

PECOS DISTRICT DRILLING CONDITIONS OF APPROVAL

OPERATOR'S NAME:	Marathon Oil Permian LLC
LEASE NO.:	NMNM013647
WELL NAME & NO.:	Cave Lion Federal 26 35 5 WD 10H
SURFACE HOLE FOOTAGE:	287'/S & 1811'/W
BOTTOM HOLE FOOTAGE:	150'/N & 2313'/W
LOCATION:	Section 5, T.26 S., R.35 E., NMPM
COUNTY:	Lea County, New Mexico

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

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 13-3/8 inch surface casing shall be set at approximately 1165 feet (a minimum of 25 feet 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 1/3rd casing with fluid while running intermediate casing to maintain collapse safety factor.

2. The minimum required fill of cement behind the 9-5/8 inch 1st 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 7 inch 2nd intermediate casing is:

- Cement should tie-back at least 200 feet into previous casing string. Operator shall provide method of verification.

4. The minimum required fill of cement behind the 5 1/2 x 4-1/2 inch production casing is: Cement should tie-back 200' into the previous casing. Operator shall provide method of verification.

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 **10,000 (10M) psi.**

Variance approved to use a 5M annular. The annular must be tested to full working pressure (5000 psi.)

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. **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. **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 2nd 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 (one log per well pad is acceptable) 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. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.

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. The casing integrity test can be done (prior to the cement setting up) immediately after bumping the plug.
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: The flex line must meet the requirements of API 16C. 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. 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.
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, except the casing pressure test can be initiated immediately after bumping the plug (only applies to single stage cement jobs).

- c. The tests shall be done by an independent service company utilizing a test plug. The results of the test shall be reported to the appropriate BLM office.
- 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. All tests are required to be recorded on a calibrated test chart. A copy of the BOP/BOPE test chart and a copy of independent service company test will be submitted to the appropriate BLM office.
- f. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes. This test shall be performed prior to the test at full stack pressure.
- g. 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.

Waste Minimization Plan (WMP)

In the interest of resource development, submission of additional well gas capture development plan information is deferred but may be required by the BLM Authorized Officer at a later date.

ZS 102218

**PECOS DISTRICT
SURFACE USE
CONDITIONS OF APPROVAL**

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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.

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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 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.

A leak detection plan will be submitted to the BLM Carlsbad Field Office for approval prior to pipeline installation. The method could incorporate gauges to detect pressure drops, siting 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.

VI. CONSTRUCTION

A. NOTIFICATION

The BLM shall administer compliance and monitor construction of the access road and well pad. Notify the Carlsbad Field Office at (575) 234-5909 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 Carlsbad Field Office at (575) 234-5972.

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 twenty (20) feet in width. The maximum width of surface disturbance, when constructing the access road, shall not exceed thirty (30) 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

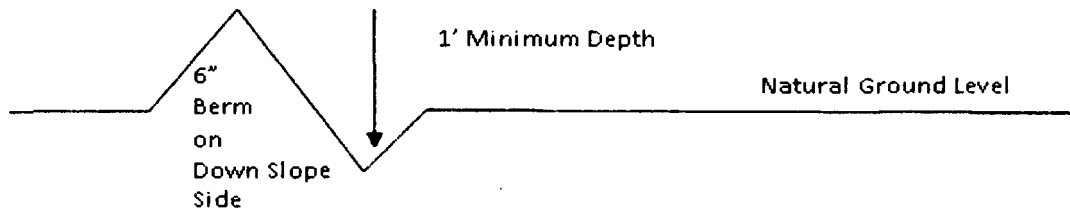
Vehicle turnouts shall be constructed on the road. Turnouts shall be intervisible with interval spacing distance less than 1000 feet. Turnouts shall conform to Figure 1; cross section and plans for typical road construction.

Drainage

Drainage control systems shall be constructed on the entire length of road (e.g. ditches, sidehill outslowing and insloping, lead-off 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.

Cross Section of a Typical 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 %);

Formula for Spacing Interval of Lead-off Ditches

Example - On a 4% road slope that is 400 feet long, the water flow shall drain water into a lead-off ditch. Spacing interval shall be determined by the following formula:

$$400 \text{ foot road with } 4\% \text{ road slope: } \frac{400'}{4\%} + 100' = 200' \text{ lead-off ditch interval}$$

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.

Livestock Watering Requirement

Any damage to structures that provide water to livestock throughout the life of the well, caused by operations from the well site, must be immediately corrected by the operator. The operator must notify the BLM office (575-234-5972) and the private surface landowner or the grazing allotment holder if any damage occurs to structures that provide water to livestock.

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

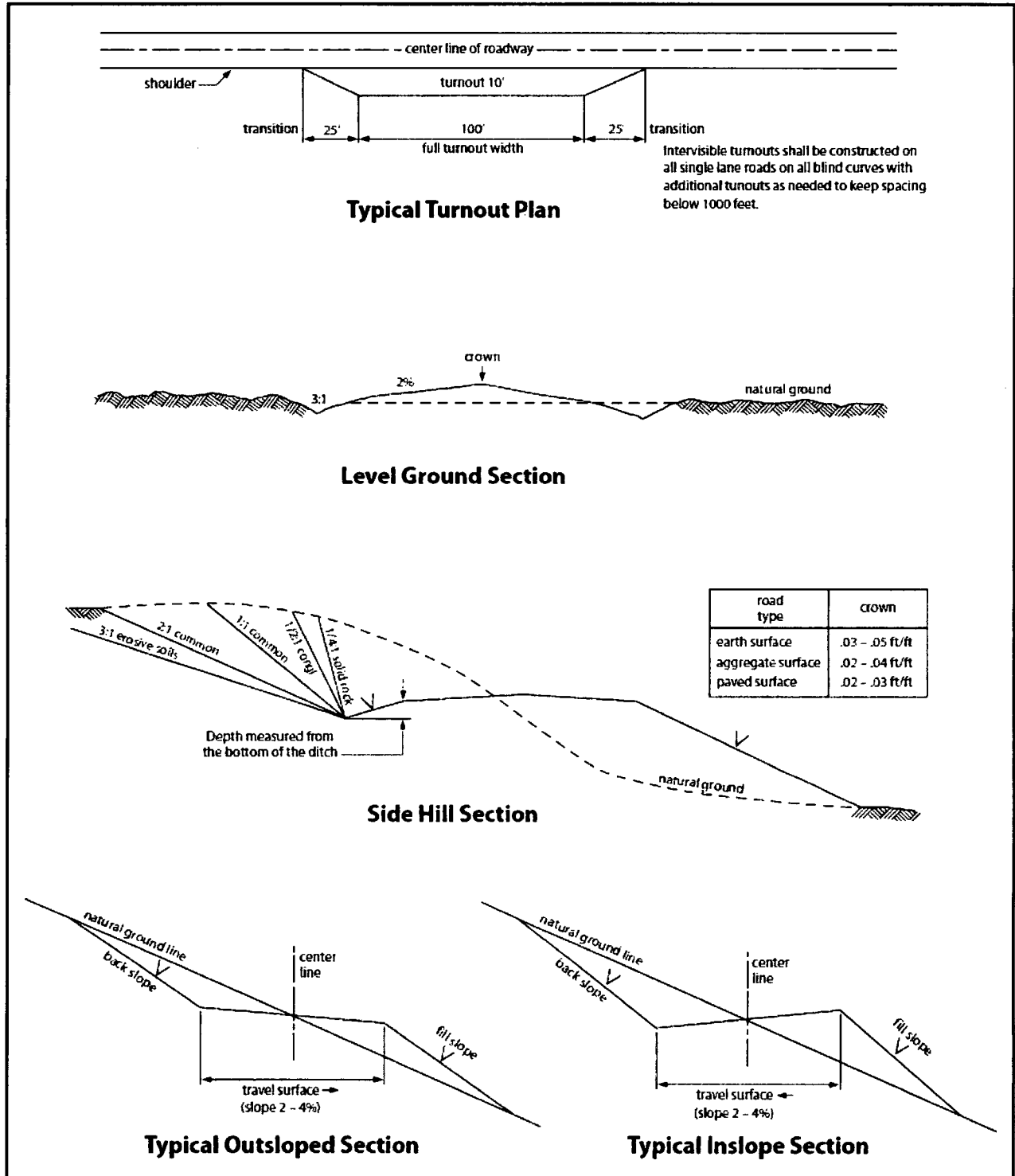


Figure 1. Cross-sections and plans for typical road sections representative of BLM resource or FS local and higher-class roads.

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).

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

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 shall be done in accordance with State law(s) and within nine (9) months prior to purchase. Commercial seed shall be either certified or registered seed. The seed container shall 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). 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. Seeding shall be repeated until a satisfactory stand is established as determined by the Authorized Officer. Evaluation of growth may 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

11/09/2018

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: Melissa Szudera

Signed on: 06/04/2018

Title: REGULATORY COMPLIANCE REPRESENTATIVE

Street Address: 5555 San Felipe St.

City: Houston

State: TX

Zip: 77057

Phone: (713)296-3179

Email address: mszudera@marathonoil.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

11/09/2018

APD ID: 10400030832

Submission Date: 06/06/2018

Operator Name: MARATHON OIL PERMIAN LLC

Well Name: CAVE LION FEDERAL 26 35 5 WD

Well Number: 10H

Well Type: OIL WELL

Well Work Type: Drill



[Show Final Text](#)

Section 1 - General

APD ID: 10400030832

Tie to previous NOS?

Submission Date: 06/06/2018

BLM Office: CARLSBAD

User: Melissa Szudera

Title: REGULATORY COMPLIANCE

Federal/Indian APD: FED

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

Lease number: NMNM013647

Lease Acres: 1281.31

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: MARATHON OIL PERMIAN LLC

Operator letter of designation:

Operator Info

Operator Organization Name: MARATHON OIL PERMIAN LLC

Operator Address: 5555 San Felipe St.

Zip: 77056

Operator PO Box:

Operator City: Houston

State: TX

Operator Phone: (713)629-6600

Operator Internet Address:

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: CAVE LION FEDERAL 26 35 5 WD

Well Number: 10H

Well API Number:

Field/Pool or Exploratory? Field and Pool

Field Name: WOLFCAMP

Pool Name: BRADLEY;
WOLFCAMP (GAS)

Operator Name: MARATHON OIL PERMIAN LLC

Well Name: CAVE LION FEDERAL 26 35 5 WD

Well Number: 10H

Is the proposed well in an area containing other mineral resources? NATURAL GAS,OIL

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: CAVE Number: 300-2

LION FEDERAL 26 35 5

Well Class: HORIZONTAL

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: 12.2 Miles

Distance to nearest well: 1330 FT

Distance to lease line: 0 FT

Reservoir well spacing assigned acres Measurement: 320 Acres

Well plat: App 2 signed CAVE_LION_FEDERAL_26_35_5_WD_10H_REV2_CERT_FORM_C_102_2018092
5124409.pdf

Well work start Date: 08/01/2018

Duration: 30 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83

Vertical Datum: NAVD88

Survey number: 21653

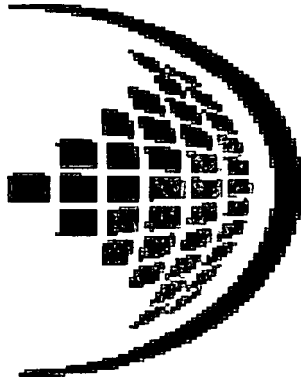
	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
SHL Leg #1	287	FSL	181 1	FWL	26S	35E	5	Aliquot SESW	32.06587 63	- 103.3921 75	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 013647	326 3	0	0
KOP Leg #1	0	FSL	231 5	FWL	26S	35E	5	Aliquot SESW	32.06545 47	- 103.3905 465	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 013647	- 988 5	131 84	131 48
PPP Leg #1	150	FSL	231 5	FWL	26S	35E	5	Aliquot SESW	32.06549 74	- 103.3905 461	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 013647	- 104 58	140 84	137 21

Operator Name: MARATHON OIL PERMIAN LLC

Well Name: CAVE LION FEDERAL 26 35 5 WD

Well Number: 10H

	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	150	FNL	231 3	FWL	26S	35E	5	Aliquot NENW	32.07919 9	- 103.3905 761	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 013647	- 104 58	185 96	137 21
BHL Leg #1	150	FNL	231 3	FWL	26S	35E	5	Aliquot NENW	32.07919 9	- 103.3905 761	LEA	NEW MEXI CO	NEW MEXI CO	F	NMNM 013647	- 104 58	185 96	137 21



TOTAL SAFETY

MARATHON OIL COMPANY

CAVE LION FEDERAL 26-35-5

WXY Well # 6H

TB Well # 8H

WA Well # 9H

WD Well # 10H

SHL: 247' FSL & 1780' FWL of Unit Letter 'N', Section 5, T-26S, R-35E
BHL: 150' FNL & 1322' FWL of Unit Letter 'C', Section 5, T-26S, R-35E

LEA County, New Mexico

Rig: H&P 480

04-13-2018

**EMERGENCY MEDICAL PROCEDURES
DO NOT PANIC
REMAIN CALM-THINK**

1. HOLD YOUR BREATH. (DO NOT INHALE, STOP BREATHING)
2. PUT ON BREATHING APPARATUS. (NOTE: DO NOT ATTEMPT RESCUE UNTIL YOU HAVE PUT ON BREATHING APPARATUS.)
3. REMOVE VICTIM (S) TO FRESH AIR AS QUICKLY AS POSSIBLE.
4. BE SURE YOU HAVE MOVED VICTIM OUT OF CONTAMINATED AREA BEFORE REMOVING YOUR RESPIRATOR.
5. APPLY MOUTH-TO-MOUTH ARTIFICIAL RESPIRATION, WHICH IS MORE EFFECTIVE, WHILE SOMEONE ELSE GETS THE OXYGEN RESUSCITATOR. RENDER OXYGEN RESUSCITATION ONLY IF PORPERLY TRAINED IN ITS USE.
6. PROVIDE FOR PROMPT TRANSPORTATION TO HOSPITAL AND CONTUNUE GIVING ARTIFICIAL RESPIRATION IF NEEDED.
7. HOSPITAL (S) OR MEDICAL FACILITIES NEED TO BE INFORMED BEFOREHAND, OF THE POSSIBILITY OF H2S GAS POISONING, NO MATTER HOW REMOTE THE POSSIBLITY IS.

Lea Regional Medical Center
5419 N Lovington Hwy, Hobbs, NM 88240
AMBULANCE
FIRE DEPARTMENT- HOBBS, NM
POLICE - HOBBS, NM

(575)492-5000

911

(575) 397-9308

(575) 397-9265

8. NOTIFY EMERGENCY-ROOM PERSONEL THAT THE VICTIM (S) HAVE POSSIBLY BEEN EXPOSED TO H2S GAS POISONING.

**TOTAL SAFETY INC
1420 East Greene St.
Carlsbad, NM 88220**

THIS H2S DRILLING OPERATIONS PLAN WAS PREPARED BY:

**Sean Chamblee
Strategic Account Manager
Cell: 713-703-6295**

**TOTAL SAFETY INC
1420 East Greene St
Carlsbad, NM 88220
Phone:432-561-5049**

H2S DRILLING OPERATIONS PLAN INDEX

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INTRODUCTION

H2S DRILLING OPERATIONS PLAN

This Drilling Operations Plan was written specifically for:

**MARATHON OIL COMPANY
3122 NATIONAL PARKS HIGHWAY
CALRSBAD, NM 88220**

Action Plan for Accidental Release of H2S
CAVE LION FEDERAL 26-35-5
WXY Well # 6H
TB Well # 8H
WA Well # 9H
WD Well # 10H

LEA COUNTY, NM

Information, provisions and practices, as set forth in this plan, may be subject to revision and/or updating.

04-13-2018

**MARATHON OIL COMPANY
3122 NATIONAL PARKS HIGHWAY
CARLSBAD, NM 88220**

CAVE LION FEDERAL 26-35-5

WXY Well # 6H

TB Well # 8H

WA Well # 9H

WD Well # 10H

LEA COUNTY, NEW MEXICO

Directions:

FROM THE MARATHON OFFICE AT 411 TIDWELL, CARLSBAD, NM HEAD SOUTH ON TIDWELL RD TOWARD US HWY 285 N FOR 0.2 MILES. TURN LEFT ONTO US HWY 285 S, HEADING SOUTHEAST, FOR 5.1 MILES TO NM HWY 31. TURN LEFT ONTO NM HWY 31, HEADING EAST. FOR 7.7 MILES TO NM HWY 128 EAST. TURN RIGHT ONTO NM HWY 128E, HEADING EAST, FOR 38.7 MILES TO BATTLE AXE ROAD (COUNTY ROAD 2). TURN RIGHT ONTO BATTLE AXE ROAD, HEADING SOUTH, FOR 0.3 MILES. KEEP RIGHT TO STAY ON BATTLE AXE ROAD. HEADING WEST FOR 2.6 MILES. TURN RIGHT TO STAY ON BATTLE AXE ROAD, HEADING WEST FOR 9.3 MILES TO A CALICHE ROAD. TURN LEFT ON CALICHE ROAD, HEADING SOUTH FOR 0.7 MILES TO A "T" INTERSECTION OF CALICHE ROAD. TURN LEFT ONTO CALICHE ROAD, HEADING EAST FOR 8.07 MILES TO A 2 TRACK ROAD. CONTINUE ON THE 2 TRACK ROAD FOR 0.5 MILES TO THE PROPOSED LEASE ROAD FOR THE CAVE LION FEDERAL 26-35-5 WELL PAD.

**GPS Coordinates 32.07920366 -103.39377740
LEA COUNTY, NEW MEXICO**

PURPOSE OF PLAN: The purpose of this plan is to safeguard the lives of the public, contract personnel and company personnel in the event of equipment failure or disasters during drilling or completion operations in formations which may contain Hydrogen Sulfide Gas, H₂S.

As a precautionary measure, this Drilling Plan has been prepared to assure the safety of all concerned, should a disaster occur. However, the Oil Company Representative may have specified materials and practices for the drilling or completion of this well, which supercede the minimum requirements as outlined in this plan.

Definitions: For the purpose of this plan the following definitions are to be referred to:

Controlled Release – Any release that is planned and occurs during normal operations. A controlled release is managed per the procedures outlined in this section.

Uncontrolled Release – Any release that is unplanned and not immediately contained utilizing established shut-in procedures. An uncontrolled release is normally associated with a loss of well control.

SCBA – (Self Contained Breathing Apparatus) – A full-face mask respirator with a supplied positive pressure air source.

Donned SCBA – When it is required per this plan to “don” a SCBA, personnel will be 100% masked up and be on supplied breathing air.

SCBA On Person – When it is required per this plan to have SCBA “on person”, personnel will be required to wear the SCBA equipment - but not be masked up.

“Qualified Buddy” – Person who has been fit tested and is trained and is familiar with the requirements of donning an SCBA. This person will provide immediate assistance to another person who may be utilizing an SCBA or SkaPack in an IDLH atmosphere in the event of an emergency situation.

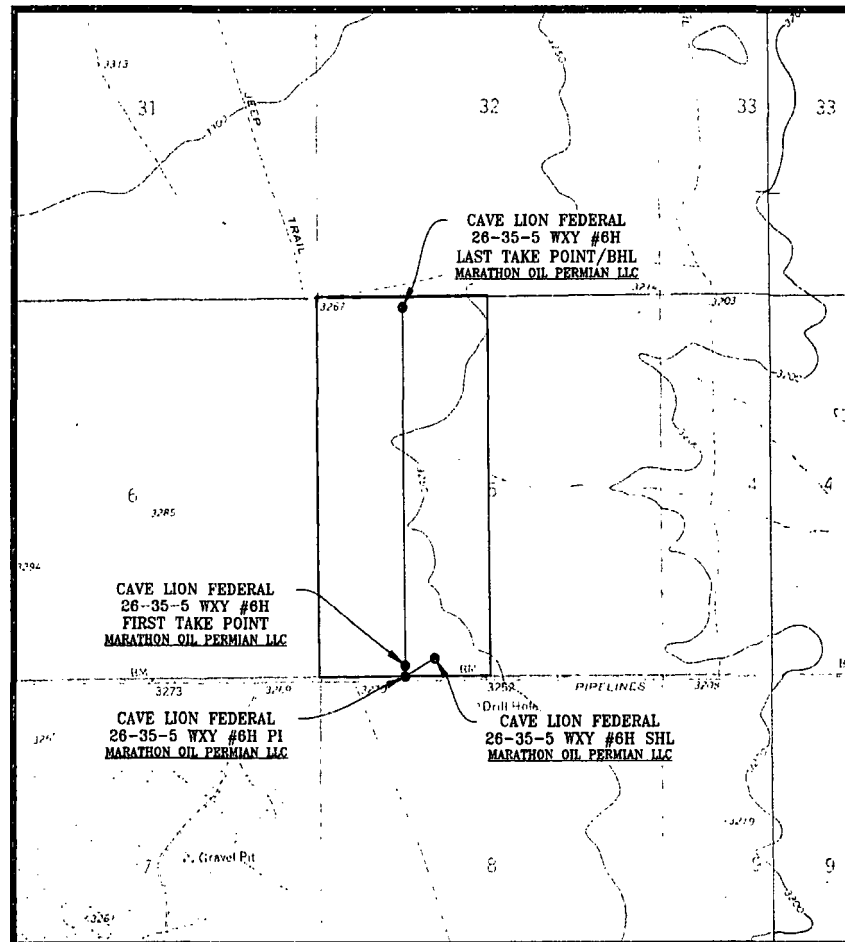
In Scope Personnel – Rig Personnel who will be working or otherwise present in potential H2S release areas, including the rig floor, cellar, pits, and shaker areas. This would not include 3rd party contractors who do not have a function, besides evacuating the rig, during an emergency condition such as during a well control event or H2S / LEL alarm. All qualified personnel that have a function to shut a well in during an emergency will be considered In-Scope per this plan

Out of Scope Personnel –. All personnel that are not in scope will be Out of Scope per the definition of this plan

H2S Office – Onsite office trailer space or vehicle that will be designated as the H2S office

Marathon H2S Plan Custodian – Marathon HES Advisor, Supervisor or Technician that has been specifically assigned per the authorization page of this plan to maintain this document.

LOCATION VERIFICATION MAP

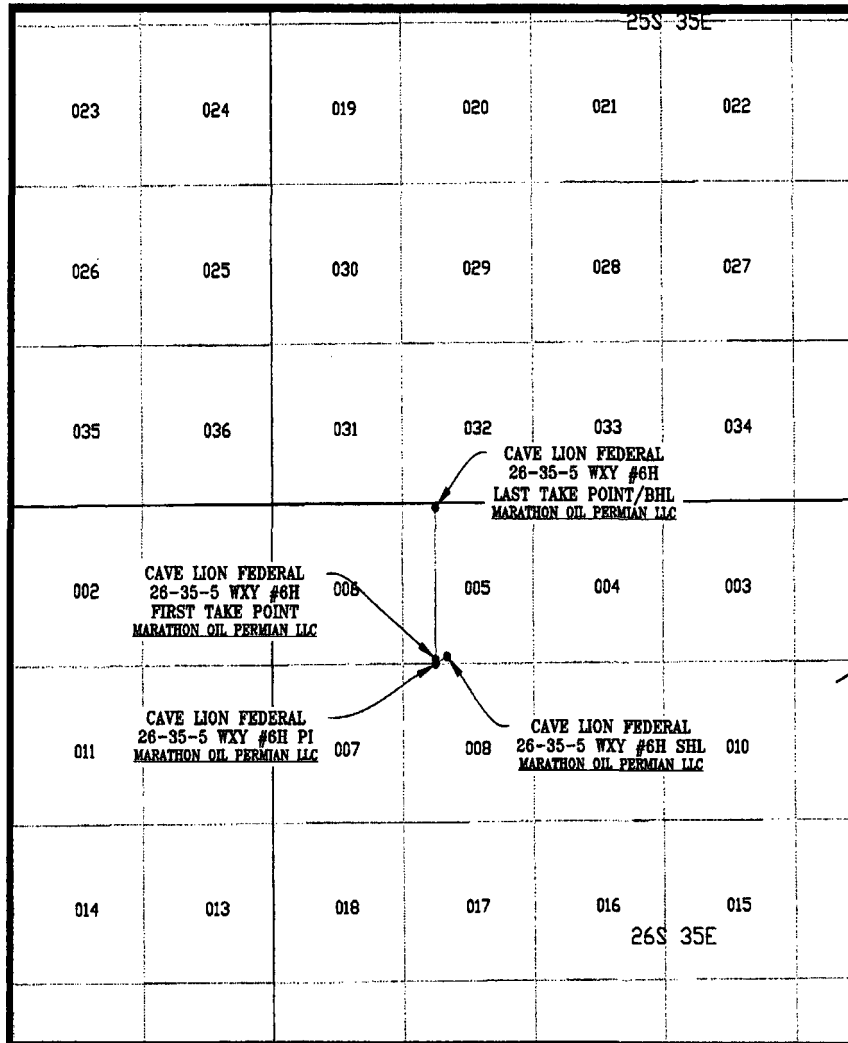


SEC. 5 TWP. 26-S RGE. 35-E
SURVEY: N.M.P.M.
COUNTY: LEA
DESCRIPTION: 247 FSL & 1780' FWL
ELEVATION: 3265'
OPERATOR: MARATHON OIL PERMIAN LLC
LEASE: CAVE LION FEDERAL 26-35-5
U.S.G.S. TOPOGRAPHIC MAP: ANDREWS PLACE, N.M.

SCALE: 1" = 2000'
CONTOUR INTERVAL = 10'

PREPARED BY:
K-SQUARED GLOBAL, LLC
1309 LOUISVILLE AVENUE, MONROE, LA 71201
318-323-6800 OFFICE
JOB No. R3757_003

VICINITY MAP



SFC. 5 TWP. 26-S RGE. 35-E
 SURVEY: N.M.P.M.
 COUNTY: LEA
 DESCRIPTION: 247 FSL. & 1780' FWL
 ELEVATION: 3265'
 OPERATOR: MARATHON OIL PERMIAN LLC
 LEASE: CAVE LION FEDERAL 26-35-5
 U.S.G.S. TOPOGRAPHIC MAP: ANDREWS PLACE, N.M.

SCALE: 1" = 1 MILE

PREPARED BY:
 R-SQUARED GLOBAL, LLC
 1309 LOUISVILLE AVENUE, MONROE, LA 71201
 318-323-6900 OFFICE
 JOB No. R3757_003

SAFETY EQUIPMENT

All H2S related Safety Equipment must be installed, tested and Operational at a depth of 500 feet above, or 3 days prior to penetrating the first zone expected to contain H2S.

SAFETY EQUIPMENT PROVIDED BY TOTAL SAFETY INC.

<u>QTY</u>	<u>EQUIPMENT</u>
6 each	30-minute self-contained breathing apparatus
6 each	ELSA Escape Packs
1 Lot	Sufficient low-pressure airline hose with quick connects
1	6 Channel fixed H2S monitor
4	H2S Sensors (Loc determined at rig up – General: Cellar, Shale Shaker, floor/driller area)
4	Explosion proof Alarm Station (1-Drill Floor, 1- Pits/Shakers, 1- Generators, 1 Quarters area)
10	Personal H2S Monitors
1	Gastec pump type gas detector
Set	Various range of H2s & SO2 detector tubes
2 each	Windsocks w/frames and poles
1 Set	H2S and briefing area signs
1 Set	Well condition signs and flags
1	Flare Gun & Flares

TYPE OF EQUIPMENT AND STORAGE LOCATIONS

1. There will be six 30-minute self-contained breathing apparatus on location. They will be positioned as follows: Two at Briefing Area #1 Two at Briefing Area #2, Two at rig dog house. SCBA Facepieces will be equipped with voice amplifiers for effective means of communication when using protective breathing apparatus.
2. There will be six Escape-type packs on location. One for the Derrickman. One on the Shaker. One at the bottom of rig house stairway and spares.
3. A Gastec, pump type, gas detector with low and high range detector tubes for H₂S and SO₂ will be located in the doghouse
4. Two Briefing Areas will be designated at opposite ends of the location.
5. The Briefing Area most upwind is designated as the Safety Briefing Area #1. In an emergency, personnel must assemble at this upwind area for instructions from their supervisor.
6. The H₂S 'Safety' trailer provided by Total Safety, Inc. will contain a cascade system of at least 5 each -300 C.F. air cylinders that will provide a continuous air supply to air lines located on the rig. Note: This trailer will **Only** be provided if H₂S conditions require the use of the Air Trailer. (If Required)
7. Two windsocks will be installed so as to be visible from all parts of the location.
8. A well condition warning sign will be displayed at the location entrance to advise of current operating conditions. The condition signs must be at least 200' from the entrance but not more than 500' away.
9. A list of emergency telephone numbers will be kept on rig floor, tool pusher's trailer, the Oil Company's trailer and in the "safety" trailer (if Provided).
10. The primary means of communication will be cell phones.

11. A barricade will be available to block the entrance to location should an emergency occur. In most cases the use of a vehicle is used to block the entrance.

12. A 6-channel H₂S monitor will be located in the doghouse. The 3 sensors will be installed: one on the shale shaker, one at the Cellar, one at the rig floor.

13. An undulating high and low pitch siren and light will be installed on the derrick "A" leg.

14. If H₂S concentration reach 10 ppm an explosion-proof bug blower (fan) will be installed under the rig floor to disperse possible accumulations of H₂S.

15. Any time it is necessary to flare gas containing H₂S, a Sulfur Dioxide monitor or Detector tubes will be used to determine SO₂ concentrations.

16. A flare gun with flares will also be provided in the event it is necessary to ignite the well from a safe distance.

OPERATING PROCEDURES

BLOWOUT PREVENTION MEASURES DURING DRILLING

1. Blowout Prevention Requirements:

All BOP equipment shall meet the American Petroleum Institute specifications as to materials acceptable for H₂S service and tested accordingly (or to BLM specifications).

2. Drilling String Requirements:

All drill string components are to be of material that meets the American Petroleum Institute's specifications for H₂S service. All drill string components should be inspected to IADC critical service specifications prior to running in well.

GAS MONITORING EQUIPMENT

1. A continuous H₂S detection system, consisting of three H₂S detectors and an audible/visual warning system will be in operating during all phases of this H₂S Drilling Operations Plan. The detection system will be adjusted and calibrated such that an H₂S exposure of 10 ppm or higher (at any sensor) will trigger the audible and visual portion (wailing or yelping siren) of the warning system (i.e. H₂S continually present at or above threshold levels) a trained operator or H₂S supervisor will monitor the H₂S detection system.

2. When approaching or completing H₂S formations, crewmembers may attach personnel H₂S monitors to their person.

3. Hand held H₂S sampling gas detectors will be used to check areas not covered by automatic monitoring equipment.

CREW TRAINING AND PROTECTION

1. All personnel working at the well site will be properly trained in accordance with the general training requirements outlined in the API Recommended Practices for Safe Drilling of Wells Containing H₂S. The training will cover, but will not be limited to, the following:

- a. General information of H₂S AND SO₂ GAS
- b. Hazards of these gases
- c. Safety equipment on location
- d. Proper use and care of personal protective equipment
- e. Operational procedures in dealing with H₂S gas
- f. Evacuation procedures
- g. First aid, reviving an H₂S victim, toxicity, etc.
- h. Designated Safe Briefing Areas
- i. Buddy System
- j. Regulations
- k. Review of Drilling Operations Plan

2. Initial training shall be completed when drilling reaches, a depth of 500' above or 3 days prior to penetrating (whichever comes first) the first zone containing or expected to contain H₂S. It must also include a review of the site specific Drilling Operations Plan and, if applicable, the Public Protections Plan.

3. Weekly H₂S and well control drills for all personnel on each working crew shall be conducted.

4. All training sessions and drills shall be recorded on the driller's log or its equivalent.

5. Safety Equipment:

As outlined in the Safety Equipment index, H₂S safety protection equipment will be available to/or assigned each person on location.

6. One person (by job title) shall be designated and identified to all on-site personnel as the person primarily responsible for the overall operation of the on-site safety and training programs. This will be the PIC

METALLURGICAL CONSIDERATIONS

1. Steel drill pipe used in H₂S environments should have yield strength of 95,000psi or less because of potential embrittlement problems. Must conform to the current National Association of Corrosion Engineers (NACE) Standard MR-0175-90, Material Requirement, Sulfide Stress Cracking Resistant Metallic Material for Oil Field Equipment. Drill stem joints near the top of the drill string are normally under the highest stress levels during drilling and do not have the protection of elevated down hole temperatures. These factors should be considered in design of the drill string. Precautions should be taken to minimize drill string stress caused by conditions such as excessive dogleg severity, improper torque, whip, abrasive wear or tool joints and joint imbalance. American Petroleum Institute, Bulletin RR 7G, will be used as a guideline for drill string precautions.
2. Corrosion inhibitors may be applied to the drill pipe or to the mud system as an additional safeguard.
3. Blowout preventors should meet or exceed the recommendations for H₂S service as set forth in the latest edition of API RI 53.

MUD PROGRAM AND TREATING

1. It is of utmost importance that the mud be closely monitored for detection of H₂S and reliability of the H₂S treating chemicals.
2. Identification and analysis of sulfides in the mud and mud filtrates will be carried out per operators prescribed procedures.
3. The mud system will be pre-treated with Zinc Carbonate, Ironite Sponge or similar chemicals of H₂S control prior to drilling into the H₂S bearing formation. Sufficient quantities of corrosion inhibitor should be on location to treat the drill string during Drill Stem Test Operations. Additionally, Aqua Ammonia should be on hand to treat the drill string for crew protection, should H₂S be encountered while tripping string following drill stem testing

WELL CONTROL EQUIPMENT

1. Flare System

- a. A flare system shall be designed and installed to safely gather and burn H₂S Bearing gas.
 - 1. Flare lines shall be located as far from the operating site as feasible and in a manner to compensate for wind changes.
 - 2. The flare line mouth shall be located not less then 150' from wellbore.
 - 3. Flare lines shall be straight unless targeted with running tees.
 - 4. Flare Gun & Flares to ignite the well

2. Remote Controlled Choke

- a. A remote controlled choke shall be installed for all H₂S drilling and where feasible for completion operations. A remote controlled valve may be used in lieu of this requirement for completions operations.

3. Mud-gas separators and rotating heads shall be installed and operable for all exploratory wells.

OPERATING CONDITIONS

A Well Condition Sign and Flag will be posted on all access roads to the location. The sign shall be legible and large enough to be read by all persons entering the well site and be placed a minimum of 200' but no more than 500' from the well site which allows vehicles to turn around at a safe distance prior to reaching the site.

DEFINITION OF WARNING FLAGS

1. Condition:
GREEN-NORMAL OPERATIONS
Any operation where the possibility of encountering H₂S exists but no H₂S has been detected.
2. Condition:
YELLOW-POTENTIAL DANGER, CAUTION
Any operation where the possibility of encountering H₂S exists and in all situations where concentrations of H₂S are detected in the air below the threshold level (10ppm)
 - i. Cause of condition:
 - *Circulating up drill breaks
 - *Trip gas after trip
 - *Circulating out gas on choke
 - *Poisonous gas present, but below threshold concentrations
 - *Drill stem test
 - b. Safety Action:
 - *Check safety equipment and keep it with you
 - *Be alert for a change in condition
 - *Follow instructions
3. Condition:
RED-EXTREME DANGER
Presence of H₂S at or greater than 10ppm. Breathing apparatus must be worn.
 - a. Safety action:

***MASK UP.** All personnel will have protective breathing equipment with them. All nonessential personnel will move to the Safe Briefing Area and stay there until instructed to do otherwise. All essential Qualified Personnel, using the "Buddy System" (those necessary to maintain control of the well) will don breathing apparatus to perform operations related to well control.

The decision to ignite the well is the responsibility of the operator's on-site representative and should be made only as a last resort, when it is clear that:

- *human life is endangered**

- *there is no hope of controlling the well under prevailing conditions**

Order evacuation of local people within the danger zone. Request help from local authorities, State Police, Sheriff's Dept. and Service Representative.

CIRCULATING OUT KICK (WAIT AND WEIGHT METHOD)

If it is suspected that H₂S is present with the gas whenever a kick is taken, the wait and weight method of eliminating gas and raising the mud will be followed.

1. Wait and Weight Method:

a. The wait and Weight Method is:

- *increase density of mud in pits to 'kill' weight mud.**

- *open choke and bring pump to initial circulating pressure by holding casing pressure at original valve until pump is up to predetermined speed.**

- *when initial circulating pressure is obtained on drill pipe, zero pump stroke counter and record time.**

- *reduce drill pipe pressure from initial circulating pressure to final circulating pressure by using pump strokes and/or time according to graph**

- *when 'kill' weight mud is at the bit, hold final circulating pressure until kill weight mud is to surface.**

b. If a kick has occurred, the standard blowout procedure will be followed and the wait and weight method will be used to kill the well. When the well has been put on the choke and circulation has been established, the following safety procedure must be established.

- *determine when gas is anticipated to reach surface.**

- *all non-essential personnel must be moved to safe briefing area
- *all remaining personnel will check out and keep with them their protective breathing apparatus.
- *mud men will see that the proper amount of H₂S scavenging chemical is in the mud and record times checked
- *make sure ignition flare is burning and valves are open to designated flare stacks

CORING OPERATIONS IN H₂S BEARING ZONES

1. Personal protective breathing apparatus will be worn from 10 to 15 stands in advance of retrieving the core barrel. Cores to be transported should be sealed and marked to the presence of H₂S.
 - a. Yellow Caution Flag will be flown at the well condition sign.
 - b. The “NO SMOKING” rule will be enforced

DRILL STEM TESTING OF H₂S ZONES

1. The DST subsurface equipment will be suitable for H₂S service as recommended by the API
2. Drill stem testing of H₂S zone will be conducted in daylight hours
3. All non-essential personnel will be moved to an established safe area or off location
4. The “NO SMOKING” rule will be enforced
5. DST fluids will be circulated through a remote controlled choke and a separator to permit flaring of gas. A continuous pilot light will be used.
6. A yellow or red flag will be flown at entrance to location depending on present gas condition
7. If warranted, the use of Aqua Ammonia for neutralizing the toxicity of H₂S from drill string
 - a. During drill stem tests adequate Filming Amine for H₂S corrosion and Aqua Ammonia for neutralizing H₂S should be on location.
8. On completion of DST, if H₂S contaminated formation fluids or gases are present in drill string, floor workers will be masked up before test valve is removed from drill string and continue “mask

on" conditions until such time that readings in the work area do not exceed 10ppm of H₂S gas.

EMERGENCY PROCEDURES

SOUNDING ALARM

In case of an alarm the crews will muster up at the designated area. Total Safety will be dispatched with (2) HES Techs who are to go in under protective breathing air and check the alarm readings and sniff ambient air for the presence of H₂S.

By no means are the Co. Rep or HES Advisor to go in under air with the HES Tech. If there is another method in place where the Rig Manager is to go in with the Tech we need to ensure that the rig company has cleared them and that they are properly trained.

1. The fact is to be instilled in the minds of all rig personnel that the sounding alarm means only one thing: H₂S IS PRESENT. Everyone is to proceed to his assigned station and the contingency plan is put into effect.

DRILLING CREW ACTIONS

1. All personnel will don their protective breathing apparatus. The driller will take necessary precautions as indicated in operating procedures.
2. The Buddy system will be implemented. All personnel will act upon directions from the operator's on-site representative.
3. If there are non-essential personnel on location, they will move off location.
4. Entrance to the location will be patrolled, and the proper well condition flag will be displayed at the entrance to the location.

RESPONSIBILITIES OF PERSONNEL

In order to assure the proper execution of this plan, it is essential that one person be responsible for and in complete charge of implementing these procedures. The responsibility will be as follows:

1. The operator's on-site representative or his assistant
2. Contract Tool Pusher

STEPS TO BE TAKEN

In the event of an accidental release of a potentially hazardous volume of H₂S, the following steps will be taken:

1. Contact by the quickest means of communications: the main offices of Oil Company & Contractor as listed on the preceding page.
2. An assigned crewmember will blockade the entrance to the location. No unauthorized personnel will be allowed entry into the location.
3. The operator's on-site representative will remain on location and attempt to regain control of the well.
4. The drilling company's rig superintendent will begin evacuation of those persons in immediate danger. He will begin by telephoning residents in the danger zone. In the event of no contact by telephoning, the tool pusher will proceed at once to each dwelling for a person-to-person contact. In the event the tool pusher cannot leave the location, he will assign a responsible crewmember to proceed in the evacuation off local residents. Upon arrival, the Sheriff's Department and TOTAL SAFETY personnel will aid in further evacuation.

LEAK IGNITION

Leak Ignition procedure: (used to ignite a leak in the event it becomes necessary to protect the public)

1. Two men, the operator's on-site representative and the contractor's rig superintendent or TOTAL SAFETY's representative(s), wearing self-contained pressure demand air masks must determine the perimeter of the flammable area. This should be done with one man using an H₂S detector and the other one using a flammable gas detector. The flammable perimeter should be established at 30% to 40% of the lower flammable limits.
2. After the flammable perimeter has been established and all employees and citizens have been removed from the area, the ignition team should move to the up-wind area of the leak perimeter and fire a flare into the area if the leak isn't ignited on the first attempt, move in 20 to 30 feet and fire again. Continue moving in and firing until the

leak is ignited or the flammable gas detector indicates the ignition team is moving into the hazardous area. If trouble is incurred in igniting the leak by firing toward the leak, try firing 40 degrees to 90 degrees to each side of the area where you have been firing. If still no ignition is accomplished ignite the copper line burner and push it into the leak area. This should accomplish ignition. If ignition is not possible due to the makeup of the gas, the toxic leak perimeter must be established and maintained to insure evacuation is completed and continue until the emergency is secure.

3. The following equipment and man-power will be required to support the ignition team:
 - a. one flare gun with flares
 - b. four pressure demand air packs
 - c. two nylon ropes tied to the ignition team
 - d. two men in a clear area equipped with air packs
 - e. portable propane bottle with copper line
4. The person with the final authority to ignite the well.

GENERAL EQUIPMENT

1. Two areas on the location will be designated as Briefing Areas. The one that is upwind from the well will be designated as the "Safe Briefing Area"
2. In the case of an emergency, personnel will assemble in the upwind area as per prior instructions from the operator's representative.
3. The H2S "Safety" trailer provided by TOTAL SAFETY will contain at least 5 air cylinders, a resuscitator, one 30-minute air pack and will have a windsock.
4. Two windsocks will be installed.
5. A condition warning sign will be displayed at the location entrance.
6. A list of emergency telephone numbers will be kept on the rig floor, tool pusher's trailer and the Oil Company's trailer.
7. Two barricades will be available to block the entrance to location.
8. An undulating high and low pitch siren will be installed.
9. A telephone line or mobile phone will be available at the well site for incoming and outgoing communications.

CRITICAL OPERATIONS

These guidelines will be implemented during H2S alarms on drilling locations with the intent of minimizing catastrophic damage of “**critical tasks**” **ONLY** and exposure of field personnel (e.g. cement in the stack). We will wait on Total Safety (or H2S Safety Company) for all other alarm events that aren’t defined as “critical”.

- 1.) H2S alarm sounds, crews secure well, and muster based off of wind direction. MOC Operation, MOC Safety, and H2S service company notification will be made and representative from the H2S Service Company is in route to location.
- 2.) Two qualified in scope personnel will don SCBA, utilizing the "buddy system", and respond to area of H2S alarm location to verify the presence of H2S utilizing hand held four gas analyzer or other approved and provided method.
- 3.) If no H2S is found, the “all clear” will be authorized by the Marathon Oil Drilling Superintendent and HES to resume operations. H2S service company will still be required to respond.

Note: Personnel will return to muster area awaiting H2S service company and additional equipment if H2S is verified.

Note: Personnel will be trained annually on H2S and the elements of this guideline. The MOC HES Advisor and Co Man will receive hands on training from a H2S service company field tech, on how to properly identify the location of the alarming sensor, and the proper method for checking the alarmed area.

APPENDICES

EMERGENCY & MEDICAL FACILITIES:

Marathon Oil Corporation Emergency Numbers			
Brent Evans	Drilling Manager	blevans@marathonoil.com	832 967-8474
Mark Bly	Drilling Superintendent	permiansuper@marathonoil.com	281-840-0467
Chad Butler	Drilling Superintendent	permiansuper@marathonoil.com	281-840-0467
Jacob Beaty	Drilling Engineer	jabeaty@marathonoil.com	713-296-1915
Camilo Arias	Drilling Engineer	aarias@marathonoil.com	713-296-2985
Noah Adams	HES Professional	njadams@marathonoil.com	713-591-4068
Nick Rogers	Lead HES Advisor	permiandches@marathonoil.com	281-659-3734
Scott Doughty	Lead HES Advisor	permiandches@marathonoil.com	281-659-3734
H&P 480	Company Man	Hp480@marathonoil.com	281-768-9946
H&P 498	Company Man	Hp498@marathonoil.com	281-745-0771
H&P 441	Company Man	Hp441@marathonoil.com	
H&P 423	Company Man	Hp423@marathonoil.com	
Precision 594	Company Man	PD594@marathonoil.com	
H&P 480	HES Advisor	Hp480hes@marathonoil.com	
H&P 498	HES Advisor	Hp498hes@marathonoil.com	
H&P 441	HES Advisor	HP441hes@marathonoil.com	
H&P 423	HES Advisor	Hp423hes@marathonoil.com	
Precision 594	HES Advisor	PD594hes@marathonoil.com	

Emergency Services Area Numbers: Or Call 911			
Sheriff (Eddy County, NM)	575-887-7551	New Mexico Poison Control	800-222-1222
Sheriff (Lea County, NM)	575-396-3611	Border Patrol (Las Cruces, NM)	575-528-6600
New Mexico State Police	575-392-5580/5588	Energy Minerals & Natural Resources Dept.	575-748-1283
Carlsbad Medical Center	575-887-4100	Environmental Health Dept.	505-476-8600
Lea Regional Medical Center	575-492-5000	OSHA (Santa Fe, NM)	505-827-2855
Police (Carlsbad, NM)	575-885-2111		
Police (Hobbs, NM)	575-392-9265		
Fire (Carlsbad, NM)	575-885-3124		
Fire (Hobbs, NM)	575-397-9308		
Ambulance Service	911	TOTAL SAFETY H2S – SAFETY SERVICES	432-561-5049

For Life Flight, 1st dial “911” They will determine nearest helicopter and confirm the need for helicopter.

ADDITIONAL INFORMATION

A. HYDROGEN SULFIDE ESSAY

A deadly enemy of those people employed in the petroleum industry, this gas can paralyze or kill quickly. At least part of the answer lies in education in the hazards, symptoms, characteristics, safe practices, treatment, and the proper use of personal protective equipment.

Hydrogen Sulfide Hazards

The principal hazard to personnel is asphyxiation or poisoning by inhalation. Hydrogen Sulfide is a colorless, flammable gas having an offensive odor and a sweetish taste. It is highly toxic and doubly hazardous because it is heavier than air (specific gravity = 1.19). Its offensive odor, like that of a rotten egg, has been used as an indicator by many old timers in the oil field, but is not a reliable warning of the presence of gas in a dangerous concentration because people differ greatly in their ability to detect smells. Where high concentrations are encountered, the olfactory nerves are rapidly paralyzed, diluting the sense of smell as a warning indicator. A concentration of a few hundredths of one percent higher than that causing irritation can cause asphyxia and death—in other words there is a very narrow margin between consciousness and unconsciousness, and between unconsciousness and death.

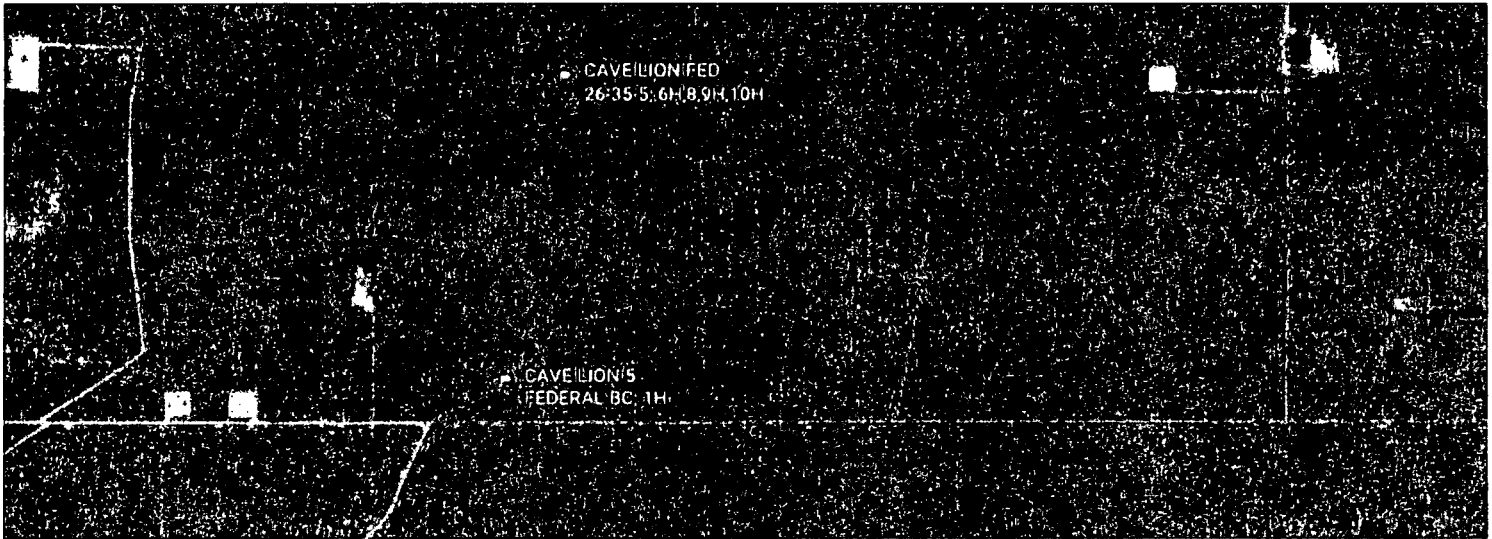
Where high concentrations cause respiratory paralysis, spontaneous breathing does not return unless artificial respiration is applied. Although breathing is paralyzed the heart may continue beating for ten minutes after the attack.

Physiological Systems

ACUTE: results in almost instantaneous asphyxia, with seeming respiratory paralysis acute poisoning, or strangulation, may occur after even a few seconds inhalation of high concentration and results in panting respiration, pallor, cramps, paralysis and almost immediate loss of consciousness with extreme rapidity from respiratory and cardiac paralysis. One breath of a sufficiently high concentration may have this result.

RESIDENTS AND LANDOWNERS

AERIAL SATELLITE MAP



RESIDENCE

THERE ARE NO RESIDENCE WITHIN 1 MILE RADIUS OF WELL LOCATION.

SUBACUTE: RESULTS IN IRRITATION, PRINCIPALLY OF THE EYES, PERSISTENT COUGH, TIGHTENING OR BURNING IN THE CHEST AND SKIN IRRITATION FOLLOWED BY DEPRESSION OF THE CENTRAL NERVOUS SYSTEM. The eye irritation ranges in severity from mild conjunctivitis to swelling and bulging of the conjunctiva photophobia (abnormal intolerance of light) and temporary blindness.

TREATMENT

1. Victim should be removed to fresh air immediately by rescuers wearing respiratory protective equipment. Protect yourself while rescuing.
2. If the victim is not breathing, begin immediately to apply artificial respiration. (See other chart for the chances for life after breathing has stopped.) If a resuscitator is available let another employee get it and prepare for use.
3. Treat for shock, keep victim warm and comfortable
4. Call a doctor, in all cases, victims of poisoning should be attended by a physician.

CHARACTERISTICS OF H₂S

1. Extremely Toxic (refer to chart for toxicity of Hydrogen Sulfide).
2. Heavier than air. Specific gravity= 1.19.
3. Colorless, has odor of rotten eggs.
4. Burns with a blue flame and produces sulfur Dioxide (SO₂) gas, which is very irritating to eyes and lungs. The SO₂ is also toxic and can cause serious injury.
5. H₂S is almost as toxic as hydrogen cyanide.
6. H₂S forms explosive mixture, with air between 4.3% and 46% by volume.
7. Between 5 and 6 times as toxic as carbon monoxide.
8. Produces irritation to eyes, throat, and respiratory tract.
9. Threshold Limit Value (TLV) maximum of eight hours' exposure without protective respiratory equipment-10ppm.

Safe Practices

If you are faced with an H₂S problem in your operations, the following safe practices are recommended:

1. Be absolutely sure all concerned are familiar with the hazards concerning H₂S and how to avoid it.
2. All employees should know how to operate and maintain respiration equipment.
3. Be able to give and demonstrate artificial respiration.
4. Post areas where there is poisonous gas with suitable warning signs.
5. Be sure all new employees are thoroughly schooled before they are sent to the field-tomorrow may be too late.
6. Teach men to avoid gas whenever possible-work on the windward side, have fresh air mask available.
7. Never let bad judgment guide you-wear respiratory equipment when gauging tanks, etc. Never try to hold your breath in order to enter a contaminated atmosphere.
8. In areas of high concentration, a two-man operation is preferred.
9. Never enter a tank, cellar or other enclosed place where gas can accumulate without proper respiratory protective equipment and a safety belt secured to a lifeline held by another person outside.
10. Always check out danger areas first with H₂S detectors before allowing anyone to enter. DO NOT TRY TO DETERMINE THE PRESENCE OF GAS BY its ODOR.
11. Wear proper respiratory equipment for the job at hand. Never take a chance with equipment with which you are unfamiliar. If in doubt, consult your supervisor.
12. Carry out practice drills every month with emergency and maintenance breathing air equipment. Telling or showing a group how to operate equipment is not enough-make them show you.
13. Maximum care should be taken to prevent the escape of fumes into the air of working places by leaks, etc.
14. Communication such as radio and telephones should be provided for those people employed where H₂S may be present.

TOXICITY OF HYDROGEN SULFIDE TO MEN

<u>H2S Per Cent (PPM)**</u>	<u>0 - 2 Minutes</u>	<u>0 - 15 Minutes</u>	<u>15 - 30 Minutes</u>	<u>30 Minutes to 1 hour</u>	<u>1 - 4 Hours</u>	<u>4 - 8 Hours</u>	<u>4 - 48 Hours</u>
0.005 (50) 0.010 (100)				Mild Conjunctiv- ities; respiratory tract irritation			
0.010 (100) 0.015 (150)		Coughing; irritation of eyes; loss of sense of smell	Disturbed respiration; pain in eyes; sleepiness	Throat	Salivation & mucous dis- charge; sharp pain in eyes; coughing	Increased symptoms*	Hemorrhage & death*
0.015 (150) 0.020 (200)		Loss of sense of smell	Throat & eye irritation	Throat & eye irritation	Difficult breathing; blurred vision; light & shy	Serious irritating effects	Hemorrhage & death*
0.025 (250) 0.035 (350)	Irritation of eyes; loss of sense of smell	Irritation of eyes	Painful secretion of tears; wear- iness	Light & shy; nasal catarrh; pain in eyes; difficult breathing	Hemorrhage & death		
0.035 (350)		Irritation of eyes; loss of sense of smell	Difficult respiration coughing; irritation of eyes	Increased irritation of eyes and nasal tract; dull pain head; weariness; light shy	Dizziness weak- ness; increased irritation; death	Death*	
0.050 (500)	Coughing collapse & unconscious- ness	Respiratory disturbances; irritation of eyes; collapse	Serious eye irritation; palpitation of heart; few cases of death*	Severe pain in eyes and head dizziness; trem- bling of extre- mities; great weakness & death*			
0.060 (600) 0.070 (700) 0.808 (800) 0.100 (1000) 0.150 (1500)	Collapse * unconscious- ness; death*	Collapse* unconscious- ness; death*					

*Data secured from experiments of dogs which have susceptibility similar to men. **PPM - parts per million

CAVE LION WELLS

Cave Lion 5 Fed
1H & 5H

Cave Lion Fed
26 35 5
6,8,9,10

Cave Lion Fed
26 35 5
12,14,15,18



Marathon Oil
Lea County, NM
Cave Lion Fed 26-35-5 (6-8-9-10)
WD #10H
Prelim Plan B
GL: 3263' + KB: 26.5' (H&P480)

US State Plane 1927 (Exact solution)
NAD 1927 (NADCON CONUS)
Datum 1958
New Mexico East 3001
Mean Sea Level

RKB Elevation: Well @ 3289.50ft (GL: 3263' + KB: 26.5' (H&P480))

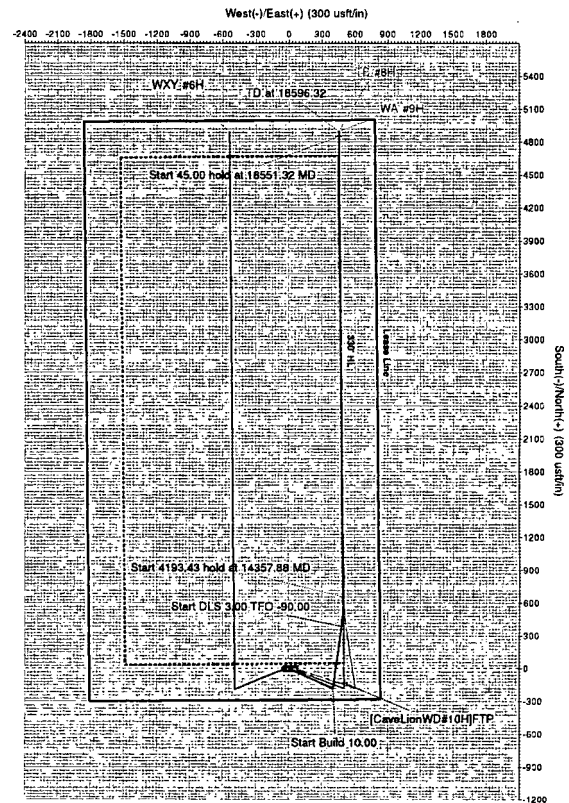
N-S	E-W	Northing	Easting	Latitude	Longitude	Spot
0.00	0.00	368917.06	791694.71	32.065750	-103.391713	

SECTION DETAILS

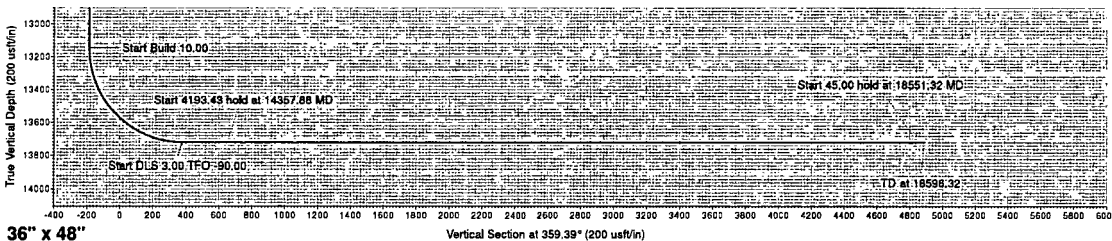
Sec	MD	Inc	Adj	TVD	N-S	E-W	Diag	Vsect
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	1800.00	0.00	0.00	1800.00	0.00	0.00	0.00	0.00
3	2300.00	10.00	114.32	2297.47	-17.92	39.66	2.00	-18.34
4	4358.07	10.00	114.32	4324.27	-185.08	365.34	0.00	-188.96
5	4858.07	0.00	0.00	4857.74	-183.00	405.00	2.00	-187.30
6	13184.38	0.00	0.00	13184.04	-183.00	405.00	0.00	-187.30
7	14084.38	90.00	7.60	13721.00	384.32	480.78	10.00	375.78
8	14357.88	90.00	359.39	13721.00	657.69	497.45	3.00	652.36
9	18551.32	90.00	359.39	13721.00	4850.89	453.15	0.00	4845.79
10	18596.32	90.00	359.39	13721.00	4895.89	452.67	0.00	4890.79

WELLBORE TARGET DETAILS (MAP CO-ORDINATES)

Name	TVD	N-S	E-W	Northing	Easting
CaveLionWD#10HJFTP	0.00	-133.45	505.79	368783.61	792200.50
CaveLionWD#10HJKOP	13148.04	-183.00	405.00	368734.06	792099.71
CaveLionWD#10HJLTP/BHL	13721.00	4850.89	453.15	393767.95	792147.88



Target Line: 13721' TVD @ 0° VS, 90° INC



36" x 48"



Azimuth to Grid North
True North: 0.50°
Magnetic North: 6.20°
Magnetic Field
Strength: 47129.5nT
Dip Angle: 59.73°
Date: 4/10/2018
Model: ICDGM

Azimuth Corrections

Total Magnetic Corr. (M to G): 6.20°

Declination (M to T): 6.70° East

Database:	WellPlanner1	Local Co-ordinate Reference:	Well WD #10H
Company:	Marathon Oil	TVD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Project:	Lea County, NM	MD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Site:	Cave Lion Fed 26-35-5 (6-8-9-10)	North Reference:	Grid
Well:	WD #10H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Prelim Plan B		

Project	Lea County, NM		
Map System:	US State Plane 1927 (Exact solution)	System Datum:	Mean Sea Level
Geo Datum:	NAD 1927 (NADCON CONUS)		
Map Zone:	New Mexico East 3001		

Site	Cave Lion Fed 26-35-5 (6-8-9-10)				
Site Position:		Northing:	388,877.06 usft	Latitude:	32.065641
From:	Map	Easting:	791,664.71 usft	Longitude:	-103.391811
Position Uncertainty:	0.00 usft	Slot Radius:	13-3/16 "	Grid Convergence:	0.50 °

Well	WD #10H					
Well Position	+N/-S	40.00 usft	Northing:	388,917.06 usft	Latitude:	32.065750
	+E/-W	30.00 usft	Easting:	791,694.71 usft	Longitude:	-103.391713
Position Uncertainty		0.00 usft	Wellhead Elevation:		Ground Level:	3,263.00 usft

Wellbore	OH				
Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	HDGM	4/10/2018	6.70	59.73	47,828.20

Design	Prelim Plan B				
Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.00	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.00	0.00	0.00	359.39	

Plan Survey Tool Program		Date 4/18/2018			
Depth From (usft)	Depth To (usft)	Survey (Wellbore)	Tool Name	Remarks	
1	0.00	1,150.00 Prelim Plan B (OH)	MWD+IFR1 OWSG MWD + IFR1		
2	1,150.00	5,400.00 Prelim Plan B (OH)	MWD+IFR1 OWSG MWD + IFR1		
3	5,400.00	10,000.00 Prelim Plan B (OH)	MWD+IFR1 OWSG MWD + IFR1		
4	10,000.00	18,596.32 Prelim Plan B (OH)	MWD+IFR1 OWSG MWD + IFR1		

Database:	WellPlanner1	Local Co-ordinate Reference:	Well WD #10H
Company:	Marathon Oil	TVD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Project:	Lea County, NM	MD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Site:	Cave Lion Fed 26-35-5 (6-8-9-10)	North Reference:	Grid
Well:	WD #10H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Prelim Plan B		

Plan Sections

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	TFO (°)	Target
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00	
2,300.00	10.00	114.32	2,297.47	-17.92	39.66	2.00	2.00	0.00	114.32	
4,358.07	10.00	114.32	4,324.27	-165.08	365.34	0.00	0.00	0.00	0.00	
4,858.07	0.00	0.00	4,821.74	-183.00	405.00	2.00	-2.00	0.00	180.00	
13,184.38	0.00	0.00	13,148.04	-183.00	405.00	0.00	0.00	0.00	0.00	[CaveLionWD#10H]K
14,084.38	90.00	7.60	13,721.00	384.92	480.78	10.00	10.00	0.00	7.60	
14,357.89	90.00	359.39	13,721.00	657.69	497.45	3.00	0.00	-3.00	-90.00	
18,551.32	90.00	359.39	13,721.00	4,850.89	453.15	0.00	0.00	0.00	0.00	[CaveLionWD#10H]L
18,596.32	90.00	359.39	13,721.00	4,895.89	452.67	0.00	0.00	0.00	0.00	

Database: WellPlanner1
Company: Marathon Oil

Local Co-ordinate Reference: Well WD #10H
TVD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))

Project: Lea County, NM

MD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))

Site: Cave Lion Fed 26-35-5 (6-8-9-10)

North Reference: Grid

Well: WD #10H

Survey Calculation Method: Minimum Curvature

Wellbore: OH

Design: Prelim Plan B

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[CaveLionWD#10H]FTP									
100.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00
200.00	0.00	0.00	200.00	0.00	0.00	0.00	0.00	0.00	0.00
300.00	0.00	0.00	300.00	0.00	0.00	0.00	0.00	0.00	0.00
400.00	0.00	0.00	400.00	0.00	0.00	0.00	0.00	0.00	0.00
500.00	0.00	0.00	500.00	0.00	0.00	0.00	0.00	0.00	0.00
600.00	0.00	0.00	600.00	0.00	0.00	0.00	0.00	0.00	0.00
700.00	0.00	0.00	700.00	0.00	0.00	0.00	0.00	0.00	0.00
800.00	0.00	0.00	800.00	0.00	0.00	0.00	0.00	0.00	0.00
900.00	0.00	0.00	900.00	0.00	0.00	0.00	0.00	0.00	0.00
1,000.00	0.00	0.00	1,000.00	0.00	0.00	0.00	0.00	0.00	0.00
1,100.00	0.00	0.00	1,100.00	0.00	0.00	0.00	0.00	0.00	0.00
1,200.00	0.00	0.00	1,200.00	0.00	0.00	0.00	0.00	0.00	0.00
1,300.00	0.00	0.00	1,300.00	0.00	0.00	0.00	0.00	0.00	0.00
1,400.00	0.00	0.00	1,400.00	0.00	0.00	0.00	0.00	0.00	0.00
1,500.00	0.00	0.00	1,500.00	0.00	0.00	0.00	0.00	0.00	0.00
1,600.00	0.00	0.00	1,600.00	0.00	0.00	0.00	0.00	0.00	0.00
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00
1,800.00	0.00	0.00	1,800.00	0.00	0.00	0.00	0.00	0.00	0.00
1,900.00	2.00	114.32	1,899.98	-0.72	1.59	-0.74	2.00	2.00	0.00
2,000.00	4.00	114.32	1,999.84	-2.87	6.36	-2.94	2.00	2.00	0.00
2,100.00	6.00	114.32	2,099.45	-6.46	14.30	-6.61	2.00	2.00	0.00
2,200.00	8.00	114.32	2,198.70	-11.48	25.41	-11.75	2.00	2.00	0.00
2,300.00	10.00	114.32	2,297.47	-17.92	39.66	-18.34	2.00	2.00	0.00
2,400.00	10.00	114.32	2,395.95	-25.07	55.49	-25.66	0.00	0.00	0.00
2,500.00	10.00	114.32	2,494.43	-32.22	71.31	-32.98	0.00	0.00	0.00
2,600.00	10.00	114.32	2,592.91	-39.37	87.13	-40.30	0.00	0.00	0.00
2,700.00	10.00	114.32	2,691.39	-46.52	102.96	-47.62	0.00	0.00	0.00
2,800.00	10.00	114.32	2,789.87	-53.67	118.78	-54.93	0.00	0.00	0.00
2,900.00	10.00	114.32	2,888.35	-60.82	134.61	-62.25	0.00	0.00	0.00
3,000.00	10.00	114.32	2,986.83	-67.97	150.43	-69.57	0.00	0.00	0.00
3,100.00	10.00	114.32	3,085.31	-75.12	166.26	-76.89	0.00	0.00	0.00
3,200.00	10.00	114.32	3,183.79	-82.27	182.08	-84.21	0.00	0.00	0.00
3,300.00	10.00	114.32	3,282.27	-89.42	197.91	-91.53	0.00	0.00	0.00
3,400.00	10.00	114.32	3,380.75	-96.57	213.73	-98.84	0.00	0.00	0.00
3,500.00	10.00	114.32	3,479.23	-103.72	229.55	-106.16	0.00	0.00	0.00
3,600.00	10.00	114.32	3,577.72	-110.87	245.38	-113.48	0.00	0.00	0.00
3,700.00	10.00	114.32	3,676.20	-118.02	261.20	-120.80	0.00	0.00	0.00
3,800.00	10.00	114.32	3,774.68	-125.18	277.03	-128.12	0.00	0.00	0.00
3,900.00	10.00	114.32	3,873.16	-132.33	292.85	-135.44	0.00	0.00	0.00
4,000.00	10.00	114.32	3,971.64	-139.48	308.68	-142.75	0.00	0.00	0.00
4,100.00	10.00	114.32	4,070.12	-146.63	324.50	-150.07	0.00	0.00	0.00
4,200.00	10.00	114.32	4,168.60	-153.78	340.32	-157.39	0.00	0.00	0.00
4,300.00	10.00	114.32	4,267.08	-160.93	356.15	-164.71	0.00	0.00	0.00
4,358.07	10.00	114.32	4,324.27	-165.08	365.34	-168.96	0.00	0.00	0.00
4,400.00	9.16	114.32	4,365.61	-167.95	371.70	-171.90	2.00	-2.00	0.00
4,500.00	7.16	114.32	4,464.60	-173.80	384.63	-177.88	2.00	-2.00	0.00
4,600.00	5.16	114.32	4,564.01	-178.22	394.41	-182.41	2.00	-2.00	0.00
4,700.00	3.16	114.32	4,663.74	-181.20	401.03	-185.46	2.00	-2.00	0.00
4,800.00	1.16	114.32	4,763.67	-182.76	404.46	-187.05	2.00	-2.00	0.00
4,858.07	0.00	0.00	4,821.74	-183.00	405.00	-187.30	2.00	-2.00	0.00

Database: WellPlanner1
Company: Marathon Oil

Local Co-ordinate Reference:
TVD Reference:

Well WD #10H
Well @ 3289.50usft (GL: 3263' + KB: 26.5'
(H&P480))
Well @ 3289.50usft (GL: 3263' + KB: 26.5'
(H&P480))

Project: Lea County, NM

MD Reference:

Site: Cave Lion Fed 26-35-5 (6-8-9-10)

North Reference:

Well: WD #10H

Survey Calculation Method:

Wellbore: OH

Design: Prelim Plan B

Grid
Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N-S (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
4,900.00	0.00	0.00	4,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,000.00	0.00	0.00	4,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,100.00	0.00	0.00	5,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,200.00	0.00	0.00	5,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,300.00	0.00	0.00	5,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,400.00	0.00	0.00	5,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,500.00	0.00	0.00	5,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,600.00	0.00	0.00	5,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,700.00	0.00	0.00	5,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,800.00	0.00	0.00	5,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
5,900.00	0.00	0.00	5,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,000.00	0.00	0.00	5,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,100.00	0.00	0.00	6,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,200.00	0.00	0.00	6,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,300.00	0.00	0.00	6,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,400.00	0.00	0.00	6,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,500.00	0.00	0.00	6,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,600.00	0.00	0.00	6,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,700.00	0.00	0.00	6,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,800.00	0.00	0.00	6,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
6,900.00	0.00	0.00	6,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,000.00	0.00	0.00	6,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,100.00	0.00	0.00	7,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,200.00	0.00	0.00	7,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,300.00	0.00	0.00	7,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,400.00	0.00	0.00	7,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,500.00	0.00	0.00	7,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,600.00	0.00	0.00	7,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,700.00	0.00	0.00	7,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,800.00	0.00	0.00	7,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
7,900.00	0.00	0.00	7,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,000.00	0.00	0.00	7,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,100.00	0.00	0.00	8,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,200.00	0.00	0.00	8,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,300.00	0.00	0.00	8,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,400.00	0.00	0.00	8,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,500.00	0.00	0.00	8,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,600.00	0.00	0.00	8,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,700.00	0.00	0.00	8,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,800.00	0.00	0.00	8,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
8,900.00	0.00	0.00	8,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,000.00	0.00	0.00	8,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,100.00	0.00	0.00	9,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,200.00	0.00	0.00	9,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,300.00	0.00	0.00	9,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,400.00	0.00	0.00	9,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,500.00	0.00	0.00	9,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,600.00	0.00	0.00	9,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,700.00	0.00	0.00	9,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,800.00	0.00	0.00	9,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
9,900.00	0.00	0.00	9,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,000.00	0.00	0.00	9,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00

Database: WellPlanner1
Company: Marathon Oil

Project: Lea County, NM

Site: Cave Lion Fed 26-35-5 (6-8-9-10)
Well: WD #10H
Wellbore: OH
Design: Prelim Plan B

Local Co-ordinate Reference: Well WD #10H
TVD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
MD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
North Reference: Grid
Survey Calculation Method: Minimum Curvature

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
10,100.00	0.00	0.00	10,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,200.00	0.00	0.00	10,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,300.00	0.00	0.00	10,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,400.00	0.00	0.00	10,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,500.00	0.00	0.00	10,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,600.00	0.00	0.00	10,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,700.00	0.00	0.00	10,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,800.00	0.00	0.00	10,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
10,900.00	0.00	0.00	10,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,000.00	0.00	0.00	10,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,100.00	0.00	0.00	11,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,200.00	0.00	0.00	11,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,300.00	0.00	0.00	11,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,400.00	0.00	0.00	11,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,500.00	0.00	0.00	11,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,600.00	0.00	0.00	11,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,700.00	0.00	0.00	11,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,800.00	0.00	0.00	11,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
11,900.00	0.00	0.00	11,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,000.00	0.00	0.00	11,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,100.00	0.00	0.00	12,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,200.00	0.00	0.00	12,163.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,300.00	0.00	0.00	12,263.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,400.00	0.00	0.00	12,363.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,500.00	0.00	0.00	12,463.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,600.00	0.00	0.00	12,563.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,700.00	0.00	0.00	12,663.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,800.00	0.00	0.00	12,763.66	-183.00	405.00	-187.30	0.00	0.00	0.00
12,900.00	0.00	0.00	12,863.66	-183.00	405.00	-187.30	0.00	0.00	0.00
13,000.00	0.00	0.00	12,963.66	-183.00	405.00	-187.30	0.00	0.00	0.00
13,100.00	0.00	0.00	13,063.66	-183.00	405.00	-187.30	0.00	0.00	0.00
13,184.38	0.00	0.00	13,148.04	-183.00	405.00	-187.30	0.00	0.00	0.00
[CaveLionWD#10H]KOP									
13,200.00	1.56	7.60	13,163.66	-182.79	405.03	-187.09	10.00	10.00	0.00
13,250.00	6.56	7.60	13,213.52	-179.28	405.50	-183.59	10.00	10.00	0.00
13,300.00	11.56	7.60	13,262.88	-171.48	406.54	-175.79	10.00	10.00	0.00
13,350.00	16.56	7.60	13,311.37	-159.44	408.14	-163.77	10.00	10.00	0.00
13,400.00	21.56	7.60	13,358.61	-143.26	410.30	-147.62	10.00	10.00	0.00
13,450.00	26.56	7.60	13,404.25	-123.05	413.00	-127.44	10.00	10.00	0.00
13,500.00	31.56	7.60	13,447.94	-98.99	416.21	-103.41	10.00	10.00	0.00
13,550.00	36.56	7.60	13,489.35	-71.24	419.91	-75.70	10.00	10.00	0.00
13,600.00	41.56	7.60	13,528.16	-40.02	424.08	-44.53	10.00	10.00	0.00
13,650.00	46.56	7.60	13,564.08	-5.56	428.68	-10.12	10.00	10.00	0.00
13,700.00	51.56	7.60	13,596.83	31.87	433.67	27.25	10.00	10.00	0.00
13,750.00	56.56	7.60	13,626.17	71.98	439.02	67.30	10.00	10.00	0.00
13,800.00	61.56	7.60	13,651.86	114.48	444.69	109.74	10.00	10.00	0.00
13,850.00	66.56	7.60	13,673.73	159.03	450.64	154.23	10.00	10.00	0.00
13,900.00	71.56	7.60	13,691.59	205.31	456.81	200.43	10.00	10.00	0.00
13,950.00	76.56	7.60	13,705.31	252.95	463.17	248.00	10.00	10.00	0.00
14,000.00	81.56	7.60	13,714.80	301.59	469.66	296.57	10.00	10.00	0.00
14,050.00	86.56	7.60	13,719.97	350.87	476.23	345.78	10.00	10.00	0.00
14,084.38	90.00	7.60	13,721.00	384.92	480.78	379.78	10.00	10.00	0.00

Database: WellPlanner1
Company: Marathon Oil

Local Co-ordinate Reference: Well WD #10H
TVD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))

Project: Lea County, NM

MD Reference: Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))

Site: Cave Lion Fed 26-35-5 (6-8-9-10)

North Reference: Grid

Well: WD #10H

Survey Calculation Method: Minimum Curvature

Wellbore: OH

Design: Prelim Plan B

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,100.00	90.00	7.13	13,721.00	400.42	482.78	395.26	3.00	0.00	-3.00
14,200.00	90.00	4.13	13,721.00	499.93	492.59	494.65	3.00	0.00	-3.00
14,300.00	90.00	1.13	13,721.00	599.81	497.18	594.48	3.00	0.00	-3.00
14,357.89	90.00	359.39	13,721.00	657.69	497.45	652.36	3.00	0.00	-3.00
14,400.00	90.00	359.39	13,721.00	699.80	497.00	694.47	0.00	0.00	0.00
14,500.00	90.00	359.39	13,721.00	799.80	495.95	794.47	0.00	0.00	0.00
14,600.00	90.00	359.39	13,721.00	899.79	494.89	894.47	0.00	0.00	0.00
14,700.00	90.00	359.39	13,721.00	999.79	493.83	994.47	0.00	0.00	0.00
14,800.00	90.00	359.39	13,721.00	1,099.78	492.78	1,094.47	0.00	0.00	0.00
14,900.00	90.00	359.39	13,721.00	1,199.78	491.72	1,194.47	0.00	0.00	0.00
15,000.00	90.00	359.39	13,721.00	1,299.77	490.66	1,294.47	0.00	0.00	0.00
15,100.00	90.00	359.39	13,721.00	1,399.76	489.61	1,394.47	0.00	0.00	0.00
15,200.00	90.00	359.39	13,721.00	1,499.76	488.55	1,494.47	0.00	0.00	0.00
15,300.00	90.00	359.39	13,721.00	1,599.75	487.50	1,594.47	0.00	0.00	0.00
15,400.00	90.00	359.39	13,721.00	1,699.75	486.44	1,694.47	0.00	0.00	0.00
15,500.00	90.00	359.39	13,721.00	1,799.74	485.38	1,794.47	0.00	0.00	0.00
15,600.00	90.00	359.39	13,721.00	1,899.74	484.33	1,894.47	0.00	0.00	0.00
15,700.00	90.00	359.39	13,721.00	1,999.73	483.27	1,994.47	0.00	0.00	0.00
15,800.00	90.00	359.39	13,721.00	2,099.73	482.21	2,094.47	0.00	0.00	0.00
15,900.00	90.00	359.39	13,721.00	2,199.72	481.16	2,194.47	0.00	0.00	0.00
16,000.00	90.00	359.39	13,721.00	2,299.71	480.10	2,294.47	0.00	0.00	0.00
16,100.00	90.00	359.39	13,721.00	2,399.71	479.04	2,394.47	0.00	0.00	0.00
16,200.00	90.00	359.39	13,721.00	2,499.70	477.99	2,494.47	0.00	0.00	0.00
16,300.00	90.00	359.39	13,721.00	2,599.70	476.93	2,594.47	0.00	0.00	0.00
16,400.00	90.00	359.39	13,721.00	2,699.69	475.88	2,694.47	0.00	0.00	0.00
16,500.00	90.00	359.39	13,721.00	2,799.69	474.82	2,794.47	0.00	0.00	0.00
16,600.00	90.00	359.39	13,721.00	2,899.68	473.76	2,894.47	0.00	0.00	0.00
16,700.00	90.00	359.39	13,721.00	2,999.68	472.71	2,994.47	0.00	0.00	0.00
16,800.00	90.00	359.39	13,721.00	3,099.67	471.65	3,094.47	0.00	0.00	0.00
16,900.00	90.00	359.39	13,721.00	3,199.66	470.59	3,194.47	0.00	0.00	0.00
17,000.00	90.00	359.39	13,721.00	3,299.66	469.54	3,294.47	0.00	0.00	0.00
17,100.00	90.00	359.39	13,721.00	3,399.65	468.48	3,394.47	0.00	0.00	0.00
17,200.00	90.00	359.39	13,721.00	3,499.65	467.42	3,494.47	0.00	0.00	0.00
17,300.00	90.00	359.39	13,721.00	3,599.64	466.37	3,594.47	0.00	0.00	0.00
17,400.00	90.00	359.39	13,721.00	3,699.64	465.31	3,694.47	0.00	0.00	0.00
17,500.00	90.00	359.39	13,721.00	3,799.63	464.26	3,794.47	0.00	0.00	0.00
17,600.00	90.00	359.39	13,721.00	3,899.63	463.20	3,894.47	0.00	0.00	0.00
17,700.00	90.00	359.39	13,721.00	3,999.62	462.14	3,994.47	0.00	0.00	0.00
17,800.00	90.00	359.39	13,721.00	4,099.61	461.09	4,094.47	0.00	0.00	0.00
17,900.00	90.00	359.39	13,721.00	4,199.61	460.03	4,194.47	0.00	0.00	0.00
18,000.00	90.00	359.39	13,721.00	4,299.60	458.97	4,294.47	0.00	0.00	0.00
18,100.00	90.00	359.39	13,721.00	4,399.60	457.92	4,394.47	0.00	0.00	0.00
18,200.00	90.00	359.39	13,721.00	4,499.59	456.86	4,494.47	0.00	0.00	0.00
18,300.00	90.00	359.39	13,721.00	4,599.59	455.80	4,594.47	0.00	0.00	0.00
18,400.00	90.00	359.39	13,721.00	4,699.58	454.75	4,694.47	0.00	0.00	0.00
18,500.00	90.00	359.39	13,721.00	4,799.58	453.69	4,794.47	0.00	0.00	0.00
18,551.32	90.00	359.39	13,721.00	4,850.89	453.15	4,845.79	0.00	0.00	0.00
[CaveLionWD#10H]LTP/BHL									
18,596.32	90.00	359.39	13,721.00	4,895.89	452.67	4,890.79	0.00	0.00	0.00

Database:	WellPlanner1	Local Co-ordinate Reference:	Well WD #10H
Company:	Marathon Oil	TVD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Project:	Lea County, NM	MD Reference:	Well @ 3289.50usft (GL: 3263' + KB: 26.5' (H&P480))
Site:	Cave Lion Fed 26-35-5 (6-8-9-10)	North Reference:	Grid
Well:	WD #10H	Survey Calculation Method:	Minimum Curvature
Wellbore:	OH		
Design:	Prelim Plan B		

MARATHON OIL PERMIAN LLC

DRILLING AND OPERATIONS PLAN

WELL NAME / NUMBER: CAVE LION FEDERAL 23 26 5 WD 10H

STATE: NEW MEXICO

COUNTY: LEA

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	TWSP	Range	Section	Aliquot/Lot/Trac	Latitude (NAD 83)	Longitude (NAD 83)	County	State	Meridian	Lease Type	Lease Number	Elevation (ft SS)	MD (RKB)	TVD (RKB)
SHL	287	FSL	1811	FWL	26S	35E	5	SESW	32.06587633 N	103.39217500 W	Lea	NM	NMP	F	NMNM013647	3263	26.5	26.5
KOP	0	FNL	2315	FWL	26S	35E	5	SESW	32.06545465 N	103.39054651 W	Lea	NM	NMP	F	NMNM013647	-9885	13184	13148
PPP	150	FNL	2315	FWL	26S	35E	5	SESW	32.06549740 N	103.39054610 W	Lea	NM	NMP	F	NMNM013647	-10458	14084	13721
BHL	150	FNL	2313	FWL	26S	35E	5	NENW	32.07919900 N	103.39057610 W	Lea	NM	NMP	F	NMNM013647	-10458	18596	13721

1. GEOLOGIC NAME OF SURFACE FORMATION

a. Permian/Quaternary Alluvium

2. ESTIMATED TOPS OF GEOLOGICAL MARKERS & DEPTHS OF ANTICIPATED FRESH WATER, OIL OR GAS

Formation	True Vertical Depth (ft)	Measured Depth (ft)	Lithologies	Mineral Resources	Producing Formation
Rustler	1064	1064	Anhydrite/Dolomite	BRINE	N
Salado	1503	1503	Salt/Anhydrite	BRINE	N
Castile	3541	3612	Base Salt	BRINE	N
Base of Salt	5098	5134	Limy Sands	BRINE	N
Lamar	5363	5399	Sand/Shales	OIL	Y
Bell Canyon	5391	5427	Sands/Shale	OIL	Y
Brushy Canyon	8000	8036	Sands/Carbonates	OIL	Y
Bone Spring	9291	9327	Sands/Carbonates	OIL	Y
1 st Bone Spring Sand	10411	10447	Sands/Carbonates	OIL	Y
2 nd Bone Spring Sand	10960	10996	Sands/Carbonates	OIL	Y
3 rd Bone Spring Sand	12045	12081	Sands/Carbonates	OIL	Y
Wolfcamp	12472	12508	Carbonates/Shales/Sands	OIL	Y
Wolfcamp X	12493	12529	Carbonates/Shales/Sands	OIL	Y
Wolfcamp Y	12551	12587	Carbonates/Shales/Sands	OIL	Y
Wolfcamp A	12581	12617	Carbonates/Shales/Sands	OIL	Y
Wolfcamp D	13721	14079	Carbonates/Shales/Sands	OIL	Y

DEEPEST EXPECTED FRESH WATER: 400' TVD

ANTICIPATED BOTTOM HOLE PRESSURE: 9,632 psi

ANTICIPATED BOTTOM HOLE TEMPERATURE: 205°F

ANTICIPATED ABNORMAL PRESSURE: N

ANTICIPATED ABNORMAL TEMPERATURE: N

3. CASING PROGRAM

String Type	Hole Size	Csg Size	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Weight (lbs/ft)	Grade	Conn.	SF Collapse	SF Burst	SF Tension
Surface	<u>17 1/2</u>	<u>13 3/8</u>	<u>0</u>	<u>1080</u>	<u>0</u>	<u>1080</u>	<u>54.5</u>	<u>J55</u>	<u>STC</u>	<u>5.52</u>	<u>2.5</u>	<u>2.5</u>
Intermediate I	<u>12 1/4</u>	<u>9 5/8</u>	<u>0</u>	<u>5436</u>	<u>0</u>	<u>5400</u>	<u>40</u>	<u>J55</u>	<u>LTC</u>	<u>1.74</u>	<u>1.15</u>	<u>2.19</u>
Intermediate II	<u>8 3/4</u>	<u>7 5/8</u>	<u>0</u>	<u>12001</u>	<u>0</u>	<u>11965</u>	<u>33.7</u>	<u>P110</u>	<u>Wedge 523</u>	<u>3.12</u>	<u>1.16</u>	<u>2.37</u>
Production Casing	<u>6 1/8</u>	<u>5 1/2</u>	<u>0</u>	<u>12001</u>	<u>0</u>	<u>11965</u>	<u>23</u>	<u>P110</u>	<u>Wedge 625</u>	<u>1.73</u>	<u>1.20</u>	<u>2.09</u>
Production Casing	<u>6 1/8</u>	<u>4 1/2</u>	<u>12001</u>	<u>18597</u>	<u>11965</u>	<u>13721</u>	<u>15.1</u>	<u>P110</u>	<u>BTC</u>	<u>1.5</u>	<u>1.26</u>	<u>2.21</u>

Minimum safety factors: Burst 1.125 Collapse 1.125 Tension 1.8 Wet/1.6 Dry

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

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

Is well located in high Cave/Karst?	N
If yes, are there two strings cemented to surface?	
(For 2 string wells) If yes, is there a contingency casing if lost circulation occurs?	
Is well located in critical Cave/Karst?	N
If yes, are there three strings cemented to surface?	

4. CEMENT PROGRAM:

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity (sks)	Yield (ft3/sks)	Density (ppg)	Slurry Volume (ft3)	Excess (%)	Cement Type	Additives
Surface	Lead	--	0	864	687	1.75	13.5	1200	100	Class C	3 lbm/sk granular LCM + 0.1250 lbm/sk Poly-E-Flake
Surface	Tail	--	864	1080	220	1.33	14.8	300	100	Class C	N/A
Intermediate I	Lead	--	0	4400	1394	1.75	12.8	2412	75	Class C	0.02 Gal/Sk Defoamer + 0.5% Extender + 1% Accelerator
Intermediate I	Tail	--	4400	5436	353	1.33	14.8	470	50	Class C	0.3 % Retarder
Intermediate II	Lead	--	5136	10900	555	2.7	11	1499	70	Class C	0.85% retarder + 10% extender + 0.02 gal/sk defoamer + 2.0% Extender + 0.15% Viscosifier
Intermediate II	Tail	--	10900	12001	179	1.09	15.6	195	30	Class H	3% extender + 0.15% Dispersant + 0.03 gal/sk retarder
Production Casing	Lead	--	11001	12001	37	2.94	10.8	110	30	Class H	13% extender + 0.75% Retarder + 0.02 gal/sk Defoamer + 0.1% viscosifier + 0.2% Fluid Loss
Production Casing	Tail	--	12001	18597	662	1.18	15.6	807	30	Class H	0.3% fluid loss + 0.02% antifoam + 0.15% dispersant + 0.4% retarder + 0.02% viscosifier

Stage tool depth(s) will be adjusted based on hole conditions and cement volumes will be adjusted proportionally. Stage tool will be set a minimum of 50 feet below previous casing and a minimum of 200 feet above current shoe. Lab reports with the 500 psi compressive strength time for the cement will be onsite for review.

Pilot hole depth: N/A TVD/MD

KOP: N/A TVD/MD

Plug top	Plug Bottom	Excess (%)	Quantity (sx)	Density (ppg)	Yield (ft3/sx)	Water gal/sk	Slurry Description and Cement Type

--	--	--	--	--	--	--	--

Attach plugging procedure for pilot hole.

N/A

5. PRESSURE CONTROL EQUIPMENT

BOP installed and tested before drilling which hole?	Size?	Min. Required WP	Type	✓	Tested to:
12 ¼"	13 5/8	5000	Annular	x	70% of working pressure
		10000	Blind Ram	x	100% of working pressure
			Pipe Ram		
			Double Ram	x	
			Other*		
8 ¾"	13 5/8	5000	Annular	x	70% of working pressure
		10000	Blind Ram	x	100% of working pressure
			Pipe Ram		
			Double Ram	x	
			Other*		
6 1/8"	13 5/8	5000	Annular	x	70% of working pressure
		10000	Blind Ram	x	100% of working pressure
			Pipe Ram		
			Double Ram	x	
			Other*		

*Specify if additional ram is utilized.

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, full opening safety valve / inside BOP and choke lines and choke manifold. See attached schematics.

Y	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.
Y	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?
Y	A multibowl wellhead is being used. The BOP will be tested per Onshore Order #2 after installation on the surface casing which will cover testing requirements for a maximum of 30 days. If any seal subject to test pressure is broken the system must be tested. See attached schematic.	

6. MUD PROGRAM:

Top Depth	Bottom Depth	Mud Type	Min. Weight (ppg)	Max. Weight (ppg)	Additional Characteristics
0	1080	Water Based Mud	8.4	8.8	
1080	5436	Brine	9.9	10.2	
5403	12001	Cut Brine	8.8	9.4	
12001	18597	Oil Based mud	11.5	13.5	

Losses or gains in the mud system will be monitored visually/manually as well as with an electronic PVT. The necessary mud products for additional weight and fluid loss control will be on location at all times.

7. AUXILIARY WELL CONTROL AND MONITORING EQUIPMENT

- a. A Kelly cock will be in the drill string at all times.
- b. A full opening drill pipe stabbing valve having the appropriate connections will be on the rig floor unobstructed and readily accessible at all times.
- c. Hydrogen Sulfide detection equipment will be in operation after drilling out the surface casing shoe until the production casing is cemented. Breathing equipment will be on location upon drilling the surface casing shoe until total depth is reached. **If Hydrogen Sulfide is encountered, measured amounts and formations will be reported to the BLM**

8. LOGGING / CORING AND TESTING PROGRAM:

- A. Mud Logger: None.
- B. DST's: None.
- C. Open Hole Logs: GR while drilling from Intermediate casing shoe to TD.

9. POTENTIAL HAZARDS:

- A. H2S detection equipment will be in operation after drilling out the surface casing shoe until the production casing has been cemented. Breathing equipment will be on location from drilling out the surface shoe until production casing is cemented. If H2S is encountered the operator will comply with Onshore Order #6.
- B. No abnormal temperatures or pressures are anticipated. All personnel will be familiar with all aspects of safe operation of equipment being used to drill this well. Adequate flare lines will be installed off the mud/gas separator where gas may be flared safely.