

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

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

**CASE NO. 12892
ORDER NO. R-11858**

APPLICATION OF MALLON OIL COMPANY FOR APPROVAL OF A PILOT (INFILL DEVELOPMENT) PROJECT INCLUDING UNORTHODOX GAS WELL LOCATIONS AND, WHERE APPLICABLE, EXCEPTION PURSUANT TO DIVISION RULE 104.D (3), FOR THE PURPOSE OF ESTABLISHING A PILOT (INFILL DEVELOPMENT) PROGRAM IN THE PICTURED CLIFFS FORMATION AND TERTIARY SYSTEM TO DETERMINE PROPER WELL DENSITY REQUIREMENTS FOR PICTURED CLIFFS AND TERTIARY GAS WELLS, RIO ARriba COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This case came on for hearing at 8:15 a.m. on July 11, 2002 at Aztec, New Mexico, before Examiner Michael E. Stogner.

NOW, on this 1st day of November, 2002, 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 this case and its subject matter.

(2) The applicant, Mallon Oil Company ("Mallon"), pursuant to Division Rules 104.C (3) and 104.D (3) seeks approval for a 25-well pilot program, including unorthodox locations, in the Pictured Cliffs formation, which may include the East Blanco-Pictured Cliffs Pool (**72400**), and/or the Tertiary system [Cabresto Canyon-Tertiary Pool (**97037**) or La Jara Canyon-Tertiary Pool (**97036**)] in order to gather data to determine proper well density requirements for the Pictured Cliffs formation and Tertiary system.

(3) The applicant has identified four separate areas in Townships 29 and 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico, as further described below, in which to gather information on the complex geology and reservoir characteristics of each

of the producing intervals in the Pictured Cliffs formation and the Ojo Alamo, Nacimiento, and San Jose formations of the Tertiary system to determine proper well density and if regulatory changes are needed to efficiently develop these reserves. Mallon also seeks flexibility in locating its proposed 25 wells to allow for topographic, cultural, and archeological considerations. The four areas are:

- (a) PILOT AREA NO. 1, which comprises Sections 6, 8, 17, and 18, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico;
- (b) PILOT AREA NO. 2, which comprises Sections 19, 20, 29, and 30, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico;
- (c) PILOT AREA NO. 3, which comprises Sections 33, 34, and 35, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico; and
- (d) PILOT AREA NO. 4, which comprises Sections 4, 5, 8, and 9, Township 29 North, Range 2 West, NMPM, Rio Arriba County, New Mexico.

(4) The Pictured Cliffs and Tertiary zones within the proposed areas are “unprorated” and are therefore not subject to Part H of the Division's statewide rules entitled “*Gas Proration and Allocation*” (Rules 601 through 605). However, both intervals are currently governed by Division Rules 104.C (3) and D (3), which provides for 160-acre spacing units, requires wells to be no closer than 660 feet to the outer boundary of their assigned units nor closer than 10 feet to any quarter-quarter section line or subdivision inner boundary, and precludes the drilling, recompletion, and production of a second gas well within a single 160-acre gas spacing unit.

(5) Mallon operates all acreage in and contiguous to the proposed pilot areas and all producing wells in the areas covered by this application and offsetting tracts. Mallon has identified 25 spacing units in which to conduct its infill program in the Pictured Cliffs formation and/or Tertiary system:

- (a) PILOT AREA NO. 1 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
 - (i) the 113.01 acres, being a non-standard gas spacing unit, comprising Lots 9 and 10 of

Irregular Section 6;

- (ii) the 151.31 acres comprising Lots 1 and 2 and the S/2 NE/4 (NE/4 equivalent) of Section 8;
 - (iii) the 160 acres comprising the SE/4 of Section 8;
 - (iv) the 160 acres comprising the NE/4 of Section 17;
 - (v) the 160 acres comprising the SW/4 of Section 17; and
 - (vi) the 160 acres comprising the NE/4 of Irregular Section 18.
- (b) PILOT AREA NO. 2 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARriba COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the NE/4 of Irregular Section 19;
 - (ii) the 160 acres comprising the SE/4 of Section 20;
 - (iii) the 160 acres comprising the SW/4 of Section 20;
 - (iv) the 175.15 acres comprising Lots 1 and 2 and the W/2 NE/4 (NE/4 equivalent) of Section 29;
 - (v) the 160 acres comprising the NW/4 of Section 29;
 - (vi) the 177.31 acres comprising Lots 4 and 5 and the N/2 SW/4 (SW/4 equivalent) of Section 29; and

- (vii) the 160 acres comprising the NE/4 of Irregular Section 30.
- (c) PILOT AREA NO. 3 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the NE/4 of Section 33;
 - (ii) the 160 acres comprising the NW/4 of Section 34;
 - (iii) the 160 acres comprising the SE/4 of Section 34;
 - (iv) the 160 acres comprising the SW/4 of Section 35;
 - (v) the 160 acres comprising the SE/4 of Section 35; and
 - (vi) the 160 acres comprising the NE/4 of Section 35.
- (d) PILOT AREA NO. 4 (TOWNSHIP 29 NORTH, RANGE 2 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the SW/4 of Section 4;
 - (ii) the 160 acres comprising the SE/4 of Section 5;
 - (iii) the 160 acres comprising the SW/4 of Section 5;
 - (iv) the 160 acres comprising the SW/4 of Section 8;
 - (v) the 160 acres comprising the SE/4 of Section 8; and

- (vi) the 160 acres comprising the SW/4 of Section 9.

(6) Representatives of the Division's Aztec District Office and the U. S. Bureau of Land Management appeared at the hearing, questioned witnesses and made statements, but did not present evidence.

(7) By Order No. R-11445, issued in Case No. 12481 on September 5, 2000, the Division combined the Cabresto Canyon-Ojo Alamo Pool, the Cabresto Canyon-Nacimiento Pool and the Cabresto Canyon-San Jose Pool into the Cabresto Canyon-Tertiary Pool covering lands in Townships 29 and 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico. Mallon operated wells that produced from each of these Tertiary intervals and, after pool consolidation, had certain spacing units (160 acres being a single quarter section) on which there was more than one well, although producing from separate intervals, produced from the new Cabresto Canyon-Tertiary Pool. At the hearing, Mallon was directed to file appropriate applications to obtain administrative authorizations to bring these wells into compliance with Division Rule 104.D (3). By Administrative Order SD-02-03 dated September 23, 2002, the Division approved Mallon's application for the simultaneous dedication of multiple wells on 17 spacing units in the Cabresto-Canyon Tertiary Pool.

(8) The following five (5) spacing units in the Cabresto Canyon-Tertiary Pool that were approved by Division Administrative Order SD-02-03 also appear in this application:

- (a) the 151.31 acres comprising Lots 1 and 2 and the S/2 NE/4 (NE/4 equivalent) of Section 8, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico;
- (b) the 160 acres comprising the SE/4 of Section 8, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico;
- (c) the 160 acres comprising the SE/4 of Section 20, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico;
- (d) the 160 acres comprising the NW/4 of Section 29, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico; and
- (e) the 177.31 acres comprising Lots 4 and 5 and the N/2 SW/4

(SW/4 equivalent) of Section 29, Township 30 North, Range 3 West, NMPM, Rio Arriba County, New Mexico.

(9) Another order issued by the Division that affects Pictured Cliffs and Tertiary gas production within the area that is the subject of this application is Division Administrative Order NSL-4355, dated September 7, 1999, as corrected by order dated October 29, 2002. This order:

- (a) identified 60,167.64 acres of Jicarilla Apache lands of which Mallon is the operator of the oil and gas mineral rights ("Mallon/Jicarilla Consolidated Contract Area");
- (b) recognized that as gas exploration and development on these lands progressed unorthodox gas well locations would be necessary to (i) avoid archeological sites; (ii) minimize disturbance to forested and wildlife habitats; (iii) minimize construction of well pads by avoiding rugged terrain when practical; and (iv) position wellbores within geologically more favorable locations in order to maximize the likelihood of obtaining commercial gas production; and
- (c) authorized Mallon to recomplete existing wells and drill new wells on the Mallon/Jicarilla Consolidated Contract Area to any and all formations and/or pools developed on 160-acre spacing from the surface to the base of the Pictured Cliffs formation, which presently include the East Blanco-Pictured Cliffs Pool and the Cabresto Canyon-Tertiary Pool (as to Townships 29 and 30 North, Range 3 West, NMPM) and the Undesignated East Blanco-Pictured Cliffs Pool and the La Jara Canyon-Tertiary Pool (as to Township 29, North, Range 2 West, NMPM), at locations that are unorthodox based on the location requirements of Division Rule 104.C (3), provided that any such unorthodox well location is no closer than the required minimum orthodox distance (660 feet) from the outer boundary of the Mallon/Jicarilla Consolidated Contract Area nor closer than 10 feet to any quarter-quarter section line or subdivision inner boundary.

(10) Because of the surface topography, cultural and archeological concerns and geological considerations addressed by Administrative Order NSL-4355, the exact location of each of the 25 proposed pilot wells has not been identified, and flexibility in locating the

pilot wells is needed.

(11) The four pilot areas as described above are located within the Mallon/Jicarilla Consolidated Contract Area, and there has been no significant change in the oil and gas mineral ownership since Administrative Order NSL-4355, as amended, was entered.

(12) The provisions of Administrative Order NSL-4355 governing unorthodox gas well locations also govern the pilot infill wells proposed by Mallon within the Mallon/Jicarilla Consolidated Contract Area, and the portions of this application that relate to unorthodox gas well locations are therefore unnecessary and should be dismissed.

(13) Testimony presented by Mallon at this hearing indicates that:

- (a) each of the four pilot areas demonstrates different geological and reservoir characteristics in the four zones to be tested with the proposed pilot project;
- (b) through the proposed pilot project, Mallon will gather data on the geological characteristics of the reservoirs, and pressure data and historical production information from wells therein which will enable it to study well performance and the effectiveness of current well density to efficiently drain these reservoirs in each of the pilot areas;
- (c) all proposed wells within the 25 spacing units identified above may not be drilled because the data collected from the initial wells will be used to modify the pilot project as it progresses; and
- (d) Mallon sent notice to all parties affected by this application and none of the parties objected to the program, well locations, or increased well density.

(14) Mallon presented geological evidence, which supports the following findings.

- (a) The Pictured Cliffs, Ojo Alamo, Nacimiento and San Jose formations within the proposed pilot areas consist of multiple, stacked, separate sandstone reservoirs with lateral stratigraphic discontinuities and sealing faults, which result in multiple no-flow boundaries in the subject formations. The drilling of pilot wells is needed to determine the well-density

requirements for optimum recovery efficiency of reserves in these producing intervals.

- (b) The Pictured Cliffs formation consists of a fine-grained sandstone in north-south oriented marginal marine sandbars, which are unlikely to communicate without permeability enhancement from fracturing. Drainage areas are thought to be elongated along the primary, north-south fracture orientation. The areas where there is evidence of communication between wells in the Pictured Cliffs formation are where the wells are located north-south of each other and therefore parallel to the primary fracture orientation. Undrained reservoir may be encountered with east-west step-out development perpendicular to the general orientation of this formation.
- (c) The Ojo Alamo formation of the Tertiary system is comprised of fine-grained to medium-grained sandstone and, as a relatively tight sand, relies on permeability enhancement through fracturing for economic production. The primary, north-south fracture orientation suggests the possibility of encountering undrained reservoir by step-out development east and west from the current wells in this interval. The formation varies in thickness from well to well and drainage areas may be irregular and limited by lateral porosity and permeability variations due to fracture orientations and depositional and lithologic discontinuities and sealing faults.
- (d) The Nacimiento formation of the Tertiary system is comprised of discontinuous fluvial sandstone reservoirs with limited aerial extent due to rapid lateral depositional changes, which suggests that increased well density may be needed to produce the reserves in this portion of the Tertiary system.
- (e) The San Jose formation of the Tertiary system is comprised of stacked alluvial and fluvial sandstones with lateral discontinuities where additional reserves may be recoverable with increased well density.

(15) Mallon presented engineering evidence, which supports the following findings.

- (a) The producing intervals in the Pictured Cliffs formation and/or Tertiary system to be tested in the proposed pilot areas demonstrate substantial variations from zone to zone in water resistivities, clay contents and permeability; and the average recovery factor for wells in all zones in the pilot project areas is approximately 25 percent of the gas in place.
 - (b) The average well performance in the Pictured Cliffs formation is typical for a tight reservoir with fracturing, showing an early rapid decline and a very long period of shallow decline. Wells in this formation are recovering approximately 20 percent of the gas in place.
 - (c) There is a wide variation in well performance in the Ojo Alamo formation, and the wells produce water that does not appear to be associated with a gas-water contact but instead is migrating through fractures. Ojo Alamo wells demonstrate an average recovery efficiency of approximately 20 percent.
 - (d) While there is limited data on the Nacimiento formation, a recovery factor of 80 percent or more should be obtained from wells in this formation. However, due to the lenticular nature of the sands that do not exist over full 160-acre units, recovery factors for these wells are averaging approximately 23 percent.
 - (e) There is a wide variation in the well performance in the San Jose formation that appears to result from individual layers declining at different rates. Wells in this formation produce water in volumes that vary from well to well. Recovery factors in the San Jose formation average approximately 40 percent although half of the wells recover less than this volume suggesting that there may be recoverable reserves in adjoining 80-acre tracts not being drained by existing wellbores.
- (16) There are sufficient differences in the performance of each of the Tertiary producing formations that each should be tested and studied separately.
- (17) Approval of the proposed pilot wells will afford an opportunity to gather the

additional data to further study the reservoir and determine if increased well density is needed to efficiently produce the reserves from the Pictured Cliffs formation and/or Tertiary system.

(18) The geologic complexity of the formations observed in each pilot area well in each producing interval will dictate the number of wells drilled and the data needed to ultimately determine the appropriate well density needed to efficiently drain these reservoirs.

(19) Approval of Mallon's application will serve to provide data for reservoir engineering and geological studies for the ultimate purposes of determining proper well density within the Pictured Cliffs formation, which may include the East Blanco-Pictured Cliffs Pool (**72400**), and/or the Tertiary system [Cabresto Canyon-Tertiary Pool (**97037**) or La Jara Canyon-Tertiary Pool (**97036**)], is in the best interest of conservation, and will serve to protect correlative rights and prevent waste.

(20) The five existing spacing units within the Cabresto Canyon-Tertiary Pool, as described in Finding Paragraph No. (8) above, were previously approved by Division Administrative Order SD-02-03, for the simultaneous dedication of two wells within a single 160-acre, more or less, spacing unit; the portion of the application pertaining to these units can therefore be **dismissed**.

IT IS THEREFORE ORDERED THAT:

(1) As an exception to Division Rule 104.D (3), which restricts the number of producing wells within a single gas spacing unit within non-prorated gas pools to only one, the applicant, Mallon Oil Company ("Mallon"), is hereby authorized to conduct a pilot infill drilling program within the following described twenty-five (25) 160-acre, more or less, spacing units in the Pictured Cliffs formation, which may include the East Blanco-Pictured Cliffs Pool (**72400**), by drilling and producing one infill gas well (two producing gas wells) per unit:

- (a) PILOT AREA NO. 1 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
 - (i) the 113.01 acres, being a non-standard gas spacing unit, comprising Lots 9 and 10 of Irregular Section 6;
 - (ii) the 151.31 acres comprising Lots 1 and 2 and the S/2 NE/4 (NE/4 equivalent) of Section 8;

- (iii) the 160 acres comprising the SE/4 of Section 8;
 - (iv) the 160 acres comprising the NE/4 of Section 17;
 - (v) the 160 acres comprising the SW/4 of Section 17; and
 - (vi) the 160 acres comprising the NE/4 of Irregular Section 18.
- (b) PILOT AREA NO. 2 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the NE/4 of Irregular Section 19;
 - (ii) the 160 acres comprising the SE/4 of Section 20;
 - (iii) the 160 acres comprising the SW/4 of Section 20;
 - (iv) the 175.15 acres comprising Lots 1 and 2 and the W/2 NE/4 (NE/4 equivalent) of Section 29;
 - (v) the 160 acres comprising the NW/4 of Section 29;
 - (vi) the 177.31 acres comprising Lots 4 and 5 and the N/2 SW/4 (SW/4 equivalent) of Section 29; and
 - (vii) the 160 acres comprising the NE/4 of Irregular Section 30.
- (c) PILOT AREA NO. 3 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):

- (i) the 160 acres comprising the NE/4 of Section 33;
 - (ii) the 160 acres comprising the NW/4 of Section 34;
 - (iii) the 160 acres comprising the SE/4 of Section 34;
 - (iv) the 160 acres comprising the SW/4 of Section 35;
 - (v) the 160 acres comprising the SE/4 of Section 35; and
 - (vi) the 160 acres comprising the NE/4 of Section 35.
- (d) PILOT AREA NO. 4 (TOWNSHIP 29 NORTH, RANGE 2 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the SW/4 of Section 4;
 - (ii) the 160 acres comprising the SE/4 of Section 5;
 - (iii) the 160 acres comprising the SW/4 of Section 5;
 - (iv) the 160 acres comprising the SW/4 of Section 8;
 - (v) the 160 acres comprising the SE/4 of Section 8; and
 - (vi) the 160 acres comprising the SW/4 of Section 9.

- (2) As an exception to Division Rule 104.D (3), Mallon is also authorized to

conduct a pilot infill drilling program within the following-described twenty (20) 160-acre, more or less, spacing units in the Tertiary system [Cabresto Canyon-Tertiary Pool (**97037**) or La Jara Canyon-Tertiary Pool (**97036**)], by drilling and producing one infill gas well (two producing gas wells) per unit:

- (a) PILOT AREA NO. 1 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
 - (i) the 113.01 acres, being a non-standard gas spacing unit, comprising Lots 9 and 10 of Irregular Section 6;
 - (ii) the 160 acres comprising the NE/4 of Section 17;
 - (iii) the 160 acres comprising the SW/4 of Section 17; and
 - (iv) the 160 acres comprising the NE/4 of Irregular Section 18.
- (b) PILOT AREA NO. 2 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
 - (i) the 160 acres comprising the NE/4 of Irregular Section 19;
 - (ii) the 160 acres comprising the SW/4 of Section 20;
 - (iii) the 175.15 acres comprising Lots 1 and 2 and the W/2 NE/4 (NE/4 equivalent) of Section 29; and
 - (iv) the 160 acres comprising the NE/4 of Irregular Section 30.
- (c) PILOT AREA NO. 3 (TOWNSHIP 30 NORTH, RANGE 3 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):

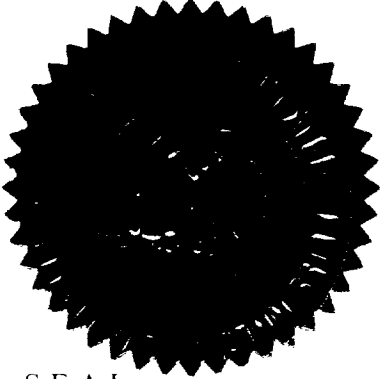
- (i) the 160 acres comprising the NE/4 of Section 33;
 - (ii) the 160 acres comprising the NW/4 of Section 34;
 - (iii) the 160 acres comprising the SE/4 of Section 34;
 - (iv) the 160 acres comprising the SW/4 of Section 35;
 - (v) the 160 acres comprising the SE/4 of Section 35; and
 - (vi) the 160 acres comprising the NE/4 of Section 35.
- (d) PILOT AREA NO. 4 (TOWNSHIP 29 NORTH, RANGE 2 WEST, NMPM, RIO ARRIBA COUNTY, NEW MEXICO):
- (i) the 160 acres comprising the SW/4 of Section 4;
 - (ii) the 160 acres comprising the SE/4 of Section 5;
 - (iii) the 160 acres comprising the SW/4 of Section 5;
 - (iv) the 160 acres comprising the SW/4 of Section 8;
 - (v) the 160 acres comprising the SE/4 of Section 8; and
 - (vi) the 160 acres comprising the SW/4 of Section 9.

- (3) The provisions of Division Administrative Order NSL-4355, dated September

7, 1999, as corrected by order dated October 29, 2002, governing unorthodox gas well locations, shall also govern the pilot infill wells proposed by Mallon within the Mallon/Jicarilla Consolidated Contract Area, and the portions of this application which relate to unorthodox gas well locations are therefore unnecessary.

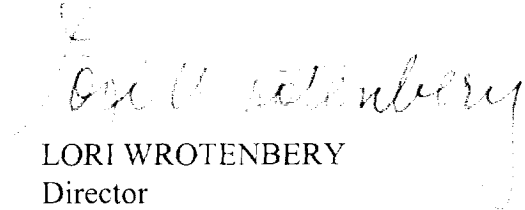
(4) Jurisdiction of this case is retained for the entry of such further orders as the Division may deem necessary.

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



SEAL

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


LORI WROTENBERY
Director