

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

**IN THE MATTER OF THE APPLICATION OF CHEVRON U.S.A., INC. FOR
AMENDMENT OF DIVISION ORDER NO. R-4442, AS AMENDED, TO
AUTHORIZE A VERTICAL EXPANSION OF THE VACUUM GRAYBURG-SAN
ANDRES UNIT AND ADDITION OF NEW WELLS FOR INJECTION OF
CARBON DIOXIDE, LEA COUNTY, NEW MEXICO.**

**CASE NO. 14114
ORDER NO. R-4442-C**

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a.m. on April 17, 2008, at Santa Fe, New Mexico, before Examiners William V. Jones, David K. Brooks, and Terry Warnell.

NOW, on this 30th day of May, 2008, the Division Director, having considered the testimony, the record and the recommendations of the Examiners,

FINDS THAT:

(1) Due public notice has been given, and the Division has jurisdiction of this case and its subject matter.

(2) Chevron U.S.A., Inc. ("Chevron") seeks an order (a) expanding the vertical limits of the Vacuum Grayburg-San Andres Unit to include a residual oil zone that is potentially productive of hydrocarbons in the Grayburg-San Andres formation, and (b) authorizing 13 additional carbon dioxide injection wells in the Vacuum Grayburg-San Andres Unit Tertiary Recovery Project.

VERTICAL EXPANSION OF THE VACUUM GRAYBURG-SAN ANDRES UNIT:

(3) Chevron is the sole owner and operator of the Vacuum Grayburg-San Andres Unit which was created by agreement of the parties and approved by Division Order No. R-4433 dated November 8, 1972. The unit, after the expansion in 1981, comprises 1485.64 acres, more or less, of State of New Mexico lands described as follows:

**LEA COUNTY, NEW MEXICO
TOWNSHIP 17 SOUTH, RANGE 34 EAST, NMPM
Section 35: W/2 SW/4**

TOWNSHIP 18 SOUTH, RANGE 34 EAST, NMPM

Sections 1 and 2: All
Section 11: NE/4 NE/4
Section 12: N/2 NW/4

(4) By Order No. R-4442, issued in Case No. 4852 on November 27, 1972, the Division authorized a pressure maintenance project within the aforementioned Vacuum Grayburg-San Andres Unit by the injection of water into the Grayburg and the San Andres formations, Vacuum Grayburg-San Andres Pool.

(5) Division Order No. R-4442-B, dated December 11, 2007, authorized Chevron to inject carbon dioxide in the Vacuum Grayburg-San Andres Unit Tertiary Recovery Project (Tertiary Recovery Project) which is composed of a Target Area within the Unit containing approximately 86% of the Unit Area.

(6) The "Unitized Formation" in the Unit Agreement for the Development and Operation of the Vacuum Grayburg-San Andres Unit Area (Unit Agreement) is defined in Article 1.4 of the Unit Agreement as follows:

Unitized Formation is that zone interval including and correlative to portions of the Grayburg and San Andres Formations found between the depths of 3,902 feet (plus 105 feet sub-sea) and 4,809 feet (minus 802 feet sub-sea) on the Welex Acoustics Velocity Log, dated February 22, 1965, run in Texaco's New Mexico "M" State Well No. 8, located 330 feet from the North line and 1880 feet from the West line of Section 1, Township 18 South, Range 34 East, Lea County, New Mexico.

(7) Chevron seeks to amend the definition of the "Unitized Formation" in Article 1.4 to include a residual oil zone that is potentially productive of hydrocarbons located below the traditional oil/water contact in the San Andres formation. The proposed definition is as follows:

Unitized Formation is to include portions of the Grayburg and San Andres Formations found between the stratigraphic equivalents of the depths of 3,902 feet and 5,020 feet on the Welex Acoustics Velocity Log, dated February 22, 1965, run in Texaco's New Mexico "M" State Well No. 8, located 330 feet from the North line and 1880 feet from the West line of Section 1, Township 18 South, Range 34 East, Lea County, New Mexico.

(8) Other than the expansion of the vertical limits of the Unitized Formation, Chevron proposes no changes in the Unit Agreement.

(9) Chevron is the sole working interest owner of this unit and the State of New Mexico is the sole mineral interest owner. The existing Unit

Agreement indicates this unit is divided into ten (10) leases all leased at 12.5 percent royalty burden. The tracts have various beneficiaries; most are "Common School Land" or "Lieu" except for Tracts No. 8 and 10, which are considered "Military Institute". Tract Participation is based on percentage of acre-feet of oil bearing productive formation underlying each tract.

(10) Data recently acquired by Chevron from logs, analogy and the Northwestern Shelf/Delaware Basin geological evidence establish:

(a) Coring has indicated the same San Andres oil is present below the currently waterflooded portion of the San Andres. Even if higher in water saturation, this oil is perhaps commercially recoverable under tertiary recovery (CO₂ injection) operations. Each well has differing degrees of clays within this deeper San Andres interval;

(b) The upper portions of this residual oil zone, known as the Transition Zone, start immediately beneath what has always been considered to be the producing oil/water contact (approximate depth of 700 feet subsea depth on the Type Log) and extends downwards for several hundred feet;

(c) Expansion of the vertical interval of the Vacuum Grayburg-San Andres Unit will enable Chevron to efficiently produce the reserves in this residual oil zone under its unit plan as part of its Tertiary Recovery Project;

(d) The injection interval in unit wells along the boundaries of the Unit will be depth limited so as to not affect offsetting units and operators;

(e) All ownership within the Unit Area is common, and the commissioner of Public Lands has given preliminary approval to the proposed vertical expansion of the Unitized Formations (Exhibit No. 4);

(f) Chevron provided notice to all affected owners, including all offset operators, all leasehold operators within one mile of the Unit Boundary, all surface owners and tenants, and the New Mexico State Land Office and no objections to this application were raised by any owner;

(g) After deepening this Unitized interval, each Tract's percentage of total acre-feet of oil bearing productive formation should remain very similar to the ratio before the deepening; and

(h) Expansion of the vertical interval of the Vacuum Grayburg-San Andres Unit will not adversely affect the correlative rights of any other interest owner in the area.

(11) Approval of the proposed expansion of the Unitized Formation will allow economic recovery of hydrocarbon reserves from the Grayburg-San Andres formation

that may not otherwise be recovered, thereby preventing waste, and will not impair correlative rights.

AUTHORIZATION TO INJECT:

(12) By Order No. R-4442-A, entered on September 18, 2001, the Division authorized tertiary recovery operations within the Vacuum Grayburg-San Andres Unit Pressure Maintenance Project by the injection of carbon dioxide ("CO₂") and other produced gases into the Grayburg and San Andres formations. This order expired of its own terms on September 18, 2003.

(13) Although Order No. R-4442-A had expired, Texaco, and later Chevron, filed administrative applications with the Division seeking authorization to expand their Vacuum Grayburg-San Andres Unit Enhanced Oil Tertiary Recovery Project with additional injection wells. These applications were approved by the Division for the following wells:

- (a) **VGSA Unit Well No. 135**, 2535' FNL & 1930' FEL (Unit G),
Section 1, Township 18 South, Range 34 East, NMPM
(Administrative Order PMX-216)
- (b) **VGSA Unit Well No. 235**
2610' FNL & 660' FEL (Unit H),
Section 1, Township 18 South, Range 34 East, NMPM
(Administrative Order PMX-216)
- (c) **VGSA Unit Well No. 249**
1390' FNL & 2530' FWL (Unit F),
Section 1, Township 18 South, Range 34 East, NMPM
(Administrative Order PMX-216)
- (d) **VGSA Unit Well No. 133**
2590' FNL & 1270' FWL (Unit E),
Section 1, Township 18 South, Range 34 East, NMPM
(Administrative Order PMX-217)
- (e) **VGSA Unit Well No. 250**
1443' FNL & 1286' FEL (Unit H)
Section 1, Township 18 South, Range 34 East, NMPM
(Administrative Order WFX-823)

(14) By Order No. R-4442-B, the Division determined that these administrative orders remained in full force and effect for the injection of **only water** pursuant to Order No R-4442 and that "CO₂ or produced gas injection and increased injection pressure in any of these wells may only be allowed if approved by subsequent orders of the Division" Order Paragraph (3), Order No R-4442-B.

(15) Chevron now seeks authorization to use each of these wells, and three additional active water injection wells (VGSA Unit Well Nos. 132, 134 and 233) for the injection of carbon dioxide as well as authorization for five new wells for the injection of carbon dioxide (VGSA Unit Well Nos. 438, 439, 440, 441 and 131) in the Tertiary Recovery Project. A complete Application for Authorization to Inject in each of the 13 wells that are the subject of this application (Form C-108) has been filed in this Case (Case No. 14114, Chevron Exhibit No. 15). VGSA Unit Well No. 145 was included in the list of wells to become injectors but has been removed, and Chevron no longer wishes it to be permitted at this time.

(16) Chevron has requested no change in the provisions governing the Tertiary Recovery Project contained in Division Order No. R-4442-B.

(17) Water injection pressure limits have been established with previous orders for several of these proposed 13 wells. Those pressure limits should remain in effect until Chevron obtains additional pressure limiting orders from the Division. The wells not already assigned a pressure limit, should be assigned initial pressure limits of 1500 psi for water injection and 1850 psi for CO₂ injection, in order to be consistent with other injection wells.

(18) Chevron presented testimony to the effect that it has reviewed the available data on all wells in the project area including all injection wells, producing wells and plugged and abandoned wells, and that there is no remedial work required on any well in the project area to enable Chevron to safely conduct CO₂ injection operations.

(19) To ensure the integrity of each well in the Vacuum Grayburg-San Andres Tertiary Project Area, Chevron will: (i) equip each injection well with an automation system which monitors pressures in the well and shuts in the well if pressures increase above predetermined levels, and (ii) conduct monthly Division-monitored bradenhead surveys on each injection well and an annual Division-monitored bradenhead survey on each producing well.

(20) Chevron's request should be granted, provided however, the Division may require the installation of additional or upgraded wellbore tubulars and packers should it become apparent that the injection of CO₂ and/or produced gases are causing abnormal corrosion problems.

(21) If not previously equipped, each of the injection wells shown on Exhibit A should be equipped with internally coated tubing installed in a packer set within 100 feet of the uppermost injection perforation or casing shoe; the casing-tubing annulus should be filled with an inert fluid; and a gauge or approved leak-detection device should be attached to the annulus in order to determine leakage in the casing, tubing or packer.

(22) The operator should give advance notification to the supervisor of the Hobbs District Office of the Division of the date and time of the installation of any new

injection equipment and of the mechanical integrity pressure tests in order that the same may be witnessed.

(23) The application should be approved and the project should be governed by the provisions of Division Rules No. 701 through 708.

IT IS THEREFORE ORDERED THAT:

(1) The application of Chevron U.S.A., Inc. ("operator") for approval of an amendment to the Unit Agreement for the Development and Operation of the Vacuum Grayburg- San Andres Unit Area to expand the vertical limits of the Unitized Formation is hereby granted.

(2) The Unitized Formation of the Vacuum Grayburg-San Andres Unit is hereby extended to include portions of the Grayburg and San Andres Formations found between the stratigraphic equivalents of the depths of 3,902 feet and 5,020 feet on the Welex Acoustics Velocity Log, dated February 22, 1965, run in Texaco's New Mexico "M" State Well No. 8, located 330 feet from the North line and 1880 feet from the West line of Section 1, Township 18 South, Range 34 East, Lea County, New Mexico.

(3) The operator is authorized to inject carbon dioxide into the Unitized Formation within each of the thirteen (13) injection wells shown on Exhibit "A" attached hereto subject to the provisions and conditions imposed on the Vacuum Grayburg-San Andres Unit Tertiary Recovery Project by Division Order No. R-4442-B.

(4) Exhibit "A" also specifies new and existing injection pressure limits for water injection and for CO₂ injection for each of these 13 wells. The operator may petition the Division to administratively modify these injection pressure limits.

(5) The operator shall immediately notify the Supervisor of the Hobbs District Office of the Division of the failure of the casing in any of the injection wells, the leakage of water, natural gas, CO₂, or oil from or around any producing well, or the leakage of water, natural gas, CO₂, or oil from any plugged and abandoned well within the enhanced oil tertiary recovery project, and shall take all steps as may be necessary to correct such failure or leakage.

(6) The injection authority granted herein for the thirteen injection wells shall terminate one year after the effective date of this order if the operator has not commenced injection operations into one or more of these wells, provided however, the Division, upon written request by the operator, may grant an extension thereof for good cause shown.

(7) The injected and recycled CO₂ and produced gas shall not be released into the atmosphere. Chevron is not yet permitted to inject CO₂ derived from industrial operations (anthropogenic CO₂) and shall apply to the Division for such permit as needed.

(8) This order does not relieve the operator of responsibility should its operations cause any damage or threat of damage to fresh water, human health or the environment, nor does it relieve the operator of responsibility for complying with applicable Division rules or other state, federal, or local laws or regulations.

(9) All provisions of Order No. R-4442-B and of any administrative orders of the Division authorizing tertiary recovery operations within the Vacuum Grayburg-San Andres Unit shall remain in full force and effect in accordance with their terms; provided that extension of the injection interval of any injection well to include any part of the extended Unitized Formation as provided in this order shall require administrative approval from the Division.

(10) Jurisdiction of this case is retained for the entry of such further orders as the Division may deem necessary.

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



SEAL

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

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

MARK E. FESMIRE, P.E.
Director

EXHIBIT "A"
Case No. 14114 Order No. R-4442-C
Vacuum Grayburg-San Andres Unit Tertiary Recovery Project **Expansion**

| API | Well Name | UL | Sec | Pressure Limit (Water) | Pressure Limit (CO ₂) |
|--------------|----------------|----|-----|------------------------------|---|
| 30-025-35686 | VGSA Unit #133 | E | 1 | 1900 | 1850 |
| 30-025-35561 | VGSA Unit #135 | G | 1 | 1900 | 1850 |
| 30-025-35562 | VGSA Unit #235 | H | 1 | 1900 | 1850 |
| 30-025-35563 | VGSA Unit #249 | F | 1 | 1680 | 1850 |
| 30-025-38001 | VGSA Unit #250 | H | 1 | 1730 | 1850 |
| 30-025-36683 | VGSA Unit #132 | I | 2 | 1510 | 1850 |
| 30-025-36681 | VGSA Unit #134 | K | 1 | 1550 | 1850 |
| 30-025-36355 | VGSA Unit #233 | L | 1 | 1900 | 1850 |
| 30-025-38553 | VGSA Unit #131 | G | 2 | 1500 | 1850 |
| 30-025-38785 | VGSA Unit #438 | A | 1 | 1500 | 1850 |
| 30-025-38786 | VGSA Unit #439 | B | 1 | 1500 | 1850 |
| 30-025-38787 | VGSA Unit #440 | C | 1 | 1500 | 1850 |
| 30-025-38788 | VGSA Unit #441 | A | 1 | 1500 | 1850 |