RECEIVED

OCT 2 2001

Bureau of Land Management
Durango, Colorado

Form 3160-3
(August 1999)

FORM APPROVED
OMB No. 1004-0136
Expires November 30, 2000

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

# APPLICATION FOR PERMIT TO DRILL OR REENTER

5. Lease Serial No.: C17422

6. If Indian, Allottee or Tribe Name:

1a. Type of Work: [X] DRILL [ ] REENTER

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

1b. Type of Well: [ ] Oil Well [X] Gas Well [ ] Other [X] Single Zone [ ] Multiple Zone

8. Lease Name and Well No.: Pargin Mountain 9U #3

2. Name of Operator: Petrox Resources Inc.

9. API Well No.:

3a. Address: 39868 Highway 13, Meeker, CO 81641

3b. Phone No. *(include area code)*: 970-878-5594

10. Field and Pool, or Exploratory: Ignacio Blanco-Fruitland Co

4. Location of Well *(Report location clearly and in accordance with any State requirements.*)*

At surface: 1310' FSL, 1755' FWL SW/4

At proposed prod. zone: 1310' FSL, 1755' FWL SW/4

11. Sec., T., R., M., or Blk. and Survey or Area: Sec. 9-T34N-R5W SUL

14. Distance in miles and direction from nearest town or post office*: 16 miles from Bayfield

12. County or Parish: Archuleta

13. State: Colorado

15. Distance from proposed* location to nearest property or lease line, ft. (Also to nearest drig. unit line, if any): 1600'

16. No. of Acres in lease: 2037.24

17. Spacing Unit dedicated to this well: 320

18. Distance from proposed location* to nearest well, drilling, completed, applied for, on this lease, ft.: 1800'

19. Proposed Depth: 2825'

20. BLM/BIA Bond No. on file: RLB0002450

21. Elevations (Show whether DF, KDB, RT, GL, etc.): 7445' G.L.

22. Approximate date work will start*: May, 2003

23. Estimated duration: 5 days

## 24. Attachments

The following, completed in accordance with the requirements of Onshore Oil and Gas Order No.1, shall be attached to this form:

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 shall 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 required by the authorized officer.

25. Signature: Sharon S. Clark — Name *(Printed/Typed)*: Sharon Clark — Date: 10/1/01

Title: Secretary

APPROVED FOR A PERIOD NOT TO EXCEED 2 YEARS

Approved by *(Signature)*: Brad Dodd — Name *(Printed/Typed)*: BRAD DODD — Date: 4/4/2013

Title: ASSOCIATE FIELD MANAGER — Office: TRES RIOS FIELD OFFICE

Application approval does not warrant or certify the 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.

**(Instructions on reverse)*

OPERATOR'S COPY

Approval of this agreement does not warrant or certify that the operator thereof and other holders of operating rights hold legal or equitable title to those rights in the subject lease which are committed hereto...

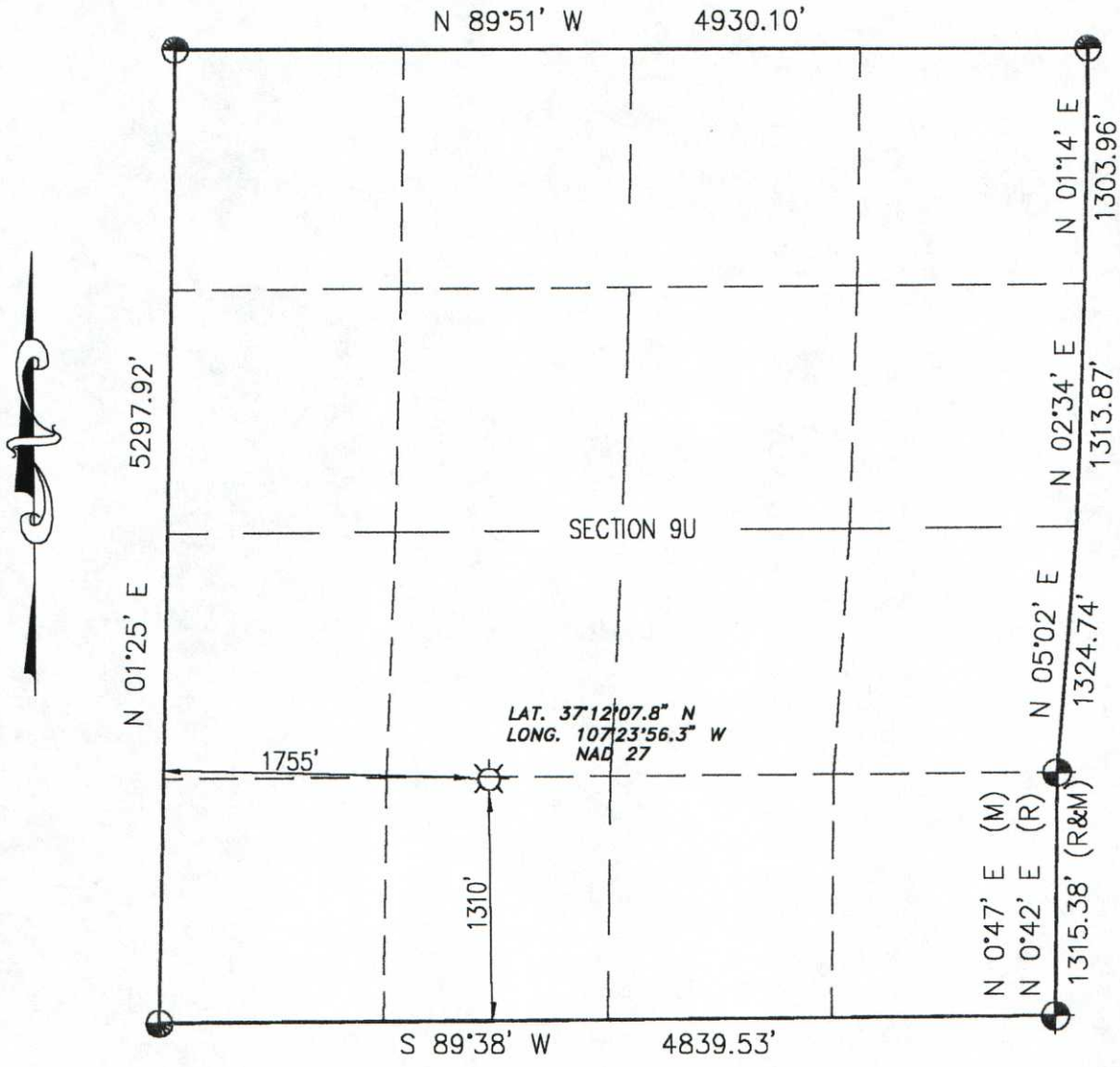
SEE ATTACHED CONDITIONS OF APPROVAL

Venting / Flaring approved for 30 days per NTL-4A

# PETROX RESOURCES, INC.

## PARGIN MOUNTAIN 9U #3

1310' FSL, 1755' FWL
SW/4 SEC. 9U, T-34-N, R-05-W, S.U.L., N.M.P.M.,
ARCHULETA COUNTY, COLORADO
GROUND LEVEL ELEVATION: 7445'




CALCULATED SECTION DIMENSIONS & CORNER POSITIONS DERIVED FROM FROM UTM COORDINATES OBTAINED FROM N.G.S. PROTRACTION MAP & CONFIRMED WITH 3D REAL TIME DIFFERENTIAL GPS.

◐ = CALCULATED POSITION.

⊕ = FOUND 1994 B.L.M. 3-1/4" ALUM. CAP

NOTES:

1. THERE PRESENTLY EXISTS NO VISIBLE IMPROVEMENTS WITHIN 200' OF THIS LOCATION OTHER THAN THOSE SHOWN HEREON OR ON THE ATTACHED PIT AND PAD DIAGRAM.
2. SURFACE USE FOR THE LAND SURROUNDING THIS LOCATION IS NATIONAL FOREST LAND.

BASIS OF BEARING

1996 B.L.M. DEPENDENT RESURVEY BEARING – BASED ON THE LINE BETWEEN THE EAST & WEST 1/4 CORNER MONUMENTS OF SEC. 14, T-34-N, R-5-W, S.U.L., N.M.P.M., ARCHULETA COUNTY, CO. – BOTH BEING 1994 B.L.M. 3-1/4" ALUMINUM CAPS. REFERENCE BEARING: WEST

BASIS OF ELEVATION

TOPO ELEVATION INTERPOLATED FROM 7.5 MIN. U.S.G.S. PARGIN MOUNTAIN QUADRANGLE MAP

0 500 1000

SCALE: 1" = 1000'

I, KENNETH E. REA, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF COLORADO, DO HEREBY CERTIFY THAT THE SURVEY REPRESENTED BY THIS PLAT WAS MADE UNDER MY DIRECT SUPERVISION AND THAT THIS PLAT ACCURATELY REPRESENTS THIS SURVEY TO THE BEST OF MY KNOWLEDGE AND BELIEF.

COLORADO REGISTERED PROFESSIONAL LAND SURVEYOR
KENNETH E. REA
31941

KENNETH E. REA
COLORADO P.L.S. #31941

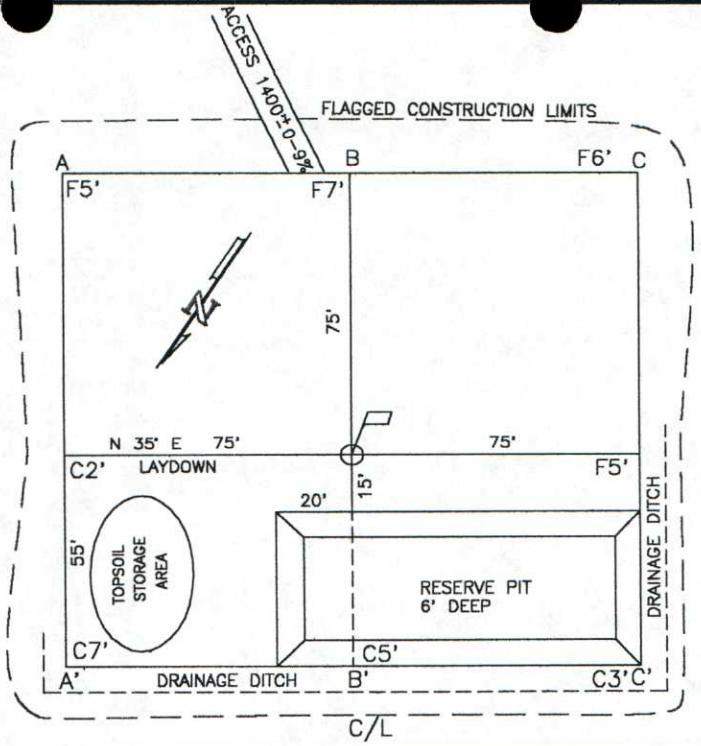
9-9-01
DATE

| | |
|---|---|
| DRAWN BY: C.R. | SURVEYED: 8/30/01 |
| CHECKED BY: K.R. | DRAWN: 9/6/01 |
| FILE NO.: PRI013WP | JOB NO. PRI013 |

PREPARED FOR:

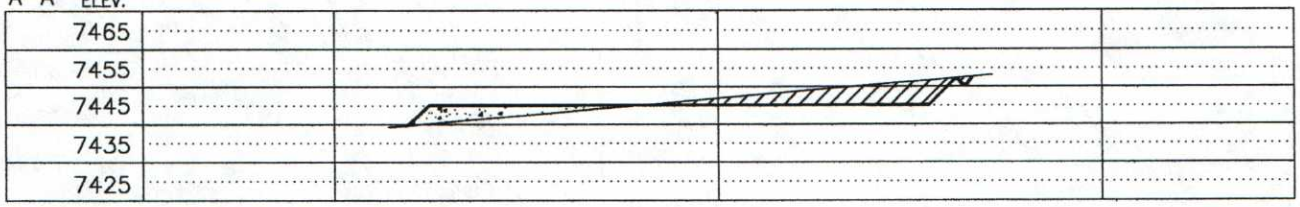
PETROX RESOURCES, INC.
MEEKER, CO.


NORTHSTAR
SURVEYING & MAPPING
75 County Rd. 231
DURANGO, CO. 81301
(970) 385-0851

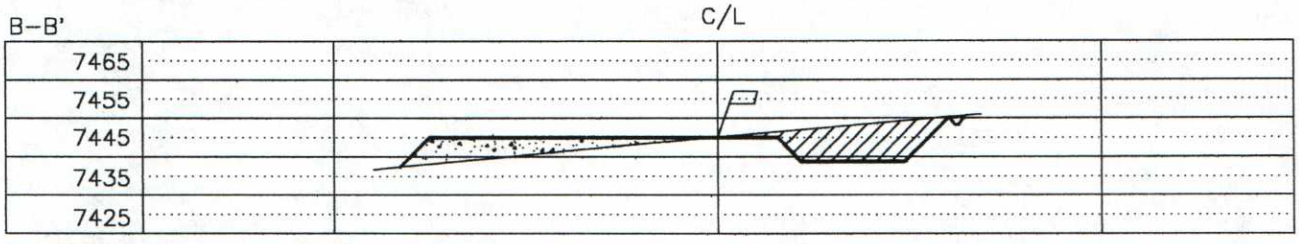



SCALE: 1" = 50'

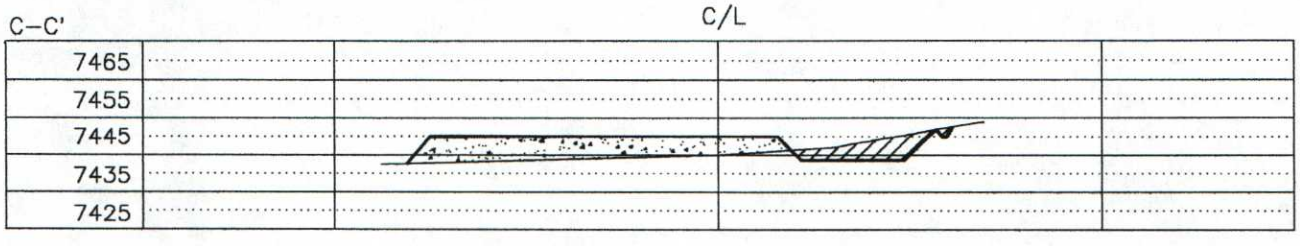
A–A'




B–B'




C–C'




COMPANY: PETROX RESOURCES, INC.

LEASE: PARGIN MOUNTAIN 9U #3

LOCATION: 1310' FSL 1755' FWL

SEC. 9U TWN. 34 N RNG. 5 W S.U.L. N.M.P.M.

COUNTY: ARCHULETA STATE: COLO.

ELEVATION: 7445'

LATITUDE: 37–12–08

LONGITUDE: 107–23–56

DRAWN BY: C.R. | SURVEYED: 7/17/01
CHECKED BY: K.R. | DRAWN: 7/26/01
FILE NO.: PRI013CF | JOB NO. PRI013

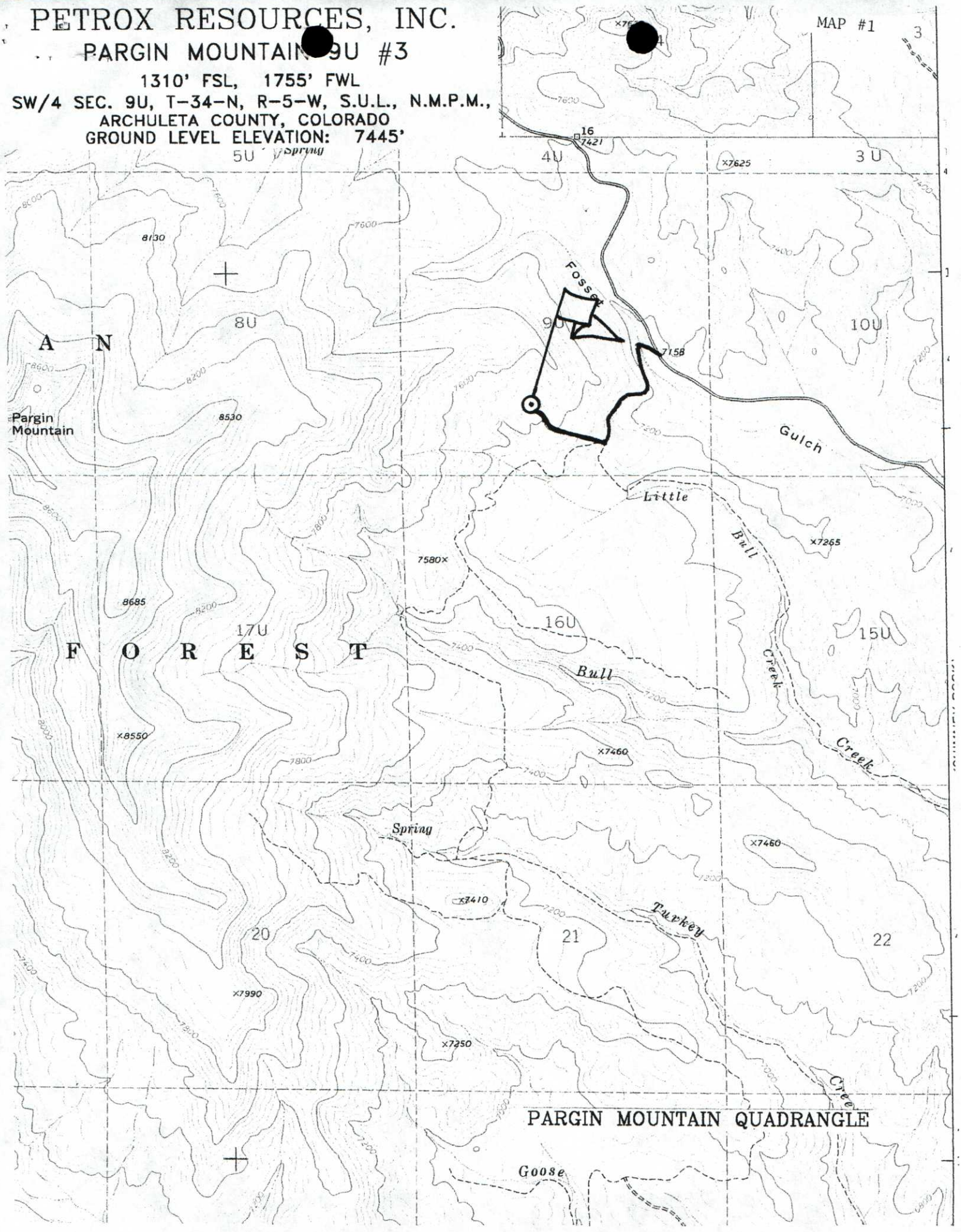
PREPARED FOR:
PETROX RESOURCES, INC
MEEKER, COLORADO

NORTHSTAR
SURVEYING & MAPPING
75 County Rd. 231
DURANGO, CO. 81303
(970) 385-0851

# PETROX RESOURCES, INC.

## PARGIN MOUNTAIN 9U #3

1310' FSL, 1755' FWL
SW/4 SEC. 9U, T-34-N, R-5-W, S.U.L., N.M.P.M.,
ARCHULETA COUNTY, COLORADO
GROUND LEVEL ELEVATION: 7445'



| | | |
|---|---|---|
| Operator | Petrox Resources, Inc | **ENGINEERING/GEOLOGY COA'S** |
| Well Name & Number: | Pargin Mountain 9U-#3 | |
| Location: | 1310' FSL 1753 FWL 9-34N-5W | |
| BHL | 1310' FSL 1753 FWL 9-34N-5W | |
| Field: | Ingnacio Blanco | |
| Lease Number: | COC-17422 | |

**Drilling Plan Conditions of Approval:** Engineer/date: 4/2/2013

In addition to the standard COA's include the following:

1. **Notify this office at least 24 hours prior to:**
   a. **Spudding well (including dry hole digger or rat hole rigs)**
   b. **Running and cementing all casings strings**
   c. **BOP Tests**

2. **All BOP tests will be done per Onshore Order # 2.**

3. **If a BLM inspector is not present during the initial BOP test, please provide chart record.**

4. **Surface/Intermediate casing volumes to be determined from caliper logs and adjusted to insure cement to surface**
   **If cement does not circulate to surface on surface/intermediate string, verify top of cement with a cement bond log.**
   **Cement must be circulated to the surface as per COGCC Order 112-85.**

5. **Submit copies of all logs to this office both paper and in Log ASCEE Standard (LAS) format.**

6. **If any operations are to start over the weekend, notify this office by noon the Fridary before. If any problems arise after hours or on weekends, call BLM personnel using the home phone numbers listed on the "INFORMATION NOTICE" of the APD. Do not leave a message on an answering machine.**

7. **Collect and submit stabilized bottom hole pressure**

8. **On directional wells, submit a copy of as drilled directional survey to BLM.**

9. **IF FLEX HOSES ARE TO BE USED DURING THE DRILLING OPERATIONS THEN A VARIANCE REQUEST VIA A SUNDRY NOTICE NEEDS TO BE SUBMITTED ALONG WITH MANUFACTURES SPECIFICATIONS.**

| | |
|---|---|
| Operator: | **Petrox Resources, Inc** |
| Well Name & Number: | **Pargin Mountain 9U-#3** |
| Location: | **1310' FSL 1753 FWL 9-34N-5W** |
| BHL | **1310' FSL 1753 FWL 9-34N-5W** |
| Field: | **Ingnacio Blanco** |
| Lease Number: | **COC-17422** |

**10. NO CHANGES ARE TO BE MADE TO THIS APPROVAL WITHOUT CONTACTING THE BLM BEFORE HAND.**

**11. Dry cuttings can only be buied on location if COGCC pit closesure sampling protocols are utilized and analyte (containment) concentrations do not exceed COGCC Table 910-1 thresholds.**

Operator: **Petrox Resources, Inc**
Well Name & Number: **Pargin Mountain 9U-#3**
Location: **1310' FSL 1753 FWL 9-34N-5W**
BHL **1310' FSL 1753 FWL 9-34N-5W**
Field: **Ingnacio Blanco**
Lease Number: **COC-17422** Spacing = 320 acre
Date Eng. done: **04/02/13**

**Engineering and Geological COA's**

**Casing Parameters**

| Type of Casing | Hole Size (inches) | Csg. Size (in.) | Csg Wght (lb/ft) | Size Csg(in.)-Grade-Wght-Thrd | | Interval (ft-ft) | Length (feet) | Set Depth TVD (feet) | Collapse | Burst (psi) | Tension (psi) | Cement Vol. (sacks) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| Surface | 9.625 | 7.000 | 20.0 | 7.0-K55-20.0-STC | | 0-400 | 400 | 400 | 2270 | 3740 | 254000 | 270 |
| Intermediate | 7.000 | 4.500 | 10.5 | 4.5-K55-10.5-STC | | 0-2868 | 2868 | 2594 | 4010 | 4790 | 146000 | 500 |
| Prod Liner | | | | | | | | | | | | |
| | | | | | | | | | | | | |

**BOP Calculations**

| | A | B | C | | | |
|---|---|---|---|---|---|---|
| TD = | 2594 TVD | 2594 | 2594 | Max MW = | 8.9 lbs/gal | Surface casing shoe |
| BHP = | 1300 psi | 1300 psi | 1300 psi | HP = | 10 psi | Surface casing shoe |
| Gradient = | 0.50 | 0.50 | 0.50 | Max MW = | 9.2 lbs/gal | Production casing shoe |
| Max. Sur. Pressure = | 1015 psi | 729 psi | 444 psi | HP = | 1241 psi | Production casing shoe |
| BOP Required= | 2M | 2M | 2M | | | |

**Safety Factors**

| | | | | | | |
|---|---|---|---|---|---|---|
| Surface | A Pb(a)= 3.69 | Min = | 1.000 | ACCEPTABLE | Pb(a) = gradient of 0.11 psi/ft | air |
| | B Pb(b)= 5.13 | Min = | 1.000 | ACCEPTABLE | Pb(b) = gradient of 0.22 psi/ft | |
| | C Pb(c)= 8.42 | Min = | 1.000 | ACCEPTABLE | Pb(c) = gradient of 0.33 psi/ft | |
| Casing = | Pc = 12.26 | Min = | 1.125 | ACCEPTABLE | | |
| | Sj = 31.75 | Min = | 1.600 | ACCEPTABLE | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Production | A Pb(a) = 4.72 | Min = | 1.000 | ACCEPTABLE | Pb(a) = gradient of 0.11 psi/ft | air |
| | B Pb(b) = 6.57 | Min = | 1.000 | ACCEPTABLE | Pb(b) = gradient of 0.22 psi/ft | |
| | C Pb(c)= 10.79 | Min = | 1.000 | ACCEPTABLE | Pb(c) = gradient of 0.33 psi/ft | |
| Casing = | Pc = 3.08 | Min = | 1.125 | ACCEPTABLE | | |
| | Sj = 4.85 | Min = | 1.600 | ACCEPTABLE | | |

**Cement Volume Calculations**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Surface | 9.625 | by | 7.000 | = | 0.2380 | cu ft/ft | |
| Casing | | Yield per sack | | = | 1.17 | cu ft/sk | |
| (Cement to Surfa | 0 | Number of sacks | | = | 102 | sacks | OK |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Production | 7.000 | by | 4.500 | = | 0.1568 | cu ft/ft | |
| Casing | | Yield per sack | | = | 1.72 | cu ft/sk | |
| (Min cement top = | 0 | Number of sacks | | = | 236 | sacks | OK |

# INFORMATIONAL NOTICE - APDs

## Tres Rios Field Office

This notice is an abstract of some major regulations and Onshore Orders and includes notification requirements and information.

1. Drilling Operations (Onshore Order No. 2)

   a. If DSTs are run, all applicable safety precautions outlined in Onshore Order No. 2 shall be observed.

   b. All indications of usable water (10,000 ppm or less TDS) shall be reported to the San Juan Field Office prior to running the next string of casing or before plugging orders are requested, whichever occurs first.

2. Well Abandonment (43 CFR 3162.3-4, Onshore Order No. 1-Sec.V)

   Approval for abandonment shall be obtained prior to beginning plugging operations. Initial approval for plugging operations may be verbal, but shall be followed up in writing within 30 days. Subsequent and final abandonment notifications are required and shall be submitted on Sundry Notice (Form 3160-5), in triplicate.

3. Reports and Notifications (43 CFR 3162.3-2, 3162.4-1, 3162.4-3, 00-6)

   a. Within 30 days of completion of the well as a dry hole or producer, a copy of all logs, core descriptions, core analyses, well-test data, geologic summaries, sample descriptions or data obtained and compiled during the drilling, workover, and/or completion operations shall be filed with a Completion Report (Form 3160-4), in triplicate. Submit casing/cementing reports and other subsequent reports via Sundry Notice, Form 3160-5.

   b. In accordance with 43 CFR 3162.4-3, this well shall be reported on MMS Form 3160, A Monthly Report of Operations, starting with the month in which drilling operations commence, and continuing each month until the well is physically plugged and abandoned.

   c. Notify this office within 5 business days of production start-up if either of the following two conditions occur:

      (1) The well is placed on production, or

      (2) The well resumes production after being off production for more than 90 days.

   APlaced on production@ means shipment or sales of hydrocarbons from temporary tanks, production into permanent facilities or measurement through permanent facilities. Notification may be written or verbal with written follow-up within 15 days.

   d. As per Onshore Order No. 6, III.A.2.b., if hydrogen sulfide is present the operator shall initially test the H2S concentration of the gas stream for each well or production facility. Submit the results of this test within 30 days of filing Form 3160-4, Well Completion or Recompletion Report and Log.

4. Environmental obligations and disposition of production (00-7, NTL-3A, NTL-4A, 43 CFR 3162.5-1, 3162.7 and 40 CFR 302-4)

a. With BLM approval, water produced from newly completed wells may be temporarily disposed into unlined pits up to 90 days. During this initial period, application for the permanent disposal method shall be made to this office in accordance with 00-7.

If underground injection is proposed, an EPA or State UIC permit shall also be required and submitted to this office.

b. Spills, accidents, fires, injuries, blowout and other undesirable events shall be reported to this office within the time frames in NTL-3A.

c. Gas may be vented or flared during emergencies, well evaluation, or initial production tests for a time period of up to 30 days or the production of 50 MMCF of gas, whichever occurs first. After this period, approval from this office shall be obtained to flare or vent gas in accordance with NTL-4A.

d. Off-lease measurement and commingling of production must be approved by the authorized officer.

5. Well Identification (43 CFR 3162.6)

Each drilling, producing or abandoned well shall be identified with the operator's name, the lease serial number, the well number, and the surveyed description of the well (either footages or the quarter-quarter section, the section, township and range). The Indian lessors name may also be required. All markings shall be legible and in a conspicuous place.

6. Bureau of Land Management, San Juan Field Office Address and Contacts:

ADDRESS: Public Lands Center PHONE: (970) 247-4874
15 Burnett Court
Durango, Colorado 81301

BUSINESS HOURS: 7:45 A.M. to 4:30 P.M. (Mountain Time), Monday-Friday

AFTER HOURS:

| | | | |
|---|---|---|---|
| Rodney Brashear | Lead Petroleum Engineering Technician<br>Home: (970) 588-3699 | Cell: | (970) 799-1244 |
| Marie Lope | Petroleum Engineering Technician<br>Home: (505) 860-6773 | Cell: | (970) 759-0182 |
| Gabe Trujillo | Petroleum Engineering Technician<br>Home: | Cell: | (970) 394-4868 |
| Alan White | Petroleum Engineering Technician<br>Home: | Cell: | (970) 317-0329 |

# ATTACHMENT 1

## USFS Surface Use Plan Of Operations (SUPO)
## and
## Conditions of Approval(COAS)

for

Petrox Resource Inc.'s

9U#3 Gas Well

National Forest System Land Surface and Federal Subsurface Mineral Estate

T34N, R5W, Sec.9U, SW1/4, Archuleta County, CO

In addition to the terms of the lease, the following surface occupancy requirements shall apply. Modifications and exceptions to these requirements must be approved in writing by an authorized representative of the U.S.D.A. Forest Service (FS), as appropriate. The following conditions shall be implemented in accordance with the requirements of the Northern San Juan Basin CBM (NSJB) FEIS and ROD including any site-specific analyses, monitoring, and mitigation measures applicable to the project.

I. PROJECT REQUIREMENTS

A. The FS point of contact for this project is Walt Brown, Columbine District Geologist, 970 385-1372. An Operator representative shall be designated for on the ground activities.

B. In an emergency, appropriate action shall be taken and the FS representative shall be promptly notified. Emergencies should also be reported to the San Juan Public Lands Dispatch Center at 970 385-1324. Any resource damage resulting from, or in response to, the emergency shall be rehabilitated as soon as practicable in a manner approved by the FS representative.

C. The FS representative and Operator representative shall schedule and attend a pre-work meeting before any on the ground project activities begin. The meeting should also be attended by any subcontractors that will be working on the project. Coordination meetings to discuss project activities shall be scheduled as needed by either the FS Representative or the Operator at a mutually agreed upon time and location. Generally, such meetings should occur on at least a weekly basis until the project is finished.

D. Surface Reclamation Bond Requirements – Surface disturbing activities associated with this project cannot begin until an appropriate financial instrument in the amount of $48,923.00 is accepted by the USFS. This financial instrument or suitable replacement shall be in effect for the life of the project and would cover the estimated cost to the USFS to reclaim the completed project in the unlikely event that Petrox is not able to fulfill final reclamation requirements.

E. The Operator will notify the FS representative at least 48 hours before project activities begin on the ground.

F. A traffic control safety plan shall be submitted by the Operator and accepted by the FS representative before project activities begin. The plan shall address all aspects of traffic control, including closure procedures for the Bull Canyon and/or Fosset Gulch Roads as necessary. All necessary signs must be installed before construction activities begin. Signs must not be nailed to trees.

G. The final accepted site plan design prepared by Russell Planning and Engineering dated 2/23/11 and attached to this document must be fully staked and flagged for construction and approved by the FS representative immediately prior to commencement of project activities.

H. Locations for any above ground facilities associated with this project, including valve sets, pipe cans, pig launchers/receivers, corrosion prevention/detection, etc., must be staked on the ground and accepted by the FS representative before construction for such facilities can begin. The staking must include the actual area of proposed disturbance to construct the facility. Any above ground facilities should be painted sudan brown, unless otherwise authorized by the FS.

I. A storm water management plan shall be developed to address all construction, reconstruction, maintenance, and operational activities and submitted to FS representative. This plan shall conform to all EPA and Best Management Practices (BMP) requirements, as well as the requirements in NSJB FEIS Section 3.6, Surface Water Resources.

J. All storm water management controls needed during the construction phase of the project, including temporary culverts and wattles, must be installed before project activities can begin.

K. Ground disturbing project activities shall not begin until the FS has completed any necessary wildlife surveys in June, 2013, to ensure that project area conditions have not changed since the last surveys in 2008.

L. Topsoil must be segregated and stored separately from subsurface materials to avoid mixing during construction, storage and interim reclamation. Subsurface materials should never be placed on top of topsoil material at any point during project activities.

M. Construction activities are only allowed during the period beginning on May 1 and ending on November 30 of any given year unless otherwise authorized by the FS in writing.

N. Outcrop Zone Plan – This project is subject to the requirements in the NSJB FEIS and ROD for gas field development within the outcrop zone in Archuleta County. Petrox has met these requirements in the "2012 Outcrop Zone Report", dated November, 2012 and revised December, 2012, and the "Technical Working Group Meeting Summaries 1 - 3" memorandums dated 9/18/12 (revised 11/29/12), 12/17/12, and 3/7/12, . In addition, the FS adds the following requirements: 1) No less than three continuous months of pressure data must be collected during the process described in the memorandums. 2) This pressure data must be supplied to the Technical Working Group within two weeks of the conclusion of the three month period. 3) The FS may require additional Conditions of Approval for this project as outcrop zone data is collected and analyzed, for the life of this well.

O. NSJB FEIS Mitigation and Monitoring Requirements – See attached monitoring and mitigation requirements applicable to federal wells constructed within the Outcrop Zone.

P. After the clearing limits for the pad and access road have been approved by the FS, the timber to be removed must be cruised using methods and personnel approved by the FS. Petrox must submit payment to the FS for the timber to be removed based on the results of the cruising process. All stumps remaining after timber is felled must be removed from the project area and disposed of off NFS land.

Q. Routine activities that are conducted to maintain safe operation of the well site such as daily site visits using a typical oil field pickup truck, minor repairs of surface facilities using equipment that can be transported by a typical oil field pickup truck, or removal of produced water by truck can be conducted year-round. All non-routine activities must be conducted during the period beginning on May 1 and ending on November 30 of any given year unless otherwise authorized by the FS in writing.

R. If existing cattle guards or fences are damaged during operations, they must be repaired to at least their pre-disturbance condition.

S. During project activities, if paleontologic or cultural resource artifacts or materials are exposed, or raptor nests are discovered, operations in the vicinity shall be halted and the FS representative shall be notified.

T. Air Quality: 1) Dust abatement measures may be required during some phases of well development, heavy maintenance, or operations, depending on seasonal conditions, resource impact and traffic considerations. The FS representative will determine if such measures are required during operations. 2) Emission Control (small stationary gas field engines built within the project area): All internal combustion gas field engines of less than or equal to 300 design-rated horsepower must not emit more than 2 grams of nitrogen oxides (NOx) per horsepower-hour. This requirement does not apply to gas field engines of less than or equal to 40 design-rated horsepower. 3) Emission Control (large stationary gas field engines built within the project area): All internal combustion gas field engines greater than 300 design-rated horsepower must not emit more than 1 gram of NOx per horsepower-hour.

U. Pitless Drilling Requirements –Due to the presence of steep slopes and erosive/unstable soils above ephemeral drainages in the pad area, steep fill slopes on the downhill sides of the pad, and

the potential for wildlife mortality and soil contamination from drilling fluids and produced water, pits for fluid management or storage are not allowed. If tanks are not used for cuttings storage, then storage areas for cuttings can be temporarily built on top of the pad. No excavations can be made into the surface of the pad when building a cuttings storage area. Cuttings storage areas will be bermed on all sides to prevent any stormwater, soil, or other material from entering or leaving the storage area. During drilling operations the temporary bermed "cuttings storage area" shall be lined with a 40-60 mil impermeable liner or equivalent. The liner must cover the berms. The size of the storage area and height of the berms shall be sufficient to store the estimated volume of cuttings from the well bore and provide one foot of freeboard above the maximum depth of cuttings in the storage area. Only dry cuttings may be stored in the cuttings storage area. Any cement wash or other fluids shall not be mixed with dry cuttings, but must be placed in a self contained tank and removed for disposal at an approved off-site location. If, for any reason, fluids do accumulate, the fluids must be removed from the storage area within 24 hours and disposed at an approved location. Upon completion of drilling operations, the cuttings shall be disposed of as soon as possible. Cuttings shall be sampled for compliance with COGCC pit closure standards (Table 910-1). The sample results shall be submitted to the FS and BLM. If all results meet closure standards, the dry cuttings may be buried in an unlined trench, located in cut material in the area shown on the accepted design for the 9U#3 gas well pad. Cuttings must be covered with a minimum of three (3) feet of clean compacted backfill material.

V. Sound mitigation plan – The FS will work with the operator to finalize the facilities, including sound walls or other noise mitigation measures, if they prove to be necessary after the testing period for the gas well is completed.

W. Monitoring – All facets of the surface operation shall be monitored by the FS to assure compliance. This will begin upon receiving notice that the operator will commence work and will continue throughout the active phases of well development on a regular visitation process and will continue on a periodic visitation until abandoned. Refer to the NSJB FEIS and ROD for monitoring and mitigation measures applicable to this project.

X. The Operator shall maintain an adequate quality control system and perform inspections as necessary to ensure that work on this project conforms to all applicable requirements, including implementation of all required mitigation measures. Such quality control methods and inspections must be documented and provided to the FS if requested.

II. WELL SIGN

A sign shall be placed on the well pad following construction activities with the following minimum information:

A. Operator Name
B. Well Name and Number
C. Legal Location (¼-¼, Section, Township and Range)
D. County and State
E. Lease Number.

III. FIRE PREVENTION

To the extent practical, the operator shall take measures to prevent uncontrolled fires on the area of operation and to suppress uncontrolled fires resulting from operations. All fires must be immediately reported to the FS representative and to the San Juan Public Lands Dispatch Center at 970 385 1324. Project activities must comply with the attached Fire Plan for Industrial Operations.

IV. CLEARING

The cleared area shall be kept to the minimum necessary for safe operation. All clearing limits shall be clearly marked and approved by the FS representative prior to any cutting. No project activities or disturbances are allowed outside the clearing limits unless authorized in writing by the FS. The clearing limit markings (e.g., paint, flagging, lathe, etc.) must be maintained until after interim reclamation of project facilities has been completed. In general, these limits and areas of avoidance will be marked using orange paint and/or flagging, and means "do not disturb".

All trees to be removed shall be designated by the FS representative, measured, and sold to the operator prior to being cut. The utilization standards for the merchantable timber shall be identified by the FS representative. After payment has been made for the merchantable timber, the operator shall cut and remove the timber. The disposal of unmerchantable timber shall be treated the same as the clearing slash.
Residual trees (merchantable and unmerchantable) damaged as a result of operations shall be treated the same as trees within the clearing limits. A damaged tree is defined as over 4" diameter at breast height with one or more of the following: 1) >50% of the bark has been skinned or removed; 2) top has been knocked out; 3) >50% of the crown has been skinned or damaged, or 4) the tree is now leaning at least 15 degrees or more.
All slash and unmerchantable timber created as a result of this project shall be disposed of in a manner that minimizes visual impacts and reduces the potential for insect infestations and/or fire danger. Acceptable methods include removal of slash and timber from the site, lopping and scattering slash and unmerchantable timber to lie within 12 inches of the ground, and chipping slash and unmerchantable timber. Other methods may be approved by the FS representative.
Stumps shall be removed, unless otherwise authorized by the FS. Stumps remaining at the FS representative's request shall be flush cut to within two inches of the ground or lower.

V. WELL PAD CONSTRUCTION

A. The pad shall be built to the specifications shown in the accepted designs produced by Russell Engineering dated 2/23/11. Topsoil shall be stripped and stored, for the use in the reclamation of the site. The FS representative shall approve the topsoil storage area shown on the accepted designs for the project. All cut bank areas shall have the stored topsoil spread immediately after the well pad has been constructed. The remaining topsoil shall be stored to accommodate its placement after drilling operations are completed. Long-term topsoil storage, if needed, shall occur in a manner that ensures soil viability, including storage depths and revegetation sufficient to maintain soil productivity until final reclamation begins.
Provisions shall be made to divert surface water around and away from the well pad. The well pad should be constructed so that water does not collect or pond within the pad area.
Construct berms or v-ditches around the pad with controlled, armored drainage to prevent erosion where necessary. Filter or settle pad runoff water prior to entering any drainage using excelsior logs, settling ponds or other methods.

VI. ROAD CONSTRUCTION, RECONSTRUCTION, MAINTENANCE, AND SNOW REMOVAL

A. The access road shall be built to the specifications shown in the accepted designs produced by Russell Engineering dated 2/23/11. The primary objective for road construction or reconstruction is to provide a safe, well-drained, maintainable aggregate surfaced road for constant service and reasonable all-weather structural support for trucks accessing well pads on public lands. The "Gold Book" titled ***OIL AND GAS Surface Operating Standards for Oil and Gas Exploration and Development*** describes the minimum guidelines to be used to develop the road design necessary to meet the primary objective. All roads constructed/reconstructed on public lands shall be designed and constructed under the direction of a registered professional engineer. A geo-technical engineer must be part of the design team to address those portions of the roads across landslides or slopes that exhibit signs of instability or meet the criteria for high landslide hazard. High landslide hazard areas are defined as areas with slopes steeper than 40 percent that are underlain by the San Jose Formation and areas with slopes steeper than 30 percent that are underlain by the Animas or Fruitland Formations or the Kirkland Shale.
The well access roads will be considered a low volume, single lane road with turnouts built for the specific purpose of accessing, drilling, maintaining and operating a natural gas well. These roads must be located, surveyed, designed, slope staked, and constructed to the standards listed below:
Design Standards and Elements

The road design standards and elements shall meet the following requirements, unless otherwise authorized by the FS. In addition, road design standards and elements shall meet the requirements of the AASHTO Publication "*A Policy on Geometric Design of Highways and Streets*.

1) Design speed of 15 mph.
2) On slopes of 0 to 20 percent, where minor horizontal and vertical alignment shifts may not affect the road design, a plan and profile is not required. Instead, standard templates, culvert locations and turnout locations and special widening locations shall be provided along with the design to the FS representative. A plan and profile showing road plan and profile and creek crossings details shall be provided to the FS representative for slopes steeper than 20 percent. The plan and profile shall identify grade, alignment, stationing, clearing limits, turnout locations, culvert locations, and special design sections. Cross sections with road templates sections shall be provided to the FS representative.
3) Travel width shall be adequate to accommodate the design vehicles and equipment. This width is generally 12-16 feet plus widening for off tracking (curve widening) and turnouts. Turnout widths shall be 8 or 10 feet or as needed for design vehicle and shall be 50 to 100 feet in length with an additional 25 to 50 foot tapers at the ends. Turnout spacing shall be as needed for safety.
4) Generally, minimum horizontal curve radius shall be 100 feet. Curve widening shall be designed in accordance with AASHTO procedures.
5) The maximum road grade shall be less than 8 percent, except for short pitches up to 12 percent for 300 feet or less, unless previously approved by the FS representative.
6) Turnout locations are generally naturally occurring, such as additional widths on ridges or other available areas on flat terrain and are normally located at 1,000-foot intervals or intervisible, whichever is less.
7) Cut slopes shall be no steeper than 1½:1 in soil and designed by a geotechnical engineer in rock. Fill slopes shall be flatter than 1½:1.
8) Drainage shall be provided for the entire road length. Culverts shall be used at all drainage locations and for ditch relief. Culverts shall be designed and sized for a 25-year frequency or greater storm, with an allowable head of one foot above the top of the pipe inlet. Culvert spacing shall be designed taking slope and soil type into consideration using a method approved in writing by the FS representative. Culverts shall disperse runoff into filter strips. At a minimum, roadside ditches of 1 foot deep and 3 feet wide from the subgrade will be required on all roads.
9) Clearing and grubbing is required on all sections of the road. All clearing and grubbing shall be confined to a clearing width identified upon completion of the construction stakes (slope stakes). Clearing limits shall be at a minimum of 3 feet beyond the top of the cut and 6 feet from the shoulder or at the toe of the fill, whichever is the greater. The clearing limits shall be marked when the road is slope staked. Branches of all trees extending over the roadbed must be trimmed to give a clear height of 14 feet above the roadbed. All vegetative debris shall be disposed of by scattering outside the roadway, or hauled off site. The slash disposal method must be approved by the FS representative.
10) All suitable excavated material is to be used in the construction of embankments, subgrades and backfill for structures. All soil material and fragmented rock removed in excavation shall be used as directed in the approved plan. Excess cut material shall not be wasted unless identified in the approved plan. Roadbed material shall not be placed when the materials or the surface are frozen or too wet for satisfactory compaction. Borrow material shall not be used until materials from roadway excavation has been placed in the embankments, unless otherwise permitted. Approval by the FS representative must be given prior to the start of excavation of borrow areas used by the operator. All fills shall be placed using layer placement method and using a roller for compaction. Fill material shall be placed in horizontal layers not exceeding 12 inches prior to compacting, except when the material contains rock more than 9" in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Compaction equipment shall be operated over the full

width of each layer until visible deformation of the layer ceases or, until the compacting equipment has completed three (3) complete passes.

11) A gravel surface shall be constructed for all weather access. An acceptable soil strength test, such as the C.B.R. Test, shall be performed to determine the gravel depths required for the projected vehicle loads and seasons of use. A pavement design method approved in writing by the FS representative shall be used to determine the required gravel depths. The subgrade width must be wide enough to provide for 3:1 side slopes on the surfacing and a 12-16 foot travel width. All gravel material must come from an undesignated source approved by the FS representative. Both the sub-grade and gravel surfacing shall be placed using layer placement method and using a roller for compaction. The gravel material shall be placed in horizontal layers not exceeding 12 inches prior to compacting, except when the material contains rock more than 9" in diameter, in which case layers may be of sufficient thickness to accommodate the material involved. Compaction equipment shall be operated over the full width of each layer until visible deformation of the layer ceases or, until the compacting equipment has completed three (3) complete passes.
12) Traffic and regulatory warning signs shall be placed in accordance to MUTCD standards.
13) All disturbed areas, including cut and fill slopes, shall be revegetated. The revegetation shall utilize the same species as listed in the Appendix.
14) A flag line shall be established over the entire route location, as approved by the FS representative at the time of the onsite visit. Flags shall be placed approximately every 100 feet, or be intervisable, whichever is less. On curves, flags shall be located at least every 50 feet, or less to define the final location of the road.
15) After the flag line is approved, the road survey and design shall be completed. The FS representative shall review the design, on the ground prior to acceptance.
16) After the design is accepted, the road shall be slope staked and the clearing limits shall be marked.
17) The operator or operator's representative must provide for an adequate inspection and quality control system to ensure compliance with all specifications, designs, and drawings. The operator shall take all necessary precautions for the protection of the work and safety of the public and employees during construction of the road.
18) The FS representative will conduct periodic inspections of the construction/reconstruction work and the operator's quality control system.
19) Construction shall be limited to when soil conditions will meet compaction requirements and will not result in ruts deeper than 4 inches. Unless otherwise agreed all compaction shall be accomplished with layer placement. Generally, conditions are considered to be too wet for construction or travel if soils within 4 inches of the surface can be rolled into threads that are 3 mm in diameter without breaking or crumbling.
20) Erosion control measures and BMPs shall be used to contain sediment inside the disturbance limits during construction and prior to the road being surfaced with gravel and vegetation established on cut and fill slopes. Erosion control structures will be maintained until successful revegetation is established on cut and fill slopes.
21) Minimize erosion at sites located in steep terrain during the construction phase by measures such as contouring, waterbars, temporary ditches, and detention basins, and minimize the period of disturbance.
22) Use filter strips and sediment traps if needed to keep all sand sized sediment on the land and disconnect disturbed soil from streams, lakes, and wetlands. Disperse runoff into filter strips.
23) Key sediment traps into the ground. Clean them out when 50% full. Remove sediment to a stable, gentle, upland site and revegetate.
24) Implement structural erosion and sediment controls such as interim or permanent waterbars, detention ponds, straw bales, silt fenced, earth dikes, and inlet and outlet protection. Provide non-structural erosion control practices such as interim and permanent and temporary seeding, revegetation, and geotextiles.

25) Implement BMPs to slow or reduce the flow of surface-water runoff across disturbed areas, including diversion of surface runoff around facilities and installing erosion control devices to prevent sedimentation of nearby water bodies.
26) Space cross drains according to road grade and soil type as indicated on table 3-35. Do not divert water from one stream to another.
27) Where applicable, the above measures are also required for well pad construction.

B. Road Maintenance

The operator shall maintain all public roads used in conjunction with operations as herein outlined:

1) Remove slides, boulders, fallen timber, overhanging brush, and other material obstructing safe road sight distance and travel.
2) Replace fills and portions of fills lost and/or which have settled below the original grade and cross-section. Gravel shall be bladed and shaped. Gravel lost during use and maintenance shall be replaced.
3) Keep drainage channels, ditches, culverts and bridges clear of debris and functioning as intended.
4) Repair fences, gates, cattle guards, culverts, bridges and other structures to standard specifications.
5) Blade and shape surface and shoulders to maintain a suitable riding surface. Earth and debris from side ditches, slides, or other sources must not be left on the road or mixed into the surface portions of the road. Blading shall not undercut banks. Gravel or other selected surface material shall not be bladed off the surface of the road. Material from slides or other sources requiring removal from the road shall not be deposited in streams or stream channels or at locations where it will wash into streams and cause damage through silting or obstruction of the streams or reservoirs.
6) All maintenance shall be performed as needed, in a timely manner or when directed by the FS representative. In addition, at the end of each operating season, maintenance work shall be performed to minimize damage from adverse weather. Such work shall include final blading to remove ruts and other irregularities that would prevent normal surface runoff, and final clearing of ditches and culverts to ensure satisfactory functioning of the road drainage system.

C. Snow Removal

The operator may remove snow from the area as necessary to maintain safe and reasonable operations of project facilities. Such removal must be done in a manner to preserve and protect roads during operations to the extent necessary to ensure safe and efficient transportation and to prevent excessive erosion damage to roads, streams and other resources.

Snow removal work shall include the following:

1) Removal of snow from all of the traveled way, including turnouts for safe and efficient use.
2) Culvert inlets shall be maintained in a functioning condition without snow plowed into them so the drainage system will function properly.
3) All material, including snow and ice, removed from the road surface shall be deposited away from drainages or stream channels at FS representative approved locations.
4) Banks shall not be undercut, nor shall gravel or other surfacing material be bladed off the road. Gravel lost or bladed off the road during snow plowing operations shall be replaced.
5) Ditches and culverts shall be kept functioning during operations and upon completion of operations.
6) "Snow Berm" is herein defined as a dike of snow, resulting from the operator's snow removal operations, which extends above the surface of the traveled way. The operator shall space, construct, and maintain drainage holes in the snow berm to obtain surface drainage without discharge on erodible fills. The operator shall remove snow berms or construct drainage holes at the end of winter operations or before spring breakup, which ever is sooner.
7) Dozers may be used to plow snow with written approval of the FS representative.

8) Equipment used to plow snow shall be equipped with shoes or runners to keep the blade a minimum two inches above the surface of the road, unless otherwise agreed to in writing by the FS representative.
9) The FS representative shall notify the operator in writing if surfacing material has been bladed off the surface of the road. The notice must state the number of road miles (rounded up to the next 0.1 mile) and the cubic yard equivalent of surfacing bladed off. The FS representative calculation of the cubic yardage will be available for review. Upon such notice, the operator shall replace the surfacing material, in kind, no later than 90 days after notification, unless otherwise agreed to in writing.

VI. PIPELINE CONSTRUCTION

All gas and produced water pipelines used to connect this well with a collection system are required to be placed in the access road disturbance corridor, generally in the road prism within five feet either side of road centerline , unless otherwise authorized. It is recommended that the lines be placed in the same trench at the time of initial road construction prior to gravel surfacing. The pipeline system (mechanical components as well as construction and reclamation plans) must meet all applicable regulations and be designed and constructed under the direction of a professional engineer registered in the State of Colorado, unless otherwise authorized by the FS.

The Operator, Operator's employees or Operator's subcontractors shall perform all work with explosives in such a manner as not to endanger life or property in accordance with all state and Federal regulations.

1) Construction shall be limited to when soil conditions will meet compaction requirements and will not result in ruts deeper than 4 inches. Unless otherwise agreed all compaction shall be accomplished with layer placement. Generally, conditions are considered to be too wet for construction or travel if soils within 4 inches of the surface can be rolled into threads that are 3 mm in diameter without breaking or crumbling.
2) Erosion control measures and BMPs shall be used to contain sediment inside the disturbance limits during construction and prior to the road being surfaced with gravel and vegetation established on cut and fill slopes. Erosion control structures will be maintained until vegetation is established on cut and fill slopes.
3) Minimize erosion at sites located in steep terrain during the construction phase by measures such as contouring, waterbars, temporary ditches, and detention basins, and minimize the period of disturbance.
4) Use filter strips and sediment traps if needed to keep all sand sized sediment on the land and disconnect disturbed soil from streams, lakes, and wetlands. Disperse runoff into filter strips.
5) Key sediment traps into the ground. Clean them out when 50% full. Remove sediment to a stable, gentle, upland site and revegetate.
6) Implement structural erosion and sediment controls such as interim or permanent waterbars, detention ponds, straw bales, silt fenced, earth dikes, and inlet and outlet protection. Provide non-structural erosion control practices such as interim and permanent and temporary seeding, revegetation, and geotextiles.
7) Implement BMPs to slow or reduce the flow of surface-water runoff across disturbed areas, including diversion of surface runoff around facilities and installing erosion control devices to prevent sedimentation of nearby water bodies.
8) Pipeline construction that crosses ephemeral, intermittent, or perennial streams would require additional mitigation measures. Digging of new open trenches shall not occur more than one week prior to laying pipelines within 100 feet of stream crossings. Within one week post pipeline placement within 100 feet or stream crossings, open trenches must be backfilled, stabilized, and must provide adequate cross drainage.
9) Any pipeline construction in areas of known or potential landslide areas shall require a design accepted by the FS representative prior to construction that minimizes to acceptable levels the risk that water from broken or leaking pipelines could activate landslides. Such a design could include leak detection systems or secondary containment systems (e.g., pipe-in-pipe).

10) Stockpiling topsoil, spreading topsoil as soon as pipeline construction is completed and prompt revegetation of disturbed areas are required elements of pipeline construction if the pipeline is outside of a road corridor.

11) Pipelines that cross stream channels on the surface should be located above the 100-year flood elevation. Where pipelines will be buried under stream channels, an analysis of channel degradation and scour should be completed to ensure the lines are not exposed and broken during extreme runoff events. Without such an analysis, pipeline crossings should be excavated to bedrock and placed beneath all alluvial material. The level of the pipe should be held constant at that same elevation across the floodplain. If the line is placed at shallower depths beneath the floodplain, channel migration may expose the line where it is not designed to pass beneath the channel. (This is to prevent breakage and water contamination during high flow events.)

## VII. OPERATIONS

### A. Production

1) During all operations, the operator shall maintain structures, equipment and other facilities in a safe, neat and workman like manner.
2) A Spill Contingency Plan shall be provided to the FS representative if requested. A copy of this Plan must be kept on file at the operator's project office.
3) In the event of a spill or leak meeting FS, BLM, or COGCC reporting requirements, the FS representative must be immediately notified. Final cleanup operations for the spill or leak must be approved by the FS representative who will recommend additional action as necessary.
4) Certifications or approvals issued by State Agencies above and beyond federal requirements will be accepted.

### B. Wildlife Resources

1) Nets, screens or covers will be installed over all fluid pits, vents, tanks, and equipment openings to prevent wildlife mortality or wildlife contact with well products, fluids, or equipment openings. More information can be obtained at the U.S. Fish and Wildlife Service's wildlife contaminants website: (http://mountain-prairie.fws.gov/contaminants/contaminants1c.html).
2) Unless otherwise authorized by the FS, automated monitoring systems must be installed at well and pipeline facilities to minimize vehicle trips and reduce human/wildlife conflicts.
3) To the extent practicable, use noise reduction technologies at all facilities during construction, testing and operation phases.
4) Prohibit activities within 300 feet of any occupied raptor nests during the period May 1 to July 31.
5) Schedule routine maintenance activities to occur between 0900 and 1500 hours at facilities during the period beginning December 1 and ending April 30 of any given year.

### C. Sanitation and Garbage

1) A portable toilet shall be made available during multi-day construction and maintenance activities. Sewage shall be contained and disposed of at a designated sanitary disposal facility.
2) The well pad and adjoining areas shall be kept in a neat and safe condition during all phases of the operation.
3) The well pad, adjoining area, and access road must be cleaned of all trash, materials and equipment within five days of termination of construction or heavy maintenance operations. Cleanup operations also include removal of all flagging, wooden lath, signs and other identifying devices from public lands. The Operator is also responsible for cleanup and maintenance of their facilities, including access roads, until final reclamation has been completed and approved by the FS representative.

4) The operator shall dispose of refuse from this use, including waste materials, garbage and rubbish of all kinds by removing it from public lands.
5) If trash is stored on site prior to complying with 5. above, the trash must be stored in a bear-proof manner.

VIII. RECLAMATION

A. Bonds - The FS has determined that a surface reclamation bond is required for this project.
B. Reclamation Plans: Interim and final reclamation must meet the standards in this document and in the APD, unless otherwise authorized in writing by the FS. Reclamation must address the four components of successful reclamation described below.
C. Interim Reclamation: Interim reclamation measures should be initiated when facility construction activities are completed. Interim reclamation measures include recontouring and revegetating all areas of facilities (including access roads, pipelines and well pads) not needed for long-term operations. The FS representative may require additional measures for interim reclamation to minimize long-term disturbance on or around project facilities.
D. Final Reclamation: If the well is not productive initially or at the point in time when it becomes un-economic, the entire well site and well access roads shall be fully reclaimed, unless otherwise directed by the FS or the private surface owner.
   1) Well Pads, Well Access Roads and Ancillary Facilities
      (a) The well site, ancillary facilities, and associated well access roads shall be re-contoured to pre-construction conditions. Gravel surfacing can be buried on site as long as there is at least one foot of soil cover.
      (b) Topsoil shall be respread over the entire disturbed area.
      (c) All areas of soil disturbance or compaction associated with the project shall be scarified to at least a 4-inch depth and drainage structures installed at FS representative specified locations and revegetated as described below.
   2) Reclamation, Revegetation, and Weeds
      (1) Certified weed-free straw mulch, hydromulch, or erosion control blankets are recommended following all seeding activities, particularly on sites with slopes greater than 20 percent.
      (2) Reclamation Standards
      The four components of successful reclamation are recontouring, revegetation, soil erosion, and noxious weeds. Monitoring of these standards by the federal agency should occur one year after reclamation efforts are initiated, and evaluation for compliance with these standards will occur two years after reclamation efforts are initiated.
      (a) Recontouring Standard: The recontouring component will be considered successful when reclaimed sites are recontoured back to the original contour, and blend in as naturally as possible with the topography of adjacent lands.
      (b) Revegetation Standard: Revegetation will be considered successful when the percent canopy cover of desirable vegetation on the site is at least eighty percent of the canopy cover of the desirable vegetation on the site before the disturbance or at least eighty percent of the canopy cover of the desirable vegetation on a reference area for the site, as determined by a visual appraisal. Definitions: 1. Desirable Vegetation: Native plant species, unless the vegetation on the reference area or the site before it was disturbed included acceptable non-native plant species, in which case those non-native plant species can be included in the 80 percent canopy cover requirement with FS approval. 2. Reference Area: A relatively undisturbed piece of land (preferably adjacent to or near the site needing revegetation) that has soils, topography, and a plant community similar to the site being revegetated. Reference areas will be approved by the FS. 3. Visual Appraisal: Ocular or transect methods are acceptable. The Ocular Plant Composition or the Cover-Frequency Transect methods, as described in the Forest Service Region 2 Rangeland Analysis and Management Training Guide, are recommended. 4. #PLS = pounds of pure live seed. 5. Seeding rates listed below are for drilled seed. Broadcast rates should be doubled.

Revegetation Seed Mixes: Unless otherwise authorized, a minimum of two native grass species from the list below will be used at the recommended rates. One of the annual species listed below can also be used along with the native species.

Native Grass Species

| | |
|---|---|
| Arizona fescue (*Festuca arizonica), variety Redondo* | 4#PLS/acre |
| Western wheatgrass (*Pascopyrum smithii), varieties Barton/Rosanna* | 10#PLS/acre |
| Indian Ricegrass (*Oryzopsis hymenoides), varieties Paloma/Rimrock/Nezpar* | 6#PLS/acre |
| blue grama (*Bouteloua gracilis), varieties Alma/Hachita/Lovington* | *3*#PLS/acre |
| muttongrass (*Poa fendleriana)* | *3*# PLS/acre |
| junegrass (*Koeleria macrantha), varieties Prairie/Uncompahgre Plateau* | *4*#PLS/acre |
| bottlebrush squirreltail (*Elymus elymoides), varieties Colorado Ecotype/Toejam* | *8*#PLS/acre |
| needleandthread *(Stipa comata)* | *10*#PLS/acre |

Annual Species

| | |
|---|---|
| Barley *(Hordeum vulgare)* | 80#PLS/acre |
| Wheat *(Triticum aestivumx Secale cereale)* | 80#PLS/acre |
| Oats *(Avena sativa)* | 80#PLS/acre |

Only Colorado certified weed-free seed mixes and mulches may be used. The operator must provide certification tags or copies to the FS, preferably prior to application. Native trees, shrubs, or forbs may be used on some occasions if agreed to by the FS and the operator

(c) Soil Erosion Standard: The soil erosion component will be considered successful when gully erosion is absent, and sheet and rill erosion is absent or minimal (less than 5% of the site shows evidence of sheet and rill erosion in the form of pedestalled plants, sediment accumulation, or rills). Bare soil may be present on the reclaimed sites as comparable, relatively undisturbed adjacent sites naturally display bare soil.

(d) Noxious Weed Standard: The noxious weed component will be considered successful when noxious weeds are absent on the reclaimed site. Noxious weeds shall be treated on all areas disturbed by this project, as necessary to eradicate weeds during the course of operations and reclamation, as described below:

(i) The operator shall conduct a project area pre-disturbance noxious weed inventory to establish baseline conditions and assist the development of appropriate noxious weed management strategies.

(ii) The operator shall employ any cleaning methods necessary to ensure that any equipment, including transportation, construction, heavy maintenance and workover equipment, is free of noxious weed material before project implementation.

(iii) The operator shall control, contain, and eradicate noxious weeds (as applicable) on all areas disturbed by this project during the course of construction, operation, and reclamation. Additional noxious weed management guidance can be obtained from the FS representative.

(iv) Seed certification tags from the seed bags used for revegetation shall be submitted to the FS within 1 month following seed application. When straw, mulch or gravel is needed for construction, operation or reclamation activities, these materials must be certified to be weed-free, and a copy of the certification must be provided to the FS representative to be included in the project record.

# Fire Plan for Industrial Operations
# San Juan National Forest

This plan outlines the Operator's responsibilities for fire prevention and suppression activities within the Operator's project area. For the purposes of this provision, the project area is defined as the area within **one half mile ( 0.5 miles )** of the project boundary.

**Fire Precautions (9/93)**

**I. SMOKING AND LUNCH FIRE RESTRICTIONS**

Smoking is prohibited except inside a building, developed recreation site, vehicle, or while seated in an area of at least three feet in diameter that is barren or cleared of all flammable materials. 36 CFR 261.52(d), 42 CFR 9212(a).

The building of camp, lunch, warming and other fires within the project area and vicinity is prohibited, except at established camps or at other safe places where all flammable material has been cleared away sufficiently to prevent the start and spread of wildfires. The FS representative may, upon written request, designate specific places where campfires may be built for purposes of heating lunches.

**II. SPARK ARRESTERS AND MUFFLERS**

Operating or using any internal combustion engine, on any timber, brush, or grass covered land, including trails and roads traversing such land, without a spark arrester, is prohibited. The spark arrester must be maintained in effective working order, meeting either (1) Department of Agriculture, Forest Service standard 5100, *Spark Arresters for Internal Combustion Engines* (current edition); or (2) the Society of Automotive Engineers (SAE) recommended Practices J335, *Multiposition Small Engine Exhaust System Fire Ignition Suppression* (current revision), and J350, 36 CFR 261.52(j), 43 CFR 9212.1(h).

Passenger vehicles, pickups, medium and large highway trucks (80,000 GVW) will be equipped with a factory designed muffler system which is specified for the make and model of the respective vehicle/truck or with a muffler system that is equivalent or that exceeds factory specifications.

Exhaust systems shall be properly installed and continually maintained in serviceable condition.

**III. FIRE EXTINGUISHERS AND TOOLS ON EQUIPMENT**

While in use, each piece of equipment with an internal combustion engine shall be provided with at least the following:

1. One fire extinguisher, at least 5# ABC with an Underwriters Laboratory (UL) rating of 3A – 40BC, or greater.
2. One shovel, sharp, size 0 or larger, round-pointed with an overall length of at least 48 inches.
3. One axe, sharp, double bit 3½#, or one sharp Pulaski.

Extinguishers, shovels, axes, and Pulaski's shall be mounted so they are readily available to the operator. All tools shall be maintained in a serviceable condition.

**IV. POWER SAWS**

Each gasoline engine power saw shall be provided with one chemical-pressurized fire extinguisher of not less than 8-ounce capacity by weight, and one size 0 or larger, round-pointed shovel with an overall length of at least 48 inches. The extinguisher and shovel shall be maintained in good working order. The extinguisher shall be with the power saw operator and immediately available for use at all times. The extinguisher shall not be affixed to the saw. The shovel shall be readily available to the operator of the saw at all times. Having the shovel with the gas can used to refuel the saw may be considered "readily available" if not more than 200 feet from the saw. During periods of critical fire danger, the FS may prescribe other precautionary measures.

Any fueling or refueling of a power saw shall be done in an area which has first been cleared of material which will carry fire. The power saw shall be moved at least 10 feet from the place of fueling or refueling before starting.

**V. BLASTING AND WELDING**

The use of fuses in blasting shall not be permitted except near power lines where the danger of accidental detonation is present, and then only by special written permission of the FS. Whenever the relative humidity falls below 50 percent, the Operator shall place a watchman at each point where blasting is done who shall remain on duty for at least one hour after blasting is finished, and who shall be equipped with a shovel and a water-filled backpack can equipped with hand pump. During periods when the relative

humidity falls below 20 percent, blasting shall be discontinued unless authorized, with special provisions, in writing by the FS. Blasting shall not be permitted in any area not cleared to mineral soil without advance written approval of the FS and with such special precautions as may be required.
Prima Cord shall not be used in clearing operations, and in other areas where timber has been felled and slash not burned.
Unless otherwise directed in writing by the FS, all flammable material shall be cleared for 10 feet around any piece of equipment being welded. In addition, the Operator shall provide a fire extinguisher of a size and type designed to extinguish a fire in the flammable materials surrounding the spot being welded.
In order to determine the relative humidity, the operator shall either (a) provide and maintain weather instruments that will measure relative humidity in the area where the blasting will occur; or (b) provide communications to obtain weather data from the FS.
Explosives shall be stored at all times in a locked box marked "Explosives". Powder and blasting caps shall be stored in separate boxes.

**VI. STORAGE OF FLAMMABLES**

Gasoline, oil, grease and other highly flammable material shall be stored either in a separate building, or at a site where all debris is cleared within a radius of 25 feet. Storage buildings or sites shall be a minimum distance of 50 feet from other structures. Storage buildings shall be adequately posted to warn of the flammables and to prohibit smoking in or around the building.

**VII. CAMP FIRE PROTECTION**

The ground around all trailers, buildings, and other facilities constructed or placed on or near the project area shall be kept free of flammable material for a distance of at least 20 feet from the wall of such structure. Burning of such flammable material shall be as prescribed by the FS in writing.
Stovepipes of all wood burning stoves shall be equipped with suitable roof jacks and serviceable spark arresters. Stovepipes shall be no closer than 2 feet from any wood or other flammables unless adequately protected by metal or asbestos shield.

**Fire Precautions and Control**

**I. PLANS**

Prior to initiating the Operator's operations during the Fire Precautionary Period, which is from **May 15** thru **October 1**, the Operator shall file with the FS a Fire Prevention and Control Plan providing for the prevention and control of fires on the project area. The Plan shall include a detailed list of personnel and equipment at the Operator's disposal for implementing the Plan. This requirement may be met by preparing a single Plan for more than one project.

**II. FIRE PRECAUTIONS**

Specific Fire Precautionary measures listed shall be applicable during the Operator's operations in the Fire Precautionary Period. The Contracting Officer may change the dates of the Fire Precautionary Period by advance written notice, if justified by unusual weather or other conditions. Required tools and equipment shall be kept in serviceable condition and immediately available for fire fighting at all times during the Operator's operations in the Fire Precautionary Period.

**A. Substitute Precautions**

The FS may authorize substitute measures or equipment, or waive specific requirements by written notice, if substitute measures or equipment will afford equal protection, or some of the required measures and equipment are unnecessary.

**B. Emergency Precautions**

The FS may require the necessary shutting down of equipment on portions of the Operator's operations when emergency fire precautions are necessary. Under such conditions, after the Operator ceases active operations, the Operator shall release for hire by the FS, if needed, shutdown equipment for fire standby on the project area and personnel for fire standby or fire patrol, when such personnel and equipment are not needed by the Operator for other fire fighting or protection from fire. Equipment shall be paid for at fire fighting equipment rates common in the area or at prior agreed rates and, if Operator requests, shall be operated only by personnel approved by the Operator. Personnel so hired shall be subject to direction and control by the FS and shall be paid by the FS at fire fighting rates common in the area or at prior agreed rates.

## III. FIRE CONTROL

The Operator shall, both independently and in cooperation with the FS, take all reasonable and practicable action to prevent and suppress fires resulting from the Operator's operations and to suppress any forest fire on the project area. The Operator's independent initial fire suppression action on such fires shall be immediate and shall include the use of all necessary personnel and equipment at the Operator's disposal on the project area.

### A. Operator's Reinforcement Obligations

Whenever an Operations Fire or Negligent Fire, whether on or off the project area, or any other forest fire on the project area, has not been suppressed by initial action and appreciable reinforcement strength is required, the FS may require further actions by the Operator until such fire is controlled and mopped up to a point of safety. Such actions may include any or all of the following as necessary to fight such fire:

1) **Suspend Operations**
   To suspend any or all of the Operator's operations.
2) **Personnel**
   To release for employment by the FS any or all of the Operator's personnel engaged in the Operator's operations. Any organized crew so hired shall include the Operator's supervisor, if any. Personnel so employed shall be paid at the FS standard emergency fire fighting rates.
3) **Equipment**
   The Operator shall make available for rental to the FS any or all equipment suitable for fire fighting and currently engaged in the Operator's project area. The equipment shall be hired at firefighting equipment rates common in the area or at prior agreed rates.
   Equipment shall be operated only by personnel approved by the Operator, if so requested by the Operator.

## IV. FIRE SUPPRESSION COSTS

The Operator's obligations for cost of fire suppression vary according to three classifications of fires as follows:

### A. Operations Fire

An Operations Fire is a fire caused by the Operator's operations other than a Negligent Fire.
The FS, except as provided in Section III, shall, under 16 USC 572, perform fire suppression activities on Operations Fires. The Operator agrees to reimburse the FS for such cost for each Operations Fire. The cost of the Operator's actions, supplies, and equipment on any such fire provided pursuant to Section III, or otherwise at the request of the FS, shall be credited toward such maximum. If the Operator's actual cost exceeds the Operator's obligation stated above, the FS shall reimburse the Operator for the excess.

### B. Negligent Fire

A Negligent Fire is a fire caused by negligence or fault of the Operator's operations, including, but not limited to, one caused by smoking by persons engaged in the Operator's operations during the course of their employment, or during rest or lunch periods; or if the Operator's failure to comply with the requirements of Sections II and III results in a fire starting or permits a fire to spread. Damages and the cost of suppressing Negligent Fires shall be borne by the Operator.

### C. Other Fires on Project Area

The FS shall pay the Operator, at fire fighting rates common in the area or at prior agreed rates, for equipment or personnel furnished by the Operator pursuant to Section III, or otherwise at the request of the FS, on any fire on the Project area other than an Operations Fire or a Negligent Fire.

## V. STATE LAW

The Operator shall not be relieved by the terms of this contract of any liability to the United States for fire suppression costs recoverable in an action based on State law, except for such costs resulting from Operations Fires. Amounts due the Operator for fire fighting expenditures in accordance with BT7.41 shall not be withheld pending settlement of any such claim or action based on State law.

## VI. PERFORMANCE BY OPERATOR

Where the Operator's employees, agents, Operators, subcontractors, or their employees or agents perform the Operator's operations in connection with fire responsibilities, the Operator's obligations shall be the same as if performance was by the Operator.

**Should Fire Restrictions become necessary, the following describes the stage levels.**

**I. STAGE I AND STAGE II FIRE RESTRICTIONS**

There will be two fire restriction stages: Stage I and Stage II. Stage III denotes area closure. Each agency within a fire restriction area must write its own agency document that authorizes the restrictions within its jurisdiction. Each agency is responsible for using its own format, citing the specific codes of Federal Regulation (CFR) and United Stated Code (U.S.C.) and having the appropriate legal counsel review the document to assure it is correct and enforceable. To establish consistency, reduce confusion and standardize restrictions, the following criteria will be used in all restriction documents:

A. **STAGE I** The following acts are prohibited until further notice:
   1) Building, maintaining, attending, or using a fire, campfire, coal or wood burning stove, any type of charcoal fueled broiler or open fire of any type in undeveloped areas.
   2) Smoking, except within an enclosed vehicle or building, in a developed recreation site or while stopped in an area at least 3 feet in diameter that is barren or cleared of all flammable vegetation.
   3) Using explosive material: (i.e.: fireworks, blasting caps or any incendiary device which may result in the ignition of flammable material.}
   4) Welding, or operating acetylene or other similar torch with open flame.
   5) Operating or using any internal combustion engine without a spark arresting device properly installed, maintained and in effective working order meeting either:
      (a) Department of Agriculture, FS Standard 5100-1a; or
      (b) Appropriate Society of Automotive Engineers (SAE) recommended practice J335 (b) and J350 (a).
   6) Possible Exemptions
      (a) Persons with a written permit specifically authorizing the otherwise prohibited act or omission.
      (b) Fires in constructed, permanent fire pits or fire grates within developed recreation sites.
      (c) Any Federal, State, or local officer or member of an organized rescue or firefighting force in the performance of an official duty.
      (d) Mechanical stoves and appliances fueled by bottled or liquid gas which allow the operator to control or extinguish the flame with a valve are permitted provided that such devices are approved by Underwriters laboratory Inc.
      (e) Owners or lessees of land in the restricted area.
      (f) Residents in the restricted area.

B. **STAGE II** The following acts are prohibited until further notice:
   1) Building, maintaining, attending, or using a fire, campfire, coal or wood burning stove, any type of charcoal fueled broiler or open fire of any type.
   2) Smoking, except within an enclosed vehicle or building.
   3) Using explosive material: (i.e.: fireworks, blasting caps or any incendiary device which may result in the ignition of flammable material.)
   4) Welding, or operating acetylene or other similar torch with open flame.
   5) Operating or using any internal combustion engine without a spark arresting device properly installed, maintained and in effective working order meeting either:
      (a) Department of Agriculture, FS Standard 5100-1a: or
      (b) Society of Automotive Engineers (SAE) recommended practice J335 (b) and J350 (a).
   6) Operating a chainsaw without a chemical pressurized fire extinguisher of not less than 8 ounces capacity by weight, and one size 0 or larger round pointed shovel with an overall length of at least 36 it was 48" above inches. The extinguisher shall be with the chainsaw operator. The shovel may be kept with the fueling supplies but readily available.
   7) Other possible restricted acts under Stage II
      (a) Operating a motorized vehicle off designated roads and trails.
      (b) Operating a chainsaw outside the hours of 5 a.m. and 11 p.m.

(c) Overnight camping limited to listed campgrounds and recreation sites.

8) Possible Exemptions
   (a) Persons with a written permit specifically authorizing the otherwise prohibited act or omission.
   (b) Any Federal, State or local officer or member of an organized rescue or firefighting force in the performance of an official duty.
   (c) Mechanical stoves and appliances fueled by bottled or liquid gas which allow the operator to control and extinguish the flame with a valve are permitted provided that such devices are approved by Underwriters Laboratory Inc.
   (d) Owners or lessees of land in the restricted area.
   (e) Residents in the restricted area.

**C. Stage III Fire Restrictions**

1) Before the fire season, the "Council" will review the evaluation guidelines and determine threshold levels that substantiate the need for closures.
2) Examples include:
   (a) Potential loss of life due to explosive fire conditions.
   (b) Potential for extreme or blowup fire behavior.
   (c) Stage I or Stage II restrictions are not effective in reducing the number of human-caused fires.
   (d) Resources across the geographic area are at a critical shortage level.
   (e) Proximity to substantial population centers.
   (f) The extent of wildland-urban interface.

# NSJB FEIS Section 3.3, Migration and Seepage of Methane

## 3.3.10 Mitigation and Monitoring

Unless otherwise stated, the following mitigation and monitoring measures would be funded by the companies.

### Monitoring

The following monitoring measures apply to federal CBM wells proposed within the 1.5-mile Fruitland outcrop buffer zone and not necessarily to other federal CBM wells in the Project Area. Many of these measures have been implemented as required by the COGCC and BLM. A number of these monitoring requirements are programmatic, meaning that they apply comprehensively to the Fruitland Formation outcrop in the NSJB in addition to lands inside the Project Area. The appropriate set of requirements for any proposed federal CBM well would be determined on a case-by-case basis. Additional measures may be required, modified, or may be discontinued as field data is collected and the mechanisms of gas seepage and ground/surface water depletions are better understood.

Companies are to submit annual monitoring report(s) to the BLM and FS or to an entity funded by the companies charged with data administration and review. The goal of the monitoring and reporting requirement is to provide for early detection, prevention and/or mitigation of potential methane seepage, water depletion, and water quality impacts related to CBM development. These requirements include:

- Conduct water table monitoring in gas seep areas.
- Fruitland Outcrop Reconnaissance — before operations commence and then every third year, conduct low altitude, high-resolution aerial photography to map the vegetation on and immediately adjacent to the Fruitland outcrop. This work would coincide with and be tied into similar work conducted in La Plata County under COGCC Orders 112–156 and 112–157. Identify "suspect" areas requiring further field investigation. Locate the suspect areas and survey for the presence or absence of methane, carbon monoxide, and hydrogen sulfide. If methane seeps or seeps of other gases from the outcrop of the Fruitland Formation are identified, then implement a plan for mapping the seeps in detail and monitoring the seeps to identify any changes in extent of impacted area, and volume, concentration, composition, and stable isotope ratios. Attempt to identify the cause of the changes.
- Post Completion Pressure Build-Up Test — after well completion and prior to sales, make a bottom hole pressure measurement using a bottom hole gauge after a 48-hour shut-in period, provide these data to BLM and COGCC within one month of conducting each test.
- Plugged and Abandoned Wells – Identify all plugged and abandoned (P&A) wells located within one mile of a proposed well location. Any P&A well within one mile of a proposed well that is identified shall be assessed for risk taking into account cementing practices reported in the P&A. The operator shall notify the BLM and COGCC of the risk assessment of plugging procedures. The risk assessment shall be reviewed and appropriate action taken to pursue further investigation and remediation if warranted.
- Soil Gas Survey — Prior to beginning well production, conduct a soil gas survey around any well identified through the P&A well risk assessment described above. This includes establishment of at least one permanent soil monitoring probe (vapor tube), and surveying the area on an annual basis.
- Emergency Preparedness Plan (EPP) — Submit an EPP to Archuleta County or La Plata County as applicable. The EPP shall include as-built facilities maps showing the location of wells, pipelines, and other facilities, except control valve locations that may be held confidential.

The EPP shall include an emergency personnel contact list, that must be updated whenever the contact information changes.

#### *3.3.10.1.1 Methane and $H_2S$ Seepage Monitoring Program*

- Continue bimonthly monitoring of 180 existing vapor tubes (soil gas flow rates, methane, oxygen, hydrogen sulfide, and carbon dioxide content in the shallow gases) at 12 existing transects along the outcrop. (New tubes were added at Beaver Meadows Road and Yellowjacket Pass in 2001.)
- Add vapor tube transects at the Florida River, Edgemont Ranch, Fosset Gulch Road, and the Piedra River area.
- Conduct statistical-trend analysis of methane seep data annually.
- Conduct aerial infrared photography survey of outcrop, as described above, once every three years. This infrared imagery is used to identify vegetation changes, to supplement the pedestrian surveys, and provide a regular photographic record of the conditions at the outcrop.
- Conduct pedestrian surveys of the outcrop annually to identify recent vegetation die-offs, map the affected areas, and sample subsurface-soil gas to evaluate whether active methane seepage is responsible for die-offs. Revegetation at previously mapped seepage locations should also be noted.

#### *3.3.10.1.2 Groundwater Monitoring*

- Install groundwater-monitoring wells and/or shallow piezometers along the outcrop of the Fruitland Formation, to evaluate whether the effects of CBM dewatering extend to the outcrop in all areas, or whether portions of the outcrop may be hydraulically isolated from the down dip producing areas. Initially, the primary focus of groundwater-level monitoring will be to monitor shallow, near-outcrop water levels, but there may also be a need for deeper wells, located further from the outcrop to monitor down-hole pressure and groundwater levels to provide comprehensive information about Fruitland Formation hydrogeology.
- Quantify the overall water balance, including recharge and discharge, of the Fruitland Formation and Pictured Cliffs Sandstone and develop a monitoring program that can provide early detection of groundwater impacts. Should this prove to be technically and economically feasible, the agencies and operators would explore whether to proceed with implementing the study.
- Fruitland Outcrop Spring Survey — Conduct a regional reconnaissance survey to identify all springs that emanate from the outcrop of the Fruitland Formation. Thereafter, survey these springs on an annual basis at approximately the same time of the year as the initial survey. Ideally, inspections of springs would be repeated at low flow periods, like late summer, for comparison purposes. At a minimum, test for and measure methane concentration, water chemistry, and flow rate.
- Continue to inventory springs, wells, and groundwater seeps (wetlands) along the outcrop of the Pictured Cliffs and Fruitland and Kirtland Formations.
- Groundwater Monitoring Program — On an annual basis, monitor water wells within one-half mile of the Fruitland outcrop following the procedures established in COGCC Orders 112–156 and 112–157. Prior to well drilling activities, provide the BLM and the FS a list of all tested water wells, the analytical results, and the locations surveyed using GPS or other accurate method. Provide the BLM, FS, COGCC and the property owner with copies of all test results within 3 months of collecting the samples used for the test.

- Continue monitoring water levels at the Walker well (Texas Creek), the Meloche well (Pine River area – Kirtland Formation), and the Bureau of Reclamation piezometers in the Ridges Basin area.
- Monitor water levels at springs and wells, measure flows at springs (download dataloggers and maintain database).
- Collect time-series water chemistry and temperature data from producing CBM wells.
- Submit annual reports documenting conditions and highlighting changes that may be due to weather/climate or CBM development activities.
- Provide copies to the BLM and FS of the water monitoring reports required by COGCC Order No. 112–156.

#### *3.3.10.1.3 CBM Produced-Water Chemistry Time-Series Sampling*

Sample producing wells located within 3 miles of the Fruitland/Pictured Cliffs contact and analyze for common ions, pH, total dissolved solids (TDS), and wellhead fluid temperature quarterly (once every 3 months) for 1 year. The initial water sample would be analyzed for the stable isotopes of hydrogen and oxygen. After the initial four samples have been collected, sampling would occur every 6 months for the next 2 years. The data would be evaluated after this 3-year period to decide whether this program should continue

*Water Chemistry Monitoring — Private Wells*

Continue to collect water samples from water wells as required by COGCC Orders 112–156 and 112–157 and by similar monitoring requirements adopted by the FS and BLM for wells in Archuleta County. Sample wells for concentrations of methane, as well as the major cation and anion components of groundwater. Methane detected above the threshold level of 1.0 mg/L would then be analyzed for isotopic composition. Analyze the isotopic composition of samples to obtain information on the origins of the methane (biogenic vs. thermogenic). Submit results to the BLM and FS as part of the annual monitoring report described above.

The purpose of these water chemistry sampling efforts is to monitor for changes in water quality and to document changes, if any.

*Climatic/Weather-Monitoring Station*

- Install a continuous weather-monitoring station on National Forest near or on the Fruitland Outcrop. Data collected from this station would include wind speed and direction, barometric pressure, precipitation, and temperature. These data would be used in evaluating vapor tube flow rates and concentrations of methane, as well as for air modeling input and calibration.
- Use precipitation data in evaluating data on water level collected at monitoring wells, springs, and seeps. Data on precipitation are critical for evaluating recharge potential along the outcrop and natural versus human-induced fluctuations in groundwater.
- Compile and issue data reports annually, noting deviations from regional long-term climatic averages.

#### *3.3.10.1.4 Integration with Other Monitoring Efforts*

BLM and FS would continue to work with the COGCC and the gas industry to achieve a unified, comprehensive, efficient, and non-duplicative water and gas seepage monitoring and mitigation plan for the Project Area.

- The COGCC is conducting a monitoring effort that includes maintaining six flux pyramids, annual surveys of the outcrop, and installing and monitoring deep monitoring wells.
- BP America is continuing to monitor the Pine River area, which consists of flux pyramids and monitoring wells. Two flux pyramids are installed in the channel of the Pine River. These locations were selected to capture methane from active seeps in the riverbed. BP also collects water-level data from the Gurr Federal, Salmon shallow, intermediate, and deep wells, the Pole Barn monitoring well, and the Morgan's house well.

The monitoring efforts described above are intended to complement these ongoing efforts.

### *3.3.10.1.5 Fruitland Outcrop Zone Monitoring Program — Fosset Gulch Federal Unit*

The following monitoring requirements would apply to wells drilled in the Fruitland Formation outcrop zone, defined as the area bounded by a line 1½ miles basin ward of the outcrop contact between the Fruitland Formation and the Kirtland Formation. The COGCC has established these requirements for private mineral estate wells drilled in the Fosset Gulch area that are within ¾-mile to 1½-mile proximity of the Fruitland Formation outcrop. These same requirements would be applied as conditions of approval for federal wells within the same area:

- Fruitland Outcrop Reconnaissance — During 2005 and then on an every 3-year basis (e.g. 2008, 2011, etc), a low altitude, high-resolution aerial photography will be used to map the vegetation along the Fruitland Formation outcrop in those sections of land in T34N R5W, South of Ute Line (SUL) and Sections 9,13,14,15, and 16 in T34N R5W, North of Ute Line (NUL) in which the Fruitland Formation outcrops. This work will coincide with and be tied into similar work conducted in La Plata County under COGCC Orders 112–156 and 112–157. Once the aerial imagery is reviewed, "suspect" areas requiring further field investigation will be identified. Using a GPS and the IR imagery the suspect areas will be located and surveyed for the presence or absence of methane, carbon monoxide, and hydrogen sulfide. If methane seeps or seeps of other gases from the outcrop of the Fruitland Formation are identified, then the operator shall develop a plan for mapping the seeps in detail and monitoring the seeps to identify any changes in extent of impacted area, and volume, concentration, composition, and stable isotope ratios. In addition, the operator shall attempt to identify the cause of the changes.
- Fruitland Outcrop Spring Survey — during summer 2005 an initial regional reconnaissance survey to identify all springs that emanate from or that appear to emanate from the outcrop of the Fruitland Formation in T34N R5W SUL and Sections 9, 13, 14, 15, and 16 in T34N R5W NUL shall be surveyed, including accurately locating each spring using GPS or other land survey technology. Thereafter these springs shall be visited on an annual basis at approximately the same time of the year as the 2005 survey. At a minimum, methane concentration, water chemistry, and flow rate shall be tested and measured.
- Groundwater Monitoring Program — On an annual basis the operator will monitor private water wells in those sections of land in T34N R5W SUL and Sections 9, 13, 14, 15, and 16 in T34N R5W, NUL in which the Fruitland Formation outcrops following the parameters established in COGCC Orders 112–156 and 112–157. Prior to start up of any drilling activities, the operator shall provide the COGCC and BLM with a list of all tested water wells, the analytical results, and the locations surveyed using GPS or other accurate method. Copies of all test results shall be provided to the COGCC, BLM and the property owner within 3 months of collecting the samples used for the test.
- Produced Water Limitations — The operator shall limit water production to less than 100 barrels of water per day per well. Once the wells are online and producing and drilling and completion fluids have been removed from the wells, the operator shall collect one water sample from each well and analyze these samples for major anions and cations, TDS, pH, conductivity,

and other parameters as appropriate. These data shall be provided to the COGCC and BLM within 3 months of sample collection by

- Post Completion Pressure Build-Up Test — after completion and prior to sales a bottom hole pressure measurement must be made using a bottom hole gauge after a 48 hour shut-in period. The operator shall provide these data to the COGCC and BLM within one month of conducting each test.
- Soil Gas Survey — The Big Horn-Schomburg #1 (05–007–05100) well is located in SESE Section 14 T34N R5W. This well was drill and abandoned in 1961 and from the records available to the COGCC it appears that the top of the Fruitland Formation is close to or comes to the ground surface at this location. Prior to beginning production of any of the proposed wells, the operator shall conduct a soil gas survey around this well, shall establish at least one permanent soil monitoring probe (vapor tube) at this location, and shall survey the area on an annual basis. See #7 below for additional requirements regarding this DA well.
- Plugged and Abandoned Wells — The operator shall identify all P&A wells located within one mile of a proposed well location. Any P&A well within one mile of a proposed well that is identified shall be assessed for risk taking into account cementing practices reported in the P&A. The operator shall notify the COGCC and BLM of the risk assessment of plugging procedures. The agencies shall review the risk assessment and take appropriate action to pursue further investigation and remediation if warranted.
- Emergency Preparedness Plan — The operator shall submit an EPP to Archuleta County. The EPP shall include as-built facilities maps showing the location of wells, pipelines, and other facilities, except control valve locations that may be held confidential. The EPP shall include an emergency personnel contact list, that must be updated whenever the contact information changes.

## Mitigation

In addition to the design features of the alternatives developed to avoid impact, the federal land managers, State of Colorado (COGCC), and the development companies are considering a range of comprehensive mitigation strategies to reduce methane seepage. The following mitigation measures would be available as described below as part of a comprehensive management approach to address gas seepage and water depletion impacts if they occur. LTE and the La Plata Energy Council are also in the process of investigating a range of methane seep mitigation approaches that may result in an expanded list of mitigation options that would be available during project implementation:

- Construct a series of closely spaced shallow wells immediately downdip of the coal bed outcrops using horizontal, directional, or conventional drilling methods. These wells would be operated under suction to recover methane as it migrates from the deeper basin region toward the outcrop. Should this approach prove technically and economically feasible, the agencies and operators will explore its further application as a mitigation measure.
- Re-inject CBM produced water proximal to or within the outcrop to offset water depletion impacts as well as increasing hydrostatic head on the Fruitland gas reservoir to reduce gas seepage. Should this technique prove technically and economically feasible, the agencies and operators will explore its further application as a mitigation measure.
- Reclaim areas of vegetation stress and die-off. Reclamation methods may include prevention of methane seepage into soil using vapor-barrier or collection technology, removal of dead vegetation, revegetation of bare soil areas once methane seepage has been controlled, reducing erosion and sedimentation of bare soil areas using best management practices (BMPs), such as recontouring, ditching, storm water control plans, etc.

- Limit CBM well water production to less than 100 barrels of water per day per well to prevent or upon detection of adverse methane seepage or water depletion impacts related to CBM production from federal gas wells. Once the wells are online and producing and drilling and completion fluids have been removed from the wells, the operator shall collect one water sample from each well and analyze these samples for major anions and cations, TDS, pH, conductivity, and other parameters as appropriate. These data shall be provided to the BLM, FS, and COGCC within 3 months of sample collection.
- Federal gas wells that are shown to be causing methane seepage and/or water depletion impacts to critical resources may be shut-in on a case-by-case basis to temporarily or permanently halt water and gas production. Critical resources include private property, domestic water wells, perennial water sources such as springs and rivers, and areas of critical wildlife habitat.
- Recommend that Archuleta County prepare and implement building regulations for the area on and immediately adjacent to the Fruitland outcrop similar to those in La Plata County.

#### *3.3.10.2.1 Property Impacts*

The following mitigation approaches address operator responsibility, liability, and response to potential private property impacts:

- If reasonable evidence indicates that CBM development has impacted water well quantity or degraded water quality to less than State drinking water standards, the operator will replace the lost quantity of well water and/or treat or replace well water that has been degraded with water that meets State drinking water standards. This monitoring approach prescribes baseline monitoring of private wells as described above to detect change in water well quantity and quantity.
- If monitoring identifies potentially dangerous gas seeps that threaten existing residences or critical resources, the operator will clearly identify the seep area on the ground if it presents an immediate hazard to human health and safety and utilize the best management practices available to mitigate methane seepage (e.g., fans, improved ventilation, physical gas barriers, gas detection systems, etc.). This monitoring prescribes baseline monitoring to establish current methane levels in residences along the Fruitland Formation outcrop. Any new residences constructed on the Fruitland Formation outcrop would meet county construction standards that incorporate methane mitigation construction approaches.
- If monitoring indicates a loss of vegetation (trees, pasture) or loss of land use due to the drying up of a spring as a result of CBM development, the operator will compensate the affected property owner for the loss of such property value.

#### *3.3.10.2.2 Mechanism for Addressing Property Impacts*

Fruitland outcrop impacts, if they were to occur, would generally be located on federal or private land within proximity of the leases on which CBM wells are drilled. To establish a mechanism for addressing potential private property impacts incurred off-lease, the federal agencies would require the following of the CBM producers, in addition to the monitoring outlined above:

- As a condition of federal gas well approval, producers will be required to offer a property owner agreement or bond agreement to potentially affected parties that addresses monitoring and measurement protocols, forms of mitigation, and/or compensation for damages that may result from gas production along or near the Fruitland outcrop. The particular environmental effects to be addressed in such property owner agreements are those identified in Sections 3.3.6 and 3.3.10.2.1 of this analysis and include but are not limited to the reduction, interruption, or

contamination of domestic and agricultural waters, health and safety concerns centered around potential methane seepage, and the loss of vegetation or soil productivity due to methane seepage.

- Potentially affected parties include all property or water well owners located on the Fruitland Formation outcrop and the area ½ mile basinward of the outcrop falling within 1½ miles of any point along a proposed gas well bore, when the gas well bore is plotted as a surface feature.

- Producers will be required to identify and contact potentially affected parties prior to completion of the permitting process. Producers will be required to offer property owner agreements to mitigate the key concerns of water and of methane seepage to potentially affected parties and to provide evidence of such offers to the federal agencies as part of their application for permits to drill.

➢ The goal of the required property owner agreements would be to effectively and equitable address the projected effects of drilling and producing coal bed methane near and along the Fruitland outcrop. The federal agencies recognize that there may indeed be preferred approaches to mitigating effects to property owners that fall outside of the agencies' authority. For instance, as suggested during public comment, producers and affected property owners alike may find it advantageous to organize and pool resources to implement a mitigation fund (an example is provided in Appendix N) to address compensation of property owners that experience property impacts due to CBM development. Such a mitigation approach could prove more efficient for producers and property owners in terms of development and implementation of the action, and could provide greater levels of surety for all participants. Such a fund is established to address the same concerns outlined above, and where participation in the mitigation fund is offered to those property owners with land or water sources located on, or within close proximity of the Fruitland Formation and Pictured Cliffs Sandstone outcrop/subcrop along the San Juan Basin Rim in La Plata County and Archuleta Counties, Colorado, could prove a more effective substitute for individual property owner agreements.