL

Operator: CIMAREX ENERGY COMPANY

Well Number: 17H

#### APD Package Report Contents

- Form 3160-3
- Operator Certification Report
- Application Report
- Application Attachments
  - Well Plat: 1 file(s)
- Drilling Plan Report
- Drilling Plan Attachments
  - Blowout Prevention Choke Diagram Attachment: 2 file(s)
  - Blowout Prevention BOP Diagram Attachment: 2 file(s)
  - Casing Design Assumptions and Worksheet(s): 4 file(s)
  - Hydrogen sulfide drilling operations plan: 1 file(s)
  - Proposed horizontal/directional/multi-lateral plan submission: 2 file(s)
  - Other Facets: 3 file(s)
  - Other Variances: 3 file(s)
- SUPO Report
- SUPO Attachments
  - New Road Map: 3 file(s)
  - Attach Well map: 1 file(s)
  - Production Facilities map: 4 file(s)
  - Water source and transportation map: 1 file(s)
  - Well Site Layout Diagram: 1 file(s)
  - Recontouring attachment: 1 file(s)
  - Other SUPO Attachment: 11 file(s)
- PWD Report
- PWD Attachments
  - None
- Bond Report

- Bond Attachments
  - None

# PECOS DISTRICT DRILLING CONDITIONS OF APPROVAL

<b>OPERATOR'S NAME:</b>	<b>Cimarex Energy Company</b>
<b>LEASE NO.:</b>	<b>NMNM043562</b>
<b>WELL NAME &amp; NO.:</b>	<b>Cascade 29 Federal 17H</b>
<b>SURFACE HOLE FOOTAGE:</b>	<b>390'/S &amp; 410'/W</b>
<b>BOTTOM HOLE FOOTAGE:</b>	<b>100'/N &amp; 1170'/W</b>
<b>LOCATION:</b>	<b>Section 29, T.25 S., R.33 E., NMPM</b>
<b>COUNTY:</b>	<b>Lea County, New Mexico</b>

COA

H2S	<input type="radio"/> Yes	<input checked="" type="radio"/> No	
Potash	<input checked="" type="radio"/> None	<input type="radio"/> Secretary	<input type="radio"/> R-111-P
Cave/Karst Potential	<input checked="" type="radio"/> Low	<input type="radio"/> Medium	<input type="radio"/> High
Variance	<input type="radio"/> None	<input checked="" type="radio"/> Flex Hose	<input type="radio"/> Other
Wellhead	<input type="radio"/> Conventional	<input checked="" type="radio"/> Multibowl	<input type="radio"/> Both
Other	<input type="checkbox"/> 4 String Area	<input type="checkbox"/> Capitan Reef	<input type="checkbox"/> WIPP
Other	<input type="checkbox"/> Fluid Filled	<input type="checkbox"/> Cement Squeeze	<input type="checkbox"/> Pilot Hole
Special Requirements	<input type="checkbox"/> Water Disposal	<input type="checkbox"/> COM	<input type="checkbox"/> Unit

## A. HYDROGEN SULFIDE

Hydrogen Sulfide (H2S) monitors shall be installed prior to drilling out the surface shoe. If H2S is detected in concentrations greater than 100 ppm, the Hydrogen Sulfide area shall 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.

## B. CASING

1. The 10-3/4 inch surface casing shall be set at approximately **985** feet (a minimum of 25 feet (Lea County) into the Rustler Anhydrite and above the salt) and cemented to the surface.
  - 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 will be a minimum of **8 hours** or 500 pounds compressive strength, whichever is greater. (This is to

include the lead cement)

- 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.

**Operator shall filled 1/3<sup>rd</sup> of casing with fluid while running intermediate casing to maintain collapse safety factor.**

2. 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.

**Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry due to cave/karst or potash.**

3. The minimum required fill of cement behind the 5-1/2 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 calculates to 23%.**

### **C. PRESSURE CONTROL**

1. Variance approved to use flex line from BOP to choke manifold. Manufacturer's specification to be readily available. No external damage to flex line. Flex line to be installed as straight as possible (no hard bends).
2. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **2000 (2M) psi**.
3. Operator has proposed a multi-bowl wellhead assembly. This assembly will only be tested when installed on the intermediate casing. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be **3000 (3M) 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.
  - e. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.



## GENERAL REQUIREMENTS

The BLM is to be notified 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)

☒ Chaves and Roosevelt Counties

Call the Roswell Field Office, 2909 West Second St., Roswell NM 88201.

During office hours call (575) 627-0272.

After office hours call (575)

☒ Eddy County

Call the Carlsbad Field Office, 620 East Greene St., Carlsbad, NM 88220,

(575) 361-2822

☒ Lea County

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

393-3612

1. 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.
  - a. In the event the operator has proposed to drill multiple wells utilizing a skid/walking rig. Operator shall secure the wellbore on the current well, after installing and testing the wellhead, by installing a blind flange of like pressure rating to the wellhead and a pressure gauge that can be monitored while drilling is performed on the other well(s).
  - b. When the operator proposes to set surface casing with Spudder Rig
    - Notify the BLM when moving in and removing the Spudder Rig.
    - Notify the BLM when moving in the 2<sup>nd</sup> Rig. Rig to be moved in within 90 days of notification that Spudder Rig has left the location.
    - BOP/BOPE test to be conducted per Onshore Oil and Gas Order No. 2 as soon as 2nd Rig is rigged up on well.
2. 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 are located, this does not include the dog house or stairway area.

3. 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.

A. CASING

1. Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size or are Non-API. 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.). The initial wellhead installed on the well will remain on the well with spools used as needed.
2. Wait on cement (WOC) for Potash Areas: 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 for all cement blends, 2) until cement has been in place at least 24 hours. WOC time will be recorded in the driller's log.
3. 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.
4. Provide compressive strengths including hours to reach required 500 pounds compressive strength prior to cementing each casing string. Have well specific cement details onsite prior to pumping the cement for each casing string.
5. No pea gravel permitted for remedial or fall back remedial without prior authorization from the BLM engineer.
6. 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. Formation at the shoe shall be tested to a minimum of the mud weight equivalent anticipated to control the formation pressure to the next casing depth or at total depth of the well. This test shall be performed before drilling more than 20 feet of new hole.

7. 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.
8. Whenever a casing string is cemented in the R-111-P potash area, the NMOCD requirements shall be followed.

**B. 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 Sec. 17.
2. If a variance is approved for a flexible hose to be installed from the BOP to the choke manifold, the following requirements apply: 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. These documents shall be posted in the company man's trailer and on the rig floor.
3. 5M or higher system requires an HCR valve, remote kill line and annular to match. The remote kill line is to be installed prior to testing the system and tested to stack pressure.
4. If the operator has proposed a multi-bowl wellhead assembly in the APD. The following requirements must be met:
  - 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. Whenever any seal subject to test pressure is broken, all the tests in OOGO2.III.A.2.i must be followed.
  - e. 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.
5. 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. In potash areas, 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. For all casing strings, casing cut-off and BOP installation can be initiated at twelve hours after bumping the plug. However, **no tests** shall commence until the cement has had a minimum of 24 hours setup time.
- c. 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 (8 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).
- d. 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. If a twelve hour or twenty-four hour chart is used, tester shall make a notation that it is run with a two hour clock.
- e. The results of the test shall be reported to the appropriate BLM office.
- f. 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.
- g. 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.
- h. BOP/BOPE must be tested by an independent service company within 500 feet of the top of the Wolfcamp formation if the time between the setting of the intermediate casing and reaching this depth exceeds 20 days. This test

does not exclude the test prior to drilling out the casing shoe as per Onshore Order No. 2.

**C. DRILLING MUD**

Mud system monitoring equipment, with derrick floor indicators and visual and audio alarms, shall be operating before drilling into the Wolfcamp formation, and shall be used until production casing is run and cemented.

**D. 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.

**PECOS DISTRICT  
SURFACE USE  
CONDITIONS OF APPROVAL**

**Cascade 29 Federal Com 15H  
Cascade 29 Federal Com 16H  
Cascade 29 Federal Com 17H  
Cascade 29 Federal Com 29H  
Cascade 29 Federal Com 30H  
Cascade 29 Federal Com 31H  
Cascade 29 Federal Com 43H  
Cascade 29 Federal Com 44H  
Cascade 29 Federal Com 45H**

**Lease Number NMNM 0001917  
Cimarex Energy CO**

**TABLE OF CONTENTS**

Standard Conditions of Approval (COA) apply to this APD. If any deviations to these standards exist or special COAs are required, the section with the deviation or requirement will be checked below.

- ☐ **General Provisions**
- ☐ **Permit Expiration**
- ☐ **Archaeology, Paleontology, and Historical Sites**
- ☐ **Noxious Weeds**
- ☐ **Special Requirements**
  - Lesser Prairie-Chicken Timing Stipulations
  - Ground-level Abandoned Well Marker
  - Hydrology
- ☐ **Construction**
  - Notification
  - Topsoil
  - Closed Loop System

Federal Mineral Material Pits  
Well Pads  
Roads

☐ **Road Section Diagram**

☐ **Production (Post Drilling)**

Well Structures & Facilities

Pipelines

Electric Lines

☐ **Interim Reclamation**

☐ **Final Abandonment & Reclamation**

## **I. GENERAL PROVISIONS**

The approval of the Application For Permit To Drill (APD) is in compliance with all applicable laws and regulations: 43 Code of Federal Regulations 3160, the lease terms, Onshore Oil and Gas Orders, Notices To Lessees, New Mexico Oil Conservation Division (NMOCD) Rules, National Historical Preservation Act As Amended, and instructions and orders of the Authorized Officer. Any request for a variance shall be submitted to the Authorized Officer on Form 3160-5, Sundry Notices and Report on Wells.

## **II. PERMIT EXPIRATION**

If the permit terminates prior to drilling and drilling cannot be commenced within 60 days after expiration, an operator is required to submit Form 3160-5, Sundry Notices and Reports on Wells, requesting surface reclamation requirements for any surface disturbance. However, if the operator will be able to initiate drilling within 60 days after the expiration of the permit, the operator must have set the conductor pipe in order to allow for an extension of 60 days beyond the expiration date of the APD. (Filing of a Sundry Notice is required for this 60 day extension.)

## **III. ARCHAEOLOGICAL, PALEONTOLOGY & HISTORICAL SITES**

Any cultural and/or paleontological resource discovered by the operator or by any person working on the operator's behalf shall immediately report such findings to the Authorized Officer. The operator is fully accountable for the actions of their contractors and subcontractors. The operator shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery shall be made by the Authorized Officer to determine the appropriate actions that shall be required to prevent the loss of significant cultural or scientific values of the discovery. The operator shall be held responsible for the cost of the proper mitigation measures that the Authorized Officer assesses after consultation with the operator on the evaluation and decisions of the discovery. Any unauthorized collection or disturbance of cultural or paleontological resources may result in a shutdown order by the Authorized Officer.

## **IV. NOXIOUS WEEDS**

The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes the roads, pads, associated pipeline corridor, and adjacent land affected by the establishment of weeds due to this action. The operator shall consult



with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

## **V. SPECIAL REQUIREMENT(S)**

### **Timing Limitation Stipulation / Condition of Approval for lesser prairie-chicken:**

Oil and gas activities including 3-D geophysical exploration, and drilling will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities, pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Additionally, no new drilling will be allowed within up to 200 meters of leks known at the time of permitting. Normal vehicle use on existing roads will not be restricted. Exhaust noise from pump jack engines must be muffled or otherwise controlled so as not to exceed 75 db measured at 30 feet from the source of the noise.

**Ground-level Abandoned Well Marker to avoid raptor perching:** Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well. For more installation details, contact the Carlsbad Field Office at 575-234-5972.

### **Hydrology**

The entire well pad(s) will be bermed to prevent oil, salt, and other chemical contaminants from leaving the well pad. The compacted berm shall be constructed at a minimum of 12 inches with impermeable mineral material (e.g. caliche). Topsoil shall not be used to construct the berm. No water flow from the uphill side(s) of the pad shall be allowed to enter the well pad. The integrity of the berm shall be maintained around the surfaced pad throughout the life of the well and around the downsized pad after interim reclamation has been completed. Any water erosion that may occur due to the construction of the well pad during the life of the well will be quickly corrected and proper measures will be taken to prevent future erosion. Stockpiling of topsoil is required. The top soil shall be stockpiled in an appropriate location to prevent loss of soil due to water or wind erosion and not used for berming or erosion control. If fluid collects within the bermed area, the fluid must be vacuumed into a safe container and disposed of properly at a state approved facility.

Tank battery locations will be lined and bermed. A 20 mil permanent liner will be installed with a 4 oz. felt backing to prevent tears or punctures. Tank battery berms must be large enough to contain 1 ½ times the content of the largest tank or 24 hour production, whichever is greater. Automatic shut off, check valves, or similar systems will be installed for tanks to minimize the effects of catastrophic line failures used in production or drilling.

When crossing ephemeral drainages the pipeline(s) will be buried to a minimum depth of 48 inches from the top of pipe to ground level. Erosion control methods such as gabions and/or rock aprons should be placed on both up and downstream sides of the pipeline crossing. In addition, curled (weed free) wood/straw fiber wattles/logs and/or silt fences should be placed on the downstream side for sediment control during construction and maintained until soils and vegetation have stabilized. Water bars should be placed within the ROW to divert and dissipate surface runoff. A pipeline access road is not permitted to cross these ephemeral drainages. Traffic should be diverted to a preexisting route. Additional seeding may be required in floodplains and drainages to restore energy dissipating vegetation.

Prior to pipeline installation/construction a leak detection plan will be developed. The method(s) could incorporate gauges to detect pressure drops, situating valves and lines so they can be visually inspected periodically or installing electronic sensors to alarm when a leak is present. The leak detection plan will incorporate an automatic shut off system that will be installed for proposed pipelines to minimize the effects of an undesirable event.

Any water erosion that may occur due to the construction of overhead electric line and during the life of the power line will be quickly corrected and proper measures will be taken to prevent future erosion. A power pole should not be placed in drainages, playas, wetlands, riparian areas, or floodplains and must span across the features at a distance away that would not promote further erosion.

## **VI. CONSTRUCTION**

### **A. NOTIFICATION**

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the at least 3 working days prior to commencing construction of the access road and/or well pad.

When construction operations are being conducted on this well, the operator shall have the approved APD and Conditions of Approval (COA) on the well site and they shall be made available upon request by the Authorized Officer.

### **B. TOPSOIL**

The operator shall strip the top portion of the soil (root zone) from the entire well pad area and stockpile the topsoil along the edge of the well pad as depicted in the APD. The root zone is typically six (6) inches in depth. All the stockpiled topsoil will be redistributed over the interim reclamation areas. Topsoil shall not be used for berming the pad or facilities. For final reclamation, the topsoil shall be spread over the entire pad area for seeding preparation.

Other subsoil (below six inches) stockpiles must be completely segregated from the topsoil stockpile. Large rocks or subsoil clods (not evident in the surrounding terrain) must be buried within the approved area for interim and final reclamation.

### **C. CLOSED LOOP SYSTEM**

Tanks are required for drilling operations: No Pits.

The operator shall properly dispose of drilling contents at an authorized disposal site.

### **D. FEDERAL MINERAL MATERIALS PIT**

Payment shall be made to the BLM prior to removal of any federal mineral materials. Call the .

### **E. WELL PAD SURFACING**

Surfacing of the well pad is not required.

If the operator elects to surface the well pad, the surfacing material may be required to be removed at the time of reclamation. The well pad shall be constructed in a manner which

creates the smallest possible surface disturbance, consistent with safety and operational needs.

#### **F. EXCLOSURE FENCING (CELLARS & PITS)**

##### **Exclosure Fencing**

The operator will install and maintain exclosure fencing for all open well cellars to prevent access to public, livestock, and large forms of wildlife before and after drilling operations until the pit is free of fluids and the operator initiates backfilling. (For examples of exclosure fencing design, refer to BLM's Oil and Gas Gold Book, Exclosure Fence Illustrations, Figure 1, Page 18.)

#### **G. ON LEASE ACCESS ROADS**

##### **Road Width**

The access road shall have a driving surface that creates the smallest possible surface disturbance and does not exceed fourteen (14) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed twenty-five (25) feet.

##### **Surfacing**

Surfacing material is not required on the new access road driving surface. If the operator elects to surface the new access road or pad, the surfacing material may be required to be removed at the time of reclamation.

Where possible, no improvements should be made on the unsurfaced access road other than to remove vegetation as necessary, road irregularities, safety issues, or to fill low areas that may sustain standing water.

The Authorized Officer reserves the right to require surfacing of any portion of the access road at any time deemed necessary. Surfacing may be required in the event the road deteriorates, erodes, road traffic increases, or it is determined to be beneficial for future field development. The surfacing depth and type of material will be determined at the time of notification.

##### **Crowning**

Crowning shall be done on the access road driving surface. The road crown shall have a grade of approximately 2% (i.e., a 1" crown on a 14' wide road). The road shall conform to Figure 1; cross section and plans for typical road construction.

##### **Ditching**

Ditching shall be required on both sides of the road.

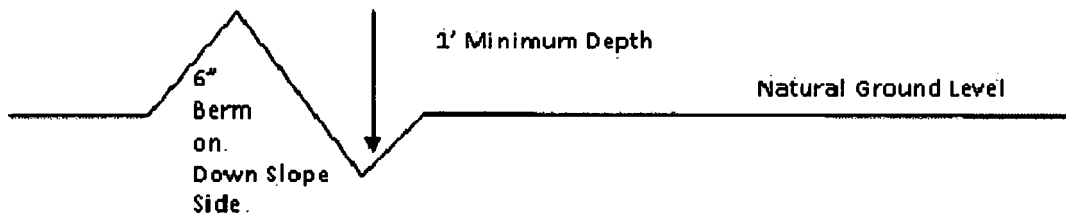
##### **Turnouts**

Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

### **Drainage**

Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outsloping and insloping, leadoff ditches, culvert installation, and low water crossings).

A typical lead-off ditch has a minimum depth of 1 foot below and a berm of 6 inches above natural ground level. The berm shall be on the down-slope side of the lead-off ditch.



All lead-off ditches shall be graded to drain water with a 1 percent minimum to 3 percent maximum ditch slope. The spacing interval are variable for lead-off ditches and shall be determined according to the formula for spacing intervals of lead-off ditches, but may be amended depending upon existing soil types and centerline road slope (in %);

### **Cattle guards**

An appropriately sized cattle guard sufficient to carry out the project shall be installed and maintained at fence/road crossings. Any existing cattle guards on the access road route shall be repaired or replaced if they are damaged or have deteriorated beyond practical use. The operator shall be responsible for the condition of the existing cattle guards that are in place and are utilized during lease operations.

### **Fence Requirement**

Where entry is granted across a fence line, the fence shall be braced and tied off on both sides of the passageway prior to cutting. The operator shall notify the private surface landowner or the grazing allotment holder prior to crossing any fences.

### **Public Access**

Public access on this road shall not be restricted by the operator without specific written approval granted by the Authorized Officer.

### Construction Steps

1. Salvage topsoil
2. Construct road

3. Redistribute topsoil
4. Revegetate slopes

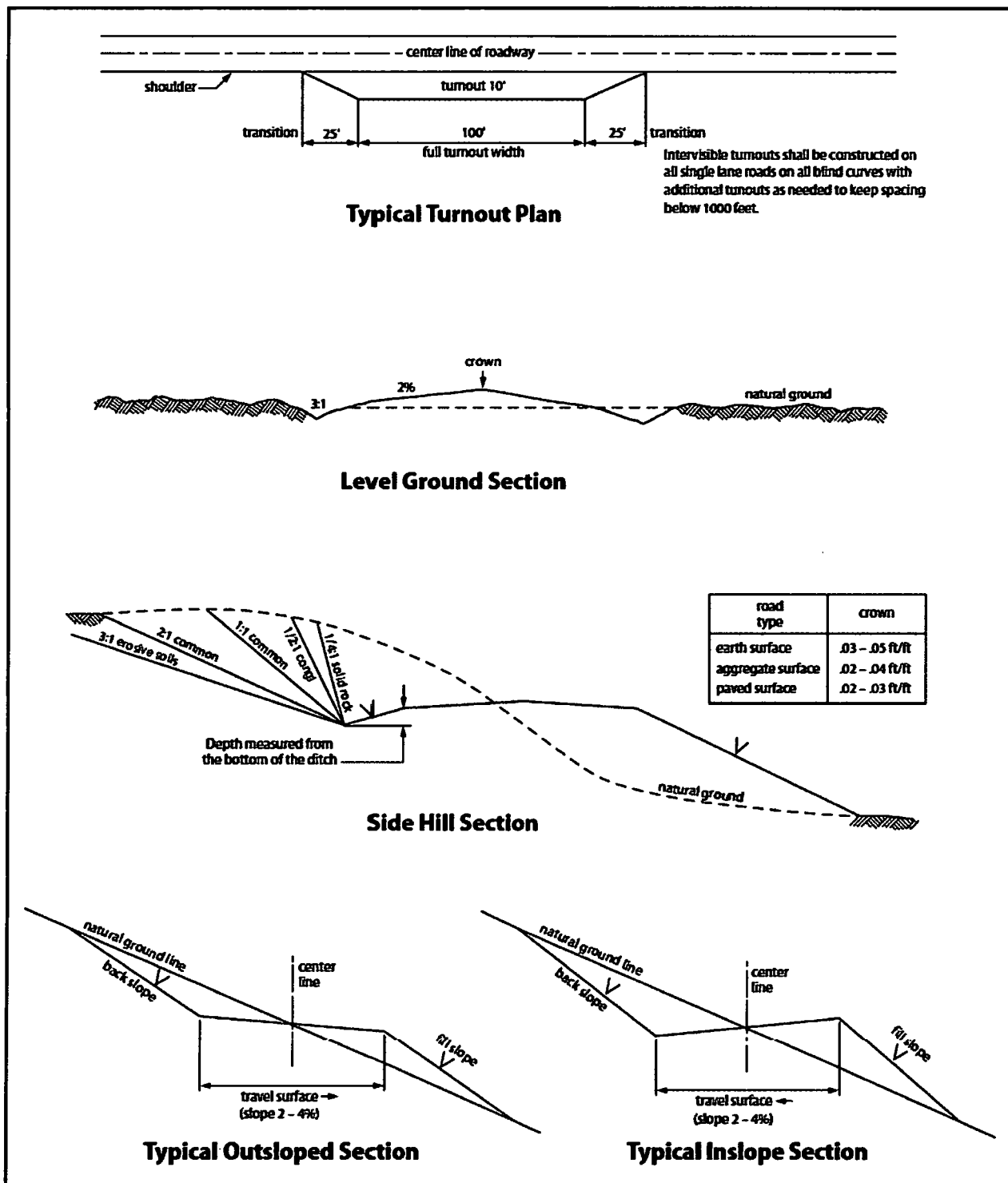


Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.



## **VII. PRODUCTION (POST DRILLING)**

### **A. WELL STRUCTURES & FACILITIES**

#### **Placement of Production Facilities**

Production facilities should be placed on the well pad to allow for maximum interim recontouring and revegetation of the well location.

#### **Exclosure Netting (Open-top Tanks)**

Immediately following active drilling or completion operations, the operator will take actions necessary to prevent wildlife and livestock access, including avian wildlife, to all open-topped tanks that contain or have the potential to contain salinity sufficient to cause harm to wildlife or livestock, hydrocarbons, or Resource Conservation and Recovery Act of 1976-exempt hazardous substances. At a minimum, the operator will net, screen, or cover open-topped tanks to exclude wildlife and livestock and prevent mortality. If the operator uses netting, the operator will cover and secure the open portion of the tank to prevent wildlife entry. The operator will net, screen, or cover the tanks until the operator removes the tanks from the location or the tanks no longer contain substances that could be harmful to wildlife or livestock. Use a maximum netting mesh size of 1 ½ inches. The netting must not be in contact with fluids and must not have holes or gaps.

#### **Chemical and Fuel Secondary Containment and Exclosure Screening**

The operator will prevent all hazardous, poisonous, flammable, and toxic substances from coming into contact with soil and water. At a minimum, the operator will install and maintain an impervious secondary containment system for any tank or barrel containing hazardous, poisonous, flammable, or toxic substances sufficient to contain the contents of the tank or barrel and any drips, leaks, and anticipated precipitation. The operator will dispose of fluids within the containment system that do not meet applicable state or U. S. Environmental Protection Agency livestock water standards in accordance with state law; the operator must not drain the fluids to the soil or ground. The operator will design, construct, and maintain all secondary containment systems to prevent wildlife and livestock exposure to harmful substances. At a minimum, the operator will install effective wildlife and livestock exclosure systems such as fencing, netting, expanded metal mesh, lids, and grate covers. Use a maximum netting mesh size of 1 ½ inches.

#### **Open-Vent Exhaust Stack Exclosures**

The operator will construct, modify, equip, and maintain all open-vent exhaust stacks on production equipment to prevent birds and bats from entering, and to discourage perching, roosting, and nesting. (*Recommended exclosure structures on open-vent exhaust stacks are in the shape of a cone.*) Production equipment includes, but may not be limited to, tanks, heater-treaters, separators, dehydrators, flare stacks, in-line units, and compressor mufflers.

#### **Containment Structures**

Proposed production facilities such as storage tanks and other vessels will have a secondary containment structure that is constructed to hold the capacity of 1.5 times the largest tank, plus freeboard to account for precipitation, unless more stringent protective requirements are deemed necessary.

#### **Painting Requirement**

All above-ground structures including meter housing that are not subject to safety requirements shall be painted a flat non-reflective paint color, **Shale Green** from the BLM Standard Environmental Color Chart (CC-001: June 2008).

### **B. PIPELINES**

#### **BURIED PIPELINE STIPULATIONS**

A copy of the application (Grant, APD, or Sundry Notice) and attachments, including conditions of approval, survey plat and/or map, will be on location during construction. BLM personnel may request to you a copy of your permit during construction to ensure compliance with all stipulations.

Holder agrees to comply with the following stipulations to the satisfaction of the Authorized Officer:

1. The Holder shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under this grant.
2. The Holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC 2601 et seq. (1982) with regards to any toxic substances that are used, generated by or stored on the right-of-way or on facilities authorized under this right-of-way grant. (See 40 CFR Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the authorized officer concurrent with the filing of the reports to the involved Federal agency or State government.
3. The holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq. or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, et seq.) on the Right-of-Way (unless the release or threatened release is wholly unrelated to the Right-of-Way holder's activity on the Right-of-Way), or resulting from the activity of the Right-of-Way holder on the Right-of-Way.

This agreement applies without regard to whether a release is caused by the holder, its agent, or unrelated third parties.

4. If, during any phase of the construction, operation, maintenance, or termination of the pipeline, any oil or other pollutant should be discharged from the pipeline system, impacting Federal lands, the control and total removal, disposal, and cleaning up of such oil or other pollutant, wherever found, shall be the responsibility of holder, regardless of fault. Upon failure of holder to control, dispose of, or clean up such discharge on or affecting Federal lands, or to repair all damages resulting therefrom, on the Federal lands, the Authorized Officer may take such measures as he deems necessary to control and clean up the discharge and restore the area, including where appropriate, the aquatic environment and fish and wildlife habitats, at the full expense of the holder. Such action by the Authorized Officer shall not relieve holder of any responsibility as provided herein.

5. All construction and maintenance activity will be confined to the authorized right-of-way.
6. The pipeline will be buried with a minimum cover of 36 inches between the top of the pipe and ground level.
7. The maximum allowable disturbance for construction in this right-of-way will be 30 feet:
- Blading of vegetation within the right-of-way will be allowed: maximum width of blading operations will not exceed 30 feet. The trench is included in this area. (*Blading is defined as the complete removal of brush and ground vegetation.*)
  - Clearing of brush species within the right-of-way will be allowed: maximum width of clearing operations will not exceed 30 feet. The trench and bladed area are included in this area. (*Clearing is defined as the removal of brush while leaving ground vegetation (grasses, weeds, etc.) intact. Clearing is best accomplished by holding the blade 4 to 6 inches above the ground surface.*)
  - The remaining area of the right-of-way (if any) shall only be disturbed by compressing the vegetation. (*Compressing can be caused by vehicle tires, placement of equipment, etc.*)
8. The holder shall stockpile an adequate amount of topsoil where blading is allowed. The topsoil to be stripped is approximately 6 inches in depth. The topsoil will be segregated from other spoil piles from trench construction. The topsoil will be evenly distributed over the bladed area for the preparation of seeding.
9. The holder shall minimize disturbance to existing fences and other improvements on public lands. The holder is required to promptly repair improvements to at least their former state. Functional use of these improvements will be maintained at all times. The holder will contact the owner of any improvements prior to disturbing them. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting of the fence. No permanent gates will be allowed unless approved by the Authorized Officer.
10. Vegetation, soil, and rocks left as a result of construction or maintenance activity will be randomly scattered on this right-of-way and will not be left in rows, piles, or berms, unless otherwise approved by the Authorized Officer. The entire right-of-way shall be recontoured to match the surrounding landscape. The backfilled soil shall be compacted and a 6 inch berm will be left over the ditch line to allow for settling back to grade.

11. In those areas where erosion control structures are required to stabilize soil conditions, the holder will install such structures as are suitable for the specific soil conditions being encountered and which are in accordance with sound resource management practices.

12. The holder will reseed all disturbed areas. Seeding will be done according to the attached seeding requirements, using the following seed mix.

- |  |  |
|--|--|
| <input type="checkbox"/> seed mixture 1                | <input type="checkbox"/> seed mixture 3          |
| <input type="checkbox"/> seed mixture 2                | <input type="checkbox"/> seed mixture 4          |
| <input checked="" type="checkbox"/> seed mixture 2/LPC | <input type="checkbox"/> Aplomado Falcon Mixture |

13. All above-ground structures not subject to safety requirements shall be painted by the holder to blend with the natural color of the landscape. The paint used shall be color which simulates "Standard Environmental Colors" – **Shale Green**, Munsell Soil Color No. 5Y 4/2.

14. The pipeline will be identified by signs at the point of origin and completion of the right-of-way and at all road crossings. At a minimum, signs will state the holder's name, BLM serial number, and the product being transported. All signs and information thereon will be posted in a permanent, conspicuous manner, and will be maintained in a legible condition for the life of the pipeline.

15. The holder shall not use the pipeline route as a road for purposes other than routine maintenance as determined necessary by the Authorized Officer in consultation with the holder before maintenance begins. The holder will take whatever steps are necessary to ensure that the pipeline route is not used as a roadway. As determined necessary during the life of the pipeline, the Authorized Officer may ask the holder to construct temporary deterrence structures.

16. Any cultural and/or paleontological resources (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the Authorized Officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the holder.

17. The operator shall be held responsible if noxious weeds become established within the areas of operations. Weed control shall be required on the disturbed land where noxious weeds exist, which includes associated roads, pipeline corridor and adjacent land affected by the establishment of weeds due to this action. The operator shall consult with the Authorized Officer for acceptable weed control methods, which include following EPA and BLM requirements and policies.

18. Escape Ramps - The operator will construct and maintain pipeline/utility trenches [that are not otherwise fenced, screened, or netted] to prevent livestock, wildlife, and humans from becoming entrapped. At a minimum, the operator will construct and maintain escape ramps, ladders, or other methods of avian and terrestrial wildlife escape in the trenches according to the following criteria:

- a. Any trench left open for eight (8) hours or less is not required to have escape ramps; however, before the trench is backfilled, the contractor/operator shall inspect the trench for wildlife, remove all trapped wildlife, and release them at least 100 yards from the trench.
- b. For trenches left open for eight (8) hours or more, earthen escape ramps (built at no more than a 30 degree slope and spaced no more than 500 feet apart) shall be placed in the trench.

### **Temporary Water Line:**

Subject to the terms and conditions which are shown below, is hereby approved:

- Surface pipelines 6.5 inch to 16 inch OD may be in place for no more than 180 days not including installation. In accordance with your request, this 180 day period is requested to begin 5/1//2018.
- Surface pipeline will be in operation for no more than 180 days; a maximum of seven (7) days authorized for installation of the lay flat poly line prior to operation.
- Surface pipelines larger than 6.5 inch to-16-inch OD may be in place for no more than 180 days from date of authorization; 5/1/2018, unless a SF-299 is submitted within 30 days of this decision expiring requesting a long term buried fresh water pipeline, and processing of the SF-299 is not yet complete at the end of 30 days, in which case the line(s) may be left in place until a decision is made on the SF-299.
- All lines will be removed when no longer in use.
- Width of authorized use is 15-feet.
- No blading and/or earthwork will be allowed in order to place the pipeline except burying the line under crossings.
- The pipeline will be buried under all intersecting routes, including BLM-designated trails and access roads into caliche pits, rancher watering stations, etc. All such buried crossings will be removed when the pipeline is removed, unless otherwise approved by the Authorized Officer. Pipelines larger than 6.5-inch OD may utilize other crossing methodologies (but any fill placed over pipeline must be brought in from off-site).
- Pipeline crossings of fences should be avoided where possible. If a crossing is necessary, contact fence owner [usually the grazing permittee] prior to installation, and install by threading pipeline under the lowest wire of the fence; pipeline should never cross on top of any fence wires.

- The pipeline shall stay within 10 feet maximum of existing disturbance (e.g. lease road, pipeline right-of-way etc.); placement should be within 5 feet whenever possible.
- Placement of pumps or other high-maintenance equipment shall be installed along maintained lease roads.
- Gas or diesel pumps, generators, or compressors shall be placed on visquen matting [or 20 mil plastic] and in a containment structure capable of containing all potentially released fuels. Containments must be protected against wildlife deaths in accordance with oilfield best management practices.
- Due to potential damage to natural resources, no work is allowed during inclement weather.
- Pipeline will be marked with your company's name and contact number, at beginning and ending points, at all public-road crossings, and at intervals not exceeding every 0.6 mile, unless otherwise approved by the Authorized Officer.
- Should unforeseen damage occur to resources, BLM will require reclamation of the impacted land.
- No water may be released into the environment without BLM consent.
- Placement of surface pipelines along or under public roadways may require permits from the road authority.
- This authorization is limited to lands under BLM jurisdiction. If your proposed pipeline crosses lands under private ownership or under other agency jurisdiction, you are responsible for obtaining all necessary permits and approvals from those parties.

### **C. ELECTRIC LINES**

#### **STANDARD STIPULATIONS FOR OVERHEAD ELECTRIC DISTRIBUTION LINES**

**A copy of the grant and attachments, including stipulations, survey plat and/or map, will be on location during construction. BLM personnel may request to you a copy of your permit during construction to ensure compliance with all stipulations.**

Holder agrees to comply with the following stipulations to the satisfaction of the Authorized Officer:

1. The holder shall indemnify the United States against any liability for damage to life or property arising from the occupancy or use of public lands under this grant.
2. The holder shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the holder shall comply with the Toxic Substances Control Act of 1976 as amended, 15 USC 2601 et seq. (1982) with regards to any toxic substances that are used, generated by or stored on the right-of-way or on

facilities authorized under this right-of-way grant. (See 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193.) Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act, section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances shall be furnished to the authorized officer concurrent with the filing of the reports to the involved Federal agency or State government.

3. The holder agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. 9601, et seq. or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, et seq.) on the Right-of-Way (unless the release or threatened release is wholly unrelated to the Right-of-Way holder's activity on the Right-of-Way), or resulting from the activity of the Right-of-Way holder on the Right-of-Way. This agreement applies without regard to whether a release is caused by the holder, its agent, or unrelated third parties.

4. There will be no clearing or blading of the right-of-way unless otherwise agreed to in writing by the Authorized Officer.

5. Power lines shall be constructed and designed in accordance to standards outlined in "Suggested Practices for Avian Protection on Power lines: The State of the Art in 2006" Edison Electric Institute, APLIC, and the California Energy Commission 2006 . The holder shall assume the burden and expense of proving that pole designs not shown in the above publication deter raptor perching, roosting, and nesting. Such proof shall be provided by a raptor expert approved by the Authorized Officer. The BLM reserves the right to require modification or additions to all powerline structures placed on this right-of-way, should they be necessary to ensure the safety of large perching birds. Such modifications and/or additions shall be made by the holder without liability or expense to the United States.

Raptor deterrence will consist of but not limited to the following: triangle perch discouragers shall be placed on each side of the cross arms and a nonconductive perching deterrence shall be placed on all vertical poles that extend past the cross arms.

6. The holder shall minimize disturbance to existing fences and other improvements on public lands. The holder is required to promptly repair improvements to at least their former state. Functional use of these improvements will be maintained at all times. The holder will contact the owner of any improvements prior to disturbing them. When necessary to pass through a fence line, the fence shall be braced on both sides of the passageway prior to cutting the fence. No permanent gates will be allowed unless approved by the Authorized Officer.



7. The BLM serial number assigned to this authorization shall be posted in a permanent, conspicuous manner where the power line crosses roads and at all serviced facilities. Numbers will be at least two inches high and will be affixed to the pole nearest the road crossing and at the facilities served.

8. Upon cancellation, relinquishment, or expiration of this grant, the holder shall comply with those abandonment procedures as prescribed by the Authorized Officer.

9. All surface structures (poles, lines, transformers, etc.) shall be removed within 180 days of abandonment, relinquishment, or termination of use of the serviced facility or facilities or within 180 days of abandonment, relinquishment, cancellation, or expiration of this grant, whichever comes first. This will not apply where the power line extends service to an active, adjoining facility or facilities.

10. Any cultural and/or paleontological resource (historic or prehistoric site or object) discovered by the holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the Authorized Officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant cultural or scientific values. The holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the Authorized Officer after consulting with the holder.

11. Special Stipulations:

- For reclamation remove poles, lines, transformer, etc. and dispose of properly.
- Fill in any holes from the poles removed.

**Timing Limitation Stipulation/Condition of Approval for Lesser Prairie-Chicken:**

Oil and gas activities including 3-D geophysical exploration, and drilling will not be allowed in lesser prairie-chicken habitat during the period from March 1st through June 15th annually. During that period, other activities that produce noise or involve human activity, such as the maintenance of oil and gas facilities, geophysical exploration other than 3-D operations, and pipeline, road, and well pad construction, will be allowed except between 3:00 am and 9:00 am. The 3:00 am to 9:00 am restriction will not apply to normal, around-the-clock operations, such as venting, flaring, or pumping, which do not require a human presence during this period. Additionally, no new drilling will be allowed within up to 200 meters of leks known at the time of permitting. Normal vehicle use on existing roads will not be restricted. Exhaust noise from pump jack engines must be muffled or otherwise controlled so as not to exceed 75 db measured at 30 ft. from the source of the noise.

This authorization is subject to your Certificate of Participation and/or Certificate of Inclusion under the New Mexico Candidate Conservation Agreement. Because it involves surface disturbing activities covered under your Certificate, your Habitat Conservation Fund Account with the Center of Excellence for Hazardous Materials Management (CEHMM) will be debited according to Exhibit B Part 2 of the Certificate of Participation.

## **VIII. INTERIM RECLAMATION**

During the life of the development, all disturbed areas not needed for active support of production operations should undergo interim reclamation in order to minimize the environmental impacts of development on other resources and uses.

Within six (6) months of well completion, operators should work with BLM surface management specialists (Jim Amos: 575-234-5909) to devise the best strategies to reduce the size of the location. Interim reclamation should allow for remedial well operations, as well as safe and efficient removal of oil and gas.

During reclamation, the removal of caliche is important to increasing the success of revegetating the site. Removed caliche that is free of contaminants may be used for road repairs, fire walls or for building other roads and locations. In order to operate the well or complete workover operations, it may be necessary to drive, park and operate on restored interim vegetation within the previously disturbed area. Disturbing revegetated areas for production or workover operations will be allowed. If there is significant disturbance and loss of vegetation, the area will need to be revegetated. Communicate with the appropriate BLM office for any exceptions/exemptions if needed.

All disturbed areas after they have been satisfactorily prepared need to be reseeded with the seed mixture provided below.

Upon completion of interim reclamation, the operator shall submit a Sundry Notices and Reports on Wells, Subsequent Report of Reclamation (Form 3160-5).

## **IX. FINAL ABANDONMENT & RECLAMATION**

At final abandonment, well locations, production facilities, and access roads must undergo "final" reclamation so that the character and productivity of the land are restored.

Earthwork for final reclamation must be completed within six (6) months of well plugging. All pads, pits, facility locations and roads must be reclaimed to a satisfactory revegetated, safe, and stable condition, unless an agreement is made with the landowner or BLM to keep the road and/or pad intact.

After all disturbed areas have been satisfactorily prepared, these areas need to be revegetated with the seed mixture provided below. Seeding should be accomplished by drilling on the contour whenever practical or by other approved methods. Seeding may need to be repeated until revegetation is successful, as determined by the BLM.

Operators shall contact a BLM surface protection specialist prior to surface abandonment operations for site specific objectives (Jim Amos: 575-234-5909).

Ground-level Abandoned Well Marker to avoid raptor perching: Upon the plugging and subsequent abandonment of the well, the well marker will be installed at ground level on a plate containing the pertinent information for the plugged well.

### Seed Mixture for LPC Sand/Shinnery Sites

The holder shall seed all disturbed areas with the seed mixture listed below. The seed mixture shall be planted in the amounts specified in pounds of pure live seed (PLS)\* per acre. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed will be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed will be either certified or registered seed. The seed container will be tagged in accordance with State law(s) and available for inspection by the authorized officer.

Seed will be planted using a drill equipped with a depth regulator to ensure proper depth of planting where drilling is possible. The seed mixture will be evenly and uniformly planted over the disturbed area (smaller/heavier seeds have a tendency to drop the bottom of the drill and are planted first). The holder shall take appropriate measures to ensure this does not occur. Where drilling is not possible, seed will be broadcast and the area shall be raked or chained to cover the seed. When broadcasting the seed, the pounds per acre are to be doubled. The seeding will be repeated until a satisfactory stand is established as determined by the authorized officer. Evaluation of growth will not be made before completion of at least one full growing season after seeding.

Species to be planted in pounds of pure live seed\* per acre:

<u>Species</u>	<u>lb/acre</u>
Plains Bristlegrass	5lbs/A
Sand Bluestem	5lbs/A
Little Bluestem	3lbs/A
Big Bluestem	6lbs/A
Plains Coreopsis	2lbs/A
Sand Dropseed	1lbs/A

\*Pounds of pure live seed:

Pounds of seed x percent purity x percent germination = pounds pure live seed



U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## Operator Certification Data Report

08/06/2019

### Operator Certification

*I hereby certify that I, or someone under my direct supervision, have inspected the drill site and access route proposed herein; that I am familiar with the conditions which currently exist; that I have full knowledge of state and Federal laws applicable to this operation; that the statements made in this APD package are, to the best of my knowledge, true and correct; and that the work associated with the operations proposed herein will be performed in conformity with this APD package and the terms and conditions under which it is approved. I also certify that I, or the company I represent, am responsible for the operations conducted under this application. These statements are subject to the provisions of 18 U.S.C. 1001 for the filing of false statements.*

**NAME:** Hope Knauls

**Signed on:** 11/14/2018

**Title:** Regulatory Technician

**Street Address:** 202 S. Cheyenne Ave, Ste 1000

**City:** Tulsa

**State:** OK

**Zip:** 74103

**Phone:** (918)295-1799

**Email address:** hknaults@cimarex.com

### Field Representative

**Representative Name:**

**Street Address:**

**City:**

**State:**

**Zip:**

**Phone:**

**Email address:**



U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## Application Data Report

08/06/2019

APD ID: 10400036215

Submission Date: 11/14/2018

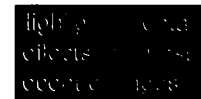
Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

Well Type: OIL WELL

Well Work Type: Drill



[Show Final Text](#)

### Section 1 - General

APD ID: 10400036215

Tie to previous NOS? Y

Submission Date: 11/14/2018

BLM Office: CARLSBAD

User: Hope Knauls

Title: Regulatory Technician

Federal/Indian APD: FED

Is the first lease penetrated for production Federal or Indian? FED

Lease number: NMNM043562

Lease Acres: 640

Surface access agreement in place?

Allotted?

Reservation:

Agreement in place? NO

Federal or Indian agreement:

Agreement number:

Agreement name:

Keep application confidential? YES

Permitting Agent? NO

APD Operator: CIMAREX ENERGY COMPANY

Operator letter of designation:

### Operator Info

Operator Organization Name: CIMAREX ENERGY COMPANY

Operator Address: 600 N. Marienfeld St., Suite 600

Zip: 79701

Operator PO Box:

Operator City: Midland

State: TX

Operator Phone: (432)620-1936

Operator Internet Address: [tstathem@cimarex.com](mailto:tstathem@cimarex.com)

### Section 2 - Well Information

Well in Master Development Plan? NO

Master Development Plan name:

Well in Master SUPO? NO

Master SUPO name:

Well in Master Drilling Plan? NO

Master Drilling Plan name:

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

Well API Number:

Field/Pool or Exploratory? Field and Pool

Field Name: BRUSHY CANYON Pool Name: WC-025 G-09  
S253309P; UPR WOLFCAMP

Is the proposed well in an area containing other mineral resources? USEABLE WATER

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Describe other minerals:**

**Is the proposed well in a Helium production area?** N

**Use Existing Well Pad?** NO

**New surface disturbance?**

**Type of Well Pad:** MULTIPLE WELL

**Multiple Well Pad Name:**

**Number:** W2W2 PAD 1

**Well Class:** HORIZONTAL

**CASCADE 29 FEDERAL**

**Number of Legs:** 1

**Well Work Type:** Drill

**Well Type:** OIL WELL

**Describe Well Type:**

**Well sub-Type:** INFILL

**Describe sub-type:**

**Distance to town:** 23.1 Miles

**Distance to nearest well:** 20 FT

**Distance to lease line:** 390 FT

**Reservoir well spacing assigned acres Measurement:** 320 Acres

**Well plat:** Cascade\_29\_Fed\_17H\_C102\_Plat\_20181114124655.pdf

**Well work start Date:** 11/08/2019

**Duration:** 30 DAYS

### Section 3 - Well Location Table

**Survey Type:** RECTANGULAR

**Describe Survey Type:**

**Datum:** NAD83

**Vertical Datum:** NAVD88

**Survey number:**

**Reference Datum:**

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	390	FSL	410	FWL	25S	33E	29	Aliquot SWS W	32.095392	-103.601531	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 043562	3402	0	0
KOP Leg #1	334	FSL	955	FWL	25S	33E	29	Aliquot SWS W	32.0952278	-103.599775	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 043562	-8402	11833	11804
PPP Leg #1	437	FSL	1093	FWL	25S	33E	29	Aliquot SWS W	32.0955056	-103.599325	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 043562	-8787	12266	12189

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
EXIT Leg #1	100	FNL	117 0	FWL	25S	33E	29	Aliquot NWN W	32.10855 8	- 103.5990 7	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 043562	- 902 8	170 94	124 30
BHL Leg #1	100	FNL	117 0	FWL	25S	33E	29	Aliquot NWN W	32.10855 8	- 103.5990 7	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 043562	- 902 8	170 94	124 30





U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## Drilling Plan Data Report

08/06/2019

APD ID: 10400036215

Submission Date: 11/14/2018

Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

[Show Final Text](#)

Well Type: OIL WELL

Well Work Type: Drill

### Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	RUSTLER	3402	935	935		USEABLE WATER	N
2	TOP SALT	2104	1298	1298		NONE	N
3	BASE OF SALT	-1312	4714	4714		NONE	N
4	LAMAR	-1507	4909	4909		NONE	N
5	BELL CANYON	-1535	4937	4937		NONE	N
6	CHERRY CANYON	-2588	5990	5990		NONE	N
7	BRUSHY CANYON	-4134	7536	7536		NATURAL GAS,OIL	N
8	BONE SPRING	-5630	9032	9032		NATURAL GAS,OIL	N
9	AVALON SAND	-5911	9313	9313		NATURAL GAS,OIL	N
10	WOLFCAMP	-8787	12189	12189		NATURAL GAS,OIL	Y

### Section 2 - Blowout Prevention

Pressure Rating (PSI): 10M

Rating Depth: 17094

**Equipment:** A BOP consisting of three rams, including one blind ram and two pipe rams and one annular preventer. An accumulator that meets the requirements in Onshore Order #2 for the pressure rating of the BOP stack. A rotating head may be installed as needed. A Kelly clock will be installed and maintained in operable condition and a drill string safety valve in the open position will be available on the rig floor.

**Requesting Variance?** YES

**Variance request:** Co-flex line between the BOP and choke manifold. Certification for proposed co-flex hose is attached. The hose is not required by the manufacturer to be anchored. In the event the specific hose is not available, one of equal or higher rating will be used. Variance to include Hammer Union connections on lines downstream of the buffer tank only. Cimarex requests a 5M annular variance for the 10M BOP system. See attached procedure.

**Testing Procedure:** A multi-bowl wellhead system will be utilized. After running the 10-3/4" surface casing, a 13 5/8" BOP/BOPE system with a minimum working pressure of 10000 psi will be installed on the wellhead system and will be pressure tested to 250 psi low followed by a 10000 psi test. Annular will be tested to 50% of working pressure. The pressure

Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

test will be repeated at least every 30 days, as per Onshore Order No. 2. The multi-bowl wellhead will be installed by vendor's representative. A copy of the installation instructions has been sent to the BLM field office. The wellhead will be installed by a third-party welder while being monitored by the wellhead vendor representative. All BOP equipment will be tested utilizing a conventional test plug. Not a cup or J-packer type. A solid steel body pack-off will be utilized after running and cementing the intermediate casing. After installation the pack-off and lower flange will be pressure tested to 10000 psi. The surface casing string will be tested as per Onshore Order No. 2 to at least 0.22 psi/ft or 1500 psi, whichever is greater. The casing string utilizing steel body pack-off will be tested to 70% of casing burst. If well conditions dictate conventional slips will be set and BOPE will be tested to appropriate pressures based on permitted pressure requirements.

**Choke Diagram Attachment:**

Cascade\_29\_Fed\_17H\_Choke\_10M\_20181110153718.pdf

**BOP Diagram Attachment:**

Cascade\_29\_Fed\_17H\_BOP\_10M\_20181110153745.pdf

**Pressure Rating (PSI): 5M**

**Rating Depth: 12633**

**Equipment:** A BOP consisting of three rams, including one blind ram and two pipe rams and one annular preventer. An accumulator that meets the requirements in Onshore Order #2 for the pressure rating of the BOP stack. A rotating head may be installed as needed. A Kelly clock will be installed and maintained in operable condition and a drill string safety valve in the open position will be available on the rig floor.

**Requesting Variance? YES**

**Variance request:** Co-flex line between the BOP and choke manifold. Certification for proposed co-flex hose is attached. The hose is not required by the manufacturer to be anchored. In the event the specific hose is not available, one of equal or higher rating will be used. Variance to include Hammer Union connections on lines downstream of the buffer tank only.

**Testing Procedure:** Co-flex line between the BOP and choke manifold. Certification for proposed co-flex hose is attached. The hose is not required by the manufacturer to be anchored. In the event the specific hose is not available, one of equal or higher rating will be used. Variance to include Hammer Union connections on lines downstream of the buffer tank only.

**Choke Diagram Attachment:**

Cascade\_29\_Fed\_17H\_Choke\_5M\_20181110152223.pdf

**BOP Diagram Attachment:**

Cascade\_29\_Fed\_17H\_BOP\_5M\_20181110152251.pdf

**Section 3 - Casing**

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	14.75	10.75	NEW	API	N	0	985	0	985			985	J-55	40.5	BUTT	3.51	6.94	BUOY	15.77	BUOY	15.77
2	PRODUCT ION	6.75	5.5	NEW	API	N	0	11833	0	11833			11833	L-80	20	LT&C	1.15	1.19	BUOY	1.86	BUOY	1.86

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
3	INTERMEDIATE	9.875	7.625	NEW	API	N	0	12633	0	12381			12633	L-80	29.7	BUTT	2.47	1.19	BUOY	1.81	BUOY	1.81
4	PRODUCTION	6.75	5.0	NEW	API	N	11833	17094	11833	12430			5261	HCP-110	18	BUTT	1.66	1.69	DRY	53.97	BUOY	53.97

#### Casing Attachments

**Casing ID:** 1      **String Type:** SURFACE

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

**Casing Design Assumptions and Worksheet(s):**

Cascade\_29\_Fed\_17H\_Casing\_Assumptions\_20181110154753.pdf

**Casing ID:** 2      **String Type:** PRODUCTION

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

**Casing Design Assumptions and Worksheet(s):**

Cascade\_29\_Fed\_17H\_Casing\_Assumptions\_20181110154812.pdf

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

#### Casing Attachments

**Casing ID:** 3      **String Type:** INTERMEDIATE

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

**Casing Design Assumptions and Worksheet(s):**

Cascade\_29\_Fed\_17H\_Casing\_Assumptions\_20181110154839.pdf

**Casing ID:** 4      **String Type:** PRODUCTION

**Inspection Document:**

**Spec Document:**

**Tapered String Spec:**

**Casing Design Assumptions and Worksheet(s):**

Cascade\_29\_Fed\_17H\_Casing\_Assumptions\_20181110155235.pdf

#### Section 4 - Cement

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead		0	985	332	1.72	13.5	571	50	Class C	Bentonite
SURFACE	Tail		0	985	156	1.34	14.8	208	25	Class c	LCM
INTERMEDIATE	Lead	4850	0	1263 3	601	3.64	10.3	2186	50	Tuned Light	LCM
INTERMEDIATE	Tail		0	1263 3	207	1.3	14.2	268	25	50:50 (Poz:H)	Salt, Bentonite, Fluid Loss, Dispersant, SMS
INTERMEDIATE	Lead		0	1263 3	786	1.88	12.9	1476	50	35:65 (Poz:C)	Salt, Bentonite

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
PRODUCTION	Lead		1183 3	1709 4	373	1.3	14.2	484	10	50:50 (Poz:H)	Salt, Bentonite, Fluid Loss, Dispersant, SMS

PRODUCTION	Lead		0	1709 4	373	1.3	14.2	484	10	50:50 (Poz:H)	Salt, Bentonite, Fluid Loss, Dispersant, SMS
------------	------	--	---	-----------	-----	-----	------	-----	----	---------------	--

### Section 5 - Circulating Medium

**Mud System Type:** Closed

**Will an air or gas system be Used?** NO

**Description of the equipment for the circulating system in accordance with Onshore Order #2:**

**Diagram of the equipment for the circulating system in accordance with Onshore Order #2:**

**Describe what will be on location to control well or mitigate other conditions:** Sufficient mud materials will be kept on location at all times in order to combat lost circulation or unexpected kicks. In order to run DSTs, open hole logs, and casing, the viscosity and water loss may have to be adjusted in order to meet these needs.

**Describe the mud monitoring system utilized:** PVT/Pason/Visual Monitoring

### Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
0	985	SPUD MUD	8.3	8.8							
985	1263 3	OTHER : Brine Diesel Emulsion	8.5	9							
1263 3	1709 4	OIL-BASED MUD	12	12.5							

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

## Section 6 - Test, Logging, Coring

**List of production tests including testing procedures, equipment and safety measures:**

No DST Planned

**List of open and cased hole logs run in the well:**

CNL,DS,GR

**Coring operation description for the well:**

N/A

## Section 7 - Pressure

**Anticipated Bottom Hole Pressure:** 8079

**Anticipated Surface Pressure:** 5344.4

**Anticipated Bottom Hole Temperature(F):** 192

**Anticipated abnormal pressures, temperatures, or potential geologic hazards?** YES

**Describe:**

Lost circulation may be encountered in the Delaware mountain group. Abnormal pressure as well as hole stability issues may be encountered in the Wolfcamp.

**Contingency Plans geohazards description:**

Lost circulation material will be available, as well as additional drilling fluid along with the fluid volume in the drilling rig pit system. Drilling fluid can be mixed on location or mixed in vendor mud plant and trucked to location if needed. Sufficient barite will be available to maintain appropriate mud weight for the Wolfcamp interval.

**Contingency Plans geohazards attachment:**

**Hydrogen Sulfide drilling operations plan required?** YES

**Hydrogen sulfide drilling operations plan:**

Cascade\_29\_Fed\_17H\_H2S\_Plan\_20181110161253.pdf

## Section 8 - Other Information

**Proposed horizontal/directional/multi-lateral plan submission:**

Cascade\_29\_Fed\_17H\_AC\_Report\_20181110161402.pdf

Cascade\_29\_Fed\_17H\_Directional\_Plan\_20181110161405.pdf

**Other proposed operations facets description:**

Cimarex requests a 5M annular variance for the 10M BOP system. See attached procedure.

**Other proposed operations facets attachment:**

Cascade\_29\_Fed\_17H\_Gas\_Capture\_Plan\_20181110161527.pdf

Cascade\_29\_Fed\_17H\_Drilling\_Plan\_20181110161550.pdf

Cascade\_29\_Fed\_17H\_Flex\_Hose\_20181110161600.pdf

**Other Variance attachment:**

Cascade\_29\_Fed\_17H\_Multibowl\_procedure\_20181110161645.pdf

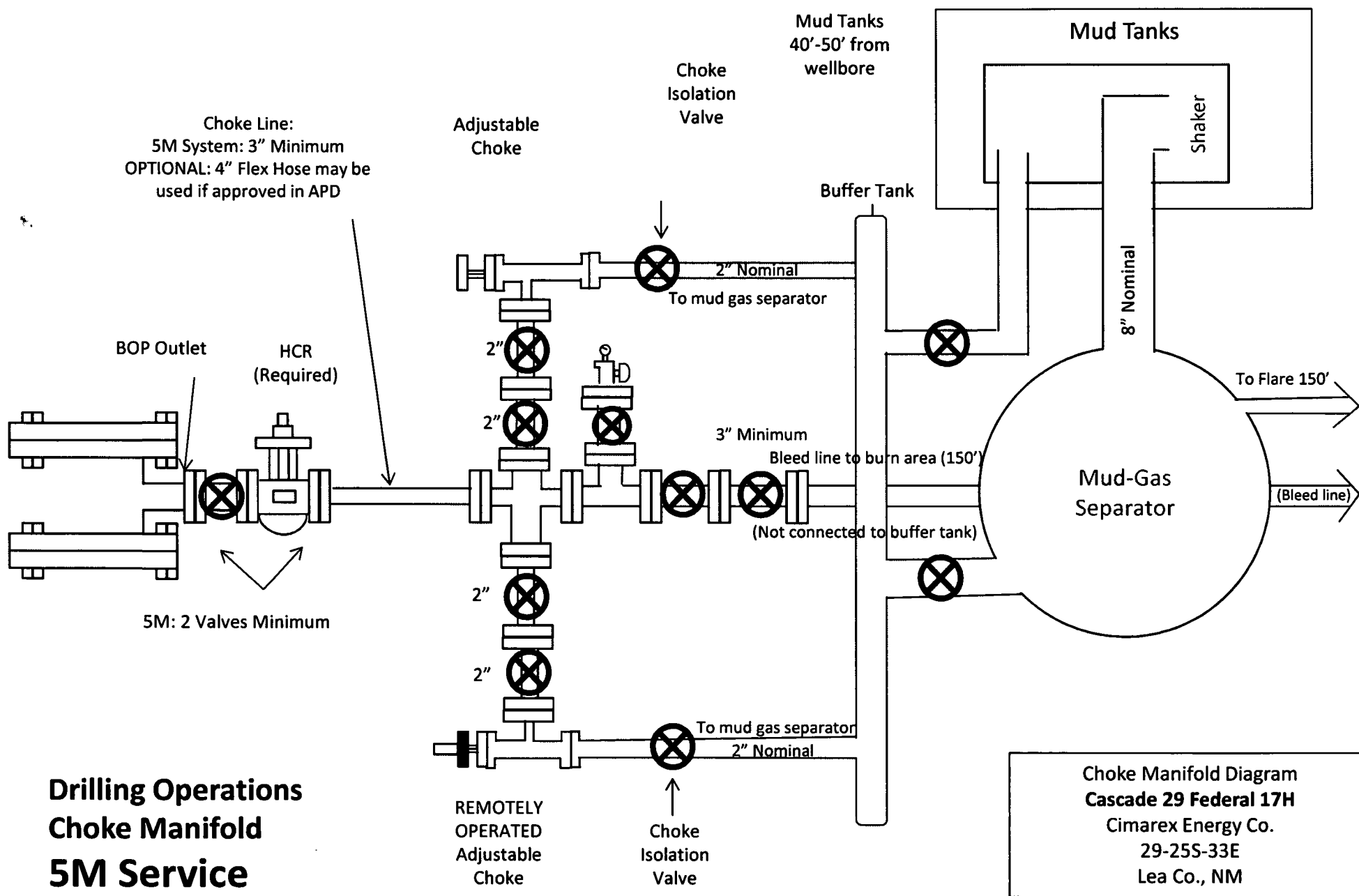
**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

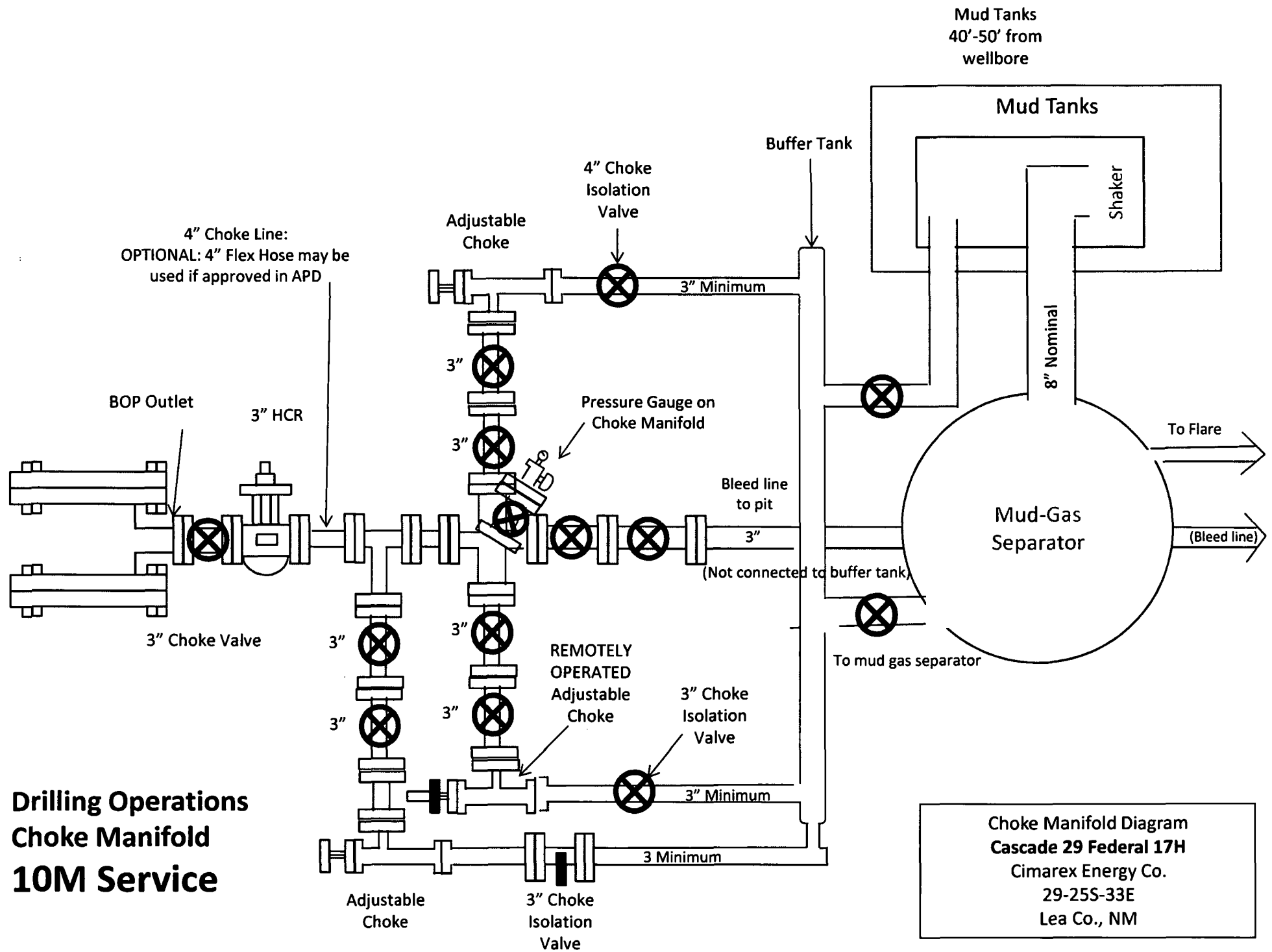
Cascade\_29\_Fed\_17H\_Multibowl\_Wellhead\_20181110161647.pdf

Cascade\_29\_Fed\_17H\_Well\_Control\_10M\_w\_5M\_annular\_Plan\_\_BLM\_Approved\_\_20181113162528.pdf





# **Drilling Operations Choke Manifold 10M Service**



Choke Manifold Diagram  
 Cascade 29 Federal 17H  
 Cimarex Energy Co.  
 29-25S-33E  
 Lea Co., NM

Drilling 9-7/8" hole below  
10-3/4" Casing

Fill Line

Flowline

5000# (5M)  
BOP

Annular Preventer

SRR & A

Pipe Rams

Blind Rams

2" Minimum Kill Line

Kill Line

Drilling  
Spool

3" minimum choke line

Choke Line

2 Valves Minimum  
(HCR Required)

2 Valves and a check valve

Wellhead  
Assembly

11" 5000 psi x 7-1/16" 10,000 psi  
Wellhead Assembly

Wellhead  
Assembly

13-5/8" 3000 psi x 11" 5000 psi  
Wellhead Assembly

5000# BOP  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM

13-5/8" 3000#psi x 13-3/8" SOW Casing Head

Drilling 6-3/4" Hole  
below 7-5/8" Casing

5M Annular Preventer

10M Double  
Ram BOP

Pipe Rams

Blind Rams

2" Kill Line Valves (2)  
with Check Valve

3" Manual Choke Valve  
and 3" HCR Valve

2" Kill Line

3" Choke Line

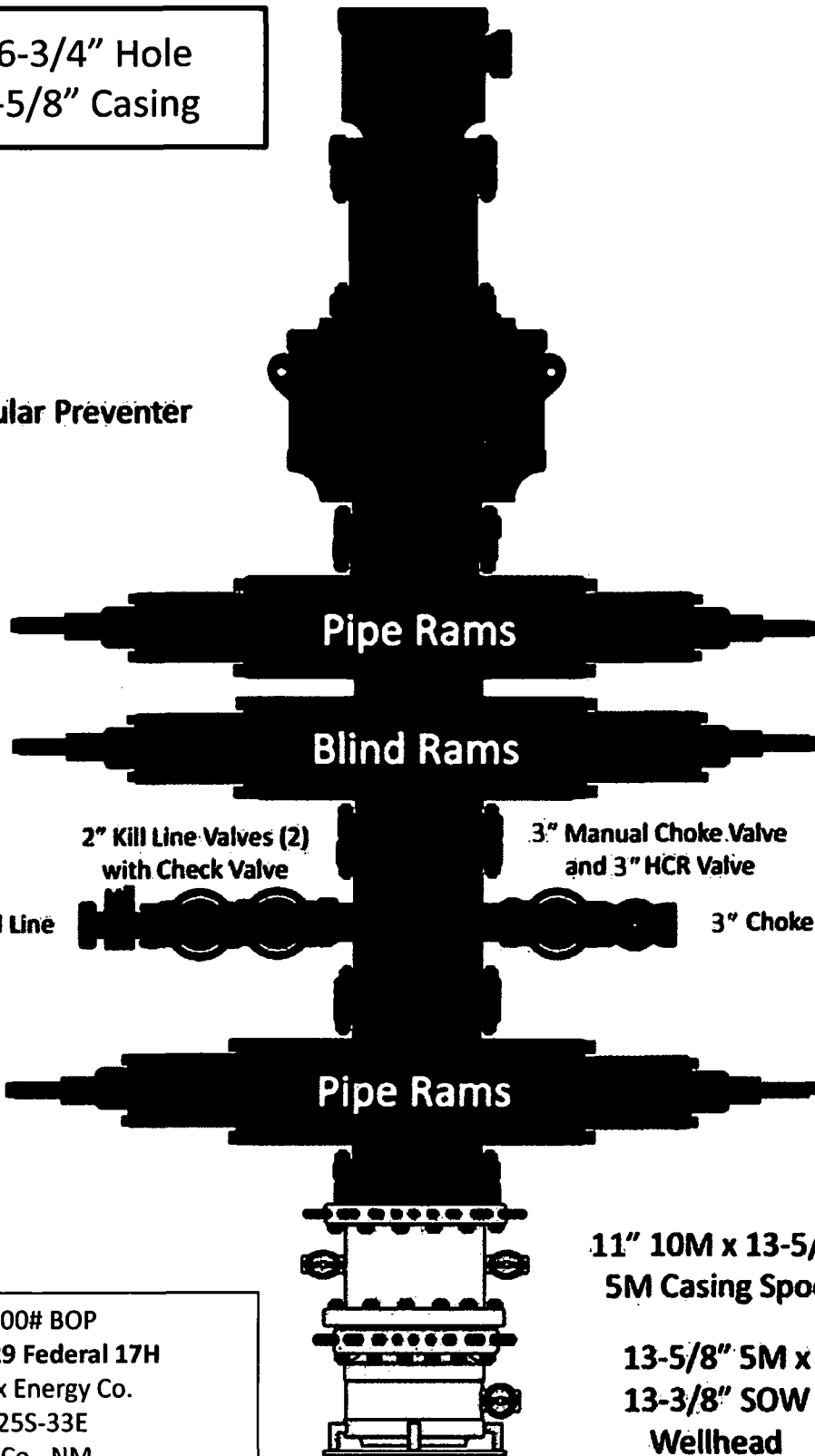
10M Single  
Ram BOP

Pipe Rams

10,000# BOP  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM

11" 10M x 13-5/8"  
5M Casing Spool

13-5/8" 5M x  
13-3/8" SOW  
Wellhead



## Cascade 29 Federal 17H

### Casing Assumptions

#### Casing Program

Hole Size	Casing Depth From	Casing Depth To	Setting Depth TVD	Casing Size	Weight (lb/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14 3/4	0	985	985	10-3/4"	40.50	J-55	BT&C	3.51	6.94	15.77
9 7/8	0	12633	12381	7-5/8"	29.70	L-80	BT&C	2.47	1.19	1.81
6 3/4	0	11833	11833	5-1/2"	20.00	L-80	LT&C	1.15	1.19	1.86
6 3/4	11833	17094	12430	5"	18.00	HCP-110	BT&C	1.66	1.69	53.97
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

## Cascade 29 Federal 17H

### Casing Assumptions

#### Casing Program

Hole Size	Casing Depth From	Casing Depth To	Setting Depth TVD	Casing Size	Weight (lb/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14 3/4	0	985	985	10-3/4"	40.50	J-55	BT&C	3.51	6.94	15.77
9 7/8	0	12633	12381	7-5/8"	29.70	L-80	BT&C	2.47	1.19	1.81
6 3/4	0	11833	11833	5-1/2"	20.00	L-80	LT&C	1.15	1.19	1.86
6 3/4	11833	17094	12430	5"	18.00	HCP-110	BT&C	1.66	1.69	53.97
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

## Cascade 29 Federal 17H

### Casing Assumptions

#### Casing Program

Hole Size	Casing Depth From	Casing Depth To	Setting Depth TVD	Casing Size	Weight (lb/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14 3/4	0	985	985	10-3/4"	40.50	J-55	BT&C	3.51	6.94	15.77
9 7/8	0	12633	12381	7-5/8"	29.70	L-80	BT&C	2.47	1.19	1.81
6 3/4	0	11833	11833	5-1/2"	20.00	L-80	LT&C	1.15	1.19	1.86
6 3/4	11833	17094	12430	5"	18.00	HCP-110	BT&C	1.66	1.69	53.97
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

## Cascade 29 Federal 17H

### Casing Assumptions

#### Casing Program

Hole Size	Casing Depth From	Casing Depth To	Setting Depth TVD	Casing Size	Weight (lb/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14 3/4	0	985	985	10-3/4"	40.50	J-55	BT&C	3.51	6.94	15.77
9 7/8	0	12633	12381	7-5/8"	29.70	L-80	BT&C	2.47	1.19	1.81
6 3/4	0	11833	11833	5-1/2"	20.00	L-80	LT&C	1.15	1.19	1.86
6 3/4	11833	17094	12430	5"	18.00	HCP-110	BT&C	1.66	1.69	53.97
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

Hydrogen Sulfide Drilling Operations Plan  
**Cascade 29 Federal 17H**  
Cimarex Energy Co.  
UL: M, Sec. 29, 25S, 33E  
Lea Co., NM

- 1 All Company and Contract personnel admitted on location must be trained by a qualified H<sub>2</sub>S safety instructor to the following:
  - A. Characteristics of H<sub>2</sub>S
  - B. Physical effects and hazards
  - C. Principal and operation of H<sub>2</sub>S detectors, warning system and briefing areas.
  - D. Evacuation procedure, routes and first aid.
  - E. Proper use of safety equipment & life support systems
  - F. Essential personnel meeting Medical Evaluation criteria will receive additional training on the proper use of 30 minute pressure demand air packs.

H<sub>2</sub>S Detection and Alarm Systems:

  - A. H<sub>2</sub>S sensors/detectors to be located on the drilling rig floor, in the base of the sub structure/cellar area, on the mud pits in the shale shaker area. Additional H<sub>2</sub>S detectors may be placed as deemed necessary.
  - B. An audio alarm system will be installed on the derrick floor and in the top doghouse.
- 3 Windsock and/or wind streamers:
  - A. Windsock at mudpit area should be high enough to be visible.
  - B. Windsock on the rig floor and / or top doghouse should be high enough to be visible.
- 4 Condition Flags and Signs
  - A. Warning sign on access road to location.
  - B. Flags to be displayed on sign at entrance to location. Green flag indicates normal safe condition. Yellow flag indicates potential pressure and danger. Red flag indicates danger (H<sub>2</sub>S present in dangerous concentration). Only H<sub>2</sub>S trained and certified personnel admitted to location.
- 5 Well control equipment:
  - A. See exhibit "E-1"
- 6 Communication:
  - A. While working under masks chalkboards will be used for communication.
  - B. Hand signals will be used where chalk board is inappropriate.
  - C. Two way radio will be used to communicate off location in case of emergency help is required. In most cases cellular telephones will be available at most drilling foreman's trailer or living quarters.
- 7 Drillstem Testing:

No DSTs or cores are planned at this time.
- 8 Drilling contractor supervisor will be required to be familiar with the effects H<sub>2</sub>S has on tubular goods and other mechanical equipment.
- 9 If H<sub>2</sub>S is encountered, mud system will be altered if necessary to maintain control of formation. A mud gas separator will be brought into service along with H<sub>2</sub>S scavengers if necessary.



H<sub>2</sub>S Contingency Plan  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
UL: M, Sec. 29, 25S, 33E  
Lea Co., NM

**Emergency Procedures**

In the event of a release of gas containing H<sub>2</sub>S, the first responder(s) must:

- « Isolate the area and prevent entry by other persons into the 100 ppm ROE.
- « Evacuate any public places encompassed by the 100 ppm ROE.
- « Be equipped with H<sub>2</sub>S monitors and air packs in order to control the release.
- « Use the "buddy system" to ensure no injuries occur during the 432-620-1975
- « Take precautions to avoid personal injury during this operation.
- « Contact operator and/or local officials to aid in operation. See list of phone numbers attached.
- « Have received training in the:
  - Detection of H<sub>2</sub>S, and
  - Measures for protection against the gas,
  - Equipment used for protection and emergency response.

**Ignition of Gas Source**

Should control of the well be considered lost and ignition considered, take care to protect against exposure to Sulfur Dioxide (SO<sub>2</sub>). Intentional ignition must be coordinated with the NMOCD and local officials. Additionally, the NM State Police may become involved. NM State Police shall be the Incident Command on scene of any major release. Take care to protect downwind whenever there is an ignition of the gas.

**Characteristics of H<sub>2</sub>S and SO<sub>2</sub>**

Please see attached International Chemical Safety Cards.

**Contacting Authorities**

Cimarex Energy Co. of Colorado's personnel must liaise with local and state agencies to ensure a proper response to a major release. Additionally, the OCD must be notified of the release as soon as possible but no later than 4 hours. Agencies will ask for information such as type and volume of release, wind direction, location of release, etc. Be prepared with all information available including directions to site. The following call list of essential and potential responders has been prepared for use during a release. Cimarex Energy Co. of Colorado's response must be in coordination with the State of New Mexico's "Hazardous Materials Emergency Response Plan" (HMER).

H<sub>2</sub>S Contingency Plan Emergency Contacts

**Cascade 29 Federal 17H**

Cimarex Energy Co.

UL: M, Sec. 29, 25S, 33E

Lea Co., NM

<b><u>Company Office</u></b>			
Cimarex Energy Co. of Colorado		800-969-4789	
Co. Office and After-Hours Menu			
<b><u>Key Personnel</u></b>			
<b>Name</b>	<b>Title</b>	<b>Office</b>	<b>Mobile</b>
Larry Seigrist	Drilling Manager	432-620-1934	580-243-8485
Charlie Pritchard	Drilling Superintendent	432-620-1975	432-238-7084
Roy Shirley	Construction Superintendent		432-634-2136
<b><u>Artesia</u></b>			
Ambulance		911	
State Police		575-746-2703	
City Police		575-746-2703	
Sheriff's Office		575-746-9888	
<b>Fire Department</b>		<b>575-746-2701</b>	
Local Emergency Planning Committee		575-746-2122	
New Mexico Oil Conservation Division		575-748-1283	
<b><u>Carlsbad</u></b>			
Ambulance		911	
State Police		575-885-3137	
City Police		575-885-2111	
Sheriff's Office		575-887-7551	
<b>Fire Department</b>		<b>575-887-3798</b>	
Local Emergency Planning Committee		575-887-6544	
US Bureau of Land Management		575-887-6544	
<b><u>Santa Fe</u></b>			
New Mexico Emergency Response Commission (Santa Fe)		505-476-9600	
New Mexico Emergency Response Commission (Santa Fe) 24 Hrs		505-827-9126	
New Mexico State Emergency Operations Center		505-476-9635	
<b><u>National</u></b>			
National Emergency Response Center (Washington, D.C.)		800-424-8802	
<b><u>Medical</u></b>			
Flight for Life - 4000 24th St.; Lubbock, TX		806-743-9911	
Aerocare - R3, Box 49F; Lubbock, TX		806-747-8923	
Med Flight Air Amb - 2301 Yale Blvd S.E., #D3; Albuquerque, NM		505-842-4433	
SB Air Med Service - 2505 Clark Carr Loop S.E.; Albuquerque, NM		505-842-4949	
<b><u>Other</u></b>			
Boots & Coots IWC		800-256-9688	or 281-931-8884
Cudd Pressure Control		432-699-0139	or 432-563-3356
Halliburton		575-746-2757	
B.J. Services		575-746-3569	

## Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 Anti-Collision Summary Report

Analysis Date-24hr Time: October 10, 2018 - 14:05  
 Client: Cimarex Energy  
 Field: NM Lea County (NAD 83)  
 Structure: Cimarex Cascade 29 Federal #17H  
 Slot: New Slot  
 Well: Cascade 29 Federal #17H  
 Borehole: Cascade 29 Federal #17H  
 Scan MD Range: 0.00ft - 17101.74ft

Analysis Method: 3D Least Distance  
 Reference Trajectory: Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 (Non-Def Plan)  
 Depth Interval: Every 10.00 Measured Depth (ft)  
 Rule Set: NAL Procedure: D&M Anti-Collision Standard S002  
 Min Pts: All local minima indicated.  
 Version / Patch: 2.10.740.0  
 Database / Project: US1153APP452.dti.atb.com/drilling-NM Lea County 2.10

ISCWSA0 3-D 95.000% Confidence 2.7955 sigma, for subject well. For offset wells, error model version is specified with each well respectively.

## Trajectory Error Model:

## Offset Trajectories Summary

## Offset Selection Criteria

Wellhead distance scan: Not performed

Selection filters:

Definitive Surveys - Definitive Plans - Definitive surveys exclude definitive plans

- All Non-Def Surveys when no Def-Survey is set in a borehole - All Non-Def Plans when no Def-Plan is set in a borehole

Offset Trajectory	Separation			Allow Dev. (ft)	Sep. Fact.	Controlling Rule	Reference Trajectory		Risk Level			Alert	Status
	CI-CI (ft)	MAS (ft)	EOU (ft)				MD (ft)	TVD (ft)	Alert	Minor	Major		

Results highlighted: Sep-Factor separation <= 1.50 ft

Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 (Non-Def Plan)													
Wellhead distance scan: Not performed													

4593.19	32.81	4560.63	4530.36	N/A	MAS = 10.00 (m)	0.00	0.00						MinPts
4593.21	32.81	4560.68	4530.40	145170.61	MAS = 10.00 (m)	26.00	26.00						WRP
4594.36	32.81	4560.10	4531.55	2597.67	MAS = 10.00 (m)	370.00	370.00						MINPT-O-EQU
4598.16	32.81	4561.31	4535.35	1050.12	MAS = 10.00 (m)	980.00	980.00						MINPT-O-EQU
4575.61	32.81	4565.88	4542.80	631.96	MAS = 10.00 (m)	1690.00	1679.88						MinPts-O-SF
4596.61	32.81	4586.15	4565.80	461.63	MAS = 10.00 (m)	2710.00	2699.47						MinPts-O-SF
4629.52	32.81	4609.43	4586.71	263.04	MAS = 10.00 (m)	4610.00	4577.75						MINPT-O-EQU
338.85	104.12	268.61	234.73	4.95	OSF1.50	9580.00	9523.87	OSF<5.00					Enter Alert
109.95	112.16	34.34	-2.21	1.47	OSF1.50	9610.00	9753.87		OSF<1.50				Enter Minor
80.55	119.79	-0.15	-39.24	1.00	OSF1.50	9640.00	9783.87			OSF<1.00			Enter Major
18.81	290.79	-175.60	-271.99	0.00	OSF1.50	9920.00	9663.87						MinPts
74.06	126.63	-11.19	-52.57	0.86	OSF1.50	9990.00	9633.87						Exit Major
113.21	114.61	35.97	-1.40	1.48	OSF1.50	10030.00	9673.87			OSF>1.50			Exit Minor
342.16	105.35	271.09	236.81	4.95	OSF1.50	10260.00	10203.87	OSF>5.00					Exit Alert
2571.13	91.50	2509.29	2479.63	43.29	OSF1.50	12980.00	12430.00						MinPts-CICI
2572.03	86.42	2513.58	2485.61	45.93	OSF1.50	13360.00	12430.00						MinPts-CICI
2569.31	81.29	2514.26	2488.01	48.87	OSF1.50	13820.00	12430.00						MinPts-O-ADP
2569.22	81.19	2514.26	2488.03	48.93	OSF1.50	13840.00	12430.00						MINPT-O-EQU
2569.13	80.94	2514.34	2488.19	49.08	OSF1.50	13890.00	12430.00						MinPts-CICI
2569.09	80.11	2514.85	2488.86	49.81	OSF1.50	14020.00	12430.00						MinPts-CICI
2567.84	79.11	2514.27	2488.73	50.23	OSF1.50	14250.00	12430.00						MinPts-CICI
2567.65	79.13	2514.26	2488.72	50.22	OSF1.50	14260.00	12430.00						MinPts
2567.98	79.19	2514.34	2488.77	50.16	OSF1.50	14290.00	12430.00						MinPts-O-SF
2569.43	79.11	2515.88	2490.32	50.26	OSF1.50	14490.00	12430.00						MinPts-O-SF
2569.19	81.45	2514.06	2487.75	48.77	OSF1.50	15100.00	12430.00						MinPts-CICI
2562.46	90.26	2501.45	2472.19	43.75	OSF1.50	15910.00	12430.00						MinPts-CICI
2562.83	91.43	2501.02	2471.41	43.19	OSF1.50	15990.00	12430.00						MINPT-O-EQU
2563.98	93.12	2501.07	2470.86	42.40	OSF1.50	16100.00	12430.00						MINPT-O-EQU
2564.35	93.57	2501.13	2470.77	42.19	OSF1.50	16130.00	12430.00						MinPts-O-ADP
2679.67	105.54	2608.48	2574.13	38.97	OSF1.50	17050.00	12430.00						MinPts-O-SF
2693.33	108.04	2621.80	2587.20	38.96	OSF1.50	17101.74	12430.00						TD

Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 (Non-Def Plan)													
Wellhead distance scan: Not performed													

649.75	32.81	647.25	616.94	N/A	MAS = 10.00 (m)	0.00	0.00						Surface
649.74	32.81	647.24	616.94	N/A	MAS = 10.00 (m)	26.00	26.00						WRP
84.46	32.81	64.92	51.85	4.90	MAS = 10.00 (m)	3640.00	3618.84	OSF<5.00					Enter Alert
32.03	32.81	11.05	-0.78	1.81	MAS = 10.00 (m)	3660.00	3636.32				StcRub<10.00		Enter Major
29.65	32.81	8.54	-3.16	1.46	MAS = 10.00 (m)	3680.00	3656.10			OSF<1.50			Enter Minor
28.05	32.81	6.81	-4.73	1.36	MAS = 10.00 (m)	3910.00	3885.75						MinPts
26.12	32.81	6.82	-4.69	1.36	MAS = 10.00 (m)	3920.00	3895.64						MinPts-O-SF
30.06	32.81	6.61	-2.73	1.45	MAS = 10.00 (m)	3950.00	3925.30			OSF>1.50			Exit Minor
32.51	32.81	11.11	-0.20	1.58	MAS = 10.00 (m)	3970.00	3945.07				StcRub>10.00		Exit Major
102.28	32.83	79.58	68.45	4.93	OSF1.50	4250.00	4221.87	OSF>5.00					Exit Alert
842.39	63.14	799.47	779.25	20.78	OSF1.50	9540.00	9483.87						MINPT-O-EQU
842.46	63.24	799.48	779.24	20.74	OSF1.50	9550.00	9503.87						MinPts-O-ADP
847.81	64.21	804.17	783.60	20.55	OSF1.50	9760.00	9703.87						MinPts-O-SF
2627.36	157.03	2521.84	2470.33	25.48	OSF1.50	17100.00	12430.00						MinPts-CICI
2627.36	157.07	2521.81	2470.29	25.47	OSF1.50	17101.74	12430.00						MinPts

Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 (Non-Def Plan)													
Wellhead distance scan: Not performed													

669.74	32.81	667.24	636.93	N/A	MAS = 10.00 (m)	0.00	0.00						Surface
669.74	32.81	667.24	636.93	N/A	MAS = 10.00 (m)	26.00	26.00						WRP
95.52	32.81	73.77	62.72	4.92	MAS = 10.00 (m)	4060.00	4034.04	OSF<5.00					Enter Alert
34.09	34.54	10.20	-0.45	1.48	OSF1.50	4410.00	4360.04			OSF<1.50			Enter Minor
33.81	34.67	9.86	-0.86	1.46	OSF1.50	4430.00	4399.81						MinPts
34.68	34.80	10.59	-0.23	1.49	OSF1.50	4460.00	4429.47						Exit Minor
119.43	38.17	83.15	81.25	4.92	OSF1.50	4900.00	4864.44	OSF>5.00		OSF>1.50			Exit Alert
424.50	63.53	381.31	360.97	10.37	OSF1.50	9530.00	9473.87						MINPT-O-EQU
424.55	63.59	381.32	360.95	10.36	OSF1.50	9540.00	9483.87						MinPts-O-ADP
426.29	64.07	382.74	362.21	10.32	OSF1.50	9630.00	9573.87						MinPts-O-SF
2524.87	152.42	2422.42	2372.45	25.24	OSF1.50	17101.74	12430.00						MinPts

Cimarex Cascade 29 Federal #17H Rev0 RM 05Oct18 (Non-Def Plan)													
Wellhead distance scan: Not performed													

669.74	32.81	667.24	636.93	N/A	MAS = 10.00 (m)	0.00	0.00						Surface
669.74	32.81	667.24	636.93	N/A	MAS = 10.00 (m)	26.00	26.00						WRP
152.71	48.21	119.57	104.49	4.97	OSF1.50	5330.00	5289.52	OSF<5.00					Enter Alert
56.14	56.45	17.61	-0.31	1.49	OSF1.50	6180.00	6129.80			OSF<1.50			Enter Minor
54.20	57.13	15.29	-2.92	1.42	OSF1.50	6280.00	6228.68						MinPts-CICI
54.24	57.21	15.27	-2.97	1.42	OSF1.50	6290.00	6238.54						MinPts
54.31	57.29	15.29	-2.97	1.42	OSF1.50	6300.00	6248.43						MinPts-O-ADP
57.80	58.13	18.21	-0.33	1.49	OSF1.50	6410.00	6357.17			OSF>1.50			Exit Minor

Offset Trajectory	Separation			Allow Dev. (ft)	Sep. Fact.	Controlling Rule	Reference Trajectory		Risk Level			Alert	Status
	Cl-Ct (ft)	MAS (ft)	EOU (ft)				MD (ft)	TVD (ft)	Alert	Minor	Major		
	92.25	78.08	38.35	14.17	1.78	OSF1.50	9520.00	9463.87				MinPts	
	215.72	87.73	169.73	147.59	4.50	OSF1.50	9650.00	9653.87	OSF>5.00			Ext Alert	
	2489.60	152.23	2367.28	2337.37	24.62	OSF1.50	17101.74	12430.00				MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

20.00	16.50	17.50	3.50	N/A	MAS = 5.03 (m)	0.00	0.00	CtCt<=15m<15.00				Enter Alert	Warning Alert
20.00	16.50	17.50	3.50	15753.71	MAS = 5.03 (m)	26.00	26.00					WRP	
19.99	16.50	8.18	3.49	1.88	MAS = 5.03 (m)	1600.00	1599.98					MinPts	
19.99	16.50	8.18	3.49	1.88	MAS = 5.03 (m)	1610.00	1609.97					MinPts	
58.81	19.43	45.03	39.38	4.99	OSF1.50	2690.00	2650.04	OSF>5.00				Ext Alert	
419.93	127.93	333.81	292.01	4.89	OSF1.50	14940.00	12430.00	OSF<5.00				Enter Alert	
419.94	187.03	293.82	232.01	3.38	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

39.99	32.49	37.49	7.50	N/A	MAS = 9.90 (m)	0.00	0.00	CtCt<=15m<15.00				Enter Alert	Warning Alert
39.99	32.49	37.49	7.50	169744.02	MAS = 9.90 (m)	26.00	26.00					WRP	
39.99	32.49	28.52	7.50	4.18	MAS = 9.90 (m)	1490.00	1490.00					MinPts	
39.99	32.49	28.46	7.50	4.15	MAS = 9.90 (m)	1500.00	1500.00					MinPts	
40.02	32.49	28.47	7.53	4.15	MAS = 9.90 (m)	1510.00	1510.00					MinPts	
48.92	32.49	37.40	16.42	5.15	MAS = 9.90 (m)	1680.00	1678.88	CtCt<=15m>15.00				Ext Alert	
807.23	50.23	772.91	757.00	25.29	OSF1.50	6554.48	6500.00					MinPts	
839.88	193.52	710.03	646.36	6.58	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

1634.59	32.81	1832.09	1801.78	N/A	MAS = 10.00 (m)	0.00	0.00					Surface	
1634.59	32.81	1832.07	1801.78	142169.68	MAS = 10.00 (m)	26.00	26.00					WRP	
424.83	59.99	383.46	364.84	11.30	OSF1.50	7840.00	7783.87					MinPts	
424.76	80.61	369.64	344.16	8.25	OSF1.50	11970.00	11913.87					MinPts	
419.89	129.08	332.54	290.90	4.89	OSF1.50	14990.00	12430.00	OSF<5.00				Enter Alert	
419.99	187.66	293.49	232.32	3.40	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

4560.54	32.81	4568.04	4527.74	N/A	MAS = 10.00 (m)	0.00	0.00					MinPts	
4560.57	32.81	4568.04	4527.78	141581.74	MAS = 10.00 (m)	26.00	26.00					WRP	
4560.63	32.81	4568.03	4527.82	49170.87	MAS = 10.00 (m)	50.00	50.00					MinPts	
4707.92	32.81	4587.36	4575.11	200.88	MAS = 10.00 (m)	4420.00	4389.92					MinPts	
4707.34	32.81	4588.00	4574.53	249.78	MAS = 10.00 (m)	4670.00	4637.06					MinPts	
4707.41	32.81	4589.94	4574.61	248.01	MAS = 10.00 (m)	4710.00	4676.61					MinPts	
4708.18	32.81	4588.06	4575.35	240.39	MAS = 10.00 (m)	4910.00	4874.32					MinPts	
1180.97	368.31	941.26	822.66	4.97	OSF1.50	8990.00	8933.87	OSF<5.00				Enter Alert	
760.93	541.44	399.13	219.49	2.11	OSF1.50	8990.00	8933.87					MinPts	
1183.79	367.57	944.58	826.23	4.99	OSF1.50	10800.00	10743.87	OSF>5.00				Ext Alert	
2703.17	104.70	2632.53	2598.47	39.64	OSF1.50	13040.00	12430.00					MinPts	
2702.41	102.79	2633.05	2598.62	40.38	OSF1.50	13160.00	12430.00					MinPts	
2715.37	87.81	2656.13	2627.78	47.81	OSF1.50	14010.00	12430.00					MinPts	
2715.33	87.55	2656.13	2627.78	47.84	OSF1.50	14020.00	12430.00					MinPts	
2715.31	87.45	2656.17	2627.88	47.90	OSF1.50	14040.00	12430.00					MinPts	
2722.14	82.60	2668.05	2639.25	50.74	OSF1.50	14490.00	12430.00					MinPts	
2718.11	80.62	2663.53	2637.49	52.14	OSF1.50	14690.00	12430.00					MinPts	
2707.81	80.81	2653.11	2627.00	51.82	OSF1.50	15090.00	12430.00					MinPts	
2707.84	80.92	2653.06	2626.92	51.74	OSF1.50	15110.00	12430.00					MinPts	
2707.89	80.98	2653.07	2626.91	51.71	OSF1.50	15120.00	12430.00					MinPts	
2711.28	81.82	2666.87	2629.43	51.22	OSF1.50	15280.00	12430.00					MinPts	
2713.83	82.69	2657.87	2631.14	50.72	OSF1.50	15490.00	12430.00					MinPts	
2705.67	80.61	2644.43	2615.08	46.02	OSF1.50	16190.00	12430.00					MinPts	
2705.67	92.48	2643.18	2613.18	45.08	OSF1.50	16310.00	12430.00					MinPts	
2705.65	93.04	2642.99	2612.81	44.79	OSF1.50	16350.00	12430.00					MinPts	
2706.08	93.32	2643.03	2612.76	44.65	OSF1.50	16370.00	12430.00					MinPts	
2789.72	101.91	2720.95	2687.81	42.03	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

1854.72	32.81	1852.22	1821.91	N/A	MAS = 10.00 (m)	0.00	0.00					Surface	Pass
1854.72	32.81	1852.21	1821.91	136693.06	MAS = 10.00 (m)	26.00	26.00					WRP	
842.12	84.26	784.75	757.86	15.59	OSF1.50	11970.00	11913.87					MinPts	
839.81	191.44	711.09	648.48	6.58	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

4800.18	32.81	4797.68	4767.37	N/A	MAS = 10.00 (m)	0.00	0.00					Surface	Pass
4800.17	32.81	4797.63	4767.36	115268.37	MAS = 10.00 (m)	26.00	26.00					WRP	
4795.57	32.81	4788.11	4762.77	686.64	MAS = 10.00 (m)	1860.00	1859.92					MinPts	
4791.31	32.81	4781.83	4758.50	686.81	MAS = 10.00 (m)	1860.00	1859.05					MinPts	
930.78	241.47	768.79	689.30	5.84	OSF1.50	9930.00	9873.87					MinPts	
2741.01	94.44	2677.22	2646.57	44.68	OSF1.50	15370.00	12430.00					MinPts	
2742.80	101.17	2674.52	2641.63	41.68	OSF1.50	15970.00	12430.00					MinPts	
2742.46	105.90	2671.03	2636.58	39.75	OSF1.50	16270.00	12430.00					MinPts	
2742.85	107.08	2670.62	2635.76	39.30	OSF1.50	16340.00	12430.00					MinPts	
2743.13	107.43	2670.68	2635.70	39.18	OSF1.50	16360.00	12430.00					MinPts	
2838.33	117.90	2758.90	2720.43	36.85	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

1874.71	32.81	1872.21	1841.90	N/A	MAS = 10.00 (m)	0.00	0.00					Surface	Pass
1874.71	32.81	1872.20	1841.90	140440.40	MAS = 10.00 (m)	26.00	26.00					WRP	
1874.71	32.81	1863.22	1841.90	208.33	MAS = 10.00 (m)	1490.00	1490.00					MinPts	
1723.87	32.81	1705.01	1691.06	105.94	MAS = 10.00 (m)	3680.00	3658.38					MinPts	
1261.20	87.53	1201.76	1173.66	22.39	OSF1.50	11970.00	11913.87					MinPts	
1269.84	183.51	1129.75	1088.33	9.91	OSF1.50	17101.74	12430.00					MinPts	

Cimarex Cascade 29 Federal  
#17H Rev0 RM 05Oct18 (Non-  
Def Plan)

5236.43	32.81	5232.93	5202.62	N/A	MAS = 10.00 (m)	0.00	0.00					Surface	Pass
5236.43	32.81	5232.93	5202.62	N/A	MAS = 10.00 (m)	10.00	10.00					MinPts	

Offset Trajectory	Separation			Allow Dev. (ft)	Sep. Fact.	Controlling Rule	Reference Trajectory		Risk Level			Alert	Status
	CI-Cl (ft)	MAS (ft)	EOU (ft)				MD (ft)	TVD (ft)	Alert	Minor	Major		
5206.43	32.81	5202.85	5202.82	89533.56		MAS = 10.00 (m)	26.00	26.00				WRP	
5206.56	32.81	5200.88	5202.78	2365.43		MAS = 10.00 (m)	370.00	370.00				MinPh	
5206.84	32.81	5200.08	5203.03	1604.61		MAS = 10.00 (m)	660.00	660.00				MINPT-O-EQU	
5206.67	32.81	5227.55	5202.86	930.80		MAS = 10.00 (m)	1230.00	1230.00				MinPh	
5206.76	32.81	5228.88	5202.95	822.58		MAS = 10.00 (m)	1400.00	1400.00				MinPh	
5206.95	32.81	5228.68	5203.14	772.60		MAS = 10.00 (m)	1500.00	1500.00				MINPT-O-EQU	
1855.72	298.03	1857.27	1559.69	9.49		OSF1.50	9920.00	983.87				MinPh	
1855.73	298.04	1857.27	1559.69	9.49		OSF1.50	9930.00	987.87				MinPh-O-SF	
3187.50	134.12	3097.25	3053.39	36.30		OSF1.50	13290.00	12430.00				MINPT-O-EQU	
3163.97	122.22	3081.65	3041.75	39.61		OSF1.50	13690.00	12430.00				MinPh-O-ADP	
3163.63	122.17	3081.64	3041.75	39.63		OSF1.50	13910.00	12430.00				MINPT-O-EQU	
3163.65	122.07	3081.67	3041.82	39.68		OSF1.50	13930.00	12430.00				MinPh-CICI	
3166.72	115.85	3088.65	3050.88	41.87		OSF1.50	14260.00	12430.00				MinPh-CICI	
3166.84	110.51	3092.33	3058.33	43.94		OSF1.50	14630.00	12430.00				MINPT-O-EQU	
3166.70	110.11	3092.48	3056.59	44.11		OSF1.50	14700.00	12430.00				MinPh-CICI	
3165.51	108.41	3092.41	3057.10	44.80		OSF1.50	14920.00	12430.00				MinPh-CICI	
3165.52	108.43	3092.40	3057.08	44.79		OSF1.50	14930.00	12430.00				MINPT-O-EQU	
3166.55	108.48	3092.41	3057.08	44.78		OSF1.50	14940.00	12430.00				MinPh-O-ADP	
3166.60	108.76	3093.28	3057.84	44.67		OSF1.50	15050.00	12430.00				MinPh-O-SF	
3168.79	108.80	3095.43	3060.00	44.68		OSF1.50	15160.00	12430.00				MinPh-O-SF	
3169.76	107.63	3097.18	3062.14	45.19		OSF1.50	15630.00	12430.00				MinPh-O-SF	
3154.53	114.72	3077.22	3039.81	42.13		OSF1.50	16320.00	12430.00				MinPh-CICI	
3154.80	115.62	3076.83	3039.19	41.80		OSF1.50	16370.00	12430.00				MINPT-O-EQU	
3155.28	116.17	3076.98	3039.05	41.60		OSF1.50	16400.00	12430.00				MinPh-O-ADP	
3221.68	127.66	3145.73	3104.01	38.70		OSF1.50	17101.74	12430.00				MinPh-O-SF	

Cimarex Cascade 29 Federal  
FAKEM-MWD Survey Q1-  
14305 MD (Lw Survey)

6087.20	32.81	6064.70	6034.39	N/A		MAS = 10.00 (m)	0.00	0.00				Surface	
6087.18	32.81	6064.68	6034.37	N/A		MAS = 10.00 (m)	10.00	10.00				MinPh-O-SF	
6087.18	32.81	6064.68	6034.37	N/A		MAS = 10.00 (m)	26.00	26.00				WRP	
6041.56	32.81	6032.17	6008.75	878.05		MAS = 10.00 (m)	1770.00	1769.60				MinPh-O-SF	
2800.32	270.24	2618.83	2530.08	15.75		OSF1.50	9750.00	9693.87				MinPh-O-SF	
2795.43	269.15	2614.67	2526.29	15.79		OSF1.50	9890.00	9833.87				MinPh-O-ADP	
2795.35	269.04	2614.65	2526.31	15.80		OSF1.50	9900.00	9843.87				MINPT-O-EQU	
2795.34	268.83	2614.74	2526.47	15.81		OSF1.50	9920.00	9863.87				MinPh-CICI	
3778.62	159.21	3671.85	3619.62	36.15		OSF1.50	13000.00	12430.00				MINPT-O-EQU	
3778.57	155.60	3671.80	3620.68	36.90		OSF1.50	13080.00	12430.00				MINPT-O-EQU	
3744.08	134.34	3653.65	3608.72	42.57		OSF1.50	13690.00	12430.00				MinPh	
3736.57	129.19	3645.63	3607.41	44.22		OSF1.50	14220.00	12430.00				MinPh-O-ADP	
3736.53	129.12	3645.62	3607.42	44.24		OSF1.50	14230.00	12430.00				MINPT-O-EQU	
3717.84	117.41	3638.73	3600.43	48.50		OSF1.50	14860.00	12430.00				MinPh-O-SF	
3712.19	114.56	3634.97	3597.60	49.84		OSF1.50	15130.00	12430.00				MinPh	
3706.52	115.18	3628.90	3591.34	49.31		OSF1.50	15400.00	12430.00				MinPh-CICI	
3706.78	115.94	3628.68	3590.84	48.98		OSF1.50	15450.00	12430.00				MINPT-O-EQU	
3707.03	116.25	3628.70	3590.78	48.85		OSF1.50	15470.00	12430.00				MinPh-O-ADP	
3674.53	137.89	3681.78	3636.65	44.01		OSF1.50	17030.00	12430.00				MinPh-O-SF	
3698.05	136.66	3604.78	3659.40	44.02		OSF1.50	17101.74	12430.00				TD	

Cimarex Cascade 29 Federal  
FAKEM-MWD Survey Q1-  
14305 MD (Lw Survey)

6161.59	32.81	6159.09	6128.78	N/A		MAS = 10.00 (m)	0.00	0.00				Surface	
6161.57	32.81	6159.07	6128.77	N/A		MAS = 10.00 (m)	10.00	10.00				MinPh	
6161.57	32.81	6159.07	6128.77	N/A		MAS = 10.00 (m)	20.00	20.00				MinPh	
6161.57	32.81	6159.07	6128.77	N/A		MAS = 10.00 (m)	26.00	26.00				WRP	
6161.72	32.81	6158.64	6128.91	10947.37		MAS = 10.00 (m)	180.00	180.00				MINPT-O-EQU	
3716.19	233.58	3559.35	3482.63	24.19		OSF1.50	9940.00	9893.87				MinPh	
3716.20	233.57	3559.39	3482.62	24.18		OSF1.50	9950.00	9893.87				MinPh-O-ADP	
3716.36	233.60	3559.56	3482.75	24.16		OSF1.50	9980.00	9923.87				MinPh-O-SF	
4428.06	164.62	4317.50	4263.45	40.95		OSF1.50	13380.00	12430.00				MinPh-O-ADP	
4427.91	164.42	4317.45	4263.49	41.00		OSF1.50	13400.00	12430.00				MINPT-O-EQU	
4427.73	163.92	4317.62	4263.61	41.12		OSF1.50	13450.00	12430.00				MinPh-CICI	
4428.93	147.63	4329.55	4281.10	45.69		OSF1.50	13910.00	12430.00				MinPh-O-ADP	
4409.34	132.97	4318.67	4276.35	50.67		OSF1.50	14430.00	12430.00				MinPh	
4407.56	127.44	4321.77	4280.12	52.88		OSF1.50	14480.00	12430.00				MINPT-O-EQU	
4303.63	114.43	4226.50	4189.19	57.64		OSF1.50	15710.00	12430.00				MinPh-O-SF	
4300.67	114.38	4223.99	4188.25	57.63		OSF1.50	15770.00	12430.00				MinPh-O-SF	
4300.15	114.09	4223.28	4188.05	57.77		OSF1.50	15780.00	12430.00				MinPh-O-ADP	
4279.67	121.08	4198.12	4158.59	54.10		OSF1.50	16280.00	12430.00				MinPh-CICI	
4280.11	122.40	4197.68	4157.71	53.51		OSF1.50	16350.00	12430.00				MINPT-O-EQU	
4280.58	122.68	4197.77	4157.62	53.27		OSF1.50	16380.00	12430.00				MinPh-O-ADP	
4345.00	136.03	4263.48	4208.96	48.78		OSF1.50	17101.74	12430.00				MinPh-O-SF	

# Cimarex Cascade 29 Federal #17H Rev1 RM 11Oct18 Proposal Geodetic Report

(Non-Def Plan)



**Report Date:** October 12, 2018 - 08:47 AM  
**Client:** Cimarex Energy  
**Field:** NM Lea County (NAD 83)  
**Structure / Slot:** Cimarex Cascade 29 Federal #17H / New Slot  
**Well:** Cascade 29 Federal #17H  
**Borehole:** Cascade 29 Federal #17H  
**UWI / API#:** Unknown / Unknown  
**Survey Name:** Cimarex Cascade 29 Federal #17H Rev1 RM 11Oct18  
**Survey Date:** October 05, 2018  
**Tort / AHD / DDI / ERD Ratio:** 123.510 ° / 5484.460 ft / 5.969 / 0.441  
**Coordinate Reference System:** NAD83 New Mexico State Plane, Eastern Zone, US Feet  
**Location Lat / Long:** N 32° 5' 43.41056", W 103° 36' 5.51085"  
**Location Grid N/E Y/X:** N 399209.270 rUS, E 767955.080 rUS  
**CRS Grid Convergence Angle:** 0.3888 °  
**Grid Scale Factor:** 0.99996791  
**Version / Patch:** 2.10.740.0

**Survey / DLS Computation:** Minimum Curvature / Lubinski  
**Vertical Section Azimuth:** 359.635 ° (Grid North)  
**Vertical Section Origin:** 0.000 ft, 0.000 ft  
**TVD Reference Datum:** RKB  
**TVD Reference Elevation:** 3428.200 ft above MSL  
**Seabed / Ground Elevation:** 3402.200 ft above MSL  
**Magnetic Declination:** 6.725 °  
**Total Gravity Field Strength:** 998.4288mgn (9.80665 Based)  
**Gravity Model:** GARM  
**Total Magnetic Field Strength:** 47824.606 nT  
**Magnetic Dip Angle:** 59.738 °  
**Declination Date:** October 05, 2018  
**Magnetic Declination Model:** HDGM 2018  
**North Reference:** Grid North  
**Grid Convergence Used:** 0.3888 °  
**Total Corr Mag North->Grid North:** 6.3362 °  
**Local Coord Referenced To:** Well Head

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (rUS)	Easting (rUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
SHL [390' FSL, 410' FWL]	0.00	0.00	8.65	0.00	0.00	0.00	0.00	N/A	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	100.00	0.00	95.90	100.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	200.00	0.00	95.90	200.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	300.00	0.00	95.90	300.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	400.00	0.00	95.90	400.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	500.00	0.00	95.90	500.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	600.00	0.00	95.90	600.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	700.00	0.00	95.90	700.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	800.00	0.00	95.90	800.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	900.00	0.00	95.90	900.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
Rustler	935.00	0.00	95.90	935.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1000.00	0.00	95.90	1000.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1100.00	0.00	95.90	1100.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1200.00	0.00	95.90	1200.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
Top of Salt	1298.00	0.00	95.90	1298.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1300.00	0.00	95.90	1300.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1400.00	0.00	95.90	1400.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
Nudge 2"/100' DLS	1500.00	0.00	95.90	1500.00	0.00	0.00	0.00	0.00	399209.27	767955.08	N 32 5 43.41 W 103 36 5.51	
	1600.00	2.00	95.90	1599.98	-0.19	-0.18	1.74	2.00	399209.09	767956.82	N 32 5 43.41 W 103 36 5.49	
	1700.00	4.00	95.90	1699.84	-0.76	-0.72	6.94	2.00	399208.55	767962.02	N 32 5 43.40 W 103 36 5.43	
	1800.00	6.00	95.90	1799.45	-1.71	-1.61	15.61	2.00	399207.66	767970.69	N 32 5 43.39 W 103 36 5.33	
Hold Nudge	1812.50	6.25	95.90	1811.88	-1.86	-1.75	16.94	2.00	399207.52	767972.02	N 32 5 43.39 W 103 36 5.31	
	1900.00	6.25	95.90	1898.86	-2.90	-2.73	26.41	0.00	399206.54	767981.49	N 32 5 43.38 W 103 36 5.20	
	2000.00	6.25	95.90	1998.27	-4.09	-3.85	37.24	0.00	399205.42	767992.32	N 32 5 43.37 W 103 36 5.08	
	2100.00	6.25	95.90	2097.67	-5.27	-4.97	48.07	0.00	399204.30	768003.15	N 32 5 43.36 W 103 36 4.95	
	2200.00	6.25	95.90	2197.08	-6.46	-6.09	58.90	0.00	399203.18	768013.98	N 32 5 43.35 W 103 36 4.83	
	2300.00	6.25	95.90	2296.48	-7.65	-7.21	69.73	0.00	399202.06	768024.81	N 32 5 43.33 W 103 36 4.70	

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	2400.00	6.25	95.90	2395.89	-8.84	-8.32	80.56	0.00	399200.95	768035.63	N 32 5 43.32 W	103 36 4.58
	2500.00	6.25	95.90	2495.29	-10.03	-9.44	91.39	0.00	399199.83	768046.46	N 32 5 43.31 W	103 36 4.45
	2600.00	6.25	95.90	2594.70	-11.21	-10.56	102.22	0.00	399198.71	768057.29	N 32 5 43.30 W	103 36 4.32
	2700.00	6.25	95.90	2694.11	-12.40	-11.68	113.04	0.00	399197.59	768068.12	N 32 5 43.29 W	103 36 4.20
	2800.00	6.25	95.90	2793.51	-13.59	-12.80	123.87	0.00	399196.47	768078.95	N 32 5 43.28 W	103 36 4.07
	2900.00	6.25	95.90	2892.92	-14.78	-13.92	134.70	0.00	399195.35	768089.78	N 32 5 43.26 W	103 36 3.95
	3000.00	6.25	95.90	2992.32	-15.97	-15.04	145.53	0.00	399194.23	768100.61	N 32 5 43.25 W	103 36 3.82
	3100.00	6.25	95.90	3091.73	-17.15	-16.16	156.36	0.00	399193.11	768111.44	N 32 5 43.24 W	103 36 3.69
	3200.00	6.25	95.90	3191.13	-18.34	-17.28	167.19	0.00	399191.99	768122.26	N 32 5 43.23 W	103 36 3.57
	3300.00	6.25	95.90	3290.54	-19.53	-18.40	178.02	0.00	399190.87	768133.09	N 32 5 43.22 W	103 36 3.44
	3400.00	6.25	95.90	3389.95	-20.72	-19.52	188.85	0.00	399189.76	768143.92	N 32 5 43.20 W	103 36 3.32
	3500.00	6.25	95.90	3489.35	-21.91	-20.63	199.68	0.00	399188.64	768154.75	N 32 5 43.19 W	103 36 3.19
	3600.00	6.25	95.90	3588.76	-23.09	-21.75	210.51	0.00	399187.52	768165.58	N 32 5 43.18 W	103 36 3.07
	3700.00	6.25	95.90	3688.16	-24.28	-22.87	221.33	0.00	399186.40	768176.41	N 32 5 43.17 W	103 36 2.94
	3800.00	6.25	95.90	3787.57	-25.47	-23.99	232.16	0.00	399185.28	768187.24	N 32 5 43.16 W	103 36 2.81
	3900.00	6.25	95.90	3886.97	-26.66	-25.11	242.99	0.00	399184.16	768198.06	N 32 5 43.15 W	103 36 2.69
	4000.00	6.25	95.90	3986.38	-27.85	-26.23	253.82	0.00	399183.04	768208.89	N 32 5 43.13 W	103 36 2.56
	4100.00	6.25	95.90	4085.78	-29.03	-27.35	264.65	0.00	399181.92	768219.72	N 32 5 43.12 W	103 36 2.44
	4200.00	6.25	95.90	4185.19	-30.22	-28.47	275.48	0.00	399180.80	768230.55	N 32 5 43.11 W	103 36 2.31
	4300.00	6.25	95.90	4284.60	-31.41	-29.59	286.31	0.00	399179.68	768241.38	N 32 5 43.10 W	103 36 2.19
	4400.00	6.25	95.90	4384.00	-32.60	-30.71	297.14	0.00	399178.56	768252.21	N 32 5 43.09 W	103 36 2.06
	4500.00	6.25	95.90	4483.41	-33.79	-31.83	307.97	0.00	399177.45	768263.04	N 32 5 43.07 W	103 36 1.93
	4600.00	6.25	95.90	4582.81	-34.97	-32.94	318.80	0.00	399176.33	768273.87	N 32 5 43.06 W	103 36 1.81
	4700.00	6.25	95.90	4682.22	-36.16	-34.06	329.63	0.00	399175.21	768284.69	N 32 5 43.05 W	103 36 1.68
Base of Salt	4731.97	6.25	95.90	4714.00	-36.54	-34.42	333.09	0.00	399174.85	768288.16	N 32 5 43.05 W	103 36 1.64
	4800.00	6.25	95.90	4781.62	-37.35	-35.18	340.45	0.00	399174.09	768295.52	N 32 5 43.04 W	103 36 1.56
	4900.00	6.25	95.90	4881.03	-38.54	-36.30	351.28	0.00	399172.97	768306.35	N 32 5 43.03 W	103 36 1.43
Lamar	4928.14	6.25	95.90	4909.00	-38.87	-36.62	354.33	0.00	399172.65	768309.40	N 32 5 43.02 W	103 36 1.39
Bell Canyon	4956.31	6.25	95.90	4937.00	-39.21	-36.93	357.38	0.00	399172.34	768312.45	N 32 5 43.02 W	103 36 1.36
	5000.00	6.25	95.90	4980.44	-39.73	-37.42	362.11	0.00	399171.85	768317.18	N 32 5 43.02 W	103 36 1.30
	5100.00	6.25	95.90	5079.84	-40.91	-38.54	372.94	0.00	399170.73	768328.01	N 32 5 43.00 W	103 36 1.18
	5200.00	6.25	95.90	5179.25	-42.10	-39.66	383.77	0.00	399169.61	768338.84	N 32 5 42.99 W	103 36 1.05
	5300.00	6.25	95.90	5278.65	-43.29	-40.78	394.60	0.00	399168.49	768349.67	N 32 5 42.98 W	103 36 0.93
	5400.00	6.25	95.90	5378.06	-44.48	-41.90	405.43	0.00	399167.37	768360.49	N 32 5 42.97 W	103 36 0.80
	5500.00	6.25	95.90	5477.46	-45.67	-43.02	416.26	0.00	399166.26	768371.32	N 32 5 42.96 W	103 36 0.68
	5600.00	6.25	95.90	5576.87	-46.85	-44.14	427.09	0.00	399165.14	768382.15	N 32 5 42.95 W	103 36 0.55
	5700.00	6.25	95.90	5676.27	-48.04	-45.25	437.92	0.00	399164.02	768392.98	N 32 5 42.93 W	103 36 0.42
	5800.00	6.25	95.90	5775.68	-49.23	-46.37	448.74	0.00	399162.90	768403.81	N 32 5 42.92 W	103 36 0.30
	5900.00	6.25	95.90	5875.09	-50.42	-47.49	459.57	0.00	399161.78	768414.64	N 32 5 42.91 W	103 36 0.17
	6000.00	6.25	95.90	5974.49	-51.61	-48.61	470.40	0.00	399160.66	768425.47	N 32 5 42.90 W	103 36 0.05
Cherry Canyon	6015.60	6.25	95.90	5990.00	-51.79	-48.79	472.09	0.00	399160.49	768427.16	N 32 5 42.90 W	103 36 0.03
	6100.00	6.25	95.90	6073.90	-52.80	-49.73	481.23	0.00	399159.54	768436.29	N 32 5 42.89 W	103 35 59.92
	6200.00	6.25	95.90	6173.30	-53.98	-50.85	492.06	0.00	399158.42	768447.12	N 32 5 42.87 W	103 35 59.80
	6300.00	6.25	95.90	6272.71	-55.17	-51.97	502.89	0.00	399157.30	768457.95	N 32 5 42.86 W	103 35 59.67
	6400.00	6.25	95.90	6372.11	-56.36	-53.09	513.72	0.00	399156.18	768468.78	N 32 5 42.85 W	103 35 59.54
	6500.00	6.25	95.90	6471.52	-57.55	-54.21	524.55	0.00	399155.07	768479.61	N 32 5 42.84 W	103 35 59.42
Drop to Vertical 2"/100' DLS	6528.65	6.25	95.90	6500.00	-57.89	-54.53	527.65	0.00	399154.74	768482.71	N 32 5 42.84 W	103 35 59.38
	6600.00	4.82	95.90	6571.01	-58.64	-55.23	534.50	2.00	399154.04	768489.56	N 32 5 42.83 W	103 35 59.30
	6700.00	2.82	95.90	6670.79	-59.37	-55.92	541.13	2.00	399153.35	768496.19	N 32 5 42.82 W	103 35 59.23
	6800.00	0.82	95.90	6770.73	-59.71	-56.25	544.29	2.00	399153.02	768499.35	N 32 5 42.82 W	103 35 59.19
Hold Vertical	6841.15	0.00	95.90	6811.88	-59.75	-56.28	544.59	2.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	6900.00	0.00	95.90	6870.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7000.00	0.00	95.90	6970.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7100.00	0.00	95.90	7070.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7200.00	0.00	95.90	7170.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7300.00	0.00	95.90	7270.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7400.00	0.00	95.90	7370.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7500.00	0.00	95.90	7470.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18

Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
Brushy Canyon	7565.27	0.00	95.90	7536.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7600.00	0.00	95.90	7570.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7700.00	0.00	95.90	7670.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7800.00	0.00	95.90	7770.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	7900.00	0.00	95.90	7870.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8000.00	0.00	95.90	7970.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8100.00	0.00	95.90	8070.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8200.00	0.00	95.90	8170.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8300.00	0.00	95.90	8270.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8400.00	0.00	95.90	8370.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8500.00	0.00	95.90	8470.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8600.00	0.00	95.90	8570.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8700.00	0.00	95.90	8670.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8800.00	0.00	95.90	8770.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	8900.00	0.00	95.90	8870.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9000.00	0.00	95.90	8970.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
Bone Spring	9061.27	0.00	95.90	9032.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9100.00	0.00	95.90	9070.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
Leonard Shale	9116.27	0.00	95.90	9087.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9200.00	0.00	95.90	9170.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9300.00	0.00	95.90	9270.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
Avalon Shale	9341.27	0.00	95.90	9312.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9400.00	0.00	95.90	9370.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9500.00	0.00	95.90	9470.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9600.00	0.00	95.90	9570.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9700.00	0.00	95.90	9670.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9800.00	0.00	95.90	9770.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	9900.00	0.00	95.90	9870.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10000.00	0.00	95.90	9970.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
1st Bone Spring Sand	10040.27	0.00	95.90	10011.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10100.00	0.00	95.90	10070.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10200.00	0.00	95.90	10170.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
2nd Bone Spring Carb	10252.27	0.00	95.90	10223.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10300.00	0.00	95.90	10270.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10400.00	0.00	95.90	10370.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10500.00	0.00	95.90	10470.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10600.00	0.00	95.90	10570.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
2nd Bone Spring Sand	10612.27	0.00	95.90	10583.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10700.00	0.00	95.90	10670.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10800.00	0.00	95.90	10770.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	10900.00	0.00	95.90	10870.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11000.00	0.00	95.90	10970.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11100.00	0.00	95.90	11070.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
3rd Bone Spring Carb	11100.27	0.00	95.90	11071.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11200.00	0.00	95.90	11170.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11300.00	0.00	95.90	11270.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11400.00	0.00	95.90	11370.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11500.00	0.00	95.90	11470.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11600.00	0.00	95.90	11570.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11700.00	0.00	95.90	11670.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
3rd Bone Spring Sand	11751.27	0.00	95.90	11722.00	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
	11800.00	0.00	95.90	11770.73	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18
KOP - Build 12°/100' DLS	11833.36	0.00	95.90	11804.09	-59.75	-56.28	544.59	0.00	399152.99	768499.65	N 32 5 42.82 W	103 35 59.18



Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS (°/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	11900.00	8.00	60.16	11870.51	-57.46	-53.97	548.61	12.00	399155.30	768503.68	N 32 5 42.84	W 103 35 59.14
	12000.00	20.00	60.16	11967.37	-45.58	-41.95	569.55	12.00	399167.32	768524.61	N 32 5 42.96	W 103 35 58.89
	12100.00	32.00	60.16	12057.09	-24.05	-20.18	607.50	12.00	399189.09	768562.56	N 32 5 43.17	W 103 35 58.45
Build & Turn 12°/100' DLS	12125.03	35.00	60.16	12077.96	-17.25	-13.31	619.48	12.00	399195.96	768574.54	N 32 5 43.24	W 103 35 58.31
	12200.00	38.34	46.13	12138.19	9.39	13.56	654.97	12.00	399222.83	768610.03	N 32 5 43.50	W 103 35 57.90
Wolfcamp	12266.68	42.51	35.58	12189.00	41.92	46.27	683.03	12.00	399255.54	768638.09	N 32 5 43.82	W 103 35 57.57
	12300.00	44.92	30.96	12213.09	61.09	65.52	695.63	12.00	399274.79	768650.69	N 32 5 44.01	W 103 35 57.42
	12400.00	53.06	19.23	12278.79	129.14	133.78	727.07	12.00	399343.04	768682.13	N 32 5 44.69	W 103 35 57.05
Wolfcamp Y Sand	12440.31	56.63	15.24	12302.00	160.55	165.25	736.81	12.00	399374.51	768691.87	N 32 5 45.00	W 103 35 56.93
	12500.00	62.12	9.90	12332.41	210.58	215.35	747.91	12.00	399424.61	768702.97	N 32 5 45.49	W 103 35 56.80
Wolfcamp A1 Shale	12518.93	63.91	8.32	12341.00	227.22	232.01	750.58	12.00	399441.27	768705.64	N 32 5 45.66	W 103 35 56.77
	12600.00	71.72	2.05	12371.61	301.84	306.67	757.24	12.00	399515.93	768712.29	N 32 5 46.39	W 103 35 56.68
Build 4°/100' DLS	12633.44	75.00	359.64	12381.19	333.87	338.70	757.70	12.00	399547.96	768712.76	N 32 5 46.71	W 103 35 56.68
	12700.00	77.66	359.64	12396.92	398.53	403.37	757.29	4.00	399612.62	768712.34	N 32 5 47.35	W 103 35 56.68
	12800.00	81.66	359.64	12414.86	496.89	501.72	756.66	4.00	399710.97	768711.72	N 32 5 48.32	W 103 35 56.68
	12900.00	85.66	359.64	12425.90	596.26	601.09	756.03	4.00	399810.34	768711.09	N 32 5 49.31	W 103 35 56.68
	13000.00	89.66	359.64	12429.98	696.15	700.98	755.39	4.00	399910.23	768710.45	N 32 5 50.30	W 103 35 56.67
Landing Point	13008.44	90.00	359.64	12430.00	704.60	709.43	755.34	4.00	399918.67	768710.39	N 32 5 50.38	W 103 35 56.67
	13100.00	90.00	359.64	12430.00	796.15	800.98	754.76	0.00	400010.22	768709.81	N 32 5 51.29	W 103 35 56.67
	13200.00	90.00	359.64	12430.00	896.15	900.98	754.12	0.00	400110.22	768709.17	N 32 5 52.28	W 103 35 56.67
	13300.00	90.00	359.64	12430.00	996.15	1000.98	753.48	0.00	400210.21	768708.54	N 32 5 53.26	W 103 35 56.67
	13400.00	90.00	359.64	12430.00	1096.15	1100.97	752.85	0.00	400310.21	768707.90	N 32 5 54.25	W 103 35 56.67
	13500.00	90.00	359.64	12430.00	1196.15	1200.97	752.21	0.00	400410.20	768707.26	N 32 5 55.24	W 103 35 56.67
	13600.00	90.00	359.64	12430.00	1296.15	1300.97	751.57	0.00	400510.19	768706.63	N 32 5 56.23	W 103 35 56.67
	13700.00	90.00	359.64	12430.00	1396.15	1400.97	750.94	0.00	400610.19	768705.99	N 32 5 57.22	W 103 35 56.67
	13800.00	90.00	359.64	12430.00	1496.15	1500.97	750.30	0.00	400710.18	768705.35	N 32 5 58.21	W 103 35 56.67
	13900.00	90.00	359.64	12430.00	1596.15	1600.96	749.66	0.00	400810.18	768704.72	N 32 5 59.20	W 103 35 56.67
	14000.00	90.00	359.64	12430.00	1696.15	1700.96	749.02	0.00	400910.17	768704.08	N 32 6 0.19	W 103 35 56.67
	14100.00	90.00	359.64	12430.00	1796.15	1800.96	748.39	0.00	401010.17	768703.44	N 32 6 1.18	W 103 35 56.67
	14200.00	90.00	359.64	12430.00	1896.15	1900.96	747.75	0.00	401110.16	768702.80	N 32 6 2.17	W 103 35 56.67
	14300.00	90.00	359.64	12430.00	1996.15	2000.95	747.11	0.00	401210.16	768702.17	N 32 6 3.16	W 103 35 56.67
	14400.00	90.00	359.64	12430.00	2096.15	2100.95	746.48	0.00	401310.15	768701.53	N 32 6 4.15	W 103 35 56.67
	14500.00	90.00	359.64	12430.00	2196.15	2200.95	745.84	0.00	401410.15	768700.89	N 32 6 5.14	W 103 35 56.67
	14600.00	90.00	359.64	12430.00	2296.15	2300.95	745.20	0.00	401510.14	768700.26	N 32 6 6.13	W 103 35 56.67
	14700.00	90.00	359.64	12430.00	2396.15	2400.95	744.57	0.00	401610.13	768699.62	N 32 6 7.12	W 103 35 56.67
	14800.00	90.00	359.64	12430.00	2496.15	2500.94	743.93	0.00	401710.13	768698.98	N 32 6 8.11	W 103 35 56.67
	14900.00	90.00	359.64	12430.00	2596.15	2600.94	743.29	0.00	401810.12	768698.35	N 32 6 9.10	W 103 35 56.66
	15000.00	90.00	359.64	12430.00	2696.15	2700.94	742.65	0.00	401910.12	768697.71	N 32 6 10.09	W 103 35 56.66
	15100.00	90.00	359.64	12430.00	2796.15	2800.94	742.02	0.00	402010.11	768697.07	N 32 6 11.08	W 103 35 56.66
	15200.00	90.00	359.64	12430.00	2896.15	2900.94	741.38	0.00	402110.11	768696.43	N 32 6 12.07	W 103 35 56.66
	15300.00	90.00	359.64	12430.00	2996.15	3000.93	740.74	0.00	402210.10	768695.80	N 32 6 13.06	W 103 35 56.66
	15400.00	90.00	359.64	12430.00	3096.15	3100.93	740.11	0.00	402310.10	768695.16	N 32 6 14.04	W 103 35 56.66
	15500.00	90.00	359.64	12430.00	3196.15	3200.93	739.47	0.00	402410.09	768694.52	N 32 6 15.03	W 103 35 56.66
	15600.00	90.00	359.64	12430.00	3296.15	3300.93	738.83	0.00	402510.09	768693.89	N 32 6 16.02	W 103 35 56.66
	15700.00	90.00	359.64	12430.00	3396.15	3400.93	738.20	0.00	402610.08	768693.25	N 32 6 17.01	W 103 35 56.66
	15800.00	90.00	359.64	12430.00	3496.15	3500.92	737.56	0.00	402710.08	768692.61	N 32 6 18.00	W 103 35 56.66
	15900.00	90.00	359.64	12430.00	3596.15	3600.92	736.92	0.00	402810.07	768691.98	N 32 6 18.99	W 103 35 56.66
	16000.00	90.00	359.64	12430.00	3696.15	3700.92	736.28	0.00	402910.06	768691.34	N 32 6 19.98	W 103 35 56.66
	16100.00	90.00	359.64	12430.00	3796.15	3800.92	735.65	0.00	403010.06	768690.70	N 32 6 20.97	W 103 35 56.66
	16200.00	90.00	359.64	12430.00	3896.15	3900.92	735.01	0.00	403110.05	768690.07	N 32 6 21.96	W 103 35 56.66
	16300.00	90.00	359.64	12430.00	3996.15	4000.91	734.37	0.00	403210.05	768689.43	N 32 6 22.95	W 103 35 56.66
	16400.00	90.00	359.64	12430.00	4096.15	4100.91	733.74	0.00	403310.04	768688.79	N 32 6 23.94	W 103 35 56.66
	16500.00	90.00	359.64	12430.00	4196.15	4200.91	733.10	0.00	403410.04	768688.15	N 32 6 24.93	W 103 35 56.66
	16600.00	90.00	359.64	12430.00	4296.15	4300.91	732.46	0.00	403510.03	768687.52	N 32 6 25.92	W 103 35 56.66
	16700.00	90.00	359.64	12430.00	4396.15	4400.91	731.83	0.00	403610.03	768686.88	N 32 6 26.91	W 103 35 56.66

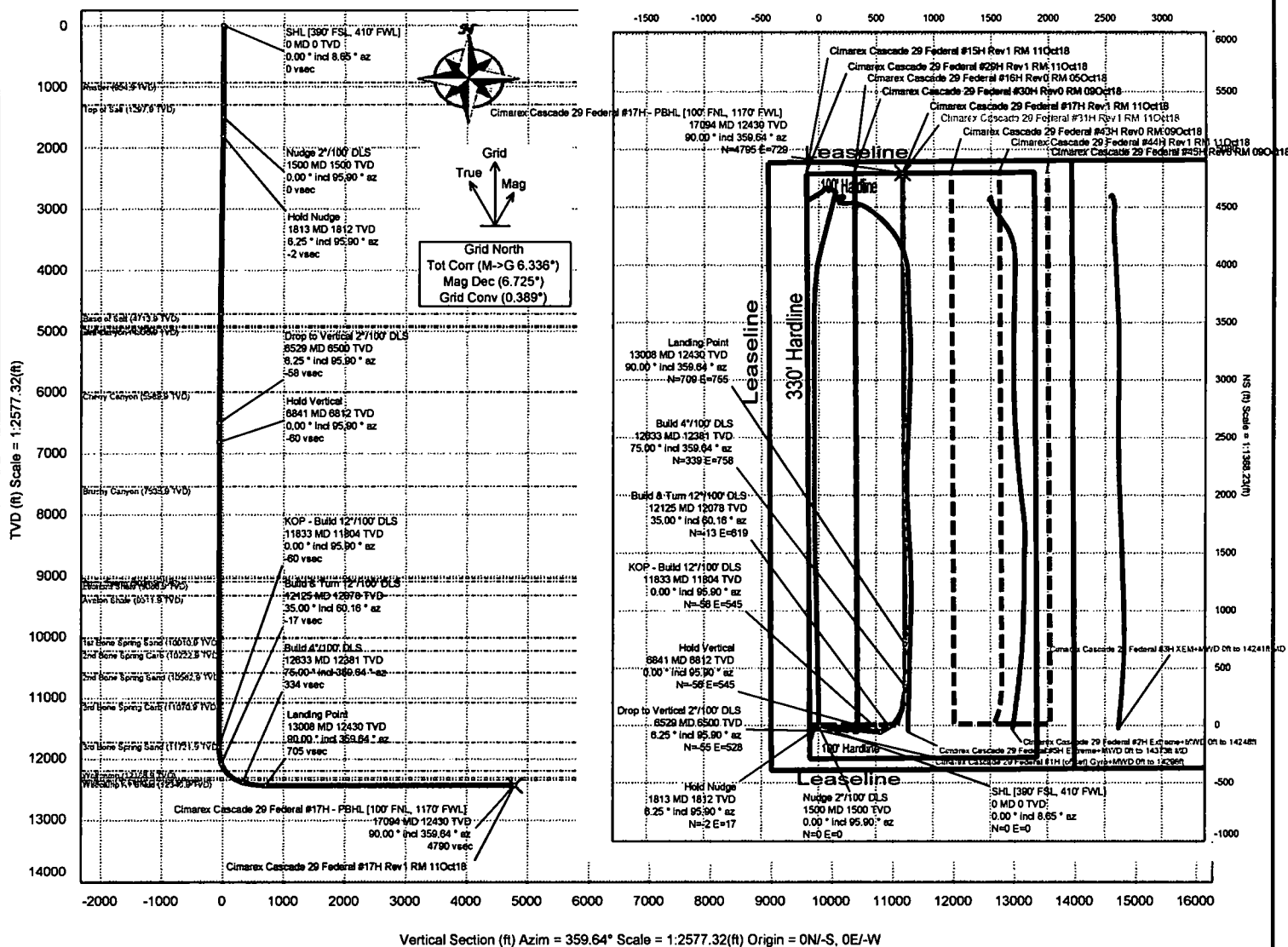
Comments	MD (ft)	Incl (°)	Azim Grid (°)	TVD (ft)	VSEC (ft)	NS (ft)	EW (ft)	DLS ("/100ft)	Northing (ftUS)	Easting (ftUS)	Latitude (N/S ° ' ")	Longitude (E/W ° ' ")
	16800.00	90.00	359.64	12430.00	4496.15	4500.90	731.19	0.00	403710.02	768686.24	N 32 6 27.90 W	103 35 56.66
	16900.00	90.00	359.64	12430.00	4596.15	4600.90	730.55	0.00	403810.02	768685.61	N 32 6 28.89 W	103 35 56.65
	17000.00	90.00	359.64	12430.00	4696.15	4700.90	729.91	0.00	403910.01	768684.97	N 32 6 29.88 W	103 35 56.65
Cimarex Cascade 29 Federal #17H - PBHL [100' FNL, 1170' FWL]	17094.08	90.00	359.64	12430.00	4790.23	4794.97	729.31	0.00	404004.08	768684.37	N 32 6 30.81 W	103 35 56.65

Survey Type: Non-Def Plan

Survey Error Model: ISCWSA Rev 0 \*\*\* 3-D 95.000% Confidence 2.7955 sigma  
Survey Program:

Description	Part	MD From (ft)	MD To (ft)	EOU Freq (ft)	Hole Size (in)	Casing Diameter (in)	Expected Max Inclination (deg)	Survey Tool Type	Borehole / Survey
	1	0.000	26.000	1/100.000	30.000	30.000		NAL_MWD_IFR1+MS-Depth Only	Cascade 29 Federal #17H / Cimarex Cascade 29 Federal #17H Rev1 RM 11Oct18
	1	26.000	17094.075	1/100.000	30.000	30.000		NAL_MWD_IFR1+MS	Cascade 29 Federal #17H / Cimarex Cascade 29 Federal

<b>Borehole:</b> Cascade 29 Federal #17H	<b>Well:</b> Cascade 29 Federal #17H	<b>Field:</b> NM Lea County (NAD 83)	<b>Structure:</b> Cimarex Cascade 29 Federal #17H
<b>Gravity &amp; Magnetic Parameters</b> Model: HOGM 2016 Dip: 59.738° Date: 05-Oct-2018 MagDec: 6.725° FB: 47824.806nT Gravity FS: 998.428mg (9.80665 Based)		<b>Surface Location</b> NADES New Mexico State Plane, Eastern Zone, US Feet Lat: N 32 5 43.41 Northing: 399209.27RUS Grid Conv: 0.3838° Lon: W 103 38 5.91 Easting: 767865.08RUS Scale Fact: 0.99996781 Plan: Cimarex Cascade 29 Federal #17H Rev1 RM 11Oct18 EW (ft) Scale = 1:1368.23(R)	



Critical Points

Critical Point	MD	INCL	AZIM	TVD	VSEC	N(+)/S(-)	E(+)/W(-)	DLS
SHL (390' FSL, 410' FWL)	0.00	0.00	8.85	0.00	0.00	0.00	0.00	
Nudge 2' 100' DLS	1500.00	0.00	95.90	1500.00	0.00	0.00	0.00	0.00
Hold Nudge	1812.50	8.25	95.90	1811.88	-1.68	-1.75	18.94	2.00
Drop to Vertical 2' 100' DLS	6529.85	8.25	95.90	6500.00	-57.89	-54.53	527.65	0.00
Hold Vertical	6841.15	0.00	95.90	6811.88	-59.75	-56.28	544.59	2.00
KOP - Build 12' 100' DLS	11833.36	0.00	95.90	11804.09	-59.75	-56.28	544.59	0.00
Build & Turn 12' 100' DLS	12125.03	35.00	60.16	12077.96	-17.25	-13.31	619.48	12.00
Build 4' 100' DLS	12833.44	75.00	359.64	12381.19	333.87	338.70	757.70	12.00
Landing Point	13008.44	90.00	359.64	12430.00	704.80	709.43	755.34	4.00
Cimarex Cascade 29 Federal #17H - PSBL (100' FNL, 1170' FWL)	17094.08	90.00	359.64	12430.00	4790.23	4794.97	729.31	0.00

**1. Geological Formations**

TVD of target 12,430  
MD at TD 17,094

Pilot Hole TD N/A  
Deepest expected fresh water

Formation	Depth (TVD) from KB	Water/Mineral Bearing/Target Zone	Hazards
Rustler	935	N/A	
Top of Salt	1298	N/A	
Base of Salt	4714	N/A	
Lamar	4909	N/A	
Bell Canyon	4937	N/A	
Cherry Canyon	5990	N/A	
Brushy Canyon	7536	Hydrocarbons	
Bone Spring	9032	Hydrocarbons	
Avalon Shale	9312	Hydrocarbons	
Wolfcamp	12189	Hydrocarbons	

**2. Casing Program**

Hole Size	Casing Depth From	Casing Depth To	Setting Depth TVD	Casing Size	Weight (lb/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
14 3/4	0	985	985	10-3/4"	40.50	J-55	BT&C	3.51	6.94	15.77
9 7/8	0	12633	12381	7-5/8"	29.70	L-80	BT&C	2.47	1.19	1.81
6 3/4	0	11833	11833	5-1/2"	20.00	L-80	LT&C	1.15	1.19	1.86
6 3/4	11833	17094	12430	5"	18.00	HCP-110	BT&C	1.66	1.69	53.97
BLM Minimum Safety Factor								1.125	1	1.6 Dry 1.8 Wet

TVD was used on all calculations.

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

Request Variance for 5-1/2" x 7-5/8" annular clearance. The portion that does not meet clearance will not be cemented

Cimarex Energy Co., Cascade 29 Federal #17H

	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
Is AC Report included?	N

**3. Cementing Program**

Casing	# Sks	Wt. lb/gal	Yld ft <sup>3</sup> /sack	H <sub>2</sub> O gal/sk	500# Comp. Strength (hours)	Slurry Description
Surface	332	13.50	1.72	9.15	15.5	Lead: Class C + Bentonite
	156	14.80	1.34	6.32	9.5	Tail: Class C + LCM
Intermediate Stage 1	601	10.30	3.64	22.18		Lead: Tuned Light + LCM
	207	14.20	1.30	5.86	14:30	Tail: 50:50 (Poz:H) + Salt + Bentonite + Fluid Loss + Dispersant + SMS
Intermediate Stage 2	786	12.90	1.88	9.65	12	Lead: 35:65 (Poz:C) + Salt + Bentonite
Production	373	14.20	1.30	5.86	14:30	Tail: 50:50 (Poz:H) + Salt + Bentonite + Fluid Loss + Dispersant + SMS

DV tool with possible annular casing packer as needed is proposed at a depth of +/- 4,850'.

Casing String	TOC	% Excess
Surface	0	42
Intermediate Stage 1	4850	47
Intermediate Stage 2	0	40
Production	12433	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 985'	FW Spud Mud	8.30 - 8.80	30-32	N/C
985' to 12633'	Brine Diesel Emulsion	8.50 - 9.00	30-35	N/C
12633' to 17094'	Oil Based Mud	12.00 - 12.50	50-70	N/C

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

The Brine 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.

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	8079 psi
Abnormal Temperature	No

Hydrogen Sulfide (H<sub>2</sub>S) monitors will be installed prior to drilling out the surface shoe. If H<sub>2</sub>S 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	H <sub>2</sub> S is present
X	H <sub>2</sub> S plan is attached

**8. Other Facets of Operation****9. Wellhead**

A multi-bowl wellhead system will be utilized.

After running the 10-3/4" surface casing, a 13 5/8" BOP/BOPE system with a minimum working pressure of 10000 psi will be installed on the wellhead system and will be pressure tested to 250 psi low followed by a 10000 psi test. Annular will be tested to 50% of working pressure. The pressure test will be repeated at least every 30 days, as per Onshore Order No. 2.

The multi-bowl wellhead will be installed by vendor's representative. A copy of the installation instructions has been sent to the BLM field office.

The wellhead will be installed by a third-party welder while being monitored by the wellhead vendor representative.

All BOP equipment will be tested utilizing a conventional test plug. Not a cup or J-packer type.

A solid steel body pack-off will be utilized after running and cementing the intermediate casing. After installation the pack-off and lower flange will be pressure tested to 10000 psi.

The surface casing string will be tested as per Onshore Order No. 2 to at least 0.22 psi/ft or 1500 psi, whichever is greater.

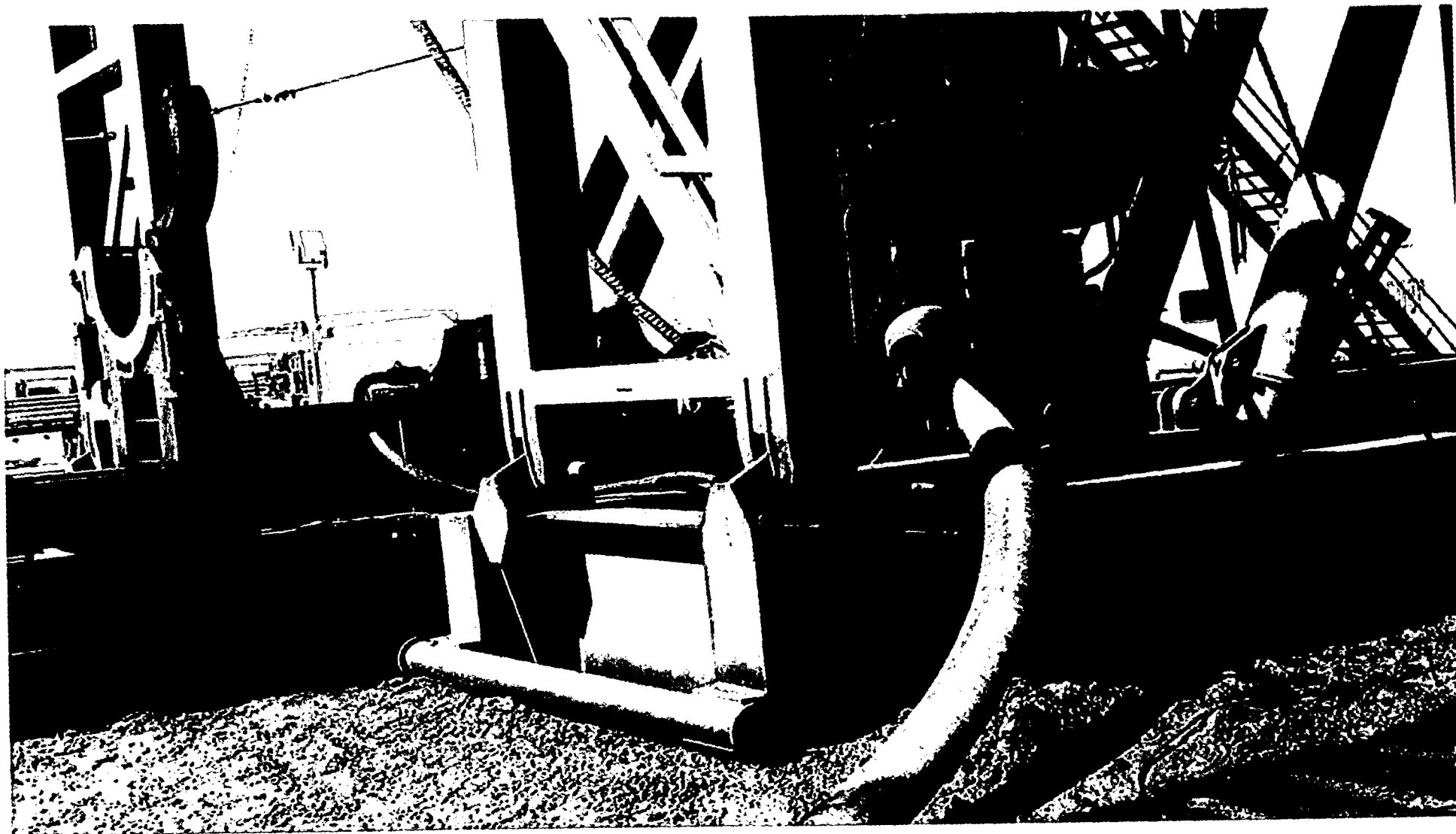
The casing string utilizing steel body pack-off will be tested to 70% of casing burst.

If well conditions dictate conventional slips will be set and BOPE will be tested to appropriate pressures based on permitted pressure requirements.





Co-Flex Hose  
**Cascade 29 Federal 17H**  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM



Co-Flex Hose Hydrostatic Test  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM



## Midwest Hose & Specialty, Inc.

### INTERNAL HYDROSTATIC TEST REPORT

<b>Customer:</b> Oderco Inc		<b>P.O. Number:</b> odyd-271	
<b>HOSE SPECIFICATIONS</b>			
<b>Type:</b> Stainless Steel Armor Choke & Kill Hose		<b>Hose Length:</b> 45'ft.	
<b>I.D.</b> 4 INCHES		<b>O.D.</b> 9 INCHES	
<b>WORKING PRESSURE</b> 10,000 PSI	<b>TEST PRESSURE</b> 15,000 PSI	<b>BURST PRESSURE</b> 0 PSI	
<b>COUPLINGS</b>			
<b>Stem Part No.</b> OKC OKC		<b>Ferrule No.</b> OKC OKC	
<b>Type of Coupling:</b> Swage-It			
<b>PROCEDURE</b>			
<u>Hose assembly pressure tested with water at ambient temperature.</u>			
<b>TIME HELD AT TEST PRESSURE</b> 15 MIN.		<b>ACTUAL BURST PRESSURE:</b> 0 PSI	
<b>Hose Assembly Serial Number:</b> 79793		<b>Hose Serial Number:</b> OKC	
<b>Comments:</b>			
<b>Date:</b> 3/8/2011	<b>Tested:</b> <i>A. J. Jones</i>	<b>Approved:</b> <i>[Signature]</i>	



Midwest Hose  
& Specialty, Inc.

## Internal Hydrostatic Test Graph

Customer: Houston

Pick Ticket #: 94260

### Hose Specifications

Hose Type  
C & K  
I.D.  
4"

Length  
45'

Type of Fittings  
4 1/2" 10K  
Die Size  
6.38"

### Verification

Coupling Method  
Swage  
Final O.D.  
6.75"

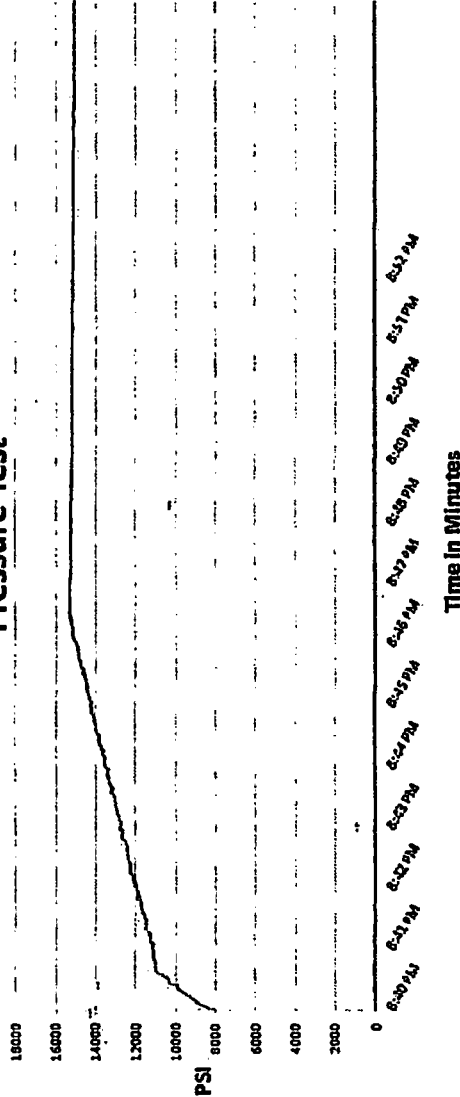
Hose Serial #  
5544

Burst Pressure  
20,000 PSI

Working Pressure  
10,000 PSI

20,000 PSI (See Safety Marking on Hose)

### Pressure Test



Test Pressure  
15,000 PSI

Time Held at Test Pressure  
11 Minutes

Actual Burst Pressure  
15,483 PSI

Comments: Hose assembly pressure tested with water at ambient temperature.

Tested By: Zac McConnell

Approved By: Kim Thomas

*Zac McConnell*

*Kim Thomas*

Co-Flex Hose Hydrostatic Test  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM

March 3, 2011

Co-Flex Hose  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM



## Midwest Hose & Specialty, Inc.

### Certificate of Conformity

<b>Customer:</b>		<b>PO</b>
DEM		ODYD-271
<b>SPECIFICATIONS</b>		
<b>Sales Order</b>	<b>Dated:</b>	
79793	3/8/2011	
<p>We hereby certify that the material supplied for the referenced purchase order to be true according to the requirements of the purchase order and current industry standards</p> <p>Supplier: Midwest Hose &amp; Specialty, Inc. 10640 Tanner Road Houston, Texas 77041</p>		
<b>Comments:</b>		
<b>Approved:</b>		<b>Date:</b>
<i>Sam Hester</i>		3/8/2011



Midwest Hose  
& Specialty, Inc.

Co-Flex Hose  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM

## Specification Sheet Choke & Kill Hose

The Midwest Hose & Specialty Choke & Kill hose is manufactured with only premium components. The reinforcement cables, inner liner and cover are made of the highest quality material to handle the tough drilling applications of today's industry. The end connections are available with API flanges, API male threads, hubs, hammer unions or other special fittings upon request. Hose assembly is manufactured to API 7K. This assembly is wrapped with fire resistant vermiculite coated fiberglass insulation, rated at 2000 degrees with stainless steel armor cover.

<b>Working Pressure:</b>	5,000 or 10,000 psi working pressure
<b>Test Pressure:</b>	10,000 or 15,000 psi test pressure
<b>Reinforcement:</b>	Multiple steel cables
<b>Cover:</b>	Stainless Steel Armor
<b>Inner Tube:</b>	Petroleum resistant, Abrasion resistant
<b>End Fitting:</b>	API flanges, API male threads, threaded or butt weld hammer unions, unbolt and other special connections
<b>Maximum Length:</b>	110 Feet
<b>ID:</b>	2-1/2", 3", 3-1/2", 4"
<b>Operating Temperature:</b>	-22 deg F to +180 deg F (-30 deg C to +82 deg C)



**Installation Procedure Prepared For:**

## **Cimarex**

**13-3/8" x 9-5/8" x 5-1/2" x 2-3/8" MBU-3T Wellhead Assy.  
With 13-5/8" 5M x 13-3/8" SOW MBU-3T Housing  
13-5/8" 5M x 7-1/16" 10M CTH-DBLHPS Tubing Head  
And 7-1/16" x 2-3/8" CTH-EN Tubing Hanger**

**Publication # IP0552**

**April, 2017**

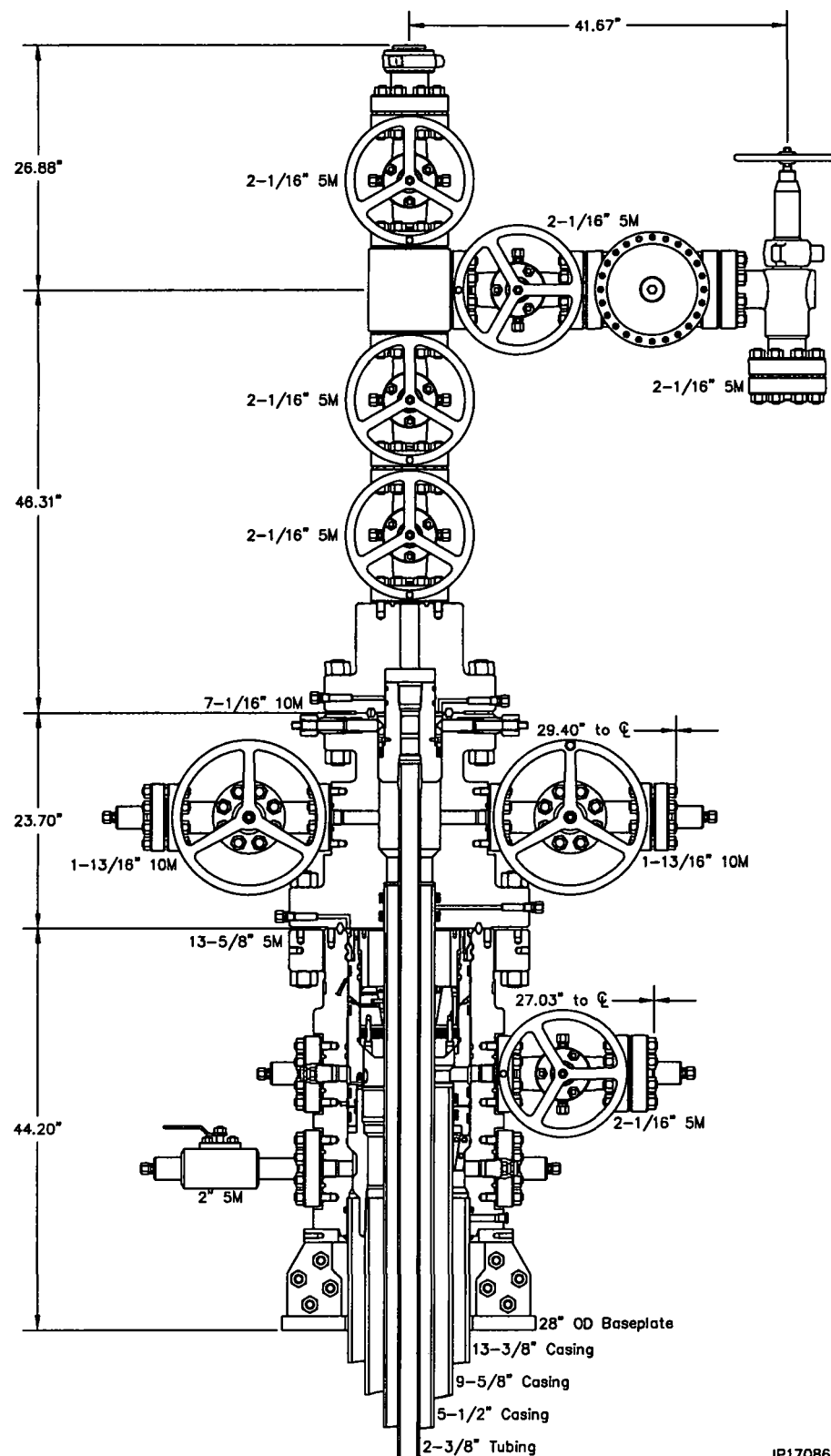
**INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CACTUS WELLHEAD, LLC. REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PERMISSIBLE ONLY AS PROVIDED BY CONTRACT OR AS EXPRESSLY AUTHORIZED BY CACTUS WELLHEAD, LLC .**

## Table of Contents

	<b>System Drawing</b>	<b>1</b>
	<b>Bill of Materials</b>	<b>2</b>
<b>Stage 1 —</b>	<b>Install the MBU-3T Wellhead Housing</b>	<b>5</b>
<b>Stage 2 —</b>	<b>Test the BOP Stack</b>	<b>7</b>
<b>Stage 3 —</b>	<b>Run the Lower Wear Bushing</b>	<b>8</b>
	Run the Wear Bushing Before Drilling	8
	Retrieve the Wear Bushing After Drilling	8
<b>Stage 4 —</b>	<b>Hang Off the 9-5/8" Casing</b>	<b>9</b>
	Running the 13-5/8" Wash Tool	13
<b>Stage 4A —</b>	<b>Hang Off the 9-5/8" Casing (Emergency)</b>	<b>14</b>
<b>Stage 5 —</b>	<b>Install the MBU-3T Mandrel Hanger Packoff</b>	<b>16</b>
	Landing the Packoff	18
	Seal Test	19
	Engaging the Lockring	19
	Retrieving the Packoff	20
<b>Stage 5A —</b>	<b>Install the MBU-3T Emergency Packoff</b>	<b>21</b>
	Landing the Packoff	23
	Seal Test	24
	Engaging the Lockring	24
<b>Stage 6 —</b>	<b>Test the BOP Stack</b>	<b>25</b>
<b>Stage 7 —</b>	<b>Run the Upper Wear Bushing</b>	<b>26</b>
	Run the Wear Bushing Before Drilling	26
	Retrieve the Wear Bushing After Drilling	26
<b>Stage 8 —</b>	<b>Hang Off the 5-1/2" Casing</b>	<b>27</b>
<b>Stage 9 —</b>	<b>Install the Tubing Head</b>	<b>29</b>
	Seal Test	30
	Flange Test	31
<b>Stage 10 —</b>	<b>Test the BOP Stack</b>	<b>32</b>
	Landing the Tubing Hanger	34
<b>Stage 11 —</b>	<b>Install the Production Tree</b>	<b>35</b>
	Seal Test	36
	Flange Test	37
	<b>Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal</b>	<b>38</b>

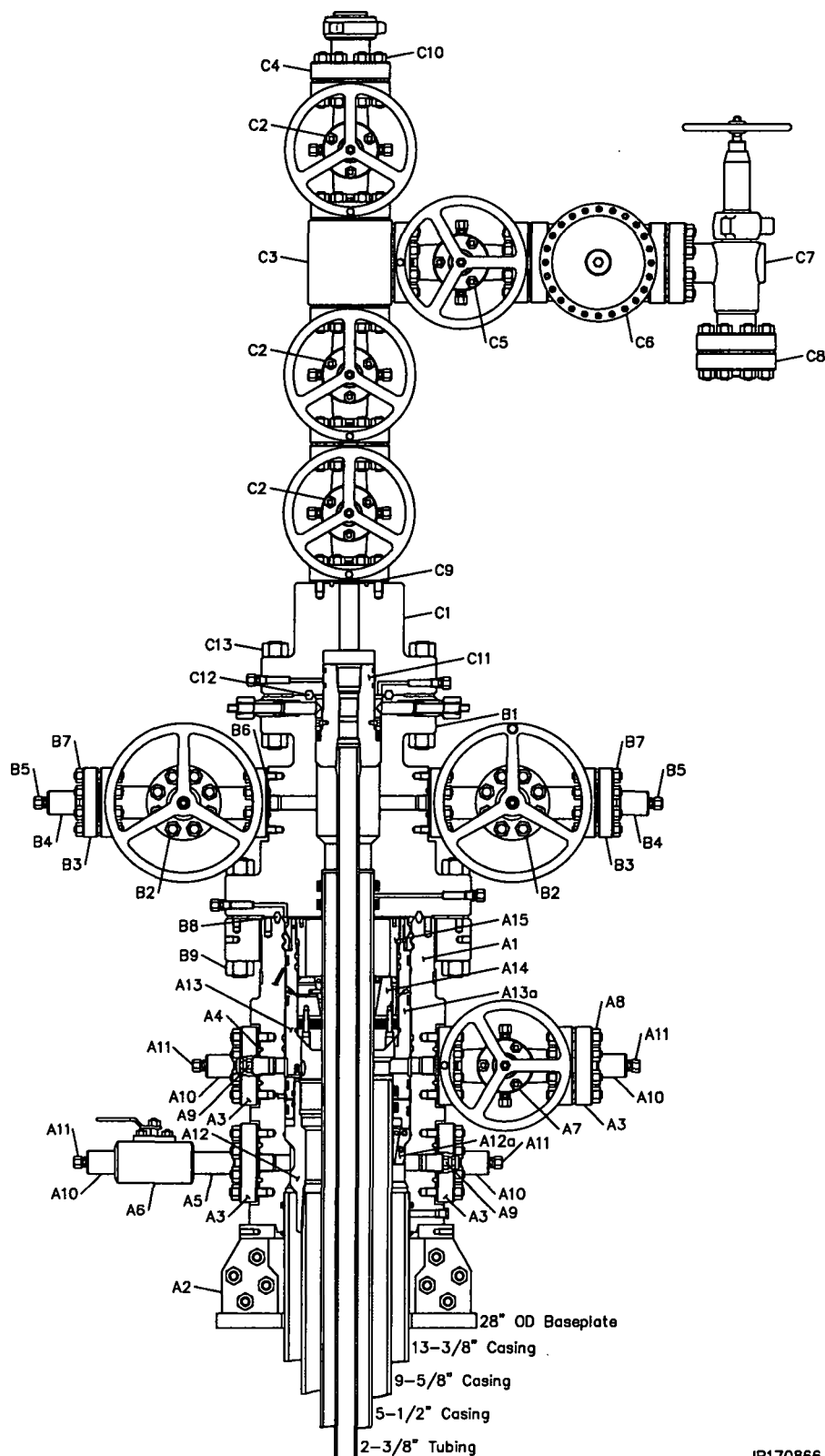


## System Drawing



IP170865

## Bill of Materials



IP170866

INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CACTUS WELLHEAD, LLC. REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PERMISSIBLE ONLY AS PROVIDED BY CONTRACT OR AS EXPRESSLY AUTHORIZED BY CACTUS WELLHEAD, LLC .

MBU-3T HOUSING ASSEMBLY		
Item	Qty	Description
A1	1	Housing, CW, MBU-3T, 13-5/8" 5M x 13-3/8" SOW, With Two 2-1/16" 5M Studded Upper And Lower Outlets, 6A-PU-AA-1-2 Part # 117620
A2	1	Baseplate Kit, Split Weldless, 28" OD x 14" ID x 11" Long, For 13-3/8" SOW & 15" Nose, With Two 4" x 4" Gout Slots And Four 5/8" Lift Threads On Top Ring, Arranged For 20" Conductor Part # 104718
A3	4	Companion Flange, 2-1/16" 5M x 2" Line Pipe, 6A-KU-EE-NL-1 Part # 200002
A4	5	Ring Gasket, R-24, 2-1/16" 3/5M Part # R24
A5	1	Nipple, 2" Line Pipe, 5000 PSI MAX WP, 4130/4140, 75K
A6	1	Ball Valve, TSI, 2 RP 5M 2" Line Pipe x 2" Line Pipe, Cast Body And End Piece, CR/NI Plated Ball, CS Stem, Delrin Seats, Buna N Seals, With Locking Device, Non-Nace Part # 103887
A7	1	Gate Valve, CW1, 2-1/16" 3/5M Flanged End, Handwheel Operated, AA/DD-NL Trim (6A-LU-AA/DD-NL-1-2) Part # 610003
A8	8	Stud, All-Thread, With Two Nuts, Black, 7/8" x 6-1/2" B7/2H, No Plating Part # 780067
A9	2	Valve Removal Plug, 1-1/2" Sharp Vee x 1-1/4" Hex, 6A-DD-NL Part # VR2

MBU-3T HOUSING ASSEMBLY		
Item	Qty	Description
A10	4	Bull Plug, CW, 2" Line Pipe x 1/2" Line Pipe, 6A-DD-NL Part # BP2T
A11	4	Fitting, Grease, Vented Cap, 1/2" NPT Alloy Non-Nace Part # FTG1
A12	1	Casing Hanger, CW, MBU-LR, Fluted, 13-5/8" 10M x 9-5/8" LC Box Bottom x 10.250" 4 Stub Acme 2G LH Box Top, 6A-U-AA-1-1 Part # 104173
A13	1	Packoff, CW, MBU-3T, Mandrel, 13-5/8" Nested x 11" With 11.250" 4 Stub Acme 2G LH Box Top, 6A-U-AA-1-1 Part # 117152
A14	1	Casing Hanger, CW, C2, 11" x 5-1/2" 6A-P-AA-3-1 Part # 108067
A15	1	Hold Down Ring, For C2 Casing Hanger, 11" Thru 4-1/2" Arranged For MBU-3T Packoff, 13-5/8" With 11.250" 4 Stub Acme 2G LH Pin x 9.06 ID x 6.25" Long With 2.25" Thread Length, 4140 110K Part # 117418

EMERGENCY EQUIPMENT		
Item	Qty	Description
A12a	1	Casing Hanger, CW, MBU-3T-LWR, Emergency, 13-5/8" x 9-5/8" 6A-PU-DD-3-1 Part # 116998
A13a	1	Packoff, CW, MBU-3T, Emergency, 13-5/8" nested x 11" x 9-5/8" With 11.250" 4 Stub Acme 2G LH box top, 6A-U-AA-1-1 Part # 117184

TUBING HEAD ASSEMBLY		
Item	Qty	Description
B1	1	Tubing Head, CW, CTH-DBLHPS, 5-1/2", 13-5/8" 5M x 7-1/16" 10M, With Two 1-13/16" 10M Studded Outlets, 17-4PH Lock Down Screws, 6A-PU-EE-0,5-2-1 Part # 100147
B2	2	Gate Valve, AOZE, FC, 1-13/16" 10M, Flanged End, Handwheel Operated, EE-0,5 Trim, 6A-LU-EE-0,5-3-1 Part # 103188
B3	2	Companion Flange, 1-13/16" 10M x 2" Line Pipe, 5000 PSI Max WP, 4130 60K 6A-KU-EE-NL-1 Part # 200010
B4	2	Bull Plug, CW, 2" Line Pipe x 1/2" Line Pipe, 6A-DD-NL Part # BP2T
B5	2	Fitting, Grease, Vented Cap, 1/2" NPT Alloy Non-Nace Part # FTG1
B6	4	Ring Gasket, BX151, 1-13/16" 10M Part # BX-151
B7	16	Stud, All-Thread With Two Nuts, Black, 3/4" x 5-1/2" Long, B7/2H Part # 780080
B8	1	Ring Gasket, BX-160, 13-5/8" 5M Part # BX-160
B9	16	Stud, All-Thread With Two Nuts, Black, 1-5/8" x 12-3/4" Long, B7/2H Part # 780087



**Cimarex**  
**13-3/8" x 9-5/8" x 5-1/2" MBU-3T Wellhead System**  
**With 13-5/8" 5M x 13-3/8" SOW MBU-3T Housing And**  
**13-5/8" 5M x 7-1/16" 10M CTH-DBLHPS Tubing Head**

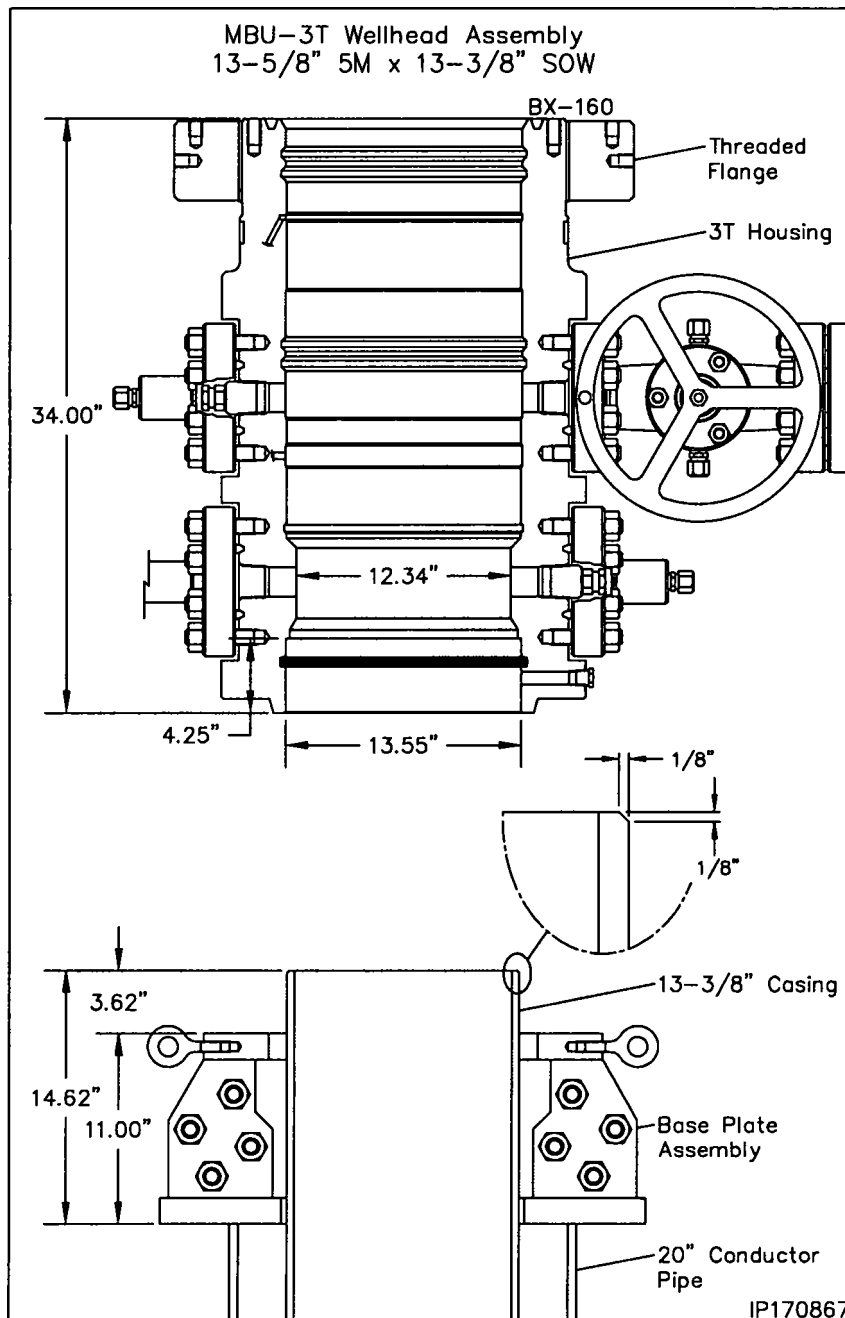
**IP 0552**  
**Page 3**

INFORMATION CONTAINED HEREIN IS THE PROPERTY OF CACTUS WELLHEAD, LLC. REPRODUCTION, DISCLOSURE, OR USE THEREOF IS PERMISSIBLE ONLY AS PROVIDED BY CONTRACT OR AS EXPRESSLY AUTHORIZED BY CACTUS WELLHEAD, LLC.

PRODUCTION TREE ASSEMBLY			PRODUCTION TREE ASSEMBLY			RECOMMENDED SERVICE TOOLS		
Item	Qty	Description	Item	Qty	Description	Item	Qty	Description
C1	1	Adapter, Tubing Head, CW, EN, 5-1/2", 7-1/16" 10M Flanged x 2-1/16" 5M Studded x 12.0" Long, 6A-PU-EE-NL-1-1 Part # 101940	C7	1	Choke, Adjustable, Techseal, N62, 2-1/16" 5M Flanged, Alloy, With 1" Max Orifice, 1" HS Stem And Seat, AA Trim Part # 103137	ST1	1	Test Plug/Retrieving Tool, CW, MBU-3T, 13-5/8" x 4-1/2" IF (NC50) Box Top and Bottom, 1-1/4" LP Bypass and Spring Loaded Lift Dogs Part # 104467
C2	3	Gate Valve, CW1, 2-1/16" 3/5M Flanged End, Handwheel Operated, AA/DD-NL Trim (6A-LU-AA/DD-NL-1-2) Part # 610003	C8	1	Companion Flange, 2-1/16" 5M x 2" Line Pipe, 6A-KU-EE-NL-1 Part # 200002	ST2	1	Wear Bushing, CW, MBU-3T-LWR, 13-5/8" x 12.31" ID x 26.5" Long Part # 116974
C3	1	Tee, CW, Studded, 2-1/16" 5M x 2-1/16" 5M, 6A-PU-EE-NL-1 Part # 100177	C9	9	Ring Gasket, R-24, 2-1/16" 3/5M Part # R24	ST3	1	Casing Hanger Running Tool, CW, MBU-LR, 13-5/8" x 9-5/8" LC Top x 10.250" 4 Stub Acme 2G LH Pin Bottom Part # 100943
C4	1	Tree Cap, CW, BHTA, B15A, 2-1/16" 5M x 2-3/8" EU Tubing ILT x 4.625" 4 Acme 2G External Threads, 6A-PU-EE-NL-1-1 Part # 100231	C10	40	Stud, All-Thread, With Two Nuts, Black, 7/8" x 6-1/2" B7/2H, No Plating Part # 780067	ST4	1	Torque Collar, CW, Casing Hanger, For Use With 10.75" OD Tool Neck And 3.25" To 5.50" Long Box Hanger Neck Part # 103374
C5	1	Gate Valve, CW1, 2-1/16" 3/5M Flanged End, Handwheel Operated, BB/EE-0.5 Trim (6A-LU-BB/EE-0.5-1-2) Part # 610004	C11	1	Tubing Hanger, CW, CTH-EN, 5-1/2", 7-1/16" x 2-3/8" EU API Modified Box Bottom x 2-3/8" EU Bot Top, With 2" HBPV Thread, 6A-U-AA-1-1 Part # 105154	ST5	1	Wash Tool, CW, MBU-3T-LR, MBS2, Fluted, 13-5/8" x 4-1/2" IF Box Top Threads, With Brushes Part # 106277
C6	1	Actuator Valve, OMNI, CS-R, 2-1/16" 5M Flanged End, Complete With Model DX-10 Diaphragm Pneumatic Actuator, Cast Body, Reverse Acting Slab Gate, Floating Seats, EE-0.5 Trim (6A-V-PU-EE-0.5-1-2), Actuator P-BB-1, Includes Manual Override, VKM M Type Part # 106676	C12	1	Ring Gasket, BX-156, 7-1/16" 10M Part # BX156	ST6	1	Packoff Running Tool, CW, MBU-3T UPR, 13-5/8" Nested, With 11.250" 4 Stub Acme 2G LH Pin Bottom x 4-1/2" IF (NC-50) Box Top With Seal Sleeve Part # 117310
			C13	12	Stud, All-Thread, With Two Nuts, Black, 1-1/2" x 11-3/4" B7/2H, No Plating Part # 780082	ST7	1	Test Plug, CW, MBU-2LR Inner, 11" x 4-1/2" IF, 1-1/4" LP Bypass Part # 108848
						ST8	1	Wear Bushing, MBU-3T-UPR, 13-5/8" x 9.00" I.D. x 14.5" Long, With O-Ring Grooves And Anti-Rotation, Arranged For 13-5/8" Retrieval Tool Part # 117158
						ST9	1	Test Plug/Retrieving Tool, CW, CTH, 7-1/16" x 3-1/2" IF, 1-1/4" LP bypass and spring loaded lift dogs Part # 100140

## Stage 1 — Install the MBU-3T Wellhead Housing

1. Run the 20" conductor and 13-3/8" surface casing to the required depth and cement as required.
2. Determine the correct elevation for the MBU-3T Wellhead Assembly.
3. Cut the 20" casing at a predetermined elevation below ground level to facilitate the installation of the balance of the wellhead equipment. Grind stub level with the horizon.
4. Cut the 13-3/8" casing 14.62" above the top of the 20" casing stub and place an 1/8" x 1/8" bevel on the OD of the stub.
5. Remove all loose rust and scale from the top 6" of the stub.
6. Examine the **28" OD Split Weldless Baseplate Assembly (Item A2)**. Verify the following:
  - baseplate assembly is clean and in good condition
  - all gussets are properly welded
  - baseplate halves are bolted together and bolts are tightened securely
  - lift eyes are in place and tightened securely
7. Attach a suitable lifting device to the baseplate assembly and carefully lower it over the 13-3/8" casing stub and land it on the 20" conductor pipe.
8. Verify that 3.62" of 13-3/8" casing is exposed above the baseplate upper support plate and the baseplate is level with the horizon.
9. Remove the baseplate assembly and set aside.
10. Examine the **13-5/8" 5M x 13-3/8" SOW MBU-3T Wellhead Assembly (Item A1)**. Verify the following:
  - all seal areas are clean and undamaged
  - weld socket is clean and free of grease and debris and o-ring is in place and in good condition
  - valves are intact and in good condition

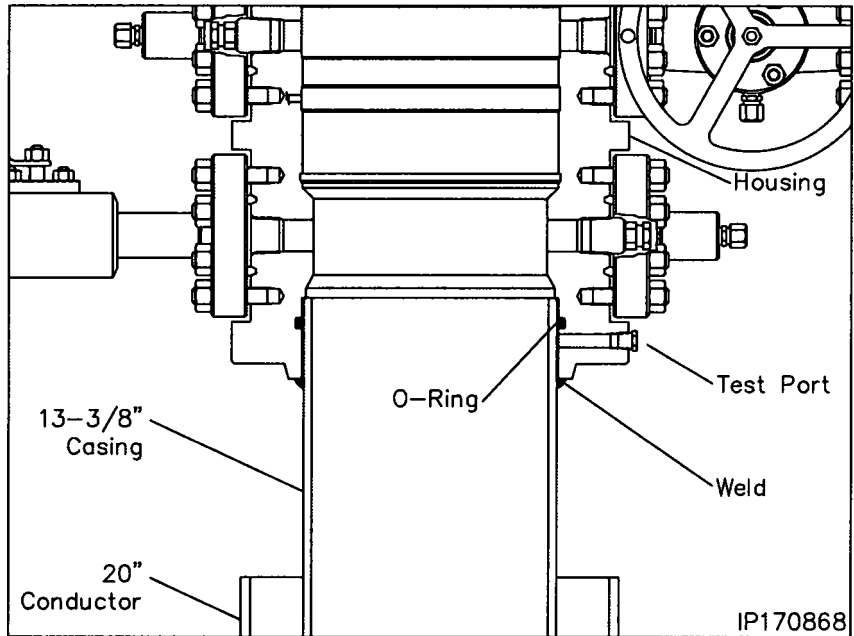


## Stage 1 — Install the MBU-3T Wellhead Housing

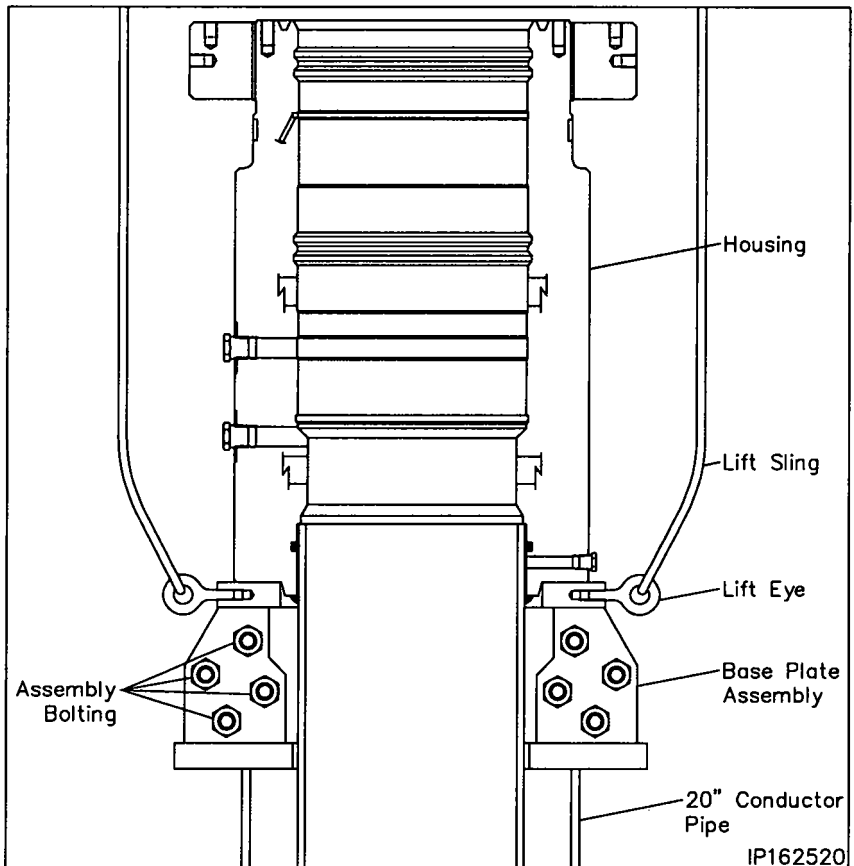
11. Align and level the Wellhead Assembly over the casing stub, orienting the outlets so they will be compatible with the drilling equipment.
12. Remove the pipe plug from the port on the bottom of the Head.
13. Slowly and carefully lower the assembly over the casing stub and externally weld the MBU-3T housing to the surface casing.

**Note:** The weld should be a fillet-type weld with legs no less than the wall thickness of the casing. Legs of 1/2" to 5/8" are adequate for most jobs.

Refer to the back of this publication for the **Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal** and for field testing of the weld connection.



14. After a satisfactory test is achieved, replace the pipe plug in the port on the bottom of the housing.
15. Remove the baseplate bolting and separate the assembly in two halves.
16. Attach a suitable lifting sling to the two lift eyes on the upper plate of one half of the assembly and carefully lower it into the cellar and on top of the 20" conductor. Push the baseplate half up against the 13-3/8" casing.
17. Pick up the remaining half of the baseplate assembly and position it on top of the 20" conductor adjacent the first half.
18. Push the two halves together and install the (8) 1" Studs with Two Nuts and tighten the bolting securely.
19. Final torque the bolts to approximately 200 ft lbs.
20. Ensure the thread flange is positioned approximately 1/8" below the top of the housing and is in proper two hole position.



21. Install BOP stack as required.

## Stage 2 — Test the BOP Stack

Immediately after making up the BOP stack and periodically during the drilling of the well for the next casing string the BOP stack (connections and rams) must be tested.

1. Examine the **13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/Retrieving Tool (Item ST1)**. Verify the following:

- 1-1/2" VR plug and weep hole plug are in place and tightened securely
- elastomer seal is in place and in good condition
- retractable lift lugs are in place, clean, and free to move
- drill pipe threads are clean and in good condition

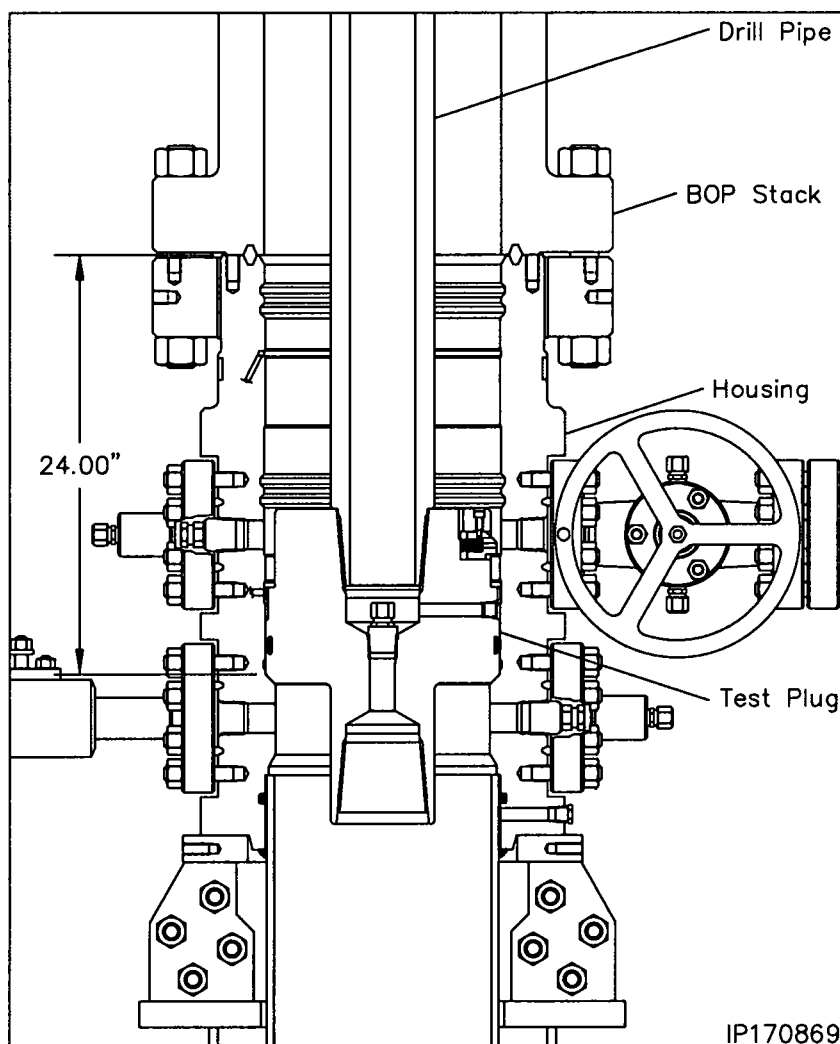
2. Position the test plug with the elastomer seal down and the lift lugs up and make up the tool to a joint of drill pipe.

**WARNING:** Ensure that the lift lugs are up and the elastomer seal is down

3. Remove the 1/2" NPT pipe plug from the weep hole if pressure is to be supplied through the drill pipe.
4. Open the housing lower side outlet valve.
5. Lightly lubricate the test plug seal with oil or light grease.
6. Carefully lower the test plug through the BOP and land it on the load shoulder in the housing, 24.00" below the top of the housing.
7. Close the BOP rams on the pipe and test the BOP to 5,000.

**Note:** Any leakage past the test plug will be clearly visible at the open side outlet valve.

8. After a satisfactory test is achieved, release the pressure and open the rams.
9. Remove as much fluid as possible from the BOP stack and the retrieve the test plug with a straight vertical lift.



**Note:** When performing the BOP blind ram test it is highly recommended to suspend a stand of drill pipe below the test plug to ensure the plug stays in place while disconnecting it from the drill pipe.

10. Repeat this procedure as required during the drilling of the hole section.

## Stage 3 — Run the Lower Wear Bushing

**Note:** Always use a Wear Bushing while drilling to protect the load shoulders from damage by the drill bit or rotating drill pipe. The Wear Bushing must be retrieved prior to running the casing.

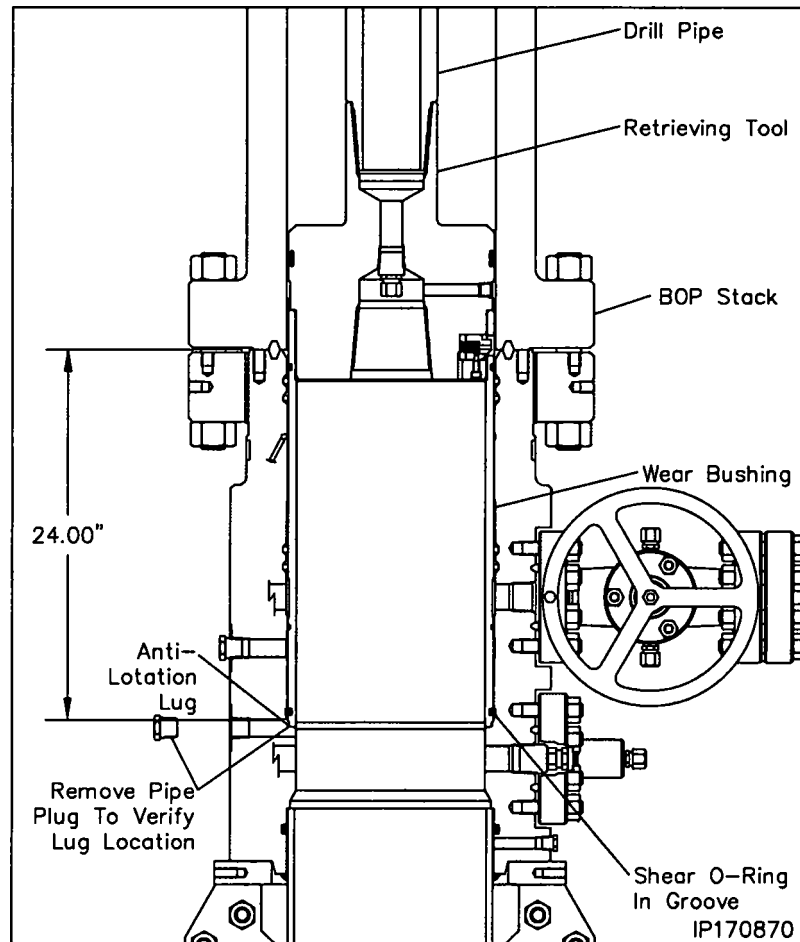
1. Examine the **13-5/8" Nominal MBU-3T-LWR Wear Bushing (Item ST2)**. Verify the following
  - internal bore is clean and in good condition
  - upper trash o-ring is in place and in good condition
  - shear o-ring cord is in place and in good condition
  - paint anti-rotation lugs white and allow paint to dry

### Run the Wear Bushing Before Drilling

2. Orient the **13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/Retrieving Tool (Item ST1)** with lift lugs down and drill pipe connection up.
3. Make up the Retrieving Tool to a joint of drill pipe.
4. Align the retractable lift lugs of the tool with the retrieval holes of the bushing and carefully lower the tool into the Wear Bushing until the lugs snap into place.

**Note:** If the lugs did not align with the holes, rotate the tool in either direction until they snap into place.

5. Apply a heavy coat of grease, not dope, to the OD of the bushing.
6. Slowly lower the Tool/Bushing Assembly through the BOP stack and land it on the load shoulder in the housing, 24.00" below the top of the housing.
7. Remove one of the 1" sight port pipe plugs from the OD of the housing and look through the hole to verify the lug has engaged the slot. The painted lug will be clearly visible through the port. Reinstall the pipe plug and tighten securely.
8. Rotate the drill pipe clockwise (right) to locate the stop lugs in their mating notches in the head. When properly aligned the bushing will drop an additional 1/2".



**Note:** The Shear O-Ring on bottom of the bushing will locate in a groove above the load shoulder in the head to act as a retaining device for the bushing.

9. Remove the tool from the Wear Bushing by rotating the drill pipe counter clockwise (left) 1/4 turn and lifting straight up.
10. Drill as required.

**Note:** It is highly recommended to retrieve, clean, inspect, grease, and reset the wear bushing each time the hole is tripped during the drilling of the hole section.

### Retrieve the Wear Bushing After Drilling

11. Make up the Retrieving Tool to the drill pipe.
12. Slowly lower the tool into the Wear Bushing.
13. Pick up and balance the riser weight and rotate the Retrieving Tool clockwise until a positive stop is felt. This indicates the lugs have snapped into the holes in the bushing.
14. Retrieve the Wear Bushing, and remove it and the Retrieving Tool from the drill string.

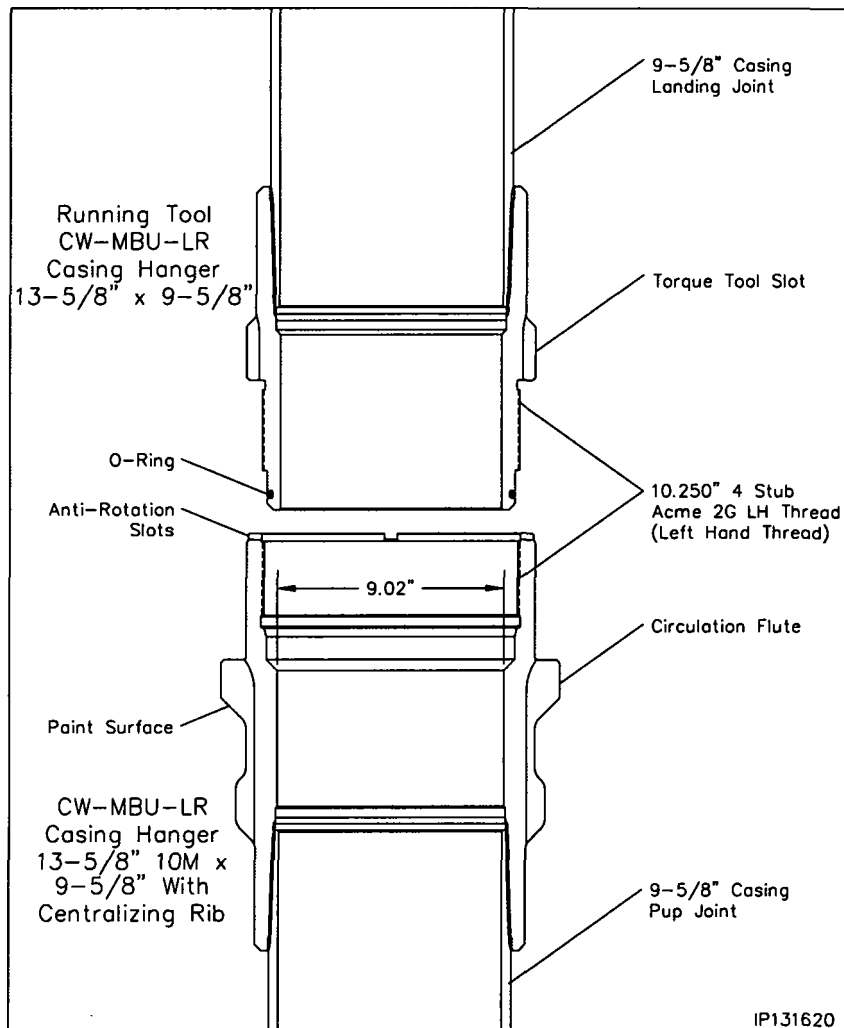


## Stage 4 — Hang Off the 9-5/8" Casing

Normally the 9-5/8" MBU-LR casing hanger and running tool will be pre assembled and torque collar installed prior to being shipped to location. If this is not the case, continue to step 2.

**Note:** If the 9-5/8" casing becomes stuck and the mandrel casing hanger can not be landed, Refer to **Stage 4A** for the emergency procedure.

1. Examine the **13-5/8" x 9-5/8" CW-MBU-LR Fluted Mandrel Casing Hanger (Item A12)**. Verify the following:
  - internal bore and threads are clean and in good condition
  - neck seal area is clean and undamaged
  - pup joint is properly installed and pin threads are clean and in good condition
2. Examine the **13-5/8" x 9-5/8" CW-MBU-3T-LR Casing Hanger Running Tool (Item ST3)**. Verify the following:
  - internal bore and threads are clean and in good condition
  - o-ring is clean and in good condition
3. Make up a 9-5/8" landing joint in the top of the running tool and torque connection to thread manufacturer's maximum make up torque.

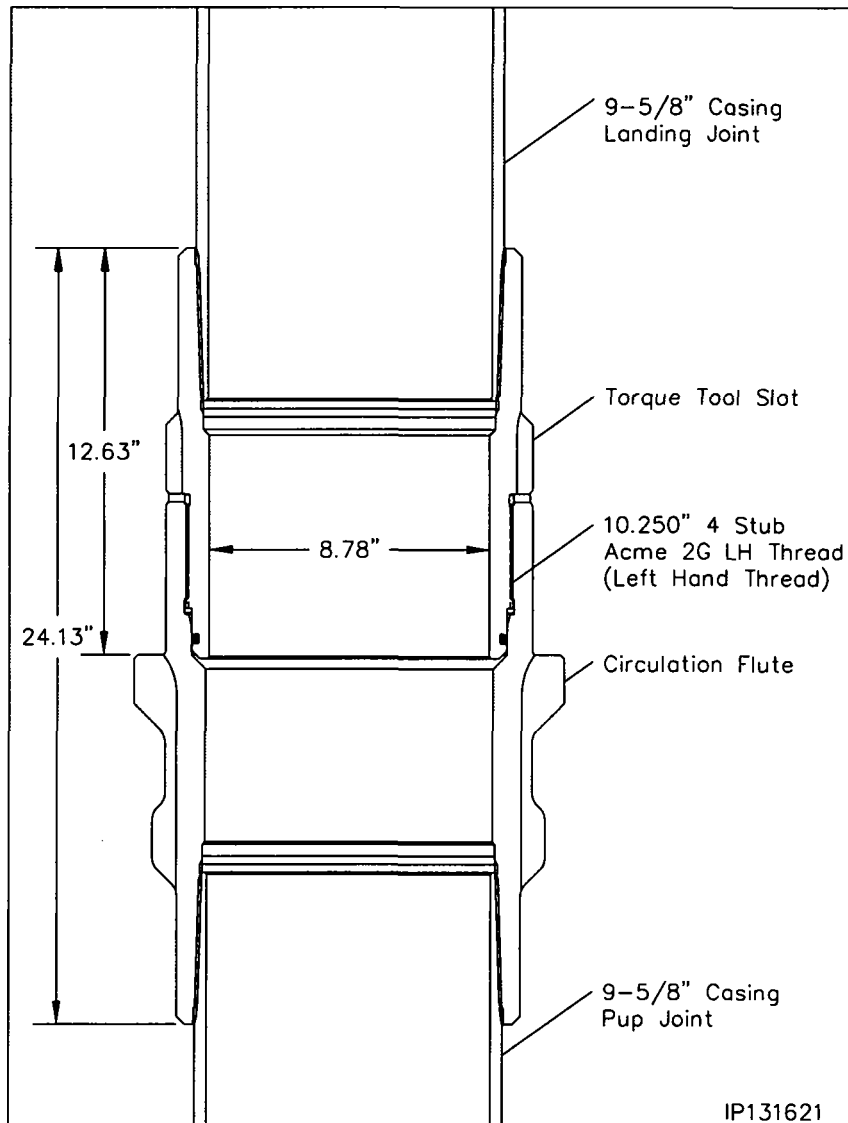


## Stage 4 — Hang Off the 9-5/8" Casing

4. On the pipe rack, thoroughly clean and lightly lubricate mating threads, seal areas and o-ring of the casing hanger and running tool with oil or a light grease.
5. **Using chain tongs only**, thread the Running Tool into the Hanger with left hand rotation until it shoulders out on the hanger body.

**WARNING:** Do Not apply torque to the Hanger/Tool connection.

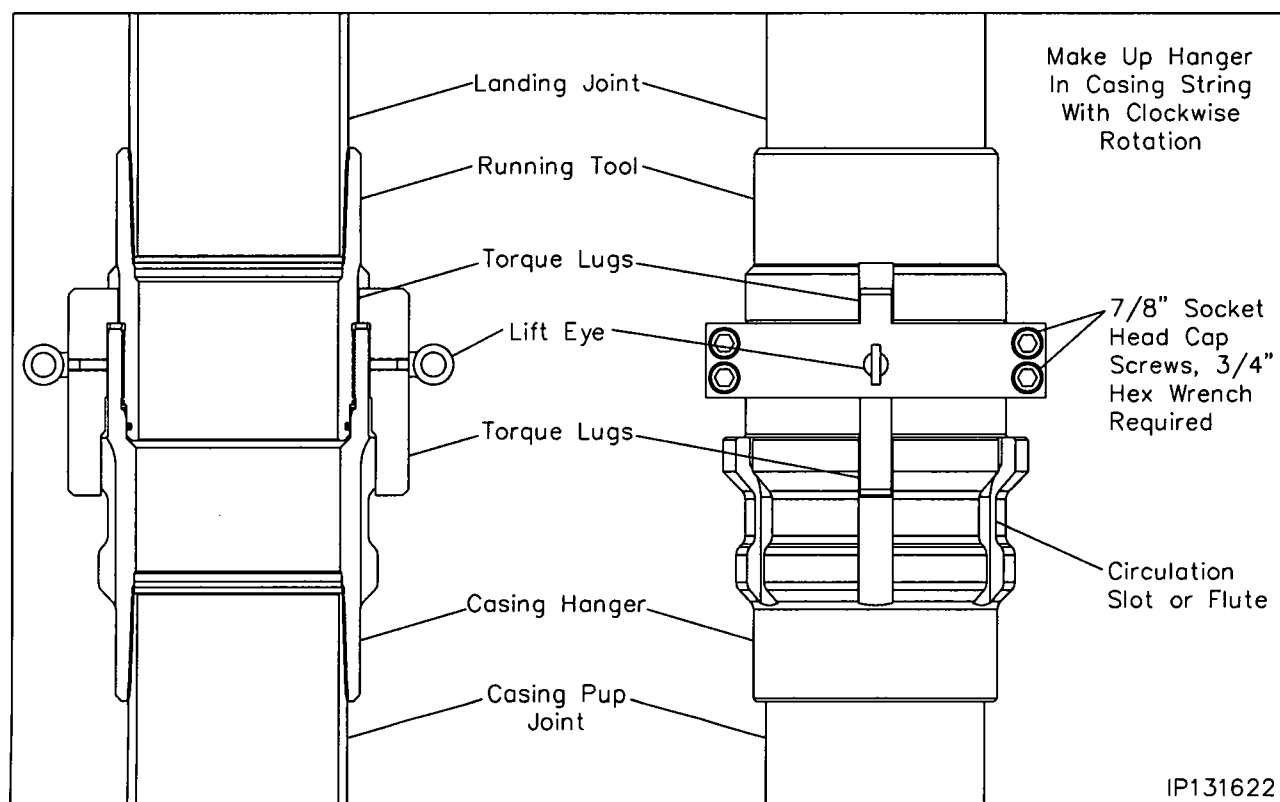
6. Paint the bottom of the landing shoulder of the hanger flutes white as indicated in IP DRW 131620
7. Using only chain tongs, rotate the running tool clockwise (right) to align the anti-rotation torque slots in the running tool with the circulation slots or flutes in the casing hanger.



## Stage 4 — Hang Off the 9-5/8" Casing

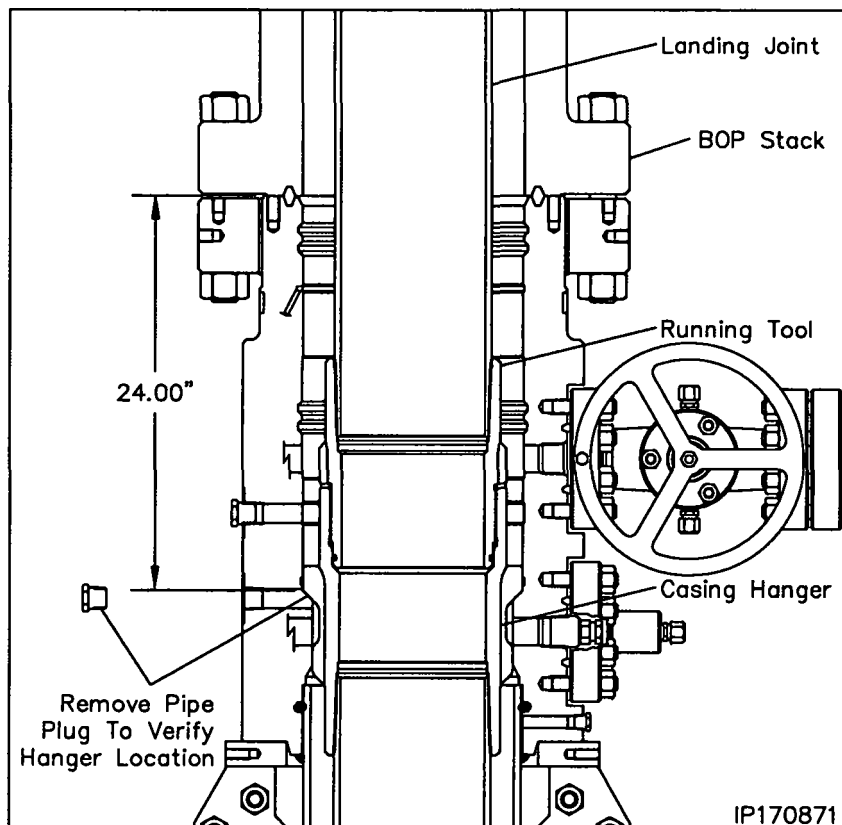
8. Examine the **13-5/8" Nominal 9-5/8" MBU-LR Casing Hanger Torque Collar (Item ST4)**. Verify the following:
  - cap screws are in place and in good condition
9. Remove the 7/8" cap screws and separate the tool in half.
10. Place one half of the tool around the hanger/running tool assembly engaging the torque lugs of the tool in the mating slots in the hanger and running tool.
11. Place the second half adjacent the first half and secure the tool halves with the 7/8" cap screws. Torque screws to approximately 100 ft lbs.
12. Run the 9-5/8" casing to the required depth and space out for the mandrel hanger.
13. Pick up the 9-5/8" casing hanger/running tool assembly and make it up in the casing string using the top drive casing handling tool. Torque connection to thread manufacturer's optimum make up torque.
14. Attach a suitable lifting device with wire slings to the lift eyes of the torque collar.
15. Using a 3/4" hex wrench, remove the 7/8" cap screws and separate the collar in two halves. Remove the tool and set assembly aside.
16. Using only chain tongs, back off the running tool one full turn and then counter clockwise to a positive stop.

**WARNING:** Do not torque connection.



## Stage 4 — Hang Off the 9-5/8" Casing

17. Calculate the total landing dimension by adding the previously determined RKB dimension and 24.00", the depth of the wellhead.
18. Starting at the top of the 45° angle load shoulder of the casing hanger measure up the landing joint the calculated dimension and place a white paint band around the landing joint at that dimension. Write LANDED on the joint.
19. Carefully lower the hanger through the BOP stack and land it on the load shoulder in the housing, 24.00" below the top of the housing.
20. Slack off all weight on the casing and verify that the landing dimension paint band has aligned with the rig floor.
21. Locate the 1" sight port pipe plug and remove the plug.
22. Look through the port to verify that the hanger is properly landed. The white paint band on the hanger will be clearly visible in the center of the open port.



23. Reinstall the pipe plug and tighten securely.
24. Place a vertical paint mark on the landing joint to verify if the casing string rotates during the cementing process.
25. Cement the casing as required.

**Note:** Returns may be taken through the circulation slots and out the BOP or out the side outlets on the lower housing.

**Note:** If the casing is to be reciprocated during cementing, it is advisable to pick up the casing hanger a minimum of 4 to 6 feet above the landing point. Place a mark on the landing joint level with the rig floor and then reciprocate above that point. If at any time resistance is felt, re-land the casing hanger immediately.

26. Using Chain Tongs Only located 180° apart, retrieve the Running Tool and landing joint by rotating the landing joint clockwise (right) approximately 16 turns.

**WARNING:** The rig floor tong may be used to break the connection but **under no circumstances is the top drive to be used to rotate or remove the casing hanger running tool.**

## Stage 4 — Hang Off the 9-5/8" Casing

### Running the 13-5/8" Wash Tool

1. Examine the 13-5/8" x 4-1/2" IF Wash Tool (Item ST5). Verify the following:
  - drill pipe threads and bore are clean and in good condition
  - all ports are open and free of debris
  - brushes are securely attached and in good condition

2. Orient the Wash Tool with drill pipe box up. Make up a joint of drill pipe to the tool.

3. Carefully lower the Wash Tool through the BOP and land it on top of the 9-5/8" casing hanger, 22.51" below the top of the housing.

4. Place a paint mark on the drill pipe level with the rig floor.

5. Using chain tongs, rotate the tool clockwise (right) approximately 6 turns to loosen any debris that may be on top of the hanger flutes.

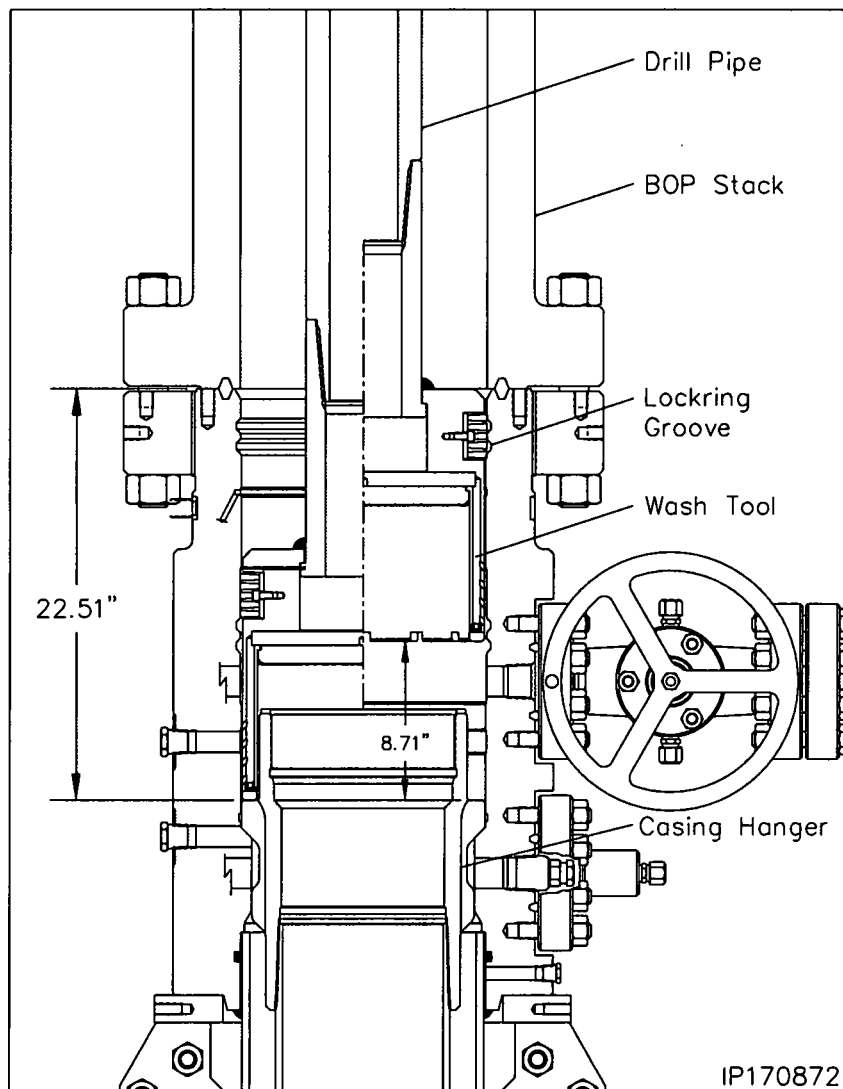
6. Open the lower side outlet valve and drain the BOP stack.

7. Pick up on the tool approximately 1" and attach a high pressure water line or the top drive to the end of the drill pipe and pump water at approximately 25 SPM through the tool and up the BOP stack.

8. Pick up the tool an additional 7.71" and rotate the tool back and forth to brush the upper lockring groove free of debris.

9. While flushing, raise and lower the tool the full length of the wellhead and BOP stack. The drill pipe should be slowly rotated (approximately 20 RPM) while raising and lowering to wash the inside of the housing and BOP stack to remove all caked on debris.

10. Once washing is complete, land the wash tool on the hanger flutes.



11. Shut down pumps and observe the returns at the open lower outlet for debris.

12. Reengage the pump and fully wash the inside of the wellhead and the entire BOP one additional cycle ensuring the stopping point is with the wash tool resting on top of the hanger flutes.

13. Once the returns are clean and free of debris, retrieve the tool to the rig floor.

14. Using a bright light, sight through the bore of the BOP stack and observe the top of the hanger neck and flutes. Ensure that there are no dark areas on top of the hanger flutes.

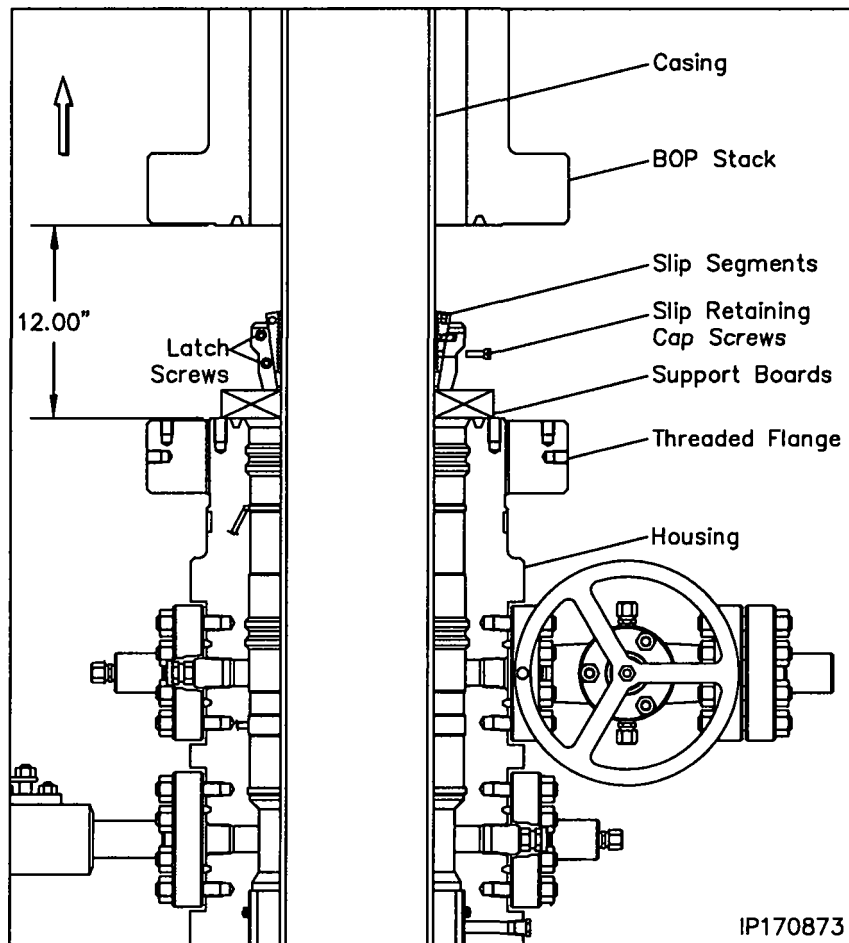
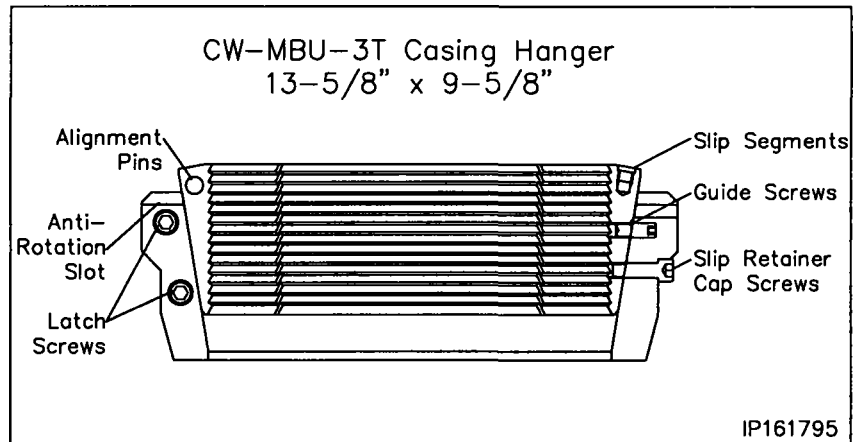
**Note:** Observe the returns at the open outlet valve. If returns are not clean, continue flushing until they are.

**WARNING:** Continue washing until all debris is removed.

## Stage 4A — Hang Off the 9-5/8" Casing (Emergency)

**Note:** The following procedure should be followed **ONLY** if the 9-5/8" casing should become stuck in the hole. If the casing did not get stuck and is hung off with the Mandrel Casing Hanger, skip this stage.

1. Cement the hole as required.
2. Drain the BOP stack through the housing lower side outlet valve.
3. Break the connection between the BOP stack and the MBU-3T housing.
4. Pick up on the BOP stack a minimum of 12" above the housing flange and secure with safety slings.
5. Washout as required.
6. Examine the **13-5/8" x 9-5/8" MBU-3T Slip Casing Hanger (Item A12a)**. Verify the following:
  - slips and internal bore are clean and in good condition
  - all screws are in place
7. There are two latch screws located in the top of the casing hanger. Using a 5/16" Allen wrench, remove the two latch screws located 180° apart and separate the hanger into two halves.
8. Place two boards on the lower adapter against the casing to support the Hanger.
9. Pick up one half of the hanger and place it around the casing and on top of the boards.
10. Pick up the second hanger half and place it around the casing adjacent the first half.
11. Slide the two hanger halves together ensuring the slip alignment pins properly engage the opposing hanger half.
12. Reinstall the latch screws and tighten securely.
13. Prepare to lower the hanger into the housing bowl.



## Stage 4A — Hang Off the 9-5/8" Casing (Emergency)

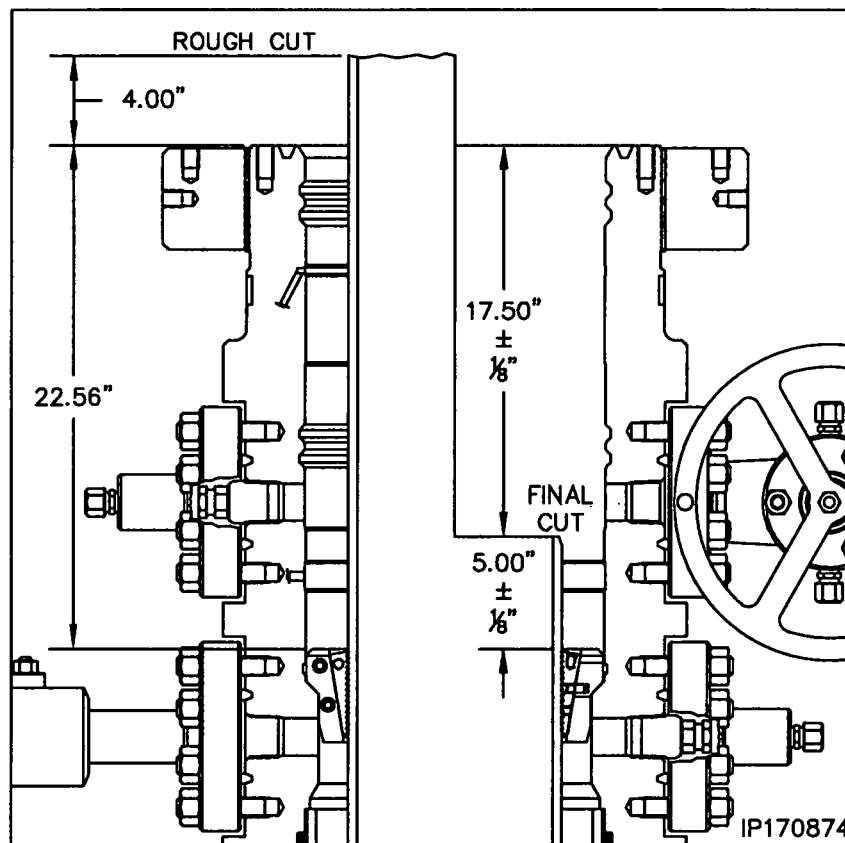
**WARNING:** Do Not Drop the Casing Hanger!

14. Grease the Casing Hanger's body and remove the slip retaining screws.
15. Remove the boards and allow the hanger to slide into the housing bowl. When properly positioned the top of the hanger will be approximately 22.56" below the top of the housing.
16. Pull tension on the casing to the desired hanging weight and then slack off.

**Note:** A sharp decrease on the weight indicator will signify that the hanger has taken weight and at what point, If this does not occur, pull tension again and slack off once more.

**WARNING:** Because of the potential fire hazard and the risk of loss of life and property, It is highly recommended to check the casing annulus and pipe bore for gas with an approved sensing device prior to cutting off the casing. If gas is present, do not use an open flame torch to cut the casing. It will be necessary to use a air driven mechanical cutter which is spark free.

17. Rough cut the casing approximately 4" above the top of the housing and move the excess casing out of the way.
18. Using the Wach's internal casing cutter, final cut the casing at 17.50"  $\pm$  1/8" below the top of the lower adapter or 5.00"  $\pm$  1/8" above the hanger body.
19. Remove the internal casing cutter assembly and reconfigure the assembly to bevel the casing. Reinstall the cutter assembly and then place a 3/16" x 3/8" bevel on the O.D. and a I.D. chamfer to match the minimum bore of the packoff to be installed.



**Note:** There must not be any rough edges on the casing or the seals of the Packoff will be damaged.

20. Thoroughly clean the housing bowl, removing all cement and cutting debris.
21. Locate the two anti-rotation notches in the top of the slip bowl.
22. Place a straight edge on top of the slip bowl and in line with the center of one of the notches.
23. Ensure the straight edge is vertical and then place a paint mark on top of the housing in line with the notch in the slip bowl.

## Stage 5 — Install the MBU-3T Mandrel Hanger Packoff

The following steps detail the installation of the MBU-3T Nested Packoff Assembly for the mandrel hanger. If the casing was landed using the emergency slip hanger, skip this step and proceed with Stage 5A for installing the emergency MBU-3T Nested packoff.

1. Examine the **13-5/8" x 11.250" 4 Stub Acme 2G LH box top MBU-3T Mandrel Hanger Nested Packoff Assembly (Item A13)**. Verify the following:

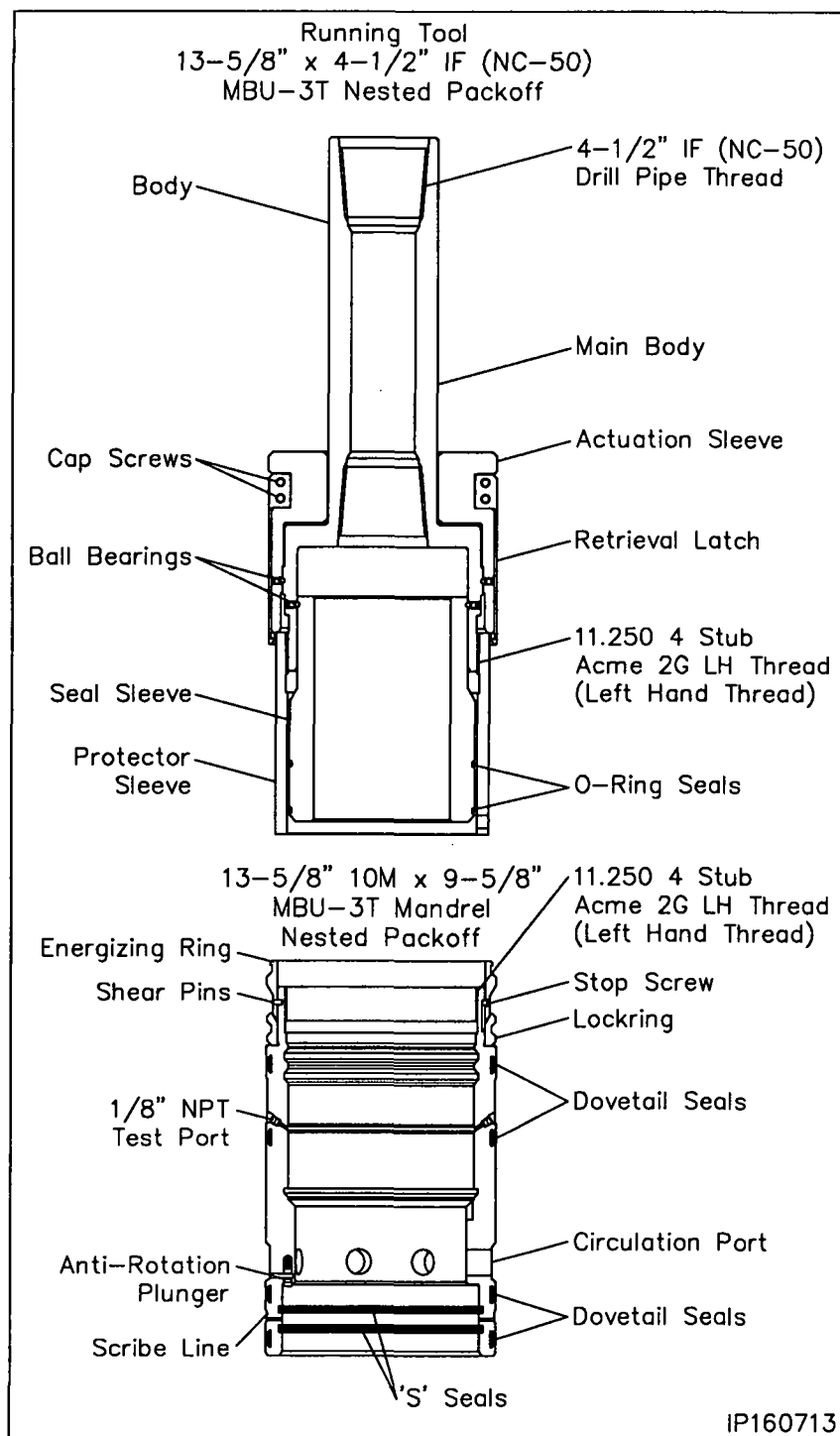
- all elastomer seals are in place and undamaged
- internal bore, and ports, are clean and in good condition
- locking is fully retracted
- energizer ring is in its upper most position and retained with shear pins and stop screws are loose
- anti-rotation plungers are in place, free to move

2. Locate the 5/16" scribe mark between the lower dovetail seals of the packoff and paint only the scribe mark white. Allow the paint to dry.

3. Inspect the ID and OD seals for any damage and replace as necessary.

4. Examine the **13-5/8" Nominal x 11.250" 4 Stub Acme 2G LH, MBU-3T Nested Packoff Running Tool (Item ST6)**. Verify the following:

- Acme threads are clean and in good condition
- retrieval latch is in position and retained with cap screws
- Remove seal sleeve protector sleeve
- seal sleeve is in position and rotates freely
- seal sleeve o-rings are in place and in good condition
- reinstall seal sleeve protector



IP160713

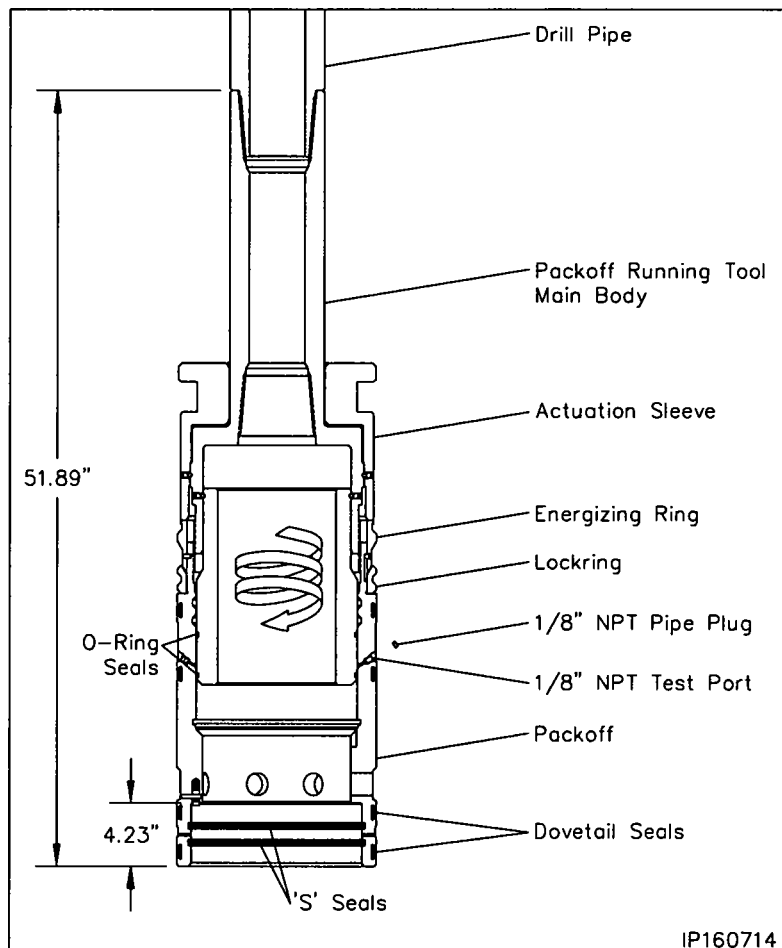


## Stage 5 — Install the MBU-3T Mandrel Hanger Packoff

5. Remove the retrieval latch and set aside.
6. Make up the running tool to 4-1/2" NC-50 drill pipe and torque the connection to optimum make up torque.
7. Pick up the Running Tool with landing joint and suspend it above the packoff.
8. Remove the tool protector sleeve with counter clockwise rotation and set the sleeve aside.
9. Thoroughly clean and lightly lubricate the mating Acme threads of the running tool and packoff with oil or light grease.
10. Lightly lubricate the seal sleeve o-rings with oil or a light grease.
11. Carefully lower the tool into the packoff and thread them together by first rotating the tool clockwise (RIGHT) to locate the thread start and then counter clockwise (LEFT) until the tool upper body makes contact with the packoff Energizing Ring. Approximately 4 turns.
12. Install (1) 1/8" NPT pipe plug in the OD test port of the packoff and tighten securely.
13. Attach a test pump to the remaining open port and inject test fluid between the seal sleeve o-rings until a stable test pressure of 5,000 psi is achieved.
14. If the test fails, remove the tool and replace the leaking o-rings.
15. After a satisfactory test is achieved remove the test pump and the 1/8" pipe plug from the opposite test port.

**WARNING:** All 1/8" pipe plugs must be removed prior to installing the packoff

16. Pick up the assembly and thoroughly clean and lightly lubricate the packoff ID 'S' seals and the OD dovetail seals with oil or light grease.

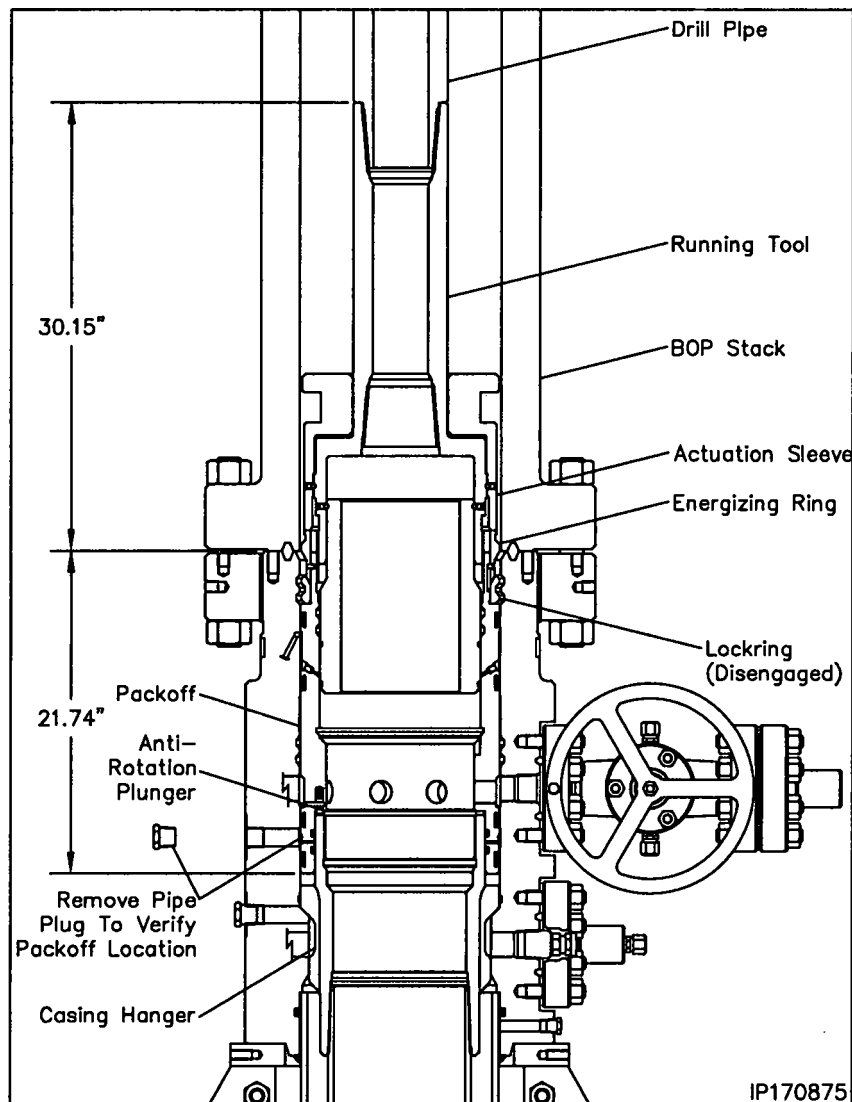


IP160714

## Stage 5 — Install the MBU-3T Mandrel Hanger Packoff

### Landing the Packoff

17. Remove the hole cover.
18. Measure up 5 foot from the bottom of the packoff and place a paint mark on the drill pipe.
19. Pick up the packoff/running tool assembly and carefully lower the assembly through the BOP marking the landing joint every five feet until the calculated dimension is reached.
20. Place a paint mark on the landing joint at that dimension and mark land off. Place an additional mark 1-1/2" above the first one and mark engaged.
21. Continue lowering the packoff until it passes over the neck of the hanger and lands on the casing hanger neck, 21.74" below the top of the MBU-3T housing.
22. Locate the upper 1" sight port pipe plug and remove the plug
23. Look through the port to verify that the packoff is properly landed. The white paint scribe line will be clearly visible in the center of the open port.
24. Reinstall the pipe plug and tighten securely.



IP170875

## Stage 5 — Install the MBU-3T Mandrel Hanger Packoff

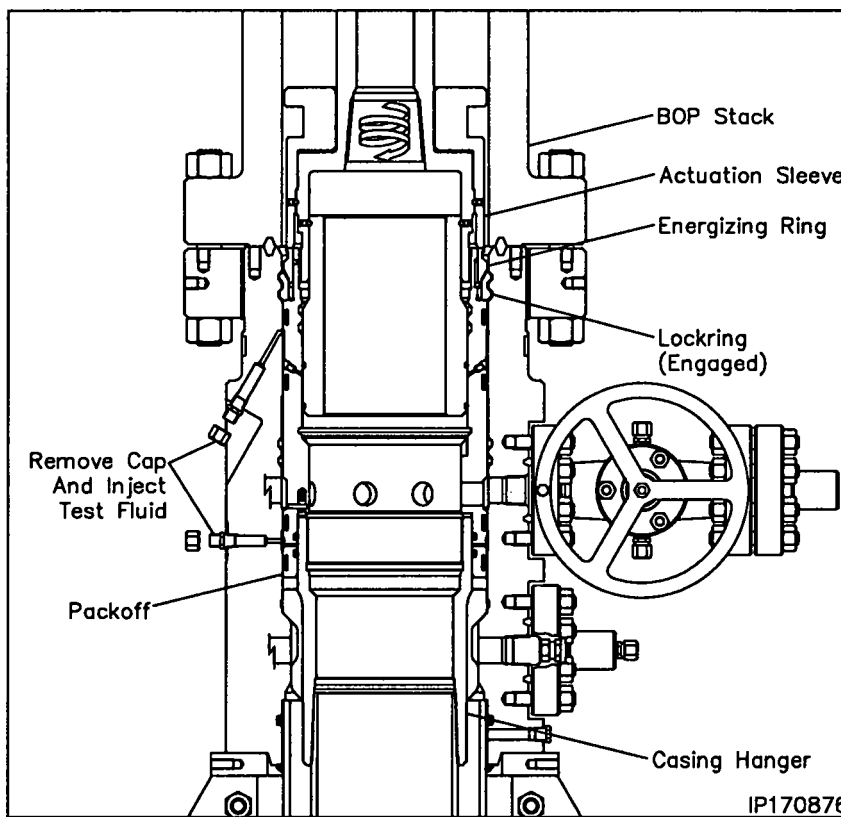
### Seal Test

25. Locate the upper and lower seal test fittings on the O.D. of the housing and remove the dust cap from the fittings.
26. Attach a test pump to the open lower fitting and pump clean test fluid between the seals until a stable test pressure of 5,000 psi is achieved.
27. Hold test pressure for 5 minutes.
28. If a leak develops, bleed off test pressure, remove the packoff from the wellhead and replace the leaking seals.
29. Repeat steps 25 through 27 for the remaining port and test seals to 5,000 psi
30. After satisfactory tests are achieved, bleed off the test pressure but leave the test manifolds in place.

### Engaging the Lockring

31. Using chain tongs only located 180° apart, slowly rotate the drill pipe counter clockwise until the anti-rotation plungers align with the slots in the top of the hanger. Expect torque of approximately 400 ft lbs. to rotate the packoff.
32. Using only chain tongs, rotate the landing joint approximately 6 to 6-1/2 turns counter clockwise to engage the packoff lockring in its mating groove in the bore of the MBU-LR housing.

**Note:** Approximately 800 to 900 ft. lbs. of torque will be required to break over the shear pins in the packoff. The torque will drop off and then increase slightly when the energizing ring pushes the lockring out. A positive stop will be encountered when the lockring is fully engaged.



**Note:** When properly engaged the second paint mark on the landing joint will align with the rig floor. VERIFY PAINT MARKS.

**WARNING:** It is imperative that the landing joint remain concentric with the well bore when rotating to engage the lockring. This can be accomplished with the use of the air hoist.

**WARNING:** If the required turns to engage the lockring are not achieved or excessive torque is encountered, remove the packoff and first call local branch and then Houston Engineering.

33. Back off the landing joint/running tool approximately three turns. Using the top drive, exert a 40,000 lbs. pull on the landing joint.
34. Reattach the test pump to the open test manifolds and retest the packoff seals as previously outlined. This will also verify that the packoff is in place.
35. After satisfactory test is achieved, bleed off all test pressure, remove test pump and reinstall the dust cap on the open fittings.
36. Using only chain tongs, rotate the landing joint clockwise until the tool comes free of the packoff (approximately 9 to 9-1/2 turns) and then retrieve the tool with a straight vertical lift.

## Stage 5 — Install the MBU-3T Mandrel Hanger Packoff

In the event the packoff is required to be removed after the locking is engaged the following procedure is to be followed.

### Retrieving the Packoff

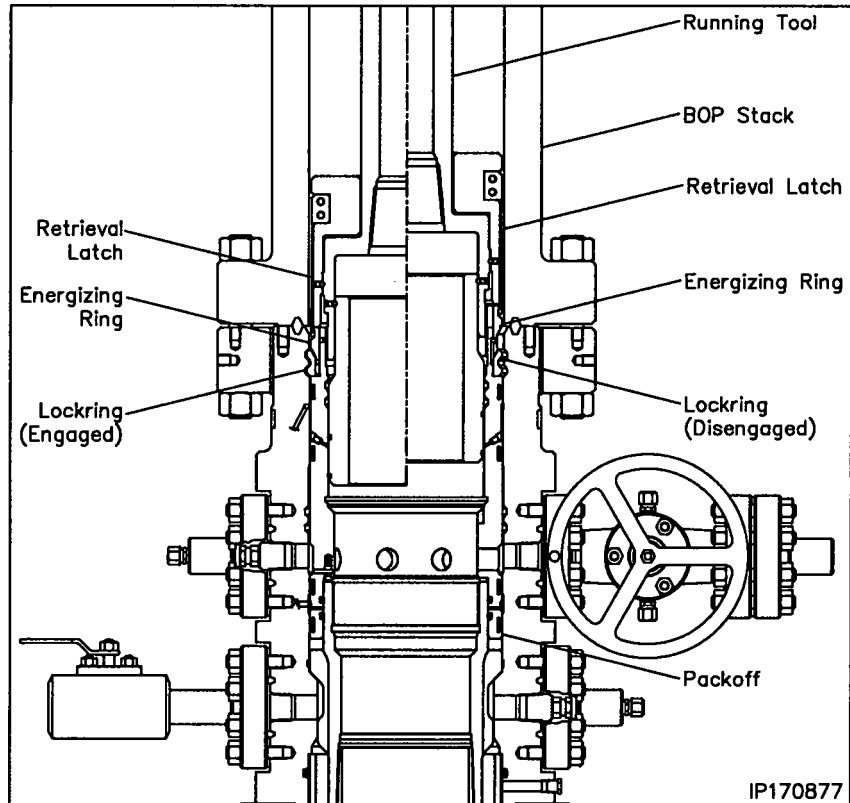
1. Position the retrieval latch so the latch finger extend from the bottom of the running tool body.
2. Reinstall the cap screws and tighten them securely.
3. Ensure the retrieval latch freely rotates on the running tool body.
4. Carefully lower the running tool through the BOP stack and into the packoff.
5. Rotate the drill pipe clockwise (Right) to locate the thread start and then counter clockwise (Left) (approximately 9 to 9-1/2 turns) to a positive stop.

**Note:** At this point the retrieval latches will have passed over the energizing ring and snapped into place.

6. Rotate the drill pipe clockwise (right) approximately 6 turns to a positive stop. The drill pipe should rise approximately 1-1/2".

**Warning:** Do not exceed the 6 turns or the packoff may be seriously damaged.

7. Carefully pick up on the drill pipe and remove the packoff from the MBU-3T wellhead with a straight vertical lift.
8. Rotate the packoff 1 turn clockwise to relax the retrieval latch.
9. Remove the (4) 1/2" cap screws and remove the latch assembly.
10. Redress the Packoff and reset as previously outlined.
11. Once the packoff is properly set, reinstall the retrieval latch on the tool.



## Stage 5A — Install the MBU-3T Emergency Packoff

**Note:** The following procedure should be followed **ONLY** if the 9-5/8" casing should become stuck in the hole and the emergency casing hanger has been installed. If the casing did not get stuck and is hung off with the Mandrel Casing Hanger and Packoff, skip this stage.

1. Examine the **13-5/8" 10M x 9-5/8" x 11.250" 4 Stub Acme 2G LH box top MBU-3T Emergency Nested Packoff Assembly (Item A13a)**. Verify the following:

- all elastomer seals are in place and undamaged
- internal bore, and ports, are clean and in good condition
- lockring is fully retracted
- energizer ring is in its upper most position and retained with shear pins

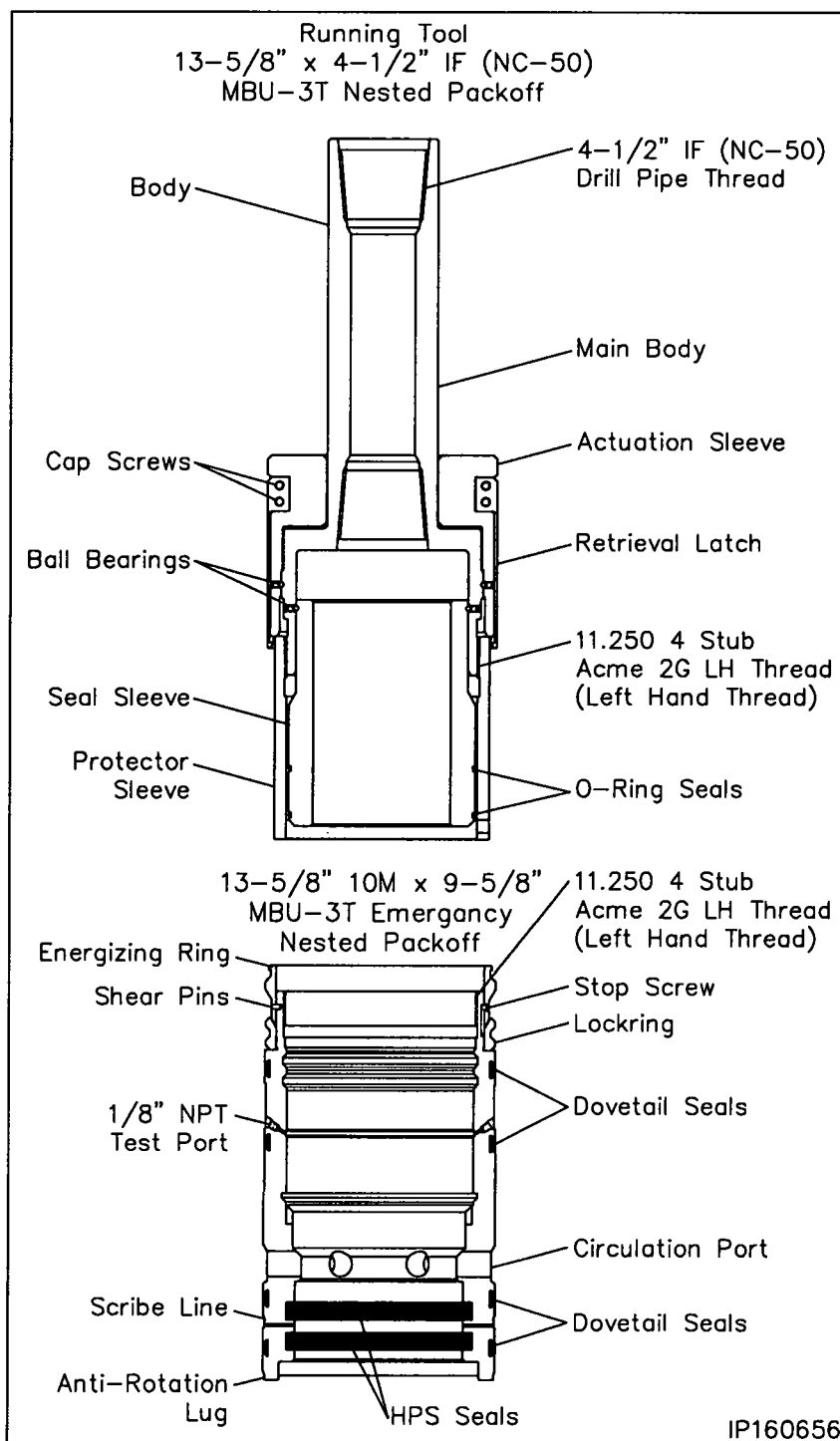
2. Inspect the ID and OD seals for any damage and replace as necessary.

3. Examine the **13-5/8" Nominal x 11.250" 4 Stub Acme 2G LH, MBU-3T Nested Packoff Running Tool (Item ST6)**. Verify the following:

- Acme threads are clean and in good condition
- retrieval latch is in position and retained with cap screws
- seal sleeve is in position and rotates freely
- seal sleeve o-rings are in place and in good condition
- reinstall seal sleeve protector

4. Make up a joint 4-1/2" IF (NC-50) drill pipe to the top of the Running Tool and tighten connection to thread manufacturer's maximum make up torque.

5. Run in the hole with two stands of drill pipe and set in floor slips.

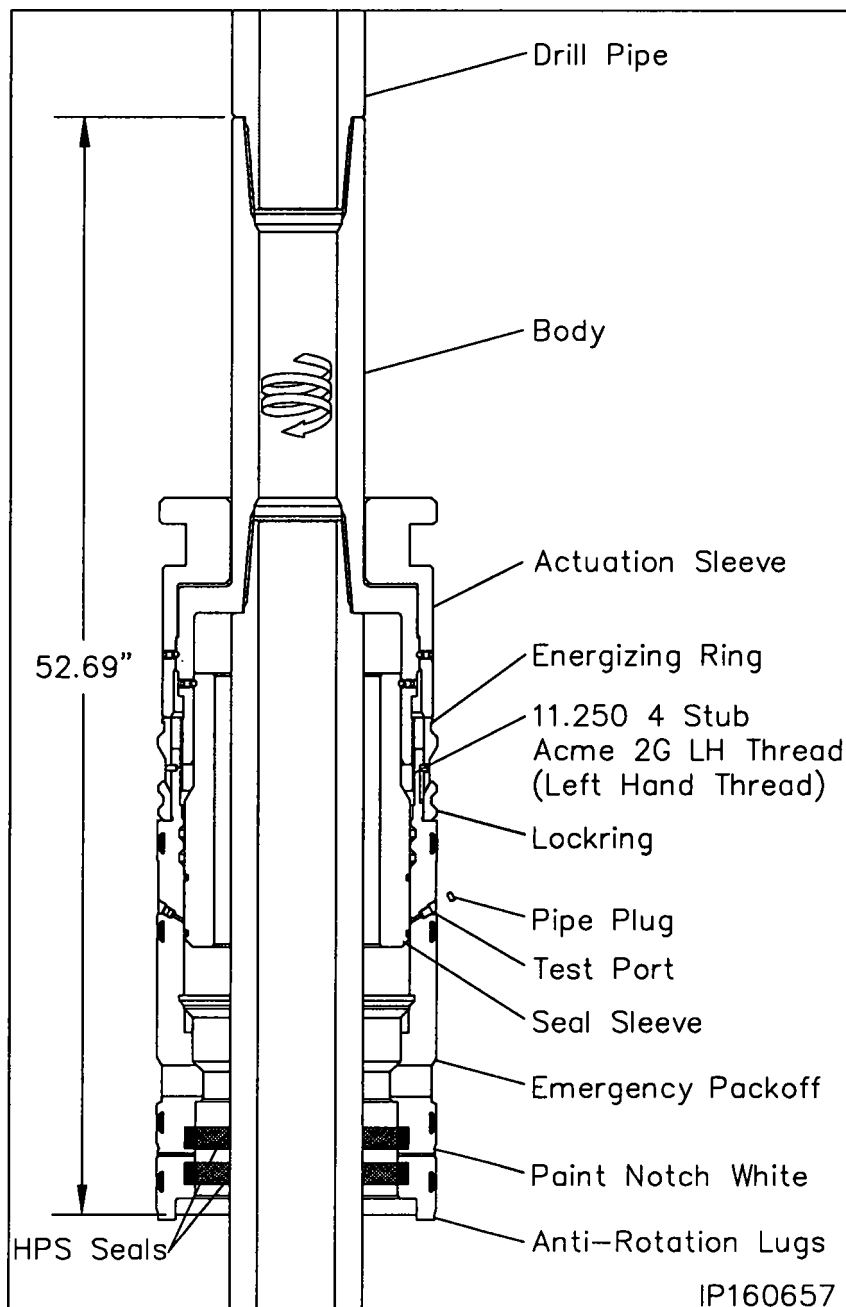


## Stage 5A — Install the MBU-3T Emergency Packoff

6. Pick up the packoff and carefully pass it over the drill pipe and set it on top of the floor slips.
7. Pick up the running tool with landing joint and remove the tool protector sleeve with counter clockwise rotation and set the sleeve aside.
8. Thoroughly clean and lightly lubricate the mating acme threads of the running tool and packoff with oil or light grease.
9. Lightly lubricate the seal sleeve o-rings with oil or a light grease.
10. Make up the running tool to the drill pipe in the floor slips using the appropriate length pin x pin sub.
11. Pick up the packoff and thread it onto the running tool with clockwise (Right) rotation until the Energizing Ring makes contact with the lower body of the tool. (Approximately 4 turns).
12. Install (1) 1/8" NPT pipe plug in the OD test port of the packoff and tighten securely
13. Attach a test pump to the remaining open port and inject test fluid between the seal sleeve o-rings until a stable test pressure of 5,000 psi is achieved.
14. If the test fails, remove the tool and replace the leaking o-rings.
15. After a satisfactory test is achieved remove the test pump and the 1/8" pipe plug from the opposite test port.

**WARNING:** All 1/8" pipe plugs must be removed prior to installing the packoff

16. Thoroughly clean and lightly lubricate the packoff ID 'HPS' seals and the OD dovetail seals with oil or light grease.



17. Using a straight edge positioned vertically and centered on the anti-rotation lug on the bottom of the packoff, place a white paint mark up the side of the packoff in line with the lug.

**Note:** The line will be used to guide the packoff anti-rotation lug into its mating notch in the slip bowl.

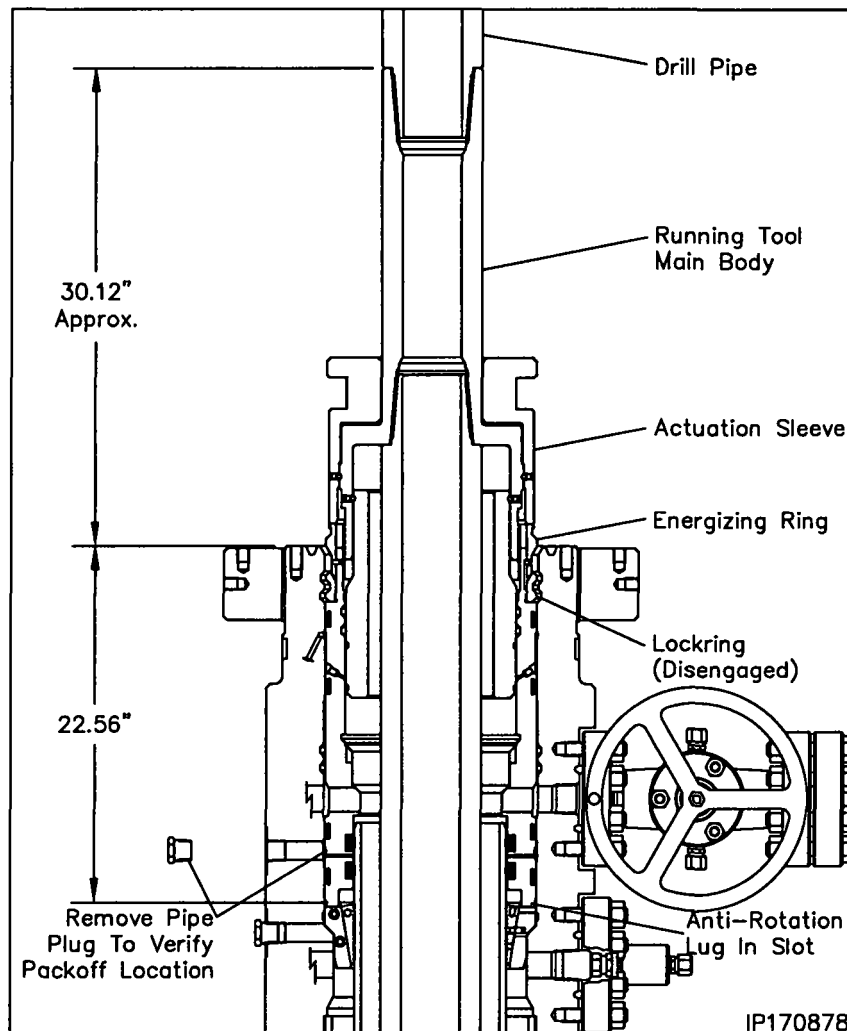
## Stage 5A — Install the MBU-3T Emergency Packoff

### Landing the Packoff

18. Pick up the drill string and remove the floor slips.
19. Carefully lower the packoff through the rig floor and position it just above the housing.
20. Align the white paint line with the existing paint mark on top of the housing.
21. While holding the packoff to maintain alignment, carefully lower the packoff into the housing until it lands on top of the slip hanger.

**Note:** When properly positioned the top of the running tool will be approximately 30.12" above the top of the MBU-3T Housing.

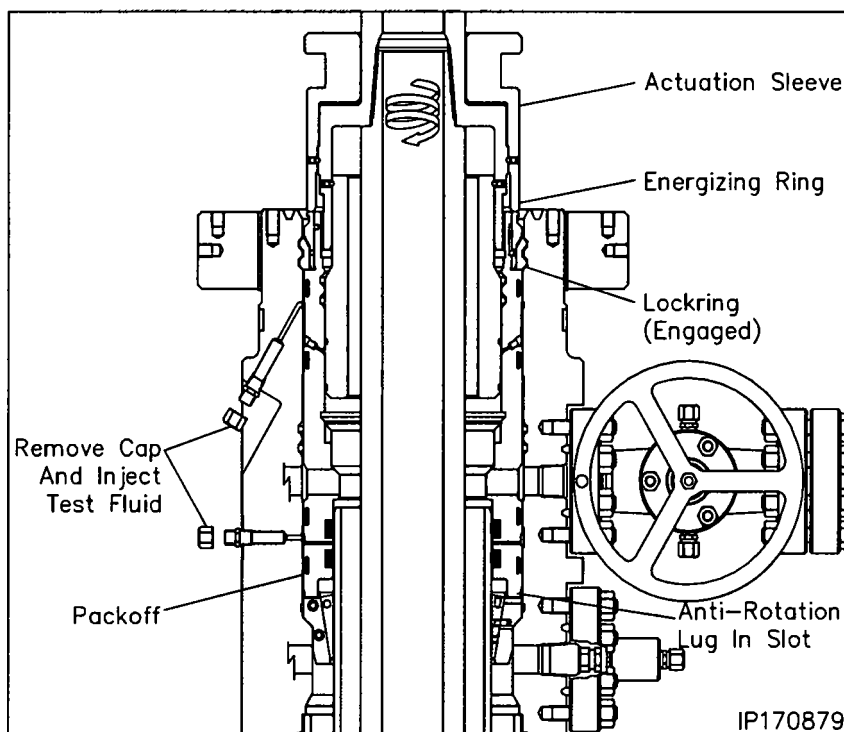
22. Remove the upper 1" LP pipe plug from the sight port to verify the packoff is properly landed. The 5/16" scribe line should be clearly visible in the center of the port.
23. With landing verified, reinstall the pipe plug and tighten securely.



## Stage 5A — Install the MBU-3T Emergency Packoff

### Seal Test

24. Locate the upper and lower seal test fittings on the O.D. of the housing and remove the dust cap from the fittings.
25. Attach a test pump to the open lower fitting and pump clean test fluid between the seals until a stable test pressure of 5,000 psi or 80% of casing collapse - Whichever is less is achieved.
26. Hold test pressure for 15 minutes.
27. If a leak develops, bleed off test pressure, remove the packoff from the wellhead and replace the leaking seals.
28. After satisfactory test is achieved, bleed off the test pressure but leave the test manifold in place.
29. Repeat steps 25 through 27 for the remaining port and test seals to 5,000 psi.



### Engaging the Lockring

30. Using only chain tongs, rotate the landing joint approximately 6 to 6-1/2 turns counter clockwise (Left) to engage the packoff locking in its mating groove in the bore of the MBU-3T housing.

**Note:** Approximately 800 to 900 ft. lbs. of torque will be required to break over the shear pins in the packoff. The torque will drop off and then increase slightly when the energizing ring pushes the locking out. A positive stop will be encountered when the locking is fully engaged.

**WARNING:** It is imperative that the drill pipe landing joint remain concentric with the well bore when rotating to engage the locking. This can be accomplished with the use of the air hoist.

**WARNING:** If the required turns to engage the locking are not achieved or excessive torque is encountered, remove the packoff and first call local branch and then Houston Engineering.

31. Back off the landing joint/running tool approximately three turns. Using the top drive, exert a 40,000 lbs. pull on the landing joint.
32. Reattach the test pump to the open test manifolds and retest the packoff seals as previously outlined. This will also verify that the packoff is in place.
33. After satisfactory test is achieved, bleed off all test pressure, remove test pump and reinstall the dust cap on the open fittings.
34. Using only chain tongs, rotate the landing joint clockwise until the tool comes free of the packoff (approximately 9 to 9-1/2 turns) and then retrieve the tool with a straight vertical lift.
35. Reinstall and nipple up the BOP stack.



## Stage 6 — Test the BOP Stack

Immediately after making up the BOP stack and periodically during the drilling of the well for the next casing string the BOP stack (connections and rams) must be tested.

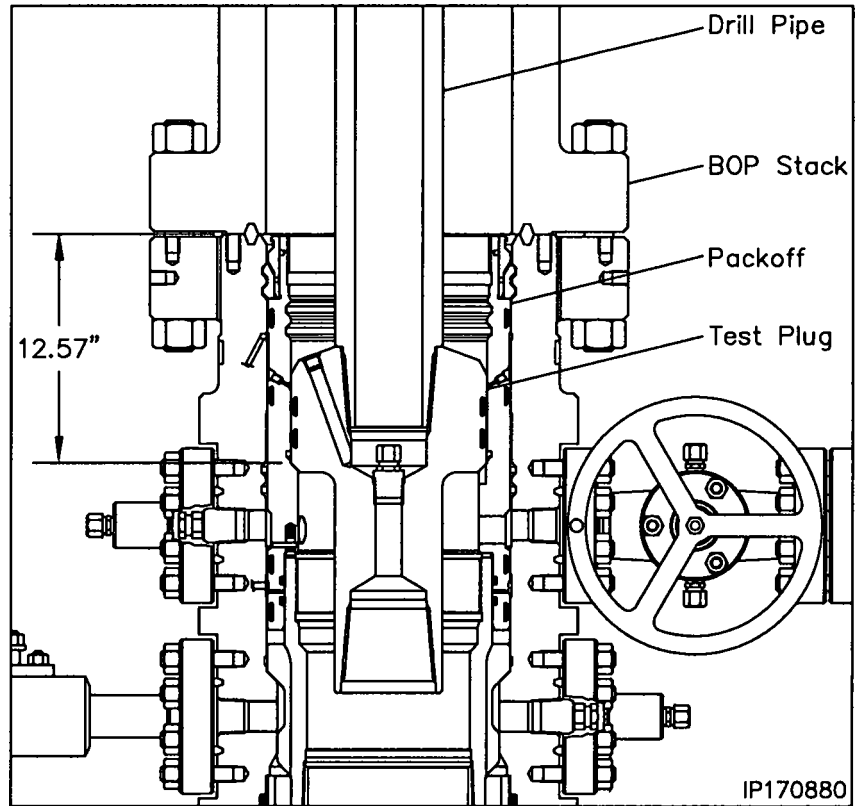
1. Examine the **11" Nominal x 4-1/2" IF CW Test Plug. (Item ST7).** Verify the following:

- 1-1/4" VR plug and weep hole plug are in place and tightened securely
- elastomer seals are in place and in good condition
- drill pipe threads are clean and in good condition

2. Position the test plug with the tong neck down and the elastomer seals up and make up the tool to a joint of drill pipe.
3. Remove the 1/2" NPT pipe plug from the weep hole if pressure is to be supplied through the drill pipe.
4. Open the housing upper side outlet valve.
5. Lightly lubricate the test plug seal with oil or light grease.
6. Carefully lower the test plug through the BOP and land it on the load shoulder in the packoff, 12.57" below the top of the housing.
7. Close the BOP rams on the pipe and test the BOP to 5,000 psi.

**Note:** Any leakage past the test plug will be clearly visible at the open side outlet valve.

8. After a satisfactory test is achieved, release the pressure and open the rams.



9. Remove as much fluid as possible from the BOP stack and the retrieve the test plug with a straight vertical lift.

**Note:** When performing the BOP blind ram test it is highly recommended to suspend a stand of drill pipe below the test plug to ensure the plug stays in place while disconnecting from it with the drill pipe.

10. Repeat this procedure as required during the drilling of the hole section.

## Stage 7 — Run the Upper Wear Bushing

**Note:** Always use a Wear Bushing while drilling to protect the load shoulders from damage by the drill bit or rotating drill pipe. The Wear Bushing must be retrieved prior to running the casing.

1. Examine the **13-5/8" x 11" x 9.00" ID MBU-3T-UPR Wear Bushing (Item ST8)**. Verify the following
  - internal bore is clean and in good condition
  - o-ring is in place and in good condition
  - shear o-ring cord is in place and in good condition
  - paint anti-rotation lugs white and allow paint to dry

### Run the Wear Bushing Before Drilling

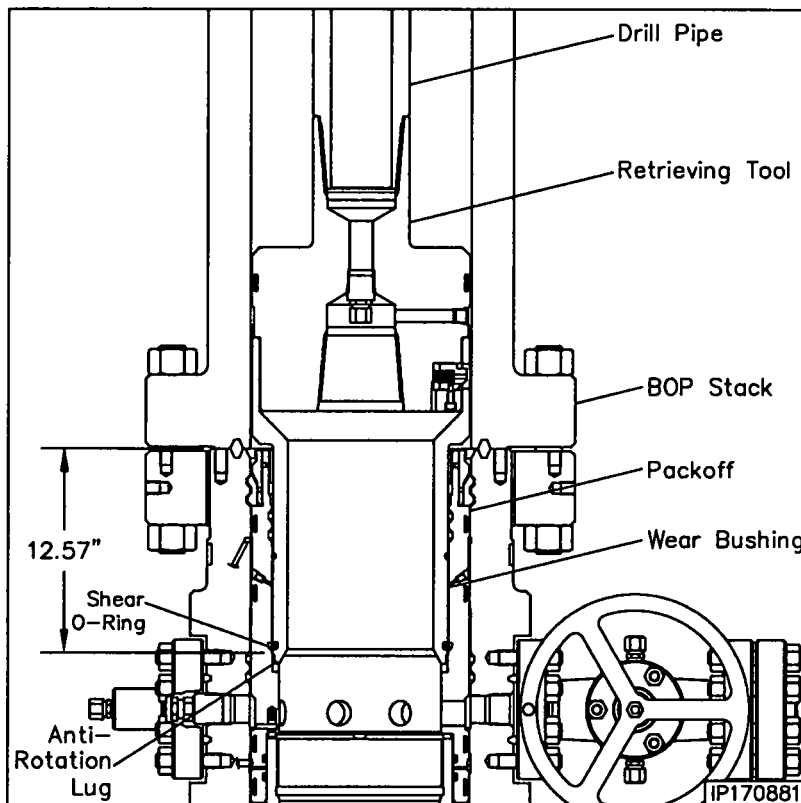
2. Orient the **13-5/8" Nominal x 4-1/2" IF (NC-50) CW Test Plug/Retrieving Tool (Item ST1)** with drill pipe connection up.
3. Attach the Retrieving Tool to a joint of drill pipe.

**WARNING:** Ensure that the lift lugs are down and the elastomer seal is up

4. Align the retractable lift lugs of the tool with the retrieval holes of the bushing and carefully lower the tool into the Wear Bushing until the lugs snap into place.

**Note:** If the lugs did not align with the holes, rotate the tool in either direction until they snap into place.

5. Apply a heavy coat of grease, not dope, to the OD of the bushing.
6. Ensure the BOP stack is drained and free of any debris from previous test.
7. Slowly lower the Tool/Bushing Assembly through the BOP stack and land it on the load shoulder in the housing, 12.57" below the top of the housing.
8. Rotate the drill pipe clockwise (right) to locate the stop lugs in their mating notches in the head. When properly aligned the bushing will drop an additional 1/2".



**Note:** The Shear O-Ring on bottom of the bushing will locate in a groove above the load shoulder in the head to act as a retaining device for the bushing.

9. Remove the tool from the Wear Bushing by rotating the drill pipe counter clockwise (left) 1/4 turn and lifting straight up.
10. Drill as required.

**Note:** It is highly recommended to retrieve, clean, inspect, grease, and reset the wear bushing each time the hole is tripped during the drilling of the hole section.

### Retrieve the Wear Bushing After Drilling

11. Make up the Retrieving Tool to the drill pipe.
12. Slowly lower the tool into the Wear Bushing.
13. Rotate the Retrieving Tool clockwise until a positive stop is felt. This indicates the lugs have snapped into the holes in the bushing.
14. Using the top drive, slowly pick up on the landing joint in 1000 lbs increments until the bushing starts to rise. This action should take a minimum of 3000 lbs pull. Do Not Exceed 60,000 lbs.
15. Retrieve the Wear Bushing, and remove it and the Retrieving Tool from the drill string.

## Stage 8 — Hang Off the 5-1/2" Casing

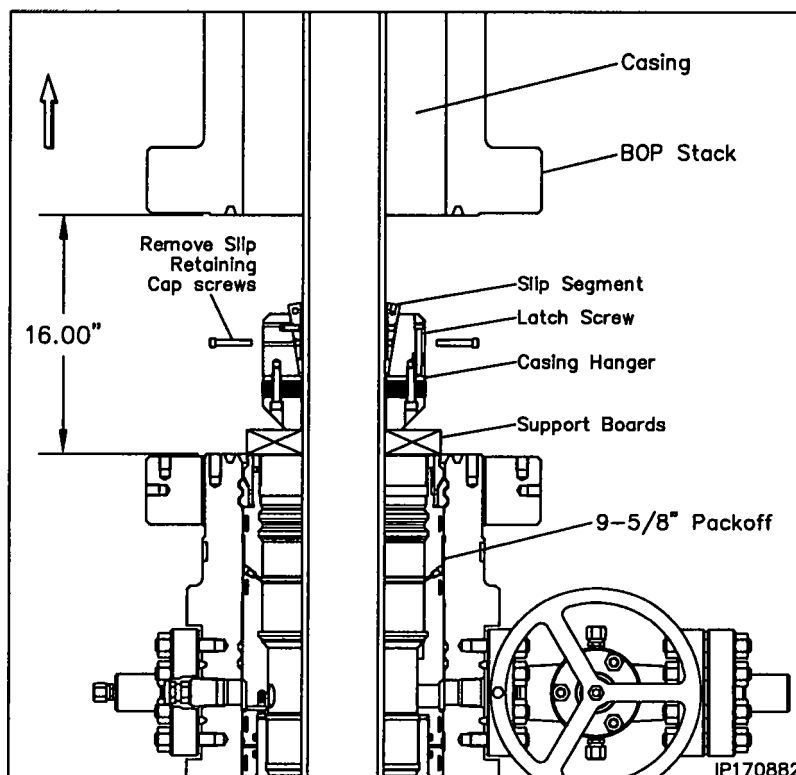
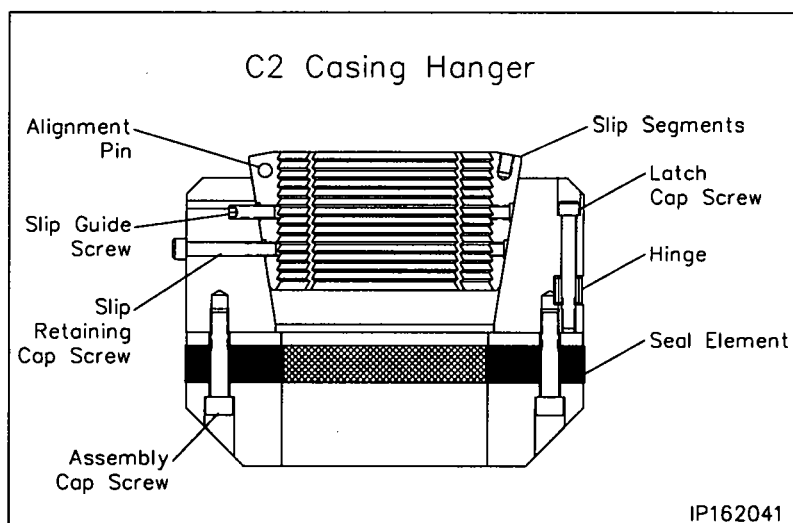
1. Run the 5-1/2" casing through the BOP to the required depth and cement the hole as required.
2. Drain the BOP stack through the housing side outlet valve.
3. Locate the actuation screw on the OD of the drilling adapter.
4. Using a hex drive, fully retract the actuation screws until they are slightly over flush with the glandnuts.
5. Pick up on the BOP stack a minimum of 16" above the housing hub and secure with safety slings.
6. Washout as required using a fresh water hose.

**Note:** Side outlet valve to remain open while setting the casing hanger.

7. Examine the 11" x 5-1/2" C2 Slip Casing Hanger (Item A14). Verify the following:
  - slips and internal bore are clean and in good condition
  - all screws are in place
  - packoff rubber is in good condition

**Note:** Ensure that the packoff rubber does not protrude beyond the O.D. of the casing hanger body. If it does, loosen the cap screws in the bottom of the hanger.

8. There are two latch screws located in the top of the casing hanger. Using a 5/16" Allen wrench, remove the two latch screws located 180° apart and separate the hanger into two halves.
9. Place two boards on the housing flange against the casing to support the Hanger.
10. Pick up one half of the hanger and place it around the casing and on top of the support boards
11. Pick up the second hanger half and place it around the casing adjacent the first half.
12. Slide the two hanger halves together ensuring the slip guide pins properly engage the opposing hanger.
13. Reinstall the latch screws and tighten securely.



## Stage 8 — Hang Off the 5-1/2" Casing

14. Using a 5/16" allen wrench, remove the slip retainer cap screws and discard them.
15. Prepare to lower the Hanger into the housing bowl.

**WARNING: Do Not Drop the Casing Hanger!**

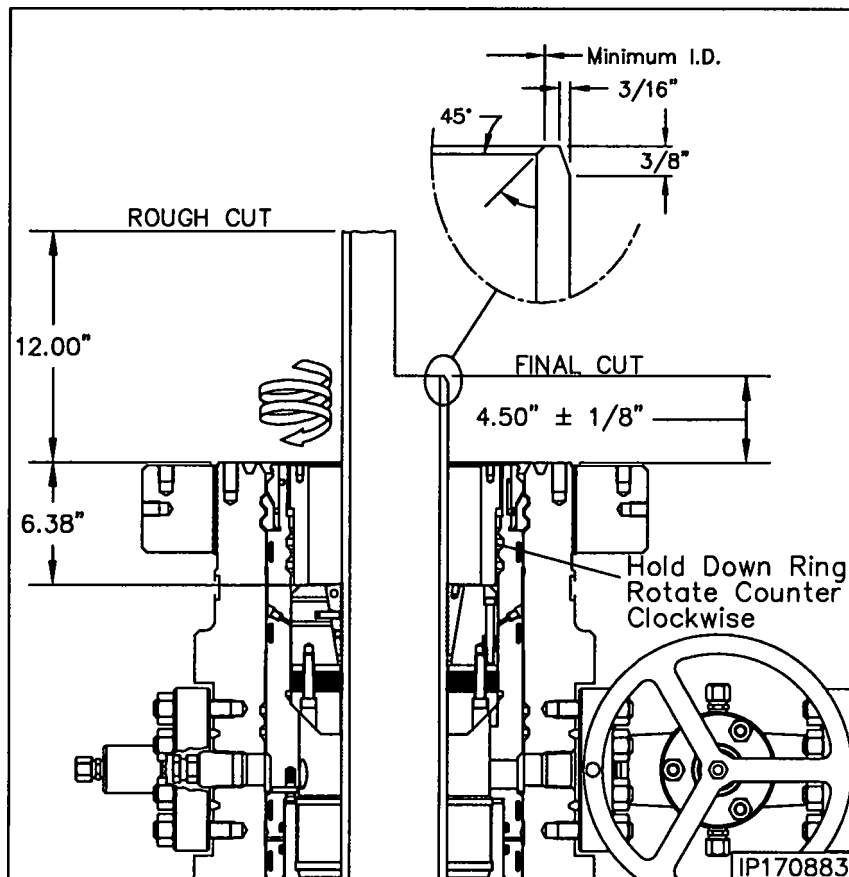
16. Lubricate the O.D. of the casing hanger liberally with a light grease or oil.
17. Remove the boards and allow the Hanger to slide into the housing bowl. When properly positioned the top of the hanger will be approximately 6.38" below the top of the housing.
18. Pull tension on the casing to the desired hanging weight and then slack off.

**Note:** A sharp decrease on the weight indicator will signify that the Hanger has taken weight and at what point, If this does not occur, pull tension again and slack off once more.

**WARNING:** Because of the potential fire hazard and the risk of loss of life and property, It is highly recommended to check the casing annulus and pipe bore for gas with an approved sensing device prior to cutting off the casing. If gas is present, do not use an open flame torch to cut the casing. It will be necessary to use a air driven mechanical cutter which is spark free.

19. Rough cut the casing approximately 12" above the top flange and move the excess casing out of the way.
20. Final cut the casing at  $4.50" \pm 1/8"$  above the top of the housing.
21. Grind the casing stub level and then place a  $3/16" \times 3/8"$  bevel on the O.D. and a I.D. chamfer to match the minimum bore of the Tubing Head to be installed.

**Note:** There must not be any rough edges on the casing or the seals of the tubing head will be damaged.



22. Using a high pressure water hose, thoroughly clean the top of the casing head, casing hanger, and casing stub and blow dry with compressed air. Ensure all cutting debris are removed.
23. Thoroughly clean and lightly lubricate the mating acme threads of the MBU-3T packoff and the slip the **Hold Down Ring (Item A15)**.
24. Thread the ring into the packoff with counter clockwise rotation to a positive stop on top of the slip hanger.
25. Fill the void above the hanger with clean test fluid to the top of the flange.

**WARNING: Do Not** over fill the void with test fluid - trapped fluid under the ring gasket may prevent a good seal from forming.

## Stage 9 — Install the Tubing Head

**Note:** The tubing head may be shipped to location with the lower frac valve pre installed and tested.

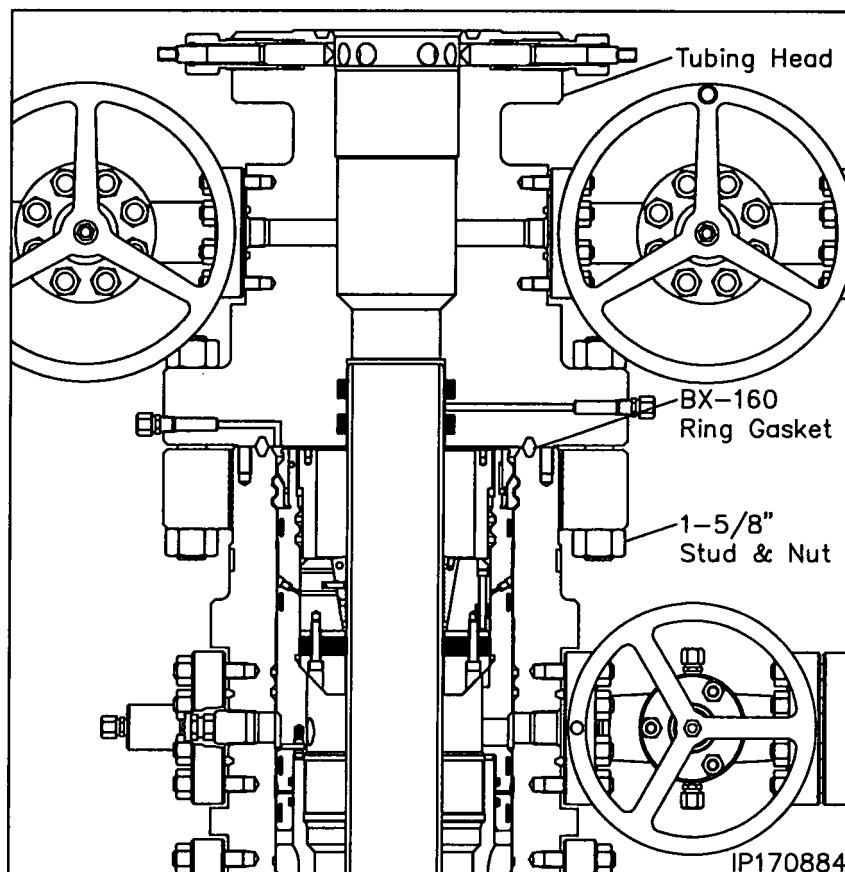
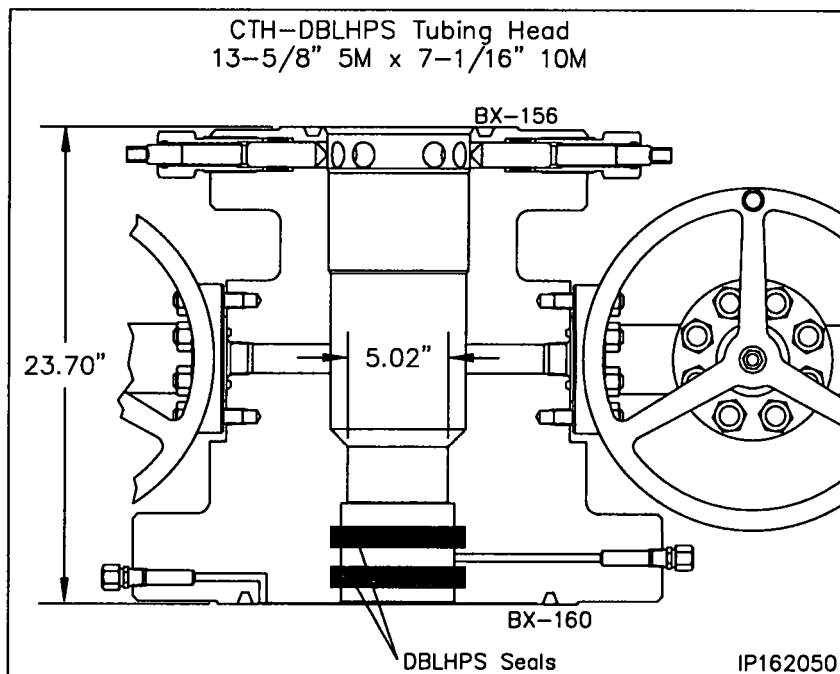
1. Examine the **13-5/8" 5M x 7-1/16" 10M CW, CTH-DBLHPS Tubing Head With 5-1/2" DBLHPS Bottom (Item B1)** Verify the following:
  - seal area and bore are clean and in good condition
  - **HPS Seals** are in place and in good condition
  - all peripheral equipment is intact and undamaged
2. Clean the mating ring grooves of the MBU-3T Housing and tubing head.
3. Lightly lubricate the I.D. of the tubing head 'HPS' seals and the casing stub with a light oil or grease.

**Note:** Excessive oil or grease may prevent a good seal from forming!

4. Install a new **BX-160 Ring Gasket (Item B6)** in the ring groove of the housing.
5. Pick up the tubing head and suspend it above the housing.
6. Orient the head so that the outlets properly align with the housing upper outlets and then carefully lower the head over the casing stub and then land it on the ring gasket.

**Warning:** Do Not damage the 'HPS' seals or their sealing ability will be impaired!

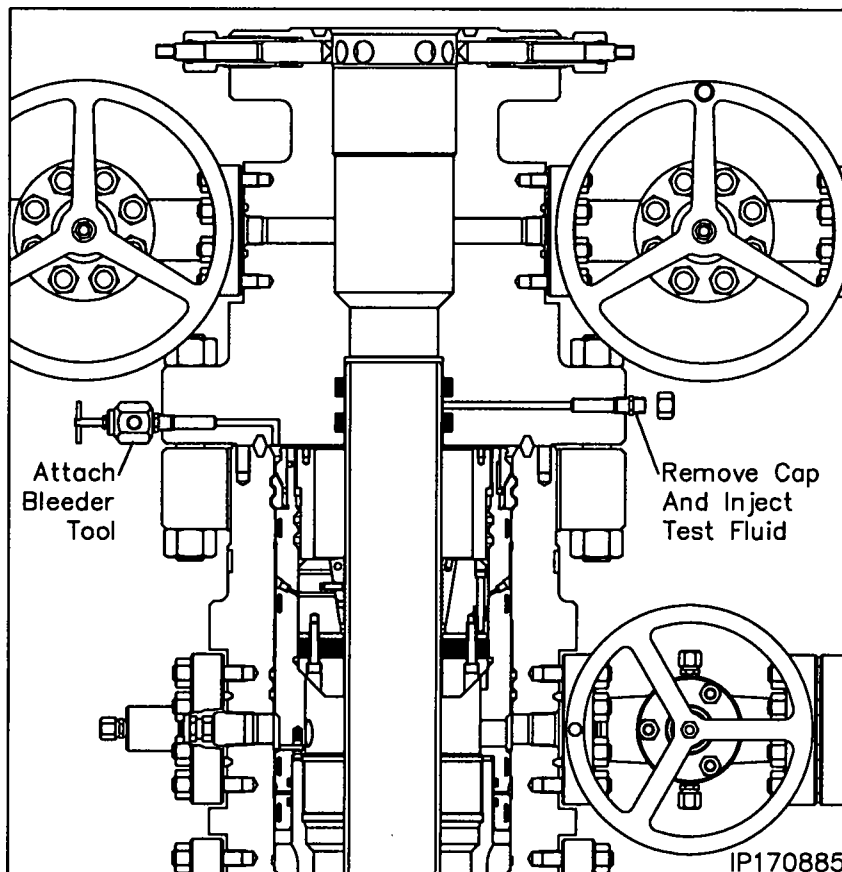
7. Make up the flange connection using the **1-5/8" x 12-3/4" studs and nuts (Item B7)**, tightening them in an alternating cross pattern.



## Stage 9 — Install the Tubing Head

### Seal Test

1. Locate the seal test fitting and one flange test fitting on the Tubing Head lower flange and remove the dust cap from both fittings.
2. Attach a Bleeder Tool to one of the open flange test fittings and open the Tool.
3. Attach a test pump to the seal test fitting and pump clean test fluid between the HPS Seals until a test pressure of **10,000 psi**.
4. Hold test pressure for 15 minutes.
5. If pressure drops, a leak has developed. Bleed off test pressure and take the appropriate action in the adjacent table.
6. After a satisfactory test is achieved, remove the Test Pump, drain test fluid and reinstall the dust cap on the open seal test fitting.

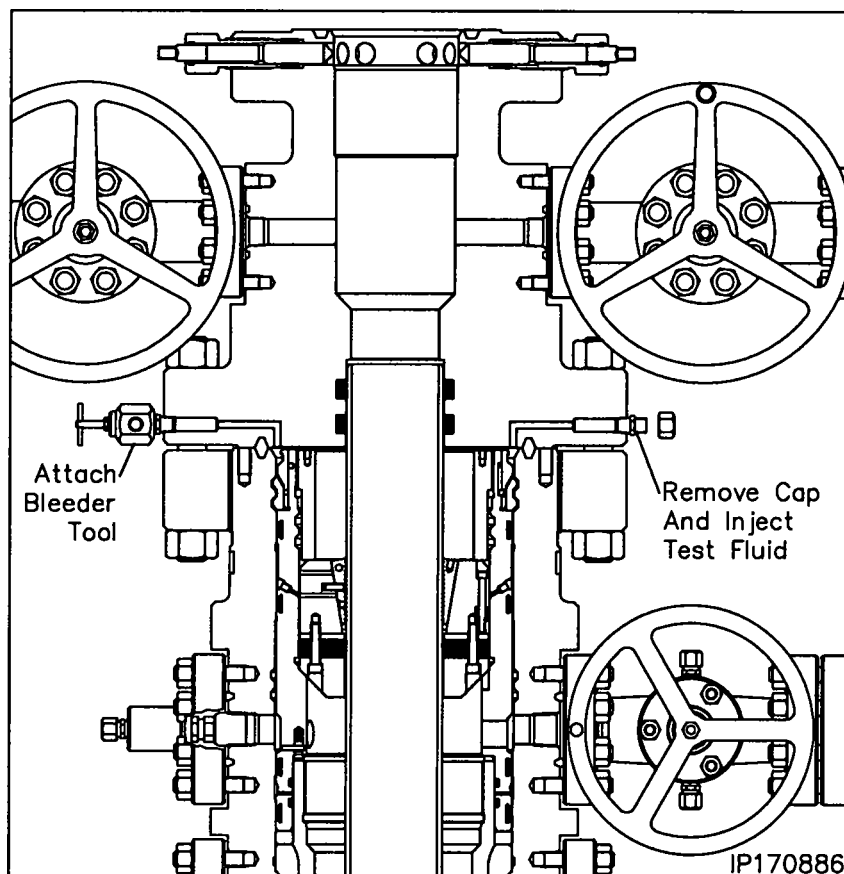


Seal Test	
Leak Location	Appropriate Action
Open bleeder tool - Lower HPS seal is leaking	Remove Tubing Head and replace leaking seals. Re land and retest seals
Into the tubing head bore - Upper HPS seal is leaking	

## Stage 9 — Install the Tubing Head

### Flange Test

1. Locate the remaining flange test fitting on the Tubing Head lower flange and remove the dust cap from the fitting.
2. Attach a test pump to the open flange test fitting and inject test fluid into the flange connection until a continuous stream flows from the opposite flange test bleeder tool.
3. Close the bleeder tool and continue to pumping test fluid to **5,000 psi**.
4. Hold test pressure for 15 minutes.
5. If pressure drops a leak has developed. Take the appropriate action from the adjacent chart.
6. Repeat this procedure until a satisfactory test is achieved.
7. Once a satisfactory test is achieved, remove the test pump and bleeder tool, drain all test fluid, and reinstall the dust caps.



Flange Test	
Leak Location	Appropriate Action
Between flanges - Ring gasket is leaking	Verify flange bolt torque. If correct, remove tubing head to clean, inspect and possibly replace damaged ring gasket.
Into Casing Annulus - Slip Hanger Seal Element Is Leaking	Remove Tubing Head, spear casing and reset the casing hanger. Redress casing, reinstall Tubing Head and retest.

## Stage 10 — Test the BOP Stack

Immediately after making up the BOP stack and periodically during the completion of the well the BOP stack (connections and rams) must be tested.

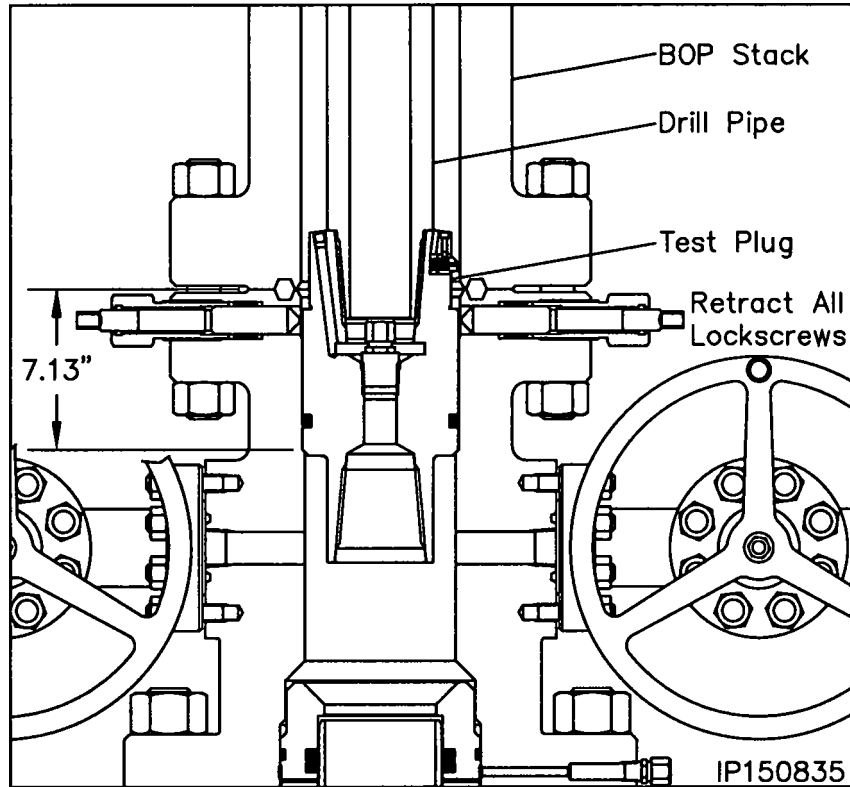
1. Examine the **7-1/16" Nominal x 3-1/2" IF CW Test Plug/Retrieving Tool (Item ST9)**. Verify the following:
  - 1-1/4" VR plug and weep hole plug are in place and tightened securely
  - elastomer seal is in place and in good condition
  - retractable lift lugs are in place, clean, and free to move
  - drill pipe threads are clean and in good condition

**Note:** Prior to installing the BOP it is recommended to attain an accurate RKB dimension for future use for accurately landing test plugs and tubing hangers. This dimension is attained by dropping a tape measure from the rig floor to the top of the wellhead flange. Pull tape taut and record the dimension from the wellhead to the top of the rig floor or kelly bushings. Ensure this dimension is placed on the BOP board in the dog house and on the drillers daily report sheet.

2. Position the test plug with the elastomer seal down and the lift lugs up and make up the tool to a joint of drill pipe.

**WARNING:** Ensure that the lift lugs are up and the elastomer seal is down

3. Remove the 1/2" NPT pipe plug from the weep hole if pressure is to be supplied through the drill pipe.
4. Open the tubing head side outlet valve and fully retract all lockscrews.
5. Lightly lubricate the test plug seal with oil or light grease.



6. Carefully lower the test plug through the BOP and land it on the load shoulder in the tubing head, 7.13" below the top of the head.

7. Close the BOP rams on the pipe and test the BOP to 10,000 psi.

**Note:** Any leakage past the test plug will be clearly visible at the open side outlet valve.

8. After a satisfactory test is achieved, release the pressure and open the rams.
9. Remove as much fluid as possible from the BOP stack and the retrieve the test plug with a straight vertical lift.

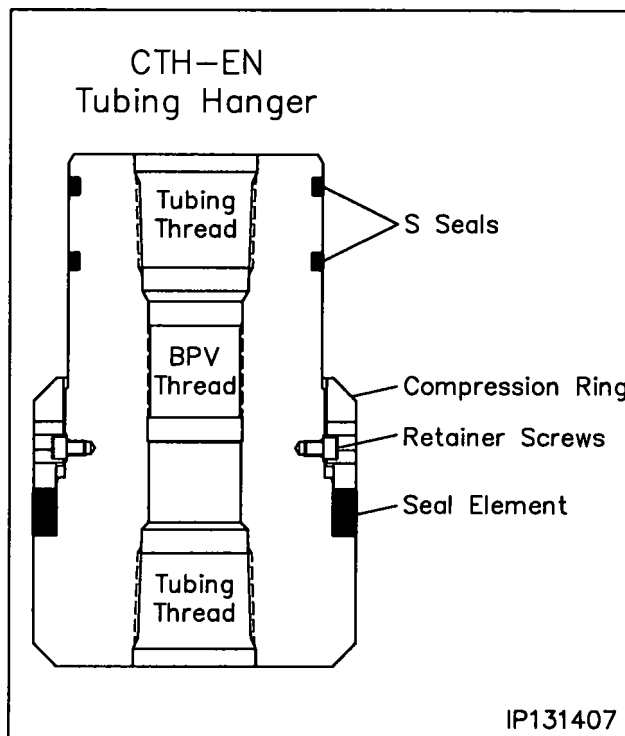
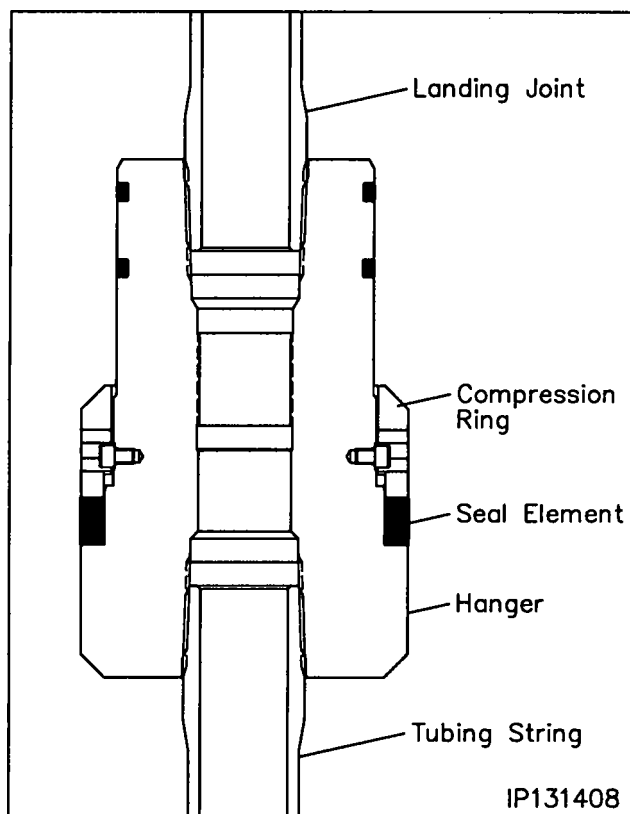
**Note:** When performing the BOP blind ram test it is highly recommended to suspend a stand of drill pipe below the test plug to ensure the plug stays in place while disconnecting from it with the drill pipe.

10. Repeat this procedure as required during the completion of the well.



## Stage 10 — Hang Off the Tubing String

1. Run the 2-3/8" production tubing string to the required depth and space out appropriately.
2. Examine the 7-1/16" x 2-3/8" EU CTH-EN Tubing Hanger (Item C11). Verify the following:
  - seal element is intact and undamaged
  - bore and internal threads are clean and undamaged
  - extended neck and neck seals are clean and undamaged
  - make up a short handling joint in the top of the hanger and tighten securely



3. At a predetermined position in the tubing string, set the tubing in the floor slips. Pick up the Tubing Hanger and make it up in the tubing string. Torque the tubing hanger to the thread manufacturer's optimum make up torque.
4. Pick up the tubing string so that the bottom of the hanger is approximately 5 feet above the rig floor and reset the floor slips.
5. Remove the handling joint and install the appropriate size landing joint in the top of the hanger and torque the landing joint to the thread manufacturer's minimum make up torque.

## Stage 10 — Hang Off the Tubing String

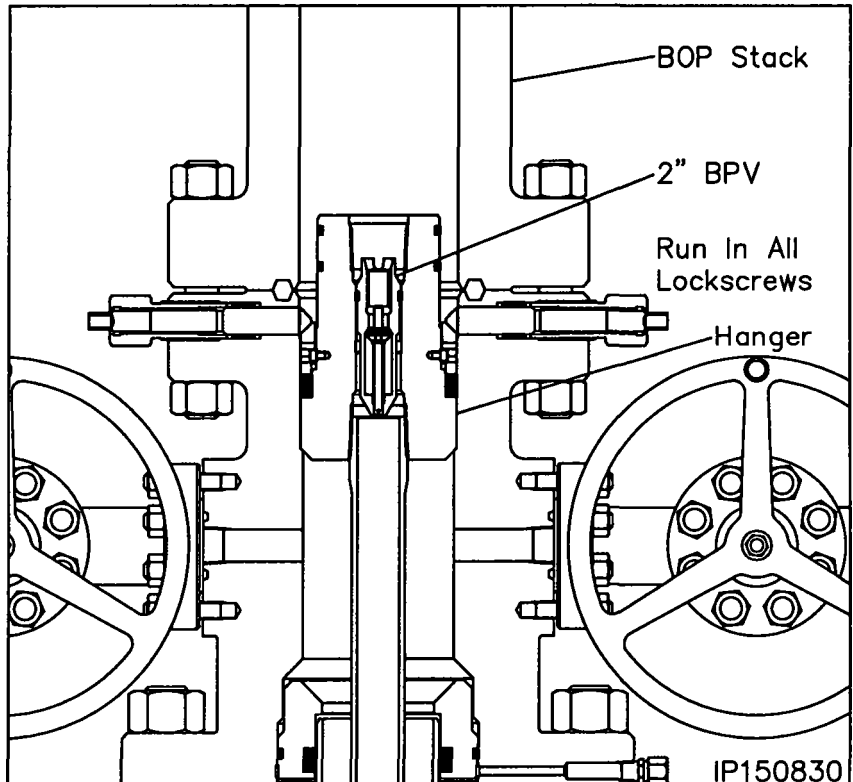
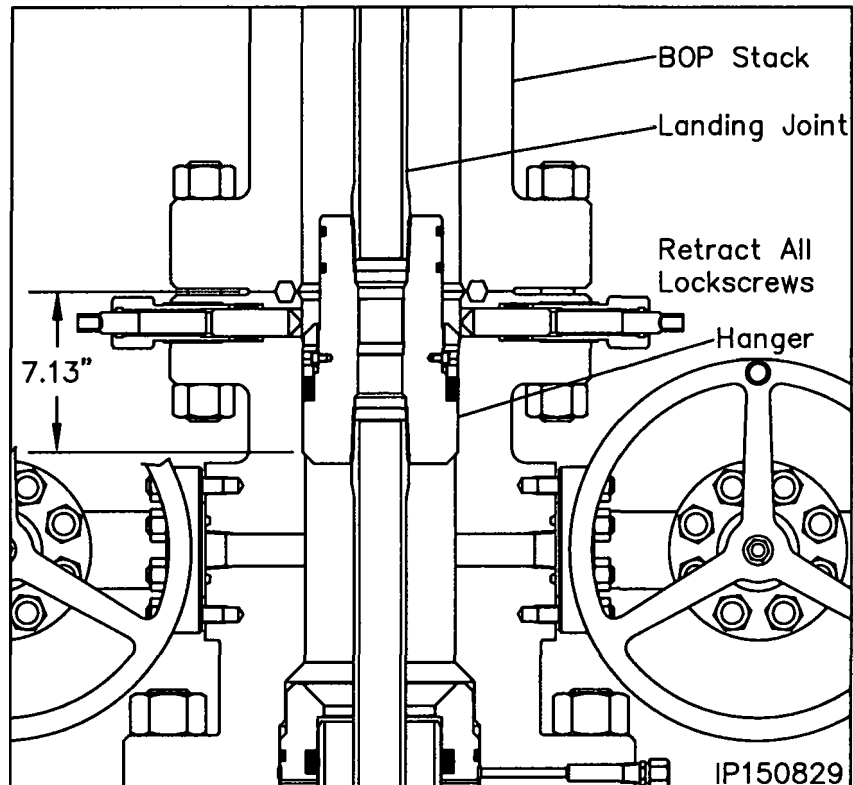
6. Calculate the distance from the top of the tubing head to the top of the rig floor and add 7.13" the depth of the tubing bowl. Record this dimension.

### Landing the Tubing Hanger

7. Drain the BOP and riser through the tubing head side outlet valve. Retract all lockscrews, and then flush the tubing head bowl with clean fresh water to remove any debris that may keep the hanger from properly landing.

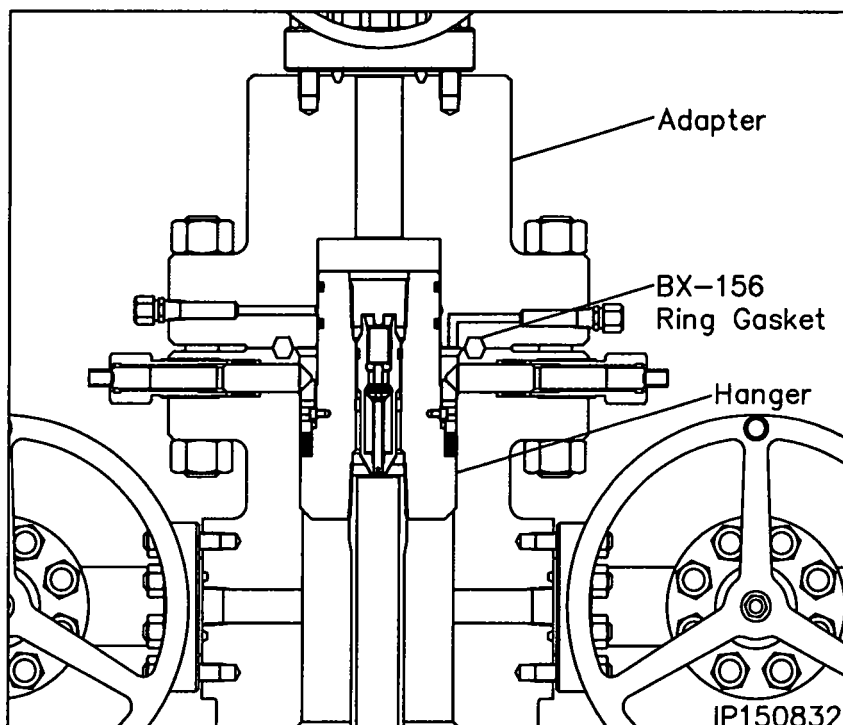
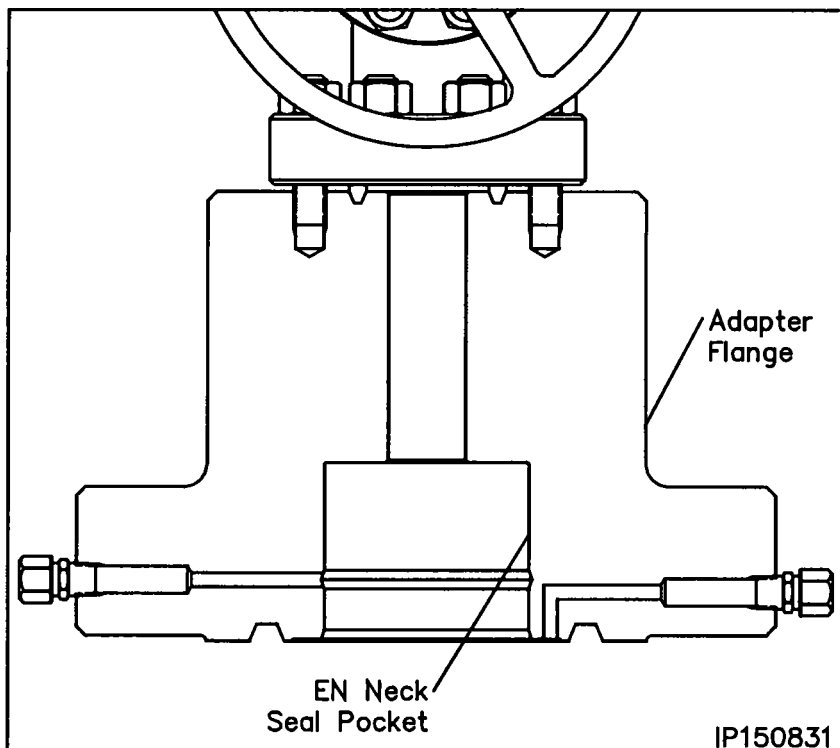
**Note:** Side outlet valve to remain open while landing the tubing hanger.

8. Thoroughly clean and lightly lubricate the hanger packoff rubber with oil or a light grease.
9. Pick up the tubing string and remove the floor slips.
10. Carefully lower the tubing hanger into the well, tallying the tubing every five feet to the recorded dimension. Place a paint mark on the landing joint at the proper elevation of the recorded dimension.
11. Continue lowering the tubing into the well and land the hanger in the tubing head and slack off all weight.
12. Run in all the tubing head lockscrews in an alternating cross pattern to refusal.
13. Retrieve the landing joint by rotating it to the left until it comes free of the hanger and then retrieve it with a straight lift.
14. Using a dry rod, install the appropriate size One-Way Back Pressure Valve in the tubing hanger bore and nipple down the BOP.



## Stage 11 — Install the Production Tree

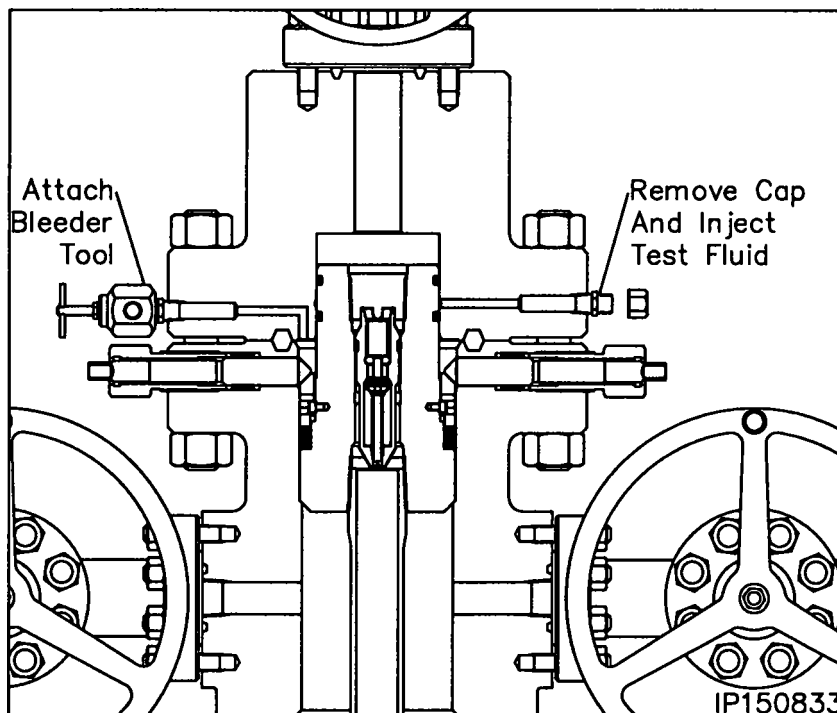
1. Using a high pressure water hose, thoroughly clean the top of the tubing head and the tubing hanger and blow dry with compressed air.
2. Carefully inspect the neck of the hanger for any damage and repair as necessary.
3. Carefully inspect the hanger neck 'S' Seals for any damage and replace as necessary.
4. Lightly lubricate the ring groove of the tubing head and the hanger 'S' Seals with oil or a light grease.
5. Place a new **BX-156 Ring Gasket (Item C12)**, in the ring groove of the tubing head and fill the void above the hanger with clean test fluid.
6. Examine the **2-1/16" 5M Single Tree with 7-1/16" 10M x 2-1/16" 5M EN Adapter Flange (Item C1)**. Verify the following:
  - internal bore and seal pocket are clean and in good condition
  - all valves, handwheels and fittings are in place and in good condition
7. Lightly lubricate the adapter seal pocket and ring groove with oil or a light grease.
8. Align and level the adapter with tree over the tubing head and then carefully lower the assembly over the tubing hanger neck and land the assembly on the ring gasket.
9. Make up the flange connection using the appropriate size **Studs and Nuts (Item C13)**, tightening them in an alternating cross pattern.
10. Retighten all lockscrews and gland nuts to refusal.



## Stage 11 — Install the Production Tree

### Seal Test

1. Locate the seal test fitting and one flange test fitting on the adapter flange and remove the dust cap from both fittings.
2. Attach a Bleeder Tool to one of the open flange test fittings and open the Tool.
3. Attach a test pump to the seal test fitting and pump clean test fluid between the S Seals until a stable test pressure of **10,000 psi** is attained.
4. Hold the test pressure for fifteen (15) minutes or as required by the drilling supervisor.
5. If pressure drops, a leak has developed. Bleed off test pressure and take the appropriate action in the adjacent table.
6. After a satisfactory test is achieved, remove the Test Pump, drain test fluid and reinstall the dust cap on the open seal test fitting.

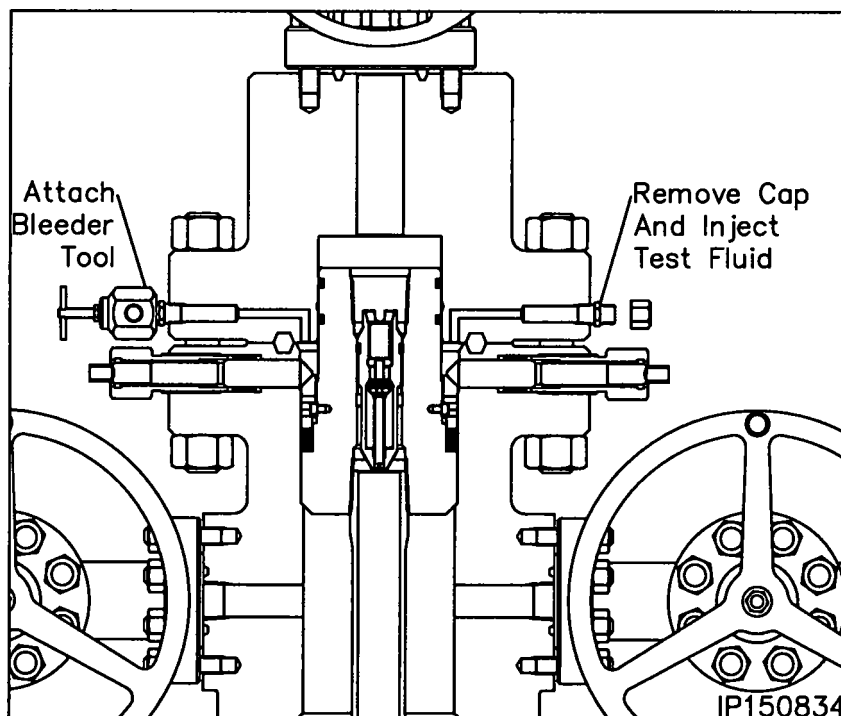


Leak Location	Appropriate Action
Into tree bore - Upper S seal is leaking	Remove the tree, replace leaking S seals, reinstall the tree and retest the connection
Open Flange Test bleeder tool - Lower S seal is leaking	Remove the tree, replace leaking S seals, reinstall the tree and retest the connection

## Stage 11 — Install the Production Tree

### Flange Test

1. Locate the remaining flange test fitting on the adapter flange and remove the dust cap from the fitting.
2. Attach a test pump to the open flange test fitting and inject test fluid into the flange connection until a continuous stream flows from the opposite flange test bleeder tool.
3. Close the bleeder tool and continue to pumping test fluid until a stable test pressure of **10,000 psi** is attained.
4. Hold the test pressure for fifteen (15) minutes or as required by the drilling supervisor.
5. If pressure drops a leak has developed at the ring gasket. Further tighten the flange connection.
6. Repeat this procedure until a satisfactory test is achieved.
7. Once a satisfactory test is achieved, remove the test pump and bleeder tool, drain all test fluid, and reinstall the dust caps.



Leak Location	Appropriate Action
Between flanges - Ring gasket is leaking	Further tighten the flange connection
Around lockscrews - Lockscrew packing is leaking	Further tighten lockscrews
Into tubing annulus - Hanger seal element is leaking	Further tighten lockscrew gland nuts
Open Seal Test bleeder tool - Lower S seal is leaking	Remove the tree, replace leaking S seals, reinstall the tree and retest the connection

## Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

**1. Introduction and Scope.** The following recommended procedure has been prepared with particular regard to attaining pressure-tight weld when attaching casing heads, flanges, etc., to casing. Although most of the high strength casing used (such as N-80) is not normally considered field weldable, some success may be obtained by using the following or similar procedures.

**Caution:** In some wellheads, the seal weld is also a structural weld and can be subjected to high tensile stresses. Consideration must therefore be given by competent authority to the mechanical properties of the weld and its heat affected zone.

- a. The steels used in wellhead parts and in casing are high strength steels that are susceptible to cracking when welded. It is imperative that the finished weld and adjacent metal be free from cracks. The heat from welding also affects the mechanical properties. This is especially serious if the weld is subjected to service tension stresses.
- b. This procedure is offered only as a recommendation. The responsibility for welding lies with the user and results are largely governed by the welder's skill. Weldability of the several makes and grades of casing varies widely, thus placing added responsibility on the welder. Transporting a qualified welder to the job, rather than using a less-skilled man who may be at hand, will, in most cases, prove economical. The responsible operating representative should ascertain the welder's qualifications and, if necessary, assure himself by instruction or demonstration, that the welder is able to perform the work satisfactorily.

**2. Welding Conditions.** Unfavorable welding conditions must be avoided or minimized in every way possible, as even the most skilled welder cannot successfully weld steels that are susceptible to cracking under adverse working conditions, or when the work is rushed. Work above the welder on the drilling floor should be avoided. The weld should be protected from dripping mud, water, and oil and from wind, rain, or other adverse weather conditions. The drilling mud, water, or other fluids must be lowered in the casing and kept at a low level until the weld has properly cooled. It is the responsibility of the user to provide supervision that will assure favorable working conditions, adequate time, and the necessary cooperation of the rig personnel.

**3. Welding.** The welding should be done by the shielded metal-arc or other approved process.

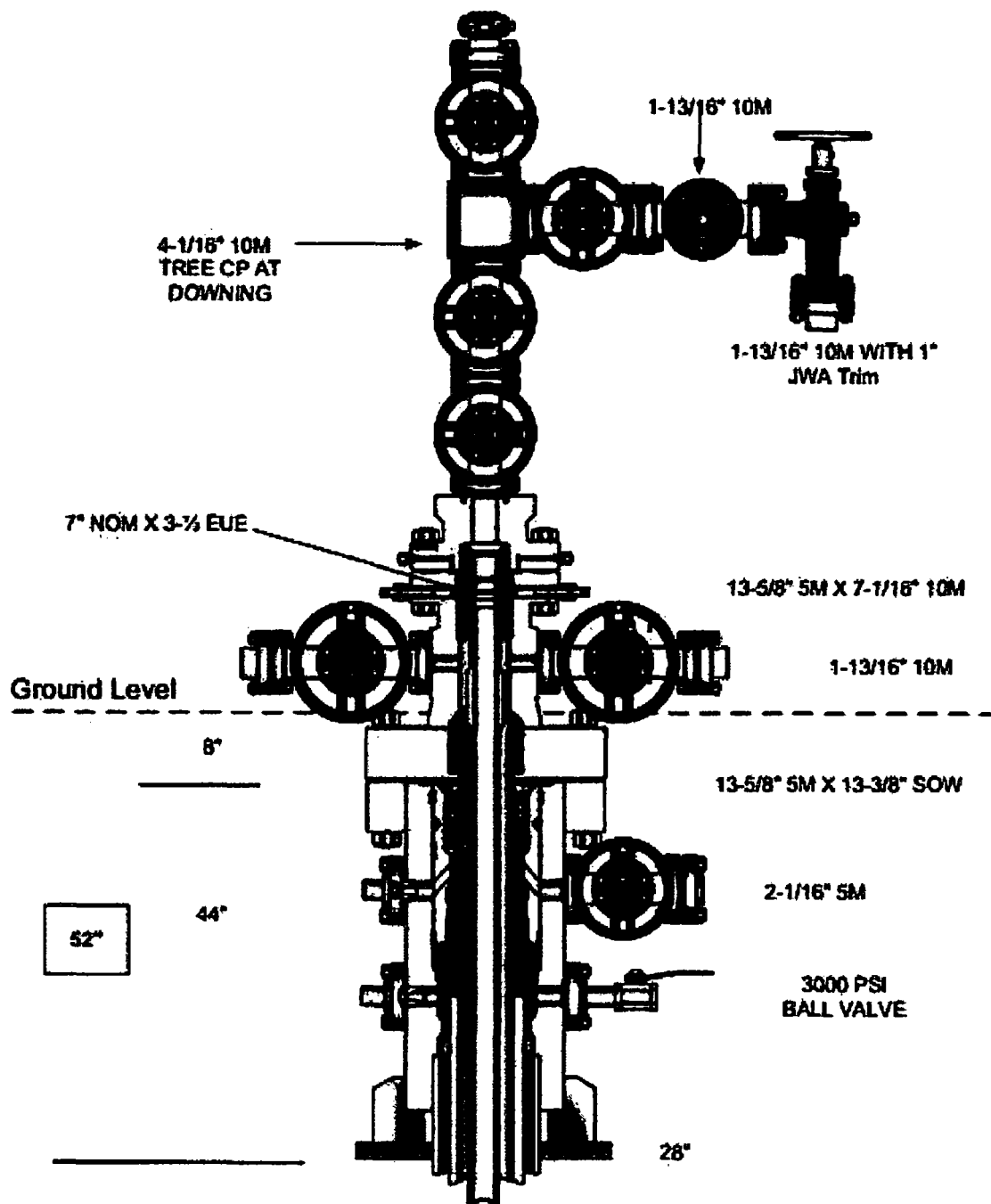
**4. Filler Metal.** Filler Metals. For root pass, it's recommended to use E6010, E6011 (AC), E6019 or equivalent electrodes. The E7018 or E7018-A1 electrodes may also be used for root pass operations but has the tendency to trap slag in tight grooves. The E6010, E6011 and E6019 offer good penetration and weld deposit ductility with relatively high intrinsic hydrogen content. Since the E7018 and E7018-A1 are less susceptible to hydrogen induced cracking, it is recommended for use as the filler metal for completion of the weld groove after the root pass is completed. The E6010, E6011 (AC), E6019, E7018 and E7018-A1 are classified under one of the following codes AWS A5.1 (latest edition): Mild Steel covered electrodes or the AWS A5.5 (latest edition): Low Alloy Steel Covered Arc-Welding Electrodes. The low hydrogen electrodes, E7018 and E7018-A1, should not be exposed to the atmosphere until ready for use. It's recommended that hydrogen electrodes remain in their sealed containers. When a job arises, the container shall be opened and all unused remaining electrodes to be stored in heat electrode storage ovens. Low hydrogen electrodes exposed to the atmosphere, except water, for more than two hours should be dried 1 to 2 hours at 600°F to 700 °F (316°C to 371 °C) just before use. It's recommended for any low hydrogen electrode containing water on the surface should be scrapped.

**5. Preparation of Base Metal.** The area to be welded should be dry and free of any paint, grease/oil and dirt. All rust and heat-treat surface scale shall be ground to bright metal before welding.

## Recommended Procedure for Field Welding Pipe to Wellhead Parts for Pressure Seal

6. **Preheating.** Prior to any heating, the wellhead member shall be inspected for the presence of any o-rings or other polymeric seals. If any o-rings or seals are identified then preheating requires close monitoring as noted in paragraph 6a. Before applying preheat, the fluid should be bailed out of the casing to a point several inches (>6" or 150 mm) below the weld joint/location. Preheat both the casing and wellhead member for a minimum distance of three (3) inches on each side of the weld joint using a suitable preheating torch in accordance with the temperatures shown below in a and b. The preheat temperature should be checked by the use of heat sensitive crayons. Special attention must be given to preheating the thick sections of wellhead parts to be welded, to insure uniform heating and expansion with respect to the relatively thin casing.
  - a. Wellhead members containing o-rings and other polymeric seals have tight limits on the preheat and interpass temperatures. Those temperatures must be controlled at 200°F to 325°F or 93 °C to 160°C and closely monitored to prevent damage to the o-ring or seals.
  - b. Wellhead members not containing o-rings and other polymeric seals should be maintained at a preheat and interpass temperature of 400°F to 600°F or 200°C to 300°C.
7. **Welding Technique.** Use a 1/8 or 5/32-inch (3.2 or 4.0 mm) E6010 or E7018 electrode and step weld the first bead (root pass); that, weld approximately 2 to 4 inches (50 to 100 mm) and then move diametrically opposite this point and weld 2 to 4 inches (50 to 100 mm) halfway between the first two welds, move diametrically opposite this weld, and so on until the first pass is completed. This second pass should be made with a 5/32-inch (4.0 mm) low hydrogen electrode of the proper strength and may be continuous. The balance of the welding groove may then be filled with continuous passes without back stepping or lacing, using a 3/16-inch (4.8 mm) low hydrogen electrode. All beads should be stringer beads with good penetration. There should be no undercutting and weld shall be workmanlike in appearance.
  - a. Test ports should be open when welding is performed to prevent pressure buildup within the test cavity.
  - b. During welding the temperature of the base metal on either side of the weld should be maintained at 200 to 300°F (93 to 149°C).
  - c. Care should be taken to insure that the welding cable is properly grounded to the casing, but ground wire should not be welded to the casing or the wellhead. Ground wire should be firmly clamped to the casing, the wellhead, or fixed in position between pipe slips. Bad contact may cause sparking, with resultant hard spots beneath which incipient cracks may develop. The welding cable should not be grounded to the steel derrick, nor to the rotary-table base.
8. **Cleaning.** All slag or flux remaining on any welding bead should be removed before laying the next bead. This also applies to the completed weld.
9. **Defects.** Any cracks or blow holes that appear on any bead should be removed to sound metal by chipping or grinding before depositing the next bead.
10. **Postheating.** Post-heating should be performed at the temperatures shown below and held at that temperature for no less than one hour followed by a slow cooling. The post-heating temperature should be in accordance with the following paragraphs.
  - a. Wellhead members containing o-rings and other polymeric seals have tight limits on the post-heating temperatures. Those temperatures must be controlled at 250°F to 300°F or 120 °C to 150°C and closely monitored to prevent damage to the o-ring or seals.
  - b. Wellhead members not containing o-rings and other polymeric seals should be post-heated at a temperature of 400°F to 600°F or 200°C to 300°C.
11. **Cooling. *Rapid cooling must be avoided.*** To assure slow cooling, welds should be protected from extreme weather conditions (cold, rain, high winds, etc.) by the use of suitable insulating material. (Specially designed insulating blankets are available at many welding supply stores.) Particular attention should be given to maintaining uniform cooling of the thick sections of the wellhead parts and the relatively thin casing, as the relatively thin casing will pull away from the head or hanger if allowed to cool more rapidly. The welds should cool in air to less than 200°F (93°C) (measured with a heat sensitive crayon) prior to permitting the mud to rise in the casing.
12. **Test the Weld.** After cooling, test the weld. The weld must be cool otherwise the test media will crack the weld. The test pressure should be no more than 80% of the casing collapse pressure.

# Multi-bowl Wellhead Diagram



Multi-bowl Wellhead Diagram  
Cascade 29 Federal 17H  
Cimarex Energy Co.  
29-25S-33E  
Lea Co., NM





---

## Cimarex 10M Well Control Plan

---

Version 1.0

---

## BOPE Preventer Utilization

The table below displays all BHA components, drill pipe, casing, or open hole that could be present during a required shut in and the associated preventer component that would provide a barrier to flow. It is specific to the hole section that requires a 10M system. The mud system being utilized in the hole will always assumed to be the first barrier to flow. The below table, combined with the mud program, documents that two barriers to flow can be maintained at all times, independent of the rating of the annular preventer.

Drill String Element	OD	Preventer	RWP
4" Drillpipe	4"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
4.5" Drillpipe	4.5"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
4" HWDP Drillpipe	4"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
4.5" HWDP Drillpipe	4.5"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
Drill Collars (including non-magnetic)	4.75- 5.25"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
Production Casing	5.5"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
Production Casing	5"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
Production Casing	4.5"	Lower Ram 3 1/2" - 5 1/2" VBR* Upper Ram 3 1/2" - 5 1/2" VBR*	10M
ALL	0-13 5/8"	Annular	5M
Open Hole		Blind Rams	10M

\*VBR – Variable Bore Ram

## Well Control Procedures

Proper well control response is highly specific to current well conditions and must be adapted based on environment as needed. The procedures below are given in "common" operating conditions to cover the basic and most necessary operations required during the wellbore construction. These include drilling ahead, tripping pipe, tripping BHA, running casing, and pipe out of the hole/open hole. In some of the procedures below, there will be a switch of control from the lesser RWP annular to the appropriate 10M RWP ram. The pressure at which this is done is variable based on overall well conditions that must be evaluated situationally. The pressure that control is switched may be equal to or less than the RWP but at no time will the pressure on the annular preventer exceed the RWP of the annular. The annular will be tested to 5,000 psi. This will be the RWP of the annular preventer.

### Shutting In While Drilling

1. Sound alarm to alert crew
2. Space out drill string
3. Shut down pumps
4. Shut in uppermost BOPE preventer (typically the annular preventer) and open HCR.
5. Verify well is shut-in and flow has stopped
6. Notify supervisory personnel
7. Record data (SIDP, SICP, Pit Gain, and Time)
8. Hold pre-job safety meeting and discuss kill procedure

9. If pressure is anticipated to climb to the RWP of the annular preventer during kill procedure, swap control of the well to the upper pipe ram

***Shutting In While Tripping***

1. Sound alarm and alert crew
2. Install open, full open safety valve and close valve
3. Shut in uppermost BOPE preventer (typically the annular preventer) and open HCR.
4. Verify well is shut-in and flow has stopped
5. Notify supervisory personnel
6. Record data (SIDP, SICP, Pit Gain, and Time)
7. Hold pre-job safety meeting and discuss kill procedure
8. If pressure is anticipated to climb to the RWP of the annular preventer during kill procedure, swap control of the well to the upper pipe ram

***Shutting In While Running Casing***

1. Sound alarm and alert crew
2. Install circulating swedge. Close high pressure, low torque valves.
3. Shut in uppermost BOPE preventer (typically the annular preventer) and open HCR.
4. Verify well is shut-in and flow has stopped
5. Notify supervisory personnel
6. Record data (SIDP, SICP, Pit Gain, and Time)
7. Hold Pre-job safety meeting and discuss kill procedure
8. If pressure is anticipated to climb to the RWP of the annular preventer during kill procedure, swap control of the well to the upper pipe ram

***Shutting in while out of hole***

1. Sound alarm
2. Shut-in well: close blind rams
3. Verify well is shut-in and monitor pressures
4. Notify supervisory personnel
5. Record data (SIDP, SICP, Pit Gain, and Time)
6. Hold Pre-job safety meeting and discuss kill procedure

***Shutting in prior to pulling BHA through stack***

1. Prior to pulling last joint of drill pipe thru the stack space out and check flow. If flowing see steps below.
2. Sound alarm and alert crew
3. Install open, full open safety valve and close valve
4. Shut in upper pipe ram and open HCR.

5. Verify well is shut-in and flow has stopped
6. Notify supervisory personnel
7. Record data (SIDP, SICP, Pit Gain, and Time)
8. Hold pre-job safety meeting and discuss kill procedure

***Shutting in while BHA is in the stack and ram preventer and combo immediately available***

1. Sound alarm and alert crew
2. Stab Crossover and install open, full open safety valve and close valve
3. Space out drill string with upset just beneath the compatible pipe ram.
4. Shut in upper compatible pipe ram and open HCR.
5. Verify well is shut-in and flow has stopped
6. Notify supervisory personnel
7. Record data (SIDP, SICP, Pit Gain, and Time)
8. Hold pre-job safety meeting and discuss kill procedure

***Shutting in while BHA is in the stack and no ram preventer or combo immediately available***

1. Sound alarm and alert crew
2. If possible pick up high enough, to pull string clear and follow "Open Hole" scenario
3. If not possible to pick up high enough:
  1. Stab Crossover, make up one joint/stand of drill pipe, and install open, full open safety valve and close valve
4. Space out drill string with upset just beneath the compatible pipe ram.
5. Shut in upper compatible pipe ram and open HCR.
6. Verify well is shut-in and flow has stopped
7. Notify supervisory personnel
8. Record data (SIDP, SICP, Pit Gain, and Time)
9. Hold pre-job safety meeting and discuss kill procedure



U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## SUPO Data Report

08/06/2019

APD ID: 10400036215

Submission Date: 11/14/2018

Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

Well Type: OIL WELL

Well Work Type: Drill

[Show Final Text](#)

### Section 1 - Existing Roads

Will existing roads be used? NO

### Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

Cascade\_29\_Fed\_CTB\_Road\_ROW\_20181110161939.pdf

Cascade\_29\_Fed\_W2W2\_PAD\_1\_Road\_ROW\_20181110161953.pdf

Cascade\_29\_Fed\_and\_Red\_Hills\_Road\_ROW\_20181110173502.pdf

New road type: RESOURCE

Length: 14483

Feet

Width (ft.): 30

Max slope (%): 2

Max grade (%): 6

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 18

**New road access erosion control:** The side slopes of any drainage channels or swales that are crossed will be re-contoured to original grade and compacted and mulched as necessary to avoid erosion. Where steeper slopes cannot be avoided, water bars or silt fence will be constructed, mulch/rip-rap applied, or other measures employed as necessary to control erosion. Hay bales, straw waddles or silt fence may also be installed to control erosion as needed. All disturbed areas will be seeded with a mix appropriate for the area unless specified otherwise by the landowner.

**New road access plan or profile prepared?** NO

**New road access plan attachment:**

**Access road engineering design?** NO

**Access road engineering design attachment:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Turnout?** N

**Access surfacing type:** GRAVEL

**Access topsoil source:** ONSITE

**Access surfacing type description:**

**Access onsite topsoil source depth:** 6

**Offsite topsoil source description:**

**Onsite topsoil removal process:** Push off and stockpile alongside the location.

**Access other construction information:** The operator will prevent and abate fugitive dust as needed, whether created by vehicular traffic, equipment operations or other events.

**Access miscellaneous information:**

**Number of access turnouts:**

**Access turnout map:**

### Drainage Control

**New road drainage crossing:** CULVERT,LOW WATER,OTHER

**Drainage Control comments:** To control and prevent potentially contaminated precipitation from leaving the pad site, a perimeter berm and settlement pond will be installed. Contaminated water will be removed from pond, stored in waste tanks, and disposed of at a state approved facility. Standing water or puddles will not be allowed. Drainage ditches would be established and maintained on the pad and along access roads to divert water away from operations. Natural drainage areas disturbed during construction would be re-contoured to near original condition prior to construction. Erosion Control Best Management Practices would be used where necessary and consist of seeding, fiber rolls, water bars, silt fences, and temporary diversion dikes. Areas disturbed during construction that are no longer needed for operations would be obliterated, re-contoured to near original condition prior to construction. Erosion Control Best Management Practices would be used where necessary and consist of seeding, fiber rolls, water bars, silt fences, and temporary diversion dikes. Areas disturbed during construction that are no longer needed for operations would be obliterated, re-contoured, and reclaimed to near original condition to re-establish natural drainage.

**Road Drainage Control Structures (DCS) description:** N/A

**Road Drainage Control Structures (DCS) attachment:**

### Access Additional Attachments

**Additional Attachment(s):**

### Section 3 - Location of Existing Wells

**Existing Wells Map?** YES

**Attach Well map:**

Cascade\_29\_Fed\_W2W2\_PAD\_1\_One\_mile\_Radius\_Existing\_Wells\_20181110162424.pdf

**Existing Wells description:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

#### Section 4 - Location of Existing and/or Proposed Production Facilities

**Submit or defer a Proposed Production Facilities plan?** SUBMIT

**Production Facilities description:** Production Facilities will be the same in the Cascade 29 Federal 15H, 16H, 17H, 29H, 30H, 31H, 43H, 44H & 45H

**Production Facilities map:**

Cascade\_29\_Fed\_East\_Zone\_1\_CTB\_Layout\_20181110162548.pdf

Cascade\_29\_Fed\_East\_Zone\_2\_CTB\_Layout\_20181110162615.pdf

Cascade\_29\_Fed\_West\_Zone\_1\_CTB\_Layout\_20181110162714.pdf

Cascade\_29\_Fed\_West\_Zone\_2\_CTB\_Layout\_20181110162741.pdf

#### Section 5 - Location and Types of Water Supply

##### Water Source Table

**Water source use type:** INTERMEDIATE/PRODUCTION CASING,  
SURFACE CASING

**Water source type:** MUNICIPAL

**Describe type:**

**Source latitude:**

**Source longitude:**

**Source datum:**

**Water source permit type:** WATER RIGHT

**Permit Number:**

**Source land ownership:** STATE

**Water source transport method:** PIPELINE,TRUCKING

**Source transportation land ownership:** STATE

**Water source volume (barrels):** 5000

**Source volume (acre-feet):** 0.6444655

**Source volume (gal):** 210000

**Water source and transportation map:**

Cascade\_29\_Fed\_W2W2\_Pad\_1\_Drilling\_Water\_Routes\_20181110165700.pdf

**Water source comments:**

**New water well?** NO

##### New Water Well Info

**Well latitude:**

**Well Longitude:**

**Well datum:**

**Well target aquifer:**

**Est. depth to top of aquifer(ft):**

**Est thickness of aquifer:**

**Aquifer comments:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Aquifer documentation:**

**Well depth (ft):**

**Well casing type:**

**Well casing outside diameter (in.):**

**Well casing inside diameter (in.):**

**New water well casing?**

**Used casing source:**

**Drilling method:**

**Drill material:**

**Grout material:**

**Grout depth:**

**Casing length (ft.):**

**Casing top depth (ft.):**

**Well Production type:**

**Completion Method:**

**Water well additional information:**

**State appropriation permit:**

**Additional information attachment:**

**Section 6 - Construction Materials**

**Using any construction materials:** YES

**Construction Materials description:** The drilling and testing operations will be conducted on a watered and compacted native soil grade. Soft spots will be covered with caliche, free of large rocks (3" diameter). Upon completion as a commercial producer the location will be covered with caliche, free of large rocks (3" dia.) from an existing privately owned gravel pit.

**Construction Materials source location attachment:**

**Section 7 - Methods for Handling Waste**

**Waste type:** DRILLING

**Waste content description:** Drilling Fluids, drill cuttings, water and other waste produced from the well during drilling operations.

**Amount of waste:** 15000 barrels

**Waste disposal frequency :** Weekly

**Safe containment description:** N/A

**Safe containmant attachment:**

**Waste disposal type:** HAUL TO COMMERCIAL FACILITY **Disposal location ownership:** COMMERCIAL

**Disposal type description:**

**Disposal location description:** Haul to R360 commercial Disposal

**Waste type:** GARBAGE

**Waste content description:** Garbage and trash produced during drilling and completion operations

**Amount of waste:** 32500 pounds

**Waste disposal frequency :** Weekly

**Safe containment description:** N/A

**Safe containmant attachment:**



**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Waste disposal type:** HAUL TO COMMERCIAL FACILITY      **Disposal location ownership:** COMMERCIAL

**Disposal type description:**

**Disposal location description:** Windmill Spraying Service hauls trash to Lea County Landfill

### Reserve Pit

**Reserve Pit being used?** NO

**Temporary disposal of produced water into reserve pit?**

**Reserve pit length (ft.)**

**Reserve pit width (ft.)**

**Reserve pit depth (ft.)**

**Reserve pit volume (cu. yd.)**

**Is at least 50% of the reserve pit in cut?**

**Reserve pit liner**

**Reserve pit liner specifications and installation description**

### Cuttings Area

**Cuttings Area being used?** NO

**Are you storing cuttings on location?** NO

**Description of cuttings location**

**Cuttings area length (ft.)**

**Cuttings area width (ft.)**

**Cuttings area depth (ft.)**

**Cuttings area volume (cu. yd.)**

**Is at least 50% of the cuttings area in cut?**

**WCuttings area liner**

**Cuttings area liner specifications and installation description**

### Section 8 - Ancillary Facilities

**Are you requesting any Ancillary Facilities?:** NO

**Ancillary Facilities attachment:**

**Comments:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

## Section 9 - Well Site Layout

### Well Site Layout Diagram:

Cascade\_29\_Fed\_17H\_Wellsite\_Layout\_20181110170427.pdf

### Comments:

## Section 10 - Plans for Surface Reclamation

**Type of disturbance:** New Surface Disturbance

**Multiple Well Pad Name:** CASCADE 29 FEDERAL

**Multiple Well Pad Number:** W2W2 PAD 1

### Recontouring attachment:

Cascade\_29\_Fed\_W2W2\_Pad\_1\_Interim\_Reclaim\_20181110170559.pdf

**Drainage/Erosion control construction:** To control and prevent potentially contaminated precipitation from leaving the pad site, a perimeter berm and settlement pond will be installed. Contaminated water will be removed from pond, stored in waste tanks, and disposed of at a state approved facility. Standing water or puddles will not be allowed. Drainage ditches would be established and maintained on the pad and along access roads to divert water away from operations. Natural drainage areas disturbed during construction would be re-contoured to near original condition prior to construction. Erosion Control Best Management Practices would be used where necessary and consist of seeding, fiber rolls, water bars, silt fences, and temporary diversion dikes. Areas disturbed during construction that are no longer needed for operations would be obliterated, re-contoured to near original condition prior to construction. Erosion Control Best Management Practices would be used where necessary and consist of seeding, fiber rolls, water bars, silt fences, and temporary diversion dikes. Areas disturbed during construction that are no longer needed for operations would be obliterated, re-contoured, and reclaimed to near original condition to re-establish natural drainage.

**Drainage/Erosion control reclamation:** All disturbed and re-contoured areas would be reseeded according to specifications. Approved seed mixtures would be certified weed free and consist of grasses, forbs, or shrubs similar to the surrounding area. Compacted soil areas may need to be obliterated and reclaimed to near natural conditions by re-contouring all slopes to facilitate and re-establish natural drainage.

**Wellpad long term disturbance (acres):** 3.36

**Wellpad short term disturbance (acres):** 3.583

**Access road long term disturbance (acres):** 9.657

**Access road short term disturbance (acres):** 0

**Pipeline long term disturbance (acres):** 20.78

**Pipeline short term disturbance (acres):** 0

**Other long term disturbance (acres):** 20.99

**Other short term disturbance (acres):** 0

**Total long term disturbance:** 63.76

**Total short term disturbance:** 3.583

**Disturbance Comments:** Road: 14,483', Power: 13,032', SWD: 5,043', Gas Sales: 4,760', Oil Pipeline: 5.016', Flow/Gas Lift: 6,484', Temp Water Route: 27,237', West Zone CTB 1: 5.235 acres, West Zone CTB 2: 5.209 acres, East Zone CTB 1: 5.267 acres, East Zone CTB 2: 5.277 acres.

**Reconstruction method:** After well plugging, all disturbed areas would be returned to the original contour or a contour that blends with the surrounding landform including roads unless the surface owner requests that they be left intact. In consultation with the surface owners it will be determined if any gravel or similar materials used to reinforce an area are to be removed, buried, or left in place during final reclamation. Salvaged topsoil, if any, would be re-spread evenly over the surfaces to be re-vegetated. As necessary, the soil surface would be prepared to provide a seedbed for re-establishment of desirable vegetation. Site preparation may include gouging, scarifying, dozer track-walking, mulching, or fertilizing.

**Reclamation, Re-vegetation, and Drainage:** All disturbed and re-contoured areas would be reseeded using techniques outlined under Phase I and II of this plan or as specified by the land owner. Approved seed mixtures would be certified weed free and consist of grasses, forbs, or shrubs similar to the surrounding area. Compacted soil areas may need to be obliterated and reclaimed to near natural conditions by re-contouring all slopes to facilitate and re-establish natural drainage.

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Topsoil redistribution:** Salvaged topsoil, if any, would be re-spread evenly over the surfaces to be re-vegetated.

**Soil treatment:** As necessary, the soil surface would be prepared to provide a seedbed for re-establishment of desirable vegetation. Site preparation may include gouging, scarifying, dozer track-walking, mulching or fertilizing.

**Existing Vegetation at the well pad:**

**Existing Vegetation at the well pad attachment:**

**Existing Vegetation Community at the road:**

**Existing Vegetation Community at the road attachment:**

**Existing Vegetation Community at the pipeline:**

**Existing Vegetation Community at the pipeline attachment:**

**Existing Vegetation Community at other disturbances:**

**Existing Vegetation Community at other disturbances attachment:**

**Non native seed used?** NO

**Non native seed description:**

**Seedling transplant description:**

**Will seedlings be transplanted for this project?** NO

**Seedling transplant description attachment:**

**Will seed be harvested for use in site reclamation?** NO

**Seed harvest description:**

**Seed harvest description attachment:**

## Seed Management

### Seed Table

**Seed type:**

**Seed source:**

**Seed name:**

**Source name:**

**Source address:**

**Source phone:**

**Seed cultivar:**

**Seed use location:**

**PLS pounds per acre:**

**Proposed seeding season:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

Seed Summary	
Seed Type	Pounds/Acre

**Total pounds/Acre:**

**Seed reclamation attachment:**

**Operator Contact/Responsible Official Contact Info**

**First Name:**

**Last Name:**

**Phone:**

**Email:**

**Seedbed prep:**

**Seed BMP:**

**Seed method:**

**Existing invasive species?** NO

**Existing invasive species treatment description:**

**Existing invasive species treatment attachment:**

**Weed treatment plan description:** N/A

**Weed treatment plan attachment:**

**Monitoring plan description:** N/A

**Monitoring plan attachment:**

**Success standards:** N/A

**Pit closure description:** N/A

**Pit closure attachment:**

**Section 11 - Surface Ownership**

**Disturbance type:** WELL PAD

**Describe:**

**Surface Owner:** BUREAU OF LAND MANAGEMENT

**Other surface owner description:**

**BIA Local Office:**

**BOR Local Office:**

**COE Local Office:**

**DOD Local Office:**

**NPS Local Office:**

**State Local Office:**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Military Local Office:**

**USFWS Local Office:**

**Other Local Office:**

**USFS Region:**

**USFS Forest/Grassland:**

**USFS Ranger District:**

### Section 12 - Other Information

**Right of Way needed? YES**

**Use APD as ROW? YES**

**ROW Type(s):** 281001 ROW - ROADS, 285003 ROW - POWER TRANS, 288100 ROW - O&G Pipeline, 288101 ROW - O&G Facility Sites, 288103 ROW - Salt Water Disposal Pipeline/Facility, 288104 ROW - Salt Water Disposal ApIn/Fac-FLPMA, 289001 ROW- O&G Well Pad, FLPMA (Powerline), Other

### ROW Applications

**SUPO Additional Information:** Surface disturbance will be the same for Flow/Gas lift, Sales/Buyback, Oil, SWD & Power for all Cascade 29 Federal Wells. 4 battery pads & battery road disturbances will be the same for all Cascade 29 Fed Wells. roads to well will be the same for Cascade 29 Fed 15H, 16H & 17H.

**Use a previously conducted onsite? YES**

**Previous Onsite information:** Onsite with BLM (Jeff Robertson) and Cimarex (Barry Hunt) on June 19, 2018

### Other SUPO Attachment

Cascade\_29\_Fed\_CTB\_Gas\_Sales\_ROW\_20181110172157.pdf

Cascade\_29\_Fed\_CTB\_Oil\_Pipeline\_ROW\_20181110172227.pdf

Cascade\_29\_Fed\_W2W2\_PAD\_1\_Public\_Access\_20181110172308.pdf

Cascade\_29\_Fed\_CTB\_SWD\_ROW\_20181110172334.pdf

Cascade\_29\_Fed\_W2W2\_PAD\_1\_Road\_Description\_20181110172418.pdf

Cascade\_29\_Fed\_W2W2\_Temp\_Water\_Route\_20181110172420.pdf

Cascade\_29\_Fed\_Flow\_Line\_Gas\_Lift\_ROW\_20181110172503.pdf

Cascade\_29\_Fed\_Power\_ROW\_20181110172523.pdf

Cascade\_29\_Fed\_17H\_Pkt\_for\_Jeff\_2\_20181110172925.pdf

Cascade\_29\_Fed\_17H\_SUPO\_20190408091103.pdf

Cascade\_29\_Fed\_17H\_Pkt\_for\_Jeff\_1\_20190408091516.pdf



U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## PWD Data Report

08/06/2019

APD ID: 10400036215

Submission Date: 11/14/2018

Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

Well Type: OIL WELL

Well Work Type: Drill

### Section 1 - General

Would you like to address long-term produced water disposal? NO

### Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options? NO

Produced Water Disposal (PWD) Location:

PWD surface owner:

PWD disturbance (acres):

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Describe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Lined pit Monitor description:**

**Lined pit Monitor attachment:**

**Lined pit: do you have a reclamation bond for the pit?**

**Is the reclamation bond a rider under the BLM bond?**

**Lined pit bond number:**

**Lined pit bond amount:**

**Additional bond information attachment:**

### **Section 3 - Unlined Pits**

**Would you like to utilize Unlined Pit PWD options? NO**

**Produced Water Disposal (PWD) Location:**

**PWD disturbance (acres):**

**PWD surface owner:**

**Unlined pit PWD on or off channel:**

**Unlined pit PWD discharge volume (bbl/day):**

**Unlined pit specifications:**

**Precipitated solids disposal:**

**Describe precipitated solids disposal:**

**Precipitated solids disposal permit:**

**Unlined pit precipitated solids disposal schedule:**

**Unlined pit precipitated solids disposal schedule attachment:**

**Unlined pit reclamation description:**

**Unlined pit reclamation attachment:**

**Unlined pit Monitor description:**

**Unlined pit Monitor attachment:**

**Do you propose to put the produced water to beneficial use?**

**Beneficial use user confirmation:**

**Estimated depth of the shallowest aquifer (feet):**

**Does the produced water have an annual average Total Dissolved Solids (TDS) concentration equal to or less than that of the existing water to be protected?**

**TDS lab results:**

**Geologic and hydrologic evidence:**

**State authorization:**

**Unlined Produced Water Pit Estimated percolation:**

**Unlined pit: do you have a reclamation bond for the pit?**

**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Is the reclamation bond a rider under the BLM bond?**

**Unlined pit bond number:**

**Unlined pit bond amount:**

**Additional bond information attachment:**

#### **Section 4 - Injection**

**Would you like to utilize Injection PWD options?** NO

**Produced Water Disposal (PWD) Location:**

**PWD surface owner:**

**PWD disturbance (acres):**

**Injection PWD discharge volume (bbl/day):**

**Injection well mineral owner:**

**Injection well type:**

**Injection well number:**

**Injection well name:**

**Assigned injection well API number?**

**Injection well API number:**

**Injection well new surface disturbance (acres):**

**Minerals protection information:**

**Mineral protection attachment:**

**Underground Injection Control (UIC) Permit?**

**UIC Permit attachment:**

#### **Section 5 - Surface Discharge**

**Would you like to utilize Surface Discharge PWD options?** NO

**Produced Water Disposal (PWD) Location:**

**PWD surface owner:**

**PWD disturbance (acres):**

**Surface discharge PWD discharge volume (bbl/day):**

**Surface Discharge NPDES Permit?**

**Surface Discharge NPDES Permit attachment:**

**Surface Discharge site facilities information:**

**Surface discharge site facilities map:**

#### **Section 6 - Other**

**Would you like to utilize Other PWD options?** NO

**Produced Water Disposal (PWD) Location:**

**PWD surface owner:**

**PWD disturbance (acres):**

**Other PWD discharge volume (bbl/day):**



**Operator Name:** CIMAREX ENERGY COMPANY

**Well Name:** CASCADE 29 FEDERAL

**Well Number:** 17H

**Other PWD type description:**

**Other PWD type attachment:**

**Have other regulatory requirements been met?**

**Other regulatory requirements attachment:**



U.S. Department of the Interior  
BUREAU OF LAND MANAGEMENT

## Bond Info Data Report

08/06/2019

APD ID: 10400036215

Submission Date: 11/14/2018

Operator Name: CIMAREX ENERGY COMPANY

Well Name: CASCADE 29 FEDERAL

Well Number: 17H

Well Type: OIL WELL

Well Work Type: Drill

[Show Final Text](#)

### Bond Information

Federal/Indian APD: FED

BLM Bond number: NMB001188

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment: