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. 10420*
*ORDER NO. R-9664*

APPLICATION OF UNION OIL COMPANY OF
CALIFORNIA d/b/a UNOCAL FOR DESIGNATION
OF TIGHT FORMATION, RIO ARRIBA COUNTY, NEW MEXICO

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 8:15 a.m. on December 20, 1991, at Santa Fe, New Mexico, before Examiner Michael E. Stogner.

NOW, on this 15th day of April, 1992 the Division Director, having considered the testimony, the record and the recommendations of the Examiner, and being fully advised in the premises,

FINDS THAT:

(1) Due public notice having been given as required by law, the Division has jurisdiction of this cause and the subject matter thereof.

(2) The applicant, Union Oil Company of California d/b/a Unocal ("Unocal"), requests that the Division recommend to the Federal Energy Regulatory Commission ("FERC") that the Dakota formation underlying the following lands in Rio Arriba County, New Mexico be designated as "tight formation" in accordance with Section 107 of the Natural Gas Policy Act, FERC regulations in Title 18 CFR Section 271.703 and Oil Conservation Division Order No. R-6388-A:

Township 26 North, Range 6 West, NMPM
Section 6: All

Township 26 North, Range 7 West, NMPM
Sections 1 and 2: All
Sections 11 and 12: All

Township 27 North, Range 6 West, NMPM

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| Sections 16 through 23: | All |
| Sections 26 through 32: | All |

Township 27 North, Range 7 West, NMPM

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| Sections 13 and 14: | All |
| Section 15: | E/2 |
| Section 22: | E/2 |
| Sections 23 through 26: | All |
| Section 27: | NE/4 and S/2 |
| Section 28: | S/2 |
| Sections 33 through 36: | All |

(3) The proposed "tight formation" area contains 20962.9 acres, more or less, and is inclusive of the Basin-Dakota Pool. The boundaries of the proposed area are the same as the outer boundary of the Unocal operated Rincon Unit, and the area should be designated as the "Rincon Tight Formation Area" ("Rincon Area").

(4) The type log presented by the applicant to represent the Dakota formation in the Rincon Area is the Gamma Ray - Sonic Log run on the El Paso Natural Gas Company Rincon Unit NP Well No. 130 located 990 feet from the North and East lines (Unit A) of Section 32, Township 27 North, Range 6 West, NMPM, Rio Arriba County, New Mexico.

(5) The type log, submitted as Unocal's Exhibit No. 4-A shows the Dakota producing interval in the Rincon Area includes the Dakota formation and the Graneros formation and all correlable units therein ("Dakota Producing Interval"). Based on Unocal's testimony, the vertical limits of the Dakota Producing Interval in the Rincon Area should include the entire interval found to occur from 7,360 feet to 7,661 feet on this type log.

(6) Unocal included a geological description of the Dakota formation in its application and its geological witness reviewed this description at the hearing. A summary of the geological information is as follows:

> The Dakota Producing Interval in the Rincon Area consists of a variety of marine and non-marine sandstones and mud rocks which span a geologic interval with gross thickness ranging from 240 feet to 328 feet with an average gross thickness of approximately 265 feet.

The Dakota Producing Interval in the Rincon Area is located in the east-central San Juan Basin and dips gently (monoclinal) to the northeast with an average structural gradient of approximately 66 feet per mile. The depth to the top of the Dakota Producing Interval ranges from 7,008 to 7,586 and averages 7,347 feet.

Within the Rincon Area, the Dakota formation is subdivided into five intervals (A through F) and the Graneros formation into five subunits (the Shale Interval, A1 Interval, A2 Interval, X Marker and B Interval). The Dakota Producing Interval is composed of interbedded sandstones and shales with the sandstone intervals constituting the primary reservoir flow units and the shales forming flow barriers to gas migration. The net sand values in these flow units range from 60 to 110 feet and average 80 feet. They are found in a complex pattern, which is indicative of the stratigraphic variability of the component sandstone units. In general, the net sand values increase from west to east across the Rincon Area.

There is stratigraphic continuity of the major Dakota and Graneros subunits across the Rincon Area. The two main reservoir flow units are the Graneros A1 Interval and the Dakota A Interval. The Dakota A Interval is the post persistent subunit and shows only minor thickness variations. The Graneros A1 Interval also shows good persistence, however its thickness varies considerably. The Graneros A1 Interval is thickest in the central part of the Rincon Area, but thin on the eastern and western edges.

(7) Division records indicate that at the time of the hearing, there were fifty-seven wells producing from the Basin-Dakota Pool within the proposed tight formation area.

(8) Unocal's witness testified that average in situ permeability for the Rincon Area is less than 0.1 millidarcys (md) and presented testimony and exhibits concerning several methods for determining average in situ permeability (Findings 10, 11 and 12 below). Laboratory measurement of cores was utilized with a correction applied to these

analyses and pressure build-up analysis were also used to back out permeability values utilizing fluid flow equations and the results of these analyses confirmed the validity of the core data which demonstrated the average in situ permeability for the Dakota Producing Interval in the Rincon Area to be less than 0.1 millidarcys.

(9) Core-plug petrophysical data from five wells in the Rincon Area provide the most direct method for determination of permeability. Standard petrophysical data showing horizontal porosity and permeability are available for all cores. Measured permeabilities were corrected using industry-accepted methodology defined by *Jones and Owens* which relates laboratory measured air permeability of dry, unstressed core samples to reservoir conditions. The average measured core permeability and corrected permeability on a gross or net basis are all less than 0.1 md and the permeability appears to be randomly distributed across the Rincon Area with no natural fractures of significance.

(10) The applicant presented testimony and exhibits to explain Rincon Area permeability calculations based on well performance. Eight wells were modeled using Darcy calculations and an average permeability value of 0.0435 md was obtained. This result agreed with and confirmed core data.

(11) Two pressure build-up tests were conducted in the Rincon Area utilizing a Finite Conductivity Type Curve Analyses method. These tests resulted in average drainage area permeabilities to gas of 0.043 md (Rincon Unit Well No. 184) and 0.046 (Rincon Unit Well No. 137) which agreed with and confirmed core and Darcy calculations.

(12) To show that unstimulated producing rates for Rincon Area wells are not expected to exceed FERC "tight formation" limits (5 BOPD and 290 MCFPD), Unocal presented actual pre-stimulation flow data and also calculated permeability data for the Rincon Area. The applicant presented testimony and exhibits to explain how, (applying Darcy's Law), the average pre-stimulation stabilized production at atmospheric pressure, or calculated against atmospheric pressure, in the Rincon Area was determined to be 130 MCFPD.

(13) The applicant's witness testified, based on the maximum observed historic oil/gas production ratios for wells in the area, that wells in the Rincon Area are expected to produce without stimulation approximately 2.1 BOPD and that the wells in the Rincon Area should produce no more than 5 BOPD.

(14) Within the proposed Rincon Area, the deepest known fresh water zone is the Ojo Alamo which is found at an average depth of approximately 2,500 feet or approximately 4,500 feet above the Dakota Producing Interval.

(15) Existing State of New Mexico and Federal regulations relating to casing and cementing wells will assure development of the Dakota Producing Interval will not adversely affect said aquifer.

(16) FERC Rule 271.703(c)(2)(i)(D) provides that "if the formation or any portion thereof was authorized to be developed by infill drilling prior to the date of recommendation and the jurisdictional agency has information which, in its judgement, indicates that such formation or portion subject to infill drilling can be developed absent the incentive price established in paragraph (a) of this section then the jurisdictional agency shall not include such formation or portion thereof in its recommendation."

(17) The Division, by its Order No R-1670-V, dated May 22, 1979, and effective July 1, 1979, approved infill drilling for the Basin-Dakota Gas Pool in San Juan and Rio Arriba Counties, New Mexico, and said pool includes the Dakota Producing Interval in the area under consideration here.

(18) Only one infill well has been drilled within the area proposed for tight formation designation since 1986.

(19) While the Dakota formation has been extensively drilled and infill developed in other portions of the Basin-Dakota Pool, development in the proposed Rincon Area has been essentially non-existent.

(20) Infill development of the proposed "tight formation" area has been inhibited by the poor quality of the Dakota pay and the poor prospect of commercial production therein.

(21) The applicant presented economics which indicate infill drilling within the proposed area will not occur without some type of price incentive beyond the available current market conditions.

(22) Such an incentive is currently offered through a federal tax credit available to tight formation gas wells under Section 29 of the Internal Revenue Code.

(23) The applicant's economics indicate that said tax credit would make infill drilling within the proposed unit area an attractive financial venture, which then would result in an increase of gas production which would not otherwise be produced thereby preventing waste.

(24) It is recognized by this agency that at the time of the hearing, the FERC has not yet adopted the change proposed in the Notice of Proposed Rulemaking issued in Docket No. RM-91-8-000, which would allow a jurisdictional agency to designate an infill area as a tight formation if the tax credit were necessary to develop the area, and that if such a finding were included in this order, it would be premature.

(25) However, the economics presented by the applicant show that the tax incentive would sufficiently justify further infill development in the proposed tight formation area, if the FERC were to take such matters under consideration, realizing it presently does not.

(26) Based on evidence and testimony submitted by the applicant, the Dakota Producing Interval within the vertical intervals described in Finding Nos. 4 and 5, underlying the area described in Finding No. 2, meets the criteria set forth in FERC Regulations in Title 18 CFR, Section 271.703 and should be recommended for designation as a "tight formation".

IT IS THEREFORE ORDERED THAT:

(1) A recommendation to the Federal Energy Regulatory Commission is hereby submitted pursuant to Section 107 of the Natural Gas Policy Act of 1978 and FERC Regulations in Title 18 CFR, Section 271.703 that the Dakota Producing Interval (Dakota and Graneros formations) within the vertical limits described in Finding Nos. 4 and 5 of this order, underlying the following described lands in Rio Arriba County, New Mexico, be designated as a "tight formation".

Township 26 North, Range 6 West, NMPM
Section 6: All

Township 26 North, Range 7 West, NMPM
Sections 1 and 2: All
Sections 11 and 12: All

Township 27 North, Range 6 West, NMPM
Sections 16 through 23: All
Sections 26 through 32: All

Township 27 North, Range 7 West, NMPM

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| Sections 13 and 14: | All |
| Section 15: | E/2 |
| Section 22: | E/2 |
| Sections 23 through 26: | All |
| Section 27: | NE/4 and S/2 |
| Section 28: | S/2 |
| Sections 33 through 36: | All |

The above lands contain 20,962.90 acres, more or less, and are to be designated the Rincon Tight Formation Area.

(2) Jurisdiction of this cause 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.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

WILLIAM J. LEMAY
Director

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