

**STATE OF NEW MEXICO  
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT  
OIL CONSERVATION DIVISION**

**IN THE MATTER OF THE HEARINGS  
CALLED BY THE OIL CONSERVATION  
DIVISION FOR THE PURPOSE OF  
CONSIDERING:**

**APPLICATION OF COG OPERATING, LLC  
FOR AUTHORIZATION TO CONDUCT INJECTION  
OPERATIONS FOR EVALUATION FOR SECONDARY  
RECOVERY OPERATIONS, EDDY COUNTY, NEW MEXICO.**

**CASE NO. 14455**

**APPLICATION OF COG OPERATING, LLC  
FOR AUTHORIZATION TO CONDUCT INJECTION  
OPERATIONS FOR EVALUATION FOR SECONDARY  
RECOVERY OPERATIONS, EDDY COUNTY, NEW MEXICO.**

**CASE NO. 14456**

**APPLICATION OF COG OPERATING, LLC  
FOR AUTHORIZATION TO CONDUCT INJECTION  
OPERATIONS FOR EVALUATION FOR SECONDARY  
RECOVERY OPERATIONS, EDDY COUNTY, NEW MEXICO.**

**CASE NO. 14457**

**ORDER NO. R-13281**

**ORDER OF THE DIVISION**

**BY THE DIVISION:**

These cases came on for hearing at 8:15 a.m. on April 1, 2010, at Santa Fe, New Mexico before Examiner William V. Jones.

NOW, on this 28<sup>th</sup> day of June, 2010, the Division Director, having considered the testimony, the record, and the recommendations of the Examiner,

**FINDS THAT:**

(1) Due public notice has been given, and the Division has jurisdiction of these cases and of their subject matter.

(2) Case Nos. 14455, 14456, and 14457 were consolidated at hearing for the purposes of testimony and a single order is being issued for all cases.

(3) In each of these cases, COG Operating, LLC (“COG” or “applicant”) [OGRID 229137] seeks permission to inject produced water into oil producing reservoirs to gather data for possible future water flooding or secondary recovery projects. The three projects are located within 7 miles of each other near the town of Loco Hills, Township 17 South, Ranges 29 and 30 East, Eddy County, New Mexico. The proposed wells, depths, and injection formations of each case are as follows:

Case No. 14455, COG proposes conversion to injection of these two wells:

Continental A State Well No. 11 (API No. 30-015-34742)  
1450 FNL 1907 FWL, Unit Letter F  
Section 30, T17S, R29E, NMPM  
Paddock: 3926 feet to 4277 feet and Blinebry: 4436 feet to 5088 feet

Continental A State Well No. 12 (API No. 30-015-35052)  
330 FNL 583 FWL, Unit Letter D  
Section 30, T17S, R29E, NMPM  
Paddock: 3811 feet to 4044 feet and Blinebry: 4300 feet to 5292 feet

Case No. 14456, COG proposes conversion to injection of the:

Mesquite State Well No. 15 (API No. 30-015-34496)  
1750 FSL 990 FWL, Unit Letter L  
Section 20, T17S, R29E, NMPM  
Paddock: 3873 feet to 4215 feet and Blinebry: 4336 feet to 5289 feet

Case No. 14457, COG proposes conversion of the:

Texaco BE State Well No. 8 (API No. 30-015-35253)  
330 FNL 2310 FEL, Unit Letter B  
Section 16, T17S, R30E, NMPM  
Paddock: 4367 feet to 4681 feet and Blinebry: 4922 feet to 5721 feet

(4) Prior to the hearing, Lime Rock Resources filed an objection in Case 14455 through its attorney but failed to appear at the hearing.

(5) BP America Production Company filed a “letter of concern” prior to the hearing in Case 14455. BP operates the Empire Abo Unit Well No. 47 (API No. 30-015-03193) producing from the Abo formation and located in Unit Letter J of Section 30, within the ½ mile Area of Review of the Continental A State Well No. 11. In its letter, BP expressed concern that the cement top is undetermined and possible uphole damage to this wellbore may occur due to injection by COG. BP appeared at the hearing through its attorney who stated BP is an affected party but did not wish to hinder COG’s proposal to test these two formations for water flood potential.

(6) The U.S. Bureau of Land Management (“BLM”) submitted an email (see Exhibit No. 4) expressing concerns as to the effect on the Paddock formation of the proposed 2,000 psi maximum surface injection pressure.

(7) No other party entered an appearance at the hearings or otherwise opposed these applications.

(8) Applicant presented geological and engineering testimony as follows:

- (a) The subject wells are located on the southern end of the northwest shelf. The subject Yeso reservoirs (Paddock and Blinebry) in this area were influenced by the “shelf” and are very laterally extensive. In this area, the geologic structure dips to the east and the two target formations are reasonably continuous.
- (b) The target formations in these tests are the Paddock and the Blinebry members of the Yeso formation. The Blinebry is thicker than the Paddock, has less porosity and permeability, and is completed with hydraulic fracture stimulations.
- (c) Water saturations are generally less than 40 percent in both formations and a favorable mobility ratio (based on Paddock data) exists for these fluids at this low water saturation.
- (d) Fresh water is generally less than 300 feet deep and all subject wells and all area of review wells are cased and cemented adequately to protect fresh water. There is no evidence of faults or other conduits from the injection intervals up and into the fresh water intervals. There are no water wells within 1 mile of any of the subject wells.
- (e) Well bore diagrams were submitted for all subject wells and area of review wells and included calculated or measured cement tops. COG testified that all wells are adequately cased and cemented so as to prevent vertical migration of injection fluids. The subject wells will all inject through perforations and not through open hole completions. One plastic coated tubing string will be used for injection into each well. Two injection packers will be installed on the bottom of the tubing, one packer at the top of the Paddock formation and the other at the top of the Blinebry formation. A flow regulator will be installed between the packers to ensure fluid is diverted down into the lower permeable Blinebry formation.
- (f) COG asks for 2000 psi maximum surface injection pressure in order to inject produced water into these low permeable formations and achieve a valid test within reasonable time.

- (g) To date the Paddock formation has provided most of the primary recovery of oil and gas. The Blinebry formation is now being exploited as a result of advances in hydraulic fracturing. The Jenkins (Paddock) Unit was used as a template for this proposal. These injection wells are expected to impact only 5 to 10 acres each.
- (h) The source of injection water will be from surrounding COG leases. The subject wells are being converted for injection operations and not for disposal purposes. The salinity of the insitu waters of the Paddock and Blinebry are over 10,000 mg/l of total dissolved solids.
- (i) COG testified that agreement had been reached (see Exhibit No. 6) between Lime Rock Resources and COG.
- (j) COG believes the cement top on BP's Empire Abo Unit Well No. 47 is likely adequate and has agreed to work with BP if Well No. 47 is ever affected by injection into the Continental A State Well No. 11. Furthermore, there are two producing wells located between these two wells which would likely act as pressure sinks and prevent damage to Well No. 47.
- (k) Notice was provided to the well site surface owners and to other affected parties within the ½ mile areas of review as per Division Rules.
- (l) Approval of the proposed four injection wells is necessary in order to determine whether a preferential flow direction exists and to further evaluate these reservoirs for feasibility of secondary recovery operations.
- (9) The proposed 2000 psi maximum surface injection pressure limit is equivalent to a surface pressure gradient of approximately 0.52 and is in line with other tight reservoirs being water flooded in southeast New Mexico. The downhole flow regulator will limit the volume of water being injected into the Paddock formation and divert it into the tighter Blinebry. The goal of these tests is to see what the preferential flow direction is in the tight reservoir and to see if oil is mobilized and moved in that direction. The increased pressure is logically necessary to best see these relationships. If and when the water flood project is actually implemented with multiple injection wells set into logical patterns, then the pressure limit should be based on adequate step rate test data. The requested maximum surface pressure limit of 2000 psi is reasonable for a limited well, pilot project into a tight reservoir and should be approved.
- (10) According to the submitted C-108 data, there are approximately 209 wells within the ½ mile areas of review of the proposed 4 injection wells and 6 of these are reported as plugged. The following wells were identified as of possible concern based on a review of the submitted data and should be tested frequently and repaired if the bradenhead is exposed to pressure from injection.

a. The Empire Abo Unit Well No. 47 is within the area of review of the Continental A State Well No. 11 and was of concern to BP. Upon review of the evidence presented and based on calculations, this well is likely cemented adequately. In any case there are production wells acting as pressure sinks between these two.

b. Legacy Reserves Group operates the Empire 29 Federal Well No. 1 (API No. 30-015-31813) located in Unit Letter D of Section 29. This is a Morrow gas well located near the edge of the area of review of the Mesquite State Well No. 15 and is without cement from 3000 feet to approximately 9380 feet. There are numerous "sinks" between these two wells which should prevent any injection pressure from reaching this well.

(11) Applicant is in compliance with Division Rule 5.9 and proper notice has been supplied to affected parties.

(12) The 3 proposed pilot injection projects including the 4 proposed injection wells should be approved in order to prevent waste and protect correlative rights.

**IT IS THEREFORE ORDERED THAT:**

(1) The applications of COG Operating, LLC in Cases No. 14455, 14456, and 14457 are hereby approved. The following 4 wells are approved as injection wells to be operated by COG Operating, LLC (OGRID 229137) for purposes of waterflood evaluation of the Paddock and Blinebry formations. Permitted injection intervals are as listed below.

Case No. 14455: Continental A State Well No. 11 (API No. 30-015-34742)  
Unit Letter F, Section 30, T17S, R29E, NMPM  
Paddock: 3926 feet to 4277 feet and Blinebry: 4436 feet to 5088 feet

Continental A State Well No. 12 (API No. 30-015-35052)  
Unit Letter D, Section 30, T17S, R29E, NMPM  
Paddock: 3811 feet to 4044 feet and Blinebry: 4300 feet to 5292 feet

Case No. 14456: Mesquite State Well No. 15 (API No. 30-015-34496)  
Unit Letter L, Section 20, T17S, R29E, NMPM  
Paddock: 3873 feet to 4215 feet and Blinebry: 4336 feet to 5289 feet

Case No. 14457: Texaco BE State Well No. 8 (API No. 30-015-35253)  
Unit Letter B, Section 16, T17S, R30E, NMPM  
Paddock: 4367 feet to 4681 feet and Blinebry: 4922 feet to 5721 feet

(2) The operator shall take all steps necessary to ensure that the injected water enters only the permitted injection interval and is not permitted to escape to other formations or onto the surface from injection, production, or plugged and abandoned wells.

(3) Injection into each of the injection wells shall be accomplished through lined tubing installed in a packer located within 100 feet of the uppermost injection perforation. The casing-tubing annulus shall be filled with an inert fluid, and a gauge or approved leak detection device shall be attached to the annulus in order to determine leakage in the casing, tubing, or packer.

(4) The injection wells or pressurization system shall be equipped with a pressure control device or acceptable substitute that will limit the surface injection pressures to 2000 psi.

(5) The Division Director may administratively authorize a pressure limitation in excess of the above upon a proper showing that such higher pressure will not result in the fracturing of either of the two injection formations.

(6) Prior to commencing injection operations, each well shall be pressure tested throughout the interval from the surface down to the proposed packer setting depth to insure the integrity of such casing.

(7) The operator shall give 72 hours advance notice to the supervisor of the Division's Artesia District Office of the date and time that (i) the injection equipment will be installed, and (ii) the mechanical integrity pressure tests will be conducted on the permitted injection wells, so that these operations may be witnessed by Division personnel.

(8) Without limitation on the duties of the operator as provided in Division Rules 30 and 29, or otherwise, the operator shall immediately notify the Division's district office of any failure of the tubing, casing or packer in any injection well, or of any leakage or release of water, oil or gas from around any produced or plugged and abandoned well in the area, and shall take such measures as may be timely and necessary to correct such failure or leakage.

(9) The operator shall conduct injection operations in accordance with Division Rules NMAC 19.15.26.8 through NMAC 19.15.26.15.

(10) In accordance with Division Rule No 26.12.C., the injection authority granted herein for each well shall terminate one year after the effective date of this order if the operator has not commenced injection operations into that well, provided however, the Division, upon written request, mailed by the operator prior to the termination date, may grant an extension thereof for good cause. One year after injection into any well has ceased, the authority to inject into that well will terminate *ipso facto*.

(11) The operator shall conduct yearly bradenhead tests and report results to the Division on the Empire Abo Unit Well No. 47 (API No. 30-015-03193) located in Unit Letter J of Section 30 and on the Empire 29 Federal Well No. 1 (API No. 30-015-31813) located in Unit Letter D of Section 29. If the bradenhead flow or pressure on either of these wells is found by the engineering bureau of the Division, in writing, to be adversely affected by injection into one or more of the permitted injection wells in this order, then the operator shall cease injection into the offending injection well or wells. The operator shall be allowed to resume injection after raising the cement top of the affected well or wells over the equivalent injection interval.

(12) The Division may require additional well cementing or remedial work if additional records or evidence becomes available showing a need for such work.

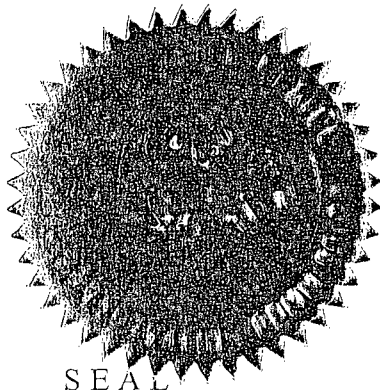
(13) The injection authority granted under this order is not transferable except upon division approval. The division may require the operator to demonstrate mechanical integrity of any injection well that will be transferred prior to approving transfer of authority to inject.

(14) The division may revoke this injection permit after notice and hearing if the operator is in violation of 19.15.5.9 NMAC.

(15) Compliance with this order does not relieve the operator of the obligation to comply with other applicable federal, state or local laws or rules, or to exercise due care for the protection of fresh water, public health and safety and the environment.

(16) Jurisdiction is retained by the Division for the entry of such further orders as may be necessary for the prevention of waste and/or protection of correlative rights or upon failure of the operator to conduct operations (i) to protect fresh or protectable waters or (ii) consistent with the requirements in this order, whereupon the Division may, after notice and hearing, or without notice and hearing in case of emergency, terminate the injection authority granted herein.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.



STATE OF NEW MEXICO  
OIL CONSERVATION DIVISION

A handwritten signature in black ink, appearing to read "Mark E. Fesmire".

MARK E. FESMIRE, P.E.  
Acting Director