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Artesia
DEC 1 3 2018
DISTRICT II-ARTESIA O.C.D.

Form 3160-3
(June 2015)

FORM APPROVED
OMB No. 1004-0137
Expires: January 31, 2018

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.
NMNM101106

6. If Indian, Allotee or Tribe Name

1a. Type of work: ☑ DRILL ☐ REENTER

1b. Type of Well: ☑ Oil Well ☐ Gas Well ☐ Other

1c. Type of Completion: ☐ Hydraulic Fracturing ☑ Single Zone ☐ Multiple Zone

7. If Unit or CA Agreement, Name and No.

8. Lease Name and Well No.
SPRUCE GROVE FEDERAL COM
1H
323613

2. Name of Operator
MACK ENERGY CORPORATION
13837

9. API Well No.
30-005-64326

3a. Address	3b. Phone No. *(include area code)*	10. Field and Pool, or Exploratory
11344 Lovington HWY Artesia NM 88211	(575)748-1288	ROUND TANK / SAN ANDRES 52770

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*
At surface NWNE / 565 FNL / 2285 FEL / LAT 32.9926121 / LONG -104.0322026
At proposed prod. zone NWNE / 5 FNL / 2285 FEL / LAT 33.0086402 / LONG -104.0324085

11. Sec., T. R. M. or Blk. and Survey or Area
SEC 28 / T15S / R29E / NMP

14. Distance in miles and direction from nearest town or post office*	12. County or Parish	13. State
30 miles	CHAVES	NM

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any)	16. No of acres in lease	17. Spacing Unit dedicated to this well
5 feet	1088.7	160

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.	19. Proposed Depth	20. BLM/BIA Bond No. in file
1500 feet	3308 feet / 8827 feet	

21. Elevations (Show whether DF, KDB, RT, GL, etc.)	22. Approximate date work will start*	23. Estimated duration
3817 feet	12/01/2018	20 days

24. Attachments

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

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

25. Signature	Name *(Printed/Typed)*	Date
(Electronic Submission)	Deana Weaver / Ph: (575)748-1288	09/20/2018
Title: Production Clerk		
Approved by *(Signature)* (Electronic Submission)	Name *(Printed/Typed)* Ruben J Sanchez / Ph: (575)627-0250	Date 12/06/2018
Title: Assistant Field Manager, Lands & Minerals	Office: ROSWELL	

Application approval does not warrant or certify that the applicant holds legal or equitable title to those rights in the subject lease which would entitle the applicant to conduct operations thereon.
Conditions of approval, if any, are attached.

Title 18 U.S.C. Section 1001 and Title 43 U.S.C. Section 1212, make it a crime for any person knowingly and willfully to make to any department or agency of the United States any false, fictitious or fraudulent statements or representations as to any matter within its jurisdiction.

APPROVED WITH CONDITIONS

(Continued on page 2)

*(Instructions on page 2)

Approval Date: 12/06/2018 RWP 12-18-18.

INSTRUCTIONS

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

ITEM 1: If the proposal is to redrill to the same reservoir at a different subsurface location or to a new reservoir, use this form with appropriate notations. Consult applicable Federal regulations concerning subsequent work proposals or reports on the well.

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

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

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

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

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

NOTICES

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

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

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

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

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

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

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

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

(Continued on page 3)

Additional Operator Remarks

Location of Well

1. SHL: NWNE / 565 FNL / 2285 FEL / TWSP: 15S / RANGE: 29E / SECTION: 28 / LAT: 32.9926121 / LONG: -104.0322026 (TVD: 0 feet, MD: 0 feet)
   PPP: NWNE / 100 FSL / 2285 FEL / TWSP: 15S / RANGE: 29E / SECTION: 28 / LAT: 32.9944399 / LONG: -104.0321974 (TVD: 3164 feet, MD: 3265 feet)
   BHL: NWNE / 5 FNL / 2285 FEL / TWSP: 15S / RANGE: 29E / SECTION: 21 / LAT: 33.0086402 / LONG: -104.0324085 (TVD: 3308 feet, MD: 8827 feet)

BLM Point of Contact

Name: Meighan M Salas
Title: Land Law Examiner
Phone: 5756270228
Email: mmsalas@blm.gov

Review and Appeal Rights

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

Geologic Conditions of Approval

:

þÿ Operator proposes 260 , which is below all usable water zones, adequately protecting groun
þÿ 25 feet salt. Operator proposes an intermediate string at 1200 this will be in the Seven
contingency plan is required for this specific APD. At this time, there are reports of H2S releases greater than 100 ppm in the area. There is possibility of lost circulation in the base of the Rustler and in the Queen and San Andres Formations.

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DISTRICT II-ARTESIA O.C.D.

PECOS DISTRICT
DRILLING OPERATIONS
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	**Mack Energy Corporation**
LEASE NO.:	**NMNM-101106**
WELL NAME & NO.:	**Spruce Grove Federal Com 1H**
SURFACE HOLE FOOTAGE:	**0565' FNL & 2285' FEL**
BOTTOM HOLE FOOTAGE	**0005' FNL & 2285' FEL Sec. 28, T. 15 S., R 29 E.**
LOCATION:	**Section 21, T. 15 S., R 29 E., NMPM**
COUNTY:	**County, New Mexico**

Communitization Agreement

- The operator will submit a Communitization Agreement to the Roswell Field Office, 2909 West 2nd Street Roswell, New Mexico 88220, at least 90 days before the anticipated date of first production from a well subject to a spacing order issued by the New Mexico Oil Conservation Division. The Communitization Agreement will include the signatures of all working interest owners in all Federal and Indian leases subject to the Communitization Agreement (i.e., operating rights owners and lessees of record), or certification that the operator has obtained the written signatures of all such owners and will make those signatures available to the BLM immediately upon request.
- If the operator does not comply with this condition of approval, the BLM may take enforcement actions that include, but are not limited to, those specified in 43 CFR 3163.1.
- In addition, the well sign shall include the surface and bottom hole lease numbers. When the Communitization Agreement number is known, it shall also be on the sign.

The Gamma Ray and Neutron well logs must be run from total depth to surface and e-mailed to Chris Bolen at cbolen@blm.gov or hard copy mailed to 2909 West Second Street Roswell, NM 88201 to his attention.

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) 6270272.
After hours cll (575) 627-0205.

A. **Hydrogen Sulfide**

1. **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.**

2. Unless the production casing has been run and cemented or the well has been properly plugged, the drilling rig shall not be removed from over the hole without prior approval. **If the drilling rig is removed without approval – an Incident of Non-Compliance will be written and will be a "Major" violation.**

3. Floor controls are required for 3M or Greater systems. These controls will be on the rig floor, unobstructed, readily accessible to the driller and will be operational at all times during drilling and/or completion activities. Rig floor is defined as the area immediately around the rotary table; the area immediately above the substructure on which the draw works is located, this does not include the dog house or stairway area.

4. **The record of the drilling rate along with the GR/N well log run from TD to surface (horizontal well – vertical portion of hole) shall be submitted to the BLM office as well as all other logs run on the borehole 30 days from completion. If available, a digital copy of the logs is to be submitted in addition to the paper copies. The Rustler top and top and bottom of Salt are to be recorded on the Completion Report.**

B. CASING

Changes to the approved APD casing program need prior approval if the items substituted are of lesser grade or different casing size 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.

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

Wait on cement (WOC) for Water Basin:

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

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.

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

Possibility of lost circulation in the Rustler, Queen, and San Andres formations.

1. The **13-3/8** inch surface casing shall be set at approximately **260** feet (a minimum of 25 feet into the Rustler Anhydrite and above the salt) and cemented to the surface. **If salt is encountered, set casing at least 25 feet above the salt.**

    a. If cement does not circulate to the surface, the appropriate BLM office shall be notified and a temperature survey utilizing an electronic type temperature survey with surface log readout will be used or a cement bond log shall be run to verify the top of the cement. Temperature survey will be run a minimum of six hours after pumping cement and ideally between 8-10 hours after completing the cement job.

    b. **Wait on cement (WOC) time for a primary cement job is to include the lead cement slurry.**

    c. Wait on cement (WOC) time for a remedial job will be a minimum of 4 hours after bringing cement to surface or 500 pounds compressive strength, whichever is greater.

    d. If cement falls back, remedial cementing will be done prior to drilling out that string.

Optional 9-5/8'' Casing: If water flow is encountered operator will set 9-5/8'' intermediate casing.

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

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

Centralizers required on horizontal leg, must be type for horizontal service and a minimum of one every other joint.

3. The minimum required fill of cement behind the **7 X 5-1/2** inch production casing is:

   ☐ Cement to surface. If cement does not circulate, contact the appropriate BLM office. **Operator may need to pump more cement as they have had reoccurring low TOCs.**

4. If hardband drill pipe is rotated inside casing, returns will be monitored for metal. If metal is found in samples, drill pipe will be pulled and rubber protectors which have a larger diameter than the tool joints of the drill pipe will be installed prior to continuing drilling operations.

C. PRESSURE CONTROL

1. All blowout preventer (BOP) and related equipment (BOPE) shall comply with well control requirements as described in Onshore Oil and Gas Order No. 2 and API 53.

2. Minimum working pressure of the blowout preventer (BOP) and related equipment (BOPE) required for drilling below the surface casing shoe shall be psi (**Installing 3M BOP, testing to 2,000 psi**).

3. The appropriate BLM office shall be notified a minimum of 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).

   a. The tests shall be done by an independent service company utilizing a test plug **not a cup or J-packer**.

   b. 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.
   c. The results of the test shall be reported to the appropriate BLM office.

d. 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.**

e. The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug. This test shall be performed prior to the test at full stack pressure.

D. DRILL STEM TEST

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

E. WASTE MATERIAL AND FLUIDS

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

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

JAM 110618

PECOS DISTRICT
CONDITIONS OF APPROVAL

OPERATOR'S NAME:	Mack Energy Corporation
WELL NAME & NO.:	GRAND FORKS FED COM 1H & 2H SPRUCE GROVE FED COM 1H
SURFACE HOLE LOCATION:	Section 28, T 15. S., R 29 E., NMPM Section 27, T 15. S., R 29 E., NMPM
COUNTY:	Chaves County, New Mexico

1. GENERAL PROVISIONS

Approval of the APD does not warrant that any party holds equitable or legal title. Any request for a variance shall be submitted to the Authorized Officer on Sundry Notice (Form 3160-5).

For BLM's surface operating standards and guidelines, refer to: The Gold Book , Fourth Edition - Revised 2007. To obtain a copy free of charge contact the Roswell Field Office (575) 627-0272 or visit BLM on the web at:
http://www.blm.gov/wo/st/en/prog/energy/oil_and_gas/best_management_practices/gold_book.html
All construction, operations, and reclamation shall follow the Onshore Oil and Gas Operations as described in the 43 CFR part 3160.

The Operator shall submit a Sundry Notice (Form 3160-5) to the Bureau of Land Management, Roswell Field Office (address above) for approval prior to beginning any new surface-disturbing activities or operations that are not specifically addressed and approved by this APD.

A site facility diagram and a site security plan shall be filed no later than 60 calendar days following first production (Onshore Order 3, Section III, I. and 43 CFR 3162.7-5).

2. 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, 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).

3. JUISTICTIONAL WATERS of the U.S.

The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers prior to discharge or dredge and fill material into waters of the United States in accordance with Section 404 of the Clean Water Act. Contact The U.S. Army Corps of Engineers regulatory New Mexico Branch Office, 4101 Jefferson Plaza NE, Albuquerque, NM 87109-3435 at (505) 342-3678 or Email: CESPA-RD-NM@usace.army.mil if you have questions.

4. ARCHAEOLOGICAL, PALEONTOLOGICAL & HISTORICAL SITES

Any cultural and/or paleontological resource discovered inadvertently 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.

5. HUMAN REMAINS AND OBJECTS OF CULTURAL PATRIMONY

The operator shall comply with procedures established in the Native American Graves Protection and Repatriation Act (NAGPRA) to protect such cultural items as human remains, funerary objects, sacred objects, and objects of cultural patrimony that are discovered inadvertently during project implementation. In the event that any of the cultural items listed above are

discovered during the course of project work, the proponent shall immediately halt the disturbance and contact the BLM within 24 hours for instructions. The proponent or initiator of any project shall be held responsible for protecting, evaluating, reporting, excavating, treating, and disposing of these cultural items according to the procedures established by the BLM in consultation with Indian Tribes.

6. NOXIOUS WEEDS

The operator shall be held responsible if noxious weeds become established within the areas of operations (access road and/or well pad). 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.

7. CAVE AND KARST

Any Cave or Karst feature discovered by the operator or by any person working on the operator's behalf shall immediately report the feature 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. During drilling, previously unknown cave and karst features could be encountered. If a void is encountered while drilling and a loss of circulation occurs, lost drilling fluids can directly contaminate groundwater recharge areas, aquifers, and groundwater quality. Drilling operations can also lead to sudden collapse of underground voids.

To mitigate or lessen the probability of impacts associated with the drilling and production of oil and gas wells in karst areas, the guidelines listed in Appendix 3, Practices for Oil and Gas Drilling and Production in Cave and Karst Areas, as approved in the Roswell Resource Management Plan Amendment of 1997, page AP3-4 through AP 3-7 shall be followed.

A more complete discussion of the impacts of oil and gas drilling can be found in the *Dark Canyon Environmental Impact*

Statement of 1993, published by the U.S. Department of the Interior, Bureau of Land Management.

8. CONSTRUCTION

NOTIFICATION: The BLM shall administer compliance and monitor construction of the access road and well pad. Notify Natural Resource Specialist, Forrest Mayer at (575) 627-0210 or the Roswell Field Office at (575) 627-0272 **at least three (3) working days prior to commencing construction of the access road and/or well pad.**

A complete copy of the *approved* APD and the attached Conditions of Approval (COAs) **shall be kept on the well's location** for reference upon inspections.

Construction over and/or immediately adjacent to existing pipelines shall be coordinated, and in accordance with, the relevant pipeline companies' policy.

Any trench left open for (8) hours or less is not required to have escape ramps; however, before the trench is backfilled, an agency approved monitor shall walk the entire length of the open trench and remove all trapped fauna. The bottom surface of the trench will be disturbed a minimum of 2 inches in order to arouse any buried fauna. All fauna will be released a minimum of 100 yards from the trench.

For trenches left open for (8) hours or more, earthen escape ramps (built at nor more than a 30 degree slope and spaced no more than 500 feet apart) shall be placed in the trench. Structures will also be authorized within the trench. Metal structures will not be authorized. Structures used as escape ramps will be placed at no more than a 30 degree slope and spaced no more than 500 feet apart.

9. TOPSOIL:

When saturated soil conditions exist on access roads or location, construction shall be halted until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils, roads and locations.

Topsoil shall be stripped following removal of vegetation during construction of well pads, pipelines, roads, or other surface facilities. This shall include all growth medium - at a minimum,

the upper 2-6 inches of soil - but shall also include stripping of any additional topsoil present at a site, such as indicated by color or texture. Stripping depth may be specified during the onsite inspection. Stripped topsoil shall be stored separately from subsoil or other excavated material and replaced prior to interim seedbed preparation. No topsoil shall be stripped when soils are moisture-saturated or frozen below the stripping depth.

The topsoil will not be used to construct the containment structures or earthen dikes that are on the outside boundaries of the constructed well pad, tanks, and storage facilities.

Each construction area is site specific as to topsoil depth. It is the operator's responsibility to ensure that topsoil, caliche, or spoils are not mixed together.

(**Pads**): topsoil will be stripped and stored in separate piles from the spoils pile. They can be stored on opposite or adjacent sides. If topsoil and spoils must be stored on the same pad side together they shall be no closer than toe to toe, not overlapping. Each pile shall be kept within 30 feet of the pad's side. 100% of the topsoil will be used for both interim and final reclamation. 100% of topsoil will be respread over the disturbed areas during reclamation.

(**Roads**): topsoil shall be stripped in such a way to follow the road's edge outside of the surfacing or drivable area. During final reclamation, after removal of surface material and re-contouring, 100% of topsoil will be respread over the disturbed areas during reclamation. Vegetation in the topsoil will help hold re-seeding, moisture content, and reduce erosion.

10. WELL PAD SURFACING:

The well pad shall be constructed in a manner which creates the smallest possible surface disturbance, consistent with safety and operational need. Surfacing of the well pad is not required. If the operator elects to surface the well pad, the surfacing material will be required to be removed at the time of reclamation.

Cattleguards

An appropriately sized cattleguard(s) sufficient to carry out the project shall be installed and maintained at fence crossing(s). Any existing cattle guard(s) on the access road

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 guard(s) that are in place and are utilized during lease operations. Gates or cattle guards on public lands will not be locked or closed to public use unless closure is specifically determined to be necessary and is authorized in writing by the authorized officer. A gate shall be constructed and fastened securely to H-braces.

Fence Requirement

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

11. PRODUCTION:

Storage

Fiberglass storage tanks are ***not*** permitted for the storage of production.

Placement of Production Facilities

Production facilities should be placed on the well pad to allow for maximum interim reclamation and re-vegetation of the well location.

Containment Structures

All production facilities shall have a lined containment structure large enough to contain **110% of the largest Tank (PLUS) 24 hours of production** (43 CFR 3162.5-1) ***Environmental Obligations***, unless more stringent protective requirements are deemed necessary by the Authorized Officer.

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, **OIL GREEN** (Standard Environmental Color Chart June 2008).

Completion Report

In accordance with 43 CFR 3160, Form 3160-4 (Well Completion or Re-completion Report and Log) must be submitted to the Bureau of Land Management, Roswell Field Office within 30 days after completion of the well or producer. Copies of all open hole and cased hole logs, core descriptions, core analyses, well test data, geologic summaries, sample descriptions, formation test reports, stimulation reports, directional survey (if applicable), and all other surveys or data obtained and compiled during the drilling, completion, and/or work over operations, shall be included with Form 3160-4.

12. INTERIM RECLAMATION:

Reclamation earthwork for interim and/or final reclamation shall be completed within 6 months of well completion or well plugging (weather permitting), and shall consist of: 1) backfilling pits, 2) re-contouring and stabilizing the well site, access road, cut/fill slopes, drainage channels, utility and pipeline corridors, and all other disturbed areas, to approximately the original contour, shape, function, and configuration that existed before construction (any compacted backfilling activities shall ensure proper spoils placement , settling, and stabilization, 3) surface ripping, prior to topsoil placement, to a depth of 18-24 inches deep on 18-24 inch centers to reduce compaction, 4) final grading and replacement of all topsoil so that no topsoil's remains in the stockpile, 5) seeding in accordance with reclamation portions of the APD and these COA's.

Any subsequent re-disturbance of interim reclamation shall be reclaimed within six (6) months by the same means described above.

Prior to conducting interim reclamation, <u>the operator is required to:</u>

- Submit a Sundry Notices and Reports on Wells (Notice of Intent), Form 3160-5, prior to conducting interim reclamation.

- Contact BLM at least three (3) working days prior to conducting any interim reclamation activities, and prior to seeding.

During reclamation, the removal of caliche is important to increasing the success of re-vegetating the site. Removed caliche may be used in road repairs, fire walls or for building

other roads and locations. In addition, 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 re-vegetated areas for production or workover operations will be allowed. If there is significant disturbance and loss of vegetation, the area will need to be re-vegetated. Communicate with the appropriate BLM office for any exceptions/exemptions if needed.

Use a certified noxious weed-free seed mixture. Use seed tested for viability and purity in accordance with State law(s) within nine months prior to purchase. Use a commercial seed mixture certified or registered and tagged in accordance with State law(s). Make the seed mixture labels available for BLM inspection.

13. SEED MIX:

SEE ATTACHED SEED MIX.

ECOSITE (ACCESS ROAD)	ECOSITE (PAD)
SHALLOW SD-3	SHALLOW SD-3

14. FINAL ABANDONMENT:

A. Upon abandonment of the well a Notice of Intent for Plug and Abandonment describing plugging procedures. Followed within 30 days you shall file with this office, a Subsequent Report of Abandonment (Form 3160-5). To be included with this report is where the plugs were placed; volumes of cement used and well bore schematic as plugged.

B. On private surface/federal mineral estate land the reclamation procedures on the road and well pad shall be accomplished in accordance with the Private Surface Land Owner agreements and a copy of the release is to be submitted upon abandonment.

C. The Operator shall promptly plug and abandoned each newly completed, re-completed or producing well which is not capable of producing in paying quantities. No well may be temporarily abandoned for more than 30 days without prior approval from this office. When justified by the Operator, BLM may authorize additional delays, no one of which may exceed an additional 12 months. Upon removal of drilling or producing equipment form the site of a well which is to be permanently abandoned, the

surface of the lands disturbed shall be reclaimed in accordance with an approved Notice of Intent for final reclamation.

D. **Final reclamation shall include:** the removal of all solid waste, trash, surfacing materials, storage facilities and all other related equipment, flow lines, and meter housing, power poles, guy wires, and all other related power materials. All disturbed areas, i.e. cuts and fills, shall be re-contoured to their original surroundings. 100% of topsoil shall be used to resurface all disturbed areas including access roads. A label of the seed mix used shall be submitted with the Final Abandonment Notice (FAN) for review once reclamation is complete.

15. PIPELINE PROTECTION REQUIREMENT:

Precautionary measures shall be taken by the operator during construction of the access road to protect existing pipelines that the access road will cross over. An earthen berm; 2 feet high by 3 feet wide and 14 feet across the access road travelway (2' X 3' X 14'), shall be constructed over existing pipelines. The operator shall be held responsible for any damage to existing pipelines. If the pipeline is ruptured and/or damaged the operator shall immediately cease construction operations and repair the pipeline. The operator shall be held liable for any unsafe construction operations that threaten human life and/or cause the destruction of equipment.

16.. WILDLIFE PROTECTION MEASURES - Best Management Practices (BMPs)

Wildlife Mortality - General
The operator will notify the Bureau of Land Management (BLM) authorized officer and nearest Fish and Wildlife Service (FWS) Law Enforcement office within 24 hours, if the operator discovers a dead or injured federally protected species (i.e., migratory bird species, bald or golden eagle, or species listed by the FWS as threatened or endangered) in or adjacent to a pit, trench, tank, exhaust stack, or fence. (If the operator is unable to contact the FWS Law Enforcement office, the operator must contact the nearest FWS Ecological Services office.)

1. **Closed top tanks are required for any containment system.** All tanks are required to have a closed top tank.

2. **Chemical and Fuel Secondary Containment Systems**
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. Closed-top tanks are required for any secondary containment systems.

3. **Open-Vent Exhaust Stacks**

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. Production equipment includes, but may not be limited to, tanks, heater-treaters, separators, dehydrators, flare stacks, in-line units, and compressor mufflers.

AFMSS

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

Operator Certification Data Report

12/10/2018

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: Deana Weaver **Signed on:** 09/18/2018

Title: Production Clerk

Street Address: 11344 Lovington HWY

City: Artesia **State:** NM **Zip:** 88211

Phone: (575)748-1288

Email address: dweaver@mec.com

Field Representative

Representative Name:

Street Address:

City: **State:** **Zip:**

Phone:

Email address:

AFMSS

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

Application Data Report

12/10/2018

APD ID: 10400032579 **Submission Date:** 09/20/2018

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - General

APD ID: 10400032579 **Tie to previous NOS?** 10400031764 **Submission Date:** 09/20/2018

BLM Office: ROSWELL **User:** Deana Weaver **Title:** Production Clerk

Federal/Indian APD: FED **Is the first lease penetrated for production Federal or Indian?** FED

Lease number: NMNM101106 **Lease Acres:** 1088.7

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:** MACK ENERGY CORPORATION

Operator letter of designation:

Operator Info

Operator Organization Name: MACK ENERGY CORPORATION

Operator Address: 11344 Lovington HWY **Zip:** 88211

Operator PO Box:

Operator City: Artesia **State:** NM

Operator Phone: (575)748-1288

Operator Internet Address: jerrys@mec.com

Section 2 - Well Information

Well in Master Development Plan? NO **Mater Development Plan name:**

Well in Master SUPO? NO **Master SUPO name:**

Well in Master Drilling Plan? NO **Master Drilling Plan name:**

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H **Well API Number:**

Field/Pool or Exploratory? Field and Pool **Field Name:** ROUND TANK **Pool Name:** SAN ANDRES

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

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

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: SINGLE WELL **Multiple Well Pad Name:** **Number:**

Well Class: HORIZONTAL **Number of Legs:** 1

Well Work Type: Drill

Well Type: OIL WELL

Describe Well Type:

Well sub-Type: DELINEATION

Describe sub-type:

Distance to town: 30 Miles **Distance to nearest well:** 1500 FT **Distance to lease line:** 5 FT

Reservoir well spacing assigned acres Measurement: 160 Acres

Well plat: SPRUCE_GROVE_FEDERAL_COM_1H_20180918102741.pdf

Well work start Date: 12/01/2018 **Duration:** 20 DAYS

Section 3 - Well Location Table

Survey Type: RECTANGULAR

Describe Survey Type:

Datum: NAD83 **Vertical Datum:** NAVD88

Survey number: 6317

	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	565	FNL	2285	FEL	15S	29E	28	Aliquot NWNE	32.9926121	-104.0322026	CHAVES	NEW MEXICO	NEW MEXICO	F	NMNM 101106	3817	0	0
KOP Leg #1	565	FNL	2285	FEL	15S	29E	28	Aliquot NWNE	32.9926121	-104.0322026	CHAVES	NEW MEXICO	NEW MEXICO	F	NMNM 101106	1239	2578	2578
PPP Leg #1	100	FSL	2285	FEL	15S	29E	28	Aliquot NWNE	32.9944399	-104.0321974	CHAVES	NEW MEXICO	NEW MEXICO	F	NMNM 066484	653	3265	3164

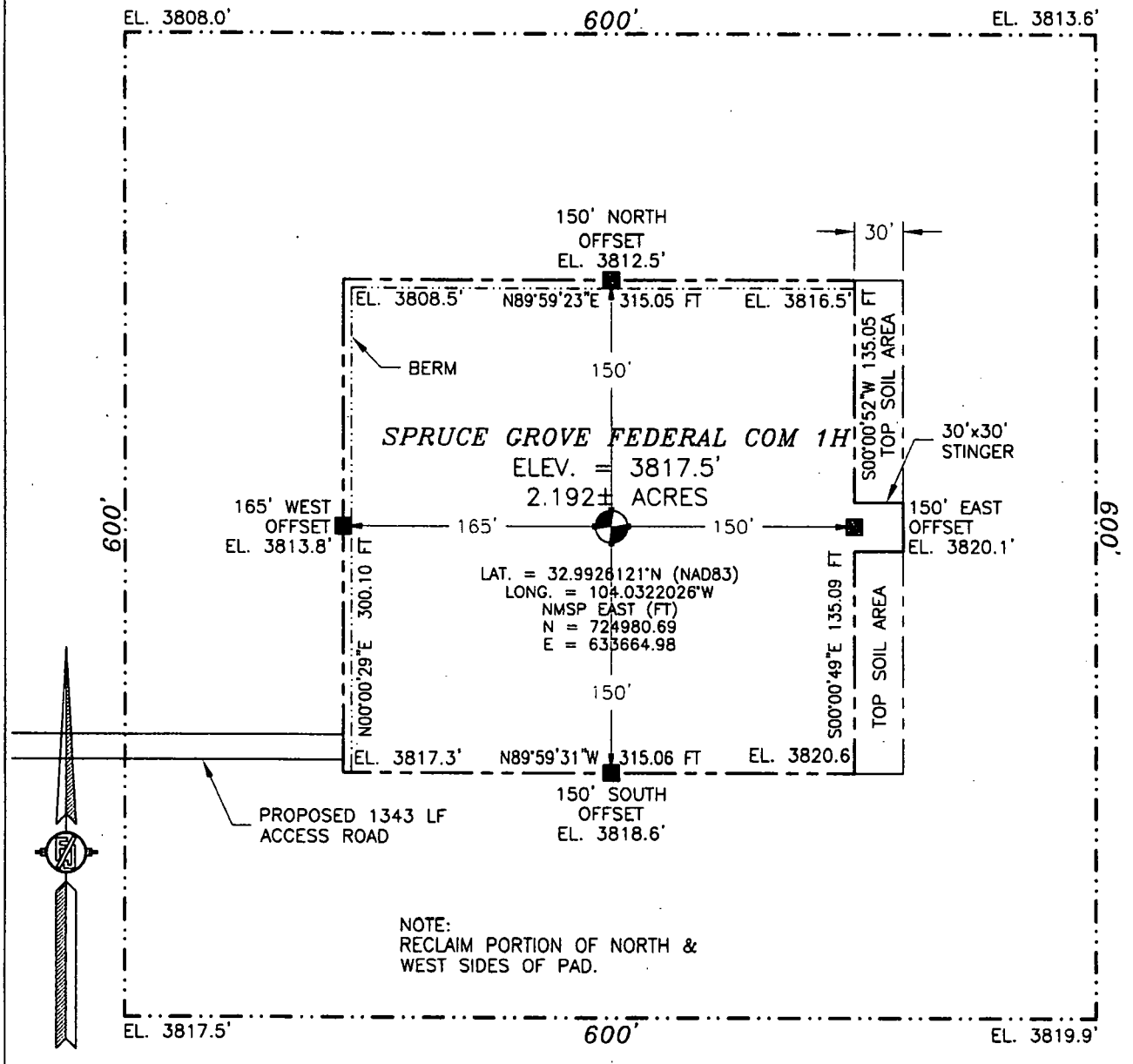
Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

	NS-Foot	NS Indicator	EW-Foot	EW Indicator	Twsp	Range	Section	Aliquot/Lot/Tract	Latitude	Longitude	County	State	Meridian	Lease Type	Lease Number	Elevation	MD	TVD
EXIT Leg #1	100	FNL	2285	FEL	15S	29E	21	Aliquot NWNE	33.008792	-104.0324012	CHAVES	NEW MEXICO	NEW MEXICO	F	NMNM 0390241	553	8700	3264
BHL Leg #1	5	FNL	2285	FEL	15S	29E	21	Aliquot NWNE	33.008642	-104.0324085	CHAVES	NEW MEXICO	NEW MEXICO	F	NMNM 0390241	509	8827	3308

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO
SITE MAP

NOTE: LATITUDE AND LONGITUDE COORDINATES ARE SHOWN USING THE NORTH AMERICAN DATUM OF 1983 (NAD83). LISTED NEW MEXICO STATE PLANE EAST COORDINATES ARE GRID (NAD83). BASIS OF BEARING AND DISTANCES USED ARE NEW MEXICO STATE PLANE EAST COORDINATES MODIFIED TO THE SURFACE



010 50 100 200

SCALE 1" = 100'

DIRECTIONS TO LOCATION

FROM THE INTERSECTION OF STATE HIGHWAY 82 AND CR 217 (HAGERMAN CUTOFF) GO NORTH ON CR 217 APPROX. 10.0 MILES, TURN WEST ON 20' CALICHE LEASE ROAD (COUNTY LINE ROAD) AND GO APPROX. 3.4 MILES, TURN NORTH ON 20' CALICHE LEASE ROAD AND GO APPROX. 0.8 OF A MILE, FOLLOW ROAD SURVEY EAST APPROX. 1343' TO THE SOUTHWEST PAD CORNER FOR THIS LOCATION.

MACK ENERGY CORPORATION

SPRUCE GROVE FEDERAL COM 1H

LOCATED 565 FT. FROM THE NORTH LINE AND 2285 FT. FROM THE EAST LINE OF SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M. CHAVES COUNTY, STATE OF NEW MEXICO

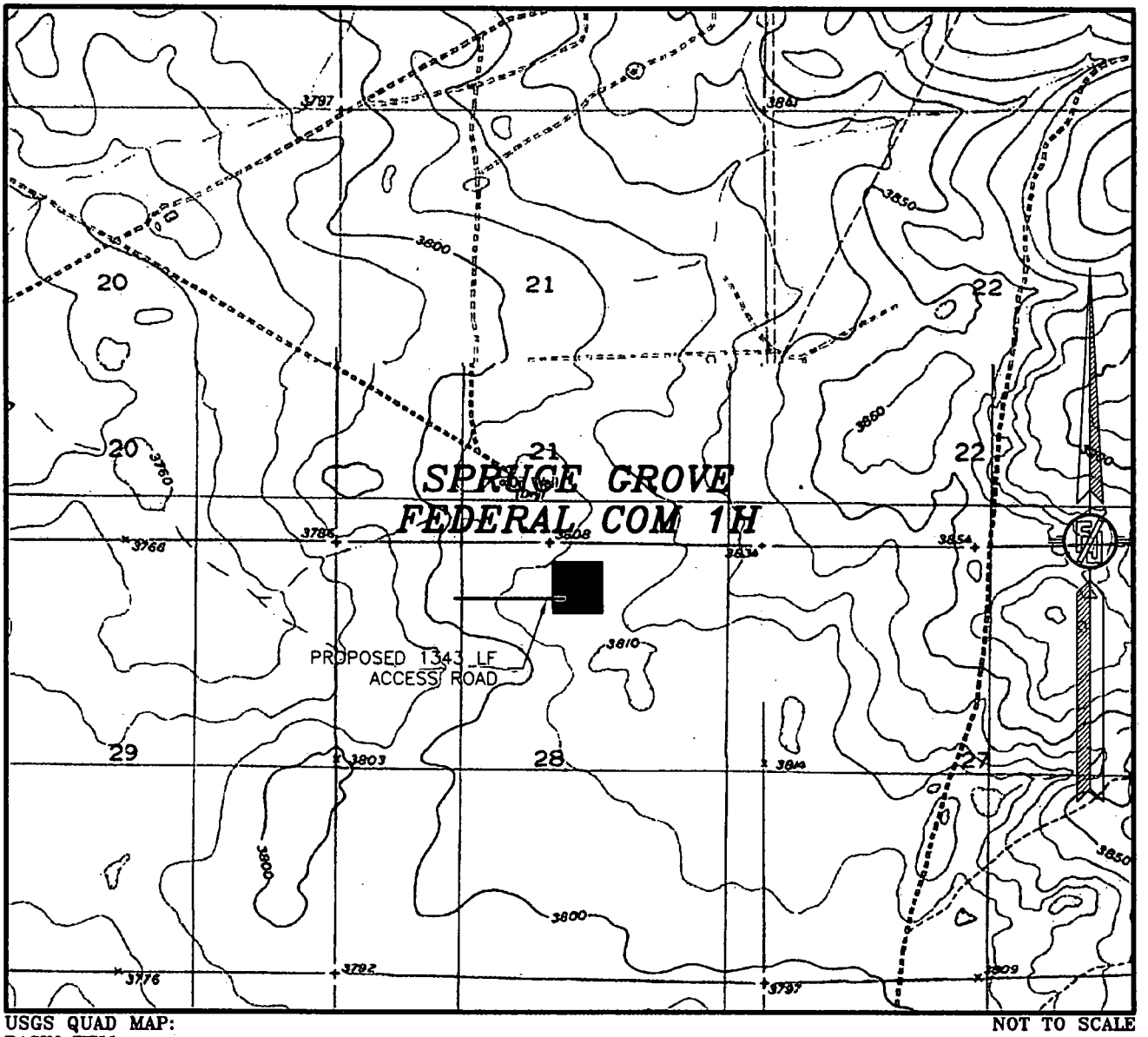
AUGUST 8, 2018

SURVEY NO. 6317A

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 *CARLSBAD, NEW MEXICO*

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

LOCATION VERIFICATION MAP



USGS QUAD MAP:
BASIN WELL

NOT TO SCALE

MACK ENERGY CORPORATION
SPRUCE GROVE FEDERAL COM 1H
LOCATED 565 FT. FROM THE NORTH LINE
AND 2285 FT. FROM THE EAST LINE OF
SECTION 28, TOWNSHIP 15 SOUTH,
RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

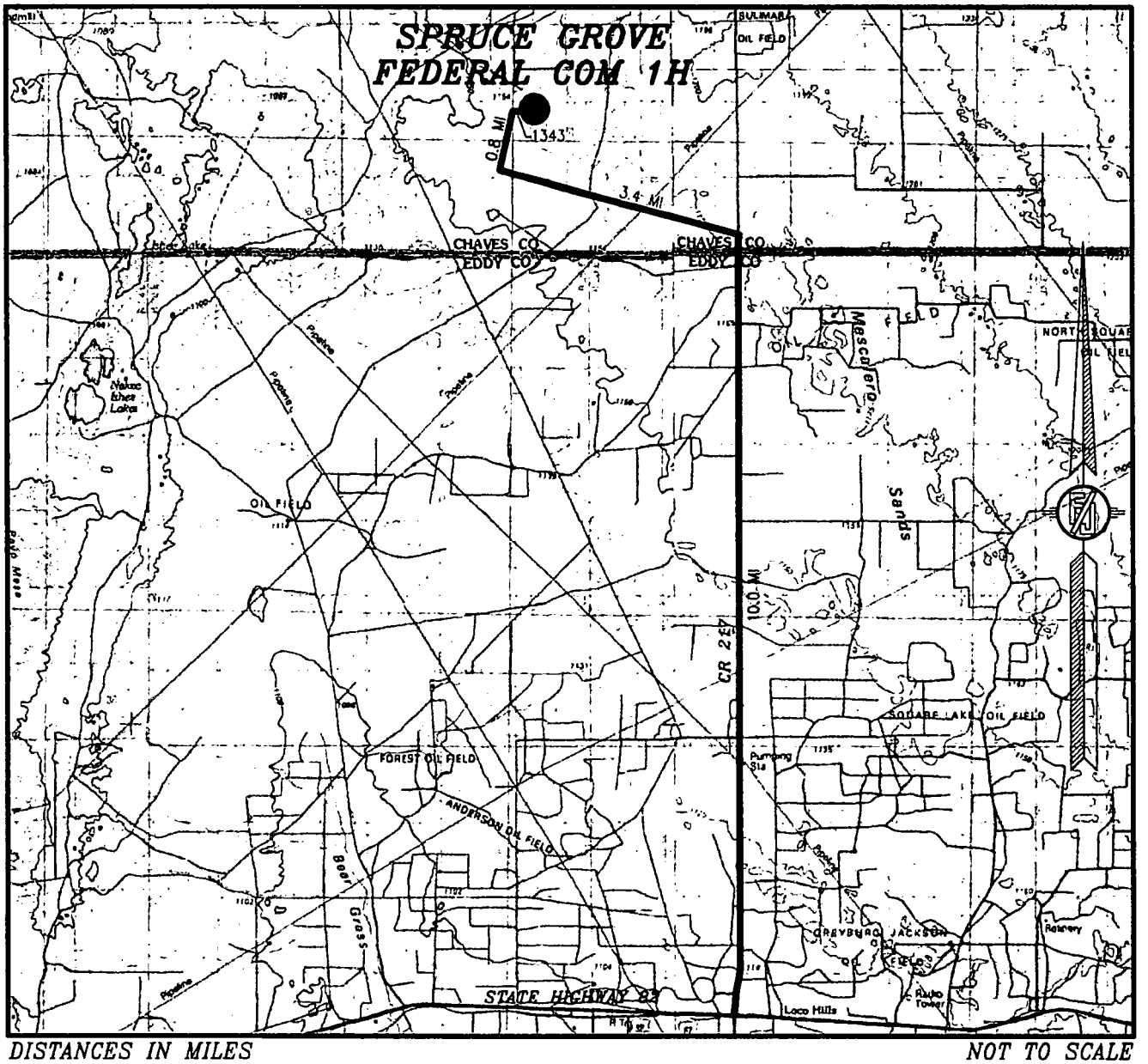
AUGUST 8, 2018

SURVEY NO. 6317A

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

VICINITY MAP



DISTANCES IN MILES

NOT TO SCALE

DIRECTIONS TO LOCATION
FROM THE INTERSECTION OF STATE HIGHWAY 82 AND CR 217 (HAGERMAN CUTOFF) GO NORTH ON CR 217 APPROX. 10.0 MILES, TURN WEST ON 20' CALICHE LEASE ROAD (COUNTY LINE ROAD) AND GO APPROX. 3.4 MILES, TURN NORTH ON 20' CALICHE LEASE ROAD AND GO APPROX. 0.8 OF A MILE, FOLLOW ROAD SURVEY EAST APPROX. 1343' TO THE SOUTHWEST PAD CORNER FOR THIS LOCATION.

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CHAVES COUNTY, STATE OF NEW MEXICO

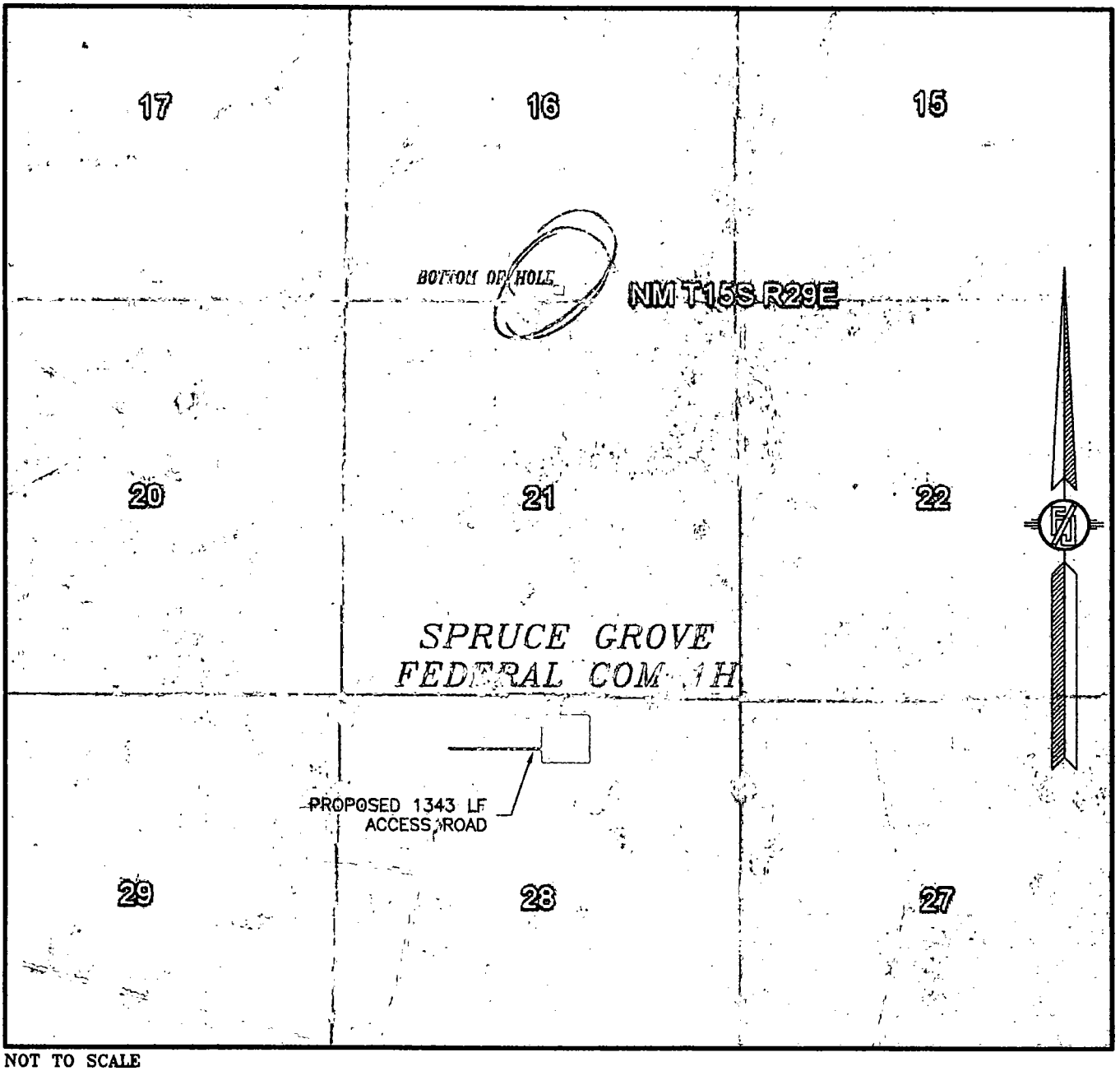
AUGUST 8, 2018

SURVEY NO. 6317A

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

AERIAL PHOTO



NOT TO SCALE
AERIAL PHOTO:
GOOGLE EARTH
FEBRUARY 2017

MACK ENERGY CORPORATION
SPRUCE GROVE FEDERAL COM 1H
LOCATED 565 FT. FROM THE NORTH LINE
AND 2285 FT. FROM THE EAST LINE OF
SECTION 28, TOWNSHIP 15 SOUTH,
RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

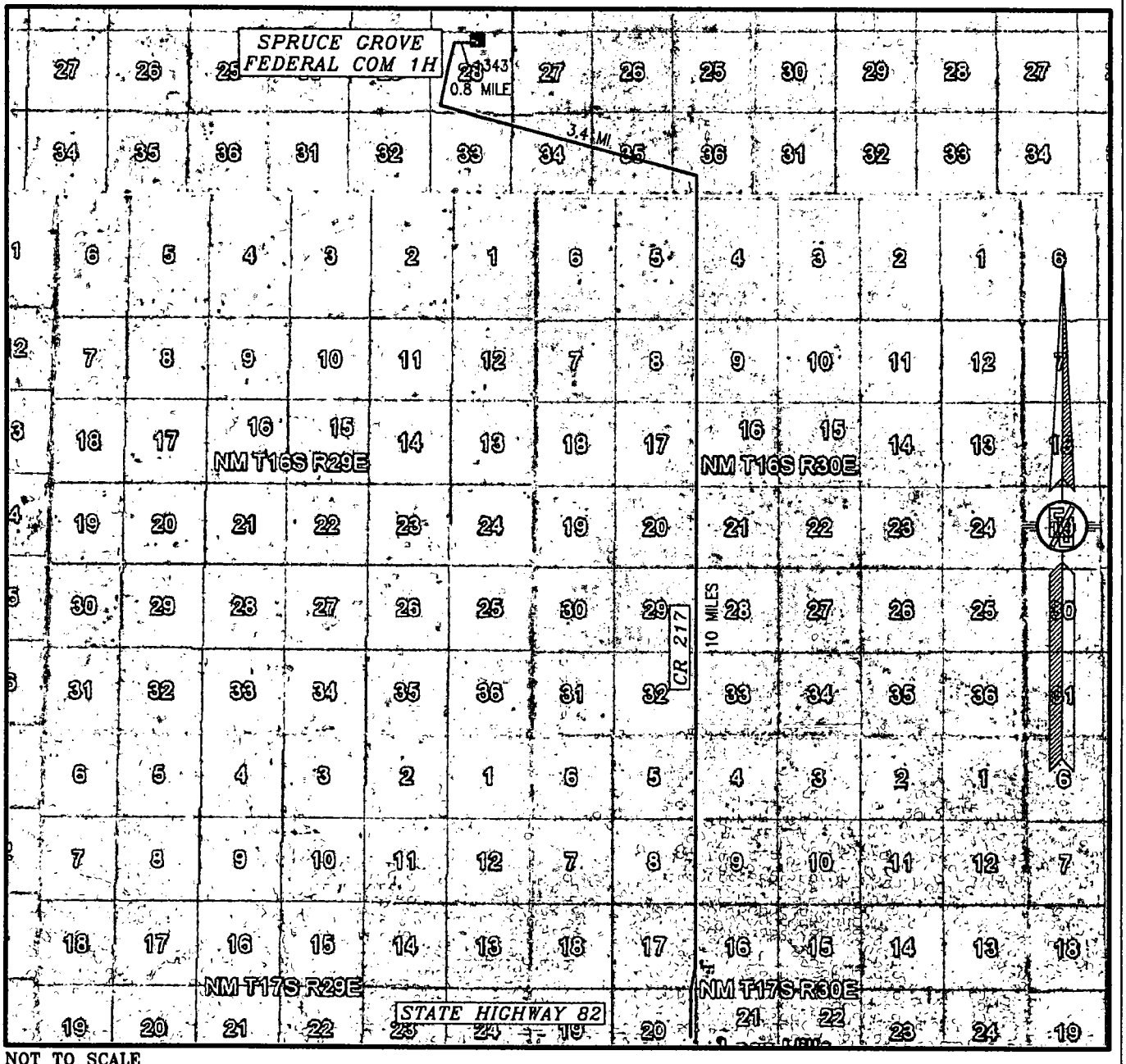
AUGUST 8, 2018

SURVEY NO. 6317A

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

ACCESS AERIAL ROUTE MAP



NOT TO SCALE
AERIAL PHOTO:
GOOGLE EARTH
FEBRUARY 2017

MACK ENERGY CORPORATION
SPRUCE GROVE FEDERAL COM 1H
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SECTION 28, TOWNSHIP 15 SOUTH,
RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

AUGUST 8, 2018

SURVEY NO. 6317A

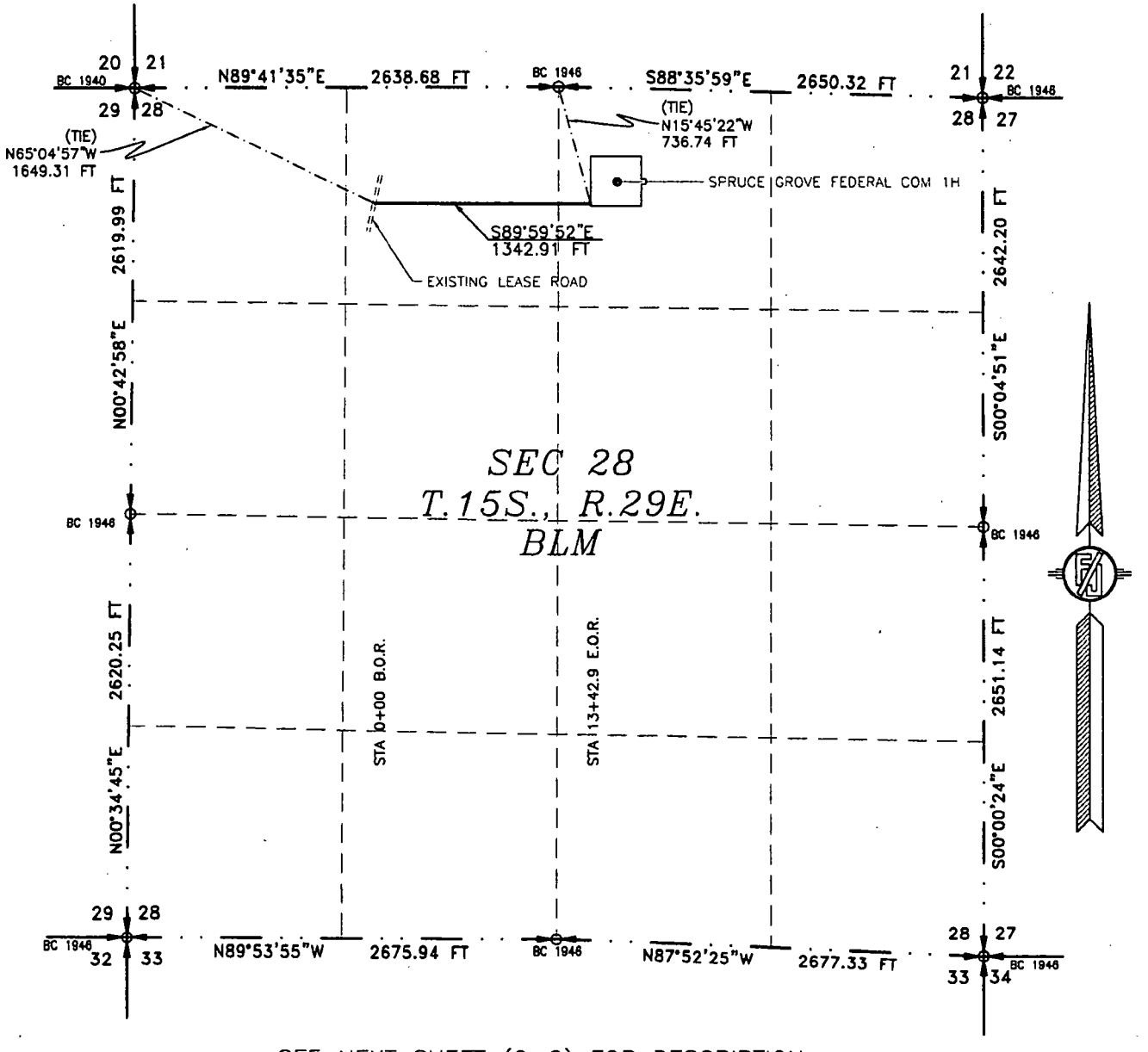
MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

ACCESS ROAD PLAT

ACCESS ROAD TO THE SPRUCE GROVE FEDERAL COM 1H

MACK ENERGY CORPORATION

CENTERLINE SURVEY OF AN ACCESS ROAD CROSSING
SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO
AUGUST 8, 2018



SEE NEXT SHEET (2-2) FOR DESCRIPTION

1000 0 1000

Scale: 1" = 1000'

GENERAL NOTES

1.) THE INTENT OF THIS ROUTE SURVEY IS TO ACQUIRE AN EASEMENT.

2.) BASIS OF BEARING AND DISTANCE IS NMSP EAST (NAD83) MODIFIED TO SURFACE COORDINATES. NAD 83 (FEET) AND NAVD 88 (FEET) COORDINATE SYSTEMS USED IN THE SURVEY.

SURVEYOR CERTIFICATE

I, FILIMON F. JARAMILLO, A NEW MEXICO PROFESSIONAL SURVEYOR NO. 12797, HEREBY CERTIFY THAT I HAVE CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR LAND SURVEYING IN THE STATE OF NEW MEXICO.

IN WITNESS WHEREOF, THIS CERTIFICATE IS EXECUTED AT CARLSBAD, NEW MEXICO, THIS 8TH DAY OF AUGUST 2018

FILIMON F. JARAMILLO NEW MEXICO 12797

FILIMON F. JARAMILLO, PLS 12797

MADRON SURVEYING, INC.
301 SOUTH CANAL
CARLSBAD, NEW MEXICO 88220
Phone (575) 234-3341

SHEET: 1-2

SURVEY NO. 6317A

MADRON SURVEYING, INC. CARLSBAD, NEW MEXICO

ACCESS ROAD PLAT

ACCESS ROAD TO THE SPRUCE GROVE FEDERAL COM 1H

MACK ENERGY CORPORATION
CENTERLINE SURVEY OF AN ACCESS ROAD CROSSING
SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO
AUGUST 8, 2018

DESCRIPTION

A STRIP OF LAND 30 FEET WIDE CROSSING BUREAU OF LAND MANAGEMENT LAND IN SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M., CHAVES COUNTY, STATE OF NEW MEXICO AND BEING 15 FEET EACH SIDE OF THE FOLLOWING DESCRIBED CENTERLINE SURVEY:

BEGINNING AT A POINT WITHIN THE NE/4 NW/4 OF SAID SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M., WHENCE THE NORTHWEST CORNER OF SAID SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M. BEARS N65°04'57"W, A DISTANCE OF 1649.31 FEET;
THENCE S89°59'52"E A DISTANCE OF 1342.91 FEET THE TERMINUS OF THIS CENTERLINE SURVEY, WHENCE THE NORTH QUARTER CORNER OF SAID SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M. BEARS N15°45'22"W, A DISTANCE OF 736.74 FEET;

SAID STRIP OF LAND BEING 1342.91 FEET OR 81.38 RODS IN LENGTH, CONTAINING 0.925 ACRES MORE OR LESS AND BEING ALLOCATED BY FORTIES AS FOLLOWS:

NE/4 NW/4	1139.90 L.F.	69.08 RODS	0.785 ACRES
NW/4 NE/4	203.01 L.F.	12.30 RODS	0.140 ACRES

GENERAL NOTES

1.) THE INTENT OF THIS ROUTE SURVEY IS TO ACQUIRE AN EASEMENT.

2.) BASIS OF BEARING AND DISTANCE IS NMSP EAST (NAD83) MODIFIED TO SURFACE COORDINATES. NAD 83 (FEET) AND NAVD 88 (FEET) COORDINATE SYSTEMS USED IN THE SURVEY.

SURVEYOR CERTIFICATE

I, FILIMON F. JARAMILLO, A NEW MEXICO PROFESSIONAL SURVEYOR NO. 12797, HEREBY CERTIFY THAT I HAVE CONDUCTED AND AM RESPONSIBLE FOR THIS SURVEY, THAT THIS SURVEY IS TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF, AND THAT THIS SURVEY AND PLAT MEET THE MINIMUM STANDARDS FOR LAND SURVEYING IN THE STATE OF NEW MEXICO.

IN WITNESS WHEREOF, THIS CERTIFICATE IS EXECUTED AT CARLSBAD, NEW MEXICO, THIS 29TH DAY OF AUGUST 2018

FILIMON F. JARAMILLO, PLS # 12797

MADRON SURVEYING, INC.
301 SOUTH CANAL
CARLSBAD, NEW MEXICO 88220
Phone (575) 234-3341

APD ID: 10400032579 **Submission Date:** 09/20/2018

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Well Type: OIL WELL **Well Work Type:** Drill

Show Final Text

Section 1 - Geologic Formations

Formation ID	Formation Name	Elevation	True Vertical Depth	Measured Depth	Lithologies	Mineral Resources	Producing Formation
1	TOP OF SALT	3817	270	270	SALT	NONE	No
2	BASE OF SALT	-755	755	755	SALT	NONE	No
3	YATES	-925	925	925	ANHYDRITE,SILTSTONE	NATURAL GAS,OIL	No
4	SEVEN RIVERS	2647	1170	1170	ANHYDRITE,SILTSTONE	NATURAL GAS,OIL	No
5	QUEEN	2167	1650	1650	ANHYDRITE,SILTSTONE	NATURAL GAS,OIL	No
6	GRAYBURG	1770	2047	2047	DOLOMITE,ANHYDRITE,SILTSTONE	NATURAL GAS,OIL	No
7	SAN ANDRES	1467	2350	2350	DOLOMITE,ANHYDRITE	NATURAL GAS,OIL	Yes

Section 2 - Blowout Prevention

Pressure Rating (PSI): 3M **Rating Depth:** 8827

Equipment: Rotating Head, Mud-Gas Separator

Requesting Variance? NO

Variance request:

Testing Procedure: The BOP/BOPE test shall include a low pressure test from 250 to 300 psi. The test will be held for a minimum of 10 minutes if test is done with a test plug and 30 minutes without a test plug.

Choke Diagram Attachment:

choke_manifold_diagram_20180823151019.pdf

choke_manifold_20180823151031.pdf

BOP Diagram Attachment:

bop_diagram_20180823151041.pdf

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Section 3 - Casing

Casing ID	String Type	Hole Size	Csg Size	Condition	Standard	Tapered String	Top Set MD	Bottom Set MD	Top Set TVD	Bottom Set TVD	Top Set MSL	Bottom Set MSL	Calculated casing length MD	Grade	Weight	Joint Type	Collapse SF	Burst SF	Joint SF Type	Joint SF	Body SF Type	Body SF
1	SURFACE	17.5	13.375	NEW	API	N	0	260	0	260			260	J-55	48	STC	5.701	4.689	BUOY	40.669	BUOY	4.74
2	INTERMEDIATE	12.25	9.625	NEW	API	N	0	1200	0	1200			1200	J-55	36	STC	3.237	7.04	BUOY	10.768	BUOY	7.04
3	PRODUCTION	8.75	7.0	NEW	API	N	0	3600	0	3600			3600	HCP-110	26	BUTT	4.413	3.317	BUOY	7.136	BUOY	3.317
4	PRODUCTION	8.75	5.5	NEW	API	N	3600	8828	3600	8828			5228	HCP-110	17	BUTT	4.988	3.547	BUOY	7.136	BUOY	3.547

Casing Attachments

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

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing_20180917121131.pdf

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Casing Attachments

Casing ID: 2 **String Type:** INTERMEDIATE

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing_20180917121639.pdf

Casing ID: 3 **String Type:** PRODUCTION

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing_20180917121859.pdf

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

Inspection Document:

Spec Document:

Tapered String Spec:

Casing Design Assumptions and Worksheet(s):

Casing_20180917122744.pdf

Section 4 - Cement

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

String Type	Lead/Tail	Stage Tool Depth	Top MD	Bottom MD	Quantity(sx)	Yield	Density	Cu Ft	Excess%	Cement type	Additives
SURFACE	Lead	260	0	260	250	1.61	14.4	347		RFC + 12% PF53 +2% PF1 +5ppsPF42+.125 pps PF29	20bbls Gelled Water, 50sx of 11# Scavenger Cement
SURFACE	Tail			260	200	1.34	14.8	347	100	Class C + 1% PF 1	20bbls gelled water, 50sx of 11# scavenger cement
INTERMEDIATE	Lead	1200	0	1200	565	1.34	14.8	469.8	100	OPTIONAL - Class C + 1% PF 1	20bbls gelled water 50sx of 11# scavenger cement
PRODUCTION	Lead	3600	0	3600	520	1.84	13.2	1871		Class C 4% PF20+4 pps PF45 +125pps PF 29	20bbls Gelled Water, 20bbls Chemical Wash, 50sx of 11# Scavenger Cement
PRODUCTION	Lead	8828	3600	8828	1675	1.48	13	1871	40	PVL+1.3 (BWOW) PF44 +5%PF174+.5%PF 606+.1% PF153+.4pps PF44	20bbls gelled water, 20bbls chemical wash, 50sx of 11# scavenger cement

Section 5 - Circulating Medium

Mud System Type: Closed

Will an air or gas system be Used? NO

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

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

Describe what will be on location to control well or mitigate other conditions: BOPE Brine Water

Describe the mud monitoring system utilized: Parson PVT with Pit Volume Recorder

Circulating Medium Table

Top Depth	Bottom Depth	Mud Type	Min Weight (lbs/gal)	Max Weight (lbs/gal)	Density (lbs/cu ft)	Gel Strength (lbs/100 sqft)	PH	Viscosity (CP)	Salinity (ppm)	Filtration (cc)	Additional Characteristics
260	1200	LSND/GEL	8.3	10	74.8		11		160000	10	Gel Strength 0-1.0 Viscosity 34-38
0	260	SPUD MUD	8.3	9.6	74.8		11		160000	10	Gel Strength 0-1.0 Viscosity 34-38
1200	8828	LSND/GEL	8.3	10	74.8		11		160000	10	Gel Strength 0-1.0 Viscosity 34-38

Section 6 - Test, Logging, Coring

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

None

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

CNL/FDC,DLL,FDC,GR

Coring operation description for the well:

Will evaluate after logging to determine the necessity for sidewall coring

Section 7 - Pressure

Anticipated Bottom Hole Pressure: 1634 **Anticipated Surface Pressure:** 906.24

Anticipated Bottom Hole Temperature(F): 95

Anticipated abnormal pressures, temperatures, or potential geologic hazards? NO

Describe:

Contingency Plans geoharzards description:

Contingency Plans geohazards attachment:

Hydrogen Sulfide drilling operations plan required? NO

Hydrogen sulfide drilling operations plan:

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Section 8 - Other Information

Proposed horizontal/directional/multi-lateral plan submission:

Spruce_Grove_Federal_Com__1H_Preliminary_Plan_1_20180918092400.pdf
h2s_contingency_plan_20180918102847.pdf
spruce_h2s_20180918102915.pdf
spruce_drill_plan_20180918102931.pdf
spruce_gas_capture_20180918105800.pdf
spruce_horizontal_20180918105826.pdf

Other proposed operations facets description:

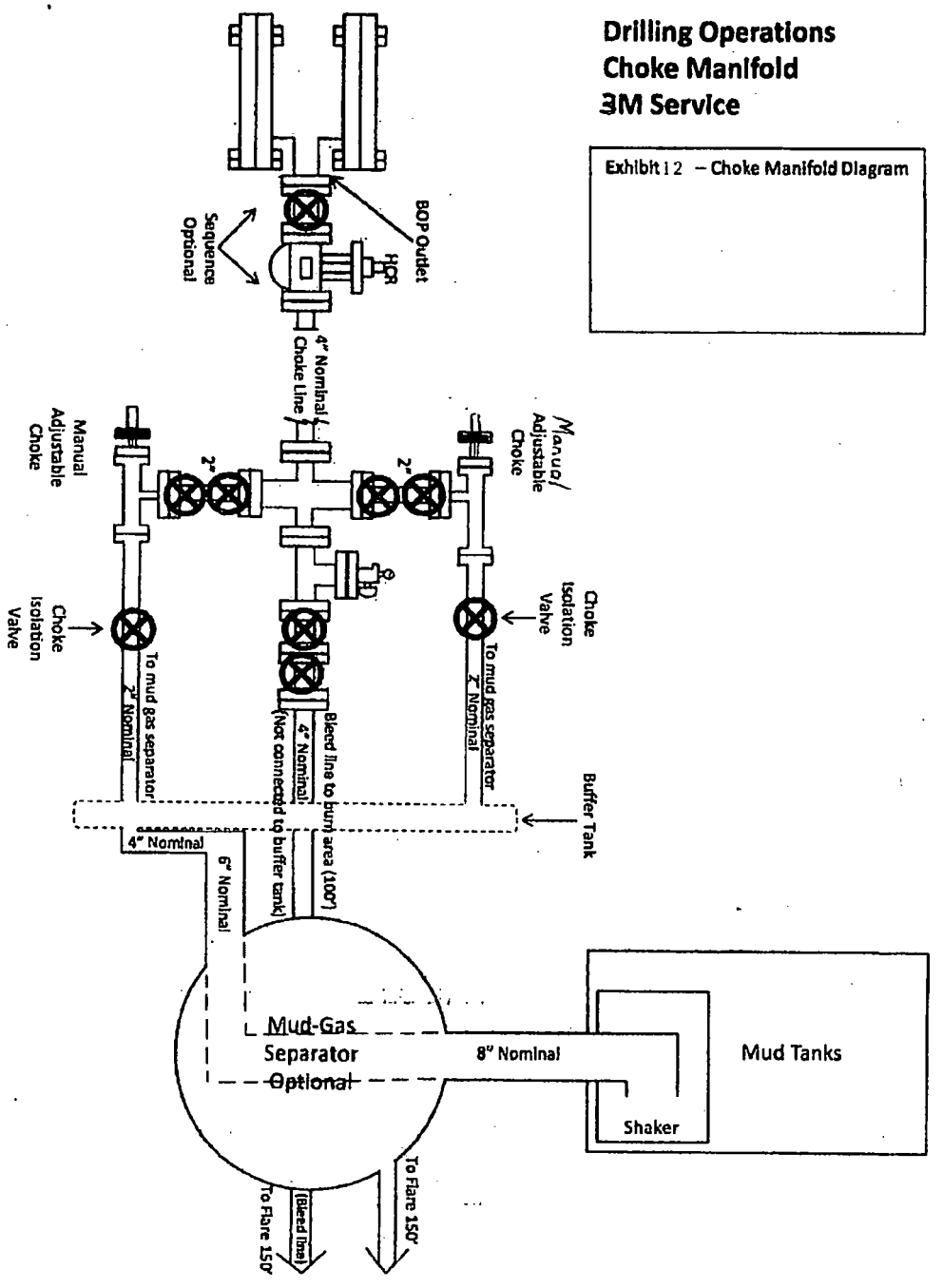
Other proposed operations facets attachment:

Other Variance attachment:

Mack Energy Corporation

MANIFOLD SCHEMATIC

Exhibit #12



Mack Energy Corporation

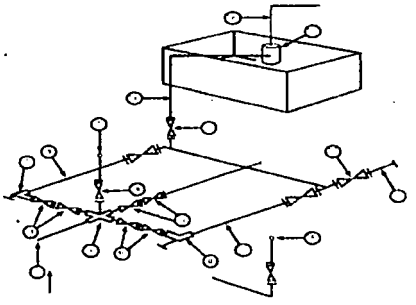
Exhibit #11

MIMIMUM CHOKE MANIFOLD

3,000, 5,000, and 10,000 PSI Working Pressure

[illegible]

3 MWP - 5 MWP - 10 MWP



Mud Pit

Reserve Pit

*** Location of separator optional**

Below Substructure

Mimimum requirements

No.		3,000 MWP			5,000 MWP			10,000 MWP		
		I.D.	Nominal	Rating	I.D.	Nominal	Rating	I.D.	Nominal	Rating
1	Line from drilling Spool		3"	3,000		3"	5,000		3"	10,000
2	Cross 3" x 3" x 3" x 2"			3,000			5,000			
2	Cross 3" x 3" x 3" x 2"									10,000
3	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
4	Valve Gate Plug	1 13/16		3,000	1 13/16		5,000	1 13/16		10,000
4a	Valves (1)	2 1/16		3,000	2 1/16		5,000	2 1/16		10,000
5	Pressure Gauge			3,000			5,000			10,000
6	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
7	Adjustable Choke (3)	2"		3,000	2"		5,000	2"		10,000
8	Adjustable Choke	1"		3,000	1"		5,000	2"		10,000
9	Line		3"	3,000		3"	5,000		3"	10,000
10	Line		2"	3,000		2"	5,000		2"	10,000
11	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
12	Line		3"	1,000		3"	1,000		3"	2,000
13	Line		3"	1,000		3"	1,000		3"	2,000
14	Remote reading compound Standpipe pressure quage			3,000			5,000			10,000
15	Gas Separator		2' x5'			2' x5'			2' x5'	
16	Line		4"	1,000		4"	1,000		4"	2,000
17	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000

(1) Only one required in Class 3M

(2) Gate valves only shall be used for Class 10 M

(3) Remote operated hydraulic choke required on 5,000 psi and 10,000 psi for drilling

EQUIPMENT SPECIFICATIONS AND INSTALLATION INSTRUCTION

1. All connections in choke manifold shall be welded, studded, flanged or Cameron clamp of comparable rating
2. All flanges shall be API 6B or 6BX and ring gaskets shall be API RX or BX. Use only BX for 10 MWP
3. All lines shall be securely anchored.
4. Chokes shall be equipped with tungsten carbide seats and needles, and replacements shall be available
5. alternate with automatic chokes, a choke manifold pressure gauge shall be located on the rig floor in conjunction with the standpipe pressure gauge.
6. Line from drilling spool to choke manifold should bee as straight as possible. Lines downstream from chokes shall make turns by large bends or 90 degree bends using bull plugged tees

Mack Energy Corporation

Minimum Blowout Preventer Requirements

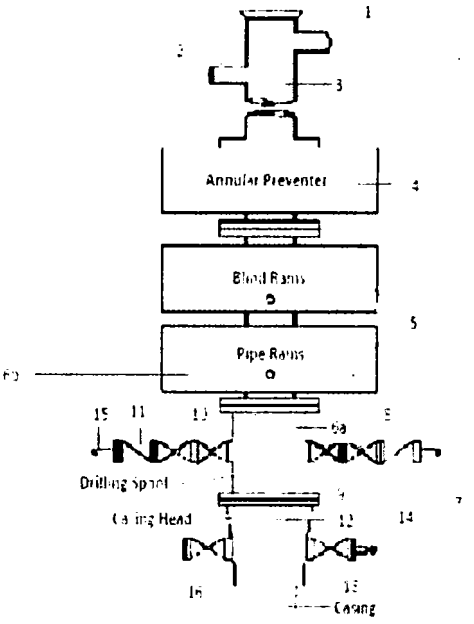
5000 psi Working Pressure

13 5/8 inch- 5 MWP

11 Inch - 5 MWP

Stack Requirements

NO.	Items	Min I.D.	Min Nominal
1	Flowline		2"
2	Fill up line		2"
3	Drilling nipple		
4	Annular preventer		
5	Two single or one dual hydraulically operated rams		
6a	Drilling spool with 2" min. kill line and 3" min choke line outlets		2" Choke
6b	2" min. kill line and 3" min. choke line outlets in ram. (Alternate to 6a above)		
7	Valve Gate Plug	3 1/8	
8	Gate valve-power operated	3 1/8	
9	Line to choke manifold		3"
10	Valve Gate Plug	2 1/16	
11	Check valve	2 1/16	
12	Casing head		
13	Valve Gate Plug	1 13/16	
14	Pressure gauge with needle valve		
15	Kill line to rig mud pump manifold		2"



OPTIONAL

16	Flanged Valve	1 13/16	

CONTRACTOR'S OPTION TO 10
CONTRACTOR'S OPTION TO FURNISH MI

1 All equipment and connections above bradenhead or casinghead. Working pressure of preventers to be 2000 psi minimum
2 Automatic accumulator (80 gallons, minimum) capable of closing BOP in 30 seconds or less and, holding them closed against full rated working pressure
3. BOP controls, to be located near drillers' position
4 Kelly equipped with Kelly cock
5 Inside blowout preventer or its equivalent on derrick floor at all times with proper threads to fit pipe being used.
6. Kelly saver-sub equipped with rubber casing protector at all times.
7 Plug type blowout preventer tester
8 Extra set pipe rams to fit drill pipe in use on location at all times
9. Type RX ring gaskets in place of Type R.

MEC TO FURNISH

1 Bradenhead or casing head and side valves
2 Wear bushing. If required

GENERAL NOTES

1. Deviations from this drawing may be made only with the express permission of MEC's Drilling Manager
2. All connections, valves, fittings, piping, etc., subject to well or pump pressure must be flanged (suitable clamp connections acceptable) and have minimum working pressure equal to rated working pressure of preventers up through choke valves must be full opening and suitable for high pressure mud service
3 Controls to be of standard design and each marked, showing opening and closing position
4 Chokes will be positioned so as not to hamper or delay changing of choke beans

Replaceable parts for adjustable choke, or bean sizes, retainers, and choke wrenches to be conveniently located for immediate use.

5 All valves to be equipped with hand-wheels or handles ready for immediate use
6. Choke lines must be suitably anchored.
7 Handwheels and extensions to be connected and ready for use
8 Valves adjacent to drilling spool to be kept open. Use outside valves except for emergency
9 All seamless steel control piping (2000 psi working pressure) to have flexible joints to avoid stress. Hoses will be permitted.
10 Casinghead connections shall not be used except in case of emergency.
11 Does not use kill line for routine fill up operations

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 13 3/8 in surface x intermediate

Total Depth: 260 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 9.6 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 9.6 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 9.6 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 129.792 psi Burst: 129.792 psi, joint strength: 129.792 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	260 ft to 0 ft			Make up Torque ft-lbs			Total ft = 260
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
13.375 inches	48 #/ft	J-55	ST&C	3,220	2,420	4,030	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
740	2,370 psi	433 ,000 #		744 ,000 #		12.559	

2nd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom 260

260 ft to 0 ft			
13.375	0 J-55	ST&C	

S.F.	Actual		Desire
collapse	5.70143	>=	1.125
burst-b	4.689281	>=	1.25
burst-t	4.74		

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft			
0	0	0	0

S.F.	Actual		Desire
collapse	#DIV/0!	>=	1.125
burst-b	0	>=	1.25
burst-t	0		
jnt strngth	40.66897	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H (Optional)

String Size & Function: 9 5/8 in surface ____ intermediate x

Total Depth: 1200 ft TVD: 1200 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse. 624 psi Burst: 624 psi. joint strength. 624 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	1200 ft to 0 ft		Make up Torque ft-lbs			Total ft = 1200
O.D.	Weight	Grade	Threads	opt.	min	mx.
9.625 inches	36 #/ft	J-55	ST&C	3,940	2,960	4,930
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
2,020 psi	3,520 psi	394 ,000 #		564 ,000 #		8.765

2nd segment	ft to ft		Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

3rd segment	0 ft to 0 ft		Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	000 #		,000 #		

4th segment	0 ft to 0 ft		Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt	min.	mx
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

5th segment	0 ft to 0 ft		Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

6th segment	0 ft to 0 ft		Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt	min	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

Select 1st segment bottom 1200

S.F.	Actual		Desire
collapse	3.237179	>=	1.125
burst-b	7.04	>=	1.25
burst-t	7.04		

1200 ft to 0 ft
9.625 0 J-55 ST&C

Top of segment 1 (ft) 0

Select 2nd segment from bottom

S.F.	Actual		Desire
collapse	#DIV/0!	>=	1.125
burst-b	0	>=	1.25
burst-t	0		
jnt strngth	10.76785	>=	1.8

0 ft to 0 ft
0 0 0 0

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 7 x 5.5 in Production x

Total Depth: 8828 ft **TVD:** 3308 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 1720.16 psi Burst: 1720.16 psi joint strength: 1720.16 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 3000 psi

1st segment	8828 ft to 3600 ft			Make up Torque ft-lbs			Total ft = 5228
O.D	Weight	Grade	Threads	opt	min.	mx.	
5.5 inches	17 #/ft	HCP-110	Buttress	4,620	3.470	5,780	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
8,580 psi	10,640 psi-lrcr	568 ,000 #		546 ,000 #		4.767	

2nd segment	2400 ft to 3300 ft			Make up Torque ft-lbs			Total ft = 900
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
7 inches	26 #/ft	HCP-110	Buttress	6,930	5,200	8,660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi-lrcr	853 ,000 #		830 ,000 #		6.151	

3rd segment	2400 ft to 0 ft			Make up Torque ft-lbs			Total ft = 2400
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
7 inches	26 #/ft	HCP-110	LT&C	6930	5200	8660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi	693 ,000 #		830 ,000 #		6.151	

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom		8828	S.F.	Actual		Desire
			collapse	4.987908	>=	1.125
8828 ft to 3300 ft			burst-b	3.546667	>=	1.25
5.5	0 HCP-110 Buttress		burst-t	3.546667		
Top of segment 1 (ft)		3300	S.F.	Actual		Desire
Select 2nd segment from bottom			collapse	4.412586	>=	1.125
			burst-b	3.316667	>=	1.25
3300 ft to 2400 ft			burst-t	3.316667		
7	26 HCP-110 Buttress		jnt strngth	7.135887	>=	1.8

	Top of segment 2 (ft)	2400	S.F.	Actual		Desire
Select	3rd segment from bottom		collapse	6.013412	>=	1.125
			burst-b	3.316667	>=	1.25
2400 ft	to 0 ft		burst-t	3.316667		
7	26 HCP-110 LT&C		jnt strngth	8.579981	>=	1.8
	Top of segment 3 (ft)	0	S.F.	Actual		Desire
Select	4th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to 0 ft		burst-t	0		
0	0 0 0		jnt strngth	6.97061	>=	1.8
	Top of segment 4 (ft)		S.F.	Actual		Desire
Select	5th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0		jnt strngth	0	>=	1.8
	Top of segment 5 (ft)		S.F.	Actual		Desire
Select	6th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0		jnt strngth	0	>=	1.8
	Top of segment 6 (ft)		jnt strngth		>=	1.8

use in colapse calculations across different pressured formations

Throe gradient pressure function

Depth of evaluation:	1,200 ft		516	psi @	1,200 ft	
Top of salt:	2,400 ft	fx #1	516			
Base of salt:	3,700 ft	fx #2	900			
TD of intermediate	4,600 ft	fx #3	540			

Pressure gradient to be used above each top to be used as a function of depth. ex. psi/ft

fx #1	fx #2	fx #3
0.43	0.75	0.45

1) Calculate neutral point for buckling with temperature affects computed also
2) Surface burst calculations & kick tolerance in surface pressure for burst
3) Do a comparison test to determine which value is lower joint strength or body yield to use in tensile strength calculations
4) Raise joint strength safety factor up to next level on page #2
5) Sour service what pipe can be used with proper degrading of strength factors and as function of temp

Adjust for best combination of safety factors

	Secondary
S.F. Collapse bottom of segment:	
S.F. Collapse top of segment:	4.76069
S.F. Burst bottom of segment:	
S.F. Burst top of segment	
S.F. Joint strength bottom of segment:	795.518
S.F. Joint strength top of segment:	
S.F. Body yield strength bottom of segment:	764.706
S.F. Body yield strength top of segment:	6.8595

Collapse calculations for 1st segment - casing evacuated

Buoyancy factor collapse:	0.847	
calculations for bottom of segment @	3308 ft	
hydrostatic pressure collapse - backside:	1720.16 psi	
Axial load @ bottom of section	0 lbs	previous segments
Axial load factor:	0	load/(pipe body yield strength)
Collapse strength reduction factor:	1	Messrs. Westcott, Dunlop, Kemler.1940
Adjusted collapse rating of segment:	8580 psi	
Actual safety factor	4.98791	adjusted casing rating / actual pressure

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 13 3/8 in surface x intermediate

Total Depth: 260 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 9.6 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 9.6 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 9.6 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 129.792 psi Burst: 129.792 psi joint strength: 129.792 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	260 ft to 0 ft			Make up Torque ft-lbs		Total ft = 260
O.D.	Weight	Grade	Threads	opt.	min.	mx.
13.375 inches	48 #/ft	J-55	ST&C	3,220	2,420	4,030
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
740	2,370 psi	433 ,000 #		744 ,000 #		12.559

2nd segment	0 ft to 0 ft			Make up Torque ft-lbs		Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs		Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

4th segment	0 ft to 0 ft			Make up Torque ft-lbs		Total ft = 0
O D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

5th segment	0 ft to 0 ft			Make up Torque ft-lbs		Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

6th segment	0 ft to 0 ft			Make up Torque ft-lbs		Total ft = 0
O D.	Weight	Grade	Threads	opt.	min.	mx.
inches	#/ft					
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift
psi	psi	,000 #		,000 #		

Select 1st segment bottom 260

260 ft to 0 ft			
13.375	0 J-55	ST&C	

	S.F.	Actual		Desire
collapse	5.70143	>=	1.125
burst-b	4.689281	>=	1.25
burst-t	4.74		

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft			
0	0	0	0

	S.F.	Actual		Desire
collapse	#DIV/0!	>=	1.125
burst-b	0	>=	1.25
burst-t	0		
jnt strngth	40.66897	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H (Optional)

String Size & Function: 9 5/8 in surface ____ intermediate x

Total Depth: 1200 ft TVD: 1200 ft

Pressure Gradient for Calculations **(While drilling)**

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for collapse. 624 psi Burst: 624 psi. joint strength. 624 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	1200 ft to 0 ft			Make up Torque ft-lbs			Total ft = 1200
O D	Weight	Grade	Threads	opt	min	mx	
9.625 inches	36 #/ft	J-55	ST&C	3,940	2,960	4,930	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
2,020 psi	3,520 psi	394 ,000 #		564 ,000 #		8.765	

2nd segment	ft to ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt	min.	mx	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom 1200

1200 ft to 0 ft			
9 625	0 J-55	ST&C	

	S.F.	Actual		Desire
	collapse	3 237179	>=	1.125
	burst-b	7.04	>=	1 25
	burst-t	7.04		

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft			
0	0	0	0

	S.F.	Actual		Desire
	collapse	#DIV/0!	>=	1 125
	burst-b	0	>=	1.25
	burst-t	0		
	jnt strngth	10.76785	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 7 x 5.5 in Production x

Total Depth: 8828 ft TVD: 3308 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 1720.16 psi Burst: 1720.16 psi. joint strength: 1720.16 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 3000 psi

1st segment	8828 ft to 3600 ft			Make up Torque ft-lbs			Total ft = 5228
O.D	Weight	Grade	Threads	opt.	min.	mx.	
5.5 inches	17 #/ft	HCP-110	Buttress	4,620	3.470	5,780	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
8,580 psi	10,640 psi-lrcr	568 ,000 #		546 ,000 #		4.767	

2nd segment	2400 ft to 3300 ft			Make up Torque ft-lbs			Total ft = 900
O.D.	Weight	Grade	Threads	opt.	min	mx.	
7 inches	26 #/ft	HCP-110	Buttress	6,930	5,200	8,660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi-lrcr	853 ,000 #		830 ,000 #		6.151	

3rd segment	2400 ft to 0 ft			Make up Torque ft-lbs			Total ft = 2400
O.D.	Weight	Grade	Threads	opt	min.	mx.	
7 inches	26 #/ft	HCP-110	LT&C	6930	5200	8660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi	693 ,000 #		830 ,000 #		6.151	

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom		8828	S.F.	Actual		Desire
			collapse	4.987908	>=	1.125
8828 ft to 3300 ft			burst-b	3.546667	>=	1.25
5.5	0 HCP-110 Buttress		burst-t	3.546667		
Top of segment 1 (ft)		3300	S.F.	Actual		Desire
Select 2nd segment from bottom			collapse	4.412586	>=	1.125
			burst-b	3.316667	>=	1.25
3300 ft to 2400 ft			burst-t	3.316667		
7	26 HCP-110 Buttress		jnt strngth	7.135887	>=	1.8

	Top of segment 2 (ft)	2400	S.F.	Actual		Desire
Select	3rd segment from bottom		collapse	6.013412	>=	1.125
			burst-b	3.316667	>=	1.25
2400 ft	to 0 ft		burst-t	3.316667		
7	26 HCP-110 LT&C		jnt strngth	8.579981	>=	1.8
	Top of segment 3 (ft)	0	S.F.	Actual		Desire
Select	4th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to 0 ft		burst-t	0		
0	0 0 0		jnt strngth	6.97061	>=	1.8
	Top of segment 4 (ft)		S.F.	Actual		Desire
Select	5th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0 0		jnt strngth	0	>=	1.8
	Top of segment 5 (ft)		S.F.	Actual		Desire
Select	6th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0		jnt strngth	0	>=	1.8
	Top of segment 6 (ft)		jnt strngth		>=	1.8

use in colapse calculations across different pressured formations

Three gradient pressure function

Depth of evaluation:	1,200 ft		516	psi @	1,200 ft	
Top of salt:	2,400 ft	fx #1	516			
Base of salt:	3,700 ft	fx #2	900			
TD of intermediate:	4,600 ft	fx #3	540			

Pressure gradient to be used above each top to be used as a function of depth. ex. psi/ft

fx #1	fx #2	fx #3
0.43	0.75	0.45

1) Calculate neutral point for buckling with temperature affects computed also
2) Surface burst calculations & kick tolerance in surface pressure for burst
3) Do a comparison test to determine which value is lower joint strength or body yield to use in tensile strength calculations
4) Raise joint strength safety factor up to next level on page #2
5) Sour service what pipe can be used with proper degrading of strength factors and as function of temp

Adjust for best combination of safety factors

	Secondary
S.F. Collapse bottom of segment:	
S.F. Collapse top of segment:	4.76069
S.F. Burst bottom of segment:	
S.F. Burst top of segment	
S.F. Joint strength bottom of segment:	795.518
S.F. Joint strength top of segment:	
S.F. Body yield strength bottom of segment:	764.706
S.F. Body yield strength top of segment:	6.8595

Collapse calculations for 1st segment - casing evacuated

Buoyancy factor collapse:	0.847	
calculations for bottom of segment @	3308 ft	
hydrostatic pressure collapse - backside:	1720.16 psi	
Axial load @ bottom of section	0 lbs	previous segments
Axial load factor:	0	load/(pipe body yield strength)
Collapse strength reduction factor:	1	Messrs. Westcott, Dunlop, Kemler,1940
Adjusted collapse rating of segment:	8580 psi	
Actual safety factor	4.98791	adjusted casing rating / actual pressure

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 13 3/8 in surface x intermediate

Total Depth: 260 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 9.6 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 9.6 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 9.6 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 129.792 psi Burst: 129.792 psi joint strength: 129.792 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	260 ft to 0 ft			Make up Torque ft-lbs			Total ft = 260
O.D.	Weight	Grade	Threads	opt	min.	mx.	
13.375 inches	48 #/ft	J-55	ST&C		3,220	2,420 4,030	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
740	2,370 psi	433 ,000 #		744 ,000 #		12.559	

2nd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min	mx	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom 260

260 ft to 0 ft			
13.375	0 J-55	ST&C	

	S.F.	Actual		Desire
	collapse	5.70143	>=	1.125
	burst-b	4.689281	>=	1.25
	burst-t	4.74		

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft			
0	0	0	0

	S.F.	Actual		Desire
	collapse	#DIV/0!	>=	1.125
	burst-b	0	>=	1.25
	burst-t	0		
	jnt strngth	40.66897	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H (Optional)

String Size & Function: 9 5/8 in surface ____ intermediate x

Total Depth: 1200 ft TVD: 1200 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 624 psi Burst: 624 psi. joint strength. 624 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut In surface pressure: 500 psi

1st segment	1200 ft to 0 ft			Make up Torque ft-lbs			Total ft = 1200
O D	Weight	Grade	Threads	opt.	min	mx.	
9.625 inches	36 #/ft	J-55	ST&C	3.940	2.960	4.930	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
2,020 psi	3,520 psi	394 ,000 #		564 ,000 #		8.765	

2nd segment	ft to ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom	1200	S.F.	Actual		Desire
		collapse	3.237179	>=	1.125
1200 ft to 0 ft		burst-b	7.04	>=	1.25
9.625 0 J-55 ST&C		burst-t	7.04		
Top of segment 1 (ft)	0	S.F.	Actual		Desire
Select 2nd segment from bottom		collapse	#DIV/0!	>=	1.125
		burst-b	0	>=	1.25
0 ft to 0 ft		burst-t	0		
0 0 0 0		jnt strngth	10.76785	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 7 x 5.5 in Production x

Total Depth: 8828 ft TVD: 3308 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 1720.16 psi Burst: 1720.16 psi, joint strength: 1720.16 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 3000 psi

1st segment	8828 ft to 3600 ft			Make up Torque ft-lbs			Total ft = 5228
O.D	Weight	Grade	Threads	opt.	min.	mx.	
5.5 inches	17 #/ft	HCP-110	Buttress	4,620	3,470	5,780	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
8,580 psi	10,640 psi-lrcr	568 ,000 #		546 ,000 #		4.767	

2nd segment	2400 ft to 3300 ft			Make up Torque ft-lbs			Total ft = 900
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
7 inches	26 #/ft	HCP-110	Buttress	6,930	5,200	8,660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi-lrcr	853 ,000 #		830 ,000 #		6.151	

3rd segment	2400 ft to 0 ft			Make up Torque ft-lbs			Total ft = 2400
O.D.	Weight	Grade	Threads	opt	min.	mx.	
7 inches	26 #/ft	HCP-110	LT&C	6930	5200	8660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi	693 ,000 #		830 ,000 #		6.151	

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt.	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom	8828	S.F.	Actual		Desire
		collapse	4.987908	>=	1.125
8828 ft to 3300 ft		burst-b	3.546667	>=	1.25
5.5 0 HCP-110 Buttress		burst-t	3.546667		
Top of segment 1 (ft)	3300	S.F.	Actual		Desire
Select 2nd segment from bottom		collapse	4.412586	>=	1.125
		burst-b	3.316667	>=	1.25
3300 ft to 2400 ft		burst-t	3.316667		
7 26 HCP-110 Buttress		jnt strngth	7.135887	>=	1.8

Top of segment 2 (ft)	2400	S.F.	Actual		Desire
Select 3rd segment from bottom		collapse	6.013412	>=	1.125
		burst-b	3.316667	>=	1.25
2400 ft to 0 ft		burst-t	3.316667		
7 26 HCP-110 LT&C		jnt strngth	8.579981	>=	1.8
Top of segment 3 (ft)	0	S.F.	Actual		Desire
Select 4th segment from bottom		collapse	#DIV/0!	>=	1.125
		burst-b	0	>=	1.25
0 ft to 0 ft		burst-t	0		
0 0 0 0		jnt strngth	6.97061	>=	1.8
Top of segment 4 (ft)		S.F.	Actual		Desire
Select 5th segment from bottom		collapse	#DIV/0!	>=	1.125
		burst-b	0	>=	1.25
0 ft to ft		burst-t	0		
0 0 0 0		jnt strngth	0	>=	1.8
Top of segment 5 (ft)		S.F.	Actual		Desire
Select 6th segment from bottom		collapse	#DIV/0!	>=	1.125
		burst-b	0	>=	1.25
0 ft to ft		burst-t	0		
0 0 0 0		jnt strngth	0	>=	1.8
Top of segment 6 (ft)		jnt strngth		>=	1.8

use in collapse calculations across different pressured formations

Three gradient pressure function

Depth of evaluation:	1,200 ft			516	psi @	1,200 ft
Top of salt:	2,400 ft	fx #1	516			
Base of salt:	3,700 ft	fx #2	900			
TD of intermediate:	4,600 ft	fx #3	540			

Pressure gradient to be used above each top to be used as a function of depth. ex. psi/ft

fx #1	fx #2	fx #3
0.43	0.75	0.45

1) Calculate neutral point for buckling with temperature affects computed also
2) Surface burst calculations & kick tolerance in surface pressure for burst
3) Do a comparison test to determine which value is lower joint strength or body yield to use in tensile strength calculations
4) Raise joint strength safety factor up to next level on page #2
5) Sour service what pipe can be used with proper degrading of strength factors and as function of temp

Adjust for best combination of safety factors

	Secondary
S.F. Collapse bottom of segment:	
S.F. Collapse top of segment:	4.76069
S.F. Burst bottom of segment:	
S.F. Burst top of segment	
S.F. Joint strength bottom of segment:	795.518
S.F. Joint strength top of segment:	
S.F. Body yield strength bottom of segment:	764.706
S.F. Body yield strength top of segment:	6.8595

Collapse calculations for 1st segment - casing evacuated

Buoyancy factor collapse:	0.847	
calculations for bottom of segment @	3308 ft	
hydrostatic pressure collapse - backside:	1720.16 psi	
Axial load @ bottom of section	0 lbs	previous segments
Axial load factor:	0	load/(pipe body yield strength)
Collapse strength reduction factor:	1	Messrs. Westcott, Dunlop, Kemler, 1940
Adjusted collapse rating of segment:	8580 psi	
Actual safety factor	4.98791	adjusted casing rating / actual pressure

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 13 3/8 in surface x intermediate

Total Depth: 260 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 9.6 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 9.6 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 9.6 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 129.792 psi Burst: 129.792 psi. joint strength: 129.792 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 500 psi

1st segment	260 ft to 0 ft			Make up Torque ft-lbs			Total ft = 260
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
13.375 inches	48 #/ft	J-55	ST&C	3,220	2,420	4,030	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
740	2,370 psi	433 ,000 #		744 ,000 #		12.659	

2nd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D.	Weight	Grade	Threads	opt.	min	mx	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom 260

260 ft to 0 ft			
13.375	0 J-55	ST&C	

	S.F.	Actual		Desire
collapse	5.70143	>=	1.125	
burst-b	4.689281	>=	1.25	
burst-t	4.74			

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft			
0	0	0	0

	S.F.	Actual		Desire
collapse	#DIV/0!	>=	1.125	
burst-b	0	>=	1.25	
burst-t	0			
jnt strngth	40.66897	>=	1.8	

Casing Design Well: Spruce Grove Federal Com #1H (Optional)

String Size & Function: 9 5/8 in surface ____ intermediate x

Total Depth: 1200 ft TVD: 1200 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse. 624 psi Burst: 624 psi joint strength. 624 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut In surface pressure: 500 psi

1st segment	1200 ft to 0 ft			Make up Torque ft-lbs			Total ft = 1200
O D	Weight	Grade	Threads	opt.	min	mx.	
9.625 inches	36 #/ft	J-55	ST&C	3,940	2,960	4,930	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
2,020 psi	3,520 psi	394 ,000 #		564 ,000 #		8.765	

2nd segment	ft to ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

3rd segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom 1200

1200 ft to 0 ft
9 625 0 J-55 ST&C

S.F.	Actual		Desire
collapse	3.237179	>=	1.125
burst-b	7.04	>=	1 25
burst-t	7.04		

Top of segment 1 (ft) 0

Select 2nd segment from bottom

0 ft to 0 ft
0 0 0 0

S.F.	Actual		Desire
collapse	#DIV/0!	>=	1 125
burst-b	0	>=	1.25
burst-t	0		
jnt strngth	10.76785	>=	1.8

Casing Design Well: Spruce Grove Federal Com #1H

String Size & Function: 7 x 5.5 in Production x

Total Depth: 8828 ft TVD: 3308 ft

Pressure Gradient for Calculations (While drilling)

Mud weight, collapse: 10 #/gal Safety Factor Collapse: 1.125

Mud weight, burst: 10 #/gal Safety Factor Burst: 1.25

Mud weight for joint strength: 10 #/gal Safety Factor Joint Strength 1.8

BHP @ TD for: collapse: 1720.16 psi Burst: 1720.16 psi joint strength: 1720.16 psi

Partially evacuated hole? Pressure gradient remaining: 10 #/gal

Max. Shut in surface pressure: 3000 psi

1st segment	8828 ft to 3600 ft			Make up Torque ft-lbs			Total ft = 5228
O.D	Weight	Grade	Threads	opt	min.	mx.	
5.5 inches	17 #/ft	HCP-110	Buttross	4,620	3.470	5,780	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
8,580 psi	10,640 psi-lrcr	588 ,000 #		546 ,000 #		4.767	

2nd segment	2400 ft to 3300 ft			Make up Torque ft-lbs			Total ft = 900
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
7 inches	26 #/ft	HCP-110	Buttross	6,930	5,200	8,660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi-lrcr	853 ,000 #		830 ,000 #		6.151	

3rd segment	2400 ft to 0 ft			Make up Torque ft-lbs			Total ft = 2400
O.D.	Weight	Grade	Threads	opt.	min.	mx.	
7 inches	26 #/ft	HCP-110	LT&C	6930	5200	8660	
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
7,800 psi	9,950 psi	693 ,000 #		830 ,000 #		6.151	

4th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D	Weight	Grade	Threads	opt.	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

5th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt.	min	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

6th segment	0 ft to 0 ft			Make up Torque ft-lbs			Total ft = 0
O.D.	Weight	Grade	Threads	opt	min.	mx.	
inches	#/ft						
Collapse Resistance	Internal Yield	Joint Strength		Body Yield		Drift	
psi	psi	,000 #		,000 #			

Select 1st segment bottom	8828	S.F.	Actual		Desire
		collapse	4.987908	>=	1.125
8828 ft to 3300 ft		burst-b	3.546667	>=	1.25
5.5 0 HCP-110 Buttress		burst-t	3.546667		
Top of segment 1 (ft)	3300	S.F.	Actual		Desire
Select 2nd segment from bottom		collapse	4.412586	>=	1.125
		burst-b	3.316667	>=	1.25
3300 ft to 2400 ft		burst-t	3.316667		
7 26 HCP-110 Buttress		jnt strngth	7.135887	>=	1.8

	Top of segment 2 (ft)	2400	S.F.	Actual		Desire
Select	3rd segment from bottom		collapse	6.013412	>=	1.125
			burst-b	3.316667	>=	1.25
2400 ft	to 0 ft		burst-t	3.316667		
7	26 HCP-110 LT&C		jnt strngth	8.579981	>=	1.8
	Top of segment 3 (ft)	0	S.F.	Actual		Desire
Select	4th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to 0 ft		burst-t	0		
0	0 0 0		jnt strngth	6.97061	>=	1.8
	Top of segment 4 (ft)		S.F.	Actual		Desire
Select	5th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0		jnt strngth	0	>=	1.8
	Top of segment 5 (ft)		S.F.	Actual		Desire
Select	6th segment from bottom		collapse	#DIV/0!	>=	1.125
			burst-b	0	>=	1.25
0 ft	to ft		burst-t	0		
0	0 0 0		jnt strngth	0	>=	1.8
	Top of segment 6 (ft)		jnt strngth		>=	1.8

use in colapse calculations across different pressured formations

Three gradient pressure function

Depth of evaluation:	1,200 ft		516	psi @	1,200 ft
Top of salt:	2,400 ft	fx #1	516		
Base of salt:	3,700 ft	fx #2	900		
TD of intermediate:	4,600 ft	fx #3	540		

Pressure gradient to be used above each top to be used as a function of depth. ex. psi/ft

fx #1	fx #2	fx #3
0.43	0.75	0.45

1) Calculate neutral point for buckling with temperature affects computed also
2) Surface burst calculations & kick tolerance in surface pressure for burst
3) Do a comparison test to determine which value is lower joint strength or body yield to use in tensile strength calculations
4) Raise joint strength safety factor up to next level on page #2
5) Sour service what pipe can be used with proper degrading of strength factors and as function of temp

Adjust for best combination of safety factors

	Secondary
S.F. Collapse bottom of segment:	
S.F. Collapse top of segment:	4.76069
S.F. Burst bottom of segment:	
S.F. Burst top of segment	
S.F. Joint strength bottom of segment:	795.518
S.F. Joint strength top of segment:	
S.F. Body yield strength bottom of segment:	764.706
S.F. Body yield strength top of segment:	6.8595

Collapse calculations for 1st segment - casing evacuated

Buoyancy factor collapse:	0.847	
calculations for bottom of sogment @	3308 ft	
hydrostatic pressure collapse - backside:	1720.16 psi	
Axial load @ bottom of section	0 lbs	previous segments
Axial load factor:	0	load/(pipe body yield strength)
Collapse strength reduction factor:	1	Messrs. Westcott, Dunlop, Kemler,1940
Adjusted collapse rating of segment:	8580 psi	
Actual safety factor	4.98791	adjusted casing rating / actual pressure

Spruce Grove Federal Com #1H, Plan 1

Operator	Mack Energy Corp	**Units**	feet, °/100ft	10:13 Monday, September 10, 2018	Page 1 of 4
Field	Round Tank	**County**	Chaves	**Vertical Section Azimuth**	359.22
Well Name	Spruce Grove Federal Com #1H	**State**	New Mexico	**Survey Calculation Method**	Minimum Curvature
Plan	1	**Country**	USA	**Database**	Access

Location	SL: 565 FNL & 2285 FEL Sec 28-T15S-R29E BHL: 5 FNL & 2285 FEL Sec 21-T15S-R29E	**Map Zone**	UTM	**Lat Long Ref**	
Site		**Surface X**	1937135	**Surface Long**	
Slot Name	**UWI**	**Surface Y**	11977194.3	**Surface Lat**	
Well Number	**API**	**Surface Z**	3835	**Global Z Ref**	Mean Sea Level
Project	**MD/TVD Ref** KB	**Ground Level**	3817.5	**Local North Ref**	Grid

DIRECTIONAL WELL PLAN

MD*	INC*	AZI*	TVD*	N*	E*	DLS*	V. S.*	MapE*	MapN*	SysTVD*
ft	deg	deg	ft	ft	ft	°/100ft	ft	ft	ft	ft
*** TIE (at MD = 2478.00)										
2478.00	0.00	0.0	2478.00	0.00	0.00		0.00	1937135.00	11977194.30	1357.00
2500.00	0.00	0.0	2500.00	0.00	0.00	0.00	0.00	1937135.00	11977194.30	1335.00
2550.00	0.00	0.0	2550.00	0.00	0.00	0.00	0.00	1937135.00	11977194.30	1285.00
*** KOP 8 DEGREE (at MD = 2578.00)										
2578.00	0.00	0.0	2578.00	0.00	0.00	0.00	0.00	1937135.00	11977194.30	1257.00
2600.00	1.76	359.2	2600.00	0.34	0.00	8.00	0.34	1937135.00	11977194.64	1235.00
2650.00	5.76	359.2	2649.88	3.62	-0.05	8.00	3.62	1937134.95	11977197.92	1185.12
2700.00	9.76	359.2	2699.41	10.36	-0.14	8.00	10.37	1937134.86	11977204.66	1135.59
2750.00	13.76	359.2	2748.35	20.55	-0.28	8.00	20.55	1937134.72	11977214.85	1086.65
2800.00	17.76	359.2	2796.46	34.13	-0.46	8.00	34.13	1937134.54	11977228.43	1038.54
2850.00	21.76	359.2	2843.51	51.03	-0.69	8.00	51.03	1937134.31	11977245.33	991.49
2900.00	25.76	359.2	2889.26	71.17	-0.97	8.00	71.17	1937134.03	11977265.47	945.74
2950.00	29.76	359.2	2933.50	94.45	-1.29	8.00	94.46	1937133.71	11977288.75	901.50
3000.00	33.76	359.2	2976.00	120.76	-1.64	8.00	120.77	1937133.36	11977315.06	859.00
3050.00	37.76	359.2	3016.57	149.97	-2.04	8.00	149.98	1937132.96	11977344.27	818.43
3100.00	41.76	359.2	3055.00	181.94	-2.48	8.00	181.96	1937132.52	11977376.24	780.00
3150.00	45.76	359.2	3091.10	216.51	-2.95	8.00	216.53	1937132.05	11977410.81	743.90
3200.00	49.76	359.2	3124.71	253.52	-3.45	8.00	253.54	1937131.55	11977447.82	710.29
3250.00	53.76	359.2	3155.65	292.78	-3.99	8.00	292.80	1937131.01	11977487.08	679.35
*** 55 DEGREE TANGENT (at MD = 3265.50)										
3265.50	55.00	359.2	3164.67	305.38	-4.16	8.00	305.40	1937130.84	11977499.68	670.33
3300.00	55.00	359.2	3184.46	333.63	-4.54	0.00	333.66	1937130.46	11977527.93	650.54
3350.00	55.00	359.2	3213.14	374.59	-5.10	0.00	374.62	1937129.90	11977568.89	621.86
*** 12 DEGREE BUILD (at MD = 3365.50)										
3365.50	55.00	359.2	3222.03	387.28	-5.27	0.00	387.32	1937129.73	11977581.58	612.97
3400.00	59.14	359.2	3240.78	416.23	-5.67	12.00	416.27	1937129.33	11977610.53	594.22
3450.00	65.14	359.2	3264.14	460.41	-6.27	12.00	460.45	1937128.73	11977654.71	570.86
3500.00	71.14	359.2	3282.75	506.79	-6.90	12.00	506.84	1937128.10	11977701.09	552.25
3550.00	77.14	359.2	3296.40	554.86	-7.55	12.00	554.91	1937127.45	11977749.16	538.60
3600.00	83.14	359.2	3304.96	604.10	-8.22	12.00	604.15	1937126.78	11977798.40	530.04
3650.00	89.14	359.2	3308.33	653.95	-8.90	12.00	654.01	1937126.10	11977848.25	526.67
*** LANDING POINT (at MD = 3661.33)										
3661.33	90.50	359.2	3308.36	665.29	-9.06	12.00	665.35	1937125.94	11977859.59	526.64
3700.00	90.50	359.2	3308.03	703.95	-9.58	0.00	704.01	1937125.42	11977898.25	526.98
3750.00	90.50	359.2	3307.59	753.94	-10.26	0.00	754.01	1937124.74	11977948.24	527.41
3800.00	90.50	359.2	3307.15	803.93	-10.95	0.00	804.01	1937124.05	11977998.23	527.85
3850.00	90.50	359.2	3306.72	853.93	-11.63	0.00	854.01	1937123.37	11978048.23	528.28
3900.00	90.50	359.2	3306.28	903.92	-12.31	0.00	904.01	1937122.69	11978098.22	528.72

Spruce Grove Federal Com #1H, Plan 1

Operator	Mack Energy Corp	**Units**	feet, °/100ft	10:13 Monday, September 10, 2018	Page 2 of 4
Field	Round Tank	**County**	Chaves	**Vertical Section Azimuth**	359.22
Well Name	Spruce Grove Federal Com #1H	**State**	New Mexico	**Survey Calculation Method**	Minimum Curvature
Plan	1	**Country**	USA	**Database**	Access

Location	SL: 565 FNL & 2285 FEL Sec 28-T15S-R29E BHL: 5 FNL & 2285 FEL Sec 21-T15S-R29E	**Map Zone**	UTM	**Lat Long Ref**	
Site		**Surface X**	1937135	**Surface Long**	
Slot Name	**UWI**	**Surface Y**	11977194.3	**Surface Lat**	
Well Number	**API**	**Surface Z**	3835	**Global Z Ref**	Mean Sea Level
Project	**MD/TVD Ref** KB	**Ground Level**	3817.5	**Local North Ref**	Grid

DIRECTIONAL WELL PLAN

MD*	INC*	AZI*	TVD*	N*	E*	DLS*	V. S.*	MapE*	MapN*	SysTVD*
ft	deg	deg	ft	ft	ft	°/100ft	ft	ft	ft	ft
3950.00	90.50	359.2	3305.84	953.92	-12.99	0.00	954.00	1937122.01	11978148.22	529.16
4000.00	90.50	359.2	3305.41	1003.91	-13.67	0.00	1004.00	1937121.33	11978198.21	529.59
4050.00	90.50	359.2	3304.97	1053.90	-14.35	0.00	1054.00	1937120.65	11978248.20	530.03
4100.00	90.50	359.2	3304.53	1103.90	-15.03	0.00	1104.00	1937119.97	11978298.20	530.47
4150.00	90.50	359.2	3304.10	1153.89	-15.71	0.00	1154.00	1937119.29	11978348.19	530.90
4200.00	90.50	359.2	3303.66	1203.88	-16.39	0.00	1203.99	1937118.61	11978398.18	531.34
4250.00	90.50	359.2	3303.23	1253.88	-17.07	0.00	1253.99	1937117.93	11978448.18	531.77
4300.00	90.50	359.2	3302.79	1303.87	-17.75	0.00	1303.99	1937117.25	11978498.17	532.21
4350.00	90.50	359.2	3302.35	1353.86	-18.43	0.00	1353.99	1937116.57	11978548.16	532.65
4400.00	90.50	359.2	3301.92	1403.86	-19.11	0.00	1403.99	1937115.89	11978598.16	533.08
4450.00	90.50	359.2	3301.48	1453.85	-19.79	0.00	1453.98	1937115.21	11978648.15	533.52
4500.00	90.50	359.2	3301.04	1503.84	-20.47	0.00	1503.98	1937114.53	11978698.14	533.96
4550.00	90.50	359.2	3300.61	1553.84	-21.15	0.00	1553.98	1937113.85	11978748.14	534.39
4600.00	90.50	359.2	3300.17	1603.83	-21.84	0.00	1603.98	1937113.16	11978798.13	534.83
4650.00	90.50	359.2	3299.73	1653.82	-22.52	0.00	1653.98	1937112.48	11978848.12	535.27
4700.00	90.50	359.2	3299.30	1703.82	-23.20	0.00	1703.97	1937111.80	11978898.12	535.70
4750.00	90.50	359.2	3298.86	1753.81	-23.88	0.00	1753.97	1937111.12	11978948.11	536.14
4800.00	90.50	359.2	3298.43	1803.80	-24.56	0.00	1803.97	1937110.44	11978998.10	536.57
4850.00	90.50	359.2	3297.99	1853.80	-25.24	0.00	1853.97	1937109.76	11979048.10	537.01
4900.00	90.50	359.2	3297.55	1903.79	-25.92	0.00	1903.97	1937109.08	11979098.09	537.45
4950.00	90.50	359.2	3297.12	1953.78	-26.60	0.00	1953.97	1937108.40	11979148.08	537.88
5000.00	90.50	359.2	3296.68	2003.78	-27.28	0.00	2003.96	1937107.72	11979198.08	538.32
5050.00	90.50	359.2	3296.24	2053.77	-27.96	0.00	2053.96	1937107.04	11979248.07	538.76
5100.00	90.50	359.2	3295.81	2103.76	-28.64	0.00	2103.96	1937106.36	11979298.06	539.19
5150.00	90.50	359.2	3295.37	2153.76	-29.32	0.00	2153.96	1937105.68	11979348.06	539.63
5200.00	90.50	359.2	3294.94	2203.75	-30.00	0.00	2203.96	1937105.00	11979398.05	540.06
5250.00	90.50	359.2	3294.50	2253.75	-30.68	0.00	2253.95	1937104.32	11979448.05	540.50
5300.00	90.50	359.2	3294.06	2303.74	-31.36	0.00	2303.95	1937103.64	11979498.04	540.94
5350.00	90.50	359.2	3293.63	2353.73	-32.04	0.00	2353.95	1937102.96	11979548.03	541.37
5400.00	90.50	359.2	3293.19	2403.73	-32.73	0.00	2403.95	1937102.27	11979598.03	541.81
5450.00	90.50	359.2	3292.75	2453.72	-33.41	0.00	2453.95	1937101.59	11979648.02	542.25
5500.00	90.50	359.2	3292.32	2503.71	-34.09	0.00	2503.94	1937100.91	11979698.01	542.68
5550.00	90.50	359.2	3291.88	2553.71	-34.77	0.00	2553.94	1937100.23	11979748.01	543.12
5600.00	90.50	359.2	3291.44	2603.70	-35.45	0.00	2603.94	1937099.55	11979798.00	543.56
5650.00	90.50	359.2	3291.01	2653.69	-36.13	0.00	2653.94	1937098.87	11979847.99	543.99
5700.00	90.50	359.2	3290.57	2703.69	-36.81	0.00	2703.94	1937098.19	11979897.99	544.43
5750.00	90.50	359.2	3290.14	2753.68	-37.49	0.00	2753.93	1937097.51	11979947.98	544.86

Spruce Grove Federal Com #1H, Plan 1

Operator	Mack Energy Corp	**Units**	feet, °/100ft	10:13 Monday, September 10, 2018	Page 3 of 4
Field	Round Tank	**County**	Chaves	**Vertical Section Azimuth**	359.22
Well Name	Spruce Grove Federal Com #1H	**State**	New Mexico	**Survey Calculation Method**	Minimum Curvature
Plan	1	**Country**	USA	**Database**	Access

Location	SL: 565 FNL & 2285 FEL Sec 28-T15S-R29E BHL: 5 FNL & 2285 FEL Sec 21-T15S-R29E	**Map Zone**	UTM	**Lat Long Ref**	
Site		**Surface X**	1937135	**Surface Long**	
Slot Name	**UWI**	**Surface Y**	11977194.3	**Surface Lat**	
Well Number	**API**	**Surface Z**	3835	**Global Z Ref**	Mean Sea Level
Project	**MD/TVD Ref** KB	**Ground Level**	3817.5	**Local North Ref**	Grid

DIRECTIONAL WELL PLAN

MD*	INC*	AZI*	TVD*	N*	E*	DLS*	V. S.*	MapE*	MapN*	SysTVD*
ft	deg	deg	ft	ft	ft	°/100ft	ft	ft	ft	ft
5800.00	90.50	359.2	3289.70	2803.67	-38.17	0.00	2803.93	1937096.83	11979997.97	545.30
5850.00	90.50	359.2	3289.26	2853.67	-38.85	0.00	2853.93	1937096.15	11980047.97	545.74
5900.00	90.50	359.2	3288.83	2903.66	-39.53	0.00	2903.93	1937095.47	11980097.96	546.17
5950.00	90.50	359.2	3288.39	2953.65	-40.21	0.00	2953.93	1937094.79	11980147.95	546.61
6000.00	90.50	359.2	3287.95	3003.65	-40.89	0.00	3003.93	1937094.11	11980197.95	547.05
6050.00	90.50	359.2	3287.52	3053.64	-41.57	0.00	3053.92	1937093.43	11980247.94	547.48
6100.00	90.50	359.2	3287.08	3103.63	-42.25	0.00	3103.92	1937092.75	11980297.93	547.92
6150.00	90.50	359.2	3286.65	3153.63	-42.93	0.00	3153.92	1937092.07	11980347.93	548.36
6200.00	90.50	359.2	3286.21	3203.62	-43.62	0.00	3203.92	1937091.38	11980397.92	548.79
6250.00	90.50	359.2	3285.77	3253.61	-44.30	0.00	3253.92	1937090.70	11980447.91	549.23
6300.00	90.50	359.2	3285.34	3303.61	-44.98	0.00	3303.91	1937090.02	11980497.91	549.66
6350.00	90.50	359.2	3284.90	3353.60	-45.66	0.00	3353.91	1937089.34	11980547.90	550.10
6400.00	90.50	359.2	3284.46	3403.59	-46.34	0.00	3403.91	1937088.66	11980597.89	550.54
6450.00	90.50	359.2	3284.03	3453.59	-47.02	0.00	3453.91	1937087.98	11980647.89	550.97
6500.00	90.50	359.2	3283.59	3503.58	-47.70	0.00	3503.91	1937087.30	11980697.88	551.41
6550.00	90.50	359.2	3283.15	3553.58	-48.38	0.00	3553.90	1937086.62	11980747.88	551.85
6600.00	90.50	359.2	3282.72	3603.57	-49.06	0.00	3603.90	1937085.94	11980797.87	552.28
6650.00	90.50	359.2	3282.28	3653.56	-49.74	0.00	3653.90	1937085.26	11980847.86	552.72
6700.00	90.50	359.2	3281.85	3703.56	-50.42	0.00	3703.90	1937084.58	11980897.86	553.15
6750.00	90.50	359.2	3281.41	3753.55	-51.10	0.00	3753.90	1937083.90	11980947.85	553.59
6800.00	90.50	359.2	3280.97	3803.54	-51.78	0.00	3803.89	1937083.22	11980997.84	554.03
6850.00	90.50	359.2	3280.54	3853.54	-52.46	0.00	3853.89	1937082.54	11981047.84	554.46
6900.00	90.50	359.2	3280.10	3903.53	-53.14	0.00	3903.89	1937081.86	11981097.83	554.90
6950.00	90.50	359.2	3279.66	3953.52	-53.82	0.00	3953.89	1937081.18	11981147.82	555.34
7000.00	90.50	359.2	3279.23	4003.52	-54.51	0.00	4003.89	1937080.49	11981197.82	555.77
7050.00	90.50	359.2	3278.79	4053.51	-55.19	0.00	4053.89	1937079.81	11981247.81	556.21
7100.00	90.50	359.2	3278.35	4103.50	-55.87	0.00	4103.88	1937079.13	11981297.80	556.65
7150.00	90.50	359.2	3277.92	4153.50	-56.55	0.00	4153.88	1937078.45	11981347.80	557.08
7200.00	90.50	359.2	3277.48	4203.49	-57.23	0.00	4203.88	1937077.77	11981397.79	557.52
7250.00	90.50	359.2	3277.05	4253.48	-57.91	0.00	4253.88	1937077.09	11981447.78	557.95
7300.00	90.50	359.2	3276.61	4303.48	-58.59	0.00	4303.88	1937076.41	11981497.78	558.39
7350.00	90.50	359.2	3276.17	4353.47	-59.27	0.00	4353.87	1937075.73	11981547.77	558.83
7400.00	90.50	359.2	3275.74	4403.46	-59.95	0.00	4403.87	1937075.05	11981597.76	559.26
7450.00	90.50	359.2	3275.30	4453.46	-60.63	0.00	4453.87	1937074.37	11981647.76	559.70
7500.00	90.50	359.2	3274.86	4503.45	-61.31	0.00	4503.87	1937073.69	11981697.75	560.14
7550.00	90.50	359.2	3274.43	4553.44	-61.99	0.00	4553.87	1937073.01	11981747.74	560.57
7600.00	90.50	359.2	3273.99	4603.44	-62.67	0.00	4603.86	1937072.33	11981797.74	561.01

Spruce Grove Federal Com #1H, Plan 1

Operator	Mack Energy Corp	**Units**	feet, °/100ft	10:13 Monday, September 10, 2018	Page 4 of 4
Field	Round Tank	**County**	Chaves	**Vertical Section Azimuth**	359.22
Well Name	Spruce Grove Federal Com #1H	**State**	New Mexico	**Survey Calculation Method**	Minimum Curvature
Plan	1	**Country**	USA	**Database**	Access

Location	SL: 565 FNL & 2285 FEL Sec 28-T15S-R29E BHL: 5 FNL & 2285 FEL Sec 21-T15S-R29E	**Map Zone**	UTM	**Lat Long Ref**	
Site		**Surface X**	1937135	**Surface Long**	
Slot Name	**UWI**	**Surface Y**	11977194.3	**Surface Lat**	
Well Number	**API**	**Surface Z**	3835	**Global Z Ref**	Mean Sea Level
Project	**MD/TVD Ref** KB	**Ground Level**	3817.5	**Local North Ref**	Grid

DIRECTIONAL WELL PLAN

MD*	INC*	AZI*	TVD*	N*	E*	DLS*	V. S.*	MapE*	MapN*	SysTVD*
ft	deg	deg	ft	ft	ft	°/100ft	ft	ft	ft	ft
7650.00	90.50	359.2	3273.56	4653.43	-63.35	0.00	4653.86	1937071.65	11981847.73	561.44
7700.00	90.50	359.2	3273.12	4703.42	-64.03	0.00	4703.86	1937070.97	11981897.72	561.88
7750.00	90.50	359.2	3272.68	4753.42	-64.72	0.00	4753.86	1937070.29	11981947.72	562.32
7800.00	90.50	359.2	3272.25	4803.41	-65.40	0.00	4803.86	1937069.60	11981997.71	562.75
7850.00	90.50	359.2	3271.81	4853.41	-66.08	0.00	4853.85	1937068.92	11982047.71	563.19
7900.00	90.50	359.2	3271.37	4903.40	-66.76	0.00	4903.85	1937068.24	11982097.70	563.63
7950.00	90.50	359.2	3270.94	4953.39	-67.44	0.00	4953.85	1937067.56	11982147.69	564.06
8000.00	90.50	359.2	3270.50	5003.39	-68.12	0.00	5003.85	1937066.88	11982197.69	564.50
8050.00	90.50	359.2	3270.06	5053.38	-68.80	0.00	5053.85	1937066.20	11982247.68	564.94
8100.00	90.50	359.2	3269.63	5103.37	-69.48	0.00	5103.85	1937065.52	11982297.67	565.37
8150.00	90.50	359.2	3269.19	5153.37	-70.16	0.00	5153.84	1937064.84	11982347.67	565.81
8200.00	90.50	359.2	3268.76	5203.36	-70.84	0.00	5203.84	1937064.16	11982397.66	566.24
8250.00	90.50	359.2	3268.32	5253.35	-71.52	0.00	5253.84	1937063.48	11982447.65	566.68
8300.00	90.50	359.2	3267.88	5303.35	-72.20	0.00	5303.84	1937062.80	11982497.65	567.12
8350.00	90.50	359.2	3267.45	5353.34	-72.88	0.00	5353.84	1937062.12	11982547.64	567.55
8400.00	90.50	359.2	3267.01	5403.33	-73.56	0.00	5403.83	1937061.44	11982597.63	567.99
8450.00	90.50	359.2	3266.57	5453.33	-74.24	0.00	5453.83	1937060.76	11982647.63	568.43
8500.00	90.50	359.2	3266.14	5503.32	-74.92	0.00	5503.83	1937060.08	11982697.62	568.86
8550.00	90.50	359.2	3265.70	5553.31	-75.61	0.00	5553.83	1937059.39	11982747.61	569.30
8600.00	90.50	359.2	3265.27	5603.31	-76.29	0.00	5603.83	1937058.71	11982797.61	569.74
8650.00	90.50	359.2	3264.83	5653.30	-76.97	0.00	5653.82	1937058.03	11982847.60	570.17
8700.00	90.50	359.2	3264.39	5703.29	-77.65	0.00	5703.82	1937057.35	11982897.59	570.61
8750.00	90.50	359.2	3263.96	5753.29	-78.33	0.00	5753.82	1937056.67	11982947.59	571.04
8800.00	90.50	359.2	3263.52	5803.28	-79.01	0.00	5803.82	1937055.99	11982997.58	571.48
*** TD (at MD = 8827.33)										
8827.33	90.50	359.2	3263.28	5830.61	-79.38	0.00	5831.15	1937055.62	11983024.91	571.72

Mack Energy Corporation

Legal Description:
Mack Energy-San Andres MDP Area
Chaves Co. New Mexico
Various Sections
T-15-S, R-28-E and R-29-E

H2S

"Contingency Plan"

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H2S CONTINGENCY PLAN SECTION

Scope:

This contingency plan provides an organized plan of action for alerting and protecting the public within an area of exposure prior to an intentional release, or following the accidental release of a potentially hazardous volume of hydrogen sulfide. The plan establishes guidelines for all personnel whose work activity may involve exposure to Hydrogen Sulfide Gas (H_2S).

Objective:

Prevent any and all accidents, and prevent the uncontrolled release of H2S into the atmosphere.

Provide proper evacuation procedures to cope with emergencies.

Provide immediate and adequate medical attention should an injury occur.

Discussion of Plan:

Suspected Problem Zones:

Implementation: This plan, with all details, is to be fully implemented 1000' before drilling into the first sour zone.

Emergency Response Procedure: This section outlines the conditions and denotes steps to be taken in the event of an emergency.

Emergency Equipment and Procedure: This section outlines the safety and emergency equipment that will be required for the drilling of this well.

Training Provisions: This section outlines the training provisions that must be adhered to 1000' before drilling into the first sour zone.

Emergency call list: Included are the telephone numbers of all persons that would need to be contacted, should an H2S emergency occur.

Briefing: This section deals with the briefing of all persons involved with the drilling of this well.

Public Safety: Public Safety Personnel will be made aware of the drilling of this well.

Check Lists: Status check lists and procedural check lists have been included to ensure adherence to the plan.

Genera/Information: A general information section has been included to supply support information.

EMERGENCY PROCEDURES SECTION

I. In the event of any evidence of H2S level above l0ppm, take the following steps immediately:

   a. Secure breathing apparatus.

   b. Order non-essential personnel out of the danger zone.

   c. Take steps to determine if the H2S level can be corrected or suppressed, and if so, proceed with normal operations.

II. If uncontrollable conditions occur, proceed with the following:

   a. Take steps to protect and/or remove any public downwind of the rig, including partial evacuation or isolation. Notify public safety personnel and the New Mexico Oil Conservation Division or Bureau of Land Management, whichever is appropriate, of the situation.

   b. Remove all personnel to the Safe Briefing Area.

   c. Notify public safety personnel for help with maintaining roadblocks and implementing evacuation.

   d. Determine and proceed with the best possible plan to regain control of the well. Maintain tight security and safety measures.

III. Responsibility:

   a. The Company Approved Supervisor shall be responsible for the total implementation of the plan.

   b. The Company Approved Supervisor shall be in complete command during any emergency.

   c. The Company Approved Supervisor shall designate a back-up Supervisor in the event that he/she is not available.

EMERGENCY PROCEDURE IMPLEMENTATION

I. Drilling or Tripping

a. *All Personnel*

i. When alarm sounds, don escape unit and report to upwind Safe Briefing Area.

ii. Check status of other personnel (buddy system).

iii. Secure breathing apparatus.

iv. Wait for orders from supervisor.

b. *Drilling Foreman*

i. Report to the upwind Safe Briefing Area.

ii. Don Breathing Apparatus and return to the point of release with the Tool Pusher or Driller (buddy system).

iii. Determine the concentration of H_2S.

iv. Assess the situation and take appropriate control measures.

c. *Tool Pusher*

i. Report to the upwind Safe Briefing Area.

ii. Don Breathing Apparatus and return to the point of release with the Drilling Foreman or the Driller (buddy system).

iii. Determine the concentration of H_2S.

iv. Assess the situation and take appropriate control measures.

d. *Driller*

i. Check the status of other personnel (in a rescue attempt, always use the buddy system).

ii. Assign the least essential person to notify the Drilling Foreman and Tool Pusher, in the event of their absence.

iii. Assume the responsibility of the Drilling Foreman and the Tool Pusher until they arrive, in the event *of* their absence.

e. *Derrick Man and Floor Hands*

i. Remain in the upwind Safe Briefing Area until otherwise instructed by a supervisor.

f. *Mud Engineer*

i. Report to the upwind Safe Briefing Area.

ii. When instructed, begin check of mud for pH level and H_2S level.

g. *Safety Personnel*

i. Don Breathing Apparatus.

ii. Check status of personnel.

iii. Wait for instructions from Drilling Foreman or Tool Pusher.

II. Taking a Kick

a. All Personnel report to the upwind Safe Briefing Area.

b. Follow standard BOP procedures.

III. Open Hole Logging

a. All unnecessary personnel should leave the rig floor.

b. Drilling Foreman and Safety Personnel should monitor the conditions and make necessary safety equipment recommendations.

IV. Running Casing or Plugging

a. Follow "Drilling or Tripping" procedures.

b. Assure that all personnel have access to protective equipment.

SIMULATED BLOWOUT CONTROL DRILLS

All drills will be initiated by activating alarm devices (air horn). One long blast, on the air horn, for ACTUAL and SIMULATED Blowout Control Drills. This operation will be performed by the Drilling Foreman or Tool Pusher at least one time per week for each of the following conditions, with each crew:

Drill #1 Bottom Drilling

Drill #2 Tripping Drill Pipe

In each of these drills, the initial reaction time to shutting in the well shall be timed as well as the total time for the crew to complete its entire pit drill assignment. The times must be recorded on the IADC Driller's Log as "Blowout Control Drill".

Drill No.:
Reaction Time to Shut-In: minutes, seconds.
Total Time to Complete Assignment: minutes, seconds.

I. Drill Overviews

a. Drill No. 1-Bottom Drilling

i. Sound the alarm immediately.

ii. Stop the rotary and hoist Kelly joint above the rotary table.

iii. Stop the circulatory pump.

iv. Close the drill pipe rams.

v. Record casing and drill pipe shut-in pressures and pit volume increases.

b. Drill No. 2-Tripping Drill Pipe

i. Sound the alarm immediately.

ii. Position the upper tool joint just above the rotary table and set the slips.

iii. Install a full opening valve or inside blowout preventer tool in order to close the drill pipe.

iv. Close the drill pipe rams.

v. Record the shut-in annular pressure.

II. Crew Assignments

a. Drill No. 1-Bottom Drilling

i. Driller

1. Stop the rotary and hoist Kelly joint above the rotary table.
2. Stop the circulatory pump.
3. Check Flow.
4. If flowing, sound the alarm immediately
5. Record the shit-in drill pipe pressure
6. Determine the mud weight increase needed or other courses of action.

ii. Derrick man

1. Open choke line valve at BOP.
2. Signal Floor Man #1 at accumulator that choke line is open.
3. Close choke and upstream valve after pipe tam have been closed.
4. Read the shut-in annular pressure and report readings to Driller.

iii. Floor Man #1

1. Close the pipe rams after receiving the signal from the Derrickman.
2. Report to Driller for further instructions.

iv. Floor Man #2

1. Notify the Tool Pusher and Operator representative of the H_2S alarms.
2. Check for open fires and, if safe to do so, extinguish them.
3. Stop all welding operations.
4. Turn-off all non-explosions proof lights and instruments.
5. Report to Driller for further instructions.

v. Tool Pusher

1. Report to the rig floor.
2. Have a meeting with all crews.

3. Compile and summarize all information.

4. Calculate the proper kill weight.

5. Ensure that proper well procedures are put into action.

vi. Operator Representative

1. Notify the Drilling Superintendent.

2. Determine if an emergency exists and if so, activate the contingency plan.

b. Drill No. 2 - Tripping Pipe

i. Driller

1. Sound the alarm immediately when mud volume increase has been detected.

2. Position the upper tool joint just above the rotary table and set slips.

3. Install a full opening valve or inside blowout preventer tool to close the drill pipe.

4. Check flow.

5. Record all data reported by the crew.

6. Determine the course of action.

ii. Derrick man

1. Come down out of derrick.

2. Notify Tool Pusher and Operator Representative.

3. Check for open fires and, if safe to do so, extinguish them.

4. Stop all welding operations.

5. Report to Driller for further instructions.

iii. Floor Man #1

1. Pick up full opening valve or inside blowout preventer tool and stab into tool joint above rotary table (with Floor Man #2).

2. Tighten valve with back-up tongs.

3. Close pipe rams after signal from Floor Man #2.

4. Read accumulator pressure and check for possible high pressure fluid leaks in valves or piping.

5. Report to Driller for further instructions.

iv. Floor Man #2

1. Pick-up full opening valve or inside blowout preventer tool and stab into tool joint above rotary table (with Floor Man #1).

2. Position back-up tongs on drill pipe.

3. Open choke line valve at BOP.

4. Signal Floor Man #1 at accumulator that choke line is open.

5. Close choke and upstream valve after pipe rams have been closed.

6. Check for leaks on BOP stack and choke manifold.

7. Read annular pressure.

8. Report readings to the Driller.

v. Tool Pusher

1. Report to the rig floor.

2. Have a meeting with all of the crews.

3. Compile and summarize all information.

4. See that proper well kill procedures are put into action.

vi. Operator Representative

1. Notify Drilling Superintendent

2. Determine if an emergency exists, and if so, activate the contingency plan.

IGNITION PROCEDURES

Responsibility:

The decision to ignite the well is the responsibility of the DRILLING FOREMAN in concurrence with the emergency response officials. In the event the Drilling Foreman is incapacitated, it becomes the responsibility of the RIG TOOL PUSHER. This decision should be made only as a last resort and in a situation where it is clear that:

1. Human life and property are endangered.

2. There is no hope of controlling the blowout under the prevailing conditions.

If time permits, notify the main office, but do not delay if human life is in danger. Initiate the first phase of the evacuation plan.

Instructions for Igniting the Well:

1. Two people are required for the actual igniting operation. Both men must wear self-contained breathing apparatus and must use a full body harness and attach a retrievable safety line to the D-Ring in the back. One man must monitor the atmosphere for explosive gases with the LEL monitor, while the Drilling Foreman is responsible for igniting the well.

2. The primary method to ignite is a 25mm flare gun with a range of approximately 500 feet.

3. Ignite from upwind and do not approach any closer than is warranted.

4. Select the ignition site best suited for protection and which offers an easy escape route.

5. Before igniting, check for the presence of combustible gases.

6. After igniting, continue emergency actions and procedures as before.

7. All unassigned personnel will limit their actions to those directed by the Drilling Foreman.

Note: After the well is ignited, burning Hydrogen Sulfide will convert to Sulfur Dioxide, which is also highly toxic. Do not assume the area is safe after the well is ignited.

TRAINING PROGRAM

When working in an area where Hydrogen Sulfide (H_2S) might be encountered, definite training requirements must be carried out. The Company Supervisor will ensure that all personnel, at the well site, have had adequate training in the following consistent with the requirements in ANSI/ASSE Z390.1-2006 (R2010) Accepted Practices for Hydrogen Sulfide (H2S) Training Programs:

1. Physical and Chemical Properties of Hydrogen Sulfide.
2. Sources of Hydrogen Sulfide.
3. Human Physiology and Medical Evaluation.
4. Work Procedures.
5. Personal Protective Equipment.
6. Use of Contingency Plans and Emergency Response.
7. Burning, Flaring and Venting of Hydrogen Sulfide.
8. State and Federal Regulatory Requirements.
9. Hydrogen Sulfide Release Dispersion Models
10. Rescue Techniques, First Aid and Post-Exposure Evaluation
11. Methods of Detection and Monitoring
12. Engineering Controls
13. Transportation of Hydrogen Sulfide Cargoes
14. Emerging Technology

Service company personnel and visiting personnel must be notified if the zone contains H_2S, and each service company must provide proof of adequate training and equipment for their employees before they arrive at the well site.

EMERGENCY EQUIPMENT REQUIREMENTS

Lease Entrance Sign:

Should be located at the lease entrance with the following information:

CAUTION- POTENTIAL POISON GAS
HYDROGEN SULFIDE
NO ADMITTANCE WITHOUT AUTHORIZATION

Respiratory Equipment:

- Fresh air breathing equipment should be placed at the safe briefing areas and should include the following:
- Two SCBA's at each briefing area.
- Enough airline units to operate safely, anytime the H_2S concentration reaches the IDLH level (100 ppm).
- Cascade system with enough breathing air hose and manifolds to reach the rig floor, the derrick man and the other operation areas.

Windsocks or Wind Streamers:

- A minimum of two 10" windsocks located at strategic locations so that they may be seen from any point on location.
- Wind streamers (if preferred) should be placed at various locations on the well site to ensure wind consciousness at all times. (Corners of location).

Hydrogen Sulfide Detector and Alarms:

- 1- Four channel H_2S monitor with alarms.
- Four (4) sensors located as follows: #1- Rig Floor, #2- Bell Nipple, #3- Shale Shaker, #4- Mud Pits.
- Gastec or Draeger pump with tubes.
- Sensor test gas.

Well Condition Sign and Flags:

The Well Condition Sign w/flags should be placed a minimum of 150' before you enter the location. It should have three (3) color coded flags (green, yellow and red) that will be used to denote the following location conditions:

GREEN- Normal Operating Conditions
YELLOW- Potential Danger
RED- Danger, H_2S Gas Present

Auxiliary Rescue Equipment:

- Stretcher
- 2- 100' Rescue lines.
- First Aid Kit properly stocked.

Mud Inspection Equipment:

Garret Gas Train or Hach Tester for inspection of Hydrogen Sulfide in the drilling mud system.

Fire Extinguishers:

Adequate fire extinguishers shall be located at strategic locations.

Blowout Preventer:

- The well shall have hydraulic BOP equipment for the anticipated BHP.
- The BOP should be tested upon installation.
- BOP, Choke Line and Kill Line will be tested as specified by Operator.

Confined Space Monitor:

There should be a portable multi-gas monitor with at least 3 sensors (O_2, LEL H_2S). This instrument should be used to test the atmosphere of any confined space before entering. It should also be used for atmospheric testing for LEL gas before beginning any type of Hot Work. Proper calibration documentation will need to be provided.

Communication Equipment:

- Proper communication equipment such as cell phones or 2-way radios should be available at the rig.
- Radio communication shall be available for communication between the company man's trailer, rig floor and the tool pusher's trailer.

- Communication equipment shall be available on the vehicles.

Special Control Equipment:

- Hydraulic BOP equipment with remote control on the ground.
- Rotating head at the surface casing point.

Evacuation Plan:

- Evacuation routes should be established prior to spudding the well.
- Should be discussed with all rig personnel.

Designated Areas:

Parking and Visitor area:

- All vehicles are to be parked at a pre-determined safe distance from the wellhead.
- Designated smoking area.

Safe Briefing Areas:

- Two Safe Briefing Areas shall be designated on either side of the location at the maximum allowable distance from the well bore so they offset prevailing winds or they are at a 180 degree angle if wind directions tend to shift in the area.
- Personal protective equipment should be stored at both briefing areas or if a moveable cascade trailer is used, it should be kept upwind of existing winds. When wind is from the prevailing direction, both briefing areas should be accessible.

Note:

- Additional equipment will be available at the Alliance Safety office.
- Additional personal H_2S monitors are available for all employees on location.
- Automatic Flare Igniters are recommended for installation on the rig.

CHECK LISTS

Status Check List

Note: Date each item as they are implemented.

1. Sign at location entrance. _____
2. Two (2) wind socks (in required locations). _____
3. Wind Streamers (if required). _____
4. SCBA's on location for all rig personnel and mud loggers. _____
5. Air packs, inspected and ready for use. _____
6. Spare bottles for each air pack (if required). _____
7. Cascade system for refilling air bottles. _____
8. Cascade system and hose line hook up. _____
9. Choke manifold hooked-up and tested. (before drilling out surface casing.) _____
10. Remote Hydraulic BOP control (hooked-up and tested before drilling out surface casing). _____
11. BOP tested (before drilling out surface casing). _____
12. Mud engineer on location with equipment to test mud for H_2S. _____
13. Safe Briefing Areas set-up _____
14. Well Condition sign and flags on location and ready. _____
15. Hydrogen Sulfide detection system hooked -up & tested. _____
16. Hydrogen Sulfide alarm system hooked-up & tested. _____
17. Stretcher on location at Safe Briefing Area. _____
18. 2 -100' Life Lines on location. _____
19. 1-20# Fire Extinguisher in safety trailer. _____
20. Confined Space Monitor on location and tested. _____
21. All rig crews and supervisor trained (as required). _____

22. Access restricted for unauthorized personnel. _____

23. Drills on H_2S and well control procedures. _____

24. All outside service contractors advised of potential H_2S on the well. _____

25. NO SMOKNG sign posted. _____

26. H_2S Detector Pump w/tubes on location. _____

27. 25mm Flare Gun on location w/flares. _____

28. Automatic Flare Igniter installed on rig. _____

Procedural Check List

Perform the following on each tour:

1. Check fire extinguishers to see that they have the proper charge.
2. Check breathing equipment to insure that they have not been tampered with.
3. Check pressure on the supply air bottles to make sure they are capable of recharging.
4. Make sure all of the Hydrogen Sulfide detection systems are operative.

Perform the following each week:

1. Check each piece of breathing equipment to make sure that they are fully charged and operational. This requires that the air cylinder be opened and the mask assembly be put on and tested to make sure that the regulators and masks are properly working. Negative and Positive pressure should be conducted on all masks.
2. BOP skills.
3. Check supply pressure on BOP accumulator stand-by source.
4. Check all breathing air mask assemblies to see that straps are loosened and turned back, ready for use.
5. Check pressure on cascade air cylinders to make sure they are fully charged and ready to use for refill purposes if necessary.
6. Check all cascade system regulators to make sure they work properly.
7. Perform breathing drills with on-site personnel.
8. Check the following supplies for availability:
   - Stretcher
   - Safety Belts and Ropes
   - Spare air Bottles
   - Spare Oxygen Bottles (if resuscitator required)
   - Gas Detector Pump and Tubes
   - Emergency telephone lists
9. Test the Confined Space Monitor to verify the batteries are good

EVACUATION PLAN

General Plan

The direct lines of action prepared by Mack Energy Corporation to protect the public from hazardous gas situations are as follows:

1. When the company approved supervisor (Drilling Foreman, Tool Pusher or Driller) determine that Hydrogen Sulfide gas cannot be limited to the well location, and the public will be involved, he will activate the evacuation plan. Escape routes are noted on the area map.

2. Company safety personnel or designee will notify the appropriate local government agency that a hazardous condition exists and evacuation needs to be implemented.

3. Company approved safety personnel that have been trained in the use of the proper emergency equipment will be utilized.

4. Law enforcement personnel (State Police, Local Police Department, Fire Department, and the Sheriff's Department) will be called to aid in setting up and maintaining road blocks. Also, they will aid in evacuation of the public if necessary.

NOTE: Law enforcement personnel will not be asked to come into a contaminated area. Their assistance will be limited to uncontaminated areas. Constant radio contact will be maintained with them.

5. After the discharge of gas has been controlled, "Company" safety personnel will determine when the area is safe for re-entry.

See Specific Site Safety Plan or Job Safety Analysis to be completed during drilling

Emergency Assistance Telephone List

PUBLIC SAFETY:	911 or
Pecos Valley Communication Center (Chaves County Police, Fire, EMS)	(575) 624-7590
Central Dispatch (Eddy County Police, Fire, EMS)	(575) 616-7155
Hospitals:	
Roswell	(575) 622-8170
Artesia	(575) 748-3333
Dept. of Public Safety/SE New Mexico	(575) 622-7200
Highway Department	(575) 637-7200
New Mexico Oil Conservation	(575) 748-1283
Bureau of Land Management	(575) 622-5335

Mack Energy Corporation

Company Drilling Supervisor

Jim Krogman	(575) 703-7385

Drilling Foreman

Emilio Martinez	(575) 703-5231

Silver Oak Drilling

Silver Oak Drilling	(575) 746-4405

Tool Pusher:

Darren Mc Bride	(575) 703-6070
Osiel Sanchez	(575) 703-4109

Safety

Lee Hassell (Alliance Safety)
(806) 217-2950
Scott Ford (Mack Energy)
(505) 692-4976
Robbie Houghtaling (Silver Oak)
(575) 703-2122

Intentionally Blank –Space provided for Specific Site Safety Plan or Job Safety Analysis

Affected Notification List

(within a 65' radius of exposure @ IOOppm)

The geologic zones that will be encountered during drilling are known to contain hazardous quantities of H_2S. The accompanying map illustrates the affected areas of the community. The residents within this radius will be notified via a hand delivered written notice describing the activities, potential hazards, conditions of evacuation, evacuation drill siren alarms and other precautionary measures.

Evacuee Description:
Residents: **THERE ARE NO RESIDENTS WITHIN 3000' ROE.**

Notification Process:

A continuous siren audible to all residence will be activated, signaling evacuation of previously notified and informed residents.

Evacuation Plan:
All evacuees will migrate lateral to the wind direction.

The Oil Company will identify all home bound or highly susceptible individuals and make special evacuation preparations, interfacing with the local and emergency medical service as necessary.

Toxic Effects of H_2S Poisoning

Hydrogen Sulfide is extremely toxic. The acceptable ceiling concentration for eight-hour exposure is 10 PPM, which is .001% by volume. Hydrogen Sulfide is heavier than air (specific gravity -1.192) and is colorless and transparent. Hydrogen Sulfide is almost as toxic as Hydrogen Cyanide and is 5-6 times more toxic than Carbon Monoxide. Occupational exposure limits for Hydrogen Sulfide and other gases are compared below in Table 1. Toxicity table for H_2S and physical effects are shown in Table 2.

Table I
Permissible Exposure Limits of Various Gases

Common Name	Symbol	Sp. Gravity	TLV	STEL	IDLH
Hydrogen Cyanide	HCN	.94	4.7 ppm	c	
Hydrogen Sulfide	H2S	1.192	10 ppm	15 ppm	100 ppm
Sulfide Dioxide	so2	2.21	2 ppm	5 ppm	
Chlorine	CL	2.45	.5 ppm	1 ppm	
Carbon Monoxide	CO	.97	25 ppm	200 ppm	
Carbon Dioxide	C02	1.52	5000 ppm	30.000 ppm	
Methane	CH4	.55	4.7% LEL	14% UEL	

Definitions

A. TLV- Threshold Limit Value is the concentration employees may be exposed based on a TWA {time weighted average) for eight {8) hours in one day for 40 hours in one {1) week. This is set by ACGIH {American Conference of Governmental Hygienists) and regulated by OSHA.

B. STEL- Short Term Exposure Limit is the 15 minute average concentration an employee may be exposed to providing that the highest exposure never exceeds the OEL {Occupational Exposure Limit). The OEL for H_2S is 19 PPM.

C. IDLH -Immediately Dangerous to Life and Health is the concentration that has been determined by the ACGIH to cause serious health problems or death if exposed to this level. The IDLH for H_2S is 100 PPM.

D. TWA- Time Weighted Average is the average concentration of any chemical or gas for an eight {8) hour period. This is the concentration that any employee may be exposed based on an TWA.

TABLE 2

Toxicity Table of H_2S

Percent%	PPM	Physical Effects
.0001	1	Can smell less than 1ppm.
.001	10	TLV for 8 hours of exposure.
.0015	15	STEL for 15 minutes of exposure.
.01	100	Immediately Dangerous to Life & Health. Kills sense of smell in 3 to 5 minutes.
.02	200	Kills sense of smell quickly, may burn eyes and throat.
.05	500	Dizziness, cessation of breathing begins **in a few minutes.**
.07	700	Unconscious quickly, death will result if not rescued promptly.
.10	1000	Death will result unless rescued promptly. Artificial resuscitation may be necessary.

PHYSICAL PROPERTIES OF H2S

The properties of all gases are usually described in the context of seven major categories:

COLOR
ODOR
VAPOR DENSITY
EXPLOSIVE LIMITS
FLAMMABILITY
SOLUBILITY (IN WATER)
BOILING POINT

Hydrogen Sulfide is no exception. Information from these categories should be considered in order to provide a fairly complete picture of the properties of the gas.

COLOR- TRANSPARENT

Hydrogen Sulfide is colorless so it is invisible. This fact simply means that you can't rely on your eyes to detect its presence. In fact that makes this gas extremely dangerous to be around.

ODOR- ROTTEN EGGS

Hydrogen Sulfide has a distinctive offensive smell, similar to "rotten eggs". For this reason it earned its common name "sour gas". However, H_2S, even in low concentrations, is so toxic that it attacks and quickly impairs a victim's sense of smell, so it could be fatal to rely on your nose as a detection device.

VAPOR DENSITY- SPECIFIC GRAVITY OF 1.192

Hydrogen Sulfide is heavier than air so it tends to settle in low-lying areas like pits, cellars or tanks. If you find yourself in a location where H_2S is known to exist, protect yourself. Whenever possible, work in an area upwind and keep to higher ground.

EXPLOSIVE LIMITS- 4.3% TO 46%

Mixed with the right proportion of air or oxygen, H_2S will ignite and burn or explode, producing another alarming element of danger besides poisoning.

FLAMMABILITY

Hydrogen Sulfide will burn readily with a distinctive clear blue flame, producing Sulfur Dioxide (SO_2), another hazardous gas that irritates the eyes and lungs.

SOLUBILITY- 4 TO 1 RATIO WITH WATER

Hydrogen Sulfide can be dissolved in liquids, which means that it can be present in any container or vessel used to carry or hold well fluids including oil, water, emulsion and sludge. The solubility of H_2S is dependent on temperature and pressure, but if conditions are right, simply agitating a fluid containing H_2S may release the gas into the air.

BOILING POINT- (-76 degrees Fahrenheit)

Liquefied Hydrogen Sulfide boils at a very low temperature, so it is usually found as a gas.

RESPIRATOR USE

The Occupational Safety and Health Administration (OSHA) regulate the use of respiratory protection to protect the health of employees. OSHA's requirements are written in the Code of Federal Regulations, Title 29, Part 1910, Section 134, Respiratory Protection. This regulation requires that all employees who might be required to wear respirators, shall complete a OSHA mandated medical evaluation questionnaire. The employee then should be fit tested prior to wearing any respirator while being exposed to hazardous gases.

Written procedures shall be prepared covering safe use of respirators in dangerous atmospheric situations, which might be encountered in normal operations or in emergencies. Personnel shall be familiar with these procedures and the available respirators.

Respirators shall be inspected prior to and after each use to make sure that the respirator has been properly cleaned, disinfected and that the respirator works properly. The unit should be fully charged prior to being used.

Anyone who may use respirators shall be properly trained in how to properly seal the face piece. They shall wear respirators in normal air and then in a test atmosphere. (Note: Such items as facial hair (beard or sideburns) and eyeglass temple pieces will not allow a proper seal.) Anyone that may be expected to wear respirators should have these items removed before entering a toxic atmosphere. A special mask must be obtained for anyone who must wear eyeglasses. Contact lenses should not be allowed.

Respirators shall be worn during the following conditions:

A. Any employee who works near the top or on the top of any tank unless tests reveal less than 20 ppm of H_2S.

B. When breaking out any line where H_2S can reasonably be expected.

C. When sampling air in areas where H_2S may be present.

D. When working in areas where the concentration of H_2S exceeds the Threshold Limit Value for H_2S (10 ppm).

E. At any time where there is a doubt as to the H_2S level in the area to be entered.

EMERGENCY RESCUE PROCEDURES

DO NOT PANIC!!!

Remain Calm -Think

1. Before attempting any rescue you must first get out of the hazardous area yourself. Go to a safe briefing area.

2. Sound alarm and activate the 911 system.

3. Put on breathing apparatus. At least two persons should do this, when available use the buddy system.

4. Rescue the victim and return them to a safe briefing area.

5. Perform an initial assessment and begin proper First Aid/CPR procedures.

6. Keep victim lying down with a blanket or coat, etc.., under the shoulders to keep airway open. Conserve body heat and do not leave unattended.

7. If the eyes are affected by H_2S, wash them thoroughly with potable water. For slight irritation, cold compresses are helpful.

8. In case a person has only minor exposure and does not lose consciousness totally, it's best if he doesn't return to work until the following day.

9. Any personnel overcome by H_2S should always be examined by medical personnel. They should always be transported to a hospital or doctor.

Attached to Form 3160-3
Mack Energy Corporation
Spruce Grove Federal Com #1H NMNM-101106
SHL : 565 FNL & 2285 FEL, NWNE, Sec. 28 T15S R29E
BHL : 5 FNL & 2285 FEL, NWNE, Sec. 21 T15S R29E
Chaves County, NM

Mack Energy Corporation
Onshore Order #6
Hydrogen Sulfide Drilling Operation Plan

I. HYDROGEN SULFIDE TRAINING

All personnel, whether regularly assigned, contracted, or employed on an unscheduled basis, will receive training from a qualified instructor in the following areas prior to commencing drilling operations on this well:

1. The hazards an characteristics of hydrogen sulfide (H2S)
2. The proper use and maintenance of personal protective equipment and life support systems.
3. The proper use of H2S detectors alarms warning systems, briefing areas, evacuation procedures, and prevailing winds.
4. The proper techniques for first aid and rescue procedures.

In addition, supervisory personnel will be trained in the following areas:

1. The effects of H2S on metal components. If high tensile tubular are to be used, personnel well be trained in their special maintenance requirements.
2. Corrective action and shut-in procedures when drilling or reworking a well and blowout prevention and well control procedures.
3. The contents and requirements of the H2S Drilling Operations Plan and Public Protection Plan.

There will be an initial training session just prior to encountering a known or probable H2S zone (within 3 days or 500 feet) and weekly H2S and well control drills for all personnel in each crew. The initial training session shall include a review of the site specific H2S Drilling Operations Plan and the Public Protection Plan. **The concentrations of H2S of wells in this area from surface to TD are low enough that a contingency plan is not required.**

II. H2S SAFETY EQUIPMENT AND SYSTEMS

Note: All H2S safety equipment and systems will be installed, tested, and operational when drilling reaches a depth of 500 feet above, or three days prior to penetrating the first zone containing or reasonable expected to contain H2S.

1. Well Control Equipment:

A. Flare line.
B. Choke manifold.
C. Blind rams and pipe rams to accommodate all pipe sizes with properly sized closing unit.
D. Auxiliary equipment may include if applicable: annular preventer & rotating head.

2. **Protective equipment for essential personnel:**

   A. Mark II Survive air 30-minute units located in the doghouse and at briefing areas, as indicated on well site diagram.

3. **H2S detection and monitoring equipment:**

   A. 1 portable H2S monitors positioned on location for best coverage and response. These units have warning lights and audible sirens when H2S levels of 20 PPM are reached.

4. **Visual warning systems:**

   A. Wind direction indicators as shown on well site diagram (Exhibit #8).
   B. Caution/Danger signs (Exhibit #7) shall be posted on roads providing direct access to location. Signs will be painted a high visibility yellow with black lettering of sufficient size to be readable at a reasonable distance from the immediate location. Bilingual signs will be used, when appropriate. See example attached.

5. **Mud program:**

   A. The mud program has been designed to minimize the volume of H2S circulated to surface. Proper mud weight, safe drilling practices and the use of H2S scavengers will minimize hazards when penetrating H2S bearing zones.

6. **Metallurgy:**

   A. All drill strings, casings, tubing, wellhead, blowout preventer, drilling spool, kill lines, choke manifold and lines, and valves shall be suitable for H2S service.
   B. All elastomers used for packing and seals shall be H2S trim.

7. **Communication:**

   A. Radio communications in company vehicles including cellular telephone and 2-way radio.
   B. Land line (telephone) communication at Office.

8. **Well testing:**

   A. Drill stem testing will be performed with a minimum number of personnel in the immediate vicinity, which are necessary to safely and adequately conduct the test. The drill stem testing will be conducted during daylight hours and formation fluids will not be flowed to the surface. All drill-stem-testing operations conducted in an H2S environment will use the closed chamber method of testing.

Attached to Form 3160-3
Mack Energy Corporation
Spruce Grove Federal Com #1H NMNM-101106
SHL : 565 FNL & 2285 FEL, NWNE, Sec. 28 T15S R29E
BHL : 5 FNL & 2285 FEL, NWNE, Sec. 21 T15S R29E
Chaves County, NM

EXHIBIT #7

WARNING

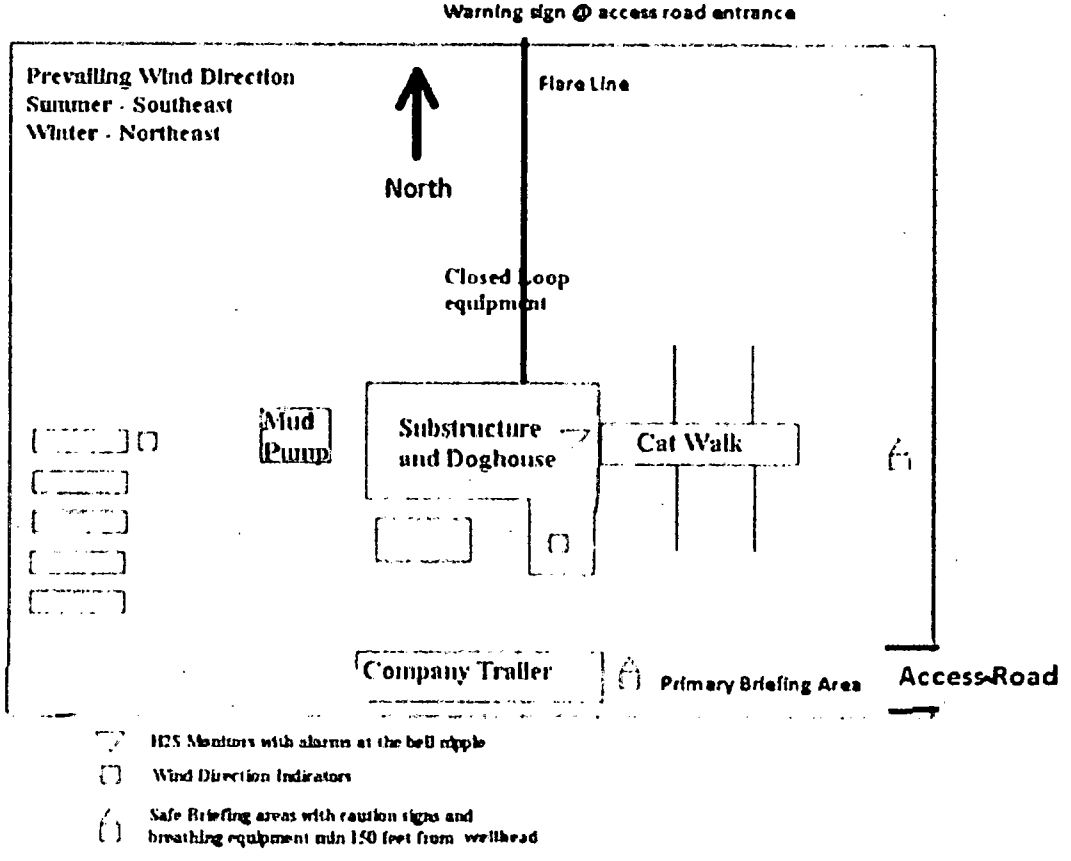
YOU ARE ENTERING AN H2S

AUTHORIZED PERSONNEL ONLY

1. BEARDS OR CONTACT LENSES NOT ALLOWED
2. HARD HATS REQUIRED
3. SMOKING IN DESIGNATED AREAS ONLY
4. BE WIND CONSCIOUS AT ALL TIMES
5. CHECK WITH MACK ENERGY FOREMAN AT OFFICE

MACK ENERGY CORPORATION

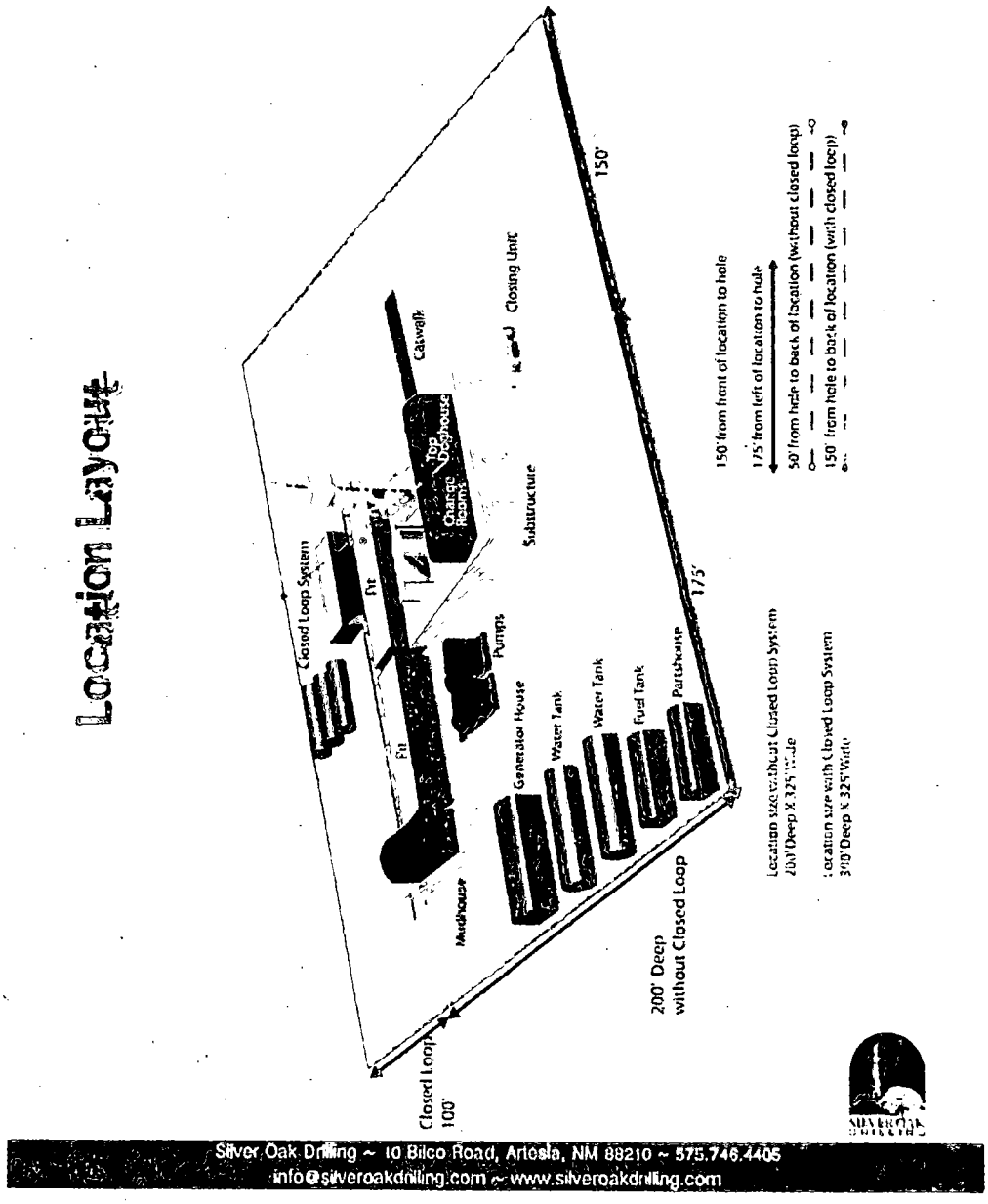
1-575-748-1288



B.

There will be no drill stem testing.

DRILLING LOCATION H2S SAFTY EQUIPMENT
Exhibit # 8



Mack Energy Corporation Call List, Chaves County

Artesia (575)	Cellular	Office
Jim Krogman	432-934-1596	748-1288
Emilio Martinez	432-934-7586	748-1288

Agency Call List (575)

Roswell

State Police	622-7200
City Police	624-6770
Sheriff's Office	624-7590
Ambulance	624-7590
Fire Department	624-7590
LEPC (Local Emergency Planning Committee	624-6770
NMOCD	748-1283
Bureau of Land Management	627-0272

Emergency Services

Boots & Coots IWC	1-800-256-9688 or (281)931-8884
Cudd pressure Control	(915)699-0139 or (915)563-3356
Halliburton	746-2757
Par Five	748-9539
Flight For Life-Lubbock, TX	(806)743-9911
Aerocare-Lubbock, TX	(806)747-8923
Med Flight Air Amb-Albuquerque, NM	(505)842-4433
Lifeguard Air Med Svc. Albuquerque, NM	(505)272-3115

Attached to Form 3160-3
Mack Energy Corporation
Spruce Grove Federal Com #1H NMNM-101106
SHL : 565 FNL & 2285 FEL, NWNE, Sec. 28 T15S R29E
BHL : 5 FNL & 2285 FEL, NWNE, Sec. 21 T15S R29E
Chaves County, NM

DRILLING PROGRAM

1. **Geologic Name of Surface Formation**

   Quaternary

2. **Estimated Tops of Important Geologic Markers:**

Top of Salt	270'
Base of Salt	755'
Yates	925'
Seven Rivers	1170'
Queen	1650'
Grayburg	2047'
San Andres	2350'

3. **Estimated Depths of Anticipated Fresh Water, Oil and Gas:**

Water Sand	150'	Fresh Water
Yates	925'	Oil/Gas
Seven Rivers	1170'	Oil/Gas
Queen	1650'	Oil/Gas
Grayburg	2047'	Oil/Gas
San Andres	2350'	Oil/Gas

No other formations are expected to give up oil, gas or fresh water in measurable quantities. Setting 9 5/8" casing to 1200' and circulating cement back to surface will protect the surface fresh water sand. Salt section and shallower zones above TD, which contain commercial quantities of oil and/or gas, will have cement circulated across them by cementing 5 ½" production casing, sufficient cement will be pumped to circulate back to surface.

4. **Casing Program:**

Hole Size	Interval	OD Casing	Wt, Grade, Jt, cond, collapse/burst/tension
17 1/2"	0-260'	13 3/8"	48#, J-55, ST&C, New, 5.70143/4.689281/4.74
OPTIONAL- 12 1/4"	0-1200'	9 5/8"	36#, J-55, ST&C, New, 3.237179/7.04/7.04 - OPTIONAL
8 ¾"	0-3600'	7"	26#, HCP-110, Buttress, LT&C, New,4.412586/3.316667/3.316667
8 ¾"	3600-8828'	5 ½"	17#, HCP-110 Buttress, New, 4.987908/3.54667/3.546667

5. **Cement Program:**

13 3/8" Surface Casing: Lead 250sx, RFC+12%PF53+2%PF1+5ppsPF42+.125ppsPF29, yld 1.61, wt 14.4 ppg, 7.357gals/sx, excess 100%. Tail: 200sx. Class C+1% PF1, yld 1.34, wt 14.8 ppg, 6.323 gals/sx, excess 100%
OPTIONAL**9 5/8" Intermediate Casing: Lead 565sx, Class C+1% PF1, yld 1.34, wt 14.8 ppg, 6.323 gals/sx, excess 100%

7" & 5 ½" Production Casing: Lead 520sx Class C 4% PF 20+4 pps PF45 +1.25pps PF-29, yld 1.84, wt 13.2 ppg, 9.914gals/sx, excess 40%, Tail 1675sx, PVL + 1.3% (BWOW) PF44 + 5% PF174 + .5% PF606 + .1% PF153 +.4% PF44, yield 1.48, wt 13.0, 7.57gals/sx, 40% excess.

6. Minimum Specifications for Pressure Control:

The blowout preventer equipment (BOP) shown in Exhibit #10 will consist of a double ram-type (3000 psi WP) minimum preventer. This unit will be hydraulically operated and the ram type preventer will be equipped with blind rams on top of 4 1/2" drill pipe rams on bottom. The 11" BOP will be nippled up on the 8 5/8" surface casing and tested by a 3rd party to 2000 psi used continuously until TD is reached. All BOP's and accessory equipment will be tested to 2000 psi before drilling out of intermediate casing. 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 (Exhibit #10) will include a Kelly cock and floor safety valve and choke lines and choke manifold (Exhibit #11) with a minimum 3000 psi WP rating

7. Types and Characteristics of the Proposed Mud System:

The well will be drilled to TD with a combination of fresh and cut brine mud system. The applicable depths and properties of this system are as follows:

DEPTH	TYPE	WEIGHT	VISCOSITY	WATERLOSS
0-260'	Fresh Water	8.5	28	N.C.
0-1200'	Cut Brine	9.1	29	N.C.
1200'-TD	Cut Brine	9.1	29	N.C.

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

8. Auxiliary Well Control and Monitoring Equipment:

A. Kelly cock will be kept in the drill string at all times.
B. A full opening drill pipe-stabbing valve with proper drill pipe connections will be on the rig floor at all times.

9. Logging, Testing and Coring Program:

A. The electric logging program will consist of GR-Dual Laterolog, Spectral Density, Dual Spaced Neutron, CSNG Log from T.D. to 8 5/8 casing shoe.
B. Drill Stem test is not anticipated.
C. No conventional coring is anticipated.
D. Further testing procedures will be determined at TD.

10. Abnormal Conditions, Pressures, Temperatures and Potential Hazards:

No abnormal pressures or temperatures are anticipated. The estimated bottom hole at TD is 120 degrees and estimated maximum bottom hole pressure is 1600 psig. Low levels of Hydrogen sulfide have been monitors in producing wells in the area, so H2S may be present while drilling of the well; a plan is attached to the Drilling program. No major loss of circulation zones has been reported in offsetting wells.

11. Anticipated Starting Date and Duration of Operations:

Road and location work will not begin until approval has been received from the BLM. The anticipated spud date is December 1, 2018. Once commenced, the drilling operation should be finished in approximately 20 days. If the well is productive, an additional 30 days will be required for completion and testing before a decision is made to install permanent facilities.

Attachment to Exhibit #10
NOTES REGARDING THE BLOWOUT PREVENTERS
Spruce Grove Federal Com #1H
Chaves County, New Mexico

1. Drilling nipple to be so constructed that it can be removed without use of a welder through rotary table opening, with minimum I.D. equal to preventer bore.
2. Wear ring to be properly installed in head.
3. Blow out preventer and all fittings must be in good condition, 2000 psi WP minimum.
4. All fittings to be flanged.
5. Safety valve must be available on rig floor at all times with proper connections, valve to be full 2000 psi WP minimum.
6. All choke and fill lines to be securely anchored especially ends of choke lines.
7. Equipment through which bit must pass shall be at least as large as the diameter of the casing being drilled through.
8. Kelly cock on Kelly.
9. Extension wrenches and hands wheels to be properly installed.
10. Blow out preventer control to be located as close to driller's position as feasible.
11. Blow out preventer closing equipment to include minimum 40-gallon accumulator, two independent sources of pump power on each closing unit installation all API specifications.

Mack Energy Corporation

Minimum Blowout Preventer Requirements

3000 psi Working Pressure

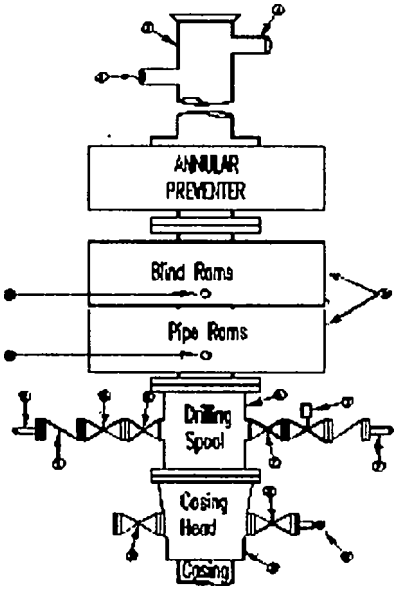
13 3/8 inch- 3 MWP

11 Inch - 3 MWP

EXHIBIT #10

Stack Requirements

NO.	Items	Min I.D.	Min Nominal
1	Flowline		2"
2	Fill up line		2"
3	Drilling nipple		
4	Annular preventer		
5	Two single or one dual hydraulically operated rams		
6a	Drilling spool with 2" min. kill line and 3" min choke line outlets		2" Choke
6b	2" min. kill line and 3" min. choke line outlets in ram. (Alternate to 6a above)		
7	Valve Gate Plug	3 1/8	
8	Gate valve-power operated	3 1/8	
9	Line to choke manifold		3"
10	Valve Gate Plug	2 1/16	
11	Check valve	2 1/16	
12	Casing head		
13	Valve Gate Plug	1 13/16	
14	Pressure gauge with needle valve		
15	Kill line to rig mud pump manifold		2"



OPTIONAL

16	Flanged Valve	1 13/16	

CONTRACTOR'S OPTION TO FURNISH (CO)

CONTRACTOR'S OPTION TO FURNISH (MEC)

1. All equipment and connections above bradenhead or casinghead. Working pressure of preventers to be 2000 psi minimum
2. Automatic accumulator (80 gallons, minimum) capable of closing BOP in 30 seconds or less and, holding them closed against full rated working pressure.
3. BOP controls, to be located near drillers' position
4. Kelly equipped with kelly cock
5. Inside blowout preventer or its equivalent on derrick floor at all times with proper threads to fit pipe being used
6. Kelly saver-sub equipped with rubber casing protector at all times
7. Plug type blowout preventer tester
8. Extra set pipe rams to fit drill pipe in use on location at all times
9. Type RX ring gaskets in place of Type R

MEC TO FURNISH

1. Bradenhead or casing head and side valves
2. Wear bushing if required

GENERAL NOTES

1. Deviations from this drawing may be made only with the express permission of MEC's Drilling Manager
2. All connections, valves fittings, piping, etc., subject to well or pump pressure must be flanged (suitable clamp connections acceptable) and have minimum working pressure equal to rated working pressure of preventers up through choke valves must be full opening and suitable for high pressure mud service
3. Controls to be of standard design and each marked showing opening and closing position
4. Chokes will be positioned so as not to hamper or delay changing of choke beans
5. All valves to be equipped with hand-wheels or handles ready for immediate use
6. Choke lines must be suitably anchored
7. Handwheels and extensions to be connected and ready for use
8. Valves adjacent to drilling spool to be kept open. Use outside valves except for emergency
9. All seamless steel control piping (2000 psi working pressure) to have flexible joints to avoid stress. Hoses will be permitted
10. Casinghead connections shall not be used except in case of emergency
11. Does not use kill line for routine fill up operations

Replaceable parts for adjustable choke, or bean sizes, retainers, and choke wrenches to be conveniently located for immediate use

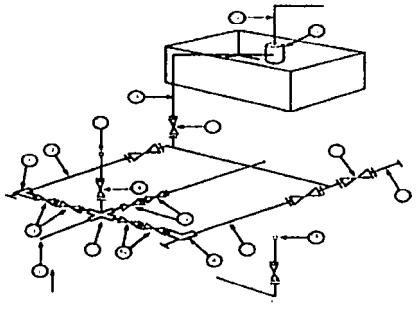
Mack Energy Corporation

Exhibit #11

MINIMUM CHOKE MANIFOLD

3,000, 5,000, and 10,000 PSI Working Pressure

3 MWP - 5 MWP - 10 MWP



Mud Pit

Reserve Pit

*** Location of separator optional**

Below Substructure

Minimum requirements

No.		3,000 MWP I.D.	3,000 MWP Nominal	3,000 MWP Rating	5,000 MWP I.D.	5,000 MWP Nominal	5,000 MWP Rating	10,000 MWP I.D.	10,000 MWP Nominal	10,000 MWP Rating
1	Line from drilling Spool		3"	3,000		3"	5,000		3"	10,000
2	Cross 3" x 3" x 3" x 2"			3,000			5,000			
2	Cross 3" x 3" x 3" x 2"									10,000
3	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
4	Valve Gate Plug	1 13/16		3,000	1 13/16		5,000	1 13/16		10,000
4a	Valves (1)	2 1/16		3,000	2 1/16		5,000	2 1/16		10,000
5	Pressure Gauge			3,000			5,000			10,000
6	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
7	Adjustable Choke (3)	2"		3,000	2"		5,000	2"		10,000
8	Adjustable Choke	1"		3,000	1"		5,000	2"		10,000
9	Line		3"	3,000		3"	5,000		3"	10,000
10	Line		2"	3,000		2"	5,000		2"	10,000
11	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000
12	Line		3"	1,000		3"	1,000		3"	2,000
13	Line		3"	1,000		3"	1,000		3"	2,000
14	Remote reading compound Standpipe pressure gauge			3,000			5,000			10,000
15	Gas Separator		2' x 5'			2' x 5'			2' x 5'	
16	Line		4"	1,000		4"	1,000		4"	2,000
17	Valve Gate Plug	3 1/8		3,000	3 1/8		5,000	3 1/8		10,000

(1) Only one required in Class 3M

(2) Gate valves only shall be used for Class 10 M

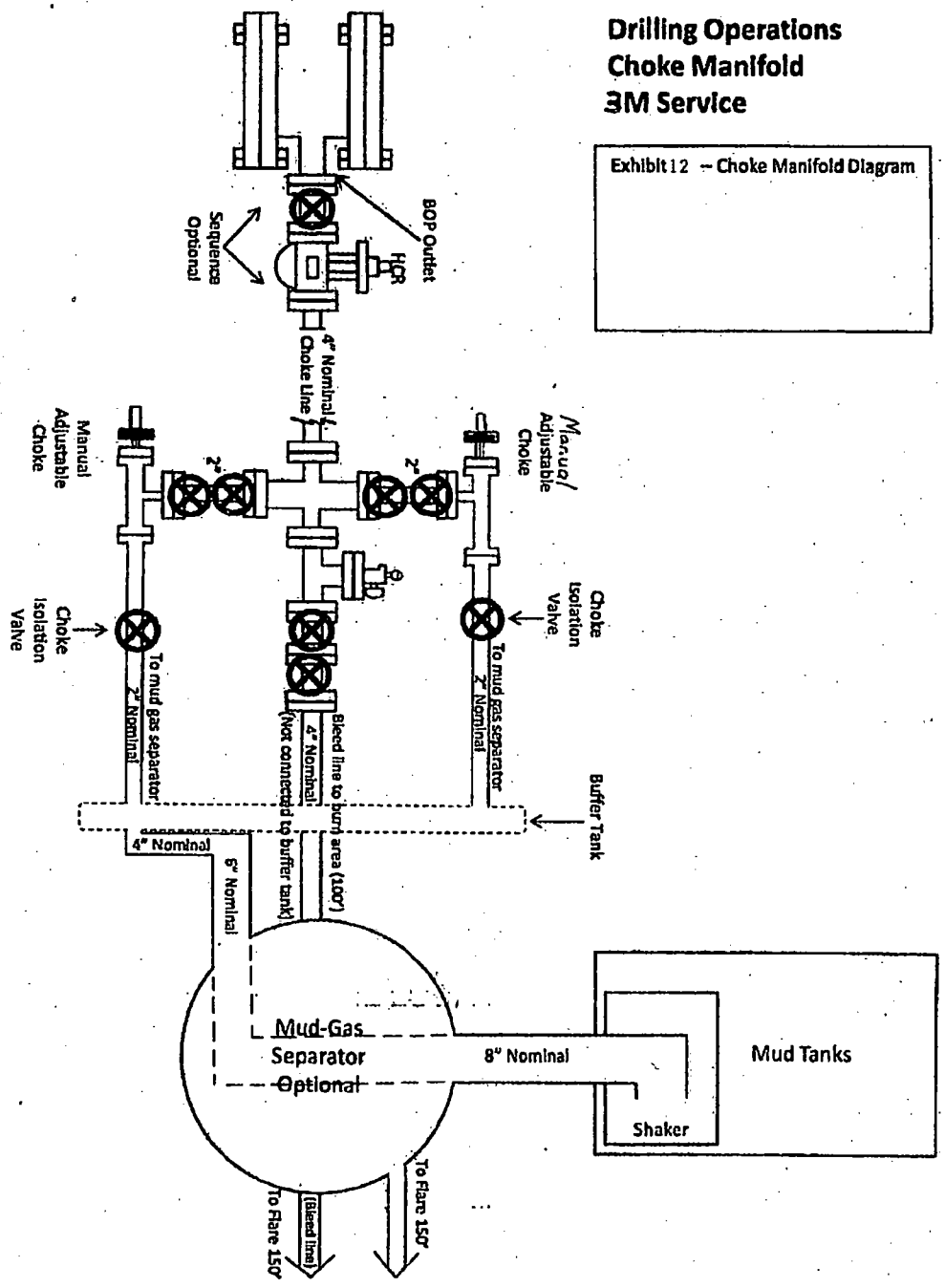
(3) Remote operated hydraulic choke required on 5,000 psi and 10,000 psi for drilling

EQUIPMENT SPECIFICATIONS AND INSTALLATION INSTRUCTION

1. All connections in choke manifold shall be welded, studded, flanged or Cameron clamp of comparable rating
2. All flanges shall be API 6B or 6BX and ring gaskets shall be API RX or BX. Use only BX for 10 MWP
3. All lines shall be securely anchored
4. Chokes shall be equipped with tungsten carbide seats and needles and replacements shall be available
5. alternate with automatic chokes, a choke manifold pressure gauge shall be located on the rig floor in conjunction with the standpipe pressure gauge
6. Line from drilling spool to choke manifold should bee as straight as possible. Lines downstream from chokes shall make turns by large bends or 90 degree bends using bull plugged tees

Mack Energy Corporation

MANIFOLD SCHEMATIC
Exhibit #12



APD ID: 10400032579 **Submission Date:** 09/20/2018

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

Well Type: OIL WELL **Well Work Type:** Drill

Highlighted data reflects the most recent changes

Show Final Text

Section 1 - Existing Roads

Will existing roads be used? YES

Existing Road Map:

Vicinity_Map_20180823152259.pdf

Existing Road Purpose: ACCESS,FLUID TRANSPORT **Row(s) Exist?** NO

ROW ID(s)

ID:

Do the existing roads need to be improved? NO

Existing Road Improvement Description:

Existing Road Improvement Attachment:

Section 2 - New or Reconstructed Access Roads

Will new roads be needed? YES

New Road Map:

Vicinity_Map_20180823152335.pdf

New road type: TWO-TRACK

Length: 1343 Feet **Width (ft.):** 14

Max slope (%): 1 **Max grade (%):** 2

Army Corp of Engineers (ACOE) permit required? NO

ACOE Permit Number(s):

New road travel width: 14

New road access erosion control: The maximum width of the running surface will be 14'. The road will be crowned and ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope and 3' wide. Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage and to be consistent will local drainage patterns. The average grade will be less than 1%. No turnouts are planned. No culverts, cattleguard, gates, low water crossings or fence cuts are necessary. Surfacing material will consist of native caliche. Caliche will be obtained from the nearest BLM approved caliche pit located Sec. 19 T15S R29E and Sec 34 T15S R29E

New road access plan or profile prepared? NO

New road access plan attachment:

Access road engineering design? NO

Access road engineering design attachment:

Access surfacing type: OTHER

Access topsoil source: ONSITE

Access surfacing type description: Caliche will be obtained from the nearest BLM approved caliche pit located Sec. 19 T15S R29E and Sec 34 T15S R29E

Access onsite topsoil source depth: 2

Offsite topsoil source description:

Onsite topsoil removal process: Blade topsoil into windrow along up-slope edge of road.

Access other construction information:

Access miscellaneous information:

Number of access turnouts: **Access turnout map:**

Drainage Control

New road drainage crossing: OTHER

Drainage Control comments: The maximum width of the running surface will be 14'. The road will be crowned and ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope and 3' wide. Water will be drainage patterns. The average grade will be less than 1%. No turnouts are planned. No culverts, cattleguard, gates, low water crossings or fence cuts are necessary. Surfacing material will consist of native caliche. Caliche will be obtained from the nearest BLM approved caliche pit located Sec. 19 T15S R29E and Sec. 34 T15S R29E.
Road Drainage Control Structures (DCS) description: The maximum width of the running surface will be 14'. The road will be crowned and ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope and 3' wide. Water will be drainage patterns. The average grade will be less than 1%. No turnouts are planned. No culverts, cattleguard, gates, low water crossings or fence cuts are necessary. Surfacing material will consist of native caliche. Caliche will be obtained from the nearest BLM approved caliche pit located Sec. 19 T15S R29E and Sec. 34 T15S R29E.
Road Drainage Control Structures (DCS) attachment:

Access Additional Attachments

Additional Attachment(s):

Section 3 - Location of Existing Wells

Existing Wells Map? YES

Attach Well map:

Spruce_Grove_Federal_Com__1H_20180823154622.pdf

Existing Wells description:

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

Submit or defer a Proposed Production Facilities plan? SUBMIT

Production Facilities description: Mack Energy Corporation will produce this well at the White Rock Federal Com CTB NW/4 NW/4 Sec. 28 T15S R29E, Chaves County. If the well is productive, contemplated facilities will be as follows: 1) San Andres Completion: Will be sent to White Rock Fed Com CTB NW/4 NW/4 Sec. 28 T15S R29E, Chaves County. The facility is shown in attachment. 2) The tank battery and facilities including all flow lines and piping will be installed according to API specifications. 3) Any additional caliche will be obtained from a BLM approved caliche pit. Any additional construction materials will be purchased from contractors. 4) It will be necessary to run electric power if this well is productive. Power will be run by CVE and they will send in a separate plan for power. C. Proposed flow lines will tren west to White Rock Fed CTB. Flowline will be a 4' poly surface line, 3318.95' in length with a 40 psi working pressure.
Production Facilities map:

white_rock_facility___20180823154710.pdf

Section 5 - Location and Types of Water Supply

Water Source Table

Water source use type: CAMP USE, DUST CONTROL, INTERMEDIATE/PRODUCTION CASING, STIMULATION, SURFACE CASING

Water source type: GW WELL

Describe type:

Source longitude:

Source latitude:

Source datum:

Water source permit type: OTHER

Source land ownership: OTHER

Describe land ownership:

Water source transport method: TRUCKING

Source transportation land ownership: OTHER

Describe transportation land ownership:

Water source volume (barrels): 2000

Source volume (acre-feet): 0.25778618

Source volume (gal): 84000

Water source and transportation map:

Water_Source_2_20180823155040.pdf
Water_Source_3_20180823155050.pdf
Water_Source_20180823155104.pdf

Water source comments: Please see attachments. City/Municipal Water: Town of Hagerman Sec 10 T14S R26E, Mor-West Sec 20 T17S R30E Brine Water: Salty Dog Sec 5 T19S R36E Wasserhund Sec 36 T16S R34E
New water well? NO

New Water Well Info

Well latitude: **Well Longitude:** **Well datum:**

Well target aquifer:

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

Aquifer comments:

Aquifer documentation:

Well depth (ft): **Well casing type:**

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

New water well casing? **Used casing source:**

Drilling method: **Drill material:**

Grout material: **Grout depth:**

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

Well Production type: **Completion Method:**

Water well additional information:

State appropriation permit:

Additional information attachment:

Section 6 - Construction Materials

Construction Materials description: All caliche required for construction of drill pad and proposed new access road (approximately 2500 cubic yards) will be obtained from approved caliche pit @ Sec. 34 T15S R29E and/or Sec 19 T15S R29E
Construction Materials source location attachment:

Caliche_Pits_20180824082732.pdf

Section 7 - Methods for Handling Waste

Waste type: SEWAGE

Waste content description: Sewage and Gray Water will be placed in container and hauled to an approved facility. Container and disposal handled by Black Hawk.
Amount of waste:

Waste disposal frequency : Weekly

Safe containment description: Sewage and Gray Water will be placed in container and hauled to an approved facility, Container and disposal handled by Black Hawk.
Safe containmant attachment:

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

Disposal location description: Black Hawk will dispose at an approved location. Black Hawk Keith Willis 575-631-6378

Waste type: GARBAGE

Waste content description: Garbage and trash produced during drilling or completion operations will be collected in a trash bin and hauled to an approved local landfill. No toxic waste or hazardous chemicals will be produced by this operation.
Amount of waste: pounds

Waste disposal frequency : Weekly

Safe containment description: Garbage and trash produced during drilling or completion operations will be collected in a trash bin and hauled to an approved local landfill. No toxic waste or hazardous chemicals will be produced by this operation.
Safe containmant attachment:

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

Disposal location description: Black Hawk will dispose at an approved location. Black Hawk, Keith Willis 575-631-6378

Waste type: PRODUCED WATER

Waste content description: Water produced from the well during completion may be disposed into a steel tank. After the well is permanently placed on production, produced water will be collected in tanks (fiberglass) and trucked to the Round Tanks SWD 1, L-0729 30-005-64095, Sec 19 T15S R29E 1980 FSL 1980 FWL, Chaves County NM; produced oil will be collected in steel tanks until sold.
Amount of waste: 2080 barrels

Waste disposal frequency : Weekly

Safe containment description: Water produced from the well during completion may be disposed into a steel tank. After the well is permanently placed on production, produced water will be collected in tanks (fiberglass) and trucked to the Round Tank SWD 1 L-0729 30-005-64095, Sec 19 T15S R29E 1980 FSL 1980 FWL, Chaves County NM; produced oil will be collected in steel tanks until sold.
Safe containmant attachment:

Waste disposal type: OFF-LEASE INJECTION **Disposal location ownership:** STATE

Disposal type description:

Disposal location description: Round Tank SWD 1, L-0729, 30-005-64095, Sec 19 T15S R29E 1980 FSL 1980 FWL, Chaves County , NM

Waste type: DRILLING

Waste content description: Drill cuttings and fluids will be disposed into the steel tanks and hauled to R-360 disposal facility, permit number NM-01-0006. Located on HWY 62 To MM 66. Drilling fluids will be contained in steel tanks using a closed loop system. No pits will be used during drilling operations.
Amount of waste: 380 barrels

Waste disposal frequency : Weekly

Safe containment description: Drill cuttings and fluids will be disposed into the steel tanks and hauled to R-360 disposal facility, permit number NM-01-0006. Located on HWY 62 to MM 66. Drilling fluids will be contained in steel tanks using a closed loop system. NO pits will be used during drilling operations.
Safe containmant attachment:

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

Disposal location description: R-360 disposal facility, permit number NM-01-0006. Located on HWY at MM 66

Reserve Pit

Reserve Pit being used? NO

Temporary disposal of produced water into reserve pit?

Reserve pit length (ft.) **Reserve pit width (ft.)**

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

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

Reserve pit liner

Reserve pit liner specifications and installation description

Cuttings Area

Cuttings Area being used? NO

Are you storing cuttings on location? NO

Description of cuttings location

Cuttings area length (ft.) **Cuttings area width (ft.)**

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

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

WCuttings area liner

Cuttings area liner specifications and installation description

Section 8 - Ancillary Facilities

Are you requesting any Ancillary Facilities?: NO

Ancillary Facilities attachment:

Comments:

Section 9 - Well Site Layout

Well Site Layout Diagram:

Site_Map_20180806161638.pdf

Comments: The well site and elevation plat for the proposed well is shown in attachment. It was staked by Maddron Surveying, Carlsbad, NM. The drill pad layout, with elevations staked by Maddron Surveying, is shown in attachment. Dimensions of the pad are shown. Topsoil, if available will be stockpiled per BLM specifications. Because the pad is almost

level no major cuts will be required. Diagram below shows the proposed orientation of the location. No permanent living facilities are planned, but a temporary foreman/ toolpusher's trailer will be on location during the drilling operations.

Section 10 - Plans for Surface Reclamation

Type of disturbance: New Surface Disturbance **Multiple Well Pad Name:**

Multiple Well Pad Number:

Recontouring attachment:

Drainage/Erosion control construction: Edges of location will be bermed to prevent run off or erosion.

Drainage/Erosion control reclamation: The maximum width of the running surface will be 14'. The road will be crowned and ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope an 3' wide. Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage and to be consistent with local drainage patterns.

Well pad proposed disturbance (acres): 2.192	**Well pad interim reclamation (acres):** 0.76	**Well pad long term disturbance (acres):** 1.43
Road proposed disturbance (acres): 0.92	**Road interim reclamation (acres):** 0.49	**Road long term disturbance (acres):** 0.43
Powerline proposed disturbance (acres): 0	**Powerline interim reclamation (acres):** 0	**Powerline long term disturbance (acres):** 0
Pipeline proposed disturbance (acres): 2.28	**Pipeline interim reclamation (acres):** 1.9	**Pipeline long term disturbance (acres):** 0.38
Other proposed disturbance (acres): 0	**Other interim reclamation (acres):** 0	**Other long term disturbance (acres):** 0
Total proposed disturbance: 5.392	**Total interim reclamation:** 3.15	**Total long term disturbance:** 2.24

Disturbance Comments:

Reconstruction method: 1) Caliche will be removed, ground ripped and stockpiled topsoil used to recontoured as close as possible to the original natural level to prevent erosion and ponding of water. 2) Area will be reseeded as per BLM specifications. Seeding will be done when moisture is available and weather permitting. Pure Live Seed will be used to prevent noxious weeds. Annual inspection of growth will be done and necessary measures taken to eliminate noxious weeds.
Topsoil redistribution: 1) Caliche will be removed, ground ripped and stockpiled topsoil used to recontoured as close as possible to the original natural level to prevent erosion and ponding of water. 2) Area will be reseeded as per BLM specifications. Seeding will be done when moisture is available and weather permitting. Pure Live Seed will be used to prevent noxious weeds. Annual inspection of growth will be done and necessary measures taken to eliminate noxious weeds.
Soil treatment: 1) Caliche will be removed, ground ripped and stockpiled topsoil used to recontoured as close as possible to the original natural level to prevent erosion and ponding of water. 2) Area will be reseeded as per BLM specifications. Seeding will be done when moisture is available and weather permitting. Pure Live Seed will be used to prevent noxious weeds. Annual inspection of growth will be done and necessary measures taken to eliminate noxious weeds.
Existing Vegetation at the well pad: The area around the well site is grassland and topsoil is sandy. The vegetation is native scrub grass with sagebrush.
Existing Vegetation at the well pad attachment:

Existing Vegetation Community at the road: The area around the road is grassland and topsoil is sandy. The vegetation is native scrub grass with sagebrush.
Existing Vegetation Community at the road attachment:

Existing Vegetation Community at the pipeline: The area around the pipeline is grassland and topsoil is sandy. The

vegetation is native scrub grass with sagebrush.

Existing Vegetation Community at the pipeline attachment:

Existing Vegetation Community at other disturbances: The area around the well site is grassland and topsoil is sandy. The vegetation is native scrub grass with sagebrush.
Existing Vegetation Community at other disturbances attachment:

Non native seed used? NO

Non native seed description:

Seedling transplant description:

Will seedlings be transplanted for this project? NO

Seedling transplant description attachment:

Will seed be harvested for use in site reclamation? YES

Seed harvest description: A cultural resources examination has been requested and will be forwarded to your office in the near future.
Seed harvest description attachment:

Seed Management

Seed Table

Seed type: **Seed source:**

Seed name:

Source name: **Source address:**

Source phone:

Seed cultivar:

Seed use location:

PLS pounds per acre: **Proposed seeding season:**

Seed Summary

Total pounds/Acre:

Seed Type	Pounds/Acre

Seed reclamation attachment:

Operator Contact/Responsible Official Contact Info

First Name: Jerry **Last Name:** Sherrell

Phone: (575)748-1288 **Email:** jerrys@mec.com

Seedbed prep:

Seed BMP:

Seed method:

Existing invasive species? NO

Existing invasive species treatment description:

Existing invasive species treatment attachment:

Weed treatment plan description: The holder shall seed all disturber areas will the seeds mixture listed by BLM. The seed mixture will be planted in the amounts specified in pounds of pure live seed (PLS)* per acres. There shall be no primary or secondary noxious weeds in the seed mixture. Seed will be tested and the viability testing of seed will be done in accordance with State Laws and the nine (9) months prior to purchase. Commercial seed will be either certified or registered seed. The seed container will be tagged in accordance with State Law (s) and available for inspection by the authorized office.
Weed treatment plan attachment:

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

Success standards: The seeding will be repeated until a satisfactory stand is established as determined by the authorized office. Evaluation of growth will not be made before completion of at least one full growing season after seeding.
Pit closure description: No pit

Pit closure attachment:

Section 11 - Surface Ownership

Disturbance type: WELL PAD

Describe:

Surface Owner: BUREAU OF LAND MANAGEMENT

Other surface owner description:

BIA Local Office:

BOR Local Office:

COE Local Office:

DOD Local Office:

NPS Local Office:

State Local Office:

Military Local Office:

USFWS Local Office:

Other Local Office:

Operator Name: MACK ENERGY CORPORATION

Well Name: SPRUCE GROVE FEDERAL COM **Well Number:** 1H

USFS Region:

USFS Forest/Grassland: **USFS Ranger District:**

Section 12 - Other Information

Right of Way needed? NO **Use APD as ROW?**

ROW Type(s):

ROW Applications

SUPO Additional Information:

Use a previously conducted onsite? YES

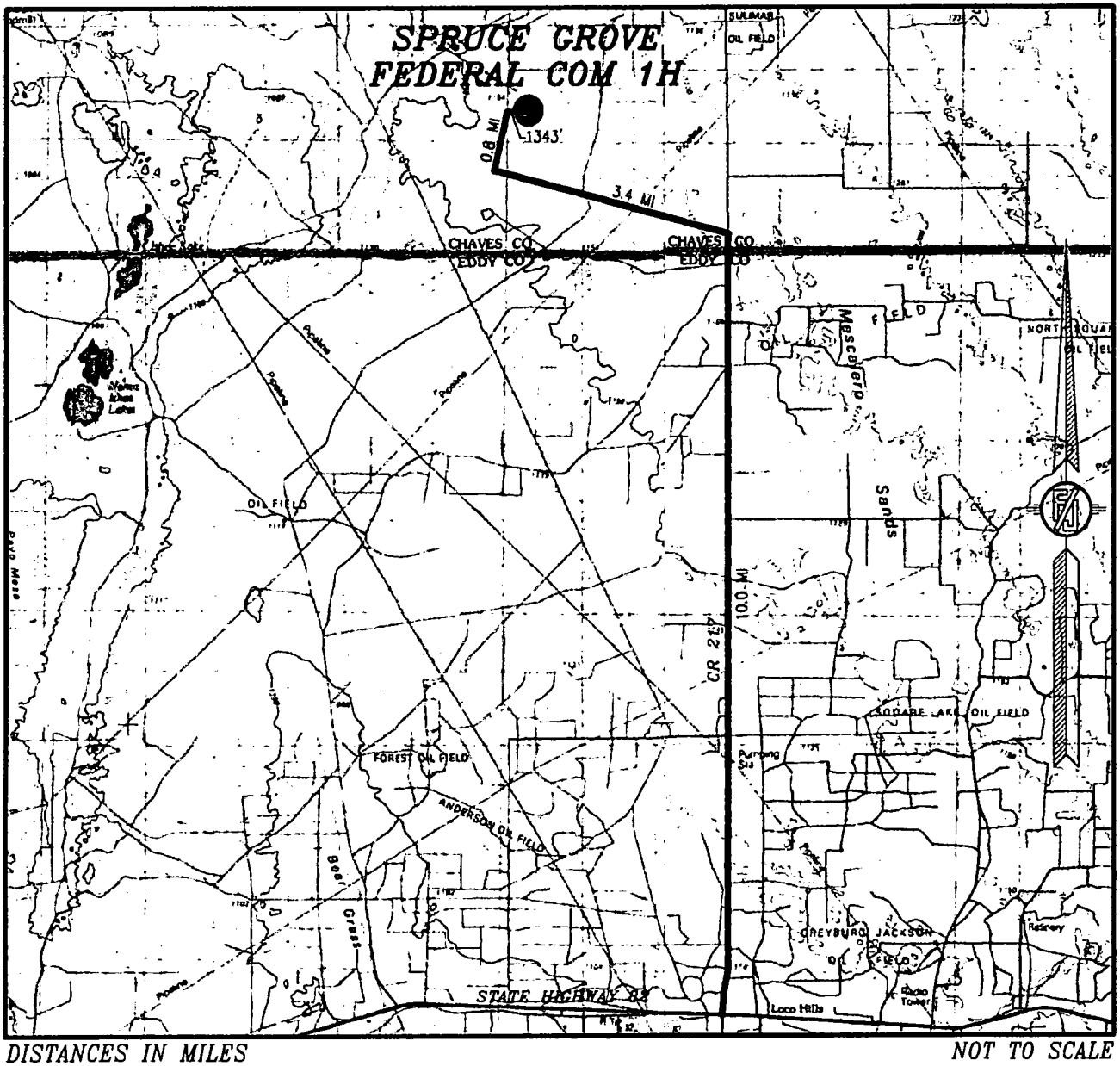
Previous Onsite information: 7/31/2018

Other SUPO Attachment

spruce_SUPO_20180918102648.pdf

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

VICINITY MAP



DISTANCES IN MILES

NOT TO SCALE

DIRECTIONS TO LOCATION
FROM THE INTERSECTION OF STATE HIGHWAY 82 AND CR 217 (HAGERMAN CUTOFF) GO NORTH ON CR 217 APPROX. 10.0 MILES, TURN WEST ON 20' CALICHE LEASE ROAD (COUNTY LINE ROAD) AND GO APPROX. 3.4 MILES, TURN NORTH ON 20' CALICHE LEASE ROAD AND GO APPROX. 0.8 OF A MILE, FOLLOW ROAD SURVEY EAST APPROX. 1343' TO THE SOUTHWEST PAD CORNER FOR THIS LOCATION.

MACK ENERGY CORPORATION
SPRUCE GROVE FEDERAL COM 1H
LOCATED 565 FT. FROM THE NORTH LINE
AND 2285 FT. FROM THE EAST LINE OF
SECTION 28, TOWNSHIP 15 SOUTH,
RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

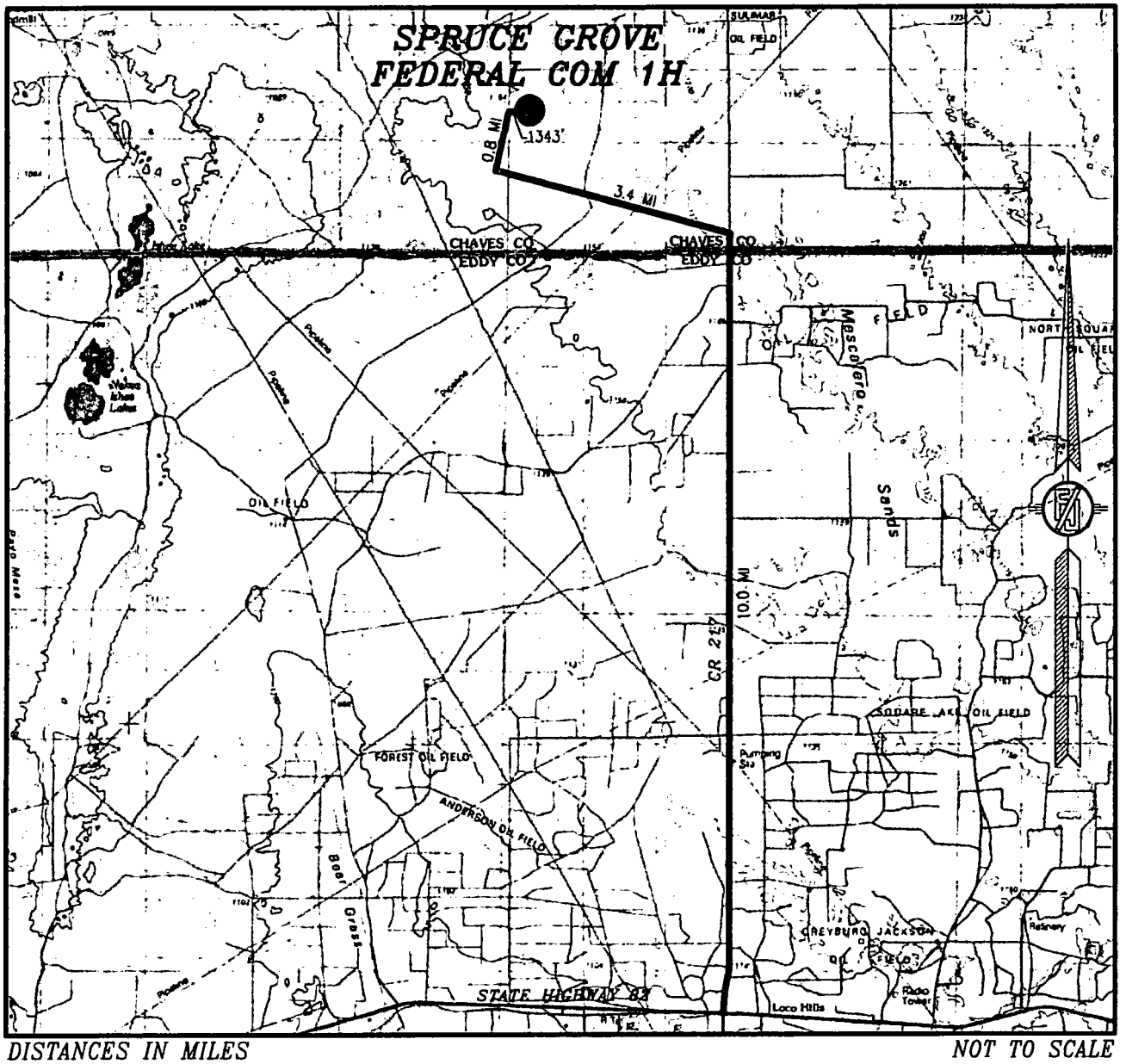
JUNE 22, 2018

SURVEY NO. 6317

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

VICINITY MAP



DISTANCES IN MILES

NOT TO SCALE

DIRECTIONS TO LOCATION
FROM THE INTERSECTION OF STATE HIGHWAY 82 AND CR 217 (HAGERMAN CUTOFF) GO NORTH ON CR 217 APPROX. 10.0 MILES, TURN WEST ON 20' CALICHE LEASE ROAD (COUNTY LINE ROAD) AND GO APPROX. 3.4 MILES, TURN NORTH ON 20' CALICHE LEASE ROAD AND GO APPROX. 0.8 OF A MILE, FOLLOW ROAD SURVEY EAST APPROX. 1343' TO THE SOUTHWEST PAD CORNER FOR THIS LOCATION.

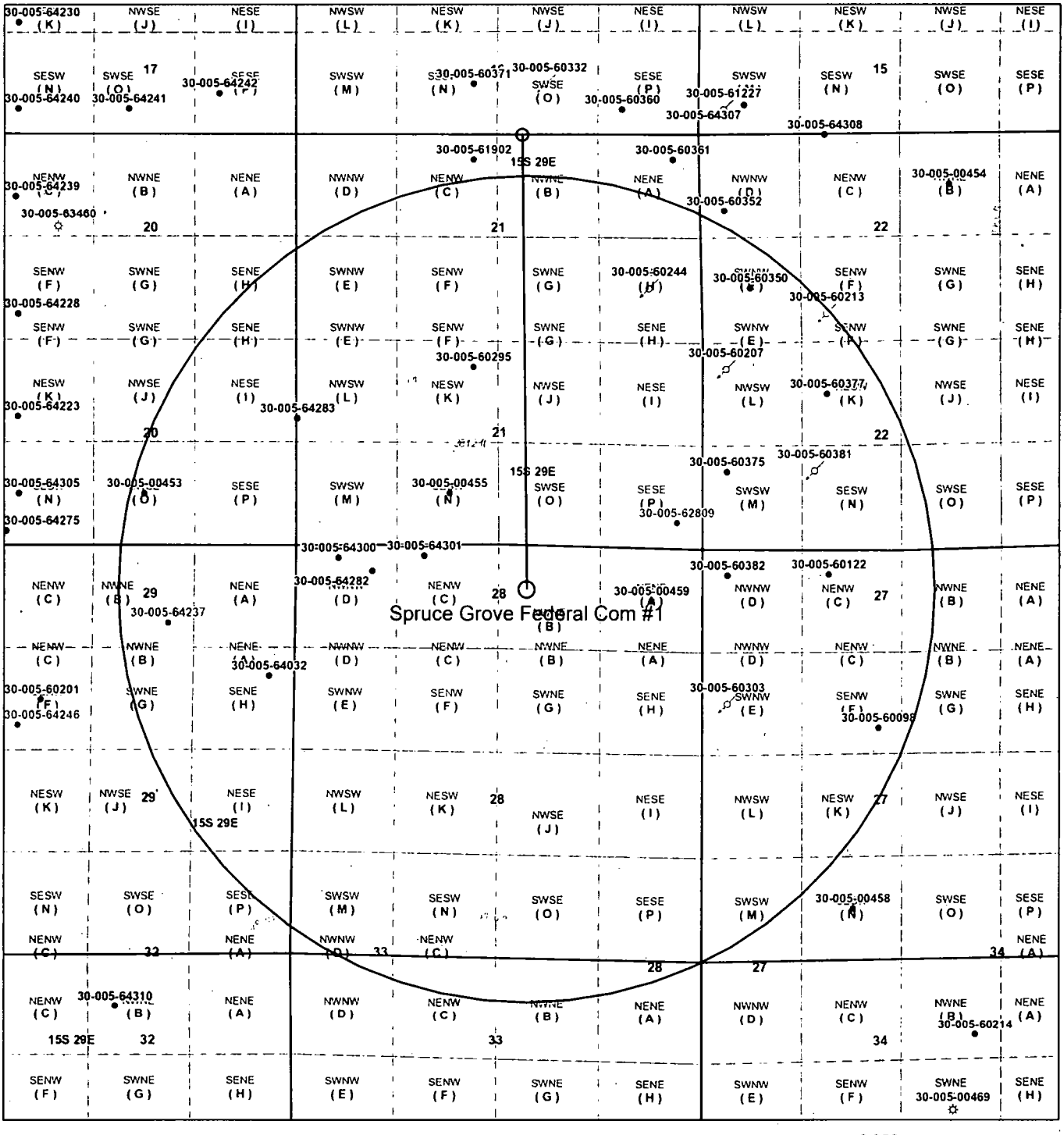
MACK ENERGY CORPORATION
SPRUCE GROVE FEDERAL COM 1H
LOCATED 565 FT. FROM THE NORTH LINE AND 2285 FT. FROM THE EAST LINE OF SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO

JUNE 22, 2018

SURVEY NO. 6317

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 CARLSBAD, NEW MEXICO

Spruce Grove Federal Com #1H



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1:18,056

0 0.17 0.35 0.7 mi

0 0.28 0.55 1.1 km

Override 1

Override 1

Points

Override 1

Override 2

Well Locations - Small Scale

Active

New

Plugged

Cancelled

Temporarily Abandoned

Well Locations - Large Scale

Miscellaneous

CO2 Active

CO2 Cancelled

CO2 New

CO2, Plugged

CO2, Temporarily Abandoned

Gas Active

Gas, Cancelled, Never Drilled

Gas, New

Gas, Plugged

Gas, Temporarily Abandoned

Injection, Active

Injection, Cancelled

Injection, New

Injection, Plugged

Injection, Temporarily Abandoned

Oil, Active

Oil, Cancelled

Oil, New

Oil, Plugged

Oil, Temporarily Abondoned

Salt Water Injection, Active

Salt Water Injection, Cancelled

Salt Water Injection, New

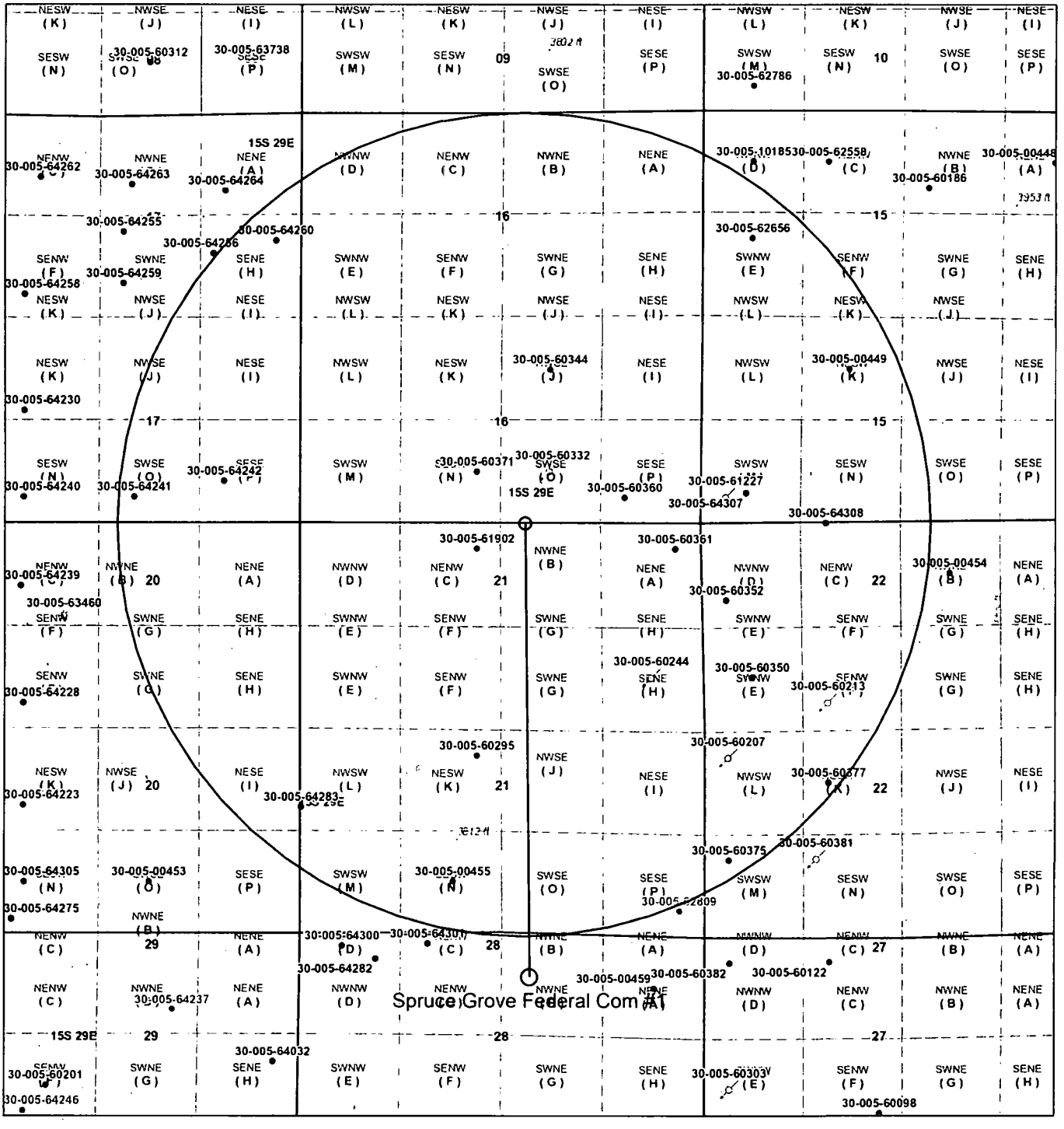
Salt Water Injection, Plugged

Salt Water InjectionTemporarily Abandoned

Water, Active

Water, Cancelled

Spruce Grove Federal Com #1H BHL



8/9/2018, 10:13:51 AM

1:18,056

0 0.17 0.35 0.7 mi

0 0.28 0.55 1.1 km

- Override 1
- Override 1

Points

- Override 1
- Override 2

Well Locations - Small Scale

- Active
- New
- Plugged
- Cancelled
- Temporarily Abandoned

Well Locations - Large Scale

- Miscellaneous
- CO2 Active
- CO2 Cancelled
- CO2 New
- CO2, Plugged
- CO2, Temporarily Abandoned
- Gas Active
- Gas, Cancelled, Never Drilled
- Gas, New
- Gas, Plugged
- Gas, Temporarily Abandoned
- Injection, Active
- Injection, Cancelled
- Injection, New
- Injection, Plugged
- Injection, Temporarily Abandoned
- Oil, Active
- Oil, Cancelled
- Oil, New
- Oil, Plugged
- Oil, Temporarily Abondoned
- Salt Water Injection, Active
- Salt Water Injection, Cancelled
- Salt Water Injection, New
- Salt Water Injection, Plugged
- Salt Water InjectionTemporarily Abandoned
- Water, Active
- Water, Cancelled

OCD, Bureau of Land Management, Texas Parks & Wildlife, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA, BLM

New Mexico Oil Conservation Division

NM OCD Oil and Gas Map. http://nm-emnrd.maps.arcgis.com/apps/webappviewer/: New Mexico Oil Conservation Division

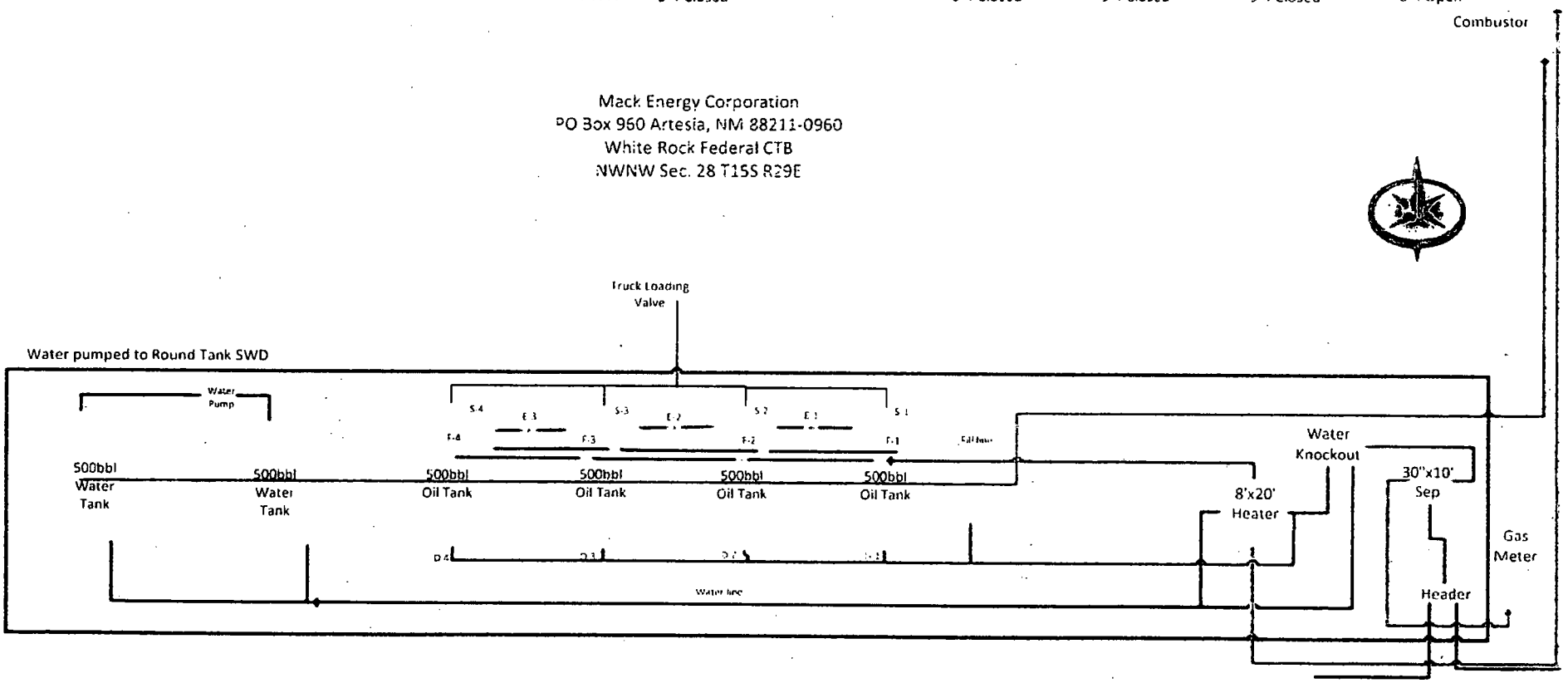
Production Phase

Tank 1	Tank 2	Tank 3	Tank 4
F-1 Open	F-1 Closed	F-1 Closed	F-1 Closed
F-2 Closed	F-2 Open	F-2 Closed	F-2 Closed
F-3 Closed	F-3 Closed	F-3 Open	F-3 Closed
F-4 Closed	F-4 Closed	F-4 Closed	F-4 Open
E-1 Open	E-1 Open	E-1 Closed	E-1 Closed
E-2 Closed	E-2 Closed	E-2 Open	E-2 Open
D-1 Open	D-1 Closed	D-1 Closed	D-1 Closed
D-2 Closed	D-2 Open	D-2 Closed	D-2 Closed
D-3 Closed	D-3 Closed	D-3 Open	D-3 Closed
D-4 Closed	D-4 Closed	D-4 Closed	D-4 Open
S-1 Closed	S-1 Closed	S-1 Closed	S-1 Closed
S-2 Closed	S-2 Closed	S-2 Closed	S-2 Closed
S-3 Closed	S-3 Closed	S-3 Closed	S-3 Closed
S-4 Closed	S-4 Closed	S-4 Closed	S-4 Closed

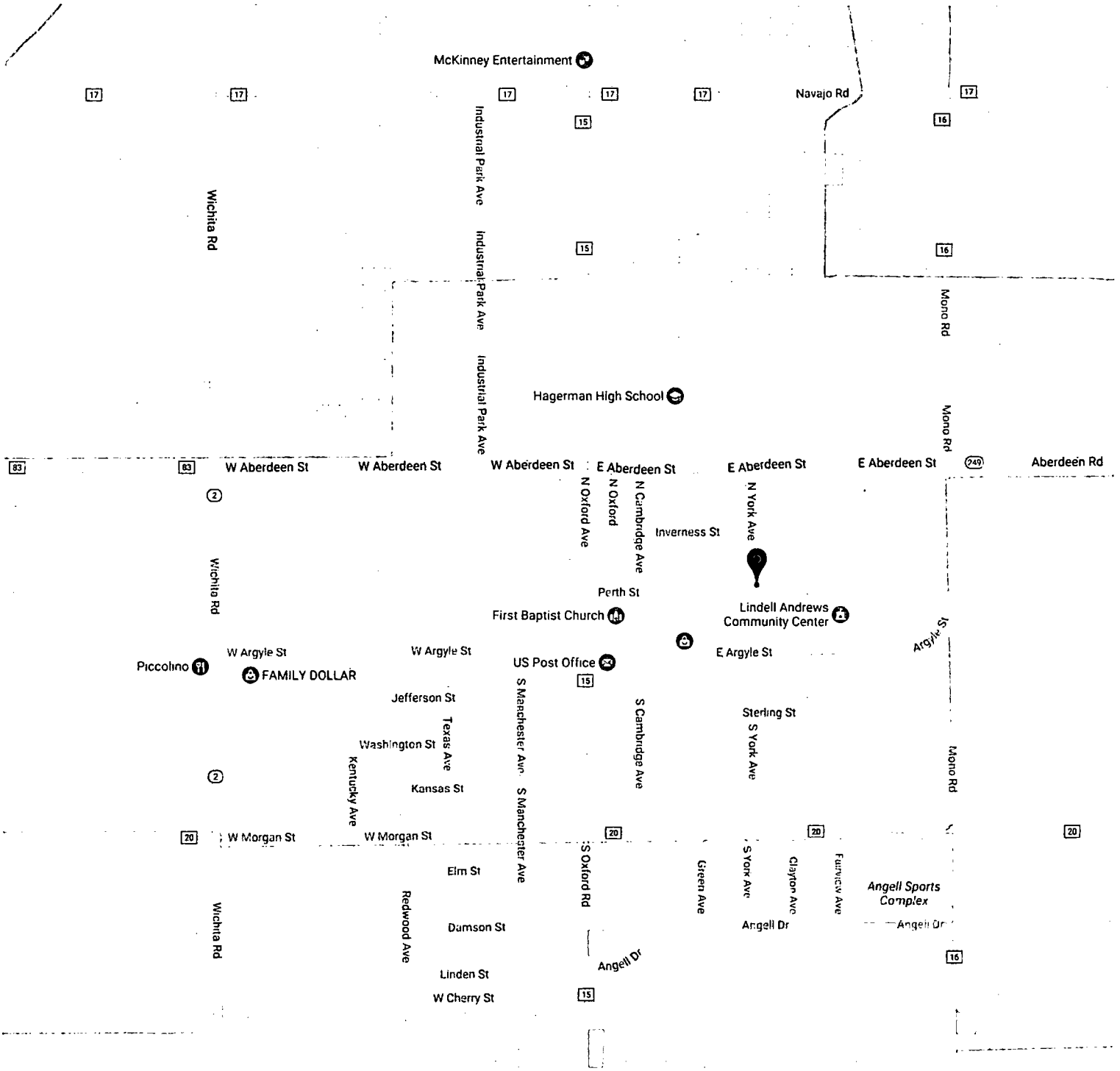
Sales Phase

Tank 1	Tank 2	Tank 3	Tank 4
F-1 Closed	F-1 Closed	F-1 Open	F-1 Closed
F-2 Closed	F-2 Closed	F-2 Closed	F-2 Open
F-3 Open	F-3 Closed	F-3 Closed	F-3 Closed
F-4 Closed	F-4 Open	F-4 Closed	F-4 Closed
E-1 Closed	E-1 Closed	E-1 Open	E-1 Open
E-2 Open	E-2 Open	E-2 Closed	E-2 Closed
D-1 Closed	D-1 Closed	D-1 Open	D-1 Closed
D-2 Closed	D-2 Closed	D-2 Closed	D-2 Open
D-3 Open	D-3 Closed	D-3 Closed	D-3 Closed
D-4 Closed	D-4 Open	D-4 Closed	D-4 Closed
S-1 Open	S-1 Closed	S-1 Closed	S-1 Closed
S-2 Closed	S-2 Open	S-2 Closed	S-2 Closed
S-3 Closed	S-3 Closed	S-3 Open	S-3 Closed
S-4 Closed	S-4 Closed	S-4 Closed	S-4 Open

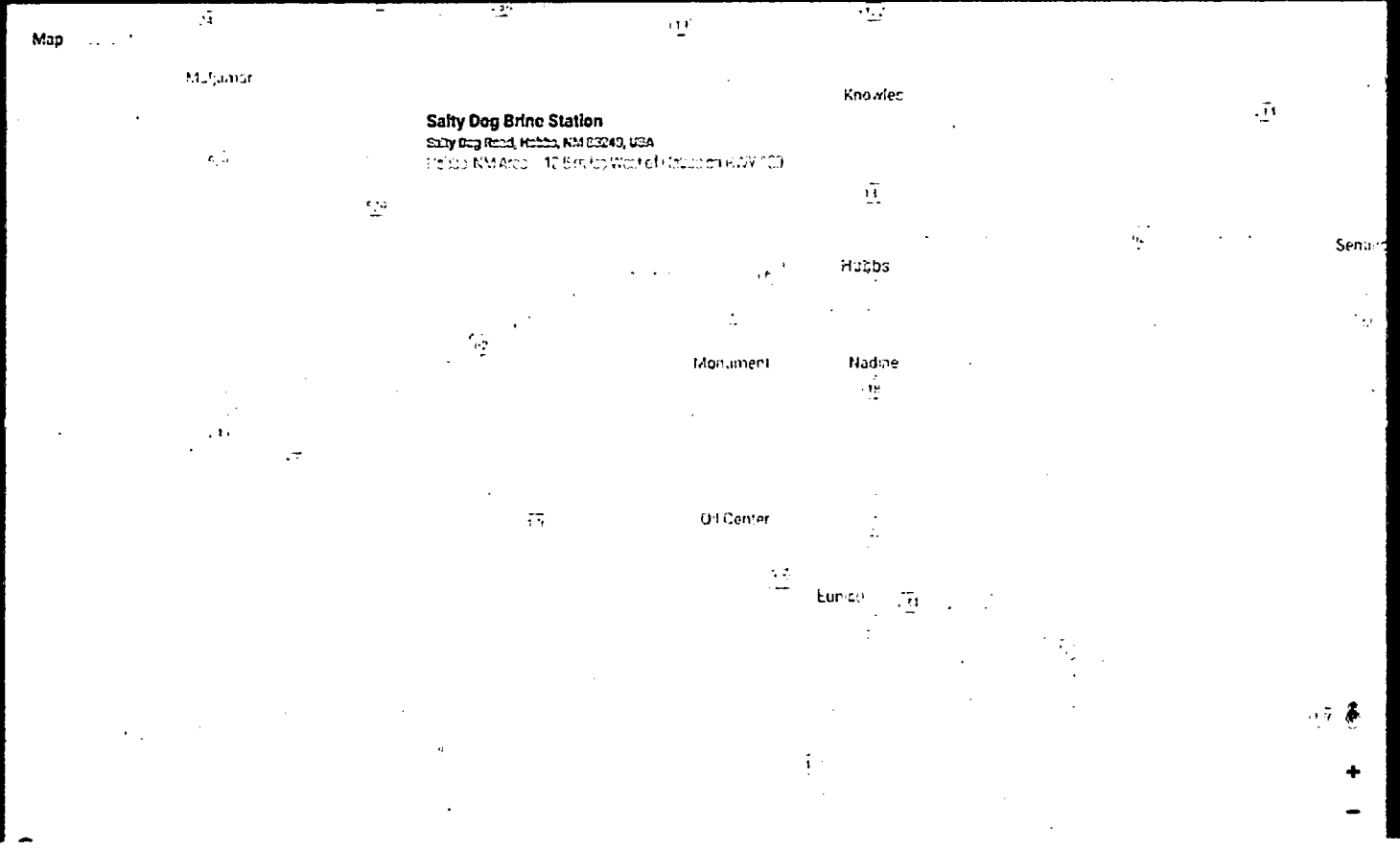
Mack Energy Corporation
PO Box 960 Artesia, NM 88211-0960
White Rock Federal CTB
NWNW Sec. 28 T15S R29E



33°06'55.3"N 104°19'24.4"W



STANDARD


Map
Knowles
Salty Dog Brine Station
Salty Dog Road, Hobbs, NM 88240, USA
Hobbs
Monument
Nadine
Oil Center
Eunice

32°49'05.3"N 103°59'03.7"W

Mor-West Corp. — Loco Hills FW

Goat Ropers Rd

Hagerman Cutoff Rd

Goat Ropers Rd

Lovington Hwy

Loco Hills Post Office

Loco Hills

Hagerman Cutoff Rd

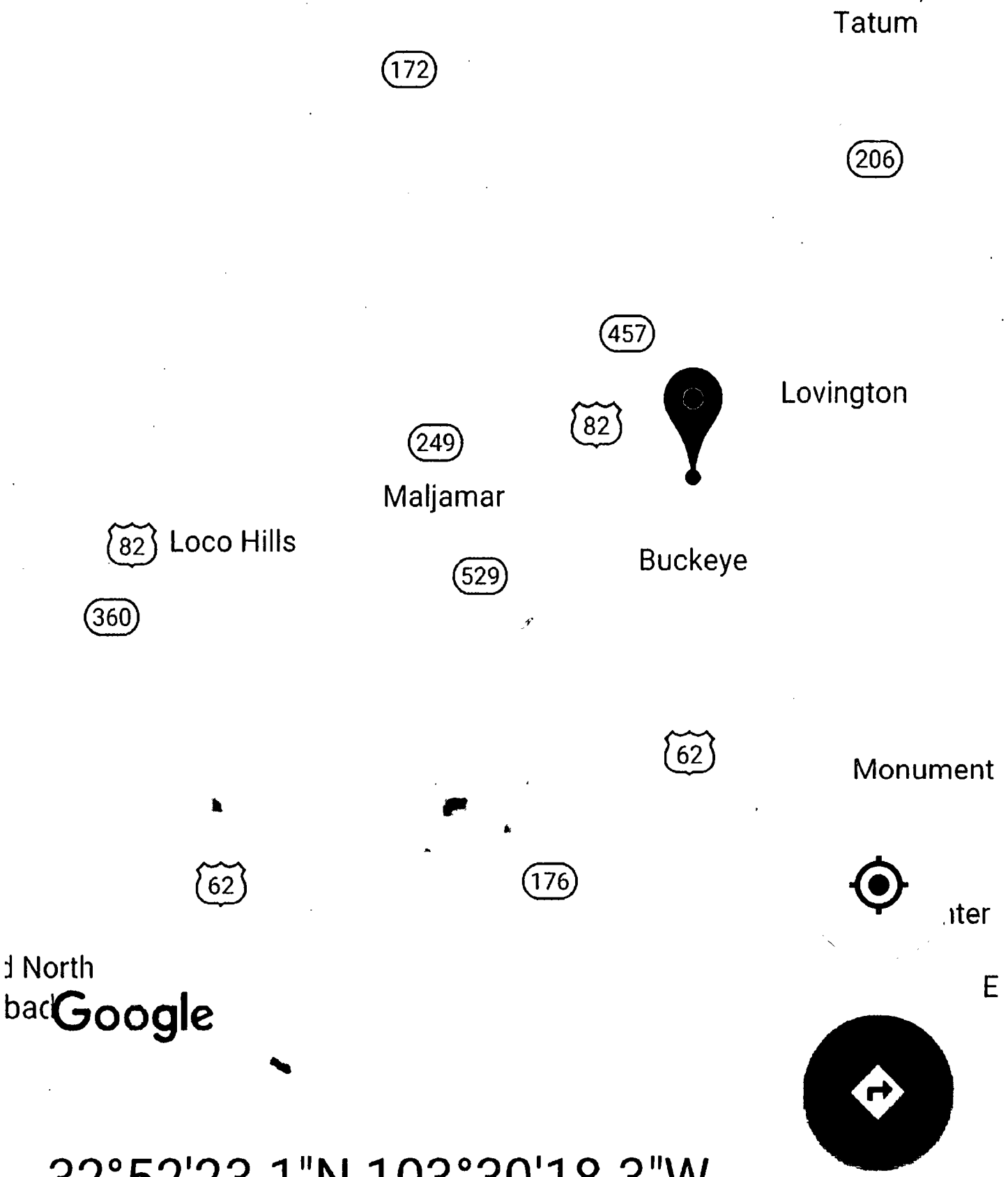
Google

Rd

32°49'05.3"N 103°59'03.7"W

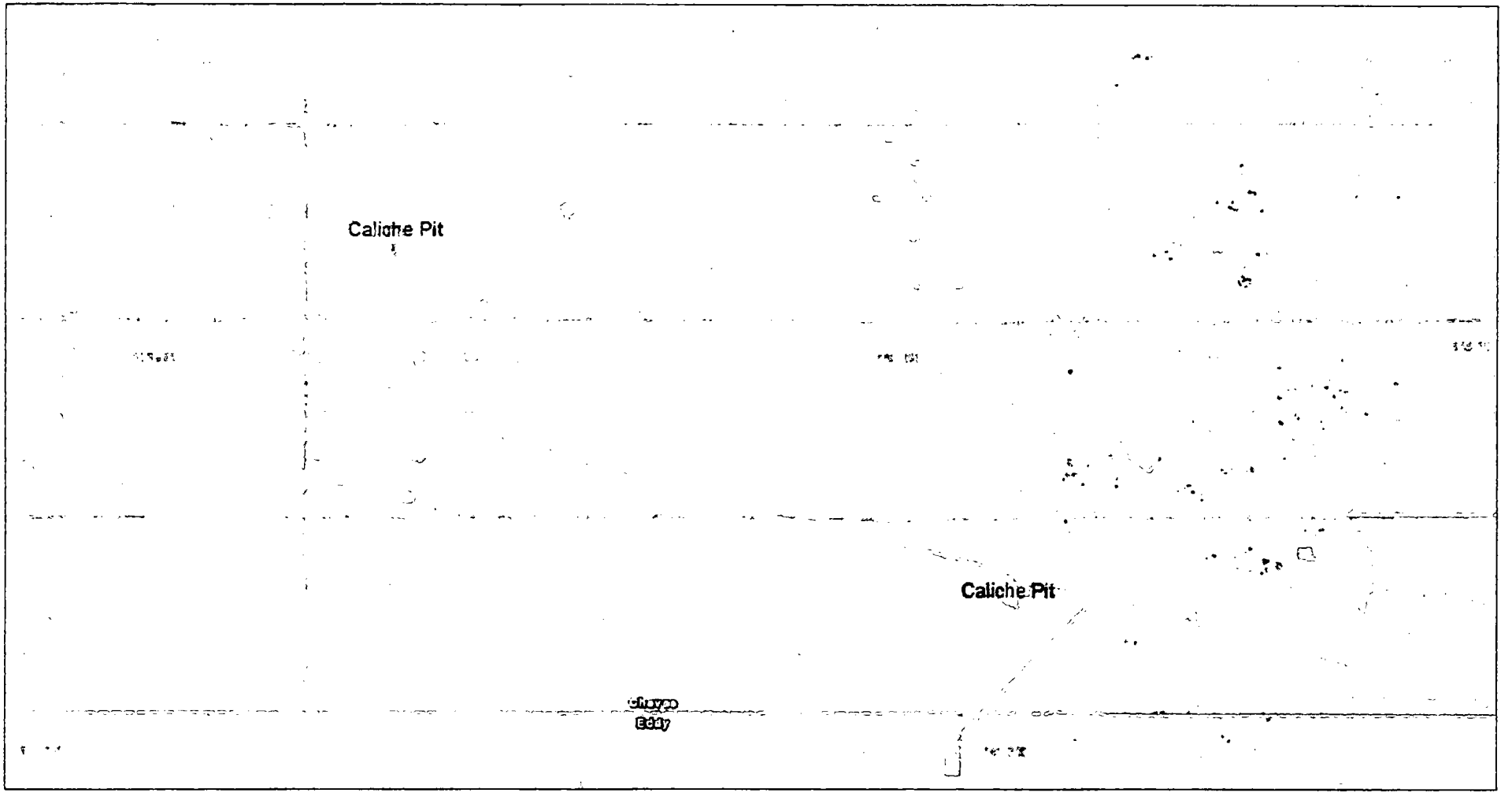
32°52'23.1"N 103°30'18.3"W

Gandy Corp - Wasserhund BW



32°52'23.1"N 103°30'18.3"W

ArcGIS Web Map



July 27, 2017

1:36,112

Areas

- Override 1
- OCD District Offices
- PLSSTownship
- PLSSFirstDivision

0 0.35 0.7 1.4 mi

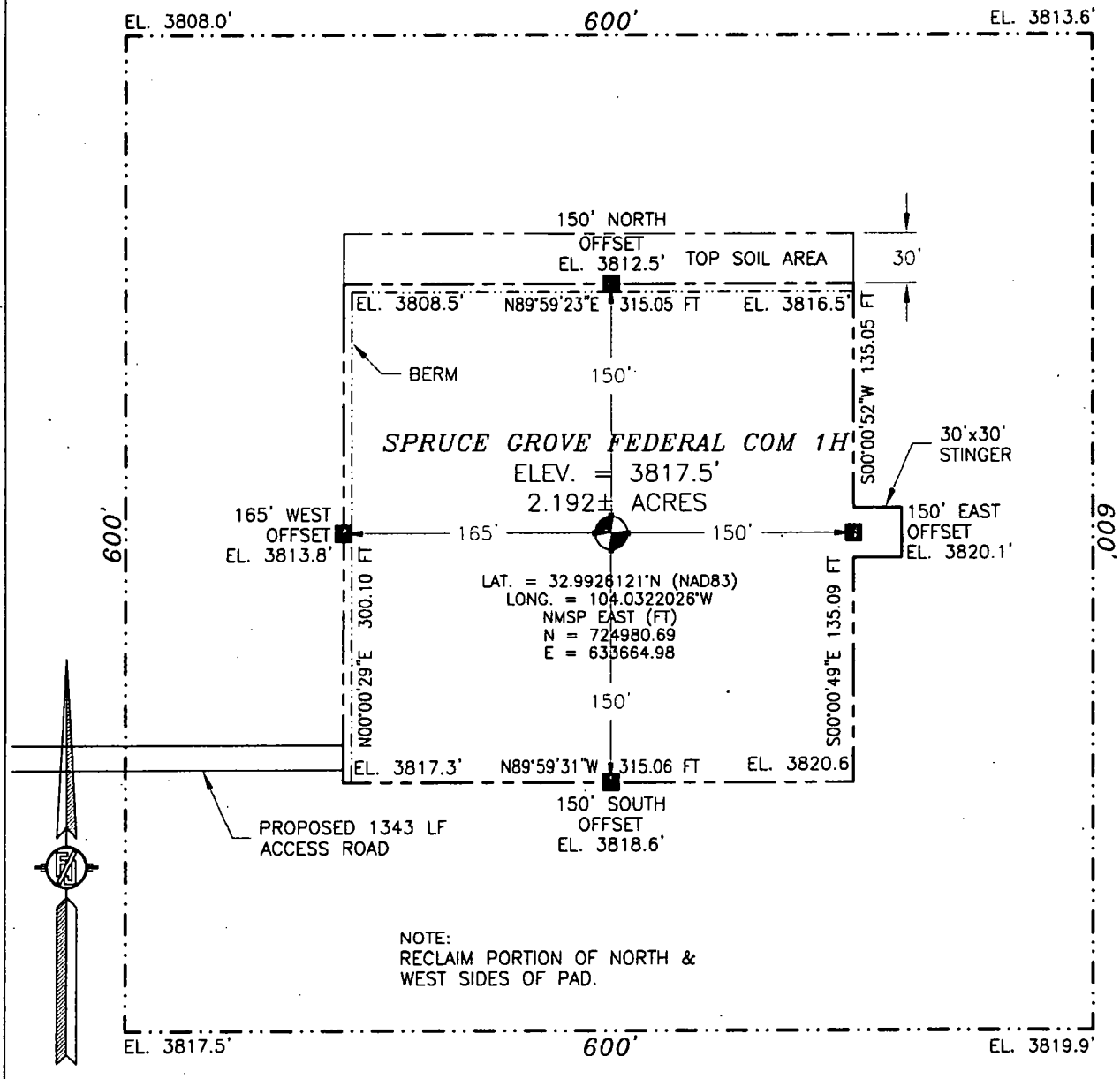
0 0.5 1 2 km

OCD
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics,

Web AppBuilder for ArcGIS

SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M.
CHAVES COUNTY, STATE OF NEW MEXICO
SITE MAP

NOTE: LATITUDE AND LONGITUDE COORDINATES ARE SHOWN USING THE NORTH AMERICAN DATUM OF 1983 (NAD83). LISTED NEW MEXICO STATE PLANE EAST COORDINATES ARE GRID (NAD83). BASIS OF BEARING AND DISTANCES USED ARE NEW MEXICO STATE PLANE EAST COORDINATES MODIFIED TO THE SURFACE



010 50 100 200

SCALE 1" = 100'

DIRECTIONS TO LOCATION

FROM THE INTERSECTION OF STATE HIGHWAY 82 AND CR 217 (HAGERMAN CUTOFF) GO NORTH ON CR 217 APPROX. 10.0 MILES, TURN WEST ON 20' CALICHE LEASE ROAD (COUNTY LINE ROAD) AND GO APPROX. 3.4 MILES, TURN NORTH ON 20' CALICHE LEASE ROAD AND GO APPROX. 0.8 OF A MILE, FOLLOW ROAD SURVEY EAST APPROX. 1343' TO THE SOUTHWEST PAD CORNER FOR THIS LOCATION.

MACK ENERGY CORPORATION

SPRUCE GROVE FEDERAL COM 1H

LOCATED 565 FT. FROM THE NORTH LINE AND 2285 FT. FROM THE EAST LINE OF SECTION 28, TOWNSHIP 15 SOUTH, RANGE 29 EAST, N.M.P.M. CHAVES COUNTY, STATE OF NEW MEXICO

JUNE 22, 2018

SURVEY NO. 6317

MADRON SURVEYING, INC. 301 SOUTH CANAL (575) 234-3341 *CARLSBAD, NEW MEXICO*

SURFACE USE AND OPERATING PLAN

1. Existing Access Roads

A. All roads to the location are shown in Exhibit #6. The existing lease roads are illustrated and are adequate for travel during drilling and production operations. Upgrading existing roads prior to drilling well, will be done where necessary.

B Directions to Location: From intersection of State Highway 82 and CR 217 go North on CR 217 approx. 10.0 miles, turn west on 20' caliche lease road (county line road) and go approx. 3.4 miles, turn North on 20' caliche lease road and go approx. 0.8 of a mile, follow road survey East approx. 1343' to the Southwest pad corner for the location

C. Routine grading and maintenance of existing roads will be conducted as necessary to maintain their condition as long as any operations continue on this lease.

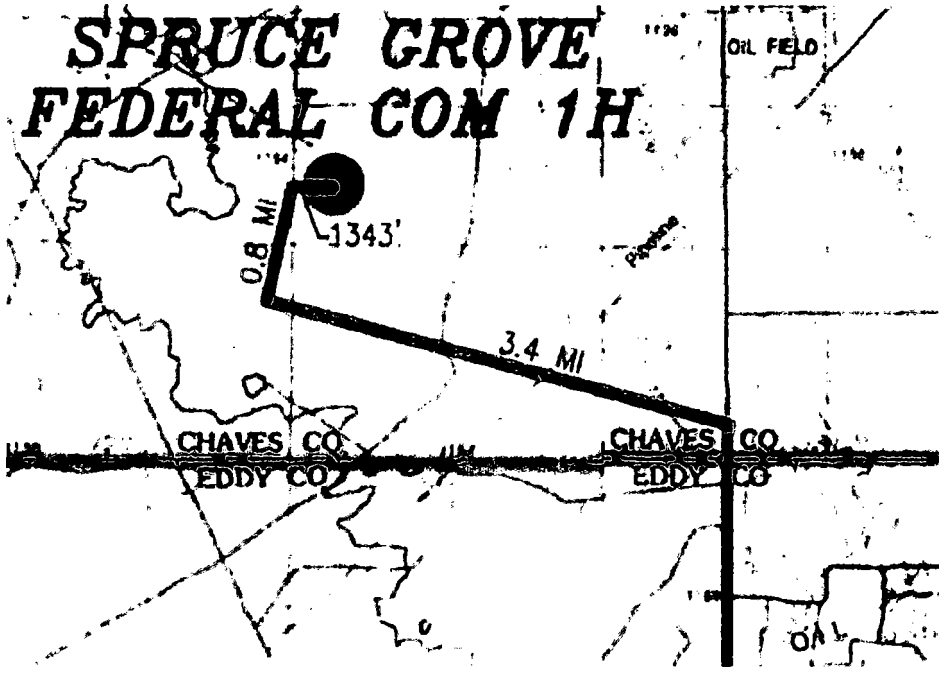


Exhibit #6

1. Proposed Access Road:

Vicinity Map shows this location with existing road and 1343' of new road exiting the Southwest corner of the pad. Proposed upgrade of existing road will be done along staked centerline survey. Necessary maintenance will be done to insure traffic stays within the access road. The road has been constructed as follows:

A. The Maximum width of the running surface will be 14'. The road will be crowned and ditched and constructed of 6" rolled and compacted caliche. Ditches will be at 3:1 slope and 3 feet wide. Water will be diverted where necessary to avoid ponding, prevent erosion, maintain good drainage, and to be consistent with local drainage patterns.

B. The average grade will be less than 1%.

C. No turnouts are planned.

D. No culverts, cattleguard, gates, low water crossings or fence cuts are necessary.

E. Surfacing material will consist of native caliche. Caliche will be obtained from the nearest BLM approved caliche pit located Sec. 19 T15S R29E and Sec. 34 T15S R29E.

F. The access road as shown in Exhibit #6 is existing.

2. Location of Existing Wells:

Exhibit #16 shows all existing wells within a one-mile radius of this well.

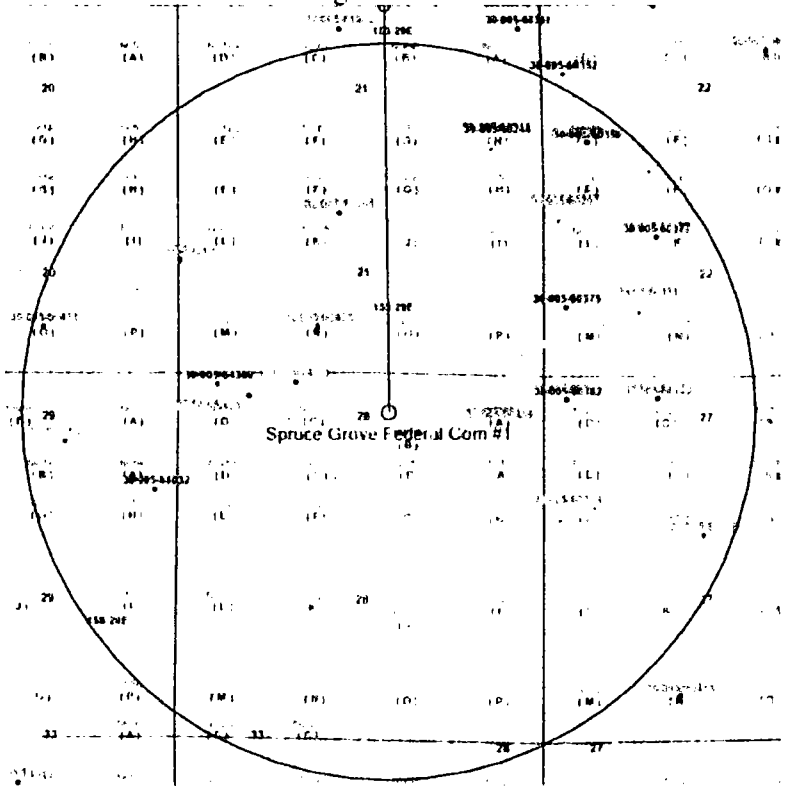


Exhibit #16

3. Location of Existing and/or Proposed Facilities:

A. Mack Energy Corporation will produce this well at the White Rock Federal CTB.

B. If the well is productive, contemplated facilities will be as follows:

1) San Andres Completion: Will be sent to the White Rock Federal CTB located at the NW/4 NW/4 Sec 28 T15S R29E. The Facility is shown in Exhibit #13.

2) The tank battery and facilities including all flow lines and piping will be installed according to API specifications.

3) Any additional caliche will be obtained from a BLM approved caliche pit. Any additional construction materials will be purchased from contractors.

4) It will be necessary to run electric power if this well is productive. Power will be run by CVE and they will send in a separate plan for power.

5) Proposed flow lines will run west to the White Rock Federal CTB. The white will be a 3" poly surface line. 3318.95' in length with a 40 psi working pressure.

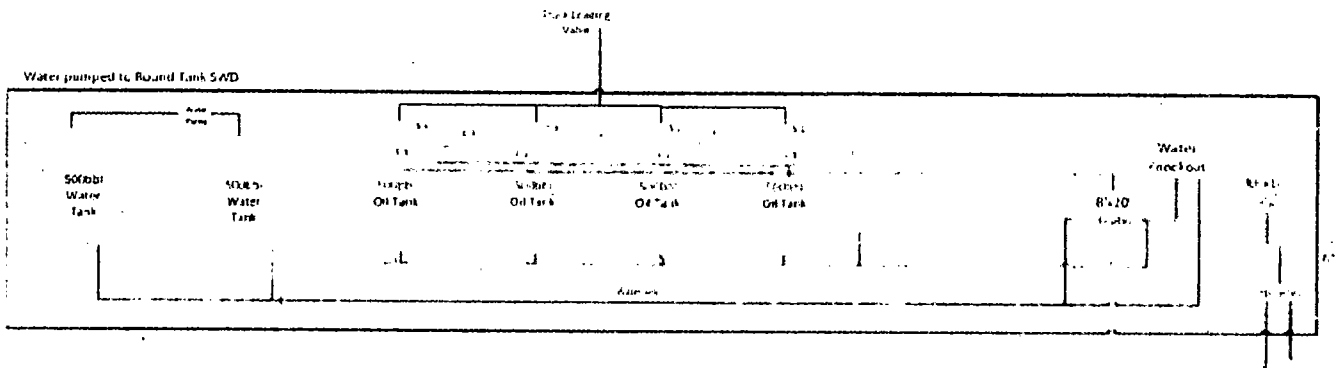


Exhibit #13

4. Location and Type of Water Supply:

The well will be drilled with combination brine and fresh water mud system as outlined in the drilling program. The water will be obtained from commercial water stations in the area and hauled to location by transport truck over the existing and proposed access roads shown in Exhibit #6. If a commercial fresh water source is nearby, fasline may be laid along existing road ROW's and fresh water pumped to the well. No water well will be drilled on the location.

5. Source of Construction Materials:

All caliche required for construction of the drill pad and proposed new access road (approximately 2500 cubic yards) will be obtained from BLM approved pit located at Sec. 19 T15S R29E and Sec. 34 T15S R29E.

6. Methods of Handling Waste:

A. Drill cuttings and fluids will be disposed into the steel tanks and hauled to R-360 disposal facility, permit number NM-01-0006. Located on Hwy 62 at MM 66.

B. Water produced from the well during completion may be disposed into a steel tank. After the well is permanently placed on production, produced water will be collected in tanks (fiberglass) and trucked to our Round Tank SWD #1; produced oil will be collected in steel tanks until sold.

C. Garbage and trash produced during drilling or completion operations will be collected in a trash bin and hauled to an approved local landfill. No toxic waste or hazardous chemicals will be produced by this operation.

D. After the rig is moved out and the well is either completed or abandoned, all waste materials will be cleaned up within 30 days. In the event of a dry hole only a dry hole marker will remain.

E. Sewage and Gray Water will be placed in container and hauled to a approved facility. Container and disposal handled by Black Hawk.

F. Drilling fluids will be contained in steel tanks using a closed loop system Exhibit #12. No pits will be used during drilling operations

7. **Ancillary Facilities:**

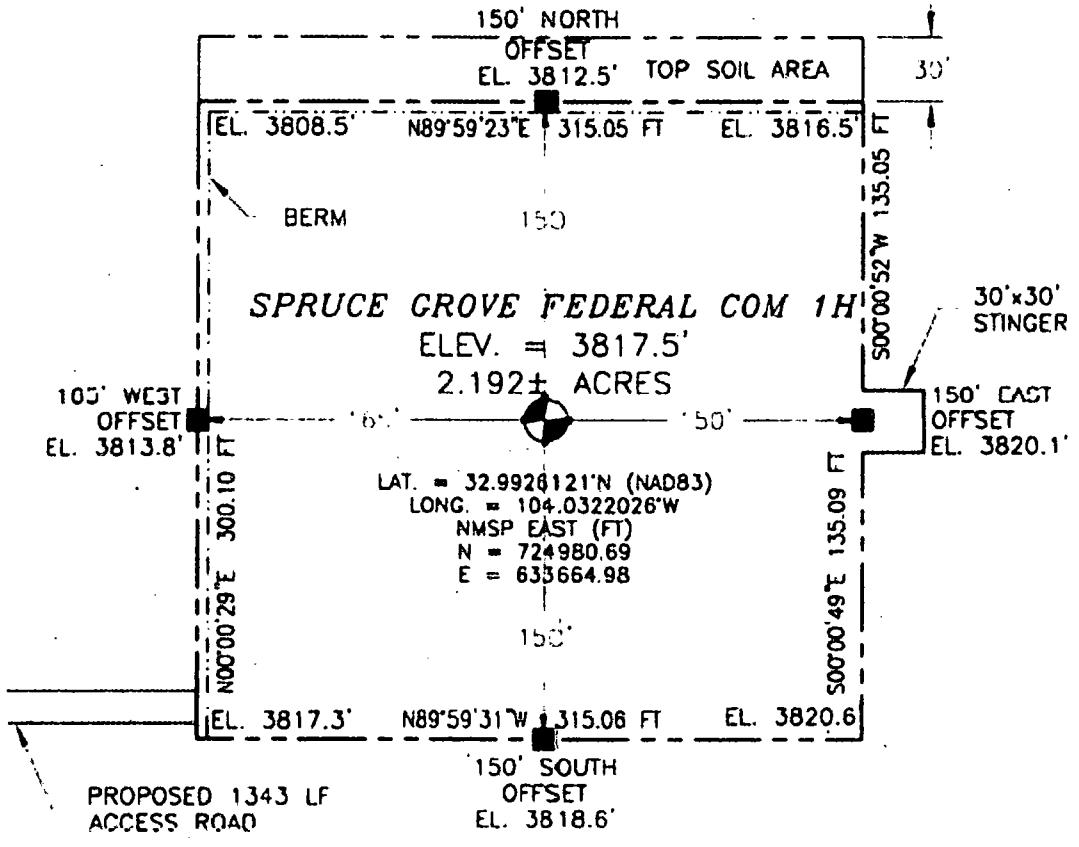
No airstrip, campsite or other facilities will be built as a result of the operation on this well.

8. **Well Site Layout:**

A. The well site and elevation plat for the proposed well is shown in Exhibit #14. It was staked by Maddron Surveying, Carlsbad, NM.

B. The drill pad layout, with elevations staked by Maddron Surveying, is shown in Exhibit #14. Dimensions of the pad are shown. Topsoil, if available, will be stockpiled per BLM specifications. Because the pad is almost level no major cuts will be required.

C. Diagram below shows the proposed orientation of the location. No permanent living facilities are planned, but a temporary foreman/toolpusher's trailer will be on location during the drilling operations.



Exhibit# 14

9. **Plans for Restoration of the Surface:**

A. Upon completion of the proposed operations, if the well is completed, any additional caliche required for facilities will be obtained from a BLM approved caliche pit.

B. Plans for interim and or final remediation:

1) Caliche will be removed, ground ripped and stockpiled topsoil used to recontoured as close as possible to the original natural level to prevent erosion and ponding of water.

2) Area will be reseeded as per BLM specifications. Seeding will be done when moisture is available and weather permitting. Pure live seed will be used to prevent noxious weeds. Annual inspection of growth will be done and necessary measures taken to eliminate noxious weeds.

C. Exhibit #15 below shows the proposed downsized well site after Interim Reclamation. Dimensions are estimates on present conditions and are subject to change.

Reclaimed Pad 250' x 250'
1.43 acres

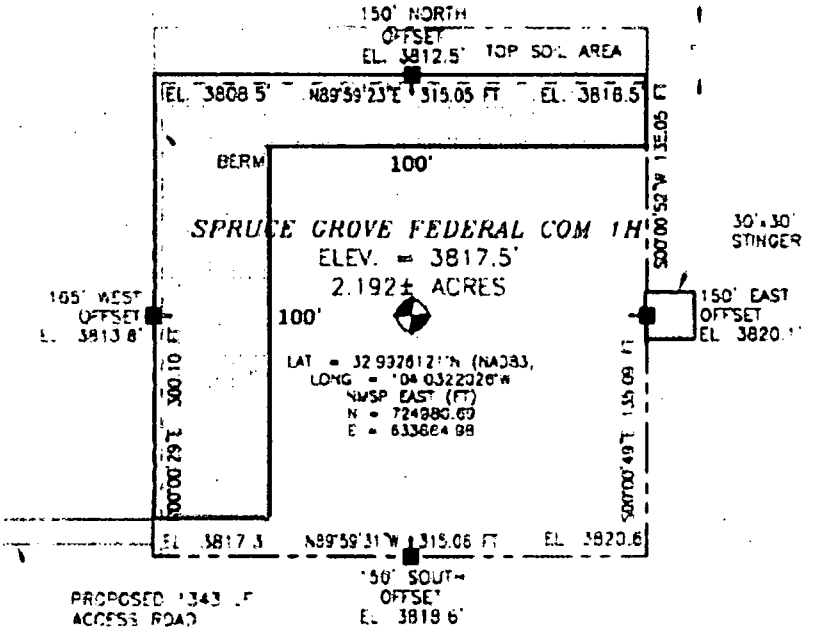


Exhibit #15

10. Surface Ownership:

The well site and lease is located entirely on Federal surface. We have notified the surface lessee of the impending operations. Bogel Limited Company, PO Box 460 Dexter, NM 88230 (575) 365-2996.

11. Other Information:

A. The area around the well site is grassland and the topsoil is sandy. The vegetation is native scrub grass with sagebrush.

B. There is no permanent or live water in the immediate area.

C. A Cultural Resources Examination has been requested and will be forwarded to your office in the near future.

12. Lessee's and Operator's Representative:

The Mack Energy Corporation representative responsible for assuring compliance with the surface use plan is as follows:

Deana Weaver
Mack Energy Corporation
P.O. Box 960
Artesia, NM 88211-0960
Phone (575) 748-1288 (office)
dweaver@mec.com

APD CERTIFICATION

I hereby certify that I, or person under my direct supervision, have inspected the proposed 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 the work associated with the operations proposed herein will be performed in conformity with this APD package and 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.

Date: 9.18.19 **Signed:** Deana Weaver

Deana Weaver

Section 2 - Lined Pits

Would you like to utilize Lined Pit PWD options?

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Lined pit PWD on or off channel:

Lined pit PWD discharge volume (bbl/day):

Lined pit specifications:

Pit liner description:

Pit liner manufacturers information:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Lined pit precipitated solids disposal schedule:

Lined pit precipitated solids disposal schedule attachment:

Lined pit reclamation description:

Lined pit reclamation attachment:

Leak detection system description:

Leak detection system attachment:

Lined pit Monitor description:

Lined pit Monitor attachment:

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

Is the reclamation bond a rider under the BLM bond?

Lined pit bond number:

Lined pit bond amount:

Additional bond information attachment:

Section 3 - Unlined Pits

Would you like to utilize Unlined Pit PWD options?

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Unlined pit PWD on or off channel:

Unlined pit PWD discharge volume (bbl/day):

Unlined pit specifications:

Precipitated solids disposal:

Decribe precipitated solids disposal:

Precipitated solids disposal permit:

Unlined pit precipitated solids disposal schedule:

Unlined pit precipitated solids disposal schedule attachment:

Unlined pit reclamation description:

Unlined pit reclamation attachment:

Unlined pit Monitor description:

Unlined pit Monitor attachment:

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

Beneficial use user confirmation:

Estimated depth of the shallowest aquifer (feet):

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

TDS lab results:

Geologic and hydrologic evidence:

State authorization:

Unlined Produced Water Pit Estimated percolation:

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

Is the reclamation bond a rider under the BLM bond?

Unlined pit bond number:

Unlined pit bond amount:

Additional bond information attachment:

Section 4 - Injection

Would you like to utilize Injection PWD options?

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Injection PWD discharge volume (bbl/day):

Injection well mineral owner:

Injection well type:

Injection well number: **Injection well name:**

Assigned injection well API number? **Injection well API number:**

Injection well new surface disturbance (acres):

Minerals protection information:

Mineral protection attachment:

Underground Injection Control (UIC) Permit?

UIC Permit attachment:

Section 5 - Surface Discharge

Would you like to utilize Surface Discharge PWD options?

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Surface discharge PWD discharge volume (bbl/day):

Surface Discharge NPDES Permit?

Surface Discharge NPDES Permit attachment:

Surface Discharge site facilities information:

Surface discharge site facilities map:

Section 6 - Other

Would you like to utilize Other PWD options?

Produced Water Disposal (PWD) Location:

PWD surface owner: **PWD disturbance (acres):**

Other PWD discharge volume (bbl/day):

Other PWD type description:

Other PWD type attachment:

Have other regulatory requirements been met?

Other regulatory requirements attachment:

AFMSS

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

Bond Info Data Report

12/10/2018

Bond Information

Federal/Indian APD: FED

BLM Bond number:

BIA Bond number:

Do you have a reclamation bond? NO

Is the reclamation bond a rider under the BLM bond?

Is the reclamation bond BLM or Forest Service?

BLM reclamation bond number:

Forest Service reclamation bond number:

Forest Service reclamation bond attachment:

Reclamation bond number:

Reclamation bond amount:

Reclamation bond rider amount:

Additional reclamation bond information attachment: