

**CASE 2176: Application of HONOLULU
for a pressure maintenance project
in the Horseshoe-Gallup Oil Pool.**

Case No.

2176

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

APPLICATION OF HONOLULU OIL
CORPORATION FOR AN ORDER AUTHORIZING
THE INJECTION OF WATER FOR PRESSURE
MAINTENANCE AND SECONDARY RECOVERY
PURPOSES INTO THE GALLUP FORMATION
UNDERLYING APPLICANT'S NAVAJO LEASE
IN THE HORSESHOE-GALLUP OIL POOL,
SAN JUAN COUNTY, NEW MEXICO PURSUANT
TO RULE 701 OF THE RULES AND REGULA-
TIONS OF THE NEW MEXICO OIL CONSERVA-
TION COMMISSION AND FOR THE PROMULGA-
TION OF SPECIAL RULES GOVERNING THE
OPERATION OF SAID PROJECT.

CASE NUMBER 2176

TO THE HONORABLE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO:

Comes the Honolulu Oil Corporation, with a certificate of authority to do business in the State of New Mexico, and hereby makes application to the New Mexico Oil Conservation Commission for an order authorizing the injection of water for pressure maintenance and secondary recovery purposes into the Gallup formation underlying Applicant's Navajo lease embracing lands within the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, pursuant to Rule 701 of the Commission, and for the promulgation of special rules governing the operation of said project, and in support thereof respectfully shows:

Reference is made to application of Honolulu Oil Corporation in Case No. 2023 before the Oil Conservation Commission. That application was dismissed upon the request of Honolulu Oil Corporation. That application was identical to the following application, except for the rules requested. The exhibits referred to hereinbelow were attached to the application of Honolulu in Case No. 2023, and are not enclosed with this application, but reference is made to the previous application and the exhibits therein which are incorporated in this application by reference.

*Respectfully,
Honolulu Oil Corp.
1-30-61*

1. That there is attached hereto, made a part hereof, and for purposes of identification marked Exhibit "1", a plat showing the Navajo lease of applicant embracing lands within the Horseshoe-Gallup Oil Pool, together with the location of all wells drilled thereon and all wells drilled within a radius of two miles from the proposed injection well hereinafter referred to, which said proposed injection well located upon said lease is producing from the Gallup formation which is a member of the Mancos formation of Cretaceous age. Said Exhibit "1" also shows the location of the proposed injection well and the ownership of the respective leasehold interests within a radius of two miles from applicant's oil and gas lease.

2. That there is outlined in red on Exhibit "1" attached hereto, the proposed project area which is a part of the lands embraced in applicant's Navajo lease, and which embrace the following described lands, to-wit:

Township 21 North, Range 17 West, N.M.P.M.

Section 5: NW $\frac{1}{4}$, SE $\frac{1}{4}$
Section 6: NW $\frac{1}{4}$, SE $\frac{1}{4}$
Section 7: All
Section 8: All

containing 1920 acres, more or less.

3. That there is filed herewith and for purposes of identification marked Exhibit "2", an electrical log of the proposed injection well, more particularly described as follows:

Honolulu's No. 4 well --- SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 5.

4. With respect to a description of the proposed injection well casing program, applicant states that said proposed injection well now has thirty feet of surface pipe cemented to the surface and 4 $\frac{1}{2}$ or 5 $\frac{1}{2}$ casing cemented from top to bottom with perforations between approximately 1150 and 1160 feet.

5. Applicant proposes to inject water through the injection well above set forth into the Gallup-Sandstone producing formation

underlying the project area, the water to be injected at rates ranging between 75 barrels and 350 barrels per day per well.

Applicant proposes to obtain the water for injection purposes from Humble Oil & Refining Company's water Well No. 1 located in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ of Section 10, Township 31 North, Range 17 West, N.M.P.M., and which is shown on Exhibit "1" attached hereto, and which said well is capable of producing water in quantities believed to be sufficient for the proposed pressure maintenance and secondary recovery project from the Morrison formation. That applicant has furnished the Office of the State Engineer with a description of said well, together with a water analysis report of the water which complies with Commission Memorandum No. 5-58 dated January 31, 1958.

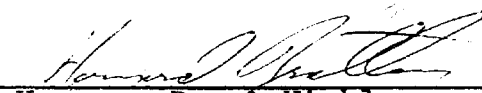
6. That applicant is the sole owner of the oil and gas lease shown on Exhibit "1" attached hereto, and which embraces all of the proposed project area, and applicant believes that it will be in the interest of conservation and the prevention of waste to inaugurate a water injection program for pressure maintenance and secondary recovery purposes as soon as possible by the injection of water into the injection well above referred to, and that said project is in the interest of obtaining the greatest ultimate recovery of oil and gas from said formation.

7. Applicant respectfully requests that the area hereinabove described be designated as the project area, and that an allowable formula fixed therefor and in connection therewith requests that the special rules which were adopted for the Humble Oil & Refining Company pressure maintenance project in Order No. R-1745, Case No. 2024, be adopted for this project, changing only the description of the project area.

Applicant requests that this application be set down for
hearing before an examiner at the earliest possible date.

Respectfully submitted,
HONOLULU OIL CORPORATION

By


Hervey, Dow & Hinkle
P. O. Box 547
Roswell, New Mexico

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date

2/13/61

CASE NO.

2176

HEARING DATE

2/8/61 9am DSN @ SF

My recommendations for an order in the above numbered case(s) are as follows:

Enter an order authorizing a press. maint.
project for Honolulu in the Horrocks Gallup
Oil Pool

Limit the project area to the SE/4
of Sec 5 and the N/2 NE/4 of Sec 8
T 31 N, R 18 W, San Juan Co, N.M.

Injection to be water thru the
Honolulu Navajo ~~well~~ Well No 4-S
located in the SE/4 SE/4 of ^{said} Sec ~~5~~ 5.

Provide project rules identical to
the Numbert Press Maint Proj as promulgated
in Order No. R 1745.


Staff Member
Examiner

No. 4-61

DOCKET: EXAMINER HEARING - WEDNESDAY, FEBRUARY 8, 1961

OIL CONSERVATION COMMISSION - 9 A. M., CONFERENCE ROOM - STATE LAND OFFICE
BUILDING, SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Oliver E. Payne, Attorney, as alternate examiner:

- CASE 2171: Application of Amerada Petroleum Corporation for permission to commingle the production from several separate pools and for an automatic custody transfer system. Applicant, in the above-styled cause, seeks permission to commingle the production from the Justis-Blinebry, Justis-Drinkard, Justis-Fusselman, and an undesignated 5000 foot pay zone from all wells presently completed or hereafter drilled on the Ida Wimberley Lease comprising portions of Sections 24, 25 and 26, Township 25 South, Range 37 East, Lea County, New Mexico. Applicant further seeks permission to install an automatic custody transfer system to handle said commingled production.
- CASE 2172: Application of Rice Engineering & Operating, Inc. for a salt water disposal well. Applicant, in the above-styled cause, seeks an order authorizing the disposal of produced salt water through its Gulf Houston Well No. 1, located 1980 feet from the South and East lines of Section 19, Township 12 South, Range 38 East, Lea County, New Mexico, with injection to be in the Devonian formation in the interval from 12,200 feet to 12,500 feet.
- CASE 2173: Application of Yates Petroleum Corporation for an order force-pooling a 322.4-acre gas proration unit in the Atoka-Pennsylvanian Gas Pool. Applicant, in the above-styled cause, seeks an order force-pooling all mineral interests in the Atoka-Pennsylvanian Gas Pool in the S/2 of Section 21, Township 18 South, Range 26 East, Eddy County, New Mexico. Interested parties include J. N. Hawkins, J. W. Potter, William H. Swearingen, Smith B. Crane, Frank F. Coon, A. F. Escobar, Olive E. Harrison, Pan American Petroleum Corporation, Mayme Ressinger, J. R. Raymond, Isabell Gallegos, Alice Heck Martin, Maze Heck Pinnell, Wave Heck Hill.

- CASE 2174: Application of Yates Petroleum Corporation for an order force-pooling a 322.2-acre gas proration unit in the Atoka-Pennsylvanian Gas Pool. Applicant, in the above-styled cause, seeks an order force-pooling all mineral interests in the Atoka-Pennsylvanian Gas Pool in the N/2 of Section 28, Township 18 South, Range 26 East, Eddy County, New Mexico. Interested parties include William H. Swearingen, Alice Heck Martin, Maze Heck Pinnell, Wave Heck Hill, J. W. Potter, James W. Hall and Mrs. Lucille Ruddell South.
- CASE 2175: Application of Sunray Mid-Continent Oil Company for an oil-oil dual completion utilizing two strings of casing. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its State "Y" Well No. 1, located in Unit G, Section 32, Township 18 South, Range 31 East, Eddy County, New Mexico, in such a manner as to permit the production of oil from the Culwin-Yates Pool and the production of oil from the North Shugart Queen-Grayburg Pool through parallel strings of 2 7/8-inch casing cemented in a common well bore.
- CASE 2176: Application of Honolulu Oil Corporation for a pressure maintenance project. Applicant, in the above-styled cause, seeks an order authorizing it to install a pressure maintenance project in the Horseshoe-Gallup Oil Pool by the injection of water into the Gallup formation through its Navajo Well No. 4, located in the SE/4 SE/4 of Section 5, Township 31 North, Range 17 West, San Juan County, New Mexico. Applicant further seeks the adoption of special rules governing the operation of said project.
- CASE 2177: Application of Phillips Petroleum Company for an automatic custody transfer system. Applicant, in the above-styled cause, seeks permission to install an automatic custody transfer system to handle the Corbin-Abo Pool production from all wells presently drilled or hereafter completed on the Eilliams Federal Lease comprising portions of Sections 33 and 34, Township 17 South, Range 33 East, Lea County, New Mexico.
- CASE 2178: Application of Humble Oil & Refining Company for permission to commingle the production from several separate leases and for an automatic custody transfer system. Applicant, in the above-styled cause, seeks permission to commingle the

CASE 2178: (Cont.)

Horseshoe-Gallup Oil Pool production from all wells presently completed or hereafter drilled on the Navajo "F" lease, comprising all of Sections 3, 4, 9, and 10, the Navajo "G" lease, comprising all of Sections 1, 2, 11 and 12; and the Navajo "M" lease, comprising the NE/4 of Section 5, all in Township 31 North, Range 17 West, San Juan County, New Mexico. Applicant further seeks permission to install an automatic custody transfer system to handle said commingled production.

CASE 2179:

Application of Drilling and Exploration Company, Inc. for approval of the Mescalero Ridge Unit Agreement. Applicant, in the above-styled cause, seeks approval of the Mescalero Ridge Unit Agreement, which unit embraces 7521 acres of Federal and State lands in Township 19 South, Range 34 East, Lea County, New Mexico.

CASE 2180:

Application of Great Western Drilling Company for an order force-pooling a 40-acre proration unit in the Eumont Gas Pool. Applicant, in the above-styled cause, seeks an order force-pooling all mineral interests in the Eumont Gas Pool in the SE/4 NE/4 of Section 32, Township 19 South, Range 37 East, Lea County, New Mexico. Interested parties include Dr. Hans May, B. A. Bowers, Estate of George F. Henneberry, William R. Kershaw, C. B. Neal, Fred Manley, Mae Williams, and W. L. Crutchfield.

CASE 2181:

Application of Gulf Oil Corporation for approval of the Hackberry Hills Unit Agreement. Applicant, in the above-styled cause, seeks approval of the Hackberry Hills Unit Agreement, which unit embraces 13,920 acres in Townships 21 and 22 South, Ranges 25 and 26 East, Eddy County, New Mexico.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2176
Order No. R-1876

APPLICATION OF HONOLULU OIL CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT IN THE
HORSESHOE-GALLUP OIL POOL, SAN JUAN COUNTY,
NEW MEXICO, AND FOR THE PROMULGATION OF
SPECIAL RULES GOVERNING THE OPERATION OF
SAID PROJECT.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on February 8, 1961, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 17th day of February, 1961, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Honolulu Oil Corporation, proposes to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through its Navajo Well No. 4-5 located in the SE/4 SE/4 of Section 5, Township 31 North, Range 17 West, NMPN, San Juan County, New Mexico.

(3) That the project area should consist of the SE/4 of Section 5 and the N/2 NE/4 of Section 8, Township 31 North, Range 17 West, NMPN, San Juan County, New Mexico.

(4) That top unit allowable should be assigned to each injection well and that the allowable assigned to any producing well in the project area should be no greater than the demonstrated ability of the well to produce, subject to top unit allowable for the pool. In the case of curtailed or shut-in producing wells, the allowable should be no greater than the

demonstrated ability of such well to produce as reflected by a 24-hour test at a stabilized rate of production immediately prior to such shut-in or curtailment. In no event should such allowable be greater than the current normal unit allowable for the Horseshoe-Gallup Oil Pool during the month of transfer.

(5) That the applicant also proposes that an administrative procedure be established whereby the pressure maintenance project may be expanded for good cause shown, and whereby additional wells in the project area may be converted to water injection.

(6) That Special Rules and Regulations for the operation of the Horseshoe-Gallup Pressure Maintenance Project Number 3 should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project in any proportion, provided that no well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the Horseshoe-Gallup Oil Pool until such time as the well has experienced a substantial response to water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the Horseshoe-Gallup Oil Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant, Homolun Oil Corporation, is hereby authorized to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, to be designated as the Horseshoe-Gallup Pressure Maintenance Project No. 3, by the injection of water into the Gallup formation through its Navajo Well No. 4-5, located in the SE/4 SE/4 of Section 5, Township 31 North, Range 17 West, NMPM, San Juan County, New Mexico.

(2) That Special Rules and Regulations governing the operation of the Horseshoe-Gallup Pressure Maintenance Project No. 3, San Juan County, New Mexico, are hereby promulgated as follows, effective March 1, 1961.

SPECIAL RULES AND REGULATIONS
FOR THE HORSESHOE-GALLUP PRESSURE
MAINTENANCE PROJECT NO. 3

RULE 1. The project area of the Horseshoe-Gallup Pressure Maintenance Project No. 3, hereinafter referred to as the Project, shall comprise the SE/4 of Section 5 and the N/2 NE/4 of Section 8, Township 31 North, Range 17 West, NMPM, San Juan County, New Mexico.

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Order No. R-1876

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the Horseshoe-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Horseshoe-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until such time as the well receives a substantial response to water injection. When such a response has occurred, the well shall be permitted to produce up to two times top unit allowable for the Pool. Production of such well at a higher rate shall be authorized only after notice and hearing. Each producing well shall

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Order No. R-1876

be subject to the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Horseshoe-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times \bar{r}_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- A_{adj} = the well's daily adjusted allowable
 TUA = ten unit allowable for the pool
 \bar{r}_a = the well's acreage factor
 P_g = average daily volume of gas produced by the well during the preceding month, cubic feet
 I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
 P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to

be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the Horseshoe-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water

injected shall be computed in accordance with the following formula:

$$N_g = (V_w \text{ inj} - V_w \text{ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^\circ}{T_r} \times \frac{1}{Z}$$

where:

- N_g - Average daily gas equivalent of net water injected, cubic feet
- $V_w \text{ inj}$ - Average daily volume of water injected, barrels
- $V_w \text{ prod}$ - Average daily volume of water produced, barrels
- 5.61 - Cubic foot equivalent of one barrel of water
- P_a - Average reservoir pressure at mid-point of the pay-zones of Horseshoe-Gallup Oil Pool in project area, psig + 12.01, as determined from most recent survey
- 15.025 - Pressure base, psi
- 520° - Temperature base of $60^\circ F$ expressed as absolute temperature
- T_r - Reservoir temperature of $87^\circ F$ expressed as absolute temperature ($547^\circ R$)
- Z - Compressibility factor from analysis of Horseshoe-Gallup gas at average reservoir pressure, P_a , interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9728	300	.8325	500	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5855
200	.8985	450	.7370	700	.5520
250	.8600	500	.6900	750	.4630
				800	.3915

RULE 9. Each month the project operator shall, within three days after the normal wait allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission,

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Order No. R-1876

outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the Pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 30 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

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CASE No. 2176
Order No. R-1876

DONE at Santa Fe, New Mexico, on the day and year herein-
above designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

J. L. Meehan

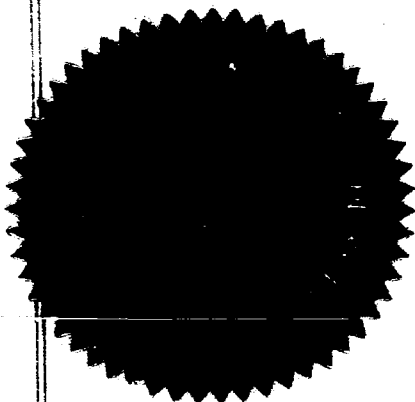
EDWIN L. MEEHAN, Chairman

E. S. Walker

E. S. WALKER, Member

A. L. Foster, Jr.

A. L. FOSTER, JR., Member & Secretary

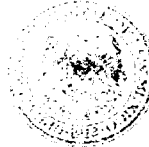


EST/

GOVERNOR
JOHN BURROUGHS
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
MURRAY E. MORGAN
MEMBER



STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY DIRECTOR

P. O. BOX 871
SANTA FE

February 17, 1961

Mr. Edward Bratton
Harvey, Row & Hinkle
Box 547
Roswell, New Mexico

Re: Case No. 2176
Order No. R-1876
Applicant:
Honolulu Oil Corporation

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. PORTER, Jr.,
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC X

Other

DRAFT

RSM/esr
February 13, 1961

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 2176
Order No. R-1874

APPLICATION OF HONOLULU OIL CORPORATION
FOR A PRESSURE MAINTENANCE PROJECT IN THE
HORSESHOE-GALLUP OIL POOL, SAN JUAN COUNTY,
NEW MEXICO, AND FOR THE PROMULGATION OF
SPECIAL RULES GOVERNING THE OPERATION OF
SAID PROJECT.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on
February 8, 1961, at Santa Fe, New Mexico, before Daniel S. Nutter
Examiner duly appointed by the Oil Conservation Commission of New
Mexico, hereinafter referred to as the "Commission," in accordance
with Rule 1214 of the Commission Rules and Regulations.

NOW, on this _____ day of February, 1961, the Commission,
a quorum being present, having considered the application, the
evidence adduced, and the recommendations of the Examiner, Daniel S.
Nutter, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Honolulu Oil Corporation, proposes
to institute a pressure maintenance project in the Horseshoe-
Gallup Oil Pool, San Juan County, New Mexico, by the injection
of water into the Gallup formation through its Navajo Well No. 475
located in the SE/4 SE/4 of Section 5, Township 31 North, Range
17 West, NMPM, San Juan County, New Mexico.

(3) That the ~~proposed~~ project area ^{should} consist of the SE/4
of Section 5 and the N/2 NE/4 of Section 8, Township 31 North,
Range 17 West, NMPM, San Juan County, New Mexico.

(4) That top unit allowable ^{should} ~~is to~~ be assigned to each
injection well and that the allowable assigned to any producing
well in the project area ^{should} ~~shall~~ be no greater than the demonstrated

ability of the well to produce, subject to top unit allowable for the pool. In the case of curtailed or shut-in producing wells, the allowable ^{should} ~~shall~~ be no greater than the demonstrated ability of such well to produce as reflected by a 24-hour test at a stabilized rate of production immediately prior to such shut-in or curtailment. In no event ^{should} ~~is~~ such allowable ^(to) be greater than the current normal unit allowable for the Horseshoe-Gallup Oil Pool during the month of transfer.

(6)^b That the applicant also proposes that an administrative procedure be established whereby the pressure maintenance project may be expanded for good cause shown, and whereby additional wells in the project area may be converted to water injection.


(7)^b That Special Rules and Regulations for the operation of the Horseshoe-Gallup Pressure Maintenance Project Number 3 should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project in any proportion, provided that no well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the Horseshoe-Gallup Oil Pool until such time as the well has experienced a substantial response to water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the Horseshoe-Gallup Oil Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant, Honolulu Oil Corporation, is hereby authorized to institute a pressure maintenance project in the Horseshoe-Gallup Oil Pool, San Juan County, New Mexico, to be designated as the Horseshoe-Gallup Pressure Maintenance Project No. 3, by the injection of water into the Gallup formation through its Navajo Well No. 4^b located in the SE/4 SE/4 of Section 5, Township 31 North, Range 17 West, NMPM, San Juan County, New Mexico.

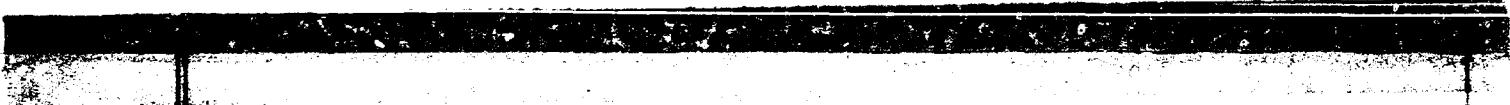
(2) That Special Rules and Regulations governing the operation of the Horseshoe-Gallup Pressure Maintenance Project No. 3, San Juan County, New Mexico, are hereby promulgated as follows, effective March 1, 1961.

SPECIAL RULES AND REGULATIONS
FOR THE HORSESHOE-GALLUP PRESSURE
MAINTENANCE PROJECT NO. 3

RULE 1. The project area of the Horseshoe-Gallup Pressure Maintenance Project No. 3, hereinafter referred to as the Project, shall comprise the SE/4 of Section 5 and the N/2 NE/4 of Section 8, Township 31 North, Range 17 West, NMPM, San Juan County,  New Mexico.

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient —



operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on a 40-acre proration unit shall be top unit allowable for the Horseshoe-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Horseshoe-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until such time as the well receives a substantial response to water injection. When such a response has occurred, the well shall be permitted to produce up to two times top unit allowable for the Pool. Production of such well at a higher rate shall be authorized only after notice and hearing. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Horseshoe-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Horseshoe-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted

oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2,000}{\frac{P_g - I_g}{P_o}}$$

where:

- A_{adj} = the well's daily adjusted allowable
- TUA = top unit allowable for the pool
- F_a = the well's acreage factor
- P_g = average daily volume of gas produced by the well during the preceding month, cubic feet
- I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet
- P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to

be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the Horseshoe-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_{w \text{ inj}} - V_{w \text{ prod}}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^0}{\bar{T}} \times \frac{1}{\bar{Z}}$$

where:

- E_g = Average daily gas equivalent of net water injected, cubic feet
- $V_{w \text{ inj}}$ = Average daily volume of water injected, barrels

- $V_w \text{ prod}$ = Average daily volume of water produced, barrels
- 5.61 = Cubic foot equivalent of one barrel of water
- P_a = Average reservoir pressure at mid-point of the pay-zones of Horseshoe-Gallup Oil Pool in project area, psig + 12.01, as determined from most recent survey
- 15.025 = Pressure base, psi
- 520° = Temperature base of 60°F expressed as absolute temperature
- T_r = Reservoir temperature of 87°F expressed as absolute temperature (547°R)
- Z = Compressibility factor from analysis of Horseshoe-Gallup gas at average reservoir pressure, P_a , interpolated from compressibility tabulation below:

Reservoir Pressure	Z	Reservoir Pressure	Z	Reservoir Pressure	Z
50	.9725	300	.8325	500	.6560
100	.9465	350	.8030	600	.6135
150	.9215	400	.7710	650	.5655
200	.8885	450	.7220	700	.5220
250	.8600	500	.6900	750	.4630
				800	.3935

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

DONE at Santa Fe, New Mexico, on the day and year herein-above designated.

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

~~JOHN BURROUGHS~~, Chairman

~~MURRAY E. MORGAN~~, Member

S E A L

A. L. PORTER, Jr., Member & Secretary

csr/

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 8, 1961

EXAMINER HEARING

IN THE MATTER OF:

Application of Honolulu Oil Corporation for a pressure maintenance project. Applicant, in the above-styled cause, seeks an order authorizing it to install a pressure maintenance project in the Horseshoe-Gallup Pool by the injection of water into the Gallup formation through its Navajo Well No. 4, located in the SE/4 SE/4 of Section 5, Township 31 North, Range 17 West, San Juan County, New Mexico. Applicant further seeks the adoption of special rules governing the operation of said project.

Case
2176

BEFORE:

Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

MR. NUTTER: Call Case 2176.

MR. MORRIS: Application of Honolulu Oil Corporation for a pressure maintenance project.

MR. BRATTON: Howard Bratton, Roswell, New Mexico, appearing on behalf of the applicant, Honolulu Oil Corporation. We have one witness. I ask he be sworn.

(Witness sworn.)

GEORGE R. HOY

called as a witness, having been previously duly sworn, testified as follows:

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DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, by whom you are employed, and in what capacity?

A George R. Hoy, employed by Honolulu Oil Corporation, Division Drilling and Proration Engineer at Midland, Texas.

Q Does your area include the area involved in the subject application?

A Yes, sir, it does.

Q Have you previously testified before this Commission as an expert witness?

A Yes, sir.

MR. BRATTON: Are the witness's qualifications acceptable?

MR. NUTTER: Yes, sir. Please proceed.

Q Will you state to the Commission the nature of the application and what you are requesting?

A This application by Honolulu Oil Corporation is for permission to inject water in the portion of the Gallup formation underlying the Honolulu Navajo Lease in the Horseshoe-Gallup Oil Pool. This lease consists of the NW/4 SE/4 of Section 5, NW/4 of the SE/4 of Section 6, all of Section 7 and 8, in Township 31 North, Range 17 West, San Juan County, New Mexico. The only production on the Honolulu Lease at present is from the SE/4 of Section 5.

Q Will you refer to the map that has been marked Applicant's Exhibit No. 1 and explain what it shows, Mr. Hoy?

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A Applicant's Exhibit No. 1 shows the portion of the Horse-shoe-Gallup Oil Field surrounding the Honolulu leases for a distance of two miles. The Honolulu lease is outlined in red, well locations of Honolulu wells and other operators' wells are also shown.

Q Mr. Hoy, the area covered by this application adjoins a project previously approved for Humble Oil and Refining in Case 2024 before this Commission, is that correct?

A Yes, sir, that is correct.

MR. BRATTON: Mr. Examiner, we have here the file of Case 2024. We will ask that the record in that case, including the exhibits, be adopted in this case by reference as I believe it will eliminate a great deal of duplication. This is actually just an extension of the project previously before the Commission, and actually the evidence in that case covered this area as well as the adjoining Humble area.

MR. NUTTER: This will save going through a lot a technical details?

THE WITNESS: All the geological and reservoir data is already covered in that file in some detail.

MR. NUTTER: The record in Case 2024 will be incorporated, by reference, in Case 2176.

Q (By Mr. Bratton) Referring to Honolulu's well itself, that we are discussing here, the injection well, will you describe it, Mr. Hoy, and the completion and what you propose?

A Yes, sir. Our proposed injection well is Honolulu's Navajo



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No. 4 located 660 feet from the south and east lines of Section 5. This will be Honolulu's Exhibit No. 2, radioactive log of the well. Well No. 4 was spudded February 24, 1959; 8-5/8 surface casing at 28 feet cemented to the surface through the annulus with 10 sacks of cement. Well then drilled to T.D. of 1,242 feet with a rotary rig using air as a circulating medium. After running the radioactive log from surface to T.D. a string of 4 1/2-inch casing 1,234 feet and cemented from top to bottom with 180 sacks of cement. After cement had set the well was perforated with two jet shots per foot from 1,095 to 1,128 feet. The well was then fracked with 200 gallons mud acid, 15,860 gallons crude oil, 40,000 pounds of sand; after cleaning out the 2-inch tubing was set at 1,116 feet and the well put on the pump. Initial potential test was 47 barrels of oil with no water. This was a 24-hour test, ending March 23, 1959. The initial gas-oil ratio was 546 cubic feet per barrel.

July 1, 1960 to January 1, 1961, production from this well averaged 8.5 barrels of oil per day; accumulated production from this well to January 1, 1961, 14,141 barrels of oil.

Q What is your proposed injection program, Mr. Hoy?

A Honolulu proposes to inject water into the Gallup sandstone formation through the perforated intervals, 1,095, 1,128 feet in the Well No. 4. The initial injection rate will be approximately 300 barrels of water per day to a reservoir fill-up which will be reached in approximately three years. Then the injection rate will drop to between 75 barrels and 200 barrels per day. During the



fill-up, injection is anticipated to be by gravity flow. Based on our present knowledge of the reservoir we do not think the pump pressure will be necessary to inject the water.

Q Where are you going to obtain the water for this program, Mr. Hoy?

A Water will be obtained from the Humble Oil and Refining Company. This water is presently being produced from the Morrison formation in the Honolulu-Humble Navajo No. 1-F located in the NW/4 of Section 10.

Q That is the same water supply that is being used for the rest of the project?

A Yes, sir, that is correct.

Q Now, have you furnished the State Engineer all of the information required as to water source and injection program, casing program?

A Yes, sir. That is on file with the State Engineer's Office, having been furnished by Humble Oil and Refining Company in the previous hearing.

Q You have been in contact with the State Engineer in connection with this application?

A Yes, sir, we have.

Q What is your estimate of recovery, again, Mr. Hoy?

A The estimated recovery, based on studies made by Honolulu engineers, under the project area, is 100,000 barrels of recoverable oil, or approximately 20% of the oil in place on the primary. The

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engineering studies also indicate that an additional recovery of approximately 22% would make a total of 42% of the recoverable oil in place which may be anticipated from the proposed pressure maintenance and secondary recovery, for an additional 110,0000 barrels, approximately.

Q Referring to your Exhibit No. 1, the project area which you propose is outlined in red on that exhibit?

A Yes, sir, that is correct.

Q What rules are you requesting?

A Honolulu is requesting that the same rules that have been applied to the Humble application, known as Horseshoe-Gallup Pressure Maintenance Project No. 2, Case No. 2024, Order 1,745, be also applied to the application made by Honolulu, excepting, of course, the project area.

Q In connection with this application, Mr. Hoy, as Exhibit No. 2 you have a log of your proposed injection well, is that correct?

A Yes, sir, we do have, and on the section there are marked the present perforated intervals.

Q You have otherwise furnished all the information required by the Commission regulations in connection with your application in this matter?

A Yes, we have.

Q Were Exhibits No. 1 and 2 prepared by you or under your supervision?



A Yes, sir, they were.

Q Is there anything further you care to testify to in connection with this?

A No, sir, I have nothing further.

MR. BRATTON: We would offer Applicant's Exhibits Nos. 1 and 2, and we have nothing further at this time.

MR. NUTTER: Honolulu's Exhibits 1 and 2 will be entered in evidence. Does anyone have any questions?

BY MR. PAYNE:

Q Is the Humble 26-F Well in Section 4 a producing well?

A Yes, sir, it is a producing well, to my knowledge, at the present time.

Q What about the 3-F Well just north of that well?

A To my understanding that is an injection well.

Q Mr. Hoy, as I understand your testimony, you are seeking adoption of the Humble rules for your project?

A Yes, sir, that is correct.

Q Now, aren't you liable to run into some trouble with these rules inasmuch as both of your producing wells directly offset wells in the Humble project and, therefore, if we have the Humble rules you can't transfer any allowable from your injection well to these two producing wells until such time as these wells have received a response?

A That is correct. However, it will require a month by month engineering study to determine the response of the producing



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Q Then, when they have received a response, neither well will be allowed to produce an excess of two times top unit allowable; you are aware of that?

A Yes, sir.

Q Do you know if the Humble No. 2 Well, and the No. 6 Well in Section 5 have received responses yet?

A No, sir, I do not know about that.

Q Actually, I suppose when you get a response what you propose to do is transfer the allowable from the No. 4 Well in more or less equal parts to the 2 and 3 wells?

A That is our present proposal, yes, sir.

Q Depending, of course, on which one receives a response first?

A Yes.

MR. BRATTON: I believe Case No. 2024 shows the pattern of the flood.

Q (By Mr. Payne) Actually, your pattern here ties right in with the Humble pattern?

A Yes, it does.

BY MR. NUTTER:

Q I believe you stated that the No. 4 Well, the proposed injection well, has produced some 14,000 barrels to date?

A Yes, sir, it has.

Q What do you expect its ultimate recovery would be if it weren't converted to water injection?



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A An estimated, between 20 and 22,000 barrels over the life of the well. However, that would be drawing it down below its economical limit.

Q Do you anticipate drilling any more wells on this lease?

A Not until we see what the response is from the proposed pressure maintenance.

Q The 100,000 barrels that you expected from the project area on primary recovery, or 20%, is that oil that underlies these three 40-acre tracts?

A No, sir. That is based on isopach studies of the entire lease.

Q This could include some additional locations?

A Yes, sir, it could.

Q You expect the three wells, plus any additional pay you may have on the isopach, will yield a total of 110,000 on secondary in addition to the 100,000 on primary, or 42% of the initial oil in place?

A Yes, sir.

BY MR. PAYNE:

Q What are the depths of these wells?

A The depth is between 1100 and 1200 feet, the producing interval. Most of our wells were drilled to a depth of below 1200 or 1250 in order to get casing set through the possible producing zones.

Q In Section 5, the No. 2 and No. 6 wells of Humble, your



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rights are below 1665 feet?

A That is correct. I will explain that a little further. The block of four sections, 5, 6, 7 and 8, was entirely purchased by Honolulu from the Navajo tribe of Indians at a lease sale, and then later, after the initial drilling in the Horseshoe-Gallup started, it seemed to be progressing northwestward, and Honolulu farmed out or assigned to R. M. Bayless the sections shown that are now owned by Humble, quarter sections. Humble purchased their acreage from R. M. Bayless. We retained the rights below 1650.

Q Do you know if Humble has expanded their pressure maintenance project to include the three wells in the NE/4 of Section 5?

A No, sir. I cannot testify to that.

Q Are you going to inject in the same benches of the Gallup as Humble is in their project?

A Yes, sir.

MR. NUTTER: Any further questions of Mr. Hoy? You may be excused.

MR. BRATTON: I might state that Humble has expanded the pressure maintenance of the NE of 5, and also that Humble concurs in the application of Honolulu and requests the application be granted.

MR. NUTTER: Do you have anything further, Mr. Bratton?

MR. BRATTON: No, sir.

MR. NUTTER: Does anyone have anything they wish to offer



in Case 2176? Take the case under advisement.

STATE OF NEW MEXICO)
COUNTY OF BERNALILLO) ss

I, JUNE PAIGE, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal this 13th day of February, 1961.

Jane Paige
Notary Public - Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2176, heard by me on 2/8, 1961.

[Signature], Examiner
New Mexico Oil Conservation Commission

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E X H I B I T S

<u>NUMBER</u>	<u>EXHIBIT</u>	<u>IDENTIFIED</u>	<u>OFFERED</u>	<u>ADMITTED</u>
Ex.#1	Map	2	7	7
Ex.#2	Radioactive Log	4	7	7

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