ASE 2469: Application of EL PASO NATURAL GAS CO. to establish rules for the LUSK-STRAWN POOL.

Case No.

2469

plication, Transcript,

mall Exhibits, Etc.

No. 8-62

DOCKET: REGULAR HEARING - WEDNESDAY - MARCH 14, 1962

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

ALLOWABLE: (1) Consideration of the oil allowable for April, 1962.

(2) Consideration of the allowable production of gas for April, 1962, from ten prorated pools in Lea and Eddy Counties, New Mexico, also consideration of the allowable production of gas from nine prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico, for April, 1962.

CASE 2469: (Rehearing):
Application of El Paso Natural Gas Company for special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including a provision for 160-acre oil proration units.

CASE 2504: Application of Consolidated Oil & Gas, Inc. for an amendment of Order No. R-1670-C to establish an allocation formula for the Basin-Dakota Gas Pool, San Juan, Rio Arriba and Sandoval Counties, New Mexico, which will differ from the allocation formula prescribed for the prorated gas pools of Northwest New Mexico by Rule 9 (C) of Order No. R-1670. Applicant recommends an allocation formula based 60 percent on acreage and 40 percent on acreage times deliverability. The Commission also may consider the establishment of minimum and maximum allowables for the Basin-Dakota Gas Pool.

CASE 2505: Southeastern New Mexico nomenclature case calling for an order creating new pools, extending and abolishing certain existing pools in Eddy, Lea, Roosevelt and Chaves Counties, New Mexico.

(a) Create a new pool classified as an oil pool for Cisco production, designated as the Baish-Cisco Pool, and described as:

TOWNSHIP 17 SOUTH, RANGE 32 EAST, NMPM
Section 21: SE/4

(b) Create a new pool classified as an oil pool for San Andres production, designated as the Pecos-San Andres Pool, and described as:

TOWNSHIP 7 SOUTH, RANGE 26 EAST, NMPM
Section 32: NE/4
Section 33: NW/4

(c) Create a new pool classified as an oil pool for Pennsylvanian production, designated as the East Prairie-Pennsylvanian Pool, and described as:

TOWNSHIP 8 SOUTH, RANGE 36 EAST, NMPM
Section 23: SW/4

(d) Create a new pool classified as an oil pool for Bone Springs production, designated as the Quahada Ridge-Bone Springs Pool, and described as:

TOWNSHIP 21 SOUTH, RANGE 29 EAST, NMPM
Section 27: SW/4

(e) Create a new pool classified as an oil pool for Bone Springs production, designated as the Scharb-Bone Springs Pool, and described as:

TOWNSHIP 19 SOUTH, RANGE 35 EAST, NMPM
Section 6: SW/4

(f) Create a new pool classified as an oil pool for Wolfcamp production, designated as the South Tulk-Wolfcamp Pool, and described as:

TOWNSHIP 15 SOUTH, RANGE 35 EAST, NMPM
Section 18: NW/4

(g) Abolish the Baish-Pennsylvanian Pool described as:

TOWNSHIP 17 SOUTH, RANGE 32 EAST, NMPM
Section 21: SE/4

(h) Abolish the East Vacuum-Abo Pool described as:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 35: S/2 & NE/4
Section 36: SW/4 & S/2 NW/4

(i) Extend the Allison-Pennsylvanian Pool to include:

TOWNSHIP 8 SOUTH, RANGE 37 EAST, NMPM
Section 33: SW/4

(j) Extend the Atoka-Pennsylvanian Gas Pool to include:

TOWNSHIP 18 SOUTH, RANGE 26 EAST, NMPM
Section 28: SW/4

(k) Extend the Blinebry Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 30: SE/4

(l) Extend the Crosby-Devonian Gas Pool to include:

TOWNSHIP 26 SOUTH, RANGE 37 EAST, NMPM
Section 3: NW/4

(m) Extend the North Hackberry-Yates Pool to include:

TOWNSHIP 19 SOUTH, RANGE 30 EAST, NMPM
Section 25: S/2 SE/4

(n) Extend the West Henshaw-Grayburg Pool to include:

TOWNSHIP 16 SOUTH, RANGE 30 EAST, NMPM
Section 2: W/2 SE/4

(o) Extend the Justis Tubb-Drinkard Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 14: NE/4 NE/4

(p) Extend the North Justis-Ellenburger Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 2: NE/4

(q) Extend the North Justis-Tubb-Drinkard Pool to include:

TOWNSHIP 25 SOUTH, RANGE 37 EAST, NMPM
Section 1: SW/4

(r) Extend the Maljamar-Strawn Pool to include:

TOWNSHIP 17 SOUTH, RANGE 32 EAST, NMPM
Section 22: NW/4

(s) Extend the Paddock Pool to include:

TOWNSHIP 21 SOUTH, RANGE 37 EAST, NMPM
Section 19: E/2 SW/4

TOWNSHIP 22 SOUTH, RANGE 37 EAST, NMPM
Section 24: E/2
Section 25: N/2 NE/4

(t) Extend the Pearl-Queen Pool to include:

TOWNSHIP 19 SOUTH, RANGE 35 EAST, NMPM
Section 31: SW/4

TOWNSHIP 20 SOUTH, RANGE 35 EAST, NMPM
Section 6: N/2 NW/4

(u) Extend the Sand Springs-Devonian Pool to include:

TOWNSHIP 11 SOUTH, RANGE 34 EAST, NMPM
Section 11: E/2 NE/4
Section 12: NW/4

(v) Extend the Shugart (Yates-Seven Rivers-Queen-Grayburg) Pool to include:

TOWNSHIP 18 SOUTH, RANGE 30 EAST, NMPM
Section 25: N/2 SE/4

(w) Extend the North Square Lake-Grayburg-San Andres Pool to include:

TOWNSHIP 16 SOUTH, RANGE 31 EAST, NMPM
Section 4: SW/4
Section 8: NW/4
Section 11: NW/4

(x) Extend the Vacuum-Abo Pool to include:

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 34: S/2 N/2
Section 35: S/2 & NE/4
Section 36: SW/4 & S/2 NW/4

CASE 2506: Northwestern New Mexico nomenclature case calling for an order extending certain existing pools in Rio Arriba and San Juan Counties, New Mexico.

(a) Extend the South Blanco-Pictured Cliffs Pool to include:

TOWNSHIP 26 NORTH, RANGE 7 WEST, NMPM
Section 25: NW/4
Section 26: NE/4

(b) Extend the Otero-Chacra Pool to include:

TOWNSHIP 25 NORTH, RANGE 6 WEST, NMPM
Section 13: NE/4

(c) Extend the Table Mesa-Dakota Oil Pool to include:

TOWNSHIP 28 NORTH, RANGE 17 WEST, NMPM
Section 34: S/2

iqg/

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

January 4, 1962

EXAMINER HEARING

IN THE MATTER OF:
Application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including provisions for 160-acre proration units and a limiting gas-oil ratio of 4000 to 1.

CASE NO. 2469

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF HEARING

EXAMINER NUTTER: We will call Case No. 2469.

MR. MORRIS: Application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico.

MR. WHITWORTH: Garrett Whitworth with Mr. Ben R. Howell representing El Paso Natural Gas with a written appearance by Seth, Montgomery, Federici & Andrews of Santa Fe. We have three witnesses, Mr. Richard Lemon, David Rainey, and David Burleson.

(Witnesses sworn.)

RICHARD LEMON,

called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. WHITWORTH:

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

A Richard Lemon. I am employed by El Paso Natural Gas. My position is assistant manager, reservoir engineer department in El Paso, Texas.

Q Have you prepared written testimony in this case?

A Yes, sir, I have.

Q Have copies of that testimony been distributed to the Commission?

A Yes, sir.

Q And the Examiner?

A Yes, sir.

Q You have read this testimony?

A Yes.

Q And you adopt it as your own and you swear to it, is that true?

A Yes, sir.

Q Have your qualifications as an expert witness been accepted by this Commission and made a matter of record?

A They have.

MR. WHITWORTH: At this time, Mr. Examiner, we offer

the prepared testimony of Richard F. Lemon together with El Paso's Exhibits 1 through 10.

EXAMINER NUTTER: Mr. Whitworth, is the prepared testimony which you are offering at this time identical to that which was furnished to the Commission and members of the staff yesterday?

MR. WHITWORTH: It is identical.

EXAMINER NUTTER: Has this been identified in any manner?

MR. WHITWORTH: It has been identified in the prepared testimony and the witness has just identified the prepared testimony.

EXAMINER NUTTER: Exhibits 1 through 10 in Case 2469?

MR. WHITWORTH: Yes, sir.

EXAMINER NUTTER: Is there anyone who desires to hear the prepared testimony of Mr. Lemon in this case?

Are there any objections to the receipt of the prepared testimony rather than oral testimony?

The testimony will be so admitted.

"Q Have you prepared an exhibit which shows the outlines of the Lusk Deep Unit, the development of the Unit and the contours with respect to the Strawn formation?

"A Yes.

"Q Please explain this exhibit to the Examiner.

"A Exhibit 1 shows the outline of the Lusk Deep Unit, which

is located in Sections 7, 8, 17, 18, 19 and 20 in Township 19 South, Range 32 East, in west central Lea County and in the eastern one-half of Section 24, Township 19 South, Range 31 East, in northeastern Eddy County, New Mexico.

"The Lusk Deep Unit is located approximately 14 miles southwest of the town of Maljamar, New Mexico and underlies a portion of the producing area in the shallower Lusk-Yates oil field. The Lusk Deep Unit area includes 2,725 acres.

"Exhibit 1 shows that three wells have been drilled in the Lusk Deep Unit to a depth sufficient to penetrate the Strawn limestone. These wells are the El Paso Natural Gas Company No. 1, No. 2 and No. 3 Lusk Deep Unit.

"The El Paso Natural Gas Company No. 1 Lusk Deep Unit was completed as a dual Bone Springs oil-Strawn oil producing well. The Bone Springs potential test was taken on October 26, 1960. Official initial potential test was 141 barrels of oil per day calculated from an actual flow gauge of 47 barrels of oil in eight hours, through a 9/64" choke. Gas-oil ratio was 1342:1. Flowing tubing pressure ranged from 900 psig to 935 psig. Production was through casing perforations from 8759'-8777'. The formation was treated with 500 gallons of acid.

"The Strawn potential test on well No. 1 was taken on October 7, 1960. Official initial potential test was 732 barrels of oil per day, calculated from an actual flow of 122 barrels of oil in four hours, through a 16/64" choke. Gas-oil ratio was

is located in Sections 7, 8, 17, 18, 19 and 20 in Township 19 South, Range 32 East, in west central Lea County and in the eastern one-half of Section 24, Township 19 South, Range 31 East, in northeastern Eddy County, New Mexico.

"The Lusk Deep Unit is located approximately 14 miles southwest of the town of Maljamar, New Mexico and underlies a portion of the producing area in the shallower Lusk-Yates oil field. The Lusk Deep Unit area includes 2,725 acres.

"Exhibit 1 shows that three wells have been drilled in the Lusk Deep Unit to a depth sufficient to penetrate the Strawn limestone. These wells are the El Paso Natural Gas Company No. 1, No. 2 and No. 3 Lusk Deep Unit.

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"The Strawn potential test on well No. 1 was taken on October 7, 1960. Official initial potential test was 732 barrels of oil per day, calculated from an actual flow of 122 barrels of oil in four hours, through a 16/64" choke. Gas-oil ratio was

2640:1. Flowing tubing pressure was 2345 psig. Production was through casing perforations from 11,168'-11,193'. Completion was natural.

"The El Paso Natural Gas Company No. 2 Lusk Deep Unit was drilled to a total depth of 13,974' to test the Devonian and was subsequently plugged back and completed as a dual Strawn oil-Morrow gas well. The Strawn potential test was taken on April 1, 1961. Official initial potential test was 641 barrels of oil per day, calculated from an actual flow gauge of 53.4 barrels of oil in two hours, through a 16/64" choke. Gas-oil ratio was 3329:1. Flowing tubing pressure was 2400 psig. Production was through casing perforations from 11,220'-11,250'. Perforations were treated with 600 gallons of acid.

"The Morrow potential test was taken on April 1, 1961. Calculated absolute open flowing potential was 31,500 Mcf of gas per day. Gas-condensate ratio was 24,790:1. Shut-in tubing pressure was 3618 psig. Production was through casing perforations from 12,380'-12,398'. Perforations were treated with 600 gallons of acid.

"The El Paso Natural Gas Company No. 3 Lusk Deep Unit was completed as a dual Strawn oil-Morrow gas producing well. The Strawn potential test was taken on November 1, 1961. Official initial potential test was 285 barrels of oil, calculated from an actual flow gauge of 71.27 barrels of oil in six hours, through a 10/64" choke. Gas-oil ratio was 2397:1. Flowing

tubing pressure was 2887 psig. Production was through casing perforations from 11,310'-11,340'. Completion was natural.

"The Morrow potential test was taken on October 31, 1961. Calculated absolute open flowing potential was 30,000 Mcf of gas per day. Gas-condensate ratio was 12,559:1. Shut-in tubing pressure was 3845 psig after being shut in for 72 hours. Production was through casing perforations from 12,370'-12,390'. Completion was natural.

"Shown on Exhibit 1 is an interpretation of the subsurface configuration of the top of the Strawn limestone on the area covered by the plat. This plat is an excerpt taken from a larger structural map contoured on top of the Strawn limestone. This larger map was prepared from information obtained from correlation of electrical and radioactivity logs on a regional basis and incorporates a certain amount of siesmic data. The regional strike mapped on the top of the Strawn formation is approximately north-to-south in the immediate vicinity of the Lusk Deep Unit. A low structural area or trough on the eastern edge of the plat and a low area in the western one-half of Section 12, Township 19 South, Range 31 East are evident. The contours show that the regional dip of the geologic horizon created by the top of the Strawn formation is from west to east at approximately 450' per mile. This regional dip has a closure of a maximum of 200' in portions of Sections 17, 18, 19 and 20 with reference to the top of the Strawn formation. Additional drilling will be required to

further detail the area and define the limits of production.

"The present and proposed revision to the unit participating area is indicated by the shaded areas.

"Q Would you explain the cross-section of six wells on Exhibit No. 2 and what this exhibit shows, and other pertinent information concerning these wells which you have considered.

"A Exhibit 2 is a geological cross-section relating the Strawn Limestone section in the Lusk Strawn Pool area. This cross-section trends in a northwest-southeasterly direction and contains the well logs on the three Lusk Unit Strawn completions, the Pan American Nos. 1 and 2 Greenwood Unit and the Shell No. 1 Perry-Federal. A sub-sea datum of 6000' was selected for the purposes of correlating the logs. The sections in the wells over which drillstem tests were conducted and the perforated intervals are indicated in red and green. The trace of the cross-section appears in the inset map.

"From an interpretation of this cross-section, the following inferences can be reasonably drawn:

"1. The line of Section A-A' is almost parallel to regional strike.

"2. The Strawn oil producing reature is not primarily related to any large deep regional structural feature or anticlinal trend, but is a local north-to-south trending anticlinal feature with an indicated structural closure of 200'. The producing area is also controlled by porosity development, the

thickness and quality of the producing horizon being dependent upon the degree of development of the porosity. An illustration of this is the fact that no porosity is indicated in the Strawn formation from the electrical or radioactivity logs on the Pan American No. 2 Greenwood Unit, located 4 - 3/5 miles northeast of the El Paso Natural Gas Company No. 2 Lusk Deep Unit. The porosity is also undeveloped in the equivalent Strawn section in the Shell Oil Company No. 1 Perry-Federal, located 4 - 1/3 miles southeast of the El Paso Natural Gas Company No. 3 Lusk Deep Unit.

"3. The pool limits for the Lusk-Strawn Oil Pool are not as yet established by drilling.

"4. The dip on the east flank of the producing structure is quite steep. The top of the Strawn in the No. 1 Lusk Unit is 148' higher structurally than in the No. 3 Lusk Unit.

"There has been no evidence of formation water found in studies of test and production data for the Strawn formation in this immediate area. No formation water was found during testing or production of the three Lusk Deep Unit wells.

"The nearest comparable oil production from the Strawn formation is in the Shell Oil Company No. 1 Querecho Plains Unit, located approximately six miles northeast of the El Paso Natural Gas Company No. 2 Lusk Deep Unit. This well was completed as a Strawn oil well on January 11, 1957, through casing perforations from 11,595'-11,625' in the Strawn limestone. Initial flowing

potential was 221 barrels of oil per day with no water reported. The total cumulative production to November 1, 1961, was 257,100 barrels of oil with no water being reported.

"The Shell Oil Company No. 2 Querecho Plains Unit, located 1 - 1/3 miles south of the No. 1 Querecho Plains Unit, drillstem tested the section equivalent to the producing zone in the No. 1 well. Recovery was 95' of drilling mud with no water.

"It may be concluded from this exhibit that the lateral limits of the Lusk Strawn oil pool will be controlled principally by the development of porosity and permeability with no indication of the presence of a water drive. Furthermore, the Strawn reservoir will operate under a solution gas drive where the chief source of reservoir energy will be supplied by the expansion of the oil and gas.

"Q Do you have an exhibit showing reservoir completion data on wells drilled in the Lusk-Strawn Oil Pool?

"A Yes, that is El Paso's Exhibit No. 3.

"Q Would you please explain this exhibit?

"A The various reservoir and completion data available from the three wells completed to date are shown in summary form in Exhibit 3. The completion data such as top of pay, perforated interval, treatment and potential test information previously discussed are listed under item 2.

"Item No. 3 of this exhibit sets forth the reservoir fluid characteristics. Analysis of a sub-surface oil sample taken

on well No. 2 on August 20, 196, indicated the following characteristics:

a. Saturation or bubble point pressure, psig. 4150

b. Reservoir volume factor @ orig. press. 2.605

c. Solution gas-oil ratio, cu. ft./bbl. 3084

d. Oil viscosity @original press .. cp. 0.146

e. Oil gravity, °API. 47.5

"The reservoir characteristics for the Strawn formation are shown under item 4. The Strawn formation in each of the three wells completed to date has been cored. The average formation factors based on averaging 86 feet of core considered to be the net pay interval are: porosity - 7.1%, water saturation - 30.9% and permeability of 17.7 millidarcys. The average net pay based on cores and well logs of the three wells is 38 feet.

"In connection with reservoir characteristics, production tests have indicated the wells to have high producing capacities. Productivity indexes of 2.0 and 2.6 have been calculated from production tests on wells Nos. 1 and 2. It is significant to note from these tests that producing rates of 300 BOPD and 390 BOPD from wells Nos. 1 and 2 can be obtained with a drawdown bottom-hole pressure of only 150 psi. Although a PI test has not been conducted on well No. 3, it is anticipated that this well will have similar producing characteristics.

"Q Do you have performance history data for the Lusk-Strawn Oil Pool?

"A Yes, that is El Paso's Exhibit No. 4.

"Q Would you please explain what this exhibit shows?

"A The performance history of the Lusk-Strawn Oil Pool is depicted graphically in Exhibit 4. This exhibit shows the number of producing wells, oil production and pressure data related to time. The total cumulative oil production for the three producing wells to December 1, 1961 is 122,537 barrels. The wells produced 14,134 barrels during the month of November. The pressure information shown on this graph will be discussed in detail in a later exhibit.

"Recent gas-oil ratio tests, although not represented in Exhibit 4, indicate a producing ratio of approximately 2400 cubic feet per barrel. In view of the high initial producing gas-oil ratio of the undersaturated Strawn oil, the limiting ratio of 4000 cubic feet per barrel being requested in this case is, in my opinion, a reasonable limit.

"The gas production from the pool is presently being flared; however, a processing agreement is being worked out with Phillips to provide for gathering the produced gas. It is anticipated that this agreement will be consummated in the very near future.

"Q El Paso's Exhibit No. 5 is a composite electrical log of Well No. 1 in the Lusk Deep Unit. Is that correct?

"A That is correct.

"Q Please explain the pertinent facts that this log shows.

"A Exhibit 5 shows the correlation of the electric log with the micro log on Lusk Deep Unit Well No. 1 with reference to the perforated interval. The microlog, which indicates formation porosity, reveals the Strawn limestone interval to be a continuous section with no important barriers which would block the flow of reservoir fluids.

"Q What is El Paso's Exhibit No. 6?

"A It is a core analysis summary of Well No. 1 in the Lusk Deep Unit.

"Q Please explain this exhibit to the Examiner.

"A The Core Analysis Summary for the Lusk Deep Unit Well No. 1 is shown in Exhibit 6. It is indicated in this exhibit that 33 of the 41 net feet assigned this well was actually cored. The net interval of 41 feet is based on cores available and well logs. The average characteristics of the 33 feet of the net pay interval which was cored are: Porosity - 8.3%, water saturation 28.5% and permeability - 24.6 millidarcys. It is important to note that fractures were noted over much of the cored interval which would enhance the ability for free fluid movement. Therefore, considering the characteristics of the Strawn reservoir complete drainage both vertically and horizontally should occur.

"Q Do you have information and data to show that one well will effectively and efficiently drain an area in excess of 160 acres in the Lusk-Strawn Oil Pool?

"A Yes, I have a pressure interference graph which is El

Exhibit No. 7.

"Q Please explain this exhibit to the Examiner?

"A Exhibit 7 presents the pressure interference observed from data on the three Strawn completions in the Rusk Deep Unit. This graph relates the bottom-hole pressure at a subsea datum of 7585' against time for each well. It is apparent from this exhibit that production from the producing wells has caused a reduction in reservoir pressure which becomes evident when pressures are taken on newly completed wells prior to production. The first such indication was observed upon completion of Well No. 2 in April, 1961. The bottom-hole pressure in Well No. 2 after five days shut-in time was 5799 psig, 11 pounds below the original reservoir pressure of 5810 psig. A pressure taken in No. 1 seven days later after the well had been shut-in for 73 hours was 5802 psig. The approximate oil production corresponding with these pressures was 35,000 barrels. Although in this instance the pressure reduction from the original pressure is slight the pressures on the two wells are in very close agreement. Wells Nos. 1 and 2 are located 1866 feet apart. A circle having a radius of 1866 feet indicates a drainage area of 251 acres.

"Bottom-hole pressures taken on August 5, 1961 on Wells Nos. 1 and 2 after approximately 80,000 barrels of oil had been produced were 5766 psig and 5765 psig, respectively. These pressures were recorded the same day after the wells had been shut-in for 72 hours and were recorded by the same bottom-hole pressure

bore. The close agreement of pressures in these two wells indicates excellent communication within the Strawn reservoir.

"A bottom-hole pressure survey conducted the 6th and 7th of November, 1961 on Wells Nos. 1 and 2 and a new completion, No. 3, indicated the following feet, an original reservoir volume factor of 2,605 and an estimated recovery factor of 15%, original recoverable oil reserve of 833 barrels per acre is calculated. The estimated barrels of oil recovery for 40, 80 and 160 acre spacing patterns are 33,320, 66,640 and 133,280, respectively. The corresponding recoverable gas reserves for these spacing patterns computed on the basis of 14,920 Mcf/acre are 597,000 Mcf, 1,194,000 Mcf and 2,387,000 Mcf, respectively.

"Q Have you compared the calculated performance of wells if they were drilled on 40, 80 and 160 acre spacing with the actual performance of Well No. 1 in the Lusk-Strawn Oil Pool?

"A Yes, and I have shown this comparison on El Paso's Exhibit No. 9.

"Q Please explain this exhibit to the Examiner.

"A Exhibit 9 shows the pressure history of the Lusk Deep Well No. 1 plotted against cumulative oil production. Superimposed upon this graph are the calculated pressure-production trends assuming production is derived solely from 40, 80 and 160 acre spacing units. The calculated performance curves are shown for the pressure range above the saturation or bubble point pressure where the reservoir energy is supplied principally by the

expansion of reservoir oil. In this instance, however, the expansion of the rock and connate water were considered in the material balance calculation in calculating the individual pressure trends.

"Reservoir characteristics such as net feet of pay, porosity and connate water saturation pertaining to Well No. 1 were employed in computing the calculated pressure trends. These factors combine to present what is considered to be a maximum relation between pressure and cumulative oil production for the various spacing patterns. It is noted from studying this graph that the actual pressure performance observed in Well No. 1 is almost flat compared with the predicted performance curves for 40, 80 and 160 acre drainage areas.

"The maintenance of the actual pressure is, in my opinion, caused by the influx of fluid into the vicinity of Well No. 1. In the absence of evidence supporting a water drive it may be concluded that the influxing fluid is oil. It is, therefore, quite apparent from this exhibit, which presents an independent approach from that previously discussed in Exhibit 7, that the drainage area of Well No. 1 is considerably in excess of 160 acres.

"Q Have you made a study of the profit or loss to be derived from drilling wells on 40, 80 and 160 acre spacing in the Lusk-Strawn Oil Pool?

"A Yes, and I have compared the economics for each of

these spacing patterns on El Paso's Exhibit No. 10.

"Q Please explain this exhibit to the Examiner.

"A Exhibit 10 has been prepared to show the economics assuming the Lusk-Strawn Pool is completely developed on a spacing pattern of 40, 80 and 160 acres per well. This exhibit shows that a net loss of $187,000 per well would result if the pool was developed entirely on 40 acre spacing. On 80 acre spacing a net loss of $75,000 per well would result. For 160 acre spacing a net profit of $147,000 per well would be realized. The 160 acre spacing pattern is the smallest regular spacing pattern which results in a profitable well. The net profit to investment ratio for this spacing is 0.50 to 1.

"The foregoing economics are based on an estimated well cost of $298,000 for a single completion well in the Strawn formation. Although the three wells completed to date have been duals, in the Strawn and Bone Springs or Morrow, complete development of the pool, however, would require the drilling and completion of a number of single completed wells. I have, therefore, used the single completion well cost in presenting my economics for the various spacing patterns. The net profit for each of the well spacing patterns are computed before income tax or deduction of overriding royalties or base royalties in excess of the usual 1/8.

"Q Mr. Lemon, from all of your studies, these exhibits and the data and information you have obtained pertaining to the Lusk-

Strawn Oil Pool, are you of the opinion that in this pool one well will effectively and efficiently drain an area in excess of 160 acres?

"A I am.

"Q Then, is it your recommendation that this Commission promulgate rules which will provide for 160 acre spacing for oil wells in this pool?

"A That is my recommendation.

"Q If the Commission sees fit to grant applicant's application in this case, is it your opinion that that would prevent waste and protect correlative rights?

"A That is my opinion.

"Q Were exhibits 1 through 10 prepared by you or under your supervision?

"A They were."

EXAMINER NUTTER: Does anyone have any questions of Mr. Lemon?

MR. MORRIS: Yes.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Lemon, the application in this case requests 4000-to-one limiting GOR for the subject pool and on page 8 of your prepared testimony you have indicated that a producing ratio of approximately 2400 cubic feet per barrel was prevalent in the pool at this time. Would you state your reasons for believing

the 4000 cubic feet per barrel should be the limiting GOR?

A Under the state-wide regulations, 2,000 limit would be imposed upon the pool and since the solution rate here is 2400, you would be penalizing yourself.

Q Why 4,000 rather than 2500 or 3,000? Do you expect the ratios to increase rapidly in this pool?

A The pool appears to have a crude unsaturated by 1660 pounds so that present ratio should be continued for some time. That is, there shouldn't be any increase in the producing ratio.

Q With no increase in producing ratio, then, there would not be any necessity for having a 4,000-to-one ratio?

A I felt a 4,000 ratio by comparison in other pools that have 2,000 limit imposed upon them would be reasonable in this case. For instance, if you have a solution ratio of 1,000, that 2,000 limit allows you to produce a considerably higher ratio before penalties are imposed. I felt that the 4,000 with respect to the 2400 producing ratio would be a reasonable limit.

Q How long do you think it would take for an average well in this pool to begin producing at a constant GOR of 4,000-to-one?

A It's a matter of how rapidly the pool is developed. That would have quite a bearing of when that would occur, probably a few years under the present density that we have there.

Q Mr. Lemon, on page 12 of your prepared testimony you have stated that all of your figures are based upon an estimated

recovery factor of 15%. Now, perhaps this is a question I should have left to the engineer. Could you briefly tell me first, do you think 15% is a conservative factor?

A I don't believe it is conservative, no.

Q Has it been your experience in pools of this type to experience greater than 15% recovery factor based on approximate figures?

A It's been my experience that a 20% factor is a very good recovery for depletion type reservoirs or where you have a solution ratio than what we have here. The shrinkage of oil is considerably less than we have noted here so I felt like that 15% under those conditions would be a reasonable factor or until we get below bubble point and obtain some performance history, it is rather difficult to really make an actual calculation to find out what the recovery factor might be.

Q If your 15%, in fact, turned out to be too low a figure, it would drastically change your computation concerning the recoverable reserves under 160, 80, and 40-acre tracts?

A Just how drastic that might be, there would be some change, naturally, if you had a high recovery factor.

Q In direct proportion to the amount of error, would it not?

A The amount of the difference --

Q In other words, if you had a 20% recovery rather than a 15% recovery, you would have estimated your recoverable reserves

recovery factor of 15%. Now, perhaps this is a question I should have left to the engineer. Could you briefly tell me first, do you think 15% is a conservative factor?

A I don't believe it is conservative, no.

Q Has it been your experience in pools of this type to experience greater than 15% recovery factor based on approximate figures?

A It's been my experience that a 20% factor is a very good recovery for depletion type reservoirs or where you have a solution ratio than what we have here. The shrinkage of oil is considerably less than we have noted here so I felt like that 15% under those conditions would be a reasonable factor or until we get below bubble point and obtain some performance history, it is rather difficult to really make an actual calculation to find out what the recovery factor might be.

Q If your 15%, in fact, turned out to be too low a figure, it would drastically change your computation concerning the recoverable reserves under 160, 80, and 40-acre tracts?

A Just how drastic that might be, there would be some change, naturally, if you had a high recovery factor.

Q In direct proportion to the amount of error, would it not?

A The amount of the difference --

Q In other words, if you had a 20% recovery rather than a 15% recovery, you would have estimated your recoverable reserves

25% too low.

A Actually, if you increased it to 20%, you'd have a third increase.

MR. MORRIS: Did you offer your Exhibit No. 10?

MR. WHITWORTH: Exhibits 1 through 10.

Q (by Mr. Morris) Referring to Exhibit 10, your well investment figure is shown to be $298,000. I believe somewhere in your prepared testimony you have stated that this figure is based entirely upon the cost of a single completion and no allocation has been made in the case of dual completions to attribute portions of that cost to the cost of a dual completion.

A That's right. It is economics. It is based entirely on the estimated cost of a singly completed well.

Q Now, you said there are three wells completed in the Lusk-Strawn Pool?

A That's correct.

Q All three are dual completions?

A That is correct.

Q One in the Bone Springs and two in the Morrow?

A That's right.

Q Based upon the tests that you have made and the approximate figures in the Bone Springs, would it be economic for you to drill a well as a single completion to the Bone Springs?

A Presently dualled in the Bone Springs, No. 1 well has produced 5,000 barrels from the Bone Springs, and presently, it's

a shut-in well, loaded up with water. I would point out, in connection with the Bone Springs Well No. 3 which was located 1650 feet to the southeast, just had a slight wiggle through that section. The Bone Springs as a source of dualling a well, I don't think could be counted on at present.

Q In making your computations as to whether it's feasible to dually complete in the Bone Springs, do you set a certain amount or a certain cost figure upon the dual completion in the Bone Springs that you would set aside as part of the well investment cost?

A I am advised by the drilling department they do make allocations between the two zones, more or less of an A-B-C type setup where you have a common hole down to the Bone Springs and your own individual completion within the Bone Springs, and then you have additional drilling costs from there to the lower horizons.

Q How much did it cost to drill your No. 1 well?

A $474,000.

Q Do you attribute to the Bone Springs formation the difference between that $474,000 and your $298,000 shown on Exhibit 10?

A There has been a different allocation than that.

Q It is more than that to the Bone Springs?

A No, I believe it will be less.

Q In the wells -- now, I believe your No. 2 and 3 wells

are dualled in the Morrow formation?

A Yes, sir.

Q Has it been your experience in these two wells, based on production, that you have experienced so far from the Morrow wells drilled individually that single completions would be feasible in the Morrow?

A The Morrow is presently shut-in. It hasn't produced.

Q Based on the tests that you have made in the Morrow, would it appear they would be economical to complete as single completion?

A I believe, based on reserves attributed to the Morrow, that a singly completed well in the Morrow, perhaps, would pay out. I would have to check that to be positive. I haven't performed that calculation.

Q Would you tell me what the cost of the dual completion of the No. 2 and 3 wells was?

A No. 2 cost $731,000. The reason for that high cost was because it was drilled to the Devonian. No. 3, which is probably closer to what a comparable dualled well would cost, cost $414,000.

Q Have you made any calculations of costs between the Morrow formation and the Strawn formation in that well?

A Not in that particular well. I was using average costs for the Morrow-Strawn dual of $396,000. The allocation on that would be $171,000 for the Strawn and $225, I believe, for the Morrow.

Q If you had several other Morrow-Strawn dual completions in this area, it might be that your well investment as attributed to the Lusk-Strawn pool would be something less than shown on Exhibit 10?

A Assuming you made every well a dual, then you'd have a different economic picture. With respect to the Morrow, the spacing which we would at least seek for that formation would be greater than the 160 that we are presently seeking here, so that you would still have a single Strawn well in order to fully develop the Lusk-Strawn pool.

Q Mr. Lemon, has any consideration been given to the possibility of secondary recovery in this area?

A We have considered it. However, at the moment we do not have any definite plans as to secondary recovery program.

Q On the data available to you now, would it appear secondary recovery would be feasible?

A It would require economic analysis of the situation to study the feasibility to determine whether you could economically perform such an operation.

Q Secondary recovery projects have been successfully carried out in formations of this type?

A The fact that a definite program hasn't been decided for this field, it would more or less depend on what kind of approach we took as far as just what the economics would be here.

Q You have stated in your testimony that you believe this

be a solution gas drive pool with excellent communication. It has been your experience, has it not, that such pools have lent themselves very favorably to secondary recovery?

A It depends on the amount of oil, and so forth, that can be recovered. That would have a bearing on the economics and what would apply in one field may or may not apply here.

Q So, at the very least, El Paso has not entirely ruled out the possibility of secondary recovery in the area?

A That's right.

Q If a recovery project were instituted in the pool and if it were done on an economic basis, then, of course, that would enhance the overall economic picture of the pool?

A Generally, that's the idea of the operation, to get a higher realization of money.

Q Mr. Lemon, on your Exhibit 10, you stated the oil value was $2.76 after transportation expense. What is the transportation expense involved?

A $.12 truck charge.

Q You are not trucking it in?

A No, sir, the basic crude production price for West Texas sour crude. In view of the gravity of the oil in this Strawn Pool, there is a penalty so that reduces the price to the $2.76.

Q You have shown the lifting cost to be $.25 per barrel. You used that figure throughout your calculations wherein the

case of the 40-acre proration unit it was applied something over 33,000 barrels and on an 80-acre unit, to 66,000 some-odd barrels and then on the 160-acre unit to well over 133,000 barrels. Does it seem reasonable to you? Does the $.25 lifting cost seem reasonable to apply in each of these cases?

A I have used what I consider to be the average charge. I don't have the work over or anything like that included in it. In all probability the ultimate picture could be different.

Q You might also experience a lesser cost?

A With every barrel of oil that you remove you will have some cost in connection with it.

Q Wouldn't it be reasonable, Mr. Lemon, to foresee a smaller barrel lifting cost on 160-acre spacing unit than on an 80 and smaller on an 80 than on a 40?

A Considering the IP rates for the various sized units that I have shown, the fact that you have a semi-monthly charge which I assume is what you're getting at, you have a slightly lower lifting cost in the case of a 160-acre unit.

Q And a smaller cost in the case of an 80 over a 40?

A The 80 would be higher than the 40.

Q It would be higher? The figure on the 80 would be lower.

A No, higher, because you'd have the same monthly charge but a lower monthly rate of oil.

Q Yes, but your charge per barrel would be less on the 80.

A I believe -- excuse me, on the 80 it would be lower than on the 40.

MR. MORRIS: That's all I have; thank you.

EXAMINER NUTTER: Are there any other questions of Mr. Lemon?

CROSS EXAMINATION

BY EXAMINER NUTTER:

Q You use 15% recovery factor for oil. What recovery factor did you use for gas?

A I believe it figures out to 80-some-odd percent. I believe I can give you an exact figure.

Q I'd appreciate knowing the recovery figure for gas.

A About 87%.

Q You're figuring 9¢ per MCF of gas, I presume?

A Yes, sir.

Q Is that the rate at which you are presently negotiating with Phillips?

A That is approximately the price that it would work out to be on a raw basis.

Q Does that include any liquids?

A Yes, sir.

Q So that 15% recovery factor for solution gas reservoir -- you have seen solution gas reservoirs that have recovered more than 15% on primary recovery, have you not?

A I have.

Q A suming 15% recovery on the 33,000 barrels per 40-acre tract which you had used in your computations, that would indicate a reasonable accumulation of approximately 220,000 barrels per 40-acre tract, is that correct?

A That's correct.

Q And initial primary recovery would be 33,000 barrels, correct?

A That is correct. So it would follow that the approximately 187,000 barrels left in the reservoir at the end of primary completion.

Q Would it be worth taking a look at as far as pressure maintenance or secondary recovery is concerned?

A Yes, sir.

Q Now, on your formation volume factor, Mr. Lemon, I think you use a volume factor of 2.6?

A That is correct.

Q Now, that wasn't obtained on a sample of oil from the first well that was drilled. It was obtained from a sample of oil in the No. 2 well?

A That is correct.

Q Was that well -- were conditions in that well indicative of recent conditions when that sample was obtained?

A Since the apparent bubble point is 4150 the sample is considerably unsaturated. You should get a representative sample

Q This volume factor is taken up to recent conditions?

A That is correct.

Q Now, refer to your Exhibit No. 7 which lists the shut-in times on each of these bottomhole pressures, please.

A I believe my prepared testimony contains a number of the times.

Q I don't have all of them. Maybe you can fill me in. How about the original pressure of 5810?

A 158 hours.

Q How about the pressure taken in February on that No. 1 well?

A 73 hours.

Q And the third pressure taken in April on the No. 1 well?

A 73 hours.

Q And the pressure taken on the No. 1 well in August?

A 72 hours.

Q I believe that final pressure on one was in November and was 100 hours?

A That is correct.

Q Now, the initial pressure of 5799 on the No. 2 well in April?

A I show 5 days.

Q That No. 5 was shut-in?

A Yes.

Q How about the second pressure?

A 72 hours.

Q And the pressure taken in September on the No. 2?

A 14 days.

Q And the final pressure on No. 2 was 98 hours?

A That is correct.

Q You only have one pressure on 3 and that was initial after 136 hours?

A Yes.

Q Do you have any pressure build-up curves on these wells?

A No.

Q Have you made a tabulation of the pressure build-up? If so, does it indicate how long it's going to take one of them to completely stabilize?

A The indicated time, in view of the characteristics of the pool, wouldn't require very much time.

Q What percent of build-up do you get in 24 hours?

A Conversely, on a draw-down, I don't have detailed build-up data. On draw-down test, the bottom was run in the well and 24 hours later there wasn't any change in the bottomhole pressure. Considering the characteristics, permeability, and so forth, you'd certainly expect excellent build-up characteristics.

Q Speaking of draw-down, the PIs that you mentioned in your direct testimony there indicates a full rate of 390 barrels for the respective two wells. Did you take PIs at any other flowing rates?

A PIs actually weren't conducted.

Q Extrapolated?

A Simply developed by assuming 150 pounds draw-down multiplied by the draw-down by the respective PIs.

Q What rate of flows were the PIs taken at?

A One was based on 170.7 barrels of oil per day.

Q 170.7?

A Yes, sir.

Q And the No. 2?

A 258.2 barrels per day.

Q You are presently producing with an average GOR of 2400-to-one?

A Approximately so.

Q How long is it contemplated it will be before you're selling the gas produced from these wells?

A I attempted to find out positively when that would occur. I am advised that negotiations are very nearly completed but not quite. I would assume upon the signing of the agreement the sale of the gas will take place immediately..

Q How far will Phillips have to lay a line before they can buy this gas?

A I don't have that figure.

Q Have you made any computation as to the value of the gas that's being flared each day at the present time?

A No.

Q I don't suppose you have made a computation of the

value of the gas that would be flared under the proposed allowable provision for this 160-acre spacing unit?

A I would like to correct my previous statement. I actually have made a rough calculation as to the amount of gas that has been flared, yes.

Q Somewhere in the neighborhood of slightly over $200 a day?

A Under it.

Q That is at the average of 2400 GOR?

A To the projected allowable?

Q Yes.

A Approximately $200 a day.

Q Is there any other pay in the area besides the Morrow, Bone Springs and Strawn?

A There is shallow production in the Yates.

EXAMINER NUTTER: Are there any further questions of Mr. Lemon? If not, he may be excused.

(Witness excused.)

DAVID H. RAINEY,

called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. WHITWORTH:

Q Would you please state your name for the record, by whom you are employed, and in what capacity you are employed?

A David H. Rainey, administrative assistant, proration department for El Paso Natural Gas Company.

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

A Yes.

Q Have your qualifications been made a matter of record?

A Yes.

Q And accepted by this Commission?

A Yes, sir.

Q Mr. Rainey, have you prepared a written statement in this case?

A Yes, I have.

Q Has that testimony been submitted to the Examiner and the Commission previously?

A Yes, sir, it has.

Q When was that submitted?

A Yesterday.

Q You have read this testimony and you have adopted it as your own and you swear to it at this time?

A Yes, sir, I do.

Q Was El Paso Natural Gas Company's Exhibit No. 11 prepared by you?

A Yes, sir.

MR. WHITWORTH: At this time, Mr. Examiner, we offer the prepared testimony of David H. Rainey and El Paso Natural

Gas Company's Exhibit No. 11. Exhibit No. 11 is actually incorporated into the testimony itself rather than set out separately.

EXAMINER NUTTER: Is the prepared testimony identical to that which was offered to the Commission?

MR. WHITWORTH: Identical.

EXAMINER NUTTER: Is there objection to the receipt of the prepared testimony of Mr. Rainey as written testimony rather than oral testimony in this case?

The testimony will be admitted into the record.

"Q Will you please state the purpose of the rules which you intend to propose?

"A I believe that the evidence has clearly shown that 160 acre spacing is not only justified but necessary for the development of the Lusk Strawn Pool. We, therefore, intend to propose field rules which will provide for 160 acre spacing. Because of the high solution gas-oil ratio and the high producing gas-oil ratio in this under-saturated reservoir, which, according to the evidence, is still producing at pressures substantially in excess of the bubble point, we believe that the evidence shows that a gas-oil ratio limit of 4,000 cubic feet of gas per barrel of oil is reasonable and equitable.

"Q Do you have proposed special rules and regulations for the Lusk Strawn Pool?

"A Yes. I have seven Special Rules which I would recommend that the Commission adopt for this Pool. They are contained as

follows in El Paso's Exhibit No. 11.

SPECIAL RULES AND REGULATIONS FOR THE LUSK STRAWN OIL POOL

Rule 1. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, and not nearer to nor within the limits of another designated Strawn Pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereafter set forth.

Rule 2. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, shall be located on a designated drilling tract consisting of 160 contiguous acres, more or less, substantially in the form of a square, which is a quarter section being a legal subdivision of the United States Public Lands Survey.

Rule 3. Each well completed or recompleted in the Lusk Strawn Pool or in the Strawn Formation within one mile of said pool shall not be drilled closer than 660 feet to any quarter section line of the tract or closer than 330 feet to any quarter quarter section line, or subdivision inner-boundary, nor closer than 1,320 feet to a well drilled to or capable of producing from the same pool.

Rule 4a. For good cause shown, the Secretary-Director of the Commission may grant an exception to the requirement of Special Rule 2. without notice and hearing where an

application has been filed in due form and where the unorthodox size or shape of the tract is due to a variation in the legal subdivision of the United States Public Lands Survey or where the following facts exist and the following provisions are complied with:

(1) The non-standard unit consists of less than a standard unit and lies wholly within a single governmental quarter section.

(2) The entire non-standard unit may reasonably be presumed to be productive of oil from said pool.

(3) The applicant presents written consent in the form of waivers from all offset operators.

(4) In lieu of Paragraph 3 of this Rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard unit. The Secretary-Director may approve the application if, after a period of 30 days, no operator has entered an objection to the formation of the non-standard unit.

Rule 4b. The allowable assigned to such non-standard unit shall bear the same ratio to a standard allowable in the Lusk Strawn Pool as the acreage in such non-standard unit bears to 160 acres.

Rule 5. A 160 acre proration unit in the Lusk Strawn Oil Pool shall be assigned a 160 acre proportional factor of

8.67 for allowable purposes. For purposes of computing allowables a unit of not less than 158 acres nor more than 162 acres shall be considered to contain the number of acres in a standard unit. In the event there is more than one well on a 160 acre proration unit, the operator may produce the allowable assigned to the unit from the wells on that unit in any proportion.

Rule 6. The gas-oil ratio limitation for all wells in the Lusk Strawn Pool shall be four thousand (4,000) cubic feet of gas per barrel for oil produced. Any oil well in the Lusk Strawn Oil Pool producing with a gas-oil ratio in excess of four thousand (4,000) cubic feet per barrel of oil shall be allowed to produce daily only that volume of gas obtained by multiplying the top unit allowable for the pool as determined by the applicable rules of the Commission and, as proposed herein, times the limiting gas-oil ratio (four thousand (4,000) cubic feet).

Rule 7. The vertical limits of the Lusk-Strawn Oil Pool shall be the Strawn Formation.

"Q How did you arrive at the figure of 8.67 as the proportional factor for a 160 acre oil well in Rule 5?

"A The proportional factor of 8.67 is arrived at by using the proportional factor for a 40 acre unit with a depth range of 11,000 feet to 12,000 feet and adding three normal unit allow-

ables for the three additional 40 acre units. That is, we have followed the procedure which the Commission used in going from a 40 acre unit to an 80 acre unit."

EXAMINER NUTTER: Does anyone have any questions of Mr. Rainey?

MR. MORRIS: Yes.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Rainey, referring to Rule 3 shown on Exhibit No. 11, the reading of the rule terminates with the requirement that the wells be located no closer than 1320 feet to a well drilled or capable of producing from the same pool.

A Yes.

Q What is the reason for your recommending that requirement?

A That is specifically in there in regard to an effort to be sure that there is a standard pattern of development within the pool so the well could not be located within an individual 160-acre spacing in case somebody wanted to drill another well on the 160-acre tract.

Q Mr. Rainey, assume with me for the moment that the application of El Paso is granted and that 160-acre tracts are established, your Rule 3 requires that the wells be located no closer than 660 to the quarter section line. That would be the outer boundary of the 160-acre unit?

A Yes, sir.

Q In the event the operator wanted to drill more than one well on his 160-acre proration unit, would he still be allowed to produce only one allowable for the proration unit?

A Yes, sir.

Q From the two or more wells?

A That's correct.

Q What objection would there be to having him located closer than 1320 feet?

A We are protecting him from himself.

Q If a man wanted to --

A He could still do it under this rule. He could put them on a diagonal which would be putting them more than 1320 feet apart.

Q If the unorthodox location were for some reason obtained, under your proposed rule whereby a well might be located closer than 660 to a boundary line, then an operator wanted to drill a well at a standard location in the adjoining unit, he'd run up against the 1320 foot rule?

A Yes, that's true.

Q Referring to Rule 4b, unless I'm missing it, 4b does not coincide with Rule 5 in computing the allowable.

A It does. We propose that the basic unit, the basic allowable shall be 160 acres. Anything less than 160 acres shall be reduced by the proportion the acreage bears to the 160 acres.

Q I follow you. It is your proposal that a 160-acre proration unit be assigned an allowable as follows: One 40-acre assigned a normal allowable with the depth factor and the other three 40-acre tracts assigned standard normal 40-acre unit allowable without the depth factor?

A One additional normal unit allowable.

Q Which would arrive at a proportional factor of 8.67.

A That's correct. We did the same thing in this case that the Commission did in going to the 40, merely adding one normal unit allowable for the additional tract.

MR. MORRIS: I believe that's all I have.

EXAMINER NUTTER: Are there any other questions of Mr. Rainey?

He may be excused.

(Witness excused.)

DAVID T. BURLESON,

called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. WHITWORTH:

Q Mr. Burleson, please state your full name for the record, by whom and in what capacity you are employed.

A David T. Burleson, El Paso Natural Gas Company, El Paso, service area coordinator for the Permian division.

Q You haven't previously testified before the Commission?

A No, sir.

Q Would you please tell to the Examiner briefly your qualifications?

A I have a B. S. degree from Oklahoma State University in geology, an L. B. degree from the University of Oklahoma, and I have been employed by El Paso Natural Gas land department for approximately three and a half years. I have served for the past year and a half as area coordinator for the Permian area embracing Southeastern New Mexico, including Lea and Eddy counties. We administer leases involved in the Lusk unit, among others.

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

EXAMINER NUTTER: Yes; please proceed.

Q (by Mr. Whitworth) Mr. Burleson, you have prepared written testimony in this case, have you not?

A Yes, sir, I have.

Q Has that testimony previously been submitted to the Examiner, to the Commission as has the prepared testimony of the other witnesses?

A Yes, it has.

Q You have read this prepared testimony and you adopt it as your own and you swear to it at this time, is that correct?

A Yes, I do.

Q Mr. Burleson, you have prepared El Paso Natural Gas Company's Exhibit No. 12 in this case, have you not?

A It was prepared under my supervision. I have checked that exhibit. It is correct.

MR. WHITWORTH: At this time, we offer the prepared testimony of David Burleson and El Paso's Exhibit No. 12.

EXAMINER NUTTER: Does anyone wish to hear the prepared testimony? Is there objection to receipt of the prepared testimony in lieu of the oral testimony?

The testimony will be admitted.

"Q Mr. Burleson, referring to El Paso's Exhibit No. 12, what does the red line show?

"A The red line shows the pool boundaries of the Lusk-Strawn Oil Pool.

"Q What does the yellow line show?

"A The yellow line shows the boundaries of the Lusk Deep Unit.

"Q Does this exhibit show the offset operators surrounding the Lusk-Strawn Oil Pool?

"A Yes.

"Q To your knowledge, has anyone opposed the granting of El Paso's application in this case.

"A No.

"Q Who are the committed working interest owners in the unit?

"A El Paso Natural Gas Company, Phillips Petroleum Company, Kerr-McGee Oil Industries, Inc. and Gulf Oil Corporation.

"Q Have they concurred in this application?

"A Yes.

"Q Please point out the presently approved participating area for the Strawn formation.

"A The presently approved Strawn participating area consists of the NE/4 of Section 19, W/2 NW/4 of Section 20, SE/4 of Section 18, SW/4 SW/4 of Section 17, and the E/2 SW/4 of Section 18, all in Township 19 South, Range 32 East, N.M.P.M., Lea County, New Mexico, containing 520.00 acres, more or less."

EXAMINER NUTTER: Does anyone have any questions of Mr. Burleson?

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Burleson, your exhibit reflects all of the acreage within the unit area as Federal acreage?

A Yes, it is all Federal acreage of the undivided type wherein the working interest owners share in accordance to the interest which they hold, notwithstanding where the well may be located.

MR. MORRIS: That's all.

EXAMINER NUTTER: Are there any further questions of Mr. Burleson?

The witness may be excused.

(Witness excused.)

EXAMINER NUTTER: Mr. Whitworth, we have received all

the record. Is there any objection to receipt of El Paso exhibits 1 through 12?

Applicant's Exhibits 1 through 12 will be admitted in evidence.

Is there anything further?

MR. WHITWORTH: That's all we have. Does the Commission have a letter of concurrence from Phillips Petroleum Company in this case?

MR. MORRIS: The Commission is in receipt of a telegram from Phillips Petroleum Company concurring in El Paso's application.

MR. WHITWORTH: Good.

MR. MORRIS: The Commission is also in receipt of a letter from Kerr-McGee Oil Industries, Inc., also concurring in the application.

EXAMINER NUTTER: Does anyone have anything further they wish to offer in the case?

MR. KASTLER: C. T. Kastler appearing on behalf of Gulf Oil Corporation. Gulf has a small working interest in the Lusk Deep Unit and as such is an interested party in this hearing. Gulf Oil Corporation has previously been furnished and has considered the testimony in this case. It is our opinion that El Paso has put a reasonable interpretation on the data available furnished at this hearing, that sufficient data were presented to show that one well is capable of draining more than 160 acres and

the economics presented in El Paso's Exhibit No. 10 shows that the profit-to-investment ratio for wells drilled on 160-acre proration units will be only .5 to 1.

It is Gulf Oil's opinion that additional allowables should be granted to wells drilled on wider spacing units and El Paso's recommendation of draining three additional normal unit allowables for the three additional 40-acre tracts contained in the 160-acre proration unit is certainly a reasonable request under the circumstances presented in this case.

EXAMINER NUTTER: Do you concur?

MR. KASTLER: I concur.

EXAMINER NUTTER: Anyone else?

We will take Case No. 2469 under advisement.

* * * *

INDEX

STATE OF NEW MEXICO)
)ss.
COUNTY OF SAN JUAN)

I, THOMAS F. HORNE, NOTARY PUBLIC in and for the County of San Juan, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

Thomas F. Horne
NOTARY PUBLIC

My Commission Expires:

October 2, 1965

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2469, heard by me on 1-4, 1962.

....., Examiner
New Mexico Oil Conservation Commission

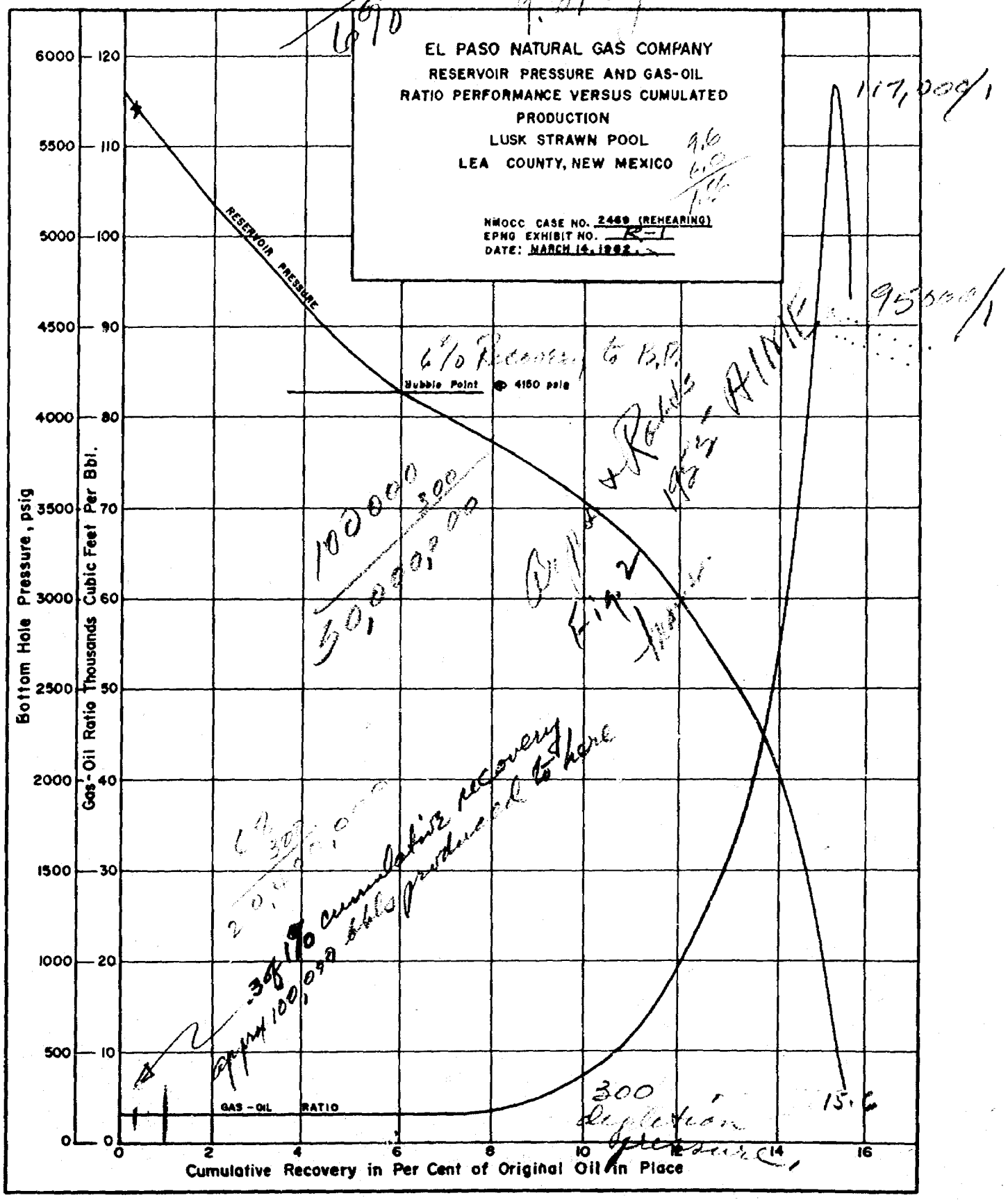
EL PASO NATURAL GAS COMPANY

RESERVOIR PRESSURE AND GAS-OIL RATIO PERFORMANCE VERSUS CUMULATED PRODUCTION

LUSK STRAWN POOL

LEA COUNTY, NEW MEXICO

NMOCC CASE NO. 2469 (REHEARING)
EPNG EXHIBIT NO. R-1
DATE: MARCH 14, 1962



BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF EL PASO NATURAL GAS COMPANY FOR SPECIAL RULES AND REGULATIONS FOR THE LUSK-STRAWN POOL, LEA COUNTY, NEW MEXICO, TO PROVIDE FOR 160-ACRE DRILLING AND SPACING UNITS WITH A LIMITING GAS-OIL RATIO OF 4000/1 AND FOR OIL ALLOWABLE BASED ON 160-ACRE SPACING.	CASE NO. 2469

MOTION TO CORRECT THE RECORD

Comes now El Paso Natural Gas Company, Applicant in the above-styled and numbered cause, and files this Applicant's Motion To Correct the Record in said cause, and for grounds therefor, respectfully alleges and states:

I.

This case was heard by an examiner on January 4, 1962 at Santa Fe, New Mexico. A reporter designated by the New Mexico Oil Conservation Commission to transcribe the record was present and a verbatim record of the proceedings was taken and transcribed by said reporter.

II.

Applicant has received a copy of said transcribed record and has carefully examined the same. Said record is incorrect in certain particulars hereinafter set out. In order to make said record conform to the evidence presented at the hearing and to speak the truth, said record should be corrected in the following particulars, to-wit:

1.	Page 7	Line 21	"Reature"	should be	"Feature"
2.	Page 8	Line 5	"NE"	Should be	"NW"
3.	Page 10	Line 1	"August 20,196"	should be	"August 20,1961"
4.	Page 10	Line 7	"°APL"	should be	"°API"
5.	Page 10	Line 20	Add "In" after "Drawdown"		
6.	Page 12	Line 25	Add "Paso" after "El"		
7.	Page 14	Line 5	Between "Following" and "Feet" entire Page 11 of prepared testimony omitted		
8.	Page 14	Line 6	"2,605"	should be	"2.605"
9.	Page 16	Line 18	"Single"	should be	"Singly"
10.	Page 18	Line 3	"Rate"	should be	"Ratio"
11.	Page 19	Line 9	Add "Lower" after "Have a"		
12.	Page 27	Line 10	"Completion"	should be	"Depletion"
13.	Page 27	Line 22	"Recent"	should be	"Original"
14.	Page 28	Line 16	"One"	should be	"No. 1"
15.	Page 28	Line 22	"No. 5"	should be	"No. 2"
16.	Page 29	Line 17	add "hole pressure" after "bottom"		
17.	Page 29	Line 22	"full"	should be	"flow"
19.	Page 29	Line 23	"floor"	should be	"flow"
20.	Page 30	Line 2	add "and" after "drawdown"		
21.	Page 30	Line 3	"by the"	should be	"that"
22.	Page 36	Line 18	Last two sentences of Rule 6 omitted.		
23.	Page 37	Line 18	"the" after "so" should be "two"		
24.	Page 37	Line 19	add "unit" after "spacing"		
25.	Page 39	Line 9	"to the 40"	should be	"from 40 to 80 acres"
26.	Page 44	Line 6	"draining"	should be	"granting"
27.	Page 25	Line 16	"semi"	should be	"same"

WHEREFORE, Applicant prays that said record be corrected in the manner above set out.

Respectfully submitted,

Alan Seth

Attorney for Applicant

No. 1-62

DOCKET: EXAMINER HEARING - THURSDAY - JANUARY 4, 1962

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

The following cases will be heard before Daniel S. Nutter, Examiner, or Elvis A. Utz, as alternate examiner:

CASE 2448: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its C. J. Holder, State Holder Oil Unit, State "CA", State Oil Unit and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Cha Cha-Gallup Oil Pool with water injection initially to be through five wells located in Sections 8 and 16, Township 28 North, Range 13 West, and Section 23, Township 28 North, Range 12 West, and requests adoption of special rules to govern the operation of said project.

CASE 2449: (Continued)

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pressure maintenance project on its Navajo Tribal "H" and Gallegos Canyon Unit Leases, San Juan County, New Mexico, in the Totah-Gallup Oil Pool with water injection initially to be through five wells located in Section 35, Township 29 North, Range 13 West, Section 12, Township 28 North, Range 13 West, and Sections 13 and 24, Township 29 North, Range 14 West, and requests adoption of special rules to govern the operation of said project.

CASE 2429: (Continued)

Application of Standard Oil Company of Texas for approval of the Jurnegan Point Unit Agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the Jurnegan Point Unit Agreement embracing 10,240.84 acres, more or less, of State and fee lands in Township 24 South, Ranges 24 and 25 East, Eddy County, New Mexico.

CASE 2452: (Continued)
Application of Southwest Production Company for an order pooling all mineral interests in the Basin-Dakota Gas Pool in the W/2 of Section 7, Township 30 North, Range 11 West, San Juan County, New Mexico. Interested parties include Maleta Y. Brimhall, Phoenix, Arizona, and Barbara Brimhall Burnham, Aztec, New Mexico.

CASE 2463: Application of Amerada Petroleum Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its L. M. Lambert Well No. 2, located in Unit G of Section 6, Township 20 South, Range 37 East, Lea County, New Mexico, as a dual completion (conventional) in the Grayburg and McKee zones in the Monument Field, with the production of gas from the Grayburg zone to be through a string of 1 ½-inch tubing and the production of gas from the McKee zone to be through a parallel string of 2 3/8-inch tubing.

CASE 2464: Application of Amerada Petroleum Corporation for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its State NJ "A" Well No. 1, located in Unit A of Section 2, Township 25 South, Range 37 East, Lea County, New Mexico, as a triple completion (combination) in the McKee, Fusselman and Ellenburger zones in the North Justis Field, with the production of oil from the Fusselman and Ellenburger zones to be through tubing installed within parallel strings of 3 ½-inch casing and the production of oil from the McKee zone to be through a parallel string of 2 7/8-inch casing, all of said casing strings to be cemented in a common well bore.

CASE 2465: Application of Skelly Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Hobbs "N" Well No. 1, located in Unit D of Section 8, Township 18 South, Range 35 East, Lea County, New Mexico, as a dual completion (conventional) in the Vacuum-Abo Pool and in an undesignated Drinkard pool, with the production of oil from both zones to be through parallel strings of 2 1/16-inch tubing.

CASE 2466: Application of Shell Oil Company for a 320-acre non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to establish a

320-acre non-standard gas proration unit in the Eumont Gas Pool, comprising the S/2 of Section 22, Township 21 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the Turner Well No. 7, located at an unorthodox location 1650 feet from the South line and 330 feet from the West line of said Section 22.

CASE 2467: Application of Shell Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 12, located 4620 feet from the South line and 660 feet from the East line of Section 4, Township 21 South, Range 37 East, Lea County, New Mexico, as a dual completion (tubingless) in the Drinkard and Blinebry Oil Pools, with the production of oil from both zones to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2468: Application of Shell Oil Company for a triple completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Livingston Well No. 11, located 3300 feet from the South line and 660 feet from the West line of Section 3, Township 21 South, Range 37 East, Lea County, New Mexico, as a triple completion (tubingless) in the Drinkard Oil, Tubb Gas and Blinebry Oil Pools, with the production of oil from the Drinkard and Blinebry zones and the production of gas from the Tubb zone to be through parallel strings of 2 7/8-inch casing cemented in a common well bore.

CASE 2469: Application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including provisions for 160-acre proration units and a limiting gas-oil ratio of 4000 to 1.

CASE 2470: Application of J. R. Cone for a 40-acre non-standard gas proration unit and for an exception to Order No. R-1670, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the establishment of a 40-acre non-standard gas proration unit in the Blinebry Gas Pool comprising the NE/4 SE/4 of Section 21, Township 21 South, Range 37 East, Lea

County, New Mexico, said unit to be dedicated to the Anderson Well No. 2, located 1650 feet from the South line and 330 feet from the East line of said Section 21. Applicant further seeks an exception to Rule 34 (A) of the special rules and regulations for the Blinebry Gas Pool as contained in Order No. R-1670, to permit the gas produced from said Anderson Well No. 2 to be produced into a low-pressure separator only.

CASE 2471: Application of Leonard Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks permission to complete its Federal Ginsberg Well No. 8, located in Unit M of Section 31, Township 25 South, Range 38 East, Lea County, New Mexico, as a dual completion (conventional) in the Langlie-Mattix and Justis-Blinebry Pools, with the production of oil from both zones to be through parallel strings of 2 3/8-inch tubing, separation of the zones to be by a liner re-entry shoe seal assembly.

CASE 2472: Application of Newmont Oil Company for approval of a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of the West Loco Hills Grayburg No. 4 Sand Unit Agreement, covering 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.

CASE 2473: Application of Newmont Oil Company for expansion of its Loco Hills Waterflood Project, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks permission to expand its Loco Hills Waterflood Project to include the proposed West Loco Hills Grayburg No. 4 Sand Unit Area, comprising 5320 acres, more or less, in Townships 17 and 18 South, Ranges 29 and 30 East, Eddy County, New Mexico.

Set for hrg in Jan.
Case 2469 Rom

El Paso Natural Gas Company

El Paso, Texas

November 17, 1961

New Mexico Oil Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Gentlemen:

I have enclosed original and two (2) copies of the application of El Paso Natural Gas Company for adoption of special pool rules for the Lusk Strawn Pool, Lea County, New Mexico to provide for 160 acre drilling and spacing units with a limiting gas-oil ratio of 4000 to one and for the granting of oil allowables in said pool based on 160 acre spacing. Would you please set this matter down for hearing as soon as possible.

Yours very truly,

Garrett C. Whitworth

Garrett C. Whitworth
Attorney

GCW:ads

Enclosures (3)

Docketed 11-20-61

LAW OFFICES OF
MODRALL, SEYMOUR, SPERLING, ROEHL & HARRIS
SIMMS BUILDING
P.O. BOX 466
ALBUQUERQUE, NEW MEXICO
TELEPHONE CHAPEL 3-4511

J. R. MODRALL
AUGUSTUS T. SEYMOUR
JAMES E. SPERLING
JOSEPH E. ROEHL
GEORGE T. HARRIS
DANIEL A. SISK

LELAND S. SEDBERRY
ALLEN C. DEWEY
FRANK H. ALLEN
JAMES A. BORLAND
JAMES P. SAUNDERS

JOHN F. SIMMS (1885-1954)

September 26, 1962

Mrs. Rosemary Sena
File Room
Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Mrs. Sena:

I return herewith an executed copy of the application of El Paso Natural Gas Company in the Lusk Strawn Pool which I checked out yesterday. Please indicate on your records such return.

Thank you very much.

Very truly yours,

MODRALL SEYMOUR SPERLING ROEHL & HARRIS

BY James E. Sperling

JAMES E. SPERLING

ch
encl

BEFORE THE OIL CONSERVATION COMMISSION

OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF EL PASO NATURAL GAS COMPANY FOR ADOPTION OF SPECIAL POOL RULES FOR THE LUSK STRAWN POOL, LEA COUNTY NEW MEXICO, TO PROVIDE FOR 160 ACRE DRILLING AND SPACING UNITS WITH A LIMITING GAS-OIL RATIO OF 4000 TO 1 AND FOR OIL ALLOWABLE BASED ON 160 ACRE SPACING.

CASE NO. 2469

A P P L I C A T I O N

COMES NOW El Paso Natural Gas Company, a Delaware corporation, authorized to do business in the State of New Mexico, hereinafter called "Applicant" and alleges and states as follows:

I.

Applicant is the operator of the Lusk Deep Unit and wells producing oil from the Lusk Strawn Pool in Lea County, New Mexico. Said pool is governed by statewide rules of this Commission.

II.

Special pool rules and regulations should be adopted by this Commission concerning the drilling of oil wells in said pool and the production therefrom including, but not limited to, provisions for drilling and proration units. A proration unit should be a governmental quarter section of the U. S. Public Lands Survey consisting of not less than 160 acres and establishing a limiting gas-oil ratio in said pool of 6,000 cubic feet of gas to one barrel of oil. 4000 ?

III.

Throughout the horizontal limits of said pool, the Strawn formation constitutes a common oil reservoir and the study of geological and engineering data now available pertaining to said Strawn formation indicates that one well will efficiently and economically drain the recoverable oil in place in said formation underlying an area in excess of 160 acres. A drilling and

spacing unit for oil wells drilled to the Strawn formation should be composed of a quarter section according to U. S. Public Land Surveys containing approximately 160 acres. No oil well should be drilled on such drilling unit on which another oil well has been completed or approved for completion in said pool. Allowables for said pool should be based on 160 acre spacing.

IV.

Said 160 acre drilling and spacing units should consist of a quarter section within a single section and the unit well should not be drilled closer than 660 feet from the boundary of such governmental quarter section.

V.

It is economically impractical and wasteful to drill wells in the Lusk Strawn Oil Pool on drilling units smaller than 160 acres and closer spacing would create waste by compelling the drilling of unnecessary wells.

VI.

The establishment of drilling and spacing units as herein requested is necessary for the orderly development of a common source of supply in said Lusk Strawn Oil Pool as the same is now constituted or may later be extended. This will protect the correlative rights of all parties affected, will prevent both physical and economic waste, will eliminate drilling unnecessary wells and will promote the recovery of oil from said pool in an efficient and economical manner.

WHEREFORE, Applicant respectively requests this matter be set for hearing after due notice as prescribed by law and upon such notice and hearing, the Commission issue its order establishing special pool rules for the Lusk Strawn Pool providing for 160 acre drilling and spacing units, for a limiting gas-oil ratio of 4,000 to one and for allowables based on 160 acre spacing and such other and further relief to which Applicant may show itself justly entitled.

Garrett C. Whitworth
Attorney for Applicant

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

January 8, 1962

COPY

El Paso Natural Gas Company
P. O. Box 1492
El Paso, Texas

Attention: Mr. Garrett C. Whitworth

Gentlemen:

Reference is made to Case No. 2469, the application of El Paso Natural Gas Company for 160-acre proration units and a 4000 to 1 limiting gas-oil ratio for the Lusk Strawn Pool, Lea County, New Mexico, which was heard by me as trial examiner for the Commission January 4, 1962.

In order to properly evaluate the evidence presented at the hearing, we would appreciate receiving the following information, all related to the evidence submitted but in more detail:

1. Copy of the laboratory report of the analysis of the sub-surface fluid sample.

2. Copies of the core analyses of the cores taken in the Strawn formation in Unit Wells No. 1, No. 2, and No. 3, as prepared by the laboratory, as well as copies of the micro logs of the three wells.

3. An itemized cost accounting of the drilling, equipping, and dual completing of Unit Wells No. 1, No. 2, and No. 3.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

In order to expedite the disposition of this case, we would appreciate receiving the above material by Monday, January 15, 1962.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/ix

cc: Mr. A. L. Porter, Jr.

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
DL = Day Letter
NL = Night Letter
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The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

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DAN NUTTER, EXAMINER, OIL CONSERVATION COMM=
MOGAN HALL SANTA FE NMEX=

RE CASE NO 2469. PHILLIPS PETROLEUM COMPANY CONCURS WITH THE SPECIAL FIELD RULES PROVIDING FOR 160 ACRE PRORATION UNITS AND A 4000 TO 1 LIMITING GOR FOR THE LUSK STRAWN POOL, LEA COUNTY N M AS PROPOSED BY EL PASO NATL GAS COMPA Y=
J N PERKINS PROD DEPT PHILLIPS PET CO MIDLAND TEX==

2469 160 A 4000 1 N M=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

REGULAR HEARING

March 14, 1962

IN THE MATTER OF:
Application of El Paso Natural Gas Company for special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico to provide for 160-acre drilling and spacing units with a limiting gas-oil ratio of 4000/1 and for oil allowable based on 160-acre spacing.

CASE NO. 2469 REHEARING

BEFORE: Honorable Edwin L. Mechem, Governor
Mr. E. S. (Johnny) Walker, Land Commission
Mr. A. L. (Pete) Porter, Sec-Dir. of Commission

TRANSCRIPT OF HEARING

MR. PORTER: The Hearing will come to order. Case 2504 will not be taken up until afternoon. If we conclude the other Case, 2469, before noon then we'll take up Case 2504 at 1:15. If the other case isn't concluded, we will take it up as quick as we can get to it. We will reconvene after lunch at 1:15. We'll continue with 2469, and I would like to ask for appearances in the case.

MR. MORRIS: In the matter of application of El Paso Natural Gas Company for special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico to provide for 160-acre drilling and spacing units with a limiting gas-oil ratio of 4000/1 and for oil allowable based on 160-acre spacing.

MR. SETH: Appearances, Mr. Ben Howell, Garrett Whitworth and Oliver Seth for El Paso Natural Gas, and for Phillips, Mr. Nicola. Mr. Howell.

MR. HOWELL: If it please the Commission, at the outset we have a motion to file and before filing it I think, in fairness, a statement should be made that neither Miss Dearnley, nor any of her present associates, was the person who took the record in this particular Hearing. We have a motion to correct the record of the case before the Examiner. We tried a rather unusual approach insofar as this Commission is concerned and transcribed all of the testimony in advance, giving to the Staff and to all parties interested copies of the testimony, and then had the witness merely adopt the testimony. There are a number of errors in the record, including the omission of one full page of testimony which is the page that I expect to read; and the omission of portions of the rules that we proposed, as well as several others; so I'm offering a motion to correct the record, a written motion in these some twenty-seven instances in which the record is incorrect, and I would like to file this motion and ask that the record be so corrected. We can show in many instances the canned testimony as it was filed in comparison with the record to show the errors that crept in.

MR. MORRIS: If the Commission please, I would like to state my position in support of Mr. Howell's motion.

MR. PORTER: In that case, the Commission will cause

the record to be corrected.

MR. HOWELL: I believe that in the interest of time, rather than to sit down and read the entire record before the Examiner that it will save the Commission's time, and all of our time, if I would make an opening statement somewhat longer than is customary here and attempt to summarize the testimony that's in the case. Now, we have placed upon the wall the Exhibits which were offered in the original record. We have furnished copies of those Exhibits for the Commission and the Staff, I think, already has the copies which were given them last time, which were distributed.

This is an application by El Paso Natural Gas Company to establish one hundred sixty acre spacing in the Strawn-Pennsylvanian Oil Pool in the area of the Lusk Deep Unit in Lea County, New Mexico. The Examiner found and the Commission, in turn, found that one well would drain in excess of forty acres and allowed eighty-acre spacing and found that the Commission, or the Examiner and the Commission were not convinced that the recovery factor used in our estimates was correct or that the cost estimates of drilling a single completion well to the Strawn were as high as we estimated.

Now, I would like to go back to the touchstone first of all and that's the statute. I'm referring to Section 65-3-14, Sub-section B here which grants the authority, it says the Commission may establish a proration unit for each pool, such

being the area that can be efficiently and economically drained and developed by one well. Now, I read that as a mandate that when that fact is established beyond a shadow of a doubt, that the proration unit should be fixed at the area that one well can efficiently and economically drain.

Now, the statute further grants permission to the Commission to consider several factors in reaching its determination and, in so doing, the Commission shall consider the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of the augmentation of risks arriving from the drilling of an excessive number of wells, and the prevention of reduced recovery which might result from the drilling of too few wells.

I would like to address a few comments to our position insofar as economic loss is concerned. We take the position, and I believe we reflect the opinion of the operators generally, that the use of economic loss there doesn't mean that we've necessarily got to lose money on every well. We've suffered an economic loss if by drilling unnecessary wells the profits which the operator might make have been substantially and materially reduced. This case is important to us and it's important to the industry. I think it's important to the state. I believe that anybody who read John Kelly's Mark-up At Denver will realize that the Federal Government is looking at the manner in which the oil

industry conducts itself and the states handle the regulation. I don't believe there's an operator in this area that would want to go under Federal regulation. But the oil and gas industry is faced with economic squeeze and the costs have become of vital importance in the production of oil and gas in this state, and every other state, and we think that great consideration should be given, not to the point as to whether or not eighty-acre spacing or forty-acre spacing would be the breaking point between making a profit and losing, but whether or not that spacing, granted that the well will drill the area sought for, would materially reduce the profit, that's an economic loss as this statute provides.

Now, what testimony did we put on? I'll try to summarize what the record shows. For that purpose I'll go up here and refer to the Exhibits. The first testimony was, as an expert witness, Mr. Richard Lemmon. He introduced Exhibit Number One which consists of a plat showing the outlines of the Lusk Deep Unit which is a Federal-type Unit, in Lea County, New Mexico. It embraces approximately four sections of land, somewhat irregular outlines, shows the contour lines of the Strawn on here; the location of the three wells which have been drilled, the Lusk Number 1, the Lusk Number 2, and the Lusk Number 3 Well; the present participating area in the Strawn; and the proposed expansion of the participating area.

Exhibit Number Two consists of a cross-section showing

the logs of the three Lusk Deep Unit Wells in the center as correlated with wells a distance of a few miles in each direction. The ultimate conclusion, which is not challenged, drawn from the testimony of this witness is that the pool's limits have not yet been established, the horizontal limits have not been established, that there is no evidence of any water drive in the reservoir and that the chief source of the reservoir energy is the expansion of the oil and gas in the reservoir.

Exhibit Number Three is a schedule of the reservoir completion data, showing in detail the data concerning each of the three wells. One might say that it shows that the reservoir fluid was analyzed and that each of these three wells was cored. I've listened to a lot of cases up here and I don't remember a single case in which every well in the reservoir has had a core and we have had the benefit of the core analysis or the reservoir information that we have in this particular case. The average factors show a porosity of 7.1 percent, water content of 30.9 percent, permeability of 17.7 millidarcies, and an estimated net pay of thirty-eight feet. The witness also deduced from the tests and the data that each of the wells had the capacity to produce the oil allowables sought.

Exhibit Number Four is a performance history of each of the wells in the pool; the three wells showing the reduction in the gas-oil ratio which is approximately twenty-four hundred to one.

Exhibit Number Five is a composite electric log correlated with the micro log. It shows as to the Lusk Number 1 Well a continuous Strawn section without interruption in the section and with sufficient fracturing that there is good drainage, both vertically and horizontally, in the reservoir.

Exhibit Number Six is the core analysis of the Lusk Number 1 Well. It shows a complete drainage, both vertically and horizontally, in the Strawn-Pennsylvanian formation.

Now, Exhibit Number Seven, to a layman such as I am, is a particularly compelling and important exhibit. This is a pressure decline graph showing that the initial Well Number 1 came in at an initial reservoir pressure of 5,810 pounds. That was tested in November of 1960. The Number 2 Well was drilled and tested, bottom hole pressures, these were tested in April of 1961; within five days, the test was taken on the Number 1 Well. The Number 1 Well had dropped a small amount, about ten pounds, but the two wells were at approximately the same pressure. In August both wells were again tested after being shut in. The pressures were within a pound of each other at that time. Another test was taken on one well in September and in November, on November 1, the Number 3 Well was completed, again the pressures were taken on the Number 1 and the Number 2 and there isn't three pounds difference between the Number 1 Well, the Number 2 Well and the Number 3 Well; a drop of approximately one hundred pounds in the reservoir pressure which has taken place

over the period of months and with the production of over 100,000 barrels of oil. Now, on the spacing, as this Exhibit shows, taking the radius between the wells as shown by this pressure drop, one hundred ninety-six acres which covered the drainage as to Number 1, the radius and two hundred fifty-one acre drainage would be deduced from the information shown by the Number 3. I say their Number 1, it should be the Number 2 Well.

I think that certainly, to me, seems to be of extreme significance and in all the cases that I've listened to here, I have never seen one in which the correlation was so clear and the communication shown so exactly to corroborate the core analyses and the tests. We feel that we could stop right here; that we would have made a case, that we would have complied with what the statute says if we stopped right here. We aren't doing it, we're going forward.

We have made a calculation which was introduced as our Exhibit Number Eight, the volumetric calculation of the recoverable reserves. At that time the witness, Mr. Lemmon, used a recovery factor of fifteen percent, that factor was challenged. I will state that we intend to put on testimony and show that further calculations which he has made and in which he has extended his material balance calculation further reveal that probably he should have used fifteen and six-tenths percent instead of fifteen percent, but it's at least reasonably close.

Exhibit Nine is the calculated performance and curve

that one would expect from the drainage if a well was only draining forty acres, eighty acres or one hundred sixty acres. It would show the decline that one would expect from the fluid moving within those areas, and the actual performance shows that the well is staying at the same producing characteristics and the drop of one hundred pounds in pressure. This, the witness says, shows an influx of fluid and I would like to read a paragraph or two of that testimony.

"The maintenance of the actual pressure is, in my opinion, caused by the influx of fluid into the vicinity of Well Number 1. In the absence of evidence supporting a water drive it may be concluded that the influxing fluid is oil. It is, therefore, quite apparent from this Exhibit, which presents an independent approach from that previously discussed in Exhibit Seven, that the drainage area of Well Number 1 is considerably in excess of one hundred sixty acres."

Exhibit Number Ten shows the economics for the various well spacing patters in the Lusk-Strawn Pool. I'd also like to read some of the witness's testimony as to that. "This Exhibit shows that a net loss of $187,000 per well would result if the pool was developed entirely on forty-acre spacing. On eighty-acre spacing a net loss of $75,000 per well would result. For one hundred sixty-acre spacing, a net profit of $147,000 per well would be realized. The one hundred and sixty-acre spacing pattern is the smallest regular spacing pattern which results in

a profitable well."

Now, the economics were based upon the estimate of single completion in the Strawn wells, that cost $298,000. The three wells drilled had actually cost in excess of that, much in excess of it; they were dually completed. One well was completed also in the Bone Springs. Two of the wells were completed also in the Morrow Gas Formation. The actual cost as shown at that time for the Number 1 Well was $474,000; for the Number 2 Well, $731,000; for the Number 3 Well, $414,000, which was not the final figure for a Morrow dual. Our estimate was that considering only the Strawn and excluding the costs of the dual formation, the $298,000 was a reasonable cost for a single well. Further study has lead our witness, and we will of[illegible]r testimony to show that perhaps that might have been high, that might have been high to the extent of $12,000, our testimony will show, and the net result is that instead of losing $75,000 on eighty-acre spacing, we would only lose $59,000 a well if the eighty-acre spacing is maintained.

Now, as to cross examination, I can summarize very briefly. The witness, Lemmon, was cross examined as to his recommended four thousand to one gas-oil ratio, as to the recovery factor, as to the dual completions, the actual well costs, as to the Morrow dual formations; and he pointed out that the Morrow is a gas formation so it wouldn't be expected that a hundred sixty-acre spacing would be applicable to a gas formation

at that depth and there would not be available a Morrow dual well for each well to be completed in the future.

He was cross examined concerning secondary recovery and expressed the opinion that it was too early to predict the economics or possibilities of secondary recovery. The figures that he used in making his estimates were two dollars seventy-six cents per barrel of oil after deducting a twelve cent trucking charge, that he had used an estimate of twenty-five cents per barrel for lifting costs, that he had allowed an eighty percent recovery factor for the gas in the Strawn formation and had applied nine cents as the cost.

I believe that fairly summarizes the testimony of the witness, Richard Lemmon. The next witness offered was David Rainey who testified as to the proposed rules. He recommended rules which I might say are normal and provide for one hundred sixty-acre spacing and four thousand to one gas-oil ratio, and a proportional factor for prorational indication of 8.67. He arrived at that figure by taking the depth factor for a well between eleven and twelve thousand feet drilled on forty acres which would be 5.67 and adding three units of one for the additional three forty acres that would be attached thereto.

The witness, David Burleson, testified as to the ownership and offered in evidence Exhibit Number Eleven, which shows the ownership within the Lusk Unit and also the ownership of working interests, the operators to the off-setting acreage.

I believe that constitutes a fair resume of that testimony and we wish to offer the entire record as corrected of the Hearing before the Examiner as our initial offering.

MR. PORTER: The record of the Examiner Hearing will be made a part of this record, Mr. Howell.

MR. HOWELL: We have two witnesses to be sworn and that concludes my opening statement.

MR. PORTER: Will you have your two witnesses stand and be sworn?

(Witnesses sworn.)

RICHARD F. LEMMON,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HOWELL:

Q Will you please state your name for the record?

A My name is Richard F. Lemmon.

Q Are you the same person who testified in the Hearing before the Examiner in this Case Number 2469?

A Yes, sir, I am.

Q Now, will you refer your recollection to your testimony in the original Hearing with reference to the recovery factor which you used in estimating the recoverable reserves. What was that?

A Fifteen percent.

Q Have you any additional data or have you performed any additional calculations in the intervening time with reference to that recovery factor?

A Yes, sir, I have. Since the last Hearing, I have conducted what is called a Material Balance Calculation to determine analytically what the expected recovery would be in this Strawn Pool.

Q Well now, what do you mean by "Material Balance Calculation"?

A Material Balance Calculation, as I have employed it here, is simply an application of the conservation of matter. As with similar engineering processes, a balance is made between the material in the reservoir and those produced. For instance, in this case here, the original gas in the reservoir should remain equal to the gas produced, plus the gas remaining in the reservoir at any one particular point in time. This type balance is commonly referred to as Schilthius type balance.

Q Is that a recognized engineering process for estimating recoverable reserves from reservoirs?

A Yes, sir, it is commonly employed in the reservoir engineering approach to determining recovery factors.

Q Now, would you tell us what the additional calculations or additional work you have done revealed?

A Based upon these Material Balance Calculations the estimated recovery for the Lusk Pool is 15.6 percent. This

material balance was conducted, based on the bottom hole sample that was taken in the Well Number 2, and other related information. I might further add that of the 15.6 percent recovery, it is estimated that 6 percent of the oil in place will be recovered above what is called the bubble point, the bubble point occurring at 4,150 pounds.

Q Let me interrupt a minute there. Was that bubble point determined from an actual test of the fluid in this reservoir?

A It was determined from a bottom hole sample.

Q Taken at an early point in the development of the reservoir?

A Yes, sir, considering the under-saturated nature of the reservoir and the fact that our most recent bottom hole pressure survey indicated a pressure of 5,700 pounds, there had not been a sufficient pressure drop for the oil to cause any gas to come out, at any pressure within the point 5,800 to 4,150.

Q And, as I understand, you say that in your estimate the expansion of the oil itself would produce about 6 percent of the reserves in place?

A Yes, sir. The original oil in place, 6 percent would be recovered due to the expansion of the oil, plus the expansion of the rock. Now, I have included the expansion in the rock in connate water in this calculation to take full benefit of the expansion that would occur during the process of depleting the

pressure in the reservoir. That additional recovery would amount to about 1-1/2 percent of the original oil in place. That combined with the 4-1/2 percent that we would get from the oil adds up to 6 percent.

Q Which takes place before the gas begins to come out in the reservoir itself?

A That is correct.

Q Now, what additional recovery would you expect when the gas comes out in the reservoir and the gas itself acts as reservoir energy?

A Based upon my Material Balance Calculation that additional recovery would amount to 9.6 percent of the original oil in place.

Q Now, have you made any Exhibit illustrating the work which you did and the results which you received from your calculations?

A Yes, sir, I have.

Q Is it on the board and have copies been distributed?

A Yes, sir.

Q How have you numbered that Exhibit?

A We haven't shown a number on it.

Q Will you number that as El Paso Exhibit R-1, please?

(Whereupon, El Paso Exhibit R-1, marked for Identification.)

Q Would you just move over to the board please, Mr.

Lemmon, and explain to the Commission just what that Exhibit reflects and the conclusion that you draw from it?

A Exhibit R-1 is a graph relating the reservoir pressure, which is shown along the left hand side here, with the estimated recoverable oil in percent of the original oil in place in the reservoir. The graph shows that the reservoir pressure would decline down to the level of 4,150 pounds, at which point the recovery would amount to 6 percent. The additional recovery derived by the expansion of the oil and gas would add an additional 9.6 percent, bringing the total recovery to 15.6 percent of the original oil in place.

Also shown on this graph is the predicted gas-oil ratio which would occur during the process of depletion. The sample indicated a gas-oil ratio of approximately 3,000 cubic feet per barrel. That ratio would continue to increase as the bubble point pressure is reached, gas-oil ratio increasing up to a high point of approximately 117,000 cubic feet per barrel. Then dropping off down to about a hundred and, or about 95,000 cubic feet per barrel. The recovery at that point would coincide to the 15.6 percent recovery.

Q Now, in this calculation of a material balance as you did here, please tell us the data you used and what assumptions you made.

A As I had pointed out earlier in this Hearing, in order to perform such Material Balance Calculation, certain information

has to be available. We have a bottom hole sample analysis on the crude from the reservoir so that point is taken care of. The additional information that is required is what is referred to as relative permeability of gas to oil. That factor is the ability of the gas to move in the presence of the oil. It's normally referred to, or related to, the liquid saturation in the reservoir. In this particular instance, until the pressure declines substantially below the bubble point we would not have this information available directly from this formation; therefore, it is necessary to determine a curve which would apply considering the characteristics of this reservoir by which you will make your Material Balance Calculation.

Q Now, you assumed a curve. How did you determine the curve that you would assume?

A As mentioned earlier, the reservoir demonstrated fractured characteristics. That is one important point in arriving at any KGKO curve, which is relative permeability of gas to oil, in that the fracture pattern would give what is referred to as a poor conformance of the gas to the oil, which means that the gas-oil ratios would probably rise earlier and probably to much higher values than what would occur in formations where you don't have the fractured conditions, where you may have a different grading of the formation and so forth.

Q Did you select a curve that reflected data indicated in other Pennsylvanian Pools?

A Yes, sir, I reviewed the literature, reservoir engineering literature, for the purpose of trying to find a curve which I felt would be applicable to the Lusk-Strawn Oil Pool.

Q Did you select the curve which you think best reflects the characteristics of this pool from your own study of it?

A Yes, sir.

Q What additional information did you use?

A As I had mentioned earlier, information that's derived from the bottom hole samples, such as your reservoir volume factors which is the shrinkage of the oil or relation of the shrinkage of the oil solution, gas-oil ratios, oil viscosities, gas compressibility factors, all of that information was available from the bottom hole sample. In addition to that information, it's necessary to have the viscosity of the gas. In this instance I relied upon the information in the literature which gave average viscosity values for gas having the characteristics of the gas found in the Lusk-Strawn Pool.

Q Have you any further comments with reference to your opinion as to the recovery factor in this particular Lusk-Strawn Pool?

A Yes, sir. As I had expressed earlier, I felt considering the characteristics in this reservoir that a 15 percent recovery factor was certainly applicable. Also, I might point out that considering the under-saturated nature of the crude, we recovered 6 percent of the oil in place without bubbling any gas

out. The additional recovery of 9.6 was from that bubble point pressure to the depletion pressure of 300 pounds that we used here. Therefore, had we not had the additional recovery due to the expansion of the oil in the rock we would have a very poor recovery.

Q At this time did you actually extend calculations to a more definite point than you had done the first time in reaching the 15.6 figure?

A Yes, sir. That's right.

Q Did you make a very complicated calculation and actually run the thing out?

A That's right. Because of the nature of the Material Balance, it requires quite a number of trial and error relations, that is, you need to keep your materials in balance so that, in so doing, over the pressure range that we have here, a large number of calculations are actually required in order to deplete the pressure.

Q Is there anything further you would like to discuss in connection with that recovery factor, Mr. Lemmon?

A No, sir, I believe that covers it.

Q I believe at the initial Hearing, your testimony was to the effect that the gas, the casinghead gas, produced from these three wells had not yet been sold?

A That is correct.

Q Has there been any change in that status since then?

A No, sir. El Paso, I understand, have completed their tap for the pipe line connecting company so that they're waiting on a tie-in.

Q Has there been a contract signed?

A Yes, sir.

Q With whom?

A Phillips.

Q So since the last Hearing the contract has been executed?

A That's right.

Q And signed for sale of this casinghead gas. Is the price which will be received approximately the same as the price you used in calculating your economics before?

A Yes, sir. I had used a price of nine cents per MCF which would still be applicable.

Q Now, since the Hearing before did you revise any of the Exhibits that you used to reflect the additional calculations which you have made?

A Yes, sir.

Q Are they posted on the board?

A Yes, sir.

Q Have you marked those Exhibits in any way?

A I show the first of the two exhibits that I have, the first being Exhibit Eight, Revised; the second being Exhibit Ten, Revised.

(Whereupon, El Paso Exhibits Nos. Eight, Revised and Ten, Revised marked for Identification.)

Q To what extent do those revised Exhibits differ from the original Exhibits?

A Considering the Exhibit Eight, Revised, first, previously I had used a recovery factor of 15 percent which was estimated. Now I have employed the results of the Material Balance Calculation and employed 15.6 percent which is a very slight increase.

Q What does that change as to your barrels recoverable?

A Applying that new factor I have, in place of the previous eight hundred thirty-three barrels per acre, eight hundred sixty-six barrels per acre.

Q Are there any changes on it?

A No, sir.

Q Now, as to your revised Exhibit Ten, what changes occurred there?

A The changes I have employed there reflect the change in recovery indicated in Exhibit Eight, Revised, and also considers the new estimated well costs for single completion well of $287,000 in place of the $298,000 previously used.

Q You based it upon the testimony which we expect to introduce as to well costs on further study?

A Yes.

Q Now, what difference does that reflect in recovery

based upon forty, eighty, and one hundred sixty-acre spacing?

A Summarizing the total recovery in money for various spacings, the return for a forty-acre spacing pattern would be a loss per well of $173,000.

Q How does that compare with your original estimate?

A Previously we had indicated this to be $187,000. Considering eighty-acre spacing units, the loss per well would be $59,000. That was in place of the $75,000 we had used in our previous testimony. On the one hundred sixty-acre spacing pattern, the total profit would be $170,000 as compared with $147,000 used previously.

Q Do you have any further comments in connection with the economics as reflected by your revised Exhibit Ten?

A Only that the views expressed earlier have not changed, that the smallest regular spacing pattern on which you can drill an economical well would be one hundred sixty acres.

MR. HOWELL: No further questions.

MR. PORTER: Does anyone have a question of Mr. Lemmon?

MR. MORRIS: Yes, sir.

MR. PORTER: Mr. Morris.

CROSS EXAMINATION

BY MR. MORRIS:

Q Mr. Lemmon, referring to your Exhibit Number Eight, Revised, is it true that the figure of 7.1 percent of the porosity which you state to be an average from the core analyses

of the three wells is a crucial factor in determining the recovery factor in this pool?

A Well, considering if you doubled it or something, you naturally would double your recovery.

Q Could you say that generally the porosity bears some direct proportion to the recoverable reserves that you would calculate using that figure?

A Yes, sir.

Q Could you give me the actual porosity figures from the core analyses of the Number 1, 2, and 3 Wells?

A I might mention before I give you these, that any average you would come up with would be dependent on the certain number of feet that would be considered as net pay.

Q Would you give me the net feet of pay in each well that were considered in arriving at the porosity?

A In Well Number 1, we estimated 8.3 percent, on thirty-three feet of core interval there. For Number 2, an average of 5.6 percent porosity for eighteen fee. For Well Number 3, 6.3 percent porosity for 24.5 feet.

Q Mr. Lemmon, the net pay average which you show on your Exhibit Number Eight, Revised, is thirty-eight feet. Why would thirty-eight feet be the figure that is shown on the average porosity as based upon feet of net pay which would average quite a bit less than thirty-eight feet?

A The reason being that the full interval was not

cored in each instance there, and we relied on the electric logs plus the micro logs to determine the total porous interval and then we applied these various averages that we had determined in each of the wells to that full interval, recognizing that if the log appeared to be about the same level, we assumed that the same porosity would be applicable over that interval. Thereby if you did it that way, you would end up with the thirty-eight feet that we have used rather than what you have.

Q Mr. Lemmon, also on your Exhibit Number Eight, Revised, you've shown the permeability to be 17.7 millidarcies as an average figure. I wonder if you could give me a breakdown on that per well, please?

A In the case of the Number 1 Well, average permeability corresponding -- in fact, all of these values I will read you will correspond to the other values to footage that I gave you. In the case of Well Number 1, the average permeability is 24.6 millidarcies.

Q All right.

A For Well Number 2, 13.7. For Well Number 3, 10.1.

Q I believe, also, you've shown an average figure for water saturation, could you give me those figures on a well by well basis?

A Well Number 1 is 28.5 percent. Well Number 2, 29.8, Well Number 3, 36.3.

Q Could you give me the feet of net pay that were not

considered in determining these other figures, but the feet of net pay which you believe to exist in each of the three wells?

A In the case of Well Number 1, we estimated 26 feet of other section. Well Number 2, 30 feet, Well Number 3, 24 feet.

Q Mr. Lemmon, in giving me the figures for percent of porosity in each well, you stated that the 8.3 percent is based upon the cores of thirty-three feet of net pay and you have just informed me that you believe there are only twenty-six feet of net pay in that well?

A Not net. Were you talking about net or other? I thought you described that as "other section".

Q No, I wanted the net pay in each well, please.

A I beg your pardon. In Well Number 1, we show forty-one feet. Well Number 2, eighteen feet, Well Number 3, fifty-four feet.

Q Mr. Lemmon, do you show on your Exhibit Eight a figure representing the barrels per acre foot of oil in place?

A Not as such. It can be derived from that. However, we show the barrel per acre rather than per acre foot.

Q So that if we divided by your thirty-eight feet of net pay, you would have the barrels per acre foot?

A That's correct.

Q Turning to your Exhibit Number Ten, Revised, Mr. Lemmon, do you have a breakdown available on the figure of $287,000 which you show to be a representative well investment?

A I believe that will be covered by our other witness.

MR. HOWELL: We will put that other testimony on by the same witness who testified as to well costs before.

Q (By Mr. Morris) Mr. Lemmon, examining the calculation that you have made in each case of forty, eighty, and one hundred sixty-acre spacing units to arrive at the working interest net income for each size proration unit, I note that you have used the figure of twenty-five cents. Is that a lifting cost per barrel?

A That's right.

Q Now, you have used that lifting cost of twenty-five cents per barrel on forty, eighty, and one hundred sixty-acre spacing units, is that correct?

A Yes, sir.

Q Why would it cost as much to lift a barrel of oil with an allowable which you would receive on one hundred sixty-acre spacing units as it would cost to lift that same barrel with the lesser allowable you would receive in forty and eighty-acre spacing units?

A The reason I used twenty-five cents, it was just a matter of an average value applicable to this economic analysis. There's no contingency included in the figures for work-overs or anything like that. In deriving the twenty-five cents I considered $175.00 per month as being the anticipated operating cost for these wells. In answer to your question, I am

utilizing the figures I have here based on a thirty-four unit allowable rather than the thirty-five that was given today, but I think they are a little straighter to the point. For the forty-acre well I estimated that the average cost would be approximately thirty cents per barrel. In the case of the eighty-acre spacing the computed cost would be about twenty-six cents per barrel; for one hundred sixty-acre allowable the average cost would be approximately twenty cents per barrel. So it's just more or less an average figure there. As you can see, it doesn't vary very much and the overall impact on the figures wouldn't be changed materially.

Q Your figure on one hundred sixty-acre units would be slightly increased, though, would it not?

A Decreased, I believe, twenty cents.

Q Your net income would be slightly increased?

A Yes, sir.

Q Mr. Lemmon, going back to the discussion of this recovery factor for a minute, what is the range of recovery factors that you might expect when you are talking about solution gas drive reservoirs in general?

A Well, of course, on a general basis they can vary considerably.

Q They could vary, say, from a low of 10 percent as high as up to 60 percent, couldn't they?

A You are speaking only of solution drive now?

Q Yes, sir.

A I don't know just how you'd get the 60 percent for just strictly a dissolved gas drive. I can see where you would get 10 percent or over, or lower.

MR. PORTER: How about 30 percent?

A That would be probably a top value for the dissolved gas drive. However, those factors are a function of a number of variables, I might point out, though.

Q (By Mr. Morris) Do you feel that the 15.6 percent recovery factor that you have used is a conservative estimate of the actual recovery that will be experienced from this pool?

A Considering depletion drive mechanism, I don't believe it is a conservative figure.

Q Have you taken into account, Mr. Lemmon, any possibilities of secondary recovery in arriving at this 15.6 percent?

A No, sir.

Q Do you feel that secondary recovery in this area may be a possibility?

A I believe it probably would be a possibility.

Q Do you feel that it is a probability?

A That, I can't say.

Q Can you say that in other pools of this general nature that secondary recovery has proved to be feasible?

A Certainly there are a number of instances where

secondary recovery efforts are economical. I might point out that in this case the pool hasn't been defined yet, so that it's a little premature to jump in with a proposal other than just preliminary thinking.

Q El Paso certainly is not going to rule out the possibilities and probabilities of secondary recovery in this?

A I believe we would certainly consider a secondary recovery project here.

Q If a secondary recovery project were successful it could substantially increase your recovery above the 15.6 percent level, could it not?

A Assuming it would be successful.

MR. MORRIS: That's all the questions I have.

MR. PORTER: Mr. Nutter.

BY MR. NUTTER:

Q Mr. Lemmon, in using the Schilthius Material Balance Calculation, it's necessary to make some assumptions, particularly early in the life of the reservoir, is it not?

A Yes, sir.

Q From time to time as the pool is produced, it becomes imperative to obtain an accurate prediction of the ultimate recovery from that pool to run new material balances with the data that had become available as the producing life of the pool was unfolded?

A That's right.

Q How much actual producing life of the pool do you think that you had when you ran your material balance? You stated that the last test pressures that had been available were 5,700 pounds, is that correct?

A Yes, sir, in that range.

Q What percent of the cumulative recovery on your Exhibit Number R-1 would be indicated by the reservoir pressure decline being at 5,700 pounds?

A Well, as you can see, that would throw you pretty well up to the top end of the curve which would give you a very small, insignificant amount of recovery.

Q Would it be something like three-tenths of one percent?

A I believe I would agree with you. It would be three-tenths.

Q How much recovery had been made from the pool up to that time?

A Coinciding with that pressure, I believe we had something on the order of 100,000 barrels.

Q So would you estimate that the reserves in the pool would be 300 times 100,000 barrels?

A I believe you would. Let's see, three-tenths percent, that would have to be related probably to the recovery factor for an answer on that.

Q So that the cumulative recovery at the time of this pressure could not be expanded then, if it's been three-tenths

of one percent of your total ultimate recovery, you can't expand that by multiplying it by 300?

A Let me make this statement. The fact that you are still in this region above the bubble point, the information that you derive other than the pressures versus cumulative production would not assist you in predicting what would occur below the bubble point.

Q For the time being, at least, this is the most accurate area that you could make a prediction on?

A As to oil in place.

Q The expansion of the fluid and the rock?

A The initial oil in place.

Q And the rest of the curve from the bubble point on down has to be based on an estimated instantaneous gas-oil ratio?

A That's right. It has to be estimated on the performance that you derive as the pressure drops below the bubble point.

Q What did you actually use as the KGKO slope that you said that you had to derive?

A I researched through the literature to see if I could find a set of conditions which I thought would apply to this reservoir. My review of the literature disclosed an article written by Mr. J. J. Arps and T. J. Roberts who, in their article, had presented a number of relative permeability curves for various limestone, dolomite and chert fields. I refer to

figure two of their article, that article appeared in the 1955 AIME Transactions and, of course, I think Mr. Arps is pretty well recognized and certainly one of the foremost authorities in the petroleum industry. In that figure two, they show a series of curves for about twenty-five different reservoirs. Included in that figure were a few relationships for Pennsylvanian type fields, and those particular curves pretty well coincided with what he had deduced to be the average curve, so in conducting my material balance calculation I used his "T" curve that corresponds to his average curve.

Q You used his average curve?

A Yes, sir.

Q As presented in figure two?

A Figure two of his paper. I might add, there's evidence of other curves along with that graph, that's with the average curve, which give the evidence that there were fractures in some of the other fields that were considered. The presence of the fractures existing in these other fields would tend to raise the value, which would give you a smaller recovery factor actually if you would employ those curves.

Q Did his average include these Pennsylvanian type limestone reservoirs such as this?

A His average, right, it included those.

Q Now, Mr. Lemmon, on your Exhibit Number Six in the original Hearing you stated that only porosity values of over

four percent and permeability values of over one-tenth millidarcies had been included in the determination of the net pay from the core analyses?

A Yes, sir.

Q Assuming that one-tenth millidarcy would be the minimum through which you could produce the oil, but in the event you had over one-tenth of a millidarcy and three percent porosity you would have some reserves, would you not?

A You said over three percent porosity?

Q No, three percent and permeability of over one-tenth of a millidarcy.

A That's right, except in our preparation of that chart we considered that both values had to be met. That is, you had to have both a tenth millidarcy and four percent porosity.

Q I understand that. But in the event you had the permeability but you had slightly less than the four percent porosity, you would still be contributing some oil, would you not?

A That is correct.

Q And this oil has not been included in the calculation or the computation of the net pay?

A No, sir, but I would like to point out in the case of that particular Exhibit there, which was on the Well Number 1, we had also given consideration to just that sort of thing; and by analyzing the rest of the core analysis which we had neglected to use here, but still with only total overall gross section of

what we call the total Strawn zone, we found that in that twenty-six feet you have an additional pore space of 7.5 percent; so that you can see that the bulk of the oil, at least within the Well Number 1, would be included in that section that we have considered to be the net pay section.

Q I grant you that the bulk of the oil would be, but there would be some additional oil?

A 7.5 percent. That's out of 100 percent.

Q On the 1, 2, and 3 you had thirty-three feet, eighteen feet and 24.5 feet of core interval, respectively, then you had additional section of twenty-six feet, thirty feet and twenty-four feet. However, you stated that in coming up with your net pay at which to arrive at an average for the pool you used eighteen feet for the Number 2. Why did you only use the eighteen feet? You had eighteen feet of cored interval, you had thirty feet of other section as you classified it.

A Yes, sir, I believe that in that particular well the section pretty well coincided with the section that was cored, and the other portion there would have an average porosity of about 1.8 percent. There's thirty additional feet there, I believe you mentioned. Average porosity for that interval would be 1.8 percent porosity.

Q Despite the fact that you attribute only eighteen feet of net pay to this well in arriving at your average, you did perforate the well from thirty feet?

A Yes.

Q From two twenty to two fifty?

A I'll take your word for it.

Q I think your Exhibit reflects the perforated interval?

A Yes, sir. 11220 to 11250, that's correct.

Q Mr. Lemmon, I presume that Mr. Coel is going to testify in more detail as to well costs, is he not?

A Yes, sir.

MR. NUTTER: Thank you very much.

MR. PORTER: Anyone else have a question of Mr. Lemmon?

The witness may be excused.

(Witness excused.)

A F T E R N O O N S E S S I O N

TRANSCRIPT OF HEARING (Continued)

MR. PORTER: The hearing will come to order please. Mr. Howell, will you call your next witness?

MR. HOWELL: If it please the Commission, I believe I failed to offer the exhibits prepared by El Paso. That was Exhibit R-1, Exhibit 8 Revised and Exhibit 10 Revised, and I would like your permission to ask another question of the witness Lemmon with reference to these exhibits.

MR. PORTER: Yes, sir.

MR. HOWELL: Were these exhibits that I have mentioned prepared under your supervision and direction?

MR. LEMMON: Yes, sir.

MR. HOWELL: Do they correctly reflect the matters which they purport?

MR. LEMMON: Yes, sir.

MR. HOWELL: We offer in evidence these exhibits.

MR. PORTER: If there is no objection to the admission of the exhibits they will be made a part of the record.

MR. HOWELL: We'll ask Mr. Coel if he will take the stand.

EDWARD JOHN COEL,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. HOWELL:

Q Will you please state your name for the record?

A Edward John Coel.

Q By whom are you employed and in what capacity?

A By the El Paso Natural Gas Company as supervising petroleum engineer.

Q What is your experience, your technical education and well, let's say your technical education and experience with reference to the cost of drilling wells?

A I have been employed by El Paso Natural Gas Company since 1949. I received a Bachelor of Science Degree in petroleum engineering at the University of Texas in 1949. Aside from my first eighteen months of employment, I have been directly engaged by the drilling department and production department of El Paso Natural Gas Company.

Q In your work have you become familiar with the necessary and reasonable cost of drilling wells in Lea County, New Mexico?

A Yes, sir, I feel so, at least those that concern us.

Q Are you familiar with the reasonable cost to be expected of drilling a single completion well in the Strawn-Pennsylvanian Oil Pool in Lea County, New Mexico?

A Yes, sir.

Q Have you prepared exhibits showing the actual cost of the three wells which have been drilled by the El Paso in this

pool?

A Yes, sir, I have.

Q Are these exhibits broken down into reasonable detail as to the various elements of cost?

A Yes, sir, they are, both for materials and services.

Q Will you identify the exhibit which reflects the actual cost of the Number 1 well as El Paso Exhibit 2-R?

(Whereupon, El Paso Exhibit No. 2-R marked for identification)

A We have such an exhibit, and we have labeled it "Field Well Cost," it does show the total book cost, accounting cost, rather, as we have on our books of this well.

Q And is broken down into detail?

A Yes, sir, as to tubular goods, wellhead equipment, other equipment, contract cost, cementing, formation treatment, special services, materials and so forth.

(Whereupon, El Paso Exhibits Nos. 3-R and 4-R marked for identification)

Q Have you prepared an Exhibit R-3 covering the field well cost actually incurred in drilling the Number 2 well?

A Yes, sir, I have.

Q Those costs shown on Exhibit Number 2--

A Are actual costs by book.

Q --or Exhibit 3, I beg your pardon.

A 3-R, sir.

Q 3-R. Have you likewise prepared Exhibit 4-R showing

the actual well costs incurred in drilling the Number 3 well?

A Yes, sir, I have. There is a slight deviation between this one and the previous exhibits due to the fact that this is an incomplete well cost but it is our latest book cost to date. It sometimes takes as much as six months to close out the books on a well after drilling.

Q This reflects the costs that have been actually put on the books and in your opinion there are still outstanding costs that will be added?

A We know of some that will be added, yes, sir.

(Whereupon, El Paso's Exhibit No. R-5 marked for identification)

Q Now, have you prepared as El Paso's Exhibit R-5 an estimate to cover the cost of the development well singly completed in the Strawn-Pennsylvanian formation in the Lusk Deep Unit Area?

A I have, sir.

Q I wish you would state to the Commission what those estimates are and the data and information you used in making that estimate.

A Well, the estimate totals $286,823.00. It is a slight deviation from the one that was in evidence in the previous case since we are able now with the more accurate casing design and more complete accounting costs to estimate further the materials to be used in a single well. It is based primarily upon the

drilling of the Lusk-3 onto which we undertook to apply the best drilling techniques that we, that could be applied from what we had learned from the drilling of the 1 and 2. In other words, the Number 3, we did everything possible to make a good cheap completion and using those same criteria, the estimate of the single well was based.

Q Now, tell the Commission whether or not in your opinion this is a fair and reasonable cost that might be expected for such a well.

A It is a fair and reasonable cost, in my opinion.

Q Now, are there any situations or conditions which exist in this particular area that are somewhat different from the ordinary and general conditions in Lea County?

A Yes, sir, there are. For one thing, we run our intermediate string to the top of the Delaware and we do have what is really a normal grade in pressure near the Strawn formation, but it is greater than is often found at the same depth in other parts of Lea County. Therefore, we have to carry a higher mud weight while drilling this well and this necessitates us to run a deeper string of intermediate casing to prevent loss of circulation in the Yates and Seven River formations.

Q Is that a condition that is not general in Lea County?

A In another area not too far from us we know that it does not exist.

Q Does this estimate include tank battery cost?

A Yes, sir, it does, and the Exhibit 4-R also, or 4-R also includes our book and tank battery cost to date so that we could show that this was a reasonable estimate for a tank battery to fit on a well.

Q Were these exhibits prepared by you or under your direction?

A They were.

Q Are they correct and do they reflect the matters to which they relate?

A Yes, sir, they do.

MR. HOWELL: We offer the exhibits in evidence.

MR. PORTER: Any objections to the exhibits being entered?

MR. HOWELL: No further questions.

MR. PORTER: They will be admitted to the record. Any questions?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Coel, the estimate of the cost of a single Strawn well here is Exhibit 5-R, is that correct?

A Yes, sir.

Q Now, on 5-R you have got 4700 feet of 9 and 5/8's intermediate casing at a cost of $27,000.00. This will be approximately 5.75 per foot, is that what you have to pay for that casing?

A Slightly higher than that, but that's close enough.

Q And your five and a half would be approximately two and a half a foot or somewhere in that neighborhood?

A Yes, sir.

Q So you have a total cost of casing and tubing of $74,000.00?

A Casing, tubing and you'll note also on there we included casing inspection and some trucking that we tried to estimate coming from our Jal yard.

Q Now, the wellhead equipment, I presume this is Christmas Tree for a flowing well?

A Yes.

Q That $5800.00?

A Yes, sir.

Q Now, the 86,500 for a contract cost, what is that based on, Mr. Coel?

A It's based on the actual contract that we had on the Number 3 well, it's not a straight footage contract but it is a footage contract to 10,000 foot. At that point we take over the well on day work basis and drill it to total depth.

Q Well, now, does this include day work--

A Yes, sir.

Q --in this figure?

A This does include day work both for completion and drilling of the last 1500 or so feet here.

Q But the last 1500 is on a day basis?

A Yes, it is.

Q And the contract--

A It is based on 10,000 foot.

Q 10,000?

A Yes, sir.

Q Now, the $10,100.00 for cementing, is that actually based on cementing costs for these various strings of casing?

A Yes, sir, it is. It's related almost directly to the Lusk Unit Number 3. We have tried to estimate where we could cut cementing costs and where we would have to add them on each string.

Q Now, we get down to the special services, including $9500.00 for logging. Is it necessary to do $9500.00 worth of logging on all these development wells as development of the pool proceeds?

A This is a cost over which frankly I have no control. Our goelogist, geology department specifies the amount of logging; we try to give them plenty of room. In this case we actually added some logs of our own where we want to run cement bond determination logs and so forth.

Q Well, I noticed on the logs that were run on the first three wells, some of them had quite a number of additional logs other than the micro log which we have copies of.

A Yes.

Q And some of them don't have all these other logs, will

you be running all these logs on all the wells?

A We have to estimate for that because we have done it so often in the past, sometimes it's adequate not to run them all and sometimes if there is any show in the formations above then they may want to run extra logs for that reason, or if they are not satisfied with what they do receive at the time.

Q So this is actually a contingency figure on logging rather than actual cost?

A It's a slight contingency on log.

Q Do actual mud bills run approximately $28,000.00 for drilling an 11,000 foot well here?

A Yes, sir, they will.

Q Do you have any particular problems that require that much mud?

A No. We have got, for one thing, brine is included in here and that's a pretty, getting to be a pretty expensive item right now, didn't used to be; the drilling of the first 4700 foot is with brine, we use a water and then water soap and eventually an oil emulsion, what we call drilling milk, and that is a mud that lends itself to good drillability features and yet can be weighted up at the time necessary and has been done that way.

Q And you are drilling then with an oil mud, then?

A With an oil emulsion type mud, yes, sir.

Q Now, the tank battery cost $14,000.00. Is the tank battery going to cost 14,000 for each well?

A It has.

Q Do you have individual tank batteries for all the wells?

A There are right now, yes, sir.

Q Is this going to be a necessary procedure in the future, to build a tank battery for each well?

A Well, oftentimes on units it's not. You oftentimes build a central storage battery, but at the present time we have built individual batteries. I don't know, it will be up to the production department in that area as to how they will actually handle those but these costs do reflect what has been spent so far.

Q And the locations, I notice $8500.00 per location.

A Yes, sir, that's--

Q Is this a mountainous country, or--

A No, it's very sandy, it's often necessary to caliche the roads to be able to get in and out in all weather.

Q You include access in your location?

A Yes, sir, that's right.

Q How many miles of access road are there?

A Well, if you'll notice in this figure we have shown $8500.00, as against the Number 3 we have $12,907.00. We hope that our road is going to be close enough to the next well that we won't have to re-caliche or build clear to the well. In other words, it's a matter of extending the field roads you already put in.

Q Not to be facetious, it would be less for roads if the wells were on eighty acre spacing than on hundred and sixty?

A There would be more of them though.

Q But you wouldn't have to go so far.

A More locations involved anyway. In that sandy country most of the locations do have to be caliched in most cases.

MR. PORTER: Anyone else have any questions of this witness? You may be excused.

(Witness excused)

MR. PORTER: Did you offer your exhibits in this?

MR. HOWELL: Yes, I believe we offered them.

MR. PORTER: Yes, you did. Does that conclude your testimony?

MR. HOWELL: That concludes the testimony which we have to offer.

MR. PORTER: Anyone else have any testimony to offer?

MR. NICOLA: Phillips would like to call a witness to make a statement. I would like to be sworn, if I may.

MR. PORTER: Yes, sir. Pete Nicola.

(Witness sworn)

O. P. NICOLA,

called as a witness herein, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. SETH:

Q Would you state your name and your position, please?

A O.P. Nicola. I'm director of proration in the Production Department at Phillips Petroleum Company at Bartlesville, Oklahoma.

Q Do you have a statement to give the Commission?

A Yes, sir, I do. Phillips Petroleum owns over 10 per cent interest in the Lusk Deep Unit and we are participating in the cost which El Paso has reported here today. We adopt El Paso's facts, figures and testimony respecting well costs and reserves. Evidence at the original hearing conclusively showed that one well will drain at least a hundred and sixty acres; therefore it would seem to us that to permit more than one well on a hundred and sixty acres would be permitting the drilling of unnecessary wells. But, aside from the purely statutory point of view, the oil industry is beset with oversupply. The industry heretofore has practiced willful waste in many states by drilling more wells than were necessary either to recover the hydrocarbons or to satisfy the market demand. Per well allowables have gradually been reduced to compensate for more and more new wells, so from the standpoint of the need or rather the lack of need for additional oil, it would seem only logical for a hundred and sixty acre spacing to be adopted here and anywhere else where it can be shown that no waste will occur.

Some day on down the line the operators will want to engage in secondary recovery, probably water flooding. The number and

location of wells drilled for primary production will have no relationship to the wells that may be needed for such secondary operations; additional wells, if needed, can be drilled at that time.

It seems to us that for the Commission to insist that two wells should be drilled on each hundred and sixty acre trace at this time is not conducive to the efficient utilization of the resources of the industry. A quarter of a million dollars or more is a lot of money for drilling a well in this field and should be wisely spent,

Phillips Petroleum Company respectfully urges that the Commission adopt the hundred and sixty acre spacing for the Lusk-Strawn Pool. I might add here that Phillips is going to connect it to take the gas to its Lea Gasoline Plant and we have authorized the expenditure of the money for the pipe to lay it and it should be connected within not more than two months from now. I believe that's all I have.

MR. PORTER: Anyone have a question of Mr. Nicola? You may be excused.

(Witness excused)

MR. PORTER: Anyone have a statement to make in the case?

MR. MORRIS: If the Commissioner please, I have three communications, one from Phillips Petroleum Company, one from Kerr-McGee Oil Industry and one from Gulf Oil Corporation, all in support of El Paso's application.

MR. HOWELL: If it please the Commission, I would like to conclude with an argument, which I shall try to keep brief. I would like to again touch the touchstone of the statute and say the Commission may establish a proration unit for each pool, such being the area that can be efficiently and economically drained and developed by one well. I want to read a few sentences from the testimony of Mr. Lemmon which stands uncontradicted and unchallenged, "Bottom hole pressures taken on August 5th, 1961 on wells Numbers 1 and 2 after approximately 80,000 barrels of oil had been produced with 5766 pounds square inch gauge and 5765 pounds square inch gauge respectively, these pressures were recorded the same day after the wells had been shut in for seventy-two hours and were recorded by the same bottom hole pressure bomb. The close agreement of pressures in these two wells indicates excellent communication within the Strawn reservoir. A bottom hole pressure survey conducted the 6th and 7th of November, 1961 on Wells Number 1 and 2 and a new completion, Number 3, indicated the following pressure data: Well Number 1, 5704 pounds square inch gauge; Well Number 2, 5706 pounds square inch gauge; and Number 3, 5710 pounds square inch gauge. On this survey, the wells were shut in one hundred hours, ninety-eight hours and one hundred thirty-six hours, respectively. The significant fact apparent from these data is the pressure recorded on Well Number 3. The pressure of 5710 pounds, one hundred pounds per square inch below the original was very nearly the same as those recorded on Wells

Number 1 and 2, even though Well Number 3 had not been previously produced. Thus the oil production from Wells Numbers 1 and 2, which totaled 110,000 barrels, caused a reduction in reservoir pressure in Well Number 3. The distance between Wells Number 1 and 3 is 1650 feet. The drainage area indicated by this distance is one hundred ninety-six acres. It is therefore obvious that drainage has occurred over areas in excess of a hundred and sixty acres within a period of several months."

"What is your conclusion from this exhibit with reference to the extent that one well is able to effectively and efficiently drain an area in the Lusk-Strawn Oil Pool?"

"In my opinion, from the data shown on this exhibit and other data and information that I have studied, one well in the Lusk-Strawn Oil Pool will effectively and efficiently drain an area in excess of one hundred and sixty acres."

Now, that is unchallenged before this Commission and we submit that that has met the test that the statute requires. The Commission, however, may consider other things and in so doing the Commission shall consider the economic loss caused by the drilling of unnecessary wells. I think that no one would make the contention that in order to prevent the drilling of an unnecessary well the operator should be required to show that that well will constitute a loss and put him in the red ink and not pay out. I think we still have enough private enterprise in this country that there is nothing wrong with making a profit, and if the

profit is reduced unreasonably, the well has suffered an economic loss.

Now, the only challenges which have been given to the testimony that have been offered, and these challenges have not been supported by the evidence, but have requested the figures which were used in determining the ultimate recovery, the figures which were used in the cost. What if they are 10 per cent wrong, what if they are 15 per cent wrong, does that effect the ultimate issue in this case which is that it is the duty of this Commission to establish a spacing on the area that one well will drain. The economic loss, these other factors are merely frosting on the cake and even in this case the frosting has got vitamins in it because the proof certainly shows that eight-acre spacing is going to cost somewhere between $75,000.00 and $59,000.00 a well, loss.

The next item: protection of correlative rights. This area is a unit area, all of the operators are asking for this, no one is opposing it, the handling of royalties is governed by the unit agreement. There is no possible invasion of correlative rights by granting this application. Correlative rights, including those of royalty owners, the prevention of waste, there isn't one word of testimony in here, one inference that a well cannot economically and efficiently and effectively drain a hundred and sixty acres. There hasn't been any challenge that there would be any oil left in the ground on a hundred and sixty acre spacing. You consider that element, you can come only to one conclusion.

The avoidance of the augmentation of risks arising from the drilling of an excessive number of wells, I think that speaks for itself. We have shown clearly that no other wells are needed here and the prevention of reduced recovery which might result from the drilling of too few wells, I reiterate, there isn't a line of testimony, there isn't a serious challenge to that testimony which establishes beyond a shadow of a doubt that the communication in this reservoir is excellent, and that one well will drain a full one hundred sixty acres.

We submit that from this record we have established clearly and conslusively the points that are required by the law and that the Commission should establish rules for this pool, establishing one hundred and sixty acre spacing proration units adopting the suggestions made as to the gas-oil ratio and the unit allocations. Thank you.

MR. PORTER: Anyone else like to make a statement? The Commission will take the case under advisement.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, MARIANNA MEIER, NOTARY PUBLIC in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached transcript of hearing was reported by me in stenotype and that the same was reduced to typewritten transcript under my personal supervision and contains a true and correct record of said proceedings, to the best of my knowledge, skill and ability.

NOTARY PUBLIC

My Commission Expires:

April 8, 1964

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. 2469
Order No. R-2175-B

APPLICATION OF EL PASO NATURAL GAS
COMPANY FOR THE ESTABLISHMENT OF
SPECIAL RULES AND REGULATIONS FOR
THE LUSK-STRAWN POOL, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on March 14, 1962, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this 4th day of April, 1962, the Commission, a quorum being present, having considered the testimony presented and the exhibits received at said hearing, 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, El Paso Natural Gas Company, on rehearing, seeks a modification of the Special Rules and Regulations for the Lusk-Strawn Pool as contained in Order No. R-2175 entered in Case No. 2469 on January 30, 1962, to provide for the development of said pool on 160-acre proration units.

(3) That the present testimony of the applicant indicates that one well can efficiently drain 160-acres.

(4) That the present testimony of the applicant relative to the economics of drilling in the subject pool indicates that development on less than 160-acre oil proration units would be uneconomical.

(5) That the Special Rules and Regulations for the Lusk-Strawn Pool as contained in Order No. R-2175 should be modified to provide for 160-acre oil proration units.

IT IS THEREFORE ORDERED:

(1) That Special Rules and Regulations for the Lusk-Strawn Pool, Lea County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE LUSK-STRAWN POOL

RULE 1. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn formation within one mile of the Lusk-Strawn Pool, and not nearer to nor within the limits of another designated Strawn pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the Lusk-Strawn Pool shall be located on a unit containing 160 acres, more or less, substantially in the form of a square, which is a quarter section being a legal subdivision of the United States Public Lands Survey.

RULE 3. Each well completed or recompleted in said pool shall not be drilled closer than 660 feet to any quarter section line nor closer than 330 feet to any quarter-quarter section line. Any well which was drilling to or recompleted in the Lusk-Strawn Pool prior to January 4, 1962, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director of the Commission may grant an exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising less than 160 acres. All operators offsetting the proposed non-standard unit shall be notified of the application by registered or certified mail, and the application shall state that such notice has been furnished. The Secretary-Director of the Commission may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lusk-Strawn Pool as the acreage in such non-standard unit bears to 160 acres.

RULE 5. A 160-acre proration unit (158 through 162 acres) in the Lusk-Strawn Pool shall be assigned a 160-acre proportional factor of 8.67 for allowable purposes, and in the event there is more than one well on a 160-acre proration unit, the operator may produce the allowable assigned to the unit in any proportion.

RULE 6. The limiting gas-oil ratio in the Lusk-Strawn Pool shall be 4000 : 1.

PROVIDED HOWEVER, That the provisions of Rules 5 and 6 shall not become effective until such time as all wells presently completed in the subject pool are connected to a casinghead gas gathering system.

(2) That Order No. R-2175 entered in Case No. 2469 on January 30, 1962, is hereby superseded.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

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

esr/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

APPLICATION OF EL PASO NATURAL GAS COMPANY FOR THE ESTABLISHMENT OF SPECIAL RULES AND REGULATIONS FOR THE LUSK-STRAWN POOL, LEA COUNTY, NEW MEXICO.

CASE No. 2469
Order No. R-2175-A

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for reconsideration upon the Application of El Paso Natural Gas Company for a Rehearing in Case No. 2469, Order No. R-2175, heretofore entered by the Commission on January 30, 1962.

NOW, on this 15th day of February, 1962, the Oil Conservation Commission, a quorum being present, having considered the Application for Rehearing,

FINDS:

(1) That the Application for Rehearing alleges that the applicant has new and additional evidence to present concerning well costs and recoverable reserves in the Lusk-Strawn Pool, Lea County, New Mexico.

(2) That the Application for Rehearing should be granted.

IT IS THEREFORE ORDERED:

That the Application of El Paso Natural Gas Company for Rehearing in Case No. 2469, Order No. R-2175, is hereby granted. The rehearing in this matter shall be heard by the Commission at its regular monthly hearing on March 14, 1962, and such new order shall be entered after rehearing as may be required under the circumstances.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

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

esr/

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. 2469
Order No. R-2175

APPLICATION OF EL PASO NATURAL GAS
COMPANY FOR THE ESTABLISHMENT OF
SPECIAL RULES AND REGULATIONS FOR
THE LUSK-STRAWN POOL, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on January 4, 1962, 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 30th day of January, 1962, 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, El Paso Natural Gas Company, seeks the establishment of special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico, including provisions for 160-acre oil proration units and for a limiting gas-oil ratio of 4000 : 1.

(3) That the evidence presented by the applicant concerning the drainage characteristics of the reservoir indicates that good communication exists and that one well can drain in excess of 40 acres.

(4) That the evidence presented by the applicant concerning the economics of drilling in the subject pool reflects that development on 80-acre proration units will be unprofitable; that this evidence is based, in part, upon well costs which appear to the Commission to be excessive and upon recoverable reserves which appear to be too conservative.

(5) That, in the opinion of the Commission, the subject pool can be efficiently and economically drained and developed on 80-acre proration units.

(6) That the application for 160-acre oil proration units in the subject pool should be denied.

(7) That inasmuch as the solution gas-oil ratio in the subject pool is 3084 : 1, a limiting gas-oil ratio of 4000 : 1 is justified.

(8) That special rules and regulations should be established for the Lusk-Strawn Pool providing for 80-acre oil proration units and for a limiting gas-oil ratio of 4000 : 1.

(9) That to prevent the flaring of an undue amount of casinghead gas, the allowable and gas-oil ratio provisions of the special rules should be made effective on the date all wells in the subject pool are connected to a casinghead gas gathering facility.

IT IS THEREFORE ORDERED:

(1) That the application of El Paso Natural Gas Company for the establishment of 160-acre oil proration units in the Lusk-Strawn Pool, Lea County, New Mexico, is hereby denied.

(2) That special rules and regulations for the Lusk-Strawn Pool in Lea County, New Mexico, are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS
FOR THE LUSK-STRAWN POOL

RULE 1. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn formation within one mile of the Lusk-Strawn Pool, and not nearer to nor within the limits of another designated Strawn pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the Lusk-Strawn Pool shall be located on a unit containing 80 acres, more or less, which consists of the N/2, S/2, E/2 or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in said 80-acre unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either quarter-quarter section in the 80-acre unit on which the well is located.

Any well which was drilling to or recompleted in the Lusk-Strawn Pool prior to January 4, 1962, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the Lusk-Strawn Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the Lusk-Strawn Pool shall be assigned an 80-acre proportional factor of 6.67 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit in any proportion.

RULE 6. The limiting gas-oil ratio in the Lusk-Strawn Pool shall be 4000 : 1.

PROVIDED HOWEVER, That the provisions of Rules 5 and 6 shall not become effective until such time as all wells in the subject pool are connected to a casinghead gas gathering system.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

E. S. WALKER, Member

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

esr/

KERR-McGEE OIL INDUSTRIES, INC.

Kerr-McGee Building • Oklahoma City 2, Oklahoma

December 26, 1961

Oil Conservation Commission
State of New Mexico
Box 871
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr.

Gentlemen:

Kerr-McGee Oil Industries, Inc., has received a notice of the application of El Paso Natural Gas Company for an order establishing special rules and regulations for the Lusk-Strawn Pool, Lea County, New Mexico. This is styled case 2469, in which applicant seeks among other things 160-acre proration units and a limiting gas-oil ratio of 4000 to 1. This case is scheduled to be heardon January 4, ~~1961~~ 1962.

The Lusk-Strawn Pool is located essentially within the boundaries of the Lusk Deep Unit which is a Federal type of undivided unit. Kerr-McGee Oil Industries, Inc. is a working interest owner in the Lusk Deep Unit and concurs in the application to establish proration units of 160 acres each with a limiting gas-oil ratio of 4000 to 1, and respectfully requests that the Commission approve the units and establish the rules as requested in the application.

Very truly yours,

KERR-McGEE OIL INDUSTRIES, INC.

C. F. Miller, Manager
Production Department

CFM/rl

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

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

P. O. BOX 871
SANTA FE

February 15, 1962

Re: CASE NO. 2469
ORDER NO. R-2175-A
APPLICANT:
EL PASO NATURAL GAS COMPANY

Mr. Garrett Whitworth
El Paso Natural Gas Company
P. O. Box 1492
El Paso, Texas

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.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC

OTHER Mr. Oliver Seth
Mr. Bill Kastler
Mr. L. E. Fitzjarrald (Phillips)

SETH, MONTGOMERY, FEDERICI & ANDREWS
ATTORNEYS AND COUNSELORS AT LAW
301 DON GASPAR AVENUE
SANTA FE, NEW MEXICO

A. K. MONTGOMERY
OLIVER SETH
WM. FEDERICI
FRANK ANDREWS
FRED C. HANNAHS
GEORGE A. GRAHAM, JR.

J. O. SETH
COUNSEL

POST OFFICE BOX 828
TELEPHONE YU 3-7315

December 28, 1961

New Mexico Oil Conservation Commission
P.O. Box 871
Santa Fe, New Mexico

Re: Case No. 2469
El Paso Natural Gas Company

Gentlemen:

Please consider this letter to be our entry of appearance in Case No. 2469, application of El Paso Natural Gas Company for special rules in the Lusk-Strawn pool. We will have associated with us, Ben Howell and Garrett Whitworth, and other attorneys of the El Paso Natural Gas Company.

Very truly yours,

OS:fa

Oliver Seth

El Paso Natural Gas Company

El Paso, Texas

MAIN OFFICE OCC

1962 JAN 12 AM 8:24

January 10, 1962

Mr. Daniel S. Nutter
Chief Engineer
Oil Conservation Commission
State of New Mexico

Case 2469

Dear Dan:

I have enclosed the items that you asked for in your letter of January 8, 1962 to supplement the evidence in Case No. 2469. In your absence on Wednesday, January 10, 1962, I discussed item three with Dick Morris and it was agreed that an itemized cost accounting of the estimated well costs in the Lusk Deep Unit Area in lieu of the itemization of the actual cost of Unit Wells Nos. 1, 2 and 3 would probably satisfy your third requirement. As you know, actual costs are far in excess of the estimated costs and we believe the estimated costs to be a conservative figure.

I hope the enclosed supplemental items will be satisfactory.

Yours very truly,

Garrett C. Whitworth

Garrett C. Whitworth

GCW:mr

Enclosures

NEIL B. WATSON
FRED A. WATSON

LAW OFFICES
WATSON & WATSON
CARPER BUILDING - P. O. DRAWER E
ARTESIA, NEW MEXICO

TELEPHONE
SHerwood 6-4151

April 14, 1966

Oil Conservation Commission,
Santa Fe, New Mexico.

Attention: Mrs. Ida Rodriguez,
Secretary to Director.

Dear Mrs. Rodriguez:

I herewith return to you the Transcript of Hearing of January 4, 1962 in Case No. 2469, and the Transcript of Hearing of March 14, 1962 in Case No. 2469, Rehearing, with reference to the Lusk - Strawn Pool in Lea County, New Mexico.

Thank you very much for letting us borrow these.

Yours very truly,

Neil B. Watson

Neil B. Watson.

NBW:lve
enc.

via Certified Mail, R.R.R.,
No. 602644

fbm

Gulf Oil Corporation

ROSWELL PRODUCTION DISTRICT

W. A. Shellshear
DISTRICT MANAGER
F. O. Mortlock
DISTRICT EXPLORATION MANAGER
M. I. Taylor
DISTRICT PRODUCTION MANAGER
H. C. Vivian
DISTRICT SERVICES MANAGER

March 9, 1962

1962 MAR 10 PM 3 08

P.O. Drawer 1938
Roswell, New Mexico

New Mexico Oil Conservation Commission
Post Office Box 871
Santa Fe, New Mexico

Re: Application for Rehearing of Case No. 2469 Before the Oil Conservation Commission of the State of New Mexico, Lusk-Strawn Pool, Lea County, New Mexico

Gentlemen:

As a result of the Commission granting a rehearing of the subject case, to be held March 14, 1962, the Gulf Oil Corporation personnel have reviewed the data presented at the original hearing held January 4, 1962, and have also discussed with El Paso Natural Gas Company personnel the data they plan to present at the rehearing.

After reviewing all the data, it is Gulf's opinion that El Paso Natural Gas Company has put a reasonable interpretation on the data furnished at these hearings. With reference to the rehearing, Gulf finds that well costs data and recoverable reserve estimates are realistic for this area.

Therefore, Gulf recommends that the Commission adopt 160-acre proration units for the Lusk-Strawn Unit and that for allowable purposes, three additional normal unit allowables for the three additional 40-acre units contained in a 160-acre proration unit be granted.

Yours very truly,

GULF OIL CORPORATION

W. A. Shellshear

W. A. Shellshear

RHF:ers

cc: El Paso Natural Gas Company
Post Office Box 1492
El Paso, Texas

PREPARED TESTIMONY OF DAVID T. BURLESON

Question: Mr. Burleson, referring to El Paso's Exhibit No. 12, what does the red line show?

Answer: The red line shows the pool boundaries of the Lusk-Strawn Oil Pool.

Question: What does the yellow line show?

Answer: The yellow line shows the boundaries of the Lusk Deep Unit.

Question: Does this exhibit show the offset operators surrounding the Lusk-Strawn Oil Pool?

Answer: Yes.

Question: To your knowledge, has anyone opposed the granting of El Paso's application in this case.

Answer: No.

Question: Who are the committed working interest owners in the unit.

Answer: El Paso Natural Gas Company, Phillips Petroleum Company, Kerr-McGee Oil Industries, Inc. and Gulf Oil Corporation.

Question: Have they concurred in this application?

Answer: Yes.

Question: Please point out the presently approved participating area for the Strawn formation.

Answer: The presently approved Strawn participating area consists of the NE/4 of Section 19, W/2 NW/4 of Section 20, SE/4 of Section 18, SW/4 SW/4 of Section 17, and the E/2 SW/4 of Section 18, all in Township 19 South, Range 32 East, N.M.P.M., Lea County, New Mexico, containing 520.00 acres, more or less.

PREPARED TESTIMONY

DAVID H. RAINEY FOR EL PASO NATURAL GAS COMPANY

IN CASE NO. 2469

Question: Will you please state the purpose of the rules which you intend to propose?

Answer: I believe that the evidence has clearly shown that 160 acre spacing is not only justified but necessary for the development of the Lusk Strawn Pool. We, therefore, intend to propose field rules which will provide for 160 acre spacing. Because of the high solution gas-oil ratio and the high producing gas-oil ratio in this under-saturated reservoir, which, according to the evidence, is still producing at pressures substantially in excess of the bubble point, we believe that the evidence shows that a gas-oil ratio limit of 4,000 cubic feet of gas per barrel of oil is reasonable and equitable.

Question: Do you have proposed special rules and regulations for the Lusk Strawn Pool?

Answer: Yes. I have seven Special Rules which I would recommend that the Commission adopt for this Pool. They are contained as follows in El Paso's Exhibit No. 11.

SPECIAL RULES AND REGULATIONS FOR THE LUSK STRAWN OIL POOL

Rule 1. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, and not nearer to nor within the limits of another designated Strawn Pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereafter set forth.

Rule 2. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, shall be located on a designated drilling tract consisting of 160 contiguous acres, more or less, substantially in the form of a square, which is a quarter section being a legal subdivision of the United States Public Lands Survey.

Rule 3. Each well completed or recompleted in the Lusk Strawn Pool or in the Strawn Formation within one mile of said pool shall not be drilled closer than 660 feet to any quarter section line of the tract or closer than 330 feet to any quarter quarter section line, or subdivision inner-boundary, nor closer than 1,320 feet to a well drilled to or capable of producing from the same pool.

Rule 4a. For good cause shown, the Secretary-Director of the Commission may grant an exception to the requirement of Special Rule 2. without notice and hearing where an application has been filed in due form and where the unorthodox size or shape of the tract is due to a variation in the legal subdivision of the United States Public Lands Survey or where the following facts exist and the following provisions are complied with:

Case 2469
EPNG Exhibit No. 11.

(1) The non-standard unit consists of less than a standard unit and lies wholly within a single governmental quarter section.

(2) The entire non-standard unit may reasonably be presumed to be productive of oil from said pool.

(3) The applicant presents written consent in the form of waivers from all offset operators.

(4) In lieu of Paragraph 3 of this Rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard unit. The Secretary-Director may approve the application if, after a period of 30 days, no operator has entered an objection to the formation of the non-standard unit.

Rule 4b. The allowable assigned to such non-standard unit shall bear the same ratio to a standard allowable in the Lusk Strawn Pool as the acreage in such non-standard unit bears to 160 acres.

Rule 5. A 160 acre proration unit in the Lusk Strawn Oil Pool shall be assigned a 160 acre proportional factor of 8.67 for allowable purposes. For purposes of computing allowables a unit of not less than 158 acres nor more than 162 acres shall be considered to contain the number of acres in a standard unit. In the event there is more than one well on a 160 acre proration unit, the operator may produce the allowable assigned to the unit from the wells on that unit in any proportion.

Rule 6. The gas-oil ratio limitation for all wells in the Lusk Strawn Pool shall be four thousand (4,000) cubic feet of gas per barrel for oil produced. Any oil well in the Lusk Strawn Oil Pool producing with a gas-oil ratio in excess of four thousand (4,000) cubic feet per barrel of oil shall be allowed to produce daily only that volume of gas obtained by multiplying the top unit allowable for the pool as determined by the applicable rules of the Commission and, as proposed herein, times the limiting gas-oil ratio (four thousand (4,000) cubic feet). The gas volume thus obtained shall be known as the daily gas limit of such well. The daily oil allowable therefore shall then be determined and assigned by dividing the daily gas limit by its producing gas ratio.

Rule 7. The vertical limits of the Lusk-Strawn Oil Pool shall be the Strawn Formation.

Question: How did you arrive at the figure of 8.67 as the proportional factor for a 160 acre oil well in Rule 5?

Answer: The proportional factor of 8.67 is arrived at by using the proportional factor for a 40 acre unit with a depth range of 11,000 feet to 12,000 feet and adding three normal unit allowables for the three additional 40 acre units. That is, we have followed the procedure which the Commission used in going from a 40 acre unit to an 80 acre unit.

PREPARED TESTIMONY OF DAVID T. BURLESON

Question: Mr. Burleson, referring to El Paso's Exhibit No. 12, what does the red line show?

Answer: The red line shows the pool boundaries of the Lusk-Strawn Oil Pool.

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Answer: El Paso Natural Gas Company, Phillips Petroleum Company, Kerr-McGee Oil Industries, Inc. and Gulf Oil Corporation.

Question: Have they concurred in this application?

Answer: Yes.

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Answer: The presently approved Strawn participating area consists of the NE/4 of Section 19, W/2 NW/4 of Section 20, SE/4 of Section 18, SW/4 SW/4 of Section 17, and the E/2 SW/4 of Section 18, all in Township 19 South, Range 32 East, N.M.P.M., Lea County, New Mexico, containing 520.00 acres, more or less.

CASE NO. 2469

PREPARED TESTIMONY OF
RICHARD F. LEMON
EL PASO NATURAL GAS COMPANY

Q. Have you prepared an exhibit which shows the outlines of the Lusk Deep Unit, the development of the Unit and the contours with respect to the Strawn formation?

A. Yes.

Q. Please explain this exhibit to the Examiner.

A. Exhibit 1 shows the outline of the Lusk Deep Unit, which is located in Sections 7, 8, 17, 18, 19 and 20 in Township 19 South, Range 32 East, in west central Lea County and in the eastern one-half of Section 24, Township 19 South, Range 31 East, in northeastern Eddy County, New Mexico.

The Lusk Deep Unit is located approximately 14 miles southwest of the town of Maljamar, New Mexico and underlies a portion of the producing area in the shallower Lusk-Yates oil field. The Lusk Deep Unit area includes 2,725 acres.

Exhibit 1 shows that three wells have been drilled in the Lusk Deep Unit to a depth sufficient to penetrate the Strawn limestone. These wells are the El Paso Natural Gas Company No. 1, No. 2 and No. 3 Lusk Deep Unit.

The El Paso Natural Gas Company No. 1 Lusk Deep Unit was completed as a dual Bone Springs oil-Strawn oil producing well. The Bone Springs potential test was taken on October 26, 1960. Official initial potential test was 141 barrels of oil per day calculated from an actual flow gauge of 47 barrels of oil in eight hours, through a 9/64" choke. Gas-oil ratio was 1342:1. Flowing tubing pressure ranged from 900 psig to 935 psig. Production was through casing perforations from 8759'-8777'. The formation was treated with 500 gallons of acid.

The Strawn potential test on well No. 1 was taken on October 7, 1960. Official initial potential test was 732 barrels of oil per day, calculated from an actual flow of 122 barrels of oil in four hours, through a 16/64" choke. Gas-oil ratio was 2640:1. Flowing tubing pressure was 2345 psig. Production was through casing perforations from 11,168'-11,193'. Completion was natural.

The El Paso Natural Gas Company No. 2 Lusk Deep Unit was drilled to a total depth of 13,974' to test the Devonian and was subsequently plugged back and completed as a dual Strawn oil-Morrow gas well. The Strawn potential test was taken on April 1, 1961. Official initial potential test was 641 barrels of oil per day, calculated from an actual flow gauge of 53.4 barrels of oil in two hours, through a 16/64" choke. Gas-oil ratio was 3329:1. Flowing tubing pressure was 2400 psig. Production was through casing perforations from 11,220'-11,250'. Perforations were treated with 600 gallons of acid.

The Morrow potential test was taken on April 1, 1961. Calculated absolute open flowing potential was 31,500 Mcf of gas per day. Gas-condensate ratio was 24,790:1. Shut-in tubing pressure was 3618 psig. Production was through casing perforations from 12,380'-12,398'. Perforations were treated with 600 gallons of acid.

The El Paso Natural Gas Company No. 3 Lusk Deep Unit was completed as a dual Strawn oil-Morrow gas producing well. The Strawn potential test was taken on November 1, 1961. Official initial potential test was 285 barrels of oil, calculated from an actual flow gauge of 71.27 barrels of oil in six hours, through

a 10/64" choke. Gas-oil ratio was 2397:1. Flowing tubing pressure was 2887 psig. Production was through casing perforations from 11,310'-11,340'. Completion was natural.

The Morrow potential test was taken on October 31, 1961. Calculated absolute open flowing potential was 30,000 Mcf of gas per day. Gas-condensate ratio was 12,559:1. Shut-in tubing pressure was 3845 psig after being shut in for 72 hours. Production was through casing perforations from 12,370'-12,390'. Completion was natural.

Shown on Exhibit 1 is an interpretation of the sub-surface configuration of the top of the Strawn limestone on the area covered by the plat. This plat is an excerpt taken from a larger structural map contoured on top of the Strawn limestone. This larger map was prepared from information obtained from correlation of electrical and radioactivity logs on a regional basis and incorporates a certain amount of siesmic data. The regional strike mapped on the top of the Strawn formation is approximately north-to-south in the immediate vicinity of the Lusk Deep Unit. A low structural area or trough on the eastern edge of the plat and a low area in the western one-half of Section 12, Township 19 South, Range 31 East are evident. The contours show that the regional dip of the geologic horizon created by the top of the Strawn formation is from west to east at approximately 450' per mile. This regional dip has a closure of a maximum of 200' in portions of Sections 17, 18, 19 and 20 with reference to the top of the Strawn formation. Additional drilling will be required to further detail the area and define the limits of production.

The present and proposed revision to the unit participating area is indicated by the shaded areas.

Q. Would you explain the cross-section of six wells on Exhibit No. 2 and what this exhibit shows, and other pertinent information concerning these wells which you have considered.

A. Exhibit 2 is a geological cross-section relating the Strawn Limestone section in the Lusk Strawn Pool area. This cross-section trends in a northwest-southeasterly direction and contains the well logs on the three Lusk Unit Strawn completions, the Pan American Nos. 1 and 2 Greenwood Unit and the Shell No. 1 Perry-Federal. A sub-sea datum of 6000' was selected for purposes of correlating the logs. The sections in the wells over which drillstem tests were conducted and the perforated intervals are indicated in red and green. The trace of the cross-section appears in the inset map.

From an interpretation of this cross-section, the following inferences can be reasonably drawn:

1. The line of Section A-A' is almost parallel to regional strike.
2. The Strawn oil producing feature is not primarily related to any large deep regional structural feature or anticlinal trend, but is a local north-to-south trending anticlinal feature with an indicated structural closure of 200'. The producing area is also controlled by porosity development, the thickness and quality of the producing horizon being dependent upon the degree of development of the porosity. An illustration

of this is the fact that no porosity is indicated in the Strawn formation from the electrical or radioactivity logs on the Pan American No. 2 Greenwood Unit, located 4 - 3/5 miles northwest of the El Paso Natural Gas Company No. 2 Lusk Deep Unit. The porosity is also undeveloped in the equivalent Strawn section in the Shell Oil Company No. 1 Perry-Federal, located 4 - 1/3 miles southeast of the El Paso Natural Gas Company No. 3 Lusk Deep Unit.

3. The pool limits for the Lusk-Strawn Oil Pool are not as yet established by drilling.

4. The dip on the east flank of the producing structure is quite steep. The top of the Strawn in the No. 1 Lusk Unit is 148' higher structurally than in the No. 3 Lusk Unit.

There has been no evidence of formation water found in studies of test and production data for the Strawn formation in this immediate area. No formation water was found during testing or production of the three Lusk Deep Unit wells.

The nearest comparable oil production from the Strawn formation is in the Shell Oil Company No. 1 Querecho Plains Unit, located approximately six miles northeast of the El Paso Natural Gas Company No. 2 Lusk Deep Unit. This well was completed as a Strawn oil well on January 11, 1957, through casing perforations from 11,595'-11,625' in the Strawn limestone. Initial flowing potential was 221 barrels of oil per day with no water reported. The total cumulative production to November 1,1961 was 257,100 barrels of oil with no water being

reported.

The Shell Oil Company No. 2 Querecho Plains Unit, located 1 - 1/3 miles south of the No. 1 Querecho Plains Unit, drillstem tested the section equivalent to the producing zone in the No. 1 well. Recovery was 95' of drilling mud with no water.

It may be concluded from this exhibit that the lateral limits of the Lusk Strawn oil pool will be controlled principally by the development of porosity and permeability with no indication of the presence of a water drive. Furthermore, the Strawn reservoir will operate under a solution gas drive where the chief source of reservoir energy will be supplied by the expansion of the oil and gas.

Q. Do you have an exhibit showing reservoir completion data on wells drilled in the Lusk-Strawn Oil Pool?

A. Yes, that is El Paso's Exhibit No. 3.

Q. Would you please explain this exhibit?

A. The various reservoir and completion data available from the three wells completed to date are shown in summary form in Exhibit 3. The completion data such as top of pay, perforated interval, treatment and potential test information previously discussed are listed under item 2.

Item No. 3 of this exhibit sets forth the reservoir fluid characteristics. Analysis of a sub-surface oil sample taken on well No. 2 on August 20, 1961 indicated the following characteristics:

a. Saturation or bubble point pressure, psig.....4150

b. Reservoir volume factor @ orig. press.....2.605

c. Solution gas-oil ratio, cu. ft./bbl.....3084

d. Oil viscosity @ original press., cp.....0.146

e. Oil gravity, ^{o}API..... 47.5

The reservoir characteristics for the Strawn formation are shown under item 4. The Strawn formation in each of the three wells completed to date has been cored. The average formation factors based on averaging 86 feet of core considered to be the net pay interval are: porosity - 7.1%, water saturation - 30.9% and permeability of 17.7 millidarcys. The average net pay based on cores and well logs of the three wells is 38 feet.

In connection with reservoir characteristics, production tests have indicated the wells to have high producing capacities. Productivity indexes of 2.0 and 2.6 have been calculated from production tests on wells Nos. 1 and 2. It is significant to note from these tests that producing rates of 300 BOPD and 390 BOPD from wells Nos. 1 and 2 can be obtained with a drawdown in bottom-hole pressure of only 150 psi. Although a PI test has not been conducted on well No. 3, it is anticipated that this well will have similar producing characteristics.

Q. Do you have performance history data for the Lusk-Strawn Oil Pool?

A. Yes, that is El Paso's Exhibit No. 4.

Q. Would you please explain what this exhibit shows?

A. The performance history of the Lusk-Strawn Oil Pool is depicted graphically in Exhibit 4. This exhibit shows the number of producing wells, oil production and pressure data related to time. The total cumulative oil production for the three producing wells to December 1, 1961 is 122,537 barrels. The wells produced 14,134 barrels during the month of November. The pressure information shown on this graph will be discussed in detail in a later exhibit.

Recent gas-oil ratio tests, although not represented in Exhibit 4, indicate a producing ratio of approximately 2400 cubic feet per barrel. In view of the high initial producing gas-oil ratio of the undersaturated Strawn oil, the limiting ratio of 4000 cubic feet per barrel being requested in this case is, in my opinion, a reasonable limit.

The gas production from the pool is presently being flared; however, a processing agreement is being worked out with Phillips to provide for gathering the produced gas. It is anticipated that this agreement will be consummated in the very near future.

Q. El Paso's Exhibit No. 5 is a composite electrical log of Well No. 1 in the Lusk Deep Unit. Is that correct?

A. That is correct.

Q. Please explain the pertinent facts that this log shows.

A. Exhibit 5 shows the correlation of the electric log with the micro log on Lusk Deep Unit Well No. 1 with reference to the perforated interval. The micro log, which indicates formation porosity, reveals the Strawn limestone interval to be a continuous section with no important barriers which would block the flow of reservoir fluids.

Q. What is El Paso's Exhibit No. 6?

A. It is a core analysis summary of Well No. 1 in the Lusk Deep Unit.

Q. Please explain this exhibit to the Examiner.

A. The Core Analysis Summary for the Lusk Deep Unit Well No. 1 is shown in Exhibit 6. It is indicated in this exhibit that 33 of the 41 net feet assigned this well was actually cored. The net interval of 41 feet is based on cores available and well logs. The average characteristics of the 33 feet of the net pay interval which was cored are: Porosity - 8.3%, water saturation - 28.5% and permeability - 24.6 millidarcys. It is important to note that fractures were noted over much of the cored interval which would enhance the ability for free fluid movement. Therefore, considering the characteristics of the Strawn reservoir complete drainage both vertically and horizontally should occur.

Q. Do you have information and data to show that one well will effectively and efficiently drain an area in excess of 160 acres in the Lusk-Strawn Oil Pool?

A. Yes, I have a pressure interference graph which is El Paso's Exhibit No. 7.

Q. Please explain this exhibit to the Examiner?

A. Exhibit 7 presents the pressure interference observed from data on the three Strawn completions in the Lusk Deep Unit. This graph relates the bottom-hole pressure at a subsea datum of 7585' against time for each well. It is apparent from this exhibit that production from the producing wells has caused a reduction in reservoir pressure which becomes evident when pressures are taken on newly completed wells prior to production. The first such indication was observed upon completion of Well No. 2 in April, 1961. The bottom-hole pressure in Well No. 2 after five days shut-in time was 5799 psig, 11 pounds below the original reservoir pressure of 5810 psig. A pressure taken in No. 1 seven days later after the well had been shut-in for 73 hours was 5802 psig. The approximate oil production corresponding with these pressures was 35,000 barrels. Although in this instance the pressure reduction from the original pressure is slight the pressures on the two wells are in very close agreement. Wells Nos. 1 and 2 are located 1866 feet apart. A circle having a radius of 1866 feet indicates a drainage area of 251 acres.

Bottom-hole pressures taken on August 5, 1961 on Wells Nos. 1 and 2 after approximately 80,000 barrels of oil had been produced were 5766 psig and 5765 psig, respectively. These pressures were recorded the same day after the wells had been shut-in for 72 hours and were recorded by the same bottom-hole pressure bomb. The close agreement of pressures in these two wells indicates excellent communication within the Strawn reservoir.

A bottom-hole pressure survey conducted the 6th and 7th of November, 1961 on Wells Nos. 1 and 2 and a new completion, No. 3, indicated the following

pressure data: Well No. 1 - 5704 psig, Well No. 2 - 5706 psig and No. 3 - 5710 psig. On this survey the wells were shut-in 100 hours, 98 hours and 136 hours, respectively. The significant fact apparent from these data is the pressure recorded on Well No. 3. The pressure of 5710 psig, 100 psi below the original, was very nearly the same as those recorded on Wells Nos. 1 and 2, even though Well No. 3 had not previously produced. Thus the oil production from Wells Nos. 1 and 2, which totaled 110,000 barrels, caused a reduction in reservoir pressure in Well No. 3. The distance between Wells Nos. 1 and 3 is 1650 feet. The drainage area indicated by this distance is 196 acres.

It is therefore obvious that drainage has occurred over areas in excess of 160 acres within a period of several months.

Q. What is your conclusion from this exhibit with reference to the extent that one well is able to effectively and efficiently drain an area in the Lusk-Strawn Oil Pool?

A. In my opinion, from the data shown on this exhibit and other data and information I have studied, one well in the Lusk-Strawn Oil Pool will effectively and efficiently drain an area in excess of 160 acres.

Q. Have you calculated recoverable oil reserves in the Lusk-Strawn Oil Pool?

A. Yes, and I have shown these reserves on El Paso's Exhibit No. 8.

Q. Please explain this exhibit to the Examiner.

A. Exhibit 8 shows the volumetric or pore volume reserve calculation using data derived from averaging reservoir data of the three completed Strawn wells. Utilizing an average porosity of 7.1%, water saturation of 30.9%, net pay of 38

feet, an original reservoir volume factor of 2.605 and an estimated recovery factor of 15%, original recoverable oil reserve of 833 barrels per acre is calculated. The estimated barrels of oil recovery for 40, 80 and 160 acre spacing patterns are 33,320, 66,640 and 133,280, respectively. The corresponding recoverable gas reserves for these spacing patterns computed on the basis of 14,920 Mcf/acre are 597,000 Mcf, 1,194,000 Mcf and 2,387,000 Mcf, respectively.

Q. Have you compared the calculated performance of wells if they were drilled on 40, 80 and 160 acre spacing with the actual performance of Well No. 1 in the Lusk-Strawn Oil Pool?

A. Yes, and I have shown this comparison on El Paso's Exhibit No. 9.

Q. Please explain this exhibit to the Examiner.

A. Exhibit 9 shows the pressure history of the Lusk Deep Well No. 1 plotted against cumulative oil production. Superimposed upon this graph are the calculated pressure-production trends assuming production is derived solely from 40, 80 and 160 acre spacing units. The calculated performance curves are shown for the pressure range above the saturation or bubble point pressure where the reservoir energy is supplied principally by the expansion of reservoir oil. In this instance, however, the expansion of the rock and connate water were considered in the material balance calculation in calculating the individual pressure trends.

Reservoir characteristics such as net feet of pay, porosity and connate water saturation pertaining to Well No. 1 were employed in computing the calculated pressure trends. These factors combine to present what is considered

to be a maximum relation between pressure and cumulative oil production for the various spacing patterns. It is noted from studying this graph that the actual pressure performance observed in Well No. 1 is almost flat compared with the predicted performance curves for 40, 80 and 160 acre drainage areas.

The maintenance of the actual pressure is, in my opinion, caused by the influx of fluid into the vicinity of Well No. 1. In the absence of evidence supporting a water drive it may be concluded that the influxing fluid is oil. It is, therefore, quite apparent from this exhibit, which presents an independent approach from that previously discussed in Exhibit 7, that the drainage area of Well No. 1 is considerably in excess of 160 acres.

Q. Have you made a study of the profit or loss to be derived from drilling wells on 40, 80 and 160 acre spacing in the Lusk-Strawn Oil Pool?

A. Yes, and I have compared the economics for each of these spacing patterns on El Paso's Exhibit No. 10.

Q. Please explain this exhibit to the Examiner.

A. Exhibit 10 has been prepared to show the economics assuming the Lusk-Strawn Pool is completely developed on a spacing pattern of 40, 80 and 160 acres per well. This exhibit shows that a net loss of $187,000 per well would result if the pool was developed entirely on 40 acre spacing. On 80 acre spacing a net loss of $75,000 per well would result. For 160 acre spacing a net profit of $147,000 per well would be realized. The 160 acre spacing pattern is the smallest regular spacing pattern which results in a profitable well. The net profit to investment ratio for this spacing is 0.50 to 1.

The foregoing economics are based on an estimated well cost of $298,000 for a single completion well in the Strawn formation. Although the three wells completed to date have been duals, in the Strawn and Bone Springs or Morrow, complete development of the pool, however, would require the drilling and completion of a number of singly completed wells. I have, therefore, used the single completion well cost in presenting my economics for the various spacing patterns. The net profit for each of the well spacing patterns are computed before income tax or deduction of overriding royalties or base royalties in excess of the usual 1/8.

Q. Mr. Lemon, from all of your studies, these exhibits and the data and information you have obtained pertaining to the Lusk-Strawn Oil Pool, are you of the opinion that in this pool one well will effectively and efficiently drain an area in excess of 160 acres?

A. I am.

Q. Then, is it your recommendation that this Commission promulgate rules which will provide for 160 acre spacing for oil wells in this pool?

A. That is my recommendation.

Q. If the Commission sees fit to grant applicant's application in this case, is it your opinion that that would prevent waste and protect correlative rights?

A. That is my opinion.

Q. Were exhibits 1 through 10 prepared by you or under your supervision?

A. They were.

PREPARED TESTIMONY

DAVID H. RAINEY FOR EL PASO NATURAL GAS COMPANY

IN CASE NO. 2469

Question: Will you please state the purpose of the rules which you intend to propose?

Answer: I believe that the evidence has clearly shown that 160 acre spacing is not only justified but necessary for the development of the Lusk Strawn Pool. We, therefore, intend to propose field rules which will provide for 160 acre spacing. Because of the high solution gas-oil ratio and the high producing gas-oil ratio in this under-saturated reservoir, which, according to the evidence, is still producing at pressures substantially in excess of the bubble point, we believe that the evidence shows that a gas-oil ratio limit of 4,000 cubic feet of gas per barrel of oil is reasonable and equitable.

Question: Do you have proposed special rules and regulations for the Lusk Strawn Pool?

Answer: Yes. I have seven Special Rules which I would recommend that the Commission adopt for this Pool. They are contained as follows in El Paso's Exhibit No. 11.

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Rule 3. Each well completed or recompleted in the Lusk Strawn Pool or in the Strawn Formation within one mile of said pool shall not be drilled closer than 660 feet to any quarter section line of the tract or closer than 330 feet to any quarter quarter section line, or subdivision inner-boundary, nor closer than 1,320 feet to a well drilled to or capable of producing from the same pool.

Rule 4a. For good cause shown, the Secretary-Director of the Commission may grant an exception to the requirement of Special Rule 2. without notice and hearing where an application has been filed in due form and where the unorthodox size or shape of the tract is due to a variation in the legal subdivision of the United States Public Lands Survey or where the following facts exist and the following provisions are complied with:

Case 2469
EPNG Exhibit No. 11.

(1) The non-standard unit consists of less than a standard unit and lies wholly within a single governmental quarter section.

(2) The entire non-standard unit may reasonably be presumed to be productive of oil from said pool.

(3) The applicant presents written consent in the form of waivers from all offset operators.

(4) In lieu of Paragraph 3 of this Rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard unit. The Secretary-Director may approve the application if, after a period of 30 days, no operator has entered an objection to the formation of the non-standard unit.

Rule 4b. The allowable assigned to such non-standard unit shall bear the same ratio to a standard allowable in the Lusk Strawn Pool as the acreage in such non-standard unit bears to 160 acres.

Rule 5. A 160 acre proration unit in the Lusk Strawn Oil Pool shall be assigned a 160 acre proportional factor of 8.67 for allowable purposes. For purposes of computing allowables a unit of not less than 158 acres nor more than 162 acres shall be considered to contain the number of acres in a standard unit. In the event there is more than one well on a 160 acre proration unit, the operator may produce the allowable assigned to the unit from the wells on that unit in any proportion.

Rule 6. The gas-oil ratio limitation for all wells in the Lusk Strawn Pool shall be four thousand (4,000) cubic feet of gas per barrel for oil produced. Any oil well in the Lusk Strawn Oil Pool producing with a gas-oil ratio in excess of four thousand (4,000) cubic feet per barrel of oil shall be allowed to produce daily only that volume of gas obtained by multiplying the top unit allowable for the pool as determined by the applicable rules of the Commission and, as proposed herein, times the limiting gas-oil ratio (four thousand (4,000) cubic feet). The gas volume thus obtained shall be known as the daily gas limit of such well. The daily oil allowable therefore shall then be determined and assigned by dividing the daily gas limit by its producing gas oil ratio.

Rule 7. The vertical limits of the Lusk-Strawn Oil Pool shall be the Strawn Formation.

Question: How did you arrive at the figure of 8.67 as the proportional factor for a 160 acre oil well in Rule 5?

Answer: The proportional factor of 8.67 is arrived at by using the proportional factor for a 40 acre unit with a depth range of 11,000 feet to 12,000 feet and adding three normal unit allowables for the three additional 40 acre units. That is, we have followed the procedure which the Commission used in going from a 40 acre unit to an 80 acre unit.

PREPARED TESTIMONY OF DAVID T. BURLESON

Question: Mr. Burleson, referring to El Paso's Exhibit No. 12, what does the red line show?

Answer: The red line shows the pool boundaries of the Lusk-Strawn Oil Pool.

Question: What does the yellow line show?

Answer: The yellow line shows the boundaries of the Lusk Deep Unit.

Question: Does this exhibit show the offset operators surrounding the Lusk-Strawn Oil Pool?

Answer: Yes.

Question: To your knowledge, has anyone opposed the granting of El Paso's application in this case.

Answer: No.

Question: Who are the committed working interest owners in the unit.

Answer: El Paso Natural Gas Company, Phillips Petroleum Company, Kerr-McGee Oil Industries, Inc. and Gulf Oil Corporation.

Question: Have they concurred in this application?

Answer: Yes.

Question: Please point out the presently approved participating area for the Strawn formation.

Answer: The presently approved Strawn participating area consists of the NE/4 of Section 19, W/2 NW/4 of Section 20, SE/4 of Section 18, SW/4 SW/4 of Section 17, and the E/2 SW/4 of Section 18, all in Township 19 South, Range 32 East, N.M.P.M., Lea County, New Mexico, containing 520.00 acres, more or less.

RESERVOIR AND COMPLETION DATA

LUSK STRAWN POOL

1. Location of Pool

Approximately 14 miles southwest of Maljamar, New Mexico, Sections 18, 19, and 20, T-19S, R-32E, Lea County, New Mexico.

2. Completion Data-Lusk Deep Unit Wells:

a. Formation		Pennsylvanian Strawn Limestone	
b. Well Number	1	2	3
c. Total Depth	11,232'	13,974'	12,623'
d. Top of Strawn Limestone	11,017' (-7416')	11,070' (-7465')	11,156' (-7563')
e. Top of Strawn Pay	11,149' (-7548')	11,216' (-7611')	11,291' (-7698')
f. Completion Date	10-7-60	4-1-61	11-1-61
g. Perforated Interval	11,168' - 11,193'	11,220' - 11,250'	11,310' - 11,340'
h. Treatment	Natural	600 gals. acid	Natural
i. Initial Potential Test			
(1) Potential (BOPD)	732	641	285
(2) Choke size (in.)	16/64	16/64	10/64
(3) GOR (cu.ft./bbl.)	2640	3329	2397
(4) Casing Pressure (psig)	Packer	Packer	Packer
(5) Tubing Pressure (psig)	2345	2400	2887

3. Reservoir Fluid Characteristics:

a. Saturation Pressure (bubble point) (psig)	4150
b. Formation Volume Factor @ Original Pressure	2.605
c. Solution Gas-Oil Ratio (cu. ft./bbl.)	3084
d. Oil Viscosity @ Original Pressure (cp)	0.146
e. Oil Gravity (^{o}API @ 60^{o}F)	47.5

4. Reservoir Characteristics:

a. Porosity	7.1
b. Permeability (md.)	17.7
c. Water Saturation (%)	30.9
d. Net Pay (ft.)	38 (average 3 wells)
e. Reservoir Temperature (^{o}F)	161
f. Original Reservoir Pressure (psig)	5810
g. Probable Reservoir Mechanism	Solution gas drive

N.M.O.C.C. Case No. 2469
EPNG Exhibit No. 3
Date January 4, 1962

RESERVOIR AND COMPLETION DATA

LUSK STRAWN POOL

1. Location of Pool

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N.M.O.C.C. Case No. 2469
EPNG Exhibit No. 3
Date January 4, 1962

EL PASO NATURAL GAS COMPANY

LUSK DEEP UNIT WELL NO. 1

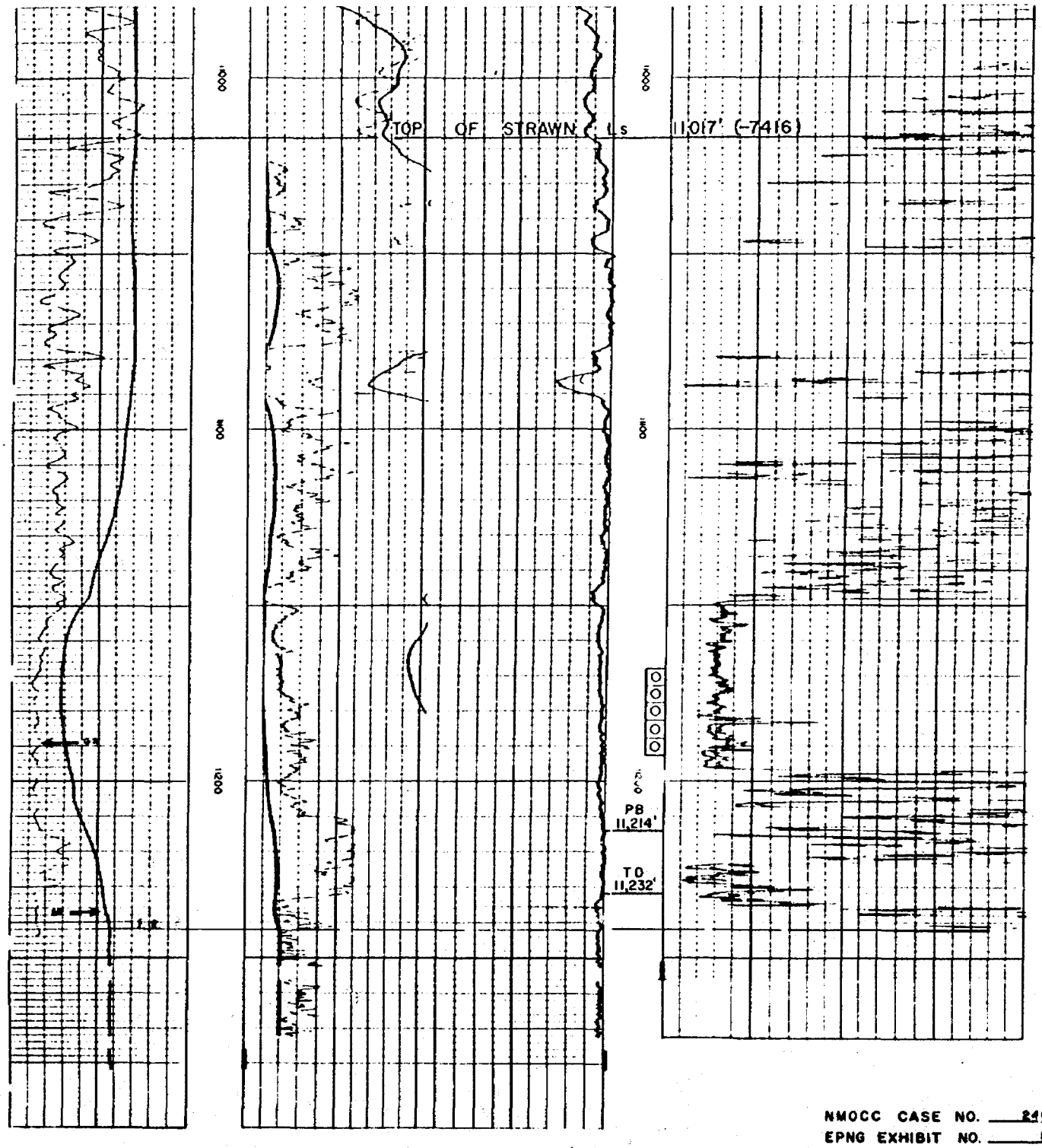
ELEV. 3600 D.F.

NE/4 NE/4 SEC. 19, T-19-S, R-32-E

ELECTRIC LOG OF STRAWN PAY SECTION

COMPOSITE ELECTRIC LOG

MICRO LOG



NMOCC CASE NO. 2499

EPNG EXHIBIT NO. 5

DATE January 4, 1962

CORE ANALYSIS

LUSK DEEP UNIT WELL #1

STRAWN PAY

Porous Interval (Micro Log) 11,149'-11,196'. Net Pay (Micro Log) 41'.
Cored Interval 11,148'-11,198'
Perforated Interval 11,168'-11,193'
Depth Correlation 11,148' Core-Gamma = 11,161' Micro Log

Depth Interval	Footage	Permeability (md.)	Porosity (%)	Water Saturation (% Pore Space)
11,148.0-49.6	1.6	16.5	11.5	28.3
49.6-51.1	1.5	22.0	11.8	22.9
51.1-52.1	1.0	21.0	10.9	24.4
52.1-53.5	1.4	9.8	9.9	24.8
53.5-55.0	1.5	15.0	11.0	25.0
55.0-56.4	1.4	6.2	9.6	26.2
56.4-58.0	1.6	20.0	8.9	21.6
58.0-59.5	1.5	49.0	8.2	30.3
59.5-61.0	1.5	11.1	9.6	32.2
61.0-62.3	1.3	11.0	9.5	25.0
62.3-63.9	1.6	37.9	7.6	21.7
63.9-65.0	1.1	14.0	9.6	26.6
65.0-66.5	1.5	19.5	9.2	27.6
66.5-68.0	1.5	13.0	9.8	22.3
68.0-69.4	1.4	1.9	7.4	20.3
69.4-71.0	1.6	6.1	5.9	27.5
71.0-72.1	1.1	23.0	7.7	28.7
72.1-73.0	0.9	36.0	10.6	27.4
73.0-74.5	1.5	39.0	6.3	37.6
74.5-76.2	1.7	5.1	6.3	30.6
77.4-79.0	1.6	1.8	2.7	33.5
79.0-80.0	1.8	18.5	6.1	39.5
80.8-82.5	1.7	152.0	4.8	45.1
Net Pay (Cored Int.)	33.3			
Weighted Average		24.6	8.3	28.5

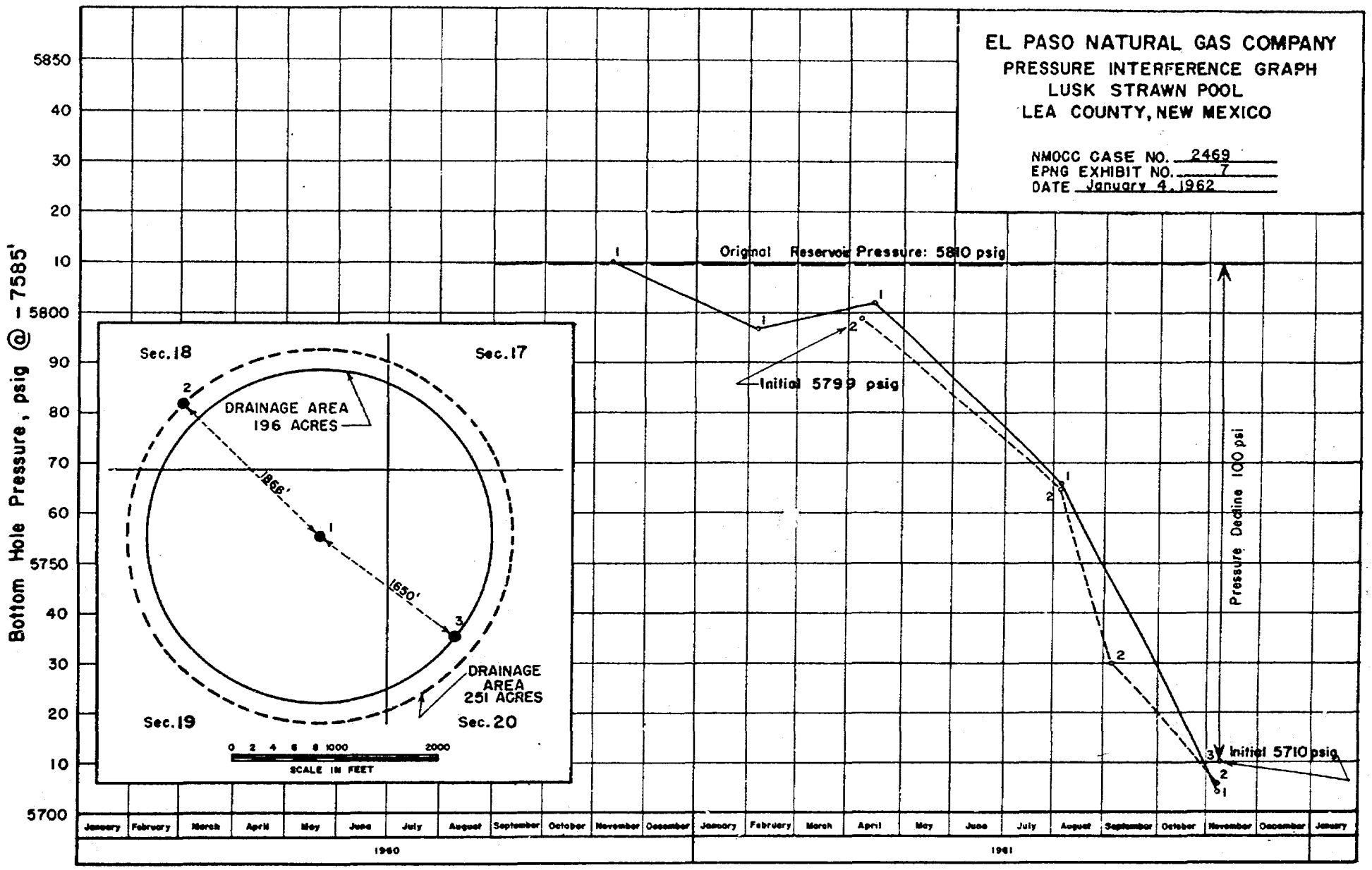
Note: (1) Only Porosity values over 4% and Permeability values over 0.1 millidarcy are included.

(2) Total Strawn Porosity Interval was not cored in this well.

N.M.O.C.C. Case No. 2469
EPNG Exhibit No. 6
Date January 4, 1962

EL PASO NATURAL GAS COMPANY
PRESSURE INTERFERENCE GRAPH
LUSK STRAWN POOL
LEA COUNTY, NEW MEXICO

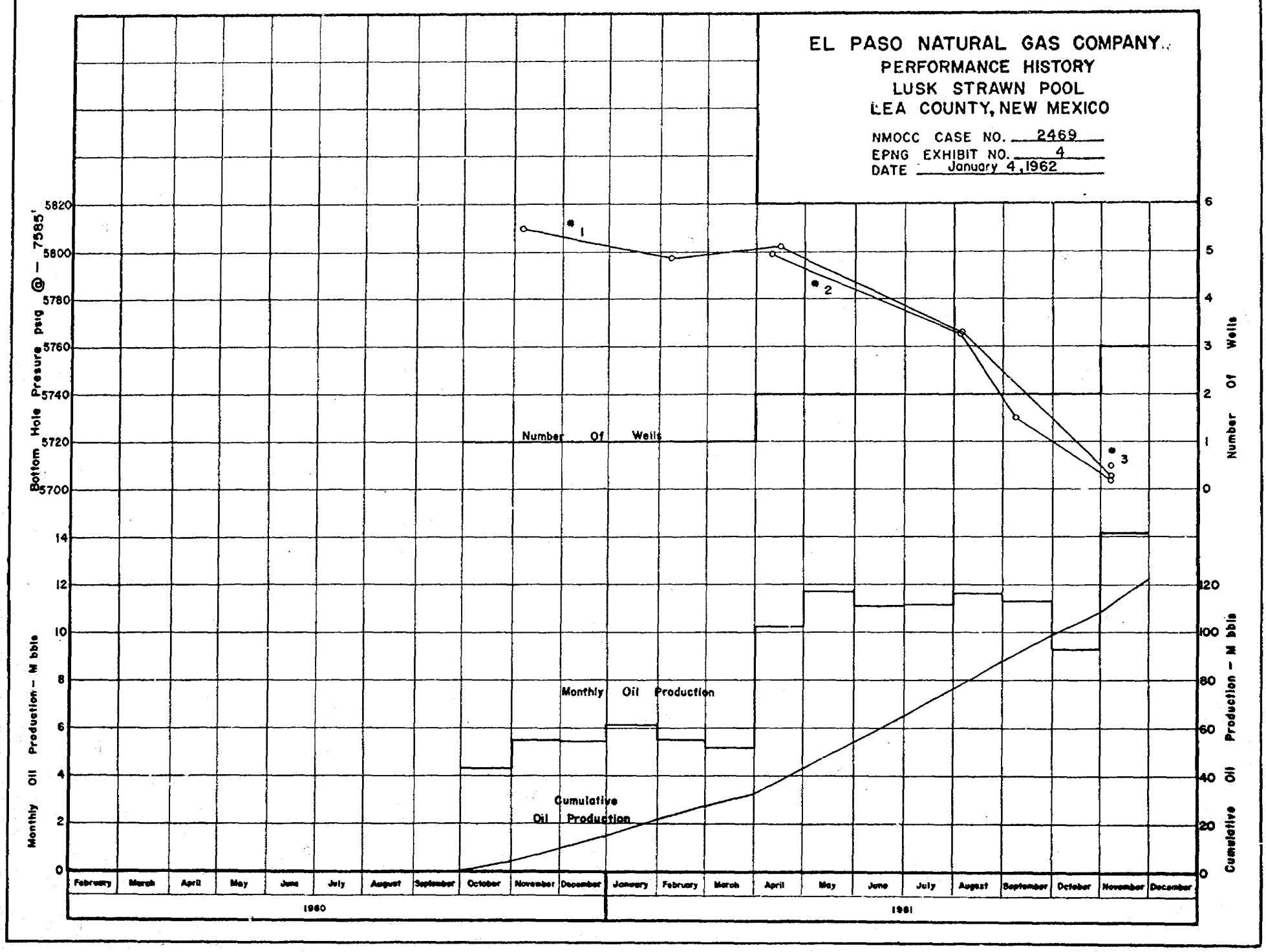
NMOCC CASE NO. 2469
EPNG EXHIBIT NO. 7
DATE January 4, 1962



EL PASO NATURAL GAS COMPANY

PERFORMANCE HISTORY
LUSK STRAWN POOL
LEA COUNTY, NEW MEXICO

NMOCC CASE NO. 2469
EPNG EXHIBIT NO. 4
DATE January 4, 1962



RECOVERABLE OIL RESERVES

LUSK STRAWN POOL

STRAWN LIMESTONE PRODUCING INTERVAL

Basic Data

Porosity 7.1% (avg. from core analyses #1, #2, and #3 wells)
Permeability 17.7 md. (avg. from core analyses #1, #2, and #3 wells)
Net Pay 38 ft. (avg. from micro log and core analyses #1, #2, and #3 wells)
Water Saturation 30.9% (avg. from core analyses #1, #2, and #3 wells)
Recovery Factor 15% (estimated)
Formation Volume Factor 2.605 @ original pressure.

Volumetric Calculation

$$\text{Original Recoverable Oil Reserve} = \frac{7758\ \phi\ (1-Sw)\ Ah}{Bo} \times \text{Oil Recovery Factor}$$

$$\text{Original Recoverable Oil Reserve} = \frac{(7758)\ (0.071)\ (0.691)\ (38)}{(2.605)} \times 0.15 = 833$$

Original Recoverable Oil Reserve = 833 Bbls./Acre

In which: 7758 bbls. = equivalent volume in 1 acre foot
ϕ (phi) = porosity as a decimal fraction of bulk volume
Sw = interstitial water as a decimal fraction of the pore volume
Ah = volume of 1 acre of reservoir, in acre feet
Bo = formation volume factor

N.M.O.C.C. Case No. 2469
EPNG Exhibit No. 8
Date January 4, 1962

ECONOMICS FOR VARIOUS WELL SPACING PATTERNS LUSK STRAWN POOL

1. Basic Data

Oil Value (After transportation expense), $/Bbl.	2.76
Estimated Value of Produced Gas, $/M^{2}cf	90
Net Lease Interest, %	87.5
State Production Taxes, %	6.15
Lifting Costs, $/Bbl.	0.25
Well Investment, $	298,000

W.I. Net Income = [Oil Recovery X Oil Price + Gas Recovery X Gas Price] X Net Interest X (1 - Taxes) - Lifting Cost

2. 40 Acre Spacing Units

Estimated Reserves:
Oil - 33,320 Bbls.
Gas - 597 M^{2}cf

W.I. Net Income = [33,320 X 2.76 + 597 X 90] X 0.875 (1-0.0615) -
33,320 X 0.25 = $111,313

Loss per Well = $298,000 - $111,313 = $186,687 ($187,000)

3. 80 Acre Spacing Units

Estimated Reserves:
Oil - 66,640 Bbls.
Gas - 1,194 M^{2}cf

W.I. Net Income = [66,640 X 2.76 + 1194 X 90] X 0.875 (1 - 0.0615) -
66,640 X 0.25 = $222,626

Loss per Well = $298,000 - $222,626 = $75,374 ($75,000)

4. 160 Acre Spacing Units

Estimated Reserves:
Oil - 133,280 Bbls.
Gas - 2,387 M^{2}cf

W.I. Net Income = [133,280 X 2.76 + 2387 X 90] X 0.875 (1 - 0.0615) -
133,280 X 0.25 = $445,179

Net Profit = $445,179 - $298,000 = $147,179 ($147,000)

Profit to Investment Ratio = 0.50 to 1

N. M. O. C. C. Case No. 2469
EPNG Exhibit No. 10
Date January 4, 1962

SPECIAL RULES AND REGULATIONS FOR THE LUSK STRAWN OIL POOL

Rule 1. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, and not nearer to nor within the limits of another designated Strawn Pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereafter set forth.

Rule 2. Each well completed or recompleted in the Lusk-Strawn Pool or in the Strawn Formation within one mile of said Pool, shall be located on a designated drilling tract consisting of 160 contiguous acres, more or less, substantially in the form of a square, which is a quarter section being a legal subdivision of the United States Public Lands Survey.

Rule 3. Each well completed or recompleted in the Lusk Strawn Pool or in the Strawn Formation within one mile of said pool shall not be drilled closer than 660 feet to any quarter section line of the tract or closer than 330 feet to any quarter quarter section line, or subdivision inner-boundary, nor closer than 1, 320 feet to a well drilled to or capable of producing from the same pool.

Rule 4a. For good cause shown, the Secretary-Director of the Commission may grant an exception to the requirement of Special Rule 2. without notice and hearing where an application has been filed in due form and where the unorthodox size or shape of the tract is due to a variation in the legal subdivision of the United States Public Lands Survey or where the following facts exist and the following provisions are complied with:

Case 2469
EPNG Exhibit No. 11.

(1) The non-standard unit consists of less than a standard unit and lies wholly within a single governmental quarter section.

(2) The entire non-standard unit may reasonably be presumed to be productive of oil from said pool.

(3) The applicant presents written consent in the form of waivers from all offset operators.

(4) In lieu of Paragraph 3 of this Rule, the applicant may furnish proof of the fact that said offset operators were notified by registered mail of his intent to form such non-standard unit. The Secretary-Director may approve the application if, after a period of 30 days, no operator has entered an objection to the formation of the non-standard unit.

Rule 4b. The allowable assigned to such non-standard unit shall bear the same ratio to a standard allowable in the Lusk Strawn Pool as the acreage in such non-standard unit bears to 160 acres.

Rule 5. A 160 acre proration unit in the Lusk Strawn Oil Pool shall be assigned a 160 acre proportional factor of 8.67 for allowable purposes. For purposes of computing allowables a unit of not less than 158 acres nor more than 162 acres shall be considered to contain the number of acres in a standard unit. In the event there is more than one well on a 160 acre proration unit, the operator may produce the allowable assigned to the unit from the wells on that unit in any proportion.

Rule 6. The gas-oil ratio limitation for all wells in the Lusk Strawn Pool shall be four thousand (4,000) cubic feet of gas per barrel for oil produced. Any oil well in the Lusk Strawn Oil Pool producing with a gas-oil ratio in excess of four thousand (4,000) cubic feet per barrel of oil shall be allowed to produce daily only that volume of gas obtained by multiplying the top unit allowable for the pool as determined by the applicable rules of the Commission and, as proposed herein, times the limiting gas-oil ratio (four thousand (4,000) cubic feet). The gas volume thus obtained shall be known as the daily gas limit of such well. The daily oil allowable therefore shall then be determined and assigned by dividing the daily gas limit by its producing gas oil ratio.

Rule 7. The vertical limits of the Lusk-Strawn Oil Pool shall be the Strawn Formation.

Distribution of Final Reports

20 Copies	Mr. L. C. Zinc El Paso Natural Gas Company 19th Floor, Wilco Building Midland, Texas
2 Copies	Mr. John J. Gill Pan American Petroleum Corporation Box 268 Lubbock, Texas
2 Copies	Phillips Petroleum Company Box 791 Midland, Texas
2 Copies	Delhi-Taylor Oil Corporation Box 67 Farmington, New Mexico
2 Copies	Mr. R. H. Kress Gulf Oil Corporation Box 669 Roswell, New Mexico
2 Copies	Southern California Petroleum Corporation Petroleum Life Building Midland, Texas
2 Copies	Mr. Donald Fish Kerr-McGee Oil Industries, Inc. Amarillo Globe News Building Amarillo, Texas
2 Copies	Delhi-Taylor Oil Corporation 1700 Corrigan Tower Building Dallas, Texas

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TELEGRAM

W. P. MARSHALL, PRESIDENT

1201 (4-60)

SYMBOLS
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1962 FEB 15 AM 8 54

ALLEGATIONS AND PLEAS MADE BY EL PASO NATURAL GAS COMPANY IN ITS AFORSEAID APPLICATION FOR REHEARING. PHILLIPS PETROLEUM COMPANY URGES THE COMMISSION TO GRANT THE REQUESTED REHEARING, AND UPON THE CONCLUSION OF SUCH REHEARING, TO ESTABLISH THE 160 ACRE DRILLING AND SPACING UNITS, 4000 TO 1 LIMITING GAS=OIL RATIO, AND ALLOWABLE BASED ON 160=ACRE SPACING AS REQUESTED BY EL PASO=

PHILLIPS PETROLEUM CO L E FITZJARRALD
VICE PRESIDENT=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

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W. P. MARSHALL, PRESIDENT

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1962 FEB 15 AM 8:54

K BRA166 NL PD=HUX BARTLESVILLE OKLA 14=

NEW MEXICO OIL CONSERVATION COMMISSION, ATTN OF
A L PORTER JR SECRETARY= SANTA FE NMEX=

IN RE: CASE NUMBER 2469 = LUSK STRAWN POOL, LEA COUNTY,
NEW MEXICO = APPLICATION OF EL PASO NATURAL GAS COMPANY
FOR A REHEARING ON ITS APPLICATION FOR ESTABLISHMENT
OF SPECIAL RULES AND REGULATIONS TO PROVIDE FOR 160
ACRE DRILLING AND SPACING UNITS WITH A LIMITING
GAS=OIL RATIO OF 4000 TO 1 AND FOR OIL ALLOWABLE BASED
ON 160 ACRE SPACING. PHILLIPS PETROLEUM COMPANY, OWNER
OF AN INTEREST IN THE LUSK DEEP UNIT WHICH IS SUBJECT
TO RULES FOR THE LUSK STRAWN POOL CONCURS IN THE

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

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

P. O. BOX 871
SANTA FE

January 30, 1962

Re: CASE NO. 2469
ORDER NO. R-2175
APPLICANT:
El Paso Natural Gas Company

Mr. Garrett Whitworth
Mr. Ben Howell
El Paso Natural Gas Company
Box 1492
El Paso, Texas

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.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC

OTHER Mr. Bill Kastler (Gulf Oil Corporation)
Mr. Oliver Seth

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER

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

P. O. BOX 871
SANTA FE

April 4, 1962

Re: CASE NO. 2469
ORDER NO. R-2175-B
APPLICANT:
El Paso Natural Gas Company

Mr. Ben Howell
El Paso Natural Gas Company
P. O. Box 1492
El Paso, Texas

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A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC

OTHER Mr. Garrett Whitworth
Mr. Oliver Seth
Mr. O. P. Nicola

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF EL PASO NATURAL GAS COMPANY FOR THE ESTABLISHMENT OF SPECIAL RULES AND REGULATIONS FOR THE LUSK STRAWN POOL, LEA COUNTY, NEW MEXICO, TO PROVIDE FOR 160-ACRE DRILLING AND SPACING UNITS WITH A LIMITING GAS-OIL RATIO OF 4000/1 AND FOR OIL ALLOWABLE BASED ON 160-ACRE SPACING	CASE NO. 2469

APPLICATION FOR REHEARING

COMES NOW El Paso Natural Gas Company, a Delaware Corporation, with license to do business in the State of New Mexico, hereinafter called "Applicant" and files this, its application for rehearing before the New Mexico Oil Conservation Commission in the above styled and numbered cause and for grounds therefor would respectfully show:

I.

Hearing was held on this case by an Examiner on January 4, 1962 at Santa Fe, New Mexico; and by Order No. R-2175 which was issued on the 30th day of January 1962, the Commission found, among other things, that Applicant's application for 160-acre proration units in the Lusk Strawn Pool should be denied, and that special rules and regulations should be established for said pool providing for 80-acre oil proration units. The Commission also found that well costs presented in the evidence and testimony of Applicant were excessive and recoverable reserves, as shown by Applicant on said hearing, were too conservative. The record amply supports Applicant's estimated well costs. There is no evidence to the contrary. If the Commission considered any matter to the contrary, it considered evidence outside the record on which Applicant had no chance to cross-examine.

II.

By Rule 2 of Special Rules and Regulations for the Lusk Strawn Pool, the Commission established 80-acre spacing therein and by Rule 5 it established an 80-acre proportional factor for allowable purposes.

III.

In the absence of conflicting testimony in the record, the above mentioned findings and rules of the Commission were not based on the transcript of testimony and record made as required by Section 65-3-11.1 of the New Mexico Statutes Annotated, 1953 Compilation.

IV.

The uncontradicted evidence presented and comprising the record of the hearing in this case establishes conclusively that one well drilled in the Lusk Strawn Pool can efficiently, effectively, and economically drain an area of at least 160 acres. Nothing is presented in the transcript of testimony and the entire record of this case that would indicate anything to the contrary. If any matter was considered by the Commission to the contrary, then the Commission considered evidence outside the record on which this Applicant had no chance to cross-examine.

V.

The order of the Commission in establishing 80-acre spacing for wells in the Lusk Strawn Pool will cause the drilling of unnecessary wells and will cause economic loss. The Commission's order fails to give effect to the uncontradicted evidence and fails to comply with the provisions of Section 65-3-14(b), New Mexico Statutes Annotated, 1953 Compilation, which provides:

> "The Commission may establish a proration unit for each pool, such being the area that can be

> efficiently and economically drained and developed by one (1) well, and in so doing, the Commission shall consider the economic loss caused by the drilling of unnecessary wells, the protection of correlative rights, including those of royalty owners, the prevention of waste, the avoidance of the augmentation of risks arising from the drilling of an excessive number of wells, and the prevention of reduced recovery which might result in the drilling of too few wells."

Applicant is prepared to submit additional evidence as to well costs and recoverable reserves in rebuttal of the announced fact findings.

WHEREFORE, Applicant requests that this matter be set down for a rehearing before the Commission persuant to Rule 1222, Rules and Regulations of the New Mexico Oil Conservation Commission, and that on such rehearing the Commission issue rules and regulations establishing proration units of 160 acres for each well completed or recompleted in the Lusk Strawn Pool and for oil allowables based on 160-acre proration units.

Garrett C. Whitworth
Attorney for Applicant

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OIL CONSERVATION COMMISSION=
STATE OF NEW MEXICO SANTA FE NMEX=

ATTN: A L PORTER JR

¶ REFERENCE CASE NO. 2469 SET FOR HEARING ON MARCH 14, 1962 CONCERNING LUSK DEEP UNIT UPON APPLICATION OF EL PASO NATURAL GAS COMPANY. KERR-MCGEE SUPPORTS THIS APPLICATION AND RESPECTFULLY REQUESTS THAT COMMISSION GRANT 160 ACRE DRILLING AND SPACING UNIT WITH LIMITING GAS-OIL RATIO 4000 TO 1 AND OIL ALLOWABLE BASED ON 160 ACRE SPACING FOR THE LUSK-STRAWN POOL, LEA COUNTY, NEW MEXICO. KERR-MCGEE OIL INDUSTRIES, INC. OWNS APPROXIMATELY A 10 PERCENT WORKING INTEREST IN THE ENTIRE UNIT=

KERR MCGEE OIL IND INC C F MILLER=

ESTIMATED WELL COSTS

Exhibit B-2

Lease:	Unit	Well No.: 1	
Location:	19, T-19-S, R-22-E	County: Lea	State: NM
Formation:	Tubb/Drinkard/Abo/Strawn	Proposed Depth: 11,232'	

							PRODUCING WELL Sub.	PRODUCING WELL Total	DRY HOLE
TUBULAR GOODS:									
Surface Casing		Ft.	13-3/8	Inch.		$/Ft.	$ 5,900		$
Int. Casing	5,[illegible]	Ft.	9-5/8	Inch.		$/Ft.	29,800		
Prod. Casing	1,[illegible]9	Ft.	7	Inch.		$/Ft.	54,000		
		Ft.		Inch.		$/Ft.			
		Ft.		Inch.		$/Ft.			
Tubing	11,125	Ft.	2-3/8	Inch.		$/Ft.	7,800		
	8,710	Ft.	2-1/16	Inch.		$/Ft.	9,600	$ 107,100	
WELLHEAD EQUIPMENT:							6,600	6,600	
OTHER EQUIPMENT:									
Liner Hangers and Production Packers							4,100	4,100	
CONTRACT COSTS:									
Footage		Ft.				$/Ft.	158,500		
Daywork		Day				$/Day			
Daywork		Day				$/Day			
Daywork		Day				$/Day		158,500	
CEMENTING: (Cement and Pump Trucks)									
Surface							1,200		
Intermediate							5,700		
Production							3,300		
Liner									
Liner									
Sq. Job.							2,400	12,600	
FORMATION TREATMENT:									
Acidizing							2,800		
Fracturing Equipment									
Fluid			Gal. Oil						
			Gal. Water						
Sand			Lbs.						
Tank Rental								2,800	
SPECIAL SERVICES: (Surveys and Tests)									
Perforating							3,000		
Mud Logging									
Electric and Radioactive Logging							6,500		
Drill Stem Tests							11,000		
Cores							1,300	21,800	
MATERIALS:									
Drilling Mud and Chemicals							42,000		
Drilling Gas or Air									
Water							2,000		
Bits							35,000		
Fuel									
Cement Equipment (shoes, collars, etc.)							2,100		
Bridge Plugs and Retainers									
Miscellaneous (welding, hauling, rental of tongs, etc.)							17,900	117,000	
ACCESS AND LOCATION:							8,500	8,500	
						Total Direct Cost	439,000	439,000	
Legal, Stores, and Supervision							35,000	35,000	
						~~ESTIMATED~~ TOTAL COST	$ 474,000	$ 474,000	$

WORKING INTEREST:

El Paso Natural Gas Company _____

Others _____

ESTIMATED COST ONLY — Each participating owner to pay proportionate share of actual well cost subject to operating agreement.

Date	PARTNER'S APPROVAL:
Proposed By	Date
[illegible] By	By

...L COSTS

	Well No. 2
	County Lea
, T-19-S, R-32-E	Est. Total Depth: 13,974'
orrow - Devonion	

TUBULAR GOODS					PRODUCING WELL Sub.	PRODUCING WELL Total	...Y HOLE
Surface Casing	...,	13-3/8	Inch.	$/Ft.	$ 50,300		$
Int. Casing	...,	9-5/8	Inch.	$/Ft.	97,900		
Prod. Casing	...,		Inch.	$/Ft.			
Liner	2,...	5"	Inch.	$/Ft.	6,100		
			Inch.	$/Ft.			
Tubing	...,	2-3/8	Inch.	$/Ft.	7,800		
	2,...	2-3/8	Inch.	$/Ft.	9,300	$ 171,400	
WELLHEAD EQUIPMENT:					5,000	5,000	
OTHER EQUIPMENT: Liner Hangers and Production Packers					5,700	5,700	
CONTRACT COSTS: Footage		Ft.		$/Ft.	196,000		
Daywork		Day		$/Day			
Daywork		Day		$/Day			
Daywork		Day		$/Day		196,000	
CEMENTING: (Cement and Pump Trucks) Surface					8,600		
Intermediate					4,300		
Production							
Liner					2,900		
Liner							
Sq. Job.					2,900	18,700	
FORMATION TREATMENT: Acidizing					700		
Fracturing Equipment							
Fluid		Gal. Oil					
		Gal. Water					
Sand		Lbs.					
Tank Rental						700	
SPECIAL SERVICES: (Surveys and Tests) Perforating					2,100		
Mud Logging					11,600		
Electric and Radioactive Logging					16,000		
Drill Stem Tests					4,200		
Cores					20,200	54,100	
MATERIALS: Drilling Mud and Chemicals					57,300		
Drilling Gas or Air					28,400		
Water					4,100		
Bits					53,500		
Fuel					1,800		
Cement Equipment (shoes, collars, etc.)					2,600		
Bridge Plugs and Retainers							
Miscellaneous (welding, hauling, rental of tongs, etc.)					60,000	207,700	
ACCESS AND LOCATION:					6,300	6,300	
Legal, Stor..., Supervision, etc.				Total Direct Cost	665,600	665,600	
				~~ESTIMATED~~ TOTAL COST	65,400	65,400	
					$ 731,000	$ 731,000	$

MAKING INTEREST:
El Paso Natural Gas Company
Others

ESTIMATED COST ONLY — Each participat... owner to pay proportionate share of actual well cost subject to operating agreement.

Date
Prepared By
...d By

PARTNER'S APPROVAL:
Date
By

COST

Well No. 3

County Lea

Est. Total Depth: 12,621'

						PRODUCING WELL		DRY HOLE
						Sub.	Total	
TUBULAR GOODS								
Surface Casing		Ft. 20	Inch.		$/Ft.	$ 346		$
Int. Casing		Ft. 13-3/8	Inch.		$/Ft.	5,606		
Prod. Casing		Ft. 9-5/8	Inch.		$/Ft.	26,635		
		Ft. 5-1/2	Inch.		$/Ft.	32,331		
		Ft.	Inch.		$/Ft.			
Tubing	11,238	Ft. 2-1/16	Inch.		$/Ft.	8,608		
	12,323	Ft. 2-1/16	Inch.		$/Ft.	9,419	$ 85,819	
Inspection						2,874		
WELLHEAD EQUIPMENT:						7,714	7,714	
OTHER EQUIPMENT:								
Liner Hangers and Production Packers						2,726	2,726	
CONTRACT COSTS:								
Footage		Ft.			$/Ft.	116,438		
Daywork		Day			$/Day			
Daywork		Day			$/Day			
Daywork		Day			$/Day		116,438	
CEMENTING: (Cement and Pump Trucks)								
Surface						2,300		
Intermediate						5,900		
Production						2,273		
Liner								
Liner								
Sq. Job.						2,900	13,373	
FORMATION TREATMENT:								
Acidizing								
Fracturing Equipment								
Fluid		Gal. Oil						
		Gal. Water						
Sand		Lbs.						
Tank Rental								
SPECIAL SERVICES: (Surveys and Tests)								
Perforating						2,700		
Mud Logging								
Electric and Radioactive Logging						7,000		
Drill Stem Tests						4,900		
Cores						1,436	16,036	
MATERIALS:								
Drilling Mud and Chemicals						33,671		
Drilling Gas or Air								
Water						7,206		
Bits						9,478		
Fuel						3,972		
Cement Equipment (shoes, collars, etc.)						3,200		
Bridge Plugs and Retainers								
Miscellaneous (welding, hauling, rental of tongs, etc.)						26,291	83,818	
Surface Installation (Tanks, etc.)						15,843		
ACCESS AND LOCATION:						12,907	28,750	
Total Direct Cost						354,674	354,674	
Legal, Stores, Supervision, etc. [redacted]						20,222	20,222	
Incomplete ESTIMATED TOTAL COST						$ 374,896	$ 374,896	$

WORKING INTEREST

El Paso Natural Gas Company _____

Others _____

ESTIMATED COST ONLY — Each participating owner to pay proportionate share of actual well cost subject to operating agreement.

PARTNER'S APPROVAL:

Date

El Paso Natural Gas Company

WELL COST ESTIMATE

El Paso, Index # R-5

Lease Name: Lusk Deep Unit Area	Well: Single Completion Development	Pool: Lusk Deep Unit	
Location: T-19-S, R-32-E	County: Lea	State: New Mexico	
Formation: Strawn - Single	Est. Total Depth: 11,500'		

		PRODUCING WELL		DRY HOLE
		Sub.	Total	
TUBULAR GOODS				
Surface Casing	800 Ft. 13-3/8 Inch. ____ $/Ft.	$ 5,488		$
Int. Casing	4,700 Ft. 9-5/8 Inch. ____ $/Ft.	27,006		
Prod. Casing	11,500 Ft. 5-1/2 Inch. ____ $/Ft.	29,426		
____	____ Ft. ____ Inch. ____ $/Ft.			
____	____ Ft. ____ Inch. ____ $/Ft.			
Tubing	11,150 Ft. 2-3/8 Inch. ____ $/Ft.	10,350		
Csg. Inspection & Trucking	Inch. ____ $/Ft.	2,000	$ 74,270	
WELLHEAD EQUIPMENT: ____		5,800	5,800	
OTHER EQUIPMENT:				
Liner Hangers and Production Packers		1,200	1,200	
CONTRACT COSTS:				
Footage	____ Ft. ____ $/Ft.	86,535		
Daywork	____ Day ____ $/Day			
Daywork	____ Day ____ $/Day			
Daywork	____ Day ____ $/Day		86,535	
CEMENTING: (Cement and Pump Trucks)				
Surface		1,200		
Intermediate		5,600		
Production		3,300		
Liner				
Liner				
____				
Sq. Job.			10,100	
FORMATION TREATMENT:				
Acidizing 500 gallons MCA plus trucking		650		
Fracturing Equipment ____				
Fluid ____ Gal. Oil				
____ Gal. Water				
Sand ____ Lbs.				
Tank Rental ____			650	
SPECIAL SERVICES: (Surveys and Tests)				
Perforating ____		1,500		
Mud Logging ____				
Electric and Radioactive Logging ____		9,500		
Drill Stem Tests ____		1,500		
Cores ____		600	14,100	
Seperator & Tank Rental		1,000		
MATERIALS:				
Drilling Mud and Chemicals		28,000		
Drilling Gas or Air				
Water		6,000		
Bits		5,460		
Fuel		3,250		
Cement Equipment (shoes, collars, etc.)		2,800		
Bridge Plugs and Retainers				
Miscellaneous (welding, hauling, rental of tongs, etc.)		12,500	72,010	
Tank Battery		14,000		
ACCESS AND LOCATION:		8,500	8,500	
Total Direct Cost		273,165	273,165	
Plus 5 % Contingency		13,658	13,658	
ESTIMATED TOTAL COST		$ 286,823	$ 286,823	$

WORKING INTEREST:

El Paso Natural Gas Company ____

Others ____

ESTIMATED COST ONLY — Each participating owner to pay proportionate share of actual well cost subject to operating agreement.

Date	PARTNER'S APPROVAL:
Prepared By	Date
Approved By	By

RECOVERABLE OIL RESERVES

LUSK STRAWN POOL

STRAWN LIMESTONE PRODUCING INTERVAL

Basic Data

Porosity 7.1% (avg. from core analyses #1, #2, and #3 wells)
Permeability 17.7 md. (avg. from core analyses #1, #2, and #3 wells)
Net Pay 38 ft. (avg. from micro log and core analyses #1, #2, and #3 wells)
Water Saturation 30.9% (avg. from core analyses #1, #2, and #3 wells)
Recovery Factor 15.6% (calculated)
Formation Volume Factor 2.605 @ original pressure.

Volumetric Calculation

$$\text{Original Recoverable Oil Reserve} = \frac{7758\ \phi\ (1-Sw)\ Ah}{Bo} \times \text{Oil Recovery Factor}$$

$$\text{Original Recoverable Oil Reserve} = \frac{(7758)\ (0.071)\ (0.691)\ (38)}{(2.605)} \times 0.156$$

Original Recoverable Oil Reserve = 866 Bbls./Acre

In which: 7758 bbls. = equivalent volume in 1 acre foot
ϕ (phi) = porosity as a decimal fraction of bulk volume
Sw = interstitial water as a decimal fraction of the pore volume
Ah = volume of 1 acre of reservoir, in acre feet
Bo = formation volume factor

N.M.O.C.C. Case No. 2469 Rehearing
EPNG Exhibit No. 8 Revised
Date March 14, 1962

ECONOMICS FOR VARIOUS WELL SPACING PATTERNS LUSK STRAWN POOL

1. Basic Data

Oil Value (After transportation expense), $/Bbl.	2.76
Estimated Value of Produced Gas, $/M^{2}cf	90
Net Lease Interest, %	87.5
State Production Taxes, %	6.15
Lifting Costs, $/Bbl.	0.25
Well Investment, $	287,000

W.I. Net Income = [Oil Recovery X Oil Price + Gas Recovery X Gas Price] X Net Interest X (1 - Taxes) - Lifting Cost

2. 40 Acre Spacing Units

Estimated Reserves:

Oil - 34,640 Bbls.

Gas - 600 M^{2}cf

W.I. Net Income = [34,640 X 2.76 + 600 X 90] X 0.875 (1-0.0615) - 34,640 X 0.25 = $114,166

Loss per Well = $287,000 - $114,166 = $172,834 ($173,000)

3. 80 Acre Spacing Units

Estimated Reserves:

Oil - 69,280 Bbls.

Gas - 1,200 M^{2}cf

W.I. Net Income = [69,280 X 2.76 + 1200 X 90] X 0.875 (1 - 0.0615) - 69,280 X 0.25 = $228,334

Loss per Well = $287,000 - $228,334 = $58,666 ($59,000)

4. 160 Acre Spacing Units

Estimated Reserves:

Oil - 138,560 Bbls.

Gas - 2,400 M^{2}cf

W.I. Net Income = [138,560 X 2.76 + 2400 X 90] X 0.875 (1 - 0.0615) - 138,560 X 0.25 = $456,668

Net Profit = $456,668 - $287,000 = $169,668 ($170,000)

Profit to Investment Ratio = 0.59 to 1

N.M.O.C.C. Case No. 2469 Rehearing
EPNG Exhibit No. 10 Revised
Date March 14, 1962

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

October 12, 1960

REPLY TO
P. O. BOX 4337
MIDLAND, TEXAS

El Paso Natural Gas Company
19th Floor, Wilco Building
Midland, Texas

Attention: Mr. L. C. Zinc

Subject: Core Analysis
Lusk Deep Unit No. 1 Well
Wildcat
Lea County, New Mexico
Location: Sec. 19-T19S-R32E

Gentlemen:

Strawn formation analyzed from 11,148 to 11,198 feet is interpreted to be oil productive where permeable. The measured productive capacity of 838 millidarcy-feet is believed adequate for natural flow rates. Average core analysis values and calculated original stock-tank oil in place are given on page one of the report.

Formation analyzed from 11,198 to 11,221 feet was found to be impermeable and nonproductive

We sincerely appreciate this opportunity to be of service to you.

Very truly yours,

Core Laboratories, Inc.

R S Bynum Jr (RF)

R. S. Bynum, Jr.,
District Manager

RSB:PE:sp

Form F-11B

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 1 of 1 File WP-3-1546
Well Lusk Deep Unit No. 1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Strawn 11,148.0-11,198.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		50.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		31.5
FEET OF CORE INCLUDED IN AVERAGES		44.1	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(e)	27
AVERAGE PERMEABILITY: MILLIDARCYS	Max. 90°	19 7.2	OIL GRAVITY: °API	(e)	48
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	Max. 90°	838 318	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1000
AVERAGE POROSITY: PER CENT		7.1	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.60
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		7.6	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		251

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

Distribution of Final Reports

20 Copies	Mr. L. C. Zinc El Paso Natural Gas Company 19th Floor, Wilco Building Midland, Texas
2 Copies	Mr. John J. Gill Pan American Petroleum Corporation Box 268 Lubbock, Texas
2 Copies	Mr. R. E. Bridgewater Phillips Petroleum Company Box 791 Midland, Texas
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CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

September 29, 1961

RESERVOIR FLUID DIVISION

El Paso Natural Gas Company
19th Floor, Wilco Building
Midland, Texas

Attention: Mr. Dale Lockett

Subject: Reservoir Fluid Study
E. P. Lusk No. 2 Well
Lea County, New Mexico
Our File Number: RFL 1974

Gentlemen:

Subsurface fluid samples were collected from the E. P. Lusk No. 2 well by a representative of Core Laboratories, Inc. The results of fluid studies performed using these samples are transmitted to you in the following report.

The saturation pressure of the fluid was determined to be 4150 psig at the reservoir temperature of 161° F. This value is significantly lower than the reservoir pressure measured prior to sampling and is indication that the reservoir presently exists in an undersaturated condition. At the time of sampling, the oil level in the tubing was at the surface. This condition is often found in undersaturated reservoirs and tends to confirm the conclusion.

Under differential pressure depletion conditions at the reservoir temperature of 161° F., the fluid evolved 3084 cubic feet of gas at 14.696 psia and 60° F. per barrel of residual oil at 60° F. The associated formation volume factor was measured to be 2.722 barrels of saturated fluid per barrel of residual oil. The specific gravity and compressibility of the gas evolved during this depletion are presented on page five of the report with the density of the liquid phase at the various depletion pressures. The viscosity of the liquid phase under similar depletion conditions varied from a minimum of 0.134 centipoise at saturation pressure to 1.352 centipoises at atmospheric pressure.

A stage separation test was performed on the fluid at pressures approximating field conditions. The primary separator gas tank liquid ratio was measured to be 1916 standard cubic feet of gas per barrel of stock tank oil. The formation volume factor was measured to be 2.181 barrels of saturated fluid per barrel of stock tank oil.

It was a pleasure to cooperate with you in performing this study. Should you have any questions or if we may assist you further, please do not hesitate to contact us.

Very truly yours,

Core Laboratories, Inc.
Reservoir Fluid Division

P. L. Moses (PLM)

P. L. Moses,
Operations Supervisor

PLM:pb
7 cc. - Addressee

Form 69385

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974

Company El Paso Natural Gas Company — Date Sampled August 20, 1961

Well E. P. Lusk No. 2 — County Lea

Field Undesignated — State New Mexico

FORMATION CHARACTERISTICS

Formation Name	Strawn
Date First Well Completed	, 19
Original Reservoir Pressure	PSIG @ Ft.
Original Produced Gas-Oil Ratio	SCF/Bbl
Production Rate	Bbl/Day
Separator Pressure and Temperature	PSIG, °F.
Oil Gravity at 60° F.	°API
Datum	7585 Ft. Subsea
Original Gas Cap	

WELL CHARACTERISTICS

Elevation	3605 KB Ft.
Total Depth	Ft.
Producing Interval	11,220-11,250 Ft.
Tubing Size and Depth	In. to Ft.
Productivity Index	Bbl/D/PSI @ Bbl/Day
Last Reservoir Pressure	56[illegible] PSIG @ 11,100 Ft.
Date	August 20, 19 61
Reservoir Temperature	160 * °F. @ 11,100 Ft.
Status of Well	Shut in
Pressure Gauge	Amerada (DO)
Normal Production Rate	Bbl/Day
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG, °F.
Base Pressure	PSIA
Well Making Water	None % Cut

SAMPLING CONDITIONS

Sampled at	11,100 Ft.
Status of Well	Shut in
Gas-Oil Ratio	SCF/Bbl
Separator Pressure and Temperature	PSIG, °F.
Tubing Pressure	2964 PSIG
Casing Pressure	Dual PSIG
Core Laboratories Engineer	SR
Type Sampler	Perco

REMARKS: * Temperature extrapolated to mid-point of producing interval = 161° F.

Form 54801

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974
Well E. P. Lusk No. 2

VOLUMETRIC DATA OF Reservoir Fluid SAMPLE

1. Saturation pressure (bubble-point pressure) 4150 PSIG @ 161 °F.

2. Thermal expansion of saturated oil @ 6000 PSI = $\frac{\text{V @ 161 °F}}{\text{V @ 74.5°F}}$ = 1.07755

3. Compressibility of saturated oil @ reservoir temperature: Vol/Vol/PSI:

From 6000 PSI to 5500 PSI = 21.62×10^{-6}

From 5500 PSI to 4800 PSI = 24.47×10^{-6}

From 4800 PSI to 4150 PSI = 31.64×10^{-6}

4. Specific volume at saturation pressure: ft^3/lb 0.03001 @ 161 °F.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974
Well E. P. Lusk No. 2

Reservoir Fluid SAMPLE TABULAR DATA

PRESSURE PSI GAUGE	PRESSURE-VOLUME RELATION @ 161 °F., RELATIVE VOLUME OF OIL AND GAS, $V/V_{SAT.}$	VISCOSITY OF OIL @ 161 °F., CENTIPOISES	DIFFERENTIAL LIBERATION @ 161 °F.		
			GAS/OIL RATIO LIBERATED PER BARREL OF RESIDUAL OIL	GAS/OIL RATIO IN SOLUTION PER BARREL OF RESIDUAL OIL	RELATIVE OIL VOLUME, V/V_R
6000	0.9523				2.592
5500	0.9627				2.620
5420		0.146			
5200		0.144			
5000	0.9742	0.141			2.652
4800	0.9794	0.139			2.666
4600	0.9849	0.137			2.681
4500	0.9882				2.690
4400	0.9913	0.135			2.698
4300	0.9946				2.707
4200	0.9981	0.135			2.717
4150	1.0000	0.134	0	3084	2.722
4125	1.0015				
4106	1.0027				
4101			179	2905	2.612
4078	1.0045				
4051			337	2747	2.520
4050		0.139			
4004	1.0094				
4000		0.143			
3977			522	2562	2.412
3950		0.146			
3902			680	2404	2.321
3891	1.0172				
3850		0.152			
3800			852	2232	2.225
3771	1.0274				
3700		0.160			
3674			1025	2059	2.129
3558	1.0478				
3527			1187	1897	2.041
3500		0.172			
3352			1349	1735	1.954

V = Volume at given pressure
$V_{SAT.}$ = Volume at saturation pressure and the specified temperature.
V_R = Residual oil volume at 14.7 PSI absolute and 60° F.

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974
Well E. P. Lusk No. 2

Reservoir Fluid SAMPLE TABULAR DATA

PRESSURE PSI GAUGE	PRESSURE-VOLUME RELATION @ 161 °F., RELATIVE VOLUME OF OIL AND GAS, $V/V_{SAT.}$	VISCOSITY OF OIL @ 161°F., CENTIPOISES	DIFFERENTIAL LIBERATION @ 161 °F.		
			GAS/OIL RATIO LIBERATED PER BARREL OF RESIDUAL OIL	GAS/OIL RATIO IN SOLUTION PER BARREL OF RESIDUAL OIL	RELATIVE OIL VOLUME, V/V_R
3302	1.0786				
3300		0.184			
3100			1543	1541	1.853
3042	1.1201				
3000		0.202			
2756	1.1809				
2752			1762	1322	1.743
2600		0.228			
2436	1.2753				
2351			1970	1114	1.642
2200		0.258			
2144	1.4024				
1950			2152	932	1.555
1888	1.5495				
1800		0.302			
1649	1.7494				
1550			2319	765	1.477
1463	1.9630				
1400		0.356			
1252	2.2793				
1150			2472	612	1.406
1030	2.7986				
1000		0.430			
772	3.7963				
748			2626	458	1.336
600		0.530			
347			2783	301	1.259
130			2907	177	1.187
0		1.352	3084	0	1.052
				@ 60° F.	= 1.000

Gravity of residual oil = 42.9 °API @ 60° F.

V = Volume at given pressure
$V_{SAT.}$ = Volume at saturation pressure and the specified temperature.
V_R = Residual oil volume at 14.7 PSI absolute and 60° F.

Form 32938

CORE LABORATORIES, INC.
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DALLAS, TEXAS

File RFL 1974
Well E. P. Lusk No. 2

Differential Pressure Depletion at 161° F.

Pressure PSIG	Oil Density Gms/Cc	Gas Gravity	Deviation Factor Z
4150	0.5342	1.050	0.865
4101	0.5409	1.040	0.849
4051	0.5459	1.031	0.825
3977	0.5531	1.015	0.823
3902	0.5597	0.994	0.811
3800	0.5668	0.964	0.799
3674	0.5754	0.934	0.784
3527	0.5840	0.901	0.774
3352	0.5937	0.864	0.766
3100	0.6063	0.823	0.765
2752	0.6221	0.794	0.772
2351	0.6383	0.777	0.787
1950	0.6540	0.766	0.813
1550	0.6697	0.781	0.843
1150	0.6848	0.810	0.886
748	0.7010	0.904	0.933
347	0.7189	1.135	0.967
130	0.7369	1.666	
0	0.7704		

Form 54802

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974

Well E. P. Lusk No. 2

SEPARATOR TESTS OF Reservoir Fluid SAMPLE

SEPARATOR PRESSURE, PSI GAUGE	SEPARATOR TEMPERATURE, ° F.	SEPARATOR GAS/OIL RATIO See Foot Note (1)	STOCK TANK GAS/OIL RATIO See Foot Note (1)	STOCK TANK GRAVITY, ° API @ 60° F.	SHRINKAGE FACTOR, $V_R/V_{SAT.}$ See Foot Note (2)	FORMATION VOLUME FACTOR, $V_{SAT.}/V_R$ See Foot Note (3)	SPECIFIC GRAVITY OF FLASHED GAS
390	72	1916					
to							
32	72	306	6	47.9	0.4586	2.181	0.777 *

* Specific gravity of composite gases.

(1) Separator and Stock Tank Gas/Oil Ratio in cubic feet of gas @ 60° F. and 14.7 PSI absolute per barrel of stock tank oil @ 60° F.

(2) Shrinkage Factor: $V_R/V_{SAT.}$ is barrels of stock tank oil @ 60° F. per barrel of saturated oil @ 4150 PSI gauge and 161 ° F.

(3) Formation Volume Factor: $V_{SAT.}/V_R$ is barrels of saturated oil @ 4150 PSI gauge and 161 ° F. per barrel of stock tank oil @ 60° F.

Form 55819

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974

Company El Paso Natural Gas Company Formation Strawn

Well E. P. Lusk No. 2 County Lea

Field Undesignated State New Mexico

HYDROCARBON ANALYSIS OF Reservoir Fluid SAMPLE

COMPONENT	WEIGHT PER CENT	MOL PER CENT	DENSITY @ 60° F. GRAMS PER CUBIC CENTIMETER	° API @ 60° F.	MOLECULAR WEIGHT
Hydrogen Sulfide					
Carbon Dioxide	0.21	0.24			
Nitrogen	0.83	1.58			
Methane	16.39	53.85			
Ethane	7.21	12.65			
Propane	6.73	8.06			
iso-Butane	1.18	1.07			
n-Butane	2.86	2.60			
iso-Pentane	1.54	1.12			
n-Pentane	1.99	1.46			
Hexanes	3.43	2.10			
Heptanes plus	57.63	15.27	0.8209	40.7	199
	100.00	100.00			

Core Laboratories, Inc.
Reservoir Fluid Division

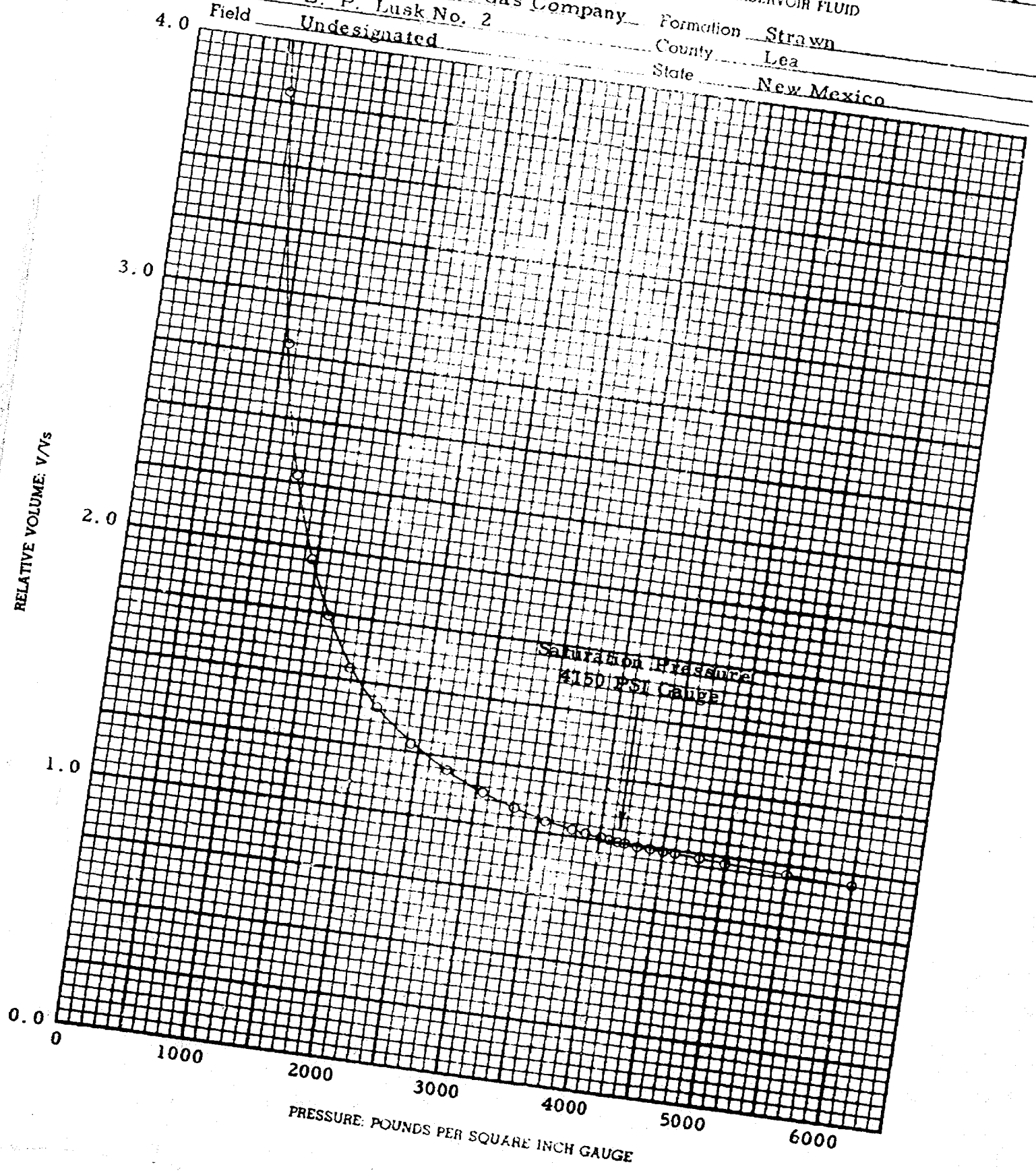
P. L. Moses (FV)

P. L. Moses,
Operations Supervisor

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

PRESSURE-VOLUME RELATIONS OF RESERVOIR FLUID

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico

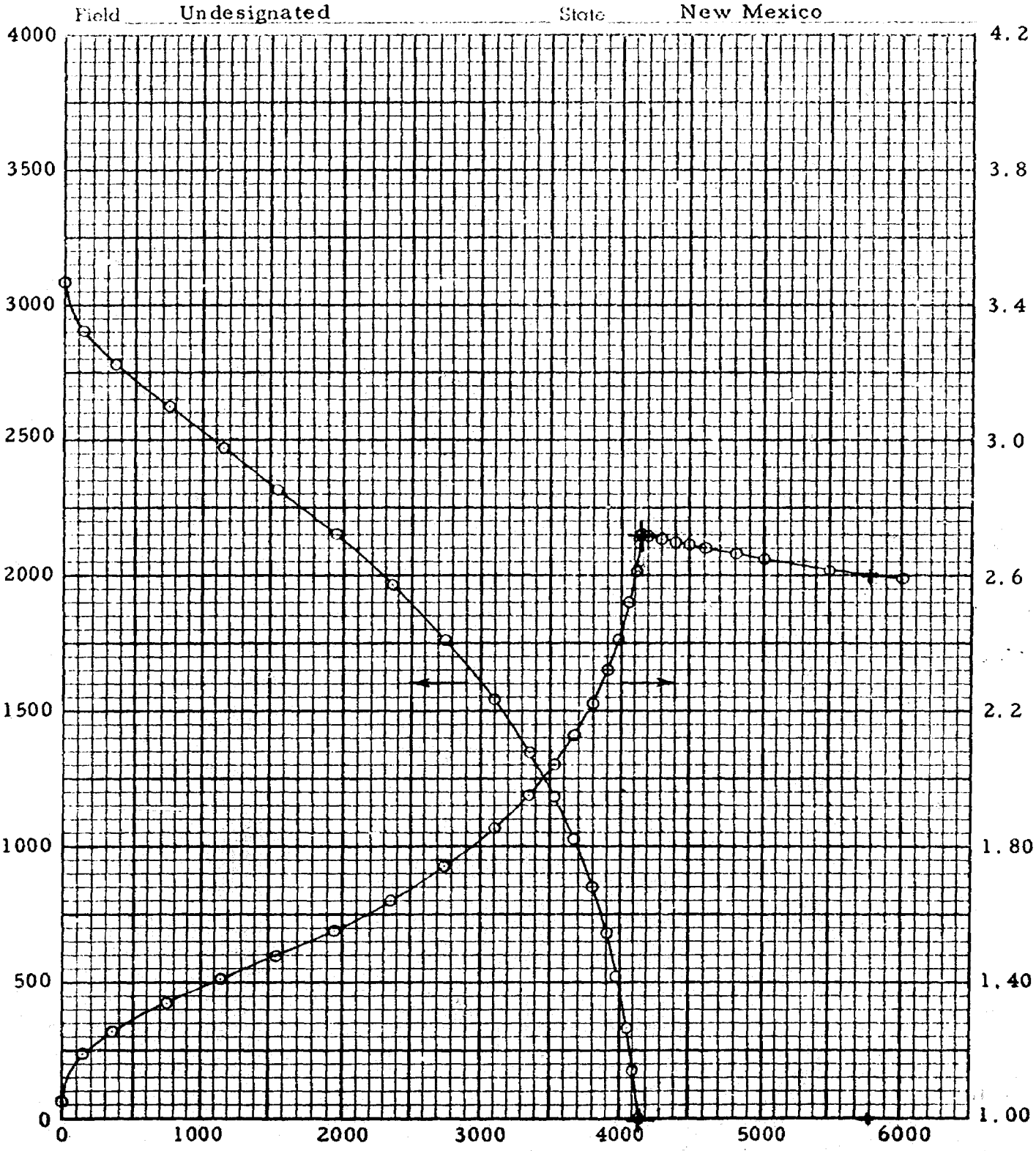


CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974

DIFFERENTIAL VAPORIZATION OF RESERVOIR FLUID

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico

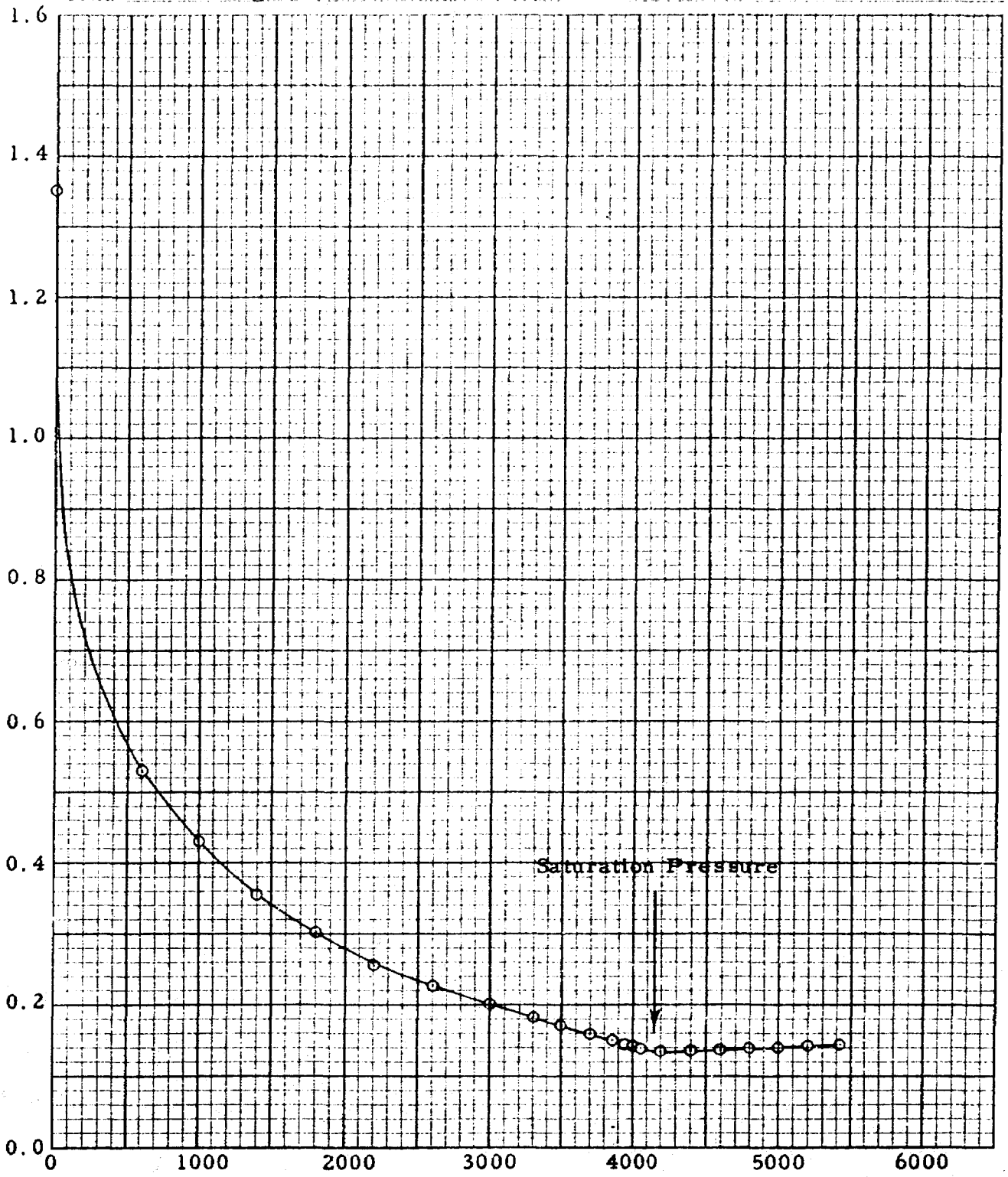


CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

File RFL 1974

VISCOSITY OF RESERVOIR FLUID

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico



CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

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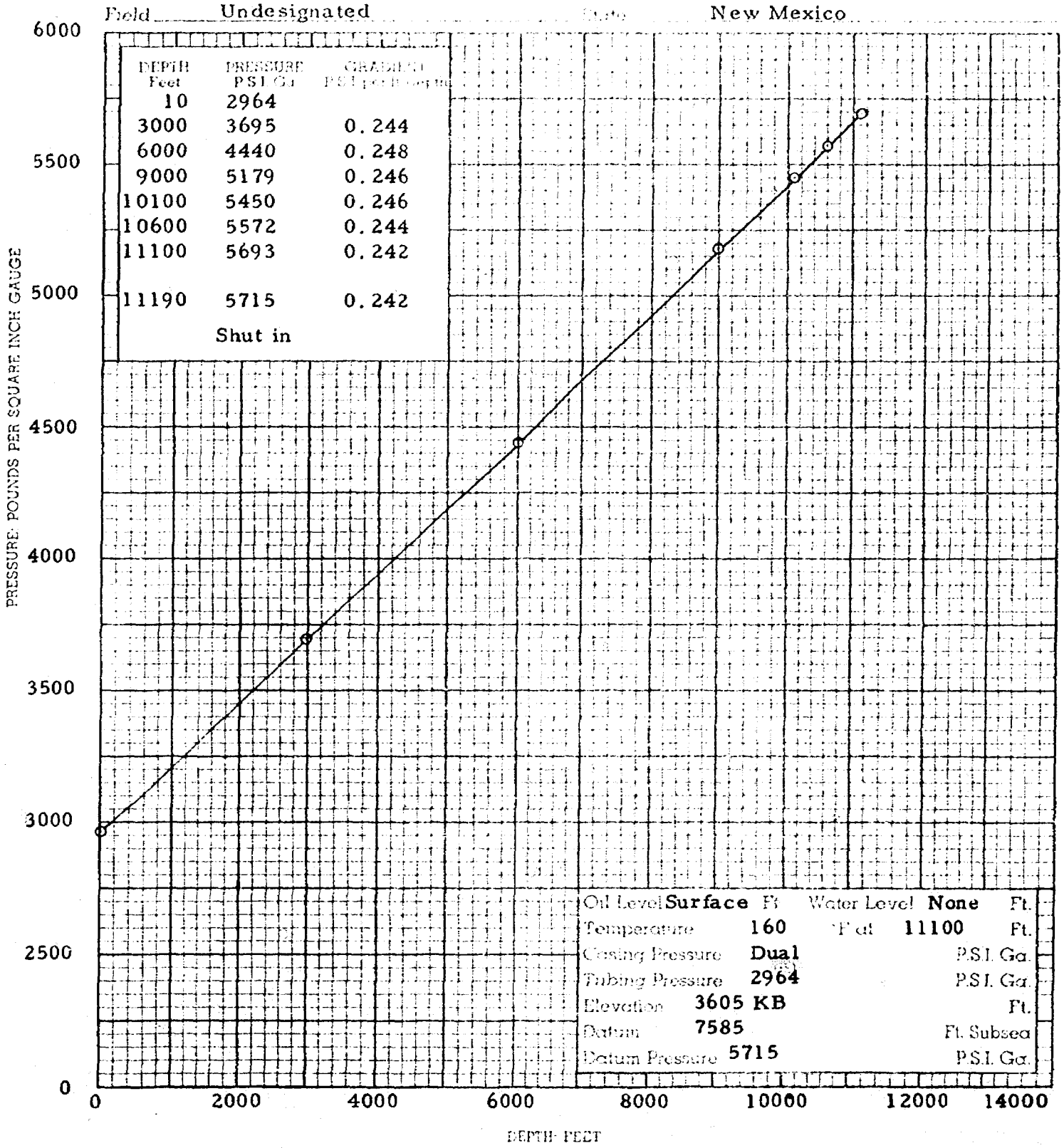
File RFL 1974

Company El Paso Natural Gas Company Formation Strawn
Well E. P. Lusk No. 2 County Lea
Field Undesignated State New Mexico

DEPTH Feet	PRESSURE PSI Ga	GRADIENT PSI per Foot
10	2964	
3000	3695	0.244
6000	4440	0.248
9000	5179	0.246
10100	5450	0.246
10600	5572	0.244
11100	5693	0.242
11190	5715	0.242

Shut in



Oil Level	Surface	Ft	Water Level None	Ft.
Temperature	160	°F at	11100	Ft.
Casing Pressure	Dual			P.S.I. Ga.
Tubing Pressure	2964			P.S.I. Ga.
Elevation	3605 KB			Ft.
Datum	7585			Ft. Subsea
Datum Pressure	5715			P.S.I. Ga.